

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

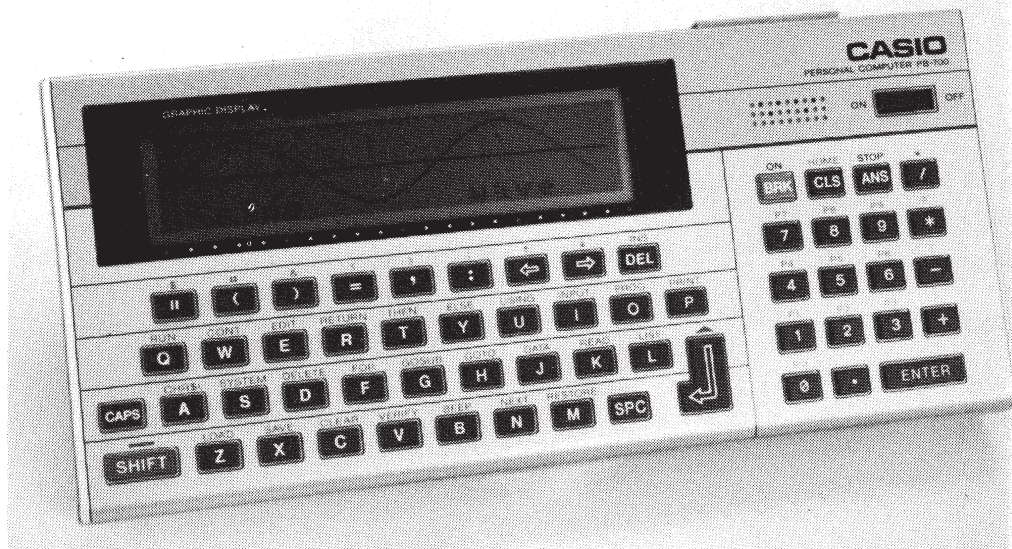
On the calculator side of the PB-700, there is a very useful key, called ANS. On pressing this key you obtain the result or "answer" of the last calculation, whether it was from program execution or by manual means. So even if you forget to jot the last answer down it can always be retrieved until a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

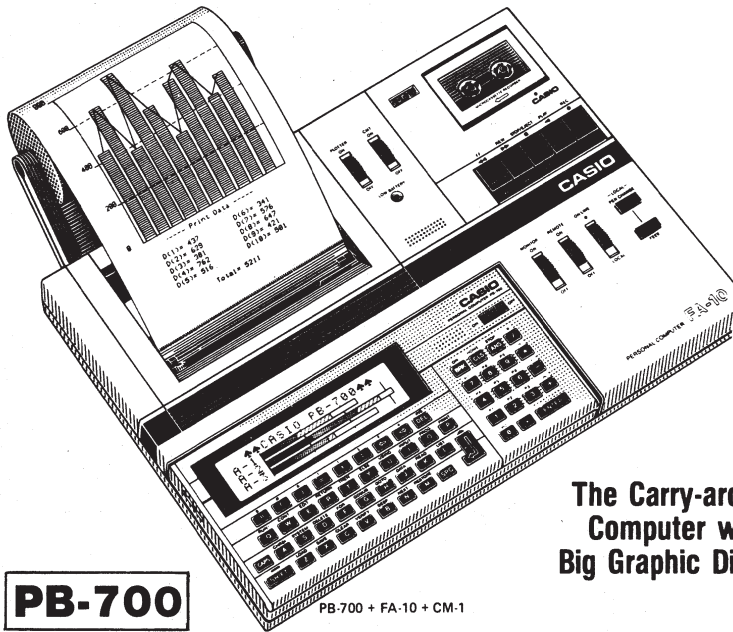
Conclusion

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.

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PB-700

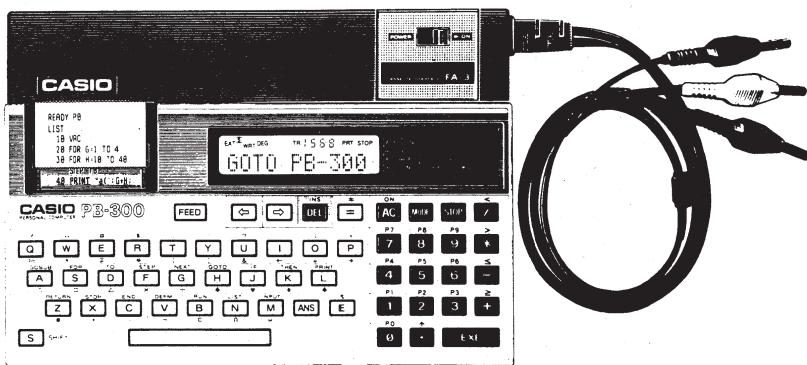
PB-700 + FA-10 + CM-1

- MEMORY: RAM — Standard 4K bytes installed. Expandable up to 16K bytes. ROM — 25K bytes installed.
- KEYBOARD: ASCII type keyboard.
- DISPLAY: Text — 20 columns x 4 lines (80 characters). Graphics — 160 x 32 dots.
- POWER SOURCE: DC — For operation and memory protection.
- OPTIONS:
 - FA-10: 4-colour graphic plotter-printer and cassette interface.
 - FA-4: Printer interface conforming to Centronics standard and cassette interface.
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