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S JAPANESE TECHNOLOGY TAKING OVER THE WORLD?

REVIEWED INSIDE
■ Digital VCR ■ Philips DVD player

BUILD an IR data link for your PC

PLUS: Airline disasters, fog machines free radicals, alternative therapy devices, Teminator 2, and Dilbert

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LCD Meter Project

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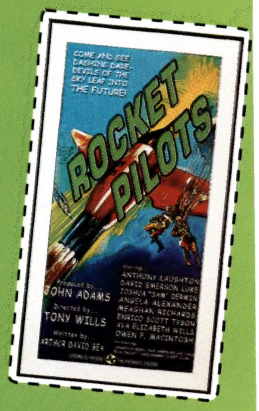
Hitachi's GD-5000 DVD-ROM

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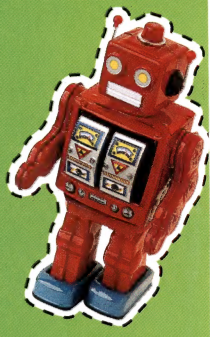


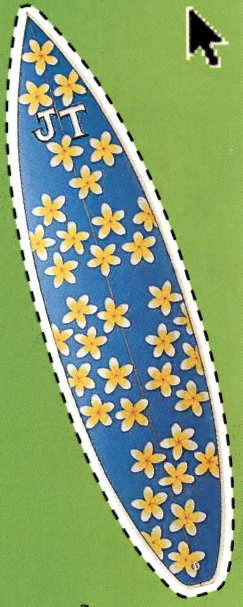
Pioneer's Happy little system













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ELECTRONICS AUSTRALIA MAGAZINE **VOL. 62, NO. 4**
APRIL 2000

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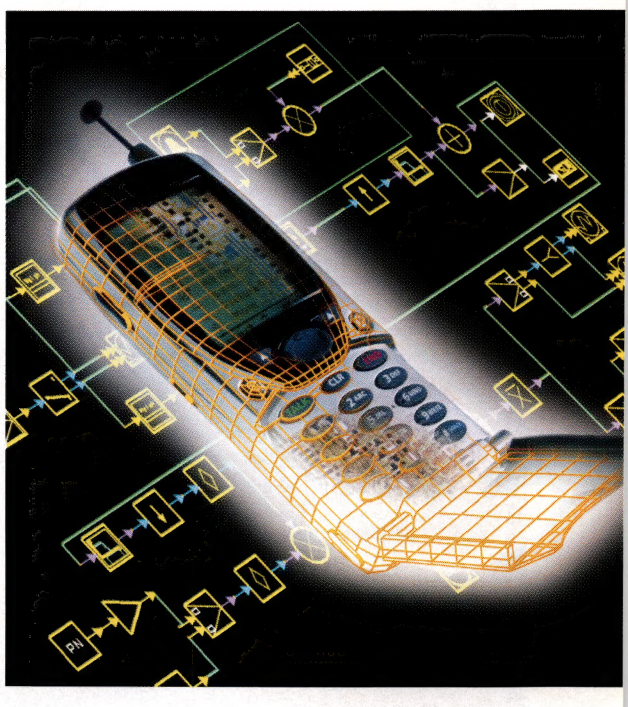


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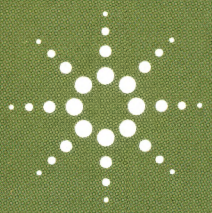
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WHAT'S NEW

IN THE EVER CHANGING WORLD OF ELECTRONICS

THIS MONTH

Proxima Ultralight DX2 Projectors

Hitachi CMP205SXU 25" Plasma Monitor

Gateway Plug'n'Play Micro Server

Denon UD-M5 Super Micro Component System

Anritsu MW9076 OTDR

Tektronix CSA8000 Signal Analyser

C-Tech C-Pen 600 Scanner an Translator

DSP Development Corp. DADiSP spreadsheet

IBM Internet PCs

Kenwood iDAB Digital Car Radio

Omnivision OV7620 Camera Chips

Neumann KMS105 Microphone

FujiFilm Finepix Digital Cameras

Pioneer DRM-7000 DVD-R Storage Library

Denon DVD-1500 DVD Player

Genex GX8500 SACD Recorder

Encore Surround Sound System

Panasonic PF90 19" Flatscreen Monitor

Dick Smith Electronics Fog Machine

IBM ScrollPoint Mouse

Sunbeam Internet appliances



FROM THE LIGHTEST TO THE **BRIGHTEST**

PROXIMA'S NEW RANGE of ultraportable XGA Projectors features the latest Texas Instruments Digital Light Processing (DLP) technology.

Weighing in at just over two kilos, the UltraLight DS2, UltraLight DX2 and UltraLight DX3 comprise the industry's first and only line of lightweight projectors that features both a zoom lens and digital keystone correction with on-screen display for the best possible image.

The UltraLight DS2 features 700 lumens, SVGA native resolution with high quality XGA scaling, and a removable Proxima video module for greater portability.

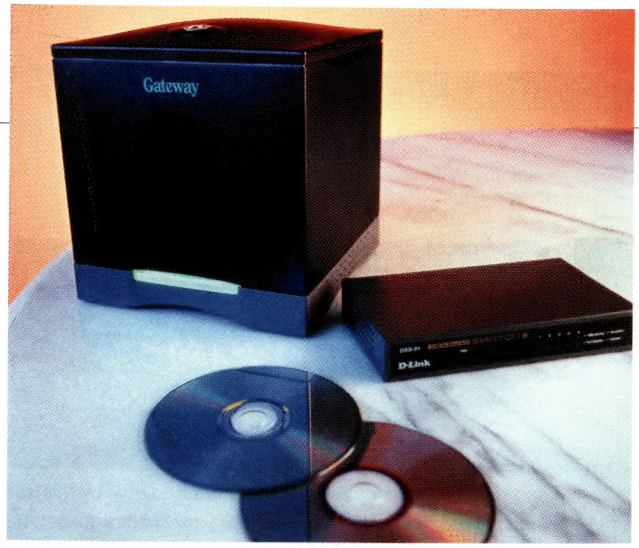
The UltraLight DX2 is compatible with SXGA computers, and video sources such as VCRs and DVDs. It features 700 lumens, XGA native resolution with high quality SXGA scaling, and Proxima's unique design that includes a removable video module. The UltraLight DX2 is the first projector to feature the new, smaller 0.7" XGA DLP chip technology.

The UltraLight DX3, Proxima's premium DLP-based projector, is the world's brightest and lightest in its weight class. With 1100 lumens, this two-kilo projector can outperform all others in a wide variety of room lighting conditions. The UltraLight DX3 offers fully-featured, state-of-the-art connectivity including video, VGA, DVI digital computer input, and USB allowing users to hot plug their mouse.

The anticipated street price for the UltraLight DS2 is US$2999; US$3999 for the UltraLight DX2, and US$5499 for the UltraLight DX3.

■ *For more information visit* ***www.proxima.com****, or their recently launched e-commerce store,* ***www.ePresenter.com****, a one-stop shop for presentation tools and accessories.*





Gateway serving in 30 minutes

GATEWAY'S NEW easy-to-use micro server appliance is designed to simplify set-up, operation and administration of network tasks such as Internet services, email, file sharing and Web hosting.

This Plug'n'Play Server, which includes a five port switch and cabling, provides a turnkey plug and play server solution for both PC and Macintosh environments. It is Linux-based, requires minimal installation and configuration expertise and can be up and running in 30 minutes.

■ *It comes in two basic configurations, 10GB/32MB or 20GB/64MB with prices ranging from $2,999 to $3,499.*

Bookshelf hifi with MiniDisc

THE NEW UD-M5 super micro component system from Denon offers a three-disc CD auto-changer and 40-station pre-set AM/FM stereo receiver with 60 watts of stereo sound quality. Among the features of its 30+30 stereo amplifier are an SDB circuit and a 4-Mode preset equaliser. There are also three audio inputs and two audio outputs, a subwoofer output, a remote control and a headphone jack.

The system provides an optional, matching MiniDisc recorder, with new PICK-REC technology, which allows the user to record the song they are listening to, even if the song is nearly finished.

■ *The UD-M5 has an RRP of $799. For more info call* ***AWA Audio Products on 1800 642 922*** *or email them at:* ***info@audioproducts.com.au.***

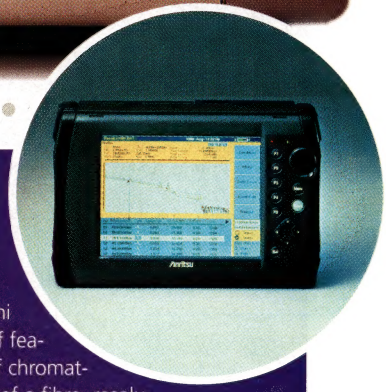


New plasma monitor from Hitachi

HITACHI HAVE JUST released their new 25" SXGA colour Plasma Display. The CMP205SXU is a new generation 25" monitor featuring the very latest in plasma screen technology. With an SXGA input capability (1280 x 1024) and wide viewing angle it is an ideal accessory for computer users in the fields of CAD/CAM and graphics design, large room presentations, monitoring applications and information kiosks.

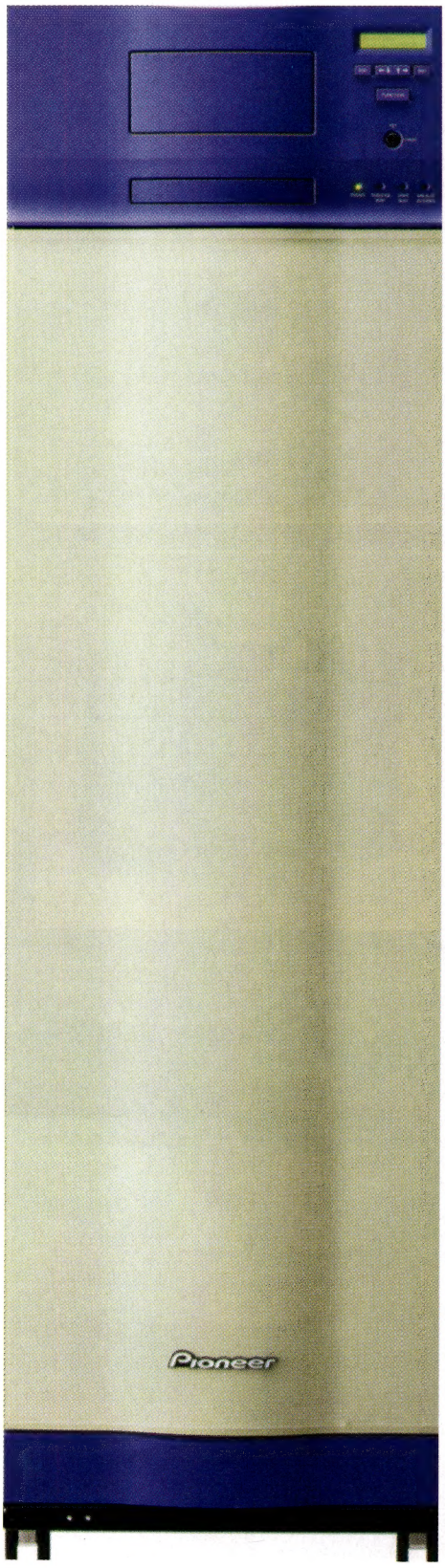
■ *The CMP20SSXU is available now from Hitachi resellers at a cool $17,400.*

LOOKS COOL, WHAT IS IT?



GIVE UP? It's a mini OTDR of course. Used for testing fibre optic cabling, the MW9076 Mini OTDR incorporates a number of features including measurement of chromatic dispersion from just one end of a fibre, resolution of 50,000 points, and an internal optical switch permitting up to eight fibres to be measured at a time.

■ *If you know what OTDR stands for, you might like to contact* ***Anritsu Pty Ltd on 1800 689 685****, and then let the rest of us know...*



Storage tank

NO, IT ISN'T an electric hot water heater, it is instead Pioneer's new FlexLibrary data storage system. The DRM-7000 is the world's first DVD-R compatible storage library capable of housing up to16 drives — including DVD-ROM, DVD-R or CD-R. it can handle 720 discs, and gives a whopping 3.38TB of storage. The DRM-7000's Hypermagazine hot-swap capability allows 20 discs to be exchanged at once without interrupting other operations. It also allows a magazine to be exchanged without interrupting changer operation, even when the power is on.

■ *If you really need somewhere to keep your MP3 collection, and don't mind the $15,000 price tag, then contact Pioneer electronics on* ***(03) 9587 1495.***

Denon DVD for under a grand

DENON HAS LAUNCHED a DVD player that has high quality home theatre sound and high grade video colour reproduction for under $1000. With Dolby Digital, DTS digital decoding and CCV (Colour Component Video) as well as S-VHS outputs, the new Denon DVD-1500 video player embodies many of the high-end audio-visual features previously reserved for DVD players costing considerably more.

A recommended retail price of $999 means the Denon DVD-1500 breaks previously established price barriers for high quality, fully featured DVD players that have the latest audio-video developments.

It also supports S-Video and composite video connections, and has a newly developed disc loading mechanism that minimises vibration that can effect visual and sound quality, together with an advanced digital servo. The DVD-1500 is equipped with a drive mechanism capable of reading discs at double speed. Information is read and held in a buffer before it is reproduced, so that no interruption is heard, should the pickup have skipped for any reason. Besides DVDs, it can also play CDs and video CDs, and there is also a compression feature for low volume listening which reduces the dynamic range without losing the clarity at low volume levels.

■ *For further information on this, or any other Denon product, phone AWA Audio products Ltd. On (02) 9669 3477, or email* ***info@audioproducts.com.***



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"Are these the best kit speakers in the world?...On the evidence, we'd have to say that VAF's I-66 design would be odds on favourite to take out the award."
Best Buys Speakers, Amplifiers, Receivers

"... don't think there's any other way you could obtain this high level of sound quality at such a low price..."
Australian HI-FI

"The VAF DC-Series home theatre system exhibits a new benchmark of excellence in every criteria: construction, design finish , innovation...it seems almost churlish to mention the astounding value that each of these components represents."
Best Buys Home Theatre

"A new benchmark in excellence in every criteria: construction, design, finish, innovation."
Best Buys Home Theatre 97' 98'

"Highly and unreservedly recommended."
Best Buys Home Theatre

"... In value for money stakes or even sound for dollar stakes for that matter, they're nigh on impossible to beat."
Australian HI-FI

"We love the DC-Xs. These are true high fidelity speakers, and deserve a pedigree second to none. we are confident that that will be the case in time. Their performance is a revelation. The combination of the DC-Xs, the DC-6 and DC-2s is a happy, fully compatible, articulate and balanced system that beats anything we can think of in its price range. Actually,probably close to twice its price range."
Best Buys Home Theatre 98' 99'

"All areas of the DC-X's performance could easily be attributed to models costing a great deal more...The very design of the DC-x sets a few new standards in speaker engineering, some of which help it achieve incredible levels of versatility across amplifiers and source products and Home Theatre applications...Amazing value!"
Audio Video Lifestyle Magazine

"Unmatched performance at the price.The new DC-2 significantly raises the standard by which speakers at its price will be measured. This speaker is destined to become a classic."

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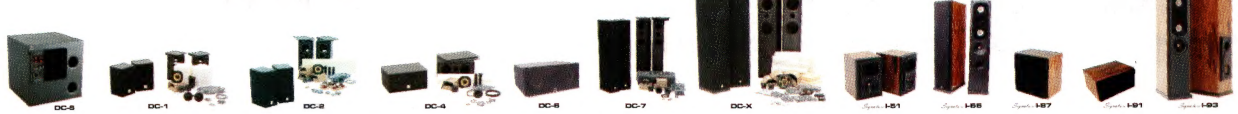
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NEWS HIGHLIGHTS



CPU BUNFIGHT CONTINUES

AMD HAVE DEMONSTRATED a 1.1GHz version of the AMD Athlon processor, manufactured in its Fab 30 facility in Dresden, Germany. The demonstration featured the newest version of the AMD Athlon processor that integrates high-performance on-die Level 2 (L2) cache. The device is manufactured using AMD's HiP6L 0.18 micron process technology featuring copper interconnects. The demonstration required no special cooling techniques and was shown in conjunction with a presentation at the International Solid-State Circuits Conference (ISSCC).

AMD have also reached a computer industry milestone by announcing the first of shipments of 1GHz Athlon processors. The first commercially available systems based on the 1GHz AMD Athlon processor will be available from Compaq Computer Corporation and Gateway. Compaq have broken the 1GHz frequency barrier by announcing models of the Presario family that support the 1GHz Athlon chip.

AMD is currently shipping its 1GHz Athlon processors priced at US$1,299 in 1,000 unit quantities. They've also announcing the availability of 950MHz ($999 in 1000 lots) and 900MHz ($899) AMD Athlon processors

Meanwhile, the slugging match between AMD and Intel continues with Intel striking back with demostration of a 1.5GHz processor, using its next generation Pentium processor developed under the code name Willamette. Early production versions, available as early as the second half of this year, will run at around 1.3GHz.

For the moment, the announcement has put Intel back in the processor performance leadership role, after AMD had upstaged Intel by showing off a 1.1GHz Athlon chip just a week earlier.

The new Willamette microarchitecture will be Intel's first new architecture for its 32-bit chip family since the PentiumPro chip was launched in 1995. Intel said the production models of the Willamette will be guaranteed to run at more than 1GHz. In addition Intel plans to sell a version of its current Pentium III chip running at around 1GHz. "We will be shipping hundreds of thousands of Willamettes by the end of this year", said Albert Yu, general manager of Intel's microprocessor products group.

While some analysts have begun to wonder how fast PC processors need to be, Intel chairman Andy Grove said the additional power will enable developers to bring advanced new capabilities to the home and office which simply cannot be offered on current PCs. And for server systems, there is almost never enough processing power a chip can supply. "Performance on the server level is absolutely mandatory", Grove said.

Intel wouldn't say if the Willamette will be called Pentium, but regard the company's Pentium brand is too valuable to ignore. "It would be fair to assume that we'll find a way to leverage that name", they said.

Intel also introduced a new low-priced chip called Timna, aimed at inexpensive PCs. It will be available this year. Timna is named after a national park in Israel where it was designed, and will be part of the Celeron line. The chip integrates both processor functions, a memory controller and a graphics controller.

When it comes to actually shipping processors though, AMD still has the last word with its history-making 1GHz Athlon.



FIRST COLOUR PALM

PALM HAS LAUNCHED the first colour version of its popular palm handheld organizer. The Palm IIIc will retail in the United States for US$440.

"We believe this is the lightest, smallest, full-functioning hand-held computer anybody is offering today", boasted John Cook, director of consumer product marketing at Palm, which remained under 3Com ownership while Palm raised an expected US$570 million in an initial public stock offering.

The Palm IIIc comes with 8MB of memory. The system weighs just 6.8 ounces, compared to 11 ounces of the competing Compaq Aero 2130.

Drawbacks of the system are a current lack of colour applications, although that is likely to change as many developers are expected to add colour to their Palm software. Also, the colour machines consume more power, reducing battery life to just five hours of continuous use.

Cook believes the Palm IIIc will compete effectively against the other colour systems, which are bulkier and have even less battery life than the Palm system. However analysts said that many customers may be disappointed. Market research shows that users do more on colour machines, such as playing games. The short battery life will cause many users to keep their sessions on the Palm IIIc much shorter than they may like.

DRIVING ONLINE OR ONLINE DRIVING?

NICK DIFIORE OF VISTEON Automotive Systems demonstrates the company's new ICES (Information, Communication, Entertainment, Safety and Security) system in preparation for its unveiling at the Consumer Electronics Show in Las Vegas. ICES, using voice commands, provides drivers with access to the Internet where they can check e-mail and obtain real-time information such as news, weather reports and stock prices. The system, which also provides access to turn-by-turn navigation systems, will be available later in 2000. (WirePix)





HP LAUNCHES ITS NETWORK PC

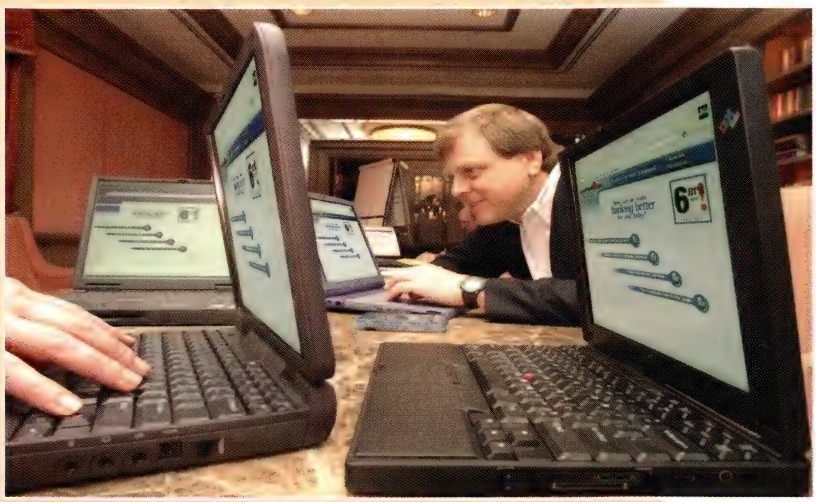
FOLLOWING IN THE footsteps of Compaq, Dell, IBM, and others, Hewlett-Packard has launched a stripped down, low-cost PC for use in corporate networks. The e-Vectra starts at just US$549 without a monitor and floppy drive. It measures about half the size of a VCR.

The stripped down machines are the industry's answer to increasing demand by corporate customers to reduce the average annual cost of maintaining PCs. Many corporate users have very little use for some of the more popular features in a standard PC system. Companies can save vast sums by providing those employees with lower-cost machines that feature fast processors and big hard-drives, but no slots for expanding memory and other technology that make the boxes bulky and expensive to service.

"It's the new breed of desktop. It's smaller, neater and less cumbersome", said analyst Roger Kay of International Data Corp. "This is a first step in the conversion of desktops over to Internet appliances."

Hewlett-Packard calls the eVectra 'legacy-lite', meaning it contains some older technology for connecting printers and other devices, along with newer universal serial bus (USB) ports.

The eVectra will compete with machines such as Compaq's US$499 iPaq and Dell's $699 WebPC. The eVectra comes with an optional CD-ROM or DVD drive, an 8.4 gigabyte hard drive, and the choice of a 500MHz Celeron processor or a 600MHz Pentium III.



INTERNET BANK

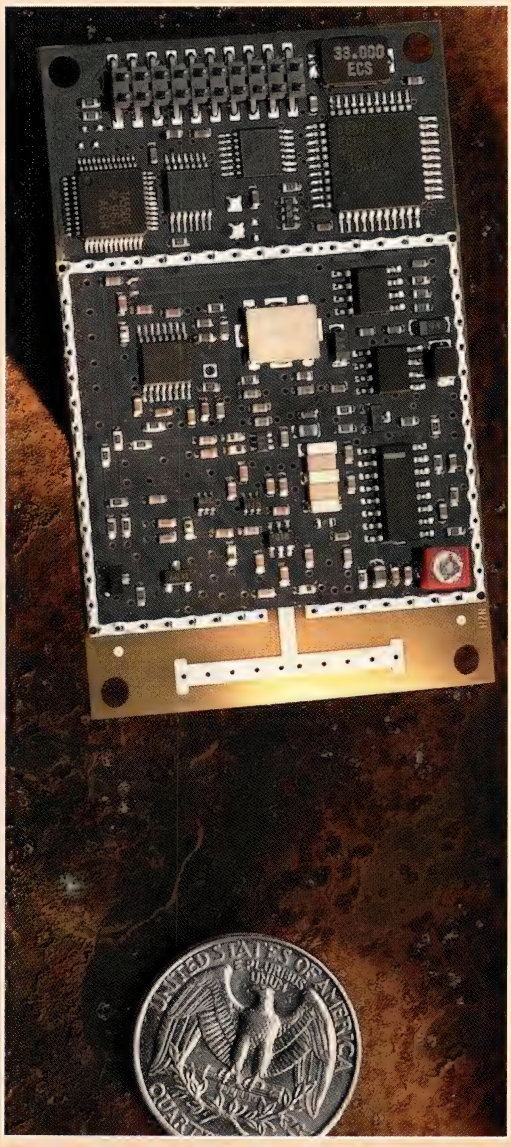
INTERNET-BASED EVERBANK.COM opened its virtual doors in New York earlier this year, offering interest yields (on checking) of more than six times the national average. Forecasts are that over 30 percent of US households (26 million people) will bank online by 2003. According to Everbank, their new web bank also offers Instant Decision Mortgages, the "fastest mortgage on earth," through its Real Estate Center.

NEWS HIGHLIGHTS

MICROSOFT CD-ROM HOLOGRAM

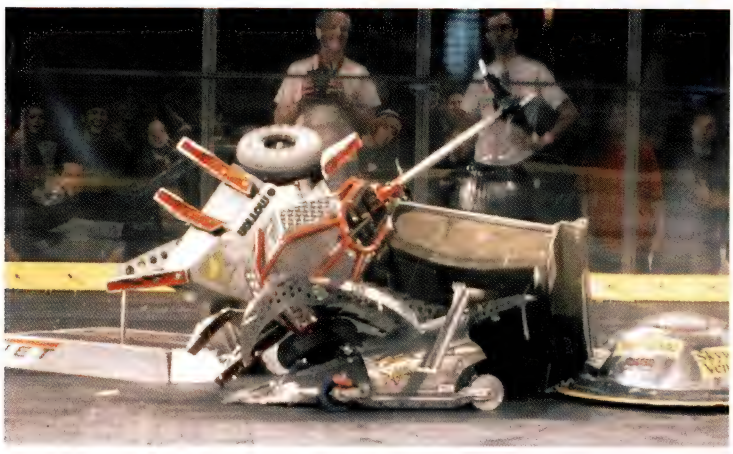
MICROSOFT'S NEW EDGE-TO-EDGE CD-ROM hologram is intended to thwart counterfeiting of Microsoft Windows 2000 — as if...





HOPPING TRANSCEIVER MODULE

KANSAS FIRM AEROCOMM INC. has just released the LX2400, first in its ConnexRF family of low-cost data transceiver modules for OEM use in handheld terminals, security systems, remote controls and consumer electronics. The LX2400 operates at 2.4GHz and is the first such unit to employ frequency-hopping spread spectrum (FHSS) technology, for superior security and low interference. (Business Wire photo)



ROBOT WARS CHAMPIONSHIP

ALWAYS A FACINATING ABUSE of technology, the Robot Wars BattleBots are at it again. The remote controlled robots recently battled it out in the world premiere of the BattleBots World Championship: Bot Bowl 1 (as in Super Bowl — get it?). Check out the internet for competition results, robot designs, how-to articles, case studies, and loads of action shots.

MITSUBISHI DONATES TO AUSTRALIAN UNIVERSITIES

MITSUBISHI ELECTRIC AUSTRALIA has announced a generous support program for Australia and New Zealand university engineering students, involving the donation of 1400 16 Bit MCU Development Kits to electrical engineering faculties. The program was officially launched at Sydney University, by Mitsubishi Electric Australia's Executive Director, John Hill and Senator the Hon Richard Alston, Minister for Communications, Information Technology and the Arts.

The MCU Development Kit contains Mitsubishi Electric Australia's M16C 62 Series Flash MCU, and the relevant hardware and software for programming and testing applications. Using this kit, electrical engineering students will gain hands-on experience with the latest MCU technology.

The M16C 62 Series combines RISC/CISC architecture to produce C code efficiency. It offers extremely low power consumption, 8 MIPS performance and a high number of peripheral circuits, as well as In-Situ FLASH programmability. The 62 group offers superior performance and the versatility for today's complex electronic products.

According to Mitsubishi, that this is the first time such a wide reaching program has been initiated in Australasia. A similar program, based on the Australasian model, will be extended overseas into universities in the UK around April. ■



Left to right: Mitsubishi's John Hill, Senator Alston and Professor Judy Raper officially launching the Mitsubishi Electric Australia Young Engineers MCU Development Program.

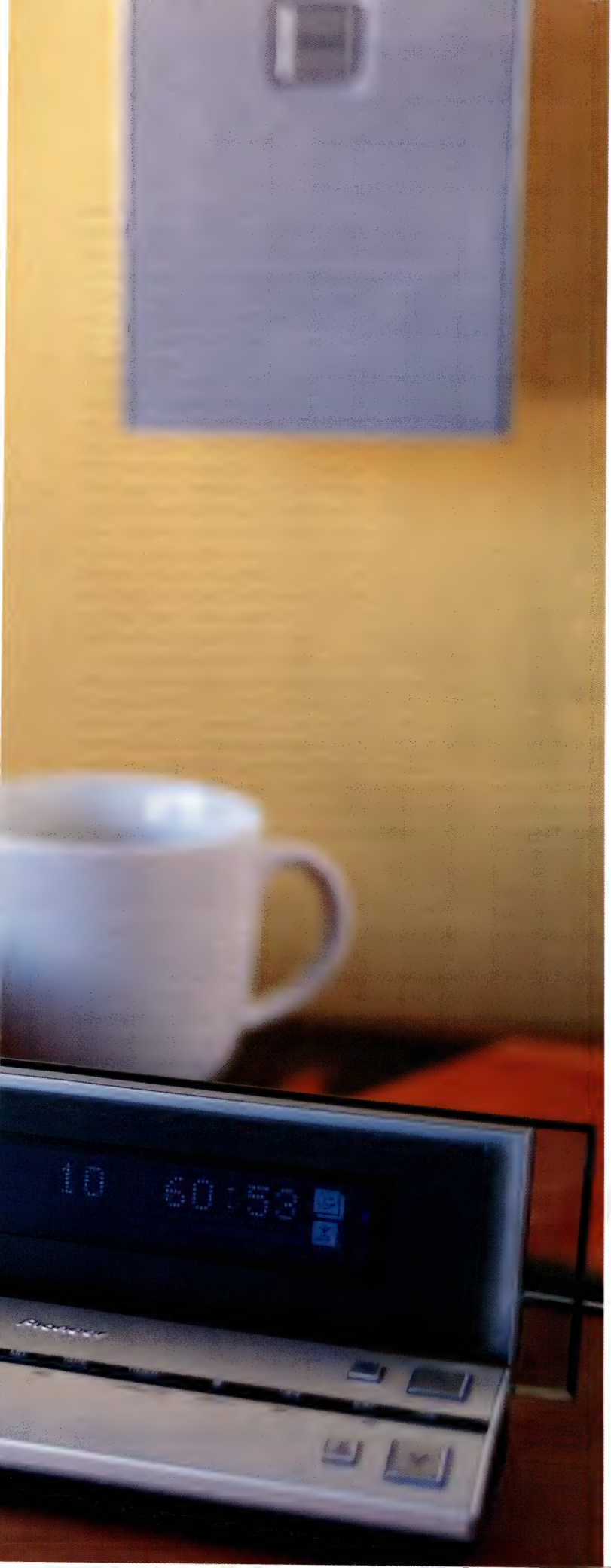


PIONEER'S BOLD NEW EQUATION:

L+8=LIFESTYLE

By **Rob Evans**





A mini hifi system is just a bonsai version of the real thing, right? Shrink the amplifier, CD player and speakers, and you have a setup that takes up little space, sounds pretty good, and can be easily recognized as a hifi system — job done.

UNTIL QUITE RECENTLY, this has been the design approach taken by most audio gear manufactures — with a few notable exceptions — in order to satisfy the booming consumer demand for compact hifi systems, apparently spurred on by our space-conscious modern lifestyle. The array of mini (compact, midi, or whatever spin you'd like to put on it) hifi systems on retailers shelves have mostly been in this bonsai category, with a few tearaway models featuring front panel display pyrotechnics that would put Sydney harbour's Y2K celebrations to shame.

A limited choice of bland or tacky, some would argue.

This conservative approach to small hifi design is not the only way though, as mainstream manufacturer Pioneer Electronics is now demonstrating with a fresh new breed of compact systems that have been designed with a heavy emphasis on function, and style. Gone is the scaled-down 'when I grow up I want to be a hifi system' look, and in its place is a futuristic — even minimalist — looking setup that integrates the electronics into one small block, but brings the controls and display (shown here) out to the user via a cable.

Loosely grouped under the banner of Lifestyle Systems, Pioneer have a number of variations in the new range, including their Vision Plus 5.1-channel home theatre setup plus two almost identical hifi systems - models L+8 and L+9. The common thread here is the separated control/display unit, the electronics in a small integrated block, and speaker systems made up from tiny wall-mount units and a single subwoofer. It's a highly stylised approach that's perhaps not to everyone's taste, but it's undeniably space efficient and a welcome change amongst the sea of conventional-format mini hifi systems.

Lifestyle L+8

Priced at $1299, the L+8 mini hifi is the starting point in Pioneer's Lifestyle range, but can be expanded with matching add-on units (minidisk, cassette, and soon to come, a CD recorder) via a multiway ribbon cable setup. The system as it stands is an AM/FM receiver and CD player in a compact block (220 x 75 x 318mm), plus a set of shallow satellite speakers (123 x 240 x 70mm) and a chunky little subwoofer (150 x 340 x 305mm) - all in a muted silver, grey and black colour scheme.

This might sound fairly uninspiring on paper, but it's really the execution of this concept that sets the Lifestyle system apart from other compact sound systems. The focus of the whole arrangement is the unusual display/control unit, which is tethered at the end of a 1.5 metre cable and features large-digit fluro display plus a detachable 18-button remote control.

The clever bit here is that the display/control unit can be positioned just where you like it (presumably in a prominent spot) while the receiver/CD module is free to sit in the most convenient or discrete location on the shelf. You can even wall-mount the control/display unit, by the way, plus detach

Philips' DVD 718

The new Philips DVD 718 seems to be an updated version of the company's earlier model 725 DVD player, which we reviewed last August. Although there are no new facilities, it does offer good solid video and audio performance at a significantly lower price. By Jim Rowe

ALTHOUGH PHILIPS was one of the firms which played an active role in developing DVDs, since then they seem to have been content to let other firms occupy the 'bleeding edge' positions in pushing DVD player technology. They've certainly been releasing updated models, and at roughly the same rate as most of the other firms; it's just that *their* models have often been at the middle or lower end of the market, lacking some of the bells and whistles found in other firms' new offerings.

I guess this is a very sensible approach from a marketing, sales and profitability point of view, even if it doesn't leave reviewers like me with much to get enthusiastic about!

The new DVD 718 is a prime example. It's almost identical with the model 725 that I reviewed last August, in both appearance and performance; the only obvious difference is that the 725's Karaoke facility with its dual microphone inputs and volume controls has gone, which is probably no great loss for Australian buyers.

While there's no great technical excitement about the 718, then, it's nevertheless a well engineered product in terms of both build and performance. And the real point of interest is its *price*: the RRP has now dropped 27% — from $1095 down to $799. If that's not dramatic enough for you, I've already seen it on offer in one chain of discount stores for $599, or $499 after trading in 'your old VCR'!

Philips may not be setting the pace in terms of technical bells and whistles, then, but with the DVD 718 they're certainly doing so in terms of driving the prices down. This should give it great appeal for first-time DVD player buyers, as there seems to be only one other player currently down at this 'economy' pricing level.

So what do you actually *get* for your $499 after tradein? Quite a neat and functional basic DVD player, in fact, in its low-profile light-grey case with satin silver front panel.

There's an S-video (Y/C) output in addition to two composite video outputs, to provide greater flexibility in achieving better image reproduction. And there's not one but *two* pairs of mixed-down stereo audio outputs, to hook up to your stereo or Pro-Logic surround sound system.

While there's no built-in digital multi channel surround sound decoder, you do get both digital and optical bitstream outputs to drive an external decoder, or one in a late-model AV amplifier. And as well as knowing how to squirt sound tracks with Dolby Digital encoding out through these bitstream outputs, the DVD 718 is also 'DTS compatible' — meaning that it also knows how to pass these out too. In fact it does the same with MPEG2 tracks, MPEG1 tracks (as on Video CDs) and even the uncompressed PCM sound on standard audio CDs.

By the way, one feature that the DVD 718 *has* retained from its predecessor the 725 is its built-in 'virtual surround sound' processor, to produce a synthetic surround sound effect when you use the player's mixed-down analog stereo outputs with a standard stereo TV or hifi system. As with the model 725 the 718 uses SRS TruSurround technology, licensed from SRS Labs Inc.

This feature will no doubt be found quite attractive by the many consumers who as yet haven't invested in a full surround sound setup, so it's nice to see that it has been retained.

Another 725 feature that the 718 retains is the ability to play CD-R and CD-RW discs, as well as pressed CDs and DVDs. This is by virtue of it having a dual-wavelength laser pickup, operating at either 650 or 780nm. Not a feature of great importance to many non-technical consumers, perhaps, but nevertheless one that can be handy — and uncommon even on players selling for three times the 718's price.

THESE ARE ALL VERY ACCEPTABLE FIGURES, AND ESPECIALLY SO FOR

Again the 718 retains the 725's 'Resume' function, which lets you reload any of the last four discs you've had in the player, and begin playing its movie from exactly where you left off. It's not a feature that I tend to rate all that highly myself, but you might find it handy if you can only watch DVD movies in short sessions...

Other features that the 718 retains from the 725 include a front-panel stereo headphone jack with its own volume control; a 'parental control' PIN-code feature that can be used to restrict which discs can be viewed by children; a selectable 'autoplay' function; and the very handy programmable horizontal picture facility, allowing you to centre the picture accurately on your TV/monitor/projector screen.

The rated video performance of the 718 when playing DVDs seems to be the same as the 725, and quite impressive: roughly 500 lines of resolution using the S-video output and a good monitor or TV. It uses the same 10-bit video DAC, not surprisingly.

As before the 718 also uses 24-bit DACs for the built-in audio decoder, which handles the stereo PCM from CDs



or the stereo/Pro Logic mixdown sound from multichannel DVDs; this gives excellent waveform resolution and improved distortion and noise performance. As a result the rated audio performance is also virtually identical with the 725, with a frequency response of 4Hz - 20kHz for CDs and 4Hz - 22kHz for DVDs. The signal to noise ratio is quoted as better than 96dB and typically 100dB, with 90dB dynamic range, crosstalk at 1kHz better than -100dB and distortion and noise at 1kHz better than 85dB down.

As mentioned earlier the 718 is physically almost identical with the 725, like it measuring a modest 435 x 305 x 68mm and weighing only 4kg. It again draws only 20 watts when operating and 5W in standby mode. It also comes with virtually the same compact IR remote control.

What we found

We were able to test a sample of the DVD 718 for a couple of weeks, which allowed us to both run the instruments over it and also try it out in a typical home theatre situation.

On the instruments, the sample 718 seemed to give measurements that were if anything slightly better than we were able to achieve with its predecessor. Measured frequency response with our test CDs was flat within +0dB/-0.15dB from 2Hz to 20kHz, and only 3dB down at just below 22kHz

AN 'ECONOMY' PLAYER.

— virtually ruler flat. Channel balance was excellent, within 0.03dB, while the replay linearity was very good indeed down to -90dB. With a 20kHz low pass filter we were also able to achieve a S/N ratio of better than 98dB, and virtually the same figure for crosstalk. These are all very acceptable figures, and especially so for an 'economy' player.

The squarewave and impulse performance turned out to be in the 'very good' category, with only a moderate amount (about 7.5%) of symmetrical ringing due to the anti-aliasing filter.

In the home theatre setup I was able to try out the DVD 718 with the new Denon AVC-A10SE five-channel AV amplifier, and take advantage of that amp's built-in decoding for both Dolby Digital and DTS 5.1-channel discrete surround sound. As mentioned in the Denon review I was using my own collection of speakers with the amp, but all of quite good quality. The images were being displayed on a high quality Sony 68cm stereo TV.

Checked out with the Video Essentials test DVD, and using the S-video output, the 718's video proved to be extremely good. There were virtually no colour artifacts on the moving Fresnel zone plate pattern, and the horizontal resolution (NTSC) clearly extended to beyond 400 lines. As you'd expect this translated into very clean, sharp images with some of my reference movie discs.

There was nothing wrong with the sound quality, either. I tried both the 718's mixed-down analog audio, via the Denon's analog inputs and played in either stereo or Dolby Pro Logic (i.e., matrix surround), and its optical bitstream output for full Dolby Digital 5.1-channel (even 6.1-channel: see the Denon review) discrete surround. In each case the sound quality was subjectively about as good as you could wish for, using that method — but of course that was at least partly due to the capabilities of the Denon amplifier.

Overall, then, the Philips DVD 718 gave a very impressive performance, with any of the DVDs and CDs I tried. There's no doubt that it's a very good player in anyone's terms, despite its low-end price and 'no frills' approach.

If you're after a good basic DVD/CD player, it would be very difficult to find one offering better value for money.

Not a bell or a whistle in sight, but for the price, no one's complaining... The remote is nothing special either, but it's easy to drive and does the job.



PERFORMANCE RATING: PHILIPS DVD 718



A compact 'low end' DVD movie and CD player.

Good Points: Very good video and basic audio performance; S-video and optical/coaxial bistream audio outputs; able to play CD-R discs; resume function etc. Also very low street price!

Weak Points: Fairly basic facilities; no component video outputs or built-in surround decoding.

RRP: $799 (street price typ. $599)

Available: Many AV dealers. For more information call Philips Electronics on 1300 36 3391, or visit its website (www.philips.com.au).

JVC's dynamic duo
The DVS1 DV/S-VHS VCR

Suddenly, there is a lot of attention being paid to consumer level digital video recording. While Hitachi makes its early announcements about a DVD camcorder, **Barrie Smith** looks at JVC's move to market with a recording device that straddles the current standards in digital and analogue video.

IT WAS IN the summer of '91 when I last fiddled with one — a double deck VCR with a pair of stacked VHS units. Made by Amstrad, the unit cost just under $1000 and with it you could dub VHS to VHS copies or make endless repeated replays from the paired players. HQ equalisation had just come in, so the copies were of better than 'good' quality. Within weeks of its appearance in stores, though, the forces that maintain copyright in this country had it removed from the shelves, fervently aware of its prowess in making pirate tapes. There hasn't, as far as I know, been anything like it since.

So here we are, wound forward to '00 — with a double deck VCR again, but this time the double deck is more of your side-by-side. This time of course, digital is all the go, so JVC in its marketing wisdom has seen fit to pair one MiniDV recorder/player on the left, with a matching S-VHS/VHS device slipped in over to the right.

Cosmetically smart, with its champagne brushed satin fascia, the twin VCR would sit happily in almost any stylish decor, thanks in part to its uncluttered front panel. The deck itself is a little heavy, at 7.6kg and a touch bulky, measuring 440 x 130 x 380mm. But, aside from the hefty price, the JVC unit is a remarkable machine in many other ways.

Look under the full width, half height front panel and you discover AV inputs and pushbuttons to drive each deck — no doubt to help out if, on some future day, you find the remote loses itself!

For what it's worth, the largish remote has 38 buttons, a jog/shuttle and a four-way rocker for channel selection and other modes. In appearances, the remote has to be the most busily labelled device I've ever come across. But the good news is that after a few days with it, the loads of text sprinkled across the remote made operational sense.

COSMETICALLY SMART, WITH ITS CHAMPAGNE BRUSHED SATIN FASCIA, THE TWIN VCR WOULD SIT HAPPILY IN ALMOST ANY STYLISH DECOR

Fully-configured

The DVS1 is, all respects, a fully-configured VCR deck. It records vision in DV, S-video or VHS, and sound as PCM digital stereo (for DV) and hifi VHS stereo (for S-VHS/VHS). With all this, taping high quality programmes off air takes on a new glow; you can set up its internal tuner to bring in all the stations, it has a timer so you can preset the deck for unattended recording, and it has a useful random edit facility for dubbing a final assembly from the DV side to S-VHS or VHS. There's also a 99 channel frequency-synthesised tuner with Hyperband on board as well.

Other features include a multi-band TV/satellite compatible jog/shuttle remote, a multi-lingual colour on-screen menu, NTSC and VHS playback on PAL TV with hifi audio, and auto or manual tape tracking. It even has the ability to make 50 repeat playbacks — if you need such a mode!

For the discriminating, here are the extra nice bits: you can record off air from an antenna input, from a line input from a composite signal device, from a component S-video source, or from a DV source. And you can record any of these signals onto DV or S-VHS/VHS. Think about it: off air recording in digital... It's a pity the MiniDV cassettes are no longer than 90 minutes in LP mode!

Setup

As is the way with these things, this clever VCR arrived minus the instruction book — which arrived a week later. With such a complex instrument it was not easy to get the basics in step — but at least one proud achievement of mine was to tune all the stations in my area, flying blind.

I was also easily able to make copies onto DV or VHS — but not to and from each other. The latter task and many others had to wait until the manual arrived, complete with the answers. Over 80 pages of 'em!

Video-wise

In one way, the DVS1 is a response to Apple's iMac DV computer — for those keen on digital video, and find that while they are video-wise, they may well be profoundly computer-ignorant. The JVC unit will answer many a need; you could assemble and complete an edit, then make a sub-master on S-VHS good enough to make acceptable third generation VHS copies. No cables needed, no computer savvy required.

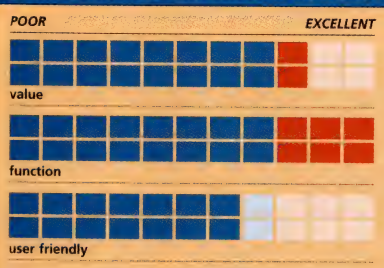
The front of the deck has the usual — and gold plated — inputs for composite and component camera connections as well as a DV/IEEE 1394/FireWire/iLINK two-way terminal. The rear has the usual in/outputs for an antenna, an S-video output and SCART connectors which can (with a SCART-to-RCA adapter) accept composite video and stereo sound signals.

Camcorder world

Borrowing some touches from the camcorder world, the DVS1 has an array of digital special effects like classic film, monotone, sepia, strobe and date insert that can be applied to the DV output during playback while you dub to S-VHS or VHS. There is also a 10X digital zoom — but go past a 3-5X digital enlargement and you get an eye full of pixels. For me, a 10X digital zoom — or even worse, the 100X often claimed for



PERFORMANCE RATING: DVS1 DV/S-VHS VCR



Good Points: Analogue and DV in/out fully on tap.

Bad Points: Lack of NTSC recording. Audibly noisy in operation.

The extras: This is not to say that these points they are JVC exclusives, but more an indication of the design thrusts found in current highly-specified, usually higher priced VCR decks.

Important are JVC's proprietary DigiPure technologies — a group which includes a TBC (Time Base Corrector), 3D Colour circuitry for improved colour separation and S/N ratio, and the 3R picture system which applies edge correction to the luminance signal to enhance detail.

camcorders — is mere marketing bait.

The Random Assemble editing function mentioned earlier allows you to preselect eight scenes — eight sets of eight 'in points' and eight 'out points' — right down to the frame, and in this fashion you can set up a jump free edit session. The basic set of eight scenes can be multiplied eight times to take the eventual tally to 64. Deft frame freezing on the record machine means the total of 64 scenes could possibly be extended even further.

Selecting the precise frame for the scene beginning and end can be performed using the deck's accurate jog shuttle control. Set up the dub to the S-VHS/VHS side and the DVSI will automatically seek out the points you've chosen on the MiniDV tape, and dub them over to Super VHS/VHS in exactly the order you want.

Furthermore, you get to choose from among four fades and 13 wipe styles to be automatically applied to scene transitions during the editing operation. Other advanced editing techniques such as insert editing and audio dubbing can also be accomplished.

So who needs it?

I must confess I am at a loss to know which specific market sector would account for the major sales figures. But it is obvious that semi-pro video makers like the wedding crowd and low budget corporate video creators would probably extract great benefit from the DVS1.

The domestic user? Probably only the cash-rich video enthusiast who spends weekends dubbing the Sunday night movies to give the relos — and the camcorder crowd still wary of those Wintel/Macintosh boxes.

In detail the technologies are:

- The Precision 3-D colour circuit to provide clear colour separation without bleeding, sharpens image edges, and recovery of colour in small areas.
- Digital 3-D YNR which applies the Hadamard transform algorithm to reduce fine dust-like noise in the picture.
- Digital 3-D CNR which removes uneven colour noise from the picture and improves the S/N ratio by approximately 3dB.
- Digital 3R Picture System which applies edge correction to the luminance signal to enhance detail.

DigiPure technology is described as a group of digital-based 'picture improvement' technologies that help reproduce a video picture relatively free from noise, interference and artefacts. The overall idea is to take maximum advantage of Super VHS's inherent high-resolution picture.

At the base of the DigiPure technology array is JVC's original Digital Wide TBC (Time Base Corrector) which digitally removes jitter from fluctuating video signals. By applying 3-dimensional signal processing technology to the video playback signal which has been 'purified' by the TBC, blotchy noise that could not be eradicated using 2-dimensional noise reduction can be reduced by approximately 3 to 4dB, while colour smear and bleeding are dramatically improved. Also, unlike 2-dimensional NR, there is extremely little degradation in diagonal resolution, making it possible to reproduce finely detailed images.

Saving the best for last

The grandly labelled Biconditional Equalised Tracking System (BEST) checks the tape in use during recording and playback and compensates to provide the highest possible recording and playback pictures. The default mode is 'on' for both record and playback.

JVC also market a digital printer (GV-DT1/GV-DT3) which connects direct to the VCR's DV output. This is interesting, as this possibly makes the device the market's first FireWire printer! ■

Blimey! It's a Happy Tune



Just when you though it was safe to check out small sound systems for the kitchen or a kid's bedroom, along comes Pioneer's Happy Tune to confuse the issue. More like a mini hifi system than the portable radio/CD unit it's designed to replace, the Happy Tune is just what fashion-conscious young people want, apparently. **Rob Evans** grapples with youth marketing, again...

As a longstanding and major manufacturer of audiovisual gear, Pioneer has gone through something of a metamorphosis in the last year or so. This was reportedly triggered by a top-to-bottom purge in the company's management structure, with the end result being a new, market-savvy Pioneer that seems firmly focused on doing things differently. And now, it certainly does.

Part of this difference is Pioneer's recognition of the size and buying power of the worldwide youth market, which has let their designers off the leash to create a whole spectrum of new products, ranging from highly innovative to arguably odd-ball. Whether the cheesily-named Happy Tune fits into this latter category is a debatable point, but as they've done before, Pioneer appear to have found a new, untapped market niche by creating a unique product.

"...CUTE OR APPALLING, IT DEPENDS

That market is for small-footprint sound systems that

offer more style than the common black plastic, portable CD/radio unit - the scourge of kitchens and kid's bedrooms. Without a product like the Happy Tune, these 'ghetto blasters' are the only real choice when a reasonable-sounding, small CD/radio system is needed. The irony here is that these are designed as *portable* units, complete with carry handles, integrated speakers and detachable cords, but they rarely leave their resting place.

Made up from three small (145 x 137mm) cubes, the Happy Tune is a stackable CD/receiver system designed to easily fit into bench spaces and shelves, while avoiding the dreaded plastic-blob look of the portable alternative. Whether you find its style cute or appalling depends on personal taste (and possibly your age) of course, but along with the space-efficient shape, it does offer a distinct advantage over the ghetto blaster approach.

Oddly enough, this is that the speaker boxes are constructed out of low-tech particle board rather than molded plastic, which adds up to a much better sound through a lack of cabinet resonances. Have you ever noticed that portable CD/radio unit's have characteristic sound, almost regardless of their size and manufacturer? It's those nasty, resonant plastic enclosures that are to blame for the boxy sound. With good old chunky wooden speaker cabinets to house its 100mm full-range drivers, the Happy Tune has a sonic head start here.

Otherwise the unit has the functions and features you'd pretty much expect to find in a micro sound system, including a top-mounted CD player, a 24-preset AM/FM radio, and a formidable 5W+5W (RMS) amplifier system — equivalent to around 8kW in a PMPO rating! Along with that, the system also offers a 23-button remote control (in standard-issue translucent plastic), a built-in clock with programmable sleep/wakeup functions, plus four preset equalisation modes and a 'power bass' button.

Is everybody happy?

As a rival to a run-of-the-mill portable radio/CD unit, the Happy Tune is a distinctive little system that deserves all the attention it will get. Unfortunately though, part of this attention is bound to be negative thanks to the reinterpreted 1970's styling, and to be blunt, the dopey name...

Why Happy Tune? Here we might have an insight into how Pioneer categorises its world markets, and therefore which product style and name appears in various countries. A quick scan of Pioneer's world websites shows that the unit is called Happy Tune in

ON YOUR TASTE (AND POSSIBLY AGE)"

Japan and south-east Asia, musiQube in America, and it's not even available in the UK and some parts of Europe — perhaps they're far too serious there.

Being a relatively minor market though, it's most likely that Australia and New Zealand (Oceania if you like) are just grouped in the Asian market as a matter of convenience, so we simply get the naming and style choices for that region.



Jumped-up clock radio, or a stylish micro sound system? It's a conversation piece either way... The main unit and remote have lots of tempting function buttons, but you'll need the optional MiniDisk player to use them all.



OPEN FIST

BY STEWART FIST

Radical triplets

LAST MONTH I wrote a rather heavy piece dealing with different chemical bond types - covalent, ionic and hydrogen. I pointed out that while it is correct to say radio and light waves (non-ionising EMF) may lack the photon power to break covalent bonds, this was no guarantee that they couldn't affect biological systems. Witness the fact that we can see, and that plants use photosynthesis as a primary input for their survival and proliferation.

If the common industry claim that non-ionising EMF is incapable of causing tissue damage or duplication (cancer is uncontrolled growth) were even remotely true, then the world as we know it couldn't exist. And if non-ionising radiation is capable of changing normal biological functions such as sight and plant-cell growth and division, then it is possibly capable of causing abnormal functions.

This doesn't prove that radio waves are harmful of course, but it does completely undercut the main claims of axiomatic safety that the cellphone industry still relies on as its foundation excuse for not funding independent research into possible long-term biological effects. It also destroys any claims that cellphones "conform to safety standards" when there are no standards based on biological evidence apart from the old ones of tissue heating.

If you put one alga cell into a test-tube containing a phosphate solution, sugar, or whatever, and place that test-tube in a dark cupboard, nothing much will happen. Leave it in the light for a day however and the non-ionising light will have had a profound effect on both the organism and the solution. You'll have a test-tube full of green slime, and the chemical bath will have been modified; covalent bonds will have been broken.

Yet the photons responsible lack the power to break covalent bonds, so why is this so?

Life energy

The answer is fairly obvious when you think for a moment. The photon by itself may lack the power, but you can only assume that it acts alone in totally inert, dead, solutions. Where there is life within a cell, there is already a substantial energy supply, and the photon just supplements or distorts it. That is, in fact, how we see.

Photosynthesis and sight are remarkably similar processes. In the case of the algal boom, the result comes from a form of isometric conversion, where the combined energy of the photons and the food-source, change (but don't break) covalent bonds.

There is no direct break like a photon bullet hitting a molecule and splitting it asunder, but rather a complex chain of carbon, hydrogen and oxygen changes both its shape and its own energy levels. The messages signalled by this shape change, can trigger an amazingly complex series of actions associated with cell division and proliferation.

In both plants and animals, the main source of the energy supplied to individual cells comes from the conversion of ATP (adenosine **tri**phosphate) to ADP (adenosine **di**phosphate).

The photosynthesis apparatus inside a plant is embedded in the membrane of a cell called a chloroplast, and electrons are shuttled rapidly from one molecule to another to carry them across the membrane before they can recombine with their positive charge. On the far side of the membrane, this energy is stored as energy-rich molecules of adenosine triphosphate (ATP).

ATP is actually the repository for energy in almost all living cells; it's the chemical fuel that powers most of the reactions in our bodies. When it disassembles and loses the third phosphate atom, the breakage of this energy-rich covalent bond transfers power to other molecules.

Working out how all this happened won Drs. Paul Boyer, John Walker and Jens Skou a Nobel Prize.

Skou discovered that the main work performed by the ATP breakdown was ion-pumping, and the protein responsible for the pumping, expels three sodium ions for every two potassium ions admitted.

A HARDWORKING INDIVIDUAL

In all cells (including nerve cells) an ionic imbalance is vital if the organism is to function in a healthy way. Sodium and potassium ions carry a single positive electric charge, so when the cell pumps Na+ out and allows only a partial replacement from the K+, the cell interior becomes negatively charged.

However, if the pumping stops, the ions rapidly change places and an electric current is generated. This is, in fact, the cause of the electrical impulses that run along nerve cells.

Now here is the stunning statistical stuff. A hardworking individual actually manufactures and uses up to a tonne of ATP a day maintaining this voltage differential and sustaining the life forces in the cells. Individual cells can generate voltages of about 0.75 volt, and they collectively have a power output of about 100 watts per square metre, if you laid them out in a sheet. Normally the differential across a cell membrane is only 0.1 volts but the walls are so thin that this represents a voltage gradient of about 100,000 volts per centimetre.

One of the more disturbing facts that we now know, is that laboratory studies confirm that the cell membrane is probably the primary site where interactions between cells and EMF can take place. And the cell's surface change can be signalled to enzymes which are involved in the modulation of brain and nerve functions, and the regulation of the immune system, hormone flow (via the nervous system), and cell growth (normal and carcinogenic).

Free-radicals and DNA

The energy-giving ATP to ADP processes also result in the production of 'free-radicals' within the cells, and these then require natural 'anti-oxidants' to restrict possible damage to the cell nucleus. Unfortunately both terms have been overused and debauched by the health-food industry — but they are real factors in cell biology which are slowly becoming better understood. Just ignore the hype of Vitamin-supplement marketing, (except, possibly, for Vitamin E).

Free-radicals generally result from the break-down of oxygen resulting in highly aggressive radical ions which could damage proteins (specifically DNA), and, untold millions are being formed in your body every second. Normally they last only a nanosecond or two because they immediately link up with other free-radicals or radical-scavengers and form non-aggressive molecules.

One of the worries, however, is that magnetic fields or external electrical influences may change the way in which free-radicals are moved, removed or neutralised.

Radical ions on their own are called 'singlets', and their structure and reaction kinetics are not totally understood although obviously they have a strong magnetic component since all their electrons are spinning in the one direction.

Electron spin is a key factor. Most chemical bonds consist of atoms sharing electrons with different spin directions (cancelling each other's magnetic fields), and in a chemical reaction, each partner reclaims its electrons and moves away to form a new bond. For two free-radicals to join and neutralise each other (forming a 'singlet-pair'), they must have electrons spinning in opposite directions.

MANUFACTURES AND USES UP TO A TONNE OF ATP

That's not normally a problem because the cytoplasm (the 'jelly-matrix') surrounding the cell nucleus has plenty of them at any one time. However for some reason singlets with the same spin will sometimes form 'triplet-pair', and these triplet-pair states are longer lasting, highly aggressive, and can conceivably cause damage to a protein chains like DNA as it is being formed in the cytoplasm. (They are called 'triplets' because the pairs can reunite in three different ways.)

Singlets are highly aggressive also, but they generally have short life-spans and don't have time to migrate into the nucleus to damage the functioning DNA. So we can say that it is most likely that singlets are only an indirect problem, singlet-pairs are non-aggressive, while the much rarer triplet-pairs are only a potential worry.

There's a lot more to this nuclear spin research that, frankly, I just don't understand. And, I should point out, that not everyone believes in triplet theory either.

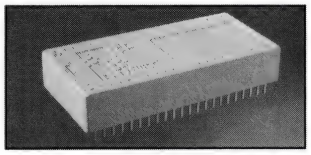
However there are other possible paths for radicals to inflict damage at this intra-cell level. One well-substantiated theory is that the free-radicals attach to water molecules and produce hydrogen peroxide (H2O2), while another is that they break down the molecules into hydroxyl ions (OH-). Both of these chemicals have the aggressiveness to damage DNA, and the potential life-span necessary for them to occasionally migrate from the cytoplasm into the nucleus.

There's now some important laboratory work being done on cells in culture, trying to understand how these fundamental cell-processes work and how much they can be effected by low-frequency modulation. The maximum response for some inter-cellular messenger ions seems to be around 16Hz. It has also been reported a number of times that various important immune functions are modulation frequency-dependent — such as cultured lymphocytes from the immune system attacking and killing tumour cells.

It is important to remember, however, that there's a lot more to learn in the lab before anyone can make the conceptual jump from a cell-culture in a Petri dish to a human using a cell phone. ❖

THE TIGER COMES TO AUSTRALIA

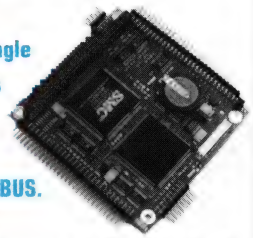
You've seen the BASIC Tiger and Tiny Tiger advertised in the US magazines: they are now available in Australia from JED.



Tigers are modules running true complied (not tokenised), Multitasking BASIC at 20 Mhz, but only draw 45mA. They have memory, 4 x 10-bit analog inputs, digital I/O, two serial ports, RTC, and are superb small controllers for scientific and industrial applications. **Tigers range in memory size from 32k Ram, 128k FLASH (less than $A100) to 6Mb.** A development system (W95/98/NT), with a proto board, is only $275. JED has a local board/controller with LCD/Kbd and industrial I/O.

See our www site or call for data sheets.

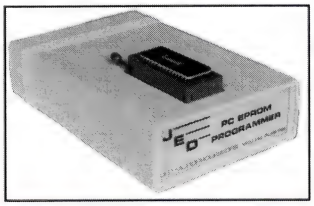
Three PC/104 single board computers based on X86, one with 5 UARTs, LPT & JBUS.



The **PC540** (at $350) uses an 80C188EB, with 40 I/O, 2 UARTs & timers uses $179 Pacific C.
The **PC541** is a V51 PC/XT DOS computer with 20 I/O, PC UARTs, LPT, FDC IDE disk. The new **PC543** uses an AMD ÉLAN (386) cpu at 33 Mhz with 4 MB DRAM, 16 MB FLASH, five RS232 (2 opt. RS485), LPT and JBUS. (All have JBUS, JED's 26-pin ribbon cable bus for industrial I/O. All boards are 3.6" by 3.8"on the PC/104 bus, and range from $350 to $500.)

$300 PC-PROM Programmer
Also: Chiprase Eraser $225.

This programmer plugs into a PC printer port and reads, writes and edits any 28 - pin or 32 pin PROM without needing special plug-in cards.



JED Microprocessors Pty Ltd
www.jedmicro.com.au
173 Boronia Road, Boronia, 3155
Ph 03 9762 3588
Fax 03 9762 5499
(prices do not include freight,sales tax or gst.)



Olympus C-2000Z

It seems that photography is at a turning point: film versus digital. Digital photography is now so good, it rivals film. However — for overall quality, film still wins out. But things are changing, as Tom Moffat found after purchasing his Olympus C-2000. Life just hasn't been the same since.

A MERE THREE years ago, a digital camera was little more than a toy — a must-have toy, but a toy none the less. Just for the sake of being digital, people were willing to accept awful image quality, as you can see in the shot of a staff reunion for a TV station I worked for in Hobart (Fig.1). It was taken with a Kodak DC-20 digital camera, and the resulting photo is tiny (only 320 x 240 pixels), unsharp, and has compression artefacts along with a green/blue colour cast. But back then it was pure magic.

The most important thing about it at the time was that the photo was taken on March 3, 1997, in Hobart, and I was looking at it the very next morning, 16,000km away in the USA. Photos could finally travel by e-mail.

Back in the pre-digital days, if I wanted to include photos with an EA article, I had to copy the article to a floppy disk, enclose the photos in an envelope, and snail-mail the whole works to Electronics Australia. That was bad enough when they only had to go from Hobart to Sydney, but from the USA to Sydney it took two weeks and the postage was positively scary.

I had to do some fast talking to convince the editor at the time, Jim Rowe, to let me use digital photos. He finally agreed, provided they were to be printed no more than two columns wide — otherwise the image quality would suffer. Nowadays you'll notice there's a photo with almost every Moffat's Madhouse column, and heaps of them with my feature articles. And in the past three years, I've used nothing but e-mail to submit my work.

It's interesting to see how digital photography has spread and become accepted. A few months ago in a radio interview, a veteran press photographer said that seventy percent of the White House press corps are now using digital, but he was still using film. This, he said, was to his advantage.

Every night after work, the digital photographers deleted every photo that wasn't used that day, so they could start the next morning with a clean memory card.

But then the Monica Lewinski scandal erupted. The film photographer knew, somewhere,

Left: *A self-portrait of the C-2000Z, taken in an illuminated make-up mirror.*

Below: *Scenic Kah Tai Lagoon in Port Townsend, Washington.*





Fig.1: *The TV station staff reunion, as shot with Kodak's DC-20 digicam.*



Tom's prize-winning photograph of a Vancouver street scene, taken with his beloved Oly.

he had a photo of Monica and President Clinton in a cuddle. He hired a temporary researcher to go back through more than 5000 negatives, and there it was — an exclusive photo, his alone. All the digital guys had deleted theirs. The photo made the cover of Newsweek and big bucks for the photographer.

Moral of the story: Save everything, don't delete. You never know when you'll need an old photo. And that photographer's story was what convinced me to buy a CD burner, so from now on I can save everything I shoot. One blank recordable CD costing $2.00 can hold around 1500 high-resolution digital pictures.

Newspapers have been a little slow to accept digital, but if they are printing stuff from the White House press corps, they don't have much choice. One paper in my town has been using digital for about a year and a half now, but the other more conservative paper avoided digital until just a couple of months ago. Over that time I have done two publicity photo-shoots for them, one pre-digital and one post-digital. Both shoots were done with the same performing artist.

For the first job, I turned up with my trusty Nikon and plenty of film. We blasted off about 20 shots with various poses and lighting. Then I had to remove the film from the camera and take it for processing. When I arrived at the





This marine panorama was taken with the C-2000Z. Take a careful look, because next month we'll tell how it was done.

newspaper office, I was told that a commercial processor was going to do it instead. So off I went to the other side of town.

Yes, they said, an arrangement had been made, but was I aware it was going to cost forty bucks for rush processing and a contact sheet of prints? A quick phone call to the performing artist resulted in screams of range, and eventual acceptance. The newspaper had his pictures that same afternoon.

Prior to the second photo shoot, I phoned my friend who runs the photo lab at the newspaper and asked when they were going digital? His response was "We already have". So I grabbed my itty-bitty Olympus digital camera, and we blasted off about 20 shots with various poses and lighting.

I then popped the memory card out of the camera and slid in into the side of my laptop computer. The artist and I were soon looking through the photos, and he said "I want that one, and that one." So I copied them onto a floppy disk and sent them off to the newspaper office. The processing costs: zilch. The time: mere minutes. And the performer got to choose the pictures *he* liked rather than letting the newspaper do it.

Today' s digital cameras just keep getting better and better. Last week I was shown a photo of a man's face, taken by a high-end digital camera. It had been printed to 10 x 8" size on an Epson printer, using special photographic-grade paper. And I couldn't for the life of me tell that it wasn't a film photograph. You could count the individual whiskers on the guy's face, see hairs poking out of his nose, reflections in his eyes.

But, on the wall across the table from me is a calendar with photos by the late Tasmanian wilderness photographer Peter Dombrovskis. Peter liked to use a big camera with 6 x 7cm film. You just don't get better quality than that, especially in the hands of a guy like Peter. Will digital overtake it? Not for a long time, I expect. It's a lot like television. Everybody shoots digital video these days, and it looks pretty impressive. But when there is something really special such as a big-money commercial, the medium of choice is 35mm colour negative film.

The Olympus C-2000

Digital cameras can dazzle you with their image quality, and frustrate you with their quirks. They are full of surprises — sometimes I come across something that looks like it will make a wonderful picture. I take it, and then get it home and load it into the computer, and bleechh! A total dud. Other times what began as a routine shutter-click produces a result that pops your eyeballs. The street scene in Vancouver is one of those. It's been the desktop wallpaper on my computer for the past couple of months — my favourite display place. And (late news flash!) it's just won first prize in a digital photography competition.

Let's look a little closer now at what it's like to live with a state-of-the-art digital camera, the Olympus C-2000. This isn't just a quick review, I've had the camera since October last year and since then, up to today, it has taken 867 photos. This I know because the camera embeds a serial number into each photo's file name. That's 24 rolls of 36-exposure 35mm film, for free. The Olympus is fairly representative of all the high-end 'pro-sumer' digicams in the two-megapixel range.

The Oly is my third digital camera. The previous two were Epsons — the first, a PhotoPC 500, was released about the same time as the Kodak DC-20 mentioned



Fig.3: *An example of the picture quality from Epson's PhotoPC 550 digicam.*

I ASKED, WHEN THEY WERE GOING DIGITAL? HIS RESPONSE WAS "WE ALREADY HAVE".







As Mark Dytham explains: 'Your average Tokyo apartment is small so you don't have to spend much cash at DIY stores doing it up. And because it's small you tend to buy super mini stereos. Small is cute, small is expensive and has status. Small is desirable.'

Money no object

Despite a deepening recession, tiny playthings are becoming more popular than ever thanks to Japan's unique consumer profile, particularly that of the young. Children especially are enjoying increased spending power with 70 per cent of Japan's teens getting regular allowances of US$220 per month on average. Put earnings from part time work and gifts from doting relations on top of this and the average is more like US$600 a month. Twentysomethings also keep up the demand for the latest gewgaws.

"People have a high disposable income in Japan," says Dytham. "Young singles live with parents, and not having a mortgage, because you rent, really helps — it means a lots of spare

UNUSEFUL ITEMS



AS A WELCOME antidote to Japan's surfeit of value added gadgetry comes its other triumph: the art of Chindogu — a subversive attempt to undermine the very notion of the indispensable gadget with surreal consequences. Reading like an anarchic and wittier version of that Sunday newspaper insert the Innovations catalogue, the collection found in the book 101 Unuseless Japanese Inventions never fail to please, if not actually perform any practical task.

Translated into English Chindogu means literally an odd or distorted tool. They raise the question: could all of our favourite Japanese gadgets be classified as honoury Chindogu? To answer the question Kenji Kawakami, the genius behind Chindogu, has thoughtfully prepared a checklist.

The Ten Tenants of Chindogu

Every Chindogu is an almost useless object, but not every almost useless object is a Chindogu. In order to transcend the realms of the merely almost useless, and join the ranks of the really almost useless, certain vital criteria must be met. It is these criteria, a set of ten vital tenets, that define the gentle art and philosophy of Chindogu. Here they are:

1. A Chindogu cannot be for real use

It is fundamental to the spirit of Chindogu that inventions claiming Chindogu status must be, from a practical point of view, (almost) completely useless.

If you invent something that turns out to be so handy that you use it all the time, then you have failed to make a Chindogu. Try the Patent Office.

2. A Chindogu must exist

You're not allowed to use a Chindogu, but it must be made. You have to be able to hold it in your hand and think 'I can actually imagine someone using this. Almost.' In order to be useless, it must first be.

3. Anarchy

Inherent in every Chindogu is the spirit of anarchy Chindogu are man-made objects that have broken free from the chains of usefulness. They represent freedom of thought and action: the freedom to challenge the suffocating historical dominance of conservative utility; the freedom to be (almost) useless.

cash for the next even flatter, thinner, screen."

As the recession bites harder in Japan and the nation cuts back on expense items like foreign travel and new cars indulging in gadgetry frenzies is helping compensate the loss. They also aid the fight against the overwhelming urge to grey conformity says Dytham.

"In the world of uniformed schoolgirls and salarymen the gadget is the way to differentiate yourself. It could be a customised pocket bell or a LoveGety — an electronic dating game."

"The main point is people send most of their time in the office, they have to stay late, until the boss has left. Gadgets are a way of relieving this stress, bringing a bit of enjoyment into the office, whether its a PDA (of which there are hundreds here to choose from) or a Hello Kitty calculator."



Fuelling this need for escapist toys for young and old alike has been big business in Japan since the end of WWII. Mass production of distinctive Japanese robots and other toys in the 1960s was made possible by new technology and new materials: plastic vinyl and other petrochemicals. These fuelled a Japanese toy boom until the oil shock of 1973, which hit Japan very hard. Plastic toy manufacturers were forced search for other toy ideas and so they started to look at using microchips.

Loveable little egg

The birth of chip-based toys finally led one Japanese designer to conceive the unlikely international hit, the Tamagotchi. Brainchild of Aki Maita of Bandai, the Tamagotchi or 'loveable little egg' once found 200 million doting owners although now its tribble-like colonisation of every child's pocket has halted.

According to Bandai the 30-year-old Tamagotchi creator joined the company because she failed to get a teaching post but still wanted to work with children. Impressed by the quality of some of the company's TV character toy spin-offs she decided to apply to Bandai for a job where she found a place in the marketing department.

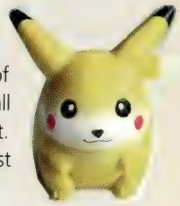
"My job was to analyse Bandai sales data where I learnt that toys and games connected to rearing pets, or animals were doing very well. I then realised that many of my fellow Tokyoites were keeping small pets because our cramped apartments that make it difficult to keep a dog or a cat."

This led her to conceive the small-toy-as-pet idea and told her boss who gave her the go-ahead to develop the idea with the help of a production team.

The Tamagotchi, it was decided, was to be aimed at the all important high school girls. "We found through reading their magazines that the girls love characters that are cute and round. They are drawn to these typically cute figures usually designed for much younger children. So we included all of these features in Tamagotchi", says Maita.

The Tamagotchi was an instant hit with the school girl fad leaders and soon everyone in Japan then every child out of Japan wanted one.

Of course not every gadget boom in Japan exports it self as easily across the globe, but if its small, cute and electronic we tend to think of it as Japanese. And while Japan becomes more adept at feeling the pulse of its young consumers, the global village school learns all the quicker that yet another Japanese design is hot. What's 'cute' in Japan today becomes 'cool' in the West tomorrow. The dustbin takes care of the rest. ■



4. Chindogu are tools for everyday life
Chindogu are a form of non-verbal communication understandable to everyone, everywhere. Specialised or technical inventions, like a threehandled sprocket loosener for drainpipes centred between two under-the-sink cabinet doors (the uselessness of which will only be appreciated by plumbers), do not count.

5. Chindogu are not for sale
Chindogu are not tradable commodities. If you accept money for one you surrender your purity. They must not even be sold as a joke.

6. Problem solving
Humour must not be the sole reason for creating a Chindogu The creation of Chindogu is fundamentally a problem-solving activity. Humour is simply the by-product of finding an elaborate or unconventional solution to a problem that may not have been that pressing to begin with.

7. Chindogu is not propaganda
Chindogu are innocent. They are made to be used, even though they cannot be used. They should not be created as a perverse or ironic comment on the sorry state of mankind.

8. Chindogu are never taboo
The International Chindogu Society has established certain standards of social decency. Cheap sexual innuendo, humour of a vulgar nature, and sick or cruel jokes that debase the sanctity of living things are not allowed.

9. Chindogu cannot be patented
Chindogu are offerings to the rest of the world - they are not therefore ideas to be copyrighted, patented, collected and owned. As they say in Spain, mi Chindogu es tu Chindogu.

10. Chindogu are without prejudice
Chindogu must never favour one race or religion over another. Young and old, male and female, rich and poor - all should have a free and equal chance to enjoy each and every Chindogu.



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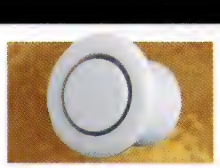
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Rhino

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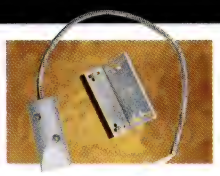


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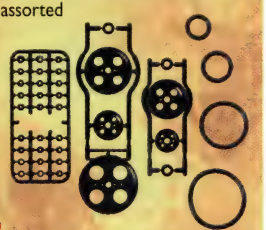
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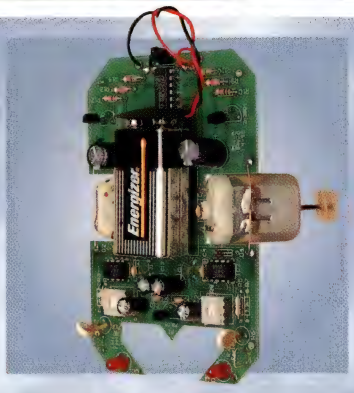


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SILICON CHIP Apr '00



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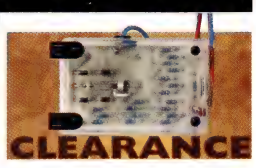
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Metal Detector Kit

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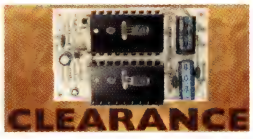
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Tinnitus Relief Kit

K 3703 — SAVE $12 — $15

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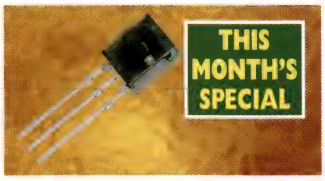
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FORUM

CONDUCTED BY JIM ROWE

Those shonky electronic 'alternative therapy' devices: an update

A couple of years ago, we had quite a kerfuffle here which began when I published a letter from volunteer health care worker and former nurse 'Cheryl', about the worrying growth of 'alternative therapy' electronic gadgets that were claimed to cure all kinds of serious ailments. This month we start off the column with an update from the ever-vigilant Cheryl, telling of the progress that has been made in protecting people from these bogus claims and products.Restoration of vintage radios means different things to different people. For a start there are varying degrees of 'restoring', which include repairing, rebuilding and reconstruction.

REGULAR READERS of *EA* and this column will probably remember the January 1998 column fairly well, because we tied it to a cover picture showing a function generator and a handful of components, with a coverline reading 'Can You Cure Cancer & AIDS with a Handful of Electronics?'. In the column itself I ran the letter from Cheryl (she prefers to be known just by that name) plus some photos she'd sent of some of the more shonky electronic gadgets claimed to cure various ailments, and various items of evidence supporting her claims, which had been provided by people like Bruce Morrison of the Hunter Area Health Service's Biomedical Engineering Department and Barry Williams of the Australian Skeptics.

It made very interesting and thought-provoking reading, and when we followed it up in later issues with more supporting evidence and opinions from both Cheryl and respected medical authorities like Professor John Dwyer of the University of NSW, there was quite a deal of controversy as well. Cheryl and I both received our share of abusive mail for daring to criticise the 'alternative health care' industry, but there was also a lot of support as well. In fact I was sent a fair bit of information on all kinds of weird and wonderful electronic devices, some of which were claimed to cure everything from ingrown toenails to bowel cancer.

We ended up drawing attention to quite a lot of this stuff in the ensuing 12 months or so, to the point where I started to get complaints from readers who felt I was turning the column (and perhaps the magazine itself) into one solely devoted to exposing shonky electronic health products. So we allowed the topic to rest for a while, and turned our attention back to others of more general electronics interest.

While we were doing so, it appears that things haven't been exactly standing still in the 'alternative health gizmos' area, though. Apparently new products (or at least new rehashes of old products) keep on being released on the market, accompanied by the same kinds of outlandish and scientifically untested/untestable claims. But there also seems to have been at least *some* action to protect vulnerable members of our society from those promoting them, taken by bodies such as the Australian Competition and Consumer Commission (ACCC).

My own attention was drawn back to this area only a couple of weeks ago by another letter from our original correspondent Cheryl, providing a timely update on what's happened since January 1998. I found it very interesting, and I think you will too. Here it is:

Since the publication of my letter in the cover story 'Can You Cure Cancer and AIDS — with a handful of electronics?' in the January 1998 'Forum', I have followed with great interest readers' comments, editorials and features on the bogus health devices. I would like all at EA, and your readers, to know that this was the first Australian media report on the bogus cure devices — followed by the Newcastle Herald, A Current Affair and the Sydney Morning Herald — and that all the EA reports have since been viewed by numerous mainstream media and various investigating authorities.

As this is a global growth industry which is almost impossible to police without widespread media exposure and tough action by regulatory authorities, EA's commitment to reporting some of the devices, operators and dangers will ensure that the public (and particularly the devices industry), health/medical professionals, mainstream media, consumer bodies and the authorities are more fully informed.

The electronics industry is also at risk and in need of education, when reputable products and company names are used by this industry. Many electronic items such as function generators, CB radios, digital multimeters and so on are altered and resold to make these 'cure' devices. Products and company names on these and components give credibility to the devices,

I trust that those EA readers irritated by frequent reports will understand that this is a serious major public health and electronics issue. In order to prove this to the authorities, I continued my 'undercover work' in 1998 posing as a sufferer of various cancers, sometimes with a child cancer friend, or with HIV-AIDS, hepatitis B or C and other diseases — so as to obtain more concrete evidence, the devices and propaganda books, videos etc. The bill was pricey for someone on disability welfare, but the Australian Skeptics generously reimbursed me $3400.

The level of gross, careless and irresponsible interfer-

MANY ELECTRONIC ITEMS SUCH AS CB RADIOS AND SO ON ARE ALTERED AND RESOLD

ence in the diagnosis and management of serious and life-threatening conditions such as cancer and infectious diseases (including vaccine preventable and sexually transmissible infections), and that some factions openly target children, never ceases to appal and disturb me.

Some action has been taken by investigating authorities, but sadly most cases remain unreported by the media — due mostly to victims' fears of lodging formal complaints and publicity. The exception being the Australian Competition and Consumer Commission (ACCC), which has instigated federal court cases against two operators/companies — namely Raylight P/L in Adelaide, SA and Vital Earth Co P/L of Hunter, NSW.

Both companies are facing breaches of Section 52 and 53 of the Trade Practices Act for misleading and deceptive conduct. The ACCC sought injunctions, refunds and corrective advertisements — hoping these 'test cases' would send a strong warning to the- industry that they can be prosecuted. However this will not happen without widespread media reporting. (Refer to ACCC's media website, at **www.accc.gov.au/media**)

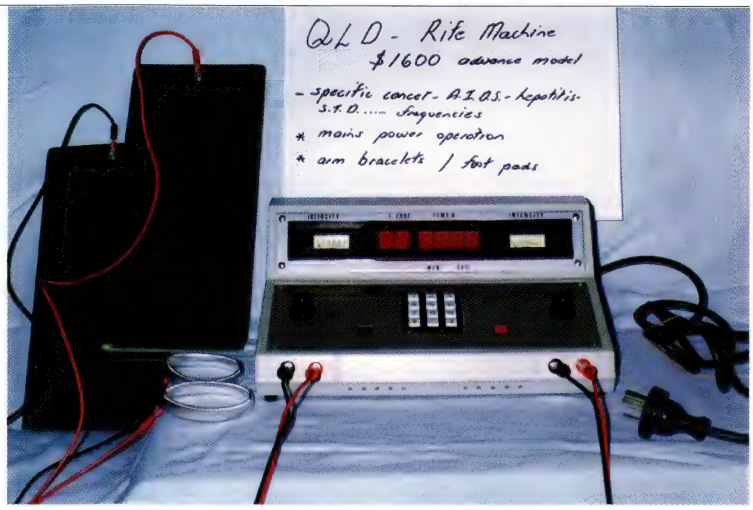
The Therapeutic Goods Act was amended in May 1998, abolishing the AUST L Listing of these bogus devices on the Australian Register of Therapeutic Goods (ARTG) (see EA January 1998) — a serious and dangerously flawed system, requiring no proof of efficacy, which afforded electronic junk an endorsement by the highest health assessment body in the country. Now, unbelievably, these devices are treated just like any consumer product and come under the auspices of various Trade Practices Acts.

As the use of unscientific (nonsense) electronic screening-diagnostic and treatment-curing devices is widespread in the alternative health industry — taxpayers and some private health fund contributors (through Medicare and Ancillary rebates) are financially supporting this industry when the devices are used by qualified therapists, holistic doctors, nurses and dentists.

Meanwhile the industry continues down its dangerous path. More screening-diagnostic and treatment-curing devices flood the market, costing $100's and $1000's, mostly designed and built by electronic tinkerers, some claiming to be electronic engineers, in their backyard worksheds. Some are even conducting their own 'research studies' using very ill people — both devices and 'studies' then promoted as valid and scientific.

A most notable case reported on '60 Minutes' in May 1999 highlights the dangers posed by this industry. In NZ the parents of a four year old child, diagnosed with potentially lethal cancer, abandoned his chemotherapy after reading a recent book promoting the 1930's cancer-pathogens destroying electronic device of Dr Royal Rife (see EA January 1998). This led many desperate sufferers flocking to similar Rife clinics in NZ.

TO MAKE THESE 'CURE' DEVICES



Our correspondent Cheryl sent this photo of a Rife-type machine now being sold in Queensland, for about $1600. Mains operated, it's claimed to generate frequencies specifically targeted at curing AIDS, hepatitis and sexually transmitted diseases. The currents are passed through the body via metal arm bracelets and conductive foot pads...

A "60 Minutes" update in August 1999 reported that many of these people were now seriously ill. From a USA contact I learnt that a NZ speaker was to front the September 1999 Third International Rife Conference in Canada, no doubt to boast to the world of their 'successful cure' of a child cancer sufferer — increasing my concerns for children.

More worrying is that the NZ inventor-therapist is now claiming victory for 'curing' the little boy with his NZ$3,500 Quantum Booster-super Rife machine, which also addresses the problems of HIV, hepatitis, diabetes etc. He wrote advising me in July 1999 of his plan to expand his QB-Rife business to Australia in 2000 — and he has now invented a NZ$6,000 'Bioresponder' device. He and other NZ operators can do so unimpeded by any of our state-federal health, medical practice, therapeutic goods and consumer- trade laws.

When children become victims of dangerous industries such as bogus health devices, we should all demand that governments conduct a full and open public enquiry, requiring all operators and practitioners to be publicly accountable for all their products, practices and claims — and review and update all legislations so that the public (and desperate, vulnerable people) are fully educated and protected.

We should also remember that interference in the management of infectious diseases can have serious ramifications for the entire community, not just the users of the devices — and unborn babies and children can become victims. I remain deeply concerned and grateful to EA for your contributions to public awareness.

Thank you indeed for that update, Cheryl, and I hope that the magazine has played a small role in drawing public attention to these dubious 'alternative electrotherapy' devices. We're only a 'tiddler' compared with major newspapers, magazines and TV current affairs programs, but among our modest readership there are a surprising number of 'influential' people.

By the way I took Cheryl's advice and looked at the ACCC website, where I found a media release regarding their proceedings in the Federal Court of Australia against Raylight Pty Ltd, marketer of products including the 'Parasite Zapper' and a 'Colloidal Silver Generator'.

Dated November 4, 1999, the release (you'll find it at **www.accc.gov.au/media/mr-215-99.htm**) explains that



FORUM

CONDUCTED BY JIM ROWE

Raylight's director Mr Herbert Nathan has given the Federal Court undertakings not to represent that the Parasite Zapper is capable of neutralising HIV or is effective in treating serious medical conditions such as HIV, hepatitis and herpes, as well as obesity.

Raylight has also given undertakings not to represent that the Colloidal Silver Generator is effective at killing intestinal bacteria and viruses, or that it's helpful to AIDS sufferers when used together with the Parasite Zapper, or that it prevents 'opportunistic infections originatings from the stomach and intestines'.

Furthermore the company has undertaken to give refunds to people who may have been misled into purchasing either the Parasite Zapper or the Colloidal Silver Generator. Mr Nathan also gave an undertaking not to design, create or procure the publication of advertisements or promotional material containing any of these representations concerning the two products.The same release explains that an operator of two websites, a Mr Colin Ronald Dixon, has also given undertakings to the Federal Court to stop making representations on the websites concerning the effectiveness of products called the 'Vital Silver 2000' and the 'Vital Silver 3000 Zapper', both marketed by the firm Vital Earth Company Pty Ltd. Apparently both sites carried representations to the effect that the colloidal silver allegedly made by the products killed a wide range of bacteria, viruses and parasites, and could be used successfully to treat meningitis, diabetes, leprosy, lupus, skin cancer, syphilis and whooping cough.

At the end of that release there's a statement to the effect that proceedings would be held in the Federal Court on November 23 against the Vital Earth Company and its director Darryl John Jones, regarding their own representations regarding the Vital Silver 200, Vital Silver 2000 Automatic and Vital Silver 3000 Zapper. However I couldn't find any later announcement regarding the results of that hearing.

What I did find, though, in a newspaper clipping sent by Cheryl herself, was a small newspaper item noting that 'Port Stephens inventor' Darryl Jones had been too ill to attend a Federal Court hearing to face legal action brought by the ACCC, over alleged breaches of sections 52 and 53 of the Trade Practices Act. The report said that Justice Tony Whitlam had put the case over until March 3, so that the results of that deferred hearing might be available on the ACCC website by the time you read this.

Incidentally perhaps my own skepticism is a little too active, but I thought there was a certain irony in the idea of a promotor of products claimed to cure almost every known ailment, himself being too ill to attend a court hearing about their efficacy!

Seriously, though, while it's good to see that the ACCC has been able to institute legal action against some of the people making outlandish claims for their 'alternative therapy' devices, the results to date still don't seem all that impressive. All that seems to have been achieved is getting two small firms to stop making the most blatant claims, and offer refunds to those customers game enough to claim they were misled into buying the products. It's not much, is it, when we're talking about products that could result in the unnecessary suffering or even death of seriously ill people when they're conned into relying on them instead of legitimate and scientifically validated medical treatments.

Surely what's really needed, as Cheryl says, is a full and open public enquiry, able to thoroughly test claims made, publicise the finding properly and punish those found guilty of dangerous deception. In fact it sounds like a permanent job for the ACCC itself, doesn't it?

Anyway, I'm very grateful to Cheryl for drawing our attention back to the subject and providing her update. I don't know about you, but I really admire her committment to the cause of protecting desperate and vulnerable people from being exploited by 'alternative therapy' quacks, and more so since she is apparently not a well lady herself.

I'm delighted to learn that others share this admiration, too. While I was looking around on the web before writing this column, I visited the Australian Skeptics web site (**www.skeptics.com.au**), where I discovered that they had awarded their 1999 Australian Skeptic of the Year award to none other than (you guessed it) 'Nurse Cheryl'. She is the first woman to receive the award, which has gone in previous years to distinguished scientists such as Professors Derek Freeman, Peter Doherty and Michael Archer.

At the presentation Cheryl was described as 'a modest woman who seeks no personal publicity' but '...who has conducted an almost single-handed campaign to expose to critical scrutiny the potentially dangerous unsubstantiated claims made by manufacturers of various electronic gadgets that are alleged to cure every known illness.' It went on to explain that:

Cheryl was a nurse working for an overseas aid agency who, through her duties, suffered from a debilitating injury

DO PEOPLE HAVE TO DIE BECAUSE

that reduced her ability to work. She returned to Australia where, finding that orthodox medicine could do little to alleviate her pain and suffering, she sought the attention of various 'alternative' practitioners. It was this experience that caused Cheryl to begin her campaign to expose the claims made by promoters of various 'cure-all' therapies to the light of critical enquiry.

You'll find the complete citation on the Skeptics website, in the file at **www.skeptics.com.au/features/spoon/bswin99.htm**. However I'd like you to read the last two paragraphs, which I'm also reproducing here with their kind permission:

Unfortunately, both the regulatory authorities and the media seem only to be interested if they can presented with complaints from victims of these things, and neither group seems to be interested in doing any sort of investigations on their own behalf. Do we have traffic regulations in this country only because people have complained



THEY HAVE FALLEN VICTIM TO PLAUSIBLE SOUNDING SALES PITCHES?

about being run down by cars? Do people have to die from lack of proper medical treatment, because they have fallen victim to plausible sounding sales pitches? If so, how many need to die before someone in authority will take responsibility — will show that they care?

Cheryl has done everything she can to expose this dangerous trade, though her resources are limited and her health is not robust. But Nurse Cheryl cares, and for this reason we are very pleased to award her the accolade of Australian Skeptic of the Year for 1999.

It's an honour that's well and truly deserved, I hope you'll agree. I also hope that more of the mainstream media take up the case soon, and thus apply more pressure to the politicians and lawmakers to act.

In the meantime, concerned readers of EA might care to write to their local member, and/or to the head of the ACCC Professor Alan Fels, displaying their support for the need for tougher laws regarding shonky electronic therapy devices. I'm sure that this would have good credibility, coming from electronics people themselves.

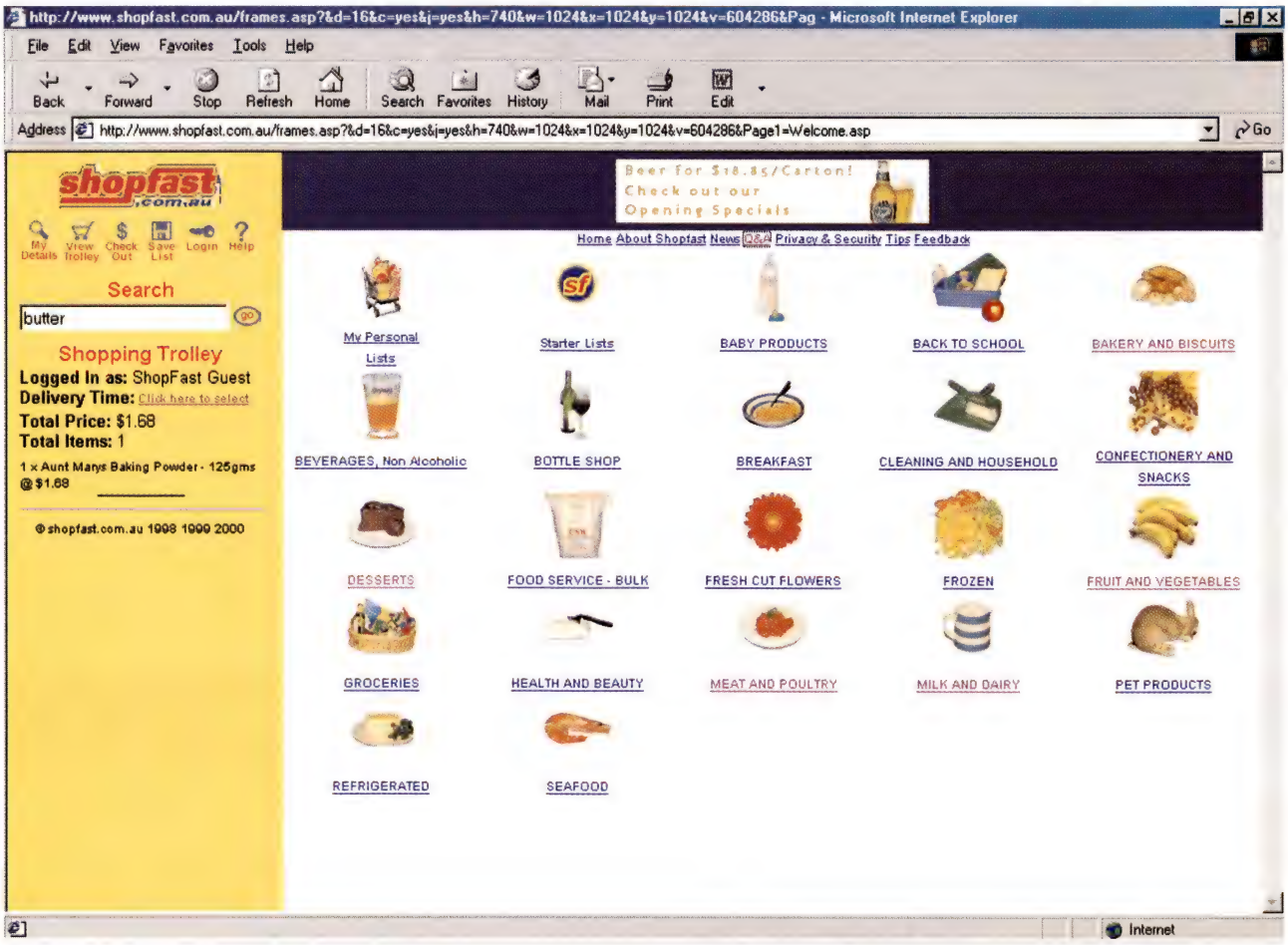
Cheryl has done a great job of making us all aware of this problem, folks — now how about lending her a hand to achieve a more effective solution?

By the way, I can recommend the Australian Skeptics website for those with a critical and open-minded bent. They're a breath of fresh air, in this era of anti-intellectualism and touchy-feely alternatives to the scientific method.

My grateful thanks to Cheryl and the Australian Skeptics for their help in preparing this month's column. And if you come across any more evidence about shonky electronic therapy devices, please let me know so we can bring them to our readers' attention. I know we don't want to turn Forum into a column that's obsessed with the subject, but we don't want to abandon Cheryl and the ACCC to fight the forces of darkness alone, either, do we? ❖

Sell, store or eat it
you can do it all on the Net

The Internet has changed over the last few years. Once merely a library and communication system, it's expanding into something resembling bad 50s science fiction; an omniscient being that can do anything, just for the asking... **Jean-Baptiste Cattley** dons his space helmet and ventures forth.



NOW THAT THE internet is finally coming of age, not only can you look stuff up, you can actually ***do*** stuff with it. There's a huge range of products and services available, many of which have popped up within the last 12 months, so we thought it was time to take a look at some of them.

As with anything you can write about the Internet, this list doesn't even scratch the surface, but it might point out a few landmarks in the massive, chaotic and very cool mess that is the web.

E-commerce

WARNING: Buzzword alert! Yes, that very-quickly-annoying term, 'e-commerce' is about to rear its ugly head. People make a huge fuss about it, but there's really nothing magic going on. All it takes is a simple way to showcase your goods and services, let your customers build an order, and then arrange payment and delivery. Some sites make such a hassle out of the whole process that nobody really bothers. Others sites don't.

Shopfast

(http://www.shopfast.com.au)

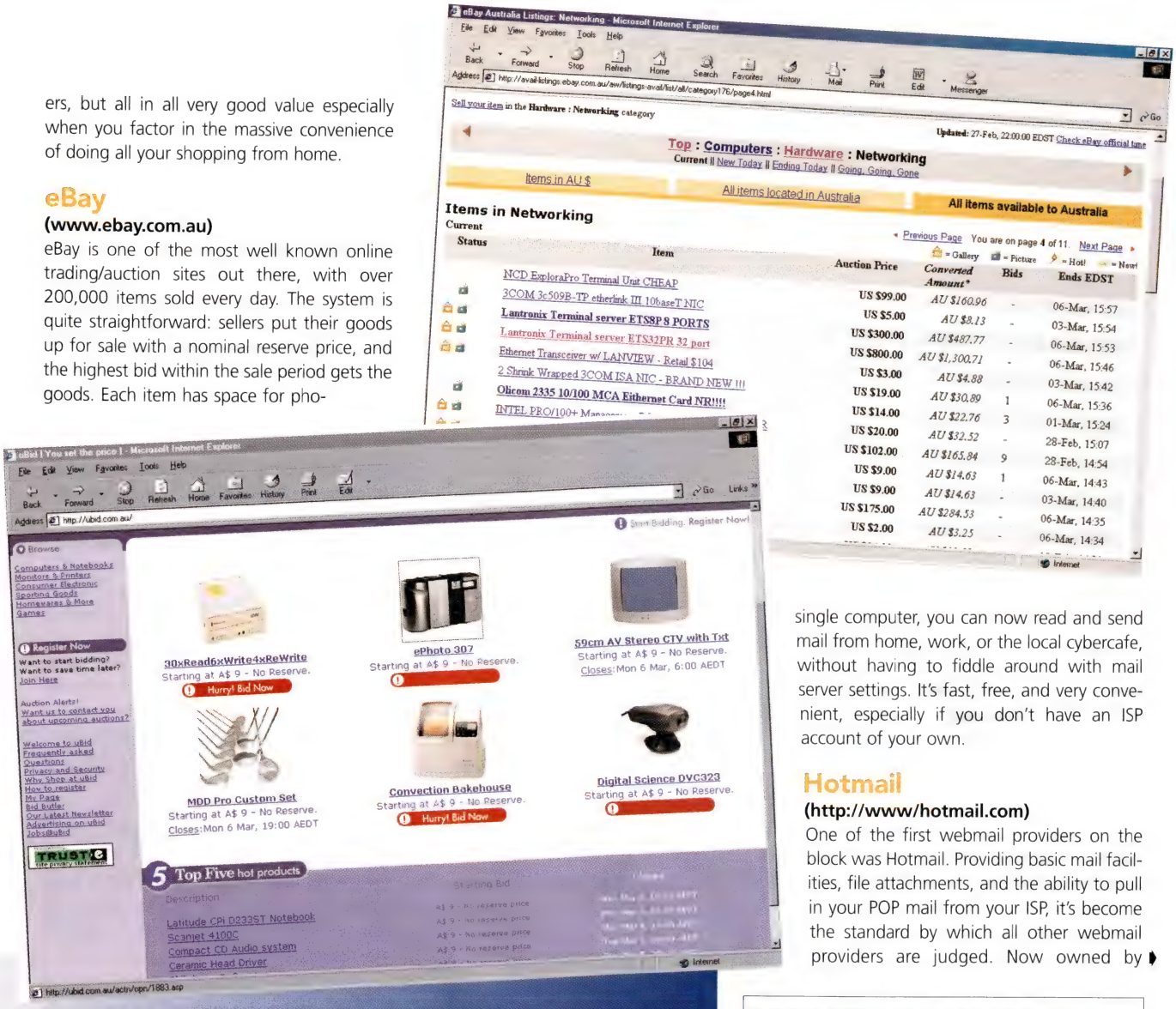
Shopfast is a good example of how the whole e-commerce thing ought to work. A Sydney-based company providing home-delivered groceries and produce, Shopfast has a flat $5.95 delivery fee, eliminating one of the biggest stings in the tail of most e-commerce setups. The site is easy to navigate, and while it could possibly do with a few more photos, it's simple, no-nonsense, and easy to use. The prices are within reason, a few eyebrow-rais-

ers, but all in all very good value especially when you factor in the massive convenience of doing all your shopping from home.

eBay

(www.ebay.com.au)

eBay is one of the most well known online trading/auction sites out there, with over 200,000 items sold every day. The system is quite straightforward: sellers put their goods up for sale with a nominal reserve price, and the highest bid within the sale period gets the goods. Each item has space for pho-



tos of the goods, contact details of the seller and seller's track record (comments from previous buyers).

Thanks to a rather clever automatic bidding system, buyers can secretly specify the maximum amount they want to pay, and the system will keep upping the bid by the minimum amount required to stay ahead of the pack. The online medium is perfect for special-interest items; you don't have to wait a year to find an auction willing to sell your collection of 1920's radio valves, you can just stick it in an appropriate category and people will find it.

uBid

(http://www.ubid.com.au)

uBid is another online auction service, providing brand-name goods to users, at the price they want to pay. uBbid's buying team hunt around for cut-price electricals, whitegoods, computer equipment and household items, then put them up for auction on the Ubid website, with minimum prices usually as low as $9. Whoever makes the highest bid by the close of the auction gets the goods. There's a standard returns policy, guarantees on all goods, and even a maximum suggested bid, to prevent you from accidentally going over the recommended retail price.

EMAIL SERVICES

One extremely popular online service is web-based email. No longer tied to a single computer, you can now read and send mail from home, work, or the local cybercafe, without having to fiddle around with mail server settings. It's fast, free, and very convenient, especially if you don't have an ISP account of your own.

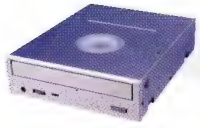
Hotmail

(http://www/hotmail.com)

One of the first webmail providers on the block was Hotmail. Providing basic mail facilities, file attachments, and the ability to pull in your POP mail from your ISP, it's become the standard by which all other webmail providers are judged. Now owned by



Movies on your PC with the GD-5000



SUMMARY

❒ An internal DVD-ROM drive able to read practically all CD and DVD media formats.
❒ 8X DVD, 40X CD.

KEY FEATURES

❒ Automatic detection of media type.
❒ No software drivers required.

PROS

❒ Easy to setup and install.
❒ Reads anything.

CONS

❒ Like most DVD-ROMs, it is region encoded.
❒ You'll need a fast PC (and viewing software) to play DVD movies.

OVER THE PAST COUPLE of years, we've covered quite a number of DVD players, designed to integrate into your home theatre setup and display movies on your expensive large screen TV. If you're like me however, you don't have an expensive large screen TV, because you've thrown all your money at your computer instead.

This doesn't mean that you can't enjoy all the latest releases, because your computer is quite capable of playing DVD movies so long as it has the essentials — a fair amount of horsepower and a DVD-ROM drive. I won't get into a debate about the brand of horsepower to use (Intel and AMD are stealing the show at the moment, although anything above 400MHz should do), however for the actual DVD drive, I recommend Hitachi's new GD-5000 DVD-ROM. Why? Because quite simply, it rocks.

Companies like Hitachi have stopped manufacturing CD-ROM drives, with forecasts that DVD-ROM sales will exceed those for CD-ROMs by late this year. Predictions for next year are that 85 million DVD-ROM drives will be sold versus a quickly declining 45 million CD-ROMs.

In the press release that accompanied our review unit, Hitachi says "We are the leading company in DVD-ROM manufacturing and since our decision to terminate CD-ROM production, we have seen a big increase in DVD sales".

With DVD discs popping up all over the place (I've even seen them as cover discs on some UK computer magazines), you really are going to be left behind if you stick with your existing CD-ROM.

I'D SAY IT WILL READ JUST ABOUT ANYTHING THAT IS ROUND



Impressive specs

The GD-5000 is a fifth-generation drive with very impressive specs, and as well as being fast, it can read just about anything you can throw at it. It's one of the fastest DVD-ROM drives available today, with data transfer rates up to 11.08MB/s (8X) for DVD-ROM and 6MB/s (40X) for CD-ROM with full constant angular velocity (CAV). The exciting thing about it however, is its ability to read pre-recorded DVD-RAM disks making it a truly universal replay device.

Look at Fig.1 and you can see that it can handle CD-ROMs, CD-R, CD-RW, PhotoCD, DVD-ROM (both single and double sided), DVD-R and even Type II DVD-RAM discs. It'll play CD audio, CD-I, VCD and of course DVD movies as well. Hitachi call the GD5000 the 'Swiss Army knife' of data storage, which I feel is a rather good description. In fact, with the possible exception of a life saver, I'd go as far as saying that it will read anything that is round, flat and has a hole in the middle.

Great you say, but what's involved in setting it up? Very little, actually. You simply plug it into a spare IDE port on your PC, and you are away. The drive automatically detects the type of media being played, and so there aren't any drivers to be installed.

I didn't realise this at first, and so spent 20 minutes searching the Hitachi website for the appropriate drivers to no avail... While I was there, I found a firmware update for the drive. However after downloading, unzipping and running the installation utility, it transpired that the drive was

SPECIFICATIONS

The GD-5000 uses the personal computer industry standard IDE/ATAPI bus interface, supporting burst transfer rates of 33.3 MB/s (Ultra DMA Mode 2) and 16.6 MB/s (PIO Mode 4). In addition to its fast (8X) data transfer rate, the GD-5000 has typical data access rates of 120 ms when reading DVD media, and 90 ms when reading CD media. When reading DVD-RAM media, the data transfer rate is 1.38 MB/s.

❒ **Transfer Rate**
8.31 MB/s (max) (DVD-ROM)
3.6 MB/s (max) (CD-ROM)

❒ **Burst Transfer Rate**
ATAPI PIO Mode 4 16.6MB/s (SCSI)

❒ **Average Access Time**
180ms (DVD)
120ms (CD-ROM)

❒ **Disc Types**
DVD - Single sided, Single layer (4.7GB)
DVD - Single sided, Double layer (8.5GB)



AND FLAT WITH A HOLE IN THE MIDDLE

DVD - Double sided, Single layer (9.4GB)
DVD - Double sided, Double layer (17.0GB)
DVD - R
CD-ROM Mode - 1 & 2 data disc
CD-ROM XA, CD-I, CD-R, CD-RW
CD-DA, CD-Extra, Photo-CD, CD Text

❒ **General**
512KB Buffer Memory
Enhanced IDE (ATAPI) interface

❒ **Contact:**
Hitachi Australia 13-15 Lyonpark Road, North Ryde NSW 2113
Tel: (02) 9888 4100; Fax: (02) 9888 4188;
Web: **www.hitachi.com.au**

What's this Type II media?

If you are familiar with DVD-RAM discs, you'll know that they come encased in a plastic 'caddy' with shutter, much like a jumbo floppy disk. This is known as Type I DVD-RAM media, and it can't be played in the GD-5000. Instead, you use the new Type II media, which is identical except that the internal DVD disc can be removed from its case and placed in the player's tray, like a standard CD or DVD.

already running with the latest firmware version. Oh well, you can't improve on perfection it seems.

While I was on the net, I also had a look for any Region Code hacks for the GD-5000. These little programs are designed to enable you to change the region code for the player, and will let you play DVDs from any region.

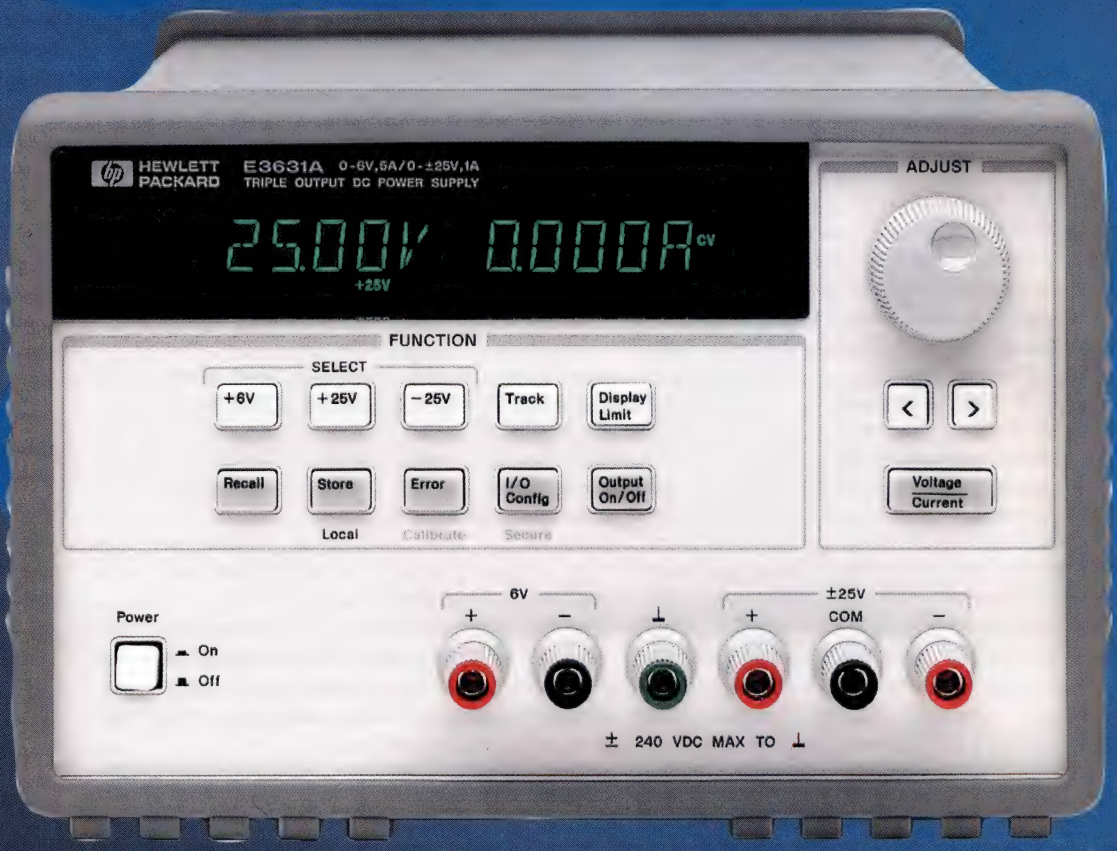
When you first get the drive, you can change its region code up to five times -- after that, the drive locks to the last code set, and there is no changing it back. These hack utilities let you continue changing the drive's code as long as you like, and thus let you play DVDs from other zones. While there were several sites devoted to this (slightly less than legal) subject, none of them had anything for the GD-5000. Perhaps the drive is a bit too new -- I'll look again later.

As well as being able to read practically any optical media format under the sun, the GD-5000 is also pretty cheap too: $279 including tax at the time of writing.

Well, it's cheap, works well, handles everything, and you'll be out of date if you don't have one. Yes, you guessed it, I wend out and bought one. I suggest that you do too. ❖



Win one of 10



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HISTORY & CROSSWORD

Electronics Australia is one of the longest-running technical magazines in the world. We started as Wireless Weekly in August 1922 and became Radio and Hobbies in Australia in April 1939. The title was changed to Radio, Television and Hobbies in February 1955 and finally, to Electronics Australia in April 1965. Here are some interesting items from past issues:



50 YEARS AGO

Space Ships: A. C. CLARKE, 32-year-old astronomer and assistant secretary of the British Interplanetary Society, recently lectured the Oxford University Heretics Club on space ships and life on other planets.

Said Clarke:

The first guided missile to reach the moon will probably crash into it in the fifties. The first space ship capable of reaching another world may still lie half a century ahead. If theories about increasing heat of the sun's rays are correct and oceans begin to boil there is no doubt that stern necessity will bring about conquest of other planets.

Application of atomic discoveries to space ships will cut the journey to a fraction of the time now estimated for chemical fuels. The journey to Mars would take 258 days by fuel propulsion, but an atomic ship would do it in a few weeks.

Any races we encounter will almost certainly be superhuman or subhuman — most likely the former, since ours must surely be one of the youngest cultures in the universe.



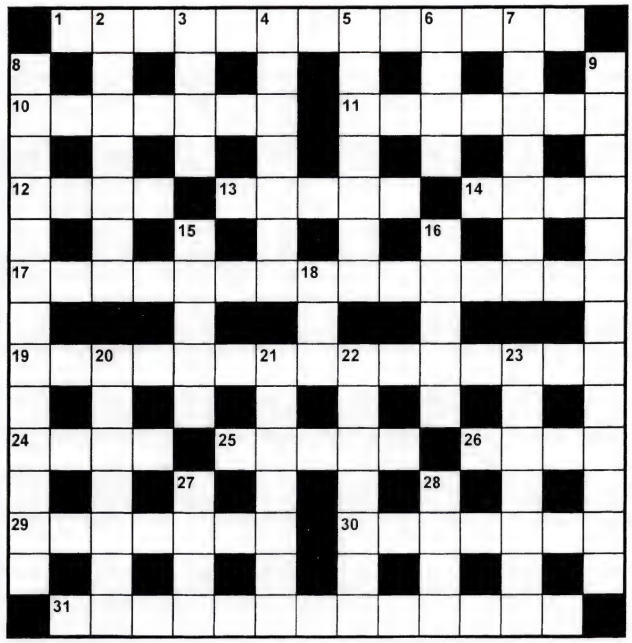
25 YEARS AGO

LOW cost solar cells may soon be reality: Two new electronic devices which show promise as solar cells for converting the sun's energy into usable electricity were recently announced by Bell Telephone Laboratories.

One of the new cells has an efficiency of 12.5 percent in converting sunlight to electricity. This is comparable to the efficiency of silicon solar cells now used in such specialised applications as satellites and space vehicles.

The most common solar cells, invented at Bell Laboratories over 20 years ago, are made of extremely pure man-made crystals of silicon and have an efficiency of about 11 to 14 percent. However they are so expensive to make that they are used only in applications where cost is not a primary factor.

The new devices can also be used as photodetectors, and in fact resulted from studies aimed at finding new photodetectors for converting light into electrical signals. As photodetectors, both devices are sensitive to infrared light and to part of the visible light spectrum. One device is more than twice as efficient as conventional silicon photodetectors at a wavelength of 1.06 microns. Low-loss glass fibres, which will be used in future optical communications systems, operate best near this wave length. ■



ACROSS

1 Book used in workshop. (7,6)
10 Rebound. (7)
11 Shine tremulously. (7)
12 Viewer's side of a screen. (4)
13 Sudden shaking shocks. (5)
14 Inflict a severe shock. (4)
17 Range of frequencies detectable by eye. (7,8)
19 Modern means of recording. (5,5,5)
24 Area above some beacons: the -- of silence. (4)
25 Once-supposed non-viscous fluid in Space. (5)
26 Superior sound. (4)
29 Intercepting a telephone call. (7)
30 Concerned with most distant point in orbit. (7)
31 Professional person studying the atmosphere. (13)

DOWN

2 Scientific phenomena. (7)
3 Peruse a screen. (4)
4 Electrode. (7)
5 An error in progress. (7)
6 End of a digit. (4)
7 Measuring instrument. (7)
8 Averaged speed of an electron. (5,8)
9 Signals; broadcasts. (13)
15 Terminate (a project, etc). (5)
16 Proton donors. (5)
18 Subscriber trunk dialling. (1,1,1)
20 Crossover of nerve impulse. (7)
21 Whole number. (7)
22 Inspect directly. (7)
23 Supports in certain speakers. (7)
27 Having electrical potential. (4)
28 Name of synthesiser. (4)

March Solution

T	W	O	H	U	N	D	R	E	D	■	G	A	N	G
A	■	H	■	■	■	I	■	T	■	P	■	U	■	E
S	Y	M	M	E	T	R	I	C	A	L	■	D	I	N
T	■	M	■	X	■	G	■	H	■	E	■	I	■	E
E	L	E	C	T	R	E	T	■	I	N	D	O	O	R
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R	E	S	T	O	C	K	■	N	O	T	E	P	A	D
T	■	■	■	U	■	E	■	■	■	E	■	L	■	■
H	O	I	S	T	S	■	T	R	I	M	M	I	N	G
L	■	D	■	L	■	R	■	A	■	P	■	F	■	A
O	R	E	■	E	L	E	C	T	R	O	N	I	C	S
O	■	A	■	T	■	A	■	E	■	■	■	E	■	E
P	I	L	E	■	C	R	O	S	S	W	O	R	D	S



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70 IR Data link
74 Serviceman
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82 Computer Clinic
84 Information Centre
87 Experimenting with Electronics
90 LCD panel meter
94 FM Radio Card
96 Marketplace
98 Webwatch
98 Dilbert

generator

IDEAS FOR EXPERIMENTERS:

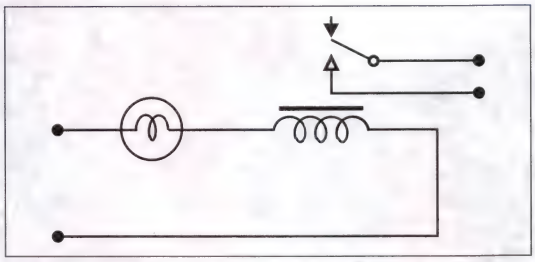
Speed relay closing time

Relay closing times can be substantially reduced by temporarily overdriving the coil.

This can be achieved both easily and safely by utilising the change in resistance of a filament lamp connected in series with the relay.

The relay coil should be rated at approximately half the circuit voltage, and a lamp chosen for a series resistance (when warm) that's equal to the relay coil resistance.

This circuit was originally designed for discharging



NiCad batteries in radio control in (RC) gear, but has been modified to use as an indication of battery capacity in remote telemetry equipment.

THIS MONTH'S WINNER!

12V battey conditioner

This circuit was originally designed for discharging NiCad batteries in radio control in (RC) gear, but has been modified to use as an indication of battery capacity in remote telemetry equipment.

The battery is changed at regular intervals (just in case), but this circuit is used during routine inspections to monitor its health by recording the discharge time into a known load. You can get some idea of the battery's capacity from load current and time, however as a log is kept, you only need to check that it maintains a reasonably constant discharge time to know that all is well.

The size of the load resistor not important, as long as output relay can handle the current and the battery discharges over a couple of hours or more to get a sensible indication. In our case the battery we were testing was 12V/7ah, and the load resistor was 5 ohm 50 watt. The timer section (inside the dotted line) could be disregarded, but there's no point discharging the battery if no indication is given of it's capacity — it helps to remove a NiCad's memory effect, but without the timer you have no idea if the battery has had it.

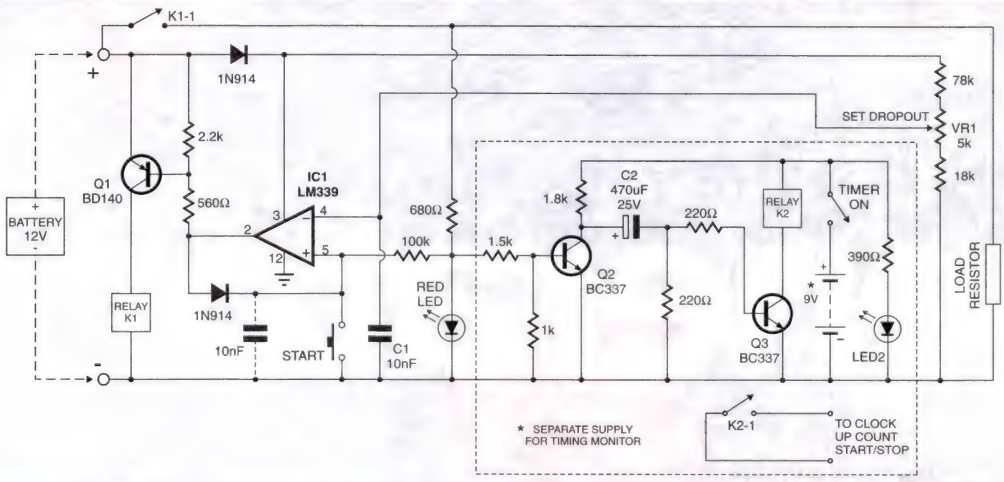
With a battery requiring cycling connected, IC1's non-inverting input (pin 5) is held high via the diode and its inverting input (pin 4) is somewhat lower, so the output (pin 2) is high and transistor Q1 is off. Pushing the start button pulls pin 5 to ground, turns on Q1, and sets relay K1 which connects battery to load resistor via contacts K1-1.

LED1 is now on, and supplies a reference voltage to pin 5. The battery run-down continues until pin 4 is at a lower voltage (it's fed from the 78k - 5k pot - 18k voltage divider) where IC1's output goes high, shutting off K1 and the output load.

The second (timer) section monitors action at LED1. At start-up, the clock (DSE Y-1023) is reset to start the up-count. When the cycler shuts down, the timer section detects the high to low transistion on LED1 and pulses relay K2 on then off. Contacts K2-1 close for approxrimately 1 second, which stops the clock's up count.

With this setup you can even come back days later, if required, and the battery's discharge time will be showing. Multiply that figure by the average discharge current, and an approximate battery capacity is known — or conversely, just log the discharge time for future reference.

Jeff Jorgensen
Bundaberg, QLD
$30

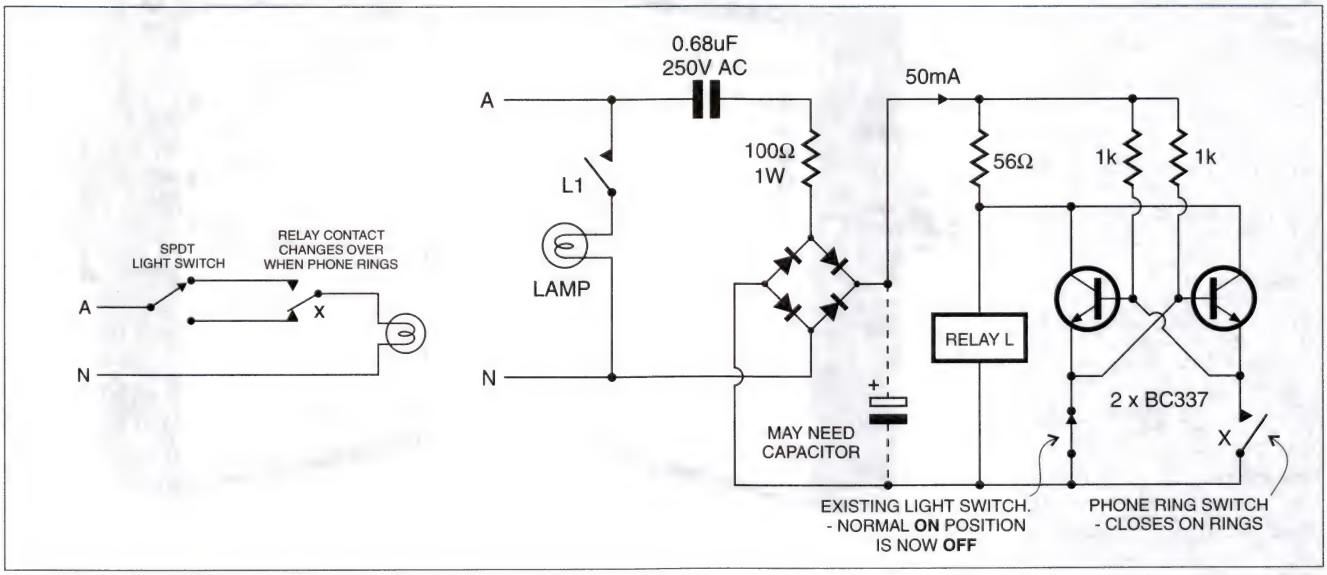


IDEAS

Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

Win our 'IDEA OF THE MONTH' Prize! Valued at $469!

As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is a Video Inspection Capture System from Allthings Sales & Services, which consists of a colour CCD camera, close-up lens set, adjustable stand and lamp, PCI video capture card and software, plus video cable and two plugpacks. You can find out more about this great system at the Allthings website; www.allthings.com.au



Exclusive-OR Function from discrete components

I wanted to set up a system for a deaf friend where a desk lamp would flash on when the phone rings, but I also wanted it to blink off when the phone rings and it was already switched on. This exclusive-or (XOR) function is easily implemented with a SPDT switch and changeover contacts on the (purely hypothetical) relay which operates when the ring signal is received. See Fig.1

In my case it wasn't so easy, I wanted to retain the existing SPST switch on the desk lamp for aesthetic reasons and I was limited to a single 'make' (normally open) contact on my hypothetical ring detect relay. One solution would be to use XOR gate IC such as the 4030, where a relay (for the lamp) operates when one and only one of the two SPST contacts closed.

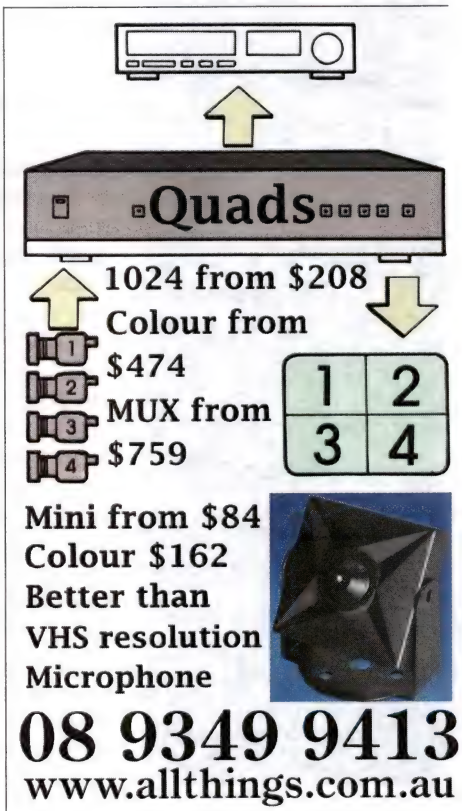
It seemed like a waste to use only one gate out of a package of four, so I devised a discrete circuit that performs the same function but will cope with a wider range of supply voltages. As you can see in Fig.2, each switch contact enables the corresponding transistor, but shorts out the base of the other. If just one of the contacts close (as shown) the transistor disables relay L by shunting current away from its coil, which is normally supplied via the 56 ohm resistor.

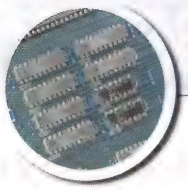
As you can also see, if both switches are open there is no current path through the transistors so the relay remains on, similarly if both switches are closed there is no base current in either transistor, so again, the relay is enabled. The only way it can be released is if one and only one switch is closed.

The circuit is powered from the mains via a capacitor and is arranged so that current is always flowing, which avoids high voltages on the transistors — also, a protection diode across the relay coil is not required. The arrangement also means that the sense of the existing light switch is inverted (the 'off' position becomes 'on'), but fortunately this was acceptable in my case. If it hadn't been, a break (normally closed) contact on the relay could apply power to the lamp, or perhaps the lamp switch could have been physically turned upside down.

This circuit is a bit anti-social since it is always consuming power, but not enough to matter. If actually using this circuit it may be a good idea to use an opto-coupler in place of contact X, an isolated current loop would then connect to your (hypothetical) ring detect circuit. In the circuits, contact X represents a contact on a hypothetical relay which operates when the phone rings. The rules regarding connections to the telephone network do not apply to hypothetical circuits.

Graham Leadbeater
Ringwood, Vic **$40** ■





CONSTRUCTION **PROJECT**

IR DATA LINK & PROPERTY MINDER

PARTS LIST

Transmitter board

resistors

(All 0.25W 1% unless indicated)

R1,6	1k
R2	68k
R3	470 ohms
R4,8	10k
R5	47k
R7	1.5k
R9	10 ohms
R10	4.7 ohms 1/2W
VR1	20k horiz. trimpot
VR2	10k horiz. trimpot

capacitors

C1	22nF greencap or MKT
C2,6,7	15nF ceramic
C3	1.5nF greencap or MKT
C4	100uF 16VW RB electrolytic
C5	0.47uF monolithic
C8	1000uF 16VW RB electrolytic

semiconductors

D1,2	1N4148 or similar
D3,4	G1G or similar
Q1	BC548 or similar NPN
Q2	C8050 or similar NPN
Q3	IRF9530 or similar P-channel MOSFET*
IC1,2	555 timer IC
L1-5	5mm IR LEDs

miscellaneous

PC board, 77 x 63mm (Oatley copyright); tinned copper wire for links; insulated wire for lower, data inputs; 'mystery box' for housing and MOSFET Q3*.

Receiver board

resistors

(All 0.25W 1% unless indicated)

R1,4,10,12	10k
R2,14	4.7k
R3,6,11,13	47k
R5	470 ohms
R7,8	680 ohms
R9	1k

capacitors

C1,7	100uF 16VW RB electrolytic
C2,3	15nF ceramic
C4	56nF greencap or MKT
C5	10uF 16VW electrolytic
C6	0.47uF monolythic

semiconductors

IC1	LM567 tone decoder
Q1,2	C8550 or similar PNP
Q3,4	C8050 or similar NPN
ZD1	5.6V 400mW zener
LED1	5mm red LED
LED2	5mm green LED
D1	G1G or similar

Miscellaneous

HC312 or PIC12043 integrated IR receiver; DIL relay, D51A24 or similar; PC board 77 x 53mm (Oatley copyright); insulated wire for power leads and data output.



Here's a low cost 'two in one' project with two fairly distinct applications: it can be used as a shop/property minder, to detect entry and exit of personnel, or as an optical communications link for transmitting data. In either case the operation is based on a beam of invisible infra-red light.

by Andrew Palmer

THE TRADITIONAL type of 'shop minder' uses a beam of visible light across a doorway, so that anyone passing through the doorway breaks the beam briefly and hence activates an alarm of some kind. This type of system generally works reasonably well, and has the advantage that the visible light beam does allow easy alignment of the 'transmitter' and 'sensor' (receiver) units. However the visibility of the beam also makes it more vulnerable to being 'avoided', by anyone seeking to enter or leave without being detected. This kind of avoidance is much harder if a beam of infra-red (IR) light is used, at a wavelength which is invisible to the human eye. That's probably why IR systems have become more popular in recent years, especially as IR emitting LEDs and laser diodes have become lower in price.

This multipurpose project is based on a high power IR transmitter using a bank of IR LEDs, and a matching IR receiver. As a security device it can be used either with the two together on a common board, as a detector responding to IR light 'bouncing back' from objects or people (range up to about 10m), or with the two separated and at either end of the IR beam, as a 'break the beam' property protection system with a range of up to 40m.

Alternatively the two-part version can be used to implement a 'wireless' IR data communications link, to transmit data between buildings, across corridors etc. In this mode they will even provide a useful range using reflections from walls and ceilings — as well as direct line-of-sight links. Typical applications in this 'data link' mode could include a wireless link from a laptop PC to an office printer, or retrieving data from a data logger in a building on the other side of a lane, etc. The maximum data rate is not high (typically around 3000 bits per second), but enough for low-speed data links.

The range of the system can be greatly increased by positioning the IR receiver module at the focal point of a small parabolic reflector, such as a reflector removed from a small torch. The effective range can also be increased by adding more series strings of IR LEDs and resistors in the transmitter. For example adding an extra string of one resistor and five more LEDs would increase the range by approximately 1.4 times.

By the way, the use of IR LEDs in perimeter protection is much safer than laser diode systems, because the IR radiation isn't concentrated in a narrow beam. Despite this the detection zone is still restricted to almost a 'string line', the width of which is mainly determined by the detector area and is not related to the solid angle of the energy being transmitted by the LEDs. Placing a small blackened tube over the receiver sensor/module will help maintain maximum range in bright light by reducing possible saturation of the detector to direct sunlight etc.

The transmitter

As you can see from the schematic (Fig.1), the transmitter section is based on two 555 timer ICs, with power MOSFET Q3 used to provide drive current capability for the IR LEDs.

IC1 operates as either an astable oscillator or a logic inverter, depending on the position of the 'Fence/Data' link. With the link in the Fence position, sensing pins 2 and 6 of IC1 are connected via C1, VR1 and R2 to discharge pin 7, and then to the positive rail via R1. This allows the 555 to function as an astable oscillator, with a square wave output at pin 3. With VR1 centred the approximate frequency of this oscillator is 360Hz. This 'subcarrier' frequency is used to gate or modulate the main IR carrier frequency oscillator formed by IC2 and its associated components. This oscillator's frequency of approximately 38kHz is set by VR2.

When the output of IC1 is high, the 38kHz oscillator IC2 runs and produces an output. During this time MOSFET Q3 is switched off and on at the 38kHz rate. Note that the output duty cycle is not symmetrical and results in the MOSFET being turned on for approximately only 10% of the time. This saves power and also reduces heating in the LEDs.

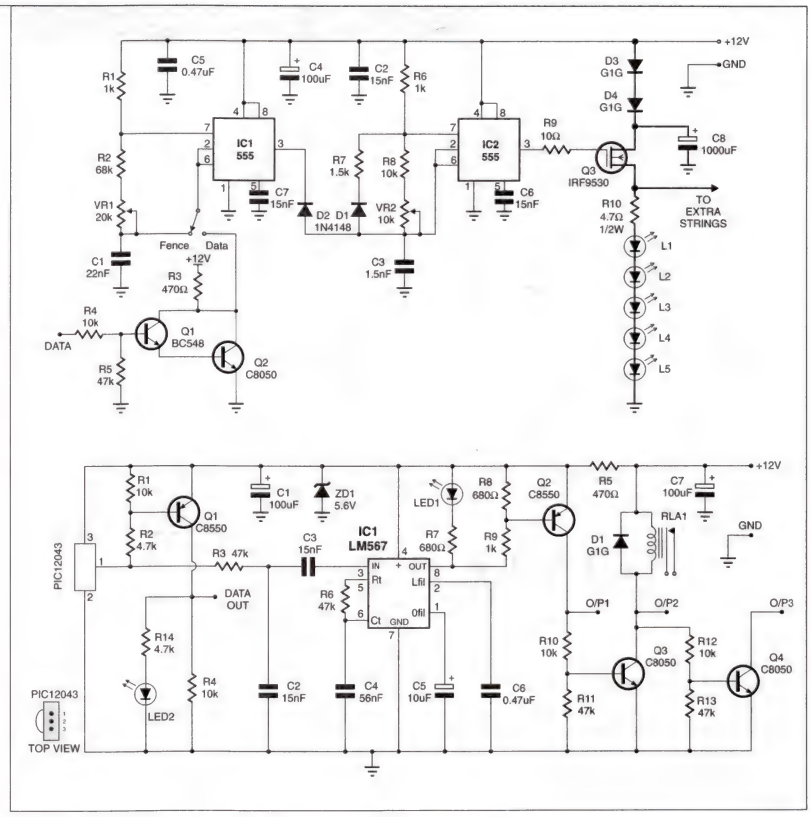
When the output of IC1 is low, the 38kHz oscillator is disabled from running due to pins 2 and 6 of IC2 being pulled low via isolation diode D2. During this time the output of IC2 is high and MOSFET Q3 is turned off.

When the link controlling IC1 is in the 'Data' position, IC1 no longer acts as an oscillator but simply as a data inverter. Because its sensor pins 2 and 6 are connected to the collectors of data inverter transistors Q1 and Q2, its output at pin 3 follows the data input directly, so the 38kHz carrier oscillator ends up being gated/modulated by the incoming data.

Transistors Q1 and Q2 are connected as a high-gain Darlington pair to provide a relatively high impedance for the circuit's data input.

The IR LEDs used have a maximum continuous current rating of 100mA, but at 10% duty cycle the maximum peak current can be 1A. Resistor R10 is used to limit the peak current to approximately 750mA. Diodes D3 and D4 are included so that the MOSFET can switch off completely when the output from IC2 goes high, as the 555's output does not switch to the full supply voltage.

Capacitor C8 acts as a reservoir, helping to provide the peak LED current when Q3 switches on.



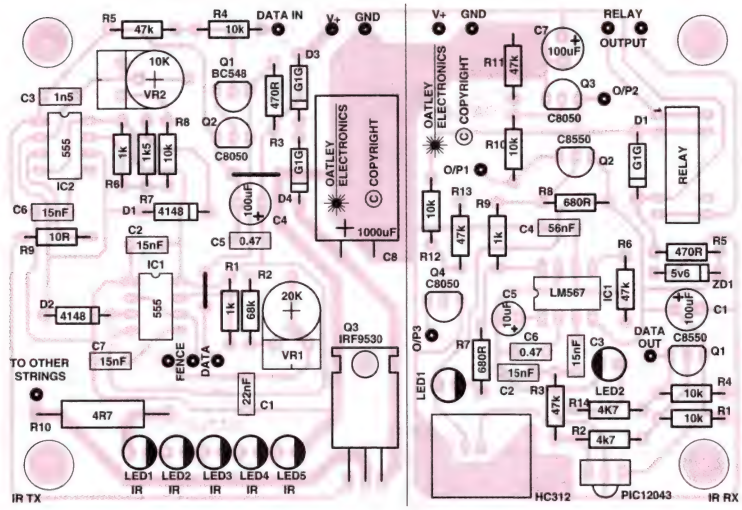
Here are the circuits for the transmitter (top) and receiver modules. It's very easy to use them for either doorway or perimeter monitoring, or transmitting low-speed data over a short distance.

The receiver

As you can see from Fig.2, the receiver is even simpler than the transmitter. It's based on an IR detector module, which can be either a PIC12043 fully integrated device in a modified TO-92 plastic case or an HC-312 hybrid module in a small metal case. Both are designed to detect IR light modulated at the 38kHz rate, and include a PIN photo diode and all the signal processing: amplification, detection, automatic gain control etc.

In each case the output from the receiver module is an inverted form of the original 360Hz subcarrier from IC1 in the transmitter, or the Data signal applied to the transmitter.

When the system is used as a data link, transistor Q1 in the receiver inverts this signal so that the output signal developed across R4 is of the same polarity as the original data. LED2 pulses



Here are the overlay diagrams for the PC boards. They're shown here joined together, as they come in the kit. If you're building the transmitter and receiver into separate boxes, they should be sawn apart before fitting the components.

with the received data, to show that the link is operating correctly.

As well as going to Q1, the output from the IR detector passes through low-pass filter R3/C2 to IC1, which serves as a tone decoder with a centre frequency of approximately 360Hz. So when a subcarrier of the correct frequency is present, the output pin (8) of IC1 will go to a low state. This causes LED1 to glow and also turns on inverter transistor Q2, so that output O/P1 will go high. As well Q3 is turned on, so O/P2 goes low and relay RL1 operates. This also removes the bias from Q4, which turns off so any load connected to its collector stops operating.

Logically the oposite of these events takes place when a 360Hz subcarrier is *not* being received: the output of IC1 goes high, LED1 goes out, Q2 and Q3 stop conducting, the relay drops out and Q4 conducts — so that any load in its collector circuit is activated.

It's this multiple set of outputs that gives the circuit its flexibility, and makes it able to be used in both 'break the beam' or 'reflect the beam' type applications. For example when a subcarrier signal is present at the receiver (either from a direct beam or reflected beam) the relay is operated and its contacts are closed — which could be used to operate a lamp or buzzer. When the beam is broken the relay contacts open, but if a 12V buzzer is connected between O/P3 and +12V the buzzer would in this case sound when the beam is broken.

NOTE: A complete kit for this project is available for $28 plus postage from Oatley Electronics, of PO Box 89, Oatley NSW 2223. The kit (K130) includes a combined PC board (which can be cut into separate transmitter and receive boards if required), all on-board components and a new/surplus 'mystery box' unit from which can be obtained both the IRF9530 power MOSFET (Q3) and one plastic housing. Please note that the PCB design for this project is copyright to Oatley Electronics, and boards will not be available commercially from any other firm.

Construction

As you've probably realised already from the photos, the transmitter and receiver can each be wired up on small PC boards, with the transmitter board measuring 62 x 77mm and the receiver board 52 x 77mm. However to minimise costs and also allow greater flexibility, both boards are actually supplied in the kit as a single 'siamese twin' PCB.

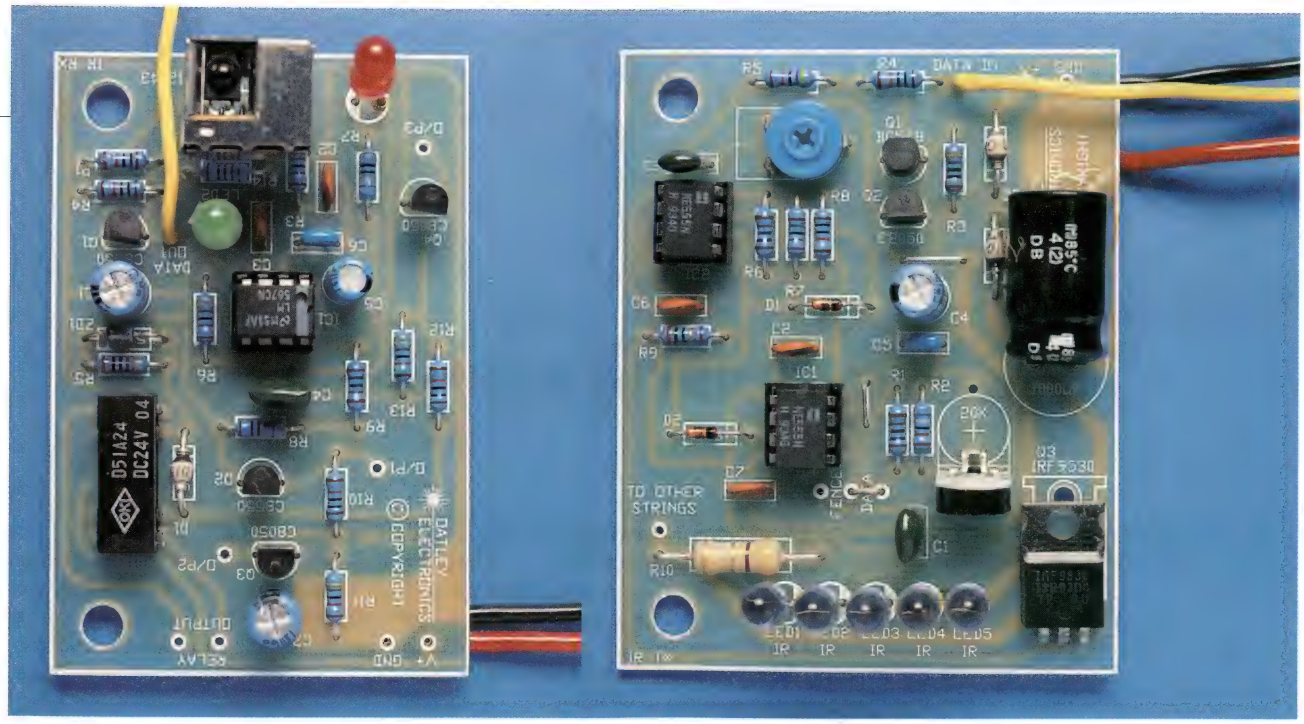
If the kit is to be used for a 'break the beam' security system or a one-way data transmission link, this dual PCB will have to be cut in two. Needless to say this is best done before soldering any components to the PCB. On the other hand if the kit is to be used as a 'reflect the beam' security detector or two-way data transceiver, the PCB will not have to be cut.

Note though that if you're going to be doing much experimenting with these applications, it might still be a good idea to cut the boards apart before fitting the components, rather than possibly having to do it after they're added. They can always be mounted side by side, if that proves feasible and desirable in your application. Because of the proximity of the LEDs and the IR receiver module on the dual PCB, it may be necessary to add some IR shielding between the two if they are left together. You might need to fit a cardboard or opaque plastic tube over the IR detector (perhaps held in place with Blu Tac or similar), some aluminium foil etc.

Whether you do cut the board in two or leave it in one piece, the transmitter and receiver components should be added to them/it in the usual fashion, using the overlay diagram as a guide to their location and orientation. Note that the transmitter section has two short wire links as well as the Fence/Data programming link, and all three can be fitted using component lead offcuts.

As usual, it's easiest if you fit the low-profile resistors and capacitors first, followed by the larger capacitors, preset pots, diodes, transistors and ICs. Take care with the orientation of all of the polarised parts (including the DIL relay), and note that capacitor C8 on the transmitter board is mounted horizontally so that if desired, the board can be mounted up behind the front panel of a case with the transmitting LEDs protruding through matching holes.

Another point to mention here is that the final version of the receiver PCB which will be provided in the kits has provision for *either* the PIC12043 or HC-312 IR detectors, and each kit will have either one or the other depending on availability. The board shown in the photos was an earlier version, which was designed mainly for PIC device and had to be modified underneath for the HC-312. The PCB overlay shows how to fit either one in the final board, so there shouldn't be any problem fitting whichever is provided in your particular kit.



Use this photo of the receiver (left) and transmitter (right) boards as a guide when you're wiring up your own.

As you can see from the photos, either or both of the modules can be fitted into the 'mystery box' plastic case, if you wish. However the details of this are left up to you. In many cases you might want to use a different style of case for one or the other module, especially if you want to experiment with reflectors, etc.

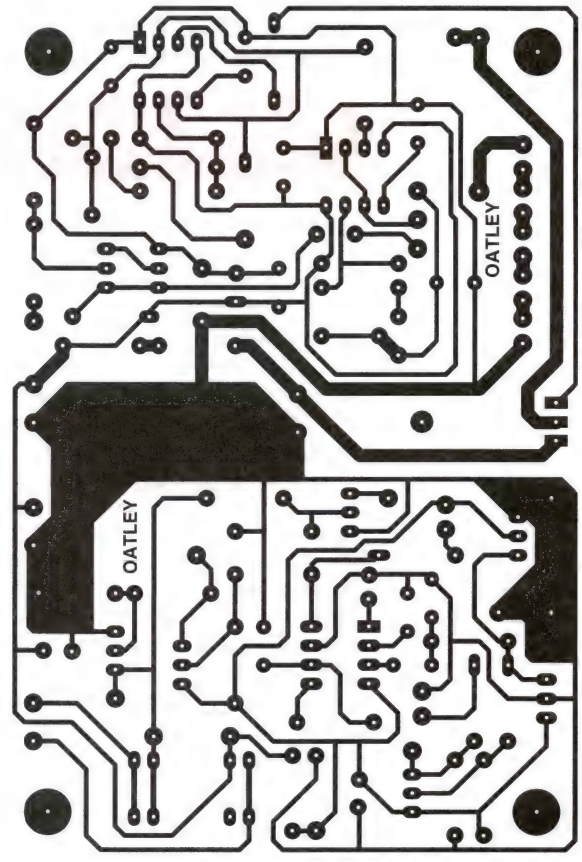
Setup & adjustment

Setting up the system is fairly straightforward, and is largely the same whether you're going to be using it for security detection or as a data link. First of all you need to set the carrier frequency of the transmitter to the peak response frequency of the receiver's IR detector, as this will give the system maximum range. It's done by adjusting preset pot VR2, with the two units placed so that the receiver detector is receiving only a small amount of the IR radiation from the LEDs. If the two are in fairly close proximity, or still side by side on the dual PCB, you can either partially cover the detector to attenuate the signal, or have a shield between the two and arrange a fairly distant reflecting object to 'bounce' a small amount back for the adjustment.

The presence of the received signal is indicated by LED2 on the receiver board. The idea is to set VR2 for a response with the least amount of reflected signal, or with the transmitter and receiver as far apart as possible.

The second setting up adjustment is only necessary if you're going to use the project as a door minder/intrusion detector, where IC1 in the transmitter needs to be set up to give the subcarrier frequency that matches the response of the tone decoder chip in your receiver. Here preset pot VR1 is used to adjust the subcarrier frequency, and LED1 in the receiver is used to indicate the tone decoder's response. The idea in this case is to set VR1 halfway between the points where the decoder IC just fails to detect the signal, as indicated by LED1.

That's really all there is to it. The two modules are easy to put together and set up, but have lots of flexibility for experimenting. Have fun! ❖



Here's the pattern for the combined PCB, reproduced actual size for those who like to make their own boards. Etched and silk-screened boards are of course supplied as part of the Oatley Electronics kit, but you won't be able to get etched boards from other firms because Oatley holds the commercial copyright.



SERVICE MAN

An elusive intermittent in professional equipment, **and a resurrection by a self proclaimed Saint**

OUR FIRST CONTRIBUTOR this month is Michael Pace, from Thuringowa in Queensland. Michael has an interesting story about a long term intermittent in some very professional gear. His tale just goes to show that these types of fault do not only occur in domestic type devices.

By the way, before I hand over to Michael, I'd like to remind readers that this column is dedicated to servicing not just TVs and VCRs but anything with a technology background. Domestic *and* professional, mostly but not exclusively electronic, with the only requirement being that the story is interesting. Michael's story is definitely interesting — here's what he has to say...

Having read your magazine for many years I have, like most readers, always enjoyed the Serviceman. However, I can't remember ever reading about problems encountered in cinemas. Several years ago, I worked in a multiplex cinema in Canberra, where the amplification systems give little trouble overall — but occasionally Murphy arrives and makes his presence well known.

The problem started in Cinema 3, with the loss of the high-frequency section of the centre channel. The amplifier system is bi-amped for all three screen channels, and in this case it looked like the failure of the electronic crossover unit — this unit was sent away for repair, but was returned with no fault found.

On reinstallation it worked fine, as had the loaner unit we had during its absence, but failure of the HF section soon followed. There was further investigation over a period of time, but nothing was found.

In the meantime several other amplifiers had failed, but as this was cured with a simple modification of replacing a failed resistor with one of a higher wattage, it was decided to continue and replace the resistor in all the amplifiers. Because of the replacement program, the centre channel amplifier from Cinema 3 became the centre channel amplifier in Cinema 5 and of course, Murphy came along too.

The occasional loss of the high-frequency channel became less and less occasional, so the first thing checked was the modification to the amplifier — but that definitely proved to be okay. We returned it to the amplifier rack, the HF soon disappeared again, so we were really back to square one.

I set up the amplifier with a dummy load made from jug elements and drove the amplifier with a signal generator for several days. I calculated that the amplifier was running near its full load and in this time it never looked like stopping. So, reluctantly, it was returned once again to service.

It stopped.

Frustration, then success!

Frustration was setting in, as this fault was now six months old and no resolution was in sight. After repeating the exercise over again, and still nothing coming to light, I put the amplifier back into service with the covers removed; this time monitoring the input and the output with an oscilloscope, with the probes connected to the back of the Canon sockets.

The amplifier ran for several days before it failed. There was no sign of a trace on either channel, which gave the distinct impression that the electronic crossover had died. But as the spare amplifier had never failed at all when it was connected to the crossover, it immediately cleared this unit.

THE PROBLEM STARTED IN CINEMA 3, WITH THE LOSS OF THE HIGH

When I started to remove the input plug from the amplifier, the signal immediately returned and no amount of wriggling the plug would make it stop. It ran for several days before it stopped again and touching the Canon plug and socket combination immediately restored the signal. Fitting a new Canon plug and socket fixed the problem permanently.

A post-mortem conducted on the plug and socket found that after a period of time the connection simply failed and became an open circuit. It had never occurred to me that these professional quality Canon plug and socket combinations would fail in this way.

Well now! Who would have guessed?

Actually, Michael, I assume that the problem was contact resistance between the pin and socket, and not a physical break in another part of the assembly. Those Canon plugs have circular pins that are machined just slightly oversize. To allow the pin to enter the socket, a pair of very fine saw cuts are made in the pins, at right angles. These cuts allow the pins to compress just

enough to enter the socket, while maintaining good contact pressure due to the springy nature of the pin material. The design is almost foolproof so I can't imagine how Michael's amplifier came to be so unreliable.

Of course, now that we are alerted to the fact that Canon plugs can fail in this way, Murphy will see to it that none ever do. But it's something to think about, just the same.

Thanks for that story, Michael. Oh! And by the way, we *have* had a couple of cinema stories in the past — about the resurrection of the old Drive-In at Sheparton, in Victoria. It was some time ago, though.

Now we come to a story about the resurrection of an old TV. We have had plenty of this kind of tale in the past, but there never seems to be any repetition of problems. A thousand old sets have failed in a thousand different ways and our contributors have had to devise as many solutions to get them going again.

This story is no exception. It comes from Cameron Rogers, of Cooma in New South Wales. As you'll see, Cameron worked very hard to get a set, any set, going to hand over to a worthy cause. He succeeded and developed an interesting story for these pages in the process.

Cheap TV

It all started when a friend of mine asked if I could find an inexpensive (that is 'free') TV for his daughter who had split up with her husband — he'd got the TV and she'd got the kids.

FREQUENCY SECTION OF THE CENTRE CHANNEL

I had no recoverable sets in my shed, and so I went hunting at a couple of TV repair shops for a suitable set among some of their potential landfill.

The first place I went was a shop that I had done repair work for some time ago and knew the owner quite well. With a bit of grave digging, I obtained an old but likely candidate in the form of a 50cm Sharp C-206X. I feared that this set had a heater to cathode short, although I hoped I was wrong.

When I had examined the set, the blue gun was coming on full with retrace lines, so I was a bit dubious about the set due to its age and the fault. But beggars can't be choosers, so I offered $10 to compensate for any useful parts the owner might have otherwise salvaged.

On getting the set back to my bench I found that my worst fears were correct, there was indeed an intermittent heater to cathode short but I managed to temporarily dislodge the short by gently tapping on the neck of the tube (of course wearing my safety glasses). This gave me a rolling picture. I had also noticed several loud arcs when the set was switched on or off.

I knew immediately what this meant and checked and found that the earth return lead from the tube aquadag had been left off the CRT board which, when replaced, stopped the arcing.

Reworking some dry joints around the vertical hold pot stabilised what was now a surprisingly good but still intermittently full blue picture.

I attacked the short with gradually more and more aggressive attempts tapping to dislodge it and later trying blow it out with gradually increased bursts of current. Unfortunately, as I suspected would happen, the heater blew before the short did. Putting the corpse in the shed, I now knew how Dr Frankenstein must have felt when he blew the heads off some of his early attempts at creating a monster.

LOOKING FOR AN OLD VALVE?

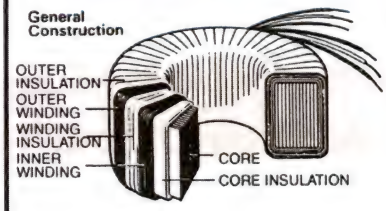


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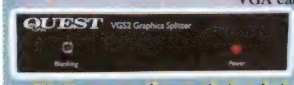
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SERVICE MAN

not a LOPT wrong...

I then decided to visit the remaining TV repair shop. A friend of mine who is a very good tech works there but I didn't really expect to find anything useful in his graveyard. He offered to sell me a second hand tube which was not a good match for the Sharp, or a 50cm AWA C4817 which he thought might have had a LOPT failure.

As the tube he had offered me did not have a yoke or purity magnets fitted and was not even a match for the Sharp's I opted to take the AWA, again paying a token sum. I didn't hold out much hope for this set either, for if the LOPT were to have failed, it would blow the budget if I had to fit a new one. I hoped I might have a second-hand transformer in my shed that would have been a suitable replacement.

AT ONCE IT CRACKLED AND HISSED WITH THE SCREEN FLASHING ON AND OFF, AND

After the first disaster I was beginning to question my own sanity in this endeavour.

With the AWA on the bench, I took the back off and after a quick once over could not find anything especially wrong so I stood back and fired it up.

At once it crackled and hissed with the screen flashing on and off rapidly and with discoloured blobs in between. With such a performance I could well believe the diagnosis of a possible LOPT failure.

However, it was the power switch that was arcing, not the LOPT. I suspect that a quick diagnosis of the set originally made them decide the LOPT had failed but with the set being less than new it was deemed a write-off and stuck out in the graveyard.

With the switch fixed the set now showed a picture with poor purity which was easily diagnosed as having no auto degaussing. The winding read OK but the thermistor (RP901) feeding it was O/C. I had no suitable replacement on hand until I remembered the corpse in the shed. Sure enough, it had a suitable thermistor that did the job.

The picture was now perfect! Then I did a bit of preventative work, resoldering some suspect joints on the board and the LOPT. During the soak test I noticed some faint arcing and an ozone smell. It turned out this arcing came from the focus pin through a small gap in the CRT socket insulation to a track on the board.

The voltages were all OK as were all the associated components and the picture was fine despite the discharge! A small smear of silicone around the gap soon 'cured' the problem...

Once I had confirmed this, I put bit more silicon on to make certain it would hold and it hasn't missed a beat since. In fact the set worked so well, I was almost hesitant to part with it, but then, that would have jeopardised my sainthood.

So there! Saint Cameron was ultimately successful in doing his good deed, although I can't help thinking he may have wasted the initial Sharp.

A heater-cathode short is a dramatic fault and one that writes off the tube for any critical viewer. But they can be salvaged for less critical viewers, often with nothing more than a length of wire!

Most heater circuits have one side grounded somewhere in the system. As a result, the short pulls the cathode down to ground and turns the relevant gun hard on. If the heater circuit can be isolated from ground, it can float at the cathode potential, restoring normal conditions to the electron gun.

The problem with this treatment is that the heater wiring adds masses of capacitance to the video output circuit. This destroys the high frequency response of that particular output, thereby blurring the picture to a point beyond which most viewers will accept.

The first time I struck this problem, I solved most of the difficulties by feeding the heater with a small 240V/6.3V transformer mounted on the tube baseboard. This minimised the added capacitance and it worked OK, but I later found an ever better way.

Taking a leaf out of the Philips/Kriesler (and some other makes) TVs which powered the heater from the line output transformer, I found that two turns of light wire around the LOPT would drive the heater circuit of almost any tube you could find.

Of course, I had to remove totally the old 6.3V wiring to the tube baseboard. And I normally insulated the old heater wiring on the power transformer or power supply PCB, to remove any possibility of accidental shorts.

Some people argued that this was not a good way to solve the problem. They claimed that the extra load on the line output stage would shorten the life of the transformer or the output transistor. But given that the set would otherwise be written off, I don't feel too bad about it.

On a slightly different tack, the same procedure could be used to squeeze a bit more life from a worn-out tube. Three turns around the core of the LOPT would over-run the heater by a volt or two and force a slightly higher emission from the worn out cathode. I've used this technique several times to gain a few months for pensioner customers, giving them time to save a bit towards a new set.

So back to Saint Cameron.

If he had been aware of the foregoing procedures, he

might have been able to salvage the old Sharp and the rest of the story may never have eventuated. Oh well! It's always easy to be wise after the event.

Thanks for your story Cameron. And I hope your fee for telling us will in some way compensate for not being able to keep the old AWA for yourself.

Get your name in print!

Now, getting back to the subject of contributions. At the moment the 'contribs' file is almost empty. After next month's column I might have to do some extra leg-work to get material from far-flung colleagues. Really, I would rather stay at home editing your stories so come on, you would-be authors. Boot up your word processors and get writing!

DISCOLOURED BLOBS IN BETWEEN.

I've just been thinking about the many ways now open to you for submitting a story. Once upon a time you had to write it out in longhand and post it in to us. Of course, you can still do that if you wish, though I think it's a bit masochistic. Nowadays you can type it out and post it. Or you can type it into a word processor, save it on a floppy disc and send that. Or if you have access to e-mail, you can send it directly into EA.

But what if you can't type? Well, that's not a problem. Several people have told their stories onto an audio tape and sent that to us. It's not necessary to 'write' your story before you record it. Just tell the hows and the whys onto the tape and I can sort it out and prepare it for publication. For that sort of submission, a circuit diagram is invaluable.

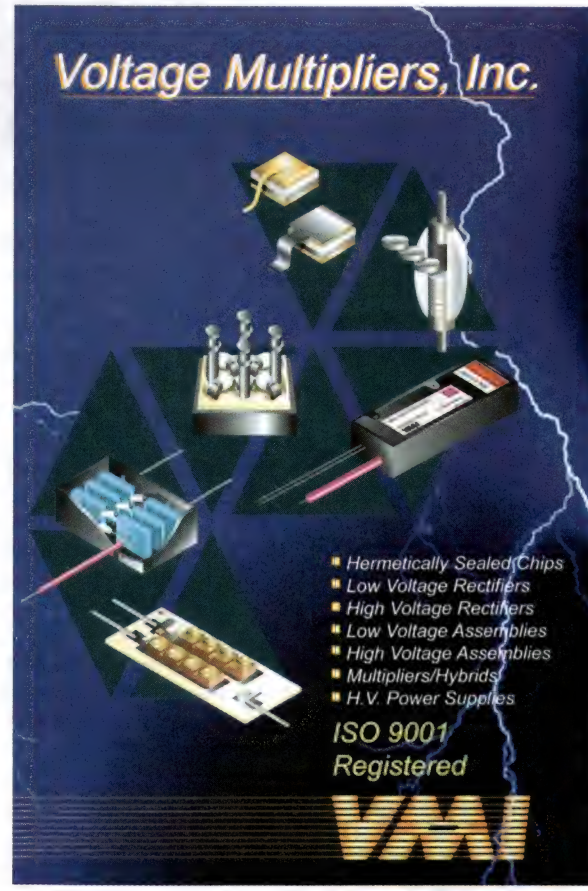
One enterprising contributor once sent his story on videotape. He taped the symptoms, then filmed himself as he went about repairing the appliance. That worked very well and made quite an interesting story. Nowadays we could even grab frames from the tape to illustrate the story in the magazine!

So there is no reason why you can't get your story into these pages. You have a wide choice of media to submit it on. And of course, we still pay (yes, **pay**) for contributions. If you've wasted hours over a difficult job, here's a chance to recoup at least some of your lost income.

Finally, by the time you read this, I will be going into hospital to undergo a heart bypass operation. As you probably realise, surgeons these days rely heavily on electronics to assist them in their occupation. It is my hope that their electronics have been serviced by technicians as enthusiastic and skilful as most of our readers. I'll let you know how I get on.■

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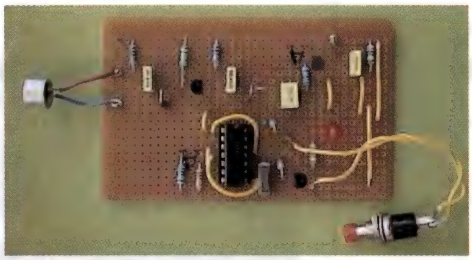
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$10 WONDERS

BY OWEN BISHOP

Call waiting



ONE OF THE best things to come out of Telstra recently has been their Message Bank service. This gives us the essential functions of an answering machine, without having to buy an answering machine! Now all we have to do when we come home is to listen for the syncopated dialling tone, to know that there is a message or messages waiting for us. But one thing an answering machine does do that the Message Bank doesn't, is to flash a red warning lamp when there is a call waiting. Ok, so all you have to do is pick up the phone and listen, but many of us are too busy to do this when we arrive back home loaded with the grocery shopping or accompanied by a horde of kids hungry for a meal. Until we need to make an outgoing call perhaps several hours later, or even the next day, the Message Bank remains unheeded and forgotten. This month's Wonder demands the attention that the waiting messages deserve.

The device also helps you to return calls when no message has been left. As before, the LED will be flashing when you come home. If you then pick up the telephone and the dialling tone is its usual monotonous self, you know that someone has rung. Use the Call Return facility to find out who rang.

How it works

The circuit has two sections, one to detect the ringing sound and the other to flash the lamp. As Fig.1 shows, the detector circuit is similar to the one we used in the Sound Operated Trigger (EA March 1999). The main difference here is that we have left out one of the amplification stages. The reason for this is that the circuit must not be too sensitive. A sensitive circuit will trigger the LED to flash at the slightest sound. A dog barking, a distant door slamming, somebody shouting in the street and many other incidental noises could start the LED flashing. Instead, we rely on placing the microphone very close to the telephone ringer and keeping sensitivity low.

The electret microphone detects the phone's ring, and the signal passes through C1 to the base of Q1. R2 and R3 to give about 1.2V base bias to the transistor Q1. Actually, the MPSA14 is not a single transistor but a pair of transistors on the same chip connected as shown in Fig.2. This is a known as a *Darlington Pair*, where the emitter current of Q1a becomes the base current of Q1b, so the gain of the pair in the *product* of the current gains of the individual transistors. If each transistor has a current gain of 100, for example, the gain of the pair is 10,000 times. This is plenty enough gain for our purpose. Incidentally the base-emitter voltage drop of a silicon transistor is about 0.6V. There are two transistors in Q1, which explains why the base (of Q1) must be biased to 1.2V to turn the pair on.

Back to Fig.1 though, where the amplified signal next goes through C2 and then to a diode pump. A diode pump is rather like pumping up a tyre that has a puncture. The pump injects a little more air into the tyre at each stroke and, provided you pump fast enough, the pressure gradually builds up. Stop pumping and it falls back again. When the voltage at C2 increases, current flows through D2 and charges C3. When the voltage decreases, the current can not return through D2. Instead, it flows through D1, maintaining the charge on C2. Thus,

IF YOU IGNORE THE PHONE AFTE

PARTS LIST

resistors
(all 5%, 0.25W)

R1	2.2k
R2	220k
R3	56k
R4, R8, R11	10k
R5, R7, R9	1M
R6	18k
R10	10M
R12	180 ohms

capacitors

C1	10nF MKT or polyester
C2	22nF MKT or polyester
C3, C5	220nF MKT or polyester
C4	100nF MKT or polyester

semiconductors

D1, D2	1N4148 signal diode
D3	light-emitting diode
IC1	4011 quad 2-input NAND gate
Q1	MPSA14 NPN Darlington transistor (or equiv.)
Q2, Q3	BC548 NPN transistor

miscellaneous

MIC1	Electret microphone insert
SW1	SPST toggle/slide/rocker switch
SW2	Push-to-make push-button

Stripboard 52mm x 92mm (20 strips x 35 holes), 5 x 1mm terminal pins, battery holder for 4 x AA cells, 14-pin IC socket.

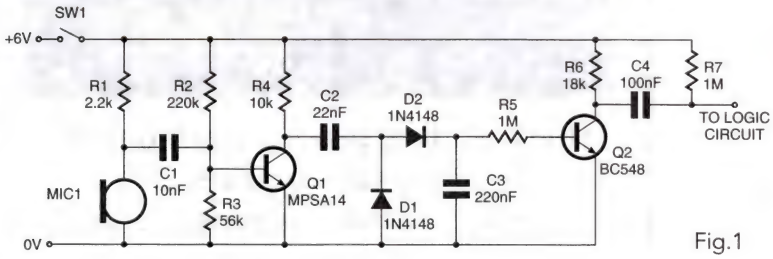


Fig.1

The analogue section of the circuit (above) uses a Darlingon transistor for the high-gain front end. The circuit below shows the internal construction of these 'super' transistors.

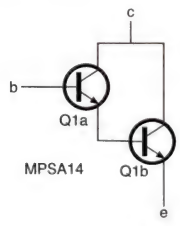


Fig.2

The Alert responds to the sound of the telephone ringing. It has a single indicator, which is a red light-emitting diode. (It can, of course, be any other colour if you prefer.) When you go out, you reset the circuit and the LED switches off. If the telephone rings at any time when you are out, the circuit detects the sound and the LED starts flashing. It remains flashing indefinitely until you press the reset button again. If you still ignore the telephone after this warning, there is nothing much the Wonder can do about it, but at least it has tried.

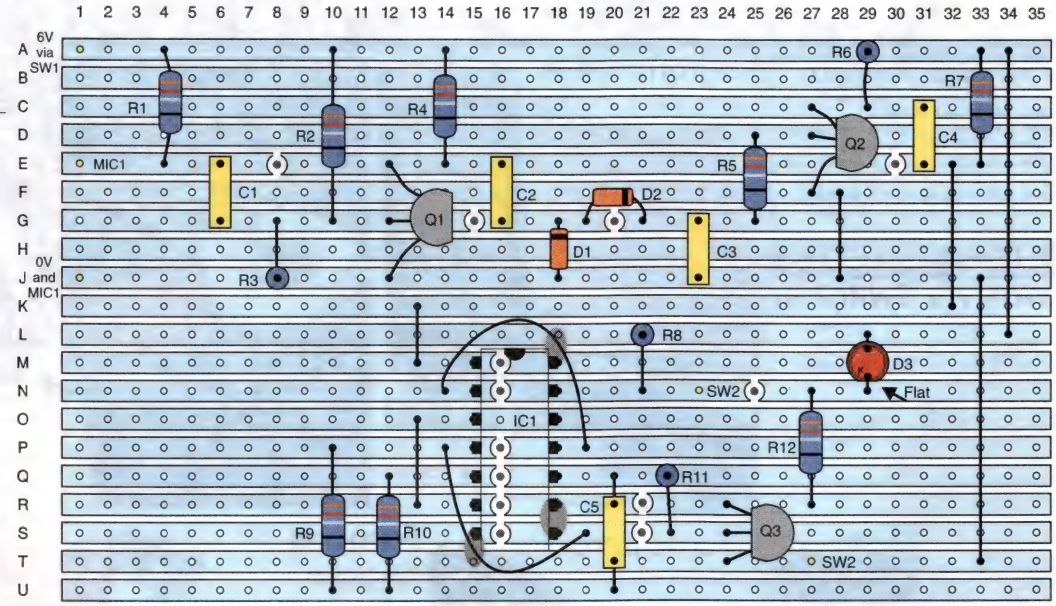


Fig.3: It's a big board with a fair few parts, so take things slowly. There's nothing particularly difficult about construction though, so you shouldn't have any problems.

the voltage on C3 rises on the positive going half cycle but does not fall on the negative going half-cycle. The charge on C3 rises to a few volts and stays there for as long as the sound lasts. The charge leaks away slowly through R5 to the base of Q2, so the voltage across C3 gradually falls to zero in the absence of sound.

With a strong burst of sound from the telephone ringer, the voltage across C3 rises well above 0.6V and Q2 is turned on for a short period. Turning Q2 on causes a fall in voltage at its collector, so a low pulse passes across C4 to the output of the circuit. The output voltage is normally pulled up to 6V (logic high), but a pulse coming through C4 will bring it down to 3V or lower, which acts as a logic low input. From C4, the signal goes to one of a pair of NAND gates. These are cross-connected as a set-reset flip-flop. Both inputs (pins 1 and 13) are normally held high, but a low pulse on either input may cause the circuit to change state. In the reset state (triggered by pressing SW2), the output at pin 3 is low. In the set state (triggered by receiving a low pulse from the diode pump) the output at pin 3 is high. A high output at pin 3 makes the input at pin 6 go high. This enables the oscillator circuit built from the other pair of NAND gates. With resistor and capacitor values shown, the output at pin 10 alternates between high and low at 2Hz. This turns Q3 on and off and the LED flashes twice a second.

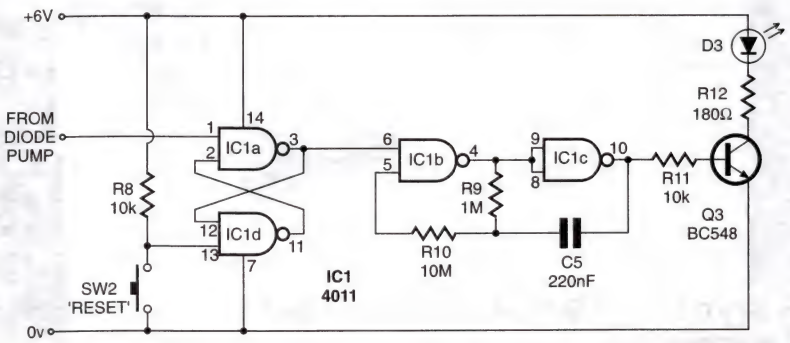
Construction

The circuit is powered by four AA cells in a battery holder. The circuit draws 12mA when 'listening' so alkaline cells should last about 200 hours. The cells will run out sooner if you leave the LED flashing (so press reset *now* and check the call!). You could use rechargeable cells for economy.

The circuit can be mounted in any small plastic box you have to hand. The microphone can be mounted on short leads as in the photo or you may use longer leads in some circumstances to get it close to the source of sound.

In fact, you may like to tape it firmly to the telephone base so that it picks up vibrations from the sounder by direct contact. If you mount the microphone on leads longer than about 10cm long, use single-core mini shielded cable.

The microphone has a 'ground' terminal and a positive terminal. The ground terminal is connected to the metal casing of the microphone by a metal track. Solder the ground terminal to the shielding of the cable and solder the other end of the shielding to the 0V pin on the left of Fig.4. Solder the core of the cable to the positive terminal of the microphone at one end and to the MIC1 terminal pin on the board at the other end.



THIS WARNING, THERE IS NOT MUCH THE WONDER CAN DO, BUT AT LEAST IT TRIED.

Build and test the analogue and digital parts of the circuit individually before connecting them together. The first wire connecting link runs from E32 to K32 (connecting to C4/R7). From track K there is a second link running to pin 1 of IC1. Leave out one of these links until both sections of the circuit have been tested.

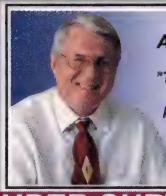
There is more soldering in this project than in many, but the components are well spaced out, so this makes good soldering practice for the beginner. Note the blobs of solder beneath IC1. They join the power pins 7 and 14 to the power rails and also pin 8 to pin 9.

With the power switched on, test the sound circuit by tapping gently on the microphone with a pencil. Monitor the voltage at the output (lower end of R7). The voltage should normally be a little less than 6 V and should drop below 3 V when the microphone is tapped. However, the

(Continued on page 97)

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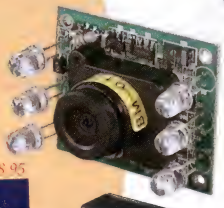


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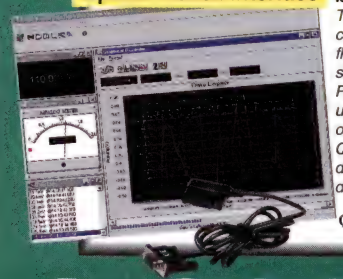
Features: *Auto ranging • EF Detect • Data Hold function • Temperature • AC/DC Voltage 250mV–750V • AC/DC Current 250µA–10A • Resistance 250Ω–25MΩ • Diode Check & Buzzer • Optically Insulated RS232 Interface (Q 1082)*

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Meets EN61010–1 IEC1010–1 CATII 1kVDC/750VAC CATIII 600VAC/DC with 6.5kV transient protection!

Q 1080 **$155**

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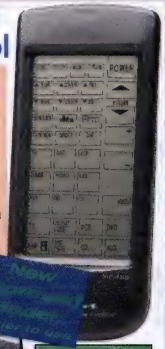


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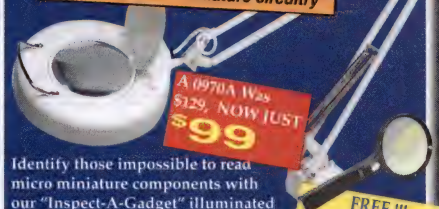
...to this!

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Ideal meter for students, teachers, tradesmen, etc.

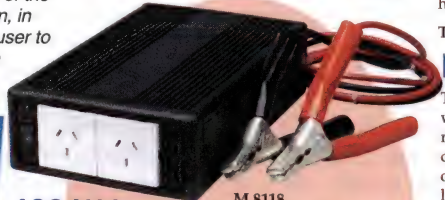


Featuring an extra large display, this multi-function meter hosts all the usual functions as well as a transistor tester, capacitance up to 2000pF continuity/diode test, temperature and frequency counter up to 20kHz.

Includes Holster & Temperature Probe!

Q 1066 Was $89, NOW **69.95**

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600 W Inverter

M 8118 ONLY **$389**

Features:
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- 90% Efficiency • Thermal and overload protection
- Compact and lightweight • Audible Low Battery Alarm & Shutdown • High Surge Capability
- Fan cooled

This inverter will generate 240V AC power from your car battery! Up to 600W of appliances can be powered such as televisions, VCR's, incandescent lights, shavers, etc. Use it as an emergency back-up power supply for your home or as an independent power source in a caravan, avoid the costly conversion of mains powered appliances to 12VDC.

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SOLDERING GRUNT TO GO!!

MASSIVE 120W Heat capacity! Simple "thumb-start" piezo ignition refillable gas storage!



"This has all the convenience features of a normal gas iron, such as quick heating, no power cords, light weight and best of all, it comes with a blow torch tip."
Silicon Chip Mag, Sept '97

The T 2601 kit comprises of a 120W Gas Soldering Iron PLUS a handy carry case with a range of tips and accessories including cleaning sponge, solder dispenser, blow torch, hot air blower and hot knife cutter.

T 2601 Normally $149 ,NOW **$129**

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This well designed LCD module will take care of most of your requirements of digital voltmeter displays. Ranges and decimal place options are easily configured by PCB links. Small, compact, reliable and comes complete with plastic surround for a professional finish.

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S 5260 6 Sector Panel
ONLY $249

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Inductance & Capacitance Meter

UpTeK

An essential piece of test equipment for designing crossovers, power supplies, RF circuits, etc.

- 3.5 Digit LCD Readout • Diode & Continuity Test
- Auto Power Off
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SAVE 20%!!

150W Active Sub-Woofer Module

The inclusion of this sub-woofer will enhance any existing sound system and add a touch of realism to any home theatre sound system.

This completely self-contained amplifier module simply fits into the back of a sub-woofer cabinet. The unit will automatically spring into life from it's Standby mode once a signal is received. The Volume and Crossover Frequency Controls together with the Phase Correction Switch allows the sub-woofer to be set for a desired sound. Installation can be completed in just minutes.

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New Improved Detection Technology!

Features: • Double twin optics for improved detection • Automatic temperature compensation • Compatible with many standard alarm systems • Vertical adjustment for detection angle • Normal or Pulse count modes

Alarm systems with standard P.I.R's are prone to false triggering. The S 5309 features double twin optics which reduces the number of false triggers, all at the price you would expect to pay for a standard P.I.R.

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This little gadget can easily be used to create a very simple panic alarm, remote lighting control or to control any other item you may wish to operate remotely.

Ideal for controlling your lights, garage doors, etc

Operates in 3 modes: • **On/Off** The contacts are switched alternately, • **Momentary** The contacts are held closed while the button is held down in the momentary mode. • **Panic** The button must be held down for 2 seconds to operate the relays and also trip the transistor output.

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Perfect for hi-fi or car audio subwoofers!
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P 8140 6 way mains filter
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P 8150, 6 way mains filter + Tel. protector
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Electrical surge is a major cause for home appliance breakdown. This surge protector eliminates spikes from the 240VAC mains supply, saving your household appliances. Suitable for any standard 10A GP outlet. The P 8150 model also has standard telephone connectors enabling you to protect your telephone.

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(SC Feb. '2000) Generate sine/square waves with this audio waveform generator. See website for full details.

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BY JEAN BAPTISTE CATTLEY

Making **autostart CDs**, Space Invaders and more...

Autostart CD

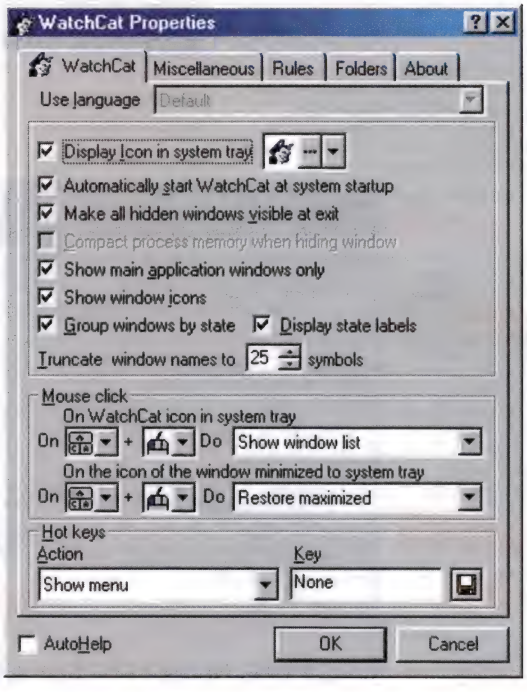
I have a web page photo album installed on a CD ROM. The HTM files are buried among the four hundred or so photo files and are the very devil to find. I understand that INF files are autorun files but I guess they run EXE files, not HTM files. Is there a simple way to write an INF file which will be equivalent to double-clicking on an HTM file which will launch Internet Explorer or Netscape? Your help will be appreciated. (John Starr, by email)

Yes, this is dead easy. All you need to do is add an AUTORUN.INF file to the root directory of your CD, containing the following line:

[Autorun]

open=explorer myhtmlfile.htm

Replacing the filename as appropriate, of course. You can specify any command line you want, so 'open=echo y I format c:' would be a Really Bad Idea. If you want, you can also specify an icon file to use as well, by adding a line containing icon=iconfile.ico, where iconfile is either an ICO file, or an offset into a DLL. You can even put AUTORUN.INF on your hard drives too, and launch a program or document whenever you double-click on C: — though quite why you'd want to is another question entirely.



WatchCat *will make your life a lot simpler, and won't cost you a cent. There are enough rules, settings and tickboxes to keep you going for years.*

Sound advice

I have found out that my Sound Blaster 16 doesn't work in DOS, so when I was in the library I found the issue that this column started in and read about making the CD-ROM work in DOS (Thanks this was a great help :-)). I was wondering what I have to do to the CONFIG.SYS and the AUTOEXEC.BAT to get the Sound Blaster working as well. (Simon Dredge, by email)

If your SoundBlaster is working in Windows, then you probably can get away with adding something along the lines of SET BLASTER=A220 I5 D1 H5 P330 to your CONFIG.SYS file, depending on the Address, IRQ, DMA, High DMA and MIDI Port settings of your card. If your card is plug-and-play, try running CTCM or DIAGNOSE from the DOS prompt. If all else fails, download new drivers from http://support.soundblaster.com/files/download.asp?OS=Dos&prod=sb_16. Hope this helps!

Space invader

I have a PC with Windows 95 installed. I installed a game called Blade Runner, which is Win95 compatible, using the 'Maximum' installation. I then proceeded to look to see how much free space remained on my hard drive. Properties of the drive reported 1.7GB used, leaving about 170MB free. Why is it taking so much space for just Win95 with only one game installed? I looked at the properties of the game folder, and it showed 1.7GB used, so it all seems to be there.

I then installed the game on my neighbour's computer, and it only showed 591MB used. My computer is thus not showing the correct amount of disk space allocated. I have asked various people what could be causing this, and they generally agree that it is a software problem, and blowing Windows 95 away and reinstalling Windows 98 would probably do the trick. I don't really want to do this, though, as I have 95 quite nicely set up on this machine. What's causing this, and how can I fix it? (Roger Monk, Alexandria NSW)

OK, we have a number of things here. First up, if one folder shows exactly the same amount of space used as the entire drive, including the Windows folder itself, you may indeed have a problem. Try running Scandisk on the drive, and see if that changes anything. If the free space is being incorrectly

FDISK efforts

I read your article about FDISK in the February 2000 Computer Clinic section of with great interest. It has helped me to clarify how to use FDISK and its options. I have partitioned my hard disk with one primary DOS partition and several logical partitions. I have retrieved some free space from some logical partitions and would like to add them back to the primary DOS partition. Can you please advise me how to do it? Where can I get further information about FDISK? I looked on the web site of Electronics Australia but could not find anything about it. Thank you for your help. (Yves Dumas, by email)

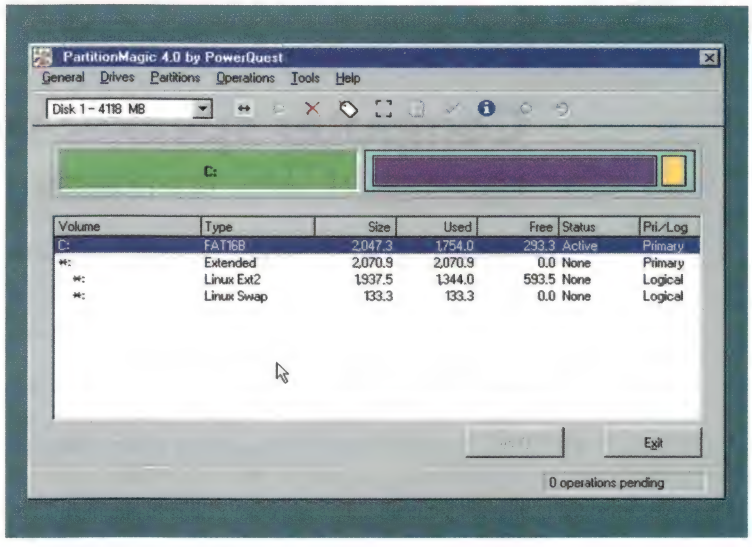
Hmm. You've just come up against one of the major limitations of FDISK — you can't modify a partition without deleting it and re-adding it at the size you want. You can create a new partition using the left over space without deleting anything, but that's about the best you can do without losing all your data, or going to third-party software such as PartitionMagic, from Powerquest.

PartitionMagic basically does everything, allowing you to non-destructively resize, move, convert, create and delete partitions, all through a rather nice graphical interface. At US$70, it's perhaps not a spur-of-the-moment purchase, but if you're going to be mucking around with partitions in the long run, it's definitely worth it. Check it out now at www.powerquest.com

Open another window

How can I open a new window for web pages I look at on my desktop? If I have a page open and I click a page I already had saved on my hard disk, it goes in the same window. I don't want to lose the page I had, so how can I make it open a new one instead? I can do Open in new window if its a link, but this doesn't work for files. Can you help me? (R. Kutters, by email)

Sure can. You haven't said what version of Explorer you're using, but if you're not running IE5, you should be, it beats the competition into the ground (grab it now at http://www.microsoft.com/ie). To stop Explorer from reusing windows when opening a file or shortcut, go to Tools | Internet options -> Advanced, and uncheck the rather appropriately-labelled 'Reuse windows for launching shortcuts' checkbox, and hit OK. Your taskbar will soon be cluttered with lots of lovely windows that you'll keep forgetting to close...



Partition Magic *takes over where FDISK leaves off. It's a tad more expensive though.*

Tray bon

Of course, if your taskbar is a mess (for instance if you run a mail client such as Microsoft Outlook, or some other program that you generally need to leave running), you've undoubtedly wished that Windows had a 'minimise to system tray' feature built in.

Amazingly enough Software pick of the month just happens to be a terribly handy little utility called Watchcat. Watchcat allows you to take any window and minimise it to the system tray at the tap of a hotkey, or even hide it altogether. It can even take your application out of the alt-tab loop, if you really don't want to see it. It also protects applications from over-zealous use of alt-F4, as well. There's even a mini scripting language to provide default behaviour for a given application.

On top of all that, they've also included a handy little shortcuts folder feature that allows you to navigate your desktop, the network and your local file system with fold-out menus very much like the Start menu. (IE5 users can do this already, assuming they have the Desktop Update installed; simply drag My Computer onto the toolbar, double-click the dividing bar to shrink it down to size, and you have one-click access to your whole computer. Nice.) This is this the first utility of this kind that actually works, doesn't get in the way, and (you saw it coming, didn't you?) is completely free. Get it today at http://207.153.240.9/files/?/desktop/wcatsi.zip.■

reported, Scandisk ought to fix it.

If that doesn't do it, check that the directory structure is actually the same on the two machines. It's possible that the install screwed up somewhere and installed two copies of itself, or forgot to remove its install files. However, my guess would be that your game directory simply has an awful lot of files in it. As you're using Windows 95, your drive is most likely partitioned as FAT16, which having only 4096 clusters to allocate, wastes an huge amount of space if you use it to store small files on a large partition. With the maximum size of 2GB, a 1-byte file takes up 32K of disk space!

If you went to Windows 98, and converted your drive to FAT32, you'd most likely end up with a figure much closer to the 591MB used on your neighbour's machine.

If you look at the screenshot, you'll see that I'm actually using FAT16 on my Windows 98 box... There is a reason for this, apart from general laziness and distrust of this newfangled technology stuff — I sometimes want to stick my drive into an NT box, and NT can't access FAT32 drives without third-party software. If anyone's interested, you can get a FAT32 driver for NT at http://www.sysinternals.com/fat32.htm — the free version is read-only, the read/write version will set you back US$39.

I'm just cheap, in case you hadn't noticed, and thus stick with good old FAT16. (I keep most of my stuff on a file server anyway, so disk space is rarely an issue for me anyway, so there.)



INFORMATION CENTRE

BY PETER PHILLIPS

Computer speaker systems, audio power ratings, GPS to measure velocity, and more...

This month we answer a number of questions posed by readers in previous columns, like how to measure boat speed, fluid flow, thickness of paint and so on. As well, we continue the discussion started in January about the black art of audio power ratings.

IN JANUARY WE discussed audio amplifier and speaker power ratings, in particular computer speaker power ratings. I presented a number of questions to our readership, in the hope experts from the field might be able to de-mystify some of the power ratings manufacturers and others apply to this type of equipment. As a result, I've now received a number of letters from readers on this topic, which we'll deal with directly. But first a few comments about a computer speaker system (Altec Lansing, model ACS33) that I recently purchased for around $140.

This system has two 5W RMS 75mm satellite speakers (one with integrated volume control) that cover a frequency range of 250Hz to 18kHz, and a 15W RMS 100mm long throw subwoofer with a frequency range of 70Hz to 250Hz. The system therefore has a total power rating of 25W RMS. These are the specifications given on the box and in the manual, so nothing tricky here. Furthermore, the system has a full-bodied sound that is very satisfying on most types of music. It exhibits a few peaks and troughs over the audio frequency range, but overall it's quite fantastic.

Interestingly, the specifications don't try to make the system appear better than it is, so perhaps there's a link between the realistic specifications of a decent sounding system and those of a cheaper system with an ordinary sound. As Frank Muir in a BBC radio show once quipped when asked what he thought of a particular product: "The advertisements speak highly of it".

Now let's look at what readers have to say (and ask) about speaker power ratings. The first letter is a good introduction, as the writer disagrees with a lot of what I said in the January issue about power ratings.

Power ratings

In January you made the statement: "Average power in a purely resistive circuit is the product of RMS voltage and RMS current." This is way off the mark, and the case you make goes from bad to worse. Wrong information is worse than no information.

The RMS value of a 100V peak sine wave is Vpk x 0.707, which equals 70.7V RMS. This is also the value of the DC voltage which can do the same work. Other values are the peak to peak value of 200V and the average value, which is the average height of a half cycle of a sine wave. The equation is Vpk x 0.637, giving an average voltage of 63.7V. Quite a lot of difference between RMS and average, eh?

Another point is that the above values only apply to a sine wave. For any others, the ratios are different. For example, for a perfect square wave the peak, RMS and average values are the same. Returning to your statement, surely you can see that the average value must be different to the RMS value. As well, if RMS values for current and voltage are used, the RMS power must be identical to that for the same DC values of voltage and current. This is the continuous power.

When we get into handling music and voice, we are often at the mercy of non-sine waves and the advertising people. In the USA, some AM transmitters are specified as "10W of transmit power", which is actually the peak-to-peak envelope reading. Hidden in the small print is "carrier 3.5W RMS". Likewise, audio equipment is given larger numbers so more dollars can be charged. To say the least, speaker and amplifier ratings are often highly suspect.

And finally, the confusing statement that "power is always positive" unlike voltage and current which can go negative. Does this mean that in the negative half cycle, you can't be burnt by the heat from the power, but you can be electrocuted because the voltage isn't really there? Time to rewrite the article I think! ***(John Postlethewaite, Forestville, NSW)***

THE AVERAGE VALUE OF A PURE

I don't want to go on a lot here John, as I think I covered this topic fairly well in January. But there are few things I'd like to deal with. Let's start with an average value, which is simply the sum of a range of instantaneous values divided by the number of values. The average value of a pure sine wave is zero. Your value is for *half* a sine wave, which has little application here. However, if an AC voltage or current has a DC component, the average value of the waveform is the DC value. Your statement that the peak, RMS and average values of a perfect square wave have the same value is equally wrong, as its average (over a full cycle, assuming the wave has equal positive and negative half cycles) is also zero.

Regarding 'positive' and 'negative' power, I think you've misquoted me. I'm referring to the power in a pure resistance, in which the power waveform is always positive. In a reactive circuit, the power waveform straddles the zero line, suggesting negative and positive power. In effect, over a full cycle, power is taken from the source and then

returned to it, depending on how much resistance (loss) there is in the circuit. But remember, if the circuit is purely reactive, there's no heat, so you won't get burnt. Yet you'll sure get burnt if you hang on to the 240V line, or interrupt the circuit and let current flow through you. Strange stuff electricity! Now for the next letter, which asks about PMPO, or peak music power output.

PMPO versus RMS

I read with interest Neil McCrae's comments in January regarding amplifier power output. The attached copies from 'RCA Solid State Power Circuits Designer's Handbook' 1972 give some information about testing methods. Perhaps a synopsis might interest readers.

Another related topic is the PMPO specification found on many small sound systems and amplifiers like those used on computers. A quick search on the Internet shows that PMPO stands for "Peak Music Power Output", but no formula to relate it to RMS. I recently saw powered stereo computer speakers with a rating of 80 watts, in big bold print on the carton. Smaller print stated a 2 x 3W RMS rating. I've tried in vain to relate the two values. Maybe a reader can enlighten us on how the magic is performed. ***(Tony Hagen, Carnegie, Vic)***

Thank you Tony for your comments and for the article you sent, which I'll be referring to later in the column. As for PMPO ratings, like you I'm confused, as there seems to be no consistency. As you'll read shortly, Neil McCrae mentions PMPO and its relationship with RMS, but his figures sure don't turn a 3W per channel amplifier into 80W PMPO. So, here's Neil's letter, which replies to the questions I posed in January.

music is full of peaks, the peak music power must, according to this theory, be twice the RMS power!

But the method of measurement I described in January has nothing to do with such fictitious ratings. Rather it is concerned with the duty cycle inherent in music and speech in that there's always an average level and a much higher instantaneous or "peak" level. I quoted a range of between 3dB and 14dB for the peak to average ratio for typical music and speech. This means the average music power delivered by an amplifier is generally much lower than the power delivered on musical or speech peaks, if those peaks reach the maximum power available from the amplifier when measured using a continuous tone.

If the amplifier has a regulated power supply or is of a design (e.g. class A) where the current drawn by the amplifier does not significantly increase as the power output increases, then the supply voltage to the amplifier will be

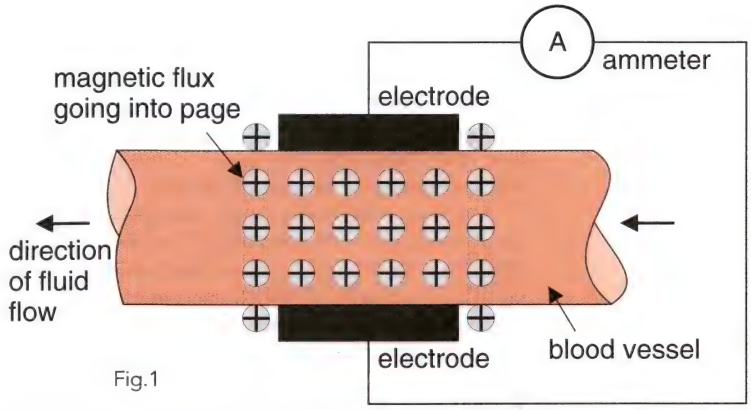


Fig.1

SINE WAVE IS ZERO. YOUR VALUE IS FOR *HALF* A SINE WAVE...

Audio power ratings

You are right that the subject is not mundane. With regard to the questions you posed, I offer the following:

Regarding the relationship between RMS and music power, there's an arbitrary relationship used by marketers where they declare, without any real basis, that music power is some kind of 'peak' power and that it's twice the RMS power output of an amplifier. So an amplifier that genuinely develops 10W RMS per channel is declared to produce a music power of 20W. They then add the power outputs of the two channels, so a 10 watt per channel amplifier becomes a 40 watt peak music power output (PMPO) amplifier. The PMPO is something you cannot really measure or relate to actual working conditions, but it looks good on paper.

The idea stems from the fact that the peak voltage of a sine wave is 1.414 times its RMS value. Then, since power is a function of the square of the voltage, the 'peak' power must be 1.414 squared, or twice the RMS power. Since stable. Therefore the available power output when driven by music and speech will be much the same as the power output obtained using continuous tone measurement (the so-called RMS output).

So in answer to your question "Is there a standard in the industry for the relationship between RMS and music power?", the answer is no if you are discussing an audio amplifier that is measured according to the method I described in January. This is because, as explained above, any difference between the power output figures depends entirely on the design of the amplifier in question, especially on the stability of the supply voltage available to the amplifier. Of course if you are talking about the retail industry, the answer is yes. Just take the RMS figures and double them to quote a peak music power output (PMPO).

On the question of standards, the Australian Standard is AS 1127 - Sound System Equipment - and it is virtually identical to the International Standard IEC 268. As a matter of interest I served on the Standards Australia technical



INFORMATION CENTRE

BY PETER PHILLIPS

committee that drafted AS 1127. The Standards prescribe definitions and methods of measurement etc, but as they are not mandatory there's no guarantee that a local or overseas manufacturer has complied with them. And even if they have, there's no certainty that retailers will not place their own interpretation on performance figures and methods of measurement.

Sadly, there is enormous confusion about definitions and methods of measurement for parameters such as frequency response, power bandwidth, output impedance, load impedance, damping factor, input impedance, source impedance, signal to noise ratio, equivalent noise input, noise factor etc, which does not help the audio industry gain a clear understanding of the subject. ***(Neil McCrae, East Hawthorn, Vic)***

Thanks Neil for your letter, which explains things very well. The document Tony Hagen sent makes similar points to yours Neil, although it quotes different standards (being from 1972). The document discusses the effect on output power caused by the design of the amplifier's power supply, and discreetly alludes to the inconsistency in measurement techniques used by manufacturers. It also states that "an audio power amplifier using an unregulated supply can deliver more output power under transient conditions than under steady-state conditions". Hence the need for the type of tests Neil described in January.

And finally, if you want to know more about measuring amplifier power, I recommend the 1979 <I>EA<$> project "1kHz Tone Burst Source", a device that provides an input signal in accordance with the US standard IHF-A-202. The text discusses a range of measurements typically done on power amplifiers. Now let's move onto other topics.

Flow measurement

In February a reader asked about using magnetics to measure boat speed and water flow. The next letter makes a point I should have remembered, you can indeed use magnetism to measure flow, providing the liquid is conductive.

You can measure liquid flow or speed using magnets provided the liquid has some conductivity. This is because a moving liquid acts like a moving wire in a magnetic field; it generates a voltage that is at right angles to both the magnetic field and the direction of flow. The only application I have seen though was in a set of blood flow measuring probes. ***(David Millist, Goroka, Papua New Guinea)***

Thanks for this reminder David. As it turns out, the next letter is from a member of the medical profession, who describes the very application you mention.

Blood flow measurement

Congratulations on your most interesting column and on your excellent magazine. I'm a first time writer, long time reader. In answer to the issue of flow measurement by magnetism, an example of such a device is the electromagnetic flow probe used in medicine to measure blood flow through blood vessels during surgery, such as the aorta.

The principle is based on Faraday's laws of induction. That is, when a conductor is moved through a uniform magnetic field such that it cuts the lines of the field, a current is induced in the conductor at right angles to the direction of travel and proportional to the velocity.

In a flow meter, the moving conductor is replaced by fluid flowing across the magnetic field lines, with electrodes positioned at right angles to the direction of flow and to the lines of the field. The current induced between the two electrodes reflects not only the velocity of the flow but the direction as well (reverse fluid current = reverse electrical current).

As you may well understand, if a current was applied to the electrodes, the effect will work in reverse and you will have created a fluid pump. This is analogous to running a generator as a motor or vice-versa. Unfortunately the magnitude of the effect is small unless huge fields and currents are used. The same principle can in theory be used to measure the velocity of a boat. I guess the important questions are: is the boat to be used in fresh or salt water, and does this make a difference? ***(Dr James Chee, email)***

Thank you James for your kind comments, and for the above information. James included a diagram (see Fig.1) which shows the arrangement he describes. It's interesting to note that blood is quite conductive, unlike dry skin. So if a voltage has direct access to your blood stream, expect quite a large current to flow. The next letter on this topic describes how to measure the speed of a boat.

Measuring boat speed

These days you use GPS to measure boat speed, because it tells you the true speed and bearing you are making, regardless of currents or other complications like a yacht's leeway. GPS always tells you when you are achieving the best speed to your destination, which may well not be your best forward speed. Knowing your position is handy too!

I'm familiar with ultrasonic logs, but I think maybe your reader is confusing magnetic with acoustic methods, unless he's talking about a magnetic pickup to achieve a 'friction-free' log prop rotation in a mechanical device. ***(Kevin Shackleton, email, WA)***

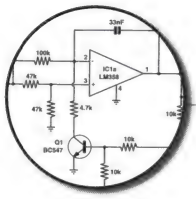
Not being familiar with GPS systems, I would not have thought of this. But it makes sense, as a modern GPS system has all kinds of facilities, and I guess speed measurement is one of them. Thanks for explaining this method Kevin.

Measuring paint thickness

In the February column, a reader asked about measuring the thickness of a layer of paint. This letter suggest a possible technique that uses a 555 timer...

Your correspondent with the paint thickness problem might like to try a capacitance measurement device. Most paints are reasonably good insulators, so a small flat metal probe pressed against the surface, with the underlying metal earthed, might work. The 'capacitance' would be connected from pin 6 of a 555 IC to ground,

(continued on page 97)



This month, Darren Yates continues with his look at op-amp circuits.

Voltage-controlled oscillator

While op-amps are commonly used in audio circuits, they also have a place in control circuitry as well and our first circuit this month shows this up nicely.

Fig.1 shows a voltage-controlled amplifier using an LM358 dual op-amp IC. These are quite cheap at about $1.50 and available from all the usual suspects. What really makes them quite useful is that the inputs can be taken all the way to ground and the op-amp still works.

Most other op-amps such as the common LF353 from National Semiconductor or the TL072 from Texas Instruments require you to keep both inputs a few volts above ground or use split supply rails in order for the device to work correctly. The LM358 is design to work specifically with single-rail supplies so it makes it ideal for battery operation.

Looking at the circuit, IC1a is connected up as an integrator, that is, the capacitor is connected in the negative feedback loop with both inputs connected to a DC control voltage.

The idea here is that the time it takes for the capacitor to charge is directly proportional to the DC input voltage.

However, on its own IC1a will only ever charge up the capacitor once.

IC1b is connected up as a Schmitt trigger whose output drives an NPN transistor connected to the inverting input of IC1a.

What happens is that as the capacitor charges up, the output of IC1a drops and falls below the lower threshold level of IC1b. IC1b's output then goes high, turning on transistor Q1.

That begins to discharge the integrator capacitor and IC1a's output slowly rises. This happens until the upper threshold level of IC1b is met, when IC1b's output then drops low, turning off Q1 and allow the capacitor to charge up again.

This takes place ad infinitum. The frequency of the square wave output of IC1b is proportional to the DC input voltage. To change the range of frequency, you simply change the value of the integrating capacitor.

The circuit is ideal for making your own digital voltmeter projects, it also will work as a frequency-modulation (FM) circuit as well. The only limitation is that the LM358 is only good for about 1MHz — after that the signal level drops considerably and turns into a triangle waveform.

Still, it's definitely one to keep in your circuit scrapbook.

Voice-operated relay

This next circuit in Fig.2 uses an audio input from an electret microphone insert to control the closure of a relay. It's quite simple and again uses the LM358 — one half as a high-gain audio amplifier and the other half as a comparator. Really in this context, we don't give a hoot about the audio quality — we just want signal amplification and plenty of it.

As you can see, IC1a is set up as an AC amplifier with a gain of 151. You get that by the equation:

GAIN = 1 + (150k / 1k) = 151

No AC-coupling capacitors are used in the input circuitry but the output is AC-coupled to a diode charge-pump consisting of diodes D1 and D2 plus a 2.2uF capacitor. All this part of the circuit does is turn the clipped AC waveform into a DC voltage, which is then fed into the non-inverting input of IC1b. Once that voltage rises above the threshold set by the 2.2k/10k resistor string, IC1b's output flies up, turns on transistor Q1 which fires the relay.

The 1M resistor across the capacitor ensures that during silent the capacitor discharges so that its voltage falls, IC1b's output falls low, Q1 is turned off and the relay opened.

Because the relay coil is just that — a coil — diode D3 protects Q1 from the sharp positive voltage back EMF spikes.

Again, the whole circuit is pretty straightforward and you should have little trouble getting this to work on proto-board or Veroboard.

Tips on op-amps for audio

When designing audio circuits, it's important you choose the right op-amp IC — it really is a case of 'horses for courses'.

Op-amp ICs such as the LM358 and its quad cousin, the LM324 are great as oscillators, comparators and control amplifiers but they make lousy audio amplifiers. The reason is that they work in Class-A mode for low-level signals but then switch to Class-B for large-level signals. Class-A is fine but Class-B introduces copious amounts of crossover distortion. They're also quite noisy too so they're not the go for audio.

Better choices are National Semiconductor's LF351, the dual LF353 and quad LF347. Texas Instruments' TL071, TL072 and TL074 make good amplifiers as well.

The relatively new LM833 from National is an excellent audio amplifier option — low distortion, good signal-to-noise ratio, excellent frequency bandwidth and they're quite cheap — about $2.50 for a dual package.

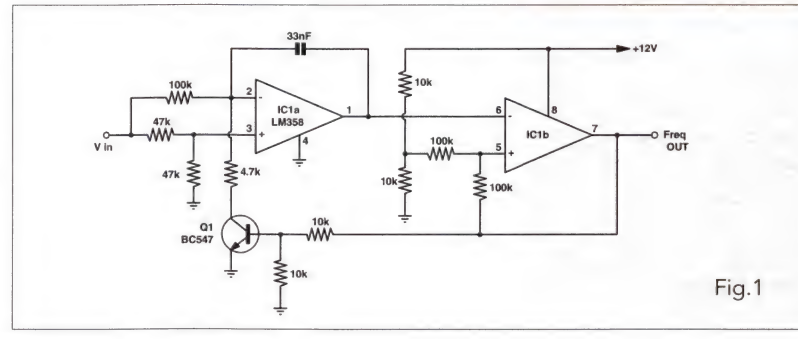


Fig.1

The only problem with them is that they can be a bit 'hot', meaning they can easily break out into oscillation if you're not careful with your design.

The LF353 is a good alternative for sensitive circuitry such as graphic equalisers and the like.

The NE5534 from Philips is also another common but very worthwhile choice for low-level audio.

The only drawback with these devices is that they are comparatively power-hungry and not really the best choice for battery-powered circuits.

One option is the TL06X series from TI — these have a much lower current consumption however they not as quiet and introduce more noise into an audio circuit that the others. Unfortunately, you can't have it both — unless you're prepared to spend some big dollars on something like an SSM2200-type microphone preamplifier IC, design specifically for the task.

Op-amp ICs are generally quite forgiving and will operate over a fairly wide range of voltages — most will handle up to +-18VDC (36VDC) and down to +-4.5VDC (9VDC) — get somewhere within that range and you shouldn't have too much trouble getting a circuit to work.

But remember to include supply-decoupling capacitors — 0.1uF MKT types do the job nicely. The more you can help the op-amp with clean, well laid-out circuit designs, the better they'll operate.

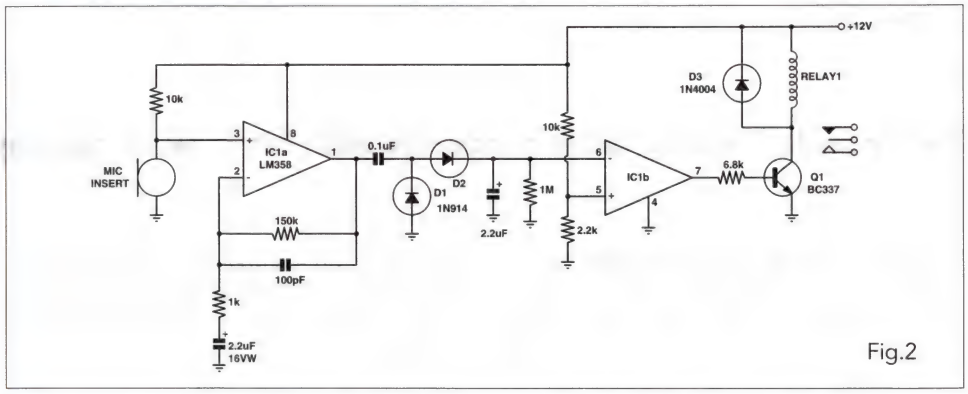


Fig.2

DC-DC converter

The circuit in Fig.3 will need some fine-tuning when you build it up but it will convert a 12VDC voltage into 24VDC. Again, we use the LM358 — the first half as a control comparator and the second half as an oscillator.

Looking at the circuit, IC1a is connected up as basically a comparator but with a tiny amount of hysteresis, meaning that there is a slight overlap in voltage levels to when the output rises and falls. This is done by supplying a small amount of positive feedback.

Note that the non-inverting input is connected to a 5.1V Zener diode, which is our reference voltage and the inverting input is a tapped resistor network connected to the output.

Whenever the inverting input is below 5.1V, the output of IC1a is high and vice versa. Now the output is used to control IC1b, which is set up as an oscillator.

This time we use copious amounts of positive feedback to set up the oscillator but not it will only operate when the output of IC1a is high — so as it falls low, the whole thing stops. The output of IC1b drives transistor Q1, which in turn controls inductor L1. Here we're exploiting an inductor's tendency to maintain the energy level stored in it when the current flowing through is switched off.

If you measured it on a CRO, you see that the voltage at Q1's collector would rise tens of volts above the supply rail for a very short period of time — generally not much more than a few milliseconds. However, the trick is to make that spike appear every few milliseconds. That voltage spike is then dumped into the 470uF reservoir capacitor via diode D1.

Note that this is not your ordinary diode but a fast-recovery type, specifically designed for this task. One type is the 1N4936 from Dick Smith Electronics, which will set you back about 40 cents.

Basically, when the output rises above 24V, the inverting input of IC1a rises above the 5.1V threshold voltage and shuts the circuit down — momentarily. With no oscillation, the output voltage soon falls and the circuit fires up again. In this way, the circuit provides its own voltage regulation — to a point. If you need a rock-steady 24VDC output, use a three-terminal 78XX regulator with the appropriate voltage step-up resistors.

Note too that we're not just plucking voltage out of thin air here. What we're really doing is converting current into voltage using the inductor and as usual, we have to supply more energy that we can get out of it.

For example, say you wanted 20VDC output at 50mA and the input will be 10VDC. You're going

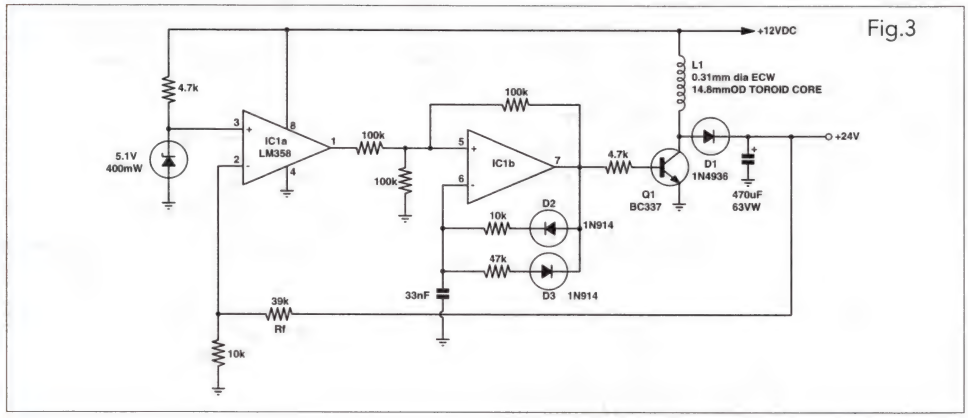


Fig.3

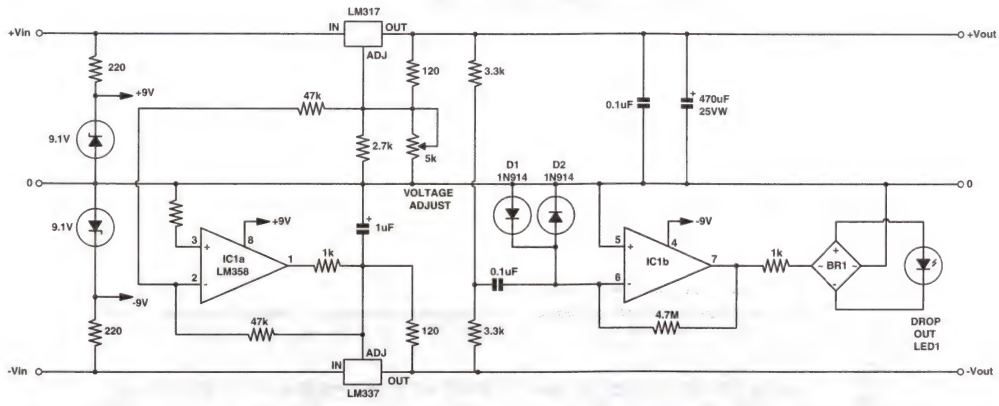


Fig.4

to have to supply that 10VDC at up to 150mA, depending upon the efficiency of the circuit.

The efficiency is simply — output power/input power and it will always be less than 100 percent. In fact, in a circuit like this, it will be barely better than 60 percent. Of course, you can vary the output voltage by changing the resistor string connected to the output.

To increase the output voltage, increase resistor Rf however a point of warning — make sure that the spike voltage does not exceed the voltage rating of the transistor — a BD139 can only handle one amp but it as a Vce (collector-emitter voltage) rating of 80VDC which should be enough.

This circuit can be a little tricky to get going so don't build it unless you have spare transistors and always measure the input current — it's quit easy for this circuit to pull far too much if you're not careful. However, once set up correctly it will run like clockwork.

Dual-tracking supply

One of the most valuable tools on any workbench is a dual-tracking variable power supply, that supplies + and - volts, ideal for op-amp circuits.

Rather than using a dual-gang pot to control two three-terminal regulators, hoping that they will come close to the right voltage, this circuit uses the LM358, one as an inverting DC amplifier and the other as a drop-out voltage indicator. I haven't shown you all of the components but by now you should be getting the hang of designing your own circuits.

The circuit uses an LM317 and LM337 variable voltage regulator ICs — one for the positive rail and one for the negative. Our circuit (Fig.4) uses a single pot to control the LM317 producing the positive voltage rail with IC1a supplying the mirror correction voltage to the LM337 — in this way, the negative voltage rail 'tracks' the positive rail so that you get equal magnitude but opposite polarity in voltage.

IC1b is connected up as an AC amplifier with a diode bridge on the output. This part of the circuit is continuously on the look out for AC ripple on the supply rails — a sure sign that not only is the circuit not regulating but that you're probably loading down the output via a short circuit.

It's called a 'dropout indicator' and the LED only lights up when this occurs so it's a good safety feature. It won't stop the problem but at least it alerts you to it.

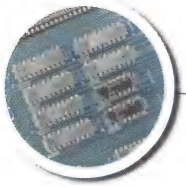
You could easily run this circuit from a 12VAC plug pack — that way you don't have to worry yourself about mains wiring you don't feel confident. Note that we haven't shown the rectifier bridge for the input from the AC plug pack — you should know how to rig one up by now.

Note also that if you built this circuit up, you'll need to provide heatsinks for the two regulator ICs — they will get quite hot particularly if you pull lots of current at a low output voltage. These ICs are internally compensated and shut down if they get too hot so good heatsinking is the go.

OK, enough for this month — we'll look at some more circuits next month. ❖

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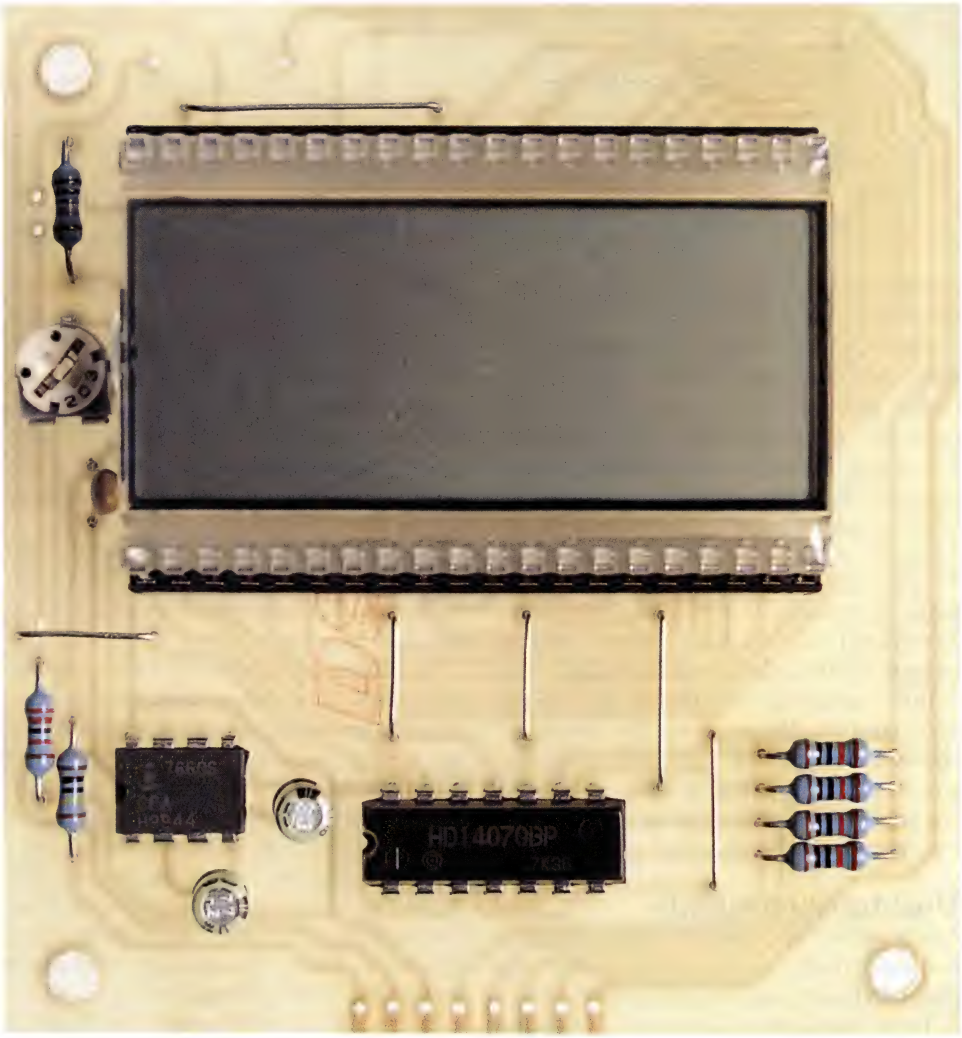
IC1	ICL7106 Display Driver
IC2	ICL7660 Voltage Converter
IC3	CD4070 quad XOR gate
LED1	3mm Green LED
LCD	3.5 Digit LCD module

miscellaneous

PCB 73 x 78mm, coded A0LCD04; 40-pin IC socket; hookup wire, solder etc.

note: A kit of parts for this project, including the backlit LCD module, is available from Futurlec for just $19.90.

For more information, check out the Futurlec website at www.futurlec.com.

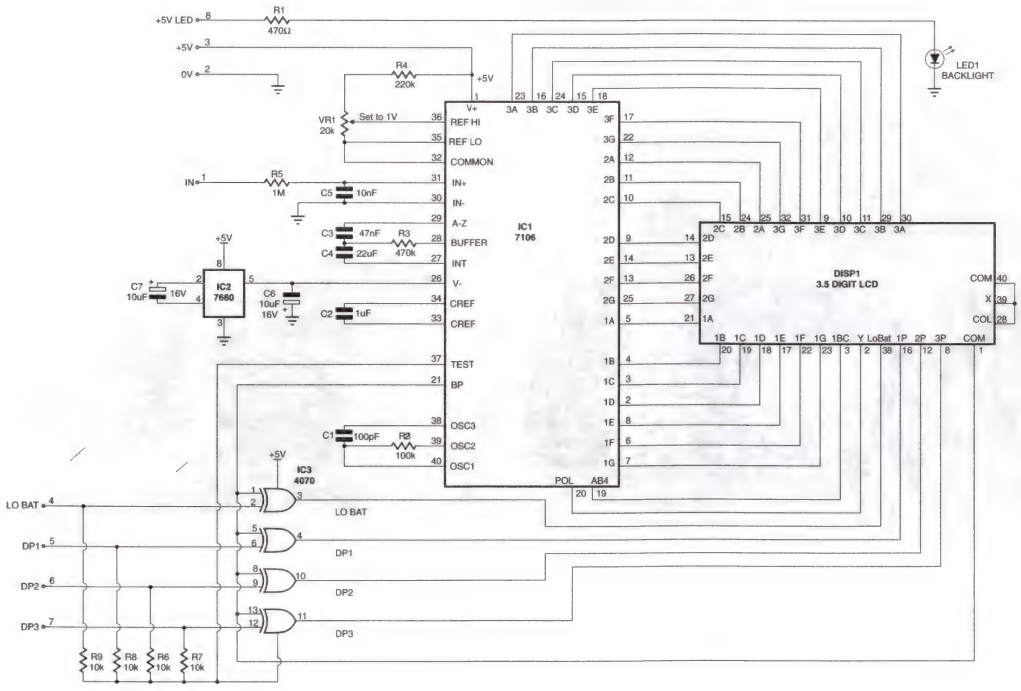


Need a simple LCD panel meter? This simple design offers a single ended 0-2V input, with automatic negative display and auto zeroing. It runs off a single +5V supply, is easy to mount and includes an LED backlight for easy reading in all light conditions.

By Allan Bonnard

THE IDEA BEHIND the development of this kit was to have a simple module that could be used in a number of projects, without any changes to their design. Something like a drag-and-drop object in a computer program. As well, the module had to be easy to mount and require no special external components.

The problem with many LCD modules today, is that they are fine measuring differential signals that are external to the system, but when they are to become part of complete system they require additional components to extend their voltage range so that signals down to 0V can be read. Another pitfall with LCD units is, of course, that they can't be read at night, whereas 7-segment LED displays can be read at most times, but consume somewhat more current. Thus on this project an LED backlight was included behind the LCD, enabling the LCD to be lit for reading at all times. This backlight can either be left on continuously or switched off to reduce power consumption.



There's really not much to the panel meter's circuit. All of the smarts is in the ICL7106 display driver (IC1), which has a dual-slope A/D coverter plus all the necessary latches and decoder.

Circuit Description

The Circuit is based around the ubiquitous 7106 IC, which as far as ICs go, is a classic. The original version dates back many years, is now produced by numerous manufacturers and forms a part of many of today's digital multimeters. The success of this IC is in part due to the numerous internal features that make it straightforward to interface to an LCD.

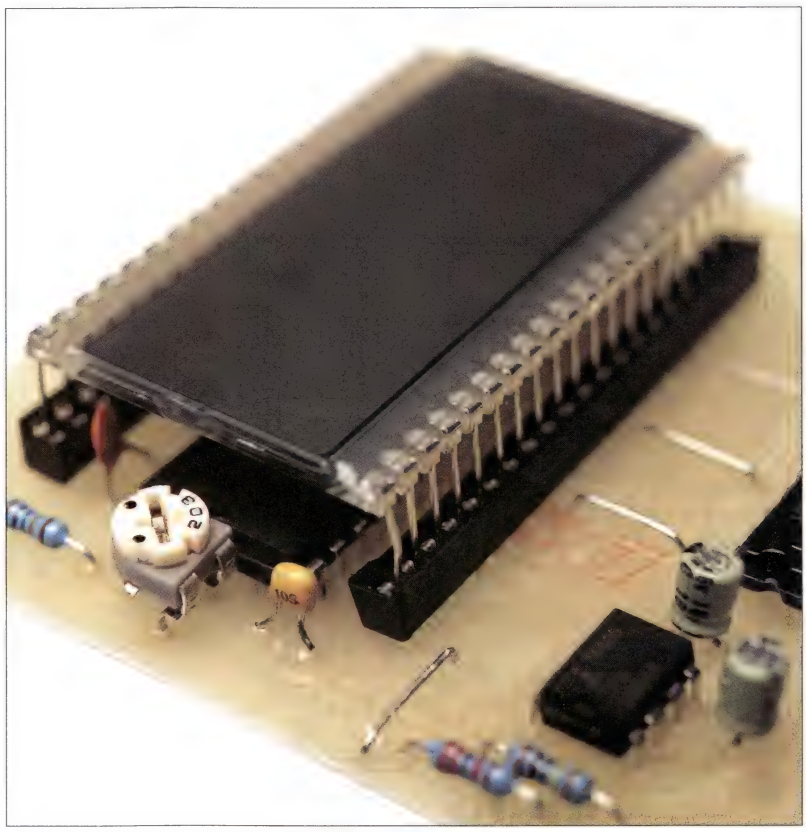
Its analogue section includes a signal integrator and auto-zero function to analyse the signal and provide an output suitable for the digital section. This IC (and its sister the 7107 for LED displays), use a dual slope, integrating ADC (see box) to convert the analogue signal to a digital form, as well as latches and decoders to translate the converted value and drive the appropriate segments on the display.

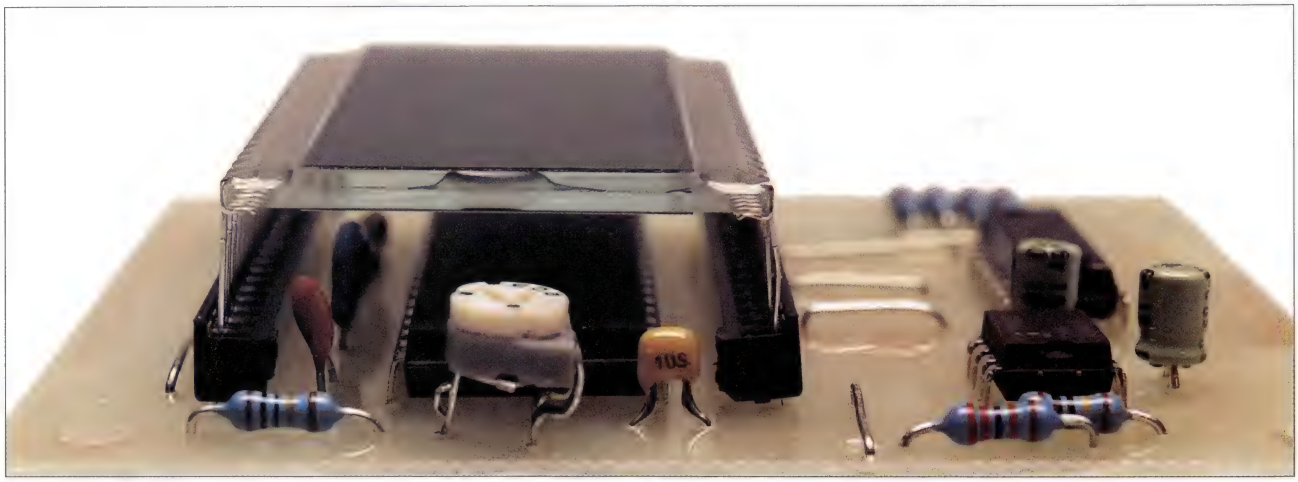
The number of updates or readings the IC can perform each second is determined by the time it takes to perform the integration and de-integration steps, and in this project a total of three readings per second are taken.

The size of C1 and R2 determine the speed of the clock used in the integrating process, While C3 and C4 form part of the integrator circuit. The purpose of R4 and VR1 is to set the reference voltage for the system, which equals one half the full scale reading on the display. In this case, our full-scale reading is to be 2V, and so the voltage at reference will need to be set to 1V.

The 7660 (IC2) is a voltage converter, which generates -5V from a5V supply. This IC uses a charge pump principle to achieve the -5V supply used to run the 7106. Normally the 7106 can only read input signals down to within 1V of its negative supply, which presents a problem espe-

Cockroach-like, the A0LCL04 display mounts onto the board via a butchered 40-pin PCB socket.





Using a double story approach, the display driver chip (IC1) hides under the LCD module. The component overlay (right) doesn't show the LCD module, but how it mounts should be clear from the photos.

cially when your signal is referenced to ground and is in the small mV range.

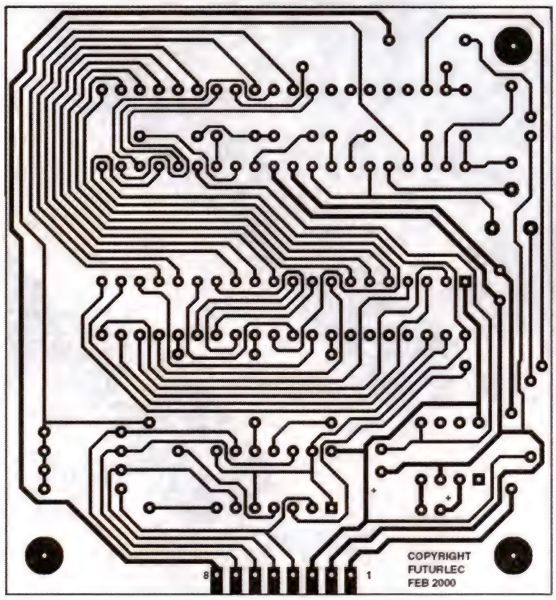
With the 7106 running on a +/-5V supply, we can now read signals from -2V to +2V, all referenced to ground, or single ended input as it is commonly referred to.

The final part of our circuit are the 4070 XOR gates, To understand why they are used, we need to understand a little about LCDs.

Basically, to turn on a segment in a LCD, you need to drive it with a high frequency square wave. The 7106 generates this square wave internally, and outputs it to each segment that is to be turned on.

Along with the signal going to the segment, we also need an out of phase (inverted) version of the signal going to the backplane of the LCD. This creates a voltage difference across the segment, and it turns on.

This is fine for the digits on the display, as the 7106 takes care of all this for us. The problem comes when we want to control the decimal points or the LO BATT indicator. To do this, we will need to drive them with a control signal that is 180 degrees out of phase with the display's backplane. If we apply the backplane signal to one input of an XOR gate, and a logic 1 control voltage to the other, we'll get an inverted version of the backplane signal which will activate the required segment. If we bring the control input low to a logic 0, the gate's output will be in phase with the backplane, and the segment will turn off. With these XOR gates doing all the phase inversion for us, we only need simple logic levels to control the decimal points and battery indicator.

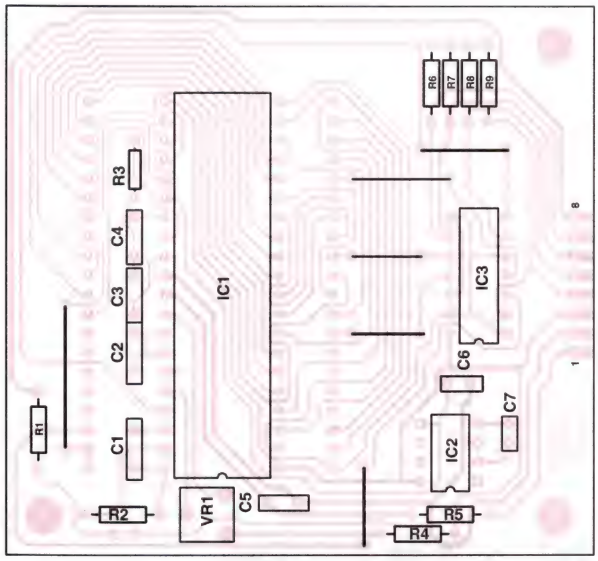


If you're really keen, you can use this full-size artwork pattern to make your own PCB.

Construction

Assembly of the unit is quite simple and should not take longer than a few hours. The first thing to do is to install the socket for the LCD unit. The socket is made by cutting a 40-pin socket in half longitudinally with a sharp knife to create two 20-pin socket strips. Clean up the strips, and remove any remaining plastic supports so that they won't foul against IC1 when it is installed. Solder the two strips into place, ensuring that the pins are vertical.

The resistors and capacitors can now be installed, along with the variable resistor VR1. This is all quite uncomplicated, but care should be taken with the resistors and capacitors around IC1. In particular C1-C4 should be mounted as close to the board as possible, as the LCD will be mounted directly over them.



Once this is complete, proceed to install the ICs. An IC socket shouldn't be used with IC1, as this will raise the IC too far to fit the LED backlight.

Next, mount the LCD into the socket already prepared. Care should be exercised with the pins to ensure they are lined up prior to pressing the LCD into place. Also, ensure that the LCD is orientated correctly; there is a small gap in the black strip around the front of the LCD — this gap should be on the left, when looking at the LCD face on. When it is in place, the LED backlight can be inserted between the 7106 and the LCD. Fix this backlight into position and then connect the wiring to the terminals.

Setting Up

Before applying power to the unit, have a quick look around the printed circuit board to ensure the ICs are correctly installed and that no solder bridges have been formed across tracks. Connect a 5V supply to the power pins on the circuit board (pin 2 is 0V, pin 3 is +5V), and with a multimeter check for +5V on pin 1 of IC1, pin 8 of IC2 and pin 14 of IC3.

If all seems well, check for -5V at pin 5 of IC2, the output of the negative rail generator. With these voltages in order, we are ready to set up the display.

Adjust VR1 to obtain 1V across the REF HI and REF LOW pins of IC1 (pins 36 and 35 respectively) This is the reference voltage for IC1, and the 1V setting will give a FSD of 2V on the display. The decimal points and LED backlight can also be checked, by applying +5V at their respective terminals. The unit is now ready to go, and can be used for many different types of display functions, including voltage, current, temperature etc. ❖

Dual slope converters

Measuring a voltage with a dual slope converter involves two separate, but related procedures or phases. The first of these phases is Input Signal Integration, where the input signal is integrated over a fixed period of time. At the end of the timing period, the output of the integrator will have risen to a certain voltage dependent on the level of the input signal.

The second phase is Reference Voltage Integration (or 'de-integration'), where a reference voltage of an opposite polarity is applied to the input of the integrator. The time taken for the integrator's output to return to zero is (quite conveniently) directly proportional to the size of the original input signal. This time is measured, and the value of the input signal can then be calculated.

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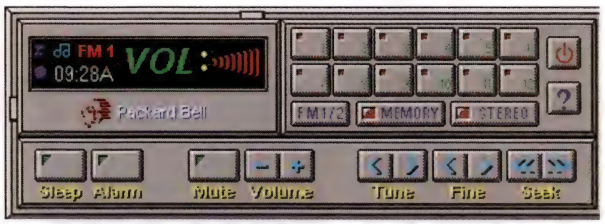
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FM radio card

A radio in your PC? It's been done before, with varying degrees of success; usually you end up with something less than satisfactory, and use up precious IRQs in the process. Either that, or the radio is an external box that attaches via the parallel port, and you start wondering if it was all really worth it — you might as well twiddle the knobs yourself on a proper tuner, and let the PC get on with other tasks.

These were my initial thoughts when I first heard about Oatley Electronics' FM radio card, an 8-bit ISA card and associated software that operates over the 88 - 108MHz FM band. The radio connects to your soundcard's audio input to play through the PC's speakers, with a simple dipole antenna plugging into a socket on the radio's back plate.



fact, the thing works far better than my existing radio in terms of sensitivity and selectivity — where I live, radio reception is poor at the best of times, and so when the radio card started pulling in the stations, I couldn't help but to be impressed.

Made by Aztech for Packard Bell, the radio card uses the TEA5712 AM/FM stereo DTS radio IC as the basis of its design. A PAL decodes tuning and volume commands dumped on port 0x350 in the PC, and the radio IC does the rest.

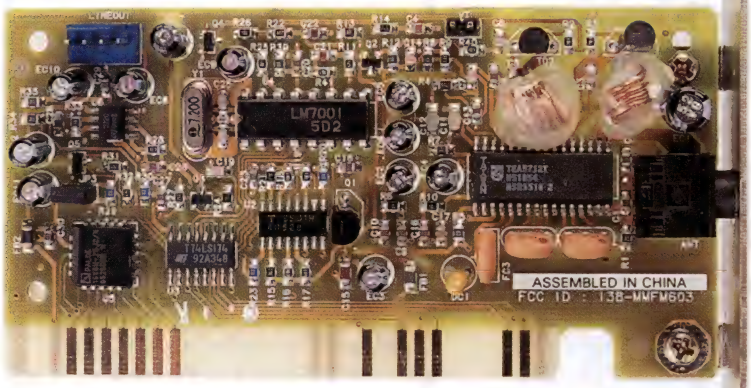
Installation is dead easy; simply drop the card into a spare ISA slot, run a CD-audio cable from the card's four-pin header to the line input on your sound card, and run the setup program. A small popup control panel is the main user interface, and you can manually program the 12 pre-set buttons to all the local stations, or simply let the software scan through automatically.

...WHEN THE RADIO CARD STARTED PULLING IN THE STATIONS, I COULDN'T

Internet radio, eat your heart out... Why waste bandwidth downloading music when you can pop one of these in your PC instead?

Now, the thought of putting a sensitive FM tuner inside your PC may seem a little strange, particularly as the average computer is one of the electrically nosiest environments around. To be honest, I was expecting all sorts of interference, especially as the card isn't shielded in any way, and liable to pick up interference from everything else going on inside the box.

So, OK, I was wrong. Wrong, because the radio doesn't use up any IRQs, DMAs or other system resources, and wrong because the card doesn't pick up the slightest hum buzz or chirrup from the PC. In



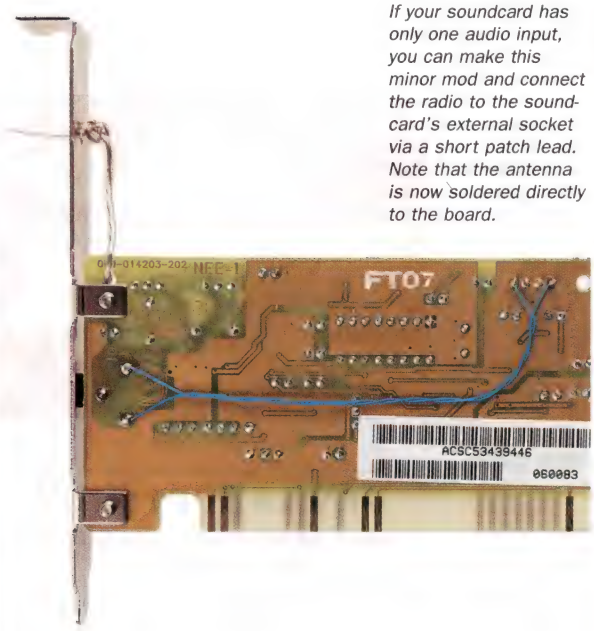
Going further

The radio card as it stands is pretty good, but there are a few things you can do to work around a few minor problems. The first of these problems is the fact that the audio signal is designed to connect to your soundcard's audio input, which may well already be used for your CD-ROM's audio channel. Swinging this input over to the radio card means that you won't be able to listen to CDs on your system, which is annoying to say the least.

After a bit of investigation, I found that the antenna input was in reality a stereo 3.5mm socket. Bingo! It should be an easy matter to convert this to a line output, and feed it into the soundcard via a short patch cable on the back of the PC.

As it turned out, it *was* easy; simply a matter of cutting the track from the top end of C2 where it heads off under the socket. The left and right channels were then wired across the back of the card to the now isolated socket, and a long-wire antenna (made up from the original dipole) was fed through a small hole drilled in the back plate, and soldered to the top of C2.

After re-installing the card, I ran a short patch cable from the radio's newly converted socket to the soundcard's line input socket. Now the CD audio could be connected



If your soundcard has only one audio input, you can make this minor mod and connect the radio to the soundcard's external socket via a short patch lead. Note that the antenna is now soldered directly to the board.



internally and controlled by the appropriate volume control in Win95, with the radio signal controlled via the line input.

More bands

If you feel like going further with modifications to your radio card, then I'd suggest you hop along to **www.redsword.com/tjacobs/geeb/fmcard.htm**. Here you'll find lots of info on how to modify the card to receive in other bands, including EMWIN data at 150.435MHz, NOAA weather services around 162MHz, as well as TV and other FM broadcasts.

The card is a very easy receiver to work on and easy to control with your own programs too. On the site, you'll find C++ code that explains how to interface to the card, along with datasheets and other technical help. It is well worth visiting, even if you don't intend modifying this very versatile device.

HELP BUT TO BE IMPRESSED

Listen hear

Along with the radio card, Oatley are offering some quite respectable amplified PC speakers. These complement the radio card perfectly, and look the part too. They were originally designed to be mounted on the sides of Packard Bell monitors and are magnetically shielded. As they have their own internal amplifier (with volume and tone controls), you could plug your modified radio card directly into them, or use them to replace those tacky little squawk boxes you've been using up to now. These speakers are very swish, with curved sides and measure 260 x 170 x 80mm.

To top it all off, you can buy the whole shebang for only $30 — that's the radio card, speakers and plugpack, and considering the quality of these items, I'd suggest you snaffle one as soon as you can.■

Prices & Availability

FM radio card	$15
Powered speakers (with plugpack)	$18
The lot	$30

Contact Oatley Electronics, P.O. Box 89, Oatley NSW 2223; Phone (02) 9584 3563, Fax: (02) 9584 3561; email: oatley@world.net.

Weblinks

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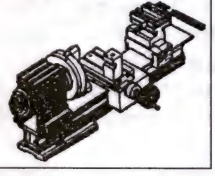
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$10 WONDERS

BY OWEN BISHOP

(Continued from page 79)

action may be too quick to spot with a meter. If you get any sort of response, the circuit is probably OK. You could check it with an oscilloscope, if you have one. Otherwise, wait until you have connected the logic circuit. Another test point is the junction of C3 and D2. This normally is at a few tens of millivolts but rises briefly to 2 or 3 volts (sometimes more) when the microphone is tapped.

To test the logic, first temporarily connect pin 1 of IC1 to the 6V line, and then switch on the power. The LED will probably start flashing — press SW2 and it should stop. To start it flashing again, break the connection between pin 1 and the 6V supply. This may start it straight away but, if it does not, briefly connect pin 1 to the 0V line. If the LED never flashes, check that you have soldered it in the correct way round. With most LEDs, the 'flat' on the rim should be toward the lower edge of the board.

When both parts are working correctly, solder in the wire links to join them together. Place the circuit close to a telephone and wait for that call. Some telephones have adjustable loudness and allow you to trigger the sounder to judge how loud it is. If you have such a telephone, it makes testing this project that much easier. ■

INFORMATION CENTRE

BY PETER PHILLIPS

(Continued from page 86)

and the resistive elements adjusted to give a suitable output frequency range. It might be necessary to coat the probe with polythene film as extra insulation. Also calibration for different kinds of paint would be needed. There are other problems such as the need for a smooth flat surface. I use this method to get pressure readings from an aneroid barometer. <$>(Robin Stokes, email)

This idea seems more practical than the method the reader was proposing Robin, which involved measuring light and sound to calculate the thickness. And as you say, this is a technique you are familiar with.

What??

The question this month comes from a book titled MENSA, A Compendium of Conundrums, *by Peter Jackson. I'm not sure whether the questions are all MENSA standard, but I especially liked this one as it's not difficult to solve, and you might be surprised at the answer:*

Copper wire is made by a process called drawing, in which solid copper is drawn and coaxed by rollers into a single wire. Each pair of rollers has a circular groove around its circumference, with each subsequent pair of rollers having a smaller diameter groove. As the copper passes through each set of rollers, it becomes thinner, until the required diameter is reached. So: What is the length (in kilometres) of the wire produced from a cubic metre of copper, if the final diameter of the wire is 1mm?

Answer to March

The answer given in the text book is 6.27A. You would need to know that it takes 4,184 joules (4200J in some text books) to heat 1kg of water, and that one litre of water weights one kilogram. The total energy required is 12 x 4180 x 45 (temperature difference), giving 2,259,360J. Dividing this value by the time (25 minutes converted to seconds = 2500s) gives a power input of 1506.24W. Current is power divided by voltage, so I = 6.276A. I wonder how many Stage 1 electrical or electronic trades students got the right answer! ■

Ultimate test **gear**

BY DARREN YATES

COMPUTERS — you either love 'em or hate 'em but I guess that depends on what operating system you use. The best way to see computers is as the ultimate bit of test gear.

TEST GEAR I hear you ask? Well how about turning your PC into an audio oscilloscope? Point your browser to **http://polly. phys.msu.su/~zeld/oscill.html** and download Oscilloscope for Windows. It turns your PC's sound card into a two-channel audio oscilloscope using the line-level input.

You can use it as either a single or dual-trace mode and XY as well and has a 20kHz bandwidth. And if you're after a spectrum analyser, it has one of those built in as well.

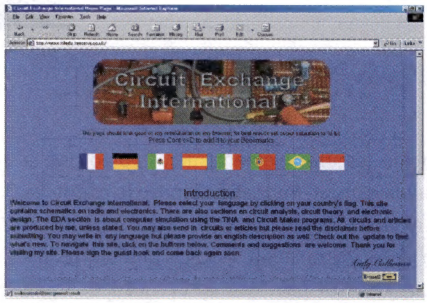
You can also export data to a file.

Best of all, it's free for personal use. There's a version for both Windows 95 and 3.1 and at less than 100KB, you won't notice the download time.



There's plenty of satisfaction that goes along with designing your own circuitry — someone once said to me that half the fun of electronics is the debugging of circuits that almost work. He never did tell me what the other half was...

If you find yourself in a position of reinventing the wheel, there are a few circuit repositories on the Internet that may well save you time.



One such site is Circuit Exchange International and you can find it at **www.mit-edu.freeserve.co.uk** There's nothing earth-shatteringly new about the circuits but there's plenty here to spark your imagination. If you're new to electronics and you're short of circuits to try out, there's plenty here worth a look.

I hate it when I'm sitting down to design something and I forget how to do it. The other day I just could not remember how to make a monostable using a couple of transistors.

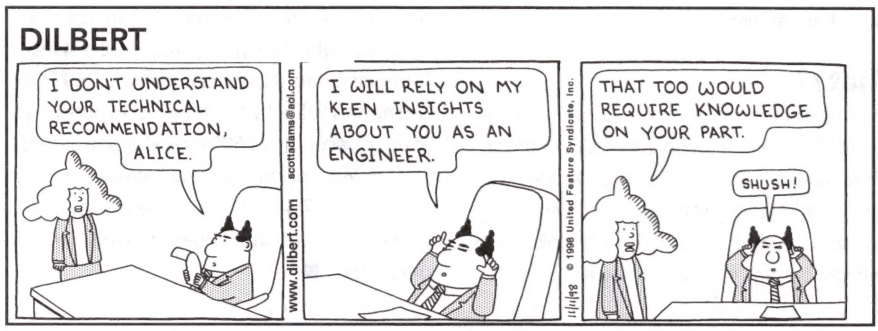
DesignNotes.Com is a great site with plenty of interesting stuff to read and circuits to glean. If you fancy your talents, you can even submit a design for a chance to win $US100 each month. Head over to **www.designnotes.com**.

If you're lacking a bit of theory, there are plenty of tutorials well worth a read at this site from power supplies to audio. If you're new to electronics, this site is a must-see.

I must admit I love sites that are a bit off-the-wall. You know the ones... "build a nuclear-powered 20kW audio power amp for your car" and that sort of thing but every now and then you find one that's for real. Not a nuclear reactor mind you but how about a Dolby AC-3 adapter for an all laserdisc player?

Read all about it at **www.kmntech.com /projects/ac3mod.htm** Mind you, read the caveat before you start hacking at the circuit board just in case. Just the thing to thumb your nose up at those technocrat wannabes...

In fact, this site isn't bad and includes circuit diagrams plus step-by-step guide on how to do it. I guess the answer is "If only it was worth it..." ■



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4IN VIDEO MONITOR
Screen 81 X 59mm 12Vdc... 375mA204 X 104 X 41mm Composite video in. Res. 450 TV lines Weight 650g Intro price of **$145**



UHF AUDIO / VIDEO TRANSMITTER KIT
Kit inc all components needed to build A/V TX as pictured, 12Vdc @ 10mA operation. just $28 suitable plugcack $5



SUPER LOW PRICE + LASER AUTOMATIC LASER LIGHT SHOW KIT: MKIII.
Automatically changes every 5 - 60 secs. Countless great displays (K115) + very bright 650nM laser module. $60 Kit+ case $75



TWO MOTOR LASER LIGHTSHOW KIT
Inc. motors, mirrors, reversing switch & all electronic components. Lots of patterns, flowers, stars etc. $16
Laser module $8
KEY-CHAIN LASER POINTER $10 .
Line lens+$0.80...X-hair lens (+) $0.80...
Module (no case) only $8
IR LASER DIODE SECIAL 5mW 780nM (barley visible) Sharp LTO26 Req. 65mA.Diode plus focus lens (no housing) $18....constant current driver kit $10

BRAND NEW MICROPHONES!!!
DESKTOP MICROPHONE
Ideal for computers etc. uni-directional electret mic. insert & terminated with a stereo 3.5mm plug.



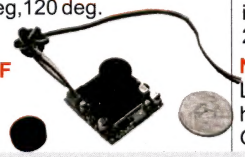
NEW 80mm 12V FANS
Ideal replacement for computer power supply fans. 12V @ 0.15A...$4 or 4 for $12



SOLAR PANELS: Quality SIEMENS brand Polycrystalline cells. Open circuit voltage 5.7V, Short circuit current 0.22A, Peak power 1W @ 100mW per square cm. 4 panels req. to charge 12V batteries. 160 x 55 x 5mm. Terminated with a 25cm long figure eight cable. (SP1) $10 each or 4 for $36.



HOUSED VIDEO CAMERAS
CCD COLOUR IN SWIVEL CASE $190
CCD B/W IN SWIVEL CASE $99
PCB VIDEO CAMERAS
B/W CCD CAMERAS $89
pinhole (60deg.), 92 deg,120 deg. add $10 for 150 deg.



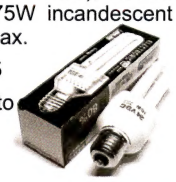
ASK FOR A FREE VHF MODULATOR AND PLUG PACK WITH EACH CAMERA

COMPUTER CPU HEAT SINKS
Three types, 1st is a small self adhesive low profile $0.60...2nd is a larger clip-on type $1... 3rd type is larger still clip-on type $1... for pictures see our website

PELTIER EFFECT DEVICES.
4A △T 65deg. Qmax 42W $25
6A △T 65deg. Qmax 60W $27.50
8A △T 65deg. Qmax 75W $30
Comes with info to build cooler / heater All 40 X 40mm.



12V DC / 13W COMPACT FLUORESCENT TUBE: These CFL's must not be installed in 240V AC sockets. (Edison Screw), centre positive. Equivalent to a 75W incandescent lamp. 180mm long, 47mm max.
base diameter: (CFL12) $25
24V DC / 10W Equivalent to 60W incandescent lamp.
(AS ABOVE) : (CFL24) $23

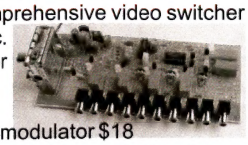


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DVE BRAND inc. onboard mains switch. +5V @ 15A ...-5V @ 0.3V ...+12V @ 6A ...-12V @ 0.3A...$15....IEC MAINS LEAD TO SUIT $2

"POWER LIGHT" MULTI TORCH:
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4 CHANNEL AUDIO/VIDEO SWITCHER
This is the most comprehensive video switcher kit we have seen. Inc. REC/PLAY output for VCR, put a security channel on your TV. $45... Optional UHF modulator $18
Ask for a free plug pack with each A/V SW kit



CFL INVERTER KIT
our very popular inverter. Very Efficient Driver kit can drive a number of CFL's from 12vdc.
SPECIAL 1 inverter & 3 CFLs: $45



QUALITY AUSTRALIAN MADE FEATURE PACKED MINI ALARM SYSTEM CONTROL
Features inc. boot release, central locking output, imobiliser output, indicator flash relay. With 2 key-fob transmitter keys. $99

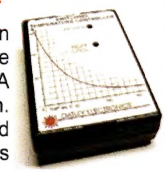


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Listen to radio on your computer while you work hard. These cards are brand new & with S/W Great bargain $15

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100 curly cords for $10



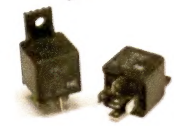
PELTIER CONTROLLER KIT
this kit is a switch mode design and correctly controls the temperature of peltiers to 10A using a very efficient design. Inc PCB, all on-board components & suitable surplus case. (k140) $17



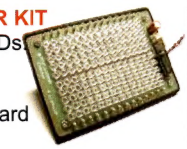
ACTIVE STEREO SPEAKERS
Philips brand. New in original packing.Great for PCs or portable radios $12



AUTOMOTIVE RELAYS
30A STDP contacts with 73 ohm coil. These are a common standard relay. $4 ea or $4 for $12



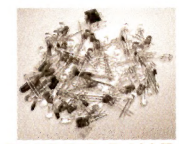
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With PS2 connector. Just $12



OPTO PACK: contains a total of 103 opto semi-conductors, various colours, visible & IR



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RADIO CONTROL MODEL SERVOS
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FM TRANSMITTER MK 1 KIT:
Our smallest transmitter. Range is about 50m. Stable design, Has high audio sensitivity. PCB: 46 x 1 5mm: (K10) $13



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G.E. 20VA 14VDC @700mA
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AUDIOVOX 12Vdc @ 400mA
9Vac @1A
All $5 Ea. or 5 for $20 (can be mixed)



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