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# User Note 72

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Title:

## IBM PC Configurations

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### Synopsis

This Note is designed to aid users considering the purchase of an IBM PC (or PC compatible) microcomputer. You should only read this if you already have a rough idea of what you want. Having read it, you should be able to specify precisely what components should be ordered to make up your system.

### Keywords

IBM PC

**Contents**

# 1 Introduction

This Note is designed to aid users considering the purchase of an IBM PC (or PC compatible) microcomputer. You should only read this if you already have a rough idea of what you want. Having read it, you should be able to specify precisely what components should be ordered to make up your system.

All equipment described herein can be bought through the ERCC. The ERCC "IBM PC Hardware List" and "IBM PC Software List" available from User Liaison tabulates the equipment mentioned here and gives the latest prices. Having identified your requirements, contact the ERCC Administration to place orders. (Note that telephone numbers of these contact points are listed in section 5 below.)

Because of the variety of options and since there is more than one way of building a system with given functionality, comparative pricing of different options may result in cost savings.

If you are not sure what your requirements are, please contact ERCC User Liaison on 031-667 1081 extension 2641, who will be pleased to discuss your problem.

IMPORTANT. This Note has no support implications. Listing of a product herein does not mean that it is necessarily supported by the ERCC or any other University body. The support position on these products is detailed elsewhere.

The information in this Note is liable to change without notice.

# 2 Hardware

The basic components of an IBM PC or PC compatible can be divided into five: system unit, keyboard, display and display adaptor, memory, and expansion items. These components are described under headings for IBM and non-IBM hardware. Printers are also discussed under a separate heading.

## 2.1 IBM Hardware

All IBM items carry a seven digit part number, and these should be specified when ordering.

### 2.1.1 System Units

The "System Unit" is the main case containing the processor, expansion cards and disk drives. It forms the bulk of the cost of the PC. Several System Units are available from IBM, and are described under separate headings below. Each comes with a Guide to Operations manual.

#### 2.1.1.1 IBM PC (8130152)

This is the basic IBM PC unit with 8088 processor and five full-size expansion slots. One slot is used up, and one is required for a display

adaptor card (see section 2.1.2). There is one 360K disk drive, with the capability to take one further drive. It is therefore usual to order a second disk drive with this system unit. The part number for a second 360K disk drive is 1503810. This unit comes with space for 256K of memory, but only 64K is present.

#### 2.1.1.2 IBM PC XT (8130000)

This is the hard disk version of the PC, with 8088 processor, one 360K floppy disk drive, and one 10M hard disk drive. There is space for 256K of memory, with 128K present. An asynchronous communications card is also supplied with the system. There is a total of eight expansion slots, two being half-size and six full-size. Of these, two full-size and one half-size slots are used up, and one further slot is required for a display adaptor card (see section 2.1.2).

#### 2.1.1.3 IBM PC AT Base (8130040)

This is the base unit of the AT (Advanced Technology) computer. It comes with 80286 processor, single 1.2M floppy disk drive, and built-in battery-backed clock-calendar. Because only a single disk drive is provided, it is usual to order a further disk drive. A 360K disk drive (6450207) can be purchased to allow ordinary IBM PC disks to be read and written, or a second 1.2M disk drive (6450206) can be purchased, or a second 20M hard disk drive (6450205) can be purchased. Note that the 1.2M disk drives can read from, but cannot write to, 360K disks. The AT has space for 512K of memory, and this Base model comes with 256K. There are eight full-size expansion slots, of which six will support 8-bit or 16-bit cards, and two will support 8-bit cards only. (8-bit cards are cards used in the standard PC and XT.) Of these, one 16-bit slot is already in use. Note that not all expansion cards for the PC or XT will necessarily work with the AT. The Base model can be upgraded to the Enhanced model by the addition of a 20M hard disk (6450205), memory, and a Serial/Parallel adaptor (see relevant sections of this Note).

#### 2.1.1.4 IBM PC AT Enhanced (8130041)

This is the hard disk version of the PC AT computer. It comes with 80286 processor, single 1.2M floppy disk drive, 20M hard disk, and built-in battery-backed clock-calendar. A 360K disk drive (6450207) can be purchased to allow ordinary IBM PC disks to be read and written, and/or a second 1.2M disk drive (6450206) can be purchased. Note that the 1.2M disk drives can read, but cannot write to, 360K disks. The AT has space for 512K of memory, and this Enhanced model comes with all 512K. There are eight full-size expansion slots, of which six will support 8-bit or 16-bit cards, and two will support 8-bit cards only. (8-bit cards are cards used in the standard PC and XT.) Of these, one 8-bit and one 16-bit slots are already in use. Note that not all expansion cards for the PC or XT will necessarily work with the AT.

### 2.1.2 Keyboards

Obviously, every system will require a keyboard. The following keyboards are available:

#### 2.1.2.1 IBM PC Keyboard (1501105)

This is the standard UK keyboard suitable for use with the PC or XT. It is not suitable for use with the AT.

#### 2.1.2.2 IBM PC AT Keyboard (6450225)

This is the UK keyboard for use with the AT. It is not suitable for use with the PC or XT.

### 2.1.3 Display Options

Each system requires a Display Adaptor card which fits into one of the expansion slots in the system unit, and a Display Monitor which connects to it. The following are the IBM offerings. See also the section on non-IBM hardware for alternatives. Note that both the Monochrome and the Colour Display Adaptors may be in the system at the same time, and the user can switch from one to the other in software. Both the Mono and Colour adaptors may be used in the PC, XT and AT.

#### 2.1.3.1 Monochrome

A Monochrome system requires a Mono Display Adaptor (1504900). In addition, this card provides a parallel connection for a printer. It requires a Monochrome Display Monitor (8130050), which is a green-screen monitor. The Mono Display Adaptor cannot handle graphics. (For monochrome graphics, see the Hercules card in the section on non-IBM hardware.)

#### 2.1.3.2 Colour

A colour system requires a Colour Display Adaptor (1504910) (which does not provide a printer port). This connects to a Colour Display Monitor (8130003), and it can display graphics. However, the resolution of the colour display is limited, and it is not recommended for heavy word-processing use. There is a noticeable screen flicker when the screen scrolls, but most applications packages perform screen management, and do not allow the screen to scroll. Note that if a parallel printer is to be connected, a separate printer adaptor must be purchased (see section 2.1.5.1).

### 2.1.4 Memory

#### 2.1.4.1 PC and XT models

Memory for these systems comes in 64K increments. A minimum of 128K (=2x64K) is required for a usable system. A reasonable memory size is 256K (=4x64k). The PC and XT can both take this amount of memory on their system unit motherboard.

To expand beyond the capacity of the system unit motherboard, it is necessary to use a memory expansion card. For the PC and XT, the IBM Memory Expansion Card (1501013) provides space for a further 256K (64K of memory is supplied with the card). A further Memory Expansion Card may be added, provided the total memory installed in the system does not exceed 640K.

Note that for the PC and XT there are multifunction cards available which take the place of the IBM Memory Expansion Cards, and provide extra functionality. See the section on non-IBM hardware for such a card.

The memory chips themselves are available in units of 64K, part number (1501003).

### 2.1.4.2 AT models

The AT models (Base and Enhanced) can take up to 512K on their system unit motherboard. A 256K memory Module Kit (6450202) is available to boost the AT Base model up to 512K. For the AT, the maximum user memory under the PC DOS operating system is 640K, and a 128K Expansion Option (6450209) (using one slot) is available to boost total memory to this limit. Additional memory is supplied as 512K Memory Expansion Options (6450203) (using one slot). This extra memory is usable under the XENIX operating system, or as a RAMdisk under PC DOS.

## 2.1.5 Expansion Options

This section lists expansion cards from IBM for the PC, XT and AT, together with other expansion hardware. Check the section on non-IBM hardware for alternatives.

### 2.1.5.1 IBM Expansion Cards

Printer adaptor card (1505200) (half size card). This provides a parallel printer port. Not required if IBM Mono Display Adaptor is used.

Asynchronous Communications adaptor card (1502074) (half size card). This provides a serial RS232 communications port. It is provided free with the XT system unit.

Serial/Parallel adaptor card (6450215) (half size card). This provides one serial and one parallel printer port. It should be used only with the AT, and is supplied free with the AT Enhanced model.

Prototype card (1501400). This is a blank expansion card intended for those who wish to build their own hardware into their PC or XT. The equivalent Prototype card for the AT is part number (6450220).

Game Control adaptor (1501300). This card allows the user to connect his own joysticks to the IBM PC for games control or other applications program.

### 2.1.5.2 Other IBM Expansion Options

Maths co-processor 8087 kit (1501002). This is a chip which fits onto the PC or XT motherboard. It is not suitable for the AT.

Maths co-processor 80287 kit (6450211). This is a chip which fits onto the AT motherboard. It is not suitable for the PC or XT.

Display Stand (6450216). This is a stand for use with either the colour or monochrome display.

Floor Standing Enclosure (6450218). This is for the AT only.

The following expansion units each provide six extra full-size slots (two used up) and two extra half-size slots. One further slot is used in the main system unit for the connection card.

PC Expansion Unit (8130001). This is a box the same size as the main system unit, giving hard disk capability to the PC. It contains one 10M hard disk. Note that a second 10M hard disk can be added to this unit (1602500).

PC XT Expansion Unit (8130002). This is a box the same size as the main system unit, giving the XT a second hard disk.

## 2.2 Non-IBM Hardware

There are many IBM PC compatible micros on the market, of varying degrees of compatibility. Work is in progress to identify a suitable PC compatible to recommend as an alternative to the IBM.

There are also many expansion cards available for the IBM PC and compatibles, providing a variety of functions. Cards which are recommended by the ERCC are listed below.

### 2.2.1 Hercules Card

This full size card is an alternative to the IBM Mono Display Adaptor or Colour Graphics Adaptor. It offers monochrome graphics capability, provided suitable software is used to drive it. It has a parallel printer port like the mono display adaptor, and works with the standard IBM Mono Display Monitor. It emulates the IBM Mono Display Adaptor except that it also has high resolution graphics. Supplied with the card is a version of Basic which allows the programmer to access the graphics. Some applications programs (such as Lotus 1-2-3) make use of the graphics capabilities of this card.

### 2.2.2 AST MegaPlus II Card

This is a full-size "multifunction" board for the PC and XT (but not the AT. It is available in a variety of options as follows. The card always comes with 64K of memory, a battery-backed clock/calendar, and one asynchronous communications port. There is space for up to 256K of memory on the board, which uses the same memory chips as the IBM (see section 2.1.4.1). A parallel printer port can be specified, as can a second asynchronous communications port. This card thus replaces the IBM Memory Expansion Option card, the Asynchronous Communications

adaptor card, and optionally the Parallel Printer adaptor card and a second Asynchronous Communications adaptor card.

## 2.3 Printers

A number of printers are recommended for use with the IBM PC. This section lists them under headings of printer type. Note that although all the printers described here will work with the IBM PC under PC DOS, a particular applications package may not be able to drive a particular printer, or to use all its facilities. Always make sure that the package you wish to use will work with your printer before you buy it.

The usual printer interface used on the IBM PC is a parallel interface. A parallel interface cable suitable for the IBM Graphics Printer and its emulators is available as part number (1525612). Serial printers can also be used if the PC has a serial interface card installed. Serial cables will be different for each printer: contact Service Support for further details.

Contact User Liaison for further information on any of these printers.

### 2.3.1 Dot Matrix

The IBM Graphics Printer (8130053) is available, but is not recommended. It consists of an Epson MX80 printer with IBM firmware installed which allows it to print the extended character set which IBM uses on the PC. All the dot matrix printers described below emulate the IBM Graphics Printer, while providing extra functionality.

The MX80 has now been superseded by the Epson FX80 (80 column wide) and FX100 (132 column wide) printers. These are faster and more flexible than the MX80, but lack the special firmware to let them print the IBM extended character set. Many people will not need to print the extended character set, but for those who do, there is a software package called SET FX+ available, which will (among other things) allow the extended character set to be printed on the FX printers. Note that a perspex printer stand (1525614) is available for the IBM Graphics printer and the Epson FX80.

As a more expensive alternative to the Epson, there is the NEC Pinwriter P3 (132 column wide) printer. This does not require special software to print the IBM extended character set. It has a range of print qualities, some of which exceed the Epson print quality. Unlike the Epson printers, a cut sheet feeder is available for it.

The Philips GP300(L)-PX1 dot matrix printer is a very high quality dot matrix printer for the IBM PC. It can take a cut-sheet feeder, with two paper magazines in use simultaneously. Several different fonts are available.

### 2.3.2 Daisywheels

The Diablo 630 is recommended for use with the IBM.

The IBM 5216 Wheelprinter (6082132) is also available. Note that either a parallel interface (6373257) and cable (8509390), or a serial interface (6082250) and cable (8509386), should be ordered with this

printer.

### 2.3.3 Other Printers

The IBM 5201 Quietwriter (1341356) is also available for the IBM PC. A pin wheel form feeder (1341091) and cut-sheet feeder (6373101) is available for this printer.

## 3 Software

There is a wide variety of software available for the IBM PC. This section cannot do more than scratch the surface of the software market. There are several publications which summarize the range of available software in depth.

### 3.1 Operating Systems

Every user requires an Operating System (OS) for his computer. The commonest OS is PC DOS from IBM. Most applications packages for the IBM PC run under this OS, and it is supported by the ERCC.

PC DOS has gone through a number of versions. At the time of writing, the highest version number is 3.1. It is always best to buy the highest version number available, since (generally speaking) programs which run on a particular version will also run on later versions. Note that the AT models require DOS version 3.0 or greater. The part number of PC DOS 3.1 is (6834242). Users of DOS 3.0 (6834197) can buy a 3.0 to 3.1 upgrade kit (6834247).

Operating systems other than PC DOS are available. The UCSD p-System is available in several versions: the recommended version (which is not the IBM one) runs under PC DOS. Contact Small Systems Unit for further information.

### 3.2 Languages

This section lists recommended compilers and interpreters for program development. Note that listing of an item here does not imply any ERCC support commitment for the product.

For all languages which require source program preparation using an editor, the IBM Professional Editor (6024048) is recommended. It also has some limited text processing capability.

#### 3.2.1 Assembler

The IBM Macro Assembler (6024002) for the IBM PC is recommended. It has been developed by Microsoft, and produces standard OBJ object files for linking with the standard LINK program supplied with PC DOS.

### 3.2.2 Basic

Two versions of Basic are supplied with PC DOS. These are called Disk Basic and Advanced Basic. The former is a subset of the latter. The manual for these interpreters comes with the system unit, but the software itself is distributed with PC DOS. There is also a Basic compiler available, which is very close to the Advanced Basic. Its part number is (6024003). A Basic Programming Development System (6024046) may also be purchased. It comprises a text file editor, a Structured Basic pre-processor, a Basic Formatter, and a Basic cross-referencer. It is designed to aid writing large Basic programs.

### 3.2.3 Pascal

Work is in progress to identify a Pascal compiler to recommend.

### 3.2.4 Fortran

Work is in progress to identify a Fortran compiler to recommend.

### 3.2.5 C

Work is in progress to identify a C compiler to recommend. There are several on the market: the best according to press reviews appears to be the Microsoft C compiler.

### 3.2.6 Other Languages

Many other languages are available. Those from IBM include Cobol (6024011), APL (6024077) (requires 8087 and colour display), and Logo (6024076). Other suppliers offer Forth, PL/1, Lisp and Prolog.

## 3.3 Packages

The greatest variety of software for the IBM PC is of the applications package type. This includes word processing, spreadsheets, databases, and many more. Work is in progress to identify suitable packages in these areas. Contact User Liaison for further details.

## 3.4 Communications

The Xtalk communications package is supported on the IBM PC, XT and AT. It requires an Asynchronous Communications adaptor or equivalent multifunction card, and a connecting cable. It allows the PC to emulate an asynchronous terminal, and to transfer files between EMAS and the PC.

To obtain a copy of Xtalk, please send a formatted floppy disk to the Service Support Unit, ERCC, The King's Buildings, Mayfield Road, Edinburgh EH9 3JZ. To obtain a cable, please send an order form to the same address, stating whether you are using an Asynchronous Communications adaptor, AST Multifunction card, or Serial/Parallel adaptor.

## 4 Examples

This section lists some example configurations.

### 4.1 Basic Monochrome System

This is a monochrome PC with two disk drives, 128K memory and capability for asynchronous communications. It has 2 free full length expansion slots. For a system which can support graphics, simply replace the IBM Mono display/printer adaptor by the Hercules Mono Graphics card.

| | |
|---|---|
| PC System Unit | 8130152 |
| Double sided disk drive | 1503810 |
| UK Keyboard | 1501105 |
| Monochrome Display | 8130050 |
| Mono display/printer adaptor | 1504900 |
| Asynchronous Comms adaptor | 1502074 |
| 64K memory module | 1501003 |
| PC DOS 3.1 | 6384242 |

### 4.2 Colour Graphics System

This is a colour graphics PC with two disk drives, 256K memory, and capability for asynchronous communications. It has two free expansion slots.

| | |
|---|---|
| PC System Unit | 8130152 |
| Double sided disk drive | 1503810 |
| UK Keyboard | 1501105 |
| Colour Display | 8130003 |
| Colour graphics adaptor | 1504910 |
| Asynchronous Comms adaptor | 1502074 |
| 3 off 64K memory modules | 1501003 |
| PC DOS 3.1 | 6384242 |

### 4.3 System with Multifunction Card

This is a monochrome PC with two disk drives, 320K memory, and two asynchronous communications ports. It has two free expansion slots. A battery-backed clock-calendar is provided.

| | |
|---|---|
| PC System Unit | 8130152 |
| Double sided disk drive | 1503810 |
| UK Keyboard | 1501105 |
| Monochrome Display | 8130050 |
| Mono display/printer adaptor | 1504900 |
| 3 off 64K memory modules | 1501003 |
| PC DOS 3.1 | 6384242 |
| AST Multifunction card with extra serial port | |

### 4.4 Hard Disk System

This is a monochrome PC with single floppy disk drive, 10M hard disk, asynchronous communications capability, and 256K memory. There are three free expansion slots.

| | |
|---|---|
| XT System Unit | 8130000 |
| UK Keyboard | 1501105 |
| Monochrome Display | 8130050 |
| Mono display/printer adaptor | 1504900 |
| 2 off 64K memory modules | 1501003 |
| PC DOS 3.1 | 6384242 |

### 4.5 Base AT system

This is a monochrome AT with two 1.2M floppy disk drives, 256K memory, and asynchronous communications capability. There are five free expansion slots.

| | |
|---|---|
| AT Base system unit | 8130040 |
| 1.2M floppy drive | 6450206 |
| UK Keyboard for AT | 6450225 |
| Monochrome Display | 8130050 |
| Mono display/printer adaptor | 1504900 |
| Asynchronous Comms adaptor | 1502074 |
| PC DOS 3.1 | 6384242 |

### 4.6 Enhanced AT system

This is a colour AT with one 1.2M floppy disk drive, 20M hard disk drive, 512K memory, and asynchronous communications capability. There are five free expansion slots.

| | |
|---|---|
| AT Enhanced system unit | 8130041 |
| UK Keyboard for AT | 6450225 |
| Colour Display | 8130003 |
| Colour graphics adaptor | 1504910 |
| PC DOS 3.1 | 6384242 |

## 5 Contact Points

### 5.1 ERCC Administration

Contact Mr J. Robertson on 031-667 1081 extension 2613 for information on prices for equipment in this Note, and to place orders.

### 5.2 Service Support

Contact Mr T. Jackson on 031-667 1081 extension 2641 for information about installation of PCs ordered through ERCC, cables for PCs, and provision of Xtalk software.

### 5.3 User Liaison

Contact Mr J. Livingstone on 031-667 1081 extension 2641 for assistance in identifying the configuration best suited to your needs, for advice on suitable applications packages or if necessary to arrange requirement analysis and specialized consultancy.

### 5.4 Advisory

Contact Advisory on 031-667 1081 extension 2976 for assistance with PC DOS or Xtalk problems.

### 5.5 Training Unit

Contact Mrs K. Buckner on 031-667 1011 extension 2301 for demonstrations of IBM PC hardware and Software.

### 5.6 Small Systems Unit

Contact 031-667 1081 extension 2611 for advice on systems aspects of IBM PC use.