SEL-3332
Intelligent Server

Instruction Manual

20140307

SCHWEITZER ENGINEERING LABORATORIES, INC.

PM3332-01

⚠CAUTION

Equipment components are sensitive to electrostatic discharge (ESD). Undetectable permanent damage can result if you do not use proper ESD procedures. Ground yourself, your work surface, and this equipment before removing any cover from this equipment. If your facility is not equipped to work with these components, contact SEL about returning this device and related SEL equipment for service.

⚠DANGER

Disconnect or de-energize all external connections before opening this device. Contact with hazardous voltages and currents inside this device can cause electrical shock resulting in injury or death.

⚠DANGER

Contact with instrument terminals can cause electrical shock that can result in injury or death.

⚠WARNING

Have only qualified personnel service this equipment. If you are not qualified to service this equipment, you can injure yourself or others, or cause equipment damage.

⚠WARNING

Use of this equipment in a manner other than specified in this manual can impair operator safety safeguards provided by this equipment.

⚠WARNING

This device is shipped with default passwords. Default passwords should be changed to private passwords at installation. Failure to change each default password to a private password may allow unauthorized access. SEL shall not be responsible for any damage resulting from unauthorized access.

⚠WARNING

Never use standard null-modem cables with the SEL-3332. Using any non-SEL cable can cause severe power and ground problems involving Pins 1, 4, and 6 on the SEL-3332 communications ports.

⚠ATTENTION

Les composants de cet équipement sont sensibles aux décharges électrostatiques (DES). Des dommages permanents non-décelables peuvent résulter de l'absence de précautions contre les DES. Raccordez-vous correctement à la terre, ainsi que la surface de travail et l'appareil avant d'en retirer un panneau. Si vous n'êtes pas équipés pour travailler avec ce type de composants, contacter SEL afin de retourner l'appareil pour un service en usine.

⚠DANGER

Débrancher tous les raccordements externes avant d'ouvrir cet appareil. Tout contact avec des tensions ou courants internes à l'appareil peut causer un choc électrique pouvant entraîner des blessures ou la mort.

⚠DANGER

Tout contact avec les bornes de l'appareil peut causer un choc électrique pouvant entraîner des blessuers ou la mort.

⚠AVERTISSEMENT

Seules des personnes qualifiées peuvent travailler sur cet appareil. Si vous n'êtes pas qualifiés pour ce travail, vous pourriez vous blesser avec d'autres personnes ou endommager l'équipement.

⚠AVERTISSEMENT

L'utilisation de cet appareil suivant des procédures différentes de celles indiquées dans ce manuel peut désarmer les dispositifs de protection d'opérateur normalement actifs sur cet équipement.

⚠AVERTISSEMENT

Cet appareil est expédié avec des mots de passe par défaut. A l'installation, les mots de passe par défaut devront être changés pour des mots de passe confidentiels. Dans le cas contraire, un accés non-autorisé á l'équipement peut être possible. SEL décline toute responsabilité pour tout dommage résultant de cet accés non-autorisé.

⚠AVERTISSEMENT

Ne jamais utiliser de cables standards à inversion de signaux ("null-modem") avec le SEL-3332. L'utilisation d'un cable d'une autre provenance que SEL peut causer de sérieux problèmes de neutre et d'alimentation impliquant les fiches 1, 4 et 6 sur les ports de communication du SEL-3332

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Preface

Manual Overview

The SEL-3332 Intelligent Server manual includes necessary information to properly install the product.

The scope of the manual covers specifications, installation and mechanical information, operating system configuration, self-monitoring, alarming, and IRIG-B generation. Please refer to included software manuals or Quick-Start guides for proper use of the application software.

An overview of each manual section and topics follows:

Preface. Describes the manual organization and conventions used to present information.

Section 1: Introduction and Specifications. Describes the basic features and functions of the SEL-3332; lists the specifications.

Section 2: Installation. Describes how to mount and wire the SEL-3332; illustrates wiring connections for various applications.

Section 3: Embedded Operating System Configuration. Describes the features of the embedded operating system that is used in the SEL-3332.

Section 4: SEL SysMon. Describes custom functions built into the SEL-3332. These functions are accessed by using a custom IRIG-B, Status, and Alarms Control Panel called the SEL SysMon GUI.

Section 5: Troubleshooting. Lists common operating and troubleshooting questions.

Appendix A: Software and Manual Versions. Details differences between manual versions. Provides a record of changes made to the manual since the initial release.

Appendix B: Device Update Agent. Describes the use and general concept of the update mechanism for the embedded operating system.

Appendix C: Resetting BIOS. Describes the original BIOS settings and steps needed to reset the BIOS.

Conventions

Safety Information

This manual uses three kinds of hazard statements, formatted as follows:

⚠CAUTION
Indicates a potentially hazardous situation that, if not avoided, **may** result in minor or moderate injury or equipment damage.

⚠WARNING
Indicates a potentially hazardous situation that, if not avoided, **could** result in death or serious injury.

⚠DANGER
Indicates an imminently hazardous situation that, if not avoided, **will** result in death or serious injury.

Section 1
Introduction and Specifications

Overview

The SEL-3332 Intelligent Server is a system of hardware and software representing the best features of the PC-AT compatible computer architecture, embedded microcontroller architecture, embedded operating system, and protocol server software. The SEL-3332 provides an easily configurable graphical interface for mapping serial and Ethernet data between numerous clients and servers.

Features

The SEL-3332 provides a rugged, easy-to-use, flexible protocol conversion device for substation or other harsh environments. The SEL-3332 is based on a PC-AT compatible computing platform and a separate microcontroller. The following features and enhancements are included in the system:

- **Operating System**

  The embedded operating system provides extreme flexibility and functionality along with increased security. Direct write access to files or hardware has been eliminated.

- **Watchdog Timer**

  A separate system watchdog microcontroller provides an extra level of computer system reliability. The microcontroller reboots the computer if there is an operating system problem or a problem with selectable specific software services.

- **IRIG Updated System Clock**

  The microcontroller decodes an IRIG-B signal from an external IRIG-B source and updates the computer system clock.

- **IRIG Generation**

  Demodulated IRIG-B is generated by the microcontroller from the PC-AT computer system clock when an external IRIG-B signal is absent. Synchronize this system clock with a network time server, if desired.

- **Connected Device Time Synchronization**

  Demodulated IRIG-B is provided to the connected Intelligent Electronic Devices (IEDs) using the connected EIA-232 cable. Demodulated IRIG-B output is also provided on a separate BNC connector.

- **Local or Remote Configuration**

  Use a VGA monitor, keyboard, and mouse to locally configure the SEL-3332 Intelligent Server, or configure it remotely over the Ethernet network using Windows Remote Desktop. Configure the protocol conversion software on the same SEL-3332 that is used during run-time application.

  Alternately, a separate configuration application can be used on a different computer and the resultant configuration files loaded onto the SEL-3332 that is used during the run-time application.

Models and Options

Models

Complete ordering information is not provided in this instruction manual. See the latest SEL-3332 Model Option Table at www.selinc.com, under **SEL Literature > Ordering Information** (Model Option Tables).

Options

The SEL-3332 has the following options and features:

- Power Supply Ranges
  - 24/48 Vdc
  - 48/125 Vdc or 120 Vac
  - 125/250 Vdc or 120/230 Vac
- Communication Options
  - One, eight, or sixteen serial ports, EIA-232, byte oriented protocols.
  - Ethernet 1, 10/100BASE-T copper or 100BASE-FX fiber-optic port, jumper selectable (standard).
  - Ethernet 2, 100BASE-FX fiber-optic Ethernet port with a MAC address that is separate from Ethernet 1 (standard).
  - Four Universal Serial Bus (USB) ports (standard).
- Storage Options
  - Primary: 1 GB, 2 GB, 4 GB, 8 GB
  - Secondary: None, 1 GB, 2 GB, 4 GB, 8 GB
- Processor
  - Intel® Pentium® M 1.4 GHz with 1 GB DDR ECC SDRAM
- IRIG-B time-code input
  - modulated
  - demodulated
- Mounting
  - horizontal panel
  - horizontal 19-inch rack
- Protocol Server Software
  - Port/Point count options
  - Protocol selections

Applications

Figure 1.1 shows a typical configuration using the SEL-3332. The Intelligent Server supports numerous serial and Ethernet servers and clients. The system shown below only depicts the real-time SCADA data collection connections. Other connections may be desired for engineering access.

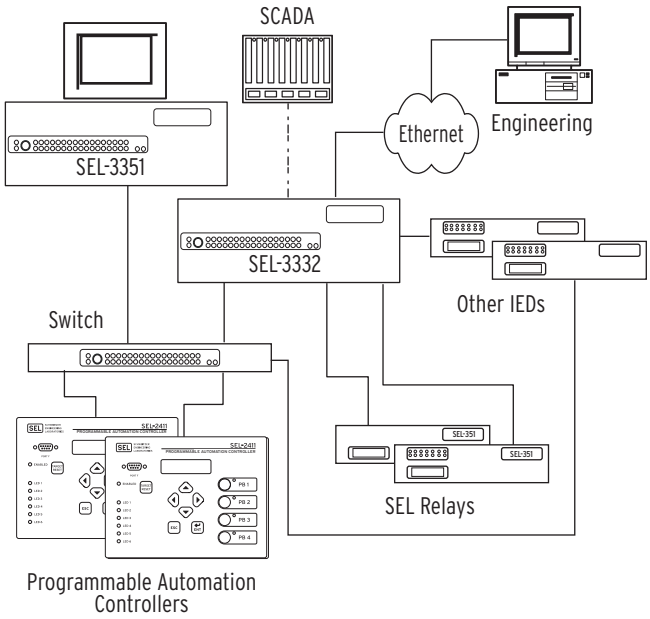

Figure 1.1 Functional Model

Specifications

General

Peer-to-Peer Protocols

IEC 61850 GOOSE

Master Protocols

IEC 61850 MMS, SEL Fast Message, DNP3 Serial and LAN/WAN, Modbus® RTU and TCP/IP, IEC 60870-5-103, LG8979, SES-92, Harris 5000/6000

Slave Protocols

IEC 61850 MMS, DNP3 Serial and LAN/WAN, Modbus® RTU and TCP/IP, IEC 60870-5-101/104, LG8979, SES-92, Harris 5000/6000, Conitel 2020, GETAC/BETAC 7020, CDC Type 2, Recon 1.1

Enterprise Applications

Port Server, Logic Calculator, Data Logger, Event File Collection, OPC Client/Server

Terminal Connections

Rear Screw-Terminal Tightening Torque

Minimum:	0.8 Nm (7 in-lb)
Maximum:	1.4 Nm (12 in-lb)

User terminals and stranded copper wire should have a minimum temperature rating of 105°C and a minimum insulation thickness of 0.4 mm. Ring terminals are recommended.

Power Supply

Option:	125/250 Vdc or 120/230 V 50/60 Hz
DC Range:	85–300 Vdc
AC Range:	85–264 Vac
Frequency Range:	30–120 Hz
Burden:	<40 W
Option:	48/125 Vdc or 120 V 50/60 Hz
DC Range:	38–140 Vdc
AC Range:	85–140 Vac
Frequency Range:	30–120 Hz
Burden:	<40 W
Option:	24/48 Vdc
DC Range:	20–60 Vdc polarity dependent
Burden:	<40 W

Operating Temperature, Performance

–40° to +75°C (–40° to +167°F)

Operating Temperature, Safety

–40° to +75°C (–40° to +167°F)

Storage Temperature

–40° to +85°C

Relative Humidity

5 to 95% noncondensing

Maximum Altitude

2000 m

Atmospheric Pressure

80 ... 110 kPa

Overvoltage Category

Category II

Pollution Degree

2

Weight (Maximum)

5 kg (11 lbs)

Serial Ports

1, 8, or 16 rear-panel ports, DB-9 connectors

USB Ports

2 rear-panel ports, 2 front-panel ports
USB 1.1 Compliant
200 mA current limit for rear-panel ports
200 mA current limit for front-panel ports

Ethernet Ports

2 rear-panel fiber-optic ports, 1 rear-panel copper port

Fiber-Optic

Max TX Pwr.:	–14 dBm
Min TX Pwr.:	–19 dBm
RX Sensitivity:	–32 dBm
System Gain:	13 dB
Wavelength:	1300 nm
Source:	LED
Connector Type:	ST

Serial Data Speed

300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps (meets EIA/TIA-562 specifications)

Time-Code Input

Connector:	Female BNC
Time-Code:	Modulated IRIG-B Demodulated IRIG-B TTL compatible

Note: Automatically sets SEL-3332 real-time clock/calendar.

Time-Code Output

Pinout:	DB-9 port connectors Pin 4 TTL-level signal Pin 6 chassis ground reference Female BNC
Connectors:	16 rear DB-9 port connectors Female BNC

Note: Outputs are generated from IRIG-B input (when present) or generated by SEL-3332.

Type Tests

Electromagnetic Compatibility Immunity

Electrostatic Discharge:	IEC 60255-22-2:1996 IEC 61000-4-2:1995 IEEE C37.90.3-2001 Severity Level: 2, 4, 6, 8 kV contact discharge; 2, 4, 8, 15 kV air discharge

Fast Transient Disturbance:	IEC 61000-4-4:1995 IEC 60255-22-4:2002 Severity Level: Class A 4 kV, 2.5 kHz on power supply and outputs; 2 kV, 5 kHz on communication lines
Radiated Radio Frequency:	IEC 61000-4-3:1998 IEC 60255-22-3:2000 Severity Level: 10 V/m IEEE C37.90.2-1995 Severity Level: 35 V/m
Surge Withstand:	IEEE C37.90.1-2002 Severity Level: 4 kV, 2.5 kHz on power supply and outputs; 2 kV, 5 kHz on communication lines
Conducted Emissions:	EN 55011:1998 Level: Class A IEC 60255-25:2000
Radiated Emissions:	EN 55011:1998 Level: Class A IEC 60255-25
Voltage Fluctuations and Flicker:	IEC 61000-3-3:2002
Harmonic Current Emissions:	IEC 61000-3-2:2001 Level: Class A
Surge Withstand Capability Immunity:	IEC 60255-22-1:1988 Severity Level: Power supply and outputs: 2.5 kV peak common mode 1.0 kV peak differential mode Communications ports: 1.0 kV peak common mode
Surge Immunity:	IEC 61000-4-5:1995 IEC 60255-22-5:2002 Severity Level: 0.5, 1.0 kV Line-to-Line 0.5, 1.0, 2.0 kV Line-to-Earth
Conducted Immunity:	IEC 61000-4-6:1996 IEC 60255-22-6:2001 Severity Level: 10 Vemf
Power Frequency Magnetic Field Immunity:	IEC 61000-4-8:1993 Severity Level: 1000 A/m for 1 s 100 A/m for 1 min.
Pulse Magnetic Field Immunity:	IEC 61000-4-9:1993 Severity Level: 1000 A/m, Level 5
Power Supply Variation and Interruption:	IEC 61000-4-11 IEC 60255-11

Environmental

Cold:	IEC 60068-2-1:1990 Test Ad: 16 hours at –40°C
Dry Heat:	IEC 60068-2-2:1974 Test Bd: 16 hours at +75°C
Damp Heat, Cyclic:	IEC 60068-2-30:1980 Test Db: (12 + 12-hour cycle), 95% r.h. 25° to 55°C, 6 cycles
Object Penetration:	IEC 60529:2001, IP30 from front of unit
Vibration:	IEC 60255-21-1:1988 Endurance Class 1 Response Class 1 IEC 60255-21-2:1988 Shock Withstand, Bump Class 1 Shock Response Class 1 IEC 60255-21-3:1993 Quake Response Class 2

Safety

Dielectric Strength:	IEC 60255-5:2000 3100 Vdc on power supply 2500 Vac on contact output Type tested for one minute IEEE C37.90-1989 3100 Vdc for 1 min. on power supply 2500 Vac on contact output Type tested for one minute IEEE Std 1613-2003
Impulse:	IEC 60255-5:2000 IEEE Std 1613-2003 IEEE C37.90-1989 Severity Level: 0.5 Joule, 5 kV
LED:	IEC 60825-1:1993 + A1:1997 + A2:2001

Real-Time Clock/Calendar

Battery Type:	IEC No. BR2335 Lithium
Battery Life:	10 years with power 2 years without power

Memory

RAM:	1 GB
Primary CompactFlash:	1 GB, 2 GB, 4 GB, 8 GB
Secondary CompactFlash:	None, 1 GB, 2 GB, 4 GB, 8 GB

Certifications

ISO: SEL-3332 is designed and manufactured using ISO 9001-certified quality program.

CE: CE Mark
EN 50263:1999—EMC Directive, Low Voltage Directive
EN 61010-1:2001—Low-Voltage Directive (Safety)

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Section 2
Installation

Overview

The first steps in applying the SEL-3332 Intelligent Server are installing and connecting the unit. This section describes common installation features and requirements. A successful installation requires an understanding of both the physical and software functions.

To install and connect the Intelligent Server safely and effectively, you must be familiar with the device configuration features and options. Carefully plan unit placement, cable connections, and Intelligent Electronic Device (IED) communications during initial design.

This section contains connection drawings for mouse, keyboard, monitor, Ethernet, USB, EIA-232, IRIG-B, and power. Use these drawings as a starting point for planning your particular Intelligent Server application.

Unit Placement and Maintenance

Proper placement of the SEL-3332 helps make certain that you receive years of trouble-free operation. Use the following guidelines for proper installation of the SEL-3332.

Physical Location

Mount the SEL-3332 in a sheltered enclosed environment (a building or an enclosed cabinet) that does not exceed the temperature and humidity ratings for the unit (see *Specifications on page 1.4*). The unit is rated Installation/Overvoltage Category II and Pollution Degree 2. This rating allows mounting of the unit indoors or in an outdoor (extended) enclosure where the unit is protected against exposure to direct sunlight, precipitation, and full wind pressure, but temperature and humidity are not controlled.

Unit Mounting

Panel mount and 19-inch rack mount options are available. The following diagrams show dimensions and panel cutout size for the unit.

Cleaning

Use care when cleaning the SEL-3332. Use a mild soap or detergent solution and a damp cloth to clean the unit chassis. Allow the unit to air dry, or wipe dry with a soft, dry cloth. Do not use abrasive materials or polishing compounds on any unit surface. Be careful cleaning the front and rear panels because a permanent plastic sheet covers each panel; do not use harsh chemical solvents such as xylene or acetone on these surfaces.

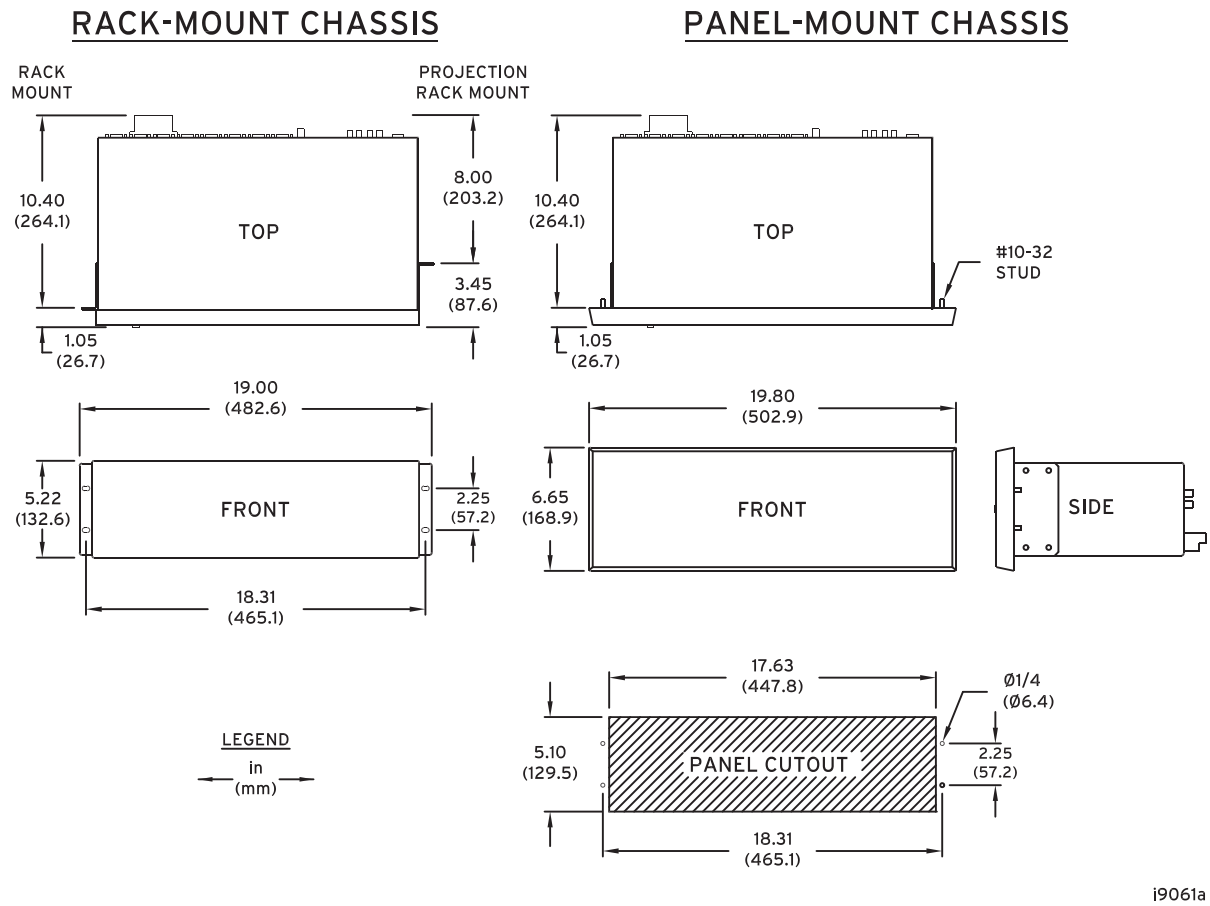

Figure 2.1 Dimensions Diagram

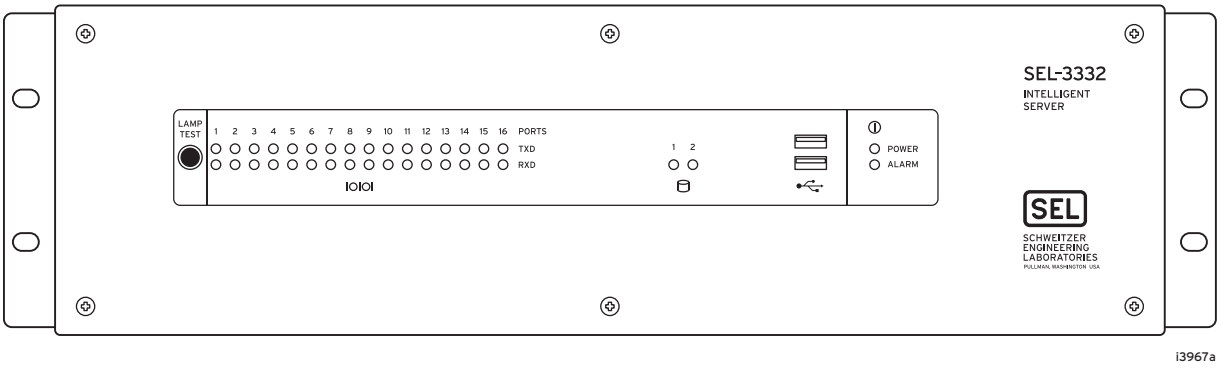

Figure 2.2 Front Rack-Mount Diagram

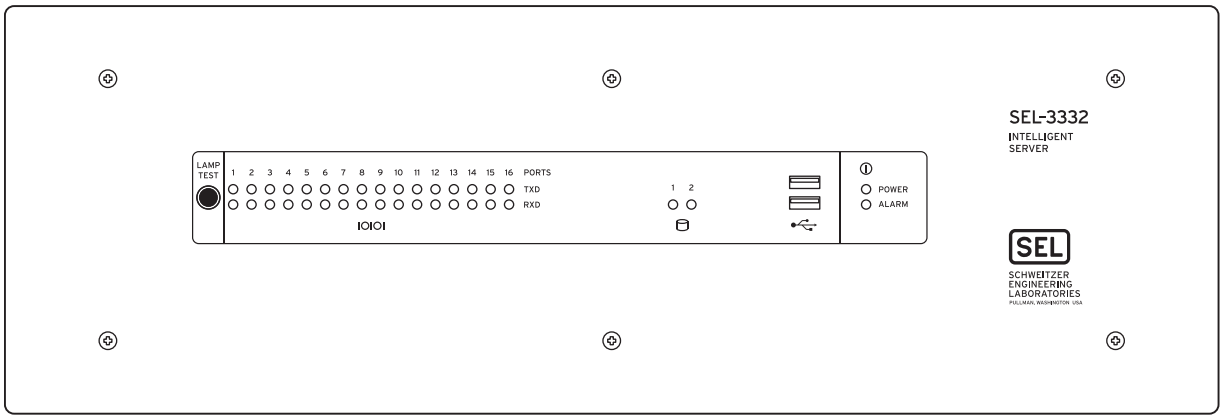

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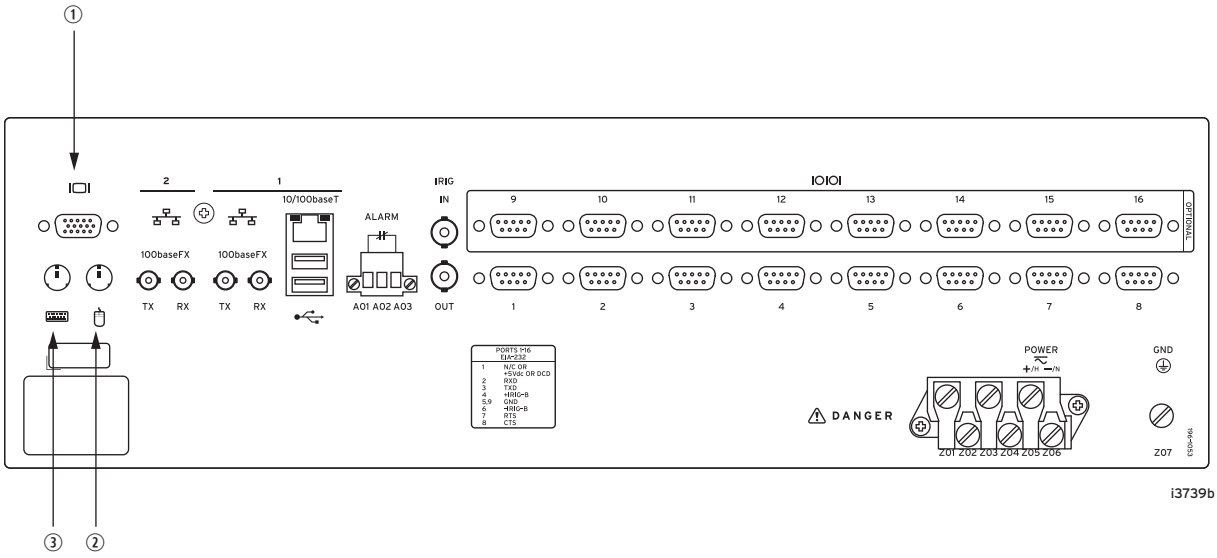
Figure 2.3 Front Panel-Mount Diagram

Rear-Panel Connections



i3739b

① Monitor connection is optional. If desired, connect a standard DB-15 monitor cable into the monitor port. Otherwise, the SEL-3332 is accessible through the Remote Desktop Connection. See Section 3: Embedded Operating System Configuration for operational details regarding the Remote Desktop Connection. Connect a VESA compliant monitor. The maximum supported resolution is 1600 by 1200 dpi.

② Mouse connection is optional. If desired, connect a standard PS/2 mouse into the mouse port or connect a USB compatible mouse into a USB port. See Table 2.2 for compatible mouse pointing devices. Otherwise, the mouse functionality is applied through the Microsoft® Remote Desktop Connection.

③ Keyboard connection is optional. If desired, connect a standard PS/2 keyboard into the keyboard port or connect a USB compatible keyboard into a USB port. See Table 2.2 for compatible keyboards. Otherwise, the keyboard functionality is applied through the Microsoft Remote Desktop Connection application.

NOTE: A USB mouse/keyboard is highly recommended over a PS/2. The PS/2 mouse/keyboard ports do not pass RFI and fast transient and emissions tests. PS/2 ports are for setup only, not for long-term use.

Figure 2.4 Rear-Panel Diagram

The physical layout of the connectors on the rear panel of an SEL-3332 is shown in *Figure 2.4*.

Ethernet Connection

Ethernet connection to the SEL-3332 is optional. It is not required for serial port protocol conversion. Ethernet connection is only required if Remote Desktop Connection or an Ethernet protocol connection is desired.

The SEL-3332 is equipped with dual Ethernet. Ethernet 1 is jumper selectable between copper 10/100BASE-T or fiber-optic 100BASE-FX (see *Figure 2.9* and *Table 2.4*). Ethernet 1 contains only one MAC address. The Ethernet 1 copper and fiber interface cannot be used at the same time. Changing from copper to fiber requires a power cycle.

Ethernet 2 is 100BASE-FX only. Ethernet 2 has a separate MAC address from Ethernet 1.

A full discussion of MAC addresses is beyond the scope of this manual. See your network administrator for questions or concerns.

The LEDs on the copper Ethernet 1 jack apply to both copper and fiber connections. The left LED illuminates orange for a 10 Mbaud connection and green for a 100 Mbaud connection. The LED on the right flashes yellow during data transfer.

The dual Ethernet function of the SEL-3332 is the same as a standard dual Ethernet PC-AT compatible computer.

Alarm Contact Connection

The SEL-3332 provides a normally closed, dry alarm contact driven by the microcontroller. The microcontroller closes or pulses the alarm contact during certain operational events. The contact closes if the system computer BIOS, hardware, software, or operating system malfunctions. The Alarm Contact also pulses during a log on or log off. Ratings for the contact are 30 A make, 6 A continuous, and 0.5 A or less break (depending on circuit voltage). The Alarm Contact has a maximum safety rating of 250 Vac/330 Vdc.

IRIG-B Connections

The SEL-3332 accepts modulated (B122) or demodulated (B002) IRIG-B input. Demodulated IRIG-B is provided on the BNC IRIG-B output connector and on Pins 4 and 6 of the serial communications ports.

The IRIG-B signal preference is given to the BNC connector, IRIG-B input. When this signal is not present, then IRIG-B is generated from the system computer clock and distributed to the IRIG-B output connections. The system computer clock is either free running or can be updated from the local area network (LAN) by using network time protocol (NTP). The embedded operating system uses Network Time Protocol Version 3 with algorithmic enhancements from NTP4. The SEL-3332 is able to generate demodulated IRIG-B output from NTP.

The system clock and the microcontroller decoded or encoded IRIG-B are synchronized when they are greater than 900 ms apart. Therefore, the system clock is accurate to ± 900 ms.

IRIG-B input is *not* available on any serial communications ports. Refer to *Table 2.4* and *Figure 2.9* for IRIG-B jumper selections.

The IRIG-B signal includes code for day-of-the-year and time-of-day. It does not include a code to identify the year. To set the device calendar to the proper year, you need to set the date on each device receiving an IRIG-B signal. Most SEL IEDs store the year for the set date with the relay settings in nonvolatile memory. So once the date is properly set, the relay will maintain the proper year even if relay power is cycled off and on.

Serial Port Communications

One, eight or sixteen serial ports are available on the SEL-3332, depending on ordering options. Each serial port has a communications port number assigned in the operating system similar to a standard PC-AT compatible computer.

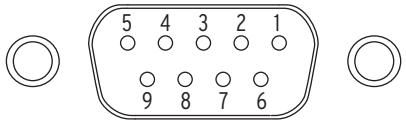
The serial communications ports function as standard EIA-232 ports with the additions of IRIG-B and +5 V power. See *Figure 2.5* for EIA-232 DB-9 female connector pin numbers. See *Table 2.1* for EIA-232 serial port pin functions.

Table 2.1 Serial Port Connector Pin Definition

Pin	Ports 1–16
1	N/C or +5 Vdc or DCD[a]
2	RXD
3	TXD
4	+IRIG-B
5, 9	GND
6	–IRIG-B (GND)
7	RTS
8	CTS

[a] Jumper configurable

Pin 1 on the ports can provide as much as 0.6 A at 5 V (3 W) total for all 16 ports.



Female chassis connector, as viewed from outside panel.

Figure 2.5 EIA-232 DB-9 Connector Pin Numbers

The communications circuits have internal surge protection.

Common serial cable configurations are shown in the following figures. Refer to SEL-5801 Cable Selector Software for the most recent cable configurations.

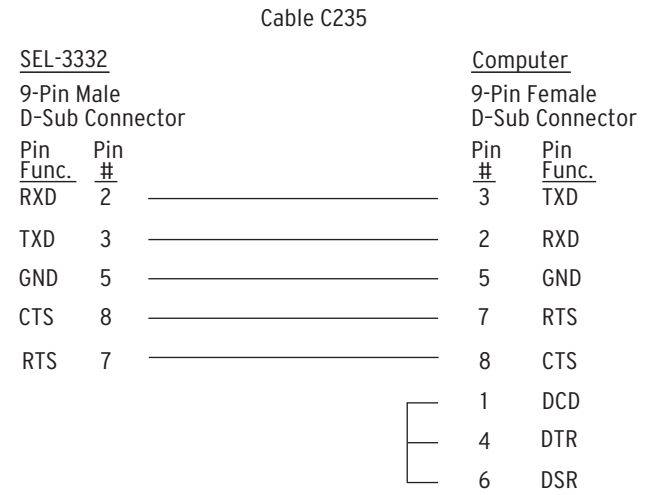


Figure 2.6 SEL Cable C235

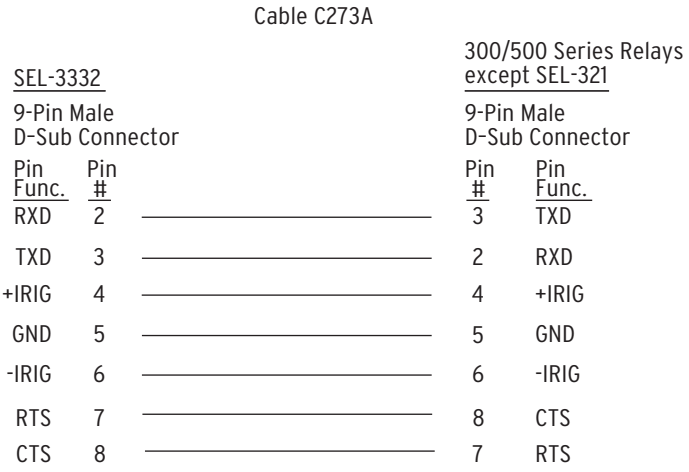


Figure 2.7 SEL Cable 273A

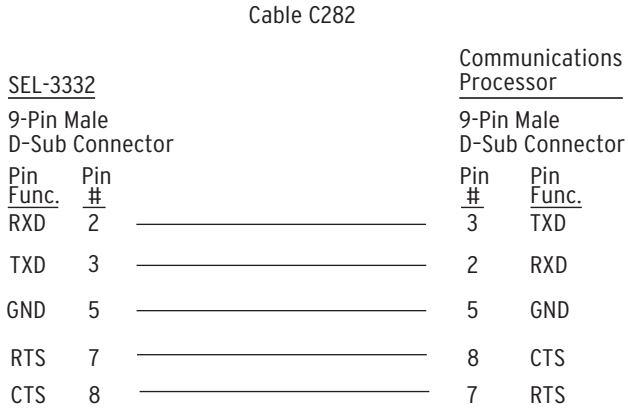


Figure 2.8 SEL Cable 282

⚠WARNING
Never use standard null-modem cables with the SEL-3332. Using any non-SEL cable can cause severe power and ground problems involving Pins 1, 4, and 6 on the SEL-3332 communications ports.

The following list provides additional rules and practices you should follow for successful communication using EIA-232 serial communications devices and cables:

- You should keep the length of the communications cables as short as possible to minimize communications circuit interference and also to minimize the magnitude of hazardous ground potential differences that can develop during abnormal power system conditions.
- EIA-232 communications cable lengths should never exceed 50 feet, and you should always use shielded cables for communications circuit lengths greater than 10 feet.
- Modems or fiber optics are required for communication over long distances and to provide isolation from ground potential differences between device locations.
- Route communications cables away from power and control circuits. Switching spikes and surges in power and control circuits can cause noise in the communications circuits if not adequately separated.
- Lower baud rate communication is less susceptible to interference and will transmit greater distances over the same medium than with higher baud rates. You should use the lowest baud rate that provides adequate data transfer speed.

Port Isolators

SEL offers a data-line-powered isolator for use with EIA-232 ports and metallic communications cables. The SEL-2910 Port Isolator also isolates IRIG-B time code inputs on the same communications port. These isolators break cable ground loops and are useful in existing applications of metallic cables in switchgear. SEL does not recommend using port isolators for circuits outside the control house. Fiber should be used in such applications. Refer to SEL Application Guide AG2001-06, *Avoiding Magnetic Induction Issues in Communication Cabling*, for detailed information.

Fiber-Optic Cables

One benefit of applying the SEL-3332 as the hub of a star topology is it enables low cost, point-to-point fiber-optic connections. The SEL-2800 series of fiber-optic transceivers connects directly to the serial port connectors on the rear of the SEL-3332. Fiber-optic links improve safety by isolating the equipment from hazardous and damaging ground-potential rise, eliminate instrumentation system ground-loop problems, reduce susceptibility to RFI and EMI, and allow longer signal paths than metallic EIA-232 connections.

USB Connections

The SEL-3332 provides four USB 1.1 connections. Two USB ports are located on the front and two are located on the rear of the product. Most USB 2.0 peripheral devices are compatible with USB 1.1. However, a very limited subset of USB device drivers have been included in the embedded operating system. Limiting the number of available drivers reduces the risk of driver and software incompatibilities.

Refer to *Table 2.2* for a list of compatible USB devices. Obtain an updated list from the SEL website.

Table 2.2 USB and PS/2 Compatible Devices

Hub
Generic USB Hub
Mouse
HID Mouse
Key Tronic® USB Keyboard
Logitech USB Wheel Mouse
Logitech PS/2 Port Mouse
Microsoft PS/2 Mouse
Microsoft USB Wheel Mouse Optical
Microsoft USB IntelliMouse
Microsoft USB IntelliMouse Optical
PS/2 Compatible Mouse
Keyboard
HID Keyboard
Microsoft USB Internet Keyboard
Microsoft Office Keyboard
Memory Stick
Most USB Memory Sticks

NOTE: A USB mouse/keyboard is highly recommended over a PS/2. The PS/2 mouse/keyboard ports do not pass RFI and fast transient and emissions tests. PS/2 ports are for setup only, not for long-term use.

Serial Board Jumpers

The serial board jumpers are set at the factory. Do not modify the jumper positions. The following table lists the jumper positions.

Table 2.3 Serial Board Jumpers

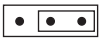
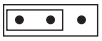
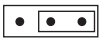
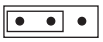
Bottom Board	
Jumper 1	Second Position
Jumper 2	All on
Jumper 3	All on
Jumper C[a]	10 (IRQ)
Top Board	
Jumper 1	Not jumpered
Jumper 2	All on
Jumper 3	All on
Jumper C[a]	5 (IRQ)

[a] All other jumpers are in the Off position.

Main Board Jumpers

Set the main board jumpers to meet your requirements. See *Table 2.4* for jumper functions and positions. See *Figure 2.9* for jumper location on the main board.

Table 2.4 Main Board Jumper Positions

Function	Jumper Position	Access From Front
JMP1	Fixed in position B	No
JMP2 Serial Port Pin 1	DCD Connection–Default 	No
	No Connection 	
	+5 Vdc Connection 	
JMP3 IRIG-B	Demodulated–Default 	No
	Modulated 	
JMP4 Microcontroller Reset	Reset Enabled–Default 	No
	Reset Disabled 	
JMP5 Ethernet 1 Fiber-Optic Selection	10/100BASE-T Enabled–Default 	Yes
	100BASE-FX Enabled 	

Jumper 1 is a hard-soldered jumper that modifies the alarm contact function from normally closed to normally open.

Jumper 2 connects serial port pin 1 to a +5 Vdc source, no connection, or Data Carrier Detect (DCD). DCD is asserted when an external modem establishes a connection to another modem over a telecommunications network.

Do not move jumpers 3 or 4 from their default positions in the SEL-3332.

Jumper 5 position determines the Ethernet 1 media. Off position enables copper and On position enables fiber-optic Ethernet connection. The Off or On position is read during boot. Changing position requires a reboot.

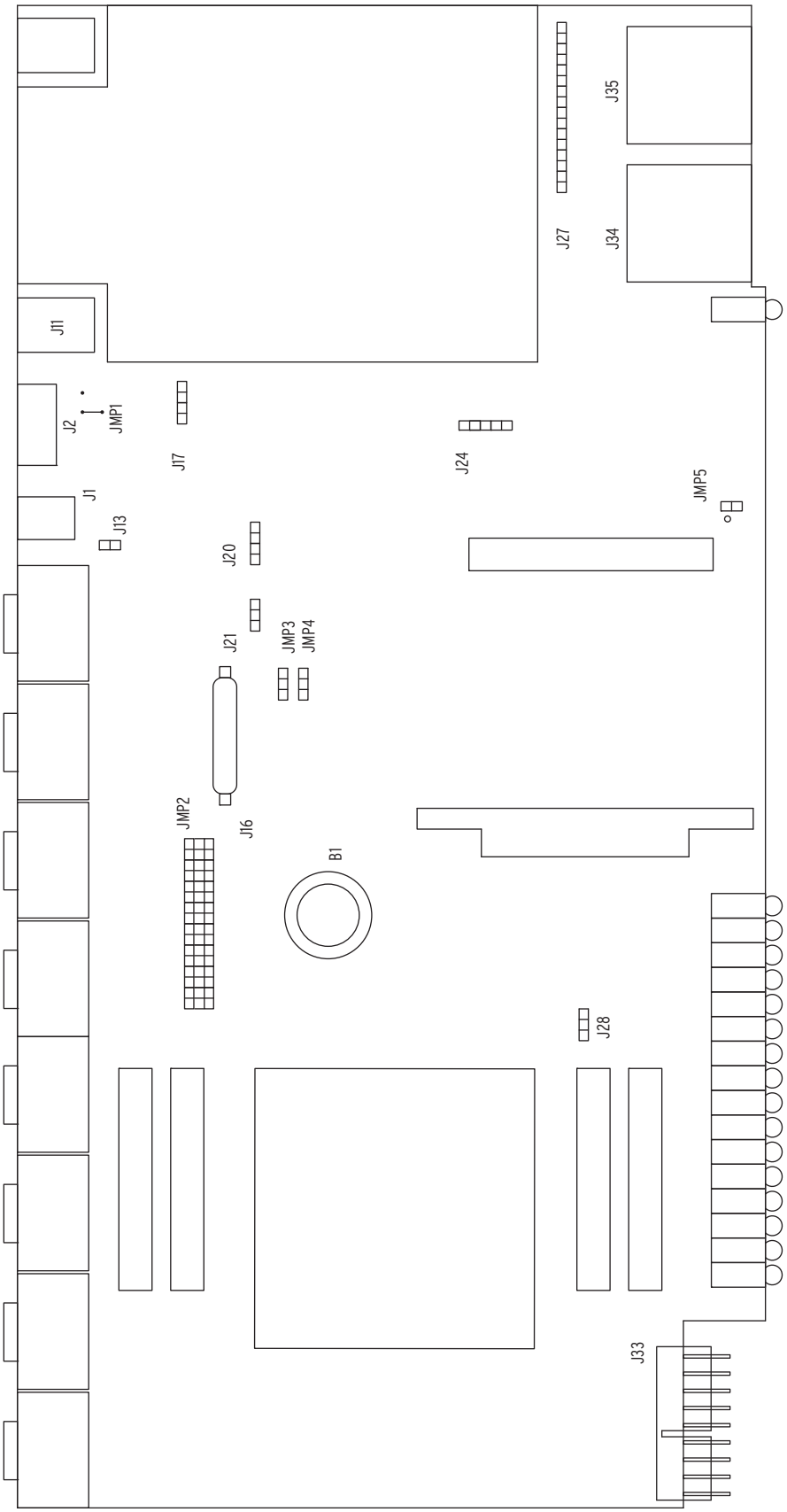


Figure 2.9 Jumper Locations

Grounding

Connect the grounding terminal (**#Z07**) labeled **GND** on the rear panel to a rack frame ground or main station ground for proper safety and performance. Use 12 AWG (4 mm^2) or heavier wire less than 6.6 feet (2 m) in length for this connection. This terminal connects directly to the internal chassis ground of the SEL-3332.

Power Connections

Connect the power terminals on the rear panel (**Z05(+/H)** and **Z06(-/N)**) to the proper ac or dc power source. Ensure the connected voltage is with the rated range for the power supply ordered. Rated voltages are indicated on the serial number label.

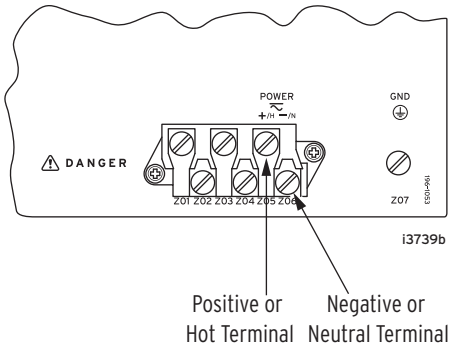


Figure 2.10 Power Connections

⚠WARNING
Do not operate device unless properly grounded.

⚠WARNING
Failure to ensure proper voltage levels can cause equipment damage.

The power terminals are isolated from the chassis ground. Use 16 AWG (1.5 mm^2) size or larger wire to connect to the power terminals.

Place an external switch, circuit breaker, or other overcurrent protection device in the power leads. The overcurrent protection device must interrupt both the hot and neutral power leads if dc powered. The maximum current rating for the overcurrent protection device must be no greater than 20 A. Be sure to locate this device within 9.8 feet (3.0 m) of the SEL-3332. Disconnect devices must comply with IEC 60947-1 and IEC 60947-3.1.

Operational power is internally fused on the power supply. Replacing the internal power supply fuse is not recommended unless indicated otherwise by your local SEL representative. An internal fuse failure indicates possible circuit board or electronic failure that may cause sporadic or incorrect device operation.

Initial Checkout and Startup

The initial checkout and startup is broken into two operating methods. The first method uses the Microsoft Remote Desktop Connection application and an Ethernet connection as the initial interface to the SEL-3332. The second method utilizes a monitor, mouse, and keyboard as the initial interface to the SEL-3332. Unlike other SEL products, the SEL-3332 functions like a standard, single-function computer rather than an embedded menu driven device. You cannot set up the SEL-3332 by using a serial connection and ASCII commands.

Checkout Using Remote Desktop Connection (Method 1)

NOTE: Each SEL-3332 ships with a unique computer name. The computer name is the SEL serial number located on the rear of the unit (for example, SEL2004050009).

Step 1. Verify that you are using Windows 95 or later on your personal or work computer.

Step 2. Verify with your network administrator that your network has a functioning DHCP and DNS server.

Step 3. Connect the SEL-3332 to your Ethernet network.

Connecting a keyboard, mouse, and monitor to the SEL-3332 is not necessary and will not affect using the Remote Desktop Connection.

Step 4. Apply power to the SEL-3332.

There is not a power switch. The SEL-3332 is designed to be continuously powered without the need for customer intervention.

Step 5. Wait for approximately three minutes after applying power while the SEL-3332 boots. Allow up to 15 minutes to boot at the extreme temperature limits.

Step 6. Verify that the Alarm LED goes out.

Step 7. Ping the SEL-3332 from your computer to ensure that it is visible on the network.

To ping the SEL-3332, open a command prompt and type **ping** followed by the computer name. See *Figure 2.11*.

Contact your network administrator if you cannot ping the SEL-3332. Do not proceed to *Step 8* if you cannot successfully ping the SEL-3332.

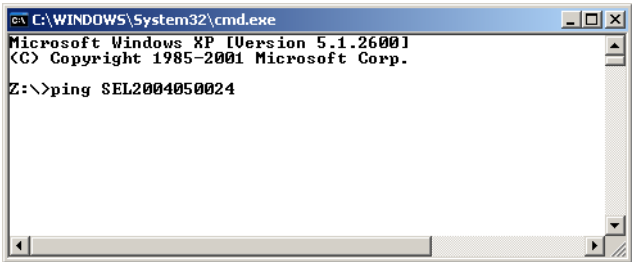


Figure 2.11 Ping Command

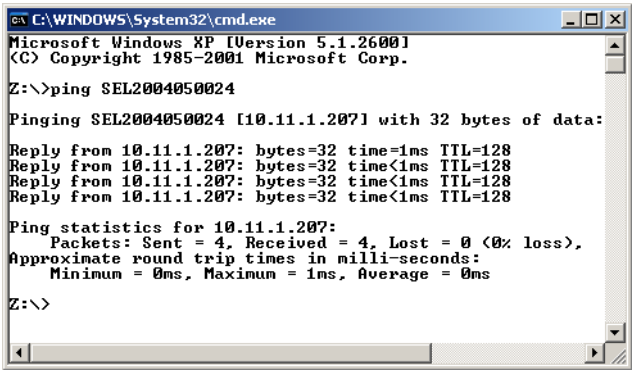


Figure 2.12 Ping Response

Step 8. Make a shortcut to the Remote Desktop Connection application **mstsc.exe** on your personal or work computer.

The application is usually located in the C:\WINDOWS\system32 or C:\WINNT\system32 folder. Contact your computer administrator if you are unable to locate the application.

Step 9. Launch **mstsc.exe** on your personal or work computer.

This should start the Remote Desktop Connection.

Step 10. Enter the computer name of the SEL-3332 to which you want to establish a connection.

Step 11. Click **Options**.

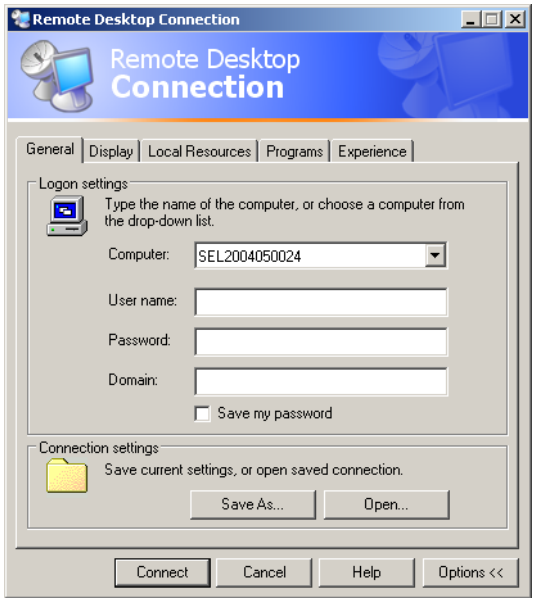


Figure 2.13 SEL-3332 Remote Desktop Connection

Step 12. Open the **Experience** tab to choose the connection speed.

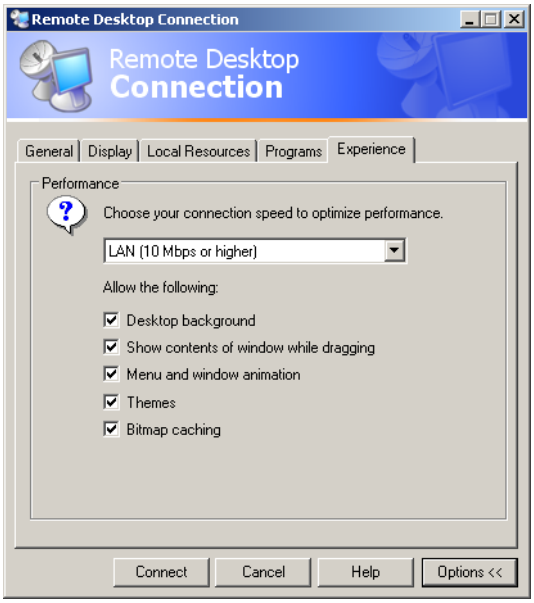


Figure 2.14 Experience Tab Showing LAN Connection

NOTE: Each SEL-3332 ships with a unique computer name. The computer name is the SEL serial number located on the rear of the unit (for example, SEL2004050009).

Step 13. Press the **Connect** button on the bottom of the dialog box. This should connect you to the SEL-3332.

Step 14. Enter the default user name and password that shipped with the unit.

User name: Administrator

Password: SEL3332

The SEL-3332 Control Bar is displayed after successful logon. See *Figure 2.15*.

NOTE: Passwords and user names should be changed during initial setup to ensure device security. Forgetting the Administrator user name or password will require reinstallation of the factory image. See User Accounts and Passwords on page 3.2 for instructions on setting user names and passwords.

Figure 2.15 SEL-3332 Control Bar

Proceed to *Section 3: Embedded Operating System Configuration* or proceed to the software application manufacturer's manual to continue with protocol translation configuration. Specific protocol conversion software is launched from the Control Bar. Select **Data Mapping > SUBNET Solutions Inc. > SubstationSERVER.NET**.

Checkout Using Monitor, Keyboard, and Mouse (Method 2)

Step 1. Connect a monitor, keyboard, and mouse to the SEL-3332 as described in *Figure 2.4*. *Table 2.2* provides a list of compatible peripherals.

Step 2. Power up the monitor.

Step 3. Apply power to the SEL-3332.

A power switch is not available. The SEL-3332 is designed to be continuously powered without the need for customer intervention.

Step 4. The SEL-3332 will go through the initial BIOS boot followed by the embedded operating system boot.

A successful boot ends with the logon dialog box as shown in *Figure 2.16*.

Figure 2.16 Logon Window

NOTE: Passwords and user names should be changed during initial setup to ensure device security. Forgetting the Administrator user name or password will require reinstallation of the factory image. See User Accounts and Passwords on page 3.2 for instructions on setting user names and passwords.

Step 5. Enter user name and default password.

User name: Administrator

Password: SEL3332

The SEL-3332 Control Bar is displayed after a successful logon. See *Figure 2.17*.

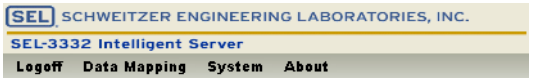


Figure 2.17 SEL-3332 Control Bar

Proceed to *Section 3: Embedded Operating System Configuration* or proceed to the software application manufacturer's manual to continue with protocol translation configuration. Specific protocol conversion software is launched from the Control Bar. Select **Data Mapping > SUBNET Solutions Inc. > SubstationSERVER.NET**.

Field Serviceability

The SEL-3332 is designed to give years of trouble-free and maintenance-free operation. However, this section enumerates the items that are field serviceable. SEL recommends contacting your local SEL representative before performing any of the service items in this section. Contacting SEL allows necessary feedback for SEL to determine if a common failure mode is developing. It also allows SEL to provide any recent suggestions or clarifications to the following procedures.

Fuse Replacement

⚠CAUTION
Equipment components are sensitive to electrostatic discharge (ESD). Undetectable permanent damage can result if you do not use proper ESD procedures. Ground yourself, your work surface, and this equipment before removing any cover from this equipment. If your facility is not equipped to work with these components, contact SEL about returning this device and related SEL equipment for service.

⚠DANGER
Disconnect or de-energize all external connections before opening this device. Contact with hazardous voltages and currents inside this device can cause electrical shock resulting in injury or death.

To replace the power supply fuse, perform the following steps:

Step 1. De-energize the device by disconnecting or removing power.

Be sure proper tagging is applied to the power source to avoid accidental reenergization.

Step 2. Remove all connections from the rear of the device.

Step 3. Remove the device from the panel or 19-inch rack.

Step 4. Remove the front panel.

Step 5. Remove the top cover.

Step 6. Remove the side and rear screw connections (see *Figure 2.18*) between the heatsink and the case.

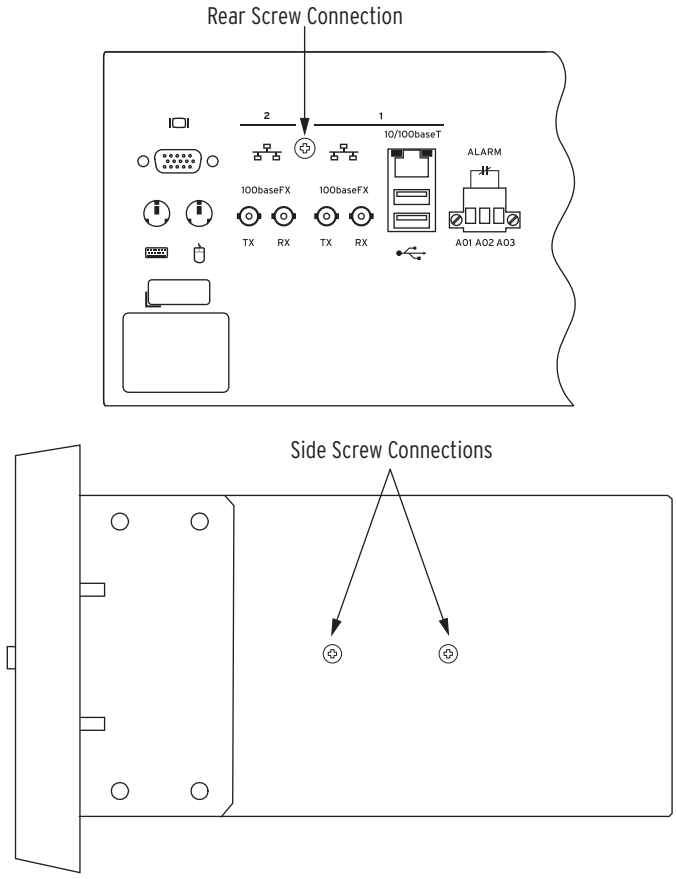


Figure 2.18 Screw Connections

Step 7. Disconnect the power supply cable.

Step 8. Gently slide out the top tray.

Step 9. Locate the power supply mounted on the bottom of the chassis.

Step 10. Locate the fuse on the power supply.

Step 11. Replace the fuse with fuse types listed in *Table 2.5*.

Table 2.5 Fuse Requirements for the SEL-3332 Power Supply

Nominal Power Supply Voltage Rating	Fuse F1	Fuse Description
24/48 V	T6.3A H250V	5x20 mm, time-lag, 6.3 A, high break capacity, 250 V
48/125 V 120 V 50/60 Hz	T3.15A H250V	5x20 mm, time-lag, 3.15 A, high break capacity, 250 V
125/250 V 120/230 V 50/60 Hz	T3.15A H250V	5x20 mm, time-lag, 3.15 A, high break capacity, 250 V

Follow the provided steps to reassemble the tray.

Step 1. Gently slide in the top tray.

Step 2. Replace the side and rear screws.

Step 3. Connect the heatsink to the case.

Step 4. Connect the power supply cable.

Step 5. Replace the top cover.

Step 6. Replace the front panel.

Step 7. Replace the device from the panel or 19-inch rack.

Step 8. Replace all connections on the rear of the device.

Step 9. Connect the power.

Real-Time Clock and BIOS Battery Replacement

A lithium battery powers the clock (date and time) if the external power source is lost or removed. The battery also maintains the configured system computer BIOS settings. See *Appendix C: Resetting BIOS* for setting the BIOS settings. The battery is a 3 V lithium coin cell, Ray-O-Vac® BR2335 or equivalent. At room temperature, the battery will operate nominally for 2 years at rated load with no external power source present. When the device is powered from an external source, the battery experiences a low self-discharging rate. Thus, battery life may extend well beyond 10 years. The battery cannot be recharged.

NOTE: The unit may not boot if the battery is dead.

Step 1. De-energize the device by disconnecting or removing power.

Be sure proper tagging is applied to the power source to avoid accidental reenergization.

Step 2. Remove all connections from the rear of the device.

Step 3. Remove the device from the panel or 19-inch rack.

Step 4. Remove the front panel.

Step 5. Remove the top cover.

Step 6. Locate the battery.

Step 7. Carefully remove the battery from underneath the retaining clip.

Properly dispose of the battery.

Step 8. Locate the power supply that is fixed mounted on the bottom of the chassis.

Step 9. Install a new battery with the positive (+) side up.

Step 10. Replace the top cover.

Step 11. Replace the front panel.

Step 12. Reinstall the device into the panel or 19-inch rack.

Step 13. Replace the cable connections in the rear of the device.

Step 14. Reapply power to the device but do *not* let it boot into Windows.

Step 15. Press **F2** to access BIOS settings.

Interrupt the boot cycle to reset the BIOS settings. See *Appendix C: Resetting BIOS* for BIOS settings and instructions.

Step 16. After BIOS settings have been reset and saved, cycle power and allow a full boot into the embedded operating system.

CompactFlash Upgrade

The SEL-3332 utilizes an industrial rated CompactFlash® card for the primary IDE hard drive. The device is designed to eliminate repeated writing to the CompactFlash card which preserves the card for many years of trouble-free service. RAM is used to store settings until the user decides to commit the complete, current configuration to Protected Storage. A detailed discussion of Protected Storage is covered in *Protected Storage on page 3.16*.

Under normal operation there should be no need to replace the CompactFlash card for the lifetime of the product.

⚠WARNING

Forgetting the Administrator user account name or password will require reinstallation of the original image onto the CompactFlash card. There are no secret or back-door passwords that will offer access if you forget your Administrator password. See Section 5: Troubleshooting for image

Step 1. De-energize the device by disconnecting or removing power.

Be sure proper tagging is applied to the power source to avoid accidental reenergization.

Step 2. Remove the front panel.

Step 3. Remove the CompactFlash card by gently pulling it straight out.

Step 4. Place the new CompactFlash card obtained from SEL into the SEL-3332.

Step 5. Reinstall the front cover.

Step 6. Reapply source power to reboot the SEL-3332.

The initial boot process will take up to five minutes or more. Do not interrupt the initial reboot.

The original factory settings are now restored to the device. The original user account and password are applied.

Section 3
Embedded Operating System Configuration

Overview

This section describes the features of the embedded operating system used in the SEL-3332 Intelligent Server.

The embedded operating system offers the best balance between security, reliability, functionality, and maintainability.

⚠WARNING
The embedded operating system used in the SEL-3332 has been minimized as much as possible to achieve reliability, security, and stability. It is not hack proof. Do not attempt to add or remove software or hardware.

- **Security**

  The embedded operating system in the SEL-3332 has been verified against common security verification tools to minimize vulnerabilities.

- **Reliability**

  Reliability is built into the SEL-3332 by limiting which operating system components are available and installed. Reliability is also achieved by restricting the device to a limited set of software and drivers that are thoroughly tested for compatibility and stability.

NOTE: The SEL-3332 uses a write filter to protect the operating system from inadvertent setting changes. Alterations to the operating system, including User account, Security, and Network setting changes, must be committed to Protected Storage for permanent activation. See Protected Storage on page 3.16 for more information.

- **Functionality**

  Most networks, software, and hardware are Microsoft® Windows compliant as is the SEL-3332.

- **Maintainability**

  PC-AT compatible hardware and Windows compatible software provide virtually limitless opportunity for future growth and backward compatibility.

Control Bar Functions

Once logged on, the SEL-3332 provides access to operating system functions and software through the SEL-3332 **Control Bar** (see *Figure 3.1*). Using a custom control panel provides added security and reliability by limiting access to files and folders.

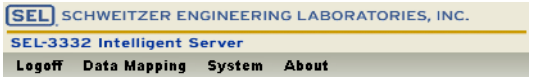


Figure 3.1 SEL-3332 Control Bar

The SEL-3332 Control Bar appears on the initial desktop screen. To maintain a common and orderly interface, users are prevented from saving data files to the SEL-3332 desktop screen. Select other user directories for storing program data files.

Logging On and Off

The SEL-3332 maintains the standard Windows logon methods. *Figure 3.2* shows the Standard Windows logon dialog box.

NOTE: Passwords and user names should be changed during initial setup to ensure device security. Forgetting the Administrator user name or password will require reinstallation of the factory image. See User Accounts and Passwords for instructions on setting user names and passwords.

Figure 3.2 Logon Dialog Box

To log off, select the **Log Off** item from the **Control Bar** and select **Log Off User** from the menu. Selecting **Commit to Protected Storage** from the menu will open the confirmation dialog box. Selecting **Cancel** will not commit changes. Select **Shutdown** or **Restart** to commit your current setup to Protected Storage. See *Protected Storage on page 3.16* for more information.

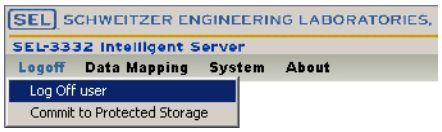


Figure 3.3 Logoff Dialog Box

User Accounts and Passwords

The SEL-3332 contains User Accounts dialog box as shown in *Figure 3.5*. Simply select **System > User Accounts** from the SEL-3332 **Control Bar** (see *Figure 3.4*).

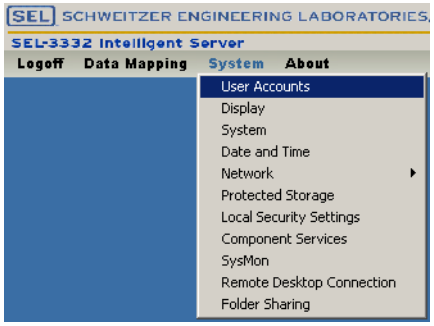


Figure 3.4 Selecting User Accounts

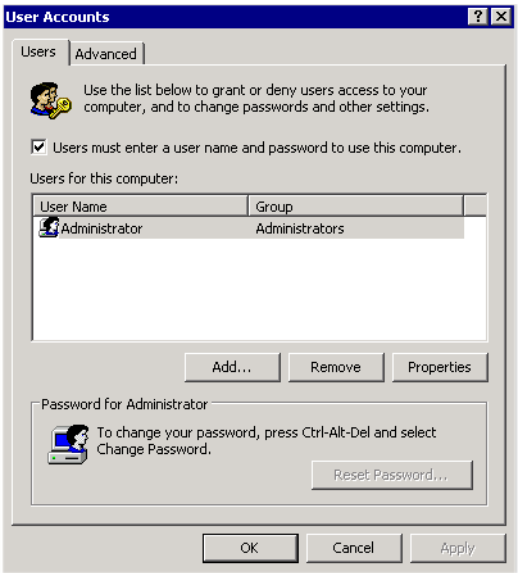


Figure 3.5 User Accounts Dialog Box

The Administrator account is predefined. Administrators have complete and unrestricted access to the following computer/domain functions:

- Upgrade the operating system
- Install the operating system or software updates from SEL
- Configure critical computer-wide operating system parameters
- Take ownership of objects
- Perform network configuration

The management of passwords is controlled in the **User Accounts** windows. Password selection follows the same principles as those in Windows XP:

- Passwords can be up to 127 characters in length.

  However, if you are operating on a network that also uses Windows 95 or Windows 98, consider passwords no longer than 14 characters. Otherwise, you may not be able to logon to the network.
- Uppercase/lowercase letters, numerals, and symbols may be used.

⚠WARNING

This device is shipped with default passwords. Default passwords should be changed to private passwords at installation. Failure to change each default password to a private password may allow unauthorized access. SEL shall not be responsible for any damage resulting from unauthorized access.

To update the Administrator password, press **Ctrl+Alt+Del** from a keyboard locally connected to the SEL-3332 then select the **Change Password** button.

To update user passwords, select **System > User Accounts** (see *Figure 3.6*). Highlight the user name then click on the **Reset Password** button.

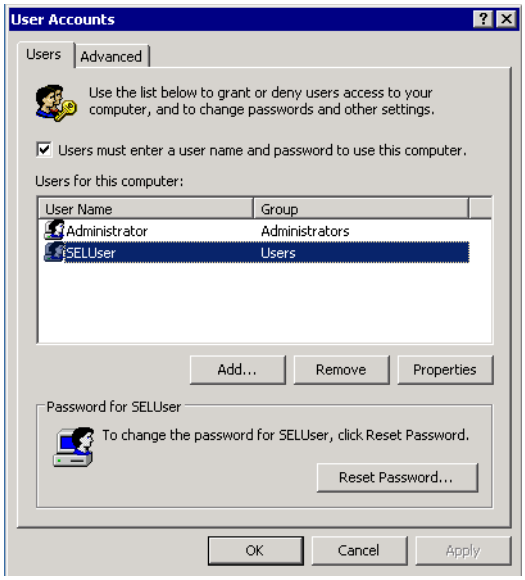


Figure 3.6 Selecting a User in the User Accounts Window

Enter the new password in both the **New password** and **Confirm new password** text boxes (see *Figure 3.7*). Follow your company's policies regarding user accounts and passwords. Contact your network or computer administrator if you are unsure of which options or settings need to be made.

Figure 3.7 Reset Password Dialog Box

Display

The SEL-3332 offers user-configurable display settings. However, these options cannot be utilized if you are using the Remote Desk Connection function.

To access the display property options on the SEL-3332, select **System > Display** from the SEL-3332 **Control Bar**.

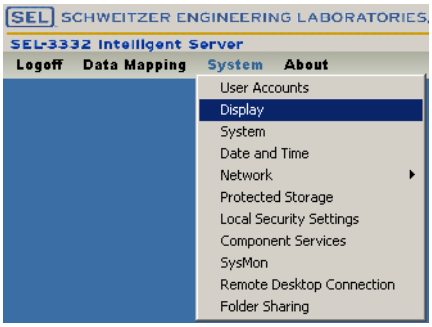


Figure 3.8 Selecting Display

The standard Windows display features are available. Refer to Windows XP operating system information available at most bookstores and online.

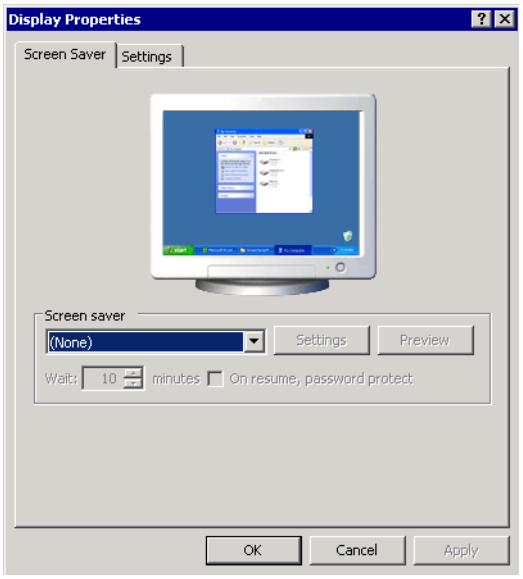


Figure 3.9 Display Properties Dialog Box

Computer Name

Rename your computer during initial setup. Every computer on an Ethernet network must have a unique computer name. The SEL-3332 ships with an automatically generated, unique computer name. This computer name should be changed to something meaningful and easy to remember. The default, unique computer name is **SEL** followed by the serial number with no separating spaces. The serial number is located on the rear of the SEL-3332.

The following figures illustrate how to set the computer name. From the SEL-3332 **Control Bar**, select **System > System** (see *Figure 3.10*). Under the **Computer Name** tab, select **Change** (see *Figure 3.11*). Follow your company's policies for computer naming. Contact your network or computer administrator for assistance in setting a computer name.

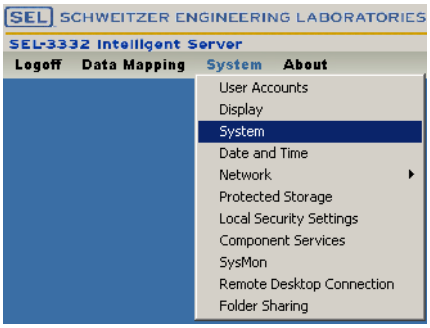


Figure 3.10 Selecting System

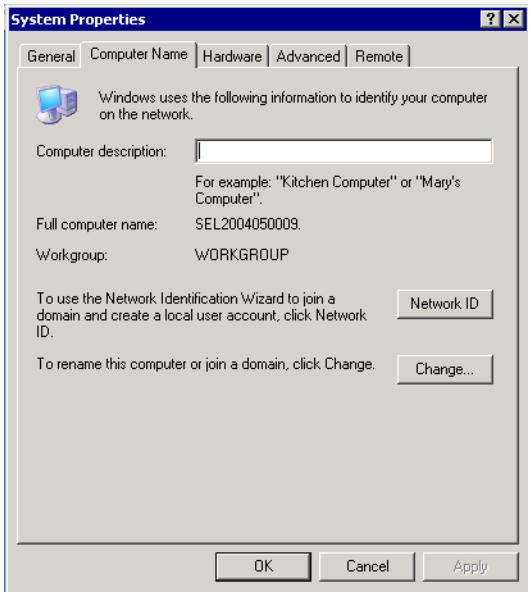


Figure 3.11 Setting Computer Name

Network Identification Wizard

The Network Identification Wizard assists you in installing the SEL-3332 on your network. From the **Control Bar**, select **System > System** (see *Figure 3.10*). Under the **Computer Name** tab, select **Network ID** (see *Figure 3.11*) to start the wizard. Contact your network or computer administrator for assistance.

Hardware

The **Hardware** tab is part of the **System Properties** dialog box. The selection options under this tab are not implemented. Do not attempt to install additional hardware on your SEL-3332. A list of acceptable hardware peripherals is provided in *Table 2.2* and on the SEL website.

Performance

The **Performance** options located under the **Advanced** tab (see *Figure 3.12*) should not be adjusted. The SEL-3332 has been thoroughly tested with the default settings.

User Profiles

Options for User Profiles are located under the **Advanced** tab (see *Figure 3.12*). In the **User Profiles** area, select **Settings**. *Figure 3.12* and *Figure 3.13* illustrate how to gain access to user profiles. Contact your computer administrator for guidance regarding User Profiles.

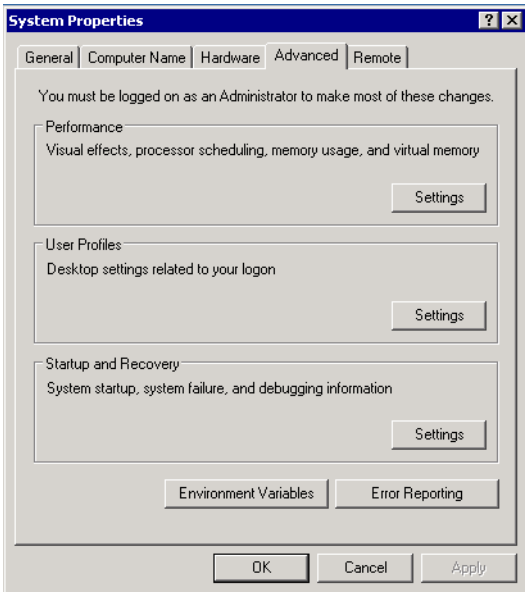


Figure 3.12 Advanced Options Dialog Box

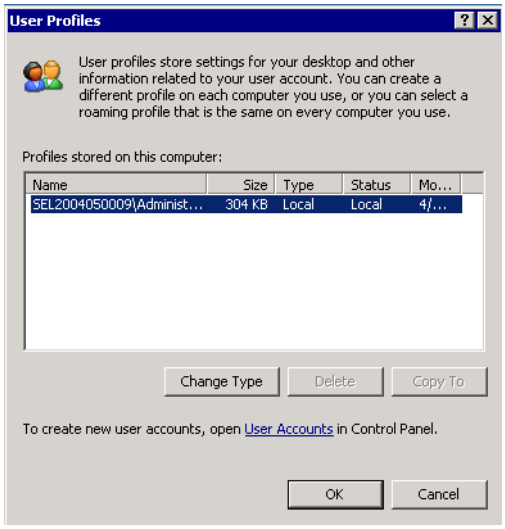


Figure 3.13 User Profiles Dialog Box

The User Accounts hyperlink has been removed due to a secure access limitation.

Startup and Recovery

Do not modify any settings located in the **Startup and Recovery** portion under the **Advanced** tab.

Environment Variables

Create a path for Device Update Agent (see *Appendix B*) by accessing Environment Variables. See *Appendix B* for details on the software update mechanism. Do not modify Environment Variables until you have read *Appendix B*.

To set an Environment Variable, select **System > System** (see *Figure 3.10*). Select the **Advanced** tab (see *Figure 3.12*). Select the **Environment Variables** option (see *Figure 3.14*). Highlight the variable and value line to be modified and select **New**. Paths may be modified (select **Edit**) or deleted (select **Delete**).

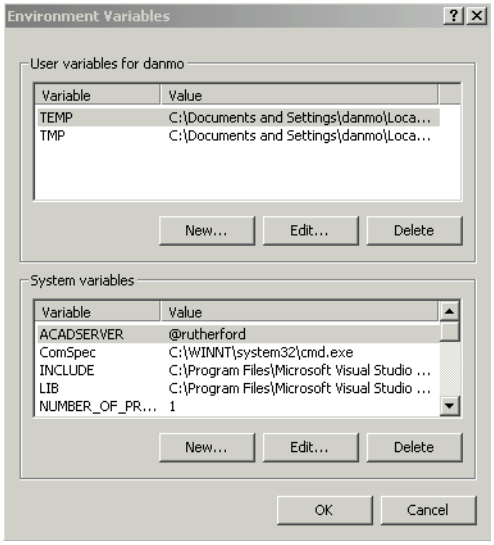


Figure 3.14 Environment Variables

Remote Assistance

Remote Assistance is located under the **Remote** tab (see *Figure 3.15*). Remote Assistance is disabled because of security and reliability concerns. Selecting the **Remote Assistance** check box will not enable this function.

Remote Desktop Server

Remote Desktop may be enabled to permit connections using Windows Remote Desktop Connection from your personal or work computer.

Remote Desktop is enabled by default.

To allow access via the Remote Desktop, select the **Remote** tab (see *Figure 3.15*). Use the **Select Remote Users** function to limit who may have access to the SEL-3332.

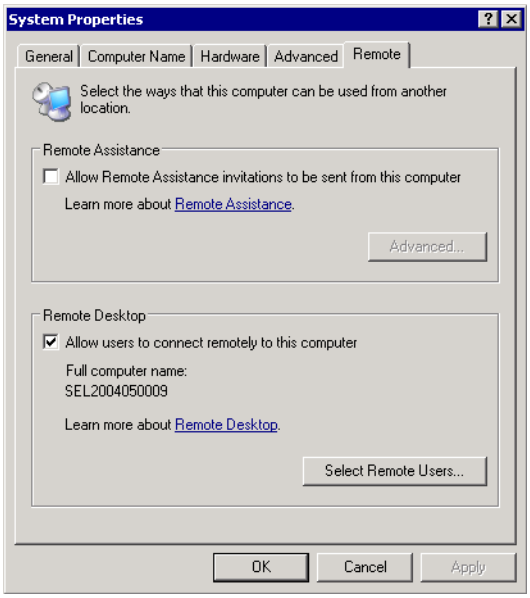


Figure 3.15 Remote Desktop Dialog Box

To enable Remote Desktop connections for a particular user, select the **Select Remote Users** function and select **Add** to access remote user rights.

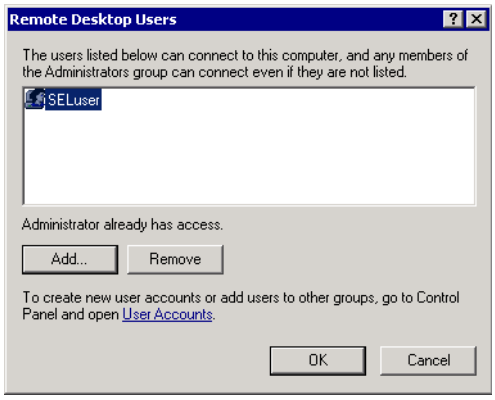


Figure 3.16 Remote User Setup

Redirection of the clipboard, drives, and communication ports have been disabled for security purposes.

Use a shared folder to move files between the SEL-3332 and other computers.

Remote Desktop Client

Use the SEL-3332 to remotely connect to another computer to view files or other information.

A detailed example of using Windows Remote Desktop Connection is given in *Section 2: Installation*. The example in *Section 2* depicts using a personal or work computer to connect to an SEL-3332. However, the function is the same when using the SEL-3332 to remotely connect to another PC or SEL-3332.

Date and Time

The SEL-3332 System Date and Time is adjusted to stay in synchronization with the IRIG-B signal obtained from an external IRIG clock. You will not be able to manually set the System Date and Time when an IRIG-B signal is present.

The computer system clock becomes the master system clock if IRIG-B input is lost or is not connected. Demodulated IRIG-B will then be generated from the computer system clock. The IRIG-B signal generated by the SEL-3332 is set by the **Date and Time Properties** dialog box (see *Figure 3.20*) when an external IRIG source is not available.

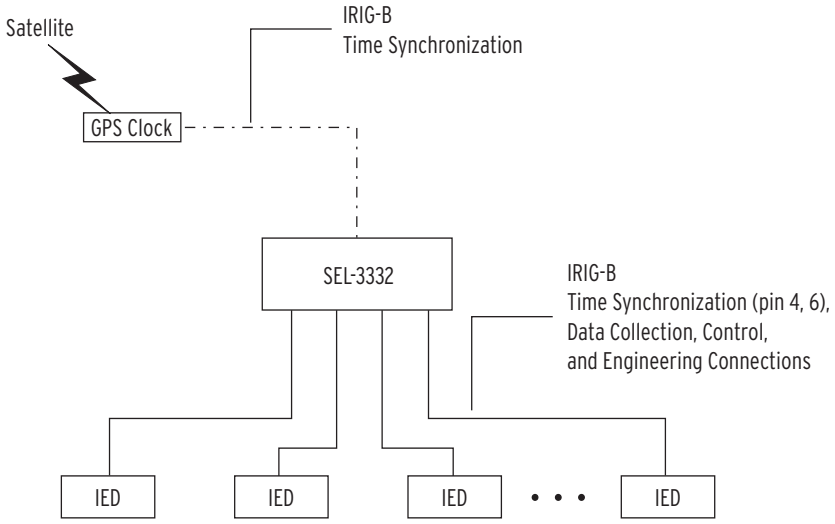


Figure 3.17 Time Synchronization With IRIG-B

The SEL-3332 allows connection to a Network Time Server. The network time updates the system clock. Then demodulated IRIG-B is generated from the system clock to synchronize connected Intelligent Electronic Devices (IEDs). This is only true when a local IRIG-B signal is not present. The local IRIG-B signal is dominant.

Contact your network or computer administrator to determine the acceptable method to connect to a Network Time Server.

The following figures illustrate how to set the system Date and Time. Select **System > Date and Time** (see *Figure 3.18*). Under the **Date & Time** tab, set the date and time, as necessary (see *Figure 3.19*).

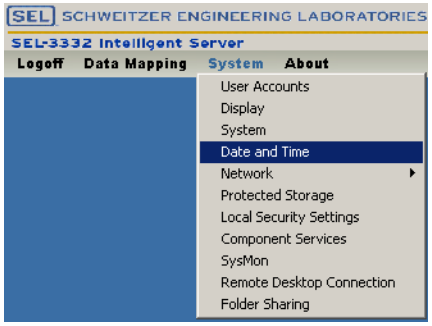


Figure 3.18 Selecting Date and Time

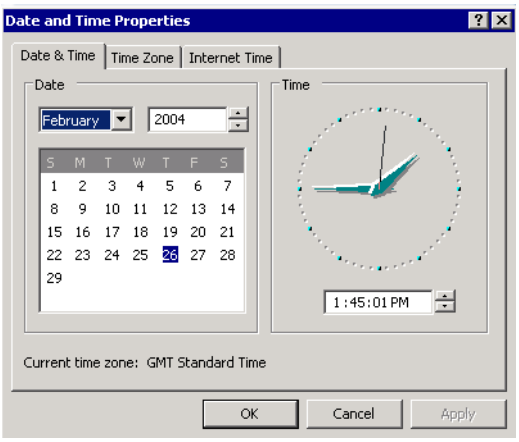


Figure 3.19 Setting System Date and Time

Network Properties

Instructions on setting up Windows based networks are beyond the scope of this manual. Refer to your network or computer administrator for assistance. Also, there are many good references online that provide overviews of computer networking.

The SEL-3332 has dual Ethernet. A separate MAC address is associated with each Ethernet connection. Therefore, each Ethernet connection may have a separate IP address and may belong to a separate network.

Local Area Connections

Figure 3.20 and *Figure 3.21* show how to access the **Local Area Connection Properties** dialog box. Select **System > Network**. Select either **Local Area Network 1** or **Local Area Network 2** (see *Figure 3.20*).

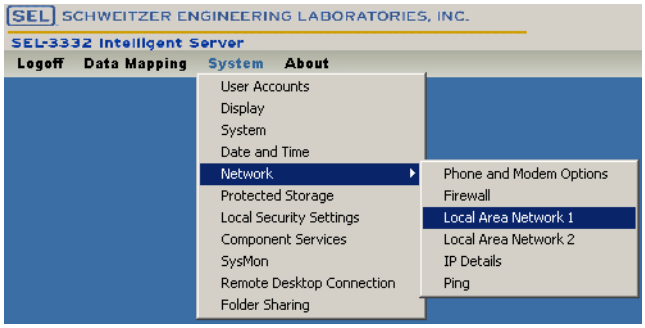


Figure 3.20 Accessing Network Properties

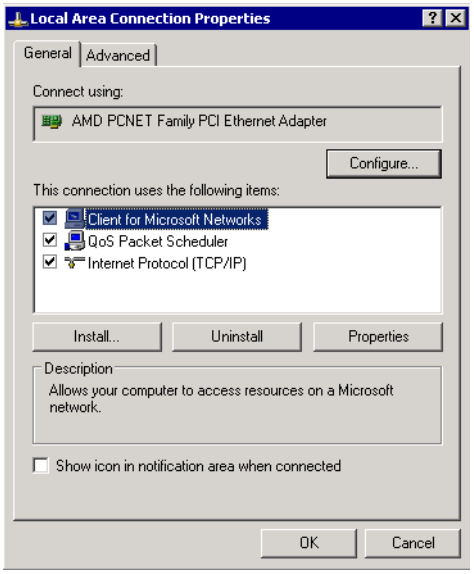


Figure 3.21 Local Area Connection Properties

IP Details

To view the current SEL-3332 network configuration, select **System** > **Network** > **IP Details**.

Ping

To ping another computer select **System** > **Network** > **Ping**.

Services

The Component Services interface lists all of the processes that are running on the embedded operating system.

Access the Services interface by selecting **System** from the SEL-3332 Control Bar. Select **Component Services** (see *Figure 3.22*). *Figure 3.23* illustrates the **Component Services** window viewing the standard tab.

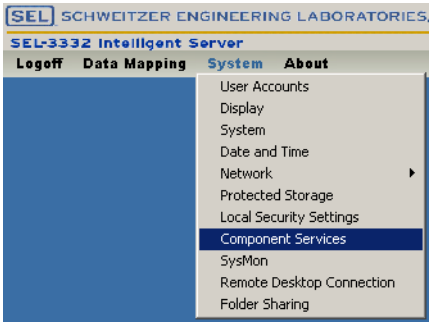


Figure 3.22 Accessing Component Services

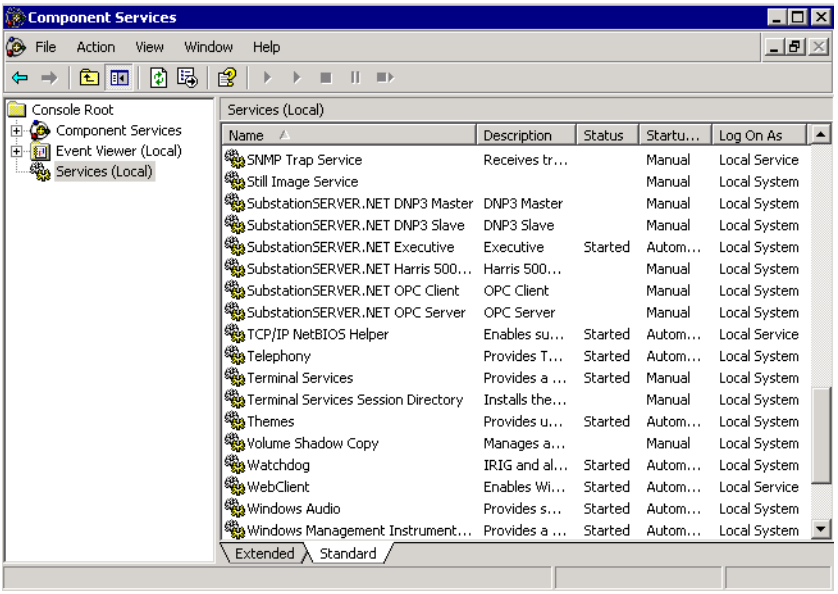


Figure 3.23 Component Services Window

Use the **Services** interface to specifically decide what action the SEL-3332 takes during a trouble or failure condition associated with a service.

Use the following steps to set a service to pulse or set the alarm contact.

Step 1. Select a service row.

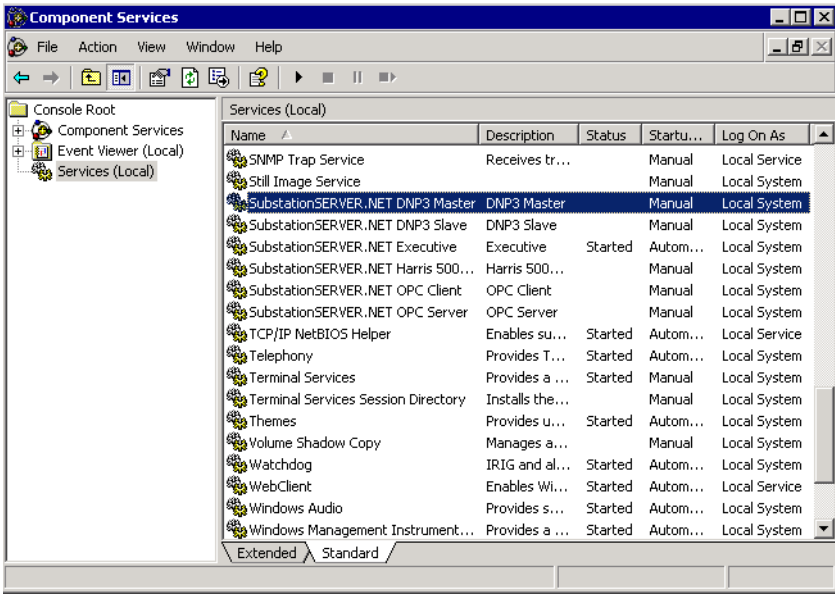


Figure 3.24 Selecting a Service

Step 2. Right-click the highlighted row.

Step 3. Select **Properties**.

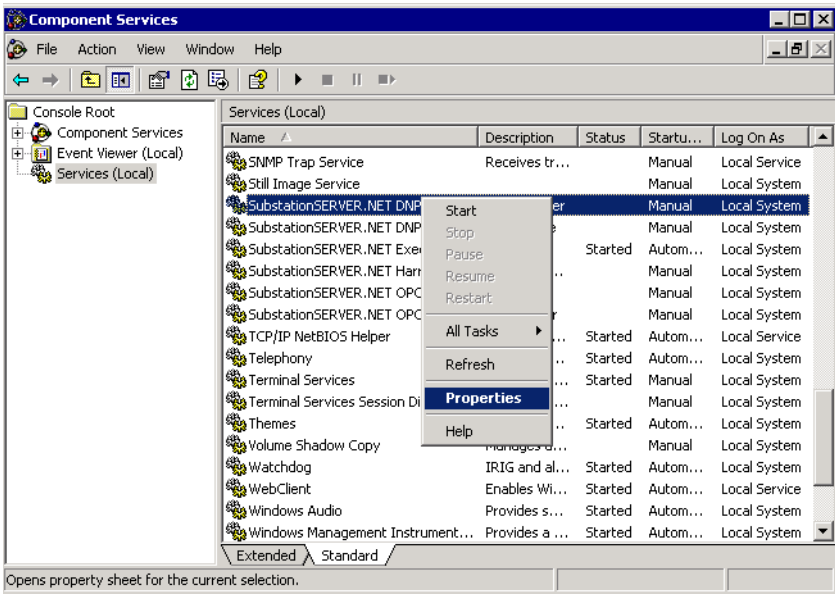


Figure 3.25 Selecting Properties Option

Step 4. Select the options in *Figure 3.26* to set a pulse or set the alarm contact.

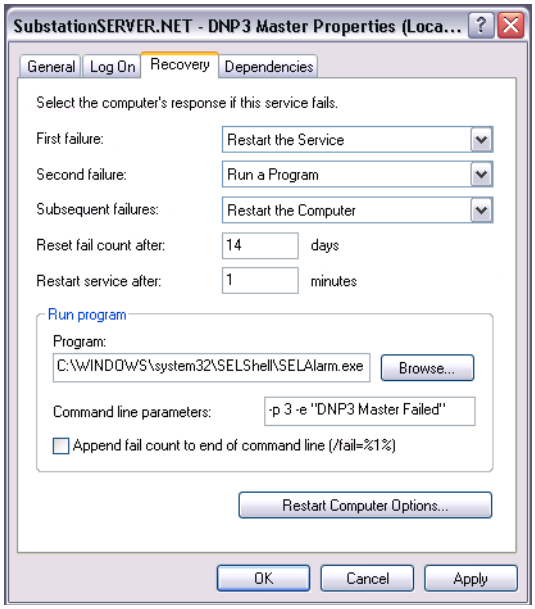


Figure 3.26 Setting a Service to Pulse an Alarm Contact

If you chose the settings shown in *Figure 3.26*, then the SEL-3332 will try to restart the DNP3 Master protocol service on the first failure within a fourteen-day period. On the second failure, the SEL-3332 runs the application C:\Windows\System32\SELShell\SELAlarm.exe with a command line parameter. This program will pulse the alarm contact. The command line parameter of three, in this example, instructs the SELAlarm.exe application to pulse the contact for three seconds. The command line parameter can be set from 1 to 30. This equates to a pulse duration range of 1 to 30 seconds.

Event Viewer

The main tool for troubleshooting Windows and Windows applications is the Event Viewer. To access the Event Viewer, select **System** from the SEL-3332 **Control Bar** then select **Component Services**.

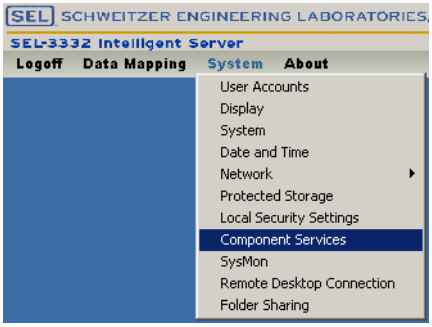


Figure 3.27 Accessing Component Services

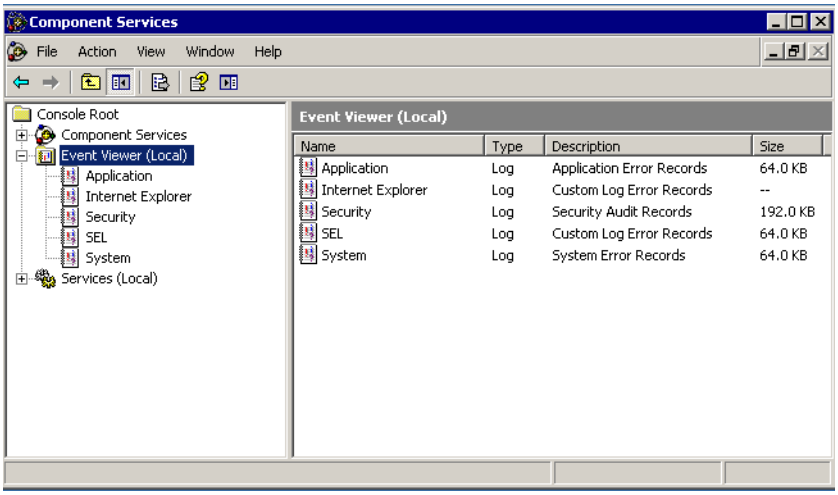


Figure 3.28 Event Viewer

In addition to operating system errors, look to the Event Viewer to see any assertion or deassertion of overcurrent alarms, CPU burden alarms, and IRIG-B status changes. Do not adjust the default log properties for the Application, Internet Explorer®, Security, SEL, and System log properties (for example, see *Figure 3.30*). Access the log properties by selecting the Application, Security, System, Internet Explorer, or SEL row, right-click and select **Properties**.

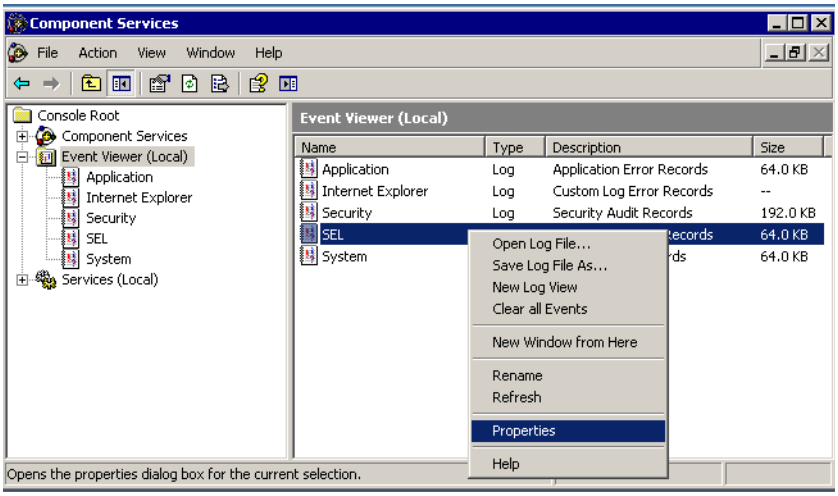


Figure 3.29 Accessing Application, Security, SEL, and System Properties

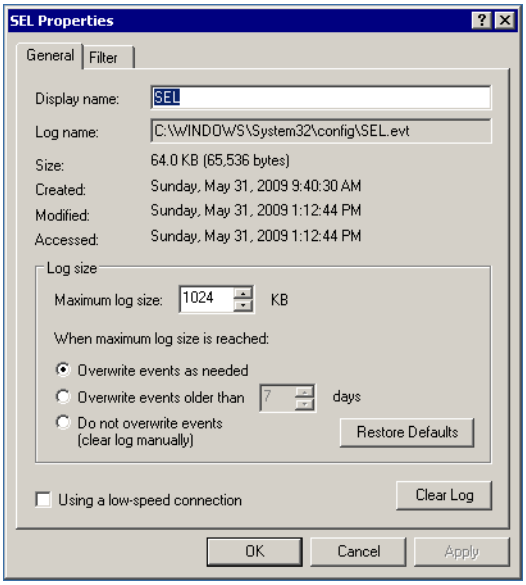


Figure 3.30 SEL Properties Dialog Box

Protected Storage

The SEL-3332 uses a write filter to protect the permanent storage (CompactFlash® card) from burning out or from becoming corrupted due to improper shutdown. The SEL-3332 uses a RAM overlay to store all modifications. Commit all configuration and modifications from RAM to protected CompactFlash storage when you are satisfied with the current setup of the SEL-3332. Once committed, the SEL-3332 will always retain this configuration until Commit is run again.

When you open or create and modify a file by using the protocol conversion software, saving the modifications by using the traditional Windows save methods does *not* commit the modifications to permanent, Protected Storage. Rather they are just saved to the RAM overlay. If you wish to make your modifications permanent, you will need to commit to Protected Storage by logging off. You can then log back on. Also, saving settings in Windows or in an application will not be permanent if you select Windows save and then cycle power without committing to Protected Storage by logging off.

Once committed, the protected volume and all of its settings and configuration become extremely resistant to permanent corruption.

Make any modifications or configuration that you desire without worry of causing unrepairable function. Cycle power and the SEL-3332 will return to its previous state if you do not commit the configuration to Protected Storage.

Settings and configuration can only be committed to Protected Storage by restarting the SEL-3332. To commit your settings or configuration from RAM to CompactFlash, select the **Logoff** item from the **Control Bar**, then select **Commit to Protected Storage**. From the dialog box, select **Shutdown** or **Restart** to commit your current setup to Protected Storage.

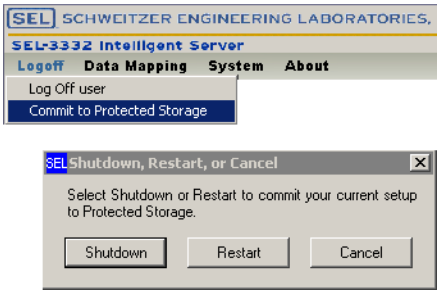


Figure 3.31 Commit to Protected Storage Dialog Box

The Protected Storage control panel displays the current status of the Protected Storage and associated overlay. In addition, the Protected Storage control panel provides a method of committing to Protected Storage and restarting the SEL-3332.

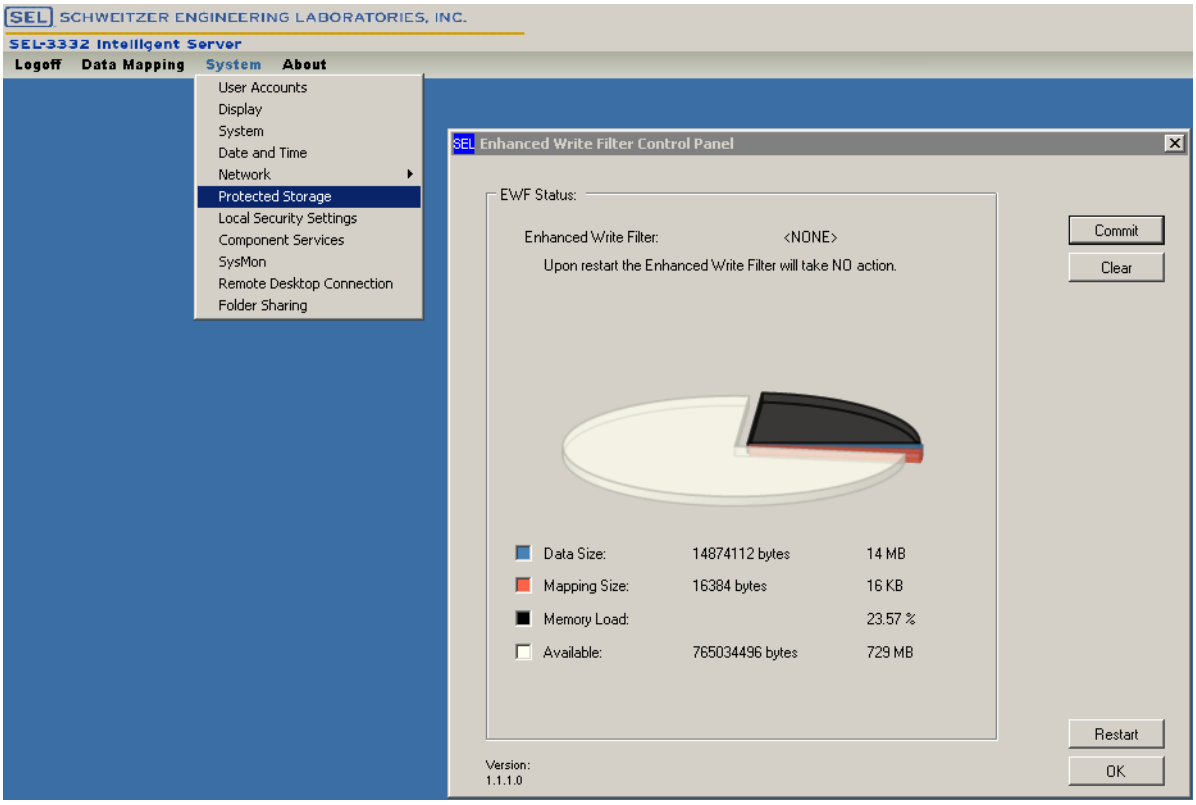


Figure 3.32 Protected Storage Control Panel

Proper understanding of the Protected Storage is needed for troubleshooting. If the SEL-3332 appears to be malfunctioning, use a USB memory stick to save log files before cycling power. Cycling power will return the SEL-3332 to its previous saved state. This will delete all modifications including log files or other information needed for troubleshooting unless you reassign the file path for event logs.

Use a USB Memory Stick to eliminate the loss of event logs during a power cycle. The following example illustrates how to modify the file path for event logs.

EXAMPLE 3.1 Automatically Save Event Logs to a USB Memory Stick

Step 1. Place a USB memory stick in either the front or rear USB ports.

Step 2. Open the **Environment Variables** dialog box by selecting **System > System** from the **Control Bar**.

Step 3. Click on the **Advanced** tab.

Step 4. Click on the **Environment Variables** button. See *Figure 3.33*.

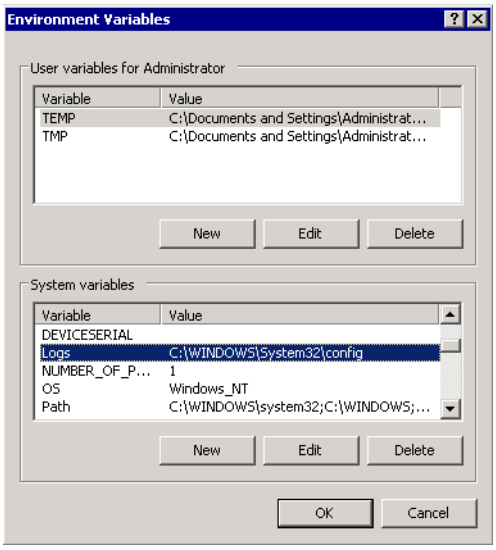


Figure 3.33 Environmental Variables

Step 5. Locate the **System Variables** list box on the bottom.

Step 6. Scroll down until you can see the **Logs** variable.

Step 7. Highlight the **Logs** row.

Step 8. Select **Edit**.

Step 9. Change the Value to **D:** (no slash).

The CompactFlash hard drive that is located inside the SEL-3332 is the C:\ drive. Plugging in USB memory sticks will create additional drives starting with D:\.

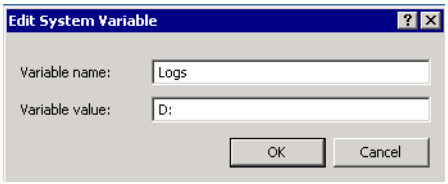


Figure 3.34 Edit System Variable Dialog Box

Step 10. Select **OK** to save your settings.

Step 11. Log off and commit your changes to Protected Storage.

Step 12. Log on to the SEL-3332.

Step 13. Open Event Viewer by selecting **System > Component Services**.

Step 14. Expand the **Event Viewer** tree menu.

Step 15. Right click on **Application**.

Step 16. Select **Properties**. See *Figure 3.35*.

The Log Name should now reflect your new file path and AppEvent.Evt file.

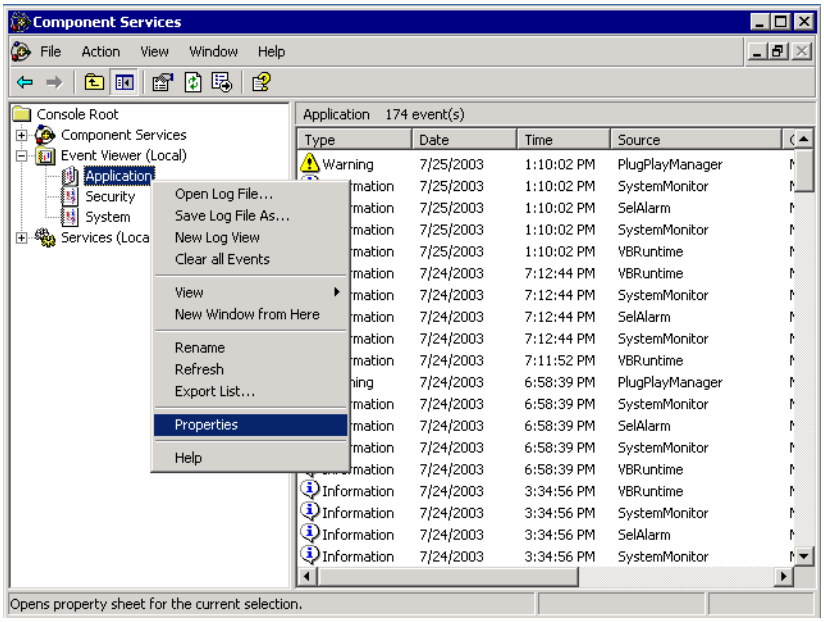


Figure 3.35 Selecting Application Properties

A reboot is required to initialize the event files on the new USB drive.

Local Security Settings

A major portion of the security infrastructure that is native to Windows XP Professional has been retained in the embedded operating system used in the SEL-3332.

The following illustration shows how to launch the Local Security Settings.

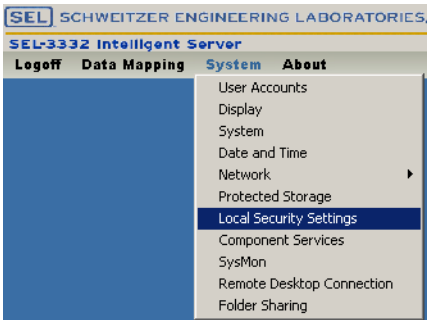


Figure 3.36 Accessing Local Security Settings

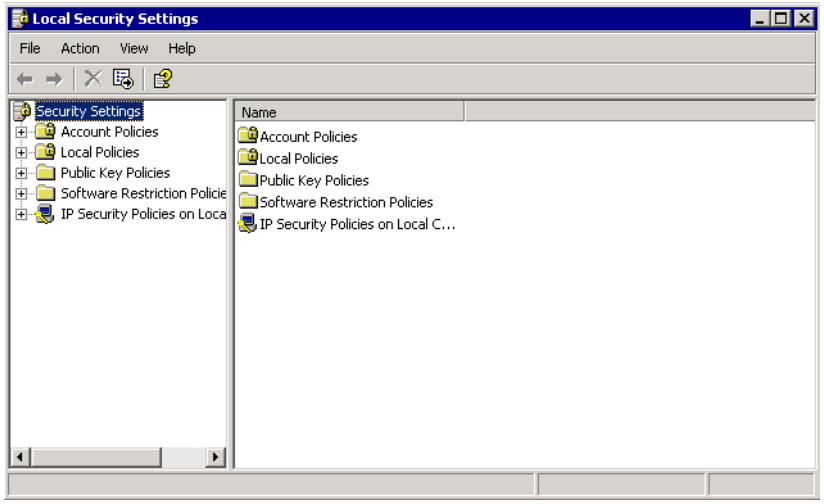


Figure 3.37 Local Security Settings Window

A detailed discussion of Microsoft Windows XP Embedded security is beyond the scope of this manual. Refer to your computer security administrator for guidelines to setting your SEL-3332.

Follow your company's computer security policies.

Simple Network Management Protocol

The SEL-3332 includes Simple Network Management Protocol Support (SNMP). SNMP is disabled by default. Choosing whether or not to use SNMP is a major decision. Completely research SNMP and the potential security risks before deciding on using SNMP.

As always, follow your company's policies regarding SNMP.

The SEL-3332 ships with SNMP Security configuration per Microsoft Knowledge Base Article 324261 *How to: Configure Network Security for the SNMP Service in Windows Server 2003.*

The following figures illustrate how to enable SNMP.

Step 1. From the Control Bar, select **System > Component Services**.

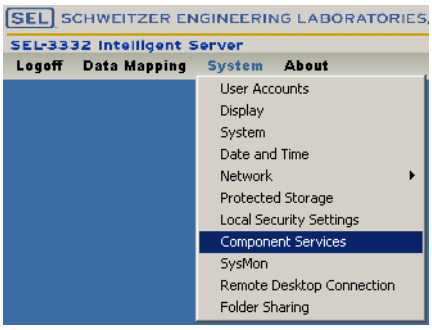


Figure 3.38 Selecting Component Services

Step 2. Select **Services**.

Step 3. Select **SNMP Service**.

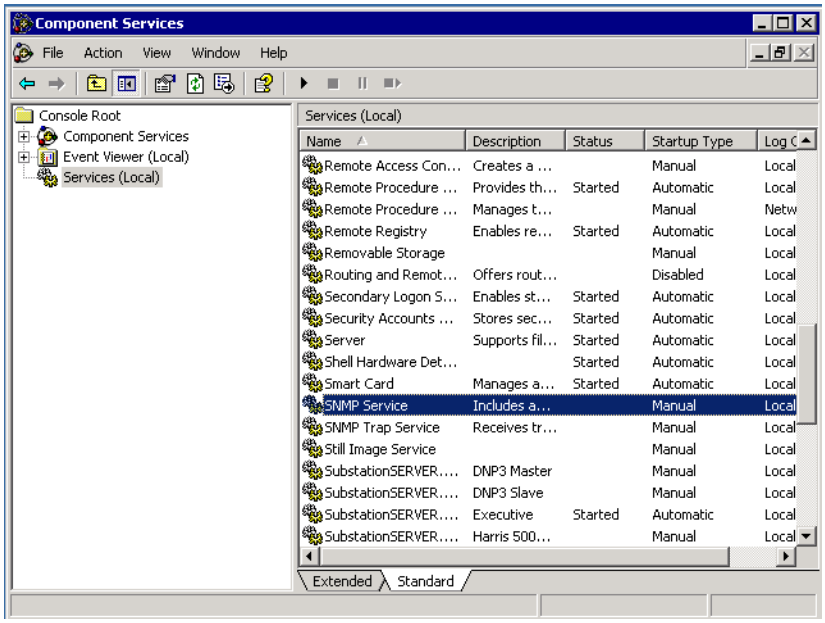


Figure 3.39 Component Services Window

Step 4. Right click the **SNMP Service** row.

Step 5. Select **Properties**.

Step 6. Click the **Start** button.

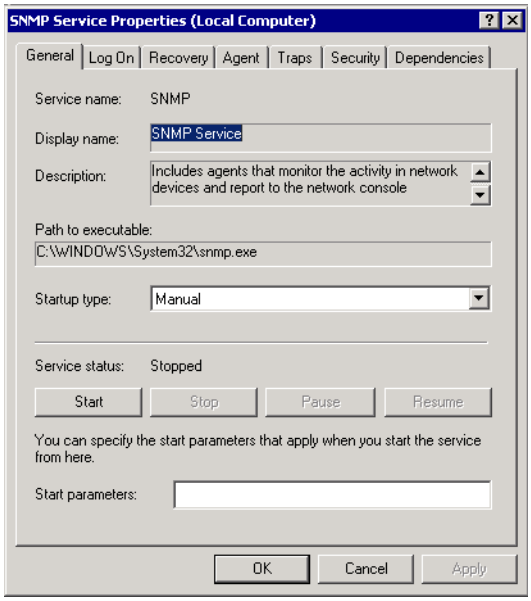


Figure 3.40 SNMP Service Properties Dialog Box

Step 7. Click **OK**.

The status should now show as started.

If you want SNMP to start every time power is cycled, change the **Startup type** to **Automatic**. Remember to commit to Protected Storage.

Folder Sharing

Use folder sharing to allow access to application files between two or more computers.

Application specific files such as configuration files or settings files may need to be shared between the SEL-3332 and a personal or work computer. Some application software is separated into a run-time or reduced function application that resides on the SEL-3332 and an enhanced configuration software that may reside on your personal or work computer. Use folder sharing to allow both of these computers to see the same files.

Folder sharing does not allow the creation of new folders. Use the application software's **File > Save As** function or the File Manager system tool to allow access to creating a folder. The following figure illustrates how to create a folder using application software running on the SEL-3332.

Step 1. From the application software, click **File > Save As**.

Step 2. Click the **Create New Folder** button.

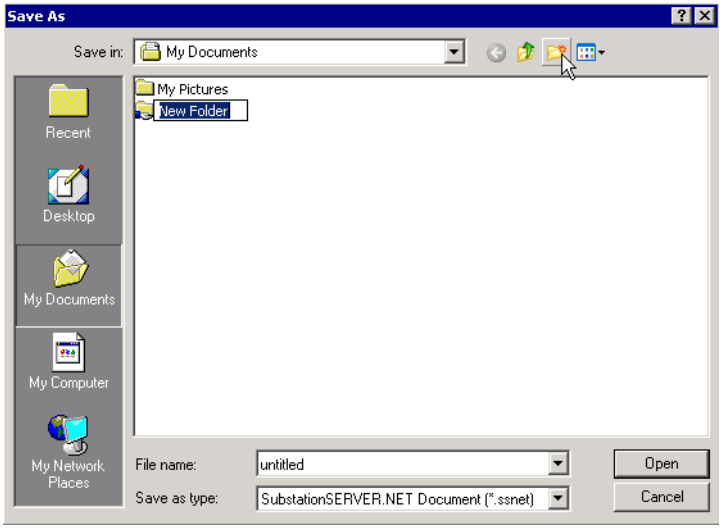


Figure 3.41 Creating a New Folder

Step 3. Name the folder.

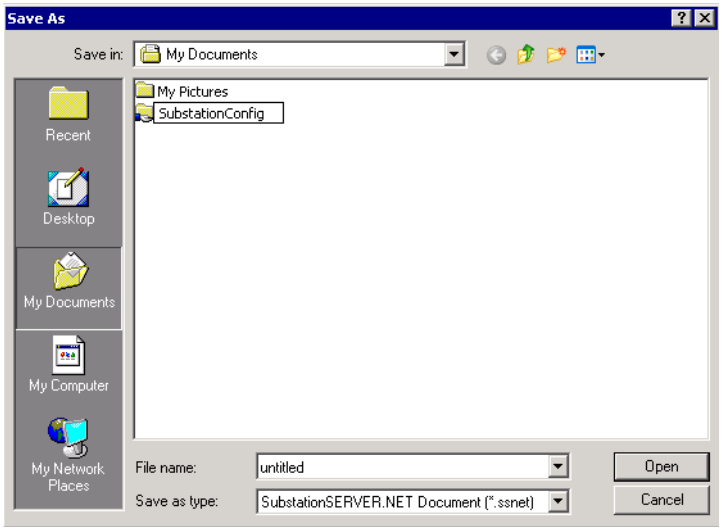


Figure 3.42 Naming the Folder

After the folder is created, use Folder Sharing to set the sharing permissions to the newly created folder. The following figures illustrate how to share folders.

Step 4. From the **Control Bar**, select **System > Folder Sharing**.

Step 5. Select the **Shares** folder.

Step 6. Right click and select **New > File Share**.

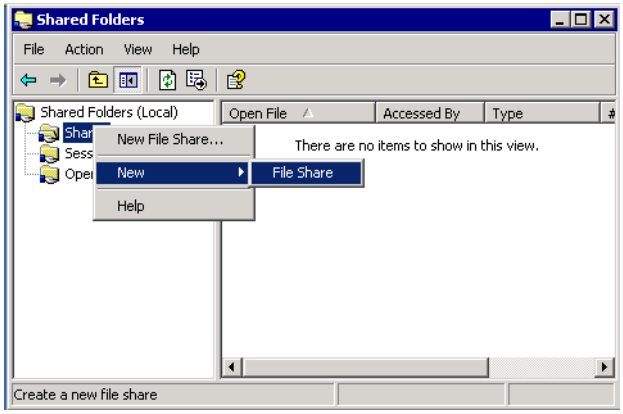


Figure 3.43 Selecting Files Share Option

Step 7. Browse to the folder created in *Step 3*.

Step 8. In the **Share name** text box, type the folder name.

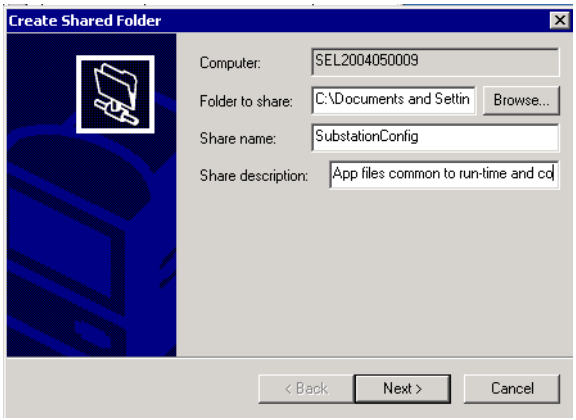


Figure 3.44 Create Shared Folder Dialog Box

Step 9. Add a description of the folder in the **Share description** text box.

Step 10. Click **Next**.

All users have full control is selected by default. If this is not selected, please select it.

Step 11. Click **Finish**.

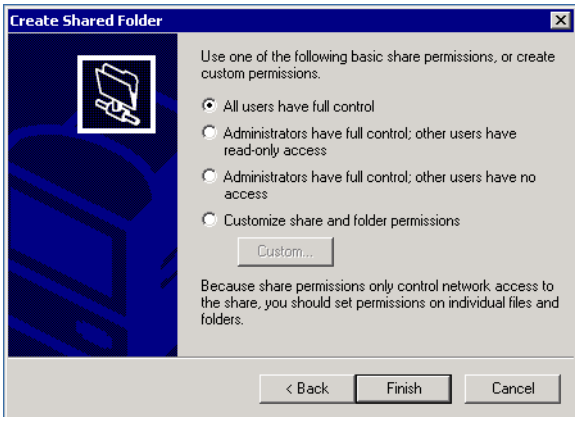


Figure 3.45 Created Shared Folders Permission Dialog Box

You will be prompted to create another shared folder. (Choose **Yes** or **No**.)

Notice the Shared Folder you created is now displayed in the list (see *Figure 3.46*).

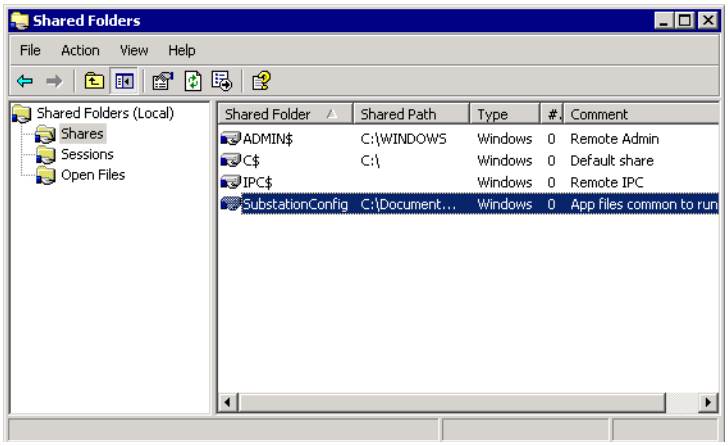


Figure 3.46 Shared Folders Window

Section 4
SEL SysMon

Overview

This section describes the SEL System Monitor Graphical User Interface (SysMon) that displays and configures IRIG, status, and alarm settings in a familiar tabbed Windows® interface. SysMon is a graphical front-end interface for the operation of the SEL SysMon Service functions with the SEL-3332 hardware. SysMon is launched from the control bar when you log on to the Windows operating system, whereas the SEL SysMon Service starts automatically when you boot up your SEL-3332.

Figure 4.1 is an overview of how the SEL Service and SysMon GUI use both the Windows Event Viewer for logging and the alarm contact. Use the alarm contact and Windows event log data to pass alarms and notifications on to SCADA from your SEL-3332.

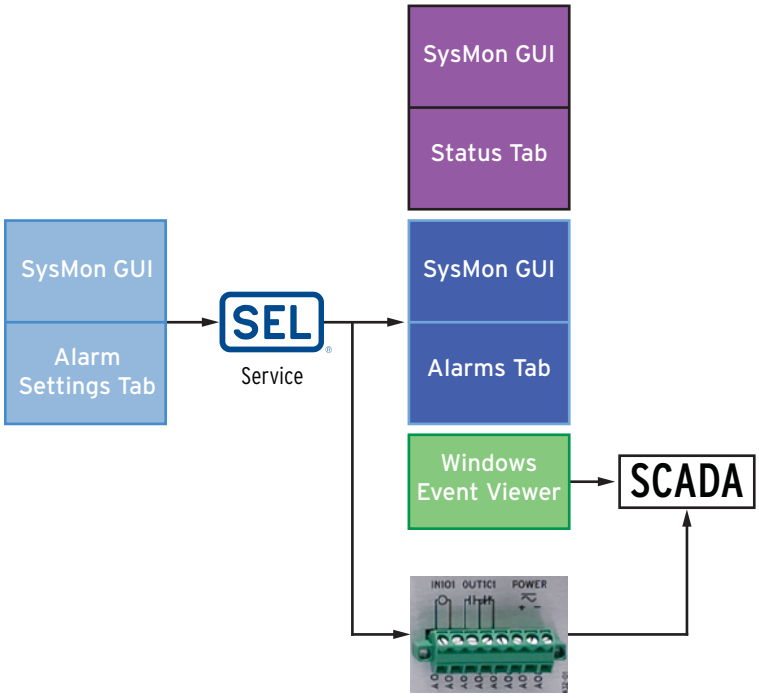


Figure 4.1 Overview of SEL Service and SysMon

SysMon Functions

The application provides four main tabs: Status, Alarm Settings, Alarms, and Time/Watchdog. The sections that follow describe what you can configure or read within each tab in more detail.

Opening and Closing SysMon

In the SEL-3332 control bar, click on the **System** menu (see *Figure 4.2*) to access SysMon.

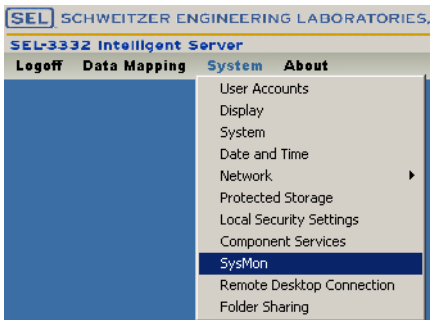


Figure 4.2 Starting SysMon

Clicking on the Close button (the X in the top right corner of the application) closes the application.

Status

A summary of status information is available at the status tab (see *Figure 4.3*). The following is a description of the different types of status information. This tab is unique from the other tabs because you can make no configuration changes to the SysMon Service from this window.

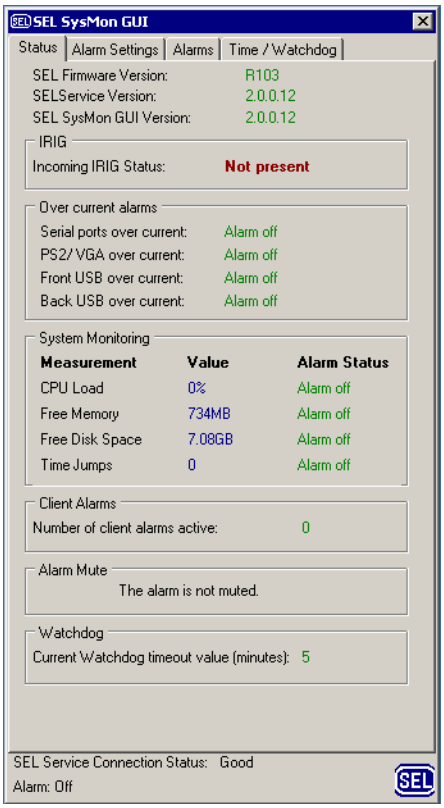


Figure 4.3 Status Tab

System Version Information

SysMon displays version information for SEL firmware, SEL service, and SysMon at the top of the **Status** tab. This information is useful when upgrading your system or determining applicability of a service bulletin.

IRIG

SysMon displays status messages of **Not present**, **Modulated**, or **Demodulated** according to the presence and type of IRIG-B time signal to which it is connected. A status of **Not present** indicates that the SEL-3332 is not connected to an external IRIG time source.

Overcurrent Alarms

The SEL-3332 supplies power from the Serial, USB, and VGA ports. These ports provide current limiting to prevent equipment damage in the event of a short circuit. Shorting the power on these ports will not affect the operation of the SEL-3332. Exceeding the limits shown in *Table 4.1* will cause an alarm to activate and the device to enter an alarm state.

When alarms are active, the alarm contact latches (turns on) on the back of the SEL-3332, the alarm light on the front of the SEL-3332 illuminates, and SysMon sends a log message to the SEL Windows Event Log.

Table 4.1 Current Limited Sections

Ports	Limit
VGA and PS/2	0.2 A, 5 Vdc, 1.0 W total for both
Front USB Ports	0.6 A, 5 Vdc, 3.0 W total for both
Rear USB Ports	0.6 A, 5 Vdc, 3.0 W total for both
EIA-232 Ports	0.6 A, 5 Vdc, 3.0 W total for all

System Monitoring

SEL SysMon Service monitors CPU load, system free memory, system free disk space, and time jumping conditions on one-second intervals. The alarm contact latches (turns on) when any of these resources violate conditions with parameters that you can specify from the **Alarm Settings** tab. This section of the SysMon **Status** tab shows present monitored values and whether an alarm is enabled or disabled. The following text explains each of these monitored items.

CPU Load

The SEL-3332 will alarm for greater than 50 percent CPU burden longer than 60 seconds. You can configure these settings, but adjustment of the CPU load settings is not recommended. Contact your SEL representative if the CPU burden is routinely alarming in your application.

Free Memory

The SEL-3332 alarms if the available RAM drops to less than 40 MB for more than three minutes.

Free Disk Space

The SEL-3332 alarms when disk space is less than 40 MB. Delete unused application files if the primary CompactFlash® or hard drive disk space is low.

Time Jumps

The SEL-3332 alarms if there are more than four time jumps in five minutes. A time jump occurs upon modification of the system time to align it with the most accurate time source.

Client Alarms

From the SEL-3332 display, you can see a count of the number of active client alarms. You can test the alarm contacts from the **Alarms** tab (see *Figure 4.9*).

Alarm Mute

Use the **Alarms** tab (see *Figure 4.9*) to mute or unmute the alarm. When you mute the alarm, SysMon displays the remaining mute time in seconds.

Watchdog

The Watchdog Timeout value displays in minutes. You can configure the Watchdog Timeout value from the bottom of the Time/Watchdog configuration window (see *Figure 4.12*). This setting takes effect upon startup of the SysMon Service.

Service Status Indicator

Common to the bottom area of each SysMon window is the service status indicator section (see *Figure 4.4*) which indicates the state of the SysMon service.

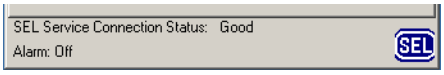


Figure 4.4 Service Status Indicator

If an alarm condition exists, then the icon in the lower right alternates between the SEL icon and a red exclamation mark. The same red exclamation mark is visible in the Windows system tray when SysMon is closed and an alarm condition exists.

Alarm Settings

Use the **Alarm Settings** tab (see *Figure 4.5*) to configure the following soft alarms: CPU, Free Memory, Disk Space, and Time Jumping. Here, you can also configure the seconds for an alarm to clear (Alarm Clear Time). You can disable each alarm independently.

The SysMon Service uses the values you set on the **Alarm Settings** tab to implement a system of user-configurable alarm conditions. The alarm contact latches (turns on) when any individual soft alarm capability is enabled and any alarm condition is present. If the soft alarm condition is met, or all soft alarms are disabled, the alarm contact will only latch on if a hardware alarm condition is active.

When you disable an alarm, the corresponding alarm section remains grayed out until it is reenabled. The SysMon service sends Windows Event Log messages to the SEL event log when an alarm condition occurs and the alarm is enabled. See *Table 4.2* for all default settings, including maximum and minimum configurable ranges.

Table 4.2 Alarms and SysMon Service Default Settings

Setting	Default	Min. Value	Max. Value
CPU Load Average Threshold Value	60 percent	1 percent	100 percent
CPU Load Grace Period	60 seconds	1 second	600 seconds
CPU Load Average Window Size	180 seconds	1 second	600 seconds
Free Memory Threshold	40 MB	40 MB	512 MB
Free Memory Grace Period	60 seconds	1 second	600 seconds
Free Disk Space Threshold	40 MB	40 MB	4096 MB
Number of time jumps that cause an alarm	4 jumps	1 jump	100 jumps
Time in which jumps must occur	300 seconds	1 second	65535 seconds
Alarm Clear Time	2 seconds	1 second	30 seconds
Alarm Pulse Duration	15 second	30 seconds	10 seconds
Test Alarm Mute Duration	5 minutes	1 minute	10 minutes
IRIG Good Requirement	0 seconds	0 seconds	1000 seconds
IRIG Bad Requirement	5 seconds	0 seconds	1000 seconds
Watchdog Timeout Value	5 minutes	1 minute	8 minutes

CPU Alarm Configuration

CPU load is averaged over a period of time called the average window. If the average exceeds the threshold for longer than the grace period, the alarm activates. The CPU Alarm clears automatically when the average CPU use falls below the CPU Load Average Threshold for the Alarm Clear Time.

Free Memory Alarm Configuration

If free memory falls below the Free Memory Alarm Threshold for longer than the Free Memory Alarm Grace Period, the Free Memory Alarm activates. Once the Free Memory Alarm is activated it remains in the alarm state until the amount of free memory remains above the Free Memory Alarm Threshold for the duration of the Alarm Clear Time.

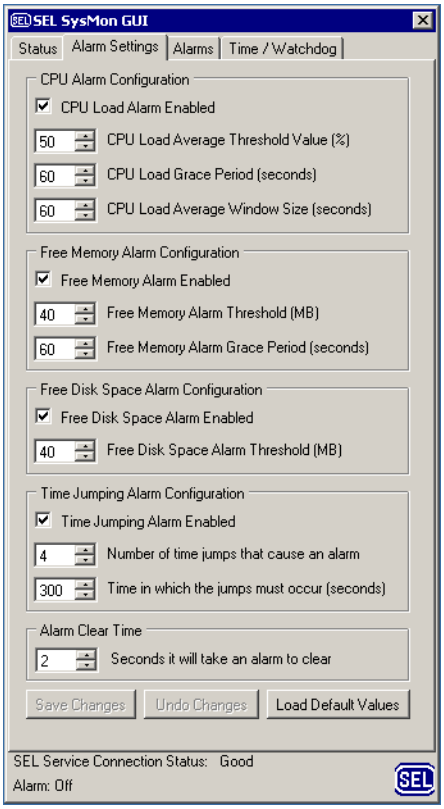


Figure 4.5 Alarm Settings Configuration Tab

Free Disk Space Alarm Configuration

The Free Disk Space Alarm activates when free system disk space falls below the Disk Space Alarm Threshold. The alarm condition clears when free system disk space increases above the Free Disk Space Alarm Threshold.

Time Jumping Alarm Configuration

Adjust thresholds to monitor how often time jumps occur. Investigate excessive time jump alarms—they may indicate multiple time systems attempting to adjust the system clock, resulting in unreliable time information on the system clock.

Alarm Clear Time

To avoid very short alarm pulses, the SysMon service holds all system monitor alarms on for a minimum clear time. This is the time without violations that causes SysMon alarms to transition from an On to Off state.

Save Changes, Undo Changes, Load Default Values Buttons

At the bottom of the **Alarm Settings** tab, but above the **Service Status Indicator** area, are three buttons (see *Figure 4.6*).

Figure 4.6 Save, Undo, or Load Defaults Buttons (Only Load Default Values Available)

In the absence of settings changes, the **Save Changes** and **Undo Changes** buttons are grayed out (see *Figure 4.6*). Making any changes to the settings on this page causes SysMon to provide options for saving, undoing, or loading default values. As soon as you make a change to any settings on the **Alarm Settings** tab, the previously grayed out buttons become available (see *Figure 4.7*).

Figure 4.7 Save, Undo, or Load Defaults Buttons (All Buttons Available)

Changes will be lost if you select a different tab without saving changes. If you make one or more changes and attempt to navigate away from the **Alarm Settings** tab, SysMon displays a dialogue box (see *Figure 4.8*) warning that you will lose changes. If you choose **Yes**, you will lose any changes you made to the **Alarm Settings**.

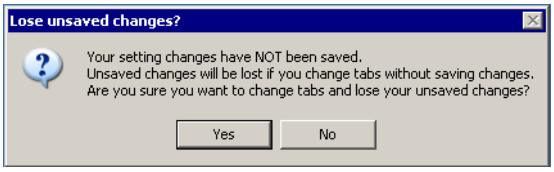


Figure 4.8 Lose Unsaved Changes Dialog Box

If you choose **No**, you can save or undo changes before switching to a different tab. A similar set of buttons exists on the **Time/Watchdog** tab in the middle of that configuration area, and these buttons function identically to those for the Alarm Settings warning.

Alarms

The **Alarms** tab is an interface for monitoring soft alarms and testing the alarm contacts on the SEL-3332 (see *Figure 4.9*). SysMon displays a count of the number of active client soft alarms at the top of the tab and lists active individual alarms with a check box for selective deletion.

The **Client Alarm List** displays a maximum of 20 alarms, even though more than 20 alarms can be active at a time. The 20 oldest alarms display individually. The count of active alarms on the **Status** tab and the **Alarms** tab shows the total number of alarms.

Adding Client Alarms

You can add client alarms in the **Test Client Alarm** area. Type a short Alarm Explanation in the provided box. Next choose what type of alarm you want to set. **Latched** will turn the alarm contacts on until the alarm clears. **Pulsed** allows an alarm to remain active for a configurable duration as long as 30 seconds. After selecting latched or pulsed and the pulse duration, click the **Add Alarm** button to add the client alarm. The alarm should appear in the **Client Alarm List** area. SysMon removes a pulsed client alarm and decrements the number of active alarms when the pulse duration expires. A Latched alarm will remain active until you delete the alarm.

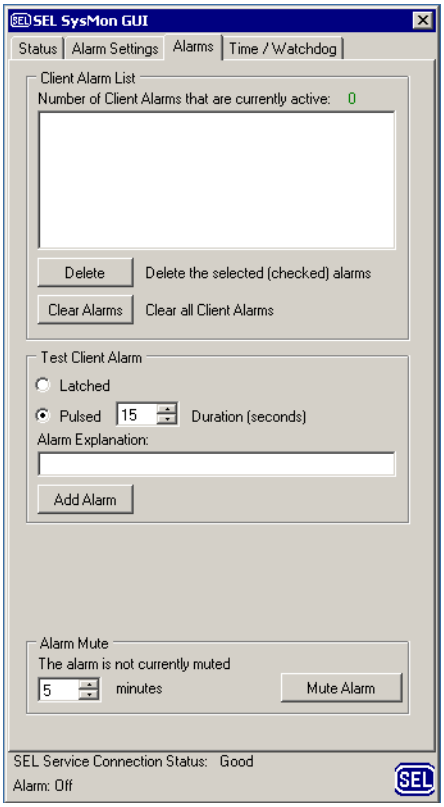


Figure 4.9 Alarms Tab

Deleting Client Alarms

Delete individual client alarms by selecting the checkbox for the alarm(s) to remove and using the **Delete** button (see *Figure 4.10*). Using the **Clear Alarms** button removes all active alarms. When you have removed the last active alarm, the alarm contact opens and the red LED on the front of the SEL-3332 turns off. There is also an audible click, and the SEL icon will no longer alternate to the red exclamation mark.

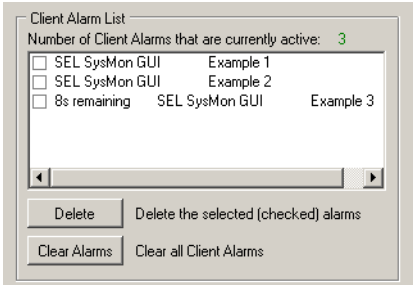


Figure 4.10 Example Client Alarms

Muting All Alarms

You can mute alarms for a configurable duration. See *Table 4.2* for the default mute duration. To use Alarm Mute, select the number of minutes and press the **Mute Alarm** button at the bottom of the **Alarms** configuration tab (see *Figure 4.10*). While alarms are muted, the SysMon system will continue to be

accepted and processed alarms, but the alarm light will not turn on nor will the alarm contact latch. When the alarm is unmuted or the mute timeout expires, the alarm contact and corresponding LED return to normal operation.

Time/Watchdog

Use the **Time/Watchdog** configuration tab (see *Figure 4.12*) to configure how the SEL-3332 synchronizes time or to adjust the watchdog timeout. Additional explanations for each of these configuration options follows.

IRIG

The top of the **Time/Watchdog** window indicates the **IRIG-B IN** (top) BNC at the back of the SEL-3332. The status will read **Not present** (see *Figure 4.12*) if no IRIG-B source is present. If an IRIG-B source is connected to the SEL-3332, the status will read **Modulated** or **Demodulated** depending on the type of IRIG-B signal.

Master Time Source

SysMon Service on the SEL-3332 checks the state of the IRIG signal about once a second and keeps Windows System time synchronized with IRIG time via a Windows Time Provider called the SEL Time Provider.

The SEL Time Provider is the master source on startup if IRIG is present and good; otherwise the SEL-3332 uses the system clock as the master time source on startup. A transition from the SEL Time Provider as the master time source to System Time as the master time source occurs if the IRIG source is consistently bad for the configurable IRIG Bad Requirement period (see *Table 4.2*). A transition from System Time as the master time source to SEL Time Provider as the master time source occurs if the IRIG source is consistently good for the IRIG Good Requirement period (see *Table 4.2*). The SEL-3332 creates an SEL Windows Event Log entry whenever the master time provider transitions between sources.

SysMon Service configures the hardware to provide outgoing IRIG if incoming IRIG is present. The SysMon Service configures the hardware to provide outgoing IRIG from the operating system clock if there is no external IRIG source.

NTP Server

The SEL-3332 can serve as an NTP Time Server. The status of the current NTP Server is shown as **Enabled** or **Disabled**. The button toggles back and forth to list the option opposite to the present configuration. There are several seconds of delay while the SysMon Service makes the necessary changes. A green state message changes between Enabled and Disabled to reflect the present setting.

NTP Client

The **Open Windows Time/Date Control Panel** button displays when there is no IRIG source connected to the SEL-3332. This opens the Windows Date and Time Properties window, where you can select an NTP server to use in synchronizing the system clock (see *Figure 4.11*). Make sure to check the **Automatically synchronize with an Internet time server** checkbox to allow the System Time to update this way.

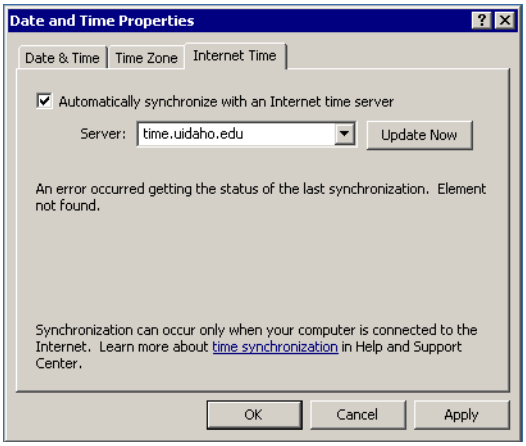


Figure 4.11 Windows Date and Time Properties

It is common when using an NTP time server to have trouble synchronizing with the remote NTP source. Check with your network and system administrator to verify that the necessary ports and protocols (typically UDP port 123) are allowed through any firewalls between the NTP time server and your SEL-3332.

Watchdog Configuration

SysMon Service resets the hardware watchdog every second. If SysMon Service fails to reset the watchdog after a period equal to half the Watchdog Timeout, then the SysMon system writes a warning log message to the SEL Windows Event Log. If SysMon Service fails to reset the watchdog for a period of 75 percent or more of the Watchdog Timeout, then SysMon Service writes one Error event log message to the SEL Windows Event Log per failure. The watchdog hardware (ATMEL) will force a reboot of the SEL-3332 if the ATMEL does not receive a reset within the Watchdog Timeout (see *Table 4.2*) period.

The forced reboot is to bring the SEL-3332 back to a known good state after problems such as memory exhaustion, disk space depletion, or CPU issues. See *Table 2.4* for instruction on disabling the watchdog if you do not want this behavior for your intended use of the SEL-3332.

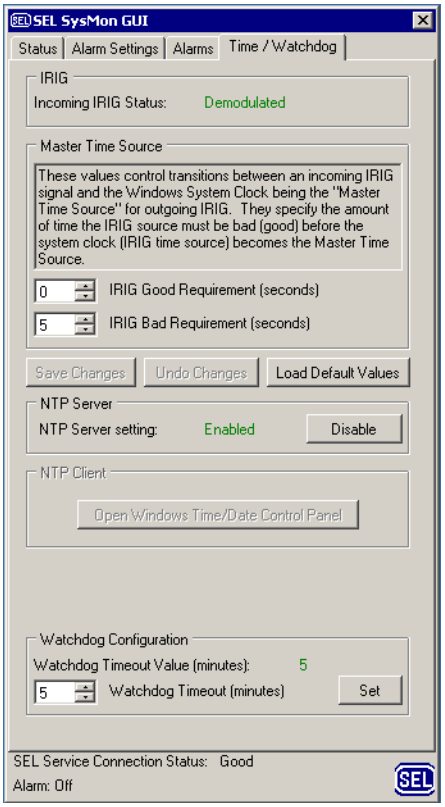


Figure 4.12 Time/Watchdog Configuration Tab

SEL SysMon Service and SEL SysMon GUI Processes

SysMon Service runs as a Windows Service. To access SysMon Service settings, select **System > Component Services** from the SEL-3332 **Control Bar** and scroll down to find SELService from the list of services.

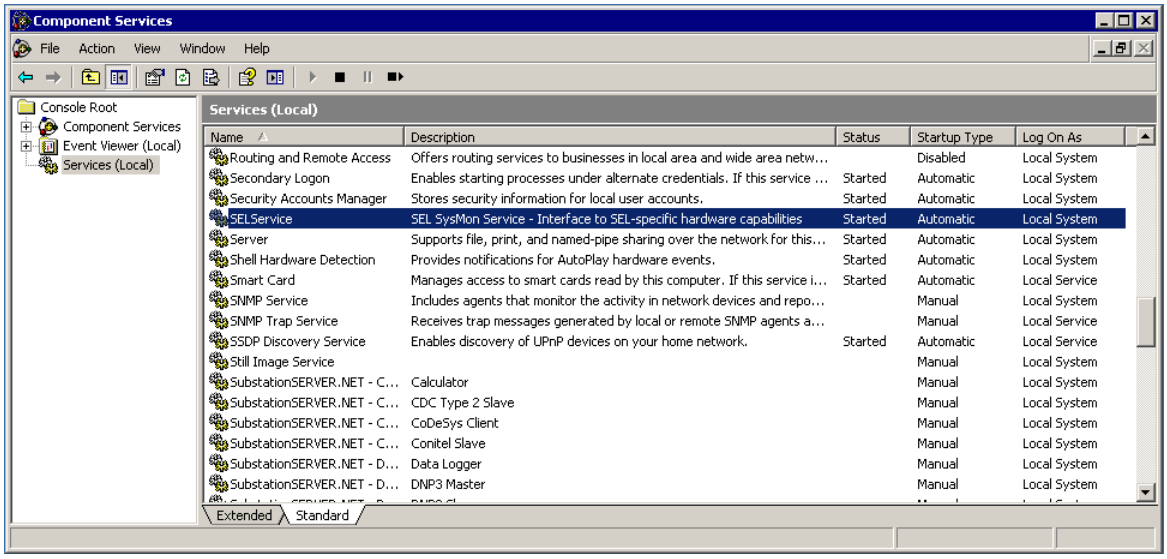


Figure 4.13 SELService in Windows Services List

Right-click on SELService and select **Properties** to verify that the SEL SysMon Service is configured to start automatically whenever the SEL-3332 boots up (see *Figure 4.14*).

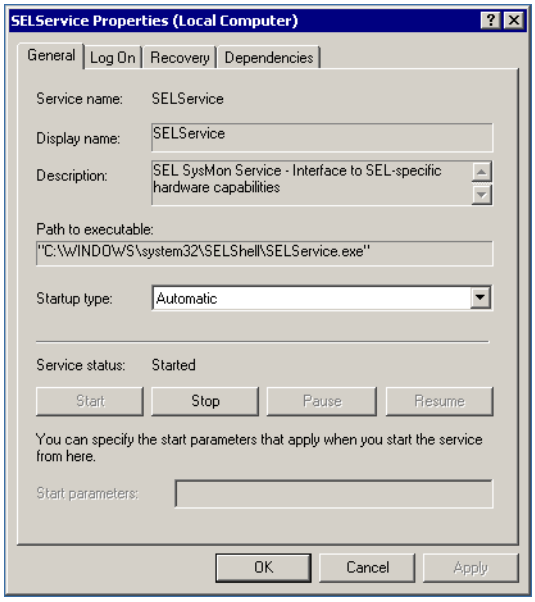


Figure 4.14 SEL SysMon Service Properties

Should the SEL SysMon Service ever stop running or fail to start initially, SysMon will display and error in the status notification area and flash the red exclamation mark (see *Figure 4.15*).

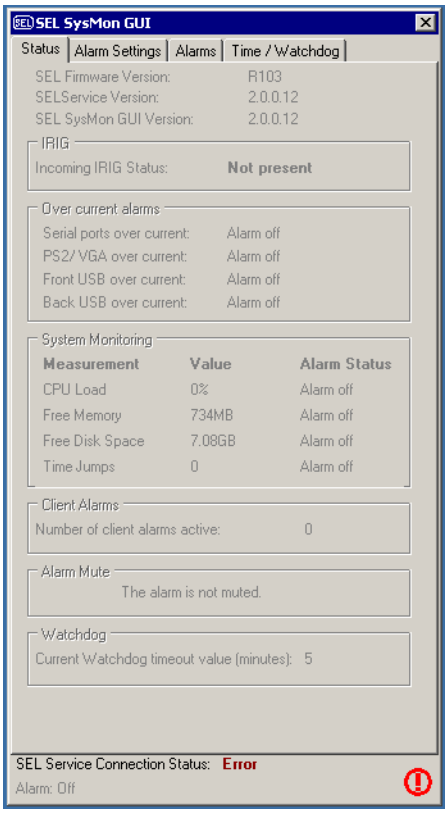


Figure 4.15 SysMon With SELService Not Running

When the SysMon Service is not running, the rest of the SysMon entries become grayed out. Restart the SEL SysMon Service to fix the problem. Check event log messages to troubleshoot why the service stopped. If you do not restart the service within the Watchdog timeout value, the watchdog will reset the computer and you will lose any outstanding changes made since the last commit and reboot.

SysMon Service Default Settings

SysMon stores persistent configuration and state information in Windows and displays these data when you start SysMon Service and SysMon GUI to configure default SysMon Service and GUI settings. SysMon Service also has compiled default settings that the program will use if the last saved state is unavailable for any reason.

Upgrading SEL SysMon Service and SysMon Application

The programs for managing IRIG, status, and alarm settings on the SEL-3332 should already be installed when you receive your SEL-3332. No installation should be necessary. To upgrade from an existing version of the SysMon application or SysMon Service, refer to the installation instructions included with the upgrade.

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Section 5
Troubleshooting

Overview

Please refer to the SEL website (www.selinc.com) for up-to-date troubleshooting information.

Common Operation Oversights

Blank Monitor

The SEL-3332 is compliant with most computer monitors. The video selections available are 800 by 600, 1024 by 758, 1152 by 864 and 1600 by 1200. Ensure that your monitor meets this specification.

Table 5.1 lists possible causes and solutions for a blank monitor.

Table 5.1 Blank Monitor Troubleshooting

Symptoms/Possible Cause	Diagnosis/Solution
Monitor goes blank during boot up	➤ Ensure BIOS defaults are correct. See *Appendix C: Resetting BIOS* to restore default BIOS settings.
Power saver is activated	➤ Move your mouse to ensure that the screen saver is not activated.
Monitor power is off	➤ Locate and verify that the monitor power indication LED is illuminated. ➤ If the LED is not illuminated, locate the monitor power button and press to turn the power on. ➤ If the power does not come on, verify that the correct power supply is connected to the monitor. ➤ Verify that the monitor's video cable is plugged into the SEL-3332.
SEL-3332 power is off	➤ Verify that the SEL-3332 power LED is illuminated. ➤ If the SEL-3332 LED is not illuminated, re-examine the power outlet and power connection to the SEL-3332 monitor. ➤ Ensure that your SEL-3332 is properly being powered. Note that the SEL-3332 is available with multiple voltage levels.
Equipment failure	➤ Contact your computer administrator if you cannot determine the cause.
Miscellaneous	➤ Verify that the monitor brightness is not turned all the way down.

Networking

Although proper computer system networking is an extremely broad topic, there are a few steps that can aid in simple network troubleshooting.

Ensure that the Ethernet hub, switch, or router is compatible with the SEL-3332. The SEL-3332 has the ability to connect to 10BASE-T and 100BASE-T copper cable connected equipment. The SEL-3332 has the ability to connect to two 100BASE-FL fiber Ethernet connections.

Verify that the SEL-3332 and the network are communicating by observing the LEDs associated with the Ethernet network switch or hub. If the LEDs display no activity, then verify that the proper cabling exists.

If you are sure the Ethernet cabling is proper, then ping the SEL-3332 from a work or personal computer. As a basic rule, nothing will work if pinging does not work. When pinging, use an IP address or computer name.

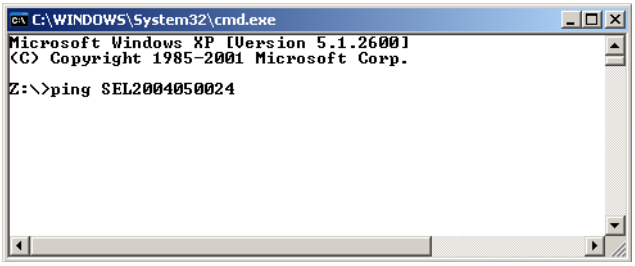

Figure 5.1 Ping Command

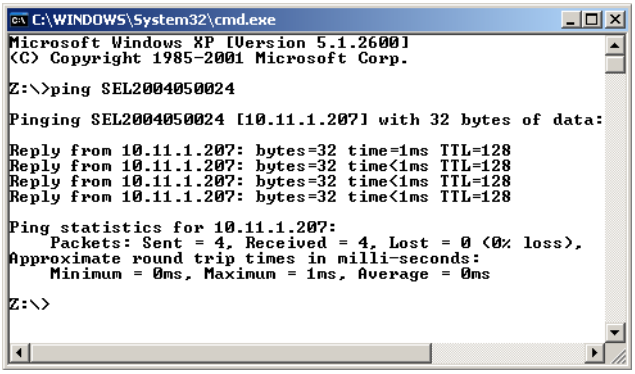

Figure 5.2 Ping Response

Factory Assistance

We appreciate your interest in SEL products and services. If you have questions or comments, please contact us at:

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Appendix A

Software and Manual Versions

Software

Determining the Software Versions in Your SEL-3332

To find the revision number in your SEL-3332, select **About** in the SEL-3332 Control Bar.

Table A.1 lists the software, firmware, and shell versions, a description of modifications, and the instruction manual date code that corresponds to these versions. The most recent version is listed first.

Table A.1 Software Revision History (Sheet 1 of 2)

Identification Numbers	Summary of Revisions	Manual Date Code
Operating System: R3.0.4 Firmware: R103 Shell Version: R1.0.0 SelService Version: 2.0.0.12 SEL SysMon GUI Version: 2.0.0.12	➤ Manual update only (see *Table A.2*).	20140307
Operating System: R3.0.4 Firmware: R103 Shell Version: R1.0.0 SelService Version: 2.0.0.12 SEL SysMon GUI Version: 2.0.0.12	➤ Manual update only (see *Table A.2*).	20090910
Operating System: R3.0.4 Firmware: R103 Shell Version: R1.0.0 SelService Version: 2.0.0.12 SEL SysMon GUI Version: 2.0.0.12	➤ New versions of SEL System Control Monitor and Watchdog. New names become SEL SysMon (application) and SELService (service).	20090625
Operating System: R3.0.4 Firmware: R103 Shell Version: R1.0.0	➤ Operating System updated to Service Pack 3.	20090508
Operating System: R3.0.3 Firmware: R103 Shell Version: R1.0.0	➤ Manual update only (see *Table A.2*).	20090406
Operating System: R3.0.3 Firmware: R103 Shell Version: R1.0.0	➤ Manual update only (see *Table A.2*).	20080220
Operating System: R3.0.3 Firmware: R103 Shell Version: R1.0.0	➤ Updated Protected Storage sub-system.	20071116
Operating System: R3.0.2 Firmware: R103 Shell Version: R1.0.0	➤ Updated per Daylight-Saving Time date change.	20070214
Operating System: R3.0.1 Firmware: R103 Shell Version: R1.0.0	➤ Manual update only (see *Table A.2*).	20061129

Table A.1 Software Revision History (Sheet 2 of 2)

Identification Numbers	Summary of Revisions	Manual Date Code
Operating System: R3.0.1 Firmware: R103 Shell Version: R1.0.0	➤ Manual update only (see *Table A.2*).	20060718
Operating System: R3.0.1 Firmware: R103 Shell Version: R1.0.0	➤ Updated communications port mapping.	20060628
Operating System: R3.0.0 Firmware: R103 Shell Version: R1.0.0	➤ Initial version.	20060421

Instruction Manual

The date code at the bottom of each page of this manual reflects the creation or revision date.

Table A.2 lists the instruction manual release dates and a description of modifications. The most recent instruction manual revisions are listed at the top.

Table A.2 Instruction Manual Revision History (Sheet 1 of 2)

Revision Date	Summary of Revisions
20140307	Section 1 ➤ Updated *Certifications* in *Specifications*.
20090910	Section 1 ➤ Updated processor option in *Models and Options*. ➤ Updated RAM information *Specifications*.
20090625	Section 3 ➤ New figures to reflect name change of System Control Monitor to SysMon. ➤ New Event Log figures to show introduction of SEL Event Log. Section 4 ➤ Renamed IRIG, Status, and Alarms section as SEL SysMon. ➤ Entirely new content reflecting new version and features of SELService and SEL System Monitor (SysMon).
20090508	Appendix A ➤ Updated for operating system version R3.0.4.
20090406	Section 1 ➤ Updated *Master Protocols* and *Slave Protocols* and added *Peer-to-Peer Protocols* in *Specifications*.
20080220	Section 1 ➤ Updated Slave Protocols in *Specifications*.

Table A.2 Instruction Manual Revision History (Sheet 2 of 2)

Revision Date	Summary of Revisions
20071116	Section 1 ➤ Updated storage options in *Options*. ➤ Added CDC Type 2 to *Slave Protocols* in *Specifications*. ➤ Updated *Memory* in *Specifications*. Section 3 ➤ Updated control bar screen captures throughout section. ➤ Updated *Logging On and Off*. ➤ Updated *Protected Storage*. Appendix A ➤ Updated for operating system version R3.0.3. Appendix B ➤ Updated *Device Updates*.
20070214	Appendix A ➤ Updated for operating system version R3.0.2.
20061129	Section 1 ➤ Updated *Master Protocol* and *Slave Protocols* in *Specifications*.
20060718	Section 1 ➤ Added UL/CSA information.
20060628	Appendix A ➤ Updated for operating system version R3.0.1.
20060421	➤ Initial version.

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Appendix B
Device Update Agent

Device Updates

SEL will issue updates to the SEL-3332 as needed and will be available for download from the SEL website. The updates can be deployed locally via USB removable storage or over a network via a shared folder. Most updates only require using the Device Update Agent. However, some updates may require a complete copy over the SEL-3332 Intelligent Server's CompactFlash® card hard drive. The following subsections give a general description of the update process. Specific instructions may also be furnished with the release of the update.

The SEL-3332 uses the Device Update Agent to update the system. The Device Update Agent scans a designated folder for the files contained in the update package distributed by SEL. This package includes a file named SELUpdate.dua and may also contain additional files located in a working folder, which the SELUpdate.dua file uses during the update. By default, the designated folder is the root of the D:\ drive. This default is correct if you choose to use the Local Update method below and your SEL-3332 is not equipped with a secondary CompactFlash card.

If you choose to place the update in a location other than the default D:\, you will need to use the **Environment Variables** dialog box, also described in *Environment Variables on page 3.7*, to change the System variable **SELUpdatePath** to the correct location. For example, if the SEL-3332 is equipped with a secondary CompactFlash card that is assigned to the D:\ drive and you choose to use the Local Update method below and place the update on a USB removable storage disk, set the environment variable to E:\, the drive letter the USB removable storage disk will be assigned. Similarly, if you choose to use the Network Update method, set the environment variable to the path of the network shared folder, for example, C:\SharedUpdateFolder. Any changes to the environment variables will require a commit and reboot to take effect.

Local Update

Use a USB removable storage device to update the SEL-3332.

Step 1. Copy the entire contents of the SEL-3332 update to the root of a USB removable storage disk.

Step 2. Plug the USB removable storage disk into one of the available USB ports on the SEL-3332.

Step 3. Start the Component Services by selecting **System** > **Component Services**.

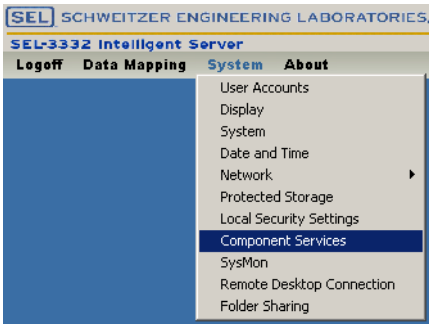

Figure B.1 Accessing Component Services

Step 4. Select the **Services** folder.

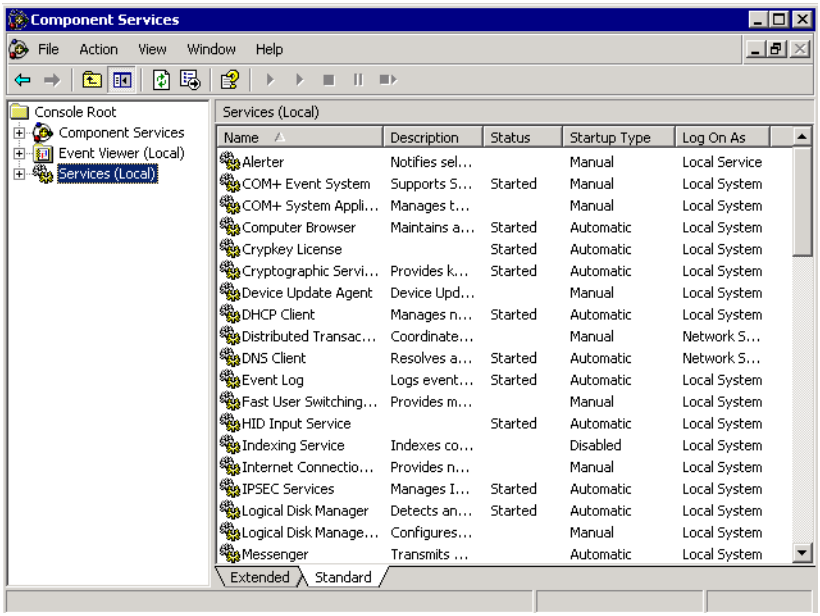

Figure B.2 Selecting the Services Folder

Step 5. Select the **Device Update Agent** row.

Step 6. Right-click and select **Start**. The update should begin immediately.

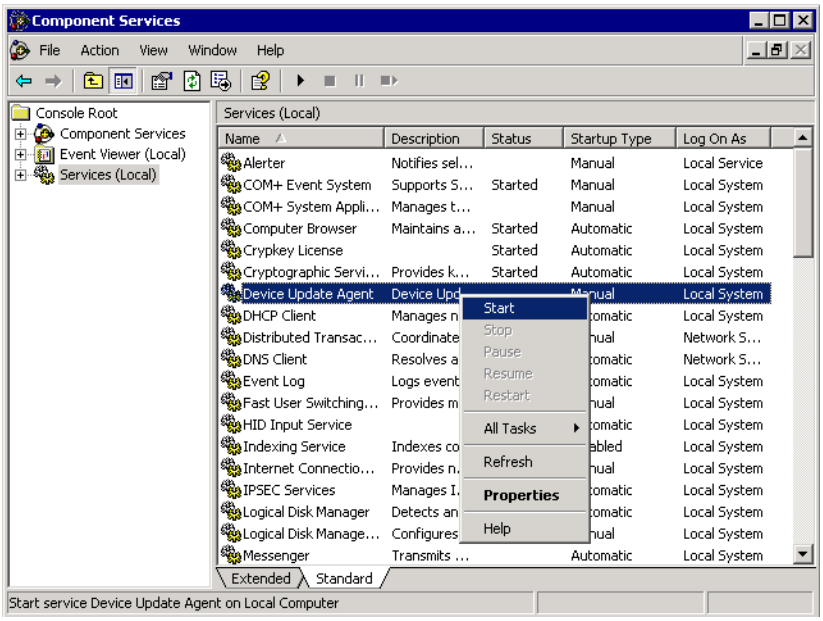

Figure B.3 Selecting the Device Update Agent Row

Wait for the update to finish installing. Most updates will automatically commit and reboot when the update is finished. After the SEL-3332 runs the update, it will delete the SELUpdate.dua file.

Step 7. Remove the USB removable storage disk and verify the SELUpdate.dua file is no longer present. This indicates that the update was successful.

Step 8. Repeat for all SEL-3332 devices that apply to the update.

Network Update

Use folder sharing to update the SEL-3332 over a network.

Step 1. Create a shared folder on the targeted SEL-3332 (see *Folder Sharing on page 3.22*).

Step 2. Copy the entire contents of the SEL-3332 update to the shared folder from your network connected computer.

Step 3. Start the Device Update Agent service as shown in *Local Update on page B.1*. The update should begin immediately.

Wait for the update to finish installing. Most updates will automatically commit and reboot when the update is finished. After the SEL-3332 runs the update, it will delete the SELUpdate.dua file.

Step 4. Verify the SELUpdate.dua file is no longer present in the network shared folder. This indicates that the update was successful.

NOTE: Make sure the SELUpdatePath environment variable is set to the path to the SELUpdate.dua file in the shared folder.

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Appendix C
Resetting BIOS

Resetting BIOS

The SEL-3332 ships with the proper BIOS settings. Do not modify the BIOS settings unless either of the following has occurred.

- The ETX single board computer has been replaced or removed.
- The baseboard battery has been replaced.

Reset the BIOS using the following steps.

⚠CAUTION
Read the following steps before attempting to reset the BIOS. Contact your computer administrator if you have any concerns.

Step 1. Connect a keyboard and monitor.

Step 2. Apply power to the SEL-3332.

Step 3. Press the **<F2>** key during the boot sequence.

The BIOS boot menu should be displayed.

Step 4. Select **Exit** at the bottom of the list.

Step 5. Select **Load Defaults** to reset BIOS to factory default.

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Glossary

10/100BASE-T 10BASE-T is a variant of Ethernet that allows devices to be connected via twisted-pair cable. 100BASE-T incorporates any of several Fast Ethernet standards (under IEEE 802.3) or planned standards for twisted-pair cables. Fast Ethernet is a version of Ethernet capable of 100 Mbps, instead of the 10 Mbps data transfer speed for standard Ethernet.

100BASE-FX Fast Ethernet over optical fiber. Fast Ethernet is a version of Ethernet capable of 100 Mbps, instead of the 10 Mbps data transfer speed for standard Ethernet.

3U The designation of the vertical height of a device in rack units. One rack unit, U, is approximately 1.75 inches or 44.45 mm.

A Abbreviation for amps or amperes; unit of electrical current flow.

ac Abbreviation for alternating current.

ACPI Advanced Configuration and Power Interface. An open industry standard developed by Intel, Microsoft, and Toshiba for configuration and power management.

ASCII Abbreviation for American Standard Code for Information Interchange. Defines a standard set of text characters. The SEL-3332 uses ASCII text characters to communicate through the use of serial ports.

BIOS Basic Input/Output System. System software that provides the most basic interface to peripheral devices and controls the first stage of the boot process, including operating system installation.

Burden Percentage of time during which the CPU is working.

CMOS Complementary Metal Oxide Semiconductor. A semiconductor fabrication technique that makes use of n- and p- doped semiconductor material to achieve low-power dissipation.

CompactFlash® A type of nonvolatile relay memory used for storing large blocks of nonvolatile data.

CPU Central processing unit.

CRT Cathode ray tube. A type of monitor.

CTS Clear to send.

Current Limiting Keeping current within a specified threshold.

dc Abbreviation for direct current.

DCD Digital Control Design Language. A language for simulating computer systems.

Dry Contact An initially available contact that is neither connected to nor energized by voltage (such voltage is usually supplied externally).

DSR Dynamic Service Register.

DTR Data Terminal Ready. A wire in an EIA-232 connection that tells data communications equipment (typically a modem) that the computer or terminal is ready to transmit and receive data.

EIA-232 Electrical definition for point-to-point serial data communications interfaces, based on the standard EIA/TIA-232. Formerly known as RS-232.

EMI Electromagnetic Interference.

Environment Variables Environment variables are part of Windows® System Properties. Adding, deleting, and editing these variables changes your Windows system configuration.

ESD Electrostatic discharge. The sudden transfer of charge between objects at different potentials caused by direct contact or induced by an electrostatic field.

Ethernet A network physical and data link layer defined by IEEE 802.2 and IEEE 802.3.

ETX End of Text. The interrupt character (also obtained through Ctrl+C) used on many operating systems to interrupt a running program.

Firmware The nonvolatile program stored in the relay that defines relay operation.

GND Ground.

GPS Global Positioning System. Source of position and high-accuracy time information.

GUI Graphical user interface.

HMI Human machine interface.

IRIG-B A time code input that the relay can use to set the internal relay clock.

IRQ3/IRQ5 Interrupt requests that cause the processor to suspend normal instruction execution temporarily and to begin an interrupt handler routine. An interrupt condition persists as long as the input is active. Some processors have several interrupt request inputs, allowing different priority interrupts.

LCD Liquid Crystal Display.

LED Light-Emitting Diode. Used as indicators on the Intelligent Server front panel.

MAC Address The hardware address of a device connected to a shared network medium.

MOV Metal-Oxide Varistor.

Network Time Server A device that provides system-wide time synchronization for distributed computer network/client server applications.

Null-modem Cable	A serial cable for direct connection of computers without use of a modem.
PC	Personal Computer.
Peak Common Mode	Maximum voltage between a signal line and common (ground).
Peak Differential Mode	Maximum voltage between two signal lines.
Ping	Packet InterNet Groper. A program that tests the ability to communicate with a remote device by sending one, or repeated, echo requests to a remote location and waits for replies. The term is also used as a verb to indicate the action of sending signals to and receiving echoes from remote devices.
Pinout	The definition or assignment of each electrical connection at an interface. Typically refers to a cable, connector, or jumper.
Protocol	A language for communication between devices.
RAM	Random-Access Memory.
RC Filter	Resistive-Capacitive Filter. A filter composed of a resistor and capacitor.
RFI	Radio-Frequency Interference.
RTS	Request to Send.
RXD	Received data.
SCADA	Supervisory Control and Data Acquisition.
Star Topology	Connection scheme in which multiple devices connect to one common node device.
TTL	Transistor-Transistor Logic. A term originating with Texas Instruments describing a common semiconductor technology for building discrete digital logic integrated circuits.
TXD	Transmitted data.
V	Abbreviation for volts; unit of electromotive force.
VESA	Video Electronic Standards Association.
W	Abbreviation for watts; unit of electrical power.
Write Leveling	Technique by which information written to CompactFlash card is spread throughout the storage area to prevent exhausting individual memory locations.

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Page numbers appearing in bold mark the location of the topic's primary discussion.

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