SEL-735 Power Quality and Revenue Meter

Quick-Start Guide

I. Introduction

This *Quick-Start Guide* explains how to install, configure, test, and operate the SEL-735 Power Quality and Revenue Meter. For detailed information on these topics, please refer to the *SEL-735 Power Quality and Revenue Meter Instruction Manual* located at *www.selinc.com*.

II. SEL-735 Overview

This section outlines essential installation information, including front-panel layout, rear-panel layout, labels, and dimensions.

A. Front-Panel Layout

The front-panel interface consists of programmable pushbuttons and LEDs, an LCD, a keypad, a test mode LED, and an optical communications port.

Figure 1 Front-Panel Layout

B. Rear-Panel Layout

Removable connectors allow easy wiring for PT circuits, I/O, communications, and the auxiliary power supply. The CT circuits require ring terminals for safety.

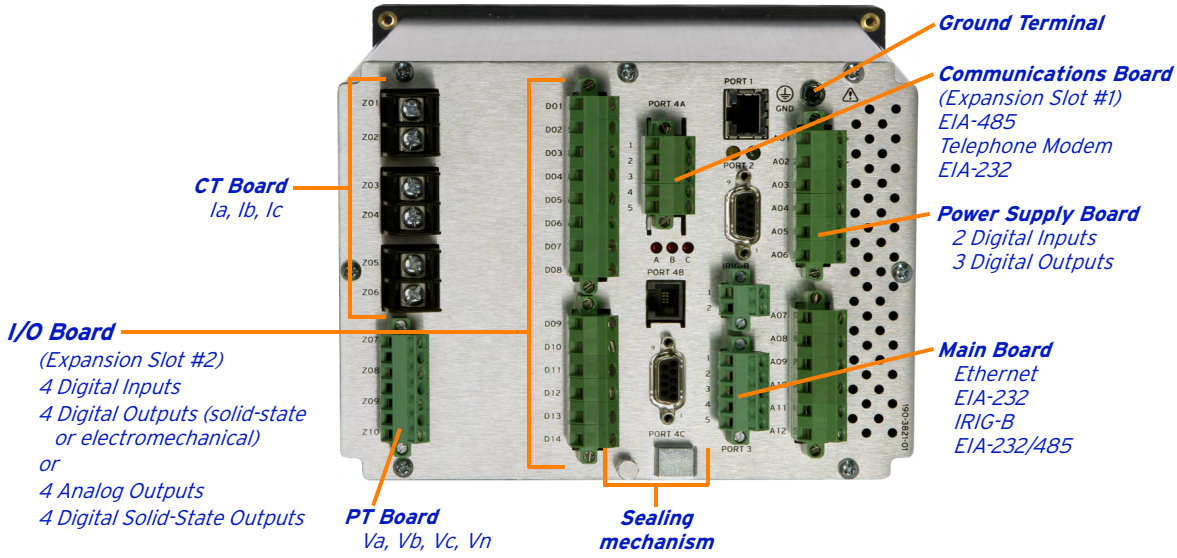


Figure 2 Rear-Panel Layout

C. Labels and Dimensions

The top and side labels depict important information, including auxiliary power supply input voltage.

The cutout dimensions for the horizontal and vertical meter chassis are identical. The vertical chassis is designed to fit into existing panel cutouts with an optional retrofit bezel.

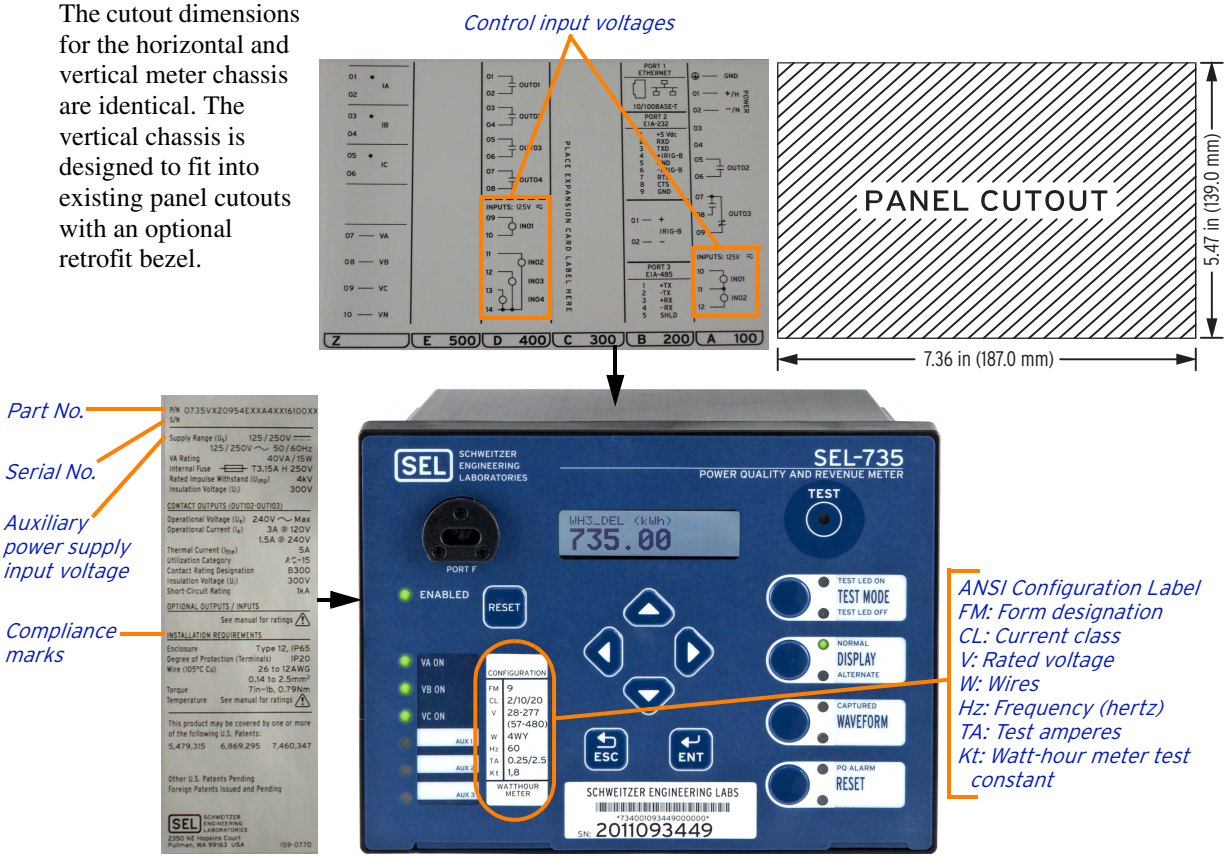


Figure 3 Labels and Dimensions

III. SEL-735 Installation and Wiring

This section outlines how to mount the SEL-735 and wire the power supply, PT, and CT connections.

A. Required Installation Tools

- 5/32-inch x 1/32-inch slotted-tip screwdriver for Connectorized® terminal blocks
- #2 or #3 Phillips® screwdriver for current inputs and panel mounting screws
- #6 ring terminals for CT connections
- Serial cable: SEL cable C234 or SEL cable C287, or ANSI optical probe (For more information, see *Table 1* or SEL serial-to-USB cable C662.)
- ACSELERATOR QuickSet® SEL-5030 Software CD

PC System Requirements

- EIA-232 serial port or Ethernet connection to allow communication to SEL devices
- CD-ROM drive
- Microsoft® Windows® 7 32-bit and 64-bit Microsoft Windows Vista 32-bit and 64-bit Microsoft Windows XP Professional, Home or Tablet PC Editions 32-bit Microsoft Windows 2000
- 200 MB hard disk space
- Microsoft Windows administrative level privileges (required for installation)

B. Recommended Torque Values

- Current terminals: 12 in-lb
- Connectorized terminals (accept wire size 12–24 AWG):
  - 7 in-lb for wire connections
  - 2 in-lb for retaining screws
- Mounting screws: 12 in-lb

C. Mounting Options

SEL supplies each SEL-735 with four #8 screws for mounting the meter in a rectangular panel cutout shown in *Figure 3*. For detailed information on mounting options, communications cables, and other accessories, please refer to the SEL-735 *Metering Accessories* flyer, found at *www.selinc.com*.

Mount the SEL-735 using one of the following options:

- Panel mount (standard)
- Retrofit bezel
- Indoor enclosure
- 19-inch rack-mount bracket
- Wall-mount bracket
- Outdoor enclosure

D. Power Supply Connections

Before powering the SEL-735, connect the ground terminal ⏚ (**GND**-to-earth ground). See *Figure 2* for the location of the chassis ground.

Choose one of the following methods to power the SEL-735.

1. Auxiliary Power Supply

Connect auxiliary power supply input voltages to terminals A01 and A02.

The SEL-735 supports three power supply options:

- High-voltage ac/dc supply (85–275 Vdc, 85–264 Vac)
- Medium-voltage dc-only supply (19–58 Vdc)
- Low-voltage dc-only supply (9.6–30 Vdc)

2. PT Power

To power the SEL-735 from the PT circuit, connect terminals Z07 to A01 and Z10 to A02 using 12–24 AWG wire.

E. Voltage and Current Connections

The SEL-735 supports Form 9 (4-wire wye), Form 5 (3-wire delta), and Form 36 (4-wire wye) connections.

Form 5, 3-wire delta connection

Voltages

Wire the phase-to-phase voltages to terminals Z07 and Z09. Connect the neutral wire to terminals Z08 and Z10.

Currents

Wire the currents to terminals Z01–Z02 and Z05–Z06.

Form 9, 4-wire wye connection

Voltages

Wire the phase-to-neutral voltages to terminals Z07, Z08, and Z09. Connect the neutral wire to terminal Z10.

Currents

Wire the currents to terminals Z01–Z02, Z03–Z04, and Z05–Z06.

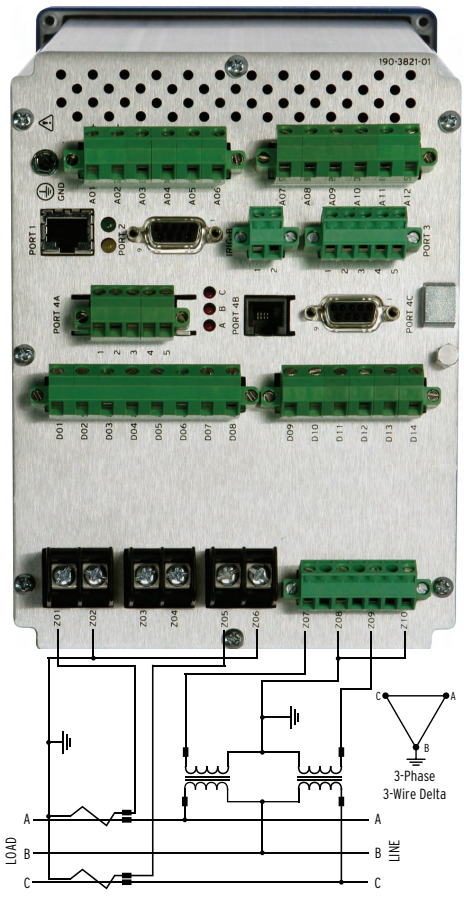
Form 36, 4-wire wye connection

Voltages

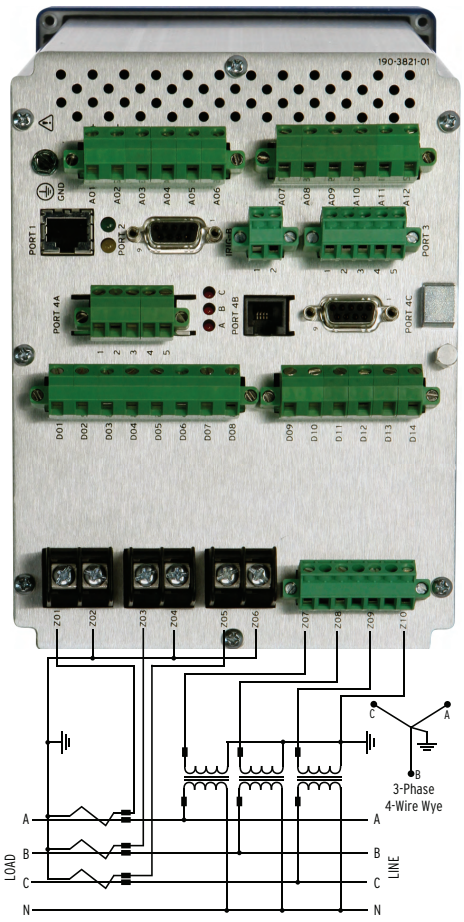
Wire the phase-to-neutral voltages to terminals Z07 and Z09. Connect the neutral wire to terminals Z08 and Z10.

Currents

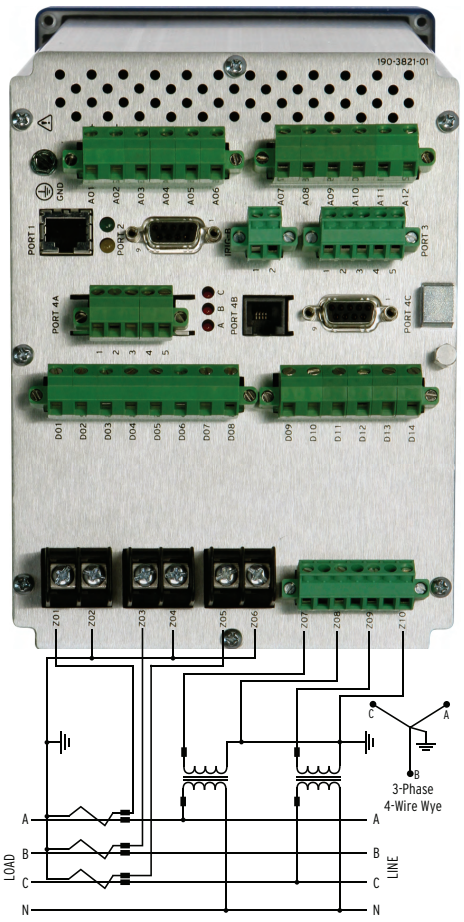
Wire the currents to terminals Z01–Z02, Z03–Z04, and Z05–Z06.



Form 5, 2-Element, 3-Wire Delta



Form 9, 3-Element, 4-Wire Wye



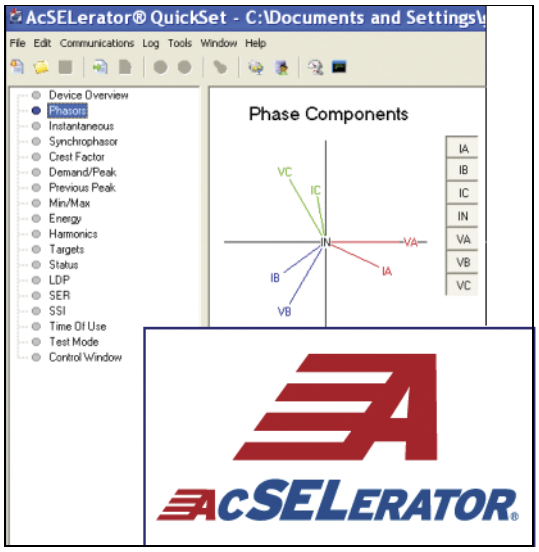
Form 36, 2 1/2-Element, 4-Wire Wye

IV. ACSELERATOR QuickSet SEL-5030 Software

A. Overview

SEL ships all SEL-735 meters with ACSELERATOR QuickSet. Use ACSELERATOR QuickSet to perform the following tasks.

- ➤ Read and send configuration settings with an SEL-735.
- ➤ Save and open configuration settings on a PC.
- ➤ Monitor real-time power system data.
- ➤ Control the meter remotely.
- ➤ Configure the communications ports.
- ➤ Retrieve the LDP, SER, and VSSI reports.
- ➤ Display waveforms from event reports.



B. Install ACSELERATOR QuickSet

Install ACSELERATOR QuickSet with the enclosed CD, or download from *www.selinc.com*. On the SEL website, click on **Products > Software Solutions > Settings Software > ACSELERATOR QuickSet Software**, click on **Download**, save, and then run Install.exe. A wizard will guide an installation or an upgrade of ACSELERATOR QuickSet.

C. Configure ACSELERATOR QuickSet Communications

From a Windows PC, open ACSELERATOR QuickSet by clicking **Start > Programs > SEL Applications > ACSELERATOR QuickSet** or by double-clicking the ACSELERATOR QuickSet icon. For initial communications, connect any available serial or optical port on the meter to the PC using an ANSI optical probe, a C234 or C287 serial cable, or a C662 serial-to-USB cable.

The SEL-735 supports various optical probes. *Table 1* lists compatible probes and any special requirements.

Table 1 Optical Part Probes

SEL-735 Compatible Optical Probes	Connector	Special Instructions
ABACUS ELECTRICS A6Z (SEL part number C660)	DB-9	None
ABACUS ELECTRICS A7Z	DB-9	DTR Off
ABACUS ELECTRICS A9U (SEL part number C661)	USB	DTR Off; requires software driver
ELSTER/ABB UNICOM™ III	DB-9	DTR Off
GE SmartCoupler SC-1A	DB-9	DTR Off
Microtex Electronics FR3	USB	Maximum 19200 bps rate; requires software driver
P+E Tecnik K01-USB	USB	Requires software driver; cannot use to upgrade firmware
uData Net PM500-300	DB-9	DTR Off; requires power from ac adapter or connector for mouse or keyboard

To access the communications parameters in ACSELERATOR QuickSet, select **Communications > Parameters**. *Figure 4* shows the default serial port parameters for the SEL-735.

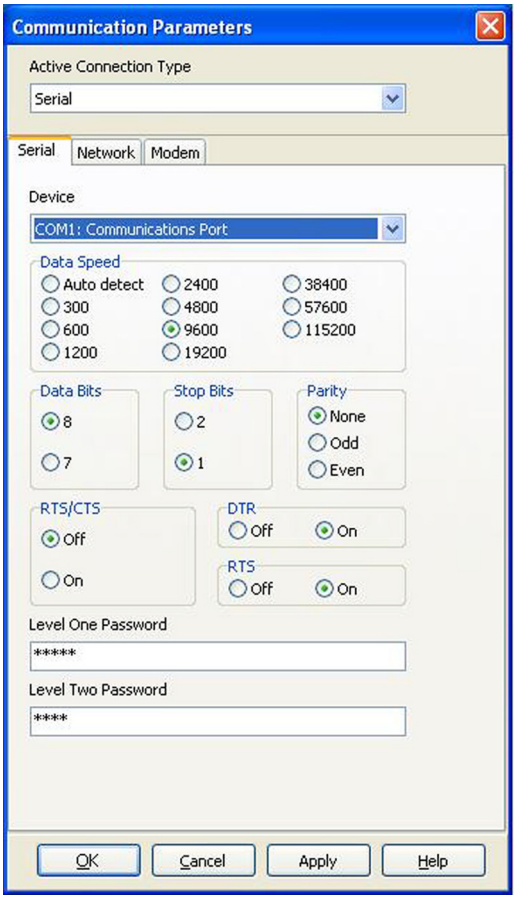


Figure 4 Default Communications Parameters

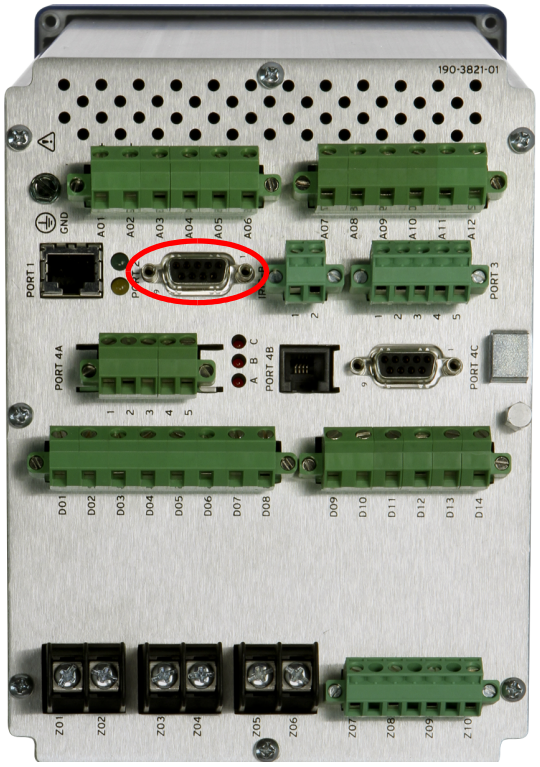


Figure 5 SEL-735 Serial Port 2

Figure 6 Cables for the SEL-735

D. Settings Editor

This section discusses how to read, modify, save, and send configuration settings within ACSELERATOR QuickSet.

1. Toolbar and Icon Functions

ACSELERATOR QuickSet allows access to features through both menus and icons. This document describes how to access features using the menu structure. *Figure 7* illustrates the icon functions in the ACSELERATOR QuickSet toolbar.

Quick Tip: *Hover over icons to view the title and function.*

Quick Tip: *Press F1 in ACSELERATOR for help.*

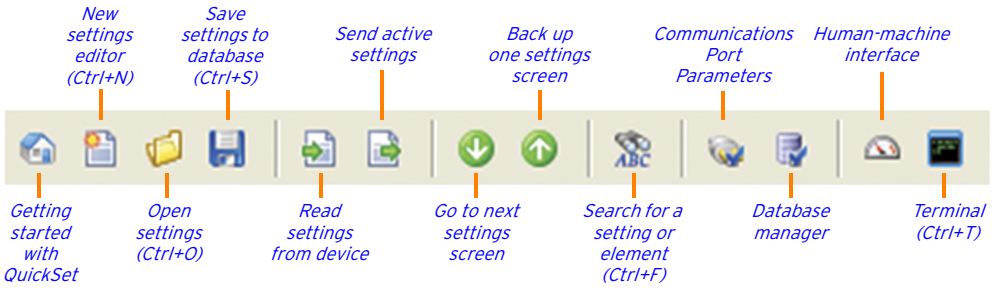


Figure 7 Icon Functions

2. Read Configuration Settings From the Meter Into ACSELERATOR QuickSet

Before editing configuration settings, ACSELERATOR QuickSet must read them from the SEL-735.

Click **File > Read** as shown in *Figure 8* to read meter configuration settings.

3. Modify Configuration Settings

A settings tree view appears when ACSELERATOR QuickSet successfully reads meter configuration settings from the SEL-735.

Click the plus sign (+) to expand a setting group, or click a group name to see all associated configuration settings.

ACSELERATOR QuickSet automatically hides unavailable configuration settings and flags invalid configuration settings at the bottom of the screen.

Right-click on any setting for the previous or default value.

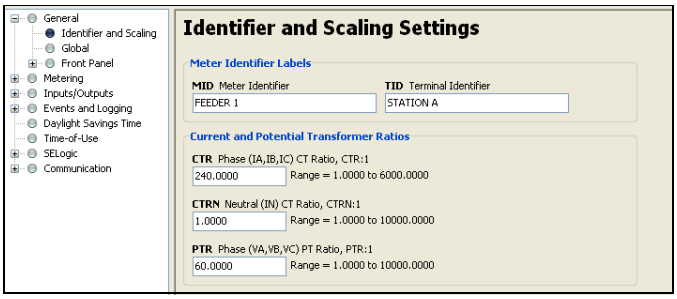


Figure 8 Meter Configuration Settings

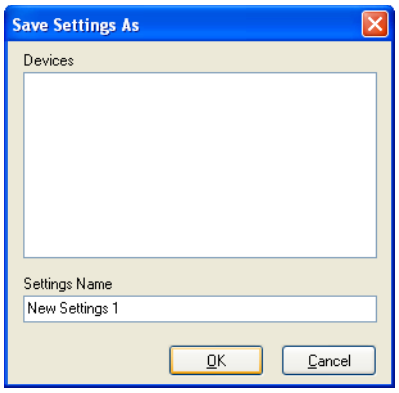


Figure 9 Save Settings

4. Save Configuration Settings to the PC Hard Drive

Select **File > Save** to save changes made within ACSELERATOR QuickSet to the PC hard drive. Replace **New Settings 1** in the **Settings Name** text box with a unique name. Click **OK** to save the configuration settings to the ACSELERATOR QuickSet settings database on the PC hard drive.

5. Send Configuration Settings to the Meter to Update All Modified Configuration Settings

The **File > Send** command sends any changes made within ACSELERATOR QuickSet to the meter. ACSELERATOR QuickSet automatically selects modified configuration settings groups and warns if these settings will overwrite existing data or change active communications parameters.

Figure 10 Settings Group/Class Select

E. Commonly Used Configuration Settings

This section outlines commonly used meter configuration settings, including: Meter and Terminal Identifier, Current and Potential Transformer Ratios, Demand Metering, KYZ Pulse, Daylight Savings Time, Load Profile, Front-Panel Display, and Communications.

1. General Settings

The General settings include the Meter Identifier (MID), Terminal Identifier (TID), and Current and Potential Transformer Ratios (CTR and PTR).

To access General settings, expand **General > Identifier and Scaling** from the ACSELERATOR QuickSet settings editor tree.

a. MID and TID Settings

Meter reports include the MID and TID for easy meter identification. These configuration settings help uniquely identify each meter within a system.

Quick Tip:
The MID setting must match the MV-90® Master File Device ID setting.

b. Current and Potential Transformer Ratios

You can configure the meter to scale the following reports to report in primary units:

- Meter Reports (MET)
- Human Machine Interface (HMI)
- Load Profile (LDP)
- Display Points (DP)
- Distributed Network Protocol (DNP)
- Modbus®
- CTR and PTR settings
- Front-Panel LCD

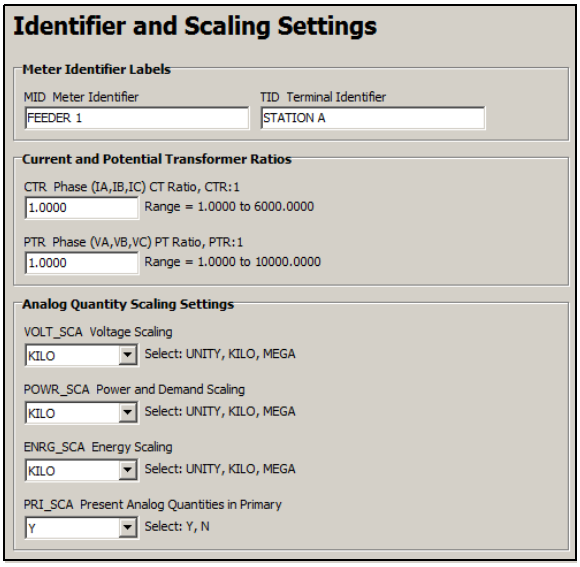


Figure 11 MID, TID, CTR, and PTR Settings

SELOGIC® control equations are secondary quantities and are unaffected by CTR and PTR values.

To set the CT and PT ratios, choose **General > Identifier and Scaling** from the ACSELERATOR QuickSet settings editor tree. Note that the CTR and PTR values are net ratios. For example, a 1200:5 CT ratio equates to a CTR setting of 240.

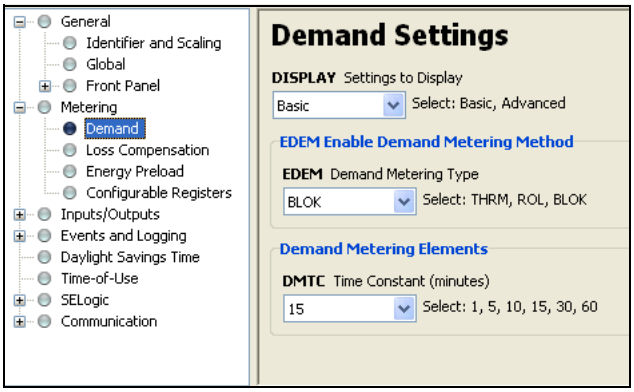


Figure 12 Demand Metering

2. Demand Metering

The SEL-735 supports Thermal, Rolling, and Block demand types with intervals of 1, 5, 10, 15, 30, and 60 minutes.

To configure demand metering, choose **Metering > Demand** from the ACSELERATOR QuickSet settings editor tree.

3. KYZ Pulse Settings

The KYZ Pulse Settings define the KYZ pulse weight. *Figure 13* depicts the KYZ settings that configure 1.8 kWh/pulse.

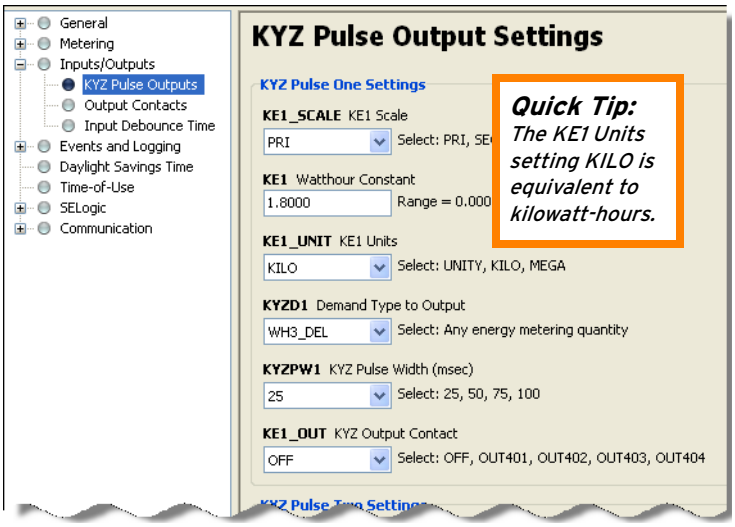


Figure 13 KYZ Pulse Settings

Quick Tip:
The KE1 Units setting KILO is equivalent to kilowatt-hours.

4. Map KYZ Pulse Settings

Before the KYZ outputs will operate, the user must configure the meter to map the KYZ pulses to a form A KY output contact as shown in *Example 1* or a form C KYZ output contact as shown in *Example 2*. The SEL-735 supports four Form A outputs or two Form C outputs. Please verify that the meter contains solid-state output contacts prior to configuring KYZ outputs. Electro-mechanical contact outputs are only rated for 10,000 closures. With default KYZ configuration settings and 5 A and 120 V applied, 10,000 closures occur in just 30 hours.

EXAMPLE 1 Map a Form A KY Pulse Setting to OUT401

Step 1: Select **Inputs/Outputs > KYZ Pulse Outputs** from the ACSELERATOR QuickSet settings editor tree.

Step 2: Set **KE1_OUT** to **OUT401**. ACSELERATOR QuickSet automatically maps the KYZ pulses to **OUT401**.

Step 3: If necessary, repeat steps 1 and 2 to add an additional KY output.

Quick Tip:
KYZ pulses require solid-state output contacts.

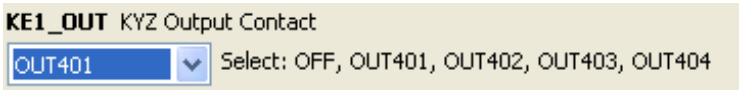


Figure 14 Output Contact 401 Equation

EXAMPLE 2 Map a Form C KYZ Pulse Setting to OUT401/OUT402

Step 1: Select **Inputs/Outputs > Output Contacts** from the ACSELERATOR QuickSet settings editor tree.

Step 2: Type **KYZD1** in the **OUT 401 Output Contact 401** equation box.

Step 3: Type **NOT KYZD1** in the **OUT 402 Output Contact 402** equation box.

Step 4. If necessary, repeat steps 1-3 to add an additional KYZ output.

Quick Tip:
If the number of KYZ outputs is half the expected value, divide the KE1 setting by two.

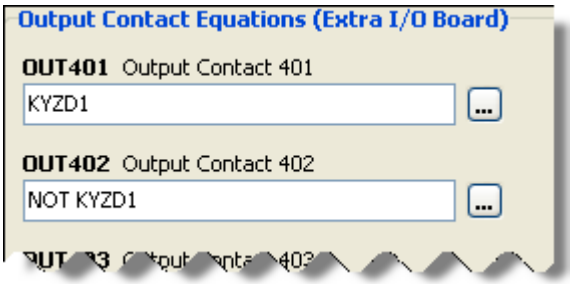


Figure 15 Output Contact 401/402 Equations

5. Date and Time Configuration Settings

a. Set the Date and Time

The SEL-735 internal time clock is accurate to 5 seconds per month at room temperature and accurate to 30 seconds per month at temperature ranges from –40°C to +85°C. Use one of the methods listed below to improve time-clock drift.

- Configure MV-90 to set the clock during every read.
- Connect an SEL communications processor to the SEL-735.
- Set the time periodically using the DNP or Modbus protocol.
- Set the time with ACSELERATOR QuickSet.
- Connect an IRIG-B time-code input to the SEL-735.

b. Daylight-Saving Time (DST)

By default, the meter ships with the 2007 United States DST calendar. The meter begins DST on the second Sunday in March at 2:00 a.m. and ends DST on the first Sunday in November at 2:00 a.m.

To enable DST, choose **Daylight Savings Time** from the ACSELERATOR QuickSet settings editor tree and select **Enable Daylight Savings Time Settings**. Enter or accept the default **Start Time** and **Stop Time**, then click **Start Dates** and **Stop Dates** to select the present DST schedule.

If the meter is connected to an external time source, disable the DST setting in the SEL-735 to avoid time-source conflicts.

c. Time Configuration Settings With MV-90

If using the **Auto Timeset** option as an MV-90 Master File setting:

- Disable the **Enable Daylight Savings** option in the SEL-735.
- Do not connect an external time source. This keeps the meter clock synchronized with the PC clock and MV-90.

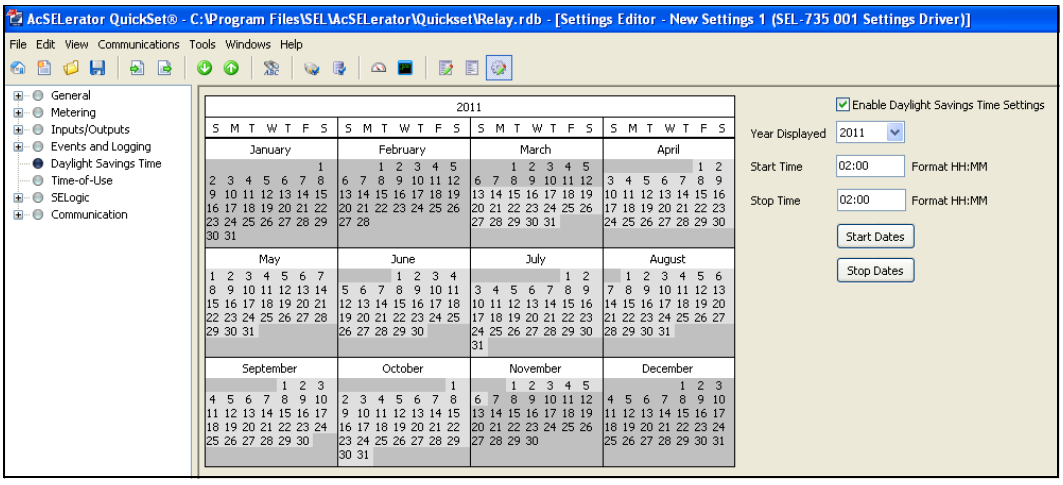


Figure 16 Daylight-Saving Time Settings

6. Load Profile (LDP) and MV-90

The SEL-735 supports as many as 12 recorders, each having 16 channels, with an acquisition rate of 3–59 second or 1–120 minute intervals. The load profile settings LDLIST tool presents a list of all available LDP values.

Meter reading software built into ACSELERATOR QuickSet quickly retrieves, graphs, and exports LDP data in .HHF or .CSV formats. Third-party meter reading software, such as MV-90 from Itron®, can automatically read LDP data from the SEL-735. The data are also available through the SEL Ymodem, Modbus, and DNP protocols.

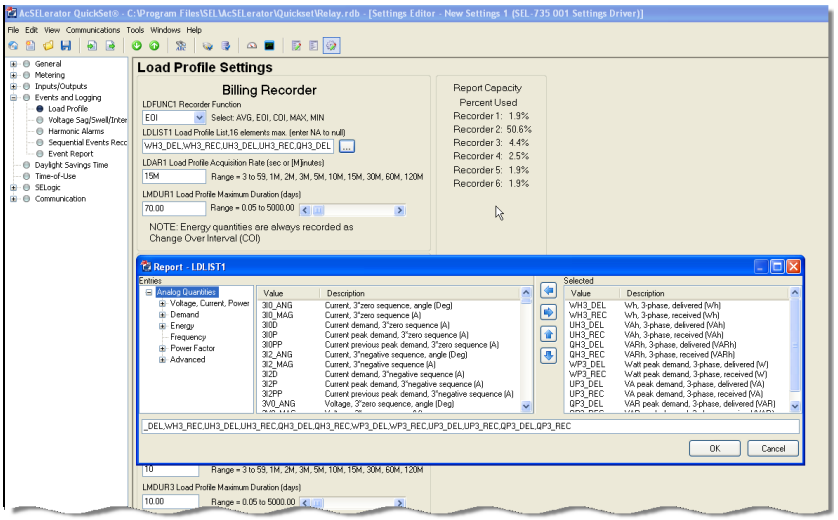


Figure 17 Load Profile Settings

CAUTION: *Sending new LDP settings clears the LDP records stored in the SEL-735.*

The SEL-735 follows the IEEE power flow notation as depicted in *Figure 18*. Verify this notation when selecting LDP quantities.

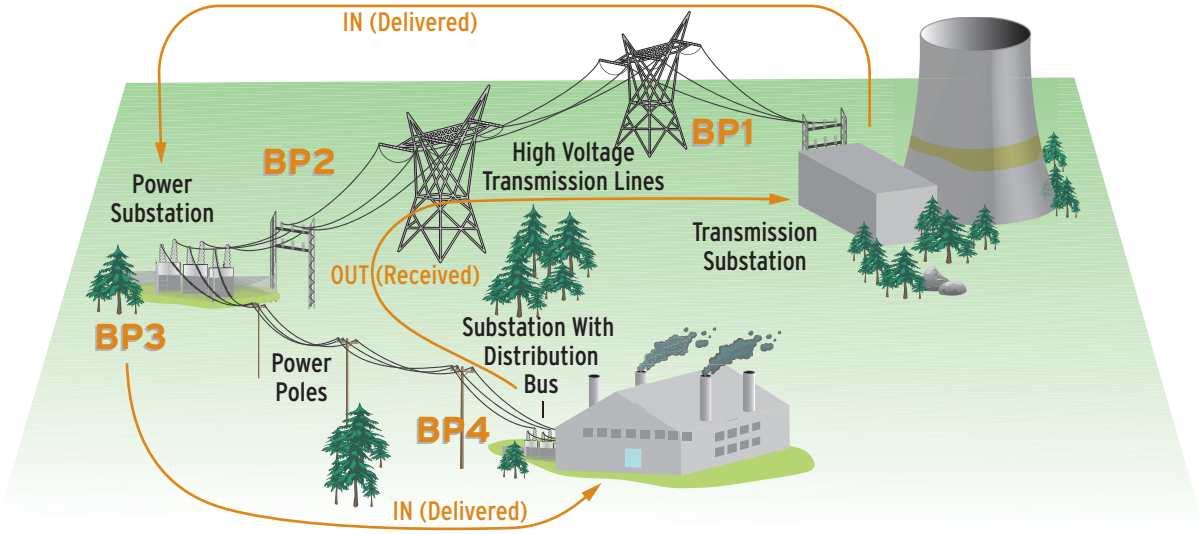


Figure 18 IEEE Power Flow Notation With Billing Points (BP) Shown

7. Scaling and Display Settings

The VOLT_SCA, POWR_SCA, ENRG_SCA, and PRI_SCA configuration settings affect how the meter reports quantities to communications channels and internal and external interfaces. The meter always reports LDP1 energy values as change-over-internal (COI) in primary kilo units to ensure compatibility with MV-90 software. All other LDP recorders report energy as defined by the scaling settings.

8. Communications and Protocol Settings

The SEL-735 supports the communications protocols listed in *Table 2*. The Ethernet port supports six simultaneous communications sessions, including five DNP3 LAN/WAN sessions. Port 4 supports three communications options, but only one is available at a time.

To change the communications parameters, click on the desired communications port followed by Communications in the ACSELERATOR QuickSet settings editor tree.

Table 2 Available Communications Protocols

Protocols	Ethernet (Port 1[a])	Serial: EIA-485, Modem, and EIA-232 (Port 2, Port 3, Port 4[a])	Front Port (Port F)
SEL ASCII	•	•	•
MODM	•	•	•
Modbus RTU		•	•
Modbus TCP	•		
DNP3	•	•	•
IEC 61850	•		

[a] Additional cost option.

9. Send and Save Configuration Settings

After completing all configuration settings in ACSELERATOR QuickSet, save and send them as detailed in *Section IV. ACSELERATOR QuickSet SEL-5030 Software*.

V. Human-Machine Interface (HMI)

The ACSELERATOR QuickSet HMI displays instantaneous meter information, captures reports, and allows test and control of the SEL-735. To access the Meter and Control interface, choose **Tools > HMI > HMI** in the main ACSELERATOR QuickSet window.

To maneuver through the windows, click on the HMI tree-view list until the required display appears on the right-hand side. Press **F1** in the HMI window to view help on each interface.

A. Device Overview

The Device Overview window emulates the front-panel interface of the SEL-735 and updates approximately every second. This window displays instantaneous metering information, and contact I/O and front-panel LED status.

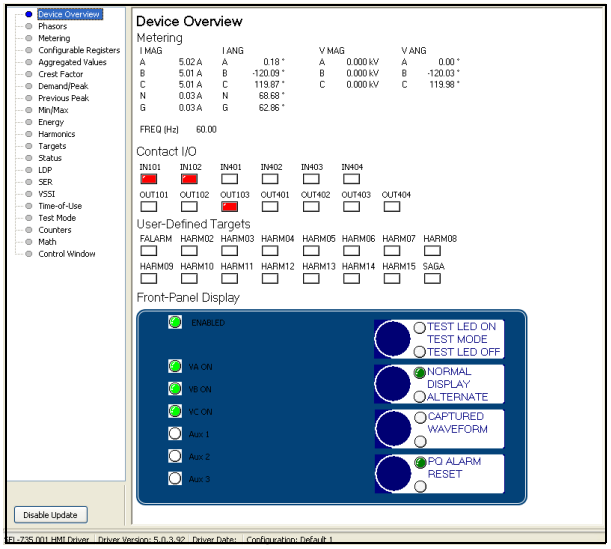


Figure 19 Device Overview Window

B. Phasors

Phasor diagrams are a powerful troubleshooting tool. Technicians and engineers can quickly determine and resolve wiring issues at a glance. This section contains phasor diagrams from three example installations. *Example 3* depicts a phasor diagram from a properly wired installation. *Example 4* and *Example 5* depict the most common wiring issues.

EXAMPLE 3 Correct Phase Rotation

Figure 20 illustrates a balanced, three-phase, ABC rotation installation with lagging power factor. Study the phasors in the counterclockwise direction and note that they read as A-B-C. The SEL-735 registers Watt-hours delivered for this condition.

Use the Phase Rotation button at the bottom of the screen to switch phasor calculation reference between clockwise ABC and counterclockwise ACB phase rotation. Click the buttons to the right of the phasor quantities to hide individual phase vectors.

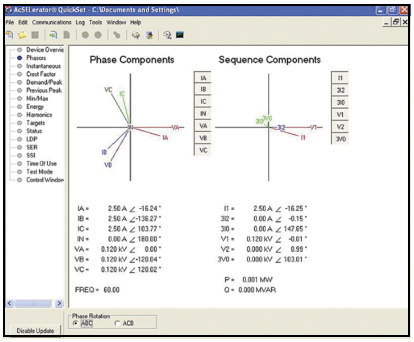


Figure 20 Correct Phase Rotation

EXAMPLE 4 Incorrect Phase Rotation

Figure 21 illustrates the phasor diagram of a balanced, three-phase installation with lagging power factor and two swapped phases. Note that the phasor diagram reads counterclockwise A-C-B. This phasor response indicates that the VB/VC and IB/IC connections are swapped. The system responds with unexpected ACB phase rotation instead of the IEEE standard ABC rotation. The SEL-735 still registers energy correctly, but the power quality functions will not operate correctly.

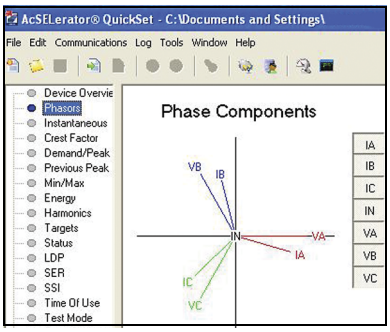


Figure 21 Incorrect Phase Rotation

EXAMPLE 5 Reversed CT Connections

Many times CT polarity convention varies from site to site, which can lead to reversed CT connections. The top label of the SEL-735 indicates CT polarity convention with a dot that denotes current flow out of the instrumentation transformer and into the SEL-735 CT terminal.

Figure 22 illustrates the phasor diagram of a balanced, three-phase installation with lagging power factor and reversed IA, IB, and IC connections. Note the abnormal position of the phase current with respect to their phase voltages. The SEL-735 incorrectly registers Watt-hours received for this condition.

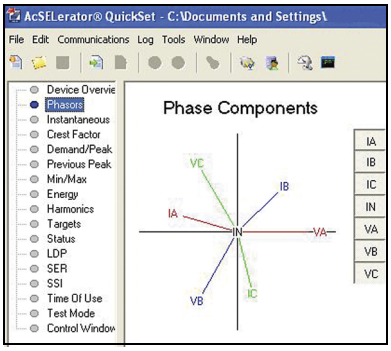


Figure 22 Reversed CT Connections

C. LDP and SSI

The ACSELERATOR QuickSet HMI displays Load Profile and Voltage Sag/Swell/Interruption (VSSI) reports. To capture any of these reports, select the required date range and click **Export**.

1. Load Profile (LDP)

The SEL-735 adds an entry to the load profile recorder at the interval set by the LDAR setting. This entry contains the time stamp, the present value of the selected LDLIST analog quantities, and a checksum.

2. Voltage Sag/Swell/Interruption (VSSI)

The SEL-735 records voltage sags, swells, and interruptions with 1 ms accuracy. Enable and configure VSSI in the Voltage Sag/Swell/Interruption Settings window of ACSELERATOR QuickSet.

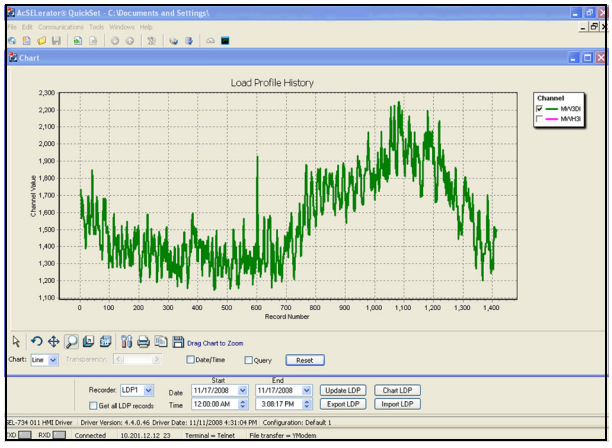


Figure 23 LDP Graph in HMI

D. Test Mode

The ACSELERATOR QuickSet HMI allows simple test mode interaction and eliminates the need to navigate through the front panel to enable test mode. While in test mode, the SEL-735 stops collecting LDP and Demand data and places an asterisk next to records in the LDP report.

To place the meter into test mode, select a Test Mode Quantity from the drop down box and click **Enter Test Mode**. The test mode window depicts an optical port that pulses a red test pulse in conjunction with the actual front optical port. Click **Exit Test Mode** at the end of an accuracy test to restore normal meter operation.

Quick Tip: *The QuickSet HMI supports all rear-panel communications ports when in test mode.*

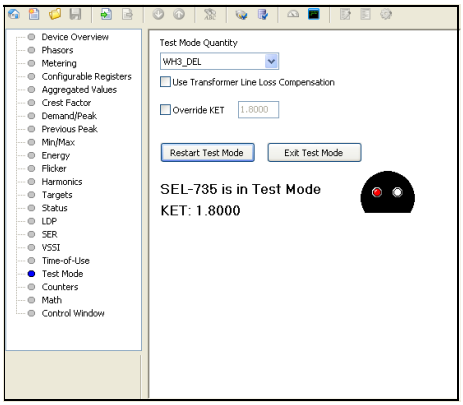


Figure 24 Test Mode

E. Control Window

The control window provides an interface to set the date and time, reset data, and test output contacts. For example, to set the time, click **Set** next to the Time edit box to update the time in the meter.

ACSELERATOR QuickSet prompts for a 2AC password before it will control the meter or reset data. See *Section VI. Security and Passwords* for additional information.

Quick Tip: *To reset the Peak Demand, click the Reset button under Peak.*

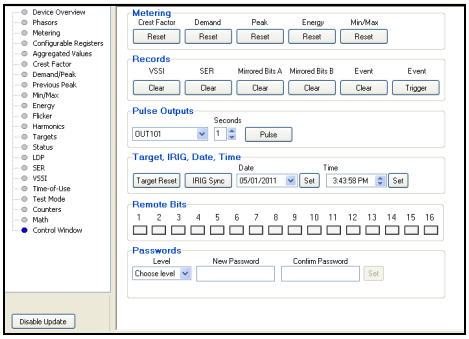


Figure 25 Control Window

VI. Security and Passwords

A. Security

The SEL-735 supports four access levels to prevent unauthorized entry. *Table 3* describes the default passwords and the capabilities of each access level. The user must enter the ACC Access Level before entering the EAC or 2AC Access Levels.

Table 3 Default Passwords and Access Levels

Access Level	Terminal Prompt	Default Password	Capability
0AC	=	NA	Entry access level
ACC	=>	OTTER	View configuration settings and meter data
EAC	E=>	BLONDEL	Reset demands and perform all ACC commands
2AC	=>>	TAIL	Change configuration settings, reset all data, and perform all EAC and 2AC commands

B. Changing Passwords

To prevent unauthorized access, set strong passwords as described in the steps below. For example, the password **OTTER** is weak because it is a six-character word found in the dictionary. The password **O#h”pVw&** is strong because it is random, undefined, and contains eight characters.

Step 1. Access ACSELERATOR QuickSet HMI as previously discussed in *Human-Machine Interface (HMI) on page 12*.

Step 2. Click on **Control Window** in the tree-view to display the **Control** window.

Step 3. Select the Level in the **Passwords** section for the Access Level that you want to change (see *Figure 26*).

Step 4. Type the new password in the **New Password** and **Confirm Password** text boxes.

Step 5. Click **Set** next to the **Confirm Password** text box.

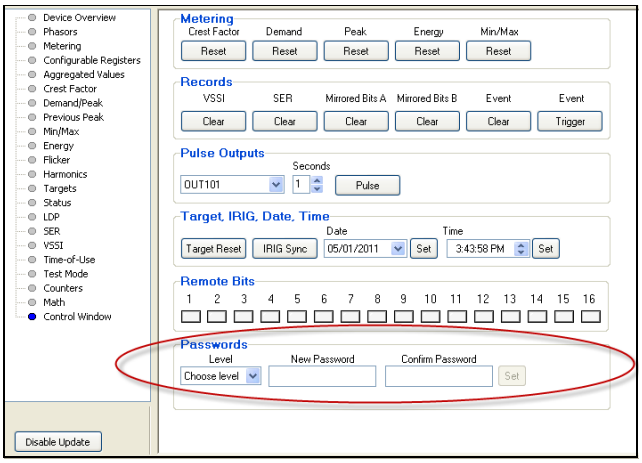


Figure 26 Control Window

A message will appear confirming that the meter accepted the new password.

VII. Factory Support

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

Direct meter support line: +1.509.334.8793

Meter support email: metersupport@selinc.com

Metering website: *www.selmeters.com*

Notes

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