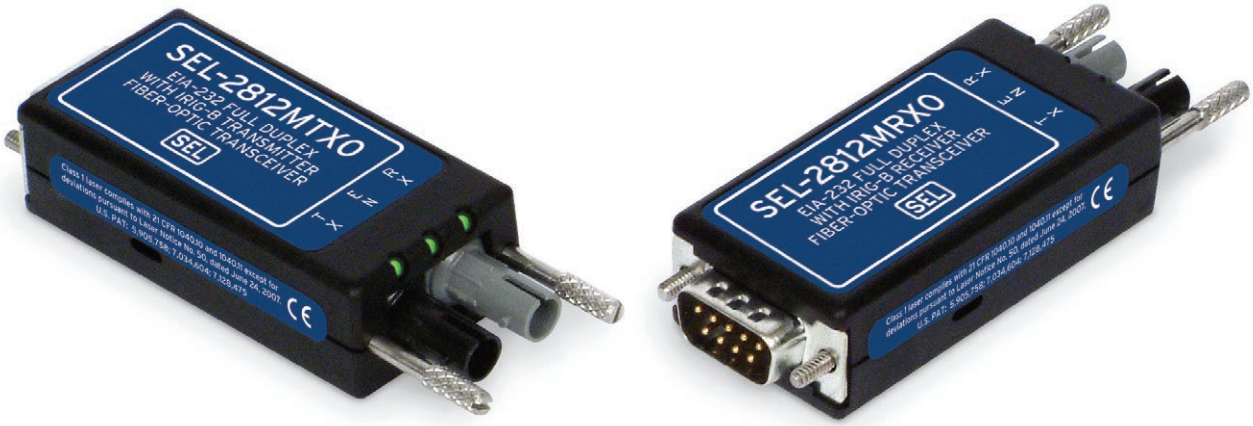
SEL-2812

Fiber-Optic Transceivers With IRIG-B



Enable full-duplex serial communications plus IRIG-B time synchronization with one pair of fibers

- Zero settings and no external power connections make application easy.
- Data and time synchronization with millisecond accuracy reduces cabling and saves costs.
- Fiber-optic cables isolate data communication from ground potential rise and electrical interference.

Features and Benefits

Economically Transfer Data Plus Time Synchronization Signals

Achieve data rates up to 115.2 kbps for a full-duplex serial link with up to 4 kilometers (2.5 miles) of multimode optical fiber. The same transceivers and fibers simultaneously transfer simplex IRIG-B time code.

Achieve Millisecond Timing Accuracy

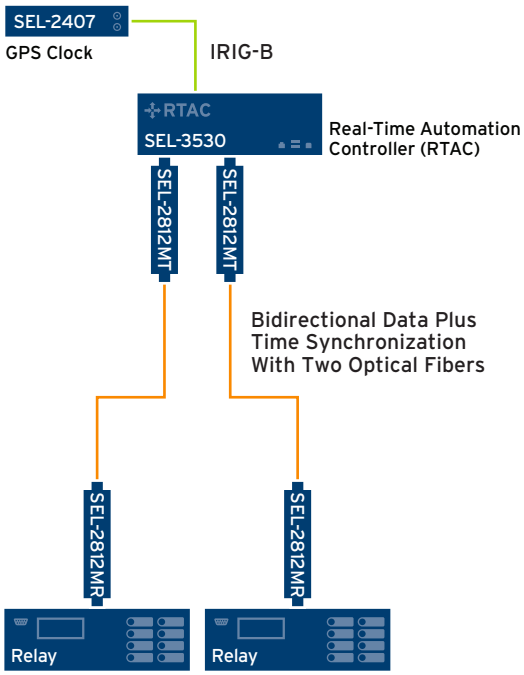
SEL-2812 Fiber-Optic Transceivers With IRIG-B are suitable for time-tagging to the millisecond for SCADA, relay event reports, sequential events recording, and alarm logs.

Apply Easily

You can plug the SEL-2812 directly into a standard 9-pin serial connector (DB-9). No jumpers, settings, or special mounting is required. The transceiver receives power from the host device via the connector; no separate power supply or power wiring is needed. One pair of fibers handles a duplex serial data link and a simplex IRIG-B time code link.

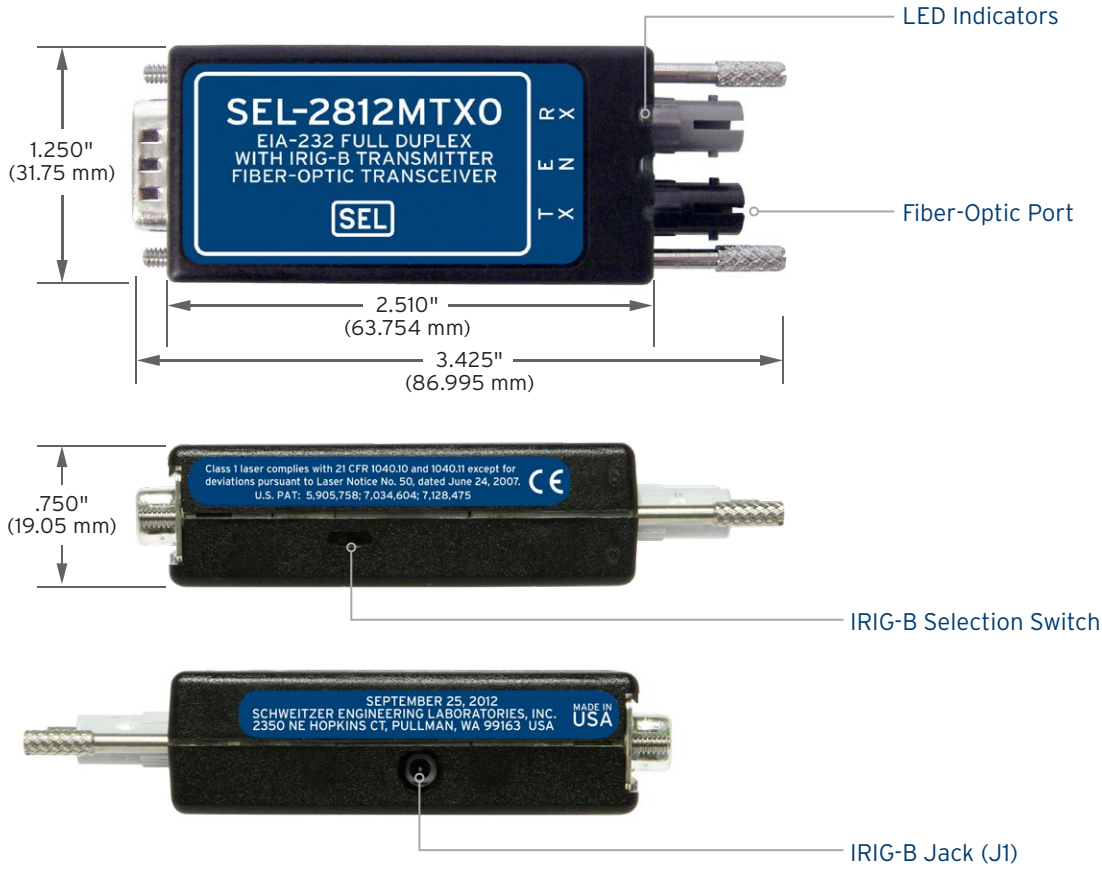
Increase Data Transfer Reliability

Apply the SEL-2812 in harsh electrical and physical environments. The transceiver is far less susceptible to electromagnetic interference (EMI) and radio frequency interference (RFI) than copper links and provides improved isolation from ground potential rise and other electrical hazards.



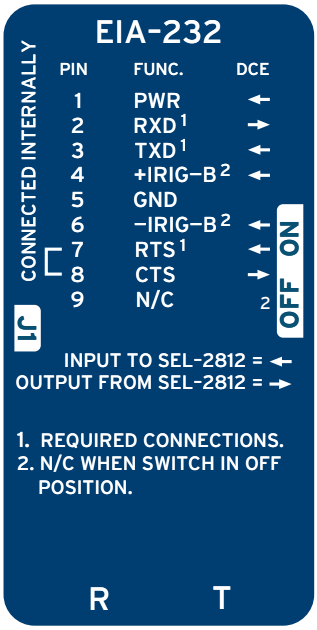
Data plus time synchronization.

Product Overview



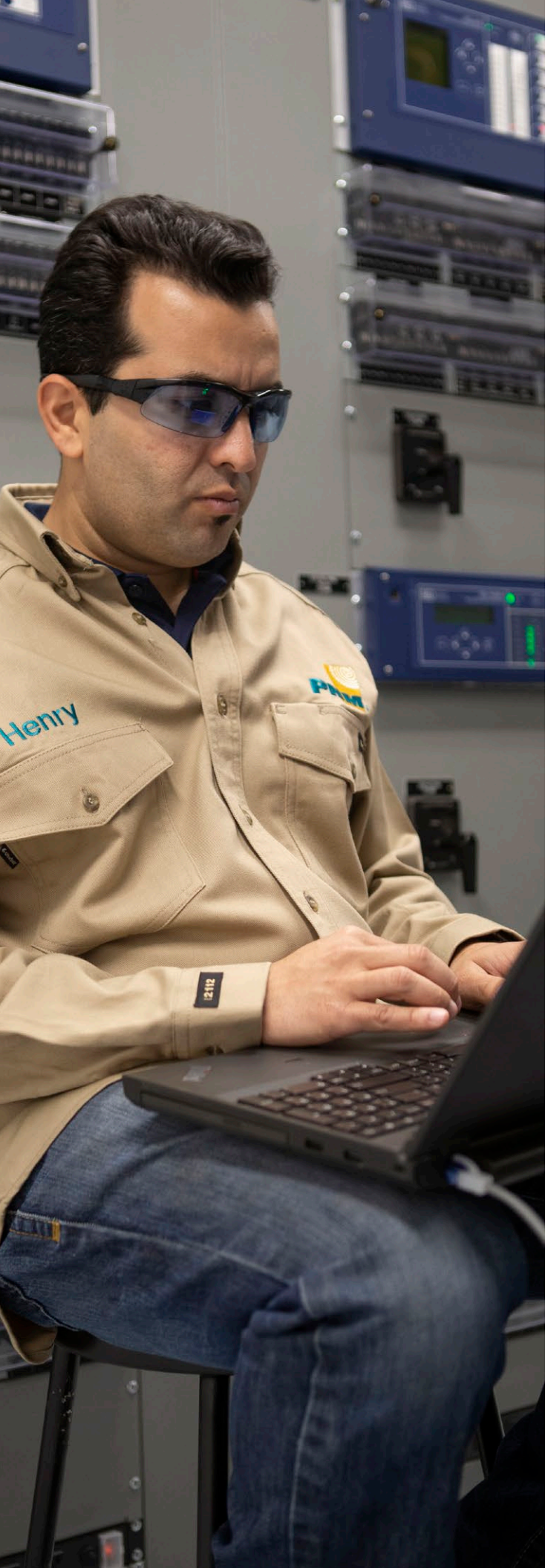
SEL-2812MTX0

SEL-2812FTX0



Back Label With EIA-232 Pin Usage

Imprinted on the bottom of the device.



Application Information

Connecting and Disconnecting Fiber Cable

You can use the supplied connector caps to cover ST connectors that are not connected to a fiber cable to prevent reflected light from appearing as a received message.

Determining Maximum Cable Length

The table below shows maximum cable lengths based on typical fiber loss. The optical power budget includes transmit and receive connector coupling loss; therefore, you can determine the maximum cable length by dividing the total optical power budget by the typical fiber loss/km specification.

To calculate the maximum cable length for your application, first ask your fiber cable supplier for fiber loss/km and connector/splice loss specifications (over the expected temperature range) based on an 850 nm wavelength optical source. Calculate the available optical power budget by subtracting the total connector/splice attenuation from the power budget specification shown in the table below. Divide the available optical power budget by the fiber loss/km specification to determine the maximum cable length.

Example Power Budget

Fiber Type	50 µm
Splice Loss (fusion)	0.2 dB/splice
Fiber Loss at 850 nm	2.7 dB/km
SEL-2812 Optical Budget	12 dB
Less Splice Loss (1 • 0.2 dB)	0.2 dB
Available Power	11.8 dB
Maximum Cable Length	11.8 dB ÷ 2.7 dB/km = 4.37 km

Typical Cable Length

Fiber Diameter (µm)	Available Power (dB)	Typical Fiber Loss (dB/km)	Maximum Cable Length (km)
50	12	2.7	4.44
62.5	12	3.2	3.75
200	12	6.5	1.85

Power, Transmit, and Receive LED indicators

The EN (Power) LED will illuminate red as soon as it has the minimum power applied to Pin 3 and Pin 1 or 7 of the DB-9 serial port.

The Transmit and Receive LEDs illuminate green when the transmit or receive signals of the SEL-2812 are active. These LEDs help verify the function of the transceiver.

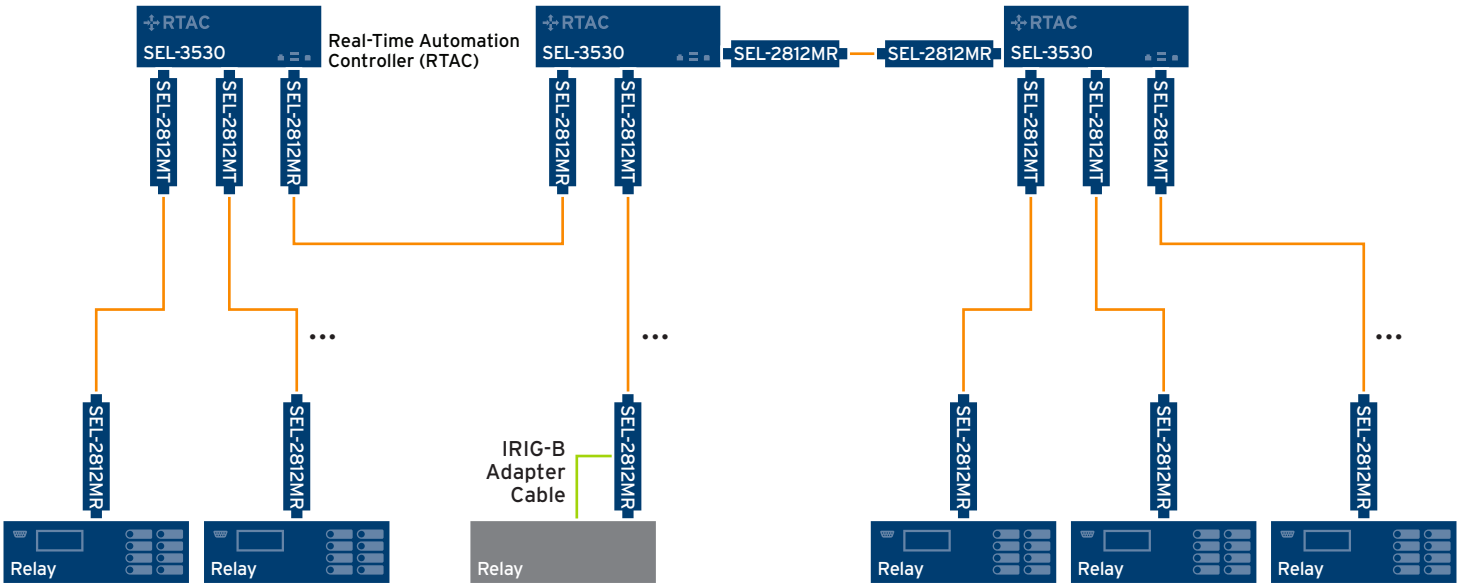
Application Examples

SEL Automation Processors and Relays

Use an SEL-2812MTX0 for each IED port on an SEL information processor. A duplex fiber-optic cable can connect each SEL-2812MTX0 to an SEL-2812MRX0 mounted on each relay or processor. Appropriate adapter cables then connect the IRIG-B output on the SEL-2812MRX0 to the IRIG-B input on the remote device. The information processor communicates with interleaved ASCII and binary messages over the full-duplex serial link by using the same fibers that are also synchronizing the device clocks with simplex IRIG-B signals.

SEL Real-Time Automation Controller (RTAC) and Relays

Connect SEL-2812MTX0 Transceivers to the serial ports of a relay and an SEL RTAC. SEL Mirrored Bits® communications enables high-speed exchange of protection information between generating plants and associated switchyards or between multiple control houses in the same substation. You can transfer to backup protection based on loss of potential or failures detected by diagnostics. The SEL-2812 Transceivers allow you to keep the dc circuits segregated between cabinets and provide directional element-based bus protection.



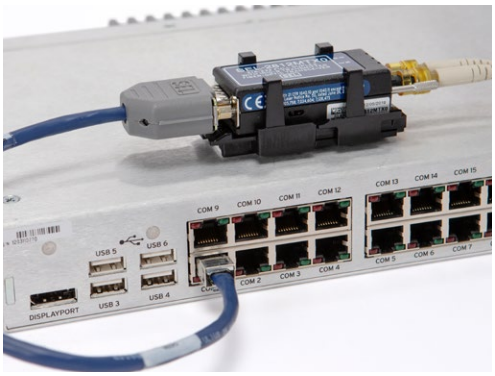
Conformal-Coating Option

The SEL-2812MTX1, SEL-2812MRX1, SEL-2812FTX1, and SEL-2812FRX1 are available with optional conformal coating for additional protection against environmental and chemical contaminants.

Transceiver Mounting Options

Use an SEL Transceiver Mounting Kit and adapter cable when connecting the SEL-2812 to IEDs with an RJ-45 male serial connector or when the mounting depth is an issue (e.g., in switchgear applications). These kits provide a simple and secure way to remote-mount the transceiver away from the host connector:

- 915900573—Mounting Kit for SEL Transceiver; includes mount only
- 915900574—Mounting Kit for SEL Transceiver; includes mount and SEL-C478A cable (6 ft, DB-9 female to RJ-45 male)
- 915900575—Mounting Kit for SEL Transceiver; includes mount and SEL-C641 cable (6 ft, DB-9 female to DB-9 male)



Cables

SEL Multimode Fiber-Optic Cable

SEL-C805 200 µm Core Fiber-Optic Cables are available at the lowest price for distances under 2.0 km (1.24 mi). SEL-C807 Multimode 62.5/200 µm or SEL-C808 Multimode 62.5/125 µm Core Fiber-Optic Cables work best for distances up to 6.25 km (3.88 mi). Options include:

- Standard-duty duplex zipcord for indoor riser applications (2 fibers) not exposed to direct sunlight.
- Heavy-duty waterblocked round cable for indoor and outdoor applications (2 or 4 fibers).

Each link between SEL-2812 Transceivers uses two fibers. You can specify the length you need when ordering optical cables that are terminated at the SEL factory with ST connectors. Or, you can order bulk unterminated cable, a termination kit, and connectors to easily terminate your own cables.

IRIG-B Adapter Cables

C654	Mono Plug to BNC
C655	Mono Plug to DB-9
C656	Mono Plug to Ring Terminals

SEL-2812 Specifications

General	
Data Rate	Up to 115.2 kbps, full duplex, no jumpers or settings
Link Data Delay	**Serial data** 6 µs plus 5 µs/km of fiber **IRIG-B time code** 15 µs plus 5 µs/km of fiber Note: Link includes two transceivers and fibers.
Optical Source	850 nm (infrared) VCSEL transmitter **Typical transmit level** −13.0 dBm **Maximum output level** −10.0 dBm **Minimum output level** −15.5 dBm **Minimum RX sensitivity** −27.5 dBm **Optical budget** 12 dB
IRIG-B Connections	Switch selects IRIG-B connections via DB-9 connector or IRIG-B jack
Operating Temperature	−40° to +85°C (−40° to +185°F)
Projection From DB-9 Connector	127 mm (5.0 in) typical, including fiber-optic connector and minimum cable bend radius
Power Requirements	Receives adequate power from an EIA-232 TXD data line connected to Pin 3 and Pin 1 or 7 of the DB-9 connector.
Fiber-Optic Cable and Connectors	ST connectors Multimode fiber (50−200 µm) SEL provides compatible SEL-C805 Multimode 200 µm, SEL-C807 Multimode 62.5/200 µm, and SEL-C808 Multimode 62.5/125 µm Core Fiber-Optic Cables.

SEL SCHWEITZER ENGINEERING LABORATORIES

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