

Software Problems	Action
Is your software program OK?	<p>To determine if problems are caused by the software, verify that:</p> <ol style="list-style-type: none"> <li>1. Your system unit has the minimum memory requirements needed to use the software. Refer to the information supplied with the software to verify memory requirements.</li> <li>2. The software is designed to operate on your system unit.</li> <li>3. Other software works on your system unit.</li> <li>4. The software you are using works on another system unit.</li> </ol> <p>If you received any error messages when using the software program, refer to the information supplied with the software for a description of the messages and solutions to the problem.</p> <p>If the items above have been verified and the problem remains, contact your place of purchase or service technician for help.</p>

**Note:** If you cannot find your problem in the troubleshooting charts, go to “Starting the Computer” on page 5-2 to test the system unit. If you have already run the test program, or if running the test does not find the problem, have the system unit serviced.

## Error Messages

Error messages indicate that a problem exists in your hardware or software. Troubleshooting and servicing of complex problems resulting in these error messages should be performed by a trained service technician.

System unit problems can result in two types of error messages — POST and diagnostic.

- POST error messages appear when POST finds problems with the hardware during startup or when a change in the hardware configuration is found. POST error messages are 3-, 4-, 5-, 8-, or 12-character alphanumeric messages and include brief text messages (except I999XXXX errors).
- Diagnostic error messages appear when the Diagnostic program detects a problem with a hardware option. The messages present text information that can be used to identify a failing part.

**Note:** Error messages for operating-system and software problems are generally text messages, but they also can be numeric messages. For information about these error messages, refer to the information that came with the operating system or application program, or both.

## POST Messages

The system unit might display more than one error message. Often, the first error to occur causes subsequent errors. Always follow the suggested action for the *first* error message that appears.

In the following table, *X* can be any alphanumeric character.

POST Message	Description
101 102 103 104 105 106 107 108 109	A failure occurred during testing of the processor card and microprocessor. <b>Action:</b> Have the system unit serviced.
110	A memory parity failure occurred during testing of the processor card. <b>Action:</b> Run the diagnostic tests to verify that a problem exists in the memory-module kits.  See if you can reconfigure (swap) your system memory to aid in identifying the defective memory module.  If you cannot identify the defective memory module in this way, have the system unit serviced.
111 112 113	An input/output (I/O) channel check occurred during testing of the processor card and memory. This failure generally is caused by an adapter. <b>Action:</b> Have the system unit serviced.
114	An adapter read-only memory (ROM) error occurred. <b>Action:</b> Remove the options. If you can boot the system unit without the option installed, reinstall each option and retest. When an option fails, replace it.  If the problem cannot be isolated and corrected, have the system unit serviced.
115	A direct memory access (DMA) error occurred. <b>Action:</b> Have the system unit serviced.
116	A system-board port read/write error occurred. <b>Action:</b> Have the system unit serviced.
120	A microprocessor error occurred. <b>Action:</b> Have the system unit serviced.
151	A failure occurred during the testing of the real-time clock. <b>Action:</b> Run the diagnostic programs to get more information.
161	The memory-retention battery is dead. <b>CAUTION:</b> <b>Danger of explosion if the memory-retention battery is incorrectly replaced.</b>  <b>Replace the battery with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.</b>  <b>Action:</b> You can still use the system unit without replacing the battery, but you will have to run the Configuration/Setup Utility program and set the time and date each time you turn on the system unit.

POST Message	Description
162	<p>A change in device configuration occurred. This error occurs under one or more of the following conditions:</p> <ul style="list-style-type: none"> <li>• A new device has been installed.</li> <li>• A device has been moved to a different location or cable connection.</li> <li>• A device has been removed or disconnected from a cable.</li> <li>• A device is failing and is no longer recognized by the system unit as being installed.</li> <li>• An external device is not turned on.</li> <li>• An invalid checksum is detected in the battery-backed memory.</li> </ul> <p><b>Action:</b> Verify that all external devices are turned on. External devices must be turned on before the system unit is turned on.</p> <p>If you did not add, remove, or change the location of a device, a device is probably failing. Running the diagnostic programs might isolate the failing device, but you must have the system unit serviced.</p>
163	<p>The clock is not working correctly.</p> <p><b>Action:</b> Set the correct date and time. If the date and time are set correctly and saved and the 163 error message reappears, replace the memory-retention battery.</p> <p>If this does not correct the problem, have the system unit serviced.</p> <p>Until the system unit is serviced, the system unit can be used, but any application programs that use the date and time will be affected.</p>
164	<p>A change in the memory configuration occurred. This error can be caused by adding memory, removing memory, or incorrectly installing memory.</p> <p><b>Note:</b> The system unit can be used with decreased memory capacity.</p> <p><b>Action:</b></p> <ol style="list-style-type: none"> <li>1. If you have newly installed memory, verify that the new memory is correct for your system unit and that the memory module configuration matches one of the configurations shown in the system memory table.</li> <li>2. Running the diagnostic tests might isolate the location of the problem memory-module kit and provide additional information.</li> <li>3. If the system diagnostic tests fail, have the system unit serviced.</li> </ol>
20X	<p>A failure occurred during testing of the memory. This error can be caused by incorrectly installed memory, a failing memory-module kit, or a system-board failure.</p> <p><b>Action:</b></p> <ol style="list-style-type: none"> <li>1. If you just installed memory, verify that the new memory is correct for your system unit, that it is installed correctly, and that the memory module configuration matches one of the configurations shown in the system memory table.</li> <li>2. Run the diagnostic tests to verify the problem.</li> </ol> <p>If the system diagnostic tests fail, have the system unit serviced.</p>

POST Message	Description
301 302 303 304 305	<p>A failure occurred during testing of the keyboard and keyboard controller. These error messages also might be accompanied by a continuous beep.</p> <p><b>Action:</b> Ensure that:</p> <ol style="list-style-type: none"> <li>1. Nothing is resting on the keyboard and pressing a key</li> <li>2. No key is stuck</li> <li>3. The keyboard cable is connected correctly to the keyboard and to the correct connector on the system unit.</li> </ol> <p>Running the diagnostic tests can isolate the system unit component that failed, but you must have your system unit serviced.</p> <p><b>Note:</b> If you have just connected a new mouse or other pointing device, turn the system unit off and disconnect that device. Wait at least 5 seconds, and then turn the system unit on. If the error message goes away, replace the device.</p> <p>If the error message remains, have the keyboard and cable or the system unit serviced.</p>
601	<p>A failure occurred during testing of the diskette drive and diskette-drive controller. This error can be caused by a loose or incorrectly connected cable, a failing drive, or a failing processor card.</p> <p><b>Action:</b> The system unit can be used, but one or more diskette drives might not work. Running the diagnostic tests can isolate the diskette drive that failed, but you must have your system unit serviced.</p>
602	<p>The system unit is not able to start the diskette in the drive. The diskette might be damaged or formatted incorrectly.</p> <p><b>Action:</b> Try another startable diskette that is in working condition.</p>
604	<p>A failure occurred during the testing of a diskette drive.</p> <p><b>Action:</b></p> <ol style="list-style-type: none"> <li>1. Verify the Configuration/Setup Utility program correctly reflects the type of diskette drive you have installed.</li> <li>2. Run the system diagnostic programs.</li> <li>3. If the system diagnostic programs fail, replace the diskette drive.</li> </ol>
11XX	<p>A failure occurred during testing of the system-board serial port.</p> <p><b>Action:</b> If you have a modem, serial printer, or other serial device attached to your system unit, verify that the serial cable is connected correctly. If it is, use the following procedure:</p> <ol style="list-style-type: none"> <li>1. Turn off the system unit.</li> <li>2. Disconnect the serial cable from the serial port.</li> <li>3. Turn on the system unit.</li> </ol> <p>If the POST error message does not reappear, either the serial cable or the device is probably failing. (See the documentation that came with the serial device for additional testing information.)</p> <p>If the POST error message reappears, have the IDE device or system unit serviced.</p>
178X	<p>A failure occurred during testing of the hard disk drive or a primary or secondary IDE device.</p> <p><b>Action:</b> Run the system diagnostic tests.</p>
2401	<p>A failure occurred during testing of the video controller. This error can be caused by a failing display, a failing processor card, or a failing video adapter.</p> <p><b>Action:</b> Verify that the display is connected correctly to the video port. If so, have the system unit serviced.</p>

POST Message	Description
8601 8602 8603	<p>A failure occurred during testing of the pointing device (mouse) and pointing device controller.</p> <p><b>Note:</b> An 8603 error can be caused by the addition or removal of a mouse.</p> <p>This error can be caused by the pointing device or by a failing processor card.</p> <p><b>Note:</b> This error also can occur if electrical power was lost for a very brief period and then restored. In this case, turn off the system unit for at least 5 seconds, and then turn it back on.</p> <p><b>Action:</b> Ensure the keyboard and pointing device are attached to the correct connectors. If they are connected correctly, use the following procedure:</p> <ol style="list-style-type: none"> <li>1. Turn off the system unit.</li> <li>2. Disconnect the pointing device from the system unit.</li> <li>3. Turn on the system unit.</li> </ol> <p>If the POST error message does not reappear, the pointing device is probably failing. (See the documentation that came with the pointing device for additional testing information.) If the problem remains, have the pointing device serviced.</p> <p>If the POST error message reappears, run the diagnostic tests to isolate the failure. If the diagnostic tests do not find a problem and the POST error message remains, have the system unit serviced.</p>
19990301	<p>A hard-disk failure occurred.</p> <p><b>Action:</b> Have the system unit serviced.</p>
19990305	<p>An operating system could not be found.</p> <p><b>Action:</b> Run diagnostic tests to verify that the hard disk is functioning correctly. If there is a problem with the hard disk (such as a bad sector), you might have to reinstall the operating system.</p> <p>If you cannot reinstall the operating system, have the system unit serviced.</p>
Other Numbers	<p>The system unit POST found an error.</p> <p><b>Action:</b> Follow the instructions on the screen.</p>

## Diagnostic Messages

Diagnostic error messages appear when the Diagnostics diskette program detects a problem with the system unit. The messages present text information that can be used to identify a failing part.

Although parts of your system unit may be failing, you might be able to continue to use it. However, you will need to have your system unit or option serviced.



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# Part 2. Technical Descriptions

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## Chapter 6. IBM 586 or 586E Single-Board Computer

The IBM 586 or 586E Single-Board Computer (processor card) is a 586-class single-board computer designed for use in ruggedized applications, such as the embedded products and complete systems offered by IBM WorldWide Plant Floor Solutions group. Two models are available: the 586E (with Ethernet) and the 586 (without Ethernet). The processor card can be combined with the PMC video card for complete system function.

The processor card supports Intel Pentium microprocessors with processor bus speeds between 50 MHz and 66 MHz, and a PCI bus operating at up to 33 MHz. The features of the processor card include:

- Pentium processors up to 200 MHz
- Optional 256 KB or 512 KB of pipelined synchronous burst cache
- 8 MB to 256 MB of extended data-out (EDO) parity DRAM
- An integrated PCI IDE controller that supports IDE modes 0, 1, 2, and 3, or PIO mode 4, and ATA multi-word DMA modes 0, 1, and 2.
- Two NS16550 serial ports
- Parallel port with extended-capabilities port (ECP) and enhanced-parallel port (EPP) support
- Diskette controller (1.44 MB and 2.88 MB support)
- Real-time clock
- Keyboard port
- Mouse port
- Optional PCI 10 BaseT/100 BaseTx Ethernet
- Optional PMC card
- Software upgradeable BIOS
- External PCI expansion connectors 2.1 revision
- PCI Industry Computer Manufacturer's group (PICMG) edge connector that supports external ISA and PCI adapters
- IEEE P1386 PMC card connector

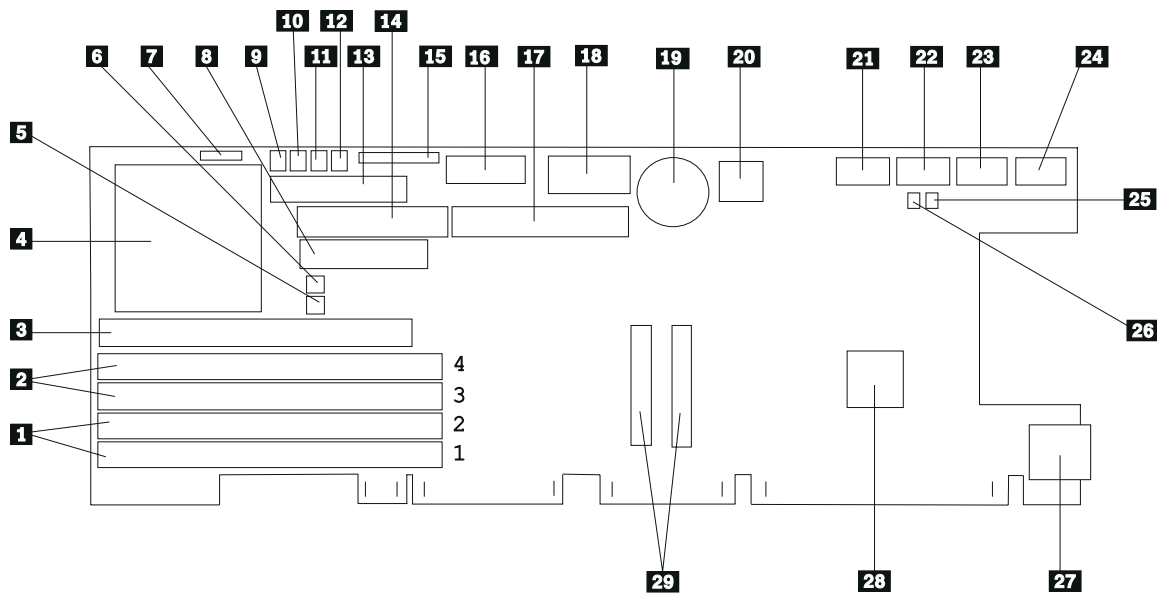


Figure 6-1. Single Board Computer Component Layout

- 1** Memory SIMM bank 0
- 2** Memory SIMM bank 1
- 3** Cache socket
- 4** Processor
- 5** 5 V dc fan connector
- 6** 12 V dc fan connector
- 7** Password clear pad
- 8** Parallel port connector
- 9** Power-on indicator connector
- 10** HDD access light connector
- 11** Speaker light connector
- 12** Reset switch connector
- 13** FDD connector
- 14** Secondary IDE connector (3.5-inch form factor)
- 15** Mini-FDD connector
- 16** Configuration switches
- 17** Primary IDE connector (2.5-inch form factor)
- 18** External power connector
- 19** Memory-backup battery
- 20** BIOS Flash ROM
- 21** Serial port A connector
- 22** Serial port B connector
- 23** Hex displays
- 24** Keyboard/mouse connector
- 25** RS-422 transmit-termination jumper
- 26** RS-422 receive-termination jumper
- 27** Ethernet connector (optional)
- 28** Ethernet boot ROM (optional)
- 29** PMC connector

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## Memory Subsystem

### SIMMs

The processor card has four 72-pin SIMM sockets organized into two banks of memory. These sockets can accept gold-tabbed, 60-ns, EDO parity SIMMs. These SIMMs can be 4 MB, 8 MB, 16 MB, 32 MB, or 64 MB. Each bank of memory must contain a pair of SIMMs identical in size, speed, and technology. The banks can be different; the processor card will optimize for the maximum performance of each bank.

### Cache

There is a single level-2 (L2) cache socket on the processor card. This socket can be populated with a single cache memory module in either 256 KB or 512 KB sizes. L2 cache is not required for proper operation on the processor card. If L2 cache is not installed, the processor card will operate using the internal cache on the microprocessor. L2 cache gives increased performance in almost all applications. The amount of performance increase is application-dependent. There are no switches to be set when the size of the cache is changed.

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## Indicators

### Hex Displays

There are two hex displays viewable from the top of the processor card. These displays give codes indicating the progress of the POST for the processor card. When the processor card has completed POST successfully, the displays will show a 00, and the operating system will start loading. If an error is detected during POST, the error code will be displayed in the hex displays, as follows:

1. The start code of **EE**
2. The first two digits of the error code
3. The second two digits of the error code
4. The end code of **EE**

For example, if a 162 configuration error occurred at power-on, you would see **EE 01 62 EE** in the hex displays. This will repeat until you press a key.

**Note:** The 162 error will not display when the processor card is set to auto-configure mode. In auto-configure mode, the processor card automatically reconfigures itself and reboots.

### Power-On LED

This 2-pin connector on the processor card provides input to the system power-on indicator. It turns on the LED whenever 5 volts is applied to the processor card.

The connector is a 2-pin header attached through a cable to the system power-on LED (green).

Pin	Description
1	–
2	+

### **HDD Access LED**

This connector will drive a hard-disk-drive-accessed LED. It will light the LED whenever there is activity to either of the IDE ports.

The connector is a 2-pin header that connects through a cable to the HD-access LED (yellow).

Pin	Description
1	+
2	-

### **Speaker LED**

This 2-pin connector on the processor card is used to drive a speaker or an LED. A standard PC-class speaker can be connected to this connector and it will give the normal system audio outputs.

The speaker light connector is a 2-pin header attached through a cable to the system speaker LED.

Pin	Description
1	Data out
2	Vcc

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## **I/O Connectors**

### **Diskette Drive Connectors**

The processor card provides for attaching a single diskette drive through one of two connectors. Only one connector can be used at a time.

#### **34-Pin 2x17**

This connector is a standard diskette interface. The port supports two diskette drives through the addition of a 34-pin ribbon cable.

This connector is a 2x17 header.

Pin	Description	Pin	Description
1	Ground	2	Density Sel
3	Key	4	N/C
5	Ground	6	DRate 0
7	Ground	8	-Index
9	Ground	10	-Motor 0
11	Ground	12	-FDSel 1
13	Ground	14	-FDSel 0
15	Ground	16	-Motor 1
17	Ground	18	Dir
19	Ground	20	-Step
21	Ground	22	-WData
23	Ground	24	-WGate
25	Ground	26	-Track 0
27	Ground	28	-WrProt
29	Ground	30	-RData
31	Ground	32	HD Select
33	DRata 1	34	DskChange

#### Mini 1x26

This mini-header supports a single, laptop-style diskette drive through the addition of a 26-pin flat circuit cable.

The connector is a mini 2x13 header.

Pin	Description	Pin	Description
1	+5 V	2	Index
3	+5 V	4	Drive Select
5	+5 V	6	Disk Change
7	NC	8	Ready
9	HD Out	10	Motor On
11	DRate 1	12	Direction Select
13	NC	14	Step
15	Ground	16	Write Data
17	Ground	18	Write Gate
19	Ground	20	Track 00
21	Ground	22	Write Protect
23	Ground	24	Read Data
25	Ground	26	Side Out Select

## IDE Connectors

The processor card has two IDE connectors: one to the primary controller and the other to the secondary controller. Both interfaces support PIO modes 0 through 4 and DMA modes 0 through 2. These interfaces support transfer rates of up to 16.7 MB per second, depending on the installed hard drive installed. The PIO and DMA modes are set through the Configuration/Setup Utility program.

### Mini 50-pin 2x25

This connector provides a signal path to the primary IDE controller. It supports the laptop-style 2.5-inch-drive interface through a 50-pin, flat-ribbon cable. This interface supports two drives.

A mini 2x25 header is used for the primary IDE connector.

Pin	Description	Pin	Description
A	Test Only	B	Test Only
C	Master/Slave	D	Master/Slave
E	Not Used	F	Not Used
1	-Reset	2	Ground
3	Data 7	4	Data 8
5	Data 6	6	Data 9
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 2	16	Data 14
17	Data 0	18	Data 15
19	Ground	20	Key
21	DRQx	22	Ground
23	-IOW	24	Ground
25	-IOR	26	Ground
27	IOCHRDY	28	NC
29	-DACKx	30	Ground
31	-IRQ14	32	-IOCS16
33	HA1	34	NC
35	HA0	36	HA2
37	-CS0(1F0h)	38	-CS1(3F0h)
39	-IDEACT	40	Ground
41	+5 Volts	42	+5v Motor
43	Ground	44	AT Interface

#### 40-pin 2x20

This header is the secondary IDE connector. It supports the standard 3.5-inch-drive interface through a 40-pin, flat-ribbon cable. This interface supports two drives.

A 2x20 header is used for the secondary IDE connector. It is connected to the secondary IDE interface.

Pin	Description	Pin	Description
1	-Reset	2	Ground
3	Data 7	4	Data 8
5	Data 6	6	Data 9
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 1	16	Data 14
17	Data 0	18	Data 15
19	Ground	20	Key
21	DRQy	22	Ground
23	-IOW	24	Ground
25	-IOR	26	Ground
27	IOChRdy	28	NC
29	-DACKy	30	Ground
31	-IRQ 14	32	-IO CS 16
33	HA1	34	Ground
35	HA 0	36	HA 2
37	-CS 0(1F0h)	38	-CS 1 (3f0h)
39	-IDEACT	40	Ground

#### Keyboard/Mouse

The processor card has an 8-position header (2x4) that provides both the keyboard and mouse inputs. Any IBM-compatible mouse or keyboard will work with these ports. This connector is designed to be interfaced to standard mouse and keyboard connectors through a cable.

The keyboard/mouse connector is a right-angled 2x4 header attached through a cable to the PMC video card.

Pin	Description	Pin	Description
1	Keyboard Data	2	Ground
3	5 Volts	4	Keyboard Clock
5	Mouse Data	6	Ground
7	5 Volts	8	Mouse Clock

## Parallel Port

The processor card has a 26-pin (2x13) connector that provides a full-function, bi-directional parallel port. This port supports the Extended Capability Port (ECP) and the Enhanced Parallel Port (EPP) modes. The Configuration/Setup Utility program configures these modes in the BIOS. This connector is designed to be interfaced to the standard system parallel port connector through a cable.

A 2x13 header is used for the parallel port. The port is attached to the system chassis through a 26-pin ribbon cable.

Pin	Description		Pin	Description	
	ECP	EPP		ECP	EPP
1	-Strobe	-Write	2	-Auto FD	-Dstrobe
3	Data 0	Data 0	4	-Error	-Error
5	Data 1	Data 1	6	-Init	-Init
7	Data 2	Data 2	8	-Select In	-ASTrobe
9	Data 3	Data 3	10	Ground	Ground
11	Data 4	Data 4	12	Ground	Ground
13	Data 5	Data 5	14	Ground	Ground
15	Data 6	Data 6	16	Ground	Ground
17	Data 7	Data 7	18	Ground	Ground
19	-ACK	-ACK	20	Ground	Ground
21	Busy	-Wait	22	Ground	Ground
23	PE	PE	24	Ground	Ground
25	Select	Select	26	Reserved	Reserved

## Serial Port

The processor card has two serial ports on two 10-pin headers. These ports are designed to be interfaced to the system unit through cables. The Configuration/Setup Utility program controls the software setup for these ports.

### Serial Port A

Serial Port A normally is configured to be COM1 and is a standard NS16550-compatible serial port.

The connector is a 2x5 header attached through a 10-pin cable to a male 9-pin D-sub connector fastened to the chassis.

Table 6-1. COM Port 1 (RS-232 only)			
Pin	Description	Pin	Description
1	Carrier Detect	2	Data Set Ready
3	Receive Data	4	Request to Send
5	Transmit Data	6	Clear to Send
7	Data Terminal Ready	8	Ring Indicator
9	Ground	10	Key



## Serial Port B

Serial Port B normally is configured to be COM2 and is a standard NS16550-compatible serial port. Serial Port B can have one of two physical interfaces: RS-232 or RS-422/485. Configuration switch 4 controls the physical interface.

The connector is a 2x5 header attached through a 10-pin cable to a male 9-pin D-sub connector fastened to the chassis.

Table 6-2. COM Port 2 (RS-232, RS-422/485)

Pin	Description		Pin	Description	
	RS-232	RS-422/485		RS-232	RS-422/485
1	Carrier Detect	TD–	2	Data Set Ready	NC
3	Receive Data	RD–	4	Request to Send	NC
5	Transmit Data	TD+	6	Clear to Send	NC
7	Data Terminal Ready	RD+	8	Ring Indicator	NC
9	Ground	Ground	10	Key	Key

## Ethernet

The processor card has an optional 10 BaseT/100 BaseTx Ethernet port. This port is available to the user through a standard RJ45 connector on the rear of the card. The Ethernet port requires 100-ohm, category-5, shielded twisted-pair cabling.

The connector is a single RJ45 connector.

Pin	Description	Pin	Description
1	TD+	2	TD–
3	RD+	4	NC
5	NC	6	RD–
7	NC	8	NC

## Ethernet Boot ROM

When the optional boot ROM is installed, the processor card will boot over a network. In this mode, the processor card will boot with no other media installed. The remote boot function requires that the network operating system support this function. Refer to your operating system documentation and the documentation supplied with the boot ROM feature for more information.

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## Miscellaneous Connectors

### 5 V dc Fan Power Connector

This connector provides 5 volts to power a fan-cooled heat sink. It is not used currently.

The connector is a 2-pin header.

Pin	Description
1	+5.0 V
2	Ground

### 12 V dc Fan Power Connector

This connector provides 12 volts to power a fan-cooled heat sink. It is not used currently.

The connector is a 2-pin header.

Pin	Description
1	+12 V
2	Ground

### Reset Switch

This connector is used with a system unit reset switch. When the two pins are shorted together, the processor card performs a hardware reset.

The connector is a 2-pin header attached through a cable to the backplane. When used in stand-alone mode, this connector can be attached to a system reset switch.

Pin	Description
1	-Reset
2	Ground

### PMC Connector

The processor card supports the IEEE P1386 PMC standard connections; it uses the PMC connection for video support. The PMC video card attaches to the PMC connector and provides SVGA video output.

### BIOS Flash ROM

The BIOS for the processor card is contained in Flash ROM. This lets the BIOS be updated through software. IBM will provide BIOS update diskettes whenever necessary.

### Memory-Retention Battery

This battery is used to maintain the information stored in the CMOS (complimentary metal oxide semiconductor) memory. It also is used to power the time-of-day clock when the system unit is powered off. If a password is lost or forgotten, you must remove the battery for 10 minutes, and then replace it. This removes all the contents of the CMOS memory, and the password. You will have to run the Configuration/Setup Utility program after you replace the battery.

### External Power

This connector provides additional power to the processor card. You do not have to provide power to this connector if the processor card is plugged into a backplane that supports the PICMG standard. In ISA, only backplane power should be provided to this connector.

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## Jumpers and Switches

### RS-422 Transmit Termination Jumper

This jumper provides a 100-ohm resistor between the two transmit data lines (+ and -). The line-to-line resistor is connected when the jumper is installed.

### RS-422 Receive Termination Jumper

This jumper provides a 100-ohm resistor between the two receive data lines (+ and -). The line-to-line resistor is connected when the jumper is installed.

## Switch Functions

Switch	Description
1	CPU speed 0
2	CPU speed 1
3	Reserved
4	Enable RS-232
5	Auto boot
6	CPU/PCI clock speed 0
7	CPU/PCI clock speed 1
8	Disable video
9	Reserved

### CPU Selection Switches

Switches 1, 2, 6, and 7 are used to set the processor speed. Switches 1 and 2 set the internal clock multiplier for the microprocessor. Switches 6 and 7 set the external bus speed. The following table shows the switch settings.

1	2	6	7	Multiplier	Base Freq	Proc Freq
Off	On	On	On	3.0x	66 MHz	200 MHz
On	On	On	On	2.5x	66 MHz	166 MHz
On	On	On	Off	2.5x	60 MHz	150 MHz
On	Off	On	On	2.0x	66 MHz	133 MHz
On	Off	On	Off	2.0x	60 MHz	120 MHz
Off	Off	On	On	1.5x	66 MHz	100 MHz
On	Off	Off	On	2.0x	50 MHz	100 MHz
Off	Off	On	Off	1.5x	60 MHz	90 MHz
Off	Off	Off	On	1.5x	50 MHz	75 MHz

### Enable RS-232 Switch

Switch 4 controls the electrical interface of serial port B. If the switch is ON, the port has a standard RS-232 interface. If the switch is OFF, the port has a standard RS-422/485 interface. The serial connector pin-outs for the 7588 Industrial Computer are shown in Appendix D, "Jumpers, Switches, and Pin Assignments."

**Auto Boot**

Switch 5 lets the processor card auto-configure at power-on. In the auto-configure mode, BIOS detects configuration errors at power-on and alters the CMOS settings to match the hardware. This feature is useful in situations where an operator or keyboard and display are not available to clear the configuration error.

Use this feature carefully; changes in configuration of previously configured and operating systems can indicate a hardware failure. These failures could lead to inconsistent operation of hardware and applications running on the system.

**Disable Video**

Switch 8 lets you disable video through a switch on the processor card. When this switch is in the On position, the processor card disables all video, including the PMC video card and any video cards.

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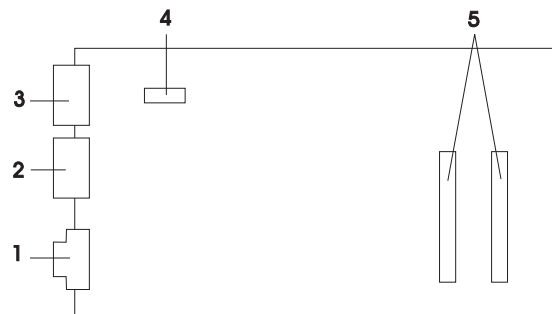
## Chapter 7. Analog Video PCI Mezzanine Card (PMC) Form Factor Card

The Analog Video PCI Mezzanine Card (PMC) Form Factor Card (PMC video card) is a high-performance video card with the following features:

- High-performance S3 Trio64V+ video chip set
- 2 MB of video memory with a 64-bit interface
- Support for non-interlaced video modes of up to 1280x1024 at 75 Hz
- Display power-management signaling (DPMS) energy management
- Pass-through connectors for the mouse and keyboard interfaces

The PMC video card attaches to the processor card using the PMC connectors and mounting hardware. BIOS automatically detects presence of the PMC video card and configures it as the default video port for the system.

The PMC video card has five connectors.



*Figure 7-1. PMC video card Connectors*

- 1** The display connector is a standard 15-pin, D-shell connector. The output is standard SVGA. The resolution available is determined by the video driver and the display used.
- 2 and 3** The keyboard (2) and mouse (3) connectors are 6-pin, mini-DIN connectors for attaching a standard keyboard and PS/2-style mouse. The interface for the keyboard and mouse port resides on the processor card. The PMC video card simply provides an external connector for these ports and passes the signals to the processor card through the keyboard/mouse input connector.
- 4** The keyboard/mouse input connector is an 8-pin header that connects the input from the external connectors to the processor card. It is connected directly to the mini-DIN connectors with no processing or logic.
- 5** The PMC connectors are the main signal interface between the processor card and the PMC video card.



---

## Part 3. Hardware Maintenance and Service

Part 3 contains service-oriented information to assist in diagnosing problems and identifying and replacing parts that have failed.

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## Chapter 8. Service Information

This section contains the general checkout procedures, related service procedures, symptom-to-FRU indexes, and removal and replacement procedures for the 7588 Industrial Computer.

**Note:** This manual and the diagnostic tests are intended to test IBM products only. Non-IBM products can give false errors and invalid system responses during testing. If you remove a non-IBM device and the symptom goes away, the problem is with the device you removed.

---

### Configuration/Setup Utility Program

#### Attention

The system you are servicing could have a customized configuration (settings other than default settings). Running the Configuration/Setup Utility program can alter those settings. Make a list of the current configuration settings and verify that the same settings are in place when service has been completed.

The Configuration/Setup Utility program is stored in the permanent memory. This program includes settings for the following:

- Devices and I/O Ports
- Date and time
- Security
- Start options
- Advanced setup
- ISA-legacy resources

To run the Configuration/Setup Utility program,

1. Power-off the system unit and wait a few seconds until all in-use lights go off.
2. Power-on the system unit.
3. When the Configuration/Setup Utility prompt appears on the screen, press F1.
4. When the Configuration/Setup Utility menu appears, follow the instructions on the screen.
5. When finished, select **System Summary** to verify that all configuration changes have been accepted.

---

## BIOS Levels

An incorrect level of BIOS can cause false error and unnecessary parts replacement. Use the following information to determine the current level of BIOS installed in the system unit, the latest BIOS available for the system unit, and where to obtain the latest level of BIOS.

- Current Level BIOS information.
  1. Run the Configuration/Setup Utility program to determine the level of BIOS installed.
- Sources for determining the latest level BIOS available.
  1. World Wide Production Solutions Home Page  
<http://wwprodsoln.bocaratton.ibm.com/>
  2. Bulletin Board System (BBS)
  3. Levels 1 and 2 Support
  4. RETAIN
- Sources for obtaining the latest level BIOS available.
  1. World Wide Production Solutions Home Page  
<http://wwprodsoln.bocaratton.ibm.com/>
  2. Bulletin Board System (BBS)
  3. Levels 1 and 2 Support

To update (flash) the BIOS, see “Flash (BIOS/VPD) Update Procedure.”

---

## Vital Product Data

Each system unit has a unique vital product data (VPD) code stored in the nonvolatile memory on the processor card. After you replace the processor card, the VPD must be updated. To update the VPD, see “Flash (BIOS/VPD) Update Procedure.”

---

## Flash (BIOS/VPD) Update Procedure

### Attention

Refer to the information label located inside the system unit cover for any model-specific information.

You need to update the VPD only if the processor card is changed. Otherwise, the Flash update program retains the VPD. To update the VPD, do the following.

1. Power-off the system unit.
2. Insert the Flash update diskette into drive A.
3. Power-on the system unit.
4. When the Update Utility appears, select your country/keyboard, and then press Enter.
5. If the system unit serial number was previously recorded, the number is displayed with an option to update it. Press **Y** to update the serial number.
6. Type the 7-digit serial number of the system unit you are servicing, and then press Enter.
7. Follow the instructions on the screen to complete the Flash (BIOS/VPD) update procedure.

---

## Diagnostic and Test Tools

The following tools are available to help identify and resolve hardware-related problems:

- Power-on self-test (POST)
  - POST Beep Patterns
  - Error Code Format
- Error messages
- QAPlus/PRO Diagnostic Program.

### Power-On Self-Test (POST)

Each time you power on the system unit, it performs a series of tests that check the operation of the system unit and some options. This series of tests is called the *power-on self-test*, or *POST*. POST does the following:

- Checks some basic processor card operations
- Checks the memory operation
- Starts the video operation
- Verifies that the diskette drive is working
- Verifies that the hard disk drive is working

If POST finishes without detecting any problems, you hear a single beep and the first screen of your operating system or application program appears.

If POST detects a problem, an error message appears on your screen. A single problem can cause several error messages to appear. When you correct the cause of the first error message, the other error messages probably will not appear on the screen the next time you turn on the system unit.

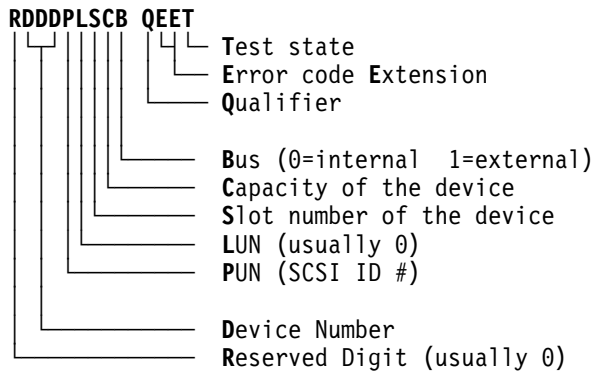
**Beeps:** POST generates patterns of beeps to indicate successful completion of POST or to indicate an error. One beep and the appearance of text on the display indicates successful completion of the POST. More than one beep indicates the POST detects an error.

**POST Error Code Format:** This section provides an explanation of the encoded non-SCSI and SCSI POST error codes. Error messages are displayed on the screen as 3, 4, 5, 8, 12, or 13 digits. An “X” in an error message can be any number or letter. The shorter POST errors are highlighted in “Symptom-to-FRU Index” on page 8-14. Some digits will represent different information for SCSI errors versus non-SCSI errors.

The following figure shows which digits display the shorter POST errors. The figure also defines additional SCSI information.

**Notes:**

1. Non-IBM device error codes and documentation supersede this list.
2. Duplicate SCSI ID settings will cause misleading error symptoms or messages.



## Error Messages

Messages generated by the software—the operating system or application programs—generally are text messages, but they also can be numeric. Basically, there are five types of error messages:

- POST error messages
- POST beep patterns
- Diagnostic error messages
- Software-generated messages
- Multiple messages

Error Message	Description
POST Error Messages	Displayed when POST finds problems with the hardware or detects a change in the hardware configuration.
POST Beep Patterns	Beeps emitted from the speaker if POST finds a problem. One beep indicates POST completed successfully. More than one beep indicates POST found a problem.
Diagnostic Error Messages	Displayed when a test program finds a problem with a hardware option.
Software-Generated Error Messages	Displayed if a problem or conflict is found by an application program, the operating system, or both. For an explanation of these messages, refer to the information supplied with that software package.
Multiple Messages	The first error that occurs can cause additional errors. Follow the suggested action of the first error displayed. In this case, the system displays more than one error message. Always follow the suggested action instructions for the <i>first</i> error message displayed.

## QAPlus/PRO Diagnostic Program

The QAPlus/PRO diagnostic program shipped on diskette with the system unit provides the primary method for testing the system unit. You can use this DOS-based program to test the IBM components of the system unit and some external devices. The amount of time required to test all components depends on the number of components. The more optional adapters and devices you have attached to your system unit, the longer the testing takes. To access QAPlus/PRO, boot the system unit with the QAPlus/PRO diskette in the diskette drive.

This test program includes the following features.

Feature	Description
Advanced Diagnostic Tests	Identifies most problems associated with the following major components: <ul style="list-style-type: none"><li>• Processor card</li><li>• Hard disk drives</li><li>• Diskette drives</li><li>• CD-ROM drives</li><li>• RAM</li><li>• Serial and parallel ports</li><li>• PMC video card adapter</li><li>• Printer</li><li>• Keyboard</li><li>• Mouse</li></ul>
Flexible Test Control	Allows you to: <ul style="list-style-type: none"><li>• Run groups of tests in batch</li><li>• Specify parameters to use for each test (for example, video modes, disk cylinders, and port addresses)</li><li>• Specify the number of passes you want to run (one to continuous)</li><li>• Log the test results to a text dBase file (DBF) format</li><li>• Save all test settings for future use</li><li>• View System Information</li><li>• View the server configuration information (for example, you can view the IRQ/DMA assignments, memory usage, and device drivers)</li><li>• Select System Utilities</li><li>• Run a low-level format</li><li>• Format a diskette</li></ul>

The QAPlus/PRO program provides advanced functions and utilities for users and service or support professionals to troubleshoot even the most difficult problems.

## Module Tests Menu

### Attention

A customized setup configuration (other than default settings) might exist on the system unit you are servicing. Running the Configuration/Setup Utility program might alter those settings. Note the current configuration settings and verify the settings are in place when service has been completed. To start the Configuration/Setup Utility program, see "Configuration/Setup Utility Program" on page 8-1.

Normally, when you select the Module Tests Menu, all adapters and devices installed in the system unit are highlighted on the menu.

- If an adapter or device not installed in the system unit is highlighted on the menu, use the procedure in "Undetermined Problem" on page 8-28 to find the problem.
- If an adapter or device is installed in the system unit and is not highlighted on the menu, you have one of the following conditions.
  - The diagnostic code for the adapter or device is not on the diagnostic diskette.
  - The SCSI controller failed (on the processor card or SCSI adapter).
  - An unrecognizable adapter is installed.
  - The missing device is defective or requires an additional diskette or service manual.
  - A defective adapter caused the device not to be highlighted on the menu.

If a device is missing from the list, replace the device. If this does not correct the problem, use the procedure in "Undetermined Problem" on page 8-28 to find the problem.

**Program Navigation:** You can maneuver within the test programs by typing the first letter of a menu choice, pressing the function keys, or using command-line options.

**Typing the First Letter of a Menu Choice:** Throughout the test programs, typing the first letter of an option on a menu is the same as moving to that item with the cursor and pressing Enter; however, this function is not enabled on test group screens.

**Pressing the Function Keys:** Press the following keys to maneuver throughout the test programs.

Keys	Action
Enter	Select an item, run the test module, or run the test
Down Arrow (↓)	Moves the cursor down
Up Arrow (↑)	Moves the cursor up
F1	Calls up the appropriate Help information. Use the up arrow key or the down arrow key to scroll through the information. Pressing F1 from within a Help screen provides a help index from which you can select different categories. One of the important help categories is function key usage. Pressing Esc exits Help and returns to where you left off.
Esc	Go back to the previous menu

Additional functions are available with the following keys.

Keys	Action
<b>Tab</b>	Move to test group (or move to parameters)
<b>Spacebar</b>	Toggle modules on/off (or toggle tests on/off)
<b>F2</b>	View test results log
<b>F10</b>	Local menu
<b>+</b>	Next logical unit number (for example, LUN 1, LUN 2, and so forth)
<b>–</b>	Previous logical unit number

**Command-Line Options:** The following command-line options are available when initially starting the diagnostic program from within its directory. Enter **QAPLPRO /XXX**, where **/XXX** represents one of the following commands.

Command	Action
<b>/B&amp;W</b>	The <b>/B&amp;W</b> command line option forces the program to load in Black and White (Monochrome) mode, which is often more readable on laptop computers.
<b>/LOG=file</b>	The <b>/LOG=file</b> command line option directs the test programs to start using a specified Error Log file.
<b>/INT10</b>	The <b>/INT10</b> command line option forces the test programs to use the BIOS for screen writes.
<b>/OXXX</b>	The <b>/OXXX</b> command line option, where XXX=test group (for example, MBD/MEM/VID/HDU/ FDU/KBD/COM/LPT, and so forth) omits the designated test group from testing.
<b>/USERCONFIG=file</b>	The <b>/USERCONFIG=file</b> command line option tells the test programs to look for a user diagnostic configuration file other than the default USERDIAG.CFG.
<b>/SCRIPT=file[,R]</b>	The <b>/SCRIPT=file[,R]</b> command line option with the “,R” runs the selected script. See “Scripting” on page 8-8 for a description of scripting.
<b>Note:</b> You can use a “–” instead of a “/” as the command-line switch.	

**Viewing the Test Groups:** As you move the cursor bar up or down in the Module Tests Menu, the right-hand screen changes to show the attributes, parameters, and the selected tests of the corresponding test group. The “◆” symbol indicates a module selected for testing.

The indicated attributes are characteristics of the selected test module that are used by the test programs to determine which tests to run or how to run selected tests. Attributes are also used to limit the allowable range of parameters (for example, – ending cylinder).

Parameters are values you select to establish the scope of tests. For example, you can select Extended Memory testing parameters and limit the testing to a specific range of test blocks by specifying the starting and ending memory block. This might be appropriate if prior experience indicates that problems are likely to exist in a specific area of memory. By selecting these limiting parameters, you reduce memory testing time.

**Scripting:** Scripting lets you select specific groups of tests, testing parameters, and options. Your selection is saved for later use as a test *script*. To set up a test script, first select all the appropriate test groups and specific tests you want to run from the Module Tests selection under Diagnostics. You also should select appropriate testing parameters and options. See “Program Navigation” on page 8-6 for instructions on saving a test script.

**Changing Logical Unit Numbers:** In some instances, you can have more than one logical unit number (LUN) for a particular module. LUNs represent individual devices within a test group or module. For example, you might have two diskette drives or two hard disk drives; or you might have base, extended, shadow, and cache memory installed in the system unit. This configuration might result in as many as 4 or 5 different LUNs in the Memory Test Group.

From either the Module Tests Menu or a test group window, you can change to a different LUN (where applicable) by pressing the plus (+) key (next LUN) or the minus (–) key (previous LUN).

**Test-Group Specifications:** In the upper-right-hand portion of the testing screen (or just the upper portion if you switched to an individual test group screen) are the specifications for the related test group.

**Note:** In the Hard Disk Test Group specification area, if a software program compressed your drive, the indicated size is the compressed size of the logical drive.

**Starting the Diagnostic Program:** To start the diagnostic program, do the following.

1. Insert the diagnostic diskette into drive A.
2. Power-on the system unit.
3. When the diagnostic **Main Menu** is displayed, select **Diagnostics** and press Enter.
4. Select **Quick Check** and press Enter.
5. Follow the instructions that appear on your screen. If an error is displayed, go to “Symptom-to-FRU Index” on page 8-14.

**Module Tests Selection:** If the test programs do not find a problem, or you want to perform in-depth testing, the Module Tests selection provides a method to run individual tests on a single module. For example, you can run an individual test for the diskette drive, or you can run groups of tests for several modules. In the Module Tests selection, you can define how many times each test should run and how the test program should log the errors.

To start the Module Tests, do the following.

1. Insert the diagnostic diskette into drive A.
2. Power-on the system unit.
3. When the diagnostic **Main Menu** is displayed, select **Diagnostics** and press Enter.
4. Select **Module Tests** from the Diagnostics Menu.
5. Use the up and down arrow keys to move the highlight bar from one selection to the next in the Module Tests Menu.
6. Use the following instructions to select and run tests.

**Note:** As you scroll down the selection menu, the Test Group window to the right changes to correspond to the highlighted Module.



### Running Selected Module Tests

To run selected tests for a test group, do the following.

1. Use the up and down arrow keys to move the cursor to your selection.
2. Press Enter.

A “◆” appears next to your selection.

### Running All Selected Modules

To run all selected test modules, do the following.

1. Use the down arrow key to move the cursor to the last choice, **Run All Selected**.
2. Press Enter.

A “◆” appears next to your selection.

### Changing Selected Tests in Test Groups

To change selected tests in a test group, do the following.

1. Use the up and down arrow keys to move the cursor to your selection.
2. Press Tab to move into the expanded Test Group window.
3. Scroll to the test you want to select or deselect.

#### Attention

Items indicated by a directly adjacent “\*” (red text on color screens) are destructive tests.

4. Press the spacebar at the highlighted test to toggle between selected (indicated by a “◆”) and not selected.

**Note:** Typing the first letter of a test does not activate the test, unlike menu operations.

5. Press Enter.

### Running an Individual Test

To run an individual test, do the following.

1. Use the up and down arrow keys to move the highlighted bar to the test you want to run.
2. Press Enter to run the test.

The results of the test appear in the lower-right-hand Test Log window. Also, if you enabled Test Logging, the results are recorded in the Test Log.

3. After the tests have been completed, press Esc to return to the Module Tests Menu.

**Stopping the Tests:** To stop running a specific test or stop testing after you have started a test, press Esc while the test is running. The test pauses at the first possible opportunity, and the Skip/Abort Test Menu appears with the following options.

Option	Action
Continue	The test program begins testing where it stopped.
Skip to next test	The test program skips the current test, but remaining tests for the selected Test Module continue.
Skip to next group	The test program skips the remaining tests in the current test group.
Abort all tests	The test program stops and returns to the previous menu.

---

## General Checkout

### Attention

The drives in the system unit you are servicing might have been rearranged or the drive startup sequence changed. Be extremely careful during write operations such as copying, saving, or formatting. Data or programs can be overwritten if you select an incorrect drive.

Diagnostic error messages appear when a test program finds a problem with a hardware option. For the test programs to properly determine if a test *Passed*, *Failed*, or *Aborted*, the test programs check the error-return code at test completion.

General error messages appear if a problem or conflict is found by an application program, the operating system, or both. For an explanation of these messages, refer to the information supplied with that software package.

### Notes:

1. Before replacing any parts, make sure the latest level of BIOS is installed on the system unit. A down-level BIOS might cause false errors and unnecessary replacement of the processor card. For more information on how to determine and obtain the latest level BIOS, see "BIOS Levels" on page 8-2.
2. If multiple error codes are displayed, diagnose the first error code displayed.
3. If the system unit stalls with a POST error, go to "Symptom-to-FRU Index" on page 8-14.
4. If the system unit stalls and no error is displayed, go to "Undetermined Problem" on page 8-28.
5. If an installed device is not recognized by the diagnostic program, that device might be defective.

### 001

- Power-off the system unit and all external devices.
- Check all cables and power cords.
- Set all display controls to the middle position.
- Insert the Diagnostic diskette into drive A.
- Power-on all external devices.
- Power-on the system unit.
- Check for the following responses:
  1. One or two beeps (depending on the diagnostic version level).
  2. Readable instructions or the Main Menu.

## DID YOU RECEIVE THE CORRECT RESPONSES?

Yes No

002

Go to the "Symptom-to-FRU Index" on page 8-14.

003

## ARE ALL INSTALLED DEVICES IN THE COMPUTER HIGHLIGHTED ON THE MODULE TEST MENU OR HARDWARE CONFIGURATION REPORT?

Yes No

004

Go to "Module Tests Menu" on page 8-6.

005

Run the Advanced Diagnostic test. If necessary, refer to "Diagnostic and Test Tools" on page 8-3.

- If you receive an error, go to "Symptom-to-FRU Index" on page 8-14.
- If the test stops and you cannot continue, replace the last device tested.
- If the system unit has incorrect keyboard responses, go to "Keyboard."
- If the printer has incorrect responses, go to "Printer" on page 8-12.
- If the display has problems such as jittering, rolling, shifting, or being out of focus, go to "Display" on page 8-14.

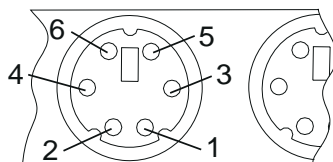
## Keyboard

If the keyboard is experiencing problems and a mouse or other pointing device is attached, remove it to see if the error symptom goes away. If the symptom goes away, the mouse or pointing device is defective. If the symptom does not go away, do the following.

001

- Power-off the system unit.
- Disconnect the keyboard cable from the system unit.
- Power-on the system unit and check the keyboard cable connector on the system unit for the voltages shown. All voltages are  $\pm 5\%$ .

Pin	Voltage ( vDC)
1	+5.0
2	Not Used
3	Ground
4	+5.0
5	+5.0
6	Not Used



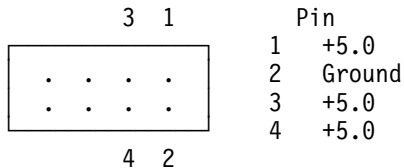
(continued)

## ARE THE VOLTAGES CORRECT?

Yes No

002

- Power-off the system unit.
- Disconnect the keyboard/mouse cable from the processor card.
- Power-on the system unit and check the keyboard/mouse connector on the processor card for the voltages shown.



## ARE THE VOLTAGES CORRECT?

Yes No

003

Replace the keyboard/mouse cable. If the problem remains, replace the processor card.

004

Replace the PMC video card.

005

On keyboards with a detachable cable, replace the cable. If the problem remains or if the cable is permanently attached to the keyboard, replace the keyboard. If the problem remains, replace the processor card.

## Printer

If a printer is experiencing problems, do the following.

1. Make sure the printer is connected properly and is powered on.
2. Run the printer self-test.

If the printer self-test does not run correctly, the problem is in the printer. Refer to the printer service manual.

If the printer self-test runs correctly, install a wrap plug in the parallel port and run the diagnostic tests to determine which part failed.

If the diagnostic tests (with the wrap plug installed) do not detect a failure, replace the printer cable. If that does not correct the problem, replace the processor card or adapter connected to the printer cable.

## Power Supply

If the power-on indicator is not on, the power-supply fan is not running, or the system unit will not power-off, do the following.

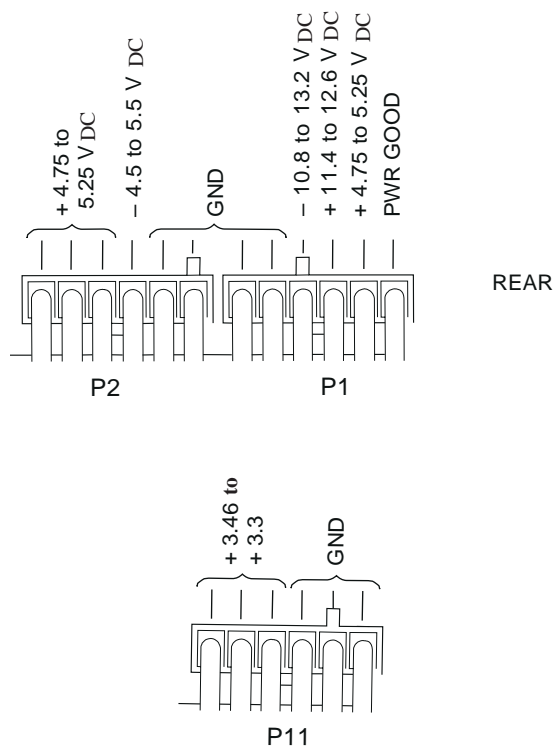
Check/Verify	Action
1. Check the following for proper installation. <ul style="list-style-type: none"><li>• Power Cord</li><li>• On/Off Switch connector</li><li>• On/Off Switch Power Supply connector</li><li>• Backplane Power Supply connectors</li></ul>	<b>Reseat</b>
2. Check the power cord for proper continuity.	<b>Power Cord</b>
3. Check the power-on switch for continuity.	<b>Power-on Switch</b>

If these are correct, check the voltages shown in “Backplane Power-Supply Connections.”

## Backplane Power-Supply Connections

The backplane of the 7588 Industrial Computer has five green LEDs at the front next to the power supply connectors, one for each of the five output voltages from the power supply. If any of these LEDs is not lit, verify the power supply cables are correctly installed on the backplane. If the power supply connections are correct and the previous checks are correct, replace the power supply.

**Note:** These voltages must be checked with the power supply cables connected to the backplane.



---

## Display

If the screen is rolling, replace the display assembly. If that does not correct the problem, replace the PMC video card.

If the screen is not rolling, do the following to run the display self-test.

1. Power-off the system unit and the display.
2. Disconnect the display signal cable.
3. Power-on the display.
4. Turn the brightness and contrast controls to their maximum setting. The screen should be a uniform white or light gray test color.
5. If you do not see the test color, replace the display. If there is a test color on the screen, replace the PMC video card.

**Note:** During the first two or three seconds after the display is powered on, the following might occur while the display synchronizes with the system unit.

- Unusual patterns or characters
- Static, crackling, or clicking sounds
- A “power-on hum” on larger displays

A noticeable odor might occur on new displays or displays recently removed from storage. These sounds, display patterns, and odors are normal; do not replace any parts.

If you are unable to correct the problem, go to “Undetermined Problem” on page 8-28.

---

## Symptom-to-FRU Index

The symptom-to-FRU index tables list error symptoms, as well as parts to be replaced and corrective actions to take. The parts and corrective actions are listed in order of decreasing effectiveness in problem solving. Replace the parts or take actions in the order suggested. The Xs in the tables represent a number from 0 to 9.

Always begin with “General Checkout” on page 8-10. If you are unable to correct the problem using these tables, go to “Undetermined Problem” on page 8-28.

### Notes:

1. If you have both an error message and an incorrect pattern of beeps, diagnose the error message first.
2. If you cannot run the diagnostic tests, but did receive a POST error message, diagnose the POST error message.
3. If you did not receive any error message, look for a description of your error symptoms in the first part of this index.
4. Check all power supply voltages before you replace the processor card. (See “Power Supply” on page 1-4.)
5. Check the hard disk drive jumper settings before you replace a hard disk drive. (See “Hard Disk Drive Jumper Settings” on page D-2.)

### Important

1. Some errors are indicated with a pattern of beeps. (See “Beep Symptoms” on page 8-15.)
2. The processor chip is a separate part from the processor card. (See “Removing and Replacing the Processor Card” on page 8-35.)

## Beep Symptoms

The system unit produces patterns of beeps to assist in diagnosing many problems. The processor card and the PMC video card provide the processor function for the 7588 Industrial Computer. If the beeps indicate an processor card failure, or if there is no beep and the system unit is not responding, separate the PMC video card from the processor card and rerun the test. If the failure goes away or changes, replace the PMC video card first, and then the processor card.

Beeps	Description
<b>1-2-X</b>	<ul style="list-style-type: none"> <li>• One beep</li> <li>• A pause (or break)</li> <li>• Two beeps</li> <li>• A pause (or break)</li> <li>• Any number of beeps</li> </ul>
<b>4</b>	Four continuous beeps
<b>1-1-3</b> CMOS read/write error	<ol style="list-style-type: none"> <li>1. Run Setup.</li> <li>2. Processor Card</li> </ol>
<b>1-1-4</b> ROM BIOS check error	<ol style="list-style-type: none"> <li>1. Processor Card</li> </ol>
<b>1-2-X</b> DMA error	<ol style="list-style-type: none"> <li>1. Processor Card</li> </ol>
<b>1-3-X</b>	<ol style="list-style-type: none"> <li>1. Memory Module</li> <li>2. Processor Card</li> </ol>
<b>1-4-4</b>	<ol style="list-style-type: none"> <li>1. Keyboard</li> <li>2. Processor Card</li> </ol>
<b>1-4-X</b> Error detected in first 64 KB of RAM.	<ol style="list-style-type: none"> <li>1. Memory Module</li> <li>2. Processor Card</li> </ol>
<b>2-1-1, 2-1-2</b>	<ol style="list-style-type: none"> <li>1. Run Setup.</li> <li>2. Processor Card</li> </ol>
<b>2-1-X</b> First 64 KB of RAM failed.	<ol style="list-style-type: none"> <li>1. Memory Module</li> <li>2. Processor Card</li> </ol>
<b>2-2-2</b>	<ol style="list-style-type: none"> <li>1. PMC Video Card</li> <li>2. Processor Card</li> </ol>
<b>2-2-X</b> First 64 KB of RAM failed.	<ol style="list-style-type: none"> <li>1. Memory Module</li> <li>2. Processor Card</li> </ol>
<b>2-3-X</b>	<ol style="list-style-type: none"> <li>1. Memory Module</li> <li>2. Processor Card</li> </ol>
<b>2-4-X</b>	<ol style="list-style-type: none"> <li>1. Run Setup.</li> <li>2. Memory Module</li> <li>3. Processor Card</li> </ol>
<b>3-1-X</b> DMA register failed.	<ol style="list-style-type: none"> <li>1. Processor Card</li> </ol>
<b>3-2-4</b> Keyboard controller failed.	<ol style="list-style-type: none"> <li>1. Processor Card</li> <li>2. Keyboard</li> </ol>
<b>3-3-4</b> Screen initialization failed.	<ol style="list-style-type: none"> <li>1. PMC Video Card</li> <li>2. Processor Card</li> <li>3. Display</li> </ol>

Beeps	Description
<b>3-4-1</b> Screen retrace test detected an error.	<ol style="list-style-type: none"> <li>1. PMC Video Card</li> <li>2. Processor Card</li> <li>3. Display</li> </ol>
<b>3-4-2</b> POST is searching for video ROM.	<ol style="list-style-type: none"> <li>1. PMC Video Card</li> <li>2. Processor Card</li> </ol>
<b>4</b>	<ol style="list-style-type: none"> <li>1. PMC Video Card</li> <li>2. Processor Card</li> </ol>
All other beep patterns.	<ol style="list-style-type: none"> <li>1. Processor Card</li> </ol>
One long and one short beep during POST. Base 640 KB memory error or shadow RAM error.	<ol style="list-style-type: none"> <li>1. Memory Module</li> <li>2. Processor Card</li> </ol>
One long and two or three short beeps during POST. (PMC video card error)	<ol style="list-style-type: none"> <li>1. Display Adapter</li> <li>2. Processor Card</li> </ol>
Three short beeps during POST.	<ol style="list-style-type: none"> <li>1. See "Removing and Replacing the Processor Card" on page 8-35.</li> <li>2. Processor Card</li> </ol>
Continuous beep.	<ol style="list-style-type: none"> <li>1. Processor Card</li> </ol>
Repeating short beeps.	<ol style="list-style-type: none"> <li>1. Check for stuck keyboard key.</li> <li>2. Keyboard Cable</li> <li>3. Processor Card</li> </ol>

## No Beeps

Symptom/Error	Action
No beep during POST but the system unit works correctly.	<ol style="list-style-type: none"> <li>1. LED Board</li> <li>2. LED Cable</li> <li>3. Processor Card</li> </ol>
No beep during POST.	<ol style="list-style-type: none"> <li>1. See "Undetermined Problem" on page 8-28.</li> <li>2. Processor Card</li> <li>3. Memory Module</li> <li>4. Any Adapter or Device</li> <li>5. Power Cord</li> <li>6. Power Supply</li> </ol>