

Reference Manual

VSBC-7

Pentium / K6 based SBC with
Ethernet, Video, Audio and
Industrial I/O



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Ethernet, Video, Audio and
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MVSBC-7



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 3 Release

- Production release

Rev 2 Release

- Beta test board

Rev 1 Release

- Pre-production only. No customer releases.

Support Page

The **VSBC-7 Support Page**, at <http://www.versalogic.com/private/vsbc7support.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 VSBC-7 users only. It cannot be reached through our web site. You must enter this address directly to find the support page.

Model VSBC-7
Pentium / K6 based SBC with Ethernet, Video, Audio
and Industrial I/O

REFERENCE MANUAL



VERSALOGIC
CORPORATION

Doc. Rev. 07/14/04

VERSALOGIC CORPORATION

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Description

The VSBC-7 is a feature-packed single board computer designed for OEM control projects requiring fast processing, industrial I/O, flexible memory options, and designed-in reliability and longevity (product lifespan). Its features include:

- MMX-class processors
 - Intel Pentium MMX CPUs
 - AMD K6 CPUs
- 8 to 256 MB system RAM
- 512 KB level 2 cache
- Optional Compact Flash Adapter
- 10/100 Ethernet interface
- AGP based video
- Flat Panel Display support
- PC/104-Plus expansion site
- Dual PCI based IDE controllers
- Dual USB 1.0 interfaces
- PCI based audio
- 4 COM + 1 LPT port
- CPU temperature sensor
- Keyboard and PS/2 mouse port
- Industrial I/O
 - Analog input option
 - 16 channel Opto 22 compatible
 - Three spare 16-bit counter/timers
 - Two RS232/422/485 selectable ports
- Two RS-232/422/485 selectable ports
- Watchdog timer
- Vcc sensing reset circuit
- EBX Compliant. 5.75" x 8.00" footprint
- UL and CE compliant
- Flash BIOS with OEM enhancements
- Latching I/O connectors
- Customizing available
- Low power fanless version

This Super Socket 7 compliant single board computer will accept Intel Pentium MMX, AMD K6-2, K6-2E+ and K6-III+ CPU chips. Processing speeds up to 550 MHz are available. The board is compatible with popular operating systems such as Windows CE, QNX, Windows NT/95/98, VxWorks, and Linux.

A full complement of standard I/O ports is included on the board. Additional I/O expansion is available through the high speed PCI-based PC/104-Plus expansion site (which supports both PC/104 and PC/104-Plus expansion modules).

System memory expansion is supported with a high-reliability latching 168-pin DIMM socket. Low power 3.3V 168-pin DIMM modules up to 256 MB are available. SDRAM modules PC-100 are accepted (see specifications on page 3). Application programs and files can be stored on an optional CompactFlash device.

The VSBC-7 features high reliability design and construction including latching I/O connectors. It also features a watchdog timer, voltage sensing reset circuits, and self-resetting fuse on the 5V supply to the keyboard, mouse, USB 1.0 and Opto 22 I/O ports.

VSBC-7 boards are subjected to a 48-hour burn-in and 100% functional testing and are backed by a limited two-year warranty.

US-based manufacturing, careful parts sourcing, and US-based technical support ensure the highest possible quality, reliability, service, and product longevity for this exceptional SBC.

Technical Specifications

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

Board Size: 5.75" x 8.00" x 1.75"; EBX Compliant

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 EDO DRAM, keyboard, and mouse)

VSBC-7cx 233 MHz Pentium CPU 5V ± 5% @ 4.7 A (23.5 W) typ.

VSBC-7gx 400 MHz K6-2 CPU 5V ± 5% @ 5.8 A (29.0 W) typ.

VSBC-7kx 550 MHz K6-III+ CPU 5V ± 5% @ 5.8 A (29.0 W) typ.

VSBC-7nx 350 MHz K6-2E+ CPU Fanless 5V ± 5% @ 3.1 A (15.5 W) typ.

+3.3V or ±12V may be required by some expansion modules

System Reset:

V_{CC} sensing, resets below 4.37V typ.

Watchdog timeout

DRAM Interface:

One 168-pin DIMM socket.

16 to 256 MB, 3.3 volt, parity or non-parity SDRAM.

Note: Parity and ECC features are not supported by the BIOS.

Video Interface:

Based on C&T 69030 chip. 4 MB VRAM standard. Resolutions to 1600 x 1200.

Optional flat panel display interface. 3.3V and 5V flat panel display support

IDE Interface:

Two channels, one 40-pin IDE, and one 44-pin 2mm compatible with enhanced IDE mode 4 and Ultra DMA

Supports up to four IDE devices (hard drives, CD-ROM, etc.)

Floppy Disk Interface: One 34-pin connector, supports two floppy drives

Ethernet Interface: 10/100 Ethernet based on AMD AM79C973 chip. On-board RJ-45 Ethernet cable connector.

Compact Flash Interface Option:

IDE-based socket. Compatible with Type I and II cards (Flash modules or Microdrives). Uses 2mm IDE connector

Audio Interface:

PCI-bus, AC '97 compatible. TTL level volume up/down

Stereo Line Out = 1V_{RMS} into 10K ohms, Stereo Line In = 1 V_{RMS} into 10K ohms.

Analog Input:

8-channel, 12-bit, single-ended, 6 microsecond, channel independent input ranges:

±5, ±10, 0 to +5V, 0 to +10V

Note: Analog input is available only on -r versions.

COM1–2 Interface: RS-232, 16C550 compatible, 115K baud max.

COM3–4 Interface: RS-232/422/485, 16C550 compatible, 460K baud max.

USB Interface:

1.0 compliance

One 10-pin header

LPT Interface:

Bi-directional/EPP/ECP compatible

Opto 22 / Digital Interface:

16 channel, full compliance, ±24 ma outputs

BIOS: General Software embedded BIOS with OEM enhancements

Field upgradable with Flash BIOS Upgrade Utility

Bus Speed: CPU External: 100MHz, PCI, PC/104-Plus: 33MHz, PC/104: 8MHz

Compatibility:

PC/104 – Full compliance

Embedded-PCI (PC/104-Plus) – Full compliance, 3.3V or 5V modules

EBX – Full compliance

Specifications are subject to change without notice.

Technical Support

If you have problems that this manual can't help you solve, first visit the VSBC-7 Product Support web page at <http://www.versalogic.com/private/vsbc7support.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.

VSBC-7 Support Website

<http://www.versalogic.com/private/vsbc7support.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 Air 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.

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 VSBC-7.

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.

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

- VSBC-7 Single Board Computer
- 168-pin DIMM SDRAM Memory Module PC-100
- ATX Power Supply
- SVGA Video Monitor
- Keyboard with PS2 connector
- 3.5" Floppy Disk Drive (optional)
- IDE Hard Drive (optional)
- IDE CD ROM Drive (optional)

DRAM MODULE

- Insert DRAM module into the DIMM socket. Latch into place.

CABLES / PERIPHERAL DEVICES

- Plug video adapter cable (p/n VL-CBL-1007) into socket J1 and attach video monitor.
- Plug keyboard adapter cable (p/n VL-CBL-1602) into socket J14 and attach keyboard.
- Plug floppy data cable (p/n VL-CBL-3403) into socket J15 and attach floppy drive.
Note! Floppy drive should be connected after the twist in the cable.
- Plug hard drive data cable (p/n VL-CBL-4001) into socket J17. Attach hard drive and CD ROM drive to the connectors at the opposite end of the cable.
- Plug power supply into J7.
- Attach power supply cables to external drives.
- Jumper hard drive to operate as a master device.

CMOS Setup / Boot Procedure Preliminary

- Turn power on.
- Press the DEL key the instant that video is displayed (during the memory test).
- Verify correct CMOS Setup information (see table below)
- Insert bootable floppy disk into floppy drive or allow the system to boot from the hard drive.

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: | Fl 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 | 15MB |
+-----+-----+-----+-----+-----+

```

Custom Configuration

```

+-----+
|                                     |
|               System BIOS Setup - Custom Configuration                   |
|               (C) 2000 General Software, Inc. All rights reserved         |
|-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Cache                  : Enabled | COM1 (03F8) Enable/IRQ : IRQ4 |
| BIOS Extension         : Disabled | COM2 (02F8) Enable/IRQ : IRQ3 |
| CPU Temperature Threshold : 70 C | COM3 (03E8) Enable/IRQ : IRQ4 |
| Display Type           : CRT     | COM4 (02E8) Enable/IRQ : IRQ3 |
| Parallel Port Mode     : SPP     | LPT1 (0378) Enable/IRQ : IRQ7 |
| Interrupt Vector Restore : Disabled | USB Controller Enable/INT : Disabled |
| IDE 0 PIO Mode         : Auto    | PCI INT A              : IRQ11 |
| IDE 1 PIO Mode         : Auto    | PCI INT B              : IRQ11 |
| IDE 2 PIO Mode         : Auto    | PCI INT C              : IRQ11 |
| IDE 3 PIO Mode         : Auto    | PCI INT D              : IRQ11 |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+

```

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.

Operating System Installation

The standard “PC” architecture used on the VSBC-7 makes the installation and use of most of the standard x86 processor based operating systems very straight forward. The operating systems listed below use the standard installation procedures as provided by the maker of the OS. If special optimized hardware drivers are available for a particular operating system, you can find these drivers, or a link to the drivers, at the VSBC-7 Product Support web page at <http://www.versalogic.com/private/vsbc7support.asp>.

WINDOWS 95

Use the standard installation procedures. Windows 95 does have a bug regarding some AMD CPUs running too fast for the software. Any VSBC-7 running a CPU faster than 300MHz will need to have this patch installed, which you can download from the Microsoft web site at http://www.microsoft.com/windows95/downloads/contents/WURecommended/S_WUServicePacks/AMDPatch/Default.htm.

To install the patch, you need to have Windows 95 already running on the VSBC-7. This means you will need to jumper the CPU to run at 250MHz for the initial installation. See page 16 for jumpering information. Jumper V9 for a 2.5 multiplier.

WINDOWS 98 / 2000 / ME

Use the standard installation procedures

QNX NEUTRINO

Use the standard installation procedure to install over a Windows 98 installation.

REDHAT LINUX 7.0

Use the standard installation procedures.

DOS

Use the standard installation procedures.

Dimensions and Mounting

The VSBC-7 complies with all EBX standards which provide for specific mounting hole and PC/104-*Plus* stack locations as shown in the diagram below.

Caution The single board computer must be supported at all eight mounting points to prevent excessive flexing when expansion modules are mated and demated. Flex damage caused by excessive force on an improperly mounted circuit board is not covered under the product warranty.

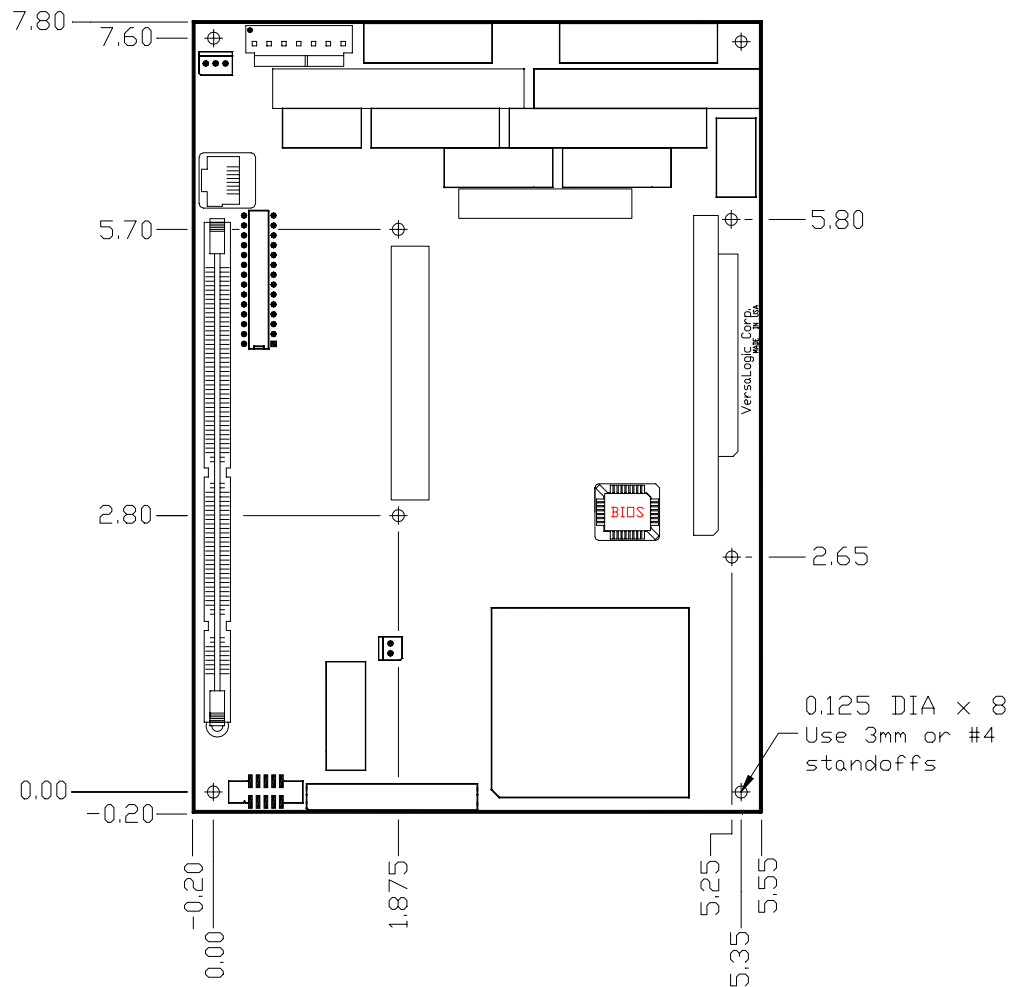


Figure 1. Dimensions and Mounting Holes

(Not to scale. All dimensions in inches.)

HARDWARE ASSEMBLY

The VSBC mounts on four hardware standoffs using the corner mounting holes (A). These standoffs are secured to the underside of the circuit board using pan head screws.

Four additional standoffs (B) must be used under the circuit board to prevent excessive flexing when expansion modules are mated and demated. These are secured with four male-female standoffs (C) threaded from the topside which also serve as mounting struts for the PC/104 stack.

The entire assembly can sit on a table top or it can be secured to a base plate. When bolting the unit down, make sure to secure all eight standoffs (A and B) to the mounting surface to prevent circuit board flexing. Refer to the drawing on page 9 for dimensional details.

An extractor tool is available (part number VL-HDW-201) to separate the PC/104 modules from the stack.

Note! Standoffs and screws are available as part number VL-HDW-101.

STANDOFF LOCATIONS

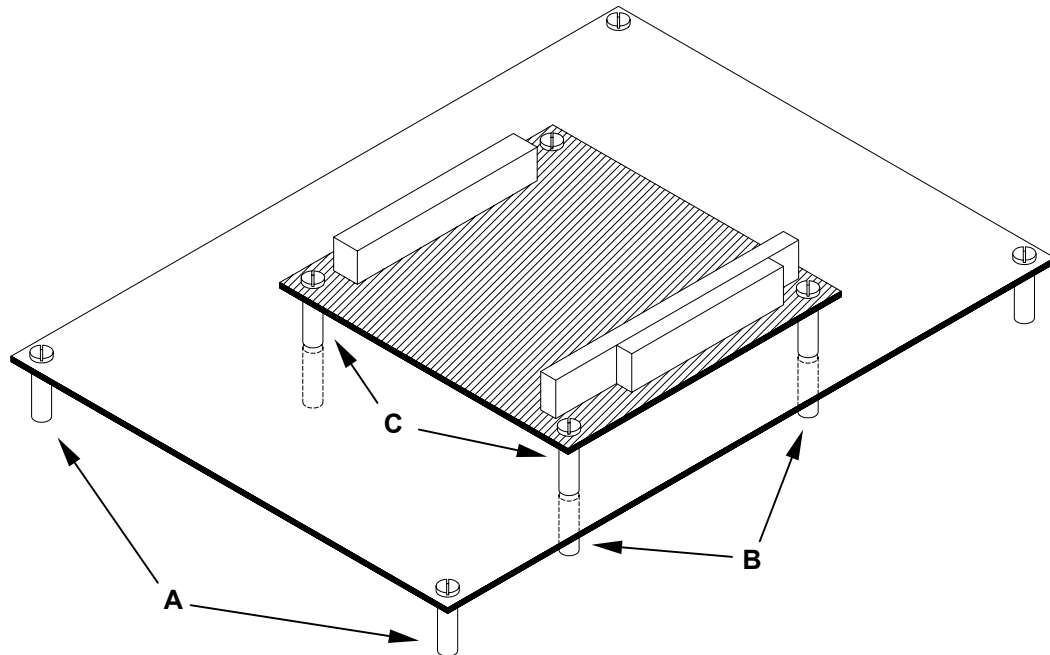


Figure 2. Standoff Locations

External Connectors

CONNECTOR LOCATION DIAGRAM

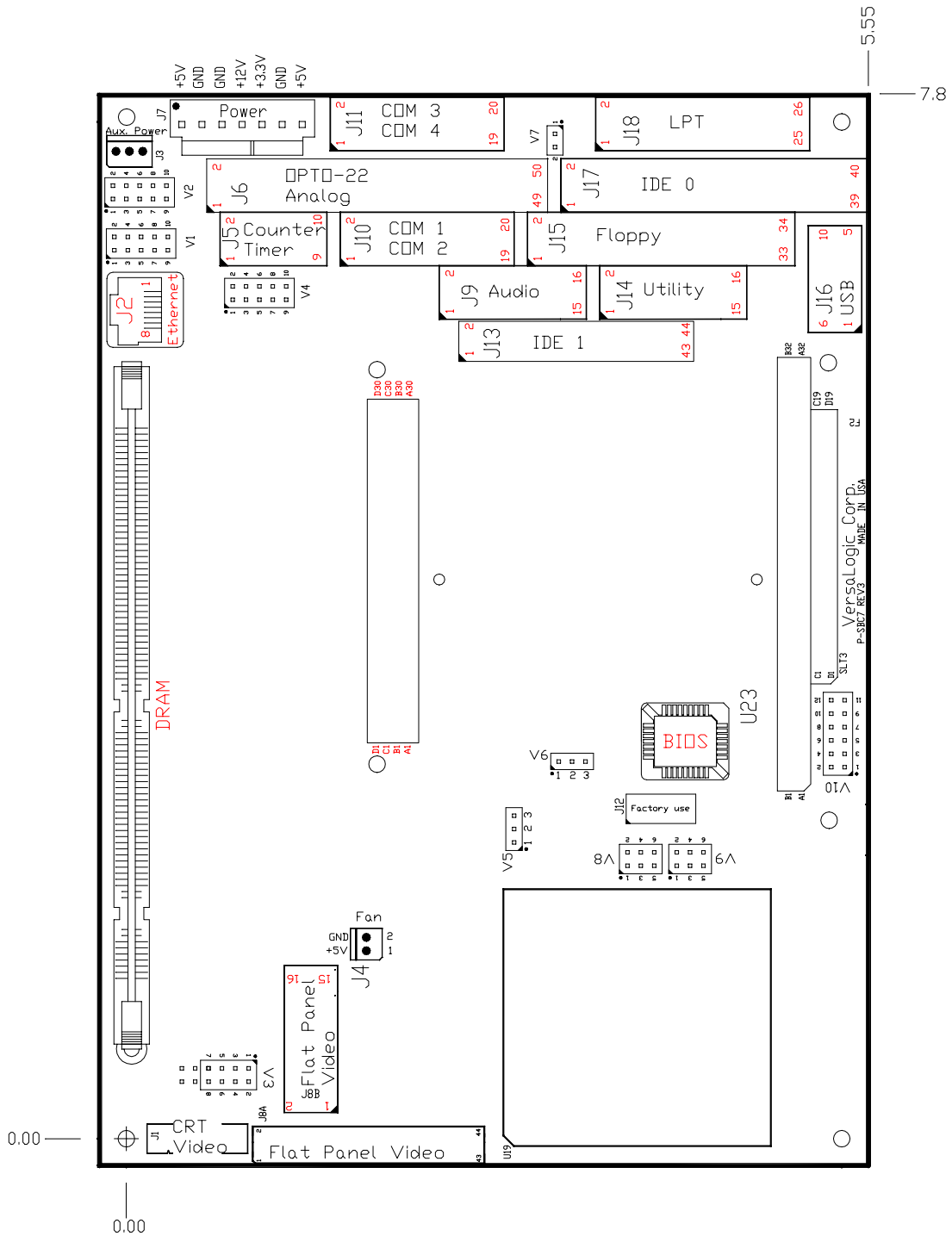


Figure 3. Connector Location Diagram

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 1: Connector Functions and Interface Cables

Connector	Function	Mating Connector	Transition Cable	Cable Description	Page	‡Pin 1 Location	
						X Coord.	Y Coord.
J1	SVGA Video Output	2mm 10-pin	VersaLogic VL-CBL-1007	1 foot 10-pin socket to 15-pin D-sub SVGA connector	30	-.035	-.375
J2	Ethernet	RJ-45 Crimp-on Plug	—	—	34	N/A	N/A
J3	PC/104-Plus Auxiliary Power (-5V & -12V)	Molex 10-11-2033 + Molex 08-50-0005 (3ea.)	See connector J7	See connector J7	18	7.325	.075
J4	Fan Power Output (+5V)	Molex 22-01-3027 or Molex 22-01-2025	Provided with fan assembly	—		1.405	-1.795
J5*	Counter / Timer Signals	3M 3473-7600	User supplied	—	47	6.675	-.900
J6*	Opto-22 Interface and Analog Input (-r version)	3M 3425-7600	VersaLogic VL-CBL-5007	1.5 foot, 50-pin socket to 34-pin socket and 16-pin socket	45, 37	7.075	-.550
J7	Main Power Input (EBX Compliant)	Molex 09-50-8073 + Molex 08-52-0072 (7 ea.)	VersaLogic VL-CBL-2021	Interface from industry standard ATX power supply (to J3 and J7)	18	7.550	-.375
J8A	Flat Panel Interface	Adam Tech 2FCS-44-SG + Adam Tech 2CTA §	Custom	Contact Factory	30	-.120	-.985
J8B	Flat Panel Interface	Adam Tech 2FCS-16-SG + Adam Tech 2CTA §	Custom	Contact Factory	31	.170	-1.410
J9	Audio	3M 3452-7600				6.275	-2.540
J10*	COM1 and COM2 Ports	3M 3421-7600	VersaLogic VL-CBL-2001	1 foot, 20-pin socket to two DB9F serial port connectors	23	6.675	-1.800
J11*	COM3 and COM4 Ports	3M 3421-7600	VersaLogic VL-CBL-2001	1 foot, 20-pin socket to two DB9F serial port connectors	23	7.535	-1.725
J12	PLD Reprogramming Port (Factory use Only)	—	—	—	—	2.265	-3.860
J13*	IDE Hard Drive Channel 1	2mm 44-pin			25	5.924	-2.550
J14*	Speaker, IDE LED, Programmable LED, Fused Vcc, Keyboard, PS/2 mouse, Push-Button Reset	3M 3452-7600	VersaLogic VL-CBL-1602	1 foot breakout cable. 16-pin socket to two 6-PIN mini DIN panel mount, programmable LED and HD activity LED, speaker, and reset switch.	28	6.275	-3.740
J15*	Floppy Drive Interface	3M 3414-7600	VersaLogic VL-CBL-3403	1.5 foot 34-pin dual floppy drive interface cable	29	6.675	-3.200
J16*	Dual USB 1.0 Connector	Molex 14-56-2051	VersaLogic VL-CBL-0501 (two required)	6 inch transition cable. 5 pin connector to USB receptacle connector.	44	6.225	-5.350
J17*	IDE Hard Drive Channel 0	3M 3417-7600	VersaLogic VL-CBL-4001	1.5 foot 40-pin dual IDE drive interface cable	25	7.075	-3.450
J18*	LPT1 Port	3M 3399-7600	VersaLogic VL-CBL-2601	1 foot 26-pin socket to DB-25F connector	24	7.535	-3.710

* **Note:** These standard .100" dual-row low profile headers are 3M 2500 series compatible. They are compatible with 3M snap-in latches, socket retaining clips, polarizing posts, and keys.

§ **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:** Relative to upper location diagram holes. See page 11.

Jumper Block Locations

Note! Jumpers shown in as-shipped configuration.

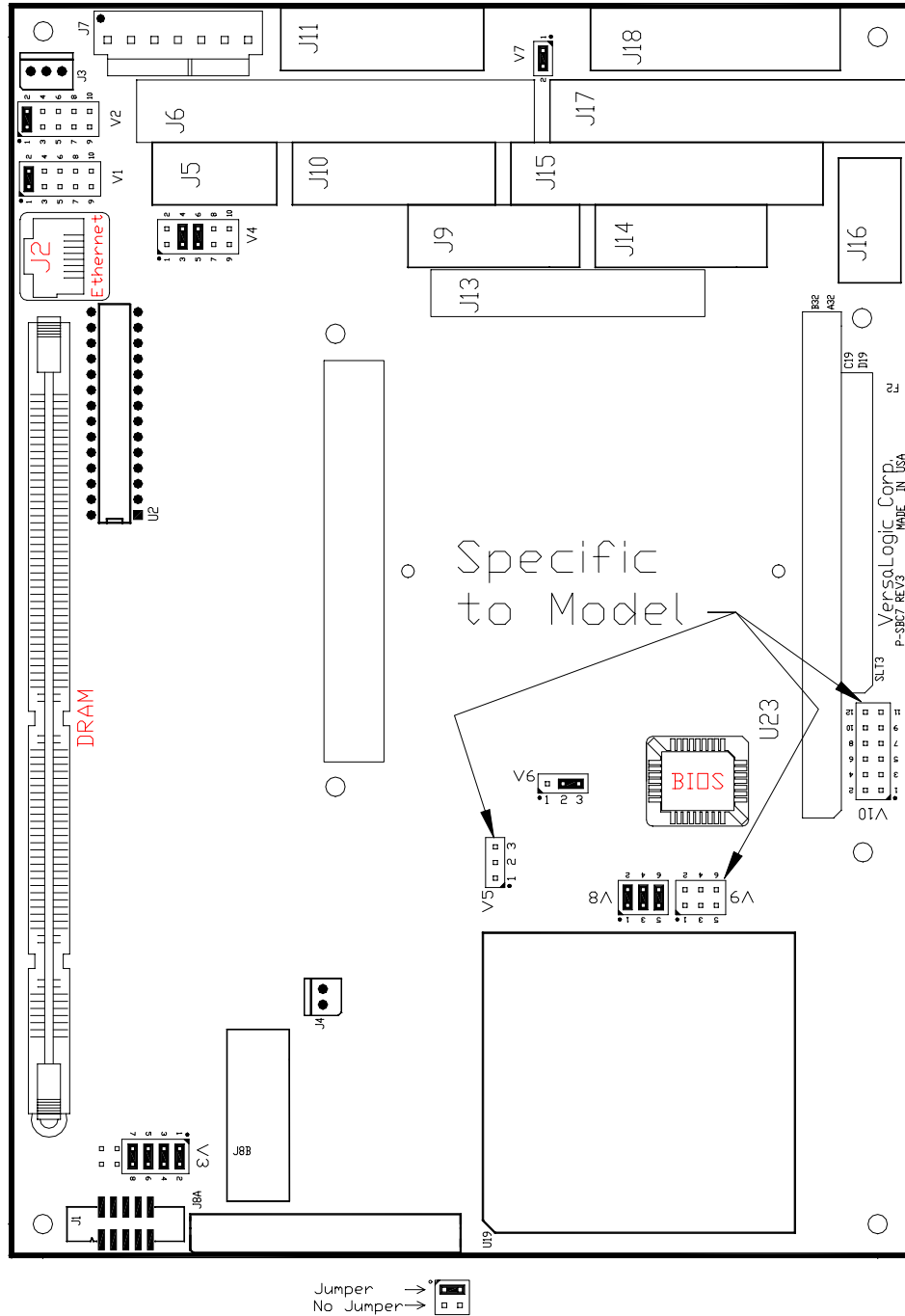
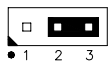
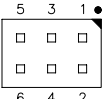
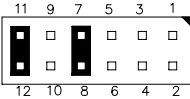
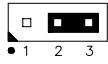
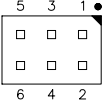
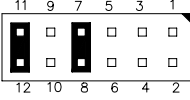
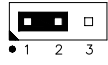
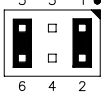
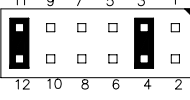
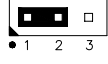
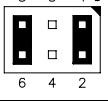
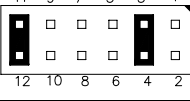
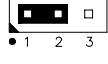
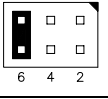
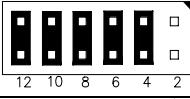
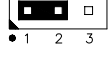
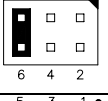
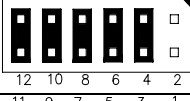
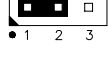
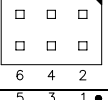
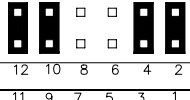

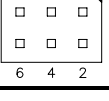
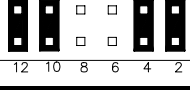


Figure 4. Jumper Block Locations

Table 2: Jumpers per Model

MODEL	Bus Speed V5	CPU Speed V9	CPU Voltage V10
VSBC-7cp Pentium 233 CPU No Analog			
VSBC-7cr Pentium 233 CPU With Analog			
VSBC-7gp K6-2 AMD 400 CPU No Analog			
VSBC-7gr K6-2 AMD 400 CPU With Analog			
VSBC-7kp K6-IIIE+ AMD 550 CPU No Analog			
VSBC-7kr K6-IIIE+ AMD 550 CPU with Analog			
VSBC-7np K6-2E+AMD 350 CPU Fanless No Analog			
VSBC-7nr K6-2E+AMD 350 CPU Fanless with Analog			

JUMPER SUMMARY

Table 3: Jumper Summary

Jumper Block	Description	As Shipped	Page																																																																																																						
V1	<p>COM3 Configuration</p> <div style="display: flex; justify-content: space-around; text-align: center;"> <div> <p>RS-232</p> </div> <div> <p>RS-422</p> </div> <div> <p>RS-485 Endpoint Station</p> </div> <div> <p>RS-485 Intermediate Station</p> </div> </div> <p><i>Note! Jumper V1 is shown in the vertical orientation. On the VSBC-7 circuit board, the jumper block is oriented horizontally.</i></p>	RS-232	22																																																																																																						
V2	<p>COM4 Configuration</p> <div style="display: flex; justify-content: space-around; text-align: center;"> <div> <p>RS-232</p> </div> <div> <p>RS-422</p> </div> <div> <p>RS-485 Endpoint Station</p> </div> <div> <p>RS-485 Intermediate Station</p> </div> </div> <p><i>Note! Jumper V2 is shown in the vertical orientation. On the VSBC-7 circuit board, the jumper block is oriented horizontally.</i></p>	RS-232	22																																																																																																						
V3	<p>Flat Panel Selection</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>V3[7-8]</th> <th>V3[5-6]</th> <th>V3[3-4]</th> <th>V3[1-2]</th> <th>Number</th> <th>Type</th> </tr> </thead> <tbody> <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> </tbody> </table>	V3[7-8]	V3[5-6]	V3[3-4]	V3[1-2]	Number	Type	In	In	In	In	—	—	In	In	In	Out	1	1024x768 Dual Scan STN Color	In	In	Out	In	2	128x1024 TFT Color	In	In	Out	Out	3	640x480 Dual Scan STN Color	In	Out	In	In	4	800x600 Dual Scan STN Color	In	Out	In	Out	5	640x480 Sharp TFT Color	In	Out	Out	In	6	640x480 18-bit TFT Color	In	Out	Out	Out	7	1024x768 TFT Color	Out	In	In	In	8	800x600 TFT Color	Out	In	In	Out	9	800x600 TFT Color	Out	In	Out	In	10	800x600 TFT Color	Out	In	Out	Out	11	800x600 Dual Scan STN Color	Out	Out	In	In	12	800x600 Dual Scan STN Color	Out	Out	In	Out	13	1024x768 TFT Color	Out	Out	Out	In	14	1280x1024 Dual Scan STN Color	Out	Out	Out	Out	15	1024x600 Dual Scan STN Color		30
V3[7-8]	V3[5-6]	V3[3-4]	V3[1-2]	Number	Type																																																																																																				
In	In	In	In	—	—																																																																																																				
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In	Out	In	In	4	800x600 Dual Scan STN Color																																																																																																				
In	Out	In	Out	5	640x480 Sharp TFT Color																																																																																																				
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In	Out	Out	Out	7	1024x768 TFT Color																																																																																																				
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Out	In	In	Out	9	800x600 TFT Color																																																																																																				
Out	In	Out	In	10	800x600 TFT Color																																																																																																				
Out	In	Out	Out	11	800x600 Dual Scan STN Color																																																																																																				
Out	Out	In	In	12	800x600 Dual Scan STN Color																																																																																																				
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V4	<p>Counter/Timer 4 Clock Source</p> <div style="display: flex; justify-content: space-around;"> <div> <p>External Input</p> </div> <div> <p>6 MHz</p> </div> </div> <p><i>Note! Only 1/2 of jumper block V4 is shown in this picture.</i></p>	6 MHz	47																																																																																																						

Jumper Block	Description	As Shipped	Page																																													
V4	<p>Counter/Timer 5 Clock Source</p> <p>6 MHz CTC#4 External Input</p> <p><i>Note! Only ½ of jumper block V4 is shown in this picture.</i></p>	6 MHz	47																																													
V5	<p>Front Side Bus Speed</p> <p>Normal 100 MHz 66 MHz</p>	100 MHz	20																																													
V6	<p>CMOS RAM and Real Time Clock Erase</p> <p>Erase Normal Operation</p> <p><i>Note! Do not operate the board with the jumper in the erase position. Leave the jumper in position V6[1-2] for at least one full minute to fully erase CMOS RAM.</i></p>	Normal	27																																													
V7	<p>Opto 22 I/O Rack Power</p> <p>In — I/O rack power provided by VSBC Out — I/O rack power provided externally</p>	In	45																																													
V8[1-2]	<p>System BIOS Selector</p> <p>In — Primary System BIOS occupies F0000h to FFFFFh Out — Secondary System BIOS occupies F0000h to FFFFFh</p> <p><i>Note! The secondary System BIOS is field upgradable using the BIOS upgrade utility. See www.versalogic.com/private/vsbc7support.asp for further information.</i></p>	In	—																																													
V8[3-4]	<p>Video BIOS Selector</p> <p>In — Primary Video BIOS occupies C0000h to C9FFFh Out — Secondary Video BIOS occupies C0000h to C9FFFh</p> <p><i>Note! The secondary Video BIOS is field upgradable using the BIOS upgrade utility. See www.versalogic.com/private/vsbc7support.asp for further information</i></p>	In	—																																													
V8[5-6]	<p>General Purpose Input 1</p> <p>In — CPU reads bit as 0 Out — CPU reads bit as 1</p> <p><i>Note! This jumper is reserved. Contact factory for more information.</i></p>	In	—																																													
V9	<p>CPU Clock Speed Multiplier</p> <table border="1"> <thead> <tr> <th>V9[5-6]</th> <th>V9[3-4]</th> <th>V9[1-2]</th> <th>Multiplier</th> <th>Bus Frequency</th> </tr> </thead> <tbody> <tr> <td>Out</td> <td>Out</td> <td>In</td> <td>6.0</td> <td>110b</td> </tr> <tr> <td>Out</td> <td>In</td> <td>In</td> <td>2.5</td> <td>100b</td> </tr> <tr> <td>Out</td> <td>In</td> <td>Out</td> <td>3.0</td> <td>101b</td> </tr> <tr> <td>Out</td> <td>Out</td> <td>Out</td> <td>3.5</td> <td>111b</td> </tr> <tr> <td>In</td> <td>Out</td> <td>In</td> <td>4.0</td> <td>010b</td> </tr> <tr> <td>In</td> <td>In</td> <td>In</td> <td>4.5</td> <td>000b</td> </tr> <tr> <td>In</td> <td>In</td> <td>Out</td> <td>5.0</td> <td>001b</td> </tr> <tr> <td>In</td> <td>Out</td> <td>Out</td> <td>5.5</td> <td>011b</td> </tr> </tbody> </table>	V9[5-6]	V9[3-4]	V9[1-2]	Multiplier	Bus Frequency	Out	Out	In	6.0	110b	Out	In	In	2.5	100b	Out	In	Out	3.0	101b	Out	Out	Out	3.5	111b	In	Out	In	4.0	010b	In	In	In	4.5	000b	In	In	Out	5.0	001b	In	Out	Out	5.5	011b	Varies	20
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V10	<p>CPU Core Voltage Selection</p> <table border="1"> <thead> <tr> <th>V10[11-12]</th> <th>V10[9-10]</th> <th>V10[7-8]</th> <th>V10[5-6]</th> <th>V10[3-4]</th> <th>V10[1-2]</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>Out</td> <td>In</td> <td>In</td> <td>In</td> <td>In</td> <td>Out</td> <td>Power Now</td> </tr> <tr> <td>In</td> <td>In</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>1.30 V</td> </tr> <tr> <td>In</td> <td>In</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>In</td> <td>1.35 V</td> </tr> <tr> <td>In</td> <td>In</td> <td>Out</td> <td>Out</td> <td>In</td> <td>Out</td> <td>1.40 V</td> </tr> <tr> <td>In</td> <td>In</td> <td>Out</td> <td>Out</td> <td>In</td> <td>In</td> <td>1.45 V</td> </tr> <tr> <td>In</td> <td>In</td> <td>Out</td> <td>In</td> <td>Out</td> <td>Out</td> <td>1.50 V</td> </tr> <tr> <td>In</td> <td>In</td> <td>Out</td> <td>In</td> <td>Out</td> <td>In</td> <td>1.55 V</td> </tr> <tr> <td>In</td> <td>In</td> <td>Out</td> <td>In</td> <td>In</td> <td>Out</td> <td>1.60 V</td> </tr> <tr> <td>In</td> <td>In</td> <td>Out</td> <td>In</td> <td>In</td> <td>In</td> <td>1.65 V</td> </tr> <tr> <td>In</td> <td>In</td> <td>In</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>1.70 V</td> </tr> <tr> <td>In</td> <td>In</td> <td>In</td> <td>Out</td> <td>Out</td> <td>In</td> <td>1.75 V</td> </tr> <tr> <td>In</td> <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>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>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>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>In</td> <td>Out</td> <td>2.00 V</td> </tr> <tr> <td>In</td> <td>In</td> <td>Out</td> <td>In</td> <td>In</td> <td>In</td> <td>2.05 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>SHDN</td> </tr> <tr> <td>In</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>In</td> <td>2.10 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>In</td> <td>Out</td> <td>2.20 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>In</td> <td>In</td> <td>2.30 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>Out</td> <td>In</td> <td>Out</td> <td>Out</td> <td>2.40 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>Out</td> <td>In</td> <td>Out</td> <td>In</td> <td>2.50 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>Out</td> <td>In</td> <td>In</td> <td>Out</td> <td>2.60 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>Out</td> <td>In</td> <td>In</td> <td>In</td> <td>2.70 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>In</td> <td>Out</td> <td>Out</td> <td>Out</td> <td>2.80 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>In</td> <td>Out</td> <td>Out</td> <td>In</td> <td>2.90 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>In</td> <td>Out</td> <td>In</td> <td>Out</td> <td>3.00 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>In</td> <td>Out</td> <td>In</td> <td>In</td> <td>3.10 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>In</td> <td>In</td> <td>Out</td> <td>Out</td> <td>3.20 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>In</td> <td>In</td> <td>Out</td> <td>In</td> <td>3.30 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>In</td> <td>In</td> <td>In</td> <td>Out</td> <td>3.40 V</td> </tr> <tr> <td>In</td> <td>Out</td> <td>In</td> <td>In</td> <td>In</td> <td>In</td> <td>3.50 V</td> </tr> </tbody> </table> <p>Note! Bold entries correspond to the approved CPU list on page 20. Do not confuse CPU Core Voltage with CPU I/O voltage. The VSBC-7 will only work with CPU chips with an I/O voltage of 3.3V.</p>	V10[11-12]	V10[9-10]	V10[7-8]	V10[5-6]	V10[3-4]	V10[1-2]	Voltage	Out	In	In	In	In	Out	Power Now	In	In	Out	Out	Out	Out	1.30 V	In	In	Out	Out	Out	In	1.35 V	In	In	Out	Out	In	Out	1.40 V	In	In	Out	Out	In	In	1.45 V	In	In	Out	In	Out	Out	1.50 V	In	In	Out	In	Out	In	1.55 V	In	In	Out	In	In	Out	1.60 V	In	In	Out	In	In	In	1.65 V	In	In	In	Out	Out	Out	1.70 V	In	In	In	Out	Out	In	1.75 V	In	In	In	Out	In	Out	1.80 V	In	In	In	Out	In	In	1.85 V	In	In	In	In	Out	Out	1.90 V	In	In	In	In	Out	In	1.95 V	In	In	In	In	In	Out	2.00 V	In	In	Out	In	In	In	2.05 V	In	Out	Out	Out	Out	Out	SHDN	In	Out	Out	Out	Out	In	2.10 V	In	Out	Out	Out	In	Out	2.20 V	In	Out	Out	Out	In	In	2.30 V	In	Out	Out	In	Out	Out	2.40 V	In	Out	Out	In	Out	In	2.50 V	In	Out	Out	In	In	Out	2.60 V	In	Out	Out	In	In	In	2.70 V	In	Out	In	Out	Out	Out	2.80 V	In	Out	In	Out	Out	In	2.90 V	In	Out	In	Out	In	Out	3.00 V	In	Out	In	Out	In	In	3.10 V	In	Out	In	In	Out	Out	3.20 V	In	Out	In	In	Out	In	3.30 V	In	Out	In	In	In	Out	3.40 V	In	Out	In	In	In	In	3.50 V	Varies	20
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Power Supply

POWER CONNECTORS

Main power is applied to the VSBC-7 through an EBX style 7-pin polarized connector (mating connector Molex Housing 09-50-8073, Pins 08-52-0072). A 3-pin auxiliary power input connector is also provided to supply $-5V$ and $-12V$ to the PC/104-*Plus* stack.

See page 11 for connector pinout and location information.

Warning! To prevent severe and possibly irreparable damage to the system, it is critical that the power connectors be wired correctly. Make sure to use both $+5VDC$ pins and all three ground pins to prevent excess voltage drop.

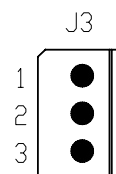
Table 4: Main Power Connector Pinout

J7 Pin	Signal Name	Description
1	+5VDC	Power Input
2	Ground	Digital Ground
3	Ground	Digital Ground
4	+12VDC	Power Input
5	+3.3VDC	Power Input
6	Ground	Digital Ground
7	+5VDC	Power Input

Note! The $+3.3VDC$ and $+12VDC$ inputs on the main power connector are only required for PC/104-*Plus* expansion modules that require these voltages.

Table 5: Auxiliary Power Connector Pinout

J3 Pin	Signal Name	Description
1	$-5VDC$	Power Input
2	Ground	Digital Ground
3	$-12VDC$	Power Input



Note! The Auxiliary Power Connector uses VersaLogics CBL-2021 Power Adapter Cable. Auxiliary voltages are only required for PC/104-*Plus* expansion modules that require these voltage.

POWER REQUIREMENTS

The VSBC-7 requires only +5 volts ($\pm 5\%$) for proper operation. The voltage required for the RS-232 ports and analog input sections are generated with a DC/DC converter. A variable low-voltage supply circuit provides power to the CPU and other on-board devices.

The exact power requirement of the VSBC-7 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 VSBC-7, and driving long RS-232 lines at high speed can increase power demand.

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.

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-HB3/5-2). Life expectancy under normal use is approximately 10 years.

Note! The VSBC-7 is designed to boot even with a dead or removed battery. See page 21 for further information.

CPU

FRONT SIDE BUS SOLUTION

Jumper block V5 selector between a FSB or 66 MHz or 100 MHz. 100MHz is the normal setting, 66 MHz is primarily for using Pentium CPU's See page 16.

CPU CLOCK SPEED MULTIPLIER

Jumper block V9 is used to multiply the on-board 66 or 100 MHz bus clock to match the internal clock speed of the CPU chip. For example, the 400 MHz CPU with a 100 MHz FSB uses a multiplier of 4.0

See page 16 for jumper configuration details.

CPU CORE VOLTAGE SELECTION

Jumper block V10 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 jumper configuration details.

POWERNOW FEATURE

Special low power versions of the AMD K6-2E+ and K6-III+ CPU chips support a new feature to tailor the CPU speed and power dissipation to the processing task at hand. This is accomplished with a new CPU register that controls both the Clock Speed Multiplier, and the Core Voltage Selection. This register can be changed dynamically as the application program is running. The special PowerNow jumpering of V10 must be observed for this feature to work correctly.

See page 17 for jumper configuration details.

System RAM

COMPATIBLE MEMORY MODULES

The VSBC-7 will accept one 168-pin DIMM memory module with the following characteristics:

- Size 8 to 256 MB
- Voltage 3.3 Volt
- Error Detection Parity or Non-Parity
- Error Correction ECC or Non-ECC
- Type SDRAM, PC-100

Note: Parity and ECC features are not supported in the BIOS.

CMOS RAM

CLEARING CMOS RAM

Jumper V6[2-3] is normally inserted to provide battery power to the CMOS RAM circuits. The jumper can be briefly moved to position V6[1-2] to erase the contents of the CMOS RAM should it become necessary to do so. Do not operate the board with the jumper in the erase position.

Note! The jumper should remain in position V6[1-2] for a full minute to properly erase the CMOS RAM contents.

Real Time Clock

The VSBC 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.

CompactFlash Adapter

A mezzanine style CompactFlash Adapter is available as an separate item (VersaLogic # VL-CFA-1a). This adapter plugs directly into J13, the 44-pin 2mm IDE1 header, and is secured with two 3mm screws to the VSBC-7 board. Once this adapter is attached, any CompactFlash Drive plugged into the adapter will appear as a standard IDE drive to your operating system. It is configured in CMOS Setup like any other secondary IDE drive.

Serial Ports

The VSBC-7 features four on-board 16550 based serial channels located at standard PC I/O addresses. COM1 and COM2 are RS-232 (115.2K baud) serial ports with interrupts fixed at IRQ4 and IRQ3 respectively. IRQ use can be enabled/disabled in CMOS Setup.

COM3 and COM4 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 registers) of 230K and 460K baud. IRQ lines are chosen in CMOS Setup, and can be mapped to any IRQ line.

Each COM port can be independently enabled or disabled in the CMOS Setup screen.

COM PORT CONFIGURATION

There are no configuration jumpers for COM1 and COM2 since they only operate in RS-232 mode.

Jumper V1 is used to configure COM3 for RS-232/422/485 operation. Jumper V2 is used to configure COM4. See page 15 for jumper configuration details.

COM3 / COM4 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 COM3 or COM4 on and off:

```
mov  dx,03ECh  ; Point to COM3 Modem Control register
mov  dx,02ECh  ; or COM4 if desired
in   al,dx     ; Fetch existing value
or   al,01h    ; Set bit D0
out  dx,al     ; Turn DTR on (enables line driver)

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

SERIAL PORT CONNECTORS

See the *Connector Location Diagram* on pages 11 and 12 for connector and cable information. The pinout of the DB9 connector applies to use of the VersaLogic transition cable #VL-CBL-2001.

Table 6: Connectors J10/J11 — Serial Port Pinout

COM1 J10 Pin	COM2 J10 Pin	COM3 J11 Pin	COM4 J11 Pin	RS-232	RS-422	RS-485	DB9 Pin
1	11	1	11	DCD	—	—	1
2	12	2	12	DSR	—	—	6
3	13	3	13	RXD*	TxD+	TxD+	2
4	14	4	14	RTS	TxD-	TxD-	7
5	15	5	15	TXD*	—	—	3
6	16	6	16	CTS	Ground	Ground	8
7	17	7	17	DTR	RxD-	TxD/RxD-	4
8	18	8	18	RI	RxD+	TxD/RxD+	9
9	19	9	19	Ground	Ground	Ground	5
10	20	10	20	N/C	—	—	—

Parallel Port

The VSBC-7 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-2601.

Table 7: LPT1 Parallel Port Pinout

J18 Pin	Centronics Signal	Signal Direction	DB25 Pin
1	Strobe	Out	1
2	Auto feed	Out	14
3	Data bit 1	In/Out	2
4	Printer error	In	15
5	Data bit 2	In/Out	3
6	Reset	Out	16
7	Data bit 3	In/Out	4
8	Select input	Out	17
9	Data bit 4	In/Out	5
10	Ground	—	18
11	Data bit 5	In/Out	6
12	Ground	—	19
13	Data bit 6	In/Out	7
14	Ground	—	20
15	Data bit 7	In/Out	8
16	Ground	—	21
17	Data bit 8	In/Out	9
18	Ground	—	22
19	Acknowledge	In	10
20	Ground	—	23
21	Port Busy	In	11
22	Ground	—	24
23	Paper End	In	12
24	Ground	—	25
25	Select	In	13
26	No Connect	—	—

EIDE Hard Drive / CD-ROM Interfaces

Two EIDE interfaces are available to connect up to four hard disk or CD-ROM drives. Connector J17 is the primary IDE controller with a 40-pin .1" connector and connector J13 is the secondary IDE controller with a 44-pin 2mm connector. Use CMOS Setup to specify the drive parameters of the attached drives.

Note! The EIDE ports are designed to operate with newer high-speed EIDE drives. This includes "EIDE Type 4" and "Ultra DMA" interfaces. Some older EIDE drives, which are typically EIDE Type 0-3, do not operate reliably with this interface (due to signal ringing and timing problems). These slower EIDE drives are still available from a number of distributors. VersaLogic recommends the use of only EIDE Type 4 or Ultra DMA type drives with the VSBC-7 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: EIDE Hard Drive Connector Pinout

J17 Pin	Signal Name	EIDE Signal Name	Function
1	HRST*	Host Reset	Reset signal from CPU
2	Ground	Ground	Ground
3	IDE7	DATA 7	Data bit 7
4	HD8	DATA 8	Data bit 8
5	HD6	DATA 6	Data bit 6
6	HD9	DATA 9	Data bit 9
7	HD5	DATA 5	Data bit 5
8	HD10	DATA 10	Data bit 10
9	HD4	DATA 4	Data bit 4
10	HD11	DATA 11	Data bit 11
11	HD3	DATA 3	Data bit 3
12	HD12	DATA 12	Data bit 12
13	HD2	DATA 2	Data bit 2
14	HD13	DATA 13	Data bit 13
15	HD1	DATA 1	Data bit 1
16	HD14	DATA 14	Data bit 14
17	HD0	DATA 0	Data bit 0
18	HD15	DATA 15	Data bit 15
19	Ground	Ground	Ground
20	NC	NC	No connection
21	NC	NC	No connection
22	Ground	Ground	Ground
23	HWR*	HOST IOW*	I/O write
24	Ground	Ground	Ground
25	HRD*	HOST IOR*	I/O read
26	Ground	Ground	Ground
27	NC	NC	No connection
28	HAEN	ALE	Address latch enable
29	NC	NC	No connection
30	Ground	Ground	Ground
31	HINT	HOST IRQ14	IRQ14
32	XI16*	HOST IOCS16*	Drive register enabled
33	HA1	HOST ADDR1	Address bit 1
34	NC	NC	No connection
35	HA0	HOST ADDR0	Address bit 0
36	HA2	HOST ADDR2	Address bit 2
37	HCS0*	HOST CS0*	Reg. access chip select 0
38	HCS1*	HOST CS1*	Reg. access chip select 1
39	NC	NC	No connection
40	Ground	Ground	Ground

Table 8: 44-pin 2mm Connector Pinout

J13 Pin	Signal Name	EIDE Signal Name	Function
1	HRST*	Host Reset	Reset signal from CPU
2	Ground	Ground	Ground
3	IDE7	DATA 7	Data bit 7
4	HD8	DATA 8	Data bit 8
5	HD6	DATA 6	Data bit 6
6	HD9	DATA 9	Data bit 9
7	HD5	DATA 5	Data bit 5
8	HD10	DATA 10	Data bit 10
9	HD4	DATA 4	Data bit 4
10	HD11	DATA 11	Data bit 11
11	HD3	DATA 3	Data bit 3
12	HD12	DATA 12	Data bit 12
13	HD2	DATA 2	Data bit 2
14	HD13	DATA 13	Data bit 13
15	HD1	DATA 1	Data bit 1
16	HD14	DATA 14	Data bit 14
17	HD0	DATA 0	Data bit 0
18	HD15	DATA 15	Data bit 15
19	Ground	Ground	Ground
20	NC	NC	No connection
21	NC	NC	No connection
22	Ground	Ground	Ground
23	HWR*	HOST IOW*	I/O write
24	Ground	Ground	Ground
25	HRD*	HOST IOR*	I/O read
26	Ground	Ground	Ground
27	NC	NC	No connection
28	HAEN	ALE	Address latch enable
29	NC	NC	No connection
30	Ground	Ground	Ground
31	HINT	HOST IRQ14	IRQ14
32	XI16*	HOST IOCS16*	Drive register enabled
33	HA1	HOST ADDR1	Address bit 1
34	NC	NC	No connection
35	HA0	HOST ADDR0	Address bit 0
36	HA2	HOST ADDR2	Address bit 2
37	HCS0*	HOST CS0*	Reg. access chip select 0
38	HCS1*	HOST CS1*	Reg. access chip select 1
39	NC	NC	No connection
40	Ground	Ground	Ground
41	+5V	+5V	5V Power
42	+5V	+5V	5V Power
43	Ground	Ground	Ground
44	NC	NC	No Connection

Utility Connector

KEYBOARD/MOUSE INTERFACE

A standard PS/2 keyboard and mouse interface is accessible through connector J14. In addition, connector J14 supports a programmable LED output, hard drive activity LED, and a speaker output as shown in the table below. The pinout of the PS/2 connectors applies to use of the VersaLogic transition cable #VL-CBL-1602.

Table 9: Utility Connector

J14 Pin	Signal Name	Description	PS/2 Pin
1	PBRST*	Push-button reset	
2	GND	Ground	
3	PLED*	Programmable LED	
4	MKPWR	Protected +5V	
5	SPKO*	Speaker Output	
6	MKPWR	Protected +5V	
7	IDE_LED*	IDE Drive Indicator LED	
8	MKPWR	Protected +5V	
9	MKPWR	Protected +5V	
10	XMSDATA	Mouse Data	4
11	GND	Ground	1
12	MSCLK	Mouse Clock	3
13	MKPWR	Protected +5V	5
14	KBDATA	Keyboard Data	4
15	GND	Ground	1
16	KBCLK	Keyboard Clock	3

← Mouse Connector

← Keyboard Connector

PROGRAMMABLE LED

The Utility Connector J14 includes an output signal for attaching a software controlled LED. Connect the cathode of the LED to J14 pin 3, connect the anode to +5V. An on-board resistor limits the current to 15 mA when the circuit is turned on.

To turn the LED on and off, set or clear bit D7 in I/O port 0E0h. When changing the register, make sure not to alter the value of the other bits.

The following code examples show how to turn on and off the LED. Refer to page 52 for further information:

LED On		LED Off	
in	al, E0h	in	al, E0h
or	al, 80h	and	al, 7Fh
out	E0h, al	out	E0, al

Note! The LED is turned on by the BIOS during system startup. This causes the light to function as a "power on" indicator if it is not otherwise controlled by user code.

EXTERNAL SPEAKER

A miniature 8 ohm speaker can be connected between J14 pin 5 (SPKO*) and J14 pin 6 (MKPWR).

PUSH-BUTTON RESET

The Utility Connector J14 (see page 28) includes an input for a push-button reset switch. Shorting J14 pin 1 to ground will cause the VSBC-7 to reboot.

Floppy Drive Interface

The VSBC-7 supports a standard 34-pin PC/AT style floppy disk interface at connector J15. Up to two floppy drives can be attached to this port. CMOS Setup can be used to enable or disable the floppy disk interface.

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 10: Floppy Disk Interface Connector Pinout

J15 Pin	Signal Name	Function
1	Ground	Ground
2	R/LC	Load Head
3	Ground	Ground
4	NC	No Connection
5	Ground	Ground
6	NC	No Connection
7	Ground	Ground
8	INDX*	Beginning Of Track
9	Ground	Ground
10	MTR1*	Motor Enable 1
11	Ground	Ground
12	DRV0*	Drive Select 0
13	Ground	Ground
14	DRE1*	Drive Select 1
15	Ground	Ground
16	MTR0*	Motor Enable 0
17	Ground	Ground
18	DIR	Direction Select
19	Ground	Ground
20	STEP*	Motor Step
21	Ground	Ground
22	WDAT*	Write Data Strobe
23	Ground	Ground
24	WGAT*	Write Enable
25	Ground	Ground
26	TRK0*	Track 0 Indicator
27	Ground	Ground
28	WPRT*	Write Protect
29	Ground	Ground
30	RDAT*	Read Data
31	Ground	Ground
32	HDSL	Head Select
33	Ground	Ground
34	DCHG	Drive Door Open

Video Interface

An on-board Asiliant Technologies 69030 video controller with 4MB video RAM provides full SVGA video output capabilities for the VSBC-7.

A 40KB video BIOS is located at C0000h.

SOFTWARE CONFIGURATION

The video interface shares PCI interrupt “INTC*” with the Ethernet controller. The CMOS Setup screen is used to select the IRQ line routed to INTC*.

VIDEO RESOLUTIONS

Several standard VESA SVGA modes and color depths are available depending upon the amount of installed video RAM.

Table 11: Video Resolutions

4 MB Video RAM <i>(standard)</i>
640 x 480, 16M colors
800 x 600, 16M colors
1024 x 768, 16M colors
1280 x 1024, 16M colors
1600 x 1200, 64K colors

VIDEO OUTPUT CONNECTOR

See the *Connector Location Diagram* on page 11 for pin and connector location information. An adapter cable, part number VL-CBL-1007, is available to translate J1 into a standard 15-pin D-Sub SVGA connector.

Table 12: Video Output Pinout

J1 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

FLAT PANEL DISPLAY CONNECTOR

See the *Connector Location Diagram* on page 11 for pin and connector location information.

Table 13: Flat Panel Display Pinout

J8A 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 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	FP0	Data Output		UD3	UD7	B0	B0	B00	R1	R1	UR1	UR0	UR0
10	FP1	" "		UD2	UD6	B1	B1	B01	B1	G1	UG1	UG0	UG0
11	FP2	" "		UD1	UD5	B2	B2	B02	G2	B1	UB1	UB0	UB0
12	FP3	" "		UD0	UD4	B3	B3	B03	R3	R2	UR2	UR1	LR0
13	FP4	" "		LD3	UD3	B4	B4	B10	B3	G2	LR1	LR0	LG0
14	FP5	" "		LD2	UD2	G0	B5	B11	G4	B2	LG1	LG0	LB0
15	FP6	" "		LD1	UD1	G1	B6	B12	R5	R3	LB1	LB0	UR1
16	FP7	" "		LD0	UD0	G2	B7	B13	B5	G3	LR2	LR1	UG1
17	FP8	" "	P0		LD7	G3	G0	G00	SHF CLKU	B3		UG1	UB1
18	FP9	" "	P1		LD6	G4	G1	G01		R4		UB1	LR1
19	FP10	" "	P2		LD5	G5	G2	G02		G4		UR2	LG1
20	FP11	" "	P3		LD4	R0	G3	G03		B4		UG2	LB1
21	FP12	" "	P4		LD3	R1	G4	G10		R5		LG1	UR2
22	FP13	" "	P5		LD2	R2	G5	G11		G5		LB1	UG2
23	FP14	" "	P6		LD1	R3	G6	G12		B5		LR2	UB2
24	FP15	" "	P7		LD0	R4	G7	G13		R6		LG2	LR2
25	FP16	" "					R0	R00					LG2
26	FP17	" "					R1	R01					LB2
27	FP18	" "					R2	R02					UR3
28	FP19	" "					R3	R03					UG3
29	FP20	" "					R4	R10					UB3
30	FP21	" "					R5	R11					LR3
31	FP22	" "					R6	R12					LG3
32	FP23	" "					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	DDCDATA	Serial Data											
42	DDCCLK	Serial Data											
43	+3V	Power Supply											
44	+3V	Power Supply											

SECONDARY FLAT PANEL DISPLAY CONNECTOR

Table 14: Flat Panel Display Pinout

J8B Pin	Signal Name	Function
1	+5V	Power Supply
2	GND	Ground
3	FP24	Data Output
4	FP25	" "

5	FP26	"	"
6	FP27	"	"
7	FP28	"	"
8	FP29	"	"
9	FP30	"	"
10	FP31	"	"
11	FP32	"	"
12	FP33	"	"
13	FP34	"	"
14	FP35	"	"
15	GND	Ground	
16	+5V	Power Supply	

COMPATIBLE FLAT PANEL DISPLAYS

The following list of flat panel displays are reported to work properly with the Asilant Technologies 69030 video controller chip used on the VSBC-7:

- Sharp LQ057Q3DC02
- Sharp LQ084V1DG21
- Sharp LQ10D344
- Sharp LQ10D346
- Sharp LQ10D367
- Sharp LQ10D421
- Sharp LQ9D161
- Sharp LQ9D340
- Sharp LQ10D131
- Sharp LQ12S08
- Sharp LQ12S31
- Sharp LQ12S41
- Sharp LQ64D142
- Sharp LQ64D341
- Sharp LQ64D343
- Sharp LQ104V1DG11
- Sharp LM64K101
- Sharp LM64P101
- Sharp LM64P839
- Sharp LM32P10
- Sharp LM8V31
- Sharp LM64C35P
- NEC NL6448AC33-27
- NEC NL6448AC33-18
- NEC NL6448AC33-24
- LG Elec. LCA4VE02A
- LG Elec. LP104S2
- Samsung LT104V4-101
- Hitachi TX31D27VC1CAB
- Hitachi TX26D80VC1CAA

Ethernet Interface

The VSBC-7 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 QNX, VxWorks and other RTOS vendors. Win95/98/NT ship with built-in support for this Ethernet interface. The drivers load automatically when the operating system is installed.

SOFTWARE CONFIGURATION

The Ethernet interface shares PCI interrupt “INTC*” with the AGP video controller. The CMOS Setup screen is used to select the IRQ line routed to INTC*.

STATUS LED

Two colored LEDs (D1) 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 J2.
No Tx/Rx data activity.
- OFF Cable not plugged into J2
Cable not plugged into active hub
- BLINKING Active Ethernet cable plugged into J2.
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 15: RJ45 Ethernet Connector

J2 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 +

Audio

The audio interface on the VSBC-7 is implemented using the Cirrus Logic CS4281 PCI based audio controller and the CS4297A audio Codec '97. This interface meets or exceeds Microsoft's PC 97, PC 98 and PC 99 audio performance requirements. Drivers are available for all Windows based operating systems. To obtain the most current versions, consult the VSBC-7 Product Support web page at <http://www.versalogic.com/private/vsbc7support.asp>.

J9 provides the low level stereo input and low level stereo output connection points. The outputs will drive any standard "powered" PC speaker set. Also, TTL level up / down volume controls are provided. An "up" pushbutton switch and a "down" pushbutton switch are normally connected between the appropriate pins on the connector and the ground reference. Activation of a switch results in the volume level stepping up or down.

SOFTWARE CONFIGURATION

The audio interface uses PCI interrupt "INTD*". The CMOS Setup screen is used to select the IRQ line routed to INTD*.

EXTERNAL CONNECTIONS

Connector J9 is configured so that a standard 4-pin CD-ROM audio connector can be used to directly provide the low level stereo input.

Table 16: Audio Connector

J9 Pin	Signal Name	Function
1	VOL-ON	Volume down switch input
3	GND	Switch Ground
7	VOL-UP	Volume up switch input
5	GND	Switch Ground
2,4,6,8,11,12,13,14,	AGND	Audio Ground
9	R-OUT	Right channel output
15	L-OUT	Left channel output
10	R-IN	Right channel input
16	L-IN	Left channel input

Watchdog Timer

A watchdog timer circuit is included on the VSBC-7 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 0E0h. 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 and resets to 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 53 for additional information.

There is no provision for selecting a different timeout period using software.

The following code example refreshes the watchdog:

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

Analog Input

The VSBC-7 employ a multi-range, 12-bit A/D converter which will accept up to eight single-ended input signals. The converter features fast 6 microsecond conversion time, with channel independent input ranges of 0 to +5V, $\pm 5V$, 0 to +10V, and $\pm 10V$.

HARDWARE CONFIGURATION

There are no jumpers associated with the analog input circuitry.

EXTERNAL CONNECTIONS

Single-ended analog voltages are applied to connector J6 as shown in the table below.

Table 17: Analog Input Connector

J6 Pin	Signal Name	Function
1	ADCH0	Channel 0 Analog Input
2	ADCH1	Channel 1 Analog Input
3	ADGND	Analog Ground
4	ADCH2	Channel 2 Analog Input
5	ADCH3	Channel 3 Analog Input
6	ADGND	Analog Ground
7	ADCH4	Channel 4 Analog Input
8	ADCH5	Channel 5 Analog Input
9	ADGND	Analog Ground
10	ADCH6	Channel 6 Analog Input
11	ADCH7	Channel 7 Analog Input
12	ADGND	Analog Ground

Note! Connector J6 also includes signals for the Opto 22 interface.

Warning! All analog inputs are fault protected to $\pm 16V$ (board power on or off). Exceeding these maximums can cause permanent damage to the A/D converter circuitry. Such damage is not covered under warranty.

CALIBRATION

There are no calibration adjustments. Calibration, if desired, is accomplished by mathematical transformation in software.

ANALOG CONTROL REGISTER

ACR (WRITE) 00E4h

D7	D6	D5	D4	D3	D2	D1	D0
PD1	PD0	ACQMOD	RNG	BIP	A2	A1	A0

Table 18: Analog Control Register Bit Assignments

Bit	Mnemonic	Description																																				
D7, D6	PD1, PD0	<p>Clock and Power-Down Selection — These bits select the power savings mode and clock source for the A/D circuit.</p> <table border="1"> <thead> <tr> <th>PD1</th> <th>PD0</th> <th>Mode</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>Normal Operation / External Clock Mode</td> </tr> <tr> <td>0</td> <td>1</td> <td>Normal Operation / Internal Clock Mode</td> </tr> <tr> <td>1</td> <td>0</td> <td>Standby Power-Down (STBYPD)</td> </tr> <tr> <td>1</td> <td>1</td> <td>Full Power-Down (FULLPD)</td> </tr> </tbody> </table> <p><i>Note! STBYPD and FULLPD selections do not affect the clock mode.</i></p>	PD1	PD0	Mode	0	0	Normal Operation / External Clock Mode	0	1	Normal Operation / Internal Clock Mode	1	0	Standby Power-Down (STBYPD)	1	1	Full Power-Down (FULLPD)																					
PD1	PD0	Mode																																				
0	0	Normal Operation / External Clock Mode																																				
0	1	Normal Operation / Internal Clock Mode																																				
1	0	Standby Power-Down (STBYPD)																																				
1	1	Full Power-Down (FULLPD)																																				
D5	ACQMOD	<p>Acquisition Mode — This bit selects the type of acquisition mode.</p> <p>ACQMOD = 0 Internal Acquisition. A write to the ACR register will initiate an acquisition interval whose duration is internally timed. Conversion starts when this six-clock-cycle acquisition interval (3.26µs) ends.</p> <p>ACQMOD = 1 External Acquisition. Use this mode for precise control of the sampling aperture and/or independent control of acquisition and conversion times. The acquisition and start-of-conversion is controlled with two separate writes to the ACR register. The first write, written with ACQMOD = 1, starts and acquisition interval of indeterminate length. The second write, written with ACQMOD = 0, terminates acquisition and starts conversion. However, if the second write contains ACQMOD = 1, an indefinite acquisition interval is restarted.</p> <p><i>Note! The address bits for the input mux (A0–A2) must have the same values on the first and second write pulses. Power-down mode bits (PD0, PD1) can assume new values on the second write.</i></p>																																				
D4, D3	RNG, BIP	<p>Range and Polarity Selection — These bits select the input range and polarity on a channel-by-channel basis.</p> <table border="1"> <thead> <tr> <th>RNG</th> <th>BIP</th> <th>Input Range</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0 to +5V</td> </tr> <tr> <td>1</td> <td>0</td> <td>0 to +10V</td> </tr> <tr> <td>0</td> <td>1</td> <td>±5V</td> </tr> <tr> <td>1</td> <td>1</td> <td>±10V</td> </tr> </tbody> </table> <p><i>Warning! The board can be damaged if voltages in excess of ±16V are applied.</i></p>	RNG	BIP	Input Range	0	0	0 to +5V	1	0	0 to +10V	0	1	±5V	1	1	±10V																					
RNG	BIP	Input Range																																				
0	0	0 to +5V																																				
1	0	0 to +10V																																				
0	1	±5V																																				
1	1	±10V																																				
D2-D0	A2, A1, A0	<p>Input Channel Address — These bits select which input channel you wish to convert.</p> <table border="1"> <thead> <tr> <th>A2</th> <th>A1</th> <th>A0</th> <th>Channel</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>Channel 0</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>Channel 1</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>Channel 2</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>Channel 3</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>Channel 4</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>Channel 5</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>Channel 6</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>Channel 7</td> </tr> </tbody> </table>	A2	A1	A0	Channel	0	0	0	Channel 0	0	0	1	Channel 1	0	1	0	Channel 2	0	1	1	Channel 3	1	0	0	Channel 4	1	0	1	Channel 5	1	1	0	Channel 6	1	1	1	Channel 7
A2	A1	A0	Channel																																			
0	0	0	Channel 0																																			
0	0	1	Channel 1																																			
0	1	0	Channel 2																																			
0	1	1	Channel 3																																			
1	0	0	Channel 4																																			
1	0	1	Channel 5																																			
1	1	0	Channel 6																																			
1	1	1	Channel 7																																			

DIGITAL CONTROL / ANALOG STATUS REGISTER

DCAS (READ/WRITE) 00E2h

D7	D6	D5	D4	D3	D2	D1	D0
COM1DIS	COM2DIS	IRQ4DIS	IRQ3DIS	—	DONE	DIRHI	DIRLO

Table 19: Digital Control / Analog Status Register Bit Assignments

Bit	Mnemonic	Description
D7	COM1DIS	COM1 Disable — Enables and disables COM1. COM1DIS = 0 Enables COM1. COM1DIS = 1 Disables COM1.
D6	COM2DIS	COM2 Disable — Enables and disables COM2. COM2DIS = 0 Enables COM2. COM2DIS = 1 Disables COM2.
D5	IRQ4DIS	COM1 IRQ4DIS Disable — Enables and disables IRQ4DIS line to COM1. IRQ4DIS = 0 Enables IRQ4 to COM1. IRQ4DIS = 1 Disables IRQ4 to COM1.
D4	IRQ3DIS	COM2 IRQ3DIS Disable — Enables and disables IRQ3DIS line to COM2. IRQ3DIS = 0 Enables IRQ3 to COM2. IRQ3DIS = 1 Disables IRQ3 to COM2.
D3	—	Reserved — These bits have no function.
D2	DONE	Analog Input Conversion Complete — This status bit is used to determine when it is OK to read data from the A/D converter. DONE = 0 Conversion underway, data not yet available. DONE = 1 Analog input conversion has completed. Valid data is available to be read from the ADCLO and ADCHI registers. Done is reset to “0” when a new conversion is started. <i>Note! This bit is not valid until an A/D conversion cycle has been triggered.</i>
D1	DIRHI	Direction Control for Opto 22 Digital I/O Hi Port — This bit controls the input/output direction of the digital I/O signals DIO8–DIO15. DIRHI = 0 Input DIRHI = 1 Output <i>Note! See page 45 for further information.</i>
D0	DIRLO	Direction Control for Opto 22 Digital I/O Lo Port — This bit controls the input/output direction of the digital I/O signals DIO0–DIO7. DIRLO = 0 Input DIRLO = 1 Output <i>Note! See page 45 for further information.</i>

ADC DATA HIGH REGISTER**ADCHI (READ) 00E5h**

D7	D6	D5	D4	D3	D2	D1	D0
D11 / 0	D11 / 0	D11 / 0	D11 / 0	D11	D10	D9	D8

The ADCHI register is a read register containing the upper 4 bits of data from the A/D conversion results. It is used in conjunction with the ADCLO register to read the complete 12-bit data word.

When reading data, it is normal convention to read the ADCLO register first, followed by the ADCHI register.

Table 20: ADCHI Bit Assignments

Bit	Mnemonic	Description
D7-D4	D11 / 0	Sign Extension — These four bits read as “0” in unipolar input mode (BIP = 0), in bipolar input mode, D11 is duplicated (sign extended) into these four bits.
D3-D0	ADCDATA	A/D Input Data (Most Significant Nibble) — These bits contain data bits D11 through D8 of the conversion results.

ADC DATA LOW REGISTER**ADCLO (READ) 00E4h**

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

The ADCLO register is a read register containing the lower 8 bits of data from the A/D conversion results. It is used in conjunction with the ADCHI register to read the complete 12-bit data word.

After a conversion is complete (as reported by the DONE bit in the ADCSTAT register) the ADCLO register should be read first, followed by the ADCHI register. A word-wide input instruction from the ADCLO register (in ax,dx) will fetch data from both registers in the proper sequence.

The data registers are located on an even address boundary to facilitate efficient single-cycle reading of the A/D data.

Table 21: ADCLO Bit Assignments

Bit	Mnemonic	Description
D7-D0	ADCDATA	A/D Input Data (Least Significant Byte) — These bits contain data bits D7 through D0 of the conversion results.

TWO'S COMPLEMENT DATA FORMAT (±5V AND ±10V ONLY)

The A/D converter translates applied analog voltages into 12-bit, two's complement digital words. The full analog input range is divided into 4096 steps. The output code (0000h) is associated with a mid-range analog value of 0 Volts (ground).

The formulas for calculating analog or digital values are given by:

$$Digital = \left[\frac{Analog}{Step} \right] \qquad Analog = Step \times Digital$$

Where:

- Analog = Applied voltage
- Digital = A/D Conversion Data
- Step = 0.004882813 Volts (0 to +10V Range)
0.002441406 Volts (0 to +5V Range)

Sample values are shown in the table below:

Table 22: Two's Complement Data Format

±5V Input Voltage	±10V Input Voltage	Hex	Decimal	Comment
+5.000000	+10.000000	—	—	Out of range
+4.997559	+9.995117	07FFh	2047	Maximum positive voltage
+2.500000	+5.000000	0400h	1024	Positive half scale
+1.250000	+2.500000	0200h	512	Positive quarter scale
+0.002441	+0.004883	0001h	1	Positive 1 LSB
0.000000	0.000000	0000h	0	Zero (ground input)
-0.002441	-0.004883	FFFFh	-1	Negative 1 LSB
-1.250000	-2.500000	FE00h	-512	Negative quarter scale
-2.500000	-5.000000	FC00h	-1024	Negative half scale
-5.000000	-10.000000	F800h	-2048	Maximum negative voltage

BINARY FORMAT (0 TO +5V AND 0 TO +10V ONLY)

The full analog input range is divided into 4096 steps. The output code (0000h) is associated with an analog input voltage of 0 Volts (ground). All codes are considered positive.

The formulas for calculating analog or digital values are given by:

$$Digital = \left[\frac{Analog}{Step} \right] \quad Analog = Step \times Digital$$

Where:

- Analog = Applied voltage
 Digital = A/D Conversion Data
 Step = 0.002441406 Volts (0 to +10V Range)
 0.001220703 Volts (0 to +5V Range)

Sample values are shown in the table below:

Table 23: Binary Data Format

±5V Input Voltage	±10V Input Voltage	Hex	Decimal	Comment
+5.000000	+10.000000	—	—	Out of range
+4.998779	+9.997559	0FFFh	4095	Maximum voltage
+2.500000	+5.000000	0800h	2048	Half scale
+1.250000	+2.500000	0400h	1024	Quarter scale
+0.001220	+0.002441	0001h	1	1 LSB
0.000000	0.000000	0000h	0	Zero (ground input)

ANALOG INPUT CODE EXAMPLE

The following code example illustrates the procedure for reading a ±10V analog voltage from channel 0:

```

      OUT    0E4h,18h    ;Select channel 0 and begin conversion
BUSY: IN    AL,0E2h     ;Get A/D status
      AND    AL,04h     ;Isolate the DONE bit
      JZ     BUSY       ;Loop back if conversion isn't complete
DONE: MOV   DX,00E4h    ;Point to ADCLO register
      IN    AX,DX      ;16-bit input reads ADCLO and ADCHI into AX

```

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 VSBC-7. With USB 1.0, there is no need to have separate connectors for many common PC peripherals.

The USB 1.0 interface on the VSBC-7 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 24: USB 1.0 Interface Connector

J16 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 J16 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.

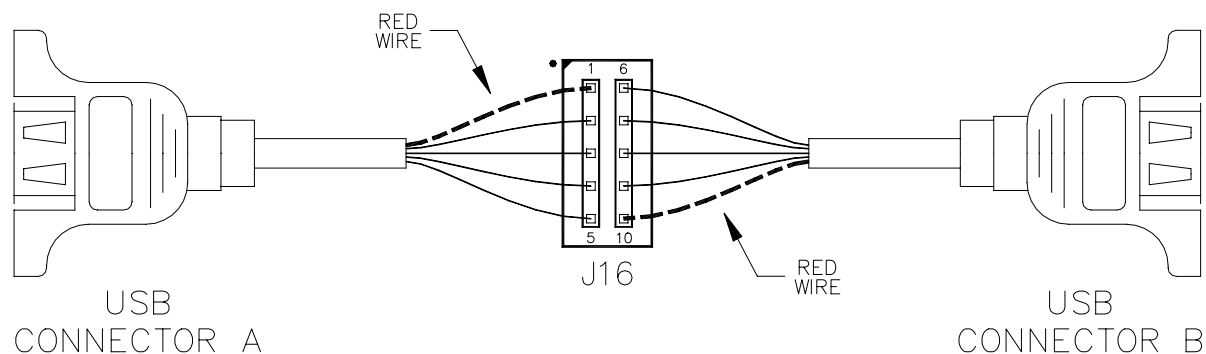


Figure 4. USB 1.0 Connector Orientation Diagram

Opto 22 (Digital I/O) Interface

The VSBC-7 includes a 16-channel digital I/O interface. The digital lines are grouped as two 8-bit bi-directional ports. The direction of each port is controlled by software, and each signal is pulled-up to +5V with a 10K ohm resistor.

The 24 mA source/sink drive and short protected outputs are an excellent choice for industrial TTL interfacing, or they can be used to interface directly (plug compatible) with standard opto-isolated modular I/O racks.

EXTERNAL CONNECTIONS

Table 25: Digital I/O Connector

J6 Pin	Signal Name	Function
13	NC	No Connection
14	GND	Digital Ground
15	NC	No Connection
16	GND	Digital Ground
17	DIO0	OPTO 22 Module 15
18	GND	Digital Ground
19	DIO1	OPTO 22 Module 14
20	GND	Digital Ground
21	DIO2	OPTO 22 Module 13
22	GND	Digital Ground
23	DIO3	OPTO 22 Module 12
24	GND	Digital Ground
25	DIO4	OPTO 22 Module 11
26	GND	Digital Ground
27	DIO5	OPTO 22 Module 10
28	GND	Digital Ground
29	DIO6	OPTO 22 Module 9
30	GND	Digital Ground
31	DIO7	OPTO 22 Module 8
32	GND	Digital Ground
33	DIO8	OPTO 22 Module 7
34	GND	Digital Ground
35	DIO9	OPTO 22 Module 6
36	GND	Digital Ground
37	DIO10	OPTO 22 Module 5
38	GND	Digital Ground
39	DIO11	OPTO 22 Module 4
40	GND	Digital Ground
41	DIO12	OPTO 22 Module 3
42	GND	Digital Ground
43	DIO13	OPTO 22 Module 2
44	GND	Digital Ground
45	DIO14	OPTO 22 Module 1
46	GND	Digital Ground
47	DIO15	OPTO 22 Module 0
48	GND	Digital Ground
49	PWR	+5V Rack Power*
50	GND	Digital Ground

* Optional. Refer to jumper V7 on page 16.

Note! The digital signals on connector J6 are shared with the analog input interface.

RACK POWER

When jumper V7 is installed, up to 250 mA can be drawn from J6 pin 49 to power the Opto 22 interface rack or other external equipment. The power output is protected by a self resetting circuit breaker.

Warning! If the I/O rack is powered by a separate external supply, the power jumper on the I/O rack or jumper V7 must be removed.

SIGNAL DIRECTION

The 16 I/O signals are divided into two 8-bit I/O ports. The direction of each port is controlled by the DIRHI and DIRLO bits in the DCAS register (see page 39).

DIGITAL I/O DATA PORTS

DIOHI (READ/WRITE) 00E7h

D7	D6	D5	D4	D3	D2	D1	D0
DIO15	DIO14	DIO13	DIO12	DIO11	DIO10	DIO9	DIO8

DIOLO (READ/WRITE) 00E6h

D7	D6	D5	D4	D3	D2	D1	D0
DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1	DIO0

Table 26: Register Bit Assignments

Bit	Mnemonic	Description
D7-D0	DIO15–DIO8 DIO7–DIO0	<p>Digital I/O Data — Data written to these register is driven onto the Opto 22 Digital I/O port signals when the port direction is set to output mode. When the port is in input mode, these bits reflect the input state of the signal lines.</p> <p>DIO = 0 Signal low (GND) DIO = 1 Signal high (+5V)</p> <p>Note! Opto 22 modules use inverted logic. An "on" module is a "0" logic level.</p>

Auxiliary Timer/Counter Channels

The VSBC-7 includes three uncommitted 8254 type counter/timer channels for general application program use. Control signals for the three channels are available on connector J5.

JUMPER CONFIGURATION

Jumper V4 selects the clock source for channels 4 and 5. Options include:

- Internal 6 MHz timebase
- External clock from connector J5
- Cascading channels 4 and 5 together for 32-bit counter/timer operations

See page 15 for jumper configuration details.

EXTERNAL CONNECTIONS

Table 27: Counter/Timer I/O Connector

J5 Pin	Signal Name	Function
1	OCTC3	CTC Channel 3 Output
2	GCTC3	CTC Channel 3 Gate Input
3	ICTC4	CTC Channel 4 Input
4	GND	Digital Ground
5	OCTC4	CTC Channel 4 Output
6	GCTC4	CTC Channel 4 Gate Input
7	ICTC5	CTC Channel 5 Input
8	GND	Digital Ground
9	OCTC5	CTC Channel 5 Output
10	GCTC5	CTC Channel 5 Gate Input

COUNTER / TIMER REGISTERS

Table 28: Counter / Timer Registers

Mnemonic	R/W	Address	Name
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
TCW	W	0047h	Timer Control Word

OPERATION

Operational details for this industry standard 8254 type counter/timer chip are beyond the scope of this manual. Register details, operational modes, and programming information can be obtained from the VersaLogic website by downloading the 8254.PDF data sheet.

PC/104 Expansion Bus

The VSBC-7 will accept up to four PC/104 and/or three PC/104-*Plus* expansion modules. Both 3.3V and 5.0V modules are supported.

ARRANGING THE STACK

If PC/104-*Plus* modules will be used, they go on the stack first (closest to the VSBC-7 circuit board). The first module is called "slot 0", the next module is "slot 1", and the third module is "slot 2". Make sure to correctly configure the "slot position" jumpers on each PC/104-*Plus* module to match its physical position in the stack.

The BIOS automatically configures the I/O ports and Memory map allocation, including allocation of interrupts.

PC/104 modules are stacked on top of the PC/104-*Plus* modules; 16-bit modules first followed by 8-bit PC/104 modules. Lastly, non-standard modules which lack feedthrough connectors should be assembled on top of the stack.

Note Some modules may require $-12V$ and/or $-5V$ for correct operation. Check that the proper connections to the 3-pin auxiliary power input connector (J3) are made if your expansion module(s) use these voltages. See pages 11 and 18 for details.

I/O CONFIGURATION

PC/104 Modules

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 50. These ports are used by on-board peripherals and video devices.

PC/104-Plus Modules

PC/104-*Plus* modules do not use CPU I/O addressing. No configuration is necessary except to jumper the expansion module for the correct stack position.

Memory and I/O Map

MEMORY MAP

The lower 1 MB memory map of the VSBC-7 is arranged as shown in the following table. CMOS setup is used to choose between DRAM and PC/104 for three sections of memory from 0C0000h to 0EFFFFh.

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

Table 29: Memory Map

Start Address	End Address	Comment
F0000h	FFFFFh	System BIOS
CC000h	DFFFFh	PC/104
C0000h	CBFFFh	Video BIOS
A0000h	BFFFFh	Video RAM
00000h	9FFFFh	Video RAM
E0000h	EFFFFh	Flash Page, BIOS Ext.

I/O MAP

The following table lists the common I/O devices in the VSBC-7 I/O map. User I/O devices should be added in the 100h – 3FFh range, using care to avoid the devices already in the map as shown below.

Table 30: On-Board I/O Devices

I/O Device	Standard I/O Addresses
Auxillary Counter/Timer Channels	44h – 47h
Special Control Register	0E0h
Watchdog Hold-Off Register	0E1h
Digital Control / Analog Status Register	0E2h
Map and Paging Control Register	0E3h
Analog Control / ADC Low Register	0E4h
ADC High Data Register	0E5h
Digital I/O Low Data Register	0E6h
Digital I/O High Data Register	0E7h
Primary Hard Drive Controller	1F0h – 1F7h
Secondary Hard Drive Controller	170h – 177h
COM2 Serial Port	2F8h – 2FFh
COM4 Serial Port	2E8h – 2EFh
LPT1 Parallel Port	378h – 37Fh
SVGA Video	3B0h – 3DFh
COM3 Serial Port	3E8h – 3EFh
Floppy Disk Controller	3F0h – 3F7h
COM1 Serial Port	3F8h – 3FFh

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

Interrupt Configuration

The VSBC-7 has the standard complement of PC type interrupts. Ten non-shared interrupts are routed to the PC/104 bus, and up to four IRQ lines are automatically allocated as needed to PCI devices.

There are no interrupt configuration jumpers. All configuration is handled through CMOS setup. The switches in the diagram below indicate the various CMOS Setup options. Closed switches show factory default settings.

Note If your design needs to use interrupt lines on the PC/104 bus, we recommend using IRQ5, IRQ9, and/or IRQ10. Make sure to configure CMOS Setup with the chosen PC/104 interrupts. This prevents their allocation to PCI devices.

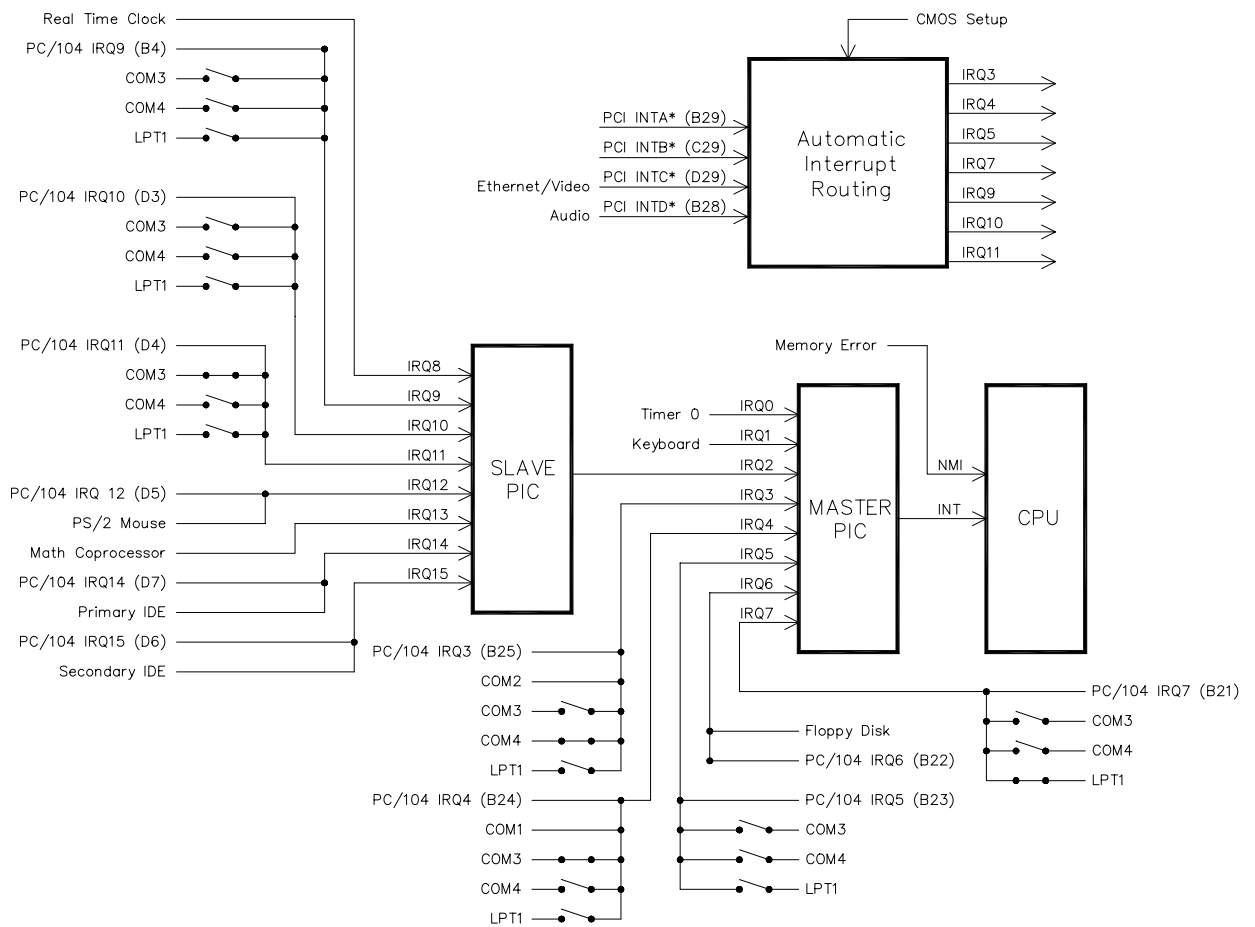


Figure 5. Interrupt Circuit Diagram

Special Control Register

SCR (READ/WRITE) 00E0h

D7	D6	D5	D4	D3	D2	D1	D0
LED	TEMP	Reserved	Reserved	Reserved	NMIEN	GPI	WDOGEN

Table 31: Special Control Register Bit Assignments

Bit	Mnemonic	Description
D7	LED	Light Emitting Diode — Controls the programmable LED connector J7 LED = 0 Turns LED off. LED = 1 Turns LED on.
D6	TEMP	Temperature Status — Indicates CPU case temperature. TEMP = 0 CPU case temperature is below value set in CMOS Setup TEMP = 1 CPU case temperature is above value set in CMOS Setup <i>Note! This bit is a read-only bit.</i>
D5-D3	Reserved	Reserved — This bit has no function. Always reads as 1.
D2	NMIEN	Non-Maskable Interrupt Enable — Controls the generation of Non-Maskable interrupts whenever the CPU temperature sensor detects an over-temperature condition. NMIEN = 0 Disable NMIEN = 1 Enable
D1	GPI	General Purpose Input — Indicates the status of jumper V8[5-6]. GPI = 0 Jumper Out GPI = 1 Jumper In <i>Note! This bit is a read-only bit</i>
D0	WDOGEN	Watchdog Enable — Enables and disables the watchdog timer reset circuit. WDOGEN = 0 Disables the watchdog timer. WDOGEN = 1 Enables the watchdog timer.

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 VSBC-7 product.

Bit	Mnemonic	Description																																				
D7-D3	PC4-PC0	<p>Product Code — These bits are hard coded to represent the product type. The VSBC-7 will always read as 10001. Other codes are reserved for future products.</p> <table> <thead> <tr> <th>PC4</th> <th>PC3</th> <th>PC2</th> <th>PC1</th> <th>PC0</th> <th>Product Code</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>VSBC-7</td> </tr> </tbody> </table> <p><i>Note! This bits are read-only.</i></p>	PC4	PC3	PC2	PC1	PC0	Product Code	1	0	0	0	1	VSBC-7																								
PC4	PC3	PC2	PC1	PC0	Product Code																																	
1	0	0	0	1	VSBC-7																																	
D2-D0	REV2-REV0	<p>Revision Level — These bits are represent the VSBC-7 circuit revision level.</p> <table> <thead> <tr> <th>REV2</th> <th>REV1</th> <th>REV0</th> <th>Revision Level</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>Initial product release</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>Reserved</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>Reserved</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>Reserved</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>Reserved</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>Reserved</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>Reserved</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>Reserved</td> </tr> </tbody> </table> <p><i>Note! This bits are read-only.</i></p>	REV2	REV1	REV0	Revision Level	0	0	0	Initial product release	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
REV2	REV1	REV0	Revision Level																																			
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1	0	0	Reserved																																			
1	0	1	Reserved																																			
1	1	0	Reserved																																			
1	1	1	Reserved																																			

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 VSBC-7 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.

Map and Paging Control Register

MPCR (READ/WRITE) 00E3H

D7	D6	D5	D4	D3	D2	D1	D0
FPGEN	SB-SEL	VB-SEL	Reserved	Reserved	PG2	PG1	PG0

Table 32: Map and Paging Control Register Bit Assignments

Bit	Mnemonic	Description																																				
D7	FPGEN	<p>FLASH Paging Enable — Enables a 64K page frame from E0000h to EFFFFh. Used to gain access to the on-board FLASH memory.</p> <p>FPGEN = 0 FLASH page frame disabled. FPGEN = 1 FLASH page frame enabled.</p> <p><i>Note! This bit is for factory use only. It is used to write user default CMOS setup values to FLASH and to upgrade the system BIOS. When FPGEN = 1, the Page Select bits are used to access various blocks within the FLASH.</i></p>																																				
D6	SB-SEL	<p>System BIOS Selection — Indicates the status of jumper V8[1-2]</p> <p>SB-SEL = 0 Jumper out, Secondary System BIOS selected. SB-SEL = 1 Jumper in, Primary System BIOS selected.</p> <p><i>Note! This bit is a read-only bit.</i></p>																																				
D5	VB-SEL	<p>Video BIOS Selection — Indicates the status of jumper V8[3-4]</p> <p>VB-SEL = 0 Jumper out, Secondary Video BIOS selected. VB-SEL = 1 Jumper in, Primary Video BIOS selected.</p> <p><i>Note! This bit is a read-only bit.</i></p>																																				
D4	—	Reserved — This bit has no function.																																				
D3	—	Reserved — This bit has no function.																																				
D2-D0	PG2-PG0	<p>Page Select — Selects which 64K block of FLASH will be mapped into the page frame at E0000h to EFFFFh</p> <table border="1"> <thead> <tr> <th>PG2</th> <th>PG1</th> <th>PG0</th> <th>Memory Range within FLASH</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>000000h to 00FFFFh</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>010000h to 01FFFFh</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>020000h to 02FFFFh</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>030000h to 03FFFFh</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>040000h to 04FFFFh</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>050000h to 05FFFFh</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>060000h to 06FFFFh</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>070000h to 07FFFFh</td> </tr> </tbody> </table>	PG2	PG1	PG0	Memory Range within FLASH	0	0	0	000000h to 00FFFFh	0	0	1	010000h to 01FFFFh	0	1	0	020000h to 02FFFFh	0	1	1	030000h to 03FFFFh	1	0	0	040000h to 04FFFFh	1	0	1	050000h to 05FFFFh	1	1	0	060000h to 06FFFFh	1	1	1	070000h to 07FFFFh
PG2	PG1	PG0	Memory Range within FLASH																																			
0	0	0	000000h to 00FFFFh																																			
0	0	1	010000h to 01FFFFh																																			
0	1	0	020000h to 02FFFFh																																			
0	1	1	030000h to 03FFFFh																																			
1	0	0	040000h to 04FFFFh																																			
1	0	1	050000h to 05FFFFh																																			
1	1	0	060000h to 06FFFFh																																			
1	1	1	070000h to 07FFFFh																																			

Appendix A — Other References



PC Chipset <i>ALi Aladdin V+ Chipset</i>	Acer Laboratories Inc., (www.acerlabs.com)
Ethernet Controller	AMD AM79C973
Video Controller <i>69030</i>	Chips and Technologies (Asilant Technologies) (www.Asilant.com)
A/D Converter <i>Maxim 197</i>	Maxim Integrated Products, (www.maxim-ic.com)
PC/104 Specification <i>PC/104 Resource Guide</i>	PC/104 Consortium, (www.controlled.com/pc104)
CPU Chips <i>K6 & K6-2</i> <i>Pentium</i>	Advanced Micro Devices, (www.amd.com) Intel Corporation, (www.intel.com)
PC/104-Plus Specification <i>PC/104 Resource Guide</i>	VersaLogic Corp., (www.versalogic.com)
General PC Documentation <i>The Programmer's PC Sourcebook</i>	Microsoft Press, mspress.microsoft.com
General PC Documentation <i>The Undocumented PC</i>	www.amazon.com