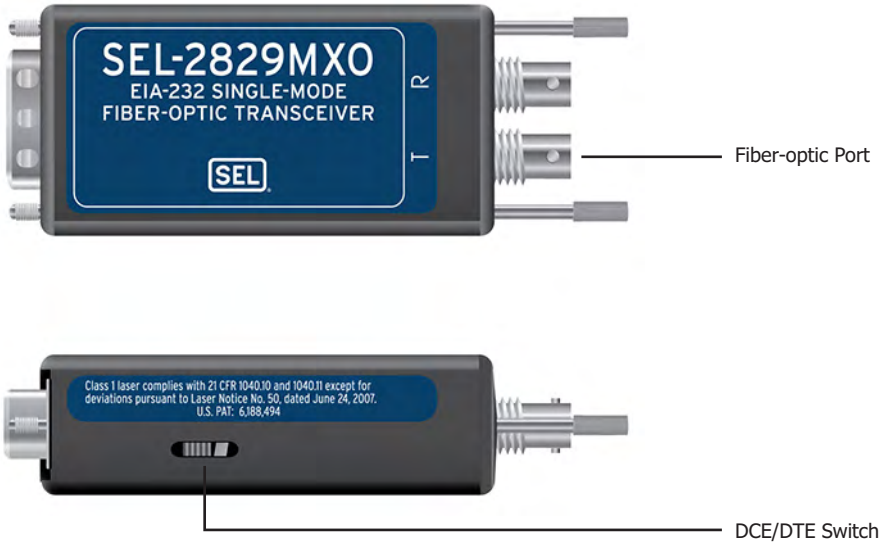
SEL-2829/2830/2831 Single-Mode Fiber-Optic Transceivers for Long-Distance Links

Key Features and Benefits

- **Flexible, Long-Range Fiber-Optic Communication.** Send serial data as far as 110 kilometers by using a single-mode fiber-optic cable with standard ST connectors. Use data rates from 0–40,000 bits per second. Choose between data communications equipment (DCE) and data terminal equipment (DTE) standard pin configurations and eliminate the need for adapters.
- **Easy Application.** Plug the transceiver directly into a standard 9-pin serial connector (DB-9). The transceiver receives power from the host device and does not require a separate power supply, power wiring, or special mounting. Transmit continuous light pulses for simpler testing with an optical meter. Apply with ST pre-terminated fiber-optic cables.
- **Secure and Reliable Data Transfer.** Maximum bit error rate (BER) of 10^{-9}. Far less susceptible to EMI/RFI than copper links.
- **Improved Safety.** SEL fiber-optic products provide isolation from induced voltages resulting from ground potential rise and electromagnetic induction commonly caused by control cables.

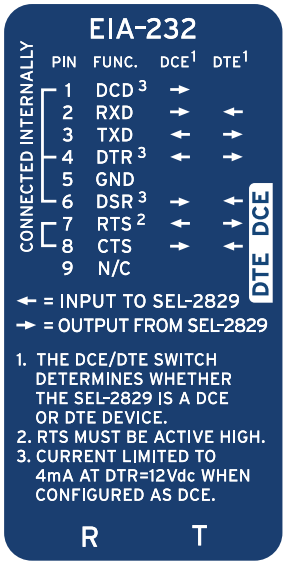
Product Overview

A DTE/DCE switch is available on the SEL-2829, SEL-2830, and SEL-2831. Use this switch to select whether the transceiver is operating as DTE or as DCE. The switch must be in the DCE position to connect the transceiver to an SEL relay or communications processor port.



SEL-2829MXO

SEL-2829FXO

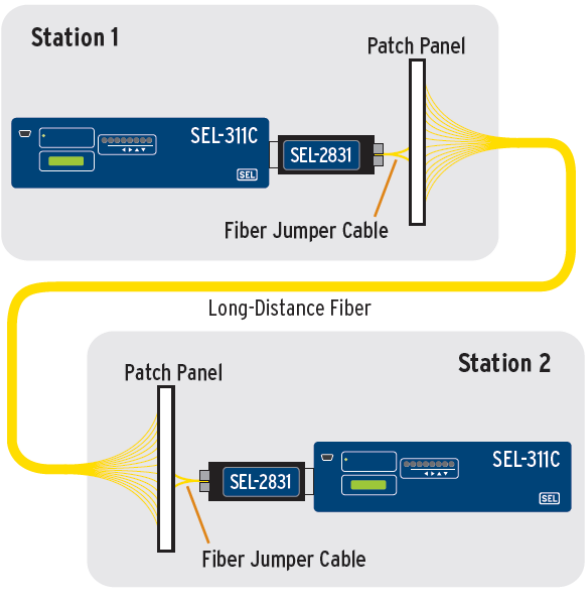


Label With
EIA-232 Pin Usage

Imprinted on the bottom of the device

Application Examples

Connect the transceivers to the EIA-232 port of SEL relays on opposite ends of a protected line, then connect the transceivers together by using a single-mode fiber-optic cable with ST connectors. Use MIRRORED BITS® communications for teleprotection schemes, including POTT, DCUB, or DCB. Apply high-reliability, low-cost SEL transceivers in harsh electrical and physical environments for the safety and signal integrity advantages that fiber-optic cable provides.



Application Information

Device Connections

Plug the transceiver directly into a standard 9-pin serial connector (DB-9). The transceiver does not require special mounting, jumpers, or settings. The DB-9 connector provides power directly to the transceiver from the host device without the need for a separate power supply or wiring. A single-mode fiber-optic cable connects the ST connectors of each transceiver to allow a full-duplex serial data link.

Adapter Cables

When mounting depth is an issue, such as in switchgear applications, use an SEL-C780, SEL-C641, or SEL-C641R adapter cable. The SEL-C780 is a 6-inch ribbon cable that allows for mounting of the fiber transceiver at a 90-degree angle to the mating DB-9 host connector. You can configure the length of the SEL-C641 (shielded) and SEL-C641R (double-shielded with metal connector housings) cables, which allows you to mount the transceiver as far as 1.8 m (6.0 ft) away from the DB-9 host connector.

When mounting the transceiver to an SEL-3300 series automation and computing platform or other SEL device that has an RJ45 serial port, you can use the SEL-C478A or SEL-C478N adapter cable to mount the transceiver as far as 1.8 m (6.0 ft) away from the RJ45 serial connector.

SEL-C780: 15.24 cm (6.00 in), low-profile adapter cable, DB-9 male to DB-9 female

SEL-C641: 0.3 to 1.8 m (1.0 to 6.0 ft) shielded adapter cable, DB-9 male to DB-9 female

SEL-C641R: 0.3 to 1.8 m (1.0 to 6.0 ft) double shielded adapter

SEL-C478A: 0.3 to 1.8m (1.0 to 6.0 ft) shielded adapter cable, RJ45 male to DB-9 female

SEL-C478N: 0.3 to 1.8m (1.0 to 6.0 ft) shielded adapter cable, RJ45 male to DB-9 female and BNC female

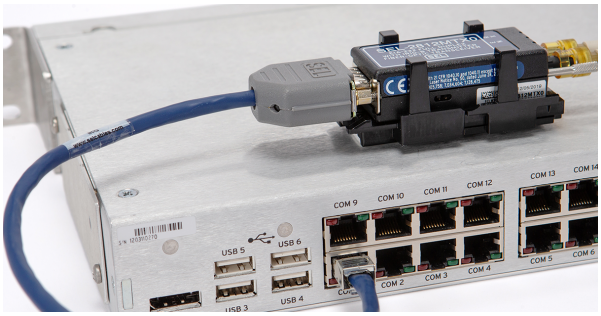
Transceiver Mounting Options

Use an SEL Transceiver Mounting Kit and adapter cable when connecting the SEL transceiver to IEDs with an RJ45 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 remotely 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 RJ45 male)

915900575: Mounting kit for SEL transceiver; includes mount and SEL-C641 cable (6 ft, DB-9 female to DB-9 male)



Safety Information

The SEL-2829 uses an LED transmitter and the SEL-2830 and SEL-2831 use a laser transmitter. When working with these devices, observe the following safety precautions:

Do not look into the fiber (laser) ports/connectors.

Do not look into the end of an optical cable connected to an optical output.

Do not perform any procedures or adjustments that this data sheet does not describe.

During installation, maintenance, or testing of the optical ports, use only test equipment qualified for Class 1 laser products.

Incorporated components, such as transceivers and laser emitters, are not user serviceable. Return units to SEL for repair or replacement.

Power Requirements

The SEL-2829, SEL-2830, and SEL-2831 draw power from the data and control lines of the 9-pin subminiature D connector (DB-9), as shown in *Table 1*. Total current draw is less than 18 mA (SEL-2829) or 24 mA (SEL-2830 and SEL-2831).

Table 1 Data and Control Line Power Inputs

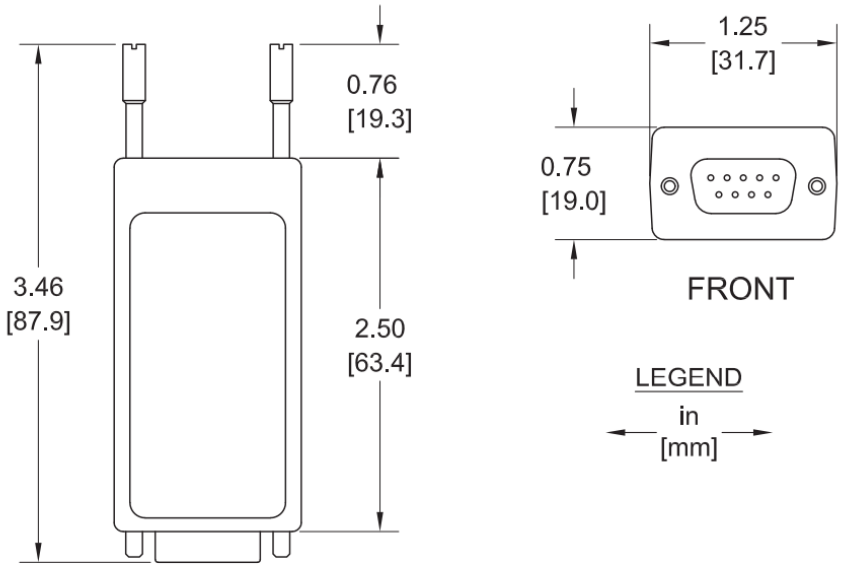
Pin	Switch Position
2, 8	DTE
3, 7	DCE
4, 6	DTE or DCE

The transceiver additionally draws power per *Table 2*.

Table 2 Other Power Input

Pin	Voltage (Vdc)
1	+5 to +10 Vdc

Diagrams and Dimensions



Specifications

Compliance

Designed and manufactured under an ISO 9001 certified quality management system
CE Mark
UKCA Mark
CFR 47 Part 15 Class A
This Class A 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

General

Data Rate

As high as 40,000 bits per second, full duplex, no jumpers or settings.

Link Data Delay

36 µs + 5 µs/km of fiber

Fiber-Optic Port

SEL-2829

Wavelength	1300 nm
Optical Connector	ST
Fiber Type	Single mode
Link Budget	20 dB
Typical TX Power	–27 dBm
Max. TX Power	–20 dBm
Min. TX Power	–36 dBm
Min. RX Sensitivity	–56 dBm
Fiber Size	9 µm

SEL-2830

Wavelength	1300 nm
Optical Connector	ST
Fiber Type	Single mode
Link Budget	40 dB
Typical TX Power	–10 dBm
Max. TX Power	–3.6 dBm
Min. TX Power	–17.6 dBm
Min. RX Sensitivity	–56 dBm
Fiber Size	9 µm

SEL-2831

Wavelength	1550 nm
Optical Connector	ST
Fiber Type	Single mode
Link Budget	40 dB
Typical TX Power	–10 dBm
Max. TX Power	–3.6 dBm
Min. TX Power	–17.6 dBm
Min. RX Sensitivity	–56 dBm
Fiber Size	9 µm

Projection From DB-9 Connector

127 mm (5 in) typical, including fiber-optic connector and minimum cable bend radius.

Power Requirements

The SEL-2829, SEL-2830, and SEL-2831 can be powered from Pin 3 (Pin 2 in DTE mode) and Pin 1 or Pin 7 (Pin 8 in DTE mode) of its DB-9 connector.

Pin 1 Power:	+5 to +10 Vdc
Pin 2, 3, 4, 6, 7, or 8:	Parasitic power
Maximum Current Draw	18 mA (SEL-2829)
	24 mA (SEL-2830 and SEL-2831)

Environmental

Operating Environment	
Indoor Use Only	
Insulation Class:	3
Pollution Degree:	2
Overvoltage Category:	2
Operating Temperature:	–40° to +85°C (–40° to +185°F)
Non-Operating Temperature:	–40° to +85°C (–40° to +185°F)
Relative Humidity:	0%–95%, noncondensing
Altitude:	2000 m (6562 ft)

Type Tests

Electromagnetic Compatibility General

Measuring Relays and Protection Equipment:	IEC 60255-26:2013

Electromagnetic Compatibility Emissions

Radiated and Conducted Emissions:	IEC 60255-26:2013, Clause 7.1
	EN 60255-26:2013, Clause 7.1
	CISPR 22:2008
	EN 55022:2010
	CISPR 11:2009 + A1:2010
	EN 55011:2009 + A1:2010
	Canada ICES-001 (A) / NMB-001 (A)

Electromagnetic Compatibility Immunity

Conducted RF Immunity:	IEC 60255-26:2013, Clause 7.2.8
	EN 60255-26:2013, Clause 7.2.8
	IEC 61000-4-6:2008
	Severity Level: 10 V unmodulated, open circuit equivalent
Radiated RF Immunity:	IEC 60255-26:2013, Clause 7.2.4
	EN 60255-26:2013, Clause 7.2.4
	IEC 61000-4-3:2006 + A1:2007
	+ A2:2010
	Severity Level: 10 V/m
	IEEE C37.90.2-2004
	Severity Level: 20 V/m

Power Frequency

Magnetic Field Immunity:	EN 60255-26:2013, Clause 7.2.10
	IEC 61000-4-8:2009
	Severity Level 5: 100 A/m >60 s;
	1000 A/m 1 to 3 s; 50/60 Hz

Electrostatic Discharge

Immunity:	IEC 60255-26:2013, Clause 7.2.3
	EN 60255-26:2013, Clause 7.2.3
	IEC 61000-4-2:2008
	Discharge Severity Level:
	±2, 4, 6, 8 kV contact;
	±2, 4, 8, 15 kV air
	IEEE C37.90.3-2001
	Discharge Severity Level:
	±2, 4, 8 kV contact;
	±4, 8, 15 kV air

Environmental

Cold:	IEC 60068-2-1:2007
	Severity: 16 hours at –40°C
Dry Heat:	IEC 60068-2-2:2007
	Severity Level: Test Bd; 16 hours at +85°C
Damp Heat, Steady State:	IEC 60068-2-78:2012
	Severity Level: Test Cab; 10 days, 40°C, 93% RH
Damp Heat, Cyclic:	IEC 60068-2-30:2005
	Severity Level: Test Db, Variant 2; 12 hr at 25°C + 1
Vibration:	IEC 60255-21-1:1988
	Severity Level: Class 1 Endurance; Class 2 Response
Shock and Bump:	IEC 60255-21-2:1988
	Severity Level: Class 1 Shock Withstand, Bump; Class 2 Shock Response
Seismic:	IEC 60255-21-3:1993
	Severity Level: Class 2 Quake Response

Safety

Measuring Relays and Protection Equipment:	IEC 60255-27:2014
Laser Safety:	21 CFR 1040.10
	Class 1 Laser Product (SEL-2830 and SEL-2831)
	Safety Notes: Although Class 1 lasers and LEDs are considered to be eye safe, avoid staring into the transmitter or fiber-end infrared radiation.
	The lasers and LEDs do not require maintenance and 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.
	FCC CFR 47 Part 15 Class A
	This Class A 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.

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

Notes

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

PDS2829-01