

SLIMLINE™ 320 MOTHERBOARD

USER'S GUIDE



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Section 1. Introduction

This manual is designed to provide technical information about your Slim-Line 320 motherboard.

Who Should Read This Manual

This manual provides technical information about your Northgate Slim-Line 320 motherboard. Since your Northgate computer has been built exactly as you ordered it, and it has been extensively tested, it is possible that you will never need to refer to the information provided here. **However, if you ever want to change the configuration of your system, this manual is absolutely essential.** In it, you'll find information for upgrades like adding an internal modem or more memory. In addition, more technical information is provided, like pin-outs and interrupt levels. You may want to read this manual simply because you are curious about the guts of your system. Go ahead. A drawing in Appendix C shows the major components of the motherboard and the other sections present all the information most users will want to know.

Overview

This manual has the following sections and appendices.

Sections

- Section 1 describes the features of the system's Intel 80386 micro-processor and the 386 motherboard.
- Section 2 gives information about connectors and jumpers found on the motherboard. Refer to this section if you are going to make changes to your system.
- Section 3 provides configuration details of the following:
 - Clock Speed Configuration
 - Video Configuration
 - Memory Configuration
 - Serial and Parallel Port Configuration
 - Disk Drive Configuration
 - Installing a Math Coprocessor
- Section 4 consists of technical information about pin assignments, DMA channels, interrupts, etc.

Appendixes

- Appendix A explains the power-on self test (POST) and lists BIOS error messages.
- Appendix B is a quick reference to all jumper settings.
- Appendix C is a drawing of the motherboard. Use this drawing to locate components, jumpers and switches on your SlimLine 320 motherboard.

80386 CPU Features

The Intel 80386 is a 32-bit microprocessor. The chip's major features are:

- 20 MHz Microprocessor
- Large Address Space:
 - 4 Gigabytes Physical
 - 64 Terabyte Virtual
- Integrated Memory Management, Four-level Memory Protection and Support for Virtual Memory and Operation System
- Two iAPX 86 Upward Compatible Operating Modes:
 - iAPX 86 Real Address Mode
 - Protected Virtual Address Mode

SlimLine 320 Motherboard Features

In addition to the CPU features, the Northgate SlimLine 320 motherboard has the following features:

- 1, 2, 4 or 8Mb of local memory
- DRAM byte parity generation
- Two 8-bit slots and three 16-bit I/O slots, arranged in an expansion T-adaptor that allows expandability in the SlimLine case.
- Optional Processor Extension:
 - 80387 Numeric Data Processor
- Standard I/O bus speed
- Peripheral support
 - 13 interrupt request channels
 - 2 Timer/Counter channels
 - Dallas real-time clock

Section 2. Connectors and Jumpers

This section provides information about the connectors and jumpers used to configure your motherboard.

Please refer to the diagram on the last page of this manual for the location of connectors and jumpers on the Northgate SlimLine 320 motherboard. Detailed function descriptions are listed below.

Connectors

The motherboard has the following connectors:

- Hardware Reset Button Connector J2
- Keyboard Connector J5
- Turbo LED Connector J6
- Power-on LED and Switch J8
- Speaker Connector J10
- Serial Port COM1 Connector J14
- Serial Port COM2 Connector J13
- Parallel Port LPT1 Connector J15
- Floppy Disk Cable Connector J16
- Hard Disk Cable Connector J17
- Hard Drive LED Connector J23
- Power-supply Connectors P8 and P9

The reset button connector (J2) is a 2-pin Berg strip that connects to the reset button. This connection should always be OPEN or the system will not boot.

The keyboard connector (J5) is a 5-pin, 90-degree Printed Circuit Board (PCB) mounting, DIN connector. The pin assignments are as follows:

Pin	Assignment
1	Clock
2	Data
3	N.C.
4	Ground
5	+5 Vdc

The turbo LED connector (J6) is used to indicate CPU speed. It lights when the motherboard is running at the high clock rate. Pin 1 should be connected to the positive end of the LED. Reverse connection would cause the LED not to light.

The power LED and keylock connector (J8) is a 5-pin Berg strip. The pin assignments are as follows:

Pin	Assignment
1	Power-on LED data
2	N.C.
3	Ground
4	Keyboard Inhibit
5	Ground

The speaker connector (J10) is a 4-pin Berg strip. The pin assignments are as follows:

Pin	Assignment
1	Speaker Signal
2	Ground
3	N.C.
4	+5 Vdc

The pin assignments for the serial and parallel ports (J13, J14, and J15) are given in the *Technical Reference* section of this manual.

The pin assignments for the power-supply connectors (P8 and P9) are as follows:

Pin	Assignment
1	Power good
2	+5 Vdc
3	+12 Vdc
4	-12 Vdc
5	Ground
6	Ground
7	Ground
8	Ground
9	-5 Vdc
10	+5 Vdc
11	+5 Vdc
12	+5 Vdc

Jumpers

The SlimLine 320 allows you to select different configuration settings by opening or closing circuits. Circuits are closed by installing a small plug (called a jumper) across a set of pins (called a header). To leave the circuit open, remove the jumper.

Often, you can remove a jumper with your fingers. If the jumper is stuck on the pins, you might need to use a needle-nose pliers. Be careful not to bend the pins.

Jumper settings are identified by label and pin numbers. For example, if you want to set the main memory size to 1MB SIMMs, you must install a jumper across pins 1 and 2 of J11 and J12.

The SlimLine 320 motherboard has the following configuration settings:

- Wait state for bus memory I/O - J1 (See *Appendix B*)*
- VGA BIOS enable - J3 (See *Video Configuration*)*
- Turbo select jumper - J7 (See *Clock Speed Configuration*)
- Video enable jumper - J4 (See *Video Configuration*)
- VGA, EGA, CGA, or monochrome select when on-board VGA is disabled - J9 (See *Video Configuration*)
- VGA monitor enable - J20 (See *Appendix B*)*
- Main memory SIMMs size - J11, J12 (See *Memory Configuration*)
- SIMMs size and page mode wait state select - SW1 (See *Memory Configuration*)
- Memory configuration - SW2 (See *Memory Configuration*)
- Hard disk interrupt 14 control - J18 (See *Appendix B*)*
- IOCHCK for VGA enable - J19 (See *Appendix B*)*
- Serial and parallel port enable - SW3 (See *Serial and Parallel Port Configuration*)
- Serial and parallel port IRQ select - SW4 (See *Serial and Parallel Port Configuration*)
- On-board hard and floppy disk controller enable - W5 (See *Disk Drive Configuration*)
- Floppy disk type select - W6 (See *Diskette Drive Configuration*)
- J24 (Not supported at present) (See *Appendix B*)*
- W1 (Not supported at present) (See *Appendix B*)*
- W8 (Not supported at present) (See *Appendix B*)*

* Do not change these settings. Factory settings are shown in Appendix B.

Section 3. System Configurations

This section explains how to change settings on your motherboard when you add or change your system.

Clock Speed Configuration

The CPU clock select jumper (J7) is used to switch high to low CPU speed. The factory-set configuration is no jumper, which allows the CPU speed to be set by the turbo button on the control panel. The jumper assignments for J7 are as follows:

Jumper Settings for J7

Jumper Setting	Configuration
No jumper	High speed (speed controlled by turbo switch)
2,3	Low speed (10 MHz is low speed)

Video Configuration

The Northgate SlimLine 320 uses unique on-board VGA video circuitry. This eliminates the need for a video board. This section describes video drivers, changing the monitor or installing a plug-in video card, and using two monitors.

Video Drivers

You received 2 diskettes with software drivers and VGA utilities for high resolution settings with your system.

To use the drivers to increase screen resolution for software programs, refer to the SlimLine VGA User's Guide that was provided with your system. This manual gives detailed instructions for installing the screen drivers and using the various utilities provided on the diskettes.

The SlimLine VGA Utility diskette contains the following programs:

- ZYDIAG, a VGA testing program
- ZYDRAW, a VGA test program
- ZYROM, which provides VGA and system BIOS information
- ZYDEMO, a VGA test program
- FRACTINT, which displays and generates fractal images
- SETVID, which allows you to reset the video resolution

To run these programs, insert the utility diskette into the disk drive, log onto the A:\UTILS subdirectory, and type the name of the program you want to run. Follow the instructions that appear on the screen.

NOTE: ALL VIDEO DRIVERS AND UTILITIES DO NOT WORK WITH ALL MONITORS.

Changing the Monitor or Installing a Plug-In Video Card

The SlimLine 320 includes an on-board VGA controller. Thus, most users will never want to install a different video board in their system. However, if you install a plug-in video board in the SlimLine 320, you may need to change jumper blocks on J4, J20, or J9.

Video enable (J4) is used to enable the on-board VGA circuitry. The jumper assignments are as follows:

Jumper Settings for J4

Jumper Setting	Configuration
Jumper off	VGA disabled
Jumper on	VGA enabled

On-board VGA BIOS enable (J3) is used to enable the on-board VGA BIOS. If you've disabled on-board VGA, remove the jumper from J3 also. The jumper assignments are as follows:

Jumper Settings for J3

Jumper Setting	Configuration
Jumper off	VGA BIOS disabled
Jumper on	VGA BIOS enabled

VGA monitors are enabled with **J20**. Do not remove the jumper. See *Appendix B* for more information.

If the on-board VGA circuitry is disabled (with **J4**), you can plug an add-on video board into the SlimLine 320 motherboard. Then, you will need to set **J9** for the type of monitor. You will need to set **J9** as shown below.

Jumper Settings for J9

Jumper Setting	Configuration
Pins 1 and 2	Monochrome monitor
Pins 2 and 3	VGA, EGA, or CGA monitor

Two Monitors

The SlimLine 320 supports two monitors. You can install a plug-in color or monochrome adapter into the bus without disabling the on-board VGA adapter. The VGA BIOS will automatically shift itself to the opposite mode. If you install a color adapter, the VGA will set itself up in monochrome mode. If you install a monochrome adapter, the VGA will set itself up in color mode. Note: Having two monitors is useful with certain types of debugging software that can take advantage of dual-monitor systems. Most software will ignore the second monitor.

Memory Configuration

The Northgate SlimLine 320 can be configured with up to 16 Megabytes (MB) of Random Access Memory (RAM). The motherboard can hold up to 8 MB of RAM. You can add additional RAM by using 16-bit expansion boards. Keep the following in mind if you change the memory configuration of your SlimLine 320:

- The motherboard uses Single In-Line Memory Modules (SIMMs) instead of RAM chips. See *SIMM Installation* for instructions on installing SIMMs.
- Memory on the motherboard runs at a much higher speed than memory on expansion boards. Therefore, it is highly recommended that you always fill the motherboard with 8MB of RAM before you add memory boards to the system.
- When you change memory you must change jumpers at **J11**, **J12**, **SW1**, and **SW2**. Refer to *Memory Jumper Settings*.

SIMM Installation

Please note the following when installing SIMMs:

- ❑ There are 8 memory slots, divided into two banks (0 and 1) utilizing 4 SIMMs per bank (refer to the motherboard diagram in Appendix C.)
- ❑ Bank 0 must be completely filled before installing SIMMs in bank 1. If you add any SIMMs to bank 1, you must completely fill it.
- ❑ Each bank can use either 256KB SIMMs or 1MB SIMMs, however, you can not mix sizes on the motherboard. The SIMMs must be rated at 80ns or faster.
- ❑ SIMMs are extremely sensitive to static electricity. Keep them in the anti-static bag until you are ready to install them. Make sure that you are grounded before you touch them. To ground yourself, simply touch a metallic surface (such as the back plate of the computer).
- ❑ To install a SIMM, simply align the SIMM edge connector in the motherboard socket and push the top edge of the SIMM forward until the plastic alignment pins snap into the holes on the SIMM. Removing the SIMMs can be tricky. Use your fingernails or a small screwdriver to gently pull the locking tabs out, allowing the SIMM to slip off of the alignment pins (see Figure 1). Then, gently lift out the SIMM.

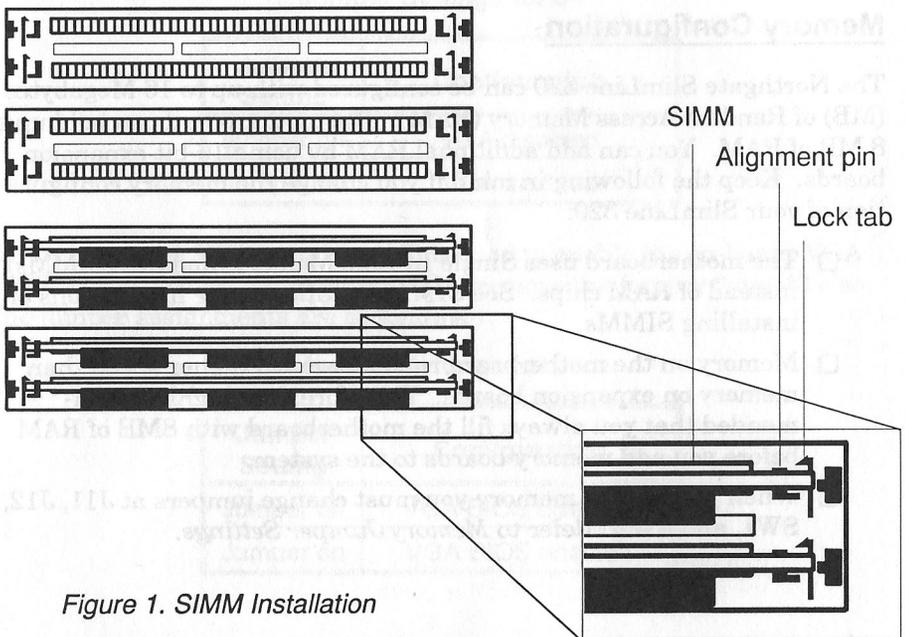


Figure 1. SIMM Installation

Memory Jumper Settings

Jumpers at **J11**, **J12**, and **SW1-1** allow the system to recognize the type of SIMMs used on the motherboard (256K or 1MB). Refer to the following table for jumper settings. (Note: Do not change SW1-2, 1-3, or 1-4.) Refer to the following table.

SIMMs Size Configuration

SIMM Type	Jumper at J11	Jumper at J12	SW1-1
256K	2,3	2,3	off
1MB	1,2	1,2	on

Use switch **SW2** to set total memory configuration. For example, to set the total RAM at 8MB, set SW2-1, SW2-3, and SW2-4 on. Refer to the following table.

System Memory Configuration

Total RAM	Bank 0 RAM	Bank 1 RAM	SW2				16-bit Memory Start Address
			1-1	2-2	3-3	4-4	
1 MEG	4X256K	0	off	off	off	off	160000
2 MEG	4X256K	4X256K	on	off	off	off	260000
4 MEG	4X1 MEG	0	off	off	on	on	460000
8 MEG	4X1 MEG	4X1 MEG	on	off	on	on	860000

Note that the table also gives the starting address for 16-bit memory. You will use this address if you use expansion boards to add 16-bit memory to the system.

Adding 16-Bit Memory Expansion Boards to the System

If you add 16-bit memory to your system, keep the following in mind.

- You will need to read the manual that comes with your 16-bit card very closely. When you install the card, you will need to configure it so the memory on the card is installed at the proper address. This configuration may be accomplished with switches, software, or a combination of both.
- 16-bit memory will always be installed above whatever other memory is installed on the motherboard. Refer to the table above for the four possible memory addresses.

Serial and Parallel Port Configuration

Some expansion cards, particularly local area network (LAN) cards and some internal modem cards, need to use Interrupt Requests (IRQs) that are normally reserved for the COM ports. If you are using your SlimLine 320 in a network, read the network documentation carefully. You may need to disable one of the COM ports. Keep the following in mind:

- If you need to disable a COM port, be sure to disable its IRQ by removing the appropriate jumper block from SW4.
- It is possible to disable a port's IRQ and still use the COM port. However, devices that require IRQs (like a mouse or a modem) will no longer function in the COM port.

The serial and parallel ports are enabled by the 4 pairs of pins at SW3. The jumper assignments are as follows:

Jumper Settings for SW3

Pin Pair	Jumper Not Installed	Jumper Installed
1-1	Enable COM1	Disable COM1
2-2	Enable COM2	Disable COM2
3-3	Enable LPT	Disable LPT
4-4	On-board Parallel Port as LPT1	On-board Parallel Port as LPT2

The IRQs for the serial and parallel ports are set with the 4 pairs of pins at SW4. The jumper assignments are as follows:

Jumper Settings for SW4

Pin Pair	Assignment
1-1	ON = IRQ4 for COM1
2-2	ON = IRQ3 for COM2
3-3	ON = IRQ5 for LPT
4-4	ON = IRQ7 for LPT

Disk Drive Configuration

The Northgate SlimLine 320 uses on-board Integrated Drive Electronics (IDE) hard disk controller circuitry. This controller can support up to two IDE disk drives. If you want to install a plug-in hard disk controller, you will need to disable the on-board IDE circuitry. (See *Hard Disks*.)

Diskette Drives

Jumpers at W5 and W6 are used to configure disk drives.

The 4-pin header at W5 enables the on-board disk controllers. The jumper assignments are as follows:

Jumper Settings for W5

Pin Pair	Jumper Not Installed	Jumper Installed
1-1	Enable on-board floppy disk controller	Disable on-board floppy disk controller

The W5 jumper assignments for the hard disk controller follow in *Hard Disks*.

The Northgate SlimLine 320 supports 3 1/2" and 5 1/4" diskette drives, or applications without drives, as shown below.

The following configurations are available for internal diskette drives:

- Two 3 1/2" drives
- One 3 1/2" and one 5 1/4" drive
- One 3 1/2" or one 5 1/4" drive
- No drives

You can select which disk drive is the boot-drive (the disk drive that DOS will look to first when the computer starts up). This selection is made with the floppy disk connector cable that connects the floppy disk drives to the motherboard. Refer to the illustration *Cabling For One 5 1/4" Drive and One 3 1/2" Drive* for connections.

The 2 pairs of pins at W6 control two floppy disk options. The jumper assignments are as follows:

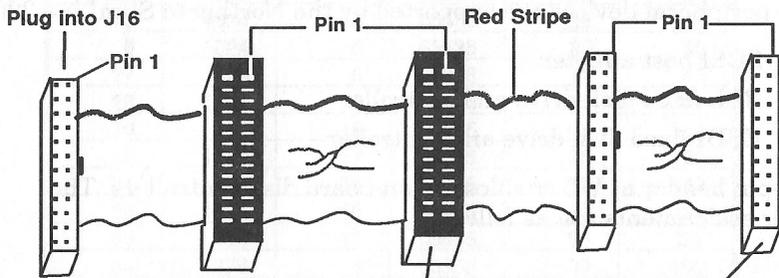
Jumper Settings for W6

Pin Pair	Jumper Installed	Jumper Not Installed
1-1	2-speed 1.2 5 1/4" floppy drive	1-speed floppy drives
2-2	187ns Write Precomp	125ns Write Precomp

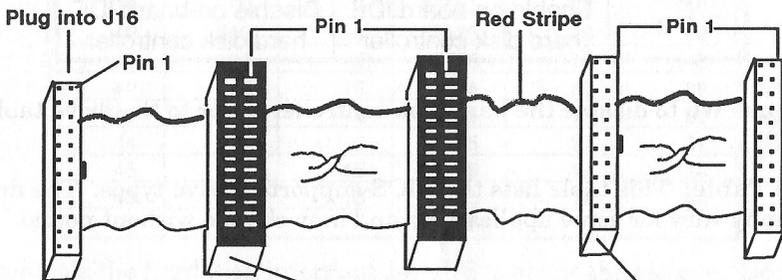
Very Important:

When connecting the floppy drive cable, make sure you **plug Pin 1 of the cable connector into Pin 1 on the board and floppy drive**. The larger connectors (for the 5.25" drives) on the floppy drive cable have a tiny number 1 that indicates the Pin 1 connector. The smaller connectors (for 3.5" drives) have a small arrow that indicates the Pin 1 connector. Pin 1 on the cable is also indicated by the RED stripe. When you plug the connector cable, orient it so the RED stripe corresponds to Pin 1.

CABLING FOR ONE 5.25 DRIVE AND ONE 3.5 DRIVE

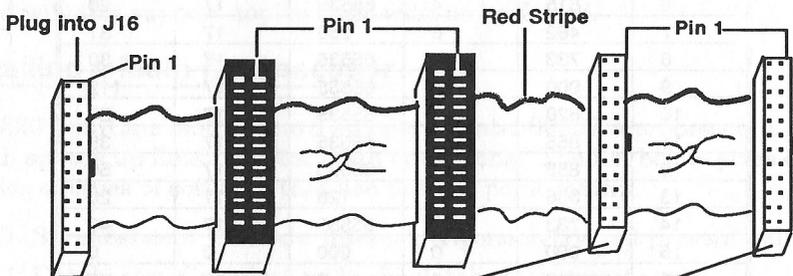


To make the 5.25 drive the boot drive connect this to the 5.25 drive and this to the 3.5 drive.



To make the 3.5 drive the boot drive connect this to the 5.25 drive and this to the 3.5 drive.

CABLING FOR TWO 3.5 DRIVES



Connect this to the boot drive and this to the other 3.5 drive.

Hard Disks (Standard Configuration)

These peripheral devices are supported by the Northgate SlimLine 320.

- SCSI host adapter
- RLL fixed disk drive and controller
- ESDI fixed disk drive and controller

The 4-pin header at W5 enables the on-board disk controllers. The jumper assignments are as follows:

Jumper Settings for W5

Pin Pair	Jumper Not Installed	Jumper Installed
2-2	Enable on-board IDE hard disk controller	Disable on-board IDE hard disk controller

If you use W5 to disable the hard disk controller, refer to the drive table below.

Drive Table: This table lists the BIOS-supported drive types. The drive table may vary for some applications and may change without notice.

Type	Cyln	Heads	W-Pcomp	Sec/Track	MB
1	306	4	128	17	10
2	615	4	300	17	20
3	615	6	300	17	31
4	940	8	512	17	62
5	940	6	512	17	47
6	615	4	65535	17	20
7	462	8	256	17	31
8	733	5	65535	17	30
9	900	15	65535	17	112
10	820	3	65535	17	20
11	855	5	65535	17	35
12	855	7	65535	17	50
13	306	8	128	17	20
14	733	7	65535	17	43
15	000	0	000	0	0
16	612	4	0	17	20
17	977	5	300	17	41
18	977	7	65535	17	57
19	1024	7	512	17	60
20	733	5	300	17	30
21	733	7	300	17	43
22	733	5	300	17	30
23	306	4	0	17	10

Type	Cyln	Heads	W-Pcomp	Sec/Track	MB
24	612	4	65535	26	31
25	1024	8	65535	26	104
26	1024	5	65535	26	65
27	1024	5	65535	17	43
28	1250	5	65535	35	107
29	217	16	65535	63	107
30	1250	7	65535	35	150
31	303	16	65535	63	149
32	1221	15	65535	36	322
33	654	16	65535	63	322
34	776	8	65535	33	100
35	1309	16	65535	63	644
36	1412	13	65535	34	305
37	1224	15	65535	34	305
38	619	16	65535	63	305
39	960	9	65535	26	110
40	809	6	65535	26	62
41	965	5	65535	17	40
42	312	16	65535	36	88
43	615	4	65535	17	20
44	615	6	65535	17	31
45	917	15	65535	17	114
46	965	10	65535	17	80
47	User defined				

J18 controls the hard disk interrupt 14. J18 is set at the factory. Do not remove the jumper from pins 1 and 2.

Keyboard Configuration

The Northgate SlimLine 320 motherboard supports 84- and 101/102-key keyboards. All AT-compatible keyboards are supported. This motherboard will also support applications with no keyboard.

Installing a Math Coprocessor

The 320 SlimLine motherboard accepts an Intel 80387 coprocessor, a chip which speeds up floating point math operations. The list below gives examples of types of software that use floating point math:

- Spreadsheets: Periodic interest, trigonometry, net present value
- Databases: Calculations in the database (interest etc.)
- Graphics: Draw-type programs when drawing objects
- Desktop publishing: Fonts, display redraws, Postscript emulation
- Presentation graphics: Charts and graphs from data
- CAD: Drawings generated by formulas, redraws

Installation

To install a math coprocessor, follow the steps below:

1. Turn off your computer, disconnect any peripherals, and unplug the power cord from the wall outlet.

Note: Your computer and the math coprocessor chip can be damaged by static discharge. Be sure to ground yourself by touching the metal computer case before you begin installing the math coprocessor chip.

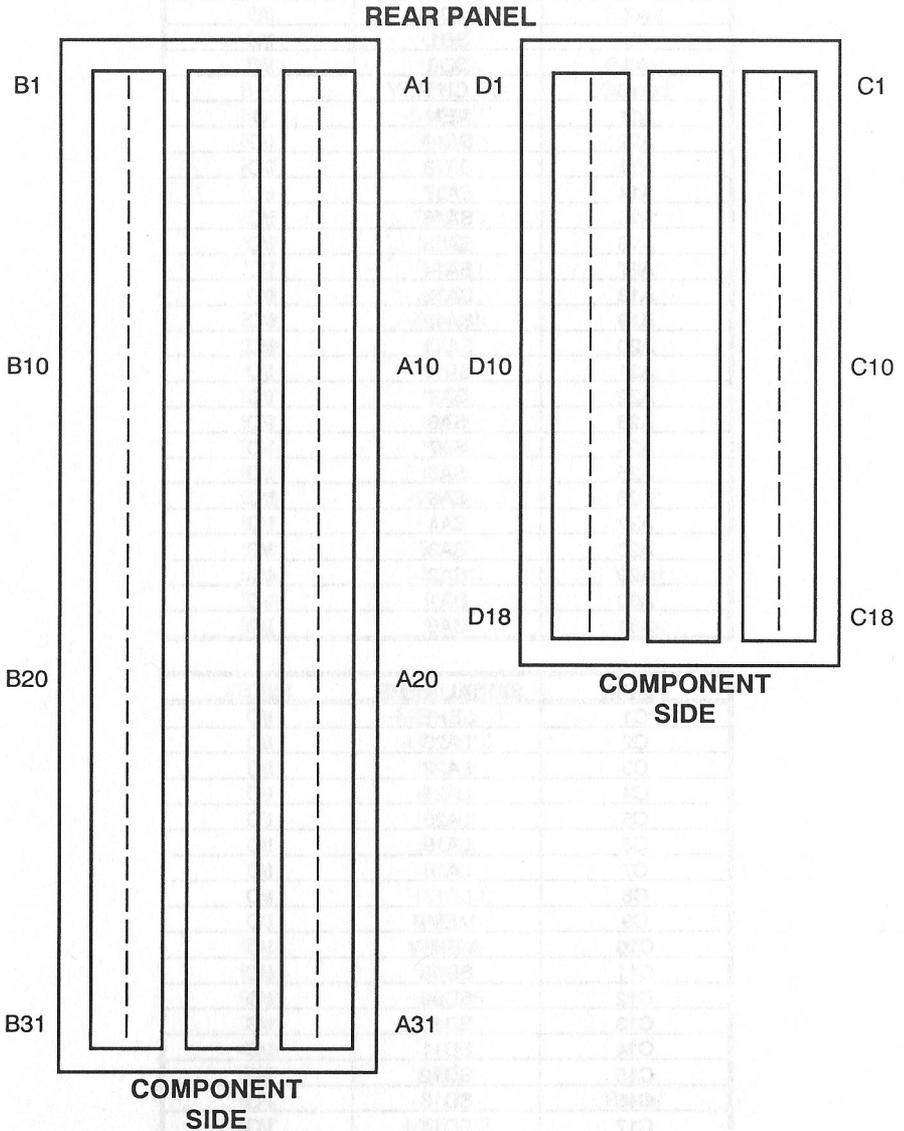
2. Remove the cover from the computer as described in your computer user's guide.
3. Remove the math coprocessor chip from its anti-static package and examine the connector pins on the underside. If any pins are bent, carefully straighten them with needle-nose pliers.
4. Find the coprocessor socket on your computer's system board (refer to the motherboard drawing in Appendix C). To orient the chip correctly, you must match pin 1 on the chip with pin 1 on the socket. The chip and the socket each have a notch on the pin 1 corner. Align the notches before you insert the chip. If you insert the chip the wrong way, it will be damaged.
5. Press firmly on the chip to seat the pins in the socket. The pins are barely visible when the chip is fully inserted. **You may have to press hard to seat the chip all the way.**
6. Put the cover back on your computer. Reconnect all the cables and cords, and plug the power cord into the wall outlet.

Turn on your computer. Run the CMOS setup as described on the CMOS Setup card.

Section 4. Technical Reference

I/O Expansion Slots

The following figures show the pin numbering for I/O channel connectors.



I/O Channel Connector Pin Assignment

I/O PIN	SIGNAL NAME	I/O
A1	-I/O CH CK	I
A2	SD7	I/O
A3	SD6	I/O
A4	SD5	I/O
A5	SD4	I/O
A6	SD3	I/O
A7	SD2	I/O
A8	SD1	I/O
A9	SD0	I/O
A10	-I/O CH RDY	I
A11	AEN	O
A12	SA19	I/O
A13	SA18	I/O
A14	SA17	I/O
A15	SA16	I/O
A16	SA15	I/O
A17	SA14	I/O
A18	SA13	I/O
A19	SA12	I/O
A20	SA11	I/O
A21	SA10	I/O
A22	SA9	I/O
A23	SA8	I/O
A24	SA7	I/O
A25	SA6	I/O
A26	SA5	I/O
A27	SA4	I/O
A28	SA3	I/O
A29	SA2	I/O
A30	SA1	I/O
A31	SA0	I/O

I/O PIN	SIGNAL NAME	I/O
C1	SBHE	I/O
C2	LA23	I/O
C3	LA22	I/O
C4	LA21	I/O
C5	LA20	I/O
C6	LA19	I/O
C7	LA18	I/O
C8	LA17	I/O
C9	-MEMR	I/O
C10	-MEMW	I/O
C11	SD08	I/O
C12	SD09	I/O
C13	SD10	I/O
C14	SD11	I/O
C15	SD12	I/O
C16	SD13	I/O
C17	SD14	I/O
C18	SD15	I/O

I/O Channel Connector Pin Assignment

I/O PIN	SIGNAL NAME	I/O
B1	GND	Ground
B2	RESET DRV	O
B3	+5 VDC	Power
B4	IRQ 9	I
B5	-5 VDC	Power
B6	DRQ2	I
B7	-12 VDC	Power
B8	OWS	I
B9	+12 VDC	Power
B10	GND	Ground
B11	-SMEMW	O
B12	-SMEMR	O
B13	IOW	I/O
B14	IOR	I/O
B15	-DACK3	O
B16	DRQ3	I
B17	-DACK1	O
B18	DRQ1	I
B19	-Refresh	I/O
B20	CLK	O
B21	IRQ7	I
B22	IRQ6	I
B23	IRQ5	I
B24	IRQ4	I
B25	IRQ3	I
B26	-DACK2	O
B27	T/C	O
B28	BALE	O
B29	+5 VDC	Power
B30	OSC	O
B31	GND	Ground

I/O PIN	SIGNAL NAME	I/O
D1	-MEM CS16	I
D2	-I/O CS16	I
D3	IRQ10	I
D4	IRQ11	I
D5	IRQ12	I
D6	IRQ15	I
D7	IRQ14	I
D8	-DACK0	O
D9	DRQ0	I
D10	-DACK5	O
D11	DRQ5	I
D12	-DACK6	O
D13	DRQ6	I
D14	-DACK7	O
D15	DRQ7	I
D16	+5 VDC	Power
D17	-MASTER	I
D18	GND	Ground

Serial and Parallel Pin Connections

Serial

DCD (Data Carrier Detect)	• 1	• 6	DSR (Data Set Ready)
Serial In	• 2	• 7	RTS (Request To Send)
Serial Out	• 3	• 8	CTS (Clear To Send)
DTR (Data Term. Ready)	• 4	• 9	Ring Indicator
Ground	• 5	• 10	N/C (No Connection)

Parallel

Data Strobe	• 1	• 14	Auto Feed
Data 0	• 2	• 15	Error
Data 1	• 3	• 16	Initialize
Data 2	• 4	• 17	Select-in
Data 3	• 5	• 18	Ground
Data 4	• 6	• 19	Ground
Data 5	• 7	• 20	Ground
Data 6	• 8	• 21	Ground
Data 7	• 9	• 22	Ground
Acknowledge	• 10	• 23	Ground
Busy	• 11	• 24	Ground
Paper Empty	• 12	• 25	Ground
Select	• 13	• 26	N/C

DMA Channels

PAGE REGISTER	I/O HEX ADDRESS
DMA Channel 0	0087
DMA Channel 1	0083
DMA Channel 2	0081
DMA Channel 3	0082
DMA Channel 4	Cascade
DMA Channel 5	008B
DMA Channel 6	0089
DMA Channel 7	008A

CHANNEL	FUNCTION
0	Spare
1	SDLC (Synchronous Data Link Communication)
2	Floppy Diskette
3	Spare
4	Cascade for DMA Controller 1
5	Spare
6	Spare
7	Spare

Interrupts

LEVEL	FUNCTION
0	System Timer
1	Keyboard
2	Interrupt from Controller 2 (Levels 8-15)
3	Serial Port 2 (COM2)
4	Serial Port 1 (COM1)
5	Parallel Port 2 (LPT2)
6	Diskette Controller
7	Parallel Port 1 (LPT1)
8	Real-Time Clock
9	Software redirected to INT 0AH (IRQ 2)
10	Reserved
11	Reserved
12	Reserved
13	Coprocessor
14	Hard Disk Controller
15	Reserved

Timers

CHANNEL	FUNCTION
0	System Timer
1	Memory Refresh
2	Speaker Tone

CMOS RAM Address Map

ADDRESS	DESCRIPTION
00-0D	Real-time clock information
0E	Diagnostic status byte
0F	Shutdown status byte
10	Diskette drive type byte (drives A and B)
11	Reserved
12	Fixed disk type byte (drives C and D)
13	Reserved
14	Equipment byte
15	Low base memory byte
16	High base memory byte
17	Low expansion memory byte
18	High expansion memory byte
19-2D	Reserved
2E-EF	2-byte CMOS checksum
30	Low expansion memory byte (as determined by post)
31	High expansion memory byte (as determined by post)
32	Date century byte
33	Information flags (set during power-up)
34-3F	Reserved

Real-Time Clock Information

BYTE	FUNCTION	ADDRESS
0	Seconds	00
1	Seconds alarm	01
2	Minutes	02
3	Minutes alarm	03
4	Hours	04
5	Hours alarm	05
6	Day of week	06
7	Date of month	07
8	Month	08
9	Year	09
10	Status Register A	0A
11	Status Register B	0B
12	Status Register C	0C
13	Status Register D	0D

Appendix A: Power-on Self Tests and BIOS Messages

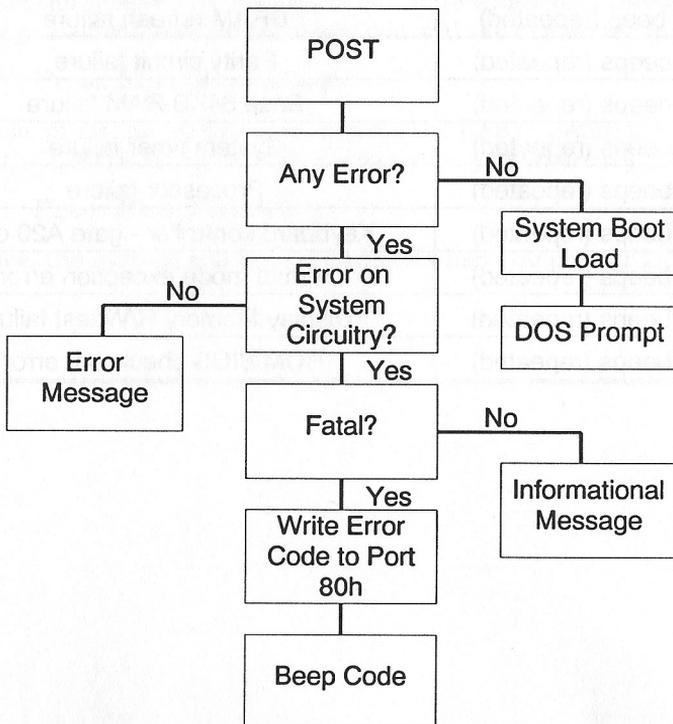
Power-On Self Tests

The following section provides a general description of the power-on self tests performed and the messages displayed by the 386 BIOS. It is provided to help you perform initial diagnostics.

When power is applied to the computer, the ROM BIOS runs a series of self tests and hardware initialization processes. These tests and initializations are referred to as the POST (Power-on Self Tests). The most essential hardware (i.e., video and RAM) is initialized first. These elements of the system must be functioning properly before the system tests can be run. When the system successfully completes the POST, it loads the operating system software into the RAM.

POST Flowchart

The flowchart below is provided to help you pin-point problems that may occur during startup.



Errors Reported by the BIOS

The BIOS performs various diagnostic tests at the time the system is powered up. If an error is encountered during these tests, you will hear a beeping tone or see an error code displayed on your monitor. If the error occurs before the monitor is initialized, the system reports the error with beeps. (Refer to the list of beep codes below to determine the cause of the error.)

Some errors are called fatal, in which case the system halts after reporting the error. Other errors are called non-fatal; the BIOS reports the error and will attempt to continue the process.

Beep Codes

Message/Beep(s)	Description
1 long and 3 short beeps	Conventional & extended memory test error
1 long and 8 short beeps	Video display test error
1 short beep (repeated)	DRAM refresh failure
2 short beeps (repeated)	Parity circuit failure
3 short beeps (repeated)	Base 64KB RAM failure
4 short beeps (repeated)	System timer failure
5 short beeps (repeated)	Processor failure
6 short beeps (repeated)	Keyboard controller - gate A20 error
7 short beeps (repeated)	Virtual mode exception error
8 short beeps (repeated)	Display Memory R/W test failure
9 short beeps (repeated)	ROM BIOS checksum error

Fatal Error Messages

Displayed Message	Probable Cause
CMOS INOPERATIONAL	The CMOS register test failed.
8042 GATE-A20 ERROR	The system encountered an error as it was trying to access protected mode.
INVALID SWITCH MEMORY FAILURE	The switches that indicate the amount of system memory are not correct.
DMA ERROR	DMA controller page register test failed.
DMA #1 ERROR	Test of DMA Unit 1 register failed.
DMA #2 ERROR	Test of DMA Unit 2 register failed.

Non-Fatal Errors

When the system encounters a non-fatal error, it will display an error message on the screen and attempt to continue whatever process it is performing. Below the error message, you will see one of two messages:

*** Press F1 to Run Setup.**

In this case, press the F1 key and perform the CMOS Setup procedure. (Refer to the CMOS Setup card that came with your system.)

*** Press F1 to Continue.**

In this case, the system will try to continue when you press F1.

The list below gives the non-fatal error messages and their causes.

Error	Probable Cause
CMOS battery state low	The CMOS battery has failed or is weak. Press F1 to run Setup.
CMOS system options not set	CMOS battery failure or CMOS checksum test failed. Press F1 to run Setup.
CMOS checksum failure	CMOS battery is low or CMOS checksum test failed. Press F1 to run Setup.
CMOS display type mismatch	The display type found does not match the type in the CMOS. Press F1 to run Setup in the CMOS memory.
CMOS memory size mismatch	The amount of memory found does not match the amount in the CMOS. Press F1 to run Setup in the CMOS memory.
CMOS time and date not set	The system encountered a problem when it checked the date and time. Press F1 to run Setup in the CMOS memory.
C:Drive Failure	The drive type found does not match the type in the CMOS. Press F1 to run Setup in the CMOS memory.
CH-2 timer error	The test that checks DMA channels 0, 1, and 2 failed. Press F1 to continue.
Keyboard error	The test that checks the keyboard failed. Press F1 to continue.
KB/Interface error	The test that checks the keyboard failed. Press F1 to continue.
Display switch setting not proper	The test that checks the type of video display failed. Press F1 to continue.
FDD controller error	The test that checks the type of floppy disk controller has failed. Press F1 to continue. The system may still boot from the hard disk.
HDD controller error	The test that checks the type of hard disk controller has failed. Press F1 to continue. System may still boot from a floppy disk.
C: Drive error	The initialization of hard drive C: has failed. Press F1 to continue.
D: Drive error	The initialization of hard drive D: has failed. Press F1 to continue.
D: Drive failure	The hard disk Setup process has failed. Press F1 to continue.

Appendix B: Jumper Settings Quick Reference

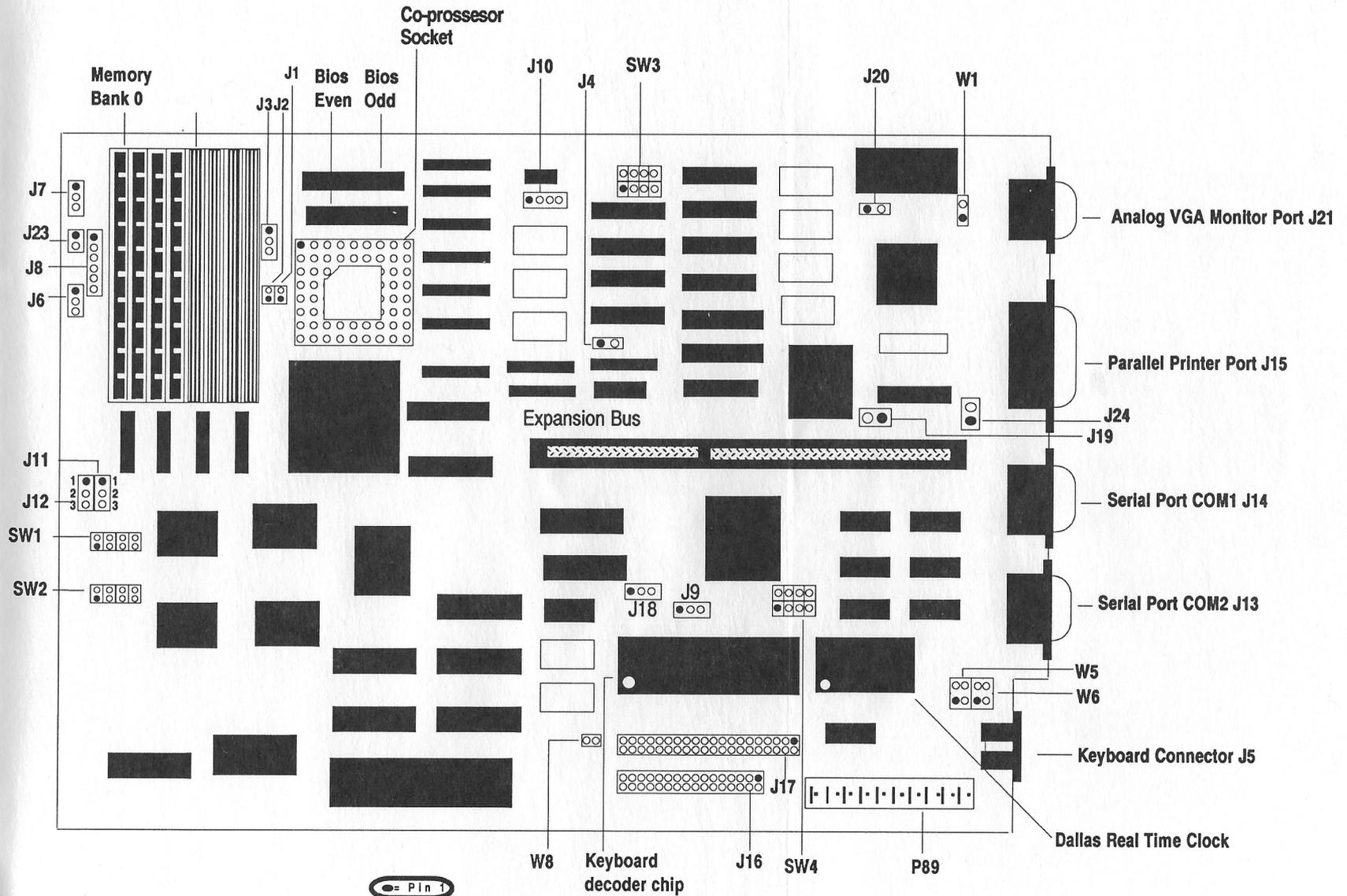
Setting	Description	Default
W8	(Not supported at present)	Off
Par 2	On-1.5ns write timing, Off-1.5ns write timing	On
Par 1	On-5-speed 1.5 Tbit floppy drive, Off-1-speed	Off
W7	Control floppy disk 7ns	Off
Par 3	On-disable on-board IDE hard disk controller	Off
Par 2	On-disable on-board IDE hard disk controller	Off
Par 1	On-disable on-board floppy disk controller	Off
W6	Control on-board hard & floppy disk controller enable	On
W5	(Not supported at present)	Off
W4	Control enable for 1.44MB and 1MB disk	Off
Par 4	Off-on-board parallel port as LPT1, On-as LPT2	Off
Par 3	Off-enable LPT, On-disable LPT	Off
Par 2	Off-enable COM2, On-disable COM2	Off
Par 1	Off-enable COM1, On-disable COM1	Off
SW3	Control 25 pin and parallel port enable	On
SW2	Control 25 pin and parallel port enable	On
SW1	Control memory configuration	On
W3	Control 2 Mbit cache, On-1MB SIMM	On
W2	Control 2 Mbit cache, On-1MB SIMM	On
W1	Control 2 Mbit cache, On-1MB SIMM	On
W0	Control 2 Mbit cache, On-1MB SIMM	On
W17	Control 2 Mbit cache, On-1MB SIMM	On
W16	Control 2 Mbit cache, On-1MB SIMM	On
W15	Control 2 Mbit cache, On-1MB SIMM	On
W14	Control 2 Mbit cache, On-1MB SIMM	On
W13	Control 2 Mbit cache, On-1MB SIMM	On
W12	Control 2 Mbit cache, On-1MB SIMM	On
W11	Control 2 Mbit cache, On-1MB SIMM	On
W10	Control 2 Mbit cache, On-1MB SIMM	On
W9	Control 2 Mbit cache, On-1MB SIMM	On
W8	Control 2 Mbit cache, On-1MB SIMM	On
W7	Control 2 Mbit cache, On-1MB SIMM	On
W6	Control 2 Mbit cache, On-1MB SIMM	On
W5	Control 2 Mbit cache, On-1MB SIMM	On
W4	Control 2 Mbit cache, On-1MB SIMM	On
W3	Control 2 Mbit cache, On-1MB SIMM	On
W2	Control 2 Mbit cache, On-1MB SIMM	On
W1	Control 2 Mbit cache, On-1MB SIMM	On
W0	Control 2 Mbit cache, On-1MB SIMM	On

Appendix B: Jumper Settings Quick Reference

Jumper	Description	Default
J1	Controls wait state for bus memory I/O	(leave on)
J3	On-board VGA BIOS enable	(leave on 2 & 3)
J4	Controls video enable On=VGA enabled, Off=VGA disabled	On
J7	Controls turbo Off=high speed (controlled by turbo switch) On 2 & 3=low speed (10MHz)	Off
J9	Controls video select On 1 & 2=monochrome, On 2 & 3=VGA, EGA, CGA	N/A
J11	Controls main memory SIMMs size On 1 & 2=1MB SIMMs, On 2 & 3=256K SIMMs	N/A
J12	Controls main memory SIMMs size On 1 & 2=1MB SIMMs, On 2 & 3=256K SIMMs	N/A
J18	Controls hard disk interrupt 14	(leave on)
J19	Enables IOCHCK for VGA circuitry	(leave on)
J20	Controls VGA enable	(leave on)
J24	(Not supported at present)	Off
SW1-1	Controls SIMMs size and page mode wait state Off=256K SIMMs, On=1MB SIMMs	N/A
SW2	Controls memory configuration	N/A
SW3 Pair 1	Controls serial and parallel port enable Off=enable COM1, On=disable COM1	Off
Pair 2	Off=enable COM2, On=disable COM2	Off
Pair 3	Off=enable LPT, On=disable LPT	Off
Pair 4	Off=on-board parallel port as LPT1, On=as LPT2	Off
SW4	Controls serial and parallel port IRQ select	(leave on 1, 2, 3, 4)
W1	(Not supported at present)	Off
W5 Pair 1	Controls on-board hard & floppy disk controller enable Off=enable on-board floppy disk controller On=disable on-board floppy disk controller	Off
Pair 2	Off=enable on-board IDE hard disk controller On=disable on-board IDE hard disk controller	Off
W6 Pair 1	Controls floppy disk type On=2-speed 1.2 5 1/4" floppy drives, Off=1-speed	Off
Pair 2	On=187ns write precomp, Off=125ns write precomp	Off
W8	(Not supported at present)	Off

Appendix C

320 MicroStation Motherboard





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