SEL-1101
Computing Platform

Instruction Manual

20060327

SCHWEITZER ENGINEERING LABORATORIES, INC.

PM1101-01

⚠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-1101. Using any non-SEL cable can cause severe power and ground problems involving Pins 1, 4, and 6 on the SEL-1101 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.

⚠WARNING

Ne jamais utiliser de cables standards à inversion de signaux (“null-modem”) avec le SEL-1101. 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-1101.

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Preface

Manual Overview

The SEL-1101 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-1101; lists the specifications.

Section 2: Installation. Describes how to mount and wire the SEL-1101; illustrates wiring connections for various applications.

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

Section 4: IRIG, Status, and Alarms. Describes the System Control Monitor driver.

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

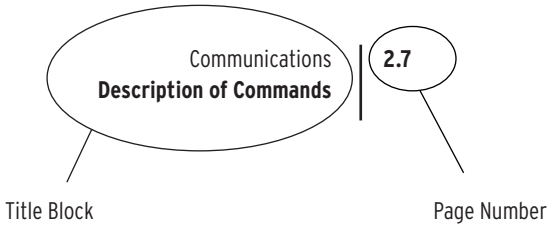
Appendix A: Software and Manual Versions. Details differences between manual versions. Provides a record of changes made to the manual since the initial release.

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

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

Page Numbering

This manual shows page identifiers at the top of each page; see the figure below.



Page Number Format

The page number appears at the outside edge of each page; a vertical bar separates the page number from the page title block. The page numbers of the SEL-1101 Computing Platform Instruction Manual are represented by the following building blocks:

- Section number
- Actual page number in the particular section

The section title is at the top of the page title block, with the main subsection reference in bold type underneath the section title.

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-1101 Computing Platform is a PC-AT compatible computer platform with an additional embedded microcontroller. Use the SEL-1101 to provide a solution using extremely rugged SEL hardware and your software.

Features

The SEL-1101 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-1101 provides a form factor specifically designed for substation and industrial control panels. This includes rear-panel connectors, separate front-panel Tx and Rx LEDs for each serial port, and complete surge protection.

- **Power Supply**

  Many power supply options are provided in the SEL-1101. Ordering options from 24 V to 250 V ac or dc are available.

- **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 unrecoverable operating system or application problem.

- **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-1101. Update the system clock from an IRIG-B input or from the network Time Server. Generate 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-1101 Model Option Table at www.selinc.com, under **SEL Literature**, **Ordering Information** (Model Option Tables).

Options

The SEL-1101 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 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 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)
(Maximum continuous CPU burden of 50%)

Operating Temperature, Safety

–40° to +75°C (–40° to +167°F)

Storage Temperature

–40° to +85°C

Relative Humidity

5 to 95% non-condensing

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 SEL-1101.

Supported Form Factors

PC104, PC104+

CPU Type

Transmeta Crusoe TM5800

System Speed

733 MHz

Chipset

North Bridge:	Integrated with Processor
South Bridge:	VIA VT82C686B

BIOS

AMI BIOS

Cache

Integrated 64 KB instruction and data, 512 KB L2 write-back cache

On-Board VGA

Chips and Technology M69030
4 MB Video Memory
Maximum Resolution 1600 x 1200

LAN

Ethernet 1: AMD PCNet—Fast +; Fiber Optic or Copper
Ethernet 2: AMD PCNet—Fast +; Fiber Optic

Memory

256 MB, PC100/PC133 SODIMM, 3.3 V, x1

Super I/O

VIA VT82C686B

RTC/CMOS

VIA VT82C686B

Keyboard Controller

VIA VT82C686B

Local Bus IDE

VIA VT83C686B, IDE1, 2 Ultra DMA 33/66/100
IDE0 Dual CompactFlash® Type 2 Sockets
IDE1 44 pin header, 3.5" HD mounting bracket

USB

2 rear, 2 front, USB 1.1 Compliant

Power Supply

Does not support ACPI.

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 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

Certifications

ISO: SEL-1101 is designed and manufactured using ISO 9001 certified quality program.

UL: UL 61010C-1

CSA: CSA C22.2 No. 61010-1

CE: CE Mark
EN50263:1999-EMC Directive, Low Voltage Directive
EN 61010-1-Low-Voltage Directive (Safety)

Section 2
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 of the SEL-1101 helps make certain that you receive years of trouble-free operation. Use the following guidelines for proper installation of the SEL-1101.

Physical Location

Mount the SEL-1101 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-1101. 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.

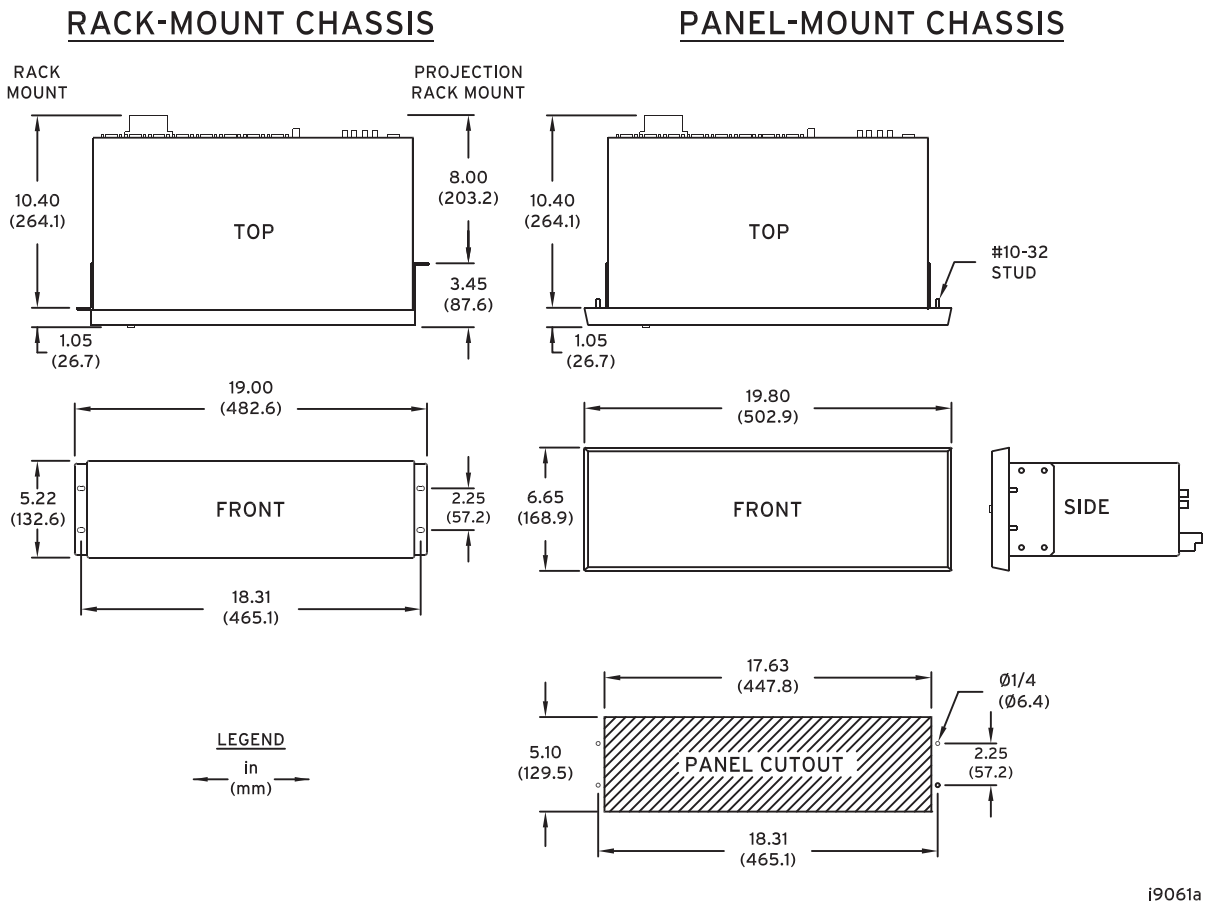


Figure 2.1 Dimensions Diagram

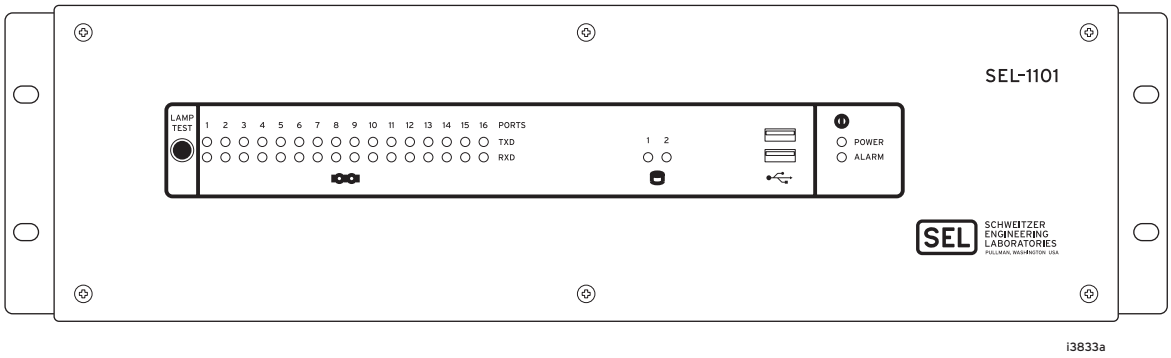


Figure 2.2 Front Rack-Mount Diagram

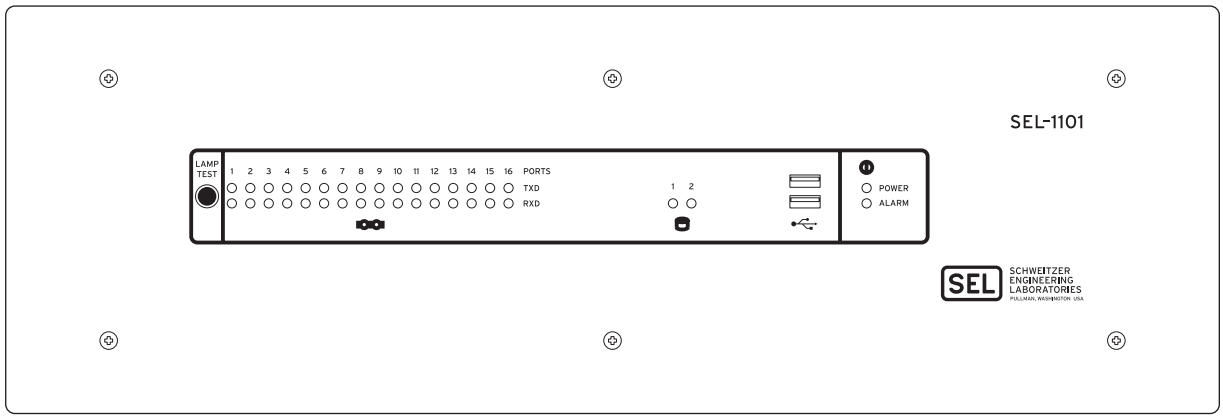
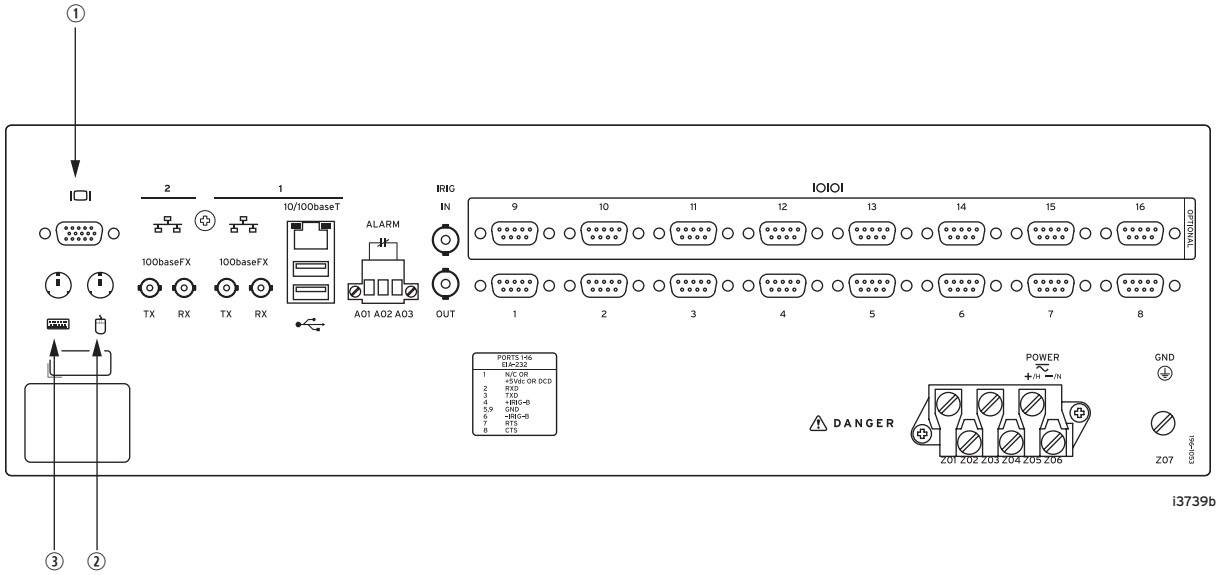


Figure 2.3 Front Panel-Mount Diagram

Rear-Panel Connections



① Optionally connect a monitor. If desired, connect a standard DB-15 monitor cable into the monitor port. Connect a VESA compliant monitor. The maximum supported resolution is 1600 x 1200.

② Optionally connect a mouse. If desired, connect a standard PS/2 mouse into the mouse port or connect a USB compatible mouse into a USB port.

③ Optionally connect a keyboard. If desired, connect a standard PS/2 keyboard into the keyboard port or connect a USB compatible keyboard into a USB port.

NOTE: PS/2 ports are for setup only and not intended for long-term use. For permanent installations, use a USB keyboard and mouse.

Figure 2.4 Rear-Panel Diagram

The physical layout of the connectors on the rear panel of an SEL-1101 is shown in *Figure 2.4*.

Ethernet Connection

The SEL-1101 is equipped with dual Ethernet. Ethernet 1 is jumper selectable between copper 10/100BASE-T or fiber-optic 100BASE-FX (see *Figure 2.8* 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-1101 is the same as a standard dual Ethernet PC-AT compatible computer.

Alarm Contact Connection

The SEL-1101 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. The contact is rated to make 30 A, carry 6 A, and interrupt 0.5 A (depending on circuit voltage). The Alarm Contact has a maximum safety rating of 250 Vac/330 Vdc.

Appendix C 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 CD-ROM.

IRIG-B Connections

The SEL-1101 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 2.4* and *Figure 2.8* 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. 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-1101 power is cycled off and on.

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-1101 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-1101 power is cycled off and on.

Serial Port Communications

One, eight, or sixteen serial ports are available on the SEL-1101, 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.

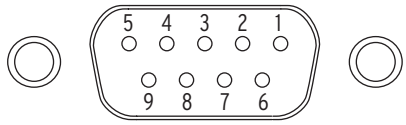
The serial communications ports function as standard EIA-232 ports with the additions of IRIG-B and +5 V power. See *Figure 2.5* for EIA-232 DB-9 female connector pin numbers. See *Table 2.1* for EIA-232 serial port pin functions.

Table 2.1 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.

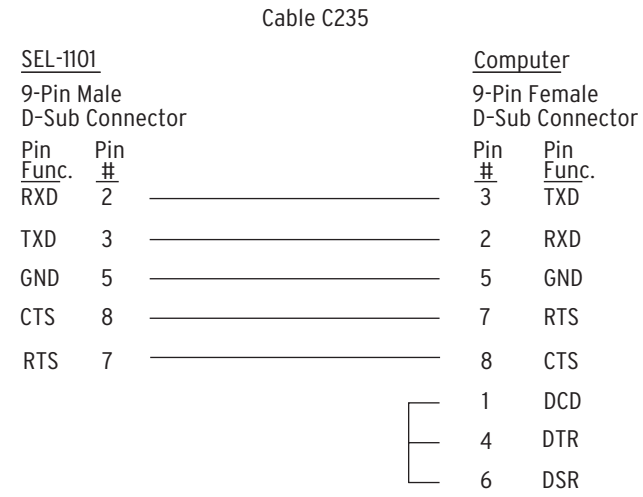


Figure 2.6 SEL Cable C235

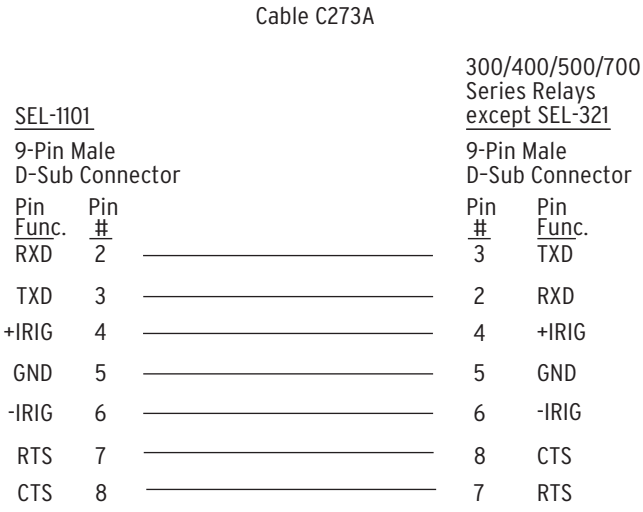


Figure 2.7 SEL Cable 273A

⚠WARNING
Never use standard null-modem cables with the SEL-1101. Using any non-SEL cable can cause severe power and ground problems involving Pins 1, 4, and 6 on the SEL-1101 communications ports.

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

- 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 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.

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
9	200	Lower XTREME8 Port 1	COM 5	Rear
9	208	Lower XTREME8 Port 2	COM 6	Rear
9	210	Lower XTREME8 Port 3	COM 7	Rear
9	218	Lower XTREME8 Port 4	COM 8	Rear
9	220	Lower XTREME8 Port 5	COM 18	Internal 10 pin header
9	228	Lower XTREME8 Port 6	COM 2	Rear
9	230	Lower XTREME8 Port 7	COM 3	Rear
9	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 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. 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

The SEL-2800 family of fiber-optic transceivers connects directly to the serial port connectors on the rear of the SEL-1101. 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-1101 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.

Serial Board Jumpers

The XTREME8 serial board jumpers shown in the following table are set at the factory.

Table 2.3 Serial Board Jumpers

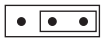
Bottom Board	
Jumper 1	Second Position, I/O–200
Jumper 2	All on
Jumper 3	All on
Jumper C[a]	9 (IRQ)
Top Board	
Jumper 1	All off, I/O–300
Jumper 2	All on
Jumper 3	All on
Jumper C[a]	5 (IRQ)

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

Main Board Jumpers

Set the main board jumpers to meet your requirements. See *Table 2.4* for jumper functions and positions. See *Figure 2.8* 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
	10BASE-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.

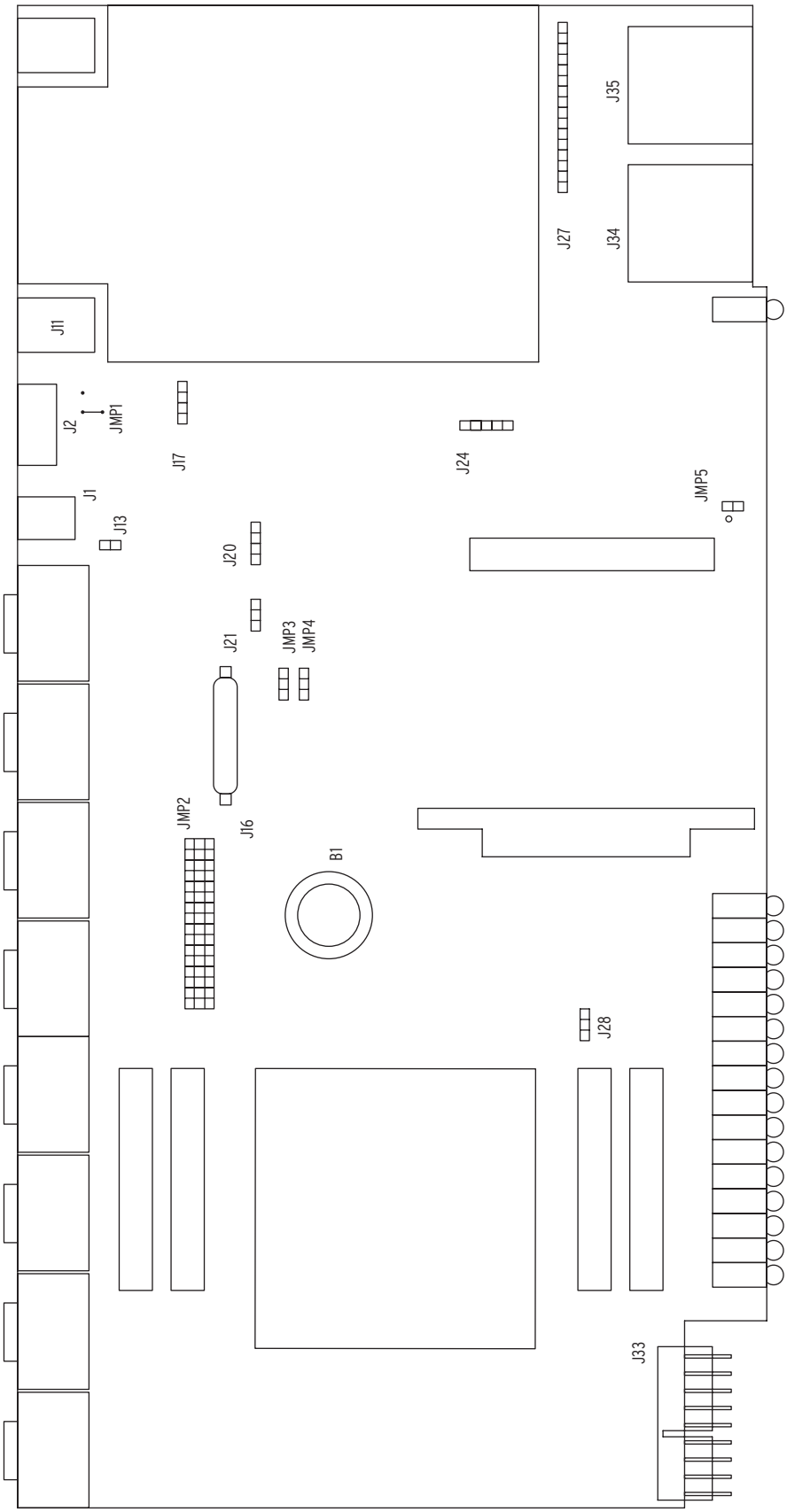


Figure 2.8 Jumper Locations

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-1101.

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.

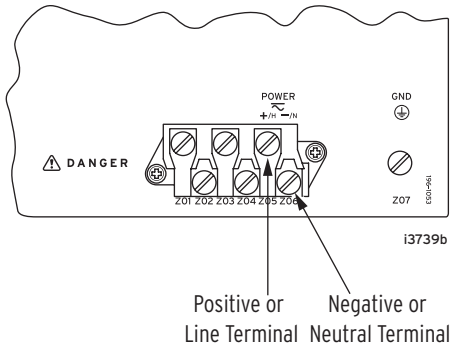


Figure 2.9 Power Connections

⚠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-1101. 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.

Field Serviceability

The SEL-1101 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 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 2.10*) between the heatsink and the case.

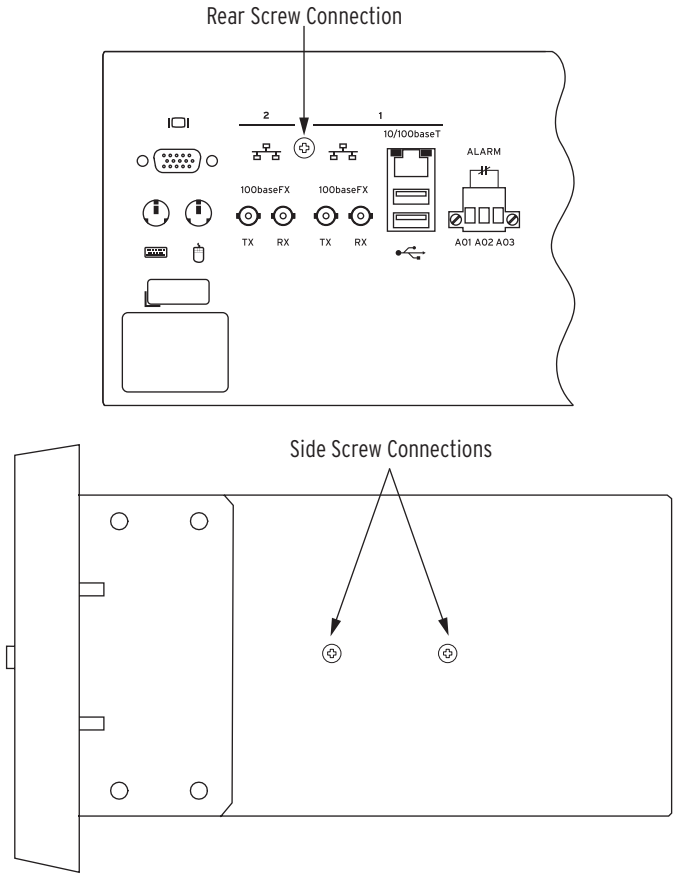


Figure 2.10 Screw Connections

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-1101 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 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.

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 B: Resetting BIOS* for details. 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 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. Reapply power to the device but do *not* let it boot into the operating system.

Step 14. Press **Del** during the boot process to enter BIOS.

Step 15. After BIOS settings have been reset and saved, cycle power and allow a full boot into installed operating system.

Removing or Installing a Traditional Rotating Hard Drive

The SEL-1101 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.

⚠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.

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 2.10*) 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 2.11*.

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 2.8*).

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.

Use the following 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.

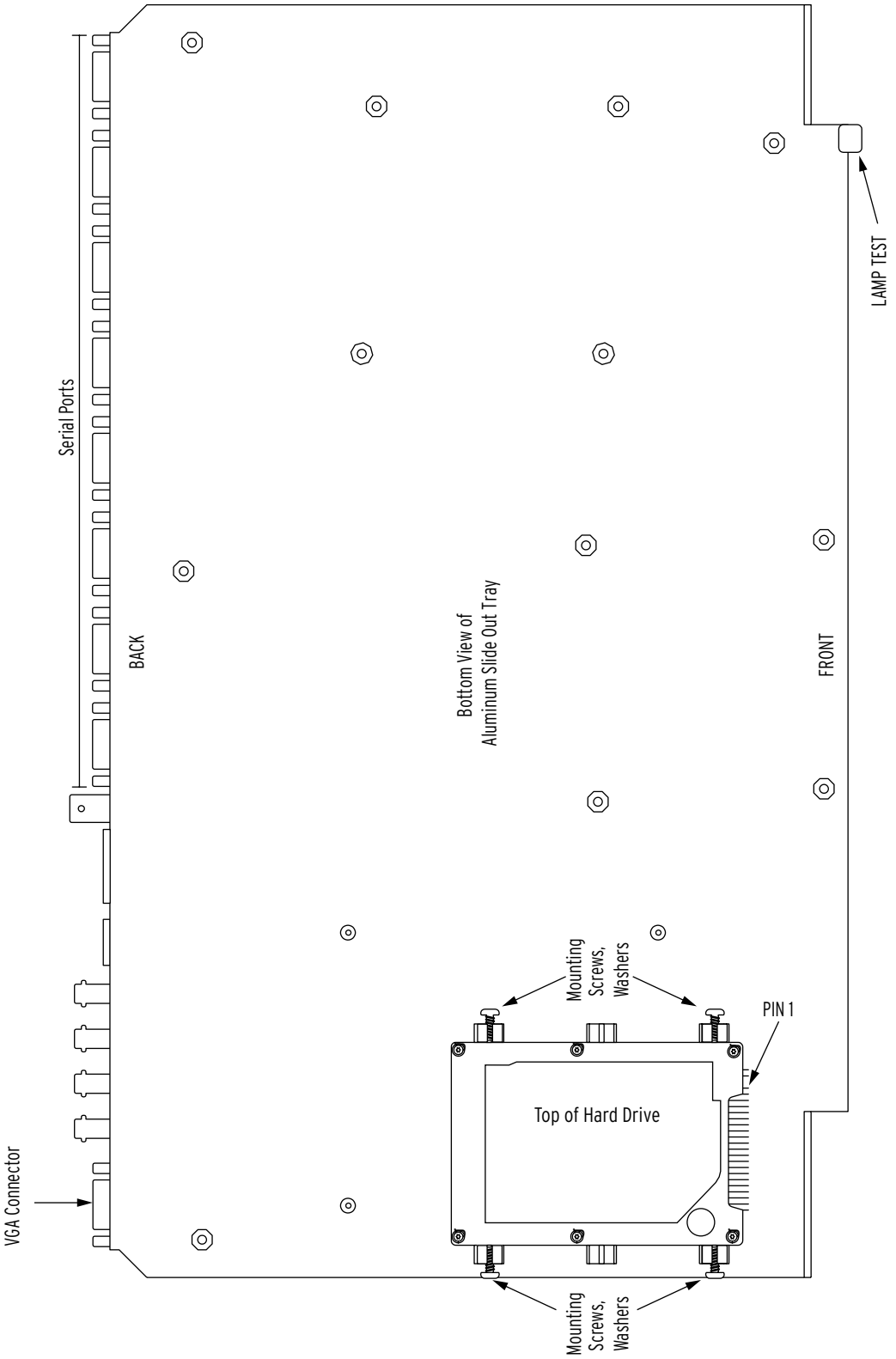


Figure 2.11 Hard Drive Mounting

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-1101 has two Type II CompactFlash sockets that function as IDE/ master and slave hard drive connections.

To remove or install a CompactFlash, 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 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. Re-energize the unit.

Step 7. Press **Delete** during the boot process to enter BIOS.

Step 8. Verify new CompactFlash hard drive is available.

Step 9. Verify BOOT order and save.

Step 10. Pay close attention to the boot process to verify that the new drive is acknowledged by the BIOS.

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Section 3
Operating System and Software Installation

Overview

The initial installation of software onto the SEL-1101 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-1101.

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 converter has 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-1101 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-1101.

Step 6. Select **F8** during the boot process to display boot menu.

Step 7. Select **USB boot**.

Step 8. The SEL-1101 will now try booting from the CD-ROM.

Step 9. Continue with the install process.

Using Standard Internal Type 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-1101 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-1101.

Step 5. Select **F8** during the boot process to display boot menu.

Step 6. Select **USB boot**.

Step 7. The SEL-1101 will now try booting from the CD-ROM.

Step 8. Continue with the install process..

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 eject the USB memory stick.

Step 3. Boot the SEL-1101.

Step 4. Insert the memory stick into the SEL-1101.

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

Using CompactFlash

Step 1. Deenergize the SEL-1101.

Step 2. Properly tag out the power source to avoid accidental energization.

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

Step 4. Remove the front panel.

Step 5. Remove the CompactFlash card from the SEL-1101 if using a CompactFlash drive.

Step 6. Place the CompactFlash card in a reader/writer connected to your laptop or desktop computer.

Step 7. Copy the software installation package onto the CompactFlash card.

Step 8. Properly eject the CompactFlash card.

Step 9. Insert the CompactFlash into the SEL-1101.

Step 10. Replace the front panel.

Step 11. Energize the SEL-1101.

Step 12. Login and navigate to the software installation package.

Using USB CD-ROM Drive

Step 1. Connect USB CD-ROM Drive to the SEL-1101.

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
IRIG, Status, and Alarms

Overview

The System Control Monitor driver and application provides access to the **IRIG, Status and Alarms Control Panel**. This control panel provides a custom interface that is not part of any standard Microsoft® interface. It is the interface to the microcontroller information.

System Control Monitor

The System Control Monitor is a Windows-only application and a service that is used to communicate with the microcontroller.

Refer to the CD-ROM that shipped with your SEL-1101. The System Control Monitor contains three files: systemmonitor.exe, selalarm.exe, and systemcontrolmonitor.exe. These files self-extract when you run systemcontrolmonitor.exe.

To install the System Control Monitor, run the systemcontrolmonitor.exe program from the CD-ROM. Install the System Control Monitor software by using a USB CD-ROM or simply copy the systemcontrolmonitor.exe file to a USB memory stick and then use the memory stick for the installation. The installation will create a service named Watchdog and will create and install the other applications into the C:\Windows\System32\SELShell folder.

Watchdog Service

The Watchdog service is the communications driver or interface to the microcontroller. This service communicates through COM17. Generate COM17 by remapping COM2, I/O Address x2F8. Use **Control Panel > System > Hardware Tab > Device Manager** to access the serial port communications settings. The following screen capture illustrates the remapping for Windows® XP.

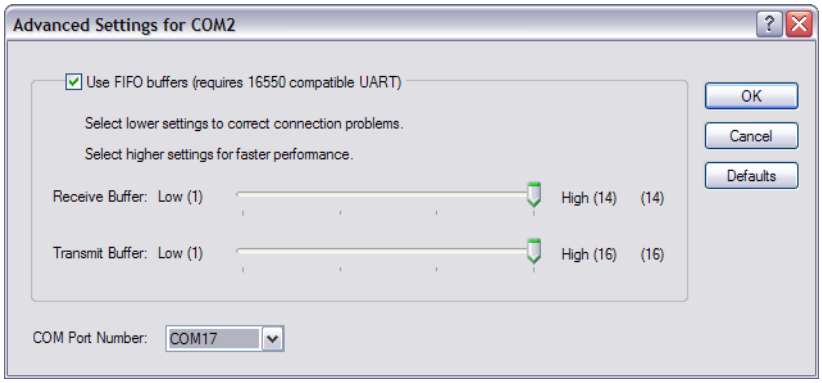

Figure 4.1 COM2 Serial Port Remapping

The Watchdog service communicates with the microcontroller using the following settings; 38400, 8, N, 1.

The Watchdog service performs the following, specific tasks:

- Pings the microcontroller every 15 seconds to reset the watchdog timer.
- Provides the USB, keyboard, mouse, monitor, and serial port overcurrent status.
- Serves error or warning data to Windows log.
- Queries Windows for CPU, hard drive, and RAM performance data.
- Determines external or internal IRIG status and adjusts Windows system time appropriately.

Available RAM

The SEL-1101 has 256 MB of RAM. The System Control Monitor will alarm when RAM is below 40 MB.

Disk Space

The System Control Monitor will alarm when disk space is below 40 MB.

CPU Burden

The device temperature rating of –40 to +75°C assumes a continuous average processor burden of 50 percent. The default settings for alarming are greater than 50 percent CPU burden for greater than 30 seconds. The alarm contact will close for operation outside of these parameters. Adjustment of these settings is possible but not recommended.

Refer to the **IRIG, Status and Alarms Control Panel** dialog box (*Figure 4.2*) to locate the CPU burden settings.

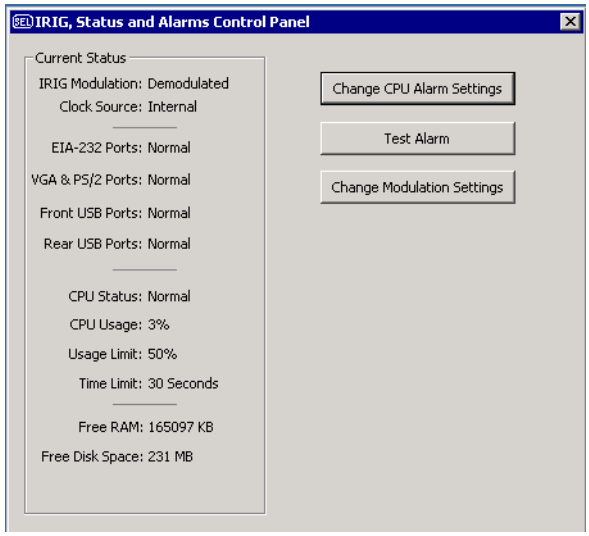

Figure 4.2 IRIG, Status, and Alarm Control Panel

Selecting the **Change CPU Alarm Settings** button shown in *Figure 4.2* allows the user to configure CPU burden set points for alarming.

Overcurrent Status

The SEL-1101 sources power out of the EIA-232, USB, PS/2, and VGA ports. Current limiting on these ports is provided to ensure that there will not be equipment damage in the event of a short circuit on these ports. Shorting the power on these ports will not affect the operation of the SEL-1101.

Table 4.1 shows the current limited sections.

Table 4.1 Current Limited Sections

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

Exceeding the limits shown in *Table 4.1* will cause the alarm contact to close and the status will change in the **IRIG, Status and Alarms Control Panel** dialog box.

IRIG-B

The **IRIG, Status and Alarms Control Panel** (see *Figure 4.2*) shows the current IRIG-B status. A status of External IRIG indicates that a separate IRIG clock is currently supplying time to the SEL-1101. The external IRIG source has the highest precedence. If there is no external source, then the SEL-1101 will provide IRIG from the computer system clock and the indication will be Internal or External NTP. Internal means the Windows system clock is free running and is not being corrected. External NTP means the Windows system clock is being periodically updated by a network-time server.

Accuracy between the Windows system clock and IRIG-B signal is ±900 ms.

Select **Change Modulation Settings** to set **Modulated** or **Demodulated** as the IRIG input to the SEL-1101 from an external source (see *Figure 4.3*). The **Modulated** and **Demodulated** radio buttons are ignored if the SEL-1101 internal Windows clock is sourcing time.

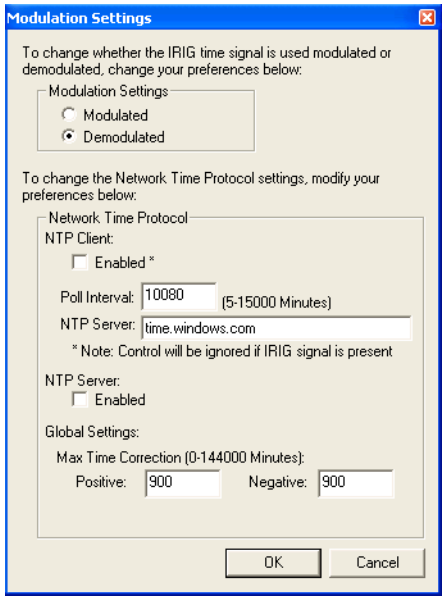

Figure 4.3 Modulation Settings Window

Alarm Contact Test

Contained in the **IRIG, Status and Alarms Control Panel** (see *Figure 4.2*) is a **Test Alarm** button. Enter the pulse duration in seconds and press the **Test Alarm** button to test the alarm contacts. See *Figure 4.4*.

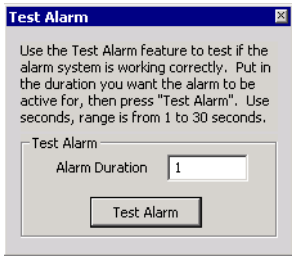

Figure 4.4 Test Alarm Window

Use the selalarm.exe program to pulse the alarm contact. *Figure 4.5* and *Figure 4.6* illustration how to pulse the SEL-1101 alarm contact when a service stops responding.

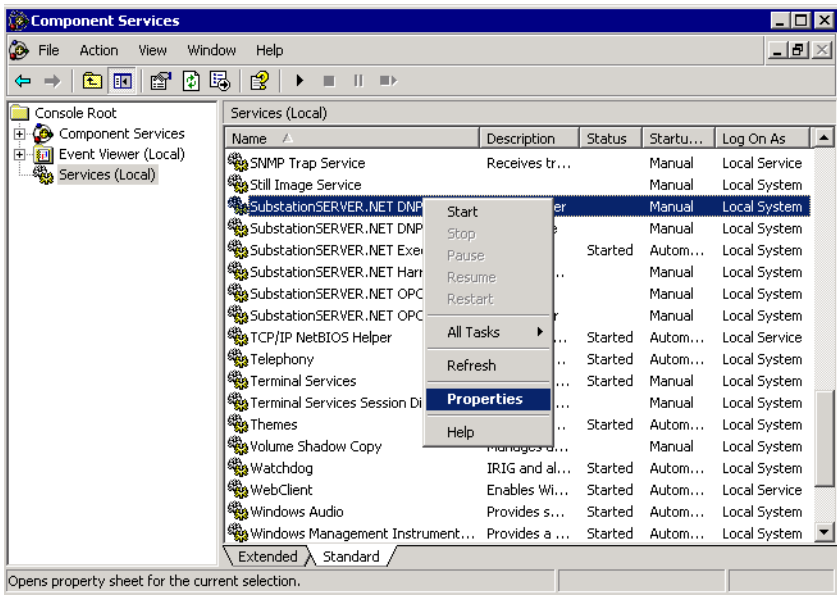

Figure 4.5 Selecting Properties Option

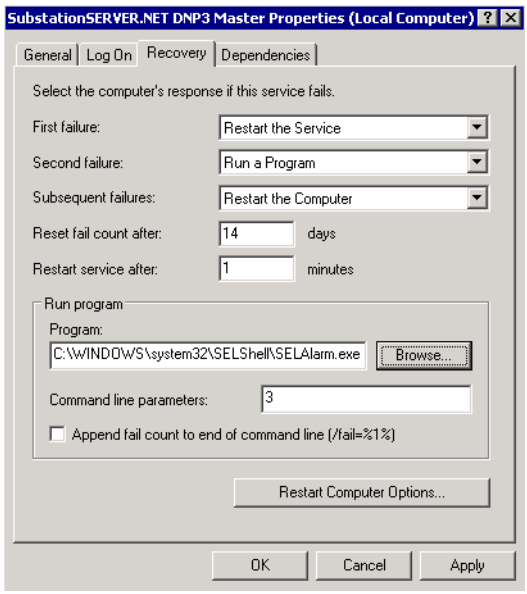

Figure 4.6 Setting a Service to Pulse an Alarm Contact

Use any other program to launch selalarm.exe to pulse the SEL-1101 alarm contact.

If you chose the settings shown in *Figure 4.6*, then the SEL-1101 will try to restart the DNP3 Master protocol service on the first failure within a fourteen-day period. On the second failure, the SEL-1101 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.

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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-1101 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
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-1101.
SEL-1101 power is off	➤ Verify that the SEL-1101 power LED is illuminated. ➤ If the SEL-1101 LED is not illuminated, re-examine the power outlet and power connection to the SEL-1101. ➤ Ensure that your SEL-1101 is properly being powered. Note that the SEL-1101 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-1101. The SEL-1101 has the ability to connect to 10BASE-T and 100BASE-T copper cable connected equipment. The SEL-1101 has the ability to connect to two 100BASE-FX fiber Ethernet connections.

Verify that the SEL-1101 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-1101 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.

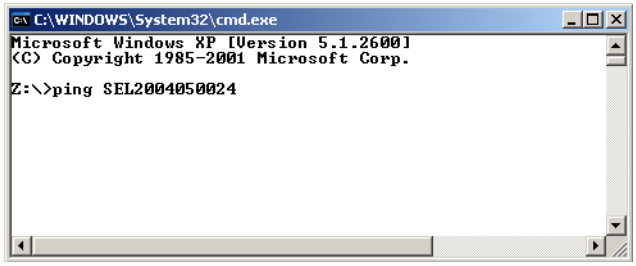

Figure 5.1 Ping Command

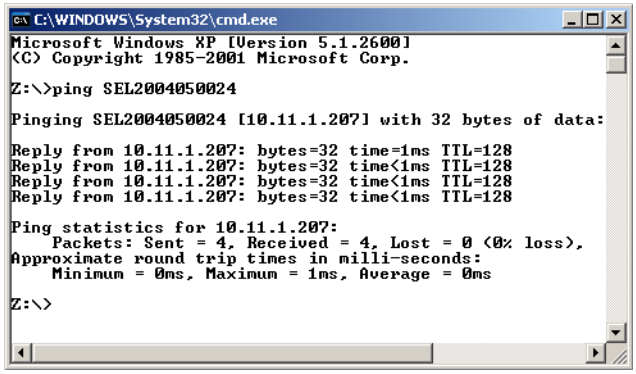

Figure 5.2 Ping Response

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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2350 NE Hopkins Court
Pullman, WA USA 99163-5603
Tel: (509) 332-1890
Fax: (509) 332-7990
Internet: www.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	Description of Changes	Manual Date Code
This release differs from the previous version as follows: 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
This release differs from the previous version as follows: Firmware: R103 System Monitor: R1.1.1.2 System Control Monitor: R1.1.1.1	**Firmware** ➤ Improved performance at cold temperatures.	20060111
This release differs from the previous version as follows: Firmware: R102 System Monitor: R1.1.1.1 System Control Monitor: R1.1.1.1	**Firmware** ➤ No change.	20051121
This release differs from the previous version as follows: 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
	➤ Original release.	20050111

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

Revision Date	Summary of Revisions
This manual differs from the previous version as follows:	
20060327	**Section 2** ➤ Updated *Figure 2.11* Hard Drive Mounting.
This manual differs from the previous version as follows:	
20060111	**Appendix A** ➤ Updated for firmware/software revisions.
This manual differs from the previous version as follows:	
20051121	**Section 1** ➤ Updated to correct battery life specification. **Section 2** ➤ Updated *Table 2.3* Serial Board Jumper 1. ➤ Removed F1 reference in real-time clock and BIOS battery replacement. ➤ Removed Microdrive installation and removing instructions. **Section 3** ➤ Removed *Standard Internal Type CD-ROM and IDE-IDE Adapter.* ➤ Inserted *Standard CD-ROM with USB Connection*. **Section 4** ➤ Changed system control monitor install program name to systemcontrolmonitor.exe. **Appendix A** ➤ Changed firmware revision name. **Appendix C** ➤ Updated function and command codes.
This manual differs from the previous version as follows:	
20051107	**Appendix A** ➤ Updated for firmware revisions.
20050111	Initial Release

Appendix B
Resetting BIOS

Resetting BIOS

The SEL-1101 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.

IMPORTANT: 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-1101.

Step 3. Press **Delete** during the boot sequence.

The BIOS boot menu should be displayed.

Step 4. Select **Auto Configure with Optimal Settings** near the bottom of the list.

Step 5. Make the following modifications to the BIOS shown in *Table B.1*.

Follow the same order shown in the *Table B.1* when making the edits (they are order dependent).

NOTE: Create a new supervisor password (recommended).

Table B.1 BIOS Modifications

Standard CMOS	Date: Time:	
	Floppy A	Not installed
	Boot Sector Virus Protection	Enabled
Advanced CMOS	Quick boot	Enabled
	Wait for **F1**	Disabled
	Press **DEL** message	Disabled
Advanced Chipset	USB Legacy Device	All Device
	LCD Type	#7 1024 x 768
	LCD CRT Selection	CRT
Power Management	ACPI	No
	Restore on ac power loss	Power on
	Power Type select	PC-AT
PCI/Plug and Play	IRQ5	ISA/EISA
	IRQ9	ISA/EISA
Peripheral Setup	Add LPT Function Select	LPT (SSP)
	Onboard FDC	Disable
	Onboard Parallel	Disabled
	Onboard AC ‘97 Audio	Disabled

Appendix C
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 C.1*)
	03	End of text byte—fixed
Response:	02 06 03	Acknowledge
	02 15 03	Error

Table C.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 C.2*)
03	End of text byte—fixed

Table C.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 C.3*.

Table C.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 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 0E 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 C.3*)	BCD*
	45	Minutes (see *Table C.3*)	
	18	Hours (see *Table C.3*)	
	74	Days (see *Table C.3*)	
	02	Days x 100 (see *Table C.3*)	
	04	Year (see *Table C.3*)	
	20	Year x 100 (see *Table C.3*)	
	26	Milliseconds x 10 (see *Table C.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:Millisecond)

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 C.3*)	BCD
	45	Minutes (see *Table C.3*)	
	18	Hours (see *Table C.3*)	
	74	Days (see *Table C.3*)	
	02	Days x 100 (see *Table C.3*)	
	04	Year (see *Table C.3*)	
	18	Century (see *Table C.3*)	
	26	Milliseconds x 10 (see *Table C.3*)	
	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 C.4*.

Table C.4 Block 2 Read System Status from Microcontroller

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 0	10 Minutes 10 Seconds			1 Minute 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							
			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 C.4*)
- FA Register 1 (see *Table C.4*)
- 00 FW checksum test (see *Table C.4*)
- 8F Watchdog Time-out (set) (see *Table C.4*)
- 00 Kick Watchdog (see *Table C.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 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-1101 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.

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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