

# **SEL-RD Relay Display**

## **Instruction Manual**

20080530

 **SCHWEITZER ENGINEERING LABORATORIES, INC.**



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The information in this manual is provided for informational use only and is subject to change without notice. Schweitzer Engineering Laboratories, Inc. has approved only the English language manual.

This product is covered by the standard SEL 10-year warranty. For warranty details, visit [www.selinc.com](http://www.selinc.com) or contact your customer service representative.

PMRD-01

# MANUAL CHANGE INFORMATION

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The date code at the bottom of each page of this manual reflects the creation or revision date. Date codes are changed only on pages that have been revised and any following pages affected by the revisions (i.e., pagination). If significant revisions are made to a section, the date code on all pages of the section will be changed to reflect the revision date.

Each time revisions are made, both the main table of contents and the affected individual section table of contents are regenerated and the date code is changed to reflect the revision date.

Changes in this manual to date are summarized below (most recent revisions listed at top).

**Manual Creation Date:** 1991

Revision Date	Summary of Revisions
20080530	Added barcode to the front cover.
980216	<p>The <i><b>Manual Change Information</b></i> section has been created to begin a record of revisions to this manual. All changes which occur following this revision date code will be recorded in this Summary of Revisions Table.</p> <p>This manual differs from previous revisions as stated in the following summary:</p> <p><b>Specifications</b> - Weight of SEL-RD changed</p> <p><b>Baud Rate Selection</b> - Clarifications</p> <p><b>Getting Started</b> - Caution on “hot-plugging” clarified</p> <p><b>Relay Passwords</b> - Clarifications</p> <p><b>Troubleshooting</b> - Added this section</p>



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## FEATURES

The SEL-RD is a low-cost user interface for up to four SEL relays. The SEL-RD includes the following features:

- Provides easy access to target, meter, status, fault history, and breaker information
- Offers a simple method for sending setting group commands to any of four connected relays, eliminating the expense of a computer or terminal
- Switches between four connected relays to reduce the number of user interfaces
- Switches the selected relay between the SEL-RD Relay Display Computer and the front-panel EIA-232 Test Port to simplify portable computer connection for relay testing
- Front-panel LEDs indicate the selected relay and front-panel Test Port status
- Automatic self testing of RAM, ROM, and display ensures continuous reliable operation
- The SEL-RD may be mounted for convenient viewing with relays at any location
- Compact package requires limited panel space

## SPECIFICATIONS

**Dimensions** 3.4" x 9.5" x 1.05" (8.64cm x 24.13cm x 2.67cm) (H x W x D)

**Unit Weight** 1.0 pounds (0.45 kilograms)

**Shipping Weight** 1.5 pounds (0.68 kilograms)

**Display Functions** TARGET, METER, STATUS, FAULT, BREAKER, GROUP, and PORT

**Self Testing** RAM, ROM, and display tests

**Power Supply** Drawn from relay connected to Port 1 of the SEL-RD:  
+5 V: 400 mA typical

**RFI Tests** Type tested in field from a ¼-wave antenna driven by 20 watts at 150 MHz and 450 MHz, randomly keyed on and off at a distance of one meter from unit.

**Operating Temperature** -4° to +158°F (-20° to +70°C)

**Burn-In Temperature** Twenty (20) temperature cycles from ambient to 75°C (167°F) over a 48-hour period.

## INSTALLATION

### Mounting

The **Mechanical Drawing** section includes a suggested panel layout. The SEL-RD chassis must be connected to protective (earth or frame) ground for safety and performance. One of the mounting studs can be used for this purpose.

### Connection

Connect the SEL-RD to the relays and optionally to a portable computer or terminal as shown below. The relay connected to Port 1 must be capable of supplying +5 Vdc to the SEL-RD. SEL-200 series relays must have internal jumpers installed to provide +5 Vdc through their rear EIA-232 ports. See **Communication Circuits** for further details.

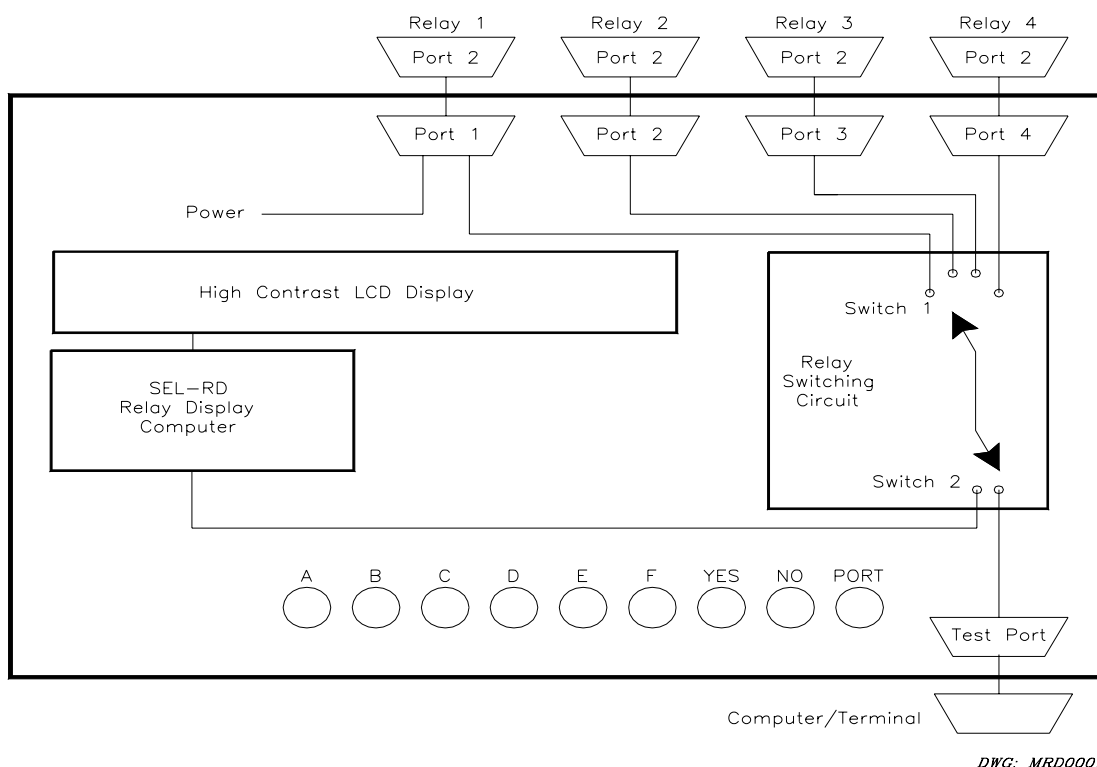
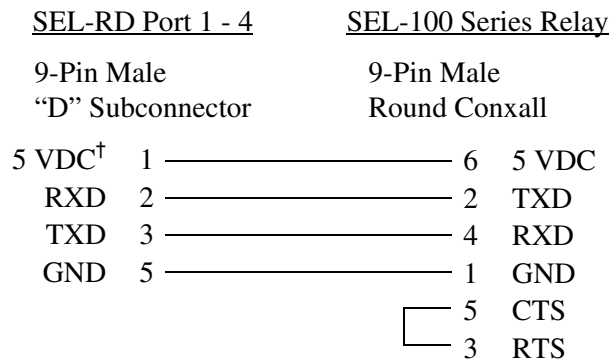


Figure 1: SEL-RD Block Diagram

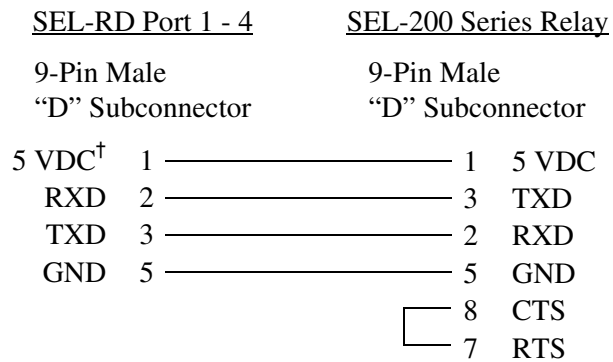


## **EIA-232 Cables**

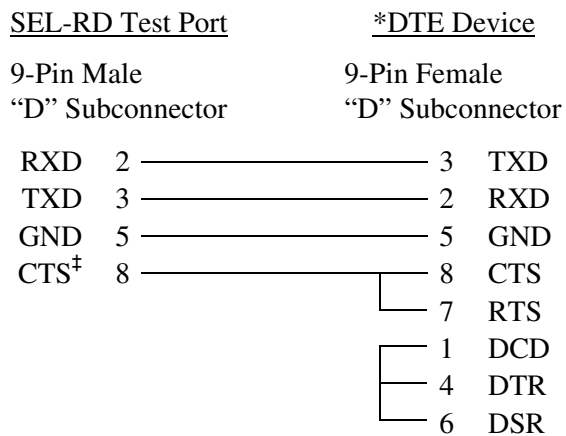
### **Cable C371**



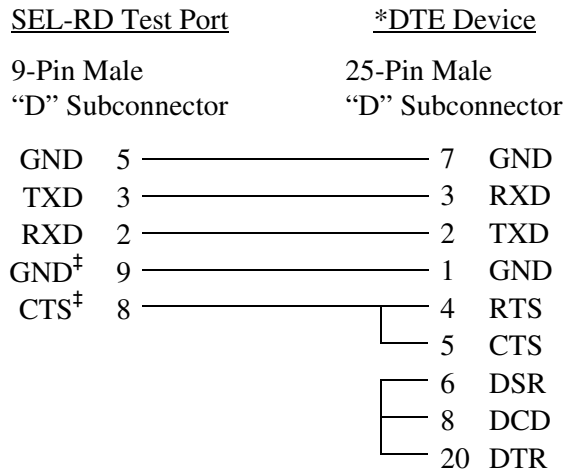
### **Cable C271**



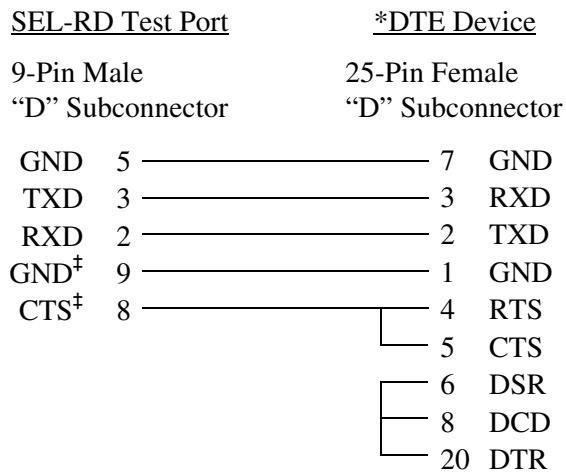
### **Cable C234A**



### Cable C223A



### Cable C227A



\* DTE = Data Terminal Equipment (Computer, Terminal, Printer, etc.)

<sup>†</sup> This is connected only on Port 1 as the power source input.

<sup>‡</sup> These signals are not connected internally on the SEL-RD.

## **Baud Rate Selection**

You can remove the front cover to access SEL-RD baud rate jumper. Unscrew the two jack screws on the Test Port connector, remove the other front-panel screw, and pull the cover off.



### **CAUTION**

The SEL-RD contains devices sensitive to Electrostatic Discharge (ESD). When working on the SEL-RD with the cover removed, work surfaces and personnel must be properly grounded or equipment damage may result.

Available baud rates are: 300, 600, 1200, 2400, 4800, and 9600. Select the baud rate by moving the shunt on J7 to the desired position. All connected relay baud rate settings must match the SEL-RD baud rate.

After selecting the baud rate, replace the cover and screws and tighten them securely.

## **Communication Circuits**

Passive RC filters protect the communications circuits. Minimize communication circuit difficulties by keeping the length of the EIA-232 cables as short as possible. Lengths of twelve feet or less are recommended; cable length should never exceed 100 feet. Use shielded communications cable for lengths greater than ten feet.

**Note:** All SEL-RD power requirements are supplied by a relay via the EIA-232 cable connected to Port 1. Therefore, a maximum length of 15.0 feet is recommended with 22 AWG wire or 9.0 feet with 24 AWG wire.

## **OPERATION**

### **Command Key Overview**

The SEL-RD can be connected to one, two, three, or four relays and switched between these relays. It sends commands to the selected relay and displays data from the relay. The SEL-RD has the following command keys:

1. TARGET
2. METER—Some METER commands not valid for all relay types.
3. STATUS
4. FAULT
5. BREAKER—Not valid for all relay types.
6. GROUP—Valid only for multiple setting group relays.
7. PORT

In addition, it has two keys for scrolling up/down or answering yes/no.

The TARGET, METER, BREAKER, GROUP, and PORT command keys support multiple commands. To select a command, press the appropriate command key. The screen displays command options, which you may examine using the scroll up and down keys. When the desired command appears, press the corresponding command key again. The SEL-RD sends the command to the relay and displays the response.

To view status or fault history information, press the appropriate command key (i.e., STATUS or FAULT). The SEL-RD sends the command to the relay and displays the response.

Some responses are longer than two lines. Use scroll up and down to read the entire response.

### **Getting Started**

Deenergize the relay you intend to connect to the SEL-RD Port 1. Connect the Relay Port 2 to the SEL-RD Port 1, using an appropriate cable, as described in the *Installation* section above.

**CAUTION**

Do not plug an SEL-RD Port 1 cable into a relay unless the relay is deenergized. “Hot-plugging” the Port 1 relay can cause it to reset and lose date, time, and event reports.

Turn on the relay connected to SEL-RD Port 1. This automatically turns on the SEL-RD. The following message indicates that the SEL-RD is on:

Attempting Relay Access ----- >

Accessing Port 1 Relay  
Please Wait

After accessing the relay, the SEL-RD briefly presents the message:

Relay Port Selected ----- >  
SEL-RD/Test Port Selected----- >

Port 1 Enabled  
Relay Display Enabled

It then displays a standby message:

Product Name and  
Software Version----- >  
Relay ID String----- >

SEL-RD            VER R100  
RELAY ID STRING

The SEL-RD software version appears in the upper right hand corner of the screen (e.g., version R100).

If access to the relay connected to SEL-RD Port 1 is not successful, the SEL-RD attempts to access SEL-RD Ports 2, 3, and 4. If no SEL-RD relay ports can be accessed, SEL-RD Port 1 connects to the SEL-RD Test Port.

If the SEL-RD fails to access a relay, there is a failure in the communications channel between the SEL-RD and the connected relay. Check the relay passwords, baud rate jumpers, and cabling.

To check the other communication channels, refer to the ***PORT Commands: Switch Relay Port and Enable Test Port*** portion of this manual.

## **Relay Passwords**

The SEL-RD requires correct passwords for each connected relay.

To set passwords for the SEL-RD, connect a portable computer/terminal to the Test Port, change relay ports, and enable the Test Port as described in the ***PORT Commands: Switch Relay Port and Enable Test Port*** section. Send **PASSWORD <Enter>** to the connected relay. The SEL-RD stores password information returned by the selected relay in EEPROM.

Repeat for all relays connected to the SEL-RD.

Make any password changes to the relay(s) through the SEL-RD. This practice ensures that the SEL-RD passwords are updated whenever the relay passwords are changed

## **TARGET Commands: Access Relay Targets**

TARGET displays relay targets, relay words, contact inputs, and contact outputs.

Press TARGET to select TARGET commands:

Target Command----->	TARGET 0 (TARGET to accept, scroll to change, other keys to exit)
----------------------	--

Scroll to the desired target command (TARGET 0 ... TARGET 8, TARGET R) and press TARGET again to send the command. The following sample display shows TARGET 0 for the SEL-151 relay:

Target Names----->	INST A	B	C	Q	N	RS	LO
Targets----->	1	1	0	0	1	1	0 1

## **METER Commands: Access Metering Data or Reset Demand Registers**

METER displays meter, demand, or peak demand information; resets demand; or resets peak demand of the selected relay on command (where applicable).

Press METER to select METER commands:

Meter Command ----->	METER (METER to accept, scroll to change, other keys to exit)
----------------------	--

Use the scroll keys to select one of the following:

METER	(instantaneous)
METER D	(demand)
METER RD	(reset demand)
METER RP	(reset peak)

Press METER again to send the command. Reset functions prompt you for a confirmation. Press YES to confirm, NO to reject.

The following sample display shows METER for the SEL-151 relay:

Meter Values ----->	MET IA=123456 B=123456 C=123456 R=123456
Meter Values ----->	3I2=123456 P=-1234.567 Q=-1234.567

Use the scroll keys to view additional METER lines.

The SEL-RD can update the METER display every one-half second. The SEL-RD automatically attempts the *Fast Meter* function when you select METER. If Port 2 of the SEL relay has not been upgraded to respond to the *Fast Meter* command, the SEL-RD defaults to the standard meter function, updating the METER display every five seconds.

**Note:** Contact the factory to verify *Fast Meter* capability in an SEL relay.

You can visually confirm the SEL-RD *Fast Meter* function by observing the separator between the meter quantity labels and values. A colon (:) indicates fast meter; an equal sign (=) indicates standard meter.

### **STATUS Command: Channel Offsets, Power Supply Voltages, and Test Status**

STATUS displays analog channel offsets, power supply voltages, and self test status information for the selected relay.

Press STATUS to send a STATUS command:

Status Header----->	RELAY 1 STATUS REPORT
Date and Time----->	DATE: 01/01/91                      TIME: 00:00:00

Use the scroll keys to view additional STATUS lines.

The SEL-RD automatically displays any relay status warning.

### **FAULT Command: Retrieve Relay Fault History**

FAULT displays fault history information.

Press FAULT to send a HISTORY command. The following sample display shows the first fault of an SEL-151 relay fault history:

#, Date, Time,	1	12/2/91	01:36:59.070	AG	2.43
Event, Location----->	0	2798	2	INSTAQN	
Shot, Current, Group, Targets --->					

Use the scroll keys to view the entire fault history.

The SEL-RD automatically displays the relay fault history after a new fault.

### **BREAKER Commands: Access Breaker and External Breaker Data**

BREAKER displays breaker relay and external trips with interrupted current sums or resets these quantities.

Press BREAKER to select BREAKER commands:

Breaker Command----->	BREAKER (BREAKER to accept, scroll to change, other keys to exit)
-----------------------	---

Scroll to the desired breaker command (BREAKER, BREAKER R) and press BREAKER again to send the command.

The following sample display shows BREAKER for the SEL-151 relay:

Relay Trips----->	Rly Trips=65535 From: 01/01/91 22:33:51
Interrupted Current Sums ----->	AI=99999.99 IB=99999.99 IC=99999.99 KA

Use the scroll keys to view additional BREAKER information.

Reset functions prompt you for a confirmation. Press YES to confirm, NO to reject.

### **GROUP Setting Commands: Change Relay Setting Group**

GROUP changes the relay setting group.

Press GROUP to select the GROUP commands:

Group Command----->	GROUP 1 (GROUP to accept, scroll to change, other keys to exit)
---------------------	---

Scroll to the desired group setting command (GROUP 1 ... GROUP 6) and press GROUP again to send the command.

The SEL-RD returns the following message after sending a GROUP 1 command to an SEL-151 relay with the relay contact inputs set to GROUP COMMAND SELECTION:

Contact Inputs Selection ----->	Active Group = 1
Group Command Selection ----->	Group Variable = 1

Active Group is the setting group currently in use; the Group Variable is the setting group selected with a group command.

### **PORT Commands: Switch Relay Port and Enable Test Port**

PORT controls two software switches as shown in Figure 1. Switch 1 selects one of the four relay ports. Switch 2 controls whether the selected relay port is connected to the front-panel Test Port or the SEL-RD Relay Display Computer.

Press PORT to select PORT commands:

Port Command ----->	PORT 1 (PORT to accept, scroll to change, other keys to exit)
---------------------	---

Use the scroll keys to select one of the following:

PORT 1	(relay port 1)	] Switch 1
PORT 2	(relay port 2)	
PORT 3	(relay port 3)	
PORT 4	(relay port 4)	
TEST PORT	(front-panel test port)	] Switch 2
SEL-RD	(relay display)	

Press PORT again to send the command.

The SEL-RD attempts to access the relay as described in *Getting Started*. The following sample display shows a message confirming access to Port 4:

Relay Port Selected ----->  
SEL-RD/Test Port Selected----->

Port 4 Enabled Relay Display Enabled
---

## STANDBY

The SEL-RD enters STANDBY when it starts communications with a relay. The SEL-RD also enters STANDBY when you push a key other than scroll up/down or the last command key pressed.

In STANDBY, pressing scroll up or down keys tests the display.

The following message indicates STANDBY:

Product Name and  
Software Version----->  
Relay ID String----->

SEL-RD	VER R100
RELAY ID STRING	

## TROUBLESHOOTING

### Blank or Strange Display

1. Is the SEL-RD receiving power? Ensure that Port 1 is connected to a host relay with the proper cable (see **EIA-232 Cables** section) and the connections are secure. Ensure that the host relay is powered up and operating normally. Ensure that the host relay has +5 Vdc on pin 1 of the port connected to the SEL-RD.

**Note:** Some relays must have a main board jumper installed to provide +5 Vdc power to the EIA-232 ports.

2. Are the connecting cables too long? See **Communication Circuits** section for maximum lengths.
3. Although the high contrast LCD display in the SEL-RD is rated to operate over a wide range of ambient temperatures, it may become dim, sluggish, or unreadable under certain conditions. A contrast adjustment control is provided if adjustment becomes necessary.

Remove the front cover as outlined in the **Baud Rate Selection** portion of this manual.



#### CAUTION

The SEL-RD contains devices sensitive to Electrostatic Discharge (ESD). When working on the SEL-RD with the cover removed, work surfaces and personnel must be properly grounded or equipment damage may result.

The adjustment control is above the TARGET button and may be turned with a small flat-bladed screw driver.

After adjusting, replace the cover and screws and tighten them securely.

4. See #4 below.



## **Buttons Not Responding**

1. Have all communications to the connected relays gone *through* the Test Port on the SEL-RD? The SEL-RD may not have the proper passwords. See ***Relay Passwords*** section.
2. Is the SEL-RD switched to the proper relay? Ensure that the proper port LED is lit. See ***PORT Commands: Switch Relay Port and Enable Test Port*** section.
3. Are all attached relays set with the same baud rate as the SEL-RD? See ***Baud Rate Selection*** section.
4. If the SEL-RD appears to be “locked up”, a soft-boot can be performed by simultaneously pressing the YES, NO, and A buttons. Assuming the SEL-RD is powered and operating, this “3-button push” will have the same effect as if power had been cycled.

## **Last Resort**

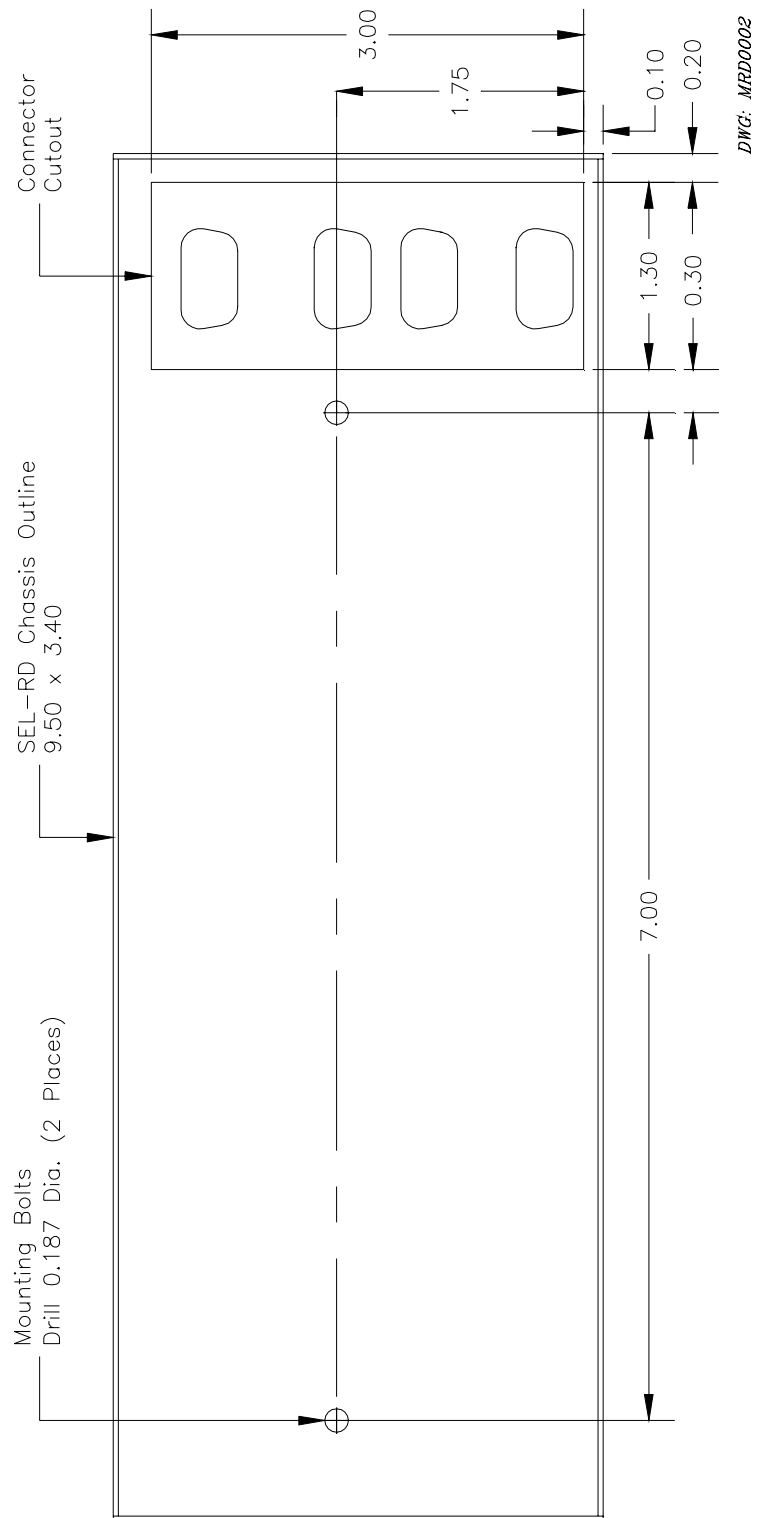
If cycling power to the SEL-RD becomes necessary, it is best to do so by cycling power to the host relay. If the SEL-RD is “hot-plugged” into a powered host relay, it may cause the relay to reset (thereby losing date, time, and event reports). If cycling power does not clear the problem, contact SEL for assistance.

## **FACTORY ASSISTANCE**

We appreciate your interest in SEL products and services. If you have questions or comments, please contact us at:

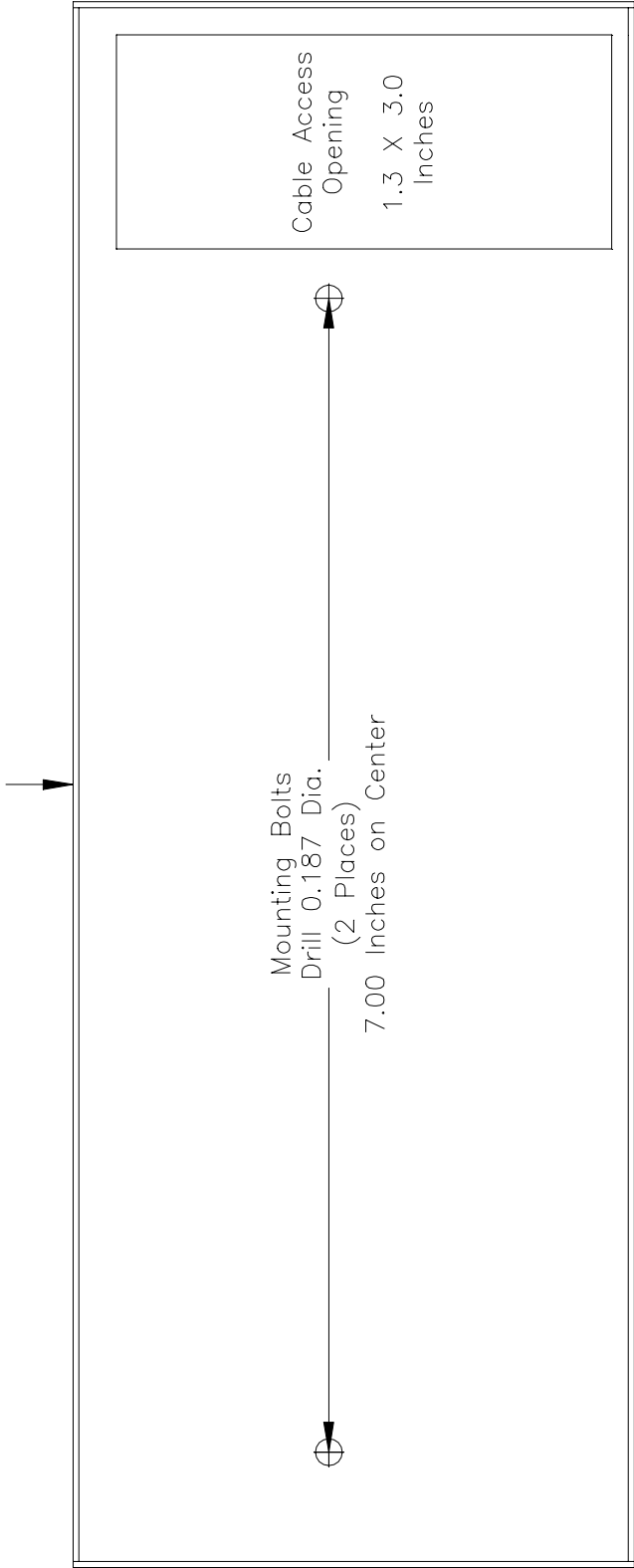
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## MECHANICAL DRAWING



**Figure 2: Panel Layout for SEL-RD (all dimensions in inches)**

SEL-RD Chassis Outline



Complete Dimensioning Shown in Mechanical Drawings

PANEL TEMPLATE FOR SEL-RD

DWG: MRD0004

