ILH-386V SBC User's Manual

For MCSI PART NO. 72900 ILH-386V
All-In-One Single Board Computers
For Industrial/Embedded Systems Applications

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PREFACE

This manual provides information about the MCSI ILH-386V All-In-One Single Board Computer. This information is intended for users who must implement IBM PC/AT compatible computer solutions to a wide variety of applications which cannot be satisfied using conventional desktop computers. This manual assumes that the reader has a good understanding of MS-DOS and the standard IBM PC/AT compatible architecture. For more information on the IBM PC compatible hardware and software architecture, refer to any of the many books available on the subject. A few suggestions are listed below:

- *Advanced MS-DOS Programming*, Microsoft Press
- *Programmers Guide to the IBM PC*, Microsoft Press
- *Programming the 80386*, Sybex
- *Undocumented DOS*, Addison Wesley

INVENTORY CHECKLIST

The complete ILH-386V All-In-One Single Board Computer package consists of the following:

ILH-386V All-In-One Single Board Computer
PROMDISK-Chip Software Utilities with ROM-DOS ver 6.22 (optional)
ILH-386V Software Utilities Diskette
This Manual

If any of the above is missing or appears to be damaged, inform MCSI immediately.

Table of Contents

SECTION 1 - INTRODUCTION

The ILH-386V All-In-One Single Board Computer (SBC) is a high performance system board that provides the primary elements for building an IBM PC / AT compatible computer for a wide variety of embedded systems applications. The ILH-386V SBC contains all the basic elements found in a standard IBM PC / AT compatible desktop computer system. The most outstanding features include: an on-board VGA display controller which supports most popular flat panel displays, a WatchDog timer, an optional PROMDISK-Chip™ Disk Emulator, and a compact half size form factor. The optional PROMDISK disk emulator comes complete with the ROM-DOS version 6.22 operating system, and emulates a bootable hard disk drive with capacities up to 32M-bytes. The WatchDog timer and PROMDISK-Chip make the board ideally suited for controlling critical processes where unattended operation is essential. The compact half size form factor makes it ideally suited for embedded applications.

The ILH-386V SBC is fully compatible with the IBM PC / AT (ISA Bus) which means virtually all the software written for the IBM PC / AT will run on the ILH-386V SBC.

The ILH-386V uses an 80C386SX mega cell, which is 100% compatible with the Intel 80C386SX microprocessor.

FEATURES

A complete list of features is listed below:

- IBM PC / AT Compatible Plug-in Computer
- Includes an Intel 80C386SX compatible microprocessor
- ALI Chip Set
- AMI Industry Standard BIOS
- 40MHz Operation
- Passive Backplane Architecture
- 32M-Byte DRAM System Memory (single sided SIMM)
- SVGA Controller with CRT / LCD Interface with 1M-byte Video Memory
- PS2 / AT Compatible Keyboard Port
- Four High Speed Serial Ports, COM1, COM2, COM3, COM4, or disabled
- RS-232, RS-422, or RS-485 Interface for Serial Port 3
- Enhanced Parallel Printer Port, LPT1, LPT2, or disabled
- DS12B887 Clock / Calendar with Battery Back-up
- PROMDISK-Chip Socket Supports up to 32MB PROMDISK-Chip Disk Emulator
- Infrared Data Access Port for future applications
- 1K-bit E^2Key Memory for Storing User Data
- Low Power CMOS Design
- 1 / 2 Size AT Plug-in Multilayer Board for Low EMI and High Reliability
- WatchDog Timer and Power Monitor
- Dual Floppy Disk Port Supports Two 3.5" or 5.25" Drives up to 2.88M-bytes
- IDE Hard Disk Port
- PC / 104 Compatible Interface Port
- On-board Mini Speaker
- On-board External Power Connector for Stand-alone Operation
- Optional External Reset
- Optional *Datalight* DOS 6.22 Operating System

SECTION 2 - SYSTEM DESCRIPTION

The following sections describe the major system features of the ILH-386V All-In-One Single Board Computer.

PROCESSOR

The ILH-386V SBC uses a high performance 40MHz, 386SX compatible microprocessor. The 386SX microprocessor is fully object code compatible with the 8086/8088, 80286, and 80386 family of products. Some of the distinctive features include:

- 16-bit External Data Bus
- 32-bit Internal Architecture
- 32M-byte Directly Addressable Memory Space
- Internal 14 Word by 16-bit Register Set
- Operand Addressing Modes
- Bit, Byte, Word, and String Operations
- 8 & 16-bit Signed/Unsigned Arithmetic
- Integrated Memory Manager

SYSTEM MEMORY (DRAM)

The ILH-386V SBC can support up to 32M-bytes of dynamic random access memory (DRAM) organized as one bank of 8Mx36 including parity bits. The memory is configured using one 72pin single in-line single-sided memory module socket (SIMM), which will accept SIMMs organized as 1MB, 2MB, 4MB, 8MB, 16MB, or 32MB with a maximum access time of 60ns.

DMA CONTROLLER

The ILH-386V SBC memory refresh and DMA functions are included in the System Controller chip which includes the equivalence of two 82C37 DMA controllers. The two DMA controllers are cascaded to provide four DMA channels for transfers to 8-bit peripherals (DMA1) and three channels for transfers to 16-bit peripherals (DMA2). DMA2 Channel 0 provides the cascade interconnection for the two DMA devices thereby maintaining IBM PC/AT compatibility. The DMA channel assignments are listed below:

DMA Channel 0: Not Used (8-bit)
DMA Channel 1: Not Used (8-bit)
DMA Channel 2: Floppy Disk (8-bit)
DMA Channel 3: Not Used (8-bit)
DMA Channel 5: Not Used (16-bit)
DMA Channel 6: Not Used (16-bit)
DMA Channel 7: Not Used (16-bit)

The DMA request (DRQx) and acknowledge (DACKx/) lines are available on the P1 98-pin edge connector.

INTERRUPT CONTROLLER

The ILH-386V SBC has the equivalence of two 82C59A interrupt controllers included in the System Controller chip. The controllers accept requests from peripherals, resolve priorities on pending interrupts and interrupts in service, interrupt the CPU, and provide the vector address of the interrupt service routine. The two interrupt controllers are cascaded in a fashion compatible with the IBM PC/AT. The interrupt priority and assignments are shown below in descending order of priority:

Highest	IOCHCK/	Parity Check (Non-maskable)
	IRQ0	System Timer (Not Available)
	IRQ1	Keyboard (Not Available)
	IRQ8	Real Time Clock (Not Available)
	IRQ9	S/W Redirect to INT 0AH (IRQ2)
	IRQ10	Serial Port 2
	IRQ11	Serial Port 1
	IRQ12	Not Used
	IRQ13	Co-processor (Not Available)
	IRQ14	Fixed Disk
	IRQ15	Not Used
	IRQ3	Serial Port 4
	IRQ4	Serial Port 3
	IRQ5	Parallel Port 2 (Not Used)
	IRQ6	Floppy Disk Controller
Lowest	IRQ7	Parallel Port 1

The interrupt request lines IRQx and IOCHCK/ are available on the 98-pin edge connector except as noted above.

TIMERS

The ILH-386V SBC has the equivalence of an 82C54 Programmable Timer included in the System Controller chip. The 82C54 is a three channel Programmable Counter/Timer chip. The three timers are driven by a 1.19MHz clock source derived from the on-board 14.31818MHz crystal oscillator. The three timers are used as follows:

TIMER Channel 0: System Timer
TIMER Channel 1: Timer for DRAM refresh
TIMER Channel 2: Tone Generation for Audio

CLOCK/CALENDAR AND CMOS RAM

The ILH-386V SBC uses a Dallas DS12B887 which is the equivalence of an MC146818 real time clock/calendar with 128 bytes of CMOS RAM. An internal lithium battery provides power to the RTC chip for at least ten years when the system power is off.

The 128 byte CMOS RAM consists of 14 bytes used by the clock/calendar, and 114 bytes used by the system BIOS.

Should your CMOS become corrupted, i.e. loss of battery power or accidentally clobbered, strange errors may occur while attempting to run your programs. Refer to Section 3.0 for instructions on resetting the initial SETUP values.

KEYBOARD

The ILH-386V SBC contains an IBM PC/AT compatible keyboard controller for interfacing to a generic IBM PC/AT compatible keyboard. The keyboard controller assembles the serial data from the keyboard into bytes and interrupts the CPU via IRQ1 after each byte is ready to be read. The IRQ1 service routine reads port 60H to get the keyboard scan code and acknowledges by sending a positive pulse to port 61H to clear the interrupt for the next byte. Refer to Appendix D for the keyboard connector location and pin assignments.

SPEAKER PORT

The ILH-386V SBC contains an on-board sub-miniature audio speaker to provide audio interface to the user. Because of the small size of the speaker, the sound output is much reduced over that of the standard speaker found in most desktop computers. A connector is provided to connect an external speaker if the sound output is not sufficient. Refer to Appendix D for the speaker port connector location and pin assignments.

RESET SWITCH

The ILH-386V SBC includes an on-board power detector and power on reset circuit to reset the computer after power is applied, and to hold the computer reset during low power, brown-out conditions. In addition, there are provisions for connecting an external, normally open, push button reset switch. Refer to Appendix D for the reset switch connector location and pin assignments.

PRINTER PORT

The ILH-386V SBC contains a multimode parallel port which has the equivalence an IBM PC/AT Parallel Printer Port. The multimode parallel printer port supports the PS/2 type bi-directional parallel port (SPP), the enhanced parallel port (EPP), and the extended capabilities port (ECP) parallel port modes. The port can be configured as a standard IBM PC/AT compatible LPT1, LPT2, or LPT3 printer port, or disabled completely using the CMOS SETUP utility. Refer to Appendix E for the printer configuration jumpers, and Appendix D for the connector location and pin assignments.

SERIAL PORTS

The ILH-386V SBC has the equivalence of four NC16C550 UARTs. The four UARTs can be configured as standard IBM PC/AT compatible serial ports or individually disabled using the CMOS SETUP utility in accordance with the table below:

SERIAL PORT CMOS CONFIGURATION SETTINGS

Serial Port	Connector	Address	Interrupt
1	CN17	3F8H, 2F8H, (3E8H), 2E8H	3, 4, 5, 9, 10, (11)
2	CN14	3F8H, 2F8H, 3E8H, (2E8H)	3, 4, 5, 9, (10), 11
3	CN1	(3F8H), 3E8H	3, (4)
4	CN21	(2F8H), 2E8H	(3), 4

() Denotes Default Setting

In addition, serial port three can be jumper selectable to operate in RS-232, RS-422, or RS-485 mode. The data rates are independently programmable up to 115.2K baud. The serial ports use an enhanced RS-232 interface chip which operates +5VDC only. Serial ports three and four provide 5V or 12V current on the RI signal for powering serial devices such as mouse or track ball. Refer to Appendix E

for the serial port configuration jumpers and Appendix D for the connector location and pin assignments.

FLOPPY DISK PORT

The ILH-386V SBC contains an IBM PC/AT compatible dual floppy disk port with the equivalence of an NEC PD72056B Floppy Disk Controller, an on-chip analog data separator, and an IBM PC/AT compatible floppy disk adapter bus interface circuit. The Floppy Disk Port can be disabled using the CMOS SETUP Utility. An on-board three section analog filter provides optimum performance with the following disk drive types:

5.25"	360K Double-Sided
3.5"	720K High Capacity
5.25"	1.2M High Capacity
3.5"	1.44M High Density
3.5"	2.88M High Density

Refer to Appendix D for the connector location and pin assignments.

IDE HARD DISK PORT

The ILH-386V SBC contains an Integrated Drive Electronics (IDE) Port which directly interfaces to hard disk drives with embedded controllers. The IDE Port can be configured using the CMOS SETUP Utility. Refer to Appendix D for the connector location and pin assignments.

VGA DISPLAY PORT

The ILH-386V SBC includes an HMC HM86508 VGA CRT display and flat panel controller. The VGA display port is fully compatible with IBM VGA, EGA, CGA, and MDA display adapters, and provides improved performance and additional functionality. The board includes 1M-bytes of high speed video memory. The VGA display controller supports the following display resolutions:

1024x768 256 Colors (1M VRAM)
1280x1024 16 Colors (1M VRAM)

The VGA controller is designed to support most popular flat panel displays and can provide simultaneous operation for most CRT/flat panel configurations. Since the timing and interface requirements differ radically for each type of flat panel display, the VGA control BIOS must be customized specifically to meet the requirements of the individual display. The supported flat panel displays and their applicable BIOSs are listed in Appendix G.

WATCHDOG TIMER

The ILH-386V SBC includes a WatchDog Timer circuit. The WatchDog Timer ensures that if an application program gets "lost or bombs", the system will reset or a non-maskable interrupt will be issued to the CPU. The WatchDog Timer is enabled by reading I/O port 443H. Once enabled, the WatchDog Timer must be triggered by reading I/O port 443H within the time out period, otherwise the WatchDog Timer will force a hardware reset or activate the IOCHCK/ line, generating a non-maskable interrupt. The WatchDog Timer can be disabled by reading I/O port 43H. A jumper is provided to select the time out period and to enable the WatchDog Timer circuit. The time out period can be set at 1, 2, 10, 20, 110, or 220 seconds. Refer to Appendix E for the configuration jumpers.

OPTIONAL PROMDISK-CHIP DISK EMULATOR

The ILH-386V includes a 32-pin socket designed to accept the MCSI PROMDISK-Chip. The PROMDISK-Chip Disk Emulator is a unique Flash Memory array which emulates a bootable Read/Write hard disk drive. The PROMDISK-Chip is offered in 4MB, 8MB, 16M, and 32MB byte capacities and comes complete with ROM-DOS version 6.22 installed. The PROMDISK-Chip occupies a 4K block of memory space above 640K, whose starting address is selected by jumper JP19. The PROMDISK-Chip uses the Datalight FlashFX® integrated Flash File System and boot utilities. For jumper locations refer to Appendx E.

The CardTrick FlashFX File System and ROM-DOS allow the PROMDISK-Chip to operate as a non-volatile Read/Write disk drive. This means that you can list directories, copy files, and read and write to the Flash memory on PROMDISK-Chip through standard DOS interrupts and commands.

E^2 KEY 1K-BIT USER EEPROM

The ILH-386V SBC includes the E^2 Key 1K-bit electrically erasable memory. This memory is useful for storing user data such as password, terminal address, configuration parameters, etc. The memory is configured as 64 words, which can be accessed a word at a time, and uses the parallel port for the hardware interface. Software utilities are provided on our WebSite which include a demo program, and two C library functions for integrating into your application program.

PC/104 COMPATIBLE INTERFACE PORT

The ILH-386V SBC includes a PC/104 compatible interface port. The PC/104 interface port allows the ILH-386V board to operate in a standalone configuration, which makes it ideal for embedded applications. The PC/104 standard offers total hardware and software compatibility with the PC/ISA bus architecture using ultra small stackable modules. Consult factory for available modules.

IRDA INFRARED INTERFACE PORT

The ILH-386V SBC contains a built in IrDA infrared interface port which supports Serial Infrared (SIR) or Amplitude Shift Keyed IR (ASKIR) interfaces. The IrDA port is addressed as COM2 and must be setup in the BIOS' Integrated Peripheral Setup. When the IrDA port is enabled, the standard COM2 serial port is disabled.

SECTION 3 - SETUP

The ILH-386V SBC uses an AMI BIOS which contains an internal Setup Utility for configuring the system. The system configuration settings are stored in the on-board CMOS memory, which is backed up by a Lithium battery. Should your CMOS become corrupted, i.e. loss of battery power or accidentally clobbered, strange errors may occur while attempting to run your programs. A jumper at JP13 has been provided to force the BIOS to use its internal default SETUP values. This is accomplished by first removing power from the ILH-386V and momentarily interrupting the battery power to the system controller chip. To interrupt the battery power, momentarily install JP13. After waiting a few seconds, remove JP13. **Note: on boards containing a Dallas DS12B887 real time clock chip, this procedure must be performed with the power on. Refer to Appendix E for the jumper location.**

The Setup Utility can be invoked by first causing a cold boot (reset) or a warm boot (**Cntrl Alt Del)** and pressing the **Del** key when instructed. This will cause the memory diagnostics to be aborted and the Setup Utility to display the MAIN SETUP MENU. Using the ↑↓ cursor keys, move the highlighted bar to the option you wish to modify and then press **Enter** to select it. When in the MAIN SETUP MENU, the **F2** and **F3** keys are used to select the colors used in the setup screens, and the **F10** key is used to save the changes before exiting the Setup Utility. The **Esc** key may be used to exit the Setup Utility without saving the changes. The **PgUp** and **PgDn** keys are used to scroll through the selections for a given setting. **PgUp** is also used to decrease the setting and **PgDn** to increase the setting.

After making the desired selections from the various setup menus press the **Esc** key to exit the current menu. You save your selections by pressing the **F10** key or by selecting the appropriate selection from the MAIN SETUP MENU.

Notes:

1. The user should be aware that improper selection of certain values in the ADVANCED SETUP UTILITY may cause unpredictable results. If this occurs select the AUTO CONFIGURATION WITH FAILSAFE SETTINGS from the MAIN SETUP MENU.

2. If your system does not require a keyboard or display be sure to set the "Primary Display" and "Keyboard" to **Absent.**

3. In order to change the interrupt settings for the serial ports, you must first select the AUTO CONFIGURATION WITH OPTIMAL SETTINGS from the MAIN SETUP MENU. Then proceed to the PERIPHERAL SETUP MENU to change the settings.

SECTION 4 - USING THE PROMDISK-CHIP DISK EMULATOR

The PROMDISK-Chip Disk Emulator operates as a Read/Write fixed disk drive. The paragraphs that follow describe how to use the optional PROMDISK-Chip.

USING ROM-DOS AND OTHER DISK OPERATING SYSTEMS

The PROMDISK-Chip has been preconfigured at the factory with the latest version of the Datalight ROM-DOS disk operating system. In addition, a current copy of the operating system is supplied on a floppy diskette.

If the operating system is accidentally erased from the PROMDISK-Chip it may be restored using the SYS command. The DOS format utility should not be used to restore the operating system.

To change the operating system version or type you should simply use the equivalent DOS SYS command to transfer the operating system.

PROMDISK LOW LEVEL FORMAT

The Flash memory contained on the PROMDISK-Chip board was initialized with the Datalight CardTrick low level format at the factory. During normal operation the Flash memory should never require reformatting unless there is a serious hardware or software malfunction. In the event it has been determined that the low level format is corrupted, proceed as follows:

1. At the DOS prompt, run the PROMDISK-Chip low level format utility PDCFMT.EXE located on the distribution diskette in the PDCHIP3 subdirectory.
2. Install a bootable floppy diskette in drive A and boot the system.
3. At the DOS prompt type SYS C: to transfer a bootable copy of DOS to PROMDISK-Chip.
4. Remove the floppy diskette from drive A: and reboot the system from PROMDISK-Chip.

CAUTION: Do Not use the DOS Fdisk utilities on the PROMDISK-Chip.

SECTION 5 - INSTALLATION

This section describes the procedures for installing the ILH-386V All-In-One Single Board Computer into your system. The following is a list of typical peripherals required to build a minimum system:

- Passive Backplane and Power Supply
- IBM PC/AT Type Keyboard
- Display Monitor
- Floppy or Hard Disk with MS-DOS or PROMDISK Disk Emulator

INSTALLING THE SIMM

When installing or removing the DRAM SIMM, be sure to first touch a grounded surface to discharge any static electricity from your body. Use the following procedure to install the SIMMs:

1. Insert the first SIMM edge connector at a slight angle into the SIMM socket. Note that the SIMM is keyed and will only go in one way.

2. Push the SIMM back into the connector carefully until it snaps into place.

3. Check to make sure the SIMM is inserted securely.

To remove the SIMM, use a small screw driver to pull back the holding clip on each side of the SIMM and lift the SIMM from the connector.

INSTALLING THE PROMDISK-CHIP

When installing or removing the PROMDISK-Chip, be sure to first touch a grounded surface to discharge any static electricity from your body. Use the following procedure to install the PROMDISK-Chip:

1. Align pin one (white dot or square pad) on the PROMDISK-Chip with pin one of the PROMDISK-Chip socket on the CPU board.

2. Push the PROMDISK-Chip into the socket carefully until it is fully seated.

3. Check to make sure the PROMDISK-Chip is installed securely, and there are no bent pins. **CAUTION: The PROMDISK-Chip will be permanently damaged if installed incorrectly!**

To remove the PROMDISK-Chip, insert a small screwdriver between the PROMDISK-Chip and the socket and gently pry around the edge until the PROMDISK-Chip is released from the socket.

INSTALLING PC/104 MODULES

The ILH-386V boards contain the full PC/104 expansion bus at female connectors CN9 and CN10. The PC/104 expansion module can be plugged directly into the female connectors CN9 & CN10 on the ILH-386V CPU board.

COMPLETING THE INSTALLATION

To complete the installation, the following steps should be followed:

1. Set the configuration jumpers in accordance with Appendix E.

2. Install the ILH-386V SBC into one of the 98-pin I/O slots in a passive backplane.

3. Connect the applicable I/O cables and peripherals, i.e. floppy disk, IDE hard disk, monitor, keyboard, power supply, etc.

4. Connect an IBM PC compatible keyboard.

5. Turn power on to the display monitor.

6. Turn power on to the backplane power supply.

7. After the BIOS sign-on message is displayed, press the **Del** key to enter the Setup Utility.

8. Reconfigure the ILH-386V CMOS using the internal SETUP.

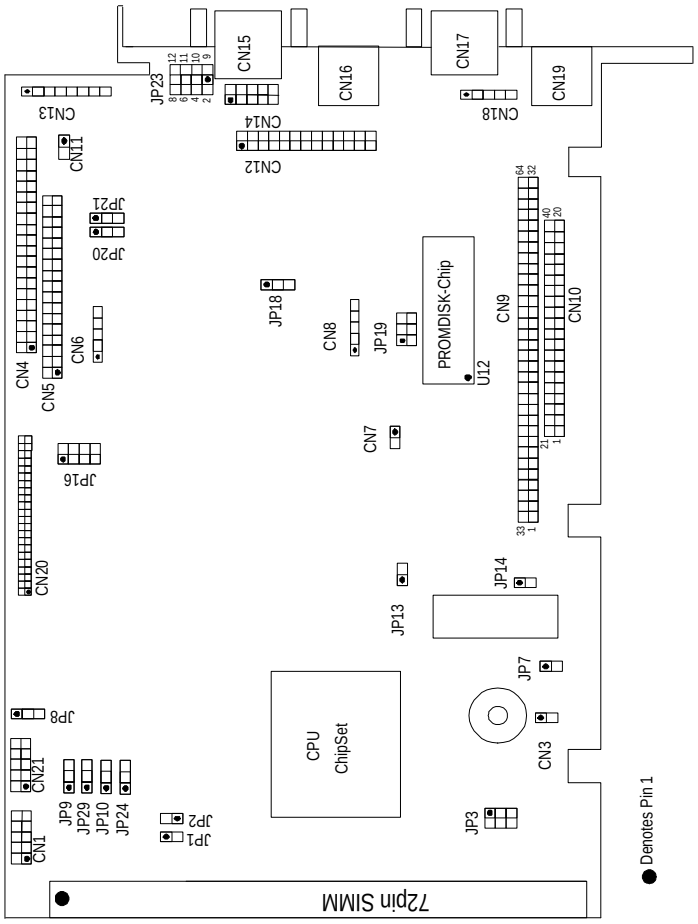
9. Boot the system.

APPENDIX A - SPECIFICATIONS

This appendix lists the specifications for the ILH-386V All-In-One Single Board Computer.

CPU:	Includes Intel compatible 80C386SX (40MHz)
Memory:	System Memory Expandable to 32M-bytes (1-72pin single-sided SIMM Socket)
BIOS:	AMI with Internal SETUP and ROM defaults
Clock / Cal:	PC / AT Compatible with battery back-up
PC / 104 Bus:	PC / 104 Expansion bus (64-pin CN9 & 40-pin CN10 Header / Connectors)
I / O Bus:	IBM PC / AT Compatible 98-pin Edge Connector
DMA:	7 Channels (4 8-bit & 3 16-bit)
Timers:	3 Programmable
Interrupts:	16
Reset:	Controlled by on-board power detector with provisions for external reset switch CN7
I / O Ports:	3 -RS-232 Serial Ports: Port 1 at rear connector CN17, and Ports 2 & 4 at header / connector CN14 & CN21 respectively. 1 - RS-232 / 422 / 485 Serial Port 3 at connector / header CN1 1 - Parallel Printer Port at connector CN12 1 - PS2 Keyboard Port at header CN18 and at rear PS2 type connector CN19 1 - PS2 Mouse Port at header CN16 1 - On-board Speaker with Speaker Port at header CN3 1 - Dual 3.5" / 5.25" Floppy Disk Port at connector CN5 1 - IDE Hard Disk Port at connector CN4 1 - WatchDog Timer 1 - External Power Connector CN13 1 - IrDA Infrared Data Port at connector CN6
Video Port:	1 - VGA Video Port at rear connector CN15 1- Flat Panel / LCD Port at Connector CN20 Chipset: HMC HM86508 VRAM: 1M-byte Resolution: CRT: 1024x768 256 Colors, LCD / TFT / STN: 800x600
PROMDISK Port:	1- 32pin socket supports MCSI 4M, 8M, 16M, or 32M PROMDISK-Chip
Speed:	8-40MHz
Battery:	Lithium for Clock / Calendar & CMOS RAM (ten years typical)
Benchmark:	LANDMARK v2.0 = 31MHz
Size:	1 / 2 Size AT board 7.08"L X 4.8"H
Weight:	12 Oz.
Power:	+5VDC @ 1.5A

APPENDIX B - BOARD OUTLINE



APPENDIX C - MEMORY AND I/O MAPS

The following is the memory map for the ILH-386V SBC. The addresses are fully PC/AT compatible, unless otherwise specified.

ILH-386V SBC Memory Map

Address	Used For	Size
00000H - 003FFH	Interrupt Vectors	1.0K
00400H - 005FFH	BIOS Values	0.5K
00600H - 9FFFFH	User RAM (DOS)	638.5K
A0000H - AFFFFH	Reserved for EGA*	64.0K
B0000H - B7FFFH	Video RAM (MDA)*	32.0K
B8000H - BFFFFH	Video RAM (CGA)*	32.0K
C0000H - C3FFFH	Video BIOS*	16.0K
C4000H - C7FFFH	EMS Window	16.0K
C8000H - DFFFFH	ROM Scan Devices*	96.0K
E0000H - EFFFFH	BIOS Extensions	64.0K
F0000H - FFFFFH	BIOS	64.0K
100000H - 1FFFFFFH	User Memory	32.0M

External to the ILH-386V

The following is the I/O map for the ILH-**386V** SBC. I/O addresses are fully PC/AT compatible, unless otherwise specified.

ILH-386V SBC I/O Map

Address	Function
000H - 01FH	DMA Controller #1
020H - 021H	Interrupt Controller #1
022H - 023H	Configuration Address Register
040H - 05FH	System Timers
060H - 063H	Keyboard, Status, & System Control
070H - 07FH	Clock/Calendar & CMOS Ram Access
080H - 083H	DMA Page Register
0A0H - 0BFH	Interrupt Controller #2
0C0H - 0DFH	DMA Controller #2
0F0H	Clear Math Co-processor Busy
0F1H	Reset Math Co-processor
108H - 109H	I/O Controller Configuration Registers
1F0H - 1F8H	IDE Hard Disk
278H - 27FH	Parallel Printer Port LPT2
2E8H - 2EFH	Serial Port COM4
2F8H - 2FFH	Serial Port COM2
378H - 37FH	Parallel Printer Port LPT1
3E8H - 3EFH	Serial Port COM3
3F0H - 3F7H	Floppy Disk Controller
3F8H - 3FFH	Serial Port COM1
043H	Disable WatchDog Timer
443H	Enable WatchDog Timer

APPENDIX D - CONNECTORS

CN5 Floppy Disk Port Connector

Pin	Signal Name
2	RPMLC
4	Not Used
6	Not Used
8	INDEX/
10	MOTOR0/
12	DRIVE SELECT1/
14	DRIVE SELECT0/
16	MOTOR1/
18	DIRECTION/
20	STEP/
22	WRITE DATA/
24	WRITE GATE/
26	TRACK0/
28	WRITE PROTECT/
30	READ DATA/
32	HEAD SELECT/
34	DISK CHANGE/

All odd numbered pins are GND

CN4 IDE Hard Disk Port Connector

Pin	Signal	Pin	Signal
1	IDERST/	2	GND
3	IDED7	4	IDED8
5	IDED6	6	IDED9
7	IDED5	8	IDED10
9	IDED4	10	IDED11
11	IDED3	12	IDED12
13	IDED2	14	IDED13
15	IDED1	16	IDED14
17	IDED0	18	IDED15
19	GND	20	Not Used
21	Not Used	22	GND
23	IDEIOW/	24	GND
25	IDEIOR/	26	GND
27	Not Used	28	IDEALE
29	Not Used	30	GND
31	IRQ14	32	IOCS16/
33	IDESA1	34	Not Used
35	IDESA0	36	IDESA2
37	HDCS0/	38	HDCS1/
39	IDEACT/	40	GND

CN12 Printer Interface Connector

Pin	Signal	Pin	Signal
1	STROBE/	14	AUTOFD/
2	PDAT0	15	ERROR/
3	PDAT1	16	INIT/
4	PDAT2	17	SLCTIN/
5	PDAT3	18	GND
6	PDAT4	19	GND
7	PDAT5	20	GND

CN12 Printer Interface Connector (continued)

Pin	Signal	Pin	Signal
8	PDAT6	21	GND
9	PDAT7	22	GND
10	ACK/	23	GND
11	BUSY	24	GND
12	PE	25	GND
13	SLCT	26	GND

CN13 Auxiliary Power Connector

Pin	Signal Name
1	+5VDC
2	+12VDC
3	-12VDC
4	GND
5	GND
6	-5VDC
7	+12VDC
8	+5VDC

CN18 Keyboard Header/Connector

Pin	Signal
1	KBCLK
2	KBDATA
3	N/C
4	GND
5	+5VDC

CN19 Keyboard Connector (PS2 type)

Pin	Signal
1	KBDATA
2	N/C
3	GND
4	+5VDC
5	KBCLOCK
6	N/C

CN17 Serial Port #1 Connector

Pin	Signal Name
1	CARRIER DETECT
2	RECEIVE DATA
3	TRANSMIT DATA
4	DATA TERMINAL READY
5	GND
6	DATA SET READY
7	REQUEST TO SEND
8	CLEAR TO SEND
9	RING INDICATOR

CN14 Serial Port #2 Connector

Pin	Signal Name
1	CARRIER DETECT
2	RECEIVE DATA
3	TRANSMIT DATA
4	DATA TERMINAL READY
5	GND
6	DATA SET READY
7	REQUEST TO SEND
8	CLEAR TO SEND
9	RING INDICATOR
10	N/C

CN1 Serial Port 3 Connector

Pin	Signal Name
1	CARRIER DETECT (TX-)
2	RECEIVE DATA (TX+)
3	TRANSMIT DATA
4	DATA TERMINAL READY
5	GND
6	DATA SET READY (RX+)
7	REQUEST TO SEND (RX-)
8	CLEAR TO SEND
9	RING INDICATOR (5V or 12V)
10	N/C

Signal in () refer to RS-422/485 Configuration

CN21 Serial Port 4 Connector

Pin	Signal Name
1	CARRIER DETECT
2	RECEIVE DATA
3	TRANSMIT DATA
4	DATA TERMINAL READY
5	GND
6	DATA SET READY
7	REQUEST TO SEND
8	CLEAR TO SEND
9	RING INDICATOR (5V or 12V)
10	N/C

CN7 Reset Header/Connector

Pin	Signal Name	Description
1	RESET/	Connect to switch, ground this pin to reset
2	GND	Ground

CN11 IDE LED Header/Connector

Pin	Signal Name	Description
1	+5VDC	Connect to IDE LED anode (+)
2	IDE LED	Connect to IDE LED cathode (-)

CN8 Keylock Header/Connector

Pin	Signal Name	Description
1	LED POWER (+)	Connect to anode of power LED
2	N/C (Key)	N/C (Key)
3	GND	Connect to cathode of power LED
4	KB LOCK/	Connect to ground to inhibit keyboard
5	GND	Ground

CN3 Speaker Port Header/Connector

Pin	Signal Name	Description
1	GND	Connect to Speaker (-)
2	SPEAKER	Connect to Speaker (+)

CN9 PC/104 Interface Connector

Pin	Signal	Pin	Signal
A1 (1)	IOCHK/	B1 (33)	GND
A2 (2)	SD7	B2 (34)	RESET
A3 (3)	SD6	B3 (35)	+5VDC
A4 (4)	SD5	B4 (36)	IRQ9
A5 (5)	SD4	B5 (37)	-5VDC
A6 (6)	SD3	B6 (38)	DRQ2
A7 (7)	SD2	B7 (39)	-12VDC
A8 (8)	SD1	B8 (40)	
A9 (9)	SD0	B9 (41)	+12VDC
A10 (10)	IOCHRDY	B10 (42)	(KEYWAY)
A11 (11)	AEN	B11 (43)	SMEMW/
A12 (12)	SA19	B12 (44)	SMEMR/
A13 (13)	SA18	B13 (45)	IOW/
A14 (14)	SA17	B14 (46)	IOR/
A15 (15)	SA16	B15 (47)	DACK3/
A16 (16)	SA15	B16 (48)	DRQ3
A17 (17)	SA14	B17 (49)	DACK1/
A18 (18)	SA13	B18 (50)	DRQ1
A19 (19)	SA12	B19 (51)	REFRESH
A20 (20)	SA11	B20 (52)	SYSCLK
A21 (21)	SA10	B21 (53)	IRQ7
A22 (22)	SA9	B22 (54)	IRQ6
A23 (23)	SA8	B23 (55)	IRQ5
A24 (24)	SA7	B24 (56)	IRQ4
A25 (25)	SA6	B25 (57)	IRQ3
A26 (26)	SA5	B26 (58)	DACK2/
A27 (27)	SA4	B27 (59)	TC
A28 (28)	SA3	B28 (60)	BALE
A29 (29)	SA2	B29 (61)	+5VDC
A30 (30)	SA1	B30 (62)	OSC
A31 (31)	SA0	B31 (63)	GND
A32 (32)	GND	B32 (64)	GND

() Denotes PCB connector

CN10 PC/104 Interface Connector

Pin	Signal	Pin	Signal
C0 (21)	GND	D0 (1)	GND
C1 (22)	SBHE/	D1 (2)	MEMCS16/
C2 (23)	LA23	D2 (3)	IOCS16/
C3 (24)	LA22	D3 (4)	IRQ10
C4 (25)	LA21	D4 (5)	IRQ11
C5 (26)	LA20	D5 (6)	IRQ12
C6 (27)	LA19	D6 (7)	IRQ15
C7 (28)	LA18	D7 (8)	IRQ14
C8 (29)	LA17	D8 (9)	DACK0/
C9 (30)	MEMR/	D9 (10)	DRQ0
C10 (31)	MEMW/	D10 (11)	DACK5/
C11 (32)	SD8	D11 (12)	DRQ5
C12 (33)	SD9	D12 (13)	DACK6/
C13 (34)	SD10	D13 (14)	DRQ6
C14 (35)	SD11	D14 (15)	DACK7/
C15 (36)	SD12	D15 (16)	DRQ7
C16 (37)	SD13	D16 (17)	+5VDC
C17 (38)	SD14	D17 (18)	MASTER/
C18 (39)	SD15	D18 (19)	GND
C19 (40)	(KEYWAY)	D19 (20)	GND

() Denotes PCB connector

CN6 IrDA Data Port Connector

Pin	Signal Name	Description
1	+5V	Connect to anode of power LED
2	N/C	No Connection
3	IR-RX	Infrared Receive Data
4	GND	Ground
5	IR-TX	Infrared Transmit Data

CN20 LCD Interface Connector

Pin	Signal	Pin	Signal
1	+12V	2	+12V
3	GND	4	GND
5	+5V	6	+5V
7	FPVEE	8	GND
9	P0	10	P1
11	P2	12	P3
13	P4	14	P5
15	P6	16	P7
17	P8	18	P9
19	P10	20	P11
21	P12	22	P13
23	P14	24	P15
25	P16	26	P17
27	P18	28	P19
29	P20	30	P21
31	P22	32	P23
33	GND	34	GND
35	SHFCLK	36	FLM
37	M	38	LP
39	GND	40	ENABLK
41	GND	42	N/C
43	FPVDD	44	+5V

CN15 VGA Display Connector (15-pin Sub-D)

Pin	Signal	Pin	Signal
1	RED	2	GREEN
3	BLUE	4	N/C
5	GND	6	GND
7	GND	8	GND
9	N/C	10	GND
11	N/C	12	DDCDAT
13	HSYNC	14	VSYNC
15	DDCCLK		

CN16 PS2 Mouse Connector

Pin	Signal
1	MDATA
2	N/C
3	GND
4	+5VDC
5	MCLOCK
6	N/C

APPENDIX E - CONFIGURATION JUMPERS

JP3 CPU Speed Setting

CPU Speed	1-2	3-4	5-6
8MHz	OFF	ON	ON
16MHz	ON	OFF	ON
20MHz	OFF	OFF	ON
25MHz	ON	ON	OFF
40MHz	ON	OFF	OFF

JP1 & JP2 DRAM Selection Jumpers

Time	JP1	JP2
On-Board*	ON	ON
72pin SIMM	OFF	OFF

Custom Option

JP18 WatchDog Timer Control Jumper

2-3	RESET when time out occurs. (Default)
1-2	NMI (IOCHRDY) when time out occurs.
OFF	Disable

JP16 WatchDog Timer Time-out Period Jumper

Time	1-2	3-4	5-6	7-8
1 second	OFF	OFF	ON	OFF
2 seconds	OFF	OFF	ON	ON
10 seconds	OFF	ON	OFF	OFF
20 seconds	OFF	ON	OFF	ON
110 seconds	ON	OFF	OFF	OFF
220 seconds	ON	OFF	OFF	ON

JP19 PROMDISK-Chip Address Selection Jumper

Address	1-2	3-4	5-6
CE000H	ON	OFF	OFF
D6000H	OFF	ON	OFF
DE000H	OFF	OFF	ON

JP13 Clear CMOS Jumper

OFF	Normal Operation (Default)
ON	Clear CMOS Setup

JP24 BIOS Programming Jumper

2-3	5V Vpp
1-2	12V Vpp

JP20, JP21, & JP23 Serial Port 3 Interface Selection Jumper

Mode	JP20	JP21	JP23
RS-232	2-3	OPEN	1-9 3-10 5-11 7-12
RS-422	1-2	2-3	1-2 3-4 5-6 7-8
RS-485	1-2	1-2	1-2 3-4 5-6 7-8

JP9 & JP29 Serial Port 3 RI Selection Jumper

Function	JP9	JP29
RI Signal	2-3	1-2
5V	1-2	1-2
12V	1-2	2-3

JP8 & JP10 Serial Port 4 RI Selection Jumper

Function	JP8	JP10
RI Signal	2-3	1-2
5V	1-2	1-2
12V	1-2	2-3

APPENDIX F - BIOS ERROR BEEP CODES

During the POST (Power On Self Test) routines, which are performed each time the system is powered on, errors may occur.

Nonfatal errors are those which, in most cases, allow the system to continue the boot up process. The error messages normally appear on the screen.

Fatal errors are those which will not allow the system to continue the boot-up procedure. If a fatal error occurs, you should consult with MCSI Customer Service for possible repairs.

These fatal errors are communicated through a series of audible beeps. The numbers on the fatal error list below correspond to the number of beeps for the corresponding error. All errors listed, with the exception of number eight, are fatal errors.

No. of Beeps	Error Message
1	**Refresh Failure** - The memory refresh circuitry is faulty.
2	**Parity Error** - A parity error was detected in the first 64K block of system memory.
3	**Base 64KB Memory Failure** - A memory failure occurred within the first 64KB of memory.
4	**Timer Not Operational** - Timer #1 has failed to function properly.
5	**Processor Error** - The CPU chip has generated an error.
6	**8042-Gate A20 Failure** - The keyboard controller (8042) contains the Gate A20 switch which allows the CPU to operate in virtual mode. This error message means that the BlOS is not able to switch the CPU into protected mode.
7	**Processor Exception lnterrupt Error** - The CPU chip has generated an exception interrupt.
8	**Display Memory Read /Write Error** - The video adapter is either missing or the video memory is faulty. PLEASE NOTE: This is not a fatal error.
9	**ROM Checksum Error** - The ROM checksum value does not match the value encoded in the BIOS.
10	**CMOS Shutdown Register Read/Write Error** - The shutdown register for the CMOS memory has failed.

APPENDIX G - LIST OF FLAT PANELS SUPPORTED

The ILH-386V CPU has been tested with the following flat panel displays. Since the timing and interface requirements are different for each display type and manafacturer, the BIOS chip must be reprogrammed with the applicable BIOS file, located on the distribution diskette, as shown in the table below:

Manufacturer	Part Number	BIOS File	Description
Casio	MD650TS00-01	MLCD.ROM	Mono DSTN 640x480
Hitachi	LMG5160XUFC	MLCD.ROM	Mono DSTN 640x480
Hitachi	TX26D60/TX24D55	TFT_S1.ROM	TFT 640x480-SYNC (16bit)
Hitachi	TX26D60/TX24D55	TFT_S2.ROM	TFT 640x480-SYNC (18/24 bit)
Hosiden	HLM6667	MLCD.ROM	Mono DSTN 640x480
NEC	NL8060AC26-04(5)	TFT86_S1.ROM	TFT 800x600-SYNC (16 bit)
NEC	NL8060AC26-04(5)	TFT86_S2.ROM	TFT 800x600-SYNC (18/24 bit)
NEC	NL8060BC31-02	TFT86_S1.ROM	TFT 800x600-SYNC (16 bit)
NEC	NL8060BC31-02	TFT86_S2.ROM	TFT 800x600-SYNC (18/24 bit)
Optrex	DMF-50260NFU-FW-8	MLCD.ROM	Mono DSTN 640x480
Panasonic	S817	PLASMA.ROM	PLASMA 640x480
Planar	EL640.480-A	EL.ROM	EL 640x480
Sanyo	LCM-5331-22NTK	DSTN.ROM	Color DSTN 640x480
Sharp	LM64C35P	DSTN.ROM	Color DSTN 640x480
Sharp	LQ10D321	TFT_S1.ROM	TFT 640x480-SYNC (16 bit)
Sharp	LQ10D321	TFT_S2.ROM	TFT 640x480-SYNC (18/24 bit)
Toshiba	LTM09C015A	TFT_LP1.ROM	TFT 640x480-LP (16 bit)
Toshiba	LTM09C015A	TFT_LP2.ROM	TFT 640x480-LP (16/24 bit)
Toshiba	LTM09C015A	TFT_S1.ROM	TFT 640x480-SYNC (16 bit)
Toshiba	LTM09C015A	TFT_S2.ROM	TFT 640x480-SYNC (18/24 bit)

The flash chip can be programmed on-board using the FLASH634.COM utility.

Example: To program the BIOS with the MLCD.ROM file, at the DOS prompt type:

```
flash634 mlcd.rom
```

When the program is finished reboot the system.

Note: The default BIOS for ILH-386V CPU is the DSTN.ROM