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Diversified Technology, Incorporated

CPC8640

CompactPCI Compliant Intel Celeron Single Board Computer

Configuration Guide

Rev 1.0

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Service Department
476 Highland Colony Parkway
P. O. Box 748
Ridgeland, MS 39157
RMA#_____

To contact the Service Department:

Telephone: (601)-856-4121
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Email: tech@dtims.com

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TABLE OF CONTENTS

1 Product Overview

1.0 General Overview 1-1
1.1 System Memory 1-1
1.2 Real Time Clock and Non-Volatile Memory 1-1
1.3 System Environmental Monitor 1-1
1.4 Keyboard and Mouse Ports 1-1
1.5 Reset, Power Indicator, and Speaker Port 1-2
1.6 CompactPCI Bus 1-2
1.7 Backplane Requirements 1-2
1.8 PCI Enhanced IDE 1-2
1.9 Peripheral I/O 1-2
1.10 PCI Ethernet 1-2
1.11 PCI Video Support 1-3
1.12 PCI SCSI 1-3
1.13 PCI Universal Serial Bus (USB) 1-3
1.13 Flash Disk 1-3

2 Configuration Information

2.0 Overview 2-1
2.1 System Memory 2-1
2.2 L2 Cache 2-1
2.3 CPU Configuration. 2-1
2.4 IDE Hard Disk Interface 2-1
2.5 Floppy Disk Interface 2-1
2.6 10/100 Base-T Ethernet Interface 2-1
2.7 SCSI. 2-2
2.8 PCI Super VGA. 2-2
2.9 Parallel Port 2-2
2.10 Serial Ports 2-2
2.11 Keyboard / Mouse Configuration. 2-2
2.12 System Monitor. 2-3
2.13 Flash Disk 2-3
2.14 Universal Serial Bus (USB) 2-3

3 Quick Reference

3.0 Peripheral Connectors 3-1
3.1 Connector Pinouts 3-3
3.2 Jumper Settings 3-9

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4 ROM Utilities

4.0 Features 4-1
4.1 ROM Utilities 4-3
4.2 System Summary 4-4
4.3 System Setup 4-6
4.4 Hard Disk Setup 4-8
4.5 Boot Options 4-10
4.6 BIOS Options 4-12
4.7 Peripherals 4-15
4.8 PCI Config 4-17
4.9 PNP Exclusions 4-19
4.10 Cache Config 4-21
4.11 Chipset Config 4-23
4.12 System Monitor 4-25
4.13 Thermal Manager 4-27
4.14 Exit 4-29

5 Troubleshooting Guide

5.0 Error Messages and Problem Areas 5-1

6 System Resource Maps

6.0 Memory Map 6-1
6.1 Interrupt Map 6-2
6.2 I/O Address Map 6-3

A System Monitor VI Programming Instructions

A.0 Overview A-1
A.1 Monitored Conditions A-1
A.2 Alarming Methods A-2
A.3 Programming the Monitor Through the I/O Ports A-3
A.4 Reading the Monitor Port Status A-3
A.5 Sending a Command to the Monitor A-3
A.6 Sending Data to the Monitor A-4
A.7 Receiving Data From the Monitor A-4
A.8 Programming the Monitor Using the Serial Port A-4
A.9 Temperature Notes A-16
A.10 Modem Connection Requirements A-16
A.11 Example Application A-17
A.12 Remote Data Retrieval Mechanisms A-18
A.13 Quick Reference A-21

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B System Monitor VI Programming Utility

B.0 DUTIL.exe Utility B-1

C Peripheral Drivers

C.0 Ethernet Drivers C-1
C.1 Windows 95/98 . . . . . C-1
C.2 Windows NT 3.51 . . . . . C-1
C.3 Windows NT 4.0 . . . . . C-2
C.4 Solaris 2.6 . . . . . C-2

D Ethernet Diagnostic Utility

D.0 Introduction D-1
D.1 Using 82559TLK D-1

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1

Product Overview

1.0 General Overview
1.1 System Memory
1.2 Real Time Clock and Non-Volatile Memory
1.3 System Environmental Monitor
1.4 Keyboard and Mouse Ports
1.5 Reset, Power Indicator, and Speaker Port
1.6 CompactPCI Bus
1.7 Backplane Requirements
1.8 PCI Enhanced IDE
1.9 Peripheral I/O
1.10 PCI Ethernet
1.11 PCI Video Support
1.12 PCI SCSI
1.13 PCI Universal Serial Bus (USB)
1.13 Flash Disk

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1.0 General Overview

The CPC8640 is a 32-bit compliant CompactPCI Celeron (PPGA) single board computer. The CPC8640 provides ethernet integration in the form of an Intel 82559 10/100 Base-T PCI ethernet controller, support for IDE hard drives and other common PC style peripherals. All I/O connections are available at the rear of the chassis using DTI's IEEE 1101.11 compliant rear-panel I/O module, the CPI602. The CPC8640 is fully compliant with the CompactPCI standard. DTI manufactures a line of backplanes designed to support CompactPCI.

1.1 System Memory

There are two 72-bit wide DIMM sockets on the CPC8640 organized as two banks. 8MB to 512MB of Synchronous DRAM can be installed using 1Mx72, 2Mx72, 4Mx72, 8Mx72, 16Mx72 and 32Mx72 DIMMs. The CPC8640 will automatically detect the presence of memory and optimize DRAM timing parameters accordingly.

The CPC8640 supports a data integrity feature called ECC mode (Error Correction Code). This feature uses the parity bits in Synchronous DRAM DIMMs to correct single bit errors in DRAM without halting the system due to a parity error.

1.2 Real Time Clock and Non-Volatile Memory

The CPC8640 has a real time clock with a built-in lithium battery for storing time and date and system configuration. This battery has a projected life of at least 10 years under normal operation.

1.3 System Environmental Monitor

The CPC8640 features an independent 16-bit microcontroller used for monitoring the system environment. This controller monitors board voltages, ambient board temperature, the approximate temperature of the Celeron processor, and the rotation of external system fans if they are equipped with strobe outputs. The nominal values for these measurements and the allowable tolerances are programmable by the user's software or by a utility program provided. Inputs which violate the programmed tolerances cause an alarm interrupt to the system. The measurement values are also available to the user's software.

Another function of the system environment monitor is to provide a watchdog timer for the system. Additional features include support for external indicators, switch closure inputs, external temperature sensors, monitoring of system boot status and BIOS diagnostics and a dedicated serial port to facilitate remote system monitoring and control. See Appendix A for a full description of the system monitor. This feature is provided through DTI's System Monitor on stick module SMS001, which is installed to the CPC8640 board.

1.4 Key board and Mouse Ports

The CPC8640 provides connectors on the front panel for PS/2 style keyboard and mouse. Additionally, keyboard and mouse interfaces are available at the rear panel using the CPI602 I/O board. The power for the keyboard and mouse ports is filtered and fuse protected on the CPC8640.

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1.5 Reset, Power Indicators, and Speaker Ports

A recessed RESET button is provided on the front panel of the CPC8640. A green LED is provided to indicate when RESET is active.

Power indication LEDs are provided on the front panel. Green LEDs indicate the presence of all the system voltages, including +3V, +5V, +12V, and -12V. A standard PC-compatible speaker port is provided by the CPC8640. The physical connector is located on DTI's CompactPCI backplane. The power supply for the speaker is fuse protected onboard the backplane.

1.6 CompactPCI Bus

The CPC8640 32-bit expansion bus is fully compatible with the CompactPCI V2.0 Standard. Direct support is provided for seven CompactPCI slots, all capable of operating as standard PCI mastering devices. Additional PCI expansion is possible using external PCI-PCI bridge devices. The PCI busclock runs at 33 MHz.

1.7 Backplane Requirements

The CPC8640 is a 6U-size single board CompactPCI computer slotcard and requires a passive backplane for expansion purposes and basic operation. The CPC8640 is designed to be fully compatible with the CompactPCI V2.0 Standard. All I/O is routed to the rear of the chassis using the CPI602 rear-panel I/O module. DTI manufactures a full range of backplanes with various numbers of expansion slots.

1.8 PCI Enhanced IDE

The high performance PCI Enhanced IDE interface on the CPC8640 is fully compatible with ATA and ATAPI specifications. Support for up to PIO mode 4 timing is provided directly by the "auto-typing" feature of the BIOS. High speed IDE transfer rates up to 16.6 MB/s are possible. Bus mastering IDE is also supported through the use of drivers for the appropriate operating system.

1.9 Peripheral I/O

A floppy port, parallel port, and two RS-232 serial ports are provided by the CPC8640. The floppy port supports two drives, either of which can be 360KB, 720KB, 1.2MB, or 1.44MB.

The parallel interface is fully compliant to the IEEE 1284 standard. A protection circuit prevents damage to the parallel port when an external printer powers up or operates at voltages higher than the CPC8640.

The serial ports have 16550 compatible UARTs with 16 byte buffers for reliable high speed data transfers. Baud rates up to 115,200 are supported.

1.10 PCI Ethernet

The ethernet interface on the CPC8640 is implemented with the Intel 82559 ethernet controller. The controller is a bus-mastering device that uses a MII (Media Independent Interface) to communicate with the physical layer. The physical layer is implemented as auto-negotiating 10 Base-T / 100 Base-TX through a single RJ45 connector. Both full and half duplex operation is supported.

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1.11 PCI Video Support

The CPC8640 provides enhanced 3D graphics performance by utilizing the C&T69000 video controller for standard and extended VGA modes. It also provides support for various flat panels. Active matrix TFT panel displays and passive matrix panel displays like DSTN and SSTN are supported. Some of the more notable features are its advanced frame rate control (FRC) for STN panels, auto-expansion and centering for text and graphics modes on high resolution panels, and advanced power sequencing techniques for the panel power and control/data signals.

1.12 PCI SCSI

The SCSI interface for the CPC8640 is provided by the Adaptec 7880 PCI SCSI controller with 32-bit PCI bus interface. The chip is a high performance bus mastering device that provides high data throughput in the system with low CPU and system bus utilization. The SCIS interface supports double speed SCSI-3 operation for transfer rates up to 20MB/s with Ultra-SCSI
devices. This feature is jumper configurable.

1.13 PCI Universal Serial Bus (USB)

The CPC8640 provides a Universal Serial Bus (USB) host controller that is UHCI compatible. The host controller's root hub has two programmable USB ports. Port 0 is a Series-A type receptacle locatedon the front panel of the CPC8640. Port 1 is routed to the rear-panel I/O board for connection at the rear of the chassis.

1.14 Flash Disk

The CPC8640 provides the user with an onboard flash disk allowing the board to boot to an OS without any floppy or hard drive connected to the system. Currently, the maximum flash disk size available is 72MB.

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2

Configuration Information

2.0 Overview
2.1 System Memory
2.2 L2 Cache
2.3 CPU Configuration
2.4 IDE Hard Disk Interface
2.5 Floppy Disk Interface
2.6 10/100 Base-T Ethernet Interface
2.7 SCSI
2.8 PCI Super VGA
2.9 Parallel Port
2.10 Serial Ports
2.11 Keyboard / Mouse Configuration
2.12 System Monitor
2.13 Flash Disk
2.14 Universal Serial Bus (USB)

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2.0 Overview

The following section explains the various hardware features and configuration requirements for the CPC8640. Configuration changes are made in one of two ways, software setup through the CPC8640 ROM-based setup utility or by jumper settings. A jumper location diagram is located in Section 3.

2.1 System Memory

The CPC8640 supports up to 512 megabytes of SDRAM memory. The board provides two 168-pin 72-bit DIMM sockets, U2 and U5, which make up two banks of memory. Either bank may be used, however, it is recomended that Bank 0 at U5 be populated if only one DIMM is used. The memory size of each bank does not have to be matched. If mixed speeds of SDRAM are used, both DIMM will be set for the lowest speed. DIMM modules sizes of 1M, 2M, 4M, 8M, 16M or 32M by 72 are accepted by either bank. The SDRAM must be PC66 or PC100 compliant.

The system memory is automatically sized by the CPC8640 BIOS and requires no hardware configuration. DIMM modules are automatically detected by the CPC8640 and configured for optimal performance.

2.2 L2 Cache

All cache on the CPC8640 will be contained within the processor. CPUs are available with 128k of secondary cache integrated in the Celeron processor.

2.3 CPU Configuration

The system, CPU, and PCI clock speeds are configured using jumpers E1, E2, E3, and E4. A configuration table in Section 3 shows the available speeds and the correct jumper settings.

2.4 IDE Hard Disk Interface

The CPC8640 supports a 32-bit PCI local bus IDE hard disk interface. The IDE interface supports both primary and secondary drives. When enabled, the IDE interface utilizes IRQ14. The IDE signals are routed through the J9 connector for connection to a rear-panel or backplane-mounted IDE connector. All IDE configuration is handled in the CPC8640 ROM-based Configuration Utility.

2.5 Floppy Disk Interface

The CPC8640 supports /AT compatible floppy disk drives. The floppy disk interface supports 360K, 720K, 1.2M, or 1.4M disk drives. The floppy interface can be enabled or disabled using the CPC8640 Configuration Utility. When enabled, the floppy interface utilizes IRQ6 and DMA channel 2. The floppy drive signals are routed through the J8 connector for connection to a rear-panel or backplane mounted floppy connector.

2.6 10/100 Base-T Ethernet Interface

The CPC8640 supports an auto switching 10 Base-T / 100 Base-TX ethernet interface. This is provided by the Intel 82559 ethernet controller. The ethernet signals are routed through J8 for connection to a rear-panel mounted RJ45 connector. UTP-5 data-grade cable should be used for reliable operation. The ethernet interface is compatable with the Intel Pro100t ethernet adapter. This means that the Intel Pro100t drivers will be used by the CPC8640 to configure the ethernet interface. The interface can be enabled or disabled in the ROM utilities.

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2.7 SCSI

The SCSI interface on the CPC8640 is controlled by the Adaptec 7880 fast SCSI controller with a 32-bit PCI bus interface. This chip is a high performance bus mastering device that provides high data throughput in the system with low CPU and bus utilization.

The SCSI interface is compliant to SCSI-1, SCSI-2, and SCSI-3 standards. The CPC8640 Configuration Utility can be used to enable or disable the SCSI interface. Jumper E9 controls the termination to the upper 8-bits of the Wide-SCSI data bus. Placing a shunt on E9 disables this ternimation. Double speed Ultra-SCSI transfers can be enabled by removing jumper E8. The SCSI interface signals are routed through J9 for connection to a rear-panel mounted SCSI controller for hard drive interface.

2.8 PCI Super VGA

The CPC8640 provides a high performance video controller with 32-bit PCI bus interface. With 2MB of video memory integrated in the video controller, all standard, super, and extended VGA modes are supported. It also provides support for flat panel displays such as VGA, XGA, and SVGA modes in TFT or DSTN display types. Connecting the CRT interface to the CPC8640 is made via a 15-pin D-Sub connector at J1. Also, the CRT interface is routed to the rear panel I/O throgh J10 to a rear I/O connector.

Jumper E6 is used to enable or disable the onboard video support. Jumpers E10-E13 are provided for the user to select the appropriate flat panel mode.

2.9 Parallel Port

The printer port interface on the CPC8640 is configured entirely with the CPC8640 Configuration Utility. It may also be disabled through the utility. The parallel port signals are routed through connector J8 for connection to rear-panel mounted 25-pin female D-SUB connector.

2.10 Serial Ports

Two high-speed serial ports are available on the CPC8640. Both are “16550" compatible. The serial ports are configured via the CPC8640 Configuration Utility. Serial port 1 can be configured as COM1 (3F8h) or COM3 (3E8h), and utilizes IRQ4. Serial port 2 can be configured as COM2 (2F8h) or COM4 (2E8h), and utilizes IRQ3. Both ports can be disabled entirely. Both serial port interfaces have their signals routed through connector J8 for connection to rear-panel mounted 9-pin male D-SUBs.

2.11 Keyboard/Mouse Configuration

PS/2 type keyboards and mice may be used with the CPC8640.

The +5 volt supply for the keyboard is protected from short circuits by a current limiting device. This device limits the total current available to the keyboard and mouse to approximately 1.2 A. If more current than this is drawn, the current limiting device will reduce the current output of the keyboard and mouse port to a few milliamps. In order to reset the current limiting device, remove the short circuit and power down the system for approximately 30 seconds.

The keyboard connects to the PS/2 connector at J2 or to a rear-panel mounted connector through J9. The mouse connects to the PS/2 connector at J3 or to a rear-panel mounted connector through J9. E7 is used to enable mouse interrupt IRQ12. If the mouse port is not being used, removing E7 frees IRQ12 for use by the other devices.

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2.12 System Monitor

Appendix A contains detailed information explaining how to use the included utilities to configure the system monitor.

The CPC8640's system monitor has the ability to communicate with other computer systems using a dedicated serial port. All System Monitor inputs, outputs, and dedicated serial port signals are routed through J8 for connection to rear-panel mounted connectors.

Alarm LED polarity can be configured using the jumpers E16 - E19.

A shunt can be placed at E20 to provide the System Monitor status of the CPU heatsink fan. The fan strobe signal will be routed to the System Monitor through general purpose input #4. The System Monitor can be configured to monitor this fan whenever the fan is connected to jumper J6.

2.13 Flash Disk

An onboard flash disk can be installed on the CPC8640 at location U41. Once installed, this device acts like a hard drive and uses standard OS partitioning, formatting, and utility copying without the needs for cables and external drives. This allows the CPC8640 to boot the OS without any floppy drive or hard drive connected to the system. The flash disk is currently available in sizes up to 72MB. All flash disk configuration is handled in the ROM based configuration utility.

2.14 Universal Serial Bus (USB)

The CPC8640 provides two USB ports. Port 0 is a standard Series-A receptacle located at J4 on the CPC8640 front panel. Port 1 is routed through J9 for connection to a rear-panel mounted connector.

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3

Quick Reference

3.0 Peripheral Connectors
3.1 Connector Pinouts
3.2 Jumper Settings

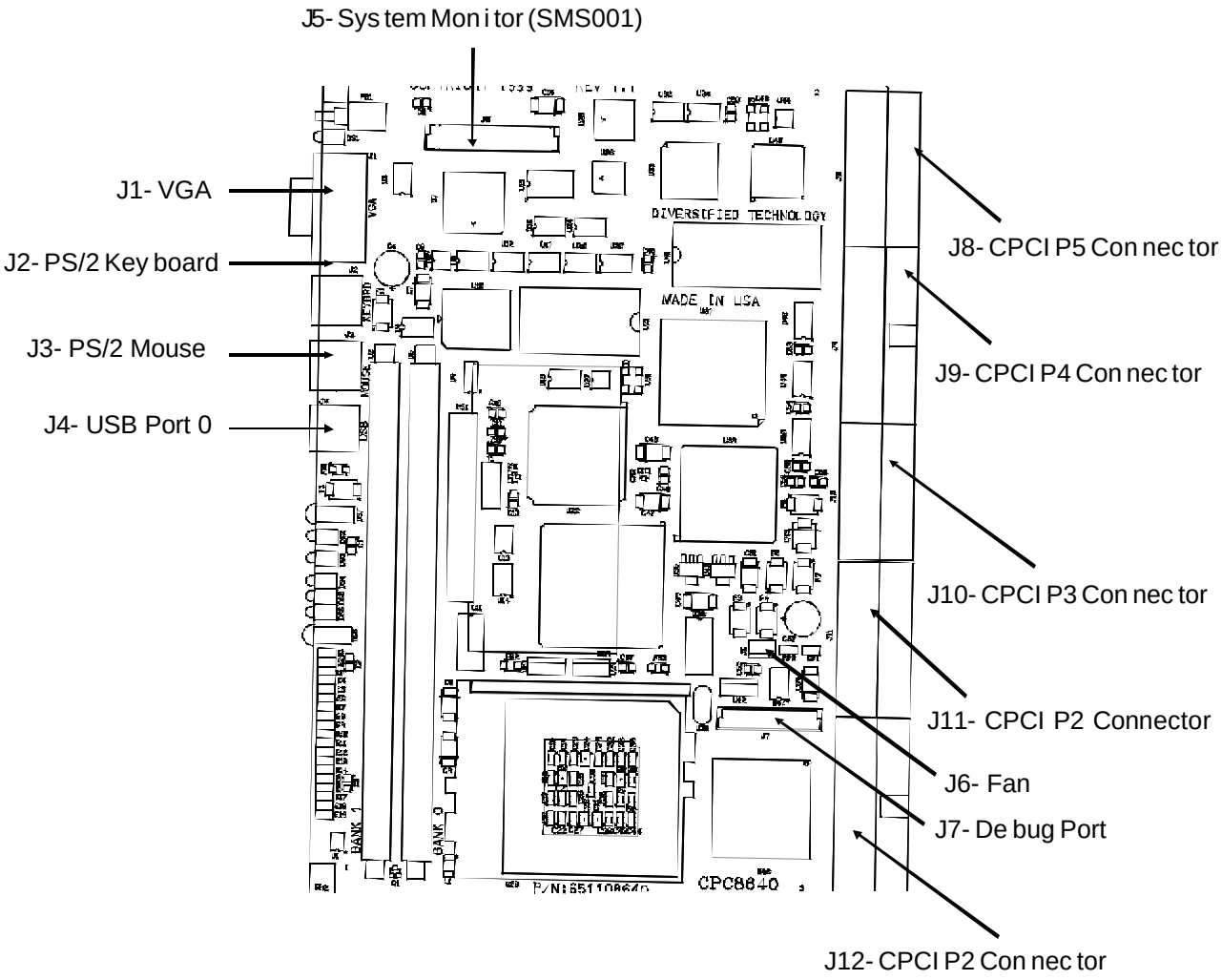
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3.0 Peripheral Connectors

Connector No.	Function	Physical Description
J1	VGA	15-Pin D-Shell
J2	Keyboard	PS/2 Right Angle
J3	Mouse	PS/2 Right Angle
J4	USB Port	Right Angle USB
J5	System Monitor Interface	80-Pin SMT High Density
J6	CPU Fan Power	3-Pin Friction Lock
J7	Debug Port	60-Pin SMT High Density
J8	Rear Panel I/O (CompactPCI P5 Connector)	CompactPCI “B” Type
J9	Rear Panel I/O (CompactPCI P4 Connector)	CompactPCI “A” Type
J10	Rear Panel I/O (CompactPCI P3 Connector)	CompactPCI “AB” Type
J11	CompactPCI P2 Connector	CompactPCI “B” Type
J12	CompactPCI P1 Connector	CompactPCI “A” Type

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Connector Locations



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3.1 Connector Pinouts

J1- Standard VGA Connector	
PIN	SIGNAL
1	Analog Red Output
2	Analog Green Output
3	Analog Blue Output
4	N/C
5	GND
6	GND
7	GND
8	GND
9	N/C
10	GND
11	N/C
12	N/C
13	Horizontal Sync
14	Vertical Sync
15	N/C

J2- Front Panel PS/2 Keyboard Port	
PIN	SIGNAL
1	DATA
2	N/C
3	GND
4	+5 Volts
5	CLOCK
6	SHIELD GND

J3 - Front Panel PS/2 Mouse Port	
PIN	SIGNAL
1	DATA
2	N/C
3	GND
4	+5 Volts
5	CLOCK
6	SHIELD GND

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J4 - USB Port 0	
PIN	SIGNAL
1	VCC
2	DATA-
3	DATA+
4	GND

J8- Rear-Panel I/O P2 (CompactPCI P5) Con nec tor					
47	SM_GPI3	SM_GPI4	SM_GPI5	GND	RXI-
46	SM_GPI7	GND	SM_GPI8	GPI11	RXI+
45	SM_GPI9	SM_GPI2	SM_GPI1	GND	TXI-
44	SM_GPO1	GND	SM_GPO2	SM_GPO3	TXI+
43	TEMP_SDA	TEMP_SCL	SM_RTS	GND	SM_DTR
42	SM_DCD	GND	SM_DSR	SM_CTS	SM_RI
41	SM_RXD	SM_TXD	RED	GND	GREEN
40	BLUE	GND	HSYNC	VSYNC	DDC_SDA
39	DDC_SCL	LP_STB/	LP_D7	GND	LP_D6
38	LP_D5	GND	+5V	LP_D4	LP_D3
37	LP_D2	LP_D1	LP_D0	GND	LP_ACK/
36	LP_BUSY	GND	+5V	LP_PE	LP_SLCT
35	LP_AFD/	LP_ERR/	LP_INIT/	GND	LP_SLIN/
34	SOUT1	GND	+5V	DTR1/	RTS1/
33	SIN1	DCD1/	RI1/	GND	CTS1/
32	DSR1/	GND	+5V	SOUT2	DTR2/
31	RTS2/	SIN2/	DCD2/	GND	RI2/
30	CTS2/	GND	+5V	DSR2/	WP/
29	+5V	TRK0/	INDEX/	GND	HDSEL/
28	WGATE/	GND	WDATA/	DIR/	STEP/
27	DR0/	DR1/	MTR0/	GND	MTR1/
26	DRATE0/	GND	RDATA/	DENSEL	DSKCHG/
PIN	A	B	C	D	E

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J9- Rear-Panel I/O P1 (CompactPCI P4) Con nec tor					
25	N/C	USB_P1+	USBP1-	SPEAKER	N/C
24	MS_DATA	N/C	N/C	KB_CLK	KB_DATA
23	N/C	N/C	N/C	GPO4	MS_CLK
22	N/C	N/C	OC1	GPI0	N/C
21	IDE_CS0/	N/C	N/C	GPI0	N/C
20	IDEIRQ	N/C	N/C	IDE_A1	IDE_A0
19	IDEIOW/	IDEIOR/	DIORDY	GND	IDEDAK/
18	IDE_D12	GND	IOCS16/	IDE_A2	IDE_CS1/
17	IDE_D10	IDE_ACT/	IDE_D2	GND	IDE_D7
16	IDE_RSTDRV/	GND	+5V	IDE_D4	IDE_D15
15	DDRQ0	IDE_D1	IDE_D6	GND	IDE_D13
Key Area					
11	IDE_D9	IDE_D3	IDE_D8	GPI6	IDE_D11
10	N/C	N/C	IDE_D0	IDE_D5	IDE_D14
9	SCSITERM	N/C	N/C	N/C	N/C
8	SSEL/	N/C	+5V	SBSY/	SATN/
7	SMSG/	SREQ/	SACK/	GND	SRST/
6	SCDPH/	GND	SCDPL/	SC_D/	SI_O/
5	SCSI_D3	SCSI_D2	SCSI_D1	GND	SCSI_D0
4	SCSI_D6	GND	+5V	SCSI_D5	SCSI_D4
3	SCSI_D10	SCSI_D9	SCSI_D8	+5V	SCSI_D7
2	SCSI_D14	+5V	SCSI_D13	SCSI_D12	SCSI_D11
1	+5V	-12V	SCSI_D15	+12V	+5V
PIN	A	B	C	D	E

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J10- CompactPCI P3 Connector					
19	FP_G2	+3.3V	FP_G1	GND	FSPCLK
18	GND	+3.3V	GND	FP_R0	GND
17	FP_G4	GND	FPD(30)	GND	+12V
16	GND	N/C	GND	FPD(25)	+12V
15	FP_G5	GND	FPD(31)	GND	GND
14	GND	ENABKL	GND	FPD(24)	+5V
13	FP_G7	GND	FP_B0	GND	+5V
12	GND	N/C	GND	FP_R1	GND
11	FP_B4	GND	FPD(33)	GND	ENAVDD
10	GND	FPDE	GND	FPD(26)	ENAVEE
9	FP_B4	GND	FPD(32)	GND	GND
8	GND	FP_R3	GND	FPD(27)	FP_R2
7	FP_B5	GND	FP_B1	GND	GND
6	GND	FP_R4	GND	FP_G0	FP_R6
5	FP_B7	GND	FPF(34)	GND	GND
4	GND	FP_R5	GND	FPD(29)	FP_G3
3	FPVSYNC	GND	FPD(35)	GND	FP_G6
2	GND	FP_R7	GND	FPD(28)	FP_B3
1	FPHSYNC	GND	N/C	GND	FP_B6
PIN	A	B	C	D	E

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J11- CompactPCI P2 Connector					
47	*	*	*	*	*
46	CLK6	*	*	*	*
45	CLK5	*	*	*	*
44	*	*	*	*	*
43	*	*	*	GND	*
42	*	*	PBRST/	REQ6/	GNT6/
41	*	*	*GPI8	*	*
40	*	*	*GPI7	REQ5/	GNT5/
39	*	*	*	*	*
38	*	GND	*	*	*
37	*	*	*	*	*
36	*	*	+5V	*	*
35	*	*	*	*	
34	*	*	+5V	*	*
33	*	*	*	*	
32	*	*	*	*	*
31	*	*	*	*	*
30	*	*	*	*	*
29	*	*	*	*	*
28	CLK4	*	GNT3/	REQ4/	GNT4/
27	CLK2	CLK3	*	GNT2/	REQ3/
26	CLK1	*	REQ1/	GNT1/	REQ2/
PIN	A	B	C	D	E

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J12- CompactPCI P1 Connector					
25	+5V	REQ64/	ENUM/	+3V	+5V
24	AD[1]	+5V	+5V	AD[0]	ACK64/
23	+3V	AD[4]	AD[3]	+5V	AD[2]
22	AD[7]	GND	+3V	AD[6]	AD[5]
21	+3V	AD[9]	AD[8]	GND	C/BE[0] /
20	AD[12]	GND	+5V	AD[11]	AD[10]
19	+3V	AD[15]	AD[14]	GND	AD[13]
18	SERR/	GND	+3V	PAR	C/BE[1] /
17	+3V	SDONE	SBO/	GND	PERR/
16	DEVSEL/	GND	+5V	STOP/	LOCK/
15	+3V	FRAME/	IRDY/	GND	TRDY/
Key Area					
11	AD[18]	AD[17]	AD[16]	GND	C/BE[2] /
10	AD[21]	GND	+3V	AD[20]	AD[19]
9	C/BE[3] /		AD[23]	GND	AD[22]
8	AD[26]	GND	+5V	AD[25]	AD[24]
7	AD[30]	AD[29]	AD[28]	GND	AD[27]
6	REQ0/	GND	+3V	CLK0	AD[31]
5			RST/	GND	GNT0/
4		GND	+5V	IRQ14	IRQ15
3	INTA/	INTB/	INTC/	+5V	INTD/
2		+5V			
1	+5V	-12V		+12V	+5V
PIN	**A**	**B**	**C**	**D**	**E**

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3.2 Jumper Settings

SPEED CONFIGURATION					
CPU Speed(MHz)	**BUS SPEED (MHz)**	**E1**	**E2**	**E3**	**E4**
300	66	OFF	ON	OFF	ON
333	66	ON	OFF	OFF	ON
366	66	OFF	OFF	OFF	ON
400	66	ON	ON	ON	OFF
433	66	OFF	ON	ON	OFF

E5- Manufacturing Test	
ON	Enabled
*OFF	Disabled

E6- VGA Options	
*ON	Enabled
OFF	Disabled

E7- Mouse Interrupt (IRQ 12)	
*ON	Enabled
OFF	None

E8	Ultra-SCSI Transfer
ON	Disabled
*OFF	Enabled

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E9	Upper 8-bit Termination
ON	Disabled
*OFF	Enabled

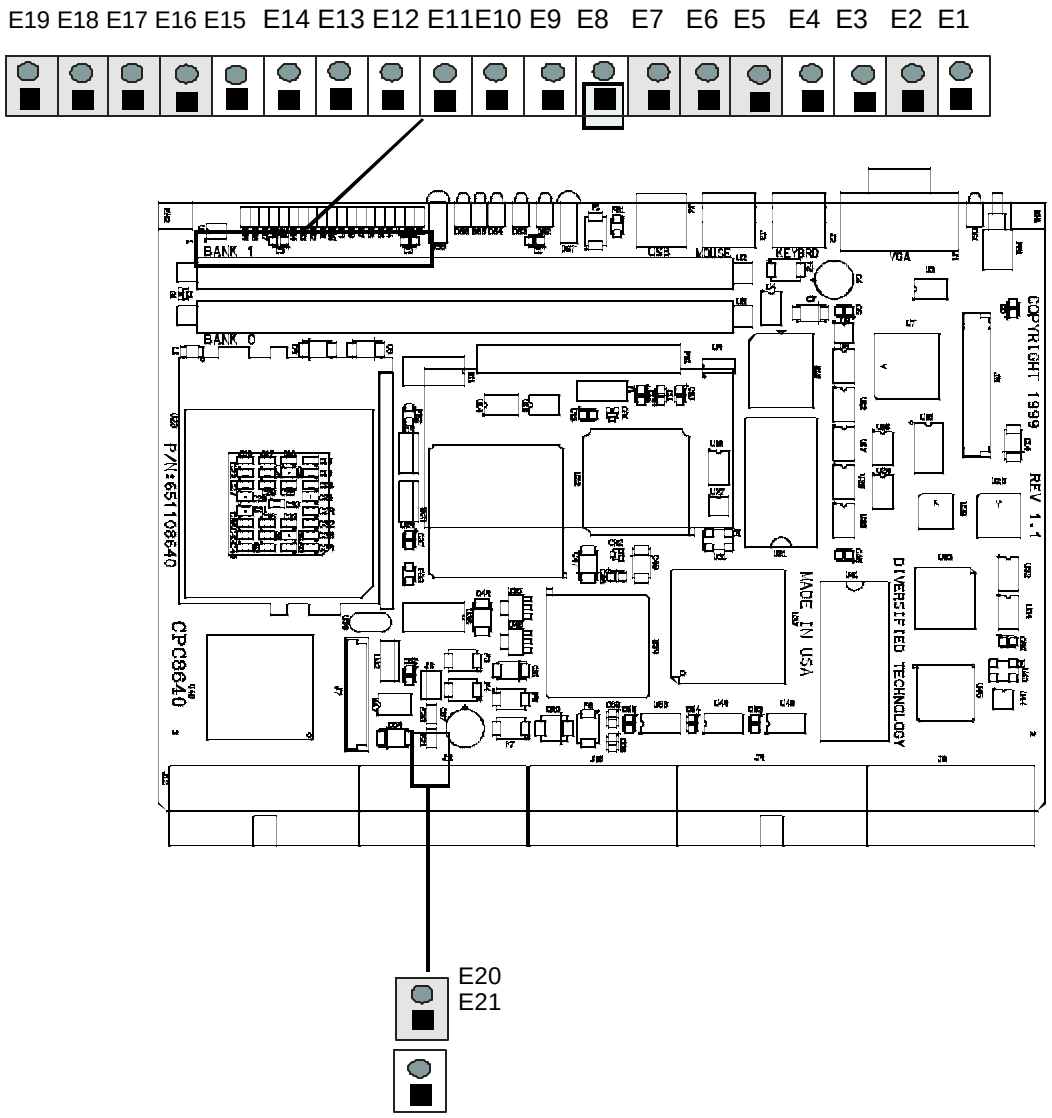
E10	E11	E12	E13	Flat Panel Support Type
OFF	ON	OFF	ON	640 X 480 TFT
OFF	OFF	OFF	ON	800 X 600 TFT
ON	OFF	OFF	ON	1024 X 768 TFT
OFF	ON	ON	ON	1280 X 1024 TFT
ON	OFF	ON	ON	640 X 480 DSTN
OFF	OFF	ON	ON	800 X 600 DSTN
ON	ON	ON	ON	1024 X 768 DSTN
OFF	OFF	ON	OFF	1280 X 1024 DSTN

System Monitor Alarm Indicator LED Polarity	
E16-GPO0, E17-GPO1, E18-GPO2, E19-GPO3	
*ON	Active High LED
OFF	Active Low LED

E20	CPU Heatsink Fan Strobe
*ON	System Monitor Monitors Fan Strobe at GPI #4
OFF	Free GPI #4

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Jumper Settings



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4

ROM Utilities

4.0 Features
4.1 ROM Utilities
4.2 System Summary
4.3 System Setup
4.4 Hard Disk Setup
4.5 Boot Options
4.6 BIOS Options
4.7 Peripherals
4.8 PCI Config
4.9 PNP Exclusions
4.10 Cache Config
4.11 Chipset Config
4.12 System Monitor
4.13 Thermal Manager
4.14 Exit

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4.0 Features

- Automatic IDE Hard Disk Detection and Configuration
- Automatic Mouse Detection
- ROM Based Utilities
- Help Windows
- System Monitoring Functions
- Thermal Management
- Plug and Play Support

DTI BIOS

The DTI BIOS Software supports all of the IBM /AT standard functions and several DTI specific functions and features. Features of the DTI BIOS include built-in utilities, help windows, and system monitoring functions.

Upon initial execution, the DTI BIOS checks for valid entries in the System Monitor parameter table stored in the BIOS ROM. If valid, the System Monitor Unit ID and Modem Dial String are programmed into the System Monitor. This allows the System Monitor to call a remote site if errors occur during the BIOS power-on-self-test (POST). The POST consists of a battery of tests which check and initialize the various functions of the system. Each POST test has an associated unique code number which is written to the System Monitor and to a diagnostic port. This enables systems connected through serial linkage to monitor the status of the POST tests. After the video initialization portion of the POST is complete, the BIOS will display DTI sign-on messages in the upper left corner of the screen. Throughout the POST, a message will be displayed at the bottom of the screen describing the key stroke that can be used to gain access to the ROM Utilities. As the POST executes various tasks, error messages will be displayed for any failures that occur. The user will be prompted to press the <F1> key before the BIOS initiates the boot sequence if errors are detected. One of the last things that the BIOS does is to send an error report to the System Monitor. Any errors that occur during the POST or in the booting process are included in this report.

The BIOS automatically looks for the presence of a mouse and, if found, enables the mouse support in the BIOS. Otherwise, mouse support is disabled. The status of the mouse is displayed on the SYSTEM SUMMARY screen.

The System BIOS is compatible with the *Plug and Play Specification* Version 1.0A. The two areas that are addressed by the System BIOS are Resource Management and Runtime Services.

Resource Management provides the ability to manage the fundamental system resources which include DMA, Interrupt Request Lines (IRQs), I/O and Memory addresses. These resources, termed system resources, are in high demand and commonly are over allocated or allocated in a conflicting manner in ISA systems, leading to system configuration failures.

The resource manager takes on the responsibility for configuring Plug and Play cards, as well as system board devices during the power up phase. After the POST process is complete, control of the Plug and Play device configuration passes from the system BIOS to the system software. The BIOS does, however, provide configuration services for system board devices even after the POST process is complete. These services are known as Runtime Services.

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Runtime Services provide a mechanism whereby a Plug and Play operating system, such as Windows '95, may perform resource allocation dynamically at runtime. The operating system may directly manipulate the configuration of devices which have traditionally been considered static.

The ROM Utilities are provided for the user to have easy access to all of the necessary utilities to setup and configure the CPC8640. One of the features of the ROM Utilities is its ability to sense the presence of IDE Hard Disk Drives and automatically configure the hard drive parameters in the HARD DISK SETUP Utility. The ROM Utilities are accessible during the POST as long as the following string is displayed.

PRESS < F2 > TO ENTER SETUP

Access to the ROM Utilities will not take place until after the POST. There might be a short delay from the time the <F2> is pressed until the utilities are actually entered. However, the following message will be displayed during the waiting period.

ENTERING SETUP . . .

Many configuration options within the ROM Utilities have HELP information available. Pressing <F1> while an option is highlighted will invoke a pop-up window with a brief description of the option if help is available.

System Monitor Error Reporting

As the BIOS executes tests during the POST, a record of the errors that occur is accumulated. These are typically non-critical errors. The errors and a brief description of their cause is listed below.

DISK_ERROR	: Hard drive controller failure or boot failure
KYBD_ERROR	: Keyboard failed (stuck key or no keyboard installed)
POS_ERROR	: POST Timeout error
CMOS_ERROR	: CMOS Checksum Invalid
TIMER_ERROR	: Timer error
RTC _ERROR	: Real Time Clock Failed
CONFIG_ERROR	: System configuration differs from CMOS configuration
OPROM_ERROR	: Option ROM Error
COP_ERROR	: Math Coprocessor error
DISKETTE_ERROR	: Floppy drive error or boot failure
BOOT_ERROR	: Boot failure
CACHE_ERROR	: Error occurred configuring the secondary cache
IO_ERROR	: An I/O address conflict exists
OTHER_ERROR	: Other error

The DISK_ERROR and DISKETTE_ERROR flags can be set in two different places in the POST. During the drive controller and interface tests, the BIOS will set these bits to indicated drive errors. After the POST is completed, the BIOS boot sequence is executed and if an error occurs reading from the boot source, the BOOT_ERROR flag and the flag for the drive that failed are set. The boot sequence selection in the ROM Utilities is used in defining the meaning of the DISK_ERROR and DISKETTE_ERROR flags. If the boot sequence is set for A:\ then C:\, the DISKETTE_ERROR flag will be set if no floppy diskette is in the drive or if the diskette is blank. The BOOT_ERROR flag will not be set unless C:\ is also non-bootable. For a boot sequence of C:\ then A:\, the DISK_ERROR flag will be set if no hard drive is installed.

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4.1 ROM Utilities

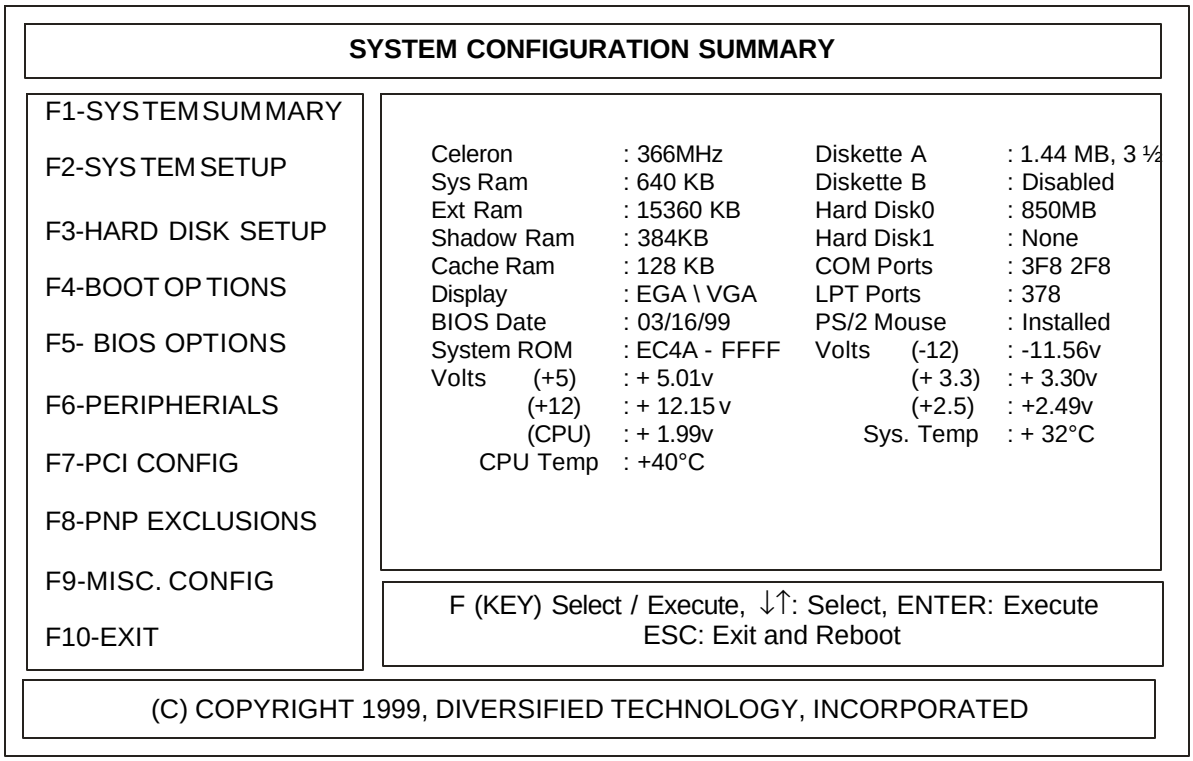
The ROM Utilities consist of various easy-to-use utilities required in the configuration of the CPC8640. The function of each utility is briefly described in the table below. Battery backed CMOS RAM is used to store the configuration/setup parameters selected in the ROM Utilities. On power-up the CMOS RAM parameters are used to configure the system. If the CMOS RAM is corrupt, default parameters stored in ROM are used to configure the system. If no errors occurred during the POST, the System Configuration Summary Screen will be displayed, else, ROM Utility configuration errors detected during the POST will be displayed and the default values loaded. As each utility is selected using the arrow keys, the contents of the utility will be displayed. This allows the user to view the current settings of each utility without having to actually execute the utility. To execute a specific utility, either press the function key associated with the utility or move the highlighted bar onto the utility and press <ENTER>.

ROM UTILITIES	
SYSTEM SUMMARY	Display various information about the system installed
SYSTEM SETUP	Used to configure the time/date, floppy drive and video types
HARD DISK SETUP	Used to configure the hard drive types
BOOT OPTIONS	Used to specify boot device ordering
BIOS OPTIONS	Used to setup various BIOS features
PERIPHERALS	Used to enable/disable onboard I/O devices
PCI CONFIG	Configure PCI interrupt lines
PNP EXCLUSIONS	Specify used non-PNP ISA resources
CACHE CONFIG	Used to configure the memory cache regions
CHIPSET CONFIG	Used to configure parameters related to the chipset
SYSTEM MONITOR	Used to setup monitoring functions
THERMAL MANAGER	Allows configuration of CPU throttle temperatures and speed settings
LOAD FROM ROM	Used to load BIOS ROM defaults into CMOS
LOAD FROM CMOS	Used to reload the values which were in CMOS when the ROM Utilities were entered
SAVE TO CMOS	Used to save the current ROM utilities configuration to CMOS

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4.2 System Summary

The SYSTEM CONFIGURATION SUMMARY utility provides valuable information about the system resources installed. The information supplied can also be useful in preventing I/O conflicts when installing adapter cards. The SYSTEM CONFIGURATION SUMMARY screen is shown below, followed by a brief description of information supplied.



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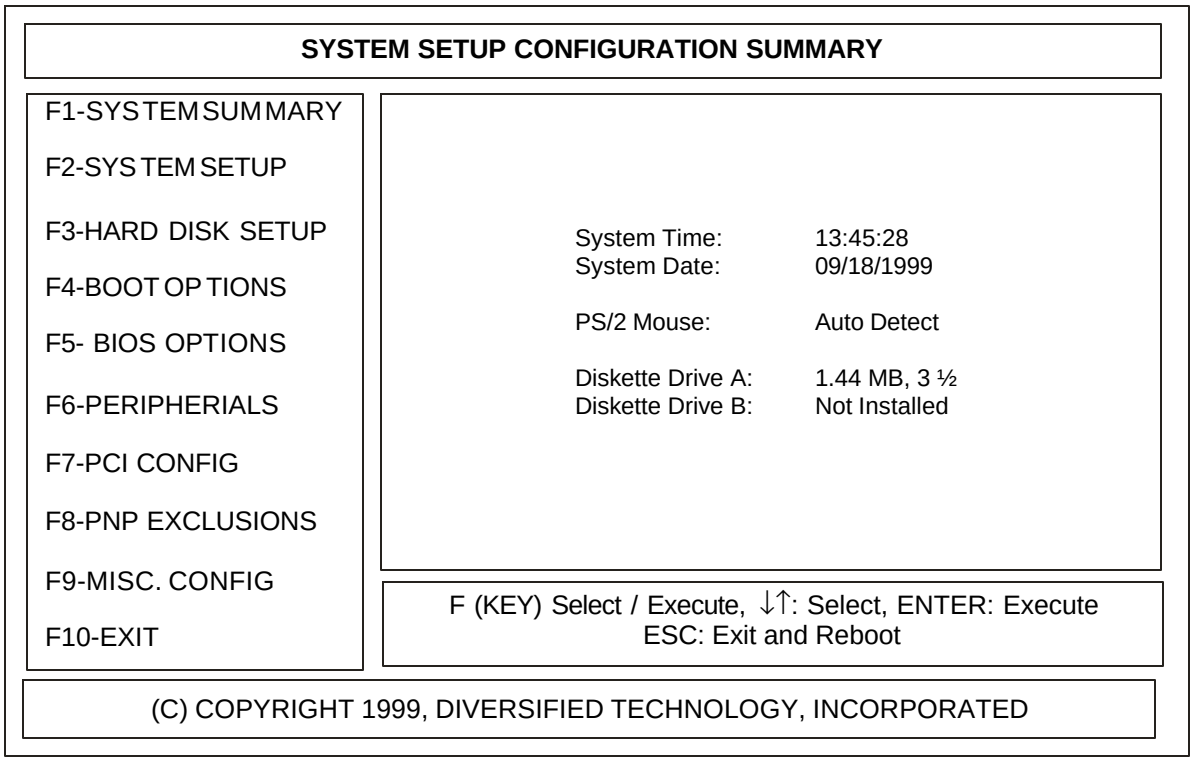
SYSTEM SUMMARY DESCRIPTIONS

- CPU: Displays the type and speed of processor installed.
- SYSTEM RAM: Displays the amount of installed system RAM up to 640KB.
- EXTENDED RAM: Displays the amount of installed extended RAM beyond1024 KB.
- SHADOW RAM: Displays the amount of available RAM between 640 and 1024 KB.
- CACHE RAM: Displays the amount of installed external cache RAM.
- DISPLAY: Displays the installed video type.
- BIOS DATE: Displays the date on which the CPC8640 BIOS was generated.
- SYSTEM ROM: Displays the memory segment address range occupied by the system BIOS.
- VOLTS: Displays the current status of the system and CPU voltage sources.
- TEMPERATURE: Displays the current temperature of the CPU, and the temperature in the area occupied by the CPC8640.
- DISKETTE A & B: Displays the media type selected for both floppy drives.
- HARD DISK 0 - 1: Displays the drive types selected for both hard drives.
- COM PORTS: Displays the I/O addresses of all installed serial ports.
- LPT PORTS: Displays the I/O addresses of all installed parallel ports.
- PS/2 MOUSE: Displays whether or not a mouse was detected by the BIOS during the POST.

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4.3 System Setup

The SYSTEM SETUP CONFIGURATION UTILITY is used to configure the system time/date, type of floppy disk drives installed, and PS/2 mouse control. The amount of memory installed will automatically be determined and displayed.



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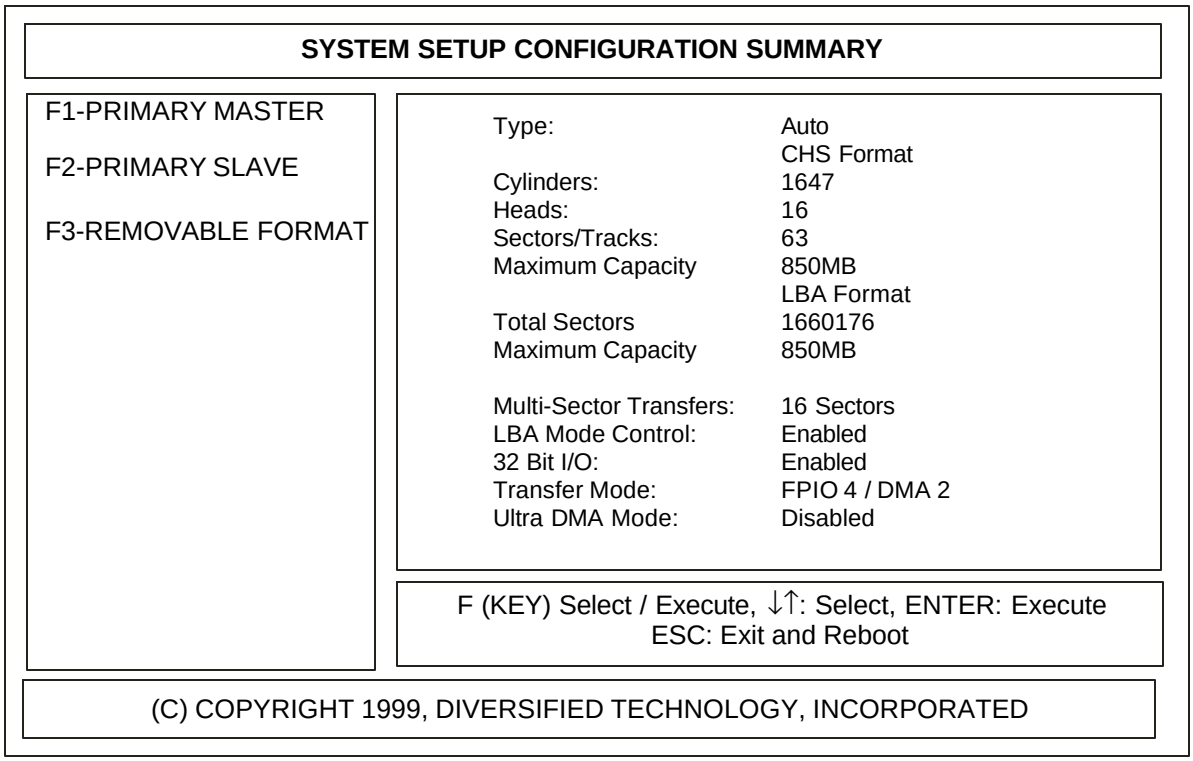
SYSTEM SETUP DESCRIPTIONS

- SYSTEM TIME: To enter a new time, type in the new time as HOUR:MINUTE:SECONDS and then press ENTER . The time is displayed in 24 hour format; therefore, AM hours range from 0 through 11 and the PM hours range from 12 through 23. Invalid times cannot be entered.
- SYSTEM DATE: New dates are selected by typing in the new date as MONTH/DAY/YEAR and then pressing ENTER . If one of the parameters is out of range, the new date will not be entered.
- PS/2 MOUSE: Enable, Disable, or Auto Detect are the available options for the PS/2 mouse. To use the mouse interrupt, IRQ 12, for another device, the mouse interface must be disabled.
- FLOPPY DISKS: Drive types 360K, 720K, 1.2M, and 1.44M are supported. A NOT INSTALLED option is also available for diskless workstations. No floppy error messages will be displayed if NOT INSTALLED is selected.

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4.4 Hard Disk Setup

The HARD DRIVE CONFIGURATION UTILITY is used to configure the hard drives installed in the system.



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HARD DRIVE SETUP DESCRIPTIONS

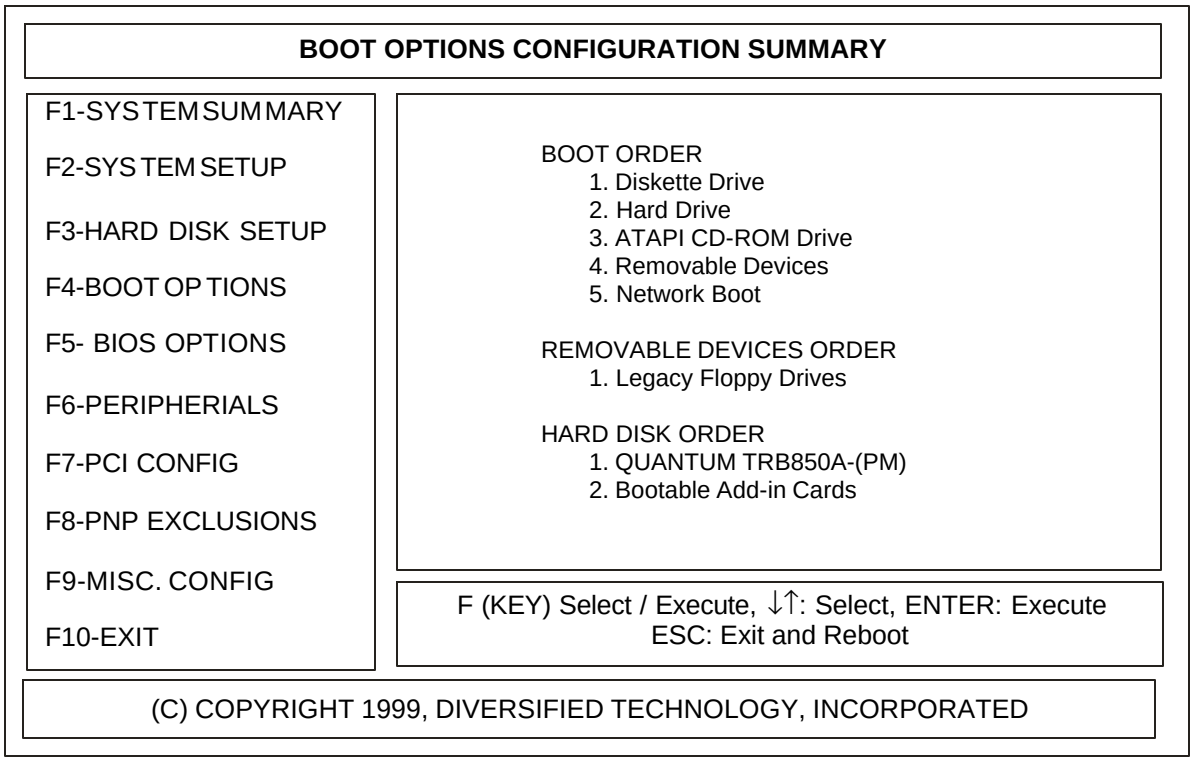
The configuration options described below work identically for HARD DRIVE 0 - 1.

- TYPE: Type choices include Auto, User, CD-ROM, ATAPI Removable, IDE Removable, and None. If the USER type is selected, the hard drive parameters must be configured manually. The USER type may be configured differently for HARD DRIVE 0 and HARD DRIVE 1.The CD-ROM type will enable bootable CD-ROM support for an IDE CD-ROM drive attached as a master or slave. An IDE CD-ROM can be made the boot device through the BOOT OPTIONS screen.If AUTO type is selected, the hard drive parameters are read during boot-up, and are configured automatically. The hard drive information, such as manufacturer and model number, is displayed during POST. Selecting this type will prevent setting other hard drive parameters manually. Use this setting only on enhanced IDE drives that autotype correctly.TheATAPI Removable type will support ATAPI Removable Media. This includes drives for high capacity floppies that can be formatted as floppies or hard disks, e.g. MKE LS 120.The IDE Removable type will support IDE Removable Media. This includes drives for high capacity floppies that can be formatted as floppies or hard disks, e.g. IOMega Zip.
- LBA FORMAT: Very large IDE drives (over 8.4GB) parameters in the CHS (Cylinders, Heads, and Sectors) section will autotype to a default size of 8.4GB or smaller, to remain compatable with DOS and older operating systems. The LBA format displays the true size that newer operating systems and drivers will be able to use.
- MULTI-SECTOR TRANSFERS: If Autotyping is used, the BIOS will automatically set the transfer rate to the maximum supported by the hard drive. Otherwise, the transfer rate can be overridden to 2, 4, 8, or 16 sectors.
- LBA MODE: Logical Block Access uses 28-bit addressing of the hard disk instead of CHS (Cylinder/Head/Sector) addressing.
- 32 BIT I/O: This option enables 32-bit data transfers on Local Bus and PCI drives. This should be enabled for the maximum possible transfer rate.
- TRANSFER MODE: The modes supported are standard, Fast PIO 1 - 4, and FPIO 3&4/ DMA 1&2. The actual mode to use is drive dependent; the higher the number, the higher the throughput.
- ULTRA MODE: Selects Ultra DMA Modes 0 - 2. The actual mode used is drive dependent; the higher the number, the higher the throughput.
- REMOVABLE FORMAT: All removable devices detected will appear in this list. Devcies can be set to either removable or fixed. The selection for the devices will be reflected under BOOT ORDER in the BOOT OPTIONS screen.

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4.5 Boot Options

The BOOT OPTIONS CONFIGURATION UTILITY is used to determine the order in which the BIOS attempts to boot from devices. The BIOS attempts to boot from the devices at the top of the list first. If the device is not bootable, then the next item down in the list is tried. Removable Devices and Hard Disks have further ordering within there category. Items are moved up in the list by selecting and using the right arrow or the plus key. Items are moved down in the list by selecting and using the left arrow or minus key. The following page describes the configuration options.



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BOOT OPTIONS DESCRIPTIONS

- BOOT ORDER: Selects the boot order for installed boot devices. The BIOS attempts to boot from items at the top of the list first.
- REMOVABLE DEVICES: Boot from Legacy floppy diskette drives, removable LS-120 or ZIP drive. The desired removable device must be selected through REMOVABLE DEVICES ORDER described below.
- HARD DRIVE: Boot from hard disk drive. The desired hard drive must be selected through HARD DRISK ORDER described below.
- ATAPI CD-ROM Drive: Boot from IDE CD-ROM
- NETWORK BOOT: Boot from network adapter that hooks interrupt 19h.
- REMOVABLE DEVICES ORDER: Selects the boot order for removable disk drives. The BIOS attempts to boot from items at the top of the list first.
- LEGACY FLOPPY DRIVES: Boot from the floppy drive that is listed for Diskette A: under SYSTEM SETUP.
- REMOVABLE DEVICES: Boot from listed Removable devices. All Removable devices specified as removable will appear in the list.
- HARD DISK ORDER: Selects the boot order for installed hard disk drives. The BIOS attempts to boot from items at the top of the list first.
- IDE DRIVES: Boot from listed IDE drives. All IDE drives detected will appear in the list.
- BOOTABLE ADD-IN CARDS: Boot from ISA or PCI adapters such as SCSI controllers

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4.6 BIOS Options

The BIOS OPTIONS CONFIGURATION UTILITY provides various features which affect performance and speed of the system. Below is the BIOS OPTIONS screen with the default parameters displayed. To change the BIOS OPTIONS settings, use the arrow keys to select and scroll the available parameters.

BIOS OPTIONS CONFIGURATION SUMMARY

F1-SYSTEM SUMMARY
F2-SYSTEM SETUP
F3-HARD DISK SETUP
F4-BOOT OPTIONS
F5- BIOS OPTIONS
F6-PERIPHERIALS
F7-PCI CONFIG
F8-PNP EXCLUSIONS
F9-MISC. CONFIG
F10-EXIT

BIOS OPTIONS	
Floppy Seek:	Enabled
Summary Screen At Boot:	Enabled
SETUP Prompt During POST:	Enabled
Pause on POST Errors:	Enabled
Large Disk Access Mode:	DOS
Plug & Play O/S:	No
CONSOLE REDIRECTION	
COM Port Address:	Disabled
Baud Rate:	9600
Console Type:	PC ANSI
Flow Control:	XON/XOFF
KEYBOARD OPTIONS	
Key Click:	Disabled
Auto-Repeat Rate:	30/sec
Auto-Repeat Delay:	1/2sec
Numlock at Boot	Auto

F (KEY) Select / Execute, ↓↑: Select, ENTER: Execute
ESC: Exit and Reboot

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BIOS OPTIONS DESCRIPTIONS

- FLOPPY SEEK: During the POST, the BIOS tests the floppy drives to verify that the installed drives are functional and match the drive types selected in the CMOS SETUP. This option has been provided to allow the user to significantly speed up the boot process by disabling the test. The available options ENABLED and DISABLED are selectable using the arrow keys.
- SUMMARY SCREEN AT BOOT: When this option is ENABLED, the SYSTEM CONFIGURATION SUMMARY window will be displayed while the system is booting up.
- SETUP PROMPT DURING POST: When this option is ENABLED, the prompt ‘ Press to enter SETUP ‘ will be displayed during the POST.
- PAUSE ON POST ERRORS: This option determines whether the POST will pause and wait for user input when an error occurs. Select between ENABLED or DISABLED using the arrow keys.
- LARGE DISK ACCESS MODE: The default is “DOS”. Set to “Other for operating systems such as Windows NT or OS/2.
- PLUG AND PLAY O/S: If disabled (default), the BIOS will set up any Plug & Play devices and devices selected to be Auto configured. If enabled, the operating system is assumed to configure plug & play devices and devices selected to be Auto configured..

CONSOLE REDIRECTION DESCRIPTIONS

- **COM PORT ADDRESS:** The console redirection feature can be Enabled or Disabled. This allows all video output to be redirected through the serial port during the POST and DOS. In addition, input through the serial port will control the CPU through the POST and DOS. Console redirection is enabled when this item is set to the desired COM port. The available choices are 3F8/IRQ4, 2F8/IRQ3, 3E8/IRQ4, 2E8/IRQ3, Onboard COMA (3F8/IRQ4), AND Onboard COMB (2F8/IRQ3).
- **BAUD RATE:** Selects the baud rate for console redirection. The available baud rates are: 600, 1200, 2400, 4800, 9600, 19200, 38400, and 115200
- **CONSOLE TYPE:** Selects the emulation mode used for console redirection transfers. The available choices are VT100 and PC ANSI.
- **FLOW CONTROL:** Selects the flow control used for console redirection. The available choices are No Flow Control, XON/XOFF, and RTS/CTS.

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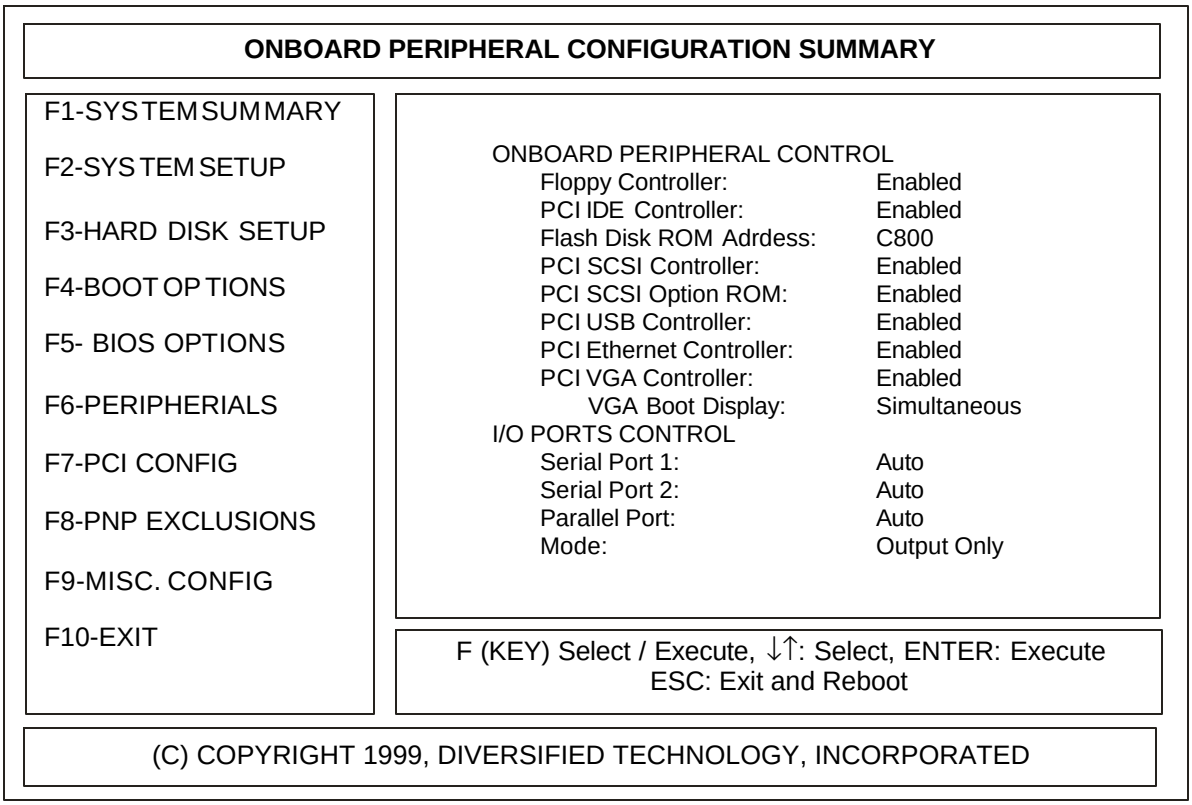
KEYBOARD OPTIONS DESCRIPTIONS

- KEY CLICK: When this option is ENABLED, the system speaker will make a clicking noise when each keyboard key is pressed. Use the arrow keys to select ENABLED or DISABLED.
- AUTO-REPEAT RATE: The Typematic rate refers to the speed at which keystrokes are repeated when a key is pressed for a period of time. In other words, as a key is pressed and held down on the keyboard, the key will be displayed on the screen then there will be a noticeable pause (typematic delay) before the key pressed is repeated multiple times on the screen (typematic rate). The available options for the typematic rate are 2, 6, 10, 13.3, 18.5, 21.8, 26.7, and 30 chars/sec. Use the arrow keys to set the typematic rate.
- AUTO-REPEAT DELAY: The typematic delay is the length of time from the key being pressed to the beginning of the typematic rate. The available options for the typematic delay are , , , and 1 sec. Use the arrow keys to set the typematic delay.
- NUMLOCK AT BOOT: NUMLOCK is a key on the keyboard which selects the function of the keypad on the right-hand side of the keyboard. The keypad serves two functions, one being a numerical keypad and the other being a cursor control keypad. If the NUMLOCK LED above the NUMLOCK key is ON, the keypad is in numerical mode. The NUMLOCK ON AT BOOT option allows the user to choose the function of the keypad after the system boots. The available options, ENABLED and DISABLED, are selectable using the arrow keys.

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4.7 Peripherals

The ONBOARD PERIPHERAL CONFIGURATION UTILITY allows onboard devices to be enabled, disabled, or configured. The CPC8640 uses a programmable I/O adapter that includes two serial ports, a parallel printer port, and a floppy disk interface.



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PERIPHERALS DESCRIPTIONS

- FLOPPY CONTROLLER: The floppy disk interface options are Enabled or Disabled. The user may have to disable the floppy disk interface if an external floppy disk interface card is in use.
- PCI IDE CONTROLLER: The onboard PCI IDE hard drive interface can be set for Primary, Secondary, Both, or disabled. The Secondary interface claims IRQ 15 when enabled. It may be necessary to disable the IDE interface if another hard drive controller is in use.
- FLASH DISK ROM ADDRESS: The optional flash disk option ROM address is controlled by this setting. When set to disabled the option ROM is not mapped. The ROM address is selectable from C800 to DFFF in 8K increments.
- PCI SCSI CONTROLLER: The onboard PCI SCSI interface can be enabled or disabled. This device is not visable on the PCI bus when disabled.
- PCI SCSI OPTION ROM: Enables or disables the option ROM on the onboard SCSI controller.
- PCI USB CONTROLLER: The onboard PCI USB interface can be enabled or disabled. It may be necessary to disable the USB interface if another USB controller is in use. NOTE: The DTI BIOS does not currently support USB BIOS extensions or functions.
- PCI ETHERNET CONTROLLER: The onboard PCI Ethernet interface can be enabled or disabled. This device is not visible on the PCI bus when disabled.
- PCI VGA CONTROLLER: This shows the presence of the onboard PCI VGA controller.
- SERIAL PORT 1 & 2: The two serial ports can be configured to one of four possible settings, disabled, or set for Auto configuration.

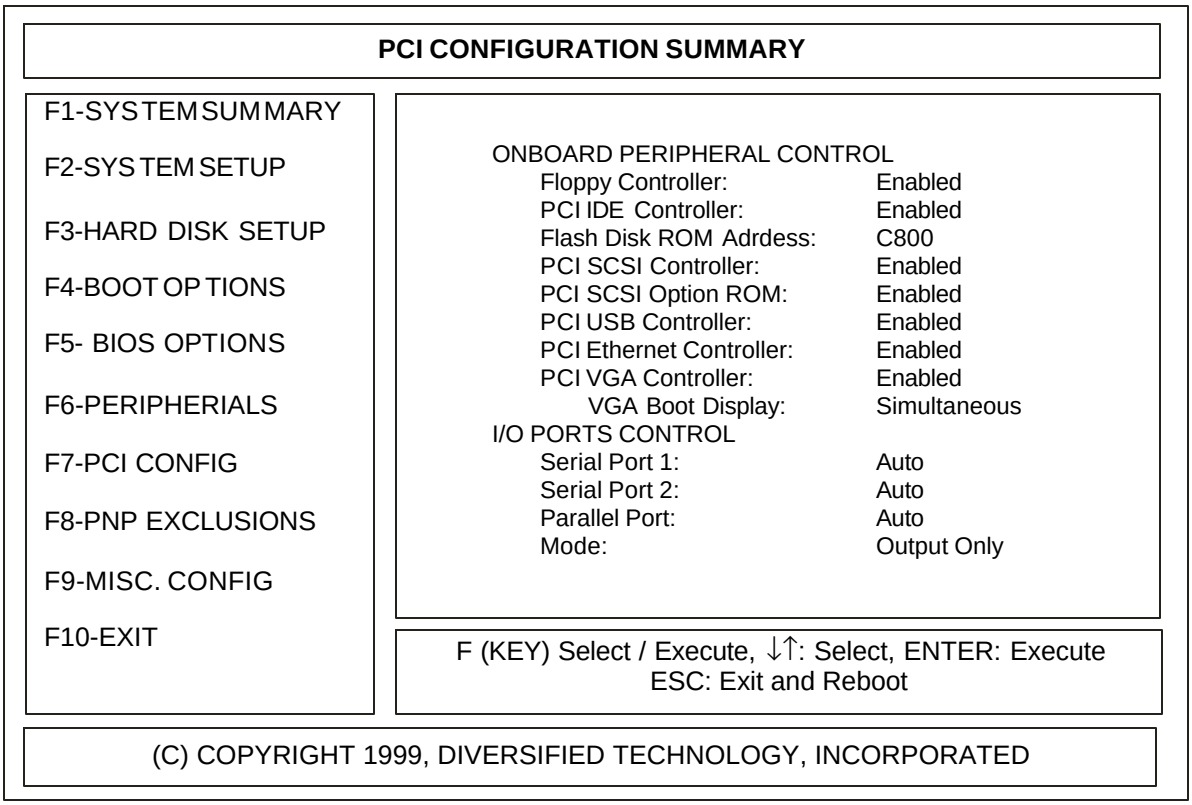
I/O	Interrupt	COM Port
3F8H	IRQ4	COM1
2F8H	IRQ3	COM2
3E8H	IRQ4	COM3
2E8H	IRQ3	COM4

- PARALLEL PORT: The parallel port can be enabled, disabled, or set for Auto configuration. Three possible I/O base addresses are 378h, 3BCh, or 278h. The two possible interrupts are IRQ5 or IRQ7.
- PARALLEL PORT Mode: In “Output Only” mode the LPT port functions like a standard printer port. Three other available modes are Bi-Directional, ECP, and EPP.
- PARALLEL PORT DMA CHANNEL: The DMA channel used in ECP mode can be routed to DMA channel 1, 2, or 3.

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4.8 PCI Config

The PCI Specification outlines that each slot on a PCI backplane have four Interrupt lines designated as INTA, INTB, INTC, and INTD. These INT lines are used to deliver IRQs to the devices on the PCI adapter cards installed that require interrupts. The PCI Setup Utility allows the user to select which system Hardware IRQ is associated with each PCI INT line. The INT line to be used by a PCI device will be defined in the PCI IRQ line register in the devices PCI Configuration Space. The first interrupt of each PCI Slot is typically assigned INTA. To prevent multiple adapters having only one device using the same IRQ, the four INT lines are not tied directly to the four INT lines on each PCI connector. Instead the INT lines are staggered such that INTA of each slot (the first INT line to be used) is tied to a different PCI IRQ line. See the example on the next page.



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PCI CONFIG DESCRIPTIONS

- PCI INTERRUPTS: This option allows the user to select the interrupt to be used by the PCI device(s) installed. The available options are IRQ 3, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15, DISABLED, and AUTO.
- PCI PARITY CHECKING: Enabling this feature tells the BIOS to set the Parity Enable bit in the PCI configuration space of all PCI devices that support parity checking.

IRQ Routing Example

The example below illustrates the PCI INT line connections for a four slot PCI design. IRQ's 9, 10, 11, and 15 were used for demo purposes only. The CompactPCI CPU board will be inserted in slot 1 of the backplane, hence the C PCI expansion slots are numbered starting from slot 2.

CMOS Configurable

PCI IRQ line 0 = IRQ9 = INT A
PCI IRQ line 1 = IRQ10 = INT B
PCI IRQ line 2 = IRQ11 = INT C
PCI IRQ line 3 = IRQ15 = INT D

PCI IRQ Routing Tables

	PCI Connector			
	INTA	INTB	INTC	INTD
CPCI Slot 2	INTD	INTA	INTB	INTC
CPCI Slot 3	INTC	INTD	INTA	INTB
CPCI Slot 4	INTB	INTA	INTD	INTC
CPCI Slot 5	INTA	INTB	INTC	INTD
CPCI Slot 6	INTD	INTA	INTB	INTC
CPCI Slot 7	INTC	INTD	INTA	INTB
CPCI Slot 8	INTB	INTC	INTD	INTA

Actual INT line connected

CPCI Slot 2	IRQ15	IRQ9	IRQ10	IRQ11
CPCI Slot 3	IRQ11	IRQ15	IRQ9	IRQ10
CPCI Slot 4	IRQ10	IRQ11	IRQ15	IRQ9
CPCI Slot 5	IRQ9	IRQ10	IRQ11	IRQ15
CPCI Slot 6	IRQ15	IRQ9	IRQ10	IRQ11
CPCI Slot 7	IRQ11	IRQ15	IRQ9	IRQ10
CPCI Slot 8	IRQ10	IRQ11	IRQ15	IRQ9

Actual IRQ line connected

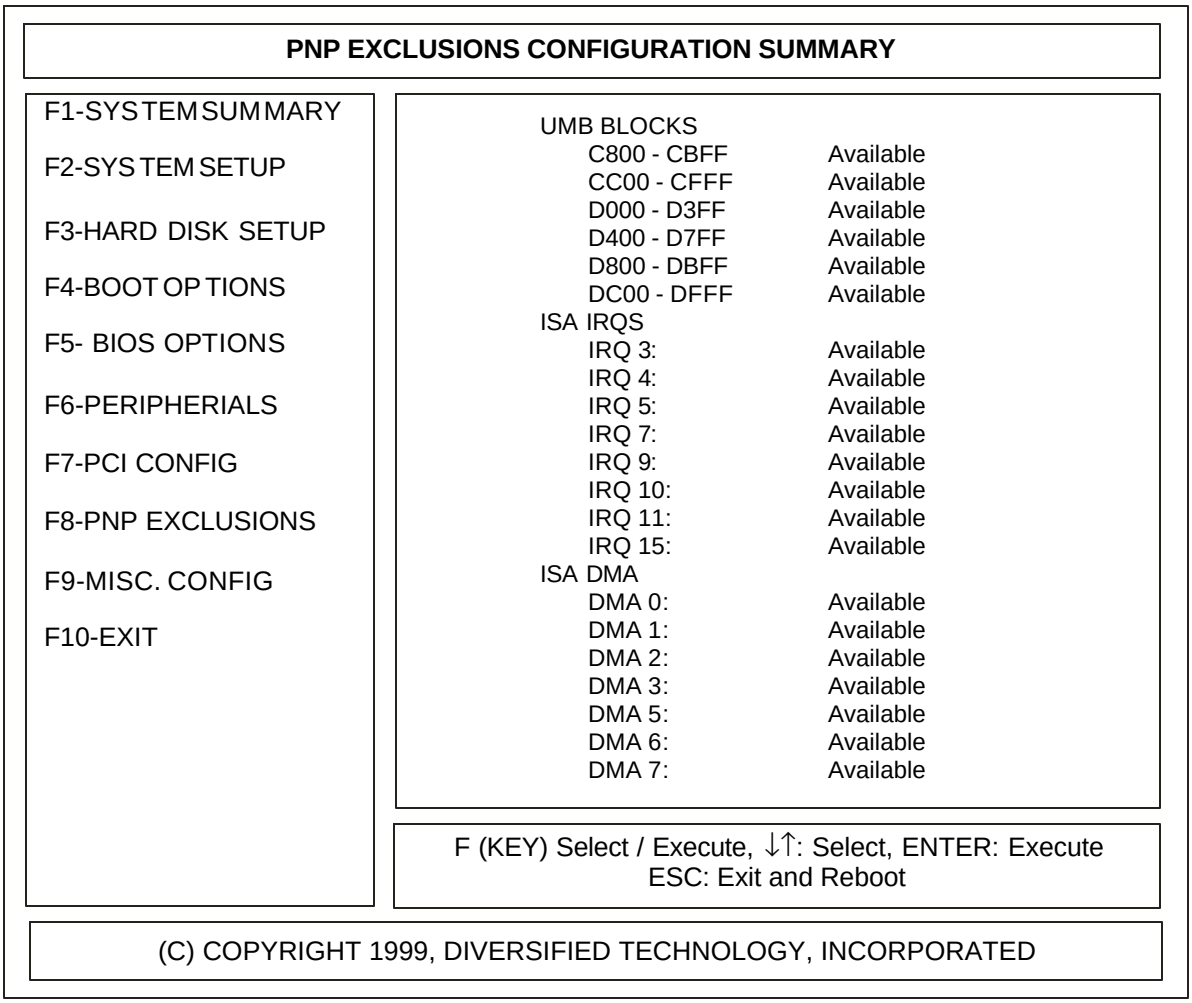
Note: This shows that the first interrupt (PCI Connector INTA) assigned to each PCI slot is different.

- RESET CONFIGURATION DATA: If set to "Yes", the plug & play configuration is reset after leaving SETUP. This option is automatically reset to "No".
- SECURE CONFIGURATION DATA: If set to "Yes", the OS cannot modify the configuration data.

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4.9 PNP Exclusions

The PCI EXCLUSIONS CONFIGURATION UTILITY is used to tell the BIOS which resources are used by non-PNP ISA cards. This information is used by the BIOS to inform the user of resource conflicts. If non-PNP ISA resources are not specified, the BIOS could give resources to a PNP or PCI device that are already in use by some non-PNP ISA card. Set any memory, interrupts, or DMA resources used by non-PNP ISA cards to reserved.



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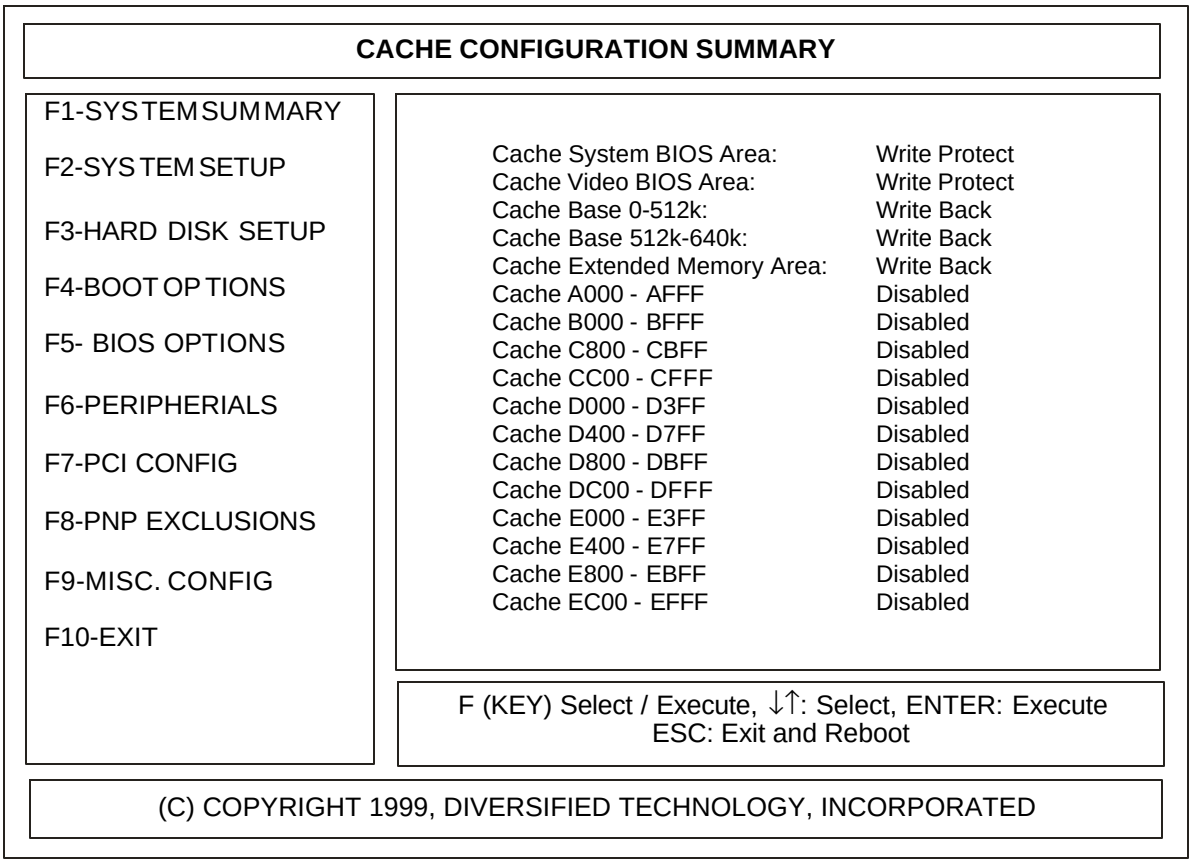
PNP EXCLUSIONS DESCRIPTIONS

- UMB BLOCK: This section is used to reserve upper memory blocks (UMBs) for use by non-PNP ISA cards. Blocks can be reserved in 16K increments from 6800h to DFFFh.
- ISA IRQs: This section is used to reserve interrupts for use by non-PNP ISA cards.
- ISA DMA: This section is used to reserve DMA channels for use by non_PNP ISA cards.

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4.10 Cache Config

The CACHE CONFIGURATION UTILITY is used to configure the system cache. Set the item to "Disabled" to disable caching for each range listed. Set all items to "Disabled" to disable all memory caching.



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CACHE CONTROL DESCRIPTIONS

- CACHE SYSTEM BIOS AREA: This option controls caching of the system BIOS area.
- CACHE VIDEO BIOS AREA: This option controls caching of the video BIOS area.
- CACHE BASE 0-512K: This option controls caching of base memory at 0-512K.
- CACHE BASE 512K-640K: This option controls caching of base memory at 512-640K. This may need to be set to NC if the memory hole is enabled for this region.
- CACHE EXTENDED MEMORY: This option controls caching of system memory above one megabyte
- CACHE MEMORY REGIONS: These options determines how to configure the specified regions of memory from A000h to EFFFh.

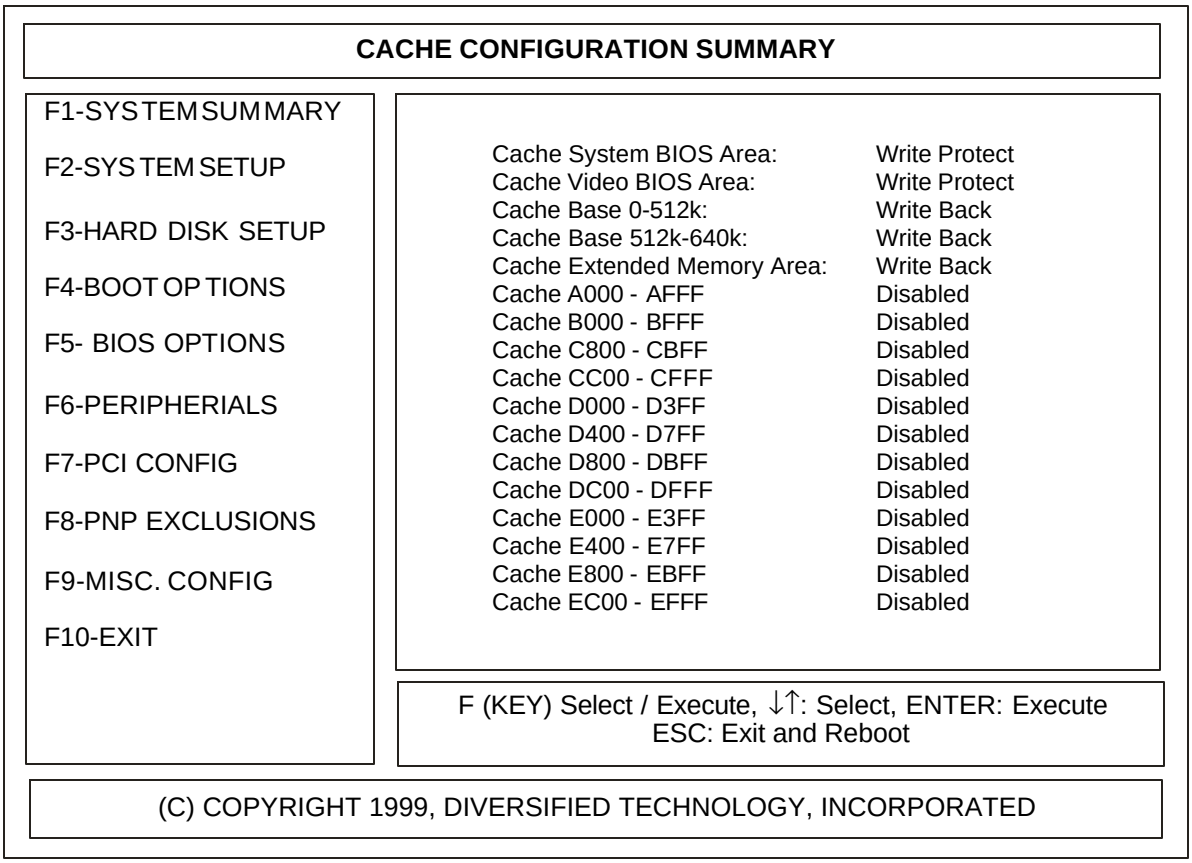
Each Cache Setup Option will have one or more of the following Control Options:

Disabled
Write Back
Write Through
Write Protected
Write Combining

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4.11 Chipset Config

The CHIPSET CONFIGURATION UTILITY is used to configure items specific to the chipset



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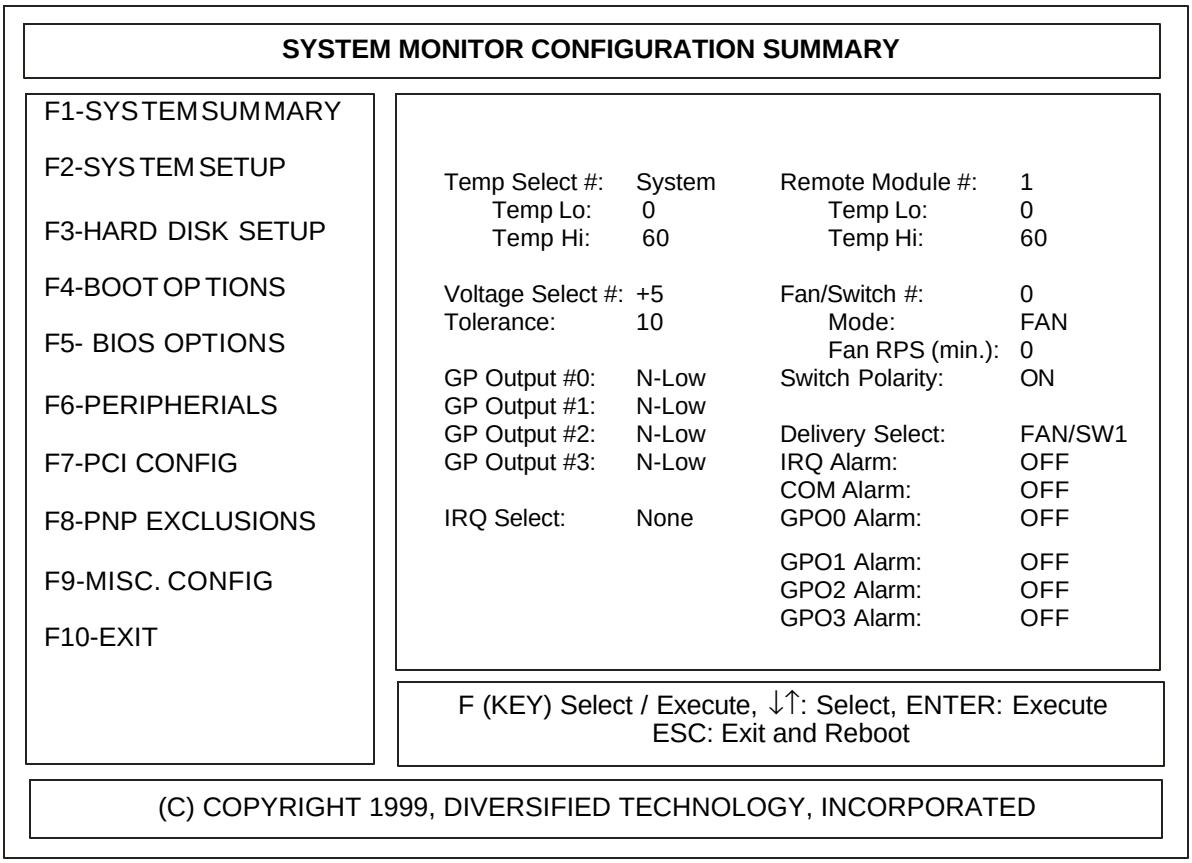
CHIPSET CONTROL DESCRIPTIONS

- CPU MICROCODE UPDATE: Causes the CPU microcode update stored in onboard NVRAM to be loaded into the processor during POST.
- RESET BUS ON WARM BOOT: Specifies that the BIOS performs a hard reset for all warm boot conditions.
- 8-BIT I/O RECOVERY: I/O recovery defines the number of SYSCLKS inserted for 8-bit I/O to the ISA bus. Slow I/O boards may need more cycles.
- 16-BIT I/O RECOVERY: I/O recovery defines the number of CLKS inserted for 16-bit I/O to the ISA bus. Slow I/O boards may need more cycles.
- MEMORY HOLE: Used to enable a 64KB hole in memory at 512K-640K or a 1MB hole in memory at 15MB-16MB. This allows legary ISA adapters to map into the physical address space.
- MEMORY ERROR CORRECTION: Select the error correction type used from EC, ECC, ECC Scrub, or Disabled.

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4.12 System Monitor

The System Monitor on the CPC8640 was designed to identify and report system, environmental, and BIOS failures. Specific voltage ranges and temperature boundaries, the method of failure reporting, and the configuration of FAN inputs as SWITCH inputs are user configurable. The System Monitor Utility is provided to setup these user configurable items.



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SYSTEM MONITOR DESCRIPTIONS

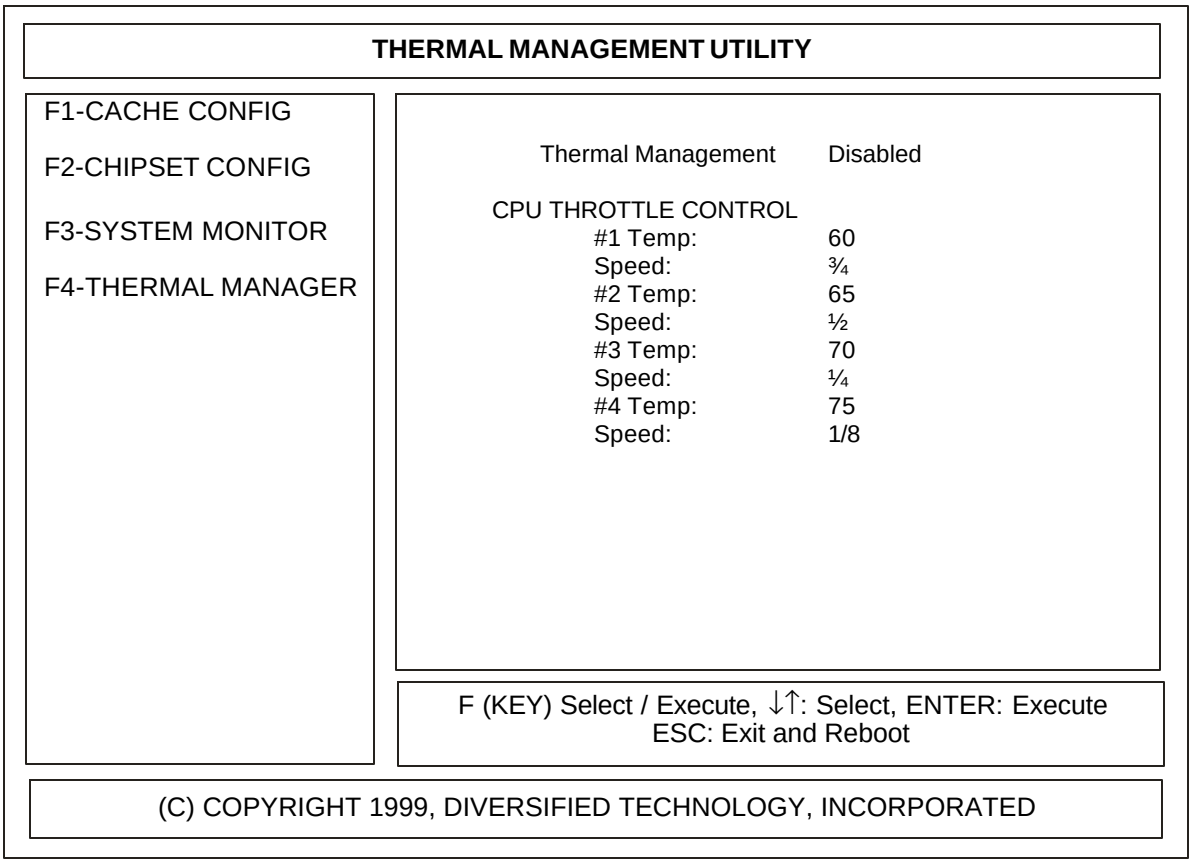
Refer to Appendix A for a complete description of the System Monitor functions and its supported commands.

- SYSTEM AND CPU TEMPERATURES : The LO and HI optrions for the system and CPU temperatures define the boundary within which the environmental temperatures of the CPC8640 must remain. A System Temperature Alarm is generated if its temperature crosses either of its boundary conditions. A CPU Temperature Alarm is generated if its temperature crosses either of its boundary conditions. The type of alarm generated is configured by the delivery selects.
- VOLTAGE TOLERANCES : The six system voltage sources (+5v, +/- 12v, +3.3v, and +2.5v) and the CPU voltage sources are monitored. Each voltage line has a programmable +/- percentage tolerance for alarm conditions. The alarm source which is configured by the delivery byte is common among all voltage lines. The default tolerance for all voltage lines is 10%.
- GPO MODES : Four programmable General Purpose Outputs (GPO) are provided through the System Monitor. They can be configured as alarm sources by each monitored item or they can configured to always be turned ON. The four GPO mode options in the System Monitor Utility represent the master controls for GPO configuration. The GPOs can be configured as active HIGH or LOW outputs. If the GPO is set for F-LOW or F-HIGH, it will be forced to its active state. The N-LOW and N-HIGH options select the polarity of the output but allows the Delivery Select Alarms to activate them.
- SYSTEM MONITOR IRQ: This will connect an interrupt to the System Monitor. When selecting an interrupt route, make sure the interrupt selected does not conflict with any of the other devices installed. The available selections are none, 10 and 11.
- REMOTE MODULE TEMPERATURES: The LO and HI remote temperature options define the boundary within which the environmental temperature of the CPC8640 must remain. A Remote Temperature Alarm is generated if the temperature crosses either of these boundary conditions. The type of alarm generated is configured by the delivery selects.
- FAN / SWITCH SELECTIONS : The SYSTEM MONITOR has eight inputs that can be configured to monitor FAN rotational speeds. Seven of these inputs can be also be configured to monitor the ON/OFF status of a switch. The eighth input is used to enable temperature monitoring of remote sensors. Each FAN monitor has a programmable RPS (revolutions per second) value that defines the least number of RPS allowed before an alarm is generated. Each SWITCH monitored has a polarity setting that defines which switch state (ON or OFF) should trigger an alarm. Use the arrow keys to select the FAN to configure and then setup the configuration as required. Each FAN has its own alarm source control byte.
- DELIVERY SELECTS : The SYSTEM MONITOR offers six different methods of notifying the user of a failure. They are an interrupt to the CPU (either IRQ10 or IRQ11), setting one of four General Purpose Outputs, and reporting through the serial port. Each monitored item has its own set of alarm statuses. The alarm(s) used to report an error condition is determined by the monitor items DELIVERY byte. Use the arrow keys to select the monitored item and display its current DELIVERY byte settings

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4.13 Thermal Manager

The Thermal Manager is responsible for monitoring the temperature of the Celeron CPU installed and preventing the CPU from overheating. If the CPU becomes too hot it will begin to malfunction and potentially become damaged. Given normal circumstances and adequate air flow, the temperature of the CPU should remain within the normal operating ranges. The Thermal Manager allows four temperature break points to be set along with an associated CPU speed. The temperature is monitored as it rises and once a break point is reached the CPU speed is reduced to the selected speed. When the throttle break point is reached, the next break point is used as the upper threshold limit. The speed will throttle back up when the temperature of the CPU is less than the previous break point. For maximum protection against CPU overheating set the fourth speed setting to the lowest setting.



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THERMAL MANAGER DESCRIPTIONS

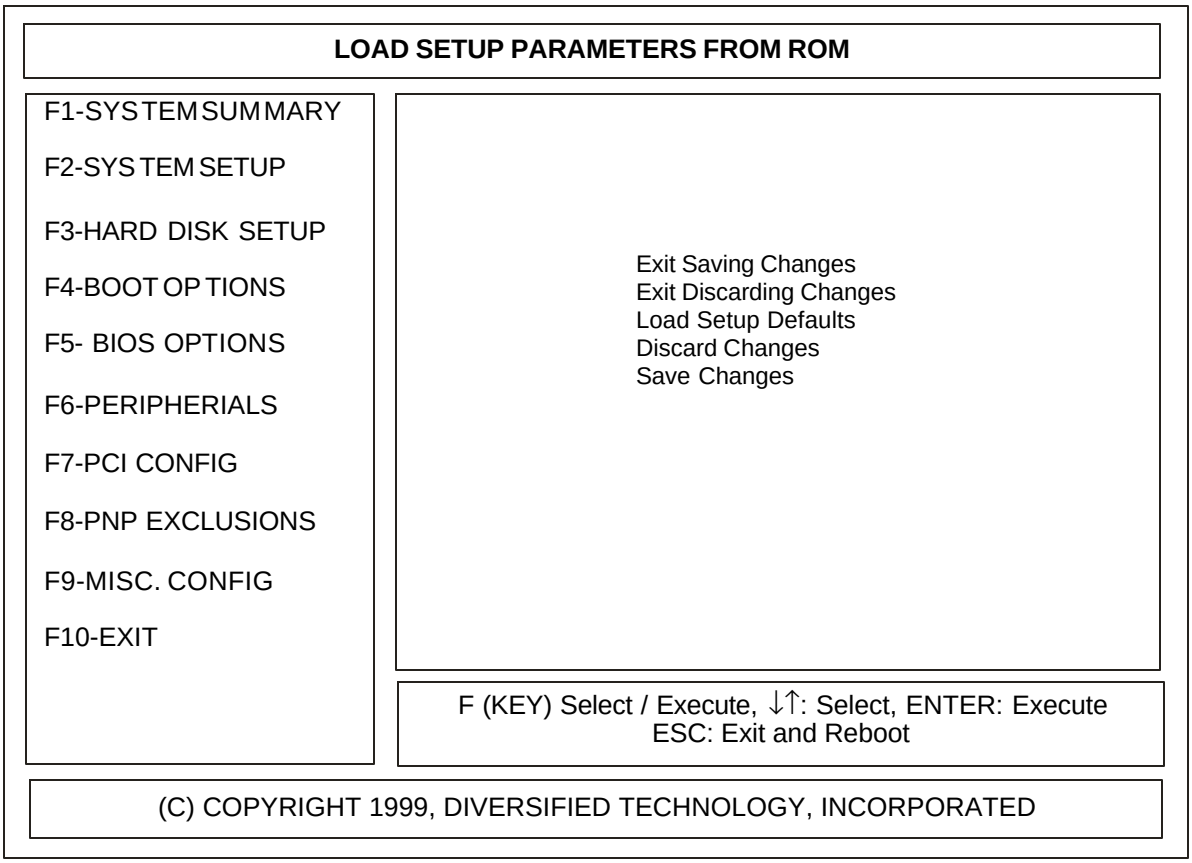
Thermal Management: Enables or disables thermal management. There are four thresholds that can be programmed for thermal management. Each threshold has a temperature and speed setting.

- #1 -4 Temp: Temperature threshold, in degrees Celsius.
- Speed: Speed setting for each threshold. Valid settings are 3/4, 1/2, 1/4, and 1/8.

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4.14 Exit

EXIT MENU provides a way to exit setup and save or discard changes. It also provides a way to load the default settings stored in the BIOS.



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EXIT DESCRIPTIONS

- EXIT SAVING CHANGES: Exits SETUP and saves all changes to CMOS.
- EXIT DISCARDING CHANGES: Exits SETUP and discards any changes.
- LOAD SETUP DEFAULTS: Loads the SETUP factory default values.
- DISCARD CHANGES: Discard any changes made during setup
- SAVE CHANGES: Save changes immediately to CMOS

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5

Troubleshooting Guide

5.0 Error Messages and Problem Areas

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5.0 Error Messages and Problem Areas

Capitalized, italicized statements within quotation marks are messages that are displayed on your screen. Statements not in quotation marks are problems, or problem areas, that are encountered.

NO VIDEO

1. Verify that power is connected to the computer.
2. Verify that the monitor is ON and has power.
3. Verify that all the add-in cards are fully inserted into the /AT Bus Expansion Slot.
4. Remove all connectors from reset, keylock and speaker ports. If the video works after removing the connectors, review the port connections in Section 3.
5. Verify that the monitor type is the same as the video card type being used (i.e., a monochrome monitor with a monochrome card or a color monitor with a CGA card, etc.).

CPC8640 APPEARS TO HAVE LOCKED UP
(NO ACTION GENERATED BY PRESSING A KEY)

1. If an add-in video card is installed (e.g., MONO or CGA), verify that the primary monitor is connected. With the power OFF, remove the unused or secondary video card.

PARITY PROBLEMS

1. Verify that the memory DIMMs are inserted properly in their respective sockets (refer to the CPC8640 memory configuration).

"KEYBOARD FAILURE"
"KEYBOARD CONTROLLER FAILURE"
"KEYBOARD DATA LINE FAILURE"
"KEYBOARD CLOCK LINE FAILURE"
"KEYBOARD STUCK KEY FAILURE"

These messages indicate that the POST was unable to complete the initialization of the keyboard.

1. Verify that there are no "stuck" keys on the keyboard.
2. Verify that the keyboard is properly connected to the computer.
3. If a switchable keyboard is used, verify that the switch is positioned for an /AT computer.

CMOS CONFIGURATION ERROR"

This message typically indicates that the CMOS SETUP information stored in CMOS RAM does not match the hardware identified by the POST.

1. Use the CMOS SETUP utility to verify that the FLOPPY DRIVE TYPE, FIXED DRIVE TYPE, VIDEO TYPE, and MEMORY SIZE are set correctly. If the memory configuration has changed, the CMOS SETUP information will appear to be correct. If everything appears to be correct, save the displayed configuration.

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2. If an add-in memory card is used to extend the memory capabilities of the CPC8640, verify that the add-in card is properly configured and the CMOS SETUP utility reflects the size of the installed memory. The memory test which executes on power-up will indicate the size of both the BASE and EXTENDED memory found by the Power-ON-Self-Test (POST).
3. If this error only occurs on a power cycle, see CONFIGURATION INFORMATION.

"FLOPPY DRIVE CONTROLLER NOT FOUND"

This message indicates that the POST was unable to initialize the floppy disk controller.

1. Verify that only one floppy controller in the system is enabled.

"FLOPPY DRIVE 0 NOT FOUND"
"FLOPPY DRIVE 1 NOT FOUND"

This message indicates that the POST was unable to access the designated floppy disk drive.

1. Use the CMOS SETUP utility to verify that no drive type is specified for a drive that does not exist.
2. Verify that the floppy cable is properly connected to the drive and controller and that conductors 10 through 16 are twisted between the controller and drive A.
3. Verify that the power connector is connected to the drive.

"INVALID SYSTEM CONFIGURATION DATA"

This message indicates that the storage space for the system configuration data does not checksum to zero.

1. Use the CMOS SETUP Utility and change the CMOS setting "RESET CONFIGURATION DATA" to "YES"

"FLOPPY DRIVE CONFIGURATION ERROR"

This message indicates that the drive(s) specified in the CMOS SETUP utility does not match the type of floppy detected by the POST.

1. Use the CMOS SETUP utility to select the appropriate floppy drive installed.
2. If no floppy drives are installed, use the CMOS SETUP utility to verify that no FLOPPY DISK TYPE is specified.

"NO BOOT DISK PRESENT -
PRESS F1 TO RETRY OR F2 TO ENTER ROM UTILITIES"

This message indicates that no floppy disk or hard disk could be found to boot from.

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1. If boot ing from a floppy disk, ver ify that the disk is prop erly in serted and the drive door is closed.
2. In sert a dif fer ent bootable floppy disk into the drive and press <F1>.
3. If at tempt ing to boot from a hard disk, in sert a bootable floppy disk into drive A and press ENTER. Af ter boot ing from the floppy disk, ver ify that drive C is ac ces si ble. Use the FDISK (or sim i lar) util ity to ver ify that a bootable par ti tion ex ists and is AC TIVE. Re move the floppy disk from drive A and re set the sys tem. If the drive can not be ac cessed or par ti tion can not be found, the drive may need to be re for mat ted.

CAUTION: Re for matting a drive causes the data on the drive to be lost.

4. If at tempt ing to boot from a hard disk, use the CMOS SETUP util ity to ver ify that the cor rect FIXED DISK TYPE is con fig ured.

"ER ROR READING FLOPPY DISK -
PRESS F1 TO RE TRY OR F2 TO ENTER ROM UTIL ITIES"
or
"INVALID BOOT SEC TOR ON FLOPPY DISK -
PRESS F1 TO RE TRY OR F2 TO ENTER ROM UTIL ITIES"

This mes sage in di cates that a floppy disk ap peared to be in the drive, but a valid boot sec tor could not be read from the disk.

1. Ver ify that the disk is prop erly in serted and the drive door is closed.
2. In sert a dif fer ent bootable floppy disk into drive and press <F1>.
3. Use the CMOS SETUP util ity to ver ify that the cor rect FLOPPY DISK TYPE is configured.

"ER ROR READING HARD DISK -
PRESS F1 TO RE TRY OR F2 TO ENTER ROM UTIL ITIES"
or
"INVALID BOOT SEC TOR ON HARD DISK -
PRESS F1 TO RE TRY OR F2 TO ENTER ROM UTIL ITIES"

This mes sage in di cates that the POST was un able to ac cess the hard disk us ing the FIXED DISK TYPE pa ram e ters spec i fied in the CMOS SETUP util ity.

1. Use the CMOS SETUP util ity to ver ify that the cor rect FIXED DISK TYPE is con fig ured.
2. In sert a bootable floppy disk into drive A and press <F1>. Af ter boot ing from the floppy disk, ver ify that drive C is ac ces si ble. Use the FDISK (or sim i lar) util ity to ver ify that a bootable par ti tion ex ists and is AC TIVE. Re move the floppy disk from drive A and re set the sys tem. If the drive can not be ac cessed or a par ti tion can not be found, the drive may need to be re for mat ted. Use the HARD DISK PREP util ity to low level for mat MFM/AT drives.
   CAUTION: Re for matting a drive causes the data on the drive to be lost.

"HARD DRIVE CON TROLLER NOT FOUND"

1. If no hard disk is in stalled, use the CMOS SETUP util ity to spec ify NONE for FIXED DISK TYPE.

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2. If an add-in /AT hard disk controller is being used, verify that it is properly inserted into the expansion slot.
3. If an add-in 8-bit /XT hard disk controller is being used, use the CMOS SETUP utility to set the FIXED DISK TYPE to NONE. In some cases, the /XT hard disk controller may have to be removed from the system in order for the system to enter the CMOS SETUP utility.
4. Verify that the primary hard disk controller is configured for I/O address 1F0h and IRQ14, and the secondary controller is configured for I/O address 170h and IRQ15.
5. Make sure the power cable is connected properly.
6. Use the manufacturer's documentation to verify that all jumpers are configured correctly.

"HARD DRIVE FAILURE"

This message indicates that the POST was unable to access the hard disk using the FIXED DISK TYPE parameters specified in the CMOS SETUP utility.

1. Verify that the hard drive has power connected to it.
2. Verify that the hard disk cables are connected properly.
3. Enter the CMOS SETUP utility and verify the hard disk type. Refer to the manufacturer's specifications on the hard drive for configuration information.
4. The drive may need to be formatted.
   WARNING: This will cause loss of all data on the drive.

"HARD DRIVE CONFIGURATION ERROR"

This message indicates that the FIXED DISK TYPE specified in the CMOS SETUP Utility was not valid. This typically occurs when the specified type has 0 for the number of cylinders.

1. If no hard disk is being used, use the CMOS SETUP utility to set the FIXED DISK TYPE to NONE.
2. The parameters listed in the CMOS SETUP utility must never exceed the specifications for the number of cylinders or heads. The USER DRIVE TYPE utility will allow the exact parameters of the drive to be entered.

"REAL TIME CLOCK IS STOPPED"
"REAL TIME CLOCK IS NOT SET"

These messages indicate that the battery backed real time clock is not set correctly or has failed.

1. Use the CMOS SETUP utility to set the time and date.

"XXXX0h OPTIONAL BAD CHECKSUM = Y"

This message indicates that the POST identified an expansion ROM signature at segment XXXX, but the checksum was not 0. This typically indicates that the ROM is invalid or is too slow to be accessed by the CPC8640.

"I/O CARD PARITY ERROR"

This message indicates that an I/O card activated the I/O channel check signal, which is typically used to indicate a RAM parity error on an add-in card. This may occur if the card is too slow to be accessed by the CPC8640.

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“Non-System disk or disk ER ROR
Re place and strike any key when ready”

This mes sage in di cates that a floppy disk ap peared to be in the drive, but a valid boot sec tor could not be read from the disk.

1. Ver ify that the disk is prop erly in serted and the drive door is closed.
2. In sert a dif fer ent bootable floppy disk into the drive and press a key.
3. Use the CMOS SETUP util ity to ver ify that the cor rect FLOPPY DISK TYPE is con fig ured.

SE RIAL OR PAR AL LEL (PRINTER) PORT PROB LEMS

1. Ver ify that the pe riph eral de vice has power and is turned on.
2. Ver ify that the pe riph eral de vice is prop erly con nected to the se rial or par al lel port.

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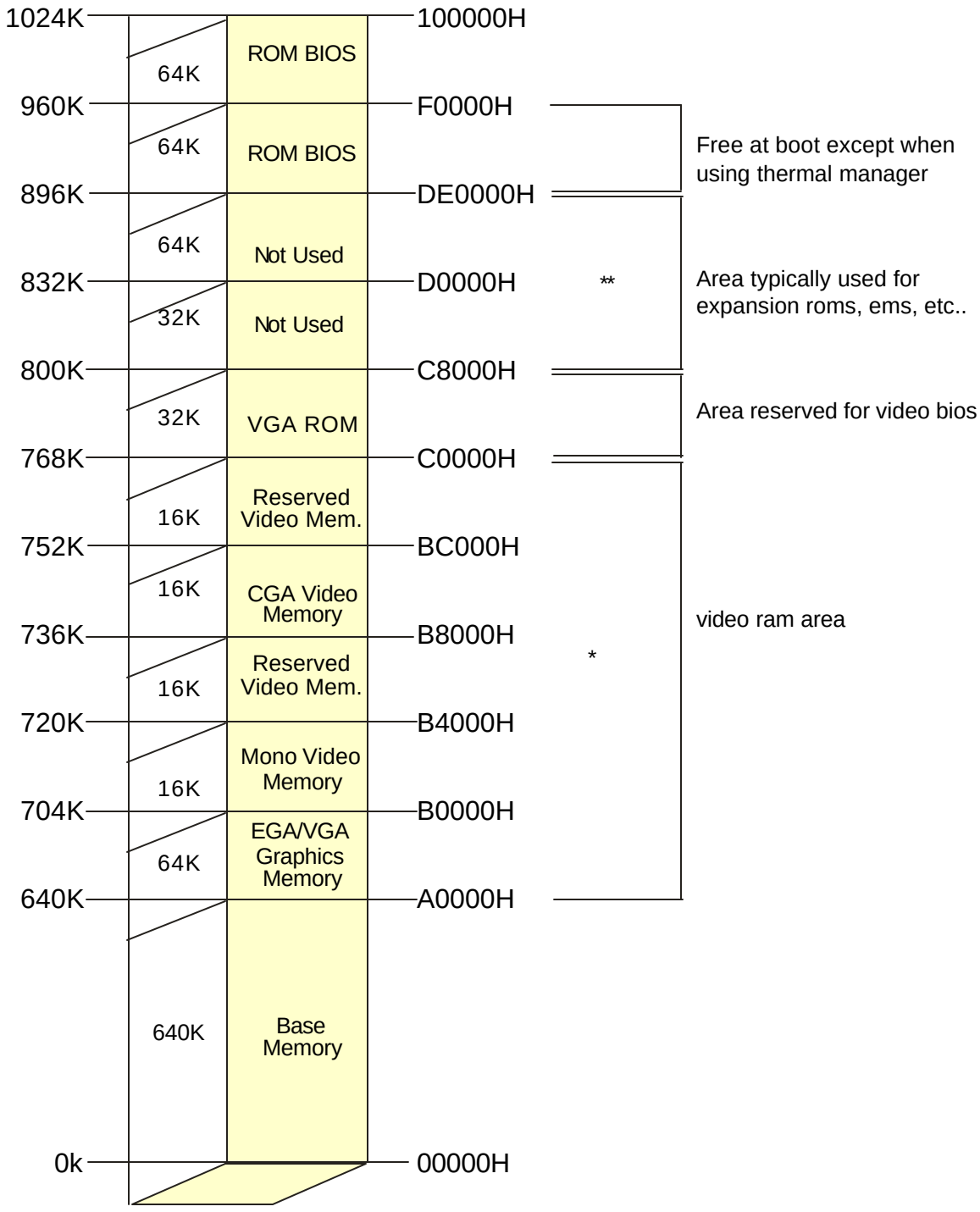
6

System Resources Maps

6.0 Memory Map
6.1 Interrupt Map
6.2 I/O Address Map

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6.0 Memory Map

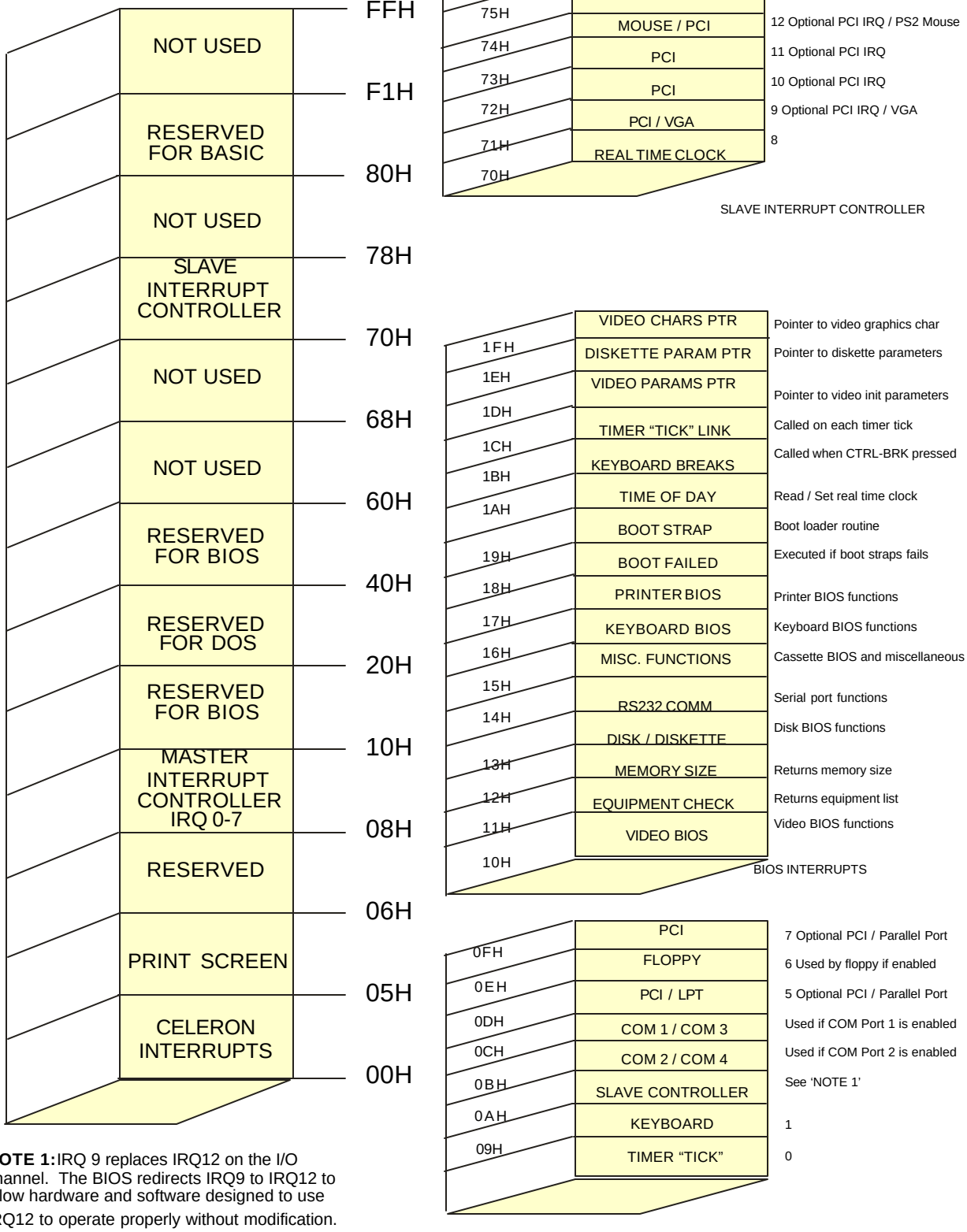


* The designated areas of memory for the video functions are occupied only if that specific type of adapter is installed.

** Onboard SCSI BIOS requires 32k if enabled. Onboard Flash Disk BIOS requires 8k if installed.

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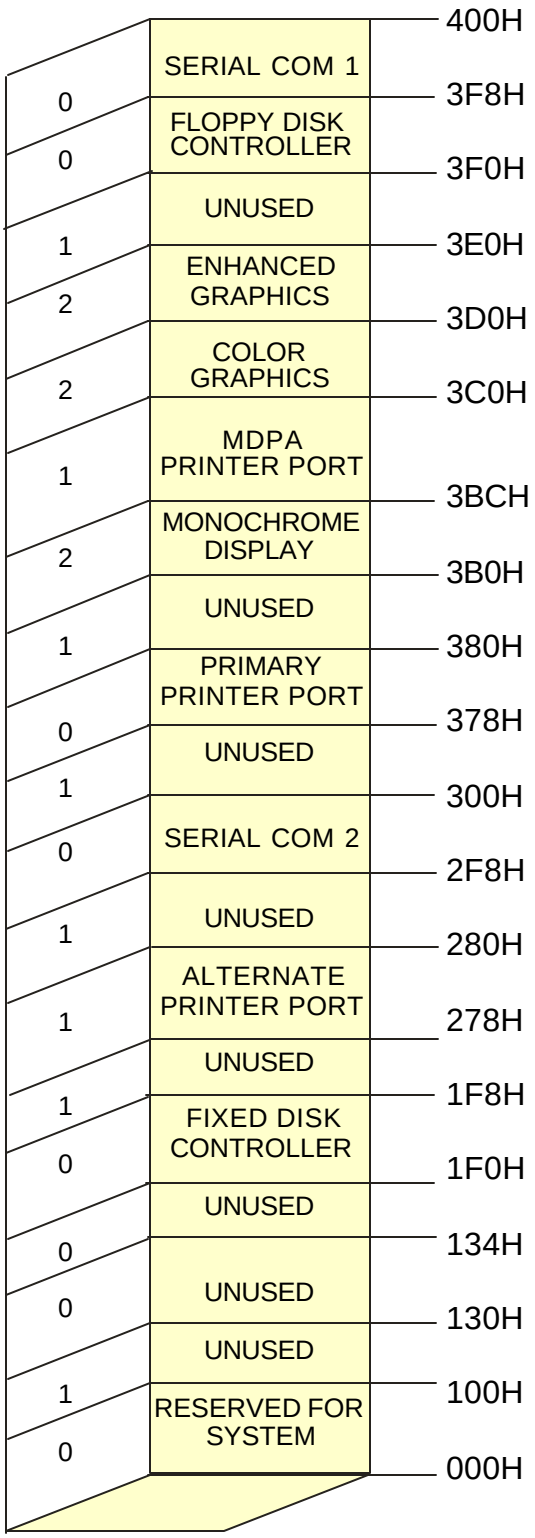
6.1 Interrupt Map



NOTE 1: IRQ 9 replaces IRQ12 on the I/O channel. The BIOS redirects IRQ9 to IRQ12 to allow hardware and software designed to use IRQ12 to operate properly without modification.

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6.2 I/O Address Map



0- These I/O locations are reserved for onboard functions and must be used by expansion I/O cards unless the onboard address is disabled

1- These I/O locations are unused, and may be used by expansion I/O cards.

2- These I/O locations are unused, but are typically used by common expansion I/O cards.

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A

System Monitor VI Programming Instructions

A.0 Overview
A.1 Monitored Conditions
A.2 Alarming Methods
A.3 Programming the Monitor Through the I/O Ports
A.4 Reading the Monitor Port Status
A.5 Sending a Command to the Monitor
A.6 Sending Data to the Monitor
A.7 Receiving Data From the Monitor
A.8 Programming the Monitor Using the Serial Port
A.9 Temperature Notes
A.10 Modem Connection Requirements
A.11 Example Application
A.12 Remote Data Retrieval Mechanisms
A.13 Quick Reference

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A.0 Overview

The onboard system monitor of the CPC8640 is a CPU-independent, programmable device capable of monitoring the CPC8640's voltages and temperatures, the rotational speed of up to eight cooling fans, the switch status of up to eight different switch closure devices, and the temperature status of remote parts of the system through a unique daisy chain temperature interface. Each monitored event can be individually programmed to generate one or more of seven separate alarm types upon entering an error condition. The CPC8640 system monitor also supports a serial port interface that is capable of sending a user programmable dial string to a modem to report error conditions to a remote control site. To identify each unit that may call in to the control site, a programmable unit identification number is provided. The monitor's serial interface is capable of answering an incoming call, and it will respond to remote interrogation commands. The monitor also has a mode of operation that will allow communication through I/O port 132h and the serial port of the monitor. In addition to monitoring the system's environmental conditions, the CPC8640's monitor also stores the last POST code that the BIOS issues during the unit powerup. Supplementing the POST code storage, if the BIOS determines that an error condition exists, it will send an error code defining the error condition to the monitor for storage. Since the system monitor is independent from the CPU, this allows remote diagnosis of power up error conditions.

A.1 Monitored Conditions

System Voltages: The monitored system voltages are the +/- 12 volt lines, the +5 volt lines, 3.3 volts, 2.5 volt power supply, and the CPU power supply. Each voltage line has a programmable +/- percent tolerance for an alarm condition. The default tolerance is 10 percent. All of the voltage lines use the same programmable alarm issuing method.

System Temperatures: The temperatures monitored are the ambient system temperature and the temperature under the CPU. The alarm issuing method for the ambient temperature is separately programmable from the method used for the CPU.

Fan Rotational Speed: The CPC8640 can monitor the rotation rate of up to eight fans at a time. Each fan has a minimum rotations per second (RPS) value that can be specified for its alarm condition. Also, each fan has an individually programmable alarm method.

Switch Closure: Fan input lines that are not being used to monitor fan rotational speeds can be programmed to monitor the ON/OFF status of a switch. Each fan input can be programmed as switch monitors. Each switch can be programmed to be active high or active low for its alarm condition:

Remote Temperatures: Up to 7 remote temperature parts can be connected to the CPC8640's System Monitor. Each part can be programmed to generate an alarm if its temperature goes outside of its programmed high or low boundaries.

POST Codes: The CPC8640 BIOS sends its POST codes to I/O port 80h and to the system monitor. The system monitor stores each POST code as it is received. The monitor will report the last POST code received upon user request.

BIOS Failure Codes: The CPC8640 BIOS is capable of diagnosing several types of errors. If an error condition is detected by the BIOS, it will send an error code to the system monitor. If a modem dial string or unit identification number have been programmed, the monitor will report this error code. Otherwise, the monitor will report this code upon user request.

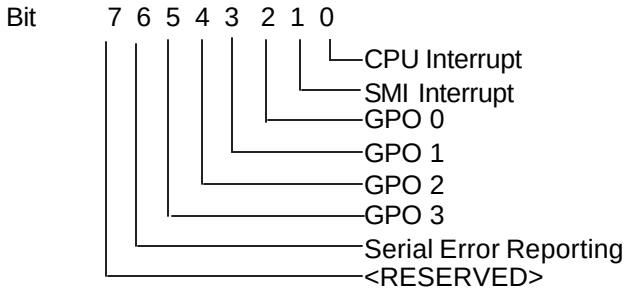
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BIT

0 DISK_ERROR	: Hard drive controller failure or boot failure
1 KYBD_ERROR	: Keyboard failed (stuck key or no keyboard installed)
2 EISAR_ERROR	: RESERVED
3 EISAC_ERROR	: RESERVED
4 POS_ERROR	: POST Timeout error
5 CMOS_ERROR	: CMOS Checksum Invalid
6 TIMER_ERROR	: Timer error
7 RTC_ERROR	: Real Time Clock Failed
8 CONFIG_ERROR	: System configuration differs from CMOS configuration
9 OPROM_ERROR	: Option ROM Error
10 COP_ERROR	: Math Coprocessor error
11 DISKETTE_ERROR	: Floppy drive error or boot failure
12 BOOT_ERROR	: Unable to boot successfully
13 CACHE_ERROR	: Error occurred configuring the secondary cache
14 IO_ERROR	: An IO address conflict exists
15 OTHER_ERROR	: Other error

A.2 Alarming Methods

The CPC8640 System Monitor offers seven different alarming methods to the user for each monitored event. Which alarm(s) used for an error condition is determined by the Delivery byte for the monitored event. A Delivery byte is defined as follows:



- CPU Interrupt: If this bit is set in an event's delivery byte, an error condition will cause IRQ10 or IRQ11 to be generated. The interrupt generated is selectable in the System Monitor Setup Utility.
- SMI Interrupt: If this bit is set in an event's delivery byte, a System Management Interrupt will be generated on an error condition. This type of alarm is intended to be used with the Power and Thermal Management support of the BIOS.
- GPO 0-3: These bits of the delivery byte, when set, cause the corresponding General Purpose Output lines to assert on an error condition. The GPO lines are pins 7, 9, 11, and 13 of the J1 header connector of the SMS001 attached to the CPU board.
- Serial Error Reporting: If this bit is set in an event's delivery byte, an error message will be sent to the serial port on an error condition. If a dial string has been programmed, the monitor will know to send the dial string to the modem, wait for a connection, and then send the error message. If the Unit identification string has been programmed, the monitor will send the Unit identification string before it sends the error message. The system monitor serial port is set at 9600 BAUD, 8-bit word size, no parity, and 1 stop bit. The port uses RTS/CTS hardware handshaking.

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The delivery byte for an event is programmed by sending the Set Delivery Byte command for that event, followed by the delivery byte itself defining what alarm method is to be used on an error condition for that event. For example, if a CPU interrupt is to be generated and GPO 0 is to be turned on when Fan 1 falls below its minimum rotations per second, a delivery byte of 05h would be sent to the monitor after s ending the Set Fan 1 Delivery Byte command.

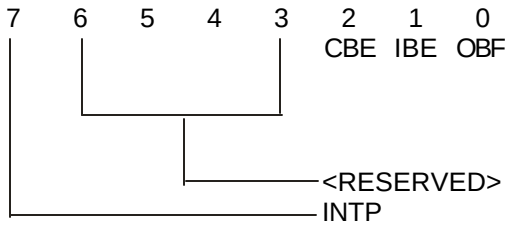
A.3 Programming The Monitor Through The I/O Ports

Typically the System Monitor is programmed using the BIOS System Monitor Configuration Utility, which is capable of programming all features of the monitor. The following section is provided for those users who wish to write their own utilities to control the monitor.

The CPC8640 System Monitor is programmed by sending commands to I/O port 133h and data to I/O port 132h, and reading data back from I/O port 132h. A command - data byte sequence is described as follows:

A.4 Reading The Monitor Port Status

To determine the monitor ports status, the user would read port 133h to get the monitor's status by te. The status byte returned is defined as follows:



CBE: Command Buffer Empty: This bit is set when the command input buffer to the monitor is empty, ready to accept a command.
IBE: Input Buffer Empty: This bit is set when the data input buffer is empty, ready to accept data.
OBF: Output Buffer Full: This bit is set when the monitor has data waiting for the user in port 132h.
INTP: Interrupt Pending: This bit is set when there are no interrupts or SMIs to be sent to the system. If this bit is clear, the monitor has an interrupt or SMI to send. Perform command 000 (read system status) to clear an interrupt pending.

A.5 Sending A Command To The Monitor

If the user wants to sent a command to the monitor, the user should first make sure that the command buffer is empty (CBE set). If it is, then the user can send a command to the monitor through port 133h. See the command descriptions at the end of this section for a list of valid commands and the number of corresponding data bytes that are associated with them. Before sending or receiving data to or from port 132h, the CBE bit should be checked after the command is sent, it should be set before sending data to the monitor.

Before sending a command to the monitor, the INTP bit (bit-7) should be checked. If it is clear, the monitor has an interrupt or SMI to send to the CPU. The system monitor will not send the interrupt if it has a command to process, so commands should not be sent until the bit is set.

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A.6 Sending Data To The Monitor

Some commands require an additional data byte(s) to be sent to the slave. To send the data byte(s) to the monitor, the user again must read port 133h and determine that the input buffer is empty (IBE set). If the input buffer is empty, then the user can send the appropriate data to the monitor through port 132h. It is important to note that commands are sent to the monitor through port 133h and data is sent through port 132h. Similarly, data sent from the monitor is read through port 132h, and the buffer's status is read through port 133h.

A.7 Receiving Data From The Monitor

Some commands instruct the monitor to send the user data. After sending such a command, the user should read port 133h until the output buffer full (OBF) bit is set. When this bit is set, the user can read port 132h to obtain the data. If two bytes are returned, the user should read port 133h a second time until the output buffer full bit is set again, and then read port 132h to obtain the second byte. See the command descriptions to determine the number of returning data bytes.

NOTE: Command/Data byte sequences may be entered through software or manually using MS-DOS DEBUG or equivalent. However, if entering commands manually, it is important to note that if a command requires a data byte to follow it, the data must be sent within 2 seconds, or the command is thrown away.

To summarize, the command-data sequence then involves these steps:

1. If OBF set, read data bytes and throw away, repeat if necessary to flush buffer.
2. Wait CBE set, write command to port 133h, wait CBE set again.
3. Wait IBE set, write data to port 132h, repeat for all data bytes.
4. Wait OBF set, read data byte, repeat for all output data.

A.8 Programming The Monitor Using The Serial Port:

The monitor can also be programmed through the serial port. The serial port communicates at 9600 baud, 8 data bits, no parity, and 1 stop bit. The same commands that are used to program the monitor through the I/O ports are used to program the monitor through the serial port, though the serial commands are entered in ASCII. Commands that cannot be entered using the serial port are the Set Password, Set Dial String, and Set Unit ID Commands. Commands sent to the serial port are prefixed with the '@' character, followed by the command and data bytes, each separated with a colon. For example, to use the Set Switch Polarity command to set Fan 4 to act as a switch closure monitor, and to be active high, the following procedure would be used. First, by looking up the command in the Command Description List, the Set Fan Minimum RPS command is found to be Command 2Ah. The command is followed by two data bytes: the first byte is the fan to set, and the second byte is the active state of the switch The command sequence would be as follows:

@2A:03:01<CR>

There are several key points to note about the above string. First, the @ symbol is the first character. This tells the monitor that the characters following it make up a command string. The next point to note is that the command, in ASCII, is the hex value of the command. Also note that a colon separates the command from the first data byte, and another colon separates the second data byte from the first. Another point to note is that switch four is specified with '03' and not just '3'. The numbering system used by the monitor starts with zero. The monitor expects the command and data bytes to be entered in two digits. Finally note that the command is processed when a carriage return is sent at the end of the string.

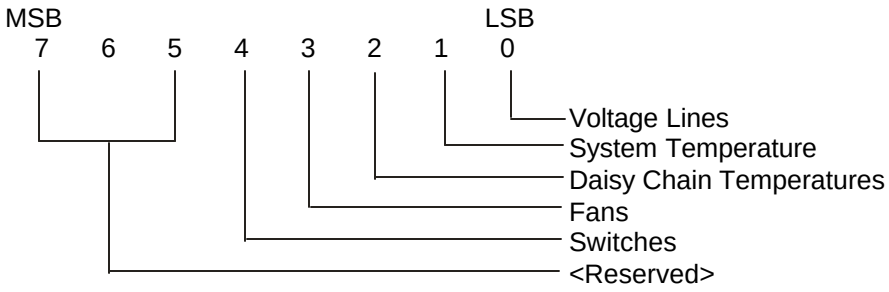
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Serial Reporting Verbose Mode: The Monitor can be set to send verbose strings upon receiving commands, or can be set to send only hex values. This is done by sending command 09h followed by a 00 to disable or a 01 to enable verbose mode. The monitor defaults to verbose mode enabled.

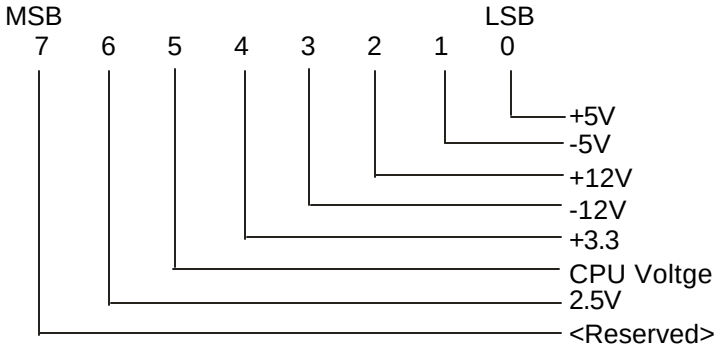
Password Entry: The Monitor can be programmed with a three character password through the I/O port using command 05h. If the password is programmed, then the monitor will request the password from the user upon first using the serial port.

LIST OF COMMANDS:

COMMAND	Data OUT	IN	Description:
00h	01	00	GET SYSTEM STATUS: This command returns a byte mask indicating the status of the events being monitored. A bit set to 1indicates a failure. The byte mask is defined as follow:

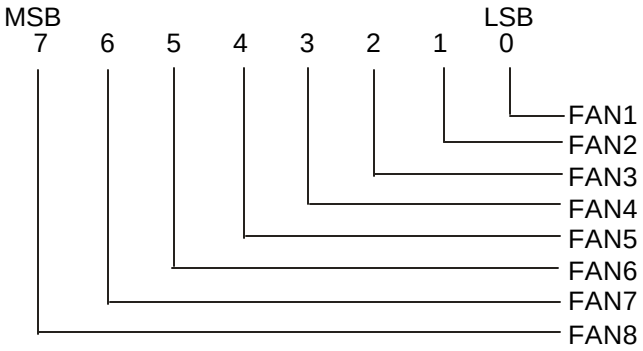


01h	01	00	GET VOLTAGE STATUS: This command returns a byte mask indicating the status of the voltage channels. A bit set to 1 indicates a failure. The byte mask is defined as follows:

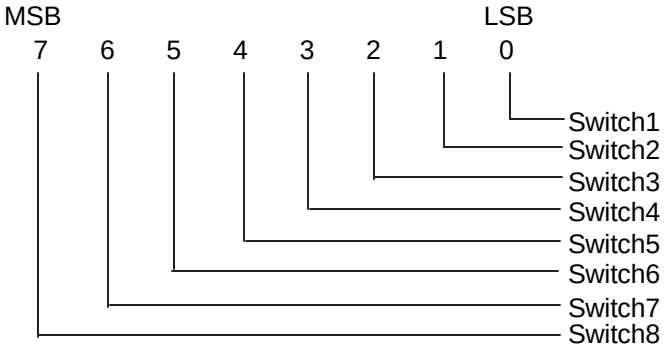


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COMMAND	Data OUT	IN	Description:
02h	01	00	GET FAN STATUS: This command returns a byte mask indicating the status of the fans. A bit set to 1 indicates a failure. The byte mask is defined as follows:

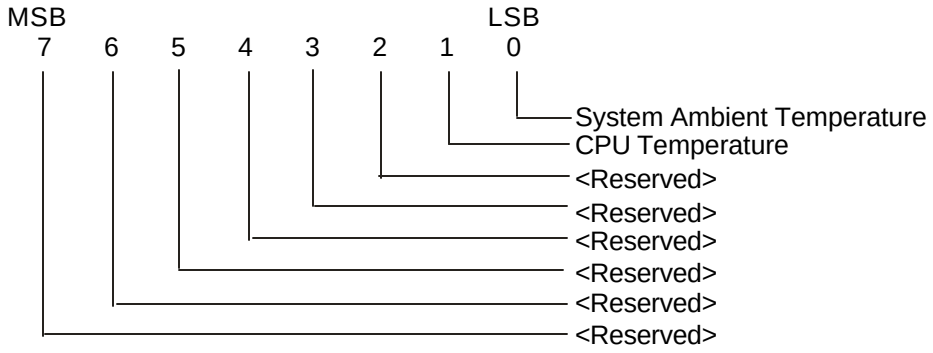


03h	01	00	GET SWITCH STATUS: This command returns a byte mask indicating the status of the switches. A bit set to 1 indicates a failure. The byte mask is defined as follows:

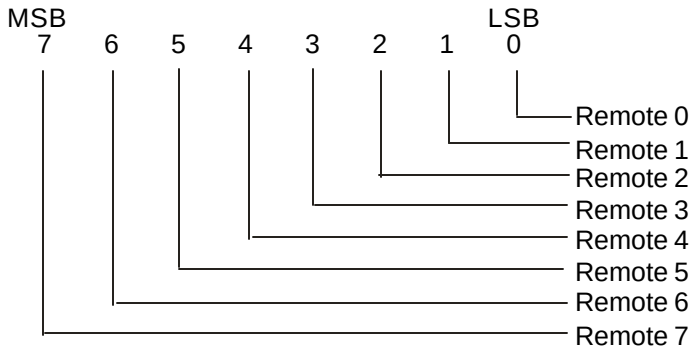


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COMMAND	Data OUT	IN	Description:
04h	01	01	GET TEMPERATURE STATUS: This command, followed by a 1 or 0, returns a byte mask indicating the status of the temperatures monitored. A bit set to 1 indicates a failure. A 0 return is the overall system temperature status:



and a 1 returns the remote temperature part status.



05h	00	03	SET PASSWORD (I/O port only): This command, followed by a three byte string, sets the password for serial port access. When the password is set, the serial port will require the password to be entered before it will allow commands to obeyed. Sending all zeros as the password will disable the password checking.

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COMMAND	Data OUT	IN	Description:
06h	00	1-20	SET DIAL STRING (I/O port only): This command, followed by up to 20 data bytes, sets the modem dial string for the serial port. If the string is shorter than 20 characters, send a hex 2A to terminate the string. This dial string will be sent before an error string is sent. After sending the dial string, the monitor will wait for DCD to be asserted. If DCD does not get asserted after 2 minutes, the monitor will abort its attempt to make a connection until another error condition occurs.
07h	00	1-10	SET UNIT ID (I/O port only): This command, followed by up to 10 data bytes, sets the unit ID string for serial error reporting. If the string is shorter than 10 characters, send a hex 2A to terminate the string. When this string is set, it will be sent before every error message string to identify the unit that is sending the error message.
08h	00	01	TOGGLE SERIAL ECHO: This command, followed by a data byte, enables or disables the serial port echo. 00 disables echoing, and 01 enables echoing. The default value is echoing disabled.
09h	00	01	TOGGLE NON-VERBOSE MODE: This command,followed by a data byte, enables or disables verbose strings sent out the serial port. 00 disables verbose mode, and 01 enables verbose mode. The default value is verbose mode enabled.
0Ah	00	01	ENABLE WATCHDOG: This command, followed by a count value, enables the watchdog function of the monitor. If the monitor does not receive the strobe watchdog command before the count value expires, the system will be reset. The count value is in fifty millisecond increments, which allows a maximum of 12.75 seconds (255*50ms) of strobe cycle time. Sending a value of zero as the count will disable the watchdog function.
0Bh	00	01	WATCHDOG WARNING COUNT: This command,followed by a count value, sets a point where the alarm(s) specified by the watchdog warning delivery byte will be generated. The count value is in the same 50 millisecond increments that the Enable Watchdog count is in. This function is provided to give a warning to the CPU that a reset is about to occur if the strobing means stops.
0Ch	00	00	STROBE WATCHDOG: This function resets the internal watchdog counter of the monitor, preventing a system reset until the Enable Watchdog Count expires. *** See commands 3Ah, 3Bh, and 3Ch for further watchdog information.

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COMMAND	Data OUT	IN	Description:
0Dh	00	02	BIOS FAILURE DEFINITION: This command is intended for use with the system BIOS, however, it can be used as a general purpose two byte storage method. The command, followed by two data bytes, stores those two data bytes in the monitor's memory.
0Eh	02	00	GET BIOS FAILURE DEFINITION: This command returns the two bytes sent to the monitor by command 0Dh.
0Fh	01	00	GET LAST POST CODE: This command returns the last POST code that was sent to the monitor by the system BIOS.
10h	00	03	SET LOW BOUNDARY TEMPERATURE: This command, followed by three data bytes, sets the low boundary condition for an alarm for the system ambient, CPU, or remote temperatures. The first data byte defines which module's boundary to set: 00=system ambient temp 01=CPU temp 02= <RESERVED> 03=Remote temp 0 04=Remote temp 1 05=Remote temp 2 06=Remote temp 3 07=Remote temp 4 08=Remote temp 5 09=Remote temp 6 0A=Remote temp 7 The next two bytes form a nine bit two's complement number that defines the low temperature. The magnitude of the number should be twice that of the desired temperature, because the temperature module measures the temperature in 1/2 degree Celsius increments. The first byte is the most significant byte. **NOTE:**The lowest temperature the monitor is capable of reading is -55 C. See the Temperature Notes section of this appendix for more information on how to calculate the value for a desired temperature and how to calculate the two's complement of a number.
11h	02	01	GET LOW BOUNDARY: This command, followed by a data byte specifying which module desired, returns that temperature module's current low boundary for failure: 00=system ambient temp 01=CPU temp 02=<RESERVED> 03=Remote temp 0 04=Remote temp 1 05=Remote temp 2 06=Remote temp 3 07=Remote temp 4 08=Remote temp 5 09=Remote temp 6 0A=Remote temp 7 The boundary temperature is returned high byte first, in a nine bit two's complement format, of a magnitude twice that of the actual temperature. See the Temperature Notes section of this appendix for more information on two's complement numbers.

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COMMAND	Data OUT	IN	Description:
12h	00	03	SET HIGH BOUNDARY TEMPERATURE: This command, followed by three data bytes, sets the high boundary condition for an alarm for either the system ambient, CPU, or remote temperatures. The first data byte defines which module's boundary to set: 00=system ambient temp 01=CPU temp 02=<RESERVED> 03=Remote temp 0 04=Remote temp 1 05=Remote temp 2 06=Remote temp 3 07=Remote temp 4 08=Remote temp 5 09=Remote temp 6 0A=Remote temp 7 The next two bytes form a nine bit two's complement number that defines the high temperature. The magnitude of the number should be twice that of the desired temperature, because the temperature module measures the temperature in 1/2 degree Celsius increments. The first byte is the most significant byte. NOTE: The highest temperature the monitor is capable of reading is 125 C. See the Temperature Notes section of this appendix for more information on how to calculate the value for a desired temperature and how to calculate the two's complement of a number.
13h	02	01	GET HIGH BOUNDARY: This command, followed by a data byte specifying which module is desired, returns that temperature module's current high boundary for failure: 00=system ambient temp 01=CPU temp 02= <RESERVED> 03=Remote temp 0 04=Remote temp 1 05=Remote temp 2 06=Remote temp 3 07=Remote temp 4 08=Remote temp 5 09=Remote temp 6 0A=Remote temp 7 The boundary temperature is returned high byte first, in a nine bit two's complement format, of a magnitude twice that of the actual temperature. See the Temperature Notes section of this appendix for more information on two's complement numbers.

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COMMAND	Data OUT	IN	Description:
14h	02	01	GET TEMPERATURE: This command, followed by a data byte specifying which module is desired, returns that temperature module's current temperature: 00=system ambient temp 01=CPU temp 02= <RESERVED> 03=Remote temp 0 04=Remote temp 1 05=Remote temp 2 06=Remote temp 3 07=Remote temp 4 08=Remote temp 5 09=Remote temp 6 0A=Remote temp 7 The temperature is returned high byte first in a nine bit two's complement format of a magnitude twice that of the actual temperature in degrees Celsius. See the Temperature Notes section of this appendix for more information on how to calculate the actual temperature from a two's complement value.
1Ah	00	01	ENABLE TERMINAL TRANSFER MODE: This command enables terminal transfer mode. When Terminal Tx mode is enabled, all data sent to the I/O port 132h will be echoed out of the monitor's serial port. Also, any data sent into the monitor's serial port will be sent to port 132h.
1Bh	01	01	DISABLE TERMINAL TRANSFER MODE: This command will set the monitor back to standard operating mode. NOTE: To disable terminal Tx mode from the serial port send '@@@'.
1Ch	00	02	FORCE GENERAL PURPOSE OUTPUT LINE: This command followed by a byte specifying a General Purpose Output Line (GPO 0 - 3), then followed by either a00 or 01, forces the specified GPO line to either a low or high state respectively.
1Dh	00	02	SET GENERAL PURPOSE OUTPUT LINE ACTIVE STATE: This command, followed by a byte specifying a General Purpose Output Line (GPO 0 - 3), then followed by either a 00 or 01, sets the specified GPO line's active state on an error condition to either active low or active high, respectively.
1Eh	01	01	GET GENERAL PURPOSE OUTPUT LINE ACTIVE STATE: This command, followed by a byte specifying which General Purpose Output Line (GPO 0 - 3), returns that line's active state for an alarm condition.

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COMMAND	Data OUT	IN	Description:
20h	02	01	GET VOLTAGE CHANNEL X: This command, followed by a data byte specifying which voltage channel is desired, returns that channel's current voltage reading. The first byte returned is the whole part of the number, and the second byte is the decimal part of the number, i.e., 3.4v would return first a 3, and then a 4 as the second byte. Voltage lines are specified as follows: 00 -- +5 voltage 01 -- 3.3 voltage 02 -- +12 voltage 03 -- -12 voltage 04 -- 2.5 voltage 05 -- CPU voltage
21h	01	01	GET VOLTAGE X TOLERANCE: This function returns the tolerance value for the specified voltage line. Voltage lines are selected as follows: 0 -- +5 voltage tolerance 1 -- 3.3 voltage tolerance 2 -- +12 voltage tolerance 3 -- -12 voltage tolerance 4 -- 2.5 voltage tolerance 5 -- CPU voltage
22h	00	02	SET VOLTAGE X TOLERANCE: This function,followed by a voltage line byte and a tolerance byte, sets the +/- percentage tolerance for the specified line. Tolerances should be sent in as the desired percentage, i.e., 25% should be sent in as 25. Voltage lines are selected as follows: 0 -- +5 voltage tolerance 1 -- 3.3 voltage tolerance 2 -- +12 voltage tolerance 3 -- -12 voltage tolerance 4 -- 2.5 voltage tolerance 5 -- CPU voltage
25h	01	01	GET FAN X STATUS: This function, followed by a fan number byte, returns a byte value that represents the current rotations per second of the specified fan.

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COMMAND	Data OUT	IN	Description:
26h	00	02	SET FAN X MINIMUM RPS: This function,followed by a fan number byte and a minimum rotational value byte, sets the minimum rotations per second value before an error condition occurs for fan x. Valid minimum rps settings are 10 to 255. If a value of 1 - 9 is sent, the monitor uses a value of 10. If a value of zero is sent, the monitor ceases to monitor the fan.**NOTE:** This function must be set in order for the fan to be monitored.
27h	01	01	GET FAN X MINIMUM RPS: This function, followed by a fan number byte, returns the current minimum rps value stored for fan x.
2Ah	00	02	ENABLE/DISABLE SWITCH X: This function,followed by a switch number byte, then a polarity byte, enables or disables switch monitoring for that switch, and sets the polarity for that switch. If the polarity byte is 0, the polarity for no error is OFF. If the polarity byte is 1, the polarity for no error is ON. If the polarity byte is any other value, switch monitoring for this switch is disabled, and fan checking is enabled. Fans 1-7 are the only fan lines that can be set to be switch monitors.
2Bh	01	01	GET SWITCH X POLARITY: This function,followed by a switch number byte, returns the current polarity setting of the switch.
2Ch	01	01	READ SWITCH X:This function, followed by a switch number byte, returns the current status of the specified switch.
30h	00	02	SET VOLTAGE / TEMPERATURE / WATCHDOG DELIVERY: This command, followed by two data bytes, specifies the delivery method for either the voltage lines, temperatures, or watchdog warning. The first data byte specifies which event to set, and the second byte is the delivery byte itself. The events are specified as follows: 00 = Voltage Delivery Byte 01 = System Ambient Temperature Delivery Byte 02 = CPU Temperature Delivery Byte 03 = Remote Temperature Delivery Byte 04 = Watchdog Warning Delivery Byte
31h	01	01	GET VOLTAGE TEMPERATURE/WATCHDOG DELIVERY: This command, followed by a data byte specifying a monitored event, returns that events current Delivery Byte. Events are specified as follows: 00 = Voltage Delivery Byte 01 = System Ambient Temperature Delivery Byte 02 = CPU Temperature Delivery Byte 03 = Remote Temperature Delivery Byte 04 = Watchdog Warning Delivery Byte

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COMMAND	Data OUT	IN	Description:
32h	00	02	SET FAN X DELIVERY: This command,followed by two data bytes, specifies the delivery method used for an alarm condition on a fan line. The first byte specifies which fan line, and the second byte specifies the delivery method.NOTE: Since the switch monitoring is done through the fan lines, the delivery bytes for fans 1-7 will specify the delivery method for the switch on that line. The delivery byte for fan 8 doubles as the delivery method for the daisy chain temperature interface in the same manner.
33h	01	01	GET FAN X DELIVERY: This command, followed by a data byte specifying a fan number, returns that fan's delivery byte.
3Ah	00	01	SET WATCHDOG TICK COUNT TIME GRANULARITY: Starting with System Monitor Version 2.3 and up, this command allows the user to define the watchdog count granularity from 50 milliseconds (default) to 1.35 seconds. Command 3Ah, followed by a data byte between 1 and 27, determines the amount of time that each tick value set by command 0Ah represents. One tick count is equal to 50 milliseconds times the granularity value. For example, if the granularity value is set to 20 (14h), then each tick count is [.050s x 20] or 1 second. Therefore, if the watchdog count value programmed using command 0Ah is 15, then the watchdog timeout value is [15 x 1s] or 15 seconds.

Granularity (CMD 3 Ah)

Tick Count (CMD 0Ah)	1	2	3	4	5	...	27
1	50ms	100ms	150ms	200ms	250ms	...	1.35s
2	100ms	200ms	300ms	400ms	500ms	...	2.7s
3	150ms	300ms	450ms	600ms	750ms	...	4.05s
4	200ms	400ms	600ms	800ms	1s	...	5.4s
5	250ms	500ms	750ms	1s	1.25s	...	6.75s
. . .	. . .	. . .	. . .	. . .	. . .	. . .	
FFh	12.75s	25.5s	38.25s	51s	63.75		5.7min

1 Tick Count 50ms x granularity value

Watchdog Timeout Values for Tick Count vs Granularity

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COMMAND	Data OUT	IN	Description:
3Bh	01	00	GET WATCHDOG TICK COUNT GRANULARITY: This command returns the user defined timer granularity value. If a value of 0 is returned, then the no user value has been programmed, and the default of 50ms per tick is being used.
3Ch	00	01	ENABLE HOT SWAP CPU: This command, followed by a data byte, enables or disables the Hot Swap CPU changeover string from being sent on a watchdog timeout. This command is intended to be used on a CPU board operating in a DTI Hot Swap chassis. Enabling this feature with a data byte of 01 will cause the System Monitor to initiate an active CPU changeover on a watchdog timeout. A data byte of 00 disables this feature. See the Hot Swap chassis manual for further information on Hot Swap capabilities
45h	0	1	REMOTE TEMPERATURE MODULE COUNT: Returns the number of remote temperature sensors detected.
47h	0	1	CELERON DETECTION MASK: Returns 01h to indicate that the Celeron was detected.
4Eh	0	1	WRITE TO MAILBOX: This command, followed by a data byte, writes to the Mailbox byte stored in the System Monitor. The Mailbox storage area is intended to be used as a means of establishing a communications protocol with a remote site. See section A.12.1 for detailed information.
4Fh	1	0	READ MAILBOX: This command returns the current value stored in the MailBox. See section A.12.1 for a detailed description.
50h	0	1	CPU TEMPERATURE MODULE COUNT: Returns number of CPU temperatures modules, which should be one.
51h	0	1	TEMPERATURE MODULE COUNT: Returns total number of temperature modules. This includes system ambient, CPU, and remote temperature sensors.
52h	0	9	WRITE BLOCK IN SCRATCHPAD: This command, followed by a block number and 8 data bytes, will write data to the scratchpad. The block # is limited to 00-1Fh. See section A.12.2 for a description of the scratchpad.
53h	8	1	READ BLOCK IN SCRATCHPAD: This command, followed by a block #, returns 8 data bytes from the scratchpad. The block # is limited to 00-1Fh. See section A.12.2 for a description of the scratchpad.

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A.9 Temperature Notes

The temperature module is capable of measuring -55 C to +125 C. These temperatures are measured in 1/2 degree increments by the temperature monitor. Thus, the reported value from the temperature module is twice that of the current temperature.

The temperature module uses two's complement numbers to report the current temperature. Two's complement is a unique form of representing signed numbers. In two's complement, the most significant bit(MSB) of a number is used to signify the sign of the number. If the MSB is 1, the number is negative. Conversely, if the MSB is 0, the number is positive.

To convert a normal negative unsigned number to two's complement, the following procedure is used: 1. Complement the number bitwise, 2. Add 1 to the result. The same procedure is used to convert a two's complement number back to an unsigned number. Note: This conversion is ONLY necessary IF the number is negative (MSB = 1). Let's look at an example:

Suppose the temperature is -55 C. The temperature module will report that as a 0192h. This number is in 9-bit, two's complement form. Since the most significant bit is the lowest bit of the high byte, and it is one, we know the temperature is negative. Now we complement the 92h, and we get 6Dh. To this, we add one to get 6Eh, which is 110 decimal. Since this number represents the number of 1/2 degree increments the temperature module has counted, we divide this number by 2 to get 55. Since we knew that this number was negative from the MSB, we have now finished calculating the temperature to be -55 C.

The same type of procedure can be used to calculate the two's complement for the boundary values of the temperature module.

NOTE: The sign bit, which is the least significant bit of the high byte for the boundary value, is the ONLY bit that is allowed to be set by the temperature module. If a byte that has a value greater than one is sent to the monitor as the high byte for a boundary value, the monitor will ignore the new boundary value and keep the previous one. Let's look at an example of programming a boundary condition. Suppose a low boundary of negative 2 degrees Celsius is desired. First, the two's complement must be calculated. The first step is to multiply the number by two. Next, the complement of the resulting number, 4, is taken. The complement of 4 is 01FBh (remember the number is nine bits). To this number, add 1 to get the two's complement, which is 01FCh. To program the monitor's system low boundary, the following steps would be taken. First, the set system low boundary command, 10h, would be sent to port 133h. Next, when the command has been read by the monitor (CBE set), the high byte of the boundary temperature, 01h, would be sent to port 132h. After the monitor reads this byte (IBE set), the low byte of the boundary temperature, FCh, would be sent to port 132h.

A.10 Modem Connection Requirements

The System Monitor requires the following when a modem is connected to it:

1. The baud rate of the modem serial port MUST be fixed at 9600 baud. Most modems operate in a mode that will cause the baud rate of the serial port to match the connection rate. This mode of operation is not supported by the System Monitor, and should be disabled on the modem.

2. The word size MUST be fixed at 8 data bits, no parity, 1 stop bit.

3. Jumper E1 must be installed on the SMS001 attached to the CPC8640 CPU board. This will set the serial port of the System Monitor to DTE mode.

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4. The modem connected must be set to use RTS/CTS handshaking.

5. The modem must also be programmed to raise the DCD line ONLY when a connection is made to a remote modem. Some modems can be set to have DCD always asserted. The System Monitor uses the DCD line to determine if the dial string should be sent. If DCD is always asserted, the dial string will not be sent.

A.11 Example Applications

The System Monitor of the CPC8640 is a very versatile device, with a wide variety of capabilities. During the development and testing of this device, the engineers at Diversified Technology often came up with creative applications of the System Monitor. The following example applications are listed in this section to provide a means of demonstrating the versatility of the Monitor. The examples are broken down into both typical and atypical uses of the separate capabilities of the Monitor.

Application #1: Fan/Switch Input Lines

The obvious application of the fan input lines is the monitoring of the cooling fans of the system. However, the monitor is capable of measuring any square wave signal that swings between 0 and 5 volts, up to 15,300 rpm!

The fan input lines can also double as switch closure monitors. The condition the switch line should normally be at is programmable as either normally high, or normally low. If the switch condition changes, then an alarm is generated. In one example application, three fan lines were programmed as switch closure monitors. These lines were attached to three separate airflow meters. These airflow meters drove their output lines low if the amount of air flowing through them dropped below a certain point. The switch closure lines of the System Monitor were programmed to be normally high, and set to generate an interrupt if the line went to a low condition.

Application #2: Watchdog/Watchdog Warning

Another example application used the watchdog monitor capability of the Monitor, setting it to its maximum timeout, approximately 12 seconds. The system then set the watchdog warning to be an interrupt, and set it to occur at roughly half of the maximum, or about 6 seconds. The system's strobe input to the watchdog was set to occur at less than one second intervals. In this example application, the interrupt service routine would receive the watchdog warning interrupt 6 seconds before the system reset would occur, if the strobing mechanism were stopped. The interrupt service routine could then do anything from performing an emergency shutdown of the operating system, to acting as the strobe to the watchdog in place of the normal strobing mechanism.

Application #3: General Purpose Outputs

The System Monitor has four general purpose output lines. These lines are programmable as either active low or active high. Typically, these lines are used to drive LEDs, which would be an active low output. However, other applications could use the output line to drive an active high digital device or perhaps a relay.

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Application #4: Serial Reporting / Interrogation

The most advanced features of the System Monitor are the serial capabilities it has. In one example application, a unit could be set up with a modem connected to the Monitor's serial port. The Monitor will answer any incoming calls made to the modem. This allows the unit's voltages, temperatures, etc. to be interrogated remotely. Other applications could chain multiple units to a central monitoring station through a serial switch box.

A.12 Remote Data Retrieval Mechanisms

The System Monitor provides for communication between applications on different systems, linked by the System Monitor serial port. One mechanism is the Data Transfer Control Protocol, which allows real-time communication between a remote and local system. Another mechanism is the Scratchpad, which provides a small bank of memory within the System Monitor, accessible locally through the I/O ports, or remotely via serial port.

Data Transfer Protocol

DEFINITION: System Monitor support has been added to provide a Data Transfer Control Protocol to allow better serial communications through the System Monitor's Terminal Transfer Mode. The mechanism by which the protocol is used consists of a "MailBox" byte, which can be written to and read by both local and remote sites by using predefined MailBox values to begin and terminate data transfers.

COMMAND STRUCTURE: To write to the MailBox byte, command 4Eh is sent to the System Monitor, followed by the byte value to write to the MailBox. This can be done from both the I/O port as well as the serial port of the System Monitor. To read the current MailBox byte, command 4Fh is sent to the System Monitor, which will return the current value of the MailBox byte. Again, this can be done from both the I/O port as well as the serial port of the System Monitor.

FUTURE USE/ RESERVED VALUES: Future uses for this Data Transfer Protocol could be a networked collection of chassis' with DTI CPU Boards in them connected over a multi-drop serial link, or perhaps a further defined Dial In Response Protocol. Diversified Technology Engineering has reserved the values 00h - 1Fh and F0h - FFh for the MailBox byte. DTI intends to use these values for future data transfer devices connected to the System Monitor. Currently defined values are as follows:

Mailbox Values	Mailbox Values
00h - Idle	07h - <Reserved>
01h - Attention	| |
02h - Acknowledge	1Fh - <Reserved>
03h - Inquiry	| |
04h - Write	F0h - <Reserved>
05h - NAK	| |
06h - End of Session	FFh - <Reserved>

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EXAMPLE USE: In a typical application, a driver of some sort would poll the MailBox byte of the System Monitor using command 4Fh. A remote system could then initiate a data transfer by setting the MailBox byte to the Attention value, to which the driver would respond by triggering an application software package to run. The remote system would poll the MailBox byte, waiting for the local system's application software to set it to the Acknowledge value. Using a Request/Acknowledge type protocol, a user can easily set up a logical communications package. The Data Transfer Protocol is used by the LCD display firmware in DTI's FTS910 Fault Tolerant System. The LCD is a 2x20 character display used to show current system environmental data and provides a mechanism for Real-Time application interaction invoked by the LCD User. The FTS910 firmware supports a "System Inquiry" function which sets the Data Transfer Protocol Mailbox to indicate that a user is requesting data. With DTI's Unixware driver installed, the Mailbox would be polled and the communication linkup completed after detecting the Inquiry request. The driver would then display data directly to the LCD display. The following example implements a transaction of 32 data bytes between a local and remote system.

Example inquiry cycle:

	Local	Remote
1.	Send command 01h to remote	
2.		Respond with 02h
3.	Send command 03h	
4.		Respond with 02h
5.		Switch to terminal transfer mode
6.		Send data, 32 bytes padded with 0s if necessary plus a 1 byte checksum. Stop ID is AA55
7.	Verify checksum	
8.	Send command 02h (or 05h if error)	
9.		Retransmit or exit terminal mode
10.		If exiting, respond with 00h
11.	Send command 06h	
12.		Respond with 00h

Example write cycle:

	Local	Remote
1.	Send command 01h to remote	
2.		Respond with 02h
3.	Send command 04h	
4.		Switch to terminal transfer mode
5.		Respond with 02h
6.	Send data, 32 bytes padded with 0s is necessary plus a 1 byte checksum. Stop ID is AA55.	
7.		Verify checksum
8.		Send 02h (or 05h is error)
9.	Retransmit or respond with 00h	
10.		If 00h sent, respond with 02h
11.	Send command 06h	
12.		Respond with 00h

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Scratchpad Functions

Functions 52h and 53h provide an interface for utilizing the Scratchpad. This space is intended for user applications, which can write to this area and retrieve it a later time. This area can be read or written to from by both the I/O port and the serial port.

The Scratchpad is written or read in blocks of eight bytes. There are 32 blocks (in hex, 00-1Fh), for a total of 256 bytes. The block number is required when reading or writing to the Scratchpad. The syntax of commands 52h and 53h follow with examples.

Command 52h: Write 8 bytes to Block X in Scratchpad

Format:

52h - X - data bytes, where x is a value between 0 and 1fh

EXAMPLE

The serial port command would be formatted:

@52:0E:1A:9E:F3:03:67:4A:9B:A8

This example writes 8 bytes to block 0Eh.

Command 53h: Read 8 bytes from Block X in Scratchpad

Format:

53h - X, where X is a value between 0 and 1fh.

EXAMPLE

The serial port command would be formatted:

@53:0E

This example reads the 8 bytes from block 0Eh. If verbose mode is enabled, the following text string is returned on the serial port:

1A9EF303674A9BA8 (hex)

If verbose mode is not enabled, then the 8-byte string is returned in binary.

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A.13 System Monitor Quick Reference

CMD	Data OUT/IN	Description
00	1 / 0	Get system status byte
01	1 / 0	Get voltage status byte
02	1 / 0	Get fan status byte
03	1 / 0	Get switch status byte
04	1 / 0	Get temperature status byte
05	0 / 3	Set password (I/O port only)
06	0 / 14	Set dial string (I/O port only)
07	0 / 10	Set Unit ID (I/O port only)
08	0 / 1	Toggle Serial Echo
09	0 / 1	Toggle Non-Verbose Mode
0A	0 / 1	Enable watchdog (Set count)
0B	0 / 1	Watchdog warning count
0C	0 / 0	Strobe watchdog
0D	0 / 2	BIOS failure definition
0E	2 / 0	Get BIOS Failure definition
0F	1 / 0	Get Last POST code
10	0 / 3	Set Low boundary temperature
11	2 / 1	Get low boundary
12	0 / 3	Set High boundary temperature
13	2 / 1	Get High boundary
14	2 / 1	Get temperature
1A	0 / 0	Enable Terminal Tx Mode
1B	0 / 0	Disable Terminal Tx Mode
1C	0 / 2	Force On/Off GPO(s) x
1D	0 / 2	Set GPO (x) Active State
1E	1 / 1	Get GPO (x) Active State
20	2 / 1	Get voltage x
21	1 / 1	Get voltage x tolerance
22	0 / 2	Set voltage x tolerance
25	1 / 1	Get fan x RPS
26	0 / 2	Set fan x minimum RPS
27	1 / 1	Get fan x minimum RPS
2A	0 / 2	Enable/Disable switch x
2B	1 / 1	Get switch x polarity
2C	1 / 1	Read switch x
30	0 / 2	Set voltage/system temp / CPU temp /watchdog delivery
31	1 / 1	Get voltage/system temp/CPU temp/watchdog delivery
32	0 / 2	Set fan/switch x delivery
33	1 / 1	Get fan/switch x delivery
3A	0 / 1	Set Watchdog Granularity
3B	1 / 0	Get Watchdog Granularity
4E	0 / 1	Write to Mailbox
4F	1 / 0	Read From Mailbox
52	0 / 9	Write to Scratchpad
53	8 / 1	Read From Scratchpad

Sub-Command Values

Timeout	Granularity	Count
30s	20	30
1 min	20	60
1½ min	20	90
2 min	20	120
2½ min	20	150
3 min	20	180
3½ min	20	210
4 min	20	240
4½ min	25	216
5 min	25	240
5½ min	26	254

Tick Count Granularity & Count Values for common

Temperatures	
System	00h
CPU	01h
Remote 0	03h
Remote 1	04h
Remote 2	05h
Remote 3	06h
Remote 4	07h
Remote 5	08h
Remote 6	09h
Remote 7	0ah
Voltages	
(+5)	00h
(3.3)	01h
(+12)	02h
(-12)	03h
(2.5)	04h
(CPU)	05h

Delivery Bytes	
Voltage	00h
System Temp	01h
CPU Temp	02h
Remote temp	03h
Watchdog	04h
Fan / SW	
Fan 1	00h
Fan 2	01h
Fan 3	02h
Fan 4	03h
Fan 5	04h
Fan 6	05h
Fan 7	06h
Fan 8	07h
GPOs	
GPO 0	00h
GPO 1	01h
GPO 2	02h
GPO 3	03h

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Serial Port Commands

Command	Description
@00	Get System Status Byte
@01	Get Voltage Status Byte
@02	Get Fan Status Byte
@03	Get Switch Status Byte
@04	Get Temp Status Byte
@08:xx	Toggle Serial Echo xx = 00 echo OFF xx = 01 echo ON
@09:xx	Toggle Verbose Mode xx = 00 Verbose OFF xx = 01 Verbose ON
@0A:cc	Enable Watchdog (Set count)
@0B:cc	Set Watchdog Warning Point
@0C	Strobe Watchdog
@0E	Get BIOS Fail Code Word
@0F	Get Last POST Code Received
@10:mm:hh:ll	Set Low Temperature Boundary
@11:mm	Get Low Temperature Boundary
@12:mm:hh:ll	Set High Temperature Boundary
@13:mm	Get High Temperature Boundary
@14:mm	Get Temperature
@1A	Enable Terminal Transfer Mode
@20:vv	Read Voltage Line
@21:vv	Get Volt vv Tolerance
@22:vv:tt	Set Volt vv Tolerance
@25:ff	Get Fan ff Status
@26:ff:rr	Set Fan ff minimum RPS
@27:ff	Get Fan ff minimum RPS
@2A:ss:pp	Enable/Disable Switch
@2B:ss	Get Switch Polarity
@2C:ss	Read Switch ss
@30:aa:dd	Set Monitored Item Alarm Delivery
@31:aa	Get Monitored Item Alarm Delivery
@32:ff:dd	Set Fan/Switch ff Alarm Delivery
@33:ff	Get Fan/Switch ff Alarm Delivery
@3A:gg	Set Watchdog Granularity
@3B	Get Watchdog Granularity
@4E:xx	Write xx to Mailbox
@4F	Read Mailbox
@52:YY	Write data to Scratchpad
@53:YY	Read data from Scratchpad YY = 0 -> IF = 8 byte block selection

Symbol Ledgend

mm = Module:
- 00= System Ambient Temperature
- 01= CPU1 Temperature
- 02= <RESERVED>
- 03= Remote 0
- 04= Remote 1
- 05= Remote 2
- 06= Remote 3
- 07= Remote 4
- 08= Remote 5
- 09= Remote 6
- 0A= Remote 7

hh = High byte of boundary value

ll = Low byte of boundary value

cc = Count in Tick Count increments

aa = Alarm:
- 00 = voltage
- 01 = System Temp
- 02 = CPU Temp
- 03 = Remote temp
- 04 = Watchdog

dd = Delivery Byte

gg = Granularity value (1 < gg < 27 (1bh))

vv = Channel:
- 00 = +5v
- 01 = 3.3v
- 02 = +12v
- 03 = - 12v
- 04 = 2.5v
- 05 = CPU

tt = Voltage tolerance value (%)

ff = Fan/Switch Number: 00 = fan 1... 07 = fan 8

rr = Minimum fan RPS

ss = Switch Numbers: 00 = switch 1... 06 = switch 7

pp = Polarity:
- 00 = Negative (open)
- 01 = Positive (closed)
- 03 = Not Enabled as a switch

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B

System Monitor VI Programming Utility

B.0 DUTIL.exe Utility

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B.0 DUTIL.exe Utility

The DUTIL.EXE utility allows the user to program a Unit ID string and/or a Dial String into the system FLASH. Once programmed, the system BIOS will send the Unit ID and Dial String to the System Monitor during each power up of the system.

Enter DUTIL at the DOS prompt to execute the utility. If a Unit ID and Dial String have been programmed previously, the utility will display them. If no Unit ID and Dial String have been programmed, the utility will display an example Dial String, and a blank entry for the Unit ID.

After entering the desired Unit ID and/or Dial String, the utility will prompt the user for confirmation to program the FLASH. After receiving confirmation, the utility will program the user's Unit ID and Dial String into a blank portion of the FLASH. There is room for four Dial strings in the FLASH.

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C

Peripheral Drivers

C.0 Ethernet Drivers
C.1 Windows 95/98
C.2 Windows NT 3.51
C.3 Windows NT 4.0
C.4 Solaris 2.6

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C.0 Ethernet Drivers

The procedures outlined below provides the information needed to install network support for the Intel 82559 PCI ethernet adapter. The following operating systems were tested at 10 and 100 Mbps:

Windows 95/98
Windows NT 3.51
Windows NT 4.0
Solaris 2.6

C.1 Windows 95/98

If the driver for the Intel 82558/559 included with Windows 95/98 does not work, then follow this procedure to install the driver from Intel's Driver Release 2.51 for the Pro/100B or Pro/100+.

This driver update is available on the Internet at http://cs.intel.com. It should also be included with your board.

1. Go to "Network Setup" in "Control Panels".
2. Click on "Network Adapters". If Windows lists an adapter for the 82558/559 or Pro/100B, Pro/100+ already, then delete it.
3. Click on "Add". Insert the driver diskette in the floppy drive. Windows will list its supported drivers. Click on "Have Disk".
4. Click on the "82559" driver.
5. Verify the adapter settings. The data rate usually defaults to "Auto", but can be overridden to 10 Mbps or 100 Mbps, in full or half-duplex.
6. After installing the driver, make sure the protocols that you require are loaded, and bound to the new driver.
7. Reboot to install the new driver.

C.2 Windows NT 3.51

Windows NT 3.51 does not identify the Intel 82557, 82558, or 82559 interfaces, and requires the OEM provided driver from Intel. The driver tested was from Intel's Driver diskette (available at http://cs.intel.com), and should be included with your board.

To install the driver during installation of NT 3.51, select "OEM diskette" from the choice of network adapters to install. Insert the driver diskette in the floppy, and select "Intel (CR) Pro Adapter."

To install on an existing installation of NT 3.51.

1. Double-click the Network Icon in the Control Panel.
2. Click the Add Adapter button.
3. Do NOT select an Intel adapter from the list. Instead, scroll to the end of the list and select: "<Other> Requires disk from manufacturer". Click continue.
4. Insert the Intel Driver Release 2.51 diskette in the drive, and click OK.
5. Select "Intel (CR) Pro Adapter" and click OK.
6. The PROSet utility will scan for the adapter and display information (NIC address). Click the test button to run diagnostics. Note that it will test for connection to the network, and this will fail if the adapter is not connected to a network at this time.
7. Click OK to exit test screen and return to PROSet menu. Click OK to accept the adapter's configuration and exit.

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8. Click OK in the Network Settings dialog. Other configuration screens may appear. Configure as desired. When prompted, restart Windows NT. NOTE: The NDIS 3 miniport driver will automatically get installed.
9. Repeat for additional adapters.

C.3 Windows NT 4.0

Windows NT 4.0 identifies and installs a driver for the 82559 family of ethernet interfaces. However, Intel recommends installing the most recent drivers for their network interface cards, so follow this procedure to install the driver from the driver release 2.51 diskette:

1. Go to Control Panels under "Start" or "My Computer".
2. Click on the Network icon.
3. Select adapter tab and click Add.
4. Select Have Disk. Insert the Driver diskette in the disk drive and click OK.
5. Select "Intel (CR) Pro Adapter" from the list of available drivers and click OK.
6. The PROSet utility will run and display information about the adapter (NIC address, etc.) Optionally, you can test the adapter by clicking the Test button.
7. To exit PROSet, click OK on the main menu.
8. Select protocols required (such as TCP/IP) by selecting the protocol tab.
9. Select all network services required by selecting the Service tab.
10. Click close to continue. Other configuration screens may appear. Configure as required.

Note that after the driver is installed, the adapter may be listed as "Intel 82559 based 10/100 Ethernet PCI Adapter." PROSet will display the adapter specifically as "Intel EtherExpress PRO/100+ PCI 100Base-TX, 10BaseT" adapter. Also the NDIS4.0 miniport driver will automatically get installed in NT 4.0.

C.4 Solaris 2.6

Solaris provides the latest driver in its version 2.6. No extra installation is required.

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D

Ethernet Diagnostic Utility

D.0 Introduction
D.1 Using 82559TLK

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D.0 Introduction

The CPC8640 uses the Intel 82559 PCI Ethernet controller. The 82559TLK utility is included to allow the user to view the NIC address, edit the SROM contents, load SROM defaults, or perform a self-test of the 82559.

D.1 Using 82559TLK

COMMAND LINE

The utility requires that the Ethernet must be enabled on the CPC8640. The utility will scan for the 82559 and display the SROM controller. If the 82559TLK utility is run on a system without an 82559 present, it will simply exit with the message:

"Intel 82559 Ethernet Controller not found"

Likewise, the utility cannot run on a system with more than one 82559 present. If a PCI card on the bus also uses the 82559, then the utility will exit with the message:

"More than one Intel 82559 Ethernet Controller is present.
There can only be one Intel 82559 present in the system."

A seldom used command line switch can be used to allow the utility to work in this case. The command line switch "/BUSx", where x is a number from 0 to 9, will force the utility to limit its search for the 82559C to PCI bus x. In the case of the CPC8640:

82559TLK /BUS0

Invoking the utility with this command line switch will force the utility to use the onboard 82559.

SROM CONTENTS

The utility will display the contents of the SROM, along with the menu options. The SROM contents have 128 bytes of information, with the first 6 bytes highlighted in yellow. This is the NIC address, and the utility will not allow the user to change it since this address is unique to the board.

The other SROM values shown are defined by Intel, and should not be changed. Besides the 82559TLK utility, the only other software that is capable of changing the SROM contents is the boot ROM, which uses the SROM to store information necessary for booting from the network. Unless DTI Engineering provides specific instructions on what SROM values to change, the user should not change the SROM contents.

THE MENU

The menu consists of these functions:

Load SROM Defaults: In case the SROM contents were inadvertently changed by this utility, this function will restore the SROM values to the factory default.

Do Self-Test Command: This utility will issue a self-test command to the 82559C and display results of this test.

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Edit Mode: This feature allows the user to edit the SROM contents. The cursor control keys can be used to move the cursor to the particular area of the SROM to edit. Note that you cannot edit the first six bytes, the NIC address. Also, the utility permits editing the buffer freely, but does not actually write the buffer to the SROM until the “Alt-P” key sequence is pressed.

SROM values are entered in hexadecimal; therefore, you are limited to entering values with keys 0 -9, and A - F. The last two bytes of the buffer are a checksum which is automatically calculated each time a byte is changed.

EXITING THE UTILITY

The key sequence “Alt-X” is required to exit the utility. It may be necessary to run the utility again to confirm that any changes made to the SROM were actually performed. Any changes made to the SROM will not take effect until the system is shut down and restarted from a cold boot.

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