A+ CRAM STUDY-GUIDE

by BooBox

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BEEP CODES

Original IBM POST error codes

- 1 short beep - Normal POST - system is OK
- 2 short beeps - POST error - error code shown on screen
- No beep - Power supply or system board problem
- Continuous beep - Power supply, system board, or keyboard problem
- Repeating short beeps - Power supply or system board problem or keyboard
- 1 long, 1 short beep - System board problem
- 1 long, 2 short beeps - Display adapter problem (MDA, CGA)
- 1 long, 3 short beeps - Enhanced Graphics Adapter (EGA)
- 3 long beeps - 3270 keyboard card

POST AMI BIOS beep codes

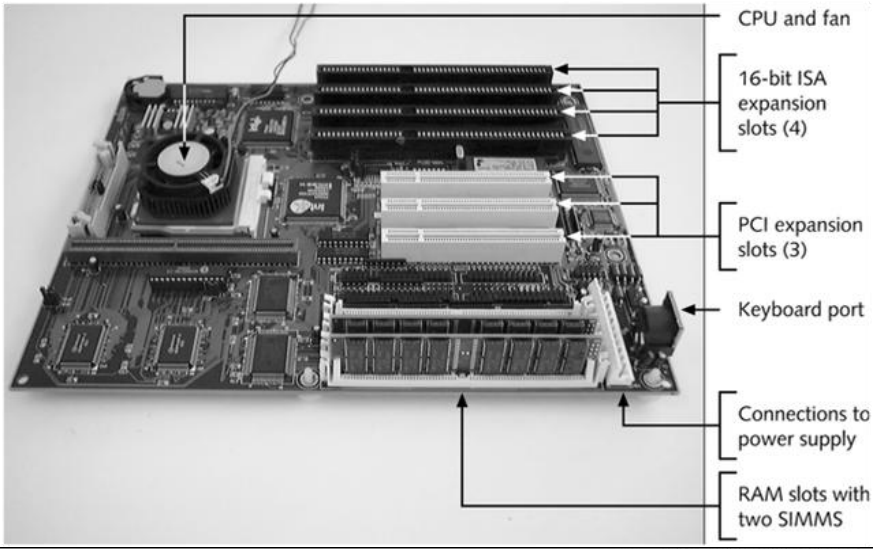
- 1 - Memory refresh timer error
- 2 - Parity error in base memory (first 64 KiB block)
- 3 - Base memory read/write test error
- 4 - Mother board timer not operational
- 5 - Processor error
- 6 - 8042 Gate A20 test error (cannot switch to protected mode)
- 7 - General exception error (processor exception interrupt error)
- 8 - Display memory error (system video adapter)
- 9 - AMI BIOS ROM checksum error
- 10 - CMOS shutdown register read/write error
- 11 - Cache memory test failed

BIOS	Key to Press During POST to Access Setup
AMI BIOS	Del
Award BIOS	Del
Older Phoenix BIOS	Ctrl+Alt+Esc or Ctl+Alt+s
Newer Phoenix BIOS	F2 or F1
Dell computers using Phoenix BIOS	Ctrl+Alt+Enter
Older Compaq computer such as the Deskpro 286 or 386	Place the diagnostics disk in the disk drive, reboot your system, and choose Computer Setup from the menu.
Newer Compaq computers such as the ProLinea, Deskpro, Deskpro XL, Deskpro XE, or Presario	Press the F10 key while the cursor is in the upper-right corner of the screen, which happens just after the two beeps during booting.*
All other older computers	Use a setup program on the disk that came with the PC to access setup.

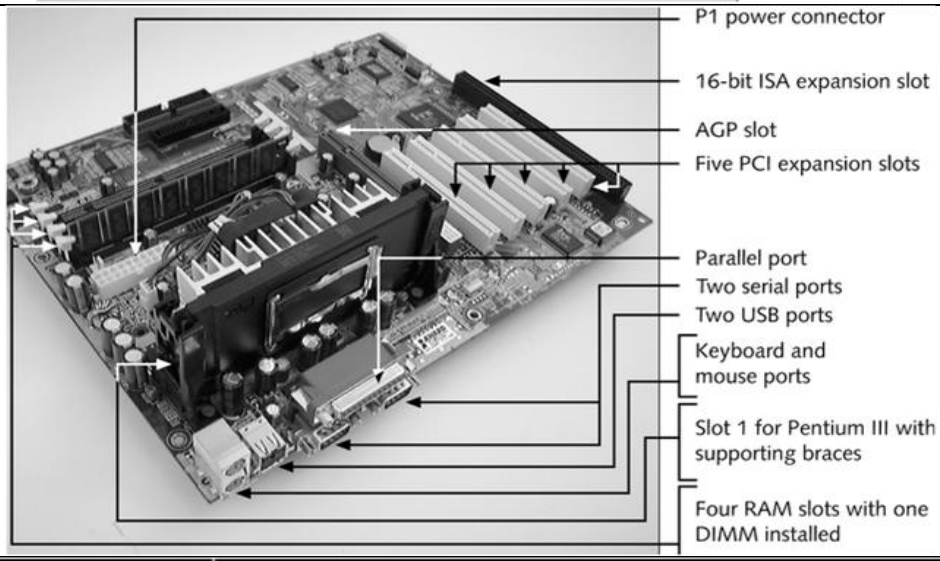
*For Compaq computers, the CMOS setup program is stored on the hard drive in a small, non-DOS partition of about 3 MB. If this partition becomes corrupted, you must run setup from a floppy disk. If you cannot run setup by pressing F10 at startup, suspect a damaged partition or a virus taking up space in conventional memory.

Form Factors

AT Form Factor



ATX Form Factor



Type of Motherboard	Description
AT	▪ Oldest type of motherboard still used in some systems ▪ Uses P8 and P9 power connections (see Figure 5-1) ▪ Measures 30.5 cm × 33 cm (12 inches × 13 inches)
Baby AT	▪ Smaller version of AT. Small size is possible because motherboard logic is stored on a smaller chip set. ▪ Uses P8 and P9 power connections ▪ Measures 33 cm × 22 cm (12 inches × 8.7 inches)
ATX	▪ Developed by Intel for Pentium systems ▪ Has a more conveniently accessible layout than AT boards ▪ Includes a power-on switch that can be software-enabled and extra power connections for extra fans ▪ Uses a P1 connector (see Figure 5-1) ▪ Measures 30.5 cm × 24.4 cm (12 inches × 9.6 inches)
Mini ATX	▪ An ATX board with a more compact design ▪ Measures 28.4 cm× 20.8 cm (11.2 inches × 8.2 inches)

RECOVERY CONSOLE COMMANDS

1. Open a command window
2. Change to the \i386 folder on the Windows 2000 CD-ROM
3. Enter **winnt32 /cmdcons** (A+)
4. Restart computer

System File Checker (Sfc.exe) Switches

Switch	Function
/cachesize=x	Sets, in megabytes, the size of the file cache.
/enable	Enables normal operation of WFP.
/purgecache	Empties the file cache and immediately scans all protected system files, populating the Dllcache folder with confirmed correct versions of system files (may require insertion of the Windows 2000 CD as source for correct versions).
/quiet	Replaces incorrect versions of system files with correct ones without prompting the user.
/scanboot	Performs a scan of protected system files every time the system boots.
/scannow	Performs an immediate scan of protected system files.
/scanonce	Performs a scan of protected system files the next time the system boots.
/cancel	Cancels pending scans of protected system files
/?	Displays a list of available switches for the sfc command.

Recovery Console Commands

Command	Description
Attrib	Changes the attributes of a file or folder (works the same as the DOS version, as in the following example): `Attrib -r -h -s filename` This command removes the read, hidden, and system attributes from the file.
Batch	Carries out commands stored in a batch file: `Batch file1 file2` The commands stored in file1 are executed, and the results written to file2. If no file2 is specified, results are written to the screen.
Cd	Displays or changes the current directory.
Chkdsk	Checks a disk and repairs or recovers the data.
Cls	Clears the screen.
Copy	Copies a single uncompressed file, for example: `Copy A:\File1 C:\WINNT\File2` Copies the file on the floppy disk named File1 to the hard drive, WINNT folder, naming the file File2. Use the command to replace corrupted files. No wildcard characters are allowed.
Del	Deletes a file: `Del File1`
Dir	Lists files and folders.
Disable	Used when a service or driver starts and prevents the system from booting properly: `Disable servicename` This command disables a Windows 2000 system service or driver, restarts the computer without it, and helps you determine the problem.
Diskpart	Creates and deletes partitions on the hard drive. Enter the command with no arguments to display a user interface.
Enable	Enables a Windows 2000 system service or driver: `Enable servicename`
Exit	Quits the Recovery Console and restarts the computer.
Expand	Expands a compressed file and copies it from a floppy disk or a CD to the destination folder. For example: `Expand A:\File1 C:\WINNT` Expands the file on the floppy disk, copying it to the hard drive.

Command	Description
Fixboot	Rewrites the OS boot sector on the hard drive. If a drive letter is not specified, the system drive is assumed. `Fixboot C:` Use this command when the boot sector is damaged.
Fixmbr	Rewrites the Master Boot Record boot program. This command is the same as Fdisk/MBR. Use this command when the Master Boot Record is damaged.
Format	Formats a logical drive. If no file system is specified, NTFS is assumed: `Format C:/fs:FAT32` Uses FAT32 file system `Format C:/fs:FAT` Uses FAT16 file system
Help	Help utility appears for the given command:`Help Fixboot`
Listsvc	Lists all available services.
Logon	Allows you to log on to an installation with the Administrator password.
Map	Lists all drive letters and file system types.
Md or Mkdir	Creates a directory: `MD C:\TEMP`
More or Type	Displays a text file on screen: `TYPE filename.ext`
Rd or Rmdir	Deletes a directory: `RD C:\TEMP`
Rename or Ren	Renames a file: `Rename File1.txt File2.txt`
Set	Displays or sets Recovery Console environmental variables.
Systemroot	Sets the current directory to the directory where Windows 2000 is installed.
Type	Displays contents of a text file: `Type File1.txt`

Command	Description
1. Systemroot	Makes the Windows folder the current folder.
2. CD System32\Config	Makes the Windows registry folder the current folder.
3. Ren Default Default.save Ren Sam Sam.save Ren Security Security.save Ren Software Software.save Ren System System.save	Renames the five registry files.
4. Systemroot	Returns to the Windows folder.
5. CD repair\RegBack	Makes the registry backup folder the current folder.
6. Copy default C:\WINNT\system32\config Copy Sam C:\WINNT\system32\config Copy Security C:\WINNT\system32\config Copy Software C:\WINNT\system32\config Copy System C:\WINNT\system32\config	Copies the five registry files from the backup folder to the registry folder.

CPU Sockets and Slots

Socket/Slot	Processors
Socket 4	Pentium 60/66, Pentium 60/66 OverDrive
Socket 5	Pentium 75-133, Pentium 75+ OverDrive, AMD K5
Socket 6*	486DX4, 486 Pentium OverDrive
Socket 7	Pentium 75-200, Pentium 75+ OverDrive, Pentium MMX, AMD K6
Super Socket 7	AMD K6-2, K6-III
Socket 8	Pentium Pro
Slot 1	Pentium II, Pentium III, Celeron, and all SECC and SECC2
Slot 2	Pentium II Xeon, Pentium III Xeon
Slot A	Early AMD Athlon
Socket 370	PPGA processors, including Pentium III and Celeron
Socket 423	Early Pentium 4
Socket A (Socket 462)	AMD Athlon, Athlon XP, Athlon XP-M, Athlon MP, Thunderbird, Duron, Sempron
Socket 478	Pentium 4, Pentium 4 Extreme Edition, Celeron
Socket 479	Pentium M, Celeron M
Socket 486	80486
Socket 563	AMD low-power mobile Athlon XP-M

Socket 603	Intel Xeon
Socket 604	Intel Xeon with Micro FCPGA package
Socket 754	Athlon 64, Sempron, Turion 64
Socket 771	Xeon 50x0 dual-core
Socket T (LGA 775)	Pentium 4, Pentium D dual-core, Celeron D, Pentium Extreme Edition
Socket 939	Athlon 64, Athlon 64 FX, Athlon 64 X2, Opteron 100-series
Socket 940	Athlon 64 FX (FX-51), Opteron
Socket F (Socket 1207)	Replaces Socket 940 when used with Opteron multiprocessor systems
Socket 940	Athlon 64 FX (FX-51), Opteron
Socket F (Socket 1207)	Replaces Socket 940 when used with Opteron multiprocessor systems
Socket AM2	AMD single-processor systems, replaces Socket 754 and Socket 939
Socket S1	AMD-based mobile platforms, replaces Socket 754 in the mobile sector
PAC418	Itanium
PAC611	Itanium 2

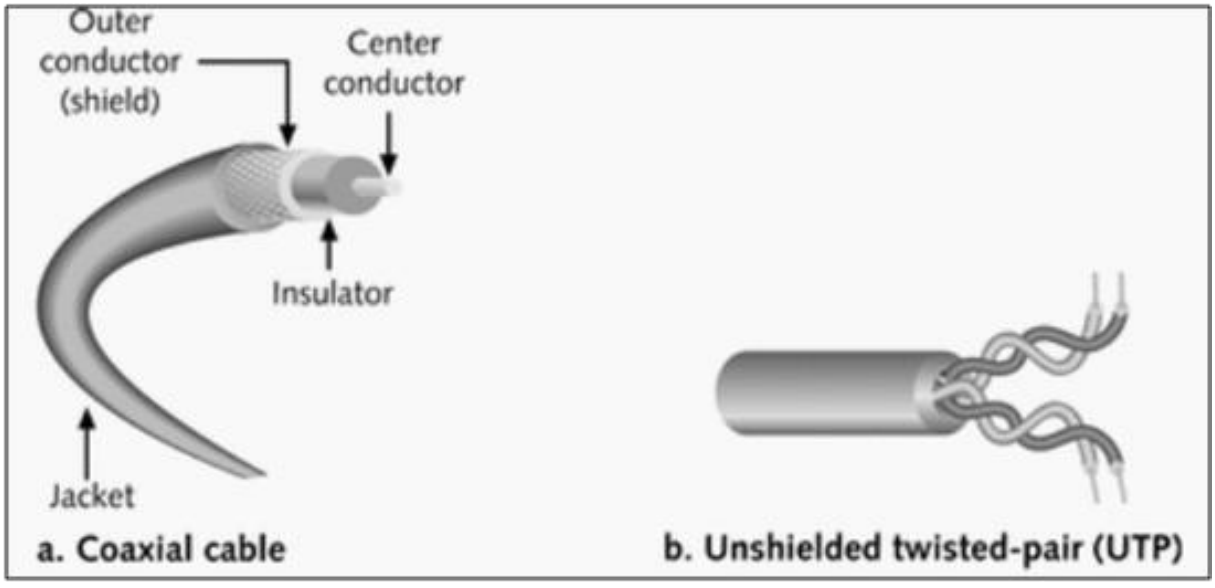
*Socket 6 was a paper standard only and was never implemented in any systems.

Memory Cache	Where Located
L1 cache	On the CPU die. All CPUs today have L1 cache.
L2 cache	Inside the CPU housing. The first CPU to contain L2 was the Intel Pentium Pro.
L2 cache	On the motherboard of older systems.
L3 cache	Inside the CPU housing, further away from the CPU than the L2 cache. The Intel Itanium housing contains L3 cache.
L3 cache	On the motherboard when there is L2 cache in the CPU housing. Used with some newer AMD processors

Ethernet Cabling

Cable System	Speed	Cables and Connectors	Maximum Cable Length
10Base2 (ThinNet)	10 Mbps	Coaxial uses a BNC connector	185 meters or 607 feet
10Base5 (ThickNet)	10 Mbps	Coaxial uses an AUI 15-pin D-shaped connector	500 meters or 1,640 feet
10BaseT and 100BaseT (Twisted-pair)	10 or 100 Mbps	UTP or STP uses an RJ-45 connector	100 meters or 328 feet
10BaseF, 10BaseFL, 100BaseFL, 100BaseFX, or 1000BaseFX (fiber-optic)	10 Mbps, 100Mbps, or 1 Gbps	Fiber-optic cable uses an ST or SC fiber-optic connector	500 meters up to 2 kilometers (6,562 feet)

Media	Cost	Ease of Installation	Attenuation	Susceptibility to Interference and Signal Capture
Unshielded Twisted Pair (UTP)	Inexpensive	Very easy	High	High
Shielded Twisted Pair (STP)	Inexpensive to moderate	Easy to moderate	High	Moderate to Slightly High
Coaxial	Moderate	Easy	Moderate	Moderate
Fiber Optic	Expensive	Difficult	Low	Low



Technology	Maximum Throughput Speeds	Common Uses
GSM mobile telephone service	9.6 to 14.4 Kbps	Wireless technology used for personal and business mobile telephones
Regular telephone (POTS, for Plain Old Telephone Service)	Up to 56 Kbps	Home and small business access to an ISP using a modem
X.25	56 Kbps	Provides communication between mainframes and terminals
ISDN	64 Kbps to 128 Kbps	Small to medium-size business access to an ISP
IDSL (ISDN Digital Subscriber Line)	128 Kbps	Home and small business access to an ISP
DSL Lite or G.Lite	Up to 384 Kbps upstream and up to 6 Mbps downstream	Less expensive version of DSL
ADSL (Asymmetric Digital Subscriber Line)	640 Kbps upstream and up to 6.1 Mbps downstream	Most bandwidth is from ISP to user
SDSL (Symmetric DSL)	1.544 Mbps	Equal bandwidths in both directions
Technology	**Maximum Throughput Speeds**	**Common Uses**
HDSL (High-bit-rate DSL)	Up to 3 Mbps	Equal bandwidths in both directions
Cable modem	512 Kbps to 5 Mbps	Home or small business to ISP
VDSL (Very-high-rate DSL)	Up to 55 Mbps over short distances	Future technology of DSL under development
802.11b wireless	Up to 11 Mbps	Most popular wireless
802.11a wireless	Up to 54 Mbps	Shorter range than 802.11b, but faster
802.11g	Up to 54 Mbps	Not readily available; compatible with 802.11b, but faster
Frame Relay	56 Kbps to 45 Mbps	Businesses that need to communicate internationally or across the country
Fractional T1	*n* times 64 Kbps (where *n* = number of channels or portions of a T1 leased)	Companies expecting to grow into a T1 line, but not yet ready for a T1

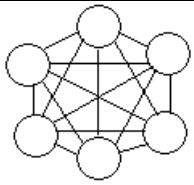
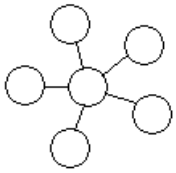
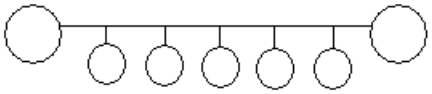
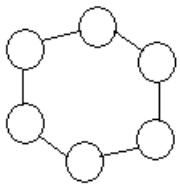
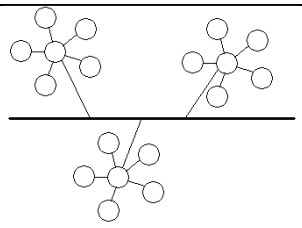
Technology	Maximum Throughput Speeds	Common Uses
T1	1.544 Mbps	To connect large companies to branch offices or an ISP
Token Ring	4 or 16 Mbps	Used for local network
Ethernet	10 or 100 Mbps	Most popular technology for a local network
T3	45 Mbps	Large companies that require a lot of bandwidth and transmit extensive amounts of data
OC-1	52 Mbps	ISP to regional ISP
FDDI	100 Mbps	Supports network backbones from the 1980s and early 1990s; also used to connect LANs across multiple buildings
Technology	**Maximum Throughput Speeds**	**Common Uses**
ATM	25, 45, 155, or 622 Mbps	Large business networks and LAN backbones
OC-3	155 Mbps	Internet or large corporation backbone
Gigabit Ethernet	1 Gbps	Latest Ethernet standard
OC-24	1.23 Gbps	Internet backbone, uses optical fiber
OC-256	13 Gbps	Major Internet backbone, uses optical fiber
SONET (Synchronous Optical Network)	51, 155 , 622, 1244, or 2480 Mbps	Major backbones

Table 18-4 Bandwidth technologies

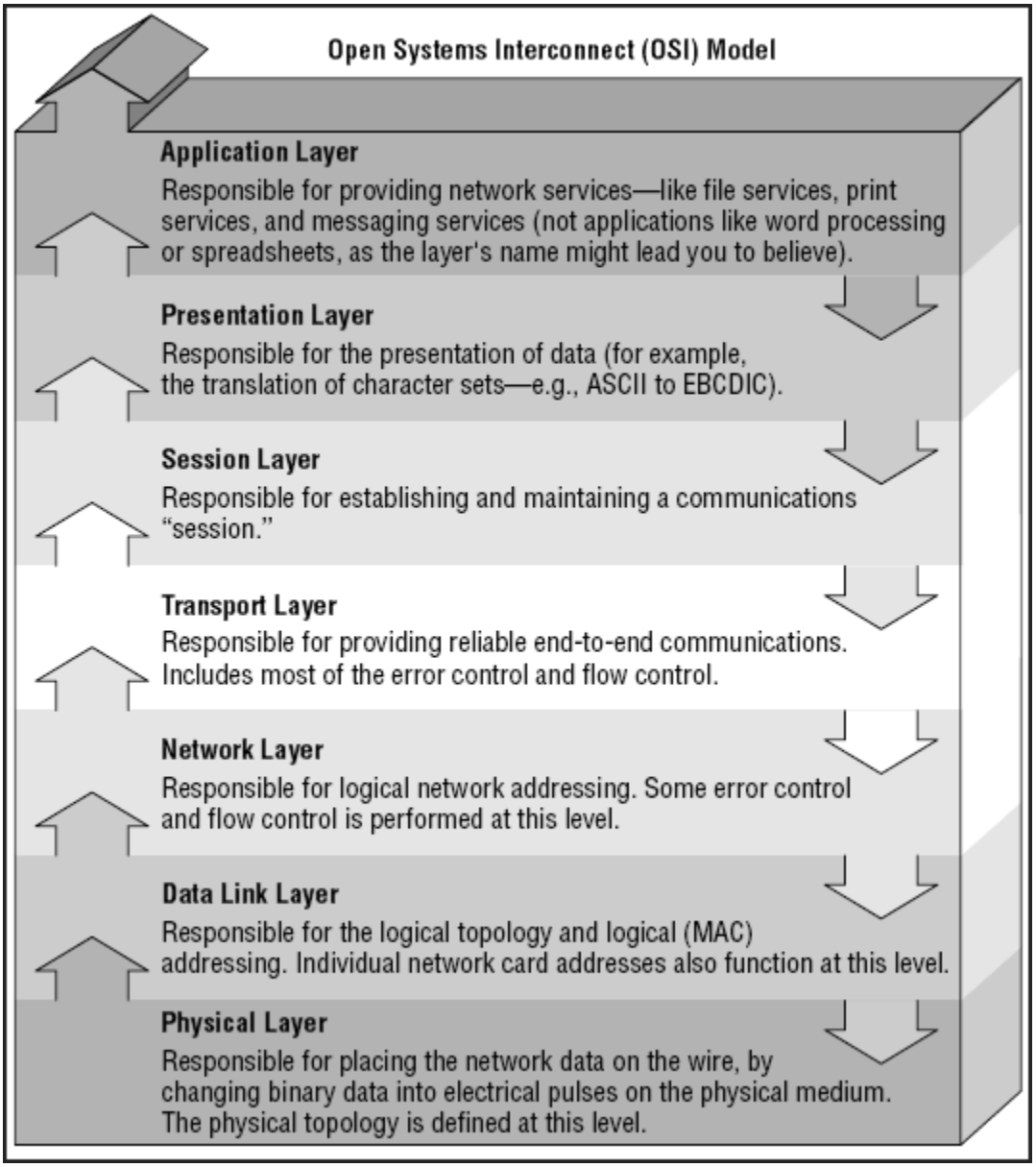
CAT Summary

Category 1 - Voice Only (Telephone Wire)
Category 2 - Data to 4 Mbps (LocalTalk)
Category 3 - Data to 10 Mbps (Ethernet)
Category 4 - Data to 20 Mbps (16 Mbps Token Ring)
Category 5 - Data to 100 Mbps (Fast Ethernet)

Specification	Cable Type	Maximum length
10BaseT	Unshielded Twisted Pair	100 meters
10Base2	Thin Coaxial	185 meters
10Base5	Thick Coaxial	500 meters
10BaseF	Fiber Optic	2000 meters
100BaseT	Unshielded Twisted Pair	100 meters
100BaseTX	Unshielded Twisted Pair	220 meters

Mesh	Star	Bus
		
Ring	**Network Topologies**	**Tree**
		

The OSI Model



Common Ports

The following is a list of common ports. During a network security audit, port scans will be perfeormed to determine what network services are available. These services can be on different Operating systems.

20 FTP data (File Transfer Protocol)
21 FTP (File Transfer Protocol)
22 SSH (Secure Shell)
23 Telnet
25 SMTP (Send Mail Transfer Protocol)
43 whois
53 DNS (Domain Name Service)
68 DHCP (Dynamic Host Control Protocol)
79 Finger
80 HTTP (HyperText Transfer Protocol)
110 POP3 (Post Office Protocol, version 3)
115 SFTP (Secure File Transfer Protocol)
119 NNTP (Network New Transfer Protocol)
123 NTP (Network Time Protocol)
137 NetBIOS-ns
138 NetBIOS-dgm
139 NetBIOS
143 IMAP (Internet Message Access Protocol)
161 SNMP (Simple Network Management Protocol)
194 IRC (Internet Relay Chat)
220 IMAP3 (Internet Message Access Protocol 3)
389 LDAP (Lightweight Directory Access Protocol)
443 SSL (Secure Socket Layer)
445 SMB (NetBIOS over TCP)
666 Doom
993 SIMAP (Secure Internet Message Access Protocol)
995 SPOP (Secure Post Office Protocol)
1243 SubSeven (Trojan - security risk!)
2049 NFS (Network File System)
3306 mySQL
4000 ICQ
5010 Yahoo! Messenger
5190 AOL Instant Messenger
5632 PCAnywhere
5900 VNC
8080 HTTP

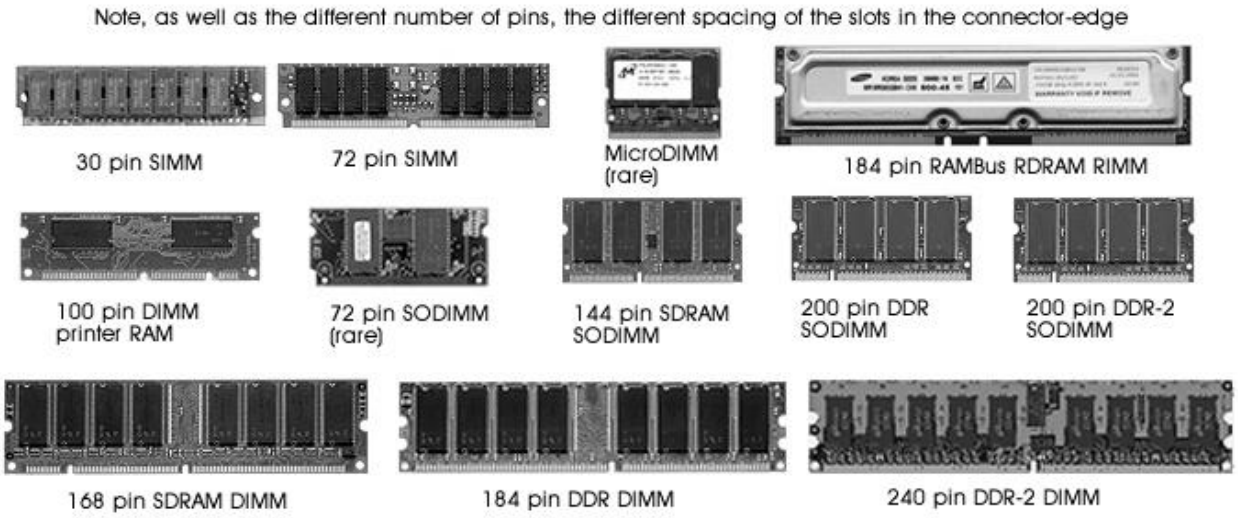
RAM Specifications

- **DRAM (memory) modules**
  - Single In-line Pin Package (SIPP)
  - Single In-line Memory Module (SIMM)
  - Dual In-line Memory Module (DIMM)
  - Rambus In-line Memory Module (RIMM), technically DIMMs but called RIMMs due to their proprietary slot.
  - Small outline DIMM (SO-DIMM). Smaller version of the DIMM, used in laptops. Comes in versions with:
    - 72 pins (32-bit)
    - 144 pins (64-bit)
    - 200 pins (72-bit)
  - Small outline RIMM (SO-RIMM). Smaller version of the RIMM, used in laptops.

Common DRAM modules

Common DRAM packages as illustrated to the right, from top to bottom:

1. DIP 18-pin (DRAM chip, usually pre-FPRAM)
2. SIPP (usually FPRAM)
3. SIMM 30-pin (usually FPRAM)
4. SIMM 72-pin (so-called "PS/2 SIMM", usually EDO RAM)
5. DIMM 168-pin (SDRAM)
6. DIMM 184-pin (DDR SDRAM)
7. DIMM 240-pin (DDR2 SDRAM)—(not pictured.)



Registry Keys

HKEY_CLASSES_ROOT

Abbreviated HKCR, HKEY_CLASSES_ROOT stores information about registered applications, including **associations** from file extensions and OLE object class ids to the applications used to handle these items. On Windows 2000 and above, HKCR is a compilation of HKCU\Software\Classes and HKLM\Software\Classes. If a given value exists in both of the subkeys above, the one in HKCU\Software\Classes is used. [2]

HKEY_CURRENT_USER

Abbreviated HKCU, HKEY_CURRENT_USER stores settings that are specific to the currently logged in user. HKCU mirrors the current user's subkey of HKEY_USERS.

HKEY_LOCAL_MACHINE

Abbreviated HKLM, HKEY_LOCAL_MACHINE stores settings that are general to all users on the computer. This key is found within the file %SystemRoot%\System32\Config\system on NT-based versions of Windows. Information about system hardware is located under the SYSTEM key.

HKEY_USERS

Abbreviated HKU, HKEY_USERS contains subkeys corresponding to the HKEY_CURRENT_USER keys for each user registered on the machine.

HKEY_CURRENT_CONFIG

Abbreviated HKCC, HKEY_CURRENT_CONFIG contains information gathered at runtime; information stored in this key is not permanently stored on disk, but rather regenerated at boot time.

System Files

File	Location
Ntldr	Root folder of the system partition (usually C:\)
Boot.ini	Root folder of the system partition (usually C:\)
Bootsect.dos	Root folder of the system partition (usually C:\)
Ntdetect.com	Root folder of the system partition (usually C:\)
Ntbootdd.sys*	Root folder of the system partition (usually C:\)
Ntoskrnl.exe	*winnt_root*\system32 folder of the boot partition
Hal.dll	*winnt_root*\system32 folder of the boot partition
System	*winnt_root*\system32\config folder of the boot partition
Device drivers	*winnt_root*\system32\drivers folder of the boot partition

*Ntbootdd.sys is used only with a SCSI boot device.

Table 6-2 Files needed to boot Windows NT/2000/XP successfully

NT Loader (NTLDR) – Loads Windows NT. It is located in the root folder of the system partition.

Boot.ini – Specifies the Windows NT path of installation.

BootSect.dos – Contains the address of the boot sector location of each operating system.

NTDetect.com – A command file that identifies hardware components during bootup and sends the information to NTLDR.

NTBootdd.sys – Device driver that allows access to SCSI or ATA drives that are not related to the BIOS.

Ntoskrnl.exe – The Windows NT operating system kernel. It is located in the Windows\System32 folder.

Hal.dll – Hardware abstraction layer dynamic link library. It tells the operating system kernel how to interface with the hardware.

Device Drivers – Contain instructions for the operating system for hardware devices.

Boot Sequence for x86-Based Machines

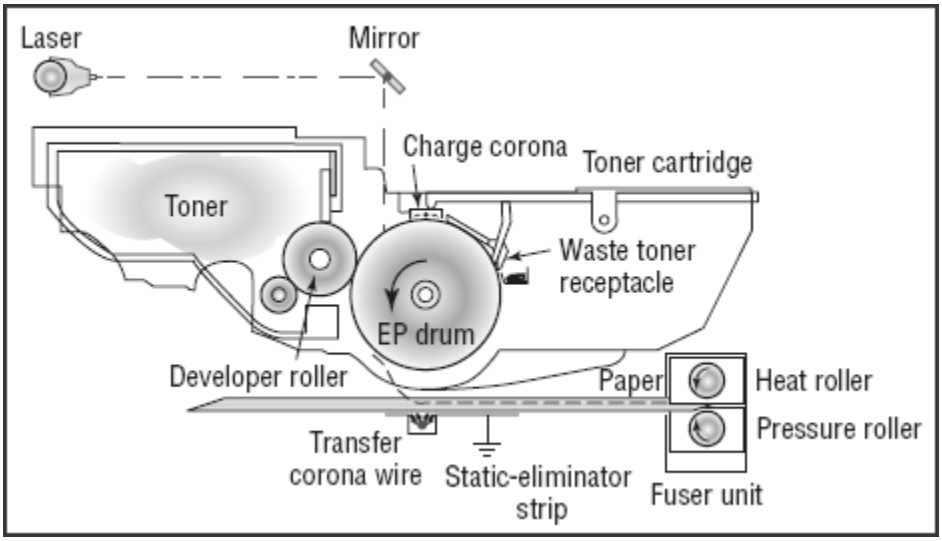
1. Power on self-test (POST).
2. Find boot device and load boot record (handled by the system BIOS). The master boot record (MBR) reads the partition table, determines the location of the boot record, and then jumps to that sector and begins execution there.
3. Windows NT bootstrap routine finds and loads NTLDR.

   NOTE: Steps 2 and 3 as documented on page 474 of the Windows NT System Guide are in reverse, incorrect order. The step order listed here is correct.
4. NTLDR switches processor to 32-bit flat memory mode.
5. NTLDR reads the BOOT.INI and displays operating system choices.
6. User selects an operating system (Windows NT in this example).
7. NTLDR loads NTDETECT.COM.
8. NTDETECT.COM builds the hardware list. It then passes the list and control back to NTLDR. If an operating system other than Windows NT is selected, BOOTSECT.DOS is loaded and control is passed to it.
9. NTLDR loads NTOSKRNL.EXE.
10. NTOSKRNL.EXE loads and initializes Windows NT using information from the Registry to load and initialize drivers and other system settings.

IRQ Assignments

IRQ 0 - System timer. Reserved for the system. Cannot be changed by a user.
IRQ 1 - Keyboard. Reserved for the system. Cannot be altered even if no keyboard is present or needed.
IRQ 2 - Second IRQ controller. See below for explanation.
IRQ 3 - COM 2(Default) COM 4(User)
IRQ 4 - COM 1(Default) COM 3(User)
IRQ 5 - Sound card (Sound Blaster Pro or later) or LPT2(User)
IRQ 6 - Floppy disk controller
IRQ 7 - LPT1(Parallel port) or sound card (8-bit Sound Blaster and compatibles)
IRQ 8 - Real time clock
IRQ 9 - ACPI SCI or ISA MPU-401
IRQ 10 - Free / Open interrupt / Available / SCSI
IRQ 11 - Free / Open interrupt / Available / SCSI
IRQ 12 - PS/2 connector Mouse / If no PS/2 connector mouse is used, this can be used for other peripherals
IRQ 13 - Math co-processor. Cannot be changed
IRQ 14 - Primary IDE. If no Primary IDE this can be changed
IRQ 15 - Secondary IDE

Laser Printing



Cleaning - The Rubber Blade removes any excess toner which drops into the debris cavity. The eraser lamp that removes any excess charge off the photosensitive drum. This leaves the drum with a charge of **0 Volts**

Conditioning - The primary cornea (High Voltage Wire) adds a negative charge of around **-600 volts to -1000 volts**

Writing - The laser light hits the photosensitive drum, where the light hits the drum it dissapates the negative charge to the centre of the drum which is grounded. This then leaves sections of the drum with a voltage of **-100 volts**

Developing - The drum rolls through a supply of negativly charged toner particles (Particles are **-200 Volts to -500 Volts**)

Where the drum hasnt been touched by the laser light a lower negative charge is still there, so the particles are not attracted to this section of the photosensitive drum.

Transfer - A strong positive charge is applied the the paper, the particles of toner are attracted to the paper.

Fusing - The toner that is on the paper is heated and pressurised, the toner becomes bonded to the paper.