TOSHIBA

Equium™ 5160D, 5200D, and 6200D Series

Preliminary Maintenance Manual

DDM-2970016-A00

Chapter 1
Hardware Overview

System Features

The Equium™ Models 5160D, 5200D, and 6200D are some of the most powerful microcomputers available today. Models 5160D, 5200D, and 6200D are low-profile desktop models that deliver the following features:

- ❑ Microprocessor

  The Intel Pentium® microprocessor operates at three speeds:

  - 166 MHz MMX (Model 5160D)
  - 200 MHz MMX (Model 5200)
  - 200 MHz Pentium® Pro (Model 6200D)

- ❑ Memory

  Each Equium™ Model 5160D and 5200D computer comes equipped with 32 megabytes (MB) of 60 ns EDO RAM, expandable to 192 MB EDO RAM non-parity (32-bit).

  Each Equium™ Model 6200D computer comes equipped with 32 megabytes (MB) of 60 ns EDO RAM, expandable to 256 MB EDO RAM non-parity (32-bit).

- ❑ Cache memory

  Each Equium™ model comes equipped with 256 kilobytes (KB) write-back SRAM.

- ❑ Disk storage

  Each Equium™ model comes equipped with one 3.5" 1.44 MB / 1.2 MB / 720 KB (formatted) Floppy Disk Drive.

  The Equium™ series comes with the following standard Enhanced IDE hard disk drives:

  - 2.1 GB (Model 5160D)
  - 2.5 GB (Model 5200D)
  - 3.0 GB (Model 6200D)

- ❑ CD-ROM

  Each Equium™ computer comes equipped with one ATAPI 12X CD-ROM drive.

- ❑ Display system

  The Equium™ series monitors are available in 15- and 17-inch versions. The monitors have the following features:

  - .28 mm dot pitch (15 inch), .26 mm dot pitch (17 inch)
  - 60 Hz non-interlaced refresh rate at resolutions up to 1280x1024
  - EPA Energy Star compliant
  - Monitor has integrated speakers and headphone jack

- ❑ 104-key Windows 95 compatible keyboard
- ❑ PS/2 three-button mouse
- ❑ Audio system

  16-bit stereo Sound Blaster - Pro compatible audio.
- ❑ 145 watt (Models 5160D and 5200D) or 200 watt (Model 6200D) power supply
- ❑ PCI and ISA expansion slots are supported by a connector on the system board designed to accept a riser card. The riser card provides three ISA and two PCI slots.
- ❑ Back panel connectors are provided for video and audio, the keyboard, the PS/2 mouse, a parallel interface, an RJ45 LAN interface, the serial interface, and a Universal Serial Bus (USB) connector provides two USB connectors.
- ❑ Sleep button

  The sleep button places the computer in a power saving mode with near-instant response time to requests by attached devices.
- ❑ Two expansion bays (one occupied by the CD-ROM drive).
- ❑ Low-profile, desktop chassis:
  - Easy installation of 5.25" and 3.5" devices
  - Front access to reset and sleep controls
  - Power, HDD, FDD, and CD-ROM indicators displayed on front

System Configuration

The Equium™ Personal Computer is shown in Figure 1-1 and its system configurations are illustrated in Figure 1-2 and Figure 1-3.

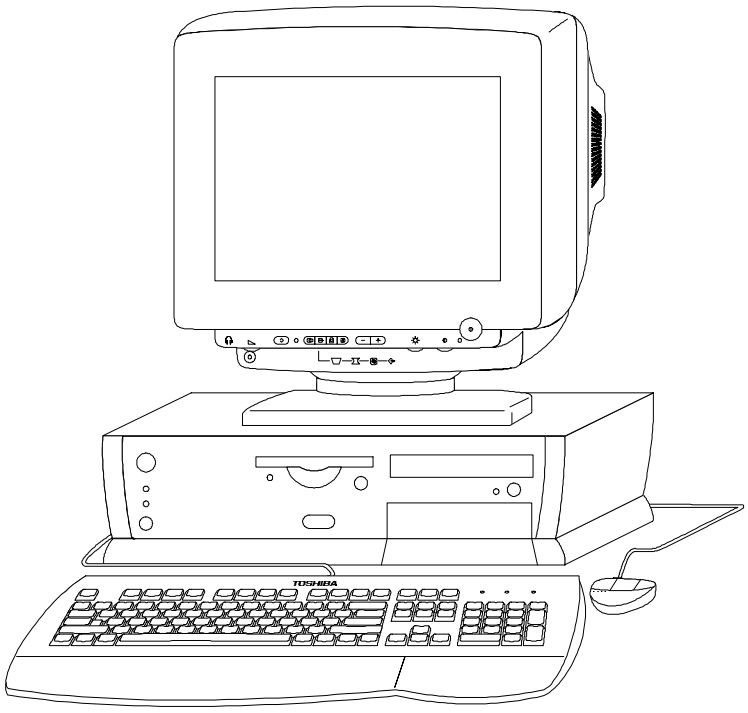

Figure 1-1 Equium™ Personal Computer

Illustration not available at the time of this preliminary release.

Figure 1-2 Equium™ System Unit Configuration (Models 5160D and 5200D)

Figure 1-3 Equium™ System Unit Configuration (Model 6200D)

Equium™ Field Replaceable Units (FRUs)

Each Equium™ computer consists of the following FRU's.

- System board
- Microprocessor
- Single Inline Memory Modules (SIMMs)
- Power Supply
- 3.5" Floppy Disk Drive (FDD)
- 3.5" Enhanced IDE Hard Disk Drive (HDD)
- CD-ROM Drive
- Cooling Fan
- Keyboard
- Mouse
- Monitor
- Real-Time Clock Battery

A description and specification list for each FRU follows.

System Board

Models 5160D and 5200D System Boards

The Equium™ Models 5160D and 5200D come equipped with Intel CU430HX system boards. The Models 5160D and 5200D system board supports the following set of features:

- ❑ Uses a 9-inch by 13-inch LPX form factor.
- ❑ Uses a type 7 Zero Insertion Force (ZIF) socket to house any of the Intel Pentium® processors.
- ❑ Intel Pentium® MMX microprocessor running at 166 MHz (Model 5160D), and 200 MHz (Model 5200D).
- ❑ Uses Intel's 82430HX PCIset. The Intel 82371SB PCI/ISA IDE Accelerator (PIIX3) provides an integrated Bus Mastering IDE controller with two high performance IDE interfaces for up to four devices (such as hard drives or CD-ROM).
- ❑ Supports up to 192 MB of Extended Data Out (EDO) RAM (32-bit non-parity) using six standard 72-pin tin lead SIMM sockets.
- ❑ Uses a Flash BIOS with the following features:
  - Uses both hardware and software Secure Flash features to protect Flash contents from corruption.
  - Uses a BIOS that complies with the Desktop Management Interface (DMI-compliant).
  - Uses the E28F002BX 2 MB Flash EEPROM type BIOS with a capacity of 256 KB.
- ❑ Uses the National PC87306BV I/O controller to integrate the following standard PC I/O functions:
  - floppy interface,
  - two FIFO serial ports,
  - one EPP/ECP capable parallel port,
  - a Real Time Clock,
  - keyboard controller,
  - support for an IrDA and Consumer Infra Red compatible interface.
- ❑ Integrates an ATI RAGE II graphics controller with SGRAM graphics memory to support SVGA graphics at resolutions up to 1280 x 1024 with 2 MB of SGRAM installed. Supports up to 4MB of graphics memory using an add-in module from ATI.
- ❑ Integrates a business audio solution using a Creative Laboratories Vibra 16C audio codec on the system board to provide 16-bit stereo, Sound Blaster Pro compatible audio.

- Integrates a complete LAN interface onboard using the Intel 82557 LAN controller.
- Provides an onboard telephony (modem) connection from modem audio to the system board mic/spkr.
- A hardware monitoring ASIC provides the following monitoring functions:
  - Integrated temperature sensor
  - Power supply voltage monitoring
  - Storage of POST results and error codes
- Back panel connectors are provided for video, audio I/O, keyboard and PS/2 mouse connectors, one parallel port interface, RJ45 LAN interface, and two Universal Serial Bus (USB) connectors.
- PCI and ISA expansion slots are supported by a connector on the system board designed to accept a riser card. An on-board jumper allows support of risers with two PCI and three ISA slots.

The system board has the configuration shown in Figure 1-4.

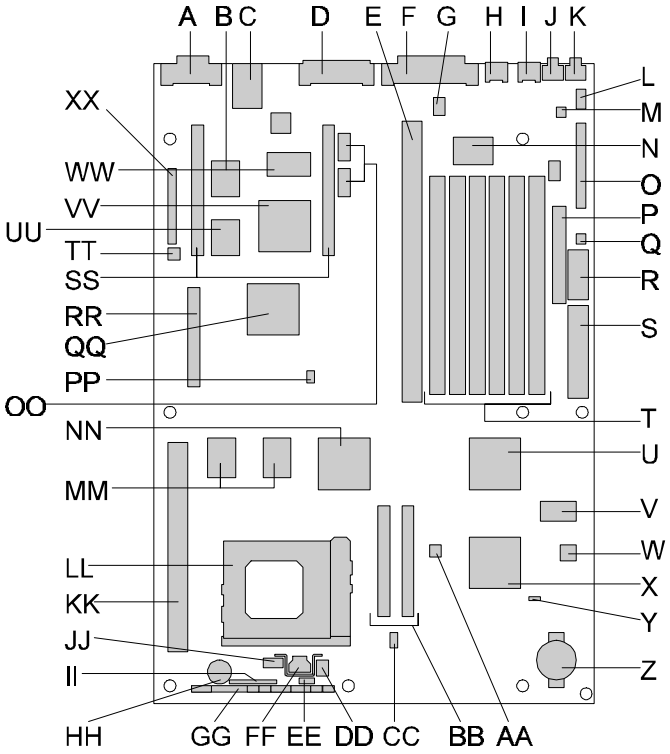

Figure 1-4 Models 5160D and 5200D System Board Layout

Table 1-1 Models 5160D and 5200D System Board Layout Key

Key	Description	Key	Description	Key	Description
A	VGA connector (15-pin, J1N1)	B	SGRAM, video, 128Kx32x2 (U2L2)	C	LAN connector (RJ45, J2N1)
D	Side-by-side USB connector option (4x1x2, J4N1)	E	ISA/PCI riser socket (J6J2)	F	Parallel connector (DB25, J6N1)
G	CD Audio header (1x4, J6N2)	H	PS/2 Mouse connector (J7N1)	I	PS/2 Keyboard Connector (J8N1)
J	Microphone input jack (J8N2)	K	Audio output jack (J9N2)	L	Wave Table header (2x4, J9N1)
M	Telephony (modem) header (2x2, J9M1)	N	Creative Labs Vibra16C audio controller (U7M1)	O	MIDI/Audio header (2x17,J9L1)
P	Floppy connector (J9K1)	Q	Soft-OFF header (1x3, J9K2)	R	Std 3.3V power connector (J9J1)
S	Main power connector (J9H1)	T	SIMM sockets (J6J1, J7J1, J7J2, J7J3, J8J1, J8J2)	U	National PC87306B Ultra I/O controller (U7E1)
V	Flash BIOS TSOP/PSOP(E28F002, U9D1, U9D2)	W	Hardware monitor ASIC (U9C1)	X	Intel SB82371SB (PIIX3, U7C1)
Y	Intrusion-detect photo-transistor (Q8B1)	Z	Real-time clock battery (BT9A1)	AA	Flash recovery jumper block (2x3, J6C2)
BB	IDE connectors (J5C1, J6C1)	CC	Vcc regulator header (2x3, J5B1)	DD	3-wire fan header (1x3, J4A4)
EE	Keyboard lock header (1x3, J4A3)	FF	Voltage regulator (U3A1)	GG	Front panel connector (1x29, J4A1)
HH	Onboard speaker (LS2A1)	II	Front panel header 2 (1x9, J2A2)	JJ	PWR/HDD LED header (1x4, J3A2)
KK	CELP socket (J1D1)	LL	Socket 7 Pentium® processor socket (U3C1)	MM	Mcache PBSRAM (32Kx32, U3E1, U2E1)
NN	Intel FW82439HX (TXC, U4E1)	OO	COM1/COM2 header (5x2, J4L1, J4M1)	PP	Jumper block, 2/3 PCI slot (2x3, J4G1)
QQ	ATI 264GT-B video controller (U3H1)	RR	VGA header (2x20, J1H1)	SS	Video memory upgrade header (2x27, J1L1, J4L2)
TT	Security header (1x2, J1K1)	UU	SGRAM, video, 128Kx32x2 (U2K2)	VV	LAN Controller (82557, U3K1)
WW	National DP83840 (U3L1)	XX	Jumper block header (J1K2)		

Table 1-2 Models 5160D and 5200D System Board Environmental Specifications

Parameter	Specification
Temperature	
– Non-Operating	-40 ^{o} F to 158 ^{o} F (-40^{o}C to 70^{o}C)
– Operating	32 ^{o} F to 131 ^{o} F (0^{o}C to 55^{o}C)
DC Voltage	
– +3.3 V	±5 %
– +5 V	±5 %
– -5 V	±5 %
– +12 V	±5 %
– -12 V	±5 %
Vibration	
– Unpackaged	5 Hz to 20 Hz : 0.01g² Hz sloping up to 0.02 g² Hz
	20 Hz to 500 Hz : 0.02g² Hz (flat)
– Packaged	10 Hz to 40 Hz : 0.015g² Hz (flat)
	40 Hz to 500 Hz : 0.015g² Hz sloping down to 0.00015 g² Hz

Model 6200D System Board

The AP440FXsystem boardused in the Model 6200D is a 64-bit, high-performance, mixed-voltage, energy-conscious, highly integrated platform. The Model 6200D system board supports the following set of features:

- ❑ Uses a 9-inch by 13-inch LPX form factor.
- ❑ Uses a type 8 Zero Insertion Force (ZIF) socket to house the standard processor.
- ❑ Intel Pentium® Pro microprocessor running 200 MHz.
- ❑ Uses Intel's 82440FX chipset. The Intel 82371SB PCI/ISA IDE Xccelerator (PIIX3) provides an integrated Bus Mastering IDE controller with two high performance IDE interfaces for up to four devices (such as hard drives or CD-ROM).
- ❑ Uses a Flash BIOS with the following features:
  - Uses both hardware and software Secure Flash features to protect Flash contents from corruption.
  - Implements virus protection during boot.
  - Uses a BIOS that complies with the Desktop Management Interface (DMI-compliant).
  - Uses the E28F002BX 2 MB Flash EEPROM type BIOS with a capacity of 256 KB.

- Uses the National Super I/O controller (the National PC87307 or the pin-compatible National PC87308 device) to integrate the following standard PC I/O functions:
  - floppy interface, two FIFO serial ports and one EPP/ECP capable parallel port,
  - Real Time Clock,
  - keyboard controller, and
  - support for an IrDA and Consumer Infrared interface at both slow and medium speeds.
- Integrates a Crystal audio codec (CS4236) on the system board to provide 16-bit stereo, Sound Blaster Pro compatible audio. (Provides an onboard telephony (modem) connector used for connecting the modem to the system board audio mic/spkr.)
- Integrates an S3 ViRGE DX graphics controller onboard to support SVGA graphics at resolutions up to 1600x1200 (2MB of video DRAM installed). An enhanced LBP VESA feature connector supports external multimedia capabilities.
- A hardware monitoring ASIC provides the following monitoring functions:
  - Integrated temperature sensor
  - Power supply voltage monitoring
  - Storage of POST results and error codes
- Back panel connectors are provided for video, audio I/O, keyboard and PS/2 mouse connectors, one parallel port interface, two Universal Serial Bus (USB) connectors, and one 9-pin serial port.
- PCI and ISA expansion slots are supported by a connector on the system board designed to accept a riser card. An onboard jumper supports riser cards with two PCI and three ISA slots.

The system board has the configuration shown in Figure 1-5.

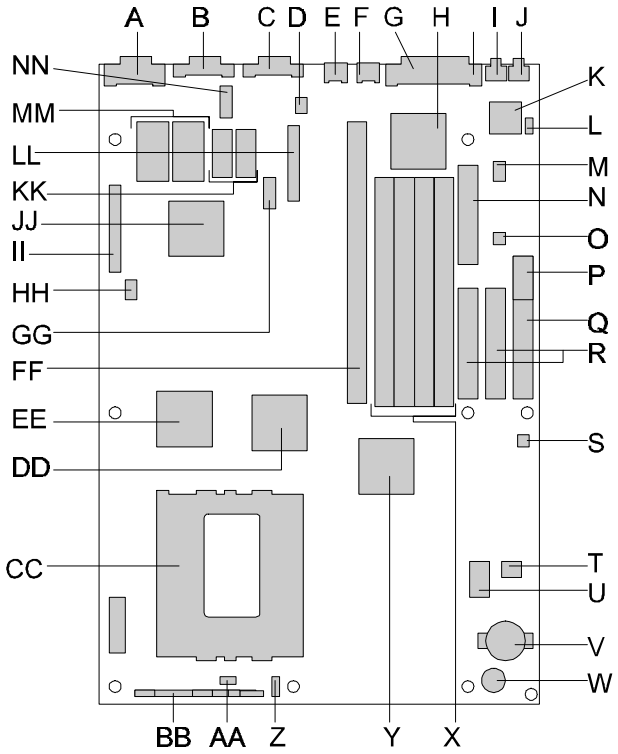

Figure 1-5 Model 6200D System Board Layout

Table 1-3 Model 6200D System Board Layout Key (1/2)

Key	Description	Key	Description	Key	Description
A	VGA connector (15-pin, J1N1)	B	COMM1 9-pin DB9 (J4N2)	C	Side-by-side USB connector (J3N1)
D	LAN wakeup header (2x1, J5N1)	E	PS/2 mouse connector (J5N2)	F	PS/2 keyboard connector (J6N1)
G	Parallel connector (DB25, J7N1)	H	Enhanced Super I/O Controller, National PC87307 (U7M1)	I	Microphone input jack (J8N1)
J	Audio output jack (J9N2)	K	Crystal audio controller (U9M1)	L	CD-ROM header (4x1, J9N1)
M	Wavetable header (2x4, J9L1)	N	Floppy connector (J8L1)	O	Telephony (modem) header (2x2, J9K1)
P	Standard 3.3V power connector (J9J1)	Q	Main power connector (J9H1)	R	IDE connectors (J8H1, J9H2)
S	Soft OFF header (3x1, J9F1)	T	Hardware monitor ASIC (U9C1)	U	Flash BIOS (E28F002, U8C1)
V	Real-time clock battery (BT9B1)	W	Onboard speaker (L9A1)	X	SIMM sockets (J6J1, J7J1, J7J2, J7J3)
Y	Intel SB82371SB (PIIX3, U6E1)	Z	Auxiliary fan header (1x3, J4A1)	AA	Keylock header (3x1, J3A1)

Table 1-3 Model 6200D System Board Layout Key (2/2)

Key	Description	Key	Description	Key	Description
BB	Front panel connector (J2A1)	CC	Socket 8 Pentium® Pro processor socket (U3C1)	DD	Intel SB82441FX (PMC, U4F1)
EE	Intel SB82442FX (DBX, U2F1)	FF	ISA/PCI riser socket (J6J2)	GG	Consumer/Fast IR header (5x2, J4L1)
HH	Jumper block, 2/3 PCI slot (2x3, J1J1)	II	LPB VESA header (J1K1)	JJ	TRIO64 V+ or S3 ViRGE video controller (U2K1)
KK	Video DRAM (1MB, U3M1, U3M2)	LL	Configuration jumper block (J4L2)	MM	Video DRAM expansion to 2MB (U2M1, U2M2)
NN	COM2H header (5x2, J3N1)				

Table 1-4 Model 6200D System Board Environmental Specifications

Parameter	Specification
Temperature	
– Non-Operating	-40 ^{o} F to 158 ^{o} F (-40^{o}C to 70^{o}C)
– Operating	32 ^{o} F to 131 ^{o} F (0^{o}C to 55^{o}C)
DC Voltage	
– +3.3 V	±5 %
– +5 V	±5 %
– -5 V	±5 %
– +12 V	±5 %
– -12 V	±5 %
Vibration	
– Unpackaged	5 Hz to 20 Hz : 0.01g² Hz sloping up to 0.02 g² Hz
	20 Hz to 500 Hz : 0.02g² Hz (flat)
– Packaged	10 Hz to 40 Hz : 0.015g² Hz (flat)
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Microprocessor

Models 5160D and 5200D Microprocessors

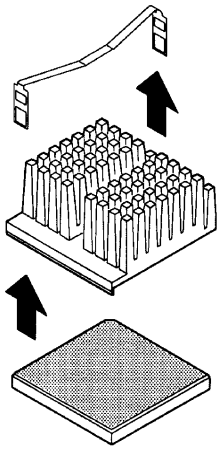

Figure 1-6 Microprocessor (Models 5160D and 5200D)

Each Equium™ Model 5160D computer comes with a 3.3 volt Pentium® MMX processor running at 166 MHz. Each Equium™ Model 52000D computer comes with a 3.3 volt Pentium® MMX processor running at 200 MHz.

The Pentium® processor maintains full backward compatibility with the 8086, 80286, Intel386™ and Intel486™ processors. It supports both read and write burst mode bus cycles, and includes separate 8 KB on-chip code and data caches that employ a write-back policy. The Pentium® processor has an advanced numeric coprocessor that significantly increases the speed of floating point operations, while maintaining backward compatibility with math coprocessors that comply with ANSI/IEEE standard 754-1985.

Model 6200D Microprocessor

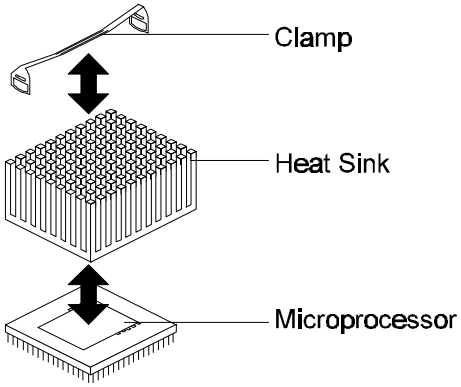

Figure 1-7 Microprocessor (Model 6200D)

Each Equium™ Model 6200D computer comes with a 200 MHz Pentium® Pro processor. A system board voltage regulator circuit provides the required voltages from the 5 V and 3.3 V taps off the power supply. The onboard voltage regulator makes use of the VID capabilities to automatically adjust its voltage output to match that of the installed processor.

The Pentium® Pro processor integrates the second level cache and cache controller that were previously implemented on the system board. The internal, non-blocking L2 cache on the 200 MHz processor is 256 KB, while a second versions of the 200 MHz processor integrates a 512 KB cache. The Pentium® Pro processor has an advanced numeric coprocessor that significantly increases the speed of floating point operations, while maintaining backward compatibility with math coprocessors that comply with ANSI/IEEE standard 754-1985.

An approved Pentium® Pro heatsink is necessary for proper thermal dissipation in an LPX compliant chassis. The processor/heatsink assembly must be securely fastened to the Socket 8 ZIF socket.

Inline Memory Modules (SIMMs)

Equium™ Models 5120D, 5200D, and 6200D computers come equipped with 32 MB of RAM.

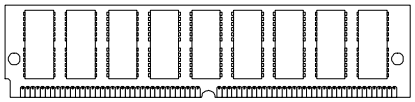

Figure 1-8 A Typical SIMM

Models 5160D and 5200D SIMM Configuration

The system board in Equium Models 5160D and 5200D, the Intel CU430HX, has six 72-pin, tin lead SIMM sockets, arranged as three banks, each with two sockets. Some important considerations are:

- The board supports 60 ns Extended Data Out (EDO) SIMMs.
- The board supports non-parity SIMMs only.
- Both sockets of a bank must be used.
- Both sockets of a bank must contain the same type (EDO), speed (60 ns), and size of SIMM.
- Only tin lead 72-pin SIMMs can be used with the standard tin lead SIMM sockets.
- There are no jumper settings required for the memory size or type. This information is automatically detected by the system BIOS.

The sockets support the following SIMM sizes:

Table 1-5 Models 5160D and 5200D SIMM Sizes

SIMM Size	Configuration (without parity)
4 MB	1 M x 32
8 MB	2 M x 32
16 MB	4 M x 32
32 MB	8 M x 32

Model 6200D SIMM Configuration

The system board in the Equium Model 6200D, the Intel AP440FX, has four 72-pin tin-lead SIMM sockets that make it possible to install up to 128 MB of RAM. The sockets support 1M x 32 (4 MB) single-sided modules, 2M x 32 (8 MB), 4M x 32 (16 MB), and 8M x 32 (32 MB) single-sided modules. Minimum memory size is 8 MB and maximum memory size, using four 8M x 32 SIMM modules, is 128 MB. Memory timing requires 60 ns fast page devices or, for optimum performance, 60 ns EDO DRAM. Both parity and non-parity memory modules are supported. With parity SIMMs, the board can be configured to support ECC operation.

The four sockets are arranged in two banks of two sockets each. The sockets are designated Bank 0 and Bank 1. Each bank provides a 64/72-bit wide data path. Both SIMMs in a bank must be of the same memory size and type, although the types and sizes of memory may differ between banks. Bank 0 only, Bank 1 only, or both of the banks may be populated. There are no jumper settings required for the memory size or type, which is automatically detected by the system BIOS. Use only tin lead SIMMs when adding DRAM.

> *Note: Due to electrical loading characteristics, 64 MB SIMMs using 16 Mb technology are not qualified for use on the AP440FX system board. 64 MB SIMMs using 64 Mb technology have not been qualified, however, they may be supported by the system board when they become available, depending upon the individual characteristics of the memory module. If 64 MB SIMMs are qualified for use on the AP440FX system board, the total onboard memory capacity becomes 256 MB.*

Extended Data Out (or Hyper Page) DRAM is designed to improve the DRAM read performance. EDO DRAM holds the memory data valid until the next memory access cycle, unlike standard fast page mode DRAM that tri-states the memory data when the precharge cycle occurs, prior to the next memory access cycle. EDO DRAM timings are X-2-2-2.

Power Supply

Each Equium™ Model 5160D and 5200D computer comes equipped with a 145 W power supply. Each Equium™ Model 6200D computer comes equipped with a 200 W power supply.

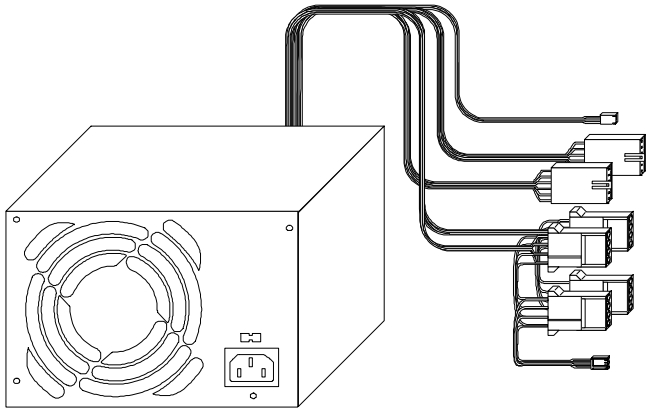

Figure 1-9 Power Supply

Table 1-6 145 W Power Supply Specifications (Models 5160D and 5200D)

Item	Specification	
Electrical	**US**	**Metric**
– Voltage Select Setting	115 VAC	230 VAC
– Operating Voltage Range	90 Vrms (Min.), 135 Vrms (Max.)	180 Vrms (Min.), 265 Vrms (Max.)
– Input Current	3 Arms	1.5 Arms
– Voltage Frequency	50 - 60 Hz (Nominal)	50 - 60 Hz (Nominal)
– Power Output	3.15 V - 3.45 V	3.15 V - 3.45 V
Weight	2.65 LB (1.2 kg)	
Environmental		
– Operating Temperature	50° to 122°F (10° to 50°C)	
– Non-Operating Temperature	-40° to 158°F (-40° to 70°C)	
– Operating Humidity	95% Relative Humidity	
– Non-Operating Humidity	95% Relative Humidity	
– Operating Altitude	10,000 ft (3,048 m) (max.)	
– Non-Operating Altitude	50,000 ft (15,240 m) (max.)	
Shock		
– Operating	1 G (peak) in any axis	
– Non-Operating	30 G (peak), 11 msec in any of the three orthogonal axis, either direction	

Table 1-7 200 W Power Supply Specifications (Model 6200D)

Item	Specification	
Electrical	**US**	**Metric**
– Voltage Select Setting	115 VAC	230 VAC
– Operating Voltage Range	90 Vrms (Min.), 135 Vrms (Max.)	180 Vrms (Min.), 265 Vrms (Max.)
– Input Current	5 Arms	3 Arms
– Voltage Frequency	50 - 60 Hz (Nominal)	50 - 60 Hz (Nominal)
– Power Output	3.15 V - 3.45 V	3.15 V - 3.45 V
Weight	2.65 LB (1.2 kg)	
Environmental		
– Operating Temperature	50° to 122°F (10° to 50°C)	
– Non-Operating Temperature	-40° to 158°F (-40° to 70°C)	
– Operating Humidity	95% Relative Humidity	
– Non-Operating Humidity	95% Relative Humidity	
– Operating Altitude	10,000 ft (3,048 m) (max.)	
– Non-Operating Altitude	50,000 ft (15,240 m) (max.)	
Shock		
– Operating	1 G (peak) in any axis	
– Non-Operating	30 G (peak), 11 msec in any of the three orthogonal axis, either direction	

Floppy Disk Drive (FDD)

Each Equium™ computer comes equipped with a triple density (2 MB / 1.6 MB / 1 MB, unformatted, 1.44 MB / 1.2 MB / .720 KB, formatted) 3.5 inch micro floppy disk drive (FDD).

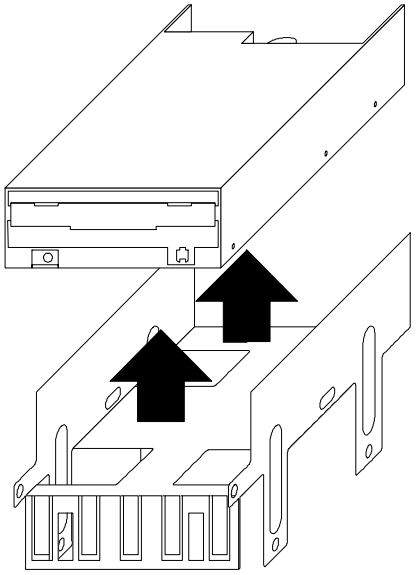

Figure 1-10 3.5" Floppy Disk Drive

Table 1-8 FDD Configuration and Performance Specifications

Item	2 MB Mode	1.6 MB Mode	1 MB Mode
Storage Capacity			
– Unformatted	2 MB	1.6 MB	1 MB
– Formatted	1.44 MB	1.2 MB	.720 KB
Data transfer rate	500 Kbps	500 Kbps	250 Kbps
Rotation speed (rpm)	300	360	300
Number of Heads	2		
Number of Cylinders	80		
Access time (ms)			
– Track to track	3 ms		
– Average	94 ms		
– Head setting time	15 ms (max.)		
Recording track density	135 tpi		
Recording method	Modified Frequency Modulation (MFM)		
Required Power	+ 5 V single (4.5 V ~ 5.5 V)		
Interface Connector	34-pin right header connector		

Table 1-9 FDD Physical Specifications

Dimension	Specification
Height	1.00 inch (25.4 mm)
Depth	5.71 inch (145 mm) (Excluding bezel)
Width	4.00 inch (101.6 mm)
Weight	.76 lb. (345 g), 0.79 lb. (360 g) (max.)

Table 1-10 FDD Environmental Specifications

Parameter	Operating	Storage	Transport
Ambient Temperature	39° - 125°F (4° to 51.7 °C)	-8° - 140°F (-22° to 60C)	-40° - 149°F (-40° to 65°C)
Relative Humidity	20% to 80% (Non-condensing)	5% to 90% (Non-condensing)	5% to 95% (Non-condensing)
Wet Bulb	85°F (29.4°C) (max.)	104°F (40°C) (max.)	113°F (45°C) (max.)
Altitude	-980 to 16,400 ft (-300 - 5,000 m)	N/A	N/A

Table 1-11 FDD Power Requirements

Mode	Average Current		Average Power	
	Typical	Max.	Typical	Max.
Standby	3.0 mA	5.0 mA	15 mW	28 mW
Read	0.30 A	0.40 A	1.5 W	2.20 W
Write	0.30 A	0.40 A	1.5 W	2.20 W
Seek (3 ms)	0.48 A	0.58 A	2.40 W	3.19 W
Seek (6 ms)	0.56 A	0.68 A	2.80 W	3.74 W
Spindle Motor Start	0.62 A	0.70 A	3.10 W	3.85 W

Hard Disk Drives

Each Equium™ computer comes equipped with one of four hard disk drives (HDD) (as listed in Table 1-7). Each HDD is a 3.5-inch, low-profile, high-capacity, enhanced IDE disk drive.

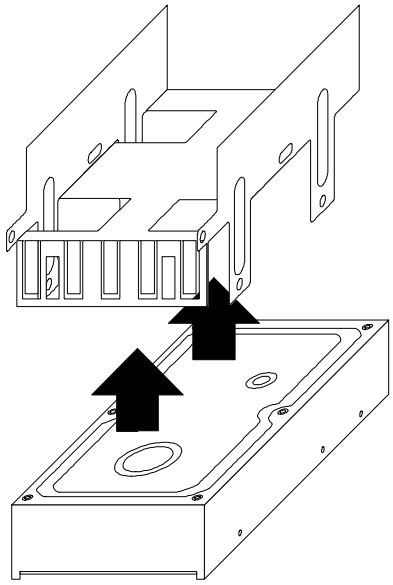

Figure 1-11 3.5" Hard Disk Drive

Table 1-12 Enhanced IDE Hard Disk Drive Configuration Specifications

Equium Model	HDD Model	Cylinders	Heads	Sectors/Track	MB
5160D	Maxtor 82187A	4,248	16	63	2,187
5200D	Maxtor 82560A	4,962	16	63	2,560
6200D	Western Digital AC33100	6,136	16	63	3,166.7

Table 1-13 Enhanced IDE Hard Disk Drive Jumper Specifications (Maxtor Models 82187A and 82560A)

Configuration	Jumper Setting
Master/Single	J50 Jumped
Slave	J50 Open
Cable Select Enabled	J48 Jumped
Write Cache Enabled (82187A) 4092 Cylinder Option Enabled (82560)	J46 Jumped

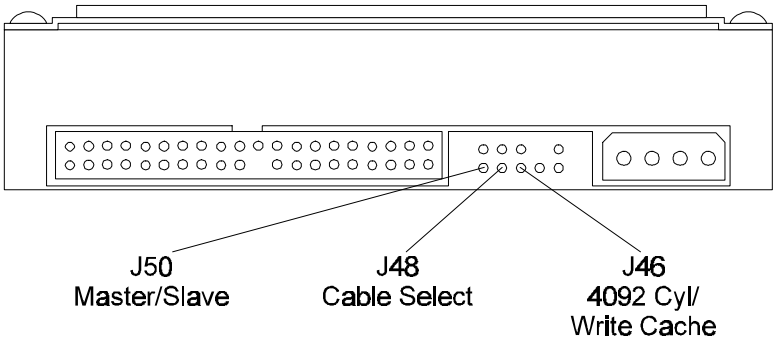

Figure 1-12 Jumper Pin Locations (Maxtor Models 82187A and 82560A)

Table 1-14 Enhanced IDE Hard Disk Drive Jumper Specifications (Western Digital Model AC33100)

Configuration	J8 Jumper Setting
Single	Pins 3 and 5
Master	Pins 5 and 6
Slave	Pins 3 and 4
Cable Select Enabled	Pins 1 and 2

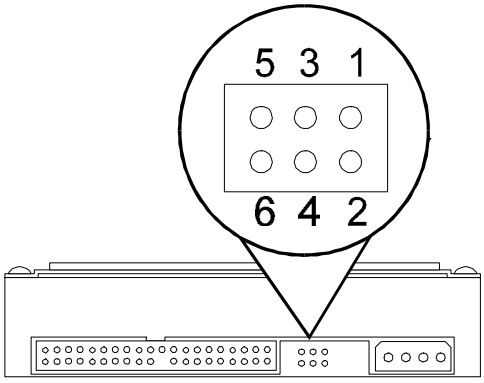

Figure 1-13 Jumper Pin Locations (Western Digital Model AC33100)

CD-ROM Drive

Each Equium™ computer comes equipped with a Toshiba XM-5702B CD-ROM 12X ATAPI drive. The drive provides Photo-CD Multi-session and Multimedia PC-3 compatibility.

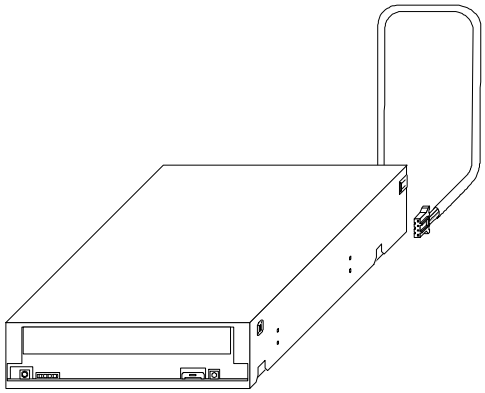

Figure 1-14 CD-ROM Drive

Table 1-15 CD-ROM Drive Physical Dimensions

Dimension	Specification
Height	1.63 in (41.5 mm)
Length	7.6 in (193 mm) (excluding bezel)
Width	5.75 in (146 mm)
Weight	2.2 LB (0.98 kg)

Table 1-16 CD-ROM Drive Performance Characteristics (1/2)

Item	Specification
Applicable Disc Formats	All: Red-Book, Yellow-Book, CD-ROM XA, CD-I, Bridge (Photo-CD, Video CD), CD-I, CD-I Ready, CD-G, and Multi-session (Photo-CD, CD EXTRA, CD-E)
Disk Sizes	4.75 in and 3 in (12 cm and 8 cm)
Data Capacity (Yellow-Book)	
– User Data/Block (Mode 1)	2,048 byte/block
– User Data/Block (Mode 2)	2,336 byte/block
Rotational Speed	
– 1X	Approx. 200 to 530 rpm
– 4X	Approx. 800 to 2,120 rpm
– 12X	Approx. 2,400 to 6,360 rpm

Table 1-16 CD-ROM Drive Performance Characteristics (2/2)

Transfer Rates[1]	
– Sustained Block Transfer Rate	
1X	75 block/s
4X	Approx. 300 block/s
12X	Approx. 900 block/s
– Sustained Data Transfer Rate (Mode 1)	
1X	150 KB/s
4X	Approx. 600 KB/s
12X	Approx. 1,800 KB/s
– Sustained Data Transfer Rate (Mode 2)	
1X	171 KB/s
4X	Approx. 684 KB/s
12X	Approx. 2,052 byte/s
– Sustained PIO Host Transfer Rate	11.1 MB/s (PIO Mode 3)
– Single Word DMA Transfer Mode 2	8.33 MB/s
– Multiple Word DMA Transfer Mode 1	13.3 MB/s
Access Times	
– Average Random Access Times	
1X	320 ms (Typical)
4X	170 ms (Typical)
12X	120 ms (Typical)
– Average Full-Stroke Access Times	
1X	400 ms (Typical)
4X	270 ms (Typical)
12X	220 ms (Typical)
Spin-up Time	12X: 3.9 s (Typical) 4.5 s (Max.)
Data Buffer Capacity	256 KB
Audio Output	
– Analog Output Level	1.0 Vrms (Typical)
– Digital Output Level	0.6 V p-p
– Headphones Output Level	0.7 Vrms (Typical)
– Headphone Connector	3.5 mm Stereo Headphone Jack
Power Supply	+ 5 V, + 12 V

[1] (1 KB = 2^{10} byte = 1024 bytes, 1 MB = 2^{20} byte = 1,048,576 bytes)

Table 1-17 CD-ROM Drive Environmental Conditions

Item	Operating	Non-Operating / Storage	Transporting
Temperature	41° to 122° F (5° to 50°C)	14° to 140° F (-10° to 60°C)	-40° to 150° F (-40° to 65°C)
Temperature Gradient	52° F/hour (max.) (11° C/hour {max.})	68° F/hour (max.) (20° C/hour {max.})	68° F/hour (max.) (20° C/hour {max.})
Humidity (Non-Condensing)	8% to 80% (wet bulb 81° F (27 °C) max.)	5% to 95%	5% to 95%
Atmospheric Pressure and Altitude	0 to 9,850 ft (0 to 3,000 m)		0 to 39,000 ft (0 to 12,000 m)

Cooling Fan

Each Equium™ computer comes equipped with a low-noise, maintenance-free cooling fan.

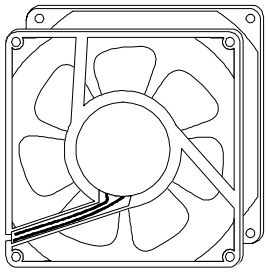

Figure 1-15 Cooling Fan

Table 1-18 Fan Specifications (Typical)

Item	Specification
Dimensions	
– Height	3.15 in (80 mm)
– Width	3.15 in (80 mm)
– Length	1 in (25.4 mm)
Weight	2.82 oz (80 g)
Rated Voltage	12 VDC
Operating Voltage Range	7.0 ~ 13.8 VDC
Rated Current	0.09 A
Rated Input Power	1.08 W
Max. Air Flow	29.0 CFM (0.82 M^3/min)
Max. Air Pressure	0.111 inH_2O (2.83 mmH_2O)
Rotational Speed	2600 rpm
Acoustical Noise	24.8 dB(A)
Environmental	
– Operating Temperature Range	32° to 158°F (0° to 70° C)
– Storage Temperature Range	-40° to 158°F (-40° to 70°C)
Connection Type	Wire

Keyboard

Each Equium™ computer comes equipped with a compact 104-key Windows 95-compatible keyboard connected to the computer by a 79 inch (2 m) cable. The cable connects to the computer through the labeled 6-pin jack on the rear of the computer.

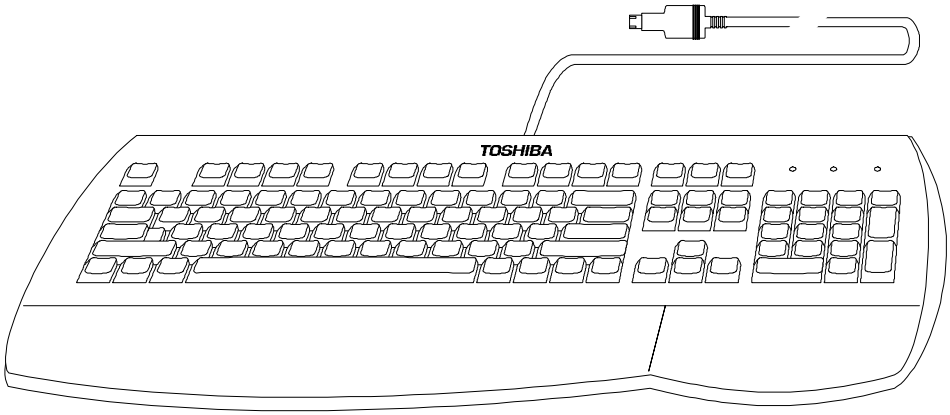

Figure 1-16 Keyboard (Models 5160D and 5200D)

Table 1-19 Keyboard Specifications

Item	Specification
Environmental Data	
– Operating Temp.	32° to 104°F (0° to 40°C)
– Non-Operating Temp.	-4° to 140°F (-20° to 60°C)
– Operating Humidity	5% to 90% non-cond. ambient temp.
– Non-Operating Humidity	0% to 95% non-cond. at 104°F (40°C)
– Operating Shock	10 G
– Non-Operating Shock	50 G
Electrical Data	
– Input Power (max.)	+5 Vdc ± .25 V at 100 mA (max.)
Mechanical Data	
– Total Travel	0.150 in ± .020 in (3.81 mm ± .5 mm)
– Travel to Peak	0.50 in ± .010 in (12.7 mm ± .25 mm)
– Peak Force	2.0 oz. ± .6 oz. (57 g ± 17 g)
– Fire Point	.120 in (3.05 mm) nominal
– Serial Data Output	Synchronous 8-bit
Dimensions	
– Height	1.5 in (38 mm)
– Length	17.90 in (455 mm)
– Depth	6.75 in (171 mm)
– Weight	1.9 LB (.86 kg)

Mouse

Each Equium™ computer comes equipped with a three-button PS/2-compatible mouse connected to the computer by a 7 foot (2.13 m) cable. The cable connects to the computer through the labeled 6-pin jack on the rear of the computer. The mouse buttons are software configurable.

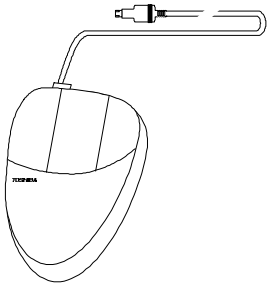

Figure 1-17 Mouse

Table 1-20 Mouse Specifications

Item	Specification
Dimensions	
– Height	1.375 in (35 mm)
– Width	2.94 in (75 mm)
– Length	4.25 in (108 mm)
Weight	5.41 oz (153 g) (including cable)
Cable Length	7 ft (2.13 m)
Base Resolution	400 dpi
Minimum Travel	156 miles (250 km)
Environmental	
– Operating Temperature Range	32° to 104°F (0° to 40° C)
– Storage Temperature Range	-4° to 140°F (-20° to 60°C)
Power Requirements	<= 10 mA
Connector Type	6-pin male PS/2-compatible mini-DIN

Monitor

Fifteen- and seventeen-inch Autoscan VGA color monitors are available for the Equium models Each monitor is a single Field Replaceable Unit.

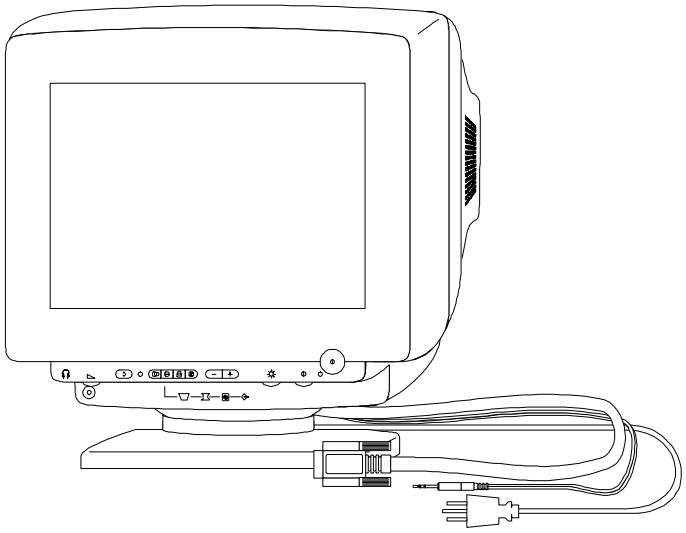

Figure 1-18 Monitor

Table 1-21 Monitor Specifications (1/2)

Item	15-inch Monitor	17-inch Monitor
General		
– Type	110 - 120 V	100 - 240 V
– Main Voltages	90 - 132 VAC	
– Frequencies	47 - 63 Hz	
– Power Consumption	100 W (max.)	100 W (max.)
– Operating Environment Limits	Temperature: 32° to 104° F (0 to 40° C) Humidity: 20 to 80% (Non-Condensing) Air Pressure: 70 to 110 Kpa	Temperature: 32° to 104° F (0 to 40° C) Humidity: 20 to 80% (Non-Condensing) Air Pressure: 70 to 110 Kpa
– Non-operating Environment Limits	Temperature: -13° to 149°F (-25° to 65° C) Humidity: 20 to 90% (Non-Condensing) Air Pressure: 30 to 110 Kpa	Temperature: -13° to 149°F (-25° to 65° C) Humidity: 20 to 90% (Non-Condensing) Air Pressure: 30 to 110 Kpa
– Weight	28 lb. (13 kg)	43.87 lb. (19.9 kg)
– Dimensions	14.74 x 15.47 x 15.31 in (WxHxD) (374 x 393 x 389 mm)	16.61 x 16.92 x 17.67 in (WxHxD) (422 x 430 x 449 mm)

Table 1-21 Monitor Specifications (2/2)

Item	15" Monitor	17" Monitor
Picture Tube		
– Size	15 inch	17 inch
– Light Transmission	57% (dark glass)	
– Deflection Angle	90 degrees	
– EHT Voltage	24.5 ± 1 kV	
– Pitch	.28 mm dotted with black matrix	.26
Video		
– Dot Rate	108 MHz	
– Image Size (WxH)	280 mm x 210 mm	
– H-Shift Range	10 mm (min.)	
– V-Shift Range	10 mm (min.)	
Sync Signal		
– Vertical Frequency	50 - 110 Hz	50 - 160 Hz
– Horizontal Frequency	30 - 66 kHz	30 - 82 kHz
Audio Input Signal		
– Speaker (L/R) Connector Type	3.5 mm stereo plug	
– Cable Length	59 inches (1.5 m)	
– Nominal L/R input level	Approx. 1V	
– L/R input impedance	Approx. 10 k Ω	
Audio Output Signal		
– Max. Speaker Power Output in 25 Ω	1 W (RMS)/channel at 10% THD (measured at 1 kHz)	1 W (RMS)/channel at 10% THD (measured at 1 kHz)
– Headphone Connector	3.5 mm jack (speakers silenced with plug inserted)	
– Headphone application	15 mW (RMS) (max.) in 32 Ω	15 mW (RMS) (max.) in 32 Ω
Internal Speakers		
– Type	L/R: 2 x 2.5 in, full range	
– Rated RMS Power	1 W	
– Nominal Impedance	25 Ω at 1 kHz	

Table 1-22 15-inch Monitor Factory Preset Resolution and Sync. Polarities

	Resolution	Horizontal	Vertical		Sync. Polarity	
Mode	**(dots x line)**	**Freq. (kHz)**	**Freq. (Hz)**	**Refresh**	**H**	**V**
VGA	640 x 400	31.5	70	Non-Interlaced	-	+
VGA	640 x 480	31.5	60	Non-Interlaced	-	-
VESA	640 x 480	37.5	75	Non-Interlaced	-	-
VESA	800 x 600	37.8	60	Non-Interlaced	+	+
VESA	800 x 600	46.8	75	Non-Interlaced	+	+
VESA	1024 x 768	48.3	60	Non-Interlaced	-	-
VESA	1024 x 768	60.0	75	Non-Interlaced	+	+
VESA	1280 x 1024	64.0	60	Non-Interlaced	+	+

Table 1-23 15-inch Monitor Power Management

Mode	H-Sync Signal	V-Sync Signal	Video Signal	Power	Recovery Time
On	Active	Active	Active	≤ 110 W	NA
Stand-By	Inactive	Active	Blanked	≤ 15 W	< 5 sec.
Suspend	Active	Inactive	Blanked	≤ 15 W	< 5 sec.
Off	Inactive	Inactive	Blanked	≤ 5 W	Normal

Real-Time Clock Battery

A coin-cell style battery, installed in a socket on the system board, provides power for the real-time clock and CMOS RAM.

The battery has an estimated life expectancy of three years. When the battery starts to weaken, it loses voltage. When the voltage drops below a certain level, the system settings stored in CMOS RAM (for example, the date and time) may be wrong. If the battery fails, replace it with an equivalent battery.

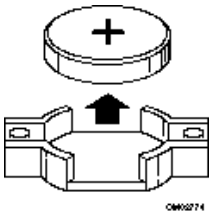

Figure 1-19 Real-Time Clock Battery

Chapter 2
Troubleshooting Procedures

Troubleshooting

Information not available at the time of this preliminary release.

Chapter 3
Tests and Diagnostics

Diagnostics Programs

Toshiba does not provide proprietary diagnostics for the desktop line of products at this time. We do, however, recommend that you obtain a copy of DiagSoft's QAPlus® /FE to run diagnostic programs on the system to assist you in troubleshooting hardware problems.

Chapter 4
Desktop Replacement Procedures

General

This chapter explains how to disassemble Equium™ desktop model computers and replace Field Replaceable Units (FRUs).

> ***NOTE**: The Equium™ desktop computer comes in three models: the 5160D, the 5200D, and the 6200D. The 5160D and the 5200D come standard with the Cumberland system board while the 6200D comes standard with the Krakatoa system board. Although these system boards are similar in architecture, there are some differences concerning connector addresses, component locations, and jumper locations. Therefore, this section includes separate instructions for both 5160D/5200D and 6200D system board removal and replacement.*

See Figure 4-1 to view the locations of internal components for the Equium™ desktop model.

When performing the procedures in this chapter, be aware of the following points:

- The procedures in this chapter assume familiarity with the general terminology associated with personal computers and with the safety practices and regulatory compliance required for using and modifying electronic equipment.
- All replacement procedures are a continuation of removal procedures. Replacement procedures should not be performed without first performing the relevant removal procedures.

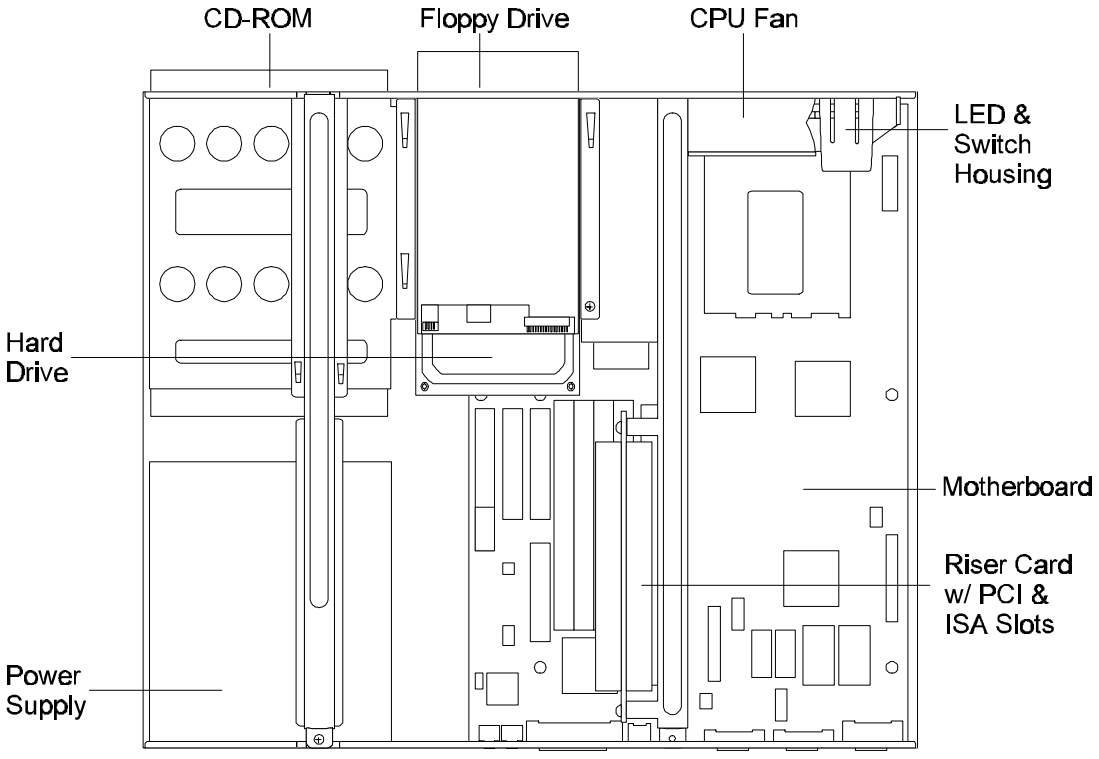

Figure 4-1 Equium™ Internal Desktop Components

Safety Precautions

Before you begin disassembly procedures, read the following safety precautions and observe them *carefully* as you work.

DANGER: *1. Always use the Real-Time Clock (RTC) battery that is authorized by Toshiba or compatible with the computer. Since other batteries have different specifications, they may be incompatible with the Equium™, and they may burst or explode. Heating the battery could cause leakage of alkaline solution. Throwing the battery into a fire could cause the battery to explode. Batteries can retain electrical charge, so there is danger of electrical shock even when the computer is disconnected from the AC power source.*

2. The power supply and other components carry high voltages. To avoid the risk of electric shock (when you turn on the power of a partially assembled computer to check operation), be very careful not to touch connectors or components. Also, do not disassemble individual components during first-level maintenance.

WARNING: ***To avoid the risk of electrical shock or other injury:***

1. Always turn the computer's power off and disconnect the AC power cord from the power source before disassembly.

2. Remove metal jewelry or accessories such as necklaces, bracelets, or rings.

3. Never work with wet or damp hands.

4. Make sure that all replacement components meet the specifications for the computer, and that all cables and connectors are securely fastened.

5. The Equium™ has many sharp edges and corners; be careful not to injure yourself.

CAUTION: To avoid damage to the computer:

1. When you change a component, make sure the replacement component meets the required specifications. Never use non-standard parts.

2. Metal objects such as screws or paper clips that fall into the computer can cause short circuits, fires, or other internal damage.

3. When assembling the computer, make sure to use the correct screws to secure FRUs and other Equium™ parts in place. Make sure all screws are securely fastened. Loose screws can cause short circuits, resulting in heat, smoke, or fire.

4. Before removing components, make sure all cables to the component have been disconnected.

5. Be sure to use the AC power cable that came with the computer or one recommended by Toshiba.

Before You Begin

In addition to the safety precautions listed in section 4.1.1, review and become familiar with the following points, which will also help you avoid personal injury and damage to the computer.

- ❑ Only disassemble the computer if it is not operating correctly.
- ❑ Use only the correct and approved tools.
- ❑ Make sure the working environment (whether you are using or storing the computer) is free of the following elements:
  - Contaminates
  - Static electricity
  - Extreme heat, cold, or humidity
- ❑ Make sure the FRU you are replacing is causing the faulty operation by performing the appropriate diagnostic tests described in Chapter 3 of this manual.
- ❑ Do not perform any operations that are not necessary and use only the described procedures for disassembling and replacing FRUs.
- ❑ Do not remove cables by pulling on the cables. Instead, remove cables by pulling the connector out of the socket.

- ❑ After removing components from the computer, store them in a safe place away from the computer, so they will not be damaged and will not interfere with your work.

- ❑ After removing screws, make sure to store them in a safe place and to identify them with the corresponding parts.
- ❑ After you have replaced an FRU, make sure the computer is functioning properly by performing the appropriate test on the FRU you have fixed or replaced.

Cables and Connectors

The Equium™ uses various types of cables and connectors for internal operation. Equium™ cables and connectors include:

- ❑ Power cables
- ❑ Data cables
- ❑ Audio cable
- ❑ Switch, LED, and fan cables
- ❑ Normal pin and latch connectors

Connecting and Disconnecting Power Cables

Power cables are groups of cables that connect the power supply to various components and to the system board. The Equium™ has three power cables that connect to the system board and five power cables that connect to components or that are unused. Power cables to the system board use latch connectors while power cables to components use normal pin connectors. See Figure 4-2.

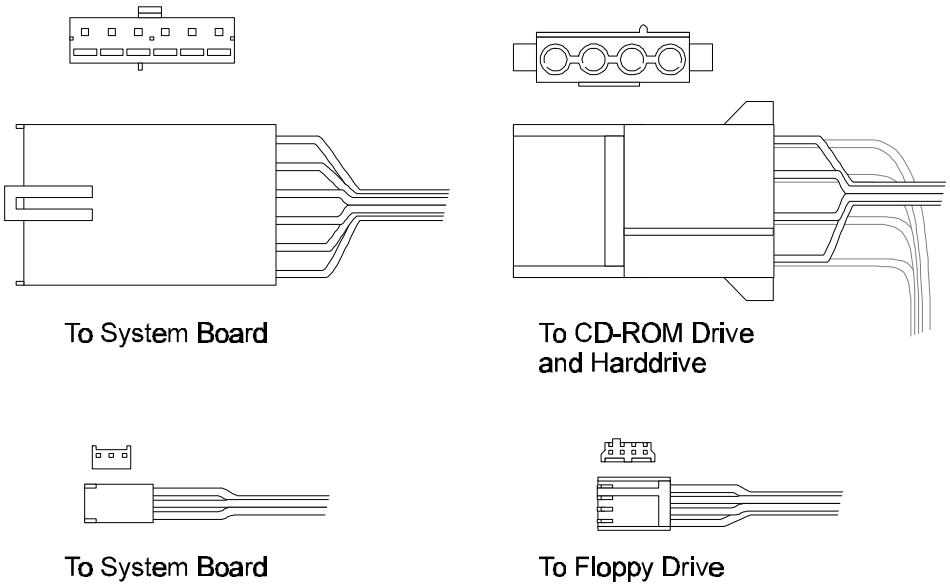

Figure 4-2 Power Cable and Connector

Connecting and Disconnecting Data Cables

Data cables are ribbon cables that connect to various components, cards, and boards in the computer. When connecting data cables to devices, make sure the red stripe on the cable is the side of the cable closest to the power connector (be aware that some of these connectors are keyed while others are not).

Each end of a data cable is labeled, identifying the proper connection. For instance, the data cable that connects the system board to the CD-ROM drive will be labeled **CPU** near the connector that must be attached to the system board and **CD-ROM** near the connector that must be attached to the CD-ROM drive. See Figure 4-3.

> ***CAUTION:*** *When disconnecting and connecting data cables, be careful not to touch the system board's video chip, which may be hot if the computer has been running.*

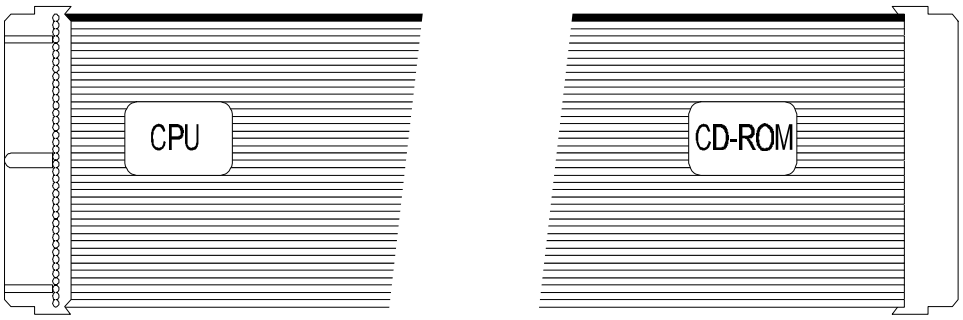

Figure 4-3 Data Cable

Connecting and Disconnecting the Audio Cable

The audio cable is a thin cable that connects the CD-ROM drive to the system board. The audio cable connector is keyed, meaning that it can only be connected to its socket one way. See Figure 4-4.

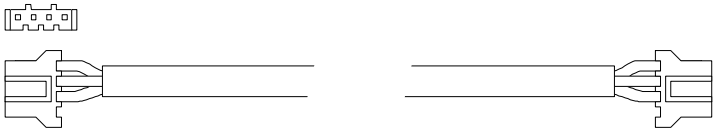

Figure 4-4 Audio Cable

Connecting and Disconnecting LED and Switch Cables

Switch and LED cables are stranded cables that are attached to the computer and connect to the system. These cables use normal pin connectors (not keyed) that are labeled with the name of the switch or LED that the cable connects to. For instance, the connector on the cable coming from the reset switch is labeled **Reset SW** while the connector on the cable coming from the hard drive is labeled **H.D.D. LED**. See Figure 4-5.

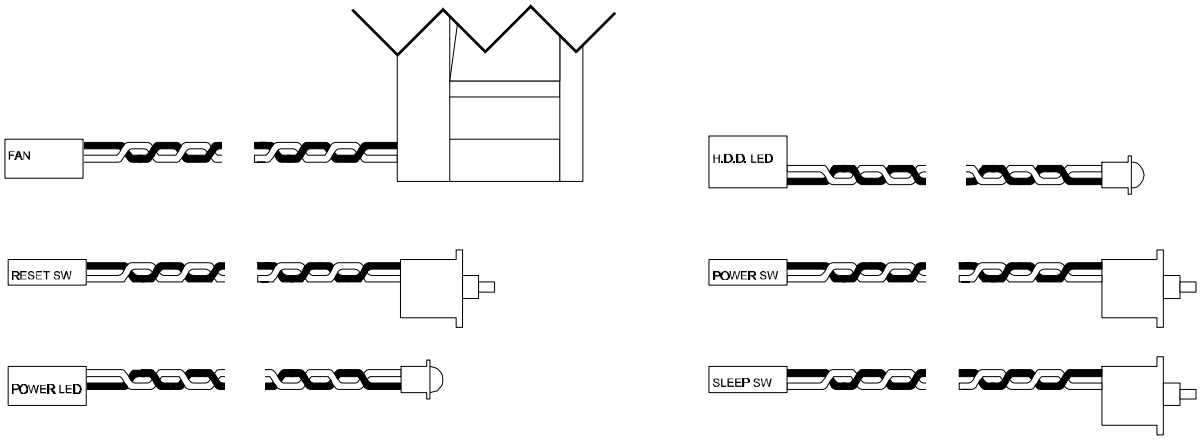

Figure 4-5 Switch and LED Cables

Switch and LED cables connect to sockets on the system board. These sockets are labeled with the name of the switch or LED that the corresponding cable connects to. For instance, the socket intended for the **Reset SW** cable is labeled **RST**.

Connecting and Disconnecting Cable Connectors

The Equium™ uses two types of cable connectors: normal pin connectors and latch connectors. To connect and disconnect these connectors, perform the following general instructions and see Figure 4-6.

- Disconnect normal pin connectors by grasping the connector and carefully pulling the connector from its socket.
- Connect normal pin connectors by aligning the holes on the cable's connector with the pins on the corresponding socket, then pushing the connector into the socket.
- Disconnect latch connectors by pressing the latch on the connector and carefully pulling the connector from its socket.
- Connect latch connectors by aligning the holes on the cable's connector with the pins on the corresponding socket, then pushing the connector into the socket until the latch catches.
- *Gently* pull on cable connectors to make sure they are secure.

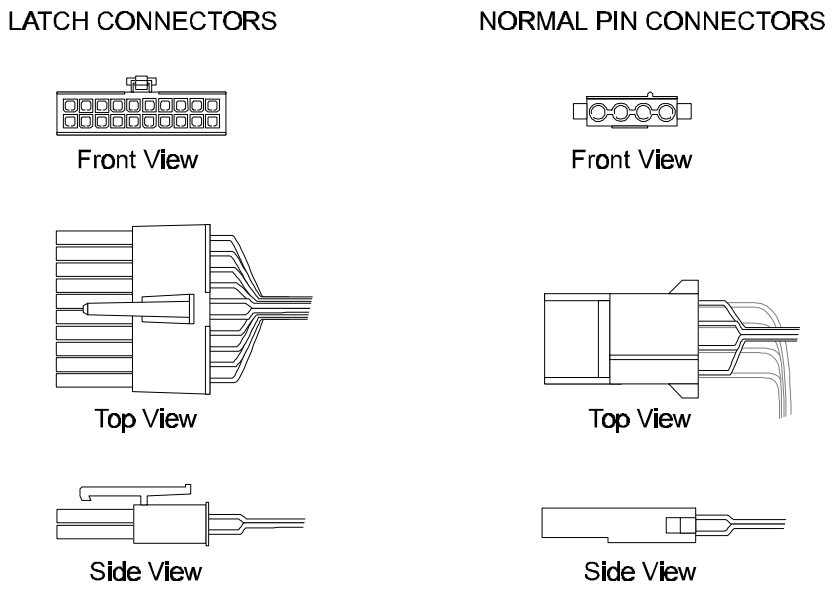

Figure 4-6 Normal Pin and Latch Connectors

Removing Expansion Cards

Because Equium™ desktop computers are low profile units using LPX form factor system boards, riser cards are used for expansion card installation. Riser cards are pass-through devices that connect to the system board and allow expansion cards to be installed parallel to the system board. The Equium™ riser card comes standard with two PCI slots and three ISA slots. As viewed from the rear and installed in the system board, the riser card has one PCI and one ISA slot on the left side and one PCI slot and two ISA slots on the right side.

Removing expansion cards from the riser card's right-side slots is standard in that you must remove the screw that secures the card to the chassis and gently pull the card free of its slot. However, to remove cards from the left-side slots, you must first remove the one screw that secures the clamp to the chassis and swing the clamp to the left, releasing any cards or slot covers; then you can gently pull the card free of its slot. See Figure 4-7.

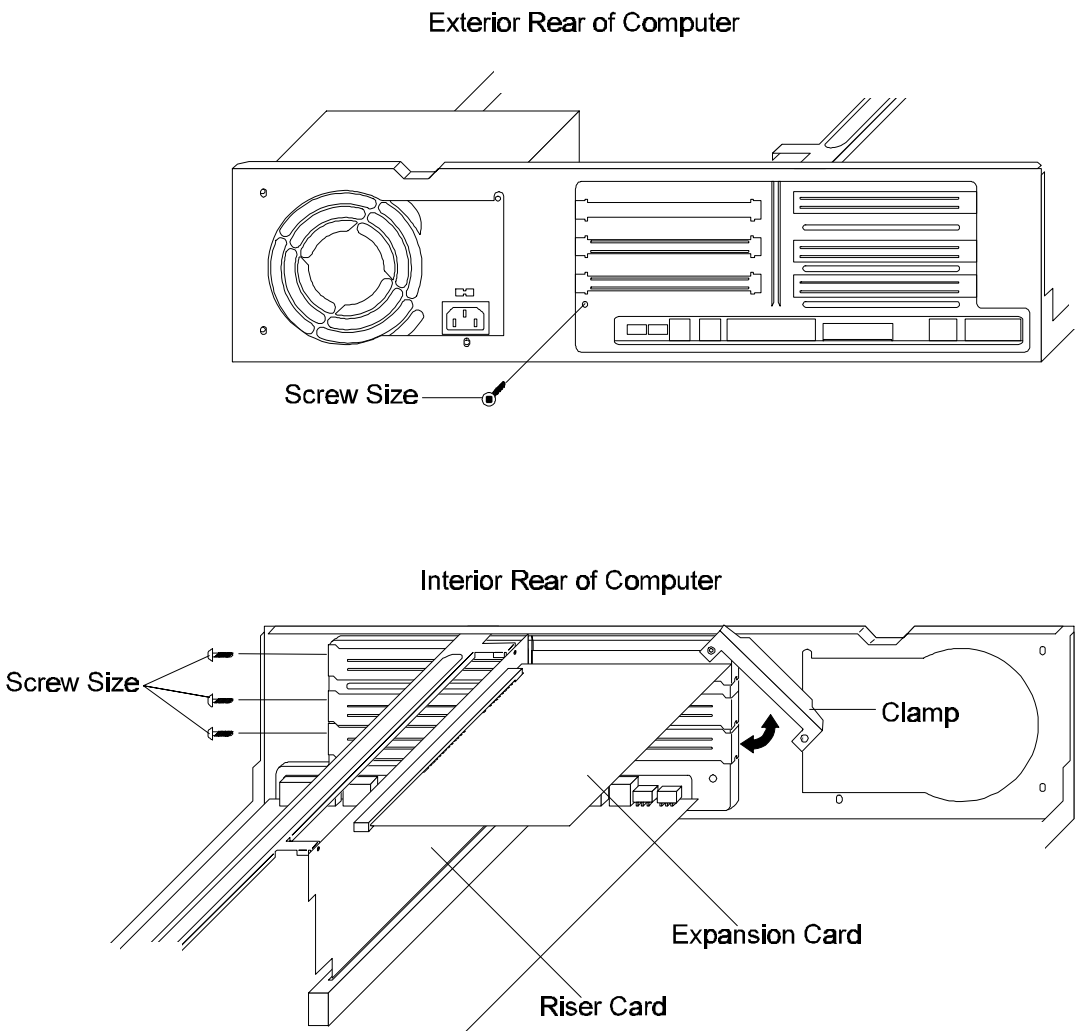

Figure 4-7 Expansion Card Removal and Replacement

Changing Jumper Settings

The system board has configuration jumpers that allow you to change the system configuration. A jumper is a small plastic-encased conductor that slips over jumper pins. To change a jumper setting, use a pair of needle-nosed pliers to remove the jumper from its current location and slide it onto the new pins to obtain the desired settings. See Figure 4-8.

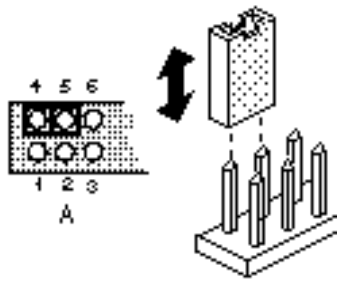

Figure 4-8 Changing Jumper Settings

I/O Connections

Equium™ I/O connections vary depending on the model. Refer to Figures 4-9 and 4-10 as appropriate for the proper I/O connections for the Equium™ model you are servicing.

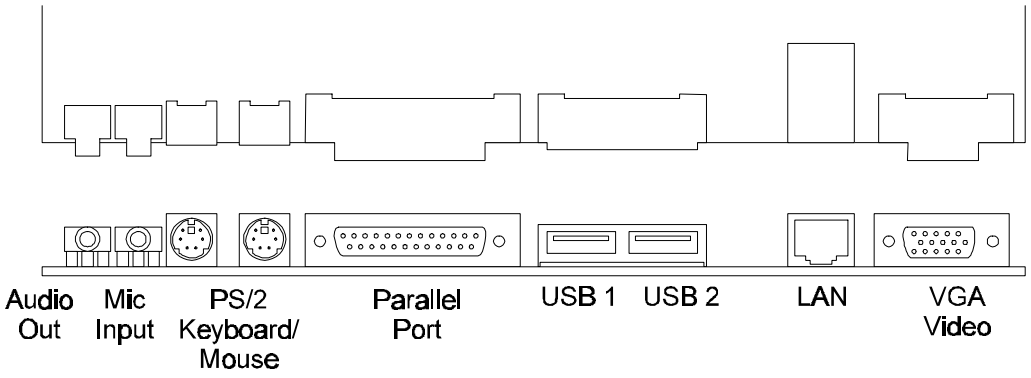

Figure 4-9 5160D/5200D I/O Connections

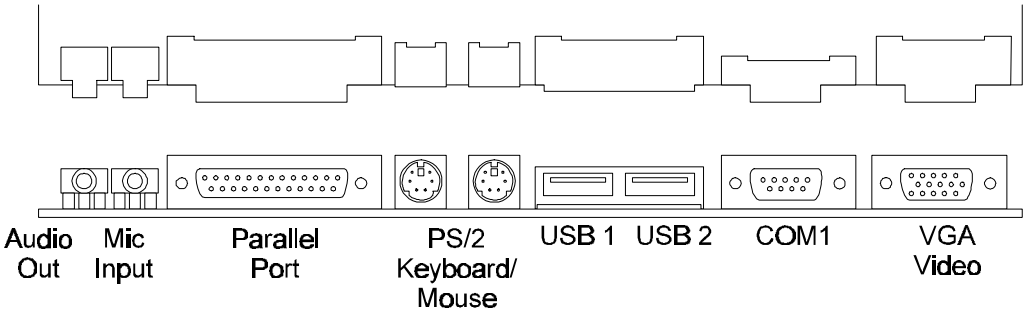

Figure 4-10 6200D I/O Connections

Assembly Reminders

While assembling the computer, remember the following general points:

- ❑ Make a note, while disassembling the computer, of the locations and connections of the various components, cards, and cables. This will make assembly easier.
- ❑ Take your time, making sure to follow the instructions closely. Many problems can occur from hurried assembly.
- ❑ Make sure all cables and connectors are securely fastened.
- ❑ Make sure cable connectors are properly attached to sockets. Attaching a connector backwards could cause improper card or component operation.
- ❑ Before securing an FRU or other components, make sure cables will not be pinched by screws or the FRU.
- ❑ When replacing side panels, make sure cables are tucked inside the computer's chassis to avoid damaging the cables.
- ❑ Make sure all latches are securely closed.
- ❑ When assembling the computer, make sure to use the correct screws to secure the various components, and make sure all screws are securely fastened. Loose screws can cause short circuits, resulting in heat, smoke, and fire.
- ❑ Make sure the correct screws are used to secure all FRUs and other computer parts. Using the incorrect screws could damage the threads or the head of the screws, resulting in improper seating of the screw. Refer to Table 4-1 for a listing of screw sizes and quantities for each FRU and computer part.

Table 4-1 FRU Screw Sizes and Quantity

FRU/Computer Part	Screw Size	Number of Screws
Floppy Disk Drive to bracket	M3x6	4
CD-ROM Drive to bracket	M3x6	4
System Board to chassis	M3x6	5
Slot Cover	TBD	4
Hard Disk Drive to bracket	M3x6	4
Power Supply to chassis	6/32x1/4	4
FDD/HDD Mounting Bracket to chassis	6/32x1/4	1
Riser Card to chassis	6/32x1/4	2
Cross Member Support to chassis	6/32x1/4	1

Protecting the System from Electrostatic Discharge (ESD)

Electrostatic discharges can cause serious damage to computer components and circuitry. Static electricity can be generated in many, seemingly innocent, ways such as walking across a vinyl floor or rubbing your hand on a carpeted area. With this in mind, it is important to protect the computer from the dangers of static electricity while you perform the removal and replacement procedures in this manual. The following information addresses effective grounding techniques and protecting components and drives from ESD.

Protecting Components from ESD

Perform the following precautions when working with computer components:

- ❑ Protect all components by placing them in anti-static packaging.
- ❑ Keep components in their protective packaging until you are ready to install them.
- ❑ Place components on a grounded, static-free surface.
- ❑ Place reusable components in protective packaging before storing them.
- ❑ Ensure you are grounded before handling components.
- ❑ When handling a card or board, place the anti-static packaging behind the card or board.
- ❑ Avoid unnecessary handling and moving of components.
- ❑ Touch the metal chassis before touching components. Keep part of your body in contact with the chassis to dissipate the static charge while handling components.
- ❑ Do not slide boards over any surface.

Protecting Drives from ESD

Perform the following precautions when working with computer drives:

- ❑ Only handle drives if you are properly grounded.
- ❑ Store drives in the original shipping packages.
- ❑ Keep drives in their protective packaging until you are ready to install them.
- ❑ Only set drives on surfaces that have at minimum 1-inch of foam.
- ❑ Place a drive's Printed Circuit Board (PCB) assembly side down on foam.

Grounding Methods to Protect the System from ESD

Perform the following precautions when preparing to work on a computer:

- ❑ Use anti-static mats, wrist or heel straps, and other anti-static materials.
- ❑ Avoid touching connector pins, leads, and PCB circuitry.

- ❑ Turn off power to the computer before removing and inserting connectors or test equipment.
- ❑ Use tools and other equipment that are conductive.

Recommended Tools and Equipment

The following equipment is necessary to disassemble and assemble the computer:

- ❑ Toshiba #1/#2 reversible magnetic screwdriver
- ❑ Small, flat-bladed screw driver
- ❑ Needle-nose pliers
- ❑ ESD mats for the working area floor and table
- ❑ An ESD wrist strap or heel grounder
- ❑ Anti-static carpeting or flooring
- ❑ Air ionizers in highly static-sensitive areas
- ❑ Protective gloves

Cover and Rear Panel

This section covers the removal and replacement of the computer's cover and rear panel.

Removing the Cover

To remove the computer's cover, perform the following procedure and see Figure 4-11.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Simultaneously press the release buttons on either side of the chassis and slide the cover forward (assuming you are standing at the rear of the computer).
3. Remove the cover from the chassis.

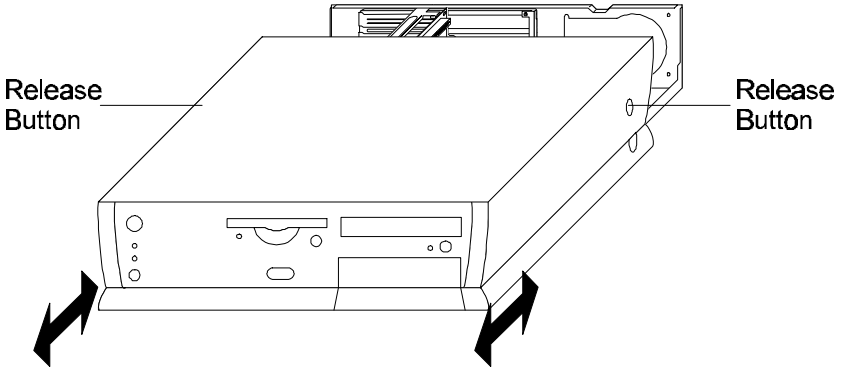

Figure 4-11 Removing and Replacing the Cover

Replacing the Cover

To replace the computer's cover, perform the following procedure and see Figure 4-11.

1. Align the cover with the chassis and slide the cover over the chassis.
2. Slide the cover toward the rear of the computer until the cover snaps into place.
3. Connect the power cord and all external cables to the computer and turn on the power.

Removing the Rear Panel

To remove the computer's rear panel, perform the following procedure and see Figure 4-12.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Release the three tabs on the back panel from their latches on the chassis.
3. Carefully pull the back panel away from the chassis, making sure that the latches on the bottom of the panel are free from the corresponding tabs on the bottom of the chassis.

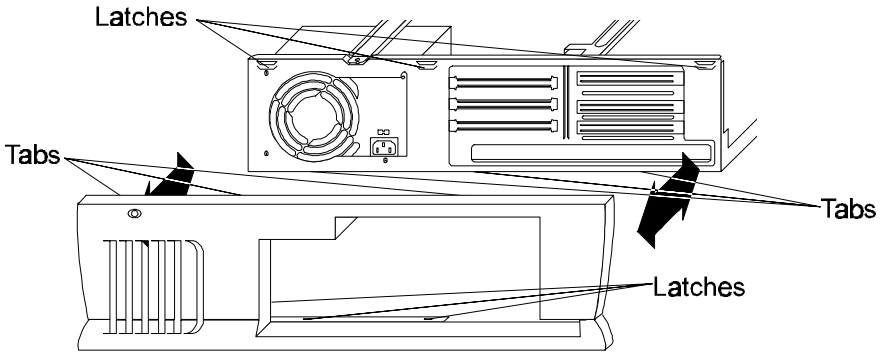

Figure 4-12 Removing and Replacing the Rear Panel

Replacing the Rear Panel

To replace the computer's rear panel, perform the following procedure and see Figure 4-12.

1. Angle the top edge of the back panel so that the three tabs at the top of the panel are aligned directly below the corresponding latches on the chassis.
2. Gently push the bottom of the panel in (toward the computer) until the three latches on the bottom of the panel are secured by the corresponding tabs on the bottom of the chassis.
3. Connect the power cord and all external cables to the computer and turn on the power.

Riser Card

This section covers the removal and replacement of the computer's riser card.

Removing the Riser Card

To remove the computer's riser card, perform the following procedure and see Figure 4-13.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)
3. Remove any expansion card from the riser card. (Refer to section 4.1.4.)

***NOTE**: When performing the following step, use a pair of needle-nosed pliers or another tool to secure the nuts while you remove the screws.*

1. Remove the two screws that secure the riser card to the chassis' crossbar.

***CAUTION**: Upon removal, the chassis' crossbar can damage riser card components. While performing the next step, avoid contact between the crossbar and riser card components.*

1. Carefully grasp the riser card and gently pull until it is free of its system board slot.

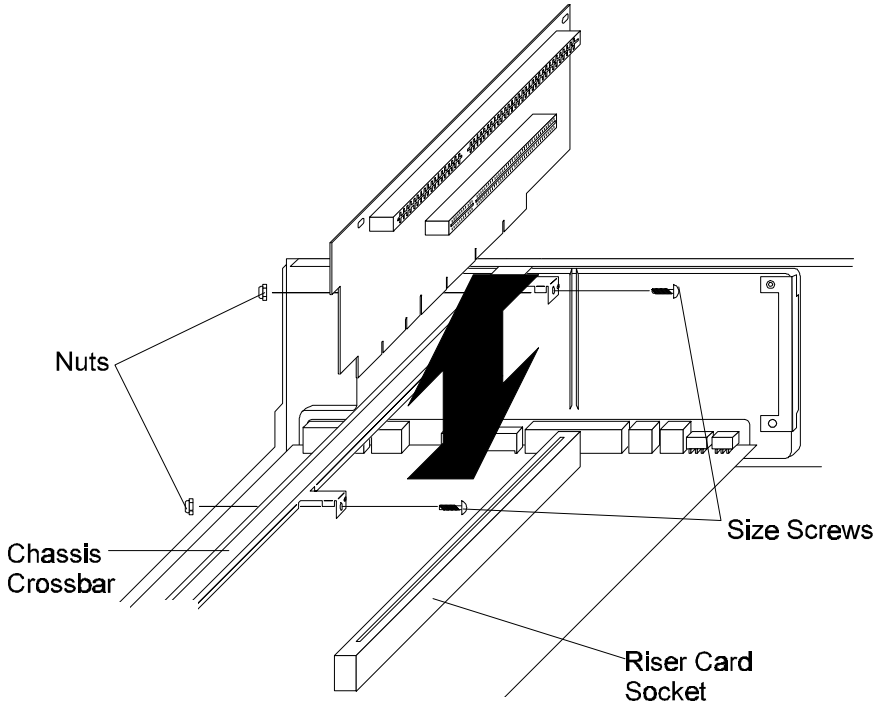

Figure 4-13 Removing and Replacing the Riser Card

Replacing the Riser Card

To replace the computer's riser card, perform the following procedure and see Figure 4-13.

1. Align the new riser card with the appropriate slot on the system board. Firmly, but carefully, press the card into the slot until the card snaps into place.
2. Secure the card to the chassis' crossbar using two screws and two nuts.
3. Re-install any expansion card to the riser card. (Refer to section 4.1.4.)
4. Replace the computer's cover. (Refer to section 4.2.2.)
5. Connect the power cord and all external cables to the computer and turn on the power.

Power Supply

This section covers the removal and replacement of the computer's power supply.

Removing the Power Supply

To remove the computer's power supply, perform the following procedure and see Figure 4-14.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)
3. Remove the computer's rear panel. (Refer to section 4.2.3.)
4. Disconnect the power cables from all components and from the system board
5. Remove the one screw that secures the support cross member to the chassis. Slide the cross member toward the rear of the computer until the cross member is free of its latches. Lift the cross member away from the chassis.
6. Remove the fourscrews that secure thepower supplyto the chassis.
7. Slide the power supply forward (toward the front of the computer) and lift it out of the chassis.

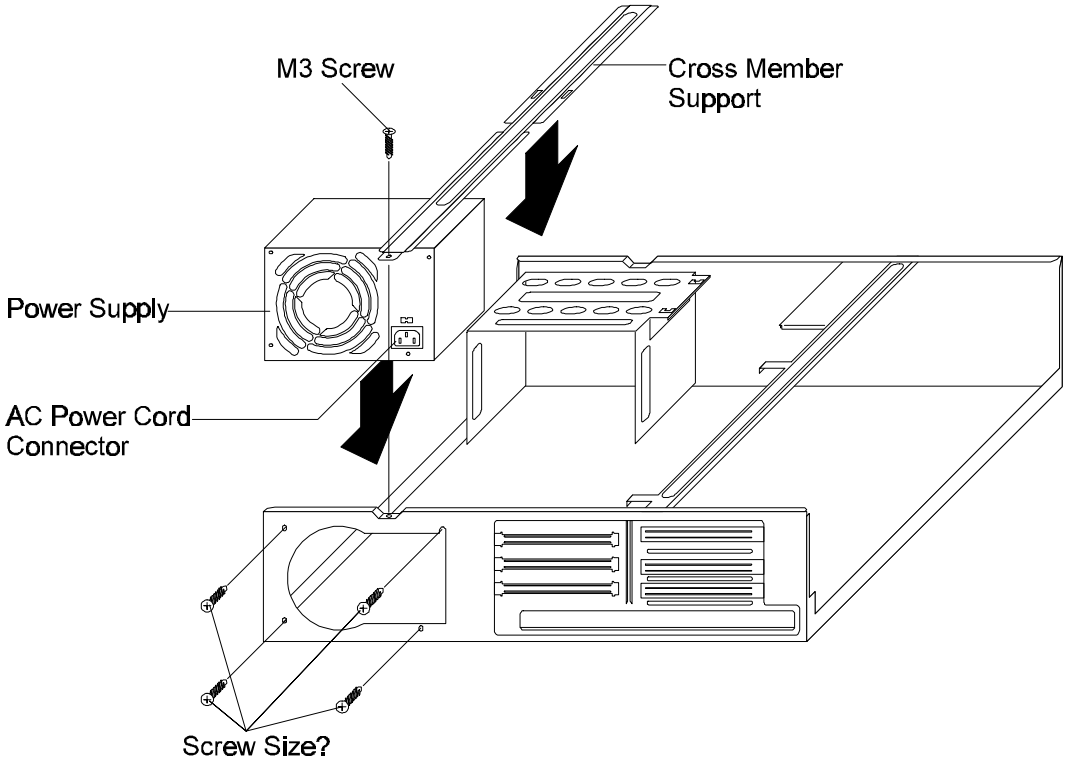

Figure 4-14 Removing and Replacing the Power Supply

Replacing the Power Supply

To replace the power supply, perform the following procedure and see Figure 4-14.

1. Set the power supply in place with the AC power cord connector at the bottom and the screw holes properly aligned with the corresponding holes on the chassis. Secure the power supply to the chassis using four screws.
2. Connect power cable P1 to the connector at J9H1 on the system board.
3. Connect power cable P2 to the connector at J9J1 on the system board.
4. Connect power cable P12 to the connector at J9K2 (J9F1 6200D) on the system board.
5. Connect power cable P8 to the FDD.
6. Connect power cable P5 to the HDD.
7. Connect power cable P7 to the CD-ROM drive.
8. Replace the computer's rear panel. (Refer to section 4.2.4.)
9. Replace the computer's cover. (Refer to section 4.2.2.)
10. Connect the power cord and all external cables to the computer and turn on the power.

Hard Disk Drive (HDD)

This section covers the removal and replacement of the computer's hard disk drive.

Removing the HDD

To remove the computer's HDD, perform the following procedure and see Figures 4-15 and 4-16.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)
3. Disconnect the power cable and the data cable from the HDD.

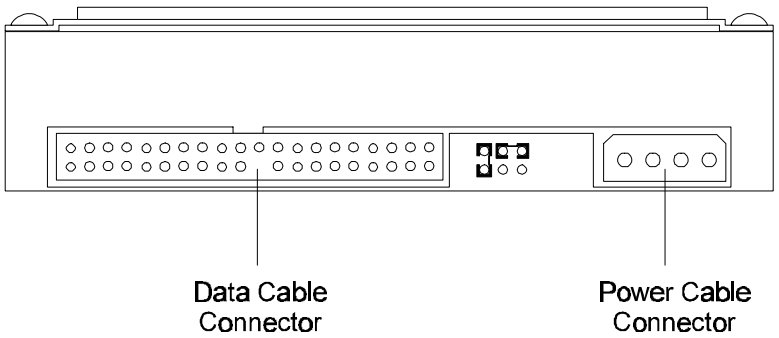

Figure 4-15 Disconnecting and Connecting HDD Cables

NOTE: *Because the HDD and the FDD are attached by a mounting bracket, you must remove the cables from the FDD in order to remove the bracket from the chassis.*

1. Remove the power and data cable from the FDD. (Refer to section 4.7.1.)

NOTE*: Because the HDD and the FDD are attached by a mounting bracket, you must remove this bracket in order to remove the HDD.*

1. Remove the FDD/HDD mounting bracket. (Refer to section 4.7.1.)
2. Remove the four (two on each side) M3 screws that secure the HDD to the mounting bracket.

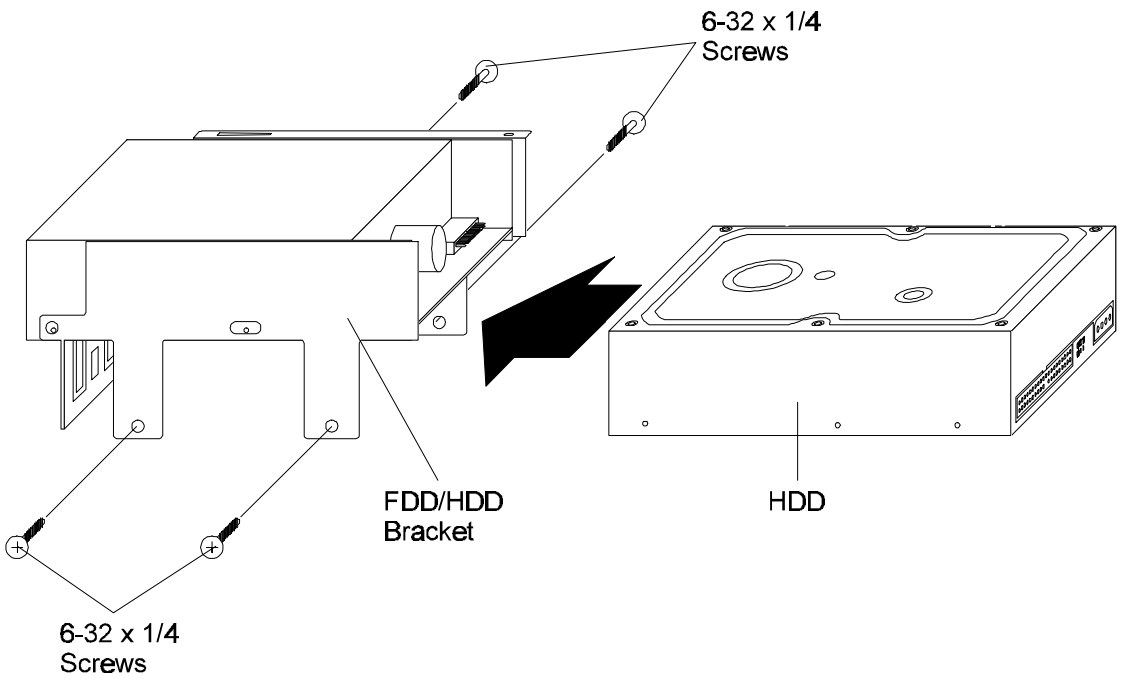

Figure 4-16 Removing and Replacing the HDD

Replacing the HDD

To replace the HDD, perform the following procedure and see Figures 4-15 and 4-16.

1. Verify that the jumper settings on the new HDD are correct for this computer's configuration. Refer to the HDD's label or section 1.3.6. for the appropriate jumper settings.
2. Secure the HDD to the mounting bracket with four (two on each side) M3 screws.
3. Replace the FDD/HDD mounting bracket. (Refer to steps 2 through 5 in section 4.7.2.)
4. Replace the computer's cover. (Refer to section 4.2.2.)
5. Connect the power cord and all external cables to the computer and turn on the power.

CD-ROM Drive

This section covers the removal and replacement of the computer's CD-ROM drive.

Removing the CD-ROM Drive

To remove the computer's CD-ROM drive, perform the following procedure and see Figures 4-17 and 4-18.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)

3. Disconnect thepower cable, the data cable, and the audio cablefrom the CD-ROM drive.

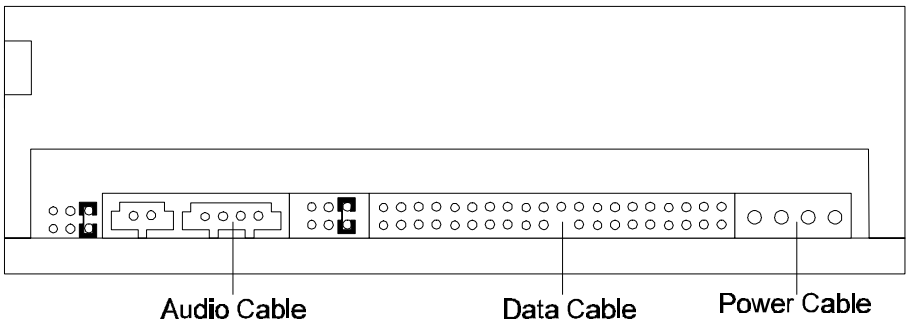

Figure 4-17 Disconnecting and Connecting CD-ROM Drive Cables

> ***NOTE:*** *Because the CD-ROM bracket and the FDD/HDD mounting bracket are side-by-side in the chassis, you must remove this mounting bracket before you can remove the CD-ROM drive.*

1. Remove the FDD/HDD mounting bracket. (Refer to section 4.7.1.)
2. Remove thefour (two on each side)screws that secure the CD-ROM drive to its bracket.
3. Carefully slide the CD-ROM drive out of its bracket.

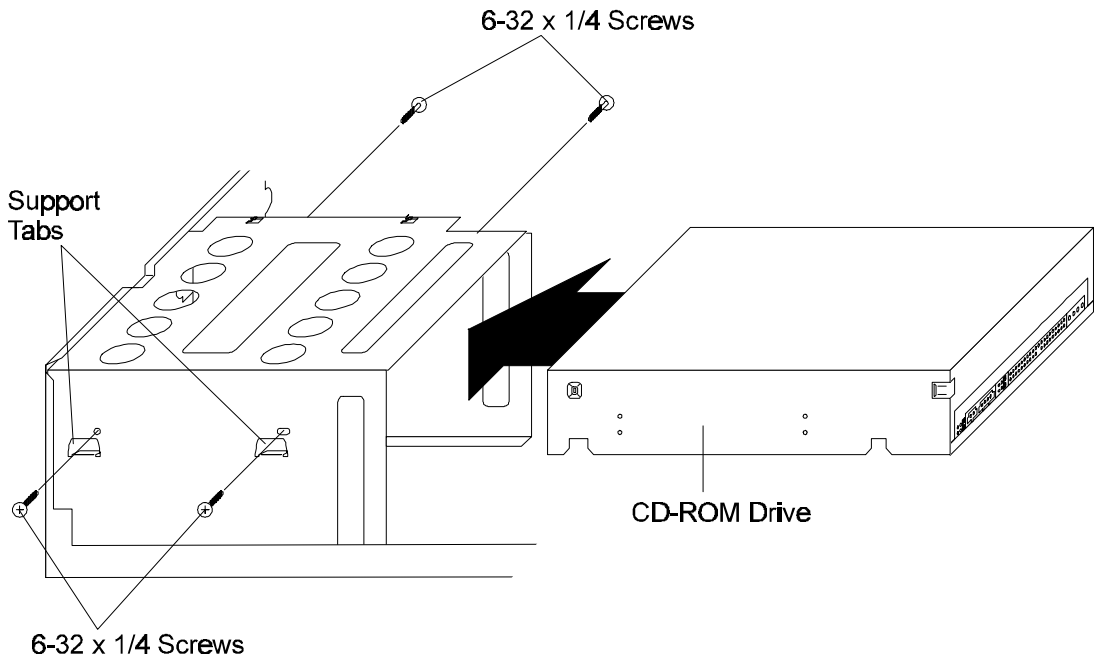

Figure 4-18 Removing and Replacing the CD-ROM Drive

Replacing the CD-ROM Drive

To replace the computer's CD-ROM drive, perform the following procedure and see Figure 4-17 through 4-19.

1. Verify that the device configuration jumper is set in the slave position.

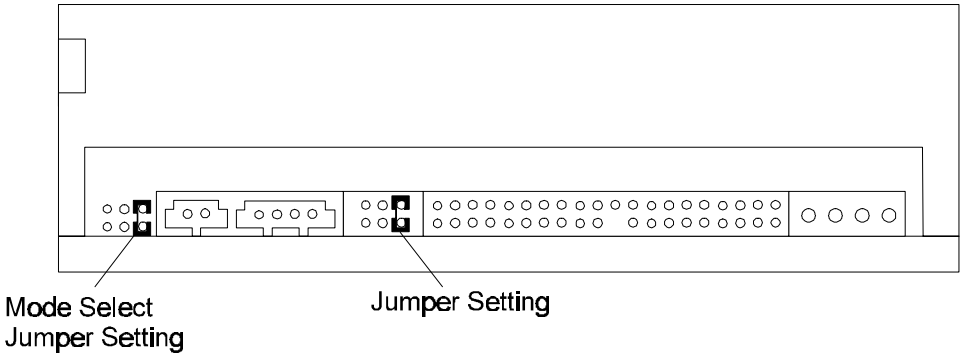

Figure 4-19 Device Configuration Jumper and Mode Select Jumper Settings

2. Verify that the mode select jumper is set to enable CD-ROM ejection.
3. Slide the CD-ROM drive into its bracket, so that the drive rests on the bracket's support tabs and the screw holes on the drive line up with the holes in the bracket.

4. Secure the CD-ROM drive to its bracket with four (two on each side) screws.
5. Connect power cable P7, the data cable, and the audio cable to the CD-ROM drive.
6. Replace the computer's cover. (Refer to section 4.2.2.)
7. Connect the power cord and all external cables to the computer and turn on the power.

Floppy Disk Drive (FDD)

This section covers the removal and replacement of the computer's floppy disk drive.

Removing the FDD

To remove the computer's FDD, perform the following procedure and see Figures 4-20 and 4-21.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)
3. Disconnect the power cable and the data cable from the FDD.

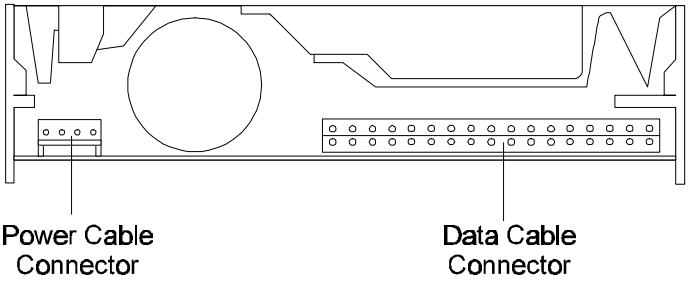

Figure 4-20 Disconnecting and Connecting FDD Cables

> ***NOTE**: Because the FDD and the HDD are attached by a mounting bracket, you must remove the cables from the HDD in order to remove the FDD from the chassis.*

1. Remove the power and the data cables from the HDD. (Refer to section 4.5.1.)
2. Remove the one screw that secures the FDD/HDD bracket to the chassis.
3. Gently push the FDD inward (toward the rear of the computer) through its face-plate slot until movement is stopped by the hook tabs. Angle the back of the mounting bracket and lift the bracket out of the chassis.

> ***NOTE**: If you are performing this procedure in order to remove the HDD, do not perform the remaining step.*

1. Remove the four (two on each side) M3 screws that secure the FDD to the mounting bracket.

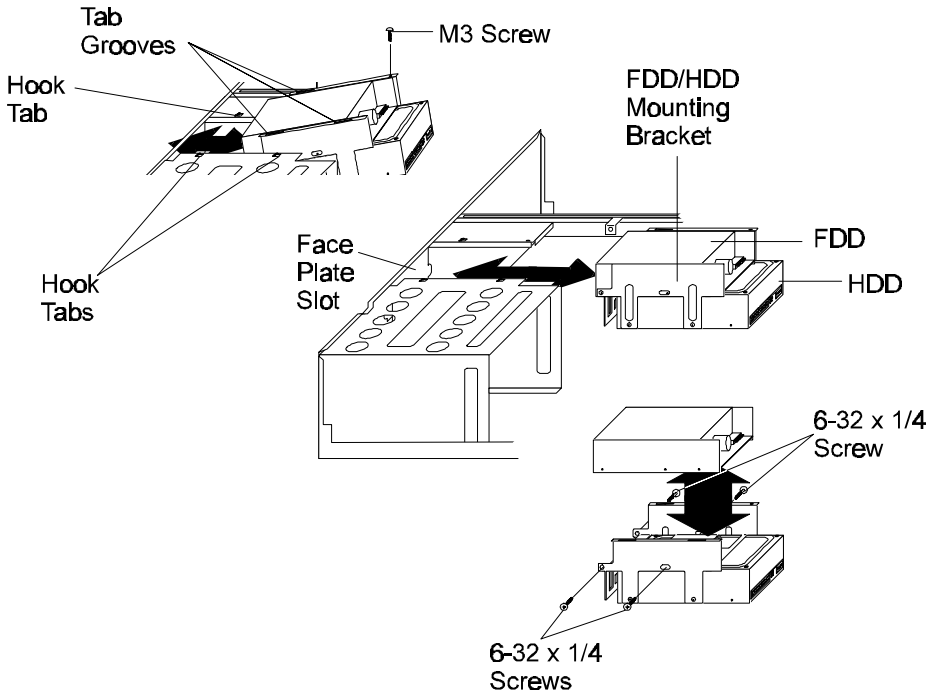

Figure 4-21 Removing and Replacing the FDD and the FDD/HDD Bracket

Replacing the FDD

To replace the computer's FDD, perform the following procedure and see Figures 4-20 and 4-21.

> ***NOTE:*** *If you are performing this procedure in order to replace the HDD, skip step 1.*

1. Connect the mounting bracket to the FDD using four (two on each side) M3 screws.
2. Angle the mounting bracket and slide the bracket forward (toward the front of the computer) until the hook tabs on the chassis are secure against the back edge of the tab grooves on the mounting bracket.
3. Secure the mounting bracket to the chassis with one 6-32 x 1/4 screw.
4. Connect power cable P8 and the appropriate data cable to the FDD.
5. Connect power cable P5 and the appropriate data cable to the HDD.
6. Replace the computer's cover. (Refer to section 4.2.2.)
7. Connect the power cord and all external cables to the computer and turn on the power.

System Board (5160D/5200D)

This section covers the removal and replacement of the 5160D/5200D system board.

Removing the System Board (5160D/5200D)

To remove the 5160D/5200D system board, perform the following procedure and see Figure 4-22.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)
3. Remove the riser card. (Refer to section 4.3.1.)
4. Disconnect all cables from the system board, including power cables, data cables, switch and LED cables, audio cables, and so on.
5. Remove the five screws that secure the system board to the chassis.
6. Gently lift the board until it is free of its two restraining pins. Carefully lift the system board out of the chassis.

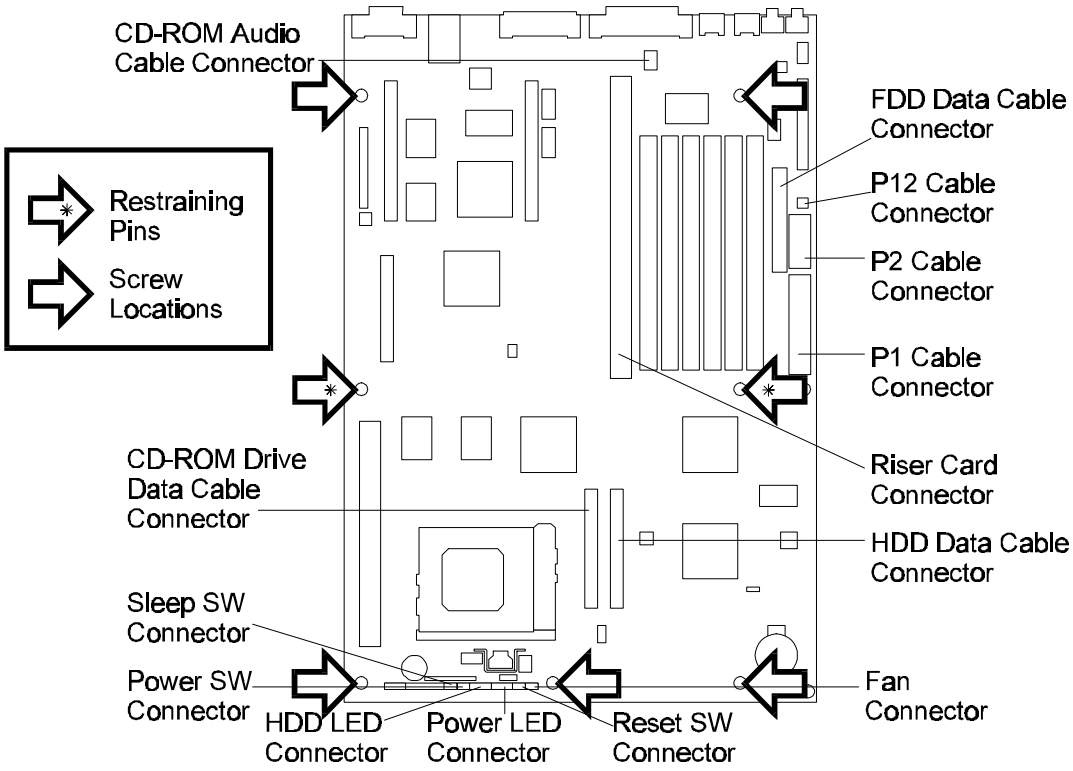

Figure 4-22 Removing and Replacing the 5160D/5200D System Board

7. Remove the heat sink and microprocessor from the system board. (Refer to section 4.11.1.)
8. Remove memory modules from the system board. (Refer to section 4.13.1.)
9. Remove the RTC battery from the system board. (Refer to section 4.14.1.)

Replacing the System Board (5160D/5200D)

To replace the 5160D/5200D system board, perform the following procedure and see Figures 4-22 and 4-23.

1. Align the system board in the chassis so that the appropriate holes on the board rest on top of the chassis' screw holes and restraining pins. Firmly, but carefully, press down until the board snaps into place.
2. Secure the system board to the chassis with five screws.
3. Install the microprocessor and heat sink on the system board. (Refer to section 4.11.2.)
4. Verify that the jumper settings for the microprocessor are correct. Refer to Table 4-2 for proper microprocessor jumper settings.

Table 4-2 5160D/5200D Microprocessor/Bus Speed Settings

Micro processor Freq. (MHz)	Host Bus Freq. (MHz)	J4L2-A	J4L2-B	J4L2-C	PCI Freq. (MHz)	Clock Multiplier	ISA Freq. (MHz)
166	66	DOWN	DOWN	UP	33	2.5	8.33
		DOWN	UP	DOWN	reserved		
		DOWN	UP	UP	reserved		
		UP	DOWN	DOWN	reserved		
		UP	DOWN	UP	reserved		
200	66	UP	UP	UP	33	3	8.33

5. Install memory modules on the system board. (Refer to section 4.13.2.)
6. Install the RTC battery on the system board. (Refer to section 4.14.2.)
7. Install the riser card. (Refer to section 4.3.2.)
8. Install expansion cards as necessary. (Refer to section 4.1.4.)
9. Connect device data cables:
   - ❑ Connect the HDD data cable to the connector at J6C1 on the system board.
   - ❑ Connect the CD-ROM data cable to the connector at J5C1 on the system board.
   - ❑ Connect the FDD data cable to the connector at J9K1 on the system board.
10. Connect power supply cables:
    - ❑ Connect power cable P12 to the connector at J9k2 on the system board.
    - ❑ Connect power cable P1 to the connector at J9H1 on the system board.
    - ❑ Connect power cable P2 to the connector at J9J1 on the system board.
11. Connect the CD-ROM audio cable to the connector at J6N2 on the system board.

> ***NOTE**: When connecting switch and LED cables, make sure the printed side of the connector faces the front of the computer.*

1. Connect switch and LED cables and the fan cable:
   - ❑ Connect the FAN cable to the pins labeled FAN (red cable to pin 2 and black cable to pin 3) on the system board.
   - ❑ Connect the RESET switch cable to the pins labeled RST (black cable to pin 4 and red cable to pin 5) on the system board.
   - ❑ Connect the POWER LED cable to the pins labeled PWRLED (green cable to pin 7 and black cable to pin 9) on the system board.
   - ❑ Connect the H.D.D. LED cable to the pins labeled HD LED (blue cable to pin 11 and black cable to pin 12) on the system board.
   - ❑ Connect the POWER SW cable to the pins labeled PS-ON (yellow cable to pin 15 and black cable to pin 16) on the system board.
   - ❑ Connect the SLEEP SW cable to the pins labeled SLP (white cable to pin 17 and black cable to pin 18) on the system board.

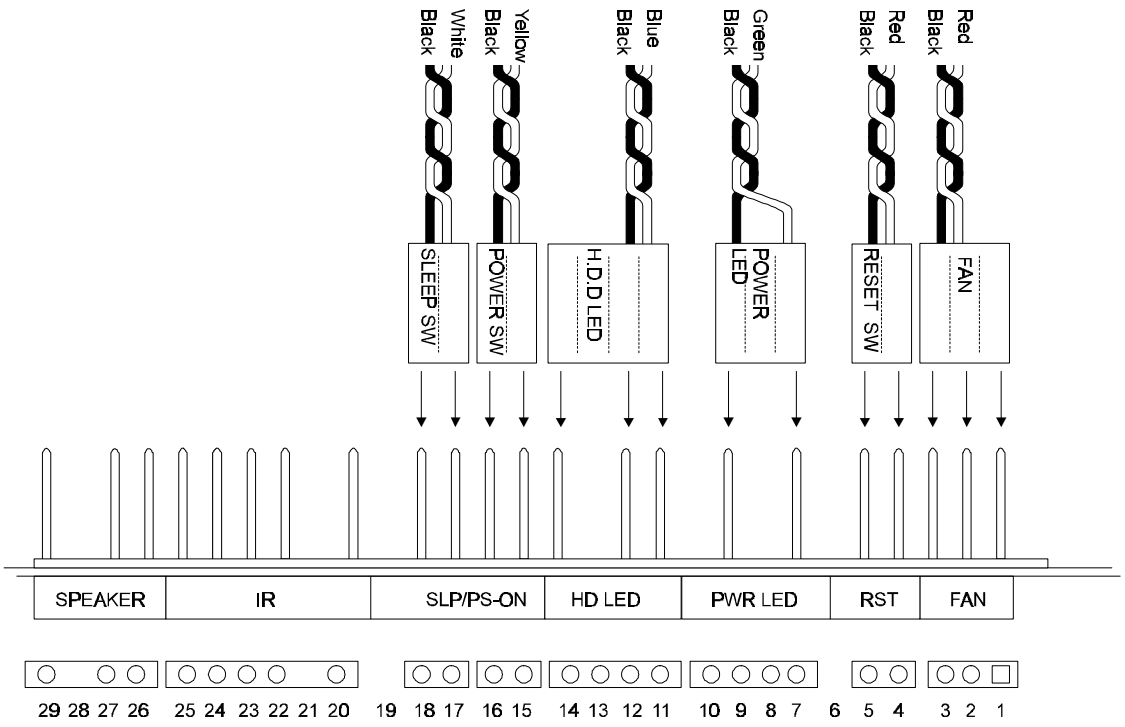

Figure 4-23 5160D/5200D Switch and LED Cable Connections

2. Replace the computer's cover. (Refer to section 4.2.2.)
3. Connect the power cord and all external cables to the computer and turn on the power.

System Board (6200D)

This section covers the removal and replacement of the 6200D system board.

Removing the System Board (6200D)

To remove the 6200D system board, perform the following procedure and see Figure 4-24.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)
3. Remove the riser card. (Refer to section 4.3.1.)
4. Disconnect all cables from the system board, including power cables, data cables, switch and LED cables, audio cables, and so on.
5. Remove the five screws that secure the system board to the chassis.
6. Gently lift the board until it is free of its two restraining pins. Carefully lift the system board out of the chassis.

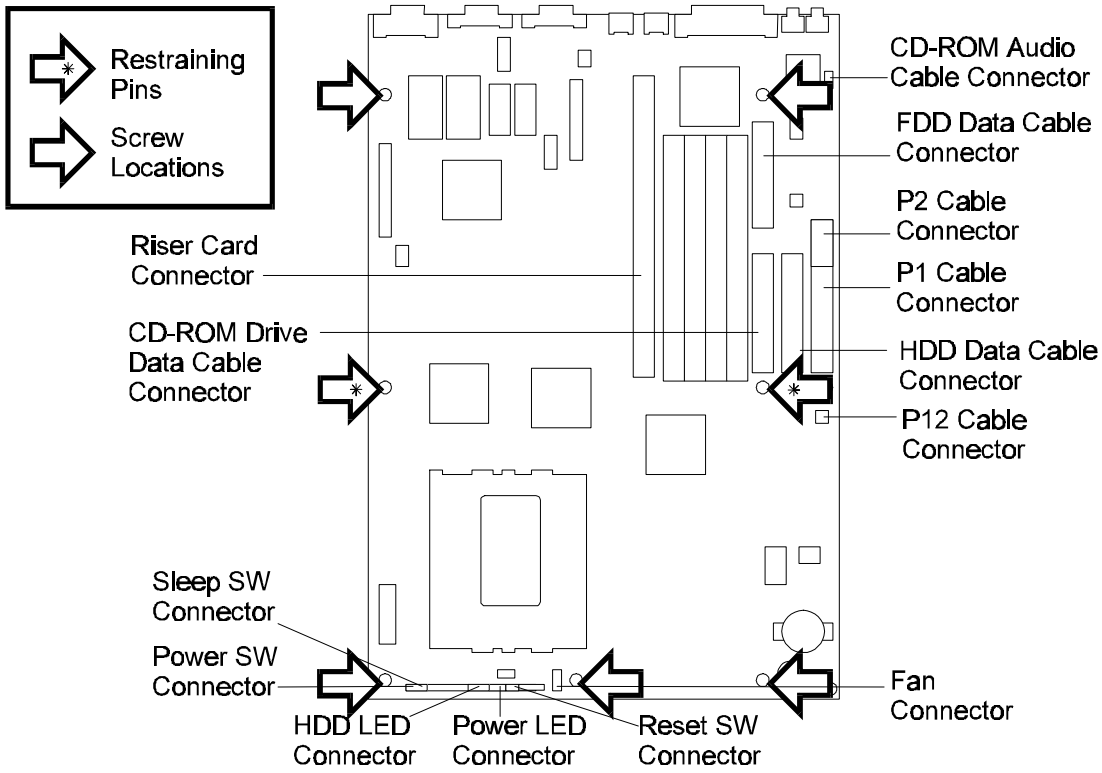

Figure 4-24 Removing and Replacing the 6200D System Board

7. Remove the heat sink and microprocessor from the system board. (Refer to section 4.12.1.)
8. Remove memory modules from the system board. (Refer to section 4.13.1.)
9. Remove the RTC battery from the system board. (Refer to section 4.14.1.)

Replacing the System Board (6200D)

To replace the 6200D system board, perform the following procedure and see Figure 4-24 and 4-25

1. Align the system board in the chassis so that the appropriate holes on the board rest on top of the chassis' screw holes and restraining pins. Firmly, but carefully, press down until the board snaps into place.
2. Secure the system board to the chassis with five screws.
3. Install the microprocessor and heat sink on the system board. (Refer to section 4.12.2.)
4. Verify that the jumper settings for the microprocessor are correct. Refer to Table 4-3 for proper microprocessor jumper settings.

Table 4-3 6200D Microprocessor/Bus Speed Settings

Micro processor Freq. (MHz)	Host Bus Freq. (MHz)	J4L2-A	J4L2-B	J4L2-C	PCI Freq. (MHz)	Clock Multiplier	ISA Freq. (MHz)
200	66	UP	UP	UP	33	3	8.33

5. Install memory modules on the system board. (Refer to section 4.13.2.)
6. Install the RTC battery on the system board. (Refer to section 4.14.2.)
7. Install the riser card. (Refer to section 4.3.2.)
8. Install expansion cards as necessary. (Refer to section 4.1.4.)
9. Connect device data cables:
   - ❑ Connect the HDD data cable to the connector at J8H1 on the system board.
   - ❑ Connect the CD-ROM data cable to the connector at J9H2 on the system board.
   - ❑ Connect the FDD data cable to the connector at J8L1 on the system board.
10. Connect power supply power cables:
    - ❑ Connect power cable P12 to the connector at J9J1 on the system board.
    - ❑ Connect power cable P1 to the connector at J9H1 on the system board.
    - ❑ Connect power cable P2 to the connector at J9F1 on the system board.
11. Connect the CD-ROM audio cable to the connector J9N1 on the system board.
12. Connect the auxiliary FAN cable to the connector at J4A1.

> ***NOTE:*** *When connecting switch and LED cables, make sure the printed side of the connector faces the front of the computer.*

1. Connect switch and LED cables:

- ❑ Connect the POWER SW cable to the pins labeled SW_ON (yellow cable to pin 1 and black cable to pin 2) on the system board.
- ❑ Connect the SLEEP SW cable to the pins labeled SLP (black cable to pin 3 and white cable to pin 4) on the system board.
- ❑ Connect the H.D.D. LED cable to the pins labeled HDLED (black cable to pin 15 and blue cable to pin 16) on the system board.
- ❑ Connect the POWER LED cable to the pins labeled PWRLED (black cable to pin 18 and green cable to pin 20) on the system board.
- ❑ Connect the RESET SW cable to the pins labeled RESET (black cable to pin 22 and red cable to pin 23) on the system board.

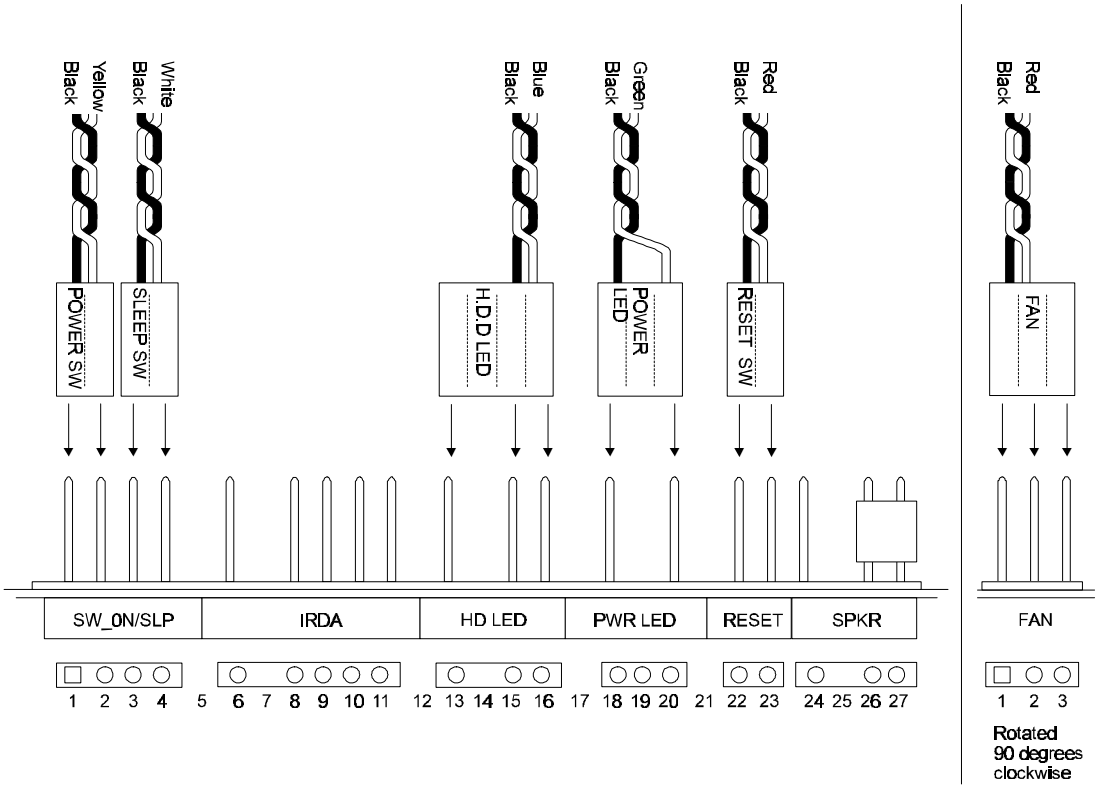

Figure 4-25 6200D Switch and LED Cable Connections

2. Replace the computer's cover. (Refer to section 4.2.2.)
3. Connect the power cord and all external cables to the computer and turn on the power.

I/O Spring (6200D)

This section covers the removal and replacement of the computer's I/O spring.

Removing the I/O Spring

To remove the I/O spring, perform the following procedure and see Figure 4-26.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)

3. Remove the system board. (Refer to section 4.9.1.)
4. Pull the I/O spring away from the system board.

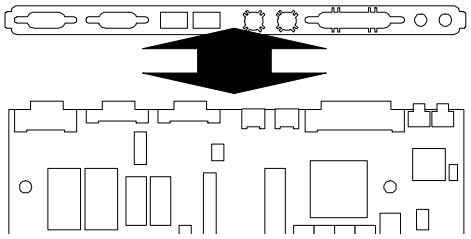

Figure 4-26 Removing and Replacing the I/O Spring

Replacing the I/O Spring

To replace the I/O spring, perform the following procedure and see Figure 4-26.

1. Align the I/O spring cutouts with the appropriate system board ports.
2. Press the I/O spring into place.
3. Replace the system board. (Refer to section 4.9.2.)
4. Replace the computer's cover. (Refer to section 4.2.2.)
5. Connect the power cord and all external cables to the computer and turn on the power.

Microprocessor (5160D/5200D)

This section covers the removal and replacement of the computer's microprocessor.

Removing the Microprocessor (5160D/5200D)

To remove the microprocessor, perform the following procedure and see Figure 4-27.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)
3. Remove the system board. (Refer to section 4.8.1.)

> ***CAUTION****: If the system has been running, the heat sink, microprocessor, and regulator may be hot. Allow a few minutes for cooling. Consider wearing protective gloves.*

> ***CAUTION:*** *While performing the next step, be careful not to break the plastic retaining tabs that secure the clamp to the heat sink.*

4. Insert the head of a small, flat-bladed screwdriver into the space between the bottom of the clamp (side closest to the edge of the system board) and the socket. Press down on the top of the clamp. Carefully pull the clamp away from the tab.

5. Ease the clamp up and away from the heat sink and the microprocessor.

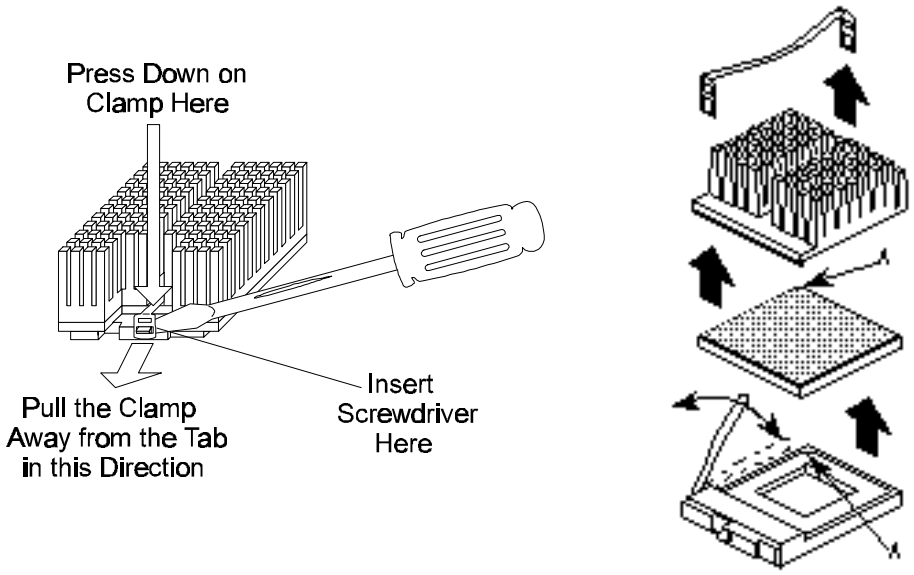

Figure 4-27 Removing the 5160D/5200D Spring Clamp, Heat Sink, and Microprocessor

***CAUTION**: Do not touch or bend the microprocessor's pins.*

6. Remove the heat sink.
7. Push the lever on the microprocessor socket down and out (away from the socket) until the lever pulls up freely. Lift the lever straight up. Remove the microprocessor from the socket.
8. Place the microprocessor in conductive foam and store it in an anti-static package.

Replacing the Microprocessor (5160D/5200D)

To replace the microprocessor, perform the following procedure and see Figure 4-27.

1. Make sure that the jumper settings on the system board are correct for the microprocessor you are installing. Refer to Appendix B for the correct jumper settings.
2. Align pin 1 on the microprocessor with side A of the socket at U3C1 on the system board. This socket is keyed, meaning that the microprocessor can only be connected one way.

> ***CAUTION:*** *While performing the next step, if the microprocessor causes excessive resistance, verify that it is properly aligned with the socket and try again. Forcing the lever down could cause damage to the microprocessor or to the system board.*

3. With the microprocessor securely in place, carefully push the lever on the socket down until the lever snaps into place.
4. Place the heat sink on top of the microprocessor. Place the clamp on the heat sink, inserting the slot on the left side of the clamp under the tab on the left side of the socket. Press down on the clamp until the slot on the right side of the clamp locks under the tab on the right side of the socket.
5. Replace the system board. (Refer to section 4.8.2.)
6. Replace the computer's cover. (Refer to section 4.2.2.)
7. Connect the power cord and all external cables to the computer and turn on the power.

Microprocessor (6200D)

This section covers the removal and replacement of the computer's microprocessor.

Removing the Microprocessor (6200D)

To remove the microprocessor, perform the following procedure and see Figure 4-28.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)
3. Remove the system board. (Refer to section 4.9.1.)

> ***CAUTION:*** *If the system has been running, the heat sink, microprocessor, and regulator may be hot. Allow a few minutes for cooling. Consider wearing protective gloves.*

CAUTION: *While performing the next step, be careful not to break the plastic retaining tab that secures the clamp to the heat sink.*

4. Insert the head of a small, flat-bladed screwdriver into the space between the bottom of the clamp and the socket (side facing the rear of the computer). Press down on the top of the clamp. Carefully pull the clamp away from the tab.
5. Ease the clamp up and away from the heat sink and the microprocessor.

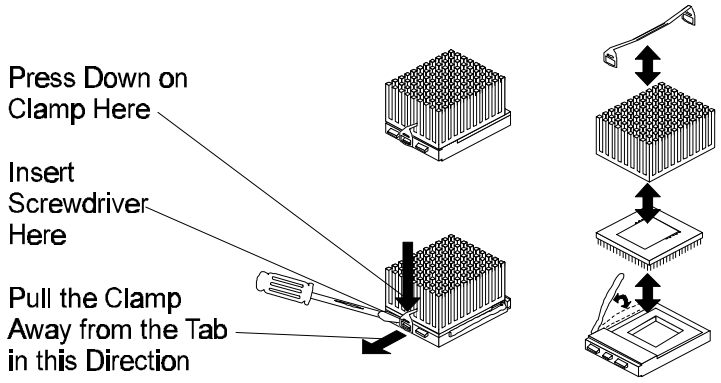

Figure 4-28 Removing the 6200D Spring Clamp, Heat Sink, and Microprocessor

CAUTION*: Do not touch or bend the microprocessor's pins.*

6. Remove the heat sink.
7. Push the lever on the microprocessor socket down and out (away from the socket) until the lever pulls up freely. Lift the lever straight up. Remove the microprocessor from the socket.
8. Place the microprocessor in conductive foam and store it in an anti-static package.

Replacing the Microprocessor (6200D)

To replace the microprocessor, perform the following procedure and see Figure 4-28.

1. Make sure that the jumper settings on the system board are correct for the microprocessor you are installing. Refer to Appendix B for the correct jumper settings.
2. Align pin 1 on the microprocessor with side A of the socket at U3C1 on the system board. This socket is keyed, meaning that the microprocessor can only be connected one way.

> ***CAUTION:*** *While performing the next step, if the microprocessor causes excessive resistance, verify that it is properly aligned with the socket and try again. Forcing the lever down could cause damage to the microprocessor or to the system board.*

3. With the microprocessor securely in place, carefully push the lever on the socket down until the lever snaps into place.
4. Place the heat sink on top of the microprocessor. Place the clamp on the heat sink, inserting the slot on the clamp under the middle tab on the socket (side facing the front of the computer). Press down on the clamp until the slot on the right side of the clamp locks under the tab on the right side of the socket.
5. Replace the system board. (Refer to section 4.9.2.)
6. Replace the computer's cover. (Refer to section 4.2.2.)
7. Connect the power cord and all external cables to the computer and turn on the power.

Memory Modules (RAM)

This section covers the removal and replacement of memory modules.

Removing Memory Modules (RAM)

To remove memory modules, perform the following procedure and see Figure 4-29.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)

> ***NOTE:*** *If an expansion card is installed on the left side of the riser card, you may be required to remove it before you can remove memory modules.*

1. Remove expansion cards as necessary. (Refer to section 4.1.4.)

2. Gently spread the retaining clip at each end of the module socket and push the module forward.
3. Holding the module only by the edges, lift the module away from the socket and store it in an anti-static package.
4. Repeat steps 4 and 5 for each module to be removed.

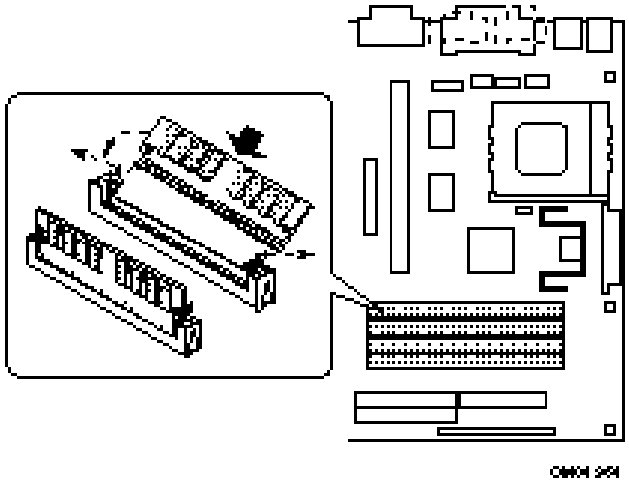

Figure 4-29 Removing and Replacing Memory Modules

Replacing Memory Modules (RAM)

Before replacing memory modules, be aware of the following points:

- ❑ When you install modules, you must completely fill at least one bank; that is, you must completely fill both sockets of the bank.
- ❑ The computer automatically detects the installed memory, so it does not matter which bank is used, as long as both sockets are filled.
- ❑ Both modules in one bank must be the same size. For instance, you cannot install an 8 MB module in one socket of bank 0 and a 16 MB module in the other socket of bank 0. However, you could use different size modules in different banks.

To replace memory modules, perform the following procedure and see Figure 4-29.

1. Position the module at a 45° angle relative to the system board. Make sure the small notch in the middle of the bottom edge of the module aligns with the notch in the module socket.
2. Insert the bottom edge of the module into the socket, making sure the module is seated firmly.
3. Hold the module at each end and gently push the top edge forward until the module snaps into place.
4. Perform steps 1 through 3 for each remaining module.
5. Replace the computer's cover. (Refer to section 4.2.2.)
6. Connect the power cord and all external cables to the computer and turn on the power.

Real-Time Clock (RTC) Battery

This section covers the removal and replacement of the RTC battery.

Removing the RTC Battery

To remove the RTC battery, perform the following procedure and see Figure 4-30.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)
3. Remove the FDD/HDD mounting bracket. (Refer to section 4.7.1.)
4. Using a small, flat-bladed screwdriver, gently pry the battery free from its socket.

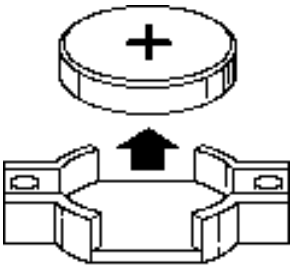

Figure 4-30 Removing and Replacing the Battery

Replacing the RTC Battery

To install an RTC battery, perform the following procedure and see Figure 4-30.

1. Align the battery with its socket on the system board, ensuring that the positive side of the battery is up. Gently press down on the battery until it snaps into place.
2. Replace the FDD/HDD mounting bracket. (Refer to section 4.7.2.)
3. Replace the computer's cover. (Refer to section 4.2.2.)
4. Connect the power cord and all external cables to the computer and turn on the power.

Fan

This section covers the removal and replacement of the fan.

Removing the Fan

To remove the fan, perform the following procedure and see Figure 4-31.

1. Turn off power to the computer, then disconnect the power cord and all external cables connected to the computer.
2. Remove the computer's cover. (Refer to section 4.2.1.)
3. Remove the system board. (Refer to section 4.8.1. or 4.9.1. as appropriate).
4. Insert a thin, long screwdriver shaft through the outside holes in the fan's casing. Align the head of the screwdriver with the center of the retaining pin. Use the screwdriver to push the pin forward until it pops free of the casing and the chassis. Repeat for each pin.
5. Pull the fan away from the chassis.

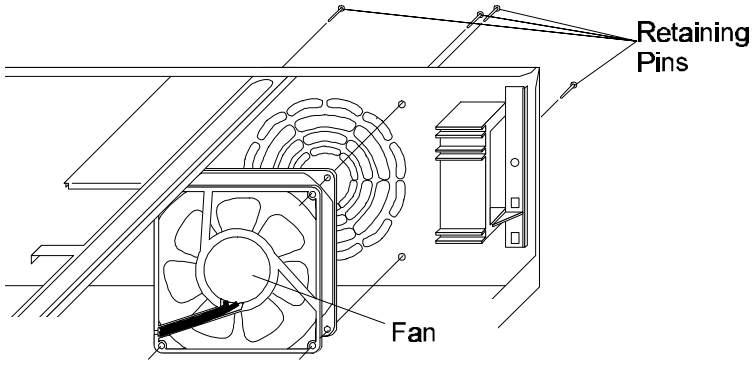

Figure 4-31 Removing and Replacing the Fan

Replacing the Fan

To replace the fan, perform the following procedure and see Figure 4-31.

1. Align the pin holes in the fan's casing with the pin holes in the rear of the chassis.
2. Insert the four retaining pins into the corresponding holes (through the rear of the chassis).
3. Push the pins in, locking the fan to the chassis.
4. Replace the computer's cover. (Refer to section 4.2.2.)
5. Connect the power cord and all external cables to the computer and turn on the power.

Keyboard

This section covers the removal and replacement of the keyboard.

Removing the Keyboard

To remove the keyboard, turn off power to the computer and disconnect the keyboard cable connector from the keyboard port in the rear of the computer. See Figure 4-32.

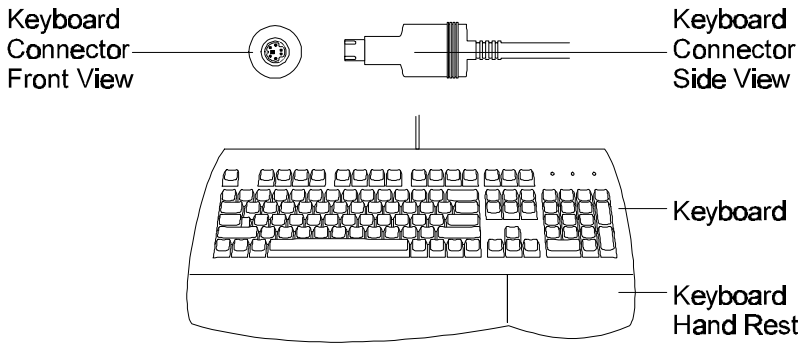

Figure 4-32 Removing and Replacing the Keyboard

Replacing the Keyboard

To replace the keyboard, align the keyboard cable connector with the keyboard port in the rear of the computer. (Refer to section 4.1.6.) Adjust the connector so that the pins on the connector align with the holes in the port. Push the connector into the port. Restore power to the computer.

Mouse

This section covers the removal and replacement of the mouse.

Removing the Mouse

To remove the mouse, turn off power to the computer and disconnect the mouse cable connector from the mouse port in the rear of the computer. See Figure 4-33.

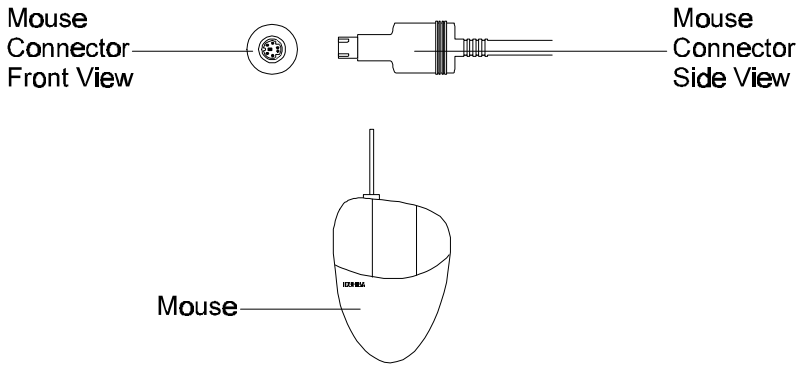

Figure 4-33 Removing and Replacing the Mouse

Replacing the Mouse

To replace the mouse, align the mouse cable connector with the mouse port in the rear of the computer. (Refer to section 4.1.6.) Adjust the connector so that the pins on the connector align with the holes in the port. Push the connector into the port. Restore power to the computer.

Monitor

This section covers the removal and replacement of the monitor.

Removing the Monitor

To remove the monitor, turn off power to the computer and disconnect the monitor cable connector from the video port in the rear of the computer. Disconnect the optional speaker cable from the line out jack in the rear of the computer. Disconnect the optional microphone cable from the microphone jack in the rear of the computer. See Figures 4-34 and 4-35.

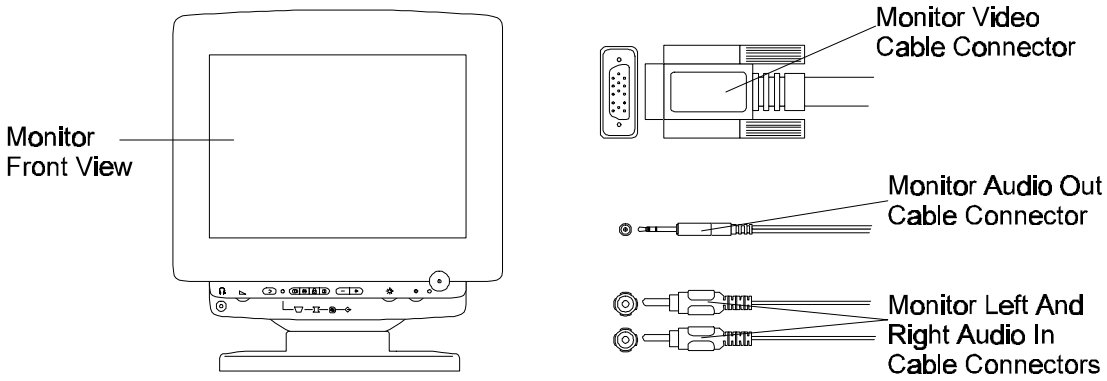

Figure 4-34 Removing and Replacing the Monitor

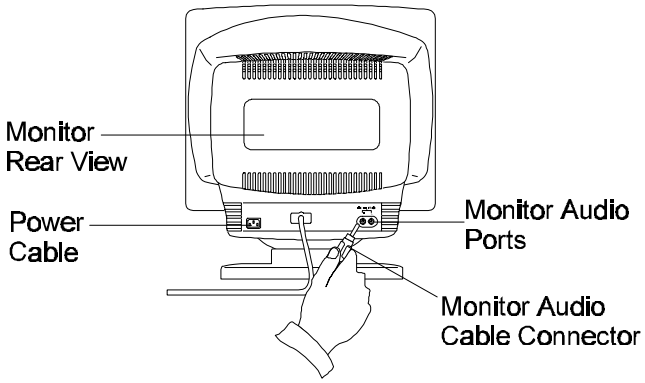

Figure 4-35 Disconnecting and Connecting Audio Cables from the Monitor

Replacing the Monitor

To replace the monitor, align the monitor cable connector with the video port in the rear of the computer. Adjust the connector so that the pins on the connector align with the holes in the port. Push the connector into the port. Tighten the connector screws until you feel tension. Plug the optional speaker cable into the line out jack in the rear of the computer. Connect the optional microphone cable into the microphone jack in the rear of the computer.. (Refer to section 4.1.6.) Restore power to the computer.

Appendix A
Models 5160D and 5200D Pinout Assignments

System Board Overview

Equium Models 5160D and 5200D use an Intel CU430HX system board. Figure A-20 shows the location and functions of the system board connectors and headers.

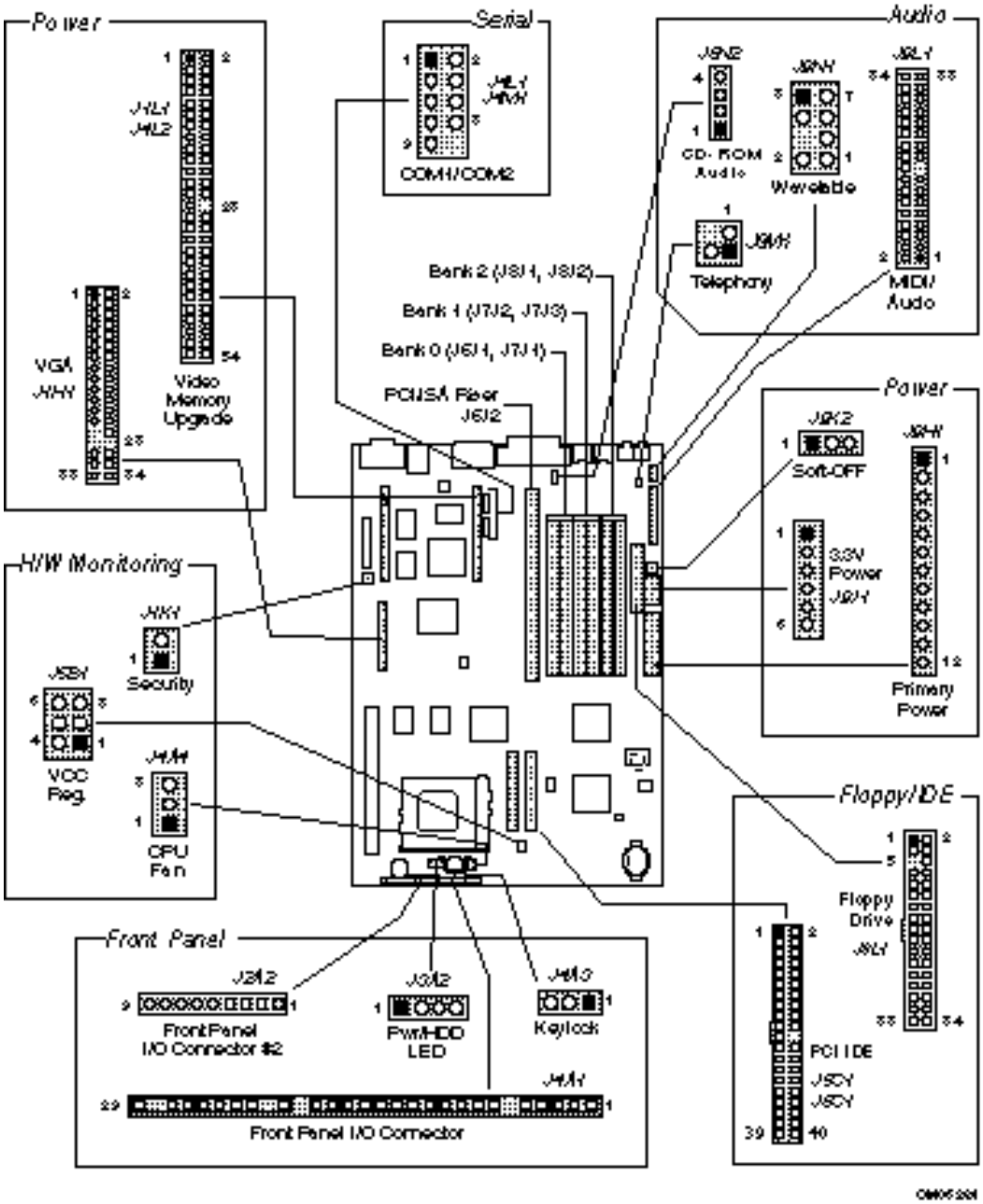

Figure A-20 System Board Connector Locations

Front Panel Connectors

The system board provides header connectors to support functions typically located on the chassis bezel. Figure A-21shows the front panel connector header. Front panel features supported include:

- CPU fan (FAN)
- System Reset (RST)
- Power LED (PWRLED)
- Hard drive activity LED (HDDLED)
- Power supply ON (PS-ON)
- Sleep/Resume (SLP)
- Infrared (IrDA) port (IR)
- System Speaker (SPKR)

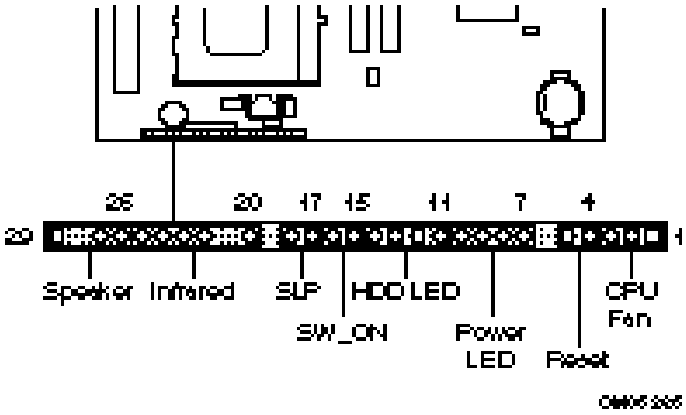

Figure A-21 Front Panel I/O Connectors

Table A-24lists the pinouts and signals for the front panel I/O connector.

Table A-24 Front Panel I/O Connector (J2A1)

Pin	Signal Name	Pin	Signal Name
1	FANNEG	16	Ground
2	FANPOS	17	SLEEP
3	FANNEG	18	SLEEPPU
4	Ground	19	No connection
5	SW_RST	20	VCC
6	No connection	21	No connection
7	PWR_PU	22	IRRIN
8	PWR_PU	23	Ground
9	PWR_LED_DRV	24	IRTX
10	PWR_LED_DRV	25	CONIR
11	HDD_PU	26	SPKR+
12	HDA#	27	SPKRHDR
13	PWR_LED_DRV	28	No connection
14	PWR_PU	29	Ground
15	SW_ON		

CPU Fan (FAN)

The 3-pin fan header of the front panel connector provides a basic 3-wire connection to a CPU fan. The center pin of the header supplies +12 VDC and the outer pins are at ground.

System Reset (RST)

This 2-pin header can be connected to a momentary SPST type switch that is normally open. When the switch is closed, the system will hard reset and run POST.

Power LED (PWRLED)

This 4-pin header drives an LED to indicate when power is applied to the system board.

Hard Drive Activity LED (HDDLED)

This 4-pin header drives an LED to indicate when hard drive activity is taking place.

Power Supply ON (PS-ON)

This 2-pin header connects to a front panel power switch. When the switch is closed, the power supply turns ON. If a mechanical switch is connected to this header, it must apply a momentary ground to the SW_ON header pin in order to signal the supply to turn ON or OFF. Because of the system board's internal debounce circuitry, the ground must be applied for at least 50ms. At least 2 seconds must pass before the power supply will recognize another ON/OFF signal (to prevent "double clicking").

Sleep/Resume (SLP)

When Advanced Power Management (APM) is activated in the system BIOS and the Operating System's APM driver is loaded, Sleep mode (Stand-By) can be entered in one of three ways: an optional front panel "Sleep/Resume" button, a user defined keyboard hot key, or prolonged system inactivity. The Sleep/Resume button is supported by a 2-pin header located on the front panel I/O connector. Closing the "Sleep" switch will generate an SMI (System Management Interrupt) to the processor which immediately goes into System Management Mode (SMM), the so called "Sleep" mode.

The front panel "Sleep mode" switch must be a momentary two pin SPST type that is normally open. The function of the Sleep/Resume button can also be achieved via a keyboard hot-key sequence, or by a time-out of the system inactivity timer. Both the keyboard hot-key and the inactivity timer are programmable in the BIOS setup (timer is set to 10 minutes by default). To re-activate the system, or "Resume", the user must simply press the sleep/resume button again, or use the keyboard or mouse. Mouse activity will only "wake up" the system if a mouse driver is loaded. While the system is in Stand-By or "sleep" mode it is fully capable of responding to and servicing external interrupts (such as in-coming FAX) even though the monitor will only turn on if a user interrupt (keyboard/mouse) occurs as mentioned above

Infrared (IrDA) Connector (IR)

Serial port 2 can be configured to support an IrDA module via a 6-pin header connector . Once configured for IrDA, the user can transfer files to or from portable devices such as laptops, PDA's and printers using application software such as LapLink. The IrDA specification provides for data transfers at 115 Kbps from a distance of 1 meter.

Speaker (SPKR)

The CU430HX system board has an onboard speaker to provide basic level beep code information. The front panel speaker connection allows an external (chassis mounted) speaker to be connected. The external or the onboard speaker provides error beep code information during the Power-On Self Test, if the system cannot use the video interface. When an external (chassis mounted) speaker is connected to the 2-pin header on the front panel connector, the onboard speaker is disabled.

Other Front Panel Connectors

In addition to the front panel I/O connector, there are three other headers included in the front panel group. Two headers (front panel header #2 and pwr/HDD LED header) provide duplicate signals to those available on the front panel I/O connector. The following tables list the pinouts and signals on the remaining front panel connectors.

Table A-25 Power/HDD LED Header (J3A2)

Pin	Signal Name
1	HDD_PU
2	HDA#
3	PWR_LED_DRV
4	PWR_PU

Table A-26 Front Panel Header #2 (J2A2)

Pin	Signal Name
1	HDD_PU
2	HDA#
3	Ground
4	SW_RST
5	VCC
6	IRRIN
7	Ground
8	IRTX
9	No connection

Table A-27 Keylock Header (J4A3)

Pin	Signal Name
1	Ground
2	KBLOCK#
3	Ground

Memory/Expansion Connectors

The CU430HX system board provides six 72-pin SIMM sockets for main memory. These sockets accept standard SIMM 72-pin modules.

The CU430HX system board uses a PCI/ISA riser connector (J6J2) to provide for expansion PCI or ISA boards. The associated riser board can support either two or three PCI slots. A pair of jumpers on the CU430HX system board must be set to define the number of PCI slots on the riser board. Refer to Appendix C for jumper block details. Table A-28 contains the pinout listing for the PCI/ISA riser connector.

Table A-28 PCI/ISA Riser Connector (J6J2) (1/2)

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
A1	IOCHK#	B1	GND	E1	GND	F1	GND
A2	SD7	B2	RSTDRV	E2	GND	F2	GND
A3	SD6	B3	Vcc	E3	PCIINT1#	F3	PCIINT3#
A4	SD5	B4	IRQ9	E4	PCIIINT2#	F4	PCIINT4#
A5	SD4	B5	-5 V	E5	Vcc	F5	Vcc
A6	SD3	B6	DRQ2	E6	Key	F6	Key
A7	SD2	B7	-12 V	E7	Vcc	F7	Vcc
A8	SD1	B8	0WS#	E8	PCIRST#	F8	PCKLF
A9	SD0	B9	+12 V	E9	GNT0#	F9	GND
A10	IOCHRDY	B10	GND	E10	REQ0#	F10	GNT1#
A11	AEN	B11	SMEMW#	E11	GND	F11	GND
A12	SA19	B12	SMEMR#	E12	PCKLE	F12	REQ1#
A13	SA18	B13	IOW#	E13	GND	F13	AD31
A14	SA17	B14	IOR#	E14	AD30	F14	AD29
A15	SA16	B15	DACK3#	E15	3.3 V	F15	3.3 V
A16	SA15	B16	DRQ3	E16	Key	F16	Key
A17	SA14	B17	DACK1#	E17	3.3 V	F17	3.3 V
A18	SA13	B18	DRQ1	E18	AD28	F18	AD27
A19	SA12	B19	REFRESH#	E19	AD26	F19	AD25
A20	SA11	B20	SYSCLK	E20	AD24	F20	CBE3#
A21	SA10	B21	IRQ7	E21	AD22	F21	AD23
A22	SA9	B22	IRQ6	E22	AD20	F22	AD21
A23	SA8	B23	IRQ5	E23	AD18	F23	AD19
A24	SA7	B24	IRQ4	E24	3.3 V	F24	3.3 V
A25	SA6	B25	IRQ3	E25	Key	F25	Key
A26	SA5	B26	DACK2#	E26	3.3 V	F26	3.3 V
A27	SA4	B27	TC	E27	AD16	F27	AD17
A28	SA3	B28	BALE	E28	FRAME#	F28	IRDY#
A29	SA2	B29	Vcc	E29	CBE2#	F29	DEVSEL#
A30	SA1	B30	OSC	E30	TRDY#	F30	PLOCK#
A31	SA0	B31	GND	E31	STOP#	F31	PERR#
C1	SBHE#	D1	MEMCS16#	G1	SDONE	H1	SERR#
C2	LA23	D2	IOCS16#	G2	SBO#	H2	AD15
C3	LA22	D3	IRQ10	G3	CBE1#	H3	AD14
C4	LA21	D4	IRQ11	G4	PAR	H4	AD12
C5	LA20	D5	IRQ12	G5	GND	H5	GND
C6	LA19	D6	IRQ15	G6	Key	H6	Key

Table A-5 PCI/ISA Riser Connector (J6J2) (2/2)

Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
C7	LA18	D7	IRQ14	G7	GND	H7	GND
C8	LA17	D8	DACK0#	G8	AD13	H8	AD10
C9	MEMR#	D9	DRQ0	G9	AD11	H9	AD8
C10	MEMW#	D10	DACK5#	G10	AD9	H10	AD7
C11	SD8	D11	DRQ5	G11	CBE0#	H11	AD5
C12	SD9	D12	DACK6#	G12	AD6	H12	AD3
C13	SD10	D13	DRQ6	G13	AD4	H13	AD1
C14	SD11	D14	DACK7#	G14	AD2	H14	AD0
C15	SD12	D15	DRQ7	G15	Key	H15	Key
C16	SD13	D16	Vcc	G16	Vcc	H16	Vcc
C17	SD14	D17	MASTER#	G17	GNT2	H17	Vcc
C18	SD15	D18	GND	G18	(GND | REQ2) *	H18	(GND | PCCLK2) *
				G19	GND	H19	GND

* These signals are (2 slot | 3 slot) jumpered signal names.

Audio Connectors

The pinouts and signal listings for the audio headers/connectors are provided in the following tables.

Table A-29 CD-Audio Header (J6N2)

Pin	Signal Name
1	Ground
2	CD-Left
3	Ground
4	CD-Right

Table A-30 Wavetable Header (J9N1)

Pin	Signal Name
1	Wave Right
2	Ground
3	Wave Left
4	Ground
5	Key
6	Ground
7	NC
8	MIDI_Out

Table A-31 Telephony Header (J9M1)

Pin	Signal Name
1	Ground
2	Mono Out
3	Mic In
4	Key

Table A-32 MIDI/Audio Upgrade Header (J9L1)

Pin	Signal Name	Pin	Signal Name
1	+5 V	2	+5 V
3	Joystick Button0	4	Joystick Button2
5	Joystick X1	6	Joystick X2
7	Ground	8	MIDI Out
9	Ground	10	Joystick Y2
11	Joystick Y1	12	Joystick Button3
13	Joystick Button1	14	MIDI In
15	+5 V	16	Key
17	Key	18	Key
19	Line Out Right	20	Ground
21	Right Speaker	22	Ground
23	Left Speaker	24	Key
25	Line Out Left	26	Ground
27	Line In Right	28	-12 V
29	Line In Left	30	Ground
31	Mic In	32	+12 V
33	Ground	34	Ground

Power Connectors

The CU430HX system board must be used with a power supply that supports remote power on/off, so the system board can turn off the system power under software control. The Powerman utility supplied for Windows 3.1x allows for soft-off as does the shutdown icon in Windows 95 Start menu. The system BIOS turns the system power off when it receives the proper APM command from the OS. For example, Windows 95 issues this APM command after the user selects "Shutdown the computer" option. APM must be enabled in the system BIOS and OS in order for the soft-off feature to work correctly. The user has the ability to determine the state of the power supply, so if the system was turned on when power was disconnected, the system turns back on when power is reapplied or it remains off, depending on the user setup configuration in CMOS.

Table A-33provides the pinout listing for the primary power supply connector of the CU430HX system board.

Table A-33 Primary Power Supply Connector (J9H1)

Pin	Signal Name/Function
1	PWRGD (Power good)
2	+5 V (VCC)
3	+12 V
4, key	-12 V
5	Ground
6	Ground
7, key	Ground
8	Ground
9	-5 V
10	+5 V (VCC)
11	+5 V (VCC)
12	+5 V (VCC)

Table A-34provides the pinout listing for the external 3.3 volt power supply connector of the CU430HX system board.

Table A-34 External 3.3 V Power Supply Connector (J9J1)

Pin	Name
1	Ground
2, key	Ground
3	Ground
4	+3.3 V
5	+3.3 V
6	+3.3 V

The pinout listing for the soft-OFF power supply connector of the CU430HX system board is shown inTable A-35. This 3-pin keyed position supports a software-controlled power supply shutoff (Soft-OFF). When connected to this position, the power supply follows remote ON/OFF commands.

Table A-35 Soft-Off Power Supply Connector (J9K2)

Pin	Signal Name/Function
1	+5 VSB (+5 Volts Standby)
2	PS_ON (Remote On/Off)
3	PS_COM (Supply presence)

Floppy/IDE Connectors

Table A-36lists the pinout and signal names for the floppy drive connector.

Table A-36 Floppy Drive Connector (J9K1)

Pin	Signal Name	Pin	Signal Name
1	Ground	2	DENSEL
3	Ground	4	Reserved
5	Key	6	FDEDIN
7	Ground	8	Index#
9	Ground	10	Motor Enable A#
11	Ground	12	Drive Select B#
13	Ground	14	Drive Select A#
15	Ground	16	Motor Enable B#
17	MSEN1	18	DIR#
19	Ground	20	STEP#
21	Ground	22	Write Data#
23	Ground	24	Write Gate#
25	Ground	26	Track 00#
27	MSEN0	28	Write Protect#
29	Ground	30	Read Data#
31	Ground	32	Side 1 Select#
33	Ground	34	Diskette Change#

Table A-37lists the pinout and signal names for the IDE connectors.

Table A-37 IDE Connectors (J5C1, J6C1) (1/2)

Pin	Signal Name	Pin	Signal Name
1	Reset IDE	2	Ground
3	Host Data 7	4	Host Data 8
5	Host Data 6	6	Host Data 9
7	Host Data 5	8	Host Data 10
9	Host Data 4	10	Host Data 11
11	Host Data 3	12	Host Data 12
13	Host Data 2	14	Host Data 13
15	Host Data 1	16	Host Data 14
17	Host Data 0	18	Host Data 15
19	Ground	20	Key
21	DDRQ0 (DDRQ1)	22	Ground
23	I/O Write#	24	Ground
25	I/O Read#	26	Ground

Table A-14 IDE Connectors (J5C1, J6C1) (2/2)

Pin	Signal Name	Pin	Signal Name
27	IOCHRDY	28	Vcc pull-down
29	DDACK0 (DDACK1)#	30	Ground
31	IRQ14 (IRQ15)	32	Reserved
33	DAG1	34	Reserved
35	DAG0	36	DAG2
37	Chip Select 1P (1S)#	38	Chip Select 3P (3S)#
39	Activity#	40	Ground

Hardware Monitoring Connectors

The hardware monitoring connectors identified in Figure A-20 are all associated with the functions performed by the hardware monitoring ASIC component on the CU430HX system board. The following tables list the pinouts and signals of the hardware monitoring connectors.

The security connector can be connected to a chassis-mounted micro-switch that closes if the chassis cover is removed. This switch can be used in addition to the onboard photo-transistor to keep track of each time the system chassis is opened.

Table A-38 Security Connector (J1K1)

Pin	Signal Name/Function
1	Ground
2	BATPWRSLP (Battery voltage)

Table A-39 Vcc Regulator Header (J5B1)

Pin	Signal Name/Function
1	VCC3 (Output of U3A1 regulator)
2	VCC3 (Output of U3A1 regulator)
3	VCC3 (Output of U3A1 regulator)
4	VCC2
5	VCC2
6	VCC2

The separate fan connector (not part of the front panel I/O connector) listed in Table A-40 has a fan sense (tachometer) line so the hardware monitoring ASIC can monitor the fan speed. This connector is keyed to prevent potential fan damage.

Table A-40 CPU Fan Connector (J4A4)

Pin	Signal Name/Function
1	Ground
2	FANPOS (+12VDC)
3	FAN1_SENSE (Tachometer signal)

Video Connectors

The video features identified in Figure A-20 are the LBP VESA connector and the video memory upgrade headers. A video memory daughtercard can be added using the video memory upgrade headers. The total installed onboard video memory can be 1MB or 2MB. With an installed video memory daughtercard, the total video memory can be either 2MB or 4MB.

Table A-41 provides the pinout and signal listing for the LBP VESA feature connector.

Table A-41 LBP VESA Feature Connector (J1H1)

Pin	Signal Name / Function	Pin	Signal Name / Function
1	Ground	2	Pixel Data 0
3	Ground	4	Pixel Data 1
5	Ground	6	Pixel Data 2
7	Enable External Pixel Data	8	Pixel Data 3
9	Enable External Sync	10	Pixel Data 4
11	Enable External Pixel Clock	12	Pixel Data 5
13	N/C, not used	14	Pixel Data 6
15	Ground	16	Pixel Data 7
17	Ground	18	PCLK, Pixel Clock
19	Ground	20	BLANKING
21	Ground	22	HSYNC, Horizontal Sync
23	N/C, not used	24	VSYNC, Vertical Sync
25	Key (no pin)	26	Ground
27	Key (no pin)	28	Key (no pin)
29	IICCLK	30	Ground
31	IICDAT	32	N/C
33	EN1	34	EN2

Table A-42 and Table A-43 provide the pinout and signal listings for the video memory upgrade headers.

Table A-42 Video Memory Upgrade Header #1 (J4L2)

Pin	Signal Name / Function	Pin	Signal Name / Function	Pin	Signal Name / Function
1	MCLK	19	VMD2	37	VMD41
2	Ground	20	VMD1	38	VMD42
3	VCC3	21	VMD0	39	VMD43
4	VWEVTR#	22	Ground	40	VMD44
5	VMD8	23	VCC3	41	VMD45
6	VMD9	24	VCAS0R#	42	Ground
7	VMD10	25	VCAS1R#	43	VMD46
8	VMD11	26	VCAS2R#	44	VMD47
9	VMD12	27	VCAS3R#	45	VMD39
10	VMD13	28	Vacant, Key	46	VMD38
11	VMD14	29	VCAS4R#	47	VMD37
12	Ground	30	VCAS5R#	48	VMD36
13	VMD15	31	VCAS6R#	49	VMD35
14	VMD7	32	Ground	50	VMD34
15	VMD6	33	VCAS7R#	51	VMD33
16	VMD5	34	VWE_CAS0R#	52	Ground
17	VMD4	35	VWE_CAS1R#	53	VCC3
18	VMD3	36	VMD40	54	VMD32

Table A-43 Video Memory Upgrade Header #2 (J1L1)

Pin	Signal Name / Function	Pin	Signal Name / Function	Pin	Signal Name / Function
1	Ground	19	VMD31	37	VMD49
2	VMD16	20	VRAS0R#	38	VMD50
3	VMD17	21	Ground	39	VMD51
4	VCC3	22	VRAS1R#	40	VMD52
5	VMD18	23	VMAR0	41	Ground
6	VMD19	24	VMAR1	42	VMD53
7	VMD20	25	VMAR2	43	VMD54
8	VMD21	26	VMAR3	44	VMD55
9	VMD22	27	VMAR4	45	VMD56
10	VMD23	28	Vacant, Key	46	VMD57
11	Ground	29	VMAR5	47	VMD58
12	VMD24	30	VCC3	48	VMD59
13	VMD25	31	Ground	49	VMD60
14	VMD26	32	VMAR6	50	VMD61
15	VMD27	33	VMAR7	51	DSF
16	VMD28	34	VMAR8	52	VMD62
17	VMD29	35	VMAR9	53	VMD63
18	VMD30	36	VMD48	54	VCC3

USB/Serial Connectors

The USB connection to the serial ports must be made using the COM1/COM2 headers (J4L1, J4M1) on the system board. Table A-44 lists the signals and pinout for the COM1/COM2 headers, and Table A-45 lists the signals and pinout for the side-by-side USB connector.

Table A-44 Serial Port Headers (J4L1, J4M1)

Pin	Signal Name	Description
1	DCD	Carrier Detect
2	DSR	Data Set Ready
3	SIN#	Serial Data In
4	RTS	Request To Send
5	SOUT#	Serial Data Out
6	CTS	Clear To Send
7	DTR	Data Terminal Ready
8	RI	Ring Indicator
9	GND	Chassis Ground
10	Key	Vacant

Table A-45 USB Port Connector (J4N1) Pinout

Pin	Signal Name
1	Power
2	USBP0#
3	USBP0
4	Ground
5	Power
6	USBP1#
7	USBP1
8	Ground

Back Panel Connectors

The back panel provides external access to two PS/2 style keyboard and mouse connectors, one parallel port, the microphone input and audio output connectors, an RS45 LAN connector, and a VGA video connector which are integrated on the system board. In addition, an RS232 serial connector or a side-by-side pair of USB connectors are also integrated on the system board. Figure A-5 shows the general location of the I/O connectors.

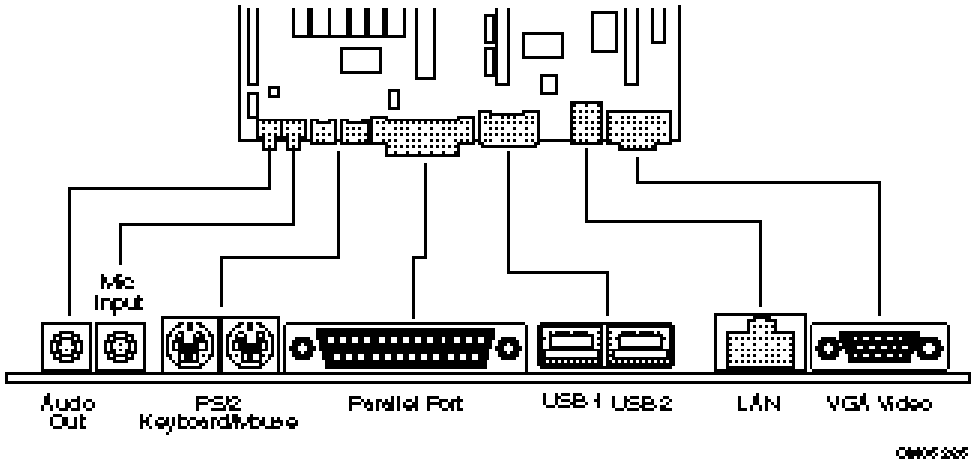

Figure A-22 I/O Connections

VGA Video Connector

Table A-46lists the pinout and signal names for the VGA video connector.

Table A-46 VGA Video Connector (J1N1)

Pin	Signal Name / Function	Pin	Signal Name / Function
1	Red Video	9	Key (no pin)
2	Green Video	10	Sync Return (Ground)
3	Blue Video	11	Monitor ID Bit 0 (not used)
4	Monitor ID Bit 2 (not used)	12	Monitor ID Bit 1 (not used)
5	Chassis Ground	13	Horizontal Sync
6	Red Return (Ground)	14	Vertical Sync
7	Green Return (Ground)	15	Not used
8	Blue Return (Ground)	Shield	Chassis Ground

LAN Connector

Table A-47lists the pinout and signal names for the RJ45 LAN connector.

Table A-47 LAN Connector (J2N1)

Pin	Signal Name
1	RJ45_TOP
2	RJ45_TXM
3	RJ45_RXP
4	BS_TERM
5	BS_TERM
6	RJ45_RXM
7	BS_TERM
8	BS_TERM

USB Back Panel Connectors

Table A-48lists the pinout and signal names for the USB back panel connectors.

Table A-48 USB Connector Pinout

Pin	Signal Name
1	Power
2	USBP0# [USBP1#]
3	USBP0 [USBP1]
4	Ground

Keyboard and Mouse Ports

Table A-49lists the pinout and signal names for the PS/2 keyboard and mouse connectors. Although they are labeled as “Keyboard” and “Mouse” on the system board and the back panel, the connectors can be used interchangeably for either keyboard or mouse.

Table A-49 PS/2 Keyboard/Mouse Connector Pinout

Pin	Signal Name / Function
1	KBD/Mouse Data
2	Reserved, No connection
3	GND, Chassis Ground
4	+5 VDC (fused)
5	KBD Clock
6	Reserved, No connection
Shield	Chassis Ground

Parallel Port

Table A-50lists the pinout and signal names for the parallel port connector.

Table A-50 Parallel Port Connector Pinout

Pin	Signal Name	Description	Pin	Signal Name	Description
1	STB#	Strobe	14	AFD#	Auto Feed
2	PPD0	Data Bit 0	15	ERROR#	Fault
3	PPD1	Data Bit 1	16	INIT#	Initializing printer
4	PPD2	Data Bit 2	17	SLCTIN#	Select input
5	PPD3	Data Bit 3	18	GND	Chassis Ground
6	PPD4	Data Bit 4	19	GND	Chassis Ground
7	PPD5	Data Bit 5	20	GND	Chassis Ground
8	PPD6	Data Bit 6	21	GND	Chassis Ground
9	PPD7	Data Bit 7	22	GND	Chassis Ground
10	ACK#	Acknowledge	23	GND	Chassis Ground
11	BUSY	Port Busy	24	GND	Chassis Ground
12	PE	Paper end	25	GND	Chassis Ground
13	SLCT	Select			

Appendix B
Model 6200D Pinout Assignments

System Board Overview

Equium Model 6200D uses an Intel AP440FX system board. The AP440FX system board has onboard connectors supporting the following feature areas:

- Front panel features.
- Memory (SIMM) and expansion (PCI/ISA riser) sockets.
- Video features.
- Serial header.
- Audio features.
- Power connectors.
- Floppy and PCI IDE connectors.

Figure B-1 identifies the connectors on the AP440FX system board, and indicates the feature area with which each connector is associated.

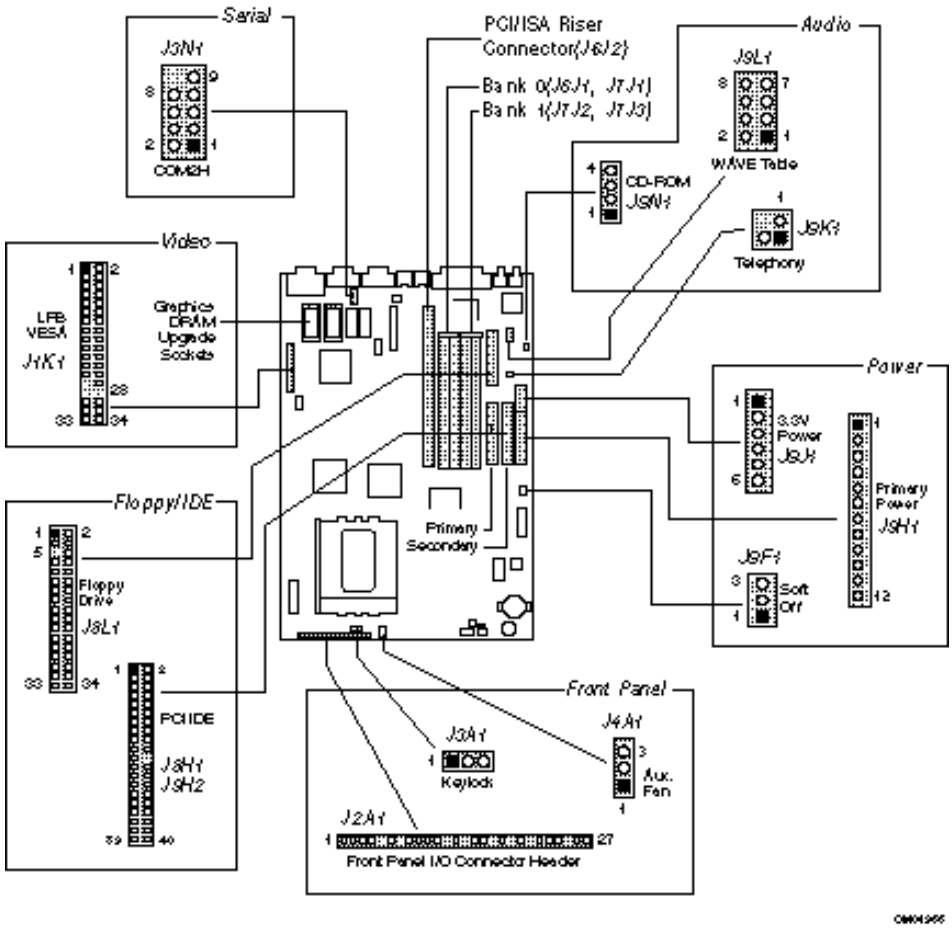

Figure B-23 System Board Connector Locations

Front Panel Connectors

The system board provides connectors to support functions typically located on the chassis bezel. In addition, connectors are provided that support a cooling fan and a keyboard interlock. Front panel features supported include:

- Soft Power-ON
- Sleep/Resume
- Infrared (IrDA) port
- Hard Drive activity LED
- Power LED
- Reset
- Speaker
- Keyboard lock

Each of the front panel connectors is identified in Figure B-23. The front panel I/O connector and keyboard lock connector are shown, in detail, in Figure B-24.

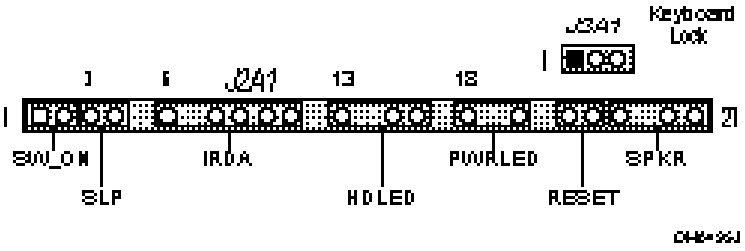

Figure B-24 Front Panel I/O Connectors

Table B-51 lists the full pinout listing for the front panel I/O connector.

Table B-51 Front Panel I/O Connector (J2A1)

Pin	Signal Name	Pin	Signal Name
1	SW_ON	15	HD ACTIVE
2	FPPWR_ON	16	+5V
3	SLEEP_REQ	17	Key
4	FPSLP	18	Ground
5	Key	19	Key
6	+5V	20	PWRDVR
7	Key	21	Key
8	IR_RX	22	Ground
9	Ground	23	FP_RESET
10	IR_TX	24	+5V
11	IR_SL1	25	Key
12	Key	26	SPKR_DAT connect
13	+5V	27	PC_SPKROUT
14	Key		

SW_ON

This 2-pin header connects to a front panel power switch. When the switch is closed, the power supply turns ON. If a mechanical switch is connected to this header, it must apply a momentary ground to the SW_ON header pin in order to signal the supply to turn ON or OFF. Because of the system board's internal debounce circuitry, the ground must be applied for at least 50ms. At least 2 seconds must pass before the power supply will recognize another ON/OFF signal (to prevent "double clicking").

Sleep/Resume

When Advanced Power Management (APM) is activated in the system BIOS and the Operating System's APM driver is loaded, Sleep mode (Standby) can be entered in one of three ways: an optional front panel "Sleep/Resume" button, a user defined keyboard hot key, or prolonged system inactivity. The Sleep/Resume button is supported by a 2-pin header located on the front panel I/O connector. Closing the "Sleep" switch generates an SMI (System Management Interrupt) to the processor which immediately goes into System Management Mode (SMM).

The front panel "Sleep mode" switch must be a momentary two pin SPST type that is normally open. The function of the Sleep/Resume button can also be achieved by using a keyboard hot-key sequence, or by a time-out of the system inactivity timer. Both the keyboard hot key and the inactivity timer are programmable in the BIOS Setup (timer is set to 10 minutes by default). To reactivate the system, or "Resume", the user must simply press the sleep/resume button again, or use the keyboard or PS/2 mouse. Mouse activity only "wakes up" the system if a mouse driver is loaded. While the system is in Standby or "sleep" mode, it is fully capable of responding to and servicing external interrupts (such as in-coming FAX) even though the monitor only turns on if a user interrupt (keyboard/mouse) occurs as mentioned above.

Infrared Connector

Serial port 2 can be configured to support an IrDA module with a 5 pin header connector. Once configured for IrDA, the user can transfer files to or from portable devices such as laptops, PDAs and printers using application software such as LapLink. The IrDA specification provides for data transfers at 115 Kbps from a distance of 1 meter. Consumer IR is also supported by the same connector.

Hard Drive LED

This 3-pin , keyed header can be connected to a front panel LED to indicate when hard drive activity is taking place. When hard drive activity is happening, the HDACTIVE pin (J2A1-15) goes low.

Power-ON LED

This 2-pin header can be connected to a front panel LED to indicate when power is applied to the system board. When the system board is powered up, power is applied to the PWRDRV pin (J2A1-20) to light the front panel LED.

Reset

This 2-pin header can be connected to a momentary SPST type switch that is normally open. When the switch is closed, the system performs a hard reset and runs POST.

Speaker

The speaker provides error beep code information during the Power-On Self Test (POST), if the system cannot use the video interface. Jumpering pins 26-27 (the last two pins of J2A1) enables the onboard speaker. To disable the onboard speaker (and allow use of the chassis speaker), remove the jumper from these pins. You can also disable the onboard speaker using a CMOS Setup option.

Keylock Connector (J3A1)

The Keylock connector pinout is listed in Table B-52.

Table B-52 Keylock Connector (J3A1)

Pin	Signal Name
1	Ground
2	KB_LOCK
3	Ground

Fan Connector (J4A1)

The auxiliary fan connector (J4A1) is a 1-by-3 header that can accept either two-position (power and ground) or three-position (power, ground, and fan sense) fan plugs. Figure B-25 indicates the required orientation and positioning of the fan plug. Table B-53 lists the signals and pinout for the fan connector.

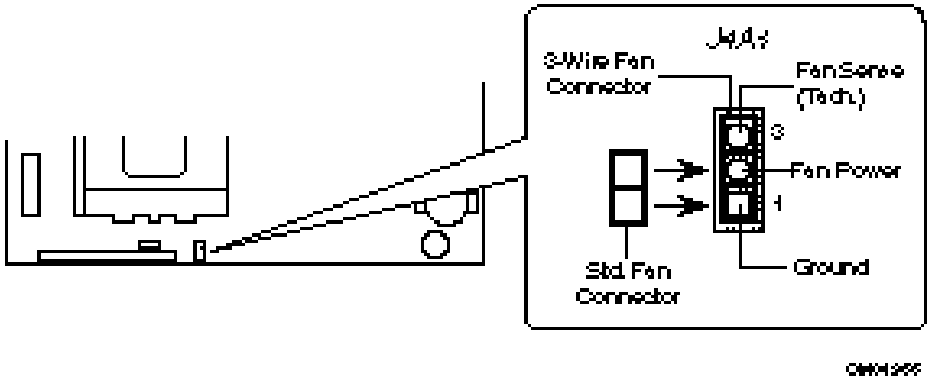

Figure B-25 Fan Connector Usage

Table B-53 Auxiliary Fan Connector (J4A1)

Pin	Signal Name / Function
1	Ground
2	Fan Power
3	Fan Sense (Tachometer)

Memory/Expansion Connectors

The AP440FX system board provides four 72-pin SIMM sockets for main memory. These sockets accept standard SIMM 72-pin modules.

The AP440FX system board uses a PCI/ISA riser connector (J6J2) to provide for expansion PCI or ISA boards. The associated riser board can support either two or three PCI slots. A pair of jumpers on the AP440FX system board must be set to define the number of PCI slots on the riser board. Table B-54 contains the pinout listing for the PCI/ISA riser connector.

Table B-54 PCI/ISA Riser Connector (J6J2) (1/2)

Pin	Signal Name	Pin	Signal Name	Pin	Signal	Pin	Signal Name
A1	IOCHK#	B1	GND	E1	GND	F1	GND
A2	SD7	B2	RSTDRV	E2	GND	F2	GND
A3	SD6	B3	Vcc	E3	PCIINT1#	F3	PCIINT3#
A4	SD5	B4	IRQ9	E4	PCIIINT2#	F4	PCIINT4#
A5	SD4	B5	-5 V	E5	Vcc	F5	Vcc
A6	SD3	B6	DRQ2	E6	Key	F6	Key
A7	SD2	B7	-12 V	E7	Vcc	F7	Vcc
A8	SD1	B8	0WS#	E8	PCIRST#	F8	PCKLF
A9	SD0	B9	+12 V	E9	GNT0#	F9	GND
A10	IOCHRDY	B10	GND	E10	REQ0#	F10	GNT1#
A11	AEN	B11	SMEMW#	E11	GND	F11	GND
A12	SA19	B12	SMEMR#	E12	PCKLE	F12	REQ1#
A13	SA18	B13	IOW#	E13	GND	F13	AD31
A14	SA17	B14	IOR#	E14	AD30	F14	AD29
A15	SA16	B15	DACK3#	E15	3.3 V	F15	3.3 V
A16	SA15	B16	DRQ3	E16	Key	F16	Key
A17	SA14	B17	DACK1#	E17	3.3 V	F17	3.3 V
A18	SA13	B18	DRQ1	E18	AD28	F18	AD27

Table B-4 PCI/ISA Riser Connector (J6J2) (2/2)

Pin	Signal Name	Pin	Signal Name	Pin	Signal	Pin	Signal Name
A19	SA12	B19	REFRESH#	E19	AD26	F19	AD25
A20	SA11	B20	SYSCLK	E20	AD24	F20	CBE3#
A21	SA10	B21	IRQ7	E21	AD22	F21	AD23
A22	SA9	B22	IRQ6	E22	AD20	F22	AD21
A23	SA8	B23	IRQ5	E23	AD18	F23	AD19
A24	SA7	B24	IRQ4	E24	3.3 V	F24	3.3 V
A25	SA6	B25	IRQ3	E25	Key	F25	Key
A26	SA5	B26	DACK2#	E26	3.3 V	F26	3.3 V
A27	SA4	B27	TC	E27	AD16	F27	AD17
A28	SA3	B28	BALE	E28	FRAME#	F28	IRDY#
A29	SA2	B29	Vcc	E29	CBE2#	F29	DEVSEL#
A30	SA1	B30	OSC	E30	TRDY#	F30	PLOCK#
A31	SA0	B31	GND	E31	STOP#	F31	PERR#
C1	SBHE#	D1	MEMCS16#	G1	SDONE	H1	SERR#
C2	LA23	D2	IOCS16#	G2	SBO#	H2	AD15
C3	LA22	D3	IRQ10	G3	CBE1#	H3	AD14
C4	LA21	D4	IRQ11	G4	PAR	H4	AD12
C5	LA20	D5	IRQ12	G5	GND	H5	GND
C6	LA19	D6	IRQ15	G6	Key	H6	Key
C7	LA18	D7	IRQ14	G7	GND	H7	GND
C8	LA17	D8	DACK0#	G8	AD13	H8	AD10
C9	MEMR#	D9	DRQ0	G9	AD11	H9	AD8
C10	MEMW#	D10	DACK5#	G10	AD9	H10	AD7
C11	SD8	D11	DRQ5	G11	CBE0#	H11	AD5
C12	SD9	D12	DACK6#	G12	AD6	H12	AD3
C13	SD10	D13	DRQ6	G13	AD4	H13	AD1
C14	SD11	D14	DACK7#	G14	AD2	H14	AD0
C15	SD12	D15	DRQ7	G15	Key	H15	Key
C16	SD13	D16	Vcc	G16	Vcc	H16	Vcc
C17	SD14	D17	MASTER#	G17	GNT2	H17	Vcc
C18	SD15	D18	GND	G18	(GND | REQ2) *	H18	(GND | PCCLK2) *
				G19	GND	H19	GND

* These signals are (2 slot | 3 slot) jumpered signal names.

Video Feature Connectors

The video features identified in Figure B-23 are the graphics DRAM upgrade sockets and the LBP VESA connector. If the S3 ViRGE graphics option is used, two DRAM devices (1 MB) are soldered to the system board in place of the DRAM sockets for a total of 2MB of video memory. When the S3 V+ graphics option is used, the DRAM sockets are used to allow user installation of 1MB of video memory, in addition to the 1MB that is already soldered to the system board.

Table B-55 provides the pinout and signal listing for the LBP VESA feature connector.

Table B-55 LBP VESA Feature Connector (J1K1)

Pin	Signal Name / Function	Pin	Signal Name / Function
1	Ground	2	Pixel Data 0
3	Ground	4	Pixel Data 1
5	Ground	6	Pixel Data 2
7	Enable External Pixel Data	8	Pixel Data 3
9	Enable External Sync	10	Pixel Data 4
11	Enable External Pixel Clock	12	Pixel Data 5
13	N/C, not used	14	Pixel Data 6
15	Ground	16	Pixel Data 7
17	Ground	18	PCLK, Pixel Clock
19	Ground	20	BLANKING
21	Ground	22	HSYNC, Horizontal Sync
23	N/C, not used	24	VSYNC, Vertical Sync
25	Key (no pin)	26	Ground
27	Key (no pin)	28	Key (no pin)
29	IICCLK	30	Ground
31	IICDAT	32	N/C
33	EN1	34	EN2

USB Side-By-Side Connector

The USB connection to the COM2 serial port must be made using the COM2H header (J3N1) on the system board. Table B-56 lists the signals and pinout for the COM2H header.

Table B-56 Serial Port (COM2H, J3N1) Pinout

Pin	Signal Name	Description
1	DCD	Carrier Detect
2	DSR	Data Set Ready
3	SIN#	Serial Data In
4	RTS	Request To Send
5	SOUT#	Serial Data Out
6	CTS	Clear To Send
7	DTR	Data Terminal Ready
8	RI	Ring Indicator
9	GND	Chassis Ground
10	Key	Vacant

COM 1 Serial Port

Table B-57 provides the pinout listing for the 9-pin DB9 COM 1 serial port.

Table B-57 COM 1 Serial Port Pinout

Pin	Signal Name	Description
1	DCD	Carrier Detect
2	SIN#	Serial Data In
3	SOUT#	Serial Data Out
4	DTR	Data Terminal Ready
5	GND	Chassis Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI	Ring Indicator

Audio Connectors

The pinouts and signal listings for the audio connectors are provided in the following tables.

Table B-58 CD-ROM Connector (J9N1)

Pin	Signal Name
1	Ground
2	CD-Left
3	Ground
4	CD-Right

Table B-59 Wavetable Connector (J9L1)

Pin	Signal Name
1	Wave Right
2	Ground
3	Wave Left
4	Ground
5	Key
6	Ground
7	NC
8	MIDI_Out

Table B-60 Telephony Connector (J9K1)

Pin	Signal Name
1	Ground
2	Mono Out
3	Mic In
4	Key

Power Supply Connectors

The AP440FX system board must be used with a power supply that supports remote power on/off, so the system board can turn off the system power under software control. The Powerman utility supplied for Windows 3.1x allows for soft-off as does the shutdown icon in Windows 95 Start menu. The system BIOS turns the system power off when it receives the proper APM command from the OS. For example, Windows 95 issues this APM command after the user selects "Shutdown the computer" option. APM must be enabled in the system BIOS and OS in order for the soft-off feature to work correctly. The user has the ability to determine the state of the power supply, so if the system was turned on when power was disconnected, the system turns back on when power is reapplied or it remains off, depending on the user setup configuration in CMOS.

Table B-61 provides the pinout listing for the primary power supply connector of the AP440FX system board.

Table B-61 Primary Power Supply Connector (J9H1)

Pin	Name	Function
1	PWRGD	Power good
2	+5 V	+5 volts VCC
3	+12 V	+12 volts
4, key	-12 V	-12 volts
5	Ground	Ground
6	Ground	Ground
7, key	Ground	Ground
8	Ground	Ground
9	-5 V	-5 volts
10	+5 V	+5 volts VCC
11	+5 V	+5 volts VCC
12	+5 V	+5 volts VCC

Table B-62 provides the pinout listing for the external 3.3 volt power supply connector of the AP440FX system board.

Table B-62 External 3.3 V Power Supply Connector (J9J1)

Pin	Name
1	Ground
2, key	Ground
3	Ground
4	+3.3 V
5	+3.3 V
6	+3.3 V

The pinout listing for the soft-OFF power supply connector of the AP440FX system board is shown in Table B63. This 3-pin, keyed position supports a software-controlled power supply shutoff (Soft-OFF). When connected to this position, the power supply follows remote ON/OFF commands.

Table B-63 Soft-Off Power Supply Connector (J9F1)

Pin	Name	Function
1	+5 VSB	+5 Volts Standby
2	PS_ON	Remote On/Off
3	PS_COM	Supply presence

Floppy/IDE Connectors

Table B-64 lists the pinout and signal names for the floppy drive connector.

Table B-64 Floppy Drive Connector (J8L1)

Pin	Signal Name	Pin	Signal Name
1	Ground	2	DENSEL
3	Ground	4	Reserved
5	Key	6	FDEDIN
7	Ground	8	Index#
9	Ground	10	Motor Enable A#
11	Ground	12	Drive Select B#
13	Ground	14	Drive Select A#
15	Ground	16	Motor Enable B#
17	MSEN1	18	DIR#
19	Ground	20	STEP#
21	Ground	22	Write Data#
23	Ground	24	Write Gate#
25	Ground	26	Track 00#
27	MSEN0	28	Write Protect#
29	Ground	30	Read Data#
31	Ground	32	Side 1 Select#
33	Ground	34	Diskette Change#

Table B-65 lists the pinout and signal names for the IDE connectors.

Table B-65 IDE Connectors (J8H1, J9H2)

Pin	Signal Name	Pin	Signal Name
1	Reset IDE	2	Ground
3	Host Data 7	4	Host Data 8
5	Host Data 6	6	Host Data 9
7	Host Data 5	8	Host Data 10
9	Host Data 4	10	Host Data 11
11	Host Data 3	12	Host Data 12
13	Host Data 2	14	Host Data 13
15	Host Data 1	16	Host Data 14
17	Host Data 0	18	Host Data 15
19	Ground	20	Key
21	DDRQ0 (DDRQ1)	22	Ground
23	I/O Write#	24	Ground
25	I/O Read#	26	Ground
27	IOCHRDY	28	Vcc pull-down
29	DDACK0 (DDACK1)#	30	Ground
31	IRQ14 (IRQ15)	32	Reserved
33	DAG1	34	Reserved
35	DAG0	36	DAG2
37	Chip Select 1P (1S)#	38	Chip Select 3P (3S)#
39	Activity#	40	Ground

Back Panel Connectors

The back panel provides external access to PS/2 style keyboard and mouse connectors as well as the two USB connectors and COM 1 serial port, one parallel port, the video connector, and the audio I/O jacks, which are integrated on the system board. Figure B-26 shows the general location of the I/O connectors.

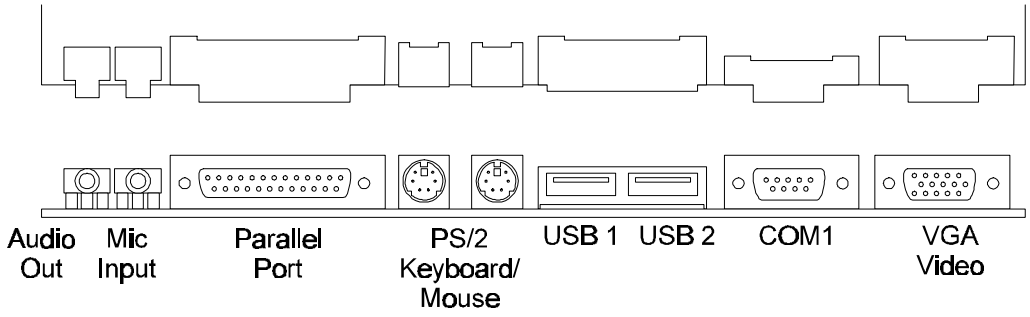

Figure B-26 I/O Connections

VGA Video Connector

Table B-66 lists the pinout and signal names for the VGA video connector.

Table B-66 VGA Video Connector (J1N1)

Pin	Signal Name / Function	Pin	Signal Name / Function
1	Red Video	9	Key (no pin)
2	Green Video	10	Sync Return (Ground)
3	Blue Video	11	Monitor ID Bit 0 (not used)
4	Monitor ID Bit 2 (not used)	12	Monitor ID Bit 1 (not used)
5	Chassis Ground	13	Horizontal Sync
6	Red Return (Ground)	14	Vertical Sync
7	Green Return (Ground)	15	Not used
8	Blue Return (Ground)	Shield	Chassis Ground

COM1 Serial Port

Table B-67 lists the pinout and signal names for the serial connector.

Table B-67 Serial Port Connector Pinout

Pin	Signal Name	Description
1	DCD	Carrier Detect
2	SIN#	Serial Data In
3	SOUT#	Serial Data Out
4	DTR	Data Terminal Ready
5	GND	Chassis Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI	Ring Indicator

USB Back Panel Connectors

Table B-68 lists the pinout and signal names for the USB back panel connectors.

Table B-68 USB Connector Pinout

Pin	Signal Name
1	Power
2	USBP0# [USBP1#]
3	USBP0 [USBP1]
4	Ground

Keyboard and Mouse Ports

Table B-69 lists the pinout and signal names for the PS/2 keyboard and mouse connectors. Although they are labeled as “Keyboard” and “Mouse” on the system board and the back panel, the connectors can be used interchangeably for either keyboard or mouse.

Table B-69 PS/2 Keyboard/Mouse Connector Pinout

Pin	Signal Name / Function
1	KBD/Mouse Data
2	Reserved, No connection
3	GND, Chassis Ground
4	+5 VDC (fused)
5	KBD Clock
6	Reserved, No connection
Shield	Chassis Ground

Parallel Port

Table B-70 lists the pinout and signal names for the parallel port connector.

Table B-70 Parallel Port Connector Pinout

Pin	Signal Name	Description	Pin	Signal Name	Description
1	STB#	Strobe	14	AFD#	Auto Feed
2	PPD0	Data Bit 0	15	ERROR#	Fault
3	PPD1	Data Bit 1	16	INIT#	Initializing printer
4	PPD2	Data Bit 2	17	SLCTIN#	Select input
5	PPD3	Data Bit 3	18	GND	Chassis Ground
6	PPD4	Data Bit 4	19	GND	Chassis Ground
7	PPD5	Data Bit 5	20	GND	Chassis Ground
8	PPD6	Data Bit 6	21	GND	Chassis Ground
9	PPD7	Data Bit 7	22	GND	Chassis Ground
10	ACK#	Acknowledge	23	GND	Chassis Ground
11	BUSY	Port Busy	24	GND	Chassis Ground
12	PE	Paper end	25	GND	Chassis Ground
13	SLCT	Select			

Appendix C
Jumper Settings

Models 5160D and 5200D Jumper Settings

There are three jumper blocks on the CU430HX system board (Models 5160D and 5200D). The jumper block at J4G1 defines the number of PCI slots (two or three slots) available on the riser board used with the system board. The jumper block at J6C2 sets the Flash memory to either normal or recovery mode of operation. The jumper block at J5B1 is only used to provide power for processors using MMX technology. The jumper block at J1K2 defines a range of microprocessor and system board configuration parameters. Figure C-1 shows the jumper block locations on the system board, and indicates how jumper placement corresponds to the value defined by the system board silk-screening.

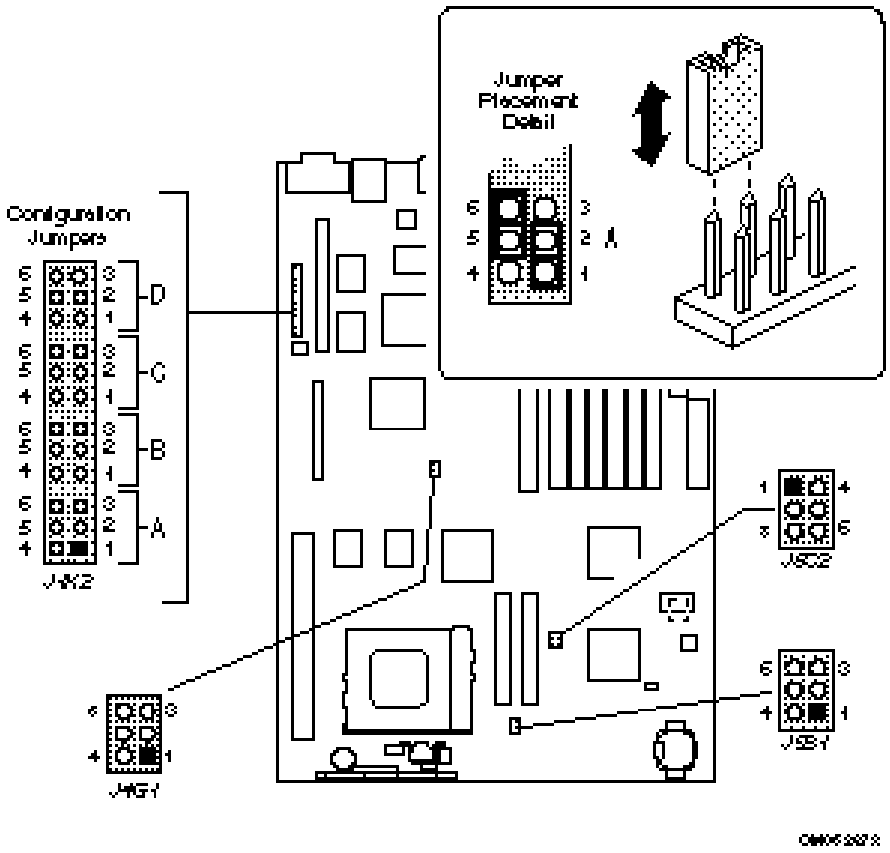

Figure C-27 Models 5160D and 5200D Jumper Locations

The jumpers on the CU430HX system board perform the following functions:

- Allow the system board to be switched between the different frequencies of the Pentium processor. Selecting a processor speed (and multiplier) also changes the Host Bus, PCI Bus, and ISA Bus frequencies.
- Changes output of the onboard voltage regulator and changes power routing to support different processor types.
- Controls clearing or normal operation of the password and CMOS.
- Enables or disables the system board setup.

- Determines whether a riser board with two or three PCI slots is being used with the system board.
- Determines whether the Flash memory is in a normal or recovery mode of operation.

Table C-71lists the CU430HX system board jumper functions and their settings.

Table C-71 Models 5160D and 5200D Configuration Jumper Settings

Function	Jumper	Position	Configuration
Flash Operation	J6C2	1-2	***NORM*** - Normal mode of operation **(Default)**
		2-3	***RCVR*** - Recovery mode of operation
VRE Selection	J6C2	4-5	***VR*** - Normal mode of operation **(Default)**
		5-6	***VRE*** - VRE operation
VCC2 Connection	J5B1	Vacant	Normal operation (VCC2 not connected)
		1-4, 2-5, 3-6	VCC2 connected (support for processors using MMX technology)
2/3 PCI Slot	J4G1	1-2, 4-5	***2 SLOTS*** - Two PCI slots in the riser card. **(Default)**
(***RISER***)		2-3, 5-6	***3 SLOTS*** - Three PCI slots in the riser card.
Password (***PSWD***)	J1K2(A)	1-2	***KEEP*** - Maintain the current (or Setup-revised) password. **(Default)**
		2-3	***CLR*** - Clear the password.
CMOS (***CMOS***)	J1K2(A)	4-5	***KEEP*** - Maintain the current (or Setup-revised) CMOS contents. **(Default)**
		5-6	***CLR*** - Clear the CMOS.
Setup (***SETUP***)	J1K2(B)	1-2	***ENBL*** - Enable setup accessibility. **(Default)**
		2-3	***DIS*** - Disable setup accessibility.
Reserved function	J1K2(B)	4-5	***ENBL*** - Reserved
(***RSVD***)		5-6	***DIS*** - Reserved **(Default)**
Host Bus Frequency (***FREQ***)	J1K2(C)	2-3, 5-6	***50 MHZ*** - Host bus 50 MHz, PCI bus 25 MHz, ISA Bus 6.25 MHz
		2-3, 4-5	***60 MHZ*** - Host bus 60 MHz, PCI bus 30 MHz, ISA Bus 7.5 MHz
		1-2, 5-6	***66 MHZ*** - Host bus 66 MHz, PCI bus 33 MHz, ISA Bus 8.33 MHz **(Default)**
		1-2, 4-5	***RSVD*** - Reserved
Microprocessor	J1K2(D)	1-2, 4-5	***1.5*** - Microprocessor clock is 1.5 times the Host Bus frequency.
Clock Multiplier		2-3, 4-5	***2.0***- Microprocessor clock is 2 times the Host Bus frequency.
(***MULT***)		2-3, 5-6	***2.5*** - Microprocessor clock is 2.5 times the Host Bus frequency. **(Default)**
		1-2, 5-6	***3.0*** - Microprocessor clock is 3 times the Host Bus frequency.

Note: The text appearing in a ***BOLD-ITALIC*** font duplicates the text of the system board silk-screening.

Model 6200D Jumper Settings

There are two jumper blocks on the AP440FX system board (Model 6200D). The smaller jumper block at J1J1 defines the number of PCI slots (two or three slots) available on the riser board used with the system board. The larger jumper block (at J4L2) defines a range of microprocessor and system board configuration parameters. Figure C-28 shows the jumper block locations on the system board, and indicates how jumper placement corresponds to the value defined by the system board silk-screening.

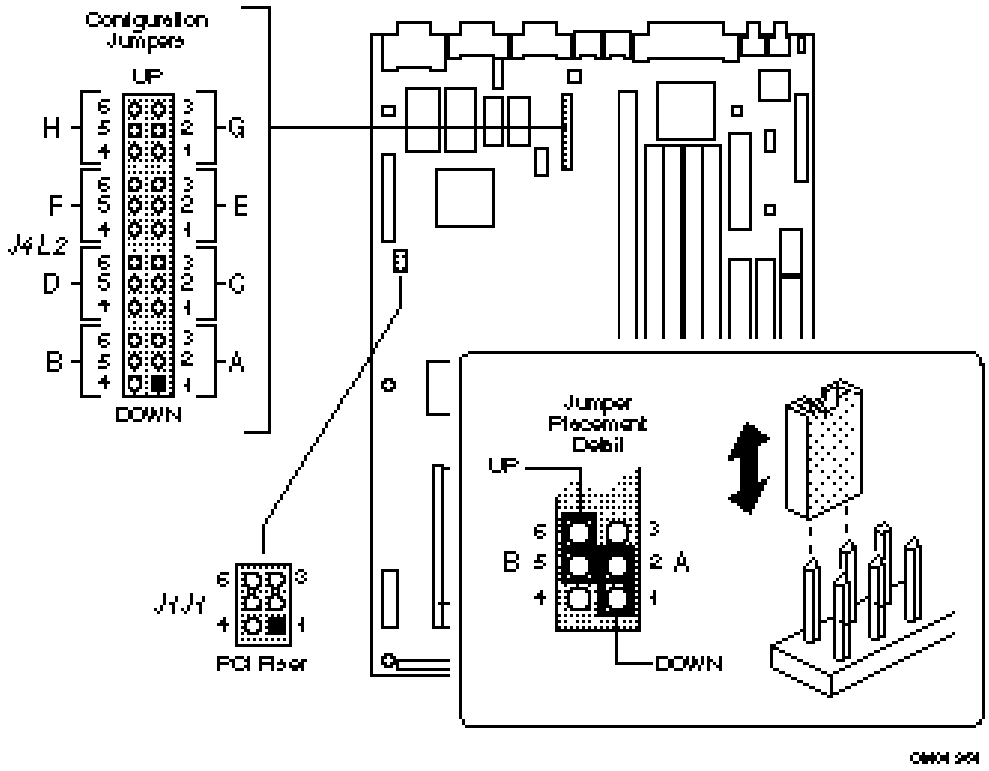

Figure C-28 Model 6200D Jumper Locations

Microprocessor Configuration (J4L2)

These allow the system board to be switched between different speeds of the Pentium Pro processor. These jumpers also affect the PCI and ISA clock speeds as shown in Table C-72.

Table C-72 Model 6200D Microprocessor/System Speed Settings

J4L2-A	J4L2-B	J4L2-C	Microprocessor Clock Multiplier	Microprocessor Freq. (MHz)	Host Bus Freq. (MHz)	PCI Bus Freq. (MHz)	ISA Bus Freq. (MHz)
DOWN	DOWN	DOWN	2.5	150	60	30	7.5
DOWN	DOWN	UP	2.5	166	66	33	8.33
DOWN	UP	DOWN	reserved				
DOWN	UP	UP	reserved				
UP	DOWN	DOWN	reserved				
UP	DOWN	UP	reserved				
UP	UP	DOWN	3	180	60	30	7.5
UP	UP	UP	3	200	66	33	8.33

Motherboard Configuration (J4L2, J1J1)

The jumpers for sections D, E, F, G, and H of J4L2 allow the selection of various system board features. A second jumper block (J1J1) allows selection of a riser board with either two or three PCI board connectors. Table C-73 lists the system board configuration jumper positions and indicates the meaning for each position.

Table C-73 Model 6200D Configuration Jumper Settings

Function	Jumper	Configuration
FDWPR - Flash Write Protect	J4L2-D, 5-6 J4L2-D, 4-5	UP - ***NOR*** (**Default**), Normal operation DOWN - ***PRT,*** Protect
FLASH - Flash Recover	J4L2-E, 2-3 J4L2-E, 1-2	UP - ***NOR*** (**Default**), Normal operation DOWN - ***REC*** - Enable Top Boot block to recover Flash.
CMOS - Clear CMOS Contents	J4L2-F, 5-6 J4L2-F, 4-5	UP - ***NOR*** (**Default**), Normal operation DOWN - ***CLR***, Clear CMOS content.
PSWCLR - Password Clear Disable/Enable	J4L2-G, 2-3 J4L2-G, 1-2	UP - ***DIS***, Disable DOWN - ***ENA***, Enable system password capability.
SETUP - Setup Enable/Disable	J4L2-H, 5-6 J4L2-H, 4-5	UP - ***ENA***, Enable DOWN - ***DIS***, Disable setup accessibility.
Riser with 2 PCI slots	J1J1, 1-2 and J1J1, 4-5	Enables use of riser card with two (2) PCI slots.
Riser with 3 PCI slots	J1J1, 2-3 and J1J1, 5-6	Enables use of riser card with three (3) PCI slots.

Note: The text appearing in a ***BOLD-ITALIC*** font duplicates the text of the system board silk-screening.

Appendix D
Error and Information Messages

Models 5160D and 5200D Error Messages and Beep Codes

BIOS Beep Codes

Table D-74 Models 5160D and 5200D BIOS Beep Codes

Beeps	Error Message	Description
1	Refresh Failure	The memory refresh circuitry on the system board is faulty.
2	Parity Error	Parity is not supported on this product, will not occur.
3	Base 64 KB Memory Failure	Memory failure in the first 64 KB.
4	Timer Not Operational	Memory failure in the first 64 KB of memory, or Timer 1 on the system board is not functioning.
5	Processor Error	The CPU on the system board generated an error.
6	8042 - Gate A20 Failure	The keyboard controller (8042) may be bad. The BIOS cannot switch to protected mode.
7	Processor Exception Interrupt Error	The CPU generated an exception interrupt.
8	Display Memory Read/Write Error	The system video adapter is either missing or its memory is faulty. This is not a fatal error.
9	ROM Checksum Error	ROM checksum value does not match the value encoded in BIOS.
10	CMOS Shutdown Register Rd/Wrt Error	The shutdown register for CMOS RAM failed.

PCI Configuration Error Messages

The following PCI messages are displayed as a group with bus, device and function information.

Table D-75 Models 5160D and 5200D PCI Configuration Error Messages (1/2)

Error Message	Explanation
NVRAM Checksum Error, NVRAM Cleared	The ESCD data was reinitialized because of an NVRAM checksum error. Try rerunning the ICU.
System Board Device Resource Conflict	A non Plug and Play ISA card has requested a resource that is already in use.
Primary Output Device Not Found	The designated primary output device (printer, modem, or other, if output is redirected) could not be found.
Primary Input Device Not Found	The designated primary input device (keyboard, mouse, or other, if input is redirected) could not be found.
Primary Boot Device Not Found	The designated primary boot device (hard disk drive, diskette drive, or CD-ROM drive) could not be found.
NVRAM Cleared By Jumper	The “Clear CMOS” jumper has been moved to the “CLR” position and CMOS RAM has been cleared.

Table D-2 Models 5160D and 5200D PCI Configuration Error Messages (2/2)

Error Message	Explanation
NVRAM Data Invalid, NVRAM Cleared	Invalid entry in the ESCD.
Static Device Resource Conflict	A non Plug and Play ISA card has requested a resource that is already in use.
PCI Error Log is Full.	If and when more than 15 PCI conflict errors are detected the log full message is displayed. If this message displays, no additional PCI errors can be logged.
Floppy Disk Controller Resource Conflict	The floppy disk controller has requested a resource that is already in use.
Primary IDE Controller Resource Conflict	The primary IDE controller has requested a resource that is already in use.
Secondary IDE Controller Resource Conflict	The secondary IDE controller has requested a resource that is already in use.
Parallel Port Resource Conflict	The parallel port has requested a resource that is already in use.
Serial Port 1 Resource Conflict	Serial port 1 has requested a resource that is already in use.
Serial Port 2 Resource Conflict	Serial port 2 has requested a resource that is already in use.

The following PCI messages are chained together to give an error message.

Table D-76 Models 5160D and 5200D Chained PCI Error Messages

Error Message		Explanation
PCI *resource name* Conflict: Bus: *aa*, Device *bb*, Function: *cc* where		A PCI resource conflict has been detected. The full message Is formed by chaining the fixed text with the variable text indicated by italics. Each message variation provides details on the type of resource conflict, and detailed information on the bus, device, and function associated with the resource conflict.
	PCI *I/O Port* Conflict:	Two devices requested the same I/O port, resulting in a conflict.
	PCI *Memory* Conflict:	Two devices requested the same memory address, resulting in a conflict.
	PCI *IRQ* Conflict:	Two devices requested the same IRQ address, resulting in a conflict.
	Bus: *aa*	Is a hexadecimal number corresponding to the PCI bus number. For desktop system boards, the bus number is 00.
	Device: *bb*	Is a hexadecimal number corresponding to the PCI device.
	Function: *cc*	Is a hexadecimal number corresponding to the active PCI function within a device.

BIOS Error Messages

Table D-77 Models 5160D and 5200D BIOS Error Messages

Error Message	Explanation
Gate A20 Error	Gate A20 on the keyboard controller is not working.
Address Line Short!	Error in the address decoding circuitry on the system board.
Cache Memory Bad, Do Not Enable Cache!	Cache memory is defective. Replace it.
CH-2 Timer Error	Most AT systems include two timers. There is an error in timer 2.
CMOS Battery State Low	CMOS RAM is powered by a battery. The battery power is low. Replace the battery.
CMOS Checksum Failure	After CMOS RAM values are saved, a checksum value is generated for error checking. The previous value is different from the current value. Run Setup.
CMOS System Options Not Set	The values stored in CMOS RAM are either corrupt or nonexistent. Run Setup.
CMOS Display Type Mismatch	The video type in CMOS RAM does not match the type detected by the BIOS. Run Setup.
CMOS Memory Size Mismatch	The amount of memory on the system board is different than the amount in CMOS RAM. Run AMIBIOS Setup.
CMOS Time and Date Not Set	Run Setup to set the date and time in CMOS RAM.
Diskette Boot Failure	The boot disk in floppy drive A: is corrupt. It cannot be used to boot the system. Use another boot disk and follow the screen instructions.
Display Switch Not Proper	The display jumper is not implemented on this product. This error should not occur.
DMA Error	Error in the DMA controller.
DMA #1 Error	Error in the first DMA channel.
DMA #2 Error	Error in the second DMA channel.
FDD Controller Failure	The BIOS cannot communicate with the floppy disk drive controller. Check all appropriate connections after the system is powered down.
HDD Controller Failure	The BIOS cannot communicate with the hard disk drive controller. Check all appropriate connections after the system is powered down.
INTR #1 Error	Interrupt channel 1 failed POST.
INTR #2 Error	Interrupt channel 2 failed POST.
Invalid Boot Diskette	The BIOS can read the disk in floppy drive A:, but cannot boot the system. Use another boot disk.
Keyboard Is Locked...Unlock It	The keyboard lock on the system is engaged. The system must be unlocked to continue.
KB/Interface Error	There is an error in the keyboard connector.
On Board Parity Error	Parity error detected in system memory.

ISA NMI Messages

Table D-78 Models 5160D and 5200D ISA NMI Messages

ISA NMI Message	Explanation
Memory Parity Error at xxxxx	Memory failed. If the memory location can be determined, it is displayed as xxxxx. If not, the message is Memory Parity Error ????.
I/O Card Parity Error at xxxxx	An expansion card failed. If the address can be determined, it is displayed as xxxxx. If not, the message is I/O Card Parity Error ????.
DMA Bus Time-out	A device has driven the bus signal for more than 7.8 microseconds.

Model 6200D Error Messages and Beep Codes

BIOS Beep Codes

Table D-79 Model 6200D BIOS Beep Codes

Beeps	Error Message	Description
1	Refresh Failure	The memory refresh circuitry on the system board is faulty.
2	Parity Error	A parity error has been detected.
3	Base 64 KB Memory Failure	Memory failure in the first 64 KB.
4	Timer Not Operational	Memory failure in the first 64 KB of memory, or Timer 1 on the system board is not functioning.
5	Processor Error	The microprocessor on the system board generated an error.
6	Gate A20 Failure	The keyboard controller might be bad. The BIOS cannot switch to protected mode.
7	Processor Exception Interrupt Error	The microprocessor generated an exception interrupt.
8	Display Memory Read/Write Error	The system video adapter is either missing or its memory is faulty. This is not a fatal error.
9	ROM Checksum Error	ROM checksum value does not match the value encoded in BIOS.
10	CMOS Shutdown Register Read/Write Error	The shutdown register for CMOS RAM failed.

PCI Configuration Error Messages

The following PCI messages are displayed as a group with bus, device and function information.

Table D-80 Model 6200D PCI Configuration Error Messages (1/2)

Error Message	Explanation
NVRAM Checksum Error, NVRAM Cleared	The ESCD data was reinitialized because of an NVRAM checksum error. Try rerunning the ICU.
System Board Device Resource Conflict	A non Plug and Play ISA card has requested a resource that is already in use.
Primary Output Device Not Found	The designated primary output device (printer, modem, or other, if output is redirected) could not be found.
Primary Input Device Not Found	The designated primary input device (keyboard, mouse, or other, if input is redirected) could not be found.
Primary Boot Device Not Found	The designated primary boot device (hard disk drive, diskette drive, or CD-ROM drive) could not be found.

Table D-7 Model 6200D PCI Configuration Error Messages (2/2)

Error Message	Explanation
NVRAM Cleared By Jumper	The “Clear CMOS” jumper has been moved to the “CLR” position and CMOS RAM has been cleared.
NVRAM Data Invalid, NVRAM Cleared	Invalid entry in the ESCD.
Static Device Resource Conflict	A non Plug and Play ISA card has requested a resource that is already in use.
PCI Error Log is Full	If and when more than 15 PCI conflict errors are detected the log full message is displayed. If this message displays, no additional PCI errors can be logged.
Floppy Disk Controller Resource Conflict	The floppy disk controller has requested a resource that is already in use.
Primary IDE Controller Resource Conflict	The primary IDE controller has requested a resource that is already in use.
Secondary IDE Controller Resource Conflict	The secondary IDE controller has requested a resource that is already in use.
Parallel Port Resource Conflict	The parallel port has requested a resource that is already in use.
Serial Port 1 Resource Conflict	Serial port 1 has requested a resource that is already in use.
Serial Port 2 Resource Conflict	Serial port 2 has requested a resource that is already in use.

The following PCI messages are chained together to give an error message.

Table D-81 Model 6200D Chained PCI Error Messages

Error Message		Explanation
PCI *resource name* Conflict: Bus: *aa*, Device *bb*, Function: *cc* where:		A PCI resource conflict has been detected. The full message Is formed by chaining the fixed text with the variable text indicated by italics. Each message variation provides details on the type of resource conflict, and detailed information on the bus, device, and function associated with the resource conflict.
	PCI *I/O Port* Conflict:	Two devices requested the same I/O port, resulting in a conflict.
	PCI *Memory* Conflict:	Two devices requested the same memory address, resulting in a conflict.
	PCI *IRQ* Conflict:	Two devices requested the same IRQ address, resulting in a conflict.
	Bus: *aa*	Is a hexadecimal number corresponding to the PCI bus number. For desktop system boards, the bus number is 00.
	Device: *bb*	Is a hexadecimal number corresponding to the PCI device.
	Function: *cc*	Is a hexadecimal number corresponding to the active PCI function within a device.

BIOS Error Messages

Table D-82 Model 6200D BIOS Error Messages

Error Message	Explanation
Gate A20 Error	Gate A20 on the keyboard controller is not working.
Address Line Short!	Error in the address decoding circuitry on the system board.
Cache Memory Bad, Do Not Enable Cache!	Cache memory is defective. Replace it.
CH-2 Timer Error	Most AT systems include two timers. There is an error in timer 2.
CMOS Battery State Low	CMOS RAM is powered by a battery. The battery power is low. Replace the battery.
CMOS Checksum Failure	After CMOS RAM values are saved, a checksum value is generated for error checking. The previous value is different from the current value. Run Setup.
CMOS System Options Not Set	The values stored in CMOS RAM are either corrupt or nonexistent. Run Setup.
CMOS Display Type Mismatch	The video type in CMOS RAM does not match the type detected by the BIOS. Run Setup.
CMOS Memory Size Mismatch	The amount of memory on the system board is different than the amount in CMOS RAM. Run AMIBIOS Setup.
CMOS Time and Date Not Set	Run Setup to set the date and time in CMOS RAM.
Diskette Boot Failure	The boot disk in floppy drive A: is corrupt. It cannot be used to boot the system. Use another boot disk and follow the screen instructions.
Display Switch Not Proper	The display jumper is not implemented on this product. This error should not occur.
DMA Error	Error in the DMA controller.
DMA #1 Error	Error in the first DMA channel.
DMA #2 Error	Error in the second DMA channel.
FDD Controller Failure	The BIOS cannot communicate with the floppy disk drive controller. Check all appropriate connections after the system is powered down.
HDD Controller Failure	The BIOS cannot communicate with the hard disk drive controller. Check all appropriate connections after the system is powered down.
INTR #1 Error	Interrupt channel 1 failed POST.
INTR #2 Error	Interrupt channel 2 failed POST.
Invalid Boot Diskette	The BIOS can read the disk in floppy drive A:, but cannot boot the system. Use another boot disk.
Keyboard Is Locked...Unlock It	The keyboard lock on the system is engaged. The system must be unlocked to continue.
KB/Interface Error	There is an error in the keyboard connector.
On Board Parity Error	Parity error detected in system memory.

ISA NMI Messages

Table D-83 Model 6200D ISA NMI Messages

ISA NMI Message	Explanation
Memory Parity Error at xxxxx	Memory failed. If the memory location can be determined, it is displayed as xxxxx. If not, the message is Memory Parity Error ????.
I/O Card Parity Error at xxxxx	An expansion card failed. If the address can be determined, it is displayed as xxxxx. If not, the message is I/O Card Parity Error ????.
DMA Bus Time-out	A device has driven the bus signal for more than 7.8 microseconds.

Appendix E
Graphics Subsystems

Models 5160D and 5200D RAGE II 3-D Graphics Controller

Equium Models 5160D and 5200D feature RAGE II 3-D graphics controllers. The ATI graphics controller is a highly integrated, 208 pin, VLSI multimedia graphics and video controller that integrates the following features:

- Controller housed in a 208-pin PQFP package.
- The controller implements video acceleration and 3-D rendering.
- The controller supports 3-D rendering with as little as 2 MB of SGRAM graphic memory.
- The controller is able to become a PCI bus master.
- The controller supports connection to Plug and Play monitors with both DDC1 (Data Display Channel 1) and DDC2B capability. This allows changing of the monitor resolutions and color options without rebooting the computer.

Table E-84 lists the available video resolutions using the video controller and a standard 2 MB of SGRAM video memory.

Table E-84 Models 5160D and 5200D Supported Video Resolutions

Table not available at the time of this preliminary release.

Model 6200D Graphics Subsystem

Equium Model 6200D features a ViRGE DX graphics controller. Table E-85 lists the video resolutions supported by each of the supported graphic options for the Model 6200D system board.

Table E-85 Model 6200D Supported Video Resolutions

Table not available at the time of this preliminary release.

The AP440FX system board supports a 34-pin VESA feature connector (which also accepts a 26-pin peripheral plug) for synchronizing graphics output with an external NTSC or PAL signal and a shared frame buffer interface to maximize multimedia performance, as well as the LPB (Local Peripheral Bus) or Scenic Highway that provides a glueless bidirectional interface to a video companion device such as an MPEG/live video decoder. The AP440FX also supports other VESA standards such as the VESA DPMS protocol to put a DPMS compliant monitor into power saving modes and the VESA Display Data Channel (DDC2B) that permits transfer of monitor identification and resolution support data for ease of use.

Appendix F
Audio Subsystems

Models 5160D and 5200D Audio Subsystem (Creative Labs Vibra 16C)

The CU430HX system board (Models 5160D and 5200D) features a 16-bit stereo audio subsystem. The audio subsystem is based upon the Creative Labs Vibra 16C (CT2505) multimedia codec. The Vibra 16C provides all the digital audio and analog mixing functions required for recording and playing of audio on personal computers. The Creative Labs Vibra 16C is a single chip VLSI solution which integrates FM synthesis, is Sound Blaster compatible and Roland MPU-401 UART mode compatible. Creative Labs Vibra 16C also provides MPCII, Adlib, and Multimedia PC Level 2 compliance to meet all of the requirements of today's multi-media applications.

The Vibra 16C has been implemented as a Plug and Play system board device. This means that there is a device node defined for the Vibra 16C and the BIOS must configure it. Although it is not a Plug and Play device, the Vibra 16C is very flexible in that it accommodates a variety of I/O addresses, DMA channels and interrupts.

The audio subsystem requires up to two DMA channels (to support full duplex operation) and one interrupt. When the Vibra 16C is programmed for full duplex operation, two DMA channels are assigned: one of the channels will be a 16-bit channel and the other will be 8 bits. The system can be configured to use either DMA channels 1 or 3 (8 bit channels) and DMA channels 5 or 7 (16 bit channels). The interrupt can be mapped to IRQ 5, 7, 9, or 10. The base address register is also configurable for a variety of base addresses ranging from I/O address 220 through address 280 (see the resource map below for more details). The ICU (ISA Configuration Utility) must be installed and configured before installing the DOS and Windows audio drivers.

Resource Map

Table F-86lists the interrupts, DMA channels, and I/O addresses associated with the audio subsystem of the CU430HX system board.

Table F-86 Vibra 16C Resource Map

Device	Interrupt (IRQ)	DMA Channel	I/O Address
Creative Labs 16C Base	2/9	8 bit DMA 1 (default)	220h-233h (default)
	5 (default)	8 bit DMA 3	240h-253h
	7	16 bit DMA 5 (default)	260h-273h
	10	16 bit DMA 7	280h-293h
FM Synthesis			388h-38Bh
Joystick (midi-port)			200h-207h
MPU-401	default is disabled		300h-301h
			330h-331h

Audio Drivers

Audio software and utilities for DOS, Windows 3.1x, and Windows 95 are installed on the system hard drive. Included in the audio software are DOS utilities that allow the user to play a CD-ROM, control sound volume and mixer settings, run diagnostics, and switch between Sound Blaster Pro and Windows Sound System modes. Windows drivers and utilities include the Windows sound driver, audio input control panel, audio mixer control panel, and a business audio transport utility.

Model 6200D Audio Subsystem

The AP440FX system board (Model 6200D) features a Crystal 4236 stereo audio subsystem. Information covering this chip will be provided at a future date.

Appendix G
BIOS Update

BIOS Upgrades

Flash memory makes distributing BIOS upgrades easy. A new version of the BIOS can be installed from a diskette. General BIOS upgrade instructions are available at the Intel World Wide Web site at *http://www-cs.intel.com/oem_developer/motherbd/genbios.html*. BIOS updates can also be downloaded from Intel's FTP site at *ftp://ftp.intel.com/pub/bios*.

The disk-based Flash upgrade utility, FMUP.EXE, has three options for BIOS upgrades:

- The Flash BIOS can be updated from a file on a disk;
- The current BIOS code can be copied from the Flash EEPROM to a disk file as a backup in the event that an upgrade cannot be successfully completed; or
- The BIOS in the Flash device can be compared with a file to ensure the system has the correct version.

The upgrade utility ensures the upgrade BIOS extension matches the target system to prevent accidentally installing a BIOS for a different type of system.

Appendix H
System Board Resources

Models 5160D and 5200D

The following information covers the CU430HX system board included in Equium Models 5160D and 5200D.

Memory Map

Table H-87 Models 5160D and 5200D Memory Map

Address Range (Decimal)	Address Range (hex)	Size	Description
1024K-196608K	100000-C000000	191M	Extended Memory
960K-1023K	F0000-FFFFF	64K	Main BIOS
944K-959K	EC000-EFFFF	16K	Boot Block (Available as UMB)
936K-943K	EA000-EBFFF	8K	VPD ESCD- DMI Configuration Info
932K-935K	E9000-E9FFF	4K	4KB Reserved for BIOS
928k-931K	E8000-E8FFF	4K	OEM Logo Area or Scan User Flash
896K-927K	E0000-E7FFF	32K	Post BIOS (Available as UMB)
800K-895K	C8000-DFFFF	96K	Available HI DOS Memory(open to ISA & PCI bus
640K-799K	A0000-C7FFF	160K	On-board video memory and BIOS
639K	9FC00-9FFFF	1K	Extended BIOS Data(Moveable by QEMM, 386MAX)
512K-638K	80000-9FBFF	127K	Extended Conventional
0K-511K	00000-7FFFF	512K	Conventional Memory

I/O Map

Table H-88 Models 5160D and 5200D I/O Map (1/3)

Address (hex)	Size	Description
0000 - 000F	16 bytes	PIIX3 - DMA 1
0020 - 0021	2 bytes	PIIX3 - Interrupt Controller 1
002E - 002F	2 bytes	Super I/O configuration registers
0040 - 0043	4 bytes	PIIX3 - counter 1
0048 - 004B	4 bytes	PIIX3 - counter 2
0060	1 byte	Keyboard Controller Byte - Reset IRQ
0061	1 byte	PIIX3 - NMI, speaker control
0064	1 byte	Keyboard Controller, CMD/STAT Byte
0070, bit 7	1 bit	PIIX3 - Enable NMI
0070, bits 6:0	7 bits	PIIX3 - Real Time Clock, Address
0071	1 byte	PIIX3 - Real Time Clock, Data
0078	1 byte	Reserved - board configuration

Table H-2 Models 5160D and 5200D I/O Map (2/3)

Address (hex)	Size	Description
0079	1 byte	Reserved - board configuration
80h	1 byte	Monitors and stores POST codes (used during POST)
85h	1 byte	Address and control functions (used during POST)
86h	1 byte	Register read/write operations (used during POST)
0080 - 008F	16 bytes	PIIX3 - DMA Page Register
00A0 - 00A1	2 bytes	PIIX3 - Interrupt Controller 2
00B2 - 00B3	2 bytes	APM control
00C0 - 00DE	31 bytes	PIIX3 - DMA 2
00F0	1 byte	Reset Numeric Error
0170 - 0177	8 bytes	Secondary IDE Channel
01F0 - 01F7	8 bytes	Primary IDE Channel
0200 - 0207	8 bytes	Audio (reserved)
0220 - 022F	16 bytes	Audio (SB compatible)
0240 - 024F	16 bytes	Audio (SB compatible)
0260 - 026F	16 bytes	Audio (SB compatible)
0278 - 027B	4 bytes	Parallel port 2
0280 - 028F	16 bytes	Audio (SB compatible)
0290 - 0297	8 bytes	H/W Monitoring ASIC
02E8	1 byte	Video (8514A)
02F8 - 02FF	8 bytes	COM2
0300 - 0301	2 bytes	MPU - 401 (MIDI)
0330 - 0331	2 bytes	MPU - 401 (MIDI)
0376	1 byte	Sec IDE Chan Cmd Port
0377	1 byte	Floppy channel 2 command
0377, bit 7	1 bit	Floppy disk chng channel 2
0377, bits 6:0	7 bits	Sec IDE Chan Status Port
0378 - 037F	8 bytes	LPT1
0388 - 038D	6 bytes	AA LIB (FM synth)
03B4 - 03B5	2 bytes	Video (VGA)
03BA	1 byte	Video (VGA)
03BC - 03BF	4 bytes	LPT3
03C0 - 03CA	11 bytes	Video (VGA)
03CC	1 byte	Video (VGA)
03CE - 03CF	2 bytes	Video (VGA)
03D4 - 03D5	2 bytes	Video (VGA)
03DA	1 byte	Video (VGA)
03E8 - 03EF	8 bytes	COM3
03F0 - 03F5	6 bytes	Floppy Channel 1

Table H-2 Models 5160D and 5200D I/O Map (3/3)

Address (hex)	Size	Description
03F6	1 byte	Pri IDE Chan Cmd Port
03F7 (Write)	1 byte	Floppy Chan 1 Cmd
03F7, bit 7	1 bit	Floppy Disk Chg Chan 1
03F7, bits 6:0	7 bits	Pri IDE Chan Status Port
03F8 - 03FF	8 bytes	COM1
04D0 - 04D1	2 bytes	Edge/level triggered
LPT + 400h	8 bytes	ECP port
0530 - 0537	8 bytes	Windows sound system
0604 - 060B	8 bytes	Windows sound system
0CF8*	4 bytes	PCI Config Address Reg.
0CF9**	1 byte	Turbo & Reset Control Reg.
0CFC-0CFF	4 bytes	PCI Config Data Register
0E80 - 0E87	8 bytes	Windows sound system
0F40 - 0F47	8 bytes	Windows sound system
0F86 - 0F87	2 bytes	Yamaha OPL3 configuration
FF00 - FF07	8 bytes	IDE Bus Master Reg.
FFA0 - FFA7	8 bytes	Primary Bus Master IDE Registers
FFA8 - FFAF	8 bytes	Secondary Bus Master IDE Registers

* DWORD access only

** Byte access only

PCI Configuration Space Map

Table H-89 Models 5160D and 5200D PCI Configuration Space Map

Bus Number (hex)	Dev Number (hex)	Function Number (hex)	Description
00	00	00	Intel 82437HX (TXC)
00	07	00	Intel 82371FB (PIIX3) PCI/ISA bridge
00	07	01	Intel 82371FB (PIIX3) IDE Bus Master
00	07	02	Intel 82371FB (PIIX3) USB
00	08	00	ATI VGA Graphics
00	0C	00	Intel 82557 Ethernet Network
00	11	00	PCI Expansion Slot: User Available
00	13	00	PCI Expansion Slot: User Available
00	0B	00	PCI Expansion Slot: User Available for 3-slot riser

DMA Channels

Table H-90 Models 5160D and 5200D DMA Channels

DMA	Data Width	System Resource
0	8- or 16-bits	
1	8- or 16-bits	Audio
2	8- or 16-bits	Floppy
3	8- or 16-bits	Parallel Port (for ECP/EPP Config.)
4		Reserved - Cascade channel
5	16-bits	Audio
6	16-bits	Open
7	16-bits	Open

Interrupts

Table H-91 Models 5160D and 5200D Interrupts

IRQ	System Resource
NMI	I/O Channel Check
0	Reserved, Interval Timer
1	Reserved, Keyboard buffer full
2	Reserved, Cascade interrupt from slave PIC
3	COM2 *
4	COM1 *
5	Audio *
6	Floppy
7	LPT1 *
8	Real Time Clock
9	Onboard Ethernet *
10	USB *
11	User available
12	Onboard Mouse Port if present, else user available
13	Reserved, Math coprocessor
14	Primary IDE if present, else user available
15	Secondary IDE if present, else user available

* Moveable resources that depend on user configuration. Resources shown are for a typical configuration.

Model 6200D

The following information covers the AP440FX system board included in Equium Model 6200D.

Memory Map

Table H-92 Model 6200D Memory Map

Address Range (Decimal)	Address Range (hex)	Size	Description
1024K-121072K	100000-8000000	127M	Extended Memory
960k-1023k	F0000-FFFFF	64K	AMI System BIOS
944K-959K	EC000-EFFFF	16K	Boot Block
936K-943K	EA000-EBFFF	8K	ESCD (Plug-N-Play configuration area)
932K-935K	E9000-E9FFF	4K	Reserved for BIOS
928K-931K	E8000-E8FFF	4K	OEM LOGO Area
896K-927K	E0000-E7FFF	32K	BIOS Reserved
800-895K	C8000-DFFFF	96K	Available HI DOS memory (open to ISA and PCI bus)
640K-799K	A0000-C7FFF	160K	Video memory and BIOS
639K	9FC00-9FFFF	1K	Extended BIOS Data (moveable by QEMM, 386MAX)
512K-638K	80000-9FBFF	127K	Extended conventional
0K-511K	00000-7FFFF	512K	Conventional

I/O Map

Table H-93 Model 6200D I/O Map

Address (hex)	Size	Description	Address (hex)	Size	Description
0000 - 000F	16 bytes	PIIX3 - DMA 1	02F8 - 02FF	8 bytes	Onboard Serial Port 2
0020 - 0021	2 bytes	PIIX3 - Interrupt Controller 1	0330 - 0331	2 bytes	MPU-401 (MIDI)
002E - 002F	2 bytes	87307 Base Configuration	0376	1 byte	Sec IDE Chan Cmd Port
0040 - 0043	4 bytes	PIIX3 - Timer 1	0377	1 byte	Sec IDE Chan Stat Port
0048 - 004B	4 bytes	PIIX3 - Timer 2	0378 - 037F	8 bytes	Parallel Port 1
0060	1 byte	Keyboard Controller Byte - Reset IRQ	0388 - 038B	4 bytes	CS4236 Audio
0061	1 byte	PIIX3 - NMI, speaker control	03BC - 03BF	4 bytes	Parallel Port 3
0064	1 byte	Kbd Controller, CMD/STAT Byte	03E8 - 03EF	8 bytes	Serial Port 3
0070, bit 7	1 bit	PIIX3 - Enable NMI	03F0 - 03F5	6 bytes	Floppy Channel 1
0070, bits 6:0	7 bits	PIIX3 - Real Time Clock, Address	03F6	1 byte	Pri IDE Chan Cmd Port
0071	1 byte	PIIX3 - Real Time Clock, Data	03F7 (Write)	1 byte	Floppy Chan 1 Cmd
0078	1 byte	Reserved - Brd. Config.	03F7, bit 7	1 bit	Floppy Disk Chg Chan 1
0079	1 byte	Reserved - Brd. Config.	03F7, bits 6:0	7 bits	Pri IDE Chan Status Port
0080 - 008F	16 bytes	PIIX3 - DMA Page Register	03F8 - 03FF	8 bytes	Onboard Serial Port 1
00A0 - 00A1	2 bytes	PIIX3 - Interrupt Controller 2	04D0 - 04D1	2 bytes	Edge/level triggered
00C0 - 00DE	31 bytes	PIIX3 - DMA 2	LPT + 400h	8 bytes	ECP port, LPT + 400h
00F0	1 byte	Reset Numeric Error	0608 - 060B*	4 bytes	CS4236 Audio
0170 - 0177	8 bytes	Secondary IDE Channel	0CF8**	1 byte	PCI Config Address Reg.
01F0 - 01F7	8 bytes	Primary IDE Channel	0CF9	1 byte	Turbo & Reset control Reg.
0200 - 0207	8 bytes	Game Port	0CFC-0CFF	4 bytes	PCI Config Data Reg
0228 - 022F	8 bytes	Parallel Port 3, ECP/EPP Mode	0FE0-0FE7	8 bytes	CS4236 Audio
290 - 0297	8 bytes	Management Extension Hardware	FF00 - FF07	8 bytes	IDE Bus Master Reg.
0240-024F	16 bytes	CS4236 Audio	FFA0 - FFA7	8 bytes	IDE primary Channel
0278 - 027B	4 bytes	Parallel Port 2	FFA8 - FFAF	8 bytes	IDE secondary channel

* This is only part of one of the Windows Sound System (WSS) selectable ranges. The defined ranges are 0530-0537, 0604-060B, 0E80-0E87, or 0F40-0F47. Only one of these ranges needs to be used for WSS to work.

** Only by DWORD accesses.

Soft-OFF Control

The system board design uses Soft-OFF control implemented under the SMM code in the BIOS. This feature is required on the AP440FX system board. The CS1 pinout of the I/O controller is connected to the Soft-off control line in the power supply circuit. The registers in the I/O controller that set the I/O address and control of the CS1 pin are NOT setup until the SMM code is activated. The code performs the following operations:

- OUT 0Ch to I/O port 2Eh
- OUT 75h to I/O port 2Fh
- OUT 11h to I/O port 2Eh
- OUT 00h to I/O port 2Fh
- OUT 0Dh to I/O port 2Eh
- OUT A0h to I/O port 2Fh

After setting the above registers, any read operation to I/O location 75H triggers the Soft-off circuit and turns the power supply off

PCI Configuration Space Map

Table H-94 Model 6200D PCI Configuration Space Map

Bus Number (hex)	Dev Number (hex)	Function Number (hex)	Description
00	00	00	Intel 82440FX (PMC) Host Bridge
00	07	00	Intel 82371SB (PIIX3) ISA bridge
00	07	01	Intel 82371SB (PIIX3) IDE Controller
00	07	02	Intel 82371SB (PIIX3) USB
00	08	00	Video Controller
00	13	00	PCI Expansion Slot:
00	11	00	PCI Expansion Slot:
00	0B	00	PCI Expansion Slot: Optional PCI Expansion Slot for 3 slot Riser

DMA Channels

Table H-95 Model 6200D DMA Channels

DMA	Data Width	System Resource
0	8- or 16-bits	Open
1	8- or 16-bits	Audio
2	8- or 16-bits	Floppy
3	8- or 16-bits	Parallel Port (for ECP/EPP Config.)
4		Reserved - Cascade channel
5	16-bits	Open
6	16-bits	Open
7	16-bits	Open

Interrupts

Table H-96 Model 6200D Interrupts

IRQ	System Resource
NMI	I/O Channel Check
0	Reserved, Interval Timer
1	Reserved, Keyboard buffer full
2	Reserved, Cascade interrupt from slave PIC
3	Serial Port 2
4	Serial Port 1
5	Audio - Codec
6	Floppy
7	Parallel Port 1
8	Real Time Clock
9	Audio - FM Synthesis
10	USB
11	Video
12	Onboard Mouse Port if present, else user available
13	Reserved, Math coprocessor
14	Primary IDE if present, else user available
15	Secondary IDE if present, else user available

Appendix I
Power Supply Voltages

Models 5160D and 5200D System Board Power Connectors

The following information covers the CU430HX system board included in Equium Models 5160D and 5200D.

The CU430HX system board is paired with a power supply that supports remote power on/off, so the system board can turn off the system power under software control. The Powerman utility supplied for Windows 3.1x allows for soft-off as does the shutdown icon in Windows 95 Start menu. The system BIOS turns the system power off when it receives the proper APM command from the OS. For example, Windows 95 issues this APM command after the user selects "Shutdown the computer" option. APM must be enabled in the system BIOS and OS in order for the soft-off feature to work correctly. The user has the ability to determine the state of the power supply, so if the system was turned on when power was disconnected, the system turns back on when power is reapplied or it remains off, depending on the user setup configuration in CMOS.

Table A-33 provides the pinout listing for the primary power supply connector of the CU430HX system board.

Table I-97 Models 5160D and 5200D Primary Power Supply Connector (J9H1)

Pin	Signal Name/Function
1	PWRGD (Power good)
2	+5 V (VCC)
3	+12 V
4, key	-12 V
5	Ground
6	Ground
7, key	Ground
8	Ground
9	-5 V
10	+5 V (VCC)
11	+5 V (VCC)
12	+5 V (VCC)

Table A-34 provides the pinout listing for the external 3.3 volt power supply connector of the CU430HX system board.

Table I-98 Models 5160D and 5200D External 3.3 V Power Supply Connector (J9J1)

Pin	Name
1	Ground
2, key	Ground
3	Ground
4	+3.3 V
5	+3.3 V
6	+3.3 V

The pinout listing for the soft-OFF power supply connector of the CU430HX system board is shown inTable A-35. This 3-pin keyed position supports a software-controlled power supply shutoff (Soft-OFF). When connected to this position, the power supply follows remote ON/OFF commands.

Table I-99 Models 5160D and 5200D Soft-Off Power Supply Connector (J9K2)

Pin	Signal Name/Function
1	+5 VSB (+5 Volts Standby)
2	PS_ON (Remote On/Off)
3	PS_COM (Supply presence)

Model 6200D System Board Power Connectors

The following information covers the AP440FX system board included in Equium Model 6200D.

The AP440FX system board is paired with a power supply that supports remote power on/off, so the system board can turn off the system power under software control. The Powerman utility supplied for Windows 3.1x allows for soft-off as does the shutdown icon in Windows 95 Start menu. The system BIOS turns the system power off when it receives the proper APM command from the OS. For example, Windows 95 issues this APM command after the user selects "Shutdown the computer" option. APM must be enabled in the system BIOS and OS in order for the soft-off feature to work correctly. The user has the ability to determine the state of the power supply, so if the system was turned on when power was disconnected, the system turns back on when power is reapplied or it remains off, depending on the user setup configuration in CMOS.

Table 61 provides the pinout listing for the primary power supply connector of the AP440FX system board.

Table I-100 Model 6200D Primary Power Supply Connector (J9H1)

Pin	Name	Function
1	PWRGD	Power good
2	+5 V	+5 volts VCC
3	+12 V	+12 volts
4, key	-12 V	-12 volts
5	Ground	Ground
6	Ground	Ground
7, key	Ground	Ground
8	Ground	Ground
9	-5 V	-5 volts
10	+5 V	+5 volts VCC
11	+5 V	+5 volts VCC
12	+5 V	+5 volts VCC

Table 62 provides the pinout listing for the external 3.3 volt power supply connector of the AP440FX system board.

Table I-101 Model 6200D External 3.3 V Power Supply Connector (J9J1)

Pin	Name
1	Ground
2, key	Ground
3	Ground
4	+3.3 V
5	+3.3 V
6	+3.3 V

The pinout listing for the soft-OFF power supply connector of the AP440FX system board is shown in Table63. This 3-pin, keyed position supports a software-controlled power supply shutoff (Soft-OFF). When connected to this position, the power supply follows remote ON/OFF commands.

Table I-102 Model 6200D Soft-Off Power Supply Connector (J9F1)

Pin	Name	Function
1	+5 VSB	+5 Volts Standby
2	PS_ON	Remote On/Off
3	PS_COM	Supply presence

Appendix J
Keyboard Scan Codes

Keyboard Scan Codes

Figure J-1 shows the key numbering for the US keyboard. Figure J-2 shows the key numbering for the Kanji keyboard.

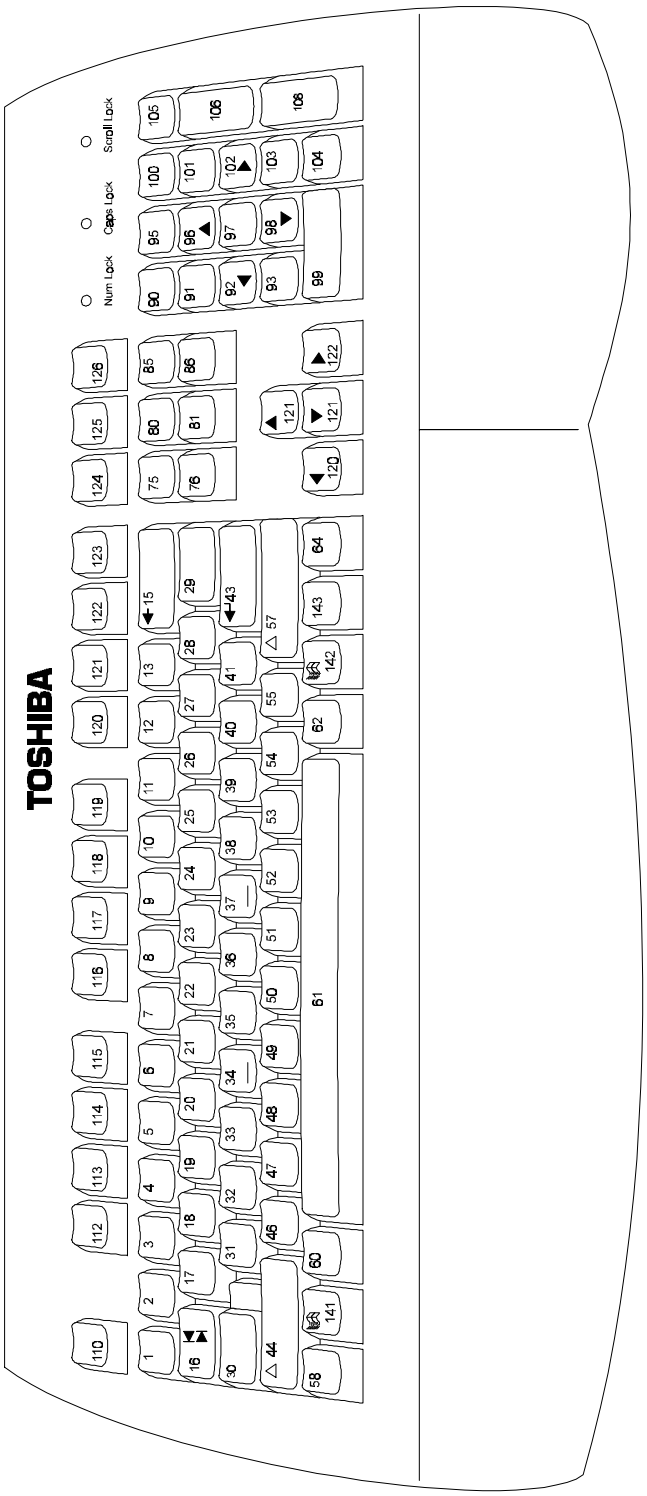

Figure J-29 United States Keyboard Numbering

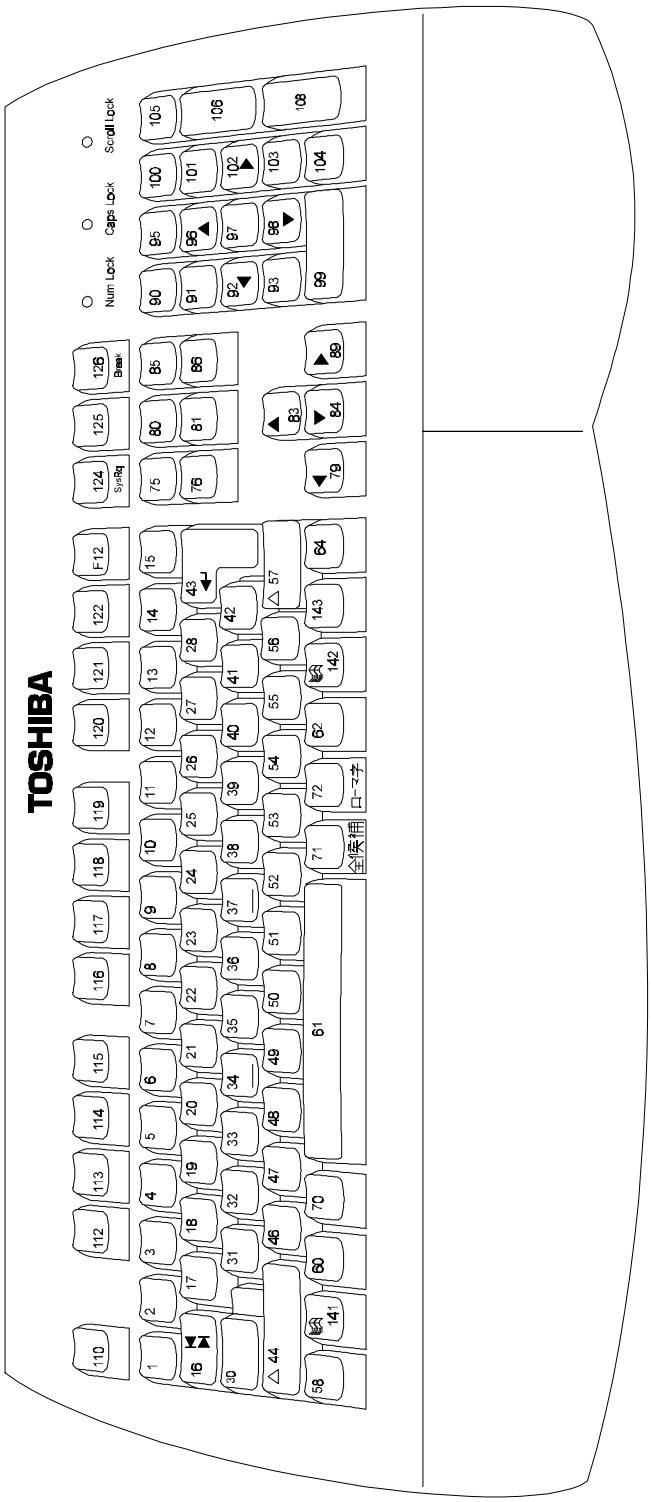

Figure J-30 Kanji Keyboard Numbering

PC and PC X/T Scan Code Set 1

Table J-103 PC and PC/XT Scan Code Set 1 (1/2)

Key Number	Make Code	Break Code		Key Number	Make Code	Break Code
1	29	A9		41	28	A8
2	02	82		42	2B	AB
3	03	83		43	IC	9c
4	04	84		44	2A	AA
5	05	85		45	56	06
6	06	86		46	2C	AC
7	07	87		47	20	AD
8	08	88		48	2E	AE
9	09	89		49	2F	AF
10	0A	8A		50	30	B0
11	0B	8B		51	31	B1
12	0C	8C		52	32	B2
13	0D	8D		53	33	B3
14	7D	FD		54	34	B4
15	0E	8E		55	35	B5
16	0F	8F		56	73	F3
17	10	90		57	36	B6
18	11	91		58	1D	9D
19	12	92		60	38	B8
20	13	93		61	39	B9
21	14	94		62	E0, 38	E0, B8
22	15	95		64	E0, ID	E0, 9D
23	16	96		70	7B	FB
24	17	97		71	79	F9
25	18	98		72	70	F0
26	19	99		75	See Table J-2	
27	1A	9A		76	See Table J-2	
28	1B	9B		79	See Table J-2	
29	2B	AB		80	See Table J-2	
30	3A	BA		81	See Table J-2	
31	1E	9E		83	See Table J-2	
32	1F	9F		84	See Table J-2	
33	20	A0		85	See Table J-2	
34	21	A1		86	See Table J-2	
35	22	A2		89	See Table J-2	
36	23	A3		90	45	C5
37	24	A4		91	47	C7
38	25	A5		92	4B	CB
39	26	A6		93	4F	CF
40	27	A7		94	7C	FC

Table J-1 PC and PC/XT Scan Code Set 1 (2/2)

Key Number	Make Code	Break Code
95	See Table J-3	
96	48	C2
97	4C	CC
98	50	D0
99	52	D2
100	37	B7
101	49	C9
102	4D	CD
103	51	D1
104	53	D3
105	4A	CA
106	4E	CE
107	7E	FE
108	E0, 1C	E0, 9C
109	78	F8
110	01	81
112	3B	BB

Key Number	Make Code	Break Code
113	3C	BC
114	30	BD
115	3E	BE
116	3F	BF
117	40	C0
118	41	C1
119	42	C2
120	43	C3
121	44	C4
122	57	D7
123	58	D8
124	See Table J-4	
125	46	C6
126	See Table J-5	
141	E0 5B	E0 DB
142	E0 5C	E0 DC
143	E0 5D	E0 DD

Cursor Key Scan Code Set 1

Table J-104 Cursor Key Scan Code Set 1

Key Number	Base Case, or Shift + Num Lock "On" Make/Break	Shift Lock "On" Make/Break	Num Lock "On" Make/Break
75	E0 52 / E0 D2	E0 AA E0 52 / E0 D2 E0 2A	E0 2A E0 / E0 D2 E0
76	E0 53 / E0 D3	E0 AA E0 53 / E0 D3 E0 2A	E0 2A E0 / E0 D3 E0 AA
79	E0 4B / E0 CB	E0 AA E0 4B / E0 CB E0 2A	E0 2A E0 4B / E0 CB E0 AA
80	E0 47 / E0 C7	E0 AA E0 47 / E0 C7 E0 2A	E0 2A E0 47 / E0 C7 E0 AA
81	E0 4F / E0 CF	E0 AA E0 4F / E0 CF E0 2A	E0 2A E0 4F / E0 CF E0 AA
83	E0 48 / E0 C8	E0 AA E0 48 / E0 C8 E0 2A	E0 2A E0 48 / E0 C8 E0 AA
84	E0 50 / E0 D0	E0 AA E0 50 / E0 D0 E0 2A	E0 2A E0 50 / E0 D0 E0 AA
85	E0 49 / E0 C9	E0 AA E0 49 / E0 C9 E0 2A	E0 2A E0 49 / E0 C9 E0 AA
86	E0 51 / E0 D1	E0 AA E0 51 / E0 D1 E0 2A	E0 2A E0 51 / E0 D1 E0 AA
89	E0 4D / E0 CD	E0 AA E0 4D / E0 CD E0 2A	E0 2A E0 4D / E0 CD E0 AA

NOTE: *If the left Shift key is held down, the AA / 2A shift break/make codes are sent along with the scan codes for the shifted character. If the right Shift key is held down, B6/36 is sent. If both Shift keys are held down, both sets of codes are sent along with the scan code for the shifted characters.*

Slash Key Scan Code Set 1

Table J-105 Slash Key Scan Code Set 1

Key Number	Scan Code Make/Break	Shift Case Make/Break
95	E0 35 / E0 B5	E0 AA E0 35 / E0 BS E0 2A

NOTE: *If the left Shift key is held down, the AA / 2A shift make/break codes are sent along with the scan codes for the shifted character. If the right Shift key is held down, B6 / 36 is sent. If both Shift keys are held down, both sets of codes are sent along with the scan codes for the shifted characters.*

Print Screen Key Scan Code Set 1

Table J-106 Print Screen Key Scan Code Set 1

Key Number	Scan Code Make/Break	Ctrl Case, Shift Case Make/Break	Alt Case Make/Break
124	E0 2A E0 37 / E0 B7 E0 AA	E0 37 / E0 B7	54 / D4

Pause Key Scan Code Set 1

Table J-107 Pause Key Scan Code Set 1

Key Number	Scan Code Make Only	Control Key Pressed	Alt Case Make/Break
126	E1 1D 45 E1 9D C5	E0 37 / E0 B7	54 / D4

NOTE: *Key number 126 is not typematic. Its scan codes occur on the make of the key only.*

PC/AT Scan Code Set 2

Table J-108 PC/AT Scan Code Set 2 (1/2)

Key Number	Make Code	Break Code		Key Number	Make Code	Break Code
1	0E	F0 0E		41	52	F0 52
2	16	F0 16		42	50	F0 5D
3	1E	F0 1E		43	5A	F0 5A
4	26	F0 26		44	12	F0 12
5	25	F0 25		45	61	F0 61
6	2E	F0 2E		46	1A	F0 1A
7	36	F0 36		47	22	F0 22
8	30	F0 3D		48	21	F0 21
9	3E	F0 3E		49	2A	F0 2A
10	46	F0 46		50	32	F0 32

11	45	F0 45		51	31	F0 31
12	4E	F0 4E		52	3A	F0 3A
13	*55*	F0 55		53	41	F0 41
14	6A	F0 6A		54	49	F0 49
15	66	F0 36		55	4A	F0 4A
16	0D	F0 0D		56	51	F0 51
17	15	F0 15		57	59	F0 59
18	1D	F0 ID		58	14	F0 14
19	24	F0 24		60	11	F0 11
20	20	F0 2D		61	29	F0 29
21	2C	F0 2C		62	E0 11	E0 F0 11
22	35	F0 35		64	E0 14	E0 F0 14
23	3C	F0 3C		70	67	F0 67
24	43	F0 43		71	64	F0 64
25	44	F0 44		72	13	F0 13
26	40	F0 4D		75	See Table J-7	
27	54	F0 54		76	See Table J-7	
28	5B	F0 5B		79	See Table J-7	
29	50	F0 5D		80	See Table J-7	
30	58	F0 58		81	See Table J-7	
31	1C	F0 1C		83	See Table J-7	
32	1B	F0 1B		84	See Table J-7	
33	23	F0 23		85	See Table J-7	
34	2B	F0 2B		86	See Table J-7	
35	34	F0 34		89	See Table J-7	
36	33	F0 33		90	77	F0 77
37	3B	F0 3B		91	6C	F0 6C
38	42	F0 42		92	6B	F0 6B
39	4B	F0 4B		93	69	F0 69
40	4C	F0 4C		94	68	F0 68

Table J-6 PC and PC/XT Scan Code Set 2 (2/2)

Key Number	Make Code	Break Code		Key Number	Make Code	Break Code
95	See Table J-8			113	06	F0 06
96	75	F075		114	04	F0 04
97	73	F0 73		115	0C	F0 0C
98	72	F0 72		116	03	F0 03
99	70	F0 70		117	0B	F0 0B
100	7C	F0 7C		118	83	F0 83
101	70	F0 7D		119	0A	F0 0A
102	74	F0 74		120	01	F0 01
103	7A	F0 7A		121	09	F0 09
104	71	F0 71		122	78	F0 78
105	7B	F0 7B		123	07	F0 07
106	79	F0 79		124	See Table J-9	

107	60	F0 6D		125	7E	F0 7E
108	E0 5A	E0 F0 5A		126	See Table J-10	
109	63	F0 63		141	E0 1F	E0 F0 1F
110	76	F0 76		142	E0 27	E0 F0 27
112	05	F0 05		143	E0 2F	E0 F0 2F

Cursor Key Scan Code Set 2

Table J-109 Cursor Key Scan Code Set 2

Key Number	Base Case, or Shift + Num Lock "On" Make/Break	Shift Lock "On" Make/Break	Num Lock "On" Make/Break
75	E0 70 / E0 F0 70	E0 F0 12 E0 70 / E0 F0 70 E0 12	E0 12 E0 70 / E0 F0 70 E0 F0 12
76	E0 71 / E0 F0 71	E0 F0 12 E0 71 / E0 F0 71 E0 12	E0 12 E0 71 / E0 F0 71 E0 F0 12
79	E0 6B / E0 F0 6B	E0 F0 12 E0 6B / E0 F0 6B E0 12	E0 12 E0 6B / E0 F0 6B E0 F0 12
80	E0 6C / E0 F0 6C	E0 F0 12 E0 6C / E0 F0 6C E0 12	E0 12 E0 6C / E0 F0 6C E0 F0 12
81	E0 69 / E0 F0 69	E0 F0 12 E0 69 / E0 F0 69 E0 12	E0 12 E0 69 / E0 F0 69 E0 F0 12
83	E0 75 / E0 F0 75	E0 F0 12 E0 75 / E0 F0 75 E0 12	E0 12 E0 75 / E0 F0 75 E0 F0 12
84	E0 72 / E0 F0 72	E0 F0 12 E0 72 / E0 F0 72 E0 12	E0 12 E0 72 / E0 F0 72 E0 F0 12
85	E0 7D / E0 F0 7D	E0 F0 12 E0 7D / E0 F0 7D E0 12	E0 12 E0 7D / E0 F0 7D E0 F0 12
86	E0 7A / E0 F0 7A	E0 F0 12 E0 7A / E0 F0 7A E0 12	E0 12 E0 7A / E0 F0 7A E0 F0 12
89	E0 74 / E0 F0 74	E0 F0 12 E0 74 / E0 F0 74 E0 12	E0 12 E0 74 / E0 F0 74 E0 F0 12

NOTE: *If the left Shift key is held down, the F0 12/12 shift make/break codes are sent along with the scan codes for the shifted character. If the right Shift key is held down, F0 59/59 is sent. If both Shift keys are held down, both sets of codes are sent along with the scan codes for the shifted characters.*

Slash Key Scan Code Set 2

Table J-110 Slash Key Scan Code Set 2

Key Number	Scan Code Make/Break	Shift Case Make/Break
95	E0 4A / E0 F0 4A	E0 F0 12 E0 4A / E0 F0 4A E0 F2

NOTE: *If the left Shift key is held down, the F0 12/12 shift make/break codes are sent along with the scan codes for the shifted character. If the right Shift key is held down, F0 59/59 is sent. If both Shift keys are held down, both sets of codes are sent along with the scan codes for the shifted characters.*

Print Screen Key Scan Code Set 2

Table J-111 Print Screen Key Scan Code Set 2

Key Number	Scan Code Make/Break	Ctrl Case, Shift Case Make/Break	Alt Case Make/Break
124	E0 12 E0 7C / E0 F0 7C E0 F0 12	E0 7C / E0 F0 7C	84 / F0 84

Pause Key Scan Code Set 2

Table J-112 Pause Key Scan Code Set 2

Key Number	Scan Code Make Only	Control Key Pressed
126	E1 14 77 1l F0 14 F0 77	E0 7E E0 F0 7E

NOTE: *Key number 126 is not typematic. Its scan codes occur on the make of key only.*

Terminal Mode Scan Code Set 3

Table J-113 Terminal Mode Scan Code Set 3 (1/3)

Key Number	Make Code	Break Code	Default Key Mode
1	0E	F0 0E	Typematic
2	16	F0 16	Typematic
3	1E	F0 1E	Typematic
4	26	F0 26	Typematic
5	25	F0 25	Typematic

6	2E	F0 2E	Typematic
7	36	F0 36	Typematic
8	3D	F0 3D	Typematic
9	3E	F0 3E	Typematic
10	46	F0 46	Typematic
11	45	F0 45	Typematic
12	4E	F0 4E	Typematic
13	55	F0 55	Typematic
14	5D	F0 5D	Typematic
15	66	F0 66	Typematic
16	0D	F0 0D	Typematic
17	15	F0 15	Typematic
18	10	F0 1D	Typematic
19	24	F0 24	Typematic
20	20	F0 2D	Typematic
21	2C	F0 2C	Typematic
22	35	F0 35	Typematic
23	3C	F0 3C	Typematic
24	43	F0 43	Typematic
25	44	F0 44	Typematic
26	40	F0 4D	Typematic
27	54	F0 54	Typematic
28	5B	F0 5B	Typematic
29	5C	F0 5C	Typematic
30	14	F0 14	Make/Break
31	1C	F0 1C	Typematic
32	1B	F0 1B	Typematic
33	23	F0 23	Typematic
34	2B	F0 2B	Typematic
35	34	F0 34	Typematic
36	33	F0 33	Typematic
37	3B	F0 3B	Typematic
38	42	F0 42	Typematic
39	4B	F0 4B	Typematic
40	4C	F0 4C	Typematic

Table J-11 Terminal Mode Scan Code Set 3 (2/3)

Key Number	Make Code	Break Code	Default Key Mode
41	52	F0 52	Typematic
42	53	F0 53	Typematic
43	5A	F0 5A	Typematic
44	12	F0 12	Make/Break
45	13	F0 13	Make/Break
46	1A	F0 1A	Typematic
47	22	F0 22	Typematic

48	21	F0 21	Typematic
49	2A	F0 2A	Typematic
50	32	F0 32	Typematic
51	31	F0 31	Typematic
52	3A	F0 3A	Typematic
53	41	F0 41	Typematic
54	49	F0 49	Typematic
55	4A	F0 4A	Typematic
56	51	F0 51	Typematic
57	59	F0 59	Make/Break
58	11	F0 11	Make/Break
60	19	F0 19	Make/Break
61	29	F0 29	Typematic
62	39	F0 39	Make only
64	58	F0 58	Make only
70	85	F0 85	Make Only
71	86	F0 86	Make Only
72	87	F0 87	Make Only
75	67	F0 67	Make only
76	64	F0 64	Typematic
79	61	F0 61	Typematic
80	6E	F0 6E	Make only
81	65	F0 65	Make only
83	63	F0 63	Typematic
84	60	F0 60	Typematic
85	6F	F0 6F	Make only
86	60	F0 6D	Make only
89	6A	F0 6A	Typematic
90	76	F0 76	Make only
91	6C	F0 6C	Make only
92	6B	F0 6B	Make only
93	69	F0 69	Make only
94	68	F0 68	Make only
95	77	F0 77	Make only
96	75	F0 75	Make only

Table J-11 Terminal Mode Scan Code Set 3 (3/3)

Key Number	Make Code	Break Code	Default Key Mode
97	73	F0 73	Make only
98	72	F0 72	Make only
99	70	F0 70	Make only
100	7E	F0 7E	Make only
101	70	F0 7D	Make only
102	74	F0 74	Make only
103	7A	F0 7A	Make only

104	71	F0 71	Make only
105	84	F0 84	Make only
+	7C	F0 7C	Typematic
(Reserved)	7B	F0 7B	Typematic
Enter	79	F0 79	Make only
(Reserved)	78	F0 78	Make only
Esc	08	F0 08	Make only
F1	07	F0 07	Make only
F2	0F	F0 0F	Make only
F3	17	F0 17	Make only
F4	1F	F0 1F	Make only
F5	27	F0 27	Make only
F6	2F	F0 2F	Make only
F7	37	F0 37	Make only
F8	3F	F0 3F	Make only
F9	47	F0 47	Make only
F10	4F	F0 4F	Make only
F11	56	F0 56	Make only
F12	5E	F0 5E	Make only
Print Scrn	57	F0 57	Make only
Scroll Lock	5F	F0 5F	Make only
Pause	62	F0 62	Make only
Left Win	8B	F0 8B	Make Break
Right Win	8C	F0 8C	Make Break
Apps	8D	F0 8D	Make Break

Appendix K
Keyboard Layouts

United States (U.S.) Keyboard

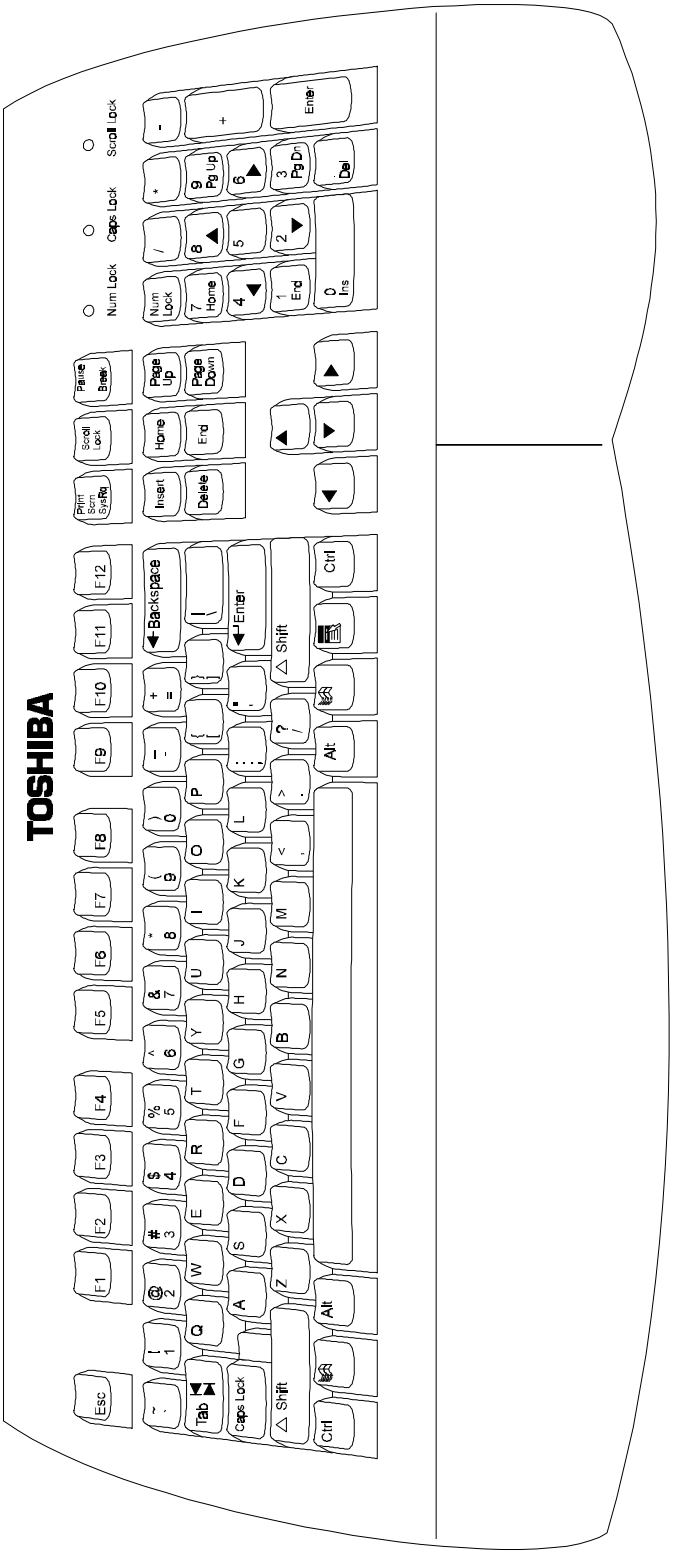

Figure K-31 United States (U.S.) Keyboard

Kanji Keyboard

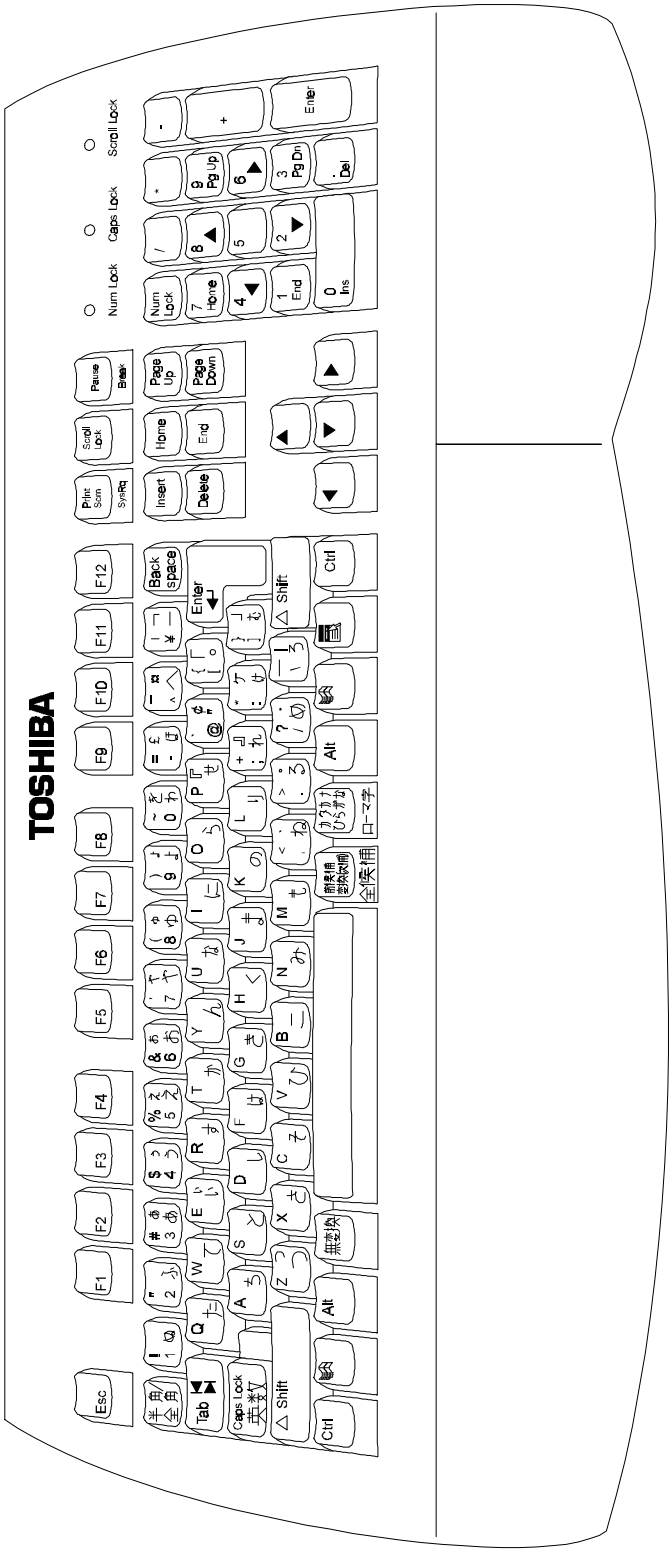

Figure K-32 Kanji Keyboard

NOTE: *This figure is a representation of the Kanji keyboard and may not match the character set exactly.*