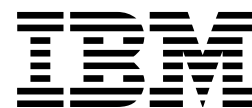




IBM 7588 Industrial Computer Installation, Operation, and Hardware Maintenance



IBM 7588 Industrial Computer Installation, Operation, and Hardware Maintenance

Important:

Before using your system, be sure to read the IBM License Agreement for Machine Code on page iii.

Before using this information and the product it supports, read the general information in Appendix A, "Notices." Be sure to read the information in "Safety Information" on page A-10, and if you are going to handle electronic components, you must also read "Handling Electrostatic-Discharge-Sensitive Devices" on page A-15.

First Edition (November 1997)

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2. Where applicable, before service is provided —
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 - b. Secure all programs, data, and funds contained in a Machine, and
 - c. Inform IBM or your reseller of changes in a Machine's location.

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About This Book

This book contains user information and service information pertaining to the IBM 7588 Industrial Computer, the IBM 586 or 586E Single-Board Computer, and the Analog Video PCI Mezzanine Card (PMC) Form Factor Card.

The following terms are used throughout this book:

- 7588 Industrial Computer is shortened to ***system unit***.
- IBM 586 or 586E Single-Board Computer is shortened to ***processor card***.
- Analog Video PCI Mezzanine Card (PMC) Form Factor Card is shortened to ***PMC video card***.

This book is divided into the following parts:

Part 1, 7588 Industrial Computer contains an introduction to the 7588 Industrial Computer, and explains how to install the computer system, operate it, and solve problems.

Part 2, Technical Descriptions describes the processor card and PMC video card. The processor card information describes the functions, features, options, and connectors on the processor card. It also contains information on upgrading the card.

The PMC video card information describes the features, functions, and connectors of the PMC video card. It also contains information on upgrading the PMC video card.

Part 3, Hardware Maintenance and Service contains service-oriented information and a parts catalog that assist in identifying and replacing parts that have failed.

Appendixes contain the special notices and supplemental information that is generally not required by the user or service person. Much of the information in the Appendixes is useful in planning computer system configuration and physical site preparation.

Related Publications

You should have the following related publications:

- The installation instructions and other documentation for devices attached to your computer.
- The manual that contains information about your operating system.
- The manuals that contain information about application programs on your computer.

Part 1. 7588 Industrial Computer

Part 1 contains an introduction to the 7588 Industrial Computer, and explains how to install it, operate it, and solve problems. Unless otherwise indicated, the information applies to all models.

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Chapter 1. Overview of the 7588 Industrial Computer

The IBM 7588 Industrial Computer is designed for an extended product life in an environment of constantly advancing technology. It is engineered for flexibility, growth, and upgradability. The chassis and covers can be used with different configurations of the industrial computer. The following are some of the features of the computer:

- It accommodates several different microprocessors
- It houses a variety of standard-width drives; it has space for two hard disk drives, a diskette drive, and a full-size 5.25-inch device, such as a CD-ROM drive
- It has data-security and power-management features

The 7588 Industrial Computer has two configurations, Model 001 and Model 101. Each configuration has 11 full-size and one half-size expansion slots for adapters and one slot for the primary processor card.

- For the Model 001 (7588-001), each expansion slot has a 16-bit ISA (industry standard architecture) connector. Two of the full-size slots also have a 32-bit PCI (peripheral component interconnect) connector.

Attention: Installing more than eight ISA adapters in a single system can overload the ISA bus and cause the adapters or the system unit to fail. Before using configurations with more than eight adapters, test the configuration thoroughly.

- For the Model 101 (7588-101), six of the full-size slots have ISA connectors and eight have PCI connectors (three slots have both connectors). The half-size slot has an ISA connector only.

Note: For Model 101, the PCI connector in slot 2 is not bus-master-capable.

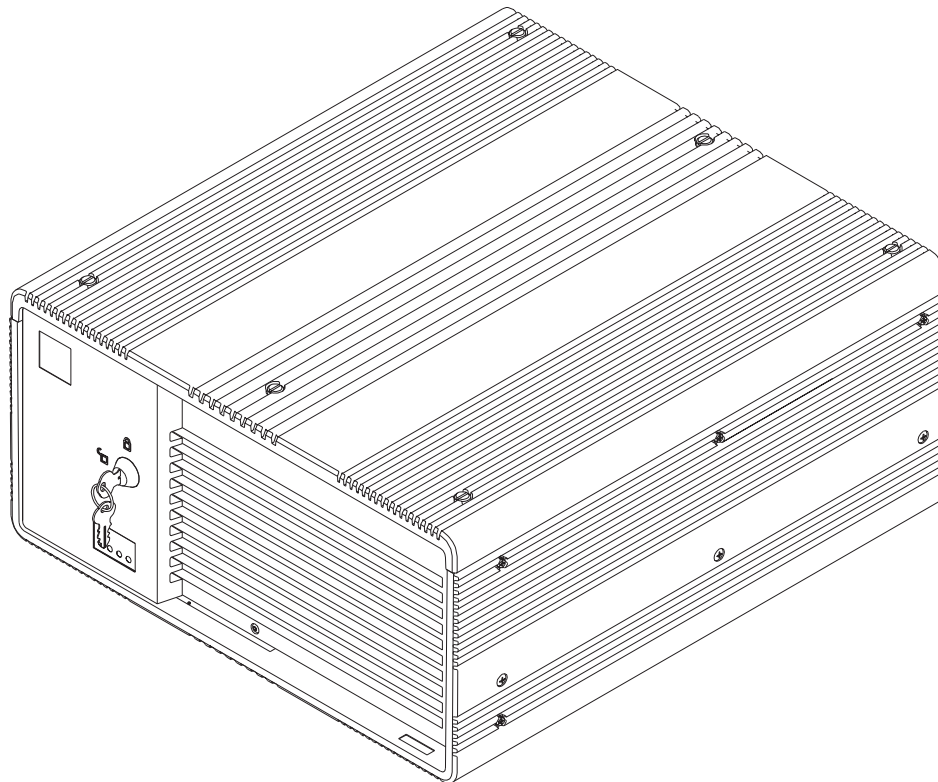


Figure 1-1. IBM 7588 Industrial Computer

General Layout of Components

Figure 1-2 and Figure 1-3 on page 1-3 show the 7588 Industrial Computer with the cover removed to show the location of the major components in the system unit. The actual options and adapters for a specific configuration may be different than the ones listed; however, the general layout is the same for all configurations,

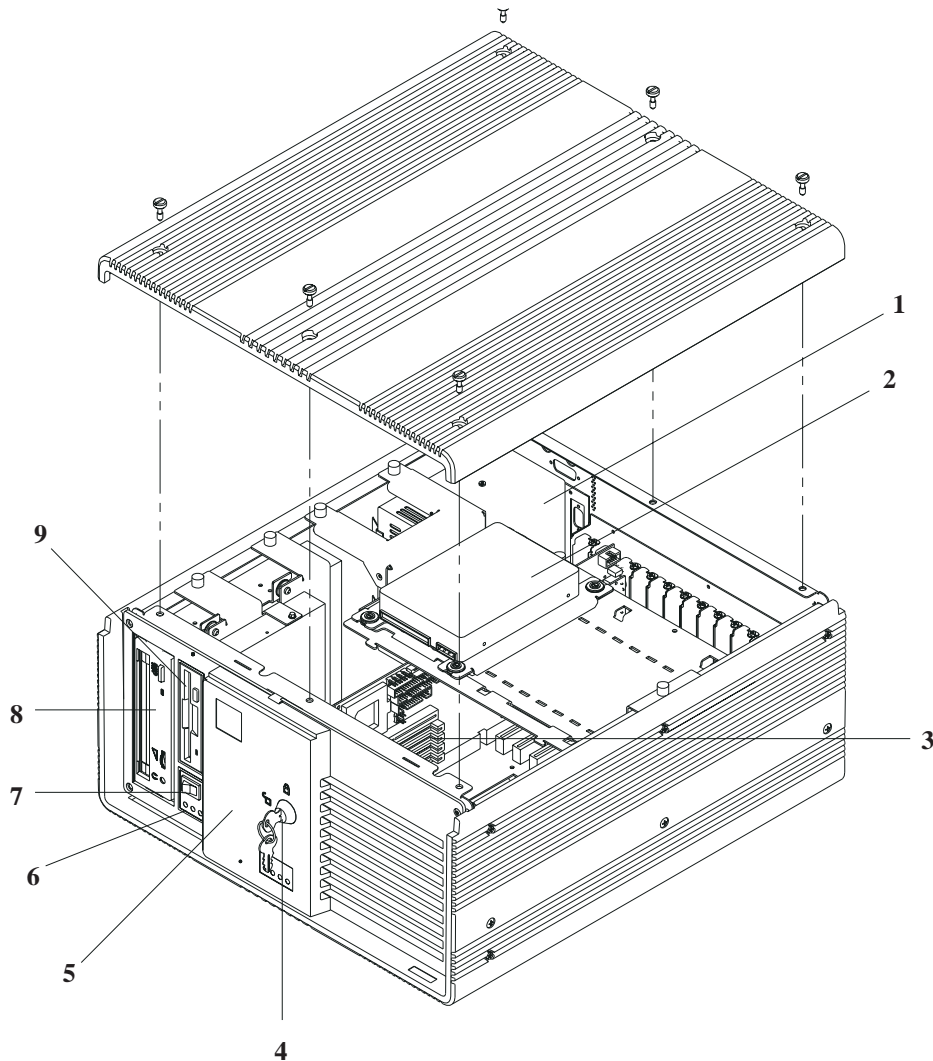


Figure 1-2. General Component Layout 1

- 1** Power supply
- 2** Hard disk drive
- 3** processor card
- 4** Key lock
- 5** Sliding door
- 6** Status light-emitting diodes (LEDs)
- 7** On/Off switch
- 8** 5.25 front access bay (optional CD-ROM drive shown)
- 9** 3.5-inch diskette drive

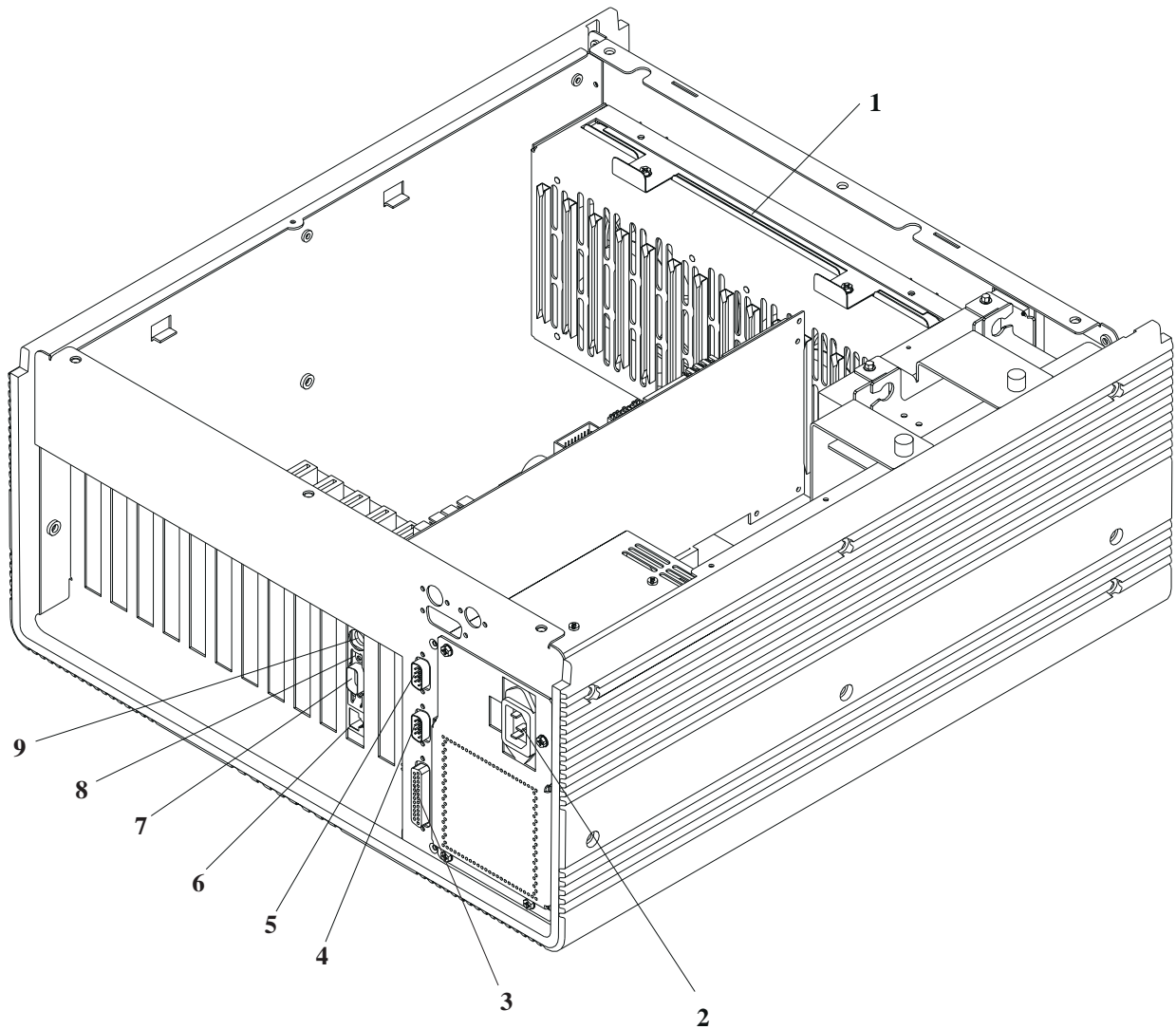


Figure 1-3. General Component Layout 2

- 1** Filter assembly
- 2** Power input connector
- 3** Parallel port connector
- 4** Serial Port B connector
- 5** Serial Port A connector
- 6** 10 BaseT/100 BaseTx Ethernet port (optional)
- 7** Video connector
- 8** Keyboard connector
- 9** Mouse connector

Specifications

The physical specifications are as follows. For more exact system-unit dimensions, see Appendix C, “7588 Industrial Computer Physical Dimensions.”

- Width: 430 mm (16.9 inches)
- Depth: 474 mm (18.7 inches)
- Height: 209 mm (8.2 inches)
- Weight: 19.2 kg (42.5 pounds)
(the actual weight depends on the installed options)

Power Supply

- 250 Watts Output—V ac input only; the voltage range is selected manually. Acceptable inputs are:
 - 100 to 125 (nominal) V ac; 50/60 Hz; 7.5 Amp (maximum)
 - 200 to 245 (nominal) V ac; 50/60 Hz; 3.25 Amp (maximum)

The following is the maximum total loading allowed for all adapters and hard disk drives installed in the system unit.

+3.3 V dc	5.0 Amps
+5 V dc	20.0 Amps
+12 V dc	4.0 Amps
–5 V dc	0.4 Amps
–12 V dc	0.4 Amps

Note: The above specifications apply to the standard, ac power supply. If you have dc power supply (it accepts dc input), refer to the manual for that power supply.

Heat Output

The estimated heat output for the system unit with a 250-Watt power supply is 350 Watts (1200 BTU/hour).

Environment

- Ambient temperature
 - Operating: 0° to 50°C (32° to 122°F)
 - Non-Operating: 0° to 60°C (32° to 140°F)
 - Shipping: –40° to 60°C (–40° to 140°F)
- Relative humidity
 - Operating: 5% to 95%
- Shock while operating
 - 30 G, 1/2 sine-wave for 3-ms duration
 - 15 G, 1/2 sine-wave for 10-ms duration
- Vibration
 - 5 to 500 Hz random at 0.67 G RMS

- IEC standard compliance

Electromagnetic compatibility:

- Power-line harmonics, flicker EN 61000-3-2 and EN 61000-3-3
- Electrostatic discharge EN 61000-4-2
- Radiated emissions EN 55022/CISPR22A
- General susceptibility EN 50082-2
- Low-voltage directive EN 60950
- Fast transients/bursts on power cables EN 61000-4-4
- Conducted immunity ENV 50141
- Radiated-electromagnetic susceptibility EN 50140
- Power-frequency magnetics-field immunity EN 61000-4-8

Chapter 2. Installing Your System Unit

This chapter provides instructions to help you set up your 7588 Industrial Computer. For complete system unit dimensions, see Appendix C, "7588 Industrial Computer Physical Dimensions."

Before You Begin

- Know the correct voltage setting for your country. If you are not sure of the voltage setting for your country, contact your place of purchase.
- Make sure you have an adequate number of properly grounded electrical outlets for your system unit, display, and printer.
- Prepare a location for your system unit that is dry and as clean as possible. Contaminants can damage the system unit.
- Leave enough space around the system unit for proper cooling and servicing. (The space needed varies depending on the type of mounting used.)
- Have this book handy in case you need additional information.
- Have blank diskettes available to create backups of the utility and startup programs.

Task 1. Unpack Your System Unit

CAUTION:

To avoid possible injury while moving or lifting the system unit, ask another person to help you.

Remove the 7588 Industrial Computer from its shipping carton, along with any other materials in the carton. Also unpack any components that will be attached externally to the system unit, for example a keyboard, display, mouse, or cables. *To prevent possible damage to adapters and internal options, do not unpack these components until you are ready to install them.*

If any items are missing, contact your place of purchase.

Task 2. Check the Voltage Range

The 7588 Industrial Computer has an automatic range-detecting power supply. There is nothing to set as long as the voltage is within the following units:

- 90 to 137
- 180 to 265

Attention:

The voltage must be between 90 and 137 volts or 180 and 265 volts. If the voltage is not within these limits, you can damage your system unit.

Task 3. Install Internal Options

Internal options are devices that are installed inside your system unit. Some internal options are installed directly onto the processor card, such as system memory, cache memory, and a PMC video card. Other internal options are installed in the drive bays and expansions slots, such as diskette drives, hard disk drives, and adapters.

Note: Some options require device drivers, refer to the instructions that came with each option to determine if a device driver is required and how to install it.

- If you do not have any options to install, go to “Task 4. Secure the System Unit.”
- If you have options to install but you want to set up and check out your system unit before installing the options, go to “Task 5. Connect the Cables.” You will have to connect the display, keyboard, and power cable, and then run the Configuration/Setup Utility. You will need to re-run the Configuration/Setup Utility after the options are installed.
- If you have options to install, install them before the system unit is mounted and the cables are attached. For instructions on installing options, use the appropriate procedures in Chapter 3, “Installing Options.”

Note: As you install the options, be sure to record any pertinent information (such as drive parameters, the memory size, and identification numbers) in Appendix B, “System Records.”

After you have installed all internal options, continue with “Task 4. Secure the System Unit”

Task 4. Secure the System Unit

Rubber feet are included with the system unit. Ensure it is secured firmly on all four padded feet, then proceed to the next step.

Task 5. Connect the Cables

Connect the system unit cables in the following order.

1. Connect all cables between the system unit and the keyboard, the mouse, the display, and any other peripheral devices.
2. Connect the power cords to the system unit, the display, and other peripheral devices.
3. Plug the power cords from the system unit, display, and other devices into properly grounded electrical outlets.
4. Continue with “Task 6. Configure the System Unit.”

Task 6. Configure the System Unit

After installing all internal options, go to “Using the Configuration/Setup Utility Program” on page 4-6 and run the Configuration/Setup Utility program. After completing the configuration, continue with “Task 7. Perform the Check-Out Procedure.”

Task 7. Perform the Check-Out Procedure

Perform the check-out procedure at least one time to determine whether the system unit is functioning properly and to familiarize yourself with the power-up sequence and system messages that occur during power up.

the system displays a message to run the Configuration/Setup utility. To run this utility, go to “Using the Configuration/Setup Utility Program” on page 4-6, then return here to complete the system-unit check-out.

1. Turn on your display and adjust the brightness and contrast controls to the approximate midpoint. (You can readjust these controls for personal viewing comfort later.)
2. Turn on the system unit.

The power-on indicator light comes on.

3. Watch the display screen and listen for a single beep.

A series of coded messages should appear on the screen. These messages are part of the normal power-on process, which occurs each time you turn on the system unit. The following is a typical power-on sequence.

- a. A blinking cursor appears on the screen.
- b. After a short time, an icon, depicting a system-unit screen, appears in the upper-right corner,



and the memory-test message appears in the upper-left corner.

- c. The system unit starts the power-on self test (POST).
4. After the system completes POST, it displays the amount of available memory and indicates the status of the self tests.
 - If POST is completed successfully, the system sounds a single beep. Continue with “Task 8. Finish the Installation.”
 - If an error is detected, the system displays the error code, and either sounds multiple beeps or does not beep at all (depending on the type of error). Record the error message and number of beeps; then go to “Troubleshooting Charts” on page 5-3 to resolve the problem. After correcting the problem, return to the start of this procedure.

Task 8. Finish the Installation

Your system unit hardware is now set up, and you are ready to finish the installation by installing the required software and completing the paperwork. The final steps are different for various configurations and applications, but you can use the following checklist as a guide.

- **Install the operating system.**
Refer to the documentation and instructions supplied with your operating system.
- **Install your application programs.**
Refer to the documentation and instructions supplied with your application programs.
- **Make backup copies.**
It is very important that you keep a backup copy of the system partition and reference diskette.
- **Record your identification numbers.**
Your system unit has important identification information that you will need if you have it serviced or if you need to order duplicate keys (for system units with keylocks). You should record this information in Appendix B, "System Records" or in another safe place.
- **Complete your registration or warranty forms.**
Complete and return the registration cards that came with your system unit.

Chapter 3. Installing Options

This chapter provides instructions on installing options in your system unit. Use the following considerations when installing options.

Install all of the options at one time to prevent having to repeatedly install and remove the system-unit cover.

Install the processor card options first. Installing these options first will prevent you from having to remove other options to access the processor card.

Use the figures in "General Layout of Components" on page 1-2 to locate components.

Before performing any installation procedures, read the information in "Safety Information" on page A-10 and in "Handling Electrostatic-Discharge-Sensitive Devices" on page A-15.

CAUTION:

- **Always remove the source of power to the system unit before starting any removal or replacement procedures. The electrical power and any backup-power source should be unplugged from the wall outlet or disconnected from its source. To make sure power is removed properly, start each removal or replacement procedure with "Turning Off the Power and Disconnecting Cables."**
- **Depending on the options installed, the system unit could weigh more than one person can lift comfortably. Do not attempt to lift the system unit by yourself. Get another person to help you.**

ATTENTION:

Whenever handling electronic components, use precautions to prevent damage from electrostatic discharge. Refer to "Handling Electrostatic-Discharge-Sensitive Devices" on page A-15 for a list of those precautions.

Turning Off the Power and Disconnecting Cables

Use the following procedure to power-down the system unit and disconnect all cables before beginning any removal or replacement procedure. If it is necessary to remove the system unit from its mounting place, use this procedure before removing the system unit.

1. Remove any removable media, such as diskettes, optical discs, or tapes, from the system unit.
2. Turn off the system unit and any attached devices.
3. Tag all cables connected to the system unit, or record their respective connectors, to prevent confusing them when they are unplugged.
4. If an internal modem, disconnect the telephone line from the wall outlet and then from the system unit (the line can cause an electrical shock if its number is called).
5. Unplug or disconnect all electrical power cords and any backup-power source. Where applicable, unplug all cables at the outlet first, then at the device.
6. Disconnect all other cables from the system unit.

When reassembling the system unit, reverse these steps.

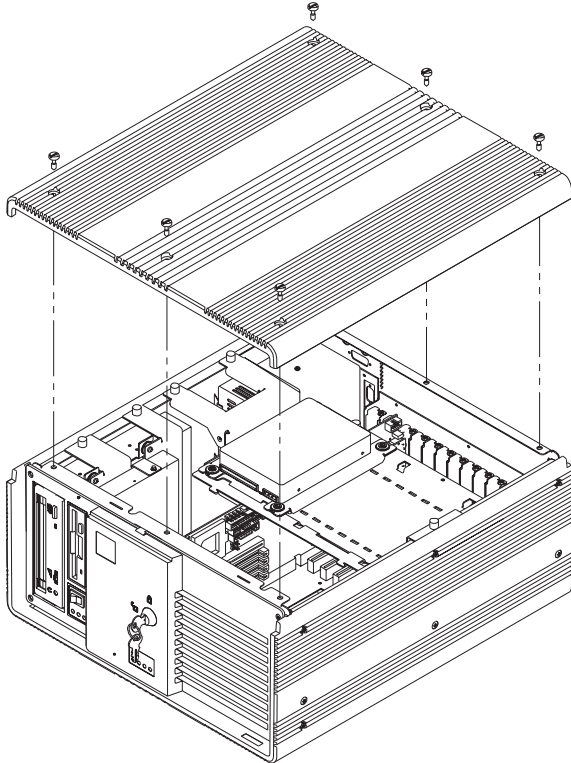
Removing the Cover

In most cases, you do not need to remove the system unit from its mounting to service it. However, if you must, do so before removing the covers.

CAUTION:

The system unit weighs over 40 pounds (19 kilograms). Do not try to hold the system unit while removing the screws; have another person hold it as you remove the screws.

To remove the cover, loosen the six cover screws and lift off the cover, as shown.

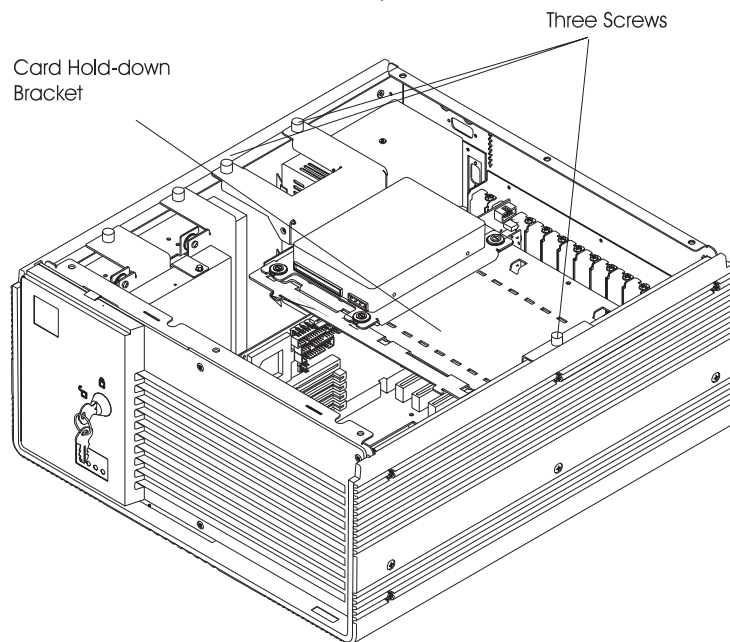


Installing Processor Card Options

The 7588 Industrial Computer uses a single-board computer as the primary processor and system logic (the processor card is described in Chapter 6, “IBM 586 or 586E Single-Board Computer”).

If you have options to install on the processor card (such as memory and the PMC video card), continue with the following steps. Otherwise, go to “Installing the Mounting Options” on page 3-12.

1. Remove the cover (refer to page 3-2).
2. Disconnect the signal and power cables from all hard drives (the hard drives do not need to be removed from the card hold-down bracket).
3. Loosen the three thumb screws; then remove the card hold-down bracket and hard drives.



4. Record the position of any adapters that interfere with disconnecting cables from the processor card, and remove those adapters (see “Removing and Replacing Feature Cards” on page 8-31).
5. Remove the screw that secures the retaining bracket for the processor card to the chassis.
6. Disconnect all cables from the processor card.
7. Pull the cables away from the processor card and carefully lift the card out of the system unit. (You might have to rock the processor card slightly from front to rear to loosen it from the connector.)
8. Place the processor card on a flat, clean, static-free surface, with the component-side facing up and the backplane connector toward you. Then continue with “Installing Memory.”

Installing Memory

Adding system memory to your system increases system performance by providing more memory for programs to use. If you have memory to install, continue with the following. Otherwise, go to “Installing a PMC Card” on page 3-7.

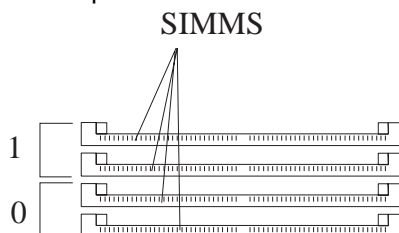
The processor card has four memory connectors that are grouped in two banks. Each connector supports 8-MB, 16-MB, or 32-MB SIMMs that are 60-nanosecond, EDO or fast-page memory.

Memory must be installed in matched pairs (same size, speed, and type). You can increase total system memory by installing additional SIMMs, or by replacing SIMMs with larger capacity SIMMs. The system detects the additional memory automatically as part of POST, and will display a prompt for you to run configuration.

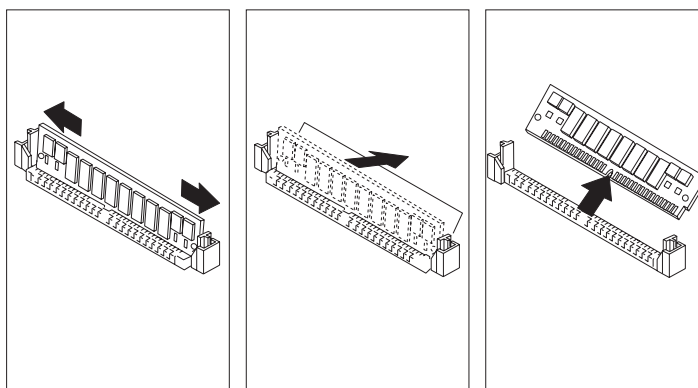
Notes:

1. SIMMs can have a maximum height of 1.0 inch (25.4 mm).
2. Install only parity SIMMs.

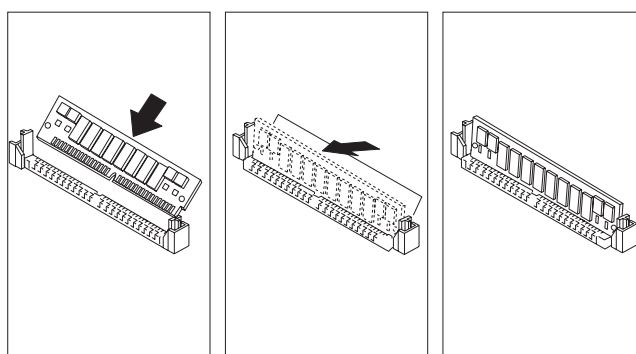
The following figure shows the SIMM banks on the processor card. Memory is installed in matched pairs. The first pair is installed in bank 0; the next pair is installed in bank 1.



1. Place the processor card on a clean, static free work area.
2. If you are not replacing SIMMs, go to step 7. If you are replacing SIMMs with larger capacity modules, continue with the next step.
3. Starting with the top-most populated SIMM connector, push outward against the retaining clips at both ends of the SIMM connector.



4. Rotate the SIMM away from the connector until it is released from the clips.
5. Lift the SIMM out of the connector.
6. Repeat these steps for each SIMM you are removing (they must be replaced in pairs).
7. Align the center key of the new SIMM with the connector (the notch in the SIMM should be to the right). Then insert the SIMM into the connector. The SIMM will seat at an angle.



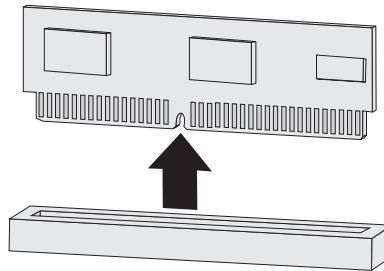
8. Rotate the top of the SIMM until it snaps into the retaining clips, as shown in the previous figure.
9. Repeat these steps for each SIMM. (Remember to install them in matched pairs.)
10. Record the configuration changes in Appendix B, "System Records."
11. Continue with "Installing Cache Memory."

Installing Cache Memory

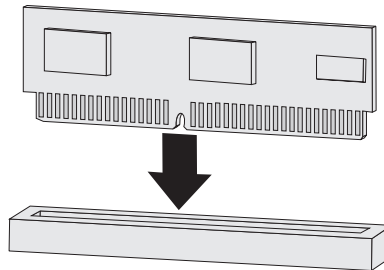
The cache memory module is located on the processor card. Adding cache memory can increase the performance of your system unit. If you are installing a cache memory module, continue with the following. If you are installing a PMC card, go to “Installing a PMC Card” on page 3-7. Otherwise, go to “Reinstalling the Processor Card” on page 3-7.

Two cache memory sizes are available, 256 KB and 512 KB.

1. Touch the static-protective bag in which the modules were packaged to any unpainted metal surface on the system unit. Then remove the memory modules from the package.
2. Gently pull the top edge of the cache memory module up and out of the connector.



3. Position the new module so the notch on the bottom edge aligns with the notch in the connector.
4. Insert the cache memory module into the connector and push down evenly. Make sure the module is fully seated in the connector.

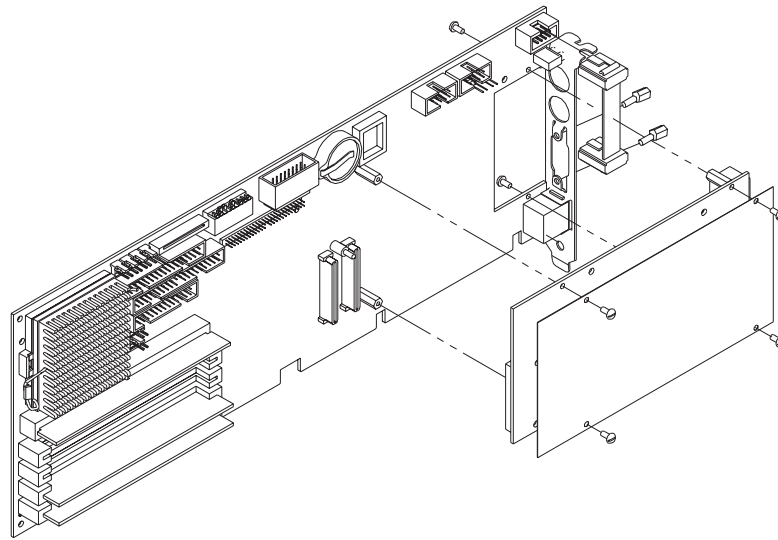


5. Reinstall the processor card into its slot and reconnect the cables that were removed.
6. Reinstall any removed adapters or drives into their original positions.
7. Reinstall the system unit cover.
8. Record the size of the cache memory module you just installed in Appendix B, “System Records.”

Installing a PMC Card

See Chapter 7, “Analog Video PCI Mezzanine Card (PMC) Form Factor Card” for information.

1. Place the processor card on a clean, static-free work area.
2. Remove the retaining bracket from the processor card.
3. Remove the PMC card from the static-free bag.
4. Attach the new retaining bracket and mounting hardware to the processor card.
5. Connect any cables between the PMC card and processor card (refer to the instructions that came with the PMC card).
6. Align the connectors on the PMC card with the connectors on the processor card and press the two cards together.



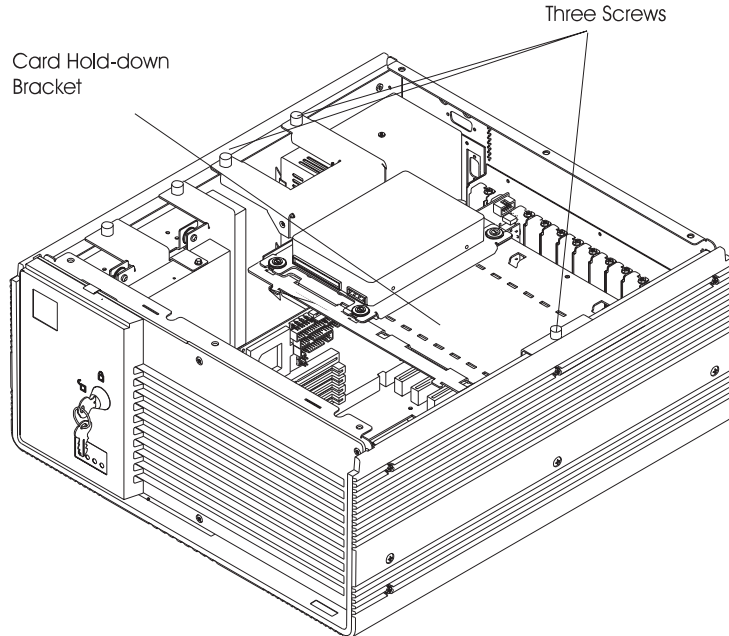
7. Install the four mounting screws.
8. Record the PMC card in Appendix B, “System Records.”
9. Continue with “Reinstalling the Processor Card.”

Reinstalling the Processor Card

1. Reinstall the processor card and reconnect all internal cables.
2. Reinstall any adapters that were removed in previous steps into the same slots from which they were removed.
3. Continue with “Installing Adapters.”

Installing Adapters

1. Remove the cover (refer to page 3-2).
2. Disconnect the power and signal cables from the hard disk drives.
3. Loosen the three screws completely; then remove the hard disk drives and hold-down bracket.



4. Refer to the instructions that came with the adapter to determine if the adapter must be installed in a specific slot (PCI slot 2 is not bus-master capable).
5. Record the location of any adapters that are in the way; then remove them.
6. Touch the static-protective bag in which the adapter is packaged to any unpainted metal surface on the system unit. Then, remove the adapter from the bag.
7. Refer to the instructions that came with the adapter to determine switch settings, jumper positions, or other special setup and handling.
8. Install the adapter in the system unit.
 - a. Grasp the adapter at the front and rear.
 - b. Align the adapter with the front and rear adapter guides and slide it into the guides (some adapters do not extend to the front adapter guide).
 - c. Press the adapter firmly to seat it completely in the connector. Full-length adapters slide into the latch on the front adapter guide.
 - d. Install and tighten the screw on the adapter-retaining bracket.
9. Record the adapter information and location in Appendix B, "System Records."
10. Reinstall any adapters you removed (make sure to install them in the original locations).
11. Continue with "Installing the Card Hold-Down Spacers."

Installing the Card Hold-Down Spacers

The 7588 Industrial Computer has a card hold-down bracket to keep the adapters in their slots in case of shock or vibration. The bracket, together with the hold-down spacers, is designed to hold standard sizes of cards in the connectors.

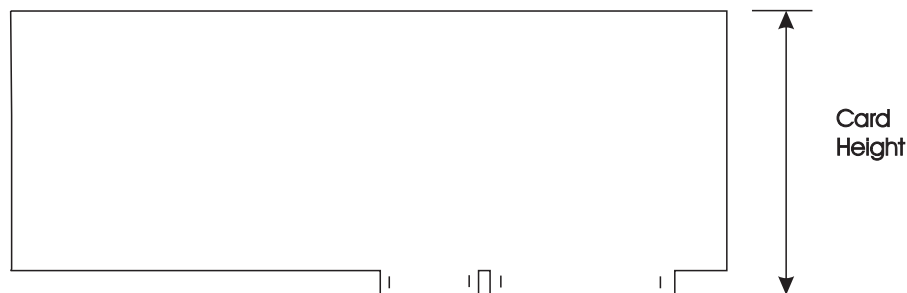
The hold-down spacers, consisting of plastic spacers and rubber pads, are included in the ship group and should be installed with each adapter, especially in environments where the system unit is subjected to constant shock and vibration.

Holes in the card hold-down bracket correspond to each expansion slot in the system unit. The holes are numbered according to the expansion slot; the holes for the PCI adapters are identified with an "A" next to the number.

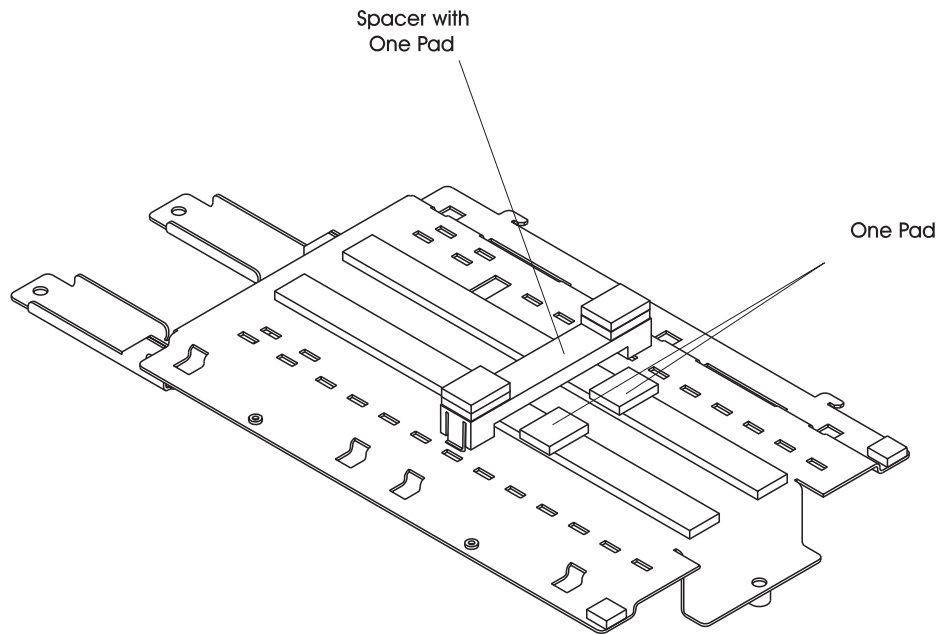
Adapters are manufactured in many different sizes. The following table shows the number of pads to use for each card size and whether the card size requires a spacer.

Note: Do not install the spacer and pads for card sizes less than 3.7 inches. These adapters are too short for the bracket to work effectively; however, these adapters generally have less mass and are less likely to be affected by vibration and shock.

Card Height (inches/millimeters)	Spacer Required	Number of Additional Pads Needed	
4.8/121.8	No	0	standard <i>tall</i> card
4.7/119.3	No	1	
4.6/116.8	No	2	
4.5/114.2	No	3	
4.4/111.7	No	4	
4.3/109.1	No	5	
4.2/106.6	Yes	0	standard <i>short</i> card
4.1/104.1	Yes	1	
4.0/101.5	Yes	2	
3.9/98.9	Yes	3	
3.8/96.4	Yes	4	
3.7/93.9	Yes	5	



1. Install the spacer and pads as shown in the following figure.



2. Reinstall the card hold-down bracket and hard drive.
3. Continue with "Installing an Internal Hard Drive."

Installing an Internal Hard Drive

Important

Not all hard drives meet the rigorous requirements for industrial-usage rating that makes up the working environment of the 7588 Industrial Computer. Before installing any drive that is not purchased specifically for use in a 7588 Industrial Computer, be sure the drive meets all environmental conditions to which it might be subjected. Refer to “Hard Disk Drive Jumper Settings” on page D-2 for more information.

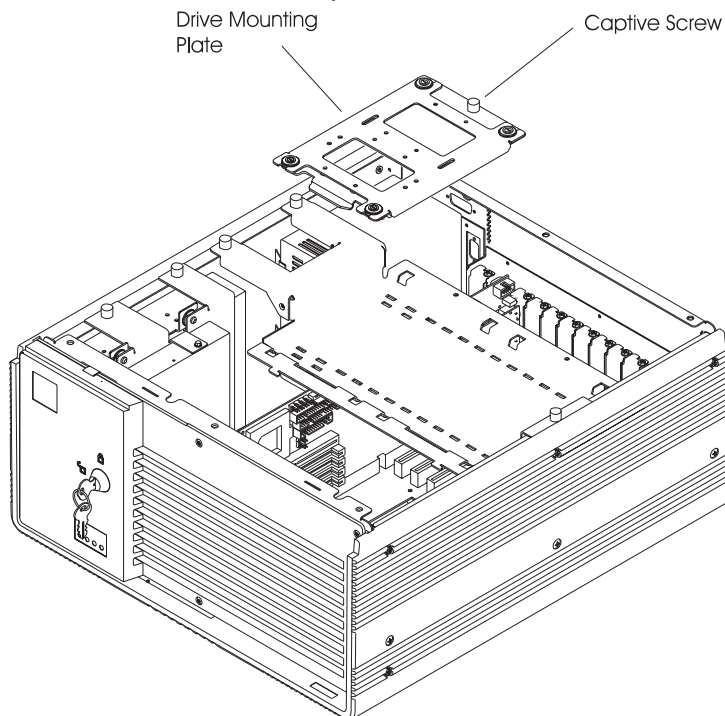
Read the instructions that came with the drive to determine any special instructions.

- Adding or changing drive mounting hardware
- Installing or changing drive installation hardware
- Setting jumpers or switches
- Removing or installing a terminator (SCSI drives only)
- Setting a unique drive ID (SCSI drives only)

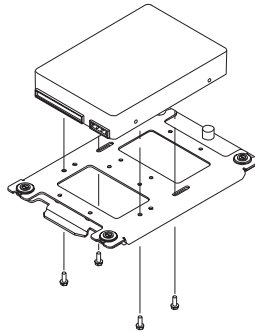
Note: When updating your configuration (“Using the Configuration/Setup Utility Program” on page 4-6), be sure that a hard drive is included as a startup device under **Start Options**; otherwise, you will not be able to boot your computer from the hard drive.

In addition, if your hard drive cannot run in the high-performance mode (the default IDE-mode selection), be sure to switch to compatible mode.

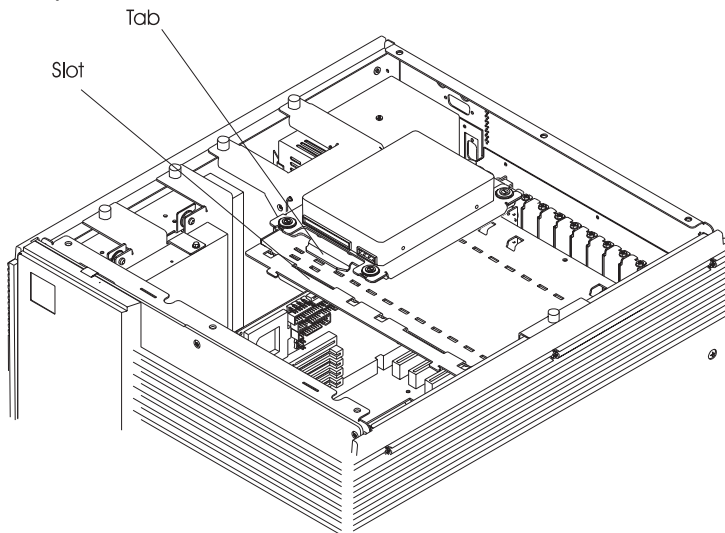
1. Remove the cover (refer to page 3-2).
2. Loosen the captive screw on an empty drive-mounting plate. Tilt the rear of the drive-mounting plate up; then lift the plate to the rear and out of the system unit.



3. Use the screws supplied with the drive to mount the hard drive to the drive-mounting plate. The connectors on the drive face the front of the system unit.



4. Connect the power and signal cables to the new drive (the cable connectors are keyed and connect only one way).
5. Insert the tab on the drive-mounting plate into the slot in the card hold-down bracket, then tilt the plate into place.



6. Tighten the captive screw.
7. Record the drive information in Appendix B, "System Records."
8. Reinstall the covers; then continue with "Installing the Mounting Options."

Installing the Mounting Options

CAUTION:

The 7588 Industrial Computer weighs more than 41.8 pounds (19 kilograms). Have another person help you lift the system unit.

If you are not installing the system unit in any type of mounting, to Chapter 4, "Operating and Configuring Your System Unit." Otherwise, go to the instructions for the type of hardware to install (refer to the following list).

- For the rack-mount option, go to "Installing the Rack-Mount Option" on page 3-13.
- For the floor-stand option, go to "Installing the Floor-Stand Option" on page 3-14.
- For the panel-mount option, go to "Installing the Panel-Mount Option" on page 3-15.