

Diversified Technology, Incorporated

LBC8516

PCI/ISA Compatible Pentium II Slot Card Computer

Configuration Guide

Rev 1.0

© Copyright 2002 by Diversified Technology, Inc. All rights reserved. Printed in the United States of America. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior permission of the publisher.

Return Shipment Information

If service or repair is required, contact DTI's Service Department for a Return Material Authorization (RMA) number and shipping instructions. If the product is out of warranty, or was damaged during shipment, a purchase order will be required for the repair. The product should be returned in its original shipping materials if available. Otherwise, the board should be placed in a conductive anti-static material, wrapped in a cushioning material and enclosed in a corrugated carton suitable for shipping. Seal the carton securely and ship pre paid to the following address with the RMA number on the label.

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

To contact the Service Department:

Telephone: (601)-856-4121
Fax: (601)-856-2888
Email: tech@dtims.com

Items determined to be covered under warranty will be returned freight pre paid. Items not in warranty will be returned freight collect, contact DTI's Service Department.

Table of Contents

1	Product Overview	
1.0	General Overview	1-1
1.1	Processor Support	1-1
1.2	System Memory	1-1
1.3	Cache Memory.	1-1
1.4	Real Time Clock and Non-Volatile Memory	1-1
1.5	System Environmental Monitor	1-1
1.6	Floppy Drive Interface	1-1
1.7	IDE Drive Interface	1-2
1.8	Keyboard and Mouse Ports	1-2
1.9	Reset, Power Indicator, and Speaker Port	1-2
1.10	PCI Bus	1-2
1.11	Serial and Parallel Ports	1-2
1.12	10/100 Base-T Ethernet	1-2
1.13	Universal Serial Bus (USB)	1-2
1.14	PCI Video Support	1-3
1.15	PCI SCSI	1-3
2	Configuration Information	
2.0	System Memory	2-1
2.1	CPU Type / Speed Selection	2-1
2.2	IDE Hard Disk Interface	2-1
2.3	Floppy Disk Interface.	2-1
2.4	10/100 Base-T Ethernet Interface	2-1
2.5	SCSI.	2-1
2.6	PCI Super VGA.	2-2
2.7	Parallel Ports.	2-2
2.8	Serial Ports.	2-2
2.9	Keyboard / Mouse Configuration.	2-2
2.10	System Monitor Configuration	2-2
3	Quick Reference	
3.0	Connector Pinouts	3-1
3.1	Jumper Settings	3-10

Table of Contents

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	4-14
4.8	PCI Config	4-16
4.9	PNP Exclusions	4-18
4.10	Cache Config	4-20
4.11	Chipset Config	4-22
4.12	System Monitor	4-24
4.13	Thermal Manager	4-26
4.14	Exit	4-28
5	Troubleshooting Guide	
5.0	Error Messages and Problem Areas	5-1
5.1	Problem Not Solved	5-5
6	System Resource Maps	
6.0	Memory Map	6-1
6.1	Interrupt Map	6-2
6.2	I/O Address Map	6-3
6.3	System I/O Map	6-4
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-18
A.10	Modem Connection Requirements	A-19
A.11	Example Application	A-19
A.12	Remote Data Retrieval Mechanisms	A-20
A.13	Quick Reference	A-23

Table of Contents

B	System Monitor VI Pop Up Utility	
B.0	Overview	B-1
B.1	Selecting the Interrupt	B-1
B.2	Selecting the Hot-Key.	B-1
C	System Monitor VI Programming Utility	
C.0	DUTIL.exe Utility	C-1
D	Peripheral Drivers	
D.0	Ethernet Drivers	D-1
D.1	Windows 95/98	D-1
D.2	Windows NT 3.51	D-1
D.3	Windows NT 4.0	D-2
D.4	Solaris 2.5 / 2.5.1	D-2
D.5	Novell Unixware 2.0	D-4
D.6	SCO Unixware 2.1.	D-4
D.7	SCO Openserver 5.	D-6
D.8	Netware 4.10	D-6
D.9	Netware DOS/ODI Drivers	D-7
E	Ethernet Diagnostic Utility	
E.0	Introduction	E-1
E.1	Using 82559TLK	E-1
F	VGA Driver Installation Guide	
F.0	Introduction	F-1
F.1	CHIPS 69000 Drivers.	F-1
F.2	Windows 3.1, WFW 3.11	F-1
F.3	Windows NT 3.51, 4.0.	F-2
F.4	Windows 95.	F-2

Product Overview

- 1.0 General Overview
- 1.1 Processor Support
- 1.2 System Memory
- 1.3 Cache Memory
- 1.4 Real Time Clock and Non-Volatile Memory
- 1.5 System Environmental Monitor
- 1.6 Floppy Drive Interface
- 1.7 IDE Drive Interface
- 1.8 Keyboard and Mouse Ports
- 1.9 Reset, Power Indicator, and Speaker Port
- 1.10 PCI Bus
- 1.11 Serial and Parallel Ports
- 1.12 10/100 Base-T Ethernet
- 1.13 Universal Serial Bus (USB)
- 1.14 PCI Video Support
- 1.15 PCI SCSI

1.0 General Overview

The LBC8516 is a PCI/ISA compatible Pentium II slot card computer system. The LBC8516 is a standard PCI full size expansion card and conforms to the PICMG backplane standard.

1.1 Processor Support.

The LBC8516 can support all speeds of the Pentium II processor in the Intel Slot 1-package. Jumpers are provided to select the CPU bus speed multiplication factor. The LBC8516 supports both 66Mhz and 100Mhz bus speeds. This bus speed is automatically set by the processor and can not be changed.

1.2 System Memory

The LBC8516 supports up to 512 mega bytes of FPM DRAM. The LBC8516 has two 72-bit wide DIMM sockets (168 pin sockets) which are arranged as Bank 0 and Bank 1. The types of DIMM modules that can be installed on the LBC8516 are 1M x 72, 2M x 72, 4M x 72, 8M x 72, 16M x 72 and 32M x 72. All DIMM modules must have an access time of 60 nano seconds or faster.

1.3 Cache Memory

The Pentium II microprocessor contains 32KB of primary cache and a 512KB secondary (L2) cache device integrated in the chip.

1.4 Real Time Clock and Non-Volatile Memory

The LBC8516 has a real time clock with a built-in lithium battery for back-up and storing time, date, and system configuration. The battery has a projected life span of 10 years.

1.5 System Environmental Monitor

The LBC8516 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 Pentium II, 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 an included utility program. Inputs which violate their programmed tolerances cause an alarm interrupt to the system. The measurement values are also available to the user's software.

Another function of the environment monitor is to provide a watch dog timer for the system. This watch dog timer is highly flexible, and can be configured to cause a system reset in case of a software failure.

Additional features include support for external indicators, switch closure inputs, external sensors, monitoring of system and control. See Appendix A for a full description of the system monitor.

1.6 Floppy Drive Interface

The standard floppy interface supports 360K, 720K, 1.2M, 1.4M, and 2.8M floppy drives. Up to two drives may be attached.

1.7 IDE Drive Interface

The high speed PCI-to-IDE drive interface can connect to one or two IDE devices. EIDE drives are supported.

1.8 Keyboard and Mouse Ports

The LBC8516 provides connectors on the rear bracket for PS/2 compatible keyboard and mouse devices. An alternate keyboard connector is also provided on the top edge of the board. /AT style keyboards can be used through an adapter cable available from DTI.

1.9 Reset, Keyboard Lock, Power Indicator, and Speaker Ports

A normally open, momentary contact switch can be connected to the LBC8516 to be used as a hardware reset switch. The switch connection is pulled up and debounced.

A normally open switch can be connected to the LBC8516 to lock out the keyboard. A key lock type switch can be used to prevent unauthorized usage of the LBC8516.

Power ON indicator is provided by the LBC8516. Current is supplied from a +5 volt source through a 240 ohm resistor. Typically, a LED is connected to this output.

An /AT compatible speaker port is provided on the LBC8516. The +5 volt supply on the speaker output port on the LBC8516 is protected from short circuit by a resettable fuse.

1.10 PCI Bus

The LBC8516 expansion bus is fully PICMG compatible. Support is provided for up to four PCI slots, each capable of operating as a PCI Master. The bus clock runs at 33MHz. The LBC8516 supports PCI transfer speeds up to 132 mega bytes per second.

1.11 Serial and Parallel Ports

Two industry standard RS-232 serial ports are provided. An industry standard parallel port is also provided.

1.12 10 / 100 Base-T Ethernet

Support for 10 or 100MB/s ethernet over twisted pair is provided by the Intel 82558 controller. Drivers for most major operating systems are available.

1.13 USB

The LBC8516 provides support for USB. This new serial bus standard can be used with a variety of low to medium speed peripherals including keyboards and pointing devices.

1.14 PCI Video Support

The LBC8516 provides enhanced 3D graphics performance by utilizing the C & T's 69000 video controller for standard and high VGA modes. It also provides support for various flat panels such as VGA, XGA, SVGA, and SXGA active matrix TFT panel displays. Passive matrix flat panels like DSTN and SSTN are also supported. Some of its 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.

1.15 PCI SCSI

The SCSI interface on the LBC8516 is controlled by the Adaptec 7880 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 SCSI interface supports double speed SCSI-3 operation for transfer rates up to 20MBytes/sec with Ultra-SCSI devices. This feature is jumper selectable on the LBC8516.

Configuration Information

- 2.0 System Memory
- 2.1 CPU Type / Speed Selection
- 2.2 IDE Hard Disk Interface
- 2.3 Floppy Disk Interface
- 2.4 10/100 Base-T Ethernet Interface
- 2.5 SCSI
- 2.6 PCI Super VGA
- 2.7 Parallel Ports
- 2.8 Serial Ports
- 2.9 Keyboard / Mouse Configuration
- 2.10 System Monitor Configuration

2.0 System Memory

The LBC8516 supports a variety of memory configuration. The board provides two 72-bit wide DIMM sockets (168 pin). These DIMM sockets are located at U14 and U15. Either bank may be used; however DTI recommends that BANK 0 at U14 be populated if only one DIMM is being used. Up to 512M of total memory of EDO memory can be used. All DIMM modules must have an access time of 60 nano second or faster. Faster devices will not improve system performance. The LBC8516 also supports use up to 512MB of 66Mhz and 100Mhz SDRAM. SDRAM must be PC66 or PC100 compliant. The memory size of BANK 0 does NOT have to match the memory size of BANK1; however mixing of EDO and SDRAM between banks is not allowed. If SDRAM speeds are mixed, both DIMMs will be set for the lowest speed. Mixing ECC and non-ECC will result in non-ECC operation. Memory size and configuration is detected automatically by the LBC8516 BIOS and requires no hardware configuration. For processor speeds greater than or equal to 350MHz, 100MHz SDRAM must be used.

2.1 CPU Type/Speed Selection

The LBC8516 supports a single Pentium II processor at 233, 266, or 300, 333, 350, or 400MHz. Jumpers are used to configure the LBC8516's CPU speed. The type of Pentium II processor determines the host bus frequency. Jumper configuration to change host bus frequency is not necessary and is automatic.

2.2 IDE Hard Disk Interface

The LBC8516 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 drive is connected via a 40-pin ribbon cable at J8. All IDE configuration is handled in the LBC8516 ROM-based Configuration Utility.

2.3 Floppy Disk Interface

The LBC8516 supports /AT compatible floppy disk drives. The floppy disk interface supports 360K, 720K, 1.2M, 1.4M, and 2.88M disk drives. The floppy interface can be enabled or disabled using the LBC8516 Configuration Utility. When enabled, the floppy interface utilizes IRQ6 and DMA channel 2. The floppy drive is connected via a 34-pin ribbon cable at J9.

2.4 SCSI

The SCSI interface on the LBC8516 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 system bus utilization.

The SCSI interface is compliant to SCSI-1, SCSI-2, and SCSI-3 standards. The LBC8516 Configuration Utility can be used to enable or disable the SCSI interface. E12 controls the termination to the upper 8-bit of the wide SCSI data bus. Placing a jumper on E12 disables this termination. Double speed Ultra-SCSI transfers can be enabled by removing E14.

2.5 10/100 Base-T Ethernet Interface

The LBC8516 supports an auto switching 10 BASE-T / 100 BASE-TX ethernet interface. This is provided by the Intel 82558 ethernet controller. An RJ45 UTP-5 data grade cable may be attached at J22. The interface can be enabled or disabled in the ROM utilities.

2.6 PCI Super VGA

The LBC8516 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 resolutions are supported. It also provides support for various flat panels such as VGA, XGA, SVGA, and SXGA active matrix TFT panel displays. Connection to the CRT interface is made via a 15-pin connector at J20. Flat panel connections to the LBC8516 are made via J10 and J11. Jumpers E5-E8 selects the appropriate flat panel support (see jumper table for options). Jumper E9 is used to enable or disable the onboard video support.

2.7 Parallel Port

The address of the parallel port may be set in the LBC8516 Configuration Utility to any standard printer port address. It may also be disabled entirely through the utility. Devices are interfaced to the LBC8516 via a 26-pin connector, J13.

2.8 Serial Ports

Two high-speed serial ports are available on the LBC8516. Both are fully IBM compatible. The serial ports are configured via the LBC8516 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. Serial Port 1 is at J16. Serial Port 2 is at J14. Both are RS-232 standard ports.

2.9 Keyboard/Mouse Configuration

/AT or PS/2 type keyboards may be used with the LBC8516. Most multi-function keyboards that select between /XT and /AT modes with a switch, usually on the underside of the keyboard, will function properly with the LBC8516 when set to the /AT position.

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 J19 or the internal IDC connector at J17. The mouse connects to the PS/2 connector at J21 or the internal IDC connector at J17. E15 is used to enable mouse interrupt IRQ12. If the mouse port is not being used, removing E15 frees IRQ12 for use by the other devices.

2.10 System Monitor Configuration

Most of the System Monitor configuration is performed in the CMOS Setup utilities. However, the System Monitor can be configured to monitor a strobe input for the fan attached to the CPU. A jumper can be placed at E11 to provide the System Monitor status of a CPU fan. If a STROBE CPU fan is installed at U7 on the LBC8516, placing a jumper at E11 will route the strobe signal of the fan to DTI system monitor on the GPI INPUT #8. The System Monitor can then be configured to monitor this fan and provide all the alarming function provided by the System Monitor.

ROM Utilities

- 3.0 Connector Pinouts
- 3.1 Jumper Settings

3.0 Connector Pinouts

U7 - FAN POWER	
PIN	SIGNAL
1	FAN STROBE
2	FUSED +12V (1A)
3	GND

J1 - FAN POWER	
PIN	SIGNAL
1	FUSED +12V (1A)
2	GND

J2 - USB PORT	
PIN	SIGNAL
1	FUSED +5V
2	USBP0-
3	USBP0+
4	SIGNAL GND

J3 - SPEAKER PORT	
PIN	SIGNAL
1	SPEAKER DATA
2	N/C
3	GND
4	FUSED +5V

J4 - KEYLOCK PORT	
PIN	SIGNAL
1	POWER LED
2	N/C
3	GND
4	KEYLOCK
5	GND

J5 - SCSI LED ACTIVITY	
PIN	SIGNAL
1	LED ANODE
2	LED CATHODE

J6 - IDE LED ACTIVITY	
PIN	SIGNAL
1	LED ANODE
2	LED CATHODE

J7 - RESET PORT	
PIN	SIGNAL
1	RESET/
2	GND

J8 - IDE CONNECTOR			
FUNCTION	PIN	PIN	FUNCTION
IDE RESET /	1	2	GND
DATA (7)	3	4	DATA (8)
DATA (6)	5	6	DATA (9)
DATA (5)	7	8	DATA (10)
DATA (4)	9	10	DATA (11)
DATA (3)	11	12	DATA (12)
DATA (2)	13	14	DATA (13)
DATA (1)	15	16	DATA (14)
DATA (0)	17	18	DATA (15)
GND	19	20	N/C
N/C	21	22	GND
I/O WRITE/	23	24	GND
I/O READ	25	26	GND
N/C	27	28	N/C
N/C	29	30	GND
IRQ(14)	31	32	IOCS16/
A1	33	34	N/C
A0	35	36	A2
IDE CHIP SELECT 0/	37	38	IDE CHIP SELELCT 1/
IDE ACTIVE/	39	40	GND

J9 - FLOPPY CONNECTOR			
FUNCTION	PIN	PIN	FUNCTION
GND	1	2	RPM
GND	3	4	N/C
GND	5	6	DRATE0
GND	7	8	INDEX
GND	9	10	MOTOR1
GND	11	12	DRIVE2
GND	13	14	DRIVE1
GND	15	16	MOTOR2
GND	17	18	DIRECTION
GND	19	20	STEP
GND	21	22	WRITE DATA
GND	23	24	WRITE ENABLED
GND	25	26	TRACK0
GND	27	28	WRITE PROTECT
GND	29	30	READ DATA
GND	31	32	HEAD SELECT
GND	33	34	DISK CHANGE

J10 - FLAT PANEL CONNECTOR			
SIGNAL	PIN	PIN	SIGNAL
FSPCLK	1	2	GND
GND	3	4	FPHSYNC
GND	5	6	FPVSYNC
GND	7	8	B7
B6	9	10	B5
GND	11	12	B4
B3	13	14	B2
GND	15	16	G7
G6	17	18	G5
GND	19	20	G4
G3	21	22	G2
GND	23	24	R7
R6	25	26	R5
GND	27	28	R4
R2	29	30	R3
GND	31	32	FPDE
GND	33	34	N/C
GND	35	36	ENABKL
GND	37	38	N/C
GND	39	40	ENAVDD
ENAVEE	41	42	GND
VCC3	43	44	VCC3
VCC	45	46	VCC
GND	47	48	GND
+12V	49	50	+12V

J11 - FLAT PANEL CONNECTORS			
SIGNAL	PIN	PIN	SIGNAL
GND	1	2	FPGPIO
GND	3	4	FPD(35)
GND	5	6	FPD(33)
GND	7	8	FPD(31)
GND	9	10	FPD(29)
GND	11	12	FPD(27)
GND	13	14	FPD(25)
GND	15	16	FPD(23)
GND	17	18	FPD(21)
GND	19	20	FPD(19)
GND	21	22	FPD(17)
GND	23	24	FPD(15)
GND	25	26	FPD(13)
GND	27	28	FPD(11)
GND	29	30	FPD(9)
GND	31	32	FPD(7)
GND	33	34	FPD(5)
GND	35	36	FPD(3)
GND	37	38	FPD(1)
GND	39	40	NC
GND	41	42	NC
NC	43	44	NC
NC	45	46	NC
NC	47	48	NC
NC	49	50	NC

J12 - SCSI CONN EC TOR			
SIGNAL	PIN	PIN	SIGNAL
GND	1	35	DATA(12)
GND	2	36	DATA(13)
GND	3	37	DATA(14)
GND	4	38	DATA(15)
GND	5	39	HIGH PARITY
GND	6	40	DATA(0)
GND	7	41	DATA(1)
GND	8	42	DATA(2)
GND	9	43	DATA(3)
GND	10	44	DATA(4)
GND	11	45	DATA(5)
GND	12	46	DATA(6)
GND	13	47	DATA(7)
GND	14	48	LOW PARITY
GND	15	49	GND
GND	16	50	GND
SCSI TERMINATION POWER	17	51	SCSI TERMINATION POWER
SCSI TERMINATION POWER	18	52	SCSI TERMINATION POWER
GND	19	53	NO CONNECT
GND	20	54	GND
GND	21	55	NO CONNECT
GND	22	56	GND
GND	23	57	BSY/
GND	24	58	ACK/
GND	25	59	RST/
GND	26	60	MSG/
GND	27	61	SEL/
GND	28	62	C_D/
GND	29	63	REQ/
GND	30	64	I_O/
GND	31	65	DATA(8)
GND	32	66	DATA(9)
GND	33	67	DATA(10)
GND	34	68	DATA(11)

J13 - PARALLEL PORT CONNECTOR			
FUNCTION	PIN	PIN	FUNCTION
STROBE/	1	2	AUTOFEED/
DATA(0)	3	4	ERROR/
DATA(1)	5	6	INIT/
DATA(2)	7	8	SELECT IN/
DATA(3)	9	10	GND
DATA(4)	11	12	GND
DATA(5)	13	14	GND
DATA(6)	15	16	GND
DATA(7)	17	18	GND
ACK/	19	20	GND
BUSY	21	22	GND
PAPER EMPTY	23	24	GND
SELECT	25	26	GND

J14, J15 - SERIAL PORT CONNECTOR PINOUT		
PIN	FUNCTION	I/O
1	GND	
2	RING DETECT	IN
3	DATA TERMINAL READY	OUT
4	CLEAR TO SEND	IN
5	TX DATA	OUT
6	REQUEST TO SEND	OUT
7	RX DATA	IN
8	DATA SET READY	IN
9	DATA CARRIER DETECT	IN
10	GND	

J15 - SYSTEM ENVIRONMENT MONITOR I/O PORT			
SIGNAL	PIN	PIN	SIGNAL
GENERAL PURPOSE INPUT 3	1	2	GENERAL PURPOSE INPUT 4
GENERAL PURPOSE INPUT 2	3	4	GENERAL PURPOSE INPUT 5
GENERAL PURPOSE INPUT 1	5	6	GENERAL PURPOSE INPUT 6
GENERAL PURPOSE OUTPUT 3	7	8	GENERAL PURPOSE INPUT 7
GENERAL PURPOSE OUTPUT 2	9	10	GENERAL PURPOSE INPUT 8 / CPU FAN STROBE
GENERAL PURPOSE OUTPUT 1	11	12	RESERVED
GENERAL PURPOSE OUTPUT 0	13	14	RESERVED
RESERVED	15	16	RESERVED
RESERVED	17	18	RESERVED
GND	19	20	FUSED +5V

J17 - INTERNAL KEYBOARD/MOUSE CONNECTOR			
SIGNAL	PIN	PIN	SIGNAL
FUSED +5V	1	2	KBDATA
KBCLOCK	3	4	NC
GND	5	6	GND
NC	7	8	MSCLOCK
MSDATA	9	10	FUSED +5V

J18 - SYSTEM MONITOR SERIAL PORT	
PIN	SIGNAL
1	GND
2	RING DETECT
3	DATA TERMINAL READY
4	CLEAR TO SEND
5	TRANSMIT DATA
6	REQUEST TO SEND
7	RECEIVE DATA
8	DATA SET READY

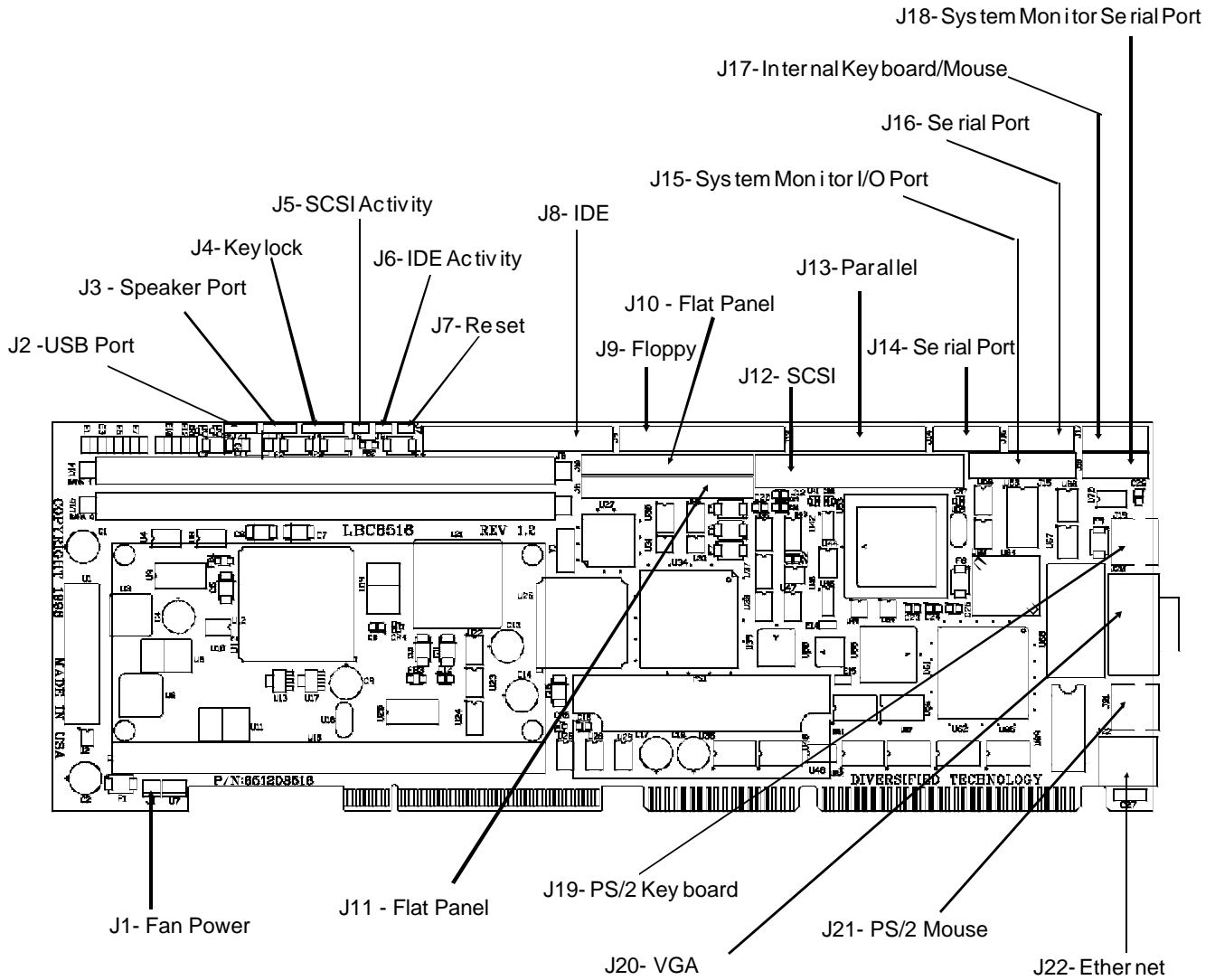
J19 - PS/2 KEY BOARD PORT	
PIN	SIGNAL
1	KBDATA
2	N/C
3	GND
4	FUSED +5V
5	KBCLOCK
6	GND

J20 - STANDARD VGA CONNECTOR	
PIN	FUNCTION
1	ANALOGREDOUTPUT
2	ANALOGGREENOUTPUT
3	ANALOGBLUEOUTPUT
4	N/C
5	GND
6	GND
7	GND
8	GND
9	N/C
10	GND
11	N/C
12	N/C
13	HORIZONTALSYNC
14	VERTICALSYNC
15	DOT CLOCK

J21 - PS/2 MOUSE PORT	
PIN	SIGNAL
1	MSDATA
2	N/C
3	GND
4	FUSED +5V
5	MSCLOCK
6	GND

J22 - ETHERNET PORT	
PIN	SIGNAL
1	TDH
2	TDL
3	RDH
4	N/C
5	N/C
6	RDL
7	N/C
8	N/C

Connector Locations



3.1 Jumper Settings

CPU SPEED	BUS	E1	E2	E3	E4
233MHZ	66MHZ	OFF	OFF	ON	ON
266MHZ	66MHZ	ON	ON	OFF	ON
300MHZ	66MHZ	OFF	ON	OFF	ON
333MHZ	66MHZ	ON	OFF	OFF	ON
350MHZ	100MHZ	OFF	OFF	ON	ON
400MHZ	100MHZ	ON	ON	OFF	ON

E5	E6	E7	E8	FLAT PANEL SUP PORT TYPE
ON	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	ON	OFF	OFF	1280 X 1024 DSTN

E9 - ONBOARD VIDEO OPTION	
*ON	ENABLED
OFF	DISABLED

E10 - MANUFACTURING TEST	
ON	TEST MODE
*OFF	NORMAL OPERATION

E11 - CPU FAN STROBE	
ON	SYSTEM MONITOR MONITORS CPU FAN STROBE
*OFF	FREES GPI INPUT 8

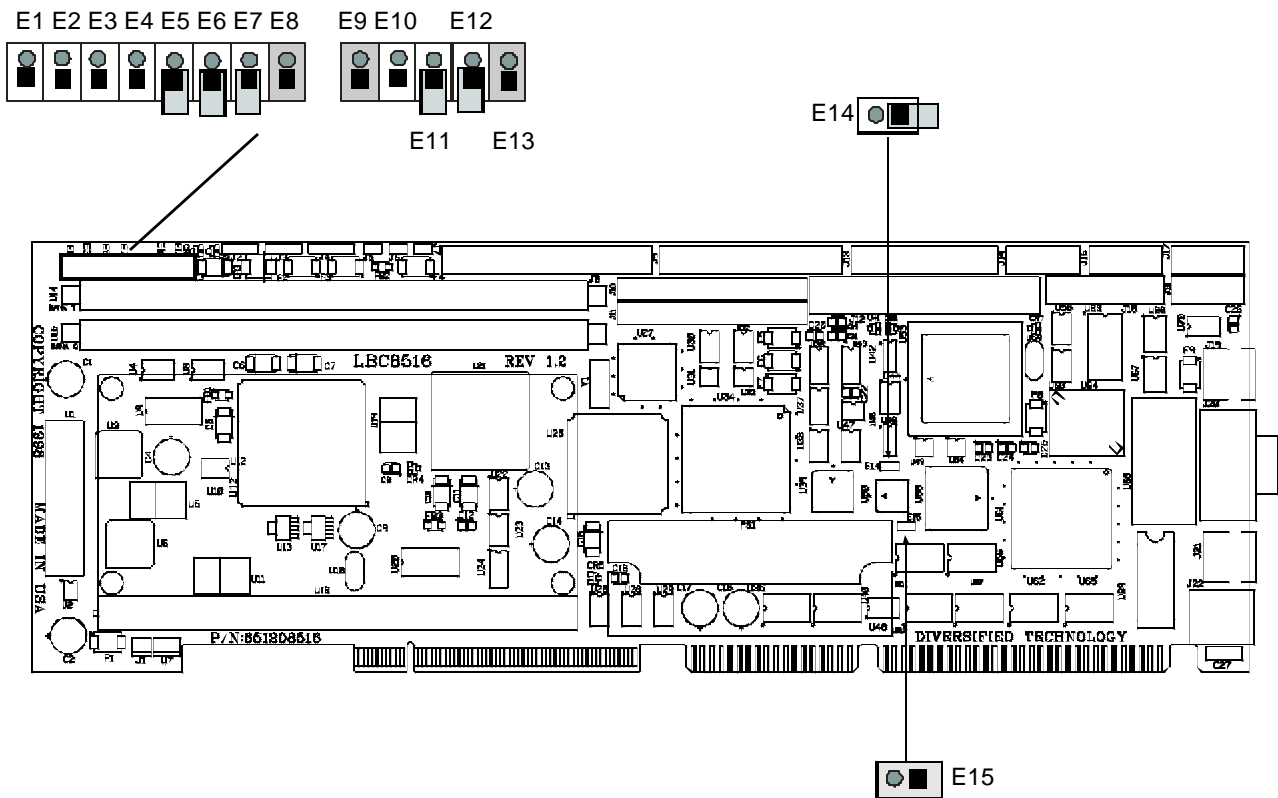
E12 - UPPER 8 BIT TERMINATION	
ON	DISABLE
*OFF	ENABLE

E13 - BRACKET GROUND	
*ON	ENABLE
OFF	DISABLE

E14 - ULTRA-SCSI TRANSFER SPEED	
ON	DISABLE
*OFF	ENABLE

E15 - MOUSE (IRQ12)	
*ON	ENABLE
OFF	DISABLE

Jumper Settings



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

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 power up or after a hardware reset, the processor begins executing code out of the onboard BIOS. The BIOS contains all of the software needed to boot the board to a working state so an operating system can be loaded. The first order of business for the BIOS is to initialize crucial system components, such as timers and chipset parts. The BIOS then performs basic components checks to ensure their presence and then sets them to a default state. Next, the cache and memory controllers must be initialized and configured for the type and configuration of the cache and memory found in the system. Once the memory is present, the compressed portions of the BIOS are de-compressed into the shadow memory occupying the standard BIOS memory ranges. The BIOS can now scan for and initialize other interfaces such as I/O devices and items on the PCI or ISA busses.

If a video adapter is in the system it is located and initialized. The video adapter will sign-on and its manufacturer, chip type, and creation date will appear on the screen. The BIOS will then display its sign-on information giving copyright information, the board name, and the version of the BIOS present in the system. At this point the following message will appear at the bottom of the screen giving the hotkey that will invoke the setup engine.

PRESS <F2> TO ENTER SETUP

If the F2 key is pressed, the message below will be displayed and the ROM UTILITIES will be entered after the option ROM scan.

ENTERING SETUP . . .

The BIOS now starts to size and clear all system memory, displaying its progress on the screen. The amount of cache in the system is also displayed along with the BIOS lower limit. The BIOS lower limit gives the lowest memory segment used by the BIOS. This information can be used to configure memory managers to remap memory and load programs into Upper Memory Blocks (UMBs). The BIOS will now sign-on any ISA or PCI option ROMs found on devices in the system. The BIOS will now check to see if the F2 key was pressed during POST. If it was, the ROM Utilities will be executed.

If any errors are detected up to this point they will now be displayed on the screen along with the following prompt to direct further actions. Pressing F1 will ignore the errors and continue with the boot process. The F2 key can be pressed to enter the ROM UTILITIES and possibly resolve any configuration error that may have been made.

PRESS <F1> TO RESUME, <F2> TO ENTER SETUP

If the F2 key was not pressed, a system summary screen will now be displayed. After 10 seconds or upon a key press the BIOS will attempt to boot the installed operating system.

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.

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.

SYSTEMMONITORERRORREPORTING

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.

4.1 ROM Utilities

The ROM Utilities consist of various easy-to-use utilities required in the configuration of the LBC8516. The function of each utility is briefly described 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 as shown on the next page. 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	Displays various information about the system installed
SYSTEM SETUP	Used to configure the time/date, floppy drive types, and the video type
HARD DISK SETUP	Used to configure the hard drive types
BIOS OPTIONS	Used to setup various BIOS features
SECURITY/VIRUS	Used to enable password protection, change current password, and enable system maintenance reminders
MEMORY CONTROLS	Allows selection of memory type and shadow regions
CACHE CONTROL	Used to configure the memory cache regions
CHIPSET CONTROL	Used to configure parameters related to the chipset
THERMAL MANAGER	Allows configuration of CPU throttle temperatures and speed settings
SYSTEM MONITOR	Used to setup monitoring functions
PCI CONTROL	Configure PCI slots
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

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.

SYSTEM CONFIGURATION SUMMARY																											
<p>F1-SYSTEMSUMMARY</p> <p>F2-SYSTEMSETUP</p> <p>F3-HARD DISK SETUP</p> <p>F4-BIOSOPTIONS</p> <p>F5-PERIPHERALS</p> <p>F6-SECURITY / VIRUS</p> <p>F7-MISC CONFIG</p> <p>F8-LOAD FROM ROM</p> <p>F9-LOAD FROM CMOS</p> <p>F10-SAVE TO CMOS</p>	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">Pentium II : 333MHz</td> <td style="width: 33%;">Dis kette A : 1.44 MB, 3 1/2"</td> </tr> <tr> <td>Monitor : 7.1</td> <td>Dis kette B : None</td> </tr> <tr> <td>System RAM: 640 KB</td> <td>Hard Disk0 : None</td> </tr> <tr> <td>Ext. RAM : 15360 KB</td> <td>Hard Disk1 : None</td> </tr> <tr> <td>Shadow RAM: 384 KB</td> <td>COM Ports : 3F8, 2F8</td> </tr> <tr> <td>Cache RAM : 512 KB</td> <td>LPT Ports : 378</td> </tr> <tr> <td>Display : EGA / VGA</td> <td>PS/2 Mouse : Not In stalled</td> </tr> <tr> <td>System ROM: F138 - FFFF</td> <td>BIOS Date : 04/13/98</td> </tr> <tr> <td>Volts (+5) : + 5.05v</td> <td>Volts (-5) : -4.87v</td> </tr> <tr> <td>(+12) : + 12.15v</td> <td>(-12) : -11.56v</td> </tr> <tr> <td>(+3.3) : + 3.30v</td> <td>(+2.5) : +2.49v</td> </tr> <tr> <td>(CPU) : + 1.99v</td> <td>CPU Temp : +32°C</td> </tr> <tr> <td>Sys. Temp : + 31.5°C</td> <td></td> </tr> </table>	Pentium II : 333MHz	Dis kette A : 1.44 MB, 3 1/2"	Monitor : 7.1	Dis kette B : None	System RAM: 640 KB	Hard Disk0 : None	Ext. RAM : 15360 KB	Hard Disk1 : None	Shadow RAM: 384 KB	COM Ports : 3F8, 2F8	Cache RAM : 512 KB	LPT Ports : 378	Display : EGA / VGA	PS/2 Mouse : Not In stalled	System ROM: F138 - FFFF	BIOS Date : 04/13/98	Volts (+5) : + 5.05v	Volts (-5) : -4.87v	(+12) : + 12.15v	(-12) : -11.56v	(+3.3) : + 3.30v	(+2.5) : +2.49v	(CPU) : + 1.99v	CPU Temp : +32°C	Sys. Temp : + 31.5°C	
Pentium II : 333MHz	Dis kette A : 1.44 MB, 3 1/2"																										
Monitor : 7.1	Dis kette B : None																										
System RAM: 640 KB	Hard Disk0 : None																										
Ext. RAM : 15360 KB	Hard Disk1 : None																										
Shadow RAM: 384 KB	COM Ports : 3F8, 2F8																										
Cache RAM : 512 KB	LPT Ports : 378																										
Display : EGA / VGA	PS/2 Mouse : Not In stalled																										
System ROM: F138 - FFFF	BIOS Date : 04/13/98																										
Volts (+5) : + 5.05v	Volts (-5) : -4.87v																										
(+12) : + 12.15v	(-12) : -11.56v																										
(+3.3) : + 3.30v	(+2.5) : +2.49v																										
(CPU) : + 1.99v	CPU Temp : +32°C																										
Sys. Temp : + 31.5°C																											
<p>F (KEY) Select / Execute, ↑↓: Select, ENTER: Execute ESC: Exit and Reboot</p>																											
<p>(C) COPYRIGHT 1998, DIVERSIFIED TECHNOLOGY, INCORPORATED</p>																											

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 beyond 1024 KB
- CACHE RAM: Displays the amount of installed external cache RAM
- SYS MON VER: Displays the version of the System Monitor if it is installed.
- DISPLAY: Displays the installed video type.
- BIOS DATE: Displays the date on which the board 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 board.
- DISKETTE A & B: Displays the media type selected for both floppy drives.
- HARD DISK 0 - 1: Displays the drive types selected for all 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.

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

SYSTEM SETUP CONFIGURATION SUMMARY	
F1-SYSTEMSUMMARY	
F2-SYSTEMSETUP	System Time: 09:00:15
F3-HARD DISK SETUP	System Date: 04/14/1998
F4-BIOSOPTIONS	Video System: EGA / VGA
F5-PERIPHERALS	System Memory: 640 KB
F6-SECURITY / VIRUS	Extended Memory: 15 MB
F7-MISC CONFIG	Diskette Drive A: 1.44 MB, 3 1/2"
F8-LOAD FROM ROM	Diskette Drive B: Not Installed
F9-LOAD FROM CMOS	
F10-SAVE TO CMOS	
F (KEY) Select / Execute, ↑↓: Select, ENTER: Execute ESC: Exit and Reboot	
(C) COPYRIGHT 1998, DIVERSIFIED TECHNOLOGY, INCORPORATED	

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.
- **VIDEO:** Mono, Color 80, and VGA/EGA video types are supported and are selected using the arrow keys.
- **FLOPPY DISKS:** Drive types 360K, 720K, 1.2M, and 1.44M are supported and are selected using the arrow keys ← →. A NOT INSTALLED option is also available for diskless workstations. No floppy error messages will be displayed if NOT INSTALLED is selected.

4.4 Hard Disk Setup

The HARD DRIVE CONFIGURATION UTILITY is used to configure the hard drives installed in the system. The following page describes the configuration options.

HARD DRIVE CONFIGURATION UTILITY																																				
<p>F1-SYSTEM SUMMARY</p> <p>F2-SYSTEM SETUP</p> <p>F3-HARD DISK SETUP</p> <p>F4-BIOS OPTIONS</p> <p>F5-PERIPHERALS</p> <p>F6-SECURITY / VIRUS</p> <p>F7-MISC CONFIG</p> <p>F8-LOAD FROM ROM</p> <p>F9-LOAD FROM CMOS</p> <p>F10-SAVE TO CMOS</p>	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 35%; text-align: center;">HARD DRIVE 0</th> <th style="width: 35%; text-align: center;">HARD DRIVE 1</th> </tr> </thead> <tbody> <tr> <td>Autotype:</td> <td style="text-align: center;">Press <F5></td> <td style="text-align: center;">Press <F5></td> </tr> <tr> <td>Type:</td> <td style="text-align: center;">Auto 2113 MB</td> <td style="text-align: center;">None</td> </tr> <tr> <td>Cylinders:</td> <td style="text-align: center;">4095</td> <td></td> </tr> <tr> <td>Heads:</td> <td style="text-align: center;">16</td> <td></td> </tr> <tr> <td>Sectors/Tracks:</td> <td style="text-align: center;">63</td> <td></td> </tr> <tr> <td>Write Precomp:</td> <td style="text-align: center;">0</td> <td></td> </tr> <tr> <td>32 Bit I/O:</td> <td style="text-align: center;">Enabled</td> <td style="text-align: center;">Disabled</td> </tr> <tr> <td>LBA Mode Control:</td> <td style="text-align: center;">Enabled</td> <td style="text-align: center;">Disabled</td> </tr> <tr> <td>Multi-sector Xfers:</td> <td style="text-align: center;">16 Sectors</td> <td style="text-align: center;">Disabled</td> </tr> <tr> <td>Xfer Mode:</td> <td style="text-align: center;">Fast PIO 4</td> <td style="text-align: center;">Standard</td> </tr> </tbody> </table>				HARD DRIVE 0	HARD DRIVE 1	Autotype:	Press <F5>	Press <F5>	Type:	Auto 2113 MB	None	Cylinders:	4095		Heads:	16		Sectors/Tracks:	63		Write Precomp:	0		32 Bit I/O:	Enabled	Disabled	LBA Mode Control:	Enabled	Disabled	Multi-sector Xfers:	16 Sectors	Disabled	Xfer Mode:	Fast PIO 4	Standard
	HARD DRIVE 0	HARD DRIVE 1																																		
Autotype:	Press <F5>	Press <F5>																																		
Type:	Auto 2113 MB	None																																		
Cylinders:	4095																																			
Heads:	16																																			
Sectors/Tracks:	63																																			
Write Precomp:	0																																			
32 Bit I/O:	Enabled	Disabled																																		
LBA Mode Control:	Enabled	Disabled																																		
Multi-sector Xfers:	16 Sectors	Disabled																																		
Xfer Mode:	Fast PIO 4	Standard																																		
<p>F (KEY) Select / Execute, ↑↓: Select, ENTER: Execute ESC: Exit and Reboot</p>																																				
<p>(C) COPYRIGHT 1998, DIVERSIFIED TECHNOLOGY, INCORPORATED</p>																																				

HARD DRIVE SETUP DESCRIPTIONS

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

- **AUTOTYPE:** Use the up/down arrow keys to position the highlight bar on to this option and then press <F5> to automatically detect hard drive parameters for the selected drive. If a hard disk is detected, the new parameters will be displayed using the USER hard disk type.
- **TYPE:** Use the left/right arrow keys to scroll among the available hard drive types. There are forty-five predefined drive types, one USER type, a CD type, and an AUTO type. If the USER type is selected, the hard drive parameters must be configured manually. Select each parameter in turn by using the up/down arrow keys. Available options may be typed in by numerical input from the user or the left/right arrow keys may be used to scroll through the options. The USER type may be configured differently for HARD DRIVE 0 and HARD DRIVE 1.

The CD type will enable bootable CD support for an IDE CD-ROM drive attached as a master or slave. If a bootable CD-ROM is detected, the CD-ROM drive becomes the boot drive, regardless of the boot sequence selected in BIOS options.

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.

- **32 BIT I/O:** This option enables 32-bit data transfers on Local Bus and PCI drives.
- **LBA MODE:** Logical Block Access uses 28-bit addressing of the hard disk instead of CHS (Cylinder/Head/Sector) addressing.
- **MULTI-SECTOR XFERS:** 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.
- **XFER MODE:** The modes supported are standard, 1, 2, 3 and 4. The actual mode to use is drive dependent; the higher the number, the higher the throughput.

4.5 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 UTILITY																											
F1-SYSTEM SUMMARY F2-SYSTEM SETUP F3-HARD DISK SETUP F4-BIOS OPTIONS F5-PERIPHERALS F6-SECURITY / VIRUS F7-MISC CONFIG F8-LOAD FROM ROM F9-LOAD FROM CMOS F10-SAVE TO CMOS	<table> <thead> <tr> <th colspan="2">BIOS OPTIONS</th> </tr> </thead> <tbody> <tr> <td>Boot sequence:</td> <td>A: then C:</td> </tr> <tr> <td>System summary screen at boot:</td> <td>Enabled</td> </tr> <tr> <td>Display SETUP prompt during POST:</td> <td>Enabled</td> </tr> <tr> <td>Pause on POST errors:</td> <td>Enabled</td> </tr> <tr> <td>Floppy seek:</td> <td>Enabled</td> </tr> <tr> <td>Console Redirect Port:</td> <td>Disabled</td> </tr> <tr> <td>Console Redirect Baud Rate:</td> <td>19200</td> </tr> <tr> <th colspan="2">KEYBOARD OPTIONS</th> </tr> <tr> <td>Key click:</td> <td>Disabled</td> </tr> <tr> <td>Keyboard typematic rate:</td> <td>30/sec</td> </tr> <tr> <td>Keyboard typematic delay:</td> <td>1/2 secretary</td> </tr> <tr> <td>Numlock:</td> <td>Auto</td> </tr> </tbody> </table> <p>F (KEY) Select / Execute, ↑↓: Select, ENTER: Execute ESC: Exit and Reboot</p>	BIOS OPTIONS		Boot sequence:	A: then C:	System summary screen at boot:	Enabled	Display SETUP prompt during POST:	Enabled	Pause on POST errors:	Enabled	Floppy seek:	Enabled	Console Redirect Port:	Disabled	Console Redirect Baud Rate:	19200	KEYBOARD OPTIONS		Key click:	Disabled	Keyboard typematic rate:	30/sec	Keyboard typematic delay:	1/2 secretary	Numlock:	Auto
BIOS OPTIONS																											
Boot sequence:	A: then C:																										
System summary screen at boot:	Enabled																										
Display SETUP prompt during POST:	Enabled																										
Pause on POST errors:	Enabled																										
Floppy seek:	Enabled																										
Console Redirect Port:	Disabled																										
Console Redirect Baud Rate:	19200																										
KEYBOARD OPTIONS																											
Key click:	Disabled																										
Keyboard typematic rate:	30/sec																										
Keyboard typematic delay:	1/2 secretary																										
Numlock:	Auto																										
(C) COPYRIGHT 1998, DIVERSIFIED TECHNOLOGY, INCORPORATED																											

BIOS OPTIONS DESCRIPTIONS

- **DISK DRIVE BOOT SEQUENCE:** The boot sequence refers to the order in which the BIOS tries to boot from the drives installed. If the BIOS is unsuccessful in booting from the first drive in the sequence, the BIOS attempts to boot from the second drive. The possible boot drives are A: (first installed floppy) or C: (first installed hard disk). Use the arrow keys to select boot sequence selections.
- **SYSTEM SUMMARY SCREEN AT BOOT:** When this option is ENABLED, the SYSTEM CONFIGURATION SUMMARY window will be displayed while the system is booting up.
- **DISPLAY SETUP PROMPT DURING POST:** When this option is ENABLED, the prompt ' Press <F2> 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.
- **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.
- **CONSOLE REDIRECT PORT:** The console redirection feature can be enabled or disabled. This allows all video output to be redirected through the serial port during the POST. In addition, input through the serial port will control the CPU through the POST.
- **CONSOLE REDIRECT BAUD RATE:** Selects the baud rate for console redirection. The possible baud rates are: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 56000.
- **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.

KEYBOARD OPTIONS DESCRIPTION

- **KEYBOARD TYPEMATIC 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.
- **KEYBOARD TYPEMATIC 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 $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1 sec. Use the arrow keys to set the typematic delay.
- **NUMLOCK:** 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.

4.6 Peripherals

The LBC8516 uses a programmable I/O adapter that includes two serial ports, a parallel printer port and a floppy disk interface. This screen allows the user to configure the serial ports and printer port, and enable or disable the floppy interface.

ONBOARD PERIPHERAL CONFIGURATION UTILITY																											
<p>F1-SYSTEMSUMMARY</p> <p>F2-SYSTEMSETUP</p> <p>F3-HARD DISK SETUP</p> <p>F4-BIOSOPTIONS</p> <p>F5-PERIPHERALS</p> <p>F6-SECURITY / VIRUS</p> <p>F7-MISC CONFIG</p> <p>F8-LOAD FROM ROM</p> <p>F9-LOAD FROM CMOS</p> <p>F10-SAVE TO CMOS</p>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center; padding: 10px 0;">I/O PORTS CONTROL</td> </tr> <tr> <td style="padding: 2px 10px 2px 20px;">COM Port 1:</td> <td style="padding: 2px 20px 2px 20px;">3F8, IRQ 4</td> </tr> <tr> <td style="padding: 2px 10px 2px 20px;">COM Port 2:</td> <td style="padding: 2px 20px 2px 20px;">2F8, IRQ 3</td> </tr> <tr> <td style="padding: 2px 10px 2px 20px;">LPT Port:</td> <td style="padding: 2px 20px 2px 20px;">378, IRQ 5</td> </tr> <tr> <td style="padding: 2px 10px 2px 20px;">LPT Mode:</td> <td style="padding: 2px 20px 2px 20px;">Output Only</td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 10px 0;">ONBOARD PERIPHERAL CONTROL</td> </tr> <tr> <td style="padding: 2px 10px 2px 20px;">Diskette Controller:</td> <td style="padding: 2px 20px 2px 20px;">Enabled</td> </tr> <tr> <td style="padding: 2px 10px 2px 20px;">PCI IDE Controller:</td> <td style="padding: 2px 20px 2px 20px;">Enabled</td> </tr> <tr> <td style="padding: 2px 10px 2px 20px;">PCI SCSI Controller:</td> <td style="padding: 2px 20px 2px 20px;">Enabled</td> </tr> <tr> <td style="padding: 2px 10px 2px 20px;">PCI Ethernet Controller:</td> <td style="padding: 2px 20px 2px 20px;">Enabled</td> </tr> <tr> <td style="padding: 2px 10px 2px 20px;">PCI USB Controller:</td> <td style="padding: 2px 20px 2px 20px;">Enabled</td> </tr> <tr> <td style="padding: 2px 10px 2px 20px;">PCI VGA Controller:</td> <td style="padding: 2px 20px 2px 20px;">Enabled</td> </tr> <tr> <td style="padding: 2px 10px 2px 20px;"> PCI VGA Boot Mode:</td> <td style="padding: 2px 20px 2px 20px;">FP or CRT (if CRT)</td> </tr> </table>	I/O PORTS CONTROL		COM Port 1:	3F8, IRQ 4	COM Port 2:	2F8, IRQ 3	LPT Port:	378, IRQ 5	LPT Mode:	Output Only	ONBOARD PERIPHERAL CONTROL		Diskette Controller:	Enabled	PCI IDE Controller:	Enabled	PCI SCSI Controller:	Enabled	PCI Ethernet Controller:	Enabled	PCI USB Controller:	Enabled	PCI VGA Controller:	Enabled	PCI VGA Boot Mode:	FP or CRT (if CRT)
I/O PORTS CONTROL																											
COM Port 1:	3F8, IRQ 4																										
COM Port 2:	2F8, IRQ 3																										
LPT Port:	378, IRQ 5																										
LPT Mode:	Output Only																										
ONBOARD PERIPHERAL CONTROL																											
Diskette Controller:	Enabled																										
PCI IDE Controller:	Enabled																										
PCI SCSI Controller:	Enabled																										
PCI Ethernet Controller:	Enabled																										
PCI USB Controller:	Enabled																										
PCI VGA Controller:	Enabled																										
PCI VGA Boot Mode:	FP or CRT (if CRT)																										
F (KEY) Select / Execute, ↑↓: Select, ENTER: Execute ESC: Exit and Reboot																											
(C) COPYRIGHT 1998, DIVERSIFIED TECHNOLOGY, INCORPORATED																											

PERIPHERAL OPTIONS DESCRIPTIONS

- COM PORT 1: The first serial port can be configured to one of four possible settings, or disabled.

I/O	INTERRUPT	COM PORT
3F8H	IRQ4	COM1
2F8H	IRQ3	COM2
3E8H	IRQ4	COM3
2E8H	IRQ3	COM4

- COM PORT 2: The second serial port can be configured to one of four possible settings, as shown above, or disabled.
- LPT PORT: Three possible I/O base addresses and two possible interrupts can be selected or the port can be disabled: 378h, 3BCh, or 278h, and IRQ5 or IRQ7.
- LPT MODE: In “Output Only” mode the LPT port functions like a standard printer port. In “Bi-directional” mode the LPT functions like an ECP port.
- DISKETTE CONTROLLER: The floppy disk interface can be 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 enabled or disabled. It may be necessary to disable the IDE interface if another hard drive controller is in use.
- PCI USB CONTROLLER: The onboard PCI USB interface can be enabled or disabled. It may be necessary to disable the IDE interface if another USB controller is in use. *NOTE:* The DTI BIOS does not currently support USB BIOS extensions or functions.
- PCI SCSI CONTROLLER: The onboard PCI SCSI interface can be enabled or disabled. This device is not visible on the PCI bus when disabled.
- 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: The onboard PCI VGA interface can be enabled or disabled. When disabled, the VGA controller’s resources are still configured so that it will function with multi-monitor operating systems.
- PCI VGA BOOT MODE: The display that the PCI VGA controller enables at boot is selectable. The options are CRT, Flat Panel, Simultaneous, and FP or CRT (if CRT).

4.7 Security / Virus

The SECURITY AND ANTI-VIRUS CONFIGURATION UTILITY allows several system security features and reminders to be enabled. Two levels of password security are available, Supervisor and User, which can be used to limit access to certain system resources. Each password consists of up to eight alpha-numeric characters and is stored in CMOS RAM. Other options include the ability to safeguard against reformatting the hard drive, and display screens during boot that remind the user to perform system backups or virus checks. The available options are described fully on the following pages.

ONBOARD PERIPHERAL CONFIGURATION UTILITY	
F1-SYSTEMSUMMARY	
F2-SYSTEMSETUP	
F3-HARD DISK SETUP	
F4-BIOSOPTIONS	
F5-PERIPHERALS	
F6-SECURITY / VIRUS	Supervisor Password is Disabled
F7-MISC CONFIG	User Password is Disabled
F8-LOAD FROM ROM	Set Supervisor Password Press <F5>
F9-LOAD FROM CMOS	Set User Password Press <F5>
F10-SAVE TO CMOS	Password on boot: Disabled
	Diskette access: User
	Fixed disk boot sector: Normal
	System backup reminder: Disabled
	Virus check reminder: Disabled
F (KEY) Select / Execute, ↑↓: Select, ENTER: Execute ESC: Exit and Reboot	
(C) COPYRIGHT 1998, DIVERSIFIED TECHNOLOGY, INCORPORATED	

SECURITY/ANTI-VIRUS OPTIONS DESCRIPTION

The first two lines of the SECURITY / ANTI-VIRUS screen indicate which password levels have been enabled. It is possible to have 1) both Supervisor and User passwords disabled, 2) Supervisor enabled and User Disabled, or 3) both passwords enabled. In Supervisor mode, all ROM utilities configuration options are accessible by the user. This is the default mode of operation when the ROM utilities are accessed with no passwords enabled. After creating a Supervisor password, the only way to run the ROM utilities in Supervisor mode is to correctly enter the Supervisor password when prompted.

WARNING: Once a password is enabled and saved, it is impossible to re-enter the ROM utilities without entering the password. Be sure to save passwords in a safe place.

- **SET SUPERVISOR PASSWORD:** This utility allows the user to enable the Supervisor password. Moving the highlight bar to this option and pressing <F5> causes the following screen to appear.

SET PASSWORD

Enter New Password:

Re-Enter New Password:

The user is forced to enter the new password twice for verification. If the new password is accepted by the system, the following will appear.

NEW PASS WORD SAVED!

Press <SPACE> to continue. . .

- **SET USER PASSWORD:** User password entry works the same as Supervisor password entry. The User password may be modified in Supervisor or User mode.
- **PASSWORD ON BOOT:** If enabled, each time the system tries to boot the user will be required to enter a password. The available options, ENABLED or DISABLED, are selectable using the arrow keys. This option is accessible in Supervisor or User mode.
- **DISKETTE ACCESS:** This option determines the user level necessary to access the floppy diskette. Note that this option does not take effect unless 'Password on boot' is ENABLED. For example, if 'Password on boot' is ENABLED and Diskette access: is SUPERVISOR, then the Supervisor password must be entered at boot up in order to use the floppy drive. If Diskette access: is USER, then anyone may access the floppy drive. Use the arrow keys to select between USER or SUPERVISOR. This option is only accessible if the ROM utilities have been entered in Supervisor mode.

- **FIXED DISK BOOT SECTOR:** Setting this option to **WRITE PROTECT** will protect against accidentally reformatting the hard disk. This option is only accessible if the ROM utilities have been entered using the Supervisor password.
- **SYSTEM BACKUP REMINDER:** The available choices for this option are **DISABLED**, **DAILY**, **WEEKLY**, and **MONTHLY**. These selections cause a reminder window to appear on the user screen whenever the system boots up. If **DAILY** is selected, the reminder will appear every day when the system boots up. The **WEEKLY** and **MONTHLY** selections work similarly. An example of the reminder window is shown below. If **<N>** is pressed in response to the prompt, the reminder will appear every time the system is rebooted until the **<Y>** response is pressed.

System Backup Reminder	
Have you performed your regularly scheduled hard disk backup?	
(Y)es	(N)o

- **VIRUS CHECK REMINDER:** This selection works the same as the System Backup Reminder. An example of the Virus Check Reminder window is shown below.

Virus Check Reminder	
Have you performed your regularly scheduled virus check?	
(Y)es	(N)o

4.8 Memory Control

The MEMORY SHADOW CONFIGURATION Utility provides the user with the ability to selectively enable and disable shadow RAM from C000:0000h to D000:DFFFh. The shadow video BIOS option enables shadow RAM from C000:0000h to C000:7FFFh. RAM shadowing refers to the copying of the BIOS from the RAM. The MEMORY SHADOW CONFIGURATION UTILITY screen is shown below.

MEMORY SHADOW CONFIGURATION UTILITY	
F1-MEMORY CONTROL	DRAM Data Integrity Mode: Non-ECC Hole in Memory: Disabled Compatibility Mode: Disabled MEMORY SHADOW REGIONS System BIOS: Shadow Video BIOS: Shadow C800 - CBFF Disabled CC00 - CFFF Disabled D000 - D3FF Disabled D400 - D7FF Disabled D800 - DBFF Disabled DC00 - DFFF Disabled
F2-CACHE CONTROL	
F3-CHIPSET CONTROL	
F4-SYSTEM MONITOR	
F5-THERMAL MANAGER	
F6-PCI CONTROL	
F (KEY) Select / Execute, ↑↓: Select, ENTER: Execute ESC: Exit and Reboot	
(C) COPYRIGHT 1998, DIVERSIFIED TECHNOLOGY, INCORPORATED	

MEMORY CONTROL DESCRIPTIONS

- **DRAM DATA INTEGRITY MODE:** This option allows the user to override the DRAM Data Integrity Mode Configured by the BIOS. If the DIMMS do not support the selected option, the BIOS configures this mode to the best supported mode of DIMMs.
- **HOLE IN LOCAL MEMORY:** Option to define a “hole” in memory where a certain address range is passed to the PCI/ISA bus instead of directed to DRAM. Possible values are disabled (default), 512K, or 15-16M.
- **COMPATIBILITY MODE :** This function changes the way in which the BIOS INT15 function 88h handles returning the amount of extended memory installed. The original IBM/AT BIOS did not provide a mechanism for reporting more than 64MB of DRAM. The maximum value returned by the BIOS INT15 function 88h was 0FFFFh which represents 64MB. When systems started supporting more than 64MB of DRAM, BIOS vendors did not have a standard way in which to report DRAM configurations over 64MB. This was not a problem for Unix based operating systems since Unix does not use the BIOS to determine the amount of DRAM installed. Windows NT and OS/2 which do use the BIOS, required a common way to determine the entire amount of DRAM installed. Enabling this functionality required that BIOS add a new INT15 function that would report the amount of extended memory in 64K increments and modify INT15 function 88h. When COMPATIBILITY MODE is ENABLED, the INT15 function 88h acts normally if less than 64MB of DRAM is installed and returns the amount of Extended Memory installed in 1K increments. If more than 64MB of DRAM is installed, INT15 function 88h returns 15MB of Extended Memory. The new INT15 function E801h is then used to return the memory between 16MB and 4GB in 64 KB blocks. Windows NT and OS/2 use the COMPATIBILITY MODE to determine the amount of Extended Memory installed.

4.9 Cache Control

The CACHE CONTROL utility provides the user with the ability to set cacheable memory options. By default, external and internal caches of the Pentium processor are enabled and used.

CACHE CONFIGURATION UTILITY			
<p>F1-MEMORY CONTROL</p> <p>F2-CACHE CONTROL</p> <p>F3-CHIPSET CONTROL</p> <p>F4-SYSTEM MONITOR</p> <p>F5-THERMAL MANAGER</p> <p>F6-PCI CONTROL</p>	<p>Memory Cache: Enabled</p> <p>Cache Sys BIOS: WP</p> <p>Cache Video BIOS: WP</p> <p>Cache Base 0-512k: WB</p> <p>Cache Base 512-640k: WB</p> <p>Cache Ext Memory: WB</p>	<p>Cache Memory Regions</p> <p>A000-AFFF: NC</p> <p>B000-BFFF: NC</p> <p>C800-CBFF: NC</p> <p>CC00-CFFF: NC</p> <p>D000-D3FF: NC</p> <p>D400-D7FF: NC</p> <p>D800-DBFF: NC</p> <p>DC00-DFFF: NC</p> <p>E000-E3FF: NC</p> <p>E400-E7FF: NC</p> <p>E800-EBFF: NC</p> <p>EC00-EFFF: NC</p>	
<p>F (KEY) Select / Execute, ↑↓: Select, ENTER: Execute ESC: Exit and Reboot</p>			
<p>(C) COPYRIGHT 1998, DIVERSIFIED TECHNOLOGY, INCORPORATED</p>			

CACHE CONTROL DESCRIPTIONS

- MEMORY CACHE: This option enables or disables the P6 memory cache.
- CACHE SYS BIOS: This option controls caching of the system BIOS area.
- CACHE VIDEO BIOS: 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 512-640K: 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 EXT 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 except Memory Cache will have one or more of the following Control Options

NC - Non Cached
WT - Write Through
WB - Write Back
WC - Write Combine
WP - Write Protected

4.10 Chipset Config

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

CACHE CONFIGURATION UTILITY																									
<p>F1-MEMORY CONTROL</p> <p>F2-CACHE CONTROL</p> <p>F3-CHIPSET CONTROL</p> <p>F4-SYSTEM MONITOR</p> <p>F5-THERMAL MANAGER</p> <p>F6-PCI CONTROL</p>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">System Error to NMI Reporting:</td> <td style="padding: 2px;">Disabled</td> </tr> <tr> <td style="padding: 2px;">Single Bit ECC:</td> <td style="padding: 2px;">Disabled</td> </tr> <tr> <td style="padding: 2px;">Multi-Bit ECC:</td> <td style="padding: 2px;">Disabled</td> </tr> <tr> <td style="padding: 2px;">PCI Parity:</td> <td style="padding: 2px;">Disabled</td> </tr> <tr> <td colspan="2" style="padding: 10px 0 0 0;"> </td> </tr> <tr> <td style="padding: 2px;">Master Latency Timer Value:</td> <td style="padding: 2px;">40</td> </tr> <tr> <td style="padding: 2px;">Gate A20 at Boot:</td> <td style="padding: 2px;">Normal</td> </tr> <tr> <td style="padding: 2px;">Processor Microcode Update:</td> <td style="padding: 2px;">Enabled</td> </tr> <tr> <td style="padding: 2px;">Large Disk Access Mode:</td> <td style="padding: 2px;">DOS</td> </tr> <tr> <td colspan="2" style="padding: 10px 0 0 0;"> </td> </tr> <tr> <td style="padding: 2px;">Reset Configuration Data:</td> <td style="padding: 2px;">No</td> </tr> <tr> <td style="padding: 2px;">Plug & Play O/S:</td> <td style="padding: 2px;">No</td> </tr> </table>	System Error to NMI Reporting:	Disabled	Single Bit ECC:	Disabled	Multi-Bit ECC:	Disabled	PCI Parity:	Disabled			Master Latency Timer Value:	40	Gate A20 at Boot:	Normal	Processor Microcode Update:	Enabled	Large Disk Access Mode:	DOS			Reset Configuration Data:	No	Plug & Play O/S:	No
System Error to NMI Reporting:	Disabled																								
Single Bit ECC:	Disabled																								
Multi-Bit ECC:	Disabled																								
PCI Parity:	Disabled																								
Master Latency Timer Value:	40																								
Gate A20 at Boot:	Normal																								
Processor Microcode Update:	Enabled																								
Large Disk Access Mode:	DOS																								
Reset Configuration Data:	No																								
Plug & Play O/S:	No																								
<p>F (KEY) Select / Execute, ↑↓: Select, ENTER: Execute ESC: Exit and Reboot</p>																									
<p>(C) COPYRIGHT 1998, DIVERSIFIED TECHNOLOGY, INCORPORATED</p>																									

CHIPSET CONTROL DESCRIPTIONS

- **SYSTEM ERROR TO NMI REPORTING:** This option allows a system error to generate an NMI. When this is disabled ECC and Parity errors are masked.
- **SINGLE-BIT ECC:** This option allows single-bit ECC errors to cause a system error.
- **MULTI-BIT ECC:** This option allows multi-bit ECC errors to cause a system error.
- **PCI PARITY:** This option allows PCI parity errors to cause a system error.
- **MASTER LATENCY TIMER VALUE:** This contains the value of the Master Timer Latency for use when the PCB is a master on the PCI Bus.
- **GATE A20 AT BOOT:** This option enables A20 just before the boot process begins. This option does not affect DOS, but may be required for some Unix operating systems.
- **PROCESSOR MICROCODE UPDATE:** This option will enable the BIOS Update Feature. From time to time, Intel publishes microcode patches to fix problems in the silicon for particular steps of CPU. If the BIOS Update Feature is enabled, these patches will be downloaded to the CPU on every power cycle.
- **LARGE DISK ACCESS MODE:** Default is "DOS". Set to "Other" for operating systems such as Windows NT or OS/2.
- **RESET CONFIGURATION DATA:** If set to "Yes", the plug & play configuration is reset after leaving SETUP. This option is automatically reset to "No".
- **PLUG AND PLAY O/S:** If disabled (default), the BIOS will set up any plug & play devices. If enabled, the operating system is assumed to configure plug & play devices.

4.11 ThermalManager

The Thermal Manager is responsible for monitoring the temperature of the Pentium II 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 two temperature break points to be set along with an associated CPU speed. The temperatures are monitored as they rise 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 second speed setting to the lowest setting. When a throttle break point is reached, the user can be alerted by one of six alarming methods. The System Monitor Interrupt (IRQ10 or IRQ11), one of four General Purpose Outputs, or serial port remote communication can be enabled for reporting the CPU temperature failure.

THERMAL MANAGEMENT UTILITY	
F1-MEMORY CONTROL F2-CACHE CONTROL F3-CHIPSET CONTROL F4-SYSTEM MONITOR F5-THERMAL MANAGER F6-PCI CONTROL	ThermalManagement: Disabled CPUTHROTTLE CONTROL #1 Temp: 60 Speed: ¾ #2 Temp: 65
F (KEY) Select / Execute, ↑↓: Select, ENTER: Execute ESC: Exit and Reboot	
(C) COPYRIGHT 1998, DIVERSIFIED TECHNOLOGY, INCORPORATED	

THERMAL MANAGER DESCRIPTIONS

- THERMAL MANAGEMENT: Enables or disables thermal management. There are two thresholds that can be programmed for thermal management. Each threshold has a temperature and speed setting.
- TEMP #1-4: Temperature threshold, in degrees Celsius.
- SPEED: Speed setting for each threshold. Valid settings are 3/4, 1/2, 1/4, and 1/8.

4.12 SystemMonitor

The System Monitor on the LBC8516 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. Refer to Appendix A for a complete description of the System Monitor functions and its supported commands.

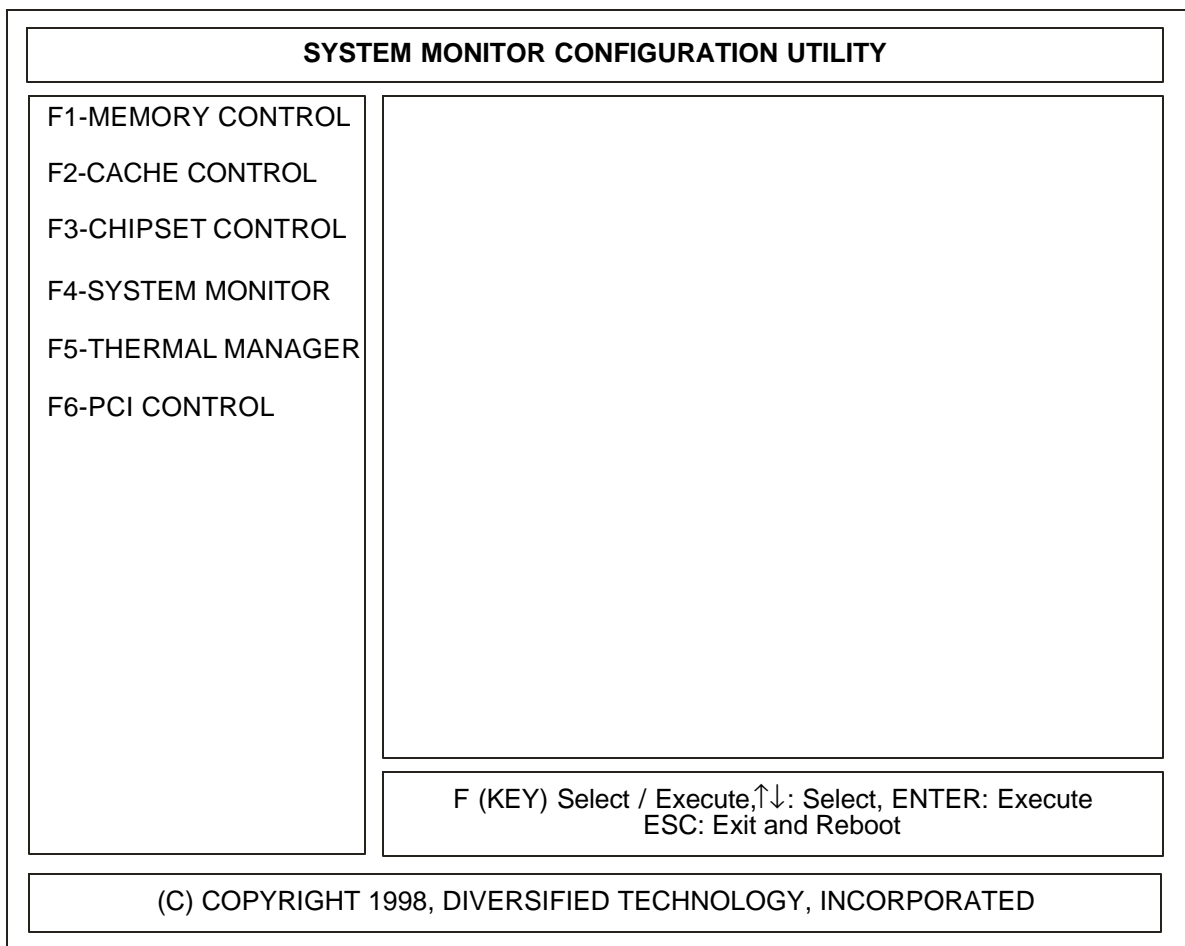
SYSTEM MONITOR CONFIGURATION UTILITY																																																									
<p>F1-MEMORY CONTROL</p> <p>F2-CACHE CONTROL</p> <p>F3-CHIPSET CONTROL</p> <p>F4-SYSTEM MONITOR</p> <p>F5-THERMAL MANAGER</p> <p>F6-PCI CONTROL</p>	<p>COM Password <F5></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">Temp Se lect#:</td> <td style="width: 33%;">Sys</td> <td style="width: 33%;">Re mote Module#:</td> <td style="width: 33%;">1</td> </tr> <tr> <td>Temp Lo:</td> <td>0°C</td> <td>Temp Lo:</td> <td>0°C</td> </tr> <tr> <td>Temp Hi:</td> <td>60°C</td> <td>Temp Hi:</td> <td>60°C</td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">Voltage Se lect#:</td> <td style="width: 33%;">+5</td> <td style="width: 33%;">Fan/Switch #:</td> <td style="width: 33%;">0</td> </tr> <tr> <td>Tolerance:</td> <td>10</td> <td>Mode:</td> <td>FAN</td> </tr> <tr> <td></td> <td></td> <td>Fan RPS (min.):</td> <td>0</td> </tr> <tr> <td></td> <td></td> <td>Switch Polarity:</td> <td>ON</td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">GP Out put #0:</td> <td style="width: 33%;">N-Low</td> <td style="width: 33%;">De liverySelect:</td> <td style="width: 33%;">FAN/SW1</td> </tr> <tr> <td>GP Out put #1:</td> <td>N-Low</td> <td>IRQ Alarm:</td> <td>OFF</td> </tr> <tr> <td>GP Out put #2:</td> <td>N-Low</td> <td>COM Alarm:</td> <td>OFF</td> </tr> <tr> <td>GP Out put #3:</td> <td>N-Low</td> <td>GPO0 Alarm:</td> <td>OFF</td> </tr> <tr> <td></td> <td></td> <td>GPO1 Alarm:</td> <td>OFF</td> </tr> <tr> <td>IRQ Se lect:</td> <td>None</td> <td>GPO2 Alarm:</td> <td>OFF</td> </tr> <tr> <td></td> <td></td> <td>GPO3 Alarm:</td> <td>OFF</td> </tr> </table> <p>Serial Port Mode DCE</p>	Temp Se lect#:	Sys	Re mote Module#:	1	Temp Lo:	0°C	Temp Lo:	0°C	Temp Hi:	60°C	Temp Hi:	60°C	Voltage Se lect#:	+5	Fan/Switch #:	0	Tolerance:	10	Mode:	FAN			Fan RPS (min.):	0			Switch Polarity:	ON	GP Out put #0:	N-Low	De liverySelect:	FAN/SW1	GP Out put #1:	N-Low	IRQ Alarm:	OFF	GP Out put #2:	N-Low	COM Alarm:	OFF	GP Out put #3:	N-Low	GPO0 Alarm:	OFF			GPO1 Alarm:	OFF	IRQ Se lect:	None	GPO2 Alarm:	OFF			GPO3 Alarm:	OFF
Temp Se lect#:	Sys	Re mote Module#:	1																																																						
Temp Lo:	0°C	Temp Lo:	0°C																																																						
Temp Hi:	60°C	Temp Hi:	60°C																																																						
Voltage Se lect#:	+5	Fan/Switch #:	0																																																						
Tolerance:	10	Mode:	FAN																																																						
		Fan RPS (min.):	0																																																						
		Switch Polarity:	ON																																																						
GP Out put #0:	N-Low	De liverySelect:	FAN/SW1																																																						
GP Out put #1:	N-Low	IRQ Alarm:	OFF																																																						
GP Out put #2:	N-Low	COM Alarm:	OFF																																																						
GP Out put #3:	N-Low	GPO0 Alarm:	OFF																																																						
		GPO1 Alarm:	OFF																																																						
IRQ Se lect:	None	GPO2 Alarm:	OFF																																																						
		GPO3 Alarm:	OFF																																																						
<p>F (KEY) Select / Execute,↑↓: Select, ENTER: Execute ESC: Exit and Reboot</p>																																																									
<p>(C) COPYRIGHT 1998, DIVERSIFIED TECHNOLOGY, INCORPORATED</p>																																																									

SYSTEMMONITOR DESCRIPTIONS

- **COM PASSWORD** : The system monitor has a serial port interface that is capable of communicating with remote sites. For serial port access security, a 3 character password can be programmed into the System Monitor. The monitor will request the password from the user the first time the serial port is accessed. Press F5 to enter a password.
- **SYSTEM TEMPERATURES** : The LO and HI system temperature options define the boundary within which the environmental temperature of the LBC8521 must remain. A System Temperature Alarm is generated if the temperature crosses either of these 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 be 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 tie 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. The default is none.
- **SERIAL PORT MODE**: Set the System Monitor serial port in DTE or DCE mode. DTE mode allows serial connection with the use of a "null modem" cable. DCE mode allows connection with a direct pass-through serial cable.
- **REMOTE MODULE TEMPERATURES**: The LO and HI remote temperature options define the boundary within which the environmental temperature of the LBC8516 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.

4.13 PCI Setup

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.



PCIOPTIONSDESCRIPTION

- 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.

CMOS Configurable

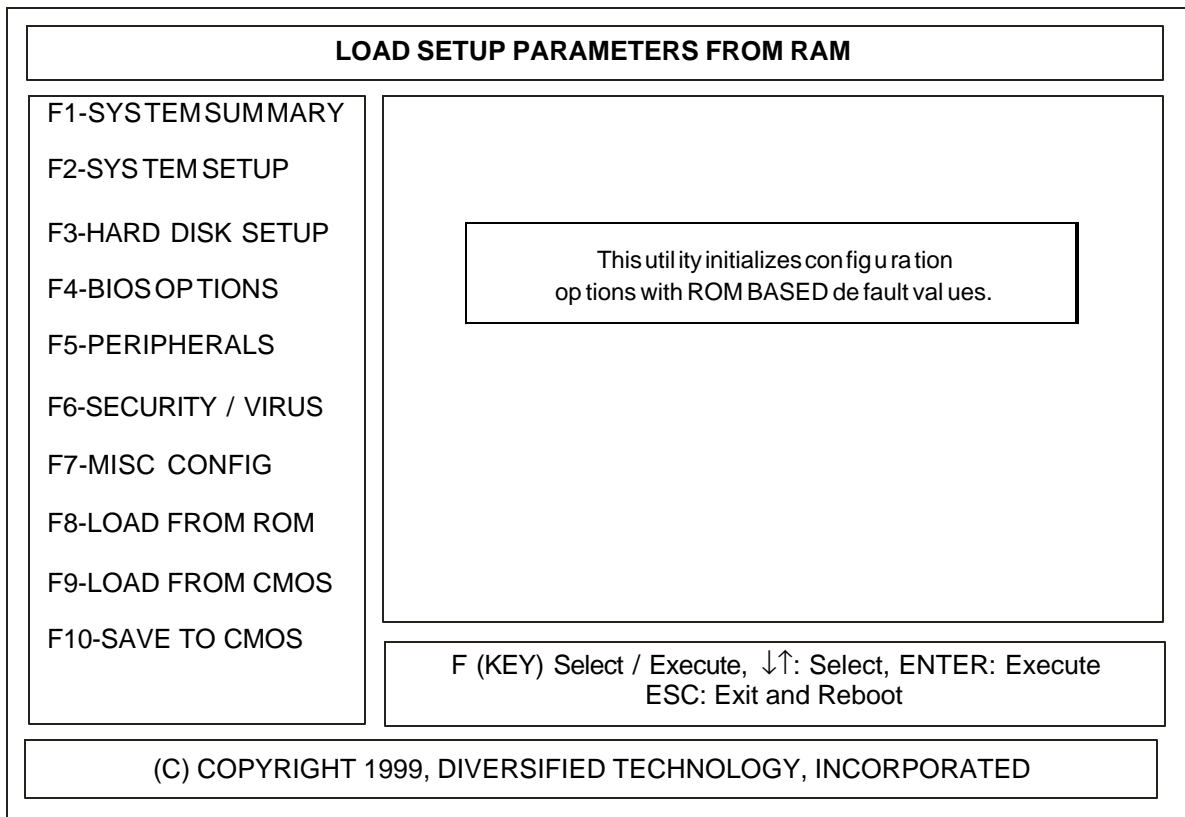
PCI IRQ line 0 = IRQ9 = INT A
 PCI IRQ line 1 = IRQ10 = INT B
 PCI IRQ line 2 = IRQ11 = INT C
 PCI IRQ line 3 = IRQ15 = INT D

PCI IRQ Routing Tables

<u>INTA</u> <u>INTB</u> <u>INTC</u> <u>INTD</u>	PCI Connector
PCI Slot 0 (INTB, INTC, INTD, INTA)	
PCI Slot 1 (INTC, INTD, INTA, INTB)	Actual INT line connected
PCI Slot 2 (INTD, INTA, INTB, INTC)	
PCI Slot 3 (INTA, INTB, INTC, INTD)	
PCI Slot 0 (IRQ10, IRQ11, IRQ15, IRQ9)	
PCI Slot 1 (IRQ11, IRQ15, IRQ9, IRQ10)	Actual IRQ line connected
PCI Slot 2 (IRQ15, IRQ9, IRQ10, IRQ11)	
PCI Slot 3 (IRQ9, IRQ10, IRQ11, IRQ15)	

4.14 Load From ROM

This utility is used to load CMOS with the default system configuration values. This can be useful when CMOS parameters have been modified and saved and the default values are desired for some reason. To begin this function press <F8> or move the highlight bar to the option and press <ENTER> . To load the defaults press <F5>. Press <ESC> to abort the function without loading the default values.



4.15 Load From CMOS

This utility is used to re-initialize the ROM utilities items with the values that were stored in CMOS at the last system boot. This can be useful if CMOS parameters have been modified, but the user decides not to put those changes into effect. To begin this function press <F9> or move the highlight bar to the option and press <ENTER>. To load from CMOS press <F5>. Press <ESC> to abort the function without loading from CMOS. This option will only work if the most recent CMOS modifications have not already been saved using the SAVE TO CMOS function.

LOAD SETUP PARAMETERS FROM CMOS RAM	
F1-SYSTEMSUMMARY F2-SYSTEMSETUP F3-HARD DISK SETUP F4-BIOSOPTIONS F5-PERIPHERALS F6-SECURITY / VIRUS F7-MISC CONFIG F8-LOAD FROM ROM F9-LOAD FROM CMOS F10-SAVE TO CMOS	<p>This utility re-initializes configuration options with the last values stored in CMOS</p> <p>F (KEY) Select / Execute, ↓↑: Select, ENTER: Execute ESC: Exit and Reboot</p>
(C) COPYRIGHT 1999, DIVERSIFIED TECHNOLOGY, INCORPORATED	

4.16 Save To CMOS

This utility is used to save the current ROM utilities configuration into CMOS. To begin this function move the highlight bar to the option and press <ENTER> or press <F10>. To save to CMOS press <F5>. Press <ESC> to abort the function without saving.

SAVE SETUP PARAMETERS FROM CMOS RAM	
F1-SYSTEMSUMMARY F2-SYSTEMSETUP F3-HARD DISK SETUP F4-BIOSOPTIONS F5-PERIPHERALS F6-SECURITY / VIRUS F7-MISC CONFIG F8-LOAD FROM ROM F9-LOAD FROM CMOS F10-SAVE TO CMOS	<div style="border: 1px solid black; padding: 10px; text-align: center;">This utility stores the current ROM Utility Configuration into CMOS RAM</div> <p>F (KEY) Select / Execute, ↓↑: Select, ENTER: Execute ESC: Exit and Reboot</p>
(C) COPYRIGHT 1999, DIVERSIFIED TECHNOLOGY, INCORPORATED	

EXITDESCRIPTION

- 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.

Troubleshooting Guide

- 5.0 Error Messages and Problem Areas
- 5.1 Problem Not Solved

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, key lock 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.).
6. Verify that the onboard AGP bus is enabled if using the onboard video and disabled if using offboard video. Refer to Section 3 for information on disabling the AGP bus.
7. Verify that the "VGA Boot Display" option is set properly in the Setup Utility. The system can be reset 5 times to set the display mode for simultaneous display.

LBC8516 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.
2. Make sure the SECONDARY CACHE is disabled if secondary cache is not installed.

PARITY PROBLEMS

1. Verify that the memory DIMMs are inserted properly in their respective sockets (refer to the LBC8516 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.

2. If an add-in memory card is used to extend the memory capabilities of the LBC8516, 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 SYSTEMCONFIGURATIONDATA”

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 RE TRY OR F2 TO ENTER ROM UTILITIES”

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

1. If booting from a floppy disk, verify that the disk is properly inserted and the drive door is closed.
2. Insert a different bootable floppy disk into the drive and press <F1>.
3. If attempting to boot from a hard disk, insert a bootable floppy disk into drive A and press ENTER. After booting from the floppy disk, verify that drive C is accessible. Use the FDISK (or similar) utility to verify that a bootable partition exists and is ACTIVE. Remove the floppy disk from drive A and re set the system. If the drive can not be accessed or partition can not be found, the drive may need to be re formatted.

CAUTION: Reformatting a drive causes the data on the drive to be lost.

4. If attempting to boot from a hard disk, use the CMOS SETUP utility to verify that the correct FIXED DISK TYPE is configured.

“ERROR READING FLOPPY DISK -
PRESS F1 TO RE TRY OR F2 TO ENTER ROM UTIL ITIES”

or

“INVALID BOOT SECTOR ON FLOPPY DISK -
PRESS F1 TO RE TRY OR F2 TO ENTER ROM UTIL ITIES”

This message indicates that a floppy disk appeared to be in the drive, but a valid boot sector could not be read from the disk.

1. Verify that the disk is properly inserted and the drive door is closed.
2. Insert a different bootable floppy disk into drive and press <F1>.
3. Use the CMOS SETUP utility to verify that the correct FLOPPY DISK TYPE is configured.

“ERROR READING HARD DISK -
PRESS F1 TO RE TRY OR F2 TO ENTER ROM UTIL ITIES”

or

“INVALID BOOT SECTOR ON HARD DISK -
PRESS F1 TO RE TRY OR F2 TO ENTER ROM UTIL ITIES”

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. Use the CMOS SETUP utility to verify that the correct FIXED DISK TYPE is configured.
2. Insert a bootable floppy disk into drive A and press <F1>. After booting from the floppy disk, verify that drive C is accessible. Use the FDISK (or similar) utility to verify that a bootable partition exists and is ACTIVE. Remove the floppy disk from drive A and re set the system. If the drive can not be accessed or a partition can not be found, the drive may need to be reformatted.

“HARD DRIVE CONTROLLER NOT FOUND”

1. If no hard disk is installed, use the CMOS SETUP utility to specify NONE for FIXED DISK TYPE.
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 LBC8516.

“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 LBC8516.

“KEY BOARD IS LOCKED”

This message indicates that the keyboard appears to be in the LOCKED position.

1. Verify that the system key is not in the locked position.
2. Verify that the key lock wires are connected to pins 4 and 5 of connector J4.

“NON-SYSTEM DISK OR DISK ERROR REPLACE AND STRIKE ANY KEY WHEN READY”

This message indicates that a floppy disk appeared to be in the drive, but a valid boot sector could not be read from the disk.

1. Verify that the disk is properly inserted and the drive door is closed.
2. Insert a different bootable floppy disk into the drive and press a key.
3. Use the CMOS SETUP utility to verify that the correct FLOPPY DISK TYPE is configured.

SERIAL OR PARALLEL (PRINTER) PORT PROBLEMS

1. Verify that the peripheral device has power and is turned on.
2. Verify that the peripheral device is properly connected to the serial or parallel port.

POWER LED DOES NOT WORK

1. Verify that the LED is connected to pins 1 and 3 of connector J4.
2. Verify that the polarization of the connection is correct. This can be checked by reversing the pin connections.

RESET BUTTON DOES NOT WORK

1. Verify that the RESET button is connected into pins 1 and 2 of connector J7.

5.1 Problem Not Solved

If you are still having problems with your LBC8516, you can call one of our service representatives. Before you make this call, we ask that you please take the following steps to insure that your problem can be solved promptly.

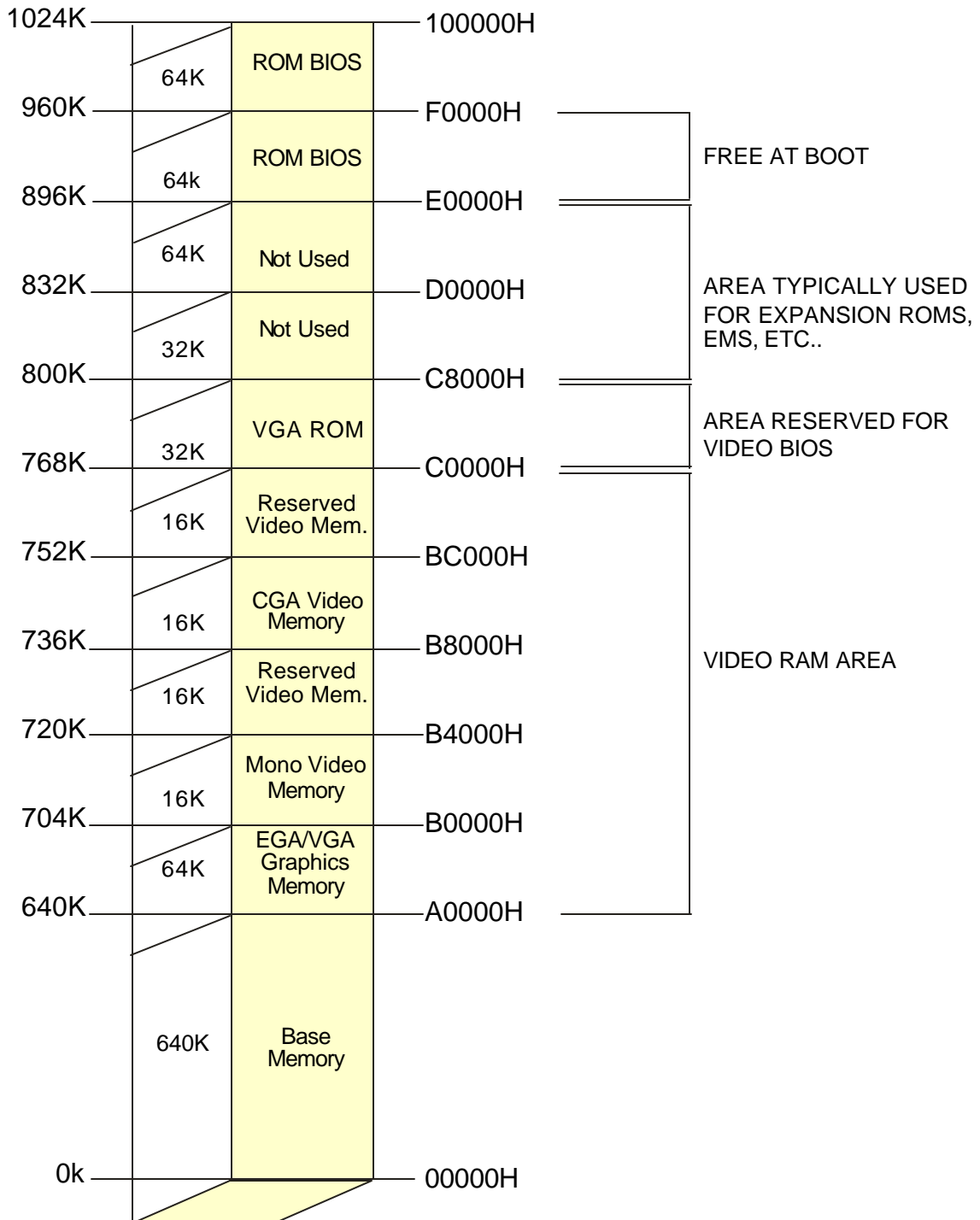
1. Write down the equipment that you are using in your computer, such as model of hard drive, hard drive controller, video card, floppy card, etc.
2. Write down the jumper settings of the LBC8516. Refer to Section 2 for jumper configurations.
3. Write down the configuration information contained in the LBC8516 ROM utilities.
4. If possible, have the system near the telephone when you call.

6

System Resource Maps

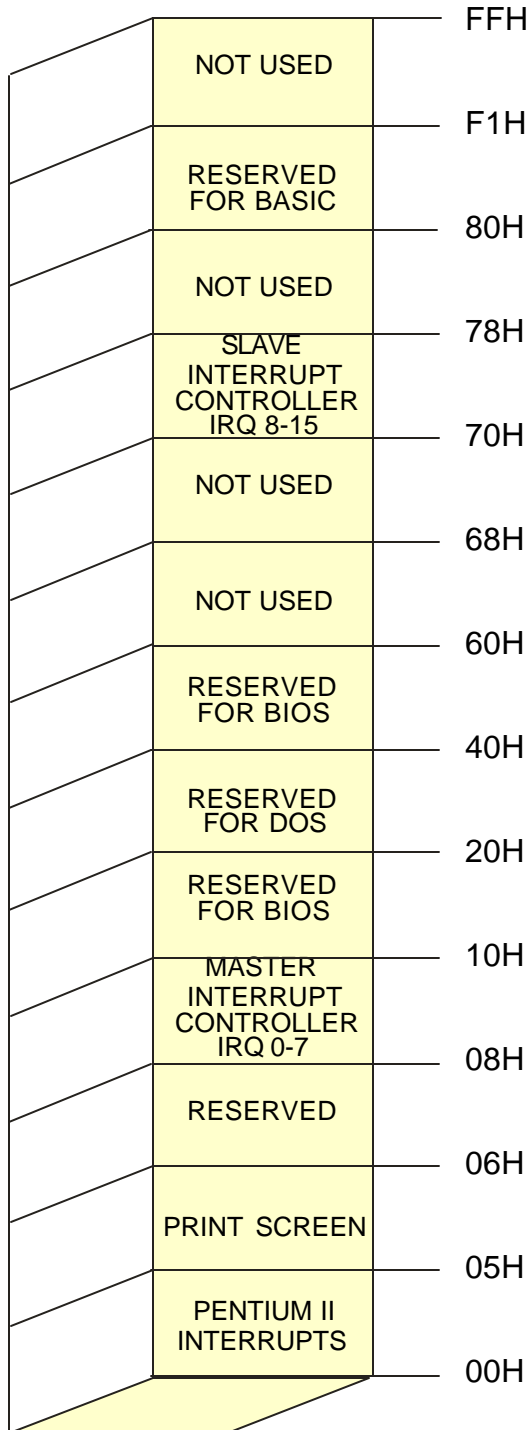
- 6.0 Memory Map
- 6.1 Interrupt Map
- 6.2 I/O Address Map
- 6.3 System I/O Map

6.0 Memory Map



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

6.1 Interrupt Map



77H	PCI	15 Optional PCI IRQ
76H	IDE	14 Used by IDE if enabled
75H	COPROCESSOR	13
74H	MOUSE / PCI	12 Optional PCI IRQ / PS2 Mouse
73H	PCI / MONITOR	11 Optional PCI IRQ / Monitor
72H	PCI / MONITOR	10 Optional PCI IRQ / Monitor
71H	PCI / VGA	9 Optional PCI IRQ / VGA
70H	REAL TIME CLOCK	8

SLAVE INTERRUPT CONTROLLER

1FH	VIDEO CHARS PTR	Pointer to video graphics char
1EH	DISKETTE PARAM PTR	Pointer to diskette parameters
1DH	VIDEO PARAMS PTR	Pointer to video init parameters
1CH	TIMER "TICK" LINK	Called on each timer tick
1BH	KEYBOARD BREAKS	Called when CTRL-BRK pressed
1AH	TIME OF DAY	Read / Set real time clock
19H	BOOT STRAP	Boot loader routine
18H	BOOT FAILED	Executed if boot straps fails
17H	PRINTER BIOS	Printer BIOS functions
16H	KEYBOARD BIOS	Keyboard BIOS functions
15H	MISC. FUNCTIONS	Cassette BIOS and miscellaneous
14H	RS232 COMM	Serial port functions
13H	DISK / DISKETTE	Disk BIOS functions
12H	MEMORY SIZE	Returns memory size
11H	EQUIPMENT CHECK	Returns equipment list
10H	VIDEO BIOS	Video BIOS functions

BIOS INTERRUPTS

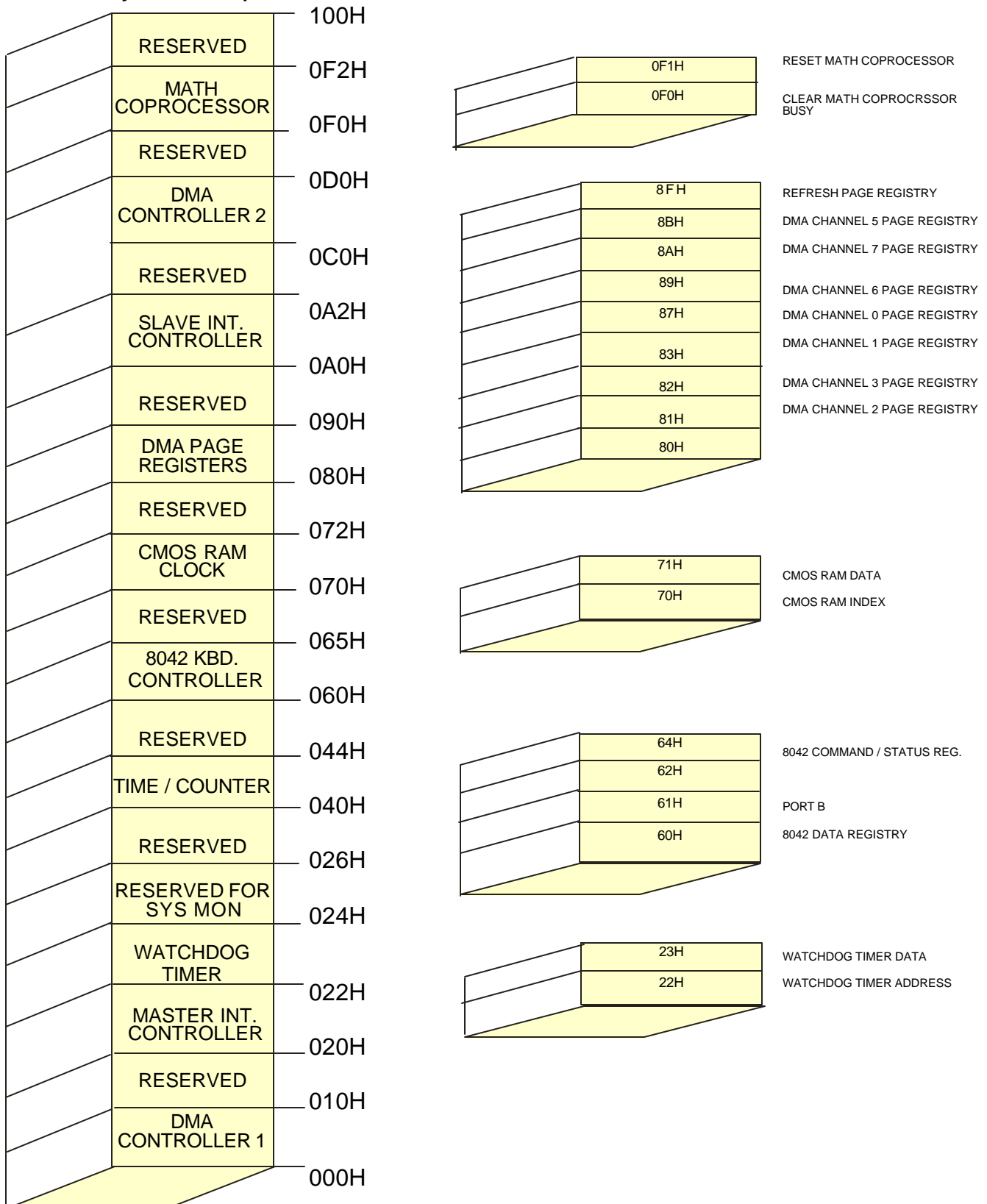
0FH	PCI	7 Optional PCI / Parallel Port
0EH	FLOPPY	6 Used by floppy if enabled
0DH	PCI / LPT	5 Optional PCI / Parallel Port
0CH	COM 1 / COM 3	Used if COM Port 1 is enabled
0BH	COM 2 / COM 4	Used if COM Port 2 is enabled
0AH	SLAVE CONTROLLER	See 'NOTE 1'
09H	KEYBOARD	1
08H		0

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.

6.2 I/O Address Map

		400H	0-	These I/O locations are reserved for onboard functions and must not be used by expansion I/O cards unless the onboard address is disabled
0	SERIAL COM 1	3F8H		
0	FLOPPY DISK CONTROLLER	3F0H		
1	UNUSED	3E0H	1-	These I/O locations are unused, and may be used by expansion I/O cards.
2	ENHANCED GRAPHICS	3D0H		
2	COLOR GRAPHICS	3C0H	2-	These I/O locations are unused, but are typically used by common expansion I/O cards.
1	MDPA PRINTER PORT	3BCH	3-	
2	MONOCHROME DISPLAY	3B0H		These ports are reserved for the system monitor
1	UNUSED	380H		
0	PRIMARY PRINTER PORT	378H		
1	UNUSED	300H		
0	SERIAL COM 2	2F8H		
1	UNUSED	280H		
1	ALTERNATE PRINTER PORT	278H		
1	UNUSED	1F8H		
0	FIXED DISK CONTROLLER	1F0H		
1	UNUSED	178H		
3	SYSTEM MONITOR	170H		
1	UNUSED	100H		
0	RESERVED FOR SYSTEM	000H		

6.3 System I/O Map



A

System Monitor Programming Instructions

- A.0 Overview
- A.1 Monitored Conditions
- A.2 Alarming Methods
- A.3 Programming Monitor Through I/O Port
- A.4 Reading 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 Monitor Using Serial Port
- A.9 Temperature Notes
- A.10 Modem Connection Requirements
- A.11 Example Applications
- A.12 Remote Data Retrieval Mechanisms
- A.13 Quick Reference

A.0 Overview

The onboard system monitor of the LBC8516 is a CPU-independent, programmable device capable of monitoring the LBC8516'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 LBC8516 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 LBC8516'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 LBC8516 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 LBC8516'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 LBC8516 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.

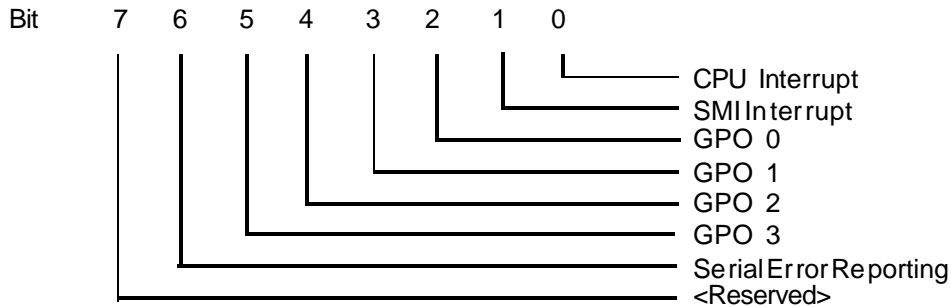
BIOS Failure Codes: The LBC8516 BIOS is capable of diagnosing several types of errors. If an error condition is detected by the BIOS, it will send an error code to the system monitor. If a modem dial string or unit identification number have been programmed, the monitor will report this error code. Otherwise, the monitor will report this code upon user request.

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 LBC8516 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 J1 on the SMS001.

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.

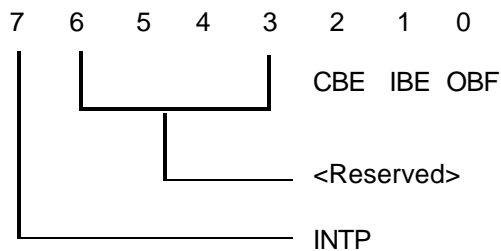
A.3 Programming The Monitor Through The I/O Ports:

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 LBC8516 System Monitor is programmed by sending commands and/or data to I/O ports 133h and 132h respectively.

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 byte. 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.

IBE - Input Buffer Empty: This bit is set when the data input buffer is empty.

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.

A.5 Sending A Command To The Monitor

If the user wants to send 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 set after the command is sent.

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 CPUs. 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.

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 (IBESet). 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.

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>.

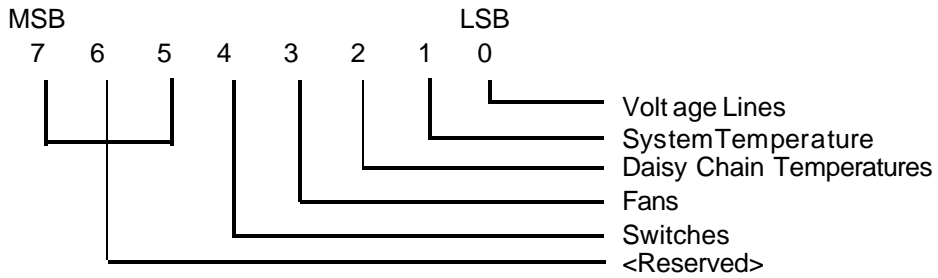
There are several key points to note about the above string. First, the @ symbol is the first character. This tells the monitor that the characters following it make up a command string. The next point to note is that the command, in ASCII, is the hex value of the command. Also note that a colon separates 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.

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.

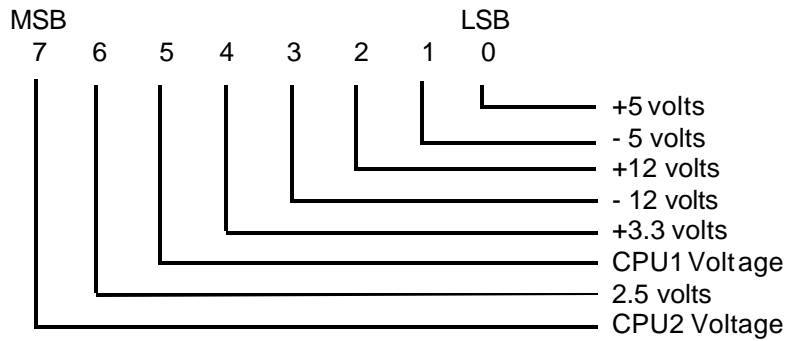
Password Entry: The Monitor can be programmed with a three character password through the I/O port using command 05h. If the password is programmed, then the monitor will request the password from the user upon first using the serial port.

LBC8516 Configuration Guide

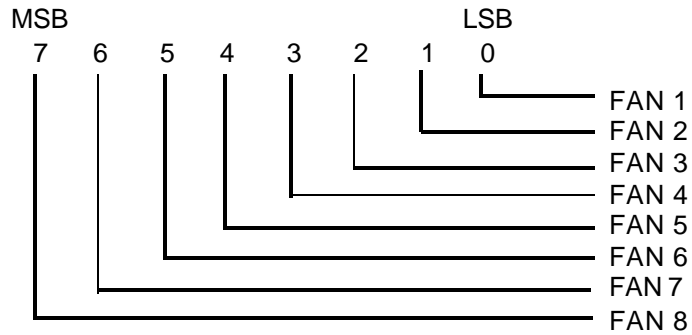
Data COMMAND	OUT	IN	Description:
00h	01	00	GET SYSTEM STATUS: This command returns a byte mask indicating the status of the events being monitored. A bit set to 1 indicates a failure. The byte mask is defined as follows:



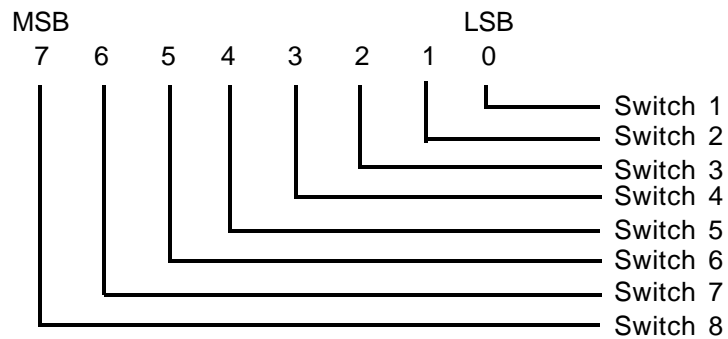
01h	01	00	GET VOLTAGE STATUS: This command returns a word mask indicating the status of the voltage channels. A bit set to 1 indicates a failure. The byte mask is defined as follows:
-----	----	----	--



Data COMMAND	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:

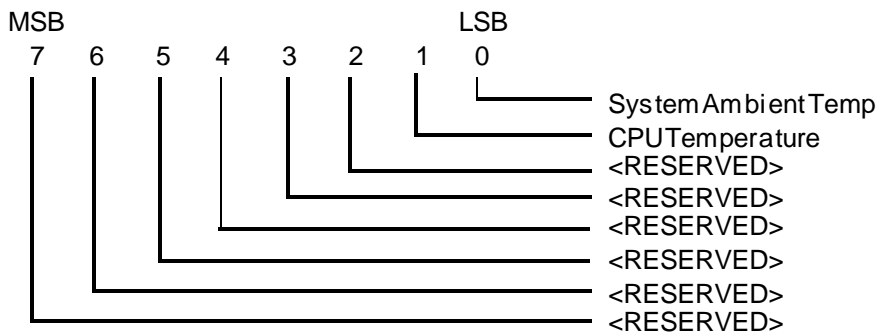


03h	01	00	GET SWITCH STATUS: This command returns a byte mask indicating the status of the switches. A bit set to 1 indicates a failure. The byte mask is defined as follows:
-----	----	----	---

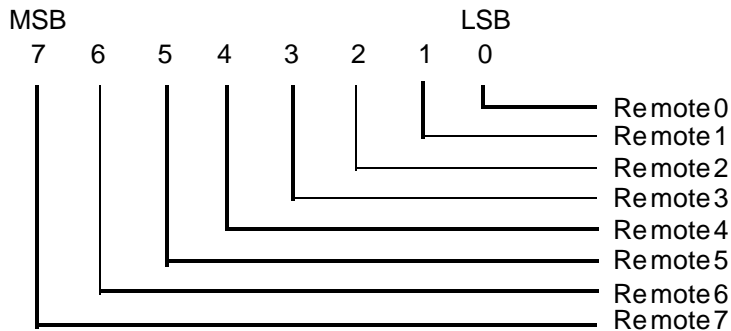


LBC8516 Configuration Guide

Data COMMAND	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 be obeyed. Sending all zeros as the password will disable the password checking.
-----	----	----	--

Data COMMAND	OUT	IN	<u>Description:</u>
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.

Data COMMAND	OUT	IN	Description:												
0Ch	00	00	<p>STROBE WATCHDOG: This function resets the internal watchdog counter of the monitor, preventing a system reset until the Enable Watchdog Count expires.</p> <p>*** See commands 3Ah, 3Bh, and 3Ch for further watchdog information.</p>												
0Dh	00	02	<p>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.</p>												
0Eh	02	00	<p>GET BIOS FAILURE DEFINITION: This command returns the two bytes sent to the monitor by command 0Dh.</p>												
0Fh	01	00	<p>GET LAST POST CODE: This command returns the last POST code that was sent to the monitor by the system BIOS.</p>												
10h	00	03	<p>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:</p> <table border="0"> <tr> <td>00=system ambient temp</td> <td>05=Remote temp 2</td> </tr> <tr> <td>01=CPU1 temp</td> <td>06=Remote temp 3</td> </tr> <tr> <td>02=<Reserved></td> <td>07=Remote temp 4</td> </tr> <tr> <td>03=Remote temp 0</td> <td>08=Remote temp 5</td> </tr> <tr> <td>04=Remote temp 1</td> <td>09=Remote temp 6</td> </tr> <tr> <td></td> <td>0A=Remote temp 7</td> </tr> </table> <p>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:</p> <p>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.</p>	00=system ambient temp	05=Remote temp 2	01=CPU1 temp	06=Remote temp 3	02=<Reserved>	07=Remote temp 4	03=Remote temp 0	08=Remote temp 5	04=Remote temp 1	09=Remote temp 6		0A=Remote temp 7
00=system ambient temp	05=Remote temp 2														
01=CPU1 temp	06=Remote temp 3														
02=<Reserved>	07=Remote temp 4														
03=Remote temp 0	08=Remote temp 5														
04=Remote temp 1	09=Remote temp 6														
	0A=Remote temp 7														

Data COMMAND	OUT	IN	<u>Description:</u>												
11h	02	01	<p>GET LOW BOUNDARY: This command, followed by a data byte specifying which module desired, returns that temperature module's current low boundary for failure:</p> <table border="0" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 50%;">00=system ambient temp</td> <td style="width: 50%;">05=Remote temp 2</td> </tr> <tr> <td>01=CPU1 temp</td> <td>06=Remote temp 3</td> </tr> <tr> <td>02=<Reserved></td> <td>07=Remote temp 4</td> </tr> <tr> <td>03=Remote temp 0</td> <td>08=Remote temp 5</td> </tr> <tr> <td>04=Remote temp 1</td> <td>09=Remote temp 6</td> </tr> <tr> <td></td> <td>0A=Remote temp 7</td> </tr> </table> <p style="margin-top: 20px;">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.</p>	00=system ambient temp	05=Remote temp 2	01=CPU1 temp	06=Remote temp 3	02=<Reserved>	07=Remote temp 4	03=Remote temp 0	08=Remote temp 5	04=Remote temp 1	09=Remote temp 6		0A=Remote temp 7
00=system ambient temp	05=Remote temp 2														
01=CPU1 temp	06=Remote temp 3														
02=<Reserved>	07=Remote temp 4														
03=Remote temp 0	08=Remote temp 5														
04=Remote temp 1	09=Remote temp 6														
	0A=Remote temp 7														
12h	00	03	<p>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:</p> <table border="0" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 50%;">00=system ambient temp</td> <td style="width: 50%;">05=Remote temp 2</td> </tr> <tr> <td>01=CPU1 temp</td> <td>06=Remote temp 3</td> </tr> <tr> <td>02=<Reserved></td> <td>07=Remote temp 4</td> </tr> <tr> <td>03=Remote temp 0</td> <td>08=Remote temp 5</td> </tr> <tr> <td>04=Remote temp 1</td> <td>09=Remote temp 6</td> </tr> <tr> <td></td> <td>0A=Remote temp 7</td> </tr> </table> <p style="margin-top: 20px;">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.</p> <p>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.</p>	00=system ambient temp	05=Remote temp 2	01=CPU1 temp	06=Remote temp 3	02=<Reserved>	07=Remote temp 4	03=Remote temp 0	08=Remote temp 5	04=Remote temp 1	09=Remote temp 6		0A=Remote temp 7
00=system ambient temp	05=Remote temp 2														
01=CPU1 temp	06=Remote temp 3														
02=<Reserved>	07=Remote temp 4														
03=Remote temp 0	08=Remote temp 5														
04=Remote temp 1	09=Remote temp 6														
	0A=Remote temp 7														

Data COMMAND	OUT	IN	Description:												
13h	02	01	<p>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:</p> <table border="0"> <tr> <td>00=system ambient temp</td> <td>05=Remote temp 2</td> </tr> <tr> <td>01=CPU1 temp</td> <td>06=Remote temp 3</td> </tr> <tr> <td>02=<Reserved></td> <td>07=Remote temp 4</td> </tr> <tr> <td>03=Remote temp 0</td> <td>08=Remote temp 5</td> </tr> <tr> <td>04=Remote temp 1</td> <td>09=Remote temp 6</td> </tr> <tr> <td></td> <td>0A=Remote temp 7</td> </tr> </table> <p>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.</p>	00=system ambient temp	05=Remote temp 2	01=CPU1 temp	06=Remote temp 3	02=<Reserved>	07=Remote temp 4	03=Remote temp 0	08=Remote temp 5	04=Remote temp 1	09=Remote temp 6		0A=Remote temp 7
00=system ambient temp	05=Remote temp 2														
01=CPU1 temp	06=Remote temp 3														
02=<Reserved>	07=Remote temp 4														
03=Remote temp 0	08=Remote temp 5														
04=Remote temp 1	09=Remote temp 6														
	0A=Remote temp 7														
14h	02	01	<p>GET TEMPERATURE: This command, followed by a data byte specifying which module is desired, returns that temperature module's current temperature:</p> <table border="0"> <tr> <td>00=system ambient temp</td> <td>05=Remote temp 2</td> </tr> <tr> <td>01=CPU1 temp</td> <td>06=Remote temp 3</td> </tr> <tr> <td>02=<Reserved></td> <td>07=Remote temp 4</td> </tr> <tr> <td>03=Remote temp 0</td> <td>08=Remote temp 5</td> </tr> <tr> <td>04=Remote temp 1</td> <td>09=Remote temp 6</td> </tr> <tr> <td></td> <td>0A=Remote temp 7</td> </tr> </table> <p>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.</p>	00=system ambient temp	05=Remote temp 2	01=CPU1 temp	06=Remote temp 3	02=<Reserved>	07=Remote temp 4	03=Remote temp 0	08=Remote temp 5	04=Remote temp 1	09=Remote temp 6		0A=Remote temp 7
00=system ambient temp	05=Remote temp 2														
01=CPU1 temp	06=Remote temp 3														
02=<Reserved>	07=Remote temp 4														
03=Remote temp 0	08=Remote temp 5														
04=Remote temp 1	09=Remote temp 6														
	0A=Remote temp 7														
1Ah	00	01	<p>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.</p>												

Data COMMAND	OUT	IN	Description:
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 a 00 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.
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 — -5 voltage 02 — +12 voltage 03 — -12 voltage 04 — 3.3v voltage 05 — CPU1 voltage 06 — 2.5 voltage 07 — <Reserved>

Data COMMAND	OUT	IN	Description:
21h	01	01	<p>GET VOLTAGE X TOLERANCE: This function returns the tolerance value for the specified voltage line. Voltage lines are selected as follows:</p> <ul style="list-style-type: none">00 — +5 voltage01 — -5 voltage02 — +12 voltage03 — -12 voltage04 — 3.3v voltage05 — CPU1 voltage06 — 2.5 voltage07 — <Reserved>
22h	00	02	<p>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:</p> <ul style="list-style-type: none">00 — +5 voltage01 — -5 voltage02 — +12 voltage03 — -12 voltage04 — 3.3v voltage05 — CPU1 voltage06 — 2.5 voltage07 — <Reserved>
25h	01	01	<p>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.</p>
26h	00	02	<p>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.</p>
27h	01	01	<p>GET FAN X MINIMUM RPS: This function, followed by a fan number byte, returns the current minimum rps value stored for fan x.</p>

Data COMMAND	OUT	IN	<u>Description:</u>
2Ah	00	02	<p>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.</p>
2Bh	01	01	<p>GET SWITCH X POLARITY: This function, followed by a switch number byte, returns the current polarity setting of the switch.</p>
2Ch	01	01	<p>READ SWITCH X: This function, followed by a switch number byte, returns the current status of the specified switch.</p>
30h	00	02	<p>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:</p> <p>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</p>
31h	01	01	<p>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:</p> <p>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</p>

Data COMMAND	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(CMD3Ah)

	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	63.75S		5.7MIN

1 Tick Count ≅ 50ms x Granularity Value

Watch dog Time out Values for Tick Count vs Granularity

<u>Data COMMAND</u>	<u>OUT</u>	<u>IN</u>	<u>Description:</u>
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 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	Pentium II DETECTION MASK: Returns a byte to indicate how many Pentium II processors were detected. Bit 0 indicates the CPU.
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 for detailed information.
4Fh	1	0	READ MAILBOX: This command returns the current value stored in the MailBox. See section A.12 for a detailed description.
50h	0	1	CPU TEMPERATURE MODULE COUNT: Returns number of CPU temperatures modules, which should be two.
51h	0	1	TEMPERATURE MODULE COUNT: Returns total number of temperature modules. This includes system ambient, CPU, and remote temperature sensors

Data COMMAND	OUT	IN	Description:
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 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 for a description of the scratchpad.

A.9 TemperatureNotes

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. In ROM Utilities, under the SYSTEM MONITOR menu, the serial port must be set to DTE mode.
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 LBC8516 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.

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.

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

00h - Idle
01h - Attention
02h - Acknowledge
03h - Inquiry
04h - Write
05h - NAK
06h - End of Session

MailBox Values

07h - <Reserved>
| |
1Fh - <Reserved>
| |
F0h - <Reserved>
| |
FFh - <Reserved>

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:

<u>Local</u>	<u>Remote</u>
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:

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

ScratchpadFunctions

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 - <8 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.

A.13 Quick Reference

CMD	Data		Description	CMD	Data		Description
	OUT/IN				OUT/IN		
00	1 / 0		Get system status byte	1E	1 / 1		Get GPO (x) Active State
01	1 / 0		Get voltage status byte	20	2 / 1		Get voltage x
02	1 / 0		Get fan status byte	21	1 / 1		Get voltage x tolerance
03	1 / 0		Get switch status byte	22	0 / 2		Set voltage x tolerance
04	1 / 0		Get temperature status byte	25	1 / 1		Get fan x RPS
05	0 / 3		Set password (I/O port only)	26	0 / 2		Set fan x minimum RPS
06	0 / 14		Set dial string (I/O port only)	27	1 / 1		Get fan x minimum RPS
07	0 / 10		Set Unit ID (I/O port only)	2A	0 / 2		Enable/Disable switch x
08	0 / 1		Toggle Serial Echo	2B	1 / 1		Get switch x polarity
09	0 / 1		Toggle Non-Verbose Mode	2C	1 / 1		Read switch x
0A	0 / 1		Enable watchdog (Set count)	30	0 / 2		Set voltage/system temp / CPU temp /watchdog delivery
0B	0 / 1		Watchdog warning count				
0C	0 / 0		Strobe watchdog	31	1 / 1		Get voltage/system temp/CPU temp/watchdog delivery
0D	0 / 2		BIOS failure definition				
0E	2 / 0		Get BIOS Failure definition	32	0 / 2		Set fan/switch x delivery
0F	1 / 0		Get Last POST code	33	1 / 1		Get fan/switch x delivery
10	0 / 3		Set Low boundary temperature	3A	0 / 1		Set Watchdog Granularity
11	2 / 1		Get low boundary	3B	1 / 0		Get Watchdog Granularity
12	0 / 3		Set High boundary temperature	4E	0 / 1		Write to Mailbox
13	2 / 1		Get High boundary	4F	1 / 0		Read From Mailbox
14	2 / 1		Get temperature	52	0 / 9		Write to Scratchpad
1A	0 / 0		Enable Terminal Tx Mode	53	8 / 1		Read From Scratchpad
1B	0 / 0		Disable Terminal Tx Mode	54	1 / 2		Read EEPROM
1C	0 / 2		Force On/Off GPO(s) x	55	0 / 3		Write EEPROM
1D	0 / 2		Set GPO (x) Active State	58	0 / 0		Update EEPROM

Timeout	Granularity	Count	Temperatures	Delivery Bytes
30S	20	30	System	Voltage
1 MIN	20	60	CPU1	System Temp
1½MIN	20	90	CPU2	CPU Temp
2 MIN	20	120	Remote 0	Remote temp
2½MIN	20	150	Remote 1	Watchdog
3 MIN	20	180	Remote 2	Fan / SW
3½MIN	20	210	Remote 3	Fan 1
4 MIN	20	240	Remote 4	Fan 2
4½MIN	25	216	Remote 5	Fan 3
5 MIN	25	240	Remote 6	Fan 4
5½MIN	26	254	Remote 7	Fan 5
			Voltages	Fan 6
			(+5)	Fan 7
			(-5)	Fan 8
			(+12)	GPOs
			(-12)	GPO 0
			(3.3)	GPO 1
			(CPU1)	GPO 2
			(2.5)	GPO 3
			(CPU2)	

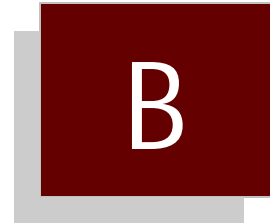
Tick Count Granularity & Count Values for common

Serial Port Commands

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

Symbol Legend

<p>mm = Module: 00= System Ambient Temperature 01= CPU1 Temperature 02= CPU2 Temperature 03= Remote 0 04= Remote 1 05= Remote 2 06= Remote 3 07= Remote 4 08= Remote 5 09= Remote 6 0A= Remote 7</p> <p>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</p>	<p>dd = Delivery Byte gg = Granularity value (1 < gg < 27 (1bh)) vv = Channel: 00 = +5v 01 = - 5v 02 = +12v 03 = - 12v 04 = 3.3v 05 = CPU 06 = 2.5v</p> <p>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</p>
--	---



System Monitor Pop-Up Utility

- B.0 Overview
- B.1 Selecting the Interrupt
- B.2 Selecting the Hot Key

B.0 Overview

The 8516.EXE program is a terminate and stay resident (TSR) program that displays the current system voltages, temperature, and fan rotational values in a pop-up window. The display window can be popped up via a hot-key sequence from the keyboard, or by an interrupt from the LBC8516 monitor. The interrupt used can be selected via a command line switch, as well as the hot-key sequence. Using a question mark as a switch will display a help screen.

B.1 SelectingTheInterrupt

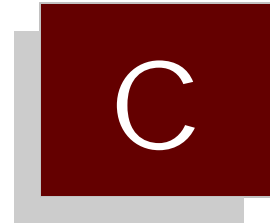
The 8516.EXE utility defaults to using interrupt 10. If the System Monitor interrupt is set for interrupt 10, no command line setting is necessary. If the System Monitor is set for interrupt 11, then use the -i11 switch at the command line when executing the program. For example, executing "8516.EXE -i11" would set the TSR to pop up when interrupt 11 occurs. Valid interrupts are 10 and 11.

B.2 SelectingTheHot-Key

The 8516.EXE utility defaults to using the ALT-D key combination to pop up the display using the keyboard. Other key combinations are selectable using the -k switch. Valid switch settings are:

- k1 for Right Shift-D
- k2 for Left Shift-D
- k4 for CTRL-D
- k8 for ALT-D

System Monitor VII Programming Utility



C.0 DUTIL.exe Utility

C.0 DUTIL.exe Utility

The DUTIL.EXE utility allows the user to program a Unit ID string, a Dial String, and a password into EEPROM. Once programmed, the System Monitor will read the Unit ID, Dial String, and password from EEPROM 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.

The password is used to prevent unauthorized access to the System Monitor over the serial port. A three digit (numbers or letters) password can be defined for the System Monitor. Set the password to all spaces to wipe out any previous password entry.

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.



Intel 82558 Ethernet Driver Procedures

- D.0 Ethernet Drivers
- D.1 Windows 95
- D.2 Windows NT 3.51
- D.3 Windows NT 4.0
- D.4 Solaris 2.5 / 2.5.1
- D.5 Novell Unixware 2.0
- D.6 SCO Unixware 2.1
- D.7 SCO Openserver 5
- D.8 Netware 4.10
- D.9 Netware DOS/ODI Drivers

D.0 Ethernet Drivers

The procedures outlined below provide the information needed to install network support for the Intel 82558 ethernet controller on the LBC8516. The following operating systems were tested at 10 and 100 Mbps:

- Windows95
- Windows NT 3.51
- Windows NT 4.0
- Solaris 2.5 / 2.5.1
- Novell Unixware 2.0
- SCO Unixware 2.1
- SCO OpenServer 5
- Novell Netware 4.10
- Netware DOS ODI Drivers

D.1 Windows 95

Windows 95 will install a default driver, Intel Pro/100B, for the Intel 82558 ethernet controller. This driver did not function in our test stand, but a procedure to make it work was located on the Intel web site (cs.intel.com). Briefly, this procedure indicated that Windows 95 will misidentify the Intel 82558 ethernet controller and load an ISA adapter driver instead. The procedure from Intel loads the Windows 95 driver from the CD afterwards.

Instead of the standard Windows 95 driver, this procedure loads the driver from Intel's DriverRelease 2.51 diskette for the Intel Pro/100B. This driver update is available from the Internet at <http://cs.intel.com>.

1. Go to "Network Setup" in "Control Panels".
2. Click on "Network Adapters". If Windows 95 lists an adapter for the Pro/100B already, then delete it.
3. Click on "Add". Insert the driver diskette in the floppy drive. Windows 95 will list its supported drivers. Click on "Have Disk".
4. The driver may be identified as "Pro/100B" or "Intel 557 family". Click on this 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.

This driver worked in our test stand, networked to a NT 4.0 Server, using the NetBEUI protocol. We were able to "see" the server in the "Network Neighborhood", and the server could likewise "see" the Win95 station. From the Win95 station, we could map a drive letter and copy files back and forth.

This driver worked in our test stand, net worked to a NT 4.0 Server, using the NetBEUI protocol. We were able to “see” the server in the “Network Neighborhood”, and the server could likewise “see” the Win95 station. From the Win95 station, we could map a drive letter and copy files back and forth.

D.2 Windows NT 3.51

Windows NT 3.51 does not identify the Intel 82558 ethernet controller, and requires the OEM provided driver from Intel. The driver tested was from Intel’s Driver Release 2.51 diskette for the Intel Pro/100B (available at <http://cs.intel.com>).

In our test stand, the driver was installed during the installation of NT 3.51. We selected “OEM diskette” from the choice of network adapters to install. This driver can be installed from “Control Panels” under the “Network” icon by clicking on “Add Adapter”.

The NT 3.51 station net worked to the NT 4.0 server station using the NetBEUI protocol. The stations could “see” each other. From the NT 3.51 station, we could map a drive letter, and copy files back and forth. The line speed would auto-negotiate 10 or 100 Mbps.

D.3 Windows NT 4.0

Windows NT 4.0 Server automatically detected and loaded a driver for the Intel 82558 ethernet controller (Pro/100B) that worked. This installation served as the test server for the other network O/S tests. The protocols tested were NetBEUI and TCP/IP. For testing purposes, the line speed was forced to either 10 or 100 Mbps to confirm that the other adapter would auto-negotiate.

D.4 Solaris 2.5 / 2.5.1

Solaris provides the latest driver and patch updates at its web site at <http://access1.sun.com>. The driver update tested was Driver Update 8, which was used for both Solaris 2.5 and 2.5.1. The driver update diskettes consist of two sets of diskettes:

1. Boot Disks: Boot disk 1 is the “Real Mode Boot Disk”. This is the first disk to boot from to begin the installation. This is followed by the remaining boot disks, as prompted. The installation then prompts the user to indicate the boot device (CD-ROM, Ethernet, Hard drive, etc.) and then proceeds to install the O/S.
2. Distribution Diskettes: These diskettes are loaded at the end of the CD-ROM installation. These diskettes are loaded as prompted, then the installation program proceeds to install the patches. These diskettes are also used to upgrade an existing Solaris installation to the latest drivers available. The patch diskettes are required to load the Intel 82558 ethernet controller (Pro/100B) driver.

In our test stand, the Driver Update was installed on Solaris 2.5 during the O/S installation. The distribution diskettes were loaded after Solaris had installed, and the patches proceeded to install for two and a half hours. After this, the board rebooted, and the network interface loaded for the Intel 82558 ethernet controller (Pro/100B driver “iprb”, network interface “iprb0”). We could then establish a FTP connection from the NT Server, and copy files back and forth.

For the Solaris 2.5.1 installation, the installation program prompted for the distribution diskettes, but did not install the patches. After the board rebooted, the network interface "iprb0" was not found, displaying an error message. We then used the "Upgrade" procedure to install the patches, which was much quicker (about 40 minutes) than installing during O/S installation. We rebooted, used the "b -r" boot option to rebuild the drivers, and the network interface was found. From the NT Server, we could establish a FTP session, and copy files back and forth.

The "Driver Update & Upgrade Procedure" is outlined below:

1. Insert "Solaris 2.5/2.5.1 x86 Driver Update & DISTRIBUTION 1 Diskette" into drive 0.
2. Login as "root", or become "root".
3. Stop volume management if it is running. You can use this command to see if volume management is running:

```
# ps -e | fgrep vold
```

Otherwise, you can stop volume management:

```
# /etc/init.d/volmgt stop
```

4. Use "cpio" to copy files off the diskette.

```
# mkdir /tmp/Drivers
# cd /tmp/Drivers
# cpio -idubI /dev/rdiskette0
```

After some time, the following message is printed:

```
End of medium on "input".
Change to part 2 and press RETURN key.
```

5. Insert "Solaris 2.5/2.5.1 Driver Update & DISTRIBUTION 2 Diskette" and press ENTER. After some time the following message is displayed:

```
End of medium on "input".
Change to part 3 and press RETURN key.
```

6. Insert "Solaris 2.5/2.5.1 Driver Update & DISTRIBUTION 3 Diskette" and press ENTER. After some time, a message with the number of blocks read is printed.

7. Remove the diskette. If you want to restart volume management, use:

```
# /etc/init.d/volmgt start
```

8. Type the following to run the installation script:

```
# ./installdu.sh
```

9. Follow the instructions afterward to shut the system down and restart. Boot with the “b-r” option.
10. A second reboot may be required.

D.5 Novell Unixware 2.0

Novell Unixware does not identify the Intel 82558 ethernet controller during installation, nor provides a driver to support the ethernet controller. Intel provides a Beta driver for Unixware 2.0 / 2.1 that works. This driver can be obtained from their secure FTP site:

```
ftp://ftp.intel.com/pub/support/other/secure_files/100buw2.exe
```

This EXE file is a self-extracting compressed file that contains the file d100u20.pkg. It also contains a text file explaining how to install the driver. To install this driver from Unixware:

1. Copy the file to a temporary install directory, and install it.

```
# doscp a:d100u20.pkg /tmp/d100u20.pkg
# pkgadd -d /tmp/d100u20.pkg
```

In our test bed, we installed this driver as user “root”, and NOT in the X-windows GUI.

2. During installation, the user is prompted for TCP/IP parameters. You must enter the number of adapters (usually 1), the IP host name (usually given), the IP address, and information (Enter Yes).
3. Shut down and restart the message. The kernel will be rebuilt, and the system will reboot. The text file in 100buw2.exe explains how to install this driver from *App Installer* in X-windows.

During our testing, we were able to establish a FTP session with the Unixware station, and copy files back and forth from the NT Server station.

D.6 SCO Unixware 2.0

SCO Unixware provides for installing drivers through the Network Interface Card Support Utility, which requires an IHV diskette. SCO has a disk image available from their FTP site for the Intel 82558 ethernet controller (Pro/100B) at <ftp://ftp.sco.com/UW21>. The file name is *ptf3019.ihv.dd.Z* for the IHV diskette image, and a text file with the same patch name has instructions for creating this disk. You can then install the driver as any third-party IHV diskette.

The procedure to create this disk, and install it, follows:

1. Become root and create a new directory by typing the following:

```
$ su
Password: <type your root password>
# mkdir /tmp/pkg
# chmod 700 /tmp/pkg
# cd /tmp/pkg
```

2. Create the IHV driver diskette.
 - A. Download the `ptf3019.ihv.dd.Z` file, which was packaged using `dd(1M)` and `compress(1)`, and the `ptf3019.txt` file to the `/tmp/pkgdir` directory on your system.
 - B. Insert a high density diskette (not write-protected) into the A: drive. If the diskette is DOS formatted, skip to the next step. Otherwise, the diskette may be formatted (in the A: drive) using the command:

```
# format -i 1 -E /dev/rdisk/f03ht
```

- C. Transfer the contents of `ptf3019.ihv.dd.Z` to a formatted diskette using the commands:

```
# uncompress /tmp/pkg/ptf3019.ihv.dd.Z
# dd if=/tmp/pkg/ptf3019.ihv.dd of=/dev/rdisk/f03ht
```

3. Install and configure the driver.
 - A. Invoke the NIC Support Utility. The utility can be accessed from the Desktop GUI "Admin_Tools"- "Networking" - "NICS_Setup" icons, or from the command line as `/usr/sbin/niccfg`. The utility provides a simple menu-oriented graphical interface with online help.
 - B. Select the "Install driver from IHV diskette" item from the `niccfg` menu presented.
 - C. Insert the IHV configuration diskette and press the <Enter> key. The utility will now install and configure the driver (d100u20) for the Intel 82558 ethernet controller (PRO/100B).
 - D. Select the "Accept all entries" item from the menu presented. The utility will dynamically load the d100u20 driver into the UnixWare kernel.
4. Establish an Internet configuration for your system.
 - A. The Internet setup required for your internet node can be established by using the utility accessed from the Desktop GUI "Admin_Tools"- "Networking"- "Internet_Setup" icons, or the command line utility, `/etc/inet/menu`.

```
# /etc/inet/menu
```

5. Reboot the system.

D.7 SCO OpenServer 5

SCO provides a MDI driver for the Pro/100B for SCO OpenServer. The SCO support site on the web is <http://www.sco.com/support>. The driver is available from their FTP site:

```
ftp://ftp.sco.com/pub/OSR500-OSR502/network/pro100b
```

This driver was tested at 10 and 100 Mbps with a NT Server client. In our test stand, we could establish a FTP session and copy files back and forth.

The procedure to install the driver follows:

1. The file must be copied to a blank, formatted 1.44 MB DOS floppy, using the dd utility. For the DOS version of this utility, the format is:

```
C:\ dd pro100b.sco a:
```

assuming the file name is pro100b.sco and the floppy is in drive A:. On a Unix system, the command is:

```
# dd if=pro100b.sco of=/dev/rfd0135ds18
```

2. Boot SCO OpenServer in system maintenance mode. Put the MDI floppy in the disk drive.
3. Run the custom utility. Select *Software* from the menu, and *Install New...*
4. Select the host (scosysv or the host name of the machine) and media device Floppy Disk Drive 0
5. Indicate whether you want a full or partial installation (typically full). After installation is complete, exit the utility.
6. Run *netconfig*. From the menu, select *Hardware*, and *Add new LAN adapter*.
7. The Pro/100B should be listed. Select continue.
8. Select the networking protocol. For TCP/IP, a screen appears to enter the networking parameters. The system needs a host name, IP address, and Netmask.
9. The utility will indicate that the installation was successful. Exit the utility.
10. At this point you are prompted to relink the kernel. Select "Yes" for this.
11. After linking, indicate that you want the new kernel to boot by default, and to rebuild the kernel environment.
12. Installation is complete. Shut down and reboot the system.

D.8 Netware 4.10

Installation of the LAN drivers for the Intel 82558 is achieved through the INSTALL NLM as usual, using the drivers from the Intel Driver Release 2.51 for the 82558 (or Pro/100B). However, the important thing to note about the ODI / LAN drivers for the Intel 82558 are that they conform to the version 3.30 ODI Assembly specification. Netware 4.10 requires a driver upgrade named LANDR9, available from the Internet:

<http://support.novell.com>

The file LANDR9.EXE is a self-extracting compressed file. Installation instructions and pertinent information are included in this file.

D.9 Netware DOS/ODI Drivers

The DOS/ODI drivers tested are on the Intel Driver Release 2.51 diskette. These drivers have been tested at 10 and 100 Mbps. The ODI driver, E100BODI, performs a self-test of the 82558 and then displays speed/duplex mode, I/O usage, etc. The drivers are loaded in the usual sequence:

```
Lsl
e100bodi
ipxodi
netx (or vlm)
```

LBC8516 Configuration Guide

The *net.cfg* file can contain overrides for the speed and duplex mode, as well. An example file is shown:

```
LinkSupport
Protocol
    Bind E100BODI

LINK DRIVER E100BODI

Frame    Ether net_802.2
Pro to col  IPX E0 Ether net_802.2
; Frame    Ether net_802.3
; Pro to col  IPX 0 Ether net_802.3
; Frame    Ether net_II
; Pro to col  IPX 8137 Ether net_II
; Frame    Ether net_snap
; Pro to col  IPX 8137 Ether net_snap

PHYADDRESS = 0      ;In form the driver PHY is located at address 0.

;Speed = 100      ;Selects between 10Mbps/100Mbps line speed
                  ;Default is autodetection.

;FORCEDUPLEX = 2 ; 0 = autodetect 1=half-duplex 2=full duplex

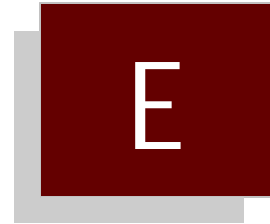
NetWare DOS Re requester

    FIRST NETWORK DRIVE = F
    NETWARE PROTOCOL = NDS BIND
    NAME CONTEXT = ".DTI"
```

NOTE: The E100BODI driver will re-isolate the PHY when the driver is unloaded. This will cause the E100BODI driver to fail later if it is re-loaded before the system is rebooted. A utility is provided called *unisolat.com* that will correct this problem, and can be called in a batch file before loading the ODI driver:

```
isl
unisolat
e100bodi
ipxodi
netx (or vlm)
```

The utility is unnecessary if the network drivers are never unloaded before rebooting, or the drivers are never re-loaded.



Ethernet Diagnostic Utility (82558TLK.EXE)

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

E.0 Introduction

The LBC8516 uses the Intel 82558 PCI Ethernet controller. The 82558TLK 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 82558.

E.1 Using 82558TLK

Command Line

The utility requires that the Ethernet must be enabled on the LBC8516. The utility will scan for the 82558 and display the SROM controller. If the 82558TLK utility is run on a system without an 82558 present, it will simply exit with the message: "Intel 82558 Ethernet Controller not found"

Likewise, the utility cannot run on a system with more than one 82558 present. If a PCI card on the bus also uses the 82558, then the utility will exit with the message: "More than one Intel 82558 Ethernet Controller is present. There can only be one Intel 82558 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 82558C to PCI bus x. In the case of the CPC8610, use 82558TLK /BUS0. Invoking the utility with this command line switch will force the utility to use the onboard 82558.

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 82558TLK 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 82558C and display results of this test. |
| 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.



VGA Driver Installation Guide

- F.0 Introduction
- F.1 CHIPS 69000 Drivers
- F.2 Windows 3.1, WFW 3.11
- F.3 Windows NT 3.51, 4.0
- F.4 Windows 95

F.0 Introduction

This appendix describes the operation and installation of the software drivers and utilities supplied on the CHIPS VGA driver Diskette that is shipped with your product.

The VGA controller is fully IBM VGA compatible. If you intend to use your VGA adapter in standard VGA modes only, you do not need to install any of the drivers from the Display Driver Diskettes.

F.1 CHIPS 69000 Drivers

The software drivers supplied on the CHIPS 69000 VGA Drivers diskette support the following operating systems:

- Windows 3.1, Windows for Workgroups 3.11
- Windows NT 3.51, 4.0
- Windows 95

F.2 Windows 3.1, WFW 3.11

These drivers are designed to work with Microsoft Windows 3.1 and WFW 3.11. You may install these drivers either through Windows or using the SETUP utility in DOS.

Driver Installation - Windows SETUP

1. Install Windows as you would normally for a VGA display. Run Windows to make sure that it is working properly.
2. Place the 69000 VGA Driver Diskette in drive A:. In Windows, from Program Manager, choose "File" from the menu, and choose "Run" from the pull-down menu. At the command prompt, enter "A:\WINDOWS". Press the ENTER key. At this point, the SETUP program determines where Windows is installed. For proper operation, the drivers must be installed in the Windows subdirectory. Press ENTER to complete the installation.

Changing Display Drivers from Windows

To change the display resolution, select "Windows Setup" icon from the "Main" window. You will be shown the current setup configuration. Select "Change Systems Settings" from the Option menu. Click on the arrow at the end of the "Display" line. You will be shown a list of display drivers. Click on the driver you want to select, then click on the OK button. Follow the directions to complete the setup.

Changing Display Drivers from DOS

Exit Windows, and run the SETUP utility from the Windows directory (e.g. C:\WINDOWS). The current setup configuration is shown. Use the up arrow on the keyboard to highlight the display driver, and press ENTER. You can now choose a driver from a menu, which will either install a driver from a floppy diskette, or use a driver already installed. Simply select the driver, and press ENTER. Select "Accept all entries" and press ENTER. It may be necessary to switch the display driver back to standard VGA if your monitor cannot support the higher resolutions or refresh rate.

F.3 Windows NT 3.51, 4.0

The drives on the 69000 VGA Drivers diskette can be installed during installation of NT or afterward. The procedure outlined installs the drivers afterward.

1. Select the "Display" icon from "Control Panels" under the "Main" window.
2. On the screen that selects the current resolutions, select "Change Driver". A menu will appear that allows you to select a new display driver. Select "OEM provided diskette". Put the 69000 VGA Drivers diskette in drive A:\WINNT_3.51" for NT v3.51 or "A:\WINNT_4.0" for NT v4.0.
3. After the drivers are copied to the hard drive, you must shut down and reboot to finish installation.

Changing Display Resolutions

Select the "Display" icon from "Control Panels" under the "Main" window. A screen appears that allows you to change the current resolution, colors, and refresh rates (if applicable). Be sure to test the resolution selected (use the "Test" button) to make sure the monitor supports the new resolution and refresh rate.

F.4 Windows 95

Perform the following steps to install the drivers for Windows 95, and configure the new drivers:

1. Select the "display" icon from "Control Panels".
2. On the Display Resolution screen, select "Change Driver".
3. Click on "Change VGA Driver". Click on "Have Diskette". Insert the 69000 VGA Drivers diskette into drive A:.
4. Enter a path of "A:\WIN_95". The drivers will be copied to the hard drive.
5. Click on "OK" to exit. You must shut down and reboot to finish installing.
6. The new drivers will boot in a default setting of 640x480x16 mode. When you change this from the "Display" icon under "Control Panels", test the new settings for compatibility with your monitor.