



SEL-3301 Protocol Gateway

Improve System Reliability
With Reliable Protocol Conversion



Create integrated systems that use substation-hardened equipment to collect data from station IEDs and provide data to multiple client devices (Network Control Centers, Communication Units, HMIs, etc.) with legacy and industry standard protocols. Use the SEL-3301 to provide simultaneous data collection, control, and time synchronization over a single cable or fiber-optic pair (using the SEL-2810 or SEL-2812 transceivers).

Major Features and Benefits

- **Comprehensive Integration Solution.** Address SCADA legacy protocols, local HMI, and time-synchronization needs.
- **Increase Reliability.** Designed and built to operate reliably in harsh substation environments. Eliminates the need for inverters by using the same power supply as SEL relays. Uses flash-based memory. Has no spinning hard drive. Withstands vibration, electrical surges and fast transients and has a wide operating temperature range.
- **Supports Multiple Clients.** Provide an optimized data set to each client increasing communication performance and efficiency and reducing burden on client devices.
- **Redundant Ethernet Connections.** (Standard)
- **Time Synchronization.** Distribute incoming IRIG-B to connected IEDs.
- **Easy to Use.** Resident intuitive Windows[®]-based interface simplifies protocol configuration. Access configuration with Windows Remote Desktop or monitor, keyboard, and mouse.

Functional Overview

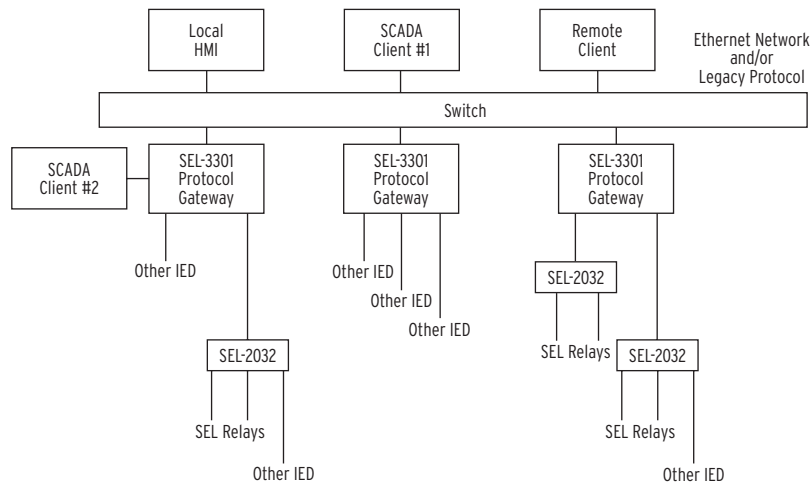


Figure 1 Functional Model

Digital Communications With IEDs

Protocol Server and Client software collects data from Intelligent Electronic Devices (IEDs) through a serial or an Ethernet connection. The software controls the specific protocol drivers and serves the real-time data to other clients through serial, Ethernet, and OLE for Process Control (OPC) connections.

Time Processor

The IRIG-B time-code input maintains the date and time and broadcasts demodulated IRIG-B time code to all rear-panel serial ports and to the SEL-3301.

Ethernet

The Ethernet connection allows the SEL-3301 to connect to redundant, high-speed Ethernet networks. Dual Ethernet allows separate local area networks (LANs) for control and data access.

Applications

Comprehensive Integration Solution

The SEL-3301 provides a comprehensive solution for station integration as shown in *Figure 1*. The SEL-3301 provides real-time data to local clients such as human-machine interfaces (HMIs), communication units, and station units. The SEL-3301 provides time synchronization and data access to the connected IEDs.

Collect and Format Data for Multiple Clients

You can use the SEL-3301 to collect and format relay data for HMIs, legacy Remote Terminal Units (RTUs), and directly to Supervisory Control and Data Acquisition

(SCADA) systems using legacy protocols. Simple settings enable you to individually configure SEL-3301 ports to define their data retrieval and storage attributes. The SEL-3301 provides a uniform data interface to the data clients so their respective software does not have to specifically accommodate each IED type.

Access Data Through Multiple Paths

Different departments in a utility may be interested in different data and different data rates. For example, a real-time data set is collected every second from the IEDs and served by the SEL-3301 to any client via any supported protocol.

Synchronize Relay Clocks in Substations

The SEL-3301 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-3301 from an

external modulated or demodulated source, such as a GPS satellite clock receiver. If no IRIG-B source is available, the demodulated IRIG-B time signal is generated internally by the SEL-3301. The SEL-3301 also accepts network time protocol (NTP) commands to set its internal clock.

Integration Features

The SEL-3301 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-3301 can provide sophisticated communication and data handling capability required for advanced substation integration projects. Data are collected and stored in the SEL-3301 database permitting quick distribution of selected data to multiple data clients using any supported protocol. *Figure 2* shows an example block diagram configuration of the SEL-3301 with SEL communications processors, relays, and peripheral devices connected.

Data Collection and Distribution

You can collect and distribute meter, status, and other information using a simple, but powerful, communications configuration. Likewise, the SEL-3301 reduces the processing burden for these external devices by separating selected data from IEDs so that only the essential information is delivered and in the form and format required.

Drive a Local Human-Machine Interface With Relay Data

Connect a computer to the SEL-3301 through the computer serial or Ethernet port. Using your own HMI software, you can build screens and specify the HMI data definition. You can create commands that instruct the SEL-3301 to send selected data to the standard serial or Ethernet port interface for the HMI package.

Substation Integration and Network Interface

Communication and information handling features make the SEL-3301 ideal for small substation integration projects, eliminating the need for separate substation or communication units. On larger integration projects, the SEL-3301 reduces or eliminates the need for costly network interface devices, otherwise required for each IED. The ability to add protocols allows the use of high-speed networks and allows your protocol choice to change in the future with minimal or no hardware impact.

Time Synchronization

The SEL-3301 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-3301 supports modulated or demodulated time-code input. If there is no external signal, the SEL-3301 generates an IRIG-B signal using an internal clock so you can synchronize device clocks without an IRIG-B receiver or local clock.

Compact Design

The SEL-3301 is available with two mounting styles: one is for mounting in panels and one is for 19-inch racks. You can reverse the mounting ears on the rack-mount case for flush or projection mounting.

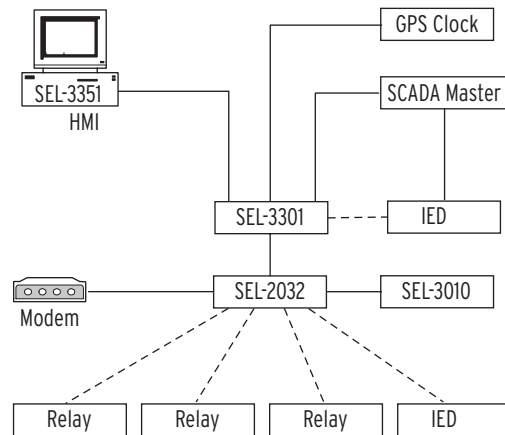


Figure 2 SEL Comprehensive Integration Solution

Guideform Specification

The SEL-3301 Protocol Gateway shall operate both star and multidrop communications networks and provide a combination of functions including automatic transmission of outgoing messages and parsing of responses, data aggregation, simultaneous collection of data from serial and Ethernet server devices (both SEL and non-SEL), and simultaneous data access for multiple client devices. The Protocol Gateway shall provide the operational and functional requirements as follows:

- **Power Supply.** The Protocol Gateway shall be capable of operating on a wide range of power supply voltages and shall be available with one of three power supply types: 85–300 Vdc or 85–264 Vac, 38–140 Vdc or 85–140 Vac, or 20–60 Vdc.
- **Temperature.** The Protocol Gateway shall be capable of continuous operation over a temperature range of -40° to $+75^{\circ}$ C at 50 percent processor burden in order to allow mounting in an outdoor control cubicle. The Protocol Gateway 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 @ $+75^{\circ}$ C), and IEC 60068-2-30:1980 (Test Db 12 + 12-hour cycle @ 25° to 55° C, 6 cycles).
- **Environmental Testing.** The Protocol Gateway 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* for details).
- **Communication Ports.** The Protocol Gateway shall have two USB front-panel ports. Two USB ports, 16 serial ports, and two Ethernet ports shall be located on the rear panel. Two pins on each

serial port shall be available as a demodulated IRIG-B time-synchronization signal. Sixteen rear ports shall have a selectable +5 Vdc output on Pin 1. Each rear serial port shall be capable of operation at 300–115200 bps. Ethernet ports shall be independent. All communication ports shall be ESD and RFI protected.

- **Password Security.** The Protocol Gateway shall have a standard Microsoft® Windows® logon system. The passwords shall be user configurable and allow up to 12 characters including case sensitive letters, digits, and special characters including !@#%&^&*()-_+=+;:;<.>/?'"\. This password scheme meets or exceeds all of the requirements of the DOE Password Guide (DOE G 205.3-1).
- **Database.** Each port shall have a separate database that allows data collection and labeling.
- **Configuration.** Configuration of messages and data processing functions shall be through a simple GUI interface. Configuration interface shall be through local keyboard, mouse, and monitor port or via Windows Remote Desktop.
- **Configuration Storage.** The Protocol Gateway shall store all settings and configuration in nonvolatile memory allowing recovery after prolonged loss of power including failure of the internal battery.
- **Alarm Output.** There shall be an alarm contact output to signal internal errors and malfunctions. The alarm contact shall be controlled by an internal watchdog system that independently monitors the operating system.
- **Warranty.** The Protocol Gateway shall be warranted for a minimum of 10 years.

Front- and Rear-Panel Diagrams

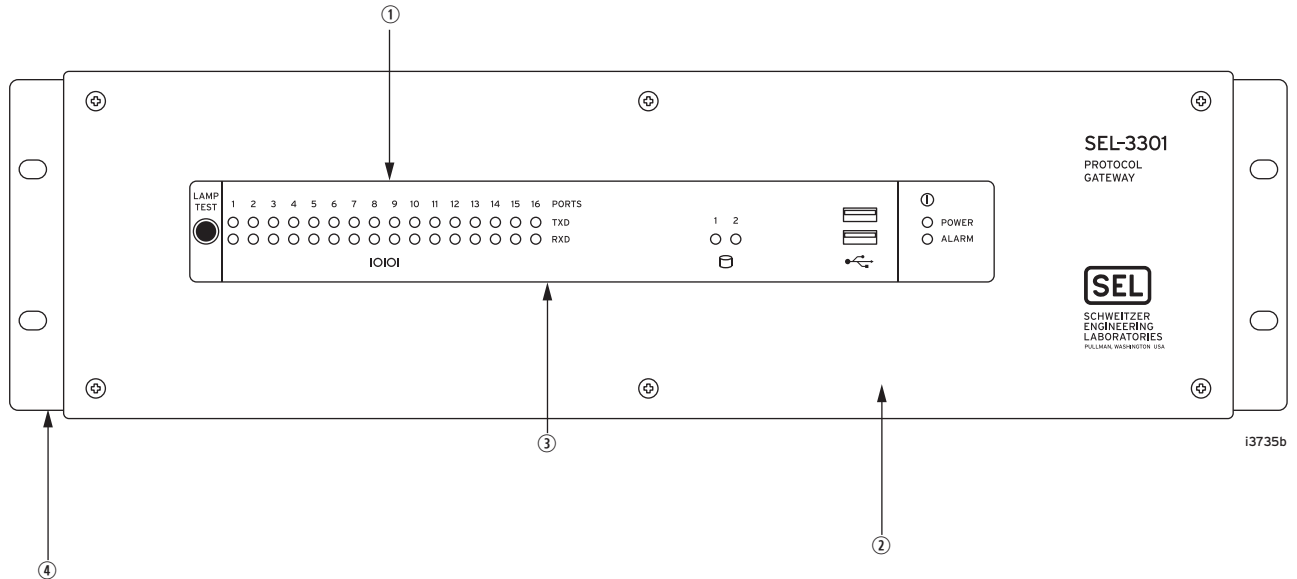


Figure 3 Front-Panel Diagram

- ① LEDs indicate transmitted and received activity on each port for easy checkout.
- ② Rugged enclosure withstands EMI, RFI, shock, and vibration. Clock battery lasts 10 years. No other maintenance is required.
- ③ High-contrast white-on-blue lettering is highly legible even in dark cubicles.
- ④ Reversible flanges for flush or projection mounting.

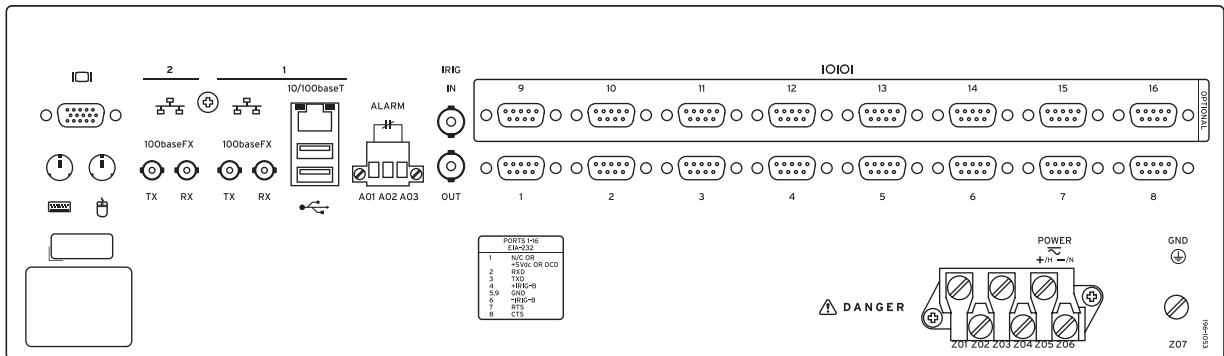
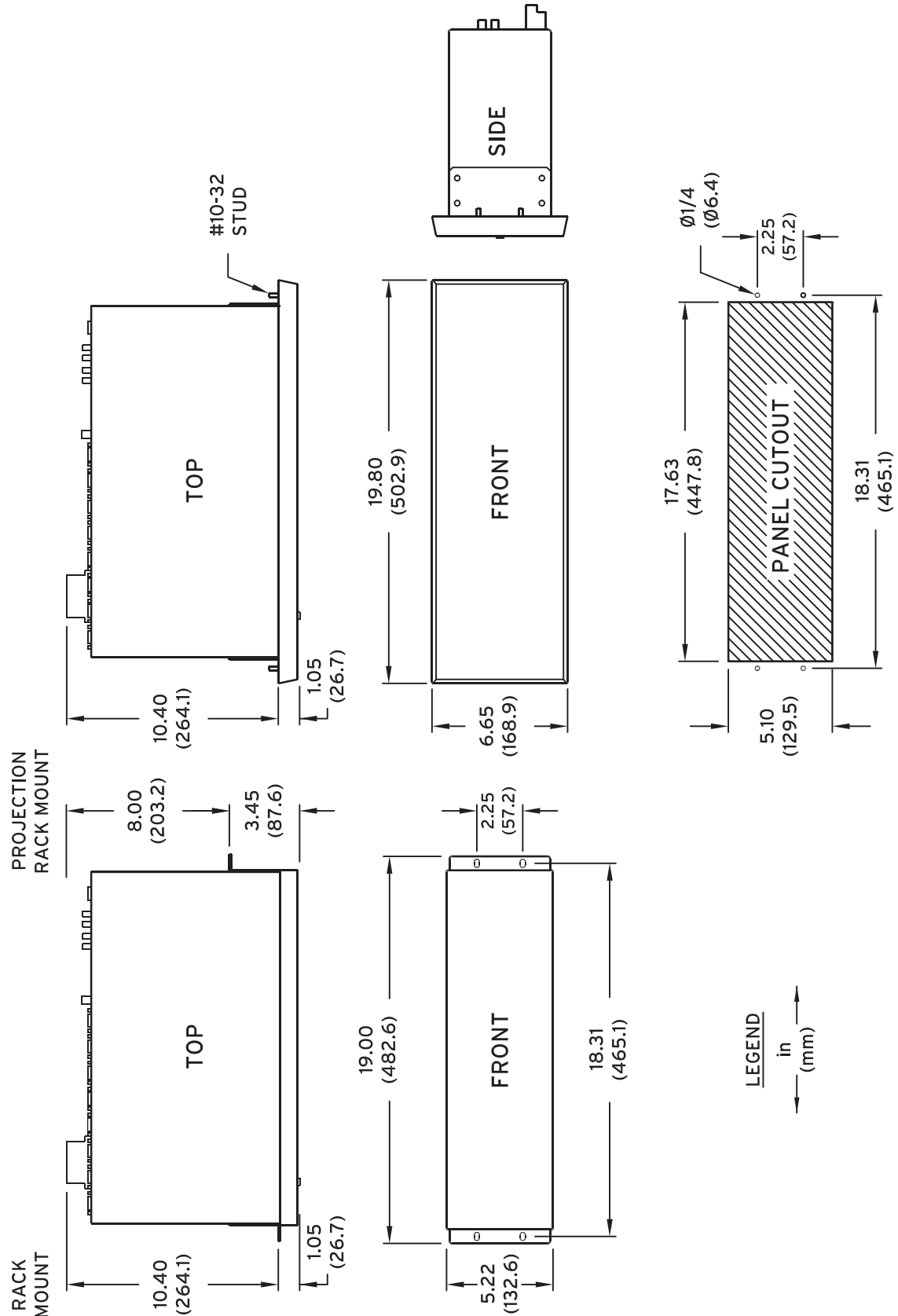


Figure 4 Rear-Panel Diagram

- ① All rear serial ports provide communication and time code. Internal clock generates time code and synchronizes to modulated or demodulated time-code input.
- ② Wide-range power supply.
- ③ All DB-9 connector pin assignments are clearly identified.
- ④ High-contrast white-on-blue lettering is highly legible even in dark cubicles.
- ⑤ Dual Ethernet connection.

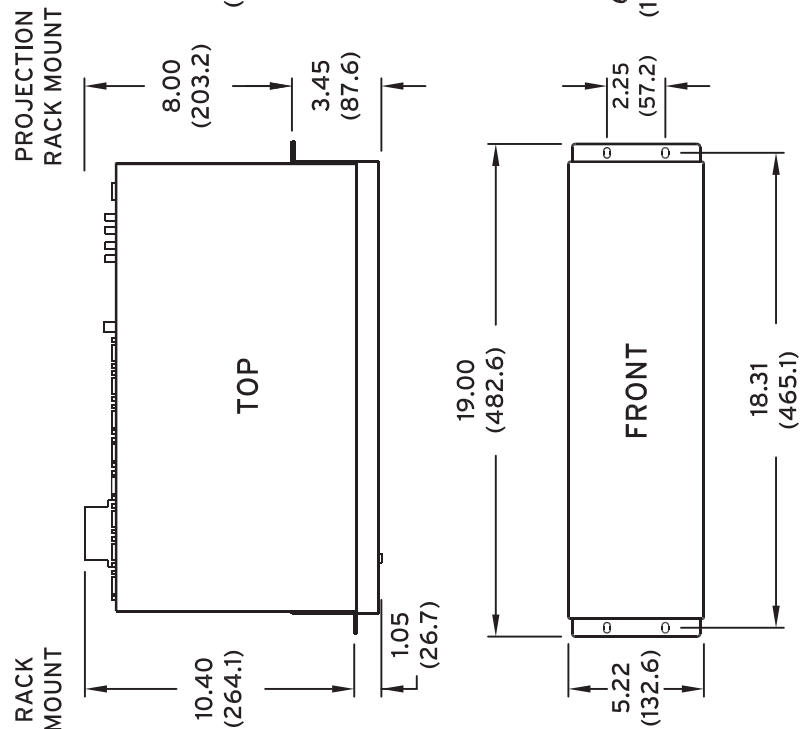
Product Dimensions

PANEL-MOUNT CHASSIS



i9061a

RACK-MOUNT CHASSIS



LEGEND
 in (mm)

Figure 5 Dimension Diagram

Specifications

General

Master Protocols

DNP3 Serial, DNP3 LAN/WAN, OPC Client, SEL Fast Messaging, MODBUS[®], MODBUS TCP/IP

Slave Protocols

DNP3 Serial, DNP3 LAN/WAN, Harris 5000/6000, OPC Server, IEC 60870-5-101, IEC 60870-5-104, Recon, LG 8979

Terminal Connections

Rear Screw-Terminal Tightening Torque

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

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

Power Supply

Option: 125/250 Vdc or 120/230 V
50/60 Hz

DC Range:	85–300 Vdc
AC Range:	85–264 Vac
Frequency Range	30–120 Hz
Burden:	<40 W

Option: 48/125 Vdc or 120 V
50/60 Hz

DC Range:	38–140 Vdc
AC Range:	85–140 Vac
Frequency Range:	30–120 Hz
Burden	<40 W

Option: 24/48 Vdc

DC Range:	20–60 Vdc polarity dependent
Burden:	<40 W

Operating Temperature, Performance

–40° to +75°C (–40° to +167°F)

Operating Temperature, Safety

–40° to +75°C (–40° to +167°F)

Storage Temperature

–40° to +85°C

Relative Humidity

5 to 95% 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

16 rear-panel ports, DB-9 connectors

USB Ports

2 rear-panel ports, 2 front-panel ports

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.

Note: Automatically sets SEL-3301 real-time clock/calendar.

Time Code Output

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

Note: Outputs are generated from IRIG-B input (when present) or generated by SEL-3301.

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, 5kHz 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, 5kHz 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

Memory

RAM:	256 MB
CompactFlash:	512 MB

Plug-In Card Slots

Second CompactFlash card.

Certifications

ISO: SEL-3301 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)

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This product is covered by the standard SEL 10-year warranty. For warranty details, visit www.selinc.com or contact your customer service representative.

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