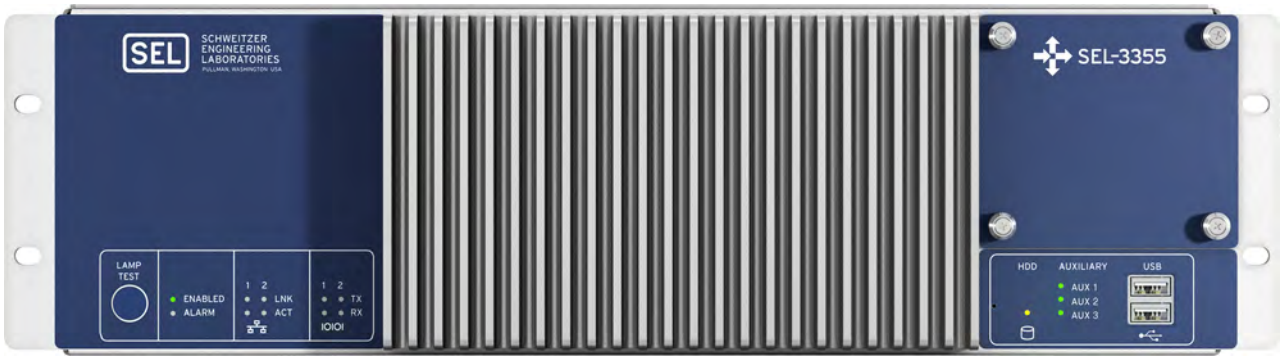
SEL-3355 Automation Controller

Improve Reliability, Availability, and Serviceability With a Rugged Automation Controller



The SEL-3355 Automation Controller uses a high-performance x86-64 architecture processor to support modern operating systems like Microsoft Windows and Linux. The extremely rugged SEL hardware of the SEL-3355 enables you to use your choice of automation controller operating system and software in very harsh environments not suitable for general purpose computers.

Integrate the SEL-3355 in computing applications that demand high performance, reliability, and low maintenance in extreme, harsh environments. The SEL-3355 offers a mean time between failure (MTBF) of at least ten times that of typical industrial computers by: eliminating all moving parts, including rotating hard drives and fans; using high-quality solid-state drives; and using error-correcting memory technology. By eliminating vent holes, the SEL-3355 significantly reduces dust buildup and foreign contaminants. Dual modular, hot-swappable, ac/dc power supplies eliminate the need for external inverters and enhance system reliability, availability, and serviceability. You can install software from SEL and third-party software vendors to customize the SEL-3355 for your specific applications. Every SEL-3355 comes with the unprecedented ten-year, worldwide SEL warranty.

Key Features and Benefits

The SEL-3355 provides a rugged, easy-to-use automation controller platform for substation, industrial, or other harsh environments.

- **x86-64 Architecture With Intel Core i7 Performance.** The SEL-3355 uses the Intel Core i7 microprocessor architecture to deliver very high performance and broad operating system and software compatibility. Multiple processor cores and Intel Hyper-Threading Technology enable you to run multiple time-critical applications simultaneously. Choose between 2.5 GHz dual-core and 2.1 GHz quad-core CPU options.
- **Wide Power Supply Range.** The SEL-3355 supports two load-sharing, hot-swappable power supply modules, enabling you to power the SEL-3355 from two independent power sources for maximum availability and without inverters.

- **More and Faster Mass Storage.** The SEL-3355 supports four, hot-swappable, 2.5" solid-state Serial Advanced Technology Attachment (SATA) drives easily accessible from the front panel. The integrated SATA controller has support for Redundant Arrays of Independent Disks (RAID) to maximize data availability and improve storage performance. High-performance, industrial-rated solid-state drives (SSD) are available as ordering options.
- **Versatile Display Interfaces.** One or two simultaneous independent high-definition display interfaces can be used to connect Digital Visual Interface (DVI) or DisplayPort monitors. Other video connections, such as High-Definition Multimedia Interface (HDMI), are available when using interface adapters.
- **Flexible System Interconnection.** A choice of 6 USB ports and as many as 26 serial ports (with SEL-3390S8 serial expansion card) support optimized I/O connections to various peripherals.
- **PCIe Expandability.** The SEL-3355 supports as many as five standard PCI/PCIe form factor expansion cards, enabling you to customize the system I/O to meet your application needs. Choose from a selection of SEL expansion cards, or install your own custom third-party expansion card enabling new or legacy applications.
- **High-Speed Network Access.** Two 10/100/1000 Mbps Ethernet connections on the rear-panel support high-speed network connectivity and enable connections to independent networks, or redundant paired network connections. Optional network interface cards, such as the SEL-3390E4 quad-gigabit Ethernet card, may be added to the SEL-3355 for additional network connectivity.
- **Remote Management.** Remote access over Ethernet using Windows Remote Desktop or Intel vPro Active Management Technology enables full access to the system video, keyboard, mouse, and storage.
- **Increased Reliability.** The SEL-3355 is designed and built to operate reliably in harsh environments, conforming to IEEE C37.90 and IEC 60255 Protective Relay Standards and IEEE 1613 Standard Environmental and Testing Requirements for Communication Networking Devices in Electric Power Substations. The automation controllerplatform meets or exceeds specifications for vibration, electrostatic discharge, fast transient, radiated emissions, dielectric strength, and pulse magnetic field disturbances.
- I**ncreased Availability.** RAID capabilities, teamed network interfaces, and redundant power supplies provide even higher data availability and maximize system uptime.
- **Increased Serviceability.** Error-correcting code (ECC) system memory can be field upgraded to 16 GB. An easily accessible front-panel drive bay enables field upgrade or replacement of SATA drives. RAID technology and hot-swappable drives allow for replacement or adding storage capacity without taking the automation controller system out of service. Add capabilities with field-serviceable PCIe expansion cards. Achieve a new level of remediation and repair capabilities with Intel vPro technology for local and remote monitoring and repair.

Functional Overview

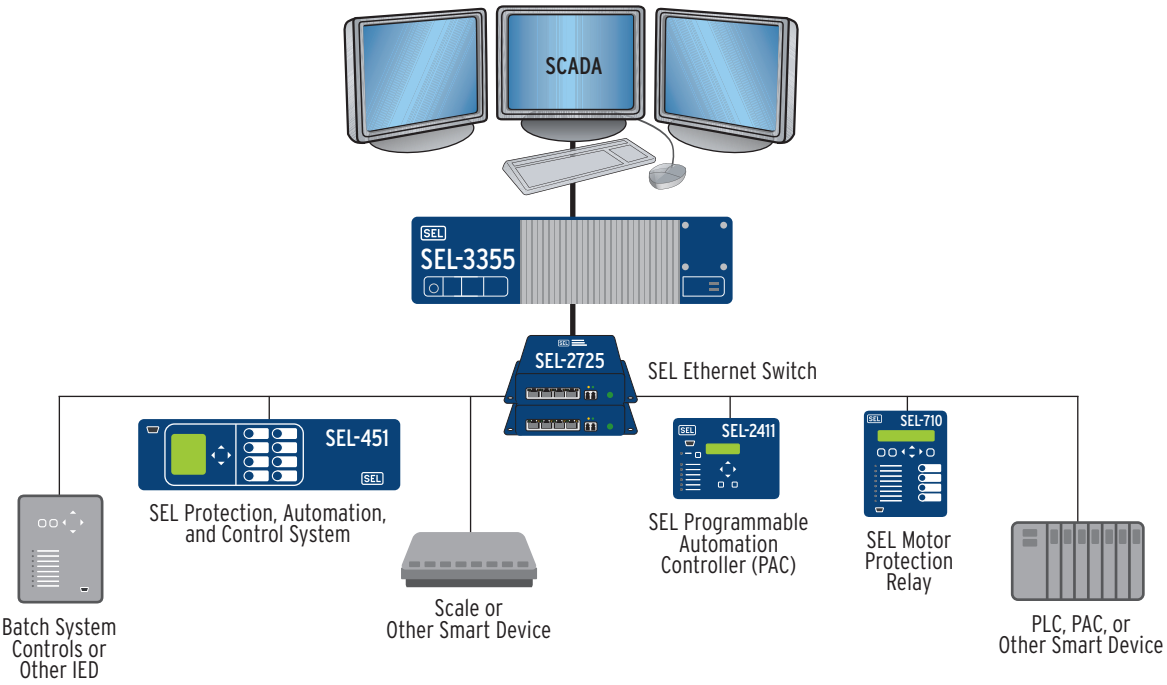


Figure 1 Functional Diagram in Utility Substation Applications

Watchdog Functionality

An embedded controller provides an extra level of automation controller system reliability. One function of the embedded controller is to restart the automation controller if there is an operating system problem or a problem with specific software services running on the operating system.

SEL System Monitor

SEL System Monitor software monitors system performance and component health. Alerts for alarm conditions are issued on configurable thresholds. Example thresholds include CPU usage, free disk space, and available system memory.

Ethernet

Ethernet connections allow the SEL-3355 to connect to as many as ten separate, high-speed Ethernet networks via two built-in gigabit Ethernet ports, plus eight additional ports by using two SEL-3390E4 PCIe network interface cards. Aggregate several ports for increased performance or redundancy or separate local area networks (LANs) for control, data, or engineering access.

Time

The SEL-3390S8 serial expansion card accepts IRIG-B time-code input for precise time input and distribution to connected devices.

EIA-232/EIA-485/EIA-422 Ports

The SEL-3355 automation controller platform comes standard with two built-in EIA-232 DB-9 ports and, optionally, as many as 24 rear-panel EIA-232/422/485 ports with RJ45 format connectors by using the SEL-3390S8 PCIe serial expansion card. Serial expansion communications ports are software selectable to function as standard EIA-232/422/485 ports with +5 V power.

Alarm Output

An alarm contact output on the rear panel can be used to signal internal errors and operating system malfunctions.

Programmable LEDs

Program three front-panel bicolor LEDs for use with your custom applications.

Out-of-Band Management

Intel vPro Active Management Technology (AMT) provides out-of-band management for security, configuration, and monitoring.

Application Examples

Virtualization for HMI and Other Applications

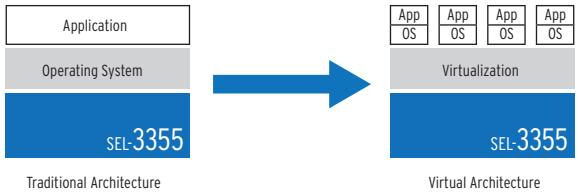


Figure 2 SEL-3355 OS and Application Virtualization Platform

Create your own virtualization appliance by leveraging Intel Virtualization Technology (VT-x) to allow one hardware platform to function as multiple "virtual" platforms. Isolate your computing activity onto separate virtual machines to maintain productivity and realize improved manageability and reduced downtime. For example, run a virtualized OS specifically for your HMI or other essential but noncritical applications. Should your HMI require that the system be restarted, simply restart the virtual machine and avoid an outage for your other critical processes. Similarly, multiple SEL-3355 automation controller platforms may be virtualized and entire operating systems transparently migrated from one physical SEL-3355 to another for hardware upgrades, security or software updates, or testing purposes.

Control System Applications

Use the SEL-3355 for process control applications, including as a human-machine interface (HMI) or for protocol conversion and high-speed control when working with other SEL products and solutions.

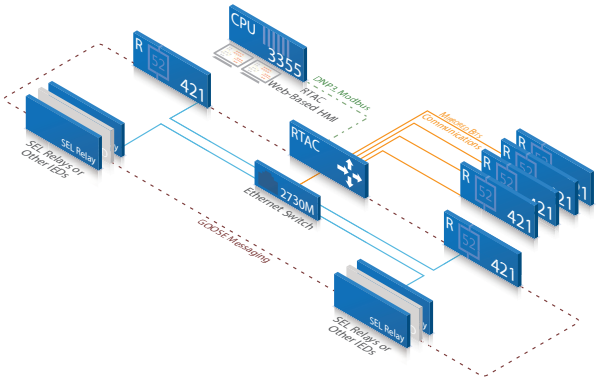


Figure 3 High-Speed Control With SEL MIRRORED BITS and IEC 61850 GOOSE Communications

Security Applications

Improve security with a single sign on (SSO), enabled through using the SEL-3355 as a local Lightweight Directory Access Protocol (LDAP) server. Centrally manage user accounts and group memberships with Microsoft Active Directory or with your choice of back-end database support.

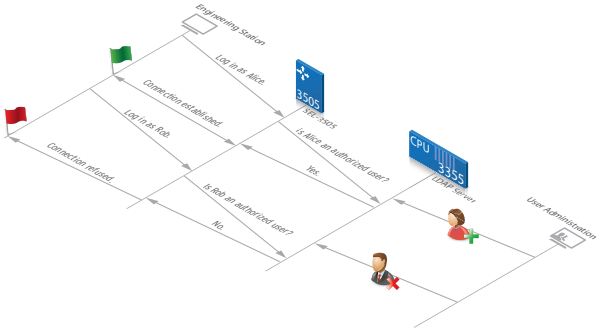


Figure 4 SEL-3355 as Remote Read-Only Domain Controller Performing Central Authentication Using LDAP

Disturbance Recording System for PRC-002-2

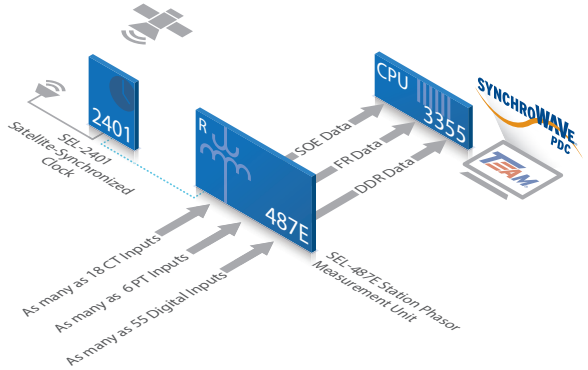


Figure 5 Reliable Hardware for Running Your Disturbance Recording System

Event Collection Applications

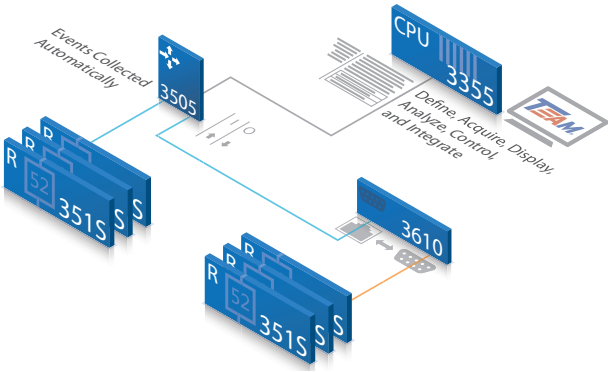
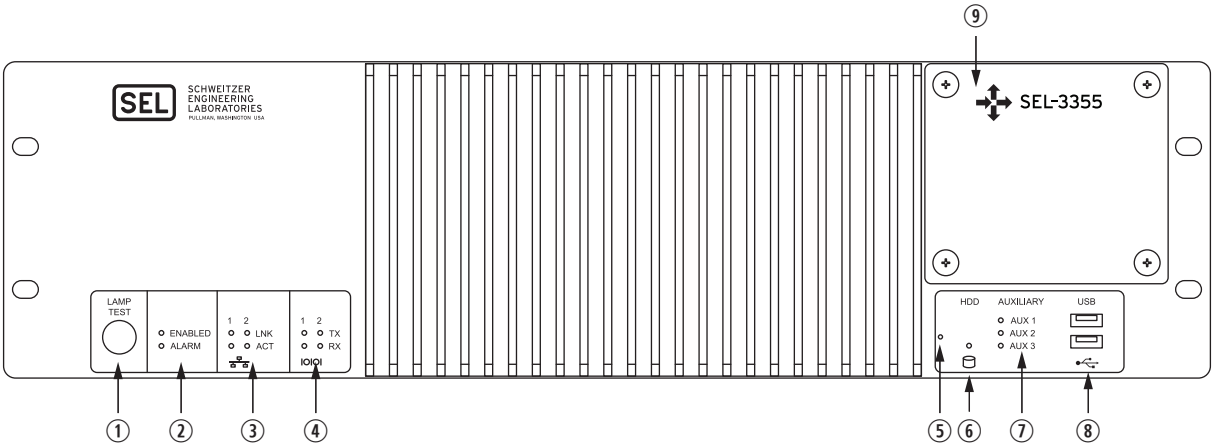


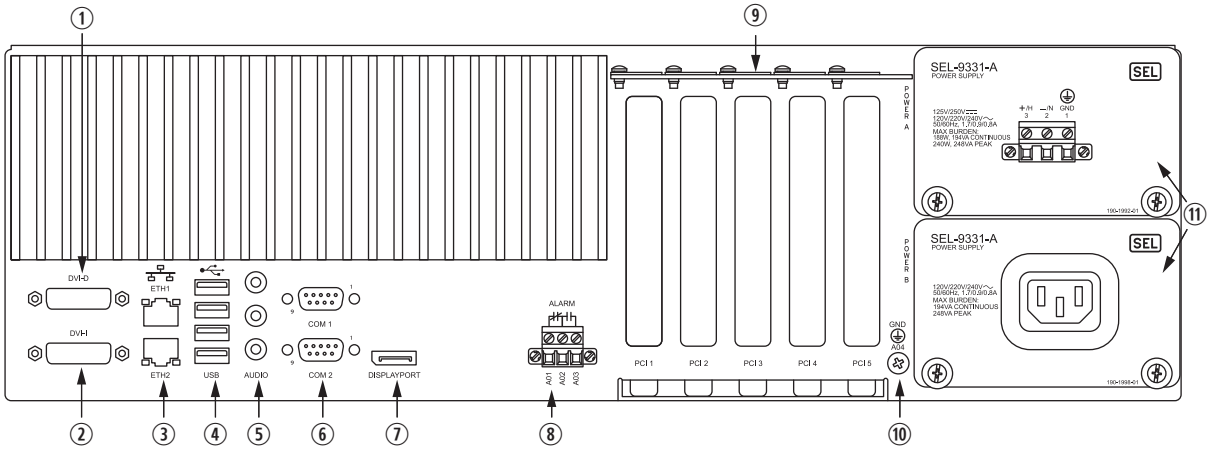
Figure 6 IED Event Collection With Optional ACSELERATOR TEAM® SEL-5045 Software

Diagrams and Dimensions



① **LAMP TEST** Button. Press and hold to test front-panel LEDs. Can be programmed to be an on/off or reset button.
② **ENABLED** and **ALARM** LEDs provide operational status. A green ENABLED LED indicates normal operation. The ALARM LED illuminates red when a nonoptimal system condition exists.
③ **ETHERNET** Status Indicators. Link (LNK) indicates that the port is connected, and activity (ACT) indicates when data are being transmitted and received.
④ **SERIAL** Status indicators. Transmit (TX) and receive (RX) LEDs indicate activity on serial ports.
⑤ **PINHOLE** Button. Provide reset and power functions, and requires a push-pin to prevent accidental use.
⑥ **HDD** Activity Indicator. Illuminates when SATA drives are accessed.
⑦ **AUXILIARY** Status Indicators. Three programmable, bicolor LEDs for your custom application.
⑧ **USB** Ports. Two easily accessible ports to connect USB 2.0 peripherals.
⑨ **SATA** Drive Bay. Removable cover plate enables easy access to SATA drives from the front panel.

Figure 7 SEL-3355 Front-Panel Diagram



① **DVI-D**. Connect digital monitors by using native DVI or an HDMI adapter.
② **DVI-I**. Connect either digital or analog monitors by using native DVI, an HDMI adapter, or a VGA adapter.
③ **ETH1** and **ETH2**. Onboard independent Gigabit Ethernet interfaces.
④ **USB** Ports. Connect as many as four USB 2.0 peripherals at the rear panel.
⑤ **AUDIO** Ports. Line Input (blue), Line Output (green), and Microphone Input (pink).
⑥ **COM1** and **COM2**. Standard EIA-232 serial ports with configurable +5 Vdc power on Pin 1.
⑦ **DISPLAYPORT**. Connect new digital monitors supporting the DisplayPort interface.
⑧ **ALARM**. The Form C alarm contact output can be wired either normally closed or normally open.
⑨ **PCI** Expansion Slots. Install SEL or third-party PCI or PCI Express expansion cards for additional network, serial, or other application-specific I/O.
⑩ **Earth Ground** Terminal Screw. The earth ground connection for the SEL-3355.
⑪ **POWER** supply modules. The rated input voltage is clearly marked on the chassis near the terminals.

Figure 8 SEL-3355 Rear-Panel Diagram

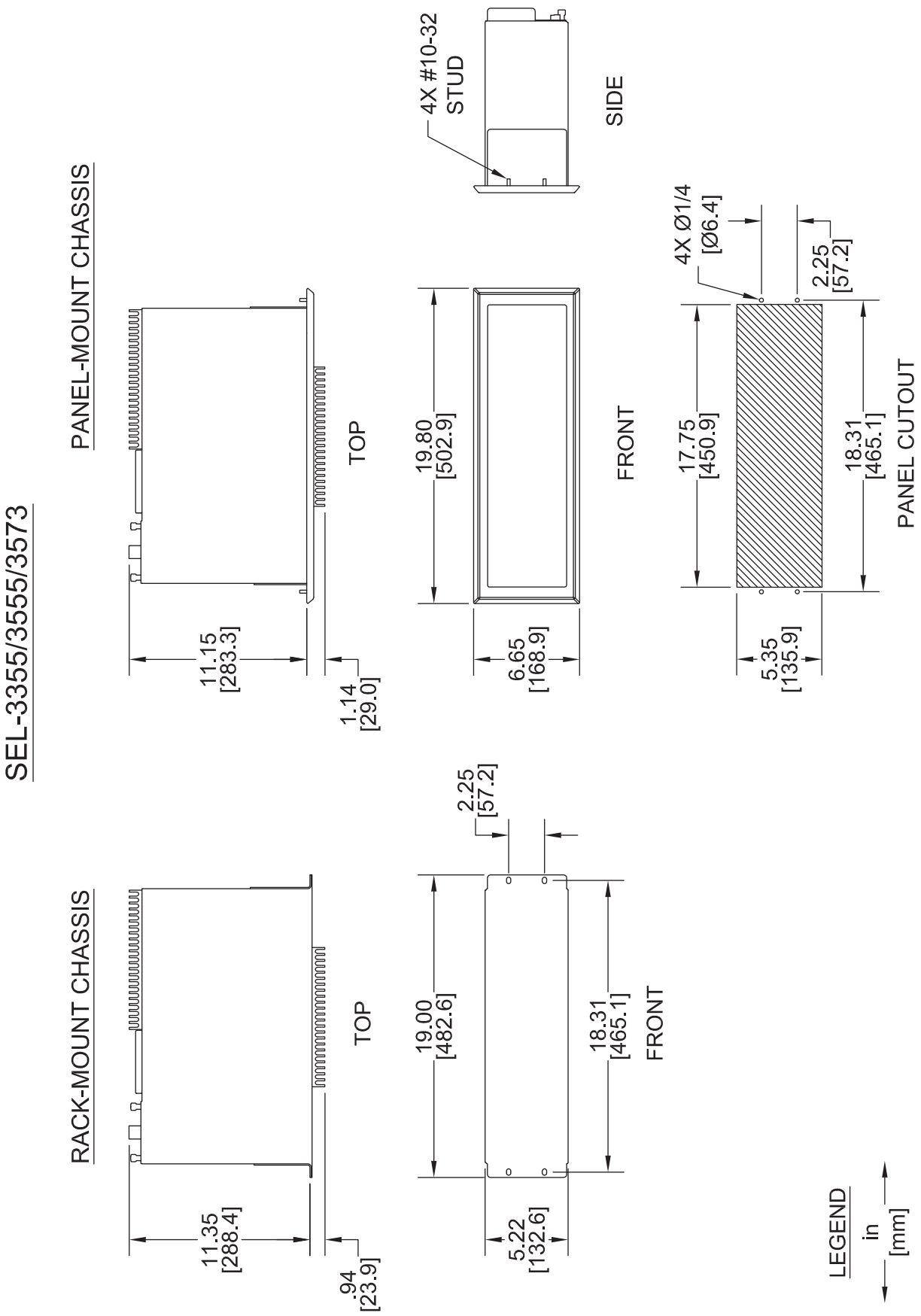


Figure 9 SEL-3355 Dimensions for Rack- and Panel-Mount Models

Specifications

Compliance

Designed and manufactured under an ISO 9001 certified quality management system

47 CFR 15B, Class A

Note: 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 to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

UL Recognized to U.S. and Canadian safety standards (File E220228; NRAQ2, NRAQ8)

CE Mark

UKCA Mark

General

Supported Operating Systems

Microsoft Windows 7
Microsoft Windows 8/8.1
Microsoft Windows 10*
Microsoft Windows Server 2008 R2
Microsoft Windows Server 2012 R2
Microsoft Windows Server 2016*
CentOS Linux 6
CentOS Linux 7
Red Hat Enterprise Linux 6
Red Hat Enterprise Linux 7
VMware ESXi (Contact SEL for hardware and version compatibility)
* Orderable as a factory-installed option.

CPU

Intel Core i7-3555LE Dual-Core

Speed:	2.5 GHz base, 3.2 GHz turbo
Cache:	2 x 256 KB L2, 4 MB L3

Intel Core i7-3612QE Quad-Core

Speed:	2.1 GHz base, 3.1 GHz turbo
Cache:	4 x 256 KB L2, 6 MB L3

RAM

4–16 GB DDR3 ECC PC3-10600 (1333 MHz)

Chipset

Intel QM77 Express Chipset

Mass Storage

Internal Drive Bay:	Supports 2.5 inch SATA drives four industrial-grade drives two consumer-grade drives SATA II 3.0 Gb/s RAID level 0, 1, 5, 10 Hot-Swap Support
Optional SATA Drives:	Industrial-Grade SLC SSD 30–250 GB 10-year warranty Industrial-Grade iMLC SSD 120–480 GB 5-year warranty Consumer-Grade MLC SSD 240–1920 GB 3-year warranty

Video

Intel HD Graphics 4000 Controller

Dual Independent Displays From 2 of the 3 Outputs:	DVI-I (digital + VGA) maximum resolution 1920 x 1200 @ 32 bpp DVI-D (digital only) maximum resolution 1920 x 1200 @ 32 bpp DisplayPort 1.1 maximum resolution 1920 x 1200 @ 32 bpp Cable length <10 m

Audio

TSI (IDT) 92HD91 HD Audio Codec

3 Analog 3.5 mm TRS Jacks:	Line input Line/headphone output Microphone input Cable length <2 m

Intel Display Audio

Digital Audio Outputs:	DVI-I, DVI-D, DisplayPort

USB

4 Rear-Panel ports, 2 Front-Panel Ports
USB 2.0 Compliant
800 mA Current Limit Each
Cable length <10 m

Expansion Cards

5 Half-Length, Full-Height PCI Expansion Card Slots:	2 PCIe x4 (Revision 2.0) 2 PCIe x1 (Revision 2.0) 1 32-bit 5 V PCI

Ethernet

2 Rear-Panel 1 Gb Copper RJ45 Ports

ETH1:	Intel 82579LM, 10/100/1000 Mbps RJ45 copper
ETH2:	Intel 82574L, 10/100/1000 Mbps RJ45 copper
Optional SEL-3390E4 PCIe x4 Expansion Cards:	As many as 8 additional 10/100/1000 Mbps ports, copper or LC fiber SFP

Serial Ports

Standard Ports:	2 EIA-232 ports, DB-9 connectors 300 to 115200 bps
Optional SEL-3390S8 PCIe x1 Expansion Cards:	As many as 24 additional EIA-232/422/485 ports, RJ45 connectors 300 to 921600 bps

(Meets EIA/TIA-562 Specifications)

Time-Code Input/Output

Main Board (Input Only)

Connector:	COM1 DB-9 serial port
Time-Code:	Demodulated IRIG-B TTL compatible

SEL-3390S8 Expansion Card (Input/Output)

Connector:	RJ45 serial port
Time-Code:	Demodulated IRIG-B TTL compatible

Note: Output generated from either IRIG-B input or SEL-3355 clock.

Real-Time Clock/Calendar

Battery Type:	IEC No. BR-2330A Lithium
Battery Life:	10 years with power 2 years without power

BIOS

Phoenix SecureCore Tiano UEFI

Trusted Platform Module

Integrated TPM 1.2

Intel Active Management Technology

Intel AMT v8.1, accessible through ETH1

Power Supply

See *Table 1* for additional burden information.

SEL-9331 160 W LV Power Supply

Voltage Rating:	48 Vdc
Voltage Range:	38–58 Vdc
Maximum Constant Burden:	149 W
Maximum Peak Burden:	225 W
DC Ripple:	<15% rated voltage
Peak Inrush:	15.5 A peak, 48 ms duration Measured per IEC 60255-1, Section 6.10. Quiescent current level derived from 40 W input.
Insulation:	3600 Vdc
Isolated From Chassis Ground:	Yes

SEL-9331 160 W HV Power Supply

Voltage Ratings:	125/250 Vdc or 120/220/240 Vac; 50/60 Hz
DC Range:	100–300 Vdc
Maximum DC Dropout:	88 Vdc
AC Range:	85–264 Vac
Frequency Range:	45–65 Hz
Maximum Constant Burden:	155 W, 160 VA
Maximum Peak Burden:	240 W, 248 VA
DC Ripple:	<15% Rated Voltage
Peak Inrush:	16.6 A peak, 4 ms duration, 240 Vac 12.8 A peak, 9 ms duration, 250 Vdc Measured per IEC 60255-1, Section 6.10. Quiescent current level derived from 75 W input.
Insulation:	3600 Vdc
Power Factor:	>0.9 (at full load)
Isolated From Chassis Ground:	Yes

Recommended External Overcurrent Protection

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

Fuse Ratings

LV Power Supply Fuse:	
Rating:	15 A
Maximum Rated Voltage:	500 Vdc, 500 Vac
Breaking Capacity:	20 kA at 500 Vdc
Type:	Time-lag T
HV Power Supply Fuse:	
Rating:	5 A
Maximum Rated Voltage:	250 Vdc, 277 Vac
Breaking Capacity:	1500 A at 277 Vac
Type:	Time-lag T
Heater Fuses F2, F3:	5 A, 125 V slow blow 125 Vdc/50 A break rating

Fuses are not serviceable.

Alarm Output Contact

Per IEC 255-0-20:1974, using the simplified method of assessment

Output Type:	Relay, Form C, break-before-make
Power Supply Burden:	<1 W maximum
Mechanical Life:	2000000 operations
Operational Voltage:	250 Vac/Vdc
Make:	30 A at 250 Vdc
Carry:	6 A continuous at 70°C
1 s Rating:	50 A
MOV Protection:	270 Vac/360 Vdc, 75 J
Insulation Voltage:	300 Vac/Vdc
Pickup Time:	<8 ms
Dropout Time:	<8 ms

Breaking Capacity (10000 operations):

24 V	0.75 A	L/R = 40 ms
48 V	0.50 A	L/R = 40 ms
125 V	0.30 A	L/R = 40 ms
250 V	0.20 A	L/R = 40 ms

Cyclic Capacity (2.5 cycles/second):

24 V	0.75 A	L/R = 40 ms
48 V	0.50 A	L/R = 40 ms
125 V	0.30 A	L/R = 40 ms
250 V	0.20 A	L/R = 40 ms

Terminal Connections

Compression Screw Terminal

Power Wiring	
Insulation:	300 V min.
Size:	12–18 AWG
Alarm Wiring	
Insulation:	300 V min.
Size:	12–18 AWG
Tightening Torque	
Minimum:	0.6 Nm (5 in-lb)
Maximum:	0.8 Nm (7 in-lb)
Crimp Ferrule Recommended	
Mounting Ear Tightening Torque	
Minimum:	0.18 Nm (1.6 in-lb)
Maximum:	0.25 Nm (2.2 in-lb)

Grounding Screw

Ground Wiring	
Insulation:	300 V min.
Size:	12 AWG, length <3 m

Tightening Torque

Minimum: 0.9 Nm (8 in-lb)

Maximum: 1.4 Nm (12 in-lb)

Ring Terminal Recommended

Serial Port

Tightening Torque

Minimum: 0.6 Nm (5 in-lb)

Maximum: 0.8 Nm (7 in-lb)

Video Port

Tightening Torque

Minimum: 0.6 Nm (5 in-lb)

Maximum: 0.8 Nm (7 in-lb)

Temperature Range

Operating

With i7-3555LE CPU: –40° to +75°C (–40° to +167°F)

With i7-3612QE CPU: –40° to +60°C (–40° to +140°F)

Note: UL ambient 40°C. See *Safety Information* in the SEL-3355 Instruction Manual for additional restrictions.

Storage

–40° to +85°C (–40° to +185°F)

Relative Humidity

5% to 95% noncondensing

Maximum Altitude

5000 m

Atmospheric Pressure

80–110 kPa

Overvoltage Category

Category II

Insulation Class

1

Pollution Degree

2

RoHS Compliance

Compliant with the European Union's RoHS directive

Weight

9.072 kg (20 lb) maximum

Product Standards

Communications Equipment in Utility Substations:	IEC 61850-3:2013 IEEE 1613-2009 Severity Level: Class 1
Industrial Environment:	IEC 61000-6-2:2005 IEC 61000-6-4:2006
Electrical Equipment for Measurement, Control, and Laboratory Use:	IEC 61010-1:2010 UL 61010-1:2016, C22.2 No. 61010-1-12 IEC 61010-2-201:2013
Measuring Relays and Protection Equipment:	IEC 60255-26:2013 IEC 60255-27:2013

Type Tests

Note: To ensure good EMI and EMC performance, type tests were performed using shielded Ethernet and serial cables with the shell grounded at both ends of the cable, and the USB, video, and audio cables with ferrite chokes. Double-shielded cables are recommended for best EMI and EMC performance.

Electromagnetic Compatibility Emissions

Conducted and Radiated Emissions:	CISPR 11:2009+A1:2010 CISPR 22:2008 CISPR 32:2015 IEC 61000-6-4:2006 IEC 61850-3:2013 FCC 15.107:2014 FCC 15.109:2014 Severity Level: Class A
Harmonic Current:	IEC 61000-3-2:2014 Severity Level: Class A
Voltage Flicker:	IEC 61000-3-3:2013

Electromagnetic Compatibility Immunity

Conducted RF:	IEC 61000-4-6:2013 Severity Level: 10 Vrms
Electrostatic Discharge:	IEC 61000-4-2:2008 IEEE C37.90.3-2001 Severity Level: 2, 4, 6, 8 kV contact discharge; 2, 4, 8, 15 kV air discharge
Fast Transient/Burst:	IEC 61000-4-4:2012 Severity Level: Class A 4 kV, 5 kHz on power supply and outputs; 2 kV, 5 kHz on communications lines
Magnetic Field:	IEC 61000-4-8:2009 Severity Level: 1000 A/m for 3 s 100 A/m for 1 m
Power Supply:	IEC 61000-4-11:2004 IEC 61000-4-17:1999+A1:2001+A2:2008 IEC 61000-4-29:2000
Radiated Radio Frequency:	IEC 61000-4-3:2006+A1:2007+A2:2010 Severity Level: 10 V/m IEEE C37.90.2-2004 Severity Level: 20 V/m
Surge Withstand Capability:	IEC 61000-4-18:2006+A1:2010 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 IEEE C37.90.1-2012 Severity Level: 2.5 kV oscillatory 4 kV fast transient
Surge Immunity:	IEC 61000-4-5:2005 0.5, 1 kV line-to-line 0.5, 1, 2 kV line-to-earth 0.5, 1, 2 kV communications ports

Environmental

Change of Temperature:	IEC 60068-2-14:2009 Severity Level: 5 cycles, 1°C per minute ramp –40°C to +60°C (i7-3612QE CPU) –40°C to +75°C (i7-3555LE CPU) IEC 60255-1:2009 IEC 61850-3:2013
Cold, Operational:	IEC 60068-2-1:2007 Severity Level: 16 hours at –40°C

Cold, Storage:	IEC 60068-2-1:2007 Severity Level: 16 hours at –40°C IEC 60255-1:2009 IEC 61850-3:2013
Damp Heat, Cyclic:	IEC 60068-2-30:2005 Severity Level: 12 + 12-hour cycle 25° to 55°C, 6 cycles, >93% r.h.
Damp Heat, Steady:	IEC 60068-2-78:2012 Severity Level: 40°C, 240 hours, >93% r.h. IEC 61850-3:2013
Dry Heat, Operational:	IEC 60068-2-2:2007 Severity Level: 16 hours at 60°C (i7-3612QE CPU) 16 hours at 75°C (i7-3555LE CPU) IEC 60255-1:2009 IEC 61850-3:2013
Dry Heat, Storage:	IEC 60068-2-2:2007 Severity Level: 16 hours at 85°C IEC 60255-1:2009 IEC 61850-3:2013
Free Fall:	IEEE 1613-2009 Severity Level: 100 mm
Vibration:	IEC 60255-21-1:1988 Severity Level: Endurance Class 2 Response Class 2 IEC 60255-21-2:1988 Severity Level: Shock Withstand, Bump Class 1 Shock Response Class 2 IEC 60255-21-3:1993 Severity Level: Quake Response Class 2

Safety

Enclosure Protection:	IEC 60529:1989+A1:1999 Severity Level: IP30
Dielectric Strength:	IEC 60255-27:2013 IEEE C37.90-2005 Severity Level: 3600 Vdc on power supply 2500 Vac on contact output 1500 Vac Ethernet ports Type tested for one minute
Impulse:	IEC 60255-27:2013 IEEE C37.90-2005 Severity Level: 5 kV common mode, power supply, contact outputs 1.5 kV Ethernet ports

Table 1 System Power Consumption

Power Consumption (Watts)[a]			
Component	**Minimum**	**Typical**	**Maximum**
Base System (Dual-Core CPU, 1 PSU, 4 GB RAM, 1 SATA Drive):	25 W	35 W	50 W
Additional Consumption From Optional Components			
Quad-Core CPU:	+2 W	+5 W	+13 W
2nd Power Supply:	+10 W	+10 W	+13 W
2nd RAM Module (4–8 GB):	+2 W	+2 W	+3 W
Additional SATA Drives, each:	+1 W	+2 W	+3 W
SEL-3390E4 Ethernet Card	+6 W	+8 W	+10 W
SEL-3390S8 Serial Card	+4 W	+5 W	+7 W
Chipset Heater[b]			
cold startup (<5°C [41°F]):	N/A	N/A	+90 W
continuous operation (0°C [32°F]):	0 W	+5 W	+10 W
continuous operation (–40°C [–40°F]):	0 W	+20 W	+40 W

[a] 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.
[b] Chipset heaters operate at low temperatures to keep the CPU and PCH within specified operating limits.

Table 2 Peripheral Connection Current Limits

Connection	Current Limit
DVI-I and DVI-D	0.2 A, +5 Vdc, 1 W total for both
DisplayPort	0.6 A, +3.3 Vdc, 2 W
COM 1 and COM 2	0.5 A, +5 Vdc, 2.5 W each
USB Ports	0.8 A, +5 Vdc, 4 W each

Technical Support

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

Schweitzer Engineering Laboratories, Inc.
2350 NE Hopkins Court
Pullman, WA 99163-5603 U.S.A.
Tel: +1.509.338.3838
Fax: +1.509.332.7990
Internet: selinc.com/support
Email: info@selinc.com

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
selinc.com • info@selinc.com

PDS3355-01