SEL-9192 Utility Grade USB Modem

Utility Grade Dial-Up Access

Major Features and Benefits

The SEL-9192 Utility Grade USB Modem provides traditional dial-up access to remote locations where harsh utility grade environmental specifications are required.

➤ **Wide Temperature Range.** Operation temperature from –40° to +85°C (–40° to +185°F).

➤ **Standard Input Voltage.** Input voltage 5–30 Vdc. Power from an external source, through the USB-B connector, or through the DB-9 connector.

➤ **Easy Configuration.** Uses standard and extended AT command set.

➤ **Compression and Speed.** Allows data speeds from 300 bps to 56 kbps. Supports V.44 and V.42bis data compression.

➤ **Durable and Reliable.** Includes Telco line surge protection, a rugged case, and SEL's 10-year warranty.

Functional Overview

The SEL-9192 is a 56 kbps dial-up modem built to withstand the extremely harsh conditions in a utility environment. Connect RTUs, communications processors, and other equipment for dial-up or dial-out engineering access or data acquisition through the DB-9 serial or USB-B connectors. Power the SEL-9192 with the optional power supply, or internally through connected USB-B or DB-9 serial ports. Configuration is simple with the extended AT command set (listed in *Table 1*).

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Applications

The SEL-9192 is ideally suited for point-to-point and point-to-multipoint dial-up access applications in harsh environments and extreme temperatures. Use the SEL-3025 Serial Shield® in conjunction with the SEL-9192 to encrypt all serial traffic across the dial-up link.

Dial-Up or Dial-Out

Figure 1 shows typical point-to-point dial-up access for data acquisition of a device. Connect the SEL-9192 to individual IEDs or connect to a communications processor to retrieve data for several IEDs in a given location. Devices that support dial-out communication can send events or other information to the host computer.
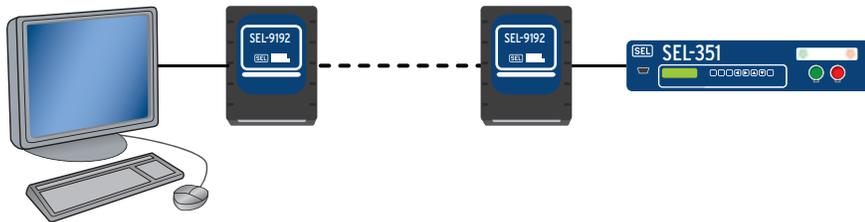
Figure 1   Dial-Up or Dial-Out Point-to-Point SCADA Communication

Figure 2 illustrates use of the SEL-9192 in a point-to-multipoint SCADA communications scheme. The host computer can access any number of dial-up devices by serially dialing each SEL-9192 connected to those end devices.
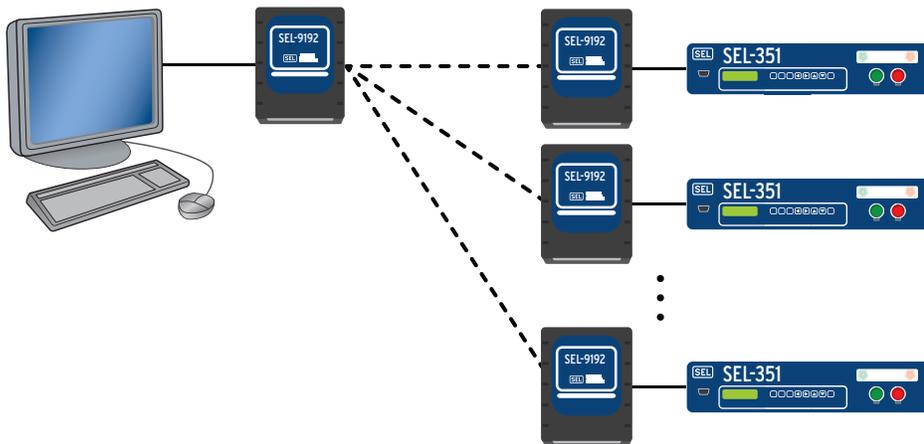
Figure 2   Dial-Up Point-to-Multipoint SCADA Communication

Add an SEL-3025 to your dial-up network to create a secure dial-up environment, as shown in *Figure 3*.

Figure 3   Secure Dial-up Engineering Access Channel

Manage IED engineering access through a communications processor such as the SEL-2032, SEL-3530 RTAC, or the SEL-3354 Embedded Automation Computing Platform, as shown in *Figure 4*. Connect the modem via USB-B or the SEL-C431 cable to the communications processor.
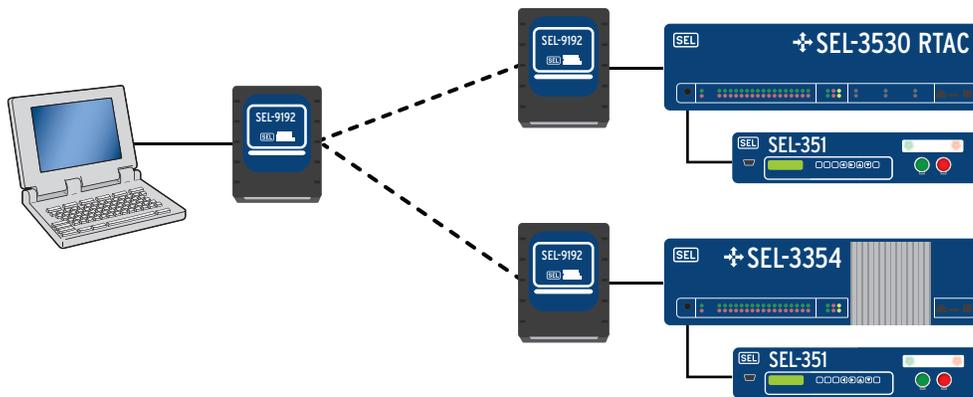
Figure 4   Engineering Access Through a Communications Processor

Use an SEL-3610 Port Server to create a modem pool with as many as eight port-powered SEL-9192 modems and as many as nine additional externally-powered SEL modems, as shown in *Figure 5*.
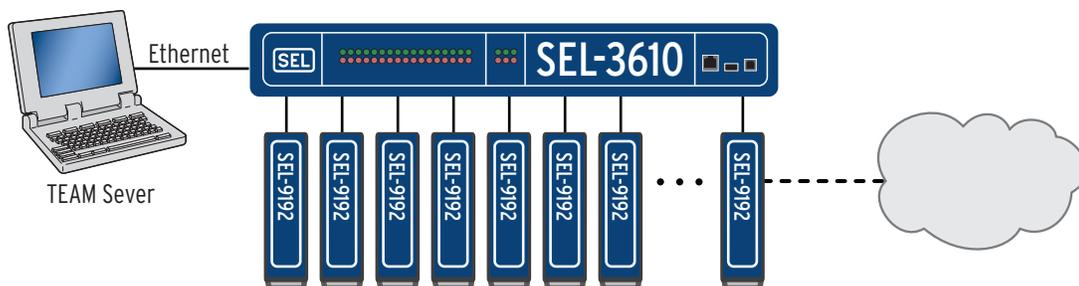

Figure 5   Modem Pool Application

Configuring

To configure the SEL-9192, install the SEL USB-to-UART driver (contained on the CD and also available on the SEL website), then connect a USB-B cable into the USB port of the modem and into a USB-A port of your PC.

Apply power to the modem in one of the following ways:

➤ Connect a USB-B cable to the modem and to the USB-A connector on your PC. The modem is automatically powered through USB. Note that if your PC runs on Windows®, you must first install the SEL USB-to-UART driver.

➤ Connect an external +5 Vdc power supply (SEL part number 230-0600) by inserting the 2.5 mm barrel connector of the supply into the mating jack on the modem.

➤ If the DTE device supports +5 Vdc power output on serial Pin 1, connect an SEL-C431 cable to the modem and DTE device. Locate the 5 V Pin 8 switch positioned between the Telco and DB-9 connectors. Slide the switch to the ON position to use port power on Pin 8 or slide the switch to the OFF position to use a straight-through serial cable with no power on Pin 8.

Use the SEL-C431 cable to connect to an SEL DTE device in a DNP dial-out scenario. The SEL-C431 cable can be no more than three meters (10 ft) in length.
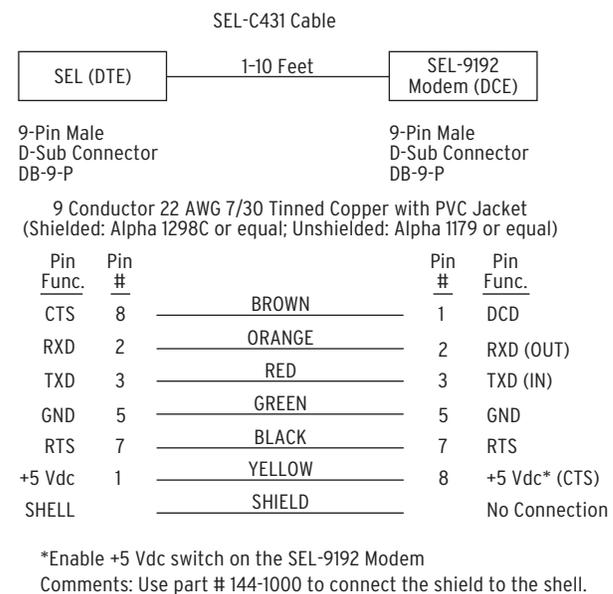

Figure 6   SEL-C431 Cable

Schweitzer Engineering Laboratories, Inc.

SEL-9192 Data Sheet

If you are using a Windows operating system on a PC to communicate with dial-up devices through the modem, you will need to install the Windows modem driver contained on the SEL-9192 Modem Drivers CD or on the SEL website. Install the driver before attempting to configure any communications connections to the modem.

The modem driver allows PC software, including terminal emulation programs, to communicate with the modem via USB or serial communications. Install the modem driver by following the directions for your version of Windows.

For Windows XP perform the following steps:

Step 1. Ensure that you have installed the SEL USB-to-UART driver and downloaded the Windows XP modem driver from the SEL-9192 modem webpage on the SEL website.

Step 2. Connect the SEL-9192 modem to the PC using a USB-B cable. Wait until the modem power LED is illuminated.

Step 3. If Windows presents a Welcome to the Hardware Update Wizard dialogue, click **Cancel**.

Step 4. From the **Start** menu, open the Control Panel and double-click **System**.

Step 5. On the **Hardware** tab, click **Device Manager**.

Step 6. Under **Other devices**, right-click **Analog Modem** and select **Update driver**.

Step 7. On the window that follows, select **No, not at this time** and click **Next**.

Step 8. Choose **Install from a list or specific location (Advanced)**.

Step 9. Click **Browse** and navigate to the SEL-9192 Modem CD or the location where you downloaded the Windows XP modem driver from the SEL website, then press **Next**.

Step 10. Wait for the driver installation to finish, then click **Finish**.

For Windows 7, 64 bit perform the following steps:

Step 1. Ensure that you have installed the SEL USB-to-UART and downloaded the Windows 7 modem driver from the SEL-9192 modem webpage on the SEL website.

Step 2. Connect the SEL-9192 modem to the PC using a USB-B cable. Wait until the modem power LED is illuminated.

Step 3. From the **Start** menu, open **Control Panel > System > Device Manager**.

Step 4. Under **Other devices**, right-click **Analog Modem** and select **Update driver**.

Step 5. Select **Browse my computer for driver software**.

Step 6. Select **Let me pick from a list of device drivers on my computer**.

Step 7. Double-click **Modems** from the list. Your PC will give a list of available standard modem drivers.

Step 8. Scroll down the Manufacturer list to Conexant. Under **Models**, select **Conexant Compatible Internal V90,K56Flex,Voice,Speakerphone**, then click **Next**.

Step 9. Click **Yes** on the warning about updating drivers.

Step 10. Click **Close** to finish the installation.

Configure the modem using a terminal emulation program or ACSELERATOR QuickSet® SEL-5030 Software's terminal screen with **AT** commands. Enter **AT** (ATtention) followed by the command, parameters, if any, and a carriage return. The modem will reply with OK.

AT Command Example

This example uses the **SO** command to instruct the modem to automatically answer after it detects two consecutive rings.

```
ATS0=2 <Enter>
OK
```

Table 1 contains basic **AT** commands. *Table 2* through *Table 6* contain extended **AT** commands. The general format is **AT***Xn*, where *X* is the command given in the table and *n* is a parameter required for some of the commands. Ensure that you save the settings into NVRAM when you are finished with the **AT&W0** command so that the settings will remain through power outages.

Table 1 AT Commands (Sheet 1 of 2)

Command	Description
A/	Repeat the previous **AT** command
A	Answer
B*n*	Select CCITT or Bell standard
B0	CCITT operation at 300 or 1200 bps
B1	Bell operation at 300 or 1200 bps (default)
D	Dial
0–9	Dial DTMF digits 0 to 9.
A–D	Dial DTMF digits A, B, C, and D.
P	Select pulse dialing; affects current and subsequent dialing.
T	Select tone dialing; affects current and subsequent dialing.
!	Flash—go on-hook for a time defined by S29.
S=*r*	Dial stored number *r* (see &Z for storing numbers).
W	Wait for dial tone detection before dialing the next digit. If no dial tone is detected within the time specified by S7, the modem aborts the rest of the sequence, goes on-hook, and generates an error message.
@	Wait for 5 seconds of silence before proceeding with next dialing string and then complete handshake sequence.
,	Pause—the modem pauses for a time specified by S8 before dialing the following digits. Most often used when dialing an outside line through a PBX.
;	Return to command mode after processing command.
^	Disable calling tone transmission; applicable to current dial attempt only.

Example of the **Dial** command: **ATDT767-8900** Meaning "ATtention Dial using Touch-tone the numbers 767–8900"

E*n*	Command echo
E0	Disables command echo.
E1	Enables command echo (default).
H*n*	Disconnect (hang up)
H0	Hang up (default)
H1	Go off-hook
I*n*	Modem identification
I0	Reports product code (either 33600 or 56000).
I1	Reports 255 if the prestored checksum value is FFh.
I2	Reports OK (for software compatibility).
I3	Reports the firmware version of the modem—Example: 3.xxx-V90_2M_DLS.
L*n*	Speaker volume
L0	Off or low volume
L1	Low volume (default)
L2	Medium volume
L3	High volume
M*n*	Speaker control
M0	Speaker is always off.
M1	Speaker is on during call establishment, but goes off when carrier is detected (default).
M2	Speaker is always on.
M3	Speaker is off during dialing and when receiving carrier, but on during answering.

Table 1 AT Commands (Sheet 2 of 2)

Command	Description
Q*n*	Quiet results codes control
Q0	Enables result codes to the DTE (default).
Q1	Disables result codes to the DTE.
S*r*	Read or write to S-register *r*
r	Establishes S-register *r* as the default register.
r = n	Sets S-register *r* to the value *n*.
r?	Reports the value of S-register *r*.
V*n*	Result code form
V0	Enables short-form (terse) result codes.
V1	Enables long-form (verbose) result codes (default).
W*n*	Error correction message control
W0	Upon connection, the modem reports only the DTE speed (e.g., CONNECT 9600). Subsequent responses are disabled (default).
W1	Upon connection, the modem reports the line speed, the error correction protocol, and the DTE speed. Subsequent responses are disabled.
W2	Upon connection, the modem reports DCE speed (e.g., CONNECT 2400). Subsequent responses are disabled.
X*n*	Extended result codes
X0	Ignores dial and busy tone. Sends CONNECT message when a connection is established by blind dialing.
X1	Disables monitoring of busy tones; sends only OK, CONNECT, RING, NO CARRIER, and ERROR. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIALTONE.
X2	Disables monitoring of busy tones. Sends only OK, CONNECT, RING, NO CARRIER, ERROR, NO DIALTONE, and CONNECT XXXX. If busy tone detection is enforced and busy tone is detected, NO CARRIER will be reported instead of BUSY. If dial tone detection is enforced or selected and dial tone is not detected, NO CARRIER will be reported instead of NO DIALTONE.
X3	Enables monitoring of busy tones; sends only OK, CONNECT, RING, NO CARRIER, ERROR, NO DIALTONE, and CONNECT or CARRIER XXXX. If dial tone detection is enforced and dial tone is not detected, NO CARRIER will be reported.
X4	Enables monitoring of busy tones; sends all messages (default).
Z0	Soft reset

Table 2 AT& Commands (Sheet 1 of 2)

Command	Description
&C*n*	Data carrier detect (DCD) option
&C0	DCD remains ON at all times.
&C1	DCD follows the state of the carrier (default).
&D*n*	Data terminal ready (DTR) option
&D0	Ignores DTR.
&D1	Enter the escape mode when ON-to-OFF transition is detected on DTR.
&D2	Hangs up, assumes command state and disable auto-answer upon detecting ON-to-OFF transition of DTR (default).
&D3	ON-to-OFF transition causes the modem to perform a soft reset. It is the same as if an **ATZ** command is issued.
&F*n*	Restore factory configuration (profile)
&G*n*	Select guard tone.
&G0	Disables guard tone (default).
&G1	Enables 550 Hz guard tone.
&G2	Enables 1800 Hz guard tone.

Table 2   AT& Commands (Sheet 2 of 2)

Command	Description
&Kn	Flow control
&K0	Disables flow control.
&K3	Enables RTS/CTS flow control (default for data modes).
&K4	Enables XON/XOFF flow control.
&K5	Supports transparent XON/XOFF flow control.
&Pn	Select pulse dial make/break ratio
&P0	39/61 make/break ratio at 10 pulses per second (default)
&P1	33/67 make/break ratio at 10 pulses per second
&P2	39/61 make/break ratio at 20 pulses per second
&P3	33/67 make/break ratio at 20 pulses per second
&Qn	Select operation mode
&Q0	Selects direct asynchronous operation.
&Q5	The modem will try an error-corrected link (default).
&Q6	Selects asynchronous operation in normal mode (allows speed buffering and flow control but no error correction).
&Sn	DSR override
&S0	DSR remains ON at all times (default).
&S1	DSR becomes active after answer tone has been detected and inactive after carrier has been lost.
&Wn	Saves the current configuration—will save DTE speed, parity settings, **AT** commands, and S-registers. Modem will default to the saved settings upon power-up or reset.
&W0	Saves the current configuration to stored profile 0.
&W1	Saves the current configuration to stored profile 1.
&V	Displays current configuration.
&Zn=x	Store telephone number to location n
n = 0–3	Enter store number location
x = Dial String	Enter telephone number to store
	Entering **AT&Z2=7678900** would store telephone number 7678900 to stored number location 2. To dial this number enter **ATDS=2**.

Table 3   AT% Commands (Sheet 1 of 2)

Command	Description
%Cn	Enables or disables data compression.
%C0	Disables data compression.
%C1	Enables MNP 5 data compression negotiation.
%C2	Enables V.42bis data compression (sets S46 bit 1).
%C3	Enables V.42bis and MNP 5 data compression (default).
%En	Line quality monitor
%E0	Disables line quality monitor and autoretrain.
%E1	Enables line quality monitor and autoretrain.
%E2	Enables line quality monitor and fall-back/fall-forward (default).
%L	Line signal level
	Returns a value that indicates the received signal level. For example, 009 = –9 dBm, 043 = –43 dBm.

Table 3 AT% Commands (Sheet 2 of 2)

Command	Description
%Q	Line signal quality
	Reports line signal quality (DAA-dependent). Returns higher order byte of the EQM value. Based on EQM value, retrain or fallback/fall forward may be initiated if enabled by %E1 or %E2.

STE Command

Use the **-STE=*n*** command to enable/disable Line-In-Use and Extension Pickup options. Use *Table 4* to determine the value of *n* for this command in your installation scenario. If the line is in use and the modem issues an **ATDT** command to dial out, the modem will not go off hook and will display a `LINE-IN-USE` result code. If the modem is off hook and the extension is picked up, the modem will drop the connection.

Table 4 -STE Command Options

-STE=n Value	Extension Pickup	Line-In-Use
0 (default)	Disabled	Disabled
1	Disabled	Enabled
2	Enabled	Disabled
3	Enabled	Enabled

AT+MS Select/Force Modulation Command

This command is useful if you need to force the modem to specific modulations or line speeds.

+MS Modulation Selection

This extended format compound parameter controls the manner of operation of modulation capabilities in the modem in one command. See *Table 5* for valid entries.

Below is an example of how to read the current settings using the **AT+MS?** command.

```
=>AT+MS? <Enter>
+MS: V90,1,300,33600,300,5600
```

Where:

V90 =	V.90
1 =	Automode enabled
300 =	min_tx_rate
33600 =	max_tx_rate
300 =	min_rx_rate
56000 =	max_rx_rate

Table 5 +MS Command Supported Rates[a] (Sheet 1 of 2)

Modulation	Carrier	Possible Minimum, Maximum, Receive, and Transmit Rates
Bell 103	B103	300
Bell 212	B212	1200
V.21	V21	300
V.22	V22	1200
V.22bis	V22B	2400 or 1200
V.23	V23C	1200rx/75tx or 75rx/1200tx
V.32	V32	9600 or 4800
V.32bis	V32B	14400, 12000, 9600, 7200, or 4800
V.34	V34	33600, 31200, 28800, 26400, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
V.90	V90	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, or 28000
K56flex	K56	56000, 54000, 52000, 50000, 48000,46000, 44000,42000,40000, 38000, 36000, 34000, or 32000

Table 5   +MS Command Supported Rates[a] (Sheet 2 of 2)

Modulation	Carrier	Possible Minimum, Maximum, Receive, and Transmit Rates
V.92 downstream	V92	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, or 28000
V.92 upstream	V92	480000, 46667, 45333, 44000, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000, 26667, 25333, or 24000

[a] <Automode> option parameters:
   0 = Automode disabled–Fixed Modulation.
   1 = Automode enabled–Automatically selected speed and modulation (default).

AT S Registers

Use the **AT** commands to set S or settings registers in the modem. To set an S register, type **ATSr=n** where r is the S register number and n is the parameter value.

You can read the S register value by typing **ATSr?**, where r is the register number. See *Table 6* for a list of supported S registers.

Table 6   AT S Registers

Register	Range	Units	Default	Description
S0	0–255	Rings	0	Ring to answer on: **ATS0=1** means answer call on first ring detected
S1	0–255	Rings	0	Number of rings counted
S2	0–127	ASCII	43	Escape code character
S3	0–127	ASCII	13	Command terminator (carriage return character or the enter key)
S4	0–127	ASCII	10	Line feed character
S5	0–127	ASCII	8	Back space character
S6	2–255	Seconds	2	Wait time for dial tone detection
S7	1–255	Seconds	50	Wait time for carrier
S8	0–255	Seconds	2	Pause time for coma in dial string
S10	1–255	.1 s	14	Loss of carrier to hang up delay
S11	50–255	.01 s	95	DTMF tone duration
S12	0–127	1/50 s	50	Escape code guard time
S24[a]	0–255	1 s	0	Sleep mode inactivity timer
S29	0–255	10 ms	70	Hook flash dial modifier time (!)
S30	0–255	10 s	0	Inactivity disconnect timer
S95			0	Result code control

[a] Sleep Mode Operation: S24 sets the length of time, in seconds, that the modem will operate in normal mode with no detected telephone line or DTE line activity before entering low-power sleep mode. The timer is reset upon any DTE or telephone line activity. If S24 is set to zero, the modem will never enter the low-power sleep mode.

Basic Modem Result Codes

There are over 300 different result codes that the modem will return in response to processing various AT commands. The codes may be displayed in word (V1) or numeric (V0) format by using the **V***n* command. The **Q***n* command controls if the result codes are issued (Q0) or not issued (Q1). The **X***n* and **W***n* commands and register S95 determines which result code format the modem will display to indicate the type of established connection. See *Table 7* for the most common result codes.

Table 7   Basic Modem Result Codes

Numeric	Word (Verbose)	Description
0	OK	The modem has received and acknowledged the command.
1	CONNECT	Connection made at 300 bps or extended result codes are off (X0).
2	RING	An incoming ring signal has been detected.
3	NO CARRIER	Reflects either an intended disconnect or a failure to complete a connection.
4	ERROR	An invalid command was issued to the modem.
5	CONNECT 1200	Indicates a 1200 bps line or DTE connection (see the **W***n* command in *Table 1*)
6	NO DIALTONE	The modem cannot detect a dial tone.
7	BUSY	The modem has detected a busy tone.
8	NO ANSWER	After S7 time has elapsed, the remote device never answered.
10	CONNECT 2400	Line speed or DTE connection at 2400 bps
12	CONNECT 9600	Line speed or DTE connection at 9600 bps
15	CONNECT 14400	Line speed or DTE connection at 14400 bps
16	CONNECT 19200	Line speed or DTE connection at 19200 bps
17	CONNECT 38400	DTE connection at 38400 bps
18	CONNECT 57600	DTE connection at 57600 bps

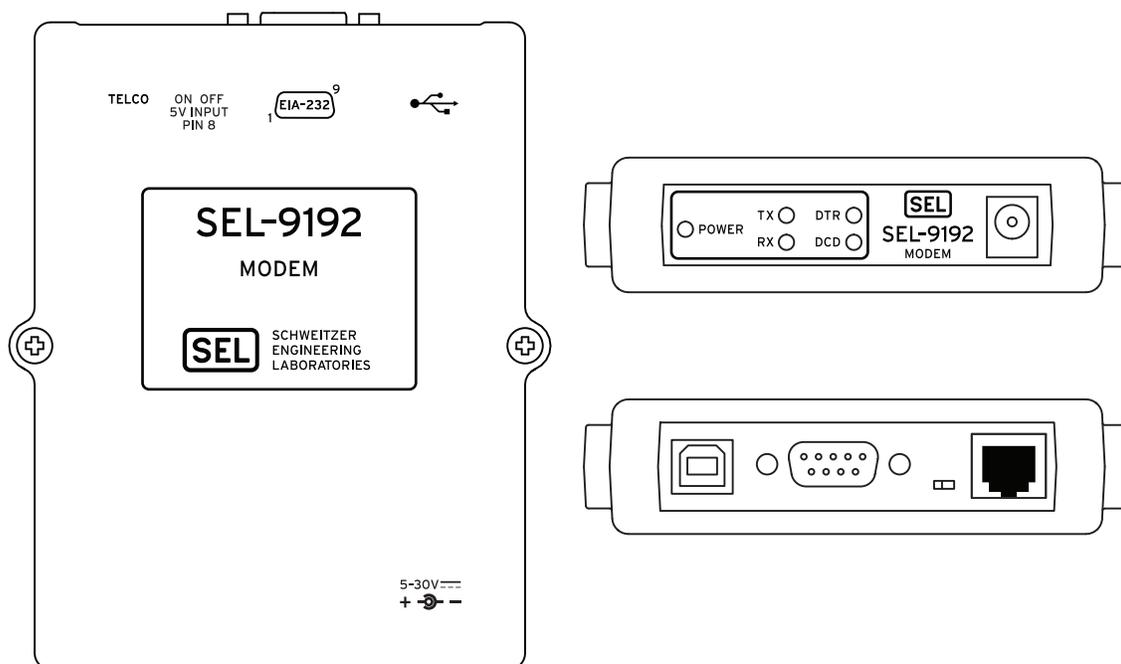# Mechanical Diagrams

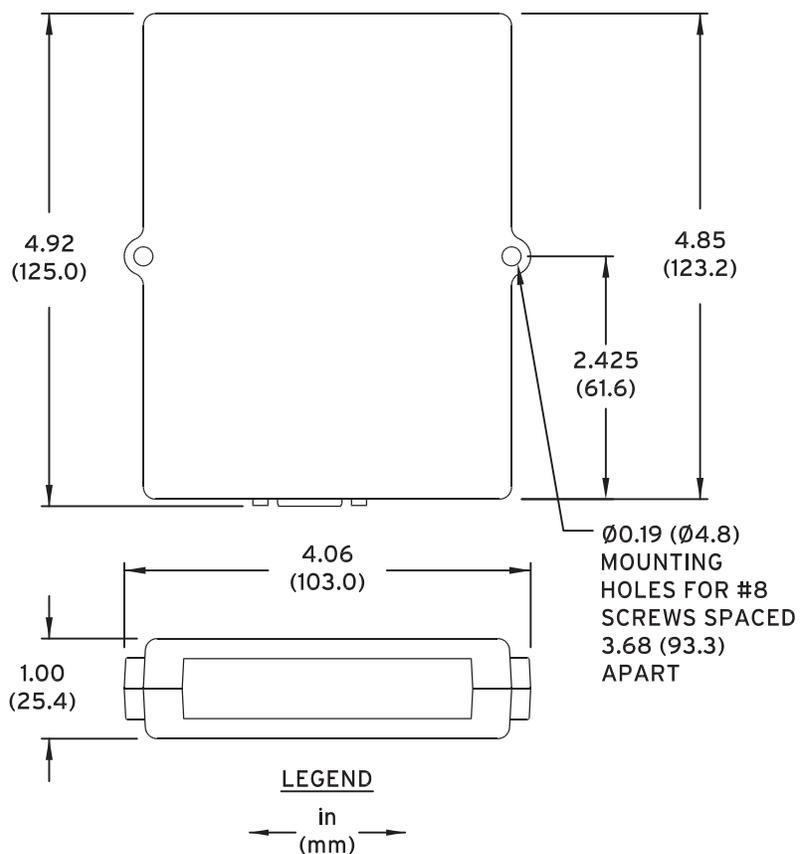**Figure 7   SEL-9192 Top, Front, and Rear Panels**

Figure 8   SEL-9192 Surface-Mount Dimensions

Specifications

Compliance

Designed and manufactured under an ISO 9001 certified quality management system

UL Recognized to U.S. and Canadian safety standards (File E220228; NRAQ)

Emissions

47 CFR 15B, Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Telecom Safety Warnings

Never install telephone wiring during a lightning storm.
Never install a telephone jack in wet locations unless the jack is specifically designed for wet locations.
Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
Use caution when installing or modifying telephone lines.
To reduce the risk of fire, use only 26 AWG or larger telecommunication line cord.
This product must be disconnected from its power source and telephone network interface when servicing.

Telecom Compliance

Canada

Contains terminal module IC: 2377A-11813
This product meets the applicable Innovation, Science and Economic Development Canada technical specifications.
The Ringer Equivalence Number (REN) indicates the maximum number of devices allowed to be connected to a telephone interface. The termination of an interface may consist of any combination of devices subject only to the requirement that the sum of the RENs of all the devices not exceed five.
Ringer Equivalence (REN): 0.7B

United States

This 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.
Registration Number US: 3A4M507B336SM-T-W
Complies with 47 CFR Part 68
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1. This equipment complies with Part 68 of the 47 CFR rules and the requirements adopted by the ACTA. Located on this equipment is a label that contains, among other information, the registration number and ringer equivalence number (REN) for this equipment or a product identifier in the format: US:AAAEQ##Txxxx
If requested, this number must be provided to the telephone company.

2. A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable 47 CFR Part 68 rules and requirements adopted by the ACTA. It's designed to be connected to a compatible modular jack that is also compliant.

3. The ringer equivalence number (REN) is used to determine the number of devices that may be connected to a telephone line. Excessive RENs on a telephone line may result in the devices not ringing in response to an incoming call. In most but not all areas, the sum of RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company. For products approved after July 23, 2001, the REN for this product is part of the product identifier that has the format US:AAAEQ##Txxxx. The digits represented by ## are the REN without a decimal point (e.g., 03 is a REN of 0.3). For earlier products, the REN is separately shown on the label.

4. If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

5. The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

6. If trouble is experienced with this equipment, please contact Multi-Tech Systems, Inc. at the address shown below for details of how to have the repairs made. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

7. Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

8. No repairs are to be made by you. Repairs are to be made only by Multi-Tech Systems or its licensees. Unauthorized repairs void registration and warranty.

9. If your home has specially wired alarm equipment connected to the telephone line, ensure the installation of this equipment does not disable your alarm equipment.
If you have questions about what will disable alarm equipment, consult your telephone company or a qualified installer.

10. Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

11. This equipment is hearing aid compatible.

12. Manufacturing Information on telecommunications device (modem):

Manufacturer:	Radicom Research, Inc.
Trade Name:	Slim Modem III
Model Number:	V92SM3-RCSP
Registration No:	US: 3A4M507B336SM-T-W
Ringer Equivalence:	0.7B
Modular Jack (USOC):	RJ11C or RJ11W (single line)
Service Center in USA:	Radicom Research, Inc. 2148 Bering Drive San Jose, CA 95131 U.S.A. (408) 383 9006 (408) 383 9007 Fax

General

Indicators

Power Status:	Green LED
Modem Tx:	Green LED
Modem Rx:	Red LED
Modem DTR:	Green LED
Modem DCD:	Red LED

Power Requirements

Voltage Input:	+5 to +30 Vdc, ±10%
Power Consumption:	< 1 W
Power Inputs:	DC external source USB-B power DB-9 power

Communication Ports

Interface:	EIA-232
Connectors:	USB Port (Type B) Female DB-9 Port (DCE)

Serial Speeds

Serial Port:	300–56000 bps
Client-to-Client:	300–33600 bps
Telephone Line:	RJ11 Port

Operating Temperature

–40° to +85°C (–40° to +185°F)

Operating Environment

Maximum Altitude:	2000 m
Atmospheric Pressure:	80–110 kPa
Overvoltage Category:	2
Measurement Category:	2
Pollution Degree:	2

Dimensions

Height:	125.0 mm (4.92 inches)
Width:	103.0 mm (4.06 inches)
Depth:	25.4 mm (1.00 inches)

Type Tests

Electromagnetic Compatibility Emissions

IEC 60255-25:2000
  Severity Level: Class: A

CFR 47 Part 15
  Severity Level: Class A

FCC 15-107:2014
FCC 15-109:2014
Severity Level: Class A

Electromagnetic Compatibility Immunity

Conducted RF Immunity:	IEC 60255-22-6:2001
	  Severity Level: 10 Vrms
	IEC 61000-4-6:2008
	  Severity Level: 10 Vrms

Electrostatic Discharge Immunity:	IEC 60255-22-2:2008
	  Severity Level: 2, 4, 6, 8 kV contact;
	  2, 4, 8, 15 kV air
	IEC 61000-4-2:2008
	  Severity Level: 2, 4, 6, 8 kV contact;
	  2, 4, 8, 15 kV air
	IEEE C37.90.3-2001
	  Severity Level: 2, 4, and 8 kV contact;
	  4, 8, and 15 kV air

Fast Transient/Burst Immunity:	IEC 60255-22-4:2008
	  Severity Level: Class A - 4 kV, 5 kHz;
	  2 kV 5 kHz on communications ports
	IEC 61000-4-4:2011
	  Severity Level: 4 kV, 5 kHz

Radiated Digital Radio Telephone RF Immunity:	ENV 50204:1995
	  Severity Level: 10 V/m at 900 MHz
	  and 1.89 GHz

Radiated Radio Frequency Immunity:	IEC 60255-22-3:2007
	  Severity Level: 10 V/m
	IEC 61000-4-3:2010
	  Severity Level: 10 V/m
	IEEE C37.90.2-2004
	  Severity Level: 35 V/m

Surge Withstand Capability Immunity:	IEC 60255-22-1:2007
	  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 60068-2-1:2007 Severity Level: 16 hours at –40°C

Damp Heat, Cyclic:	IEC 60068-2-30:2005
	  Severity Level: 25°C to 55°C, 6 cycles,
	  Relative Humidity: 95%

Dry Heat:	IEC 60068-2-2:2007 Severity Level: 16 hours at +85°C

Vibration:	IEC 60255-21-1:1988
	  Severity Level: Class 1 endurance;
	  Class 2 response
	IEC 60255-21-2:1988
	  Severity Level: Class 1 - shock withstand,
	  bump; Class 2 - shock response
	IEC 60255-21-3:1993
	  Severity Level: Class 2 (quake response)

Safety

IP Code:	IEC 60529:2001 + CRGD:2003 Severity Level: IP3X

Notes

PDS9192-01