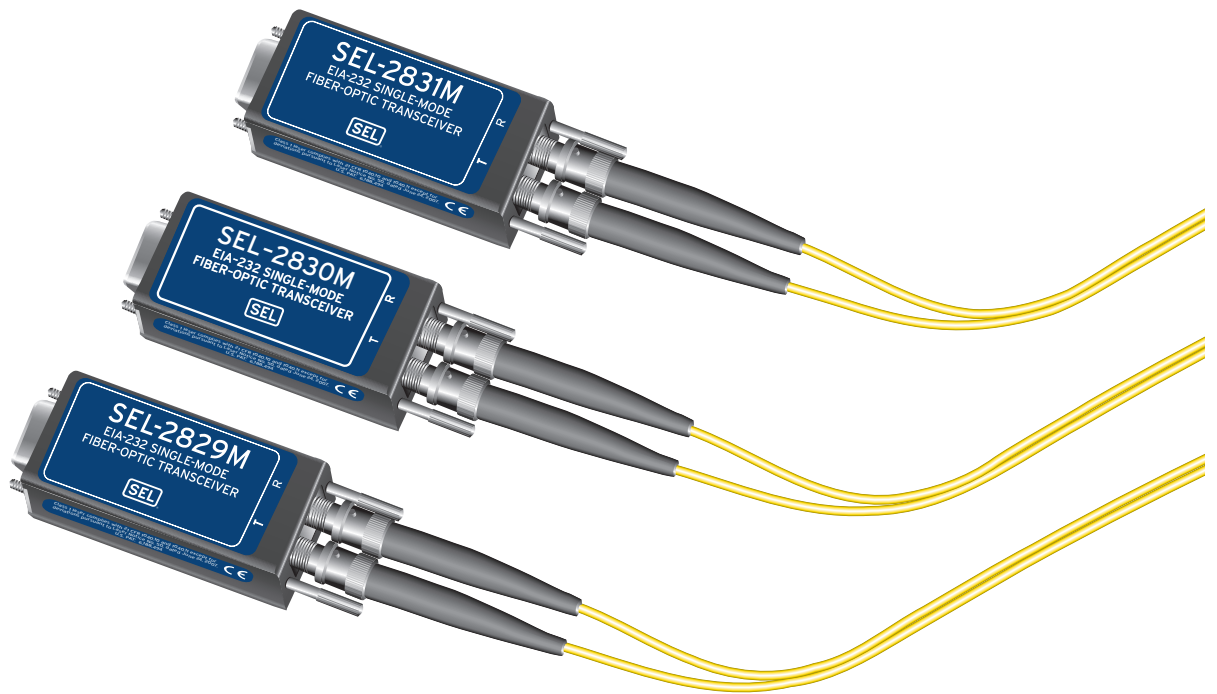


SEL-2829/2830/2831



Fiber-Optic Transceivers

Single-Mode Fiber-Optic Transceivers for Long-Distance Links



Communicate up to 110 kilometers with EIA-232 port-powered transceivers.

Features and Benefits

- **Flexible, Long-Range Fiber-Optic Communication**
Send serial data up to 110 kilometers using single-mode optical fiber with standard ST® connectors. Use data rates from 0–40,000 bits per second. Use selector switch to choose between DCE and DTE standard pin configurations, and eliminate the use of adapters.
- **Easy Application**
Plug transceiver directly onto a standard 9-pin serial connector (DB-9). No special mounting is required. Receives power from the host device via the connector; no separate power supply or power wiring is needed. Transmits continuous light pulses for simpler testing with an optical meter. Apply with ST pre-terminated fiber 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**
Eye-safe, Class 1 laser or LED products provide improved isolation from ground potential rise and other electrical hazards compared to copper connections.

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

Application Information

Choose the Model That Matches Your Distance Requirement

The SEL-2829, SEL-2830, and SEL-2831 all operate with single-mode optical fibers terminated with ST connectors. Select the model that matches the distance required for your application.

	SEL-2829	SEL-2830	SEL-2831
Typical Distance (km)	23	80	110
Wavelength (nm)	1300	1300	1550

Typical Distance and Operating Wavelength

Determining Maximum Cable Length

To calculate the maximum cable length for your application, first obtain the following specifications from your optical fiber supplier, based on the 1300 or 1550 nm optical source and the required temperature range:

1. Fiber loss (or attenuation) in dB/km
2. Connector loss in dB
3. Splice loss in dB

Determine the power lost in connectors by multiplying the number of connectors by the connector loss. Determine the power lost in splices by multiplying the number of splices by the splice loss. Subtract the power lost in splices and connectors from the total optical power to determine the available optical power. Calculate the maximum cable length by dividing the available optical power by the fiber loss.

The table below shows a distance calculation for an example optical fiber and each SEL single-mode fiber-optic transceiver. The fiber has the following characteristics:

- Fiber Core Diameter* 9.3 μm
- Connector Loss* 2 dB/Connector
- Splice Loss (fusion)* 0.2 dB/Splice
- Fiber Loss @ 1300 nm* 0.4 dB/km
- Fiber Loss @ 1550 nm* 0.3 dB/km

	SEL-2829	SEL-2830	SEL-2831
Optical Budget (dB)	14.0	40.0	40.0
Less Connector Loss (2 x 2 dB)	-4.0	-4.0	-4.0
Less Splice Loss (4 x 0.2 dB)	-0.8	-0.8	-0.8
Available Power = Budget - Losses	P=14-4-0.8	P=40-4-0.8	P=40-4-0.8
Available Power (dB)	9.2	35.2	35.2
Length = Available Power/Fiber Loss	9.2/.4	35.2/.4	35.2/.3
Maximum Cable Length (km)	23	88	117

Example Maximum Length Calculations

Fiber Loss Test With Optical Meter

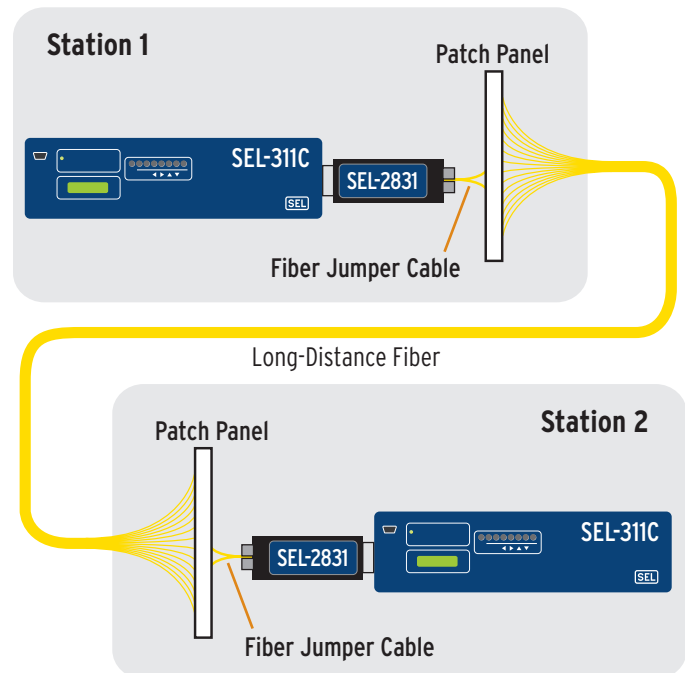
1. Configure your optical meter to measure 1300 or 1550 nm wavelength.
2. Temporarily connect optical meter to transmit ST connector (T) of local transceiver, and note dBm reading.
3. Temporarily connect the fiber-optic cable that would go to the receive ST connector (R) of the remote transceiver to the meter, and note dBm reading.
4. Calculate the measured loss by subtracting the measurement taken in Step 3 from the measurement taken in Step 2. If the difference is less than the optical budget, the attenuation is low enough to allow proper operation.
5. Repeat Steps 1-4 using transmit ST connector (T) of remote transceiver and receive ST connector (R) of local transceiver.

Connecting and Disconnecting Fiber Cable

Use the supplied connector caps to cover ST connectors that are not connected to a fiber cable. If the transceiver is transmitting data and both ST connectors are open, the transmitted (TXD) light signals may reflect off external objects into the receiver (RXD) ST connector. The reflected signals appear as messages sent from a remote transceiver.

Interstation Teleprotection Example

Connect the transceivers to the EIA-232 port of SEL relays on opposite ends of a protected line, and connect them with two fibers. Use MIRRORING BITS® communications for teleprotection schemes, including POTT, DCUB, or DCB.



Technical Specifications

Connect Directly to DB-9 Serial Ports

Compatible with SEL-200, -300, -400, -500, and -700 series relays, SEL-2032/2030/2020, SEL-2100, and SEL-4000 Relay Test Systems

Projection From DB-9 Connector

12.7 mm (5.0 in) typical, including fiber-optic connector and minimum cable bend radius

Data Rate

0–40000 bits per second, full duplex, no jumpers or settings

Data Delay

36 μ s plus 5 μ s/km of fiber

Optical Source

Transceiver	Wavelength and Type	Typical Average Transmit Level
SEL-2829	1300 nm (infrared) LED	-27 dBm
SEL-2830	1300 nm (infrared) Laser	-3.6 to -17.6 dBm
SEL-2831	1550 nm (infrared) Laser	-3.6 to -17.6 dBm

Operating Temperature

-40° to +85°C (-40° to +185°F)

Power Requirements

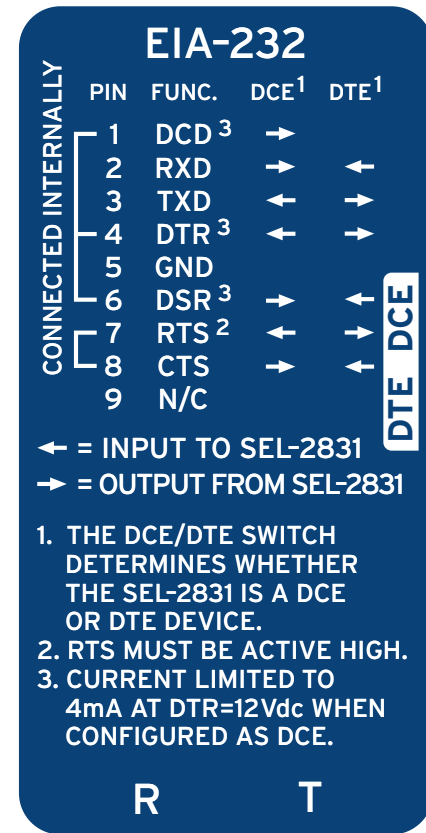
Receives power from the transmit-data input pin plus one other power input pin in the DB-9 connector. These SEL single-mode transceivers do not support hardware handshaking. Non-SEL devices should provide at least the current and voltage indicated below.

DCE Pin 3 or DTE Pin 2 (Transmit Data): 11 mA at \pm 5.2 Vdc, and
 DCE Pin 4 or DTE Pin 6: 11 mA at -5.2 Vdc, or
 DCE Pin 7 or DTE Pin 8: 11 mA at +5.2 Vdc

Connectors and Cable

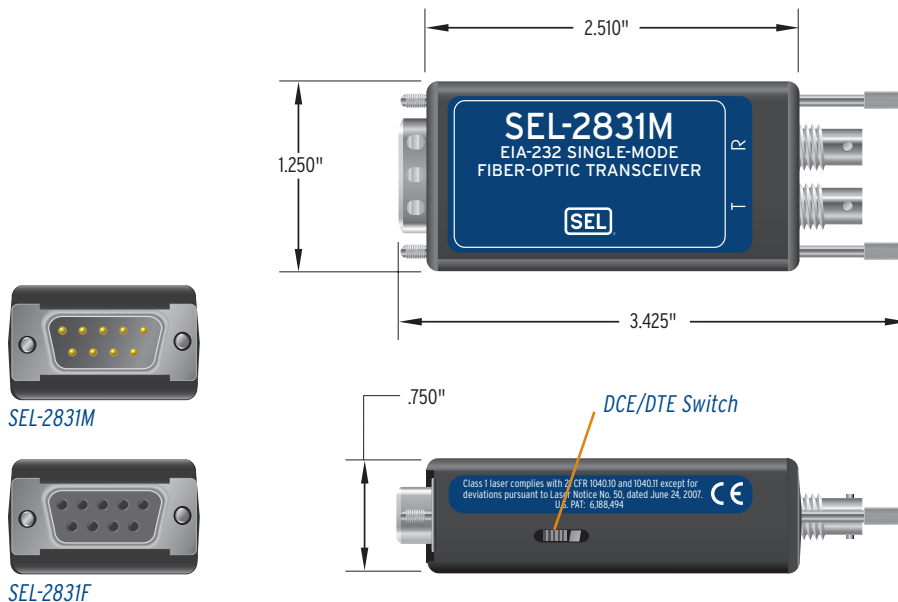
ST connectors and SEL-C809 single-mode fiber (9.3 μ m)

Back Label With EIA-232 Pin Usage



(imprinted on back of device)

Transceiver Dimensions



SEL-2831 shown. SEL-2829 and SEL-2830 have the same dimensions.

SEL-2829/2830/2831 Fiber-Optic Transceivers

Type Tests and Standards

IEEE C37.90.2

Trial Use Standard, Withstand Capability of Relay Systems to Radiated Electromagnetic Interference From Transceivers.

Exceptions:

- 5.5.2(2) Performed with 200 frequency steps per octave.
- 5.5.3 Digital Equipment Modulation Test not performed.
- 5.5.4 Test signal turned off between frequency steps to simulate keying.

IEC 60068-2-1 Fifth Edition 1990

Cold, -40°C

IEC 60068-2-2 Fourth Edition 1974

Dry Heat, +85°C

IEC 60068-2-30 Second Edition 1980

Damp Heat Cyclic, +55°C, 6 cycles

IEC 60255-22-2 Second Edition 1996

Electrostatic Discharge Immunity

Level 4

IEC 60255-21-1 First Edition 1988

Vibration Endurance Class I

Vibration Response Class II

IEC 60255-21-2 First Edition 1988

Bump and Shock Withstand Class I

Shock Response Class II

IEC 60255-21-3 First Edition 1993

Quake Response Class I

IEC 60825-1: 1993+A1: 1997+A2: 2001

Class 1 Laser Product (SEL-2830 and SEL-2831)

Class 1 LED Product (SEL-2829)

EN 60825-1: 1994+A1+A2

Class 1 Laser Product (SEL-2830 and SEL-2831)

Class 1 LED Product (SEL-2829)

21 CFR 1040.10

Class 1 Laser Product (SEL-2830 and SEL-2831)

Class 1 LED Product (SEL-2829)

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 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 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.

Fiber-Compatible Products

SEL-C809 Fiber-Optic Cables

Single-mode, fiber-optic patchcords with ST connectors.

SEL-2505 Remote I/O Module, ST Option

Provides MIRRORRED BITS communications for eight logic inputs and eight contact outputs (SEL-2830-compatible option).

SEL-2506 Rack-Mount I/O Module

Provides MIRRORRED BITS communications for eight logic inputs and eight contact outputs (SEL-2829/2830/2831-compatible options).



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