ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Versalogic VL-686-2s* at our website: ***Click HERE***

Reference Manual

VL-686-2

High speed CPU board with 10/100 Ethernet, Video, and PC/104-*Plus* expansion site

STD32™

VERSALOGIC CORPORATION

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

VL-686-2

High speed CPU board with
10/100 Ethernet, Video, and
PC/104-*Plus* expansion site

M686-2

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Product Release Notes

This page includes recent changes or improvements that have been made to this product. These changes may affect its operation or physical installation in your application. Please read the following information.

Rev 2

- Initial public release.

Rev 1

- Beta release.

Support Page

The **VL-686-2 Support Page**, at **http://www.versalogic.com/private/686-2support.asp**, contains additional information and resources for this product including:

- Reference Manual (PDF format)
- Operating system information and software drivers
- Data sheets and manufacturers' links for chips used in this product
- BIOS information and upgrades
- Utility routines and benchmark software

Note: This is a private page for VL-686-2 users only. It cannot be reached through our web site. You must enter this address directly to find the support page.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Model VL-686-2

High speed CPU board with 10/100 Ethernet, Video,
and PC/104-*Plus* expansion site

REFERENCE MANUAL



Doc. Rev. 10/01/2003

VERSALOGIC CORPORATION
WWW.VERSALOGIC.COM

3888 Stewart Road
Eugene, OR 97402
(541) 485-8575
Fax (541) 485-5712

Contents Copyright ©2001
All Rights Reserved

Notice:

Although every effort has been made to ensure this document is error-free, VersaLogic makes no representations or warranties with respect to this product and specifically disclaims any implied warranties of merchantability or fitness for any particular purpose.

VersaLogic reserves the right to revise this product and associated documentation at any time without obligation to notify anyone of such changes.

PC/104 and the PC/104 logo are trademarks of the PC/104 Consortium.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table of Contents

1. Introduction 1

Description 1

PC Compatibility 1

STD/STD32 Bus Compatibility 2

PC/104-*Plus* Compatibility 2

On-Board Memory 2

Hard Disk and Floppy Disk Interface 2

Serial Ports 2

Parallel Port 3

Counter/Timers 3

Real Time Clock with CMOS RAM 3

Interrupt Controllers 3

DMA Controllers 3

Watchdog Timer 3

Operating System Compatibility 3

Ethernet 4

Flat Panel Display Interface 4

Additional Features 4

Product Longevity / Reliability 4

Technical Specifications 5

Technical Support 6

Repair Service 6

2. Configuration / Operation 7

Overview 7

Electrostatic Discharge 7

Lithium Battery 7

Initial Configuration and Setup 8

Recommended Components 8

DRAM Module 8

Cables / Peripheral Devices 8

CMOS Setup 9

Boot Procedure 10

Creating a Bootable DOS DiskOnChip 10

I/O Configuration 11

Using 8-Bit STD Bus I/O Cards 11

Using 10-Bit STD Bus I/O Cards 11

Using 16-Bit STD Bus I/O Cards 12

Using PC/104 Modules 12

I/O Map 13

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Multiprocessor Configuration 14
Multiprocessor Jumper Configuration 14
Resistor Pack Configuration 14
Multiprocessor CPU Reset 15

3. Reference 17

Jumper Block Locations 17
Top Board (CPU Board) 17
Bottom Board (STD Bus Board) 18
Jumper Summary 19
Physical Dimensions 23
Hardware Assembly 24
PC/104-*Plus* (PCI) Slot Numbers 24
PC/104 (ISA) Modules 24
Mixing ISA and PCI Modules 24
External Connectors 25
Connector Location Diagrams (CPU Module) 25
Connector Location Diagram (STD Bus Module) 26
Connector Functions and Interface Cables 27
High Density 100-Pin Cable (JS1) 28
Power Supply 29
Power Connectors 29
Power Requirements 29
PC/104-*Plus* (PCI) Bus +3.3V Supply 29
Lithium Battery 30
CPU 31
CPU Clock Speed Multiplier 31
CPU Core Voltage Selection 31
Approved CPU List 32
Heat Sink 32
L2 Cache Memory 32
System RAM 33
Compatible Memory Modules 33
CMOS RAM 33
Clearing CMOS RAM 33
Real Time Clock 33
Setting the Clock 33
Battery Backed Static RAM 33
Disk on Chip 34
Enable / Disable 34
Compatible Devices 34
Installing the DOC Chip 34
CMOS Setup 34
Serial Ports 35
COM Port Configuration 35
COM2 RS-485 Mode Line Driver Control 35
Serial Port Connectors 36

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Parallel Port 37
IDE Hard Drive / CD-ROM Interfaces 38
Counter / Timer Interface 39
Keyboard Interface 40
Mouse Interface 40
Front Plane Interrupt Interface 41
Floppy Disk Interface 42
Speaker Interface 43
Video Interface 43
Video Resolutions 43
Video Output Connector 44
Flat Panel Display Connector 45
Compatible Flat Panel Displays 46
Flat Panel Display Selection 46
Ethernet Interface 47
Software Configuration 47
Status LED 47
Ethernet Connector 47
Watchdog Timer 48
Enabling the Watchdog 48
Refreshing the Watchdog 48
CPU Temperature Monitor 48
USB 1.0 Interface 49
Expansion Busses 50
PC/104-*Plus* 50
PC/104 50
Memory and I/O Map 51
Memory Map 51
I/O Map 52
Counter/Timers 52
Interrupt Configuration 53
Special Control Register 54
Revision Indicator Register 55
Watchdog Timer Hold-Off Register 55
I/O and Memory Map Control Register 56
Map and Paging Control Register 57

Appendix A — Other References 59

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Introduction 1

Description

The VL-686-2 is a performance-oriented processor board for STD 32 bus systems. It is specifically designed for OEM control projects requiring fast processing, compact size, flexible memory options, high reliability, and long product life span / availability. The VL-686-2 expands upon full PC hardware compatibility by offering a large array of additional peripheral devices often needed in an industrial embedded application. The product supports all operating systems designed to execute on PC hardware (DOS, Windows 95, QNX, etc.) and can be expanded using STD/STD 32 Bus I/O cards or by adding PC/104 or PC/104-*Plus* expansion modules.

- Full Socket 7 CPU Support - to 400 MHz
  - Intel Low Power Pentium MMX
  - Intel Pentium MMX
  - AMD K6-2 3D
  - AMD K6-2e low power
- 512 KB Level 2 cache
- 8 to 256 MB system RAM
- 10 / 100 dual-speed Ethernet
- PCI based video
- Flat panel display support
- 4 to 72 MB DiskOnChip® Flash support
- 128 to 512 KB Battery backed SRAM site
- PC/104-Plus high speed expansion site
- PCI based IDE controller
- Dual USB 1.0 interfaces
- 2 COM + 1 LPT port
- Keyboard and PS/2 mouse port
- OEM Extras
  - RS-232/422/485 COM port
  - Three user counter/timers
- CPU temperature sensor
- Watchdog timer
- Vcc sensing reset circuit
- Flash BIOS with OEM enhancements
- Ethernet remote boot option
- Single supply (+5V) operation
- Latching I/O connectors
- Customizing available
- Fanless operation with K6-2e CPU or Low Power Pentium MMX
- STD 32 Compatible
  - 8/16 bit data bus
  - Multiple bus masters
- Multiprocessor capable
  - Two CPU cards per card cage (on-board arbiter)
  - Up to 7 CPUs per cage with arbiter card

PC Compatibility

Standard I/O and peripheral interfaces, including a system BIOS which can be field upgraded, bootable Disk On Chip option and built-in Ethernet bring a high-power diskless embedded PC to the STD Bus form factor.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

STD/STD32 BUS COMPATIBILITY

The VL-686-2 CPU card complies with certain subsets of the STD 32 Bus specification that allow it to communicate with STD 80 compatible 8-bit and STD 32 compatible 16-bit I/O and memory cards. In addition, the card fully complies with the STD 80 Bus specification using a bus speed of 8.33 MHz. The CPU card is compatible with all I/O and memory cards that adhere to STD 80 specifications.

PC/104-*PLUS* COMPATIBILITY

The VL-686-2 features a PC/104-*Plus* expansion site allows PC/104 (ISA) and PC/104-*Plus* (PCI) modules to be stacked directly on the board. This permits the use of high speed video modules and "local" I/O expansion in systems using multiple processor cards. Use of on-board modules requires an empty card slot space next to the VL-686-2 board. Both standard PC/104 and PC/104-*Plus* (PCI 32-bit, 33 MHz) based modules are supported.

ON-BOARD MEMORY

DRAM An on-board high-reliability latching DRAM socket accepts one standard 144-pin SODIMM module. A variety of sizes may be used (up to 256MB).

BBSRAM An on-board BBSRAM socket will accept a single 512K low-power SRAM chip. Continuous battery power is supplied to the socket to provide high speed non-volatile storage of information. This RAM is accessible through a 64K page frame at E0000h in the main memory map.

DISK ON CHIP An on-board Disk on Chip socket will accept a single low profile DOC2000 or DOC Millenium chip for diskless (bootable) mass storage up to 96MB. The DOC normally appears as Drive C.

CMOS RAM Standard setup values are stored in a battery-backed CMOS RAM chip.

FLASH A 512K Flash chip stores the field upgradable System BIOS and Video BIOS. Future releases of the System BIOS will support a user defined graphics splash screen which displays when the system is booted.

HARD DISK AND FLOPPY DISK INTERFACE

Two 40-pin IDE hard disk drive interfaces, and a 34-pin floppy disk drive interface is included. Each interface supports two drives, and will work with externally mounted or in-rack devices.

SERIAL PORTS

The two on-board serial ports are hardware and software compatible with 16550 type UARTs with 16 byte FIFOs. Baud rates are programmable from 50 baud to 115K baud. COM1 is a standard RS-232 interface, COM2 can be jumpered for RS-232, RS-422, or RS-485 operation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PARALLEL PORT

The parallel port can be used as a standard bi-directional/ECP/EPP compatible LPT port or as 17 general purpose TTL I/O signals. When operating in standard bi-directional mode, each output line has a 24 ma current sink rating. Eight of the signals are programmable as a group for input or output, three are dedicated output, and five are dedicated inputs. A strobe signal, which produces a 50 µs pulse under program control, is also available as an output.

COUNTER/TIMERS

The VL-686-2 card includes six 8254 type 16-bit counter/timers. Three channels are reserved to support legacy PC architecture. The remaining three channels are unallocated, and can be clocked with on-board crystal time bases or from external inputs.

REAL TIME CLOCK WITH CMOS RAM

A battery-backed 146818 compatible real time clock (RTC) provides accurate date and time functions. This PC compatible RTC also contains 128 bytes of battery-backed CMOS RAM for storage of CMOS Setup parameters.

INTERRUPT CONTROLLERS

Two PC AT compatible 8259 type programmable interrupt controllers (PICs) are provided for full DOS functionality. Interrupt sources and destinations can be configured with jumper blocks and through CMOS Setup. Interrupt lines connect to on-card sources, STD Bus, PC/104, and PCI Bus sources, and to a user connector. External access to the non-maskable interrupt (NMI) signal is provided.

DMA CONTROLLERS

The VL-686-2 has two DMA controllers which provide a total of eight DMA channels (four 8-bit channels and four 16-bit channels.) DMA control signals for seven channels are available on the PC/104 Bus. The remaining 16-bit channel is accessible only by software. DMA control signals are not available on the STD Bus, PCI Bus, or via front plane connector.

WATCHDOG TIMER

A watchdog timer circuit provides a degree of protection against hardware and software failures. When the watchdog timer is enabled, it must be periodically updated by software at least every 250 ms. A system failure which prevents updating will reset the CPU. This same circuit monitors the +5V power, and handles a variety of CPU reset functions.

OPERATING SYSTEM COMPATIBILITY

It is fully compatible with popular operating systems including Windows CE, QNX, Windows NT/95/98, Linux, RT-Linux, OS-9, and other Real Time Operating Systems.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ETHERNET

Network communication is supported through an on-board AMD 79C973 controller chip. A built-in RJ-45 jack makes Ethernet connections a snap. Supports 10baseT and 100baseTx operation (autodetecting).

FLAT PANEL DISPLAY INTERFACE

A 44-pin connector provides support for a variety of flat panel displays. The video BIOS is pre-programmed to support 15 different classes of displays (jumper selectable). If necessary, the Video BIOS can be field upgraded to support non-standard panels.

ADDITIONAL FEATURES

The high reliability design and construction of this board also features latching I/O connectors, voltage sensing reset circuit, and a self-resetting fuse on the 5V supply to the keyboard, mouse, and USB 1.0 ports. An onboard programmable CPU temperature sensor is included for use in difficult thermal situations. The sensor output can be used to turn on additional fans, create local or remote warnings, or take other action through software triggers.

PRODUCT LONGEVITY / RELIABILITY

The VL-686-2 delivers both full performance and product longevity by utilizing only standardized components in its design. Features such as full socket 7 compatibility were made possible by its unique 2-board design with PC/104-*Plus* interconnect.

This exceptional processor card was designed from the ground up with a focus on longevity and reliability. It is fully supported by the VersaLogic design team. Both hardware and software (BIOS) customization are available in quantities as low as 25 pieces. Each board is subjected to a 48-hour burn-in and 100% functional testing and backed by a limited two-year warranty.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Technical Specifications

Specifications are typical at 25°C with 5.0V supply unless otherwise noted.

Board Size:
North Bridge: 3.55" x 3.775" (PC/104 standard).
South Bridge: Meets all STD and STD 32 Bus mechanical specifications.
Two board set. Requires three STD 32 card slots.

Storage Temperature:
–40° C to 85° C

Free Air Operating Temperature:
0° C to +60° C (free air, no airflow)

Power Requirements: *(with 32 MB RAM, keyboard, mouse, running Win95 with Ethernet)*

VL-686-2b	266 MHz AMD K6-2 CPU	5V only ±5% @ 4.4 A (20.0 W) typ.
VL-686-2c	233 MHz Intel Pentium CPU	5V only ±5% @ 4.7 A (23.5 W) typ.
VL-686-2g	400 MHz AMD K6-2 CPU	5V only ±5% @ 6.0 A (30.0 W) typ.
VL-686-2h	266 MHz AMD K6-2e CPU	5V only ±5% @ 3.9 A (19.5 W) typ.
VL-686-2s	266 MHz Intel Tillamook CPU	5V only ±5% @ 3.3 A (16.4 W) typ.

±12V may be required by some expansion modules. +3.3V is not connected to PC/104-*Plus* bus.

System Reset:
Vcc sensing, resets below 4.62V typ.
Watchdog timeout

DRAM Interface:
One 144-pin SODIMM socket, 8 to 256 MB, EDO (60 ns) or SDRAM (66 MHz or PC-100 compatible [66 MHz]).

DiskOnChip Interface:
One 32-pin, 0.6" DIP socket. Accepts one M-Systems DiskOnChip device (height limit of 0.330").
Chip accessed through 8K page frame at CC000h.

SRAM Interface:
One 32-pin, 0.6" JEDEC DIP socket. Accepts standard or battery-backed 128K or 512K SRAM chips.
Chip accessed through 64K page frame at E0000h.

CPU Temperature Monitor:
CPU thermal monitor trips at a user selectable set point. It can be monitored via an I/O port, and can optionally generate an NMI for high priority software intervention.

Video Interface:
Based on Intel/C&T 69000 chip. 2 MB VRAM. 686-2s 69030, 4MB. Resolutions to 1280 x 1024. 44-pin flat panel display interface compatible with common panels. Video BIOS includes 16 jumper selectable flat panel types, and can be user modified to support non-standard panels.

IDE Interface:
Two PCI-based IDE channels, 40-pin interface, compatible with enhanced IDE mode 4 and Ultra DMA drives.
Supports up to four IDE devices (Hard Drives, CD-ROM, ATA Flash, etc.)

Floppy Disk Interface:
Supports two floppy drives

Ethernet Interface:
Autodetect 10BaseT/100BaseTX based on AMD 79C973. 12K transmit/receive buffer.
On-board RJ-45 Ethernet cable connector.

COM1 Interface:
RS-232, 16C550 compatible, 115K baud max.

COM2 Interface:
RS-232/422/485, 16C550 compatible, 460K baud max.

LPT Interface:
Bi-directional/EPP/ECP compatible

Connectors:

Power:	—	Board receives power via STD 32 Bus connector
CPU Fan:	JN1	2-pin 0.1" header
SVGA Video:	JN2	10-pin 2mm keyed, shrouded header
FPD Video:	JN3	44-pin 2mm unkeyed, unshrouded header
I/O:	JS1	High-density 100-pin (break out to standard .1" IDC and PC connectors).
Front Plane:	JS2	4-pin 0.1" unshrouded header (IRQ15 and IRQ9 inputs)
Floppy:	JS3	34-pin 0.1" shrouded, keyed header
Ethernet:	JS5	Board mounted RJ-45 connector.
USB 1.0:	JS6	10-pin 0.1" header
IDE Channel 1:	JS8	40-pin 0.1" keyed, shrouded header on bottom side of board.
Speaker:	L1	2-pin 0.1" header
STD32:	P1/P2	112-pin gold-finger card-edge connector
PC/104-*Plus*:	SLT1/2/3	PC/104-*Plus* compliant ISA and PCI connectors. Modules stack on bottom of side of board.

BIOS: General Software embedded BIOS with OEM enhancements. Field upgradable with Flash BIOS Upgrade Utility

Bus Speed:

CPU External:	66	MHz
PCI, PC/104-*Plus*:	33	MHz
PC/104:	8.25	MHz
STD 32:	8.25	MHz

Compatibility:
PC/104 – Full compliance
Embedded-PCI (PC/104-*Plus*) – Full compliance, 3.3V or 5V modules. (See Power Supply section for restrictions.)

Specifications are subject to change without notice.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Technical Support

If you have problems that this manual can't help you solve, first visit the VL-686-2 Product Support web page at **http://www.versalogic.com/private/686-2support.asp**. If you have further questions, contact VersaLogic for technical support at (541) 485-8575. You can also reach our technical support engineers via e-mail at support@versalogic.com.

VL-686-2 Support Website
http://www.versalogic.com/private/686-2support.asp

REPAIR SERVICE

If your product requires service, you must obtain a Returned Material Authorization (RMA) number by calling (541) 485-8575. Our standard turn-around time for repairs is five working days after we receive the product.

Please provide the following information:

- Your name, the name of your company, and your phone number
- The name of a technician or engineer who we can contact if we have questions
- Quantity of items being returned
- The model and serial number (bar code) of each item.
- A description of the problem
- Steps you have taken to resolve or repeat the problem
- The return shipping address

Warranty Repair All parts and labor charges are covered, including return shipping charges for UPS 3rd Day Select delivery to United States addresses.

Non-warranty Repair All non-warranty repairs are subject to diagnosis and labor charges, parts charges, and return shipping fees. We will need to know what shipping method you prefer for return back to your facility, and we will need to secure a purchase order number for invoicing the repair.

Note! Please mark the RMA number clearly on the outside of the box before returning. Failure to do so can delay the processing of your return.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Configuration / Operation 2

Overview

ELECTROSTATIC DISCHARGE

Warning! Electrostatic discharge (ESD) can damage boards, disk drives, and other components. The circuit board must be only be handled at an ESD workstation. If an approved station is not available, some measure of protection can be provided by wearing a grounded antistatic wrist strap. Keep all plastic away from the board, and do not slide the board over any surface.

After removing the board from its protective wrapper, place the board on a grounded, static-free surface, component side up. Use an anti-static foam pad if available.

The board should also be protected during shipment or storage by keeping inside a closed metallic anti-static envelope.

Note! The exterior coating on some metallic anti-static bags is sufficiently conductive to cause excessive battery drain if the bag comes in contact with the bottom side of the VL-686-2.

LITHIUM BATTERY

Warning! To prevent shorting, premature failure, or damage to the lithium battery, do not place the board on a conductive surface such as metal, black conductive foam, or the outside surface of a metalized ESD protective pouch. The lithium battery may explode if mistreated. Do not recharge, disassemble, or dispose of in fire. Dispose of used batteries promptly.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Initial Configuration and Setup

The following list describes the recommended components and gives an abbreviated outline for setting up a typical development system.

RECOMMENDED COMPONENTS

- VL-686-2 Board Set
- 144-pin SODIMM SDRAM Memory Module (66 MHz or PC-100)
- STD 32 Card Cage
- Power Supply
- SVGA Video Monitor
- Keyboard with PS2 connector
- 3.5" Floppy Disk Drive
- IDE Hard Drive
- IDE CD ROM Drive (optional)

DRAM MODULE

- Insert DRAM module into the SODIMM socket. Gently latch into place.

CABLES / PERIPHERAL DEVICES

- Plug video adapter cable (p/n VL-CBL-1007) into socket JN2 and attach video monitor.
- Plug keyboard into PS/2 socket labeled "keyboard" (JS1[JD])
- Plug floppy data cable (p/n VL-CBL-3403) into floppy drive connector JS3.
- Plug hard drive data connector JS1[JF] into IDE hard drive.
- Optionally, a CD ROM or second hard drive can be connected to JS8 on the bottom side of the STD Bus board.
- Insert board set into STD 32 rack.

Note! If a standard PC floppy cable is used, Drive A should be connected before the twist in the cable.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CMOS Setup

The following table shows the default CMOS Setup parameters. You can always return to this condition by selecting "Restore CMOS to Factory Default" from the CMOS Setup main menu, or by discharging CMOS RAM by moving jumper VS11 to position [1-2] for 30 seconds.

Basic CMOS Configuration

```
+--------------------------------------------------------------------------+
|                  System Bios Setup - Basic CMOS Configuration            |
|             (C) 2000 General Software, Inc. All rights reserved          |
+---------------------------+--------------------+-----------------------+
| DRIVE ASSIGNMENT ORDER:   | Date: Jan 01, 1980 | Typematic Delay  : 250 ms |
| Drive A: Floppy 0         | Time: 00 : 00 : 00 | Typematic Rate   : 30 cps |
| Drive B: (None)           | NumLock:  Disabled | Seek at Boot     : None   |
| Drive C: (None)           +--------------------+ Show "Hit Del"   : Enabled |
| Drive D: (None)           | BOOT ORDER:        | Config Box       : Enabled |
| Drive E: (None)           | Boot 1st: Drive A: | F1 Error Wait    : Enabled |
| Drive F: (None)           | Boot 2nd: (None)   | Parity Checking  : (Unused) |
| Drive G: (None)           | Boot 3rd: (None)   | Memory Test Tick : Enabled |
| Drive H: (None)           | Boot 4th: (None)   | Test Above 1 MB  : Disabled |
| Drive I: (None)           | Boot 5th: (None)   | Debug Breakpoints: (Unused) |
| Drive J: (None)           | Boot 6th: (None)   | Splash Screen    : Disabled |
| Drive K: (None)           +--------------------+-----------------+-----------+
| (Loader): (Unused)        | IDE DRIVE GEOMETRY:  Sect  Hds  Cyls | Memory    |
+---------------------------+ Ide 0: Not installed                 |  Base:    |
| FLOPPY DRIVE TYPES:       | Ide 1: Not installed                 |   640Kb   |
| Floppy 0: 1.44 MB, 3.5"   | Ide 2: Not installed                 |  Ext:     |
| Floppy 1: Not installed   | Ide 3: Not installed                 |   15360Kb |
+---------------------------+--------------------------------------+-----------+
```

Custom Configuration

```
+--------------------------------------------------------------------------+
|                  System BIOS Setup - Custom Configuration                |
|             (C) 2000 General Software, Inc. All rights reserved          |
+--------------------------------------+-----------------------------------+
| Cache (L1 and L2)         : Enabled  | COM1 (03F8) Enable/IRQ    : IRQ4  |
| Ethernet                  : Enabled  | COM2 (02F8) Enable/IRQ    : IRQ3  |
| Parallel Port Mode        : SPP      | LPT1 (0378) Enable/IRQ    : IRQ7  |
| Reserved                  : (Unused) | PS/2 Mouse                : Disabled |
| DiskOnChip                : Disabled | PCI INTA                  : IRQ11 |
| CPU Temperature Threshold : 70C      | PCI INTB                  : IRQ11 |
| Interrupt Vector Restore  : Disabled | PCI INTC                  : IRQ11 |
| BIOS Extension            : Disabled | PCI INTD                  : IRQ11 |
| Display Type              : CRT      | USB Controller            : Disabled |
| Route Memory CE000-D7FFFh : PC/104   | Ide 0 PIO Mode            : Auto  |
| Route Memory D8000-DFFFFh : PC/104   | Ide 1 PIO Mode            : Auto  |
| Route I/O 0100h-027Fh     : PC/104   | Ide 2 PIO Mode            : Auto  |
| Route COM3:3E8h COM4:2E8h : PC/104   | Ide 3 PIO Mode            : Auto  |
+--------------------------------------+-----------------------------------+
```

Shadow Configuration

```
+--------------------------------------------------------------------------+
|                  System BIOS Setup - Shadow/Cache Configuration          |
|             (C) 2000 General Software, Inc. All rights reserved          |
+--------------------------------------+-----------------------------------+
| Shadowing                 : Chipset  | Shadow 16KB ROM at C000   : Disabled |
| Shadow 16KB ROM at C400   : Disabled | Shadow 16KB ROM at C800   : Disabled |
| Shadow 16KB ROM at CC00   : Disabled | Shadow 16KB ROM at D000   : Disabled |
| Shadow 16KB ROM at D400   : Disabled | Shadow 16KB ROM at D800   : Disabled |
| Shadow 16KB ROM at DC00   : Disabled | Shadow 16KB ROM at E000   : Disabled |
| Shadow 16KB ROM at E400   : Disabled | Shadow 16KB ROM at E800   : Disabled |
| Shadow 16KB ROM at EC00   : Disabled | Shadow 64KB ROM at F000   : Enabled  |
+--------------------------------------+-----------------------------------+
```

Note! Due to changes and improvements in the system BIOS, the information on your monitor may differ from that shown above.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Boot Procedure

The following instructions are typical for setting up a DOS based system to boot from a hard drive.

- Turn power on
- Press the DEL key several times after power is applied.
- Change the following CMOS Setup parameters:

```
Basic CMOS Configuration|Drive Assignment Order|Drive C = IDE 0
Basic CMOS Configuration|Boot Order|Boot 2nd = Drive C
Basic CMOS Configuration|IDE Drive Geometry = Type 3 LBA
```

- Insert bootable floppy disk into floppy drive.
- Partition and format your hard drive using FDISK and FORMAT utilities
- Transfer system files to the hard drive using the SYS command
- Eject floppy disk
- Reset computer

Creating a Bootable DOS DiskOnChip

The DiskOnChip is shipped pre-formatted, non-bootable, without any files on it. The DiskOnChip will appear as Drive D in systems with an installed hard drive. If a hard drive is not installed, the DOC will appear as Drive C.

Note! Do not specify the DOC drive in CMOS Setup. The parameters on the Basic CMOS Configuration screen are for physical ATA devices (hard drives, and ATA flash devices) directly plugged into the IDE interface(s).

1. Boot your system under DOS or Windows (if using Windows, start a DOS session)
2. Type SYS C: (or SYS D: if appropriate)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

I/O Configuration

In addition to on-board I/O devices, the VL-686-2 also supports STD/STD 32 Bus I/O cards and PC/104 (and PC/104-*Plus*) modules.

The total I/O space of the CPU card is 64K. The actual I/O map of the system is defined by the fixed addresses of the on-board devices in conjunction with the addresses used by external STD Bus and PC/104 modules. External ports can be mapped at any address which doesn't conflict with the addresses used by on-board devices.

USING 8-BIT STD BUS I/O CARDS

STD Bus I/O cards which only decode 8 address bits (A0 - A7) will work properly with the VL-686-2 provided the STD Bus signal IOEXP is decoded low on the I/O card. IOEXP will automatically be driven low in the I/O address range FC00h to FFFFh. The I/O card can be configured to use any 8-bit address in the range 00h to FFh.

- 00h – FFh (With IOEXP decoded low)

A card which does not support IOEXP will repeat every 256 (100h) bytes throughout the entire 64K I/O space. This will cause conflict with reserved I/O addresses used for on-board devices. Operation in this manner is not recommended.

Application software should be written to communicate with the I/O cards using the addresses listed above as X+FF00h. For example if your I/O card is addressed at 38h, the software should use FF38h as the I/O port address.

USING 10-BIT STD BUS I/O CARDS

STD Bus I/O cards which only decode 10 address bits (A0 - A9) will work properly with the VL-686-2 when addressed in the following I/O ranges:

- 2E8h – 2EFh IOMAP1 Bit must = 1. See page 13 for further information.
- 3E8h – 3EFh IOMAP1 Bit must = 1. See page 13 for further information.
- 100h – 1EFh IOMAP2 Bit must = 1. See page 13 for further information.
- 200h – 27Fh IOMAP2 Bit must = 1. See page 13 for further information.

Cards will repeat every 1024 (400h) bytes throughout the entire STD Bus I/O space. This means a card jumpered as shown above will occupy I/O addresses X+0000h, X+0400h, X+0800h, X+0C00h, X+1000h, X+1400h, etc., where X represents the selected I/O address(es).

If IOEXP is decoded low, the card will only appear in the FF00h to FFFFh range (assuming the card is addressed at 300h to 3FFh). Operation in this manner is not recommended.

Application software should be written to communicate with the I/O cards using the exact addresses listed above (i.e., X+0000h). For example if your I/O card is addressed at 220h, the software should use 0220h as the I/O port address.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

USING 16-BIT STD BUS I/O CARDS

STD Bus I/O cards which decode all 16 address bits (A0 - A15) will work properly with the VL-686-2 when addressed in the following I/O ranges:

- 0100h – 01EFh IOMAP2 Bit must = 1. See page 56.
- 0200h – 027Fh IOMAP2 Bit must = 1. See page 56.
- 1000h – FFFFh Always enabled

USING PC/104 MODULES

All PC/104 modules decode 10 address bits (A0 - A9) and will work properly with the VL-686-2 when addressed in the following I/O ranges:

- 100h – 1EFh IOMAP2 Bit must = 0. See page 13.
- 200h – 27Fh IOMAP2 Bit must = 0. See page 13.
- 2E8h – 2EFh COM4 Range: IOMAP1 Bit must = 0. See page 13.
- 300h – 3E7h Always enabled
- 3E8h – 3EFh COM3 Range: IOMAP1 Bit must = 0. See page 13.
- 0400h – 0FFFh Always enabled

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

I/O MAP

Various regions of the 64K I/O space are divided up and can be routed to either the PC/104 or the STD/STD 32 bus interfaces. The IOMAP1 and IOMAP2 bits in the IOMMAP Register (see page 56) control the routing of these port ranges. The control bits default to values established in the CMOS Setup *Advanced Configuration* screen, however, they can also be manipulated in real time under program control.

0000h – 00FFh	On Board Devices
0100h – 01EFh 0200h – 027Fh	**IOMAP2** 0 = PC/104 Bus 1 = STD Bus (IOEXP Signal Driven High)
01F0h – 01FFh 0280h – 02E7h 02F0h – 02FFh	Undefined
02E8h – 02EFh (COM4)	**IOMAP1** 0 = PC/104 Bus 1 = STD Bus (IOEXP Signal Driven High)
0300h – 03E7h	PC/104 Bus
03E8h – 03EFh (COM3)	**IOMAP1** 0 = PC/104 Bus 1 = STD Bus
03F0h – 03FFh	On Board Devices
0400h – 0FFFh	PC/104 Bus (IOEXP Signal Driven High)
1000h – FBFFh	STD Bus (IOEXP Signal Driven High)
FC00h – FFFFh	STD Bus (IOEXP Signal Driven Low)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Multiprocessor Configuration

The VL-686-2 CPU card supports multiple master operation for systems requiring additional processing capability or for “smart I/O” operations. In a multiple master system, one CPU must be configured as a permanent master and other CPUs are configured as temporary masters. In this scheme, a bus arbiter plugged into the STD 32 Bus "Slot X" is used to arbitrate access to the bus. A special dualmaster mode is available for any mix of two VL-686-2 or VL-586-1 CPU cards to work together without a bus arbiter. In this configuration, one CPU should be jumpered as a permanent master and the other CPU should be jumpered as a dualmaster.

MULTIPROCESSOR JUMPER CONFIGURATION

Jumper blocks VS15 and VS16 are used to select the bus mastering mode. See the jumper summary pages beginning on page 19 for jumpering details.

RESISTOR PACK CONFIGURATION

The eight resistor packs near the STD Bus connector must be removed for temporary master or dualmaster operation. Only one CPU in the card cage should have the resistor packs installed; the permanent master.

Note Two resistance values are used, 1.8KΩ and 330Ω.

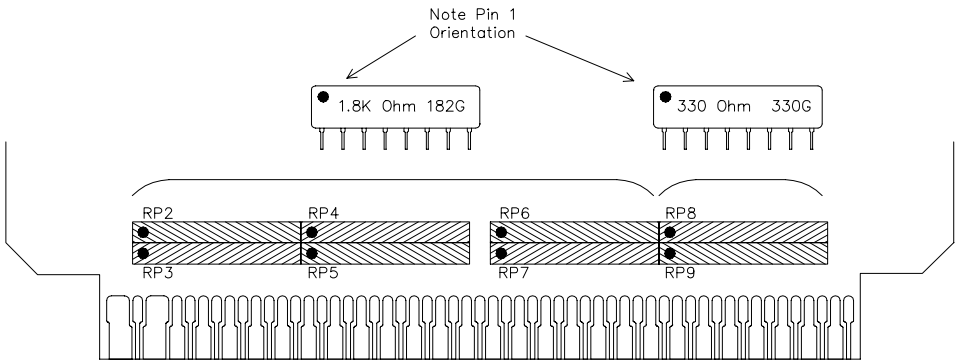


Figure 1. Multiprocessor Resistor Packs

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

MULTIPROCESSOR CPU RESET

The CPU reset configuration depends upon the selected STD Bus master mode. Jumpers VS15[1-2] and VS15[3-4] configure the CPU to drive and respond to the STD Bus signals SYSRESET* and PBRESET* in different ways depending on the bus master mode:

Permanent Master The CPU is reset by pressing the on-board push-button, and optionally, by a low level on PBRESET* arriving on the bus. Permanent masters are responsible for driving the SYSRESET* signal to reset temporary masters in the same card cage (which are configured to react to SYSRESET*). To prevent a persistent reset state, the permanent master is configured to ignore SYSRESET*.

Temporary Master The CPU is reset by pressing the on-board push-button, and optionally, by a low level on SYSRESET* arriving from the permanent master via the bus. A temporary master should never respond directly to PBRESET* nor drive SYSRESET*.

Dual Master Same as temporary master mode.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Jumper Block Locations

TOP BOARD (CPU BOARD)

Note! Jumpers on this board begin with the letters "VN", and are shown in the as-shipped configuration.

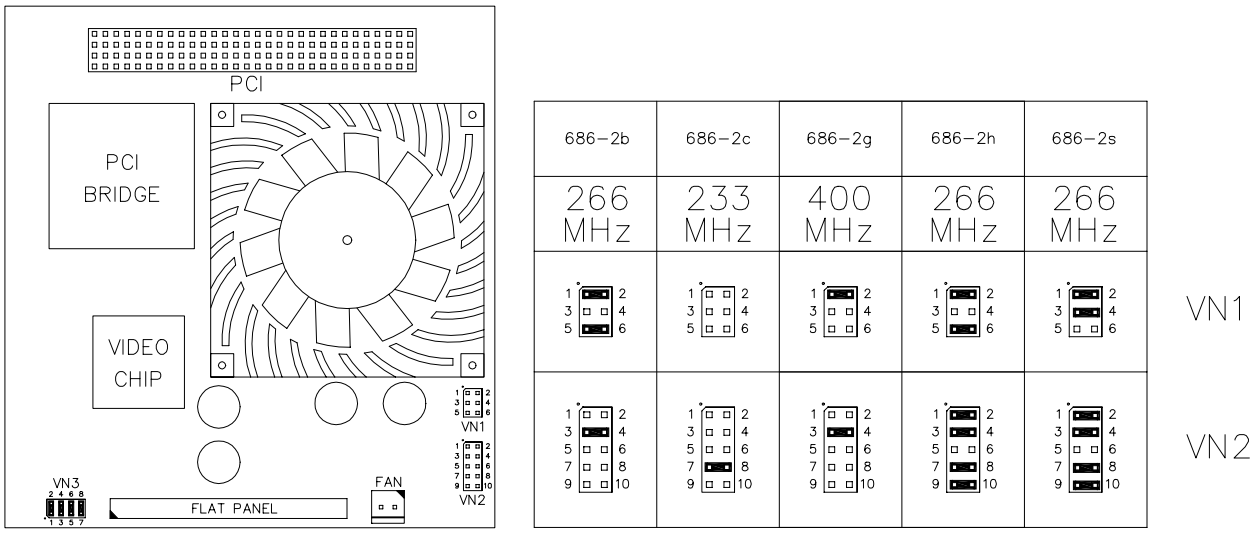


Figure 2. Jumper Block Locations (CPU Board)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Jumper Block Locations

BOTTOM BOARD (STD BUS BOARD)

Note! Jumpers on this board begin with the letters "VS", and are shown in the as-shipped configuration.

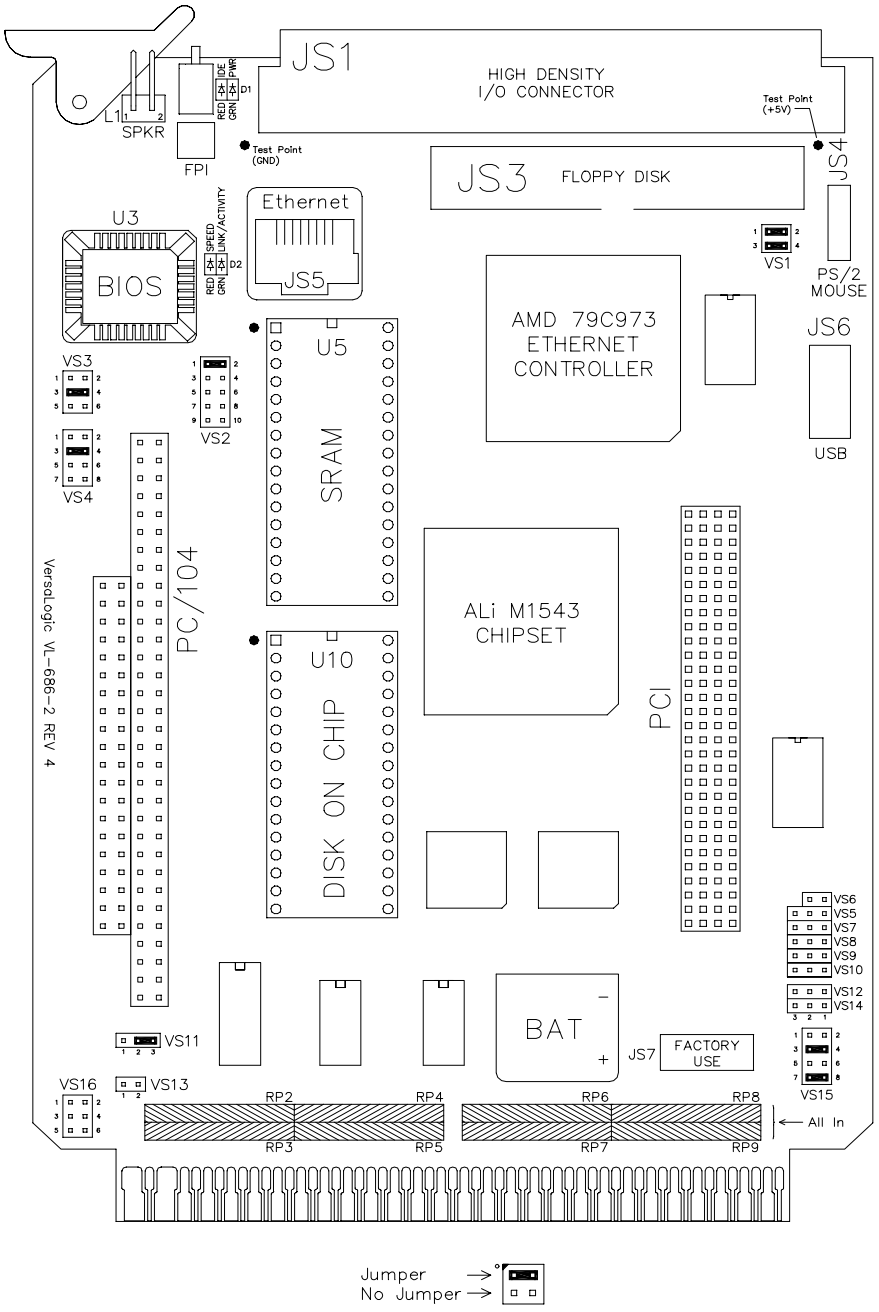


Figure 3. Jumper Block Locations (STD Bus Board)

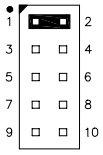
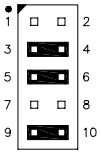
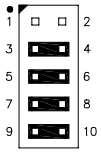
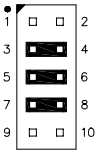
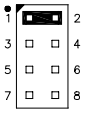
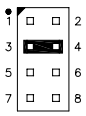
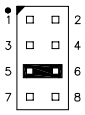
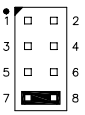
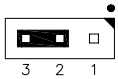
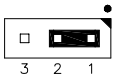
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

JUMPER SUMMARY

Table 1: Jumper Summary

<table>
<tr><th>Jumper Block</th><th>Description</th><th>As Shipped</th><th>Page</th></tr>
<tr><td>VN1</td><td>CPU Clock Speed Multiplier
<table><tr><th>VN1[5-6]</th><th>VN1[3-4]</th><th>VN1[1-2]</th><th>Multiplier</th><th>Speed</th></tr><tr><td>Out</td><td>Out</td><td>In</td><td>6.0</td><td>400 MHz</td></tr><tr><td>Out</td><td>In</td><td>In</td><td>2.5 [4.0]</td><td>166 MHz [266]</td></tr><tr><td>Out</td><td>In</td><td>Out</td><td>3.0</td><td>200 MHz</td></tr><tr><td>Out</td><td>Out</td><td>Out</td><td>3.5</td><td>233 MHz</td></tr><tr><td>In</td><td>Out</td><td>In</td><td>4.0</td><td>266 MHz</td></tr><tr><td>In</td><td>In</td><td>In</td><td>4.5</td><td>300 MHz</td></tr><tr><td>In</td><td>In</td><td>Out</td><td>5.0</td><td>333 MHz</td></tr><tr><td>In</td><td>Out</td><td>Out</td><td>5.5</td><td>366 MHz</td></tr></table>Note! Numbers in brackets are for Intel Tillamook 266 MHz CPU chips. Rev 5 only.</td><td>Varies</td><td>31</td></tr>
<tr><td>VN2</td><td>CPU Core Voltage Selection
<table><tr><th>VN2[9-10]</th><th>VN2[7-8]</th><th>VN2[5-6]</th><th>VN2[3-4]</th><th>VN2[1-2]</th><th>Voltage</th></tr><tr><td>In</td><td>In</td><td>Out</td><td>In</td><td>Out</td><td>1.80 V</td></tr><tr><td>In</td><td>In</td><td>Out</td><td>In</td><td>In</td><td>1.85 V</td></tr><tr><td>In</td><td>In</td><td>In</td><td>Out</td><td>Out</td><td>1.90 V</td></tr><tr><td>In</td><td>In</td><td>In</td><td>Out</td><td>In</td><td>1.95 V</td></tr><tr><td>In</td><td>In</td><td>In</td><td>In</td><td>Out</td><td>2.00 V</td></tr><tr><td>In</td><td>In</td><td>In</td><td>In</td><td>In</td><td>2.05 V</td></tr><tr><td>Out</td><td>Out</td><td>Out</td><td>Out</td><td>Out</td><td>2.00 V</td></tr><tr><td>Out</td><td>Out</td><td>Out</td><td>Out</td><td>In</td><td>2.10 V</td></tr><tr><td>Out</td><td>Out</td><td>Out</td><td>In</td><td>Out</td><td>2.20 V</td></tr><tr><td>Out</td><td>Out</td><td>Out</td><td>In</td><td>In</td><td>2.30 V</td></tr><tr><td>Out</td><td>Out</td><td>In</td><td>Out</td><td>Out</td><td>2.40 V</td></tr><tr><td>Out</td><td>Out</td><td>In</td><td>Out</td><td>In</td><td>2.50 V</td></tr><tr><td>Out</td><td>Out</td><td>In</td><td>In</td><td>Out</td><td>2.60 V</td></tr><tr><td>Out</td><td>Out</td><td>In</td><td>In</td><td>In</td><td>2.70 V</td></tr><tr><td>Out</td><td>In</td><td>Out</td><td>Out</td><td>Out</td><td>2.80 V</td></tr><tr><td>Out</td><td>In</td><td>Out</td><td>Out</td><td>In</td><td>2.90 V</td></tr><tr><td>Out</td><td>In</td><td>Out</td><td>In</td><td>Out</td><td>3.00 V</td></tr><tr><td>Out</td><td>In</td><td>Out</td><td>In</td><td>In</td><td>3.10 V</td></tr><tr><td>Out</td><td>In</td><td>In</td><td>Out</td><td>Out</td><td>3.20 V</td></tr><tr><td>Out</td><td>In</td><td>In</td><td>Out</td><td>In</td><td>3.30 V</td></tr><tr><td>Out</td><td>In</td><td>In</td><td>In</td><td>Out</td><td>3.40 V</td></tr><tr><td>Out</td><td>In</td><td>In</td><td>In</td><td>In</td><td>3.50 V</td></tr></table>Note! Bold entries correspond to the approved CPU list on page 31. Do not confuse CPU Core Voltage with CPU I/O voltage. The VL-686-2 will only work with CPU chips with an I/O voltage of 3.3V.</td><td>Varies</td><td>31</td></tr>
<tr><td>VN3</td><td>Flat Panel Selection
<table><tr><th>VN3[7-8]</th><th>VN3[5-6]</th><th>VN3[3-4]</th><th>VN3[1-2]</th><th>Number</th><th>Type</th></tr><tr><td>In</td><td>In</td><td>In</td><td>In</td><td>—</td><td>—</td></tr><tr><td>In</td><td>In</td><td>In</td><td>Out</td><td>1</td><td>1024x768 Dual Scan STN Color</td></tr><tr><td>In</td><td>In</td><td>Out</td><td>In</td><td>2</td><td>128x1024 TFT Color</td></tr><tr><td>In</td><td>In</td><td>Out</td><td>Out</td><td>3</td><td>640x480 Dual Scan STN Color</td></tr><tr><td>In</td><td>Out</td><td>In</td><td>In</td><td>4</td><td>800x600 Dual Scan STN Color</td></tr><tr><td>In</td><td>Out</td><td>In</td><td>Out</td><td>5</td><td>640x480 Sharp TFT Color</td></tr><tr><td>In</td><td>Out</td><td>Out</td><td>In</td><td>6</td><td>640x480 18-bit TFT Color</td></tr><tr><td>In</td><td>Out</td><td>Out</td><td>Out</td><td>7</td><td>1024x768 TFT Color</td></tr><tr><td>Out</td><td>In</td><td>In</td><td>In</td><td>8</td><td>800x600 TFT Color</td></tr><tr><td>Out</td><td>In</td><td>In</td><td>Out</td><td>9</td><td>800x600 TFT Color</td></tr><tr><td>Out</td><td>In</td><td>Out</td><td>In</td><td>10</td><td>800x600 TFT Color</td></tr><tr><td>Out</td><td>In</td><td>Out</td><td>Out</td><td>11</td><td>800x600 Dual Scan STN Color</td></tr><tr><td>Out</td><td>Out</td><td>In</td><td>In</td><td>12</td><td>800x600 Dual Scan STN Color</td></tr><tr><td>Out</td><td>Out</td><td>In</td><td>Out</td><td>13</td><td>1024x768 TFT Color</td></tr><tr><td>Out</td><td>Out</td><td>Out</td><td>In</td><td>14</td><td>1280x1024 Dual Scan STN Color</td></tr><tr><td>Out</td><td>Out</td><td>Out</td><td>Out</td><td>15</td><td>1024x600 Dual Scan STN Color</td></tr></table></td><td>—</td><td>46</td></tr>
</table>

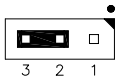
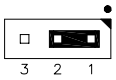
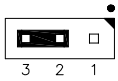
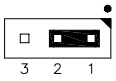
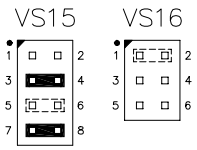
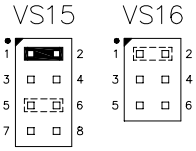
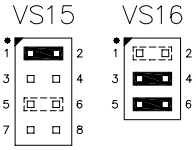
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Jumper Block	Description	As Shipped	Page
VS1[1-2]	**System BIOS Selector** In — Primary System BIOS occupies F0000h to FFFFFh Out — Secondary System BIOS occupies F0000h to FFFFFh ***Note!*** *The secondary System BIOS is field upgradable using the BIOS upgrade utility. See www.versalogic.com/private/686-2support.asp for further information.*	In	—
VS1[3-4]	**Video BIOS Selector** In — Primary Video BIOS occupies C0000h to C9FFFh Out — Secondary Video BIOS occupies C0000h to C9FFFh ***Note!*** *The secondary System BIOS is field upgradable using the BIOS upgrade utility. See www.versalogic.com/private/686-2support.asp for further information.*	In	—
VS2	**COM2 Configuration** RS-232  RS-422  RS-485 Endpoint Station  RS-485 Intermediate Station 	RS-232	35
VS3	**Counter/Timer 4 Clock Source** 250 kHz  1 MHz  External Input 	1 MHz	—
VS4	**Counter/Timer 5 Clock Source** 250 kHz  1 MHz  CTC#4  External Input 	1 MHz	—
VS5	**IRQ 9 Interrupt Source** External Input JS2 Pin 2  STD Bus INTRQ* (P44)  ***Note!*** *Other sources can be enabled for this IRQ in CMOS Setup. To avoid possible conflict with the Ethernet interface, the board is shipped with this jumper removed.*	No Jumper	—
VS6	**IRQ3 Interrupt Source** In — Connects STD Bus INTRQ* (P44) to IRQ3 Out — Disconnects the above ***Note!*** *Other sources can be enabled for this IRQ in CMOS Setup.*	Out	—

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Jumper Block	Description	As Shipped	Page
VS7	**IRQ 10 Interrupt Source** Timer 2 / STD Bus INTRQ1* (P37)  3 2 1 / 3 2 1 ***Note!*** *Other sources can be enabled for this IRQ in CMOS Setup. To avoid possible conflict with the Ethernet interface, the board is shipped with this jumper removed.*	No Jumper	—
VS8	**IRQ 11 Interrupt Source** Timer 3 / STD Bus INTRQ2* (P50)  3 2 1 / 3 2 1 ***Note!*** *Other sources can be enabled for this IRQ in CMOS Setup. To avoid possible conflict with the Ethernet interface, the board is shipped with this jumper removed.*	No Jumper	—
VS9	**IRQ 12 Interrupt Source** Timer 4 / STD Bus INTRQ3* (E67)  3 2 1 / 3 2 1 ***Note!*** *Other sources can be enabled for this IRQ in CMOS Setup. To avoid possible conflict with the Ethernet interface, the board is shipped with this jumper removed.*	No Jumper	—
VS10	**IRQ 15 Interrupt Source** Timer 5 / External Input JS2 Pin 4  3 2 1 / 3 2 1 ***Note!*** *Other sources can be enabled for this IRQ in CMOS Setup. To avoid possible conflict with the Ethernet interface, the board is shipped with this jumper removed.*	No Jumper	—
VS11	**CMOS RAM and Real Time Clock Erase** Normal Operation / Erase  1 2 3 / 1 2 3 ***Note!*** *Leave the jumper in the erase position for 30 seconds to fully erase CMOS RAM. Operation with the jumper in the erase position will prevent changes to the CMOS Setup parameters, and will force the board to use the factory default parameters as shown on page 9.*	Normal	33

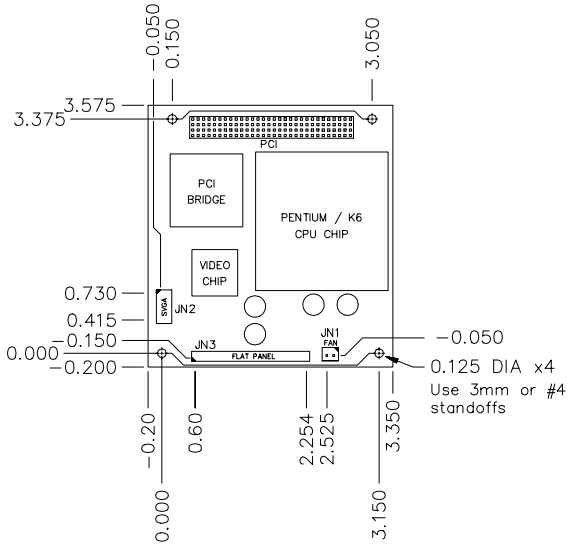
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Jumper Block	Description	As Shipped	Page
VS12	**IRQ 5 (Inter-Processor Communication) Interrupt Source** STD Bus INTRQ4* (P05)  STD Bus INTRQ* (P44)  ***Note!*** *Other sources can be enabled for this IRQ in CMOS Setup. To avoid possible conflict with the Ethernet interface, the board is shipped with this jumper removed.*	No Jumper	—
VS13	**Battery Backed SRAM Power** In — Connects battery power to socket U5 Out — Disconnects battery power to socket U5 ***Note!*** *This jumper must be out when inserting or removing the SRAM chip.*	Out	—
VS14	**IRQ 9 Interrupt Source** STD Bus INTRQ4* (P05)  STD Bus INTRQ* (P44)  ***Note!*** *Other sources can be enabled for this IRQ in CMOS Setup.*	Out	—
VS15 VS16	**Multiprocessor Configuration** Permanent Master  Temporary Master  Dual Master  ***Note!*** *The dashed jumpers are documented below.*	Permanent Master	14
VS15[5-6]	**Non-Maskable Interrupt / STD Bus Interconnect** In — Connects STD Bus NMIRQ* (P46) to CPU NMI input Out — CPU ignores activity on STD Bus NMIRQ* (P46)		—
VS16[1-2]	**General Purpose Digital Input** In — Causes bit D5 (GP0) of the SCR register to read as “1” Out — Causes bit D5 (GP0) of the SCR register to read as “0” ***Note!*** *This jumper can be used for generic application use. It does not affect on-board circuitry other than to change D5 in the SCR register.*	Out	54

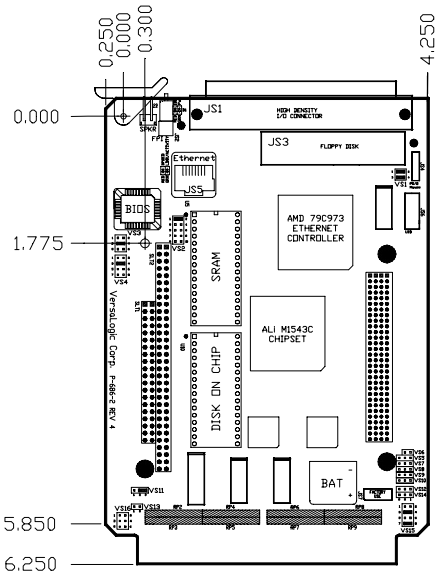
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Physical Dimensions

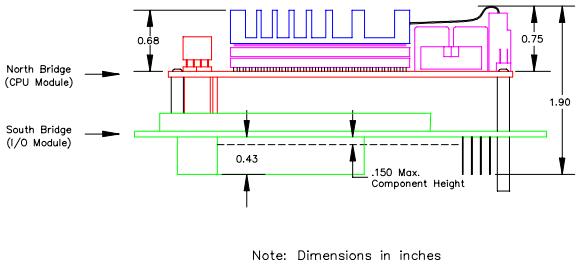
The VL-686-2 is a two board set consisting of the CPU Module (North Bridge) and the STD Bus Module (South Bridge). Dimensions are given below to help with pre-production planning and layout.



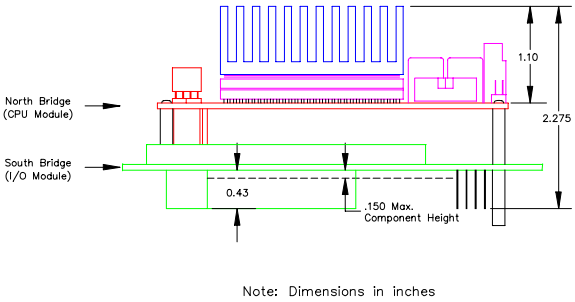
CPU Module (North Bridge)



STD Bus Module (South Bridge)



Overall Height (Fan Model)



Overall Height (Fanless Model)

Figure 4. Dimensions

(Not to scale. All dimensions in inches.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

HARDWARE ASSEMBLY

The VL-686-2 consists of two boards which are mounted together with four 5mm x 15mm M3 threaded hex male/female standoffs (p/n VL-HDW-101). These standoffs are usually secured to the top circuit board using four pan head screws.

Caution: Extreme care must be taken not to damage components near the corner mounting holes when tightening standoffs with nut driver tool.

Optional PC/104-*Plus* or PC/104 expansion modules can be attached to the bottom of the VL-686-2 board set and secured with standoffs or 5mm nuts.

Note! PC/104 expansion modules can be secured to the underside of the VL-686-2, however, the 40-pin and 64-pin ISA feedthrough connectors may need to be extended, and longer standoffs might need to be used to provide adequate clearance between the PCI connector and the components on the top side of the PC/104 module.

Refer to the drawing on page 10 for dimensional details.

An extractor tool is available (part number VL-HDW-201) to separate the (top) CPU module from the (bottom) STD Bus board.

PC/104-*PLUS* (PCI) SLOT NUMBERS

The VL-686-2 uses two PCI slot numbers ("2" and "3") for on-board use, leaving two more slot numbers ("0", and "1") available for expansion using the PC/104-*Plus* stack. A maximum of two (PCI based) PC/104-Plus cards can be attached to the VL-686-2. You must configure the PC/104-*Plus* expansion module closest to the STD Bus card as slot "0". If you add a second PC/104-Plus board, it must be configured as slot "1". Please consult your expansion board reference manual for configuration procedures.

PC/104 (ISA) MODULES

Up to four (ISA based) PC/104 boards which can be added to the bottom side of the VL-686-2.

MIXING ISA AND PCI MODULES

If you are mixing PC/104-*Plus* (PCI) and PC/104 (ISA) expansion modules together on the stack, the PC/104-*Plus* boards (2 maximum) must be positioned first on the stack (closest to the STD Bus board). The PC/104 modules are then attached to the underside of the exposed PC/104-*Plus* modules.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

External Connectors

CONNECTOR LOCATION DIAGRAMS (CPU MODULE)

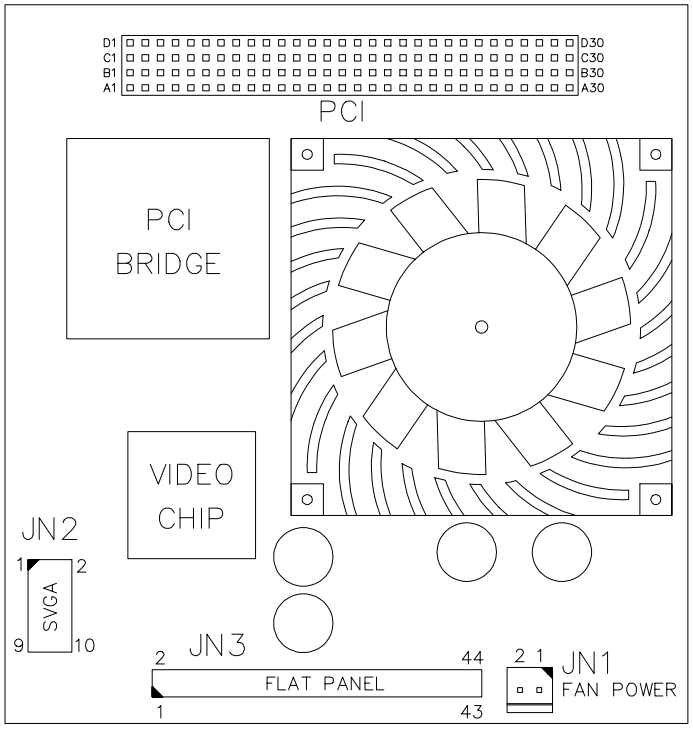


Figure 5. Connector Location Diagram (CPU Module)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CONNECTOR LOCATION DIAGRAM (STD BUS MODULE)

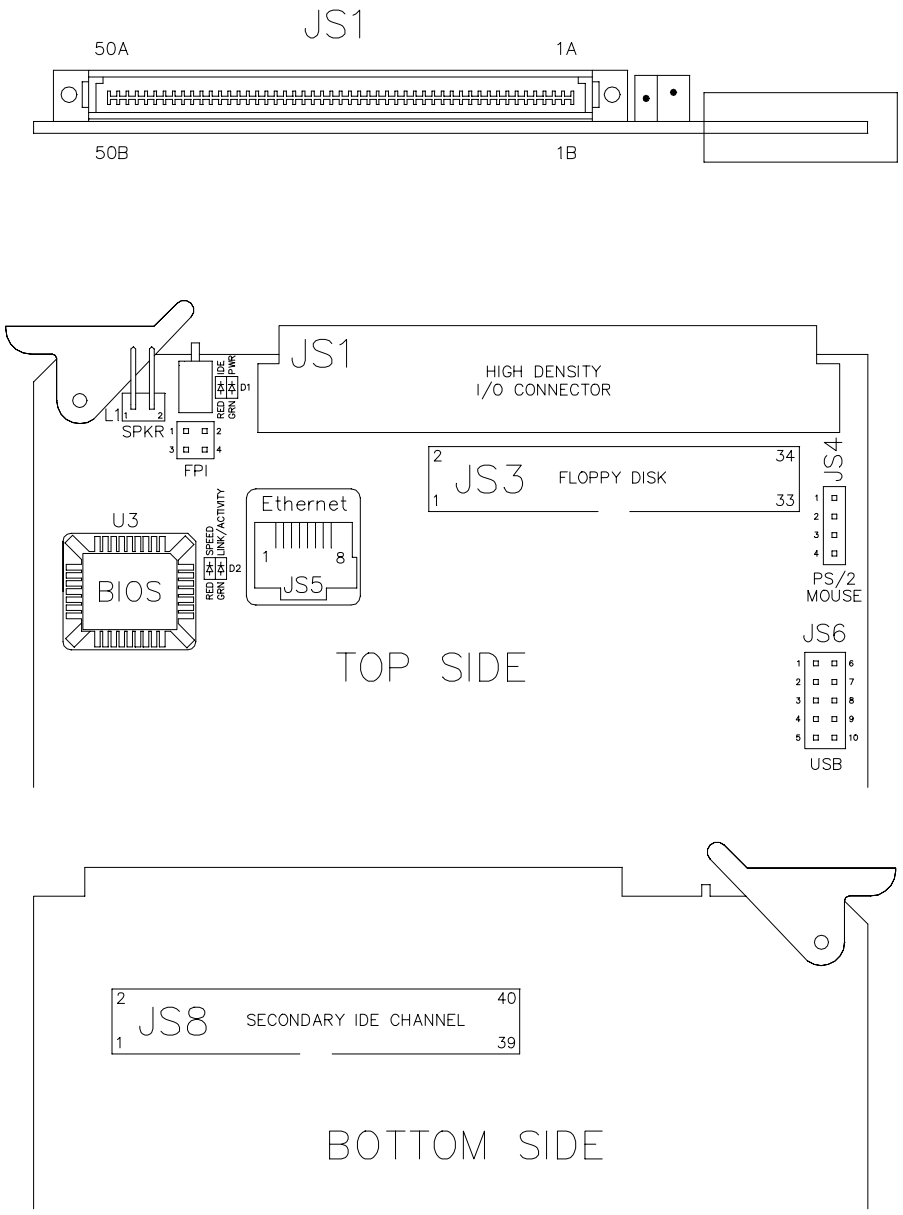


Figure 6. Connector Location Diagram (STD Bus Module)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CONNECTOR FUNCTIONS AND INTERFACE CABLES

The table below notes the function of each connector, as well as mating connectors and cables, and the page where a detailed pinout or further information is available.

Table 2: Connector Functions and Interface Cables

Connector	Function	Mating Connector	Transition Cable	Cable Description	Page
JN1	Fan Power Output (+5V)	Molex 22-01-3027 or Molex 22-01-2025	Provided with fan assembly	—	32
JN2	SVGA Video Output	Samtec TCSD-05-12.00-01 ‡	VersaLogic VL-CBL-1007		43
JN3	Flat Panel Interface	Adam Tech 2FCS-44-SG + Adam Tech 2CTA *	Custom	Contact factory. We have options available for direct attachment to most Sharp LCD panels.	45
JS1	Keyboard, LPT1, COM1, COM2, IDE0, Timers	Robinson-Nugent P50E-100S-TG	VersaLogic VL-CBL-100A	Breakout to standard PC device connectors	29
JS2	IRQ15 & IRQ9 External Input	4-pin 0.1" Dual-Row Header	—	—	—
JS3	Floppy Drive Interface	3M 3414-7600	VersaLogic VL-CBL-3403	1.5 foot 34-pin standard floppy interface cable.	—
JS4	PS/2 Mouse	4-pin 0.1" Single-Row Header	—	—	—
JS5	Ethernet	RJ-45 Crimp-on Plug	—	—	—
JS6	Dual USB 1.0 Interface	Molex 14-56-2051	VersaLogic VL-CBL-0501	Dual 8 inch transition cable. 5-pin connector to USB 1.0 receptacle connector	—
JS7	PLD Reprogramming Port *(Factory use Only)*	—	—	—	—
JS8	IDE Hard Drive Channel 1	3M 3417-7600	VersaLogic VL-CBL-4001	1.5 foot 40-pin dual IDE drive interface cable	47
L1	Speaker Interface	—	—	—	43
SLT1	ISA Connector (8-Bit)	—	—	—	—
SLT2	ISA Connector (16-Bit Extentsion)	—	—	—	—
SLT3	PCI	—	—	—	—
P1 / P2	STD 32 Bus Interface	—	—	—	—

* **Note:** This connector is a 2.00mm housing and crimp terminal style. Number of crimp terminals depends upon flat panel display model being used.

‡ **Note:** The 12.00 in this part number specifies cable length. This part number has a 12" cable attached to the 10-pin 2mm connector.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

HIGH DENSITY 100-PIN CABLE (JS1)

Cable assembly VL-CBL-100A is used to break-out this high density connector into standard PC I/O connectors. This chart shows the pinout for the cable assembly.

Table 3: JS1 High Density 100-Pin Connector Pinout

JS1 Pin	External Connector	Pin	Signal
1A	**COM2**	1	Data Carrier Detect
2A	JA	6	Data Set Ready
3A		2	Receive Data
4A		7	Request to Send
5A		3	Transmit Data
6A		8	Clear to Send
7A		4	Data Terminal Ready
8A		9	Ring Indicator
9A		5	Ground
10A		—	No Connect
11A	**LPT1**	1	Strobe
12A	JB	14	Auto feed
13A		2	Data bit 1
14A		15	Printer error
15A		3	Data bit 2
16A		16	Reset
17A		4	Data bit 3
18A		17	Select input
19A		5	Data bit 4
20A		18	Ground
21A		6	Data bit 5
22A		19	Ground
23A		7	Data bit 6
24A		20	Ground
25A		8	Data bit 7
26A		21	Ground
27A		9	Data bit 8
28A		22	Ground
29A		10	Acknowledge
30A		23	Ground
31A		11	Port Busy
32A		24	Ground
33A		12	Paper End
34A		25	Ground
35A		13	Select
36A	**TIMERS**	1	Counter / Timer 3 Out
37A	JC	2	Ground
38A		3	Counter / Timer 4 In
39A		4	Ground
40A		5	Counter / Timer 4 Out
41A		6	Ground
42A		7	Counter / Timer 5 In
43A		8	Ground
44A		9	Counter / Timer 5 Out
45A		10	Ground
46A		11	Non-Maskable Interrupt
47A	**KBD**	4	+5V
48A	JD	1	Keyboard Data
49A		3	Ground
50A		5	Keyboard Clock

JS1 Pin	External Connector	Pin	Signal
1B	**COM1**	1	Data Carrier Detect
2B	JE	6	Data Set Ready
3B		2	Receive Data
4B		7	Request to Send
5B		3	Transmit Data
6B		8	Clear to Send
7B		4	Data Terminal Ready
8B		9	Ring Indicator
9B		5	Ground
10B		—	No Connect
11B	**IDE 0**	1	Reset signal from CPU
12B	JF/JG	2	Ground
13B		3	Data bit 7
14B		4	Data bit 8
15B		5	Data bit 6
16B		6	Data bit 9
17B		7	Data bit 5
18B		8	Data bit 10
19B		9	Data bit 4
20B		10	Data bit 11
21B		11	Data bit 3
22B		12	Data bit 12
23B		13	Data bit 2
24B		14	Data bit 13
25B		15	Data bit 1
26B		16	Data bit 14
27B		17	Data bit 0
28B		18	Data bit 15
29B		19	Ground
30B		20	No connection
31B		21	No connection
32B		22	Ground
33B		23	I/O write
34B		24	Ground
35B		25	I/O read
36B		26	Ground
37B		27	I/O Channel Ready
38B		28	No connection
39B		29	No connection
40B		30	Ground
41B		31	IRQ14
42B		32	Drive 16-bit I/O
43B		33	Address bit 1
44B		34	No connection
45B		35	Address bit 0
46B		36	Address bit 2
47B		37	Reg. access chip select 0
48B		38	Reg. access chip select 1
49B		39	No connection
50B		40	Ground

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Power Supply

POWER CONNECTORS

Main power is applied to the VL-686-2 through the STD 32 Bus. There are no external connections.

POWER REQUIREMENTS

The VL-686-2 only requires +5 volts (±5%) for proper operation, however, additional PC/104 Modules or STD Bus Boards in your system may require +12VDC, –12VDC, and/or +3.3V. A variable low-voltage supply circuit provides power to the CPU, and an on-board regulator provides local +3.3V for on-board circuitry.

The exact power requirement of the VL-686-2 depends on several factors, including memory configuration, CPU speed, peripheral connections, type and number of expansion modules, and attached devices. For example, AT keyboards typically draw their power directly from the VL-686-2, and driving long RS-232 lines at high speed can increase power demand.

PC/104-*PLUS* (PCI) BUS +3.3V SUPPLY

If you plan to attach a PC/104-*Plus* expansion module which requires a +3.3V power supply from the PCI Bus, you will need to provide an external power supply to source this voltage. The VL-686-2 does not provide +3.3V to the PC/104-*Plus* (PCI) bus. There is an on-board +3.3V regulator, but this voltage is reserved for on-board circuitry, and is not available for external use.

Some PC/104-*Plus* modules are advertised as +3.3V boards, and yet, they do not require voltage on the PCI bus +3.3V power supply line. These modules will work properly without an external supply. Please work directly with the manufacturer of the expansion module to determine if the +3.3V supply voltage (from the PCI bus) is required or not.

If you plan to use a PC/104-*Plus* (PCI) module which requires +3.3V from the PCI bus, you will need to provide an external +3.3V power supply and make direct connection to the appropriate pin on the PCI bus (usually this is done through a custom PC/104-*Plus* expansion module).

There are no power-supply terminals on the VL-686-2 for connecting an external supply. The connection will have to be made through a custom PC/104-*Plus* module.

Warning! To prevent severe and possibly irreparable damage to the system, it is critical that the power be shut off when inserting and extracting the board from the card cage.

Note! The +12VDC, and –12VDC voltages are only required for PC/104 expansion modules or STD Bus cards that require these voltages.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

LITHIUM BATTERY

Warning! To prevent shorting, premature failure, or damage to the lithium battery, do not place the unit on a conductive surface such as metal, black conductive foam, or the outside surface of a metalized ESD protective pouch. The lithium battery may explode if mistreated. Do not recharge, disassemble, or dispose of in fire. Dispose of used batteries promptly.

Normal battery voltage should be at least 3.0V. If the voltage drops below 3.0V, contact the factory for a replacement (part number T-HB3/5-3). Life expectancy under normal use is approximately 10 years.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CPU

CPU Clock Speed Multiplier

Jumper block VN1 is used to multiply the on-board 66 MHz bus clock to match the internal clock speed of the CPU chip. For example, the 200 MHz CPU shown below uses a multiplier of 3.0

See page 17 for jumper configuration details.

CPU Core Voltage Selection

Jumper block VN2 is used to program a variable output voltage regulator to match the V_{CORE} power supply requirements of the CPU chip. The V_{CORE} voltage can be determined by examining the information marked on the lid of the CPU chip. See page 17 for configuration details.

Warning! To prevent damage to the CPU chip or the VL-686-2 circuitry, you must always double check the V_{CORE} voltage indicated on the cover of the CPU chip and make sure jumper VN2 is set properly.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

APPROVED CPU LIST

The following list of Socket 7, 3.3V I/O voltage, 66MHz external bus compliant CPU chips are approved for use in the VL-686-2. Care must be taken to correctly configure jumper VN1 to match the *CPU Clock Speed Multiplier* as shown in the table below. Jumper VN2 must be configured to match the *CPU Core Voltage* as marked on the cover of the CPU chip. See page 17 for jumper configuration details.

Table 4: CPU Configuration Table

Mfg.	Description	CPU Speed	CPU Clock Speed Multiplier
Intel	Pentium MMX	233 MHz	3.5
Intel	Tillamook	266 MHz	4.0
AMD	K6-2	266 MHz	4.0
AMD	K6-2E	266 MHz	4.0
AMD	K6-2	300 MHz	4.5
AMD	K6-2	333 MHz	5.0
AMD	K6-2	366 MHz	5.5
AMD	K6-2	400 MHz	6.0

Warning! Incorrect configuration can result in damage to the CPU chip and the VL-686-2 circuitry. Consult your CPU documentation to correctly identify clock speed, core voltage and I/O voltage prior to installation. Failure to configure and operate your CPU in accordance within the specified parameters will void your warranty.

HEAT SINK

A heat sink and cooling fan must be in place whenever power is applied to the CPU. The fan connects to header JN1 for power.

Table 5: Fan Power Connector

JN1 Pin	Signal Name	Function
1	GND	Ground
2	+5V	Fan Power

Note A fan is not required for the low-power K6-2E model.

L2 CACHE MEMORY

No configuration is required for the L2 Cache memory. The VL-686-2 is shipped with 512 MB of cache memory.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

System RAM

Compatible Memory Modules

The VL-686-2 will accept one 144-pin SODIMM memory module with the following characteristics:

- Storage Capacity 8 to 256 MB
- Voltage 3.3 Volt
- Error Detection Not supported
- Error Correction Not supported
- Type EDO, 60 ns or SDRAM, 66 MHz or PC-100

CMOS RAM

Clearing CMOS RAM

Jumper VS11 can be moved to position [1-2] for 30 seconds to erase the contents of the CMOS RAM. Be sure to move the jumper back to position [2-3] for normal operation.

Note Operation with the jumper in the erase position [1-2] will cut-off all battery power to the CMOS RAM and Real Time Clock chip. The board will operate in this condition, however, this will force the board to use the factory default parameters as shown on page 7. For custom programming of the Factory Default Parameters, please contact the Customization Department at VersaLogic.

Real Time Clock

The VL-686-2 features a year 2000 compliant, battery-backed 146818 compatible real time clock/calendar chip. Under normal battery conditions, the clock will maintain accurate timekeeping functions during periods when the board is powered off.

Setting the Clock

The CMOS Setup utility (accessed by pressing the [DEL] key during a system boot) can be used to set the time/date of the real time clock.

Battery Backed Static RAM

A 32-pin socket (U5 on the STD Bus board) will accept a standard 128K or 512K low-power static RAM chip for non-volatile data storage. Backup voltage is provided by the on-board battery. For 512K applications, we recommend using a Hitachi HM628512LP-7SL (or faster) low power 512K x 8 SRAM chip (VersaLogic part number VL-SRAM-512). Memory chips need be 32-pin, 0.6" DIP, low power, 200nS or faster. Data is accessed through a 64K page frame at E0000h by manipulating the Map and Paging Control Register (MPCR). See page 57 for further information.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Disk on Chip

A 32-pin socket (U10 on the STD Bus board) will accept an M-Systems DiskOnChip (DOC) Flash Disk for non-volatile, read/write data storage. The DOC can be configured as a boot device.

ENABLE / DISABLE

The DOC can be enabled or disabled through CMOS Setup by going into the Advanced Configuration screen and setting "DiskOnChip" to "Enabled". When enabled, the DOC appears in the upper memory region as an 8K page frame at CC000h.

COMPATIBLE DEVICES

Any 5 Volt, M-Systems series rev 1.10 or later DiskOnChip 2000® device will work. At the time of this writing, capacities of 8, 16, 24, 32, 48, 64, and 96MB are available. For example, the M-Systems part number for an 8 MB, 5 Volt, device is MD-2200-D8.

Note Only low-profile DOC chips may be used on the VL-686-2. Chip sizes not mentioned above may be physically too large to fit between the two modules.

INSTALLING THE DOC CHIP

1. Align pin 1 on the DOC with pin 1 of socket U10 on the I/O module.
2. Push the DOC into the socket carefully until it is fully seated.
3. Enable the DOC in CMOS Setup.

Warning! ***The DOC will be permanently damaged if installed incorrectly!*** When installing or removing the DOC, be sure to align pin-1 on the chip with pin-1 on the socket. To prevent electrostatic damage, first touch a grounded surface to discharge any static electricity from your body.

CMOS SETUP

To enable the DOC as drive C on a system without a hard disk, set the CMOS setup of drive C to “not installed”, and reboot the computer. You will also need to enable the DOC on the Advanced Configuration Screen.

Note! The DOC needs to be formatted with operating system files in order for it to serve as a boot device. The MS-DOS "SYS" command is used to accomplish this task. Refer to the M-Systems web site (www.m-sys.com) for documentation on the DOC 2000 and details on making it a bootable device under a variety of operating systems.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Serial Ports

The VL-686-2 features two on-board 16550 based serial channels located at standard PC I/O addresses. COM1 is an RS-232 (115.2K baud) serial port.

COM2 can be operated in RS-232, RS-422, or RS-485 modes. Two additional non-standard baud rates are also available (programmable in the normal baud rate registers) of 230K and 460K baud.

Interrupt assignment for each COM port is handled in CMOS Setup, and each port can be independently enabled or disabled.

COM Port Configuration

There are no configuration jumpers for COM1 because it only operates in RS-232 mode.

Jumper VS2 is used to configure COM2 for RS-232/422/485 operation. See page 17 for jumper configuration details.

COM2 RS-485 Mode Line Driver Control

The TxD+/TxD– differential line driver can be turned on and off by manipulating the DTR handshaking line.

The following code example shows how to turn the line driver for COM2 on and off:

```
mov   dx,02FCh   ; Point to COM2 Modem Control register
in    al,dx      ; Fetch existing value
or    al,01h     ; Set bit D0
out   dx,al      ; Turn DTR on (disables line driver)

in    al,dx      ; Fetch existing value
and   al,0FEh    ; Clear bit D0
out   dx,al      ; Turn DTR off (enables line driver)
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SERIAL PORT CONNECTORS

See the *Connector Location Diagram* on pages 25 and 27 for connector and cable information. The pinout of the DB9 connector applies to use of the VersaLogic transition cable #VL-CBL-100A.

Table 6: Connectors JA / JE — Serial Port Pinout

COM1 JS1 Pin	COM2 JS1 Pin	RS-232	RS-422	RS-485	JA/JE DB9 Pin
1B	1A	DCD	—	—	1
2B	2A	DSR	—	—	6
3B	3A	RXD*	TxD+	TxD+	2
4B	4A	RTS	TxD–	TxD–	7
5B	5A	TXD*	—	—	3
6B	6A	CTS	Ground	Ground	8
7B	7A	DTR	RxD–	TxD/RxD–	4
8B	8A	RI	RxD+	TxD/RxD+	9
9B	9A	Ground	Ground	Ground	5
10B	10A	N/C	—	—	—

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Parallel Port

The VL-686-2 includes a standard bi-directional/EPP/ECP compatible LPT port which resides at the PC standard address of 378h. The port can be enabled/disabled and interrupt assignments can be made via the CMOS Setup screen. The pinout of the DB25 connector applies to use of the VersaLogic transition cable #VL-CBL-100A.

Table 7: LPT1 Parallel Port Pinout

JS1 Pin	Centronics Signal	Signal Direction	JA Pin
11A	Strobe	Out	1
12A	Auto feed	Out	14
13A	Data bit 1	In/Out	2
14A	Printer error	In	15
15A	Data bit 2	In/Out	3
16A	Reset	Out	16
17A	Data bit 3	In/Out	4
18A	Select input	Out	17
19A	Data bit 4	In/Out	5
20A	Ground	—	18
21A	Data bit 5	In/Out	6
22A	Ground	—	19
23A	Data bit 6	In/Out	7
24A	Ground	—	20
25A	Data bit 7	In/Out	8
26A	Ground	—	21
27A	Data bit 8	In/Out	9
28A	Ground	—	22
29A	Acknowledge	In	10
30A	Ground	—	23
31A	Port Busy	In	11
32A	Ground	—	24
33A	Paper End	In	12
34A	Ground	—	25
35A	Select	In	13

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

IDE Hard Drive / CD-ROM Interfaces

Two IDE interfaces are available to connect up to four IDE mass-storage devices such as hard disk drives, CD-ROM drives, and/or ATA flash drives. Use CMOS Setup to specify the drive parameters of hard drives and ATA flash drives (we usually recommend LBA mode). Do not specify CD-ROM drives in CMOS Setup, as these are not handled by the on-board system BIOS.

Note! The IDE port is designed to operate with newer high-speed IDE drives. This includes "EIDE mode 3 or 4" and "Ultra DMA" interfaces. Some older IDE drives, which are typically IDE Type 0-2, do not operate reliably with this interface. These slower IDE drives are still available from a number of distributors. VersaLogic recommends the use of only IDE mode 3, 4 or Ultra DMA type drives with the VL-686-2 board.

Warning! Cable length must be 18" or less to maintain proper signal integrity. The grounds in this connector should not be used to carry motor current.

Table 8: IDE Connector Pinout

Signal Name	IDE Signal Name	Function	Primary IDE		Secondary IDE
			JS1 Pin	JF/JG Pin	JS8 Pin
HRST*	Host Reset	Reset signal from CPU	11B	1	1
Ground	Ground	Ground	12B	2	2
IDE7	DATA 7	Data bit 7	13B	3	3
HD8	DATA 8	Data bit 8	14B	4	4
HD6	DATA 6	Data bit 6	15B	5	5
HD9	DATA 9	Data bit 9	16B	6	6
HD5	DATA 5	Data bit 5	17B	7	7
HD10	DATA 10	Data bit 10	18B	8	8
HD4	DATA 4	Data bit 4	19B	9	9
HD11	DATA 11	Data bit 11	20B	10	10
HD3	DATA 3	Data bit 3	21B	11	11
HD12	DATA 12	Data bit 12	22B	12	12
HD2	DATA 2	Data bit 2	23B	13	13
HD13	DATA 13	Data bit 13	24B	14	14
HD1	DATA 1	Data bit 1	25B	15	15
HD14	DATA 14	Data bit 14	26B	16	16
HD0	DATA 0	Data bit 0	27B	17	17
HD15	DATA 15	Data bit 15	28B	18	18
Ground	Ground	Ground	29B	19	19
NC	NC	No connection	30B	20	20
NC	NC	No connection	31B	21	21
Ground	Ground	Ground	32B	22	22
HWR*	HOST IOW*	I/O write	33B	23	23
Ground	Ground	Ground	34B	24	24
HRD*	HOST IOR*	I/O read	35B	25	25
Ground	Ground	Ground	36B	26	26
NC	NC	No connection	37B	27	27
HAEN	ALE	Address latch enable	38B	28	28
NC	NC	No connection	39B	29	29
Ground	Ground	Ground	40B	30	30
HINT	HOST IRQ	IRQ14 (IDE0) / IRQ15 (IDE 1)	41B	31	31
XI16*	HOST IOCS16*	Drive register enabled	42B	32	32
HA1	HOST ADDR1	Address bit 1	43B	33	33
NC	NC	No connection	44B	34	34
HA0	HOST ADDR0	Address bit 0	45B	35	35
HA2	HOST ADDR2	Address bit 2	46B	36	36
HCS0*	HOST CS0*	Reg. access chip select 0	47B	37	37
HCS1*	HOST CS1*	Reg. access chip select 1	48B	38	38
NC	NC	No connection	49B	39	39
Ground	Ground	Ground	50B	40	40

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Counter / Timer Interface

External access to a variety of Counter/Timer signals is available through connector JC.

Table 9: Counter/Timer Connector Pinout
14-Pin Female IDC

JS1 Pin	JC Pin	Signal Name	Function
36A	1	OCTC3	Counter / Timer 3 Out
37A	2	Ground	Ground
38A	3	ICTC4	Counter / Timer 4 In
39A	4	Ground	Ground
40A	5	OCTC4	Counter / Timer 4 Out
41A	6	Ground	Ground
42A	7	ICTC5	Counter / Timer 5 In
43A	8	Ground	Ground
44A	9	OCTC5	Counter / Timer 5 Out
45A	10	Ground	Ground
46A	11	NMI*	STD Bus Non-Maskable Interrupt
—	12	N/C	
—	13	N/C	

OCTC3 — Counter / Timer 3 Output. This TTL output signal is the primary output signal for counter / timer 3.

ICTC4 — Counter / Timer 4 Input. This TTL input signal is used as the primary input control signal for counter / timer 4.

OCTC4 — Counter / Timer 4 Output. This TTL output signal is the primary output control signal for counter / timer 4.

ICTC5 — Counter / Timer 5 Input. This TTL input signal is used as the primary input control signal for counter / timer 5.

OCTC5 — Counter / Timer 5 Output. This TTL output signal is the primary output control signal for counter / timer 5.

NMI* — STD Bus Non-Maskable Interrupt. This TTL input signal is used to signal the CPU of an extremely high priority event, such as imminent loss of power, memory error, or bus parity error. Interrupts requested through this input cannot be disabled. They are latched by the CPU, and have the highest priority of all the interrupts. An NMI will abort a DMA transfer if one is in progress. A low level applied to the NMI* pin cause an INT 02h resulting in a dispatch through the interrupt vector at 0000:0008h.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Keyboard Interface

A standard PS/2 keyboard can be attached to connector JD.

Table 10: Keyboard Connector Pinout
6-Pin Mini DIN PS/2 Style

JS1 Pin	JD Pin	Signal Name	Function
47A	4	5VCC	+5V
48A	1	KBDATA	Keyboard Data
49A	3	GND	Ground
50A	5	KBCLK	Keyboard Clock
—	2	N/C	No Connection
—	6	N/C	No Connection

Mouse Interface

A PS/2 style mouse can be attached to JS4. JS4 is not installed.

Table 11: Mouse Connector Pinout

JS4 Pin	JD Pin	Signal Name	Function
1	4	5VCC	+5V
2	1	KBDATA	Mouse Data
3	3	GND	Ground
4	5	KBCLK	Mouse Clock
—	2	N/C	No Connection
—	6	N/C	No Connection

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Front Plane Interrupt Interface

A 4-pin header connector provides external access to two interrupt lines.

Table 12: Front Plane Interrupt Connector Pinout.

JS2 Pin	Signal Name	Function
1	Ground	Ground
2	FP0*	Front Plane 0 Interrupt
3	Ground	Ground
4	FP1*	Front Plane 1 Interrupt

FP0* — Front Plane 0 Interrupt. This TTL input signal is used as a general purpose interrupt request input. If jumper VS5[2-3] is inserted, a low level (or high-to-low transition) applied to the FP0* pin will request an interrupt via IRQ9. In DOS configuration, this will cause an INT 71h resulting in a dispatch through the interrupt vector at 000:01C4h.

FP1* — Front Plane 1 Interrupt. This TTL input signal is used as a general purpose interrupt request input. If jumper VS10[1-2] is inserted, a low level (or high-to-low transition) applied to the FP1* pin will request an interrupt via IRQ15. In DOS configuration, this will cause an INT 77h resulting in a dispatch through the interrupt vector at 000:01DCh.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Floppy Disk Interface

The VL-686-2 CPU card supports a standard 34-pin PC/AT style floppy disk interface at connector JS3.

Note Note that Drive A and Drive B are reversed compared to a typical PC system. This was done to accommodate a single Drive A using a straight ribbon cable without a twist. Cable length must be 18" or less to maintain proper signal integrity. The grounds in this connector should not be used to carry motor current.

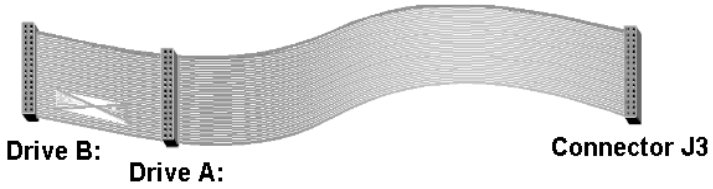


Table 13: Floppy Disk Interface Connector Pinout.

JS3 Pin	Signal Name	Function	JS3 Pin	Signal Name	Function
1	Ground	Ground	18	DIR	Direction Select
2	R/LC	Load Head	19	Ground	Ground
3	Ground	Ground	20	STEP*	Motor Step
4	NC	No Connection	21	Ground	Ground
5	Ground	Ground	22	WDAT*	Write Data Strobe
6	NC	No Connection	23	Ground	Ground
7	Ground	Ground	24	WGAT*	Write Enable
8	INDX*	Beginning Of Track	25	Ground	Ground
9	Ground	Ground	26	TRK0*	Track 0 Indicator
10	MTR1*	Motor Enable 1	27	Ground	Ground
11	Ground	Ground	28	WPRT*	Write Protect
12	DRV0*	Drive Select 0	29	Ground	Ground
13	Ground	Ground	30	RDAT*	Read Data
14	DRE1*	Drive Select 1	31	Ground	Ground
15	Ground	Ground	32	HDSL	Head Select
16	MTR0*	Motor Enable 0	33	Ground	Ground
17	Ground	Ground	34	DCHG	Drive Door Open

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Speaker Interface

Connector L1 is provided for connecting an 8Ω speaker to the card.

Table 14: Speaker Connector Pinout.

L1 Pin	Signal Name	Function
1	+5V	Power
2	Timer 2 Out	Speaker drive

Note! The pinout on this connector is different compared to the VL-586-1 STD Bus CPU board.

Video Interface

An on-board Chips and Technologies 69000 controller with 2MB video RAM (69030 controller with 4MB video RAM on the 686-2s) provides full SVGA video output capabilities for the VL-686-2.

VIDEO RESOLUTIONS

A variety of standard VESA SVGA modes and color depths are available using the installed 2MB video RAM.

Table 15: Video Resolutions

2 MB Video RAM *(standard)*
640 x 480, 16M colors
800 x 600, 16M colors
1024 x 768, 64K colors
1280 x 1024, 256 colors
1600 X 1200, 16 colors

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

VIDEO OUTPUT CONNECTOR

See the *Connector Location Diagram* on page 25 for pin and connector location information. An adapter cable, part number VL-CBL-1007 is available to translate JN2 into a standard 15-pin D-Sub SVGA connector.

Table 16: Video Output Pinout

JN2 Pin	Signal Name	Function	Mini DB15 Pin
1	GND	Ground	6
2	CRED	Red Video	1
3	GND	Ground	7
4	CGRN	Green Video	2
5	GND	Ground	8
6	CBLU	Blue Video	3
7	GND	Ground	5
8	CHSYNC	Horizontal Sync	13
9	GND	Ground	10
10	CVSYNC	Vertical Sync	14

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

FLAT PANEL DISPLAY CONNECTOR

See the *Connector Location Diagram* on page 25 for pin and connector location information.

Table 17: Flat Panel Display Pinout

JN3 Pin	Signal Name	Function	Mono SS 8-bit	Mono DD 8-bit	Mono DD 16-bit	Color TFT 9/12/ 16-bit	Color TFT 18/24 bit	Color TFT HR 18/24 bit	Color STN STN SS 8-bit (X4bP)	Color STN SS 16-bit (4bP)	Color STN DD 8-bit (4bP)	Color STN DD 16-bit (4bP)	Color STN DD 24-bit
1	+12V	Power Supply											
2	+12V	Power Supply											
3	GND	Ground											
4	GND	Ground											
5	+5V	Power Supply											
6	+5V	Power Supply											
7	ENAVEE	Power sequencing control for LCD bias voltage											
8	GND	Ground											
9	P0	Data Output		UD3	UD7	B0	B0	B00	R1	R1	UR1	UR0	UR0
10	P1	" "		UD2	UD6	B1	B1	B01	B1	G1	UG1	UG0	UG0
11	P2	" "		UD1	UD5	B2	B2	B02	G2	B1	UB1	UB0	UB0
12	P3	" "		UD0	UD4	B3	B3	B03	R3	R2	UR2	UR1	LR0
13	P4	" "		LD3	UD3	B4	B4	B10	B3	G2	LR1	LR0	LG0
14	P5	" "		LD2	UD2	G0	B5	B11	G4	B2	LG1	LG0	LB0
15	P6	" "		LD1	UD1	G1	B6	B12	R5	R3	LB1	LB0	UR1
16	P7	" "		LD0	UD0	G2	B7	B13	B5	G3	LR2	LR1	UG1
17	P8	" "	P0		LD7	G3	G0	G00	SHF CLKU	B3		UG1	UB1
18	P9	" "	P1		LD6	G4	G1	G01		R4		UB1	LR1
19	P10	" "	P2		LD5	G5	G2	G02		G4		UR2	LG1
20	P11	" "	P3		LD4	R0	G3	G03		B4		UG2	LB1
21	P12	" "	P4		LD3	R1	G4	G10		R5		LG1	UR2
22	P13	" "	P5		LD2	R2	G5	G11		G5		LB1	UG2
23	P14	" "	P6		LD1	R3	G6	G12		B5		LR2	UB2
24	P15	" "	P7		LD0	R4	G7	G13		R6		LG2	LR2
25	P16	" "					R0	R00					LG2
26	P17	" "					R1	R01					LB2
27	P18	" "					R2	R02					UR3
28	P19	" "					R3	R03					UG3
29	P20	" "					R4	R10					UB3
30	P21	" "					R5	R11					LR3
31	P22	" "					R6	R12					LG3
32	P23	" "					R7	R13					LB3
33	GND	Ground											
34	GND	Ground											
35	SHFCLK	Shift Clock. Pixel clock for flat panel data.	SHF CLK	SHF CLK	SHF CLK	SHF CLK	SHF CLK	SHF CLK	SHF CLK	SHF CLK	SHF CLK	SHF CLK	SHF CLK
36	FLM	First Line Marker. Flat panel equivalent of VSYNC.											
37	DE	Display Enable or M signal (ADCCLK) or BLANK#											
38	LP	Latch Pulse. Flat panel equivalent of HSYNC.											
39	GND	Ground											
40	ENABKL	Enable Backlight. Can be programmed for other functions.											
41	N/C	No Connection											
42	N/C	" "											
43	N/C	" "											
44	N/C	" "											

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

COMPATIBLE FLAT PANEL DISPLAYS

The following list of flat panel displays are reported to work properly with the Chips and Technologies 69000 video controller chip used on the VL-686-2:

- Fujitsu FLC31SVC6S
- Hitachi D01VC1CAA
- Hitachi LMG9970ZWCC
- Hitachi LMG9972ZWCC
- Hitachi TX34D61VC1CAD
- NEC NL8060BC31-01
- Optrex DMF-50714NCU-FW (1024x768 DSTN)
- Samsung LT121-103
- Samsung LT133X1-104
- Samsung LT133X1-124
- Sanyo LM-GK53-22NTX (DSTN)
- Sanyo LM-GD53-22NAZ
- Sharp LM15X80 (XGA DSTN)
- Sharp LQ14X01
- Sharp LQ9D03B (640x480 TFT)
- Toshiba LTM12C016
- Toshiba LTM10C209

FLAT PANEL DISPLAY SELECTION

The video BIOS shipped with the VL-686-2 supports up to 15 different flat panel configurations. Use jumper block VN3 to select which type of panel is used, and make sure to configure CMOS Setup to enable flat panel support.

See page 17 for jumper configuration details.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Ethernet Interface

The VL-686-2 features an industry-standard 10baseT / 100baseTX Ethernet interface based on the AMD AM97C973 interface chip. While this interface is not NE2000 compatible, the AM97C9xx series is widely supported. Drivers are readily available to support a variety of operating systems such as Windows 95/98/NT/2000, Linux, Solaris, QNX, VxWorks and others.

SOFTWARE CONFIGURATION

The CMOS Setup screen is used to enable or disable the Ethernet interface.

STATUS LED

Two colored LEDs (D2) located next to the RJ-45 connector provide an indication of the Ethernet status as follows:

Green LED (Link / Activity)

- ON — Active Ethernet cable plugged into JS5.
  No Tx/Rx data activity.
- OFF — Cable not plugged into JS5
  Cable not plugged into active hub
- BLINKING — Active Ethernet cable plugged into JS5.
  Tx or Rx data activity detected on the cable

Red LED (Speed)

- ON — 100baseTx (Fast) detected on Ethernet cable.
- OFF — 10BaseTx (Slow) detected on Ethernet cable.

ETHERNET CONNECTOR

A board-mounted RJ-45 connector is provided to make connection with category 5 Ethernet cable. The Ethernet controller will autodetect 10BaseT/100BaseTX connections.

Table 18: RJ45 Ethernet Connector

JS5 Pin	Signal Name	Function
4	IGND	Isolated Ground
5	IGND	Isolated Ground
6	R–	Receive Data –
3	R+	Receive Data +
7	IGND	Isolated Ground
8	IGND	Isolated Ground
2	T–	Transmit Data –
1	T+	Transmit Data +

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Watchdog Timer

A watchdog timer circuit is included on the VL-686-2 to reset the CPU if proper software execution fails or a hardware malfunction occurs.

ENABLING THE WATCHDOG

To enable or disable the watchdog, set or clear bit D0 in I/O port.When changing the contents of the register, make sure not to alter the value of the other bits.

The following code example enables the watchdog:

```
in    al,E0h
or    al,01h
out   E0h,al
```

The watchdog will be enabled after the first watchdog refresh is performed.

Note! The watchdog timer powers up in a disabled state.

REFRESHING THE WATCHDOG

If the watchdog timer is enabled, software must periodically refresh the watchdog timer at a rate faster than the timer is set to expire (250 ms minimum). Outputting a 5Ah to the *Watchdog Timer Hold-Off Register* at 0E1h resets the watchdog time-out period, preventing the CPU from being reset for the next 250 ms. See page 55 for additional information.

The following code example refreshes the watchdog:

```
mov   al,5Ah
out   E1h,al
```

CPU Temperature Monitor

A thermometer circuit is located directly under the CPU chip which constantly monitors the case temperature of the CPU. This circuit can be used to detect over-temperature conditions which can result from fan or heat sink failure or excessive ambient temperatures.

CMOS Setup is used to set the temperature detection threshold. A status bit in the *Special Control Register* can be read to determine if the case temperature is above or below the threshold. See page 54 for additional information. The VL-686-2 private support webpage includes sample software to read the temperature chip in real-time to a resolution of 0.5°C.

The system can be configured to generate a Non-Maskable Interrupt (NMI) when the temperature exceeds the threshold.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

USB 1.0 Interface

A USB 1.0 (Universal Serial Bus) connector provides a common interface to connect a wide variety of keyboards, modems, mice, and telephony devices to the VL-686-2. With USB 1.0, there is no need to have separate connectors for many common PC peripherals.

The USB 1.0 interface on the VL-686-2 is OHCI (Open Host Controller Interface) compatible, which provides a common industry software/hardware interface.

Note The USB 1.0 interface must be enabled in CMOS Setup.

Table 19: USB 1.0 Interface Connector

JS6 Pin	Signal Name	Function
1	USBPWR1	+5V (Protected)
2	USBP00	Channel 0 Data –
3	USBP01	Channel 0 Data +
4	GND1	Digital Ground
5	GND	Cable Shield
6	GND	Cable Shield
7	GND1	Digital Ground
8	USBP11	Channel 1 Data +
9	USBP10	Channel 1 Data –
10	USBPWR1	+5V (Protected)

Warning! Connector JS6 is not numbered in the conventional manner as most dual-row headers. Care must be taken to attach the USB 1.0 adapter cables as shown below to prevent voltage reversal.

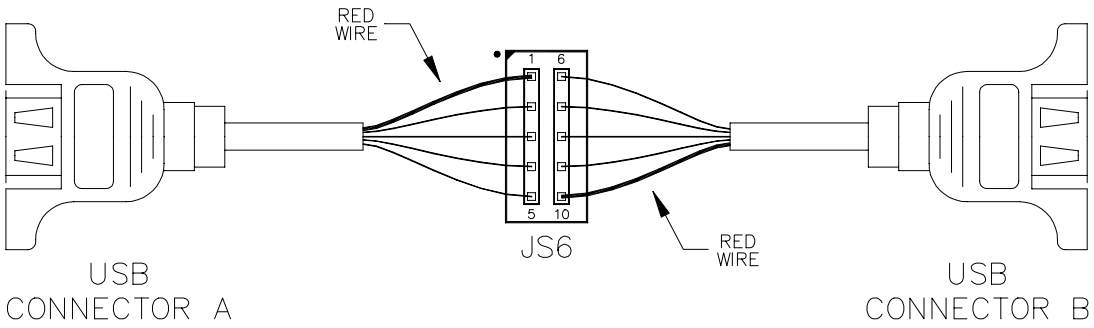


Figure 7. USB 1.0 Connector Orientation Diagram

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Expansion Busses

The VL-686-2 will accept up to four PC/104 and/or two PC/104-*Plus* expansion modules. Both 3.3V and 5.0V modules are supported.

Note! There are certain restrictions when using 3.3V modules. See the Power Supply section on page 29 for more information.

PC/104-*PLUS*

PC/104-*Plus* modules can be secured directly to the underside of the VL-686-2. Make sure to correctly configure the "slot position" jumpers on each PC/104-*Plus* module appropriately. See page 24 for further information.

Memory, I/O Port, and Interrupt allocation for PC/104-*Plus* (PCI) expansion modules is based on PCI Plug and Play technology. The BIOS automatically configures memory allocation for these devices based upon their need. To find out what resources have been allocated to PCI devices in your system, press the PAUSE key on the keyboard when the PCI information screen is displayed during the boot process.

No jumper configuration is necessary to configure PC/101-*Plus* I/O. Just make sure to jumper the expansion module for the correct slot number.

PC/104

PC/104 modules are added to the system by stacked them under the VL-686-2 (under any PC/104-*Plus* modules); 16-bit modules first followed by 8-bit PC/104 modules. If necessary, a 40-pin and 64-pin ISA feedthrough connector "extender", and long standoffs may need to be used to provide adequate clearance between the PCI connector and the components on the top side of the PC/104 module.

PC/104 I/O modules should be addressed in the 100h – 3FFh address range. Care must be taken to avoid the I/O addresses shown in the *On-Board I/O Devices* table on page 52. These ports are used by on-board peripherals and video devices.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Memory and I/O Map

MEMORY MAP

The lower 1 MB memory map of the VL-686-2 is arranged as shown in the following table.

Various blocks of memory space between A0000h and FFFFFh can be shadowed. CMOS setup is used to enable or disable this feature.

Table 20: Memory Map

Start Address	End Address	Block Size	Comment
F0000h	FFFFFh	64K	System BIOS
E0000h	EFFFFh	64K	BBSRAM, FLASH, or BIOS Ext
D8000h	DFFFFh	32K	DRAM, STD Bus, or PC/104 (ISA) Bus
CE000h	D7FFFh	40K	DRAM, STD Bus, or PC/104 (ISA) Bus
CC000h	CDFFFh	8K	DOC, or PC/104 (ISA) Bus
C0000h	CBFFFh	48K	Video BIOS
A0000h	BFFFFh	128K	Video RAM
00000h	9FFFFh	640K	DRAM

Note! The memory map is controlled by the Map and Paging Control Register and by CMOS Setup. See page 56 for more information.

Memory allocation for PC/104-*Plus* (PCI) expansion modules is based on PCI Plug and Play technology. The BIOS automatically configures memory allocation for these devices based upon their need. To find out what resources have been allocated to PCI devices in your system, press the PAUSE key on the keyboard when the PCI information screen is displayed during the boot process.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

I/O MAP

The following table lists the common I/O devices in the VL-686-2 I/O map. Add-on PC/104 Bus I/O boards should be configured for the 100h – 3FFh range, using care to avoid the devices already in the map as shown below. STD Bus cards should be configured for 1000h – FFFFh. (See page 13 for other STD I/O options).

Table 21: On-Board I/O Devices

I/O Device	Standard I/O Addresses
Counter/Timers (See Table 21)	40h – 47h
SCR Special Control Register	E0h
WDHOLD Watchdog Hold-Off Register (Write Only)	E1h
REVIND Revision Indicator Register (Read Only)	E1h
IOMMAP I/O and Memory Map Control Register	E2h
MPCR Map and Paging Control Register	E3h
Secondary IDE Controller	170h – 177h
Primary IDE Controller	1F0h – 1F7h
COM2 Serial Port	2F8h – 2FFh
LPT1 Parallel Port	378h – 37Fh
SVGA Video	3B0h – 3DFh
Floppy Disk Controller	3F0h – 3F7h
COM1 Serial Port	3F8h – 3FFh

Note! I/O ports occupied by on-board devices are freed up when the device is disabled in CMOS Setup.

I/O port allocation for PC/104-*Plus* (PCI) expansion modules is based on PCI Plug and Play technology. The BIOS automatically configures port allocation for these devices based upon their need. To find out what resources have been allocated to PCI devices in your system, press the PAUSE key on the keyboard when the PCI information screen is displayed during the boot process.

COUNTER/TIMERS

Table 22: Channels 0 to 5

Mnemonic	R/W	Address	Name
T0CNT	R/W	0040h	Timer 0 Count Load/Read
T1CNT	R/W	0041h	Timer 1 Count Load/Read
T2CNT	R/W	0042h	Timer 2 Count Load/Read
TCW012	W	0043h	Timer control word for T0,T1, and T2
T3CNT	R/W	0044h	Timer 3 Count Load/Read
T4CNT	R/W	0045h	Timer 4 Count Load/Read
T5CNT	R/W	0046h	Timer 5 Count Load/Read
TCW345	W	0047h	Timer Control Word for T3, T4, and T5

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Interrupt Configuration

The VL-686-2 has the standard complement of PC type interrupts. Several non-shared interrupts are routed to the PC/104 bus, and up to four IRQ lines are automatically allocated as needed to PCI devices.

The switches in the diagram below indicate the various CMOS Setup options. Closed switches show factory default settings.

The temperature monitor non-maskable interrupt is enabled/disabled with bit D3 (NMIEN) in the *Special Control Register*.

Note If your design needs uses interrupts on the PC/104 bus, make sure to configure CMOS Setup with the chosen PC/104 interrupts. This prevents their allocation to PCI devices.

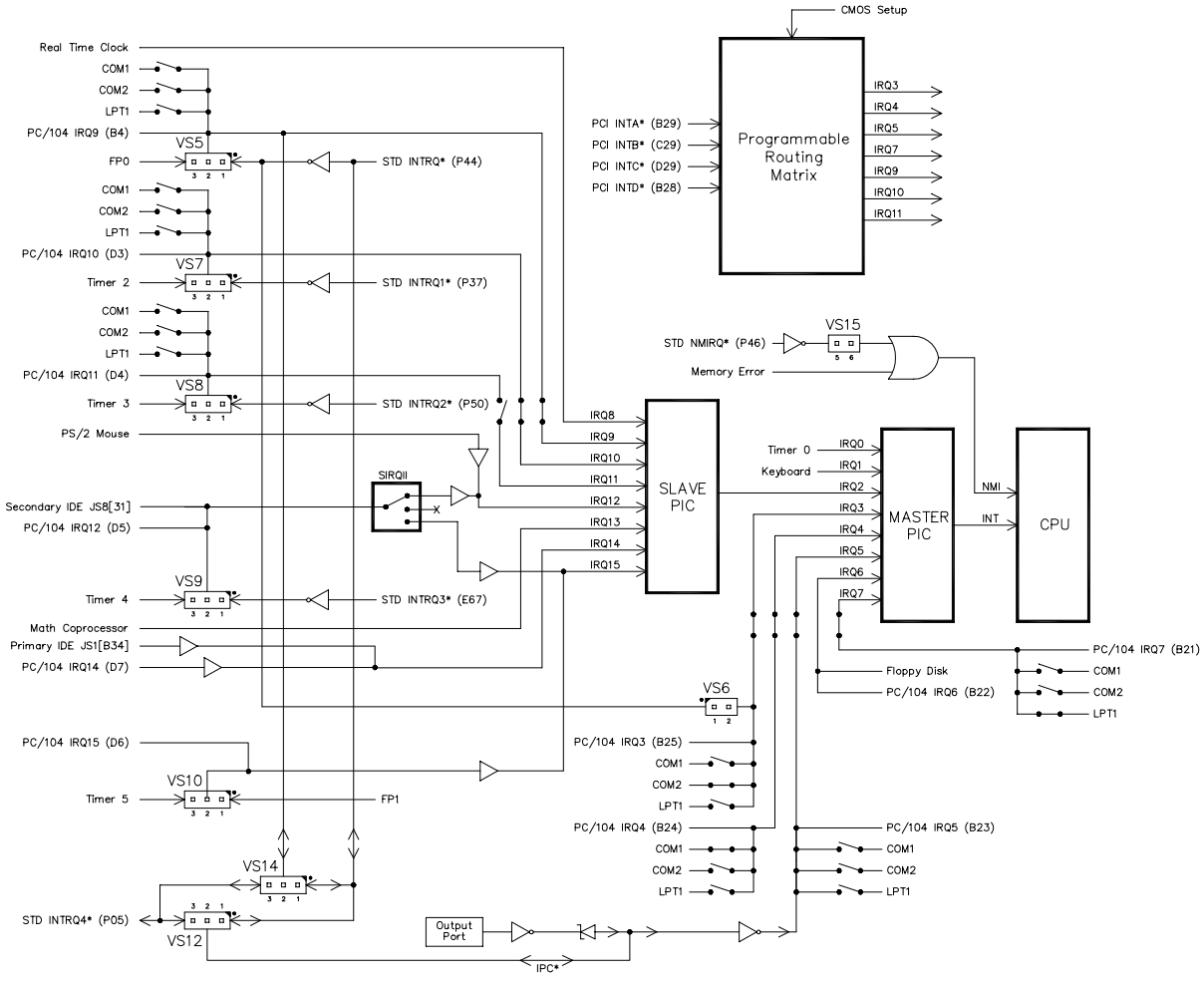


Figure 8. Interrupt Circuit Diagram

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Special Control Register

SCR (READ/WRITE) 00E0h

D7	D6	D5	D4	D3	D2	D1	D0
LED	TEMP	GP0	IPC	NMIEN	ETHDIS	PM	WDOGEN

Table 23: Special Control Register Bit Assignments

Bit	Mnemonic	Description
D7	LED	**Light Emitting Diode** — This output bit controls the green programmable LED next to the pushbutton reset switch on the edge of the STD Bus board. LED = 0 Turns LED off. LED = 1 Turns LED on.
D6	TEMP	**Temperature Status** — This input bit indicates if the CPU case temperature is above or below a predefined threshold. TEMP = 0 Colder than threshold temperature. TEMP = 1 Hotter than threshold temperature. ***Note!*** *The temperature threshold is configured in CMOS Setup (default 70°C).*
D5	GP0	**General Purpose Jumper** — This input bit shows the state of jumper VS16[1-2]. GP0 = 0 Jumper out. GP0 = 1 Jumper in. ***Note!*** *This bit is a read-only bit, and can be used for generic application use.*
D4	IPC	**Interprocessor Communication** — This output bit is used to signal the attention of other CPU cards in a multiprocessor environment. IPC controls an open collector signal which can be carried on your choice of STD Bus interrupt lines. An active low signal on this circuit (generated here, or received from the STD Bus) will trigger IRQ5. IPC = 0 Signal released for other cards to drive. IPC = 1 Signal is driven active low.
D3	NMIEN	**Non-Maskable Interrupt Enable** — This output bit controls the generation of Non-Maskable Interrupts whenever the CPU temperature sensor detects an over-temperature condition. NMIEN = 0 Disable NMIEN = 1 Enable ***Note!*** *The temperature threshold is configured in CMOS Setup (default 70°C).*
D2	ETHDIS	**Ethernet Disable** — This output bit enables and disables the Ethernet port. ETHDIS = 0 Enables Ethernet port. ETHDIS = 1 Disables Ethernet port.
D1	PM	**Permanent Master** — This input bit reflects the state of jumper VS15[7-8]. PM = 0 Jumper out. PM = 1 Jumper in. ***Note!*** *This bit is a read-only bit.*
D0	WDOGEN	**Watchdog Enable** — This output bit enables and disables the watchdog timer reset circuit. WDOGEN = 0 Disables the watchdog timer. WDOGEN = 1 Enables the watchdog timer.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Revision Indicator Register

REVIND (READ ONLY) 00E1h

D7	D6	D5	D4	D3	D2	D1	D0
PC4	PC3	PC2	PC1	PC0	REV2	REV1	REV0

This register is used to indicate the revision level of the VL-686-2 product.

Bit	Mnemonic	Description
D7-D3	PC4-PC0	**Product Code** — These bits are hard coded to represent the product type. The VL-686-2 will always read as 11001. Other codes are reserved for future products. **PC4 PC3 PC2 PC1 PC0 Product Code** 1 1 0 0 1 VL-686-2 ***Note!*** *This bits are read-only.*
D2-D0	REV2-REV0	**Revision Level** — These bits are represent the VL-686-2 circuit revision level, and should match the digit to the left of the decimal point on the model number label affixed to the board. **REV2 REV1 REV0 Revision Level** 0 0 0 Rev 4.xx and 5.xx 0 0 1 Reserved 0 1 0 Reserved 0 1 1 Reserved 1 0 0 Reserved 1 0 1 Reserved 1 1 0 Reserved 1 1 1 Reserved ***Note!*** *This bits are read-only.*

Watchdog Timer Hold-Off Register

WDHOLD (WRITE ONLY) 00E1h

D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	1	0	1	0

A watchdog timer circuit is included on the VL-686-2 board to reset the CPU if proper software execution fails or a hardware malfunction occurs. The watchdog timer is enabled/disabled by writing to bit D0 of SCR

If the watchdog timer is enabled, software must periodically refresh the watchdog timer at a rate faster than the timer is set to expire (250 ms minimum). Writing a 5Ah to WDHOLD resets the watchdog timeout period, preventing the CPU from being reset for the next 250 ms.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

I/O and Memory Map Control Register

IOMMAP (WRITE ONLY) 00E2H

D7	D6	D5	D4	D3	D2	D1	D0
Reserved	Reserved	Reserved	Reserved	MMAP2	MMAP1	IOMAP2	IOMAP1

Table 24: IOMMAP Register Bit Assignments

Bit	Mnemonic	Description
D7-D4	—	**Reserved** — These bits have no function.
D3	MMAP2	**Memory Map Select 2** — This output bit controls which bus will respond to memory (read & write) transactions in the address range CE000h to D7FFFh. MMAP2 = 0 PC/104 (ISA) Bus MMAP2 = 1 STD Bus
D2	MMAP1	**Memory Map Select 1** — This output bit controls which bus will respond to memory (read & write) transactions in the address range D8000 to DFFFFh. MMAP1 = 0 PC/104 (ISA) Bus MMAP1 = 1 STD Bus
D1	IOMAP2	**I/O Map Select 2** — This output bit controls which bus will respond to I/O port (input & output) transactions in the address range (100h to 27Fh). IOMAP2 = 0 PC/104 (ISA) Bus IOMAP2 = 1 STD Bus
D0	IOMAP1	**I/O Map Select 1** — This output bit controls which bus will respond to I/O port (input & output) transactions in the address ranges (2E8h to 2EFh) and (3E8h to 3EFh). IOMAP1 = 0 PC/104 (ISA) Bus IOMAP1 = 1 STD Bus ***Note!*** *These address ranges correspond to COM3 and COM4.*

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Map and Paging Control Register

MPCR (READ/WRITE) 00E3H

D7	D6	D5	D4	D3	D2	D1	D0
FPGEN	Reserved	SPGEN	DPGEN	Reserved	PG2	PG1	PG0

Table 25: Map and Paging Control Register Bit Assignments

Bit	Mnemonic	Description
D7	FPGEN	**FLASH Paging Enable** — Enables a 64K page frame from E0000h to EFFFFh. Used to gain access to the on-board FLASH memory. FPGEN = 0 FLASH page frame disabled. FPGEN = 1 FLASH page frame enabled. ***Note!*** *This bit is used by the Flash BIOS Update Utility (FBU) to upgrade the system BIOS. When FPGEN = 1, the Page Select bits are used to access various 64K blocks within the Flash chip.*
D6	—	**Reserved** — This read only bit has no function.
D5	SPGEN	**Battery Backed Static RAM Paging Enable** — Enables a 64K page frame from E0000h to EFFFFh. Used to gain access to the optional Dallas Semiconductor Battery-Backed Static RAM chip (512KB max.). SPGEN = 0 BBSRAM page frame disabled. SPGEN = 1 BBSRAM page frame enabled. ***Note!*** *When SPGEN = 1, the Page Select bits are used to access various 64K blocks within the BBSRAM chip.*
D4	DPGEN	**DiskOnChip Enable** — Enables a 8K page frame from CC000h to CDFFFh. Used to gain access to the Disk on Chip. DPGEN = 0 DOC page frame disabled. DPGEN = 1 DOC page frame enabled. ***Note!*** *The Page Select bits are not used when accessing the DOC.*
D3	—	**Reserved** — This read only bit has no function.
D2-D0	PG2-PG0	**Page Select** — Selects which 64K block of FLASH or BBSRAM will be mapped into the page frame at E0000h to EFFFFh. **PG2 PG1 PG0 — Memory Range within FLASH or BBSRAM** 0 0 0 — 00000h to 0FFFFh 0 0 1 — 10000h to 1FFFFh 0 1 0 — 20000h to 2FFFFh 0 1 1 — 30000h to 3FFFFh 1 0 0 — 40000h to 4FFFFh 1 0 1 — 50000h to 5FFFFh 1 1 0 — 60000h to 6FFFFh 1 1 1 — 70000h to 7FFFFh

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Appendix A — Other References

PC Chipset *ALi Aladdin IV+ Chipset*	Acer Laboratories Inc., (www.acerlabs.com)
Ethernet Controller *AMD 79C973 (from the PC Net Family of devices)*	Advanced Micro Devices, (www.amd.com)
Video Controller *69000, 69030*	Chips and Technologies Inc., (www.chips.com)
Disk On Chip *DOC2000*	M-Systems Inc., (www.m-sys.com)
PC/104 Specification *PC/104 Resource Guide*	PC/104 Consortium, (www.controlled.com/pc104)
PC/104-*Plus* Specification *PC/104 Resource Guide*	VersaLogic Corp., (www.versalogic.com)
CPU Chips	
K6 & K6-2	Advanced Micro Devices, (www.amd.com)
Pentium	Intel Corporation, (www.intel.com)
General PC Documentation *The Programmer's PC Sourcebook*	Microsoft Press, (mspress.microsoft.com)
General PC Documentation *The Undocumented PC*	www.amazon.com

The **VL-686-2 Support Page**, at **http://www.versalogic.com/private/686-2support.asp**, contains additional information and resources for this product including:

- Reference Manual (PDF format)
- Operating system information and software drivers
- Data sheets and manufacturers' links for chips used in this product
- BIOS information and upgrades
- Utility routines and benchmark software

Note! This is a private page for VL-686-2 users only. It cannot be reached through our web site. You must enter this address directly to find the support page.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP