PC Hardware
Chapter 2Labs
CPU Identification And Installation

Objective

The objective of this lab is to enable you to identify the various central processing units (CPUs), or microprocessors, and their corresponding mounting technologies from different generations of personal computers. After completing this lab exercise, you will be able to:

- Identify the various generations of CPUs, or microprocessors, used in PCs.
- Identify the various generations of CPU mounting technology used in PCs.

Lab Setup & Safety Tips

- Arrange the CPUs and the matching mounting technology, labeling each so that other students can inspect them.
- Always unplug the power cord and properly ground yourself before touching any component inside a computer.

ACTIVITY

Viewing the instructor's display

1. Record the speed and voltage(s) of each CPU provided by your instructor's display.

Figure 3-10 shows CPU socket design.

8088	
80386	
80486	
Pentium	
Pentium Pro	
Pentium II	
Pentium III	
Celeron	
AMD K-5	
AMD K-6	
Atblon	
Duron	
Other	
Other	

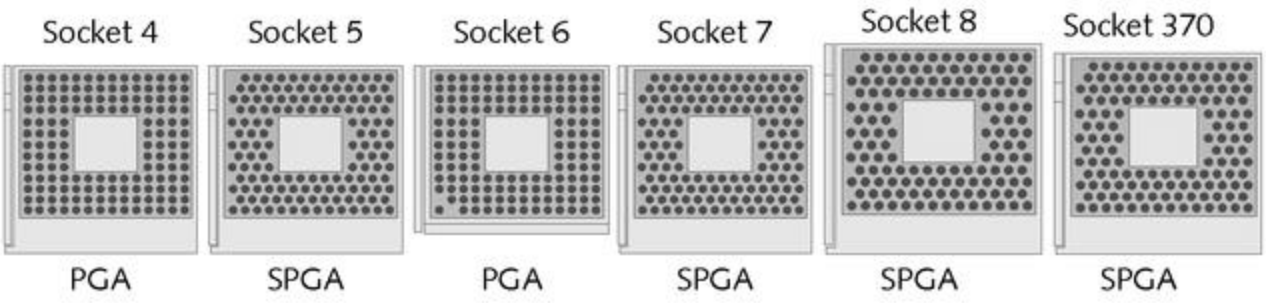


Figure 3-10 CPU sockets use either a PGA or SPGA design; rows of pins are arranged on the socket either in even rows (PGA) or staggered (SPGA)

2. In Table 3—3, note the mounting technology associated with the respective CPUs; also note the characteristics of the mounting technology.

Table 3-3 CPU sockets and slots

Connector Name	Used by CPU	Number of Pins	Voltage
Socket 4	Classic Pentium 60/66	273 pins 21 × 21 PGA grid	5 V
Socket 5	Classic Pentium 75/90/100/120	320 pins 37 × 37 SPGA grid	3.3 V
Socket 6	Not used	235 pins 19 × 19 PGA grid	3.3 V
Socket 7	Pentium MMX, Fast Classic Pentium, AMD K5, AMD K6, Cyrix M	321 pins 37 × 37 SPGA grid	2.5 V to 3.3 V
Super Socket 7	AMD K6-2, AMD K6-III	321 pins 37 × 37 SPGA grid	2.5 V to 3.3 V
Socket 8	Pentium Pro	387 pins 24 × 26 SPGA grid	3.3 V
Socket 370 or PGA370 Socket	Pentium III FC-PGA, Celeron PPGA, Cyrix III	370 pins SPGA grid	1.5 V or 2 V
Slot 1 or SC242	Pentium II, Pentium III	242 pins in 2 rows Rectangular shape	2.8 V and 3.3 V
Slot A	AMD Athlon	242 pins in 2 rows Rectangular shape	1.3 V to 2.05 V
Slot 2 or SC330	Pentium II Xeon, Pentium III Xeon	330 pins in 2 rows Rectangular shape	1.5 V to 3.5 V

Removing your workstation's CPU

1. Power off your lab workstation.
2. Unplug the system unit's power cord.
3. Verify that you are properly grounded.
4. Remove the case from your lab workstation, as shown in Figure 3-3.

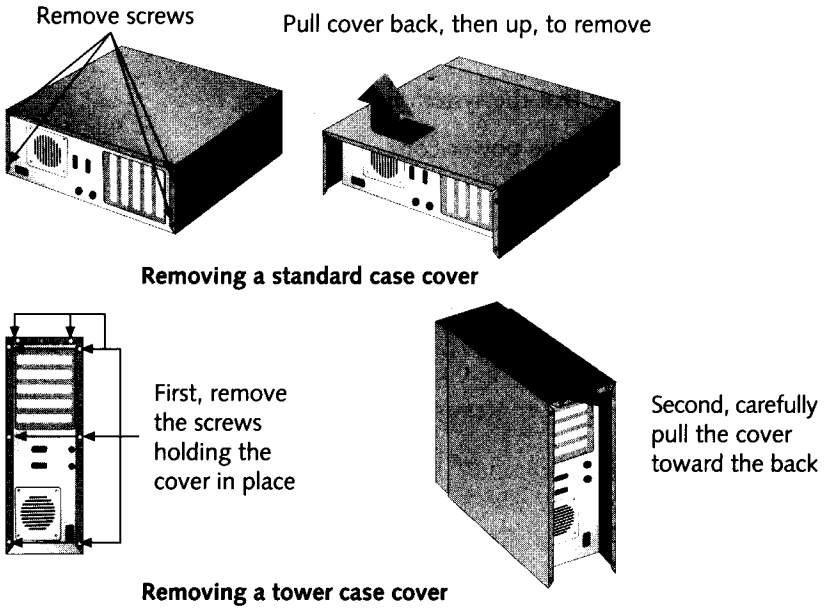


Figure 3-3 Removing the cover

5. Locate the CPU.
6. If the computer's heat sink must be removed, release the heat sink from the top of the CPU (if the heat sink doesn't come off with ease, leave it on top of the CPU).
7. (Slot architecture) Depress the release levers located at the top, on either side of the CPU.
8. (Slot architecture) Gently pull straight up on the CPU.
9. (Socket architecture) Release the ZIF lever.
10. (Socket architecture) Note how the CPU is currently installed. This will be important when you try to reinstall the CPU. Specifically note the orientation of the writing on the CPU.
11. (Socket architecture) Use the chip-pulling tool to remove your CPU. *Warning:* When removing your CPU, pull evenly straight up on the CPU; do not bend it from side to side.
12. Stand clear of the case, and plug in the power cord.
13. Power on the PC.

Reinstalling your workstation's CPU

1. Power off the workstation.
2. Remember which direction the CPU should be facing, and gently slide it back into the correct position.

3. Don't force the CPU. (Socket architecture) If it is not moving into place with ease, check for bent pins on the bottom of the CPU.

4. (Socket architecture) Lock the CPU into position using the ZIF lever.

5. (Slot architecture) Make sure that both latches on either sides of the slot have been locked back into position.

6. If necessary replace the heat sink on top of the CPU.

7. Test the installation before replacing the case.

8. Stand clear of the case, and plug in the power cord.

9. Power on the PC and verify that the system boots properly

10. Power off the PC and unplug the power cord.

11. Replace the case.

12. Plug in the system unit.

13. Power on the system unit.

14. Power off the PC.

Lab Notes:
CPU form factors – Intel currently has five form factors used to house its processors:

- SEP (Single Edge Processor) – The processor is not completely covered by the black plastic housing, making the circuit board visible at the bottom of the housing. The first Celeron processors used the SEP form factor in Slot 1.
- SECC (Single Edge Contact Cartridge) – The processor is completely covered with a black plastic housing, and a heat sink and fan are attached to the housing. You can't see the circuit board or edge connectors in an SECC form factor. The P II and P III use an SECC form factor in Slot 1.
- SECC2 (Single Edge Contact Cartridge, version 2) – The processor SECC2 has a heat sink and fan similar to the SECC, but the edge connector on the processor circuit board is visible at the bottom of the housing. P II and P III use the SECC2 form factor.
- PPGA (Plastic Pin Grid Array) – The processor is housed in a square box designed to fit flat into Socket 370. Pins are on the underside of the flat housing, and heat sinks or fans can be attached to the top of the housing using a thermal plate or heat spreader. Current Celeron Processors use this form factor.
- FC-PGA (Flip Chip Pin Grid Array) – This form factor looks like the PPGA form factor and uses Socket 370. Heat sinks or fans can be attached directly to the top of the package. The P III uses FC-PGA as one of its two from factors.

How do I control the CPU settings? – Most CPU's are configured using jumper blocks or DIP switches located directly on the system board
Do I always need a heat sink? – Any CPU, starting with a 486 and up requires a heat sink to maintain proper CPU temperature.
What is the current voltage for my CPU? – CPU voltage varies depending on the make, model and generation of the CPU. Consult both the documentation for your CPU and the Following tables:

Table 3-4 The Intel Pentium family of CPUs

Processor	Current Processor Speeds (MHz)	Primary L1 Cache	Secondary L2 Cache	System Bus Speeds (MHz)
Classic Pentium	60, 66, 75, 90, 100, 120, 133, 150, 166, 200	16K	None	66
Pentium MMX	166, 200, 233	32K	None	66
Pentium Pro	150, 166, 180, 200	16K	256K, 512K, or 1 MB	60, 66
Pentium II	233, 266, 300, 333, 350, 366, 400, 450	32K	256K, 512K	66, 100

Table 3-5 Cyrix and AMD competitors of the advanced Pentiums

Processor	Current Clock Speeds (MHz)	Compares to	System Bus Speed (MHz)	Socket or Slot
Cyrix M II	300, 333, 350	Pentium II, Celeron	66, 75, 83, 95, 100	Socket 7
Cyrix III	433, 466, 500, 533	Celeron, Pentium III	66, 100, 133	Socket 370
AMD-K6-2	166, 200, 266, 300, 333, 350, 366, 380, 400, 450, 475, 500, 533, 550	Pentium II, Celeron	66, 95, 100	Socket 7 or Super Socket 7
AMD-K6-III	350, 366, 380, 400, 433, 450	Pentium II	100	Super Socket 7
AMD Athlon	600, 650, 700, 750, 800, 850, 900, 950,	Pentium III	200	Slot A

Review Questions

Circle True or False.

1. All CPUs are the same size. True / False
2. CPU voltage varies depending on the generation and brand name of the CPU. True / False
3. Chip extractors were designed to remove the heat sink from the CPU. True / False
4. ZIF sockets are used to connect the memory to the system board. True / False
5. Which is faster: the 8088 processor or the 486 processor?

_____

_____

_____

_____

_____

6. You are currently employed as a PC support technician at the Heavenly Palace Factory Your supervisor wants to upgrade his 486 computer to a Pentium III. He has asked you to tell him the parts that he will need to purchase for this upgrade. List below the minimum parts your supervisor needs to complete this upgrade. *(Reminder:* Don't forget that many of the newer system boards don't support the same type of memory as the older 486 computers.)

7. You are at your local computer store and are considering upgrading your home PC to a Pentium Pro. Will you be able to use the CPU cooling fan from the 486 you have at home if you purchase the Pentium Pro chip?

8. What types of CPUs do the following architectures support?

Slot 1	
Slot 2	
Slot A	
Socket 8	
Socket 7	
Super Socket 7	
Socket 370	

9. What CPU form factor did the first Celeron processors use?

Configuring System Board Frequencies

Objective

The objective of this lab is to provide hands-on experience configuring system board frequencies. After completing this lab exercise, you will be able to:

- Describe the relationship between a system board's multiplier and the system board's overall performance.
- Describe how to configure the CPU frequency
- Describe how to configure a system board multiplier.
- Use manufacturer documentation to calculate the appropriate CPU frequency
- Use manufacturer documentation to calculate the appropriate multiplier.
- Identify jumper blocks which control the CPU frequency and system board multiplier.

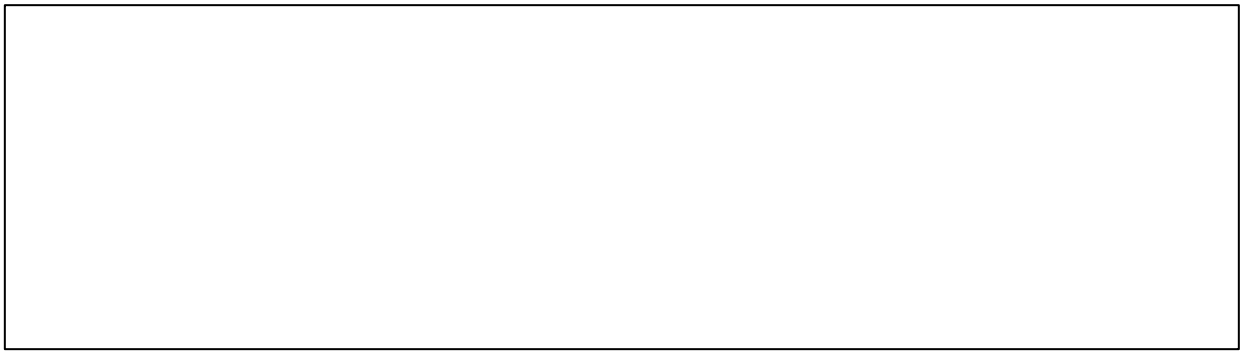
Lab Setup & Safety Tips

- Always unplug the power cord and properly ground yourself before touching any component inside a computer.

Activity

Locating jumper banks

1. Power off your PC.
2. Verify that you are properly grounded.
3. Unplug the system unit's power cord.
4. Remove the top of the case. Your jumper group may resemble that which is shown in Figure 3-4.
5. In the space provided, make a diagram of your system board, depicting the location of each jumper block found. Document your design by recording the jumper number and the function of the jumper block.



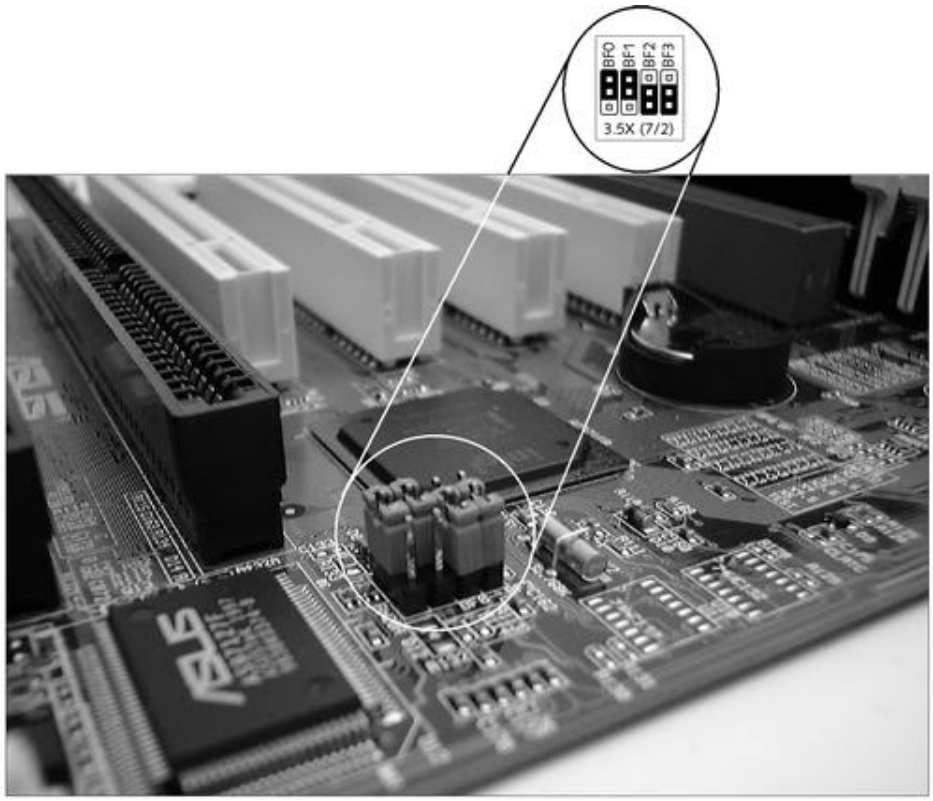


Figure 3-28 Jumper group that controls the CPU core-to-bus frequency. Compare this photo to the diagram in Figure 3-27. The jumpers are set for the multiplier = 3.5.

Understanding bus and CPU frequency

❶ Begin with the speed of your CPU
❷ The CPU speed determines the ratio (multiplier)
❸ The CPU speed also determines the bus frequency

Set the jumpers by the Internal speed of your processor as follows:

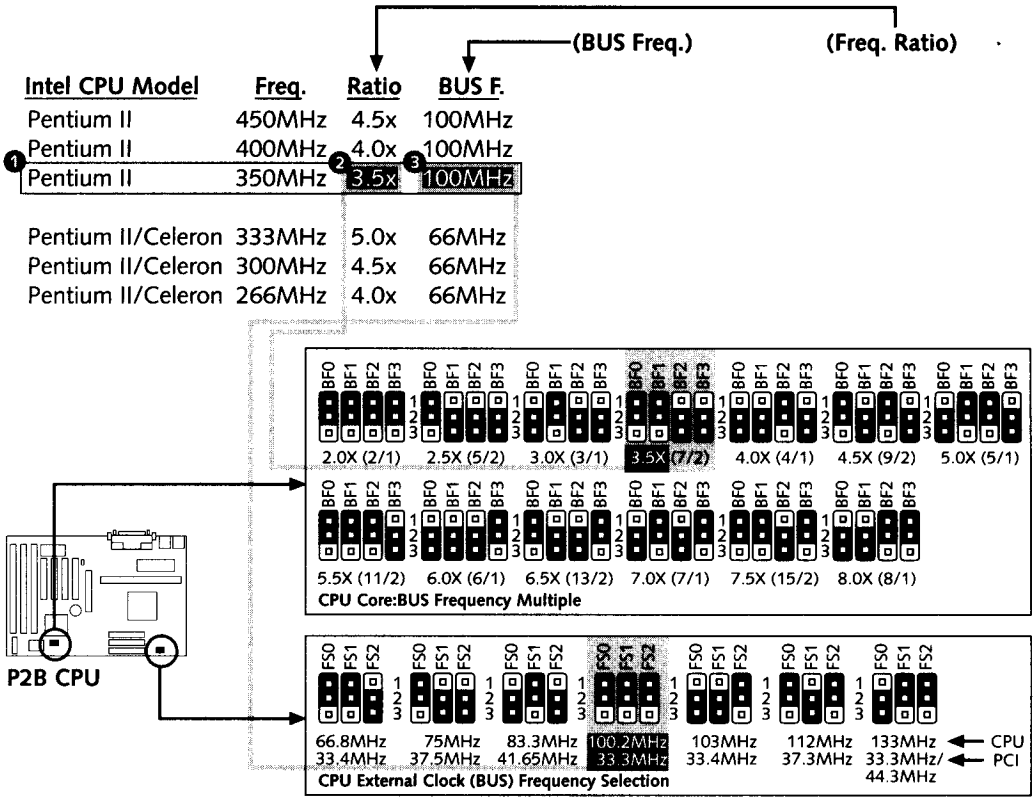


Figure 3-5 Based on the advertised speed of your CPU, select the multiplier and the bus frequency from the table, which then determines the jumper settings to use

(Remember that the term "speed" is often used, rather than "frequency", when referring to a computer's CPU or bus. Speed seems to be easier for people to understand.)

1. Use Figure 3-5 to determine the appropriate multiplier for the following processors:

Pentium II 450MHz Multiplier:	
Pentium II 400MHz Multiplier:	
Pentium II/Celeron 333MHz Multiplier:	
Pentium II/Celeron 266MHz Multiplier:	

Lab Notes:
Overclocking – The term overclocking refers to running a system board at a frequency higher then is recommended or guaranteed by the CPU or chipset manufacturer. Overclocking a computer can cause damage to the CPU and system board components.
Multiplier – The factory by which the bus speed or frequency is multiplied to get the CPU clock speed. Refer to Table 3-6 for more information.

Review Questions

Circle True or False.

1. The term CPU frequency and CPU speed are interchangeable. True *I* False
2. Two common system board bus speeds are 66 MHz and 100 MHz. True *I* False
3. The system board multiplier is really a ratio. True *I* False
4. Studies have shown that the smaller the multiplier number, the slower the system will perform. True *I* False
5. To what action does the term overclocking refer, and could it damage your workstation?

6. How will a workstation's overall performance be affected if its multiplier is configured with a larger number than it should be?

Bus Identification And PCI Expansion Card Installation

Objective

The objective of this lab is to provide a hands-on opportunity to view and identify the different types of PC expansion buses. After completing this lab exercise, you will be able to:

- Identify the various expansion buses used in PCs.
- Describe the various components of the respective expansion buses.
- Install a PCI expansion card.

Lab Setup & Safety Tips

- Arrange the system boards with their respective expansion buses so that students can inspect them.

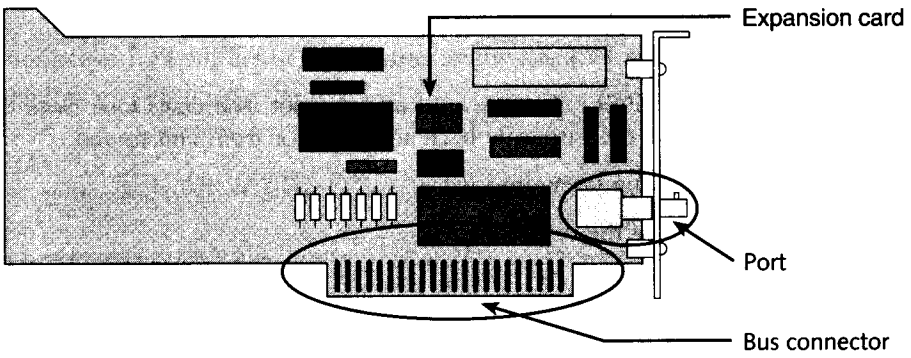
- Always unplug the power cord and properly ground yourself before touching any component inside a computer.

ACTIVITY

Getting to know expansion buses

1. Examine the bus connections in Figure 3—6, and then inspect and note the characteristics of the following architectures:

   - ISA 8-bit expansion bus
   - ISA 16-bit expansion bus
   - EISA 32-bit expansion bus
   - VLB expansion bus
   - PCI expansion bus
   - MCA expansion bus
   - AGP expansion bus



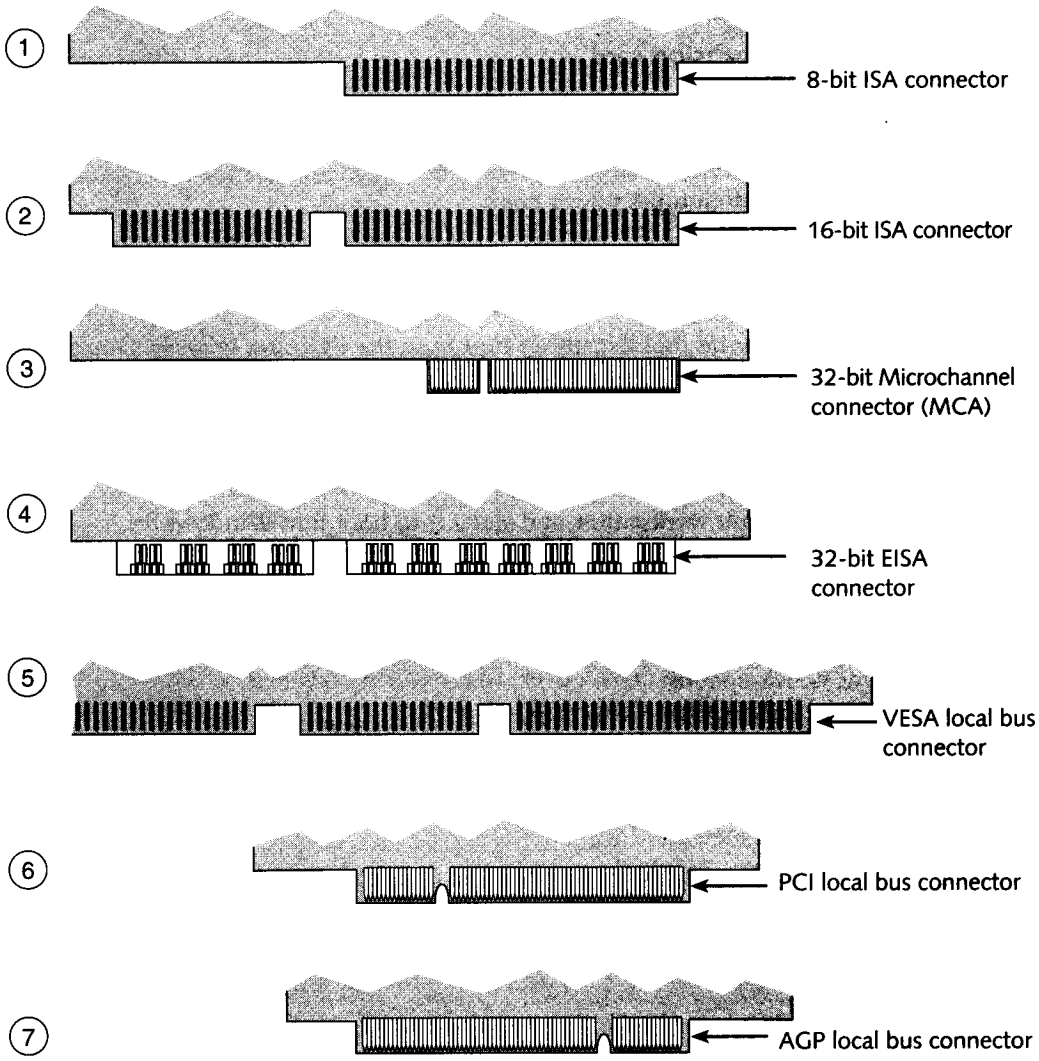


Figure 3-6 Seven bus connections on expansion cards

2. After the labels on the display are removed and then rearranged, match the labels to their corresponding expansion buses.

Installing a PCI expansion card

1. Power off your PC.
2. Verify that you are properly grounded.
3. Unplug the system unit's power cord.
4. Remove the top of the case.
5. Locate the available PCI slot where you plan to install the PCI expansion card.
6. Gently install the PCI expansion card into the slot. Warning: Don't bend the card from side to side; move the card only back and forth, or from end to end.

7. Screw the mounting screw into place.
8. Replace the top of the case.
9. Plug in the system unit.
10. Power on the lab workstation and allow it to boot into Windows 9x.
11. If prompted to install a driver for the PCI expansion, click the Cancel button.

Removing the PCI expansion card

1. Power off your PC.
2. Verify that you are properly grounded.
3. Unplug the system unit's power cord.
4. Remove the top of the case.
5. Unscrew the mounting screw from the frame.
6. Gently remove the PCI expansion card from the PCI slot. Warning: Don't bend the card from side to side; move the card only back and forth, or from end to end.
7. Replace the top of the case.
8. Plug in the system unit.
9. Power on the lab workstation, and allow it to boot into Windows 9x.

Lab Note:
What is bus speed? – Bus speed is the speed or frequency at which the data on the system board is moving.
Data Path – The data path is the number of bits of data transmitted simultaneously on a bus. See table 3-7 for more information.

Table 3-7 Buses listed by throughput in MB/sec (megabytes per second) or Mbps (megabits per second)

Bus	Bus Type	Data Path in Bits	Address Lines	Bus Speed in MHz	Throughput
Memory bus	Local	64	32	66, 75, 100 ...	Up to 528 MB/sec
AGP	Local video	32	NA	66, 75, 100 ...	Up to 1.07 GB/sec
PCI	Local I/O	32	32	33, 66	Up to 264 MB/sec
VESA or VL Bus	Local video or expansion	32	32	Up to 33	Up to 250 MB/sec

Review Questions

Circle True or False.

1. ISA is always faster than PCI. True / False

2. Microchannel is a 64-bit bus. True / False

3. Microchannel and EISA can use the same expansion slot. True / False

4. An ISA expansion card can be either 8-bit or 16-bit. True / False

5. John wants to add a sound card to his 386. Before purchasing the sound card, he is going to look at his system board to find out what type he should purchase. Below, describe to John how to tell if he has an 8-bit or a 16-bit ISA expansion slot on his system board.

6. What is one advantage of using PCI instead of ISA?