



SEL-3610 Port Server



Major Features and Benefits

The SEL-3610 Port Server is an EIA-232 or EIA-485 serial-to-Ethernet cryptographic port server. Increase the amount of available serial ports to communications processors and allow serial products to communicate with each other securely through Ethernet networks. The SEL-3610 communicates using an Ethernet tunnel. The user establishes an Ethernet connection using secure shell (SSH), Telnet, Modbus[®], or raw TCP encapsulation. Communications establish a bond between a logical Ethernet port and a physical serial port.

- ▶ **Provide Serial Tunneling.** Establish serial tunneling over Ethernet. Map any of the 17 serial ports to any of the 3 Ethernet ports with a logical IP address and port.
- ▶ **Modbus to Modbus TCP/IP.** Communicate with serial Modbus products using Modbus TCP/IP.
- ▶ **Support Secure Ethernet.** Protect your data link with SSH.
- ▶ **Ease of use.** Simple configuration and maintenance with a secure web interface that allows for convenient setup and management. PC configuration software has been eliminated.
- ▶ **Establish Time Synchronization.** Synchronize and source IRIG or Network Time Protocol (NTP).
- ▶ **Send Syslog.** Log events with Syslog for consistency, compatibility, and centralized collection.
- ▶ **Authenticate with User-Based Access Control.** Strong access control and individual user accountability.
- ▶ **5 V Pin One Power on Serial Ports.** Directly power 5 V devices from the serial ports.
- ▶ **Improve Reliability.** The SEL-3610 is built for availability, hardened for the substation, and carries a ten-year warranty.

Functional Overview

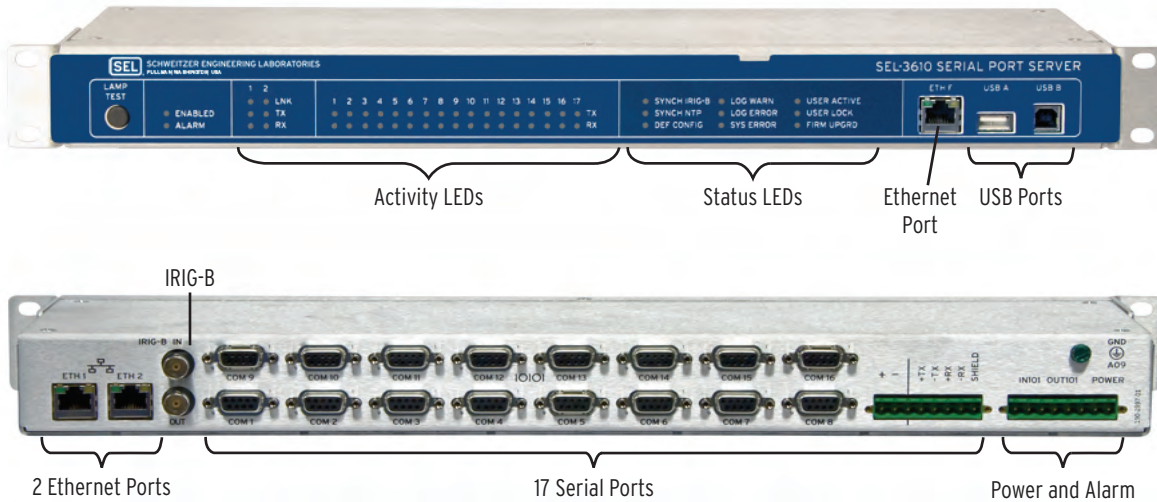


Figure 1 SEL-3610 Functional Overview

The SEL-3610 is a serial port expansion product providing additional serial ports to communication processors or computers. It is an Ethernet-to-serial transceiver for 17 serial devices. The SEL-3610 provides four options to the Ethernet communications: SSH, Telnet, Modbus, or raw TCP encapsulation.

IRIG-B and NTP are used to synchronize and source time. This provides accurate time stamps on all logs as well as providing a time distribution hub for all devices on the network. The SEL-3610 can synchronize its

internal clock with external NTP or IRIG-B sources. If the SEL-3610 is synchronized on IRIG-B it can distribute that time out to all 17 serial devices. The port server can also source NTP from its internal clock source.

A hypertext transfer protocol with security (HTTPS) web interface is an engineering access interface that is easy to configure and maintain and requires only a browser. This allows for local and remote secure management of the device without any external software.



Making Electric Power Safer, More Reliable, and More Economical ©

PLEASE LOG IN

Username:

Password:

This system is for the use of authorized users only. Individuals using this system without authority, or in excess of their authority, are subject to having all their activities on this system monitored and recorded by system personnel. Anyone using this system expressly consents to such monitoring and is advised that if such monitoring reveals possible evidence of criminal activity, system personnel may provide the evidence of such monitoring to law enforcement officials.

If you need further information about logging into the system, or need information about configuration of the system, please refer to the instruction manual.

For support and other technical enquiries, please email support@selinc.com or call (509)509-5000.

For sales enquiries, please email sales@selinc.com or call (509)509-6000.

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Figure 2 Secure, Easy-to-Use Web Management Interface

Syslog protocol is used for all logs enabling central collection and visualization of system log events. Three remote destination collection points can be programmed,

and up to 60,000 logs are stored locally. The SEL-3610 can send logs to three different remote destinations enabling central log collection.

Applications

The SEL-3610 is ideally suited for serial port expansion applications, enhancing serial products to have secure Ethernet engineering access, and point-to-point communication of serial devices over Ethernet.

Serial Port Expansion

Figure 3 shows the SEL-3610 providing serial port expansion for the SEL-3530 Real-Time Automation Controller.

This expands the amount of serial devices the communications processor manages by simply mapping virtual serial ports to the SEL-3610. Communications processors or computers will route Ethernet traffic destined for a serial device hooked to the SEL-3610 across the LAN. Depending on the Ethernet protocol desired the SEL-3610 uses SSH for encrypted and authenticated data communications, Telnet, or raw for unencrypted, serial encapsulated communications. Modbus is a mode that does protocol conversions between Modbus TCP and Modbus RTU or ASCII. Select this mode when using the Modbus protocol.

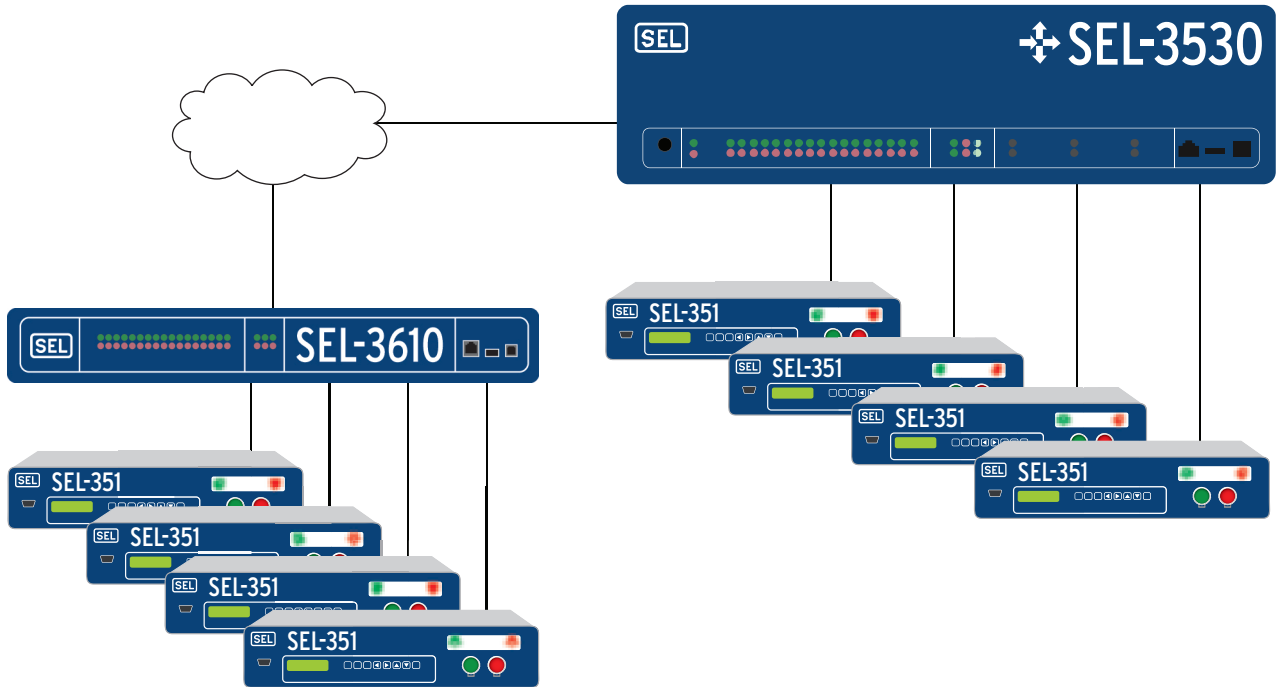


Figure 3 Serial Port Expansion Applications

Point-to-Point

Figure 4 shows the SEL-3610 in a point-to-point application allowing serial devices to communicate to each other across an Ethernet network. The SEL-3610

uses SSH for encrypted and authenticated data communications, Telnet, or raw for unencrypted communications.

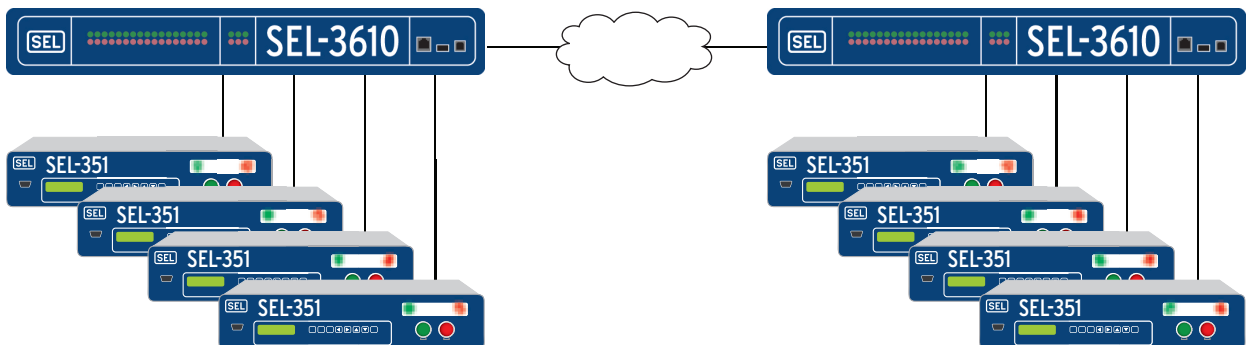


Figure 4 Point-to-Point Application

User Access

User access allows engineers access to serial devices over an Ethernet network. This mode supports SSH for secure Ethernet communication or Telnet for unencrypted connections. The user accesses the correct serial device by establishing an SSH connection to the matching logical Ethernet address and port assigned to the physical serial port. The SEL-3610 authenticates and logs all user access sessions by account name before gaining access to the device on the serial port.

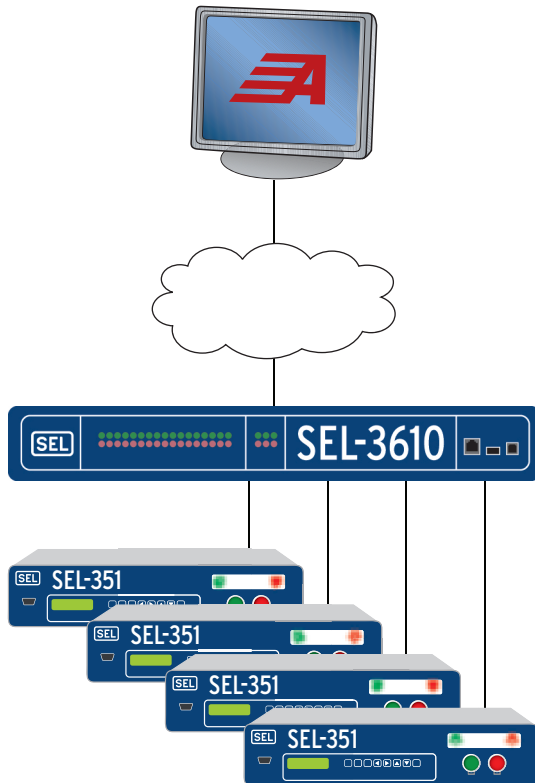


Figure 5 User Access

Time Synchronization and Distribution

The SEL-3610 time synchronizes to either IRIG-B or NTP. This synchronized time is used for time stamps on all logs the SEL-3610 generates.

The SEL-3610 also provides time distribution. Time can be distributed through all enabled serial ports or through any enabled Ethernet port. This means the SEL-3610 provides the accurate time source required by time sensitive applications like synchrophasors. IRIG-B is used to distribute time through all serial ports, and NTP is used to distribute time through all Ethernet ports. If IRIG-B is not sourced to the SEL-3610 the product cannot distribute time.

The port server can synchronize the internal clock to IRIG-B and serve NTP. This allows a satellite-synchronized clock such as the SEL-2407[®] Satellite-Synchronized Clock to source IRIG-B to the SEL-3610, and in turn the SEL-3610 sources NTP to all networked devices.

Log Collection

The SEL-3610 has the capability to store 60,000 logs locally. These logs detail product settings changes, health status, engineering access activities, and other essential changes needed for an operator to achieve a full understanding of the current state of the port server.

These logs are also provided in the syslog format, and are capable of being sent to three different locations. This not only provides a method to ensure an accurate storage of all logs for audit or compliance reasons, but also allows the operator to structure a system architecture to centrally collect logs system wide. This provides more context to the logs and shows the system state and what other products or events were happening at the same time the SEL-3610 log was generated.

There are many viewers available for syslog servers, some are free downloads and others are commercial tools with lots of flexibility. These tools centrally collect and display logs from all system products sending them events which ease the burden on system operations to collect and correlate the system logs. These tools can run on SEL computer platforms.

SSH

SSH provides the SEL-3610 with an encrypted and authenticated communications channel. This security function can be used with either pre-shared keys or with the user providing a username and password. We recommend using this mode whenever possible. SSH protects against eavesdroppers listening in on information as it traverses the communications channel; against man-in-the-middle attacks involving alteration, injection, or replaying of data between communications link endpoints; and against unauthorized access. SSH is at the application layer of the Ethernet communications allowing technicians to continue troubleshooting the links between, and analyzing, the TCP and IP header information.

User accounts with SSH provide strong authenticated access control and individual user authorization and logs actions for accountability. This mode should be used to provide authenticated and encrypted engineering access to serial products behind the SEL-3610 that use global accounts or do not support cryptographic security.

Secure Web Management

All configuration and user management of the SEL-3610 is done through a secure web management interface using HTTPS that utilizes the transport layer security (TLS). This eliminates the need for external software and is compatible with your computer's browser. There is mutual authentication that happens before a secure web management session is opened. The port server authenticates to the user by using a X.509 server-side certificate and the user authenticates to the port server by username and password. From that point on users are restricted to actions that are authorized by the role that their account is assigned. There are two roles: admin and user. The user is authorized to perform any task on the SEL-3610 except create or edit another user's account or

change the authorization rights of their own account. Administrators can perform any action on the SEL-3610, including creating and editing all accounts on the box.

There are limited roles due to the nature of the product. If a user should not be allowed to change settings in the product they should not have an account. The SEL-3610 provides syslog logging eliminating the need for read-only accounts on the SEL-3610 and simplifying account management.

The web management provides simple-to-use graphic configuration pages that display how the port server is configured through network diagrams. This is used as a way of confirming that all configurations are as the operator intends them to be. It also supplies a single place to retrieve all communications channel information and network diagrams associated with the SEL-3610.

The screenshot shows the 'SERIAL PORT MAPPINGS' page in the SEL-3610 web interface. The page includes a sidebar with navigation options like Dashboard, System, User, Network, Serial Ports, Security, Reports, and Help. The main content area shows a table of port mappings with columns for Port #, Name, Remote COM, and Action. Three mappings are listed:

Port #	Name	Remote COM	Action
3	ALL	10.33.22.100-3003	Disabled, Update, Delete
1	Eth F	cloud2com1	Disabled, Update, Delete
9	Eth 1	com9to3009	Disabled, Update, Delete

Figure 6 Serial Mapping Page

Guideform Specification

The SEL-3610 comes with the following features:

- **Ethernet-to-Serial Transceiver.** The device shall support Ethernet-to-serial and serial-to-Ethernet conversions.
- **Modbus Protocol Conversion.** The device shall support Modbus TCP to Modbus RTU and Modbus RTU to Modbus TCP conversions.
- **IRIG-B and NTP Time Synchronization and Distribution.** The device shall be capable of synchronizing to an IRIG-B or NTP input and source IRIG-B or NTP.
- **Nonintrusive Monitoring and Setting.** The device shall provide an Ethernet interface to the HTTPS management port. The management port will be used for configuration settings and monitoring, and will be protected with encryption and authentication algorithms.
- **User-Based Accounts.** The SEL-3610 employs a user-based account structure.
- **Logging.** The SEL-3610 shall support the syslog protocol to enable local logging and remote log collection.
- **Warranty.** The device shall have a minimum 10-year worldwide warranty.

Specifications

Networking

Web Management

Maximum Throughput:	10/100 Mbps
Protection Protocols:	HTTPS, TLS
Authentication:	X.509 and Username/Password
Encryption Key Strength:	128-bit, 256-bit

Ethernet Protocols

Telnet
Secure Shell (SSH)
Raw
Modbus TCP/IP

Security

User-Based Accounts

Maximum Users:	30
Password Length:	8–33 characters
Password Set:	All printable ASCII characters
User Roles:	Admin and User

Syslog

Storage for 60,000 messages
Forwarding to 3 destinations

General

Operating Temperature Range

–40° to +85°C (–40° to +185°F)

Operating Environment

Pollution Degree:	2
Overvoltage Category:	II
Relative Humidity:	5–95%, non-condensing
Maximum Altitude:	2000 m

Dimensions

1U Rack Mount:	482.6 mm W x 43.7 mm H x 159 mm D (19" W x 1.72" H x 6.26" D)
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Weight

2.35 kg (5.2 lbs)

Warranty

10 Years

Processing and Memory

Processor Speed:	533 MHz
Memory:	512 MB DDR2 SDRAM
Storage:	4 GB

Time-Code Input

Serial: Demodulated IRIG-B

On (1) State:	$V_{ih} \geq 2.2 \text{ V}$
Off (0) State:	$V_{il} \leq 0.8 \text{ V}$
Input Impedance:	2 k Ω IRIG accuracy depends on GPS accuracy
Accuracy:	250 μs , NTP accuracy depends on upstream NTP server accuracy and network configuration

Ethernet: Network Time Protocol (NTP)

Accuracy:	10 ms
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Communication Ports

Ethernet Ports

Ports:	2 rear, 1 front
Data Rate:	10 or 100 Mbps
Front Connector:	RJ-45 Female
Rear Connectors:	RJ-45 Female or LC Fiber (100 Mbps only)
Standard:	IEEE 802.3

Serial Ports

Type:	EIA-232/EIA-485
Data Rate:	1200 to 115200 bps
Connectors:	DB-9 Female (Ports 1–16), Isolated 8 pin (Port 17)
Power:	+5 Vdc power on Pin 1 (500 MA maximum)

USB Ports

1 Host Port:	Type A
1 Device Port:	Type B

Power Supply

Input Voltage

Rated Supply Voltage:	125–250 Vdc; 110–230 Vac, 50/60 Hz 48–125 Vdc; 110 Vac, 50/60 Hz
Input Voltage Range:	100–275 Vdc or 88–264 Vac 38.4–137.5 Vdc or 88–132 Vac

Power Consumption

AC:	< 40 VA
DC:	< 30 VA

Input Voltage Interruptions

20 ms @ 48 Vdc
50 ms @ 125 Vac/Vdc
100 ms @ 250 Vac/Vdc

Type Tests

Environmental Tests

Enclosure Protection:	IEC 60529:2001 + CRDG:2003 IP30 excluding the terminal blocks
Vibration Resistance:	IEC 60255-21-1:1988 [BS EN 60255-21-1: 1996] Vibration Endurance, Severity: Class 1 Vibration Response, Severity: Class 2 IEEE 1613-2003 Vibration and Shock
Shock Resistance:	IEC 60255-21-2:1988 [BS EN 60255-21-2: 1996] Bump Test, Severity: Class 1 Shock Withstand, Severity: Class 1 Shock Response, Severity: Class 2 IEEE 1613-2003 Vibration and Shock
Seismic:	IEC 60255-21-3:1993 Class 2
Cold:	IEC 60068-2-1:2007 -40°C, 16 hours IEEE 1613-2003 Service Conditions
Dry Heat:	IEC 60068-2-2:2007 85°C, 16 hours IEEE 1613-2003 Service Conditions
Damp Heat, Cyclic:	IEC 60068-2-30:2005 25-55°C, 6 cycles, 95% relative humidity

Dielectric Strength and Impulse Tests

Dielectric (HiPot):	IEC 60255-5:2000, Section 6: Dielectric Tests IEEE C37.90-2005, Section 8: Dielectric Tests IEEE 1613-2003, Dielectric Strength Section 2500 Vac for one minute on contact inputs, contact outputs 3100 Vdc for one minute on power supply
Impulse:	IEC 60255-5:2000, Impulse Section IEEE C37.90-2005, Impulse Section IEEE 1613-2003, Impulse Section Severity Level: 0.5 Joule, 5 kV

RFI and Interference Tests

EMC Immunity

Electrostatic Discharge Immunity:	IEC 60255-22-2:2008 [BS EN 60255-22-2: 2008] IEC 61000-4-2:2008 [BS EN 61000-4-2: 2008] IEEE 1613-2003 ESD Severity Level 4 8 kV contact discharge 15 kV air discharge
Radiated RF Immunity:	IEC 61000-4-3:2006 10 V/m IEEE C37.90.2-2004, 35 V/m IEEE 1613-2003 RFI
Fast Transient, Burst Immunity:	IEC 61000-4-4:2004 4 kV @ 5.0 kHz 2 kV @ 5.0 kHz for comm. ports
Surge Immunity:	IEC 61000-4-5:2005 2 kV line-to-line 4 kV line-to-earth
Surge Withstand Capability Immunity:	IEC 60255-22-1:2007 2.5 kV common-mode 2.5 kV differential-mode 1 kV common-mode on comm. ports IEEE 1613-2003 SWC
Conducted RF Immunity:	IEC 61000-4-6:2008 10 Vrms
EMC Emissions Conducted Emissions:	IEC 60255-25:2000 Class A
Radiated Emissions:	IEC 60255-25:2000 Class A

Certifications

ISO:	Equipment is designed and manufactured using an ISO 9001 certified quality program.
CE	
EMC:	EN 61000-6-2

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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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