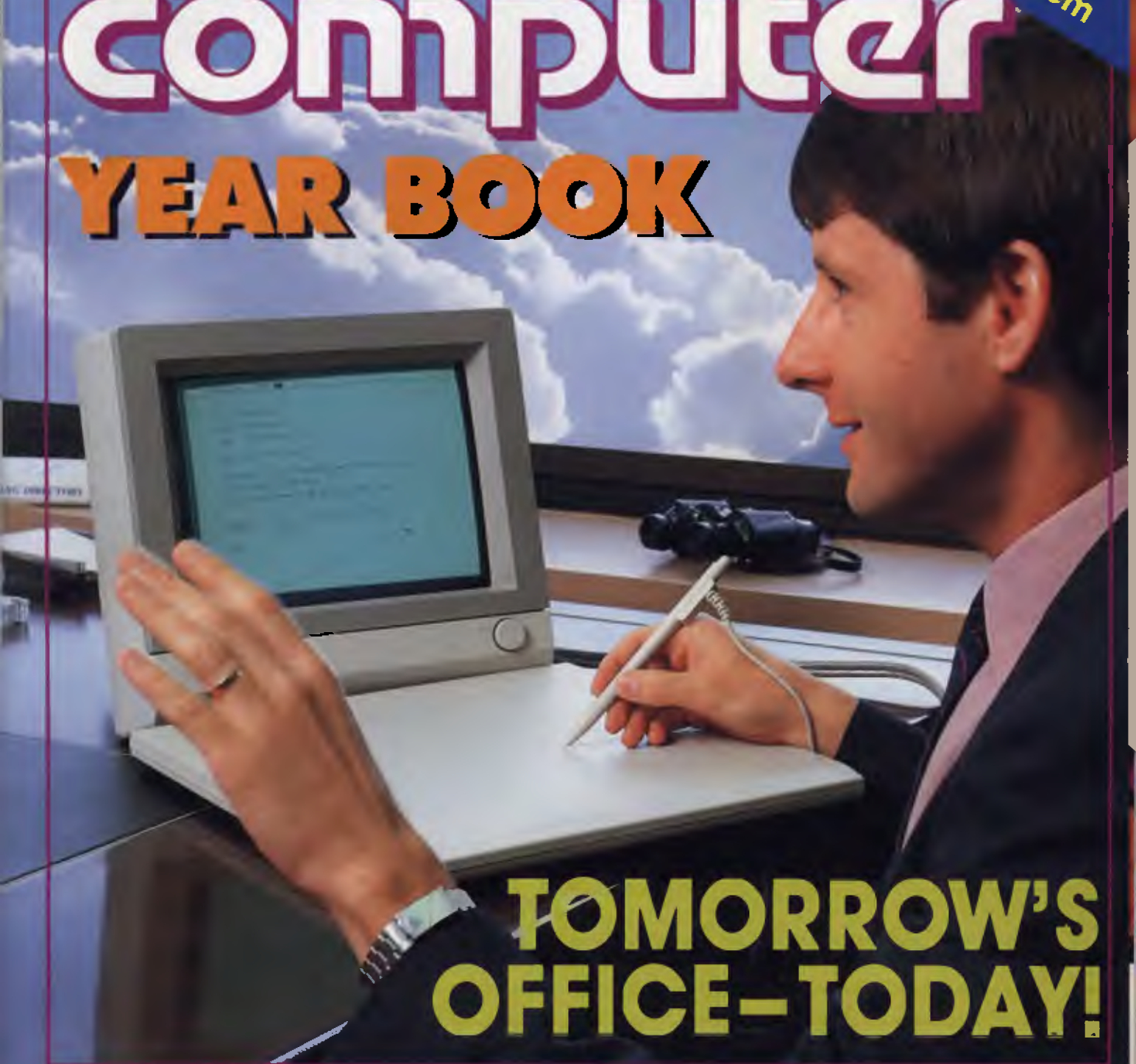


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Towards tomorrow

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NEXT MONTH INCLUDES

A whole new generation of truly portable computers is expanding the usefulness of computers – as our survey of the machines and colourful application stories will show. Speaking of generations, our youngest is growing up with computers at school, so we've asked Sharon France to present a monthly column on that topic, starting in February.

We've also got an application story that shows just how in control PCs can be. And now that we're all back at work, we continue our series on business graphics packages. Then, to round things out, Tom Moffat breathes new life into CP/M, and we have an indepth look at DOS 4.0!

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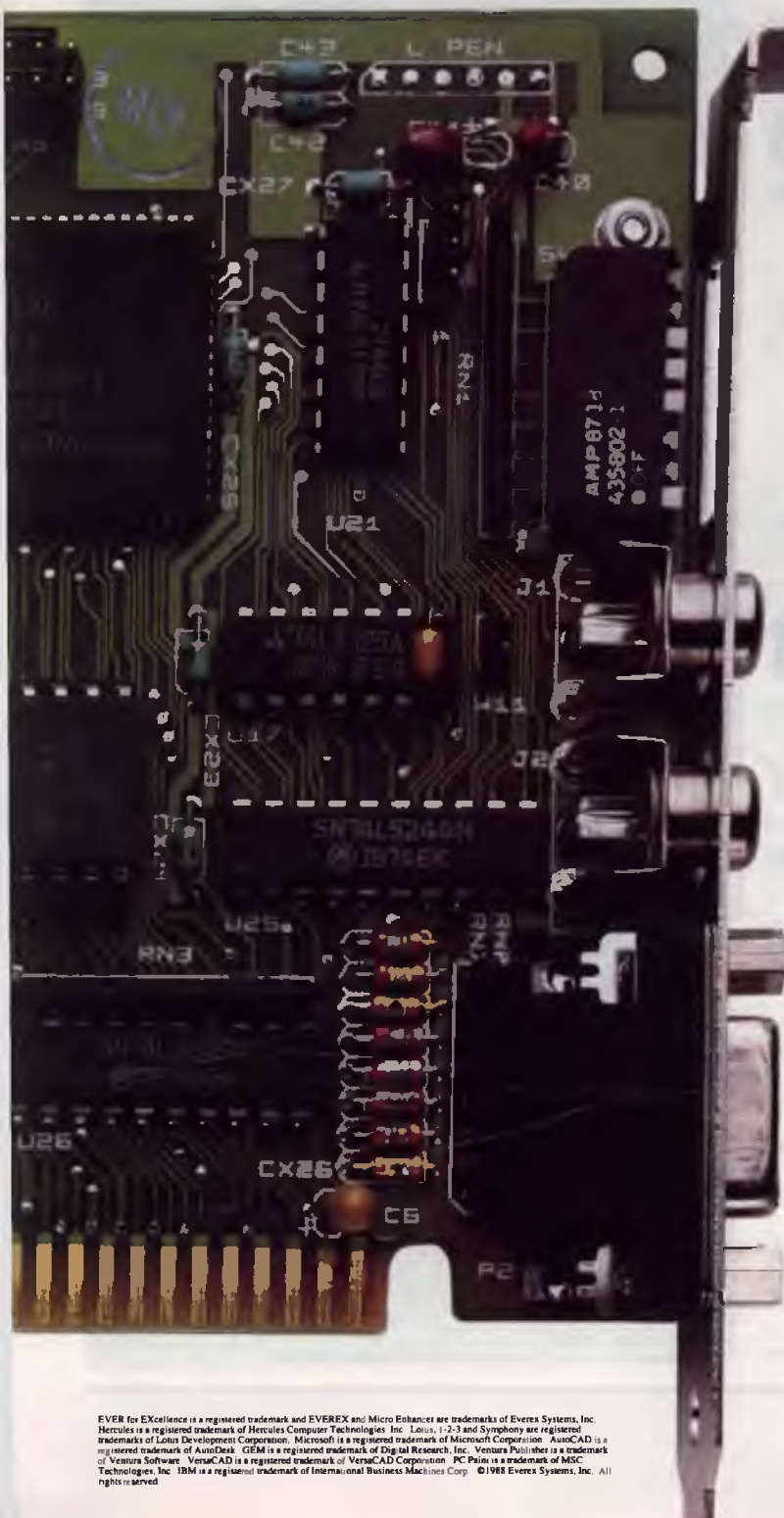
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Leaving the IC behind!

I HAVE often heard the computer industry in its current state of development compared to the automobile industry in its infancy some fifty years ago. Several comparisons come to mind that tend to support that line of thinking.

First, the number of different manufacturers that there were for cars in those early days (*What Car* notes hundreds in and out of business in the twenty years leading up to WWII) – the number of PC manufacturers who have come and gone in the last twenty years couldn't be far behind (remember the APF, Archives, QT or Micro/Cherry – those were all advertised in *YC* in January, 1982).

Second, is the current litigious state of the industry (not to mention the constant sniping that falls short of litigation); the history of General Motors in its early years could easily be gleaned from court transcripts. Then, there was a gentlemen called Selden who actually patented the *concept* of an automobile (Henry Ford fought that one and won).

Third, we have the horsepower race that sped US cars through the '50s and '60s. When all was said and done, the only reason most users wanted 300-plus horses



Magazine editor viewing the future of personal computing!

was to *have* them. Sure, some had large caravans or boats and could make use of that much power and there was the eternal argument of reserve power to get out of trouble. (My answer to that one was to wonder: if they didn't have that reserve power, would they have been so likely to get into trouble?) But, when all was said and done, few really needed power anything like that, and those that did, would very likely have been able to make efficient use of a small truck, rather than an automobile powered beyond its safe limits. All sounds familiar doesn't it? (Just change horsepower to megahertz, caravans to spreadsheets, truck to minicomputer . . .)

I won't pursue the analogy any further, other than to add, that in both industries today it's not easy to tell one manufacturer's product from the other once we get away from the Cray and Contessa class of machines (which are both somewhat out of our bounds). If you're car shopping, it comes down pretty much to price and which company can offer the colour upholstery/duco you've got your heart set on; if it's a personal computer you're after, there's not much choice in colours, unless you opt for Job's NeXT (which is nigh on unobtainable) or a Ken Done special.

Which brings me to a point that Chris Coulter, Product Marketing Manager at Wang Australia, made during a conversation recently. Briefly, he commented that in the near future a business' competitive edge is going to come from how efficiently that business can process information. That will be particularly true of service industries, but it is increasingly applicable to those with a 'real' product to sell, since the more developed products become, the more they tend to become similar.

Now the key to efficient information processing is having all the necessary information on hand and readily accessible – and that is exactly what optical storage technology is offering. A CD ROM has a thousand times the storage capacity of a floppy disk and the cost per bit of data is insignificant. In the next several years, even the smallest business will be able to afford to have gigabytes of information at its finger tips. For a glimpse of that future (and much of it is here, on-the-shelf, now) see our lead story 'Tomorrow's Office' and follow Stewart Fist's series on optical storage starting in the issue. (I think PCs have left the internal combustion machines behind!) □

January 1982

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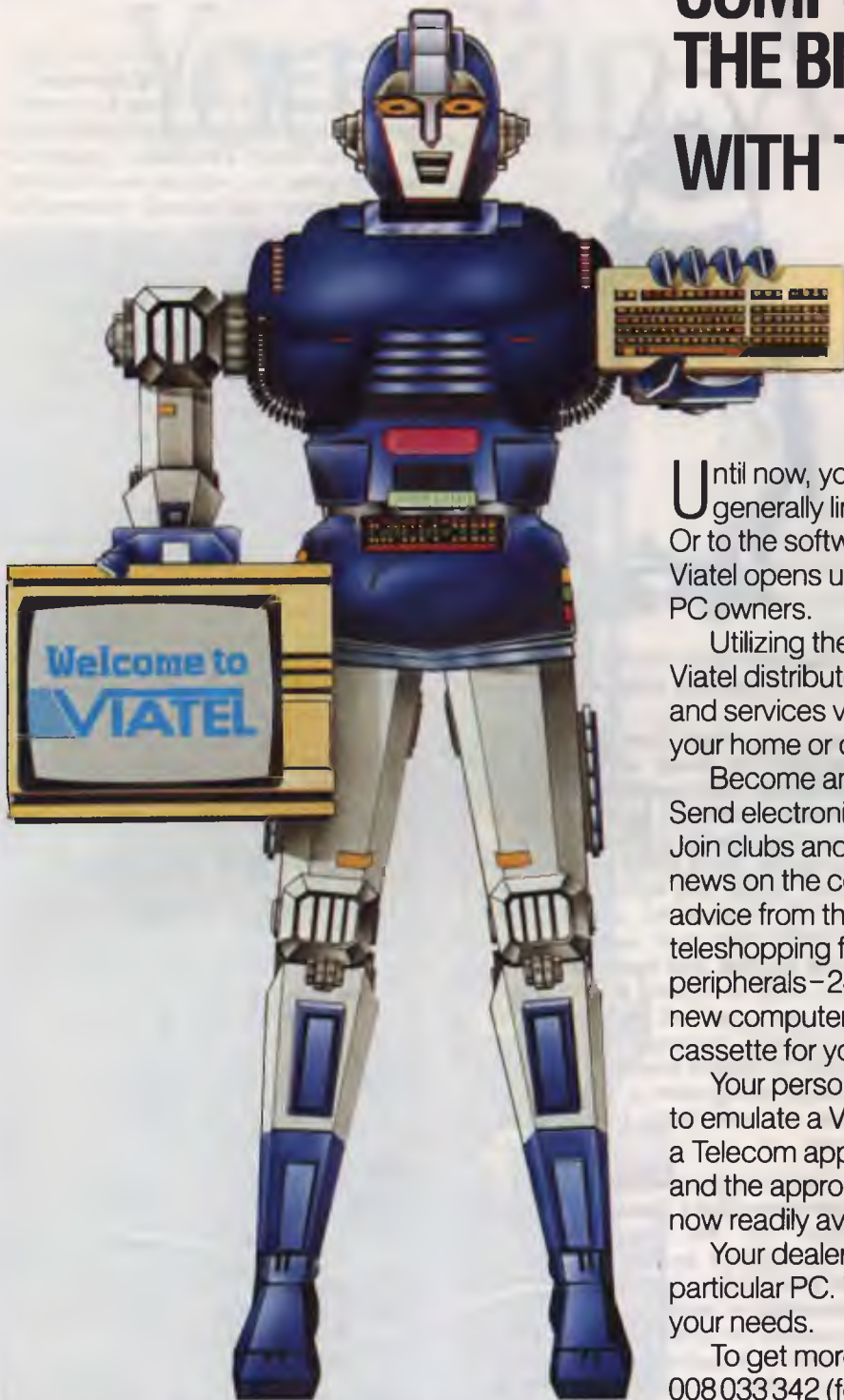
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HOWARD A. KARTEN

POST-HANGOVER January traditionally is the time for assessing the past, as well as anticipating the future. So this is a good excuse to reflect on where the PC industry has been and where going.

I suspect that all young, rapidly growing, rapidly evolving industries are inherently exciting, and the PC industry is no different. (Imagine how exciting it would have been – aside from the lack of PCs – to have been around in the early days of radio, electronics, electricity . . .) Comforting as well, in that the things we expect to change, have changed, and those which you can reasonably expect to remain constant, have also remained constant. The past year has been about as interesting as any in recent memory.

Take laptops, for instance. Vendors have been trying to push the idea of laptops for at least the past six years. Until this year, they seemed to be having precious little luck with it. One reasonably sure sign I've found that may augur well for laptops is that I notice the word 'laptop' and 'portable' showing up more and more as an adjective in the same class as Godliness or cleanliness.

Laptops *are* becoming more portable, more functional, more usable. And obviously there's a lot of optimism for this market, among manufacturers as well as the venture capitalists who usually back young companies. The past year, it's seemed as if hardly a week has gone by without the announcement of another dazzling, new, super-something laptop.

So far, one of the things that's differentiating these laptops from the ones of a few years ago – aside from obvious physical differences – is that they have not yet shown up at remainder houses. (These are places that buy – cheap – the merchandise of companies going into bankruptcy.) I noticed recently that in New York there's even a store called The Laptop Shop that claims to sell only laptops. Who knows: maybe this time around, they'll actually catch on.

I guess the only remaining question is, if you're sitting on a plane, would you really rather play with your spreadsheet, or instead prefer to have a drink and try to chat up that bird sitting next to you on the plane? Ms Computer Writer, who spends more time on airplanes than I do, says

Isn't it nice to know that trends may come and go, but hype is forever?

she's seen very few laptops in use in her travels, so maybe those buyers are behaving sensibly.

Viruses

Another subject that drew a lot of interest in the past year – an inordinate amount of interest, really – was viruses. In the US, virtually all the major publications – the *New York Times*, *Wall Street Journal*, weekly newsmagazines, as well as computer publications – had stories on viruses, and all of a sudden, companies selling anti-virus



products seemed to be springing up like mushrooms.

This has culminated, recently, in a book and a professional association. *Computer Viruses*, by Ralph Roberts, is apparently the first book-length treatment of the subject. I haven't read the book, so this shouldn't be construed as a recommendation; the book is \$US14.95 from Compute! Books, Chilton Trade Book Publishing, Radnor, Pennsylvania 19089.

However, I've noticed a very odd thing about viruses: it seems as though writers and reporters have had far more experience or encounters with them than hackers and other types notorious for their antisocial tendencies. Speaking as one who's done his share of digital mischief in computer rooms up and down the Eastern US, I know that it wouldn't be too difficult

to create a virus. But I've followed the reporting on viruses reasonably closely, and curiously enough, it seems that there are awfully few individuals who've had first-hand experience with them.

Another trend, again not surprising, has been the generally continuing drop in prices. With the exception of chip prices, which, at least in the US, have remained steady, or perhaps even risen somewhat, prices *are* coming down. I saw a mail-order ad for a Seagate 20 megabyte hard disk, plus controller, for \$US249, and they're expected to go lower yet.

Optical storage

This also seems to be the year optical storage has finally come into its own. One way I know this is because I've actually seen one or two used optical disk drives for sale! There has not been a massive shakeout in this market, and that's healthy. The advent of erasable optical storage media is probably likely to give things a boost, too.

I also know of a couple of companies that are putting some serious money into this market. Here in Massachusetts, a company called Dynabook has put an enormous amount of information for doctors onto a CD, and will be selling as reader for a fairly modest price. The idea is in part to give the doctor a portable reference library when making a house call. Now all they have to do is get the doctors to make house calls again.

Presentation graphics is another area that seems to have become hot lately. Apple Computer has long been pushing its capabilities in business graphics, particularly for reports, in ads targeted at the businessmen who presumably watch the public affairs programs on Sunday TV here.

They seem to be pushing the business benefits of presentation graphics. That's a refreshing change in an industry whose ads often talk so much about the technology that they overlook benefits.

One of the things that's remained more or less the way it was in years past is advertising of computer stuff. Still, I suppose there's a certain comfort to be found here: in a field of rapid change, isn't it nice to know that trends may come and go, but hype is forever? □

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NOT MANY many universities can offer courses to students complete with yearly scholarships, industry experience and full training in an area that is relevant to the demands of the commercial world. And on completion of the course, companies fall over themselves to offer employment to graduates with high starting salaries. The Bachelor of Science (Business Information Technology) is a new four year course run by the School of Information Technology.

The course was set up in response to chronic shortages of trained personnel in information technology within the business world. The Federal Government's 1987 budget provided funds to go ahead, and 1988 saw the first intake of students. Bob Edmonson, Associate Professor and head of the course, described the first year of operation as being very successful. Mr Edmonson said that the University's School of Information Technology was well placed to introduce the course, with a background of 12 years of offering courses in Commerce and Science.

Funding for the course comes from the Federal Government, which provides for the academic content with extra student places, and from companies which are involved in information technology. These companies provide sponsorship for each student, which at the 1988 rate was \$8000 per annum. This, as anyone who has ex-



'The industry component of the Business Information Technology Course is intimately tied to the academic content, unlike most sandwich courses . . . The main orientation of our students is in systems design and management.' – Bob Edmonson, Associate Professor and head of the course.

The Business Information Technology Course at the University of New South Wales caters for the shortage of trained personnel within the industry. Sponsoring companies contribute to student scholarships and work experience.

perienced the poverty stricken life of a tertiary student will tell you, is very helpful, and there should be more of it. As well as sponsorship, the companies provide places within their structure for each student to do a total of eighteen months (unpaid) work experience. Students are not bonded to the companies in any way. Mr Edmonson said that the industry component of the course was intimately tied to the academic content, unlike most 'sandwich courses'.

In 1988, the first year of the course had 52 students, with sponsorship from companies such as IBM (6 students) and Westpac (8 students). Mr Edmonson said that three exciting aspects have arisen from this year's experience. Firstly, the students are 'fantastic', with an interview as well as excellent HSC academic results as pre-requisites to gaining entry to the course. This is giving the sponsors a good chance of getting high flying future executives. Secondly, the sponsors are a broad range of companies, some of which compete against each other in the marketplace, but who co-operate when it is time to be involved in the management of the course. Thirdly, the University and sponsors have put together a unique course.

The actual structure of the course is as follows: the first year is spent entirely at the University. In January of the second year, students are placed within sponsoring companies to gain general business experience and information processing experience. After six months, they return to University full time for twelve months, then in mid third year return to the industry, where they are involved in project teams, programming, testing, and documentation. In the first half of fourth year, the students are involved within compa-

nies in programming and systems specifications, and they return for their final six months full time at the University.

The School uses an IBM 3090 mainframe to give students experience in SQL and relational database environments. VAX mini computers running VMS are used for teaching Cobol, BASIC and networking. Two labs of PCs are to be installed, one with IBM PS/2 model 50s in a Token Ring network with a PS/2 70 file server. The other lab will probably consist of AT compatibles linked within an Ethernet network. As well as the aforementioned programming languages, students are exposed to spreadsheets and word processing, and they design and use relational and networked database management systems. Mr Edmonson said 'The major orientation of our students is in systems design and management'.

The School of Information Systems offers degrees in both Science and Commerce. Students can take subjects from the Computer Science School which has UNIX running on a VAX computer. In higher years (honours and post-graduate), student from both schools can study expert systems with a variety of languages. In 1989, Computer Science in all probability will have a unit in Functional Programming

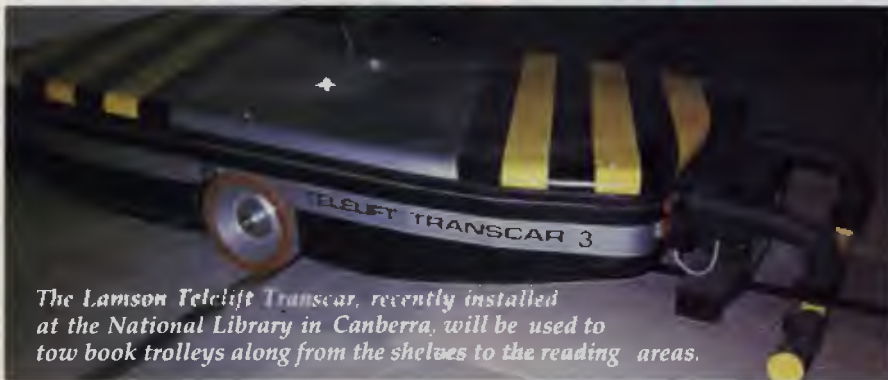
Graduates from the new Business Information Technology degree will have no trouble at all finding employment. With the current shortage of skilled people in this area, companies are queuing up already. □



Students Cassandra Millhouse, Yap Lin Mei, and John Tomkinson in the Business Information Technology course's laboratory. The course also offers mainframe experience in SQL and relational databases.



Books by Robot!



The Lamson Telelift Transcar, recently installed at the National Library in Canberra, will be used to tow book trolleys along from the shelves to the reading areas.

National Library Transcar

GERMAN computer expert, Franz Schroeder, visited Canberra recently to instal a robot vehicle system in the National Library. Lamson Telelift Transcar, as the system is known, is a computerised electric trolley system. In the National Library, computer programmed Transcars will tow book trolleys along from the shelves to the reading areas.

Schroeder writes the software programs for the Transcars which even tells the it when to hook-up for a battery charge. The Transcars are linked via infra-red overhead scanners. Instructions for each of the Transcars are written into the EPROM in the computer. The \$640,000 system operates from a menu driven terminal and screen.

Schroeder said this was his first trip to Australia. He lives in Munich where his interest in computers began with electronic components.

Schroeder undertook part-time computer training with three years of computer courses every Saturday, 52 weeks a year, from eight in the morning until six at night. He confessed to not having a computer at home because it was too much like taking the office home with you. However, he was fascinated with the Amiga owned by Lamson Engineering's Canberra manager, Arthur Watson. Lamson distrib-

ute the Telelift Transcar in Australia.

Schroeder spent an evening on the Amiga and talking with Peter McNeil, president of the Canberra Amiga Users Group. He surprised us when he said he had not seen an Amiga in Germany, as Commodore has a large factory there.

Networking OS/2

Computer company Datamatic D.P. held a seminar on Novell networking in Canberra



Franz Schroeder, of West Germany, at the controls of Transcar - he wrote the software.

recently. During the sessions, Datamatic had on display a series of PCs networked with the Novell system. Included in the network display was a Korean Hyundai PC, which Datamatic now has on Federal Government contract.

Novell networking allows different DOS machines and Macintoshes to talk to each other. Unix based systems also pose no problem for Novell although Doug Parkhurst, Canberra manager of Datamatic D.P., said Apple and Unix were not yet directly compatible with each other on networks.

Pat Ryan, product manager for Novell, said that with the introductions of OS/2, the Novell network operating system would not change. Ryan thought it would be bad enough learning OS/2 at workstation level without having to learn a new network operating system as well. Nevertheless, Ryan said Novell would fully support the OS/2 system and anything developed by IBM for OS/2, as it became available.

The design of OS/2 makes it more convenient for networking when compared with MS-DOS. OS/2 is modular, open and what Ryan called sensible, when compared with MS-DOS. Communication bits and pieces can be added to OS/2 then co-exist with it in the one workstation.

Ryan said that although '286 based systems were adequate for the present, Novell was working on a '386 based system. This will be released next year. Ryan thought 95 per cent of network OS/2 users would opt for the lowest cost solution. This involved non-dedicated netware in a single machine sharing a single CPU with OS/2. Other, more expensive options, involved separate CPUs for different applications or co-processors on a card.

Ryan sees OS/2 as a long term proposition. The Novell seminars have been held in each capital city as well as Canberra and about 75 per cent of users were asking about Macintosh networking. Only 20 per cent have asked about OS/2.

Wang open day

Following the release of the new Australian-built Wang PC 240, Wang Australia held two open days at its Canberra headquarters recently.

The Wang systems on display included the PC 240, local area networks, a desktop publishing system and a PC training system.



Terry Ann Allen and Bruce Fietz at Wang's Open day in Canberra for the launch of their new '286 machine, the PC 240 - Wang is claiming 70 per cent Australian content and has plans to export the machine to Europe and the US.

The PC 240 is assembled in Canberra, with 70 per cent Australian content. Wang's general manager, John Blackburn, says the Canberra plant will supply PCs to Europe and the US. Blackburn said production of the PC 240 will top 12,000 units a year, with more than three quarters being exported. The exports are under the partnership development scheme with the Federal Government. As a result, Wang expects to spend \$85 million on local research and development in the next five years.

The Wang PC 240 uses an 80286 chip running at either 6, 8 or 10 MHz. The machine has a battery backed real-time clock-calendar. Bruce Fietz from Wang explained that the 240 has a 20 megabyte hard disk plus a 1.2 Mbyte floppy disk drive. The compact 3½ inch drive is also available.

Fietz said the monitor with the 240 is a lightweight version, allowing it to sit easily on an arm above the workstation. He also pointed out that the 240 keyboard cable plugged into the back of the monitor not the computer. This helps keep the desktop clear.

The PC 240 has four expansion slots. One has a graphics card, one has a hard disk controller and two are free. The standard internal memory of 640k can be expanded with 2 x 2 Mbyte cards, giving a total memory of over 4.5 Mbyte.

Options available to upgrade the 240 include colour monitors, an 80287 maths co-processor and also communications hardware. The operating system is Dos 3.2. Fietz said that while Wang had its own version of OS/2 available, AT DOS machines still created the most interest.

Wang networking expert, Ralph Boldra, explained how the Wang LAN supports a wide range of PCs, including ATs and IBM PS/2 Model 30. Boldra said, 'The network uses Banyan VINES hardware and software, which in future will also support Apple Macintosh and all IBM PS/2 Models.'

The LAN offers file and print sharing, security, electronic mail plus outside communications services.

Government not game

Panther Games is a Canberra company that Austrade will not take seriously. Austrade is supposed to help Australian business export overseas, however because Panther sells computer games and not 'proper' software, Austrade will not listen.

The game Panther is keen to export, Fire Brigade, has versions for IBM, Amiga and Macintosh. It is a strategy based war game set in 1943 and works on real combat events in Russia. The name Fire Brigade comes from the name for the 48th German Panzer Corps. Several overseas army colleges, including West Point in the US, are seriously testing Fire Brigade as a simulation for officer training.

David O'Connor, a director of Panther Games, remains hopeful despite Austrade's poor attitude. The only support Austrade gave O'Connor was some photocopied pages of computer vendors from the New York telephone directory.

At present Panther does have an interested US distribution company, plus one in Scandinavia, Zytron Elektronik.

War Memorial computers

Australian War Memorial files and records are about to be computerised. Richard Llewellyn, spokesman for the War Memorial, said that the Government has agreed to spend three million dollars on the computer project.

Computer industry representatives were recently given details of the memorial

contract by staff from the War Memorial and the Department of Administrative Services.

One of the computer system requirements is for colour monitor displayed databases, for recording the thousands of war paintings in the Memorial's collection. The Memorial's holdings include one of the largest collection of Australian paintings in the world.

Public computer terminals will allow general access to some of the War Memorial files. For instance, visitors will be able to search for information about friends and relatives who fought in any of the wars Australia has been involved in. The War Memorial records go back to the Boer War of 1898.

The War Memorial will have the Request for Tenders sent out by February.

Hacker Attacker

A Canberra company, Kayfest, has just introduced two new security ideas for protecting data from the dreaded PC hacker. Kayfest makes a two-pronged attack on hackers with both a physical security system and a software system.

The physical system is the X Lock 100, a plug-in half card software disk with an outside cover lock. Once the disk is locked in, then the disk drive is effectively shut down.

Panther Games is a Canberra company that Austrade will not take seriously.

The software system is called Watchdog, a PC data security system providing ID and password control, access levels, directory protection, hard disk access limits and an audit trail system. The manager of Kayfest, David Holland, says both systems will stop hackers, but in different ways.

Holland worked with security in the Department of Defence before starting Kayfest. He evaluated overseas security systems and discovered both Watchdog and X Lock 100 in the US. Holland says that Watchdog has been approved by the US Defence Department. □

Everyone says "It's the best there is."

Any cell can contain a complete other spreadsheet that you can access with a single key.

Don't take our word for it. Use Lucid 3-D for 60 days. Return it for a full refund if not completely satisfied.

Lucid is as simple as the pictures show. And you don't have to write formulas to do that. All you do is look at the other file, navigating through easy, point and shoot directories. When you come back up (with one key) the link is made automatically for you.

Everything about Lucid works that way. Users say "It is so intuitive that I really don't need a manual." That's because we use something we call a visual command menu. Jim Seymour, the noted PC columnist, talking about Lucid in a recent article said, "If there ever was an interface idea so good it ought to be stolen and widely used, this is it."

Memory Resident

You can pop Lucid up instantly while working in your word processor or any other program. You can cut anything on the screen and paste it right into Lucid, or cut anything from a Lucid worksheet and paste into the application below. You can even run Lucid on top of 1-2-3 if you like, and cut and paste information from one to the other, including formulas.

Notepad Behind Every Cell

Another 3-D feature is that any cell can also contain a multiple page note window that you instantly access with a single keystroke. You can write notes, memos or letters that relate to your work, save them as individual files and even print them separately or with your spreadsheet.

Other Features

Lucid has over 100 innovations that cause users to say it is the best of all the spreadsheet offerings! Things like: **Speed** - background, minimal and visible recalc. **Macros** - learning macros, autoexecute macros, macros work between spreadsheets, user defined macro menus. **Mouseability** - total Mac-like mouse access, but easy keyboard control as well. **Color or Mono** - 17 user controlled color displays. **Audit** - six displays and printouts. **Windows** - multiple sheets on screen at

same time. Multiple views of the same sheet. Pop-up windows of function formulas, range names, favorite labels, macro names, file names, even a calculator. All let you select and insert right



Fig. 2. Here we are instantly. Notice the lower left corner showing we are on level 2. Grey - takes you back. There is no limit to the levels you can go. Move right down to transaction level if you like.

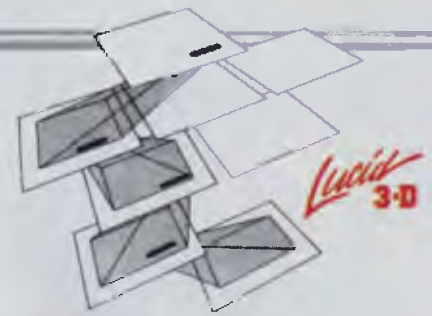
into your spreadsheet. All windows (even notes) resize and move where you want them. **Cut and Copy** - between spreadsheets, documents and between sessions. **Help** - press F1 anywhere, you get help specific to what you are doing.

Masterwork

Lucid is more than a bag of features. It is a masterwork. The overall feel is tight and polished. In fact, Paul Somerson, executive editor of PC Magazine, used one word to describe it. "Slick".

PCSG has built an excellent reputation as a developmental laboratory. Now those who have worked with Lucid 3-D tell us "you have done it again. This is software everyone should have."

Even if you don't plan to abandon 1-2-3, Lucid makes sense. Files are converted between them with ease so there's not



"The Best idea I've seen for a spreadsheet in years"

Jim Seymour, Columnist, PC Magazine, PC Week

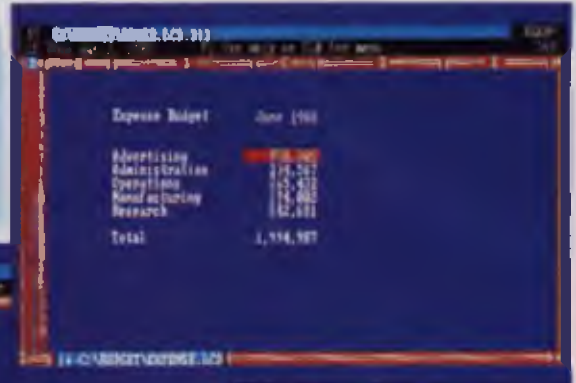


Fig. 1. Let's get the detail on those ad costs, just move the widebar to that cell and press one key (grey +).

Co-Winner of the 1987 PC Magazine Award for Technical Excellence
The other winner: Microsoft's Excel



Fig. 3. Of course, Lucid does multiple windows. Notice, you can simultaneously open windows in different directories, different drives, even down as many 3-D levels as you like. No one else can do that.

an interoffice compatibility problem. This means you can have the power and fun of Lucid 3-D, without having to upset your present systems.

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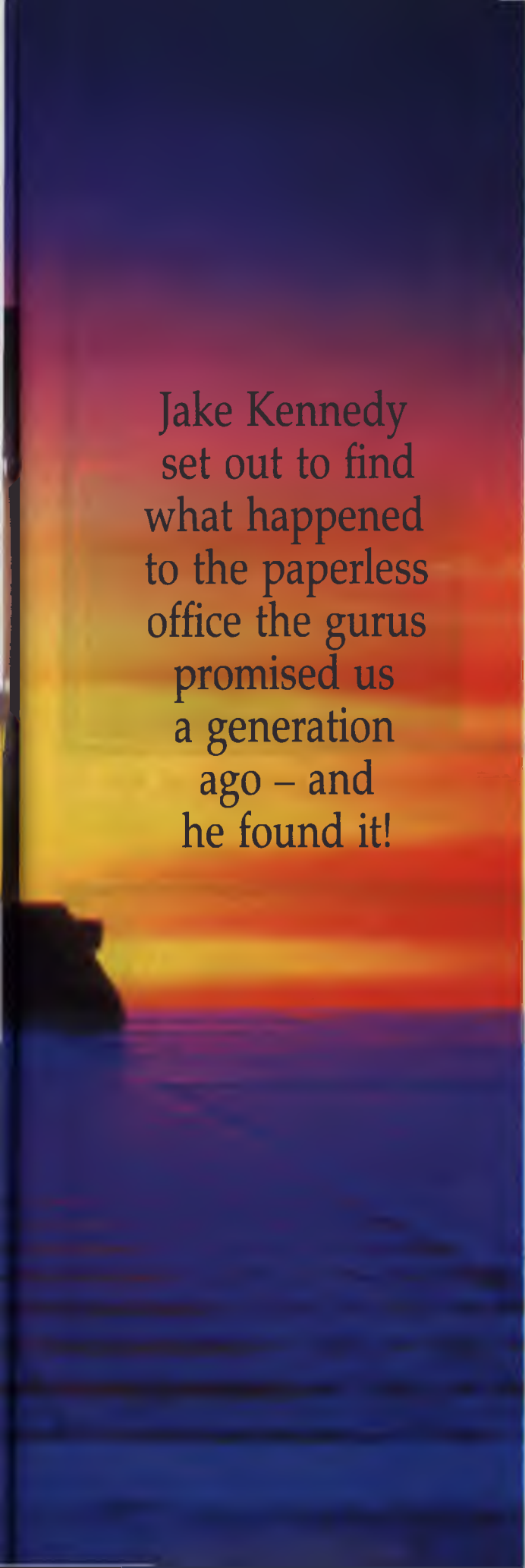
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A large, glowing screen is the central focus, set against a background of a sunset or sunrise over a body of water. The screen displays the text 'TOMORROW'S OFFICE—TODAY!' in a bold, green, sans-serif font. Below the text, two silhouetted figures of men in business attire stand with their backs to the camera, looking at the screen. The overall scene is bathed in the warm colors of the sky, transitioning from orange and red near the horizon to a deep blue at the top. The water in the foreground is dark and reflects the light from the screen and the sky.

**TOMORROW'S
OFFICE—TODAY!**



Jake Kennedy
set out to find
what happened
to the paperless
office the gurus
promised us
a generation
ago – and
he found it!

FACTS: 95 per cent of corporate information is paper-based. The average worker files 18,000 documents each year (and 3 percent of those are misfiled). There are enough documents in Australia to paper Ayers Rock 50 times. An executive spends about 3 hours per week looking for paper-based information and lower level workers spend about 4 to 5.

Whatever happened to the paperless office we were promised by the gurus a generation ago? Well, one company has taken giant strides towards that goal – the company that gave us word processing has now given us a range of products that *completely* eliminates the need for paper in an office. (In case you aren't familiar with computer history, that company is Wang.) Of course, until the whole world is using such a system, paper is going to be needed for many forms of communication outside the office, but the goal is at last in sight.

Let's spend some time in a paperless office of the not-so-distant future. Since commercial trading is the source of much of the paperwork floating around the world, we'll use a wholesale trader as our example; and, to show we aren't just thinking high-tech, we'll make it a trader in bicycles and parts. Our example office worker will be Wilbur Wright, who works in the sales department; bear in mind that he hasn't touched a piece of paper in years and all of the activities described below are done without his having to his desk.

Wright arrives at his paperless desk carrying a trendy pig-skin lunchbox (no paper, so briefcases have gone out of fashion). His 'terminal' is actually the glass surface of his desk; it's touch sensitive so he can write messages, or draw, directly on to the 'screen' (of the entire scenario presented here, this desk the only prop that does *not* exist on-the-shelf today, but Wang – and others – have it under development.) Attached to the desk is a telephone handset for adding voice messages to documents.

First, Wright checks his diary for appointments – there's a department meeting he's called, scheduled for 3 pm today, but it was flagged last night as clashing with the arrival of the Big Wheel from Head Office. OK, reschedule – in a flash, he's advised that all of those scheduled for the meeting will be free at 1 pm today, but none of the conference rooms are available; 9 am tomorrow morning is the next time that suits everyone and rooms 2 and 3 are free. A few keystrokes and a room is reserved and everyone is advised of the change.

Time to check the mail. What's this? A note from purchasing advises that the Taiwanese sprocket supplier is upping his prices again; the attached price list shows the rise is effective immediately. 'How many sprockets are we committed to sell based on the old price?' A quick search of the outstanding orders folder using 'sprocket' as the key shows the company will take a loss on quite a few if an alternative supplier can't be found quickly.

First, a note to purchasing requesting prices and delivery times from other suppliers; then a copy to the sales administrator for his comments and follow up, and attach the old and new price lists for his information. Now, mark the note for filing (indexed against the attachments and distribution list) and send it off. Then, an entry in the reminder index to chase purchasing if there's no reply by the end of the week.

Wang Integrated Imaging System

THE SHEER volume of paper that floods most offices reduces efficiency and has a profound effect on productivity and the ability to be competitive in the marketplace. Generally, if someone needs a particular piece of information, they need to search for it – and it's often misfiled, lost, accidentally destroyed, or on someone else's desk.

While microfilm-based systems are an attempt to manage masses of documents, they don't solve the problem of accessing the information quickly. There are systems that store microfilm in a unit that provides automatic retrieval, but, because of their price, they can only be justified by the largest of corporations. That means that most microfilm users need to manually locate a specific film cartridge, then locate the information, and re-file it (or misfile or lose it).

Wang have developed the Integrated Imaging System to capture information, index it, manipulate it, store it, share it and retrieve it almost instantly.

Documents can be captured on microfilm (an option aimed at those big corporates who already have a microfilm system installed) or, for more efficient handling, scanned and stored on 12-inch optical disks. Each disk can store 40,000 images or 2 gigabytes of information – that's about the same as can be held in 16, packed filing cabinet drawers (in comparison, each microfilm cartridge can only hold 4000 images). The disks can be stored in jukeboxes and any number of these can be networked; a jukebox can hold up to 136 gigabytes.

When documents are scanned in for storage on disk, they are indexed on user-defined keys and that information is stored in Wang's relational database management system, Pace, so the document, or specific data from it, can be located when needed. There is also a powerful text search system if the user needs several documents or may be unsure how a document has been indexed – for example: it might be necessary to find all documents that refer to the price of chromed handle bars not made in Taiwan or Korea, under \$5 and dated within the last 12 months.

A great advantage that the Imaging System has over manual document handling is that all documents can be accessed concurrently by any number of users. So, when marketing needs a customer file at the same time as the credit department and accounts receivable, there's no waiting or searching necessary.

Another plus is that 'imaging' a document gives a complete and accurate representation of the information it contains – by showing the information in its original context, the chances of misunderstanding and introducing bias are greatly reduced. As noted above, imaged documents take much less storage space than hard copy, and there's virtually no way a document can be lost. Add that to the time saved in locating information and other productivity increases stemming from efficient document handling, and executives can spend more time making decisions while other employees can work with information rather than look for it.



STEP Out!

WANG HAVE developed the Speech and Telephony Environment for Programmers (STEP) which effectively turns a standard pushbutton phone into a computer terminal. Upon calling a database running under STEP, users are asked for identification (generally a code number) which is entered through the telephone keypad. Then, they are given information and guided through a series of menus by a prerecorded, human voice and menu choices are indicated through the keypad.

STEP has already been applied by a number of US organisations. For example – a large university streamlined its admissions by allowing students to register over the phone using their student number as identification; simple voice prompts then lead them through curriculum choices. An international airline uses STEP to so that potential passengers can call for up-to-date information including reservations, arrival and departure times, and gate numbers.

Other applications include a women's clothing store which has a 24-hour number to take orders from customers who use their credit card number as identification; they key in the catalog number of the chosen item, quantity and colour; when inventory on a particular item runs low, a purchase order is automatically produced. And, a state motor vehicle registry is using STEP to reregister cars.

Sorry, Monty, there's nothing I can do about shipping the rest of the order.' 'Not to worry, I'll sort out what happened at this end.'

Back to the mail – here's a mail packet containing a delivery note and goods received slip each several pages long. What's this all about? There's a voice message attached, so our paperless worker picks up the handset – 'Wilbur, Orville in goods receiving. There's a discrepancy in the number of several items actually received from Kitty Hawk Bicycle Bits.' (As Orville speaks a pencil point appears on the screen and circles the items in question; first on one document and then the other.)

A click of a mouse brings up the original orders and amendments – of the three discrepancies, two reconcile against amended orders (why didn't Orville pick that up; too busy flying kites, probably); the third item, bicycle bells, appears to have been short-delivered. Now, a note to accounts routed via purchasing; a copy to Orville and attach his original packet with a handwritten reply. Better crosscheck the inventory and outstanding bells orders – all the outstanding orders can be filled except one from Hatteras Unicycles, so they need to be advised.

Blast – that old duffer at Hatteras doesn't believe in saving trees, so he still uses paper in his office. OK, print it out and post it to him (Wilbur hopes the printer isn't playing up; since paperless-ness has taken off, printer service has really gone down hill – he read yesterday that the last printer manufacturer is making them in his back yard from old spares, somewhere in Mexico). Once the likes of old Hatteras are gone, they'll probably put the old printer in the museum with the photocopier.

Feeling a bit peckish, Wilbur reaches for the phone, wondering what Betty's Byte Shoppe has on the menu today. 'Thank you for calling Betty's. Please enter your account number on the telephone keypad.' ... 'Good morning, Mr Wright. It's 10 am so our snack and breakfast menus are available for immediate delivery. If

you would like a snack, please press 1 on your telephone keypad; 2 for breakfast; use the star key for other services.'

Snack time. 'Number 1 on our snack menu today is jaffles; 2 is croissants ...' Jaffles sounds good. 'If you would like a chocolate jaffle, please press 1; 2 for ham and cheese ...' Ham and cheese it is. 'Thank you for your order. If you would like to order another tasty bite from Betty, press 1; 2 if you would like a hot drink; 3 for a cold drink. If you have finished ordering, press the star for the total and your account with us will be automatically debited Hang up if you wish to cancel the order.'

We'll leave Wilbur now to have his morning tea in peace, thinking how messy and inefficient offices must have been in the not-too-distant past. □



The sheer volume of paper that floods most offices reduces efficiency and has a profound effect on productivity and the ability to be competitive in the marketplace.



Once documents can be effectively handled electronically, the time saved in locating information and other productivity increases stemming from efficient document handling, executives can spend more time making decisions, while other employees can work with information rather than look for it.

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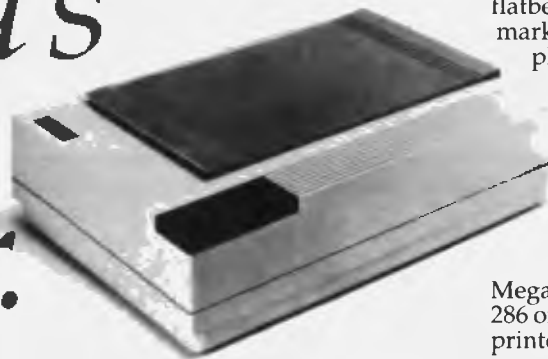
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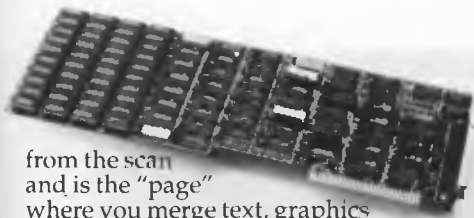
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- Softscrybe Software
- AVR-MegaBuffer
- AVR-Laser Adaptor
- SX or CX engine base laser printer (with video port)



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Freestyle

IN EARLY December, Wang released a software product that's as easy to use as writing on a piece of paper or picking up a telephone. Featuring an electronic pencil and tablet, the Wang Freestyle system lets PCs accept handwritten notes and voice messages, combining them with whatever is displayed on the computer screen. The entire combination can then be sent as a packet over a network to others in the system using Freestyle.

Another feature of the Freestyle system, the Desk, is an icon-based desktop onscreen. The Desk shows electronic paper pages in the form of one-inch-square 'stamps.' These stamps can be shown individually or in random piles; and, they can be moved around the desktop with the electronic pencil.

The Desk also includes movable icons to give a variety of other office-like features, such as stapling pages together into piles, making copies, trashing a document, placing a document in a folder, and printing or faxing it. Another icon-based feature gives a history of any Freestyle page showing the author of the page, the author of any annotations, and the last time it was printed or electronically mailed.

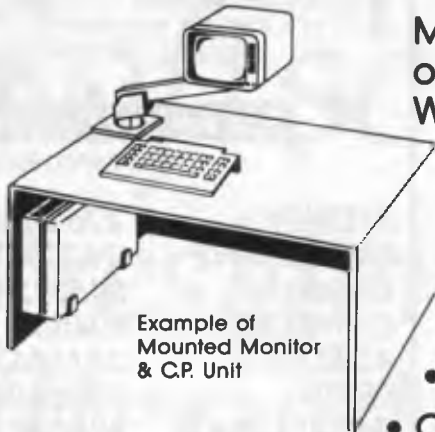
As Fred Wang, the company's president summed it up, 'Freestyle represents a major step forward in our mission to providing products that will help our customers manage 100 per cent of their business information, whether it is in the form of data, text, image or voice. [It] ushers in a new era for the

free-form, spontaneous exchanges of information that get jobs done.'



Using Wang's Freestyle package, a production manager wishing to query specifications shown on a design, would call up the relevant page onscreen; then using the handset, would attach spoken questions to the document; these questions are co-ordinated with the movement of the electronic pencil circling the specifications in question. When the designer 'replays' the combination of voice and graphics, there is no question about which specifications are being queried.

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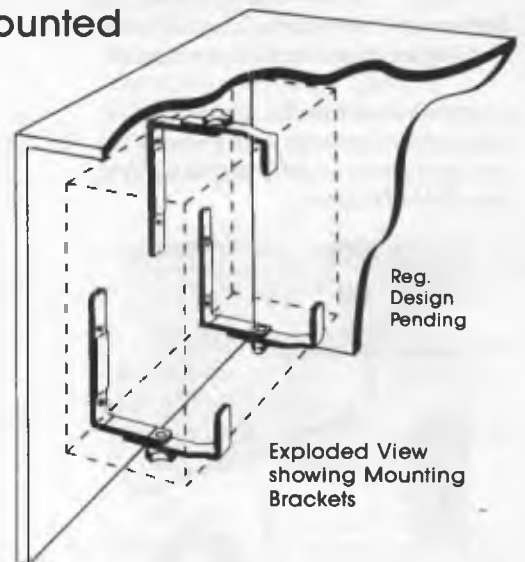
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An exciting concept!



IN DECEMBER, Fred Wang, president of Wang Laboratories, visited Australia to launch Freestyle here. (Incidentally, Fred Wang is the son of Dr An Wang, Wang's founder, who 'invented' core memory and sold the concept to IBM; he is also the 'father' of word processing.) We took the opportunity to ask, *How important is the Australian market to Wang – many multinationals give us a very low priority?* The Australian market is Wang's second largest – of 120 countries worldwide – and Wang Australia is one of only four subsidiaries worldwide with sales, manufacturing, and research and development activities.

The Wang Integrated Imaging System is an exciting concept for those of us anticipating the paperless office. How significant do you feel 'imaging technology' will be?

Imaging technology will be the fourth major evolutionary stage in computer technology. The first, second and third were the IBM 360 mainframe, Wang Word Processing and personal computers. Imaging will be a major thrust into the 1990s. Anything you can do with a filing cabinet will be feasible with imaging. It will be practicable to store all paper-based information electronically and to access it as and where required.

The need for such systems is vast – only 1 percent of information today is stored magnetically, 95 per cent is still paper-based, the remaining 4 per cent is stored in microfiche and other non-magnetic forms. Those are the rough per centages, but numbers like that don't tell the whole story because a great deal of that paper-based information is generally not readily accessible from wherever we are working. We see imaging as a major growth area – particularly for systems like optical storage that surround and support image technology.

Optical character recognition

BEFORE THE paperless office can be realised, those 18,000 documents that a clerk files each year must be converted to a form that can be handled by the likes of Wang's Integrated Imaging System. The secret to that is Optical Character Recognition (OCR), the basis of digital scanning.

As well as allowing both text and graphic documents to be edited, another advantage is that there is no need to key-in data. For example, since most 'commercial paper' is in a standard form, once it's scanned in, selected areas of the document such as those containing invoice numbers, dates

and prices, can be used as a template to designate database fields, or be the data can be written directly into an application such as a spreadsheet.

While OCR is not yet fully effective (a 300 dpi scanner typically gives about 99 per cent accurate character recognition in an 'uncontrolled' environment), properly designed forms for input and ensuring the clarity of the original, can provide 99.8 per cent accuracy. This still doesn't totally eliminate keying-in and some manual correction, but the release of 600 dpi scanners in the near future (several companies have promised them for 1989), should correct that.

Wang Australia's Strategic Marketing Manager, Gil Thew, tells of the company's future directions . . .



WANG IS generally perceived as a minicomputer company, but recently, it has introduced a range of PCs and related products. How does Wang perceive the personal computer market?

We are making a major thrust into the PC market. In addition to our 200 and 300 range of PCs, we are committed to introducing a Microsoft-developed version of IBM's OS/2 operating system.

What about multi-user systems?

We already have Xenix running on our PC range. And, about the same time we release our version of OS/2, we'll be releasing an industry-standard PC LAN product – that, coupled with new releases of Xenix should provide multi-user and multi-tasking solutions to suit all our PC customers.

In fact, we have installed the first pilot-site for our LAN at the Australian International Development Assistance Bureau, part of the Department of Foreign Affairs. Ultimately it will link 150 PCs through a Banyan-based system. In the long term, the Bureau aims to transfer all paper-based files and records to optical disk storage using our Integrated Imaging System.

Wang seems more committed to Australia than most multi-nationals. Why is this?

Our Australian customers are not only amongst the largest accounts Wang has in the world, but, in general, the Australian users are more advanced technologically. The input from our customers here is considered by Lowell to be ahead of many of our other markets. [Lowell, Massachusetts, is Wang Laboratories' head office.]

The light fantastic

Part 1 - LaserVision

DAZZLING NEW information technologies come and go with amazing frequency these days. Often they're supernovas that burn bright for a time then disappear without trace, other times they are lesser stars which become fixed in the firmaments of industry standards.

It is often not the quality of the technology that sets the tide of the future, as much as the climate of the universe at the time it was introduced. And sometimes, what appears to be a wondrous new invention is little more than a reincarnation of an idea that has been around since BC (Before Computers) – optical storage is like this.

The pre-eminent optical storage device for the last decade has been the Philips LaserVision video disk, and LaserVision predates the first PC. So, although you hear alot these days about CD-Audio, CD-ROM, and the new erasable and WORM systems, optical storage technologies aren't new.

But what is new is that optical systems seem about to make a major impact on the world – not only in the field of com-

Shakespeare's Brutus
eloquently gave us:
'There is a tide in the affairs
of men
Which, taken on the flood,
leads on to fortune'
– it's the same with new
technologies, as
Stewart Fist so eloquently
descries . . .

puters, but in video and audio; in both formal education and technical instruction; and in libraries, workshops, hospitals and homes. Optical systems are fast becoming the ubiquitous mega-mass information storage technology of the 1990s.

CD-ROM disks and drives are now shipping in volume, WORM drives are making an impact, and fully-erasable optical disk units are already in mass production. Some will be on sale in Australia by the time you read this. And, what appears to be an outdated analog technology – LaserVision – could well be as important over the next decade as the newer digital devices.

At the risk of putting a hex on the technology, I hereby proclaim that 1989 will be the 'Year of Optical Technologies'

The computer world is about to undergo a fundamental change. Until now we've seen computers primarily as machines that manipulate proprietary data – the data that you put in yourself. But no longer.

Giga-storage

WHEN WE begin to talk about storage systems with gigabytes of text or numerical data, we are, of necessity, talking about data entered by other people. The sheer volume of text implies on-line databases or mega-mass storage devices, since we can't type more than a couple of

OPTICAL STORAGE

hundred megabytes of data in a lifetime.

And when we talk about outside sources of information, we can almost assume, axiomatically, that 'the more – the better'. One of the characteristics of 'information' (in its social, rather than electronic, sense) is that 99 per cent of it is redundant – but you rarely know which 1 per cent you will need. So you need a lot to use a little.

This axiom only holds good if we have the selection and retrieval systems to find the specific information we require and select it out in manageable chunks, and present it in readable (understandable) ways. There is no point in keeping gigabytes of information if the 1 per cent we need can't be found (or can't be understood) when we want it.

Of course, we shouldn't ignore the problems of graphics, vision and sound – all of which are even more memory hungry than text, and even more dependent on large fast-action processing and enormous stores of data.

Motion video is the extreme case. I still don't see that a case has been proved for digital video, except in the production stages. But if we are viewing future computers as handling TV-quality motion-video in colour, then we will need to vastly improve our compression/decompression technologies, or learn to handle digital data at rates in the order of 25 megabytes per second. Already the Japanese are promoting a high-definition TV system that requires four times this rate. Where will it all end?

It is tempting to proclaim that, as a computer technology, optical storage has arrived 'just in time'. But this is an illusion. It's been around for a long time – we just haven't noticed.

When do you think the first videodisk was sold? 1980 ... 1970 ... 1960 ...? Try 1928 on for size. A decade before World War II, and while the BBC was just beginning to test Baird's mechanical scanning television system, Selfridges, the large London retail store, was selling a videodisk unit which used the standard black shellac 78 rpm records of the day.

Each record held a dozen still video frames compatible with the Baird B&W television sets (which is another way of saying that they had low, low quality) – and you played them on an off-the-shelf gramophone turntable. The idea might appear to be primitive, but 'videodisks' they were!

The next optical storage system to make



A number of travel agents are showing potential customers a video holiday catalog complete with moving pictures using LaserVision. Using a remote control unit, or by touching the screen, customers can decide on resorts and hotels. A videotext link is often used for the latest booking and pricing information.



In England, a large chain of home improvement centres is using LaserVision to give product information to customers.

Colour Pictures for Desktop Publishers

PUBLICATIONS produced with traditional methods frequently draw on the enormous stock of photographs offered by commercial photolibraries. Until recently there was no convenient way for desktop publishers to take advantage of such services, since many of the cost benefits of DTP were lost in having to physically handle the photos. Even if the pictures were available in a form that could be scanned into the DTP package, the low resolution of cost-efficient scanners meant that much of the quality of the image was lost. Another limitation with incorporating standard black and white photographs is that each image can use up to 4 megabytes of disc space.

However, developments in scanner technology, the TIFF (Tagged Image File Format) standard and CD-ROM have been combined by an American company, Comstock, into a catalog of 449 grey-scale images on a single compact disk. The Comstock Desktop Photography *Toolbox* includes the compact disk and a complete catalog of all the images. The CD-ROM is in the Hi Sierra format, compatible with both the Apple CD SC and DOS compact disk drives.

If a publication needs to reproduce colour images, the four-colour separations are available from the Australian distributor, Printlink, 100/110 Melton St, Blaxland 2774 NSW 10475. The retail price of the CD-ROM is \$995 (taxed).



An image from Comstock's CD-ROM as printed on an Apple LaserWriter Plus and the photograph as it appears on the catalog.

the scene was the Philips-MCA LaserVision (originally 'Discovision' in the US) videodisk, which was first shown to the press in 1973 but not in full production until the following year.

It was capable of playing just over an hour of video in the extended play mode, and about half that time if used 'interactively'. The LaserVision disk system is still widely in use around the world – mainly as a training tool and as an information source in places like libraries and museums.

Why am I telling you all this? Videodisk has been a dormant technology, rather than a dying one. Everyone recognises the enormous potential here for self-paced learning systems, on-the-street information carrels, library sources, and so on, but the cost of the computing side which drives the interactivity has been excessive.

IBM's InfoWindows

IBM's NEW InfoWindows system, for instance, uses an IBM AT to drive one or two Laserdisk units and the special touch-screen InfoWindows display unit. It costs about \$35,000 per set-up and is hell to program – so who can afford it? Because of the high pre-production costs, videodisk only comes into its own when we get



LaserVision is being used by Lloyds Bank for inhouse training. With some 48,000 staff in 1500 branches, the staff turnover rate is naturally high, so training has become a continuous commitment. One of the major benefits Lloyds found was that of being able to give the same 'behavioural objective' training to every user of the system – previously, new staff were trained by old who imparted personal biases and attitudes during the training sessions. They also found that training time with LaserVision was 30 per cent shorter.

economies of scale, and at \$35,000 per display unit, it is impossible to get these economies.

Until now there has been another problem. The interactive controls have been cumbersome beasts, requiring special 'authoring' systems and skilled programmers to drive them. The design of the information 'structure' (before anything is put onto disk) is also a specialist job, and the production of the material in the video studio also requires highly specialised skills.

Consequently, videodisk applications for training – a place where they are ideally suited – only comes about in large corporations like General Motors and the US Defence establishments, where the staff numbers are large and money is no object.

But these limitations are about to disappear; I predict that interactive video is making a spectacular comeback by being coupled with Apple Macintosh's HyperCard program. The grouping of a Mac, a mouse, and a laserdisk is a cheap and simple solution to making the videodisk work. It is the key to getting enough replay modules out there so that economies of scale begin to operate.

HyperCard applications

APPLE'S latest version of HyperCard has been designed to handle the control language of the LaserVision system. And HyperCard can be 'programmed' by non-programmers – people like your average teacher, or museum worker.

You simply create new live areas ('buttons') on any HyperCard card and link this control to the videodisk player. There is a set of ready-made buttons available off-the-shelf. All you need to do is cut and paste them in on the appropriate reference card.

You'll also need a colour video monitor attached to the player, since you can't use the Mac screen. This set-up doesn't provide a full duplication of IBM's InfoWindows functionality, but it gives you 90 per cent – and that could be enough to make videodisk work.

This takes the standard computer in new directions. Now anyone can click on the word 'elephant' in a HyperCard encyclopedia and be presented with a short video documentary of pachyderms in the wild. If you click on 'Caruso' you will hear him sing. Or click on the carburetor in your HyperCard motor manual, and you'll be taken step-by-step through the process of stripping and cleaning it.

You've probably already read about the way information is stored on, and read from, a LaserVision videodisk or CD-Audio/ROM disk using a laser beam. Both systems are essentially the same in terms of the disk manufacturing process, and the physical means of getting information onto and off the disk.

The data exists as micron-sized 'pits' imbedded into the 'land' (original surface of the disk). A laser beam is bounced off



A decade before World War II, and while the BBC was just beginning to test Baird's mechanical scanning television system, Selfridge's, the large London retail store, was selling a videodisk unit which used the standard black shellac 78 rpm records of the day.

Each record held a dozen still video frames (like that shown above) compatible with the Baird B&W television sets – you played them on an off-the-shelf gramophone turntable.

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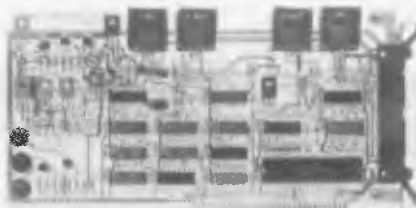
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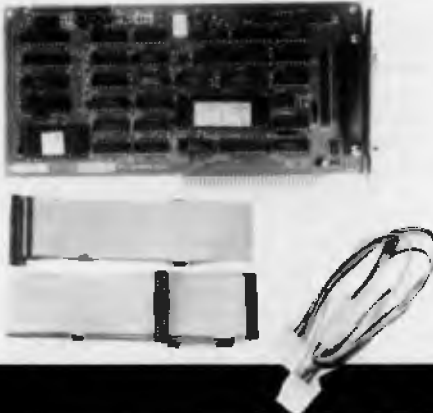
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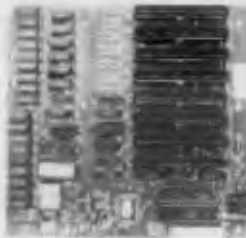
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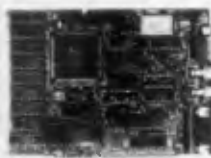
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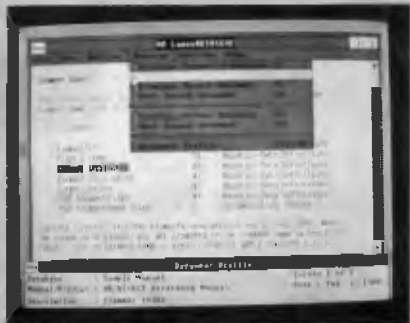
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LaserRetrieve



THE HARDWARE for optical storage technology is in its second generation and is fairly mature, but until recently writing the software interface for retrieving the data from CDs was strictly a task for specialists. Although there are a number of companies marketing CD-ROM retrieval packages, these tend to be custom designs tailored to individual users and applications. Plus, the lack of development tools available to general users meant that every new CD-ROM application had to be written by a third party.

Hewlett-Packard has recently released a package, LaserRetrieve, that provides a standard user interface and can be used developing applications inhouse. Based around a user-interface development module and database building software, the system breaks development into four major steps:

1) Data conversion – the developer prepares the data and inserts 'tags' which form the basis for retrieval searches;

2) Software development – the developer builds and indexes one central database, based on the tags;

3) Mastering – the database, on a 9-track magnetic tape, is used to cut a glass mas-

ter for the CD and the disks are replicated;

4) Interface – the information on the finished CD-ROMs is accessed via the LaserRetrieve interface.

The interface, based on Microsoft Windows, allows searching for data either by browsing or by using keywords. Browsing starts with a general table of contents and migrating to specific sections of interest. A keyword search can be based on selected words, phrases or topics.

LaserRetrieve can be used with either text or graphic documents. It also features a compressing/decompressing facility that can increase the capacity of a CD-ROM by 33 per cent.

The database building software needs an AT-compatible with 640 kilobytes of RAM, a mass storage subsystem (storage capacity must be twice the size of the database), a 9-track tape drive and a laser printer for proofing. The user interface software also requires an AT-compatible with 640 Kbyte, a minimum of 5 megabytes of hard disk storage and, of course, a CD-ROM drive.

LaserRetrieve is primarily intended for use by organisations that want to transform massive amounts of paper documents to an easily accessible electronic form, especially if there will be a need to update the CDs on a regular basis.

Hewlett-Packard uses the LaserRetrieve system itself, for its LaserRom service which provides technical support for H-P products. Subscribers to the service have access to the most current reference manuals, application notes, and solutions to problems that others have encountered. Each month, users receive a new disk and the old disk is simply thrown away.

track represents one full television image (that is, two complete TV fields). Since our PAL television signal consumes 25 frames (images) – 50 fields – per second, a few simple punches of the calculator reveal that you should be able to get 36 minutes of full-motion video on a disk in this mode.

The turntable is spinning at 1500 revs per minute (1800 rpm in NTSC, with 30 frames per second) in the CAV mode, and so each picture starts and ends in exactly the same 'angular' position on the disk. If you hold a CAV disk up to the light you will see two pie-wedge shaped disturbances in the silver reflection. These represent the $2 \times 54,000$ television vertical blanking periods (that black bar across the top of your TV picture, when the image rolls) all in-line. The blanking periods are wedge-shaped because the disk moves faster in relationship to the head at the outer circumference of the disk than it does at the inner.

If you think about the implications of this for a minute, you will see that the system of CAV image placement means that –

a) if the laser read-head isn't scanned then we can produce flicker-free still frames, since the machine will continue to read the same track indefinitely;

b) it is relatively easy to make the read-head jump a short distance across a number of tracks on the disk within the blanking period and, if we store and repeat the last frame of picture for a fraction of a second, we can achieve quite long 'clean-cut' jumps from one track to another – even those quite a distance away on the disk;

c) if the read-head is able to get a good picture from the small circumference at the inner tracks, then obviously a lot of storage potential is being wasted with the larger circumference tracks at the outer edge

It is this last point that is the basis for CLV (Constant Linear Velocity) recording, where the turntable speed is progressively reduced as the head scans outwards from the first inner tracks. It spins at 1500 rpm on the lead-in tracks and at about one-third that amount at the outer edge.

A feedback circuit ensures that the linear velocity of the head over the disk remains the same from the inner to the outer tracks. And, on average, twice the information can be held on the same disk space

But you can't get at the elements of information as quickly and easily. You've got a difference in mechanical rotation

the silver land surface and read by a photosensitive cell. There is no physical contact; no wear and tear; and moderate amounts of dirt and scratches don't make much difference

With CD-Audio and CD-ROM we can visualise quite easily how digital information may be stored – with pits representing 0s and lands representing 1s. But this concept, while overtly feasible, is wrong. But before we go into the intricacies of CD digital storage, think again about the problems of analog videodisk. How do you code an analog change in terms of pits and lands?

LaserVision system

SO, FIRST of all, let's have a look at the LaserVision videodisk system to get a feel of the problems and potentials of optical disk systems.

There are two types of LaserVision disk – CAV (Constant Angular Velocity) and CLV (Constant Linear Velocity). Both use a spiraling track beginning at the centre of the disk and working out, but the second type plays about twice the time of the first. So why bother with CAV?

There are 54,000 tracks across the radius of a videodisk (about 500 to the millimetre), and in the CAV mode each

OPTICAL STORAGE

speed for a start if you scan from an inner to an outer (or *vice versa*) track quickly.

If you look at a CLV disk in reflected light you won't see a wedge of vertical blanking because some tracks now hold fractions of images, and at the outer edge they will hold three – so there's no easy way for a head to produce a still-frame image, or to jump glitch-free from one image to another. You'll always end up with a maverick part-image left over – and you'll have to wait for image sync and mechanical speed to readjust to the change.

So CLV videodisk systems are used for linear programming – where you don't want to stop and start or jump around – and in practice, this means video movies. Unfortunately, as they stand, videodisks can't record, so the CLV videodisk is a poor substitute for a home video tape player which is why it failed in this market.

The Philips LaserVision is an analog recording system that has often been used to store digital information. However, its primary purpose is to store colour video and stereo-sound information, and it does this on a single track of pits (there is no groove) only 0.4 of a micron wide.

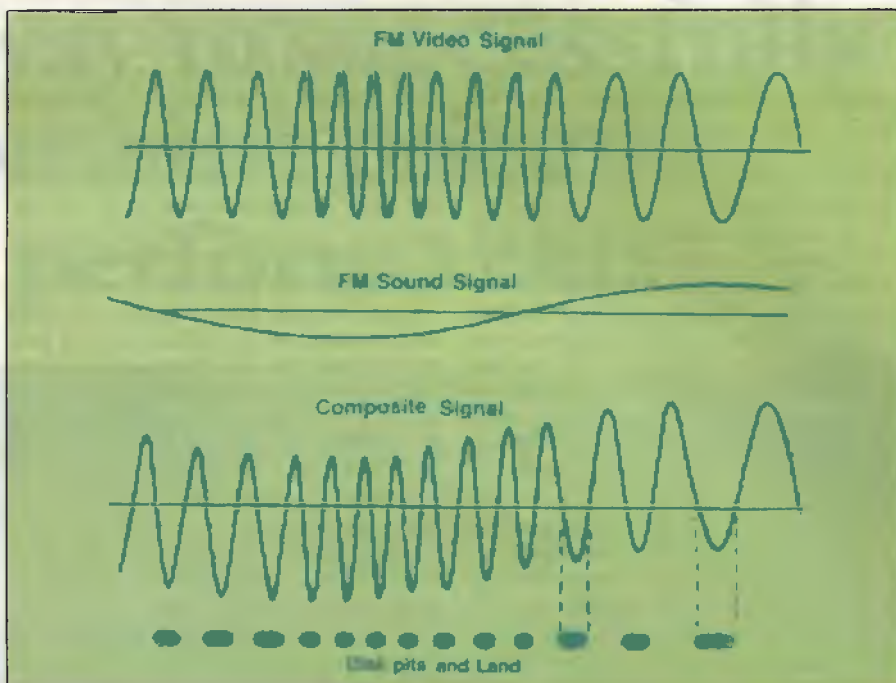
The tracks are separated by 1.6 microns, and they spiral outwards from the centre 54,000 times before reaching the outer edge. It is surprising how well they track considering the placement accuracy required.

During the manufacturing process, these 0.1 micron pits are pressing into a transparent plastic material by a nickel-cadmium 'stamper' which is made by electrolytic deposit onto an etched glass 'mother' recording disk. After the pressing, a thin layer of aluminium is vacuum deposited onto the transparent disk, and then an additional 1.1 mm protective transparent layer is sandwiched onto the outer surface.

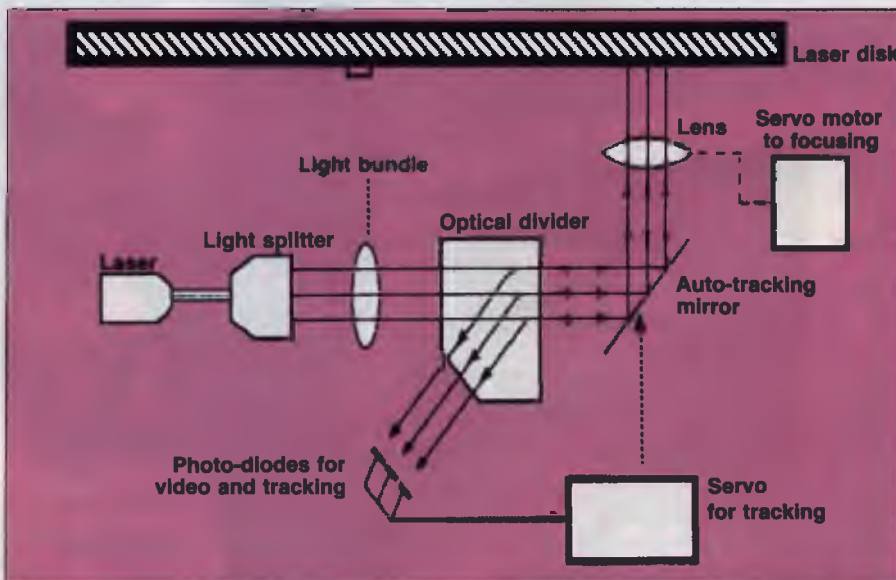
The master 'mother' disk is produced by a photo-etching process using a high-powered laser beam which is frequency modulated at around 8 MHz. The 'resting' frequency is actually 8.1 MHz, and this corresponds to the video black-level, and at this frequency the laser will create evenly spaced, ovaloid pits on the surface of the disk.

Digital analog!

REMEMBER that this is an analog composite video-and-stereo-sound signal being recorded in the form of digital pits. Pits are either there or they're not – which suggest digital – yet they record analog. There is a complex concept here that is



The basic encoding system for video and sound on a LaserDisk – in practice two sound signals and control information are combined into the composite signal and encoded as a single track. Note how the pit length and spacing are derived from the 'clipped' composite signal.



LaserVision control and tracking system – Servo motors keep the laser in focus and tracking on the spiral of pits by using the coherent nature of a laser and a light-splitter. The splitter produces three beams from the one laser source: the centre beam reads the video and the two outer beams sense the land area between tracks. When the centre beam (the read-laser) strikes a pit, the light needs to travel further down and back. This distance is equivalent to about half the wavelength of the light used, so the reflected light is about 180 degrees out of phase with the light reflected by the land and the photodiode output drops below the threshold.

OPTICAL STORAGE

difficult to grasp at first, but quite amazing in its ingenuity.

The video signal is firstly converted into a frequency modulated signal, and then the FM sound signal is added to it (in practice, two sound carriers at 2.3 and 2.8 MHz plus a pilot colour control signal of 388 KHz are added).

This complex composite FM signal is then 'clipped' at the zero voltage level, and this clipped signal drives the mastering laser. If you imagine the lower half of the wave-form in completely removed (see the accompanying diagram), you can see that the space (duration) between these half-waves defines the length of the pits, and the duration of each half-wave defines the spacing (the 'land' distance) between pits.

The reading laser can therefore reverse the process and re-create a composite wave form that can then be decoded into its constituent parts. Clever, isn't it!

The read-laser rides across the 'land' (or disk surface) and the reflected light is

read by a photodiode. When the beam comes to a pit (of 0.1 micron depth) the light travels the further distance down and back – a total extra distance of twice the pit depth which is, in fact, equivalent to about half the wavelength of the laser light being used in the read process. Thus, the light returning from a pit is 180 degrees out of phase with the light reflected by the land, and the photodiode output drops below the threshold.

Servo motors keep the laser in focus and tracking on the spiral track of pits. This is done by equally ingenious methods using the coherent nature of the laser beam and a light-splitter which actually produces three separate beams from the one laser. The centre beam reads the video and the outer two sense the land area between tracks.

With CAV disks used for interactive purposes, an incrementing frame number in digital form is added in the vertical blanking interval (the black bar at the top of the picture) and this makes it possible to find

any point on the disk very quickly. However, it still takes a couple of seconds for most machines to scan from the first frame to the last across a disk; the optical head is too heavy to shift quickly.

It is for this reason that many touch-screen information systems use two videodisk players. One can be programmed to reposition while the other is still playing.

Head mass is also a major problem with CD-ROM disks, since it sets the access time of the unit; work is underway to replace the lens and prism system by a hologram which can be made to act like a lens – but has no mass whatsoever. When this happens, optical disk systems will provide access times far in excess of those now possible with the fastest of hard disks.

In the next part of 'The Light Fantastic' we'll have a closer look at CD-Audio, CD-ROM and the High Sierra Format standard. Part 3 will cover WORM drives and erasable disks. □

Touching IBM



IBM'S NEW InfoWindow Display is an interactive presentation system featuring an IBM-developed touch screen. The system lets the viewer begin a presentation, select an option, answer a question or even order merchandise, all at their own pace, using the touch screen.

The heart of the system is an intelligent terminal that controls audio and video plus the touch screen and voice synthesis. Two speakers are integrated with the system; these can play either stereo sound or two independent audio tracks. Other requirements are an appropriately configured IBM AT or any of the PS/2 range, and a videodisk player (the system can support two); an optional adapter card enables text and graphics from the AT or PS/2 to be superimposed over the videodisk image.

The display's touch screen features up to 60 'touch spots' over the 8 x 11 inch screen. There is no grid of wires or touch-sensitive material over the screen to reduce resolution.

InfoWindow is currently being used at the Powerhouse Museum in Sydney, where visitors can interact with eight displays to learn more about exhibits and events. IBM is also using the system in its Guided Learning Centres for self-paced educational programs for both customers and employees. At Brisbane's Expo '88, 30 InfoWindows were used as an audio-visual review of Australian sport, places, nature and events.

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The Sydney Morning Herald summed up Wang's VS 5000 as "a small miracle."

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A challenge to the AI community...

HAVING READ the erudite expositions offered by my learned colleagues in this and other journals, most readers will know – or will at least believe they know – what artificial intelligence is. But for the sake of those who don't, I shall offer a short, snappy and entirely inadequate definition of the phenomenon, while the rest of youse pop off and have a go at writing a Lisp compiler.

Leaving aside cheap cracks about how many of us are endowed therewith and how many have the real McCoy, artificial intelligence is that area of computer programming where, by means of techniques into which it is not profitable to enquire, a computer is made to reason, or to appear to reason, as a human being would.

Whether or not this is a good thing is another question – I would not myself like to see a computer engaging in the type of mental processes favoured by the Ayatollah Khomeini. Nor would I have any truck with a computer which thought like Heidegger – one can only take so much humiliation. But we shall leave that aside also.

The Turing Test

ALAN TURING (he of the homonymous machine which has become so dear to our hearts) designed a hypothetical test intended to establish whether or not a machine was behaving intelligently: if a per-

Farquhar Cameron redefines Artificial Intelligence

son communicating with an unseen machine is unable to determine whether he is dealing with a machine or a human being, so the argument goes, then that machine is displaying human intelligence.

This has, ever since I heard of it, struck me as entirely inadequate, if not downright silly. To begin with, it begs the question of whether the human being participating in the experiment is himself blessed with any nous – I have a number of acquaintances in political life whom I would not trust to make a judgment of this sort, or, indeed, of any other sort. The reader will, of course, point out that politicians are not to be classed as homo sapiens, and I will not demur.

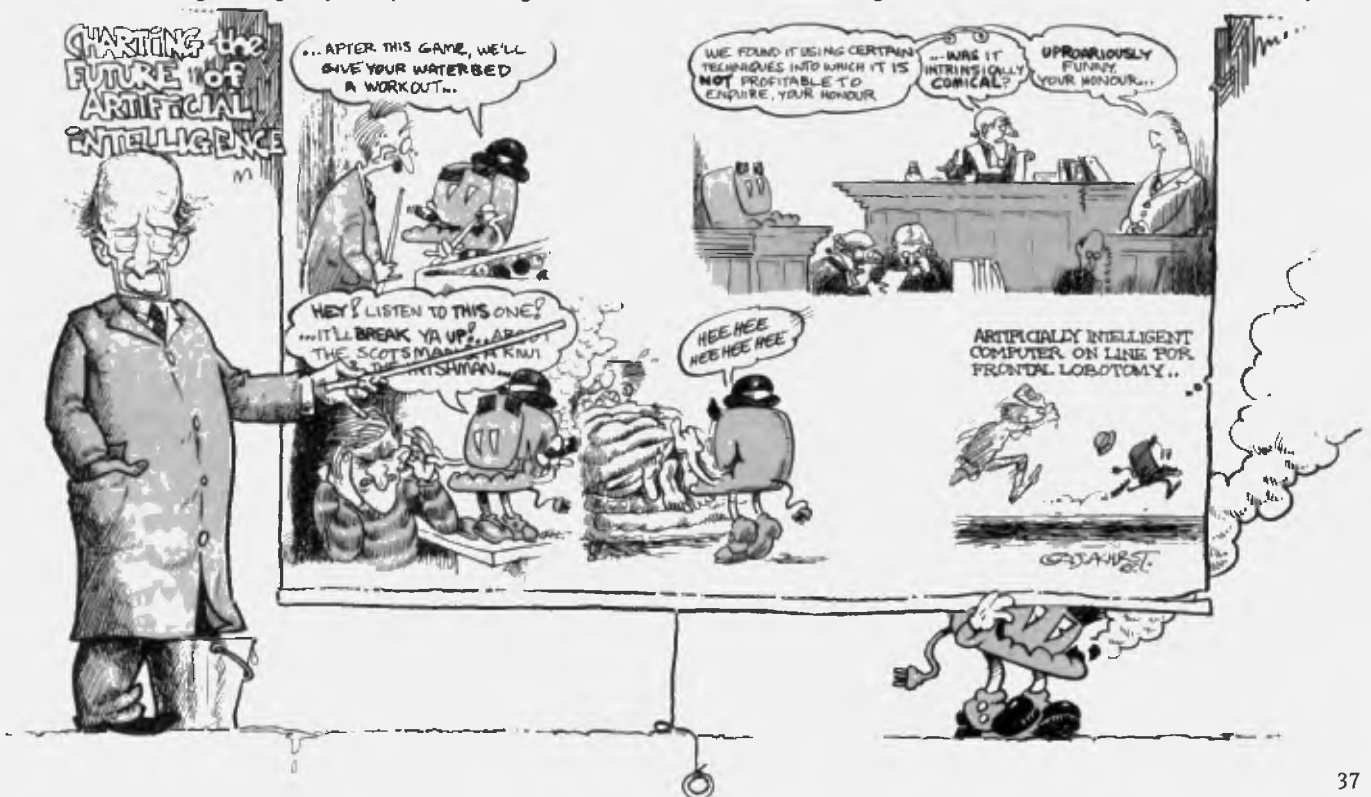
Secondly, since the test clearly requires that the parties communicating be separated at least by a wall, there is the question of person-to-person relationships, erotic and otherwise. As an essentially bonhomous and gregarious individual, and as one who has consistently failed throughout his life to heed the warnings

of his old mother, if I were the human subject I would eventually propose a meeting either in a pool hall or in the close vicinity of a waterbed, according to feedback received. I would brook no refusal. Distance would be no obstacle.

And being a very personable, urbane and charming individual, it is my experience that most of the people with whom I have regular dealings on the telephone are prepared sooner or later to get together with me, if not for a waterbedly encounter then at least for an amicable game of pool. They may not wish to repeat either experience, for I wield a mean cue, but they will generally chance their arm at least once. The computer's inevitable refusal to entertain either invitation would make me very suspicious. I would be led to probe deeper, to ask further questions, some of them highly impertinent I would rumble it. I would expose it as the fraud it was.

But most importantly – and I come now to the central point of my thesis – there is the matter of the Englishman, the Irishman and the Scotsman. Were I attempting by means of the Turing Test to establish whether my interlocutor were a machine or one of us, I would sooner or later ask it whether it had heard the one about the three gentlemen mentioned. I would expect it at the very least to groan; and how is a groan to be registered by a computer?

Let us assume, however, that that prob-



lem had been solved. But whether it groaned or cracked up on the floor clutching its belly and gasping for breath, I would expect the machine to recognise that a pleasantry, a *coup de drole*, had been attempted; and I would further expect it to ask me if I knew the difference between a sausage-dog and a costermonger (which I do, but delicacy forbids my making any disclosure here).

For it would appear to me that the capacity to appreciate a joke is one of the defining human qualities – despite his great many unpleasant features (and the number of the same is legion), man is very much a playful creature. Humourless scholars have written books to prove it. Understanding or making a joke demands the ability to stand above a situation and view it from a number of different perspectives simultaneously and is, therefore, an intelligent activity.

A sense of humour, in other words, presupposes a certain degree of intellect (which is not to say, of course, that all intellectuals are a barrel of laughs – just as

The computer's inevitable refusal to entertain either invitation would make me very suspicious.

it can be logically demonstrated that all men are not Socrates, it can be shown that intellectuals are not necessarily either especially intelligent or especially witty, as anyone who has been exposed to a gathering of Trotskyites will testify).

There are of course several varieties of humour: cruel humour, black humour, lavatory humour, puns, smut, slapstick and so on. Some of us prefer one, others prefer another – myself, I am greatly enamoured of puns, although I have so far managed to keep these columns relatively free of that lowest form of wit. A computer

claiming to behave intelligently, therefore, might not dig the one about the Irishman, the Englishman and the Scotsman.

Like Bertie Wooster, it might not see any cause for hilarity in contemplating the fate of the two lorry drivers, Smith and Jackson, who had a fatal collision and were reassembled under the name of Smithson. It might not even be entertained by hearing that I'd rather have a bottle in front of me than a frontal lobotomy. But sooner or later, if it were genuinely intelligent, one would expect to coax a chuckle out of it.

I would therefore propose a new definition of artificial intelligence, which may be taken as a challenge to the AI community: artificial intelligence is that area of computer programming where, by means of techniques into which it is not profitable to enquire, a computer is made to understand why human sexual behaviour is so rich a source of mirth, why lavatories and anything therein occurring are intrinsically comical and – above all – why other people's misfortunes are so uproariously funny. □

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Cad on the IIGS

LIKE many IIGS programs, Draw Plus by Activision has no parallel in the old Apple II series. Mac users, however, would be familiar with the concept of this program, in a monochrome version of course. Programs that allow you to draw to scale and move things around on a simulated drawing board are not new, but then neither are computer aided design (Cad) programs in general. But, to an Apple II user, it's a whole new world.

The G in GS gets a great workout with Draw Plus, and after having used it for a number of useful tasks, I'm hooked. And therein lies the bottom line – Draw Plus is really useful.

Draw Plus is basically a Cad program that allows you to draw to scale, and print the final result to either an Apple Laser printer, or an ImageWriter. No other printer is supported, which is a worry if you don't have either of the above. But then, most GS software is the same, unfortunately.

However, I have found the program most useful, even though I lack a suitable printer. It seems that the strength of the program is in its screen abilities, and printing the final result is really not important.

The program

AFTER BOOTING the program, a work area surrounded with selectable tools and functions is presented. There are six pull down menus, including the usual File and Edit menus. The two most powerful menus are titled Layout and Arrange, and these are usually accessed frequently during the task at hand. So, to put Draw Plus through its paces, I decided to re-design my office – on screen anyway.

The first task was to establish the scale to use. Selecting Drawing Size from the Layout menu, I decided on 640 x 756 pixels, equivalent to four pages in a 2 x 2 format. I could have had 96 pages (or 3840 x 2880 pixels,) but this would be a bit unwieldy, I suspect. Next came the

Apple IIGS owners can now draw plans, design colour schemes, plan room layouts, do accurate scale drawings – all using Draw Plus. Peter Phillips shows how . . .

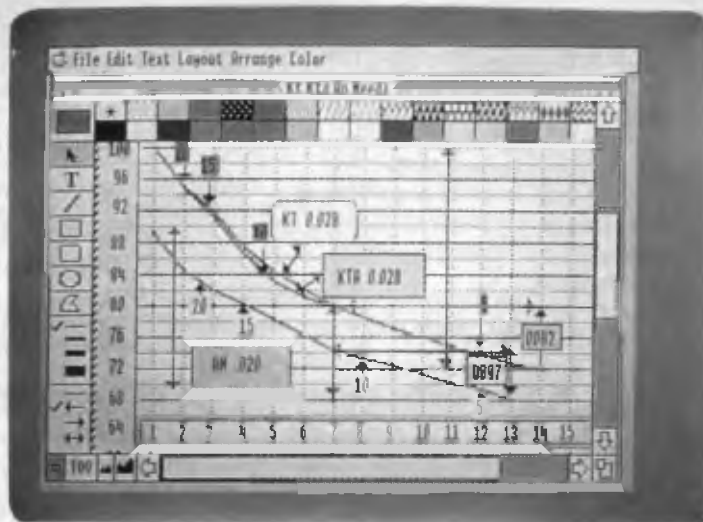
ruler size, where the choice is either the default or a custom design.

The ruler is a set of graduations on top of, and to the left of the drawing, and can be either metric or imperial. I selected metric and an increment of 1, giving 40 division across by 54 divisions down. Because the screen only shows a section of the drawing area, the total on-screen divi-

magnification was set to 100 per cent

The magnification feature allows the screen to be reduced or increased by various increments. The 200 per cent setting was a problem, possibly because I only have one 3½ inch disk drive, as Draw Plus needs to access the work disk when scaling up, and takes forever to do it. The 5¼ inch drive in slot 6 gets a workout for some reason during this process – perhaps the addition of a second 3½ inch drive would solve this by allowing the program and the work disk to both be available. However, scaling down to 50 per cent, or 25 per cent is no problem, but, in my case, any smaller meant a very unreadable screen.

I turned off the grid, an imaginary set of lines that, if active, align the drawing to the nearest line. I decided to leave the ruler lines on, (different to the rulers themselves, which can also be turned on or off) to help the accuracy. These dotted lines are placed mid way between the ruler divisions, and show as a grid over the work area.



The new office

AND NOW for the job at hand. First I drew the room, with suitable gaps for doors. Next (Mac users might now like to eat their hearts out), I coloured the area representing the room to match the floor covering. The default colours were unsuitable, but with a bit of mixing, I soon had the right colours displayed on the colour palette.

My aim was to design a new desk set-up, which had to not only fit in the available space, but had to accommodate all my gear. I drew each desk module in

turn, complete with rounded corners, in the colour that best suited the decor. I moved them here and there, adjusted them all, reshaped some using the polyline feature, until finally it all looked good. Ready to finish off, I then added the dimensions to each module, using the rulers to calculate the values.

All that remained was to determine if my gear would fit on the newly designed

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All that remained was to determine if my gear would fit on the newly designed

desk top. Easy to do with Draw Plus. I simply drew (to scale of course), each item, including the chair, the mouse mat, the computer keyboard, monitor, computer itself, the printer – everything. To identify each one required text, locked to that item.

Then, I moved each item on top of the desk if that was to be its place, or, using the Arrange menu, placed it underneath. Some items needed to be rotated to gain the best arrangement.

Sure, it took a bit of time, but then I had to learn the software as well. The end result was an accurately designed, colour co-ordinated plan that accounted for all possible variables.

Draw Plus works on the principle that all drawn items, (either a single line, a text character or a complete shape) become independent entities. This allows each entity to be manipulated without affecting the rest of the picture.

To achieve the same thing using traditional methods would require a cardboard scale cutout of the individual items, and to arrange them on the drawing sheet.

Other features

THERE ARE many other features provided, including a software interface to the companion program Paint Plus. You can also have two drawings going at once, and can use pattern fills instead of colours. Another powerful feature is the 'group' selection from the Arrange menu.

For example, although the computer representation was drawn as three separate modules, grouping the modules allowed it to become a single entity. If required, a grouped set can be ungrouped.

The Undo feature in the Edit menu is very handy, as is the Clipboard, which allows an item to be duplicated, or stored until needed.

I have since used Draw Plus for many other purposes, none of which have suffered from a lack of a suitable printer. It takes a bit of learning, but is easy to use once you get going. The screen updates are a bit slow sometimes, particularly for complex drawings. I have found no bugs, unlike Paint Plus which has the odd nasty.

The manual is straightforward and not excessively long. However, I wish this and other GS software would allow the user to format a disk from within the program. I also would love a faster loading time, with a bypass on the launcher. The launcher is boring in the extreme, and needs a lot more development yet. Oh yes, my new office is great, thanks to Draw Plus! □

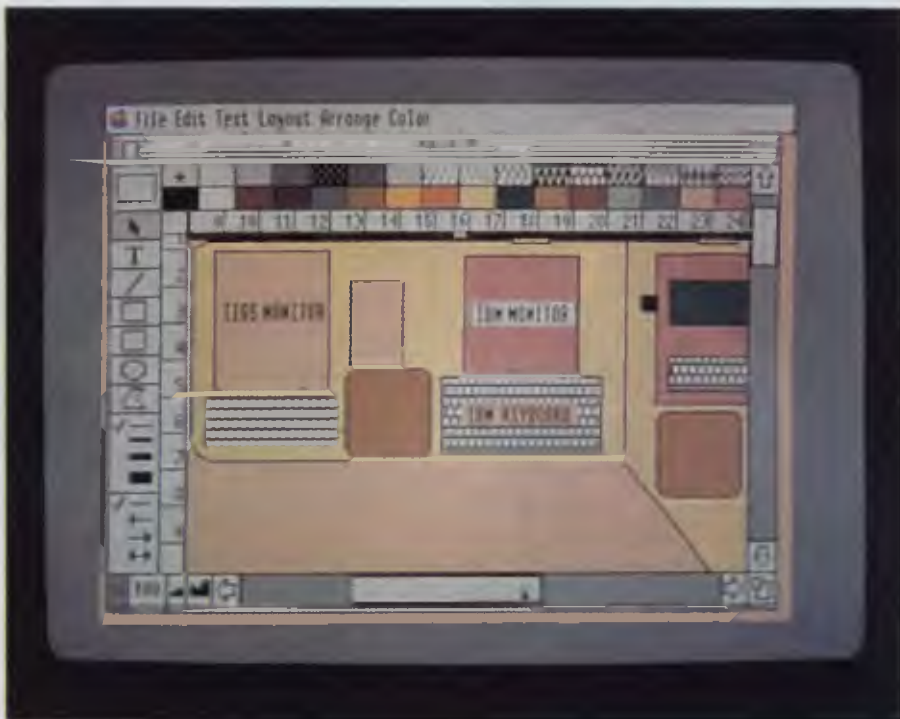


Figure 1. Draw Plus works on the principle that all drawn items, (either a single line, a text character or a complete shape) become independent entities. This allows each entity to be manipulated without affecting the rest of the picture.



Figure 2. Among the many features provided by Draw Plus, from Activision, are a software interface to the companion program Paint Plus. You can also have two drawings going at once, and can use pattern fills instead of colours.



BBCs Simulate Sailing!

Michael Floyd investigates a new use for BBCs – maritime simulation.

ON THE occasions I have flown in a Boeing 747, I been awed by the colossal size of these aircraft. Fully laden, these machines weigh in at about 250 tonnes and can fly for more than 10,000 km at a speed

of about 925 kmh, carrying more than 430 passengers and crew. It really is surprising these aircraft can fly.

But the 747 is no match, whatsoever, for the modern tanker. Take, for instance, the Iron Maiden, one of BHP's ships. Weigh-

ing an incredible 200,000 tonnes, this ship is 315 metres long (or about the length of 2½ rugby fields), and more than 15 metres deep.

Statistics of this magnitude present serious problems for some of the ports

The large size of modern tankers has presented serious problems for some of the ports around the world, including Port Kembla in NSW. The distance from the entrance to the port to the first jetty is only two ship's lengths and within that distance, a 97 degree swing needs to be made.



around the world and, until recently, Port Kembla was one of them.

The distance from the entrance of Port Kembla to the first jetty is only two ship's lengths and within that distance, a 97 degree swing needs to be made. Navigating a ship the size of the Iron Maiden through a port as 'small' as Port Kembla requires considerable skill on the part of the pilot, and, preferably, previous experience.

And, ideally, the local Maritime Services Board would only allow pilots with previous experience in the port but this is obviously not realistic. So, another solution was needed.

Maritime Simulator?

MOST READERS would be aware of flight simulators. From expensive, dedicated machines used for commercial and military training to the likes of

MARITIME SIMULATOR

Microsoft's Flight Simulator, these systems abound. But, until recently, there weren't many maritime simulators and those that were available were expensive (about \$A5 million) and needed the computing power like that of a small, dedicated, mainframe.

Maritime Dynamics, of Wales, developed the Mardyn Simulator to make this technology more affordable and accessible.

In appearance, the system closely resembles a large multi-screen video game, but its appearance is deceptive: the machine is a powerful simulator which is smaller than its more expensive counterparts but still offers more features.

And, at \$A200,000 or so, it is also significantly cheaper than comparable systems because, rather than use custom designed hardware for the simulator, Maritime Dynamics designed its system around seven networked BBC microcomputers.

Simulations

THE SIMULATOR can handle a wide range of factors affecting navigation such as shallow water, wind, variable currents, ship interaction, anchor forces, bow and stern thrusters, and bank effects. These can be specified through menus provided for the instructor.

Database modules are used to record tug control, off-line progress recording, a ship maneuvering model, environmental effects and a library of pre-programmed simulations. Through these databases the system can be configured by the instructor for a variety of real time conditions essential for accurate simulation.

For instance, navigating through a port in rough weather is obviously quite different than in calm seas. The presence and exact location of tug boats and other ships is also an important factor and for accuracy a simulator must be able to emulate the effects of these. The Mardyn can handle up to seven target ships and up to



The Mardyn Port Design and Ship Operations Simulator system, designed around seven networked BBC microcomputers, closely resembles a large multi-screen video game, but it's a powerful tool offering more features than its competitors at a fraction of the cost. Basic port layout, including jetty positions, channel widths and depths, tug operations and failure analysis (for ensuring adequate safety procedures), can all be coded in to emulate the operation of a port. Plus, the system can also provide information on a ship's ability to sail by simulating the lift and drag effects of wind.

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Power C is the new ANSI compatible C compiler that runs faster than Microsoft C and has more features than Turbo C. Power C combines high performance software with superb documentation, all for less than the price of many books on C alone. Its your fast route to fast programs without the fast bucks. Compare Power C to the competition and see how much time and money you will save.

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The Power C documentation makes it easy to learn how to program in C. The manual includes a step by step tutorial and is full of example programs.

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MARITIME SIMULATOR



The simulator can handle a wide range of factors affecting navigation such as shallow water, wind, variable currents, ship interaction, anchor forces, bow and stern thrusters, and bank effects. Database modules are used to record tug control, off-line progress recording, a ship maneuvering model, environmental effects and a library of pre-programmed simulations.

four tugs, all of which can be displayed on screen.

But the system is more flexible than this, as its full name of Mardyn Port Design and Ship Operations Simulator suggests. Basic port layout, including jetty positions, channel widths and depths, tug operations and failure analysis (for ensuring adequate safety procedures), can all be coded in to emulate the operation of a proposed port. A proposed design for a new port can thus be evaluated at what is obviously a fraction of the cost of alternative methods (of which there aren't many). As well as that, the Mardyn system can provide information on a ship's ability to sail by simulating the lift and drag effects of wind. This is useful if a ship breaks down, or a pilot is being tested for reactions to this problem.

Visuals

SIX OF THE BBCs (which are hidden within the system) control the training console. This includes a virtual graphics display, using three large, colour CRT screens. The training console also drives the radar and instrument panel display screen.

Each of the three virtual screens is independently controlled by one of the BBC microcomputers. They display representations of the port based on line graphics, which are updated in 20 second intervals.

This display is available over a full 360 degree perspective. As is the case with PC based flight simulators, the view can be adjusted to forward, aft, port or starboard. And as you might expect, when the simulator is being used to pilot a ship, the bow

and stern of the ship can be seen on the display.

The displays are generated from data stored in the exercise area database, which contains relevant information about the port and other points of interest. From this data, displays of the entire area, the position of the ship, buoys, lights, tugs and other ships can be generated in both simulated day and night time. This environment can also be tailored to suit. Optimum positions of buoys, lights and other important visual clues can quite easily be adjusted by the instructor using the set up menu.

Standard instruments for controlling a ship are provided including a steering wheel, two engine telegraphs, bow thruster controls, radar control with range and electronic bearing marker and the visual angle control mentioned earlier. The menu control system allows the instructor to select a pre-programmed exercise and specify variables such as environmental effects, faults in the ship machinery (such as loss of power or rudder) and the position of tugs, buoys, markers and other ships.

Once set up and running, the simulation can be recorded on the offline recorder designed into the machine. The recorder takes note of the path of the ship and the order given. This information is presented using an A3 plotter to show the path of the ship and a line printer for the details such as rudder angle, engine revolutions, speed, direction, depth of water and so on.

This allows for de-briefing the student at a later stage, and provides a means of analysing reactions and decisions and examining problems. Not only does this allow for students to learn from their mistakes, it also provides an opportunity for the instructor to monitor the hazardous effects of adverse weather, breakdowns and pilot's reactions to them.

Expansion

THE MARDYN Simulator can be expanded to include improved nocturnal visuals, using a 68000-based board. The already large virtual screens can be replaced with overhead mounted projectors, and the controls can be replaced with a full simulated bridge complete with fittings, ambient noise and communication facilities.

For more information contact Maritrade, 541 George St, Sydney 2000 NSW; (02) 264 1606. □



Threads of parallel processing

A look at computers of the future!

WHAVE YOU heard of the Cray supercomputer, with its hundreds of millions of floating point operations each second. At more than five million dollars for starters, and near a million dollars a year just to turn on, it is one of the big boys on the block today. It is exotic, it is expensive and it is fast, but it just isn't fast enough!

Supercomputers are used for supergraphics, to tell you how hot it will be tomorrow, to solve large science and engineering problems, and, there is one locked away in the Australian Department of Defence, used for who knows what. But these are today's machines and not tomorrow's. The Sequent, Alliant, Butterfly, BBN Ultracomputer, HyperCube, Computing surface, Active memory, Connection machine and Transputer are the beginnings of tomorrow's machines. They are all different, but they are all parallel.

So what is parallel computing and what is it going to mean? Right at the moment the field is wide open. We know for sure that the computers of the future will be parallel machines, but exactly what they will look like no-one knows - yet. There is

Rhys Francis, leader of the Threads research group at La Trobe University, describes the future of parallel processing.

a lot of research and money riding on it. We know the kinds of machines which will be in the market place in the next 10 years, we know the problems and we know some of the answers. Twenty or

thirty years' down the road, the machines could be radically different to what we have today.

For the most obvious reasons, parallel computers are already available, and more coming every day. But one of the most intriguing questions remains unanswered. How can a bunch of VLSI CPUs, M68020, NS32032, IN80386, or better yet, some of the new breed of RISC microchips which promise to be 20 times faster, be plugged together to give something ten times more powerful than a Cray for a tenth of the price? How many CPUs would it take and how would one write the software which could produce answers faster with every CPU that is added?

As we shall see, one of the largest problems facing parallel computing is the massive cost of re-writing existing code. Having a machine with 20 CPUs doesn't make existing programs run 20 times faster, and a machine with a 1000 CPUs may need completely new programming to get anything like 1000 times the speed. If this turns out to be true, selling parallel computers will be much harder unless ways can be found to automatically convert existing code

AMSEC

THIS REVIEW was prepared for AMSEC by Dr Rhys Francis, Senior Lecturer, Computer Science at La Trobe University and leader of the Thread research group on parallel processing. AMSEC is an Australian software evaluation group, with consultants in the workplace, in schools and in tertiary institutions around Australia. It can be contacted at PO Box 140 Hurstbridge 3099 Vic. or PO Box 1339, Armidale 2350 NSW.

PARALLEL COMPUTING

Parallel computing

PARALLEL computers have been around for a long time, ever since separate disk processors and DMA were invented. The Amiga this was typed on is a form of parallel machine. Disk and graphics activity can proceed at the same time as processing. That is what parallel computing is about, doing more than one thing at a time.

Your brain, of course, is a parallel processor. Close your eyes, throw something into the room in front of you, then open your eyes and find it. Unless it has rolled behind something, you see it immediately. Even if we knew how to program it, which we don't, code to do the recognition task you just did would be useless on today's machines, even a supercomputer like a Cray is hopelessly slow.

It is a fact of life that more powerful software needs more powerful hardware. The theory of relativity and the size of the physical connections needed in a computer, however, put an upper limit on its processing power. To go faster, either the switch speed has to get closer to the speed of light, the circuit has to get smaller, more data has to be manipulated each cycle, or the single system wide clock has to be removed.

Improvements in current computers are based on the first two choices. Parallel computing is all about the last two choices. The fundamental idea is to have many small fast processors working on parts of a problem in such a way that the combined result is the answer to the total problem. We know it can be done; your brain achieves its performance by parallel operation and certainly not by super fast circuit speed. All the arguments are over how to do it.

Bus-structured parallel machines

THE SIMPLEST way to design a parallel computer is to connect all the processors and all of the memory boards onto a system bus. The advantage is the similarity to existing machines and the possibility of using software with only small changes. The problem, of course, is that the single bus becomes a bottleneck and sets an upper limit to the number of processors which can be connected. When the bus is congested, a bus transfer occurring for every bus cycle, the addition of more processors can not easily increase the total throughput.

This simple statement is not the complete picture. It is well established that memory hierarchies lead to increased processing speed. That is why processors have several data registers, why disk caching works, and it is the basis on which effective virtual memory systems are founded. The performance improvement is due to the fact that over any short period almost all programs repeatedly access data drawn from a small fraction of the total memory occupied by the program.

The basic notion of a cache is that memory local to each processor, and connected between the processor and the bus, can store copies of values fetched from memory. The cache can then trap a repeated access to the same address and immediately supply the value, without having to use the bus to access memory. This reduces the processor's demand for bus cycles and, hence, can allow more processors to be attached.

A further improvement on this style of machine is to time multiplex the bus. In this design, a processor does not hold the bus for the entire time it takes to fetch a value from a memory board. Instead, the

bus is time multiplexed into very fast slots and access to memory takes two slots, one to send the address from the processor to the memory and one, perhaps eight or sixteen slots later, to send the value back from the memory to the processor. Note how the bus is sending messages between various units attached to it.

The result is that it is feasible to build today a 10 to 30 CPU workstation, with turbo speed CPUs and floating point chip sets, and a low number of bus wait states. This is much faster than anything you can buy for what it would cost to build. So why aren't such machines dominating the marketplace?

For a start the technical difficulties are formidable, even though solutions are known. Secondly it has not been clear that large numbers of suitable applications exist, after all it is going to cost more than a single CPU system. It is a far easier and cheaper manufacturing and sales path to concentrate on increasing the speed of single processors, for as long as this is possible. Finally, it is one thing to build such a machine, it is another to make all your programs run 30 times faster.

Shared memory machines

THE BUS-structured machine is a non-scalable design because once the bus is saturated, additional processors cannot be usefully added. Basically the same problem as in simpler machines, the physical size of the single connecting bus places an upper limit on the number of data transfers.

Scalability is about designing an architecture which will work for 10, 100, 1000, 10,000 and more processors; 10 is easy (well, relatively easy), 100 is feasible and such systems exist today, and a 1000 or

ALL ABOUT PARALLEL COMPUTING...



PARALLEL COMPUTING

more is very difficult using general purpose CPUs. To date, the only machines in the 10,000 CPU class are the DAP and the Massively Parallel Processor, both synchronous machines where a large number of processors all execute the same instructions but act on different data

Attempts to arrive at scalable architectures for shared memory machines, where every processor can directly address every memory location, all lead to the use of inter-connection networks. For example, the Butterfly is a shared memory machine containing 128 M68020s, and IBM's RP3 is designed to have 512 processors (proprietary IBM of course)

In these machines, the processors and memories are connected to ports on a packet switched exchange, and memory accesses are converted to messages, containing the address, which pass through the exchange to the correct memory module. The data to be returned is wrapped into a packet and then transmitted back to the appropriate processor. Note the similarity to the time multiplexed bus design. Instead of a single data path, however, an exchange can support many simultaneous messages and, as a result, many more processors.

One way to build such a machine would be to use a cross bar switch as the exchange. A cross bar uses a very large number of switches to provide a separate path between all combinations of ports. Thus, every processor has a direct path to every memory module. A cross bar switch, sadly, is very costly. The current designs use what are called Omega networks, which need far fewer switches and have some useful properties which simplify the design.

Parallel programs

DESIGNS for bus-structured or shared memory machines already exist in the mini and supermini computer markets; Sequent and Alliant are two examples. These machines have two modes of operation. In the time sharing mode, the multiple processors can be used to run several tasks simultaneously, whereas a standard machine runs one task at a time. Thus, a single CPU configuration can be purchased and as the work load grows, more CPUs can be easily added.

Each task runs on one of the processors, no faster than it would on a single CPU machine, but clearly with more processors, more work can be completed in a given time. If, however, you only have one thing to do, then the additional CPUs achieve nothing because you are not doing the right kind of parallel computing. We say there is no speedup. The main goal of parallel computing is to get the answer faster with more CPUs, that is, to show speedup.

The second mode of operation is the parallel computing mode. Here several CPUs are assigned to work on a single task. Much research has gone into efforts to run standard Fortran in this mode. It is called dusty deck processing. The idea is to take any old Fortran program and compile it with a special compiler to produce an equivalent parallel code.

Fortran is the language because the big users of super computers write Fortran, and it has the decided advantage that iteration and arrays are basically the only way to do real work. So if loops which manipulate arrays can be processed into parallel forms, the dusty deck approach will yield speedup. Of course if a program

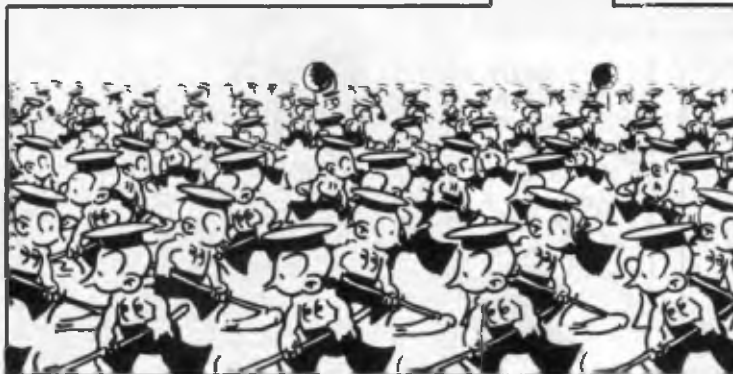
is recursive, manipulates dynamic structures or is not Fortran, it will have to be rewritten. We shall come back to this problem later.

The single largest problem in programming the machines is called contention. If every processor were to access a value stored in the same memory module, the whole machine's speed is determined by the cycle time of that memory module. Basically all the messages get delivered to the same port and can only be processed one at a time, no faster than the memory cycle time. This would be as slow as putting all the processors on a single simple bus. Thus, the whole design fails if this happens.

The solution to this problem lies in the programming and is called partitioning. If all CPUs are to be kept busy, they must generate references to values stored in different memory modules. To maximize the value of caches, it is essential that the CPUs operate over different segments of the total data of the program. Thus, maximum speed occurs when the data space of the program can be partitioned, when the partitions can be operated on independently, and when the partitions can be stored in different memory modules.

Hardly any of the program's developed in the forty years of computing history just happen to have these characteristics. Programming languages and algorithms haven't addressed this problem because it is irrelevant to coding for existing computers. This software issue is the basic stumbling block to the wide spread application of buildable parallel machines. So even in designs based on current machine structures, a major software development effort is needed before parallelism can be widely used.

SO THE MONITOR PUT A HUNDRED C.P.U.'S TO WORKING PARALLEL & IT LOOKED AS IF THERE WOULD BE GREAT SPEEDUP IN PROCESSING

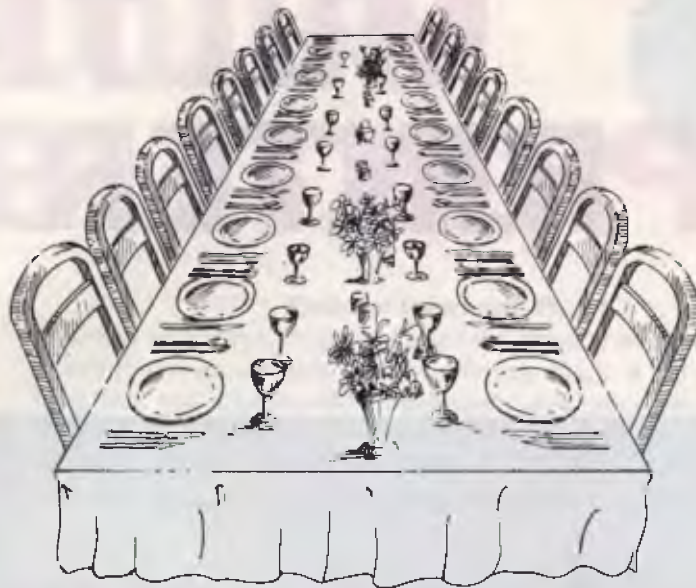


BUT THERE WAS CONTENTION OVER ACCESS TO THE ONE MEMORY MODULE



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6. The competition commences on October 31, 1988 and closes with last mail on January 30, 1989. The draw will take place in Sydney on January 31, 1989 and the winner will be notified by telephone and letter. The winner will also be announced in The Australian on February 2, 1989 and a later issue of this magazine.
7. The prize is: A President PC 88C University valued at \$3100, Star printer NX1000CL valued at \$619, Bit Blitzer modem 121 value \$299, Freeway Communications software valued at \$168.
8. The promoter is The Federal Publishing Company, 180 Bourke Road, Alexandria, NSW 2015. Permit No TC/88/2967 issued under the Lotteries and Art Unions Act 1901. Raffles and Bingo Permits Board Permit No 88/1756 issued on 28/9/88, ACT Permit No TP88/1022 issued under the Lotteries Ordinance, 1964.

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Star Micronics Printer NX-1000CL from Hypec Electronics

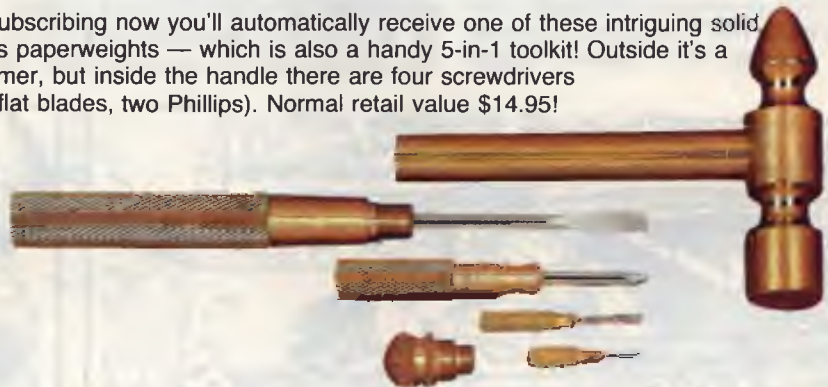
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Network machines

NETWORK machines consist of a large number of nodes, where each contains a CPU, some memory and some communication devices. The CPUs can only directly access local memory and the nodes are connected into patterns which determine the ability to access remote data. The pattern of connections, and the way code and data is fed into the network, defines the classes of these machines

It is interesting to note that most Omega switched shared memory designs actually attach each memory module to a particular CPU, so that if data happens to reside in the attached memory, the CPU has very fast access to it. If partitioning and local access to data need to be considered for shared memory machines, the appeal of the non-shared memory or network machines is greatly enhanced. The major question, of course, is the cost of access to non-local data

Clearly, network machines will have major impact in problems which can be easily split into distinct sections, and where the flow of data between these sections is very small. As the flow of data increases, the machines spend more and more time shipping data to and fro, and less time actually using it. The general result from studies of various hypercube designs is that the best results are gained with the smallest number of the largest possible data transfers.

Basically, network machines dramatically highlight the new cost and the new problem parallelism brings to programming. The cost of a program is not just measured by how much calculation needs to be done, but how often, how far, and how much data needs to be shipped from node to node. This is similar to the distribution problems which arise in shared

memory machines, but is far more dramatic in its effect. Again, no existing programs have had to consider this kind of cost and so using these machines implies a recoding and probable redesign of all existing software.

The Threads project

THE CONCURRENCY Research Group at La Trobe University is carrying out research in the area of parallel computing. In particular, the Threads project has been studying programming models for shared memory machines for several years. Our basic approach is to keep it simple, keep it safe and make it work well. We chose to work on shared memory machines because they are the wave in real world computing for the next 15 years or so. Network machines have longer term prospects, but there is just so much performance still to be gained from traditional approaches before complete software re-writes can be justified.

So what is a simple way to turn any old language into a parallel language? Well let's start by assuming you have a 'decent' language that has subroutines or procedures. Since parallel execution of larger sections of code appears likely to be cost-effective for shared memory machines, parallel procedures are an interesting idea.

We have built a compiler for a language based on Modula2 *cum* Oberon (Wirth's latest effort) which includes these simple mechanisms -

- a) An & used between two or more procedure calls makes them run in parallel; and
- b) Using a range of values (for example 1..10) as a parameter builds an array of procedures, all of which execute in parallel. As well, each procedure sees one of the values from the specified range as

though that value had been passed as the parameter.

All parallel programming systems must deal with synchronization. The basic problem is that some of the things going on at any one time can depend on other things being finished. Parallel procedure calls have some synchronization built in. All the procedures wait until they all have their parameters before any start running. This is important. With out it, some horrible errors can creep into programs; errors that are very difficult to find, because they come from mis-reading what the program means. Another synchronization occurs at the end of the procedure calls. The next line doesn't run until all of the parallel procedures have finished. This also removes some horribly subtle errors.

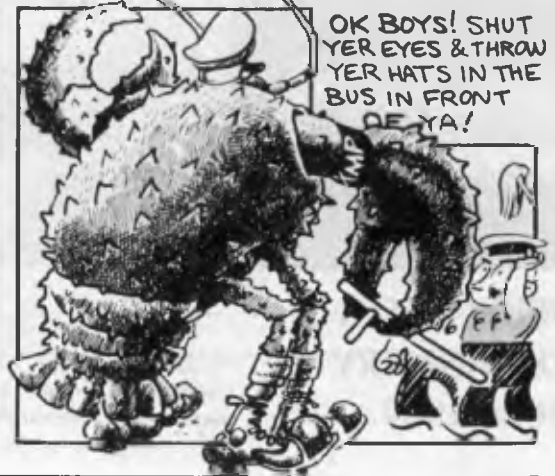
The Threads language provides a number of other features designed to help with this problem. The simplest is called a barrier. We write a barrier as the command -

sync;

which can appear anywhere in a procedure. If a collection of procedures are called to run in parallel, they will pause on reaching the 'sync' statement. They start running again when all of the still running procedures have reached one of their 'sync' statements; any that might already have finished don't count in this. Part of our research is finding simple structures like this one, which solve problems easily and cleanly, and which have direct and efficient implementations.

The basic notion of parallel threads of execution all operating within a single program is beginning to gain ground in shared memory parallel computing. Before research such as the Threads project, multi-tasking was the only concept applied to these machines. In what I have

THEN THE MONITOR CALLED IN A CRAY XMP WITH A REDUCTION & LOGICAL ENGINE, PARTITIONED, NETWORKED & MULTIPLEXED BUS



PARALLEL COMPUTING

just described, each procedure running at any time represents a 'thread' through the program. Parallel computing is about specifying and controlling many simultaneous threads in a program, rather than the one thread you have to think about now when you are programming. Given how easy it is to make mistakes with only one thread to worry about you, can see how difficult life becomes if you need to have thousands of threads.

Our work is aimed at finding efficient ways of running multi-threaded programs on real hardware and also in finding highly parallel programs which solve real problems. We have only just last year discovered how to in parallel, using a collection of threads running on a shared memory machine. If you would like a puzzle, you can try to solve this problem yourself. Imagine you and four friends have to merge 2 rows of 100 cards where each card has a name written on it and the two rows are laid out in alphabetical order. Find a way to do it where you don't talk to your friends and each of you only looks at about 1/5 of all of the cards. Actually, you each have to look at 54 of the names which is just over 1/5th of them. For two lists of 20 cards, you each have to look at 13. Amazingly, the whole process can be carried out in complete silence (without any communication of any form).

This particular example is important because it illustrates the gap between the machines that can be built and our knowledge of how to use them. The Threads project is tackling this second issue for a class of machines which we expect to dominate the computing arena in the next 10 to 15 years. Basically, a whole new world of parallel programming is opening up and we are only just beginning to solve the problems it brings.

The Parallel future

THE IMMEDIATE developments in parallel computing will appear as bus-structured designs where five or more processors can be incorporated into existing machines. These will provide instant throughput performance for multi-tasking and have the potential to provide speedup for single tasks as well.

The most pressing development effort required in these designs is in the software. From the user's point of view, this will be seen as automatic compilation of existing programs into parallel forms, or as support for parallel programming by extensions to existing languages. At the system level, the major problem is to assign tasks and parts of tasks to the many CPUs in such a way that they continue to have useful work to do.

The super computing market will probably split into two machine types. In one corner, the massively parallel arrays of simple CPUs will have a major impact. It is just the case that the design of these machines matches some number crunching tasks exactly, resulting in fantastic speeds. Where problems don't nicely map onto regular arrays with equal work to be done on all elements, they are not so good. So in the other corner we will see large Omega networks connecting super computer nodes. This design is much more flexible in the programs it can run well.

What is more, the Alliant can run existing programs using dusty deck compilers, whereas coding a network of 32 transputers to run all existing software is no mean feat! More importantly, the Alliant hardly pushes the shared memory technology to its limit. So the transputer software has to be coded to work faster with more transputers.

Two factors are likely come to the aid of network designs. Firstly, as more CPUs are added to any kind of machine, it becomes more important to control the location of data. Solutions to this problem, which will have to be developed in any event, will also apply to network machines. The second factor is the cost difference between simple networks of single chip CPUs and the expensive caches, buses and switches of the shared memory designs. Once suitable software exists, network designs should dominate. Until then, commercial economics supports the shared memory approach.

Finally, there exist machine classes we have not touched on here, including data flow, reduction and logical inference engines. None of these machines are practical replacements for existing designs, but all offer interesting possibilities if the software difficulties of shared memory and network based systems cannot be solved.

The present challenge is to extend existing hardware solutions for parallel computers beyond the thousand processor mark, and to create program design and coding strategies which let us make full use of at least that many processors. Possible hardware solutions exist and are under evaluation and construction.

As always, software lags behind, perhaps because no one wants to make a major software effort for a design which, when finally built and tested, just doesn't perform up to scratch. It seems, however, that other factors are at work. The tools for good parallel programming are basically unknown. It is a large unexplored domain which still hides many exciting discoveries. We know parallelism works, we don't know how. Uncovering the secrets is the challenge, and the future. □



SOFTSCRYBE

... and a PostScript to printing!

Who says you need a PostScript printer to print PostScript files?

ent from that found in PageMaker, which is different from that found in Adobe Illustrator and so on.

However, since PostScript is such a complex and complete language, applications have historically supported only a subset of the full PostScript commands.

It is the job of the interpreter to 'decipher' the PostScript commands coded by a programmer or printer driver and convert them into a command that the laser printer will understand. It tells the printer where to turn a pixel on and where to turn it off.

Page description languages permit the printing of much more complex pages than simple escape code command languages, like those of Epson or Diablo. As a result, a printer can merge text with graphics, produce varying font sizes and styles, and even print complex computer illustrations.

PostScript was one of the first page description languages that permitted the use of high level languages, instead of complex coding languages for programming. It was, therefore, easier and quicker to use than a comparable language like Interpress. However, the tradeoff to the ease of programming is that a PostScript program requires more time to print, since the high level commands must be converted to machine readable codes.

Yet, a page description language is only concerned with the creation of the page, not with the output device which later may print that page. It is the page description language interpreter (PDLI), normally a part of the output device, which must decipher the PDLI commands and define them in terms of the specific printing device. What this means to the user is that a PostScript file from any source can be output by any PostScript compatible output

device, from a 300 dots per inch (dpi) laser printer to a 2450 dpi digital typesetter.

Another reason it takes so long to print a PostScript file is that, font creation requires a good deal of processing. Each character must be mathematically scaled, rotated, optimised and then filled. When Apple introduced the LaserWriter for the Macintosh, it touted the fact that the printer, with its 68000 processor, was the most powerful computer it had yet produced. All that power was necessary to make PostScript printing a practical solution. But the power of the LaserWriter also incurred a penalty, in dollar terms. PostScript compatibility still adds about \$5000 to the base price of a laser printer.

What a waste!

BUT, WHY should all that computing power be relegated to the laser printer where it is only accessed during printing? Instead of having two powerful 'computers' running side by side, how about tapping the power in the computer to run the laser printer? That's what SoftScribe is all about.

SoftScribe is an interpreter, just like PostScript's own - its job is to decipher the commands created by a program's PostScript printer driver (or by a programmer), so that they can be understood by a laser printer. The difference is that the interpretation begins in the computer's expanded memory (at least 512 kilobytes of EMS is required; up to 2 megabytes are needed for large or very complex pages). And it needs an AVR MegaBuffer card to rasterize the bitmap image. (MegaBuffer is a memory buffer card that handles several different jobs: scanner memory buffer during scanning; image buffer during editing in MegaScan, a 'paint' type program; laser printer buffer during printing from MegaScan and laser printer buffer during printing from SoftScribe.) The image is then output to a laser printer through the AVR Laser Printer Interface.

This means that the least expensive 300 dpi laser printer can give PostScript-quality

Shade, Shadow, Tilt.

POSTSCRIPT INTERPRETER

ity output, although AVR's MegaScan, MegaBuffer and Laser Printer Interface are required. SoftScribe comes with the 35 resident fonts found in the Apple LaserWriter Plus. These fonts, designed by Bitstream Corporation, are scalable from 1 point to virtually any size.

A bitmap font is a grouping of pixels arranged in a pre-set pattern to represent a specific character size and type. These fonts can easily match the quality of PostScript-type outline fonts. However, bitmap fonts are very memory intensive and do not offer much flexibility in changing font size or style and must be used on the specific output device for which they were designed.

Product Details

Product: SoftScribe PDLI
From: Advanced Vision Research
Distributor: President Computers, 100 George St, Hornsby 2077 NSW (02) 476 2700
Price: \$1140 taxed

This means that the least expensive 300 dpi laser printer can give PostScript-quality output.

But, bitmap fonts print very quickly and when designed for, and used on, a specific output device can yield excellent results. Also, bitmap fonts can be edited by paint programs such as MegaScan to provide a wide variety of special effects such as outlines, pattern fills, shadows and so on.

An outline font consists of a 'master' outline that is mathematically enlarged, reduced or rotated as required. Since the one outline is used to produce the size required, outline fonts are memory efficient, and very flexible in supporting output device of different resolutions.

Since both types of font are ultimately sent to the laser printer as a bitmap, the question of 'which is best' is not really a qualitative issue. 'Which is best' will depend upon other factors such as speed of printing, the variety of fonts used and the special font effects that may be required. □



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Teaching your PC some four-letter words...

I HESITATED to submit this program to *Your Computer*. After all, it asks the computer to think of a four-letter word. Then it asks the user to type in a such a word.

My delicate sensibilities reeled from the misuse and abuse to which this innocent program might be subjected. While harmless, peaceful words such as DEAD, RAID, RANT and RAVE were in the DATA statements I submitted, I feared that when this program was up and running across the country a few wily programmers might substitute less virginal words, such as are rarely heard in polite society. Notwithstanding this danger, the program Lexicon, in its original pure form, is submitted for consumption by your computer.

Lexicon came into being when I decided I would like to write a program like 'Mastermind' which used letters, instead of numbers. Originally I was simply going to allow the computer to choose four letters at random. When I tried it, I realised my idea was stupid. It was much, much more difficult to try and select the correct four letters from twenty-six possibilities, than it is to get the correct numbers when choosing from the digits 1 to 9. I also realised that unless the letters were used in some way, there was little point in using

...with this wordy version of Mastermind, from Tim Hartnell.

letters at all. So, the idea for words was born.

Lexicon

I HAVE only used 80 possible words in this program. You can easily add as many words as you like to the DATA statements, making sure that you change the 80 in line 630 to the total number of words you've placed in the DATA statements, and that there are no letters which appear twice in the words (so ROAR, TENT and LILT could not be used).

As an alternative to words, you can substitute other symbols (such as *, %, \$ and ?) in place of the letters, to produce a game which is somewhat closer to the original Mastermind, or you could use colours if your computer can store a colour command in a string, and can decode a string in order to deduce the colours.

Writing the program was relatively simple, and I used an approach which you

may well consider adopting when creating a program from scratch. If you look at the listing, you'll see that - every so often - there is a line of asterisks. These lines break the program up into distinct 'modules', and each module carries out a specific task. The task of writing the program was made much simpler than might otherwise be the case, simply by working out what modules would be needed, and noting them down on paper.

Have a look at the listing. You'll see the first few lines (down to 70) set up the initial conditions. Leave out line 60 if you are not running this program on an IBM compatible computer. The next module (lines 90 through to 140) first select a word (by going to a separate module, the subroutine from 620 through to 680) and then tells you the aim of the game ('I AM THINKING OF A FOUR LETTER WORD WHICH YOU MUST TRY AND GUESS').

The next module is really made up of four modules. It is, as the REM statement in line 160 points out, 'the game itself'. The game is held within the loop FOR TRY=1 TO 10 (line 170) down to NEXT TRY (line 540). If your computer won't accept TRY in these lines, use T instead (and also change the word TRY in lines 730, 740 and 750 into T).

FOUR-LETTER WORDS

The first 'sub-module' within this loop asks for the user's guess, checks to see it has four letters (line 210), that the entered word is in upper case (line 220), and then checks to see if the entered word is correct (line 250). If the entered guess is the right word, action switches to yet another module, the subroutine from line 700.

After each guess is entered in this game, you get feedback in terms of 'blacks' and 'whites', where a black is your reward for getting a correct letter in the correct position, and a white is awarded if you have a letter right, but not

in the right position within the word. The number of blacks is determined by the module from 290 through to 340, and a clear variable name (BLACK), which makes the listing easier to follow, is used to count them. Similarly, in the module from line 360 through to 440, the whites are counted

Finally in this major module, the fourth section from 460 through to 540 prints out the result of your guess, and – if you have not had 10 guesses – sends action back to line 180 for the next guess. If you have not guessed the word, the program 'falls

through' to the next module (lines 560 through to 600) to tell you this. Then action moves to line 770 for the next game.

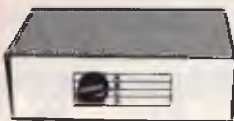
Once you've tried this idea of 'programming in modules', you're sure to find it makes the task of tackling complex programs much simpler than would be the case if you just attack the programming task like a Federal treasurer attacking an opposition leader. However, I guess in such a political attack you'd find a number of four-letter words which could be ideal for producing an 'impure' version of my Lexicon! □

```

10 REM LEXICON
20 REM (C) TIM HARTNELL 1988
30 REM INTERFACE PUBLICATIONS
40 REM *****
50 CLS:REM HOME on Apple II
60 RANDOMIZE VAL(RIGHT$(TIME$,2)):REM
   THIS LINE FOR IBM PC ONLY
70 RESTORE
80 REM *****
90 GOSUB 620:REM FIND A WORD
100 PRINT
110 PRINT "I AM THINKING OF A FOUR LETTER WORD"
120 PRINT "WHICH YOU MUST TRY AND GUESS"
130 FOR J=1 TO 1500:NEXT J
140 CLS:REM HOME on Apple II
150 REM *****
160 REM THE GAME ITSELF
170 FOR TRY=1 TO 10
180 PRINT
190 PRINT "ENTER GUESS NUMBER";TRY
200 INPUT B$
210 IF LEN(B$)>4 THEN 180
220 IF ASC(B$){ASC("Z")} THEN 250
230 INPUT "ENGAGE CAPS LOCK THEN PRESS <ENTER>";B$
240 GOTO 180
250 IF B$=C$ THEN GOSUB 700:RUN
260 BLACK=0
270 WHITE=0
280 REM *****
290 REM GET BLACKS
300 FOR C=1 TO 4
310 E(C)=ASC(MID$(B$,C,1))
320 F(C)=ASC(MID$(A$,C,1))
330 IF E(C)=F(C) THEN BLACK=BLACK+1:E(C)=0
340 NEXT C
350 REM *****
360 REM GET WHITES
370 FOR C=1 TO 4
380 IF E(C)=0 THEN 430
390 FOR D=1 TO 4
400 IF E(C){F(D)} THEN 420
410 WHITE=WHITE+1
420 NEXT D
430 NEXT C
440 A$=C$
450 REM *****
460 REM PRINT RESULT
470 PRINT B$;
480 PRINT " - ";BLACK;"BLACK";
490 IF BLACK<1 THEN PRINT "S";
500 IF BLACK=1 THEN PRINT " ";
510 PRINT " AND";WHITE;"WHITE";
520 IF WHITE<1 THEN PRINT "S"
530 IF WHITE=1 THEN PRINT
540 NEXT TRY
550 REM *****
560 REM IF DIDN'T GUESS
570 PRINT
580 PRINT "SORRY, TIME IS UP"
590 PRINT "THE WORD WAS ";A$
600 GOTO 770
610 REM *****
620 REM FIND A WORD
630 FOR T=1 TO INT(RND(1)*80+1)
640 READ A$:PRINT TAB(T);A$;
650 IF RND(1)>.5 THEN CLS
660 NEXT T
670 C$=A$:CLS
680 RETURN
690 REM *****
700 REM WIN
710 PRINT:PRINT
720 PRINT "YOU GOT IT RIGHT IN"
730 PRINT "JUST";TRY;"GUESS";
740 IF TRY>1 THEN PRINT "ES"
750 IF TRY<2 THEN PRINT
760 PRINT "THE WORD WAS ";A$
770 PRINT:INPUT "PRESS ANY KEY TO CONTINUE";B$
780 RETURN
790 REM *****
800 DATA FACE,FATE,FEAT,FEAR
810 DATA DASH,NEAT,PUSH,PAST
820 DATA DATE,DIET,DEAD,GRAB
830 DATA RANT,RAVE,MIST,DUEL
840 DATA TINY,TRIP,PERT,REST
850 DATA ROAD,RAID,SOUL,SOLE
860 DATA STAY,THIN,OVER,DOWN
870 DATA PEST,LONG,LAST,LIST
880 DATA MANY,MOST,ONLY,QUIT
890 DATA QUIZ,PACE,BATS,CATS
900 DATA THIS,TEND,BEND,TIED
910 DATA BENT,LENT,SENT,DENT
920 DATA OWED,SEAT,BEAT,MEAT
930 DATA PAIN,RAIN,MAIN,RATE
940 DATA YOUR,MORE,MIST,POST
950 DATA RISK,RICE,LICE,MICE
960 DATA DAMN,MASK,MUSK,TUSK
970 DATA OVAL,VASE,LACE,LOSE
980 DATA PENT,RENT,RUNT,MACE

```

*Listing 1. The listing for Lexicon uses 80 possible words, though you can add as many words as you like to the DATA statements. As an alternative to words, you can substitute other symbols (such as *, %, \$ and ?) in place of the letters, to produce a game which is somewhat closer to the original Mastermind, or you could use colours if your computer can store a colour command in a string, and can decode a string in order to deduce the colours.*



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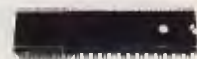
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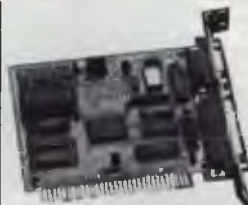


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- Cat. X19950 **\$59.00**



GOLDSTAR 20MHz COMPOSITE MONITOR

X14516 AMBER **only \$89**



GOLDSTAR 12" TTL MONITOR

X14502 AMBER **only \$99**



RITRON CGA COLOUR MONITOR

Quality monitors without the exorbitant price tag!

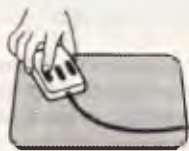
Display Tube: 14 inch 90° deflection 0.39mm Dots trio pitch. Dark face screen
Phosphor: P22
Resolution: 640 dots (horizontal) 240 line (vertical)
X **only \$445**



RITRON EGA COLOUR MONITOR

Quality monitors without the exorbitant price tag!

Display Tube: 14 inch 90° deflection dot type black matrix. Standard persistence phosphor
Active Display Area: 240 x 180mm
Resolution:
64 Colour: 720 dots(H) x 350 lines
16 Colour: 640 dots(H) x 200 lines
X **only \$645**



APPLE* COMPATIBLE SLIMLINE DISK DRIVE

Compatible with Apple 2+
Cat. X19901 **Only \$179**
FREE PACK OF S/S DISKS WITH EACH DRIVE!



RITRON 2 MONITORS

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

SPECIFICATIONS:
CRT Display Size: 12 inches non-glare 90 degree deflection
Input Signal: 1.0 - 2.5V p-p composite video signal.
Input Impedance: Normal 75 ohm, high approximately 50K ohm
Input Terminals: RCA phone jack.
Rise and Fall Time: Less than 25 us
Video Bandwidth: 20MHz
Corner: 800 lines
Geometric distortion: 2% or less
Linearity: less than 2%

Controls:
Front: Power On/Off, brightness, contrast. Rear: Vertical hold, Horizontal hold, Vertical line, Vertical size.
Green Cat. X14506 \$179
Amber Cat. X14508 \$179

ONLY \$119



RITRON VGA COLOUR MONITOR

Quality monitors without the exorbitant price tag!

Display Tube: 14 inch 90° deflection P22 Non-glare, tint. 0.31mm Dot pitch,
Active Display Area: 245 x 185mm
Resolution:
800 dots(H) x 600 lines(V)
Display Colour: TTL input
TTL input: 8/16/64 colours
Analog input: unlimited colours
X **only \$945**



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5 1/4" 2S/HD	\$41.00	\$39.00

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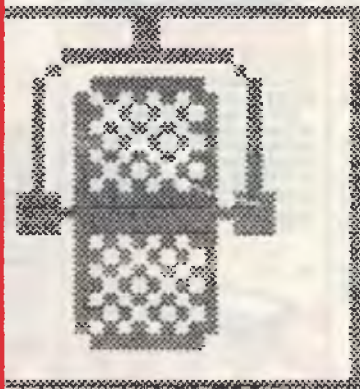
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ROD IRVING ELECTRONICS



MacRecorder

-for a sound Macintosh

SOMEHOW, I feel that a sound digitiser for a PC will always be a novelty, rather than a practical product – until we begin to measure computer RAM in gigabytes, anyway. So this bias colours my feelings about the MacRecorder by Farallon.

NetComm, the Australian agents sent the unit to me, unannounced, together with an invoice 'payable within 7 days', which nearly earned me a divorce when my wife opened the parcel.

Still, the question this wily unveiling invoked – an aggressive, 'What the hell do you want a sound digitiser for?' is both perceptive and pertinent here. What would I want a sound digitiser for?

For starters: I could add sound buttons to some HyperCard stacks, so when someone clicks on a button the machine blows a raspberry. Or I could convert my Mac II into the most expensive telephone answering machine in history.

The only problem with the second suggestion is that 1 minute of sound, digitised at a low grade telephone quality, requires 1 megabyte. So my whole Mac II with a 20 Mbyte hard disk would only be able to hold the program and an average day's incoming calls. My \$100 Dick Smith tape recording system can hold a week's worth

Here is the problem with digitised sound – digitised sound is costly in memory terms. MacRecorder has four different sampling rates, from 22 kilobytes per second down to 5.5. At the optimal

quality it consumes 22 kilobytes of memory for every second – which works out to 45 seconds per megabyte. Stereo recording doubles memory requirements, naturally.



Copy Sound to Stack



SoundEdit™

Sample Rate

- 22 KHz
- 11 KHz
- 7 KHz
- 5 KHz

Connection

- [Speaker icon]
- [Headset icon]



Create Home Button



The HyperSound control panel for the MacRecorder. HyperSound is specifically designed to add sound to HyperCard.

SOUND DIGITISER

MacRecorder

THE MACRECORDER unit is slightly larger than a cigarette box, with a built-in microphone and volume control, and a single cable that connects it to the modem or printer port. If you want stereo (only for the Mac II) you will need two units.

There's also both a mike-in and a line-in socket on the unit, to allow the use of external microphones or perhaps a CD Audio player. The line-in socket will accept sound from most amplifiers, or other sources.

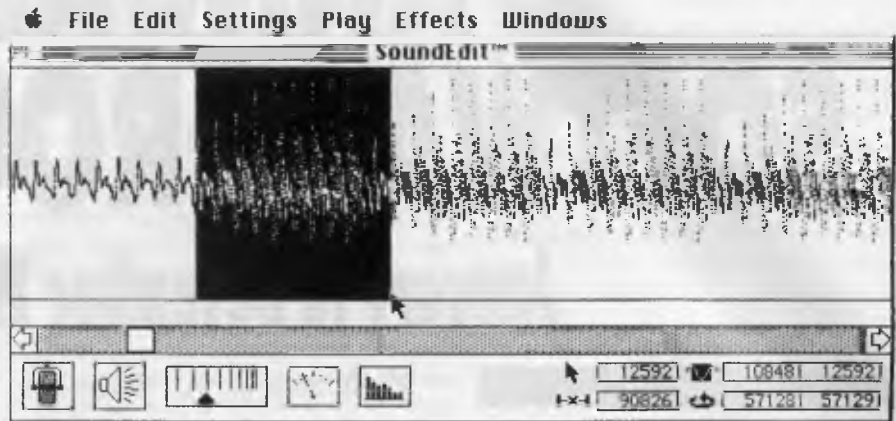
Two software programs come with the unit. SoundEdit, for general sound recording and manipulation of the sound 'images', and HyperSound, which is specifically designed to add sound to HyperCard. HyperSound needs a hard disk.

The user-interface for HyperSound is a graphic representation of a cheap cassette-recorder with forward, backward, play, stop and record buttons and a couple of dialog boxes to enable you to select the appropriate sampling rate and so on. If your IO peaks into double digits, you'll be able to use this system without straining the grey cells to their limit.

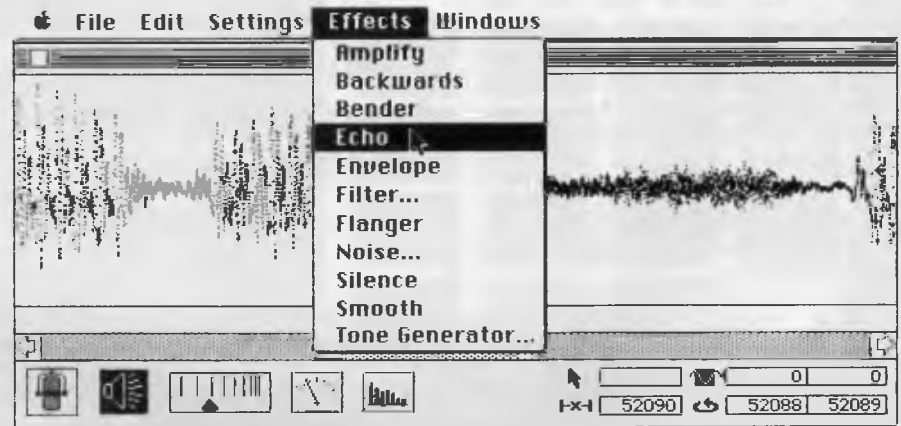
Once recorded, you can copy the sound to a stack and create a sound button on a particular card that will replay it. This sound can be anything you like – effects, speech, music, or whatever, and it can be recorded at whatever quality level you choose. But at a minimum, each sound is going to cost you a couple of kilobytes of memory.

If you are interested in speech only, MacRecorder provides a data compression system that samples at the top 22 Kbyte per second rate, but only stores one bit per sample byte – reducing the storage requirements to one-eighth. As you can imagine, this plays havoc with the sound quality, so you wouldn't use it for music.

SoundEdit is a more complex program



SoundEdit allows you to cut, copy and paste to create sound tracks for HyperCard or VideoWorks. It lets you record and edit, mix, and enhance sounds, play them backwards, or manipulate the sound envelope to create entirely new sounds. Note the waveform of the recording in the SoundEdit window.



Special effects can be added to the waveform of the recorded sound in SoundEdit.

Product Details

Product: MacRecorder

Distributor: NetComm Australia,
25 Paul St Nth, North Ryde 2113 NSW
(02) 888 5533

Price: \$349 taxed; includes SoundEdit and HyperSound; requires a 1 Mbyte Mac, preferably with 20 Mbyte hard disk.

than HyperSound. It lets you record and edit your sounds. You can mix sounds, enhance sounds, play them backwards, or manipulate the sound envelope to create entirely new sounds.

The recording can be displayed graphically as a waveform in the SoundEdit window – mono and stereo. Beneath this window is a control display panel, which includes an icon that gives a spectrum analysis (a real time graph of the frequencies present in the sound). You can also define and move a section of the waveform, and change it selectively. You have full control over amplitude, echo, pitch, filtration and so on; you can cut and paste just like any other Mac application.

SoundEdit also provides a four-channel mixer to allow you to run four soundtracks

together and control the levels of each. Since the maximum sampling rate of 22 Kbyte per second is about half that of a CD audio player, the quality of the sound is adequate for most uses.

Sound effects recorded, manipulated, and mixed in this way will be good enough for professional sound mixing studios – so I suppose there could be some use of the system in film and television production. There are some good sound-effects libraries on CD nowadays, so this could enhance their value.

If you are interested in experimentation with Mac sound, then MacRecorder will be right up your alley. It supports recording file formats of SoundEdit, Soundcap, Studio/lam Session, VideoWorks and HyperCard. □

ANNUAL SOFTWARE ROUNDUP

January to December 1988

Accounting

AppleWorks: Integrated software, with a spreadsheet, a word processor. It can be customised with other accessories, and it has a user-friendly interface. January, September.

Book Worker: From Sybiz Software, this package is designed for those who are converting from a manual bookkeeping system to a computerised one. It will handle up to 11,250 accounts, and is suitable for small businesses. Password security at two levels, and not too difficult for new users. January.

Chief: An excellent starting point for those wanting straightforward invoicing, statements and bank transactions. It also offers customer tracking. Suitable for small businesses that do not require payroll tracking, accounts payable or balance sheet generation. June.

Microsoft Works: An integrated package that includes a word processor, a spreadsheet, a database and a communications package. It is possible to copy data from one to the other. Works has file conversion facilities as well. For new computer owners. July.

TIMaster: All data in your current document can be easily manipulated by word pro-

Welcome to our annual summary of software we reviewed during the last 12 months. We hope these pages will help you find a package that does exactly what you want it to, whether you're a corporate, small business or home user.

cessing, spreadsheet and database commands without exiting to other modules or programs. Suitable for those who use numbers and statistics, and have to write reports and maintain a database as well. The latest versions include graphics and communications as well. July

Business Speciality Software

A comprehensive survey of hundreds of software packages that have been specially written to cater for the specific needs of businesses. Includes Attache, Paxus Professional Office, Payroll, Palette Applications, QCOM, SVS Superview Systems, Statgraphics, Apollo, Hospitality and Leisure System, Map Magic, Fore-Map Magic, Foresight, SAMM, MasterMiner and others. May, June.

CAD

CADKey: A high level Cad system aimed at the same market as Auto-Cad. Does not require a maths co-processor. Menu driven with on-screen prompts. CADKey has a highly-developed user friendly interface. 3-D drawing for business use. September.

DesignCad 2-D and 3-D: Design-Cad (a new release of the widely used ProDesign) comes with customizable menus, keyboard com-

The crow opened her beak to sing and show off. As she did, the cheese fell down.



Educational Software Survey: Hundreds of software packages for school and home use, and for all types of personal computers, for all age groups. Includes databases, business studies, desk top publishing, early childhood, geography, social studies and more. September.

SOFTWARE ROUNDUP

mands, advanced text handling, macros and more. An excellent entry level Cad package for those who cannot justify the cost of high-end Cad packages. DesignCad 3-D also offers many improved user features, as well as commands such as Perspective and Shade. November.

Communications

DireLink: File transfer program for two IBM compatible computers connected via their serial ports and a null modem cable. Transfers files at 115,200 baud. January.

Diga! Full featured communications package for Amiga computers, with terminal emulations and file buffers. January.

IT: Terminal emulation program for communicating with mainframes, specifically DEC VT-100 and VT-52 emulations. Shareware. July.

The NetComm Program V3: Viatel, bulletin boards and on-line services are all accessible from this Australian program (written by Cybersoft) that is controlled with menu commands. Suitable for new and experienced users. July. October.

SuperCom Version 3: Australian product featuring a snapshot program that runs on two connected machines at the same time. It can emulate a wide range of terminals, and has a full range of file transfer protocols. October.

Procomm+: A powerful and versatile communications program with many features. October.

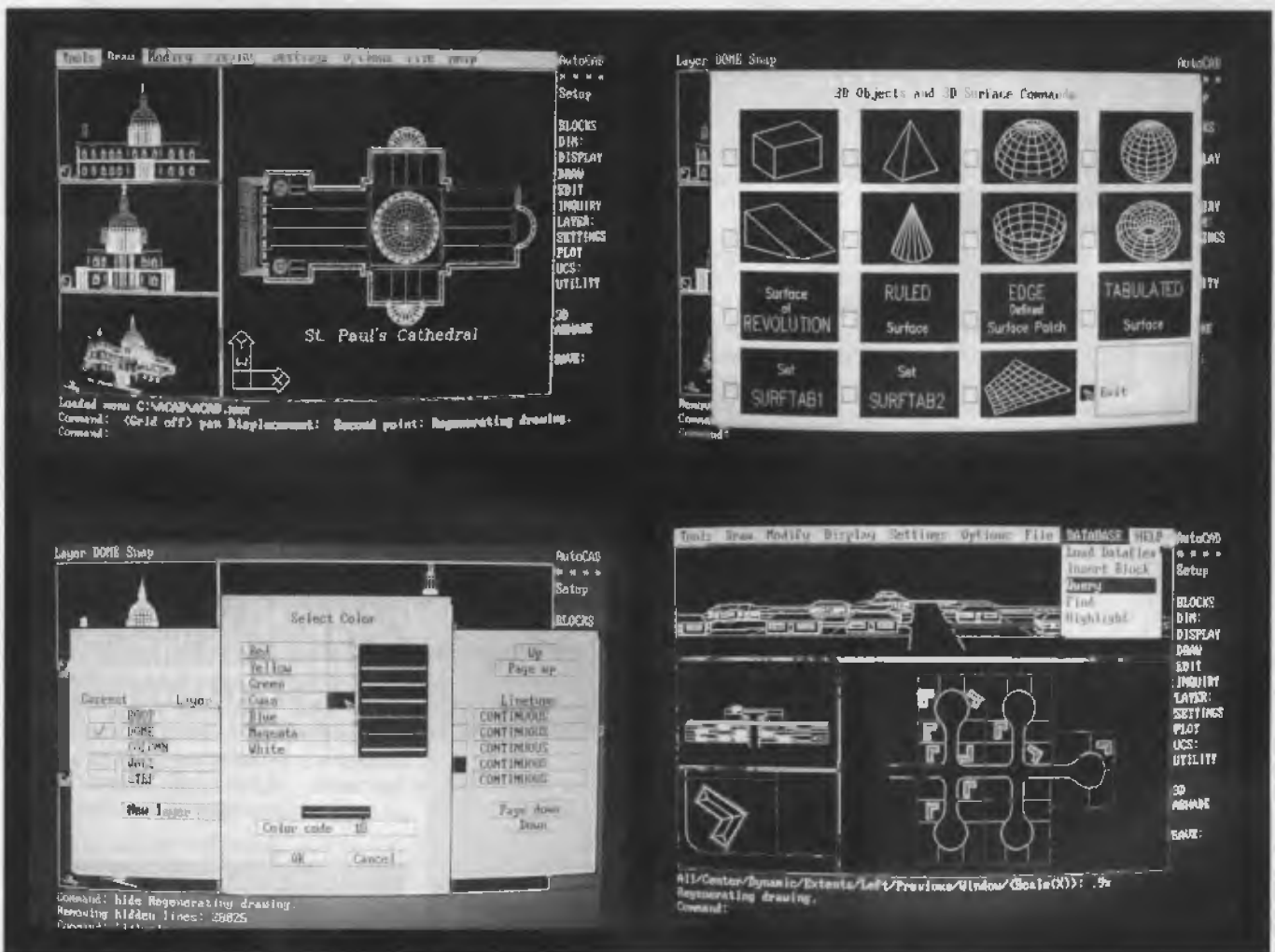
Telix 3: The latest version of this popular program which is Shareware. October.

QModem: Shareware from the US. Similar in the number of features to Telix. October.

Boyan D3: Simple to use with all the features of PC to PC and bulletin board access. For the novice to intermediate user. October.

Upstart: An integrated communications program, menu driven and TSR (terminate and stay ready). By Cybersoft, the writers of the NetComm Program. October.

Microtex: Videotex and terminal emula-



AutoCad Release 9: This popular Cad package includes an advanced menu system, zooming facilities in six different ways, dimensioning, and text entry. 3-D facility and AutoLISP are optional extensions to the base package. Intended for high-end users. November.

SOFTWARE ROUNDUP



Deluxe Photolab: From Electronic Arts for the Amiga, this program is a HAM paint program, and it allows the printing of poster-sized graphics. November.

tion software. Compatible with Viatel. October.

Databases

dBase Mac: The Macintosh version of dBase. Includes graphics capabilities for graphics databases, and a MacDraw type interface. For business users. January.

ZIM: Version 3 of this Canadian product has a lot of power, can be easily programmed by novices, and is portable from PCs to networks to mainframes. June.

Memory Mate: A text specialist database. Each record is simply free form text. Every word is indexed, so that searches are fast, and the save function has a date stamp. For home users to large businesses, an electronic equivalent to a personal secretary. July.

Q&A: A database with an integrated word processor. It has improved from earlier versions, and has form design, report design, and an 'intelligent assistant' to enable English language queries. For businesses trying to save money on program costs. July.

DAC Easy Base: A cheap, but dated, dBase clone. Suitable for home users who would like to learn how a relational database works. July.

Reflex: A Borland product, with graph and cross tabulation 'views' as well as the usual forms, list, and report views. A bargain product for users more interested in numerical analysis than records management. July.

Enable: Integrated software, including word processing, spreadsheet communications, and graphics. The relational database module is powerful and reads Lotus 1-2-3 format. For business use. August.

Open Access: A powerful relational database with SQL (structured query language) and menu interfaces. It has sophisticated view, search and report options. It also has a word processor, graphics and a powerful spreadsheet module. For business users whose primary need is for data processing. August.

Smart: A command driven program that has the optional menu interface as well. Integrated with spreadsheet, word processing and graphics programs. August.

Ability Plus: Relatively inexpensive database that is easy to set up. It uses the



Spectrum 512: A powerful graphics program for the Atari ST with 512 colours. August.

same on-screen form design for data entry and retrieval. Includes a word processor and mailmerge, spreadsheet, and graphics. For small business users. August.

RapidFile: A menu driven single file database. Fast and easy to use. August.

AskSam: The strength of this program is in handling text databases, though it can also handle numbers and dates. All words are indexed, and you can have as many different record and field types as you like. Programmable *a la* hypertext. August.

FoxBase+: A dBase III+ compiler that is faster than, and cheaper than dBase III+. It lacks some features, but has a few extras as well. For those data processing people who require more speed at less cost.

VP Info: dBase clone based on dBase II rather than on dBase II+. It has the capacity to handle 2 billion records in 10 databases. For the business user who wants to avoid the expense of dBase. September.

DBXL: A close clone of dBase. Cheaper, but it doesn't support networking. September.

Silverado: An add-in to Lotus 1-2-3, enabling database access from any spreadsheet position. Ideal for corporate use. September.

Paradox: With a 1-2-3 user interface, and the ability to store multiple tables at once, a rich programming language, and multiple table queries, Paradox is a serious rival to dBase. November.

Focus: A mainframe hierarchical database which has recently migrated to PCs. It has a fast windows display, or you can enter commands using the language. November.

DataEase: This one is not a giant, but it's ease of use is recommended for novice users. It can be customised. November.

dBase IV: Matt Whelan takes a close look; he reports on significant changes and new features in this latest version of the big dB. For small businesses to large corporations. December.

DataBoss: A Turbo Pascal code generator, which creates code from a screen painting of a database set-up. December.

Desktop Publishing

Newsmaster: An inexpensive DTP package for producing newsletters and advertising material for schools, small businesses and clubs. It is easy to learn, has a variety of fonts and an artwork library of 100 pictures. January.



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SOFTWARE ROUNDUP

Ventura Publisher: 1988 Software Product of the Year. Recommended for those needing professional quality desktop publishing. May.

GEM Desktop Publisher: An inexpensive DTP program for PCs with a Mac-like interface. August.

PFS: First Publisher: Inexpensive entry level program for home use. August.

Byline: A desktop publisher that will read dBase files. It also has a basic word processor. For first time DTP users. August.

Education

Stickybear Mathematics: Designed for use by children at home, this package consists of Numbers, Math 2, and Math Word Problems. It also has instructions, Stickybear stickers and a poster, and a hard cover story book. February.

ANUGraph: A Macintosh program for drawing and printing graphs of mathematical functions. Suitable for use in schools. February.

Touch: An Australian typing tutor suitable for both adults and youngsters. It comes complete with a 28-page manual, and there are 5 tests for assessment of accuracy and speed. February.

Amy's First Primer: For children four to eight years old. It consists of six games which teach the alphabet, keyboard, counting and number recognition. Shareware. June.

Algebra Graph(x): A program that plots graphs from equations and prints them on the screen. For mathematics and physics classrooms. June.

The Galois Algebra Package: An aid to teaching mathematics and a research tool for the practitioner. Particularly suitable for teaching modular arithmetic and finite fields. August.

Venture Writer: A computer version of the popular 'twist-a-plot' novels. For Microbees. December.

Where to look? A listing of sources of information for educational software and software reviews in each state. December.

Games

Games

Advanced Flight Simulator: Real time action with a good screen layout. You have the choice of flying fourteen planes, including a Cherokee, a Sopwith Camel, an F-18 and a Samurai XPG-12 jet. For all ages. February.

BridgePal: A Public Domain program with loads of features for brushing up on your bridge game. February.

Defender of the Crown: Attack the Norman Castle of Edmund the Grim. Award winning graphics and many user options. August.

Reach for the Stars: Edition 3 for Commodore C64's. Colonize outer star systems. August.



QuickBasic Revision 4: A major update, with many new features. This could be the standard for years to come. For EGA screens there is a Palette statement. November.

Graphics

VideoScope 3D: A 3-D animation and rendering system, including smooth shading, hidden surface removal and automatic scaling. For Amiga computers. January.

The Magician: Australian Software Commendation Award. A powerful integrated graphics package suitable for home, small business and corporate use. February.

Photon Paint: Manipulate your graphics in all Amiga graphics modes. Includes wrapping of 2-D graphics on 3-D objects

with simple luminosity control. 4096 colours. August.

Finger Paint: Shareware paint program for IBM PCs. September.

Harvard Graphics: Create a slideshow or print out colourful charts using data from other software such as Lotus 1-2-3, or original data. November.

Chart Master: Part of the business graphics series that includes Diagram Master and Sign Master. Suitable for small businesses. November.

GraphWriter: Produced by Lotus, with the ability to link spreadsheets automatically with graphics. Intended for corporate use. November.

Microsoft Chart: A powerful package for corporate use that gives the ability to create almost any manner of chart. November.

Amiga Graphics: Deluxe Paint, Digi-View, Digi-Paint, Express Paint and Photon Paint are all examined in detail. November, December.

MacDraw II: A high end drawing program for Macintosh computers. December.

Graphic Products Survey

Many graphics, Cad, presentation and business graphics packages are examined in this well rounded survey. Includes Lumena/Crystal 3-D, Artisan, Show Partner/FX, Advanced Magician, Harvard Graphics, VersaCAD and Logitech Paint-Show. Hardware is covered, as well as high resolution monitors, scanners, printers and film recorders. November.

Project Managers

Project Manager Workbench: A Project manager software that uses the Gantt chart format (bar graphs) to track time scales of various projects. A resource spreadsheet dynamically updates resources and commitments. May.

SuperProject Plus: A project manager with a wide range of options and priorities. A disciplined approach to scheduling. For business users. May.

Timeline: A project manager that is well thought out, and is ideal for low to mid level users. It includes chart production, costing, and on-line help. December.

Spreadsheets

@Liberty: A spreadsheet compiler that

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SOFTWARE ROUNDUP

converts spreadsheets from other programs, such as Lotus 1-2-3, Symphony, or Multiplan into a form that can be distributed to end users where they can use a 'run time' program to enter data. It saves having to purchase a copy of Lotus for each user, and gives extra protection and confidentiality. For businesses and the corporate environment. May.

AsEasyAs: User supported software that uses similar menu options, commands, functions and macros to Lotus 1-2-3. For low end users. May

Baler: A Lotus 1-2-3 compiler that enables run time modules of a spreadsheet to be run, without having to have Lotus operational. Good for security in business applications, and it also saves money, since it avoids purchasing of additional Lotus programs for each user. August.

SideKick: A pop up utility that includes a phone directory, notepad, calculator and Ascii table. March.

SoftPC: Software emulation package that allows MS-DOS programs to be run on the Macintosh. September.

Tornado Notes: Use this utility RAM resident program for filing, cataloging, screen grabs, lists and directories. Useful for anyone who has to keep control over lots of small amounts of information. June.

Ultrasound: Analyses and edits sound on an IBM PC. Suitable for cleaning up sound recordings or as a speech research tool. December.

Utilities

Eureka, the Solver: From Borland, a scientific problem solver that can be used for performing scientific calculations, equation solving and graphing. May.

Hypermedia: Owl's CD-Guide, and Apple's Hypercard are both examples of a radically different approach to handling all types of data, including graphics, text and sound. The user interface is via the mouse, and it is based on an intuitive approach to linking data rather than a rigid hierarchy. These products can be used by anyone, in any situation, from kindergartens to corporations. June; Hypercard instruction sets: July, August, September, October.

Mace Utilities: A safeguard against accidental reformatting of hard disks, a disk diagnostic program, a Remedy program, a cache utility, and a floppy disk transfer speed utility. May.

Metatext 3: Print enhancer for dot matrix printers giving a 9-pin printer close to 24-pin performance (apart from speed). It also provides extra fonts including the extended Ascii graphics character set. May.

Norton Utilities: A collection of programs that give an easy to use DOS shell. Includes file management, unerasing, disk test, sort disk. September. Norton's Advanced Utilities was a finalist for the Software of the Year Award.

Pop-Up DeskSet Plus: Terminate and stay resident program of utilities including a pop-up calculator, financial calculator, word, popDOS, calendar, alarm clock, and a communications program. March.

*Prices and availability
were given with the
original reviews. Back
issues are available –
refer to the Services
page.*

XTreePro: A disk utility that enables you to manage files on your hard disk without having to use DOS. Includes a word processor. July.

Microsoft Windows 2.03 and 386: Changes to this popular user interface are examined here, including the version for 386 machines which gives standard DOS applications their own virtual DOS machine (multitasking). November.

Programming

PC-Professor: A tutorial that teaches you how to use Basic. On screen menus guide you through the course. For beginners. Public domain software. January.

MetaWindows: A family of graphics routines coupled to a memory resident graphics driver. Produced by MetaGraphics, and available in most popular programming language versions, including Fortran. For programmers who would like to ease the pain of incorporating graphics, such as lines, filled shapes, windowing,

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CM103 Q-Modem — Full feature communication program.

CM104 PC-Prompt — You will never forget the right format for entering Dos Commands again.

CM105 PC-Deskteam — Calculator, calendar, Dos util., notepad, etc.

CM106 Word Processing for Kids — A word processing program designed for kids

CM107 Origami — Teaches you the Japanese art of paper folding.

CM108 Arcade Games Collection — An assortment of the finest 'arcade type' games including Scramble and Donkey Kong

CM109 ImagePrint — Allows you to produce letter quality print on your Epson or compatible printer

CM110 ProComm — Communication program that allows you to go to Dos without terminating.

CM111 Sidewriter — If your report won't fit into a page, print it sideways

CM112 PC Outline — Resident outlining program

CM113 PC Style — Writing analysis program

CM117 PC-Stock — Plot stock analysis graphs on monitor or printer.

CM119 Basic Games — Various games in Basic including Bowling, Keno, Spacewar and more.

CM120 Desktop Publisher — Publishing program for newsletters or simple applications.

CM121 LottoPro — Helps analyse Lotto trends

CM122 Bookkeeper — A complete financial tool for business and personal use where complex accounting software is not needed

CM123 Poker Anyone? — Five card draw poker against the computer.

CM124 Duke Language Toolkit — Create foreign and other fonts for EGA

CM125 Record Collector — Professional level music cataloguing program. You find song by title, artist, label, producer and many more

CM126 HDMIII — Hard disk menu system up to 10 menus/10 selections.

CM127 Lititgex — For keeping track of legal research, evidence, etc

CM128 ABC Fun Keys — For ages 2-5; learning alphabet keyboard.

CM129 AnyWord — Text file index retrieval system

CM130 PC-Flow — A flow chart designing program

CM133 T.O.P. — Over 40 procedures and functions for Turbo Pascal 4

CM134 Bradford — Letter quality fonts for Epson MX and FX.

CM135 Weight Control — Assists you in diet with info about dieting, self test.

CM136 Context & Snipix — Superimpose graphics onto text for use in desktop publishing

CM137 Beginning Sound — Helps pre-schoolers learn to read.

CM139 Grab Plus — Automatic envelope addressing utility and address database.

CM140 Formgen — Design forms for home and office.

CM141 Trilogy — Note storing and retrieving utilities for writers and others

CM142 Domino — Play dominos against the computer

CM143 Styled — Writing analysis program.

CM144 Card Track — Credit card statement analysis program

CM146 Manage — Improve your management skills by answering questions on various management topics.

CM147 Automenu — Dos Menu Program

CM149 As Easy As — Lotus 1-2-3 look-alike.

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SOFTWARE ROUNDUP

and cursor tracking into their IBM PC compatible programs. January.

The Encoder: Tim Hartnell's Basic program for data and text file security. The program scrambles text and data so they cannot be read by anyone else. January.

Glee: Develop your own computer application with this fourth generation software developed in Perth. Glee can handle database, file management, number crunching, simple text, and administrative problem solving. It can be mastered with a few hours of instruction without the need for previous programming experience. Suitable for small to medium business users. February

The Norton Guides: On-line pop-up manuals for most of the popular programming languages in use on personal computers. Instant help is at hand for definitions of commands with expanded infor-

mation available as well. April. Norton Guides was also a finalist for the Software of the Year Award. May.

Turbo Pascal Toolboxes: Available for Turbo Pascal 4 are Editor, Database, Numerical Methods, Graphix and Gameworks toolboxes. All are from Borland. Turbo Tutor is for novice Turbo Pascal programmers. May.

Turbo C: Another great product from Borland and a finalist in the Software of the Year Award. May.

Functional Programming Languages: An overview of the languages Lisp and HOPE (the successor to NPL). June.

Turbo Basic: A fast BASIC programming environment, including an editor, compiler, debug, and trace facilities. It will compile programs written for Basic, GWBasic, and QuickBasic 2.0. July.

Hi-Tech C: Professional Australian C compiler, with a low cost that includes a year of updates. Suitable for learning the C language and small business applications. July.

Turbo Pascal 4.0: Quite a few changes in this version, including wildcards and predefined data types. November.

F-PC: Forth programming with a WordStar style full screen editor, a metacompiler, an assembler/disassembler, debug routines, macros, and manual. December

CSR: C Spot Run is a collection of C language library routines, for windowing, menu creation, timer functions and 60 on, that supplement the standard libraries supplied with Microsoft C, QuickC and Turbo C. December.

Word Processors

Word Processors

Trust Writer: A WordStar lookalike which duplicates most of the commands found in WordStar, although one or two features are missing. It has a word spell check, a merge facility, and memory resident utilities. An entry level word processor that is slightly cheaper than the high flyers. January.

Webster's New World Writer: This package is easy to learn and use, inexpensive, with a choice of menu or keyboard control. It has a thesaurus and a spelling checker. For new users who don't require a power word processing program. February.

Dac Easy Word II: An easy to learn and fairly inexpensive word processor, with pull-down menus and keyboard equivalents. It has Context sensitive help screens and simple search and replace functions. A middle range word processor. February

Wordcraft: Release 3.2 has a word processor, mail merge database, and communications software. Features include search and replace, spell check, text macros, and batch files. Suitable for small business and home users. March.


Microsoft Word Version 4: A powerful word processor that has become a favourite with many computer users. Features include menu commands or function key commands, search and replace, formatting, on disk tutorial, style sheets, and much more. For the serious word worker and for business use. April.

WordMagic: Inexpensive and locally designed software. Features include block commands, WordStar style cursor control and a straight forward print menu. A simple entry level words processor. May.

WordStar 2000 Plus Release 3: The 'easier to use' version of traditional WordStar, enhanced and made faster. Features include customization, page preview, thesaurus and file finder. June.

Sprint: You can design your own word processor with this new product from Borland. It has many features including a macro language and formatting capacities. December.

Lotus Manuscript: A 'Professional Document Preparation System' that is designed for the development of large, structured documents, such as books or large scientific manuals. It is more of a 'block' processor than a conventional word processor. February. □



Lucid 3-D: A three dimensional spreadsheet, with any one cell in your spreadsheet capable of containing another spreadsheet, a document, notes etc. Complete with notepad, cut and paste, macros, clipboard. For small business and home users. September.

WHAT'S YOUR CHOICE?

Each year, Your Computer magazine presents its Personal Computer of the Year awards to those products, released in Australia during the previous twelve months, which offer innovation in concept and application, technical excellence in design and engineering, value to users, and, generally, improve the 'quality of computing'. Since the inception of the awards, seven years ago, presentations have been made in two categories: Personal Computer of the Year and Software Product of the Year. In 1985, to give recognition to the emerging Australian computer industry we introduced the Australian

your computer's 7TH ANNUAL PERSONAL COMPUTER OF THE YEAR AWARDS

1 . 9 . 8 . 9 READERS CHOICE

Software and Hardware Commendations.

This year, we are introducing three new categories: Reader's Choice of Hardware, Reader's Choice of Software for Productivity, and Read-

er's Choice of Software for Entertainment. From January 1, 1989, nominations for awards in these categories will be accepted from all readers of Your Computer. Nominations must include the category, the name of an Australian retailer of the product, and an explanation (in 50 words or less) of why you think the product should be awarded 'Reader's Choice' in its category — they must be neatly written, or printed, on an A4 sheet of paper (that's the same size as this magazine page) and reach us by March 23, 1989. It is not necessary to make nominations in all three categories. And for the best description of a winning product in the Reader's Choice categories, we'll let you choose a software package to the value of \$500.

Tune into your

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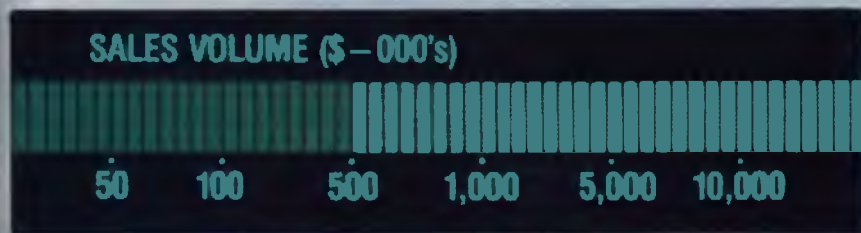
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Inkjets from Siemens

and good news for Macintosh owners!

S IEMENS Ltd has announced an attack on the private office equipment market by establishing a dealer network to distribute its full range of desktop printers. The new network will enable Siemens to fully service the Australian market.

The range of printers to be marketed includes dot matrix, inkjet and a second generation laser printer. The inkjet range includes the PT 90, PT 88S and PT 89S. The PT 90 is a letter quality printer, offering up to 340 cps (characters per second) in letter quality mode, and up to 680 cps in draft mode. At 10 characters per inch, the speed is 400 cps in draft, and 200 cps in letter quality mode. This is fast for an inkjet, and compares favourably with high-end dot

matrix printers. The big advantage that inkjet printers have is that they are remarkably quiet: 45 to 50 dB compared with a typical 55 to 57 dB of dot matrix printers.

The good news for Macintosh owners is that these inkjet printers are now Mac compatible, providing quiet, quality printing. The PT 88S is \$1500, the PT 89S (A3 version) is \$1700, and the PT 90 is \$3300, tax included.

The inkjet print head uses a 'drop on demand technology' to deliver ink to the paper. An ink cartridge feeds ink via a central channel to 32 jet channels. A voltage pulse is applied to each channel through a piezo electric tube, which increases the pressure, forcing a tiny drop of ink from

the channel. Ink cartridges can be easily replaced, with each cartridge having the capacity to print approximately 3500 A4 pages. The PT 88S and 89S printers give 66 cps in near letter quality mode and 200 cps in draft mode.

The PT 18 and PT 19 dot matrix printers have colour as standard, and are near letter quality with an 18-pin print head. They print at a maximum speed of 300 cps in draft mode, and 100 in NLQ mode. The PT 10 laser printer outputs 8 pages per minute, and has six resident fonts. It is compatible with H-P Laserjet series II printers and is priced at \$4900 (taxed).

For further details contact Siemens Advanced Business Products department, (03) 420 7476. □

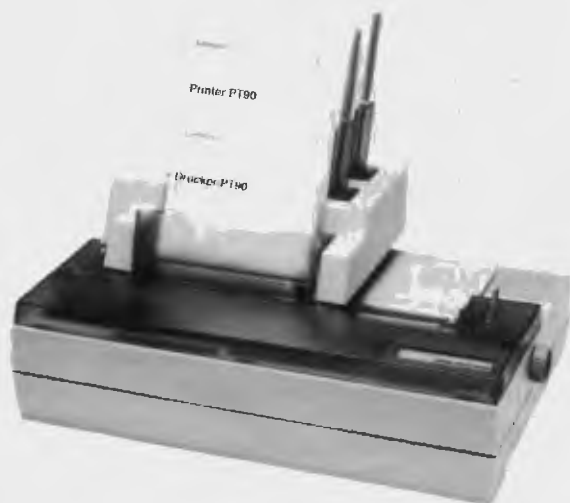


Figure 1. The PT 90 inkjet printer is fast, outputs letter quality, and is now Macintosh compatible.

The windmill in the background was printed with Siemens PT90.

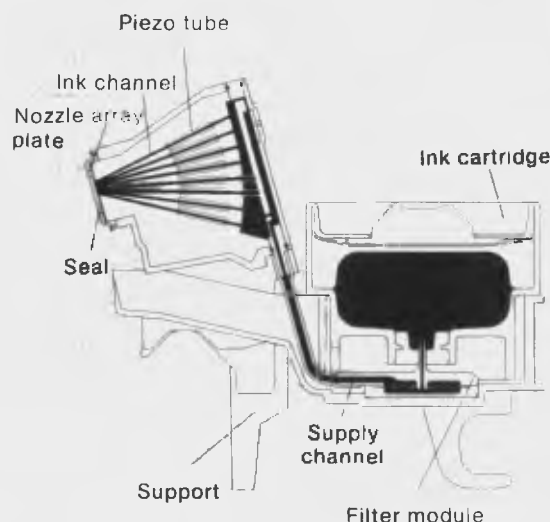


Figure 2. Siemens uses the 'drop on demand method' of delivering ink to the paper. The ink is enclosed in small piezo tubes, which contract when a voltage applied across them, squeezing out a tiny drop of ink.

Your Computer's Lexicon



Absolute address A memory address given as an offset from the lowest address in memory (0000:0000), rather than from an offset within memory – also see *relative address*

Absolute co-ordinates Co-ordinates specified in relation to a central axis, rather than by reference to the position of the prior co-ordinates used – also see *relative co-ordinates*

Absolute disk sectors To 'access an absolute disk sector' means to read a sector at a particular, numbered position on the disk.

Access code Used in the DOS Technical Reference Manual for a *Subfunction* number.

Access time The length of time needed to move data in and out of a storage device; it's calculated by adding the *seek time* and the time it takes the surface of the disk to rotate to the correct position under the read/write head.

ACK Standard ASCII abbreviation for *Acknowledge* – refer to the ASCII table.

Acknowledge An I/O signal that indicates that a task has been performed, and that the hardware is ready to perform the next task.

Adapter An interface card designed to fit into the *expansion slot* to enhance the processing power of the computer or for communicating with other devices.

One of the biggest hurdles to be jumped when learning more about computers is the jargon.

Unfortunately, computer technical literature and even many manuals intended for use by novices, are written by those who are all-to-familiar with the terms. The definitions that follow cover most of the esoteric terms (and many of the arcane ones) you are likely to encounter – when you master these, you'll be ready to jargon it up with the best of them!

The terms are specific for IBM PCs and compatibles, but most of them are also applicable to any type of personal computer.

Bold terms in the definitions are cross references.

Address A value (sometimes a label) identifying a specific memory location. Addresses are assigned so data can be retrieved or modified after it has been written to the disk. The 80286 has 16 megabytes of unique addresses, starting with 0 and increasing by 1 after each successive address. Addresses are usually expressed in the form 0040:0000 – the first half gives the *relative address* and the second, the *absolute address*.

Address register A register on some *support chips* that acts as a *pointer* to several data registers on the chip that are accessed through a single *port address*.

Addressing The means of accessing particular locations in memory through a system of absolute positions and relative offsets.

AND A logical operator which compares the bit patterns of two values; a third value (with the bits that are on in both of the original values, turned on) is then created.

ANSI.SYS A device driver supplied with DOS that performs many of the functions of the BIOS. It is used to extend software compatibility to all machines that run DOS. An '*ANSI escape sequence*' is a series of characters (beginning with a key-stroke or escape character) that is used to define graphics functions, affect cursor

LEXICON

movement, or define other functions under DOS. ANSI is an acronym for American National Standards Institute.

ASCII code A standard 8-bit information coding system that assigns a number from 0-127 that corresponds to one of the 128 ASCII (American Standard Codes for Information Interchange) characters. IBM microcomputers use an extended ASCII set of 256 characters – see the accompanying ASCII table; also see EBCDIC.

ASCII text file A text file in which all characters are represented as ASCII characters, where data elements are separated by a carriage return/line feed (CR/LF) pair, and where the end of the file is marked by a Ctrl-Z character (ASCII 26).



BAUD RATE

ASCIIZ string Same as a path string.

ASDFG see ZXCVB.

Aspect ratio The ratio of the number of vertical to horizontal dots along equal distances on the video display or in graphics printing.

Assembler Software that converts assembly language source code into machine code.

Assembly language The lowest level of programming language, in which the programmer writes instructions that directly control the actions of the CPU

Asynchronous communications A type of data transmission not based on synchronized timing between the sending device and the receiving; data transmission can occur at any time. Also referred to as serial communications.

Attribute A characteristic imparted to a device or to data. Every character of a text screen has an attribute that sets its colour, intensity, etc; device drivers have at-

tributes that tell how they handle data, control strings, etc; and files can have attributes that make them hidden, read only, etc.

Attribute byte Generally, a byte containing a code that sets a special characteristic for whatever medium it refers to. A file's attribute byte (in the disk directory) sets hidden status, read only, etc. In the video buffer there is an attribute byte for every character on the screen that holds information about colour, underlining, etc.

AUTOEXEC.BAT The name of the batch file that is automatically executed when DOS is booted

B A suffix denoting a number expressed in binary format, as in 1011B

Background colour The background colour used on the video display. It is the colour to which the screen returns when the display is cleared.

Background operation A subsidiary process that occurs while a program is running. For example, a word processing program can send data to a printer while the program is used for editing. Background operations may work by the use of interrupts.

Bandwidth A measure (in Hertz) of the range of frequencies that a communications line can transmit at maximum power.

Base address The lowest address of a group of contiguous port addresses through which a peripheral device is accessed.

Batch file A file listing DOS commands and programs. These are automatically invoked either in the order in which they are listed or by conditional branching

Baud A unit measuring the number of separate elements, such as bits, that can be transmitted per second.

BEL The standard ASCII abbreviation for Bell – refer to the ASCII table.

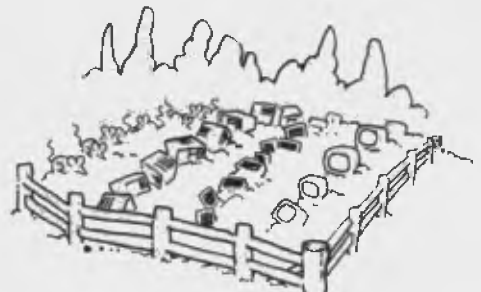
Benchmark A standard program to test the processing power of a computer; also, a standard problem to test a program's or computer's speed at file processing, calculations, sorting, etc.

Binary A numerical system based on 2; only 0 and 1 are used to express numbers. For example 1101 represents (starting from the right) 2 to the power of 1 (=2) added to 4 (2 squared) to the power of 0 (=1) added to 8 (2 cubed) to the power of 1 (=8) added to 16 to the power of 1 (=16), or 27.

BIOS The Basic Input/Output System, which is the part of the operating system that is permanently kept in the machine on ROM chips. The BIOS controls the video display, disk drives, keyboard, etc.

BIOS data area An area in memory starting at address 0040:0000 where the BIOS keeps status information and the keyboard buffer

Bit A binary digit; a bit can be either 1 or 0. It is the most basic unit of data that can be recognized and processed by a computer. Bits are grouped to form larger units of information such as a nibble, byte, or word.



BIT FIELD...

Bit field When a byte or word is viewed as a bit pattern, several bits taken together may hold a particular item of information. For example, bits 0-3 of a text attribute byte form a bit field that holds a character's foreground colour

Bit operations Program operations that read or change particular bits within data.

Bit pattern A group of bits forming a binary number; for example, an ASCII bit pattern consists of 7 data bits and 1 parity bit.

Bit plane On an EGA monitor, the video buffer is divided into four sections, referred to as bit planes 0 to 3. In 16-colour modes the four planes are in parallel, so that four bytes are located at a particular memory address. In some cases the planes may be chained, that is they are combined into one or two larger planes.

Block Usually, a unit of storage consisting of contiguous words, bytes, or records that are treated as a block when reading or writing to a disk.

Block device A device that sends or receives data in block units. Disk drives are the most common block device.

Boot To load an operating system – the term is used in the sense that the computer intends to pull itself up by its 'bootstraps'.

LEXICON

Control	Decimal	Hexadecimal	Character	Code
@	0	00		NUL
A	1	01	☐	SOH
B	2	02	☐	STX
C	3	03	☐	ETX
D	4	04	☐	EOT
E	5	05	☐	ENQ
F	6	06	☐	ACK
G	7	07	☐	BEL
H	8	08	☐	BS
I	9	09	☐	HT
J	10	0A	☐	LF

Control	Decimal	Hexadecimal	Character	Code
K	11	0B	☐	VT
L	12	0C	☐	FF
M	13	0D	☐	CR
N	14	0E	☐	SO
O	15	0F	☐	SI
P	16	10	☐	DLE
Q	17	11	☐	DC1
R	18	12	☐	DC2
S	19	13	☐	DC3
T	20	14	☐	DC4

Control	Decimal	Hexadecimal	Character	Code
U	21	15	☐	NAK
V	22	16	☐	SYN
W	23	17	☐	ETB
X	24	18	☐	CAN
Y	25	19	☐	EM
Z	26	1A	☐	SUB
[27	1B	☐	ESC
\	28	1C	☐	FS
]	29	1D	☐	GS
^	30	1E	☐	RS
_	31	1F	☐	US

Decimal	Hexadecimal	Character
32	20	!
33	21	"
34	22	#
35	23	\$
36	24	%
37	25	&
38	26	'
39	27	(
40	28)
41	29	*
42	2A	+
43	2B	,
44	2C	-
45	2D	.
46	2E	/
47	2F	0
48	30	1
49	31	2
50	32	3
51	33	4
52	34	5
53	35	6
54	36	7
55	37	8
56	38	9
57	39	:
58	3A	;
59	3B	<
60	3C	=
61	3D	>
62	3E	?
63	3F	?

Decimal	Hexadecimal	Character
64	40	@
65	41	A
66	42	B
67	43	C
68	44	D
69	45	E
70	46	F
71	47	G
72	48	H
73	49	I
74	4A	J
75	4B	K
76	4C	L
77	4D	M
78	4E	N
79	4F	O
80	50	P
81	51	Q
82	52	R
83	53	S
84	54	T
85	55	U
86	56	V
87	57	W
88	58	X
89	59	Y
90	5A	Z
91	5B	[
92	5C	\
93	5D]
94	5E	^
95	5F	_

Decimal	Hexadecimal	Character
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z
123	7B	{
124	7C	
125	7D	}
126	7E	~
127	7F	Δ

Decimal	Hexadecimal	Character
128	80	Ç
129	81	ü
130	82	ë
131	83	ä
132	84	ä
133	85	ä
134	86	ä
135	87	ä
136	88	ä
137	89	ä
138	8A	ä
139	8B	ä
140	8C	ä
141	8D	ä
142	8E	ä
143	8F	ä
144	90	ä
145	91	ä
146	92	ä
147	93	ä
148	94	ä
149	95	ä
150	96	ä
151	97	ä
152	98	ä
153	99	ä
154	9A	ä
155	9B	ä
156	9C	ä
157	9D	ä
158	9E	ä
159	9F	ä

Decimal	Hexadecimal	Character
160	A0	ä
161	A1	ä
162	A2	ä
163	A3	ä
164	A4	ä
165	A5	ä
166	A6	ä
167	A7	ä
168	A8	ä
169	A9	ä
170	AA	ä
171	AB	ä
172	AC	ä
173	AD	ä
174	AE	ä
175	AF	ä
176	B0	ä
177	B1	ä
178	B2	ä
179	B3	ä
180	B4	ä
181	B5	ä
182	B6	ä
183	B7	ä
184	B8	ä
185	B9	ä
186	BA	ä
187	BB	ä
188	BC	ä
189	BD	ä
190	BE	ä
191	BF	ä

Decimal	Hexadecimal	Character
192	C0	L
193	C1	L
194	C2	L
195	C3	L
196	C4	L
197	C5	L
198	C6	L
199	C7	L
200	C8	L
201	C9	L
202	CA	L
203	CB	L
204	CC	L
205	CD	L
206	CE	L
207	CF	L
208	D0	L
209	D1	L
210	D2	L
211	D3	L
212	D4	L
213	D5	L
214	D6	L
215	D7	L
216	D8	L
217	D9	L
218	DA	L
219	DB	L
220	DC	L
221	DD	L
222	DE	L
223	DF	L

Decimal	Hexadecimal	Character
224	E0	α
225	E1	β
226	E2	γ
227	E3	π
228	E4	Σ
229	E5	σ
230	E6	μ
231	E7	γ
232	E8	δ
233	E9	θ
234	EA	Ω
235	EB	δ
236	EC	ω
237	ED	φ
238	EE	€
239	EF	π
240	F0	≡
241	F1	±
242	F2	∑
243	F3	∫
244	F4	∫
245	F5	J
246	F6	∫
247	F7	∫
248	F8	∫
249	F9	∫
250	FA	∫
251	FB	∫
252	FC	∫
253	FD	∫
254	FE	∫
255	FF	∫

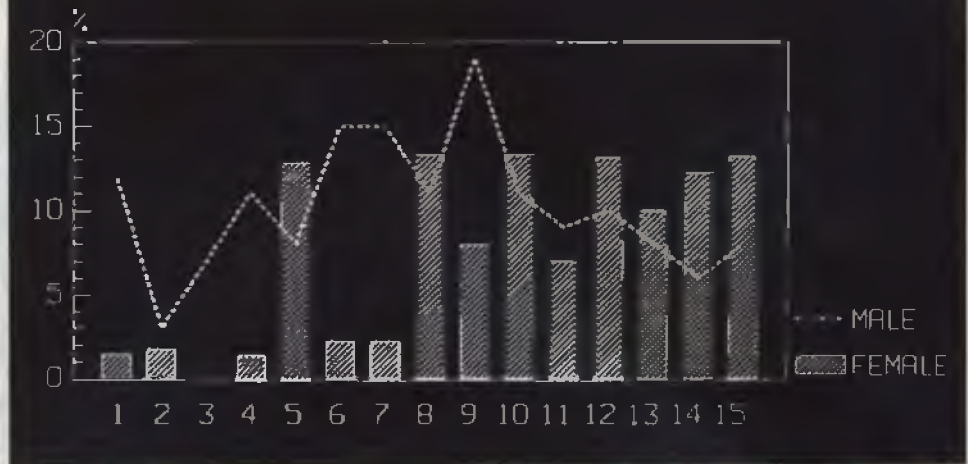
ASCII character codes – definitions for the first 32 codes are given in the text. Note that ASCII 127 has the code DEL; under DOS the code has the same effect as ASCII 8. The DEL code can be generated with Ctrl-Backspace.

FEATURE COMPARISON CHART

■ Present □ Absent ○: Optional L: Limited

FEATURE	CSS	SPSS/PC+
Data Handling		
Conditional case selection	■	■
Computed variables	■	■
Free field data formatting	■	■
Joins data files	■	■
Lag variables	■	■
Merges data files	■	■
Missing values	■	■
Reads/Writes Ascii files	■	■
Reads/Writes Lotus/dBase files	■	■
Sorts cases/variables	■	■
Split data files	■	■
Spreadsheet data editor	■	○
Transformations	■	○
Transpose data	■	○
Variable labels	■	○
Batch Facility	■	○
Macro Facility	■	L
Contingency Tables		
Multway tables	■	■
Chi-square tests	■	■
Other tests	■	■
Nonparametric Tests		
Fisher's exact test	■	■
Friedman Anova-by-ranks	■	■
Mann-Whitney U	■	■
Kendall's Tau	■	■
Kolmogorov-Smirnov	■	■
Wilcoxon	■	■
T-Tests		
Independent	■	■
Matched pairs	■	■
Correlation		
Fisher's r to z transformation	■	□
Partial correlations	■	□
Pearson correlations	■	□
Spearman rank-order	■	○
Reliability/Test Item Analysis	■	○
Regression		
Standard multiple	■	○
Logistic	■	○
Nonlinear	■	○
Residuals Analysis	■	○
Simultaneous ridge	■	○
Stepwise	■	○
Analysis of variance (Anova)		
Analysis of covariance (Ancova)	■	○
Latin-square design	■	○
Multway factorial	■	○
Nested designs	■	○
Planned comparisons	■	○
Post-hoc comparisons	■	○
Repeated measures	■	○
Split-plot designs	■	○
Unbalanced designs	■	○
Log linear models	■	○
Survival analysis	■	○
Multivariate Analysis		
Analysis of covariance (Mancova)	■	○
Analysis of variance (Manova)	■	○
Factorial Manovas	■	○
Canonical correlation	■	○
Discriminant analysis	■	○
Multivariate Analysis		
Analysis of covariance (Mancova)	■	○
Analysis of variance (Manova)	■	○
Factorial Manovas	■	○
Canonical correlation	■	○
Discriminant analysis	■	○
Factor analysis	■	○
Hotelling's T-squared	■	○
Multivariate classification	■	○
Planned multivariate comparisons	■	○
Post-hoc multivariate comparisons	■	○
Principal component analysis	■	○
Repeated measures Manovas	■	○
Cluster Analysis	■	○
Multi dimensional Scalling	■	○
Quality control	■	○
Time Series Analysis		
Auto correlation	■	○
Partial auto correlation	■	○
Cross correlation	■	○
Fast Fourier transform	■	○
Auto spectral analysis	■	○
Cross spectral analysis	■	○
Data tapering/smoothing	■	○
Box Jenkins ARIMA models	■	○
Graphics/Graph types		
Box and whisker plots	■	○
Casement plots	■	○
Chernoff faces	■	○
Contour (density) plots	■	○
Histograms/frequencies	■	○
3-D histograms	■	○
Line graphs	■	○
Logarithmic/semilogarithmic plots	■	○
Pie charts	■	○
Probability/cumulative probability plots	■	○
Scatter plots	■	○
Stem and leaf plots	■	○
X-Y-Z plots	■	○
Graph features		
Overlaid plots	■	○
Error bars	■	○
Multiple text fonts	■	○
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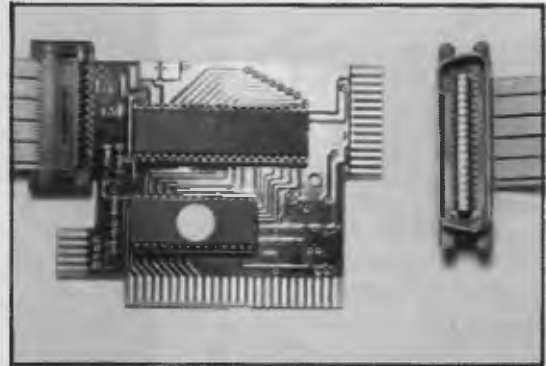
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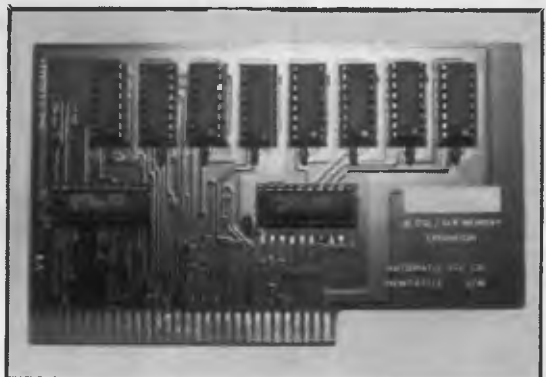
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Boot record A short program placed on a disk at the position at which the disk is first read when DOS is booted. The program provides the computer with the ability to load portions of DOS.

Boundary A defined interval in memory, in a file, etc. For example, programs are placed in memory at 16-byte boundaries, which means that the absolute memory address of such a position is always evenly divisible by 16.

BPS Bits Per Second – also see baud.

Break code The scan code that is generated when a key is released (the make code occurs when the key is first depressed).

Break detect A capability of a serial communications adaptor to sense a long sequence of logical 0s. These signal that the remote station wants transmission broken off.

BS Standard ASCII abbreviation for Back Space – refer to the ASCII table.

Buffer An area of memory that is set aside as a holding area for information in transit from one part of the computer to another. The keyboard uses a buffer, as do the disk drives and video display.

Bus A circuit for the transfer of data or signals between devices.

Byte A number of contiguous bits forming a character. A byte that consists of 8 bits can hold any value from 0 to 255, thus each character in the ASCII set can be represented by 1 byte.

Bug A hardware bug is an electrical, mechanical or electronic defect that interferes with the normal operation of a computer. Software bugs are errors in programming.

Cache A buffer between the CPU and main memory. Since the CPU searches the cache before other memory, using a cache is very quick.

Calls A call is an instruction to transfer

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control to a specific subroutine from the main program or current subroutine. After the called subroutine is executed, control returns to the main program or calling subroutine.

CAN Standard ASCII abbreviation for Cancel – refer to the ASCII table.

Carry Flag A bit in the CPU's flag register that is often used by DOS functions to indicate an error condition.

CD Carrier Detect – see DCD.

Character device A device that sends and receives data 1 character at a time, such as a printer – see **block device**.

Child process A program that runs while another program (the **parent**) is in control.

Circular queue A kind of data buffer in which data is inserted at one end and taken from the other. The two ends of the buffer are constantly changing, and two pointers keep track of the current beginning and end of the queue.

Cluster A group of disk sectors that form the basic unit in which disk space is allocated.



CONTROL STRING

Code The series of executable instructions that make up a program, as distinct from the data that they operate on. Generally, 'code' refers to the sequence of machine instructions that a compiler or assembler produces from **source code**.

Code segment The section of memory that holds the code used by a program (other segments hold the data and **stack**)

Colour attribute The bit pattern held in the **video buffer** that sets the colour for a particular dot or character on the screen. On the monochrome and colour video cards, these attributes coincide with a system of **colour code** numbers. In the PCjr and EGA, however, the colour attributes refer to the number of a **palette register**, and that register contains the code for the colour that the attribute is to be associated with.

Colour code A number from 0 to 15 that refers to one of the 16 display colours. On

an EGA attached to the IBM Enhanced Color Monitor there may be 64 colour codes (0 to 63).

.COM A program of file which has all memory addresses already written into the file before it is loaded to run by the computer – see **EXE**.

Command line A line on the video display that accepts instructions (commands), such as a line starting with the DOS prompt

Communications interrupt A hardware interrupt brought about by a serial adaptor. It can occur whenever a character arrives over the serial line, whenever it is time to send another, etc – see **asynchronous communications**.

Compiler A program that converts the **source code** instructions of a high-level language into a **machine code** file which is then executed by an **interpreter**.

Concatenate To join several items, such as character strings or files, end to end to form a larger unit.

CONFIG.SYS The name of a special file that DOS searches for when booted. The file contains information about DOS parameters and device drivers that lets DOS configure the system.

Control block See **parameter block**

Control code One of the first 32 characters of the ASCII character set. These codes are customarily used to control hardware rather than to encode data – refer to the ASCII table.

Control string A string of characters that controls hardware. Control strings are often embedded in data sent to printers and modems. They begin with a special character that signals their special status (usually ASCII 27).

CPU The Central Processing Unit (a chip) which performs the instructions that make up a computer program. For example, the Intel 80286 chip is the CPU for the IBM AT.

CRC See **Cyclic Redundancy Check**.

Critical error A device error that prevents a program from proceeding. It invokes the DOS critical error handler

Critical error handler A DOS interrupt that is invoked when a serious device error occurs. It can be replaced with an error-recovery routine.

CRLF Carriage Return/Line Feed is the pair of characters that is used to cause the cursor or print head to start a new line – refer to the ASCII table.

CRT Cathode Ray Tube – the video display.

CTS Clear To Send – a signal from a modem to a communications port indicating that the modem is ready to begin data transmission. It is part of the **handshaking** procedure.

Current block The 128-record block of file data that is currently referenced by the file control block method of file access – see **current record number**.

Current directory The directory in a **tree-structured directory** to which all file operations are automatically directed unless a **path string** specifies otherwise.

Current record number In the file control block method of file access, data is organized in blocks of 128 records. The current record number is the number of the record in the current block. For example, the current record number of **random record** 128 is 0, since it is the first record in block 1 (all counting starts from 0, so random record 128 is the 129th record in the file, block 1 is the 2nd block, and the last record of block 0 is number 127).

Cursor A symbol on the screen which shows where the next character will appear when it's typed in.



CYCLE REDUNDANCY CHECK

Cyclic redundancy check An error checking technique where a mathematically derived code follows the transmission of a block of data; the code is recalculated and compared to be sure that the data has not changed during transmission

Cylinder In disk drives, a cylinder is the group of tracks at a given distance from the center of the disk or disks mounted in the drive.

Data Characters grouped together in a specific pattern to which a meaning is assigned.

Data segment An area in memory that contains a program's data. In **assembly language** this memory area is pointed to by the DS register

Data transfer area A buffer used by the

control block method of disk access to hold data that is transferred to and from disk.

DB An assembly language term indicating that a data object is one byte long, or that it is a string comprised of one-byte codes.

Daughterboard A board that plugs into the motherboard

DC1/2/3/4 The standard ASCII abbreviation for Direct Control 1, 2, 3 or 4 – refer to the ASCII table.

DCD Data Carrier Detect – a signal from a modem to a serial port indicating that connection has been made with another modem.

DD An assembly language term indicating that a data object is 4 bytes long.

Debug Find and correct errors in a program.

Default For most commands there are optional parameters to make the command work in a specified way. Defaults are those parameters than a computer assumes unless another parameter is specified by the user

Default DTA The 128-byte data transfer area every program is given, starting from offset 80h in the program segment prefix.

Delimiter Special characters that separate data items.

Demodulator A device that converts analog to digital data; for example, receiving tones over a telephone line by means of a modem and converting them back into the original bits.

Device Generally speaking, a device is any peripheral that stores, displays, or processes information, such as a disk drive video display, or printer.

Device driver A software routine that controls and monitors a device, such as a printer or disk drive.

Device header The beginning of a DOS device driver routine, it identifies the device.

Device interrupt handler The body of a DOS device driver routine, it holds the code that carries out the device driver functions.

Device strategy A part of a DOS device driver routine that links the driver to the request header, which is the parameter block DOS creates to manage the driver.

Direct memory access DMA – a way of making rapid data transfers between peripherals and memory; it is often used for disk operations. DMA requires a special chip.

Direct memory mapping See memory mapping

DLE The standard ASCII abbreviation for Data Link Escape – refer to the ASCII table.

DMA See direct memory access

DOS prompt The symbols at the start of a DOS command line: A:> etc.

Drive specifier A two-byte string naming a disk drive, in the form A:, B:, etc.

DSR Data Set Ready – a signal from a modem to a communications port indicating that the modem is ready.

DTA Data Transfer Area – the buffer used when transferring data to and from disks by the file control block method of file access.

DTR Data Terminal Ready – a signal from a communications port to a modem indicating that the computer is ready to receive.

Dumb terminal A terminal that can only input and output data to and from the computer and cannot perform other functions.



Dump A copy of the contents of a location in memory at a specific point in time; usually in hexadecimal.

DW An assembly language term indicating that a data object is two bytes long.

EBCDIC Extended Binary Coded Decimal Interchange Code – the standard 8-bit code (with a ninth bit for parity check) used by IBM microcomputers; extended ASCII code

Echo Feedback for verification. For example, keystrokes are usually echoed on the screen, and communications output also is usually echoed.

EM The standard ASCII abbreviation for End of Medium – refer to the ASCII table.

EMM The Extended Memory Manager is a combined hardware and software solution to the 1 megabyte addressing limit of DOS; up to 16 megabytes of memory can be used.

ENQ The standard ASCII abbreviation for Enquire (about the status of a sending or receiving device) – refer to the ASCII table.

Environment string A string of one or

more specifications that DOS follows when it executes a program. The string contains configuration commands as BUFFERS or BREAK.

EOF End Of File – usually Ctrl-Z; refer to the ASCII table.

EOT The standard ASCII abbreviation for End of Transmission – refer to the ASCII table.

EPROM Erasable Programmable Read Only Memory – an EPROM can have its bit pattern erased by exposure to ultraviolet light; it can then be re-programmed.

Error code A code number produced by the operating system to indicate a particular error condition.

Error rate The measure of the quality of a transmission system; it's derived by dividing the number of incorrectly received items of data by the correctly received.

Error trapping Coding that causes program control to be passed to a special error-recovery procedure whenever a critical error occurs.

ESC The standard ASCII abbreviation for Escape – refer to the ASCII Table.

Escape sequence A control string that begins with the Escape character (ASCII 27). Most printer control, for example, is performed using escape sequences.

ESC The standard ASCII abbreviation for Escape – refer to the ASCII Table.

ETB The standard ASCII abbreviation for End Transmission Block – refer to the ASCII Table.

ETX The standard ASCII abbreviation for End of Text – refer to the ASCII Table.

.EXE A program file that requires relocation when it is loaded. Not all addresses in the program can be set until the position of the program in memory is determined. EXE files have headers that hold the information needed for relocation. They take slightly longer to load, and are slightly larger on disk, than COM files.

EXEC The DOS function that lets a program run another program. It also loads overlays.

Exit code A code passed from a child process to the parent process. For example, when one program runs another, an exit code may be passed from child to parent when the child terminates. The codes are defined in the programs.

Expansion slot On the system board of a computer there are connectors into which adapters and add on cards can be plugged to expand the functions of a computer.

LEXICON

Extended code A key code used to identify those keystrokes (or keystroke combinations) for which there are no symbols in the ASCII character set, such as the Function Keys, or the Control or Alternate key combinations. Extended codes are two bytes long; the first byte is always ASCII 0 to differentiate the code from an ordinary one-byte ASCII code.

Extended error code Introduced with DOS 3.0, these elaborate error codes are returned when an error occurs. These codes report not only the error, but also its type, its location in the hardware, and its probable means of recovery.

Extended file control block A file control block that has an extra seven-byte header field that sets the file attribute

Extra segment The place in memory pointed to by the CPU's ES register. The settings in ES and DS (the data segment register) are often used in tandem to move data from one part of memory to another.

FAT See file allocation table

Fatal error An error in a program that causes the termination of execution

FCB See file control block

FF The standard ASCII abbreviation for Form Feed – refer to the ASCII Table.

Field A group of bits or bytes allocated to hold a particular data item

File allocation table A table on every disk that keeps track of available disk space and records which clusters of disk space are allocated to which file

File attribute A setting in a file's directory entry that determines the status of the file, making it normal, hidden, read-only, etc.

File control block A parameter block that a program sets up in memory to hold information required by DOS to operate on a file.

File control block method A collection of DOS functions that access disk files by means of file control blocks. This method has been made obsolete by the file handle method of access.

File descriptor In Basic or other high level languages, a file descriptor is the buffer number under which the file was opened.

File handle A code number returned by DOS when a file is opened using the file handle method of disk access. This code is used to identify the file in all subsequent disk operations. Certain predefined handles identify the video display, the printer etc.

File handle method The method of file access that makes use of file handles. This method largely replaces the earlier file control block method of access.

File pointer A variable kept by DOS for every file it opens. The file pointer points to the position in the file from which read/write operations begin – also see pointer

Flag A flag is a variable that, by being either 'on' or 'off', tells whether or not a particular condition prevails. The CPU has a 16-bit flag register in which the bits act as indicators of the CPU's operation.

Foreground colour The colours in which characters or graphics are drawn on the screen – also see background colour

Full duplex Indicates the transmission of data to and from a computer at the same time – also see half duplex and simplex.

Framing error An error in serial communications where the data flow gets out of synchronisation, so that data bits, parity bits, start bits, and stop bits are misinterpreted – see asynchronous communications

FS The standard ASCII abbreviation for Form Separator – refer to the ASCII Table.

Function In high-level languages, a function generally refers to a procedure that converts data from one form to another. At operating system level, the word function can refer to any interrupt routine. Functions themselves may contain a number of subfunctions.

Glitch A bug caused by a voltage surge or electrical noise that results in an error in data transmission

Global character Either the question mark or full stop characters as they are used in DOS for unspecified characters in file names. They are also known as 'wild-card characters.'

GS The standard ASCII abbreviation for Group Separator – refer to the ASCII Table.

H A suffix denoting a number is expressed in hexadecimal (base 16) form, as in 0D3H – decimal numbers and their hexadecimal equivalent are given in the ASCII table for numbers up to 255.

Half duplex Indicates the transmission of

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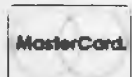
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data in only one direction at a time; for example, from a terminal to a computer – also see **Full duplex** and **simplex**.

Handle See **file handle**

Handshaking The exchange of predetermined signals between two devices to establish a connection between them.

Hardware interrupt An interrupt brought about by the action of hardware, whether a peripheral device, **support chips**, or the CPU itself

Hardware scrolling A video vertical scrolling technique that works by changing the starting point in the **video buffer** from which data is displayed, rather than by shifting the contents of the buffer.

Header A **parameter block** placed at the beginning of a program, a device driver, or other body of code or data. The header contains information about the code or data that is essential for its use. For example, the operating system places a 256-byte header (the **program segment prefix**) before every program it loads and uses the information to manage the program

Hexadecimal A numeric system with a base of 16; A, B, C, D, E and F are used, respectively, for decimal 11, 12, 13, 14, 15 and 16. Note: in the ASCII table both decimal numbers and their hexadecimal equivalent are given up to 255.

Hidden file A status that can be given to a file by setting its **attribute byte**. Hidden files are not shown in directory listings.

HT The standard ASCII abbreviation for Horizontal Tab – refer to the ASCII Table

Illegal character An arrangement of bits that is not recognized as a **character** by a particular system.

Increment To add a quantity (usually 1) to another; for example, it can be used to keep track of the number of times a loop has been executed.

Initialise To set a memory location, counter or **variable** to zero before beginning a routine.

Installable device driver A device driver that is fully integrated with DOS, so that it can make use of special error checking and control facilities.

Instruction pointer A register on the CPU that points to the next machine instruction that is to be executed. It marks offsets within the code segment

Intelligent terminal A terminal that can process data before it is transmitted to the computer.

Interpreter A program that translates **source code** one instruction at a time exe-

cuting it immediately. The programs **Basic.com** is an interpreter.

Interrupt Interrupts are software routines that are brought into action either by hardware or software. Hardware interrupts are initiated by hardware, as when a key is pressed on the keyboard; they instantly take control of the CPU, do their job, and then let the CPU return to its work. Software interrupts perform common program needs, such as sending a character to the screen or printer; they are supplied by the operating system, and they occur only when a program explicitly calls them.

Interrupt handler An **interrupt routine** – the term is used most often for **hardware interrupts**.

Interrupt vector See **vector**

I/O See **Input/Output**

Input/Output The process of transferring data between the computer and external devices.

Interface An exchange of information between one device and another, or the device that makes such an exchange possible.

IRQ Abbreviation for Interrupt Request; it's used in reference to the **maskable hardware interrupts**

ISO International Standards Organisation – a voluntary body formed to provide standards for data communications.

Iterative process To repeatedly execute a series of instructions until a specified condition is reached.

Jargon Terms and expressions invented by specialists in a field to ensure they can 'clean up' later as consultants.

Keyboard buffer A 15-character circular queue in which the keyboard interrupt deposits incoming characters



KEYBOARD BUFFER...

Keyboard interrupt A hardware interrupt that is invoked whenever a key is pressed down or released. It converts scan codes received from the keyboard microproces-

sor into the codes used by programs and inserts these codes into the **keyboard buffer**.

LF The standard ASCII abbreviation for Line Feed – refer to the ASCII table.

Linker A program that links together program **object modules**, organizing their addresses so that the modules can communicate. Even single-module programs must be linked, since the linker also sets up the code for **relocation**

Logical sector number Rather than refer to disk sectors as 'side x, track x, sector x' logical sector numbers reflect a sector's position by counting all sectors as a sequence, starting from the outside edge of the disk.

LSB Least Significant Bit or Least Significant Byte – the lowest (right-most) bit or byte in a number.

Loop A sequence of instructions in a program that is executed a certain number of times or until a certain condition has been met.

Machine instruction The numeric codes used by the CPU.

Machine language The lowest level of programming, where the programmer writes his instructions directly in the binary codes used by the CPU. **Assembly language** programming more conveniently achieves the same results by creating the codes from mnemonics like MOV or TPST

Machine language subroutine A subroutine that is written in **assembly language**, assembled, and then integrated into a program written primarily in a high level language. Such subroutines are generally used for actions that are repeated many times and that must be performed very quickly.

Macro A predefined set of instructions (macroinstruction).

Make code The kind of scan code that is generated when a key is depressed (the **break code** occurs when the key is subsequently released).

Mask A bit pattern that determines what bits in a second pattern are active. For example, particular **hardware interrupts** are disabled by setting bits in the mask register on the interrupt controller chip.

Master boot record A boot record on a hard disk. It contains the partition table, which points to the various disk partitions. Each partition begins with an ordinary boot record, which initiates loading the operating system.

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Memory allocation The allocation by DOS of a block of memory for a program's use.

Memory control block A 16-byte parameter block set up by DOS at the start of each block of memory it allocates to a program

Memory mapping Placing video data directly into the video buffer from which it is projected onto the screen.

Memory space The range of memory addresses that the CPU can access. The address space of the 8088 chip is approximately one million bytes.

Modem A MODulator/DEModulator – a device for sending data over a telephone line.

Modulation A device that converts digital to analog data; for example, sending tones over a telephone line by means of a modem

MSB Most Significant Bit or Most Significant Byte – highest (left-most) part of a bit or byte.

Multiplex To use a single device to handle several similar devices simultaneously by alternating attention among them.

NAK The standard ASCII abbreviation for Negative Acknowledgment – refer to the ASCII table

Nibble Half a byte; usually 4 bits

NUL The standard ASCII abbreviation for Null – refer to the ASCII table.

Object module A file of machine code in which the relative addresses are not yet fixed. The linker processes and combines object modules into finished .EXE or .COM program files.

Octal A numeric system based on 8

Operating system A set of programs that resides in ROM or on a disk that performs the frequently needed input/output procedures.

OR A logical operation in which the bit patterns of two value are compared and a third value is created in which all bits are turned on if either of them are on in the two component values

Overlay A subprogram that is kept on disk until the main program requires it. It is loaded into memory on top of some part of the main program, overlaying it.

Packet A group of bits that includes data and control information, an identification number, and error checking information, for transmission as a unit.

Page In video operations a page is a part of the video buffer that holds data for a single screen. The display can be switched

to show the contents of one page, and then another. The term page also refers to a 256-byte section of memory.

Patch An addition to a program to correct an error or to add extra functions.

Palette The selection of colors available in a particular video mode

Palette code A number that corresponds to a particular color from the available palette.

Palette register One of 16 registers in the EGA or PCjr that specifies the color that is

Common Chip Numbers

765 The floppy disk controller chip.
 6845 The video controller chip.
 8048 The keyboard microprocessor.
 8087 The maths co-processor chip in the PC, XT, and PCjr.
 8088 The Central Processing Unit (CPU) in the PC, XT, and PCjr.
 8237 The Direct Memory Access (DMA) chip.
 8250 The serial communications adaptor chip.
 8251 The programmable communications chip.
 8253 The programmable timer chip.
 8255 The peripheral interface adaptor chip.
 8259 The interrupt controller chip.
 76496 The PCjr's sound synthesizer chip.
 80286 The Central Processing Unit (CPU) in the AT.
 80287 The math coprocessor chip in the AT.
 82C431 Graphics controller chip.
 82C433 Attribute controller chip.
 82C434 CRT controller chip.
 146818 The chip in the AT that holds the real-time clock and configuration information.

displayed on the screen when its color code appears in video memory.

Paragraph A 16-byte unit of memory that begins from a boundary that is evenly divisible by 16.

Paragraph number A number that defines a position in memory by referring to memory in 16-byte units. Paragraph number 2, for example, refers to the second 16 bytes of memory, and when a pointer is directed at this paragraph, it points to the seventeenth byte of memory.

Parallel transmission A method of sending data between devices by sending bits simultaneously through separate wires.

It's faster than asynchronous transmission.

Parameter A number that is supplied as a specification for the performance of a device, operating system function, or programming language statement

Parameter block A group of variables set up in memory to hold information used by a device or operating system function

Parent Process A program that makes use of other programs (the child process).

Parity bit An extra bit that is added to every byte or word of memory in order to check for transmission errors by making them all odd or even. Parity bits are also attached to data in asynchronous communications.

Parse To resolve a text string into its component parts. DOS can parse command line information and reformat it for use by the file access functions.

Partition A section of a hard disk used by an operating system. A hard disk may be partitioned so that it can be used with more than one operating system.

Partition table A table included in the master boot record of a fixed disk. It contains information about the size and location of each partition

Path string A string used to identify a file in the file handle method of disk access. The string is in the same form required by DOS at command level. It may begin with a drive specifier, it may contain subdirectory names separated by backslashes, and it must be followed by an ASCII 0-byte to mark its end. The maximum string length is 63 bytes

Pel See pixel

Physical co-ordinates The co-ordinates of a point on the video display as measured from the top left corner, which has the co-ordinates 0,0 – also see world co-ordinates

Pixel A dot of video graphics. IBM refers to a pixel as a 'pel', for 'picture element'.

Pointer A variable that holds the address of another variable.

Polling Monitoring a peripheral device by continuously checking its status until a particular change comes about

Port A path through which data may be transferred between the CPU and its support chips.

Port A/B/C The three registers that programs can access on the 8255 peripheral interface chip.

Port Address A number from 0 to 65535 that addresses a port. Ports are accessed

LEXICON

by the IN and OUT instructions in assembly language, and by INP and OUT in Basic.

Printer interrupt A hardware interrupt that occurs when the printer adaptor sends a 'not busy' signal. The interrupt routine ordinarily sends a character of output data to the printer and then returns control to the CPU which allows the printer to operate while the computer is used for other purposes.

Program A sequence of instructions to direct the computer to perform a specific function or task.

Program segment prefix The 256-byte header that DOS places before all .EXE or .COM programs when they are loaded into memory. It contains variables used by DOS to manage the program, plus space for a file control block and data transfer area.

Prompt A symbol to show the beginning of a command line

Protocol The system of parameters and data formats used by a device

QWERTY see ASDFG.

RAM Random Access Memory is an integrated circuit that holds a computer's



read/write memory. RAM can be both written to and read – also see ROM.

Ramdisk A disk emulator that uses part of RAM as a disk drive. It is much quicker in operation than a physical disk, but all data is lost when the power is turned off.

Random block A block of records that are read or written by a single random file operation in the file control block method of file access.

Random record number The number entered into the random record field of a file control block. Subsequent file operations

convert the number into current block and current record values.

Raster The pattern of horizontal scanning lines on the screen of a monitor.

Real time operations Program operations that take place at a specified moment, rather than at whatever time the computer is able to accomplish them. Screen animation, alarms, and robots all use real time operations.

Record A block of data of specified size that is the unit in which information is output to or input from files.

Record number A number giving the position of a record in a file, counting from 0. For example, in a file that is organised into 10-byte records, record number 5 refers to bytes 50 to 59 of the file, even if there are no lower numbered records.

Register A place on a chip where data is stored or manipulated. In IBM microcomputers, most registers are either 8 or 16 bits long. Registers on the CPU receive values from memory and hold them while they are manipulated. Registers on the video control chip are initialized with data

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that set the video characteristics.

Relative address A memory address that is described as an offset from some point defined in memory. In .COM files, for example, variables are positioned at addresses that are relative to the starting point of the program.

Relative co-ordinate A co-ordinate that is fixed relative to the last co-ordinate used. For example, '6,7' indicates '6 to the right, then 7 up'.



RELOCATION

Relocation A process performed by DOS when an .EXE program is loaded. DOS calculates the base addresses from which all other addresses are offsets. These base addresses can not be set until the program is loaded because the position of the program in memory is not set until that time – also see .COM programs.

Reserved word A word that has a predefined meaning in a programming language and may only be used for that purpose in the language.

Request header A parameter block set up by DOS to control a device driver.

Resident program A program kept in memory after it terminates; also known as a TSR (Terminate and Stay Resident). DOS prevents it from being overlaid by subsequently loaded programs, which can access the routines it contains by means of interrupt vectors

RS The standard ASCII abbreviation for Record Separator – refer to the ASCII table.

RTS Request To Send – a signal from a communications port to a modem indicating that the computer wants to send data.

Return The expression 'on return' refers to what information is found in the CPU registers after an operating system function has been executed.



RI

RI Ring Indicator – a signal from an auto-answer modem to a communications port that tells when the telephone the modem is connected to is ringing.

ROM Read Only Memory is an integrated circuit storage device in which data is stored permanently and cannot be altered. The data in ROM remains intact even when the power to a computer is turned off.

ROM BIOS See BIOS.

Root directory The central directory on a disk positioned at an invariable location. It may contain file listings, a volume label, and pointers to subdirectories

RS-232C A set of standards specifying electrical and mechanical characteristics for interfaces between various devices; the interface usually consists of a 25-pin socket, each pin of which provides a specific function.

Scan code A code number sent from the 8048 keyboard microprocessor to the 8255 peripheral interface (or equivalent) telling which key has been pressed or released. The keyboard interrupt converts scan codes into ASCII codes, extended codes, and settings in the status bytes that keep track of the toggle and shift keys.

Sector A portion of a track on a disk which holds (usually) 512 bytes of data.

Seek time The time taken to position the read/write head over a specific cylinder or track on a disk – also see access time.

Segment A 64K area of memory set up to hold code, data, or the stack. Segments are always at 16-byte boundaries in memory, since they are derived by multiplying the value found in a segment register by 16.

Segment address An incorrect term used for both segment value and paragraph number.

Segment register One of four registers on the CPU that point to the starting positions of memory segments. The value in the register is automatically multiplied by 16 so that it points to one of the 65535 16-byte boundaries within the 1-megabyte CPU address space. The names of the segment registers are CS (Code Segment), DS

(Data Segment), SS (Stack Segment), and ES (Extra Segment).

Segment value A number that defines a position in memory by referring to memory in 16-byte units; also referred to as paragraph number.

Serial communications See asynchronous communications.

SI The standard ASCII abbreviation for Shift In (a bit to a register) – refer to the ASCII table.

Simplex The transmission of data in one direction only – also see full duplex and half duplex.

SO The standard ASCII abbreviation for Shift Out (a bit from a register) – refer to the ASCII table.

SOH The standard ASCII abbreviation for Start of Header – refer to the ASCII table

Software interrupt An interrupt brought about by a software INT instruction.



SOURCE CODE....

Source code A program as it is originally written, before it is compiled, assembled, or interpreted.

Spooling The procedure which allows the temporary storage of computer output; from Simultaneous Peripheral Operations OnLine.

Stack An area in memory that a program sets up to temporarily hold data. The last element placed on the stack is the first retrieved. A stack can be accessed more quickly than variables.

Stack segment An area of memory set aside by a program to hold the stack.

Start bit In asynchronous communications, a start bit precedes every word of data. It consists of a 0-bit, and it signals the end of the a series of 1s that fills in the variable time between words.

Starting cluster The cluster starting from which a file is recorded on disk. The file's directory entry points to the starting cluster, and the file allocation table keeps track of any subsequent clusters used by the file.

Start line The line at which the cursor image starts. For example, I4 horizontal

LEXICON

scan lines make up a line of text on the monochrome display, and these are numbered from 0 to 13. The start line for a normal cursor is 12, and the stop line is number 13.

Status byte A memory location that holds a bit pattern describing the current status of a device.



Status register An input/output register that holds a bit pattern describing the current status of a device.

Stop bit In asynchronous communications, stop bits follow every word of data. They place the communications line in a waiting state and hold it there for the minimum time that must pass before the next word is sent.

Stop line The line at which the cursor image stops – see **start line**.

STX The standard ASCII abbreviation for Start of Text – refer to the ASCII table.

SUB The standard ASCII abbreviation for Substitute – refer to the ASCII table.

Subdirectory A directory that is structured exactly as a **root directory**, except that it is held on disk as a file, rather than at **absolute disk sectors**. The root directory may contain entries that point to subdirectories, and these may in turn hold entries for other subdirectories.

Subfunction One routine of several performed by a **function** of an operating system interrupt.

Support chip Any of the major integrated circuits that connect the CPU to other parts of the computer or to external devices.

SYN The standard ASCII abbreviation for Synchronous idle – refer to the ASCII table.

Syntax The rules governing the structure of a command or a programming language.

Synchronous communications Serial communications in which the sending and

receiving stations transmit and receive data at a precisely synchronized rate.

System clock The crystal that supplies the underlying pulse that drives all circuitry, including the 8253 timer chip.

System file A special status that may be given to a file by way of its **attribute byte**. It marks the file as being part of the operating system.

Tiling When an area of a graphics display is filled with a pattern, rather than in a single color, it is said to be 'tiled'.

Time-of-day count A variable in the BIOS data area that is constantly incremented by the **timer interrupt**. Its value is used by the operating system to calculate the time of day.

Time Out An expression used in input/output operations to indicate that a peripheral device is not operating.

Timer interrupt An interrupt initiated by the 8253 timer chip 18.2 times per second. Each time it occurs the interrupt increments the BIOS **time-of-day count**.

Toggle switch An on/off switch (or key) which turns a function on the first time it's used, and off, the second.

Track A ring of disk space; 360K diskettes are divided into 40 tracks, and each track is subdivided radially into 9 sectors.

Tree-structured directory A system of subdirectories organized like the branches of a tree, where the first level of subdirectories are referenced by the root directory, and where those subdirectories reference more distant subdirectories.

TSR Terminate and Stay Resident – see **resident program**

US The standard ASCII abbreviation for Unit Separator – refer to the ASCII table.

Variable A label representing a value that changes during the execution of a program.

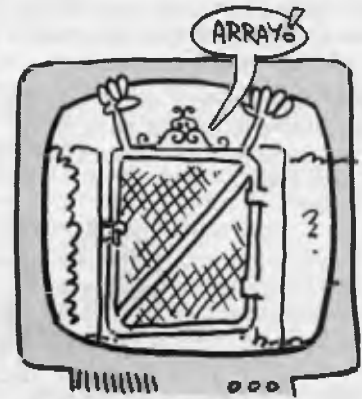
UART Universal Asynchronous Receiver/Transmitter – The device that converts serial to parallel digital data (and vice versa) so that it can be transmitted and received by a modem.

Vector The four-byte memory address of an interrupt routine. The higher two bytes give the **segment**, and the lower give the offset.

Vector Table A table of pointers. Interrupt vectors are held in 256 four-byte fields that take up the lowest 1024 bytes of memory. Each field holds the address of an interrupt routine.

Video Buffer An area in memory that is set aside to hold information displayed on

the screen. The color graphics card, for example, uses a 16K buffer. Video circuitry continuously scans the buffer, decoding the contents and projecting them on to the screen.



Video gate array A chip in the PCjr's video system that holds a number of control and status registers, including the **palette registers**.

Volume label A special directory entry used to provide an 11-character identifier for disks.

VT The standard ASCII abbreviation for Vertical Tab – refer to the ASCII table.

Wait state A time during the execution of a program when execution is interrupted for an input/output operation.

Word Generally, word refers to the size of the basic data unit used by a microprocessor. The term usually refers to a two-byte unit.

World co-ordinates A screen co-ordinate system used by software that describes the range of x and y co-ordinates; they can or cannot include negative numbers. These co-ordinates are mapped on to the screen's physical co-ordinate system, in which the top left corner is always defined as 0,0, and in which only positive numbers are used.

XON/XOR A handshaking method in asynchronous communications that uses ASCII characters 17 and 19, respectively, to signal to the transmitting station that it should resume or stop transmission. It is used when data is arriving too quickly to process.

XOR A logical operation in which the bit patterns of two values are compared and a third value is created in which the only bits that are turned on, are those in which only one bit is on out of the two compared.

ZXCVB see QWERTY



PC Demonstration

- produce your own slideshow!

As Ken Miles of AMSEC found, the PC Demonstration System is a bargain-priced (but limited) microcomputer presentation package.

THE PC Demonstration System produces a 'slide show on a microcomputer'. Like a slide show, it exhibits a sequence of static screen images (or overhead images, if you are lucky enough to have the necessary hardware). Unlike a slide show it displays only text images. In its favour, these images can be organised into very useful preset or viewer chosen sequences.

In order to do this PC Demo requires IBM PC compatibility, at least 256 kilobytes of RAM and DOS 2.0 or later.

The package consists of three modules. First is the Screen Formatter which enables you to manufacture and store text screens. Enhancements such as a choice of foreground and background colour, blinking text and boxes around text are available. Then, with Demo Maker you set the order, timing and key-initiated branching within your demonstration. Lastly, Demo Run takes the product of the other two modules and initiates and supervises your presentation.

User interface

PC Demo is easy to get along with right from the start (this virtue is lacking in

IBM's PC Storyboard, but that reflects the difference in power and flexibility). The user interface is well designed and a well written, 17-page, printable manual accompanies the package on disk.

Demo Maker, in particular, is great fun. With imagination you can make the key-selected branchings between screens very complex. It helps to prepare a sketch plan of the logical interconnections between screens that you want. It is easy to get lost, but you can print the sequence file and untangle yourself with a little pencil work.

Where a computer is already in place in the lecture room or microcomputer laboratory, this package provides a convenient means of presenting information screen by screen. The screen sequence could be back-tracked for review or branched to screens of interest to the individual viewer. I can imagine employing it to provide students with a self-paced and self-directed introduction to an unfamiliar application on a microcomputer. This could be accomplished by running the demonstration in a batch program.

A drawback for such a use is that the demonstration can only run in the 'fore-

ground'. A desirable development would be to enable its use as a co-resident background facility. This would permit the provision of flip-up help screens without having to curtail the application.

The screen images are not saved as ASCII text files but in a form intelligible only to PC Demo. This effectively prevents importation of screen text and reduces the user to having to key in every screen under Screen Formatter. Also, this version (2.0) has no facility for manufacturing or capturing graphic screen images. This is promised for later versions.

The big hitch

The version available on the Public Domain has been hobbled; it is only capable of producing demonstrations consisting of ten or fewer screens. For \$US35 the authors will provide an unhobbled version. It's like one of those sample sachets of shampoo you occasionally get in your mail.

For my part, I'll enjoy the use of the sample but I am not sufficiently impressed to buy a whole bottle. □

AMSEC

This review was prepared for AMSEC, an Australian software evaluation group with consultants in the workplace, schools and tertiary institutions around Australia. It can be contacted at PO Box 140 Hurstbridge 3099 Vic. or PO Box 1339, Armidale 2350 NSW.

Product Details

Product: PC Demonstration System
PC-SIG Disk 665
From: Public Domain
Distributor: Manacomm Pty Ltd, PO Box 509, Kenmore 4069 Old (07) 374 1311; Viatel *4900
Price: \$13 per disk plus \$5 postage and handling for any number of disks.

Screen Formatter - which allows you to create the screens for your demo.

Demo Maker - where you create a file that defines the order in which the screens will be displayed, along with the keys used to control execution of your demo.

Demo Run - which executes your demo using the file you created with Demo Maker.

Figure 1. The three modules to The PC Demonstration System.

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COMPARISON OF DFI HS-3000, vs SKYSCAN		
Company Model Name	DFI HS-3000	SkyScan D-15
Design:		
Easy Hand Held	Y	Y
	Right Hand Right Hand or Left Hand	
Software:		
1 Utility	Y	Y
2 Halo DPE	Y	No
3 OCR Format	Y	Y
4 OCR Software	Y (option)	No
Scanning Display:		
1 Continuous Display	Y	No
Image on Monitor	Y	No
2 Scanning Display on Scanner Window	Y	No
Hardware:		
1 Scanning Width	4 125"	4 125"
2 Scanning Height	10"	10"
3 Resolution (DPI)	400/300/200/100	200
4 Grey Level	32	16
5 No. of dithers	4	2
6 DMA required	Y	Y
7 Interrupt Selectable	Y	No
Image Format:		
1 Paintbrush	Y	Y
2 Dr. Halo	Y	Y
3 Page Maker (TIFF)	Y	Y
4 Window Paint (MSP)	Y	No
5 GEM, Ventura (IMG)	Y	No
Mouse support:		
1 Microsoft mouse	Y	No
2 Mouse System mouse	Y	Y
3 Microsoft compatible	Y	No
4 M.S. compatible	Y	No
5 Mouse Driver support	Y	No

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A smooth-rolling and dirt-resistant ball allows the DMS-200 Mouse to easily glide along any flat surface. Since the DMS-200 Mouse is compatible with popular software such as HALO Paint and Graph, PageMaker, EasyCAD, PC Paintbrush, and Windows, it can be used to quickly edit text and manipulate data and graphics.

The DMS-200 Mouse package comes with the mouse, a user's manual, and a utility disk containing programs which include a diagnostics program and two mouse driver programs.

HALO PAINT AND GRAPH

Paint Features:

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- Lasso
- Advanced Printer Capabilities
- Colour Swapping
- Palette Editing
- A supplemental "GRAB" program
- Supplemental PRESENTS program
- Virtual Page ability

- Text Composition
- Images Scaling
- Curve Fitting
- Menu Switching
- Fat Bit Editing
- Symbol Creation
- Image Rotation
- Non-Destructive Image Movement
- Snap Grids

Graph Features:

- Data Entry Options
- Many Chart Styles
- 18 Font Styles
- Line width with Flexibility Styles
- Many Graph Size

The DM-200s Mouse Package

It is a 3 button Mouse, both Microsoft and Mouse Systems mouse compatible. Of an excellent design, similar to the 2nd generation Microsoft Mouse, it is delivered with a mouse-pad and HALO Paint and Graph III Software.

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Moffatt's Minimum Modem...

READERS of this magazine will know of all those bulletin board systems springing up all around the country. There were hundreds listed in the October issue. They are an excellent source of cheap or free software for a variety of computers; you can transfer messages to other people all around the world, and, as well, they're jolly good fun!

We'll leave the explanation of the joys of bulletin board operation to the experts, but I'd like to tell you how to get your computer on the air with a minimum of fuss and expense.

You will, of course, need a hardware modem device; a gadget that converts digital signals from your computer into audio tones that can be sent down a phone line, and *vice versa*. These can cost anything from a couple of hundred dollars to thousands. The cheapest way out may be to consider building one from a kit.

The one I use is homemade, and fits in a box the size of two cigarette packets stuck together. Unfortunately, it is based on an older chip that only supports 300 baud operation. With 1200 baud becoming more and more popular, my little modem looks like it's facing a major rebuild.

But that's another story; what we're on about here is the software to drive the hardware device. Again, 'modem' or communications programs come in all shapes and sizes, and all prices. What you will read about here is how a confirmed cheapskate overcame the modem software problem. Some salient features of Moffatt's Minimum Modem –

Cheap – \$US20 if you do the right thing, free if you don't;

Small – Whole thing fits on one floppy

Confirmed cheapskate Tom Moffatt tells how to get your computer on the air with a minimum of fuss and expense.

disk, with plenty of spare room for software you download;

Fast – Uses the mightiest file transfer system known in this universe, or any other. Like the sound of that? Pity I can't claim credit for writing the software; all I did was collect it and sticky-tape it together, so to speak. But since I've got the system going, it's the only modem program I use now.

DSZ.COM

MOFFATT'S Minimum Modem (MMM) is based on a protocol driver program called DSZ.COM. It supports several file transfer protocols; the latest super-efficient Zmodem, the earlier Ymodem, and the traditional Xmodem that most of us started out with. The MMM package uses only the Zmodem feature, since all the bulletin boards I communicate with support it, and it is the fastest file transfer method. Speed is very important if you're stuck on 300 baud, as I am at the moment.

So what's this 'protocol driver' business? If I may quote from the DSZ documentation, 'DSZ is designed to be called from a communications bulletin board program. DSZ may also be called from

other communications programs, but the combination lacks much of the enjoyable user friendliness of a program with integrated Zmodem.'

Aha! DSZ is an accessory, not a stand alone program. It is meant to be 'called' from within some other communications package, such as ZCOMM, ProComm, or as a background operation from something really flashy like DesqView. It is also meant to be hooked into the bulletin board end of a communications link, so when you ask your favourite BBS for a download using Zmodem, it's probably using this very program. DSZ talking to DSZ.

DSZ is certainly not meant to run on its own. This could be done, since DSZ can parse a command line, but the syntax it looks for is absolutely horrid. I may be a bit feeble, but it took me literally hours of pouring through the documentation to figure out how to make DSZ do its thing. That's when the idea of the BAT files came about. Read on, MacDuff!

ProComm, mentioned above, is among my collection of software which will never be used but I can't bear to throw away. It's a flashy comms package with windows that explode out of the screen, accompanied by a little squeak (somebody forgot to oil the windows, maybe?). I've spoken with many people who swear that ProComm is the greatest comms program ever, but I'm afraid it's just not my style. Too big and complicated. Too hard!

PROCOMM.EXE is 143 kilobytes long, and there are several other files that have to be present for it to work. It's documentation file is 190 Kbyte long! If you now hang onto the DSZ program at 49 Kbyte,

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you've got yourself a *big* package. However, if you chuck out the ProComm part, and just keep DSZ, the size becomes more reasonable.

Other than looking at the pretty windows, what do we really use a modem program for? We log onto a bulletin board and tell it who we are and what we want. We then either read the bulletins therein, or transfer files up and down the phone line. Sometimes we chat with other users of the board. We send and receive electronic mail. DSZ, set up as Moffat's Minimum Modem, can do all these things. What it *can't* do is 'capture' what's coming down the line; that is, save everything, dialog and all, into a disk file. If you can do without a capture facility, then MMM will serve you well.

The trick . . .

THE TRICK is to eliminate a big, bloated 'front-end' program, yet still retain an easy way to tell the DSZ program what is required of it. This is done by using several BAT files, each one representing some function we want MMM to perform.

For those of you who haven't explored BAT files, briefly, they are lists of instructions which are carried out in turn, just as if each one had been typed in from the keyboard (see John Summerfield's article 'Going BATty' in YC, Oct. '87 for info on tricks with BAT files) So, if you wanted to have an automatic way to switch to drive A:, clear the screen, produce a directory of drive A:, and then return to drive B.; you could use your text editor to produce a simple list thus -

```
A:
CLS
DIR
B:
```

You could then name the little file DO-IT.BAT From then on, any time you typed DO-IT and DO-IT.BAT was on the logged drive, the list of instructions would be carried out. You can also feed external information into your BAT operation from the DOS command line, and you can even use special instructions to cause BAT files to make decisions based on other operations. But for our purposes, we're keeping it dead simple. Note that the MMM technique also requires the MODE.COM program from your DOS disk to be present on the MMM disk, as well as DSZ.COM and the BAT files.

There is a special batch file, AUTOEXEC.BAT, which is a list of instructions every MS-DOS computer looks for when it first

This Autoexec file gets your computer up and running, and then displays the BBS names and commands available -

```
AUTOEXEC.BAT
mono
timer/s
dir a:* .bat
```

This file initializes your comms port hardware with the parameters for the BBS you want to use and then puts your computer online. One file is required for each BBS. Downloading is automatic to your logged disk drive, once you request it from the BBS -

```
HUBB.BAT:
echo off
echo *Hobart Users' Bulletin Board, 43-5041*
a:mode com1:300,N,8,1
a:talk
```

To upload a file or files, exit the DSZ program (F1). Then from DOS type SEND <filename ext>. When the upload is finished SEND.BAT puts you back online with the BBS -

```
SEND.BAT:
echo off
echo **** Type ALT-N to abort! ****
a:dsz d sz %1
a:dsz d t
```

This file puts you back online after you have exited DSZ without uploading anything; for instance to DIR your data disk -

```
TALK.BAT:
echo off
a:dsz d t
```

Batch (.BAT) files to turn the DSZ, COM Zmodem driver into a simple, but complete, communications program.

boots up. If you now look at the first of the examples, you'll see - wait for it - AUTOEXEC.BAT. The first instruction in the list is mono, which calls a small program to select the mono/graphics adapter (I use both this and a CGA in the same computer). The next instruction, timer/s, sets up the correct date and time from the real-

time clock. And then comes your little menu: dir a:* .bat shows a list of all the BAT files on the A: drive. This is, in effect, a list of commands that MMM is prepared to respond to: select which BBS is to be used, TALK with that BBS, or SEND it files. (AUTOEXEC isn't really meant to be a command, but if you type it, the clock and screen will simply re-initialize. Nothing harmed!)

Note that Moffat's Minimum Modem is configured so that the program disk must be in drive A:. (Well, it's got to be somewhere, hasn't it?) You can then use the same disk for uploaded and downloaded data, or you can use some other drive.

BBS session

NOW LET'S work through a BBS session. First we select the BBS we want to work with, using as an example a popular one in Hobart. We type HUBB and the list of instructions in HUBB.BAT is carried out. Echo off simply stops DOS repeating the instructions back at you. The next line, another echo command, causes the rest of the text on the line to be printed on the screen. Then the MODE.COM program is called on to set up your computer's comms port with the correct baud rate, parity and so on, for the bulletin board in question. Last, HUBB.BAT calls another file, TALK.BAT. So far, the only visible operation of HUBB.BAT's operation is a message giving the name of the BBS and its phone number. Remember that HUBB stands for 'Hobart Users' Bulletin Board', so the file name and contents for other BBSs will be different. You should produce your own <bbsname>.BAT file for each BBS you use.

Now to TALK.BAT. This one stops the echo, and then fires up DSZ with the parameters required to kick it into the 'talk' mode, in which you type back and forth with the bulletin board. As DSZ comes up you will see a large 'commercial' fill the screen.

This is the software author's appeal for you to send him twenty bucks to register your copy of DSZ. If you do, you'll get is another program called PUTSNP which inserts a 'serial number password' into your copy of DSZ. This short-circuits the commercials, as well as enabling a few extra features, such as the ability to handle ANSI graphics.

I must admit I couldn't resist the challenge of doing a small hack on DSD to kill the commercials myself. I found them and got rid of them, but when I then tried to run DSZ I got a nasty message about peo-

COMMUNICATIONS

ple who hack programs, followed by an immediate exit.

Once in the talk mode, you will see, above the commercial, the bulletin board's name and phone number written there by <bbsname>.BAT. The phone number has been put there because MMM isn't an auto-dial program. You will have to swallow your pride and dial the number yourself. My phone has a little keypad for this very purpose, mounted between the talking part and the listening part. You look at the number on the screen and punch the buttons, and when you hear a tone in your ear you throw your modem switch to DATA and off you go. What could be simpler?

Let'er rip!

AFTER YOU have exchanged pleasantries with the BBS on the other end, you are ready to download some files. With the popular Opus bulletin board software, you request this by typing 'd' for download, then 'z' for Zmodem protocol, and then the filename you want. The BBS will then ask you to begin receiving, but, with DSZ running, you sit back, fold your arms, and do nothing. It's all automatic! DSZ will receive the filename from the BBS, establish a file with that name on your logged disk drive, and then tell the BBS to let 'er rip.

To upload material to the BBS, you must first tell the BBS to prepare to receive. With Opus the commands are 'u' for upload, and 'z' for Zmodem. When you're told to begin sending, you exit DSZ by pressing F1 and then, from the DOS prompt, type SEND <filename.ext>. You can specify a drive identifier, and wildcards are quite okay. So you could send something like all the .TXT files on drive B

SEND.BAT now comes into play, first echoing a message to the screen, reminding you how to bail out if something goes wrong (Alt-N for Nuke!). It next calls DSZ in the 'send' mode and transfers your filename to DSZ's command line.

The MMM package uses only the Zmodem feature since it is the fastest file transfer method.

Since DSZ has just been re-started, you will get the commercial again, followed by progress reports as the upload(s) are taking place. When the transfers are finished, DSZ will terminate, but SEND.BAT will re-start it once again, this time in the 'talk' mode. And – you guessed it – you're going to get the commercial again. It's just like trying to watch a movie on television!

Here is something you must take careful note of while uploading: when the upload is finished and DSZ is spraying its commercial all over the screen, the BBS is sending you a message asking you to describe the file just sent. Since DSZ isn't quite ready to listen, *you will miss this message*. When DSZ finally says it's talking, the BBS will be sitting there waiting for an answer to the question you never saw. That's all right, just type in your descrip-

tion. If you've sent multiple files (to Opus, at least), you will be asked to describe each of them in turn.

Finally, TALK.BAT. This file, normally called by the other .BAT files, can also be called on its own to get you back online after you've left DSZ to check space on your disk, or do a DIR or whatever. This will, of course, result in a display of the commercial yet again.

Further developments

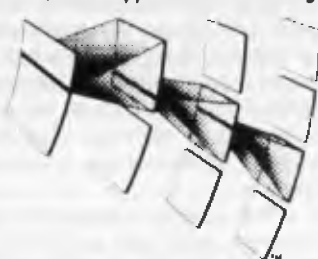
THE MOST fruitful improvement to MMM would certainly be to register DSZ to get rid of those miserable commercials. The program's author certainly found a powerful way to extract his registration fees; you pay your dough to shut the thing up! If the commercials were gone, I feel DSZ would produce a very snazzy, no-nonsense communications package. While it's actually running it seems to be totally faultless. I've been using it as MMM for quite a while, and it's never yet produced a dud transfer.

If you type 'DSZ' from DOS, with no parameters, it will produce (after the commercial of course) a list of its commands and features. You could use this information to expand the MMM system to provide Ymodem and Xmodem transfers with BBSs that can't cope with Zmodem. If you plough through the instructions, you will also discover such interesting features as 'crash recovery', apparently a way to pick up a ruined transfer in mid-stream.

As for the matter of 'captures', or lack thereof, I'm trying to come up with a lazy man's way of achieving them. There is probably a way to write a program to copy everything coming through the comms port into a disk file, but I haven't tried yet. I seem to spend too much time playing with bulletin boards! □

NEW VIEWS

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A cure for AT amnesia . . .

FOR SEVERAL years I have been the proud owner of a 10 MHz AT clone. (Who can afford the real thing?) I am extremely happy with its performance, with one minor exception. The internal clock forgets the date and time on a regular basis. All of the other data that is retained in the CMOS RAM is remembered, but the date and time go missing, particularly if the computer hasn't been used for several days. On talking to other clone owners, I have discovered that this is a common problem with the multi-speed AT clone boards.

Some readers may not fully appreciate the use of the date and time feature of a real-time clock, so I will take a little time to explain why it's so handy. Firstly, any file that is created on the computer (for example, this short review) is marked with the time and date from the system clock. This helps when you are searching for a file that was created before/after a certain date.

Also, most of the hard disk back-up routines (including DOS 3.xx) allow back-ups of files created after a certain date. Utility programs (such as Norton's) also allow the sorting of directories, based on time and date. As a minor plus, most word processing packages nowadays allow the incorporation of the time and date into a current document.

Xecom

NOW - Xecom, a US-based company that specialises in making sockets that contain a battery back-up circuit (for use with CMOS RAM chips), have incorporated a real-time clock circuit into one of its battery-backed sockets.

These sockets have a data retention time of ten years with the power removed, so a few days without being switched on are negligible. The complete socket is designed to fit under one of the ROM BIOS chips, so there are *absolutely* no circuit modifications required.

The biggest problem I had in installing the socket (it took fifteen minutes) was actually removing all the gear close to where the BIOS chips are located. I had to remove the cables from the hard disk, unscrew it and slide it partially forward, in

Rob Hill has found the cure for clones that can't remember the time or date!

order to get at the BIOS chips. I gently removed one of them (it doesn't matter which of the two you use), inserted the socket - being careful to align the notch in the correctly and then re-inserted the chip

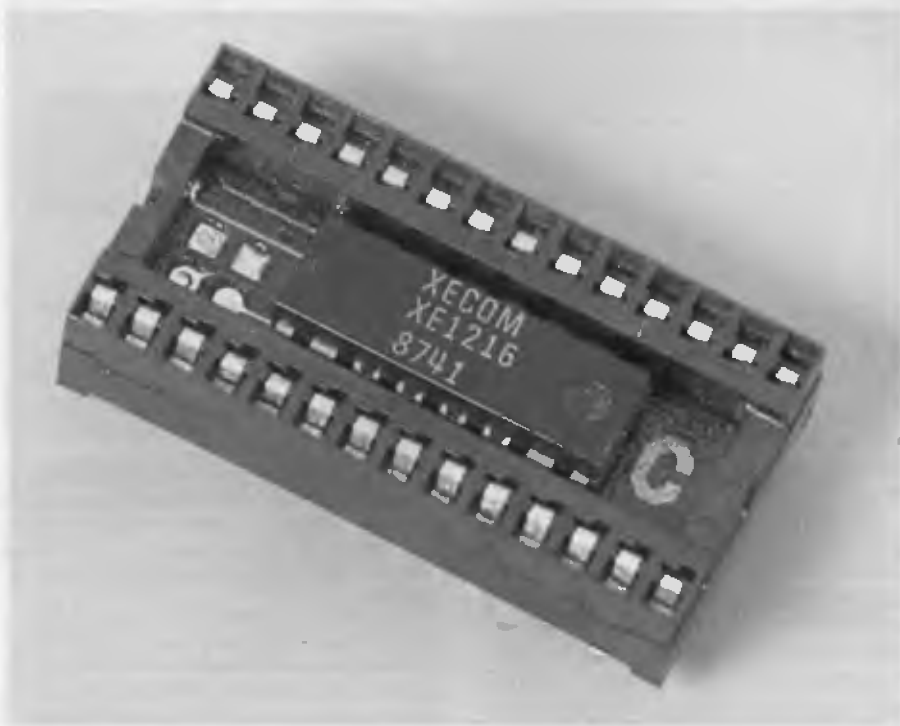
Product Details

Product: Xecom XE1216E SmartWatch
Distributor: Energy Control,
26 Boron St, Sumner Park 4074 Qld.
(07) 376 2955
Price: \$49.95 taxed

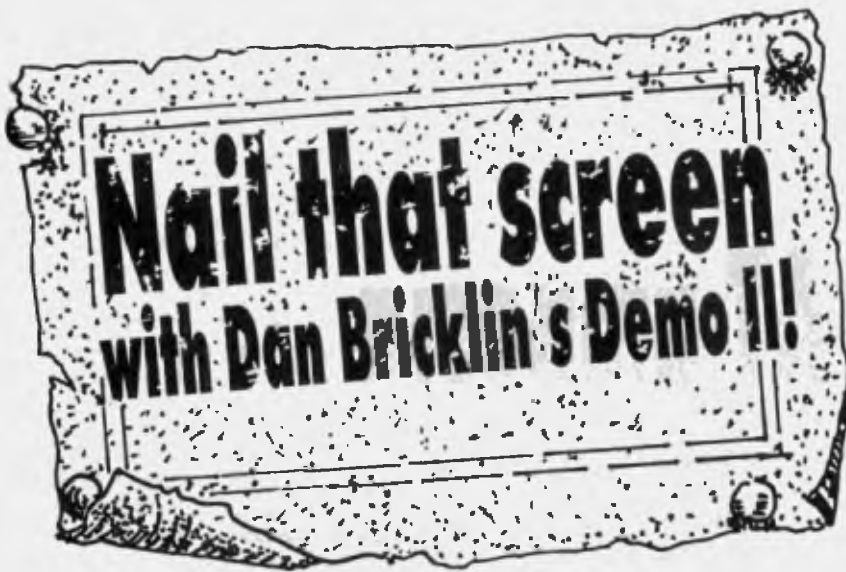
in the now slightly higher socket.

The Australian distributors, Energy Control, supply a software installation package and complete instructions on a 5¼ inch disk. I merely re-positioned the hard disk and its cables, closed the lid, switched on the power and copied everything from the floppy disk supplied to a directory called CLOCK on the hard disk. Running the install program set everything up and going. An additional program supplied on the floppy, called KLK.COM, sets up a digital clock in the top right hand corner of a CGA display (KLK.COM doesn't work with a monochrome display).

If a clock that doesn't develop amnesia is important to you, then the Xecom XE1216E SmartWatch is well worth the money you need to buy it. It also overcomes the problem of loss of time and date whenever the CMOS configuration is changed on-line. □



Many AT clones regularly forget the time and date - this battery-backed socket with a real time clock cures that amnesia.



Computer-based training, presentations and interactive displays can make full use of graphics with this functional utility. It's especially useful for tutorials and demonstrations based on CD-ROM technology.

DAN BRICKLIN'S Demo II is produced by Peter Norton Computing, the company that also gave us Norton's Utilities and Norton's Commander, both of which make life a lot easier for many DOS users.

Demo II is used to capture text and graphics screens from other programs as slides, and run a controlled sequence of slides together as a slide show. Almost anything that can be displayed by a DOS machine can be mimicked by Demo II, as well as many of the user's actions, including input from the keyboard, mouse activity and menu selection.

Slides can also be easily constructed from scratch using the menu system which is quite easy to use, and can be quickly grasped. Sub-menus allow full manipulation of all the elements that are available within the IBM text mode, including straight line drawing, flashing characters, inverse display and selection of foreground/background colours (for an explanation of the differences between text and graphics displays, see the box item).

Construction of mock up screens is quite easy once the menu commands are understood. Boxes can be quickly drawn using the cursor keys, and there are block editing commands for altering display attributes and for moving things around. As you would expect, the on-screen tutorial that comes with the program is a good place to start. Overlays can be written for existing text slides like a series of transparent acetate sheets. The slide show can

be run with slides following one another or pausing for user-input from the keyboard. Display timing, pausing, slide sequence changes and sounds can all be controlled. For the more advanced user with some programming knowledge, there is a long list of run actions, including IF and WHILE loops to give even more control over the slide show.

Text and graphics modes

THE IBM compatible PC displays text and graphics differently. For most displays, a text screen consists of 2000 character positions (25 rows of 80). Each position displays one of the 256 possible characters in the IBM extended character set (letters, capitals, numbers, box lines, special language characters, smiling faces and so on).

In addition, each position can display a character in any of 256 attributes, such as blinking, inverse and blue on red). Your monitor and your computer's display adapter determine which attributes actually show.

A graphics screen, on the other hand, displays an image as a matrix of pixels. This mode is also known as a bit-mapped display. With a 640 x 350 EGA display, there is a total of 224,000 pixels (picture elements) of different shades or colours that make up the matrix.

Nail that screen!

ONE OF the most useful components of Demo II is the capture program – two keystrokes and a text or graphics screen is captured in RAM (the default hotkeys are Left and Right Shift). To experience the speed and efficiency of this feature in action is quite amazing! First load Capture into memory; it stays there in the background, similar to other TSR (terminate and stay resident) programs such as SideKick.

You can then run any other program, such as WordStar, dBase, spreadsheets, or graphics applications, and at any time you can capture the screen image by pressing the hotkeys. All that happens is that you hear a 'beep', to confirm the capture has worked; if you hear a higher pitched sound, it means there is not enough memory, or the screen mode is unknown to the program. The actual save takes just 1/18th of a second. Several screens can be saved in this way, one after the other.

To place these captured programs into a slide show, select the input/output item from the main menu. Then, select 'retrieve' and the screen images are transferred into the Demo II slide show. I tried this with several graphics programs, including PC Paint, the Magician, and PC Paintbrush, and Capture worked well enough (as long as I remembered to select the 16-colour mode when invoking Capture in the first place – if I didn't do this, I ended up retrieving black and white graphics screens).

But what is the use of all of this flashy capturing and manufacturing of screens? An effective use for Demo II is for training novices to use particular programs on a PC. To do this, you activate Capture, then run through the steps to use such as dBase or a word processor, capturing screens each time the display changes (this can be done automatically). The whole sequence, including entry into the program, selection of menu items, entry and retrieval of information, saving to disk and exiting can then be run as a slide show.

The level of mimicry is absolute, since Demo II uses the same text screen as any other text screen application. It looks for all the world as if the actual dBase, or WordStar or whatever, is running right there before your eyes. Tutorial prompting can be added to the slide show using the overlay feature, so the new user can be guided through the learning process quickly.

Computer-based training has certain

DEMO II

advantages over classroom or even one-on-one training: the training program can be re-used many times to train any number of new users; the program can be at hand for student revision at any time; training can be altered when updated versions of a product arrive or other changes are made to an application, and schedules for training can be much more flexible. There is a program called RDemo2.EXE included with the package that will run slide shows (but not edit them), which can then be copied under the license agreement for use by third parties. This means you can legally have as many copies as you like of a tutorial.

A singing, dancing PC?

FOR MORE elaborate practices, such as desktop presentations, a number of special effects can be introduced into the slide show. Scanned graphics, such as company logos, can be added to make the presentation more spectacular, and sounds (limited to beeps, burps and simple melodies) can also be inserted at appropriate places.

An application for Demo II I saw recently, used the program to put comments on captured spreadsheet images which are passed from office to office. It's also useful for designing and printing forms. Developers and programmers could get the most from Demo II – in fact, one suspects the program was originally designed for their use only. A programmer who would like to see what a project will look like onscreen can try out ideas without having to go to all the trouble of writing and compiling the actual program.

A lot of the power of this program comes from its ability to hold many slides in RAM. This allows quick and smooth switching between slides. Supplied compacting routines replace repeated characters, attributes, or groups of pixels with a repetition count and one byte. Since many screens are composed of repeated elements, this saves a lot of space. For example, an all-blank slide takes up only 96 bytes, text screens take 300 to 4000 bytes, while a high resolution colour EGA screen can take up to 127 kilobytes. In practice, I found that 16-colour, graphics screens used around 30 Kbyte.

Most of the time Demo II is a well behaved program, with a user-friendly menu structure and a comprehensive manual to guide the user through difficult bits. But, there are some surprising faults such as the 'Fatal Error' message that pops up if you attempt to load a large slide sequence



Figure 1. Using the editor, slides can be made up from scratch using the full range of characters and attributes available from the IBM text mode.

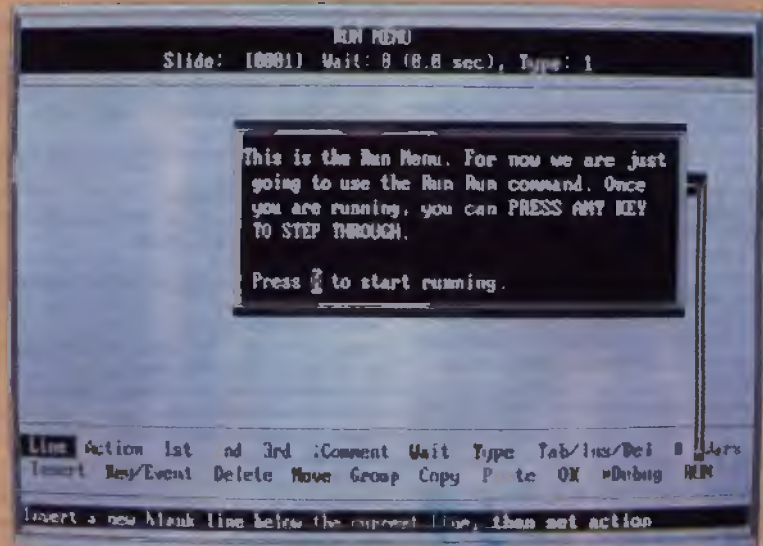


Figure 2. Demo II is ideal for tutorials. This is a screen from the Demo II demo.

when running low on memory. It prompts the user to press the Enter key, upon which you are unceremoniously dumped back to DOS. An out of memory message should be less brutal than this!

The manual is quite thorough, but it tends to be too dense in places, making it difficult to quickly grasp the concepts behind the program. The program itself is certainly flexible enough to allow for all sorts of configurations within the slide sequences. But to access the more advanced features, you definitely need to be familiar

with programming concepts. Demo II is not a program for the novice, but it can be used by the more experienced computer user with effective pleasing results. □

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Computer Connections - Part 2

FROM THE outset, the Macintosh was an 'unconventional' system, to say the least. The rather unusual shape of the machine, its graphics-based user interface and accompanying mouse, as well as the marketing emphasis on software, rather than hardware features, set this machine apart from the crowd.

So, it wasn't surprising that the designers of the Mac saw fit to use a different form of serial port than the established RS-232C used by virtually every other computer system. The Mac serial port is claimed to conform to the RS-422 standard, although the use of a 9-pin D connector allows the implementation of only a small subset of the signals defined by the standard.

All is not lost, since it is possible to set up a link between a Mac and another system using an RS-232C port, without any exotic circuitry to convert the signals between the two standards. If you are skeptical, note that Apple sell a ready-made Mac to RS-232C cable. If you only need to transfer files between the two systems occasionally, a serial cable is a much more economical alternative than options, such as a full-blown network or an extra disc drive on one system which supports the disc format of the other.

The DB-9 socket on the first Mac was later replaced on the Mac Plus and SE with an 8-pin round affair, resembling a miniature DIN socket. This connector is also used on the Apple IIGS for its modem and printer ports - see Figure 1.

If you are using one of the miniature 8-pin DIN plugs, you will need to take great care with your soldering. There is not much room for error, and too much heat will melt the plastic in the plug, turning it into a useless molten blob. I suggest you solder the inner pins before the outer ones, otherwise you may end up soldering yourself into a corner. In any case, a fine-tipped soldering iron and a steady hand are mandatory.

Figure 2 illustrates 'straight-through' cables for the two types of Mac serial port, to allow standard RS-232C peripherals to be used with a Macintosh. Because of the lack of handshaking lines on the Mac serial connector, the computer is unable to monitor the state of the link via the carrier detect line.

Want to connect a Mac to a PC without exotic circuitry? A parallel printer to a serial port? Add an external floppy drive or extra hard drive? Lengthen keyboard and monitor cables? Then - you need Mark Cheeseman's connections!



The construction of a disc drive cable is a simple affair - only a length of ribbon cable and an insulation displacement connector are needed; no soldering is required and all connections are straight through.

Part 1?

THE FIRST PART of 'Computer Connections' appeared in our October, 1988, issue. We covered mechanical considerations, solderable connectors, crimp connectors, cables, serial links and null modems. If you missed it, refer to the Services page on how to obtain back issues.

This is not a major problem, as most modems these days are intelligent enough to know what to do if the carrier disappears during the course of a session. Many have a dip-switch to allow the modem to ignore the RTS signal, and this should be set appropriately. If this is not possible, then you may have to tie pin 4 of the modem connector to pin 20, which will ensure that RTS is true whenever the computer raises DTR. If that doesn't make sense, refer to Part 1 in the October, 1988, issue.

These small round connectors are not as easy to obtain as the more common varieties, but they are available. I obtained one from David Reid Electronics in Sydney, but they are also distributed by Arista Electronics, so they should be available from many outlets.

Centronics printers

LET'S TURN our attention now to another very common connection used with PCs, the so-called Centronics printer standard. As is the case for RS-232C serial connections, the Centronics port on many computers and printers can vary widely; although it is usually much less troublesome to get a parallel printer happening than is the case with its serial counterpart.

In contrast to serial communications, which minimises cable cost at the expense of speed, the parallel alternative is capable of running at quite high speeds. This is achieved in a couple of ways. The most obvious is that each data byte is sent down 8 wires simultaneously, 1 bit per line. For a given signaling rate, this corresponds to an eight-fold increase in speed - the same ratio that results from switching from a 300 baud modem to a 2400 baud model!

In fact, the actual speed gain is even better than this, because a parallel printer does not have to communicate with the computer at a pre-determined data rate. Briefly, a serial data stream must conform to relatively strict timing constraints, in order for the receiving end to be able to accurately extract the data. Although the transmitter and receiver are re-synchronised at the beginning of every byte, speed variations beyond a few percent start to cause framing errors. These are detected when the receiving end fails to

detect a valid stop bit at the end of the frame (or byte).

This strict control over timing, as already stated, is not necessary in the case of a parallel interface. When the transmitting device (in other words, the computer) has a byte of data ready, it sends a pulse on an extra wire, known as the strobe line. This pulse is the signal to the receiving end (the printer in this case) that a valid byte is ready to be printed or loaded into the printer's internal buffer. When the printer has read the information on the 8 data lines, it acknowledges receipt of the data on, you guessed it, the acknowledge line.

Thus, the overall speed of the parallel data link depends almost entirely on the ability of the computer to send the data as fast as possible, and the printer to grab the data and signal the computer for more. This scheme ensures that the link operates at, but not beyond, the maximum speed of the slowest device. If the printer has a suitably large buffer built-in, or if an external buffer is used, then the whole file may be downloaded to the printer as fast as the computer can send it.

Since parallel printer connections are intended strictly for very short-haul applications, a couple of extra wires over a distance of a few metres makes virtually no difference to the cost of the link at all. In fact, a few extra lines are often added to printer interfaces to provide the computer with error information, and to allow the computer to reset the printer to its power-up condition, amongst others.

Centronics connectors

AS FOR D-type connectors, Centronics connectors are available in both solder and IDC varieties. However, not many computers these days have an actual Centronics connector for parallel printers, but usually use some form of less expensive connector, and use a specialised cable for the purpose of connecting the printer to the computer. For example, IBM PCs and compatibles use a DB-25 socket for this purpose (see Table 1), which has caused its fair share of confusion with serial ports!

For this reason, IDC Centronics connectors are of little use for applications, other than making up an extension for an existing cable. The exception to this is where the connector on the computer has the various signals in the same physical order as on a Centronics connector, or is itself a Centronics connector.

To connect a Centronics printer to an IBM PC compatible, you need the obvious connectors for each end of the cable, and, of course, an adequate length of suitable cable. The Centronics standard specifies that the 8 data lines and 4 of the handshaking signals should consist of twisted pairs, which results in better performance at high speeds. The down side of this of course is that you need 24 wires instead of the 13 that would be required in the case of a common return line.

Signal	Centronics Connector	DB-25
Strobe	1	1
Data 0	2	2
Data 1	3	3
Data 2	4	4
Data 3	5	5
Data 4	6	6
Data 5	7	7
Data 6	8	8
Data 7	9	9
Acknowledge	10	10
Busy	11	11
Paper End	12	12
Select	13	13
Auto Feed	14	14
Error	15	15
Initialise	31	16
Select Input	36	17
Ground	16, 19-30, 33	18-25

Table 1. Not many computers these days have an actual Centronics connector for parallel printers, but usually use some form of less expensive connector, and a special cable for the purpose. These are the IBM/Centronics parallel port pinouts. Note that the Centronics standard specifies that the 8 data lines and 4 of the handshaking signals should consist of twisted pairs to give better performance at high speeds.

Because a DB-25 obviously has less pins than a 36-pin Centronics connector, something had to be sacrificed. Clearly, to provide twisted pair signals for these 12 lines would only leave 1 pin for all the other handshaking lines. For this reason, the DB-25 port only has 8 ground lines to

serve the 17 signals traveling between the computer and the printer.

Thus, for any cable to be considered 'suitable', it must allow for these 17 signals, plus at least one earth return; giving a minimum of 18 wires. It is possible to eliminate some of the handshaking lines, but this is not recommended unless you really know what you are doing, as it does restrict the amount of information that the computer can obtain about the status of the printer.

The best way to handle the earth lines is to connect all the earth pins at both ends of the cable together, using whatever wires you have left after connecting all 17 signal pins. If you are using shielded cable, then the shield should also be connected to the ground at both ends. Any remaining wires in the cable should also be connected to ground at each end. Ideally there should be 8 ground wires, one for each ground pin on the DB-25 plug, but practical experience shows that this is really unnecessary. Simply solder a piece of bare wire to all the ground pins on each connector to form a ground 'bus', and then solder the ground wires in the cable to this bus at each end.

As the cover for the Centronics connector is in a single piece, in contrast to the split two piece backshell used on DB-25s, the cover must be slid over the cable before the connector is soldered to the wires. Failure to do this will result in you having to de-solder the pin assembly and try again! The backshell of the DB-25 may be left until after soldering, as the cable actually passes between the two halves of the assembly. Also, ensure that you make use of the cable clamps in both connectors, to relieve the stress on the soldered joints.

If you need to extend the length of an existing printer cable on an IBM compatible, you may like to consider using the existing printer cable, and an extension cable with DB-25 connectors at each end to provide the required extra length. This is because DB-25 connectors are usually much cheaper than the Centronics variety. An extension cable can be constructed relatively quickly, using an IDC type DB-25 plug and socket and a length of ribbon cable, as described in October issue. Of course you can make an extension cable with Centronics connectors at each end, but these cost considerably more than DB-25s. Also, if you want to use IDCs, the wider cable will also cost more than an equivalent length of 25-way cable.

CONNECTIONS

Pin	MDA	CGA	EGA
1	Ground	Ground	Ground
2	Ground	Ground	Secondary Red
3	-	Red	Primary Red
4	-	Green	Primary Green
5	-	Blue	Primary Blue
6	Intensity	Intensity	Secondary Green
7	Video	-	Secondary Blue
8	-----	Horizontal Sync	-----
9	-----	Vertical Sync	-----

Table 2. Any video cable is simply a straight-through affair, but only those pins that are actually used need to be connected. All of IBM's TTL video adaptors make use of a 9-pin D connector, however, the number of pins used for each adaptor is different, as shown.

Monitors and keyboards

MANY PC users (myself included) resent the intrusion of a large system unit into their precious desk real estate, and a popular solution to this problem is to locate the system unit on the floor, adjacent to the work area. Unfortunately, your choice of location can be restricted by the length of the standard keyboard and monitor cables, which in many cases is simply inadequate.

Two solutions to this problem are possible, depending upon the current configuration of the cables, and personal preference. One is to make up an extension cable, and connect this in between the existing cable and the computer. This method is useful if the monitor or keyboard has its cable permanently attached to the unit, and you don't feel up to opening the box up to disconnect the existing cable (or if the unit is still under warranty).

The other way is to completely replace the existing cable with a new longer one. This ultimately gives a neater result, as there is no join between the old and new cables.

IBM chose to use digital TTL signals for its MDA, CGA and EGA display adaptors. All three graphics adaptors use a DB-9 connector, making the construction of cables a relatively simple matter.

As is the case with any digital signal, the total number of combinations (of co-

lour in this case) is determined by the number of signal lines. Reserving 1 line as the ground, and 2 for vertical and horizontal sync, leaves us six wires for the picture information if we are using a 9-pin plug. Hence the 64-colour limit encountered with IBM's EGA display.

The way around this problem is to use analog signals for the three colour guns, thus allowing virtually any desired colour

to be produced. This is, of course, what IBM did with the VGA.

Any video cable is simply a straight-through affair, but only those pins that are actually used need to be connected. All of IBM's TTL video adaptors make use of a 9-pin D connector, however, the number of pins used for each adaptor is different, as shown in Table 2. To make a video cable, simply connect those pins actually

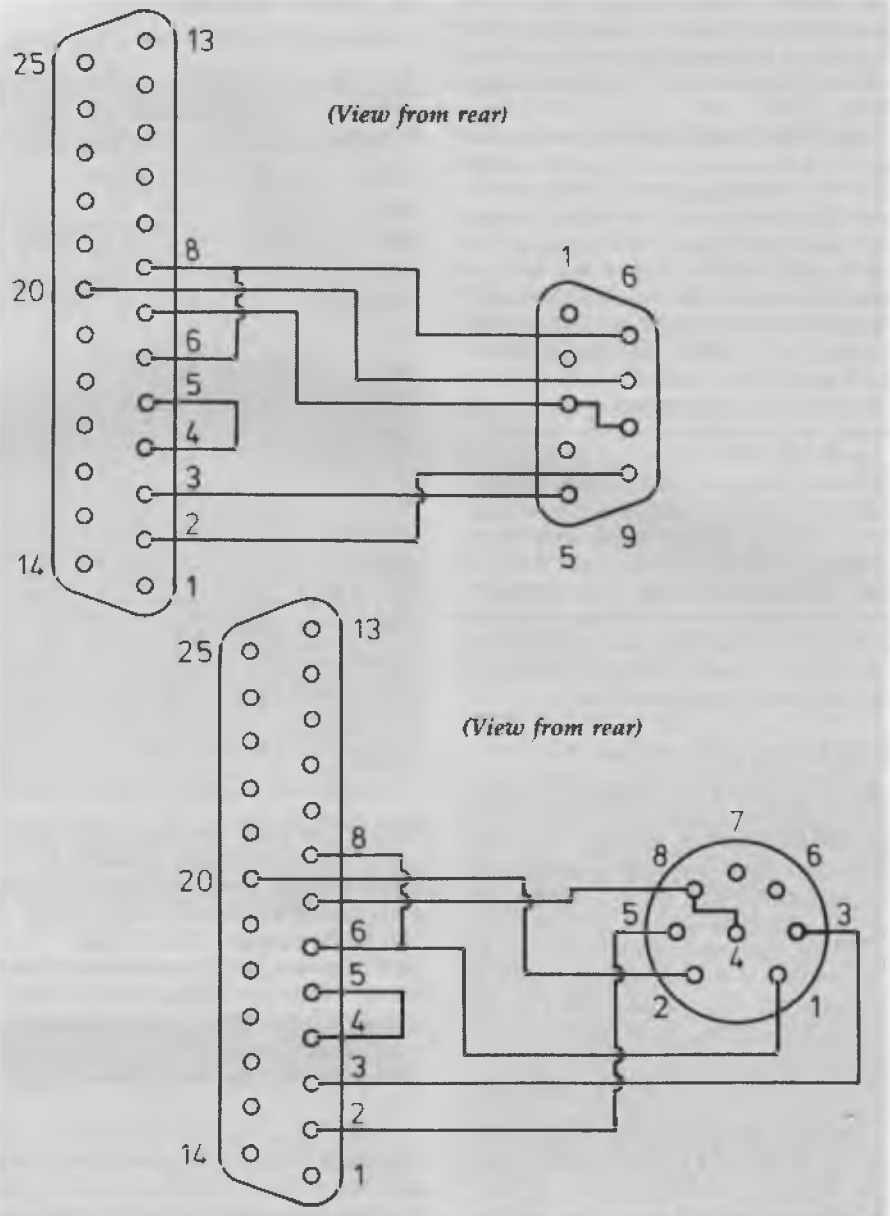


Figure 1. A null-modem cable capable of connecting a Mac to an RS-232C equipped computer, such as a PC clone, is shown in 1a) and the same connection using the 8-pin round connector is shown in 1b).

CONNECTIONS

used to the same pin at the other end of the cable. Of course, if you connect all 9 pins, then you'll end up with a cable suitable for any display (excluding, of course, VGA). If you use shielded cable, the shield should be connected to pin 1 at each end of the cable.

IBM's latest effort, the VGA (perhaps the most successful part of the PS/2 to date), uses a miniature 15-pin connector

with the same physical size as a DB-9, used for the older TTL adaptors. This means that there is that much less room for error in soldering the connectors to the cable at each end. Like the miniature connectors used on the Mac, this one is not all that easy to get (yet), but it is not impossible to find one. I obtained one again from David Reid's, which bore the Arista label, so check with your local Arista

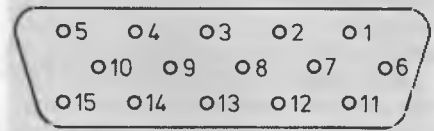


Figure 3. IBM's VGA connector uses a miniature 15-pin connector with the same physical size as the old DB-9 TTL adaptor, which means that the same backshell can be used for both. The centre row of pins is raised, making it easier to solder. VGA connectors are available from Arista component suppliers.

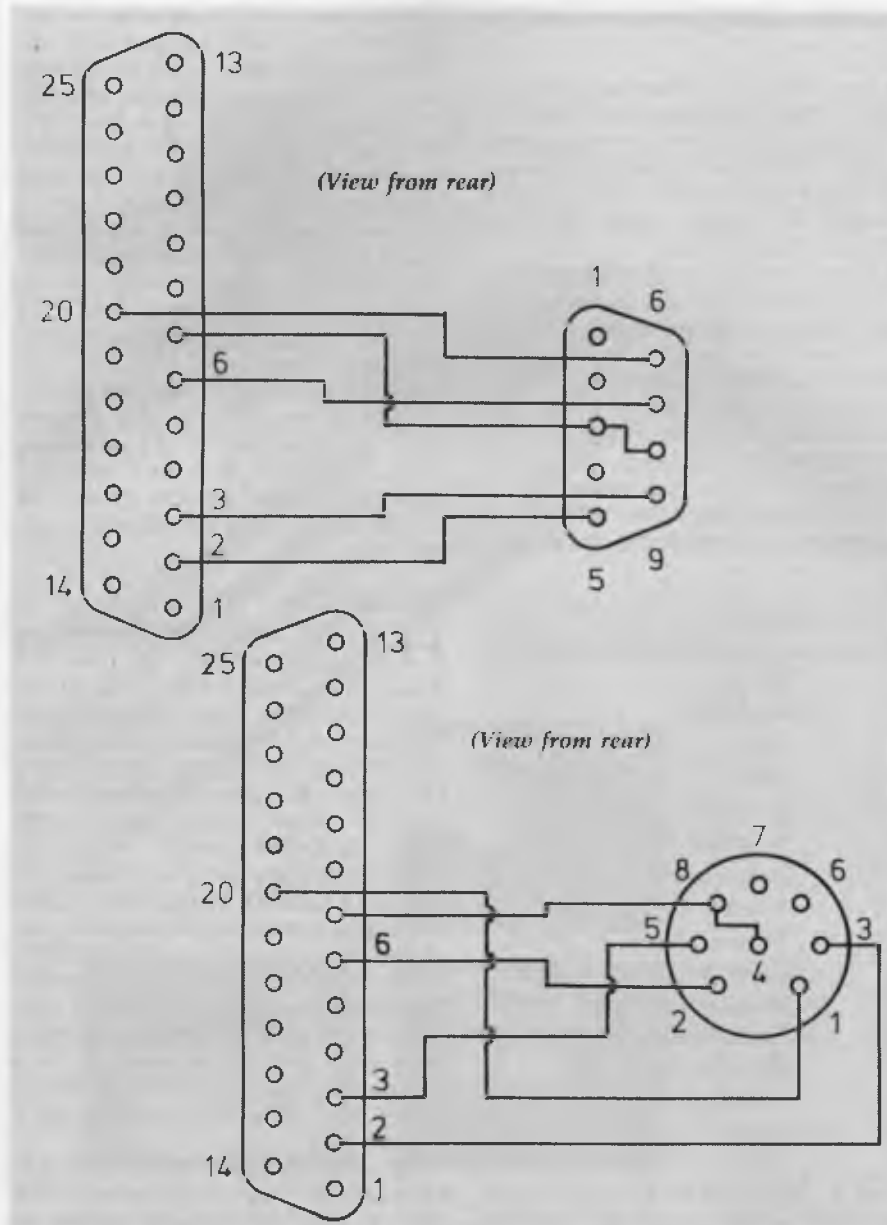


Figure 2. These diagrams show 'straight-through' cables for the two types of Mac serial port, to allow standard RS-232C peripherals to be used with a Macintosh. 2a) shows the 9-pin D connector and 2b) shows the 8-pin round connector.

dealer for details. Because this connector it the same physical size as a DB-9, the same backshell can be used for either.

Table 3 illustrates the pin-out of this port, and as you can see, three of the pins are unused (or reserved, as IBM would have it), so a typical VGA cable does not need that many more wires in the cable than an EGA one. Again, there are no swap-overs to perform, with all pins connected straight through. The pins are closely spaced, but the centre row is raised above the other two to make the job easy.

If you only intend to use the cable with one type of monitor, either monochrome or colour, then you can leave out the ground-return wire for the other monitor. If you are using shielded cable, then the shield should be connected to the digital ground (pin 10). Finally, attach the backshells to the two connectors to provide mechanical protection and support for the cable.

Keyboards for PC-compatibles, on the other hand, are a much simpler affair. Despite several revisions to the layout and number of keys, the electrical interface has remained largely the same from the first PC to the AT. The cable consists of 5 wires, and is terminated at the computer end with a 5-pin DIN plug. Because the cable is permanently attached to the computer, most people would probably want to extend the existing cable rather than delve into the case of the keyboard to attach a new one.

To do this, you need a 5-pin DIN plug, and a matching inline socket. Herein lies a trap for the unwary: there are at least three physically incompatible varieties of DIN plug with 5 pins. The one used by IBM on the PC keyboard is the most common of the three. It has all five pins lying on the arc of a semi-circle. This is the same con-

necter found on some hi-fi equipment, and is also used on MIDI cables, so availability should not be a problem

Disassemble the plug and socket, and slide the outer cover over the cable so that it can be mated to the rest of the connector once it has been attached to the cable. Any cable with 5 wires in it is suitable. Solder each wire in the cable to a pin on the plug, and the corresponding pin on the socket. That done, assemble the two metal shells and clamp the cable in place using the restraint provided on the end of one of the shells. Finally, slide the outer cover over the rest of the connector to complete the job.

Disc drives

WHILE THE need for custom-made disc drive cables is not as likely to arise as for other cables that we have discussed, there are certain circumstances when you may need to make one, so we may as well have a brief look at them. The most common reason for this would probably be a desire to add a second hard or floppy drive to an existing controller, but there is no room inside the computer enclosure for the additional drive, forcing something to be placed externally. This is even more likely with the proliferation of small footprint enclosures.

The construction of a disc drive cable is a simple affair, compared to other types of cables that we have discussed. First of all, only ribbon cable and insulation-displacement connectors are used, avoiding the need for the sometimes awkward process of soldering. In addition, the cables are all straight-through, except for one exception. I know I stated in the previous article in this series that you can't make cross-over cables with IDCs, but in this case it is not too difficult.

The floppy drive set-up in your typical PC clone, has one or two drives connected to the controller via a common 34-way ribbon cable. The ribbon cable is daisy-chained from the controller to one drive, and then to the other. In most other disc drive systems that is all there is to it as far as the cable is concerned. However, with PC compatible machines, there's a twist (if you'll excuse the pun)

The cable from the controller to the first drive in the chain (drive B:), is a simple straight-through affair, with each pin on the controller's connector connected to the corresponding pin on the disc drive's connector. However, between drive B: and drive A:, the cable is separated into three

The construction of a disc drive cable is a simple affair, compared to other types of cables that we have discussed.

sections. The first of these sections, consisting of pins 1 to 9, and the third section, containing pins 17 to 34, connect straight through to the next connector. However, the middle section (pins 10-16) is twisted through 180 degrees, before being attached to the connector.

This section of the cable corresponds to the drive-select lines, and swapping them over between the drives means that both disc drives on the cable may (indeed, should) have their drive-select jumpers configured to the same position. This makes it simpler to add an extra drive to the machine, provided that you are not the one who has to make the cable!

Once you have determined the length of cable required, carefully cut the ends so

that the ends are square. A sharp pair of scissors gives a reasonably neat result. Make sure that no strands of wire remain to short any of the wires together. Then attach an IDC connector to one end of the cable, to mate with the connector on the disc controller, using the method described in October. Some controllers use an edge-connector, while others use dual-inline (DIL) headers, so check which type you have before buying the connector.

Next, attach the connector for the second drive a suitable distance from the other end of the cable. Again, the connector on the drive may be either an edge-connector, popular on 5¼ inch drives, or a DIL header, as used on 3¼ inch drives. Now slit the remaining end of the cable twice, once between conductors 9 and 10, and again between pins 16 and 17, for a length of about five centimetres. Then twist the centre section through 180 degrees, and line up the three sections of cable in the remaining drive connector, and crimp it together.

Be sure to count the wires from the correct side of the cable. Use the coloured stripe along one side of the cable as a guide, and call this wire pin 1. When the cable is completed, line this up with the '1' label on the drive and controller connectors.

Hard discs

HARD DISC cabling requirements are not quite the same as those for floppy drives. True, they do use a 34-way ribbon cable in a daisy-chain configuration to connect the drive(s) to the controller. However, unlike floppy drives, where this single cable carries all signals to and from the drives, on hard discs it only carries the control signals.

The actual data and clock signals are carried by separate 20-way ribbon cable running between the drive and the controller. This cable is not daisy-chained between the drives, so each drive in a multi-drive system must have its own data cable. One reason for this is that more head select lines are required than for a floppy drive, owing to hard disc drives having up to 15 heads (compared with 2 for floppies).

The other reason is tied up with the behaviour of 'long' cables when called upon to carry high-frequency signals, as encountered with high-capacity hard disc drives. The term 'long' here is a relative one, as the length of cable required, before these so-called transmission-line ef-

Pin	Function
1	Red
2	Green / Mono
3	Blue
4	Unused
5	Self Test
6	Red Ground
7	Green / Mono Ground
8	Blue Ground
9	Unused
10	Digital Ground
11	Digital Ground (colour monitor)
12	Digital Ground (mono monitor)
13	Horizontal Sync
14	Vertical Sync
15	Unused

Table 3. The pinouts for the IBM VGA. As you can see, three of the pins are unused, so a typical VGA cable does not need that many more wires in the cable than an EGA one. There are no swap-overs to perform, since all pins connected straight through.

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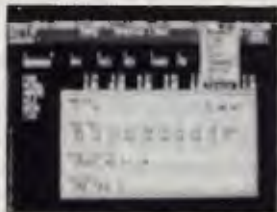
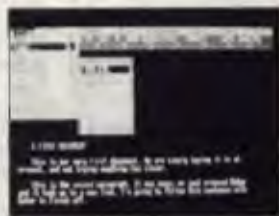
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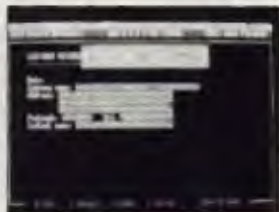


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fects become significant, varies in inverse proportion to the frequency involved.

Suffice to say, this extra cable allows data transfers to and from hard discs to take place at speeds many times faster than those for floppy drives, and this means that these lines have to operate at much higher frequencies than they do with a floppy drive.

At these frequencies, the load connected to the cable has to be carefully controlled, and the only sure way to achieve this is to have one, and only one, drive per cable. Proper termination of this cable at both ends ensures that these so-called transmission-line effects are allowed for, so that potentially data corrupting reflections do not occur.

The construction of the 34 way daisy-chain cable for hard discs is the same as for floppies, except that only 5 wires are swapped over, lines 31 to 35 inclusive. This completed, you can attack the one (or two) 20-way data and control cables. Again, check your drive(s) and controller to determine the type of connector required — either edge-connectors or DIL headers. These 20 way cables pose no special problems, having only one connector at each end, and no cross-overs at all.

Terminators

ONE FINAL point concerns terminators. These mysterious beasts are installed on the last drive in the daisy-chain, to help prevent pulses from being reflected back up the line. If there is only one drive on the cable, then this should obviously have the terminator on it. If there is more than one drive on the cable, then *only* the drive furthest from the controller should have the terminator installed.

On hard discs, the presence of the 20 way cables is unimportant — these lines are permanently terminated. It is the position of the drive on the 34 way cable which is important. The drive on the far end should have a terminator on it, and the any other drives should not.

So there you have it. A brief introduction to making cables for your computer. This is by no means a complete coverage of all possible combinations, just some of the more commonly required ones. □

The connectors and cables used to illustrate Computer Connections, Parts 1 and 2, were supplied compliments of Dick Smith Electronics.

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8088 8088 8088 8088 V20 HARDWARE HACKING

THE 8088 is dead.' 'CP/M is dead' those are quotes from a lot of people who should know better. Despite the hype from promoters of the newest and flashiest PCs, the good ol' 8088 just refuses to lie down and stop kicking. Likewise CP/M, the former world's champion microcomputer standard – it was supposed to snuff it when the IBM PC with its MS-DOS operating system came along back in 1981

Well, there are still plenty of people out there using CP/M computers on a daily basis. I'm one of them, on the grounds that I can't think of any reason why I shouldn't be using a CP/M computer. Those of you who have been following this 'Hardware Hacking' series know that I also use a stock-standard, no-frills PC XT compatible, which I have no intention of

Tom Moffat tells how to upgrade your PC with NEC's V20 processor – and then shows just how alive CP/M is!

replacing It might not be the latest 'state of the art' design, but who cares?

As for 8088 technology being 'dead', just take a look at some of the ads for new computers – there are still plenty that proudly proclaim that their microprocessor is an 8088.

However, I'm not averse to making the

occasional small improvement to my PC clone, especially when it's only going to cost me something like one per cent of the computer's original purchase price.

For an outlay of around \$20, we can retain the original 8088 operation, but gain increased efficiency, faster execution speed for many machine code instructions, some new instructions, and get lower power drain simply by changing the processor to an NEC V20 – plus it gives the ability to run code originally written for the 8080 CP/M microprocessor.

The V20

THE V20 was developed by NEC Electronics, and its more official type number is 'uPD70108' – you'll need to know this when you go racing off to your electronics shop to order one. While all the

other chip designers were getting onto the 16-bit and 32-bit bandwagon, somebody at NEC got the idea of wringing the few weaknesses out of the traditional 8088 micro, as well as taking a big step back in time by making it obey the old 8080 instruction set. Unfortunately, it lacks Z80 capability which stops a lot of the latest CP/M software running on a PC, but the elderly stuff works fine.

NEC have conveniently arranged the V20 to be physically identical with the existing 8088 chip. Since they are 'pin compatible' you can pull an 8088 out of its socket and plug a V20 in, and it will *probably* work.

Internally the V20 is a whole new kettle of fish. It has two 16-bit data busses running side by side and there is a new circuit called an 'effective address generator'. These enhancements result in some really great improvements in efficiency. For instance, the 8088 takes something like 120 clock cycles to perform a multiplication instruction; the V20 does it in less than 30. Calculation of effective addresses can take the 8088 up to 12 clocks (for indexed addressing); because of its hardware 'effective address generator', the V20 can come up with any address, in any mode, in 2 clock periods.

The V20 has even implemented some Z80 type instructions into the 8088 set, such as the ability to set, reset and test individual bits within a register or memory location.

Should I, or shouldn't I?

THE FIRST thing to consider is whether you need to install a V20 chip in your computer in the first place. You may already have one, since more and more new models are coming out with the V20 as standard. One computer that comes immediately to mind is the Acer (Multitech) PC being sold by Dick Smith Electronics. There are quite a few others, so before going chasing after a V20 chip, check the specifications of your own machine to see what microprocessor is used. If a V20 is listed as 'optional', get a torch, open the lid, and have a look. You may be lucky!

You should also note that there is a possibility that a V20 may not work correctly with your computer, or with your favourite software. I have done some pretty extensive tests with the chip and it's worked perfectly with every MS-DOS program I've tested – but be warned, there is a very remote chance that you could have trouble. If something goes wrong, you only need to remove the V20 and put your old 8088 back in.

The V20 has even implemented some Z80 type instructions into the 8088 set . . .

Obtaining your V20 may be something of an adventure – I tried to buy a V20 over the counter at a well-known retail electronics chain store. They carefully pointed out that such a thing didn't exist, and I didn't know what I was talking about. Success came from a Hobart electronics dealer (George Harvey Electric), that caters for both the enthusiast and professional markets. 'No problem', they said, 'you'll have it in a week.' And I did. If you run into strife getting your V20, George Harvey's has agreed to supply them by mail to YC readers for \$22.50, including sales tax, packing, and postage. Send your cheque to: GHE Electronics, GPO Box 617F, Hobart, Tasmania 7001

The transplant

YOU JUST pull one chip out and bung the other one in, right? Wrong. The V20 is delicate and expensive, and must be treated as such. If you get heavy-handed you can wreck your computer's motherboard or crack the chip clean in half. And then there's static electricity.

There are dire warnings constantly being put around about the dangers of static electricity to chips (like the V20) made with CMOS technology. But modern ICs are a pretty tough lot. Many thousands of them have gone through my hands over the years, and I've never yet lost one to static electricity. Although, some minor

good-sense protection against static electricity might be in order – plastic is the thing to watch out for. If you're wearing a woolen jumper, and you rub your sleeve against a plastic (Laminex) table top, and then use your fingers to put the V20 into the nice metal computer, the V20 might go boom! So let's take a few precautions. – first, no Laminex or glass covered tables, please.

My own favourite work surface for computer surgery is the ancient oak table in our dining room. And, you will probably need a torch and a small mirror handy.

To undertake the transplant, disconnect all the cables, keyboards, modems, printers, and the like. Next, open the lid, have a good look around, and identify the 8088 microprocessor: it's a big 40-pin chip, and it will likely be sitting right next to another empty 40-pin socket (unless you're extremely lucky, and own an 8087 math coprocessor). In my Unitron PC, the 8088 is right at the back of the main circuit board. The mirror and torch might come in handy to ensure the chip you've found actually has 8088 written on it.

Take careful note of the direction the 8088 is inserted. There should be a notch in one end of its housing, indicating that Pin 1 is at that end. There will probably be an outline of the chip silk-screened onto the circuit board, also showing which end has the notch. If there is no notch, use a Textacolor and draw one on the correct end of the chip, so you can get it back in the right way, if need be.

Once you've identified the 8088, it's time to remove it. Be *extremely careful* at this stage. You must insert a screwdriver blade or other flat object (*no plastic!*) between the end of the 8088 and its socket, and gently lift that end against the resistance of the pins. It will feel like a slow and painful pulling of teeth, and there may even be squeaking noises. Make sure you

```

10 REM Do 10000 square roots to test math speed.
20 REM
30 FOR I=1 TO 10000
40 A=SQR(I)
50 NEXT I
60 PRINT CHR$(7): REM BEEP!
70 END
    
```

Listing 1. MATHSPED.BAS calculates the square roots of 10,000 numbers, but throws the results away. After 10,000 trips through the loop it beeps and then exits. The square root function was chosen to give the computer's mathematics features some really good exercise.

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NEC V20

are between the chip and the socket, *not* between the socket and the circuit board. Otherwise you will rip the socket off the board, and generate many obscenities.

When you see the 8088 pins coming free on one end, wriggle the blade further under the chip, on one side and then the other, and gently lift some more. Eventually it will be free.

Before going any further, you must now prepare the V20 for insertion. If it hasn't been used before you will find its pins are splayed out at about 15 degrees from the vertical. Bend them straight by laying all the pins on one side of the V20 down onto your work surface and then roll the whole chip vertical, or a little past vertical. The idea is to bend all 20 pins on that side in one go. Once you're happy with that side, do the same thing to the other side, then check that all the pins are nicely vertical.

Next take your V20 in one hand, and grip the computer's metal case with the other (a small static precaution). Carefully set the V20 onto the socket, facing the correct way, put don't push down yet - use the torch and mirror to ensure that each pin is sitting at the top of the correct hole in the socket, ready to go in. If you go wrong at this stage, you may find that some improperly positioned pins will bend back on themselves, or fold up under the V20 where you will never see them.

Once everything looks right, press the V20 home. If it feels reluctant for some reason, find out why. Do not force it! You

may have to pull it back out and adjust one of the pins. When you're happy that the V20 is correctly installed, all that's left is the 'smoke test'. Put the covers back onto the computer, plug everything back in, and fire it up. If all is well it should boot up as normal; you should see absolutely nothing out of the ordinary.

What to expect

IF YOU refer to Table 1, you will see the results of running some MS-DOS programs under both the old 8088 and the new V20. These were all done using a Turbo clock speed of 8 MHz. One of the packages I use as part of my engineering duties is the Protel electronic design package. The package includes Protel Schematic to draw a circuit diagram of the device you're designing, and Route, which plans the layout of the copper tracks.

Considering that the V20's strong point is mathematics, it seemed an ideal candidate for speeding up. As you can see, the V20 only gained a minute or so with Schematic and, but a worthwhile several minutes with Route.

I then decided to try a few sneaky tricks on the V20, to see if I could trip it up. A little program called CPUID.COM said the V20 was a healthy 8088. No trouble there. A full system diagnostics program produced a cryptic error message on the V20, but it didn't explain what the error was.

Another test routine, CPUSPEED.COM, went into a complete tailspin when con-

	V20	8088
Time for Protel Schematic Post-processor	21:41	22:48
Time for Protel Route Demo (minutes)	16:54	19:15
What CPUID.COM says	8088, healthy	8088, healthy
What Diagnostics say	Error #501	OK
Result of running CPUSPEED.COM program	nonsense	4.77, 7.89
* CRITICAL TIME DELAY PROGRAMS *		
Weather facsimile receiver	Normal	Normal
Radioteletype decoder	Normal	Normal
Morse code receiver	Normal	Normal

Table 1. Comparison of an XT clone running a V20 and an 8088 processor.

PC-XT, GWBASIC, V20 microprocessor.....	21 seconds
PC-XT, GWBASIC, 8088 microprocessor.....	37 seconds
PC-XT, MBASIC, V20 in 8080 mode.....	3 minutes 12 seconds
Microbee, MBASIC, Z80 running CP/M.....	5 minutes 5 seconds
PC-XT, MBASIC, Z80MU emulator program...	56 minutes 36 seconds

Table 2. The results of tests using MATHSPED.BAS.

fronted with the V20. It was meant to measure how many seconds it took to complete a certain sequence of machine instructions, and then calculate the system clock speed based on execution time. This was tried on both microprocessors, at both high and low clock speeds. The program got totally bamboozled and tried to claim the clock speed was 0.31 MHz or something. Results at 8 MHz were similar. At last, some truly significant results! I suspect the program was using lots of multiply instructions to produce the 10 second delay, and of course the V20 can multiply much, much faster than the 8088.

Finally in Table 1, some tests on three programs with very critical time delay requirements (I know they're critical, because I wrote them). These programs all ran perfectly under both the 8088 and the V20.

Now, have a look at the little Basic program in Listing 1 which calculates the square roots of 10,000 numbers but throws the results away. After 10,000 trips through the loop it beeps and then exits. The square root function was chosen to give the computer's mathematics features some really good exercise.

Table 3 shows the results of these tests. As you can see the V20 had a performance advantage of better than 75 per cent over the 8088. The same Basic program was

then run under various CP/M implementations, with some truly remarkable spreads in execution times (more about this later).

A final test of the V20 against the 8088 came in the form of a Public Domain benchmark program called MIPS (for Millions of Instructions Per Second). This program tests various categories of machine instructions, and lets you know the results on each type. It uses as its base the performance of a standard PC running at 4.77 MHz, so this clock speed was used for the tests.

The run with the 8088 produced results pretty much as expected for a standard PC/XT running at 4.77 MHz. But with the V20 installed, everything improved, particularly the register-to-register transfer instructions. (Could this be because of the dual data busses working together?) There was also a very satisfying increase in the 'integer instructions' area, showing that the souped up hardware multiplies and divides were really doing their stuff.

The MIPS program really gave a true window into the V20's capabilities and its improvements over the traditional 8088. The NEC literature claims an overall execution speed improvement of 30 percent over an 8088. The bottom line shows a 31 per cent improvement over an 8088. It's nice when things actually come out like they're supposed to!

Problems

THERE have been a few reports of problems with the V20 when used with certain applications. Most of these seem to stem from the practice of using dummy multiply instructions to waste time in time delay routines.

In pre-V20 days, this was no hassle. But now any time delays based on machine code multiply instructions are going to be out of whack, since the V20's multiply is much faster than the 8088's. Apparently this trick is used in the BIOS routines in some clones, for the parallel printer driver. If you have printer troubles when using the V20, this is probably what is wrong.

Other problems have cropped up in some communications programs, particularly when running at 1200 bauds. Again, these programs appear to use dummy multiply instructions for time delays. Since the IBM's serial communications chip (the UART) is completely independent of the microprocessor, any comms software based on the UART should be immune from any timing differences in the V20.

I have used the V20 for several weeks in my Unitron PC under DOS 2.11, with absolutely no problems with printing or any other functions. I've also tried the V20 with a genuine IBM PC XT system, and again it's worked perfectly.

CP/M operation

O KAY, CP/M people, this is the moment you've been waiting for. Now, my first encounter with an IBM PC was somewhat against my will - the thing turned up at my work, and I was told I would have to learn to use it to design printed circuit boards. Prior to that, I had been using a faithful Microbee CP/M computer for word processing, spread sheets, engineering calculations and so on. I must admit I was afraid of that IBM and all I wanted to do was make it look like a 'civilized' computer, in other words, CP/M. When a Z80 emulator appeared on the scene, I thought all my Christmases had come at once.

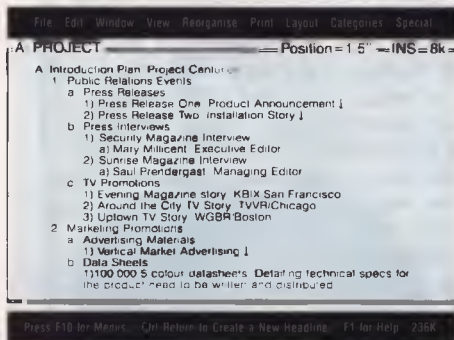
Z80MU.COM is an MS-DOS program that made the PC think it was a CP/M machine, with a Z80 microprocessor. It does this by scanning through each Z80 or 8080 machine instruction in the CP/M program. Each instruction was then translated, by a software routine, into IBM 8088 code to produce the same result. Z80MU worked, more or less, but was it slow!

If you look at Table 2 you will see just

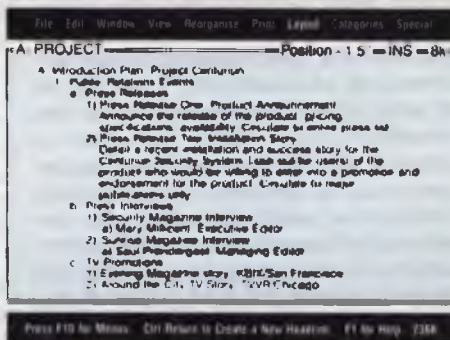
Result of "MIPS.COM", clock speed 4.77 MHz, 8088 CPU:				
BENCHMARK PERFORMANCE RELATIVE TO =>	IBM/PC 4.7Mhz	IBM/AT 8Mhz	COMPAQ 386	ACTUAL MIPS
GENERAL INSTRUCTIONS	0.95	0.28	0.14	0.15
INTEGER INSTRUCTIONS	0.98	0.15	0.07	0.16
MEMORY TO MEMORY	0.99	0.31	0.17	0.23
REGISTER TO REGISTER	1.00	0.13	0.05	0.18
REGISTER TO MEMORY	0.98	0.29	0.16	0.30
OVERALL PERFORMANCE	0.98	0.24	0.12	0.20
Result of "MIPS.COM", clock speed 4.77 MHz, V20 CPU:				
BENCHMARK PERFORMANCE RELATIVE TO =>	IBM/PC 4.7Mhz	IBM/AT 8Mhz	COMPAQ 386	ACTUAL MIPS
GENERAL INSTRUCTIONS	1.11	0.32	0.16	0.18
INTEGER INSTRUCTIONS	1.89	0.30	0.13	0.31
MEMORY TO MEMORY	1.12	0.34	0.19	0.26
REGISTER TO REGISTER	2.17	0.28	0.12	0.39
REGISTER TO MEMORY	1.08	0.33	0.18	0.33
OVERALL PERFORMANCE	1.31	0.31	0.15	0.29

Table 3. Results from the Public Domain benchmark program MIPS which tests various categories of machine instructions. It uses as its base the performance of a standard PC running at 4.77 MHz (= 1.00).

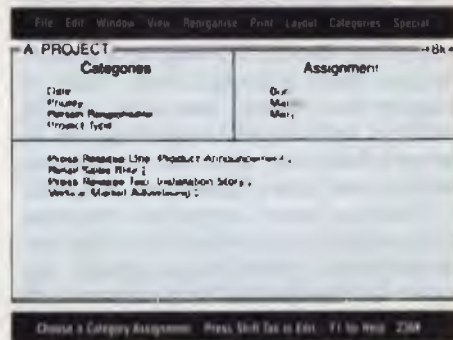
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how slow Z80MU is. That little 10,000 square root program, which runs in around five minutes on the Microbee, takes the best part of an hour under Z80MU. But, Z80MU is still floating around on various bulletin boards, and it may yet be the only way to run programs containing Z80 code. But, the V20 chip has made Z80MU pretty well redundant.

The V20's inability to run Z80 code means it will only be useful with the more elderly CP/M applications. However, there are many classics in this category, including WordStar.

A more direct way to run CP/M programs is to MS-DOS be your CP/M. There is a little Public Domain MS-DOS program called V2080.COM that does this job nicely. The biggest difference you'll find with V2080, compared with Z80MU, is speed. CP/M programs now run at the speed you'd expect, and the V20 even outruns a 'proper' CP/M machine in some cases (see Table 2).

You don't see a CP/M-style system under V2080, because there isn't any. You

just run your programs under MS-DOS, like any other V2080 looks for a file name with the extension CPM, and runs it in the V20's 8080 mode as a CP/M .COM file.

A problem with running CP/M software under V2080 is that any Z80 codes will cause the computer to crash (naturally

enough). In theory this shouldn't be a problem, because the 8080 processor being emulated should restrict any devastation caused by the crash to the 8080's 64 Kbyte addressable memory area. However, some crashes seem to let the program 'escape' from the 8080 area, where it can mess up other things – so back up before firing up! (We will attempt to prevent this when writing our own CP/M driver program – so read on.)

I used V2080 to test quite a few CP/M programs. As expected, most of the old-timers ran perfectly, but some stumbled, particularly when trying to read a longish file off the disk.

Doing your own thing

WHILE V2080 is very useful, it isn't perfect. So it raises the temptation to try to improve on it by writing your own program to use the V20's 8080 mode. So – next month (after you've installed that V20), I am going to throw a few ideas at you, but it's up to you to make them into something useful. □

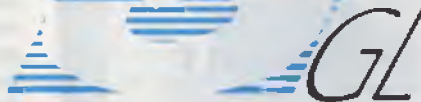
Hack it!

FOR THOSE WHO feel confident about a bit of old-fashioned hacking – in our July, 1988, issue Tom Moffat told how to fit your own reset button. In August, he showed how to gain hardware and software control of an XT's turbo speed and, in October, he described how to add extra input and output lines to a PC using the RS-232 port and the joystick connector. In November he gave us a thorough discussion of working with EPROMs. If you'd like copies of any of these, refer to the Services page on how to obtain back issues.

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HARDWARE HACKING

WANT YOUR computer to sit up and *roar*? Here's a simple project to install an external speaker to an IBM compatible; it works for Microbees, too. If you don't necessarily want a *roar*, there's a rudimentary volume control.

The project is necessary because the original purpose of the speaker, in both the PC and the Microbee, is to beep. Trouble is, there are many programs coming out nowadays that take control of the speaker's 'beep' software and make it produce fairly sophisticated music and/or sound effects. The computer's speaker, however, is quite small, and it's most likely mounted as an afterthought somewhere within.

Some PC compatibles have a little speaker grille on the front for the sound to come out; the Microbee has a grille on the bottom. My Unitron PC doesn't have an opening for the speaker at all; the sound is meant to sort of leak out through the seams, I think.

Inside the PC

THE SPEAKER driver circuit in a typical PC is shown in Figure 1. Working through the circuit backwards, the speaker connects between the computer's five volt power supply and the collector of a small switching transistor. When the transistor switches ON, the collector is pulled toward the emitter (that's the line with the little arrow on it) which is in turn connected to ground. The speaker then has 5 volts DC across it. When the transistor switches OFF, the collector is released, there's no more ground, and the speaker voltage is removed. A tone is produced when the transistor is switched on/off/on/off several thousand times a second. The tone is a 'square wave' which is a pretty raspy old sound. The 0.1 μ F capacitor between the collector and ground is there to smooth off the edges a bit.

The transistor is switched on by feeding a little current into the base (that's the line coming out the left side of the transistor symbol in Figure 1). In many PCs, the switching current comes from a logic gate integrated circuit used as a current 'driver'. This IC is helped along a bit by an extra resistor connected to the +5 volt power supply.

Had I designed that circuit I would have put another resistor between the logic gate and the base of the transistor, to limit the amount of current allowed to flow. It's a kind of safety valve. As that cir-

Making music!

Wanna blow the roof off with Scott Joplin and a home made speaker for your computer? Then listen to Tom Moffat . . .

cuit stands now, the logic IC can supply heaps of current if the transistor demands it, as would happen if the collector were connected straight to +5 volts without the speaker being there.

This would happen if the speaker were somehow shorted out - *so beware!* Do not allow the speaker wiring to become shorted or the transistor will most likely blow. It would only cost about 10 cents to replace it, but you would have to completely disassemble the computer.

The Microbee speaker driver is similar, with a few exceptions. There is a resistor in the base circuit, to limit the current. There is another resistor between the collector and the speaker, to further limit the current through the transistor. And the other side of the speaker is connected to +10 volts instead of +5.

The circuit diagram of one of the latest

Microbee system boards shows that they have abandoned the switching transistor scheme, in favour of a proper little audio amplifier. From the way it is wired up, it appears to be an LM386 type integrated circuit. There is a volume control leading into this amplifier. This is probably essential because an LM386 can produce several watts (deafening!) when driven hard.

External speaker connection

ACTUALLY, there are two options here: A volume control, and an external speaker/stereo connection. You can install either one, or both. Figure 2 shows the wiring required for both options.

The volume control is implemented with one resistor and a switch. The resistor can be inserted in series with the lead to the speaker, where it soaks up some of the power otherwise destined for the speaker. The switch simply bypasses the resistor, so all the power goes to the speaker. This means the speaker is at full volume with the switch closed, and at reduced volume with the switch open. You should experiment with various resistor values to determine what resistor is needed to bring your speaker down to what you feel is a nice 'low' setting. A 100 ohm resistor is a good starting point.

By now you're probably wondering why we are using two-position switch instead of a traditional rotary-type volume control. The reason is that 'potentiometers' in the 100 ohm range are big, expensive and troublesome. You would have a struggle finding somewhere to mount one, and the quality of the ones I've seen recently suggests they wouldn't last very long. The switch solution is easy: on, off . . . loud, soft.

The external speaker connection is implemented through a 3 $\frac{1}{2}$ mm 'shorting' type socket. 'Shorting' means that the circuit is passed through to some other device when no plug is inserted in the socket. It does *not* mean that the speaker line should be shorted. This would surely blow the transistor, on a PC at least.

A very important point to make is that any metal parts of the 3 $\frac{1}{2}$ mm socket must be insulated from the rest of the computer. There are sockets available that are made of some kind of black plastic, filling this requirement nicely. I looked in a couple of catalogs to see if I could find an instant source for you, but plastic sockets didn't get a mention. As usual, what you need never seems to be there! Looks like you'll have to sniff around some of



The external speaker consists of an oval-shaped speaker salvaged from an old radio, carefully mounted in a special cardboard enclosure marked 'Blue Banner Brand Onion Pickles, 24 Bottles', with four rusty machine screws.

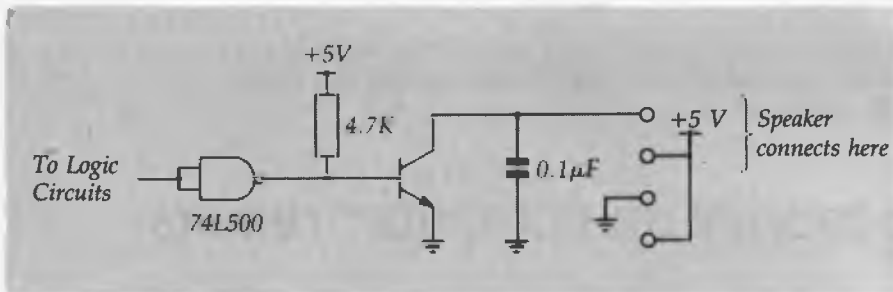


Figure 1. A typical IBM PC speaker driver circuit. In many PCs, the switching current comes from a logic gate integrated circuit used as a current 'driver'. The diagram shows four terminals in a row where the speaker connects – these represent a four-pin connector that will most likely be sitting on your computer's system board near the left-hand front. There will probably be two two-pin connectors attached here, each one with wire leads. One pair of leads will go to the speaker; the other will probably go to the light that comes on when the computer is switched on.

the electronics shops. You could also get around this problem by finding some plastic part of the computer to mount your socket on. In a Microbee this is easy, since the whole thing is plastic.

The volume control switch and the speaker socket will each need a hole drilled somewhere on your computer's case. If you refer back to the first couple of 'Hardware Hacking' installments (YC, July and October '88), you will see how a hardware reset button and a clock speed switch were mounted on the front of a PC compatible.

You could mount the two components further along toward the right of the lower front panel area, or you could mount them on the back of the computer. Be extra careful when drilling holes in a metal case; you don't want to get any filings into the computer's works! Again, take special note that the speaker socket *must* be insulated from the computer's metal case, since the outside of the socket will have voltage on it.

Now that you have an idea what's happening, and have the parts installed, it's time to wire it up. First get an ohmmeter or some other way of checking continuity, and make sure all the metal bits of your socket are really insulated from the computer's metalwork.

Referring to Figure 1, trace the leads to the speaker, and determine what you will have to do to get to the solder connections. You may have to remove the speaker, but this isn't a big job; PCs are designed to come apart fairly easily. With a Microbee, remove the system board and the speaker will be underneath – dead easy to get at.

You should now try to determine which

speaker wire goes to +5 volts, and which goes to the collector of the transistor. On a PC, two of the four connector pins may be connected together; these are both +5. Going back to the speaker for a moment, unsolder the wire that goes to the transistor collector, and leave connected the one that goes to +5 volts.

If you're installing a volume control, connect the wire you just unsoldered to one side of the switch. Connect another piece of wire to the other side of the switch, and then temporarily bridge a 100 ohm resistor across the two connections (you may have to change the resistor later). A 330 ohm resistor will be about right for a Microbee. You may find that your switch has three connections; if this is the case use the centre connection and one of the outer ones.

The free end of the second wire should now be connected to your 3½ mm socket, to the connection that mates with the metal tip of the matching 3½ mm plug. You may have to temporarily insert the plug and do some snooping with an ohm meter to find the right connection.

Next go back to the speaker and add yet another piece of wire to the connection that was previously left intact (the one that goes to +5). The other end of this wire connects to the 3½ mm socket, to the connection that mates with the metal sleeve of the matching speaker plug. The sleeve is the main barrel of the plug, that has the tip at the end.

Finally, one wire to go. Pull the plug out of the socket now, and verify with an ohmmeter that the wire going back to the switch now connects through to the third connector on the speaker socket. Solder a wire from this connection to the connec-

tor on the internal speaker from which you removed the first wire.

The idea is to let the *external* speaker plug intercept the speaker signal when it is plugged in, but to cut the signal through to the *internal* speaker when no external plug is connected.

External speaker

THE BASIC idea of a speaker external to the computer is to provide a larger speaker (for better bass note reproduction), coupled with a decent sized box (for best acoustic efficiency; that is, the most noise per watt). As a general rule, the bigger the speaker, and the bigger the box, the bigger the sound. This isn't really correct hi-fi design, it's better described as the 'Juke Box Principle'. So how do we turn a computer into a juke box?

You can go out and buy an 'extension speaker', consisting of a timber or plastic box, a speaker, and a lead with a 3½ mm plug already soldered on the end. The Rod Irving Electronics catalog has such a device, complete with a volume control already installed, for \$45. There should be plenty of others around as well. Try to get a speaker rated '8 ohms' or higher to avoid overloading the transistor in the computer. Such a speaker can also be useful for other things.

If you really want to frazzle your brain, you can use a pair of headphones instead of a speaker *Ooohh!* It hurts my ears to even think about that! Seriously though, this modification can put out enough steam to permanently damage your hearing if you use headphones. Perhaps a safety measure would be to install an extra resistor of 470 ohms or so between the speaker socket and the headphones. Test them at a distance first. Beware, please.

I solved the external speaker problem with the usual Moffat style and elegance. I had on hand an oval-shaped speaker that had been salvaged from some old radio. This was carefully mounted in a special cardboard enclosure marked 'Blue Banner Brand Onion Pickles, 24 Bottles'. An oval shaped hole was cut in the front with a Stanley knife, and the speaker was mounted behind the hole with four rusty machine screws. The box is held together with various bits of sticky tape, and the wire protrudes out one corner. The completed structure measures around 30 cm on each side, and was originally designed for use with an AM/FM radio which had seen better days. It sounds really great plugged into the computer!

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SPEAKER

A stereo amplifier adapter

THIS LITTLE circuit, shown in Figure 3, lets you substitute a 200 watt stereo system for the external speaker. If you don't like your neighbours, now's the time

to let them know. Be prepared for police action, and don't go near any dogs. Audio weapons like this were used during the Second World War to disorient the enemy; now you can have one in your very own

lounge room.

Remember that we are still working with square waves, on/off states generated by a switching transistor. A computer's beeper depends on the very sloppiness of a low

MAPLE LEAF RAG.

BY SCOTT JOPLIN

D# 2	D# 2	G# 2	G# 2	D# 3	D# 3	D# 3	D# 3	A 2	A 2	#	10
0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120		
A# 2	A# 2	D# 3	D# 3	D# 3	D# 3	D# 2	D# 2	G# 2	G# 2		20
0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	E	
D# 3	D# 3	D# 3	D# 3	A 2	A 2	A# 2	A# 2	D# 3	D# 3		30
0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	t	
D# 3	D# 3	D# 2	D# 2	E 2	E 2	E 2	E 2	D# 2	D# 2		40
0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	E	
D# 2	D# 2	E 2	E 2	E 2	E 2	D# 2	D# 2	RR 3	RR 3		50
0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	i	
G# 1	G# 1	RR 3	RR 3	G# 2	G# 2	RR 3	RR 3	G# 3	G# 3		60
0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	0 120	t	

BLOCK

NOTE EDITING ? more help F1 detail	(w)hole	(q)uarter	(-)rest	PITCH STACC. OCTAVE (r)aise (m)ore (u)p (f)lat (l)ess (d)own	(Ins)ert (Del)ete (a)djust
	(h)alf	(s)ixteenth	(.)dotted		
	(e)ighth (3)2nd	(t)riplet			

Figure 4. The editing screen from Pianoman, showing the bass line (that's the sheet music in the background).

quality speaker to smooth over the violent high-to-low and low-to-high signal transitions. So what you hear on a small speaker is an attempt at a pure tone. What comes out of a high quality stereo system is a highly amplified, variable frequency, buzz saw.

This brings to mind one Microbee game my son likes to play, called Meteor Rescue. This game produces the most disgusting, painful, unattractive noises ever heard on a Microbee speaker. Imagine these screeches, squawks, squeaks, and scratching noises, faithfully reproduced on a big stereo system. Here's how to do it - there are three basic parts: a load, DC isolation, and a voltage divider. You can build this up on a scrap of Vero-board, or haywire it all together and wrap it up in tape. Just don't bring it anywhere near me!

Now, at the left of Figure 3 is a 3 1/2 mm plug to mate with your external speaker

socket. Wired across the plug is a 22 ohm resistor; this is a 'load' to take the place of an external speaker. It must be in the circuit for the transistor to work. Next come two 0.1 μF capacitors, one in each wire going toward the stereo amplifier. The capacitors will pass audio signals, but block the passage of direct current. They are there to keep the computer's +5 volt DC supply from getting into the amplifier.

The audio then goes through a 10000 ohm resistor, to the top of a 100 ohm resistor, which is across the input to the stereo amplifier. These resistors act to divide the audio voltage by a factor of 100 (10000/100), before it goes into the stereo amplifier. Assuming a signal swing of 5 volts to start with, the stereo amplifier should get a voltage of around 50 millivolts, which is a reasonable level to feed into its tuner or auxiliary input.

There are two outputs of this circuit, one for each channel. The circuit simply

straps the two channels together so they both get the same signal from the computer. By the way, this circuit would also be useful for connecting something like a small radio, cassette recorder, or short-wave set to a stereo amplifier. That way you can serenade your neighbors with Radio Moscow if they get tired of computer noises.

Flippin' the bits

HERE IS a short discussion of how to produce noises with your computer, and believe me, it's going to be short. Whole books have been written on this subject, so we will restrict ourselves to the bare basics - just enough to get the idea.

In the IBM PC, the basic source of speaker sound is the 8253 timer chip. Channel 2 is programmed to produce a square wave at the appropriate frequency. Use of the 8253 timer chip was covered in detail in the August issue, so we won't repeat it here.

The speaker output is also under the control of Bit 1 of Output port 61 (hexadecimal), as discussed in that article. If you set the bit high, it sends the square wave from the timer chip through to the speaker. If you set the bit low, it blocks the square wave. If you send another square wave, generated in software, to Bit 1, it will combine with the square wave already coming from the timer chip to produce a speaker output consisting of both square waves mixed. This is the basis of complex sound effects on the PC.

On the Microbee you produce a tone in the speaker by sending a software generated square wave to Bit 6 of Port 2.

Ready-made software

THERE are many programs around that will make music on computers. It seems that every collection of Turbo Pascal files contains some little routine to play a tune on the computer's speaker. There are lots of Public Domain music programs floating around on the bulletin boards, but from what I can see, one stands out above all the others.

First, some background: ever since I was a kid, back in the USA, I've been fascinated by mechanical music makers. There were, and still are, lots of touristy places with fine collections of these lovely relics. The best of them would combine a piano, violin, mandolin, drums, bells and whistles, all driven by a paper roll arrangement as in a pianola. You put your five cents in

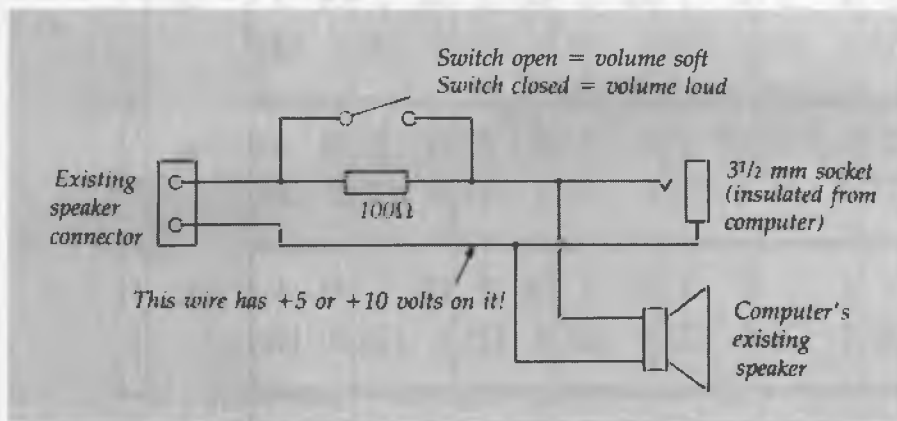


Figure 2. The wiring for an external speaker and volume switch. The volume control is implemented with one resistor and a switch.

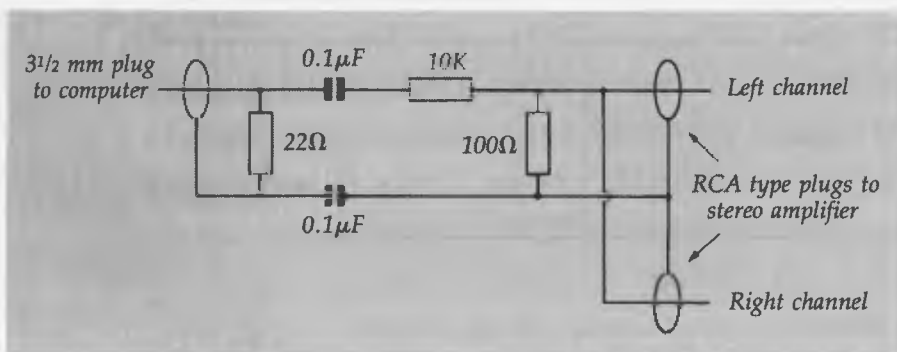


Figure 3. A circuit to connect computer audio to stereo amplifier. This circuit lets you substitute a 200 watt stereo system for the external speaker.

a slot, stood back, and the machine would put on a performance guaranteed to amaze and astound.

The very, very best of these machines was in a little town high up in the Colorado Rocky Mountains. Its *piece de resistance* was a stirring rendition of Scott Joplin's 'Maple Leaf Rag'. When you put your money in it would snort loudly, thump its drum, the piano would hit a couple of bass notes, and then the violin, mandolin, and the whole works would start up together, all playing in harmony.

That machine really blew my brains out. I just couldn't keep away from it, and I spent many long hours feeding my hard-earned pocket money into it. A bit like today's video arcades, I suppose. This miserable addiction continued into adulthood, and today my family suffers the presence of a gigantic harmonium wind organ, again driven by paper rolls. The machine is well over 100 years old, and allegedly misspent its youth entertaining the patrons in a brothel in Bendigo.

This wind organ emits some convincing huffing and puffing, and when you open the shutters and let it go into full cry, the machine shakes the walls and stops bystanders dead in their tracks. It does a pretty fair imitation of a horror movie soundtrack with *Flying Dutchman Overture*, but the tune that really gets them in is one called *American Beauty Two-Step*, which sounds remarkably like the theme from Monty Python's *Flying Circus*.

I mention these matters to introduce a Public Domain MS-DOS program called Pianoman. This thing has to be the modern equivalent of those old time music machines. It uses a disk file instead of a paper roll, but the result is the same: mechanically generated music. What's more, you can program the 'rolls' yourself so it can play any any tune you want, in four voices at once.

Pianoman was the reason for this speaker upgrade project; the music sounded pretty wishy-washy playing through the IBM's internal speaker. But with the 'Pickle Box' connected, it's got enough kick behind it to bring irate shouts of 'Shut That Bloody Thing Off!' from other parts of the house - in other words, it works very well. One of the pre-programmed tunes that comes with Pianoman is the full and original version of *Maple Leaf Rag*. The first time I ran it, all I could hear was that old music machine from my childhood. Hooked, I was, all over again. And another of Pianoman's talents

The machine is well over 100 years old, and allegedly misspent its youth entertaining the patrons in a brothel in Bendigo.

is the complete version of the Monty Python *Flying Circus* theme.

Pianoman

WHEN YOU first fire up Pianoman, the screen will show a representation of the PC's keyboard, with most keys assigned note names. At this stage you can tap the keys and play little tunes in real time. You can make the computer record what you play and then play it back to you, much like those little keyboard synthesizers sold in department stores.

But the real power of Pianoman is in its editor, which you enter by pressing F1 while in the opening screen. Figure 4 shows you the editing screen. Each box contains pitch and length information for one note. You can play the notes into the boxes in real time from the opening screen, or enter them one by one with the editor. You can ask Pianoman to play the tune that's in the editor, and you can change the tempo and the key it's being played in. You can use WordStar-like block moves and copies to shift great chunks of music from one place to another. And, when you're finished you can save the editor's contents to a disk file and reload it later.

So far this sounds pretty ordinary, but Pianoman's shining light is the ability to play a tune made up of four different 'voices', all at once. Each voice can be entered and perfected on the editor, and then the four are combined into one music file. Actually, the voices aren't played simultaneously, but one at a time in quick rotation, a form of 'time division multiplex', if you want to put a big scientific name on it. The program gives you a burst of voice 1, then voice 2, then 3, then 4, and back to voice 1. This happens very fast, so the effect is of all voices playing at once. Sometimes you can detect a kind of 'bubbling' effect, which somehow seems

to add to the charm of the music. (Charm? Well, that might be a bit much ...)

It seems the most accurate way to program a tune into Pianoman would be to work from the sheet music, planning in advance which notes will belong to which voices. The *Maple Leaf Rag* sample that comes with Pianoman has each of the four voices in separate files, as well as all the voices combined. Figure 4 shows the forth voice, which appears to be the main bass line, sitting in the editor.

If you make the editor play voice 4 on its own, it sounds like it is playing the very bottom line of notes in the sheet music for *Maple Leaf Rag*. Similarly, voice 3 seems to be the top notes of the bass clef. Voices 2 and 1 would then be the high and low parts of the treble clef. I don't read music so I can't guarantee these observations, but the notes seem to go up and down in the right places.

Pianoman has a utility to convert your finished tune into a .COM file which will cause the tune to be played when you type its name from the DOS command line. In other words, independently of the Pianoman program. As each tune is playing, it displays a small sign on the screen with the tune's name or any other comments you may like to add.

Several tunes can be combined into a .BAT file to produce a whole concert; this is what is done in *PLAY.BAT*. It's the audio equivalent of one of those 'Slide Show' programs that displays a series of pictures. You could, of course, include an appropriately insulting tune in an *AUTOEXEC.BAT* file, complete with matching screen message, as a little trap for an unsuspecting PC user.

As you can see, I'm pretty wrapped in Pianoman, although there will be those, like my family, who think the whole idea is silly. Perhaps it would be more popular if I could teach it some John Farnham songs.

Pianoman is one of those programs that certainly qualifies as a first-quality hack. It does its music job well, and its screen displays are of professional quality. I can't understand how it ended up as Public Domain instead of finding a commercial market. It's one of those programs that's just naturally good, having no other purpose in life than to make people happy.

If you'd like a copy of Pianoman, send a note to Piano, *Your Computer*, PO Box 227, Waterloo 2015 NSW and enclose \$4 (no cash, please); or, if you've got a modem, request it through your local Opus bulletin board. □



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Expanding the C128



Figure 1. The 1700 and 1750 are RAM expansion units for the 128 and are one of Commodore's better kept secrets. They are identically sized cartridges which plug into the expansion port. The only difference between them is the amount of memory they offer – the 1700 provides an additional 128 Kbyte, while the 1750 provides a massive 512 Kbyte.

FOR THE past couple of weeks I've had the pleasure to play with both of the Commodore RAM expansion units for the C128. These are one of Commodore Australia's better kept secrets, because they're not advertised and they don't even appear on CBM's dealer product lists. Even so, they are available and the possibilities of a C128 with up to 640 kilobytes of on-board memory are quite intriguing.

Two models are available, the 1700 and 1750. They are identically sized, rather large cartridges which plug into the expansion port. The only difference between them is the amount of memory they offer. The 1700 provides an additional 128 Kbyte, while the 1750 provides a massive 512 Kbyte. Both cartridges come with a manual, a demonstration disk, and an updated version of CP/M which supports the additional memory. Neither cartridge has any effect in 64 mode. The 1700 is priced at \$199, while the 1750 is priced at \$349 (both prices taxed).

In 128 mode, the first thing to note is that the cartridge memory is external to that of the computer. This means that it's

not simply a matter of plugging in the cartridge and expecting the 128 to automatically recognise the existence of the additional memory. When you power up with either cartridge installed, you still get the same 122,365 bytes free message. The memory is there, and it's accessible, but it is necessary to use a little software to access it.

The 128's Basic V.7 provides three commands specifically for accessing external memory. These are FETCH, STASH and SWAP, which are respectively used for reading, storing and, as you might expect, swapping data between internal and external memory. The demonstration disk that comes with both expansion cartridges contains several examples of how these Basic commands can be used to good effect. Essentially, the demonstrations involve the creation of a series of high resolution graphic images which are stored in the external memory. By rapidly recalling the images the programs create a quite impressive animation effect.

While this sort of animation can be very useful, it's about the limit of what you can

do from Basic. The problem is that the supported commands expect parameters which refer to direct memory locations. For the Basic programmers this is okay when you are dealing with graphic screens, because you can work out absolute memory addresses. However, if you are dealing with variables, say a database with large arrays, Basic doesn't easily yield the exact memory addresses where individual bits of data are stored. For this reason, it's no easy matter to expand variable and data arrays into the additional memory space. What's really needed is an assembly language routine which wedges into the 128's kernal operating system and makes access to the additional memory transparent – meaning that the computer automatically takes care of the housekeeping. Commodore should have included such a software 'patch' with the demo disk, because it's really asking too much of the average user to write such a code themselves.

Virtual disk drive

The other potential use of the additional memory in the cartridges is to use it as a virtual disk drive, or Ramdisk. The idea behind a Ramdisk is that it's much, much faster to transfer information between memory chips than it is to read or write from a floppy disk.

The 1700/1750 manual quotes the speed of memory transfer from cartridge to computer and *vice versa* at one megabyte per second. Disk read rates, even in the C128's fast 'burst' mode are in the order of 500 bytes per second, so we're talking about a dramatic increase in performance. The only catch is that you must load the Ramdisk from the drive at the beginning of a session, and save the new data at the end, but if your program is disk intensive, the time you save in the middle should more than compensate.

A special version of CP/M which supports the expansion memory as a virtual drive is supplied with the package, and if you are a CP/M user you will find it very easy to use. The virtual drive is accessed simply by treating it as drive 'M'. Unfortunately, Commodore neglected to provide similar software for 128 native mode. If you wish to use this feature in your own programs you'll have to write the code

YOUR COMMODORE

yourself, or purchase software which includes such support. While the market is not exactly awash with such programs, Vizastar 128 and Geos 128 are two programs which were written with the expansion memory in mind. I haven't tried it with Vizastar, but with Geos the results were quite impressive. Everything happens faster whether you are jumping from the desktop to GeoWrite or GeoPaint, copying disks, or scrolling through entire 80 column graphic pages. Apart from when you finally copy the Ramdisk back to the floppy for safe keeping, the only speed limit is that of the 128's 8502 processor chip. And while nobody claims it's the world's fastest chip, it's still fast enough not to be a problem.

Geos has a configuration file which allows you to make the most of either expansion cartridge. If you're using the smaller 1700 cartridge you can get Geos to treat it as a 'shadowed' 1541 drive. That way it remembers the last data you read from the drive, so you don't have to go back to the disk if you need it again. In this mode, all writes go directly to disk, so you



Figure 2. Geos has a configuration file which allows making the most of either expansion cartridge - if you are using the 1700, Geos can treat it as a shadowed 1541 drive.

don't have to save anything at the end of the session. You can also use it to scroll through graphic screens without delays or to fast reboot Geos from Basic with disk access.

If you have the 512K 1750, you can do all of the above, plus still have enough

memory left over to function as a Ramdisk emulating either the 1541 or 1571 drives. It's worth noting that the 1700 cartridge with only 128 Kbyte, doesn't have enough memory to emulate a single sided floppy, let alone the 1571's double sided disks. For a Ramdisk application you really need the 1750's full 512 Kbyte of RAM

On balance, I have mixed feelings about the expansion memories. The plus side is that they are immediately useful if you use CP/M, Geos or want to animate graphic screens. They have a lot of untapped potential to exploit and I'd be interested in seeing just how far they might push the limits of the 128's usefulness. The minus side is that these products would be a lot more marketable if software wedges which supported Ramdisk and transparent expanded memory were included with the package.

There's no excuses. The cartridges were originally developed in 1985, and the fact that we are still waiting for these elementary utilities makes you wonder just how serious Commodore is about supporting new growth in the 8-bit market. □

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BATCH FILES

and infinite precision

1,461,501,637,33,902,918,203,684,832,716,283,
019,655,932,542,976

In the column this month, we'll be looking at batch files to change file attributes, and to automatically save ramdisk files and park your hard disk heads. In addition, we have a program which shows how to get virtually infinite precision in a calculation.

Batch files

Ben Skeates from Mt Isa has contributed three useful batch files to us, making use of such possibilities as %I, GOTO and IF EXIST. Even if you don't want .BAT files for the specific needs he's catering to here, you'll probably learn some hints you can adapt for your own .BAT files.

Before we get into Ben's files, if you want to leave a blank line, without the unsightly full stop often seen, use [echo] [space]

[alt/255 (on the numbers pad)], to leave a clean blank line. –

echo ALT&255 together

Now Ben's first file is used to change a file from READ ONLY to READ WRITE and vice-versa –

```
echo off
cls
if "%1"==" " goto help
IF NOT EXIST %1 GOTO DUMMY
attrib +r %1
ECHO "%1" is now READ ONLY
ATTRIB %1
goto exit
:help
echo The correct syntax is:
echo READONLY [FILENAME.FILETYPE]
goto exit
:DUMMY
ECHO You must issue the READONLY command
ECHO from the directory containing the
```

The multiprecision calculating program described in the text produced the series of numbers used as a background on these pages.

ECHO file (%1) whose attribute is to be changed
:EXIT

Ben's second file is called READRITE.BAT and uses a syntax similar to the first: READRITE [filename filetype] -

```
echo off
cls
if "%1"==" goto help
IF NOT EXIST %1 GOTO DUMMY
attrib -r %1
ECHO "%1" is now READ/WRITE
ATTRIB %1
goto exit
:help
echo The correct syntax is:
echo READRITE [FILENAME.FILETYPE]
goto exit
:DUMMY
ECHO You must issue the READRITE command
ECHO from the directory containing the
ECHO file ( %1 ) whose attributes are to be
changed
:EXIT
```

If you use a RAMdrive and tend to forget to save your data before finishing a session, the following P (for PARK.BAT) could be useful. Naturally enough, you should get into the habit of parking the heads before switching off or rebooting. P.BAT checks if there are any files on D: (or wherever), and if there are, copies them to a sub-directory of your choice on C:, and then parks the heads -

```
rem P.BAT
echo off
cls
if not exists d:\*.* goto nofiles
copy d:\*.* c:\dfiles
echo D:\ files are now saved in C:\dfiles
goto next
:nofiles
echo There were no files on RAMdrive D:
:next
park
```

Multiprecision numbers

Although you can use DEFDBL to double the precision of numbers on your PC, you are still limited to 13 or so digits. The program in the column this month, which you can run on both the PC and the CPC computers, shows how you can have results of virtually unlimited precision.

To do this, you need to work out your calculation one digit at a time, and store each digit - as it is calculated - as an element in an array. Then, at the end of the calculation, you print out the elements of the array in the desired order.

The program given with this month's article - 2 TO THE N - raises 2 to just about any power you are willing to wait for. A few minutes with this program on my Amstrad PC and I knew that 2¹⁶⁰ was -

1.461,501,637,330,902,918,203,684,832,716,283,019,655,932,542,976

```
10 REM 2 TO THE N
20 REM TWO2N.BAS
30 REM *****
40 GOSUB 310:REM INITIALISE
50 Z=0:Q=Q+1
60 Z=Z+1
70 T=X(Z)+X(Z)+Y
80 IF T<10 THEN Y=0:GOTO 100
90 T=T-10:Y=1
100 X(Z)=T
110 IF Z<V OR Y=1 THEN 60
120 PRINT "2 ^"Q;
130 V=Z
140 T$=""
150 FOR H=Z TO 1 STEP-1
160 P=X(H)+48:T$=T$+CHR$(P)
170 NEXT H
180 M=-1
190 S$=""
200 FOR J=LEN(T$) TO 1 STEP -1
210 M=M+1:IF M=3 THEN S$=S$+",":M=0
220 S$=S$+MID$(T$,J,1)
230 NEXT J
240 T$=""
250 FOR J=LEN(S$) TO 1 STEP -1
260 T$=T$+MID$(S$,J,1)
270 NEXT J
280 PRINT TAB(78-LEN(T$));T$
290 IF Q<1000 THEN 50
300 REM *****
310 REM INITIALISE
320 CLS
330 DIM X(1000)
340 Q=0:Y=0:V=0
350 X(1)=1
360 RETURN
```

Listing 1. 2 TO THE N will raise to to just about any power you are willing to wait for.

Run it for as long as you can be bothered to see the miracle of multiprecision arithmetic in action. You can see that the subroutine from 200 to 230 is used to put the commas in the final number in the right spot; at present the program is limited to numbers which are 1000 characters long (including commas). This can be changed by simply changing the 1000 in line 330.

We'll be including Your Amstrad in future issues of the magazine. I'd be interested in hearing from any companies making, or importing, software and/or hardware for any of the Amstrad computers. As well, I'd be more than happy to share any of your discoveries, hints, tips, comments and programs with other users, along with details of any Amstrad-specific user groups. A copy of my 'Amstrad PC Users Companion' (disk and manual) will be given to anyone supplying PC hints which are used in this column. I have some CPC software to provide in return for CPC hints. Please write to Your Amstrad, Tim Hartnell, Your Computer, PO Box 227, Waterloo, NSW, 2015 □



Solutions to the Cold War

A FEW YEARS ago the computing world had all the appearances of a Cold War. We had the Macintosh environment on one side of the iron curtain, and MS-DOS on the other. It was a major problem to get from one side of the Berlin Wall to the other – or so it seemed.

All that has changed now; Mac and DOS can easily co-exist within the same business environment. You now have simple ways to transfer basic data from one system to the other; more complex means of translating data from one formatted media to the other; and even ways of running applications programs from one environment, within the other.

Actually, this has not all been as recent an achievement as most people think – we've always had ways to swapping data from IBM to Mac and back again, it's just that no one used them. They weren't always easy to set up the first time, although generally once established the process was reasonably foolproof. It's just that the requirement wasn't there until Macs began to make such inroads into the business world.

Crossing the barrier

By far the most common reason to cross the Mac/DOS barrier is to transfer basic ASCII files – usually from one word processor to another, and this is also the easiest. If this is your requirement, all that matters is that the text characters, punctuation and paragraph breaks come over to save re-keying; the formatting can come later.

This basic ASCII transfer can be done relatively simply, either through a direct link between the two machines, or by passing the information through some main-frame standardising system such as one of the electronic mail services.

If one system can send unformatted ASCII files, and the other can receive and format these files, then you should have no problems – from the need to decide whether you want carriage returns at the end of each line, or not. People have been doing these simple transfers daily since the Mac and PC were born.

There are a number of simple programs that make life easier at this level; applications like Lap-Link Mac (Micro Support Systems) which are specialised communi-

cations programs to exchange data over a connecting cable.

Another approach is to use the specialised disk drives like Dynafile (Imagineering) or Apple PC Drive on your Mac, so that it can read the data direct. Both of these drives only handle 5¼ inch 360 kilobyte DOS disks and attach to the Mac – but they both read and write DOS files (we'll talk about the new Apple FDHD drive later).

Requiring the transmission of 'formatted' files across the boundary increases the level of difficulty substantially. In business we commonly use SYLK and DIF and TIFF and PICT and PostScript files. In less common use there's about a thousand other formats, most of which exist in only one application. There are sixteen 'major' work processing file formats for the IBM system alone and God knows how many less significant ones. And many of these won't have anything similar in the other environment, so translation will still be necessary.

But here lies the first hint of a simple solution: if it is important for you to transmit files and formats from one system to the other, make sure that you buy applications which have versions on both. It's obviously going to be a lot easier to take a Mac Microsoft Word document across for use in MS-DOS Microsoft Word, than it is for use in WordStar. Nothing is ever as simple as it logically appears, but give yourself a head-start by matching applications, and therefore largely avoiding the need to translate formatting information.

Theoretically, if the two applications are the same program from the same company, you should be able to send formatted files from one to the other with the ease of unformatted ASCII text (assuming that you are able to transmit the whole 8 bits in the extended ASCII system), but this is certainly not true in the desktop publishing area where it is needed most – mainly because of the different ways the Mac and IBM systems handle graphics.

SuperDrive

Apple has recently released its FDHD (Floppy Drive High Density or SuperDrive) unit which handles Macintosh 3½ inch disks. This unit will read, write and format both Macintosh (400 Kbyte, 800 Kbyte and

1.44 megabyte) disks and MS-DOS (720 Kbyte and 1.44 Mbyte) disks, and it will both read and write OS/2 and Apple II ProDOS files. It is very intelligent and Apple have made it processor-independent, which means that it can be run on any Mac and on the Apple IIGS. There's no official price at the time of writing, but I'd be quite surprised if the drive costs more than \$800.

With the FDHD drive comes an Apple File Exchange program that allows you to transfer and translate files. You can do ASCII text to ASCII text, DCA to MacWrite, binary to binary (Excel WKS to Lotus 1-2-3 WKS) and so on. Apple will release more translation software later for other file formats, so this could eventually be the best means of solving the problems, since Apple has a real vested interest in making file exchange seamless for as many applications as they can.

If we skip for a moment shared access to local area networks (like AppleTalk, TOPS, Ethernet and now Token Ring), probably the next stage in IBM/Mac exchange is the use of co-processors, such as the Mac 86 and 286 boards from AST Research. These provide full MS-DOS emulation on the Mac and therefore let you run alien applications as well. There are a couple of plug-ins for the IBM as well, but the conversion of an IBM to an imitation Macintosh isn't as cost effective as going the other way. The Mac is too sophisticated to be effectively simulated by just a plug-in card.

TOPS

TOPS (Imagineering) seems to be an excellent half-way LANs solution if you need to mix PCs and Macs, since it doesn't require the dedicated server with its associated costs. TOPS is a distributed LAN system which makes every computer act as a file server to the others on the network.

The Macs just plug into TOPS through their normal LocalTalk connection, or if you need a longer link you can use Fallaron's Phonenet. The PC side of TOPS requires a a TOPS Flashcard board (Imagineering) and a copy of TOPS/DOS network software.

Don't forget that the provision of a link between the two environments through local area networks is only part of the

YOUR MAC



solution; we've always been able to transfer files (although LANs make it quicker and easier). The problem is still in translating those files so that they can be used in the other computer environment.

Again, the best solution is to use a program like Microsoft Word as a standard for both the Macs and the PCs, so that no

translation is required. Similarly, Microsoft Excel has an in-built translation mechanism that will read Lotus 1-2-3 files (but not Lotus macros or dates). But any substantial network should also be provided with a specific network translation application like Dataviz's Mac Link Plus.

Graphic files provide special problems

at every level, because the way a Mac handles graphics is quite different to the MS-DOS methods. The PICT format used in a number of drafting programs, scanners, digitisers, and desktop publishing applications (like Aldus PageMaker) is one way in which the transfer can be reasonably assured. □

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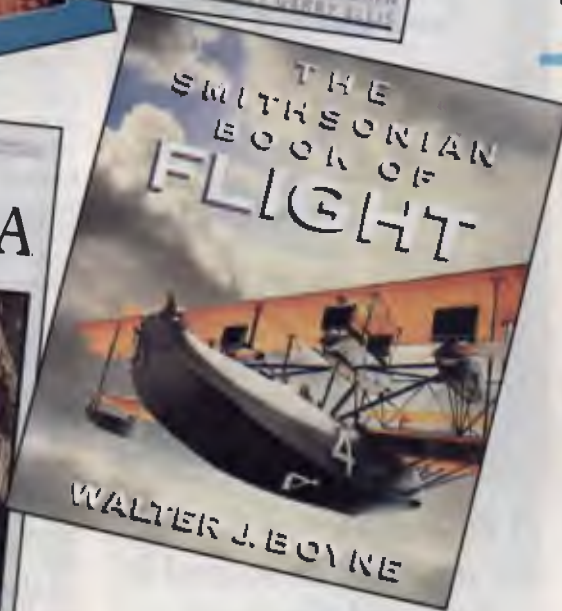
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Manual dexterity

DOS 4.0 command reference

ONLY ONE manual was needed by DOS 1.x. This was not a very ambitious operating system, and there was plenty of room in the binder for both the user guide and technical reference material for programmers. DOS 2.x was a far larger program. The manual grew to the extent that it became two manuals, the DOS manual that came with the system, and a separate DOS Technical Reference Manual, available at extra cost.

The situation was the same with DOS 3.x. DOS 4 has grown again. Not so much with the addition of new features to DOS itself, but with the addition of the DOS shell, allowing users to control their systems without ever having to encounter the dreaded DOS prompt.

After adding the information on the shell, there was less room for information on the DOS commands. The manual has adequate details on the most common commands, and brief mentions of the rest. Typically, expansive details on parameters for commands like MODE are now omitted, and the command itself only gets a passing mention.

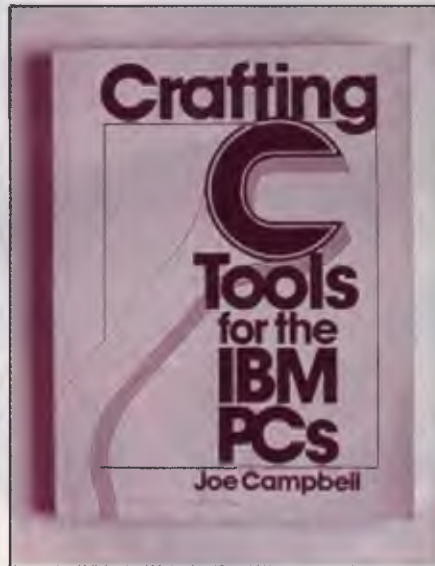
While this is adequate for the casual user, every organisation seems to have at least one DOS guru. These specialists will need more information. The answer is the *DOS 4.0 Command Reference Manual*, a wire bound, A5 size 300-page book, with far more information than anyone ever really wants to know about DOS commands and their parameters.

After a table of contents, Chapter 1 covers a summary of change to DOS from 3.3 to 4.0, the use of DOS commands in association with networks (some commands can't or shouldn't be used), describes the various types of DOS commands, and gives a tutorial on reading the syntax diagrams used in the descriptions of the various commands. These diagrams are used to show the optional and mandatory parameters to be entered for each command, and do so more clearly than can be done with words alone.

Chapter 2 is entitled Tables Of Commands. Despite the fancy title, it is really quite simple. It consists of several tables,

which contain lists of all the DOS commands. Each table lists several tasks. Against each task is the name of the command which can perform it.

'Batch Files' lists the commands used only in batch files. 'Configuration Commands' lists internal commands like FILES and BUFFERS used in the CONFIG.SYS file. 'Device Commands' lists device drivers like ANSI.SYS invoked from CONFIG.SYS files. 'Install Commands' lists four



A book only has to save me an hour or so and it has paid for itself.

external command like FASTOPEN, which can be run from within the CONFIG.SYS file. 'Creating and Maintaining Your Directories' names commands like CHDIR, APPEND and others. 'Maintaining Your Files' gives the names and tasks for commands like ATTRIB, COPY and ERASE. 'Preparing and Maintaining Your Disk and Diskettes' covers commands like CHKDSK, FORMAT and FDISK. 'Managing Input and Output Devices' covers commands like MORE, SORT, CLS and MODE.

Three other tables list commands and tasks for 'Obtaining and Changing System information', 'Using Expanded Memory Commands', and 'Managing and Maintaining Your Country Information'.

Now comes Chapter 3, called DOS Commands. In it, in alphabetical order, is detailed information on each and every DOS command. Just as one example, the first entry is for ANSI.SYS. It fills 15 pages, and covers details that previously I found after searching through reference book after book. The whole of this chapter takes no less than 290 odd pages, and is an excellent example of the way to lay out a technical document to make the contents clear, concise, accurate and accessible.

The entry for each DOS command follows a consistent layout. First the purpose of the command is explained. Next the 'type' is shown. Some DOS commands are internal to the COMMAND.COM command processor, while others are EXE or COM files and are external to the command processor. Still others are device commands, batch file commands and so on. In the 'type' part of the entry, the word 'external' will appear if the command is an external command, 'internal' if it is internal to COMMAND.COM, 'device' if it is a device driver and so on.

Next will follow a syntax diagram. Here a line starts at the left of the page. Optional commands are shown as a branch below the line, rejoining the main line after the option. Mandatory parameters are shown in capitals, and interrupt the line. If the diagram won't fit on one line, it is divided over two or more lines.

Next comes the subheading 'Parameters', and in it are listed all the optional parameter which can be used with the command in question. Now comes 'Remarks', followed by 'Examples'.

With DOS 2.x and 3.x, the information on DOS and its commands and parameters was far less than in the DOS 4.0 Manual and Command Reference Manual combined. It would have been nice to have the information in the Command Reference Manual included with each copy of DOS 4.0. As few users will need it, it's not too outrageous to have it in a

separate manual, even though it is a bit expensive for its size.

The Command Reference Manual is on IBM part number 6280253, and is available from IBM dealers for around \$50.

OS/2 and other news

I am writing this column in the second week of November, the very latest that will allow it to be included in the January issue. A couple of items of late news came to hand over the last couple of days, and while you may already have heard of them, they do have great significance for the future.

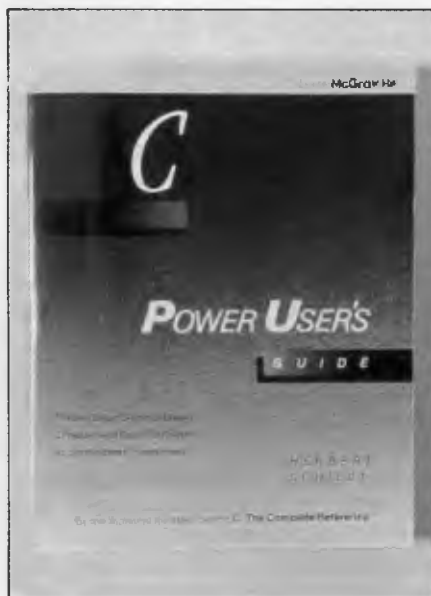
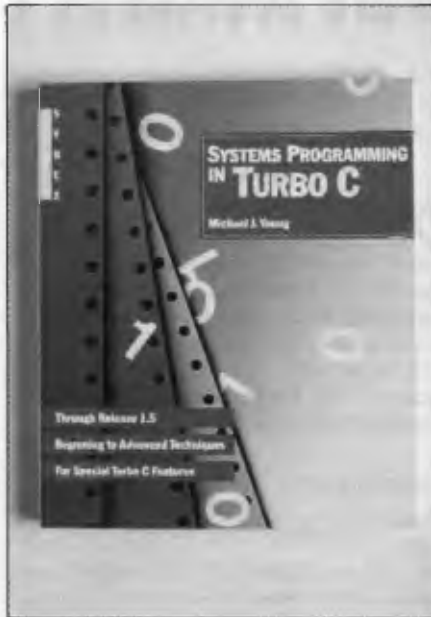
First and foremost was a joint announcement from Microsoft and IBM that shipment of OS/2 version 1.1 with Presentation Manager (a Windows and Mac like graphical interface) began on November 2, 1988. The initial text-only OS/2 allowed people to get their applications up and running under OS/2, but the 'real' OS/2 has now arrived.

OS/2 offers the opportunity for users to run more than one application at a time. One possibility might be a word processor in the foreground, with communications or a database running unseen at the same time.

OS/2 also allows the development of more complex programs with multiple threads operating at the same time, such as having an application run graphics in the foreground, while updating a spreadsheet in the background, while accessing a mainframe! We can only guess where this will all lead, but I am sure that OS/2 will have similar impact to that which occurred when the original PC and MS-DOS arrived.

More OS/2 applications are arriving from commercial publishers every day, and there are some Public Domain OS/2 programs on the bulletin boards. Paradox has been shipping an OS/2 version for some time. The Norton Guides has an 'engine' to run under OS/2 protected mode. DisplayWrite 4 has had an OS/2 version for months. Version 3 of Lotus 1-2-3, which runs under OS/2 and probably DOS, is eagerly awaited. dBase IV has started shipping, and an OS/2 version has been promised. OS/2 compilers are available for many languages.

On November 1, Microsoft announced Microsoft Word 5, which can run under DOS or OS/2 protected mode. It claims greatly improved graphics integration, an internal page preview mode, better on-line help, and much, much more. As you



read this, it should be available in the stores. I hope to review a copy in the next issue or so.

Yet more new products from Borland. Turbo C 2.0, Turbo Pascal 5.0, Turbo Assembler and Turbo Debugger have been released. For upgrades contact Tech Pacific, or Borland direct.

Books, books, books

I seem to need a vast number of computer books. A book only has to save me an hour or so and it has paid for itself. As a result I tend to buy a lots of them, and always

seem to have information available when needed. I would like to mention some of the ones I have bought recently, and which I have found to be useful.

My first book is *The IBM Programmers Challenge* by Steven Chen, published by TAB books. This contains 50 problems which can easily be solved with a short computer program. It gives some test data, correct answers if the test data is used, and sample solutions in Basic, C and Pascal. Any programmer learning one or more of these languages will profit from the exercise of writing code to solve the problems, and by analysing the sample programs in the book. My copy came from McGills, 187 Elizabeth St, Melbourne and cost \$29.95.

The current favourite topic for authors seems to be the C language. Most C textbooks start users from first principles, and get up to simple programs not much more complex than 'Hello World'. Rarely do they attempt anything more difficult than can be handled with the most common functions in the typical compiler library.

Where do you go when you outgrow the beginners' texts? I use three books that start where the others end. *Systems Programming in Turbo C* by Michael J Young, is published by Sybex and costs \$43.95. *Crafting C Tools for the IBM PCs* by Joe Campbell is published by Prentice Hall, and costs \$52.95. *C Power Users Guide*, by Herbert Schildt, is published by Osborne McGraw Hill at \$47.95.

What is special about all three is that they address real problems. All give sample code to solve the problem. Most is in C, but some is in Assembler. They are not just code fragments, but are complete functions ready to compile, link to your own code, and be called from it. Disks are available containing all the code in the books.

Typical topics include access to the BIOS, getting fast screen performance with direct writes to video memory, pull-down menus, TSRs, graphics, serial communications, directory and disk access, and much more. While no one book has all the topics, most of the topics are found in two if not all three. I can't recommend one above the other, for each has its own emphasis, but whenever I hit a wall and can't solve a problem, a little browsing through them usually brings a quick solution.

My copies came from Hotline Books at 693 George St Sydney, or Dymocks at 424 George St Sydney. □



Software sources . . .

EVERY SO often, it is time to pause in this column and talk about underground IBM software in general, rather than review one package in particular, allowing those who have recently joined us to catch up.

Software categories

Software falls into three main camps. There is commercial software, Public Domain software and User Supported software. Commercial software is just that. It is created as a retail product, with glossy packages and manuals, distributed through conventional channels and retailed through stores. Public Domain software is the exact opposite. A programmer creates a package and allows its distribution free of charge. In between is User Supported software, known also by a vast variety of names including Shareware. Here the user can try a fully functional copy of the product, and pay a registration fee when the decision is made to use it on a regular basis.

While it is neither legal nor ethical to copy commercial software, the authors of User Supported and Public Domain software encourage users to make copies and give them to friends, acquaintances and workmates, provided that those registration fees are paid for continuing use.

The package

User Supported and Public Domain software usually comes as a disk from a user group, or a file with an ARC extension from a bulletin board. Each will contain the several files that make up the application, including program files, data files and some sort of manual or brief documentation on the disk.

As a brief aside, a file with an ARC extension consists of several files, each of which has been compressed in some fashion and then combined into one file. This saves disk space and transmission time over a modem link, and also makes sure that all files for an application arrive together. A program like ARCE, ARC or PKXARC is used to separate the component files in an ARC file and expand them to their former size.

The manuals on disk are usually fully formatted, with page breaks, line breaks and margins already in place. Just copy them to a printer and the manual is yours. The following command would print the file 'manual.doc' on the printer connected

to the first parallel port. Just replace 'manual.doc' with the name of the actual file you want to print -

```
C) COPY manual.doc PRN
```

Often the registration fee for a User Supported product includes a printed and bound manual. The manuals on disk are usually full manuals, though some User Supported products only have an abbreviated manual on disk, which saves precious disk space (some manuals can be 200 kilobytes or 300 Kbytes long), and also encourages registration.

Distribution

The two primary ways of distributing underground software are user group libraries and electronic bulletin boards. Any person with a need to use a PC on more than a most superficial level should get involved with their local user group, to get assistance from other members and to give assistance where possible.

Groups with good to excellent libraries are quite common. I have had contact with groups in Sydney, Melbourne and Canberra which have excellent libraries of up-to-date Public Domain and User Supported software. Naturally, no such libraries have pirate copies of commercial software. All run bulletin boards for quick and easy exchange of software. The names and addresses are -

Melbourne PC User Group Inc, GPO Box 1728P, Melbourne 3001 Victoria; Tel: (03) 699 1943, BBS: (03) 819 6469 and (03) 819 5392.

PC Users Group, PO Box 594, Turrumurra 2074 NSW; Tel: (02) 488 9119, BBS: (02) 724 6813 and (02) 540 1842.

PC Users Group Inc, GPO Box 2229, Canberra 2061 ACT; Tel: (062) 59 7484, BBS: (062) 59 1244.

Due to sales tax complications, most user groups cannot sell to the general public, and can only sell to members. Again, to stop the bulletin boards being overloaded by visitors and locking out members, there is usually some sort of restriction on non-members' use of a bulletin board run by a user group.

There are other sources, including some commercial libraries of User Supported and Public Domain software. The best known and organised is PC-SIG, an American organisation which searches out underground software, and creates disks,

each of which has one or more similar applications on it. Its collection is now well over 1000 disks, and can be obtained from the Australian distributor, Manacomm at PO Box 509, Kenmore 4069 Queensland and from its dealers.

Already I have mentioned the phone numbers of the bulletin boards run by three user groups. There are literally hundreds of other boards out there, run with various degrees of dedication and professionalism. The best will have on them underground software within days of release by authors half a world away, will weed out suspect programs and pirate programs and will be a reliable and rapid way of having the best and latest software. Getting a modem and trying a few local boards until one is found that you like and trust is the best investment of time and money that you will ever make. Look in *Your Computer* for a rundown of the status of bulletin boards each month in 'The Prophet'; the last complete listing of bulletin board systems was in the October '88 issue.

```
10 ' *****
20 ' * *
30 ' * BACK TO BACK *
40 ' * *
50 ' *****
60 '
70 ' Prints ASCII files back to back
80 ' Odd number pages are printed
90 ' on one side. The paper is
100 ' reversed and the even pages
110 ' are printed on the other side
120 '
130 ' By J R Hepworth
140 ' Haberfield NSW
150 '
160 ' No warranty express or implied is
170 ' offered as to the fitness of this
180 ' program for any purpose. The user
190 ' shall determine if this program is
200 ' suitable for the proposed use and
210 ' shall accept all liability for any
220 ' loss or damage.
230 '
240 PRINT
250 FILES
260 PRINT "Read which file - ";
270 PRINT "press (ENTER) to quit ";
```

IBM UNDERGROUND

```

280 INFILE$ = "":INPUT "":INFILE$
290 IF LEN(INFILE$)=0 THEN CLOSE:END
300 '
310 ON ERROR GOTO 1380
320 OPEN INFILE$ FOR INPUT AS #1
330 ON ERROR GOTO 0
340 '
350 OPEN "LPT1:" FOR OUTPUT AS #2
360 '
370 CLS
380 PRINT "Select page length
390 PRINT "(1) 66 lines"
400 PRINT "(2) 70 lines"
410 '
420 I$ = INKEY$
430 PRINT I$;
440 IF I$="" THEN GOTO 420
450 PRINT:PRINT
460 PAGELEN = INSTR("12",I$)
470 IF PAGELEN = 0 THEN GOTO 370
480 IF PAGELEN=1 THEN PAGELEN=66
490 IF PAGELEN=2 THEN PAGELEN=70
500 '
510 ' *****
520 ' SELECT SIDE TO PRINT
530 ' *****
540 '
550 PRINT "Print side (1) or side (2)"
560 I$=INKEY$
570 PRINT I$;
580 IF I$="" THEN GOTO 560
590 SIDE = INSTR("12",I$)
600 IF SIDE = 0 THEN GOTO 560
610 IF I$="2" THEN SIDE = 0
620 LINENUM = 0
630 PRINT:PRINT
640 PRINT "PREPARE TO PRINT"
650 PRINT
660 PRINT "Align paper and press ";
670 PRINT "any key to continue"
680 I$=INKEY$
690 IF I$="" THEN GOTO 680
700 WIDTH #2,96
710 ' set printer to 12 CPI. Change string
720 ' in next line to match your printer
730 PRINT #2,CHR$(27);":";
740 GOSUB 790
750 CLOSE
760 SYSTEM
770 '
780 '
790 ' *****

800 ' PRINT A SIDE
810 ' *****
820 '
830 PAGENUM=1
840 IF SIDE=2 THEN SIDE = 0
850 IF EOF(1) THEN GOSUB 1080: GOSUB
      1250: CLOSE: RETURN
860 LINE INPUT #1,READLINE$
870 LINENUM=LINENUM+1
880 FFPOS = INSTR(READLINE$,CHR$(12))
890 IF FFPOS>0 THEN GOSUB 960 ELSE GOSUB 1180
900 IF LINENUM<66 THEN GOTO 840
910 GOSUB 1250
920 LINENUM=0
930 SIDE=SIDE+1
940 GOTO 840
950 '
960 ' *****
970 ' PROCESS LINE WITH FORMFEED
980 ' *****
990 '
1000 IF SIDE=1 THEN PRINT #2,LEFT$
      (READLINE$, (FFPOS-1))
1010 GOSUB 1080
1020 GOSUB 1250
1030 SIDE=SIDE+1
1040 LINENUM=1
1050 IF SIDE=1 THEN PRINT #2,MID$
      (READLINE$,FFPOS+1)
1060 RETURN
1070 '
1080 ' *****
1090 ' EXPAND FORMFEED
1100 ' *****
1110 '
1120 WHILE LINENUM<66
1130 LINENUM=LINENUM+1
1140 IF SIDE=1 THEN PRINT #2,""
1150 WEND
1160 RETURN
1170 '
1180 ' *****
1190 ' PROCESS LINE WITHOUT FORMFEED
1200 ' *****
1210 '
1220 IF SIDE=1 THEN PRINT #2,READLINE$
1230 RETURN
1240 '
1250 ' *****
1260 ' BOTTOM MARGIN
1270 ' *****
1280 '

1290 LOCATE 20,10
1300 PRINT "Page ";PAGENUM;"Completed"
1310 PAGENUM= PAGENUM+1
1320 WHILE LINENUM<PAGELEN
1330 LINENUM=LINENUM+1
1340 IF SIDE=1 THEN PRINT #2,""
1350 WEND
1360 RETURN
1370 '
1380 ' *****
1390 ' Error handling
1400 ' *****
1410 '
1420 CLS
1430 FILES
1440 PRINT CHR$(34)+INFILE$+CHR$(34);
1450 PRINT " does not exist - try again"
1460 PRINT "Select another file to read"
1470 PRINT "Press (ENTER) to quit"
1480 RESUME 280

```

Listing 1. Back To Back is a program that allows you to print on both sides of the paper.

I regret that, due to complications of sales tax, amongst other things, I am unable to sell or distribute disks of underground software.

Back to Back

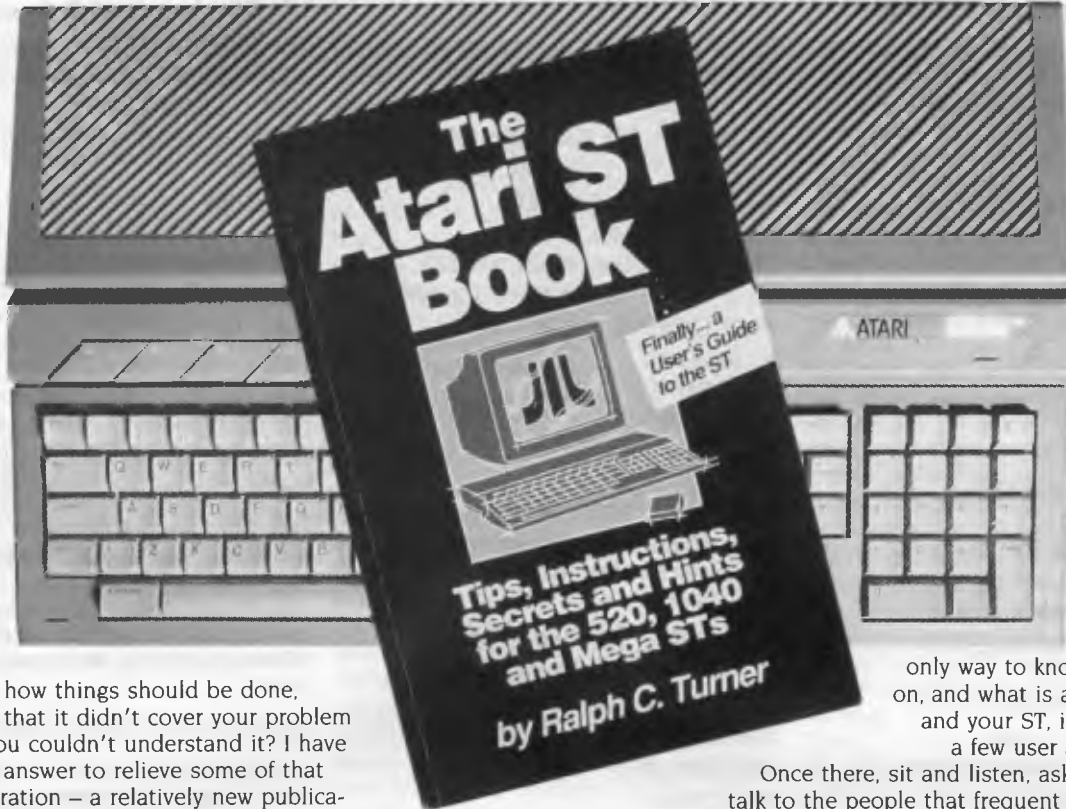
And now for a little utility program. One of my dislikes with underground software is printing out those manuals all on one side of the page. If they are printed out double sided, half the paper is used and half the storage is required. The little program is B2B.BAS, and called Back To Back.

All the user has to do is to tell the program if the paper is 66 lines or 70 lines between perforations, and if the first or second side is to be printed. It reads a formatted ASCII file and prints all the odd number pages on one side of the paper. The paper is then removed from the printer, and rethreaded with the odd pages on the inside facing the plated roller. Now the even number pages are printed, and when separated, collated and inserted in a binder, the result is a manual printed double sided.

It is written in Basic, as virtually all PC users have a Basic interpreter. While it can be compiled, most users will find that unnecessary, as it processes the file far faster than the average printer can keep up, even on a slow PC. □

A USER'S GUIDE AND TRUE CIRCLES

RITA PLUKSS



DO YOU remember how you felt after you brought home your new ST, fired it up and read the

manual to see how things should be done, only to realise that it didn't cover your problem area, or that you couldn't understand it? I have just found the answer to relieve some of that feeling of frustration – a relatively new publication called *The Atari ST Book* by Ralph C. Turner.

The Atari ST Book is a user's guide to the ST, not a programmer's guide, and as such concentrates on all those 'easy' things that seem to overwhelm a user who has been thrown into a new environment with a very scant manual and nowhere to go to solve the many problems that arise. It covers such things as RAM disks, files and their management, using the Item Selector, the AUTO Folder, copying, DESKTOP.INF, the Control Panel, installing applications, printers, modems and telecommunications.

Happily, most of the jargon that usually creeps into publications such as this has been omitted. The question and answer format is very effective, practical and easy to follow. This type of publication extends the practical information in the owner's manual and takes a lot of the frustration out of those simple tasks that seem like mountains.

The Atari ST Book by Ralph C. Turner, costs \$35, and is 159 pages; the review copy was supplied by Paragon Computers in Perth; (09) 221 3216.

More for less

In each Australian state, except Tasmania, there is at least one Atari user group. If you have never contacted your local user group you could be missing out on some interesting information and a good resource for trouble shooting. Most groups also have a Public Domain library, which if utilised properly, could save the average home computer user a great deal of money.

Buying the right software to run on your computer can be a daunting and expensive task. In some cases you will need to purchase the commercial version, in other instances you could get by with something a bit simpler and cheaper.

This is where user groups and Public Domain programs come into their own. The

only way to know what is going on, and what is available for you and your ST, is to go along to a few user group meetings.

Once there, sit and listen, ask questions, and talk to the people that frequent these meetings.

The basic requirement of most home users would include a word processor, an art package, maybe a music package, and perhaps a database and spreadsheet.

Most of these areas have programs in the Public Domain, as Shareware, or a usable (in a restricted format) demonstration version of a full commercial package. If you do not require full business packages with all the accompanying bells and whistles, why pay the high prices asked for them? If your requirements are simple, then the Public Domain library may have a program that will do the job for you.

Stwriter Elite is a simple to use (which does not mean simplistic) word processor with some use of pull down menus, but can be used entirely from the keyboard. You can also use it in all three resolutions. Although it is not a WYSIWYG (What You See Is What You Get) format, most home users would not require this degree of complexity.

Word400 is a mini text processor that operates as a desk accessory, thereby being available for use when you want to make notes while running another program. Instead of hunting for the ever elusive pen and paper to jot down a thought, just access the desktop and activate Word400 to record your insights.

Neochrome version 0.9 is in the Public Domain (version 1.0 has been released commercially). This was the original art program given away with the ST. Although it's missing some of the more involved manipulations available on the recently released art packages, it is still a very acceptable art or painting program.

Music and MIDI are well catered for with programs for both the listener and the player. Czphonic is an option ware program (demo version of a commercial program) and operates with a Casio synthesizer through MIDI channel 1.

YOUR ATARI

Databases and spreadsheets are a little harder to find in the Public Domain Shareware ground, but they are available. Whether you can find one to fulfill your specific needs depends on the complexity of your needs. There are some demonstration versions of commercial software, released as advertising promotion by the various software houses, that allow you to use all the options within the full package, but generally restrict or limit the saving of information to a very small file. Have a look at these demo versions, talk to the people that use the different packages, and really work out what your full requirements are, before spending a hundred or so dollars.

Don't rush into purchases. Evaluate your needs first. Have a look to see what is available in the Public Domain, then look at all the commercial programs, not just the first one that the salesman shows you. That way you are more likely to be satisfied with what you eventually purchase.

The only way to know what is going on, and what is available for you and your ST, is to go along to a few user group meetings.

True circles

When the SC1244 leaves the factory, the horizontal vertical aspect ratio can be anything up to 2 cm out. To check whether your monitor is true or not is a simple task. Load in any art, drafting or programming package which has an automatic (true) circle function. Draw a frame around the full screen so that you know where the corners meet, then draw a line from each corner to its adjacent corner. This will give you the true centre of the screen. Draw a horizontal line dividing the screen in half, then draw a vertical line through the same centre point.

Activate the automatic circle function, place the cursor in the exact centre of the screen and draw a large circle. Take a piece of paper and press the edge of it against the screen along the centre horizontal line. With a pencil mark the two outer circumferences and the mid point. Turn your paper 90 degrees and line it up along the vertical centre line. If the three marks on your paper match up with the two circumferences and mid point then you have a true circle on the screen which means the horizontal vertical aspect ratio is correct.

If your paper markings don't match up, then the monitor needs adjusting. At the back of the monitor are a series of adjustment holes. In my experience only the vertical size adjuster needs touching up. This is the second adjustment on the left, when viewing the monitor from the back.

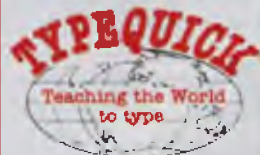
The only way to do the adjustment is to use an insulated adjusting tool. *Never* use metal, unless of course you want to buy a new monitor, or life is getting a bit too much for you. If you're not competent with electronics, a screwdriver, or have never done this sort of thing before, *do not* do it now. Take it along to a user group meeting and have someone who knows what they are doing do it for you.

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THERE ARE two types of books in this world: ones you would find useful to read and ones you would not. Deciding which is which – before you part with your cash – is not so easy when confronted with hundreds of titles in a book store.

It is not just a question of choosing well-written books over poorly-written ones, but often a case of finding subject matter presented at a level you can digest.

For example, if you have some knowledge of the subject, or if you know that you're really going to get your hands dirty, then you buy the complete reference bible on the subject.

On the other (clean) hand, if you're just trying to find out what the subject is about you need a different approach.

Microcomputer Data Security – Issues and Strategies for Business

SECURITY ASSUMES the safe and continuous operation of your computer system by trained, authorized personnel. The system itself must be protected, as well, the integrity of all programs and data. Finally, security means that 'any entered data can be retrieved at any time, without alteration by accident or deliberate intent.'

Chris Allen describes two books for decision makers who want to broaden their knowledge of computing.

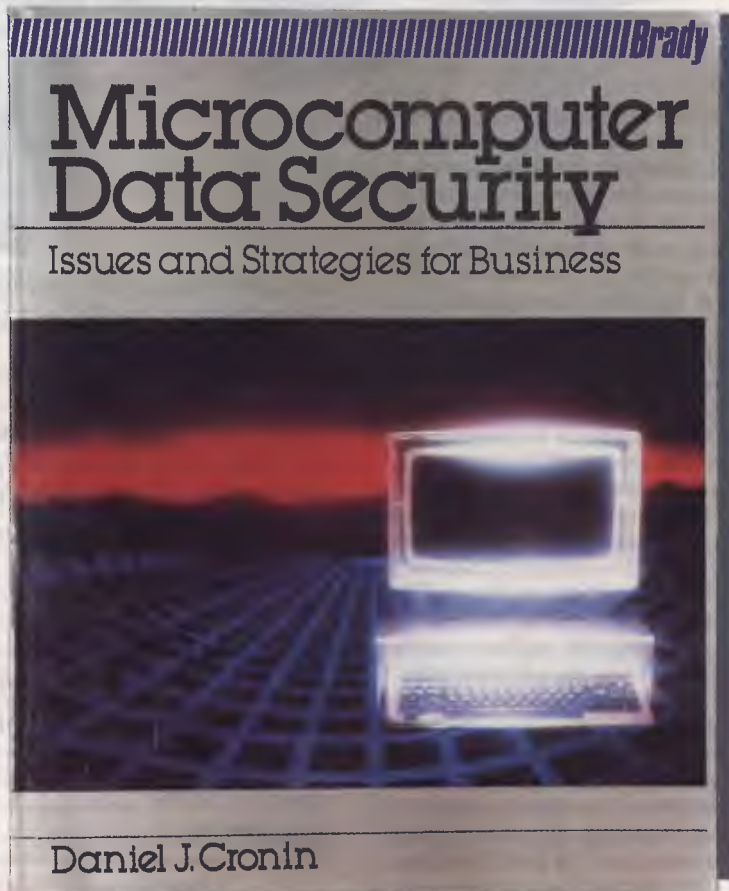
This definition of security is a guideline to the approach taken by this book. The author begins by explaining the rele-

vance of the security issue to today's microcomputing environments, the consequences of not being aware and some of the myths surrounding it. This is more significant than it might appear.

Most people think of microcomputer security as a complicated evil, possibly more effort than it is worth. It is because security covers so many areas that it appears complicated, and if it is complicated why make life more difficult by addressing it?

It is a myth that security has to be complicated and, as the author points out, the cost of security should never be more than the cost of losing data or data integrity. Obviously, some balance is required. The analogy of the defensive system of a medieval castle is used, with data being the inner bailey surrounded by hardware, operating systems and application programs and then the external world. For an intruder to access the data, the exterior levels must first be penetrated. From the security point, defences can be built at each level to keep an intruder out. This is not too difficult.

The outermost area is the physical environment in which the computer is placed. Everybody locks the door on their office or home when they leave, so an initial security measure is already in place. The author discusses defensive 'keep out' measures along with prevention/detection 'keep safe' steps.



Most of these steps need only be implemented once and thereafter require little or no maintenance.

As the discussion moves further into the computer 'castle', areas such as data backup, DOS and application weaknesses are discussed. For example, the consequences of misguided use of the FORMAT command are covered, along with steps that can be taken to minimise the likelihood of such an occurrence.

Each security area is discussed (including networking issues), with the final chapters covering the most lethal attack of all, the inside job. Your castle won't hold up under attack if the troops defending it are more interested in gaining the spoils for themselves. It also helps to have your troops actually interested in defending the castle. To keep your staff loyal does not require a heavy handed approach. Techniques for boosting employee productivity and morale can be applied to the security issue. Careful and considerate planning is required, but it pays dividends.

This book was published in 1986, so its coverage of software security packages is a little dated. Although it covers communications and weaknesses embedded into program code, there is no discussion of the viruses and Trojan horses that have been so newsworthy recently. Apart from that, the book is current.

The concise yet comprehensive coverage of the subject, combined with it's

practical approach, make this a worthwhile text for anyone remotely concerned about security (and for all those people not even remotely interested, they should be). Microcomputer security is not a bogey man to be afraid of, but merely another fact of computing life.

some of the obstacles of conventional publishing and the hurdles an individual will face in trying to produce a publication of their own.

Just how useful you will find this book depends on your knowledge of publishing, business and, to a lesser degree, computers. The traditional roles in the publishing process such as editor, writer, copy editor, compositor, designer and paste-up artist are explained and compared to the desktop publishing environment. The authors explain how each of these steps in the process of turning ideas into publications are brought together.

Publishing in any kind of volume costs a fair amount of money and enterprise - it's a business. To start and run a successful business requires an idea, an audience, marketing, careful equipment selection and financial planning. Which is exactly what this book covers. This information is conveyed in less than 220 pages, so it could hardly be considered the sole resource of information for the budding publisher, but it is a good introduction.

If you are not sure why there is such a fuss about DTP, if you think you've something to say

that others should hear or if you have an excitable friend who's about to invest his life savings in a desktop publishing venture, then this book is definitely worth your time. □



Desktop Publishing From A To Z

THIS BOOK briefs the user on the practical side of desktop publishing (DTP), the pleasure and the pain. You can't help but get the feeling that the authors have been bitten by the urge to publish, and feel some missionary-like zeal to spread the word.

Desktop Publishing from A to Z is aimed at a wide audience - both the businessman and the hobbyist. They feel that the opportunity for expression created by this new technology should be recognised by anybody who feels they have, or would like to have, something to say. To this end, the book attempts to explain what DTP, how it overcomes

Product Details

Title: *Microcomputer Data Security*
 Author: Daniel J. Cronin
 Publisher: Prentice Hall Press
 Distributor: Simon & Schuster,
 7 Grosvenor Place, Brookvale 2100
 NSW
 (02) 939 1333
 Price: \$39.95

Product Details

Title: *Desktop Publishing From A To Z*
 Authors: Bill Grout, Irene
 Athanopoulos, Rebecca Kutlin
 Publisher: Osborne McGraw-Hill
 Distributor: McGraw-Hill Australia,
 4 Barcoo Street, Roseville East 2069
 NSW
 (02) 406 4288
 Price: \$41.95
 Tax not applicable to these products.



If it's not on, it's not on!

I guess it's only fair that I confess to you that not quite all of my beloved readers totally agree with absolutely everything that I write in this column. In the spirit of fair play (and just to show what a really smooth Amigo I am), here is an example of some of my not so positive feedback.

From R.J. of Kedron, Queensland, comes the following: 'Dear Sir, In the August edition of *Your Computer*, Mr Gregg Faulkner stated the biggest laugh of the month was Atari reducing the price of their computers. I do not recall ever having read

I carefully quarantine every new disk I buy or borrow until I can examine it with a boot-sector check utility.

such a naked display of raw immaturity not to the credit of the magazine or the author.'

'What does matter is those who may actually believe his biased and childish remarks there is no place in a magazine such as *Your Computer* for bias without any commercial reason or understanding incorrect according to overseas magazines.'

'I trust that the author will exhibit sufficient intelligence to apologise...for his lack of expertise, good manners and the

doubtful quality of his journalism.'

Well RJ, you've stabbed me to the core of my being. Here I was, not believing everything I read in 'overseas magazines', but rather accepting what my eyes and ears observed first hand. *Mea Culpa*. You're quite correct, of course, R.J. - childish of me to treat such a serious subject with levity.

Another somewhat critical letter from Alan Stuart of Roleystone, WA. Alan took exception to my article in the June '88 issue in which I criticised retailers for selling software in unsealed packages. He tells me that most of the Amiga packages in the store where he helps out would be opened for a variety of reasons.

Firstly, kids want to try out a game for which they are about to pay their hard-earned pocket money. Alan adds that 'you can't go by what a reviewer in a magazine says is rubbish ... my kids think Test Drive is the best game since sliced bread'. (Point taken!)

Secondly, Alan thinks that I might be surprised at the number of software packages that come into a shop and don't work. Not quite, Alan, I would be disgusted but not surprised. I've had a taste of retailing, and I completely agree with you.

Thirdly comes the matter of viruses. Alan tells me that he opens and checks every package with a track editor to ensure that no virus is present on the disk. I commend you for your care and professionalism Alan, and wish that more retailers were as fastidious as yourself.

Unfortunately many retailers are concerned entirely with separating the customer from his (or her) cash in the quickest and least demanding way possible. Customers are often permitted to copy disks (only Public Domain, of course) on the store's machines, and security may not be as tight as it might be. One thing follows another and very shortly the store becomes the Typhoid Annie of the local Amiga community. It's a pretty good bet that any unsealed software bought from such a store will be infected.

You are absolutely correct, Alan, buying a sealed software package *is not* a guarantee precaution a person can take in the store. To steal a line from NACAIDS, as far as wrapping is concerned: 'If it's not on, it's not on!'

Protection

In these worrying times, of course, we really shouldn't take anything for granted. I carefully quarantine *every* new disk I buy

or borrow until I can examine it with a boot-sector check utility. Fortunately, I drive an Amiga 1000 so I have been able to update my Kickstart disk to include a utility called Guardian. After Kickstarting with the Guardian disk, any non-standard boot sector on any workbench disk loaded will automatically be drawn to my attention. I then have the option of allowing control to pass to the boot-sector or not.

For Amiga 500 or 2000 owners, who cannot easily change the Kickstart software, there are a number of boot-sector examination utilities available, both commercially and in the Public Domain. One of the most popular of these is called View-Boot and is available on a Fred Fish Disk.

A favourite utility of mine is called BootWriter. This utility allows me to load a small program into the boot-sector of any Workbench disk. When the disk is booted, a scrolling message is produced across the screen. The importance of this utility is that the program occupies the space on the disk where any virus must lodge. If a virus loads onto the disk, it has to destroy my scrolling message program. So long as the scrolling message happens at boot-up, the disk is clean.

A virus, in the computer context, is a small program which begins life in the warped mind of a techno-vandal.

What is a virus?

For people who are not familiar with the whole virus thing a few words of explanation may be useful. Those of you who know all about it can either check my explanation or give your eyes a rest for a couple of paragraphs.

When an Amiga boots up from a Workbench disk, one of the first things that happens is that the operating system checks sectors number zero and one on the disk. If the operating system finds some executable code in those sectors the machine hands over control to that code.

A virus, in the computer context, is a small program which begins life in the warped mind of a techno-vandal. The creator inserts the program into the boot-se-

tors of a disk. The program is written so that, if the disk is used to boot the Amiga, the program causes a copy of itself to be written into a special location in the Amiga's memory. The special property of this location is that it is not deleted by a warmboot (pressing Ctrl-A-A).

Now if the Amiga is booted from another disk the virus program in memory checks to see whether its code exists in the new disk's boot-sectors. If it doesn't already exist the program will write a copy of itself into the boot-sectors (destroying any other code which may already be there).

In many cases, the virus program also keeps a count of the number of 'generations' it has spawned. After a pre-determined number of generations the program will cause some other activity to occur, possibly a very damaging activity such as deleting the contents of the current disk or memory, or even a hard disk if one is in use.

Eradicating a virus

Fortunately, to date the creators of viruses are a lot like graffitiists. They can't resist adding a text message of some sort to their work. These text messages are the easiest way of detecting viruses as they can be easily seen when a utility program is used to display the contents of the boot-sectors of a disk.

The usual method of 'killing' a virus is to use the DOS command 'install' to rewrite the boot-sectors of an infected disk. This works with most Amiga viruses but not with the Byte-Bandit virus which intercepts the install command. The best way to kill the Byte-Bandit virus is to use the BootWriter utility to write new code into the boot-sectors.

Okay, you virus experts can come back now. Let's change the pace a little by taking a look at some of the 'home use' software now available in Australia for the Amiga.

Home use software

What I would classify as 'home use' software falls into about five or six categories: word processing, graphics, spreadsheet, music, utilities and, of course, games. Note that I have intentionally omitted database and desktop publishing, as I really don't regard these as being 'home use' software.

A number of Amiga word processing packages have been released in the past few months. ProWrite II is a big improvement on the original release. The new ver-

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sion comes complete with the new Version 1.3 printer drivers which support a wider range of popular printers and perform printing tasks much more quickly than the old Version 1.2 drivers.

Kind Words is a powerful yet friendly word processor which makes full use of the Amiga environment. It reminds me a lot of the updated form of Textcraft II and the appearance on screen is similar.

WordPerfect remains my preferred word processor (that's the one I'm using now as a matter of fact), though I would be the first to admit that it's grossly overpriced. The new version, 5.0, has now been released for the IBM and Apple machines and should be available before too long for the Amiga.

Textcraft II is a huge improvement over the original Textcraft which was one of the first software packages available for the Amiga. Looking back now at some of the early software packages for this machine, I can't figure why I was so enthusiastic about it. The new software is so far ahead in all respects. I guess it has to do with our expectations at the time.

Finally we get to Excellence!, which is a package that I find very hard to come to terms with. On screen it looks something like Textcraft and other such low-end word processors. When you read through the manual you realise that it is a very powerful package indeed. If anything it is too powerful for my taste in some areas. It looks to me like a package that can't make up its mind whether it wants to be a word processor or a desktop publishing package. I'm not sure why, but I just don't feel really comfortable with Excellence! – maybe it's just me.

There are, of course, a multitude of other word processing packages available for the Amiga. They range from good to plain lousy, and cover the full price spectrum. My best advice is try before you buy. Ask around other Amiga owners, consider their opinions and then try out the package in the store before you buy. Don't ask for extensive demonstrations on a Saturday morning though.

My friendly local proof-reader has just commented that I am in conflict with my previous opposition to stores unsealing software. Not really, I think stores should have a copy of each popular package available for demonstration purposes, but this copy should not be sold unless it is very carefully examined for virus infection. (Thanks Darrin.)

I and others covered graphics packages

for the Amiga extensively (see November '88 for features on graphics and 'Your Amiga', Sept '87), so I'll move right along to spreadsheets. For the Amiga I wouldn't recommend anything other than MaxiPlan. There are two versions available, MaxiPlan 500 and MaxiPlan Plus, the latter being somewhat more powerful and able to handle larger worksheets.

MaxiPlan is a very useful package, well written to make best use of the Amiga's facilities. It can perform most of the functions which home users would consider the province of a database, and for this reason I don't recommend a database for home use. MaxiPlan is quite easy to learn and a pleasure to use.

*The animated graphics
and sound provided with
the newest games is
nothing short of
stunning.*

Music packages

On to Music packages – oh, wow! Where to start? There are so many different types of music packages on the market. There are digitisers, packages which take in an audio signal (from either a microphone or a direct wired link) and convert it into a digital form which the Amiga can store, manipulate and replay.

There are music creation packages, which allow the user to write music, using either a conventional staff or a variety of other representations. These packages permit the selection of a group of 'instruments' from a huge and ever increasing range. The music created can be played, generally in full stereo, from the Amiga, or it can be printed out in a variety of styles.

Specialist packages turn the Amiga into a very versatile programmable synthesiser which can be used to create 'instruments' for use in other music packages. Still other packages permit the Amiga to interface with a large variety of musical devices through a MIDI interface.

In a few paragraphs it is impossible to detail the options available in this type of software. Be prepared to consider carefully the particular purpose to which you

will put a music package and then get a reputable dealer or, better still, your local user group to advise you on a suitable package.

The most useful and important utility software for home use is a good disk backup utility. Marauder II is my favourite, with Mirror and A-Copier close behind. So long as software producers insist on copy protecting their packages, sensible users will require a backup utility.

Grabbit! is a very useful set of utilities, allowing the user to capture screen images to disk file or to the printer. It also provides a means of changing the workbench colours at any time, and a couple of other little goodies. SmartKey is a very good utility from FBN Software in Canberra which permits whole lines of commands or text to be input with press of a single key. It can save heaps of time and effort on the keyboard. From the same people comes another utility called Post-Code, which allows instant access to all Australian postcodes.

There are many other useful utilities,

I commend you for your care and professionalism, Alan, and wish that more retailers were as fastidious as yourself.

many of them being available from 'Fred Fish' (see YC, Aug. '87) or other collections of Public Domain software. Such things as automatic screen darkeners, disk catalogers, calculators and a multitude of other facilities are available.

Games for the Amiga is the biggest of all the categories. There are now available literally hundreds of games, of just about every type and style imaginable. The most notable characteristic of the better recent games is the move away from simple shoot-everything-in-sight games to really sophisticated strategy-with-action games.

The animated graphics and sound provided with the newest games is nothing short of stunning.

A very good example of recent games is The Three Stooges, an offering from CinemaWare. The game is in the form of an interactive movie complete with animated characters, brilliant sound effects and even has digitised speech from the original Three Stooges films. It's great fun and makes impressive use of the Amiga's capabilities.

I won't bore regular readers by mentioning Flight Simulator II, or Jet, or FA/18 Interceptor, because regular readers will be only too aware of my enthusiasm for them. No, dammit, I will mention them. I'll even mention all the Scenery Disks (East Coast USA, Great Lakes, Europe, Japan - salivate, salivate), which are suitable for FS II and Jet (and a fervent prayer that scenery disks for Interceptor will be along soon)

Enough! I feel the need for speed. Out with WordPerfect and in with Interceptor. See you next month. □

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Pottering along and predicting the future . . .

JEFF PONTON



IN THE years since the first Microbees appeared on the market, we have seen computer technology progress in leaps and bounds. The Microbee retains a large and diverse user base, however, and perhaps no other PC in Australia has been used for such a wide range of tasks.

The extent to which this innovation is successful is often dependent, not on the size or capacity of the computer, but on the user's ability to delegate the correct tasks to the computer. No one uses an electric mixer to put the icing on the cake!

Microbee CAM!

Casual visitors to Judy and Ric Pierce's One Tree Hill Pottery, on the outskirts of Beechworth in northeastern Victoria, would be forgiven if computer aided manufacture (CAM) was the last thing on their mind. The environment is quiet bushland; the pottery blends easily into a native garden; and, inside, is a variety of practical and decorative dishes and pots in various stages of manufacture.

Typically, Ric may be operating a potter's wheel in a well-lit corner of the large room. Beyond some shelves, another area is dominated by a gas-fired Soleil kiln, constructed to Ric's own design. The general impression is that of thriving, efficient, traditional cottage-industry. The pottery products, which comprise mainly kitchenware and tableware, are wholesaled to outlets in Sydney, Melbourne, Canberra and Adelaide.

For the past eight years, the Pierces have operated the One Tree Hill Pottery fulltime. Ric's interest in pottery began as a hobby during the twelve years he spent with IBM as a systems engineer. He bought a Microbee soon after they came

onto the market, and upgraded to a Premium a couple of years ago. Essentially, his motive was to keep in touch with computing – he has since written a number of programs for local schools and businesses, occasionally acts in a consultative capacity, and regularly runs a C programming workshop, under the auspices of Wangaratta TAFE, for inmates at the Beechworth Prison.

One of the major difficulties with pottery, especially commercial pottery, is that of maintaining strict quality control during the firing of the pots in the kiln. There are two firings – an initial 'bisque' firing, followed by a 'glaze' firing. The bisque firing raises the temperature inside the kiln to about 1000 degrees Celsius; its purpose is to harden the clay pots so they can be handled with safety and dipped into water-based glazes without disintegrating. During the subsequent glaze firing, the temperature is raised to about 1300 degrees Celsius, vitrifying the clay and maturing the glazes.

Originally, Ric used to set the alarm on the kitchen stove for every thirty minutes of the eight hours of each firing period, to remind him to check the pressure of the gas and the setting of the damper (which controls the air/fuel ratio) in the kiln.

A problem with this arbitrary method of control was the possibility of something going wrong just after he had checked the kiln. It is not unusual, for example, for the fittings of the gas-tank to freeze up. Twenty-five minutes of firing at incorrect setting would have a dramatically bad effect on the pots and almost certainly result in a large batch of pots which may have to be rejected – a loss of a week's production.

Ric solved the problem by utilising his Microbee to baby-sit the firing of the kiln. He wrote a program which monitors the temperature inside the kiln at one-minute intervals over the firing period of eight hours. The one-minute intervals are determined by a simple decrementing loop in the program, which also checks for input from the keyboard. Each reading is plotted against the elapsed time and the gradient of the rising temperature is displayed on the screen in the form of a graph. If the rate of climb of the temperature is too high or too slow, an alarm sounds. A message, HIGH or SLOW is printed to the screen, indicating the likely kind of fault.

The desired rates of climb were predetermined by various observations and experiments with the kiln. Each type of firing requires changes in the rate of climb of the temperature at certain intervals.

During a glaze firing, for instance, the rate of climb is constant for the first five hours, at which point the temperature is slightly in excess of 900 degrees Celsius. The rate of climb then diminishes during the remaining hours, gradually leveling off to about 1300 degrees.

Also displayed on the screen are a numeric reading which relates to the current temperature, an alarm reading (which can be varied by the user and which rings a bell when that reading is reached), and the type of firing (glaze or bisque) which is taking place.

The level of the alarm reading is to act as a reminder that a given stage in the firing has been reached, and that various settings of the kiln may be due to be altered – for example, to go into a reduction phase to change the colour of the clay.

The program can be toggled between settings for a bisque or glaze firing, merely by pressing the Backspace key. A screen dump of the graph may be obtained at any time by pressing the Escape key.

The hardware comprises an RS232 interface connected to the pyrometer – the temperature meter of the kiln which sends input to the serial port of the Microbee. Inside the kiln is a thermocouple, which is two fine wires, of different metals, welded together. Heating this joint produces a voltage, which is displayed by the pyrometer. The meter is essentially an analog-to-digital converter.

The information about the voltage passes in parallel form to a parallel-to-serial converter, a card which is custom-built for the task, and then to the Microbee. The parallel-to-serial converter is based on a Z80 board.

The kiln-controller program is fairly simple, and is written in Microworld Basic. Comprising only about one hundred lines of code, it provides an excellent example of the realistic use of the Microbee as an aid to manufacture. When asked if he envisaged expanding the program to take over additional tasks related to controlling the kiln, Ric explained that it may well be interesting to do so as a programming exercise, but, at this stage, there was no labour-saving or other economic advantage to be derived from an expanded program.

Controls

Originally, he anticipated that the program would form part of a project to allow automatic control, from the computer, of the settings of the gas-flow and the damper. Various solenoids to enable this level of automation already exist as part of the kiln control-mechanisms. Ric even built a small motor to operate the damper.

However, in practice, there has been no point in complicating his present procedure. If the alarm rings, someone is always at hand to check the situation, and to take appropriate action. This happens perhaps three or four times during a firing. Further electro-mechanical controls would necessitate more feedback mechanisms, with consequent checks and maintenance, and would still require alarms for possible malfunctions.

Consistent with Ric's application of the KISS principle (Keep It Simple, Stupid), is the fact that he doesn't bother to convert the voltage level generated by the thermocouple to an actual

It is refreshing to find educational programs which do not limit themselves solely to the environment of the keyboard.

temperature reading, although such a conversion would be quite straightforward. The pyrometer displays the raw data in volts.

This practical example is particularly pertinent in illustrating the desirability of rigidly holding down the use of the computer to a level which positively aids a given task, or set of tasks, and which does not complicate the existing procedure to the point where use of the computer becomes counter-productive.



Figure 1. Pierce wrote a kiln controller program which monitors the temperature inside his Soleil kiln. If it detects a problem, an alarm is sounded and the likely fault is displayed onscreen.

Australia 2020

It is refreshing to find educational programs which do not limit themselves solely to the environment of the keyboard, and which utilise the capabilities of the computer as a springboard to activities and discussions in a wider context. One program I have used recently raises questions for discussion in sociology, decision-making, lifestyles, social interaction, immigration, and the future use of Australia's resources.

Australia 2020 evolved from the 1978 New Zealand futures simulation developed by Graeme Scott, a Research Fellow at the Centre for Resource Management at the University of Canterbury, in New Zealand. At the invitation of the Graduate School of Environmental Science at Monash University, he came to Australia to develop an Australian version with Peter Cock and other staff of the Graduate School. This was originally published, by the Gould League of Victoria, as an illustrated handbook.

In conjunction with Goodison Software, and with the permission of the Graduate School, John Kenna has adapted the simulation to the Microbee. The resulting software package includes a copy of the handbook and provides a range of ways of using the package, both at different levels of primary and secondary schools, and in various subject areas. The program makes good use of colour and graphics; operation requires at least a Premium Microbee.

Briefly, the user is asked to evolve a desired lifestyle from a wide range of permutations. He or she is then presented with some multiple-choice alternatives about a desired family size and preferred immigration policies. Scores are weighed, and the program projects a likely future for Australian society in the year 2020, depicting the age-distribution of the population, the rate of depletion of various national resources, and the likely outcome of other social variables, all based on the user's choices being representative of the population.

The program closely follows the layout of the handbook, and discussions about prospective choices at each stage can easily be based on the printed matter, the illustrations on the screen, or both.

Initially, the user is given \$200,000 with which to establish a lifestyle. The first purchase is a house, of which there are four widely differing options, with varying prices. Similarly, there are four localities, the inner city, a quiet suburb, out of town, or a farm environment, with prices ranging from \$10,000 to \$60,000.

The next decision relates to the user's desired form of travel, and ranges from bicycles and public transport (inconvenient if you live out of town), to the luxury of being a two-car family. One option must be exercised from each of these three basic areas.

With whatever remains of the \$200,000, the user can opt to indulge in any number of a wide range of consumer

goods and services. These include personal goods, hobbies and sports, a holiday home, the opportunity to do community work, further education, joining the yachting fraternity, becoming an art collector, taking overseas trips, and working to help Third World countries.

Everything has a price, and a score to be added to a total. Naturally, no more than the original \$200,000 may be spent. However, if the user prefers a boring existence, all of these consumer options can be skipped, although saving money in the bank confers no special status.

The fifth decision is to determine the ideal family size. The user enters her or his preferred number of children, from zero to nine. A new system of scoring is employed for this and the following decision, and subsequently reflects the difference between the expanded costs of a chosen lifestyle, extended across the population, and the more subtle effects of the ways in which two important social issues are resolved.

The final decision is based on the user's preference for one of four immigration policies for Australia, and these range from an open-door policy, with no controls on immigration, to a policy of no net immigration (entry to Australia only if someone else leaves).

The two sets of scores which the user has accumulated are weighed against each other, and one of twelve possible futures is projected. A worksheet in the handbook enables this to be calculated in a few seconds, or, if the software version is being used, the program does it immediately, displaying the first of several screens of text and graphics.

These screens can be flipped through both forwards and backwards, and there is a facility for obtaining an enlarged

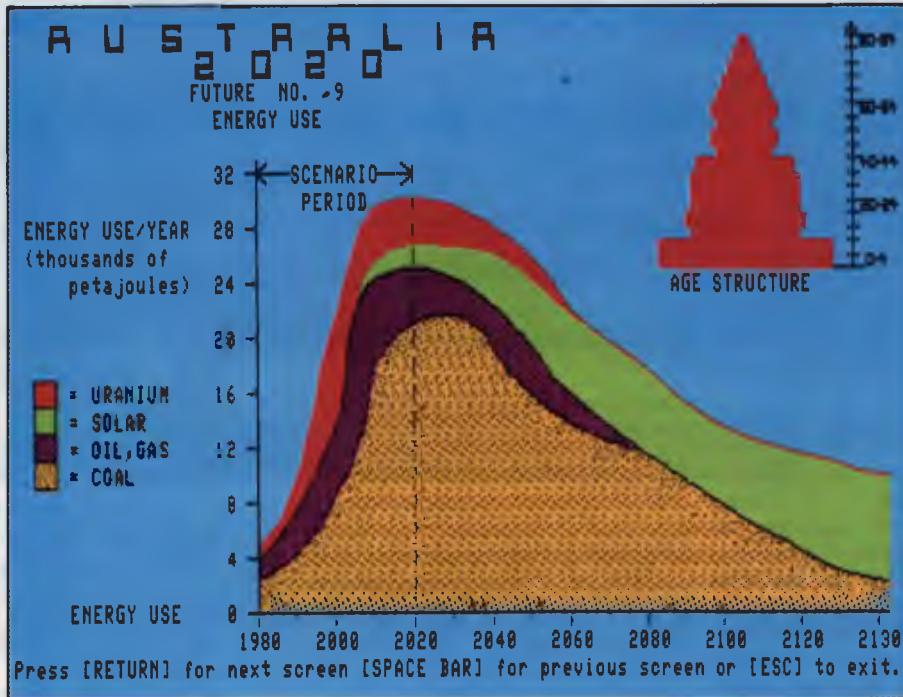


Figure 3. *Australia 2020 is a future simulator – conditions for the year 2020 are based on a user's own scenario. As well as describing that specific future in text, and showing age distribution and energy use, the program also proposed questions for discussion – these include the goals of the people living in that future and the social cost of achieving those goals.*

sideways dump of each screen by pressing Ctrl-P. Using the handbook, one simply turns to the section which details the appropriate future.

Each future comprises a summary of conditions in Australia in the year 2020. These show the population size and average age, remaining energy resources, average income, environmental quality, a list of likely social problems, and some brief comments about the society. A larger block of text describes in more detail what it would be like living in such a society, with its drawbacks, its benefits (if any), and its subsequent future hopes.

An excellent graph projects the existing energy resources and their likely depletion from 1980 to 2130, based on a continuation of the specific simulated future. The resources comprise uranium, solar energy, oil and gas, and coal. Also displayed, on the same screen (or page), is a smaller graph which shows the age structure for that particular population. The handbook, in addition, has a cartoon for each future, showing the trends in lifestyles.

The program proposes several questions for discussion, based on the simu-

lated future. These include the goals of the people living in the given society, the social costs of these goals, the support base for 'big' decisions, such as Federal or State government, and possible reasons why the user's expectations may have been realised.

I found this simulation particularly thought provoking. One aspect of the program which is not explained in the handbook, and which, consequently, does not appear in the software package, is the rationale behind the system of scoring. The logic is not readily discernible, yet it would certainly provide a further basis for discussion

about the various kinds of future which evolve from the various choices of the user.

A minor irritation is that the software version of the package makes no provision for recording the basic choices of each user, nor does it allow any results to be written to file. Without recourse to pen and paper, there is no way to compare the reasons for different simulations which result from seemingly small changes in lifestyle. This raw data could well have been incorporated into one of the screens depicting the simulated future.

Australia 2020 has wide educational appeal, and it will be particularly welcomed by teachers who prefer to use computers as an aid to classroom activities rather than as a replacement for themselves. The program may be used in a variety of contexts, and lends itself well to encouraging students and other users to seek further information about the issues it raises.

The package (priced at \$54), includes a copy of the original handbook; it's available from Goodison Software Pty Ltd, Monument Road, Kilmore 3764 Victoria. □

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The frustrations of file transfer

I THINK everyone in computing agrees that the most frustrating side of the industry is computer communications. There has got to be a reason why there are so many baldies among the over-25s in this business.

I've just had a hair-tearing morning trying to straighten out a communications problem with some friends – a problem that should be simple and straight-forward – and which is (or rather would be) if the human race was entirely composed of logical thinking, systematic people, with an encyclopaedic knowledge of Christensen's protocols, the vagaries of the Apple IIGS control panel, and the delightful eccentricities of Access II.

We were trying to transfer a series of AppleWorks files from a IIGS to WordStar format on an IBM, using a direct cable connection. Look up any of the standard beginner's textbooks and you'll find out that this is such an easy process that it is beneath the textbook writer's dignity to go into it in any detail. You'll find quotes like – 'Sending files from one computer to another is a comparative easy task using an RS-232 cable and a communications program in each machine.'

Talk about the idiotic optimists. A pop on all their houses!

Communications isn't all that difficult if you can work out what to do, once, then always repeat the procedure exactly. If you only ever go into one electronic mail box, then you can usually automate the process to the point where you don't even have to enter your password (if you are foolish). But try to do anything non-standard, anything out of the ordinary, and you've usually got big troubles.

A solution

What you need is a check-list, but each situation is different so check-lists are only ever a rough guide. The only long-term solution is to be systematic, and to try and understand the problems – then, at least, you'll have a chance of working out what is going wrong.

First of all, let's say that your file/s are in AppleWorks, which uses a format system all of its own. The way in which text files are formatted is the reason why different word processors are incompatible; they use different hidden characters (bytes) at the end of each screen line to

tell them when to move on to the next, they might have different Tab, and the suchlike information up front, and they may handle the paragraph break in entirely different ways.

It is these hidden bytes that make the words wrap; if you didn't have them, text would stream off the right-hand edge of the screen until it ran up against the limitations of the hardware. In fact these end-of-line byte/s perform at least two functions – the first says 'start again on the left of the screen' and the second says 'move down a line'.

AppleWorks has 300 bytes up front, before the text actually starts, and it uses four bytes (plus a space character) between lines. These four bytes carry information as to the distance to the next set of command bytes. If you look at the actual bytes recorded on the disk you will find at the end of every line of text a hexadecimal sequence like –

(text chars) 20 18 00 00 3C (next line of text chars)

The first \$20 character here is actually just the space that the WP uses to identify the point at which to wrap the words, so strictly speaking, it is part of the text information.

The next hex character (in this example \$18), tells the program how many text characters follow before the next carriage return or line ending. So if you were to count from the first \$00 you would find that the 25th character (hex \$18 = decimal 24) in the segment would be the next non-text control byte again.

This use of bytes as measurements creates one problem when you attempt to transmit AppleWorks files in AppleWorks format. These measurement bytes can exceed hex \$7F (decimal 127), which means that you need to transmit the full eight bits. If you try to send an AppleWorks file using a 7-bit transmission system, the eighth bit will be clipped off, and the file will therefore be unreadable (text chars) 20 18 00 00 3C (next line of text chars) by AppleWorks at the other end.

Conversion

The solution here is the same; convert everything to standard ASCII text files. In the conversion process, the WP program should strip out the WordStar soft returns

(or the AppleWorks line-end group) and only leave hard returns and spaces.

If this happens, the receiver will be left with an 'unformatted' ASCII file where each paragraph exists in an entirely unbroken string of characters (plus spaces only) from beginning to end – and the end will be signaled by a hard carriage return. There is no indication as to where lines should break on the screen, so your text may appear up to 255 characters wide and you'll need to scroll sideways on each line to read it.

This approach gets over the 7-bit text transmission problems, but unfortunately its usefulness depends on which IBM word processor the file receiver is going to use. I've had editors scream bloody murder when they get an unformatted ASCII file. The problem is at their end; some geriatric IBM word processors won't automatically insert soft-carriage returns at the end of lines, and you'd be amazed at how many editors are still using WordStar version 1.1 or earlier!

Their problem is that your file comes into their machines infinitely wide and they've got to laboriously go through each line manually adding soft-returns to get the file to appear on their screen in a usable form.

It is for this reason that Lissner made the decision to modify AppleWorks 2.0 so that it produced ASCII files that were formatted by the automatic addition of hard carriage returns on the end of each line. But, as we shall see, that has created as many problems as it solved.

Modern word processors should all be able to take in unformatted ASCII files and automatically convert them themselves. If yours can't then you should be prepared to spend some money. There are some related problems here also.

If a file has a hard-carriage return at the end of the line, you would say that it was 'formatted'. What would then distinguish a line-end from a paragraph, would be the presence of two carriage returns to mark the paragraph – one put there by the machine, and one by you. AppleWorks 2.0 creates ASCII files like this.

Similarly if you were to transmit WordStar file full of soft returns using a 7-bit protocol, the receiver could end up with a file full of hard carriage returns at the end of each line, since the eighth bit which

distinguishes soft from hard has been lost.

In these cases, the line-lengths (the formatting) has been set in concrete since the machine can't now distinguish an end-of-line return from a paragraph one. In some cases the receiver will have to laboriously step through each line to remove these end-of-line returns, before he could add, change or reformat the material on his system. Fortunately you can sometimes do a search and replace to solve this problem (although most of my WP programs won't find a carriage return).

Before some readers have apoplexy and collapse in a heap screaming 'How is it that I can send AppleWorks files through Keylink and other 7-bit electronic mail services?' I should add the rider that versions of the XModem communications protocol used in file transmissions now includes a conversion system that works pretty much like a Shift key.

When you are keying in letters and you hit the A key, normally you will get a small 'a' character which is binary 01100001; now if you hold the Shift key down and hit the A key again you get the capital 'A' character which is binary 01000001. Notice that the Shift key tells the computer to modify the third binary digit from the left - off for caps, on for lower-case.

Some forms of XModem have a special control character that is analogous to the Shift key. When this control character is received, it tells the computer to set the eighth bit on for the following 7-bit incoming character - in effect converting the whole system to 8-bits even though only 7 are being transmitted. This is an over-simplification, but it is a good way to look at it. If there are a lot of special 'extended ASCII' characters coming over the system, you will notice XModem slowing down because it is taking in two for every one it outputs.

To return to the main thrust of this article: with most of the modern IBM word processors it is best to send a file in unformatted ASCII form, since the receiver can take this basic file and format it himself to whatever screen width he wants. This way, you don't have to worry about the eighth bit, or about whether your XModem protocols match.

The moral of this story is that you have to think before you act. Are you using AppleWorks 1.3 or 2.0? Will you be transmitting using 7 bits or 8 bits? Can the WP at the other end take and reformat basic ASCII files? Can it remove hard-returns and replace them with soft? Is your com-

munications program's XModem (or other) protocol the same as that of the receiver? The list goes on!

If in doubt, send formatted AppleWorks 2.0/ASCII files if you know that they won't ever have to be modified at the other end. However, if the files may end up being reworked or printed on a laser printer, then send them in unformatted ASCII from version 1.3.

IIGS Control Panel

Even when you've got these problems ironed out, your troubles aren't over. The second main cause of problems when using an Apple IIGS is in setting up the Control Panel; this is where I get caught every time. You will need to establish the parameters - bits per second (baud) rate, whether to use 7 or 8 bits, 1 or 2 stop bits, parity and so on. You'll want XON/XOFF to be ON with file transfers since this is a standard protocol used to prevent a fast transmitting machine from overflowing a slower receiver and thus losing data.

The IIGS Control Panel also needs to be set with Buffer ON, and with both forms of handshake OFF when you are using Access II. Say NO to everything else (except for the Buffering and XON/XOFF). Other better communications programs will use handshakes but Access II doesn't, and since it is very widely used, it's worth mentioning.

Now here's the trap. The next stage is to set the communications programs on both machines with all the same parameters - baud, bit, parity settings and so on. But before you do, reboot your IIGS with the new Control Panel defaults.

If you are dealing with important files you are probably going to use XModem or one of the other common error checking systems, but (at the risk of stating the obvious) don't forget to confirm that the

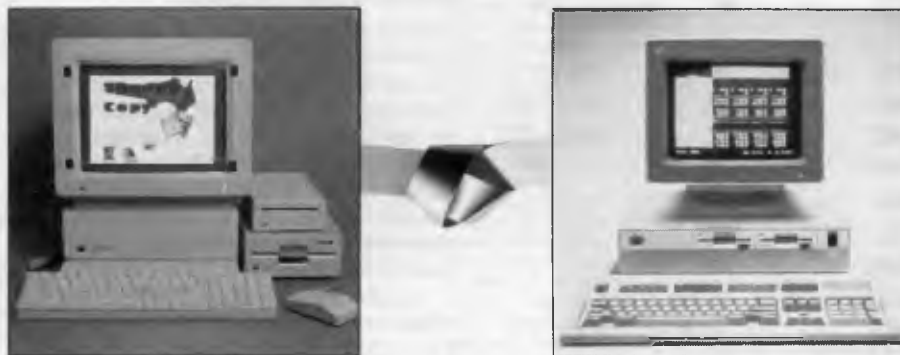
other end is using the same system. There are numerous variations in XModem that could give you trouble also, in fact the YModem protocol is only the old XModemIK under a different name, and there are dozens of other variations too.

XModem, in its basic form, uses the old Christensen's error checking protocol which does a check-sum at the end of every 128 characters. But the more common versions of XModem now have algorithms to do the fancy stuff of changing 7-bits to 8 and so on. A lot of these break the 8-bits up into two fours, then add a marker bit to the front of each to create 5-bit formats, much the same as the Kermit protocol.

You'd need to be a comms freak to bother your head with understanding the anatomy of these protocols. But be aware that Christensen's protocol is not the same as XModem except in its basic error checking sense, and so the two aren't always interchangeable. Access II users take note!

And, as a last point to watch: if you are directly linking two computers together with an RS-232 cable, don't forget that you will need a Null modem in the system to switch the Data Send line in one to the Data Receive line in the other. Pin 2 on one end of the cable must be connected to Pin 3 on the other and *vice versa*, and the Null modem does this for you. If you haven't got this cross-over between these two pins (only), the machines can't communicate.

Inevitably, you'll also find that one or other of the machines has the wrong plug/socket for the RS-232, and the cables available will not correct the problem, so always come equipped with a Gender Changer which looks like a Null modem but isn't. Dick Smith, Tandy and the like all sell these gadgets for only a few dollars each. □





Fewer Constants and More Strings

IN A PREVIOUS column, I promised to discuss some of the features of cmFORTH. This version of Forth is important, because the Novix chip (and, hence, the Maestro SuperComputer) use it. The name cmForth is simply CHARLES MOORE's version of Forth, and, in typical Moore fashion, he has pruned it to the bone.

There are *absolutely* no redundant words in cmForth. Even such mundane words as WORDS (or VLIST) are not present. The most interesting feature of cmForth is the manner in which its primitives are written. In the source screens, the BASE is set to OCTAL and primitives are defined directly in microcode, using the Forth word uCODE. For example, the cmForth word N! (store and save data) is defined so --

```
OCTAL 177300 uCODE N!
```

The 177300 is the microcoded instruction for N! - it couldn't be much simpler. A partial list of Novix microcodes is included in Table 1.

One has to be extremely careful when defining new words in cmForth. It only stores the first *two* characters of the name, followed by a length byte (containing the number of characters in the definition. Thus words like SCR! SCR@ SCR+ and SCR- are all treated as the *same word*. Care is mandatory.

ALU Microcode Instructions

CODE	a=7	a=0	a=arith/logic
10a000	DROP DUP	NOP	OVER a-
10a001		2/	OVER a- 2/
10a002		2*	OVER a- 2*
10a003		0<	
10a011		D2/	
10a012		D2*	
10a020	DROP	NIP	a
10a021		2/ NIP	a 2/
10a022		2* NIP	a 2*
10a023		NIP 0<	
10a100	SWAP	NIP DUP	SWAP OVER a

10a101		NIP DUP 2/	SWAP OVER a 2/
10a102		NIP DUP 2*	SWAP OVER a 2*
10a120	OVER	DUP	2DUP a
10a121		DUP 2/	2DUP a 2/
10a122		DUP 2*	2DUP a 2*
10a123		DUP 0<	

I/O and Memory Instructions

14a0nn			nn @ a-
14a1nn	nn @		
14a2nn			nn @ c-
14a3nn	nn I@		
14a400			n a-
14a500	n		
14a600			n c-
14a7nn			nn I@ a-
15a0nn	nn !		DUP nn ! a
15a2nn	nn I!		DUP nn I! c
15a3nn			DUP nn I!
15a5nn	nn		
16a100	@		
17a000	!		
17a300	OVER SWAP !		
17a4nn	nn X!		
17a5nn	DUP nn X!		

Table 1. A selection of NC4016 uCode instructions for the Maestro Supercomputer.

Newcomers' section

Forth makes far less use of constants and variables than do other languages. The reason for this is Forth's use (by the programmer) of the stack. Most of the data to be manipulated within a program can be handled on the stack, without the need for using named constants and variables. However, there are occasions when it is desirable to name them and it is done in the following manner.

A constant is defined by placing its value on the stack and then typing the word CONSTANT followed by its name. For example, 100 CONSTANT CENTURY <CR> defines a constant called CEN-

TURY and assigns it the value of 100.

Variables are defined in much the same way, except that some Forth systems do not require an initialisation value for the variable. It is sufficient to say VARIABLE COUNTER <CR>. If an initialisation value is required, then we usually use 0 VARIABLE COUNTER <CR>, which sets COUNTER to zero.

Obviously, constants are used when the value remains constant, but it is possible to reset the value of a constant, by placing its address on the stack and storing a new value in its address.

F88 (F-PC)

I have been warned by the person who provided me with the beta version of F-PC (see last month's column) that there are bugs in it, particularly in the editor portion. I had discovered several prior to this advice (a file I was editing 'lost' a line, and executable statements placed within source files tend to hang the computer on execution).

However, I don't believe that any of these are major problems, because now that F88 uses standard file structures (as supported by DOS), one can use one's favourite editor to create/modify source code. This does, of course, mean that you will have to exit from Forth to perform any editing functions, but it is possible to re-define EDIT to temporarily put F88 to sleep, edit a file and then re-awaken F88. I shall work on it.

One of the nicest features of having a DOS supported file structure for source code is the 'contiguity' of the code. Traditional compilation words like THRU and --> are no longer required. Neither does one have the worry of doing things like --

```
3 LOAD
5 LOAD
7 LOAD
15 LOAD
21 LOAD
```

Cut and paste operations are also far cleaner than with 1024 byte BLOCKs, especially when the code one wishes to

THE FORTH COLUMN

exchange is on widely separated source screens.

F-PC and strings

Yes, F-PC (F88) has strings *and* most normal string operations. One can create them, modify them, parse them, concatenate them, insert, delete, rotate — the list is almost endless. String variables only are supported (constants not used), as there is almost no difference in the manner of declaring either (see discussion of constants and variables above). Variables and the familiar Basic \$ sign is used (in prefix) as the string type identifier.

For speed purposes, the method of storing strings has been decided on as the length byte method, rather than the terminating character method. This involves using a 16-bit length word for each string stored, meaning that strings can be 32 kilobytes long (one bit is reserved as a sign bit). Below I have given some examples on the use of strings in F88. I hope they whet your appetite —

```
CREATE STRING1 .,$ 'This is a test string'
```

```
CREATE STRING2 .,$ ' and this is another'
```

```
STRING2 STRING1 $$+
```

```
STRING1 $.
```

The example above creates two strings (identified as such by the .\$ parameter), the \$\$+ function concatenates STRING2 to the end of STRING1 and the \$. prints the contents of the string name placed before it.

Forth yourself!

If you'd like to try F-PC, send \$15 (to cover the cost of handling, copying, the disks and return postage) to FORTH, c/o *Your Computer*, PO Box 227, Waterloo 2015 NSW. Documentation and source code are included on the disk. Cheques or money orders only, please

This example will insert STRING3 'string' into STRING2, starting at the 10th character —

```
CREATE STRING3 .,$ 'string'
STRING3 STRING2 10 $$INS
```

Here, the first line creates a string 'NUMBERS' containing the characters 0 through 9. The second line compiles a colon definition that tests a user supplied string name to determine if it contains only numbers. If the supplied string contains only numerals, then NUMBERS? returns the value -1, which can be tested with Forth's 0= IF words. A very powerful word is \$\$VER.

```
CREATE NUMBERS .,$ "0123456789"
: NUMBERS? NUMBERS SWAP $$VER 0( ;
```

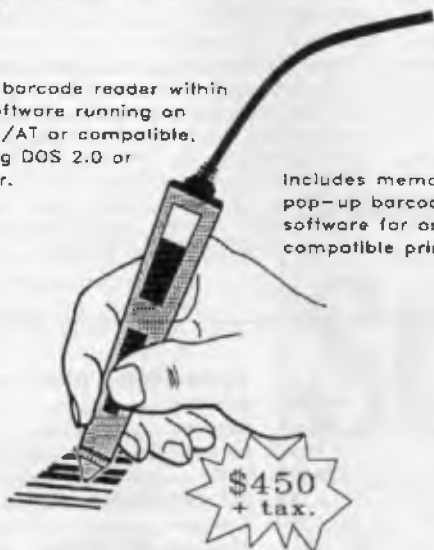
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Next month I will introduce a new and exciting concept from Maestro — a 9600 bps Full Duplex Modem, with the provision for upgrades to 19.2 Kbyte (when the CCITT standard is available) and also the provision for FAX transmission/reception — all for under \$1000. Sounds too good to be true? That's what everyone said about the Maestro 2400ZXR. □



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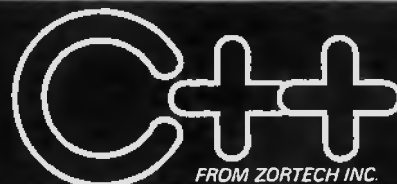
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Contributions by Telephone: Contributors who have modems and suitable software (in the MODEM7/YAM mould – see our stories on Christensen Protocols in the May and June 1983 issues) can arrange direct transfer to our com-

puters through our Bulletin Board system, which is on-line 24 hours a day, seven days a week. Contact our office by phone for details on transferring material in this way.

Contributions on Disk: Contributions can be accepted in most disk formats, although some have to be converted outside our offices, which will add to the (often lengthy) delay between receipt and acknowledgment. The preferred medium is IBM standard format single-sided, single-density, 20 cm CP/M disks or IBM PC-DOS minifloppies. We can also handle, in-office, most soft-sectored 13 cm disks, thanks to PC-Alien – so unless you have a particularly strange format, send it on disk straight from your machine. Please pack them extremely carefully if posting and label all disks with your name, address and phone number.

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IT'S A GAS!

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■ Frank is a service-oriented car repairer from Griffith, in NSW's Riverina. He was telling me recently what happens when a computer fault detector and logging device in a car is plugged into the workshop computer.

Frank or one of his merry mechanics runs through the tests. If this test gives that reading they replace the whatsit. If it gives a reading in the correct range, they go to the next test and so on.

If they get to the end of the tests and all the tests have been passed but the car has not – its performance is out of the manufacturer's specifications – there's only one thing for Frank to do. He replaces the on-board computer (or the one in the workshop).

There is an interesting difference in compatibility testing here from the way you assess your desktop. None of this 'will it run Flight Simulator' stuff. First off, is it compatible with this brand, this model, this year of car or with this on-board computer? Some car manufacturers promise upward compatibility of test gear, others just keep bringing out new and incompatible computers – little compatibility with the wallet of the dealer or the motorist who pays for it eventually.

■ The International Robot Show was about to happen when this column went to the keyboard. The blurb promoting it didn't spell out what sort of show it would be. My guess is it won't be one of those agricultural-type jobs. You know, Best Robot Bitch, Grand Champion Pool Cleaning Robot and so on. Nor I suspect, will it be one of the Miss World jobs – Miss Charity Robot, Most Eligible Robot or whatever. More likely it will be of the Motor Show variety – 0-100 in 30 secs, that sort of stuff. The 100 will probably mean 100 wheels put on cars or the like, rather than speed over the carpet or the tarmac. How long before the Robolympics?

■ One of the hardest keys to find on the keyboard of most modern PCs is the big red button which does all the work. Some-

what easier to find is the one key that destroys it all, but then only some people are lucky enough to have the second button. The buttons must be portable, because some of these people cart them from computer to computer and job to job.

Coming soon to a computer near you, the two-button keyboard. Press one button and your work is all done. Press the other and it's all done in – just the thing to do after you've printed your resignation in some companies.

■ First it was the desktop, then windows, now rooms and buildings. Where do we draw the line on metaphors for our work environments translated into computer terms? Global? No, can't have that as the end point, that started before desktops were popular on screen. Universal? They were big on the big screen.

BOOTSTRAP: In an effort to take some market share from the dreaded electricity suppliers, a gas utility company in a mainland capital has developed a gas-powered computer. It's a case of vapourware which works. Instead of a set of chips, the machine uses an array of fibre optic devices lit by gas lights. Many of the lights are catalytic so they have no naked flames, while others use a standard but tiny flame.

The system seems to be working well in many of the test installations. One problem struck so far is the amount of heat generated and the difficulty with producing a gas-powered monitor. The gasputer is still in the development stage so it will be a while before you see one on your desk and it is also why the city shall remain unnamed for now.

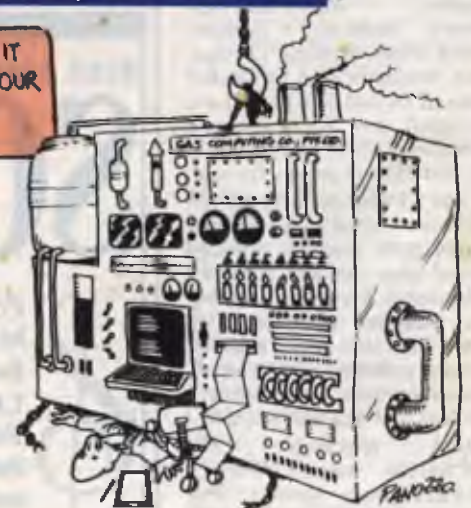
Because the portable and, particularly the laptop market, is going so strongly, the gas company is working on one powered by a methane digester. You pour a can of baked beans into the digester and it will run for about two days. Mind you, the smell is a bit rich, but when they get the bugs out of it, you never know.

There has also been one major snag with the deskbound models, which is still unresolved. The system keeps going down inexplicably and because of the intricate construction a technician has to come out and relight the pilot light.

Warren, one of our technicians was on site when this happened and said that the people using the computer are compelled to call in the gas company. He said the office staff found it little embarrassing when the bloke turned up just to stick a candle under the PC, but it's a case of knowing where to put the candle. The secretaries don't want to get their fingers burnt. □

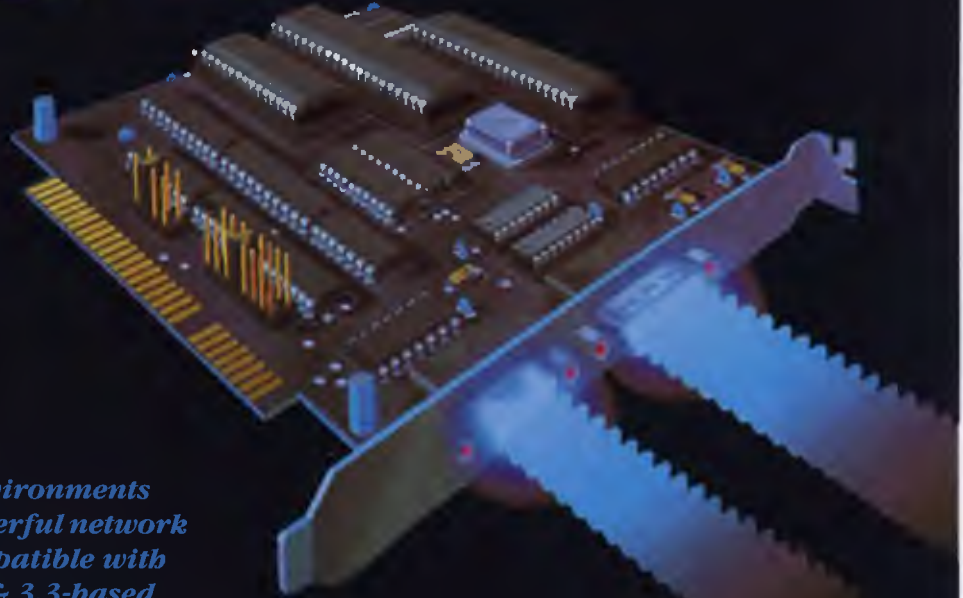
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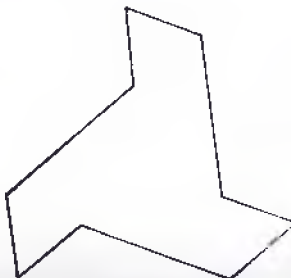
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