

User's Manual
for the
IRV-686E Single Board Computer with VGA & Ethernet

MCSI PART NO. 88500 IRV-686E
All-In-One Single Board Computers
For Industrial/Embedded Systems Applications

MICRO COMPUTER SPECIALISTS, INC.
"The Embedded PC Specialists"
2598 Fortune Way
Vista, CA 92083
U.S.A.

Voice (760) 598-2177 - Fax (760) 598-2450
email: mcsi@mcsi1.com

Revised April 6, 1999
Revision 1.1

Changes are made periodically to the information contained herein; these changes will be incorporated into new editions of this document.

Requests for copies of this publication or the product(s) which it describes should be made to MCSI.

While every effort has been made to insure that this document and its accompanying product(s) are free from defects, MCSI, its distributors, representatives, and employees shall not be responsible for any loss of profit or any other commercial damage including, but not limited to, special, incidental, consequential, or other damages occasioned by the use of this product(s).

In the event of defect the buyer's sole recourse is to receive a refund or replacement unit at MCSI's discretion if notified within the time period covered by the product warranty.

©1998 MCSI Micro Computer Specialists, Inc. All Rights Reserved.
Pentium is a registered trademark of Intel Corporation
IBM is a registered trademark of International Business Machines Corporation.
PC/XT & PC/AT are registered trademarks of International Business Machines Corporation
MS-DOS is a registered trademark of Microsoft Corporation.
All other trademarks are the properties of their respective holders.

PREFACE

This manual provides information about the MCSI IRV-686E 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 IRV-686E All-In-One Single Board Computer package consists of the following:

IRV-686E All-In-One Single Board Computer
PROMDISK-Chip Software Utilities with ROM-DOS ver 6.22 (optional)
VGA and E²Key Software Utilities
This Manual

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

Table of Contents

| | |
|---|----|
| Section 1 - Introduction | 1 |
| Features | 1 |
| Section 2 - System Description | 2 |
| Processor | 2 |
| System Memory (SDRAM) | 2 |
| Cache Memory | 2 |
| DMA Controller | 2 |
| Interrupt Controller | 3 |
| Timers | 4 |
| Clock/Calendar and CMOS RAM | 4 |
| Keyboard Port | 4 |
| Mouse Port | 4 |
| Speaker Port | 4 |
| Reset Switch | 4 |
| Printer Port | 5 |
| Serial Ports | 5 |
| Floppy Disk Port | 5 |
| EIDE Hard Disk Port | 5 |
| VGA Display Port | 5 |
| WatchDog Timer | 5 |
| Optional PROMDISK-Chip Disk Emulator | 6 |
| High Speed PCI Expansion Bus | 6 |
| Ethernet Port | 6 |
| Universal Serial Bus Port | 6 |
| IrDA Infrared Interface Port | 6 |
| Flash EPROM BIOS | 6 |
| E ² Key 1K-bit User EEPROM | 7 |
| ATX Power Supply Features | 7 |
| Section 3 - Setup | 8 |
| Section 4 - Using the PROMDISK-Chip Disk Emulator | 9 |
| Using ROM-DOS and Other Disk Operating Systems | 9 |
| PROMDISK Low Level Format | 9 |
| Section 5 - Installation | 10 |
| Installing the DIMMs | 10 |
| Installing the CPU | 10 |
| Installing the PROMDISK-Chip | 10 |
| Completing the Installation | 11 |
| Appendix A - Specifications | 12 |
| Appendix B - Board Outline | 13 |
| Appendix C - Memory and I/O Maps | 14 |
| Appendix D - Connectors | 15 |
| Appendix E - Configuration Jumpers | 20 |
| Appendix F - BIOS Error Beep Codes | 23 |

SECTION 1 - INTRODUCTION

The MCSI IRV-686E Pentium/MMX All-In-One Single Board Computer (SBC) contains all the basic elements found in a high-performance IBM PC/AT compatible desktop computer system plus some unique features which make it ideally suited for industrial applications. The most outstanding features include: An optional 32MB PROMDISK-Chip™ Disk Emulator, dual PCI EIDE hard disk ports to support 4 EIDE drives, a high performance multi-I/O controller, a WatchDog timer, a 1K-bit E²Key memory for user data, and a 10/100Mbps Ethernet Port. The board uses the ALI Aladdin 4+ Chipset which is PCI 2.1 compliant, and the Winbond W9970CF VGA controller. The multi-I/O controller includes: dual 16C550 UARTs, a floppy port, and a SPP/EPP/ECP multi-mode bi-directional parallel port. The optional PROMDISK-Chip Disk Emulator comes complete with ROM-DOS version 6.22, making it ideal for embedded diskless applications. The 1K-bit E²Key memory is a non-volatile memory is useful for storing user data, such as: critical system parameters, terminal address, etc. The WatchDog timer is ideal for controlling critical processes where unattended operation is essential.

The IRV-686E SBC is fully compatible with the IBM PC/AT ISA Bus and the PCI Bus (version 2.1) which means virtually all the software written for the IBM PC/AT will run on the IRV-686E SBC.

FEATURES

A complete list of features is listed below:

- IBM PC/AT Compatible Plug-in Computer
- Supports 233MHz Pentium/MMX, AMD K6-2 and Cyrix 6x86 type CPUs up to 333MHz
- Includes Zero Insertion CPU Socket
- ALI Aladdin 4+ ChipSet
- Includes 32 bit PCI 2.1 Compatible Bus
- AMI Plug-n-Play Flash BIOS
- Passive Backplane Architecture
- Includes 32 bit PCI 2.1 Compatible Bus
- Winbond W9970CF VGA Controller and 2MB Video RAM
- 10/100Mbps Auto-Sensing Ethernet Port Supports IEEE 802.3u 100BASE-TX Standard
- 256M-Byte High Performance SDRAM System Memory (2-168 pin DIMMs)
- 512KB Pipelined Burst Mode Secondary Cache
- Dual Floppy Disk Port Supports Two 3.5" or 5.25" Drives up to 2.88M-bytes
- PCI Extended EIDE Hard Disk Port Supports up to Four Drives
- PS2/AT Compatible Keyboard Port
- PROMDISK-Chip Socket Supports up to 32MB PROMDISK-Chip Disk Emulator
- PS2 Compatible Mouse Port
- Two High Speed 16C550 Compatible RS-232 Serial Ports
- Multimode Bi-directional Parallel Printer Port
- Dual Universal Serial Bus Ports for future expansion
- Infrared Data Access Port for future applications
- Clock/Calendar with Battery Back-up
- Low Power CMOS Design
- Full Size AT Plug-in Multilayer Board for Low EMI and High Reliability
- WatchDog Timer and Power Monitor
- On-board Mini Speaker
- Optional External Reset
- Optional *Datalight* ROM-DOS 6.22 Operating System

SECTION 2 - SYSTEM DESCRIPTION

The following sections describe the major system features of the IRV-686E All-In-One Single Board Computer.

PROCESSOR

The IRV-686E Pentium SBC supports 100MHz to 233MHz Pentium/MMX, and the AMD K6-2 processor up to 333MHz. It also supports the Cyrix 6x86MX-PR266. The Pentium microprocessor includes an on-chip 16K-byte unified instruction cache, an 16K-byte data cache, an internal high performance math co-processor, and an enhanced 64-bit data bus. The on-board jumper selectable clock generator and ZIF CPU socket makes upgrading to a higher performance CPU easy. Some of the distinctive features of the processors include:

- 64-bit External Data Bus
- 32-bit Internal Architecture
- 256M-byte Directly Addressable Memory Space
- Internal 14 Word by 32-bit Register Set
- Separate 8K-byte Data and Cache Memories
- On-chip Pipelined Floating Point Processor
- Integrated Memory Manager

SYSTEM MEMORY (SDRAM)

The IRV-686E Pentium SBC can support up to 256M-bytes of synchronous dynamic random access memory (SDRAM) organized as two banks of 64Mx72 including eight parity bits. The memory is configured using two dual in-line memory module sockets, which will accept 168-pin dual in-line memory modules (DIMMs) organized as 16MB, 32MB, 64MB, or 128MB with a maximum access time of 15ns.

CACHE MEMORY

The IRV-686E SBC includes 512K-bytes of pipelined burst mode cache memory for high speed access to blocks of data most recently read from main memory, including buffered data from the disk and video memory. The cache memory will significantly increase system performance over that of a conventional non-cached system.

DMA CONTROLLER

The IRV-686E 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: Alternate for Multi-mode Parallel Port (8-bit)
 DMA Channel 2: Floppy Disk (8-bit)
 DMA Channel 3: Multi-mode Parallel Port (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 IRV-686E 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 | SVGA Controller |
| | IRQ10 | Not Used |
| | IRQ11 | Not Used |
| | IRQ12 | Not Used |
| | IRQ13 | Co-processor (Not Available) |
| | IRQ14 | EIDE Disk Controller |
| | IRQ15 | Not Used |
| | IRQ3 | Serial Port 2 |
| | IRQ4 | Serial Port 1 |
| | IRQ5 | Alternate for Parallel Port |
| | IRQ6 | Floppy Disk Controller |
| Lowest | IRQ7 | Parallel Port |

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

TIMERS

The IRV-686E 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 IRV-686E SBC includes an MC146818 compatible real time clock/calendar with 128 bytes of CMOS RAM. An on-board industrial Lithium battery (-40° to 85°, @ 850mAH) which provides over 10 years of data retention 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.

KEYBOARD PORT

The IRV-686E 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.

MOUSE PORT

The IRV-686E SBC contains an IBM PS2 compatible mouse port for interfacing to a generic serial mouse. The mouse port controller assembles the serial data from the mouse 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 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 mouse port connector location and pin assignments.

SPEAKER PORT

The IRV-686E 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 larger 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 IRV-686E 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 IRV-686E SBC contains a multimode parallel port which has the equivalence of 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 D for the connector location and pin assignments.

SERIAL PORTS

The IRV-686E SBC has the equivalence of two NC16C550 UARTs. The two UARTs can be configured as standard IBM PC/AT RS-232C compatible COM1, COM2, COM3, or COM4 serial ports or individually disabled using the CMOS Setup utility. The data rates are independently programmable up to 115.2K baud. Refer to Appendix D for the connector location and pin assignments.

FLOPPY DISK PORT

The IRV-686E SBC contains an IBM PC/AT compatible dual floppy disk port with the equivalence of an NEC PD72056B Floppy Disk Controller, an on-chip digital data separator, and an IBM PC/AT compatible floppy disk adapter bus interface circuit. The Floppy Disk Port can be disabled by using the CMOS Setup utility. An on-chip digital data separator 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.

EIDE HARD DISK PORT

The IRV-686E SBC contains two PCI Extended Integrated Drive Electronics (EIDE) Ports which directly interfaces to up to four hard disk drives with embedded controllers. The EIDE Disk Port can be disabled using the CMOS Setup utility. Refer to Appendix D for the connector location and pin assignments.

VGA DISPLAY PORT

The IRV-686E SBC includes a Winbond W9970CF VGA display controller which interfaces directly to the local on-board PCI bus. The VGA display port is fully compatible with IBM VGA, EGA, CGA, and MDA display adapters, and provides improved performance and additional functionality. The W9970CF is a high-performance graphical user interface accelerator which combines a 64-bit DRAM-based accelerator, a 135MHz RAMDAC, 2MB of high speed DRAM, and a clock synthesizer providing multimedia capabilities with resolutions up to 1280 x 1024 x 256 colors at 75Hz. Software drivers for various operating systems are included on the distribution diskette. Additional drivers, and programming information can be found on Winbond's Website at <http://www.winbond.com.tw>. Refer to Appendix D for connector location and pin assignments.

WATCHDOG TIMER

The IRV-686E 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 (NMI). 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. Refer to Appendix E for the WatchDog Timer configuration jumpers.

OPTIONAL PROMDISK-CHIP DISK EMULATOR

The IRV-686E includes a 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 4M, 8M, 16M, and 32M byte capacities and comes complete with ROM-DOS version 6.22 installed. The PROMDISK-Chip occupies an 8K block of memory space above 640K, whose starting address is selected by jumper JP9. The PROMDISK-Chip uses the Datalight Flash/FX integrated Flash File System and boot utilities. Refer to Appendix E for the jumper location.

The Flash/FX Variable Block Flash (VBF) 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.

HIGH SPEED PCI EXPANSION BUS

The IRV-686E SBC is equipped with a high speed PCI expansion bus which allows the use of high speed I/O controllers such as SVGA, SCSI, Ethernet Network, and Serial Communications adapters. The PCI expansion bus is compatible with the PICMG (PCI Industrial Computer Manufacturers Group) 2.1 standard and supports up to 4 PCI master peripheral boards.

ETHERNET PORT

The IRV-686E SBC contains a Realtek RTL8139 highly integrated single-chip Fast Ethernet controller. The RTL8139 provides 10Mbps and 100Mbps auto-sensing operation, PCI bus master capability, and full compliance with IEEE 802.3u 100Base-TX specifications. The RTL8139 keeps network maintenance cost low and eliminates usage barriers. It also supports full-duplex operation, making possible 200Mbps of bandwidth. Refer to Appendix D for connector location and pin assignments. For more information on the Realtek Ethernet controller contact their web site at <http://www.realtek.com.tw>.

UNIVERSAL SERIAL BUS PORT

The IRV-686E SBC contains two Universal Serial Bus Ports for the future I/O expansion bus. Refer to Appendix D for connector location and pin assignments.

IRDA INFRARED INTERFACE PORT

The IRV-686E 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' Peripheral Setup. When the IrDA port is enabled, the standard COM2 serial port is disabled. Refer to Appendix D for connector location and pin assignments.

FLASH EPROM BIOS

The IRV-686E SBC contains a 128KB Flash EPROM which contains the AMI Plug-n-Play system BIOS. The Flash EPROM can be programmed on-board with the programming software utility when a new version of the BIOS is released.

E² KEY 1K-BIT USER EEPROM

The IRV-686E SBC includes the E² 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 the distribution disk which includes a demo program, and two C library functions for integrating into your application program.

ATX POWER SUPPLY FEATURES

The IRV-686E SBC provides interface connectors to support ATX power supplies. When using an ATX power supply, you must connect the +5V "Standby" signal on connector J2 pins 18 & 20 to +5VDC on the power supply to enable the standby feature. Connector J2 pin 17 is used interface to ATX power supplies that use a momentary switch to control the ON/SLEEP (OFF) function. Pushing the switch once will toggle between the ON and SLEEP modes; pushing the switch for more than four seconds will turn the system power off. Refer to Appendix D for connector location and pin assignments.

SECTION 3 - SETUP

The IRV-686E SBC uses the latest AMI Plug-n-Play BIOS which contains an internal Setup Utility for configuring the system. The BIOS includes a graphical user interface, and a new system configuration utility, as well as all the features of the standard BIOS. The system configuration settings are stored in the on-board CMOS memory which is backed up by a Lithium battery.

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** key is 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. In addition, you may also enter the setup utility directly by pressing the **Cntrl Alt Esc** simultaneously.

After making the desired selections from the various setup menus, you can 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 CHIPSET, POWER MANAGEMENT, and PNP/PCI selections may cause unpredictable results. If this occurs select the FAIL SAFE SETTINGS from the MAIN SETUP MENU and then press the **F10** to save and exit.

SECTION 4 - USING THE PROMDISK-CHIP DISK EMULATOR

The IRV-686E SBC includes a 32-pin socket which supports the MCSI PROMDISK-Chip disk emulator which 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 IRV-686E 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
- Monitor
- Floppy or Hard Disk with MS-DOS, ROM-DOS, or PROMDISK Disk Emulator

INSTALLING THE DIMMS

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

1. Insert the first DIMM edge connector into the DIMM1 socket closest to the top of the board. Note that the DIMMs are keyed and will only go in one way.
2. Push the DIMM into the connector carefully until it snaps into place.
3. Check to make sure the DIMM is inserted securely.
4. Insert the second DIMM edge connector (if required) into the DIMM2 socket.

To remove a DIMM, move the locking ejector tabs outward on each side of the DIMM and lift the DIMM from the connector.

INSTALLING THE CPU

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

1. Open the ZIF socket by lifting the release arm to its vertical position causing the sliding base plate to move to the open position.
2. Align pin one (white dot or beveled edge) on the CPU chip with pin one of the ZIF (zero insertion force) socket. Note pin 1 of the ZIF socket is located on the bottom left side of the socket. To complete the installation gently press the CPU chip into place and return the release arm to its locked position.
3. Double check the insertion and orientation of the chip before applying power. Improper installation will result in permanent damage to the chip. Refer to Appendix E for CPU speed and configuration jumpers.

To remove the CPU chip, open the ZIF socket by lifting the release arm to its vertical position and gently remove the chip.

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 (square pad) on the PROMDISK-Chip with pin one of socket U27 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.

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.

COMPLETING THE INSTALLATION

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

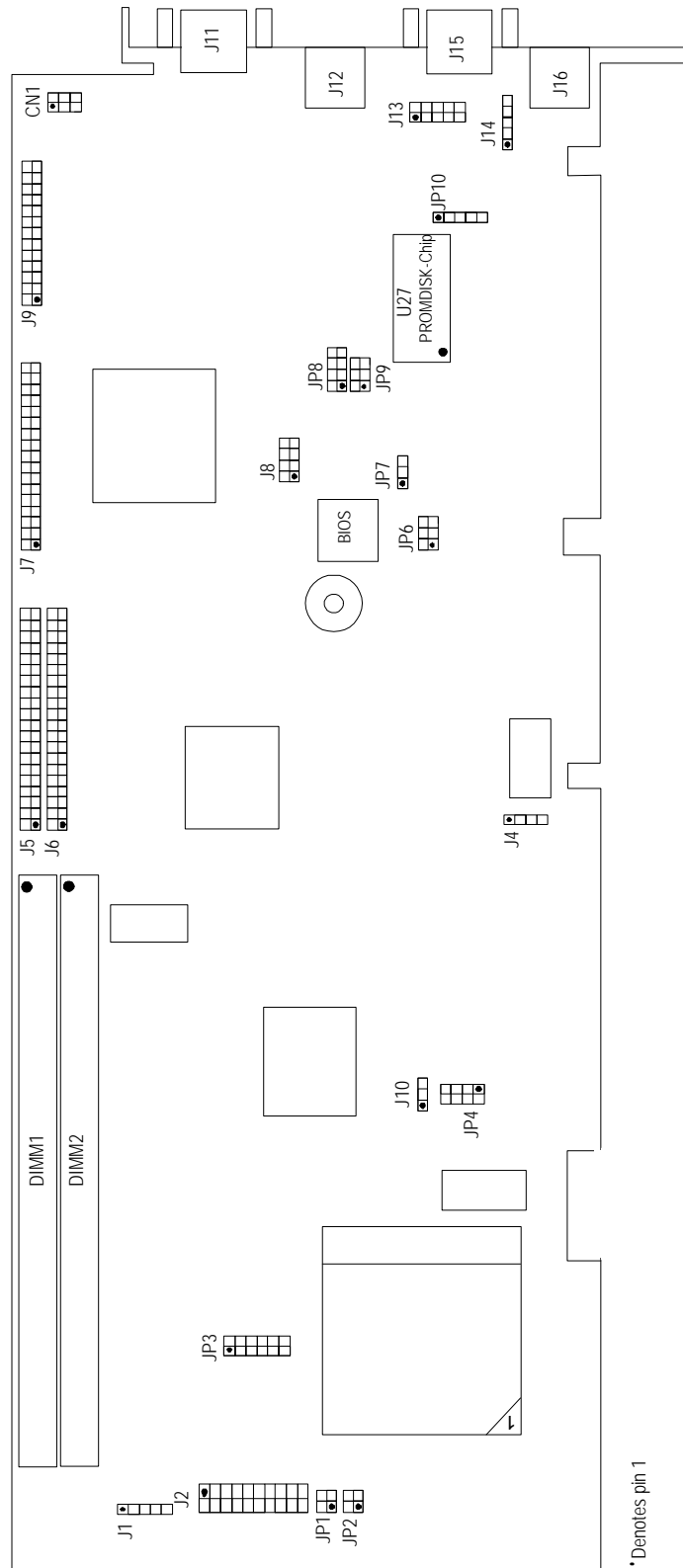
1. Set the configuration jumpers in accordance with Appendix E.
2. Install the IRV-686E SBC into one of the I/O slots in a passive backplane.
3. Connect the applicable I/O cables and peripherals, i.e. floppy disk, IDE hard disk, monitor, keyboard, power supply, etc.
4. Connect an IBM PC compatible keyboard.
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 IRV-686E CMOS using the internal SETUP.
9. Boot the system.

APPENDIX A - SPECIFICATIONS

This appendix lists the specifications for the IRV-686E All-In-One Single Board Computer.

| | |
|-----------------|--|
| CPU: | Supports: Intel Pentium/MMX up to 233MHz, AMD K6-2 up to 333MHz, and Cyrix 6x86MX processors up to 266MHz. |
| Co-processor: | Internal to the Pentium Chip |
| Memory: | System Memory Expandable to 256M-bytes. Supports: 8MB, 16MB, 32MB, 64MB, or 128MB SDRAM DIMMs using two 168-pin DIMM sockets. Internal 16K-byte Data and 16K-byte Instruction Cache Memory. 512K-bytes of High Speed pipelined burst mode Cache Memory. |
| BIOS: | AMI Plug-n-Play BIOS Flash EPROM. |
| Clock/Cal: | PC/AT Compatible with on-board Lithium battery back-up |
| I/O Bus: | IBM PC/AT Compatible 98-pin Edge Connector |
| PCI Bus: | Industry Standard version 2.1 PICMG high performance I/O bus. |
| DMA: | 7 Channels (4 8-bit & 3 16-bit) PCI Ultra DMA/33 |
| Timers: | 3 Programmable |
| Interrupts: | 16 |
| Reset: | Controlled by on-board power detector with provisions for external reset switch at header J2 |
| I/O Ports: | 2 - RS-232 Serial Ports (J15 at rear connector, and J13 header) 1 - Parallel Printer Port (at connector J9) 1 - PS2 Keyboard Port (at header J1 and at rear PS2 type connector J16) 1 - On-board Speaker with Speaker Port (J2) 1 - Dual 3.5"/5.25" Floppy Disk Port (J7) 2 - IDE Hard Disk Port (Primary at J5 & Secondary at J6) 1 - WatchDog Timer 1 - PS2 Mouse Port (J16 and header J14) 1 - IDE LED Port (J2) 1 - Keylock & Power LED (J2) 2 - Universal Serial Bus Ports (at header J8) 1 - IrDA Infrared Port (JP10) 1 - Ethernet Port (J12) |
| PCI Video Port: | 1 - PCI VGA Video Port (at rear connector J11) Chipset: Winbond VGA Video Controller VRAM: 2MB EDO DRAM Resolution: 1280 x 1024, 256 color, 75Hz 1024 x 768, 64K color, 75Hz 800 x 600, full color, 90Hz |
| Speed: | 100-333MHz jumper selectable. |
| Battery: | Lithium for Clock/Calendar & CMOS RAM (ten years typical) |
| Benchmark: | LANDMARK v2.0 =1344MHz for 233MHz 6x86 |
| Size: | Full Size AT board 13.3"L X 4.8"H |
| Weight: | 12 Oz. |
| Power: | +5VDC @ 5.5A, +12VDC @ 0.160A, -12VDC @ 0.060A |

APPENDIX B - BOARD OUTLINE



* Denotes pin 1

APPENDIX C - MEMORY AND I/O MAPS

The following is the memory map for the IRV-686E SBC. The addresses are fully PC/AT compatible, unless otherwise specified.

IRV-686E 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 VGA | 64.0K |
| B0000H - B7FFFH | Video RAM (MDA)* | 32.0K |
| B8000H - BFFFFH | Video RAM (CGA)* | 32.0K |
| C0000H - C3FFFH | Reserved | 16.0K |
| C4000H - C7FFFH | EMS Window | 16.0K |
| C8000H - DFFFFH | ROM Scan Devices* | 96.0K |
| E0000H - FFFFFH | System BIOS | 128.0K |
| 100000H - FFFFFFFFH | User Memory | 256.0M |

**External to the IRV-686E*

The following is the I/O map for the IRV-686E SBC. I/O addresses are fully PC/AT compatible, unless otherwise specified.

IRV-686E 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 & WatchDog Timer |
| 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 |
| 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 |
| 3BCH - 3BFH | Parallel Printer Port LPT3 |
| 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

J1 Keyboard Header/Connector

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

J16 Keyboard/Mouse Connector (PS2 type)

| Pin | Signal |
|-----|---------|
| 1 | KBDATA |
| 2 | MDATA |
| 3 | GND |
| 4 | +5VDC |
| 5 | KBCLOCK |
| 6 | MCLK |

J2 Keylock Header/Connector

| Pin | Signal Name | Description |
|-----|---------------|---------------------------------------|
| 2 | LED POWER (+) | Connect to anode of power LED |
| 4 | N/C (Key) | N/C (Key) |
| 6 | GND | Connect to cathode of power LED |
| 8 | KB LOCK/ | Connect to ground to inhibit keyboard |
| 10 | GND | Ground |

J7 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

J5 & J6 IDE Hard Disk Port Connectors

| 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 | IDE DRQ | 22 | GND |
| 23 | IDEIOW/ | 24 | GND |
| 25 | IDEIOR/ | 26 | GND |
| 27 | IDE CHRDY | 28 | GND |
| 29 | IDEDACK | 30 | GND |
| 31 | IRQ14 | 32 | Not Used |
| 33 | IDESA1 | 34 | Not Used |
| 35 | IDESA0 | 36 | IDESA2 |
| 37 | HDCS0/ | 38 | HDCS1/ |
| 39 | IDEACT/ | 40 | GND |

J9 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 |
| 8 | PDAT6 | 21 | GND |
| 9 | PDAT7 | 22 | GND |
| 10 | ACK/ | 23 | GND |
| 11 | BUSY | 24 | GND |
| 12 | PE | 25 | GND |
| 13 | SLCT | 26 | Not Used |

J15 Serial Port #1 9-pin Sub D Connector

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

CN1 Ethernet LED Connector

| Pin | Signal |
|-----|---------|
| 1 | +5VDC |
| 2 | 10Mbps |
| 3 | +5VDC |
| 4 | 100Mbps |
| 5 | +5VDC |
| 8 | ACTIVE |

J12 Ethernet RJ45 Connector

| Pin | Signal |
|-----|--------|
| 1 | TX+ |
| 2 | TX- |
| 3 | RX+ |
| 4 | N/C |
| 5 | N/C |
| 6 | RX- |
| 7 | N/C |
| 8 | N/C |

J13 Serial Port #2 10-pin Header/Connector

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

J11 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 | DDCDATA |
| 13 | HSYNC | 14 | VSYNC |
| 15 | DDCCLK | | |

J2 Speaker Port Header/Connector

| Pin | Signal Name | Description |
|-----|-------------|------------------------|
| 1 | SPEAKER | Connect to Speaker (-) |
| 3 | N/C | No Connection |
| 5 | N/C | No Connection |
| 7 | +5VDC | Connect to Speaker (+) |

J2 Reset Header/Connector

| Pin | Signal Name | Description |
|-----|-------------|---|
| 9 | RESET/ | Connect to switch, ground this pin to reset |

| | | |
|----|-----|--------|
| 11 | GND | Ground |
|----|-----|--------|

J2 IDE LED Header/Connector

| Pin | Signal Name | Description |
|-----|-------------|--------------------------------|
| 13 | IDE LED | Connect to IDE LED anode (-) |
| 15 | +5VDC | Connect to IDE LED cathode (+) |

J14 PS2 Mouse Header/Connector

| Pin | Signal |
|-----|--------|
| 1 | MSDATA |
| 2 | N/C |
| 3 | GND |
| 4 | +5VDC |
| 5 | MSCLK |

J8 Universal Serial Bus Ports 1 & 2 Connector

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | +5VDC | 2 | +5VDC |
| 3 | -DATA1 | 4 | -DATA0 |
| 5 | +DATA1 | 6 | +DATA0 |
| 7 | GND | 8 | GND |

JP10 IrDA Infrared Port Connector

| Pin | Signal |
|-----|--------|
| 1 | +5VDC |
| 2 | N/C |
| 3 | IR-RX |
| 4 | GND |
| 5 | IR-TX |

J4 External Battery Connector

| Pin | Signal |
|-----|--------|
| 1 | EXT + |
| 2 | N/C |
| 3 | N/C |
| 4 | EXT - |

Note: Remove jumper from 1-2 when using external battery.

J10 CPU Fan Connector

| Pin | Signal |
|-----|--------|
| 1 | N/C |
| 2 | +12VDC |
| 3 | GND |

J2 ATX Power Supply Power Switch Control

| Pin | Signal |
|-----|------------|
| 17 | Switch (+) |
| 19 | Switch (-) |

J2 Standby Connector for ATX Power Supply

| Pin | Signal |
|-----|------------------------|
| 12 | GND |
| 14 | No Connection |
| 16 | Suspend Control Signal |
| 18 | +5VDC Standby Signal |
| 20 | +5VDC Standby Signal |

APPENDIX E - CONFIGURATION JUMPERS

JP3 CPU Clock Jumper

| Frequency | 7-8 | 9-10 | 11-12 |
|-----------|-----|------|-------|
| 55MHz | ON | ON | OFF |
| 66MHz | ON | OFF | OFF |
| 66MHz | OFF | OFF | OFF |
| 75MHz | OFF | ON | ON |
| 83MHz | ON | OFF | ON |

JP3 CPU Clock Multiplier Jumper

| Multiplier | 1-2 | 3-4 | 5-6 |
|------------|-----|-----|-----|
| 1.5X | OFF | OFF | OFF |
| 2X | ON | OFF | OFF |
| 2.5X | ON | ON | OFF |
| 3X | OFF | ON | OFF |
| 3.5X | OFF | OFF | OFF |
| 4X | ON | OFF | ON |
| 4.5X | ON | ON | ON |
| 5X | OFF | ON | ON |
| 5.5X | OFF | OFF | ON |

JP4 CPU Core Voltage Jumper

| Voltage | 1-2 | 3-4 | 5-6 | 7-8 |
|---------|-----|-----|-----|-----|
| 3.5V | ON | ON | ON | ON |
| 3.4V | OFF | ON | ON | ON |
| 3.3V | ON | OFF | ON | ON |
| 3.2V | OFF | OFF | ON | ON |
| 3.1V | ON | ON | OFF | ON |
| 3.0V | OFF | ON | OFF | ON |
| 2.9V | ON | OFF | OFF | ON |
| 2.8V | OFF | OFF | OFF | ON |
| 2.7V | ON | ON | ON | OFF |
| 2.6V | OFF | ON | ON | OFF |
| 2.5V | ON | OFF | ON | OFF |
| 2.4V | OFF | OFF | ON | OFF |
| 2.3V | ON | ON | OFF | OFF |
| 2.2V | OFF | ON | OFF | OFF |
| 2.1V | ON | OFF | OFF | OFF |
| 2.0V | OFF | OFF | OFF | OFF |

JP1 & JP2 Dual/Single Voltage Select Jumpers

| CPU | JP1 1-2 | JP1 3-4 | JP2 1-2 | JP2 3-4 |
|--|------------|------------|------------|------------|
| Pentium | OFF | OFF | ON | ON |
| Pentium/MMX AMD K5/K6 Cyrix 6x86 Dual Voltage | ON | ON | OFF | OFF |

JP7 WatchDog Timer Control Jumper

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

JP8 WatchDog Timer Time-out Period Jumper

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

JP9 PROMDISK-Chip Address Jumper

| Address | JP9 |
|---------|-----|
| CE00H | 1-2 |
| D600H | 3-4 |
| DE00H | 5-6 |

JP6 BIOS Flash Chip Voltage Jumper

| Voltage | JP6 |
|----------------|------------|
| 1Mb, 12V Flash | 1-3 2-4 |
| 2Mb, 12V Flash | 1-3 4-6 |
| 1Mb, 5V Flash | 3-5 2-4 |
| 2Mb, 5V Flash | 3-5 4-6 |

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 BIOS is not able to switch the CPU into protected mode. |
| 7 | Processor Exception Interrupt 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. |
| 11 | Cache Memory Read/Write Error - A Cache Memory failure occurred, do not enable the Cache Memory to resume operation. |