

PART 1: CP/M

Encyclopaedia of Personal Computing

CP/M
**OPERATING
SYSTEM**

CP/M is quite simply the most widely used computer operating system in the world. No-one interested in microcomputers can afford to ignore it.

In this special Encyclopaedia the editors of *MicroComputer Printout* have assembled a comprehensive briefing on CP/M. In the following pages **John Gowans** examines the curious history of CP/M, reports on the machines that can run it, and the most popular programs for it. To balance the picture, **Guy Kewney** examines the disadvantages of CP/M.

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CP/M: THE STORY SO FAR

"Microprocessors and CP/M:... Where they came from is history, what they are today is fact, and what they will become is...pure science fiction speculation."

—Gary Kildall, president of Digital Research.

Reluctantly leaving aside the science fiction bit, Kildall's statement is unarguable. CP/M has a history, and it is now just about *the* fact in microcomputer operating systems; almost every manufacturer is following the Henry Fordish principle that you can have any operating system you like as long as it's CP/M.

But Digital Research and Kildall himself seem still to be lurking in the shadows. Interviews with founder Kildall are rare, and photographs of him are rarer — I have to admit that I have no idea what he looks like. Sometimes there is even the feeling that he doesn't exist at all, as when he mysteriously failed to show up at a UK CP/M User Group seminar last Autumn.

Despite all this reticence, Kildall's company has certainly made its mark in the business. One anonymous Digital Research executive (aren't they all?) has even gone so far as to call his employer "the IBM of the operating system world." But there were few hints of that in 1972, when microprocessors were young, and expanding a mini to 32k of core memory was still cause for celebration...

Dateline: Santa Clara, California, 10 years ago. In a dark and smoky room, a small group of financially motivated men set their square jaws and wrinkled their clean-cut American brows — this was serious. Or to put it another way, the high-flying engineers of Intel Corp.'s budding microprocessor division had a problem. The division was new and small, as indeed was Intel itself, and although the engineers had done a good job in upgrading the primitive 4-bit 4004 processor to a 'real' 8-bit chip, the 8008, programming it was another matter. The jaw-setting and brow-wrinkling was caused by the prospect of having to program the thing in machine code for all eternity.

The obvious solution was to write a high-level language compiler for Intel's mainframe, and use the big computer to develop machine code programs for the new chip. But Intel was a hardware firm, set up to make memory chips, and software skills were in short supply. The company started to look around for outside help.

Fortunately Gary Kildall and his one-programmer-and-a-dog company Microcomputer Applications Associates were at hand, and Intel signed up MAA to produce the language compiler the engineers needed. Kildall took big lumps from XPL, a compiler-writing language itself developed from Algol and IBM's PL/I, and eventually came up with a language called PL/M — Programming Language/Microcomputers — for the new 8008 chip.

Creating a standard

He must have done a good job, since PL/M is still the standard development language for Intel microprocessors up to and including the 16-bit IAPX 86 family. But that was in the future... Meanwhile, back in the past, MAA got on with producing PL/M programs for the 8008, starting with a paper-tape editor to help the engineers manipulate the only storage medium they had for the processor programs they were developing.

But as Intel moved on to develop the famous

8080 chip from the 8008, another small company down the road came up with a new storage medium for small computer systems. IBM has defined a standard format for the new 8in. floppy disk, and Jack Shugart's Shugart Associates had started producing cheap floppy drives that for \$500 apiece could store on one \$5 disk as much data as 200ft of paper tape.

Kildall immediately realised that you could put together a complete system with an 8080, 16k bytes of RAM, and a floppy drive at a price low enough for Intel to give each engineer one to run PL/M. The only thing needed, apart from a bit of hardware fiddling, was an operating system program that could handle floppies; and Kildall presented Intel with a proposal for just such a program. It would be written — naturally — in PL/M, and by analogy would be called Control Program/Microcomputers. At last we come to the famous initials.

But in a decision reminiscent of Apple's not to take on VisiCalc, and that of the several record companies who turned down the Beatles, Intel



passed on CP/M. What was the point, the company argued, in giving engineers a computer each when they could all use PL/M on a big timesharing mainframe? And as Intel religiously stuck to this line, Kildall decided to go it alone. An 8080 processor board and memory came from Intel, along with a Teletype ASR 33 printer terminal; an 8in. floppy disk drive was spirited out of Shugart by various and devious means, and the basic system components had been assembled in the traditional Californian garage (where do they park in Silicon Valley?).

Now Kildall had Intel's original problem in reverse. He could provide the software, but needed some hardware skills to tack all the bits together — and these came from an old friend, Berkeley professor John Torode. In the garage, Torode tied the memory to the processor and the Teletype to the box, and then put together a controller board to connect the processor to the Shugart drive. Meanwhile, in the living room one assumes, Kildall wrestled with PL/M code to finish CP/M, taking things like the paper-tape editor developed earlier and building them in.

Finally, during 1974, CP/M was up and running on Torode's Heath Robinson — or Rube Goldberg, for US readers — contraption, which surprised everybody. Still, nobody in the business took much notice. Intel's nose remained firmly in the air, and although MAA sold a few licences to the program to microcomputer start-ups there was little action until 1975, when Glenn Ewing of Imsai went to Kildall to negotiate a license. According to the mythology, Ewing and Kildall between them came up with the idea of taking all the hardware-dependent bits of CP/M — the bits that would only run on particular hardware configurations — and sticking them in a separate section that could be modified by the licensee to suit his

machine.

The rush was on. For the micro makers, the chance to get hold of a standard operating system just by modifying some of the machine-code system calls in CP/M — there are only 15 such calls — was a godsend, since it meant that their machine could run any software written for other CP/M systems. And for the software companies, writing programs for CP/M meant that their market was much bigger than it would be if they wrote for just one obscure operating system on an even more obscure micro.

Unfriendly

There were problems in going for CP/M though. For a start, it would only run on Intel's 8080 processor using IBM-Format 8in. floppies; and remember that it was originally designed for computer engineers to write programs with, and so was a bit unfriendly for the naive user. The second point wasn't too bad, since the early home computers were being sold to enthusiasts who actively enjoyed digging into the entrails of the machine and making it go — and the first software products written for CP/M by MAA and others were programmers' aids like language compilers, machine code assemblers and debuggers, and so on. And the first problem was helped by Zilog's decision to build the Z80.

When the Z80 came out, it was obvious where Zilog had got its ideas from. The instruction set, the list of machine codes that the processor understands, was made up of the 8080 set plus more than 50 others — so the Z80 would run 8080 code while allowing programmers to add on extra facilities. In particular, the Z80 would run CP/M without alteration.

So although Intel produced the 8085, a souped-up 8080, the Z80 was really a much neater chip; and CP/M systems based on Zilog's product started to outstrip the 8080 machines.

Meanwhile, Kildall and MAA began to think big. By 1976 it was clear that CP/M was going to be a major factor in the personal computer business, and that Kildall needed a new operation to handle the demand. So in typical Californian style Kildall and associate Dorothy McEwen set up a new company modestly called Intergalactic Digital Research — soon stripped of the cosmic tag as the business grew and became more commercially-minded than communally-minded.

And so things would have stood, with Digital Research licensing more and more manufacturers to sell CP/M and more and more software firms coming out with compatible products, if technology had done the decent thing and stood still; and if the personal computer market had stayed with the enthusiasts. But neither of these things happened. Microprocessor and memory chips got faster, denser, and cheaper; the 5 1/4 in. disk drive came in as a cheap alternative to the IBM-format 8in.; the Winchester hard disk was under development; and in 1978 the age of CP/M business packages opened with the release of Wordmaster (WordStar's predecessor) from MicroPro and a range of business accounting

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programs from Osborne (yes, *that* Osborne).

The new host of prospective business computer users wanted the new and cheap technology to go with the applications packages that started to flood out from the software housing; Digital Research had to make a move, and duly made it in 1979. CP/M was completely re-written.

The purpose of this was similar to the purpose of the earlier revision after Ewing's intervention. But this time storage, not Input/Output, was the problem — so Kildall took the disk parameters out of the operating system and put them in a table that the manufacturer could get at, alongside the I/O section that could already be altered. By altering the numbers in the tables, the micro firms could configure CP/M to go with any combination of 5 1/4 in. and 8 in. floppies or big Winchester hard disks. The version number you started to see on CP/M systems from 1979 onwards was 2.2 — still the current one — with all this written in.

Still, Kildall was lucky. If he had originally designed CP/M in a different way, it would not have been able to cope with faster processors, bigger memory spaces than the planned 16k, and faster disk access times. But because CP/M is what Kildall himself calls 'Spartan', a synonym for simple, rough, and ready, increasing speeds in the system just improve CP/M performance. And to cope with bigger memories, the user can simply tell CP/M to spread its boundaries and allow more room for programs; the user can do this, buying more memory when necessary and adapting CP/M without going back to the supplier.

The march of the new table-driven CP/M continued, until around 300,000 users were using it on around 3,000 different hardware configurations — 'estimated' because Digital Research licenses the product to manufacturers who don't have to tell who they

sell it on to, and 'different' in the sense of various disk types and memory sizes on the systems.

16 bit Problems

All well and good, and Kildall's income escalated steadily. But then the market and technology intervened again; and this time Digital Research could not do a quick software fix. Business users started to feel inhibited by the fact that CP/M is very strictly a single-user system (for one engineer, remember?), and wanted a way of running CP/M applications programs on a multi-user system, with various users sharing a single computer. And the never-satisfied chip makers took the next logical step, and started to launch mass-market 16-bit processor chips in 1978 and 1979.

This could have caused some trouble for Digital Research. There was no way to re-write CP/M as it stood for multi-user operation, and of course it would not work on 16-bit processors. As Kildall says, "if you look at the 8080 and at what it can do, CP/M just about fits it", or in other words even the Z80 is really under-utilised. So completely new products were needed, one or more doing multi-user operation while maintaining CP/M compatibility, and one to work on a 16-bit chip. The 16-bit version could not maintain compatibility with 8-bit CP/M, so Digital Research could pick whichever 16-bit processor chip it wanted to support.

It was an easy choice to make. Kildall's old employers at Intel had come up with the 8086 (later re-named iAPX 86) slightly ahead of the field in 1978, and had inevitably supported PL/M on it by re-hosting the language from the 8080 and calling the result PL/M-86. Using this product Digital Research could re-write CP/M for the 8086 in quick time, and so that 8086 was the choice; besides, Kildall still had a close

relationship with Intel. Work started on the 16-bit CP/M, and, maintaining the PL/M connection, the name chosen for it was CP/M-86.

While all this was going on, Digital Research approached the multi-user problem from two directions; one method was to share a single Z80 computer between various users, and the other was to allow various Z80 CP/M computers to share files amongst themselves. First came the shared single computer, and keeping the names roughly in line Digital Research called this one MP/M for Multiprogramming Monitor/ Microcomputers (I know it doesn't fit the initials, but my source is the man Kildall). The first release of this was, I am sorry to say, a disaster. Digital Research said you could hook 16 users into a Z80 CP/M machine, each having the impression that he was running the CP/M applications programs on the machine's disk. But as the number of users was increased, MP/M users found that response time degraded very quickly indeed and a user could hit a key and sit around for minutes waiting for something to happen.

MP/M 1 was quickly withdrawn, because of this problem and because of doubts about security of each user's file. A heftier MP/M 2 has now been released, which is supposed to have fixed everything. But one MP/M supplier, Casu, has done some extra fixes — including adding an extra 16k memory board, since MP/M grabs almost this amount from one unspecified and unfortunate user — and will only recommend a maximum of six users. And there are still doubts about file security... The industry is still only tentatively looking at MP/M.

Networks

The second multi-user solution, the network one, is called CP/Net (Control Program/Network)

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 - Apple + Softcard
 - Clenlo Conqueror
 - Cromemco (with CP/M or CDOS)
 - Digico Prince
 - Nascom/Gemini
 - NEC PC8000
 - North Star Horizon & Advantage
 - PET + Softbox
 - Research Machines 380Z
 - Sharp MZ-80B
 - Superbrain
 - Televideo
 - Vector MZ
 - Xerox 820
 - Zilog MCZ

Pro Pascal is developed and supported in the UK. The single-user price is £190 plus VAT.

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CP/M: HOW TO USE IT

The popularity of CP/M has been caused by the vast amount of applications programs written for it that are available off-the-shelf. But this in turn means that many users of CP/M are buying computers for the packages, and would not know an operating system if it was served to them on a plate with watercress round it. To these users, CP/M first makes its presence felt as a sign on the screen cryptically saying 'A>'. What is really going on?

What the user is seeing is a prompt from CP/M saying that it expects something to happen on the keyboard, a prompt that comes up once CP/M has been loaded into the machine successfully. But perhaps we are jumping too far ahead. An operating system is used by the computer to load things from disk, and CP/M is supplied on a disk, and CP/M is supposed to be the operating system, so... this could go round in circles for ever.

What CP/M needs is for the manufacturer to supply a little program in ROM to load in a bit of CP/M, which then loads in some more and so on. This process, so reminiscent of pulling yourself up by the bootstraps, is not surprisingly called bootstrapping or simply booting the disk. All you need to do this is to put the CP/M disk in the drive the manufacturer tells you is the boot drive, and hit reset; a message something like '64k CP/M Version 2.2' followed by that prompt will shortly appear.

The 'A' in the prompt tells you that the disk drive you are working on is drive A, the boot drive. CP/M always expects to be booted on drive A, and any other drives in the system

are given letters B, C, D, and so on.

What do you type next? Try 'DIR'. This is one of the five commands that is loaded into the computer's RAM at boot time; the others are 'REN', for re-naming files, 'ERA', to erase files, 'TYPE', which prints the contents of a file on the screen or printer if one is attached, and 'SAVE', which saves the memory contents as a file on the current disk. The current disk is always drive A unless you tell it differently by typing 'B:', 'C:', or the letter of any other drive followed by a colon. If you do this, CP/M responds with 'B>', 'C>' or whatever, and then you are working on whichever disk you have specified.

After typing DIR, CP/M will put the file directory on the screen, telling you the names of the files that are on the current disk. CP/M file names always have the same format of up to eight characters optionally followed by a full-stop and a three-letter file type. The file type section specifies what sort of file each file is; for instance a file ending in '.BAS' is a Basic program, one ending in '.ASM' is an assembler or machine code program, one ending in '.TXT' is a file full of text, and one ending in '.COM' is a command file.

If you do a DIR on your CP/M disk you will see lots of files ending in that '.COM' type. These are utilities that come with CP/M to do useful things around the computer, some provided by Digital Research and some by the system manufacturer. This brings up a nice feature and a bad feature about CP/M, since it is nice for the manufacturer to be able to add the utilities he likes to the operating system, but bad for the

user since whenever he wants to use one of these useful utilities it has to be dragged off the system disk into RAM and executed. If you have a Winchester you wouldn't even notice, but on some floppies it is tedious. The Tandy Model II has just sprung to mind for some reason...

Utilities

The Digital Research utilities are the really essential ones, and include PIP, FORMAT, MOVCPM, SYSGEN, ED, and ASM, all followed by the '.COM', but I'm bored with typing that. PIP is the Peripheral Interchange Program, which basically lets you switch files from disk to disk; FORMAT is used to format blank disks, and is suitably doctored by the manufacturer to suit its drives; SYSGEN puts a copy of the operating system on the formatted disk so it will boot; MOVCPM alters the boundaries of the operating system so that you can add more memory and get more programming space; ED is the editor, a kind of primitive word processor; and ASM is the machine code program assembler. These are the important ones, although STAT, which tells you how much space is left on disk, and DDT, the Dynamic Debugging Tool for machine code program debugging, also have their points.

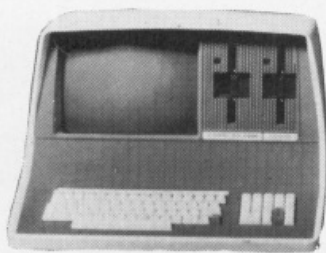
Now, to get any of these working all you have to do is type its name after the A> prompt and follow the instructions on the screen if there are any. Often there aren't, since CP/M was designed for people who knew what they were doing, and ploughing through the turgid manuals is the only unsatisfactory answer. PIP is particularly bad in this respect.

And then there is ED, 'your friendly text editor', which is dreadful. The reason for this is

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CP/M MICROCOMPUTERS IN BRISTOL

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CP/M: THE COMPUTERS THAT USE IT

"Refinements? My friend, they're up to you".
— Gary Kildall, Digital Research

Well, they're not up to me exactly. The 'refinements' to CP/M, things like making it run on systems with odd disks, screens, and maybe colour graphics were up to our friends in the microcomputer business, and they took to the task with enthusiasm. Running on over 3,000 different hardware configurations, CP/M and its associated software packages are far and away the most common products in the micro field — if you ignore Apple, Commodore, Tandy, and that well-known anomaly Clive Sinclair that is.

It might seem odd that the 'Big Three' have stayed off the CP/M bandwagon, but the explanation is simple; Apple and Commodore chose the wrong microprocessor and Tandy, although it chose right with the processor chip, couldn't be bothered to support the operating system on its machines.

From this you might have gathered that talking about CP/M hardware means talking about microprocessors and buses, but for those of a nervous disposition I will steer clear of any technical excesses. It is really very easy. If a company wants to make a CP/M micro there is only a very limited number of microprocessors to base it on, namely Intel's 8080 and 8085 and Zilog's Z80. Even if you want to build a 16-bit machine, the choice is cut to Intel's 8086 and 8088 if you need to use CP/M-86.

Of course, in saying that Commodore and Apple chose the wrong chip in MOS Technology's 6502 I am not only using hindsight but going against the fact that those two companies have not exactly done badly without CP/M. But as we shall see later, outside firms have done very well out of providing conversion kits for the Apple II and Pet to make them do what the market wants and run CP/M as well as their own wide ranges of programs.

Floppy disks

Still, there were few signs in the mid-70s that the 8080/8085/Z80 systems with floppy disks were going to be any kind of force in the market. Floppy disks were still unreliable and expensive, and CP/M was still an engineer's program development tool rather than a business-oriented operating system. Who needed the hassle? The two Steves, Wozniak and Jobs, certainly didn't as they used their meagre resources and the famous garage to put together the Apple I (a single board now lost in the mists of time) and replace paper tape with cassette tape for storage. And Chuck Peddle at Commodore didn't either, particularly since MOS Technology was Commodore's chip shop for calculators and watches, and a ready supply of 6502 chips was to hand. Even Tandy, who chose the Z80 for the TRS-80 Model I, didn't want to get involved in floppies at that early stage and skirted carefully round CP/M.

Other companies were not so coy. And another lucky break helped them move to floppies with the minimum of fuss. The break was the design of the MITS Altair, generally acclaimed as the first real personal micro.

The best-known names here are Cromemco, Systems Group, Ithaca InterSystems, North Star (thank God for the name change), Dynabits Vector Graphic, and the CompuPro Division of Godbout Electronics (there really is a gentleman called Jim Godbout, in case you had

a vision of some cosmic boxing match). The most traditional of these is Cromemco, by which I mean that this company offers a range of systems in boxes complete with its own terminals and disk units, but includes in each box a set of S100 slots for the user to plug in extra boards from Cromemco or any other IEEE 696 S100 board supplier.

These systems start with the System One CS-1, with eight spare slots, interfaces for VDU and printer, and 780k of floppy disk (the Z80A fast version of the Z80 and the 64k RAM can be taken for granted) which costs around £2,000. The System One CS-1H adds a 5M byte Winchester which adds another £1,000 or more; and then the Cromemco range goes up to the System Three with more slots at around £4,000 and the Z-2H hard disk machine at about £5,000. All these prices exclude terminals and printers, and so are pretty high; but Cromemco offers an upgraded but compatible CP/M operating system called CDOS which is a bit friendlier. Main UK supplier is Micro Centre in Edinburgh.



Multi-user

The Systems Group used to be known only as a board supplier for S100 systems, with one of its big UK customers being CASU — the firm that is approved by the Government and supplies surprising numbers of machines to British Telecom. But now Systems Group has moved into systems with the 2800 range, sold here by CPS Data Systems of Birmingham. The 2800 grows from a very expensive single-user CP/M machine to a powerful multi-user system with MP/M or the much better Oasis multi-user operating system; and you certainly pay for the growth at the bottom end.

North Star is known for its Horizon systems, which comes in at about £2,500 minus terminal and printer for a bog-standard machine, and the new Advantage, which drops the S100 bus but is cheaper and includes hi-res screen and keyboard. Comart is the best-known UK name for North Star, and has used the experience to come up with its own range of S100 machines, competitively priced, called Communicators. Dynabyte hardware is very like North Star's Horizon, but priced higher and sold by hotel giant Grand Metropolitan's Metrotech subsidiary; Vector Graphic's range is well regarded for its robustness and software, but is pricey from UK distributor Almarc Data Systems; and Ithaca Inter Systems (with its own UK subsidiary) and Godbout are primarily board makers.

All these S100 systems have the advantage of easy expandability, but the disadvantage of high initial price caused by the fact that in buying the box you are buying the empty slots and the power supply capable of powering all the slots when you fill them. Still, at the price, you get a machine you could drive a tank over without stopping it processing... and of course you get CP/M, running on the Z80 built into all of them.

But for those of us without a handy tank, the real market is in the non-S100 systems where everything is on one board and expansion comes more expensive if you should ever need it. And the first CP/M system to make a breakthrough in this area was the Superbrain from Intertec Data Systems of South Carolina.

The Altair emerged as a kit in the US magazine *Popular Electronics* early in 1975, and was built around the 8080 with a bit of memory connected to it, using a bus with 100 connections on it called, oddly enough, the S100 bus. MITS sold 3,000 Altairs in the year following the first shipment in May 1975, and imitators of the 8080/S100 concept, such as Processor Technology's Sol and the Imsai machine, quickly appeared. America works like that.

Then Zilog stepped in with the Z80 upgrade from the 8080, and Z80/S100 became the new standard to launch companies like Kentucky Fried Computers — later happily renamed North Star — and Cromemco, an offshoot from a technical University whose name we forget.

Upgraded system

Remember that it was Glenn Ewing of Imsai, one of these S100 firms, who convinced Gary Kildall to re-write CP/M to run on any computer with the right microprocessor in it. And the S100 made it simple to build up a CP/M machine, since to add memory or disks all you had to do was plug a memory board or a disk controller board into a slot on the bus and there you were.

Upgrading systems in the field was easy too, since if you wanted to move to 5.25in. floppies from the old 8in., you only had to replace the disk controller board on the bus, and tinker with a few lines of assembler in CP/M, to have an upgraded system that could happily run your old applications programs.

So the new standard CP/M machine had a Z80, 16k or so bytes of RAM, the S100 bus for expansion, and CP/M to run the whole show. And this system could easily cope with more memory, bigger floppies, Winchester hard disks, and extra processor boards plugged in to add extra users; all without changing the operating system software — or very easily changing it only a tiny bit to handle the new peripherals.

Of course it didn't last. Chip technology advanced so that a Z80, 64k of RAM, a floppy disk controller, and I/O facilities could all be put on a single board rather than four separate S100 ones. But by that time CP/M was established, and now we have what are elegantly called 'bog-standard' CP/M machines at very low prices indeed. You've all seen them. Desk-top boxes with 25 lines of 80 columns each on the built-in screen, keyboard with separate numeric pad, twin floppy disk drives mounted vertically or horizontally, and a Z80 with 64k of RAM handling the whole thing including one RS232 serial port and one parallel printer port (or two RS232s — that at least varies). And some of them are still based on the S100 bus, although these are generally pricey and sold to knowledgeable people who want as much possible future expansion as they can get.

Continued p.9

WHEN IT COMES TO MICROCOMPUTER SOFTWARE WE WROTE THE BOOK

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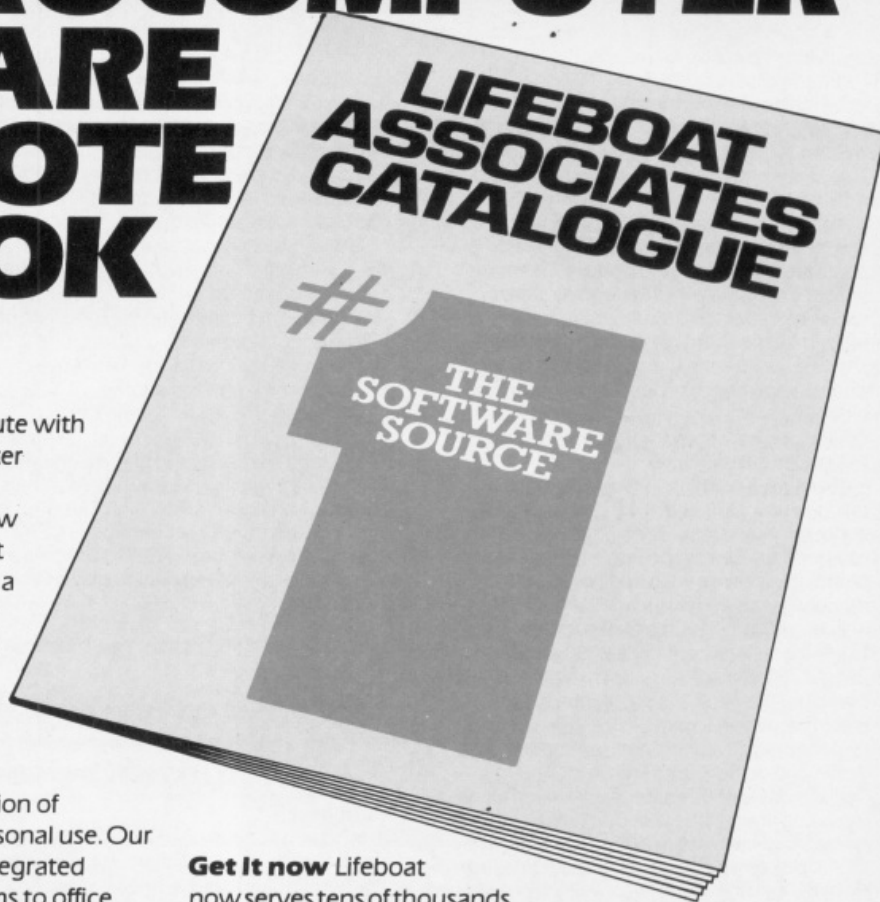
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Bog-standard

The industry is now churning out these tediously familiar machines in vast numbers, in the US, Europe, Japan, and even Hong Kong. And all these machines run bog-standard CP/M or a close relative, and will run those bog-standard CP/M packages that are making so much money for a few software houses at least.

There are so many of these cloned systems that it is impossible to list them all, but some of them deserve a mention for various reasons. After all, dammit, *Britain* has actually produced its quota.

First we can look at the S100 contenders, still going strong since the US Institute of Electrical and Electronic Engineers (best known here by its initials on the Pet's IEEE 488 user port) came up with an official S100 standard, IEEE 696. It is now something of a sales point for the S100 vendors to boast conformity with IEEE 696, and slag off other vendors by saying they don't meet it properly.

Superbrain

The Superbrain, available here from numerous suppliers was a price sensation last year at around £2,000 for one of our bog-standard systems. But it was not really standard, since it actually uses two Z80 processors — a fact that was used in the ads until it was revealed that only one of them was working at any one time. Later versions doubled the capacity of the floppy drives to a 700k byte total, and added a hard disk and network facilities; all using the same CP/M programs, with the easy upgrading of the operating system.

There were and are drawbacks with the basic Superbrain, like the screen display which is the

usual 80 x 25 but has no descenders on the letters, but it is still selling well.

Other US machines worth a look include the Altos range, from a company founded by expatriate Brit Dave Jackson, which offers up to 208k of RAM on a multi-user Z80 box and just about the widest range of operating systems around from single-user CP/M through MP/M and CP/Net, up to Oasis and Unix at the top end. Prices start around £2,000 for a single-user, Z80 system with 1M byte of floppy space, but without terminal and printer, from UK distributors Logitek and Microtex.

Then there are the systems from Televideo, Archives Inc., Industrial Microsystems (sold as Equinox here), Monroe, ADDS, Datapoint, Scientific Data, Pertec, Durango, Zilog — which only offered CP/M under user protest — California Computer Systems, Columbia Data Products, Zenith Data Systems (previously the Heathkit machine), Smoke Signal Broadcasting, and the rest of them. And that misses out literally dozens of CP/M machine makers in the US — all with their plus and minus points but all running the standard operating systems from Digital Research.

In Europe the picture is complicated by the fact that the big office equipment names have a disproportionate influence on the business; of these Olympia, Triumph Adler (a VW subsidiary), BASF and Facit have all gone for CP/M on their overpriced micros. Philips hasn't on its even more overpriced P2000, and is suffering in consequence.

Other European CP/M systems include the Shelton Sig/Net, Gemini Galaxy, Nascom 3, Clenlo Conqueror, Interactive Data Systems' Oscar, the DSC range from Extel acquisition

Digital Microsystems (headed by CP/M hardware originator John Torode, strangely enough), the LSI M3, the Rair Black Box range, Research Machines' 380Z, and the Transam Tuscan. And that is just a smattering from the UK alone. In the rest of Europe there are yet more from people like Ericsson and Tanberg from Scandinavia, and Kontron of West Germany.

Osborne

But the biggest threat is always supposed to be from Japan, although the hardware so far on view from the Panasonic, Sord, Sanyo, Toshiba, Oki, Nippon Electric and a few more are not causing much of a stir although they are all CP/M machines. The Japanese have been beaten at their own game here by Adam Osborne and his Osborne Computer Corporation.

The Osborne 1 is really a staggering example of how cheap you can make a bog-standard system these days. All the company has done is put a Z80, 64k RAM, and twin 90k floppies in a single box with a tiny 5in. screen and designed it to fold up into a portable unit looking like a sewing machine. But the price is £1,250 — and that includes a range of five top CP/M program packages that would normally cost about £800. No wonder he has cut the ground out from under the feet of the £2,000 CP/M vendors.

And if Osborne is applying pressure from below, the squeeze is also on from above in the shape of the CP/M-86 '16-bit' systems (The inverted commas are mine; I will argue unto death with anyone who tells me that the Intel

Continued p.14

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CP/M: THE PROGRAMS

The sheer number of standard CP/M programs packages is daunting for the user — there is just so much choice. True, not as much choice as there is for the Apple, say. But the Apple has a lot of games programs written for it, and CP/M is much more staid and businesslike than that; there are lots of CP/M packages that are, God help us, worthy and useful.

So when the editor (whom the saints once again preserve) asked me to give you a top ten of CP/M programs that *aren't* word processors, I worried not a little and started the kind of panicky phone-round that is becoming my trademark.

So caveat lector, as the Romans might have said if I hadn't just made it up. The packages described below are the ones I reckon to be the best-sellers, most popular, and so on; but if your favourite isn't here please do write to the editor and tell him. I am going on holiday, and am indisposed for eternity.

(Researcher's note: the products listed are in no particular order, and bear no intentional resemblance to any programs, living or dead).

1: dBase II

This comes from Ashton-Tate of Los Angeles, and is one of those super database managers that micros aren't supposed to be able to handle; viz, it is relational. If you don't know what this means, *Microcomputer Printout* ran a feature on databases a few months back. Modestly and the knowledge that it wasn't very good prevents me telling you the author.

Anyway, dBase II lets the user build up databases using a built-in command language that is as like English as possible, and then sort through them, merge them, and produce printed reports on them in the same way, at will. Input and output forms are created on the screen at the user's whim, and Ashton-Tate claims that it saves you a lot of money compared with writing database programs in Basic or any other language for that matter. Well they would, wouldn't they?

One interesting thing I found out about this undoubtedly popular package is that it is pretty hard to lay hands on in the UK — and one dealer told me that he could buy it cheaper in the US than he could from the UK distributor (mentioning no names).

Whatever, this is a highly-rated package, and will cost you £380 if you can find it.

2: MBasic

For all those readers who are used to buying a micro with a Basic language built in, it is worth explaining that CP/M has no language sold with it and you have to buy your own. Without any doubt at all, the leading CP/M language package is Microsoft's MBasic, or Basic 80 as it is also called.

Microsoft provides two versions, one an interpreter like your common-as-muck Apple or Pet ROM Basic, and the other a compiler that goes faster but is not as easy to edit.

All your favourite Basic features plus a few 'structured' additions are here, and the packages will cost you around £150 for the interpreter and maybe £190 for the compiler.

3: CBasic

But what is life without competition? As Margaret Thatcher sings in her bath. Here is another Basic compiler that is going well down the computer stores.

Originally written by Gordon Eubanks at Compiler Systems, CBasic is now an official

Digital Research product since Kildall's mob bought Eubanks' company and made him vice-president in charge of languages.

The reason for the competition with the Basic 80 compiler is simple; CBasic version 2.08 (the latest) will only set you back around £65.

4: SuperCalc

Let's play look at the name and spot the VisiClone. Sorcim spotted the fact that there wasn't a CP/M VisiCalc from Personal Software (although there is now) and jumped in with a CP/M spreadsheet financial modeller that looks like VisiCalc, has the same commands as VisiCalc, and by golly, it acts just like VisiCalc. Drawbacks: Personal Software has a lot of Visi.* products that link VisiCalc to graph plotters, indexes, pie chart drawers, and so on. Sorcim doesn't.

My mole-like source also tells me that SuperCalc is as tough to get hold of as dBase II, and that once again it is cheaper to ship packages from the US West Coast than it is to buy them from the UK distributor. Is the £190 you will pay too much? (PS: I know Personal Software is now called VisiCorp, but it is a pretty silly name isn't it? I'd feel a fool typing it out.)



5: PLink2

This looks like an odd one, but I am told that the queues for this overlay link loader start to form at dawn. And I you ask 'what is an overlay link loader', I answer that I asked just the same question. It seems that PLink2, written by Phoenix Software Associates, is a two-pass linkage editor that allows you to construct programs 8M bytes long if you ever wanted to do such a thing.

What happens is that PLink2 lets you construct this monster program on disk; and when you run it the appropriate sections are taken off disk and overlaid in your bog-standard 64k CP/M RAM. To the user, it looks like a CP/M machine with 8M bytes of RAM (if you ignore the time taken for disk accesses, of course).

Price for this, which works with all high-level languages you might care to write in, is around £185.

6: CIS Cobol

Here is one of those high-level languages, and I am amazed to say that it is actually British — well, actually it's English, but we don't want to offend the Celts. Considering Britain's supposed expertise in software, this is the only one written here that makes the top ten — Phoenix Software, writers of PLink2, may be a Ltd. rather than an Inc. or Corp., but I have this nagging feeling that it is based in Canada. Or maybe Scotland; I do know it is imported. Anyway, back to CIS.

The Cobol part of this Micro Focus product speaks for itself, and is an ANSI 74 standard Level I Cobol compiler with all that that entails. Cobol is not exactly my strong point (I'm an Algol 60 fan) but my sources tell me that CIS is not *exactly* a true compiler, but it almost is. It also has some CP/M-like features, in that it can be

configured for particular hardware by re-writing a small piece of the program called, I think, the run-time executive.

An option for CIS is a utility called Forms-2, which allows the user to design input and output forms for Cobol programs on the screen. It is very neat indeed, and adds £100 to the ordinary CIS Cobol Version 4.4 price of £400. Incidentally, the unofficial pronunciation for this product is 'kiss Cobol'.

7: Macro-80

From high-level to low-level programming with the next one, again from Microsoft. This is a machine code assembler for Z80 CP/M systems, competing with Digital Research's own MAC product. It costs £105, compared with MAC's £60, but the punters don't seem to care.

8: BSTAM

This is a handy little thing that allows the transfer of CP/M files from machine to machine, across a room or over the telecomms networks. I'm not sure, but I think the long-distance stuff is not the commonest application; BSTAM is good at switching CP/M program files from one disk format to another, from an 8in. floppy machine to a 5 1/4 in. version, for example.

Going very cheap at £100.

9: Statistics

A bit of a cheat to put this in, since there is no one stats package that cleans up the market. But the demand for all the CP/M statistics stuff is surprisingly high, and there are obviously lots of people out there who want to do standard deviations, regressions, ANOVA (whatever that is), and those other odd statistical hoops you have to jump through.

A typical package — no names again — will cost you around £100.

10: Pascal MT +

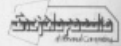
We Microcomputer Printout people like to be fashionable, and so obviously do CP/M users. Pascal is in this year, and this particular version seems to be leading the field — perhaps because it comes from Digital Research. It is not leading by much, since Sorcim's Pascal/M also has its adherents.

But Pascal MT +, originally written by MT Microsystems before Kildall's amoeba swallowed this company up, is supposed to be hot stuff for program development — according to Digital Research's Carmen Governale, anyway. Price is £150, and an add-on speed programming package puts this up to £265.

So that's my list, and to cover my tracks a bit of explanation is in order. You may wonder why all 10 are really languages and programmers' aids rather than undertakers' stock control packages. Simply, there are so many payroll, ledger, and stock control packages, that no single one has stood out in any of these areas.

Then again, some MicroPro packages like DataStar, SpellStar, CalcStar, and so on are selling well, but usually as an ancillary extra for WordStar word processing; and WordStar has a section pretty much to itself elsewhere. The same goes for MagiCalc from Peachtree, which tacks onto the Magic Wand word processor.

Besides, I think dBase II and SuperCalc beat off these admittedly strong contenders...



CP/M: THE WORDPROCESSORS

Word processing was a natural for CP/M systems, and in fact the first real applications package for the operating system, released in 1978, was a word processor. Reason? Systems with CP/M tend to have a lot of disk space — and we writers love a lot of space — and a nice big screen display of 25 80-column lines that lets you see a lot of text at once.

And as that first word processor, Wordmaster, came from MicroPro International, it is perhaps no surprise that the top-selling CP/M word processor — indeed the top-selling CP/M package of any kind, by a long way — is MicroPro's famous follow-up called WordStar.

MicroPro's entry into the CP/M software business was really caused by the fact that when Imsai, one of the early personal computer makers and CP/M licensees, went to the wall MicroPro picked up a lot of the staff. And it is nice to report that the old Imsai engineers have resurfaced with the new CP/M system from MicroPro subsidiary Performance Business Machines.

But that is neither here nor there. The thing to note is that WordStar is a *good* word processor, even though I speak as a user of the thing.

In my opinion, good word processors, let you see on the screen exactly what is going to be printed out, and do things like justify lines, wrap text around if a word is too long to fit on a line, and other things like that, without the operator having to do anything. Word Star does all that,

and when you do need to use a command WordStar has a set of menus that come up on the screen for you to choose a function from; these menus include 'help' listings that can save you rummaging through the manual. I like it, I like it.

Control Codes

Of course there are things wrong with WordStar. The command keys you hit do different things according to which menu you have on the screen, and in one particular awful case hitting the key that normally moves the cursor causes an exit from WordStar into CP/M. Very nasty indeed.

But one of the things for which the package is criticised, the fact that all the commands are control codes and need two keystrokes to use, is not MicroPro's fault. See, CP/M on so many different machines with different keyboards that the software firms can't rely on the micro makers using standard codes on the cursor controls and other control keys. However, all micros use the same codes for control-D, control-X, and so on. If the software only uses these keys, it will work on any keyboard. And if the micro has programmable function keys — the LSI M3, sold as a Word Star word processor called Caltext by Computer Ancillaries, has a particularly good crop for example — the system supplier can put all the word processor commands onto these.

I may be biased, but I think WordStar is good

value at £250 or so; and other CP/M users seem to agree.

MicroPro has come up with a whole set of 'Star products in the last couple of years, including a file manager called DataStar, a VisClone called CalcStar, and a proofreading dictionary program called SpellStar (usually with US spelling, unfortunately). But the best-selling add-on is MailMerge, a £60 extra to WordStar that allows the user to pull names and addresses out of files into form letters and onto address labels. Most WordStars sold have this option included now.

All this stuff about WordStar does not mean that other word processors for CP/M are no good. Far from it; they all meet my 'good word processor' criteria, although they do not sell as well.

Mailing list

One with a lot of support, though, is Lexisoft's Spellbinder. At least one ex-journalist, David Tebbutt of PCW fame, swears by it — although Dave swears about almost anything given a chance — and knocks WordStar. Spellbinder costs about the same, but has the mailing list facilities built in instead of being supplied as an option. There are more single-key commands, and not so much fiddling about with the 'control' key. But apart from that the facilities look the same as WordStar, and Spellbinder is certainly worth a look.

As is Magic Wand from Peachtree Software,

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WHY I HATE CP/M

Not everyone loves CP/M. Ace Micro commentator **Guy Kewney** has serious reservations.

Sport is the art of the difficult, made to look easy. If computer programming were a sport, rather than something to be done because you have to clear up the mess, then CP/M would be the greatest invention since the discovery of cricket stumps or the tennis court baseline.

By this time of the day, you will have been very good and dutiful, and will have done all your homework, and read all the important articles about CP/M in this Encyclopaedia.

You will know how important CP/M is, how standard it is, how it lets lots of people do lots of different things without confusing the computer because the computer thinks they are playing CP/M, and it knows the rules.

You may even know what CP/M is. Or you may think you do. Let me inform you what it really is.

It is a trap.

Like all good traps, it is easy to get into the thing. CP/M does all the necessary things for the programmer and the user, from petty, trivial things like knowing whether you are trying to use the keyboard, right up to complicated things like transferring a program from one disk on a computer to a different drive on another computer, changing it subtly in the process.

The question of "how do I get out of here" may not even occur to most people as they settle comfortably into CP/M, learning how to use commands like PIP, and DDT, and DIR and Control-C.

Such a comfortable, accommodating trap, despite the rather utility nature of the furniture, may seem at first to be the most remarkable des. res. you've ever seen. Why change?

Changing rules

Assuming that you really come to like your utility furniture, (and it's worth coming back to that in a moment), the problem is that the rules are changing.

Imagine that you are the world champion darts player. You turn up for a tournament equipped with heavier than lead, stronger than steel arrows with aerodynamically styled flight tips, and (just for safety) a point sharpening implement.

Grinning with masses of false teeth, a judge out of a nightmare looms towards you, and explains: "Hi! Glad you could make it – the target has just been set up. We've improved it a bit, and we've completely separated all the various segments of the board. There they are, over there on the far wall, 25 yards away, made of soap bubbles that automatically pop even when hit by the flimsiest of missiles. And we've made things a lot easier, by providing laser-guidance systems, which will guide the missiles onto the target. You can probably fire off a couple of thousand arrows a minute if you have these nice new lightweight laser-equipped pneumatic super-darts that everybody else is using, and you score one for every bubble you burst..."

Naturally you protest that at 25 paces, you stand a very small chance of reaching the target, never mind hitting anything – and anyway, your missiles aren't designed for popping bubbles.

"Oh, don't worry, there's nothing in the rules about not carrying your darts over over and

popping the bubbles by hand. They are a bit high up, I'll admit – but what the heck, we can lend you a ladder. Only trouble is, you can't leave it lying around in the target area, and you, must start each bubble-pop from the baseline, so I'm afraid you'll have to bring the ladder back to the base each time, too. There's a towel in the Gents if your points get too soapy to burst the bubbles."

It would make great television on Grandstand, especially if you could actually get a few bubbles popped. As a way of eliminating foam, however, it could prove tedious. And a lot of foam would accumulate in critical parts of the farmyard.

As technology starts to provide us with general improvements like hard disks, enormous internal memory capacities, "soft" keyboards, soft screens, and networking abilities, CP/M starts to look more like a handicap than a help.

Disgust

I'm not talking about irritating but avoidable hazards such as the problem which generates those infuriating operating system messages. They are, goodness knows, bad enough – I



even know one user who has hooked a voice synthesiser into his system and written software which detects BDOS Error messages (instead of getting a displayed message on the screen his system announces "Aw, sh*t. BDOS Error!" in a disgusted American voice). They are part of a necessary safety first system. Frankly, if CP/M couldn't tell that somebody had loaded a new diskette, most people would be likely to complain that it accidentally over-wrote important data without checking.

No, I'm referring to the simple fact that the lowest common denominator is no longer high enough to be useable by tomorrow's machines.

For example, CP/M allows you to store information in "files" each with name. One file might be a letter to your solicitor, another might be a mailing list of estate agents, yet another might be a program.

CP/M allows only eight letters, plus a three-letter "qualifier" for this name. It takes no note of how long the file is, when it was created or last accessed, and it can even get its knickers in a twist by creating two files with the same name.

Not much of this mattered a damn in 1973, when Gary Kildall first wrote the software, because you would have been lucky to find anybody with enough disk capacity to store more than a dozen or so files on a diskette. Type DIR, and look at what you've got first.

On a networked system with over 300 million characters of disk storage – something that will be as common as muck this time 1984 – there may be something like 60,000 different files. You could grow a beard like mine trying to find the one you want with CP/M, and it's probable that when you try to start a new file, you'll never think of an eight-letter name that nobody else has used yet.

Then there's the long question (without an answer yet) as to what sort of things are going to be basic necessities in ten years' time.

Help!

You can be sure that ten years ago, disk file directories were not things that worried designers of microsystems. And today, HELP commands are just starting to be used in a rudimentary way.

Anybody who wants to make life easy for the user today, can write a program that keeps several (appropriate) messages in store, and prints them on the screen whenever something seems to go wrong.

These days, what you're likely to see if you accidentally type a zero instead of an "O" is something like:

"Error S39 – unrecognised command"

which is a little better than a rude BEEP and the A> prompt but not a lot better. If somebody types an unrecognised command, it would be far better to show a whole screen of information, properly laid out (so that you don't have to read the whole thing, but can easily spot the part that is relevant to your problem) relating to the stage of the program which has been reached.

For example, a list of possible valid commands could be displayed, with a suggestion as to which one is most often used here. "Press Q if you have finished entering names."

Supporters of CP/M will say: "But there is nothing to stop you writing your own help messages!" And that's true, but it is about as helpful as most chip makers' responses of ten years ago, that you could always write your own routine to drive a printer. Driving printers ten years ago, and organising HELP messages in ten years' time, are likely to prove to be very similar necessities – you can do it yourself, but you expect the operating system to do it for you, fast and simply.

CP/M simply can't cope with that sort of demand. It is just too slow in moving information from the program to the screen, because it assumes that the screen is a terminal. Most screens were terminals, and a lot of terminals were printers, when CP/M was first invented – and so CP/M assumes that you have a piece of paper in a printer, or a screen that behaves as if it were a piece of paper in a printer.

Try it, if you don't believe me. Get CP/M to print a message on the screen, and then print another message one line above it.

You'll find that the machine is quite capable of doing this, but you can't use

CP/M for the job. You have to do it yourself – carry the darts over to the bubble, climb the ladder, dry the points, and jump.

Pop.

As long as you are content to do the things that CP/M thinks are worth doing, it is fine. Even on the big 16-bit Sirius and IBM Personal Computers running CP/M 86, you can do all the same things, but nothing else.

As long as "nothing else" means trivial things like how many characters per line on the screen, this doesn't matter much. But if it starts meaning important things like the time a command was typed, whether an automatic archive copy is due to be made, what date it is for auditing purposes, and what HELP message is due to be shown when, then there is one, inescapable conclusion.

That is: these important things won't get done.

As I said: it's a trap. Just wait until you need to get out.



THE STORY SO FAR

and was released in late 1980. This links various CP/M machines into a central server running MP/M — in this case MP/M seems OK — and allowing the CP/M machines to access central files on the disks attached to the MP/M server. To each user, these central disks look just like an extra drive on his own machine; but in fact files are sent from the server over the network lines. If you remember *Microcomputer Printout*'s network feature, this is a star configuration.

Once again, CP/Net is only tentatively being adopted. But both MP/M and CP/Net have the advantages that existing CP/M applications programs can be run very nearly unchanged, and that once again the operating systems can be configured simply to suit a wide range of computer hardware (as long as they have Z80s or 8080s or 8085s).

But that other new product we looked at briefly, CP/M-86 for Intel's 16-bit processor, looks like a gold-plated success. The most important thing is that the mighty IBM chose the cut-down 8086 processor, called the 8088, for its Personal Computer. The 8088 is cheaper to use in systems, since the databus is only 8 bits wide and all the 8080 peripheral chips — cheap and plentiful — can be used with it. But the 8088 has the same instruction set as the 8086, and internally is a 16-bit processor. Anyway, CP/M-86 runs on the IBM Personal Computer unchanged.

IBM wanted two operating systems for the machine, and signed up Digital Research's CP/M-86 for one of them; Microsoft's MSDOS, a 'CP/M-like' but cheaper system, was the other. Then came Chuck Peddle's Sirius 1, also with an 8088 and also with CP/M-86 and MSDOS; and IBM and Sirius are rapidly clocking up the sales.

From the user's point of view, one popular misconception needs to be knocked on the head at once. Programs written for Z80 or 8080 CP/M will *not* work unchanged under CP/M-86, although when you sit at the IBM Personal or Sirius the operating system prompts and commands look just the same. But look on the bright side — IBM has produced its own CP/M-86 manual, up to the standards of its other Personal Computer manuals. And that standard is high.

This last point is by no means trivial. The Digital Research manuals are dire and incomprehensible, obscure and unhelpful, and to damn them completely, were written for engineers.

Be that as it may, using the same PL/M-86 compiler from Intel as was used to generate CP/M-86, Digital Research has come up with MP/M-86 for what that's worth.

That is where things stood until a month or so ago. Then Digital Research, now relocated from the garage into palatial new headquarters at Pacific Grove overlooking the Monterey Bay, announced Concurrent CP/M-86, which allows a single user to run several tasks simultaneously and even give each task a separate 'window' display on the screen.

And this is what the future holds for CP/M and its family. More graphics, more user-friendliness, more of what Kildall calls "fat on the Interface." It takes a lot of memory, but memory is cheap. And CP/M Version 3... well, just wait and see.



THE COMPUTERS THAT USE IT

8088 is a 16-bit processor, since as far as the outside world is concerned it looks like an 8080. The IBM Personal and Chuck Peddle's Sirius 1 are really going to shake up the market for 8-bit CP/M systems, and the process has already

started. One supplier who has sold a lot of Superbrains told me that Superbrain sales were dropping right off when people found that they could buy a more powerful Sirius for the same price. Intertec too must have started twitching; the Superbrain took a 20% price cut on May 1st.

The Sirius and IBM PC are still following the CP/M route, as are people like Altos and the UK's Systime who have gone for the real 16-bit 8086 and CP/M-86 in their new systems. True, Microsoft's MSDOS is a competitor. But the leading CP/M software suppliers are quickly switching their packages to 16-bit CP/M, and the hardware suppliers are taking note.

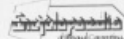
But meanwhile, what about the Big Three? Tandy is still relying on TRSDOS, even for the Model II which is a CP/M machine if ever I saw one — it even has the 8in. disks that CP/M originally required. Pickles & Trout (wonderful name) and Lifeboat Associates are supplying CP/M for the Tandy models I, II, and III, but it is still not a real factor in the market.

2nd processors

And Commodore and Apple have got the add-on blues. Microsoft, that busy firm, has launched the SoftCard; this is a board that plugs into the Apple II and gives it a Z80 to run CP/M on. Metamorphic Systems and Coprocessors of the US have gone even further and released Apple II boards that include an 8088 chip so that the lowly Apple can run 16-bit CP/M-86. Meanwhile, Small Systems Engineering has the SoftBox that plugs into the Pet — this is really a Z80 computer that uses the Pet as a terminal and ignores the 6502 processor in the Pet case. And Vector International, Digital Research's European distributor, has come up with CP/Maker to do the SoftBox job, but this can be plugged inside the Pet.

All this little excursion into hardware was meant to do was to show you that if anything is a standard on micros, CP/M is it. When Commodore starts getting dragged into the CP/M arena, you know something is going on. There is no way round it; we are all CP/M users now.

which costs around £200. Like MicroPro, Peachtree offers a whole set of programs with similar names, in this case using Magic instead of Star. So there are Magic Spell (guess what that does), MagicCalc (another difficult one), and Magic Bridge, which links all the others together into a complete-ish office automation system with communications built-in.



THE WORDPROCESSORS

Apart from the usual word processing facilities, Magic Wand has one unique feature that does not seem to be pushed forward enough. The program contains a sort of programming language that lets the user produce a very friendly system for unskilled people to use. For instance, say you are printing out form letters with different addresses at the top. The commands in Magic Wand let you set up the system so that the operator has to put the information in the proper places on the document, with warnings and prompts if the operator gets it wrong. The commands you program in will also take care of things like making sure that the date at the top of the letter always lines up with the last line of the address typed in, whether the address is two lines long or seven.

One Magic Wand expert told me that many users get on with the word processing and never even notice that the programming commands are there. Which is good news for the expert, since he is now selling Magic Wand complete with internal programs he has written to the users specs; the customer can then just

hand the package to an unskilled typist and let him get on with it.

Peachtree, which supplies the accounting software for the IBM Personal, wishes IBM had gone for Magic Wand as well. But no; the giant went for an obscure — to me at any rate — package called Easywriter. I don't know much about it, but I hear that it is remarkably easy to use, and that was why IBM picked it. With IBM's backing, Easywriter is a name to watch out for.

One name you have probably tripped over already is Electric Pencil, which is really designed for novice users — a bit like Easywriter really. This package has been round for a long time, is pretty cheap, and is nice and robust. But it does not have the editing and printing facilities that Magic Wand and WordStar have in abundance, and if you want to do a lot of editing, switching paragraphs inside files and from one file to another, the more powerful pair are a better bet.

Is there any order to these, with one being a lot better than the rest? The answer is; it depends. WordStar has more editing features, Magic Wand has more printing and formatting facilities, and Easywriter and Electric Pencil are easier to use. The only way is to suck them and see. Happy writing.



HOW TO USE IT

simple; this program is the first one Kildall wrote for Intel's 8008 processor in about 1972 and is a paper-tape editor. As Adam Osborne has said, avoid ED if you possibly can — that way, once again, madness lies.

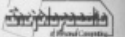
Basically, that's all there is to CP/M. Of course, it is doing lots of clever things inside the computer like connecting the keyboard to the screen — did you know the operating system did that? — organising the disk storage and figuring out whereabouts files should go on the disk, pulling off the utilities and running them when needed, and keeping that neat directory of file names. And also of course, there are little bits and pieces to the system that I haven't got room for here. But this is how CP/M looks to the user, that is pretty simple.

And as for the applications programs that you buy, all you have to do is make sure they are supplied on disks that fit the disk format of your CP/M machine. Then use FORMAT and SYSGEN to produce a formatted blank disk with CP/M on it, use PIP to copy the applications program files from the software firm's disk onto the new one, and there you are — an applications program disk. Then put this disk into drive A, reset, and at the A> prompt type in the name of the application program file (missing out the inevitable .COM on the end). You will then be running one of the growing line of CP/M packaged software.

Some manufacturers make this even easier, and typically Adam Osborne is one of them. His applications program disks come with CP/M already on, and with a little utility called AUTOST.COM also on the disk. Put an Osborne disk in drive A, boot the system, and it puts you straight into the program you want. Other micro makers please copy, an autostart utility takes up little room but saves the confusion often caused by A>.

So CP/M might be unfriendly. But really, doesn't it do its best to make life easy. Until of course you get one of the dreaded CP/M error messages that don't seem to mean anything and make you re-boot the system from scratch, losing everything you had in RAM. Now that really is something that ought to be fixed in version 3 of CP/M.

I recently lost 2,000 words of a 3,000 word feature on a CP/M word processor, for reasons which are still obscure. But that dread line 'BDOS error on A: Bad Sector' still keeps me awake at night...



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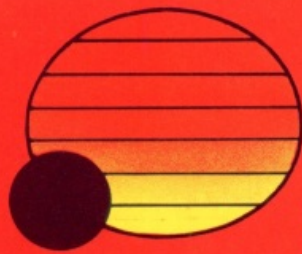
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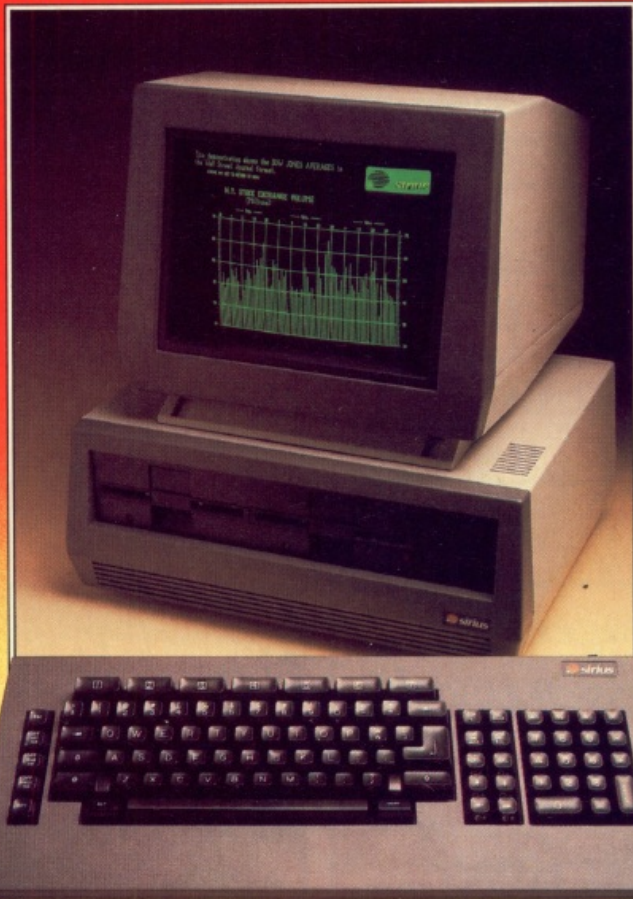
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