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SBS Embedded Computers

V5A

Pentium PC/AT Compatible VMEbus Single Board Computer

User's Manual



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V5A User's Manual
Document Number **A-935-MN-03285-A3**
Part Number **9100-31-027-A3**
Revision A3

This manual applies to the V5A Embedded PC, revision 03 and above, until superceded.

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This manual uses some generally accepted conventions, for clarity and accuracy. These include:

- The use of an 'H' suffix before a number indicates hexadecimal (base sixteen) notation.
- The use of a '-' (minus) suffix to a signal name indicates an active low signal. The signal is either true when it is at a logic zero level or the signal initiates actions on a high-to-low transition.
- Text in `Courier` Font indicates a command entry or output from an SBS embedded PC product using its built-in character set.

This manual is designed to provide information regarding the general use and application of the V5A Embedded PC, as well as detail the hardware design. Software methods and programming information are not provided in this manual. They can be found in the companion manual, the *V5A Programmer's Manual*, which came with your V5A.

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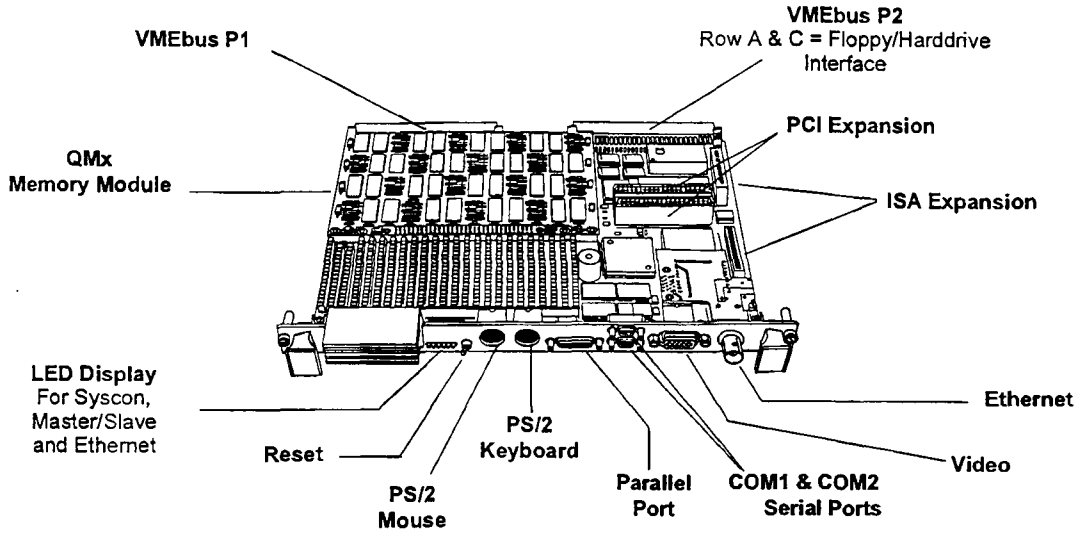
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CHAPTER 1 Introduction



Chapter Scope

This chapter describes the features, capabilities and compatibilities of the V5A.

IBM PC/AT Compatibility Features

The V5A Embedded PC is completely software compatible with the IBM PC/AT personal computer. All of the functions necessary for operation as a PC/AT are included. There are also a number of features provided on board which usually require plug-in cards in a desktop PC/AT. The following paragraphs describe features which relate to the V5A PC/AT functionality.

Intel Pentium Microprocessors

The V5A is available from the factory with an Intel Pentium processor at variety of speeds. The 100MHz, 133MHz, 166MHz, and 200MHz Pentium processors are currently supported, and support for future Pentium processors is provided. Each processor will run standard software written for the PC/AT. They provide the capability of running 8-bit (8086), 16-bit (80286), as well as full 32-bit (80386) software and operating systems. This choice of processors allows you to select a V5A with the performance best suited to your application.

Compatible ROM BIOS

To ensure compatibility with the IBM PC/AT, the V5A uses a ROM BIOS produced using "clean room" methodology, meaning that the BIOS is 100% IBM compatible without infringing on IBM's copyrights. The BIOS provides low-level machine dependent software functions, therefore relieving MS-DOS or any other common operating system from dealing with the hardware directly. Since a great many software programs use calls to the BIOS rather than to MS-DOS, it is important to have a BIOS that functions exactly like the original PC/AT BIOS. SBS Embedded Computers has added extensions to the BIOS specifically for the additional VMEbus-related features of the V5A. These extensions, however, do not compromise the normal BIOS operation. See the *V5A Programmer's Manual* for details on VME BIOS extensions.

Compatible I/O

The V5A incorporates the I/O capabilities of a complete PC/AT. These include two RS-232 serial communications ports, a parallel printer port, and a keyboard port. Also, a serial mouse port is provided. The COM-2 serial port is enhanced for selectable RS-422 or RS-485 operation.

System Memory

The V5A is available from the factory with a variety of memory technologies and sizes. Fast-Page DRAM, EDO DRAM, and Synchronous DRAM are supported.

Floppy Controller

There is a fully PC/AT compatible floppy disk controller onboard the V5A. It can control two separate 3.5" 1.44M floppy disk drives. The floppy control signals are provided through the P2 connector for simple connection to an SBS Embedded Computers VME-6200 series disk drive module, or to a custom disk drive setup using SBS Embedded Computers' VME-TB21 transition board.

Integrated Drive Electronics (IDE) Controller

The onboard Enhanced Integrated Drive Electronics (EIDE) controller provides an industry standard IDE interface for two disk drives or other peripherals. The IDE control signals are provided through the P2 connector for easy connection to a VME-6200 series disk drive module, or to a custom disk drive setup using a VME-TB21.

Small Computer Systems Interface (SCSI) Controller

The onboard Small Computer Systems Interface (SCSI) controller provides a Fast SCSI-2 compatible interface for hard disk drives or other SCSI peripheral devices. The SCSI control signals are provide through the P2 connector for painless connection to a VME-6200 series disk drive module, or to a custom disk drive setup using a VME-TB21.

Multi-Mode Video Adapter

The V5A has an ultra-high-performance PCI bus multi-mode video controller which is fully software configurable and can be set for compatibility with a wide variety of video displays. Operation with color monitors is usually achieved through emulation of IBM VGA or SVGA video. A standard 15-pin VGA connector is provided through the front panel for attaching VGA and SVGA capable monitors.

On-Board Ethernet

The V5A incorporates a high-performance DEChip 21041 Ethernet controller on-board. The V5A can be ordered with a Thinwire (10Base2) physical interface provided with a BNC connector through the front panel, or with Twisted-Pair (10BaseT) physical interface provided with an RJ45 connector through the front panel.

VMEbus VME64 Compatibility Features

The V5A is fully qualified to meet the VME64 ANSI/VITA 1-1994 standard. The VMEbus interface of the V5A is high-speed and very flexible, yet is easy for software to utilize. The following paragraphs discuss features of the V5A which pertain to its VMEbus interface.

Full VMEbus Master/Slave Operation

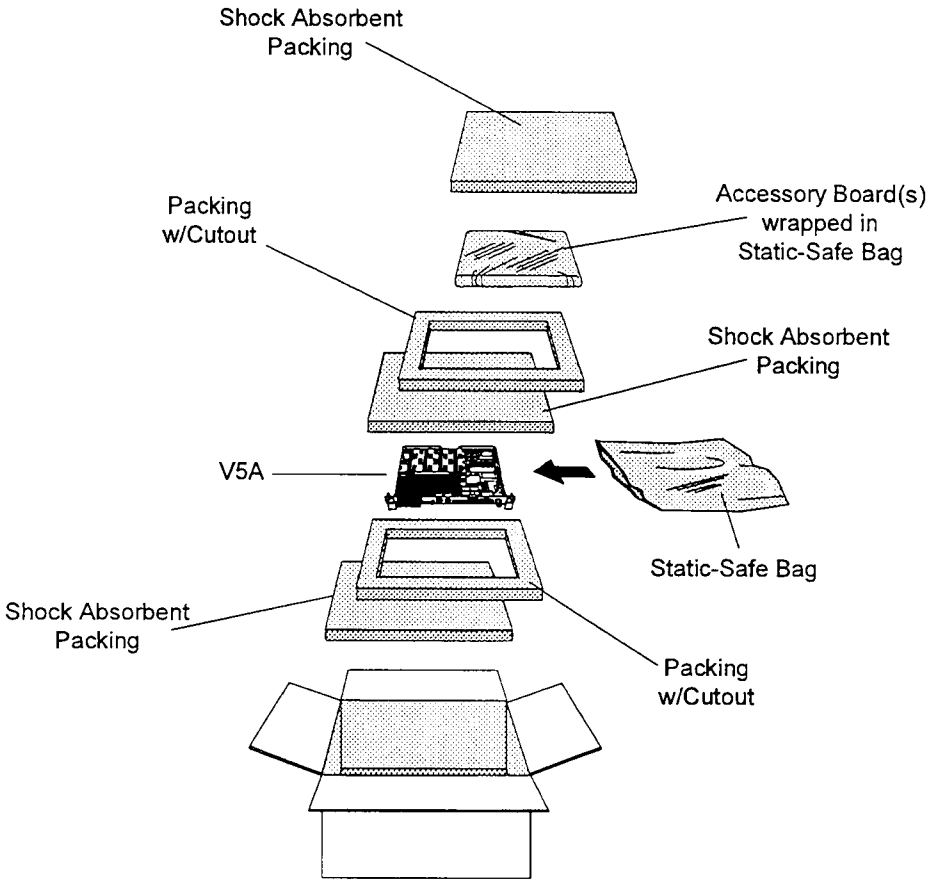
The V5A was designed to provide both VMEbus Master and VMEbus Slave capability. As such, it can initiate data transfers over the VMEbus and receive data from other VMEbus Masters. A number of facilities have been provided to enhance VMEbus Master and Slave operation.

The VMEbus interface provides four VMEbus access paths. Each can be configured as either a VMEbus master or VMEbus slave path. A path configured as a slave allows access to the V5A System DRAM and other local resources from the VMEbus. The interface can be configured to allow all, part, or none of the local address space to be accessible, allowing local data to be configured as inaccessible from the VMEbus.

An access path configured as a master allows the V5A to perform data transfers on the VMEbus. A path can be configured to appear anywhere in local address space, and map anywhere on the VMEbus, providing for a very flexible interface. One path can be located in UMB space to allow VME access from programs operating in 80x86 Real Mode.

VMEbus System Controller Capability

The V5A can be software configured as a VMEbus System Controller, independent of VMEbus Master or Slave operation. This is especially important if the V5A is going to be the only CPU card in the VMEbus system. Also, the V5A can automatically detect if it is in slot one and turn on the System Controller function.



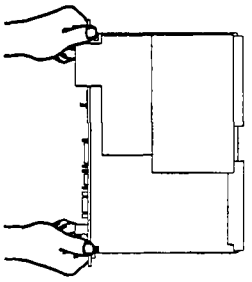
Retain all packing materials in case of future need for storage, relocation or the possibility of return for repairs.

CHAPTER 2

Unpacking, Inspection, and Initial Operation

Chapter Scope

This chapter covers the suggested inspection and preparation considerations and background information necessary prior to using the V5A. Unpacking, initial inspection, and first-time operation of the V5A are covered. Following the procedures given in the chapter is recommended, since they will verify proper operation after shipping and before the product is integrated into your VMEbus system.



Proper handling of the V5A is critical to ensure proper operation and long-term reliability. When unpacking the board, and whenever handling it thereafter, be sure to hold the V5A by the front panel or the card ejectors as shown in the drawing on this page. Do not hold the V5A by the circuit card edges, the heat sink, or the VMEbus connectors.

Electrostatic Discharge Notice

The discharge of static electricity, known as electrostatic discharge or ESD, is a major cause of electronic component failure. The V5A has been packaged in a static-safe bag which protects the board from ESD while the board is in the bag. Before removing the V5A or any other electronic product from its static-safe bag, be prepared to handle it in a static-safe environment.



You should wear a properly-functioning antistatic strap and ensure you are fully grounded. Any surface upon which you place the unprotected V5A should be static-safe, usually facilitated by the use of antistatic mats. From the time the board is removed from the antistatic bag until it is in its card cage and functioning properly, extreme care should be taken to avoid "zapping" the board with ESD. You should be aware that you could "zap" the board without your knowing it; a small discharge, imperceptible to the eye and touch, is enough to damage electronic components. Extra caution should be taken in cold and dry weather when static easily builds up.

Unpacking and Handling

The V5A has been carefully packaged to ensure adequate protection from the rigors of shipping. However, the possibility exists that shipping damage can occur. Close inspection of the shipping carton should reveal some information about how the package was handled by the shipping service. If evidence of damage or excessively rough handling is found, you should notify the shipping service and SBS Embedded Computers as soon as possible.

Only after ensuring that both you and the surrounding area are protected from ESD, carefully remove the V5A from the shipping carton by grasping it by the front panel and the VME connectors. Place the board, in its anti-static bag, flat down on a suitable surface. You may then remove the board from the anti-static bag by tearing the ESD warning labels. Again place the board flat down on the work surface.

Initial Inspection

Once the V5A has been unpacked, it is suggested you inspect it for visible damage which could have occurred during shipping or unpacking. If there is visible damage, usually in the form of bent component leads or loose socketed components, contact SBS Embedded Computers for additional instructions. Depending on the severity of the damage, it may need to be sent back to the factory to be repaired. DO NOT apply power to the board if it has visible damage. Doing so may cause further, possibly irreparable damage, as well as introduce a fire or shock hazard. Since the V5A incorporates a number of socketed components, including the CPU, memory, Ethernet adapter, these should be inspected to make sure that they are seated fully in their sockets.

Included Items

There are several accessories which are included with each V5A. You may want to make sure that you have the items shown in Table 2-1 in the event that you need them during installation or configuration.

Qty.	Item	Purpose
1	Cable Adapter	PC Keyboard Adapter

Table 2-1 Included Items

Minimum System Requirements

As shipped, the V5A has been thoroughly tested and burned-in, and is nearly ready for use in your VMEbus system. In order to verify V5A operation for the first time, it is suggested that you only configure a minimal system. It is not necessary to have disk drives or other accessories connected in order to perform the V5A confidence tests. The following items are all that are required:

VMEbus Backplane and Power Supply

You will need a standard VMEbus P1 or combination P1/P2 backplane wired into a regulated power supply capable of providing stable low noise +5 volt, +12 volt, and -12 volt sources. Make sure that the supply is capable of meeting the total power requirements of the V5A. Please refer to Chapter 2 for the V5A Specifications. Initially, you may plug the V5A into any available 6U slot of your VMEbus backplane. Later you will need to select the proper slot for your particular application. Please make sure that you do not have the power supply turned ON when the V5A is plugged into your backplane. As a reminder, you must never install or remove any VMEbus card while power is applied unless it is certified for hot-insertion (the V5A is not).

Keyboard

You should have an IBM PC/AT or compatible keyboard for initial system operation. Depending on your application, this keyboard may be a standard full-travel keyboard, or one which utilizes membrane switches for harsh environments. Note that some keyboards have a switch which selects either PC and PC/XT compatibility or PC/AT compatibility. If your keyboard is equipped with such a switch, make sure it is set for PC/AT compatibility. The miniature DIN keyboard connector is located on the front panel and is directly compatible with IBM PS2-type keyboards. If your keyboard has the normal IBM PC-type keyboard connector you will need to use the supplied cable adapter. Plug your keyboard into the keyed front panel connector labeled 'KEYBOARD' before power is applied. Plugging and unplugging the keyboard while power is applied is not recommended and can cause a software failure or damage to the keyboard or the on-board circuitry.

Video Monitor

Any VGA-compatible video monitor can be used initially for display output. The 15-pin front panel connector is fully compatible with the VGA standard connector and pinout. Plug your video monitor into the connector labeled 'VIDEO'.

After making sure that you have installed the V5A properly into your VMEbus backplane you may apply power to your video monitor and then to the VMEbus supply. When the board is completely reset, the processor should begin executing initial BIOS-resident routines.

Initial Power-On Operation

After a few seconds, the V5A System BIOS banner will be displayed as shown in Figure 2-1.

The memory test will begin. From the factory, the board is configured to do a very thorough memory test. As such, the test will proceed slowly. Once you have configured your board for the first time, the board will execute a much faster memory test on subsequent startups.

```
                    V5A Embedded SBSBIOS
            Version 1.00, SBS Embedded Computers Inc.

Hit F2 to enter setup...
Low RAM :  640
Extended RAM : 31744

EDO RAM detected
```

Figure 2-1 System BIOS Banner

If you have seen all the messages to this point, you can be confident that the board is running properly and is ready to be installed and setup for you application. You may now shut off power to the VMEbus chassis and begin board setup and configuration as described in Chapter 5.

If the board did not perform as described above, some damage may have occurred in shipping or the board is not installed or setup properly. Contact SBS technical support as described in Chapter 7 for further instructions.

CHAPTER 3 Installation and Interfacing

Chapter Scope

This chapter covers installing the V5A in a VMEbus system and interfacing the V5A to external devices and peripherals.

Installing the V5A

The V5A is designed to conform to the VMEbus physical specifications for a 6U×4HP dual eurocard (dual-height, single-width). It can be plugged directly into any standard card cage designed for these types of cards. Installation of the V5A is relatively simple as described below.

Installation Requirements

The following paragraphs describe requirements which your VMEbus system must meet in order to install and successfully integrate the V5A. If you are uncertain about any requirements, be sure to contact SBS Embedded Computers Technical Support before installing your V5A.

VMEbus Power Requirements

Power is supplied to the V5A via the VMEbus P1 connector as shown in Table 3-1.

Signal	Location on VMEbus P1
+5 Volts	Row a, pin 32
	Row b; pin 32
	Row c; pin 32
Ground	Row a; pins 9, 11, 15,17,19
	Row b; pins 20,23
	Row c; pin 9
+12 Volts	Row c; pin 31
-12 Volts	Row a; pin 31

Table 3-1 VMEbus P1 Power Pins

If you are using the V5A in a full 32-bit address system, additional power and ground pins are connected according to VMEbus specification for P2 row *b* as shown in Table 3-2.

Signal	Location on VMEbus P2
+5 Volts	Row b; pins 1,13,32
GND	Row b; pins 2,12,22,31

Table 3-2 VMEbus P2 Power Pins

The actual electrical requirements of the V5A are defined in the Specifications section of Chapter 6.

WARNING:

The P2 connector of the V5A has the a and c rows defined by SBS as the VMEbus specification permits. However, other boards on the VMEbus may also define these rows. Damage can result to the V5A or other boards if the P2 a and c row signals are bussed between boards which are not compatible.

VMEbus Backplane Requirements

Since the V5A Embedded PC is capable of generating 16- or 32-bit data and 16-, 24- or 32-bit addresses it can be used in VMEbus systems which have either a single P1 backplane or a dual P1/P2 backplane.

VMEbus P1 Connector

The V5A has been designed to directly interface with any VMEbus P1 backplane conforming to the Rev. C.1 specification. Table 3-3 summarizes the VMEbus P1 signals used.

Pin	Row a Signal	Row b Signal	Row c Signal
1	D0, Data bit 0	BBSY-	D8, Data bit 8
2	D1, Data bit 1	Not used	D9, Data bit 9
3	D2, Data bit 2	ACFAIL-	D10, Data bit 10
4	D3, Data bit 3	BG0IN-	D11, Data bit 11
5	D4, Data bit 4	BG0OUT-	D12, Data bit 12
6	D5, Data bit 5	BG1IN-	D13, Data bit 13
7	D6, Data bit 6	BG1OUT-	D14, Data bit 14
8	D7, Data bit 7	BG2IN-	D15, Data bit 15
9	GND	BG2OUT-	GND
10	SYSCLK	BG3IN-	SYSFAIL-
11	GND	BG3OUT-	BERR-
12	DS1-	BR0-	SYSRESET-
13	DS0-	BR1-	LWORD-
14	WRITE-	BR2-	AM5
15	GND	BR3-	A23
16	DTACK-	AM0	A22
17	GND	AM1	A21
18	AS-	AM2	A20
19	GND	AM3	A19
20	IACK-	GND	A18
21	IACKIN-	Not used	A17
22	IACKOUT-	Not used	A16
23	AM4	GND	A15
24	A07	IRQ7-	A14
25	A06	IRQ6-	A13
26	A05	IRQ5-	A12
27	A04	IRQ4-	A11
28	A03	IRQ3-	A10
29	A02	IRQ2-	A09
30	A01	IRQ1-	A08
31	-12V	+5VSTDBY	+12V
32	+5V	+5V	+5V

Table 3-3 V5A P1 Signals

VMEbus P1 Daisy Chain Signals

The VMEbus specification defines two signal paths which are connected in daisy chain fashion, meaning that they are intercepted at each card position before being passed on the the adjacent card. These signals are associated with bus acquisition and interrupt acknowledgement. Before plugging the V5A into the P1 backplane, you should make sure that the backplane slot is configured appropriately for these signals.

Bus Grant Daisy Chain

The VMEbus has four bus grant daisy chain signal pairs: BG0IN-/BG0OUT-, BG1IN-/BG1OUT-, BG2IN-/BG2OUT-, BG3IN-/BG3OUT-. When configuring a VMEbus P1 backplane, it is necessary to jumper all bus grant daisy chain signals on the backplane so that the bus grant outputs are connected to the bus grant inputs at all unused slots. At the slot in which a V5A is installed none of the bus grant signals should be jumpered. Most VMEbus P1 backplanes provide an easy method of jumpering the bus grant signals at each card slot position.

Interrupt Acknowledge Daisy Chain

The VMEbus has a single interrupt acknowledge daisy chain signal pair; IACKIN-/IACKOUT-. As the V5A has an on-board VMEbus interrupter, it utilizes these signals for determining that a VMEbus acknowledge cycle in progress is intended for it. Therefore, it is necessary to make sure that the IACKIN- is not connected to the IACKOUT- at the slot where the V5A is to be installed. During an interrupt acknowledge cycle, the V5A will intercept the IACKIN- signal and either respond if it has a pending interrupt at the proper level, or it will pass the signal on to the next card via the IACKOUT- signal line. The interrupt controller in non-Slot 1 applications requires the backplane to have a "wrap-around" path for IACK- to Slot 1. Most VMEbus P1 backplanes provide an easy method of setting the interrupt acknowledge daisy chain at each slot.

The Standard P2 Connector

Row *b* of the V5A P2 connector conforms to the VMEbus specification for A32/D32 operation. SBS Embedded Computers has defined the *a* and *c* rows of the P2 connector with the signals for SCSI, IDE hard disk, and ST412 floppy disk interfaces. This is perfectly acceptable and in accordance with VMEbus specifications. SBS Embedded Computers has several accessories which can adapt the row *a* and *c* signals of the P2 to standard SCSI, IDE hard disk, and ST412 floppy disk connectors. Also, SBS Embedded Computers has several disk drive modules which can directly connect to the V5A P2 via a P2-to-P2 cable. This system avoids cables in the card space of a card cage, and provides flexibility as to the placement of drives and other peripherals. The pinout of the V5A P2 connector is shown inTable 3-4.

WARNING:

The a and c rows defininitions of P2 on a V5A are not compatible with the a and c row definitions of P2 on a VME-1486. As such, the transition boards and disk drive modules available for the VME-1486 cannot be used with the V5A. Connecting a VME-1486 P2 transition board or drive module to a V5A will void your warranty and may cause possibly irreparable damage to the V5A, the peripheral, or both.

	Pin	Row a Signal	Row b Signal	Row c Signal	
	1	DB0	+5V	HDMACK-	
	2	DB1	GND	HD0	
	3	DB2	Reserved	HD1	
	4	DB3	A24	HD2	
	5	DB4	A25	HD3	
	6	DB5	A26	HD4	
	7	DB6	A27	HD5	
	8	DB7	A28	HD6	
SCSI	9	PARITY-	A29	HD7	
	10	ATN-	A30	HD8	
	11	BSY-	A31	HD9	
	12	ACK-	GND	HD10	
	13	RST-	+5V	HD11	
	14	MSG-	D16	HD12	
	15	SEL-	D17	HD13	IDE
	16	C/D-	D18	HD14	
	17	REQ-	D19	HD15	
	18	I/O-	D20	PDIAG-	
IDE	19	HDMARQ	D21	HDIOW-	
	20	FRWC-	D22	HDIOR-	
	21	FINDEX-	D23	IOCHRDY	
	22	FMT0-	GND	HDALE	
	23	FDS2-	D24	IRQ14	
	24	FDS1-	D25	IOCS16-	
	25	FMT1-	D26	HDA0	
	26	FDIRC-	D27	HDA1	
FLOPPY	27	FSTEP-	D28	HDA2	
	28	FWD-	D29	HCS0-	
	29	FWE-	D30	HCS1-	
	30	FTK0-	D31	SLVACT-	
	31	FWP-	GND	FHS-	
	32	FRD-	+5V	FDSKCHG-	FLOPPY

Table 3-4 V5A P2 Signals

Cooling Requirements

The V5A integrates a large number of high-performance components in the small space of a single-slot VME card. These components generate a lot of heat. To prevent damage to the board and to ensure reliable operation, the V5A MUST be cooled with forced air. A 100LFM fan is recommended.

Interfacing the V5A to External Devices

Several connectors are provided on-board the V5A in order to establish an electrical interconnection to external devices. The normal PC keyboard, serial, parallel and video connections are provided through the front panel where they may be easily accessed while the card is installed in a card cage. In addition, the COM-2 port has software selectable RS-422 and RS-485 signals, Thinwire Ethernet is provided through the front panel, and the standard PC/AT bus signals are provided via the two expansion interface connectors at the bottom edge of the board.

Keyboard Interface

The keyboard interface consists of four electrical connections provided on a 6-pin circular mini-DIN connector (PS/2-style). Two connections are for communication between the keyboard and the keyboard interface port. Both of these signals are CMOS compatible. Two connections provide power for the keyboard's operation. The keyboard connector with pin assignments as viewed from the front of the V5A are shown in Figure 3-1. Keyboard signal definitions are given in Table 3-5.

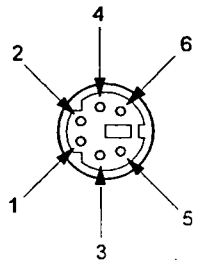


Figure 3-1 Keyboard Interface

Pin	Signal	Function
1	KBDAT	Bidirectional serial data to/from keyboard
2	NC	Not used, no connection made
3	GND	Digital Ground (0 volt) reference to keyboard
4	VCC	+5 volt power to the keyboard
5	KBCLK	Bidirectional data clock to/from keyboard
6	NC	Not used, no connection made

Table 3-5 Keyboard Interface Signals

This connector accepts any manufacturer's keyboard which is designed with a standard PC/AT interface; however, a PC/AT to PS/2 adapter is required. Such an adapter is supplied with the board. Note that many keyboard manufacturers provide keyboards which will work with either the IBM PC or PC/AT. Most of these have a switch which the user must set to match the type of computer that its used with. For the V5A, make sure that the switch is set for PC/AT operation, not for PC or PC/XT operation.

When plugging a keyboard into the V5A's keyboard connector, it is recommended that the system power be switched OFF. Plugging a keyboard into a powered-up system may cause improper initialization of the keyboard. If there is a static charge on the keyboard, it may cause damage to the V5A's keyboard controller circuitry or to the keyboard circuitry itself. If you application requires that the keyboard be plugged in while the system is powered up and running, you should take the following precautionary steps to reduce the chance of static damage to the keyboard or electronics:

1. Make sure that you are wearing a static strap which is grounded to the same ground as the VMEbus system chassis and power supply (i.e. system ground).

2. Momentarily ground the shield on the keyboard connector to the VMEbus system ground. Use 18 gauge or larger wire.

PS/2 Mouse Interface

The PS/2 mouse interface is a 6-pin circular mini-DIN connector almost identical to the keyboard interface. Two connections are for communication between the mouse and the interface port. Both of these signals are CMOS compatible. Two connections provide power for operation of the mouse. The PS/2 mouse connector has the same pin number assignments as the keyboard shown in Figure 3-1. Mouse signal definitions are given in Table 3-6.

Pin	Signal	Function
1	MSDATA	Bidirectional serial data to/from mouse
2	NC	Not used, no connection made
3	GND	Digital Ground (0 volt) reference to mouse
4	VCC	+5 volt power to the mouse
5	MSCLK	Bidirectional data clock to/from mouse
6	NC	Not used, no connection made

Table 3-6 PS/2 Mouse Interface Signals

Serial Ports

The V5A is equipped with two serial ports which are compatible with the COM-1 and COM-2 ports on a standard IBM PC. Its signals are defined for industry standard interfacing using RS-232 compatible signal levels. Because of panel space it is pinned out on a 9-pin male micro-miniature D-type connector according to the standard IBM PC pinout. COM-1 and COM-2 are stacked and are located just above the video connector. The connector pins are identified in Figure 3-2.

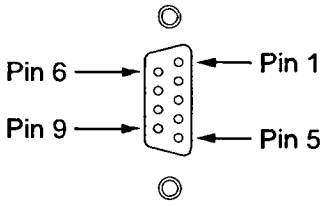


Figure 3-2 Serial Communications (COM) Port

Table 3-7 defines the signals present on the pins of the COM-1 and COM-2 port connector, their intended function and their direction.

An adapter cable to convert from the micro-miniature D to a standard 9-pin D is available from SBS Embedded Computers. The part number is CA9S24.

Pin	Signal	Direction	Function
1	DCD	To V5A	Data Carrier Detect, from modem
2	RXD	To V5A	Received Data, from modem
3	TXD	From V5A	Transmitted Data, to modem
4	DTR	From V5A	Data Terminal Ready, to modem
5	SIGND	—	Serial Interface Ground reference
6	DSR	From V5A	Data Set Ready, from modem
7	RTS	From V5A	Request To Send, to modem
8	CTS	To V5A	Clear To Send, from modem
9	RI	To V5A	Ring Indicator, from modem

Table 3-7 COM-1 and COM-2 (RS-232 Mode) Pin Assignments

Extended COM-2 Functionality

The COM-2 serial port of the V5A provides functionality beyond that of a standard PC/AT. Under software control, COM-2 can be configured for RS-422 or RS-485 operation in place of standard RS-232. RS-422 operation on the V5A is four-wire full duplex. RS-485 operation on the V5A is two-wire half duplex. Table 3-8 shows the COM-2 signals for RS-422 operation. Table 3-9 shows the COM-2 signals for RS-485 operation.

Pin	Signal	Direction	Function
1	NC	—	No connection
2	RXD-	To V5A	Receive data, negative
3	TXD-	From V5A	Transmit data, negative
4	TXD+	From V5A	Transmit data, positive
5	SIGND	—	Serial Interface Ground reference
6	RXD+	To V5A	Receive data, positive
7	NC	—	No connection
8	NC	—	No connection
9	NC	—	No connection

Table 3-8 COM-2 RS-422 Mode Pin Assignments

In RS-422 or RS-485 mode it may be necessary to provide termination at the V5A if it is at either end of a multidrop link. For RS-485 this is be done automatically by the V5A. For RS-422, terminating resistors must be installed in the external connector shield. The terminating resistors should result in a low impedance of 100 ohms or less.

Note that the DSR and CTS signals are always true which allows DOS drivers and communications software to work properly. Also, the RTS line, when true, enables the RS-422 transmitter when V5A RS-422/485 operation is enabled.

Pin	Signal	Direction	Function
1	NC	—	No connection
2	TX/RX-	From/To V5A	Transmit/receive data, negative
3	NC	—	No connection
4	NC	—	No connection
5	SIGND	—	Serial Interface Ground reference
6	TX/RX+	From/To V5A	Transmit/receive data, positive
7	NC	—	No connection
8	NC	—	No connection
9	NC	—	No connection

Table 3-9 COM-2 RS-485 Mode Pin Assignments

Parallel Port

There is a parallel port provided on the V5A and it is accessible through a front panel connector. The parallel port utilizes a 25 pin male micro-miniature D-type connector, which appears just below the keyboard port on the V5A front panel. In its normal operating mode, the port functions exactly as does a standard parallel printer port on a normal IBM PC. In this mode of operation, it will interface with printers utilizing the industry standard Centronics parallel interface. The connector pinout is shown in Figure 3-3 and the signals are defined in Table 3-10.

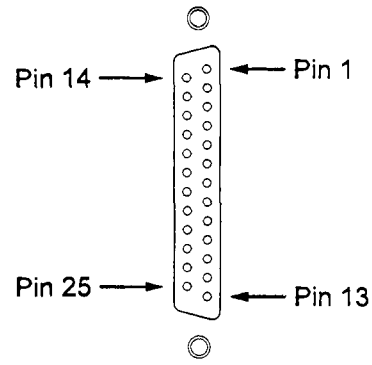


Figure 3-3 Parallel Port

A 24-inch adapter cable to convert from the micro-miniature D to a standard 25-pin D is available from SBS Embedded Computers. The part number is CA25P24. Note that the parallel printer interface is TTL level compatible, therefore limiting operation over a distance of eight feet or less.

Operation of the printer port is accomplished with routines built into the ROM BIOS supplied with the V5A. Therefore, standard MS-DOS printer functions will work with a printer attached as the "PRN" device.

Under software control, the parallel port supports the optional PS/2 type bidirectional parallel port (SPP), the Enhanced Parallel Port (EPP), and the Extended Capabilities Port (ECP) modes. Refer to the SMC FDC37C665GT manual for configuration information.

Pin	Signal	Direction	Function
1	STROBE-	Output	Data strobe
2	PD0	Output	Data bit 0
3	PD1	Output	Data bit 1
4	PD2	Output	Data bit 2
5	PD3	Output	Data bit 3
6	PD4	Output	Data bit 4
7	PD5	Output	Data bit 5
8	PD6	Output	Data bit 6
9	PD7	Output	Data bit 7
10	ACK-	Input	Data acknowledge
11	BUSY	Input	Printer busy
12	PE	Input	Printer enabled
13	SLCT	Input	Printer selected
14	AUTOFD-	Output	Automatic feed
15	ERROR-	Input	Printer error indicator
16	INIT-	Output	Initialize
17	SLCTIN-	Output	Printer select
18–25	GND	—	Signal Ground

Table 3-10 Parallel Port Pin Assignments

Video Interface

The video controller provided on-board the V5A Embedded PC is capable of supporting a variety of VGA-compatible video devices, such as VGA and SVGA CRTs. The standard 15-pin VGA connector is provided through the front panel.

Ethernet Interface

The V5A contains a high performance DEChip 21041 Ethernet controller, and comes standard with a Thinwire (10Base2) interface with a BNC connector through the front panel. It can be ordered with a Twisted Pair (10BaseT) interface with an RJ45 connector through the front panel. Table 3-11 shows the pin assignments for the RJ45, and Figure 3-4 indicates the BNC connector.

Pin	Signal
1	Transmit Data Positive
2	Transmit Data negative
3	Receive Data Positive
6	Receive Data Negative

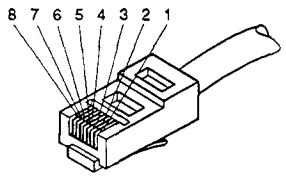


Table 3-11 Ethernet, 10BaseT, RJ45 Pin Assignments

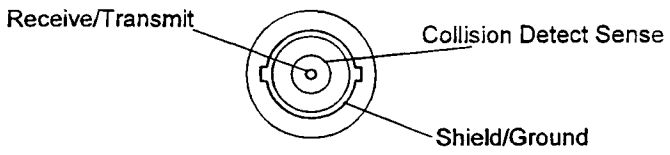


Figure 3-4 Ethernet, 10Base2 Connector

CHAPTER 4 Booting and Operation

Chapter Scope

This chapter describes the booting process of the V5A and how to use the embedded software setup features accessible during boot.

The Booting Process

When power is first applied or when the front panel RESET switch is pressed, the V5A begins executing the firmware installed in the ROM BIOS. This firmware executes a series of diagnostics which test the operation of various PC/AT hardware devices. These diagnostics are commonly referred to as POST (Power-On Self-Test).

The following is a list of error and status messages which can be generated by the BIOS during the boot process. Included is an explanation of each message.

System Error xxxx - This error will be displayed if there was a problem initializing hardware such as video, serial ports, IDE controller, and the floppy controller.

INVALID CMOS CHECKSUM! USING DEFAULTS - This error will be displayed if the BIOS has determined that the CMOS values were invalid, most likely due to a dead system battery or possibly a improper checksum written by software.

***** Extended RAM Not Found** - This error will be displayed if there was an error sizing system memory.

Error on A20 control... - This message will be displayed if a problem with the A20 line control in the keyboard controller.

Gate A20 loop fail - The message is similar to the previous one in that it indicates a problem with A20 control.

Exception Error xxx - This message will be displayed if the power-up memory test failed.

Boot Sector Signature was not the expected 55AA - This message will be displayed if there was an error reading the boot sector from the boot disk.

System Configuration Verification

During initial operation, the ROM BIOS will also try to verify that the configuration of the system hardware is actually as described in the system configuration parameters set by the Setup program. If you are booting for the first time or if you have added or changed any device on the system, you should run the Setup program described later in this chapter.

Errors Which Halt Operation

The BIOS supplied with the V5A has been specifically tailored to meet the needs of embedded applications. As such, many of the errors which would cause the BIOS to stop until a keyboard input is received have been circumvented. This was done so the a system would not require any operator input in order to completely boot. However, there are three error conditions which both warrant and require keyboard input in order to complete the booting process. These are:

- When the BIOS detects a configuration mismatch. This should not happen after the system is properly configured unless a hardware failure causes the mismatch.

- When the BIOS detects a memory error. It would be unwise to continue booting with suspect memory.

- When the BIOS detects a video error which indicates that video circuitry is not operating properly. Note that not having a video monitor attached does not cause an error.

Board Configuration & Embedded Firmware

The embedded firmware of the V5A allows you to setup the system easily, as well as perform low-level debugging. During system boot, pressing <F2> during the memory test will take you to the Embedded Setup program described below.

Embedded Setup

The Embedded Setup program is used to configure both the PC/AT and the VME settings of your V5A. To enter the Embedded Setup program, simply press the F2 key during the startup memory test.

The Embedded Setup screen will appear as shown in Figure 4-1. The screen is split into two panels. The left panel lists the types of settings available and at what general setting each group is at. The right panel shows the specific configuration options for the currently selected group. The bottom of the screen shows the commands used to navigate through the Setup program.

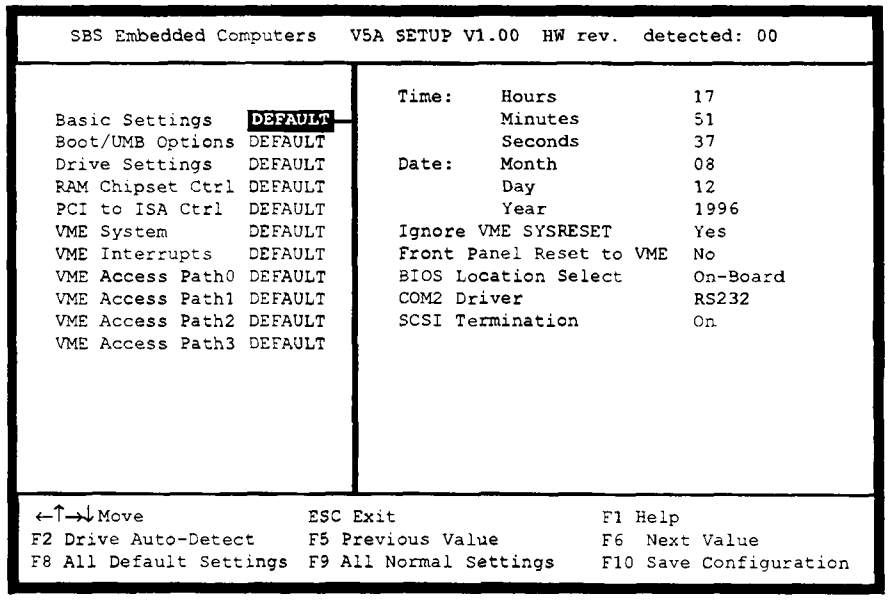


Figure 4-1 Embedded Setup

To simplify setup, each group of settings can be set to one of three states: default, normal, or advanced. If default is selected, the specific options in that group are automatically set to a safe, factory-default state. If normal is selected, the options of that group are automatically set to the appropriate values for fast, efficient operation in most applications. If the group is set to advanced, then the user can modify each individual option to suit the needs of the application.

Setup Commands

The following keys are used to operate the Setup program:

Arrow Keys	The arrow keys are used to move around the Setup screen. The up and down arrows move you through the groups and through the specific options. The right arrow moves the cursor into the specific options side of the screen if the selected group is set to Advanced. The left arrow then moves the cursor back to the groups side of the screen.
ESC	Pressing the escape key exits the Setup program. If you have made any changes, you will be asked if you want to save them before exiting. After exiting the Setup program, the board will automatically reboot.
F1	Pressing F1 will present a short help message about the selected group or option.
F2	When the Drive Settings group is selected, pressing F2 will cause Setup to attempt to auto-size any IDE disk drives attached to your V5A.
F5	The F5 key will select the previous value for a general group setting or a specific option.
F6	The F6 key will select the next value for a general group setting or a specific option.
F8	Pressing F8 will change all settings to factory defaults.
F9	Pressing F9 will change all settings to their normal state.
F10	Saves any changes you have made to the board configuration.

Using Setup

When you enter the Setup program, the cursor will be on the groups side of the screen, highlighting the setting for the first group. Using the up and down arrows will move you through the different groups. As you select different groups, the specific options for that group will show up in the right side of the screen. If you want to change the general setting for a group of options, simply use the F6 key to select the next available setting. To go back, use the F5 key.

If you need to change a specific option, first select the group which contains that option. Then use the F6 key to change the general setting of that group to Advanced. Once the group is set to Advanced, press the right arrow key to move the cursor into the options side of the screen. If you are editing specific options, the up and down arrows will move through the different options. Pressing the left arrow will return the cursor to the groups side of the screen.

For example, to change the L1 Cache Enable setting, first press the down arrow key to select the Boot/UMB Options group. Press the <F6> key until the group setting is Advanced. Then press the right arrow key to move the cursor to the specific options side of the screen. Press the down arrow key until the cursor reaches the setting for L1 Cache Enable. Press the <F6> key until the desired value is shown. Then press the left arrow key to return the cursor to the groups side of the screen.

NOTE: For some groups, the specific settings for Normal are the same as those for Default. For these groups, Default will be displayed in Setup even if you changed the group to Normal previously. Since Default and Normal are the same for these groups, none of the options have changed.

First-Time Setup

From the factory, the V5A is configured for all default settings. Although this is the safest configuration for first-time operation, it is rather conservative for best performance in most applications. You should configure you board for the first time by entering Setup and pressing <F9> to select all Normal settings. These settings are the best starting point for optimum performance and compatibility. Then as needed you can change specific settings to suit the needs of your application.

If you have an IDE drive attached to your V5A, you should select the Drive Settings group and press <F2> to auto-size the drive. Some drives may not auto-size properly. In such cases, the parameters of your drive will have to be keyed in manually by changing the Drive Settings group to Advanced and then editing the specific options.

Setup Options

The following paragraphs give a description of each group and each specific option available in Setup.

Basic Settings

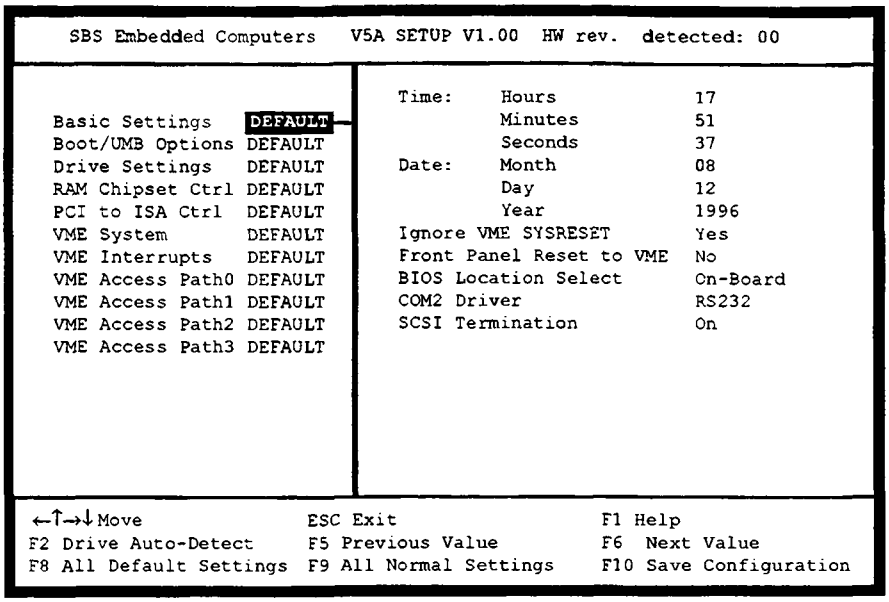


Figure 4-2 Basic Settings Screen

Time
This setting is the time of day in the real time clock. Simply enter the hours, minutes, and seconds in 24 hour format.

Date
This setting is the date in the real time clock. Simply enter the month, day, and year.

Ignore VME SYSRESET
This setting, when enabled, causes the V5A to ignore SYSRESET signals from the VMEbus. This can be useful in a development environment where you may want to reset the other boards in a VME system without resetting the V5A.

Front Panel Reset to VME
This setting enables and disables the ability of the front panel reset switch to cause a VME SYSRESET.

BIOS Location Select
This setting chooses whether the System BIOS is in the onboard Flash part or in the BIOS socket.

COM2 Driver

This setting determines the driver type for the COM2 serial port. RS-232 or RS-485 operation can be selected.

SCSI Termination

This setting enables or disables the onboard SCSI terminators.

Boot/UMB Options

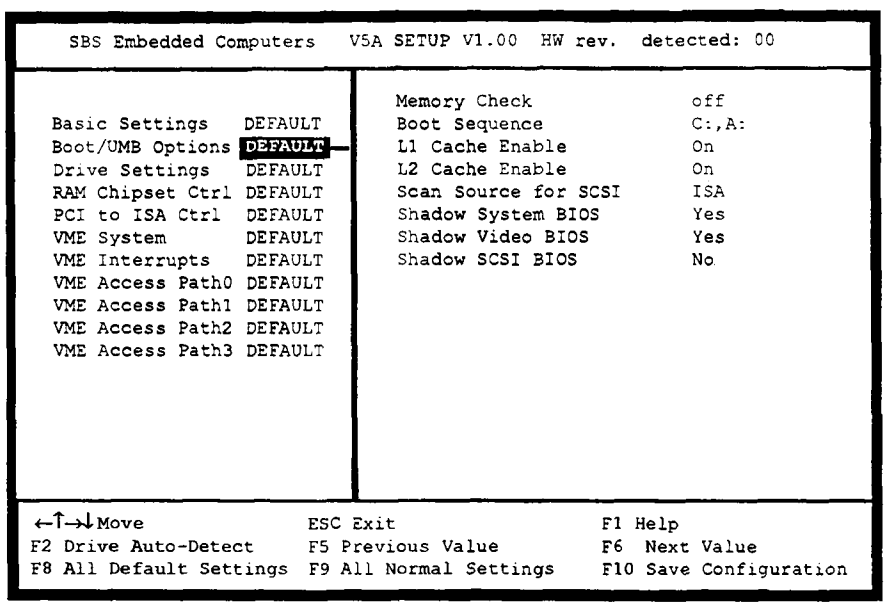


Figure 4-3 Boot/UMB Options Screen

Memory Check

This setting determines whether the BIOS does a memory check during boot.

Boot Sequence

This setting determines the order in which the BIOS searches for a bootable operating system. The options are A:;C: or C:;A:.

L1 Cache Enable

This setting enables or disables level one cache in the processor. L1 Cache is necessary for peak performance, but may not be compatible with old software.

L2 Cache Enable

This setting enables or disables level two cache. L2 cache is necessary for peak performance, but may not be compatible with old software. It is recommended that L2 cache be disabled when installing software, especially operating systems.

Flash Boot Enable
This option enables the Flash Boot capability of the V5A. This capability is used with the flash accessory products available for the V5A. For more information on flash accessories for the V5A, contact SBS Embedded Computers Sales.

DiskOnChip Mode Enable
This option enables the DiskOnChip accessory product. For more information on the DiskOnChip, contact SBS Embedded Computers Sales. **WARNING: *Do not enable this option without a DiskOnChip installed.*** Doing so may cause the board to stop operating, requiring Technical Support assistance to remedy.

Scan Source for C800:0
This setting determines where the System BIOS will scan for a SCSI BIOS or other ROMSCAN device that normally resides at the C800 segment.

Shadow System BIOS
Toggles whether the System BIOS is resident in RAM(shadow) or ROM

Shadow Video BIOS
Toggles whether the Video BIOS is resident in RAM(shadow) or ROM

Shadow SCSI BIOS
Toggles whether the SCSI BIOS is resident in RAM(shadow) or ROM

Drive Settings

Drive 0 & Drive 1 Parameters

```
SBS Embedded Computers   V5A SETUP V1.00  HW rev.  detected: 00

Basic Settings    DEFAULT        Drive 0 Cylinders          0988
Boot/UMB Options  DEFAULT        Drive 0 Heads              16
Drive Settings    DEFAULT        Drive 0 Sectors/Track      52
RAM Chipset Ctrl  DEFAULT        Drive 1 Cylinders          0000
PCI to ISA Ctrl   DEFAULT        Drive 1 Heads              00
VME System        DEFAULT        Drive 1 Sectors/Track      00
VME Interrupts    DEFAULT        IDE Enable                 Yes
VME Access Path0  DEFAULT        Floppy Enable              Yes
VME Access Path1  DEFAULT        Enable 2nd Floppy          No
VME Access Path2  DEFAULT
VME Access Path3  DEFAULT

←↑→↓Move              ESC Exit                F1 Help
F2 Drive Auto-Detect  F5 Previous Value       F6  Next Value
F8 All Default Settings  F9 All Normal Settings  F10 Save Configuration
```

Figure 4-4 Drive Settings Screen

These parameters should be set to match the parameters given by the drive manufacturer. Pressing <F2> will cause the BIOS to auto-size any IDE drives attached to your V5A. Some drives may not auto-size properly. In such cases, the parameters of your drive will have to be keyed in manually by changing the Drive Settings group to Advanced and then editing the specific options.

IDE Enable
This setting enables or disables the onboard IDE controller.

Force IDE PIO Mode 0
Enabling this setting will force the IDE controller into its safest, slowest mode. Enable this only when an IDE drive is not responding properly or when an IDE CDROM drive is attached to the primary IDE controller.

Floppy Enable
This setting enables or disables the onboard Floppy controller.

Enable 2nd Floppy
This setting enables or disables a second floppy disk drive.

RAM Chipset Ctrl.

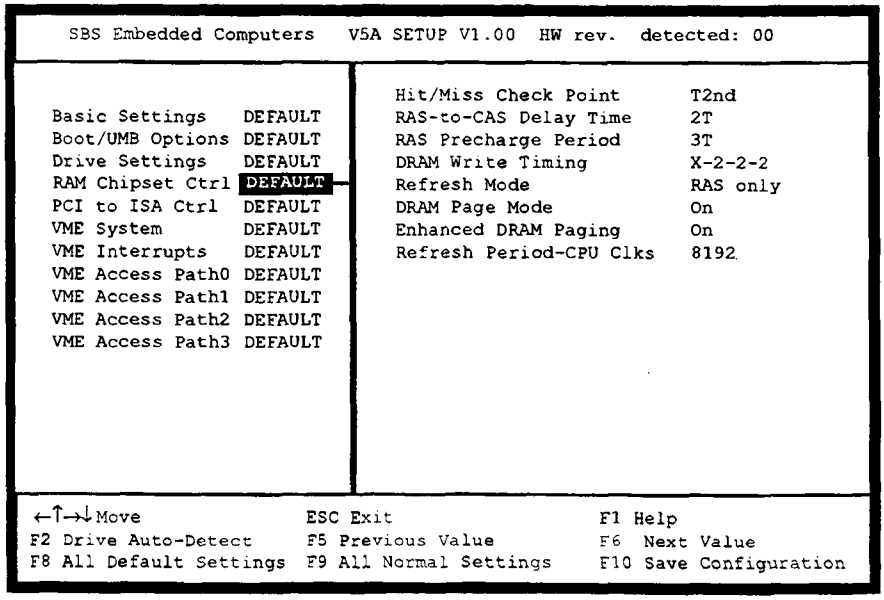


Figure 4-5 RAM Chipset Ctrl.

This screen allows Chipset RAM timing and other parameters to be changed. These settings should not be changed without full understanding of the chipset operation.

PCI to ISA Ctrl.

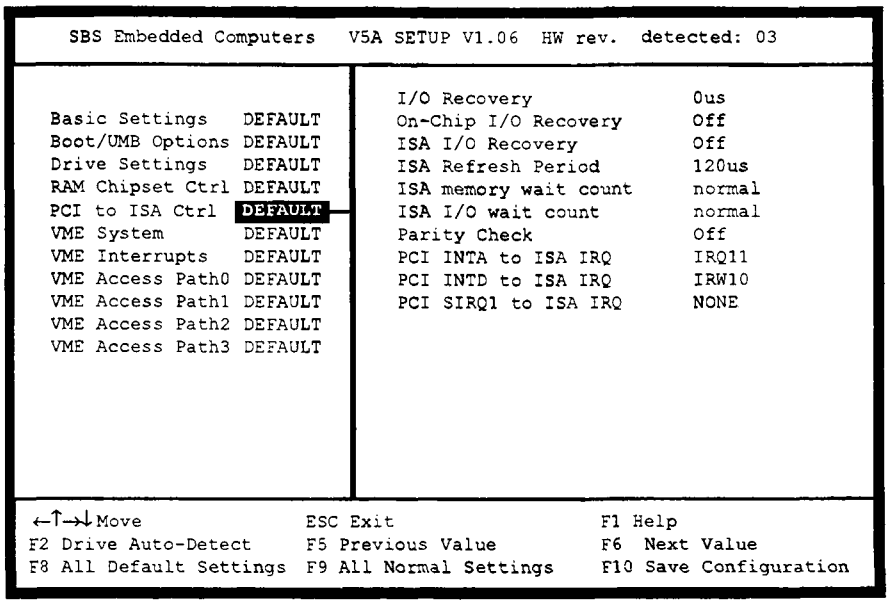


Figure 4-6 PCI to ISA Ctrl.

This screen allows you to change various PCI and ISA settings. These settings should generally be left as 'default'.

VME System

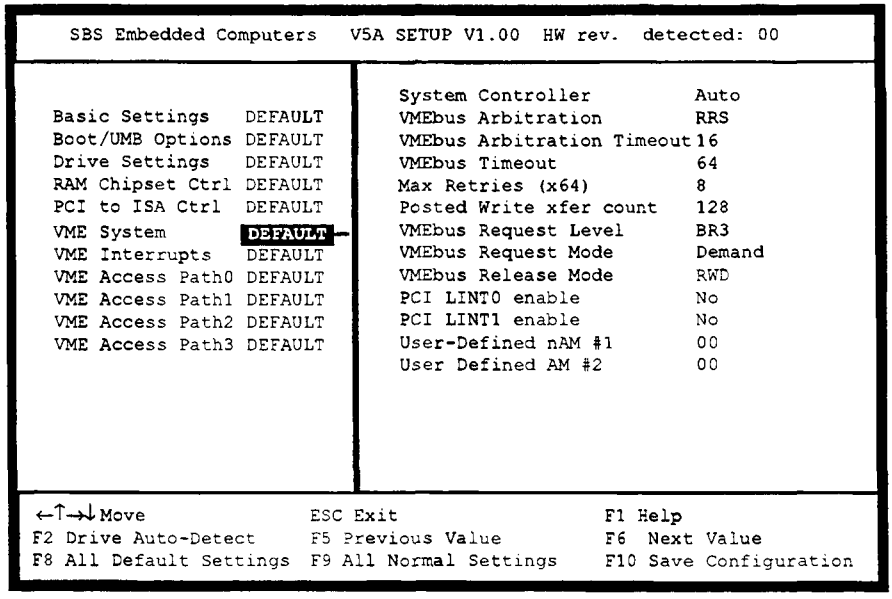


Figure 4-7 VME System Screen

System Controller

This setting turns on or turns off the system controller which controls Arbitration and VME Bus Time-out.

Arbitration
This selection is valid only when the board is a system controller. Choices are PRI(priority), RRS (round-robin-select). Note that PRI and bus request level 3, BR(3) provides SGL (single Level arbitration).

Arbitration Timeout
This setting is the amount of time (in microseconds) allowed to pass between the start of VMEbus arbitration and the generation of a timeout.

VME Bus Time-out
This setting is valid only when the board is a system controller. It times the VMEbus data transfer cycles to provide a means to terminate cycles that take too long. Settings are: 4, 16, 32, 64, 128, 256, 512, and INF (infinite); the units of time are microseconds.

Max Retries
This is the maximum number of retries before the PCI master interface signals an error condition.

Posted Write Xfer Count
This setting determines the transfer count at which the PCI Slave Channel Posted Writes FIFO gives up the VME Master Interface.

VMEbus Request Level
This option sets the priority level of requests to obtain the VMEbus from the arbiter.

VMEbus Request Mode
This setting controls how requests are handled for the VMEbus.

VMEbus Release Mode
This setting controls which method will be used to release the VMEbus.

VME Interrupts

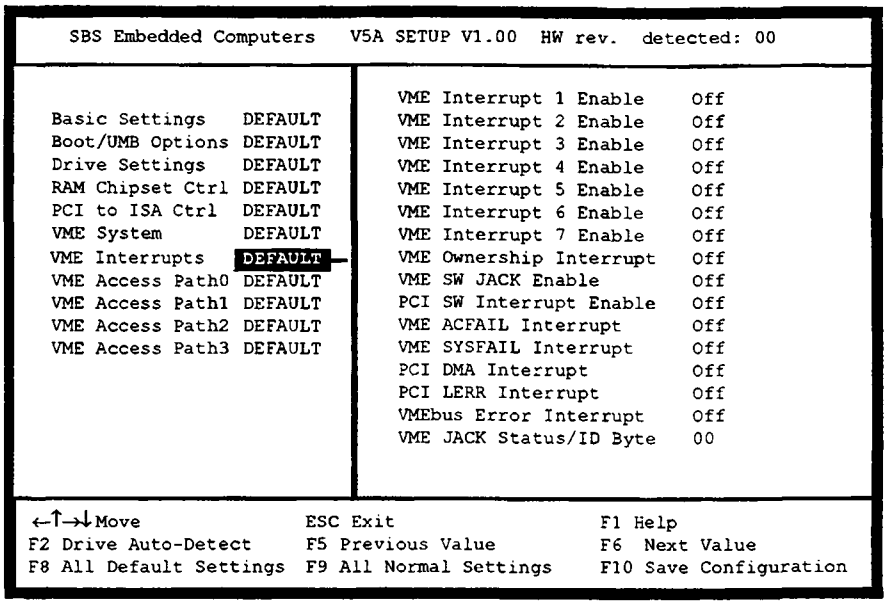


Figure 4-8 VME Interrupts Screen

This screen simply enables and disables various VME-related interrupts.

VME Access PathX

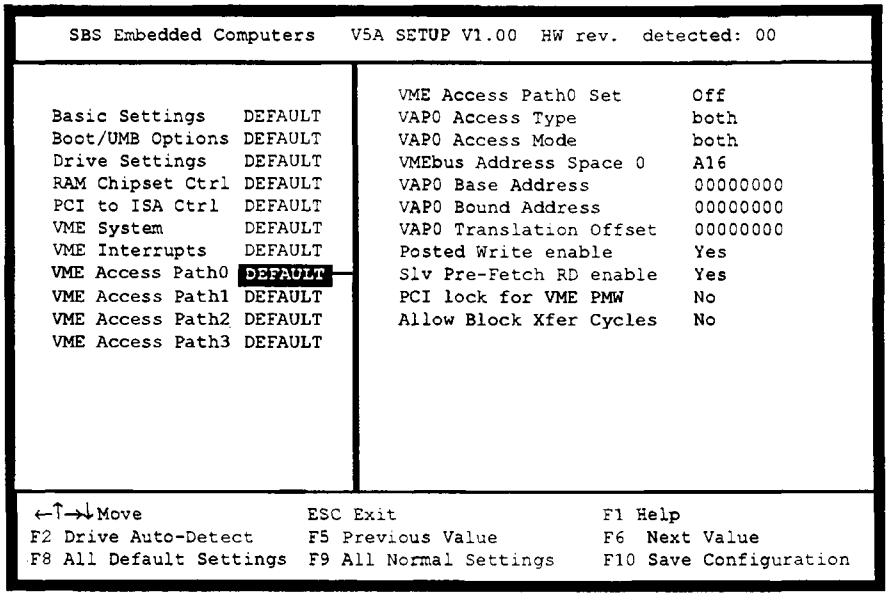


Figure 4-9 VME Access Path Screen

These screens allow the settings for a particular VME access path to be changed. There are four screens, one for each path.

VME Access Path X set

This setting selects whether a particular path is setup as a slave path, a master path, or is disabled (off).

VAPX Access Type
This setting determines the VME access type of the access path, either program or data.

VAPX Access Mode
This setting determines the VME access mode of the access path, either supervisory or user.

VMEbus Address Space X
This setting determines the VME address space where the access path will reside, either A16, A24, or A32.

VAPX Base Address
If the access path is setup as a slave, this setting is the VME base (lower) address of the access path. If the access path is setup as a master, this setting is the PCI base (lower) address of the access path.

VAPX Bound Address
If the access path is setup as a slave, this setting is the VME bound (upper) address of the access path. If the access path is setup as a master, this setting is the PCI bound (upper) address of the access path.

VAPX Translation Offset
If the access path is setup as a slave, this setting determines the address offset for mapping the slave image VME space to PCI address space. If the access path is setup as a master, this setting determines the address offset for mapping PCI address space to VME address space.

Posted Write Enable
This setting enables or disables posted writes.

Slv Pre-Fetch RD enable
This setting is only valid when the access path is setup as a slave and enables or disables slave prefetch reads.

PCI lock for VME RMW
This setting enables or disables the PCI bus lock of VMEbus Read-Modify-Write operations.

Allow Block Xfer Cycles
This setting is only valid when the access path is setup as a master and enables or disables block transfer cycles.

Software Installation Tip

When installing software, especially operating systems, it is recommended that you disable the board's level two cache to prevent complications during the installation process. For more information on disabling L2 cache using the Embedded Setup program, refer to the Embedded Setup section earlier in this chapter.

Hard Disk System Setup

For an IDE hard disk, the hard disk parameters must be set in the Setup program. The BIOS can auto-size an IDE drive, or you can enter the parameters manually. If you are using a VME-6200 drive module, refer to the specifications sheet which came with your disk module for the parameters of your particular drive.

Operating System Setup

Beyond Setup parameters, hard disk setup varies with the operating system chosen for your application. Generally, the procedures will be documented in the user's guide which came with your operating system, which is the case for MS-DOS. For MS-DOS, the section most pertinent to hard disk setup would be the section covering the FDISK command. The FDISK program sets up valid partitions on the disk. Note that MS-DOS version 5.0 and higher automatically provides these functions.

To install and setup an operating system such as MS-DOS, Microsoft Windows, Windows NT, or QNX, please refer to the documentation which came with the operating system.

CHAPTER 5 Board Resources

Chapter Scope

This chapter describes the software- and hardware-configurable options of the V5A, as well as interrupts, DMA channels, and non-AT registers.

V5A Options

Processor Type & Speed

The V5A is designed to accommodate several Pentium processors at a variety of speeds. It can operate with a 133MHz, 166MHz and 200MHz Pentium.

DRAM Size

The V5A can accommodate varying sizes of several different memory technologies through the use of QM modules. The QM modules are available in 32, 64, 128 and 256 megabyte capacities. The technologies available are Fast Page and EDO (extended data out). ECC(Error Checking and Correction)/Parity is only available with Fast Page in the 32Mb and 64Mb QM modules.

Video RAM

The V5A comes standard with two megabytes of video memory. Table 5-1 shows the colors available at each standard resolution.

On the front panel of the V5A there are six LEDs which provide important information regarding the status of the board. These LEDs are, from top to bottom:

Resolution	Colors
640×480	16.7 Million
800×600	16.7 Million
1024×768	65 Thousand
1280×1024	256

Table 5-1 Simultaneous Colors Available at Standard Resolutions

Front Panel LEDs

SCON This LED is illuminated when the V5A is configured as the System Controller in a VMEbus system. This is an important indicator in that it allows you to more easily verify that you have only one System Controller on the VMEbus.

RUN This LED indicates that the processor is active. Though this LED may flicker as other devices occupy the local bus, an extended outage could indicate that the board is locked up.

ENET This LED indicates Ethernet network activity. Note that it is not limited to packets intended for or sent from the V5A. Rather, it indicates any network packets, regardless of source or destination.

VMA This LED is illuminated when the V5A is performing a master access to the VMEbus.

VSA This LED is illuminated when the V5A is being accessed as a slave from the VMEbus.

SYS This LED is user-defined and under user software control through the User Register (see User Register in the *V5A Programmer's Manual*)

Ethernet Status LEDs

To further aid in network debugging and monitoring, the V5A has three LEDs associated with the Ethernet interface, other than the ENET LED on the front panel. These LEDs are located on the back of the board, near the bottom edge. Labeled LED501, LED502, and LED503, they indicate network activity more specific than that indicated by the front panel ENET LED. Their function is as follows:

LED501, Transmit This LED indicates when the V5A is transmitting an Ethernet packet.

LED502, Receive This LED indicates when the V5A is receiving an Ethernet packet whose destination is the V5A.

LED503, Collision This LED indicates when an Ethernet packet collision has occurred. Collisions occur when two Ethernet nodes attempt to transmit at the same time. Normally, both nodes will stop transmitting, delay for a random period of time, and retry. Occasional collisions are normal and unavoidable. Excessive collisions, however, can be an indication of network cabling or impedance problems.

PC Interrupts

The seventeen PC interrupts (including NMI) are allocated as shown in Table 5-2. Note that these are the default allocations, some can be changed. The PCI Interrupt is selectable between IRQ5, IRQ10, IRQ11, and IRQ15. IRQ11 is the default.

Interrupt	Interrupt Number	Description/Use
NMI	N/A	Parity Error
IRQ0	8	Timer
IRQ1	9	Keyboard
IRQ2	A	Chain to Interrupts 8–15
IRQ3	B	COM2
IRQ4	C	COM1
IRQ5	D	Available; Selectable as PCI Interrupt**
IRQ6	E	Floppy Disk*
IRQ7	F	LPT1
IRQ8	70	Real Time Clock
IRQ9	71	Re-Directed to IRQ2
IRQ10	72	Default PCI Interrupt D (Ethernet)**
IRQ11	73	Default PCI Interrupt A (SCSI)**
IRQ12	74	Bus Mouse
IRQ13	75	Coprocessor
IRQ14	76	IDE Hard Disk*
IRQ15	77	Available; Selectable as PCI Interrupt**

Table 5-2 PC Interrupt Allocation

* These devices can be disabled to free the occupied interrupt.

** The PCI Interrupt is configurable as PC interrupt IRQ5, IRQ10, IRQ11, or IRQ15. IRQ11 is the default setting for INTA and IRQ10 is the default for INTD. Any of these PC interrupts to which the PCI Interrupt is not assigned can be considered available for other uses.

DMA Channels

The eight PC DMA channels are allocated as shown in Table 5-4. These are the default allocations, some can be changed. With all onboard devices enabled, six DMA channels are available for use by peripheral cards. Disabling the Floppy Disk will free DMA channel 2.

DMA Channel	Description/Use
0	Memory Refresh
1	Unassigned, Available
2	Floppy Disk*
3	Unassigned, Available
4	Unassigned, Available
5	Unassigned, Available
6	Unassigned, Available
7	Unassigned, Available

Table 5-4 DMA Channel Allocation

* These devices can be disabled to free the occupied DMA channel.

V5A Registers

The V5A has several non-AT registers such as the Reset Control Register and the Serial EEPROM/Switch Register which allow complete control of the hardware by software. These registers are fully documented in the *V5A Programmer's Manual.*

V5A Memory Map

The memory space of the V5A is presented in Figure 5-3. The I/O space of the V5A is presented in Figure 5-4.

Be aware that the Local DRAM entries are dependent on the amount of DRAM installed. Also, some devices such as Floppy can be disabled, freeing space in the I/O map.

V5A Block Diagram

A functional block diagram of the V5A is presented in Figure 5-5.

Physical Address	
FFFFFFFF 0B200000	Unused/Aliased
0B1FFFFF 0A200000	VME Access Region 4* (16M)
0A1FFFFF 09200000	VME Access Region 3* (16M)
091FFFFF 08200000	VME Access Region 2* (16M)
081FFFFF 08000000	Linear Video RAM (2M)
07FFFFFF 00100000	Local DRAM (up to 128M)
000FFFFF 000F0000	System ROM (64K)
000EFFFF 000E0000	VME Access Region 1* (64K)
000DFFFF 000D0000	Universe Registers (64K)
000CFFFF 000C8000	SCSI BIOS (32K)
000C7FFF 000C0000	Video ROM (32K)
000BFFFF 000A0000	Video RAM (128K)
0009FFFF 00000000	Local DRAM (640K)

Figure 5-3 V5A Memory Map

I/O Address	
03FF 03F8	Serial Port 1
03F7 03F0	Floppy Disk
03EF 03C0	Video
03BE 03BC	Parallel Port 1
031F 0300	Ethernet
02FF 02F8	Serial Port 2
2A3	EEPROM/Serial Switch Register
2A2	User Register
2A1	BIOS Control Register
2A0	Reset Control Register
01F7 01F0	IDE

Figure 5-4 V5A I/O Map

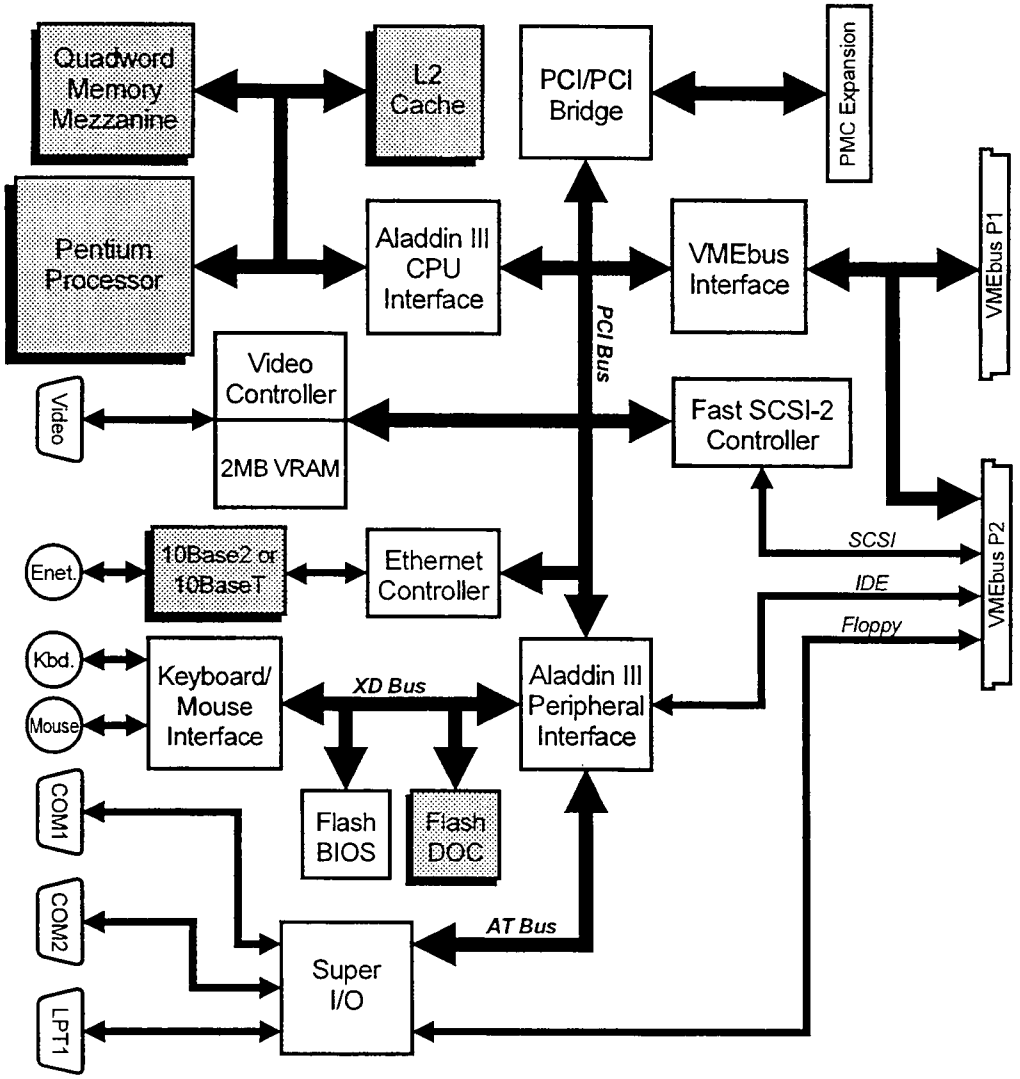


Figure 5-5 V5A Block Diagram

CHAPTER 6 Features & Specifications

Introduction to the V5A Embedded PC

The V5A is a highly integrated single-slot VMEbus computer based on the Intel Pentium family of microprocessors. It combines the proven expansion capability of the VMEbus with the application flexibility and software support of the IBM PC/AT architecture. The V5A is suitable for a variety of embedded applications requiring high processor performance. Its on-board Ethernet controller and thin-wire or twisted-pair Ethernet connection make it particularly suitable to network-based applications in distributed control systems. The V5A maintains full compliance with both IBM PC/AT platforms and VME64 VMEbus requirements.

V5A Applications

The V5A has an impressive set of features which make it the ideal solution for many embedded applications. The following paragraphs describe some general applications to which the V5A is well suited.

Operator Interface

One of the most complex and involved programming tasks concerns interfacing a computer system to a human in an efficient and intuitive manner. In machine control, for example, it is often desirable to use static or animated graphics displays for visual indication of the machine's status. Programming the operator interface can often be more involved and time-consuming than writing the machine control software. The V5A can solve these problems by allowing the use of commonly available PC applications for graphic display and graphical user interface, many of which do not require programming. A major advantage of the V5A is that it can offload the real-time processor from the burden of operator interface. SBS Embedded Computers is familiar with many user interface programs which allow the V5A to be an extremely effective operator interface with minimum effort.

Factory Automation

There are many suppliers of sophisticated programs for factory automation which run on the PC platform. Their relatively low cost and high performance are achieved through the large market that the PC/AT represents. Obviously, a major disadvantage of a common PC/AT is its unsuitability to the harsh environments of the factory floor. The V5A solves this problem with industrial-grade Eurocard packaging and rugged industrial design. Additionally, the V5A's factory processor and memory options allow it to be tailored to the performance requirements of the application.

Data Acquisition

Many VMEbus systems are implemented for high speed data acquisition because of the high aggregate bus bandwidth. The V5A can prove very useful in these systems by providing the data reduction and graphic display functions of acquisition applications. Off-the-shelf packages such as Labtech's Notebook and Acquire, and Lotus Development's Measure perform complex functions such as curve fitting, FFT, trending, alarms, and graphical presentation. The V5A can receive data at high speed through its versatile VMEbus interface and subsequently store the data where it can be utilized by one of these packages. In addition, since the V5A has a Master/Slave interface, it can directly access VMEbus-resident memory and I/O devices. SBS Embedded Computers has developed drivers for some of the most popular packages and can assist you with your specific application.

Software Development

The IBM-compatible PC/AT has become the defacto standard platform for software development. Over the last several years, most companies specializing in development tools have introduced products which run on a PC. These tools include high level language compilers, cross compilers, debuggers, analyzers, microprocessor emulators, and simulators. These developments have virtually eliminated the requirement for a dedicated development system for a particular family of microprocessors. The software engineer can now work in a more consistent environment, utilizing familiar tools, regardless of the processor or language utilized. The V5A has several features which enhance its use as a standard platform for embedded software development for VMEbus systems. These features include software controlled board configuration, programmable slave address decoding, selectable reset mode and VMEbus access monitoring capability.

Real-time Control

Since the V5A is fully PC/AT compatible, it supports a variety of general purpose operating system environments such as Microsoft's MS-DOS, Windows, and Windows NT. In addition, many real-time operating systems have been developed which utilize the IBM PC/AT hardware platform. While these operating systems will boot and run without modification on the V5A, many of the advanced features of the board will not be directly supported.

Since the V5A utilizes the Intel Pentium, it is very well suited to the processing demands of real-time environments. The VMEbus interface was specifically designed to support high performance access to bus-resident resources in a multi-tasking system. Specific design attention was given to data path control, high performance data transfer and interrupt handling—all requirements of real-time applications.

Specifications

General	
Model	V5A
Description	Pentium-Based PC/AT Compatible VMEbus Single Board Computer
Hardware Compatibility	VMEbus Dual Eurocard, VME64 ANSI/VITA 1-1994
VMEbus	
Configuration	DTB Master, Option A64/A32/A24/A16, D32/D16/D08(EO), RMW DTB Slave, Option A64/A32/A24/A16, D32/D16/D08(EO), RMW
Interrupter	Programmable, 1-of-7
Interrupt Handler	Programmable, IH(1-7)
Requester	Programmable, BR(3,2,1,0), Option ROR and RWD
Arbiter	RRS, PRI, SGL
Block Mode Transfer	Master/Slave BLT and MBLT D64/D32/D16
PCI Bus	
System Clock Rate	25, 30, or 33MHz
Serial Interfaces	
Number	2
Compatibility	IBM PC
Interface Type	COM1: RS-232; COM2: RS-232/422/485
Signals Provided	RxD, TxD, RTS, CTS, DSR, DTR, DCD, RI
Connector	Micro-Miniature DB9P
Parallel Interface	
Compatibility	Centronics Parallel, PS/2 Bidirectional
Interface	Buffered Parallel
Connector	Micro-Miniature DB25S
Mouse Interface	
Compatibility	Microsoft Mouse
Connector	6-pin Circular Mini-DIN (PS/2 Style)
Keyboard Interface	
Compatibility	IBM PC/AT
Connector	6-pin Circular Mini-DIN (PS/2 Style)
Video Interface	
Compatibility	VGA/SVGA
Capability	1280×1024×256 colors, 800×600×16.7M colors
Displays Supported	Color CRT
Connector	HD15S
Video Memory	2 Megabytes of High Speed VRAM
Disk Drive Interfaces	
Floppy Disk	ST412 Interface, WD37C65 Controller, Provided Through P2
Hard Disk	IDE Interface Provided Through P2 SCSI-2 Interface Provided Through P2
Ethernet Interface	
Type	IEEE 802.3 10Base2 (Thinwire), Provided Through Front Panel BNC Optional 10BaseT (Twisted-Pair), Provided Through Front Panel RJ45
Electrical Specifications	
Power Requirements	+5VDC @ 5–10A (memory & CPU dependent) +12VDC @ 200mA (maximum) -12VDC @ 100mA (maximum)
Physical Specifications	
Size	160mm × 233mm (Dual Eurocard), 6U×4HP
Construction	Multi-Layer Printed Circuit, 10 Layers

Environmental Specifications

Temperature	0 to 55° Celsius Inlet Air, Operating
	-40 to 85° Celsius, Non-Operating
Cooling	Forced Air, 100CFM Fan Recommended
Humidity	10 to 90% Relative Humidity, Non-Condensing
Shock	6G Max. Operating, 10G Max. Non-Operating

CHAPTER 7

Support, Service, and Warranty

Chapter Scope

The following sections describe SBS Embedded Computers product support program. It states our product warranty terms and provides details about what action to take if you experience a problem with the product.

Warranty Statement

SBS Embedded Computers VMEbus products come with a "return-to-factory" warranty which covers defects in materials and workmanship for a period of two years from the date of product shipment to the customer (original purchaser), provided the product is unmodified and has been subject to normal and proper use. This warranty applies to all standard board-level products which do not incorporate disk drives. Products which incorporate floppy or hard disk drives are also warranted for two years with the exception of the drives themselves. The drives will be warranted for a period of ninety days, as is the normal period for electromechanical components. SBS Embedded Computers makes no warranty or representation, express or implied, with respect to software, its performance, quality, or fitness for a particular purpose. This does not include the media on which the software is distributed, which carries a warranty covering defects in materials and workmanship for a period of ninety days.

If You Have a Problem with an SBS Product

Free technical support is available by phone, fax or email. Telephone suppport is available during the following Eastern Time hours:

Monday through Friday 8:30 am - 5:30 pm.

You can reach technical support at (919) 851-1101 voice, (919) 851-2844 fax or email at support@ldg.com.

Product Repairs

To expedite assistance for problems, be able to provide the following:

- Your Name, Phone and Company.
- Product with which you are having trouble.
- Serial Number and Revision. (located on the P2 Connector)
- Operating system you are running.
- Detailed description of your problem and any error messages that have appeared on the screen.

Depending on the circumstances of the problem, it may be deemed necessary to return the product to SBS Embedded Computers for repair. In order to return the product for repair, the following steps are necessary:

1. Obtain a Return Material Authorization number (RMA#) from SBS Customer Support.

2. Ship the product prepaid to the designated repair point.

3. Provide a written description of the claimed defect with the product.

Obtaining an RMA Number

To obtain a product return authorization number (RMA#), you should call our Customer Service department through our main number.

Shipping the Product

Any product returned to SBS should be in its original shipping carton if possible. Otherwise the product should be carefully packaged in a conductive packing material and placed in a cushioned corrugated carton suitable for shipping. Please mark the shipping label with the RMA number and return it to:

Customer Service Department
Att: RMA# *(put RMA number here)*
SBS Embedded Computers, Inc.
6301 Chapel Hill Road
Raleigh, NC 27607

Providing a Product Defect Report

When you are returning a product for repair, it is very important to include a written report which details the nature of the problem in order to expedite the repair. Please make sure that the following information is included:

- RMA Number
- Product:
- Serial Number
- Contact:
- Phone
- Description of the Problem/Defect

Warranty Repairs

Any product returned and found to be under warranty will be repaired or replaced at the discretion of SBS within two working days of receipt and shipped freight prepaid to the Customer.

Non-Warranty Repairs

If a product is found not to be under warranty, we will notify you of the non-warranty situation and provide you with a fixed cost and a schedule for the repair. Non-warranty repairs generally require that a purchase order be issued to SBS Embedded Computers Inc. for the amount of the repair before repairs are undertaken.



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