SEL-1102
Computing Platform

Instruction Manual

20140307

SCHWEITZER ENGINEERING LABORATORIES, INC.

PM1102-01

⚠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.

⚠CAUTION
There is danger of explosion if the battery is incorrectly replaced. Replace only with Ray-O-Vac® no. BR2335 or equivalent recommended by manufacturer. Dispose of used batteries according to the manufacturer's instructions.

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

⚠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
Do not operate device unless properly grounded.

⚠WARNING
Never use standard null-modem cables with the SEL-1102. Using any non-SEL cable can cause severe power and ground problems involving Pins 1, 4, and 6 on the SEL-1102 communications ports.

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

⚠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.

⚠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.

⚠ATTENTION
Il y a un danger d'explosion si la pile électrique n'est pas correctement remplacée. Utiliser exclusivement Ray-O-Vac® No. BR2335 ou un équivalent recommandé par le fabricant. Se débarrasser des piles usagées suivant les instructions du fabricant.

⚠ATTENTION
Lire les étapes suivantes avant toute tentative pour réinitialiser le BIOS. Contactez votre administrateur de système pour toutes questions ou préoccupations.

⚠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
Ne pas faire fonctionner ce dispositif s'l n'est pas adéquatement mis à la terre.

⚠WARNING
Ne jamais utiliser de cables standards à inversion de signaux (''null-modem'') avec le SEL-1102. 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-1102.

⚠AVERTISSEMENT
A défaut d'appliquer les bons niveaux de tension, l'équipement peut être endommagé.

⚠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.

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Preface

Manual Overview

The SEL-1102 Computing Platform 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.

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-1102; lists the specifications.

Section 2: Hardware and Field Installation. Describes how to mount and wire the SEL-1102; illustrates wiring connections for various applications.

Section 3: Operating System and Software Installation. Describes the methods of installing operating systems and software.

Section 4: SEL SysMon. Describes the System Control Monitor driver.

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: Microcontroller Communications. Describes the protocol used for communication between the main computer and the microcontroller.

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-1102 Computing Platform is a PC-AT compatible computer platform with an additional embedded microcontroller. Use the SEL-1102 to provide a solution using extremely rugged SEL hardware and your software.

Features

The SEL-1102 provides a rugged, easy-to-use computing platform for substation, industrial, or other harsh environments. The SEL-1102 is based on a PC-AT compatible computing platform and a separate microcontroller. The following features and enhancements are included in the system:

- **Form Factor**

  The SEL-1102 provides a form factor specifically designed for substation and industrial control applications. This includes rear-panel connectors, separate front-panel **TXD** and **RXD** LEDs for each serial port, and complete surge protection.

- **Power Supply**

  Three power supply options are provided in the SEL-1102. Refer to *Power Supply on page 1.3* in the *Specifications* for information about power supply ordering options.

- **Watchdog Timer**

  A separate system watchdog microcontroller provides an extra level of computer system reliability. One function of the microcontroller is to reboot the computer if there is an operating system problem with specific software services running on the operating system.

- **Time System**

  The watchdog microcontroller can work with the operating system to manage the system clock and distribute time via IRIG-B to devices connected to the SEL-1102. Update the system clock from an IRIG-B input or from the network time server. Generate demodulated IRIG-B output from the IRIG-B input or from the network synchronized or free-running system clock.

Models and Options

Models

Complete ordering information is not provided in this instruction manual. See the latest SEL-1102 Model Option Table at www.selinc.com, under SEL **Literature**, **Ordering Information** (Model Option Tables).

Options

The SEL-1102 has the following options and features:

- Pentium® M 1.4 GHz with 1 GB DDR SDRAM
- 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 useful for 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 1.1) ports (standard).
- Mounting
  - horizontal panel
  - horizontal 19-inch rack

Specifications

General

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. Ring terminals are recommended.

Power Supply

Option:	125/250 Vdc or 120/230 Vac; 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 Vac; 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

Does not support ACPI

Main Supply Voltage Fluctuations:	Up to ±10% of nominal voltage

Operating Temperature, Performance

–40° to +75°C (–40° to +167°F)
(Maximum continuous CPU burden of 50%)

Operating Temperature, Safety

–40° to +75°C (–40° to +167°F)

Storage Temperature

–40° to +85°C (–40° to +185°F)

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

Ethernet Ports

2 rear-panel fiber-optic ports, 1 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

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 the SEL-1102.

Supported Form Factors

PC104, PC104+

CPU Type

Mobile Intel Pentium M

System Speed:	1.4 GHz with 400 MHz FSB
Chipset:	Intel® 855 GME
BIOS:	AMI BIOS
Cache:	2 MB L2 write-back cache
On-Board VGA:	Integrated Intel Extreme Graphics Controller Up to 32 MB Allocated System Memory Maximum Resolution 1600 x 1200
LAN:	Ethernet 1: AMD PCNet—Fast +; Fiber Optic or Copper Ethernet 2: AMD PCNet—Fast +; Fiber Optic
Memory:	1 GB, PC2700 DDR SDRAM, ECC
Super I/O:	SMSC LP47B272
RTC/CMOS:	Intel ICH4-M
Keyboard Controller:	SMSC LP47B272
Local Bus IDE:	Intel ICH4-M, IDE1, 2 Ultra DMA 33/66/100 IDE0 Dual CompactFlash® Type 2 Sockets IDE1 44 pin header, 2.5" HD mounting bracket

USB:	2 rear-panel ports, 2 front-panel ports USB 1.1 Compliant 600 mA current limit for front 600 mA current limit for rear

Type Tests

Electromagnetic Compatibility Immunity

Electrostatic Discharge:	IEC 60255-22-2:1996 IEC 61000-4-2:2001 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 + A1:2000 + A2:2001 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 61000-4-3:2002 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 + A1:1999 + A2:2002 Level: Class A IEC 60255-25:2000
Radiated Emissions:	EN 55011:1998 + A1:1999 + A2:2002 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 60255-22-1:2005 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 + A1:2001 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 61000-4-6:2004 IEC 60255-22-6:2001 Severity Level: 10 Vemf
Power Frequency Magnetic Field Immunity:	IEC 61000-4-8:2001 1000 A/m for 1 s 100 A/m for 1 min.
Pulse Magnetic Field Immunity:	IEC 61000-4-9:2001 Severity Level: 1000 A/m, Level 5
Power Supply Variation and Interruption:	IEC 61000-4-11:2004 IEC 60255-11:1979

Environmental

Cold:	IEC 60068-2-1:1990 + A1:1993 + A2:1994 Test Ad: 16 hours at –40°C
Dry Heat:	IEC 60068-2-2:1974 + A1:1993 + A2:1994 Test Bd: 16 hours at +75°C
Damp Heat, Cyclic:	IEC 60068-2-30:1980 + A1:1985 Test Db: (12 + 12-hour cycle), 95% r.h. 25° to 55°C, 6 cycles
Object Penetration:	IEC 60529:2001 + CRGD:2003, 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

Certifications

ISO: SEL-1102 is designed and manufactured using ISO 9001 certified quality program.

Section 2
Hardware and Field Installation

Overview

To install and connect the Computing Platform 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 application.

This section also contains information on installing a rotating hard drive and other computer peripherals.

Unit Placement and Maintenance

Proper placement and maintenance of the SEL-1102 helps make certain that you receive years of trouble-free operation. Use the following guidelines for proper installation of the SEL-1102.

Physical Location

Mount the SEL-1102 in a sheltered indoor environment (a building or an enclosed cabinet) that does not exceed the temperature and humidity ratings for the unit (see *Specifications on page 1.3*). 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-1102. 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.

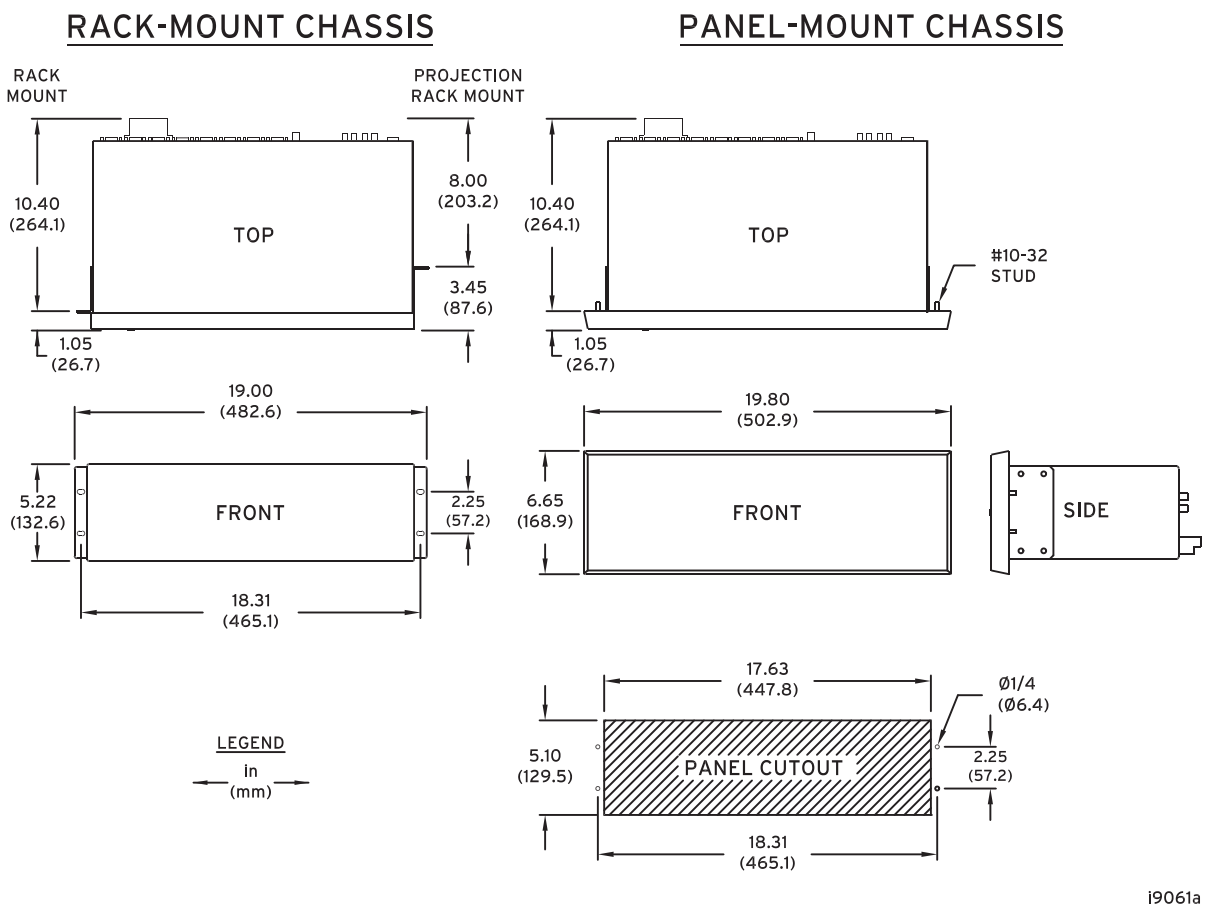


Figure 2.1 Dimensions Diagram

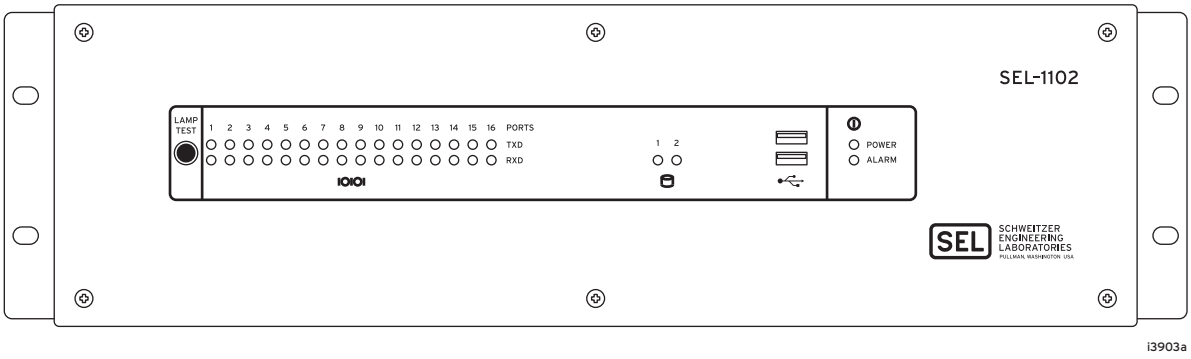


Figure 2.2 Front Rack-Mount Diagram

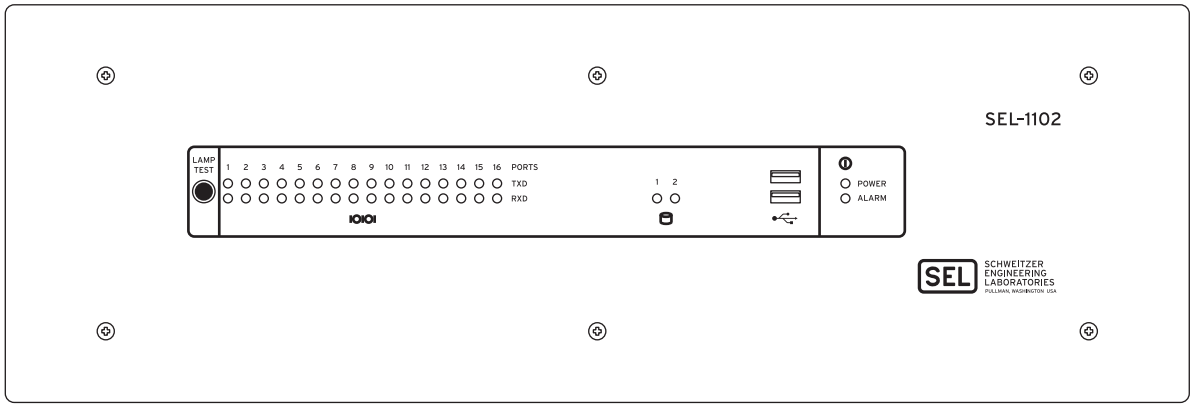
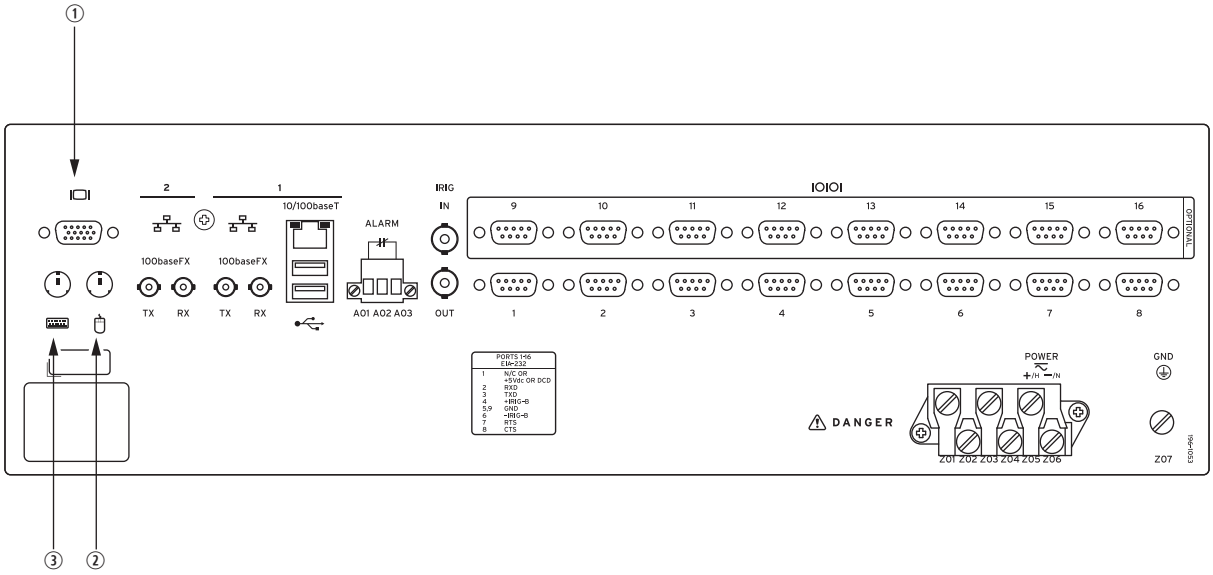


Figure 2.3 Front Panel-Mount Diagram

Rear-Panel Connections

The physical layout of the connectors on the rear panel of an SEL-1102 is shown in *Figure 2.4*.



① Monitor connection is optional. If desired, connect a standard DB-15 monitor cable into the monitor port. 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.

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.

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

Ethernet Connection

Ethernet connection to the SEL-1102 is optional. Ethernet connection is only required if Remote Desktop Connection or an Ethernet protocol connection is desired. The SEL-1102 is equipped with dual Ethernet. Ethernet 1 is jumper selectable between copper 10/100BASE-T or fiber-optic 100BASE-FX (see *Figure 2.10* 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-1102 is the same as a standard dual Ethernet PC-AT compatible computer.

Alarm Contact Connection

The SEL-1102 provides a normally closed, dry alarm contact driven by the microcontroller. When used with the SEL System Control Monitor driver, 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.

Appendix B describes the communications protocol between the microcontroller and the computer. Use the information to create your own interface to the microcontroller or use the System Control Monitor application provided on the Product Literature CD-ROM.

IRIG-B Connections

The SEL-1102 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. Refer to *Table 2.3* and *Figure 2.10* for IRIG-B jumper selections.

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 Microsoft® Windows® XP Professional operating system uses Network Time Protocol Version 3 with algorithmic enhancements from NTP Version 4. The SEL-1102 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.

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. 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 the relay or SEL-1102 power is cycled off and on.

Serial Port Communications

One, eight, or sixteen serial ports are available on the SEL-1102, 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.

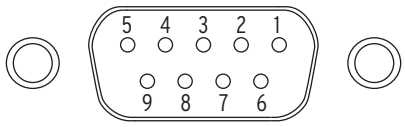
The serial communications ports function as standard EIA-232 ports with the additions of IRIG-B and +5 V power. See *Figure 2.5* for EIA-232 DB-9 female connector pin numbers. See *Table 2.1* and *Table 2.2* for EIA-232 serial port pin functions and serial ports communications mapping.

Table 2.1 EIA-232 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 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. Please refer to individual device manual and Cable Selector Software prior to selecting a proper cable.

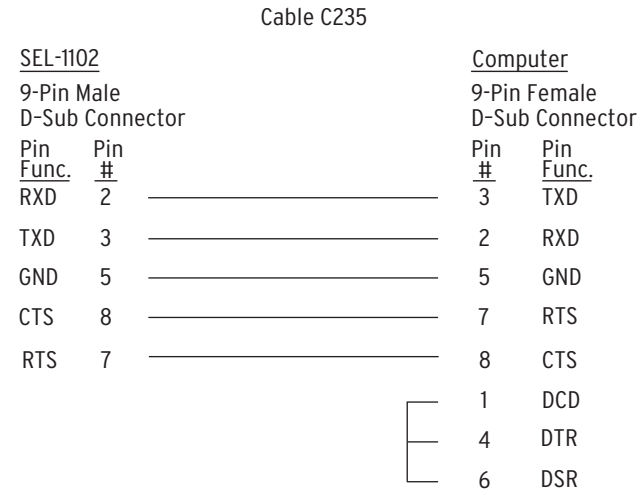


Figure 2.6 SEL Cable C235

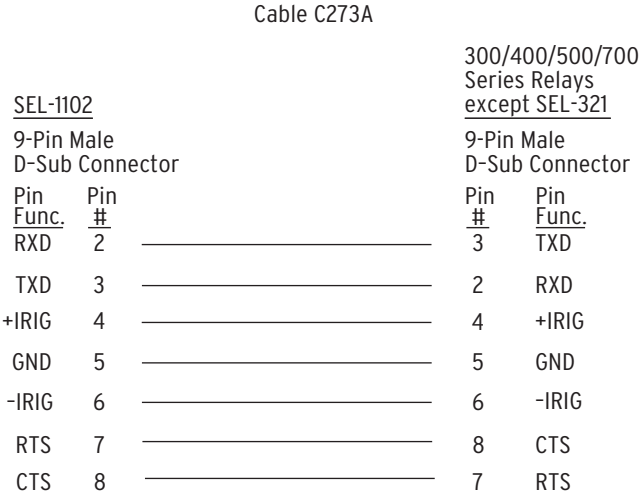


Figure 2.7 SEL Cable 273A

⚠WARNING
Never use standard null-modem cables with the SEL-1102. Using any non-SEL cable can cause severe power and ground problems involving Pins 1, 4, and 6 on the SEL-1102 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 (refer to the SEL-2800 series of products).

- 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 data rate communications is less susceptible to interference and will transmit greater distances over the same medium than with higher data rates. You should use the lowest data rate that provides adequate data transfer speed.

Table 2.2 Serial Port Communications Mapping

IRQ	I/O (hex)	Serial Communications Port	Physical Port Mapping	Location
4	3F8	Native COM Port 1	COM 1	Rear
3	2F8	Native COM Port 2	COM 17	Internal microcontroller connection
10	200	Lower XTREME8 Port 1	COM 5	Rear
10	208	Lower XTREME8 Port 2	COM 6	Rear
10	210	Lower XTREME8 Port 3	COM 7	Rear
10	218	Lower XTREME8 Port 4	COM 8	Rear
10	220	Lower XTREME8 Port 5	COM 18	Internal 10 pin header
10	228	Lower XTREME8 Port 6	COM 2	Rear
10	230	Lower XTREME8 Port 7	COM 3	Rear
10	238	Lower XTREME8 Port 8	COM 4	Rear
5	300	Upper XTREME8 Port 1	COM 13	Rear
5	308	Upper XTREME8 Port 2	COM 14	Rear
5	310	Upper XTREME8 Port 3	COM 15	Rear
5	318	Upper XTREME8 Port 4	COM 16	Rear
5	320	Upper XTREME8 Port 5	COM 9	Rear
5	328	Upper XTREME8 Port 6	COM 10	Rear
5	330	Upper XTREME8 Port 7	COM 11	Rear
5	338	Upper XTREME8 Port 8	COM 12	Rear

Port Isolators

SEL offers a data-line-powered isolator for use with EIA-232 ports and metallic communications cables. The SEL-2910 Port Isolator 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. 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 Connections

One benefit of applying the SEL-1102 as the hub of a star topology is it enables low-cost, point-to-point fiber-optic connections. The SEL-2800 family of fiber-optic transceivers connects directly to the serial port connectors on the rear of the SEL-1102. 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-1102 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.

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-1102.

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 within the rated range for the power supply ordered. Rated voltages are indicated on the serial number label.

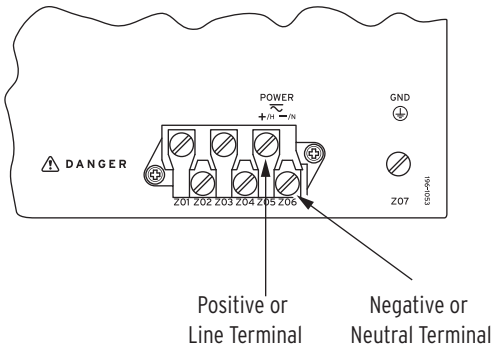


Figure 2.8 Power Connections

⚠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-1102. 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.

Serial Board Jumpers

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

Table 2.3 Serial Board Jumpers

Bottom Board	
Jumper 1	Second Position, I/O–200
Jumper 2	All on
Jumper 3	All on
Jumper A[a]	10 (IRQ)
Top Board	
Jumper 1	All off, I/O–300
Jumper 2	All on
Jumper 3	All on
Jumper C[a]	5 (IRQ)

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

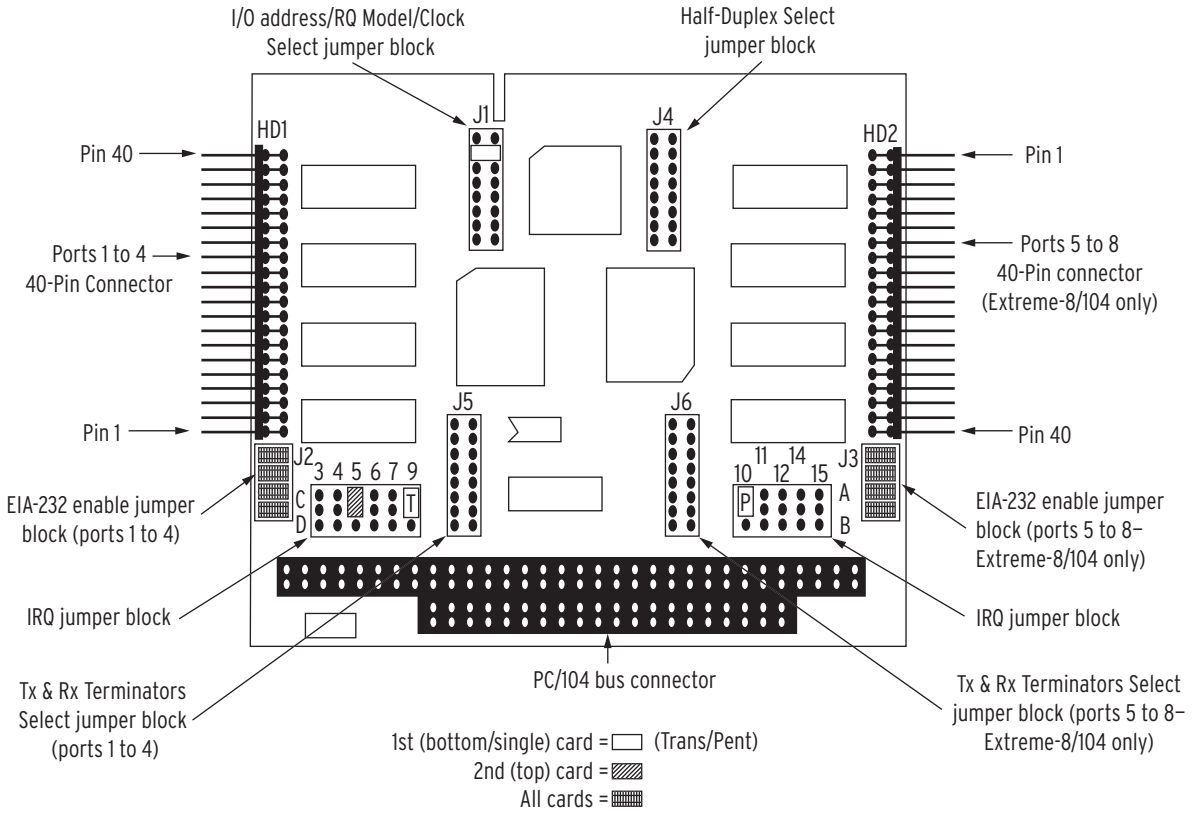
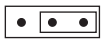
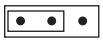
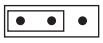
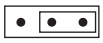


Figure 2.9 Xtreme/104 (Eight-Port Model)

Main Board Jumpers

Set the main board jumpers to meet your requirements. See *Table 2.4* for jumper functions and positions. See *Figure 2.10* 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 Disabled (Default) 	No
	Reset Enabled 	
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.

Jumper 3 sets the default function for IRIG-B input type. The unit will stay in this function unless it is specifically over-ridden by the microcontroller. The SEL System Control Monitor driver offers control of this item for a Windows operating system.

Jumper 4 enables or disables the watchdog reset functionality. The SEL System Control Monitor driver cyclically pings the watchdog microcontroller. The watchdog microcontroller will reset the computer if it does not get pinged within four minutes.

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.

Traditional Rotating Hard Drive

SEL does not recommend using a rotating hard drive. Rotating hard drives are not supported by the 10-year SEL warranty. Usually an internal, rotating hard drive can be eliminated from a properly engineered solution. You are encouraged to have all operating system components and applications installed on a CompactFlash® card. The hard drive should only be used for logging and large quantity data storage.

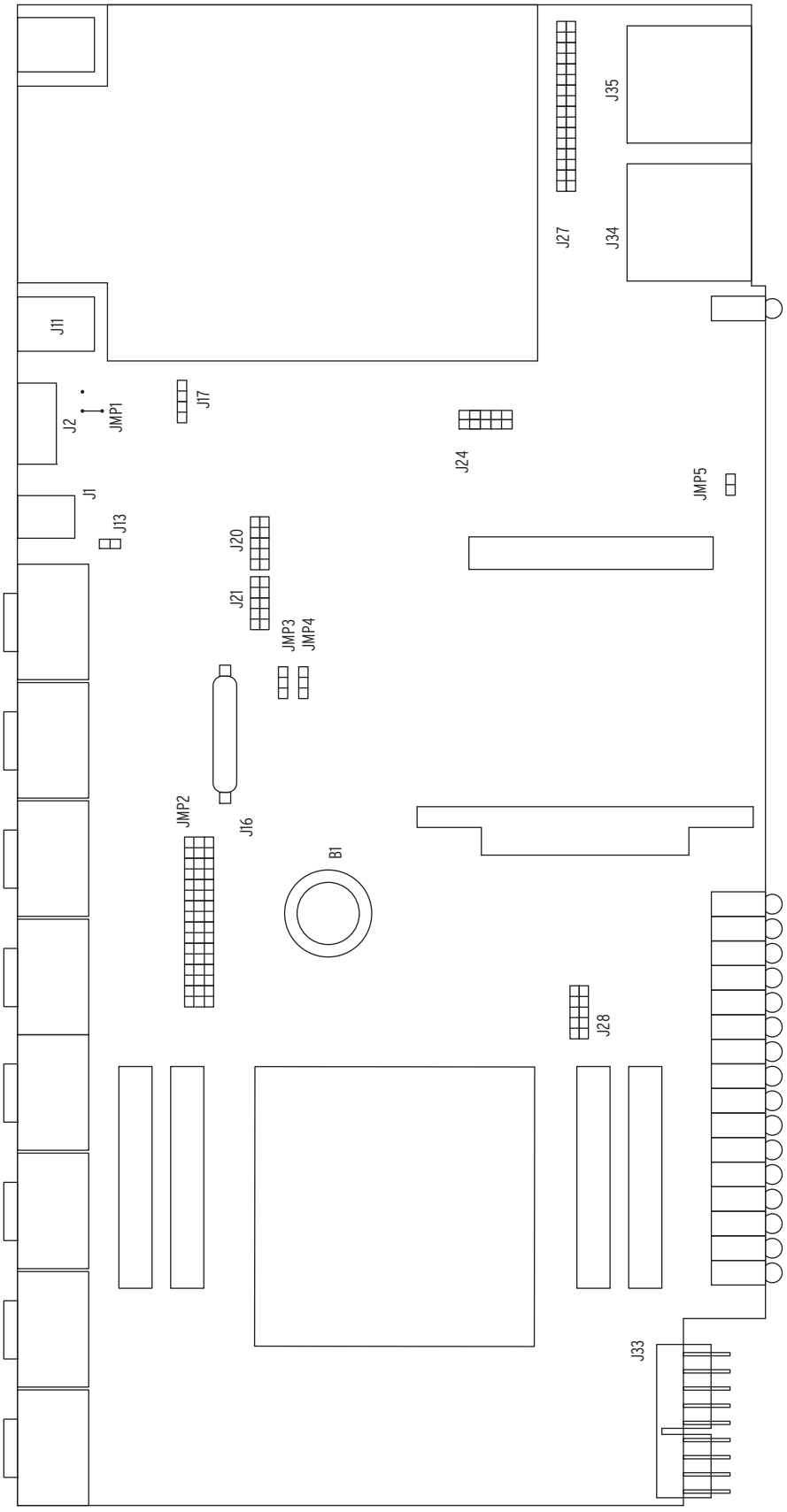


Figure 2.10 Jumper Locations

Field Serviceability

The SEL-1102 is designed to give years of trouble-free and maintenance-free operation. However, this section lists 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 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 2.11*) between the heatsink and the case.

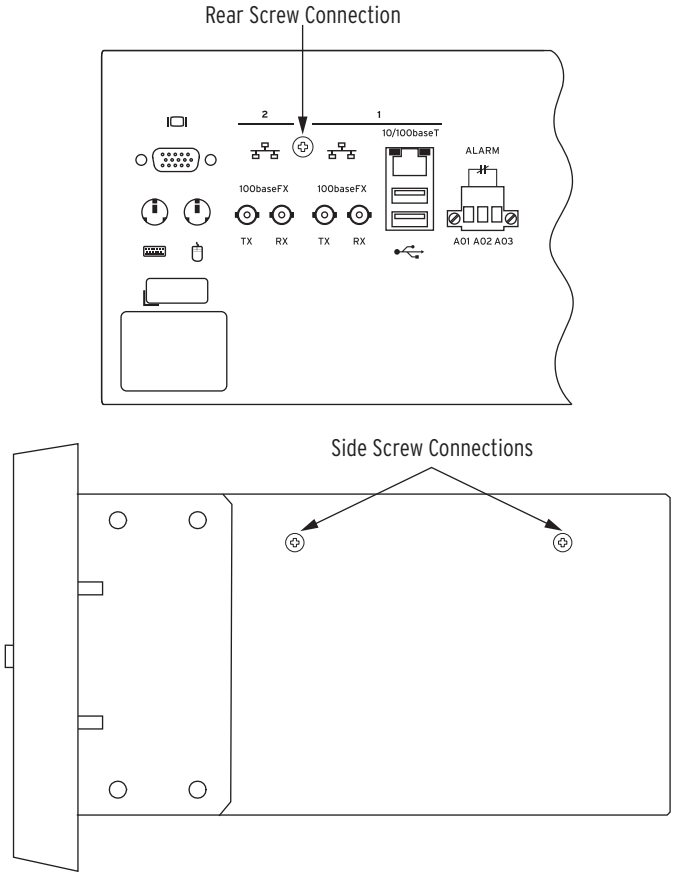


Figure 2.11 Screw Connections

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-1102 Power Supply

Nominal Power Supply Voltage Rating	Fuse F1	Fuse Description
24/48 V	T6.3AH250V	5x20 mm, time-lag, 6.3 A, high break capacity, 250 V
48/125 V 120 V 50/60 Hz	T3.15AH250V	5x20 mm, time-lag, 3.15 A, high break capacity, 250 V
125/250 V 120/230 V 50/60 Hz	T3.15AH250V	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 which connect the heatsink to the case.

Step 3. Connect the power supply cable.

Step 4. Replace the top cover.

Step 5. Replace the front panel.

Step 6. Replace the device into the panel or 19-inch rack.

Step 7. Replace all connections on the rear of the device.

Step 8. Connect the power.

Real-Time Clock and BIOS Battery Replacement

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

⚠CAUTION
There is danger of explosion if the battery is incorrectly replaced. Replace only with Ray-O-Vac® no. BR2335 or equivalent recommended by manufacturer. Dispose of used batteries according to the manufacturer's instructions.

A lithium battery powers the clock (date and time) if the external power source is lost or removed. The battery is a 3 V lithium coin cell, Ray-O-Vac® BR2335 or equivalent. The battery will operate nominally for 2 years at rated load with no external source present. When the device is powered from an external source, the battery experiences a low self-discharging rate. Thus, battery life extends well beyond 10 years. The battery cannot be recharged.

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

Step 9. Replace the top cover.

Step 10. Replace the front panel.

Step 11. Reinstall the device into the panel or 19-inch rack.

Step 12. Replace the cable connections in the rear of the device.

Step 13. After BIOS settings have been reset and saved, cycle power and allow a full boot into installed operating system.

Removing or Installing CompactFlash

⚠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.

The SEL-1102 has two Type II CompactFlash sockets that function as IDE/ master and slave hard drive connections.

To remove or install a CompactFlash, follow these 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 any devices that are connected to the front USB ports.

Step 3. Remove the six screws from the front panel.

Step 4. Remove or insert a CompactFlash.

Step 5. When ready, install the front panel and associated screws.

Step 6. Reenergize the unit.

Step 7. Press **F2** or **DEL** during the boot process to enter BIOS.

Note: Pentium M uses **F2**. Transmeta uses **DEL**.

Step 8. Verify new CompactFlash hard drive is available.

Step 9. Verify BOOT order and save.

Removing or Installing a Traditional Rotating Hard Drive

⚠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.

The SEL-1102 is equipped to accept a standard 2.5" laptop-type hard drive. The following items are required:

- One, 2.5" laptop-type hard drive
- One, 10" or longer, 44-pin IDE laptop 2.5" hard drive ribbon cable
- Four, 3 mm x 12 mm pan-head screws

Adding or removing a rotating hard drive requires substantial disassembly. Observe ESD precautions.

Step 1. Remove all connections from the rear of the device.

Step 2. Remove the device from the panel or 19-inch rack.

Step 3. Remove the front panel.

Step 4. Remove the top cover.

Step 5. Remove the side and rear screw connections (see *Figure 2.11*) between the heatsink and the case.

Step 6. Disconnect the power supply cable.

Step 7. Gently slide out the top tray.

Step 8. Turn over the aluminum tray and associated baseboard.

Step 9. Mount the hard drive as shown in *Figure 2.12*.

Step 10. Gently tighten mounting screws.

Step 11. Connect the ribbon cable.

Step 12. Verify the conductor with the red marking is connected to Pin 1.

Step 13. Turn over the aluminum tray and the attached baseboard.

Step 14. Plug the 44-pin IDE connector onto J27 (see *Figure 2.10*).

Step 15. Verify the conductor with the red marking is connected to Pin 1.

Step 16. Examine the cable installation.

There should not be any twisting of the ribbon cable.

Follow these steps to reassemble the tray.

Step 1. Gently slide in the top tray.

Step 2. Replace the side and rear screws which connect the heatsink to the case.

Step 3. Connect the power supply cable.

Step 4. Replace the top cover.

Step 5. Replace the front panel.

Step 6. Replace the device into the panel or 19-inch rack.

Step 7. Replace all connections on the rear of the device.

Step 8. Connect the power.

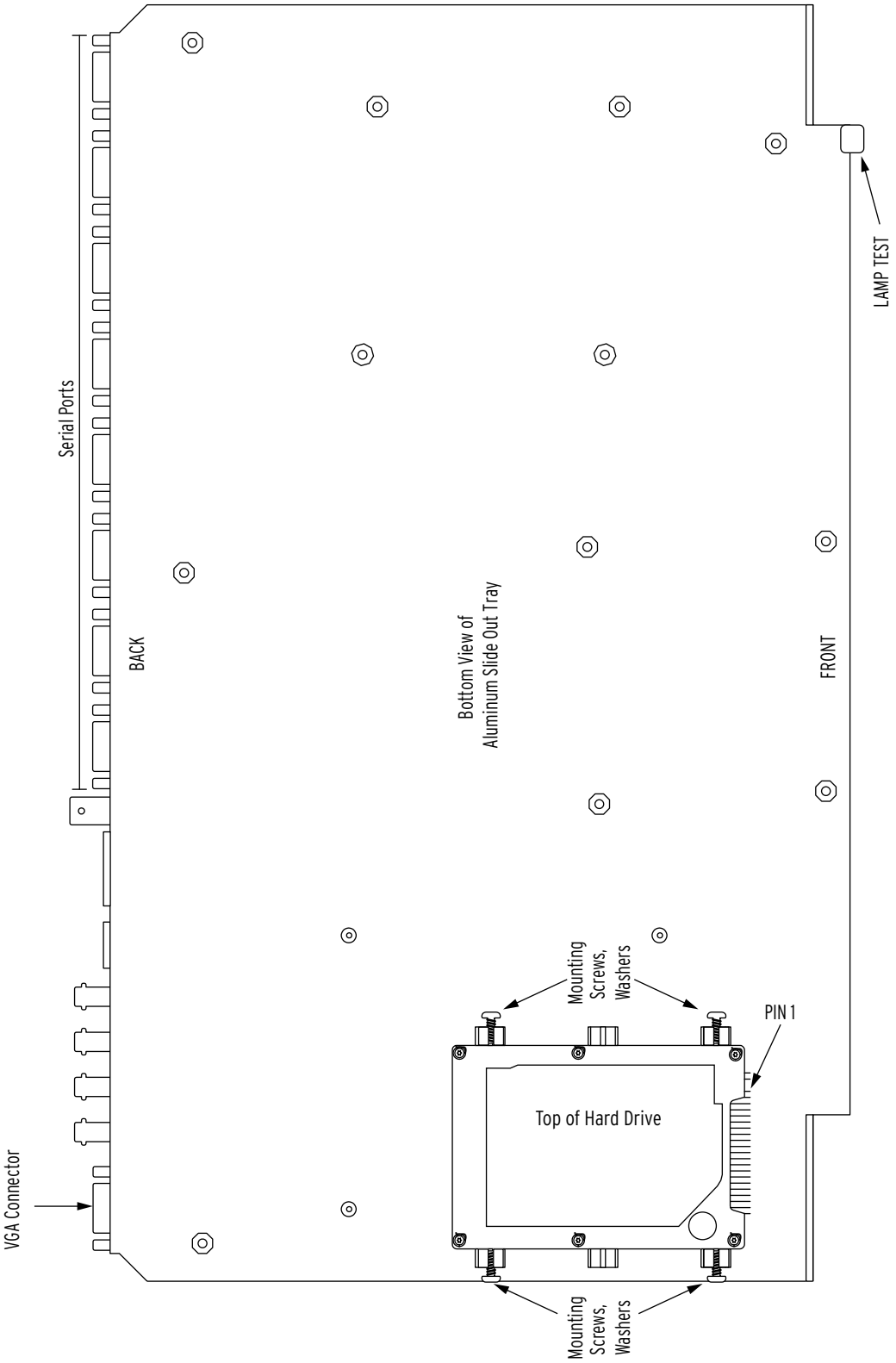


Figure 2.12 Hard Drive Mounting

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Section 3
Operating System and Software Installation

Overview

The initial installation of software onto the SEL-1102 requires special attention because of the CompactFlash® and 44-pin IDE connection. This section describes the equipment and methods that can be used to install software.

Operating System Installation

To install an operating system you first need to determine if you will be using CompactFlash or 2.5" laptop hard drive as your drive media. Any one of these three options can be physically mounted in the SEL-1102.

Using Standard Internal-Type CD-ROM With USB-to-IDE Adapter

The following steps illustrate one method of installing an operating system from a CD-ROM. This method uses a USB-to-IDE adapter. Verify that your adapter is compatible with USB 1.1 and that it contains a power supply. The adapter should have a standard 40-pin IDE female connector. This method assumes you will be using an install CD such as Windows® XP Professional or other.

Step 1. Plug the IDE-USB adapter into a standard internal type CD-ROM drive.

Step 2. Plug the adapter into an SEL-1102 USB port. This is the target unit that has either a CompactFlash or 2.5" hard drive.

Step 3. Plug in a standard VESA compliant monitor, USB or PS/2 keyboard, and USB or PS/2 mouse.

Step 4. Plug in the power supply to the CD-ROM.

Step 5. Apply power to the SEL-1102.

Step 6. Press **Esc** during the boot process to display boot menu.

Step 7. Select **USB boot**.

Step 8. The SEL-1102 will now try booting from the CD-ROM.

Step 9. Continue with the install process.

Using Standard CD-ROM with USB Connection

The following steps provide another method of installing an operating system from a CD-ROM equipped with a mini-USB connector.

Step 1. Plug the USB cable from the CD-ROM into an SEL-1102 USB port. This is the target unit that has either a CompactFlash or 2.5" hard drive.

Step 2. Plug in a standard VESA compliant monitor, USB or PS/2 keyboard, and USB or PS/2 mouse.

Step 3. Plug in the power supply to the CD-ROM.

Step 4. Apply power to the SEL-1102.

Step 5. Press **Esc** during the boot process to display boot menu.

Step 6. Select **USB boot**.

Step 7. The SEL-1102 will now try booting from the CD-ROM.

Step 8. Continue with the install process.

Driver Installation

Refer to installation notes for Windows and Linux® drivers on the SEL-1102 Product Literature CD. The Windows folder contains drivers for video, chipset, system control monitor, and serial ports. The Linux folder contains drivers for serial ports and instructions for using DMA-enabled CompactFlash. Ensure that you select the correct drivers for your CPU type.

Software Installation

Start installing the software after the operating system has been successfully installed. There are many ways to install software. Three of the simplest methods are described in this subsection.

Using USB Memory Stick

Step 1. Copy the software installation package onto a USB memory stick using your laptop or desktop computer.

Step 2. Properly remove the USB memory stick.

Step 3. Boot the SEL-1102.

Step 4. Insert the memory stick into the SEL-1102.

Step 5. Navigate to the memory stick and launch the software installation package.

Using CompactFlash

Step 1. De-energize the SEL-1102.

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

Step 2. Remove the six screws in the front panel.

Step 3. Remove the front panel.

Step 4. Remove the CompactFlash card from the SEL-1102 if using a CompactFlash drive.

Step 5. Place the CompactFlash card in a reader/writer connected to your laptop or desktop computer.

Step 6. Copy the software installation package onto the CompactFlash card.

Step 7. Properly remove the CompactFlash card.

Step 8. Insert the CompactFlash into the SEL-1102.

Step 9. Replace the front panel.

Step 10. Energize the SEL-1102.

Step 11. Login and navigate to the software and launch the installation package.

Using USB CD-ROM Drive

Step 1. Connect a USB CD-ROM Drive to the SEL-1102.

Step 2. Apply power to CD-ROM Drive.

Step 3. Insert CD-ROM software installation program.

Step 4. Navigate to the CD-ROM drive and launch the software installation package.

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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 operation of the SEL SysMon Service functions with the SEL-1102 hardware.

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-1102.

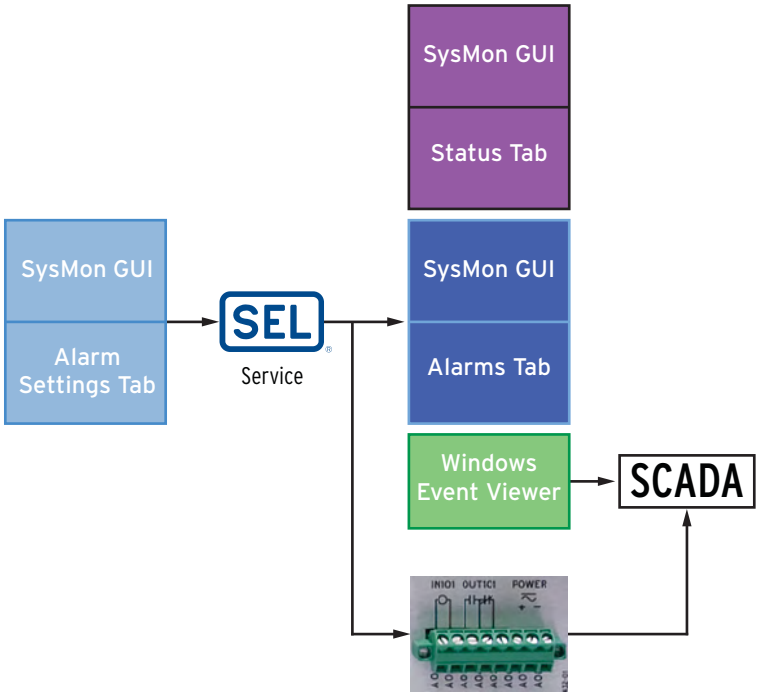

Figure 4.1 Overview of SEL Service and SysMon

Installation

Refer to the CD-ROM that shipped with your SEL-1102. The SysMon application (SELSysMonGUI.exe), SysMon Service (SELService.exe), and Alarm application (SELAlarm.exe) self-extract when you run SysMon.exe.

To install the System Monitor, run the SysMon.exe program from the CD-ROM. Install the System Monitor by using a USB CD-ROM or simply copy the SysMon.exe file to a USB memory stick and then use the memory

stick for the installation. The installation will create a service named SELService and install the other applications into the C:\Windows\System32\SELShell\ folder.

SysMon Functions

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

Opening and Closing SysMon

From the Windows® XP system tray, double-click on the SEL icon (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.

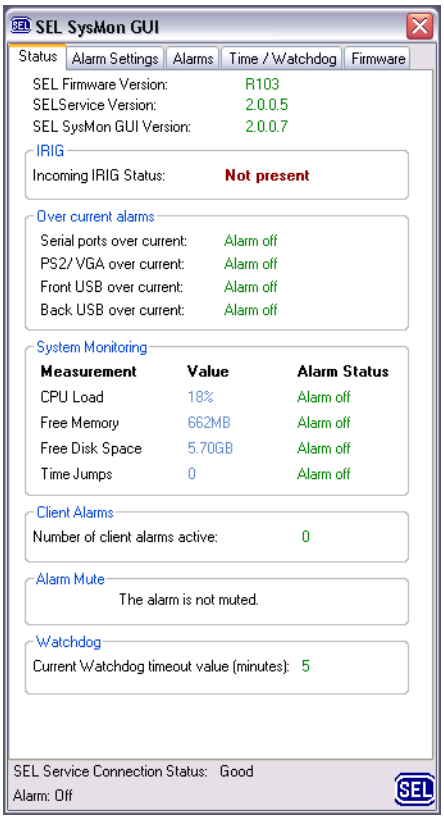

Figure 4.3 Status Tab

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-1102 is not connected to an external IRIG time source.

Overcurrent Alarms

The SEL-1102 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-1102. 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-1102, the alarm light on the front of the SEL-1102 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 all
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-1102 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-1102 alarms if the available RAM drops to less than 40 MB for more than three minutes.

Free Disk Space

The SEL-1102 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-1102 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-1102 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, the 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.

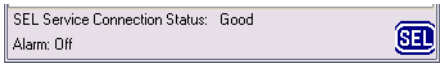

Figure 4.4 Service Status Indicator

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*) 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 re-enabled. 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	1 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 activates, 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 is selected 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 made to the **Alarm Settings**.

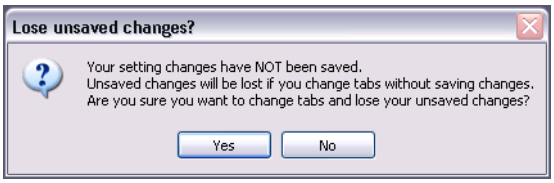

Figure 4.8 Lose Unsaved Changes Dialog Box

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 to monitor soft alarms and testing the alarm contacts on the SEL-1102 (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 of 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 automatically and decrements the number of active alarms when the pulse duration expires. A Latched alarm will remain active until you delete the alarm.

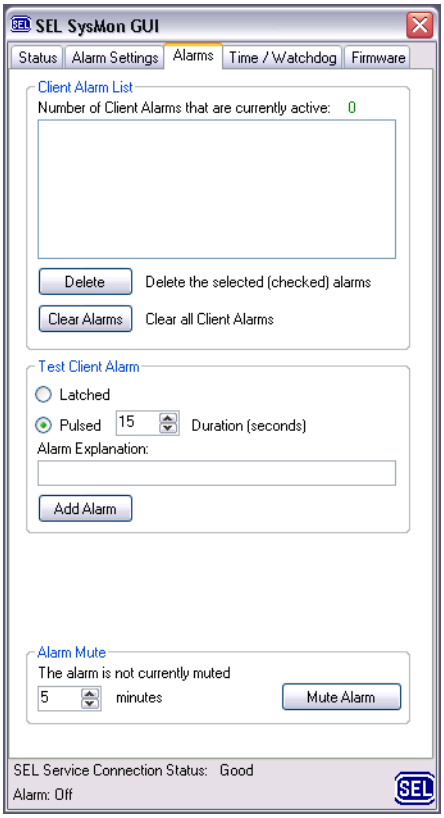

Figure 4.9 Alarms Tab

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-1102 turns off. There is also an audible click, and the SEL icon will no longer alternate to the red exclamation mark.

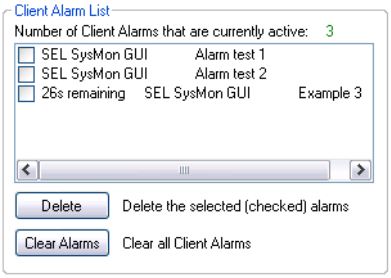

Figure 4.10 Example Client Alarms

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

accept and process 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 11*) to configure how the SEL-1102 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-1102. The status will read **Not present** (see *Figure 11*) if no IRIG-B source is present. If an IRIG-B source is connected to the SEL-1102, the status will read **Modulated** or **Demodulated** depending on the type of IRIG-B signal.

Master Time Source

SysMon Service on the SEL-1102 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-1102 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-1102 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-1102 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-1102. This opens the Windows Date and Time Properties window, from 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.

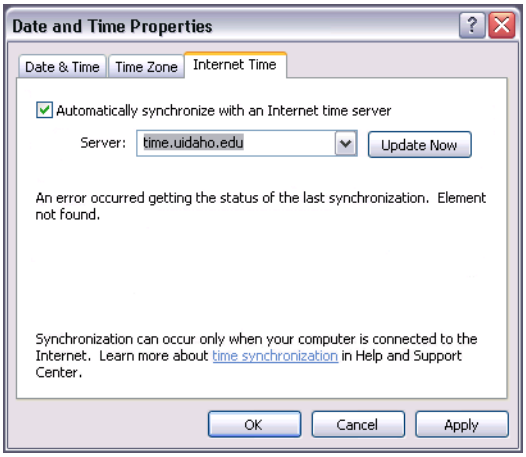

Figure 4.11 Windows Date and Time Properties

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-1102.

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 service 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-1102 if the ATMEL receives no reset within the Watchdog Timeout (see *Table 4.2*) period.

The forced reboot is to bring the SEL-1102 back to a known good state after problems such as memory exhaustion, disk space depletion, or CPU issues. See *Table 2.4* for instructions on disabling the watchdog if you do not want this behavior for your intended use of the SEL-1102.

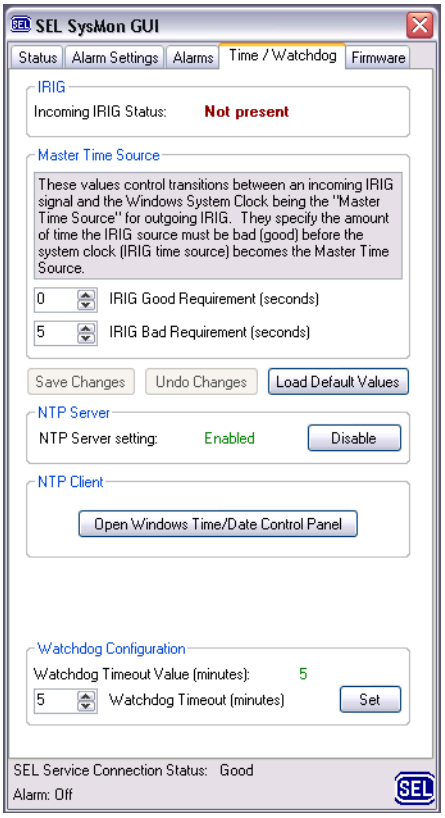

Figure 4.12 Time/Watchdog Configuration Tab

Firmware

From the SysMon configuration tab labeled **Firmware**, you can update firmware. When you select this button, SysMon displays the **Firmware Update** dialogue (see *Figure 4.13*), which prompts for the location of a firmware update file (.fwu file). You can then use a Windows Explorer-style interface to select the appropriate firmware update file.

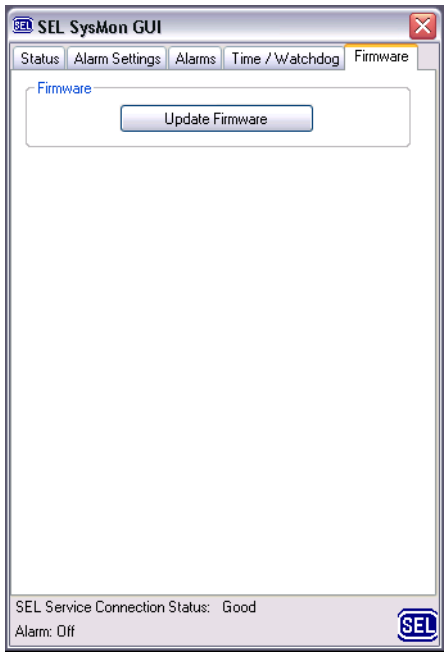

Figure 4.13 SysMon Firmware Configuration Tab

The SEL-1102 will reboot immediately following a successful firmware update. Before you update firmware, SEL recommends that you back up your present operating system and data and close all open applications.

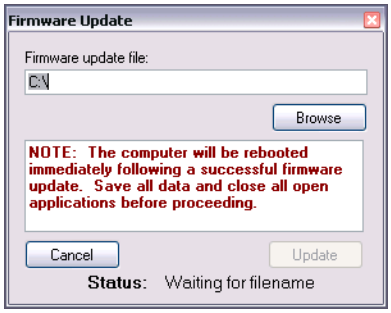

Figure 4.14 Firmware Update Dialog

SEL SysMon Service and SEL SysMon GUI Processes

SysMon Service runs as a Windows Service. To access SysMon Service settings, open the Windows Services control panel. To open the Services control panel, click **Start**, click **Run**, type **services.msc**, and click **OK**. The services control panel should display (see *Figure 4.13*). Scroll down to find SELService from the list of services.

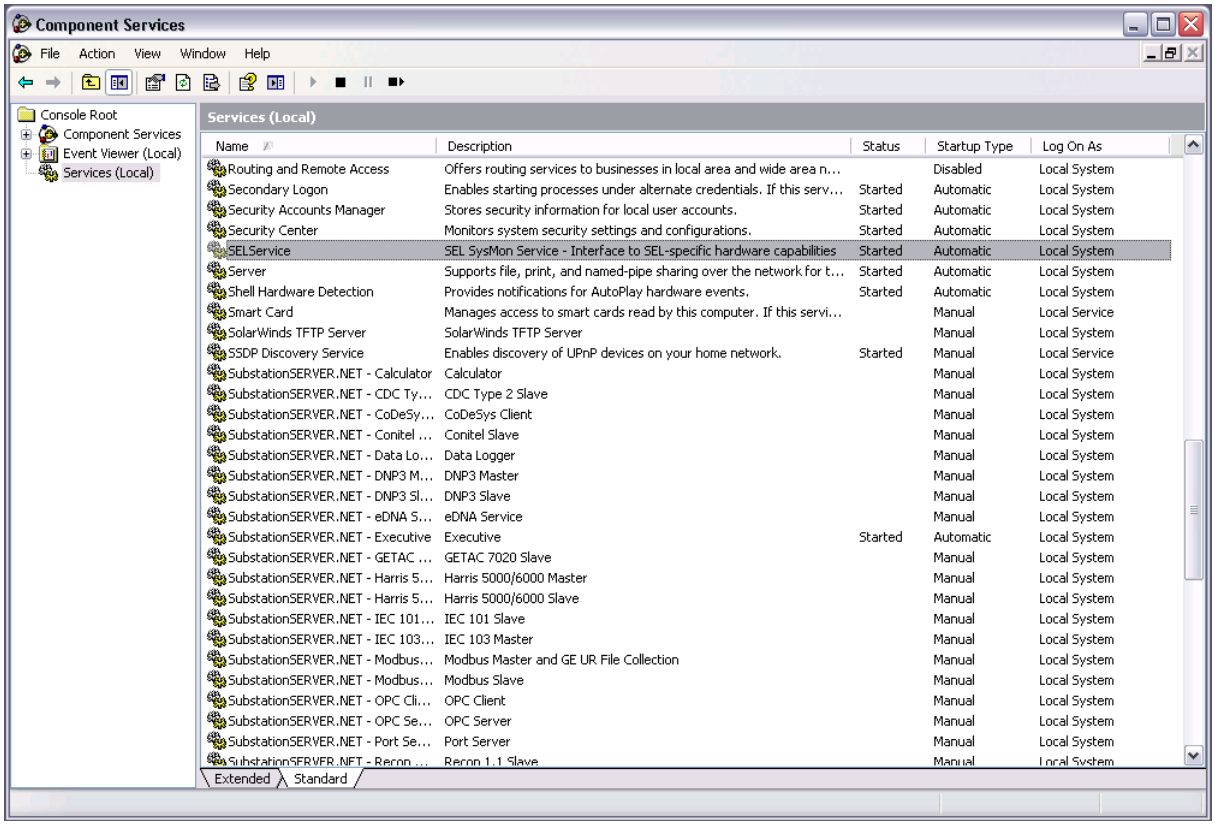

Figure 4.15 SELService in Windows Services List

Right-click on SELService and select **Properties** to verify that the SEL SysMon Service is configured to start automatically whenever the SEL-1102 boots up (see *Figure 4.14*).

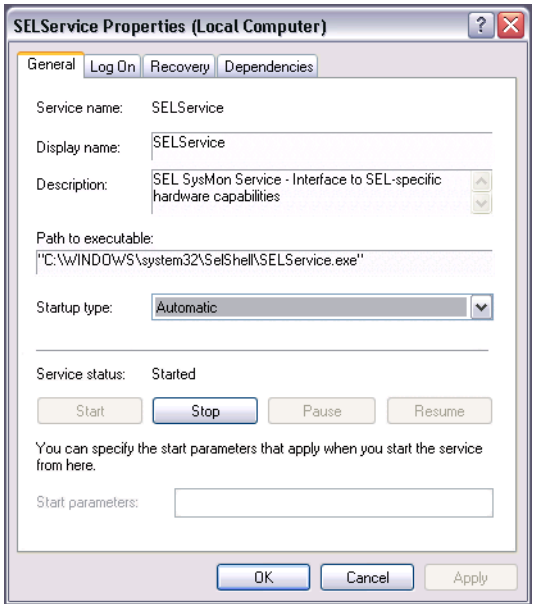

Figure 4.16 SEL SysMon Service Properties

Should the SEL SysMon Service ever stop running or fail to start initially, the SEL SysMon GUI icon in the Windows System Tray will display a balloon tip reminding you to restart SELService (see *Figure 4.17*). Restart the SEL SysMon Service to fix the problem. You may wish to 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.

Figure 4.17 SELService Balloon Tip

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

To upgrade from an existing version of the SysMon application or SysMon Service, refer to the installation instructions included with the upgrade.

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-1102 is compliant with most computer monitors. The video selections available are 800 x 600, 1024 x 758, 1152 x 864, and 1600 x 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.
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-1102.
SEL-1102 power is off	➤ Verify that the SEL-1102 power LED is illuminated. ➤ If the SEL-1102 LED is not illuminated, re-examine the power outlet and power connection to the SEL-1102. ➤ Ensure that your SEL-1102 is properly being powered. Note that the SEL-1102 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-1102. The SEL-1102 has the ability to connect to 10BASE-T and 100BASE-T copper cable connected equipment. The SEL-1102 has the ability to connect to two 100BASE-FX fiber Ethernet connections.

Verify that the SEL-1102 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-1102 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.

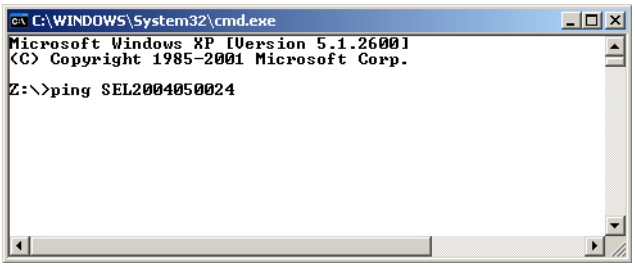

Figure 5.1 Ping Command

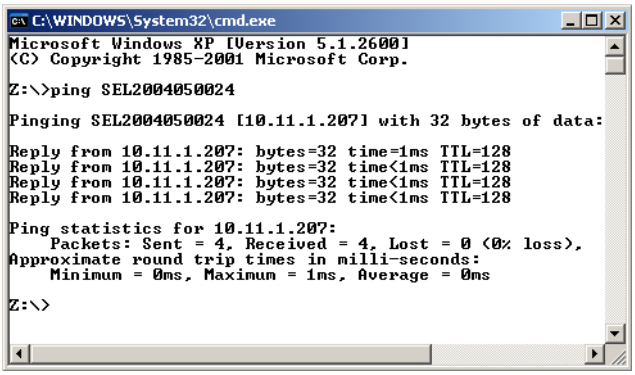

Figure 5.2 Ping Response

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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Pullman, WA 99163-5603 USA
Tel: +1.509.332.1890
Fax: +1.509.332.7990
Internet: www.selinc.com
Email: info@selinc.com

Appendix A
Software and Manual Versions

Software

Table A.1 lists the software and firmware 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

Identification Numbers	Summary of Revisions	Manual Date Code
Firmware: R103 SELService Version: 2.0.0.12 SEL SysMon GUI Version: 2.0.0.12	➤ Manual update only—See *Table A.2* for summary of manual updates.	20140307
Firmware: R103 SELService Version: 2.0.0.12 SEL SysMon GUI Version: 2.0.0.12	➤ Manual update only—See *Table A.2* for summary of manual updates.	20100430
Firmware: R103 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
Firmware: R103 System Monitor: R1.1.1.2 System Control Monitor: R1.1.1.1	➤ Manual update only—See *Table A.2* for summary of manual updates.	20090512
Firmware: R103 System Monitor: R1.1.1.2 System Control Monitor: R1.1.1.1	➤ Manual update only—See *Table A.2* for summary of manual updates.	20060613
Firmware: R103 System Monitor: R1.1.1.2 System Control Monitor: R1.1.1.1	➤ Manual update only—See *Table A.2* for summary of manual updates.	20060327
Firmware: R103 System Monitor: R1.1.1.2 System Control Monitor: R1.1.1.1	**Firmware** ➤ Improved performance at cold temperatures.	20060111
Firmware: R102 System Monitor: R1.1.1.1 System Control Monitor: R1.1.1.1	**Firmware** ➤ No change.	20051121
Firmware: R102 System Monitor: R1.1.1.1 System Control Monitor: R1.1.1.1	**Firmware** ➤ Allow saving modulated/demodulated IRIG-B settings. ➤ Improve accuracy of operating system time synchronization.	20051107
SEL-1102-R101-V0-Z001001-D20050812	Initial version.	20050812

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*.
20100430	**Section 1, Section 2, and Section 3** ➤ Removed references to Transmeta CPU. **Appendix B** ➤ Removed *Appendix B: Resetting BIOS*.
20090625	**Section 3** ➤ Software installation instructions made clearer for using CompactFlash. **Section 4** ➤ Entirely new section reflecting new improved versions of the SELService and SEL System Monitor (SysMon) Application. **Section 5** ➤ Monitor blank during bootup troubleshooting step added to *Table 5.1: Blank Monitor Troubleshooting*. **Appendix C** ➤ Edited *Table C.2: Alarm Pulse Duration Register Value*. ➤ Edited *Table C.4: Block 2 Read System Status from Microcontroller.* ➤ Corrected Read acknowledge—fixed from 05 to 06.
20090512	**Section 1** ➤ Updated Mobile Intel Pentium M System Speed and Cache specifications.
20060613	**Section 1** ➤ Edited USB specification. **Section 2** ➤ Edited *Table 2.3: Serial Board Jumpers*. ➤ Added *Figure 2.9: Xtreme/104 (Eight Port Model)*. **Section 4** ➤ Updated *Table 4.1: Current Limited Sections*.
20060327	**Section 2** ➤ Updated *Figure 2.12: Hard Drive Mounting*.
20060111	**Appendix A** ➤ Updated for firmware/software revisions.

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

Revision Date	Summary of Revisions
20051121	**Section 1** ➤ Added Transmeta CPU type. ➤ Edited battery life specification. **Section 2** ➤ Edited *Table 2.2: Serial Port Mapping IRQs*. ➤ Edited real-time clock and BIOS battery replacement for Transmeta processor. **Section 3** ➤ Edited operating system installation instructions using CD-ROM. **Section 4** ➤ Changed system control monitor install file name. **Appendix A** ➤ Updated firmware and system control monitor revision numbers. **Appendix B** ➤ Added Transmeta BIOS setting instructions. **Appendix C** ➤ Corrected functions and command codes.
20051107	**Appendix A** ➤ Updated for firmware revisions.
20050812	➤ Initial version.

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Appendix B
Microcontroller Communications

Overview

The microcontroller provides the interface between the internal and external peripherals and the main computer. The microcontroller provides the following functions:

- The microcontroller decodes the IRIG-B signal and presents the data to the main computer in the form of registers.
- The microcontroller provides overcurrent status for the following:
  - Rear USB ports
  - Front USB ports
  - Keyboard, mouse, and video ports
  - Serial port power
- The microcontroller allows the software to switch between modulated and demodulated IRIG-B.
- The microcontoller controls the alarm contact.

Microcontroller Communications Protocol

Watchdog Ping

By default, the SEL System Control Monitor (*Section 4*) pings the watchdog microcontroller ten times in the four-minute time-out period. If the watchdog does not get pinged within the four-minute time-out period and Jumper 4 (Reset Enabled) is set, then the watchdog holds the main computer in reset for 99 seconds. The normal boot process follows. This is similar to holding your finger on a PC's reset button for 99 seconds and then letting go. Use the message described below to set the time-out period suitable for your application.

The following message pings the microcontroller watchdog. SEL recommends the watchdog be pinged at least twice in a watchdog time-out period. Do not ping the watchdog more than every 15 seconds.

Write:	02 C0 C8 01 01 03	
Where:	02	Start of text byte—fixed
	C0	Slave address—fixed
	C8	Function Code
	01	Command byte length
	01	Command byte—kick
	03	End of text byte—fixed
Response:	02 06 03	Acknowledge
	02 15 03	Error

Watchdog Time-Out

The following message sets the watchdog time-out value. SEL does not recommend setting the time-out period to less than four minutes.

Write:	02 C0 C6 01 XX 03	
Where:	02	Start of text byte—fixed
	C0	Slave address—fixed
	C6	Function Code
	01	Command byte length
	XX	Command byte—time-out (see *Table B.1*)
	03	End of text byte—fixed
Response:	02 06 03	Acknowledge
	02 15 03	Error

Table B.1 Watchdog Time-Out Register Value

Function	MSb							LSb
	1	10 Minutes			1 Minute			
	0	10 Seconds			1 Second			
Watchdog Time-out	0	0	0	0	0	0	0	0
	The most significant bit indicates time units used; 1–79 minutes; 1–79 seconds							

Pulse Alarm Contact

The following message pulses the alarm contact for one second.

Write:	02 C0 C0 01 XX 03	
Where:	02	Start of text byte—fixed
	C0	Slave address—fixed
	C0	Function Code
	01	Command Byte Length
	XX	Command Byte—Pulse (see *Table B.2*)
	03	End of text byte—fixed

Table B.2 Alarm Pulse Duration Register Value

Function	MSb							LSb
	C	10 Seconds		1 Second				A
Alarm Pulse	0	0	0	0	0	0	0	0
	C is continuous, A is alarm on/off; 1–30 seconds							

Write System Time to Microcontroller

Write system time to the microcontroller in a data block form. The payload or block of data is described in *Table B.3*.

Table B.3 Block 1 Read and Write System Time to Microcontroller

Clock	Value (decimal)	MSb							LSb
		IRIG	10 Seconds			1 Second			
Seconds	00...59	0	0	0	0	0	0	0	0
		MSb represents the status of external IRIG source. 1 = External IRIG present; Read only							
			10 Minutes			1 Minute			
Minutes	00...59	x	0	0	0	0	0	0	0
		Most significant bit is not used							
				10 Hours		1 Hour			
Hour	00...23	x	x	0	0	0	0	0	0
		10 Days				1 Day			
Day 1	00...99	0	0	0	0	0	0	0	0
								100 Day	
Day 100	00...03	x	x	x	x	x	x	0	0
		10 Years				1 Year			
Year	00...99	0	0	0	0	0	0	0	0
		1000 Years				100 Years			
Century	20...29	0	0	0	0	0	0	0	0
		100 mSeconds				10 mSeconds			
Milliseconds	00...99	0	0	0	0	0	0	0	0

Write:	02 C0 9E 08 32 45 18 74 02 04 20 26 03		
Where:	02	Start of text byte—fixed	
	C0	Slave Address	
	9E	Function Code	
	08	Command byte length—fixed	
	32	Seconds (see *Table B.3*)	BCD*
	45	Minutes (see *Table B.3*)	
	18	Hours (see *Table B.3*)	
	74	Days (see *Table B.3*)	
	02	Days x 100 (see *Table B.3*)	
	04	Year (see *Table B.3*)	
	20	Year x 100 (see *Table B.3*)	
	26	Milliseconds x 10 (see *Table B.3*)	
	03	End of text byte—fixed	
Response:	02 06 03	Acknowledge	
	02 15 03	Error	

* Sample date of 2004:274:18:45:32:260 (Year:Day:Hour:Min:Sec:Milisec).

Microcontroller Time Block Read

The following message performs a block read of the IRIG-B time decoded by the microcontroller. The time values are transmitted in BCD.

Write: 02 C0 9F 03

Where:
- 02 Start of text byte—fixed
- C0 Slave address—fixed
- 9F Function Code—Read time
- 04 End of text byte—fixed

Response: 02 06 08 32 45 18 74 02 04 20 26 03

Where:
- 02 Start of text byte—fixed
- 06 Read Acknowledge—fixed
- 08 Byte Count of Payload—fixed
- 32 Seconds (see *Table B.3*) (BCD)
- 45 Minutes (see *Table B.3*) (BCD)
- 18 Hours (see *Table B.3*) (BCD)
- 74 Days (see *Table B.3*) (BCD)
- 02 Days x 100 (see *Table B.3*) (BCD)
- 04 Year (see *Table B.3*) (BCD)
- 18 Century (see *Table B.3*) (BCD)
- 26 Milliseconds x 10 (see *Table B.3*) (BCD)
- 03 End of text byte—fixed

Microcontroller I/O Status Block Read

Read system status from the microcontroller in a data block form. The payload or block of data is described in *Table B.4*.

Table B.4 Block 2 Read System Status from Microcontroller (Sheet 1 of 2)

Function	MSb							LSb
	C	**10 Seconds**			**1 Second**			**A**
Alarm Pulse	0	0	0	0	0	0	0	0
	C is continuous, A is alarm on/off; 1–30 seconds							
	OC1	**OC2**	**OC3**	**OC4**	**OCA**	**CLK1**	**CLK2**	**CLK3**
Register 1	0	0	0	0	0	0	0	0
	CLK3: 0=Demodulated, 1=Modulated CLK2: 0=External, 1=Internal CLK1: 0=No, 1=IEEE C37.118 Source OCA: 0=No, 1=Alarm on overcurrent OC4: 0=No, 1=VGA and PS/2 overcurrent OC3: 0=No, 1=USB Rear overcurrent OC2: 0=No, 1=USB Front overcurrent OC1: 0=No, 1=EIA-232 overcurrent							
FW Checksum Test	0	0	0	0	0	0	0	0
	Checksum Match: 0x01, Checksum Mismatch: 0xFF							
	1	**10 Minutes**			**1 Minute**			
	0	**10 Seconds**			**1 Second**			

Table B.4 Block 2 Read System Status from Microcontroller (Sheet 2 of 2)

Function	MSb							LSb
Watchdog Time-out	0	0	0	0	0	0	0	0
	The most significant bit indicates time units used; 1–79 minutes; 1–79 seconds							
			1 Second					**WD**
Ping Watchdog	x	x	x	x	x	x	x	0
	WD: 0=No, 1=Ping							

The following message performs a block read of the microcontoller I/O status

Request for I/O status:

Write: 02 C0 01 83 03 (hexidecimal)
Where:
- 02 Start of text byte—fixed
- C0 Slave address—fixed
- DF Function Code
- 03 End of text byte—fixed

Response: 02 06 08 00 FA 00 8F 00 00 00 A8 03
Where:
- 02 Start of text byte—fixed
- 05 Read acknowledge—fixed
- 08 Byte count of payload—fixed
- 00 Alarm (see *Table B.4*)
- FA Register 1 (see *Table B.4*)
- 00 FW Checksum Test (see *Table B.4*)
- 8F Watchdog Time-out (set) (see *Table B.4*)
- 00 Kick Watchdog (see *Table B.4*)
- 00 Firmware Checksum (MSB)
- 00 Firmware Checksum (LSB)
- A8 Firmware Build Number
- 03 End of transmission

Recommended Algorithms

Even though you can use this information to customize your specific interface to fit your needs, SEL recommends that you follow these algorithms when designing your system.

Perform the following steps in order.

Step 1. Ping the watchdog immediately following host boot.

Step 2. Set the watchdog reset interval.

Step 3. Clear the alarm.

Step 4. Read the I/O status.

Step 5. Read or write the time depending on the IRIG bit status obtained in *Step 4*.

Step 6. Periodically read the I/O status.

Step 7. Periodically ping the watchdog.

Watchdog ping interval must be less than half of the reset interval you set in *Step 2*.

Step 8. Check and adjust clock as necessary.

This is defined by the capability of the operating system and your method for setting system time.

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 Hewlett-Packard®, Intel®, Microsoft®, Phoenix®, 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-1102 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 servicing tasks.

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 registered trademark of SanDisk® corporation. 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 Data Carrier Detect.

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

DSR Data Set Ready.

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.

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

FPGA Field-programmable gate array. A gate array where the logic network can be programmed into the device after manufacture.

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.

LCD Liquid Crystal Display.

LED Light-Emitting Diode. Used as indicators on the Computing Platform 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 Grouper. 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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