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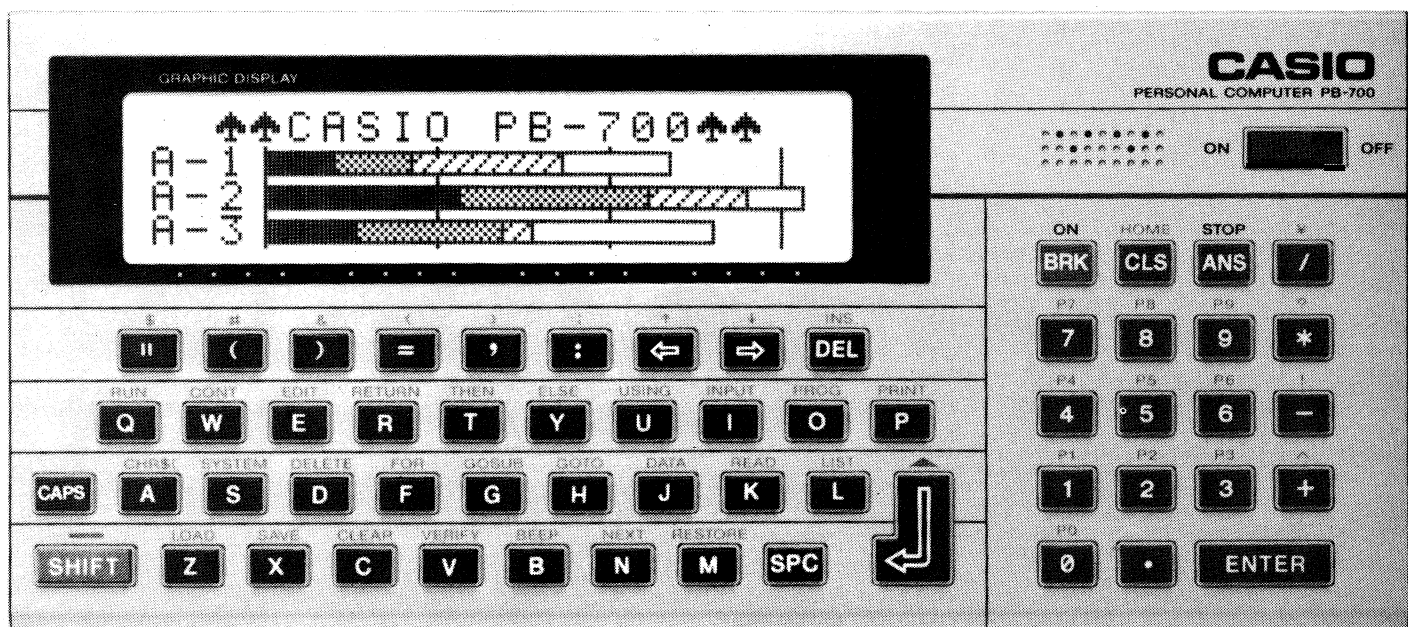
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Casio PB-700 hand-held computer

Personal computers seem to be developing along four separate lines: desk, portable, lap-type and hand-held. Here we review Casio's latest hand-held computer, the PB-700.

Compared with lap-type computers such as the Tandy Model 100 or Canon X-07, the Casio PB-700 is really small, at less than half the size. It measures 200 x 88 x 23mm (W x D x H) and weighs a mere 315 grams, including the batteries.

The keyboard is split into two sections with alphabetic on the left (QWERTY-style) and numeric keypad on the right. In all, there are 58 keys, most of which provide a particular control function.

Basic is used as the programming language and to make things easier, the most-used commands are entered by only two key presses.

Memory

Up to 10 programs can be stored and any program can be accessed by two key presses. Memory capacity of the PB-700 is 4K of RAM which can be extended to a maximum of 16K by the addition of three 4K RAM modules. Note that the amount available for the user is 1232

bytes less than the amount of RAM installed because the first 1232 bytes is required by the PB-700 itself.

The liquid crystal display format is four lines of 20 characters each. This is a lot less than the Tandy Model 100 for example (8 lines x 40 characters) but for a lot of applications it is quite adequate.

As with most liquid crystal displays, the viewing angle is relatively small, particularly the vertical viewing angle. This problem is overcome to an extent by the contrast control. This really should be called the "viewing angle" control since it alters the polarising voltage on the display.

However, even when viewed at the optimum angle, the contrast of the PB-700 display is not particularly good. This should not be a real drawback though, unless the unit is to be used for long periods at a time.

On the other hand, while some calculators using liquid crystal displays

seem to have an overly long keyboard response time, the PB-700 is very fast. While it is not possible to touch-type on the closely spaced keys, even very fast key presses do not catch the unit out.

The character format is 8 x 5 dots and lower case characters such as y have true descenders when they are actually displayed. Normally though, all characters are displayed in upper case, even though they are held in memory in upper and lower case for subsequent printout if required.

Power supply for the PB-700 is from two battery sources. The main supply is four 1.5V penlite cells while a lithium battery powers the RAM for program retention.

Casio recommend replacement of all five batteries after two years to avoid possible damage due to leakage of battery contents. However, in normal use the main batteries may have to be replaced more often than that. Estimated life of the penlite cells with continuous use is about 100 hours. Compared with the usual battery life of the larger lap computers, this is very good.

To conserve the batteries, the PB-700 has an automatic power-down feature to switch the unit off eight minutes after the last keyboard entry, unless a program is running.

CASIO PB-700: Commands and Functions

Manual Commands

CONT, DELETE, EDIT, LIST, LLIST, LOAD, NEW, PASS, PROG, RUN, SAVE, SYSTEM, VERIFY.

Program Commands

ANGLE, BEEP, CHAIN, CLEAR, CLS, DATA, DIM, DRAW/DRAWC, END, ERASE, FOR-TO-STEP/NEXT, GET, GOSUB/RETURN, GOTO, IF-THEN-ELSE, INPUT, LET, LOCATE, PRINT/LPRINT, PUT, READ, REM, RESTORE, STOP, TRON/TROFF.

Numerical Functions

SIN, COS, TAN, ASN, ACS, ATN, EXP, SQR, LOG, LGT, ABS, INT, FRAC, SGN, ROUND, PI, RND.

Character Functions

ASC, CHR\$ VAL, STR\$, LEFT\$, RIGHT\$, MID\$, LEN, INKEY\$.

With the main batteries removed, the lithium battery will protect the standard 4K of RAM for 10 months; for 16K of RAM the protection period drops to 2.5 months. Again, according to the manual, the life span of the AA cell is approximately 100 hours for continuous use.

One final point worth mentioning is that when the batteries need to be changed, no loss of program will result if one supply is removed at a time. During this operation the PB-700 should be switched off.

For those fully familiar with Basic programming, the PB-700 command list booklet is all you need to start using the unit. This has 22 pages and contains lists of manual commands, program commands, numerical functions and character functions. Also included are lists of error messages and operations, a character code table and plotter commands.

Included in this article is a list of the various commands and functions which demonstrate that the PB-700 is certainly a fully-fledged computer capable of use in many applications.

For those who are programming novices, the manual accompanying the PB-700 is invaluable. While other books on Basic would be useful as background, the PB-700 manual, entitled "Easy Trip to Basic", contains all the needed information and instruction.

With 326 pages, the manual has six chapters which go into every aspect of Basic which the PB-700 encompasses. There are also quite a few sample programs which demonstrate particular Basic commands and functions.

PB-700 capabilities

As depicted in the accompanying list, the PB-700 has 38 separate commands and 29 separate functions. Most of these require little comment and are fully explored in the manual.

One of the more interesting

commands is called PASS. This command prevents the accidental erasure or alteration of programs that may have taken a great deal of effort to create.

The PASS command is used quite simply by typing, for example, PASS "FRED" and then return/line back. This now protects all 10 program locations which are normally accessed by pressing "Shift" and then one of the numeric keys. This does not stop the programs from being used or examined but you can no longer alter them, write over or erase them.

If you forget the password though, you have a problem. The only way to solve the problem is by first dumping the said programs onto tape and then using the NEW ALL command or removing the batteries. Of course, if you can still remember the password, it is a simple matter to release it and gain access to the program area for alterations and erasure.

The SYSTEM command informs which program locations are already used, the number of bytes of RAM left, the type of angle measurement used, for example degrees, and the program area currently being accessed.

A random number generator is also provided on the PB-700. It takes the usual form of RND; in other words when the PB-700 executes this numerical function, numbers are randomly generated in the range 0 to 1.

So to gauge the performance, two lots of 10,000 random numbers were generated which were then averaged to give the following results: 0.5033 in the first instance and 0.5052 in the second instance.

Since a perfect score would be 0.5 exactly, the PB-700 really performs very well in this exercise.

All the usual numerical functions are also included in the PB-700, for example SIN, COS and EXP. As well there is a useful set of Character Functions, such as CHR\$ and ASC.

Casio PB-700

On the calculator side of the PB-700, there is a very useful key, called ANS. On pressing this key you obtain the result or "answer" of the last calculation, whether it was from program execution or by manual means. So even if you forget to jot the last answer down it can always be retrieved until a new calculation is carried out.

An interesting application of ANS is when you want to run a long program which only returns one answer of interest. You simply run the program and leave the PB-700 indefinitely. Once 8 minutes have elapsed from the time the program finishes, the PB-700 will switch off automatically. On returning to the PB-700, you just need to press the ON button followed by the ANS button and the desired result will be displayed.

Graphics

The PB-700 has a quite extensive graphics capability. In the graphics mode, the liquid crystal display is accessed by the CPU on a dot-for-dot basis, 32 x 160 or 5120 dots in all.

Two commands are available for using individual dots in drawing curves, DRAW/DRAWC and POINT. This is opposed to positioning the cursor by the command LOCATE in order to write



The Casio PB-700 can be used to generate graphic displays as this sine plot shows.

characters where required.

The DRAW command is used in the following way. DRAW (x1, y1) simply draws one dot located at x1 dots across and y1 dots down from the top left hand dot located at (0, 0). To draw a line from (x1, y1) to (x2, y2) the command DRAW (x1, y1)-(x2, y2) is used. The DRAWC command works in exactly the same way except it erases rather than draws.

The command POINT on the other hand is used to determine whether a particular point is turned on or off. This command is used in the same way as the DRAW command; POINT (x1, y1).

From the program listing for the sine wave, you can see that the DRAW function is quite simple to use. The DRAW (X, Y) statement actually does the drawing of the sine wave; DRAW (A, 2)-(A, 28) is used for the vertical axis and DRAW (A, B)-(A + 150, B) is used for the horizontal axis.

The version of Basic used by the PB-700 has the ability to trace programs. This feature is generally used for debugging. To start a program trace the command TRON is used while to end the trace sequence the command TROFF is used. Since TRON, TROFF are program commands, they can be used in programs but they are usually used by direct entry.

To obtain an appreciation of the speed of the PB-700 the following program was run.

```
10 FOR Y = 1 TO 1000
20 NEXT Y.
```

This simple program puts the unit into a loop which it repeats until Y = 1000.

Execution of this program by the PB-700 took approximately 12 seconds, or in other words each loop took 12 milliseconds to execute. The same program run on a TRS-80 was found to execute in 2.7 seconds.

So the PB-700 is not fast.

Accessories

As already mentioned, add on RAM packs are available for the PB-700. These

```
10 REM--- SINE---
20 CLS
30 A = 5: B = 15
40 M = 12
50 FOR I = 0 TO 580 STEP 4
60 X = A + I/4
70 Y = B - SIN(I)*M
80 DRAW (X, Y)
90 NEXT I
100 DRAW (A, 2)-(A, 28)
110 DRAW (A, B)-(A + 150, B)
115 BEEP
120 LOCATE 2, 3
130 PRINT "sine"
140 LOCATE 13, 3
150 PRINT "wave"
160 GOTO 160
```

This short listing can be used to generate the sine plot depicted above.

RAM packs fit into a compartment on the back of the PB-700.

The most powerful accessory for the PB-700 is the combined printer plotter and microcassette interface. This clips onto the PB-700 and prints in four colours on 114mm wide paper. A separate microcassette recorder is also available and this plugs into the cassette interface port on the PB-700.

Conclusion

While the PB-700 is a useful machine, it is fairly slow. For many applications, a scientific calculator would be cheaper and much faster. However, for applications requiring long and complicated calculations the PB-700 could well come into its own for ease of data entry and retention of final results.

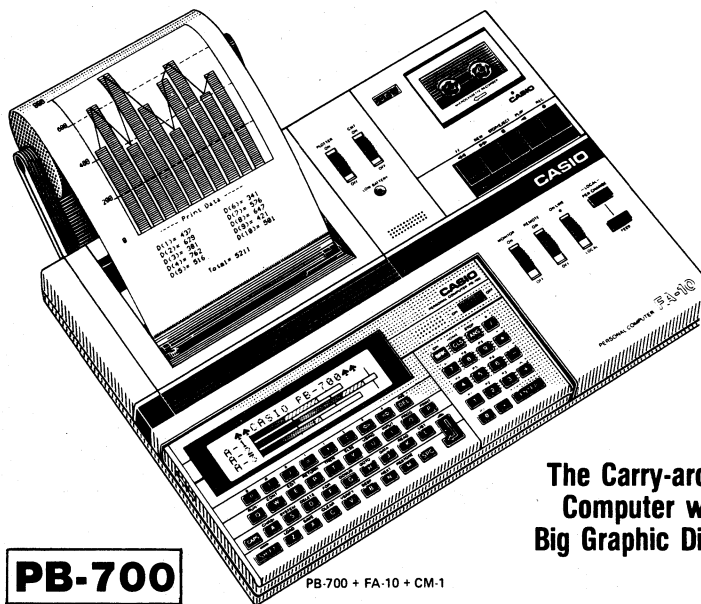
Prices of the PB-700 and its accessories are as follows. The PB-700 itself retails for \$299. The FA-10 printer-plotter is priced at \$399 while the CM-1 micro-cassette recorder is \$69. The 4K RAM packs sell for \$69.

The Casio PB-700 is distributed in Australia by Mobex Pty Ltd, 76 Parramatta Rd, Camperdown, NSW 2050. Phone (02) 516 4055.

NEW

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POCKET COMPUTERS



PB-700

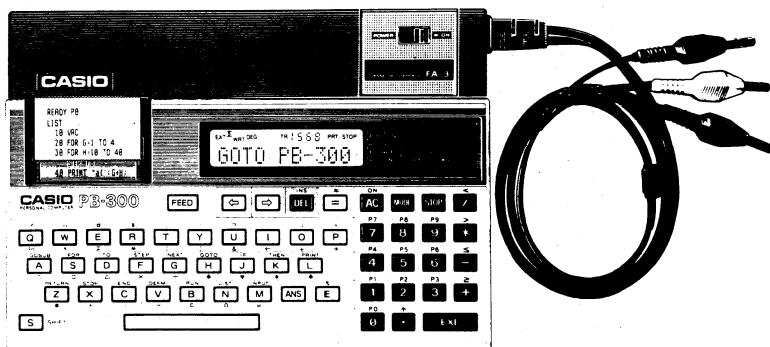
PB-700 + FA-10 + CM-1

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ROM — 25K bytes installed.
- KEYBOARD: ASCII type keyboard.
- DISPLAY: Text — 20 columns x 4 lines (80 characters).
Graphics — 160 x 32 dots.
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OR-4: 4K byte RAM expansion pack.
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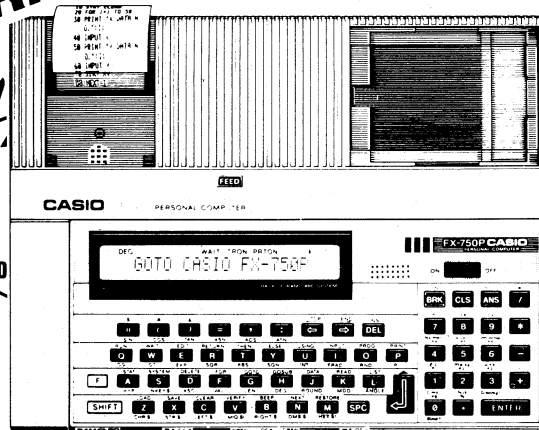
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- FX802p — PB300 with 25 Scientific Funcs
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CAMERA: A HANDS-ON TEST**

A review of the

CASSIOPEIA: CASIO'S NEW BABY

Palmtop computing seems to be the go lately, with a number of companies producing their own version of the handheld personal computer. Casio's contribution, the aptly named Cassiopeia, stands out from the crowd with its stylish looks and extra features. We decided to review the Cassiopeia along with a PCMCIA modem, to see what all the fuss was about.

by **GRAHAM CATTLEY**

The concept of truly portable computing seems to have come of age with the introduction of Microsoft's Windows CE, a scaled-down version of Windows 95 designed specifically for handheld personal computers. It's interesting to note that the Windows CE operating system was developed well before there were any handheld machines around to actually run it on. In fact, the microprocessors found in most palmtop computers were tailor-made to run the CE operating system, which just goes to show how influential Microsoft really is...

The Cassiopeia was one of the first handheld personal computers (HPCs) to hit the American market and, after a year's delay, they've finally become available in Australia. Based on Hitachi's H3 RISC processor and supporting a type II PCMCIA slot, the Cassiopeia is available with 4MB of RAM and contains Windows CE permanently installed in 4MB of ROM.

Along with the operating system itself, you get built-in pocket versions of Word and Excel, as well as calendar, task, and contact management software. You also get a CD containing HPC Explorer, which lets you easily transfer files between the Cassiopeia and your Win95 desktop computer via a high speed serial link.

One of the major selling points of the Cassiopeia is that it is Internet ready, and that by using a PCMCIA modem you can read your email and even surf the net. With this in mind, I decided to try out the Cassiopeia with a Comport SA-MC218 28.8k PCMCIA modem, kindly supplied by Casio's Australian distributor, Mobex.

Communications

One of the first things you notice about the Cassiopeia is that it doesn't

have a floppy disk drive. (It doesn't have a hard drive either, but I'll get to that later.) This would suggest that the Cassiopeia is more of a souped-up personal organiser rather than a personal computer, as any data entered into it would be difficult to extract and use on your desktop computer. This isn't true, however, as the Cassiopeia is in fact a full blown computer, and has not one, but *three* different ways of transferring data to and from other systems.

The most obvious of these is the Type II PCMCIA slot on its right side. The other two are a custom serial port hidden behind a small flap on its left side, and an adjacent IrDA infrared port that allows it to communicate with other HPCs. As it happened, I had access to another HPC manufactured by LG Electronics, and so was able to try an IR file exchange between the two. After I highlighted a file in the Cassiopeia and selected 'Send' from its file menu, it sat there waiting for a response from the other computer. I selected 'Receive' on the other HPC



The Comport PCMCIA modem is shown here with its plug-in telephone cord attached. It can handle speeds up to 28.8k, and can be used with mobile phones to make a truly portable setup.

and aligned the IR ports on both machines so that they faced each other. Within a few seconds the file was transferred — and all without cables, disks or contact between the two machines.

Hidden away around the side of the Cassiopeia is yet another comms port that allows the Cassiopeia to exchange data with other digital equipment. This is a 3.5mm stereo socket, but details on this port were a bit sketchy, and I could only find a brief mention of it in the manual where it informed you that you would need special software in order to communicate with a Casio QV digital camera. Quite why you'd want to transfer images from a camera into your Cassiopeia is beyond me, as its 480 x 240 display can only display four shades of grey, and I don't think the results would be very satisfactory.

As I said before, the Cassiopeia doesn't use a hard drive; instead relies on a RAM (lithium battery backed) to store all your files and settings. The programs themselves are stored in ROM, and so you have a potential 4MB to divide between system RAM and file storage. If you decide to install some extra applications (the CE version of Internet Explorer for example), then you may have to eat into some of the available RAM to make room. Using a simple slide bar interface, you can allocate different proportions of the available space between drive space and available RAM. This defaults to a 50/50 split that gives you 2MB for available RAM and 2MB for file storage, which seems to work well.

More power!

Surprisingly, the Cassiopeia runs on only two AA alkaline batteries, and these will last around two to three weeks with normal use. Battery life is severely shortened, however, when you try run-



The Cassiopeia uses a 117 x 60mm touch sensitive screen for the user interface instead of a mouse. It is also one of the few HPCs on the market that provide a backlight screen — perfect for playing Solitaire in bed.

ning the Cassiopeia with a PCMCIA device, such as a modem.

I was quite surprised to find that the Cassiopeia's current consumption was maintained at 1mA when the unit was turned off. This current drain was presumably for the battery backed RAM, and would mean that the batteries would need replacing on a regular basis, whether you used it or not.

I measured the current consumption of the Cassiopeia (without the modem) at 65mA. The supply current rose to 275mA whenever the Cassiopeia was processing input, or when the screen was touched with the stylus. This was obviously a sleep-between-keystrokes power saving system as used in many laptop computers, and would explain the long battery life.

This current jumped to over 600mA (and peaked at over 1000mA) when the modem was installed and running. Within a minute, a pop-up window informed us that the main batteries were getting low and would need changing. Of course, if you have the backlight on you can add an extra 100mA to all of the above figures.

With such a high current drain, you couldn't really consider using the Cassiopeia with a modem without some form of external power, such as

a plugpack.

Unfortunately, the Cassiopeia doesn't have the usual DC power socket found on most pieces of electronic equipment, and so the only way to power it is with batteries or a specially designed docking station. This docking station is available from Casio for \$90, and you will also need to buy the matching plugpack for a further \$90.

A bit pricey perhaps? Well, when you

Cassiopeia A-11

A hand-held personal computer running Windows CE. It comes with 4MB RAM, and a backlit 480 x 240 touch screen.

Good points: Nice sensitive touch-screen, reasonably robust, same price as other models that don't include a backlight.

Bad points: You have to buy a docking station in order to run it off a plugpack.

RRP: The Cassiopeia A-11 is \$999, or \$899 for the A-10 2MB model. The docking station is \$90, and the matching plugpack \$90. The Comport SA-MC218 28.8k PCMCIA modem is \$595.

Available: The Cassiopeia is available from most Brashs stores, and other major electrical retailers. More details on the Cassiopeia and on the availability of the Comport modem are available from Mobex Pty. Ltd., 72-74 Gibbes St., Chatswood NSW 2067. Phone (02) 9370 9100.

compare it with the Cassiopeia's \$999 price tag, perhaps not...

What's inside?

Of course, being an electronics enthusiast at heart, I couldn't resist opening the case to see what was inside, and I was quite surprised at the small number of ICs on the single PC (mother?) board.

There was the Hitachi H3 CPU, plus two large custom chips manufactured by Casio — one of which was the display driver, the other being the ROM. The only other ICs were a small 16-pin device and two 1MB RAM chips. The extra 2MB of RAM was mounted on a small removable PCB, accessible via a removable cover on the back of the Cassiopeia.

The rest of the main board was taken up with a forest of SMD components and a number of rather large inductors, obviously part of the power supply.

Once I'd re-assembled it, I decided to run the Cassiopeia from a 3V power supply connected to the battery terminals, so that I could try out the modem for more than a couple of minutes at a time.

I had planned to use the Cassiopeia to connect to the Internet, and so the first thing to do was to install Pocket Internet Explorer. This is supplied on CD, as part of the Microsoft Windows CE package. At this point I was well and truly stuck, as it turned out that I needed Windows 95 on my desktop machine in order to install HPC Explorer. Here at EA we run Windows 3.11 on all of our office machines, and so I had to try again on my Win95 machine at home.

Having installed HPC Explorer on my home computer, I was then able to use it to install Pocket Internet Explorer onto the Cassiopeia. The whole procedure was fairly straightforward, with HPC Explorer showing the directory structure as though it were a remote drive. (Which indeed it was.)

Once Pocket Internet Explorer was installed on the HPC, I set it up with the usual DNS and IP address information as well as the telephone number of my ISP.

Internet in a box

With the modem installed into my jury-rig setup, I was able to log on to my ISP and start surfing the Net.

Surprisingly, web pages don't look that bad on the Cassiopeia. In fact the translation to a 480 x 240 pixel display works quite well, with a 640-pixel wide page scaled to fit into the 480-pixel screen. Yes, the graphics do suffer a bit, and fine bitmapped text is difficult to read, but on

(Continued on page 78)

CASSIOPEIA

(Continued from page 27)

the whole the system works very well. As a test I downloaded a small file off the net, and was then able to transfer it to my desktop machine when I had finished the session, all quite painlessly.

As with all the pocket versions of Microsoft software, Pocket Internet Explorer doesn't have all the features of the full version, but it certainly does the job.

Installed as part of Windows CE is Terminal, a small terminal program for non-Internet connections. I tried it out by calling the EA BBS, and found one major problem in that there is no provision for downloading files whatsoever. This was irritating, to say the least.

Windows seems to have a reputation for useless terminal programs, and this one seems to be no exception. Perhaps with the growing market for HPC applications, someone will come up with something better in the future.

I should at this point say that the Comport PCMCIA modem that I had been using performed flawlessly throughout. The modem itself is dead cute, and has obviously been designed for the portable computing market as it can easily be connected to a range of digital mobile phones. It comes with a normal PSTN cable that connects the outer end of the PCMCIA card to a standard telephone socket.

I think it would rate as one of the friendliest modems I've encountered, and despite its being made in France, it detected Australian dial, ring, and busy signals correctly.

Conclusion

As it stands, the Cassiopeia is a true palmtop computer, and although it relies on a desktop PC to perform printing and software installation, it does hold its own as far as price and portability is concerned.

In using the Cassiopeia for a number of weeks I found that I had very little to say against it. It's a little slow (much like a 386SX33 running Windows), and it would be nice if you could disable the keyboard — as you tend to rest your hand on it while using the stylus. But apart from that I found it quite acceptable.

The large amount of HPC software appearing on the Internet shows that there is a fair degree of confidence in the product from third-party suppliers, and I think it's more than likely that the Cassiopeia will be around for a long time to come. ♦