PC Serial Security Kit

Instruction Manual

20120217

SCHWEITZER ENGINEERING LABORATORIES, INC.

PMPSSK-01

PMPSSK-01

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Preface

Manual Overview

This instruction manual describes the functionality and use of the PC Serial Security Kit (part number 915900225). It includes the information that is necessary to install, configure, test, and operate the kit's hardware and software.

An overview of the manual's layout and the topics that are addressed follows.

Preface. Describes the manual organization and conventions used to present information.

Section 1: Setting Up the Engineering Access Client. Explains how to install the components of the PC Serial Security Kit.

Section 2: Using the SEL-5025 Secure Port Service Software. Gives information on how to set up the PC Serial Security Kit for the first time.

Section 3: Configuring an SEL-3045 Secure SCADA Card. Provides information on installing and using ACSELERATOR QuickSet® SEL-5030 Software for configuring SEL-3045 Secure SCADA Cards.

Section 4: Testing and Troubleshooting. Describes the diagnostic functions of the SEL-5025 Secure Port Service and provides troubleshooting guidelines.

Safety Information

The manual uses hazard statements, formatted and defined as follows:

⚠DANGER
Indicates an imminently hazardous situation that, if not avoided, **will** result in death or serious injury.

⚠WARNING
Indicates a potentially hazardous situation that, if not avoided, **could** result in death or serious injury.

⚠CAUTION
Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury or equipment damage.

The following hazard statements apply to this device. See the following table for the English statements and corresponding French translations.

English	French
⚠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.	**⚠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.
⚠WARNING Use of this equipment in a manner other than specified in this manual can impair operator safety safeguards provided by this equipment.	**⚠AVERTISSEMENT** L'utilisation de cet appareil suivant des procédures différentes de celles indiquées dans ce manuel peut désarmer les dispositifs de protection d'opérateur normalement actifs sur cet équipement.

Technical Assistance

Obtain technical assistance from the following:

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Section 1

Setting Up the Engineering Access Client

The PC Serial Security Kit (part number 915900225) provides the hardware and software necessary for using your PC workstation to secure engineering access communications with remote SEL-3025 units. You will need to plug the SEL-3055 SEL Card Dock into an available USB port on your computer and install the SEL-5025 Secure Port Service Software from the software CD. The kit consists of the following items.

- SEL-3055 SEL Card Dock (USB connected)
- SEL-3045 Secure SCADA Card
- Software CD
- Printed quick-start guide

If your SEL-3045 is already configured, you may not need to install configuration software. Otherwise, you will also need to install the ACSELERATOR QuickSet® SEL-5030 Software from the software CD before you can configure the card.

Install the SEL-5025 Secure Port Service Software

Step 1. Insert the software CD into the drive.

Step 2. If Windows Autorun is enabled, the installer will launch automatically. Otherwise, run **setup.bat** from the CD.

The installation web page offers several options, including viewing documentation and installing various software items.

Step 3. On the installation page, click **Install SEL-5025 Secure Port Service**.

The software includes the SEL-5025 Secure Port Service, as well as a tray application you can use for configuring the service and displaying its status.

Step 4. The **SEL-5025 Secure Port Service Setup Wizard** (*Figure 1.1*) will guide you through the installation process. You must have 7.5 MB of available disk space for the SEL-5025 Secure Port Service.

NOTE: The SEL-5025 Secure Port Service requires Microsoft .NET Framework Version 4 (http://www.microsoft.com/download/en/details.aspx?id=17851). If the .NET Framework Version 4 is not installed, you can install this software from the CD or have the installer download it from the Internet for you.

Figure 1.1 The SEL-5025 Secure Port Service Installer

The default settings the wizard uses will install the SEL-5025 Secure Port Service Software in C:\Program Files\SEL\Secure Port Service\. The default configuration for both the service and the tray application is to have these run automatically when your system starts. *Figure 1.2* shows the tray icon (a blue icon with a white lock symbol).

Figure 1.2 The SEL-5025 Tray Application Icon

TIP: You can find this service listed in the **Services** control panel applet (services.msc) as **SEL-5025 Secure Port Service**.

The SEL-5025 Secure Port Service adds a new virtual serial port to your computer. The Windows device manager (devmgmt.msc) lists the new port as **SEL Secured Communications Port** and assigns it to COM99 by default. You can use the tray application to configure the port number. This is the port to which your applications connect for secure communication with remote devices.

Install the SEL-3055 SEL Card Dock

Once you have installed the SEL-5025 Secure Port Service Software, plug the SEL-3055 card dock into an available USB port on your computer, and plug the SEL-3045 card into the dock.

NOTE: The SSC port is associated with the card, not the card dock, so if you remove the card, the port will disappear.

When you plug in the SEL-3045, Windows will add a new serial port to your computer that is used to communicate between the PC and the SEL-3045. This serial port is the **SSC Port** shown on the **Port Mapping** page of the tray application. Unless you have more than one reader attached, there will only be one SSC port, and this port will be set correctly as shown by the tray application.

Section 2
Using the SEL-5025 Secure Port Service Software

The Windows driver for the SEL-3045 Secure SCADA Card creates a virtual serial port called “SEL-3045 Secure SCADA Card”. This card is associated with the USB port into which you have plugged the card dock. The SEL-5025 Secure Port Service assigns this port a number greater than the numbers for physical ports already on your computer and uses this port internally. Your applications should never connect directly to this port.

The Secure Port Service adds another virtual serial port called “SEL Secured Communications Port” to your computer for applications to use. The Secure Port Service assigns this port a number greater than the numbers for existing computer ports, although you can use the Secure Port Service tray application to change this assignment.

Figure 2.1 shows a typical situation in which a terminal application on the PC is using an external modem for secure communication with a remote SEL-3025 Serial Shield™. The modem is connected to the physical serial port, COM1, on the computer. The terminal program connects to COM99, the port the Secure Port Service created, and communicates normally (unencrypted). The Secure Port Service uses the SEL-3045 in the card dock on COM8, a virtual serial port the driver created, and handles encryption between the modem on COM1 and the terminal program on COM99.

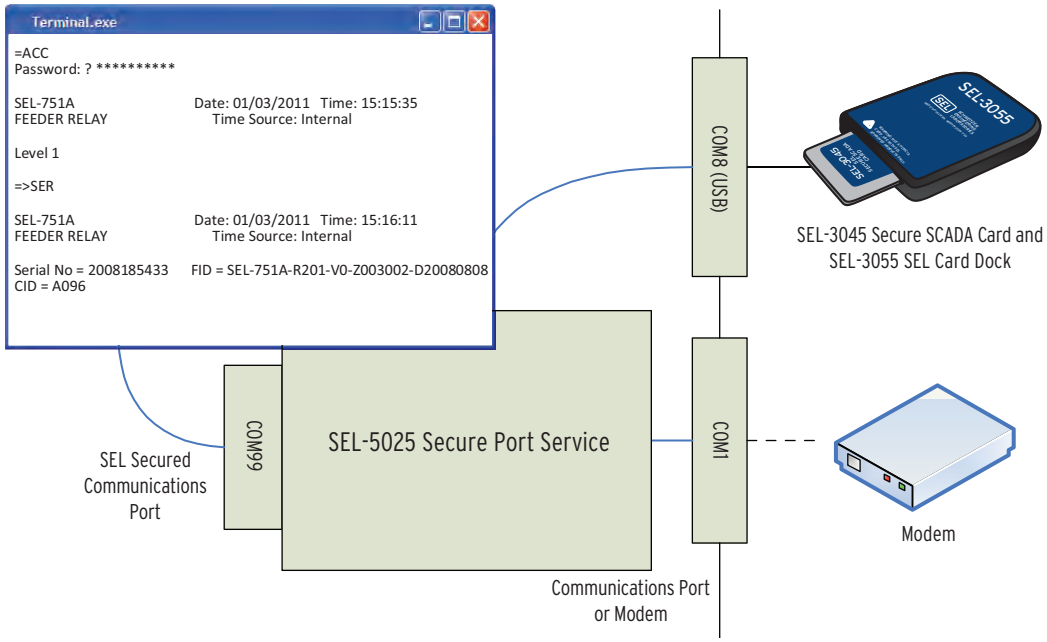

Figure 2.1 Typical SEL-5025 Secure Port Service Connections

After you have installed the SEL-3055 card dock and SEL-5025 software, you can use PC applications to encrypt communications to remote devices merely by selecting the new port when you choose the port you want to use for communication. Normally, your remote SEL-3025 units will have a consistent set of serial communications settings (baud rate, word format, parity, etc.), and both this port and the physical serial port will have matching configurations.

TIP: The **Remote Management Support** setting on the **Port Mapping** tab must match the setting for the remote device. To simplify the setup for engineering access, this setting should match for all SEL-3025 devices in your deployment that you will use for engineering access.

To configure the ports for communication, use the tray application (shown in *Figure 2.3*) to configure the speed, word format, and flow control options for the physical serial port to match your remote devices. Then use the communications program to select the secure port and configure its parameters to match exactly, as you would if you had connected directly to the physical port.

To use the tray application, right-click on the Secure Port Service icon (a blue icon with a white lock symbol) in the tray area to open a context menu. Selecting **Show Utility** from this menu opens the tray application, which displays the configuration application from which you can choose ports, configure physical communications ports, and view status messages. *Figure 2.2* shows the tray icon and the context menu. You can also open the application window by double-clicking the tray icon. When configuration is complete, close the tray application window to minimize the application and return it to the tray.

Figure 2.2 The SEL-5025 Secure Port Service Tray Application Menu

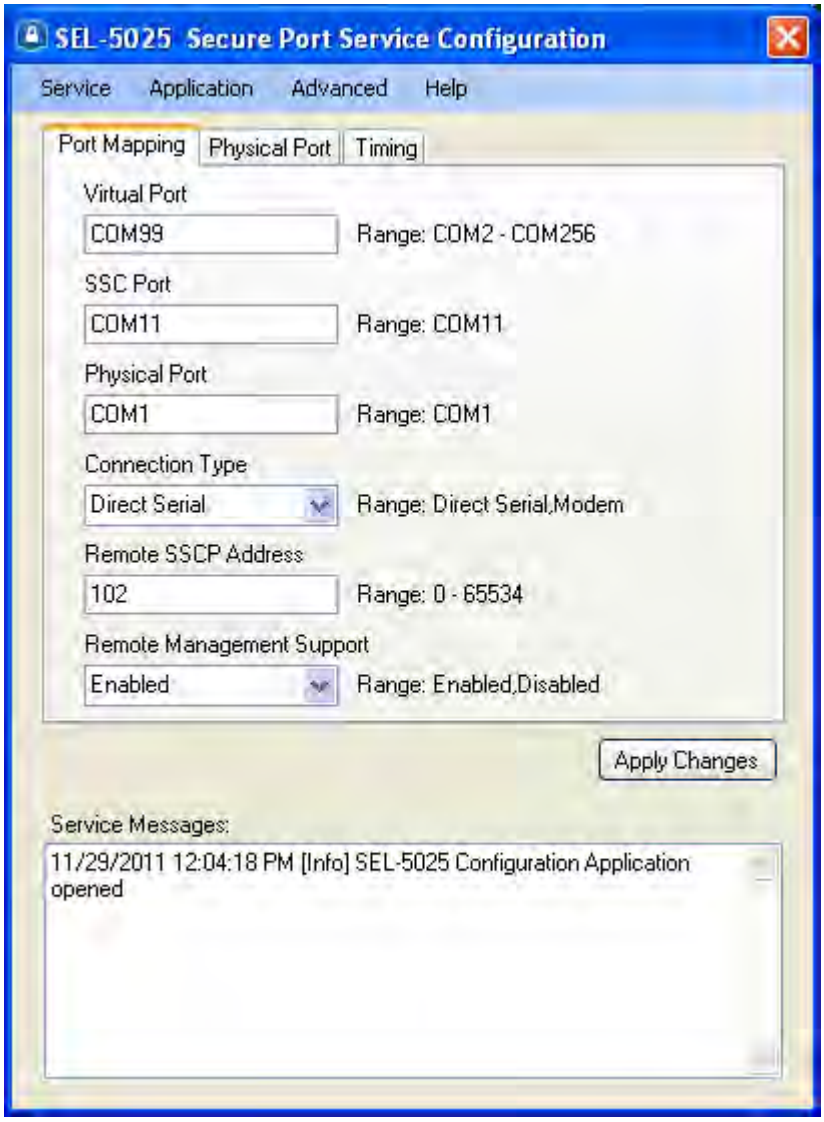

Figure 2.3 The SEL-5025 Secure Port Service Tray Application

If you configure the **Connection Type** as **Modem**, the secure port will automatically keep communications in the clear (unencrypted) until a carrier is established, allowing you to communicate with your local modem for dialing purposes. It also detects the Hayes modem escape sequence, +++, which allows communications programs to regain control of the modem and hang up at the end of the session.

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Section 3

Configuring an SEL-3045 Secure SCADA Card

If you will be configuring SEL-3045 Secure SCADA Cards on your computer, you must install ACSELERATOR QuickSet® SEL-5030 Software from the software CD. Alternatively, you can use SEL Compass® Software to install ACSELERATOR QuickSet or use SEL Compass to update your existing ACSELERATOR QuickSet installation to add support for the SEL-3045 and the SEL-3025 Serial Shield™.

NOTE TO ADMINISTRATORS: The SEL-3045 and SEL-3025 are cryptographic devices. It is important to safeguard the deployment of cryptographic keys and protect key information from disclosure. SEL strongly recommends that you keep the computer and ACSELERATOR QuickSet installation you use for issuing SEL-3045 cards and for configuring SEL-3025 Serial Shields in a physically secure location and that you limit access strictly to those personnel responsible for SEL-3045 card deployment.

Installing ACSELERATOR QuickSet SEL-5030 Software (Optional)

You can use ACSELERATOR QuickSet to configure many SEL products, including the SEL-3045 and the SEL-3025. To install ACSELERATOR QuickSet, insert the CD and/or start **setup.bat**. On the installation web page, click **Install SEL-5030 acSELerator QuickSet Software** to start the ACSELERATOR QuickSet installer (*Figure 3.1*).You must have 211 MB of disk space available for ACSELERATOR QuickSet, SEL Compass, and the necessary support files.

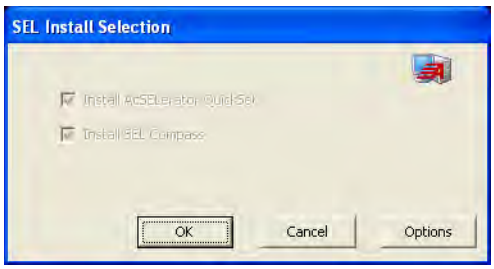

Figure 3.1 ACSELERATOR QuickSet Installer

Configuring a New SEL-3045 Using ACSELERATOR QuickSet

To run ACSELERATOR QuickSet, click the **Start** button, navigate to the **SEL Applications** group, and click on **ACSELERATOR QuickSet**.

Adding Users

ACSELERATOR QuickSet uses the User Manager to manage users and their credentials and the Device Manager to manage devices. For any user that you have not already added, you will need to first use the User Manager to add the user for the card, and then create a new SSCP credential for that user.

TIP: ACSELERATOR QuickSet is usually used to program a new card. You can restore a card to new condition by resetting it in the SEL-3055 SEL Card Dock. To do this, plug the card into the dock, then insert the end of a paperclip or some similar instrument into the small **RESET** hole in the top of the reader and press gently until you feel a click. Hold the reset depressed for a couple of seconds and release it. If the card has reset successfully, the green LED on the reader will blink slowly.

Step 1. In the main ACSELERATOR QuickSet window, choose **Tools > Device Manager > User Manager** from the menu.

Step 2. If the engineering user does not already exist, perform the following steps.

a. Click the **Create User** button to open the **Create User** dialog box.

b. In the **User** tab, enter the **User Name**, **Full Name**, and a **Description** (optional) for the user. The **Password** entry is optional; it is unnecessary for using SSCP with the SEL-3025.

Step 3. Open the **Credentials** tab, and click **New** to open the **SSCP Credential** dialog box.

Step 4. Assign a **Group Name** to uniquely identify the user of the card. This name is normally the same as the **User Name** for the cardholder.

Step 5. Set the **Remote SSCP Device Address** to the address that your remote SEL-3025 units use.

Step 6. Click the **Auto Generate Keys** button to generate cryptographically random values for the user's SSCP keys.

Step 7. Click **OK** twice to return to the User Manager, and then close the **User Manager** by clicking the inner (gray) **X** button in the top right corner of the User Manager window.

Setting Up a New SEL-3045 for a User

Use the Device Manager to add a new SEL-3045 to the view and associate the user with the view.

TIP: If you will be administering multiple cards, you can use **Add > Location** from within Connection Explorer in the Device Manager window to create a folder to contain cards. You can then create cards by right-clicking on the folder and using **Add > Device**.

Step 1. From the menu bar in the main ACSELERATOR QuickSet window, choose **Tools > Device Manager > Device Manager** or click either on the Device Manager label or corresponding icon under **Settings** in the **Getting Started with QuickSet** area.

Step 2. Right-click in Connection Explorer (the top left window) from within the Device Manager where you want to create the new card, choose **Add > Device**, then choose **SEL-3045** from the **Select Device Type** listing.

Step 3. Right-click on the new SEL-3045 device name within Connection Explorer and then rename the device to show the name or user name of the cardholder (Miller, Joe, in this example).

Step 4. Double-click on the new card from within Connection Explorer in Device Manager to open the configuration area for that card. *Figure 3.2* shows a typical view of the Device Manager configuration display that would result after you double-click on the SEL-3045 device renamed “Miller, Joe”.

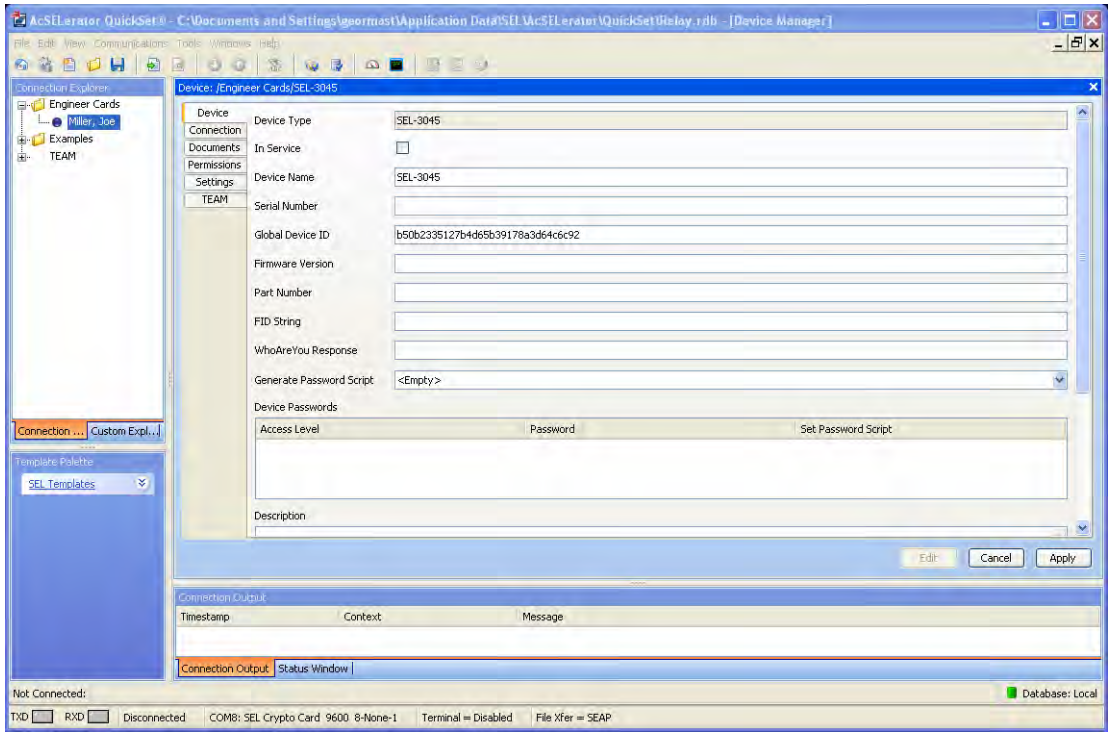

Figure 3.2 Device Manager Showing an SEL-3045

Configuring Communications to Your SEL-3045

Set up communications with the SEL-3045.

Step 1. Click the **Edit** button to allow you to change the card settings.

Step 2. Click the **Connection** tab from within the configuration area for the renamed SEL-3045.

Step 3. In the **Device** pull-down menu, choose **SEL-3045 Secure SCADA Card**.

Creating Settings for Your SEL-3045

Set the Global Settings for the card.

Step 1. Click the **Settings** tab.

Step 2. Click the **Global** node in the left pane of the Device window.

Step 3. The **Administrator Password** field will be colored red because its value is invalid. Enter a new password for administration of this card. This password must have at least eight characters and should contain both upper- and lowercase letters, numbers, and special characters (such as punctuation).

TIP: The card's Administrator password would be necessary to read settings from the card through use of ACSELERATOR QuickSet or for updating settings. For most applications, where you reset cards before provisioning, and you provision cards just once, this password will be unnecessary. If this is the case, you can use a random value that you do not need to record.

Step 4. Choose the **Network Role** for the card. For engineering access, use **Master**.

Step 5. Use the drop-down listing to the right of the **Enable Data Buffering** text box to enable or disable data buffering.

Step 6. Set the SSCP device address for this card. The address value must be unique in your system, so that log events relating to this SSCP address relate to a single identifiable card.

Step 7. Click **Apply**.

Set up SSCP credentials for access to remote SEL-3025 units.

Step 1. Click the **Permissions** tab.

Step 2. Click **Add** to display a listing of users. Select from this listing the user you want, and click **OK**. This will add the user's name to a listing under the **Users and Group** heading in the **Permissions** tab.

Step 3. Select the user's name from under the **Users and Groups** heading to add an Owner permission to the **Permissions** window.

Step 4. In the **Permissions** window, select the permission you just added and check the **Allow** check box at the end of that entry. This will create an SSCP group on the card that contains the user's SSCP credentials.

Step 5. Click **Apply** to save all of these settings to the database.

Setting Up Your SEL-3045 Cards for Engineering Access

TIP: The first remote SEL-3025 need not be an actual device—it can be a template that you use for provisioning cards and which you can use to copy, rename, and edit to create actual remote SEL-3025 units in your deployment.

Set the Remote SSCP Address you will use for Engineering Access to your remote SEL-3025 units. To do this, you must define at least one remote SEL-3025.

Step 1. In the main ACSELERATOR QuickSet window, choose **Tools** > **Device Manager** > **Device Manager** from the menu bar.

Step 2. Right-click in the Connection Explorer (left pane) window, choose **Add** > **Device**, then choose SEL-3025 from the **Select Device Type** listing.

Step 3. Right-click the new SEL-3025 in Connection Explorer and rename it. If this will be a template device, you might name it **3025 Template**.

Step 4. Double-click on the new device to open a configuration area for the new 3025 Template device.

a. Click the **Settings** tab.

b. Click the **Edit** button, and then select **SSCP General Settings**.

c. Set the **Device Address** to the value your engineering access SEL-3025 units are using.

Step 5. Click **Apply**.

Once you have set up an SEL-3025 for engineering access, complete the following steps.

Step 1. Click the **Permissions** tab, click the **Add** button, select the user for the new SEL-3045, and click **OK**. This will add the new user to the Users and Groups list.

Step 2. Select the user in the list. This will cause the pass-through permission for that user to display in the **Permissions** window. Check the **Allow** check box on that entry.

Step 3. Click **Apply**.

This completes the setup of the SSCP groups for the card. The next steps will write the completed card configuration to the card.

Programming Your SEL-3045

Send the settings data.

Step 1. In the Connection Explorer, right-click on the new **SEL-3045**.

Step 2. From the menu, select **Device Tasks**, then click **Send**.

Step 3. You will be prompted for the administrator account password for the card. For a card that has been reset, enter **Administrator** for the password.

Step 4. The data transfer could take a little longer than ten seconds. When it completes, the status bar at the bottom of the Device Manager window will show the connection state as **Disconnected** (see *Figure 3.3*).

Step 5. Remove the finished card from the card dock.

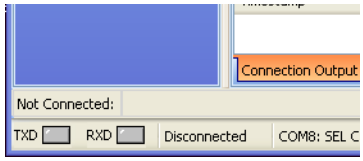

Figure 3.3 Status Bar When Programming Is Completed

Granting Engineering Access to a Remote SEL-3025

ACSELERATOR QuickSet easily grants users access to remote SEL-3025 devices in much the same way that it grants users pass-through access to the SEL-3045.

Set up communications with the card.

Step 1. Use the menu bar to choose **Tools > Device Manager > Device Manager**.

Step 2. Locate the target SEL-3025 device in the Connection Explorer.

Step 3. Double-click the target SEL-3025 to open the device configuration area.

Step 4. Click the **Edit** button so that you can change settings.

Step 5. Click the **Permissions** tab. The **Users and Groups** window shows a list of users for whom you could provide permission to that device. Initially, the window shows no users.

Step 6. Click the **Add** button to add a user to the device. This opens the **Select Users and Groups** window.

Step 7. Choose the correct card user(s) from the list by selecting names in the list and clicking **OK**.

Step 8. For each user(s) added, select the user in the **Users and Groups** window, and then check the **Allow** check box at the end of the corresponding entry in the **Permissions** window.

Step 9. Click **Apply** to save all of these settings to the database.

Send the settings data.

Step 1. In the Connection Explorer, right-click on the target SEL-3025.

Step 2. From the menu, select **Device Tasks**, then **Send**.

You will be prompted for the administrator username and password for the device.

The data transfer could take a little longer than ten seconds. When it completes, the status bar at the bottom of the Device Manager window will show the connection state as **Disconnected** (see *Figure 3.3*).

Step 3. Close ACSELERATOR QuickSet.

Section 4
Testing and Troubleshooting

Testing the Connection

Typical Configuration

Figure 4.1 illustrates a typical setup for engineering access. It is shown here to clarify the relationships between addresses and keys as they are usually configured.

In this example, there are three remote devices protected by SEL-3025 Serial Shield™ cards and three engineers, Alice, Bob, and Charlie, using workstations to access the remote devices.

All remote devices use the same SSCP address, so the SEL-3045 Secure SCADA Cards issued to the engineers can all be configured for the same remote SSCP address.

Each engineer is issued an SEL-3045 with a simple configuration, including a distinct SSCP address and a unique pair of encryption keys. Each device with which the engineer is authorized to communicate must be configured with an SSCP group having that remote address and using those keys. If there are ten engineers authorized to connect to a device, the remote device will have ten configured SSCP groups, one for each.

In *Figure 4.1*, configuration of two devices permits access by all three engineers: Alice, Bob, and Charlie. Charlie is the only person that can access the third device.

The serial communications parameters for all devices are set identically, so that it is not necessary to reconfigure port parameters when dialing up a different device.

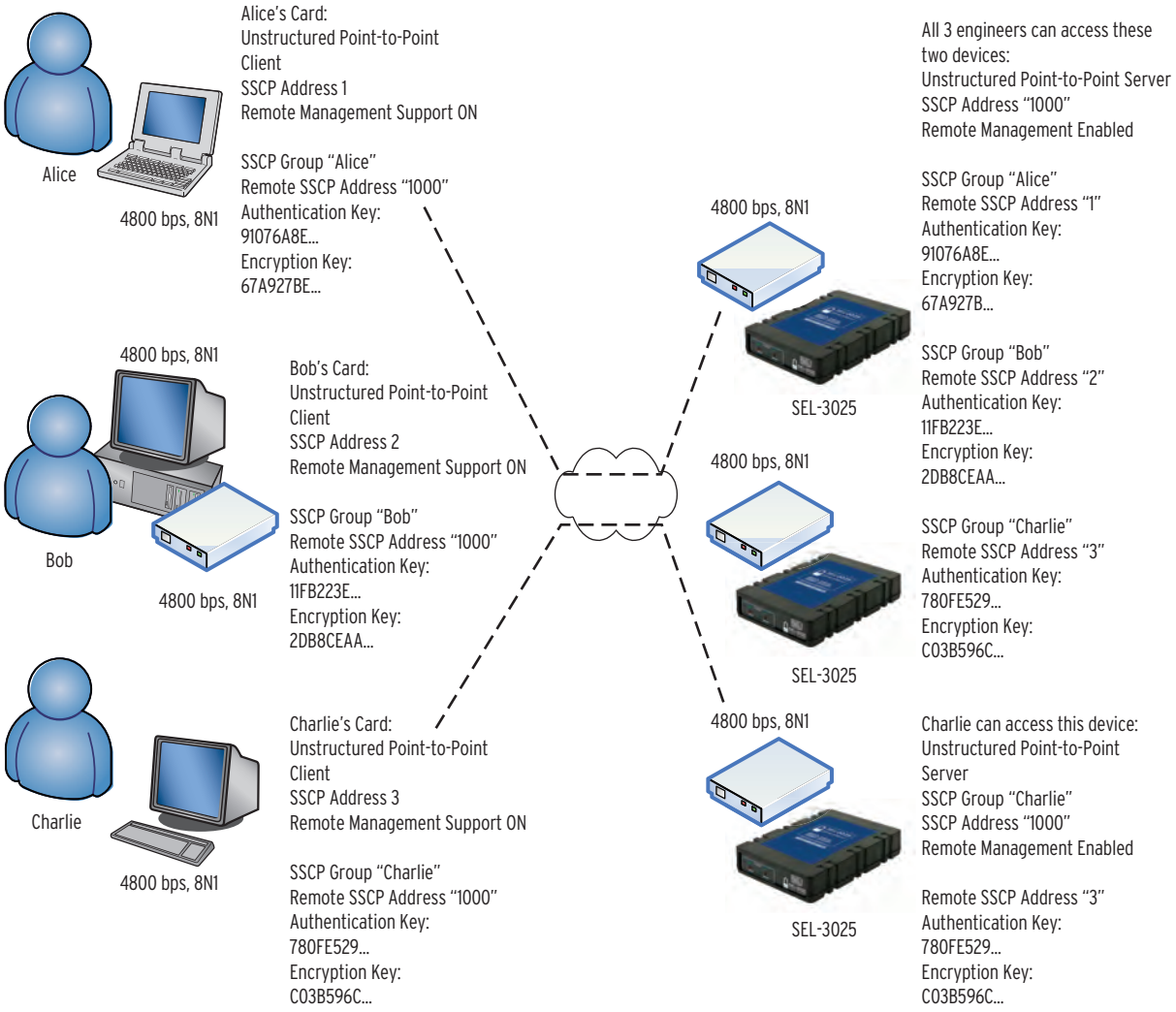

Figure 4.1 Engineering Access Architecture

Troubleshooting

The following table may help you find and resolve problems if you are unable to use the PC Serial Security kit to communicate successfully. In addition, *Figure 4.1* may be helpful to understand the relationship between devices, SSCP addresses, and keys.

Table 4.1 Troubleshooting Procedure (Sheet 1 of 2)

Problem	Possible Causes	Solution
No communication with the remote device.	Baud rates do not match.	The baud rates and character format settings for the communications application, the SEL-5025 physical port, the modem (if used), the remote modem (if used), and the remote SEL-3025 DTE port must all match.
	Cables are incorrectly configured.	This is mostly a problem with direct-serial connections for bench testing. The PC must connect to the *DTE* port of the SEL-3025 using a null modem, because the serial port of a PC is a DTE. The remote device must connect to the *DCE* port of the SEL-3025. If the remote device serial port is not DTE, a null modem must be used.
	Remote management settings do not match.	The Remote Management Support setting for the SEL-5025 must match the setting for the SEL-3025.
	SSCP addresses are incorrect.	The SSCP address for the card must appear in the Remote SSCP groups list for one of the SSCP groups configured on the remote SEL-3025. Similarly, the remote SEL-3025 unit's SSCP address must appear in the Remote SSCP Addresses list for one of the SSCP groups configured on the SEL-3045 (see *Figure 4.1*).
	The communications protocols do not match.	For engineering access, the communications protocol for both the SEL-3045 and the remote SEL-3025 must be set to **Unstructured Point-to-Point**. In any case, these values must match.
	The roles for the SEL-3045 and the SEL-3025 are set incorrectly.	One end of the communications link must be "master" and the other "slave". Normally, the remote SEL-3025 is the slave, and the PC running the SEL-5025 is the master. On the SEL-3025, the slave mode is referred to as "Server", and master is "Client" (see *Figure 4.1*).
	SSCP parameters do not match.	The authentication and encryption keys for both the SEL-3045 and the SEL-5025 must match. Using the SEL-3025 Web Management Interface, and using ACSELERATOR QuickSet® SEL-5030 Software, check that these keys are set to the same value for both devices and that the other SSCP parameters (authentication mode, encryption mode, and HMAC size) also match (see *Figure 4.1*).
	Port assignments are configured incorrectly.	The SEL-5025 tray application's configuration page lets you choose the ports used for your secure port, the SCC port (used to communicate with the SEL-3045), and the physical port. Confirm that these port assignments are correct. 1. Open the Windows device manager (click **Start**, then **Run**, type **devmgmt.msc**, and click **OK**). 2. Expand the **Ports (COM & LPT)** node by clicking on the plus (+) sign next to it. 3. Confirm that the port selected on the SEL-5025 configuration page for the physical port is shown as **Communications Port** in the port list. 4. Confirm that the port selected for the SSC port is shown as **SEL-3045 Secure SCADA Card**, and finally, confirm that the virtual port is shown as **SEL Secured Communications Port**. 5. If these are not the ports shown, change the assignments on the SEL-5025 configuration page to match the ports shown in the device manager and click **Apply Changes**.
	Terminal program is connected to the wrong port.	Check to ensure that you connected your terminal program to the virtual port created by the service (e.g., COM99), rather than the physical port.

Table 4.1 Troubleshooting Procedure (Sheet 2 of 2)

Problem	Possible Causes	Solution
The secure port is no longer listed in the list of ports to which you can connect.	The Secure Port Service can become unavailable as a result of errors and actions such as removing the SEL-3045 during a session.	If the secure port is no longer listed in the serial port configuration dialogs, perform the following steps to correct the problem. 1. Close all communications applications that use the secure port. 2. Remove the SEL-3045 from the card dock and wait a few seconds. 3. Insert the SEL-3045 into the card dock and wait for the green light on the reader to come on. 4. Restart the communications application.
Port name collision.	Software has created a port on your computer with a name similar to one of your serial ports. This sometimes happens with certain printer drivers.	Open the **Printers and Faxes** control panel applet. For each listed device, right-click the device icon, and choose **Properties**. In the properties window, open the **Ports** tab. Ensure that the device is not using the physical port that you use for serial communication. If it is, change the selection to another port and click **Apply**.
Communication with the remote device becomes unavailable.	The Data Idle Timeout has been reached.	If there is no transmission of data in either direction for the duration of the Data Idle Timeout, the port will be closed. Close the terminal program, reopen it, and reconnect to the secure port. If this happens frequently, you may need to increase the timeout value.
SEL-5010 Relay Assistant cannot find the secure serial port.	SEL-5010 cannot locate serial ports above COM32.	The default port number for the secure serial port is 99. The SEL-5010 Relay Assistant Software cannot access serial ports above number 32. To use the PC Serial Security Kit with SEL-5010 software, use the tray application configuration page to set the virtual port to a value of 32 or lower.
Unable to regain control of the modem using +++.	Recognition of the Hayes Modem escape sequence (+++) by the SEL-5025 requires that you send these characters without delays between them.	Use the copy/paste feature or a key macro to send the three characters as a group, with a one-second pause before and after the group transmission.

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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