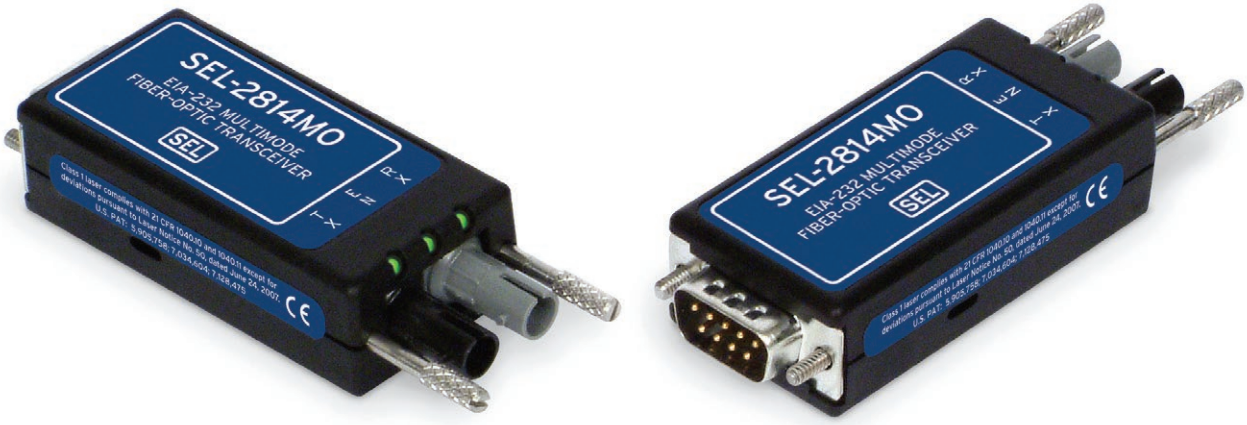
# SEL-2814

## Fiber-Optic Transceivers With Hardware Flow Control




## Communicate data and transfer hardware flow-control signals with EIA-232 transceivers

- Zero settings make it easy to apply to any 9-pin serial data port.
- Install in instrumentation, protection, and automation applications.
- Fiber-optic cables isolate data communication from ground potential rise and electrical interference.

# Features and Benefits

### Improve Communications Reliability

Send serial data up to 4 kilometers (2.5 miles) using multimode optical fiber with standard ST connectors at rates up to 115.2 kilobits per second (kbps). Apply in harsh electrical and physical environments with a link that is far less susceptible to electromagnetic interference (EMI)/radio frequency interference (RFI) than copper links.

### Use Control Lines to Improve Operation

Transfer a hardware flow control line in each direction. Use the line for data flow control to prevent overrunning buffers, key a transmitter, or sense equipment problems.

### Apply Easily

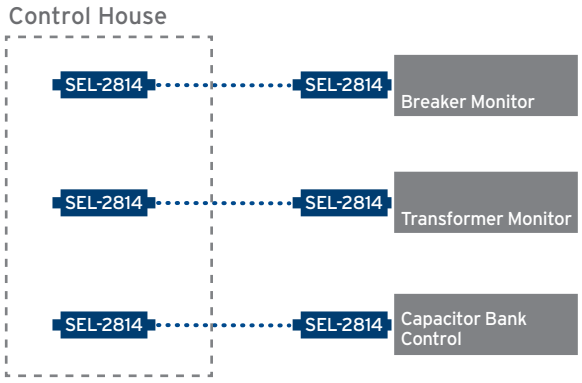
Plug SEL-2814 Fiber-Optic Transceivers With Hardware Flow Control directly onto 9-pin serial connectors (DB-9). Order transceivers with male or female DB-9 connectors. Eliminate the need for adapters by using the selector switch to choose data communications environment (DCE) or data terminal equipment (DTE) usage.

### Choose the Best Power Source

Provide power from the host device via the connector; no separate power supply or power wiring is needed. Or, if the host cannot provide power, connect an external power supply to the power input jack.

### Improve Safety

Provide improved isolation from ground potential rise and other electrical hazards compared to copper connections. This transceiver is an eye-safe, Class 1 laser product.

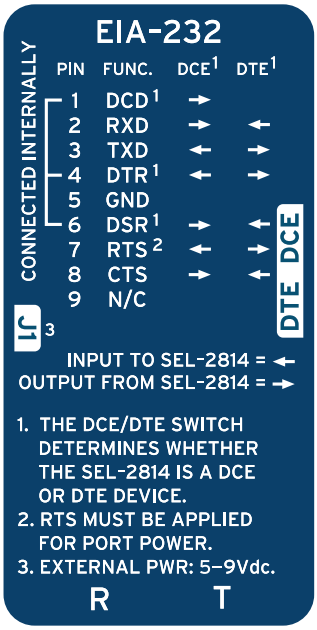



Transfer information between remote equipment and the control house in even the largest stations.

# Product Overview


SEL-2814M0

SEL-2814F0




**Back Label With EIA-232 Pin Usage**

Imprinted on the bottom of the device.

# Application Information

### Power, Transmit, and Receive LED Indicators

The EN LED will illuminate green as soon as the minimum power is applied to the data and control lines of the DB-9 serial port.

The Transmit and Receive LEDs illuminate whenever the transmit or receive signals of the SEL-2814 are active. These help verify the function of the transceiver.

### Connecting and Disconnecting Fiber Cable

Use the supplied connector caps to cover ST connectors that are not connected to a fiber cable, which prevents 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, 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 the 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**

| | |
|---|---|
| Fiber Type | 50 µm |
| Splice Loss (fusion) | 0.2 dB/Splice |
| Fiber Loss @ 850 nm | 2.7 dB/km |
| SEL-2814 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 = 4.4 km |

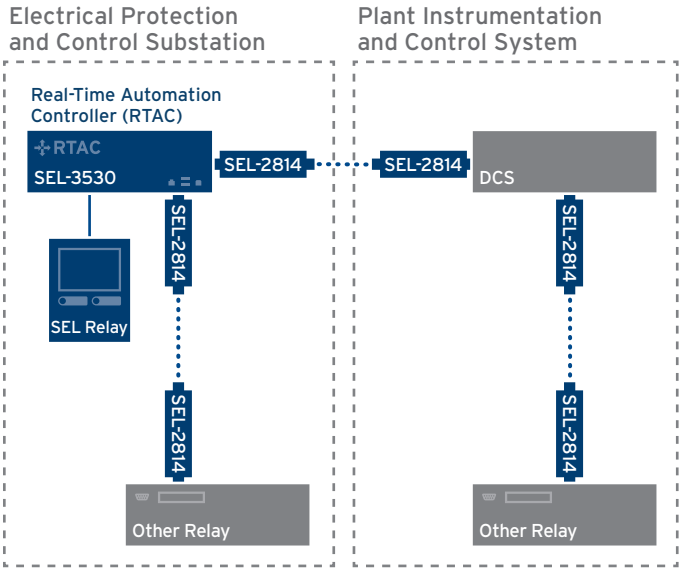
**Typical Cable Length**

| Fiber Diameter (µm) | Power Budget (dB) (−40° to +85°C) | Typical Fiber Loss (dB/km) at 25°C | Maximum Cable Length (km) |
|---|---|---|---|
| 50 | 12 | 2.7 | 4.44 |
| 62.5 | 12 | 3.2 | 3.75 |
| 200 | 12 | 6.5 | 1.85 |

# Application Example

### Instrumentation and Control Links With Hardware Flow Control

Install SEL-2814 Transceivers on the EIA-232 ports of SEL communications processors, the plant instrumentation and control system, and intelligent electronic devices (IEDs) that use hardware flow control. Connect them with multimode optical fiber that is terminated with ST connectors. Apply high-reliability, low-cost SEL transceivers in harsh electrical and physical environments for the safety and signal integrity advantages of optical fiber instead of wire.



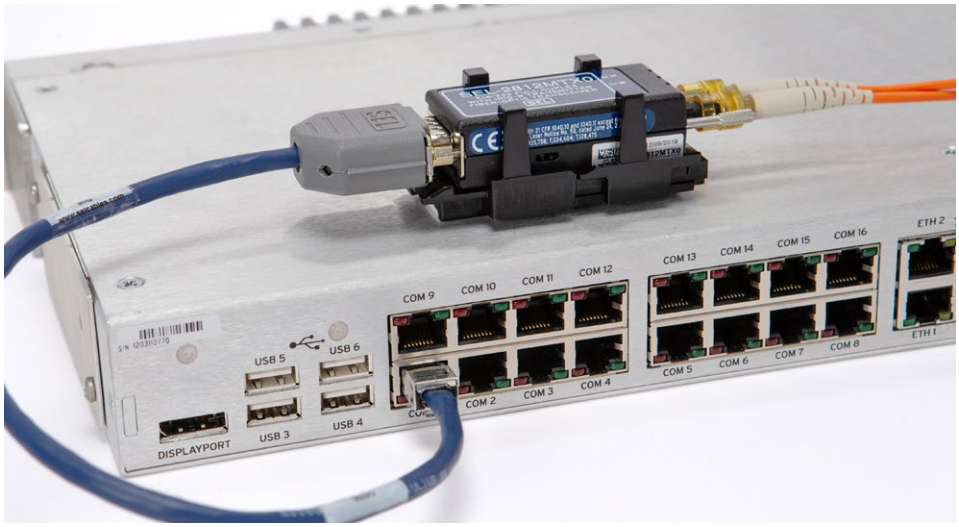

# Conformal-Coating Option

Use an SEL-2814M1 or SEL-2814F1 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-2814 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)



# SEL Multimode Fiber-Optic Cable

Choose SEL-C805 200 µm Core Fiber-Optic Cables for the lowest price at distances under 2.0 km. Select SEL-C807 Multimode 62.5/200 µm or SEL-C808 Multimode 62.5/125 µm Core Fiber-Optic Cables for distances up to 4 km.

- Standard-duty duplex zipcord for indoor riser applications (2 fibers). Do not use where 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. Specify the length when ordering optical cables that are terminated at the SEL factory with ST connectors. Or, order bulk unterminated cable, a termination kit, and connectors to easily terminate your own cables.

# Fiber Loss Test With Optical Meter

1. Configure your optical meter to measure an 850 nm wavelength.
2. Temporarily connect the optical meter to the transmit ST connector (T) of the local transceiver, and note the 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 the dBm reading.

   **Note:** The difference between the readings in Steps 2 and 3 should not exceed 12 dB. If measured readings exceed 12 dB, the fiber's attenuation is too great.
4. Repeat Steps 1–3 using the transmit ST connector (T) of the remote transceiver and the receive ST connector (R) of the local transceiver.

# Specifications

| General | |
|---|---|
| **Data Rate** | Up to 115.2 kbps, full duplex, no jumpers or settings |
| **Link Data Delay** | **Serial data**<br>6 µs plus 5 µs/km of fiber<br>Note: Link includes two transceivers and fibers. |
| **Optical Source** | 850 nm (infrared) VCSEL transmitter<br>**Typical transmit level**<br>−13.0 dBm<br>**Maximum output level**<br>−10.0 dBm<br>**Minimum output level**<br>−15.5 dBm<br>**Minimum Rx sensitivity**<br>−27.5 dBm<br>**Optical budget**<br>12 dB |
| **Operating Temperature** | −40° to +85°C (−40° to +185°F) |
| **Projection From DB-9 Connector** | 127 mm (5 in) typical, including fiber-optic connector and minimum cable bend radius |
| **Power Requirements** | Receives adequate power from a single EIA-232 TXD data line connected to Pin 3 of the DB-9 connector. Additionally, the SEL-2812 accepts power applied to Pin 1, 7, or 8. |
| **Fiber-Optic Cable and Connectors** | ST connectors<br>Multimode fiber (50−200 µm)<br>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. |

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