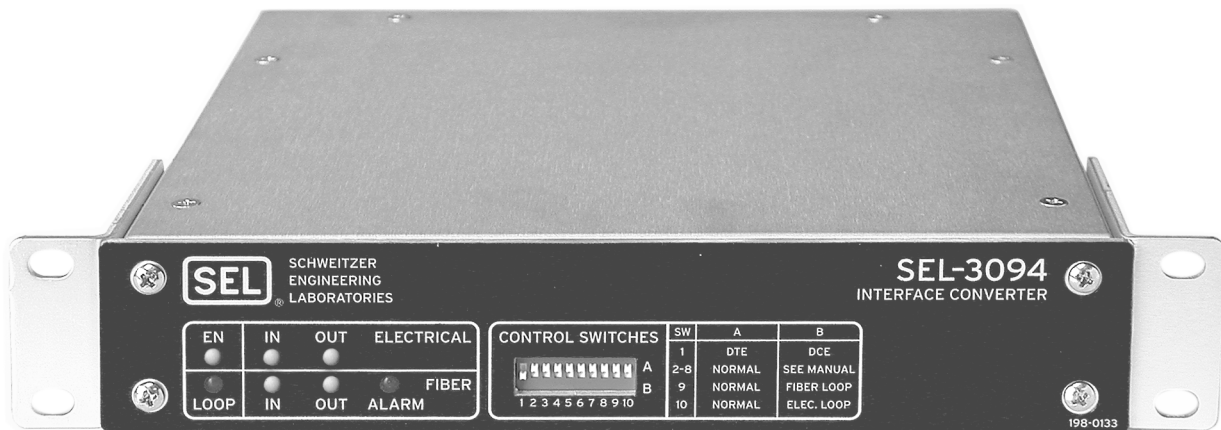




SEL-3094 Interface Converter Instruction Manual



Features, Benefits, and Applications

Use the SEL-3094 to connect any device equipped with an IEEE C37.94 standard fiber-optic interface to any device equipped with one of the supported standard electrical interfaces. The SEL-3094 converts IEEE C37.94 standard fiber-optic signals to/from standard electrical interface signals. Install the SEL-3094 close to equipment with an electrical interface, then use as much as 2 km of inexpensive multimode fiber to connect to equipment with an IEEE C37.94 standard fiber-optic interface. A selector switch configures the electrical interface as DCE or DTE.

The short electrical interfaces made possible by the SEL-3094 increase safety, robustness, and reliability while reducing the potential for ground loops. The electrical interfaces of the SEL-3094 exceed specifications for the substation electrical environment and aid in eliminating ground loops.

- ▶ **High-Speed IEEE C37.94 Interface.** The SEL-3094 uses one 64-kilobit time slot in a digital multiplexer. The SEL-3094 creates a transparent high-speed communications link between a protective relay and a digital multiplexer.
- ▶ **Electrical Interface Options.** Choose one of three electrical interfaces: ITU-T G.703, EIA-422, and EIA-232. The ITU-T G.703 and EIA-422 connections are full-bandwidth data rates at 64 kbps. Maximum data rate for the EIA-232 connection is 9600 bps.
- ▶ **Isolation.** Fiber-optic connections provide isolation and prevent ground loops associated with standard communications cables.
- ▶ **Immunity.** Dielectric properties of fiber optics provide immunity to radiated and induced voltages associated with control wiring.
- ▶ **Simple HMI.** LEDs indicate the state of inputs, outputs, and channel status.
- ▶ **Set-up.** All settings are made with 10 control switches. These switches control the product's configuration and testing facilities.
- ▶ **Universal Power.** Power supply operates from 18 to 300 Vdc and 85 to 264 Vac.

Product Overview

Figure 1 provides a functional overview of the SEL-3094.

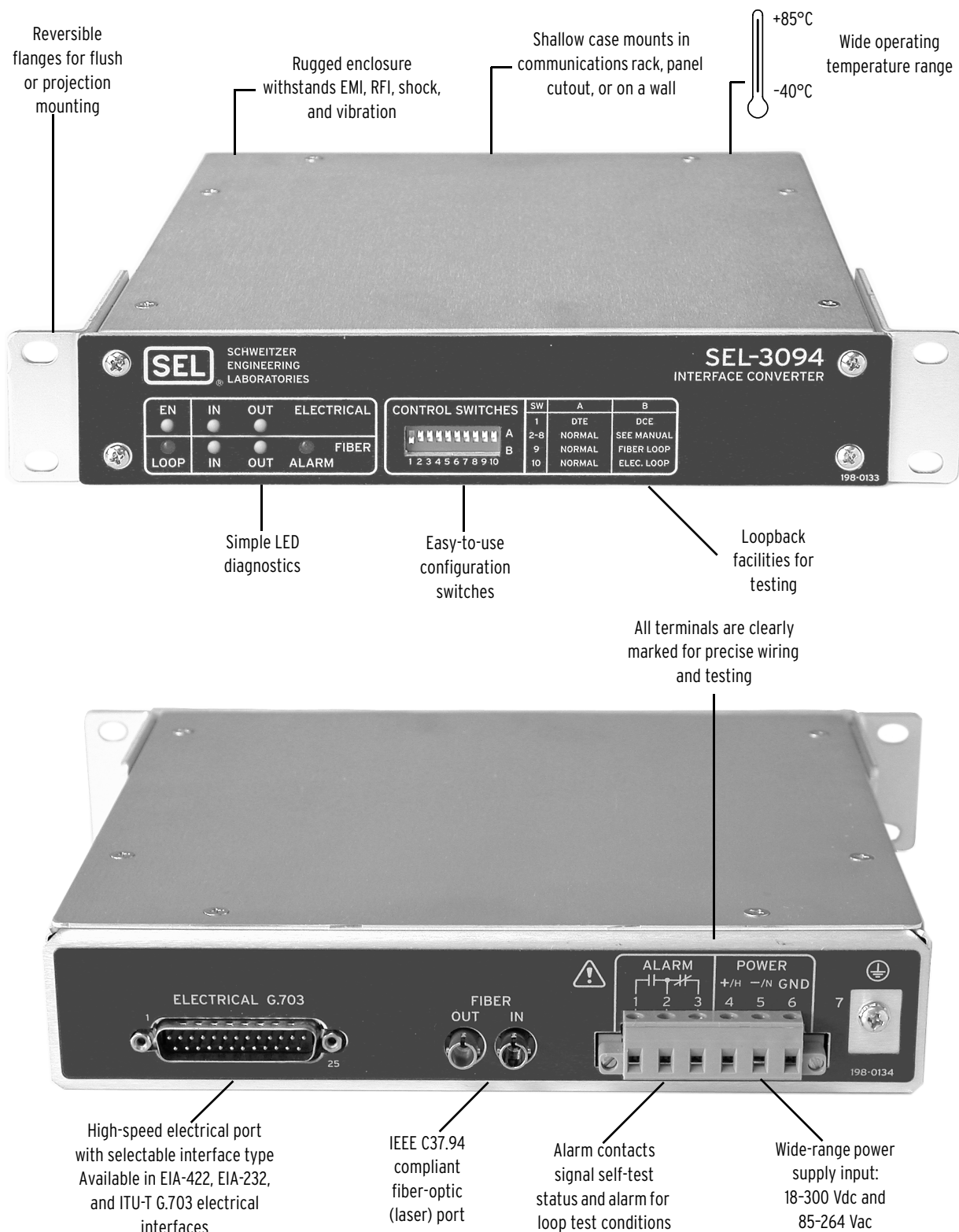


Figure 1 SEL-3094 Functional Overview

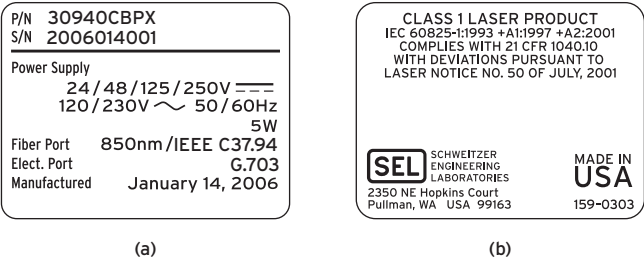


Figure 2 Serial Label (a) and Compliance Label (b)
(Location: bottom of chassis)

Applications

Connect IEEE C37.94 Compliant Teleprotection to a Noncompliant Digital Multiplexer

The IEEE C37.94 standard provides a standard fiber-optic interface directly between teleprotection and telecommunications equipment. A fiber-optic interface is especially important when the relays and communications equipment are physically separated, operate from different dc control power, or are connected to different ground mats. Older equipment and some newer equipment not intended for use in a substation do not support the IEEE C37.94 standard. The SEL-3094 allows noncompliant equipment to take advantage of the standard fiber-optic interface. In *Figure 3*, an SEL-3094 connects a compliant SEL-311L to a noncompliant multiplexer. The SEL-3094 is located near the multiplexer, so the electrical interface between the SEL-3094 and the multiplexer is as short as possible.

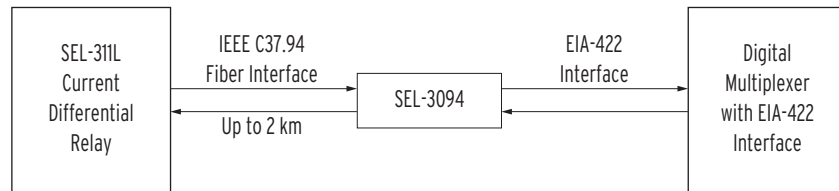


Figure 3 The SEL-3094 Provides Optical-to-Electrical Interface Conversion Between the SEL-311L Current Differential Relay and a Digital Multiplexer that Does Not Support the IEEE C37.94 Standard

Connect IEEE C37.94 Compliant Digital Multiplexer to a Noncompliant Teleprotection Device

Use the SEL-3094 configuration switches to configure the electrical interface as a DTE or DCE. In the application shown in *Figure 4*, the SEL-3094 provides an interface conversion between a digital multiplexer that supports the IEEE C37.94 standard, and teleprotection equipment that has an ITU-T G.703 electrical interface.

Interfaces can also include EIA-422 (to 64 kbps). In addition, the SEL-3094 offers an EIA-232 interface (to 9600 bps). You can use the connections shown in *Figure 5* to connect teleprotection equipment (e.g., digital protection relays with an EIA-232 port) to an IEEE C37.94 compliant multiplexer or other equipment such as routing switches.

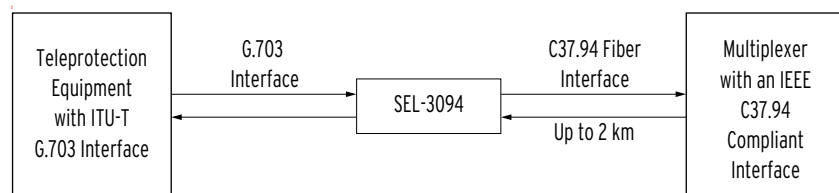


Figure 4 The SEL-3094 Provides Optical-to-Electrical Conversion Between a C37.94 Compliant Digital Multiplexer and a Noncompliant Teleprotection Device

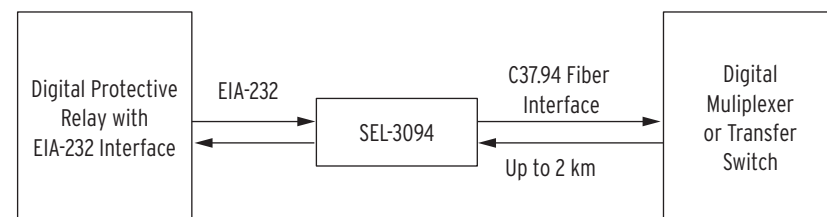


Figure 5 The SEL-3094 Interfaces EIA-232 Relays to Multiplexers and Switching Equipment

Connect a Noncompliant Digital Multiplexer to a Noncompliant Teleprotection Device With Fiber Optics

Use two SEL-3094 Interface Converters back-to-back to eliminate an electrical connection between digital multiplexers and teleprotection equipment as shown in *Figure 6*. Use two SEL-3094 Interface Converters with different electrical interfaces to convert between different electrical standards. Available electrical interfaces include the G.703 interface, and the EIA-422 interface (to 64 kbps) shown in *Figure 6*. In addition, the SEL-3094 offers an EIA-232 interface (to 9600 bps).

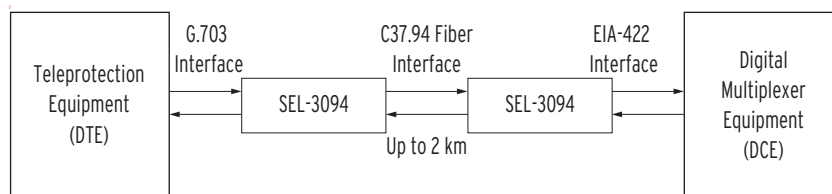


Figure 6 The SEL-3094 Provides an Optical Connection Between Two Devices While Converting the Electrical Interface Between the Two Devices

Installation

EIA-422 Interface Configuration

The SEL-3094 has 10 switches (*Figure 7*) that are used to set its configuration. This section describes the functions of the control switches.

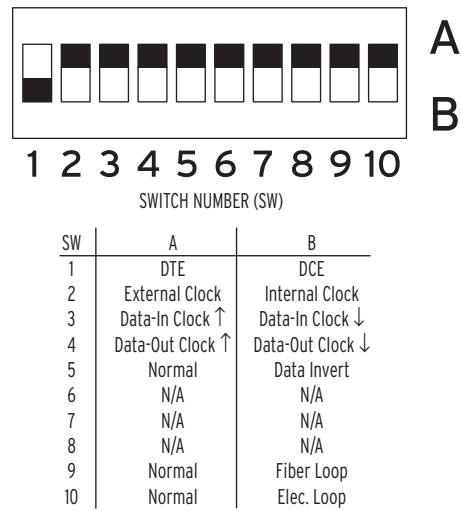


Figure 7 Control Switch Positions for the EIA-422 Version

SW1 DTE/DCE. SW1 selects the operating mode of the high-speed electrical port. For example, when connecting an SEL-3094 electrical port to a multiplexer, configure the SEL-3094 electrical interface as a DTE by moving SW1 to Position A. In DTE mode, the SEL-3094 receives clocks from the multiplexer, as shown in *Figure 8*.

When connecting the SEL-3094 electrical port to a protective relay or other DTE, configure the SEL-3094 as DCE (SW1 Position B). In DCE mode, the SEL-3094 delivers clocks to the connected DTE equipment, as shown in *Figure 10*.

SW2 External Clock/Internal Clock. SW2 selects the timing source for the SEL-3094. Normally this switch is set for External Clock. With SW2 set to Position A, the SEL-3094 synchronizes to the clock recovered from the fiber port when DCE is selected, or to the clock signals received from the electrical port when DTE is selected.

In some configurations it is desirable to have the SEL-3094 free run; set SW2 to Internal Clock (Position B) for such conditions.

SW3 Data-In Clock ↑/Data-In Clock ↓. Set SW3 to Position A when the incoming data change on the rising edge of signal Data-In Clock B (DB-25 Pin 9 for DTE, Pin 4 for DCE). See *Table 1*.

SW4 Data-Out Clock ↑/Data-Out Clock ↓. Set SW4 to Position A when the outgoing data are sampled (in the external equipment) on the rising edge of signal Data-Out Clock B (DB-25 Pin 12 for DTE, Pin 11 for DCE). See *Table 1*.

SW5 Normal/Data Invert. When SW5 is in Position B, the SEL-3094 inverts the incoming and outgoing data on the electrical port. For most applications, SW5 should be left in Position A.

SW6 Is Reserved.

SW7 Is Reserved.

NOTE: When loopback is enabled on either port, the other port stops transmitting. This results in a loss of communication for the remote device.

SW8 Is Reserved.

SW9 Normal/Fiber Loop. When SW9 is in the Fiber Loop position (Position B), the data received from the fiber-optic IN port are looped back to the fiber-optic OUT port.

SW10 Normal/Electrical Loop. When SW10 is in the Electrical Loop position (Position B), the data received from the electrical port are looped back out of the electrical port.

Table 1 EIA-422 Clock Polarity Settings for Popular Communications Equipment

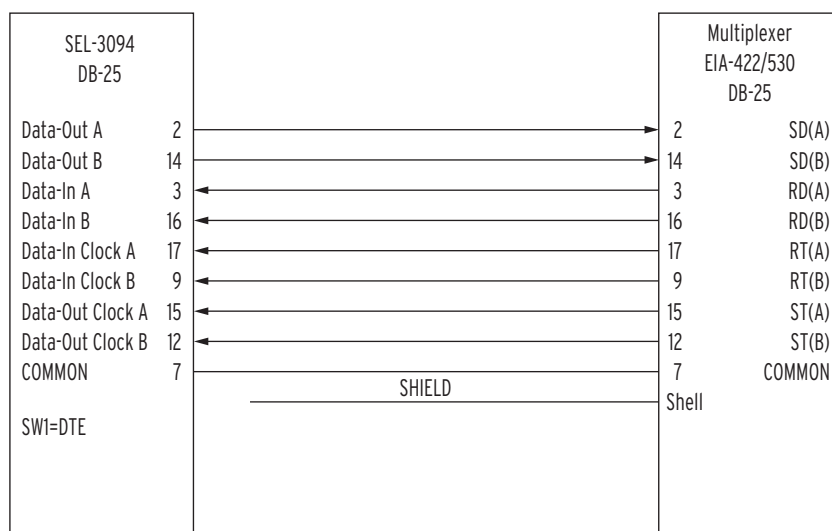
Multiplexer MFG	Product	Channel Card	Interface Adapter	DCE Tx/Rx Clock Polarity Setting	SEL-3094 Clock Polarity Setting
RFL	IMUX	DS562I	MA406IA	RXICP=Normal TXICP=Normal	SW3=B SW4=A
Pulsar	FOCUS	64K	N/A	N/A	SW3=A SW4=A
General Electric	JMUX	Nx64 Unit 86464-01	86447-90	Transmit=INT ↑ Receive=INT ↑	SW3=B SW4=A
Telco Sys	DCB/ Route 24	HSD 2476-62	N/A	N/A	SW3=B SW4=A

EIA-422 Interface Pinout

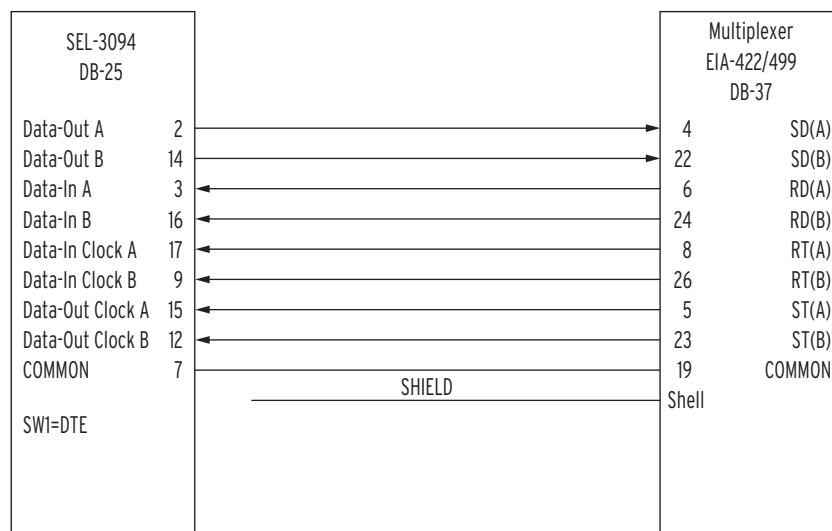
The EIA-422 interface supplied in the SEL-3094 is optically isolated from the chassis. The signal common is also isolated from the chassis, preventing ground loops. To preserve that isolation, ground the cable shield at only one end. All of the cables shown in *Table 4* connect the shield at the multiplexer end only.

The DB-25 DTE connector pinout on the SEL-3094 is shown in *Figure 8*. The pinout is per EIA-530 standard. The connections for a multiplexer with an EIA-422 DB-37 pin interface are shown in *Figure 9*.

Figure 10 shows the DB-25 DCE connector pinout on the SEL-3094. When operating the SEL-3094 in DCE mode, connect the cable shield to Pin 1 (chassis) of the DB-25 connector.



**Figure 8 Typical Connections for an SEL-3094 (DTE) to an EIA-422/
EIA-530 Multiplexer Connector**
(SEL Cable C451)



**Figure 9 Typical Connections for an SEL-3094 (DTE) to an EIA-422/
EIA-449 Pin Multiplexer Connector**
(SEL Cable C453)

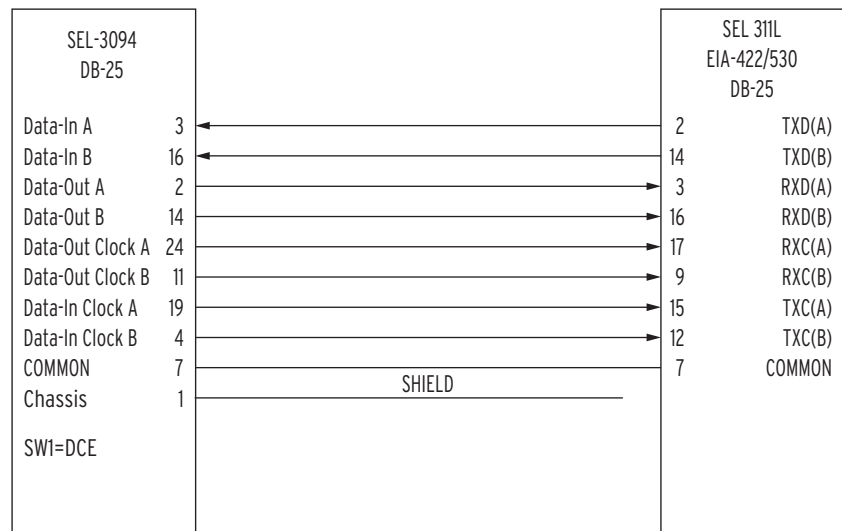


Figure 10 Typical Connections for an SEL-3094 (DCE) to an SEL-311L Relay
(SEL Cable C460)

Table 2 EIA-422 Connector Pinout

Terminal	Function
2	Data Out A
14	Data Out B
15	Data Out Clock A (DTE)
12	Data Out Clock B (DTE)
24	Data Out Clock A (DCE)
11	Data Out Clock B (DCE)
3	Data In A
16	Data In B
17	Data In Clock A (DTE)
9	Data In Clock B (DTE)
19	Data In Clock A (DCE)
4	Data In Clock B (DCE)
7	Common
1	Chassis

ITU-T G.703
Codirectional
Interface
Configuration

The SEL-3094 has 10 switches (*Figure 11*) that are used to set its configuration. This section describes the functions of these control switches.

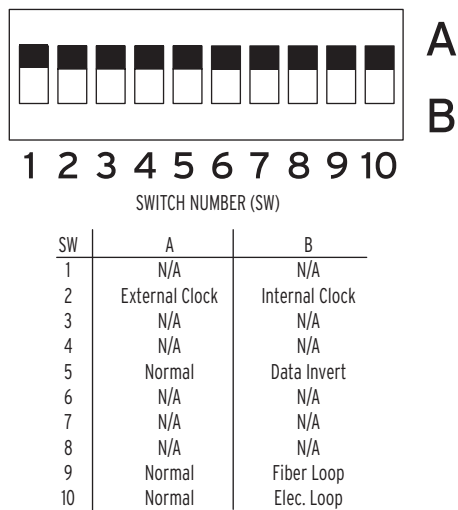


Figure 11 Control Switch Positions for the G.703 Version

SW1 Is Reserved.

SW2 External Clock/Internal Clock. SW2 selects the timing source for the SEL-3094 outgoing fiber data. Normally this switch is set for External Clock (Position A). With SW2 set to Position A, the SEL-3094 synchronizes fiber-optic transmissions to the clock recovered from the electrical interface. With SW2 set to Position B, fiber-optic transmissions free run at the nominal rate determined by the IEEE C37.94 standard. Data transmission from the electrical port is always synchronized to the clock recovered from the fiber-optic IN port.

In some configurations it is desirable to have the SEL-3094 free run; set SW2 to Internal Clock (Position B) for such conditions.

SW3 Is Reserved.

SW4 Is Reserved.

SW5 Normal/Data Invert. When SW5 is in Position B, the SEL-3094 inverts the incoming and outgoing data on the electrical port. For most applications, SW5 should be left in Position A.

SW6 Is Reserved.

SW7 Is Reserved.

SW8 Is Reserved.

SW9 Normal/Fiber Loop. When SW9 is in the Loop Fiber position (Position B), the data received from the fiber-optic IN port are looped back to the fiber-optic OUT port.

SW10 Normal/Electrical Loop. When SW10 is in the Loop Electrical position (Position B), the data received from the electrical port are looped back out of the electrical port.

NOTE: When loopback is enabled on either port, the other port stops transmitting. This results in loss of communication for the remote device.

ITU-T G.703 Codirectional Interface Pinout

The G.703 interface is transformer isolated from the chassis to 1500 Vrms. Each differential pair is transformer isolated; there is no signal common. To prevent ground loops, ground the cable shield at only one end. The DB-25 connector pinout on the SEL-3094 and the direction of signal flow is shown in *Figure 12*.

No clock polarity selections are necessary because the synchronizing clock is embedded in the transmit and receive data. A typical SEL-3094-to-multiplexer connection for a G.703 interface is shown in *Figure 12*. The multiplexer must provide a clear channel (64 kbps) for use with the G.703 codirectional interface. If your network or multiplexer equipment cannot provide a clear channel, contact SEL.

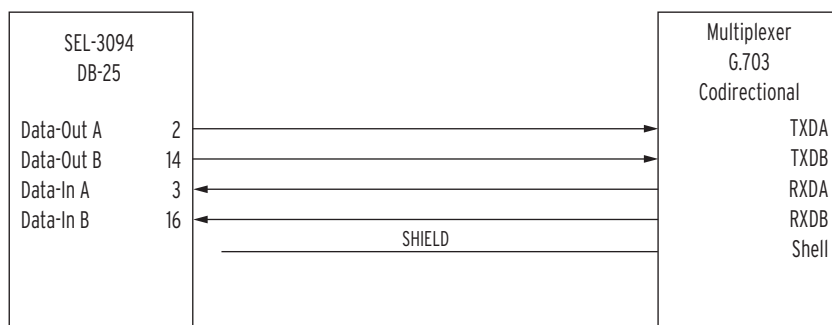


Figure 12 Typical Connections for an SEL-3094 to a G.703 Codirectional Multiplexer Interface

Table 3 G.703 Connector Pinout

Terminal	Function
2	Data Out A
14	Data Out B
3	Data In A
16	Data In B
1	Chassis Ground

EIA-422 and G.703 Electrical Interface Cables Available from SEL

Table 4 lists SEL interconnect cables available for the listed digital multiplexers. Other cables can be designed and manufactured upon request. Connector type and pinout information must be supplied for custom cables.

Table 4 Standard SEL Cables

Multiplexer MFG	Product	Channel Card	Interface Adapter	SEL Cable	Interface Type
RFL	IMUX	DS562I	MA406IA	C453	EIA-422; EIA-449
RFL	IMUX	DS562I	MA408IA	C452	G.703
Pulsar	FOCUS	64K	N/A	C451	EIA-422; EIA-530
General Electric	JMUX	Nx64 Unit 86464-01	86447-90	C450	EIA-422; Terminals
Telco Sys	DCB/Route 24	HSD 2476-62	N/A	C454	EIA-422 Non-standard

EIA-232 Interface Configuration

The SEL-3094 has 10 switches (*Figure 13*) that are used to set its configuration. This section describes the functions of these control switches.

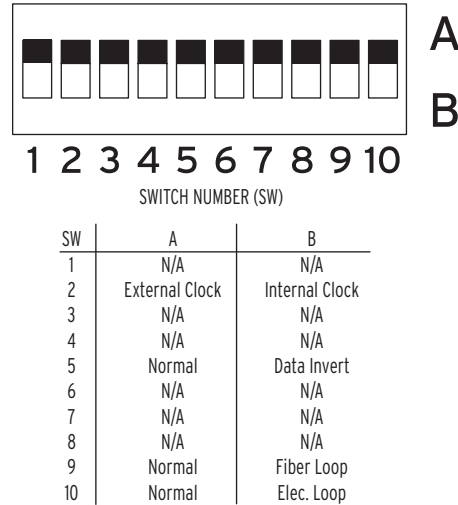


Figure 13 Control Switch Positions for the EIA-232 Version

SW1 Is Reserved.

SW2 External Clock/Internal Clock. SW2 selects the timing source for the SEL-3094 outgoing fiber data, via the OUT port. (Data transmission from the electrical port is always synchronized to the clock recovered from the fiber-optic IN port.)

With SW2 set to Position A, the SEL-3094 synchronizes fiber-optic transmissions to the clock recovered from the electrical interface. With SW2 set to Position B, fiber-optic transmissions free run at the nominal rate determined by the IEEE C37.94 standard.

Normally this switch is set for External Clock (Position A). In some configurations you might want the SEL-3094 to free run; set SW2 to Internal Clock (Position B) for such conditions.

SW3 Is Reserved.

SW4 Is Reserved.

SW5 Normal/Data Invert. When SW5 is in Position B, the SEL-3094 inverts the incoming and outgoing data on the electrical port. For most applications, SW5 should be left in Position A (normal). This switch has no effect in the loopback modes of SW9 and SW10.

SW6 Is Reserved.

SW7 Is Reserved.

SW8 Is Reserved.

SW9 Normal/Fiber Loop. When SW9 is in the Loop Fiber position (Position B), the data received from the fiber-optic IN port are looped back to the fiber-optic OUT port.

SW10 Normal/Electrical Loop. When SW10 is in the Loop Electrical position (Position B), the data received from the electrical port are looped back out of the electrical port.

NOTE: When loopback is enabled on either port, the other port stops transmitting. This results in loss of communication for the remote device.

EIA-232 Electrical Interface Pinout

The EIA-232 interface provides an isolated port. *Table 5* shows the female DB-25 connector pinout on the SEL-3094. The SEL-3094 has a DCE configuration.

Table 5 Isolated EIA-232 Connector Pinout

Terminal	Function
2	EIA-232 data in (TX)
3	EIA-232 data out (RX)
7	Signal ground/common (GND)

EIA-232 signals are asynchronous and the SEL-3094 generates a clock signal automatically from the incoming serial data. A typical SEL-3094-to-teleprotection device (relay) connection for an EIA-232 interface is shown in *Figure 14*, supplied by a C222R cable.

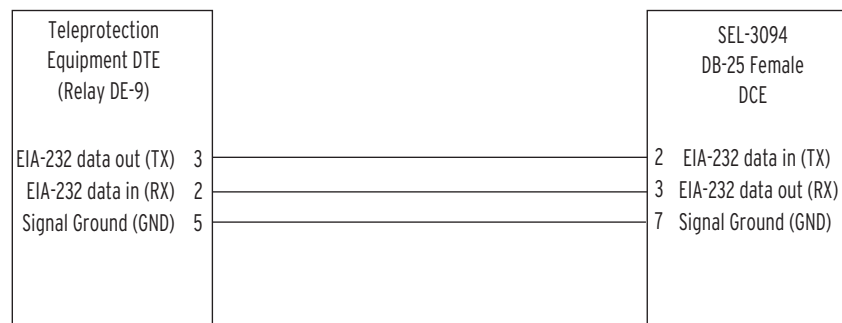


Figure 14 Typical Connections for a Protective Relay to the SEL-3094 (SEL Cable C222R)

Fiber-Optic Port

The SEL-3094 uses a fiber-optic transmitter. When working with this device, 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 instruction manual 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.

Testing and Troubleshooting

Test the SEL-3094 with IEEE C37.94 compliant teleprotection equipment connected through a multiplexer.

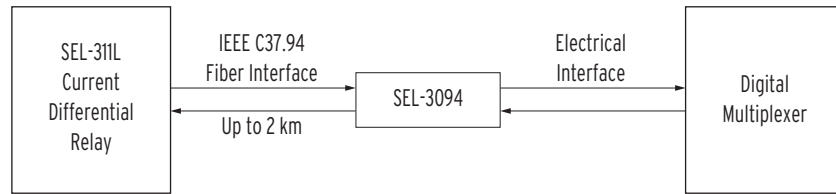


Figure 15 SEL-3094 Connecting a Noncompliant Digital Multiplexer With an SEL-311L Relay

- Step 1. Check the SEL-3094 switch settings. For this application, make sure that SW1 is set to DTE. If the electrical interface is EIA-422 and your multiplexer is listed in *Table 1*, set SW2 and SW3 as recommended in *Table 1* and set SW4 to the **EXT** position to use the clock recovered from the multiplexer.
- Step 2. Connect the chassis ground terminal of the SEL-3094 to ground (Terminal 6 or 7).
- Step 3. Connect and apply rated voltage to the power supply inputs of the SEL-3094 (positive to Terminal 4, negative to Terminal 5). The **EN** LED should illuminate. The Form B **ALARM** contact should remain closed. The **IN** LEDs and the **ELECTRICAL OUT** LED do not illuminate. The green **FIBER OUT** LED illuminates to indicate that C37.94 frames are being transmitted.
- Step 4. Make the fiber-optic connections between the SEL-3094 and the relay by connecting a fiber between the relay C37.94 transmit (TX) connector and the SEL-3094 **FIBER IN** connector. Repeat this step for the remaining fiber connection. The green **FIBER IN** LED should now illuminate. If the electrical interface is ITU-T G.703, the green **ELECTRICAL OUT** LED should illuminate.
- Step 5. Make the electrical connection between the SEL-3094 and the multiplexer. Use the recommend SEL cable or wire per *Figure 8* through *Figure 15*. The Form B **ALARM** contact should open, and the green **ELECTRICAL IN** LED should illuminate. If the electrical interface is EIA-422, the green **ELECTRICAL OUT** LED should illuminate.

FIBER ALARM LED (Yellow Alarm Condition)

Figure 16 illustrates the operation of the yellow alarm bit and LED. A yellow alarm is a remote receive alarm communicated from the remote receiver to the local device via a predefined alarm bit in the IEEE C37.94 communication frame. A yellow alarm is declared when the remote device is not receiving fiber-optic data from the SEL-3094. The remote device sets the yellow alarm bit in the frame header in the transmit direction back to the SEL-3094. If the SEL-3094 is still receiving data from the channel card, the yellow alarm bit is decoded and the yellow **FIBER ALARM** LED is illuminated.

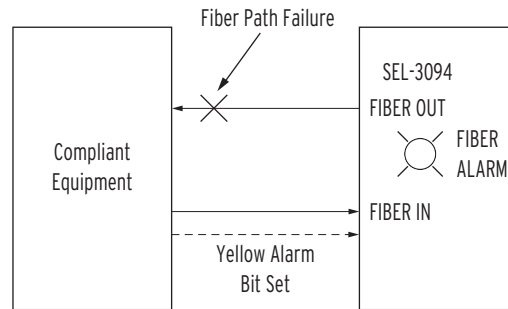


Figure 16 Link Failure and Yellow Alarm Condition

Alarms and Indications

EN ○	IN ○	OUT ○	ELECTRICAL
LOOP ○	IN ○	OUT ○	FIBER ALARM ○

Figure 17 Diagnostic LEDs

The SEL-3094 uses LEDs located on the front panel to annunciate the system's performance (*Figure 17*). *Table 6* describes the meaning of each LED.

Table 6 LED Indicators

LED	Description
EN	Indicates that the SEL-3094 power supply is healthy and that the unit is operational.
LOOP	Indicates an active fiber or electrical loop condition. See descriptions for SW9 and SW10.
ELECTRICAL IN	Indicates that data are changing and a clock signal is detected.
ELECTRICAL OUT	Indicates that data are changing and a clock signal is detected.
FIBER IN	Indicates that valid C37.94 frames are being detected.
FIBER OUT	Indicates that valid C37.94 frames are being sent.
ALARM	Indicates a C37.94 yellow alarm bit is being received from the remote device.

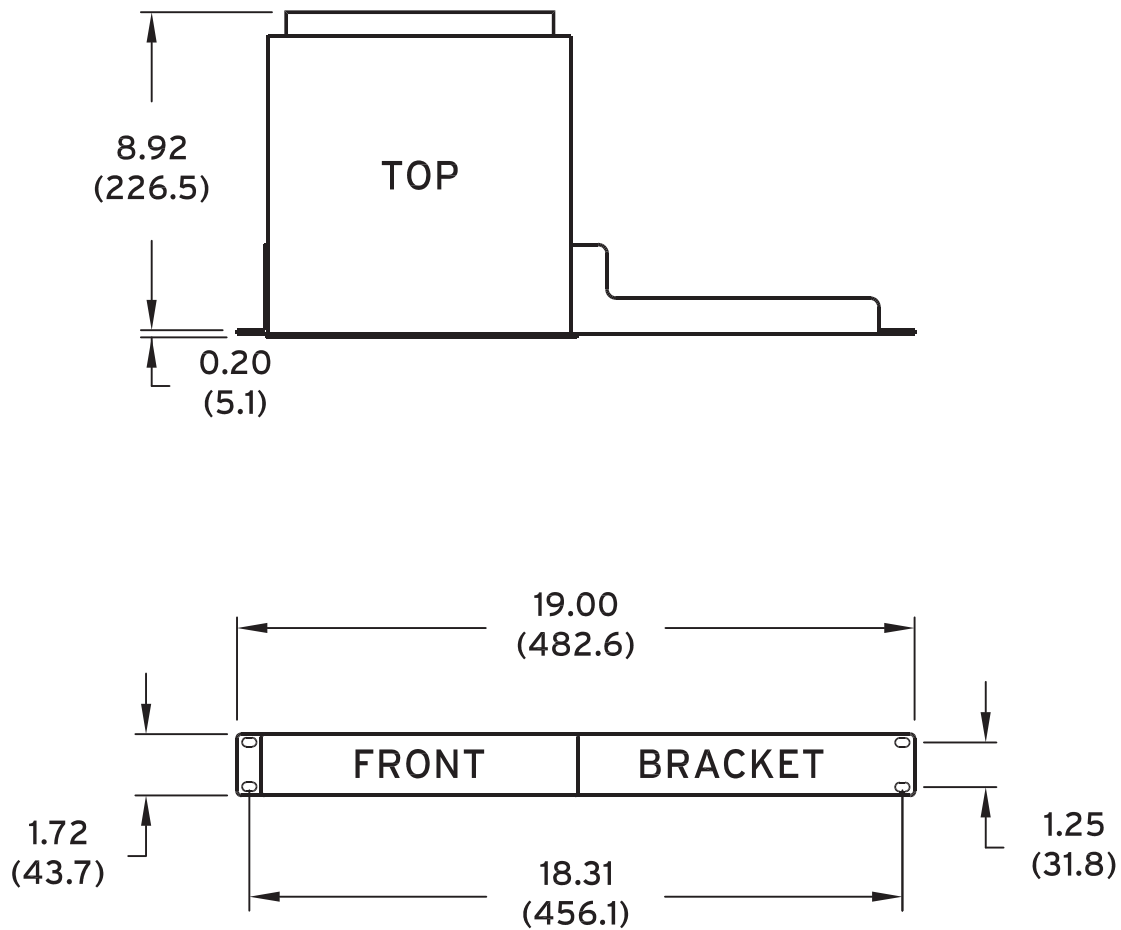
A Form C contact is provided as an alarm contact. The alarm relay is normally energized; it is de-energized when the SEL-3094 is in an alarm condition. The alarm contact symbols on the rear of the chassis are shown for the de-energized state. For example, if you would like to annunciate an active alarm with a closed contact, use Terminals **2** and **3**.

The alarm relay is de-energized by the following conditions:

- No input power or internal power supply failure.
- An active loop condition (see SW9 and SW10).
- Failure of the SEL-3094 to initialize properly on power up.

Mechanical Diagrams

RACK-MOUNT CHASSIS



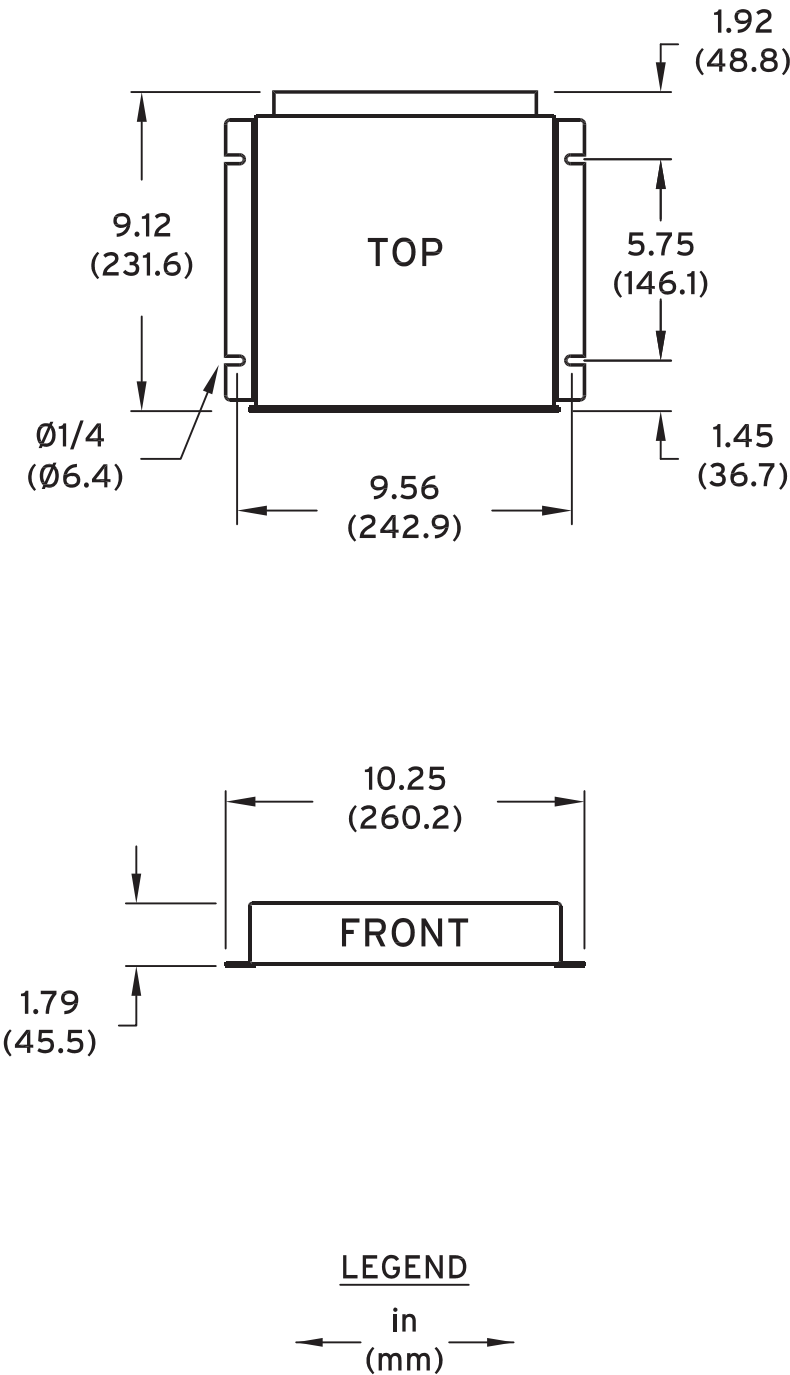
LEGEND

in
(mm)

i9035b

Figure 18 SEL-3094 Fitted With Mounting Bracket (SEL P/N 190-2981) for Mounting in a 19-Inch Rack
(Packaging ordering option B; dimensions are the same as the rack mount chassis shown in Figure 20)

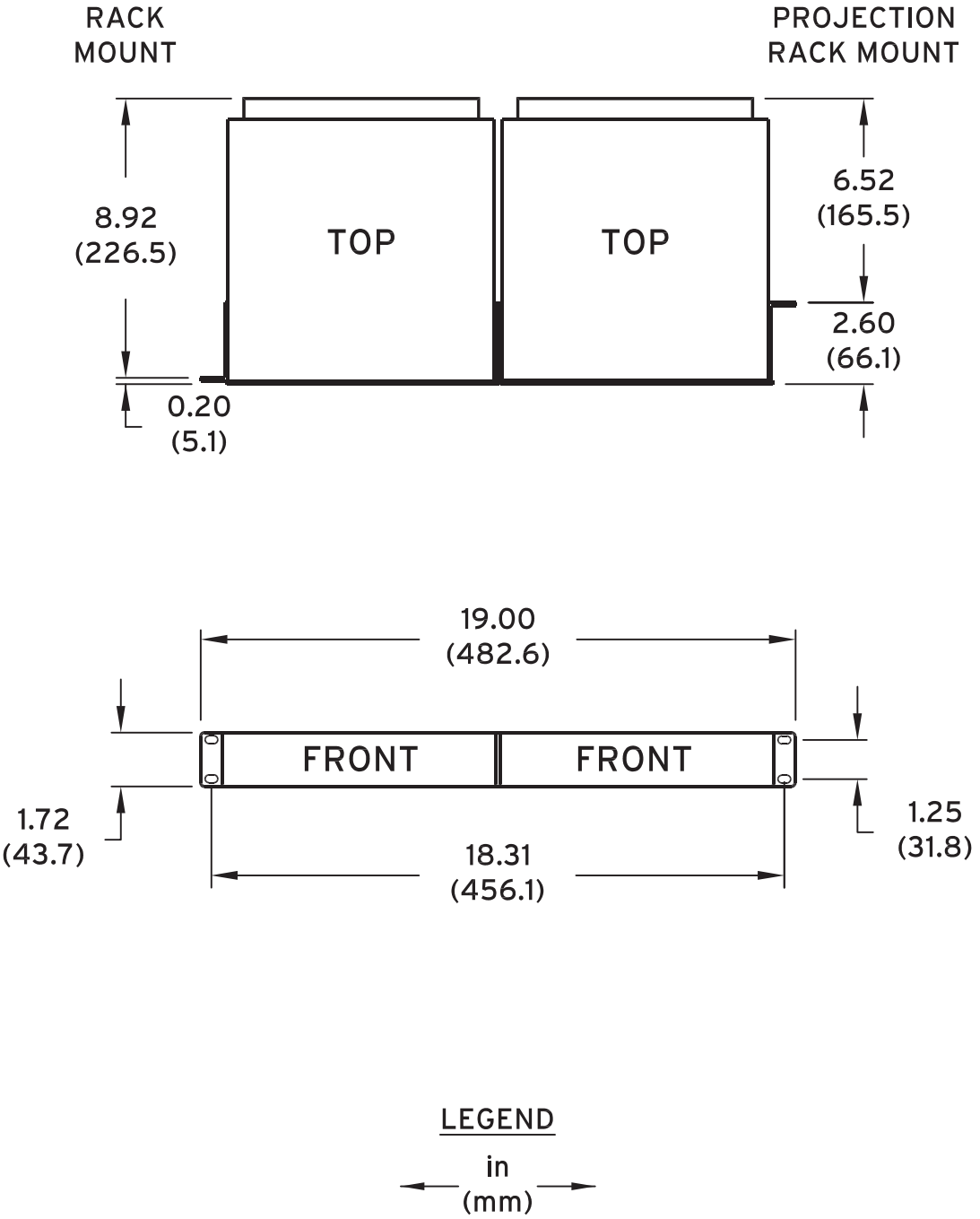
SURFACE-MOUNT CHASSIS



i9038c

Figure 19 Surface-Mount Dimensions and Drill Plan
(Packaging ordering option W)

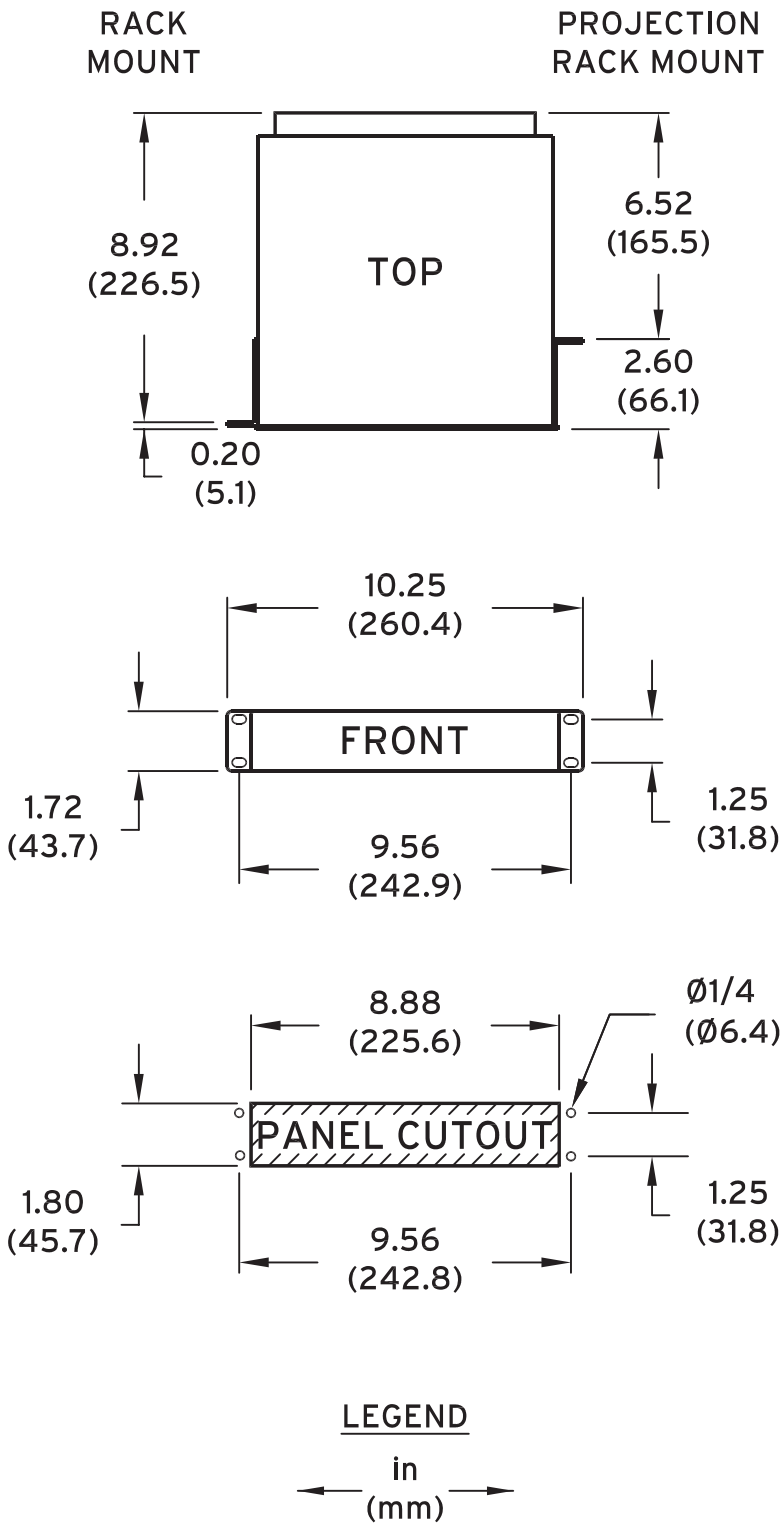
RACK-MOUNT CHASSIS



i9034b

Figure 20 Mounting Two SEL-3094 Interface Converters
(Packaging ordering option P)

RACK-MOUNT CHASSIS



i9033d

Figure 21 SEL-3094 Dimensions for Mounting a Single Chassis in a Panel
(Packaging ordering option X)

Specifications

Alarm Contact

Form C
 Carry: 6 A
 MOV protected: 270 Vac rms
 360 Vdc continuous

Power Supply

Range: 18–300 Vdc
 or 85–264 Vac
 Burden: <5 W

Maximum Data Delay

200 μ s

Maximum Delay Asymmetry

50 μ s

Optical Interface

IEEE C37.94

Port Speed (Data Rate)

64 kbps (1 DS0)

Fiber-Optic Port

Optical Interface
 Connector: ST
 Optical Source: 850 nm VCSEL transmitter
 Typical Transmit Level: –12 dBm
 Maximum Output Level: –3 dBm
 RX Sensitivity: –27 dBm
 Fiber-Optic Link Budget: 15 dB
 IEC 60825-1:1993 + A1:1997 + A2:2001
 Class 1 Laser product
 21CFR 1040.10 Class 1 Laser product

Operating Temperature Range

–40° to +85°C
 –40° to +185°F

Unit Weight

1.36 kg (3 lb, 0 oz)

Dimensions

4.45 cm H x 21.59 cm W x 23.37 cm D
 (1.75 in. H x 8.5 in. W x 9.2 in. D)

Electrical Interface Options

G.703 (64 kbps, codirectional)
 EIA-422 (64 kbps)
 EIA-232 (to 9600 bps)

Electrical Interface Connection

G.703: DB-25 Male
 EIA-422: DB-25 Male
 EIA-232: DB-25 Female

Type Tests

Electromagnetic Compatibility Immunity

Conducted RF
 Immunity: IEC 61000-4-6:2004

[BS EN 61000-4-6:1996 + CDRG:2001]
 IEC 60255-22-6:2001
 [BS EN 60255-22-6:2001]
 Severity Level: 10 Vrms

Digital Radio
 Telephone RF
 Immunity:

ENV 50204:1995
 Severity level: 10 V/m at 900 MHz and 1.89 GHz

Electrostatic
 Discharge
 Immunity:

IEC 60255-22-2:1996
 [BS EN 60255-22-2:1997]
 IEC 61000-4-2:2001
 [BS EN 61000-4-2:1995 + A1:1999 + A2:2001]
 IEEE C37.90.3-2001
 Severity level: 2, 4, and 8 kV contact; 4, 8 and 15 kV air

Fast Transient/
 Burst Immunity:

IEC 61000-4-4:1995 + A1:2000 + A2:2001
 [BS EN 61000-4-4:1995 + A1:2001 + A2:2002]
 IEC 60255-22-4:2002
 [BS EN 60255-22-4:2002]
 Severity level: 4kV at 2.5 kHz and 5 kHz

Magnetic Field
 Immunity:

IEC 61000-4-8:2001
 [BS EN 61000-4-8:1994 + A1:2001]
 Severity level: 1000 A/m for 3 seconds, 100 A/m for 1 minute
 IEC 61000-4-9:2001
 [BS EN 61000-4-9:1994 + A1:2001]
 Severity level: 1000 A/m

Power Supply
 Immunity:

IEC 61000-4-11:2004
 [BS EN 61000-4-11:2004]
 IEC 61000-4-29:2000
 [BS EN 61000-4-29:2001]
 IEC 60255-11:1979

Radiated Radio
 Frequency
 Immunity:

IEC 60255-22-3:2000
 [BS EN 60255-22-3:2001]
 IEC 61000-4-3:2002
 [BS EN 61000-4-3:2002]
 Severity level: 10 V/m
 IEEE C37.90.2-2004
 Severity Level: 35 V/m

Surge Immunity: IEC 60255-22-5:2002
 [BS EN 60255-22-5:2002]
 IEC 61000-4-5:1995 + A1:2001
 [BS EN 61000-4-5:1995 + A1:1996]
 Severity level: 1 kV Line to Line, 2 kV Line to Earth

Surge Withstand
 Capability
 Immunity:

IEC 60255-22-1:2005
 Severity level: 2.5 kV peak common mode, 1.0 kV peak differential mode
 IEEE C37.90.1-2002
 Severity level: 2.5 kV oscillatory, 4 kV fast-transient waveform

Environmental

Cold:

IEC 60068-2-1:1990 + A1:1993 + A2:1994
 [BS EN 60068-2-1:1993 + A2:1995]
 Test Ad; Cold; Severity level: 16 hours at –40°C

Dry Heat:

IEC 60068-2-2:1974 + A1:1993 + A2:1994
 [BS EN 60068-2-2:1993 + A1:1995]
 Test Bd; Dry heat; Severity level: 16 hours at +85°C

Damp Heat Cyclic:

IEC 60068-2-30:1980 + A1:1985
 [BS EN 60068-2-30:1999]

Vibration:

Test Db and guidance; Severity level: 25°C to 55°C, 6 cycles, Relative humidity: 95%
 IEC 60255-21-1:1988
 [BS EN 60255-21-1:1996 + A1:1996]
 Severity level: Class 1
 Endurance, Class 2
 Response
 IEC 60255-21-2:1988
 [BS EN 60255-21-2:1996 + A1:1996]
 Severity level: Class 1: Shock withstand, Bump, and Class 2: Shock Response
 IEC 60255-21-3:1993
 [BS EN 60255-21-3:1995 + A1:1995]
 Severity level: Class 2 (Quake Response)

Safety

Dielectric Strength: IEC 60255-5:2000
IEEE C37.90-1989
Severity level:
2500 Vac on contact
inputs, contact outputs,
and analog inputs.
3100 Vdc on power
supply. Type tested for
1 minute.

Impulse: IEC 60255-5:2000
Severity level:
0.5 Joule, 5 kV
Laser Safety: 21 CFR 1040.10
Product Class: Class 1

Certifications

ISO: Module is designed and manufactured
to an ISO 9001:2000 certified quality
program.

Notes

Notes

Notes



CAUTION: Equipment components are sensitive to electrostatic discharge (ESD). Undetectable permanent damage can result if you do not use proper ESD procedures. Ground yourself, your work surface, and this equipment before removing any cover from this equipment. If your facility is not equipped to work with these components, contact SEL about returning this device and related SEL equipment for service.



CAUTION: Class 1 LASER Product. This product uses visible or invisible LASERS based on model option. Looking into optical connections, fiber ends, or bulkhead connections can result in hazardous radiation exposure.



CAUTION: Removal of enclosure panels exposes circuitry which may cause electrical shock which can result in injury or death.



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



DANGER: Contact with this circuitry may cause electrical shock that can result in injury or death.



DANGER: Contact with instrument terminals may cause electrical shock which can result in injury or death.

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This product is covered by the standard SEL 10-year warranty. For warranty details, visit www.selinc.com or contact your customer service representative.



ATTENTION: Les composants de cet équipement sont sensibles aux décharges électrostatiques (DES). Des dommages permanents non-décelables peuvent résulter de l'absence de précautions contre les DES. Raccordez-vous correctement à la terre, ainsi que la surface de travail et l'appareil avant d'en retirer un panneau. Si vous n'êtes pas équipés pour travailler avec ce type de composants, contacter SEL afin de retourner l'appareil pour un service en usine.



ATTENTION: Produit LASER de Classe 1. Ce produit utilise des LASERS visibles ou invisibles dépendant des options du modèle. Regarder vers les connecteurs optiques, les extrémités des fibres ou les connecteurs de cloison peut entraîner une exposition à des rayonnements dangereux.



ATTENTION: Le retrait des panneaux du boîtier expose le circuit qui peut causer des chocs électriques pouvant entraîner des blessures ou la mort.



ATTENTION: L'utilisation de commandes ou de réglages, ou l'application de tests de fonctionnement différents de ceux décrits ci-après peuvent entraîner l'exposition à des radiations dangereuses.



DANGER: Tout contact avec ce circuit peut être la cause d'un choc électrique pouvant entraîner des blessures ou la mort.



DANGER: Tout contact avec les bornes de raccordement de l'appareil peut causer un choc électrique pouvant entraîner des blessures ou la mort.

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