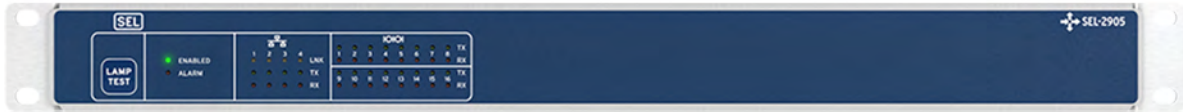




# SEL-2905 Serial Port Expander

## Seamless Serial Expansion With Native Integration



### Key Features and Benefits

Traditional serial port expansion solutions often force utilities to add IP-addressable devices, which increases the compliance scope and engineering effort required. The SEL-2905 Serial Port Expander eliminates this tradeoff by expanding serial capacity for systems running the SEL Real-Time Automation Controller (RTAC) or SEL Port Server operating system over Ethernet, without introducing IP-connected equipment.

Each SEL-2905 adds 16 software-selectable EIA-232, EIA-422, or EIA-485 serial ports. By using multiple expanders, users can scale systems to as many as 96 serial ports managed by a single RTAC or SEL Port Server. Native integration, simplified configuration, and per-port IRIG-B distribution help streamline commissioning and reduce engineering time when deploying high-density serial communications in harsh environments.

- **Increase serial capacity without adding IP-addressable devices.** Each SEL-2905 expands host serial capacity by 16 ports and supports scaling to 96 serial ports per RTAC or SEL Port Server while avoiding additional networked assets.
- **Integrate serial ports as native resources.** ACSELERATOR RTAC® SEL-5033 software presents all SEL-2905 serial ports as native host ports, eliminating expander-level configuration.
- **Manage expanders from the web interface.** The RTAC or SEL Port Server automatically discovers connected SEL-2905 devices and allows engineers to enable, disable, and manage each unit from one interface.
- **Reduce compliance complexity.** A dedicated, nonroutable Ethernet link between the RTAC or SEL Port Server and the SEL-2905 eliminates IP configuration and avoids adding routable devices.
- **Distribute precise time to connected devices.** Per-port IRIG-B output provides accurate time synchronization to every connected serial device.
- **Power fiber-optic serial transceivers directly.** Configurable +5 V port-level output powers fiber-optic serial transceivers and removes the need for separate power hardware.
- **Operate reliably in harsh utility environments.** The SEL-2905 meets IEEE 1613, IEC 60255, IEC 61000, and IEC 61010 standards and has a –40° to +85°C (–40° to +185°F) operating temperature range.

# Physical Overview



Figure 1 SEL-2905 Front View

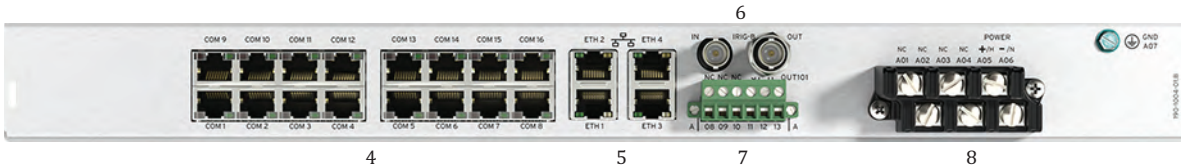


Figure 2 SEL-2905 Rear View

- |                                                                                       |                                                     |
|---------------------------------------------------------------------------------------|-----------------------------------------------------|
| 1. Enabled and Alarm LEDs                                                             | 5. Four built-in RJ45 copper Gigabit Ethernet ports |
| 2. Ethernet port link status and activity LEDs                                        | 6. IRIG-B input/output                              |
| 3. Serial Port activity LEDs                                                          | 7. Form C alarm contact output                      |
| 4. Sixteen built-in RJ45 EIA-232/EIA-422/<br>EIA-485 software-selectable serial ports | 8. Power supply                                     |

## Features

The SEL-2905 Serial Port Expander provides a simple, scalable solution to increase serial connectivity in systems running the RTAC or SEL Port Server operating system. The SEL-2905 integrates with the host, supports flexible topologies, time-distribution capabilities, and reduced compliance complexity by using a dedicated, nonroutable communications link.

### Standard Comprehensive Serial Support

Each SEL-2905 provides 16 RJ45 serial ports that support software-selectable EIA-232/422/485 communications.

- Baud rates from 300–115200 bps
- Configurable data bits (5 to 8) and parity options (e.g., None, Odd, Even, Space, or Mark)
- Pin 1 +5 Vdc output available to power connected devices
- IRIG-B output for time synchronization

### Four Copper Ethernet Ports

Each SEL-2905 includes four RJ45 copper Ethernet ports that connect to a host device and to additional SEL-2905 units.

### Native Platform Integration

The RTAC or SEL Port Server manages each connected SEL-2905 through the web interface. ACSELERATOR RTAC presents serial ports as native host device ports within project configurations, which simplifies engineering and reduces commissioning time.

### Nonroutable Layer 2 Protocol

The SEL-2905 communicates with the host device through a dedicated, nonroutable Layer 2 link that reduces compliance complexity compared to routable network solutions.

### Flexible Topologies

The SEL-2905 supports daisy-chain and star topologies for connection to a host device. These topologies enable systems to meet specific application requirements.

## IRIG-B Time Distribution

The SEL-2905 distributes accurate IRIG-B time signals from an upstream source through SEL-2905 units to connected IEDs, supporting synchronized event reporting across the system.

## Optional

The SEL-2905 has the following options:

- Conformal Coating
  - Conformally coated circuit boards

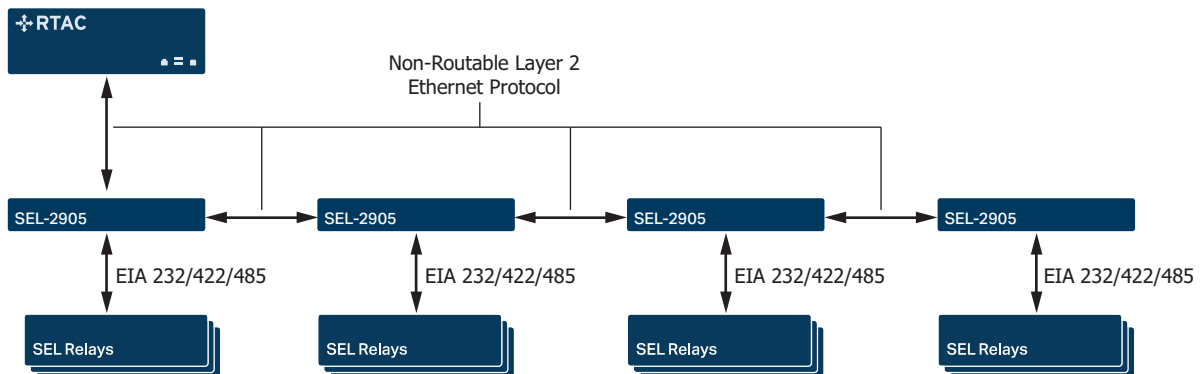
- Chassis and Mounting
  - Horizontal 1U 19-inch rack mount
  - Horizontal 1U panel mount
- Internal Power Supply
  - 24–48 Vdc
  - 48–125 Vdc or 110–120 Vac
  - 125–250 Vdc or 110–240 Vac

## Application Examples

The SEL-2905 device expands serial connectivity and supports multiple network topologies to accommodate a wide range of application requirements. In addition to increasing serial port density, the SEL-2905 distributes IRIG-B time through RJ45 serial ports to deliver synchronized time signals to connected IEDs. The following examples demonstrate how the SEL-2905 simplifies integration while enabling efficient and scalable system expansion.

### Serial Port Expansion Using a Daisy-Chain Topology

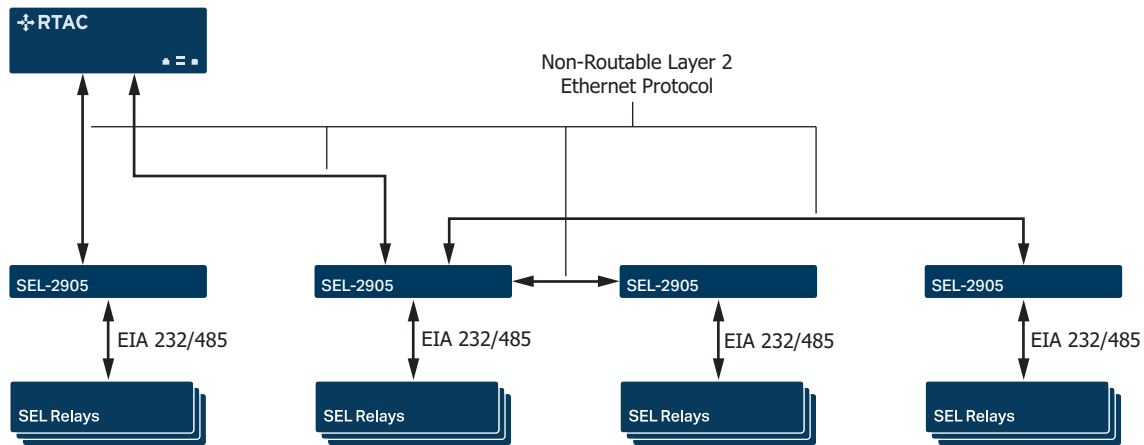
In a daisy-chain design, the controller platform connects to one SEL-2905, and each additional expander connects sequentially (*Figure 3*). This approach increases serial-port density while maintaining isolation from routable, general-purpose Ethernet networks. Each added expander contributes additional serial ports for connected IEDs without introducing IP-addressable devices.



**Figure 3** Daisy-Chain SEL-2905 Units for Serial Port Expansion

### Serial Port Expansion Using a Star Topology

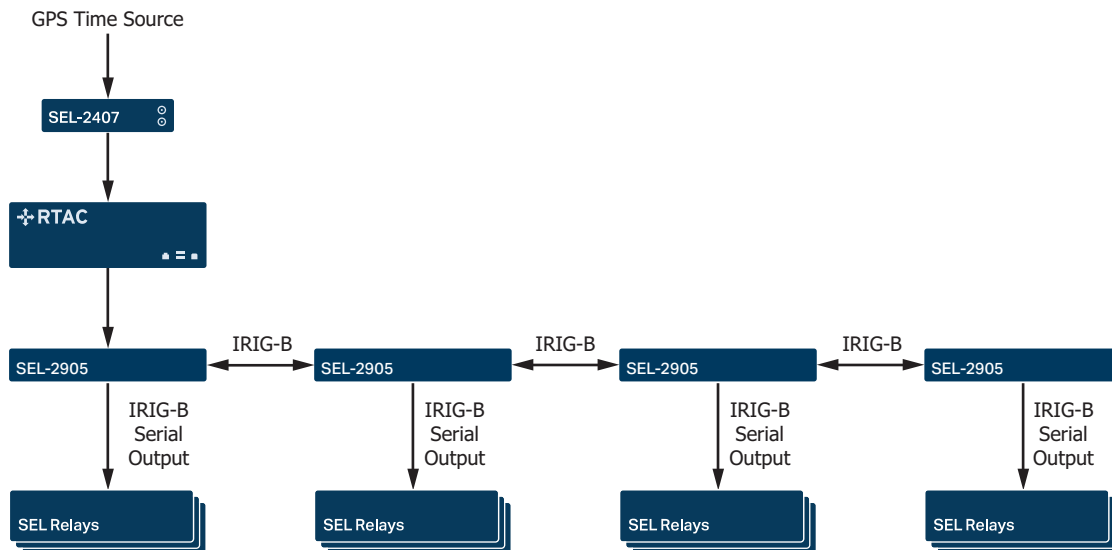
A star topology allows multiple SEL-2905 devices to communicate with the RTAC or SEL Port Server over dedicated connections. In this configuration, each expander connects directly to an Ethernet port on the host device. This configuration also supports a star arrangement between expanders. In *Figure 4*, multiple downstream units connect to a single upstream expander that connects to the host. All communications remain on an isolated, nonroutable Ethernet link, which preserves separation from routable networks and supports scalable expansion.



**Figure 4 Star Topology Using an Isolated Network for SEL-2905 Units**

## Time Distribution Using IRIG-B

To ensure consistent system time synchronization, the SEL-2905 distributes IRIG-B time signals to connected IEDs. In the application shown in *Figure 5*, a GPS time source provides accurate time to an RTAC or SEL Port Server that sends the time signal to the first expander in a daisy-chain topology. Each SEL-2905 can receive and send time signals through the IRIG-B BNC input and output ports, which enable this daisy-chain topology. Each expander then delivers the IRIG-B data to connected IEDs through its RJ45 serial ports.



**Figure 5 IRIG-B Time Distribution Through SEL-2905 Units**

# Diagrams and Dimensions

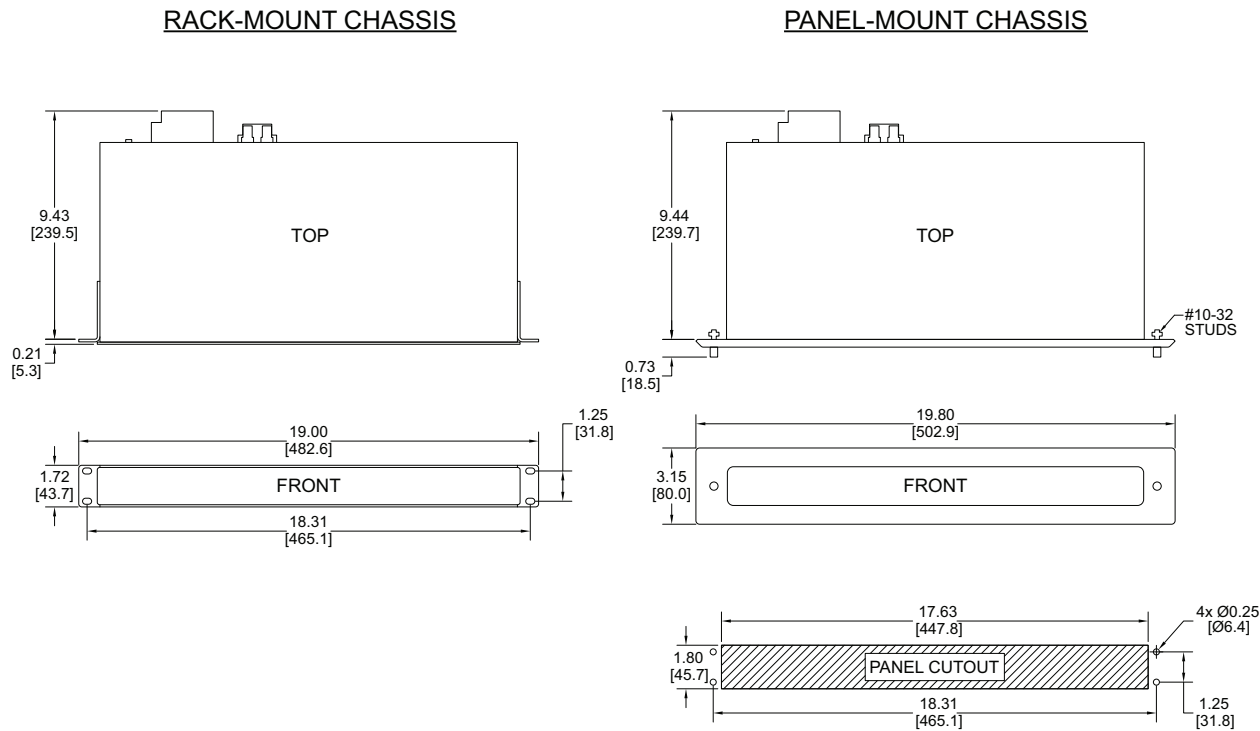


Figure 6 SEL-2905 Diagrams and Dimensions

# Specifications

**Compliance**

Designed and manufactured under an ISO 9001 certified quality management system  
47 CFR 15B Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference in which case the user will be required to correct the interference at his own expense.

UL Listed to U.S. and Canadian safety standards (File E220228; NRAQ)  
CE Mark  
UKCA Mark  
RCM Mark  
RoHS Compliant

**General**

**Operating Environment**

Operating Temperature

Range: -40° to +85°C (-40° to +185°F)

**Note:** UL maximum ambient 40°C. See the instruction manual safety information for additional restrictions.

Storage Temperature

Range: -40° to +85°C (-40° to +185°F)

- Relative Humidity: 5%–95% noncondensing

Insulation Class: 1

Pollution Degree: 2

Overvoltage Category:

| Category    | Maximum Altitude | Atmospheric Pressure |
|-------------|------------------|----------------------|
| Category II | 5,000 m          | 54–110 kPa           |

**Weight**  
1U Chassis: 2.15 kg (4.75 lb) maximum

**Communications Ports**

**Ethernet**

SEL Gigabit Ethernet controllers  
4 rear-panel 10/100/1000 Mbps ports Configuration: 4 RJ45 copper ports

**Serial**

SEL multiport serial controller

|                        |                                                                                                                             |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| EIA-232/422/485 Ports: | 16 ports<br>RJ45 connectors<br>300–115,200 bps<br>2048 byte TX and RX FIFOs each port<br>+5 Vdc port power<br>IRIG-B output |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------|

See *Surge Immunity Cable Length Requirements* for cable length restrictions.

## Time-Code Inputs and Outputs

### Time-Code Inputs

|                          |                                  |
|--------------------------|----------------------------------|
| One BNC IRIG-B Input     |                                  |
| Format:                  | IRIG-B002 or -B004 (demodulated) |
| On (1) State:            | $V_{ih} \geq 2.2 \text{ V}$      |
| Off (0) State:           | $V_{il} \leq 0.8 \text{ V}$      |
| Nominal Input Impedance: | 3.3 k $\Omega$                   |

**Note:** IRIG-B004 control bits comply with IEEE C37.118.1-2011 (reverse compatible with IRIG-B000 and IEEE C37.118-2005).

### Time-Code Outputs

|                                              |                             |
|----------------------------------------------|-----------------------------|
| One BNC IRIG-B Output, All RJ45 Serial Ports |                             |
| Format:                                      | IRIG-B004 (demodulated)     |
| On (1) State:                                | $V_{oh} \geq 2.4 \text{ V}$ |
| Off (0) State:                               | $V_{ol} \leq 0.8 \text{ V}$ |

#### Output Drive Capacity

|                   |                             |
|-------------------|-----------------------------|
| BNC IRIG-B Out:   | TTL 240 mA (> 20 $\Omega$ ) |
| Each Serial Port: | TTL 6 mA (> 400 $\Omega$ )  |

**Note:** IRIG-B004 control bits comply with IEEE C37.118.1-2011 (reverse compatible with IRIG-B000 and IEEE C37.118-2005).

## Alarm Contact Output

### Alarm Contact Output

|                      |                                                  |
|----------------------|--------------------------------------------------|
| Output Type:         | OUT101/Alarm:<br>Relay Form C Break Before Make  |
| Pilot Duty Ratings*: | B300 (UL), AC-15 (IEC)<br>R300 (UL), DC-13 (IEC) |
| Rated Voltage**:     | 24–250 Vdc 110–240 Vrms                          |

**Note:** The voltage across any of the contact output terminals must not exceed the operational voltage.

|                                          |                                                                                                  |
|------------------------------------------|--------------------------------------------------------------------------------------------------|
| Operational Voltage**:                   | 0–300 Vdc<br>0–264 Vrms                                                                          |
| Contact Protection:                      | MOV protection across open contacts<br>264 Vrms continuous voltage<br>300 Vdc continuous voltage |
| Continuous Carry**:                      | 6 A @ 70°C, 4 A @ 85°C                                                                           |
| Pickup/Dropout Time**:                   | $\leq 6 \text{ ms}$ (resistive load)                                                             |
| Power Supply Burden**:                   | $\leq 1 \text{ W}$                                                                               |
| Mechanical Endurance**:                  | 10,000 no-load operations                                                                        |
| Make (Short Duration Contact Current)**: | 30 Adc<br>1,000 operations @ 250 Vdc<br>2,000 operations @ 125 Vdc                               |

**Note:** 200 ms on, 15 s off, current interrupted by independent means.

|                                                        |                                                                   |
|--------------------------------------------------------|-------------------------------------------------------------------|
| Short-Time Thermal Withstand**:                        | 50 A for 1 s                                                      |
| Limiting Making Capacity**:                            | 1,000 W @ 250 Vdc (L/R = 40 ms)                                   |
| Limiting Breaking Capacity/<br>Electrical Endurance**: | 10,000 operations<br>10 operations in 4 s, followed by 2 min idle |

\* Per UL 508 and IEC 60947-5-1 for IEC 61010-2-201 compliance.

\*\* Parameters verified by SEL per IEC 60255-1:2009 and IEEE C37.90-2005.

## Power Supplies

### General

|                                     |                           |
|-------------------------------------|---------------------------|
| Typical Burden*:                    | 6 W, 24 VA (pf = 0.25)    |
| Maximum Burden*:                    | 8 W, 32 VA (pf = 0.25)    |
| DC Ripple:                          | 15% per IEC 60255-26:2013 |
| Input Isolated From Chassis Ground: | Yes                       |

\* See *Surge Immunity Cable Length Requirements* for additional burden information.

### Low Voltage 24–48 Vdc

|                 |                                                       |
|-----------------|-------------------------------------------------------|
| Voltage Rating: | 24–48 Vdc                                             |
| Voltage Range:  | 18–60 Vdc                                             |
| Interruption*:  | 50 ms @ 24 Vdc, 300 ms @ 48 Vdc                       |
| Peak Inrush:    | 5.4 A for 57 ms @ 24 Vdc<br>10.9 A for 77 ms @ 48 Vdc |

### Medium Voltage 48–125 Vdc or 110–120 Vac

|                              |                                             |
|------------------------------|---------------------------------------------|
| Voltage Rating:              | 48–125 Vdc, 110–120 Vac                     |
| Operational Voltage Range:   | 38–140 Vdc, 85–140 Vac                      |
| Frequency Rating:            | 50/60 Hz                                    |
| Operational Frequency Range: | 30–120 Hz                                   |
| Interruption*:               | 50 ms @ 48 Vdc,<br>500 ms @ 125 Vdc/110 Vac |

### High Voltage 125–250 Vdc or 110–240 Vac

|                              |                                                                                                                                        |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Voltage Rating:              | 125–250 Vdc, 110–240 Vac                                                                                                               |
| Operational Voltage Range:   | 85–300 Vdc, 85–264 Vac                                                                                                                 |
| Frequency Rating:            | 50/60 Hz                                                                                                                               |
| Operational Frequency Range: | 30–120 Hz                                                                                                                              |
| Interruption*:               | 100 ms @ 125 Vdc/110 Vac<br>500 ms @ 250 Vdc/220 Vac                                                                                   |
| Peak Inrush:                 | 5.4 A for 36 ms @ 125 Vdc<br>10.9 A for 49 ms @ 250 Vdc<br>6.7 A for 45 ms @ 110 Vac (156 Vdc)<br>14.6 A for 53 ms @ 240 Vac (339 Vdc) |

\* Tested per IEC 60255-26:2013 with a typical workload.

### Recommended External Overcurrent Protection

|                            |                                               |
|----------------------------|-----------------------------------------------|
| Breaker Type:              | Standard                                      |
| Breaker Rating:            | 20 A @ 250 Vdc                                |
| Current Breaking Capacity: | 10 kA                                         |
| Grounded Neutral Systems:  | Device in series with the energized conductor |
| DC and Isolated Systems:   | Device in series with both conductors         |

### Fuse Ratings

#### Low-Voltage Power Supply F1

|                    |                    |
|--------------------|--------------------|
| Type:              | 5x20 mm Time-Lag T |
| Current Rating:    | 5.0 A              |
| Voltage Rating:    | 150 Vdc            |
| Breaking Capacity: | 1,500 A @ 150 Vdc  |

#### Medium-Voltage Power Supply F1

|                    |                            |
|--------------------|----------------------------|
| Type:              | 5x20 mm Time-Lag T         |
| Current Rating:    | 3.15 A                     |
| Voltage Rating:    | 250 Vac, 300 Vdc           |
| Breaking Capacity: | 1,500 A @ 250 Vac, 300 Vdc |

## High-Voltage Power Supply F1

|                    |                            |
|--------------------|----------------------------|
| Type:              | 5x20 mm Time-Lag T         |
| Current Rating:    | 3.1 A                      |
| Voltage Rating:    | 250 Vac, 300 Vdc           |
| Breaking Capacity: | 1,500 A @ 250 Vac, 300 Vdc |

## Terminal Connections

## Ring Lug Screw Terminal

## #8 Ring Terminal Recommended

|              |           |
|--------------|-----------|
| Power Wiring |           |
| Insulation:  | 300 V min |
| Size:        | 14–16 AWG |
| Wire Type:   | Copper    |

## Ring Lug Tightening Torque

|          |                   |
|----------|-------------------|
| Minimum: | 1.0 Nm (9 in-lb)  |
| Maximum: | 2.0 Nm (18 in-lb) |

## Mounting Ear Tightening Torque

|          |                   |
|----------|-------------------|
| Minimum: | 0.9 Nm (8 in-lb)  |
| Maximum: | 1.4 Nm (12 in-lb) |

## Grounding Screw

## #6 Ring Terminal Required

|               |                     |
|---------------|---------------------|
| Ground Wiring |                     |
| Insulation:   | 300 V min           |
| Size:         | 14 AWG, length <3 m |
| Wire Type:    | Copper              |

## Tightening Torque

|          |                   |
|----------|-------------------|
| Minimum: | 0.9 Nm (8 in-lb)  |
| Maximum: | 1.4 Nm (12 in-lb) |

## Product Standards

Communications Equipment in Utility Substations: IEEE 1613-2009 Performance Class 1

**Note:** The following exceptions are applicable to the IEC61850-3 acceptance criteria regarding equipment operation during ac power dips and interruptions (refer to IEC 61850-3 subclause 7.5.5, Equipment function, and 7.5.6, Exceptions).

| Power Supply                                   | Requirement                                   | Exception                   |
|------------------------------------------------|-----------------------------------------------|-----------------------------|
| High Voltage<br>125–250 Vdc or<br>110–240 Vac  | 50 cycle voltage interruptions or dips of 60% | Not Applicable <sup>a</sup> |
| Medium Voltage<br>48–125 Vdc or<br>110–120 Vac | 50 cycle voltage interruptions or dips of 60% | Not Applicable <sup>a</sup> |

<sup>a</sup> Voltage dips or interruptions that are longer than the power supply interruption specification result in a device restart. For critical process applications that require no restarts for power source interruptions or dips longer than 100 ms, equipment is not intended to be directly connected to a public ac low-voltage power supply network. For those applications, an uninterruptible power supply is recommended.

|                                                                    |                                                                                                                                                      |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Industrial Environment:                                            | IEC 61000-6-2:2005<br>IEC 61000-6-4:2006                                                                                                             |
| Electrical Equipment for Measurement, Control, and Laboratory Use: | IEC 61010-1:2010/AMD1:2016/<br>COR:2019<br>UL 61010-1:2019, C22.2 No. 61010-1:12<br>IEC 61010-2:2017<br>UL 61010-2:2018,<br>C22.2 No. 61010-2:201:14 |

|                                            |                                                                     |
|--------------------------------------------|---------------------------------------------------------------------|
| Measuring Relays and Protection Equipment: | IEC 60255-1:2009<br>IEC 60255-26:2013 (Zone A)<br>IEC 60255-27:2013 |
|--------------------------------------------|---------------------------------------------------------------------|

**Note:** To meet Zone A performance, cables must meet length requirements in *Surge Immunity Cable Length Requirements* and shielding requirements in *Section 3: Hardware Setup and Serviceability* in the SEL-3350-1 instruction manual.

|                                                                    |                                                    |
|--------------------------------------------------------------------|----------------------------------------------------|
| Programmable Controllers:                                          | IEC 61131-2:2007                                   |
| Electrical Equipment for Measurement, Control, and Laboratory Use: | IEC 61326-1:2012                                   |
| EMC Immunity for Industrial Environments:                          | IEC 61000-6-2:2005+AC:2005                         |
| EMC Emissions for Industrial Environments:                         | IEC 61000-6-4:2006+A1:2010                         |
| Safety of Laser Products:                                          | EN 60825-1:2014<br>EN 60825-2:2004 +A1:2007+A2:201 |
| Product Ecology:                                                   | EN 63000:2016 RoHS Compliant                       |

## Type Tests

**Note:** To ensure protection-level EMI and EMC performance, type tests were performed using shielded Ethernet and serial cables with the shield grounded at both ends of the cable. Double-shielded cables are recommended for best EMI and EMC performance and required for protection-level performance on Ethernet ports.

## Electromagnetic Compatibility Emissions

|                                             |                                                                                                                                                                                                         |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Conducted and Radiated Emissions (Class A): | CISPR 11:2009+A1:2010<br>CISPR 22:2008<br>IEC 61000-6-4:2006<br>IEC 61850-3:2013<br>FCC 15.107:2014<br>FCC 15.109:2014<br>47 CFR Part 15.109<br>47 CFR Part 15.107<br>Canada ICES-001 (A) / NMB-001 (A) |
| Harmonic Current:                           | IEC 61000-3-2:2014                                                                                                                                                                                      |
| Voltage Flicker:                            | IEC 61000-3-3:2013                                                                                                                                                                                      |

## Electromagnetic Compatibility Immunity

|                                   |                                                                                                                                |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Conducted RF Immunity:            | IEC 61000-4-6:2013<br>Severity Level: 10 Vrms                                                                                  |
| Electrostatic Discharge Immunity: | IEC 61000-4-2:2008<br>IEEE C37.90.3-2001<br>Severity Level:<br>2, 4, 6, 8 kV contact discharge<br>2, 4, 8, 15 kV air discharge |
| Fast Transient/Burst Immunity:    | IEC 61000-4-4:2012<br>Severity Level:<br>4 kV, 5 kHz on power supply and contact I/O<br>2 kV, 5 kHz on communications Lines    |

**Note:** Ports with lengths limited to <2 m (e.g., USB ports) are not evaluated in Fast Transient/Burst.

|                                            |                                                                                                        |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Power Frequency Immunity on Binary Inputs: | IEC 60255-26:2013<br>Severity Level:<br>300 V common mode<br>150 V differential mode<br>50/60 Hz       |
| Conducted Common Mode Disturbance:         | IEC 61850-3:2013<br>Severity Level (Power Input Port):<br>30 V continuous<br>300 V for 1 s<br>50/60 Hz |

|                                                                                                                                                      |                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Magnetic Field Immunity:                                                                                                                             | IEC 61000-4-8:2009<br>Severity Level:<br>1,000 A/m for 3 s<br>100 A/m for 60 s<br>IEC 61000-4-9:2016<br>Severity Level:<br>1,000 A/m<br>IEC 61000-4-10:2016<br>Severity Level:<br>100 A/m for 2 s at 100 kHz and 1 MHz |
| Power Supply Immunity:                                                                                                                               | IEC 61000-4-11:2004<br>IEC 61000-4-17:1999+A1:2001<br>+A2:2008<br>IEC 61000-4-29:2000                                                                                                                                  |
| Radiated Radio Frequency:                                                                                                                            | IEC 61000-4-3:2006+A1:2007+A2:2010<br>Severity Level: 10 V/m<br>IEEE C37.90.2-2004<br>Severity Level: 20 V/m                                                                                                           |
| Slow Damped Oscillatory Waves:                                                                                                                       | IEC 61000-4-18:2006+A1:2010<br>Severity Level:<br>Power supply and contact I/O<br>2.5 kV peak common mode<br>1.0 kV peak differential mode<br>Communications ports<br>1.0kV peak common mode                           |
| Surge Withstand Capability:                                                                                                                          | IEEE C37.90.1-2012 Severity Level:<br>2.5 kV oscillatory<br>4 kV fast transient                                                                                                                                        |
| <b>Note:</b> Ports with lengths limited to <2 m (e.g., USB ports) are not evaluated in Surge Withstand Capability and Slow Damped Oscillatory Waves. |                                                                                                                                                                                                                        |
| Surge Immunity:                                                                                                                                      | IEC 61000-4-5:2005<br>Severity Level per IEC 60255-26:2013*:<br>Zone A:<br>2 kV line-to-line<br>4 kV line-to-earth<br>Zone B:<br>1 kV line-to-line<br>2 kV line-to-earth                                               |

#### Surge Immunity Cable Length Requirements

| IEC 60255-26 Port Classification | Ethernet Length Restrictions | Serial Length Restrictions |
|----------------------------------|------------------------------|----------------------------|
| Zone A Protection                | <10 m                        | <10 m                      |
| Zone A Communication             | None                         | <10 m                      |
| Zone B Protection                | <10 m                        | <10 m                      |
| Zone B Communication             | None                         | None                       |

\* Ports or applications with cable lengths limited to <10 m are excluded from the Surge test.

#### Environmental

|                        |                                                                                                |
|------------------------|------------------------------------------------------------------------------------------------|
| Change of Temperature: | IEC 60068-2-14:2009<br>Severity Level:<br>5 cycles, 1°C per minute ramp<br>-40° to +85°C       |
| Cold, Operational:     | IEC 60068-2-1:2007<br>Severity Level: 16 hours at -40°C                                        |
| Cold, Storage:         | IEC 60068-2-1:2007<br>Severity Level: 16 hours at -40°C                                        |
| Damp Heat, Cyclic:     | IEC 60068-2-30:2005<br>Severity Level:<br>12 + 12-hour cycle<br>25° to 55°C, 6 cycles, >93% RH |

|                        |                                                                                                                                                                                                                                                          |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Damp Heat, Steady:     | IEC 60068-2-78:2012<br>Severity Level:<br>40°C, 240 hours, >93% RH                                                                                                                                                                                       |
| Dry Heat, Operational: | IEC 60255-1:2009<br>IEC 61850-3:2013<br>IEC 60068-2-2:2007<br>Severity Level: 16 hours at 85°C                                                                                                                                                           |
| Dry Heat, Storage:     | IEC 60255-1:2009<br>IEC 61850-3:2013<br>IEC 60068-2-2:2007<br>Severity Level: 16 hours at 85°C                                                                                                                                                           |
| Vibration:             | IEC 60255-21-1:1988<br>Severity Level:<br>Endurance Class 2<br>Response Class 2<br>IEC 60255-21-2:1988<br>Severity Level:<br>Shock Withstand, Bump Class 1<br>Shock Response Class 2<br>IEC 60255-21-3:1993<br>Severity Level:<br>Quake Response Class 2 |

#### Safety

|                        |                                                                                                                                                                            |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enclosure Protection*: | IEC 60255-27:2013<br>Severity Level:<br>IP3X on all surfaces except:<br>IP4X on front surface<br>IP1X on wiring terminals                                                  |
| Dielectric Strength:   | IEC 60255-27:2013<br>IEEE C37.90-2005<br>Severity Level:<br>3600 Vdc on power supply<br>2500 Vac BNC IRIG-B IN<br>1500 Vac on Ethernet ports<br>Type tested for one minute |
| Impulse:               | IEC 60255-27:2013<br>IEEE C37.90-2005<br>Severity Level:<br>5 kV power supply, contact I/O,<br>BNC IRIG-B IN<br>1.5 kV Ethernet ports                                      |

\* Self-declared rating.

**Table 1 System Power Consumption (Watts)<sup>a</sup>**

| Component   | Minimum | Typical | Maximum |
|-------------|---------|---------|---------|
| Base System | 5W      | 6W      | 8W      |

<sup>a</sup> Minimum: 0% load on all components; minimum power consumption started and idle. Typical: 25-50% load on all components; good indication of most application loads. Maximum: 100% load on all components; generally cannot be reached in normal applications.

**Table 2 Peripheral Connection Rated Current Output**

| Connection | Current Limit                           |
|------------|-----------------------------------------|
| COM 1-16   | 0.5 A, +5 Vdc, 2.5 W all ports combined |

# Technical Support

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

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# Notes

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