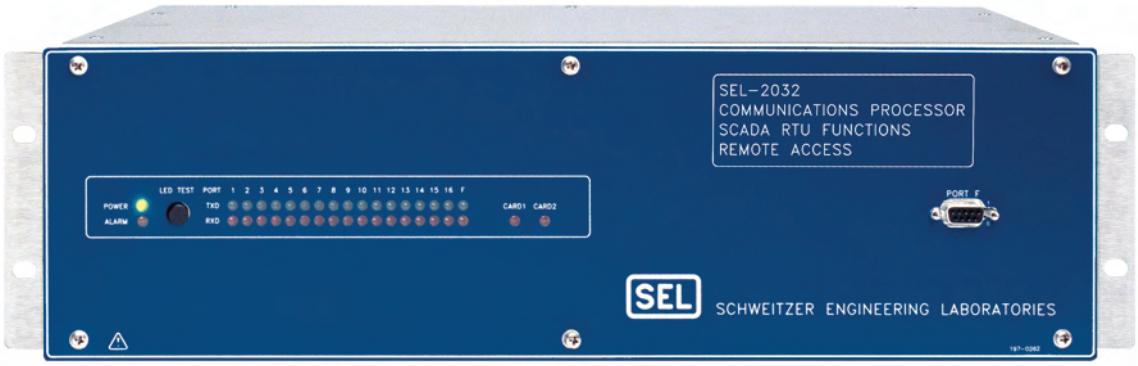
SEL-2032 Communications Processor

Integrate New and Existing Substations



Create integrated systems that use substation hardened equipment to collect data from station IEDs, process and concentrate collected data, provide data to multiple master devices (SCADA masters, RTUs, PLCs, HMIs, etc.), and provide a connection point to IEDs for engineering and maintenance. Use the SEL-2032 to provide simultaneous data collection, control, engineering access, and time synchronization over a single cable or fiber-optic pair (using SEL-2810 transceivers) with SEL IEDs. The SEL-2032 Communications Processor includes all of the powerful features of the SEL-2030 plus enhanced power-user and SCADA features.

Major Features and Benefits

- **Supports Synchrophasors.** Collect synchrophasor data from select SEL-300 and SEL-400 series relays. Map phasor data values to traditional SCADA protocols, such as DNP3 or Modbus®, for integration into Energy Management Systems and State Estimation.
- **Comprehensive Integration Solution.** Address SCADA, engineering access, local HMI, and time synchronization by using a single star network connection to each device.
- **Superior Alternative to RTU.** Use Modbus or DNP3 to communicate to off-site SCADA masters. Send relay time-stamped Sequential Events Recorder (SER) data to SCADA masters using DNP3. Use protocol converters for other protocols.
- **Increase Reliability.** Tested and designed to the same environmental specifications as SEL relays. Protects you from frequent operating system crashes and upgrades of PC-based systems.
- **Single-Point Engineering Access.** Gain engineering access to station IEDs through a single serial port, modem, or high-speed network (using the SEL-2701) connection.
- **Supports Multiple Masters.** Provide an optimized and scaled data set to each master increasing communication performance and efficiency and reducing burden on master devices.
- **Time-Stamped Data.** Collect relay SER data by using SEL Fast SER messages locally, or forward the data to a local host or SCADA master as DNP3 event data.
- **Station Automation.** Combine and react to station and system conditions by using logic processing and data manipulation.
- **Provides Ethernet UCA2 Connectivity.** Use the SEL-2701 Ethernet Processor Card to provide a UCA2 interface for serial devices.

- **Provides Ethernet DNP3 Connectivity.** Use the SEL-2701 Ethernet Processor Card to provide a DNP3 interface for serial devices.
- **Autoconfiguration.** Use autoconfiguration with SEL IEDs to automatically collect descriptions of available data, data messages, and control to automate database creation and simplify message settings.
- **Time Synchronization.** Distributes incoming IRIG-B or sends IRIG-B based on internal clock. Use SEL-2810 transceivers to time-synchronize IEDs using fiber-optic connections.

Functional Overview

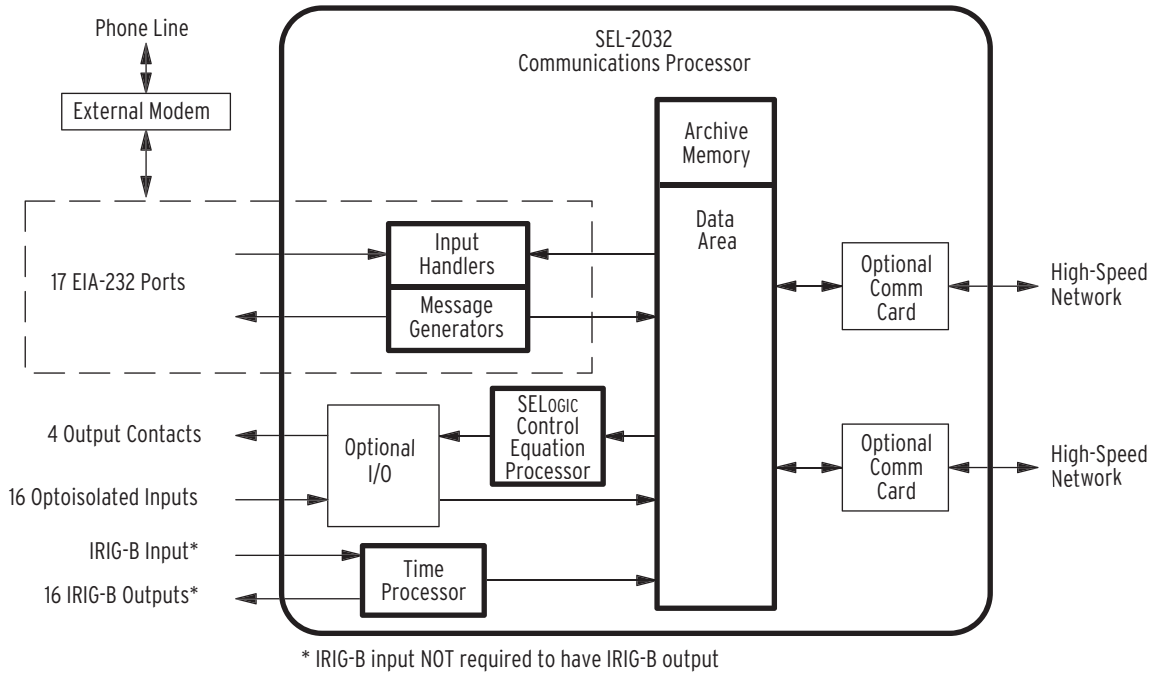


Figure 1 Functional Model

Figure 1 shows a functional model of the SEL-2032 including the Input Handlers, Message Generators, Data Area, SELOGIC® Control Equations Processor, Time Processor, optional I/O, and optional communication cards.

Input Handler/Message Generator

Each serial port includes an Input Handler and a Message Generator. When you communicate with the SEL-2032 by using the command set, the Input Handler separates the commands into their basic components. The Input Handler sends data to the Data Area and directs the Message Generator to respond based on the SEL-2032 settings that you have defined.

When you use the SEL-2032 as a port switch, the Input Handler places collected data in the Data Area, and the Message Generator reads and outputs these data to a designated port. The Input Handler also stops communication when it recognizes the default termination condition or a termination condition you have defined in settings.

Messages are predefined responses that can include data, responses to special-purpose user-defined commands, or automatic messages that you have defined in settings and that are triggered by SELOGIC control equations. You can use relay automatic messages to initiate data collection by setting the SEL-2032 to collect and store data when it receives an unsolicited message. For example, receiving a summary event report could trigger the SEL-2032 to send the **EVENT** command back to the relay. The relay would respond with the long event report, and the SEL-2032 could then save it. You can store the data in volatile RAM or in the nonvolatile archive memory.

When configured, the Input Handler receives binary Sequential Events Recorder (SER) messages from SEL relays and places them in temporary data storage. The SEL-2032 Message Generator forwards these messages along with SER messages generated by the change-of-state (COS) of the SEL-2032 local I/O to an SEL Fast SER master (for example, the TrafficWerks SEL Fast I/O Server).

Data Area With Automatic Database

The Data Area is divided into regions of volatile (RAM) and nonvolatile memory. The SEL-2032 stores settings in nonvolatile memory. SEL communications processors are unique in their ability to receive, parse, store, and distribute data. The SEL-2032 automatically parses data from SEL relays and has several parsing options for data from other devices. Nonvolatile memory is available for long-term data storage.

SELOGIC Control Equations Processor

The SELOGIC Control Equations Processor executes Boolean equations that you write to trigger transmission of messages. The Boolean values in the equations can be logic bits from the Data Area or comparisons against the present time. You can program the SEL-2032 to recognize user-defined commands and to set a bit in the Data Area when it receives one of these commands. The SELOGIC Control Equations Processor can then use this bit to initiate another operation, such as collecting data or transmitting a message. The SELOGIC Control Equations Processor also controls the optional I/O.

Time Processor

The Time Processor keeps the date and time, reads IRIG-B time input (if it is present), and broadcasts demodulated IRIG-B time code to all rear-panel serial ports. It also time-stamps data stored in the Data Area and supplies time-of-day and day-of-the-week input to the SELOGIC Control Equations Processor.

Optional Input/Output

If the optional I/O is installed in the SEL-2032, the inputs and outputs operate with the Data Area and the SELOGIC Control Equations Processor. Optoisolated inputs feed directly into the Data Area as logic bits, which you can view using SEL-2032 commands. You can program SELOGIC control equations to use the logic bits. The SELOGIC Control Equations Processor controls the output contacts on the I/O board. These outputs can be programmed to operate based on Data Area bits or time comparisons. This powerful capability lets you build adaptive relay schemes, automate responses to alarms, and directly control power apparatus.

Optional Communications Cards

The optional communications cards allow the SEL-2032 to connect to high-speed networks. See additional product model number SEL-2700 series data sheets for descriptions of the specific high-speed networks available.

Applications

Comprehensive Integration Solution

The SEL-2032 provides a comprehensive solution for station integration as shown in *Figure 2*. The SEL-2032 system provides SCADA data, local HMI data, engineering access, and time synchronization. RTU-based integration uses multiple single-purpose communications networks (see *Figure 3*).

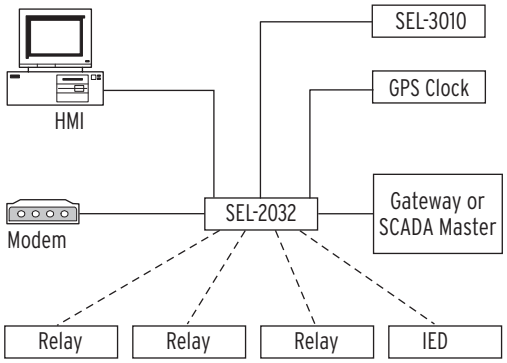


Figure 2 SEL Comprehensive Integration Solution

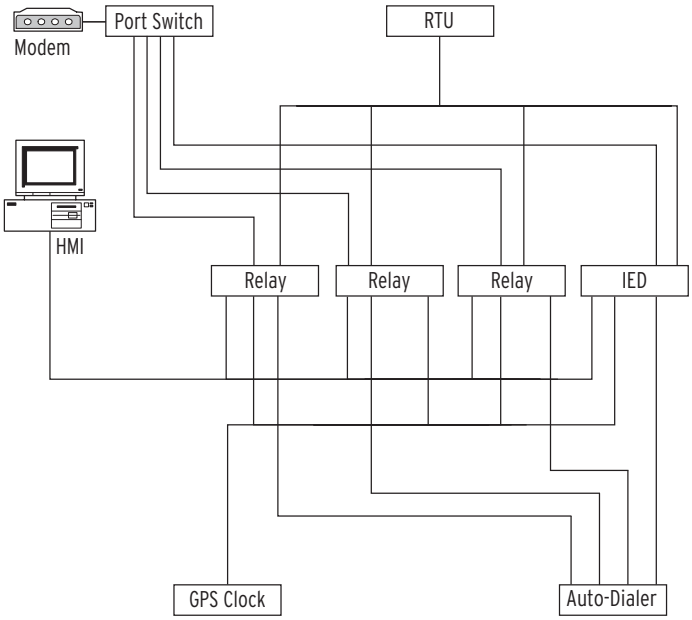


Figure 3 RTU-Based Integration System

Collect and Format Data From Relays for SCADA Systems

You can use the SEL-2032 to collect and format relay data for SCADA systems. Simple settings enable you to individually configure SEL-2032 ports to define their data retrieval and storage attributes. Instruct the SEL-2032 to automatically interrogate connected devices for data. The SEL-2032 can also provide a uniform data interface to the SCADA devices, so that the SCADA software does not have to specifically accommodate each IED type. Collect relay high-quality SER data (1 ms resolution timestamps) and forward to the SCADA master for multiple change detection or construction of a station-wide or system-wide sequential event report.

Access Data Through Multiple Paths

Different departments in a utility may be interested in different data and different data rates. For example, a system operator may be interested in metering and contact data every 5 or 10 seconds and fault location shortly after a fault. A protection engineer is usually interested in setting relays and analyzing a full event report after a fault occurs. You can accommodate these needs by connecting one port on the SEL-2032 to a SCADA RTU for the operator and a telephone modem to another port for the protection engineer.

Program SEL-2032 Database Functions

Use the SEL-2032 settings and SELOGIC control equations to build a database of load profiles and event reports and to store them in nonvolatile memory. Define commands so different devices can retrieve appropriately formatted data.

Perform Programmable Logic Controller (PLC) Functions

Use Boolean and arithmetic operators to create logical schemes to produce and forward information or perform control to eliminate auxiliary devices.

Synchronize Relay Clocks in Substation

The SEL-2032 receives an IRIG-B time-code input from a single IRIG-B receiver or local clock and distributes it to the devices connected to any of the 16 serial ports. The SEL-2032 supports modulated or demodulated time-code input.

If there is no external signal, the SEL-2032 generates an IRIG-B signal from the internal clock so that you can synchronize device clocks.

Create Station-Wide SER

Monitor local input contacts to time-stamp state changes of discrete contacts, and create and queue an SER message for each occurrence. The SEL-2032 can then forward these SER messages, and route SER messages received from relays, to a host. Use the TrafficWerks SEL Fast I/O Server as a local HMI I/O server and host or send time-stamped data as DNP3 event data to a local host or SCADA master.

Use Events to Switch Relay Setting Groups

Program the SEL-2032 to use the time of day, day of the week, or a specific event, such as a relay alarm output, to switch relay setting groups.

Monitor Relay Alarm Contacts

With the optional I/O installed, you can program the SEL-2032 to monitor relay alarm contacts. Instruct the SEL-2032 to send predetermined messages or initiate an action you designate, like closing an output contact based on these inputs.

Log Messages on a Local Printer

You can set the SEL-2032 to print selected messages, including control actions, diagnostic status messages, short event reports, and demand meter data.

Drive a Local Human-Machine Interface With Relay Data

Connect a computer to the SEL-2032 through the computer serial port. Using your own human-machine interface (HMI) software, you can build screens and specify the HMI data definition. You can create commands that instruct the SEL-2032 to send selected data to the standard serial port interface for the HMI package.

Integration Features

The SEL-2032 provides many special features needed in today's substations to communicate with a variety of microprocessor-based devices, including digital fault recorders, sequential event recorders, digital meters, and digital relays. The SEL-2032 can function as a simple, but intelligent, port switch, or it can provide sophisticated communications and data handling capabilities required for advanced substation integration projects. Data are collected, processed, and stored in the SEL-2032 database, permitting quick distribution of selected data to an RTU (remote terminal unit) or another device. *Figure 4* shows an example block diagram configuration of the SEL-2032 with SEL relays and peripheral devices connected.

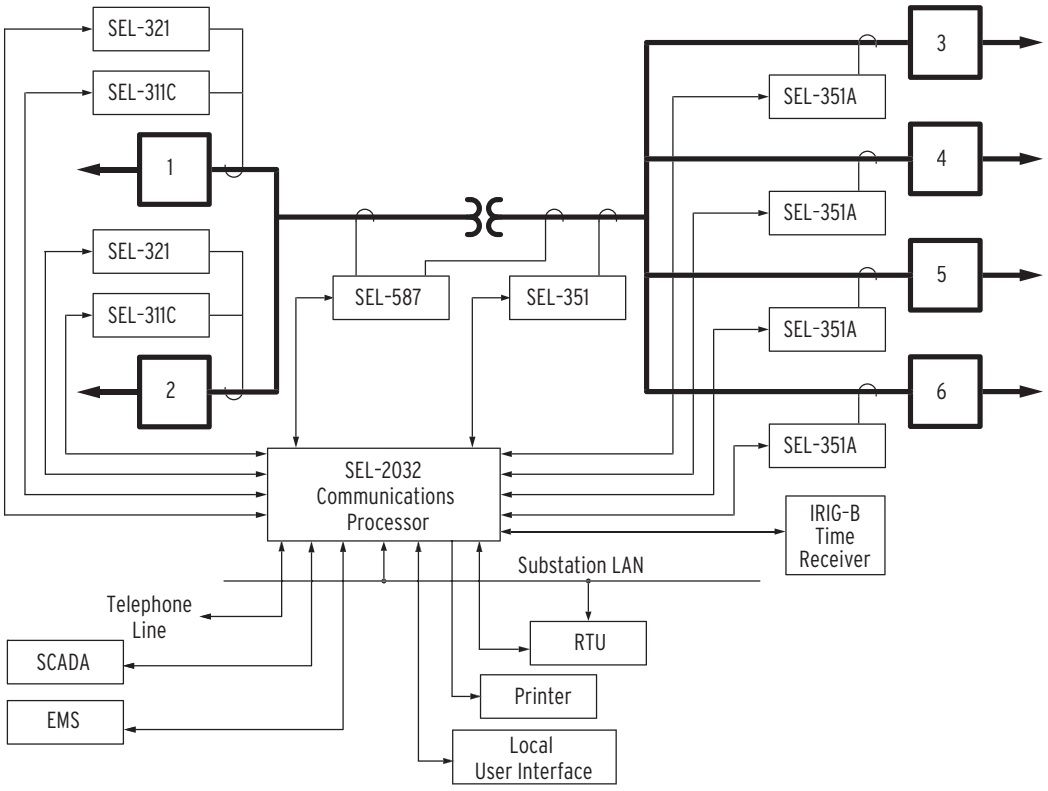


Figure 4 SEL-2032 Example Configuration Diagram

Enhanced/Intelligent Port Switching

Unlike conventional port switches, the SEL-2032 can support communications on all active ports simultaneously at speeds as high as 19200 or 38400 bps depending on port configuration. This means that you can communicate locally through the SEL-2032 with one connected IED (intelligent electronic device) at the same time that someone else is communicating remotely through the same SEL-2032 to another connected IED. Other intelligent features, like the SEL-2032 autoconfiguration function, make setup and operation much easier than with simple port switches. In advanced applications, where the SEL-2032 is used to collect, store, and distribute information, the simultaneous communication function provides an uninterrupted flow of information from all active IEDs to an RTU or station integration computer. At the same time you can communicate through the SEL-2032, either locally or remotely, with one of the connected relays or IEDs.

Data Collection, Processing, Storage, Distribution

You can collect, store, process, and distribute target, meter, event, status, sequential events records, synchrophasors, and other information—virtually all information available from an SEL relay and a variety of information available from other IEDs—with the SEL-2032 by using a simple, but powerful, set of communication commands. Likewise, the SEL-2032 reduces the processing burden for these external devices by separating selected data from IEDs so that only the essential information in the form and format required is delivered.

Substation Integration and Network Interface

Communication and information handling features make the SEL-2032 ideal for small substation integration projects, eliminating the need for separate substation network architecture. On larger integration projects, the SEL-2032 reduces or eliminates the need for costly network interface devices, otherwise required for each IED. Inclusion of Modbus and DNP3 support eases integration with systems that support Modbus or DNP3. The ability to add protocol cards allows the use of high-speed networks and allows your protocol choice to change in the future with minimal hardware impact.

Time Synchronization

The SEL-2032 can synchronize the time clocks in attached devices, such as relays, that accept a demodulated IRIG-B time signal. The demodulated IRIG-B signal is regenerated in the SEL-2032 from an external modulated or demodulated source, such as a GOES or

GPS satellite clock receiver. If no IRIG-B source is available, the demodulated IRIG-B time signal is generated internally by the SEL-2032. A setting allows you to select the external IRIG-B signal, or network command to set the SEL-2032 clock.

Optional Expanded Long-Term Information Storage

Long-term information storage, for such functions as alarms, event reports, and load profiles, can be accommodated using nonvolatile archive memory.

Optional Input/Output

Optional I/O, consisting of four programmable output contacts and 16 optoisolated inputs, is available for monitoring, control, and SER. You can use SELOGIC control equations, written in the SEL-2032 settings, to perform basic control functions such as consolidating alarms and switching adaptive relay setting groups. Jumper-configure each output contact as Form A or Form B through soldered jumper connections.

Compact Design

The SEL-2032 is available with two mounting styles; one is for mounting in panels, and one is for racks. You can reverse the mounting ears on the rack-mount case for projection mounting. *Figure 7* shows the SEL-2032 front and rear panels, both with and without the optional I/O board. Refer to *Figure 8* for dimensions and drill plans.

Optional Communications Cards

The SEL-2032 has two card slots that each accept SEL-2700 series cards. Each card has 64 incoming control points (which are set by the card), and 64 outgoing control points (which are set by the SEL-2032).

The SEL-2032 also supports virtual terminal connections through the optional communications cards. For example, with an SEL-2701 Ethernet Processor installed, Ethernet users can establish Telnet sessions through the card, issue a **PORT** command, and communicate with an IED connected to the SEL-2032.

Guideform Specification

The communications processor shall operate a star communications network and provide a combination of functions including Boolean logic processing, automatic transmission of outgoing messages and parsing of responses, data scaling, data aggregation, simultaneous collection of data from up to 16 slave devices (both SEL and non-SEL), and simultaneous data access for multiple master devices. The communications processor shall provide Modbus RTU Slave and DNP3 Level 2 Slave protocols and provide two card slots for the installation of additional protocol cards. Specific operational and functional requirements are as follows:

- **Power Supply.** The communications processor shall be capable of operating on a wide range of power supply voltages and shall be available with one of three power supply types: 85–350 Vdc or 85–264 Vac, 38–200 Vdc or 85–140 Vac, or 20–60 Vdc.
- **Temperature.** The communications processor shall be capable of continuous operation over a temperature range of –40° to +85° C in order to allow mounting in an outdoor control cubicle or in case of the failure of enclosure heating or cooling. The communications processor shall be type tested to IEC 60068-2-1: 1990 (Test Ad 16 hr @ –40°C), IEC 60068-2-2: 1974 (Test Bd 16 hr @ +85°C), and IEC 60068-2-30: 1980 (Test Db 12 + 12-hour cycle @ 55°C, 6 cycles).
- **Environmental Testing.** The communications processor shall be tested to the same standards as protective relays including IEC 60255-21-1, IEC 60255-21-2, IEC 60255-21-3, IEC 60255-22-1, IEC 60255-22-2, EN 61000-4-2, IEC 60255-22-3, IEC 60255-22-4, EN 61000-4-4, and IEEE C37.90.1 (See *Specifications on page 14* for details).
- **Input/Output.** There shall be an optional input/output module with 16 optoisolated inputs and 4 outputs. There shall be four types of inputs available rated for operation at a nominal 24 Vdc, 48 Vdc, 125 Vdc, or 250 Vdc. The inputs shall draw no more than 4 mA when nominal control voltage is applied. The outputs shall be contact type with a 30 A make and 6 A carry with MOV protection.
- **Alarm Output.** There shall be an alarm contact output programmed to signal internal errors and malfunctions. The alarm contact shall be programmable so that the alarm conditions that activate the output can include additional conditions with the communications processor, collected data, and the results of logical and mathematical calculations. The alarm contact shall be configurable to operate as a Form A or Form B contact.
- **EIA-232 Ports.** The communications processor shall have one front-panel and 16 rear-panel ports using standard DB-9 connectors and MOV protection. Two pins on each port shall be available as a demodulated IRIG-B time synchronization signal. One rear port shall be capable of receiving a demodulated IRIG-B signal. Six rear ports shall have a selectable +5 Vdc output on Pin 1. Each rear port shall be capable of operation at 300–9200 bps.
- **Password Security.** The communications processor shall have a multilevel password system requiring that you pass through lower levels to reach higher levels. The passwords shall be user configurable and allow up to 12 characters including case-sensitive letters, digits, and special characters including !@#$%^&*()-_=+;:,<.>/?'"\|. There shall be a jumper to allow emergency password disable. This password scheme meets or exceeds all of the requirements of the DOE Password Guide (DOE G 205.3-1).
- **Protocol Card Slots.** There shall be two slots that allow installation of field-installable protocol cards. The communications processor shall automatically recognize and communicate with the protocol cards.
- **Database.** Each port shall have a separate database that allows data collection and labeling. Manipulation of data within the databases shall be available via label reference or memory address reference. There shall be a programmable User region that allows the data transfer, data scaling and offset, arithmetic operations, Boolean combinations, and data concentration.
- **Configuration.** Configuration of messages and data processing functions shall be through simple message commands and data movement equations that do not require specific knowledge or tools for programming in C or other programming languages. Configuration of messages for data collection with SEL devices shall include automatic parsing and labeling of data.
- **Outgoing Messages.** The communications processor shall be capable of sending outgoing messages triggered based on collected data, calculated data, time of day, and periodic time functions. Outgoing messages can contain any binary or ASCII character, internal database registers, and automatic CRC checksum calculation.
- **Incoming Messages.** In response to an outgoing message, the communications processor shall be capable of ignoring the response or parsing as ASCII integer, ASCII floating point, character string, integer string, integer string with XON/XOFF, and flexible parsing. Flexible parsing shall be capable of handling messages that contain

numbers that may be replaced with non-numeric text temporarily through a system of decode equations.

- **Auto-Configuration.** The communications processor shall be capable of automatically communicating with SEL devices to determine communication parameters and features of the connected device.
- **Interleaved Conversations.** The communications processor shall be capable of simultaneous ASCII, binary, and IRIG-B communications with connected SEL relays over a single communications cable or with the addition of transceivers over a single fiber-optic pair. The collection of status and measurement data and control operations from master devices connected to the SEL-2032 shall not be interrupted by ASCII engineering conversations with the relay over the same cable.
- **Synchrophasors.** The communications processor shall be capable of receiving synchronized phasor measurement data via the SEL Fast Messages for synchrophasors with supported message rates of 1 per minute to 1 per second. Received synchrophasor data shall be available for use in logic processing and redistribution through outgoing protocols such as DNP3 or Modbus.
- **DNP3.** The communications processor shall be capable of operating as a DNP3 Level 2 Slave. The communications processor shall allow configuration of any incoming data or data calculated within the communications processor to be available through the DNP interface. All control points within the communications processor shall be available as DNP control points using latch on/latch off, pulse on/pulse off, or trip/close control functions. SER data collected from SEL IEDs shall be available as timestamped DNP event data.
- **Modbus.** The communications processor shall be capable of operating as a Modbus slave simultaneously on as many as three ports. The Modbus slave implementation shall allow direct access to any register within the communications processor. The Modbus implementation shall allow control of any control point within the communications processor.
- **Boolean Equation Processing.** The communications processor shall process Boolean equation statements for the purposes of triggering outgoing messages and control actions and combining collected data for retrieval by master devices.
- **Configuration Storage.** The communications processor shall store all settings and configuration in nonvolatile memory allowing recovery after prolonged loss of power including failure of the internal battery.
- **Nonvolatile Storage.** There shall be flash memory used as nonvolatile storage of incoming and calculated data within the communications processor. Data stored in the nonvolatile memory shall be available for retrieval after sustained power outage including failure of the internal battery.
- **SER Data.** The communications processor shall collect SER data from SEL IEDs. The collected SER data shall be forwarded to other SEL devices or equipment using the SEL Fast SER protocol. The communications processor shall also forward timestamped data as DNP3 event data objects with timestamps.

Front-Panel Features

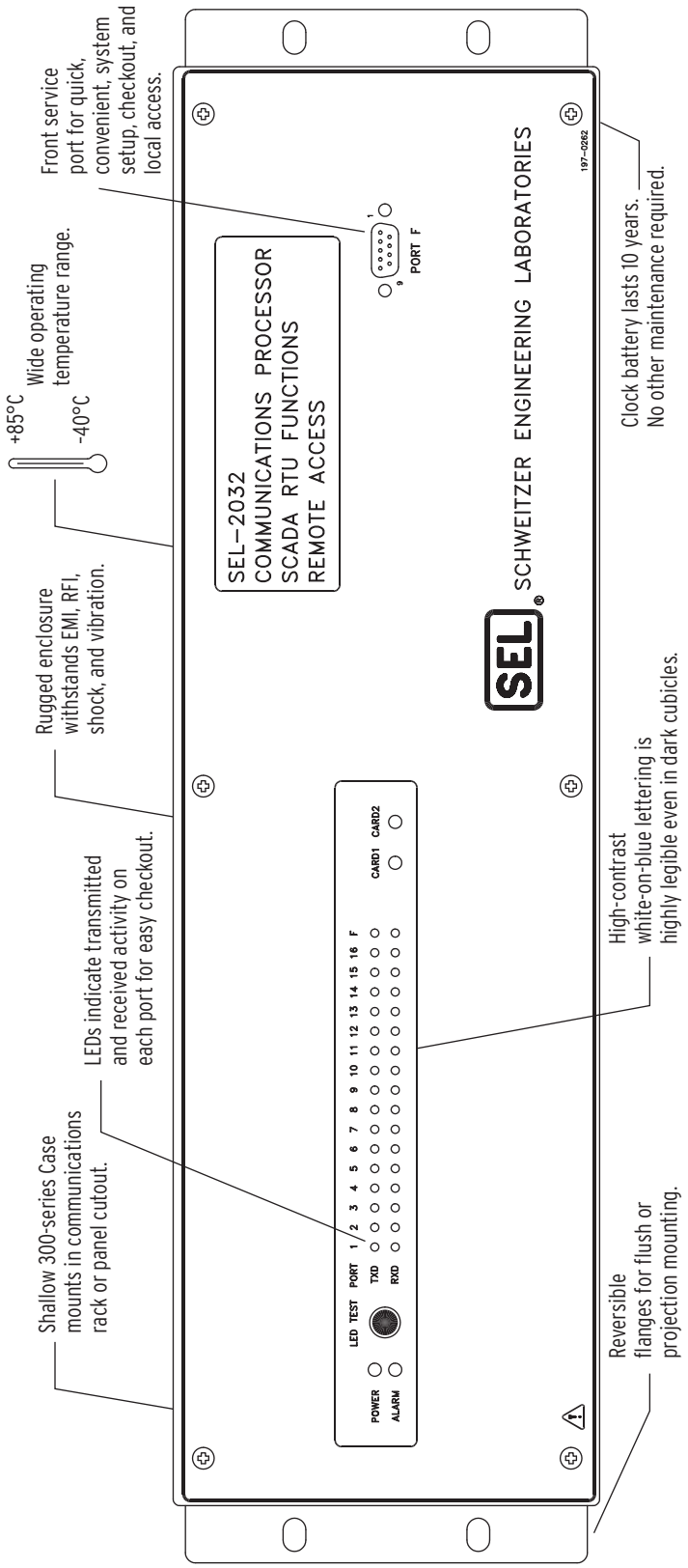


Figure 5 Front-Panel Features

Rear-Panel Features

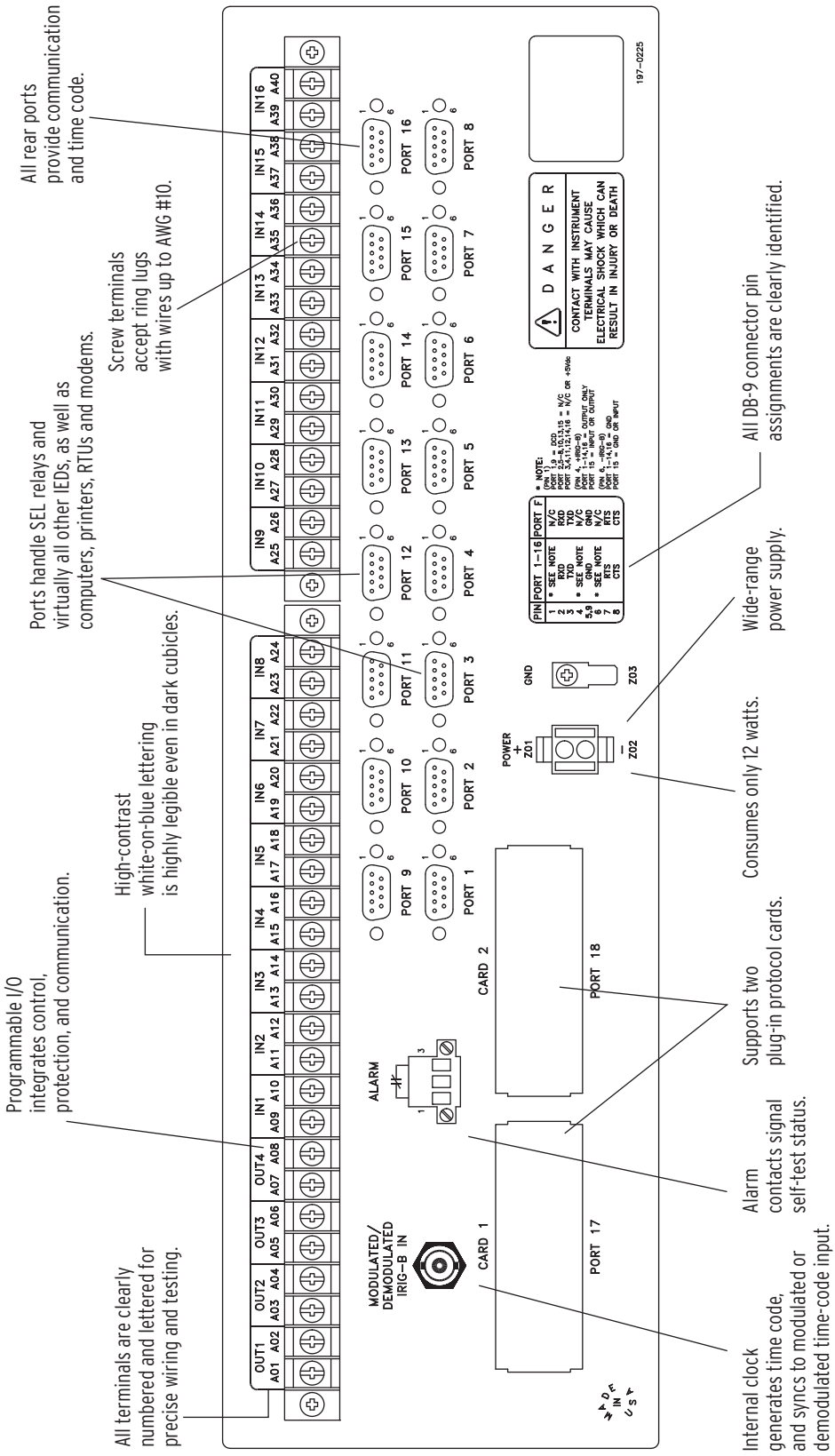
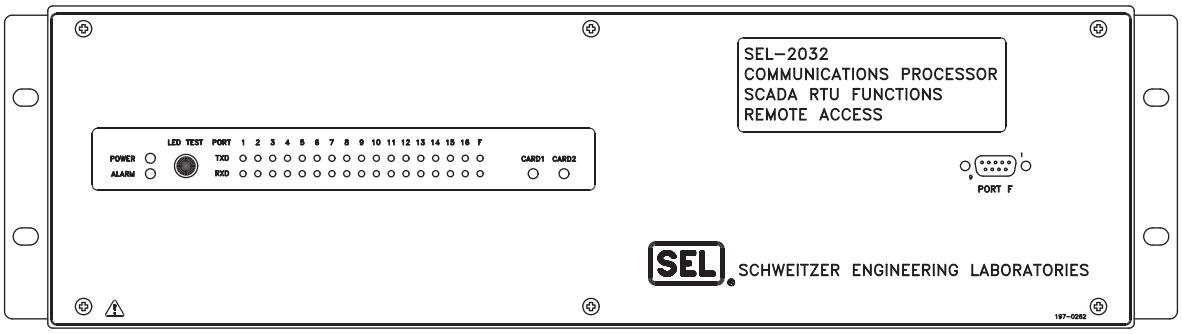
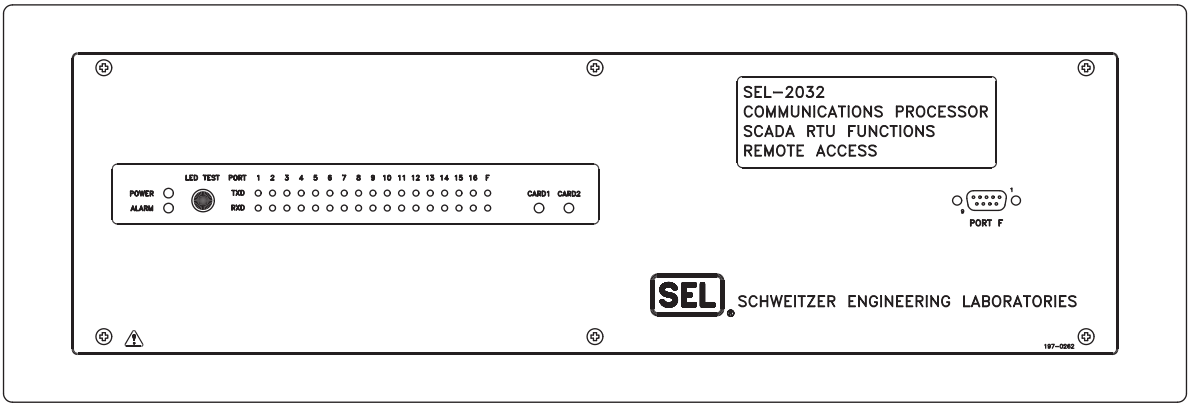


Figure 6 Rear-Panel Features

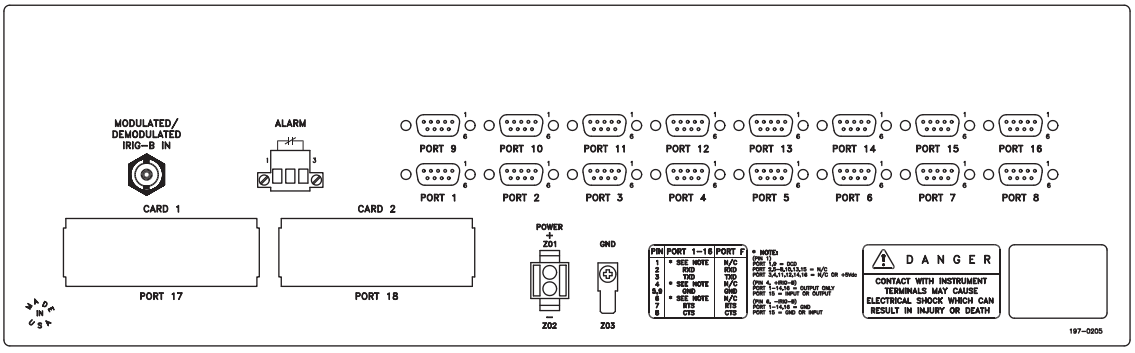
Mechanical Diagrams



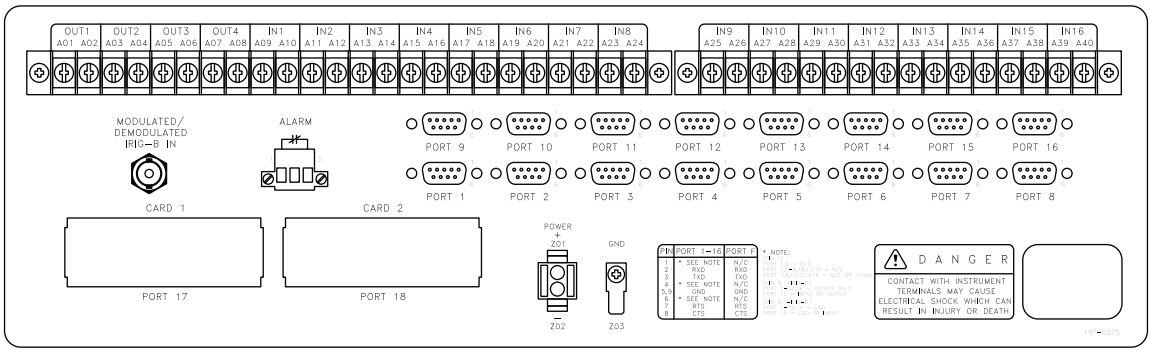
Front-Panel Rack Mount



Front-Panel Panel Mount



Rear Panel Without I/O Board



Rear Panel With I/O Board

Figure 7 SEL-2032 Front and Rear Panels

Mounting Diagrams

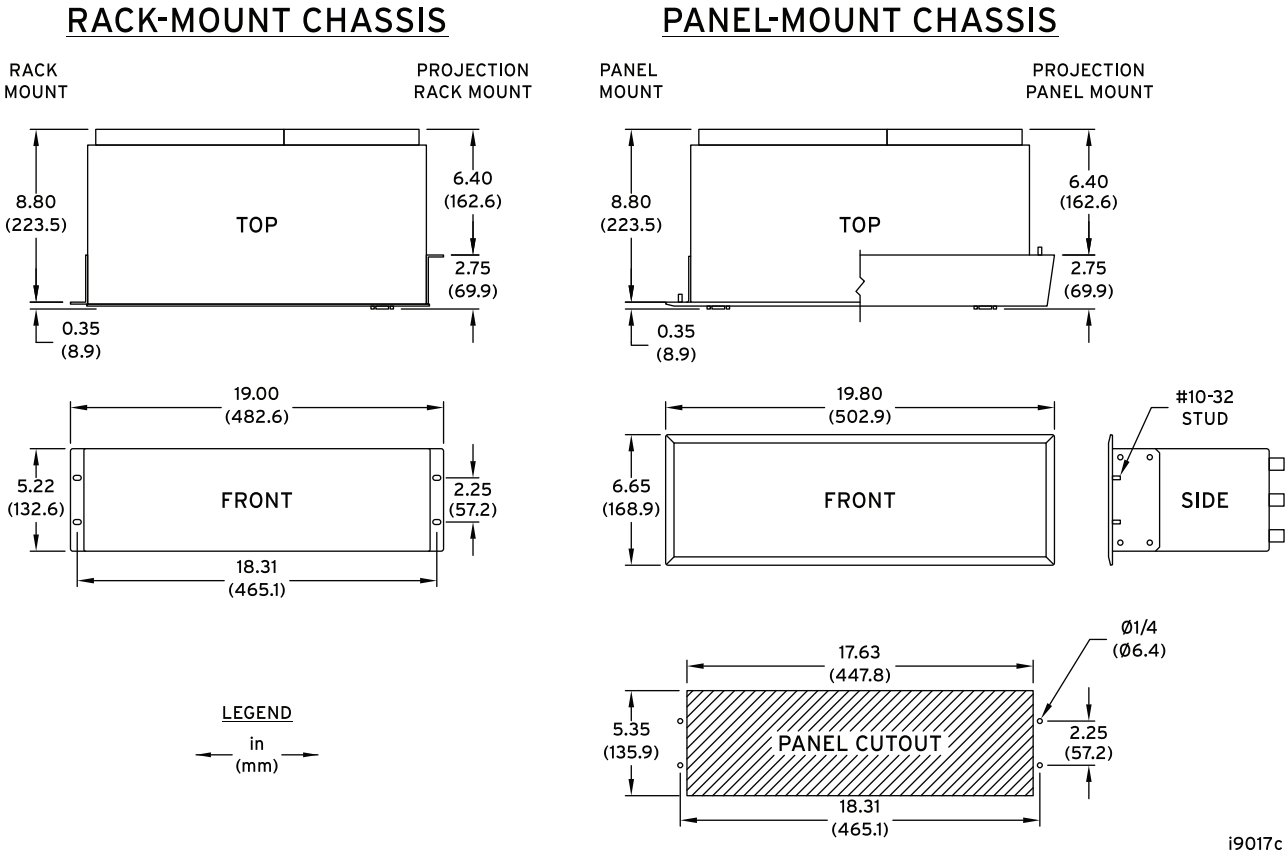


Figure 8 Dimensions and Panel-Mount Cutout

Wiring Diagram

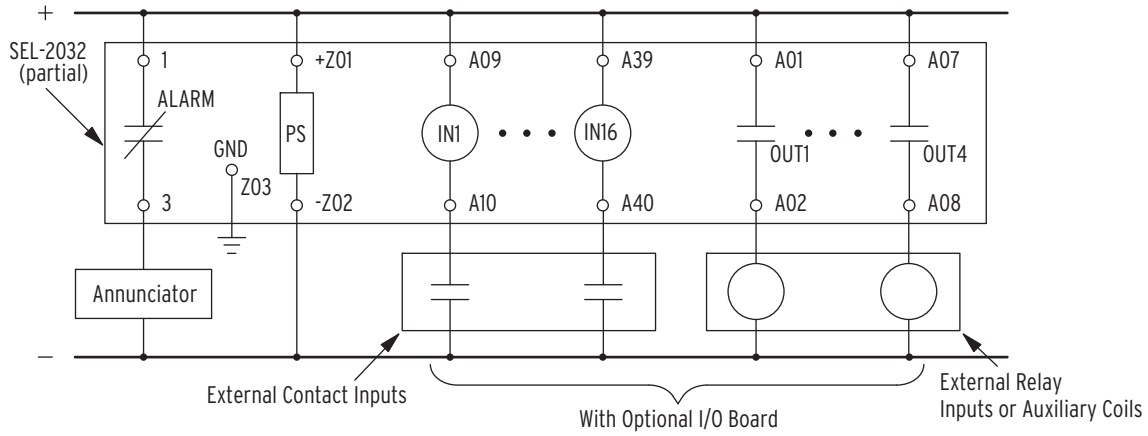


Figure 9 Typical DC Wiring Diagram

Specifications

Compliance

Designed and manufactured under an ISO 9001 certified quality management system

General

Rear Screw-Terminal Tightening Torque

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

Terminal Connections

Terminals or stranded copper wire. Ring terminals are recommended. Minimum temperature rating of 105°C.

Power Supply

Rated:	125/250 Vdc or Vac
Range:	85–350 Vdc or 85–264 Vac
Burden:	<25 W
Rated:	48/125 Vdc or 125 Vac
Range:	38–200 Vdc or 85–140 Vac
Burden:	<25 W
Rated:	24/48 Vdc
Range:	20–60 Vdc polarity dependent
Burden:	<25 W

Output Contacts

Make:	30 A
Carry:	6 A
MOV Protected:	250 Vac RMS/330 Vdc continuous

Note: Make per *IEEE C37.90 Tripping Output Performance Requirements*. MOV per IEC 60255-0-20:1974, using the simplified method of assessment. 50 A for one second.

Optoisolated Input Ratings

Level-sensitive inputs (16 inputs total, with optional I/O board)

24 Vdc:	Operate (pickup) 15–30 Vdc
48 Vdc:	Operate (pickup) 38.4–60 Vdc; Dropout 28.8 Vdc
125 Vdc:	Operate (pickup) 105–150 Vdc; Dropout 75 Vdc
250 Vdc:	Operate (pickup) 200–300 Vdc; Dropout 150 Vdc

Note: The optoisolated inputs each draw 4 mA when nominal control voltage is applied.

Serial Ports

1 front-panel/16 rear-panel ports, DB-9 connectors, MOV protected.

Time-Code Input

Connector:	Female BNC and pin-in port 15 connector
Time Code:	Modulated IRIG-B 1000 Vdc isolation Demodulated IRIG-B TTL-compatible

Note: Automatically sets SEL-2032 real-time clock/calendar.

Time-Code Output

Pinout:	Pin 4 TTL-level signal Pin 6 Chassis ground reference
Connectors:	All 16 rear DB-9 port connectors

Note: Outputs are generated from IRIG-B input (when present) or generated by CPU from real-time clock/calendar.

Operating Temperature Range

–40° to +85° C (–40° to +185° F)

Unit Weight

3U rack unit weight:	3.50 kg (7.75 lb)

Production Dielectric Strength

Power supply, logic inputs, and output contacts:	3100 Vdc for 10 seconds

Type Tests and Standards

Electromagnetic Compatibility Immunity

Electrostatic Discharge:	IEC 60255-22-2:1996 [BS EN 60255-22-2:1997] IEC 61000-4-2:1995 [EN 61000-4-2:1995] 2, 4, 6, 8 kV contact 2, 4, 8, 15 kV air
Fast Transient/Burst:	IEC 60255-22-4:1992 4 kV at 2.5 kHz and 5 kHz IEC 61000-4-4:1995 [EN 61000-4-4:1995] 4 kV, 2.5 kHz power supply 2 kV, 5 kHz I/O, signal. data, control lines
Radiated Radio Frequency:	IEC 60255-22-3:1989 10 V/m Exception: 4.3.2.2 freq. sweep approx. with 200 freq. steps per octave IEC 801-3:1984 10 V/m Exception: 9.1 freq. sweep approx. with 200 freq. steps per octave IEEE C37.90.2-1995 35 V/m
Surge Withstand Capability:	IEC 60255-22-1:1988 2.5 kV peak common mode 1.0 kV peak differential mode IEEE C37.90.1-1989 3.0 kV oscillatory 5.0 kV fast transient

Environmental

Cold:	IEC 60068-2-1:1990 + A1:1993 + A2:1994 [BS EN 60068-2-1:1993 + REAF:2005] 16 hours at –40°C
Damp Heat, Cyclic:	IEC 60068-2-30:1980 25° to 55°C, 6 cycles, relative humidity: 95% Exception: 6.3.3 humidity not less than 94%

Dry Heat:	IEC 60068-2-2:1974 + A1:1993 + A2:1994 [BS EN 60068-2-2:1993 + REAF:2005] 16 hours at +85°C
Vibration:	IEC 60255-21-1:1988 [BS EN 60255-21-1:1996 + A1:1996] Class 1 Endurance Class 2 Response IEC 60255-21-2:1988 [BS EN 60255-21-2:1996 + A1:1996] Class 1 Shock Withstand, Bump Class 2 Shock Response IEC 60255-21-3:1993 [BS EN 60255-21-3:1995 + A1:1995] Class 2 Quake Response

Safety

Dielectric Strength:	IEC 60255-5:1977 IEEE C37.90-1989 2500 Vac on contact inputs, contact outputs, and analog inputs 3100 Vdc on power supply 1 minute test
Impulse:	IEC 60255-5:1977 0.5 Joule, 5 kV

Real-Time Clock/Calendar

Battery Type:	IEC no. BR2335 lithium
Battery Life:	10 years
Clock Accuracy:	±20 minutes/year at 25°C (without power applied) ±1 minute/year at 25°C (with power applied) ±1 ms with IRIG-B time-code input

Serial Data Speeds

300, 600, 1200, 2400, 4800, 9600, 19200, 38400 bps

Memory

Base Memory:	1 MB shared RAM, 64 KB EEPROM, 1.75 MB Flash

Plug-In Card Slots

2 card slots; SEL standard shared memory data interface, and virtual terminal support.

Notes

SCHWEITZER ENGINEERING LABORATORIES, INC.
2350 NE Hopkins Court • Pullman, WA 99163-5603 U.S.A.
Tel: +1.509.332.1890 • Fax: +1.509.332.7990
www.selinc.com • info@selinc.com

PDS2032-01

SEL-2032 Data Sheet

Date Code 20150903