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

The IBM 586 or 586E Single-Board Computer (IBM SBC) is a 586-class single-board computer designed for use in ruggedized applications such as the embedded products and complete systems offered by the IBM WorldWide Plant Floor Solutions group. Two models are available: the 586E (with Ethernet) or the 586 (without Ethernet). The IBM SBC is paired with the IBM Analog Video PCI Mezzanine Card (PMC) Form Factor Card (Analog Video PMC Form Factor Card) for complete system function.

The IBM SBC supports Intel Pentium processors with processor bus speeds between 50MHz and 66MHz, and a PCI bus operating at up to 33MHz. Its features include:

- Pentium processors up to 166MHz
- Optional 0, 256KB, or 512KB of pipelined synchronous burst cache
- 8MB to 256MB of Extended Data Out (EDO) parity DRAM
- PCI local bus-resident IDE with support for IDE Mode 0, 1, 2, 3, or 4 PIO, and ATA multiword DMA modes 0, 1, and 2.
- 2 NS16550 serial ports
- 1 parallel port with Extended Capabilities Port (ECP) and Enhanced Parallel Port (EPP) support
- 1 diskette controller (1.44MB and 2.88MB support)
- 1 real-time clock
- 1 keyboard port
- 1 mouse port
- 10 BaseT/100 BaseTX PCI Ethernet (optional)
- Software upgradeable BIOS
- An IEEE P1386 PMC adapter card connector
- Analog Video PMC Form Factor Card (optional)
- External Peripheral Component Interconnect (PCI) 2.1 revision expansion slots
- PCI Industry Computer Manufacturer's group (PICMG) edge connector that supports external ISA and PCI devices.

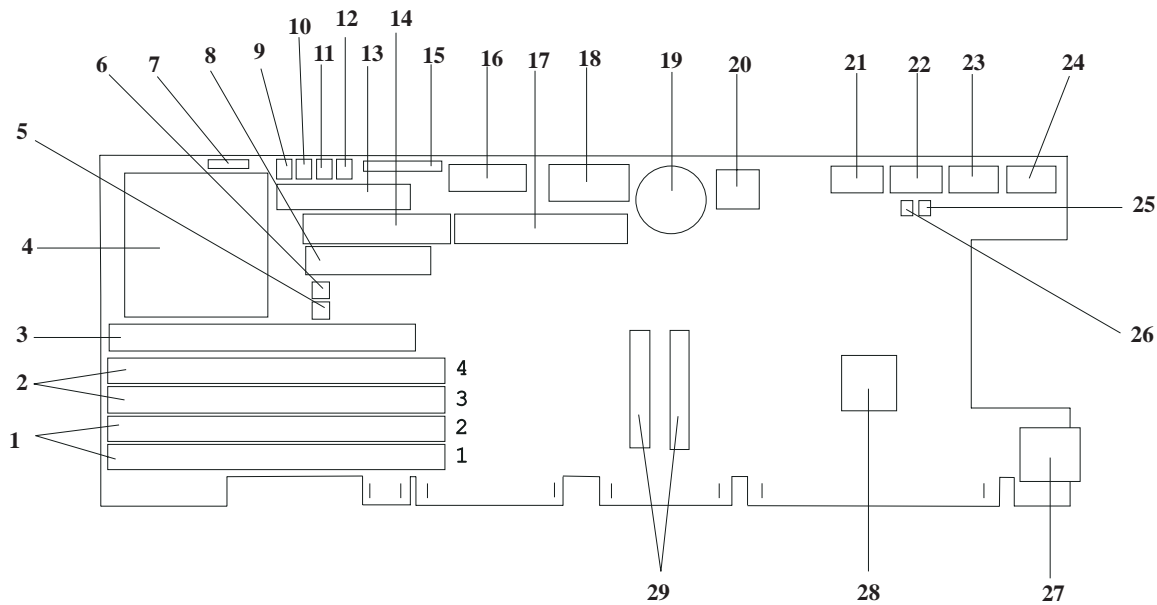


Figure 6-1. IBM SBC Component Layout

- 1** Memory SIMM Bank 0
- 2** Memory SIMM Bank 1
- 3** Cache socket
- 4** Processor
- 5** 5 VDC fan power connector
- 6** 12 VDC fan power 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-retention 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 connectors

Memory Subsystem

1 and **2** SIMMS

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

3 Cache

There is a single level-2 (L2) cache socket on the IBM SBC. This socket can be populated with a single cache memory module in either 256KB or 512KB sizes. L2 cache is not required for proper operation on the IBM SBC card. If L2 cache is not installed, the IBM SBC 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.

Indicators

23 Hex Display

There are two hex displays viewable from the top of the IBM SBC. These displays give codes indicating the progress of the POST for the IBM SBC. When the IBM SBC has completed its POST, the displays will have a 00 in them, and the operating system will start its boot. If there is an error 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 any key. These codes will not display when the IBM SBC is set to auto-configure mode (switch 5 is set to ON). In auto-configure mode, the IBM SBC automatically reconfigures itself and reboots.

9 Power-On

This 2-pin connector on the IBM SBC is used to interface to a system unit power-on indicator. It will turn on an LED connected to this connector whenever 5 VDC is applied to the IBM SBC.

10 HDD Access

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.

11 Speaker

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

12 Reset Switch

This connector is used with a system unit reset switch. When the 2 pins are connected together, the IBM SBC will do a hardware reset.

Connectors

5 5 VDC Fan Power Connector

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

6 12 VDC Fan Power Connector

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

8 Parallel Port

The IBM SBC 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 unit parallel port connector through a cable.

Serial Port

The IBM SBC 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.

21 Serial Port A

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

22 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.

24 Keyboard/Mouse

The IBM SBC 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.

27 Ethernet

The IBM SBC 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.

28 Ethernet Boot ROM

When the optional boot ROM is installed, the IBM SBC will boot over a network. In this mode, the IBM SBC 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.

Floppy Disk Drive (FDD) Connectors

The IBM SBC has a standard FDD (diskette drive) connection, available on one of two connectors:

13 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.

15 Mini 1x26

This mini-header supports a single FDD through the addition of a 26-pin flat circuit cable.

Only one of these connectors can be used at a time.

IDE Connectors

The IBM SBC has two IDE connectors:

17 Mini 50-pin 2x25

This connector is the primary IDE connector. It supports the standard 2.5-inch-drive interface.

14 40-pin 2x20

This header is the secondary IDE connector. It supports the standard 3.5-inch-drive interface.

Both interfaces support PIO modes 0 through 4 and DMA modes 0 through 2. These interfaces support transfer rates of up to 16.7MB per second, depending on the installed FDD. The PIO and DMA modes are set through the Configuration/Setup Utility program.

29 Analog Video PMC Form Factor Card Connector

The IBM SBC supports the IEEE P1386 PMC standard connections; it uses the PMC connection for video support. The Analog Video PMC Form Factor Card attaches to the PMC connector and provides SVGA video output.

20 BIOS Flash ROM

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

19 Memory-Retention Battery

This battery is used to maintain the information stored in the CMOS (complementary 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.

18 External Power

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

Jumpers

25 RS-422 Transmit Termination Jumper

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

26 RS-422 Receive Termination Jumper

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

IBM SBC Switch Functions

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

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

Enable RS-232 Switch

Switch 4 controls the electrical interface of serial port B. If the switch is in the ON position, the port has a standard RS-232 interface. If the switch is in the OFF position, the port has a standard RS-422/485 interface. The serial connector pin-outs for the 7587 Industrial Computer are shown in Appendix D, "Jumpers, Switches, and Pin Assignments."

Auto Boot

Switch 5 lets the IBM SBC auto-configure at power-on. The BIOS will detect configuration errors at power-on and alter 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 unit.

Disable video

Switch 8 lets you disable video on the IBM SBC. When this switch is in the On position, the IBM SBC disables all video, including the Analog Video PMC Form Factor Card and any video cards.

Connector Pin-Outs

This section shows the pin-outs for the following components on Figure 6-1 on page 6-2:

- Fan power connectors
- Parallel port connector
- Power-on indicator connector
- HDD access light connector
- Speaker light connector
- Reset switch connector
- FDD connector
- Secondary IDE connector
- Mini-FDD connector
- Primary IDE connector
- Serial Port A connector
- Serial Port B connector
- Keyboard/mouse connector
- Ethernet connector

The connector pin outs refer to the connectors on the IBM SBC. The system unit provides the cabling to the external customer connectors.

5 5 VDC Fan Power Connector

The 5 VDC fan power connector uses individual 2-pin berg.

Pin #	Description
1	+5.0v
2	Ground

6 12 VDC Fan Power Connector

The 12 VDC fan power connector uses individual 2-pin berg.

Pin #	Description
1	+12.0v
2	Ground

8 Parallel Port Connector

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

Description ECP	Description EPP	Cable Pin #	Cable Pin #	Description ECP	Description EPP
-Strobe	-Write	1	2	-Auto FD	-DSTRB
Data 0	Data 0	3	4	-ERROR	-ERROR
Data 1	Data 1	5	6	-INIT	-INIT
Data 2	Data 2	7	8	-SLCT IN	-ASTRB
Data 3	Data 3	9	10	GND	GND
Data 4	Data 4	11	12	GND	GND
Data 5	Data 5	13	14	GND	GND
Data 6	Data 6	15	16	GND	GND
Data 7	Data 7	17	18	GND	GND
-ACK	-ACK	19	20	GND	GND
Busy	-Wait	21	22	GND	GND
PE	PE	23	24	GND	GND
SLCT	SLCT	25	26	Reserved	Reserved

9 Power-On Indicator Connector

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

Pin #	Description
1	-
2	+

10 HDD Access Light Connector

The hard disk drive connector is a 2-pin berg attached through a cable to the system unit HDD LED (yellow).

Pin #	Description
1	+
2	-

11 Speaker Light Connector

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

Pin #	Description
1	Data out
2	Vcc

12 Reset Switch Connector

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

Pin #	Description
1	-Reset
2	GND

13 FDD Connector

A 2x17 header is used for the diskette drive connector. The connector is attached to the diskette drive through a 34-pin ribbon cable.

Description	Pin #	Pin #	Description
GND	1	2	DENSITY SEL
KEY	3	4	N/C
GND	5	6	DRATE0
GND	7	8	-INDEX
GND	9	10	-MOTOR0
GND	11	12	-FDSEL1
GND	13	14	-FDSEL0
GND	15	16	-MOTOR1
GND	17	18	DIR
GND	19	20	-STEP
GND	21	22	-WDATA
GND	23	24	-WGATE
GND	25	26	-TRK0
GND	27	28	-WRPROT
GND	29	30	-RDATA
GND	31	32	HDSEL
DRATE1	33	34	DSKCHNG

14 Secondary IDE Connector

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

Description	Pin #	Pin #	Description
-RESET	1	2	GND
DATA7	3	4	DATA8
DATA6	5	6	DATA9
DATA5	7	8	DATA10
DATA4	9	10	DATA11
DATA3	11	12	DATA12
DATA2	13	14	DATA13
DATA1	15	16	DATA14
DATA0	17	18	DATA15
GND	19	20	KEY (NC)
DRQy	21	22	GND
-IOW	23	24	GND
-IOR	25	26	GND
IOCHRDY	27	28	NC
-DACKy	29	30	GND
-IRQ14	31	32	-IOCS16
HA1	33	34	GND
HA0	35	36	HA2
-CS0(1F0h)	37	38	-CS1(3f0h)
-IDEACT	39	40	GND

15 Mini-FDD Connector

A mini 2x13 header is used for a mini-diskette drive connector. The connector is attached to the diskette drive through a 26-pin flat cable.

Description	Pin #	Pin #	Description
+5V	1	2	Index
+5v	3	4	Drive Select
+5v	5	6	Disk Change
NC	7	8	Ready
HD Out	9	10	Motor On
DRATE1	11	12	Direction Select
NC	13	14	Step
GND	15	16	Write Data
GND	17	18	Write Gate
GND	19	20	Track 00
GND	21	22	Write Protect
GND	23	24	Read Data
GND	25	26	Side Out Select

17 Primary IDE Connector

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

Description	Pin #	Pin #	Description
Test Only	A	B	Test Only
Master/Slave	C	D	Master/Slave
Not Used	E	F	Not Used
-RESET	1	2	GND
DATA7	3	4	DATA8
DATA6	5	6	DATA9
DATA5	7	8	DATA10
DATA4	9	10	DATA11
DATA3	11	12	DATA12
DATA2	13	14	DATA13
DATA2	15	16	DATA14
DATA0	17	18	DATA15
GND	19	20	KEY (NC)
DRQx	21	22	GND
-IOW	23	24	GND
-IOR	25	26	GND
IOCHRDY	27	28	NC
-DACKx	29	30	GND
-IRQ14	31	32	-IOCS16
HA1	33	34	NC
HA0	35	36	HA2
-CS0(1F0h)	37	38	-CS1(3F0h)
-IDEACT	39	40	GND
+5 Volts	41	42	+5v Motor
GND	43	44	+AT Interface

21 Serial Port A Connector

The serial port A 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)

Description	Cable Pin #	Cable Pin #	Description
Carrier Detect	1	2	Data Set Ready
Receive Data	3	4	Request to Send
Transmit Data	5	6	Clear to Send
Data Terminal Ready	7	8	Ring Indicator
GND	9	10	Key (NC)

22 Serial Port B Connector

The serial port B 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)

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

24 Keyboard/Mouse Connector

The keyboard/mouse connector is a right-angled 2x4 header attached through a cable to the Analog Video PMC Form Factor Card.

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

27 Ethernet Connector

The (optional) Ethernet connector is a single RJ45 connector.

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

Ethernet Connector Cabling

The Ethernet port requires 100 ohm category 5 shielded twisted-pair cabling.

Part 3. Analog Video PCI Mezzanine Card (PMC) Form Factor Card Information

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

The Analog Video PCI Mezzanine Card (PMC) Form Factor Card (referred to as **Analog Video PMC Form Factor Card** throughout this book) is a high-performance video card with the following features:

- High-performance S3 Trio64V+ video chip set
- 2MB of video memory with a 64-bit interface
- Support for video modes of up to 1280x1024 at 75Hz
- Display Power Management Signaling (DPMS) energy management
- Passthrough connectors for the mouse and keyboard interfaces.

The Analog Video PMC Form Factor Card attaches to the IBM 586 or 586E Single-Board Computer (IBM SBC) using the PMC connectors. It is recognized automatically by the IBM SBC BIOS and is configured as the system unit video port.

There are five connectors in the Analog Video PMC Form Factor Card:

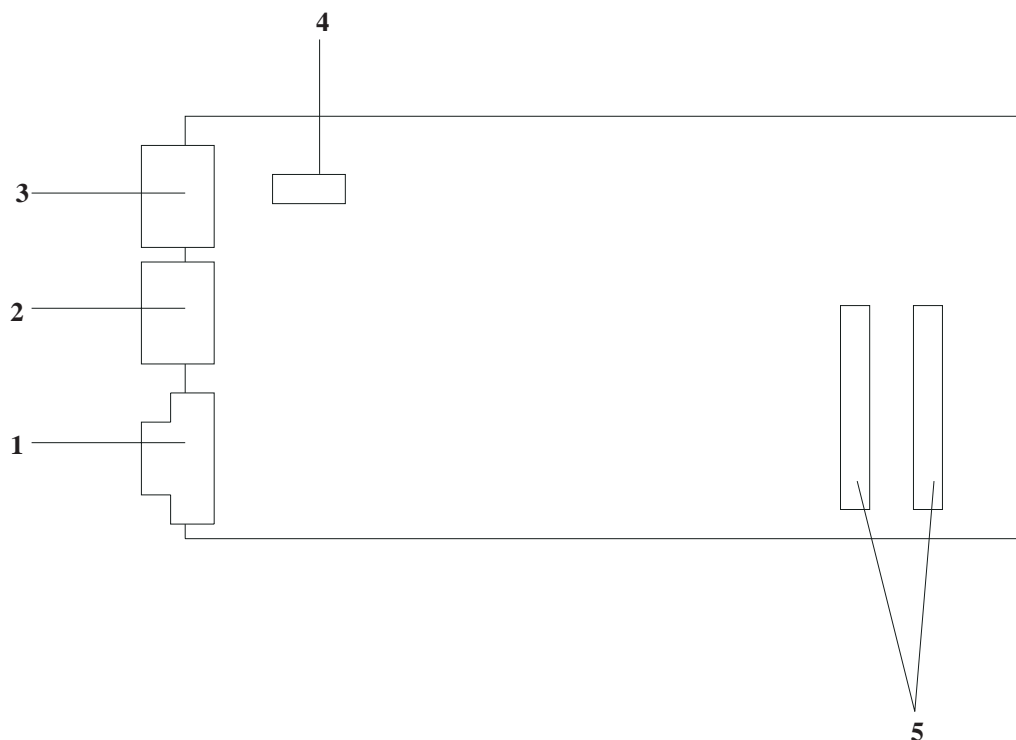


Figure 7-1. Analog Video PMC Form Factor Card Connectors

1 Video connector

This is a standard 15-pin video connector. The output of the video port is standard SVGA. The driver software controls the actual resolutions available to the user. Refer to the video driver documentation for additional information.

2 Keyboard connector

3 Mouse connector

These are 6-pin mini-DIN connectors that allow the user to connect a standard PS/2-style mouse or keyboard. The Analog Video PMC Form Factor Card acts as a passthrough device for these ports; all the circuitry resides on the IBM SBC.

4 Keyboard/mouse input connector

This 8-pin header is the input to the Analog Video PMC Form Factor Card from the IBM SBC. It is connected directly to the mini-DIN connectors with no conditioning or processing.

5 PMC connectors

These connectors are the main signal interface between the IBM SBC and the Analog Video PMC Form Factor Card.

Part 4. Hardware Maintenance Information

Part 4 contains service-oriented information to assist in recognizing and replacing field-replaceable units (FRUs) that have failed or are questionable.

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