CPU Assembly Manual

Technical Manual

PC Assembly

Introduction:

Assembling a PC from scratch is quite a bit different than disassembling and reassembling a computer that's being repaired. It's pretty easy to remove a component from a PC and then reinstall it. Building a computer from a pile of components and screws… That's not so easy.

In this exercise, you'll learn a little about the PC case and how to install computer components like the mainboard, processor, memory, power supply, interface boards, and drives. You'll also learn to recognize the correct screws and fasteners used during PC assembly. Even though the computer may work when you're finished, it's critical that you follow the assembly instructions precisely. Only then is the assembly considered complete and correct.

Words and Terms You Should Know:

These are the terms that you should learn and understand once this lesson is completed.

- ATX Tower Case
- 5.25" Drive Bay
- 3.5" Drive Bay
- AC Power Switch
- Power Switch
- Power LED
- HDD Access LED
- AC Power Inlet
- Padlock Flap Slot
- EMI I/O Shield
- I/O Device Panel
- Input Voltage Selector

The PC Case

The IW-A500 super mid ATX tower case pictured below is designed for ATX motherboards. This case is more or less typical of most PC cases. The chassis is equipped with PS/2 type power supply that meets the latest Intel P4 12V specification.

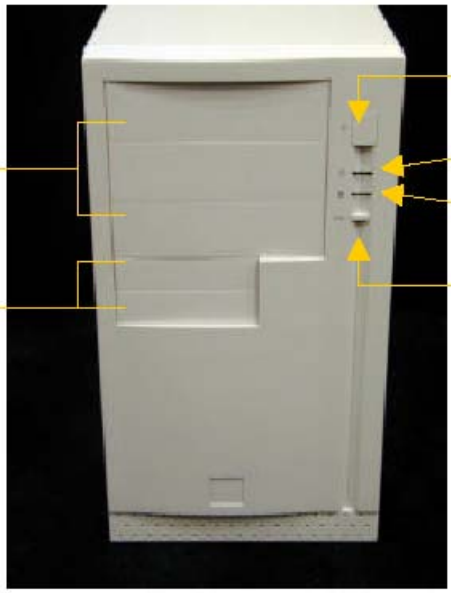
Specifications	
Height	398mm (15.69-Inch)
Width	220mm (8.69-Inch)
Depth	455mm (17.94-Inch)
Weight	N.W. 8.0kg(17.7lb) G.W. 9.0kg(19.9lb)

Includes:
ATX Mid Size Chassis
AC Switch Power Supply
AC Power Code
Screw Package
Plastic Fan Holder with Buzzer
P4 Package (standoffs x 4 sets)

Screw Package:

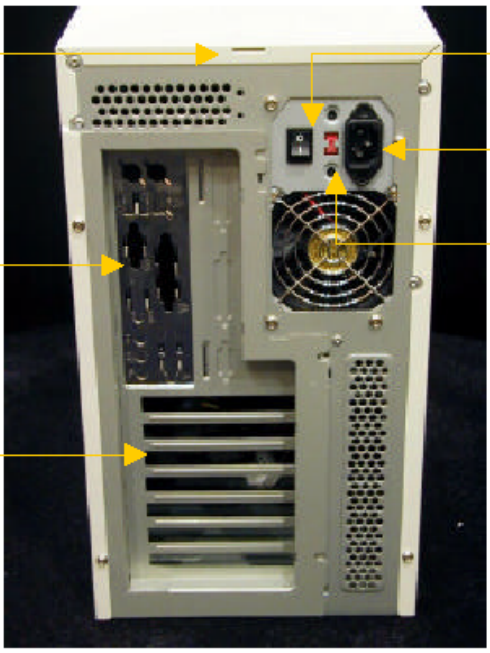
Copper Ground Screw, 1 Ea.	Rubber Foot, 4 Ea.	Key Flap, 1 Ea.
M3 x 5 Screw, 20 Ea.	#6 x 32 4.5 Rnd Head Screw, 13 Ea.	HDD Bracket, 1 Ea.
I/O Filler Plates, 6 Ea.	#6 x 32 Hex Head Screw, 17 Ea.	

Chassis Front Controls and Indicators



1.	**5.25-inch External Bay**	Three 5.25-inch external bays provide space for any 5.25-inch drive use such as CD-ROM, CD-R/W, DVD.
2.	**3.5-inch External Bay**	Two 3.5-inch external bays provide space for any 3.5-inch device use such as FDD, and HDD
3.	**Power Button**	Power On/Off button for the system.
4.	**Power LED**	Green LED indicator shows the power on/off status of the system.
5.	**HDD Access LED**	Orange LED indicator shows the access status of hard disk.
6.	**Reset Button**	Reset button for the motherboard.

Chassis Back I/O Ports and Features



1.	**Padlock Flap Slot**	On the rear side of the enclosure top cover, user can use the key flap for padlock to prevent unauthorized access to the enclosure.
2.	**EMI I/O Shield**	EMI I/O Shield for Cable Connection.
3.	**I/O Device Panel**	Seven I/O device slots for the chassis.
4.	**AC Power Switch**	Main power switch to turn the system on/off.
5.	**AC Power Inlet**	AC Power-In Connector.
6.	**Input Voltage Selector**	To select AC input voltage for 115Vac or 230Vac.

Procedure:
Complete each of the following steps in this exercise. When you see a √… That's an indication that you need to do something. This is a guide to assembling a typical computer workstation.

A. CHASSIS

Preparation: Gather all of the required materials together placing them on a large work surface. Rings, watches and jewelry must be removed.

Required Materials:

Qty	Part Description	Qty	Part Description
1	Computer Chassis Diagram	4	Self-Adhesive Rubber Feet
1	PC Technician Toolkit	1	Key Flap
1	IW-A500 ATX Super Mid Tower Case	1	Hard Disk Drive Bracket
6	#6 x 32 Hex Head Screw (Cover)		

1.√ Print the PC Trainer Inventory sheet found in **Exercise 2** of the **PC Assembly Guide** and inventory your trainer.

2.√ Make sure you have a valid work order. If the item is in the shop make sure it has a Repairable Item Tag on it.

3.√ Remove the four #6 *32 cover hex-head screws from the chassis rear panel with a #2 Phillips screwdriver or ¼" nut driver and place the screws in your parts box.

4.√ Slide the computer cover back and then up while removing it from the chassis frame. Place the cover off to the side in a safe location.

5.√ Remove the paper backing from self-adhesive rubber feet and install each foot to bottom of the chassis as shown.

6.√ Secure the key flap with #6 *32 hex head screw in the grove located in on the upper rear side of the chassis.

7.√ Install the hard disk drive bracket with a #6 *32 hex head screw as shown in the chassis diagram.

8.√ Remove the front panel by gently releasing the 6 plastic tabs that are inserted into the chassis.

9.√ Start by pulling the tabs on the left and right side until they are unhooked. Then do the same for the top and bottom. Then gently pull it off from the chassis.

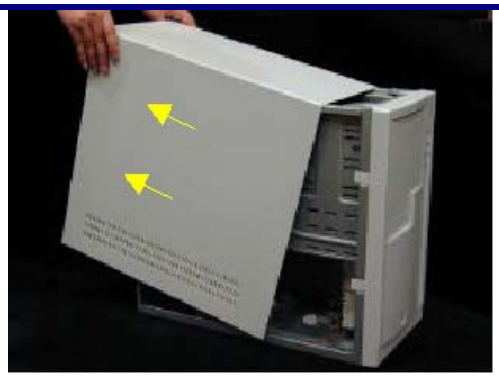


Figure 1. Slide the computer cover back and then up while removing it from the chassis frame.

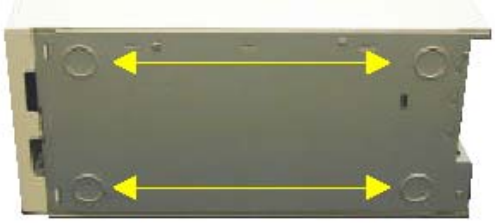


Figure 2. Install each foot to bottom of the chassis as shown.

Figure 3. Secure the key flap with a #6 x 32 hex head screw in the grove located in on the upper rear side of the chassis.

10.√ Reinstall the front panel by snapping it back into the front side of the chassis.

( ) Supervisor Check

#6 x 32 Hex Head Screw.

B. EMI I/O SHIELD

Preparation: Gather all of the required materials together placing them on a large work surface. Rings, watches and jewelry must be removed.

Required Materials:

Qty	Part Description
1	Computer Chassis Diagram
1	PC Technician Toolkit
1	IW-A500 ATX Super Mid Tower Case
6	#6 x 32 Hex Head Screw (Cover)
4	Filler Plates

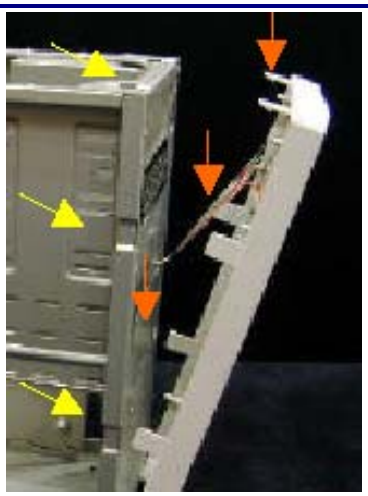


Figure 4. Remove the front panel by gently releasing the 6 plastic tabs that are inserted into the chassis.

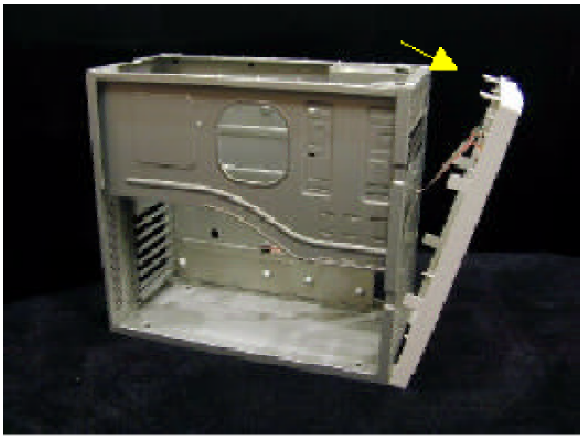


Figure 5. To remove the front panel, tilt the panel forward while removing the panel tabs from the base of the chassis

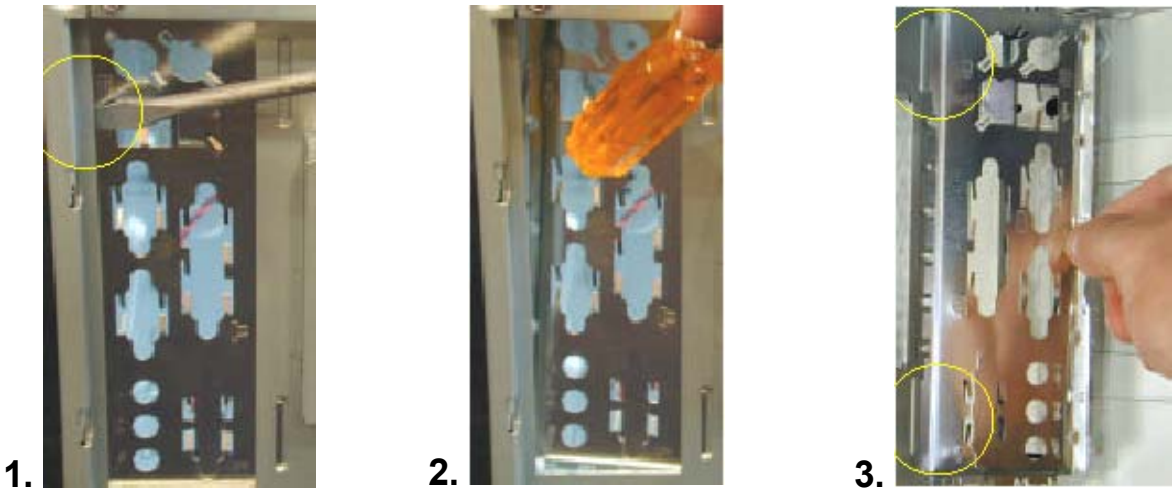


Figure 6. The standard EMI I/O shield has been installed and is compatible with most of the Intel certified motherboards. Replace it when I/O devices on the M/B do not fit in the standard I/O shield. Remove the shield with a common screwdriver following the steps below.

1.√ To remove the EMI I/O shield, use a flat-head screwdriver. Insert the tip of the flat-head screwdriver between the chassis and shield on the left side of the shield.

2.√ Push the I/O shield out gently with the handle part of the flat-head screwdriver. Do not use your fingers.

Safety Tip: The metal EMI shield is very sharp and can easily cut you. Use a tool such as the handle to a screwdriver to pop the shield in and out of the chassis.

3.√ Install the I/O shield from inside of the chassis. Position the two flat edges into the two opening slots in the chassis.

4.√ Push it into the opening, so that the 4-dotted grooves fit to the chassis wall. Make sure the I/O shield snaps into place all the way around.

( ) Supervisor Check

C. MAINBOARD INSTALLATION

Preparation: Gather all of the required materials together placing them on a large work surface. Rings, watches and jewelry must be removed. Put on an antistatic wrist-strap.

Required Materials:

Qty	Part Description	Qty	Part Description
1	Computer Chassis Diagram	1	Copper Grounding Screw
1	PC Technician Toolkit	1	ATX Mainboard
1	IW-A500 ATX Super Mid Tower Case	13	#6 x 32 Hex Head Screw
1	Mainboard Mounting Drawer	6	Filler Plates

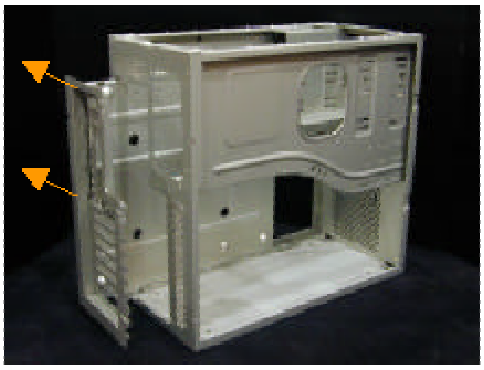
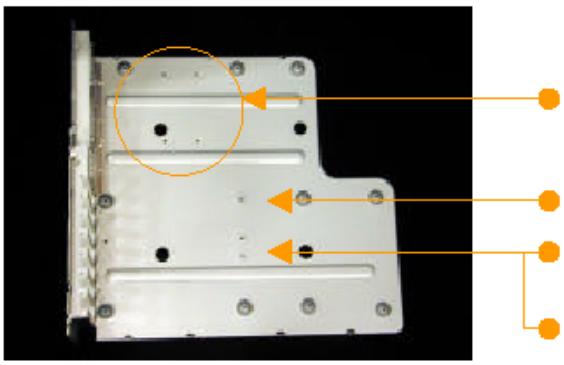


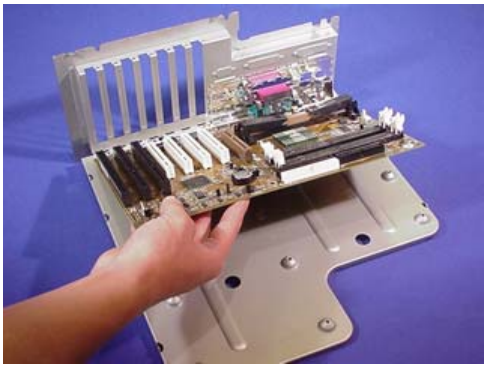
Figure 7. Removing the Mainboard Drawer from the Computer Case. Not all computer cases feature a removable drawer for the mainboard. However, it does make installation and population of the mainboard much easier.



Standoffs for the Pentium 4 (423 Pin) Mount

Copper Grounding Screw

- Flex ATX
- Micro ATX
- ATX



#6 x 32 Hex Head Screw

Copper Grounding Screw.

1.√ Remove the mainboard mounting drawer from the rear of the chassis.

2.√ Install the copper grounding screw onto the mainboard mounting drawer as shown in computer chassis diagram.

3.√ Compare the I/O ports on the mainboard to the EMI I/O shield. Remove the shield punch-outs so there is an opening for each port on the mainboard. Don't remove any more punch-outs than you have to.

4.√ Follow the mainboard user's manual to install the processor mounting bracket.

5.√ Install the mainboard and secure it with 6, #6 x 32 hex head screws.

6.√ Install I/O filler pates in each of the interface card openings on the mainboard drawer using #6 x 32 hex head screws. Always make sure there is a filler plate for each opening.

( ) Supervisor Check

Figure 8. Use 6, #6 x 32 screws to install 6 filler plates into the empty slots at the back of the chassis. Don't cover the AGP slot.

D. POPULATING THE MAINBOARD

Preparation: Gather all of the required materials together placing them on a large work surface. The mainboard should be mounted on the mainboard drawer which should be removed from the case. Rings, watches and jewelry must be removed. Put on an antistatic wrist-strap and use an antistatic mat.

Required Materials:

Qty	Part Description	Qty	Part Description
1	Mainboard User Manual	1	Thermal Compound or Pad
1	PC Technician Toolkit	1	Processor Heat Sink and Fan
1	IW-A500 ATX Super Mid Tower Case	1	Memory DIMM
1	Mainboard Mounting Drawer	1	Graphics Adapter (If Applicable)
1	ATX Mainboard	1	Sound Card (If Applicable)
1	Processor	1	Network Interface Card (If Applicable)

Processor Installation

Mainboards that comply to the ATX form factor are designed to accommodate a variety of processor package types. The first step to installing the processor is probably the most important. Make sure the processor package type matches the mainboard you're using. You can determine this by reviewing the specifications of the mainboard and comparing them with those of the processor. The second step is to make sure you install the processor correctly.

Slot Processor Package Types

- Slot 1, SECC, SECC2, SEPP Intel Pentium III, II, and Celeron Processors

Tech Note: Remember that processors are very sensitive to static electricity. You must wear an antistatic wrist-strap and use an antistatic mat when working with processors.

Figure 9. Slot 1 Intel Pentium III Processor.

1.√ Apply thermal compound (about the size of a pea) to the center of the processor chip on the processor card. You can also apply a thermal pad to the center of the heat sink.

2.√ Secure the heat sink to the processor card using the spring clip.

Figure 10. Thermal Pads and Thermal Compound.

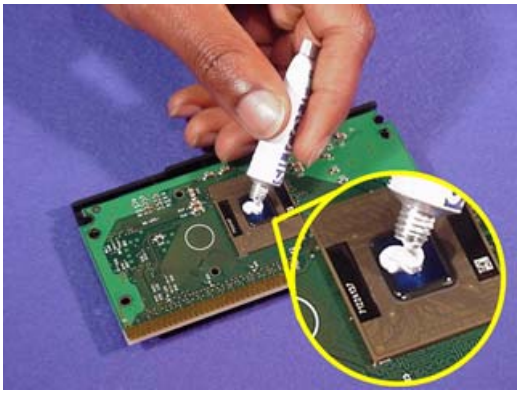


Figure 11. Applying thermal compound to processor.

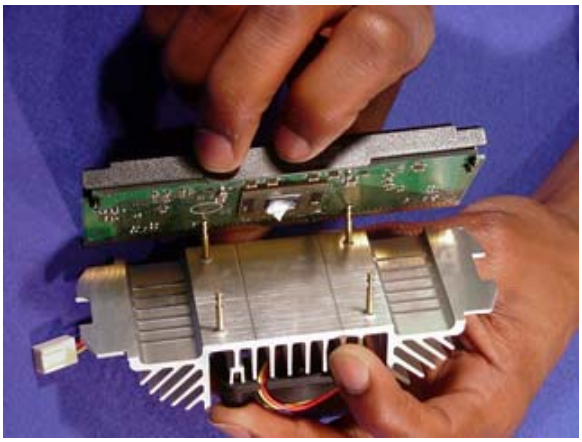
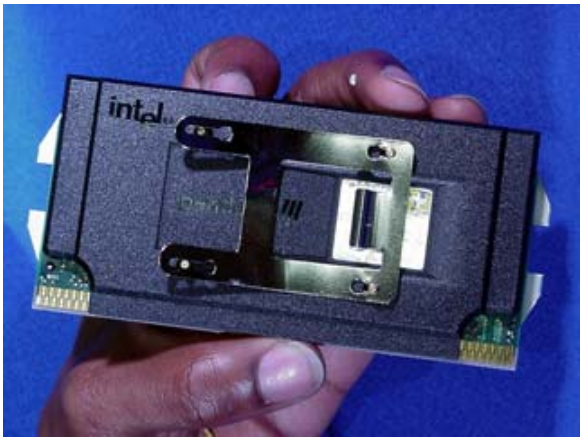


Figure 12. After you apply thermal compound, slide the heatsink registration pins through the holes in the processor board. The power cable to the fan should be positioned on top.

About Thermal Pads and Compound: Also known as heatsink tape and silicone grease, thermal pads and compound help transfer heat from the processor chip to the heatsink. Both items fill in the gaps between the heatsink and processor chip to facilitate a better transfer of heat. It keeps the processor cool. It's not just a good idea, it's required. Without a thermal pad or grease, the processor will burn up in just a few minutes… an expensive experiment.

Thermal compound is a little messy to apply and it takes a bit of practice to get it just right. If you make a mistake, use a wipe to clean up the mess and start over. Also, you need to clean off the old thermal pad or compound and apply new material anytime you remove the heatsink.



Safety Note: Thermal pads and compound are loaded with mercury… a very dangerous heavy metal. Mercury can be absorbed into your bloodstream through your skin. Therefore, you should avoid getting it on your skin. Apply grease with a swab and wash off grease immediately with soap and water.

Figure 13. The photograph to the left shows how to install the heatsink spring clip. The clip must slide all the way into locked position to make sure there's an even amount of pressure of the processor chip against the heatsink. This also improves heat transfer.

( ) Supervisor Check

3.√ Install the slot 1 processor / heatsink assembly into the mainboard.

4.√ If your Slot 1 mounting bracket features a security cap, go ahead and install it.

5.√ Plug the heatsink fans into the power jacks on the mainboard in accordance with the user's manual.

( ) Supervisor Check

Figure 14. Both the processor and the processor socket are keyed so it can be installed only one way. Line up the notches in the processor card with the tabs in the socket and then firmly press the processor card down into the Slot 1 mount and processor socket until it is fully seated.

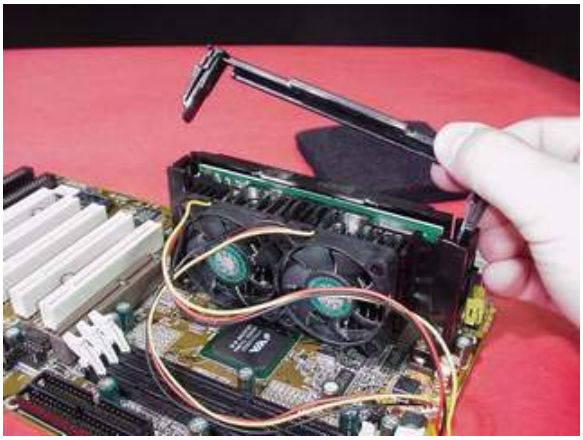


Figure 15. If you Slot 1 processor socket has such a feature, install the processor cap.

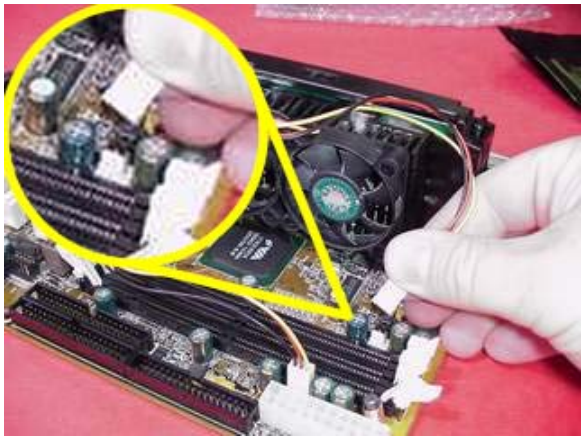


Figure 16. Plug in the heatsink fan(s) into the main board as shown in the mainboard's user manual.

Socket Processor Package Types

- FCPGA (Socket 370) - Intel Pentium III and Celeron Processors
- Socket A - AMD Athlon XP/MP and Duron Processors
- mPCGA478 (Socket 478) - Intel Pentium 4 and Celeron Processors
- Socket 603 - Intel Xenon and Xenon MP Processors
- Socket 604 - Intel Xenon Processors

Processors are Field Replaceable Modules (FRM). They need to be since they're the single most expensive component in a computer and they occasionally break. Since they're an FRM, they're handled by technicians during installation. Although the actual processor is that tiny piece of semiconductor in the center of the processor board, the technician has to be able to pick it up and insert the pins into the processor socket. That's the only reason why it's so huge.

FCPGA (Socket 370) Intel Pentium III

Socket A AMD Athlon XP

Socket A - AMD Athlon MP

mPCGA478 (Socket 478) Intel Pentium 4

Socket 603 Intel Xenon

Socket 604 - Intel Xenon

Figure 17. Socket package types are usually identified by their number of pins. (Socket 370 has 370 Pins.)

Socket Processor Installation

Installation of socket package type processors is a little difficult. It's very important you follow these steps carefully. Remember… Processors are static sensitive so treat them as ESDs. They're also fragile. The pins are easily bent and are difficult to straighten. Dropping a processor is certain death so… Please be careful.

1.√ Clean the mating surface of the heatsink with a wipe removing oxidation and old thermal pads or grease.

2.√ Open the processor's Zero Insertion Force (ZIF) socket on the mainboard.

3.√ Insert the processor into the ZIF making sure pin 1 on the processor is aligned with pin 1 on the socket.

4.√ Clean the top of the processor chip with a wipe removing oxidation and old thermal pads or grease.

5.√ Apply a new thermal pad to the heat sink or thermal compound to the top on the processor chip. Make sure the thermal pad or grease completely covers the interface between the processor chip and heatsink.

6.√ Install and secure the heatsink over the CPU using the mainboard's mounting hardware and plug in the fan.

( ) Supervisor Check

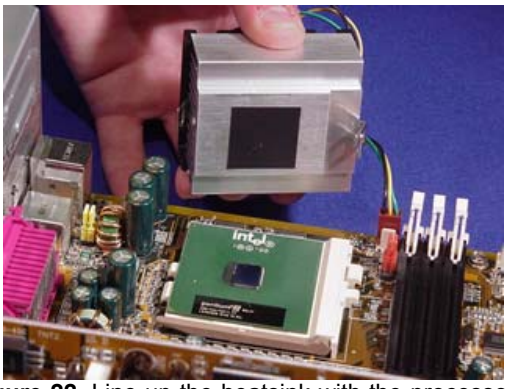


Figure 22. Line up the heatsink with the processor. Make sure the notch in the heatsink lines up with the hip of the ZIF socket. The heatsink must meet flush with the top of the processor chip.

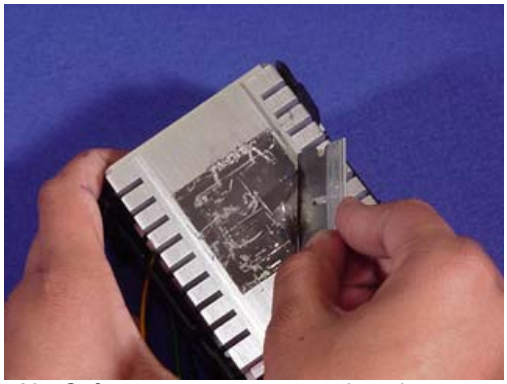


Figure 18. Safety-razors are a good tool to remove old thermal pads. All residue needs to be removed with spray cleaner.

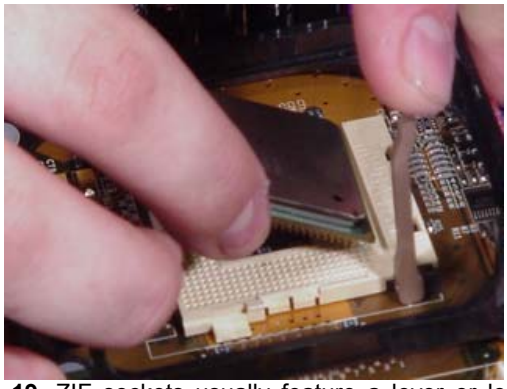


Figure 19. ZIF sockets usually feature a lever or lock that needs to be opened before the processor can be installed.

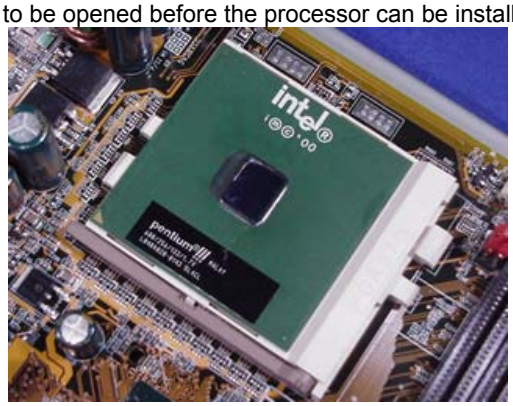


Figure 20. Pin 1 on the chip is identified with an arrow, bevel, or some other marking. Pin 1 on the chip needs to match pin 1 on the socket. Seat the processor and lock the ZIF socket.

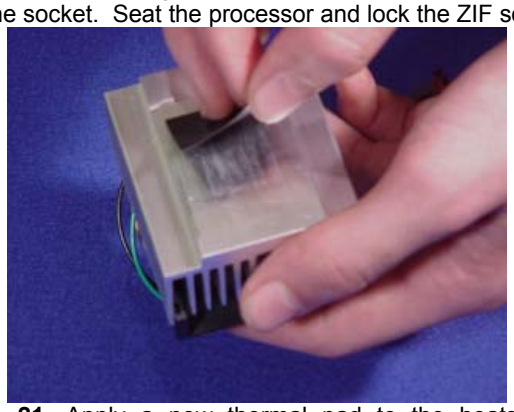
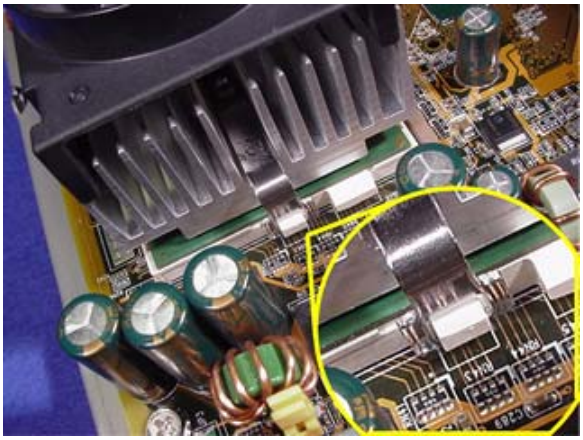
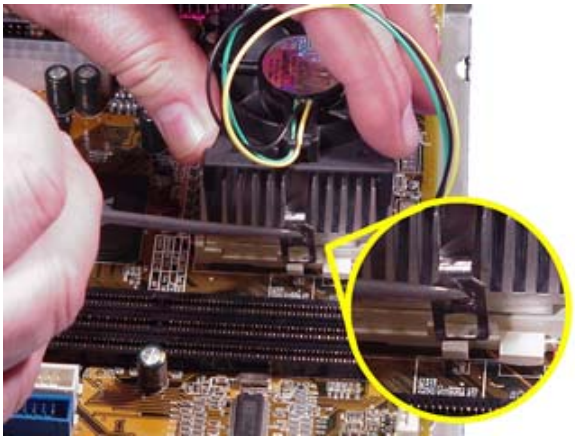


Figure 21. Apply a new thermal pad to the heatsink or thermal grease to the processor chip. Which ever you choose, make sure the pad or grease completely covers the interface between the processor chip and heatsink.





1. **2.**

Figure 23. This is the scariest part about installing the FCPGA heatsink. There's real potential to destroy the mainboard if you're not careful. Take a close look at the inset pictures before you proceed. The first step is to hook the single-holed end of the hinksink clip to the back of the ZIF socket. Next… Place a common screwdriver in the top hole of the other end of the heatsink clip and push the end of the clip down and over the catch on the ZIF socket. This is dangerous! Just a little slip of the screwdriver can gouge the mainboard making it useless. Don't forget to plug the fan in to the mainboard.

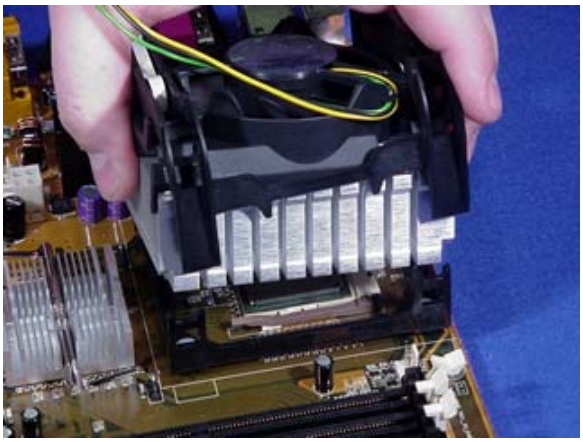


Figure 24. Although they're both socket packages, the mPCGA438 (Socket 438) is quite a bit different than the Socket 370 package. The Intel Pentium 4 is much larger, operates much faster, and therefore emits a lot more heat than the P3. That's why the heatsink and processor interface are much larger. The mount on the mainboard and the oversized heatsink clamp accommodates the heavier heatsink. The installation is essentially the same as other socket package types, but because the interface between the processor chip and heatsink is larger, the installation requires more thermal compound or a larger thermal pad. Whichever material you use, the thermal transfer device has to cover the entire interface.

Memory Module

1.√ Memory is highly sensitive to static electricity. Make sure you're using a wrist-strap and antistatic mat when installing and removing memory modules.

2.√ Line up the keys between the memory module and socket. Press the memory module into the socket firmly and evenly until it's fully seated in the socket.

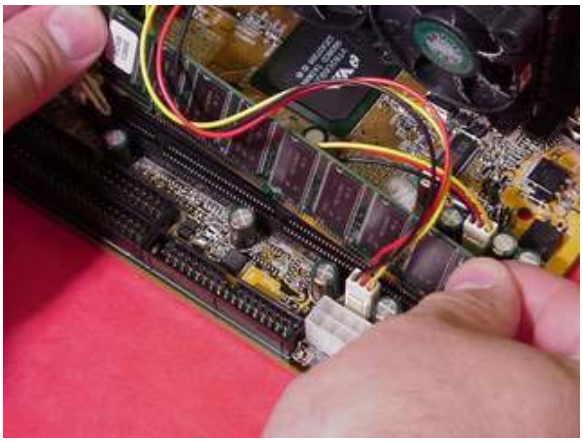


Figure 25. Installing a memory module on the mainboard.

( ) Supervisor Check

Interface Cards

Adding features to a PC is as simple as adding an interface card. Some features, like sound, video, and a network interface may already be built-in to the mainboard, but that doesn't mean you can't upgrade by installing a better card. To determine the capability of your mainboard, look through the specifications in the user manual.

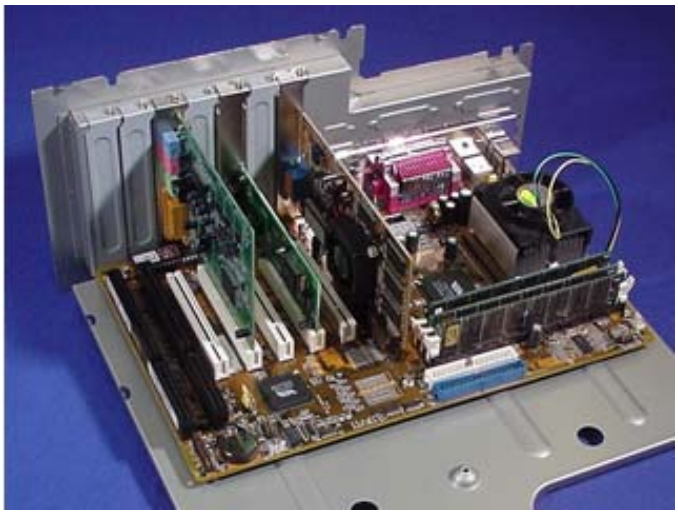


Figure 26. A completely populated mainboard installed on the mainboard drawer. Notice that each interface card is separated by a slot to achieve greater air circulation. This keeps things a little cooler.

1.√ If necessary, remove a filler plate and install a graphics adapter.
2.√ If necessary, remove a filler plate and install a sound card.
3.√ If necessary, remove a filler plate and install and network interface card.
4.√ Make sure each card is correctly seated and secured with a #6 x 32 hex head screw.
5.√ Make sure all open I/O openings are covered with a filler plate and secured with a #6 x 32 hex head screw.
( ) Supervisor Check

System Jumpers and Switches

Mainboards incorporate jumpers or switches for configuring various features built into the PC. These features may include setting the FSB Speed, Power-on by Keyboard or Mouse, Over-Clocking the Processor (Not Recommended), Chassis Intrusion Detection, Power Failure Recovery, and Clearing the CMOS Password. Most board come pre-configured from the manufacture with the factory default settings. However, these may not be the best settings for your PC. Therefore, you'll need to become familiar with the system settings for your PC. The best resource for this information is the user manual for the mainboard you're working on. Refer to it while completing the following step.

1.√ Set the system jumpers and switches on the mainboard to match the configuration of your processor and PC. Have your supervisor check your work when you're finished.

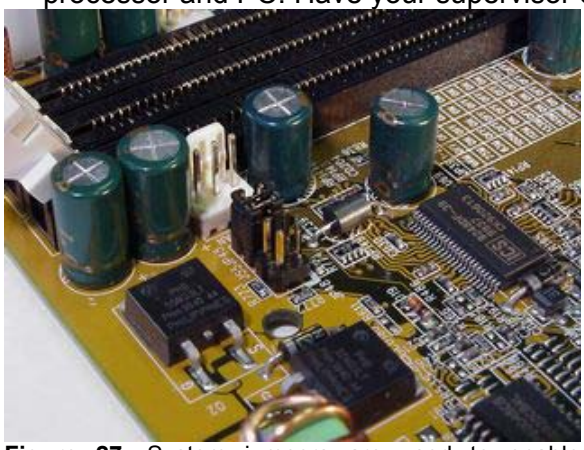


Figure 27. System jumpers are used to enable mainboard options and settings. Although the jumper settings might be screen printed on the mainboard, always refer to the user manual before making any changes.

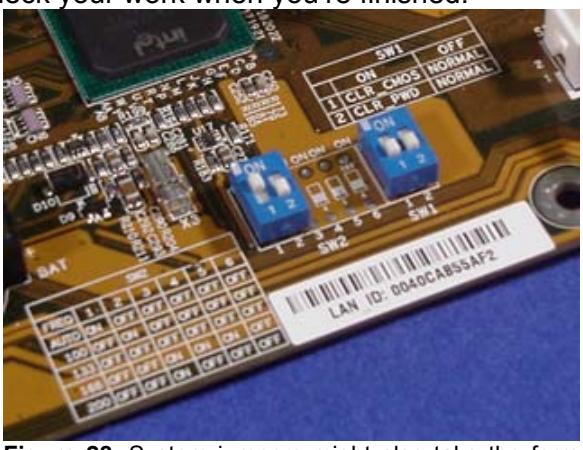


Figure 28. System jumpers might also take the form of tiny switches called DIP switches. These particular switches clear the password stored in CMOS.

AGP Graphics Adapter

PCI Sound Card

PCI Network Interface Card

E. DISK DRIVE INSTALLATION

Preparation: Gather all of the required materials together placing them on a large work surface. The mainboard, microprocessor, heatsink, memory, and interface cards should be installed. Rings, watches and jewelry must be removed.

Required Materials:

Qty	Part Description	Qty	Part Description
1	Mainboard User Manual	6	#6 x 32 4.5 Pan Head Screws
1	PC Technician Toolkit	1	3.5” Hard Disk Drive
1	IW-A500 ATX Super Mid Tower Case	1	3.5” Floppy Disk Drive
4	#6 x 32 Hex Head Screws	1	CDROM Drive
4	MK3 x 5 Pan Head Screws		

Tech Tip: Electro Magnetic Interference (EMI) can be a real problem for computers. It’s important that the PC’s internal circuitry is shielded from EMI. Every opening in the metal chassis is an opportunity for EMI to enter and exit the computer. Therefore, unused drive bays must be blocked with an EMI shield.

Figure 29. Remove and reposition the 5.25” EMI shield with a common screwdriver.

Figure 30. If you need an additional 3.5” drive bay you’ll need to remove the metal shield blocking the drive bay.

Figure 31. The same is true for the 5.25” drive bay. However, all unused drive bays should be blocked with a shield.

1.√ Remove the front panel from the chassis.
2.√ Move the 5.25” EMI shield to the middle 5.25” drive opening so the CDROM drive can be installed in the top drive bay.
3.√ If the top 3.5” drive bay is blocked with a metal shield, remove the metal shield by bending it back and forth until the metal shield breaks off. This is where the 3.5” floppy is installed.

Safety Tip: The metal EMI shields are very sharp and can easily cut you. Use a tool such as a screwdriver to pop the shield out of the chassis.

4.√ If you need to install an additional 5.25" device, you can remove the metal shield by prying it with a common screwdriver. Bend it back and forth until the metal shield breaks off.

5.√ Remove the plastic inserts from the front panel so there's access to the drives that are going to be installed.

6.√ Reinstall the front panel.

#6 x 32 4.5 pan head screw

MK3 x 5 pan head screw

External Access Drive Installation

1.√ Slide the 3.5" floppy drive into the 3.5" drive bay from outside of the chassis until the mounting holes on the side of the drive lineup with the mounting holes in the chassis base.

2.√ Adjust the drive making the drive's bezel plate flush with the front panel. Secure the drive with 4, #6 x 32 4.5 pan head screws.

3.√ Slide the CDROM drive into the 5.25" drive bay from outside of the chassis until the mounting holes on the side of the drive lineup with the mounting holes in the chassis base.

4.√ Adjust the drive making the drive's bezel plate flush with the front panel. Secure the drive with 4, MK3 x 5 pan head screws.

Figure 32. Slide the drives through the front panel until the bezel plates are flush with the front panel. Secure the drives with the appropriate screws.

Installing a 3.5" Internal Device (Hard Disk Drive)

1.√ Slide the HDD from inside of the chassis into the upper closed 3.5" drive bay.

2.√ Line up the mounting holes of the drive with the mounting holes in the chassis.

3.√ Secure the drive in place with 4, #6 x 32 hex head screws.

Installing a 2nd 3.5" Internal HDD

1.√ Find the HDD bracket and remove it from chassis.

2.√ Secure HDD Bracket to the HDD using 2, #6 x 32 4.5 pan head screws.

3.√ Slide the HDD with the bracket installed back into the top rear of the chassis lining up the mounting holes.

4.√ Secure the hard disk drive with 4, #6 x 32 hex head screws.

Figure 33. Slide the hard disk drive from inside the chassis into upper closed 3.5" drive bay. This is necessary for the IDE drive cable to reach between the CDROM and HDD.

( ) Supervisor Check

Figure 34. HDD Bracket Installation with #6 x 32 4.5 pan head screws.

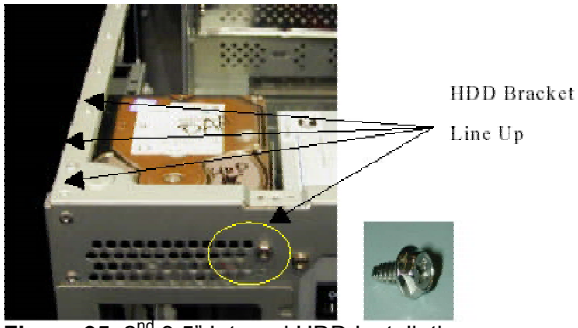


Figure 35. 2nd 3.5" Internal HDD Installation

F. CABLE INSTALLATION

Preparation: Gather all of the required materials together placing them on a large work surface. The mainboard should be fully populated and all drives should be installed. Rings, watches and jewelry must be removed.

Required Materials:

Qty	Part Description	Qty	Part Description
1	Mainboard User Manual	1	Floppy Drive Data Cable
1	PC Technician Toolkit	1	CDROM Drive Audio Cable
1	IDE Data Cable		

Front Panel Connections

1.√ Route the front panel cable to the control header.

2.√ Using the mainboard user manual as a guide, connect the front panel plugs to the header.

3.√ Make sure the print on each plug matches the print screened on the mainboard.

( ) Supervisor Check

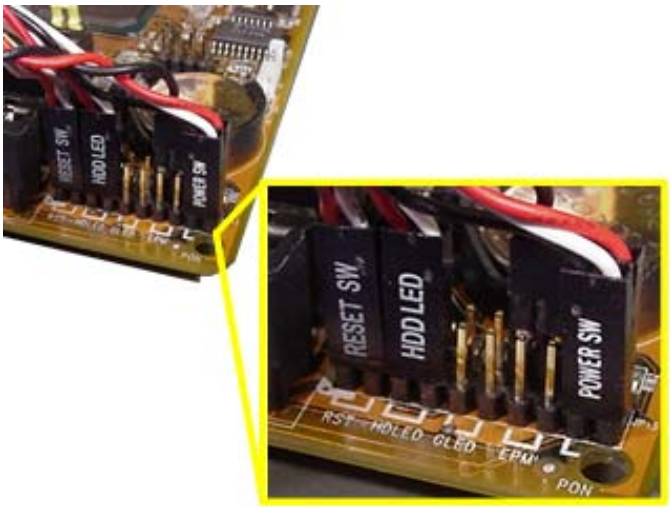


Figure 36. Front panel header connections.

Identifying Drive Data Cables

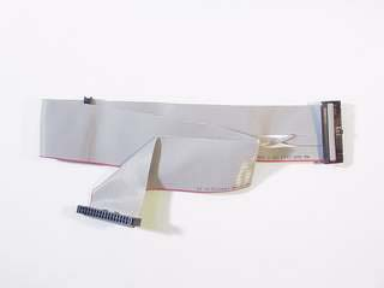


Figure 37. 34-Pin floppy drive data cable. The connector closest to the twist in the cable goes to floppy drive A:. The opposite end connects to the floppy I/O port on the mainboard. The colored stripe on the edge of the cable indicates pin 1.

Figure 38. 40-Pin IDE cable. There is no twist in the cable. The master HDD drive and mainboard should be connected to the ends of the cable. The end with the largest gap between connectors gets connected to the IDE port on the mainboard.

Figure 39. The CDROM audio cable connects between the CDROM audio port and the CDROM port on the sound card. The cable is necessary to listen to music CDs through the PC speakers.

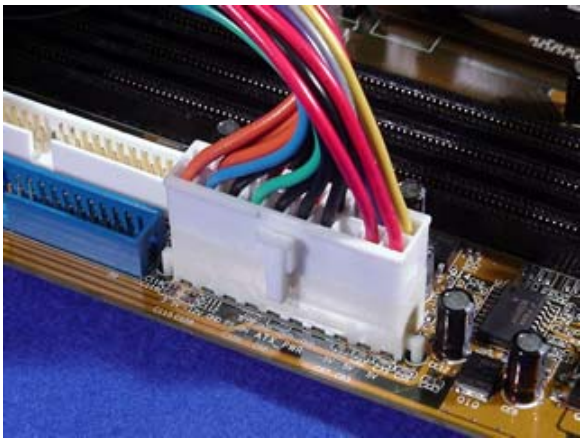


Figure 40. Install the 20 Pin ATX power connector from the power supply to the mainboard. The plug is keyed so it goes in only one way.

Installing Data and Power Cables

1.√ Locate the 20 Pin ATX power connector on the mainboard and connect it to the power supply.

2.√ If you have a Pentium 4 mainboard, you'll have to connect two additional power connections… an ATX 12V and an ATX Auxiliary connection.

3.√ Connect the end of the floppy drive cable to the mainboard. Make sure you're connecting the end that's opposite the twist in the cable. Also make sure that pin 1 on the connector matches pin 1 on the mainboard.

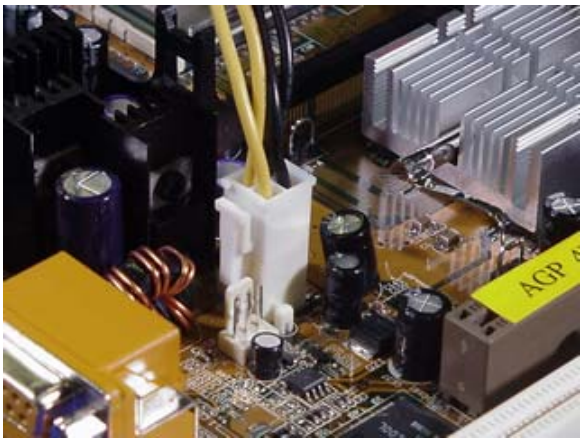


Figure 41. The Pentium 4 mainboard requires an additional 12 volt power connection.

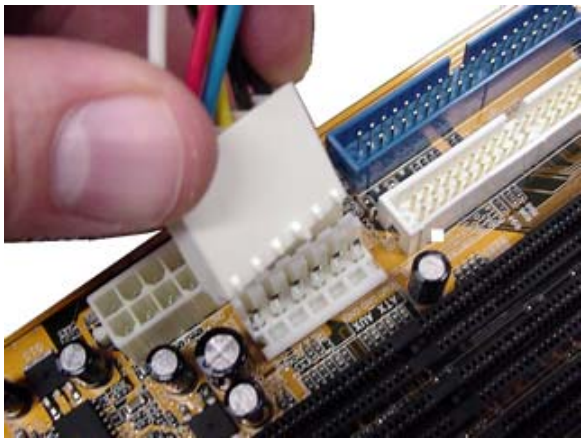


Figure 42. The Pentium 4 mainboard also requires an auxiliary power connector for 3.3V and 5V DC power.

Tech Note: Most data cable connectors are keyed with a little plastic tab so the connector can be plugged in only one way. You can force the connector in the wrong way if you really try. However, this may damage the mainboard or the device you're connecting.

The real problem is the floppy drive. Although the plug is keyed, the socket on most floppy drives is not. You have to examine the drive carefully to determine where pin 1 is located and make sure pin 1 on the data cable is connected to it.

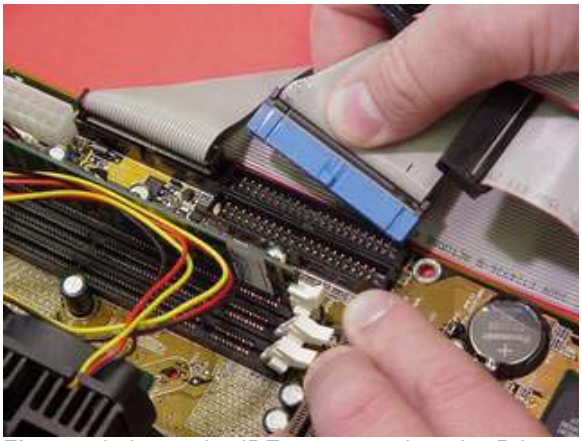
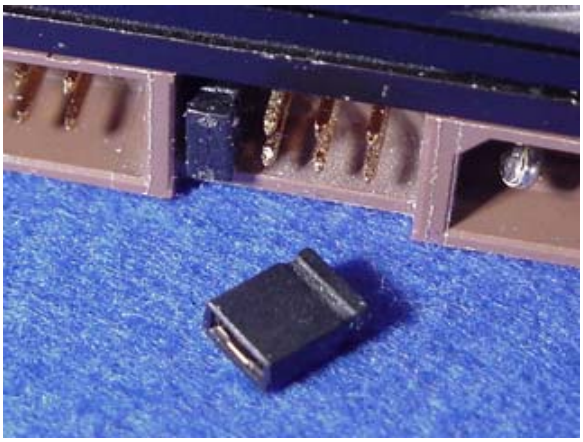


Figure 43. Insert the IDE connector into the Primary IDE port on the mainboard. Make sure that pin1 on the connector matches pin 1 on the mainboard.

4.√ Insert the IDE connector into the Primary IDE port on the mainboard. Make sure that pin1 on the connector matches pin 1 on the mainboard.

Tech Tip: Examine the IDE cable carefully. There could be up to three connectors. Notice that the distance between the center and one of the end connectors is longer than the other. The connector on the long end of the cable gets plugged into the mainboard. But which mainboard plug? There are two – The Primary and the Secondary IDE ports. The cable that's connected to the hard disk drive with the operating system needs to be plugged into the Primary IDE port. You can identify the Primary IDE port by examining for the print screened on the mainboard or by referring to the user manual.

5.√ Strap the hard disk drive as a Master drive using jumpers.



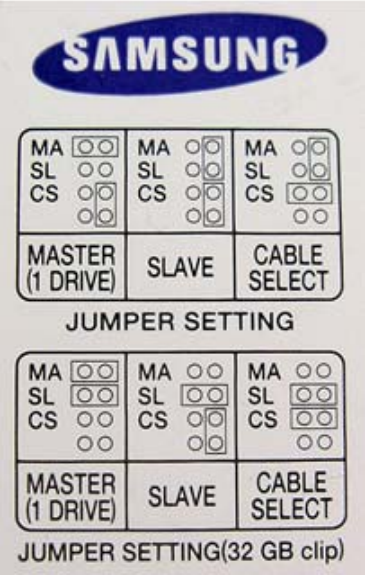


Figure 44. The primary hard disk drive holds the operating system and must be strapped as the Master drive on the Primary IDE port. The straps are removable jumpers that must be installed according to the jumper settings table. The table might be on a label secured to the drive. If not… Look in the drive's technical manual or look up the specifications for the drive on the manufacturer's web site.

6.√ Strap the CDROM drive as a slave device.
7.√ Connect the end (twisted) of the floppy cable into the floppy disk drive. Make sure pin 1 on the cable matches pin 1 on the drive.
8.√ Locate the appropriate power connector and plug it into the floppy disk drive.
9.√ Plug the middle or end connector of the Primary IDE cable into the hard disk drive.
10.√ Locate the appropriate power connector and plug it into the hard disk drive.
11.√ Plug the remaining connector of the Primary IDE cable into the CDROM Drive.
12.√ Locate the appropriate power connector and plug it into the CDROM drive.

Figure 42. The drive selection strap for the CDROM drive is usually set as the Slave drive. Remember… On a single IDE port, there is one Master drive and one Slave. The jumper settings are typically engraved into the CDROM drive case as shown above.

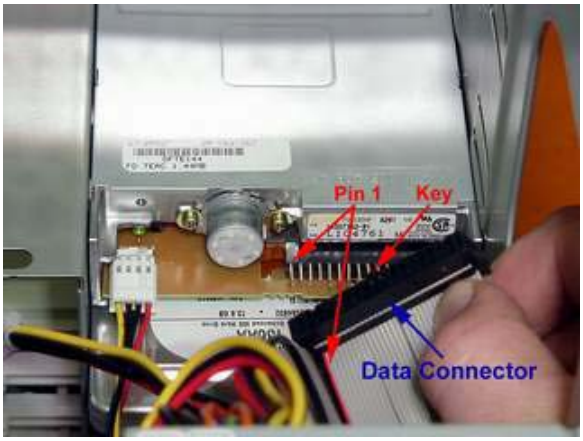


Figure 43. Connect the end (twisted) of the floppy cable into the floppy disk drive. Make sure pin 1 on the cable matches pin 1 on the drive.

13.√ Connect the audio cable from the CDROM drive to the CD connector on the sound card or mainboard.
14.√ Dress both the data and power cables so they are organized and away from sharp edges on the chassis or other devices. The cables must be routed away from any parts that might pinch them when the cover is installed.

( ) Supervisor Check

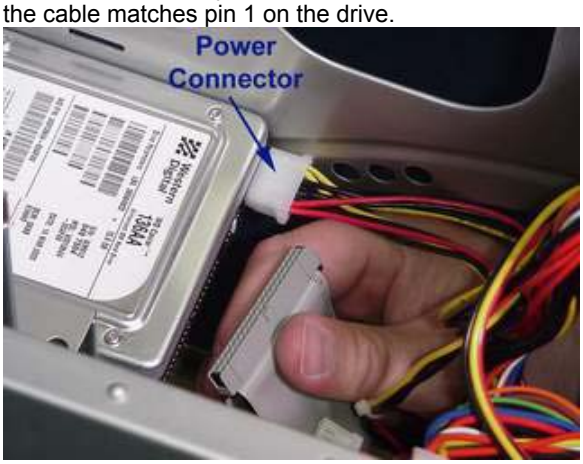


Figure 44. Plug the middle or end connector of the Primary IDE cable into the hard disk drive. The power connector must also be connected.

Figure 45. Plug the remaining connector on the Primary IDE cable into the CDROM Drive. Do the same with the audio and power connectors.

G. INSTALL OPTIONAL FRONT 8CM AUXILIARY COOLING FAN

Preparation: Gather all of the required materials together placing them on a large work surface. The mainboard drawer should be removed. Rings, watches and jewelry must be removed.

Required Materials:

Qty	Part Description	Qty	Part Description
1	Mainboard User Manual	1	8 cm, 12 Volt Computer Fan
1	PC Technician Toolkit		

Tech Note: The front 8cm 12 Volt auxiliary cooling fan is optional. This component doesn't typically come with the standard package nor should you think it necessary. However, the auxiliary cooling fan is a good idea if you plan to load the PC with lots of interface adapters, memory, and a high speed processor. Generally speaking, the cooler a PC runs the higher the reliability.

1.√ Detach the snap-on fan housing by simply pressing plastic clips down and pulling the housing from the inside of the chassis.

2.√ Insert an 8cm fan into the fan housing. The installation doesn't require mounting screws.

3.√ Reinstall the fan housing by reversing the previous steps.

4.√ Reassemble the PC checking all connections and cabling.

5.√ Plug in the auxiliary cooling fan into the mainboard.

Figure 46. Optional cooling fan housing.

( ) Supervisor Check

H. FINAL ASSEMBLY STEPS

Preparation: Gather all of the required materials together placing them on a large work surface. The PC should be completely assembled. The chassis cover should be removed. Rings, watches and jewelry must be removed.

Required Materials:

Qty	Part Description	Qty	Part Description
1	Mainboard User Manual	1	Monitor
1	PC Technician Toolkit	1	Keyboard
1	Assembled PC	1	Mouse
1	PC Assembly Checklist	2	AC Power Cords
1	Speakers or Headphones		

1.√ Complete the PC Assembly Checklist and have it verified by your supervisor.

( ) Supervisor Check

2.√ Connect the PC to a monitor.
3.√ Connect a keyboard and mouse to the PC.
4.√ Connect speakers to the PC.
5.√ Plug the PC and Monitor into AC power.
6.√ Turn the monitor on.

Tech Note: This is the moment of truth. If the PC displays error messages or sounds any error beep codes turn the computer off immediately and inform your supervisor. Most problems at this point are assembly problems. Check your work and make corrections. If problems persist, get your supervisor's help troubleshooting the PC.

7.√ Turn the PC on and observe the POST information displayed on the screen.
8.√ Turn the PC off.
9.√ Reinstall the chassis cover and secure the mainboard drawer with a #6 x 32 hex head screw.

( ) Supervisor Check

I. CMOS BIOS Setup

Preparation: Gather all of the required materials together placing them on a large work surface. The PC should be completely assembled, working, and ready to use.

Required Materials:

Qty	Part Description	Qty	Part Description
1	Mainboard User Manual	1	PC Workstation
1	Sample BIOS Setup Guide		

Tech Note: The system's BIOS ROM has a built-in setup program that allows the user to modify the basic system configuration. This information is stored in the non-volatile memory portion of the CMOS chip. Since this is non-volatile RAM, it can retain the setup information even when the power is turned off. The CMOS battery keeps track of the system's date and time. In most computers, when you turn on or reboot the system, you press the Delete key to enter the BIOS setup program. Your system may have a different key sequence to bring up the BIOS setup utility. Watch the boot screen… There's usually a hint there.

The primary BIOS Setup screen that appears is a list of the menus and functions available in the setup program. The user would select the desired item and press enter to make changes. Operating commands are located on the screen someplace. When a field is highlighted, on-line help information is displayed to give you an idea what you should do.

This is important! Configuring the system BIOS is a science in and of itself. Tweaking the BIOS is an excellent way to speed up the boot process, protect the system, enable hidden features, and even speed-up the processor. However, messing around with the system settings can also disable your computer and even destroy the processor if you're not careful.

In this portion of the exercise you'll learn some of the basic settings in the PC BIOS. You'll make some changes, set and clear a password, and get an overall taste of what the BIOS setup utility does. You'll need to refer to the mainboard's user manual to get detailed instructions on how to set all parameters specified in the system BIOS.

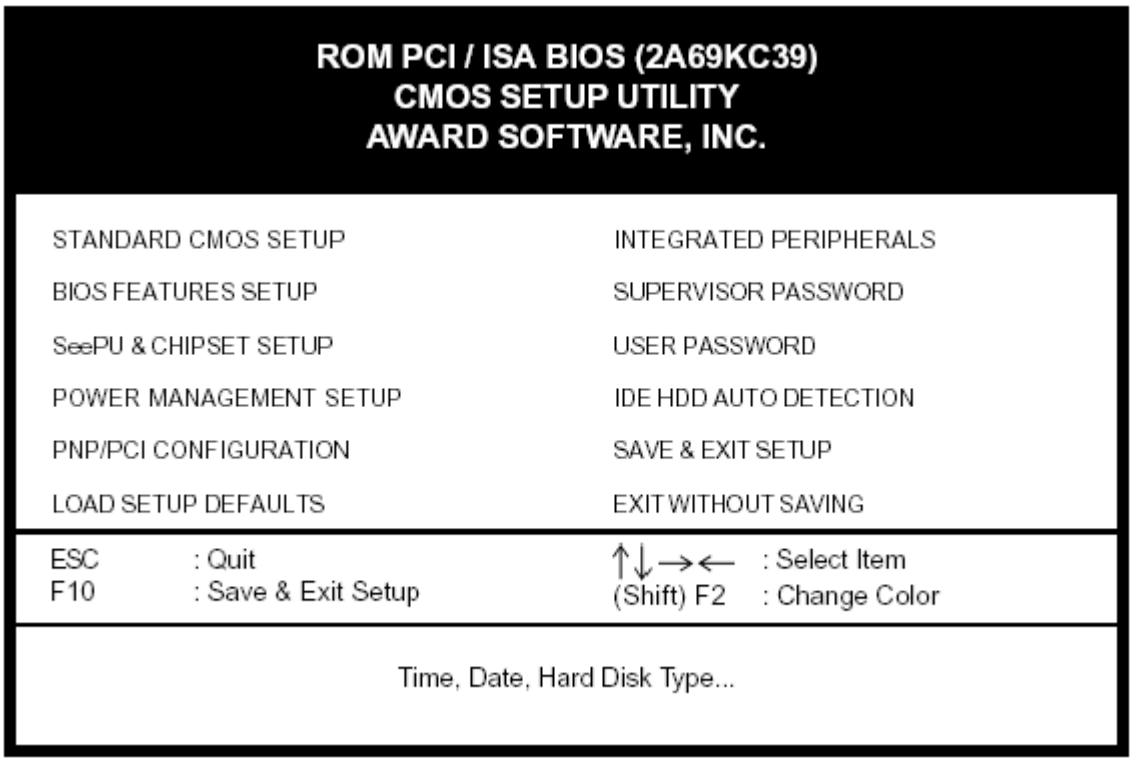


Figure 47. This is a sample primary CMOS Setup Utility. There are various manufacturers of BIOS chips. Award Software, Inc. makes this one. It will have a different look and feel than other BIOS chips. However, all BIOS chips have the same basic features. Again… To determine the full capabilities of the BIOS chip, you'll need to study the mainboard's user manual.

Here are some of the basic features you'll need to know to setup your BIOS:

Standard CMOS Setup

Date/Time
Set the date and time. Do not skip this function as all of your timed events such as power management, saving files, etc. are based on this timer.

Hard Disk Setup (Primary/Secondary; Master/Slave)
This category identifies up to four IDE hard disk drives that have been installed in the computer. This section does not show information on other IDE devices such as CD-ROM drives or other hard drive types such as SCSI drives.

Type (Auto/User/None): Use the fields under the Type column to determine the method you will use to configure the IDE devices. If you choose Auto, BIOS will automatically detect and make optimal settings for most IDE hard drives. The mainboard manufacturer recommends that you choose Auto for all drives.

Floppy Disk Drives
Choose the memory capacity and disk size that corresponds with that of your floppy disk drive(s).

BIOS Features Setup

Boot Sequence
This option sets the sequence of drives BIOS attempts to boot from after POST completes. BIOS will search these drives for an operating system.

PNP/PCI Configuration

PNP OS Installed
If you want to install a PNP compatible OS (such as Windows 95, 98, 2000, XP) set to Yes.

Supervisor Password

There are four different variables that control password settings. The first two are located under the Security Option function in BIOS Features Setup Menu. When the Security Option function is set to Setup, a password is required to enter BIOS and change BIOS settings. When the Security Option function is set to System, a password is required to enter both BIOS and the computer's operating system found on the boot drive.

The third and fourth variables are user password and supervisor password selected in BIOS. The main purpose of separating user and supervisor is to allow only the supervisor to have control over the settings in BIOS. The user, on the other hand, is only allowed to access the computer's operating system and change the user password in BIOS. Note that when there is no supervisor password set, the user password controls access to all BIOS settings. Not necessarily a good idea.

Integrated Peripherals

On-Chip USB
Some mainboards require you enable the USB ports in the BIOS before they can be used. You'll need to do this regardless of the operating systems settings.

Load Setup Defaults

Load Setup Defaults loads the default system values directly from the CMOS Setup Utility menu. These are the factory default settings and are a good place to start if you've made a mess of things while tweaking the BIOS. If the stored record created by the setup program becomes corrupted and therefore unusable, these defaults will be loaded automatically when you turn on the computer.

1.√ Study the Sample BIOS Setup Guide for detailed instructions.

2.√ Reboot the PC and enter the BIOS Setup Utility.

3.√ Set the PC for the Current Date and Time.

4.√ Set all the Hard Disk types to Auto.

5.√ Set Floppy Drive A to 1.44 3.5 in and Floppy Drive B to None.

6.√ Set the Boot Sequence to A, CDROM, C

7.√ Set the BIOS for a Plug and Play operating system.

8.√ Set the Supervisor Password to “password”

9.√ If applicable, Enable the On-Chip USB

( ) Supervisor Check

10.√ Reset the BIOS by loading the setup defaults.

11.√ Save the BIOS settings and exit the CMOS Setup Utility.

12.√ Reboot the computer and enter the BIOS Setup Utility using the supervisor password.

13.√ Refer to the mainboard’s user manual to reset the passwords with the jumpers or switches on the mainboard.

14.√ Reboot the PC to verify the password to the BIOS Setup Utility has been reset.

( ) Supervisor Check