XE–900 Single Board Computer

Reference manual

Manual part #6587, rev. D06

CONTACT INFORMATION
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Technical Support

Carefully recheck your system before calling Technical Support. Run as many tests as possible; the more information you can provide, the easier it will be for Technical Support staff to help you solve the problem. For additional technical assistance, try the following:

Technical Support telephone: 303–426–4521
E-mail Technical Support: fasthelp@octagonsystems.com
Applications Notes (via web): www.octagonsystems.com

Revision History

Revision	Reason for Change	Date
A05	Initial Production Release	02 / 05
B05	Updated connection table, clarified PC/104-*Plus* table	06 / 05
C05	Added Integrated Conductive Cooling System, updated SDRAM support to 512 MB, clarified IDE	11 / 05
D06	Corrected transposed COM5 and COM6 in Table A-3, updated to remove reference to CD	07 / 06

IMPORTANT!

Please read the following section before installing your product:

Octagon's products are designed to be high in performance while consuming very little power. In order to maintain this advantage, CMOS circuitry is used.

CMOS chips have specific needs and some special requirements that the user must be aware of. Read the following to help avoid damage to your card from the use of CMOS chips.

Using CMOS circuitry in industrial control

Industrial computers originally used LSTTL circuits. Because many PC components are used in laptop computers, IC manufacturers are exclusively using CMOS technology. Both TTL and CMOS have failure mechanisms, but they are different. Described below are some of the failures that are common to all manufacturers of CMOS equipment.

The most common failures on CPU control cards are over voltage of the power supply, static discharge, and damage to the serial and parallel ports. On expansion cards, the most common failures are static discharge, over voltage of inputs, over current of outputs, and misuse of the CMOS circuitry with regards to power supply sequencing. In the case of the video cards, the most common failure is to miswire the card to the flat panel display. Miswiring can damage both the card and an expensive display.

- **Multiple component failures:** The chance of a random component failure is very rare since the average MTBF of an Octagon card is greater than 11 years. In a 7 year study, Octagon has never found a single case where multiple IC failures were not caused by misuse or accident. It is very probable that multiple component failures indicate that they were user-induced.

- **Testing "dead" cards:** For a card that is "completely nonfunctional", there is a simple test to determine accidental over voltage, reverse voltage or other "forced" current situations. Unplug the card from the bus and remove all cables. Using an ordinary digital ohmmeter on the 2,000 ohm scale, measure the resistance between power and ground. Record this number. Reverse the ohmmeter leads and measure the resistance again. If the ratio of the resistances is 2:1 or greater, fault conditions most likely have occurred. A common cause is miswiring the power supply.

- **Improper power causes catastrophic failure:** If a card has had reverse polarity or high voltage applied, replacing a failed component is not an adequate fix. Other components probably have been partially damaged or a failure mechanism has been induced. Therefore, a failure will probably occur in the future. For such cards, Octagon highly recommends that these cards be replaced.

- **Other over-voltage symptoms:** In over-voltage situations, the programmable logic devices, EPROMs and CPU chips, usually fail in this order.

The failed device may be hot to the touch. It is usually the case that only one IC will be overheated at a time.

- **Power sequencing:** The major failure of I/O chips is caused by the external application of input voltage while the power is off. If you apply 5V to the input of a TTL chip with the power off, nothing will happen. Applying a 5V input to a CMOS card will cause the current to flow through the input and out the 5V power pin. This current attempts to power up the card. Most inputs are rated at 25 mA maximum. When this is exceeded, the chip may be damaged.

- **Failure on power-up:** Even when there is not enough current to destroy an input described above, the chip may be destroyed when the power to the card is applied. This is due to the fact that the input current biases the IC so that it acts as a forward biased diode on power-up. This type of failure is typical on serial interface chips but can apply to any IC on the card.

- **Under-rated power supply:** The board may fail to boot due to an under-rated power supply. It is important that a quality power supply be used with the XE–900 SBC that has sufficient current capacity, line and load regulation, hold up time, current limiting, and minimum ripple. The power supply for the XE–900 must meet the startup risetime requirements specified in the ATX Power Design Guide, version 1.1, section 3.3.5. This assures that all the circuitry on the CPU control card sequences properly and avoids system lockup.

- **Excessive signal lead lengths:** Another source of failure that was identified years ago at Octagon was excessive lead lengths on digital inputs. Long leads act as an antenna to pick up noise. They can also act as unterminated transmission lines. When 5V is switched onto a line, it creates a transient waveform. Octagon has seen sub-microsecond pulses of 8V or more. The solution is to place a capacitor, for example 0.1 µF, across the switch contact. This will also eliminate radio frequency and other high frequency pickup.

Avoiding damage to the heatsink or CPU

WARNING!

When handling any Octagon Single Board Computer, extreme care must be taken not to strike the heatsink (if installed) against another object, such as a table edge. Also, be careful not to drop the Single Board Computer, since this may cause damage to the heatsink or CPU as well.

Note Any physical damage to the single board computer card is not covered under warranty.

Excessive Thermal Stress

This card is guaranteed to operate over the published temperature ranges and relevant conditions. However, sustained operation near the maximum temperature specification is not recommended by Octagon or the CPU chip manufacturer due to well known, thermal related, failure mechanisms. These failure mechanisms, common to all silicon devices, can reduce the MTBF of the cards. Extended operation at the lower limits of the temperature ranges has no limitations.

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Section 1 provides installation and programming instructions, startup options, and system configuration program examples. The following chapters are included:

Chapter 1: Overview

Chapter 2: Quick start

Chapter 3: Setup programs

Chapter 1: Overview

Description

The XE–900 is a Single Board Computer (SBC) in the EPIC™ form factor. It is intended for higher-performance, low-power embedded control applications. The XE–900 SBC integrates serial communications, Ethernet, IDE hard disk port, CompactFlash socket, digital I/O, two USB ports, PS/2 keyboard and mouse port, speaker port, and video. The XE–900 SBC can be used in a stand-alone mode or expanded through a PC/104 or PC/104-*Plus* interface.

The XE–900 SBC comes with a BIOS loaded on a flash device for easy updates. It is fully compatible with most popular operating systems.

XE–900 SBC major hardware features

CPU

The XE–900 SBC can be ordered in several configurations. The CPUs available are high-performance, low-power VIA EDEN processors (Model 9) with a clock speed of either 733 MHz or 1 GHz, or a 400 MHz Model 7 version.

The XE–900 uses the VIA VT8606 north bridge and the VIA VT82C686B south bridge for some of the peripherals. The XE–900 SBC has a Front Side Bus speed of 133 MHz, an ISA bus speed of 8.33 MHz and a PCI bus speed of 33 MHz.

Cooling

The XE–900 733 MHz and 1 GHz versions come standard with either a forced air fan or an Integrated Conductive Cooling System.

SDRAM

The XE–900 supports PC-100 or PC-133 SO–DIMM modules up to 256 MB. Some low-power 512 MB SO–DIMM modules are also supported. Contact Octagon Systems for compatibility before using 512 MB modules. Use of incorrect 512 MB SO–DIMM modules may cause improper operation or damage to the XE–900.

On-board flash

On board is a socketed 512 KB boot flash that contains the BIOS.

CompactFlash socket

The CompactFlash socket accepts a Type I or Type II 3V CompactFlash card. The CompactFlash appears as an IDE device to the system. It is implemented with an ATA-4 compliant IDE controller, and appears in Setup as the Primary IDE device.

Hard disk and IDE port

The XE–900 has two ATA-4 compliant IDE controllers. The primary channel is dedicated to the CompactFlash. The secondary channel supports two additional IDE devices through a 2 mm, 44-pin connector. This connector supplies power to the devices. Octagon Systems has a 44-pin to 40-pin Hard Drive Adapter cable (part #4080 or #6246) to connect IDE devices with a 40-pin interface.

USB ports

The XE–900 provides two USB 1.1 channels, accessed through a 10-pin header. USB 1.1 provides speeds up to 12 Mbps. The Octagon two-port USB cable (part #6288) provides a direct connection from the 10-pin connector to two USB devices. USB is available when using an operating system that supports USB. DOS legacy USB is supported.

Both channels are Universal HCI compliant.

Note that USB devices are hot-swappable when a device is plugged into a standard USB connector; the pins on the connectors determine the order in which they make contact. Devices are not hot-swappable when connected to a non-standard header. You can hot swap a device through the USB connector on the two-port USB cable, or through another USB connector wired to the 10-pin header, but you cannot hot swap at the 10-pin header itself.

LPT and floppy

The XE–900 does not provide connectors for LPT parallel port or floppy disk drive. These functions, if required, can be obtained through USB devices, or PC/104 or PC/104-*Plus* devices.

Digital I/O

The 24 digital I/O lines will interface with logic devices, switch inputs, LEDs and industry standard opto module racks. The I/O lines are 0–5V logic compatible. Each line can sink or source 15mA. The lines can be individually programmed as inputs or outputs.

Ethernet

The XE–900 provides one 10/100BaseT Ethernet port and supports the IEEE 802.3 Ethernet standard.

Serial ports protected against ESD

The XE–900 SBC has six serial ports. These ports provide one 8-wire and four 4-wire RS–232C ports, and two ports of RS–422, RS–485 or TTL. COM5 can be configured as RS–232C, RS–422, RS–485 or TTL, while COM6 can be configured as RS–422, RS–485 or TTL.

PC/104 and PC/104-*Plus* interface

The PC/104 interface accepts an 8- or 16-bit PC/104 expansion board. The PC/104-*Plus* accepts industry-standard PC/104-*Plus* boards. PC/104 expansion boards are available from several manufacturers. PC/104 or PC/104-*Plus* expansion boards may be stacked on the XE–900 SBC to form a fully-integrated system.

Video

The XE–900 SBC supports CRT monitors up to 1920 x 1440 x 24 bpp (bits per pixel) resolution, and LVDS-compatible flat panel displays with up to 1600 x 1200 x 18 bpp resolution.

Keyboard, mouse, and speaker ports

The keyboard controller accepts an AT style keyboard and has a PS/2 connector. The mouse port is combined with the keyboard port and is accessed with a “Y” cable. Note that with some “Y” cables you may have to plug the mouse into the keyboard icon, and the keyboard into the mouse icon; if the mouse and keyboard do not function at power up, try switching them. A keyboard connects directly to the XE–900 while a mouse requires the “Y” cable. Most operating systems do not require a keyboard or a mouse; however, some operating systems do require both to be connected for proper booting.

A separate connector provides for a PC-compatible speaker.

Real time calendar/clock with battery backup

The real time clock is fully AT compatible. An optional off-card battery powers the real time clock when the 5 volt supply is removed.

Setup information stored in Flash for high reliability

Loss of Setup data is serious in industrial applications. Most PCs store Setup information in battery-backed CMOS RAM. If the battery fails or is replaced during routine maintenance, this information is lost. Without a keyboard and monitor in embedded applications, time consuming re-initialization is required. The XE–900 SBC stores the Setup information in Flash.

User-available EEPROM

An EEPROM has 1024 bytes available to the user. Software routines to use this available memory come with the XE–900 SBC.

Watchdog timer added for safety

The watchdog timer resets the system if the program stops unexpectedly. The watchdog is enabled, disabled and strobed under software control; it can also be enabled or disabled in Setup. The time-out period is programmable for 1, 10 or 60 seconds.

Hardware reset

A hardware reset ensures complete reset of the system and all attached peripherals. A hardware reset can be done by any of the following methods:

- An expired watchdog timer cycle
- Depressing the reset switch
- Cycling power
- Power supervisor reset

5 Volt only operation lowers system cost

- 5V ±5%
- ±12V supplied to PC/104 connector from the power connector; not required for XE–900 SBC operation
- +3.3V and +12V supplied to PC/104-*Plus* connector from the power connector; not required for XE–900 SBC operation

Rugged environmental operation

- Operating temperature
  –40° to +85°C @ 400 MHz
  –40° to +85°C @ 733 MHz, with forced air flow
  –40° to +75°C @ 1 GHz, with forced air flow
  These operating specifications also apply to units with the Integrated Conductive Cooling System.
- Nonoperating temperature –55° to 95°C, nonoperating
- Relative humidity 5% to 95% noncondensing
- Shock 40g, 3 axis
- Vibration 5g, 3 axis

Size

115 mm x 165 mm x 29.5 mm, EPIC™ form factor (board)

171.45 mm x 184.15 mm x 38.96 mm (with Integrated Conductive Cooling System)

XE–900 SBC major software features

Diagnostic software verifies system integrity automatically

The XE–900 SBC has built-in diagnostic software that can be used to verify on-card I/O and memory functions. On power-up, a series of tests is performed. If a problem occurs, the failed test can be identified by a flashing LED or a beep code. The test is performed automatically every time the system is reset or powered up. Memory verification does not require software, test equipment, monitor, keyboard, disks, or test fixtures. See the “Troubleshooting” chapter for a listing of tests and failures and their descriptions.

General Software BIOS

The XE–900 SBC has a General Software BIOS with Octagon BIOS extensions. The BIOS extensions support the INT17 functions.

Octagon BIOS extensions

BIOS extensions provided by a DOS TSR allow easy access to watchdog timer functions, serial EEPROM, digital I/O, etc.

Boot sequence

An XE–900 SBC can be configured to boot from CompactFlash, a hard disk, or a CD–ROM; or from a USB device such as a floppy drive, hard drive, or flash device. Refer to the appropriate chapters on these devices for specific configuration requirements.

Chapter 2: Quick start

This chapter covers the basics of setting up an XE–900 SBC system. The following topics are discussed:

- Component diagrams, connectors, switches and cables
- Mounting the XE–900 SBC
- Connecting a monitor and keyboard
- Installing an operating system

Component diagrams, connectors, switches and cables

Figures 2–1 and 2–2 show the connectors and switches and their locations on the XE–900 SBC. Figure 2–3 shows the dimensions of the XE–900 SBC in inches and millimeters (without the Integrated Conductive Cooling System). For dimensions and mounting diagrams with the Integrated Conductive Cooling System see page 88. The sections immediately following those figures describe the connectors and switches, and some cables that you might require.

WARNING!

The XE–900 SBC contains static-sensitive CMOS components. To avoid damaging your card and its components:

- **Ground yourself before handling the card**
- **Disconnect power before removing or inserting a PC/104 or PC/104-*Plus* expansion board.**

Figure 2–1 XE–900 SBC component diagram (top)

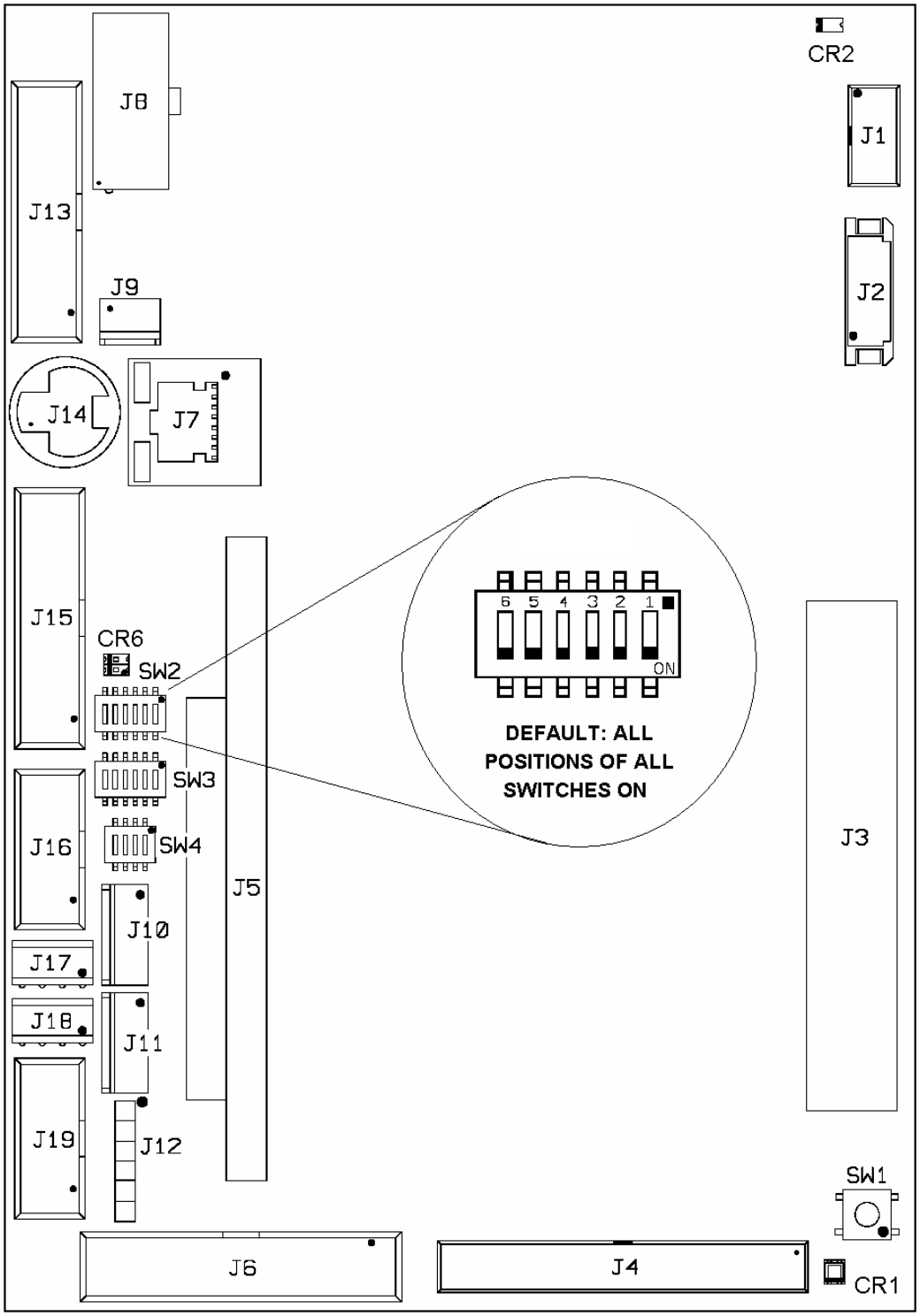


Figure 2–2 XE–900 SBC component diagram (bottom)

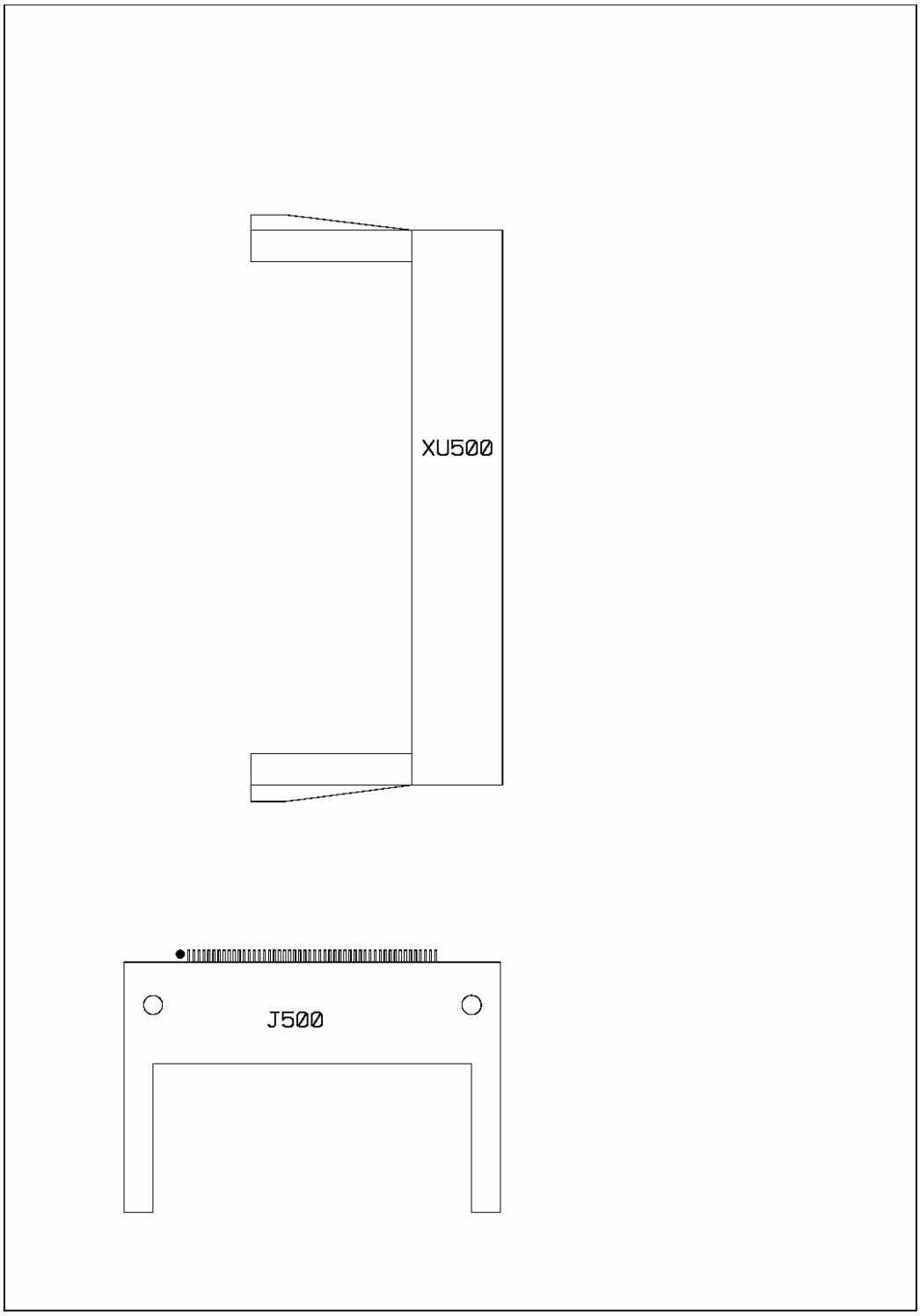
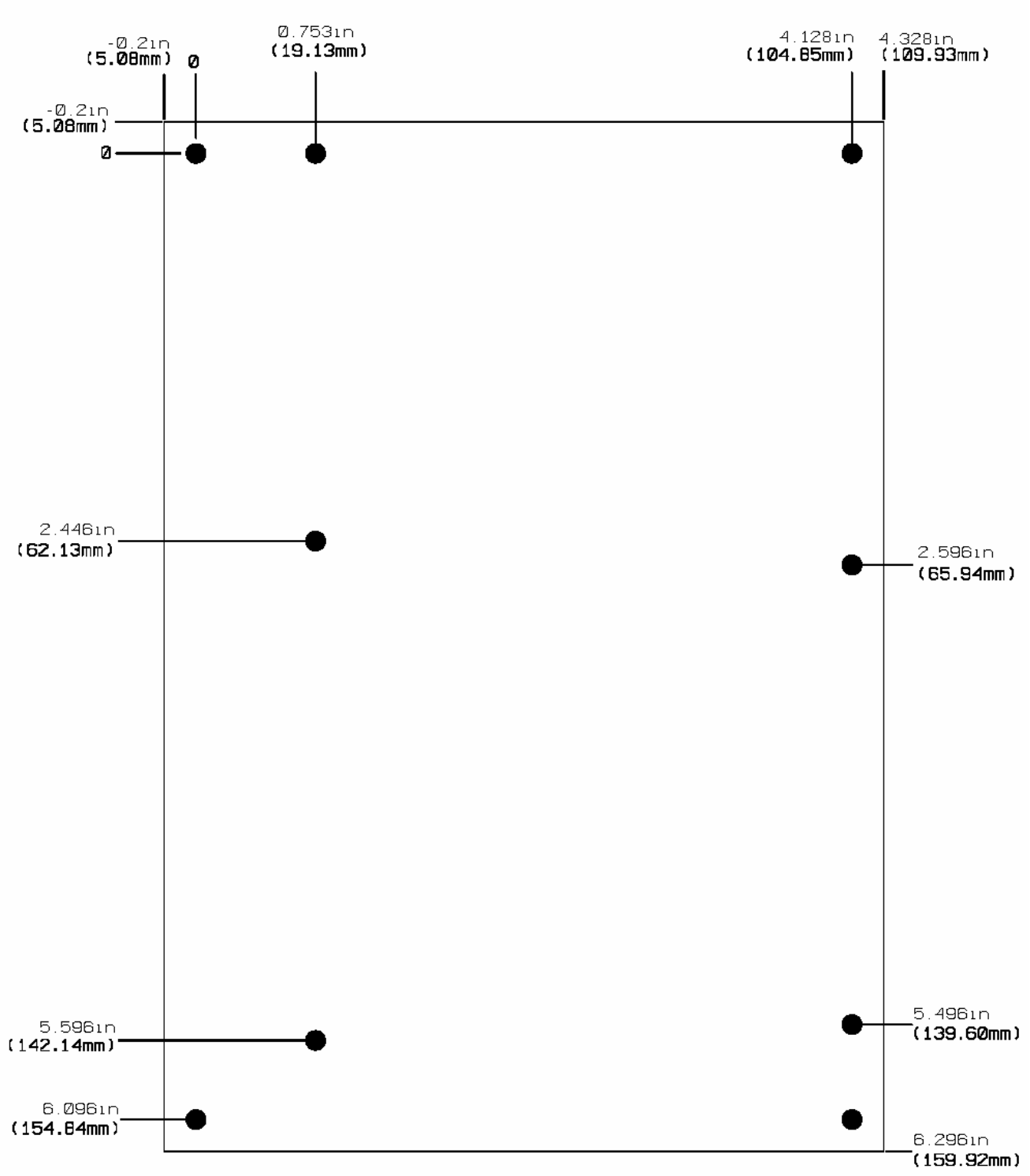


Figure 2–3 XE–900 SBC dimensions (without Integrated Conductive Cooling System)



XE–900 SBC connectors and jumpers

Table 2–1 lists the connector reference designators and function for each of the connectors. Table 2–2 lists the DIP switch reference designators and functions for each of the switches. To view the physical location of each connector and switch block refer to the illustration on page 18. For information on mating connectors see page 100. For information on custom cables see the following section.

Table 2–1 XE–900 SBC connector functions

Connector	Function
J1	VGA video
J2	LVDS video
J3	PC/104-*Plus*
J4	Hard drive
J5	PC/104
J6	Digital I/O
J7	Ethernet
J8	Power
J9	CPU fan
J10	COM6 RS–422/485
J11	COM5 RS–422/485
J12	COM5/6 TTL
J13	COM1/2
J14	PS/2 Keyboard / Mouse
J15	COM3/4
J16	COM5 RS–232
J17	PC battery
J18	Speaker
J19	USB1/2
J500	CompactFlash
XU500	SO-DIMM

Table 2–2 XE–900 SBC switch functions

Switch	Function
SW1	Reset
SW2	System selections
SW3	LVDS flat panel resolution
SW4	COM5/6 termination

Custom cables

To conserve board real estate a few connectors on the XE–900 are non-standard or provide alternate interfaces. The cables listed below connect to the XE–900 SBC and provide industry-standard interfaces. For ordering information see page 117.

- **COM PORT VTC-20F Cable.** This cable connects to the 20-pin COM1/2 or COM3/4 ports and provides two DB-9 female connectors. A VTC-20M provides two DB-9 male connectors.

- **COM PORT VTC-9F Cable.** This cable connects to the 10-pin COM5 port and provides a DB-9 female connector. A VTC-9M provides a DB-9 male connector.

- **0.100-inch RS-422/485 Cable**. This cable connects to the 5-pin header for RS-422/485 on COM5 or COM6 and provides a standard DB-9 interface.

- **CMA-26 Ribbon Cable.** Connects the 26-pin digital I/O port to an STB-26 Termination Board to provide access for field wiring

- **2 mm VGA-12 Cable.** Provides a standard 15-pin VGA interface.

- **LVDS-18 Video Cable.** Connects to the LVDS connector and provides 18-inch flying leads

- **44-pin to 40-pin IDE Cable.** Converts the 44-pin IDE header to a 40-pin IDE header.

- **Keyboard/Mouse "Y" Cable**. Connects to the PS/2 keyboard/mouse port to provide keyboard and mouse interfaces. A keyboard will plug directly into the XE–900 port. Available at most computer supply stores.

- **ATX Power Cable.** Connects to the 10-pin ATX power connector and provides a standard 20-pin ATX connector.

- **Two-port USB Cable.** Converts the 10-pin header for USB1,2 into two standard USB connectors.

Caution

USB devices are hot-swappable when a device is plugged into a standard USB connector, as pins on the connectors determine the order in which they make contact. Devices are not hot-swappable when connected to a non-standard header. You can hot swap a device through the USB connector on the two port USB cable, or through another USB connector wired to the 10-pin header, but you cannot hot swap at the 10-pin header itself.

Mounting the XE–900

WARNING!

The XE–900 contains static-sensitive CMOS components. To avoid damaging your card and its components:

- **Ground yourself before handling the card and observe proper ESD precautions**
- **Disconnect power before removing or inserting a PC/104 or PC/104-*Plus* expansion board**

Equipment required

To install the XE–900 SBC you will need the following equipment (or equivalent):

- XE–900 SBC
- +5V power supply – see the *XE–900 SBC power supply requirements* section. You might also need an ATX power cable, part #6537.
- A device with an operating system. The device could be a CompactFlash, hard disk, or CD ROM. The operating system can be Windows NT, Windows CE.net, Linux, QNX, or DOS.
- PS/2 style keyboard
- VGA monitor
- 2 mm VGA-12 Cable, part #6392
- VTC-20F Cable, part #4866 (for serial console)
- Null modem adapter, #2740 (for serial console)
- Windows HyperTerminal or equivalent terminal emulation software (for serial console)
- Your PC (for serial console)

Hardware components required to mount the XE–900 SBC (included):

- 9 threaded hex standoffs (4–40 x 3/4”)
- 9 screws (4–40 x 3/16”)
- 9 internal star lock washers (#4)
- 9 nuts (4–40)

Refer to the XE–900 SBC component diagram, figure 2–1 on page 18, for the location of various connectors, and to the mounting hole diagram, figure 2–3 on page 20, for mounting the XE–900 SBC system.

With the Integrated Conductive Cooling System use 4 #10-32 screws (not included). See page 88.

Hardware mounting

1. Use the standoffs, washers, and screws and place them in the nine holes on the XE–900 SBC board. Refer to Figure 2–3 for the center-to-center mounting hole dimensions and for the location of the designated holes used for mounting the hardware.

   WARNING!

   All nine standoffs, screws and washers must be used to secure the XE–900 SBC. The standoffs ensure full support of the board.

   WARNING!

   Verify that the washers and standoffs do not touch any of the component pads adjacent to the mounting holes. Damage will occur at power-up.

2. Connect a 5V power source to the XE–900 SBC. Refer to the Power Supply Requirements section, page 25. The power supply connector is located at J8. Refer to Figure 2–4 and Table 2–3.

Note The +12V, –12V, and +3V signals are routed to the PC/104 and PC/104-*Plus* bus only.

WARNING!

Make sure the power supply is OFF when connecting the power cable to the XE–900 SBC board. Damage to the XE–900 SBC may occur if the power is ON when connecting the power cable.

WARNING!

Accidentally crossing the wires, i.e., plugging +5V wires into the ground connector or the ground wires into the +5V connector will damage the XE–900 SBC.

Figure 2–4 Power connector, J8

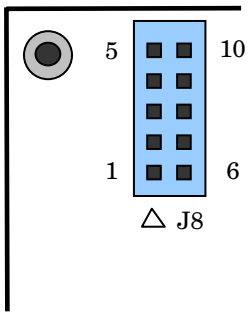


Table 2–3 Power connector: J8

Pin	Function	Function	Pin
1	nc	nc	6
2	GND	+5v	7
3	GND	+5v	8
4	+12V	–12V	9
5	+3V	GND	10

XE–900 SBC power supply requirements

The XE–900 SBC is designed to operate from a single +5 VDC supply, connected at J8. If you are using the PC/104 or PC/104-*Plus* interface, you may also require ±12 VDC and/or +3V. The connector is a 10-pin ATX PC power supply connector, and connects to a 10-pin ATX power supply, or with an adapter cable, to a standard 20-pin ATX power supply. The typical current requirement for the XE–900 SBC is listed in the *Technical Data* appendix. For the XE–900 SBC the power supply must be able to meet the 10A inrush current.

The user should consider factors such as the power cable conductor gauge, number and length of conductors, mating connectors, and the power requirements of external devices such as hard drives, floppy drives, displays, mouse, and keyboard.

It is important that a quality power supply be used with the XE–900 SBC that has sufficient current capacity, line and load regulation, hold up time, current limiting, and minimum ripple. The power supply for the XE–900 must meet the startup risetime requirements specified in the ATX Power Design Guide, version 1.1, section 3.3.5. This assures that all the circuitry on the CPU control card sequences properly and avoids system lockup.

Also, select a power supply that discharges quickly. If large power supply output capacitors are used, powering the system down and then up may lock up the XE–900 SBC. If the power supply does not drain below 0.7V, the CMOS components on the XE–900 SBC will act like diodes and forward bias, potentially damaging the XE–900 SBC circuitry.

The proper selection of a quality power supply ensures reliability and proper functioning of the XE–900 SBC.

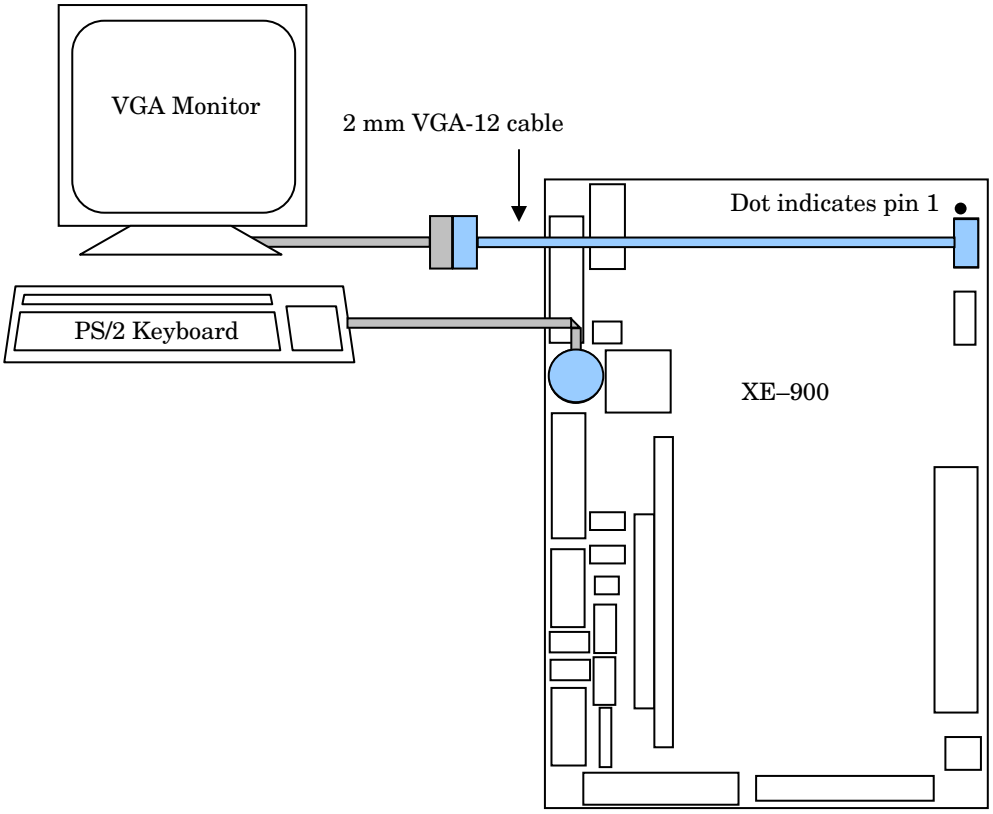
Connecting a monitor and keyboard

Figure 2–5 shows the XE–900 SBC with a monitor and keyboard. The following sections describe how to connect these items.

WARNING!

The video connector on the XE–900 is keyed, but some cables are not keyed and can be plugged in incorrectly. Ensure that pin 1 of the cable is connected to pin 1 of the connector (indicated by the dot). Incorrect connection could damage your equipment.

Figure 2–5 Connecting a monitor and keyboard



Monitor

The XE–900 SBC interfaces to a standard VGA monitor through the J1 connector using a 2 mm VGA-12 cable. Connect one end of the 2 mm VGA-12 cable into J1 and connect the other end to a VGA monitor cable.

Note The video switch, SW2 position3, must be ON to use a monitor. This is the default configuration.

Keyboard and mouse

The XE–900 SBC accepts an AT style keyboard and has a PS/2 type connector, located at J9. The mouse port shares the keyboard connector.

To use a keyboard, plug the keyboard directly into J14. To connect a mouse, use a laptop-style “Y” connector, available at computer stores, that splits the signals into keyboard and mouse connectors.

Note **With some “Y” cables you may have to plug the mouse into the keyboard icon, and the keyboard into the mouse icon; if the mouse and keyboard do not function at power up, try switching them.**

Installing an operating system

The XE–900 SBC does not come with an installed operating system. You can install an operating system onto a hard drive or CompactFlash. Octagon Systems has OS Embedder™ kits available for several operating systems. These kits directly support the unique features of Octagon products, such as digital I/O, watchdog timer, etc., eliminating the need to write special drivers. Other software kits may also be available. Contact Octagon Systems for information concerning the software development kits.

To install an operating system you will need:

- 2 mm VGA-12 video cable, #6392
- PS/2 style keyboard
- VGA monitor
- CD-ROM drive
- Operating system media
- Hard drive or CompactFlash to install the operating system on to
- If installing onto a hard drive, an IDE cable with master and slave connectors

OS on CD-ROM onto a hard drive or CompactFlash

Refer to Figure 2–6 on page 29 for the following:

1. Attach the 2 mm VGA-12 video cable to J1.
2. Connect the PS/2 keyboard to J14, a VGA monitor to the VGA-12 video cable, and a CD-ROM drive to J4. Configure the CD-ROM drive as a master.
3. If using a hard drive, configure it as a slave device and install it on the IDE cable connected to J4.

Note IDE devices have a jumper or a switch that designates whether the device is a master or a slave device. If only one device is connected to a port, it must be configured as a master. If two devices are connected, one must be configured as a master and one as a slave. The XE–900 does not use the CS signal (Cable Select) to designate master or slave on a multi-connector cable. You can use BIOS Setup to designate either the master or the slave as a boot device.

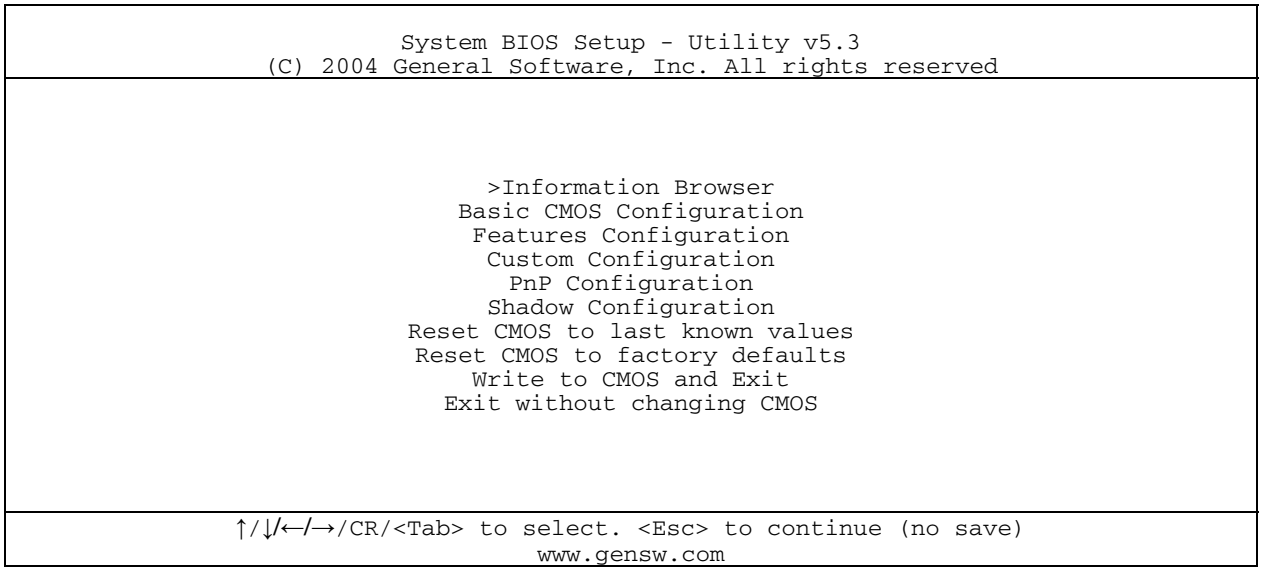
4. If using a CompactFlash, install it into the CompactFlash socket.

5. Apply power to the XE–900 SBC system. A logon message similar to the one below will appear on your PC monitor:

```
General Software P6 Class Embedded BIOS(R) 2000 Revision 5.3 Copyright (C)
2004 General Software, Inc.  All rights reserved. Octagon Systems XE900

00000589K Low Memory Passed
00117632K Ext Memory Passed
Wait.....
```

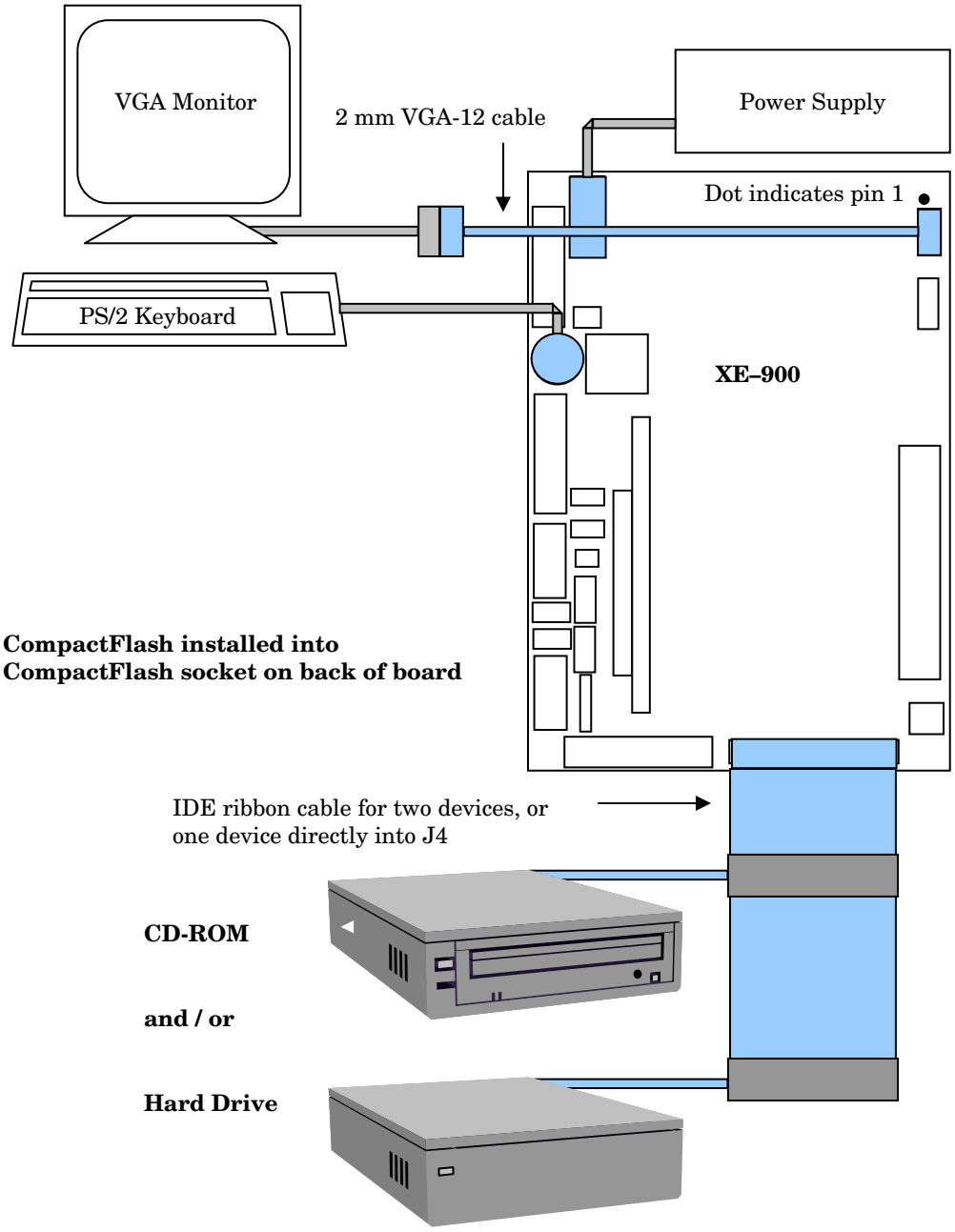
6. Enter Setup by pressing the Del key or Ctrl-C during BIOS POST sequence (this occurs between the memory test and bootup).



Note Your display message may be slightly different

7. Configure the CD–ROM as a master device in BIOS Setup, and change the boot sequence to CD-ROM drive first. Designate the hard drive or CompactFlash as drive c:.
8. Insert the operating system media into the CD-ROM drive.
9. Reboot the system. The system should boot to the CD-ROM.
10. Follow the on-screen dialog to load the operating system. Refer to the OS documentation for further information.

Figure 2–6 Installing an operating system



Chapter 3: Setup programs

This chapter discusses running the Setup configuration program on the XE–900 SBC. Setup configures devices set up by the BIOS such as serial ports, floppy drives, etc.

Setup

Setup can be entered by pressing the “Delete” key on the system keyboard or Ctrl-C when POST I/O has been redirected to a serial console during the BIOS POST sequence (this occurs between the memory test and boot).

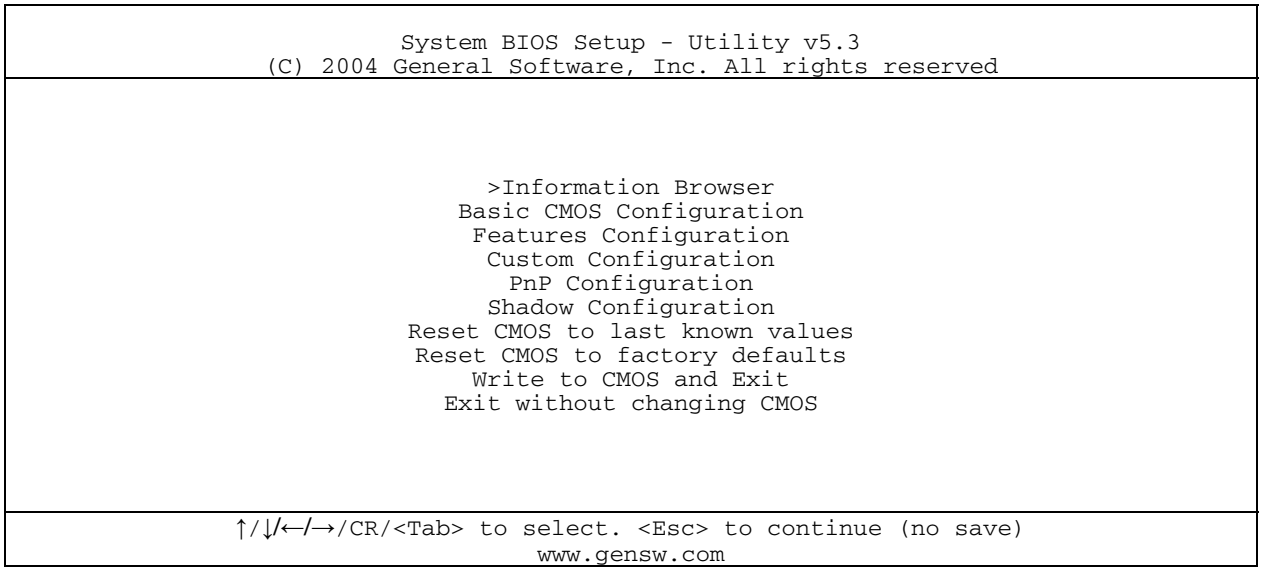
Also, by setting the “S” switch Off (Switch 2 position 1), you will force the Setup to revert to the factory-programmed defaults shown in the following menus. This allows you to boot with a known set of parameters. If you want to use the default settings for future boots, you must enter Setup and “Save” for the default values to be stored in CMOS.

Note The Setup defaults might vary slightly from those shown in the following menus depending on the BIOS revision on your card.

The system will display the XE–900 General Software System BIOS Setup Utility menu. Select the submenu by using the up/down arrows, then press <ENTER> (when using a monitor connected to the XE–900 SBC). For a serial console configuration, Ctrl + E is up and Ctrl + X is down.

System BIOS Utility menu

The Utility menu allows you to select the appropriate menus for configuration. The menus shown below are described on the following pages. Default values are shown in the menus.



Information Browser menu

The Information Browser provides information specific to the XE–900, as well as contact information for Technical Support.

Basic CMOS Configuration menu

Default values are shown in the menu.

```
                    System BIOS Setup - Basic CMOS Configuration
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DRIVE ASSIGNMENT ORDER      Date:                 Typematic Delay     : 250 ms
Drive A: (None)             Time:                 Typematic Rate      : 30 cps
Drive B: (None)             Numlock: Disabled     Seek at Boot        : None
Drive C: Ide 0/CF socket                          Show "Hit Del"      : Enabled
Drive D: (None)             BOOT ORDER            Config Box          : Enabled
Drive E: (None)             Boot 1st: Drive C:    F1 Error Wait       : Enabled
Drive F: (None)             Boot 2nd: Browser     Parity Checking     : (Unused)
Drive G: (None)             Boot 3rd: None        Memory Test Tick    : Enabled
Drive H: (None)             Boot 4th: None        Debug Breakpoints   : (Unused)
Drive I: (None)             Boot 5th: None        Debugger Hex Case   : Upper
Drive J: (None)             Boot 6th: None        Memory Test         : StdLo FastHi
Drive K: (None)             ATA DRV ASSIGNMENT:  Sect  Hds  Cyls    Memory
Boot Method: Boot Sector    Ide 0: 3 = AUTOCONFIG, LBA              Base:
FLOPPY DRIVE TYPES:         Ide 1: Not installed                    632KB
Floppy 0: Not installed     Ide 2: 3 = AUTOCONFIG, LBA              Ext:
Floppy 1: Not installed     Ide 3: 3 = AUTOCONFIG, LBA              251MB
          ↑/↓/←/→/CR/<Tab> to select or <PgUp>/<PgDn>/+/- to modify
                        <Esc> to return to main menu
```

DRIVE ASSIGNMENT ORDER: These selections allow you to assign the various drives installed to a designated alphabetic drive.

Note If using a floppy drive, assign a drive to A before assigning a drive to B (do not assign a drive to Drive B, but not Drive A). Do not skip drive C if using flash / hard drives (the first flash / hard drive should be drive C). If using a CD-ROM, DO NOT assign a drive letter to its IDE port; the operating system will automatically assign a drive letter to CD-ROMs.

Do not assign the same file system to more than one drive without considering the consequences (such as assigning IDE0 to Drive C and Drive D). This is allowed to enable aliasing of drives; however this may cause corruption of operating system cache and state unless the OS is configured for this as well. Many desktop operating systems cannot be so configured.

Drive A/B: Selections are None, Floppy 0, Floppy 1, or USB Floppy. See note above.

Drive C/D: Selections are None, Floppy 0, Floppy 1, USB Floppy, Ide 0/CF socket, Ide 2/Ext Master, Ide 3/Ext Slave, USB Hard Drive. See note above, particularly if using a CD-ROM.

Drive E/F/G/H/I/J/K: Selections are None, Ide 0/CF socket, Ide 2/Ext Master, Ide 3/Ext Slave, USB Hard Drive. See note above, particularly if using a CD-ROM.

Boot Method: Selections are Windows CE or Boot Sector. For normal boot, select Boot Sector. Windows CE users may be able to load their Windows CE environment without a DOS or other bootable environment by selecting the Windows CE option. This will cause the BIOS to attempt to find the Windows CE system file (NK.BIN) on boot disks.

FLOPPY DRIVE TYPES: These selections allow you to specify the type of floppy device for Floppy 0 and Floppy 1. The XE–900 supports USB floppies and PC/104 or PC/104-*Plus* floppies. The selections are 360 KB, 5.25"; 1.2 MB, 5.25"; 720 KB, 3.5"; 1.44 MB, 3.5"; 2.88 MB, 3.5"; Not installed. Note that the XE–900

does not support a floppy drive directly. This feature should be left Not Installed if you are not using a floppy drive; for USB floppies this should also be left as Not Installed. This frees up INT6 for other applications.

System Date: Sets the date for the system clock.

System Time: Sets the time for the system clock.

NumLock: Enables or disables NumLock.

BOOT ORDER: These selections specify the order of the devices or events which will be used to boot the XE–900. The selections are Drive A, Drive B, Drive C, Drive D, Reboot, CDROM, or None.

Note The first None stops the boot sequence; any subsequent settings in boot order after None will have no effect. The Reboot option will cause the system to attempt to reboot if the previous boot selections fail. This option requires System Management Mode to be enabled (see Features Configuration screen.)

ATA DRIVE ASSIGNMENT: These selections allow you to specify the type of devices for IDE 0, 1, 2, and 3. IDE 0 is hardwired to the CompactFlash socket; Ide1 is unavailable. Note that the XE–900 SBC only supports three IDE devices total (CompactFlash and two Secondary devices.) The available options are Not Installed; User Type; AUTOCONFIG, PHYSICAL; AUTOCONFIG, LBA; AUTOCONFIG, PHOENIX, and IDE CDROM. User Type allows you to set parameters for Sectors (63 max.), Heads (255 max.) and Cylinders (1023 max.).

Note The AUTOCONFIG, PHYSICAL; AUTOCONFIG, LBA; and AUTOCONFIG, PHOENIX options refer to the BIOS of the system which was used to format the hard drive or CompactFlash. If you have formatted a hard drive or a CompactFlash on another system than the XE–900, you might have to change this setting for the XE–900 to recognize the drive.

Typematic Delay: Sets the time before a character will repeat when a key is continuously depressed. Selections are Disabled, 250 ms, 500 ms, 750 ms, and 1000 ms.

Typematic Rate: Sets the rate at which a character will repeat when a key is continuously depressed. Selections are 30 cps, 24 cps, 20 cps, 15 cps, 12 cps, 10 cps, 8 cps, and 6 cps.

Seek at Boot: Selections are None, Floppy, Ide, Both. For faster boot, the default setting (None) does not perform floppy or IDE seek operations during POST. In rare cases, some drives may not properly initialize without this seek operation. For this reason, users may select to seek Floppy drives, IDE drives, or both during POST if desired.

Show “Hit Del”: Enabled or Disabled. When enabled, the “Hit Del to access Setup” message is displayed during boot.

Config Box: Enabled or Disabled. When enabled, the blue Configuration box will appear on screen during boot.

F1 Error Wait: Enabled or Disabled. When enabled, the system will pause at a boot error until the F1 key is pressed.

Parity Checking: This function is not used.

Memory Test Tick: Enabled or Disabled. When enabled the system produces an audible tick during the memory test at boot.

Debug Breakpoints: This function is not used.

Debugger Hex Case: Upper or Lower. Selects the case for debugger output.

Memory Test: This item allows you set the test speed for both the base memory (Lo) and the extended memory (Hi). The options are Fast, Standard, or Full.

System Memory: Displays the amount of system memory on the card.

Extended Memory: Displays the amount of extended memory on the card.

Features Configuration menu

The Features Configuration menu allows you to set some of the system features. Default values are shown in the menu.

```
                System BIOS Setup - Feature Configuration
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ACPI 2.0                        :>Enabled   System Management Mode      : Enabled
Graphical/Audio POST            : Enabled   System Management BIOS      : Enabled
System Management Bus           : Disabled  Console Redirection         : Auto
Primary IDE UDMA                : Disabled  Secondary IDE UDMA          : Disabled

          ↑/↓/←/→/CR/<Tab> to select or <PgUp>/<PgDn>/+/- to modify
                        <Esc> to return to main menu
```

ACPI 2.0: Enabled, disabled. When enabled, the BIOS supports the Advanced Control Program Interface, level 2.0. ACPI combines the resource assignment capabilities of PnP and the power management functionality similar to APM.

Graphical/Audio POST: Enabled, disabled. When enabled, the graphical splash screen is shown during POST, along with a short sound played through the PC Speaker. If disabled, the text POST screen is displayed. This feature is not available with a serial console.

System Management Bus: Enabled, disabled. When enabled, the BIOS supports the SMBus BIOS interface to allow the operating system to interact with devices on the System Management Bus.

Primary IDE UDMA: Enabled, disabled. When enabled, UDMA is available on the primary IDE interface. Note: CompactFlash devices do not support UDMA.

System Management Mode: Enabled, disabled. When enabled, the BIOS's System Management Mode environment is enabled. This allows use of Legacy USB devices, including keyboards, mice, floppy drives, fixed disk drives, flash drives, and CDROM drives, without OS drivers. This also allows USB drives to be used as boot devices.

System Management BIOS: Enabled, disabled. When enabled, the BIOS supports the industry standard System Management BIOS (formerly known as the Desktop Management Interface, or DMI).

Console Redirection: Auto, redirect. When set to Auto, the console will be redirected to the serial port COM1 in the event that no video controller is found (V switch is OFF) or if a carriage return is received on COM1 during POST. When set to Redirect the console is forced to redirect to COM1 even if a video console is available.

Secondary IDE UDMA: Enabled, disabled. When enabled , UDMA is available on the

secondary IDE interface.

Note UltraDMA modes are not supported directly by the XE–900. These modes require an 80-pin connector, and there is no adapter available for the 44-pin, 2mm IDE connector used on the XE–900.

Custom Configuration menu

The Custom Configuration menu allows you to set parameters for COM3-6, digital I/O, watchdog timer, video, and DMA channel reserved for system use. Default values are shown in the menu.

```
                    System BIOS Setup - Custom Configuration
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COM3-6 Enable (See doc.)      :>Normal     RAM Reserved for Video      : 8 MB
COM5 Mode                     : RS232/422  AGP Aperture Size           : 128
COM6 Mode                     : RS232/422  CRT Analog Output           : Enabled

Digital I/I Base Address      : 0x120      DMA Channel to Disable      : DMA2

Watchdog Timer                : Disabled

            ↑/↓/←/→/CR/<Tab> to select or <PgUp>/<PgDn>/+/- to modify
                              <Esc> to return to main menu
```

COM3-6 Enable: Normal, Disabled, Alternate. This item enables or disables COM3-6 for serial operation. COM3 through COM6 share IRQ9. The Disabled option disables I/O to COM3 through COM6. Normal and Alternate select the base address of COM3 through COM6 as shown below; only COM5 and COM6 are changed.

Port	Normal Base Address	Alternate Base Address
COM3	0x3E8	0x3E8
COM4	0x2E8	0x2E8
COM5	0x1A8	0x1C8
COM6	0x1A0	0x1C0

Note: COM1 is always enabled at base address 0x3F8, using IRQ 4; COM2 is always enabled at base address 0x2F8, using IRQ 3. IRQ9 is always used by COM3-6 even if disabled. IRQ9 is **NOT available for PC/104 devices**.

COM5 Mode: RS232/422, RS485. This item selects two-wire RS485, or four-wire operation (RS232/422 or TTL) for COM5.

COM6 Mode: RS232/422, RS485. This item selects two-wire RS485, or four-wire operation (RS232/422 or TTL) for COM6.

Digital I/O base Address: 0x120h, 0x320h, or disabled. Sets the base address for digital I/O.

Watchdog: Enabled, Disabled. Enables watchdog timer.

RAM reserved for Video: Disabled, 8MB, 16MB, 32MB. Specifies the amount of RAM reserved for video.

API Aperture Size: 2, 4, 8, 16, 32, 64, or 128. Sets the size for the API aperture.

CRT Analog Output: Enabled, disabled. When using a flat panel this must be disabled.

DMA Channel to Disable: DMA0, 1, 2, 3. The system requires one DMA channel for internal use. Whichever channel is selected will not be available on the ISA bus.

Plug-n-Play Configuration menu

The Plug-n-Play Configuration menu allows you to select IRQs and DMA channels for use by plug-n-play devices. Default values are shown in the menu.

```
                System BIOS Setup - Plug-n-Play Configuration
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Enable PnP Support              :>Enabled   Enabled PnP O/S                :Enabled

Assign IRQ0 to PnP              :Disabled   Assign IRQ8 to PnP             :Disabled
Assign IRQ1 to PnP              :Disabled   Assign IRQ9 to PnP             :Enabled
Assign IRQ2 to PnP              :Disabled   Assign IRQ10 to PnP            :Enabled
Assign IRQ3 to PnP              :Enabled    Assign IRQ11 to PnP            :Enabled
Assign IRQ4 to PnP              :Enabled    Assign IRQ12 to PnP            :Disabled
Assign IRQ5 to PnP              :Disabled   Assign IRQ13 to PnP            :Enabled
Assign IRQ6 to PnP              :Enabled    Assign IRQ14 to PnP            :Disabled
Assign IRQ7 to PnP              :Enabled    Assign IRQ15 to PnP            :Disabled


Assign DMA0 to PnP              :Disabled   Assign DMA4 to PnP             :Enabled
Assign DMA1 to PnP              :Disabled   Assign DMA5 to PnP             :Enabled
Assign DMA2 to PnP              :Disabled   Assign DMA6 to PnP             :Enabled
Assign DMA3 to PnP              :Enabled    Assign DMA7 to PnP             :Enabled

        ↑/↓/←/→/CR/<Tab> to select or <PgUp>/<PgDn>/+/- to modify
                        <Esc> to return to main menu
```

Shadow/Cache Configuration menu

The Shadow/Cache Configuration menu enables shadowing and selects the address where it will be stored. Shadowing is disabled by selecting None under Shadowing. Default values are shown in the menu.

```
                System BIOS Setup - Shadow/Cache Configuration
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Shadowing                       :>Chipset   Shadow 16KB ROM at C000        :Enabled
Shadow 16KB ROM at C400         :Enabled    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        :Enabled
Shadow 16KB ROM at E400         :Enabled    Shadow 16KB ROM at E800        :Enabled
Shadow 16KB ROM at EC00         :Enabled    Shadow 16KB ROM at F000        :Enabled

        ↑/↓/←/→/CR/<Tab> to select or <PgUp>/<PgDn>/+/- to modify
                        <Esc> to return to main menu
```

Writing to CMOS and exiting

The last four items in the Utility menu give you a Yes or No option when you select them. Selecting Yes will implement the item. Selecting No will return you to the Utility menu. Those four selections are:

- Reset CMOS to last known values
  This item restores the values that were in CMOS at boot, without exiting Setup.
- Reset CMOS to factory defaults
- Write to CMOS and Exit
- Exit without changing CMOS

Overview: Section 2 – Hardware

Section 2 discusses usage, functions, and system configurations of the XE–900 SBC major hardware features. The following chapters are included:

Chapter 4: Serial ports

Chapter 5: Console devices

Chapter 6: CompactFlash, SDRAM, and battery backup

Chapter 7: External drives

Chapter 8: Bit-programmable digital I/O

Chapter 9: CRTs and LVDS flat panels

Chapter 10: Ethernet

Chapter 11: PC/104 and PC/104-*Plus* expansion

Chapter 12: USB

Chapter 4: Serial ports

Description

The XE–900 SBC has six serial ports, COM1 through COM6. COM1 is a dedicated 8-wire RS–232C. COM2, COM3, and COM4 are dedicated 4-wire RS–232C. COM5 can be 4-wire RS–232C, RS–422, RS–485, or TTL. COM6 can be 4-wire RS–422, RS–485, or TTL.

COM1 and COM2 are accessed at the 20-pin connector at J13. COM3 and COM4 are accessed at the 20-pin connector at J15. COM5 and COM6 have separate connectors for the supported interfaces. Refer to the table on page 21 for which connector to use for the various interfaces. Refer to the *Custom Cables* section on page 22 for a description of cables that mate with these connectors.

These serial ports interface to serial device. All ports support 5-, 6-, 7-, or 8-bit word lengths, 1, 1.5, or 2 stop bits, and baud rates up to 115.2K.

The serial ports have the following specifications:

- 16C550 compatible
- 16-byte FIFO buffers
- IEC 1000, level 3, ESD protection
  — Contact discharge ±6 kV
  — Air–gap discharge ±8 kV
- Backdrive protection
- Up to 115.2k baud operation

Mating receptacles

Use a VTC–20F or VTC–20M cable to connect the 20-pin COM ports to external serial equipment. The P2 and P3 connectors on these cables are DB–9 female (VTC–20F) or DB–9 male (VTC–20M) connectors which plug directly into a 9-pin serial cable. Use a VTC–9F or VTC–9M to connect the 10-pin COM5 RS–232C port to external serial equipment For RS-422 or RS-485 on COM5 or COM6, use a 0.100 inch RS422/485 Cable (part #6683).

Figure 4–1 (following page) shows serial devices connected to the XE–900 SBC. It also shows the schematic for connecting RS–422, RS–485 and TTL devices. Note that you cannot use COM5 or COM6 for two different interfaces at the same time.

Figure 4–2 shows a null modem adapter connected to the COM1 port of a VTC–20F. A null modem adapter is required when connecting a serial console.

Serial port configurations

COM1 and COM2 are always enabled. COM3-6 can be configured in Setup in the Custom Configuration menu. The selections are Normal, Alternate, and Disabled. Normal and Alternate select different addresses for COM5 and COM6. See Table 4–1 on page 41. You must also select the Mode for COM5 and COM6. For RS–232C,

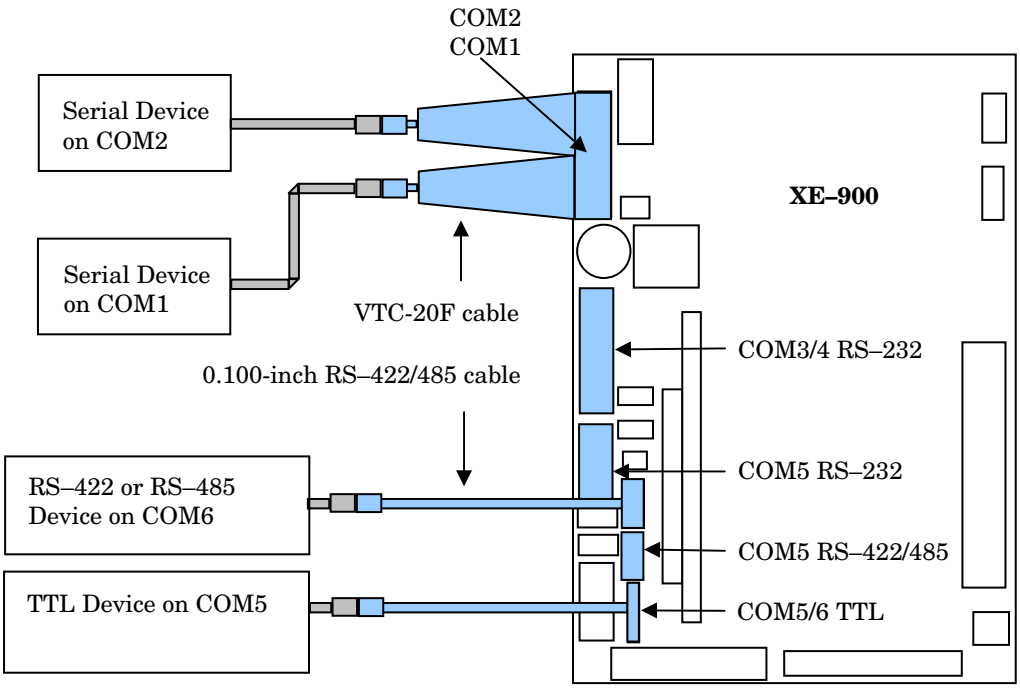
RS–422 or TTL select RS232/422. For RS–485 select RS485. For additional information on Setup menus see page 35.

If COM5 or COM6 are used for RS–422 or RS–485, and the XE–900 is at the end of the network, these ports will have to be terminated. Switch 4 terminates the network. The default setting is terminated. If the XE–900 is not at the end of the network the switch must be set to unterminated.

COM3 through COM6 all share interrupt 9. Even when these ports are disabled interrupt 9 is not available for PC/104 devices.

The COM ports configurations are shown in table 4–1. Tables 4–2 through 4–6 show the COM pin-outs for the COM ports, and table 4–7 shows the switch settings.

Figure 4–1 COM ports



Up to six serial devices total; four or five RS–232, one or two RS–422, RS–485, or TTL.

Figure 4–2 VTC-20F cable and null modem adapter

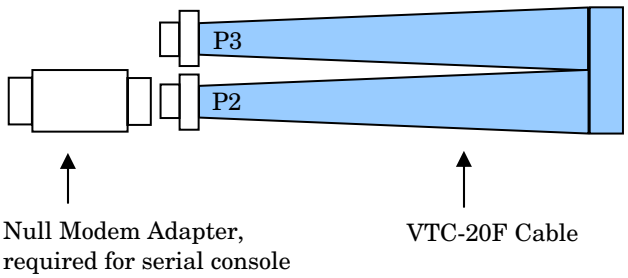


Table 4–1 Serial port configurations

COM Port	Address	IRQ	Interface	BIOS Setup	Connector
COM1	3F8h	IRQ4	RS–232 – 8 wire	NA	J13
COM2	2F8h	IRQ3	RS–232 – 4 wire	NA	J13
COM3	3E8h	IRQ9	RS–232 – 4 wire	Normal	J15
COM4	2E8h	IRQ9	RS–232 – 4 wire	Normal	J15
COM5	1A8* 1C8	IRQ9	RS–232 – 4 wire (COM5 Mode RS232)	Normal* Alternate	J16
COM5	1A8* 1C8	IRQ9	RS–422 – 4 wire (COM5 Mode RS232)	Normal* Alternate	J11
COM5	1A8* 1C8	IRQ9	RS–485 – 2 wire (COM5 Mode RS485)	Normal* Alternate	J11
COM5	1A8* 1C8	IRQ9	TTL (COM5 Mode RS232)	Normal* Alternate	J12
COM6	1A0* 1C0	IRQ9	RS–422 – 4 wire (COM6 Mode RS232)	Normal* Alternate	J10
COM6	1A0* 1C0	IRQ9	RS–485 – 2 wire (COM6 Mode RS485)	Normal* Alternate	J10
COM6	1A0* 1C0	IRQ9	TTL (COM6 Mode RS232)	Normal* Alternate	J12

* This address is used when Normal is selected in Setup. The other address is used when Alternate is selected.

Table 4–2 COM1 and COM2 connector pin-outs (J13 connector)

COM1		COM2		DB–9 Pinout	
Pin#	**RS–232 signal**	**Pin#**	**RS–232 signal**	**DB–9 pin#**	**DB–9 pin#**
1	DCD	11	nc	1	
2	DSR	12	nc		6
3	RxD	13	RxD	2	
4	RTS	14	RTS		7
5	TxD	15	TxD	3	
6	CTS	16	CTS		8
7	DTR	17	nc	4	
8	RI	18	nc		9
9	GND	19	GND	5	
10	nc	20	nc		

Table 4–3 COM3 and COM4 connector pin-outs (J15 connector)

COM3		COM4		DB–9 Pinout	
Pin#	**RS–232 signal**	**Pin#**	**RS–232 signal**	**DB–9 pin#**	**DB–9 pin#**
1	nc	11	nc	1	
2	nc	12	nc		6
3	RxD	13	RxD	2	
4	RTS	14	RTS		7
5	TxD	15	TxD	3	
6	CTS	16	CTS		8
7	nc	17	nc	4	
8	nc	18	nc		9
9	GND	19	GND	5	
10	nc	20	nc		

Table 4–4 COM5 RS–232 connector pin-out (J16 connector)

COM5 RS–232		DB–9 Pinout	
Pin#	**RS–232 signal**	**DB–9 pin#**	**DB–9 pin#**
1	nc	1	
2	nc		6
3	RxD	2	
4	RTS		7
5	TxD	3	
6	CTS		8
7	nc	4	
8	nc		9
9	GND	5	
10	nc		

Table 4–5 COM5 and COM6 RS–422/485 connector pin-outs and pin-out for 0.100-inch RS–422/485 cable

J11 COM5 connector		J10 COM6 connector		DB–9 connector	
Pin #	**Signal**	**Pin #**	**Signal**	**Pin #**	**Pin #**
1	TXD+	1	TXD+	1	
2	TXD–	2	TXD–		6
	nc		nc	2	
	nc		nc		7
	nc		nc	3	
	nc		nc		8
4	RXD+	4	RXD+	4	
5	RXD–	5	RXD–		9
3*	GND	3	GND	5	

*Note that pin 3 is not listed in numerical order.

Table 4–6 COM5 and COM6 TTL connector pin-out (J12 connector)

J12 COM5/6 TTL connector	
Pin #	**Signal**
1	TX5
2	RX5
3	GND
4	TX6
5	RX6
6	GND

Table 4–7 COM5/6 switches, Switch 4

Switch 4 – COM5/6 termination		
COM Port	**Interface**	**Switch 4 Settings**
COM5	RS–422/RS–485 no termination	Position 1 Off Position 2 Off
	RS–422/RS–485 with termination	Position 1 On* Position 2 On*
COM6	RS–422/RS–485 no termination	Position 3 Off Position 4 Off
	RS–422/RS–485 with termination	Position 3 On* Position 4 On*

* Default. These switches terminate the network. If the XE–900 SBC is not at an end of the network, set these switches to Off .

Function and use of serial ports

COM1 as serial console device

You can use COM1 as a console device to communicate with another PC. For COM1 to be a serial console, the “V” video switch (Switch 2 position 3) must be set to Off. You can also redirect the video output to a serial console on COM1 by hitting the carriage return (Enter) on the host keyboard during boot. See the Console devices chapter for more information.

Note When interfacing the XE–900 SBC to your desktop PC, you must use a null modem adapter.

COM2 through COM5 as RS–232 I/O

COM1 is an 8-wire RS–232 interface. COM2 through COM4 are dedicated 4-wire RS–232 interfaces. COM5 can also be configured through Setup as a 4-wire RS–232 interface. You can connect up to five RS–232 serial I/O devices.

COM5/6 as TTL interface

COM5 and COM6 can be used as a TTL interface. The configuration for COM5 and COM6 is selected in Setup under COM5 Mode and COM6 Mode. For TTL, select RS232/422.

One use of a TTL interface is for a TTL-level GPS module. AN RTCM SC-104 differential GPS module uses both COM ports. Some GPS modules only require one port, in which case the other port could be configured for other serial interfaces.

COM5/6 as RS–422 and RS–485 networks

COM5 and COM6 can also be used as RS–422 or RS–485. RS–422 and RS–485 use differential signaling to communicate between the devices on a network. Differential signal reduces the effect of environmental noise, allowing communication over distances up to 1200 meters.

The RS–422 and RS–485 receivers provide an active high (space) condition for shorted, open, or inactive lines. Note that RTS is used differently by RS–422 and RS–485. Review the information in the following sections regarding RTS.

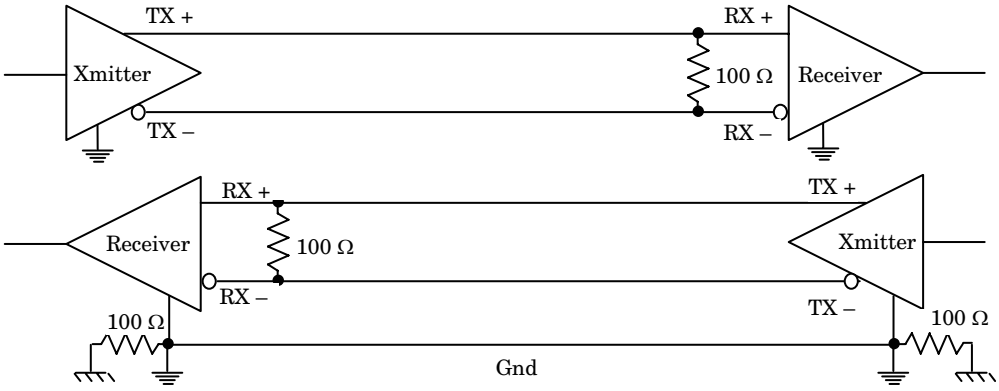
RS–422 is a point-to-point configuration. RS–485 is a multi-node configuration that allows up to 32 nodes on a network. COM5 and COM6 can be configured in BIOS Setup for RS–422 or RS–485. Refer to table 4–7 on page 43 for switch settings for terminating an RS–422/485 network.

RS–422

RS–422 is typically point to point configuration. RS–422 is also specified for multi-drop (party-line) applications where only one driver is connected to, and transmits on, a “bus” of up to 10 receivers. The device at the end of an RS–422 network must be terminated. The XE–900 SBC optionally terminates with a 100 ohm resistor. Refer to table 4–7. Figure 4–3 shows a typical RS–422 four-wire interface circuit.

The RTS* signal is used to control the transmitter and receiver in RS–422 mode. The RTS* signal is controlled by the Modem Control Register bit 1 (MCR[1], which is offset 0x04 from the UART base address). Writing MCR[1] to 0 (default state) sets RTS* to an inactive state (RTS* = logic high) which ENABLES both the RS–422 Transmitter and Receiver. Writing MCR[1] to 1 sets RTS* to an active state (RTS* = logic low) which DISABLES both the RS–422 Transmitter and Receiver.

Figure 4–3 Typical RS–422 four-wire interface circuit



RS–485

An application may implement a node as either the “host” node or as a “remote” node in an RS–485 network. There can be as many as 32 nodes without any bus repeaters in the network. A host is referred to as the node that initiates communication; a remote is referred to as a node that is addressed by the host.

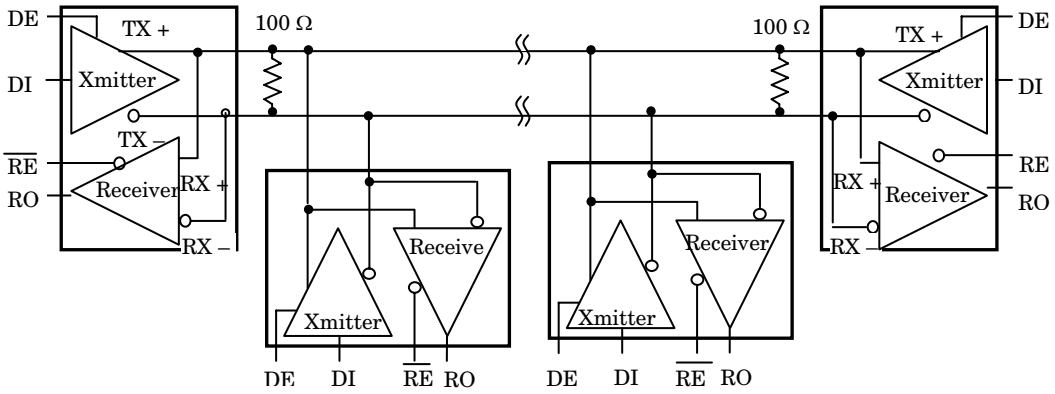
In any given communication sequence in an RS–485 network, there can only be one host. The host is responsible for initiating communication, maintaining network registration, and providing housekeeping tasks with other nodes. Remotes, however, cannot initiate a communication. They can only respond to messages that are addressed to them from the host.

The devices at each end of an RS–485 network must be terminated. Any node located between the end points should not be terminated. The XE–900 SBC optionally terminates with a 100 ohm resistor. Refer to table 4–7 on page 43.

Figure 4–4 shows a typical RS–485 network. Note that for 2-wire RS–485 networks the transmit and receive pairs must be connected together external to the XE–900 (TXD+ tied to RXD+, TXD– tied to RXD–).

The RTS* signal is used to control the transmitter and receiver in RS–485 mode. The RTS* signal is controlled by the Modem Control Register bit 1 (MCR[1], which is offset 0x04 from the UART base address). Writing MCR[1] to 0 (default state) sets RTS* to an inactive state (RTS* = logic high) and DISABLES the RS–485 Transmitter and ENABLES the Receiver. Writing MCR[1] to 1 sets RTS* to an active state (RTS* = logic low), and ENABLES the RS–485 Transmitter and DISABLES the RS–485 Receiver.

Figure 4–4 Typical RS–485 two–wire half duplex interface circuit



Chapter 5: Console devices

Description

The XE–900 SBC has three options for console devices. You can use a monitor and a keyboard as your console. You can use COM1 as the console, or you can run the system without a console device.

Selecting console devices

The following represent the options on the XE–900 SBC for console devices:

- A standard VGA/SVGA monitor and a keyboard.
- Serial console from COM1. A serial cable/null modem adapter plugged into a host PC running HyperTerminal (or equivalent) provides both input and output. The local keyboard also allows input but is not required.
- No console device means no video output, either from a monitor or the serial console. A local keyboard allows input but is not required.

Monitor and keyboard console

To use a monitor and keyboard as the console, you will need the following equipment (or equivalent):

- XE–900 SBC
- 2 mm VGA-12 video cable, #6392
- PS/2 style keyboard
- VGA monitor

WARNING!

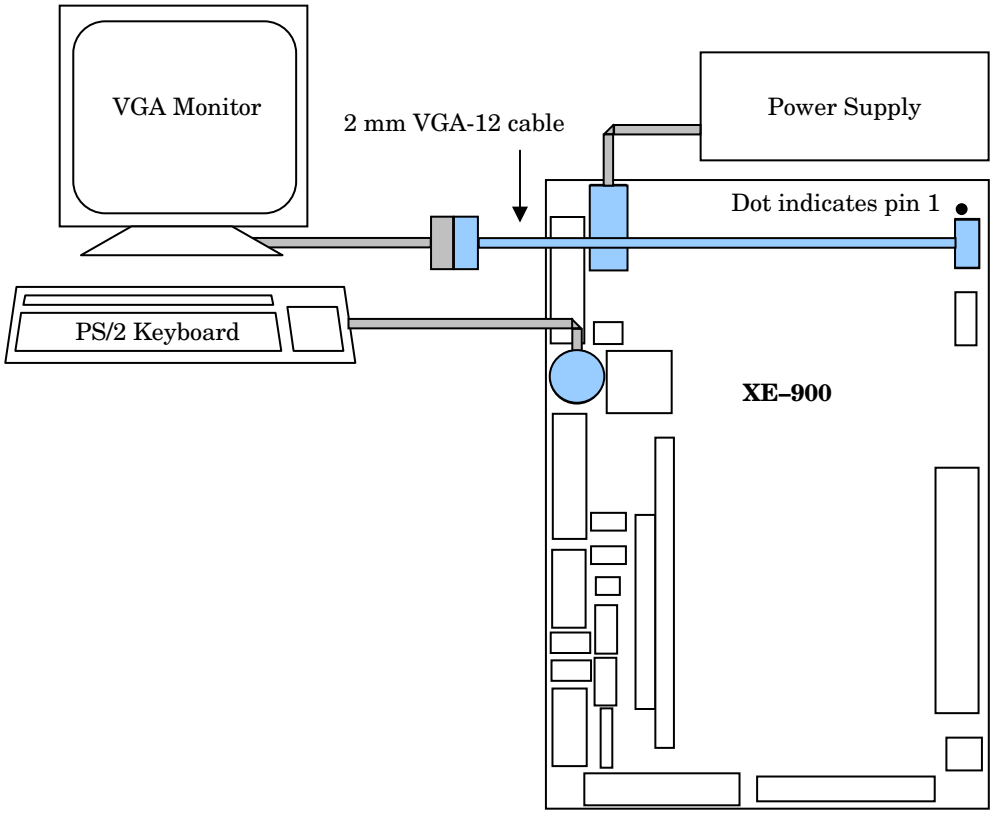
The video connector is keyed, but some connectors are not keyed and can be plugged in incorrectly. Ensure that pin 1 of the cable is connected to pin 1 of the connector (indicated by the dot). Incorrect connection could damage your equipment.

To connect a monitor and keyboard:

1. Refer to Figure 2–1 on page 18 for the location of various connectors and switches before installing the XE–900 SBC.
2. Make sure that the “V” video switch, Switch 2 position 3, is set to On.
3. Connect the VGA-12 video cable into J1.
4. Connect a VGA monitor to the VGA-12 cable, and a PS/2 style keyboard to J14.
5. If you want a mouse, use a “Y” style PS/2 adapter in J14. This allows both a mouse and a keyboard to be connected. Note that with some “Y” cables you may

have to plug the mouse into the keyboard icon, and the keyboard into the mouse icon; if the mouse and keyboard do not function at power up, try switching them.

Figure 5–1 Monitor and keyboard as console



Serial console

COM1 is used as the console device if the Console Redirection in the Features Configuration menu is set to Redirect. COM1 will also be configured as a console device if a host computer is connected to COM1 and the host keyboard sends a carriage return (Enter) during the boot process.

Note that you cannot use a serial console for a GUI interface due to the large volume of data. It can only be used with a text-based OS such as DOS.

To use COM1 as the console, you will need the following equipment (or equivalent):

- XE–900 SBC
- VTC-20F cable, #4866
- Null modem adapter, #2470 (9–pin to 9–pin)
- Host computer running HyperTerminal (or equivalent)
- Serial cable to connect XE–900 SBC COM1 to host computer serial port
- PS/2 style keyboard (optional)

Refer to Figure 2–1 on page 18 for the location of various connectors and switches before installing the XE–900 SBC.

1. Set the “V” video switch, Switch 2 position 3, to Off. An alternative way to redirect the video to a serial console is to hit the carriage return (Enter) key on the host keyboard. This will redirect the video regardless of switch settings or BIOS settings.
2. Connect a VTC-20F cable to J13 of the XE–900.
3. Connect the null modem adapter to P2 (COM1 side) of the VTC-20F cable.
4. Connect the serial cable between the null modem adapter and the serial port of the host computer.

Follow these steps to use the serial console:

5. For communication using HyperTerminal (or equivalent), the following settings must be used:

Connect using:	**Direct to COM1, COM2, COM3, or COM4** (select the port the serial cable is connected to)
Baud rate:	**115200**
Communications parameters:	**no parity, 8 data bits, 1 stop bit**
Flow control:	**none**
Terminal support:	**ANSI**
ANSI terminal option–Wrap lines that exceed terminal width:	**Yes (uncheck box)**

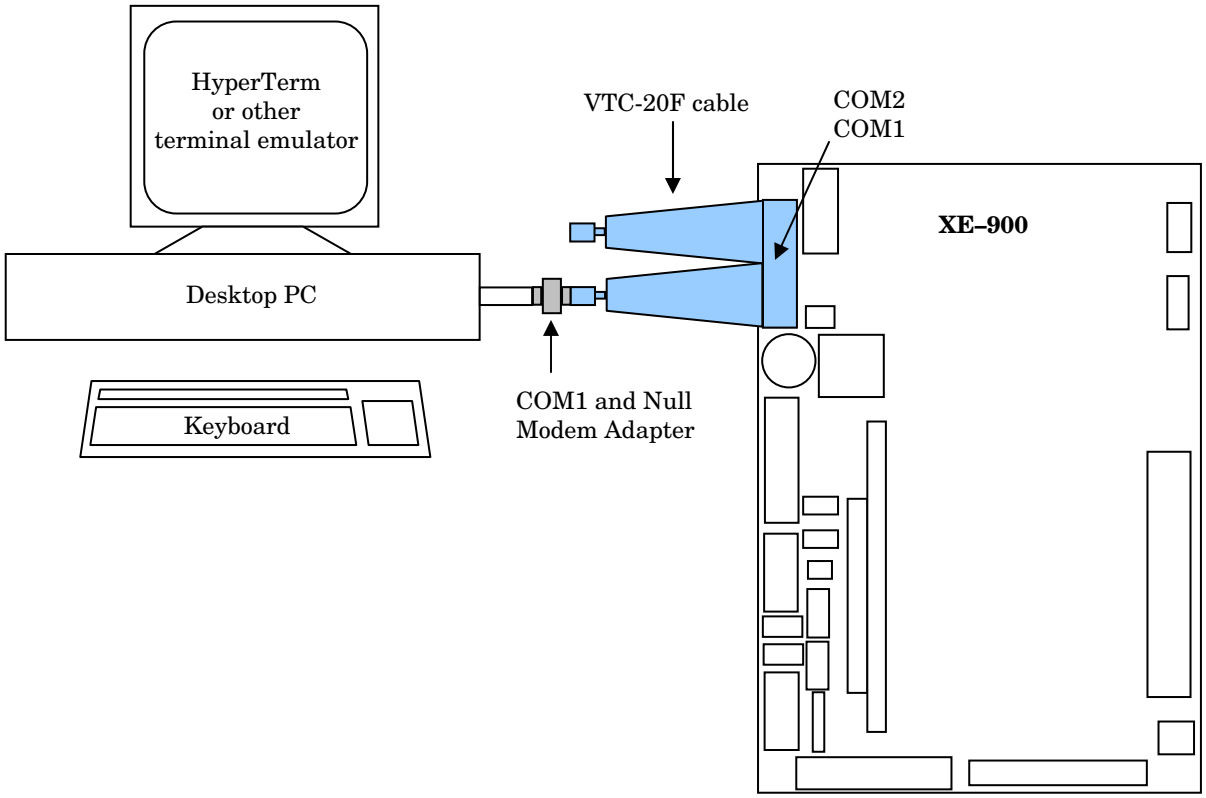
6. Start HyperTerminal. You are now ready to establish communications between the host PC and the XE–900 SBC.
7. Power on the XE–900 SBC. Console data will be redirected to COM1 and will be displayed on the host computer.
8. If you do not get the proper logon message check the HyperTerminal serial parameters of the host PC to make sure they match the settings in step 5. You might also try setting the “S” switch, Switch 2 position1, to Off to force the XE–900 SBC card to the system defaults, which includes 115200 baud rate.

Note Function keys entered on the host computer do not transmit across a serial console.

Hot key access to serial console

In some instances you might want to redirect the video to a serial console without having reconfigured Setup or setting the V switch to Off. If you have connected a serial console to COM1, pressing the Enter key on the host keyboard during the boot process will redirect video to the serial console.

Figure 5–2 The XE–900 SBC and a serial console



Chapter 6: CompactFlash, SDRAM, and battery backup

Description

The XE–900 SBC is shipped with a 512 KB socketed flash. This flash contains the BIOS.

The memory socket can accept up to 512 MB capacity PC-133 SO-DIMM modules. Refer to the SDRAM section in this chapter before installing SDRAM.

A battery backup connector is provided at J17 for an AT battery to back up the real time clock.

CompactFlash

The CompactFlash socket supports 3.3 V devices. The CompactFlash appears to the system as an IDE device. It should be automatically detected and configured as a hard drive during bootup (see "Setup configurations for CompactFlash" below.) To configure the XE–900 SBC to boot from a CompactFlash, refer to the following section "Creating a Bootable CompactFlash."

The CompactFlash socket is connected to the Primary IDE channel. This channel is configured for a Master device only. Therefore, if a CompactFlash device is installed, it will show up as a Master on the Primary IDE channel. Any additional IDE devices will show up as Secondary IDE devices.

Note Octagon Systems only recommends Industrial Grade CompactFlash (NAND technology) that implements ECC error code correction, and wear level technology.

Setup configurations for CompactFlash

Setup offers several configurations for a CompactFlash installed in IDE 0. The applicable selections are Physical, LBA, and Phoenix.

A CompactFlash that is formatted on an XE–900 SBC will be recognized at boot; however, a CompactFlash that is formatted on a host machine might not be recognized, depending on the BIOS of the host machine. If the XE–900 will not boot from a CompactFlash, change the configuration to Physical or Phoenix and reboot.

Creating a bootable CompactFlash

A CompactFlash as shipped from the factory may or may not be formatted; even if formatted, it may or may not be bootable. The following sequence shows how to create a bootable CompactFlash, and how to configure the XE–900 SBC to boot from the CompactFlash.

CAUTION

You must use an external drive such as a hard drive or CD to sys the CompactFlash. See step 5.

1. Create a bootable external device.

Note Octagon offers OS Embedders that include a CD boot disk for a variety of operating systems. Contact your Octagon representative for additional information.

2. Change the boot sequence in BIOS Setup so the XE–900 SBC boots from the external drive first. Designate the CompactFlash as drive C:. Reboot from the external device.
3. Use the appropriate commands/utility to create partitions on the CompactFlash. Refer to your operating system manual for the appropriate parameters. You might also have to refresh the MBR (Master Boot Record).
4. Reboot, using the external device.
5. Format the CompactFlash. Follow the on-screen instructions for your operating system to format the CompactFlash.
6. Copy your operating system from the external device to the CompactFlash.
7. Change the boot sequence in Setup so that the CompactFlash (hard drive) is first. Power off the XE–900 SBC and remove the external device.
8. Reboot.

SDRAM

The memory socket can accept up to 256 MB capacity SO-DIMM modules using PC100 or PC133 memory sticks. Some low-power 512 MB SO–DIMM modules are also supported. Contact Octagon Systems for compatibility before using 512 MB modules. Use of incorrect 512 MB SO–DIMM modules may cause improper operation or damage to the XE–900.

Battery backup for real time calendar clock

An AT battery can be installed to back up the CMOS real time clock. The battery can be installed J17.

Installing an AT battery

1. Power off the XE–900 SBC.
2. Install the 3.6V AT clock battery at J17.

Table 6–1 Battery connector

J17 – battery connector	
Pin #	**Pin Name**
1	Battery +
2	Key
3	nc
4	Battery –

Note See Appendix A: Mating connectors for mating information on the battery connector.

Chapter 7: External drives

Description

The XE–900 SBC is compatible with any standard IDE hard drive that has a 16-bit IDE interface. This includes CD-ROMs, CompactFlashes, and other IDE-compatible drives. The BIOS supports all IDE devices so no additional software is needed.

UltraDMA modes are not supported directly by the XE–900. These modes require an 80-pin connector, and there is no adapter available for the 44-pin, 2mm IDE connector used on the XE–900.

Note **The BIOS supports three IDE devices (which includes a CompactFlash).**

Setup configurations for hard drives

Setup offers several configurations for a hard drive. The applicable selections are Physical, LBA, and Phoenix.

A hard drive that is formatted on an XE–900 SBC will be recognized at boot; however, a hard drive that is formatted on a host machine might not be recognized, depending on the BIOS of the host machine. If the XE–900 will not boot from a hard drive, change the configuration to Physical or Phoenix and reboot.

A hard drive that will be used as a boot device should be designated as drive C:, both when it is loaded with an OS and when it is used to boot.

Hard disk controller

The XE–900 SBC supports three 16-bit IDE devices. Since the CompactFlash is connected to the primary IDE channel with a dedicated IDE controller, additional IDE devices connected through J4 will be secondary IDE devices (master and slave).

Standard IDE devices such as hard drives and CD-ROM drives are interfaced via a 44-pin connector at J4. For those IDE devices that use a 40-pin interface, use the Octagon Systems IDE cable, #4080 or #6246.

IDE combinations:

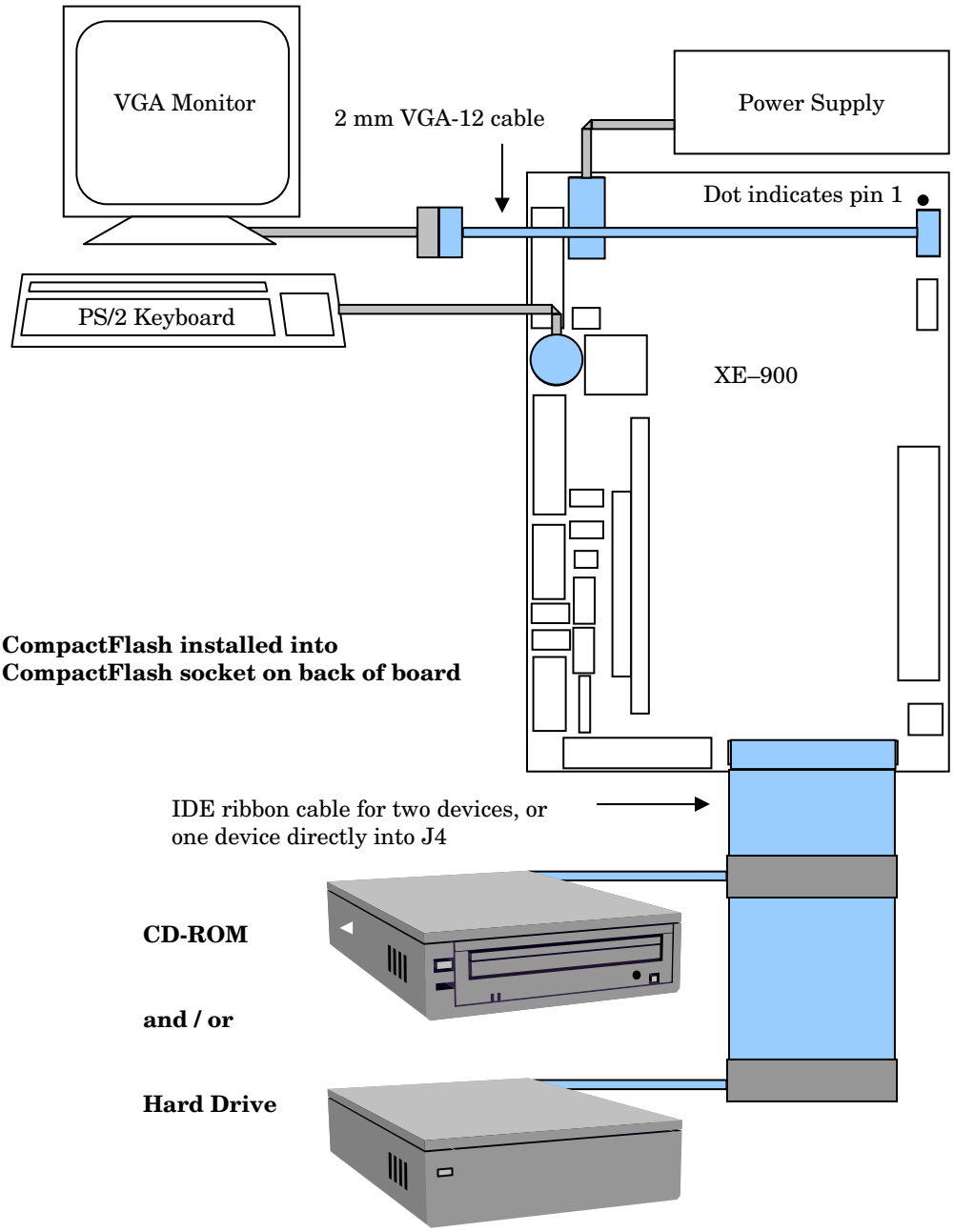
- 2 hard drives
- 1 hard drive and 1 CD-ROM drive
- CompactFlash and either of the above combinations

Master/slave designation for IDE devices

IDE devices have a jumper or a switch that designates whether the device is a master or a slave device. If only one device is connected to a channel, it must be

configured as a master. If two devices are connected, one must be configured as a master and one as a slave. The XE–900 does not use the CS signal (Cable Select) to designate master or slave on a multi-connector cable. You can use BIOS Setup to designate either the master or the slave as a boot device.

Figure 7–1 XE–900 SBC with IDE device



Installing a hard drive

1. Disconnect power to the XE–900 SBC.
2. Insert one end of the hard drive cable into the back of the hard drive. Make sure pin 1 on the cable is connected to pin 1 of the drive.
3. Insert the other end of the cable into J4.
4. If you are connecting two IDE devices, ensure that one of them is configured as a master and one is configured as a slave (see page 117). If connecting one IDE device, ensure that it is configured as a master. The BIOS will not be able to detect an IDE device that is configured as a slave unless a master device is also installed.
5. Execute the BIOS Setup program to configure your system for a hard drive. You can execute this program by pressing “Delete” during system bootup. The system steps you through the configuration. Also, refer to the Setup programs chapter for more information on the BIOS Setup program.
6. If you want to boot the system from the hard drive, you need to format the drive accordingly, and change the boot order in Setup. You will also need to designate it as drive C:, both while you are loading the OS onto it and when you are using it to boot.

Chapter 8: Bit-programmable digital I/O

Description

The bit-programmable digital I/O lines can be used to sense switch closures, turn on lamps and LEDs, and interface with other devices that have TTL input or output such as printers and scales. The digital I/O lines drive the Octagon MPB series opto-isolation module racks directly, controlling AC and DC loads to 240V at 3A. Tables 8–1 and 8–2 show the pinout for the digital I/O connector, arranged by function and by pin number. Figure 8–1 shows typical I/O configurations.

The I/O lines have the following specifications:

- Each I/O chip has 24 I/O lines, grouped into 3 ports of 8 bits
- Each bit is programmable as either 5V input or 5V output
- Read back state of each pin
- Easy-to-program
- Each line can sink and source 15 mA

Table 8–1 J6 arranged by function – digital I/O connector

J6 Digital I/O					
Pin #	**Port A**	**Pin #**	**Port B**	**Pin #**	**Port C**
19	Bit 0	10	Bit 0	13	Bit 0
21	Bit 1	8	Bit 1	16	Bit 1
23	Bit 2	4	Bit 2	15	Bit 2
25	Bit 3	6	Bit 3	17	Bit 3
24	Bit 4	1	Bit 4	14	Bit 4
22	Bit 5	3	Bit 5	11	Bit 5
20	Bit 6	5	Bit 6	12	Bit 6
18	Bit 7	7	Bit 7	9	Bit 7
				2	+5V safe*
				26	Gnd

* +5V safe is fused through a 750 mA automatic, resetting fuse

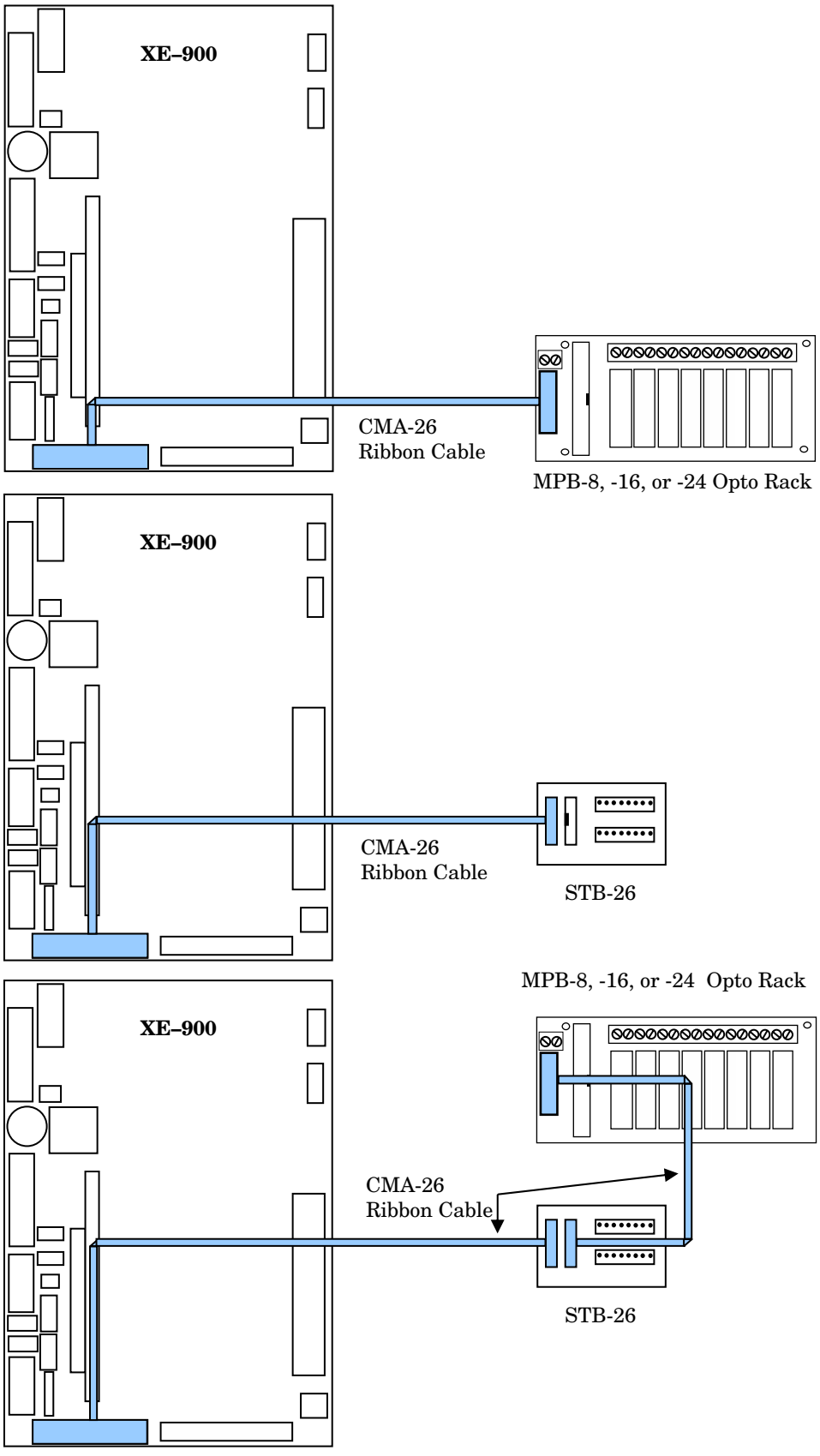
Note See the Accessories appendix for connector information for the digital I/O connector.

Table 8–2 J6 arranged by pins – digital I/O connector

J6 Digital I/O			
Pin #	**Pin Name**	**Pin Name**	**Pin #**
1	Port B, bit 4	Vcc (+5V)*	2
3	Port B, bit 5	Port B, bit 2	4
5	Port B, bit 6	Port B, bit 3	6
7	Port B, bit 7	Port B, bit 1	8
9	Port C, bit 7	Port B, bit 0	10
11	Port C, bit 5	Port C, bit 6	12
13	Port C, bit 0	Port C, bit 4	14
15	Port C, bit 2	Port C, bit 1	16
17	Port C, bit 3	Port A, bit 7	18
19	Port A, bit 0	Port A, bit 6	20
21	Port A, bit 1	Port A, bit 5	22
23	Port A, bit 2	Port A, bit 4	24
25	Port A, bit 3	Gnd	26

* +5V safe is fused through a 750 mA automatic, resetting fuse

Figure 8–1 Typical digital I/O configuration



Interfacing to switches and other devices

The STB-26 terminal board provides a convenient way of interfacing switches or other digital I/O devices to the I/O ports. I/O lines at the connector can be connected to an STB-26 with a CMA-26 cable. Parallel I/O devices are then connected to the screw terminals on the STB-26. The illustration on page 58 shows an STB-26 terminal board connected to the digital I/O. Refer to the STB-26 product sheet for more information.

Opto-module rack interface

You can interface digital I/O lines to an 8-, 16-, or 24-position opto-module rack. One end of the CMA-26 cable plugs into the I/O connector and the other plugs into an MPB–8, MPB–16, or an MPB–24 opto rack. Refer to the *MPB opto racks data sheet* for more information.

You can also use a CMA–26 cable to connect the I/O port to an STB–26 terminal board and then to the opto rack. The STB–26 has two 26-pin connectors, one of which connects to the I/O port, the other which connects to the opto rack. The illustration on page 58 shows both of these configurations.

For either configuration, run a separate power line to +5V and ground on the opto-rack.

Use the following table to determine the corresponding opto-channel position for ports A, B, and C.

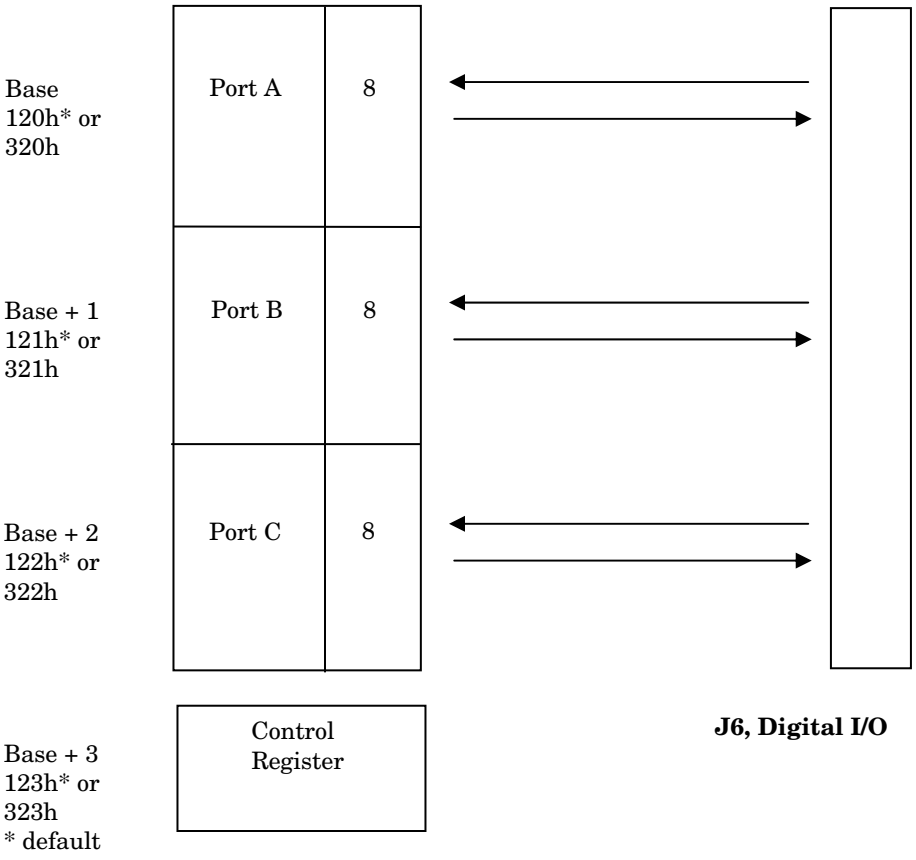
Table 8–3 Digital I/O opto-rack interface

Digital I/O opto-rack interface			
MPB opto rack		**I/O port**	**Connector pin**
Opto-module position		**Port C**	
0		Bit 0	13
1		Bit 1	16
2		Bit 2	15
3	**MPB-08**	Bit 3	17
4		Bit 4	14
5		Bit 5	11
6		Bit 6	12
7		Bit 7	9
		Port A	
8		Bit 0	19
9		Bit 1	21
10		Bit 2	23
11	**MPB-16**	Bit 3	25
12		Bit 4	24
13		Bit 5	22
14		Bit 6	20
15		Bit 7	18
		Port B	
16		Bit 0	10
17		Bit 1	8
18		Bit 2	4
19	**MPB-24**	Bit 3	6
20		Bit 4	1
21		Bit 5	3
22		Bit 6	5
23		Bit 7	7

Organization of banks

The I/O digital bank has a total of 24 I/O lines connected to a 26-pin header. The lines are configured into three groups: ports A, B and C, each group consisting of 8 bits. Any of the lines at ports A, B or C can be configured individually as inputs or outputs.

Figure 8–2 Organization of banks



Port addressing

Ports A, B, C and the control register are addressable. The base I/O address is selectable in Setup as either 120h or 320h (120h default). Ports A, B, C and the control register are addressable, with reference to the base address.

I/O lines pulled low

The I/O lines at ports A, B, and C are always pulled low. This allows a known state upon powerup. 10K ohm resistor networks are used to configure the I/O lines as low.

Configuring and programming the I/O port

The I/O chip has three ports with eight parallel I/O lines (bits) per port. All lines can be programmed as all inputs, all outputs or individually as inputs or outputs. You can alter which bits are inputs or outputs by writing a control command to the control register of the I/O bank. When a line is configured as an output, it can sink a maximum of 15 mA at 0.4V or can source 15 mA at 2.4V. On powerup and software or hardware reset, all digital I/O lines are reset as inputs.

Programming the I/O

Follow these steps to program the I/O chip:

1. Configure the I/O port bit directions, either as inputs or outputs.
2. Write to port A, B, or C with the desired level or read the bit level from the desired port.

Configuring the I/O

Follow these steps to configure the I/O chip.

Note In the following examples, "base" for I/O always refers to the base address as 120h. For a base of 320h change the numbers accordingly.

1. Write a "2" to the control register (base address + 3). This places the I/O chip in "direction" mode: (base address = 120h)

```
OUT 123h, 2  (control register, direction mode)
```

2. Set the direction of each bit. A "0" written to the corresponding line indicates an input and a "1" bit indicates an output. Each bit corresponds to the equivalent I/O line.

Table 8–4 I/O port byte

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Port I/O Line
X								7
	X							6
		X						5
			X					4
				X				3
					X			2
						X		1
							X	0

For example, writing 00011100 to port C (base address + 2) will configure port C I/O lines 0, 1, 5, 6, and 7 to be inputs and lines 2, 3, and 4 to be outputs:

```
OUT 122h, 1Ch (00011100 binary = 1C hexadecimal)
```

3. Write a "1" to the control register (base register + 3). This places the I/O chip into "preset" mode:

```
OUT 123h, 1   (control register, preset mode)
```

4. Write a bit pattern to appear at the outputs of the desired I/O port when the I/O chip is put in “operation” mode; all input bits are unaffected.

5. Write a “3” to the control register (base register + 3). This places the I/O chip back into “operation” mode:

```
OUT 123h, 3   (control register)
```

Writing and reading from I/O

Writing to or reading from the desired I/O port is accomplished with single program statements:

1. To write a bit pattern to the desired I/O port:

```
OUT 122h, FFh
```

All output bits of port C go high; all input bits are unaffected.

2. To read a bit pattern from the desired I/O port:

```
PORTC = INP(122h)
```

The byte read from port C is assigned to variable PORTC.

I/O output program examples

To configure ports A, B, and C as all outputs, issue the commands:

```
OUT 123h, 2   ‘Direction’ Mode

OUT 120h, FFh‘PortA’

OUT 121h, FFh‘PortB’

OUT 122h, FFh‘PortC’

OUT 123h, 3   ‘Operation’ Mode
```

Ports A, B, and C will now output all “1”s after issuing the following commands:

```
OUT 120h, FFh (portA)

OUT 121h, FFh (portB)

OUT 122h, FFh (portC)
```

or all “0”s after:

```
OUT 120h, 0 (portA)

OUT 121h, 0 (portB)

OUT 122h, 0 (portC)
```

I/O input program examples

To configure ports A and C as inputs and port B as outputs, issue the following commands:

```
OUT 123h, 2   'Direction Mode'

OUT 120h, 0

OUT 121h, FF

OUT 122h, 0

OUT 123h, 3   'Operation Mode'
```

To read ports A and C, issue the following commands:

```
PORTA = INP(120h)   (port A)

PORTC = INP(122h)   (port C)
```

Enhanced INT 17h function definitions

This section provides definitions for the following functions using the INT17 handler, XE900I17.EXE: Initialize I/O, Write I/O, and Read I/O.

XE900I17.EXE is a TSR program that is an XE–900 SBC BIOS extension. Once executed, the TSR is active, but it must be executed each time the system is rebooted. Copy the XE900I17.EXE utility to your boot device and add it to your AUTOEXEC.BAT.

Note The INT17 functions can only be used with DOS operating systems. If you use a different operating system, the INT17 functionality can still be used by your application but must be integrated into your software.

Initialize I/O

```
Function:            efh
Subfunction:         00h
Purpose:             To set the directions and to program the
                     initial values of an I/O port.
Calling registers:   Ah     efh
                     AL     00h
                     DI     Port A configuration
                            Initial Data  Direction Mask
                            xxxxxxxx      xxxxxxxxB
                            direction: 1=output, 0=input
                     BX     Port B configuration
                            Initial Data  Direction Mask
                            xxxxxxxx      xxxxxxxxB
                            direction: 1=output, 0=input 0->input
                     CX     Port C configuration
                            Initial Data  Direction Mask
                            xxxxxxxx      xxxxxxxxB
                            direction: 1=output, 0=input
                     DX     ffffh
```

```
Return registers:    Carry flag cleared if successful
                     Carry flag set if error
                     AL     Error code
Comments:            This function is used to initialize the
                     I/O before normal use.
```

Programming example:

```
/* Inline assembly code for Borland C++ 3.1 */
asm {
            mov   ax,0ef00h
            mov   di,00ffh      /*port A all outputs,
                                   init data=all 0's */
            mov   bx,55ffh      /*port B all outputs,
                                   init data=55h*/
            mov   cx,0000h      /*port C all inputs*
            mov   dx,0ffffh
            int   17h
      }
```

Write I/O

```
Function:            efh
Subfunction:         01h
Purpose:             To write a value to an I/O port.
Calling registers:   AH     efh
                     AL     01h
                     DI     Port A mask and data
                            Mask    Data
                            xxxxxxxx   xxxxxxxxB
                            Mask: 1=bit to be changed
                     BX     Port B mask and data
                            Mask    Data
                            xxxxxxxx   xxxxxxxxB
                            Mask: 1=bit to be changed
                     CX     Port C mask and data
                            Mask    Data
                            xxxxxxxx   xxxxxxxxB
                            Mask: 1=bit to be changed
                     DX     ffffh
Return registers:    Carry flag cleared if successful
                     Carry flag set if error
                     AL     Error code
Comments:            This function is used to initialize the
                     I/O.
```

Programming example:

```
/* Inline assembly code for Borland C++ 3.1 */
asm {
            mov   ax,0ef01h
            mov   di,00ffh   /*port A: no change */
            mov   bx,8000h   /*port B: bit 7 set to 0*/
            mov   cx,0202h   /*port C: bit 1 set to 0*/
            mov   dx,0ffffh
            int   17h
     }
```

Read I/O

```
Function:            efh
Subfunction:         02h
Purpose:             To read from an I/O port.
Calling registers:   AH     efh
                     AL     02h
                     DX     ffffh
Return registers:    AL     Port A data
                     Ah     Port B data
                     BL     Port C data
Carry flag cleared if successful
Carry flag set if error
                     AL     Error code
Comments:            This function is used to read from the
                     I/O.
```

Programming example:

```
/* Inline assembly code for Borland C++ 3.1 */
asm {
            mov    ax,0efoch
            mov    dx,0ffffh
            int    17h
            mov    aData,al
            mov    bData,ah
            mov    cData,bl
      }
```

Chapter 9: CRTs and LVDS flat panels

Description

The video system on the XE–900 SBC is implemented with the VT8606 North Bridge. It supports CRTs and LVDS flat panel displays. Displays from CGA through XVGA are supported. The XE–900 SBC supports 3V and 5V LVDS flat panel displays through the connector.

Standard VGA monitors with analog inputs are connected using a 2 mm VGA–12 cable (p/n 6392) connected to J1. LVDS flat panel displays are connected using a 20-pin connector. Octagon has a custom cable for LVDS, with a connector and 20 flying leads (Octagon #6772.)

Note EL panels, and some quarter VGA panels are not supported. Call Technical Support for information.

Video features

Below is a list of standard video features installed on the XE–900 SBC:

- CRT support with resolutions to 1920 x 1440 x 24
- LVDS flat panel support with the programmable resolutions

Connecting a monitor

To use a monitor, the Video switch, Switch 2 position 3 must be set to On, and CRT Analog Output (in the Custom Configuration menu) must be enabled. These are the default configurations. The 10-pin connector at J1 supports all analog CRT color or monochrome monitors. The 2 mm VGA–12 cable connects to J1 and provides a DB–15 video mating connector for a CRT. Refer to figure 9–1 for a diagram of connecting a CRT, and table 9–1 for the pinout for J1.

Note Switch 3, position 2 enables and disables LVDS output. If LVDS is enabled, the software will not be able to change the resolution of a CRT. The default position for LVDS is disabled.

To connect a monitor you will need the following equipment (or equivalent):

- XE–900 SBC
- 2 mm VGA-12 cable, p/n 6392
- VGA monitor

To connect a monitor:

1. Ensure that the Video switch, Switch 2 position 3 is set to On, and that CRT Analog Output (in the Custom Configuration menu) is enabled. If you have previously disabled CRT Analog Output, you can set the S switch, Switch 2 position 1, to Off and restore Setup defaults.

2. Plug the VGA–12 adapter cable into J1 on the XE–900 SBC.

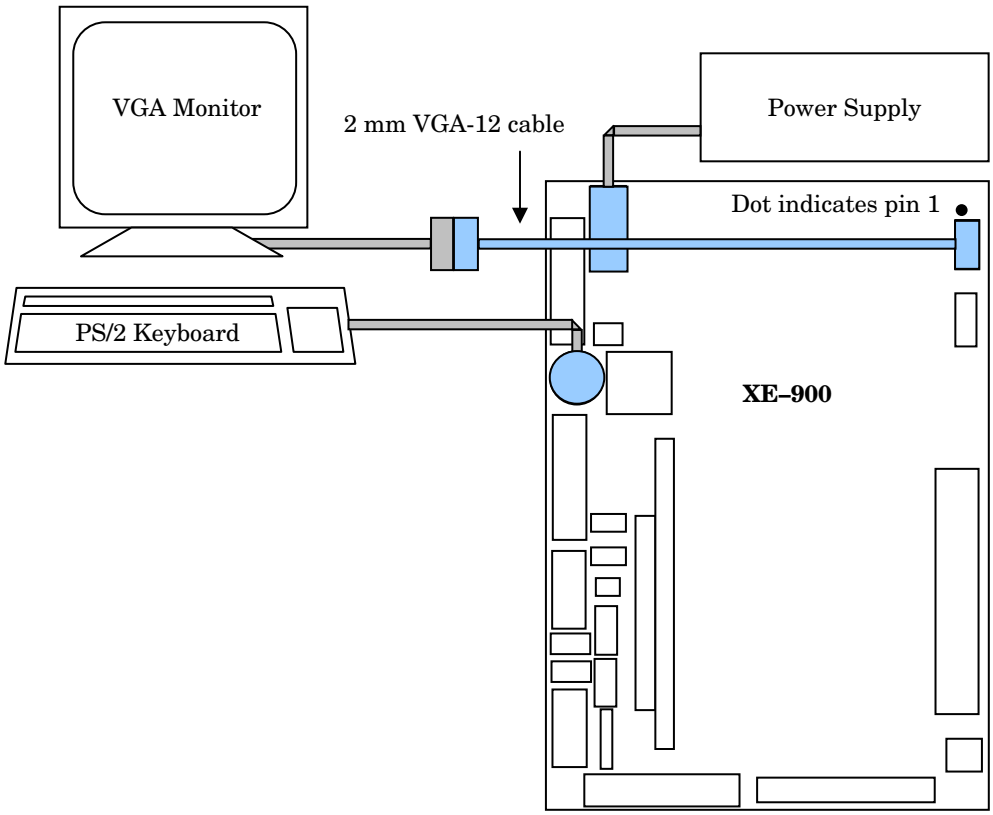
3. Plug the DB–15 end of the VGA–12 cable into the VGA cable of the monitor.

Refer to Figure 9–1.

Table 9–1 J1 – CRT connector

J1, CRT Connector			
Pin #	**Pin Name**	**Pin Name**	**Pin #**
1	RD	GR	2
3	BL	GND	4
5	+5V	GND	6
7	HSYNCOUT	DDC SDA	8
9	DDC SCL	VSYNCOUT	10

Figure 9–1 The XE–900 SBC and a VGA monitor



Connecting an LVDS flat panel display

Switch 3 selects the drivers for the supported LVDS flat panel resolutions. Table 9–2 shows the switch settings for the supported panels. Position 1 must remain On. Position 2 enables or disables the LVDS support. If you are not using an LVDS flat panel leave this switch in the On position (disabled) to free up system resources. Also, if LVDS is enabled and you are using a CRT, the software will not be able to change the resolution of the CRT.

Table 9–2 LVDS flat panel switch, Switch 3

Switch 3 - LVDS Flat Panels				
Position 1 - On (Factory use only)				This switch must remain On*
Position 2 - On				LVDS flat panel disabled*
Position 2 - Off				LVDS flat panel enabled
Position3	Position 4	Position 5	Position 6	
On	On	On	On	Reserved*
On	On	On	Off	640 x 480 x 18
On	On	Off	On	Reserved
On	On	Off	Off	1280 x 1024 x 18
On	Off	On	On	Reserved
On	Off	On	Off	Reserved
On	Off	Off	On	1600 x 1200 x 18 (2 pixels/clock)
On	Off	Off	Off	Reserved
Off	On	On	On	800 x 600 x 18
Off	On	On	Off	Reserved
Off	On	Off	On	Reserved
Off	On	Off	Off	Reserved
Off	Off	On	On	Reserved
Off	Off	On	Off	Reserved
Off	Off	Off	On	1024 x 768 x 18
Off	Off	Off	Off	Reserved

*default. Note position 2 must be set to Off to enable.

Connecting the LVDS flat panel to the XE–900 SBC

Octagon has a custom cable for LVDS, with a connector and 20 flying leads (Octagon #6772.) Table 9–3 shows the pinout for the flat panel connector. Construct a custom cable that routes the signals to the appropriate pins for your LVDS flat panel. To connect a flat panel:

1. Ensure that the Video switch, Switch 2 position 3 is set to On, and that CRT Analog Output (in the Custom Configuration menu) is disabled.
2. Ensure that the LVDS switches, Switch 3 positions 2 through 6, are properly set for your resolution.
3. Connect your custom cable from the flat panel to the flat panel connector. Refer to Figure 9–2.

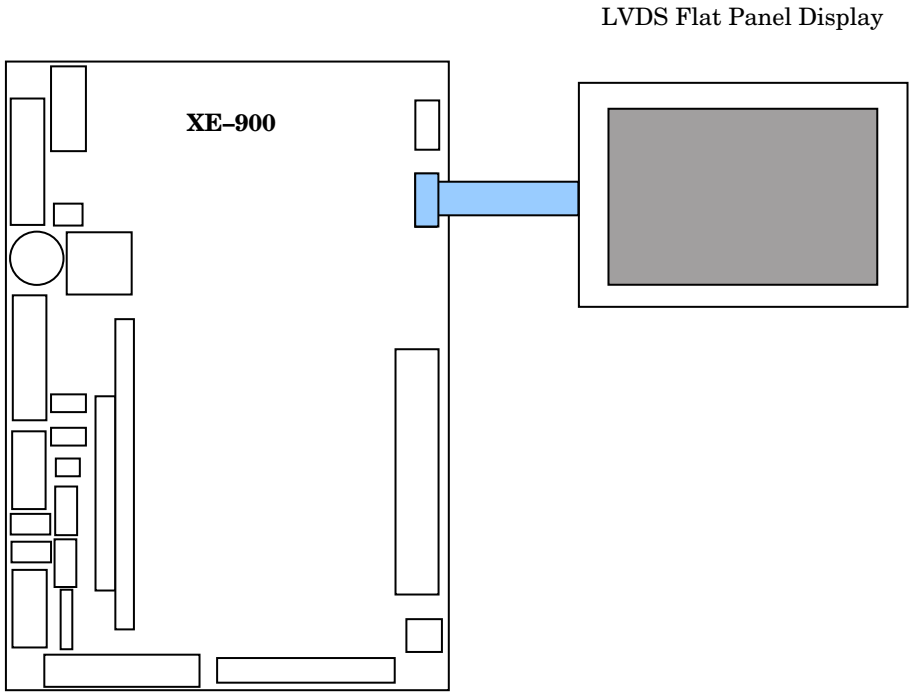
Warning

Improper wiring or connection from the flat panel to the XE–900 SBC can damage the XE–900 SBC and the flat panel. Verify the flat panel cable connections before connecting the cable to the XE–900 SBC and applying power to the system.

Table 9–3 LVDS flat panel connector: J2

J2 – LVDS flat panel connector			
Pin #	**Pin Name**	**Pin Name**	**Pin #**
1	3V	5V	2
3	GND	GND	4
5	Y0M	Y0P	6
7	Y1M	Y1P	8
9	Y2M	Y2P	10
11	YCM	YCP	12
13	Z0M	Z0P	14
15	Z1M	Z1P	16
17	Z2M	Z2P	18
19	ZCM	ZCP	20

Figure 9–2 The XE–900 SBC and a flat panel display



Chapter 10: Ethernet

Description

The XE–900 SBC provides a 10/100BaseT Ethernet port and supports the IEEE 802.3 Ethernet standard. The XE–900 SBC uses the Intel 82551ER Ethernet chip. This chip is fully Plug-N-Play compatible.

The Ethernet controller IC chip provides the following:

- 8K x 16 SRAM buffer
- Integrated 10/100 BaseT transceiver interface
- Two LEDs for link and traffic status integrated into connector

The XE–900 SBC Ethernet uses twisted–pair wiring cable. The interface terminates at the standard, 8–position, RJ–45 latching jack.

CAUTION

Use a strain relief loop when connecting to the XE–900 SBC Ethernet connector to avoid damaging the connector.

The Ethernet port uses IRQ11.

For more information on programming the Ethernet port, see the README file in the Ethernet directory of the XE–900 utilities. See page 115 for downloading the utilities.

Table 10–1 Ethernet LEDs

Ethernet LEDs		
Function	**Color**	**Description**
Activity LED	Amber	Activated by access to I/O space
Link LED	Green	Activated by network link

Chapter 11: PC/104 and PC/104-Plus expansion

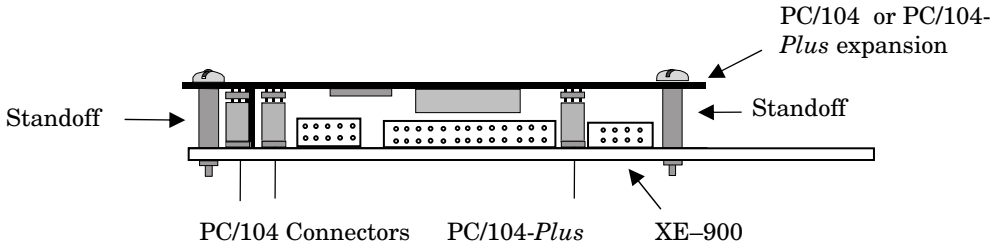
Description

The PC/104 and PC/104-*Plus* connectors allow you to interface expansion modules such as A/D converters, CardBus, digital I/O, serial ports, etc. Modules can be stacked to form a highly integrated control system. The PC/104-*Plus* expansion bus supports mastering devices.

Note The actual maximum number of modules in a stack is limited primarily to the capacitive loading on the bus and the electrical noise environment. This is especially true when wide temperature operation is required. Good design practice dictates that the modules present only one load to each bus signal. Unfortunately, there are modules on the market that violate this practice by loading the bus more heavily. Typically, it is the IOW*, IOR*, MEMW*, and RSTDRV* lines. For example, if the IOW* line is routed to four ICs on the module without a buffer, then the loading is equivalent to four PC/104 modules. Stacks with three or more expansion modules should be carefully tested under all environmental conditions. If possible, query the manufacture of the expansion module regarding loading. All Octagon products present one load.

The situation is even more critical for the PC/104-*Plus* connector since the bus speed is four times faster. The PC/104-*Plus* connector and the PC/104-*Plus* module represent one load each. Adding more than one PC/104-*Plus* module (two loads) should trigger the same testing as discussed in the previous paragraph.

Figure 11–1 Typical PC/104 module stack



WARNING!

When installing any PC/104 or PC/104-*Plus* module, avoid excessively flexing the XE–900 SBC. Mate pins correctly and use the required mounting hardware.

Note See *Appendix A - Connectors* for mating information.

Chapter 12: USB

Description

Universal Serial Bus (USB) is a hardware interface for peripherals such as the keyboard, mouse, joystick, scanner, printer, and telephony devices. USB 1.1 has a maximum transfer rate of 12 Mbits/sec. Peripherals can be plugged in and unplugged while power is applied to the system (see Caution below). The XE–900 SBC contains two USB 1.1 compliant ports.

The USB ports are accessed via a 10-pin, 0.1" pitch connector at J19 (USB 1 and 2).

Octagon provides a cable that routes the J19 signals to standard USB connectors (Octagon p/n 6288). This cable consists of two five-pin connectors that mate with the J19 connector on one end, and two USB connectors at the other end. Ensure that the arrow on the five-pin connectors is matched to the pin 1 end of J19. Any USB device can then plug into either USB interface on the USB adapter cable, or into a multi-port hub that then plugs into the USB adapter cable.

An operating system capable of utilizing the USB ports and USB devices is required for USB operation.

Caution

USB devices are hot-swappable when a device is plugged into a standard USB connector, as pins on the connectors determine the order in which they make contact. Devices are not hot-swappable when connected to a non-standard header (J19). You can hot swap a device through the USB Adapter cable connected to J19, or through another USB connector wired to the 10-pin header, but you cannot hot swap at the 10-pin header itself.

Overview: Section 3 – System management

Section 3 provides information on managing the XE–900 SBC in the areas of internal control and troubleshooting. The following chapters are included:

Chapter 13: Watchdog timer and hardware reset

Chapter 14: Serial EEPROM

Chapter 15: System switches, user switches, BIOS update, system functions, CPU fan, Integrated Conductive Cooling System (ICCS), temperature sensors, power management and LEDs

Chapter 16: Troubleshooting

Chapter 13: Watchdog timer and hardware reset

Description

The watchdog timer is a fail-safe against program crashes or processor lockups. It has programmable timeout periods of 1, 10 and 60 seconds. The watchdog timer can be enabled or disabled in Setup. INT17 software calls (a DOS TSR) or an operating system driver can be used to enable and set the timeout, strobe, and disable the watchdog timer from your application. If the timer expires, it performs a hardware reset.

Booting, power down, and strobing the watchdog timer

When the watchdog is enabled in Setup, it sets the timeout period for 60 seconds. The BIOS will strobe the watchdog during the boot process and once more just before booting is finished. The user's application must then begin strobing. The watchdog will continue until it is disabled or power down occurs.

If the watchdog is enabled in Setup and your operating system cannot load up before the timer expires, your system could reset. Also, if you do not disable the watchdog and your strobing application ends before power down you could again reset. If these watchdog situations should occur, set the "S" switch, Switch1 position 1, to Off and reboot. This causes the XE–900 SBC to boot using Setup defaults (watchdog disabled). Enter Setup, then change and save the watchdog settings in Setup.

Watchdog function definitions using enhanced INT 17h handler

This section provides definitions for the watchdog functions using the INT17 handler, XE900I17.EXE. XE900I17.EXE is a TSR program. Once executed it is active, but it must be executed each time the system is rebooted. Copy the XE900I17.EXE utility to your hard drive and add it to your AUTOEXEC.BAT.

The INT17 handler is designed for DOS based applications. If you use a different operating system and the watchdog functions are required for your application, you must supply drivers to access the watchdog. OS Development Kits are available from Octagon for Linux, QNX, and Windows CE.net that have watchdog drivers for these operating systems. Contact Octagon Systems for more information.

Enable watchdog

Function:	fdh
Subfunction:	01h
Purpose:	To enable the watchdog.
Calling registers:	AH fdh
	AL 01h
	BX timeout (0=1 second, 1=10 seconds, 2=60 seconds)
	DX ffffh
Return registers:	None
Comments:	This function enables the watchdog. Once the watchdog is enabled, it has to be strobed at a period greater than the timeout period specified or until the watchdog is disabled. Otherwise, a system reset will occur.

Programming example:

```
/* Inline assembly code for Borland C++ 3.1 */
/* set watchdog to 10 second timeout */
  asm {
            mov ax,0fd01h
            mov bx,1
            mov dx,0ffffh
            int 17h
        }
```

Strobe watchdog

Function:	fdh
Subfunction:	02h
Purpose:	To strobe the watchdog.
Calling registers:	AH fdh
	AL 02h
	DX ffffh
Return registers:	None
Comments:	This function strobes the watchdog. Once the watchdog is enabled, it has to be strobed at a period greater than the timeout period or until the watchdog is disabled. Otherwise, a system reset will occur.

Programming example:

```
/* Inline assembly code for Borland C++ 3.1 */
  asm {
            mov ax,0fd02h
            mov dx,0ffffh
            int 17h
        }
```

Disable watchdog

Function:	fdh
Subfunction:	03h
Purpose:	To disable the watchdog.
Calling registers:	AH fdh
	AL 03h
	DX ffffh
Return registers:	None
Comments:	This function disables the watchdog. Once the watchdog is enabled, it has to be strobed at a period greater than the timeout period or until the watchdog is disabled. Otherwise, a system reset will occur.

Programming example:

```
/* Inline assembly code for Borland C++ 3.1 */
  asm {
              mov ax,0fd03h
              mov dx,0ffffh
              int 17h
        }
```

Hardware reset

The reset switch (Switch SW1) allows you to reset the system without turning off the power. This provides a more complete reset than the <CTRL><ALT><DEL> method. Depressing this button pulls the circuit to ground and resets the system.

The RESET command accomplishes the same thing as the reset button. Refer to the component diagram in the Quick start chapter for the location of the reset switch, and to *Appendix B, Software utilities*, for information on the Reset utility.

WARNING!

When using COM1 as the console, the <CTRL><ALT> <DEL> commands on the host system keyboard only reset the host system. Use the RESET command to issue a hardware reset on the XE–900 SBC.

Chapter 14: Serial EEPROM

Description

A 1024-byte serial EEPROM is available to the user. The serial EEPROM does not require battery backup to maintain the data when the system power is off. The serial EEPROM is easily accessible via software interrupts by most programming languages.

Enhanced INT 17h function definitions

The serial EEPROM definitions include the following functions: Read a single word from serial EEPROM, Write a single word to serial EEPROM, Read multiple words from serial EEPROM, Write multiple words to serial EEPROM, and Return serial EEPROM size.

The XE900I17 program must be loaded to access the serial EEPROM. When XE900I17 is loaded, the following functions can be used.

Serial EEPROM

Read a single word from the serial EEPROM

```
Function:            fch
Subfunction:         00h
Purpose:             To read a single word from the on-board serial
                     EEPROM.
Calling registers:   AH     fch
                     AL     00h
                     BX     Word address (zero based)
                     DX     ffffh (User area relative address)
Return registers:    Carry flag cleared if successful
                     AX     Word read
                     Carry flag set if error
                     AL     Error code
                Error code  Meaning
                     ffh    Unknown error
                     01h    Function not implemented
                     02h    Defective serial EEPROM
                     03h    Illegal access
Comments:            This function reads a word from the user area of
                     the serial EEPROM.
```

Programming example:

```
/* Read word 2*/
unsigned int seeData;
/* Inline assembly code for Borland C++ 3.1*/
asm {
     mov ax,0fc00h
     mov bx,02h /* Read word 2*/
     mov dx,0ffffh
```

```
    int 17h
    mov seeData,ax/* store data in c environment */
  }
```

Write a single word to the serial EEPROM

Function:	fch
Subfunction:	01h
Purpose:	To write a single word to the on-board serial EEPROM.
Calling registers:	AH fch
	AL 01h
	BX Word address (zero based)
	CX Data word to write
	DX ffffh (User area relative address)
Return registers:	Carry flag cleared if successful
	Carry flag set if error
	AL Error code

Error code	**Meaning**
ffh	Unknown error
01h	Function not implemented
02h	Defective serial EEPROM
03h	Illegal access

Comments:	This function writes a word to the user area of the serial EEPROM.

Programming example:

```
/* Write 0x1234 to word 3*/
unsigned int seeData = 0x1234;
/* Inline assembly code for Borland C++ 3.1*/
asm {
  mov ax,0fc01h
  mov bx,03h /* Write word 3*/
  mov cx,seeData/* Get write data from c environment */
  mov dx,0ffffh
  int 17h
    }
```

Read multiple words from the serial EEPROM

Function:	fch
Subfunction:	02h
Purpose:	To read multiple words from the on-board serial EEPROM.
Calling registers:	AH fch
	AL 02h
	BX Word address (zero based)
	CX Word count
	DX ffffh (User area relative address)
	ES:DI Destination pointer
Return registers:	Carry flag cleared if successful
	AX Word read
	Carry flag set if error
	AL Error code

Error Code	**Meaning**
ffh	Unknown error

	01h	Function not implemented
	02h	Defective serial EEPROM
	03h	Illegal access
Comments:	This function reads multiple words from the user area of the serial EEPROM.	

Programming example:

```
/* Read 10 words starting at word 5*/
unsigned int far*seeDataPtr = new unsigned int[10];
/* Allocate storage /
/ Inline assembly code for Borland C++ 3.1*/
asm {
  mov ax,0fc02h
  mov bx,05h /* Read starts at
        word 5*/
  mov cx,10  /* Read 10 words */
  mov dx,0ffffh
  les di,seeDataPtr
  int 17h
  }
```

Write multiple words to the serial EEPROM

Function:	fch	
Subfunction:	03h	
Purpose:	To write multiple words to the on-board serial EEPROM.	
Calling registers:	AH	fch
	AL	03h
	BX	Word address (zero based)
	CX	Word count
	DX	ffffh
	DS:SI	Source pointer
Return registers:	Carry flag cleared if successful	
	Carry flag set if error	
	AL	Error code
Error Code	**Meaning**	
	ffh	Unknown error
	01h	Function not implemented
	02h	Defective serial EEPROM
	03h	Illegal access
Comments:	This function writes multiple words to the user area of the serial EEPROM.	

Programming example:

```
/* Write 8 words starting at word 6*/
unsigned int far*seeDataPtr = new unsigned int[8];
/* Allocate storage /
  unsigned int far tmpPtr = seeDataPtr;
  for(int I=0;I<8;I++)
  seeDataPtr = I;  / initialize data /
/ Inline assembly code for Borland C++ 3.1*/
  asm {
  push   ds
  mov ax,0fc03h
  mov bx,06h /* Write starts at
        word 6*/
  mov cx,8   /* Write 8 words */
  mov dx,0ffffh
  lds si,seeDataPtr
```

```
int 17h
pop ds
   }
```

Return serial EEPROM size

Function:	fch	
Subfunction:	04h	
Purpose:	To obtain the size (bytes) of the on-board serial EEPROM.	
Calling registers:	AH	fch
	AL	04h
	DX	ffffh
Return registers:	Carry flag cleared if successful	
	AX	Size of the serial EEPROM (1536 + 512)
	BX	Size available to user (512 bytes)
	Carry flag set if error	
	AL	Error code
	Error code	**Meaning**
	ffh	Unknown error
	01h	Function not implemented
	02h	Defective serial EEPROM
	03h	Illegal access
Comments:	This function returns the size (in bytes) of the serial EEPROM. Since the user cannot access all of the serial EEPROM, this function determines how much space is available to the user. This avoids the user from accessing unavailable addresses.	

Programming example:

```
unsigned int seeUserSize;
/* Inline assembly code for Borland C++ 3.1*/
asm {
   mov ax,0fc04h
   mov dx,0ffffh
   int 17h
   mov seeUserSize,bx
   }
```

Chapter 15: System switches, user switches, BIOS update, system functions, CPU fan, Integrated Conductive Cooling System (ICCS), temperature sensors, power management and LEDs

System switches

Various system function options are selected with Switch 2.

The “S” switch selects whether the card boots from user defined parameters (defined in the Setup Programs chapter), or the BIOS defaults. Setting this switch Off allows the user to return to factory programmed defaults.

The “X” switch is reserved for future use.

The “V” switch enables or disables the on-card video, allowing an external video card, or the serial console to be used.

The “U” switches are user defined and can be used for program control.

Table 15–1 System configuration switches, Switch 2

Switch 2 – System Configuration		
Label	**Description**	**Position**
S	System parameters option switch: On = enable User Setup options* Off = enable BIOS Setup default	1
X	reserved for future use	2
V	Video switch: On = enable on-card video* Off = disable on-card video	3
U1	User switch 1, default On*	4
U2	User switch 2, default On*	5

* = default

System switch

The system switch is position 1. When this switch is On the system boots using the parameters stored in Setup. When this switch is Off the system boots using the factory defaults for all parameters in Setup. Note that if you must set the system switch Off to recover your system, the user-defined parameters in Setup will not be changed unless you enter Setup, make the changes, and exit saving changes.

Video switch

The video switch is position 3. When this switch is On the on-card video is enabled. To use a serial console, or an extension-card video only without using the onboard video controller (such as a PC/104), set this switch Off.

User switches

The user switches are positions 4 and 5 and are associated with GPI 2 (user switch 1) and GPI 23 (user switch 2.) The INT17 functions provide an easy method to implement software routines according to whether or not a switch is On. Refer to the INT17 calls to read user switch on page 84.

INT17 calls to read user switches

The INT17 functions provide an easy method to implement software routines according to whether or not a user switch is On.

```
Function:            0fbh
Sub-Function:        0bh
Purpose:             To read user jumper

Calling Registers:   AH     0fbh
                     AL     0bh
                     DX     0ffffh

Return Registers:    Carry flag cleared if successful
                     AL     Jumper data
                            bit 0 user jumper 1. 1=on, 0=off
                            bit 1 user jumper 2. 1=on, 0=off
Carry flag set if error
                     AL     Error code
Comments:            This function shall be used to read the user
                     switches
```

Programming example:

```
 /* Inline assembly code for Borland C++ 3.1 */
unsigned char aData;
asm {
     MOV AX, 0fb0bh
     MOV DX, 0ffffh
     INT 17h
     MOV aData, AL
         }
if (aData & 1)
printf("U1 switch is ON\n");
```

BIOS programming using REFLASH.EXE

The BIOS on the XE–900 SBC can be updated using the REFLASH.EXE utility. This utility can be found in the \XE900\EXTBIOS subdirectory of the utilities (see page 115 to download utilities). To update the BIOS the following steps must be taken:

1. Copy REFLASH.EXE, REFLASH.CMD, and BIOS.ROM from the \XE900\EXTBIOS subdirectory to the root of a bootable CompactFlash disk.
2. Boot the XE–900 SBC from the CompactFlash disk with a CRT monitor or flat panel connected to the system.

3. At the DOS prompt for the “C” drive type REFLASH <enter>.

The utility will display a progress screen and tell you when the process is done. You may need to push the reset button or cycle the power on the system to boot from the updated BIOS.

INT17 calls to read BIOS version

The INT17 functions provide the version number of the currently-installed BIOS.

```
Function:            0fbh
Sub-Function:        00h
Purpose:             To obtain the version number of the INT 17 BIOS
                     extension

Calling Registers:   AH     0fbh
                     AL     00h
                     DX     0ffffh

Return Registers:    Carry flag cleared if successful
                     AL     Major version number (e.g. Version 2.10
                            returns 2)
                     AH     Minor version number (e.g. Version 2.10
                            returns 10)
                     BL     Version letter (e.g. Version 2.10B returns
                            'B')

                     Carry flag set if error
                     AL     Error code

Comments:            This function returns the version number of the
                     BIOS extension
```

Programming example:

```
 /* Inline assembly code for Borland C++ 3.1 */
unsigned char majorVersion;
unsigned char minorVersion;
unsigned char versionLetter;
/* Inline assembly code for Borland C++ 3.1 */
asm {
        MOV AX, 0fb00h
        MOV DX, 0ffffh
        INT 17h
        MOV majorVersion, AL
        MOV minorVersion, AH
        MOV versionLetter, BL
        }
```

System functions

The XE–900 has two additional INT 17 functions; Return CPU Type and Get Functions Implemented.

Return CPU Type

This function returns the CPU type and the system clock speed.

```
Function:            0fbh
Sub-Function:        01h
Purpose:             To obtain the CPU type and clock speed

Calling Registers:   AH     0fbh
                     AL     01h
                     DX     0ffffh

Return Registers:    Carry flag cleared if successful
                     AH     E0 = VIA C3
                     BX     Clock speed in Mhz ie.733 etc.
                     CX     Speed Index found during INT 17
                            initialization
                     DX     reserved.
                     SI     Current Speed Index

                     Carry flag set if error
                     AL     Error code

Comments:            This function returns the CPU type.
```

Programming example:

```
unsigned char cpuMajor;
        unsigned char cpuMinor;
  /* Inline assembly code for Borland C++ 3.1 */
        asm {
            MOV AX, 0fb01h
            MOV DX, 0ffffh
            INT 17h
            MOV cpuType, AH
                }
        if (cpuType == 0xE0
               printf("CPU type is VIA EDEN\n");
```

CPU fan

The XE–900 733 MHz and 1 GHz versions come with a either a cooling fan on the CPU or an Integrated Conductive Cooling System (see next section). The fan runs continuously when power is applied to the card. A tachometer feedback sends information back to the Southbridge.

Accessing CPU fan speed and temperature sensor registers is accomplished through operating system drivers. Contact Octagon Systems for driver availability and/or a Board Support Package for your Operating System (OS).

Table 15–2 J9 – CPU fan connector

J9 – CPU fan connector	
Pin #	**Pin Name**
1	GND
2	+5V
3	tachometer control

Integrated Conductive Cooling System (ICCS)

The Integrated Conductive Cooling System provides a rugged passive cooling enclosure for the XE–900. The heat sink dissipates heat from the CPU throughout the all-aluminum assembly, ensuring that the temperature of the microprocessor stays close to that of the system environment. For best results, mount the system to a heat-conductive surface, using conductive fasteners.

The Integrated Conductive Cooling System is a factory-installed configuration for the XE–900. When it is ordered you must specify whether you want 256 or 512 MB SDRAM, as these modules cannot be installed once the unit is assembled.

Do not disassemble the Integrated Conductive Cooling System. Disassembling the unit will void the warranty.

Figure 15–1 shows an orthogonal view of the assembled unit. Figure 15–2 shows the dimensions and mounting positions of the assembled unit.

Figure 15–1 Integrated Conductive Cooling System

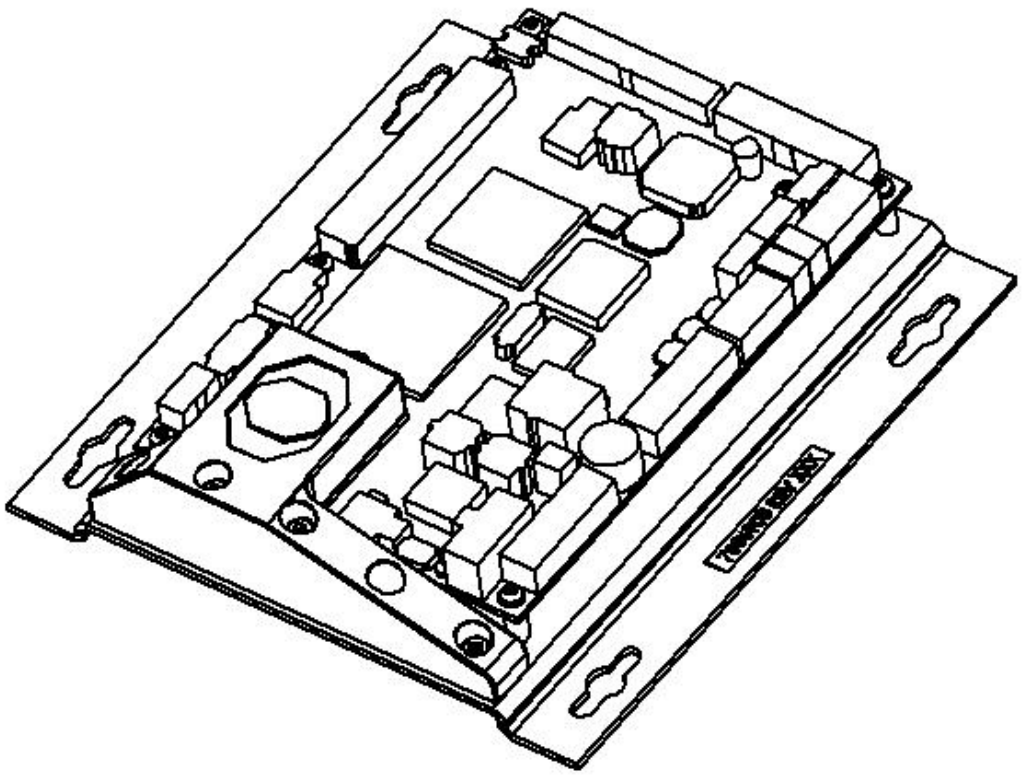
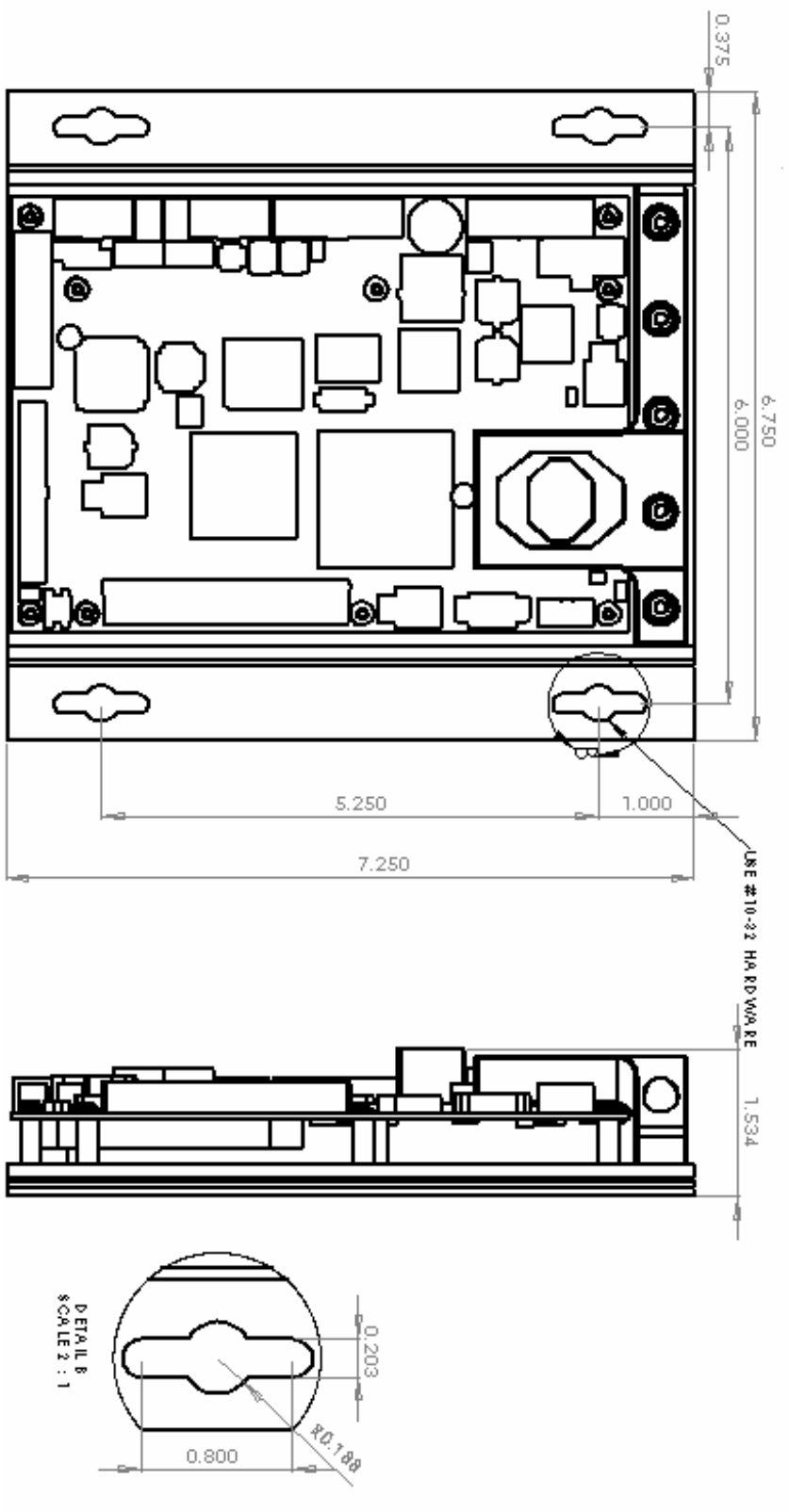


Figure 15–2 Dimensions for the Integrated Conductive Cooling System



Temperature sensors

The XE–900 has two onboard temperature sensors. One is located in the middle of the board and measures the ambient temperature of the board. The other is located next to the CPU and monitors the CPU temperature.

Accessing CPU fan speed and temperature sensor registers is accomplished through operating system drivers. Contact Octagon Systems for driver availability and/or a Board Support Package for your Operating System (OS).

Power management

The XE–900 supports ACPI 2.0 and PCI Power Management Specification 1.2. Refer to the specifications for information on how to use these functions.

ACPI 2.0

The XE–900 system hardware and BIOS support ACPI 2.0 for resource allocation, and power management states S0 and S1. This function is enabled in BIOS Setup.

PCI power management

The XE–900 supports PCI Power Management Specification 1.2. States B0 and B1 are always available. State B2 is not available when a PC/104-*Plus* (PCI) expansion card is used. State B2 cannot be used with PC/104-*Plus* specification 1.2, as necessary signals are not supported on the physical connector. This state will be automatically disabled by the system BIOS when a PC/104-*Plus* expansion card is detected by the PCI BIOS; no user adjustment is required.

LEDs

The XE–900 has three on-board LEDs, in addition to the LEDs on the Ethernet connector. See page 18 for the location of the LEDs.

CR1 contains an amber and a green LED. The amber is an activity indicator for the CompactFlash. The green is an activity indicator for the secondary IDE drive devices (hard drive, CD ROM, etc.)

CR2 is a power on LED. This indicates the system is powered.

CR6 is a bicolor User LED. The amber LED is connected to GPO22, and the green LED is connected to GPO23. CR6 is also used by the BIOS during booting to indicate the status of the boot process (see page 92).

Chapter 16: Troubleshooting

If your system is not working properly, check the following items.

No system LED activity

If there is no LED activity, check the following:

- Make sure all PC/104 or PC/104-*Plus* expansion cards are removed from the XE–900 SBC. This ensures that other cards are not interacting with the XE–900 SBC.
- Turn the “S” switch Off.
- Check all power connections to the XE–900 SBC card.
- Measure the supply voltage at the J8 power connector and verify that the voltage at the XE–900 SBC card is +5V (+/–0.25V).
- Make sure your power module provides +5V (+/–0.25V) and at least 10A of current (to meet inrush requirement).

No CRT or flat panel video

If the LEDs appear to be functioning properly, but there is no video activity, check the following:

- Make sure all PC/104 or PC/104-*Plus* expansion cards are removed from the XE–900 SBC. This ensures that other cards are not interacting with the XE–900 SBC.
- Turn the “S” switch Off.
- If using a CRT monitor, check the cable and connections going from the J1 connector to the monitor.
- If using a flat panel display, check the following:
  Check the power and cables going to the flat panel display.
  Make sure that the power module has enough current capacity to power both the XE–900 SBC card and the flat panel.
- If an analog monitor is not present or is not displaying the video data correctly, the system can be booted via the serial console by doing the following:

  1. Turn the “S” switch Off and the “V” switch On.
  2. Connect the COM port of a host computer running HyperTerminal or some other terminal software to COM1 on the XE–900 SBC using a serial console (see page 47.) The serial port settings on the host computer should be 115.2K baud, 8, N, and none.
  3. Power up the XE–900 SBC; it will boot using the serial console interface.

Video is present but is distorted

If video is present but is distorted, check the following:

- Make sure all PC/104 or PC/104-*Plus* expansion cards are removed from the XE–900 SBC. This ensures that other cards are not interacting with the XE–900 SBC.
- Turn the “S” switch Off.
- If using a CRT monitor, check the cable and connections going from the J1 connector to the monitor.
- If using a flat panel display, check the following:

  1. Cable and connections going from the XE–900 SBC to the flat panel display.
  2. Power cable going to the flat panel display.
  3. Power module for the flat panel. Make sure that the power module has enough current capacity to power both the XE–900 SBC and the flat panel.

No serial console activity

If the serial console does not appear to be functioning correctly, check the following:

- Make sure all PC/104 or PC/104-*Plus* expansion cards are removed from the XE–900 SBC. This ensures that other cards are not interacting with the XE–900 SBC.
- Turn the “S” switch Off.
- Make sure the COM1/2 connector on the XE–900 SBC is used.
- Make sure a null modem adapter is installed between COM1 of the VTC-20F cable and the serial port of your PC.
- Make sure that your terminal emulator (such as HyperTerminal) on your PC is set up properly. Refer to the Console devices chapter. Refer to the HyperTerminal manual for information on setting up communication parameters.
- After verifying the above conditions, you can monitor voltage levels by connecting an oscilloscope between the TxD* line on COM1 and ground. After power-up, you should see a burst of activity on the oscilloscope screen. The voltage level should switch between +/–8V.

Garbled serial console screen activity

If you do get activity on your console screen but the message is garbled, check the following:

- Turn the “S” switch Off to ensure the default settings for COM1. The default baud rate is 115200.

- Make sure that your terminal emulator (such as HyperTerminal) on your PC is set up properly. Refer to the Console devices chapter. Refer to the HyperTerminal manual for information on setting up communication parameters.

System generates a BIOS message but locks up when booting

- Turn the “S” switch Off and reboot.
- Verify that all the necessary boot files exist on the boot device. Copy any missing files to the boot device.
- If no files are missing, overwrite any files which may have become corrupted. In addition, you may want to format the boot device.

System will not boot from CompactFlash

Many CompactFlash devices as shipped from the factory are not bootable devices. Refer to the CompactFlash, SDRAM, and battery backup chapter to make your CompactFlash bootable. Also, try changing the IDE 0 parameters in Setup to Phoenix or Physical, and ensure that the CompactFlash is designated as drive C:.

System locks up on power-up; may or may not respond to reset switch

A common cause is using a non-Octagon power supply such as a PC desktop supply. Most of these PC supplies are rated at 5V at 20A or more. Switching supplies usually requires a 20% load to operate properly, that is, 4A or more. Since a typical Octagon system takes less than 2A, the supply does not regulate properly. Output drift up to 6–7V and/or 7–8 voltage spikes have been reported. If the power supply comes up slowly, the sequencing of ICs on the board may be out of sync, thus, causing the system to lock up.

System locks up after power-down/power-up

If the power supply does not drain below 0.7V, the CMOS components on the card will act like diodes and forward bias. This is typically caused by using power supplies that have large output capacitors. Either use a different power supply that discharges faster, leave the power off until the supply has adequate time to discharge or place a 100 ohm, large wattage resistor across the output capacitor.

LED signaling of “beep” counts

Description

The XE–900 performs a complete series of tests during power on self test (POST). The progress is recorded in port 80. Table 16–1 shows the port 80 codes.

The XE–900 SBC has a bicolor LED that is used by the BIOS to indicate the BIOS processing state. Immediately after the XE–900 SBC powers on, the LED is on and the green LED is off. Once the card boots, the amber LED turns off and the green

LED is on.

If the BIOS finds an error during POST the amber LED is flashed in a count indicating the POST code failure. The visual beep counts are defined in Table 16–2.

Count the number of flashes; the resulting number matches the POST error found in the Table 16–2. For example, five flashes indicates the CPU test failed.

The POST codes are listed in numerical order. This is not the sequence in which the actions are executed.

Table 16–1 POST port 80 codes

Port 80 Code	POST Routine Description
00h	Start POST (BIOS is executing)
01h	Start CPU register test
02h	Start power-on delay
03h	Power-on delay finished
04h	Keyboard BAT finished
05h	Disable shadowing and cache
06h	Compute ROM CRC, wait for KBC
07h	CRC okay, KBC ready
08h	Verifying BAT command to KB
09h	Start KBC command
0Ah	Start KBC data
0Bh	Start pin 23, 24 blocking and unblocking
0Ch	Start KBC NOP command
0Dh	Test CMOS RAM shutdown register
OEh	Check CMOS checksum
0Fh	Initialize CMOC contents
10h	Initialize CMOS status for date/time
11h	Disable DMA, PICs
12h	Disable Port B, video display
13h	Initialize board, start memory detection
14h	Start timer tests
15h	Test 8254 T2, for speaker, Port B
16h	Test 8254 T1, for refresh
17h	Test 8254 T0, for 18.2 Hz
18h	Start memory refresh
19h	Test memory refresh
1Ah	Test 15μsec ON/OFF time
1Bh	Test base 64KB memory
1Ch	Test data lines
20h	Test address lines
21h	Test parity (toggling)
22h	Test Base 64KB memory
23h	Prepare system for IVT initialization
24h	Initialize vector table
25h	Read 8042 for turbo switch setting
26h	Initialize turbo data
27h	Modification of IVT

28h	Video in monochrome verified
29h	Video in color mode verified
2Ah	Toggle parity before video ROM test
2Bh	Initialize before video ROM test
2Ch	Passing control to video ROM
2Dh	Control returned from video ROM
2Eh	Check for EGA/VGA adapter
2Fh	No EGA/VGA found, test video memory
30h	Scan for video retrace signal
31h	Primary retrace failed
32h	Alternate found
33h	Verify video switches
34h	Establish display mode
35h	Initialize ROM BIOS data area
36h	Set cursor for power-on msg
37h	Display power-on message
38h	Save cursor position
39h	Display BIOS identification string
3Ah	Display “Hit <DEL> to...” message
40h	Prepare protected mode test
41h	Prepare descriptor tables
42h	Enter virtual mode for memory test
43h	Enable interrupts for diagnostics mode
44h	Initialize data for memory wrap test
45h	Test for wrap, find total memory size
46h	Write extended memory test patterns
47h	Write conventional memory test patterns
48h	Find low memory size from patterns
49h	Find high memory size from patterns
4Ah	Verify ROM BIOS data area again
4Bh	Check for <DEL> pressed
4Ch	Clear extended memory for soft reset
4Dh	Save memory size
4Eh	Cold boot: Display 1st 64KB memtest
4Fh	Cold boot: Test all of low memory
50h	Adjust memory size for EBDA usage
51h	Cold boot: Test high memory
52h	Prepare for shutdown to real mode
53h	Return to real mode
54h	Shutdown successful
55h	Disable A20 line
56h	Check ROM BIOS data area again
57h	Check ROM BIOS data area again
58h	Clear “Hit <DEL>” message
59h	Test DMA page register file
60h	Verify from display memory
61h	Test DMA0 base register
62h	Test DMA1 base register
63h	Checking ROM BIOS data area again
64h	Checking ROM BIOS data area again

65h	Program DMA controllers
66h	Initialize PICs
67h	Start keyboard test
80h	Issue KB reset command
81h	Check for stuck keys
82h	Initialize circular buffer
83h	Check for locked keys
84h	Check for memory size mismatch
85h	Check for password of bypass setup
86h	Pwd checked. Do programming before setup
87h	Entering setup system
88h	Setup system exited
89h	Display power-onscreen message
8Ah	Display “Wait...” message
8Bh	Shadow system and video BIOS
8Ch	Load standard setup values from CMOS
8Dh	Test and initialize mouse
8Eh	Test floppy disks
8Fh	Configure floppy drives
90h	Test hard drives
91h	Configure IDE drives
92h	Checking ROM BIOS data area
93h	Checking ROM BIOS data area
94h	Set base and extended memory sizes
95h	Adjust low memory size for EBDA
96h	Initialize before calling C800h ROM
97h	Call ROM BIOS extension at C800h
98h	ROM C800h extension returned
99h	Configure timer/printer data
9Ah	Configure serial port base addresses
9Bh	Prepare to initialize coprocessor
9Ch	Initialize numeric coprocessor
9Dh	Numeric coprocessor initialized
9Eh	Check KB settings
9Fh	Issue keyboard ID command
0A0h	KB ID flag reset
0A1h	Test cache memory
0A2h	Display soft errors
0A3h	Set keyboard typomatic rate
0A4h	Program memory wait states
0A5h	Clear screen
0A6h	Enable parity and NMIs
0A7h	Initialize before calling ROM atE000h
0A8h	Call ROM BIOS extension at E000h
0A9h	ROM extension returned
0B0h	Display system configuration box
00h	Call INT 19h bootstrap loader
0B1h	Test low memory exhaustively
0B2h	Test extended memory exhaustively
0B3h	Enumerate PCI busses

0B4h	Initialize address manager
0B5h	Preboot address manager callout
0B6h	Test huge memory exhaustively
0B7h	Initialize SMBIOS structure table
0B8h	About to signal Firmbase
0B9h	About to initialize low small memory mgr
0BAh	About to initialize driver manager
0BBh	About to start multiprocessor init

Table 16–2 BIOS beep counts

Mnemonic Code	Beep Count	Description of Problem
POST_BEEP_REFRESH	1	Memory refresh is not working
POST_BEEP_PARITY	2	Parity error found in 1st 64KB of memory
POST_BEEP_BASE64K	3	Memory test of 1st 64KB failed
POST_BEEP_TIMER	4	T1 timer test failed
POST_BEEP_CPU	5	CPU test failed
POST_BEEP_GATEA20	6	Gate A20 test failed
POST_BEEP_DMA	7	DMA page/base register test failed
POST_BEEP_VIDEO	8	Video controller test failed
POST_BEEP_KEYBOARD	9	Keyboard test failed
POST_BEEP_SHUTDOWN	10	CMOS shutdown register test failed
POST_BEEP_CACHE	11	External cache test failed
POST_BEEP_BOARD	12	General board initialization failed
POST_BEEP_LOWMEM	13	Exhaustive low memory test failed
POST_BEEP_EXTMEM	14	Exhaustive extended memory test failed
POST_BEEP_CMOS	15	CMOS restart byte test failed
POST_BEEP_ADDRESS_LINE	16	Address line test failed
POST_BEEP_DATA_LINE	17	Data line test failed
POST_BEEP_INTERRUPT	18	Interrupt controller test failed
POST_BEEP_PASSWORD	1	Incorrect password used to access SETUP
POST_BEEP_HUGEMEM	19	Exhaustive huge memory test failed
POST_BEEP_EBDA_LOC	20	Address manager failed to reloc EBDA
POST_BEEP_ADDR_MGR	21	Address manager failed to initialize
POST_BEEP_ADSYNCH	22	Address mgr failed to synch legacy mem parameters
POST_BEEP_LOMEMMGR	23	Low memory manager failed to initialize
POST_BEEP_POST_FAIL	24	POST driver failed
POST_BEEP_PMM	25	PMM failed to initialize

Technical assistance

Carefully recheck your system before calling Technical Support. Run as many tests as possible; the more information you can provide, the easier it will be for Technical Support staff to help you solve the problem. For additional technical assistance, try the following:

Technical Support telephone: 303–426–4521

E-mail Technical Support: fasthelp@octagonsystems.com

Applications Notes (via web): http://octagonsystems.com

Overview: Section 4 – Appendices

Section 4 contains a series of appendices which provides additional information about the XE–900 SBC.

Appendix A: Technical data

Appendix B: Software utilities

Appendix C: Accessories

Appendix A: XE–900 SBC technical data

Technical specifications

CPU
VIA Eden ESP, 400 MHz, 733 MHz or 1 GHz

Front Side Bus
133 MHz

PCI bus clock
33 MHz

ISA bus clock
8.33 MHz

BIOS
AT compatible with industrial extensions

SDRAM
0 MB SDRAM supplied. SO-DIMM socket can be populated with up to 256 MB SDRAM using PC100 or PC133 memory sticks. Some low-power 512 MB SO–DIMM modules are also supported. Contact Octagon Systems for compatibility before using 512 MB modules.

On-board flash
512 KB socketed flash, contains system BIOS

Hard drive
EIDE hard drive support with on-card hard drive controller and BIOS. Accessed via 44-pin connector. Supports up to three EIDE devices. CompactFlash appears as the primary EIDE device.

CompactFlash socket
Supports Type I and Type II 3V CompactFlash devices.

USB
2 ports USB 1.1 compatible

Serial I/O
Six ports with RS–232, RS–422, RS–485, or TTL interfaces
IEC1000, level 3, ESD protection specification
- — Contact discharge ±6 kV
- — Air–gap discharge ±8 kV

Backdrive protection
16C550 compatible
Up to 115.2K baud
16-byte FIFO buffers
Switch-selectable terminations for RS–422/485 on COM5/6

Digital I/O
24 I/O lines, sink/source 15mA per line

Keyboard and mouse ports
PS/2 compatible

Ethernet
One 10/100BaseT port supporting IEEE 802.3

Video
Supports CRTs displays with resolutions up to 1920 x 1440 x 24 bpp, and LVDS flat panel displays with resolutions up to 1600 x 1200 x 18 bpp.

Watchdog timer
Time-out is 1 second, 10 seconds or 60 seconds. Strobed through built–in, enhanced INT 17h function calls.

Real time clock
AT compatible with external battery backup.

Expansion
PC/104 and PC/104-*Plus*.

Operating systems
Compatible with Windows XPe, Windows CE.net, Linux, QNX, and DOS.

PCI bus mastering
Bus mastering devices are supported on the PC/104-*Plus* connector.

Power requirements
5V ±0.25V; 3.3A @ 400 or 733 MHz, 3.4A @ 1 GHz, 10A inrush current

Note The power supply for the XE–900 must meet the startup risetime requirements specified in the ATX Power Design Guide, version 1.1, section 3.3.5. This ensures that all the circuitry on the XE–900 SBC sequences properly and avoids system lockup.

Environmental specifications

Operating temperature	–40° to +85°C @ 400 MHz –40° to +85°C @ 733 MHz, with forced air flow –40° to +75°C @ 1 GHz, with forced air flow These operating specification also apply to units with the Integrated Conductive Cooling System.
Nonoperating temperature	–55° to 95°C, nonoperating
Relative humidity	5% to 95% noncondensing
Shock	40g, 3 axis
Vibration	5g, 3 axis

Size
115 mm x 165mm x 29.5 mm, EPIC™ form factor

Weight
8 oz.

Excessive Thermal Stress

This card is guaranteed to operate over the published temperature ranges and relevant conditions. However, sustained operation near the maximum temperature specification is not recommended by Octagon or the CPU chip manufacturer due to well known, thermal related, failure mechanisms. These failure mechanisms, common to all silicon devices, can reduce the MTBF of the cards. Extended operation at the lower limits of the temperature ranges has no limitations.

Mating connectors

Table A–1 XE–900 SBC mating connectors

Connector	Function	Mating Connector
J1	VGA video	Molex 87568-1073
J2	LVDS video	Octagon #6772
J3	PC/104-*Plus*	Teka 2MR430-A7WD-368-0
J4	Hard drive	Amp 1-111626-0
J5	PC/104	Comm Conn 50711C-104G
J6	Digital I/O	Amp 746288-6
J7	Ethernet	RJ45
J8	Power	Molex #39-01-2100
J9	CPU fan	Molex 22-01-3037
J10	COM6 RS–422/485	Molex 22-01-3057
J11	COM5 RS–422/485	Molex 22-01-3057
J12	COM5/6 TTL	Berg 65039-031
J13	COM1/2	Amp 746288-4
J14	PS/2 Keyboard / Mouse	PS/2
J15	COM3/4	Amp 746288-4
J16	COM5 RS–232	Amp 746288-1
J17	PC battery	Berg 65039-033
J18	Speaker	Berg 65039-033
J19	USB1/2	Octagon #6288 cable
J500	CompactFlash	CompactFlash device
XU500	SO-DIMM	N/A

Maps

Table A–2 XE–900 SBC DMA map

XE–900 SBC DMA map		
Channel	**Description**	* One of the lower DMA channels (0 through 3) must be disabled (reserved by the system) and will be unavailable to the expansion bus. By default, DMA Channel 2 will be disabled. The user may use Setup to change this selection to any other low DMA channel.
Channel 0	available *	
Channel 1	available *	
Channel 2	available *	
Channel 3	available *	
Channel 4	Slave	
Channel 5	available	
Channel 6	available	
Channel 7	available	

Table A–3 XE–900 SBC I/O map

XE–900 SBC I/O map		
Start Addr (Hex)	**End Addr (Hex)**	**Function**
0000	001f	DMA controller 1
0020	0021	PIC 1
0040	005f	Timer
0060	006f	Keyboard Controller
0080	008f	DMA Page register
00a0	00a1	PIC 2
00c0	00df	DMA controller 2
00f0	00ff	FPU
0120	0123	Digital I/O (Optional, Default Location)
0170	0177	Secondary IDE
01a0	01a7	COM 6 (Optional, Default Location)
01a8	01af	COM 5 (Optional, Default Location)
01c0	01c7	COM 6 (Optional, Alternate Location)
01c8	01cf	COM 5 (Optional, Alternate Location)
01f0	01f7	Primary IDE
02e8	02ef	COM 4
02f8	02ff	COM 2
0320	0323	Digital I/O (Optional, Alternate Location)
0376		Reserved (Secondary IDE control)
03c0	03df	VGA
03e8	03ef	COM 3
03f6		Reserved (Primary IDE control)
03f8	03ff	COM 1
0400	044f	PMIO (see subfunctions below)
0408	040b	ACPI timer
0410	0415	ACPI CPU throttle
0448	044F	GPIO (Watchdog, Switches, LEDs, etc)
0cf8	0cff	PCI Config
ef00	ef4b	Hardware Monitoring
efa0	efaf	SMBUS
f000	fbff	PCI Assignable

Table A–4 XE–900 SBC interrupt map

XE–900 SBC interrupt map		
IRQ	**Default Device**	**Alternate**
IRQ0	System Timer	not available
IRQ1	Keyboard	not available
IRQ2	Cascade to IRQ9	not available
IRQ3	COM2	not available
IRQ4	COM1	not available
IRQ5	SMM	PC/104 when SMM and ACPI are disabled
IRQ6	unused	PC/104 or PCI
IRQ7	available for PCI	PC/104
IRQ8	RTC Alarm	not available
IRQ9	COM3-6	not available
IRQ10	available for PCI	
IRQ11	available for PCI	
IRQ12	Aux Port (mouse)	PC/104 or PCI
IRQ13	Reserved for FPU	not available
IRQ14	IDE Primary (CompactFlash)	PC/104 or PCI
IRQ15	IDE Secondary	PC/104 or PCI

Table A–5 XE–900 SBC memory map

XE–900 SBC memory map		
Start Addr (Hex)	**End Addr (Hex)**	**Function**
00000000	0009dfff	System Ram
0009e000	0009ffff	Reserved
000a0000	000bffff	Video RAM area
000c0000	000cdfff	Video ROM (virtual / shadow)
000ce000	000dffff	Unused / Available
000E0000	000fffff	BIOS ROM area (shadow)
00100000 (1MB)	Top of SDRAM – following	System RAM
Top of SDRAM – following, size varies	Top of SDRAM – following	ACPI Tables & Storage structures
Top of SDRAM – Video RAM size (set in setup)	Top of SDRAM	Reserved for onboard VGA use
Top of SDRAM	03ffffff	Unused
04000000 (1GB)	09ffffff	Assignable to PCI, Prefetchable memory
0a000000 (2.5GB)	ffefffff	Assignable to PCI, Non-Prefetchable memory
fff00000	ffffffff	Flash ROM (BOIS & Resources)

Switch settings

Table A–6 System configuration switches, Switch 2

Switch 2 – System Configuration		
Label	**Description**	**Position**
S	System parameters option switch: On = enable User Setup options* Off = enable BIOS Setup default	1
X	reserved for future use	2
V	Video switch: On = enable on-card video* Off = disable on-card video	3
U1	User switch 1, default On	4
U2	User switch 2, default On	5

* = default

Table A–7 LVDS flat panel switch, Switch 3

Switch 3 - LVDS Flat Panels				
Position 1 - On (Factory use only)				This switch must remain On*
Position 2 - On				LVDS flat panel disabled*
Position 2 - Off				LVDS flat panel enabled
Position3	Position 4	Position 5	Position 6	
On	On	On	On	Reserved*
On	On	On	Off	640 x 480 x 18
On	On	Off	On	Reserved
On	On	Off	Off	1280 x 1024 x 18
On	Off	On	On	Reserved
On	Off	On	Off	Reserved
On	Off	Off	On	1600 x 1200 x 18 (2 pixels/clock)
On	Off	Off	Off	Reserved
Off	On	On	On	800 x 600 x 18
Off	On	On	Off	Reserved
Off	On	Off	On	Reserved
Off	On	Off	Off	Reserved
Off	Off	On	On	Reserved
Off	Off	On	Off	Reserved
Off	Off	Off	On	1024 x 768 x 18
Off	Off	Off	Off	Reserved

*default

Table A–8 COM5/6 switches, Switch 4

Switch 4 – COM5/6 termination		
COM Port	**Interface**	**Switch 4 Settings**
COM5	RS–422/RS–485 no termination	Position 1 Off Position 2 Off
	RS–422/RS–485 with termination	Position 1 On* Position 2 On*
COM6	RS–422/RS–485 no termination	Position 3 Off Position 4 Off
	RS–422/RS–485 with termination	Position 3 On* Position 4 On*

* Default. These switches terminate the network. If the XE–900 SBC is not at an end of the network, set these switches to Off.

Connector pin–outs

The following tables show the pin–outs for the connectors on the XE–900 SBC.

Table A–9 J1 – CRT connector

J1, CRT Connector			
Pin #	**Pin Name**	**Pin Name**	**Pin #**
1	RD	GR	2
3	BL	GND	4
5	+5V	GND	6
7	HSYNCOUT	DDC SDA	8
9	DDC SCL	VSYNCOUT	10

Table A–10 J2 – LVDS flat panel connector

J2 – LVDS flat panel connector			
Pin #	**Pin Name**	**Pin Name**	**Pin #**
1	3V	5V	2
3	GND	GND	4
5	Y0M	Y0P	6
7	Y1M	Y1P	8
9	Y2M	Y2P	10
11	YCM	YCP	12
13	Z0M	Z0P	14
15	Z1M	Z1P	16
17	Z2M	Z2P	18
19	ZCM	ZCP	20

Table A–11 J3 – PC/104-Plus connector

Some signals and/or signal names on the XE–900 do not match the PC/104-*Plus* specification. In those instances, the signals are shown below in gray boxes. The PC/104-*Plus* specified signal is listed first, and the XE–900 signal follows.

J3 – PC/104-*Plus* connector				
Pin	**A**	**B**	**C**	**D**
1	GND	Reserved	+5	AD00
2	VI/O	AD02	AD01	+5V
3	AD05	GND	AD04	AD03
4	C/BE0*	AD07	GND	AD06
5	GND	AD09	AD08	GND
6	AD11	VI/O	AD10	M66EN/GND
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1*	AD15	+3.3V
9	SERR*	GND	Reserved	PAR
10	GND	PERR*	+3.3V	Reserved
11	STOP*	+3.3V	LOCK*	GND
12	+3.3V	TRDY*	GND	DEVSEL*
13	FRAME*	GND	IRDY*	+3.3V
14	GND	AD16	+3.3V	C/BE2*
15	AD18	+3.3V	AD17	GND
16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	C/BE3*	VI/O	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	REQ0*	GND	REQ1*	VI/O
24	GND	REQ2*	+5V	GNT0*
25	GNT1*	VI/O	GNT2*	GND
26	+5V	CLK0	GND	CLK1
27	CLK2	+5V	CLK3	GND
28	GND	INTD*	+5V	RST*
29	+12V	INTA*	INTB*	INTC*
30	-12V/GND	REQ3/not used	GRNT3/not used	GND

* active low

Table A–12 J4 – EIDE

J4 – EIDE			
Pin #	**Pin Name**	**Pin Name**	**Pin #**
44	VCC5	NC	43
42	VCC5	VCC5	41
40	Gnd	IDES.LED	39
38	IDESCSI*	IDESCS0*	37
36	IDESA(2)	IDESA(0)	35
34	NC	IDESA(1)	33
32	NC	IDESINTR	31
30	Gnd	IDESDACK*	29
28	NC	IDESIORDY	27
26	Gnd	IDESTOR*	25
24	Gnd	IDESTOW*	23
22	Gnd	IDESDRO	21
20	KEY	Gnd	19
18	IDEDS(15)	IDEDS(0)	17
16	IDEDS(14)	IDEDS(1)	15
14	IDEDS(13)	IDEDS(2)	13
12	IDEDS(12)	IDEDS(3)	11
10	IDEDS(11)	IDEDS(4)	9
8	IDEDS(10)	IDEDS(5)	7
6	IDEDS(9)	IDEDS(6)	5
4	IDEDS(8)	IDEDS(7)	3
2	Gnd	IDESRST*	1

* = active low

Table A–13 PC/104 connector

PC/104 Connector		
Pin	**D**	**C**
0	GND	GND
1	MEMCS16*	SBHE*
2	IOCS16*	LA23
3	IRQ10	LA22
4	IRQ11	LS21
5	IRQ12	LS20
6	IRQ15	LS19
7	IRQ14	LA18
8	DACK0*	LA17
9	DRQ0	MEMR*
10	DACK5*	MEMW*
11	DRQ5	SD8
12	DACK6*	SD9
13	DRQ6	SD10
14	DACK7*	SD11
15	DRQ7	SD12
16	+5V	SD13
17	MASTER*	SD14
18	GND	SD15
19	GND	GND/KEY

PC/104 Connector		
Pin	**A**	**B**
1	IOCHCK*	GND
2	D7	RSTDRV
3	D6	+5V
4	D5	IRQ9
5	D4	-5V
6	D3	DRQ2
7	D2	-12V
8	D1	ENDXFR*
9	D0	+12V
10	IOCHRDY	GND/KEY
11	AEN	SMEMW*
12	A19	SMEMR*
13	A18	IOW*
14	A17	IOR*
15	A16	DACK3*
16	A15	DRQ3
17	A14	DACK1*
18	A13	DRQ1
19	A12	REFRESH*
20	A11	SYSCLK
21	A10	IRQ7
22	A9	IRQ6
23	A8	IRQ5
24	A7	IRQ4
25	A6	IRQ3
26	A5	DACK2*
27	A4	TC
28	A3	BALE
29	A2	+5V
30	A1	OSC
31	A0	GND
32	GND	GND

Table A–14 J6 – Digital I/O connector

J6 Digital I/O			
Pin #	**Pin Name**	**Pin Name**	**Pin #**
1	Port B, bit 4	Vcc (+5V)*	2
3	Port B, bit 5	Port B, bit 2	4
5	Port B, bit 6	Port B, bit 3	6
7	Port B, bit 7	Port B, bit 1	8
9	Port C, bit 7	Port B, bit 0	10
11	Port C, bit 5	Port C, bit 6	12
13	Port C, bit 0	Port C, bit 4	14
15	Port C, bit 2	Port C, bit 1	16
17	Port C, bit 3	Port A, bit 7	18
19	Port A, bit 0	Port A, bit 6	20
21	Port A, bit 1	Port A, bit 5	22
23	Port A, bit 2	Port A, bit 4	24
25	Port A, bit 3	Gnd	26

* +5V safe is fused through a 750 mA automatic, resetting fuse

Table A–15 J7 – Ethernet connector

J7 – Ethernet connector	
RJ pin	**Pin Name**
1	TxD +
2	TxD –
3	RxD +
4	comm. mode term.
5	comm. mode term.
6	RxD –
7	comm. mode term.
8	comm. mode term.

Table A–16 J8 – Power connector

Pin	Function	Function	Pin
1	nc	nc	6
2	GND	+5v	7
3	GND	+5v	8
4	+12V	–12V	9
5	+3V	GND	10

Table A–17 J9 – CPU fan connector

J9 – CPU fan connector	
Pin #	**Pin Name**
1	GND
2	+5V
3	tachometer control

Table A–18 J10 and J11 – COM5 and COM6 RS–422/485 connector

J11 COM5 connector		J10 COM6 connector	
Pin #	**Signal**	**Pin #**	**Signal**
1	TXD+	1	TXD+
2	TXD–	2	TXD–
3	GND	3	GND
4	RXD+	4	RXD+
5	RXD–	5	RXD–

Table A–19 J12 – COM5 and COM6 TTL connector

J12 COM5/6 TTL connector	
Pin #	**Signal**
1	TX5
2	RX5
3	GND
4	TX6
5	RX6
6	GND

Table A–20 J13 – COM1 and COM2 connector

COM1		COM2	
Pin#	**RS–232 signal**	**Pin#**	**RS–232 signal**
1	DCD	11	nc
2	DSR	12	nc
3	RxD	13	RxD
4	RTS	14	RTS
5	TxD	15	TxD
6	CTS	16	CTS
7	DTR	17	nc
8	RI	18	nc
9	GND	19	GND
10	nc	20	nc

Table A–21 J14 – PS/2 keyboard mouse

J14 – PS/2 Keyboard Mouse	
Pin #	**Pin Name**
1	KDATA
2	MDATA
3	GND
4	+5V
5	KCLK
6	MCLK

Table A–22 J15 – COM3 and COM4 connector

COM3		COM4	
Pin#	**RS–232 signal**	**Pin#**	**RS–232 signal**
1	nc	11	nc
2	nc	12	nc
3	RxD	13	RxD
4	RTS	14	RTS
5	TxD	15	TxD
6	CTS	16	CTS
7	nc	17	nc
8	nc	18	nc
9	GND	19	GND
10	nc	20	nc

Table A–23 J16 – COM5 RS–232 connector

COM5 RS–232	
Pin#	**RS–232 signal**
1	nc
2	nc
3	RxD
4	RTS
5	TxD
6	CTS
7	nc
8	nc
9	GND
10	nc

Table A–24 J17 – Battery connector

J17 – battery connector	
Pin #	**Pin Name**
1	Battery +
2	Key
3	nc
4	Battery –

Table A–25 J18 – Speaker connector

J18 – speaker connector	
Pin #	**Pin Name**
1	VCC5
2	nc
3	nc
4	SPKR

Table A–26 J19 – USB connector

J19 – USB connector			
Pin #	**Pin Name**	**Pin Name**	**Pin #**
1	USB1 power	USB2 power	2
3	USB1 –	USB2 –	4
5	USB1 +	USB2 +	6
7	Gnd	Gnd	8
9	Gnd	Gnd	10

Table A–27 J500 – CompactFlash

J500 – CompactFlash connector			
Pin#	**Signal**	**Signal**	**Pin#**
1	GND	DD3	2
3	DD4	DD5	4
5	DD6	DD7	6
7	HDCS0*	GND	8
9	GND	GND	10
11	GND	GND	12
13	+5V	GND	14
15	GND	GND	16
17	GND	A2	18
19	A1	A0	20
21	DD0	DD1	22
21	DD2	NC	24
25	NC	NC	26
27	DD11	DD12	28
29	DD13	DD14	30
31	DD15	HDCS1*	32
33	NC	IOR*	34
35	IOW	+5V	36
37	IRQ14	+5V	38
39	M/S select	NC	40
41	RST*	IORDY	42
43	NC	+5V	44
45	ACTLED	PDIAG	46
47	DD8	DD9	48
49	DD10	GND	50
51	NC	NC	52

*active low

Appendix B: Software utilities

Introduction

This chapter describes the utilities listed below. The drivers and utilities are in a self-extracting zip file, located at the Octagon Systems web site on the XE–900 product page. Download this file to a separate directory on your hard drive, then double click on it to extract the files.

Support commands

XE900I17.EXE
REFLASH.EXE
RESET.COM

XE900I17.EXE

Purpose

This support command must be used to allow the system to use the INT 17h functions.

Syntax

```
XE900I17
```

REFLASH.EXE

Purpose

This support command will program a BIOS image from bios image file to the 512K flash EPROM.

Syntax

```
REFLASH
```

Remarks

Reflash.exe must have two files that are located the same directory as the reflash.exe file. These files are BIOS.BIN, a 512K BIOS image, and REFLASH.CMD, a support file that controls the programming sequence. These files are located in the XE–900 utilities (see page 115).

RESET.COM

Purpose

This support command enables the watchdog timer and allows time–out to expire, thus restarting the system.

Syntax

```
RESET
```

Remarks

The RESET command also restarts all the expansion I/O cards on the bus. This differs from a <CTRL><ALT><DEL> reboot of the system which only restarts the system but not the expansion cards. The RESET button on the XE–900 SBC also accomplishes the same thing as the RESET command.

Appendix C: Accessories

Table C–1 Cables and accessories

Product	Description	Octagon p/n
KYBD	Keyboard/mouse Y adapter cable	4186186
COM Port VTC-20F Cable	Dual serial cable (female)	4866
COM Port VTC-20M Cable	Dual serial cable (male)	4989
COM Port VTC-9F Cable	Serial cable (female)	2746
COM Port VTC-9M Cable	Serial cable (male)	2472
0.100 in RS-422/485 Cable	Serial cable for RS-422/485	6683
USB Cable	Two-port USB cable	6288
LVDS-18 Video Cable	LVDS cable with flying leads	6772
IDE Cable	44-pin to multi-connector cable: one 40-pin and one 44-pin two 40-pin and one 44-pin	 4080 6246
2 mm VGA-12, Cable, Ribbon, 12”	VGA video cable	6392
Null Modem Adapter, 9 Pin	9-pin to 9-pin	2470
AT battery	Calendar/clock battery backup	3186
ATX Power Cable	10-pin to 20-pin ATX cable	6537

Table C–2 Digital I/O accessories

Product	Description	Octagon p/n
Cables		
CMA-10-24	24” cable for I/O port, 10-pin	1743
CMA-26-12	12” cable for digital IO port, 26-pin	2776
CMA-26-24	24” cable for digital IO port, 26-pin	1257
Terminal Boards		
STB-26	Terminal board, 26-position	2905
STB-20	Terminal board, 20-position	2904
STB-10	Terminal board, 10-position	2901
TBD-100	Terminal board with LED indicators	1183
Opto Modules and Racks		
G4-IAC5	Input module, 90-140 VAC	2395
G4-IAC5A	Input module, 180-280 VAC	2396
G4-IDC5	Input module, 15-32 VDC	2397
G4-IDC5B	Input module, 4-16 VDC	2511
G4-IDC5D	Input module, 2.5-28 VDC	2529
G4-OAC5	Output module, 12-140 VAC	2398
G4-OAC5A	Output module, 24-280 VAC	2399
G4-ODC5	Output module, 5-60 VDC	2400
G4-ODC5A	Output module, 5-200 VDC	2503
MPB-08	Opto Rack, 8-position	2512
MPB-16	Opto Rack, 16-position	2513
MPB-24	Opto Rack, 24-position	2514

Warranty

Octagon Systems Corporation (Octagon), warrants that its standard hardware products will be free from defects in materials and workmanship under normal use and service for the current established warranty period. Octagon's obligation under this warranty shall not arise until Buyer returns the defective product, freight prepaid to Octagon's facility or another specified location. Octagon's only responsibility under this warranty is, at its option, to replace or repair, free of charge, any defective component part of such products.

Limitations on warranty

The warranty set forth above does not extend to and shall not apply to:

1. Products, including software, which have been repaired or altered by other than Octagon personnel, unless Buyer has properly altered or repaired the products in accordance with procedures previously approved in writing by Octagon.

2. Products which have been subject to power supply reversal, misuse, neglect, accident, or improper installation.

3. The design, capability, capacity, or suitability for use of the Software. Software is licensed on an "AS IS" basis without warranty.

The warranty and remedies set forth above are in lieu of all other warranties expressed or implied, oral or written, either in fact or by operation of law, statutory or otherwise, including warranties of merchantability and fitness for a particular purpose, which Octagon specifically disclaims. Octagon neither assumes nor authorizes any other liability in connection with the sale, installation or use of its products. Octagon shall have no liability for incidental or consequential damages of any kind arising out of the sale, delay in delivery, installation, or use of its products.

Service policy

1. If a product should fail during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rates.

2. Customers that return products for repairs, within the warranty period, and the product is found to be free of defect, may be liable for the minimum current repair charge.

Returning a product for repair

1. The customer must call Tech Support at 303-426-4521 to determine if repair service is necessary.

2. If repair service is required, Tech Support will require the customer's name, address, telephone number, email address and a list of problems found.

3. Tech Support will forward this information to the RMA Administrator who will contact the customer to issue the RMA number.
4. The customer must carefully package the product in an antistatic container. Failure to package in antistatic packaging will VOID all warranties. Then package in a safe container for shipping.
5. Write the RMA number on the outside of the shipping container.
6. The customer pays for shipping to Octagon. Octagon pays for shipping back to the customer.
7. Other conditions and limitations may apply to international shipments.

Note PRODUCTS RETURNED TO OCTAGON FREIGHT COLLECT OR WITHOUT AN RMA NUMBER CANNOT BE ACCEPTED AND WILL BE RETURNED FREIGHT COLLECT.

Returns

There will be a 15% restocking charge on returned product that is unopened and unused, if Octagon accepts such a return. Returns will not be accepted 30 days after purchase. Opened and/or used products, non–standard products, software and printed materials are not returnable without prior written agreement.

Governing law

This agreement is made in, governed by and shall be construed in accordance with the laws of the State of Colorado.

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