GENERAL INFORMATION - AT

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SECTION 1. GENERAL INFORMATION

Notes:

Product Description

The IBM PERSONAL COMPUTER AT® family consists of a variety of systems and options to meet present and future needs.

The following are features of the IBM Personal Computer AT Models 068, 099, 239:

- Power Supply
  - Manually switched to support 115 Vac or 230 Vac
  - 192 Watts.
- System Board
  - 80286 Microprocessor
  - 6 MHz Clock
  - 8 Expansion Slots
    - 6 with a 36-pin and 62-pin card edge socket
    - 2 with only the 62-pin card edge socket
  - 256K base Random Access Memory (RAM)
  - Complementary Metal Oxide Semiconductor (CMOS) RAM to maintain the system setup configuration
  - Battery to keep CMOS active when power is off.
- Speaker
- 1.2MB Diskette Drive (Drive A)
- Security Lock (Inhibits input from the keyboard)
- 84-Key Keyboard.

Additional features include:

- Fixed Disk Drives
- Diskette Drives
- Various other options and adapters.

Option Compatibility

Incompatible Adapters and Terminating Resistors

Incompatible Adapters

Certain option adapters are not compatible when used in the same system.

1. The following adapters should not be installed together in the system unit:

   - Synchronous Data Link Control (SDLC)
   - Alternate Binary Synchronous Communications (Alt BSC).

2. Possible problems may occur in the system because of adapters that share the same interrupt level. Check the adapter interrupt levels to be sure that they do not conflict. If the adapters have selectable interrupt levels, be sure their jumpers are not set for the same level.

Terminating Resistors

Terminating resistors are required on certain diskette and fixed disk drives for proper operation of the drive.

These drives always require a terminating resistor:

- Diskette Drive A
- Fixed Disk Drive C.

Always remove the terminating resistor from:

- Diskette Drive B
- Fixed Disk Drive D.

Operating Requirements

This describes the operations that take place from the time the system is turned on until the minimum operating requirements have been met.

Power Supply

The power supply can be manually set to operate at either 115 Vac or 230 Vac. The ac current is converted to dc outputs, which supply the system with proper operating voltages or are passed through a filtered-fused circuit to the Monochrome Display receptacle. No other usage of this receptacle other than with the Monochrome Display, is supported or recommended.

Whenever the power supply has been off for a minimum of one second and then switched on, the power supply generates a 'power-good' signal. The 'power-good' signal resets system logic, indicates proper operation of the power supply, and gives the system board advance warning of voltage loss when the system is switched off.

The 'power-good' signal ranges from 0.0 to 0.4 Vdc when any output is below its minimum undervoltage (UV) sense level and increases to 2.4 to 5.25 Vdc when all power supply output voltages are present and above their minimum UV sense levels.

Output (Vdc)	Minimum UV Sense Level (Vdc)
+ 5.0	+ 4.5
− 5.0	− 3.75
+12.0	+10.8
−12.0	−10.4

Once the minimum UV sense levels are established and the 'power-good' signal has risen to its active level, all system board power requirements have been met.

System Board

The major components of the system board are the 80286 microprocessor, CMOS RAM, and ROM BIOS.

Microprocessor

The microprocessor might be thought of as the action center of the system. It interprets and carries out instructions. The 80286 microprocessor can operate in two modes. The real-address mode uses all system memory below the hex 100000 address, and the protected mode uses all system memory starting at the hex 100000 address. See "System Memory" later in this section for additional memory information.

CMOS RAM

The CMOS RAM chip contains the real-time clock and 64 bytes of storage. The clock uses 14 bytes of this storage to track the date, time, and battery level. The remaining 50 bytes are assigned to store system configuration information. The information stored in the CMOS RAM is entered from the Setup program. A battery keeps this chip active when the system is off.

ROM BIOS

The ROM BIOS contains instructions and routines that make the system perform in a particular manner. It is responsible for the major I/O devices (keyboard, diskette, fixed disk drives, and video) in the system. Some adapters may have their own ROM modules that contain extended routines that work in conjunction with the system board ROM BIOS. The routines for performing the power-on self test (POST) are also contained in the ROM BIOS.

Power-On Self Test (POST)

The POST is initiated automatically with each power-on of the system. The POST can be invoked at any time by pressing the Ctrl key, the Alt key, and the Del key at the same time, then releasing them.

The POST is a series of system checks and initialization that verifies the correct operation of the base system. Two classifications of malfunctions that may be detected during the POST: critical and non-critical.

Critical malfunctions prevent the system from operating at all or could cause incorrect results that are apparent to the user. Examples of critical errors include processor or interrupt controller malfunctions.

Non-critical malfunctions are those that cause incorrect results which may not be apparent to the user. An example of a non-critical error would be a memory chip failure.

If a critical error is detected during the POST, an attempt is made to indicate the error and all testing will halt. On a non-critical error, an error code is displayed and the testing is stopped. Testing can be continued on a non-critical error, by pressing the F1 key.

After a successful POST, where no critical errors were detected, a single short beep will be generated. Control is then given to the system boot strap loader.

It is important to remember that the POST does not test all areas, but only those that allow the system to be operational enough to run the "Advanced Diagnostics" program.

System Memory

The following figure shows an example of how memory is assigned on the system board. The address is an identifier for a particular part of memory. The addresses run sequentially (in hexadecimal notation) starting at 000000 and ending at FFFFFF.

Address in Hex	Memory	Function
000000	BBBBBBBBBBBBBBBB BBBBBBBBBBBBBBBB BBBBBBBBBBBBBBBB BBBBBBBBBBBBBBBB	256K RAM On System Board
to 07FFFF	BBBBBBBBBBBBBBBB BBBBBBBBBBBBBBBB BBBBBBBBBBBBBBBB BBBBBBBBBBBBBBBB	256K RAM On System Board
080000 to 09FFFF	BBBBBBBBBBBBBBBB BBBBBBBBBBBBBBBB	128K RAM On I/O Adapter
0A0000 to 0BFFFF	RRRRRRRRRRRRRRRR RRRRRRRRRRRRRRRR	128K Video RAM Reserved for Graphics Display Buffer
0C0000 to 0DFFFF	RRRRRRRRRRRRRRRR RRRRRRRRRRRRRRRR	128K Reserved for ROM on I/O Adapters
0E0000 to 0EFFFF	RRRRRRRRRRRRRRRR	Reserved ROM on System Board
0F0000 to 0FFFFF	RRRRRRRRRRRRRRRR	Reserved ROM on System Board
0100000**	EEEEEEEEEEEEEEEE EEEEEEEEEEEEEEEE EEEEEEEEEEEEEEEE EEEEEEEEEEEEEEEE EEEEEEEEEEEEEEEE EEEEEEEEEEEEEEEE	512K RAM On I/O Adapter
to		
FDFFFF	EEEEEEEEEEEEEEEE EEEEEEEEEEEEEEEE EEEEEEEEEEEEEEEE EEEEEEEEEEEEEEEE EEEEEEEEEEEEEEEE EEEEEEEEEEEEEEEE	512K RAM On I/O Adapter (15M Maximum)
FE0000 to FEFFFF	RRRRRRRRRRRRRRRR	Reserved ROM on System Board
FF0000 to FFFFFF	RRRRRRRRRRRRRRRR	Reserved ROM on System Board

B=Base Memory R=Reserved E=Expansion Memory

**Hex 100000 = 1M in decimal notation.

Memory Switch Settings

The switches on the memory options are divided into two sections:

- Switches 1 through 5 determine the starting address for the expansion memory installed on the option.
- Switches 6, 7, and 8 have special assignments for each type of memory option.

Starting Address (Switches 1 through 5)

The switch settings can be determined through the following procedure. Assume you have 3.5M of expansion memory installed in your system and you are installing another memory option.

1. Establish your starting address by adding the amount of expansion memory already installed (3.5M) to the starting address for expansion memory.

```
 3.5M  (Amount of expansion memory installed)
+1.0M  (Starting address for expansion memory)
-------
 4.5M  (Starting address for next option)
```

2. In the following table, find the values that, when added, equal 4.5M.

Switch Number	Value in OPEN (OFF) Position
1	8M
2	4M
3	2M
4	1M
5	.5M


```
 4.0M  (Switch 2 set to Off Position)
+ .5M  (Switch 5 set to Off Position)
-------
 4.5M  (Switch Setting for new option)
```

Special Assignments (Switches 6, 7, and 8)

The following table shows the special assignments for the memory expansion option.

Switch Number	Memory Option Name	
	512KB Memory Expansion Option	
	Bank 0	Bank 1
6	ON	OFF
7	ON	ON
8	ON	OFF

Environmental Specifications

IBM Personal Computer AT

Size

- Length: 540 millimeters (21.3 inches)
- Depth: 439 millimeters (17.3 inches)
- Height: 173 millimeters (6.8 inches).

Weight

- 19.05 kilograms (42 pounds)

Environment

- Air Temperature
  - System On: 15.6 to 32.2 degrees C (60 to 90 degrees F)
  - System Off: 10 to 43 degrees C (50 to 110 degrees F).

- Humidity
  - System On: 8% to 80%
  - System Off: 20% to 80%.

- Altitude
  - Maximum altitude: 2133.6 meters (7000 feet)

Heat Output

- 1229 British Thermal Units (BTUs) per hour

Electrical

- Switch Position 115V

  - Nominal - 115 Vac
  - Minimum - 100 Vac
  - Maximum - 125 Vac.

- Switch Position 230V

  - Nominal - 230 Vac
  - Minimum - 200 Vac
  - Maximum - 240 Vac.

Special Tools

The following special tools are required to service the IBM Personal Computer AT:

A meter similar to the Triplett Model 310.[1]

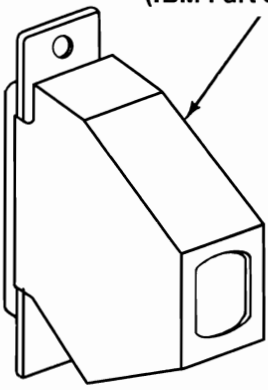
Module Puller

A tweezer-like module puller similar to the one shown below. (Used to remove the memory modules.)

1 Manufactured by Triplett Corporation, Bluffton, Ohio 45817

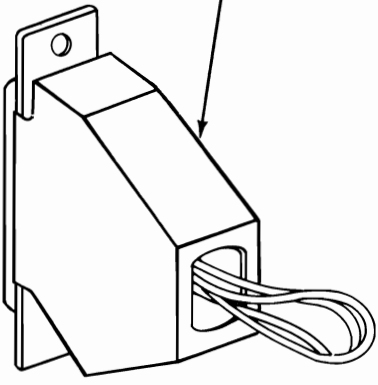
Wrap Plugs

Printer Adapter
Wrap Plug
(IBM Part 8529228)



Cluster
Terminating Plug
(IBM Part 6323481)

IBM Communications Adapter
Wrap Plug
(IBM Part 8529280)



Serial Port
Wrap Plug
(IBM Part 8286126)