

SEL-9220



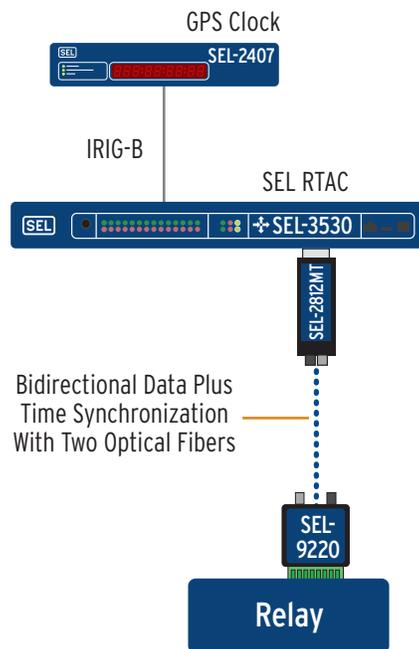
Fiber-Optic Adapter for SEL-300 Series Relays

Expand Communications for SEL-300 Series Relays



Convert EIA-485 port to fiber-optic link.

Add a Fiber-Optic Link for Data and Time Code to EIA-485 Port.



Data plus time synchronization.

Features and Benefits

■ Accomplish More With a Third Serial Link

For applications that do not use an EIA-485 network, convert the EIA-485 port of an SEL-300 series relay to a fiber-optic port that is the equivalent of an SEL-2812MR Fiber-Optic Transceiver. For example, connect an SEL-300G Generator Relay to an SEL-2600 RTD Module, an SEL-2664 Field Ground Module, and an SEL-3530 Real-Time Automation Controller (RTAC). Or, add I/O to an SEL distance or feeder relay via an SEL-2505 Remote I/O Module.

■ Easily Apply

Connects directly to the Port 1 connector with positive retention screws. Full-duplex serial data and IRIG-B time synchronization are provided via the connector. Attach with duplex optical fiber to an SEL-2812MT Fiber-Optic Transceiver at the other end of the link.

■ Increase Safety and Signal Integrity

Isolate devices from ground potential rise and electrical interference through the communications connections, using an eye-safe, Class 1 Laser product per EN 60825-1.

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

Application Information

Connecting and Disconnecting Fiber Cable

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 to the right shows maximum cable lengths based on typical fiber loss. The optical power budget includes transmit and receive connector coupling loss; therefore, the maximum cable length is determined 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 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. Divide the available optical power budget by the fiber loss/km specification to determine the maximum cable length.

Example

Fiber Type 50 μm
 Splice Loss (fusion) 0.2 dB/Splice
 Fiber Loss @ 850 nm 2.7 dB/km
 SEL-9220 Optical Budget 16 dB
 Less Splice Loss (1 • 0.2 dB) 0.2 dB
 Available Power 15.8 dB
 Maximum Cable Length 15.8 dB ÷ 2.7 dB/km = 5.85 km

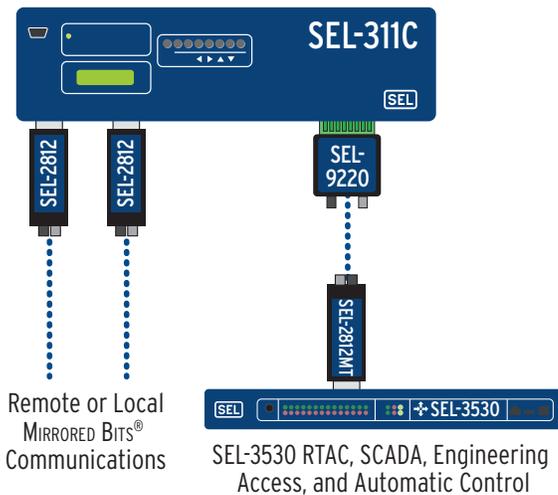
Cable Length			
Fiber Diameter (μm)	Power Budget (dB) (-40° to +85°C)	Typical Fiber Loss (dB/km) at 25°C	Maximum Cable Length (km)*
50	16	2.7	5.85
62.5	16	3.2	4.9
200	16	6.5	2.4

* Actual distance depends on specific optical fiber characteristics and number of splices.

SEL Substation Relay Application Example

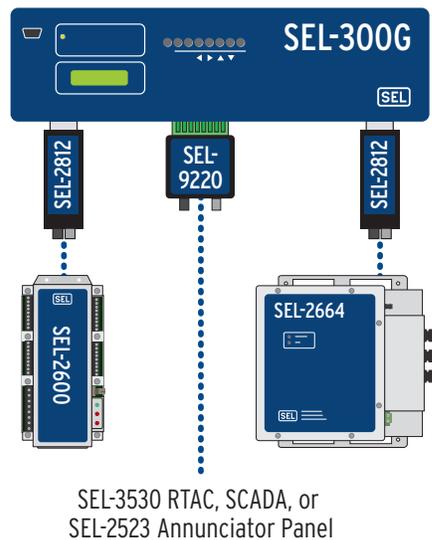
One serial port connected to an SEL-3530 RTAC or other communications processor provides interaction with the control center, engineering department, and others. Use the remaining serial ports for:

- SEL MIRRORRED BITS® communications with two other sites in a three-terminal teleprotection scheme
- Distributed bus protection schemes
- Additional I/O with SEL-2505 or SEL-2506 Remote I/O Modules
- I/O and annunciation via an SEL-2523 Annunciator Panel



SEL-300G Generator Relay Example

Full generator protection and monitoring uses three serial ports. Retrieve RTD temperature information with an SEL-2600 RTD Module, and field excitation data through an SEL-2664 Field Ground Module. Use the third serial port for connection to an SEL-3530 RTAC, another DCS or SCADA system, or an SEL-2523 Annunciator Panel.



Technical Specifications

Data Rate

Up to 115.2 kbps, full duplex, no jumpers or settings

Link Data Delay

Serial Data 6 μ s plus 5 μ s/km of fiber

IRIG-B Time Code 15 μ s plus 5 μ s/km of fiber

Note: Link includes two transceivers and fibers

Optical Source

850 nm (infrared) VCSEL transmitter

Typical Transmit Level -13 dBm

Optical Receiver

850 nm Receiver

Minimum Sensitivity -29 dBm

Operating Temperature

-40° to +85°C (-40° to +185°F)

Projection From SEL-300 Series Connector

100 mm (4 in) typical, including fiber-optic connector and minimum cable bend radius

Power Requirements

Receives power from the SEL-300 series relay

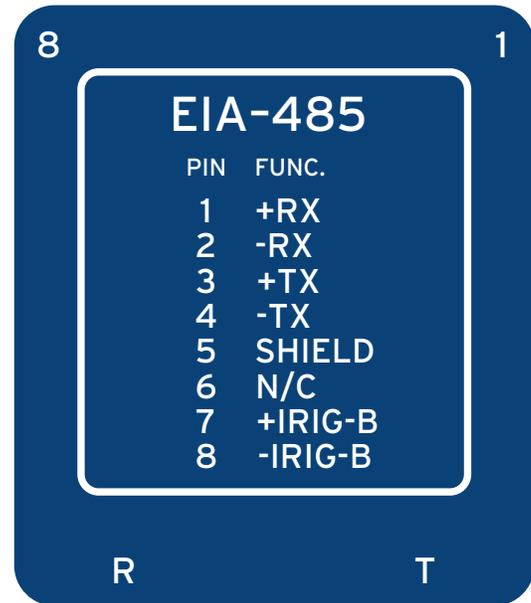
Fiber-Optic Cable and Connectors

ST connectors

Multimode fiber (50–200 μ m)

SEL provides ST-connected 200 and 62.5 μ m fiber-optic cables

Back Label With EIA-485 Pin Usage



Imprinted on the bottom of device.

Dimensions



SEL-9220 Fiber-Optic Adapter for SEL-300 Series Relays

Type Tests and Standards

Cold

IEC 60068-2-1:1990 + A1:1993 + A2:1994 [BS EN 60068-2-1:1993] -40°C

Dry Heat

IEC 60068-2-2:1974 + A1:1993 + A2:1994 [BS EN 60068-2-2:1993 + A1:1995] 16 hours at +85°C

Damp Heat, Cyclic

IEC 60068-2-30:1980 + A1:1985 [BS EN 60068-2-30:1999] Test Db, 95% r.h., 25° to 55°C, 6 cycles (12 + 12 hour cycle)

Vibration

IEC 60255-21-1:1988 [BS EN 60255-21-1:1996 + A1:1996]

IEC 60255-21-2:1988 [BS EN 60255-21-2:1996 + A1:1996]

IEC 60255-21-3:1993 [BS EN 60255-21-3:1995 + A1:1995]

EMC Immunity

Electrostatic Discharge Immunity

IEC 60255-22-2:1996 [BS EN 60255-22-2:1997]

IEC 61000-4-2:1995 [BS EN 61000-4-2:1995 + A1:1999 + A2:2001]

IEEE C37.90.3-2001

Severity Level: 2, 4, 6, 8 kV contact discharge; 2, 4, 8, 15 kV air discharge

Radio Frequency Interference Immunity

IEC 61000-4-3:2002 [BS EN 61000-4-3:2002]

IEC 60255-22-3:2000 [BS EN 60255-22-3:2001] Severity Level: 10 V/m

IEEE C37.90.2-2004 Severity Level: 35 V/m

Digital Radio Telephone RF Immunity ENV 50204:1995

Radiated Radio Frequency

ENV 50204:1995, 10 V/m

Emissions

EN 55011:1998 + A1:1999 + A2:2002 Level: Class B

IEC 60255-25:2000 [BS EN 60255-25:2000]

FCC CFR 47 Part 15 Class B

This Class B device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Eye Safety

IEC 60825-1:1993 + A1:1997 + A2:2001 Class 1 Laser Product

21 CFR 1040.10 and 1040.11

Class 1 laser complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Safety Notes: Although Class 1 lasers are considered to be eye-safe, avoid staring into the transmitter or fiber-end infrared radiation. The lasers are not user-serviceable. Return to the factory for repair or replacement.

Caution: Use of controls or adjustments, or performance of procedures other than those specified herein, may result in hazardous radiation exposure.

Accessories

Adapter Cables for EIA-485 Ports

Use an adapter cable to apply an SEL-9220 to devices that do not have an eight-position EIA-485 compression block. The transmitter (TX) outputs of the device must be asserted to properly operate the SEL-9220. These cables convert a four-wire EIA-485 port to a point-to-point fiber-optic link.

Device	EIA-485 Port		Cable Data Only	Cable Data and IRIG-B (IRIG connector if separate)
	Port No.	Connector		
SEL-300 series including "legacy" products	1	8-position compression	None Needed	None Needed
SEL-300 series with a USB and Ethernet port	1	5-position compression	C685	C686 (BNC)
SEL-500 series	1	DB9	C688	C689
SEL-700 series, -2411, -2414, -2523	4A	5-position compression	C685	C687 (2-position compression)
SEL-2431	1	DB9	C688	C689
SEL-2431	2	DB9	C688	NA
SEL-2440	2	DB9	C688	C689

Fiber-Optic Cable

- SEL-C805 fiber-optic cables for distances up to 2.5 km
- SEL-C807 fiber-optic cables for distances up to 4 km

Fiber-Compatible Devices

Device (option)	Optical Fibers
SEL-2812 Fiber-Optic Transceiver (MT or FT)	2
SEL-2600 RTD Module (SEL-2812 compatible)	1
SEL-2664 Field Ground Module	1
SEL-700 series, SEL-2407 [®] , SEL-2411, SEL-2414, SEL-2431, SEL-2440 (SEL-2812 compatible)	2
SEL-2505, SEL-2515 Remote I/O Modules (SEL-2812 compatible)	2



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