PCA-6157

Full-size Pentium®

PCI CPU Card

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5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Contents

CHAPTER 1

Hardware Configuration

This chapter gives background information on the PCA-6157. It then shows you how to configure the card to match your application and prepare it for installation into your PC.

Sections include:

- Card specifications
- Safety precautions
- Jumper settings
- Board layout

Introduction

The PCA-6157 industrial grade CPU card uses Intel's highly acclaimed Pentium P54C type 75/90/100/120/133/150/166 MHz CPUs and 82437FX "Triton" chipset. The card works with standard ISA and/or ISA/PCI bus passive backplanes.

In addition to the Pentium's 16 KB on-chip cache memory, the card has an extra 256 KB 2nd-level write-back cache. The PCA-6157 also supports 8 to 128 MB of on-board DRAM. It has two PCI EIDE interfaces (for up to four devices), a PCI SCSI-II interface, and an FDD interface (for up to two devices). Other features include two RS-232 serial ports (16C550 UARTs with 16-byte FIFO or compatible) and one enhanced parallel port (supports EPP/ECP). The card's high speed PCI EIDE controller supports mode 4 operation, which provides data transfer rates of over 16 MB/sec. and allows drive capacities of up to 8.4 GB for connecting tape drives, CD-ROMs, optical devices, etc.

In addition, the EBM3x-JA has a temperature sensor for the Pentium CPU. It automatically turns on the CPU cooling fan and outputs a CPU overheat alarm digital signal when the CPU temperature exceeds the upper-limit value set by BIOS. This ensures CPU card reliability and lengthens CPU life.

The PCA-6157's 32-bit passive PCI interface provides burst transfer speeds of up to 132 MB per second. The interface eliminates data transfer congestion and improves performance of high bandwidth applications such as graphics, video and LANs. The card also provides a standard ISA bus interface for non-PCI adapter cards, so you can still take advantage of the card's powerful on-board

PCI-EIDE and PCI SCSI-II controller when the card is plugged into an ISA bus passive backplane. You can also plug the PCA-6157 into a PCI/ISA passive backplane for use with high performance PCI-bus I/O cards.

The PCA-6157L does not have SCSI chip and temperature sensor.

The card has power on self test (POST) LEDs for quick and simple fault analysis. A backup of CMOS data is stored in the EEPROM, which protects data even after the battery has failed. The industrial-grade construction of this card allows it to withstand continuous operation in harsh environments at temperatures up to 140˚ F (60˚C). Also included is a 12-level watchdog timer, which resets the CPU or generates an interrupt if a program cannot be executed normally. This enables reliable operation in stand-alone or unattended environments.

Specifications

System

- **CPU**:
  Intel Pentium 75/90/100/120/133/150/166 MHz
- **Chipset**:
  Intel 82437FX "Triton" chipset for Pentium processor
- **BIOS**:
  AWARD, on-board POST (Power On Self Test) diagnostic function
- **Bus interface**: PCI and ISA (PC/AT) bus
- **Data bus**: 64-bit
- **Processing ability**: 64-bit
- **Bus speed**:
  ISA bus: 6.25~11 MHz
  PCI bus: ½ CPU clock
- **Cache memory size**: 256 KB
- **DMA channels**: 7
- **Interrupt levels**: 15

Memory

- **RAM memory**: Up to 128 MB on-board. Four 72-pin sockets (72-pin sockets accept 4, 8, 16 and 32 MB SIMMs)
- **Shadow RAM memory**: Supports system and video BIOS of up to 256 KB in 32 KB blocks

I/O

- **SMC 37C665 series Super I/O controller**
- **Floppy disk drive interface**: Supports up to two floppy disk drives, 5.25" (360 KB and 1.2 MB) and/or 3.5" (720 KB, 1.44 MB and 2.88 MB). BIOS enabled/disabled
- **Enhanced bi-directional parallel port**: Configurable to LPT1, LPT2, LPT3 or disabled. Standard DB-25 female connector provided. Supports EPP/ECP
- **Serial ports**: Two RS-232 ports with 16C550 UARTs (or compatible) with 16-byte FIFO buffer. Supports speeds up to 115 Kbps. Ports can be individually configured to COM1, COM2 or disabled.
- **Real time clock/calendar**: Dallas DS-12887 with lithium battery back-up for 10 years of data retention
- **PCI Enhanced IDE interface**: Supports up to four IDE (AT bus) large hard disk drives (up to 8.4 GB) or other enhanced IDE devices. Supports mode 4 (16.67 MB/sec. data transfer rate). BIOS enabled/disabled
- **Keyboard or PS/2 mouse connector**: A 6-pin mini DIN connector is located on the mounting bracket for easy connection to a keyboard or PS/2 mouse. An on-board keyboard pin header connector is also available.

NCR53C810 PCI-SCSI I/O Processor

- **SCSI drive interface**: The EBM3x-JA includes an internal connector to support SCSI-II drives.

Industrial features

- **Watchdog timer**: Can generate a system reset or IRQ11. Jumper configurable to always disabled or software programmable enabled/disabled. The timer interval is 0.5 ~ 1008 sec. (12 levels). Your program uses I/O ports hex 043 and 443 to control the watchdog timer.
- **EEPROM backup RTC data**: An EEPROM device that stores RTC data duplicates
- **CPU overheat protection**: A temperature-sensitive fan power connector and a CPU overheat alarm output to prevent and signal CPU overheating

*PCA-6157L does not have this feature.

General

- **Max. power requirements**: +5 V @ 5 A, ±12 V @ 0.1 A
- **Power supply voltage**: +5 V (+/- 5%), ±12 V (+/- 5%)
- **Operating temperature**: 0 ~ 60˚C (32 ~ 140˚F)
- **Storage temperature**: -20 ~ 80˚C (-4 ~ 176˚F)
- **Board size (L x W)**: 338 x 122 mm (13.3" x 4.8")
- **Board weight**: 0.5 kg (1.2 lb)

Jumpers and connectors

Connectors on the PCA-6157 board link it to external devices such as hard disk drives and keyboard. In addition, the board has a number of jumpers used to configure your system for your application.

The table below lists the function of each of the board jumpers and connectors. Later sections in this chapter give instructions on setting jumpers. Chapter 2 gives instructions for connecting external devices to your card.

List of Jumpers and Connectors

Number	Function
JP1	CPU clock select
JP2	Level 2 cache size select
JP3	Level 2 cache size select
JP4	Level 2 cache size select
JP5	Factory reserved
JP6	Keyboard or PS/2 mouse select
JP7	Onboard I/O chip enabled/disabled select
JP8	Flash BIOS Select
JP9	Flash BIOS Select
JP10~JP11	Factory reserved
JP12	Level 1 cache WB/WT select
JP13	Factory reserved
JP14	ISA bus clock select
JP15	Monitor mode select
JP16	CPU clock select
JP17~JP18	Factory reserved
JP19	Watchdog select

Number	Function
JP20	Factory reserved
JP21	Parallel port DMA channel select
JP22*	SCSI Enabled/Disable
JP23*	SCSI IRQ select 9/10/disable
J1	Reset switch
J2	External speaker connector
J3	Cooling fan power connector
J4	EIDE/SCSI LED connector
J5	Power LED and keylock
J6	Keyboard connector
J7	SMI switch
J8*	CPU temperature alarm output
CN1	1st EIDE connector
CN2	FDC connector
CN3	Parallel port connector
CN4	2nd EIDE connector
CN5*	SCSI II connector
CN6	DIN connector for keyboard or PS/2 mouse
COM1	Serial port 1
COM2	Serial port 2

*PCA-6157L does not support these features.

SIMM memory modules

At the left side of the card (away from the mounting plate) are the SIMM (Single In-line Memory Module) sockets which hold the card's DRAM memory. The sockets are arranged into two banks as follows: each pair of 72-pin SIMM-sockets is one bank (the left pair is Bank 0 and the right is Bank 1).

SIMM Allocation

SIMM No.	Bank	SIMM No.	Bank
SIMM 1	0	SIMM 3	1
SIMM 2	0	SIMM 4	1

SIMM configurations

The following table lists the possible SIMM combinations (8 MB ~ 128 MB) supported by the PCA-6157.

Total Memory	SIMM1	SIMM2	SIMM3	SIMM4
8 MB	4 MB	4 MB		
16 MB	4 MB	4 MB	4 MB	4 MB
16 MB	8 MB	8 MB		
24 MB	8 MB	8 MB	4 MB	4 MB
32 MB	8 MB	8 MB	8 MB	8 MB
32 MB	16 MB	16 MB		
40 MB	16 MB	16 MB	4 MB	4 MB
48 MB	16 MB	16 MB	8 MB	8 MB
64 MB	16 MB	16 MB	16 MB	16 MB
64 MB	32 MB	32 MB		
72 MB	32 MB	32 MB	4 MB	4 MB
80 MB	32 MB	32 MB	8 MB	8 MB
96 MB	32 MB	32 MB	16 MB	16 MB
128 MB	32 MB	32 MB	32 MB	32 MB

Initial inspection

Before you begin installing your card, please make sure that the following materials have been shipped:

- 1 PCA-6157 CPU card
- 1 Pentium CPU and cooling fan (optional)
- 1 User's manual
- 1 SCSI driver diskette (3½")* and 1 Bus master utility disk
- 1 Parallel port adapter (26-pin)
- 1 6-pin mini-DIN keyboard &PS/2 mouse adapter
- speaker/HDD access/reset harness.
- 1 FDD/2 EIDE cable and 1 SCSI cable

** Note: PCA-6157 only*

If any of these items are missing or damaged, contact your distributor or sales representative immediately.

We have carefully inspected the PCA-6157 mechanically and electrically before shipment. It should be free of marks and scratches and in perfect working order upon receipt.

As you unpack the PCA-6157, check it for signs of shipping damage (damaged box, scratches, dents, etc.). If it is damaged or it fails to meet the specifications, notify our service department or your local sales representative immediately. Also notify the carrier. Retain the shipping carton and packing material for inspection by the carrier. After inspection we will make arrangements to repair or replace the unit.

Caution! *Always ground yourself to remove any static charge before touching the CPU card. Modern electronic devices are very sensitive to static electric charges. Try to use a grounding wrist strap at all times. Place all electronic components in a static-dissipative surface or static-shielded bag when they are not in the chassis.*

Jumper settings

This section provides instructions on how to configure your card by setting jumpers. It also includes the card's default settings and your options for each jumper.

How to set jumpers

You configure your card to match the needs of your application by setting jumpers. A jumper is the simplest kind of electric switch. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" a jumper you connect the pins with the clip. To "open" a jumper you remove the clip. Sometimes a jumper consists of a set of three pins, labeled 1, 2 and 3. In this case you connect either pins 1 and 2, or 2 and 3.

A pair of needle-nose pliers may be useful when setting jumpers.

CPU type and clock speed (JP1, JP16)

The user can choose the CPU frequency by setting the clock generator jumper (JP1, JP16). If you change processor in the future, you must make sure that the jumpers are configured for the correct CPU clock speed. Do this before installing and applying power to the CPU board.

	JP1	JP16
Pentium 75 MHz		
Pentium 90 MHz		
Pentium 100 MHz (default)		
Pentium 120 MHz		
Pentium 133 MHz		
Pentium 150 MHz		
Pentium 166 MHz		

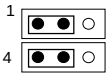
L2 cache size select (JP2, JP3, JP4)

With the PCA-6157, you can select an L2 cache size of 256 KB, 512 MB, or no cache, by setting JP2, JP3, and JP4:

	JP2	JP3	JP4
256 KB (default)			
512 KB			
No cache			

Keyboard or PS/2 mouse select (JP6)

The PCA-6157's DIN connector (CN6) provides two functions: keyboard input or PS/2 mouse input. JP6 should be set to the default configuration when using attached keyboard & PS/2 mouse adapter.

	Keyboard	PS/2 mouse
JP6	 (default)	

Onboard I/O chip enabled/disabled select (JP7)

The PCA-6157 has a built-in Super I/O chip (SMC37C665) for the FDD, parallel and serial ports. You can enable or disable the I/O chip by setting JP7.

	Enabled	Disabled
JP7		 (default)

BIOS chip selection

	EPROM BIOS	+5 V Flash (default)	+12 V Flash
JP8	1 		
JP9	1 		

L1 cache select (JP12)

The PCA-6157 has two L1 cache mode selections: write-back or write-through.

	Write-back	Write-through
JP12	1  (default)	

ISA bus clock select (JP14)

The ISA bus clock varies with the Pentium CPU bus clock. JP14 allows for two selections: $^{1}/_{6}$ CPU bus clock or $^{1}/_{8}$ CPU bus clock.

	$^{1}/_{6}$ CPU clock	$^{1}/_{8}$ CPU clock
JP14	1 	 (default)

The following table lists the clock for the Pentium 75/90/100/120/133/150/166MHz CPUs.

CPU	CPU clock
Pentium 75 MHz	50 MHz
Pentium 90 MHz	60 MHz
Pentium 100 MHz	66 MHz
Pentium 120 MHz	60 MHz
Pentium 133 MHz	66 MHz
Pentium 150 MHz	60 MHz
Pentium 166 MHz	66 MHz

Monitor mode select (JP15)

JP15 specifies the display adapter type that is attached to your PCA-6157.

	Color	Mono
JP15	1 	

Watchdog timer – system reset/IRQ11 (JP19)

When CPU processing has come to a halt, the watchdog timer can either reset the system or generate an interrupt on IRQ11. This can be set via a two-pin jumper (JP19) as shown below:

	IRQ11	System Reset
JP19	2 4 1 3 	 (default)

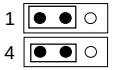
For information on programming the watchdog timer, see Appendix A.

Parallel port settings

The PCA-6157 supports an EPP/ECP (Enhanced Parallel Port/ Extended Capabilities Port) parallel port. The EPP/ECP port is much faster than previous standard ports due to the way information is passed through the bus and handled by the system. The system uses DMA (Direct Memory Access) for faster throughput and lower CPU loading. For this reason you need to configure the parallel port to handle the correct DMA channel.

DMA request output (JP21)

When the parallel port is operating in the ECP/EPP mode, it utilizes DMA (Direct Memory Access) for enhanced data transfer. The port acknowledges and requests data transfers to and from the DMA. The DMA channels available to the parallel port are DMA channels 1 and 3. The DMA channel to be used by the port is selectable by JP21.

	DMA 1	DMA 3
JP21	 (default)	

SCSI Function Select (JP22)*, (JP23)*

	Enable	Disable
JP22	 (default)	
JP23	 IRQ9 (default) IRQ10	

*PCA-6157L does not support this feature

Board layout

PCA-6157

CHAPTER 2

Connecting Peripherals

This chapter tells how to connect peripherals, switches and indicators to the PCA-6157 board. You can access most of the connectors from the top of the board while it is installed in the chassis. If you have a number of cards installed, or your chassis is very tight, you may need to partially remove the card to make all the connections.

The following table lists the connectors on the PCA-6157. For help locating the connectors, see Chapter 1.

Connectors

Label	Component
J1	Reset switch
J2	External speaker connector
J3	Cooling fan power connector
J4	EIDE/SCSI active LED
J5	Power LED and keylock
J6	Keyboard connector
J7	SMI switch
J8*	CPU temperature alarm output
CN1	1st EIDE connector
CN2	FDD connector
CN3	Parallel port connector
CN4	2nd EIDE connector
CN5*	SCSI II connector
CN6	DIN connector for keyboard or PS/2 mouse
COM1	Serial port 1
COM2	Serial port 2

*PCA-6157L does not have this feature.

Warning! *Always completely disconnect the power cord from your chassis whenever you work with the hardware. Do not make connections while the power is on. Sensitive electronic components can be damaged by sudden power surges. Only experienced electronics personnel should open the PC chassis.*

Caution! *Always ground yourself to remove any static charge before touching the CPU card. Modern electronic devices are very sensitive to static electric charges. As a safety precaution, use a grounding wrist strap at all times. Place all electronic components in a static-dissipative surface or static-shielded bag when they are not in the chassis.*

PCI EIDE hard drive connections (CN1, CN4)

The PCI EIDE (Peripheral Component Interconnect Enhanced Integrated Device Electronics) has been designed to support four IDE devices, including IDE HDD, CD-ROMs, and tape drives, through two EIDE ports.

CN1 is the first EIDE connector, and must be used first. CN4 is the second EIDE connector. Both EIDE provide data transfer rates of over 16MB/sec.

Floppy drive connections (CN2)

You can attach up to two floppy disk drives to the PCA-6157 on-board controller. You can use any combination of 5.25" (360 KB and 1.2 MB) and/or 3.5" (720 KB, 1.44 MB and 2.88 MB) drives.

The card comes with a 34-pin daisy-chain drive connector cable. On one end of the cable is a 34-pin flat-cable connector. On the other end are two sets of floppy disk drive connectors. Each set consists of a 34-pin flat-cable connector (usually used for 3.5" drives) and a printed-circuit-board connector (usually used for 5.25" drives). You can use only one connector in each set. The set on the end (after the twist in the cable) connects to the A: floppy. The set in the middle connects to the B: floppy.

Parallel port (CN3)

You normally use the parallel port to connect the card to a printer. The PCA-6157 includes an on-board parallel port, accessed through a 26-pin flat-cable connector, CN3. The CPU card comes with an adapter cable so you can use a traditional DB-25 connector. The cable has a 26-pin connector on one end and a DB-25 connector on the other, mounted on a retaining bracket. The bracket installs at the end of an empty slot in your chassis, giving you access to the connector.

SCSI-II internal connector (CN5)

The EBM3x-JA has a single 50-pin, dual in-line connector on the board for internal SCSI devices. Connection of SCSI devices requires special attention, especially when determining the last drive on the SCSI chain. Refer to your device's operating manual for detailed installation advice.

Keyboard connectors (J6, CN6)

The PCA-6157 board provides two keyboard connectors. A 5-pin connector (J6) supports passive backplane applications. A second 6-pin mini-DIN connector (CN6) on the card mounting bracket supports single-board-computer applications. The card comes with an adapter to convert from the 6-pin mini-DIN connector to a standard DIN connector.

PS/2 mouse connector (CN6)

The CN6 is a multi-function DIN connector. It can either be used for a keyboard or a PS/2 mouse. JP6 sets the function for keyboard input or for PS/2 mouse input. See "Jumper settings" in Chapter 1 to configure CN6 to PS/2 mouse input.

Reset switch (J1)

You can connect an external switch to easily reset your computer. This switch restarts your computer as if you had turned off the power then turned it back on. Install the switch so that it closes the two pins of J1.

External speaker (J2)

The CPU card has its own buzzer. You can also connect to the external speaker on your computer chassis. Connect leads to connector J2 as shown below.

External speaker (J2)

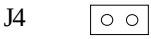
Pin no.	Function
1	Speaker out
2	Ground
3	Ground
4	+5 V_{DC}

Cooling fan power connector (J3)

The PCA-6157 provides an auto-switch power connector for CPU cooling fan. When the CPU temperature exceeds the upper-limit set in BIOS, the cooling fan power connector J3 automatically turns on. The cooling fan shuts off when the CPU is sufficiently cooled. J3 CAN ONLY BE USED FOR THE COOLING FAN! DO NOT USE IT FOR POWER INPUT!

EIDE SCSI active LED (J4)

You can connect a LED to connector J4 to indicate when any IDE/SCSI device is active. Marks on the circuit board indicate LED polarity (the pin on the right is positive).



Power LED and keylock (J5)

You can connect an LED to indicate when the CPU card is on. Pin 1 of J5 supplies power to the LED, and Pin 3 is the ground.

You can use a switch (or a lock) to disable the keyboard. In this state, the PC will not respond to any input. This is useful if you don't want anyone to change or stop a running program. Simply connect the switch between Pins 4 and 5 of J5. The pin assignments for J5 appear in the following table:

Power LED and keylock (J5)

Pin	Function
1	LED Power (+5 V)
2	No Connection
3	Ground
4	Keyboard lock
5	Ground

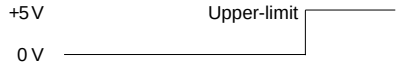
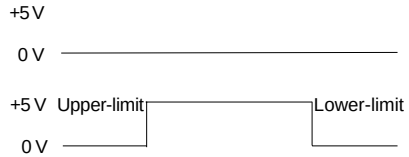
SMI switch (J7)

The PCA-6157 generates an external system management active interrupt. When J7 is given a short trigger, the CPU card could enter the sleep mode as part of the "Green Function".

CPU temperature alarm output (J8)

The EBM3x-JA provides three bits for CPU temperature overheat alarm output: TL, TH, and TCOM. These signals are used to enable the external alarm device. The following chart shows each pin assignment and their respective waveform.

CPU temperature alarm output (J8)

Pin	Function	Waveform
1	TH	
2	TCOM case 1: temperature rising case 2: temperature falling	
3	TL	
4	Ground	

The upper and lower limit values are set in BIOS. See Chapter 4.

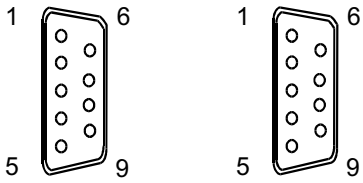
Serial ports (COM1, COM2)

The PCA-6157's two RS-232 serial ports let you connect serial devices (a mouse, printer, etc.) or a communication network. Serial ports are also known as COM ports: COM1 and COM2.

The serial ports are located on the card mounting bracket. This lets you access them through the back of the chassis when you install the card. The RS-232 standard is implemented in different ways with different devices. If you are having problems with a serial device, be sure to check the pin assignments, as shown in the following table:

RS-232 connector pin assignments

Pin	Signal
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI



COM1 **COM2**

CHAPTER 3

Power-up

After you have set the jumpers, installed SIMMs (Chapter 1), and made all external connections (Chapter 2), you are ready to power-up your system.

Follow the start-up procedure outlined in the manual for your chassis.

When you start your system, the BIOS will test the hardware and check the system configuration against the values stored in its CMOS memory.

Since this is the first time you are starting up, the BIOS will display an error message stating that the configuration does not match the stored values. You should then run the BIOS setup program as described in Chapter 4.

If the BIOS hardware diagnostic tests fail, you may see an error message on the screen describing the problem. If the BIOS found a problem early in the tests, you will need to check the BIOS POST (Power On Self Test) results, displayed on the eight LED indicators on the top of the card. See Appendix B for details.

The most common source of problems is incorrect jumper settings. Double check your settings (Chapter 1) and restart the system.

There are three methods you can use to restart your system after it is turned on:

1. Switch the power off, then on again.
2. Reboot the system. Using the keyboard, simultaneously press the CTRL, ALT and DEL keys.
3. Press the optional reset switch.

Use of each of these methods will erase data from the system RAM memory. If you can, save any data stored in memory to a hard or floppy disk before you reset your system.

CHAPTER 4

AWARD BIOS Setup

This chapter describes the card's diagnostic tests and how to set BIOS configuration data. BIOS POST (Power On Self Test) test codes appear in Appendix B.

System test and initialization

These routines test and initialize board hardware. If the routines encounter an error in during the tests, you will either hear a few short beeps or see an error message on the screen. There are two kinds of errors: fatal and non-fatal. The system can usually continue the boot up sequence with non-fatal errors. Non-fatal error messages usually appear on the screen along with the following instructions:

```
press <F1> to RESUME
```

Write down the message and press the F1 key to continue the bootup sequence.

If the routines encounter a fatal error, they will stop the tests and output a message indicating which test failed. If the fatal error comes before the screen device initializes, the card will indicate the error code through a series of beeps.

You can also determine the number of the test that failed by reading the LED indicators on the top of the PCA-6157 board. See Appendix B for details.

System configuration verification

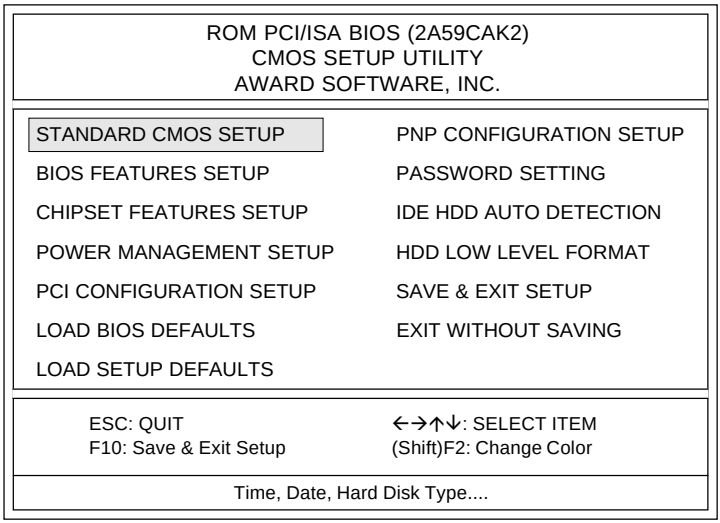
These routines check the current system configuration against the values stored in the card's CMOS memory. If they don't match, the program outputs an error message. You will then need to run the BIOS setup program to set the configuration information in memory.

There are three situations in which you will need to change the CMOS settings:

1. You are starting your system for the first time.
2. You have changed the hardware attached to your system.
3. The CMOS memory has lost power and the configuration information has been erased.

The PCA-6157's CMOS memory has integral lithium battery backup. The battery backup should last ten years in normal service, but when it finally runs down, you will need to replace the entire unit. Contact your sales representative or distributor for details.

AWARD BIOS Setup



Setup program initial screen

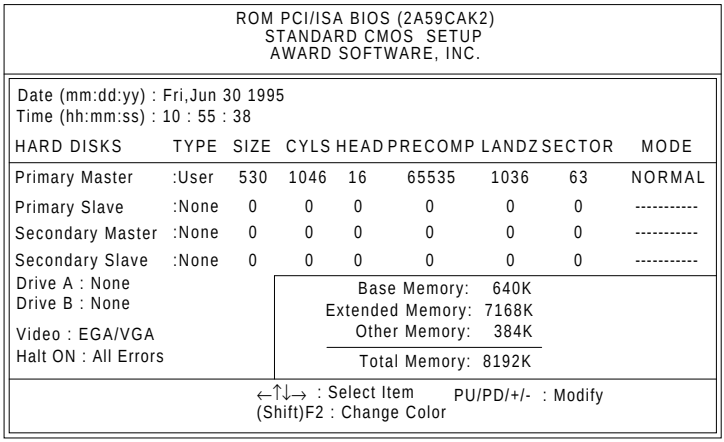
Award's BIOS ROM has a built-in Setup program that allows users to modify the basic system configuration. This type of information is stored in battery-backed RAM so that it retains the Setup information when the power is turned off.

Entering setup

Power on the computer and press <Del> immediately will allow you to enter Setup.

Standard CMOS setup

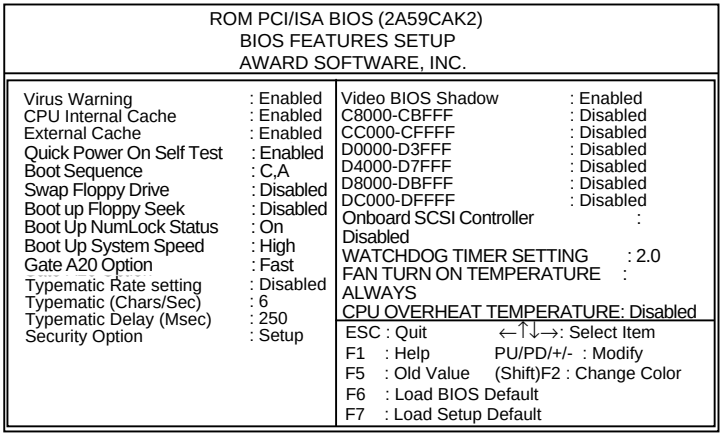
Choose the "STANDARD CMOS SETUP" option from the INITIAL SETUP SCREEN Menu and the below screen is displayed. The standard Setup Menu allows users to configure system components such as date, time, hard disk drive, floppy drive, display, and memory. In addition, it determines the way errors will be handled. Once a field is highlighted, on-line help information is displayed in the left bottom of the Menu screen.



CMOS setup screen

BIOS features setup

The BIOS features setup lists the BIOS items offered by Award, as well as the special enhanced features by Digital. The sample screen below contains the manufacturer's default values**.**



BIOS features setup

Note: If you enable the on-board SCSI controller, the BIOS will allocate 16 KB of address space for the SCSI to operate correctly. The address space allocated is from E800 to EBFF.

Virus Warning

During and after the systsem boots up, any attempt to write to the boot sector or partition table of the hard disk drive will halt the system. In this case, if Virus Warning is enabled, the following error message will automatically appear:

```
                !WARNING!
   Disk boot sector is to be modified
Type "Y" to accept write or "N" to abort
                write
          Award Software, Inc.
```

You can run the anti-virus program to locate the problem.

If Virus Warning is Disabled, no warning message will appear if anything attempts to access the boot sector or hard disk partition.

CPU Internal Cache/External Cache

Depending on the CPU/chipset design, these options can speed up memory access when enabled.

Quick Power On Self Test

This option speeds up the Power On Self Test (POST) conducted as soon as the computer is turned on. When enabled, BIOS shortens or skips some of the items during the test. When disabled, normal POST procedures assumes.

Boot Sequence

This function determines the sequence in which the computer will search the drives for the disk operating system (i.e. DOS). The default value is "A, C".

C,A	System will first search the hard drive, then the floppy drive.
A,C	System will first search the floppy drive, then the hard drive.

Boot Up Floppy Seek

During POST, BIOS will determine if the floppy disk drive installed is 40 or 80 tracks. 360 KB type is 40 tracks while 720 KB, 1.2 MB, and 1.44 MB are all 80 tracks.

Enabled	BIOS searches the floppy drive to determine if it is 40 or 80 tracks. Note that BIOS cannot differentiate 720 KB, 1.2 MB, and 1.44 MB type drives as they are all 80 tracks.
Disabled	BIOS will not search for the floppy drive type by track number. Note that there will not be any warning message if the drive installed is 360 KB.

Boot Up NumLock Status

The default is "On".

On	Keypad boots up to number keys.
Off	Keypad boots up to arrow keys.

Boot Up System Speed

Sets the speed of the system immediately after power up to high or low.

Gate A20 option

Normal	Keyboard
Fast	Chipset

Typematic Rate setting

The typematic rate determines the characters per second accepted by the computer. Typematic Rate setting enables or disables the typematic rate.

Typematic Rate (Char/Sec)

BIOS accepts the following input values (character/second) for Typematic Rate: 6, 8, 10, 12, 15, 20, 24, 30.

Typematic Delay (msec)

When holding down a key, the Typematic Delay is the time interval between the appearance of the first and second characters. The input values (msec) for this category are: 250, 500, 750, 1000.

Security Option

This setting determines whether the system will boot if the password is denied, while limiting access to Setup.

System	The system will not boot, and access to Setup will be denied if the correct password is not entered at the prompt.
Setup	The system will boot, but access to Setup will be denied if the correct password is not entered at the prompt.

Note: To disable security, select PASSWORD SETTING in the main menu. At this point, you will be asked to enter a password. Simply hit the <ENTER> key to disable security. When security is disabled, the system will boot, and you can enter Setup freely.

Video BIOS Shadow

This determines whether video BIOS will be copied to RAM, which is optional according to the chipset design. When enabled, Video Shadow increases the video speed.

C8000 - CFFFF Shadow/DC000-DFFFF Shadow

These determine whether optional ROM will be copied to RAM in blocks of 16 KB.

Enabled	Optional shadow is enabled
Disabled	Optional shadow is disabled

Onboard SCSI Controller

Enabled or disables the on-board SCSI controller.

Delay for SCSI/HDD (sec)

This allows time, in seconds, for BIOS to detect SCSI HDD devices.

Watchdog timer setting

The Watchdog timer setting determines the period of time between the halt in CPU processing and the Watchdog timer's reset signal.

Fan Turn On Temperature

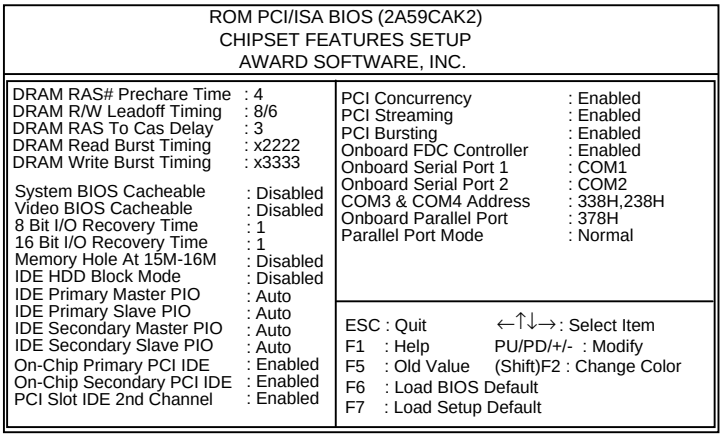
This sets the temperature limit of the CPU at which the cooling fan turns on.

CPU Overheat Temperature

The temperature limit of the CPU at which the alarm signal will output.

CHIPSET features setup

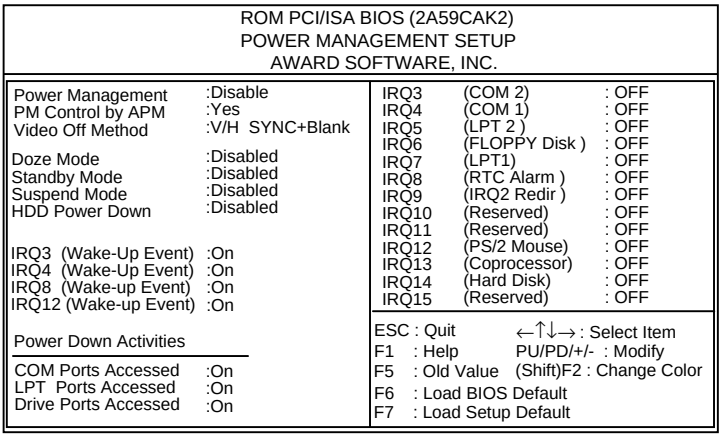
Chipset features setup allows you to modify the settings for functions associated with the chipset. This sample screen contains the manufacturer's default values for the PCA-6157**.**



CHIPSET features setup

Power management setup

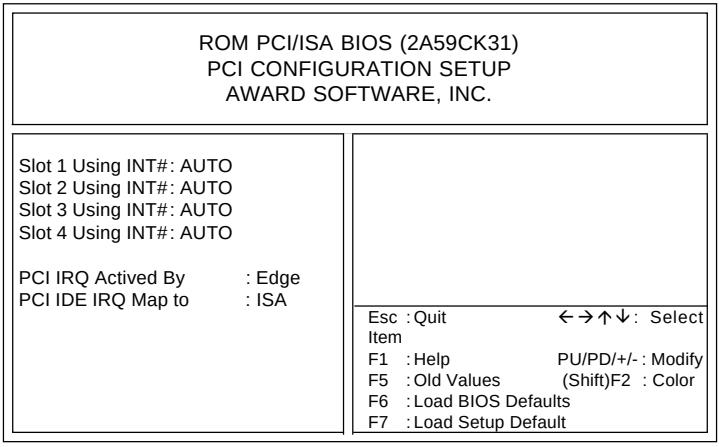
The power management setup controls the CPU card's "green" features. The following screen shows the manufacturer's default.



Power management

PCI configuration setup

This setup screen configures the PCI bus slots. All the slots use INTA#. If you install a card, you should set the card to INTA#.



PCI configuration

The PCA-6157 supports up to four PCI I/O devices. Each PCI device is assigned a different ID number (IDSEL#). Make sure that the backplane in your chassis uses the same IDSEL# for each PCI device number as your CPU card.

The table below lists the IDSEL# used by the PCA-6157.

PCI device#	IDSEL#
1	31
2	30
3	29
4	28

Slot Using INT#

This item has been set to AUTO to let the system automatically assign the device to an IRQ configuration. Improper setup may cause the system to fail, consult your dealer before making any changes.

Load BIOS defaults

"LOAD BIOS DEFAULTS" indicates the most appropriate values for the system parameters for minimum performance. These default values are loaded automatically if the stored record created by the Setup program becomes corrupted (and therefore unusable).

PNP configuration set-up

The following set-up screen configures the card for PNP functionality.

ROM PCI/ISA BIOS (2A59CAK2)
PNP CONFIGURATION SETUP
AWARD SOFTWARE INC.

Resources controlled by:	Manual	DMA-0	PCI/ISA PNP
Reset Configuration Data:	Disable	DMA-1	PCI/ISA PNP
		DMA-3	PCI/ISA PNP
IRQ-3 assigned to:	Legacy ISA	DMA-5	PCI/ISA PNP
IRQ-4 assigned to:	Legacy ISA	DMA-6	PCI/ISA PNP
IRQ-5 assigned to:	PCI/ISA PNP	DMA-7	PCI/ISA PNP
IRQ-7 assigned to:	Legacy ISA		
IRQ-9 assigned to:	Legacy ISA		
IRQ-10 assigned to:	PCI/ISA PNP		
IRQ-11 assigned to:	PCI/ISA PNP	ESC: QUIT	←↑↓→ : Select Item
IRQ-12 assigned to:	PCI/ISA PNP	F1 : Help	PU/PD/+/- : Modify
IRQ-14 assigned to:	Legacy ISA	F5 : Old Value	(Shift)F2 : Change Color
IRQ-15 assigned to:	Legacy ISA	F6 : Load BIOS Default	
		F7 : Load Setup Default	

PNP Configuration Setup

Assigning all the IRQ and DMA to read "Legacy ISA" will disable the PnP function support.

Load setup defaults

"LOAD SETUP DEFAULTS" loads the values required by the system for maximum performance.

Password setting

Choose "PASSWORD SETTING" from the CMOS setup screen to set, change, or disable the password.

IDE HDD auto detection

This utility automatically configures your hard disk parameters.

IDE low level format

Most hard disk drives are already set in low level format by the manufacturer. After extensive use, your hard disk may need to be reformatted. However, there are many other ways to maintain your hard disk. This option should be your last resort.

Save & Exit setup

This option saves the CMOS values entered in Setup Utilities and exits Setup.

Exit without change

Selecting this option lets you exit the Setup program without recording any new values or changing old ones.

CHAPTER 5

SCSI Drive Installation

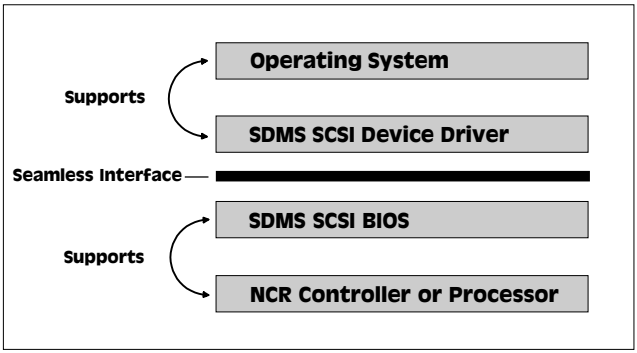
This chapter describes how to use the NCR SCSI Device Management System (SDMS). It covers the features, description, installation and command line options for:

- DOS/Windows
- OS/2
- SCO UNIX
- NetWare
- Windows NT

General Description

The NCR SCSI Device Management System (SDMS) is a complete software package that solves the increasingly complex problem of managing system I/O. It seamlessly addresses hardware and software interfaces by supporting the NCR family of SCSI processors and controllers, and a wide range of SCSI peripheral devices, while offering interoperability across application programs, operating systems, and host platforms. SDMS consists of a resident SCSI BIOS that manages all SCSI controller or processor specific functions, and a series of SCSI device drivers that provide operating system and peripheral specific support.

SDMS provides a standard method to interface SCSI I/O subsystems with devices, operating systems, and application software. It also enhances system capabilities already provided by SCSI controllers and processors by facilitating multi-threaded I/O support, system-wide SCSI device access, and creation of new applications.



The NCR SCSI Device Management System

Overview

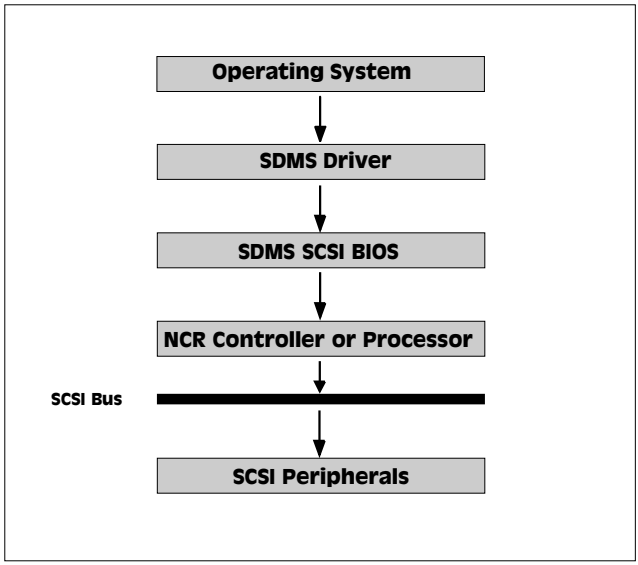
An NCR SCSI controller or processor can control peripherals such as hard disk drives, CD-ROM drives, tape drives, and removable media. SCSI peripherals are “intelligent” devices that do not need the constant attention required by “non-intelligent” devices. Up to 15 SCSI peripheral devices can be connected (via the SCSI bus) to a SCSI host bus adapter card on which the SCSI controller or processor resides. A SCSI host bus adapter can also function as a secondary adapter in a system which already has a primary hard drive controller card (lDE, ESDI, ST506). Only SCSI host bus adapters will do this, expanding the possibilities for system configuration.

SCSI BIOS

A SCSI BIOS is the bootable ROM code that manages SCSI hardware resources. It is specific to a family of NCR SCSI controllers or processors. An NCR SCSI BIOS integrates with a standard system BIOS, extending the standard disk service routine provided through INT13. It is also responsible for processing and executing SCSI requests communicated from a SCSI device driver or application. An important feature of the SCSI BIOS is that it is completely operating system independent. All ROM based SCSI BIOS support booting from a SCSI hard disk and can be ported to a variety of hardware platforms. They also support 16- and 32-bit operating systems running under real or protected addressing modes.

The NCR SCSI BIOS provides a hardware independent interface which isolates the operating system drivers and SCSI application programs from the underlying hardware. This enables a single driver to work with any host adapter or SCSI controller which has an NCR SCSI BIOS. During its boot time initialization, the SCSI 8I05 determines if another hard disk is already installed. If there is, the SCSI BIOS will map any SCSI drives it finds behind the drive already installed. Otherwise, the SCSI BIOS will install drives starting with the system boot drive. In this case, the system will boot from a drive controlled by the SCSI BIOS. If the operating system used is DOS 5.0 or above, the SCSI BIOS allows access to

a maximum of eight SCSI hard disks via INT13. The number controlled by the SCSI BIOS depends on the number of non-SDMS controlled disk drives in the system. For more information on SCSI BIOS control of hard disk drives, see Device Drivers for Windows Section.



SDMS Information Flow

SCSI Device Drivers

The SCSI device drivers translate an operating system I/O request into a data structure, and transport the structure to the SCSI BIOS (see above figure). An NCR SCSI device driver is operating system specific, but completely hardware independent. The hardware specifics are addressed by the SCSI BIOS.

Although a driverless solution exists for the DOS operating system, and provides adequate support for many applications, loading a driver (or drivers in some cases) will provide additional features. Connecting peripherals other than hard disk drives, for example, requires loading the appropriate driver(s).

The following Sections provide information on the use and installation of these drivers within each operating system.

Before you begin

SDMS software requires an IBM PC/AT or compatible computer with an 80386 or higher microprocessor. An understanding of basic operating system commands is assumed. In addition, users of this manual should have a general knowledge of the SCSI standard. For background information on this subject, refer to the SCSI-2 specification or the book SCSl: Understanding the Small Computer System Interface. Sources for these publications are listed in the preface of this document. Before using the SDMS software, the NCR SCSI controller should be configured into your system, taking into account the configuration of other host bus adapters and system resources (see Basic Rules... listed below). *Note: NCR recommends that all data be backed up before making any changes or installing any software, including NCR SCSI controllers and software. Failure to adhere to this accepted computer practice may lead to loss of data.*

Basic rules for SCSI host bus adapter and device installation

- Both ends of the SCSI bus must be terminated. Refer to the hardware manuals for the devices and the host bus adapter to determine what the terminators are, and where they are located.
- Each SCSI device must be configured with a different ID number. Refer to the hardware manuals for the devices and the host bus adapter to locate where the jumpers or dip switches are for setting ID numbers. Usually the host bus adapter is ID 7. The devices are then set at IDs 0 through 6 (plus 8 through 15 for wide SCSI). The bootable hard drive must have the lowest numerical ID.
- The red or blue line on a standard SCSI cable (or the black line on one end of a multicolored SCSI cable) designates pin one on the cable connector and must connect to pin one on the device or host bus adapter connector. Refer to the hardware manuals for the devices and the controller to locate pin one of the connector.

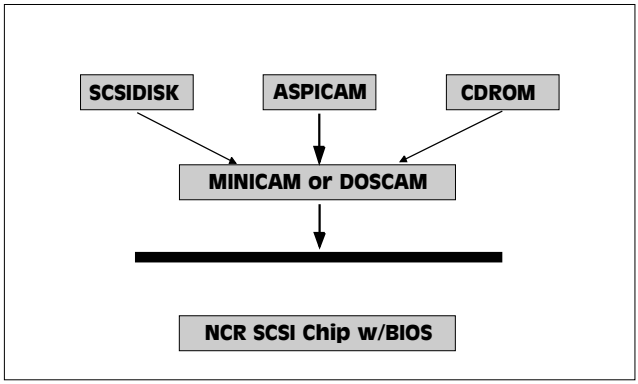
- If the system already has an internal bootable hard drive (lDE, ESDI, ST506), the drivers for the SCSI device(s) must reside on the internal bootable hard drive.
- For non-PCI devices, whenever installing multiple host bus adapters in one system, each card must be set to a different base BIOS address, as long as the primary adapter has a lower base BIOS address than the secondary adapters. Also, make certain each adapter is set to a different base I/O address and IRQ .

Device drivers for DOS/Windows

Introduction

In SDMS 3.0, the SCSI BIOS for each of the NCR family of PC SCSI chips is capable of mapping SCSI hard disk drives behind any non-SCSI hard disk drives (IDE, ESDI, etc.) within the same system. A driverless solution will allow up to eight hard drives (SCSI and non-SCSI) to be connected under DOS 5.0 and above. The SCSI BIOS also supports removable drives with 512-byte sectors as long as the media is in the drive at boot-up and remains in the drive during system operation.

Low level Virtual DMA Services (VDS) are supported by the SCSI BIOS. Therefore, to gain maximum performance, any double buffer option provided by disk caching software (such as Microsoft's SMARTDRV.EXE) should be disabled for all drives handled through SDMS. For full VDS support, including features such as scatter-gather, DOSCAM must be loaded in the CONFIG.SYS file. Connecting peripherals other than hard disk drives will also require loading the appropriate driver(s). Some of the drivers work together, and some are capable of direct communication with an NCR SCSI BIOS (see the diagram below). The following sections list these drivers, their features, and their loading requirements.



Possible device driver to BIOS communication paths

About the ProSCSI installation utility

The NCR SDMS ProSCSl installation utility provides a quick and easy method for performing either an automatic or custom installation of the SCSI device drivers in a DOS/Windows environment. It will work with any system using an SDMS supported ROM BIOS based NCR SCSI chip. The installation utility will identify the system, scan the SCSI bus, and properly install the needed SCSI device drivers. An on-line help feature makes this utility very user friendly.

The SDMS SCSI Drivers disk also holds the ProSCSI installation utility. To use the utility, insert the disk while in the DOS environment, and type:

```
INSTALL
```

Then, follow the directions presented on the screen. When performing a custom install, understanding of the information presented in the following sections for manual installation may still prove useful.

MINICAM.SYS

Features

- Supports single-threaded I/O
- Supports multiple host adapters (with SCSIDISK.SYS)
- Supports multiple Logical Unit Numbers (LUNs)
- Releases initialization code for smaller runtime size
- Has smaller runtime size than DOSCAM.SYS

Description

The function of the MINICAM.SYS driver is primarily to execute SCSI I/Os. This driver can also be used to support Advanced SCSI Programming Interface (ASPI) applications (in conjunction with ASPICAM.SYS). This allows the use of additional SCSI devices such as tape drives and scanners.

Installation

1. Use the COPY command to copy the MINICAM.SYS driver from the SDMS SCSI Drivers disk to your boot disk.
2. Add this line to your system's CONFIG.SYS file:

```
DEVICE=C:<PATH>MINICAM.SYS
```

Command Line Options

The MINICAM.SYS device driver has embedded functions which can be accessed via switches on the command line. These options are described below.

Using the /ASK Option

This option prompts the user at system boot-up whether to load MINICAM.SYS or not. For example, the line in CONFIG.SYS that loads MINICAM.SYS would look like this:

```
DEVICE=C:<PATH>MINICAM.SYS /ASK
```

Using the /T=n Option

MINICAM.SYS uses a time out mechanism to detect certain errors. When MINICAM.SYS issues a command to a SCSI device, a timer is started. If the timer expires before the command completes, MINICAM.SYS assumes that something has gone wrong with the device, and takes steps to recover. The default value for this time-out is no time out (to accommodate slow devices such as scanners). The time out value can be specified as an argument to MINICAM.SYS in the CONFIG.SYS file. This argument consists of a /T=n parameter, where n is the number of seconds you want it to wait before timing out. For example, the line in CONFIG.SYS that loads MINICAM.SYS would look like this:

```
DEVICE=C:<PATH>MINICAM.SYS /T=4
```

/T is the time out option, and 4 is the number of seconds you want it to wait before timing out.

Troubleshooting

- THE COMPUTER LOCKS UP AND WILL NOT COMPLETE BOOTING FROM A NON-SCSI HARD DISK DRIVE.

  a. Refer to the drive manufacturer's user manual.

- THE COMPUTER LOCKS UP AND WILL NOT COMPLETE BOOTING FROM A SCSI HARD DISK DRIVE.

  a. Is the SCSI BIOS seen during boot?

  Note: If the SCSI BIOS is seen during boot, a banner similar to the following will appear:

  ```
  NCR SDMS (TM) v3.0 PCI BIOS, PCI Rev. 2.0
  Copyright 1993 NCR Corporation
  NCRPCI-3.04.00
  ```

  YES Go to b.

  NO Power down all units in the system.

  Remove all SCSI cables.

  Boot system. Is the SCSI BIOS seen during boot?

YES Power down all units in the system.

Reconnect and cheek all cable and power connections.

Boot system.

Go to a.

NO Power down all units in the system.

Re-seat the host bus adapter.

Check jumper settings.

Applicable jumpers may include:

IRQ

ROM address

SCSI chip address

DMA channel

Check CMOS setup.

Boot system.

Go to a.

b. Does the SCSI BIOS see the bootable SCSI drive?

Note: When the computer boots, SDM will scan the SCSI bus. Devices found on the SCSI bus will be identified as in the following lines:

```
ID 00 QUANTUM LP52S
ID 02 SONY CD-ROM
```

YES Go to c.

NO Power down all units in the system.

Make sure the hard drives have different ID numbers (boot drive should have lowest ID).

Make sure both ends of the SCSI bus are terminated.

Check all cable and power connections.

Check CMOS setup.

Boot system.

Go to a.

c. If boot is still unsuccessful, go to the following item.

d. Make sure the hard drives have different ID numbers (boot drive should have lowest ID).

e. Make sure both ends of the SCSI bus are terminated.

f. Check all cable and power connections.

g. Boot the system.

- THE COMPUTER LOCKS UP WHILE TRYING TO LOAD MINICAM.SYS WITH EMM386.

  a. Load MINICAM.SYS before EMM386. The only adverse effect is that the driver may not then be loaded high.

DOSCAM.SYS

Features

- Performs synchronous negotiation (including fast SCSI)
- Has full Virtual DMA Services (VDS) support (including scatter-gather)
- Performs Wide SCSI negotiation
- Allows tagged command queuing
- Supports multiple host adapter (with SCSIDISK.SYS)
- Supports multi-threading
- Allows Disconnect/Reselect

Description

DOSCAM.SYS has all of the features and functionality of MINICAM.SYS, but whenever one of the above features is required DOSCAM.SYS should be loaded instead. Synchronous negotiation will allow data transfers of 5 MB/sec. (up to 10 MB/sec. for fast SCSI, and 20 MB/sec. for fast wide SCSI). Tagged command queuing provides a performance improvement under multi-threaded I/O operating systems.

Installation

1. Use the COPY command to copy the appropriate driver from the SDMS SCSI Drivers disk to your boot disk.
2. Add this line to your system's CONFIG.SYS file:

```
DEVICE=C:<PATH>DOSCAM.SYS
```

Command Line Options

The DOSCAM.SYS device driver has several embedded functions which can be accessed via switches on the command line.

Using the /RAMCOPY Option

RAMCOPY is an embedded command which tells the drivers to load the ROM on the controller card into RAM, thereby increasing the performance of the SCSI ROM.

Note: Although it increases performance, this option will use more RAM.

For example, the line in CONFIG.SYS that loads DOSCAM would look like this:

```
DEVICE=C:<PATH>DOSCAM:SYS /RAMCOPY
```

Upon boot, the RAMCOPY command will be executed and ROM will load into RAM. The first ROM will be copied into expanded memory if available.

Using the /T=n Option

DOSCAM.SYS uses a time out mechanism to detect certain errors. When DOSCAM SYS issues a command to a SCSI device, a timer is started. If the timer expires before the command completes, DOSCAM.SYS assumes that something has gone wrong with the device, and takes steps to recover. The default value for this tune-out is no time out (to accommodate slow devices such as scanners). If this option is desired, the time out value must be specified as an argument to DOSCAM.SYS in the CONFIG.SYS file. This argument consists of a /T=n parameter, where n is the number of seconds you want it to wait before timing out. For example, the line in CONFIG.SYS that loads DOSCAM.SYS would look like this:

```
DEVICE=C:<PATH>DOSCAM.SYS /T=4
```

/T is the time out option and 4 is the number of seconds you want it to wait before timing out.

Using the /ASK Option

This option prompts the use at system boot-up whether to load DOSCAM.SYS or not. For example, the line in CONFIG.SYS that loads DOSCAM.SYS would look like this:

```
DEVICE=C:<PATH>DOSCAM.SYS /ASK
```

Troubleshooting

- THE COMPUTER LOCKS UP AND WILL NOT COMPLETE BOOTING FROM A NON-SCSI HARD DISK DRIVE.

  a. Refer to the drive manufacturer's user manual.

- THE COMPUTER LOCKS UP AND WILL NOT COMPLETE BOOTING FROM A SCSI HARD DISK DRIVE.

  a. Is the SCSI BIOS seen during boot?

  Note: If the SCSI BIOS is seen during boot, a banner similar to the following will appear:

```
NCR SDMS (TM) v3.0 PCI BIOS, PCI Rev. 2.0
Copyright 1993 NCR Corporation
NCRPCI-3.04.00
```

YES Go to b.

NO Power down all units in the system.

Remove all SCSI cables.

Boot system.

Is the SCSI BIOS seen during boot?

YES Power down all units in the system.

Reconnect and check all cable and power connections.

Boot system.

Go to a.

NO Power down all units in the system.

Reseat the host bus adapter.

Check jumper settings.

Applicable jumpers may include:

IRQ

ROM address

SCSI chip address

DMA channel

Check CMOS setup.

Boot system.

Go to a.

b. Does the SCSI BIOS see the bootable SCSI drive?

Note: When the computer boots, SDMS will scan the SCSI bus. Devices found on the SCSI bus will be identified as in the following lines:

```
ID 00 QUANTUM LP52S
ID 02 SONY CD-ROM
```

YES Go to c.

NO Power down all units in the system.

Make sure the hard drives have different ID numbers (boot drive should have lowest ID).

Make sure both ends of the SCSI bus are terminated.

Check all cable and power connections.

Check CMOS setup.

Boot system.

Go to a.

c. If boot is still unsuccessful, go to the following item.

- THE DEVICE DRIVER DOES NOT RECOGNIZE ONE OF THE NON-BOOT SCSI PERIPHERALS (system may lock up).

  a. Make sure the drivers were installed in the correct sequence.

  b. Make sure the drivers' CONFIG.SYS line has the correct path to the drivers.

  c. Power down all units in the system.

  d. Make sure the hard drives have different ID numbers (boot drive should have lowest ID).

  e. Make sure both ends of the SCSI bus are terminated.

  f. Check all cable and power connections.

  g. Boot the system.

- THE COMPUTER LOCKS UP WHILE TRYING TO LOAD DOSCAM.SYS WITH EMM386.

  a. Load DOSCAM.SYS before EMM386. The only adverse effect is that the driver may not then be loaded high.

SCSIDISK.SYS

Features

- Support for removable media devices
- Supports non 512-byte sectors (1024, 2048, 4096)
- Supports multiple logical unit number (LUN) support
- Supports multiple host adapters (with DOSCAM.SYS or MINICAM.SYS)
- Provides software write protection
- Can reserve drive letters

Description

SCSIDISK.SYS is needed when connecting more than eight drives under DOS 5.0 and above. It is also required for drives with non 512-byte sectors and for removable drives if the user wants to change the media. As illustrated in Figure 2-1 at the beginning of this chapter, SCSIDISK.SYS works through MINICAM.SYS or DOSCAM.SYS, so one of these drivers must also be loaded.

Installation

1. Use the COPY command to copy the appropriate drivers from the SDMS SCSI Drivers disk to your boot disk.
2. The lines shown below must be added to your system's CONFIG.SYS file. The MINICAM.SYS or DOSCAM.SYS driver is also required. List the drivers in this sequence:

```
DEVICE=C:<PATH> MINICAM.SYS
DEVICE=C:<PATH> SCSIDISK.SYS
```

Command Line Options

The SCSIDISK.SYS device driver has several embedded functions which can be accessed via switches on the command line. These options are described below, and use the following conventions:

[] items in brackets are optional

* items in brackets followed by an * means repeat 0 or more times

| choose one of the given items

Please be aware that using spaces in specifying a command line option is not allowed.

Using the /ASK Option

This option prompts the user at system boot-up whether to load SCSIDISK.SYS or not. To use this option, the line in CONFIG.SYS which loads SCSIDISK.SYS should look like this:

```
DEVICE=C:<PATH>SCSIDISK.SYS /ASK
```

Using the /UNITS= Option

SCSIDISK.SYS allows the use of removable media, such as cartridge hard drives, each of which might have a different number of partitions. If media with different numbers of partitions are used, this option should be set to the maximum number of partitions on any one media. To use this option, the line in CONFIG.SYS that loads SCSIDISK.SYS should look like this:

```
DEVICE=C:<PATH>SCSIDISK.SYS /
UNITS=path:id:lun:num_units
[,path:id:lun:num units]*
```

For example, if there is a removable media drive at the first host adapter set to id 2, and three partitions must be reserved, the command line should be:

```
DEVICE=C:<PATH>SCSIDISK.SYS /UNITS=0:2:0:3
```

Remember, no spaces are allowed in specifying a command line option for SCSIDISK.SYS.

When SCSIDISK.SYS initializes, it will default to either:

a. One drive letter for a removable media device with no media present.

b. The number of partitions found on the media in the removable media device.

Note: The full path, id, lun, and num_units values are required for this option. Also, there is a limit of 24 device options.

Using the /PROTECT= Option

This option write-protects MS-DOS volumes on a SCSI hard drive. This option only works for drives controlled by SDMS. Any write attempt will return a Write Protected Media error code. To enable the write protection option, the line in CONFIG.SYS that loads SCSIDISK.SYS should look like this:

```
DEVICE=C;<PATH>SCSIDISK.SYS /PROTECT=drive
letter
[drive_letter]*
```

A drive_letter is any letter in the range 'C' ~ 'Z': Remember, no spaces are allowed in specifying a command line option for SCSIDISK.SYS.

Using the /EXCLUDE= Option

This option allows a user to exclude a 'path:id:lun' combination from being scanned or controlled by SCSIDISK.SYS. The path parameter is mandatory with all ids and luns for that path excluded by default if just the path is specified. To use this option, the line in CONFIG.SYS that loads SCSIDISK.SYS should look like this:

```
DEVICE=C:<PATH>SCSIDISK.SYS /
EXCLUDE=path[:id[:lun]]
[,path[:id[:lun]]]*
```

As an example, for path 0, id 2, and lun 0 the command line should be:

```
DEVICE=C:<PATH>SCSIDISK.SYS /EXCLUDE=0:2:0
```

Remember, no spaces are allowed in specifying a command line option for SCSIDISK.SYS.

Note: It is illegal to exclude a device for which an NCR boot ROM is providing an INT 13 interface. SCSIDISK.SYS will print an error message and will control those devices. Also, there is a limit of 24 ‘path:id:lun’ combinations allowed.

Using the /SSIZE= Option

SCSIDISK.SYS will default to the largest sector size found during boot. If no media is found in a removable media device, SCSIDISK.SYS will assume a 512 byte sector size. This option can overcome this default: To use this option, the line in CONFIG.SYS that loads SCSIDISK.SYS should look like this:

```
DEVICE=C:<PATH>SCSIDISK.SYS /
SSIZE=512|1024|2048|4096
```

For example, if a removable media drive is used that has a sector size of 2048 bytes, the command line should be:

```
DEVICE=C:<PATH>SCSIDISK.SYS /SSIZE=2048
```

Remember, no spaces are allowed in specifying a command line option for SCSIDISK.SYS.

Note: If SCSIDISK.SYS comes across a sector size larger than the one specified in this option, or if it finds a sector larger than the default, it will refuse to read/ write to that media. It will report an invalid media error to DOS.

Troubleshooting

- THE COMPUTER LOCKS UP AND WILL NOT COMPLETE BOOTING FROM A NON-SCSI HARD DISK DRIVE.

  a. Refer to the drive manufacturer’s user manual.

- THE COMPUTER LOCKS UP AND WILL NOT COMPLETE BOOTING FROM A SCSI HARD DISK DRIVE.

a. Is the SCSI BIOS seen during boot?

Note: If the SCSI BIOS is seen during boot, a banner similar to the following will appear:

```
NCR SDMS (TM) v3.0 PCI BIOS, PCI Rev. 2.0
Copyright 1993 NCR Corporation
NCRPCI-3.04 00
```

YES Go to b.

NO Power down all units in the system.

Remove all SCSI cables.

Boot system.

Is the SCSI BIOS seen during boot?

YES Power down all units in the system.

Reconnect and check all cable and power connections.

Boot system.

Go to a.

NO Power down all units in the system.

Reseat the host bus adapter.

Check CMOS setup.

Boot system.

Go to a.

b. Does the SCSI BIOS see the bootable SCSI drive?

Note: When the computer boots, SDMS will scan the SCSI bus. Devices found on the SCSI bus will be identified as in the following lines:

```
ID 00 QUANTUM LP52S
ID 02 SONY CD-ROM
```

YES Go to c.

NO Power down all units in the system.

Make sure the hard drives have different ID numbers (boot drive should have lowest ID),

Make sure both ends of the SCSI bus are terminated.

Check all cable and power connections.

Check CMOS setup.

Boot system.

Go to a.

c. If boot is still unsuccessful, go to the following item.

- THE DEVICE DRIVER DOES NOT RECOGNIZE ONE OF THE NON-BOOT SCSI PERIPHERALS (system may lock up).

  a. Make sure the drivers were installed in the correct sequence.

  b. Make sure the drivers' CONFIG.SYS line has the correct path to the drivers.

  c. Power down all units in the system.

  d. Make sure the hard drives have different ID numbers (boot drive should have lowest ID),

  e. Make sure both ends of the SCSI bus are terminated.

  f. Check all cable and power connections.

  g. Boot the system.

CDROM.SYS

Features

- Compatible with Microsoft's CD-ROM Extension 2.21 and above
- Multi-session Photo CD support

Description

CDROM.SYS is needed whenever a CD-ROM device is connected on the SCSI bus. It must be loaded in conjunction with Microsoft's CD-ROM Extension 2.21 or above (MSCDEX.EXE). Because CDROM.SYS communicates with the SCSI BIOS through MINICAM.SYS or DOSCAM.SYS, so one of these drivers must be loaded to use CDROM.SYS.

Installation

1. Use the COPY command to copy the appropriate driver from the SDMS SCSI Drivers disk to your boot disk.

2. Add CDROM.SYS to your CONFIG.SYS file. It goes in after MINICAM.SYS or DOSCAM.SYS and SCSIDISK.SYS (if these drivers are also being used), in this order:

   ```
   DEVICE=C:<PATH>MINICAM.SYS

   DEVICE=C:<PATH>SCSIDISK.SYS

   DEVICE=C:<PATH>CDROM.SYS /D:NAME
   ```

   Note: The /D: is not a drive letter designation; it indicates the name you wish assigned to your CD-ROM. The NAME must be included, and can be any combination of up to 8 characters.

3. To ensure that sufficient drive letters are available to identify all devices connected to the SCSI bus, add the MS-DOS LAST DRlVE command to the CONFIG.SYS file:

   ```
   LASTDRIVE=x
   ```

   With x specifying a drive letter in the range C through Z. The letter assigned to LASTDRIVE represents the last valid drive MS-DOS is able to recognize and also represents the maximum number of drives available. For example, LASTDRIVE=K allows access to eleven (11) logical drives. For further details about LASTDRIVE, consult your MS-DOS manual.

4. Unless your CD-ROM access software specifies otherwise, Microsoft's CD-ROM Extension (MSCDEX.EXE) should execute from the AUTOEXEC.BAT file in order to access your drive. Add the following line to your AUTOEXEC.BAT file:

   ```
   <PATH>MSCDEX /D:NAME
   ```

   For example, if

   ```
   DEVICE=C:<PATH>CDROM.SYS /D:MY_CD
   ```

   is in CONFIG.SYS, then:

   ```
   <PATH>MSCDEX /D:MY_CD
   ```

   should be in the AUTOEXEC.BAT file.

5. Check installation instructions for the CD-ROM drive itself. There may be other parameters necessary to include with MSCDEX.

6. When MSCDEX is loaded during the AUTOEXEC.BAT file execution, a message is returned assigning a drive letter to the CD-ROM drive. For example:

   ```
   DRIVE E = DRIVER MY_CD UNIT 0
   ```

   This informs you that the CD-ROM drive is recognized and ready for use.

Command Line Options

The CDROM.SYS device driver has one embedded function available, which can be accessed via a switch on the command line.

Using the /ASK Option

This option prompts the user at initialization tune whether to load CDROM.SYS or not. For example, the line in CONFIG.SYS that loads CDROM.SYS would look like this:

```
DEVICE=C:<PATH>CDROM.SYS /D:MY_CD/ASK
```

Using the /UPTOLUN= Option

This option is used to support multiple LUNs per Target ID on the SCSI bus. It is needed to support CDROM changers that hold several CDs at one tune, such as the Pioneer DRM604x. For example, the line in CONFIG.SYS that loads CDROM.SYS would look like this:

```
DEVICE=C:<PATH>CDROM.SYS /D:MY_CD/
UPTOLUN=x
```

Where 'x' is in the range of 0 to 7. It uses LUN 0 through LUN x to assign a separate drive letter for each of the x+1 CDs in the CD magazine. The CDROM.SYS driver defaults to supporting LUN 0 only.

Troubleshooting

- THE CD-ROM DRIVE IS NOT SEEN AT BOOTTIME, OR THE SYSTEM LOCKS UP.

  a. Make sure the driver is installed and in the correct sequence.

  b. Make sure the driver's CONFIG.SYS line has the correct path to the driver.

  c. Make sure MSCDEX, in the AUTOEXEC.BAT, has the same drive name as the CDROM driver in the CONFIG.SYS file.

  d. Make sure there is no ID or drive letter designation conflict.

  e. Power down all units in the system.

  f. Check the cable and power connections.

  g. Make sure both ends the SCSI bus are terminated.

ASPICAM. SYS

The ASPICAM.SYS supportsAdvanced SCSI Programming Interface (ASPI) applications

Description

ASPICAM.SYS is an ASPI manager which provides an interface to popular ASPI applications. Because ASPICAM.SYS communicates with the SCSI BIOS only through MINICAM.SYS or DOSCAM.SYS. It must be loaded (after either MINICAM.SYS or DOSCAM.SYS) whenever running an ASPI application. Some of the ASPI applications supported under DOS include CorelSCSI!, Sytos Plus, and Central Point Tape Backup. These provide support for tape, WORM, scanner, and other SCSI peripherals.

Installation

1. Use the COPY command to copy the ASPICAM.SYS driver from the SDMS SCSI Drivers disk to your boot disk.
2. Add ASPICAM.SYS to your system's CONFIG.SYS file after MINICAM.SYS or DOSCAM.SYS. For example, the lines in your CONFIG.SYS file might look like this:

```
DEVICE=C:<PATH>DOSCAM.SYS
DEVICE=C:<PATH>ASPlCAM.SYS
```

Command Line Options

There are no command line options with ASPICAM.SYS.

Troubleshooting

- SYSTEM LOCKS UP AT BOOTTIME.
  a. Make sure no other ASPI manager is loaded.
  b. Check for correct loading sequence in the CONFIG.SYS file.
  c. Boot the system.
- THE DEVICE DRIVER DOES NOT RECOGNIZE ONE OF THE NON-BOOT SCSI PERIPHERALS (system may lock up).
  a. Make sure the drivers were installed in the correct sequence.
  b. Make sure the drivers' CONFIG.SYS line has the correct path to the drivers.
  c. Power down all units in the system.

d. Make sure all SCSI devices have unique D numbers.

e. Make sure both ends of the SCSI bus are terminated.

f. Check all cable and power connections.

g. Boot the system.

Important additional information

Assignment of Drive Letters

The MS-DOS operating system assign drive letters to primary partitions first. After the primary partitions have been assigned drive letters the logical partitions are assigned drive letters. Do not assume that the drive letter designations will follow consecutively from device to device within a PC system.

An Example:

A PC system is configured with an IDE hard disk as the boot drive, a SCSI hard disk, and a CD-ROM drive. The IDE drive has three partitions: one primary and two logical. The SCSI hard disk has two partitions: one primary and one logical. The SCSI hard disk is assigned ID 1, and the CD-ROM is ID 4. The distribution of the drive letters will be:

A: 3½" floppy drive

B: 5¼" floppy drive

C: IDE primary partition

D: SCSI primary partition

E: IDE first logical partition

F: IDE second logical partition

G: SCSI logical partition

H: CD-ROM

WINDOWS 3.0 & 3.1

NCR DOS SCSI drivers are compatible with Windows 3.0 and 3.1. No additional drivers or configuring is needed.

Device Drivers for OS/2

Introduction

The OS/2 Version 2.X operating system provides an integrated platform featuring a graphical windowing interface, called Presentation Manager, that allows multiple applications to be viewed at the same time. Multitasking is also supported, enabling several different programs to run at the same time in different windows. Presentation Manager allows the user to switch between programs, start other programs, and maintain files and directories. OS/2 Version 2.X requires an 80386 or higher microprocessor. Other hardware requirements include a minimum of 4 megabytes of RAM (8 megabytes or more is recommended) and a minimum hard disk drive size of 40 megabytes. NCR SDMS provides the necessary SCSI device driver for OS/2 2.X. We recommend reviewing the OS/2 2.X manual prior to proceeding.

OS2CAM.ADD

Features

- Enhances host bus adapter performance
- Supports synchronous negotiation (including fast SCSI)
- Supports Wide SCSI (single-ended and differential)
- Supports multiple host adapters
- Supports Disconnect/Reselect
- Supports scatter/gather
- Allows tagged command queuing

Description

Although the NCR SCSI controller's firmware can access the SCSI hard disk drives attached to the computer independently, the SCSI device driver OS2CAM.ADD acts as an enhanced interface between the computer system and the SCSI BIOS firmware. Use of the device driver increases the abilities of the SCSI controller firmware and fully utilizes the advancements and improvements of 80386 and higher microprocessors.

The device driver is also necessary to support the use of SCSI tape drives and CD-ROM drives with an OS/2 system. The NCR OS2CAM.ADD device driver is written in compliance with the IBM OS/2 ADD (Adapter Device Driver) specification and will work with third party applications that complies with the same specification.

Installation

Installing OS2CAM.ADD (with OS/2 already installed)

The NCR device driver floppy diskette contains two files, the device driver OS2CAM.ADD and a text file, OS2CAM.DDP. When the device driver installation utility under OS/2 is activated, it looks for a file with the DDP extension. The DDP file contains the necessary information to install the SCSI device driver.

1. At the OS/2 Desktop, double-click on System Setup.
2. Double-click on Device Driver Install.
3. Insert the floppy disk containing the NCR device driver in the source drive, then click on the change button for the destination directory.
4. Choose OS2 and click on the set button.
5. Click the install button.
6. Choose the NCR OS/2 2.X driver from the list provided by clicking on it once. The choice will be highlighted. Click the OK button, then the EXIT button.

7. To make sure that the installation was successful, open the productivity folder on the OS/2 Desktop, then double-click the OS/2 System Editor to start the editor. Open the CONFIG.SYS file and find the line:

   ```
   BASEDEV=OS2CAM.ADD /V
   ```

   Check that the file OS2CAM.ADD is in the OS/2 directory on the boot drive.

Installing OS2CAM.ADD and OS/2 (from a floppy) to a SCSI Hard Drive

In this case, since OS/2 will be installed from a floppy disk, it is not required that the driver be present to install the operating system (as is the case when installing from a CD-ROM).

1. After the installation of OS/2 is complete and the WorkPlace Shell desktop is built, open the system setup folder and select (double click on) the Device Driver Install icon.
2. Insert the floppy disk containing the NCR device driver in the source drive, then click on the change button for the destination directory
3. Choose OS2 and click on the set button.
4. Click the install button.
5. Choose the NCR OS/2 2.X driver from the list provided by clicking on it once. The choice will be highlighted. Then click the OK button, then the EXIT button.
6. To make sure that the installation was successful, open the productivity folder on the OS/2 Desktop, then double-click the OS/2 System Editor to start the editor. Open the CONFIG.SYS file and find the line:

   ```
   BASEDEV=OS2CAM.ADD /V
   ```

   Check that the file OS2CAM.ADD is in the OS2 directory on the boot drive.
7. Continue with the OS/2 installation process as documented in the OS/2 Installation Guide.

Installing OS2CAM.ADD and OS/2 (from a SCSI CD-ROM) to a SCSI Hard Drive

To install OS/2 from a SCSI CD-ROM attached to an NCR host adapter, the SCSI driver must be present in order to access the CD-ROM. The following steps allow installation of OS/2 from a SCSI CD-ROM.

1. Make copies of the two floppy disks used for installation that are included with the CD-ROM version of OS/2. These disks are labeled “Installation Diskette” and “Diskette 1”.
2. Copy the files OS2CAM.ADD and OS2CAM.DDP from the NCR distribution disks to the copy of “Diskette 1”.
3. Edit the file CONFIG.SYS on the copy of “Diskette 1” by adding the following line:

   ```
   BASEDEV=OS2CAM.ADD /v 4.
   ```

4. Place the copy of “Installation Diskette” in the A: drive and reboot the computer.
5. Proceed with the OS/2 installation process as documented in the OS/2 Installation Guide.

Driver Order in the CONFIG.SYS File

Because of the way OS/2 assigns drive letters, the order in which drivers appear in the CONFIG.SYS file is important. The drivers must appear in the order in which the drive letters are to be assigned. Refer to the OS/2 documentation to fully understand this requirement.

Command Line Options

The OS2CAM.ADD driver has several embedded functions which can be accessed via switches on the command line in the CONFIG.SYS file. These options are described below.

Using the /V Option

This option appears on the command line by default. It enables display of a banner, version number, and SCSI bus information during start up of the system. The command line in CONFIG.SYS should look like this:

```
BASEDEV=OS2CAM.ADD /V
```

To disable this feature, remove this switch from the command line.

Using the /!SN Option

This option means “no synchronous”. Synchronous transfers are typically faster than asynchronous, so this option should only be used if synchronous transfers cause a problem with your system. To disable synchronous operations, the command line in CONFIG.SYS should look like this:

```
BASEDEV=OS2CAM.ADD /!SN
```

Using the /!Q Option

This option means “no queue tag support”. Queue tagging is used by high end systems to allow more than one outstanding command per SCSI device. To disable queue tag support, the command line in CONFIG.SYS should look like this:

```
BASEDEV=OS2CAM.ADD /!Q
```

Using the /ET Option

This option is used to enable Embedded Targets (LUNs). LUNs are used by high end systems, such as disk arrays, to address certain portions of a SCSI ID. Most standard SCSI devices do not use LUNs, and default to LUN 0. This option should be used only for devices that use multiple embedded targets with LUNs other than 0. To enable LUN support, the command line in CONFIG.SYS should look like this:

```
BASEDEV=OS2CAM.ADD /ET
```

Using the /DM Option

This option enables use of the IBM-supplied DASD manager (OS2DASD.SYS) for the devices listed. The DASD manager is used to support direct access devices such as hard drives, and should be enabled unless an alternative is being used. To enable DASD manager support, the command line in CONFIG.SYS should look like this:

```
BASEDEV=OS2CAM.ADD /DM: d|((d,d),[d|(d,d)])
```

Where:
d,d,...d represents a SCSI target ID. The LUN for the specified ID is assumed to be 0.

(d,d),(d,d),...(d,d) represents a SCSI target/LUN ID pair.

"|" means "or".

Using the /!DM Option

This option disables use of the IBM-supplied DASD manager (OS2DASD.SYS) for the devices listed. The DASD manager is used to support direct access devices such hard drives, and should be disabled only if an alternative is being used. To disable DASD manager support, the command line in CONFIG.SYS should look like this:

```
BASEDEV=OS2CAM.ADD /!DM:
d|((d,d),[d|(d,d)])
```

Where:

d,d,...d represents a SCSI target ID. The LUN for the specified ID is assumed to be 0.

(d,d),(d,d),...(d,d) represents a SCSI target/LUN ID pair.

"|" means "or".

Using the /SM Option

This option enables use of the IBM-supplied SCSI manager (OS2SCSI.SYS) for the devices listed. To enable SCSI manager support, the command line in CONFIG.SYS should look like this:

```
BASEDEV=0S2CAM.ADD /SM: d|((d,d),[d|(d,d)])
```

Where:

d,d,...d represents a SCSI target ID.

The LUN for the specified ID is assumed to be 0.

(d,d),(d,d),...(d,d) represents a SCSI target/LUN ID pair.

"|" means "or".

Using the /!SM Option

This option disables use of the IBM-supplied SCSI manager (OS2SCSI.SYS) for the devices listed. To disable SCSI manager support, the command line in CONFIG.SYS should look like this:

```
BASEDEV=OS2CAM.ADD /SM: d|((d,d),[d|(d,d)])
```

Where:

d,d,...d represents a SCSI target ID. The LUN for the specified ID is assumed to be 0.

(d,d),(d,d),...(d,d) represents a SCSI target/l, LTN ID pair.

"|" means "or".

Troubleshooting

- YOU CANNOT ACCESS THE SCSI DEVICE(S).
  a. Make sure the SCSI device driver is installed properly.
  b. Make sure each hard drive has power.
  c. Verify that a BASEDEV = OS2CMD.ADD line exists in the CONFIG.SYS file.
  d. Verify that OS2CAM.ADD has been placed in the OS/2 directory.
  e. Check the cable connections and the host bus adapter installation.
- THE COMPUTER HANGS OR LOCKS UP WHEN BOOTING AND THE SCSI DEVICES ATTACHED ARE NOT SEEN BY THE COMPUTER SYSTEM.

a. Make sure that all the SCSI devices are configured at different ID numbers (boot drive should have lowest ID).

b. Make sure both, but only the ends of the SCSI bus are terminated.

c. Make sure the device driver is listed in CONFIG.SYS (and loaded when booting).

- DEVICE DRIVER DOES NOT SEE ONE OF THE SCSI DEVICES.

  a. Reboot the computer.

  b. Make sure the SCSI devices have different ID numbers (boot drive should have lowest ID).

  c. Make sure bot but only the ends of the SCSI bus are terminated.

  d. Check the cable and power connections.

- OS/2 INSTALLS TO AN IDE DRIVE IN THE SYSTEM INSTEAD OF TO THE SCSI DRIVE.

  a. The IDE drive must be physically disconnected and disabled in CMOS setup before attempting to install to a SCSI drive.

- NCR ADD ERROR: ONE OF YOUR HOST ADAPTERS IS MALFUNCTIONING.

  a. Typically an interrupt problem. System BIOS may not be assigning interrupt properly. Check CMOS setup for PCI slot setup. Assign or change interrupt assigned to the slot in which the NCR adapter is placed. Reboot computer.

Important Additional Information

High Speed Tape Drive Support High-speed tape backup has become essential to computer systems as the capacities of hard disk drives have increased. For example, the NCR OS2CAM.ADD driver provides support for the Sytos Plus Version 1.35 (or above) Tape Backup System, and will function properly with the Sytos Plus software.

Device Drivers for SCO UNIX

Introduction

SCO UNIX is the first UNIX operating system licensed for IBM-compatible microcomputers. The integrated communications, file system, international application support, and documentation create an ideal platform for those requiring a full-featured, UNIX-based operating system. SCO UNIX takes full advantage of the capabilities of the 80386 and above microprocessors.

SCO UNIX 3.2v4x provides Basic Utilities and Extended Utilities, as well as their Development System packages. These items, plus the installation software, are provided on diskettes (also available on tape or CD). SCO has labeled these diskettes: N(1-2) and M1 for Installation, B(1-3) for Basic Utilities, and X(1-7) for Extended Utilities.

The NCR SDMS 3.0 SCSI device drivers are linked into the UNIX kernel. The rebuilt kernel must reside on the boot drive: either an internal, non-SCSI hard drive (IDE, ESDI, or ST506) or a SCSI hard drive. SDMS facilitates this by providing a Boot Time Loadable Driver (BTLD) and the CAM3 SCSI configuration tool. The BTLD permits an easy installation of UNIX onto a SCSI hard disk with the software provided by SCO. The CAM3 SCSI configuration tool simplifies loading the SCSI device drivers into the operating system.

The following sections provide instruction on configuring the SCO UNIX kernel with the SCSI device drivers, adding SCSI peripheral devices, and installing SCO UNIX onto a SCSI hard drive. These instructions assume you are familiar with UNIX system administration.

SCO UNIX 3.2v4x

Features

- Provides easy UNIX installation on a SCSI hard disk with the NCR Boot Time Loadable Driver (BTLD)
- Provides easy SCSI device support installation with the NCR CAM3 SCSI configuration tool
- Supports synchronous negotiation (including fast SCSI)
- Supports multiple host adapters
- Supports Disconnect/Reselect
- Supports scatter/gather
- Allows tagged command queuing
- Provides dynamic interrupt mapping
- Supports Wide SCSI (single-ended and differential)
- Supports target initiated negotiation
- Allows shared interrupts

Description

UNIX installation on a SCSI system requires that a copy of SCO UNIX be created that contains the device drivers to support SCSI devices. The installation of UNIX depends on how the SCSI devices will be configured. There are two possible installation procedures:

1. Install UNIX and the SCSI device drivers on a non-SCSI boot drive.
2. Install UNIX and the SCSI device drivers on a SCSI boot drive.

Procedure 1

If SCSI devices will be attached to a SCSI host bus adapter card while using a non-SCSI hard drive (IDE, ESDI, ST506) as the boot hard drive, execution of procedure 1 is all that is necessary. This will install the NCR SCSI UNIX device drivers on the non-SCSI boot drive to access the SCSI devices. SCSI devices supported include tape drives, CD-ROM drives, and SCSI hard disk drives that will be used as secondary storage.

Procedure 2

If the user plans to install a SCSI hard disk drive to be used as the boot hard drive, then procedure 2 will be executed. Procedure 2 uses a Boot Time Loadable Driver (BTLD) to provide a user friendly method for installing UNIX onto a SCSI hard disk drive.

Note: To use the BTLD, the Basic and Extended Utilities packages provided by SCO must be included during the installation.

Each of these procedures are described in detail below. NCR recommends that the entire installation is accomplished in one session. Be sure that the installer has sufficient time (possibly an hour) available to complete this without interruption.

The NCR CAM3 SCSI Configuration Tool

Both installation procedures use the NCR CAM3 SCSI configuration tool to load the SCSI device drivers into the operating system. This utility is provided on the diskette with the NCR SDMS drivers for SCO UNIX. The CAM3 main menu presents the following options:

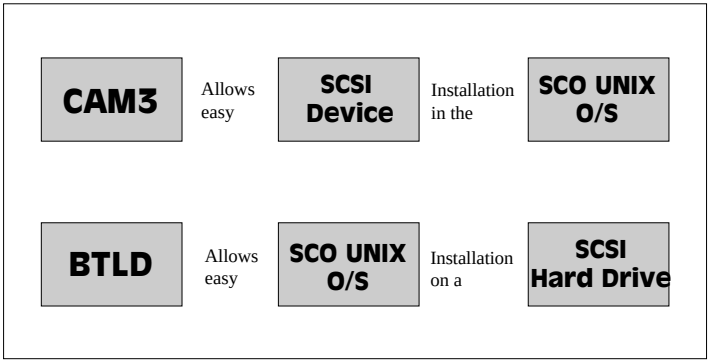
The CAM3 Main Menu Options

1. Configure the NCR SCSI Device Drivers
2. Add or Remove Specific Devices
3. Relink Unix
4. Remove All SCSI Devices
5. Show Current SCSI Configuration

Some of these options are referred to in the following procedures. After completion of either installation procedure, CAM3 can be invoked again from the UNIX prompt by typing:

```
mkdev cam3
```

In this way, CAM3 can be used to make subsequent changes in the installation.



NCR installation tools for SCO UNIX

Installation

Procedure 1

This procedure assumes UNIX is already installed on an IDE, ESDI, or ST506 hard disk drive. It will show how to include the device drivers needed to access SCSI devices installed after the non-SCSI drives. This installation is necessary to build a new UNIX kernel which includes the NCR SCSI device drivers. The basic steps for accomplishing this are outlined below. Further detail on UNIX installation can be found in the SCO UNIX System Administrator's Reference manual.

1. NCR recommends creating a second copy of UNIX.

   Log in as root and issue the command:

   ```
   cp /unix /unix.good
   ```

   This creates a second copy of UNIX under the name /unix.good.

   Note: If any problems arise with the kernel being built in UNIX, this procedure ensures that a valid copy of UNIX will be available.

   To access this valid UNIX copy, type at the colon after the boot message:

   ```
   unix.good
   ```

   To replace the system UNIX with the working UNIX copy, type at the system prompt:

   ```
   cp /unix.good /unix
   ```

2. Install the NCR SDMS SCSI UNIX device drivers.

   a. Insert the SCO SDMS SCSI Drivers floppy diskette in the drive and type:

      ```
      installpkg
      ```

      Press the Enter key to continue.

   b. A prompt will appear to insert the requested floppy diskette. Since the NCR diskette has already been inserted, press the Enter key to continue.

c. A prompt will then ask for the name of the package. Type:

```
cam3
```

Press the Enter key to continue.

d. If the SDMS driver is already present from a previous installation, a prompt inquires about replacing it. Do not replace it unless there is reason to believe it is corrupted, or a newer version is available.

e. To execute CAM3, remove the NCR floppy diskette from the drive (since CAM3 has been installed on the hard drive), then type:

```
mkdev cam3
```

Press the Enter key to continue.

f. The CAM3 main menu is displayed. To check that there are no SCSI devices installed, press 5 and Enter to show the current SCSI configuration. There should be no SCSI devices listed. If there are, press 4 for the option to remove all SCSI devices, then press y and Enter to accept the removal.

g. From the CAM3 main menu, select option 1 to configure the NCR SCSI device drivers. Three options are displayed:

1. Configure NCR Host Adapter Software
2. Remove NCR Host Adapter Software from System Configuration
3. Return to Main Menu

h. To configure the NCR host bus adapter software, select 1. from this menu.

i. Each device driver in UNIX is assigned a number known as the major device number. The major device number assigned to the host bus adapter is displayed. Write this number down, as it may be required later, and keep it with the UNIX documentation.

j. A prompt is displayed to set the interrupt line to be used by the host bus adapter. The SDMS SCO UNIX driver performs dynamic interrupt mapping. Therefore, press 0 (zero) and Enter. To exit this process, press Enter, or type q and press Enter.

Note: If the system indicates that the proper interrupt lines for the SCSI host bus adapter are not available, review the section under Troubleshooting concerning possible kernel rebuild problems and edit the device entries to eliminate the conflict.

3. Adding a SCSI Hard Drive to UNIX.

Note: If a SCSI hard disk drive will not be added to this system go to step 4.

a. Select option 5 from the CAM3 main menu to show SCSI configuration. Note the bus number of the NCR controller. You will need it throughout this installation procedure.

b. From the CAM3 main menu, select option 2 to add or remove specific devices. A list will appear showing the current configuration followed by a menu of these options:

Add or Remove Specific Devices Menu Options

1. Reconfigure Sdsk (Disk Drive)
2. Reconfigure Stp (Tape Drive)
3. Reconfigure Srom (CD-ROM)
4. Invoke the SCO low level SCSI Configuration script
5. Return to the previous menu To add the SCSI hard disk drive, select option 1 to reconfigure Sdsk, and press Enter.

c. Read the explanatory text that appears and follow the prompts: Press Enter at the next two prompts to scroll through the explanatory text A prompt will appear to add another SCSI disk. Answer y and press Enter. Select option 2 to add a drive to the SCSI controller and press Enter.

d. The system will prompt for the prefix of the SCSI host adapter that supports this device. If the default is bhba, press Enter. If the default is not bhba, type:

   ```
   bhba
   ```

   Press Enter.

e. The system will prompt for which SCSI host adapter supports the SCSI hard drive. Type the correct path number (bus number) and press Enter.

f. The system will prompt for the Target ID of the SCSI hard drive. Type the SCSI ID number and press Enter.

g. The system will prompt for the LUN (Logical Unit Number) of the SCSI hard drive. Press 0 (zero) and press Enter.

h. The system will prompt to update the SCSI Configuration file. Answer y and press Enter.

i. A prompt appears to create a new kernel to effect the driver change. Answer n (as this will be done later) and press Enter.

4. Adding a SCSI Tape Drive to UNIX.

   Note: If a SCSI tape drive will not be added to this system, go to step 5.

   a. Select option 5 from the CAM3 main menu to show SCSI configuration. Not the bus number of the NCR controller. You will need it throughout this installation procedure.

   b. From the CAM3 main menu, select option 2 to add or remove specific devices. A list will appear showing the current configuration followed by a menu of choices. To add the SCSI tape drive, select option 2 and press Enter.

   c. Instructions on using a SCSI tape drive are displayed. Press Enter at the next three prompts to scroll through the text and start the mkdev tape utility for installing a tape drive.

   d. The Tape Drive Configuration Program menu appears. Select option 1 to install a tape drive, and press Enter.

e. The Tape Drive Installation Menu appears. Select option 4 to install a SCSI tape drive, and press Enter. From the next list select the type of SCSI tape drive to install, and press Enter.

f. The system will prompt to configure the tape drive. Press y and Enter.

g. The system will prompt for the prefix of the SCSI host adapter that supports this device. If the default is bhba, press Enter. If the default is not bhba, type:

```
bhba
```

Press Enter.

h. The system will prompt for which bhba SCSI host adapter supports the tape drive. Type the correct path number (bus number) and press Enter.

i. The system will prompt for the SCSI ID of the SCSI tape drive. Type the correct ID. number (two is recommended) of the tape drive and press Enter.

j. The system will prompt for the LUN (Logical Unit Number) of the tape drive. Press 0 (zero) and Enter. The system will then prompt to update the SCSI configuration file. Answer y and press Enter.

k. A list will be displayed showing the special devices that have been created. Press Enter, and a list is displayed showing the links to the installed tape drive. When prompted for a boot string, press q and Enter to return to the Tape Drive Configuration Program menu. Press q and Enter to continue.

l. A prompt appears to create a new kernel to effect the driver change. Answer n (as this will be done later) and press Enter.

5. Adding a SCSI CD-ROM Drive to UNIX.

Note: If a SCSI CD-ROM drive will not be added to this system, go to Step 6.

a. Select option 5 from the CAM3 main menu to show SCSI configuration. Note the bus number of the NCR controller. You will need it throughout this installation procedure.

b. From the CAM3 main menu, select option 2 to add or remove specific devices. A list will appear showing the current configuration followed by a menu of choices. To add the SCSI CD-ROM drive, select option 3 and press Enter.

c. Instructions on using a CD-ROM drive are displayed. Press Enter two more times at the prompts to scroll through the explanatory text and start the mkdev cdrom utility for installing a CD-ROM drive.

d. The CD-ROM Configuration Program menu appears. Select option 1 to install a CD-ROM drive and press Enter.

e. The system will prompt to configure the CD-ROM Drive. Answer y and press Enter.

f. The system will prompt for the prefix of the SCSI host adapter that supports this device. If the default is bhba, press Enter. If the default is not bhba, type:

```
bhba
```

Press Enter.

g. The system will prompt for which SCSI host adapter supports the CD-ROM drive. Type the correct path number (bus number) and press Enter.

h. The system will prompt for the SCSI ID of the CD-ROM Drive. Type the ID number and press Enter.

i. The system will prompt for the LUN (Logical Unit Number) of the CD-ROM drive. Press 0 (zero) and press Enter.

j. The system will prompt to update the SCSI configuration file. Answer y and press Enter. A prompt appears to configure a CD-ROM/TAPE installation device. Unless this is desired, answer n and press Enter. A prompt appears to add a high-sierra file system. Answer y and press Enter. The system will display the High Sierra/ISO9600 file system Configuration Program menu. Select option 1 to add high-sierra and press Enter. The system updates the SCSI configuration file and returns to the CD-ROM Configuration Program menu. Select q and press Enter to continue.

k. A prompt appears to create a new kernel to affect the driver change. Answer n (as this will be done later) and press Enter.

6. Rebuilding the Kernel.

   a. The system now returns to the CAM3 main menu. Select option 3 to relink UNIX and press Enter.

   b. A prompt will appear asking to rebuild the kernel. Answer y and press Enter. The kernel will now be linked, which takes approximately 3 minutes. Messages will appear while the kernel is linking.

   c. When the kernel has been rebuilt, the system will prompt as to whether this kernel is to boot by default. Press y and Enter.

   d. The system will prompt whether to rebuild the kernel environment. Press y and Enter. When the CAM3 main menuappears, press q and Enter. At the custom Main Menu, highlight Quit and press Enter.

   e. To activate the new kernel the system must be rebooted. Type the command:

      ```
      reboot
      ```

      Press Enter.

   f. Press Enter at the Boot: prompt and the new kernel will load. If there is a host bus adapter with an NCR ROM installed, the NCR device driver will display a load message when the kernel loads.

   g. Log in as usual.

Procedure 2

This procedure will install UNIX on a SCSI hard disk drive. It will include the SCSI device drivers needed to access SCSI devices installed after the SCSI drive. This installation is necessary to build a new UNIX kernel that includes the NCR SCSI device drivers. Further detail on UNIX installation can be found in the SCO UNIX Systems Administrator's Reference manual.

1. Link the BTLD into the UNIX kernel during installation.
   a. If the SCSI hard disk has any existing partitions, delete them.
   b. Insert the SCO UNIX N1 installation disk and reboot the system.
   c. At the Boot: prompt type:

      ```
      link
      ```

      Press Enter.
   d. At the next prompt type:

      ```
      bscam
      ```

      Note: bscam refers to the SDMS driver package

      Do not remove the N1 diskette. Press Enter.
   e. At the next prompt, replace the N1 diskette with the SCO SDMS Device Drivers diskette (which contains the BTLD), and press Enter.

      When using the BTLD to install UNIX, the CAM3 configuration tool is automatically installed.
   f. Continue from this point as a normal installation according to the SCO UNIX documentation.

      Note: Remember, the Basic and Extended Utilities packages must be loaded when using the BTLD.
   g. NCR recommends creating a second copy of UNIX. Log in as root and issue the command:

      ```
      cp /unix /unix.good
      ```

      This creates a second copy of UNIX under the name /unix.good

      Note: If any problems arise with the kernel being built in UNIX, this procedure ensures that a valid copy of UNIX will be available.

To access this valid UNIX copy, type at the colon after the boot message:

```
unix.good
```

To replace the system UNIX with the valid UNIX, type at the system prompt:

```
cp /unix.good /unix
```

2. Install the NCR SDMS SCSI UNIX device drivers.

   a. After rebooting the system, type:

      ```
      mkdev cam3
      ```

      Press Enter to continue.

   b. Continue from Procedure 1, step 2f.

Troubleshooting

The following conditions should exist after a successful installation:

- The directory etc/conf/sdevice.d should contain a file named bhba.
- The bhba file should contain the bhba sdevice entry.
- There should be a bhba entry for each SDMS SCSI controller configured in the system in the sdevice file.
- The second field for bhba in the sdevice file should be set to "Y".
- There should be a bhba entry in the mdevice file.
- There should be a bhba entry for each SCSI device in the mscsi file.
- The directory etc/conf/pack.d/bhba should exist and contain the files Driver.o, RAMcore.h, and space.c.

To solve some problems it is necessary to be aware of certain files in the UNIX system. The directory etc/conf/cf.d contains the files sdevice, mdevice, and mscsi. Two other files in this directory, sdev.hdr and mdev.hdr, describe the values of the possible field entries in sdevice and mdevice.

The following are some problems and their suggested solutions:

- AN INTERRUPT CONFLICT MESSAGE APPEARS.

  a. In the sdevice file, check the fifth field of the bhba entry for a conflict with that of any competing driver.

- A SCSI DEVICE CANNOT BE FOUND.

  a. Reboot to observe the system configuration table when it appears.

  b. Look for bhba entries for each SCSI device connected to an NCR SCSI controller.

  c. Also, check to see that the desired value for each field exists.

- UNIX SYSTEM BEHAVES UNRELIABLY AFTER A CON FIGURATION CHANGE.

  a. Whenever the hardware or software configuration is altered, the kernel must be rebuilt. Use the Relink UNIX option of the CAM3 configuration tool, or change to the /etc/conf/cf.d directory and type:

     ```
     ./link_unix
     ```

     to rebuild the kernel.

- DURING KERNEL REBUILD, AN ERROR MESSAGE INDICATES THE CHARACTER DEVICE NUMBER OF DEVICE cn CONFLICTS WITH THE CHARACTER DEVICE NUMBER OF bhba.

  a. Reinstall the CAM3 software using the installpkg utility. Remember to reload the bhba driver.

  b. Rebuild the kernel.

- DURING INSTALLATION, THE ROOT DISK IS NOT FOUND, OR THE PARTITIONING OF THE DISK FAILS.

  a. If a SCSI tape drive is used in the initial installation: The SCSI tape drive ID should be set to “2”, and it should be configured to path 0, LUN 0.

     The ID of the tape drive should not conflict with any other SCSI device ID.

  b. If a SCSI CD-ROM drive is used in the initial installation: The SCSI CD-ROM drive ID should be set to “5”, and it should be configured to path 0, LUN 0.

     The ID of the CD-ROM drive should not conflict with any other SCSI device ID.

  c. Make sure no previous partitions exist on the root hard drive.

Important additional information

How to Remove a SCSI Hard Drive From SCO UNIX

1. From the CAM3 main menu, select the option to add or remove specific devices. A list will appear showing the current configuration followed by a menu of choices. To remove a SCSI hard drive, select option 4 and press Enter.
2. A user prompt to review SCSI ID information is displayed. After responding to the prompt, press Enter to start the mkdev.scsi utility for removing a SCSI hard drive.
3. The .scsi utility program menu appears. Select option 2 to remove a hard drive and press Enter.
4. The system will prompt to remove a SCSI device. Select option 1 to remove a hard drive and press Enter.
5. The system will prompt for the prefix of the SCSI host adapter that supports the device. If the default is bhba, press Enter. If the default is not bhba, type: bhba Press Enter.
6. The system will prompt for which SCSI host adapter supports the hard drive. Respond with the correct path number (bus number), and press Enter.

7. The system will prompt for the SCSI ID of the hard drive. Type the ID number and press Enter.
8. The system will prompt for the LUN (Logical Unit Number) of the drive. Press 0 (zero) and press Enter.
9. The system will prompt to update the SCSI configuration file. Answer y and press Enter. The system updates the SCSI configuration file and returns to the Main CAM3 Program menu.
10. A prompt appears to create a new kernel to, effect the system configuration change. Answer n (as this will be done later) and press Enter.

Note: Go to step 6 (Rebuilding the Kernel) in Procedure 1.

Device Drivers for NetWare

Introduction

The NCR SDMS 3.0 drivers allow the user to utilize an NCR SCSI controller or processor, controlled by an NCR SCSI BIOS, with NetWare. The SDMS 3.0 software, coupled with an NCR SCSI controller or processor, provides an NCR SCSI solution with in the NetWare environment. Separate drivers are provided for Novell NetWare v3.lx, and Novell NetWare v4.x. The following information will assist in a successful installation of the NCR SDMS SCSI drivers.

NetWare v3.1x, and v4.x

Features

- Supports the ASPI interface
- Provides synchronous negotiation (including fast SCSI)
- Supports multiple host adapters

- Allows multiple logical unit number (LUN)
- Supports Disconnect/Reselect
- Supports scatter-gather
- Supports tagged command queuing
- Allows shared interrupts
- Supports Wide SCSI (single-ended and differential)
- Supports device exclusion

Description

There is a separate NCR SDMS 3.0 device driver and ASPI manager for each of two major releases of NetWare. For NetWare v3.1x, the main SDMS device driver is NCRSDMS#.DSK, and the file ASPICAM3.NLM is loaded if support for the ASPI interface is desired (this is required for devices such as tape drives and scanners). For NetWare v4.x, the main SDMS device driver is NCRSDMS4.DSK, and the file ASPICAM4.NLM is loaded if support for the ASPI interface is desired.

Installation

Install NetWare as described in the Novell NetWare Installation Manual. The following information is provided to assist in the installation.

1. For NetWare v3.1x, create a directory called NET3. Copy the file NCRSDMS3.DSK from the NCR device drivers diskette into this directory. If ASPI support is desired, also copy ASPICAM3.NLM.

   For NetWare v4.x, create a directory called NET4. Copy the files NCRSDMS4.DDI and NCRSDMS4.DSK from the NCR device drivers diskette into this directory. If ASPI support is desired, also copy the file ASPICAM4.NLM.

2. Copy all the files from the NetWare system disks into the NET3, or NET4 directory.

3. Reboot the computer from the hard disk drive. To start the server program, enter the NET3, or NET4 directory and type:

   ```
   SERVER
   ```

4. When prompted, enter the name of the file server. See the chapter on file server installation in the NetWare Installation Manual for restrictions.

5. When prompted, enter the network (IPX) number. Any number not already used will do. See the chapter on file server installation in the NetWare Installation Manual for further information.

6. At the NetWare prompt, type:

   ```
   LOAD NCRSDMS3 <options>
   ```

   or

   ```
   LOAD NCRSDMS4 <options>
   ```

   This command will cause the main driver to be loaded. Without this command, NetWare will be unable to access the hard disk drive. If ASPI support is desired, also type:

   ```
   LOAD ASPICAM3
   ```

   or

   ```
   LOAD ASPICAM4
   ```

7. To bring up the Installation menu, at the NetWare prompt type:

   ```
   LOAD INSTALL
   ```

   Continue with the installation according to the file server installation chapter in the Novell NetWare Installation Manual.

8. At the Available System Options menu, select the EDIT STARTUP.NCF option and check to see that the line LOAD NCRSDMS3, or LOAD NCRSDMS4 is in the file. If not, add this line to the file. This eliminates the need to load drivers by hand every time the system is powered up. If the line appears more than once, the duplicate statements should be removed.

Command Line Options

The NCRSDMS3.DSK and NCRSDMS4.DSK drivers have many timing parameters. (At this time there are no command line options for the ASPICAM3.NLM or ASPICAM4.NLM drivers.) Following is a list of timingg parameters available, including the default option and a list of valid options. Following each parameter is a description of when a parameter should be used and any impact its use/disuse might incur.

Please note applicable versions listed for each option.

Note: If an option is specified but the assignment is not valid, then the default value will be used. The NCRSDMS3.DSK and NCRSDMS4.DSK drivers will be referred to in the remainder of this section as NCRSDMSX.DSK, where X refers to the appropriate NetWare operating system Version.

Using the Tag Command Queuing Option

Command line option:	qtags=<option>
Default value:	disable
Valid options:	enable, disable
Function:	Enable/disable tag command queuing for the devices
Possible Impact:	Tagged commands may result in improved I/O throughput in devices that support such an option.
Applicable Versions:	3.02.06 and higher

Enabling the option results in the driver issuing tagged command requests to the devices that support tagged queuing. Devices that do not support tagged queuing are not issued tagged requests. Depending on the drive controller, throughput of the device may be increased by the use of queue tags, although a optional number of queue tags is based on the specific device type.

Using the Depth of Queue Tags Option

Command line option:	qdepth=<option>
Default value:	128
Valid options:	0-128
Function:	Set the depth of the queue for tag command queuing. This value designates the depth of the queue per LUN (I_T_L nexus), e.g. this value designates the depth of the queue per device, or per LUN, if a device has multiple LUNs.
Possible Impact:	Must be set to optimize the performance of tagged command queuing.
Applicable Versions	3.04.00 and higher

This option is valid only when tag command queuing (qtags) has been enabled. Values possible for this parameter range from 0 to 128. 0 is equivalent to qtags=disable. While the actual depth of the queue depends on the specific drive controller, for single drives values of about 10-30 are typically most optimal.

A greater number may be optimal for peripherals such as disk arrays. Users should experiment with various qdepth values to determine the most optimal performance of their particular setup. The optimal qdepth value is based on different aspects of the system, including but not limited to the processor, the available memory, the disk drives, and other peripherals.

Using the Base Timeout Option

Command line option:	timeout=<option>
Default value:	15
Valid options :	Any integer value 15 to 999999999 (The number 999999999 is not a hard coded boundary in the 3.03.06 to 3.04.02 versions of the drivers. This is, however, a strongly recommended boundary. 999999999 seconds corresponds to a timeout of greater than 31 years! This value will be hard coded as an upper boundary in future releases of the driver. A value in excess of 999999999 entered for the timeout value may result in an overflow condition on the timeout parameter, and result in a timeout value of substantially less than 31 years, including the default value of 15 seconds.)
Function:	Specify the minimum value (in seconds) for command timeout.
Possible Impact:	Ensure system integrity when using a slow device. Performance may be reduced.
Applicable Versions:	3.04.00 and higher

The amount of time, in seconds, allowed for a command is dynamically determined by the number of pending commands and a base offset, or base timeout. If a device is slow, this value may be increased to insure the device has adequate time to respond to a command issued to it before the command times out.

Using the Shared Interrupts Option

Command line option:	sharedint=<option>
Default value:	disable
Valid options:	enable, disable
Function:	Supports shared interrupts
Possible Impact:	Enabling may cause a performance degradation.
Applicable Versions:	3.04.00 and higher

The shared interrupt option should be enabled any time a PCI card other than NCR Host Adapters are added to a system which assigns all PCI cards the same interrupt value. The added card must be able to support shared interrupts. The driver automatically handles the case of more than one NCR host adapter sharing an interrupt.

Using the Wide SCSI Option

Command line option:	wide=<option>
Default value:	enable
Valid options:	enable, disable
Function:	Enable/Disable support of Wide SCSI.
Possible Impact:	No Wide SCSI Support available.
Applicable Versions:	3.04.00 and higher

This option specifically allows the user to disable support of wide SCSI when using a wide SCSI controller. This option should be set to “disable” if a wide SCSI device is present on the system, but a narrow SCSI cable is connected somewhere on the bus between the wide SCSI host adapter and the wide device, thus prohibiting the transfer of wide data. If this option is set to “disable”, the wide device may still be used, but all data transferred to/from the device will be narrow (8 bit). The driver will not initiate a wide SCSI transfer request negotiation.

Using the Exclusion of Devices Option

Command line option:	xcl=<device>[:device...]
Default value:	All devices recognized by the driver, i.e. no devices are excluded.
Valid options:	p,i,l (Multiple devices may be specified with a colon separator) where p is the Path designator, and is in the range 0-7,i is the SCSI ID designator, and is in the range 0-31 ,l is the LUN designator, and in the range 0-7. The LUN parameter is optional. If no LUN is designated, all LUNs for that ID will be excluded. Multiple devices may be excluded so long as the string does not exceed 35 characters in length and devices are separated by colons.
Examples:	xcl=1,2,3 to exclude LUN 3 of the device at SCSI ID 2 on Path 1 xcl=1,2,3:2,5 to exclude LUN 3 of the device at SCSI ID 2 on Path 1, and all LUNs on the device at SCSI ID 5 on Path 2
Function:	Allows for specifying certain devices not be recognized by the driver.
Possible Impact:	Device(s) may not be accessed via NCRSDMSX driver.
Applicable Versions:	3.02.06 and higher

This option is available so that specific devices may be excluded from being recognize and accessed by the NCRSDMSX.DSK drivers. These devices are not registered with the operating system for use by the driver. Other applications/drivers can then take over the control of such devices. This option is available for support of third party vendor who write their own SCSI control applications.

The following three options affect the amount of memory used by the driver. For information on how memory is allocated by the driver, and to get an approximate feel for the amount of memory which may be saved by invoking these parameters, refer to Memory Allocation under Important Additional Information at the end of this section.

Using the Maximum Host Adapters Option

Command line option:	max_hbas=<option>
Default value:	8
Valid options:	1-8
Function:	Specify the maximum number of Host Bus Adapters to support.
Possible Impact:	If number is reduced, may allow for reduction in memory used by the driver.
Applicable Versions:	3.04.00 and higher

This parameter may be used to optimize the use of dynamically allocated memory by the driver. If less than 8 NCR based PCI host adapters, including any on board (built in to) the motherboard, are being used, this parameter will allow for a reduction in the total memory being used for the driver.

Using the Maximum SCSI IDs Option

Command line option:	max id=<option>
Default value:	32
Valid options:	8-32
Function:	Specify the maximum number of SCSI IDs each host adapter board should support.
Possible Impact:	If number is reduced, may allow for reduction in memory used by the driver.
Applicable Versions:	3.04.00 and higher

This parameter may be used to optimize the use of dynamically allocated memory by the driver. If all the host adapters, including any SCSI controllers on the motherboard are connected to less than 31 devices, a user can reduce the size of the dynamically allocated memory by setting this value to the maximum number of devices on any of the SCSI controllers.

Using the Maximum LUNs Option

Command line option:	max_lun=<option>
Default value:	4
Valid options:	1-4
Function:	Specify the maximum number of LUNs each host adapter board should support per SCSI id.
Possible Impact:	If number is reduced, may allow for reduction in memory used by the driver.
Applicable Versions:	3.04.00 and higher

This parameter may be used to optimize the use of dynamically allocated memory the driver. If less than 8 LUNs are being used per NCR based PCI host adapter SCSI id, this parameter will allow for a reduction in the total memory being used for the driver.

Important additional information

Memory Allocation

The driver allocates memory for certain structures based upon the maximum number of SCSI IDs (max_id), LUNs (max_lun), and paths (max_hbas) that may be used in the system. The amount of memory allocated is based on the following formula:

319 bytes of memory are allocated for the structure, so:

Memory Allocated = 319 x max_hbas x max_lun x max_id.

So for default allocations, the amount of memory allocated is:

Memory Allocated = 319 x 8 x 4 x 32 = 326,656 bytes (400 KB).

If, for example,

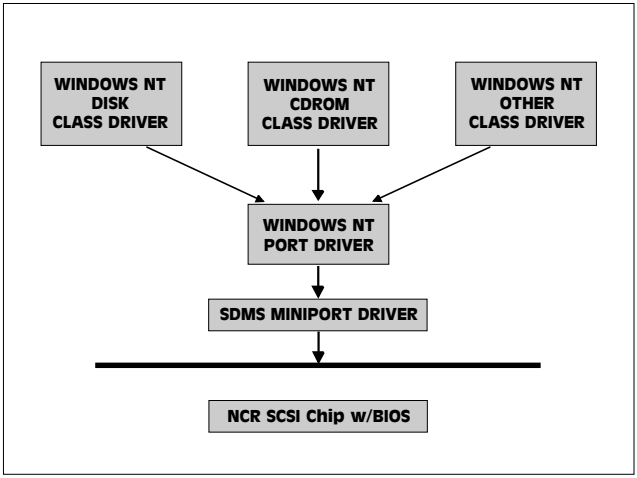
- Only one host adapter is installed (or when using an NCR based PCI SCSI embedded controller and no add in HBAs)
- Only one LUN per device will be used, and
- The bus is narrow (up to 8 SCSI IDs)

then by setting the appropriate command line options, the amount of memory allocated will be:
Memory Allocated = 319 * 1 * 1 * 8 = 2,552 bytes (2.5 KB).

Device Drivers for Windows NT

Introduction

Windows NT provides a graphical user interface environment, without DOS, incorporating many high level features (refer to the Microsoft Windows NT documentation for details). I/O requests in Windows NT are handled by an I/O manager. To address a SCSI peripheral the I/O manager goes through the appropriate drivers (refer to the figure below). The port driver as well as class drivers for hard disk, floptical, CD-ROM, printer, and scanner peripherals are provided in Windows NT Other class drivers, provided by peripheral manufacturers, may be added to support new devices. Tape device support is built into the operating system itself, and does not require a class driver. NCR SDMS 3.0 provides a miniport driver, called NCRSDMS.SYS, to complete the path to an NCR controller or processor with an SDMS SCSI BIOS. The following section describes this driver and its installation.



SCSI I/O flow in Windows NT

NCRSDMS.SYS

Features

- Synchronous negotiation (including fast SCSI)
- Tagged command queuing
- Supports multiple host adapters
- Supports multiple Logical Unit Numbers (LUNs)
- Disconnect/Reselect
- Scatter/gather
- Supports SCSI pass-through functionality
- Wide support (single-ended and differential}

Description

NCRSDMS.SYS is designed to Microsoft's specification for miniport drivers. This driver allows connection of SCSI devices including disk drives, CD-ROMs, and tape drives. To support a new SCSI device the Windows NT architecture requires that a class driver for that type device be present (usually supplied by Microsoft, or possibly by the peripheral manufacturer). No changes to NCRSDMS.SYS are required.

SCSI commands can be passed directly from a Windows application to the SCSI devices by using the SCSI pass-through facility (refer to the Microsoft Windows NT documentation for details). This facility allows applications to directly control and access SCSI devices by filling in a data structure and calling in to the port driver.

Installation

New System Installation

This procedure will install the NCRSDMS.SYS driver onto a Windows NT system. Use this procedure when installing NT onto an unused IDE or SCSI drive. NT will automatically add the driver to the registry and copy the driver to the appropriate directories.

1. Start the NT installation by booting off the Microsoft floppy disk.
2. Press Enter when the Welcome to Setup screen appears.
3. On the Setup Method screen, choose custom setup.
4. The installation program will then scan for SCSI adapters.
5. A screen will display the SCSI adapters found. Choose S to configure additional SCSI adapters.
6. Move the highlight bar to Other and press Enter.
7. When prompted, insert the SDMS SCSI Drivers disk.
8. The SDMS Miniport driver should be highlighted. Press Enter to proceed.

9. NT should now recognize the SDMS Miniport driver and the SCSI hardware. At this point, simply follow the Microsoft Windows NT installation procedure.

Existing System Installation

This procedure will install the NCRSDMS.SYS driver onto an existing Windows NT system. Use this procedure when NT has been previously installed onto an IDE drive.

1. Boot NT and log on as Administrator.
2. Open the Main window in the Program Manager.
3. Double-click on Windows NT SetUp.
4. Choose Options, then choose Add/Remove SCSI Adapters..., then choose Add.
5. On the SCSI Adapter list, go to the bottom and choose Other.
6. When prompted, insert the SDMS SCSI Drivers disk. For the path to the SDMS files, leave a:\ and select OK.
7. On the Select OEM Option menu, the SDMS Miniport driver should be highlighted. If it is not highlighted, select it. Choose OK.
8. On the Select SCSI Adapter Option menu, choose Install with the SDMS driver highlighted. At this point, the following message may occur:

   ```
   The driver(s) for this SCSI Adapter are already on
   the system. Do you want to use the currently
   installed driver(s) or install new one(s)?
   ```

   Selecting Current will use the driver already on the system, and selecting New will use the driver on the floppy disk. Either option leads to step nine.
9. For the path to the OEM SCSI adapter files, leave a:\ and select Continue.
10. On the SCSI Adapter Setup menu, choose Close.
11. Rebooting will load the SDMS Miniport driver.

Command Line Options

There are no command line options with the Windows NT device driver.

Troubleshooting

- DURING INSTALLATION, NO SCSI DEVICES ARE FOUND.
  a. Ensure that the custom setup is chosen on the Setup Method screen.
  b. Ensure that all devices are powered on and terminated correctly.
  c. Check that no devices have duplicate SCSI IDs.
- SYSTEM CRASHES DURING INSTALLATION WITH A MESSAGE INDICATING INACCESSIBLE BOOT DEVICE.
  a. This error is usually associated with an IRQ, DMA channel, I/O (chip) address, or BIOS address conflict. Set the SCSI host bus adapter (HBA) board to use a different interrupt.
- A DISK DRIVE IS RECOGNIZED AS SEVEN DIFFERENT DEVICES WHEN ONLY ONE IS PHYSICALLY CONNECTED TO THE SCSI BUS.
  a. This error is usually caused by older SCSI devices incorrect ly indicating to NT that they support multiple LL1Ns. Contact the device manufacturer for a firmware upgrade.

Important additional information

Enabling Tagged Command Queueing

The default configuration for the NCRSDMS.SYS driver does not enable tagged command queueing. To enable this feature, use the following procedure.

Note: All the entries below are case sensitive and should be entered exactly as 'disabled'.

*** WARNING ***

Changes to the NT registry may cause the system to become inoperable and unusable. Before making any changes to the registry, read the Microsoft documentation. Follow the procedure below carefully. Do not make any changes other than those outlined.

1. Boot NT and log on as administrator.
2. Open the Command Prompt window and enter the command: regedt32
3. Double click on HKEY_LOCAL_MACHINE, then on Current ControlSet, and then on Services. Services should now be highlighted.
4. Scroll down the list until the entry Nasdms is located. Clicking once on the driver will highlight the name, and the right side of the screen will show the driver parameters.
5. Choose Edit, then Add Key. For the Key Name field, enter: Device Leave the Class field blank.
6. The new key device should now be added as a subkey of Ncrsdms. Scroll down and click on Device (it should be highlighted).
7. Choose Edit, then Add Value. For the Value Name field, enter: DriveParameter For the Data field, enter: REG_SZ On the next screen, for the Data field, enter: UseTags=1
8. Choose Registry, then Exit to save changes. Rebooting will now enable tagged command queuing.

APPENDIX A

Programming the Watchdog timer

The PCA-6157 is equipped with a watchdog timer that resets the CPU or generates an interrupt if processing comes to a standstill for whatever reason. This feature ensures system reliability in industrial stand-alone and unmanned environments.

Jumper JP19, described in Chapter 1, controls the Watchdog settings. The default configuration of the timer is enabled with system reset.

If you have selected the programmable mode for the Watchdog timer, you must write a program which reads I/O port address 443 (hex) at regular intervals. The first time your program reads the port, it enables the watchdog timer. After that your program must read the port at time intervals less than 1.6 seconds, otherwise the Watchdog timer will activate and reset the CPU or generate an interrupt on IRQ11. When you want to disable the Watchdog timer, your program should read I/O port 043 (hex).

If CPU processing comes to a standstill because of EMI or a software bug, your program's signals to I/O port address 443 to the timer will be interrupted. The timer will then automatically reset the CPU or invoke an IRQ, and data processing will continue normally.

You must write your program so that it reads I/O port address 443 at an interval shorter than the timer's preset interval The timer's intervals have a tolerance of ±30%, so you should program an instruction that will refresh the timer about every second

The following program shows how you might program the Watchdog timer in BASIC:

```
10    REM Watchdog timer example program
20    X=INP(&H443) REM Enable and refresh the watchdog
30    GOSUB 1000 REM  Task #1, takes 1 sec to complete
40    X=INP(&H443) REM Refresh the watchdog
50    GOSUB 2000 REM  Task #2, takes 1 sec to complete
60    X=INP(&H043) REM Disable the watchdog
70    END
1000  REM Subroutine #1, takes 1 second to complete
      .
      .
      .
1070  RETURN
2000  REM Subroutine #2, takes 1 second to complete
      .
      .
      .
2090  RETURN
```

APPENDIX B

POST LEDs

This appendix lists the codes generated by the POST (Power On Self Test) routines. It also discusses how to read the PCA-6157's POST LED indicators.

Whenever you start up your system, the CPU card runs a series of programs to test and initialize board hardware. If the routines encounter an error in during the tests, you will either hear a few short beeps or see an error message on the screen. There are two kinds of errors: fatal and non-fatal. The system can usually continue the boot up sequence with non-fatal errors. Non-fatal error messages usually appear on the screen along with the following instructions:

```
press <F1> to RESUME
```

Write down the message and press the F1 key to continue the bootup sequence. The cure for most nonfatal error messages is simply to run the BIOS SETUP program, discussed in Chapter 4.

If the routines encounter a fatal error, they will stop the tests and output a message indicating which test failed. If the fatal error comes before the screen device initializes, the card will indicate the error code through a series of beeps.

You can also determine the number of the test that failed by reading the LED indicators on the top of the PCA-6157 board.

Please make a note of any BIOS error codes before you contact Advantech for technical support.

POST LEDs

Before the BIOS performs each system test, it writes a checkpoint code to I/O address 80H. If the test fails, the code will stay in memory. You can read the code and determine which test has failed.

The PCA-6157's POST LED indicators make this process extremely easy. You don't need any special diagnostic tools, you just read the POST code from the LEDs.

The table below shows how to read the LEDs, a series of eight LEDs located in the top left-hand corner of the board.

SELF-TEST INDICATORS

● ● ● ● ● ● ● ●
D7 D6 D5 D4 D3 D2 D1 D0

● : LIGHT OFF

○ : LIGHT ON

● ● ● ● : 0	● ○ ● ● : 4	○ ● ● ● : 8	○ ○ ● ● : C
● ● ● ○ : 1	● ○ ● ○ : 5	○ ● ● ○ : 9	○ ○ ● ○ : D
● ● ○ ● : 2	● ○ ○ ● : 6	○ ● ○ ● : A	○ ○ ○ ● : E
● ● ○ ○ : 3	● ○ ○ ○ : 7	○ ● ○ ○ : B	○ ○ ○ ○ : F

EXAMPLE

● ● ● ○ ○ ● ● ○
D7 D6 D5 D4 D3 D2 D1 D0

1 9

POST checkpoint LED indicators

The following list of checkpoint codes gives the number of each checkpoint for the AWARD BIOS POST. Codes are Copyright AWARD-BIOS CHECK-POINT, (C) 1994 Award Software Inc.

Code	Name	Description of check-point
00	Boot	
01	Processor test 1	Processor status (IFLAGS) verification tests the following processor status flags, carry, zero, sign, BIOS overflow. It will set each of these flags, verify that they are set, then turn each flag off and verify it is off.
02	Setup low memory	Early chip set initialization memory presence test. OEM chipset routines. Clear low 64 KB of memory. Test first 64 KB memory.
03	Early cache initialization	Cyrix CPU initialization, cache initialization.
04	Test memory	RAM must be periodically refreshed in order to keep the memory from decaying.
	Refresh toggle	This function assures that the memory refresh function is working properly.
05	Blank video	Keyboard controller initialization. Initialize keyboard.
06	Initialize keyboard	detect type of keyboard controller (optional). Set num_lock status.
07	Initalize video interface	Detect CPU clock. Read interface CMOS location 14h to find out type of video in use. Detect and initialize video adaptor.
08	Processor test 2	Read, write, verify all CPU registers except SS, SP, and BP with data pattern FF and 00.
09	Initialize chips	Disable NMI, PLE, ALE, UEL, SQWV. Disable video, parity checking, DMA. Reset math coprocessor, clear all page registers, CMOS shutdown byte. Initialize timer 0, 1, and 2. Set EISA timer to a known state. Initiallze DMA controllers 0 and 1. Initialize interrupt controllers 0 and 1. Initialize EISA extended registers.

Code	Name	Description of check-point
0A	Setup interrupt vectors	Initialize first 120 vectors in interrupt vector table with SPURIOUS_INT_HDLR and initialize INT 00h-1Fh according to INT_TBL
0B	Test CMOS RAM	Test CMOS RAM checksum. If bad or insert key pressed, INT OOh-1Fh according to INT_TBL
0C		Reserved.
0D	Test CMOS interface	Verifies CMOS is working correctly. Checks battery status, detects bad battery.
0E	Test video memory	Test video memory, write sign-on message to screen. Set up shadow RAM-enable according to setup.
0F	Test DMA controller 0	BIOS checksum test. Keyboard detection and initialization.
10	Test DMA controller 1	
11	Test DMA page registers	Test DMA page registers
12	Test 8259 interrupt functionality	Force an interrupt and verify the interrupt occurred.
13	Test stuck NMI bits (parity/IO check)	Verify NMI can be cleared.
14	Test timer counter 2	Test 8254 timer 0 counter 2
15	Test 8259-1 mask bits	Verify 8259 channel 1 masked interrupts by alternately turning off and on the interrupt lines.
16, 17,18~19, 1B, 1E		Reserved.
1A	Display CPU clock	
1C	Test 8259-2 mask bits	Verify 8259 channel 2 masked interrupts by alternately turning off and on the interrupt lines.
1D	Test 8259-1 mask bits	Turn off interrupts then verify no interrupt mask register is on.
Code	**Name**	**Description of check-point**
20	Enable slot 0	Initialize slot 0 (system board).
21-2F	Enable slots 1-15	Initialize slots 1 through 15.
30	Size base and extended memory	Size base memory from 256 KB to 640 KB and extended memory above 1 MB.

Code	Name	Description of check-point
31	Test base and extended memory	Test base memory from 256 KB to 640 KB and extended memory above 1 MB using various patterns. Note: This will be skipped in EISA mode and can be “skipped” with ESC key in EISA mode.
32-35, 39-3D		Reserved.
36	Setup enabled	
37	Initialize and install mouse	Detect if mouse is present, initialize mouse, install interrupt vectors.
38	Test EISA extended memory	If EISA mode flag is set then test EISA memory found in slot initialization. Note: This will be skipped in ISA mode and can be ‘skipped” with ESC key in EISA mode.
3E	Set up cache controller	Initialize cache controller.
3F		Reserved.
40	Virus protect	Display virus protect disable or enable.
41	Initialize floppy drive and controller	Initialize floppy disk drive controller and any drives.
42-43, 46-47, 4A-4D		Reserved.
44		Reserved.
45	Detect & initialize math coprocessor	Initialize math coprocessor.
48	Initialize hard disk drive and controller	Initialize hard disk drive controller and any drives.
49	Detect & initialize serial and parallel ports	Initialize serial/parallel ports (also game port).
4E	Manufacturing post loop or display messages	Reboot if manufacturing loop post loop pin is set. Otherwise display and messages (i.e. any non-fatal errors that were detected during post and enter setup).
4F	Security check	Ask for password security (optional)
50	Write CMOS	Write all CMOS values back to RAM and clear screen.

Code	Name	Description of check-point
51	Pre-boot enable	Enable parity checker, enable NMI, enable cache before boot.
58	Initiallze option ROMs	Initialize any option ROMs present from C8000h to EFFFFh. Note: When fscan option is enabled, it will initialize from C8000h to F7FFFh.
59	Initialize time value	Initialize time value in 40h: BIOS area.
60	Set up virus protection	Set up virus protection according to setup.
61	Set boot speed	Set system speed for boot.
68	Set numlock	Set numlock status according to setup.
69	Boot attempt	Set low stack boot via INT 19h
B0	Spurious	If interrupt occurs in protected mode.
B1	Unclaimed NMI	If unmasked NMI occurs, display "Press F1 to disable NMI, F2 to reboot".
BE	Chipset default initialization	Program chipset registers with power-on BIOS defaults.
BF	Chipset initialization	Program chipset registers with setup values.
C0	Turn off chipset cache	OEM specific-cache control.
C1	Memory presence test	OEM specific test to size onboard memory.
C5	Early shadow	OEM specific early shadow enable for fast boot.
CC	Cache presence test	External cache size detection test.
E1-EF	Setup pages	E1 - page 1, E2 - page 2, etc.