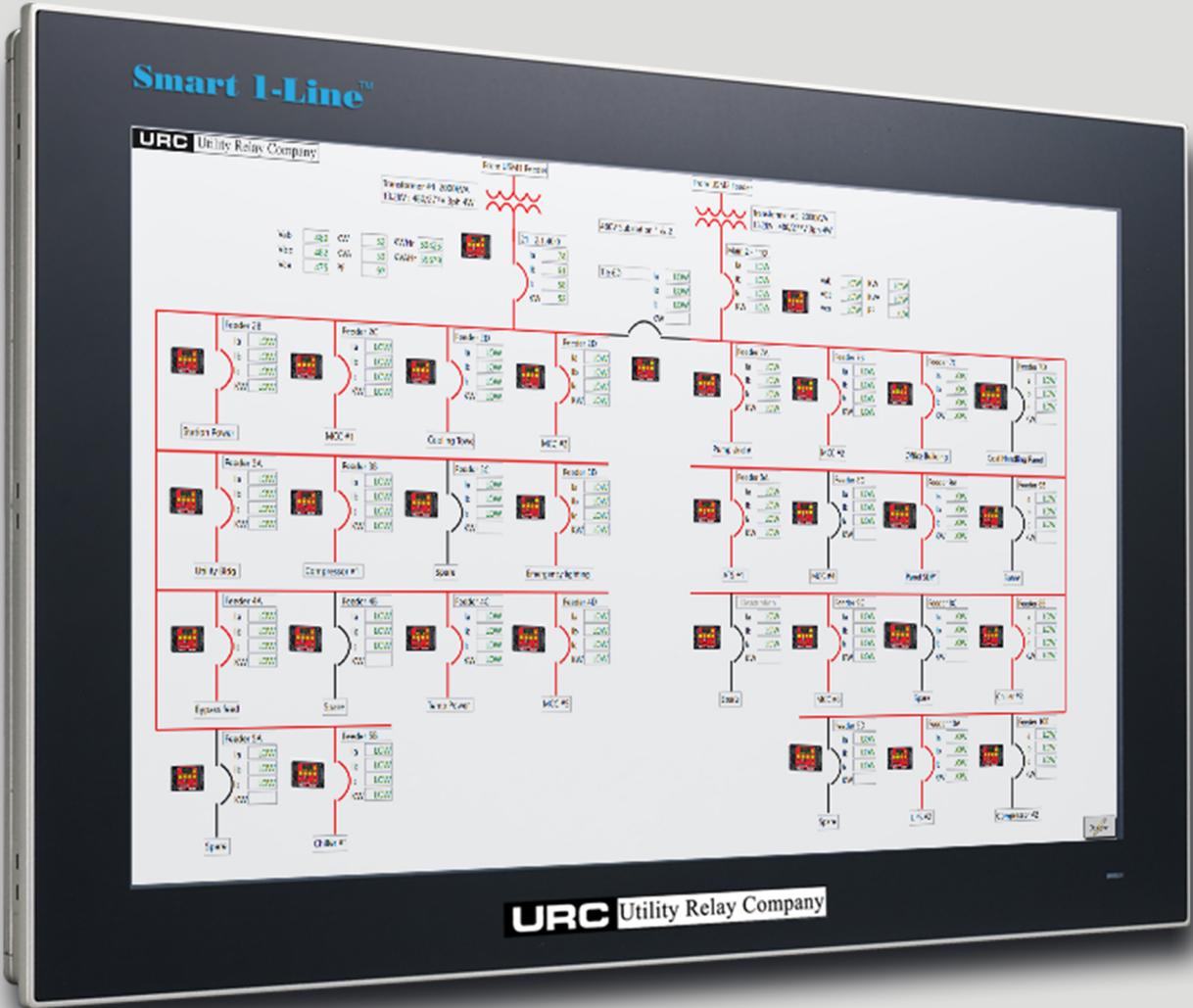


INSTRUCTION MANUAL

Touchscreen HMI
Manual v2.0

Smart I-Line[®]



Touchscreen HMI
Designed Specifically for AC-PRO-II[®]

URC Utility Relay Company
UTILITYRELAY.COM

10100 QUEENS WAY
CHAGRIN FALLS, OH 44023
USA
888.289.2864

For latest version, visit:

http://www.utilityrelay.com/Side_Bar/Instruction_Manuals.html



Manual Revision 2.0 – Sep 2022

Table of Contents

Section:	Page
1.0 Introduction and Overview	4
1.1 Typical System Diagrams	5
1.1.1 RS-485 Direct Connection.....	5
1.1.2 External RS-485-to-Ethernet Modbus Gateway (optional).....	6
1.1.3 Local Smart 1-Line + Remote Smart 1-Line.....	6
1.2 Items Included.....	7
1.3 Accessories.....	7
1.4 Warnings.....	7
2.0 Installation	8
2.1 Mounting	8
2.2 Connections	8
2.3 RS-485 Network.....	9
2.3.1 Cable and Lengths	9
2.3.2 Termination circuits	9
2.4 Ethernet (optional).....	9
2.4.1 External RS-485-to-Ethernet Gateway/Server	9
2.4.2 Modbus TCP communications to other systems.....	10
3.0 Setup and Configuration	10
3.1 Powering On	10
3.1.1 Logging into Windows	10
3.1.2 Designer Mode	11
3.1.2.1 Designer Mode Password.....	11
3.1.2.2 Drawing your 1-Line.....	11
3.1.2.3 Adding items	11
3.1.2.4 Rotating items	11
3.1.2.5 Removing items	11
3.1.2.6 Power Distribution System Changes	11
3.1.2.7 Designer Mode Toolbar	12
3.1.2.8 Smart 1-Line Settings	14
3.1.2.9 Modbus Settings	14
3.1.2.10 Timing Settings	16
3.1.2.11 Modbus Server Settings	17
3.1.2.12 Preferences Settings.....	18
3.1.2.13 User Logo	18
3.1.2.14 Diagnostics (settings).....	19
3.1.2.15 Configurations.....	19
3.1.2.16 Trends.....	20
3.1.3 Trip Unit Settings.....	21
3.1.3.1 AC-PRO-II Device Settings.....	21
3.1.3.2 AC-PRO Device Settings.....	21
4.0 Operation	22
4.1 Run Mode.....	22
4.1.1 Breaker Block	23
4.1.2 Detailed Breaker Data	24
4.1.2.1 Readings tab (AC-PRO-II only)	25
4.1.2.2 Breaker Control.....	27
4.1.2.2.1 Tripping a Breaker:	27
4.1.2.2.2 Closing a Breaker:	28
4.1.2.2.3 QUICK-TRIP ON/OFF Control:.....	29
4.1.2.3 Waveforms tab (AC-PRO-II only, FW v2.0.27 or higher).....	30
4.1.2.4 Trends tab (AC-PRO-II only)	31
4.1.2.5 Trip History tab (AC-PRO-II only)	32

4.1.2.6	Settings tab (AC-PRO-II only).....	33
4.1.2.7	TCC/Tests tab (AC-PRO-II only)	34
4.1.2.8	AC-PRO tab (includes Readings, Settings, Last Trip).....	35
4.1.2.9	Breaker Tests tab.....	36
4.1.2.10	Trip Unit Tests tab.....	37
4.1.3	Transformer.....	37
4.1.4	Bus	38
4.1.5	Description Box	38
4.1.6	Voltage data block.....	38
4.1.7	Power data block.....	38
4.1.8	Energy data block.....	39
4.1.9	Trip unit icons	39
4.1.10	Communications Status Box	40
4.1.11	Designer Mode button	40
4.1.12	Help button	40
5.0	Software and Firmware.....	41
5.1	Features by product & version	41
6.0	System performance & speed.....	42
6.1	Smart 1-Line Settings.....	42
6.2	Baud Rate	42
6.3	Power state of AC-PRO-II and/or AC-PRO trip units.....	42
7.0	General and PC Items	42
7.1	Operating System	43
7.2	Internet and/or Server Connections	43
7.3	PC & Windows Settings	43
7.3.1	Windows Accounts and Passwords	43
7.3.1.1	“Smart 1-Line” user account	43
7.3.1.2	“S1L-Administrator” account.....	43
7.3.2	Screen Timeout and Brightness settings	44
7.4	Other applications	44
7.5	Other Modbus devices	44
7.6	Panel PC Specifications.....	45
7.7	Warranty.....	45
7.8	Software updates	45
7.9	Troubleshooting	46
7.10	General Troubleshooting items	46
7.11	Getting Logs.....	46

Table of Figures

Figure 1: Smart 1-Line with 1-Line screen example.....	4
Figure 2: Typical Diagram #1: RS-485 Direct (Modbus RTU)	5
Figure 3: Typical Diagram #2: External Modbus Gateway (Modbus TCP).....	6
Figure 4: Typical Diagram #3: Local Smart 1-Line + Remote Smart 1-Line.....	6
Figure 5: VESA Mounting holes	8
Figure 6: Rear Connections.....	8
Figure 7: Typical RS-485 Network Wiring Diagram.....	9
Figure 8: RS-485 Maximum Recommended Cable Lengths.....	9
Figure 9: Designer Mode Button	10
Figure 10: Designer Mode Password.....	11
Figure 11: Designer Mode Toolbar	12
Figure 12: Designer Mode 1-Line Drawing example	13
Figure 13: Settings Menu	14
Figure 14: Modbus Settings - Example for RS-485 Direct Connection	15
Figure 15: Modbus Settings - Example for External Gateway connection	15
Figure 16: Timing Settings.....	16
Figure 17: Modbus Server Settings	17
Figure 18: Preferences Settings.....	18
Figure 19: Browse to Customer Logo Window.....	18
Figure 20: Diagnostics (settings).....	19
Figure 21: Configurations Window	19
Figure 22: Trends Window.....	20
Figure 23: Run Mode 1-Line Diagram example.....	22
Figure 24: Breaker Block: example states	23
Figure 25: Breaker symbol - area to tap	24
Figure 26: Breaker Data Window General Layout.....	24
Figure 27: Readings Tab (AC-PRO-II only).....	26
Figure 28: Trip Breaker steps	27
Figure 29: Close Breaker steps	28
Figure 30: Soft QUICK-TRIP steps	29
Figure 31: Waveforms Tab (AC-PRO-II only)	30
Figure 32: Trending Tab (AC-PRO-II only)	31
Figure 33: Trip History Tab (AC-PRO-II only).....	32
Figure 34: Settings Tab (AC-PRO-II only).....	33
Figure 35: TCC/Tests Tab (AC-PRO-II only).....	34
Figure 36: AC-PRO Tab	35
Figure 37: Breaker Tests Tab	36
Figure 38: Trip Unit Tests Tab.....	37
Figure 39: Communications Status Box	40

1.0 Introduction and Overview

Based on a rugged, fanless, touch screen industrial computer with a solid state drive and a 21.5" high-definition touchscreen, the Smart 1-Line™ is URC's modern turn-key solution for monitoring your AC-PRO-II® networks at one convenient location.

It displays a field-configurable electronic 1-Line diagram with breaker readings, status, and more. Simply tapping (clicking) a breaker symbol provides additional details and information.

The Smart 1-Line™ features include:

- Turn-key solution for monitoring URC products via Modbus communications
- Monitor Current, Voltage, Power, Energy, Breaker status, Waveforms*, Alarms, and more
- ***Trending Capability -- Data logging and graphical display of AC-PRO-II historical data
- Industrial PC with High Definition 21.5" Color Touch Screen, Solid State Drive, no moving parts (no cooling fans, etc)
- Software Pre-Installed
- Field Configurable Electronic 1-Line Diagram
- *Remote Breaker Tripping / ***Remote Close** and ***Quick-Trip control
- View Time Current Curves* and Test Data
- Wall Mount Design for Switchgear or Control Room (mount can be supplied by URC or Customer)
- RS-485 Communications to AC-PRO & AC-PRO-II
- AC-PRO-II time synchronization
- Ethernet Port for Modbus TCP communications from external gateway, or to separate system
- Smart 1-Line will provide the most features, highest communications speeds, and most future capability when used with AC-PRO-II with VDM (Voltage Divider Module) trip units.

*Feature available for AC-PRO-II only. See Section 5 for specific firmware versions.

**Feature for AC-PRO-II – requires Electrically Operated (EO) breaker with added control relay.

*** Feature added in Software version 2 (released Sept 2022)

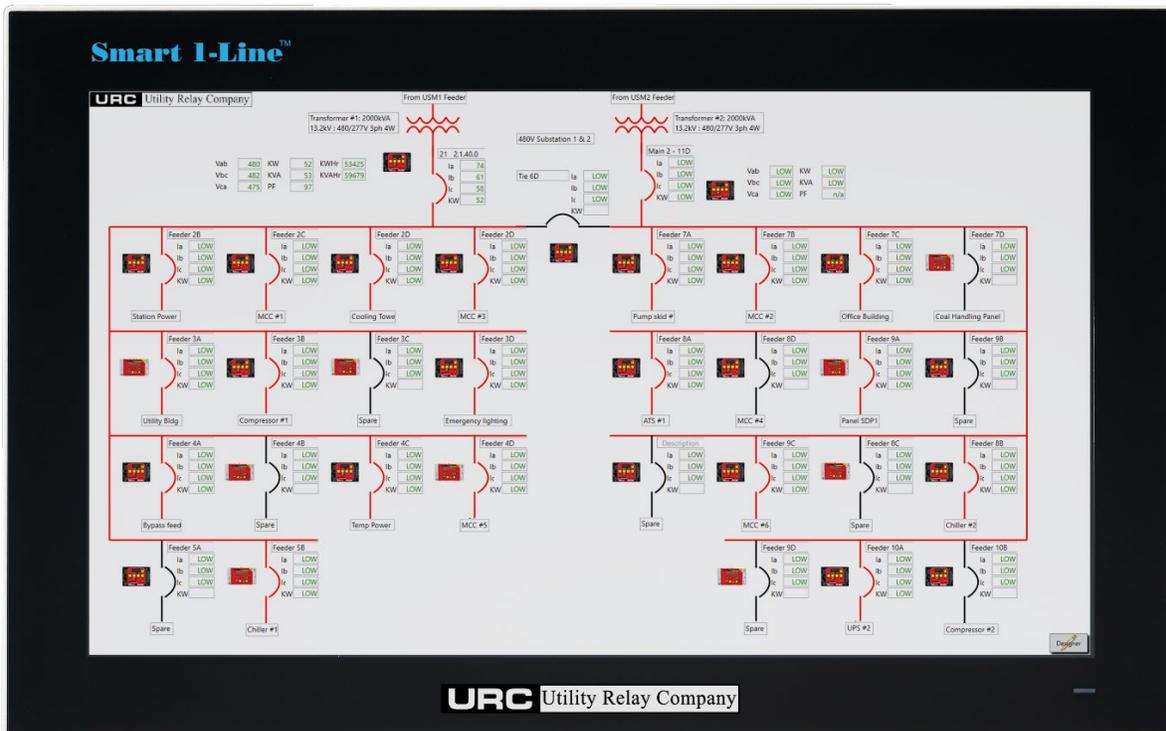


Figure 1: Smart 1-Line with 1-Line screen example

1.1 Typical System Diagrams

The Smart 1-Line can communicate with the network of trip units using a direct RS-485 connection, or via an Ethernet connection from a customer-supplied External RS-485-to-Ethernet Modbus Gateway.

1.1.1 RS-485 Direct Connection

The standard method for connecting trip units to the Smart 1-Line is a Direct RS-485 connection to the serial port on the Smart 1-Line. See the figure below for an example. See Section 3 for Settings.

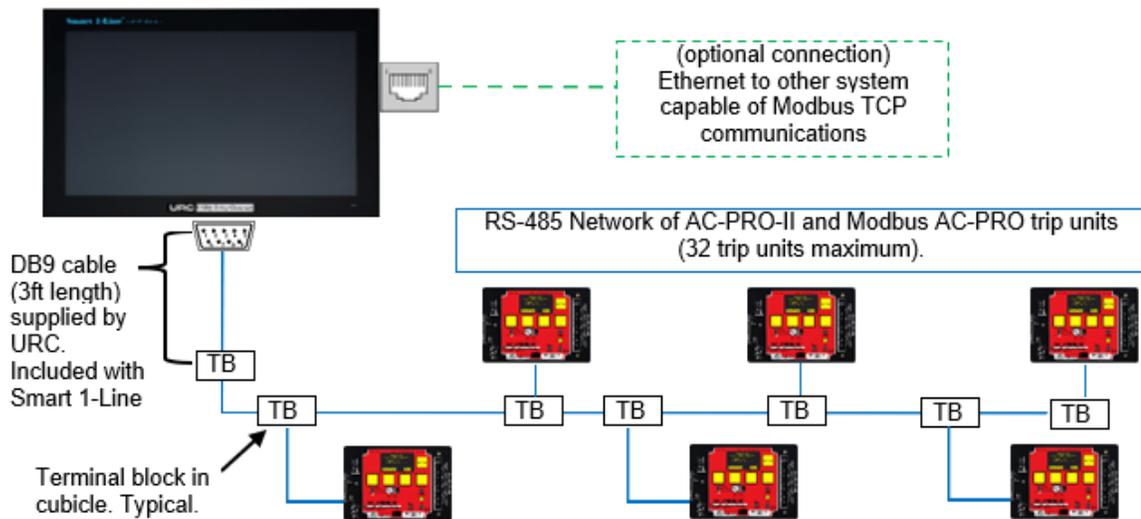


Figure 2: Typical Diagram #1: RS-485 Direct (Modbus RTU)

1.1.2 External RS-485-to-Ethernet Modbus Gateway (optional)

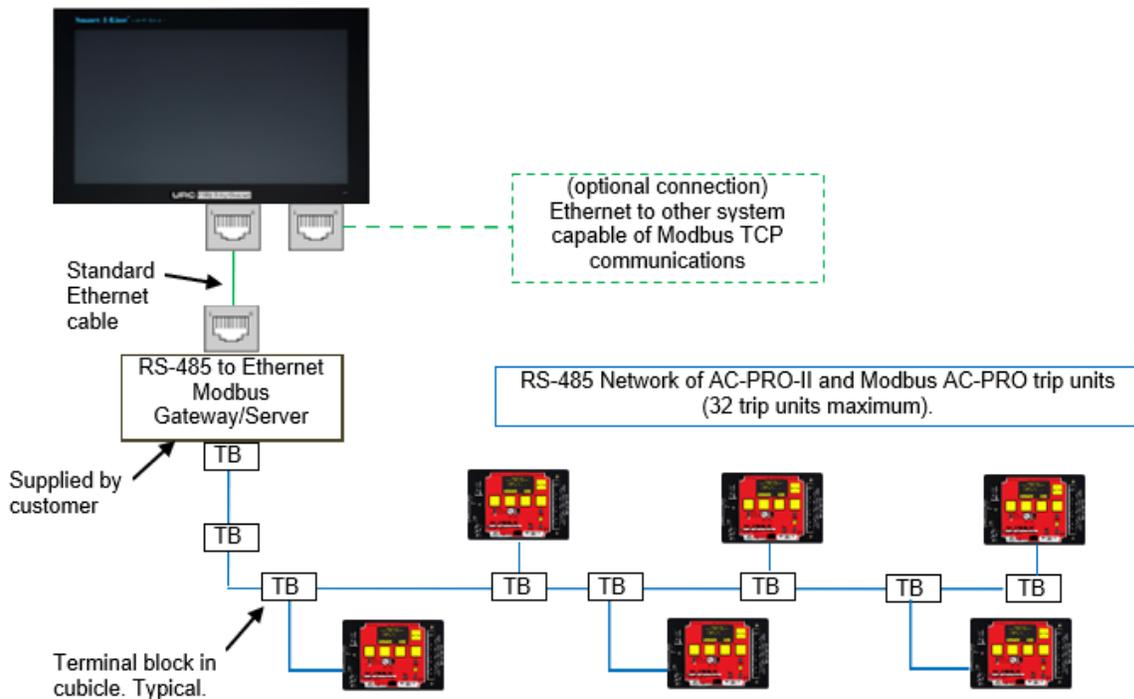


Figure 3: Typical Diagram #2: External Modbus Gateway (Modbus TCP)

1.1.3 Local Smart 1-Line + Remote Smart 1-Line

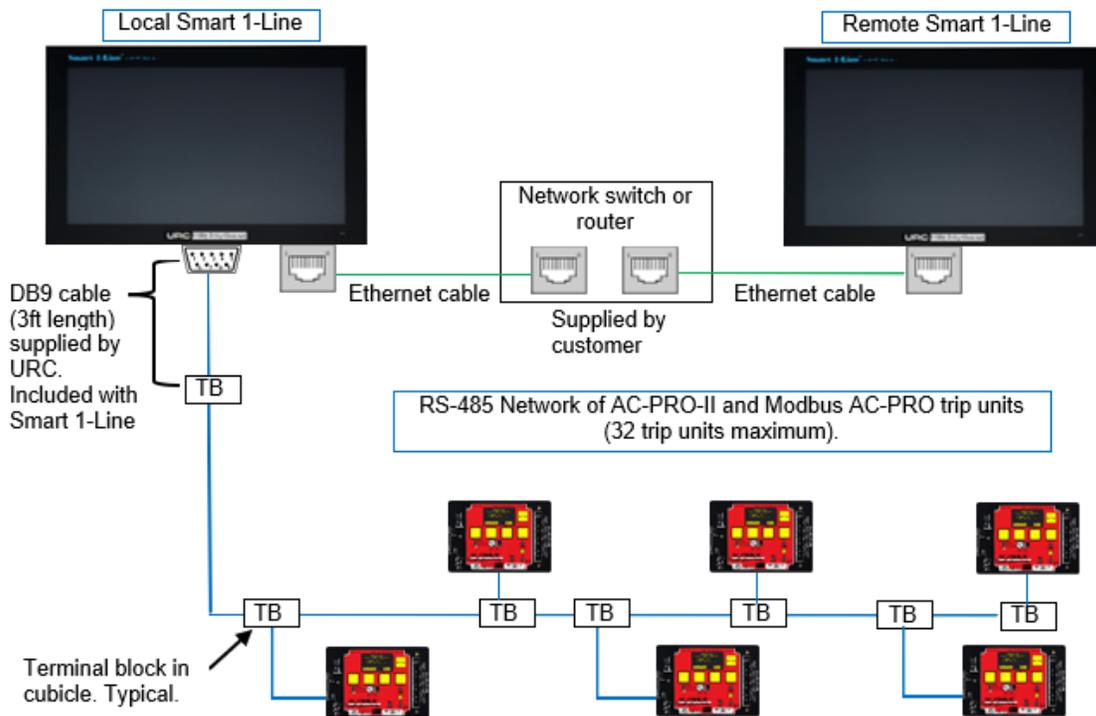


Figure 4: Typical Diagram #3: Local Smart 1-Line + Remote Smart 1-Line

1.2 Items Included

- Smart 1-Line Touchscreen Panel PC with software pre-loaded
- 120VAC to 12-24V Power Supply
- RS-485 cable with DB9 connector (3 ft. length) (URC part #CA-10-100)
- RS-485 terminal block (URC part #T-119) with mounting hardware & ring terminals
- Wall mount can be supplied by URC or by Customer

1.3 Accessories

- USB Keyboard and mouse (customer supplied) are recommended for convenience for initial setup, but not required for normal operation. Any standard USB keyboard and mouse/pointing device should be compatible. See below for some items URC has used successfully.
- Mounting: See Section 2 for mounting information and options.
- Some examples of items URC has used along with the Smart 1-Line:
 - USB keyboard (IP 65 washable): Perixx PERIBOARD-517 (available on Amazon.com)
 - USB mouse: Adesso iMouse W3 Waterproof with Magnetic Scroll Wheel (available on Amazon.com)
 - Heavy-duty Industrial Keyboard/Mouse folding shelf: RackSolutions Full Keyboard Wallmount (available on Amazon.com)
 - USB hubs & extenders: Sabrent USB hubs and extenders (available on Amazon.com)

1.4 Warnings

WARNING!

1. The Smart 1-Line information should not be exclusively relied on for situations that are critical to human safety and/or prevention of damage to equipment. All conditions shall be verified by separate means.
2. The Smart 1-Line MUST be updated if power distribution system changes occur. Examples are replacing breakers, exchanging breakers, new breakers or loads, switchgear modifications, etc. For example, if breakers are exchanged, trip unit addresses, breaker names, load descriptions, etc. must be reviewed and changed accordingly.

2.0 Installation

2.1 Mounting

Mounting hardware can be supplied by URC or by the Customer.

The Smart 1-Line is designed for surface wall-mounting, using its standard 100mm x 100mm VESA hole pattern.

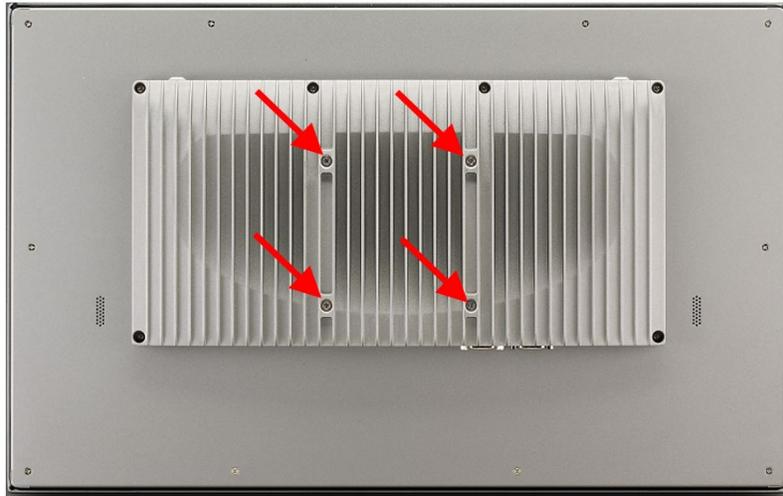


Figure 5: VESA Mounting holes

Any heavy duty VESA 100mm x 100mm capable of supporting 30 lbs can be used. (The Panel PC weighs approximately 15 lbs).

If specified, URC can supply the Panel PC OEM wall mount kit along with the Smart 1-Line. Contact URC for additional information.

2.2 Connections

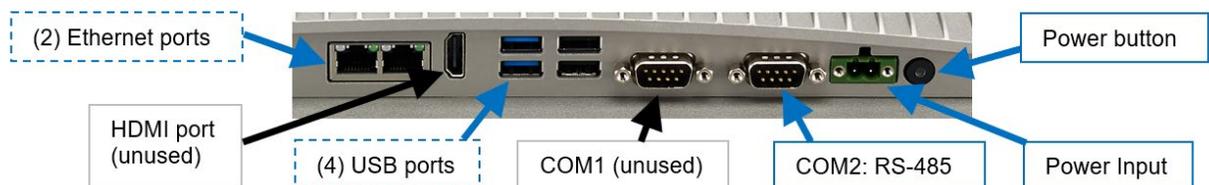


Figure 6: Rear Connections

2.3 RS-485 Network

Trip units are “daisy-chained” using a twisted-shielded cable as shown in the example diagram below.

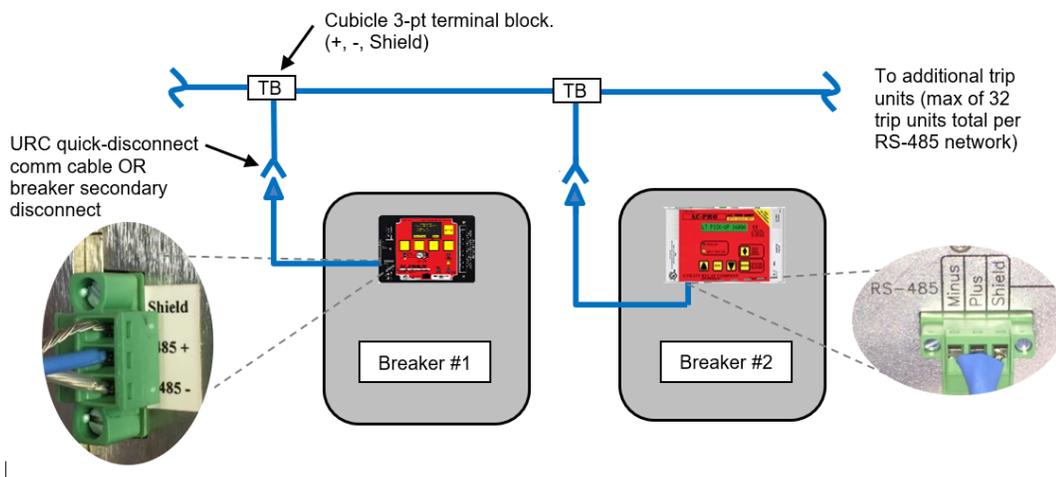


Figure 7: Typical RS-485 Network Wiring Diagram

2.3.1 Cable and Lengths

A Belden #9463 cable or equivalent can be used for the twisted shielded pair cable. Refer to the table below for maximum recommended cable lengths:

	Baud Rate				
	9600	19200	38400	57600	115200
Maximum Cable length	4000 ft	4000 ft	4000 ft	2000 ft	1000 ft
Trip Units	AC-PRO or AC-PRO-II	AC-PRO-II ONLY			

Note: communications success with maximum lengths may vary depending on the environment.

Figure 8: RS-485 Maximum Recommended Cable Lengths

Note: the above maximum lengths are based on URC testing of direct RS-485 connection to The Smart 1-Line.

2.3.2 Termination circuits

URC does NOT recommend “typical” RS-485 external “R” or “RC” termination circuits for use with AC-PRO-II and AC-PRO RS-485 wiring.

The AC-PRO-II features an internal termination network, which can be switched ON or OFF via a front accessible switch. This switch should be in the ON position for the “last” AC-PRO-II in the “loop” (RS-485 network). The switch should be in the OFF position for all other trip units in the loop (RS-485 network).

2.4 Ethernet (optional)

2.4.1 External RS-485-to-Ethernet Gateway/Server

If an external customer-supplied RS-485-to-Ethernet Modbus Gateway/Server is utilized, it must be configured to work with the Smart 1-Line.

Though most of these gateways are standard “off-the-shelf” products that should work well, each product is different and URC cannot guarantee the Smart 1-Line will work with all gateways. Please contact URC with questions about external RS-485-to-Ethernet Gateways.

URC has used and tested the following products successfully with the Smart 1-Line:

- Moxa MGate MB3180
- Lantronix XPRESS DR

If using an external RS-485-to-Ethernet Modbus Gateway/Server, it must be configured with the following settings:

- Modbus TCP Exception should be Disabled
- Response Timeout should be set to a shorter duration than the Smart 1-Line “Trip Unit Response Timeout” setting.

2.4.2 Modbus TCP communications to other systems

When the RS-485 network is wired directly to the Smart 1-Line, the Smart 1-Line can act as a “Modbus server” to other systems (“clients”).

Requirements for using the Smart 1-Line as a “Modbus server” to other systems:

- “Other systems” must be capable of Modbus communications
- “Other systems” must have drivers for AC-PRO-II and/or AC-PRO. A “driver” is simply application programming that enables the system to correctly interpret the AC-PRO-II or AC-PRO Register Map.
- Smart 1-Line “Modbus Server Settings” must be configured properly. See Section 3 of this manual.

3.0 Setup and Configuration

3.1 Powering On

Ensure the included Power supply is connected to a reliable 120VAC source, and that the power supply is also connected to the Panel PC.

Press the Power button to turn on the Smart 1-Line.

3.1.1 Logging into Windows

After Powering the Smart 1-Line, or after a screen timeout, you will be prompted for your Windows Username and Password.

If logging into Windows for the first time, use the Smart 1-Line User account Username and password provided by URC.

URC recommends changing the Smart 1-Line User account password. To change your Smart 1-Line password, you must log into the Administrative account. See Section 7.

After logging in, the Smart 1-Line application will start automatically.

After the Smart 1-Line application starts, click or tap the “Designer” button in the bottom right corner to start creating your 1-Line in Designer Mode.



Figure 9: Designer Mode Button

3.1.2 Designer Mode

3.1.2.1 Designer Mode Password

After clicking the “Designer” button, you will be prompted for the Designer Mode password. Use the password provided by URC.

To change your password, check the Change Password box, and you will be prompted to follow the instructions.



Figure 10: Designer Mode Password

3.1.2.2 Drawing your 1-Line

After entering the Designer Mode password, you can start building or editing your 1-line diagram. If you are entering Designer Mode for the first time, the drawing area will be blank. The Designer Mode toolbar contains all of the items and settings required to setup your system.

3.1.2.3 Adding items

In Designer Mode: To add items to your Smart 1-Line, simply tap or click an item in the toolbar, and then tap or click in the drawing area.

3.1.2.4 Rotating items

In Designer Mode:
The Breaker and Transformer items can be rotated 90 degrees by double-tapping or double-clicking. The Bus items can be stretched and rotated using the “grips” on each end of the line.

3.1.2.5 Removing items

In Designer Mode:
Items can be removed by dragging them off the screen to the right.

3.1.2.6 Power Distribution System Changes

The Smart 1-Line MUST be updated if power distribution system changes occur. Examples are replacing breakers, exchanging breakers, new breakers or loads, switchgear modifications, etc. For example, if breakers are exchanged, trip unit addresses, breaker names, load descriptions, etc. must be reviewed and changed accordingly.

In addition, if breakers are known to be out of service for an extended period, temporarily clear the Smart 1-Line address fields for those breakers, or temporarily remove those breakers from the Smart 1-line drawing. The reason for this is: if these breakers/addresses are left in the Smart 1-Line drawing, then the Smart 1-Line will try to communicate with these units. The communications system performance is slowed down when the Smart 1-Line attempts to communicate with units that are out of service and not responding.

3.1.2.7 Designer Mode Toolbar

Using the Designer Mode toolbar, simply click or tap on the symbol/item you want to add, and then click or tap at the location where you want to add it.

After items are added to your drawing, they can easily be moved around by clicking or tapping on the item, and then dragging to the desired location.

Toolbar Pin:
Click or tap this icon to "pin" the toolbar and keep it open. Click or tap this icon again, and the toolbar will "auto-hide" after a short delay.

Breaker:

- Click or tap on the breaker symbol in the toolbar, and then click or tap at the location where you want to add it to your drawing.
- "Description" field: enter a breaker name or designation. This information will appear next to the breaker when the Smart 1-Line is running.
- Currents (Ia, Ib, Ic) and Power (KW): It is not possible to enter information into these fields. These fields will be populated with Modbus information when the system is running.
- In the "Address" field, enter Modbus address of the particular trip unit this breaker symbol will represent.
- Up to 32 breakers can be added to your 1-Line drawing.
- If additional information is desired, additional blocks (Voltage, Power, Energy, Icon) can be added adjacent to the Breaker block. See below.

Transformer symbol:

- Click or tap on the Transformer symbol in the toolbar and then click or tap at the location where you want to add it to your drawing.
- If you want the Transformer to change to Red color when a particular breaker is closed or has current flowing through it, then enter that particular trip unit address in the "Depends" field.

Bus symbol:

- Click or tap on the Bus symbol in the toolbar and then click or tap at the location where you want to add it to your drawing.
- If you want the Bus to change to Red color when a particular breaker is closed or has current flowing through it, then enter that particular trip unit address in the "Depends" field.
- The bus symbol can be resized and stretched using the circle "grips" on each end.

Voltage, Power, and Energy Data Blocks:

- Click or tap on the block in the toolbar and then click or tap at the location where you want to add it to your drawing.
- Enter the address of the trip unit that will be used to populate this data block.
- It is not possible to enter information into the voltage fields. These fields will be populated with Modbus information when the system is running.
- Note: this data is only available from AC-PRO-II units that have the VDM (voltage divider module), or for AC-PRO units that have a PT Module connected to them.

Icon/graphic block:

- Click or tap on the block in the toolbar and then click or tap at the location where you want to add it to your drawing.
- Enter the Address of the trip unit. When in Run Mode, this graphic will change to either an AC-PRO-II or AC-PRO graphic, depending on the trip unit at the entered address.

Description Box:
This is a basic general purpose text description box. For example, it can be used for load name/identification, substation name/identification, transformer name/identification, etc.

Settings Menu button

Save button
After you have completed your design or design update, click or tap this button to Save it.

Run button: Click or tap this button to enter "Run Mode" (normal operating mode).

Figure 11: Designer Mode Toolbar

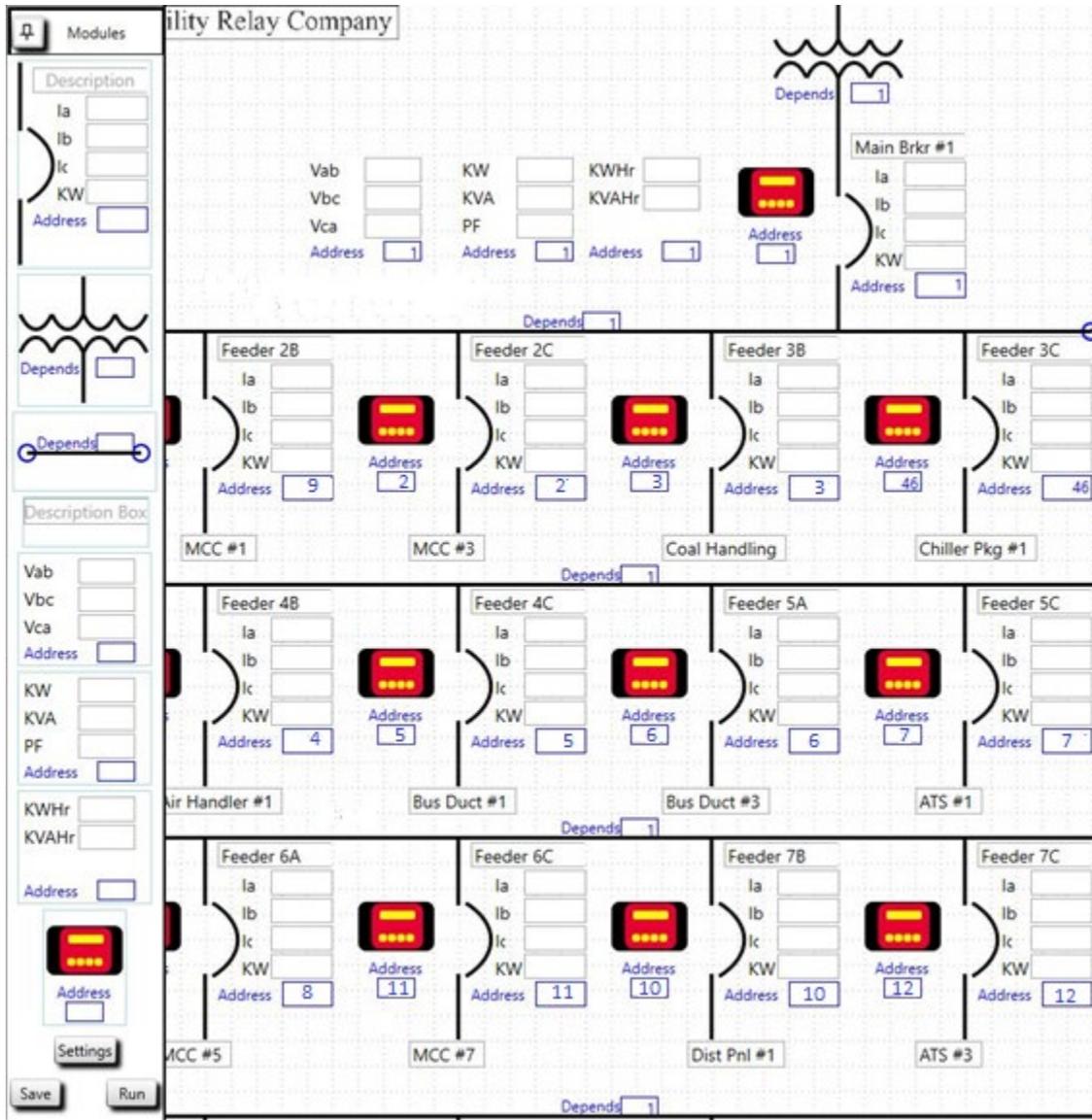


Figure 12: Designer Mode 1-Line Drawing example

3.1.2.8 Smart 1-Line Settings

The Smart 1-Line ships with “default” settings.
For most installations, only some Smart 1-Line settings will need to be re-configured.

The Smart 1-Line settings can be accessed by using the Designer Mode Toolbar. See Figure 12.
Tap or click the Settings button. This will launch the following Smart 1-Line settings menu.

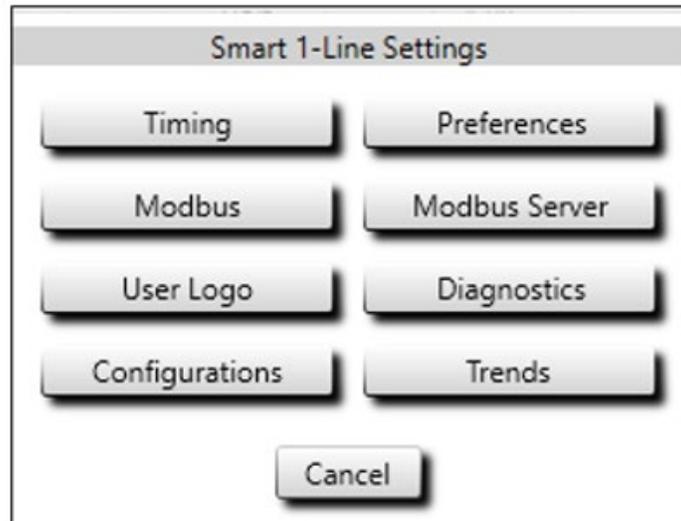


Figure 13: Settings Menu

3.1.2.9 Modbus Settings

Tap or click the “Modbus” button to access the Modbus Configuration settings.

There are two possible methods for connecting trip units to the Smart 1-Line.
Refer to Figures 14 and 15.

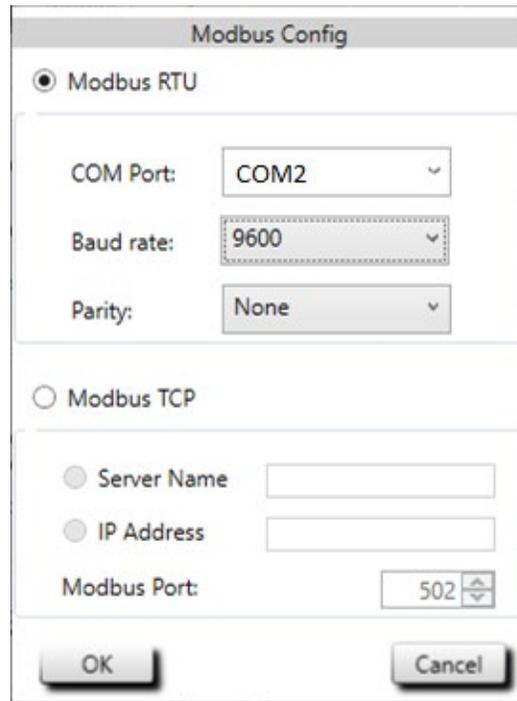
Select “Modbus RTU” and “COM2” if your trip unit RS-485 network connects directly to the Smart 1-Line Serial port. (See Figure 2). See example setting window below.

Select the “Baud rate”.

IMPORTANT: The Baud rate setting on the Smart 1-Line and ALL of the trip units **MUST** be set to the same Baud Rate.

NOTE: If any AC-PRO trip units are connected to the RS-485 network, then the Smart 1-Line and ALL trip units must be set to 9600. (the AC-PRO baud rate is fixed at 9600).

Select the “Parity” to match the trip unit settings. The Parity setting on the Smart 1-Line and all of the trip units **MUST** be set to the same setting.



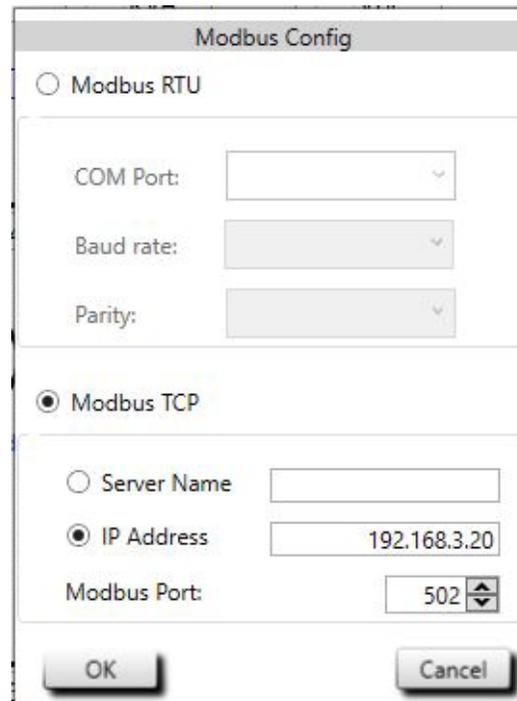
The image shows a 'Modbus Config' dialog box. At the top, 'Modbus RTU' is selected with a radio button. Below this, there are three dropdown menus: 'COM Port' is set to 'COM2', 'Baud rate' is set to '9600', and 'Parity' is set to 'None'. Below these, 'Modbus TCP' is unselected. Under 'Modbus TCP', there are two radio buttons: 'Server Name' and 'IP Address', both of which are unselected. Below these are two empty text input fields. At the bottom of the 'Modbus TCP' section, 'Modbus Port' is set to '502' in a spinner box. At the very bottom of the dialog are 'OK' and 'Cancel' buttons.

Figure 14: Modbus Settings - Example for RS-485 Direct Connection

Select “Modbus TCP” if your trip unit R-485 network connects to an external Ethernet gateway. (See Figure 3) See example setting window below.

Enter either the Server name or the IP address of the external Ethernet gateway device.

Enter the Modbus port of the external Ethernet gateway device.



The image shows a 'Modbus Config' dialog box. At the top, 'Modbus RTU' is unselected. Below this, there are three dropdown menus: 'COM Port', 'Baud rate', and 'Parity', all of which are empty. Below these, 'Modbus TCP' is selected with a radio button. Under 'Modbus TCP', there are two radio buttons: 'Server Name' (unselected) and 'IP Address' (selected). Below these are two text input fields: the first is empty, and the second contains '192.168.3.20'. Below these, 'Modbus Port' is set to '502' in a spinner box. At the very bottom of the dialog are 'OK' and 'Cancel' buttons.

Figure 15: Modbus Settings - Example for External Gateway connection

3.1.2.10 Timing Settings

URC recommends using the default Timing Settings unless changes are necessary due to the presence of multiple clients or systems.

If desired or needed for external communications, the Timing settings can be adjusted. This is typically only necessary if additional systems will be connected to the Smart 1-Line. Otherwise, the recommended default settings are shown below.

NOTE: Improper adjustment of Timing Settings can result in communications issues.

Scan Period:

Adjusts how frequently the Smart 1-Line requests data from each trip unit. For example, if this setting is set to 10 seconds, the information for each breaker will be requested (and should be updated) every 10 seconds.

Trip Unit Response Timeout:

Adjusts how long the Smart 1-Line will wait for a reply from each trip unit.

Number of Retries per Request:

Adjusts how many times the Smart 1-Line will retry a data request before determining that the trip unit is not responding.

If Trip Unit Does Not Respond:**Scan Periods to Stop Trying:**

Adjusts how many consecutive unsuccessful scan periods can occur before the Smart 1-Line will temporarily stop making requests to a trip unit.

Resume Trying After:

Applies after the above number of "Scan Periods to Stop Trying" has been met. Adjusts the duration after which the Smart 1-Line will re-attempt requests to a trip unit.

Setting	Value	Unit
Scan Period:	10	Seconds
Trip Unit Response Timeout:	1.0	Seconds
Number of Retries per Request:	4	
If Trip Unit Does Not Respond		
Scan Periods to Stop Trying:	10	
Resume Trying After:	60	Minutes

Figure 16: Timing Settings

3.1.2.11 Modbus Server Settings

These settings only need to be adjusted if the Smart 1-Line will provide Modbus data to other equipment or systems. Otherwise, the default settings should be used.

If the trip units are connected to the Smart 1-Line via RS-485, the Smart 1-Line can serve data to “other systems”, via its internal Modbus Server application. If “other systems” will obtain data from the Smart 1-Line, the Modbus Server settings will need to be changed.

Max Number of Clients:

This setting determines the maximum number of “clients” that will be allowed to request data from the Modbus Server. Internally, the Smart 1-Line has 2 clients, and thus the minimum (and default) setting is 2. If “other systems” will be obtaining data from the Smart 1-Line, the number needs to be incremented for each additional system.

NOTE: some systems or equipment might require 1 client per trip unit.

If a “local” and a “remote” Smart 1-Line will be connected to the same system, this setting should be 4.

Max Number of Queued Messages:

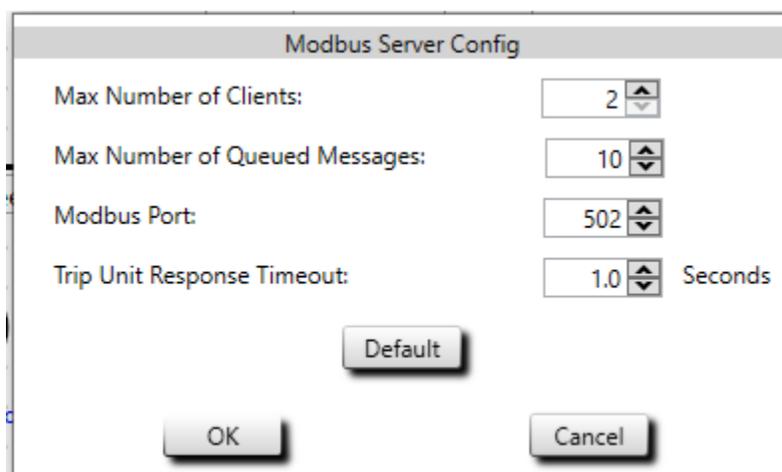
This is an advanced setting. The Modbus Server receives messages from Modbus Clients and sends them to Trip Units over RS485. If a new message from a client is received before a Trip Unit responds, it’s queued and, after the Trip Unit response (or timeout), sent to a Trip Unit. Modbus Server can queue up to “Max Number of Queued Messages”. After that, new messages from Modbus Clients are ignored.

Modbus Port:

This is an advanced setting. Well-known TCP port 502 is reserved for the Modbus Application Protocol. Avoid any other well-known ports. Make sure there are no conflicts if using a port other than 502. Refer to “Service Name and Transport Protocol Port Number Registry” at <https://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xhtml> and RFC6335 at <https://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xhtml>

Trip Unit Response Timeout:

Adjusts how long the Modbus Server will wait for a reply from each trip unit.



Setting	Value	Unit
Max Number of Clients	2	
Max Number of Queued Messages	10	
Modbus Port	502	
Trip Unit Response Timeout	1.0	Seconds

Figure 17: Modbus Server Settings

3.1.2.12 Preferences Settings

These three boxes control trip unit time synchronization, color coding and Smart 1-Line screen time.

Box 1 – Allows time synchronization between Smart 1-Line and trip units.

Box 2 – Color Coded Elements. If this box is checked, the breakers and items will change to Red if the breaker or associated breaker is closed and/or if current is flowing.

If this box is not checked, the breakers and items will not turn Red, regardless of breaker position and current.

Box 3 – Allows Screen to remain Lit if Quick-Trip QT switch is ON or if Alarms are present.

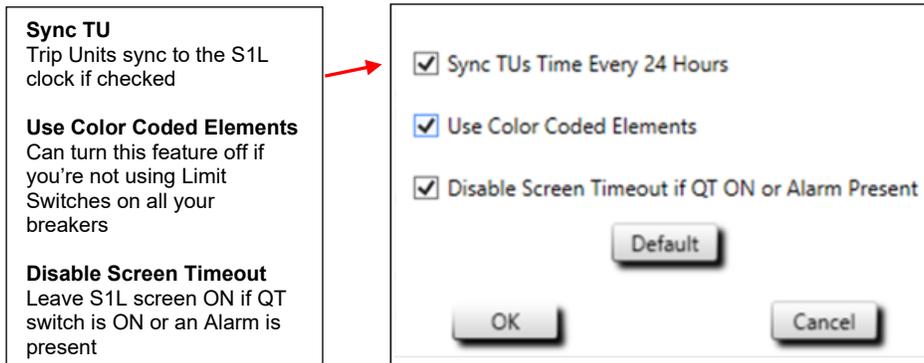


Figure 18: Preferences Settings

3.1.2.13 User Logo

If desired, a Logo image file can be imported and can appear in the upper right corner of the Smart 1-Line when it is in Run Mode. The image file format can be .png, .jpg, .gif, or .bmp. One example logo size (resolution) is 280 x 80. This size allows for a legible logo, but does not take up too much room on the Smart 1-Line screen. However, any size logo can be used. For reference & consideration, the entire Smart 1-Line screen is 1920 x 1080. Hence, a 1920 x 1080 logo would use up the whole screen, making zero 1-Line items visible. See Figure 20 for an example that shows a logo in the upper right corner.

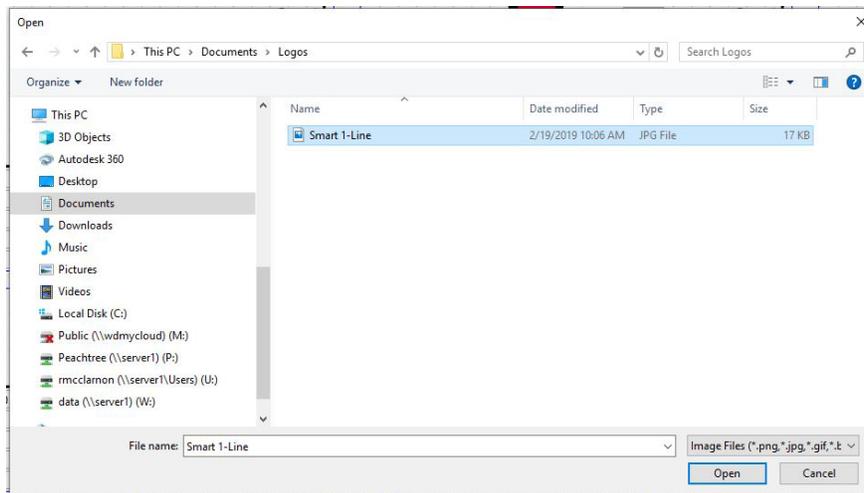


Figure 19: Browse to Customer Logo Window

3.1.2.14 Diagnostics (settings)

The Diagnostics settings window includes the following settings:

- Show / Don't show Communications Status Box. This box appears in the lower left corner when in Run Mode. See Section 4.1.10 for additional information about the Communications status box.
- Log Level: This setting should remain at the default setting unless directed by URC for troubleshooting purposes. This setting determines how much information the Smart 1-Line logs software events internally. A setting of 1 represents the least amount of data logging. A setting of 5 represents the largest amount of data logging. The default setting is 4. Do not change this setting unless instructed to by URC.

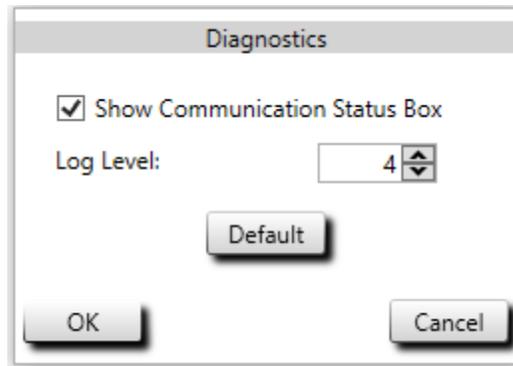


Figure 20: Diagnostics (settings)

3.1.2.15 Configurations

Use the Configurations Window to switch between various Smart 1-Lines and Smart 1-Line configurations. The Configurations Window can be "Set Active" so it is the one utilized. Configurations can also be imported and exported using the "Import" and "Export" commands. An obsolete Configuration can also be deleted.

The ability to switch configurations allows switching between 1-line diagrams.

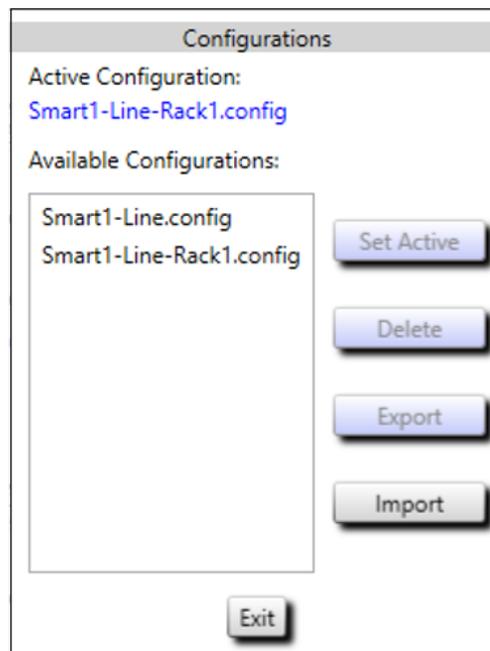


Figure 21: Configurations Window

3.1.2.16 Trends

The Smart 1-Line has Trending capability so historical currents, voltages, power and energy quantities are saved to the S1L hard drive for later retrieval. To minimize storage, the user can choose which trip units are utilized for “Trending”. See Figure 22 for Store Period, amount of “Store Time” and “Trip Units Available/Selected” choices. See Section 4.1.2.4 for Trending tab on page 29.

Store Period
The trip units chosen for historical trending can be sampled every 10, 20, 40, 80, 160 or 320 seconds.

Store Time
History can be saved between 1 day to 365 days (1 year) of active data before the S1L drive starts overwriting the data.

Trip Units Available / Selected
Choose which trip units connected to the S1L are utilized for historical trending. (Removing trip units will save memory on the S1L hard drive.

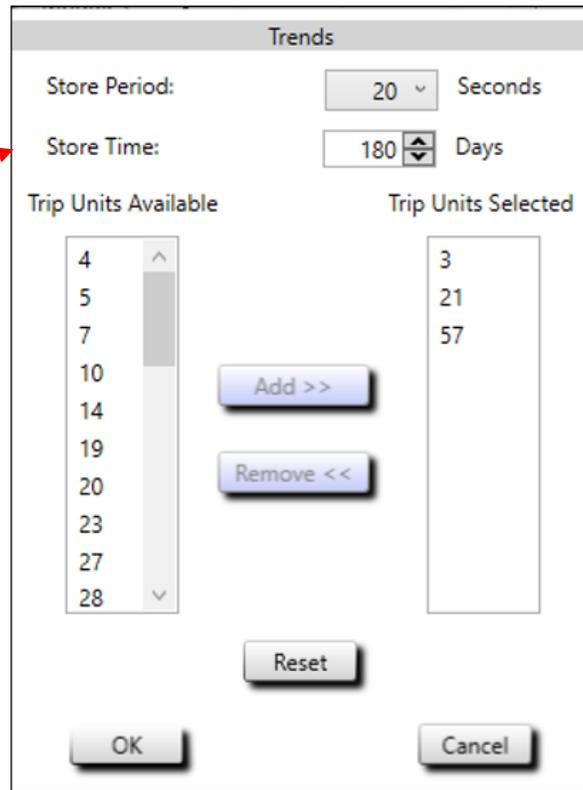


Figure 22: Trends Window

3.1.3 Trip Unit Settings

3.1.3.1 AC-PRO-II Device Settings

The AC-PRO-II device settings must be configured correctly for successful communications with the Smart 1-Line to be established.

The AC-PRO-II RS485 communications settings can easily be changed as these settings are part of the standard “Change Settings” sequence that can be performed using the AC-PRO-II screen and buttons. Refer to the AC-PRO-II Instruction Manual

The following AC-PRO-II settings must be correctly configured:

- RS-485 Communications **Enabled** setting must be set to **ON**.
- **Address** must be set to match the address of the corresponding items on the 1-Line diagram. The address must be unique (a single address cannot be used for multiple trip units).
- **Baud Rate** must be set to match the Smart 1-Line or external gateway baud rate setting.
- **Parity** must be set to match all other trip units & Smart 1-Line. If there are any AC-PRO trip units on the RS-485 network, set the AC-PRO-II parity to None. Otherwise, set AC-PRO-II trip units to Odd or Even.
- **Reply Delay** (if present) is recommended to be set to the minimum setting when used with the Smart 1-Line.
- **Forced Trip** can either be set to ENABLE or DISABLE. Set to ENABLE if you want to be able to trip the breaker using the Smart 1-Line.
- **Settings Change Over Comm** can either be set to ENABLE or DISABLE. However, presently, regardless of this setting, the Smart 1-Line is not capable of changing trip unit settings.
- **Soft QT Switch** can either be set to ENABLE or DISABLE. If set to ENABLE, the S1L can be used to turn ON or OFF QUICK-TRIP functionality remotely if not turned ON locally.
- **Alarm (Relay) settings** are user programmable. If you want the Smart 1-Line to indicate an alarm has occurred, this alarm must be set/enabled at the trip unit. See the AC-PRO-II Instruction Manual for additional information. (NOTE: Trips will be “alarmed” on the Smart 1-Line regardless of trip unit alarm settings).

3.1.3.2 AC-PRO Device Settings

The AC-PRO device settings must be configured correctly for successful communications with the Smart 1-Line to be established.

The AC-PRO RS485 communications settings can easily be changed as these settings are part of the standard “Change Settings” sequence that can be performed using the AC-PRO screen and buttons. Refer to the AC-PRO Instruction Manual.

The following AC-PRO settings must be correctly configured:

- **Address** must be set to match the address of the corresponding items on the 1-Line diagram. The address must be unique (a single address cannot be used for multiple trip units).
- **Reply Delay** (if present) is recommended to be set to the minimum setting when used with the Smart 1-Line.
- **Forced Trip** can either be set to ON or OFF. Set to ON if you want to be able to trip the breaker using the Smart 1-Line.

4.0 Operation

4.1 Run Mode

The normal operating mode of the Smart 1-Line is “Run Mode”. In this mode of operation, the Smart 1-Line will periodically request information from each trip unit (breaker). It will use this information to update the values and graphics on the 1-Line diagram. Specifically, it will request info from each unique trip unit address that is included in the “Designer Mode” 1-Line diagram.

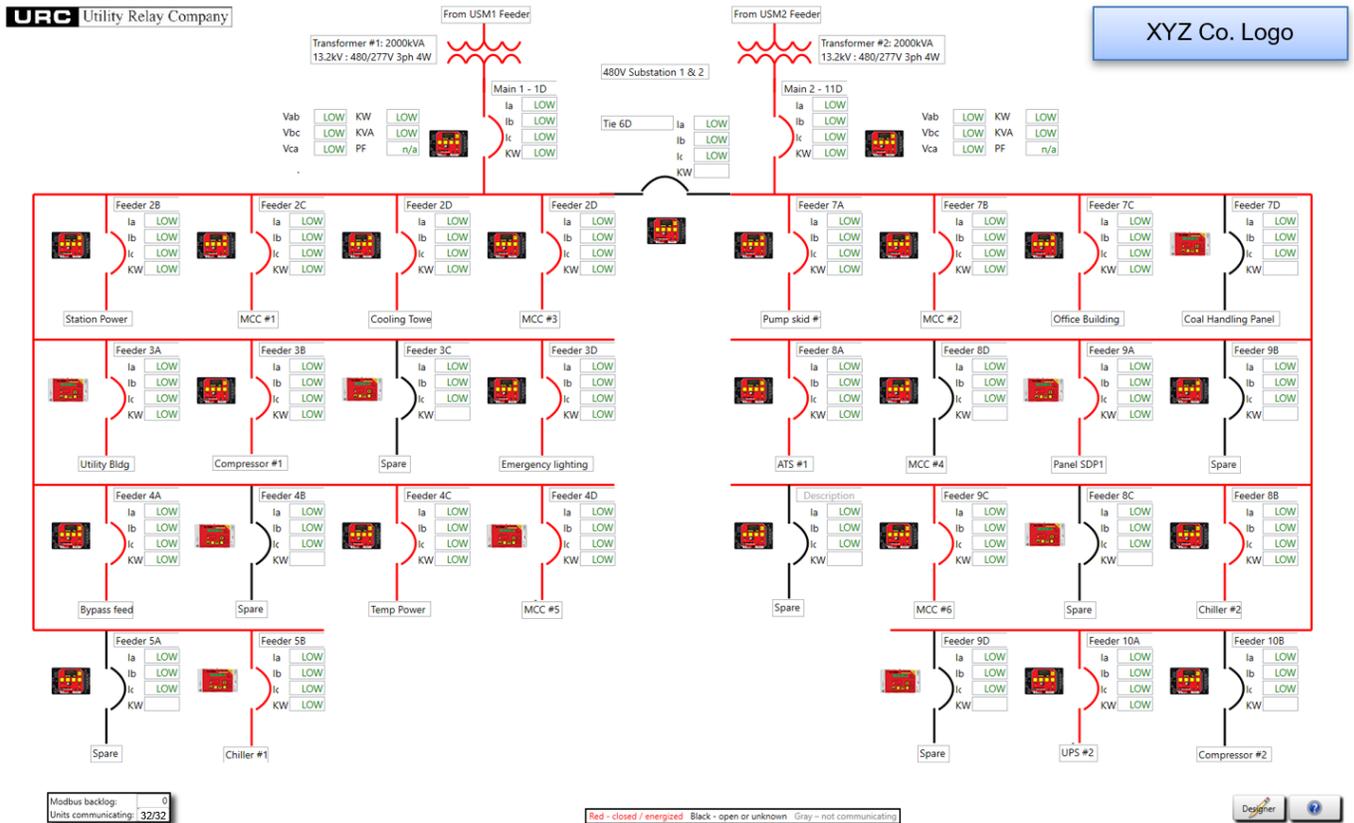


Figure 23: Run Mode 1-Line Diagram example

4.1.1 Breaker Block

In Run Mode, the Breaker Block indicates:

- Phase current values (Ia, Ib, Ic)
 - Green values indicate data obtained from the trip unit.
- Total real power value (KW) (appears if an AC-PRO-II with Voltage Divider Module or AC-PRO with PT Module is connected)
- Breaker position status and communication status
 - Red = Energized/Closed, Communications active (see Section 3 for “Preference” setting)
 - Black = Open or Unknown, Communications active (see Section 3 for “Preference” setting)
 - NOTE: This state is described as Open or Unknown as many breakers are not presently supplied with URC limit switches. Therefore, in many applications, current flow is used to indicate position, and even if current is “Low”, the breaker could still be closed.
 - Gray = Trip unit not communicating
- Breaker Tripped indication (Red “X” appears)
- Alarm indication (Red bell symbol flashes)
 - Trip occurred, Current greater than LT Pickup setting, and Actuator open circuit conditions will always result in Alarm indication
 - For AC-PRO-II, indication of alarms for other conditions is possible, but the alarm settings must be programmed at the AC-PRO-II.
- Quick-Trip indication (“QT ON” appears)
- Breaker name/description (Entered by user in Designer Mode)

The Figure below shows some example breaker states.

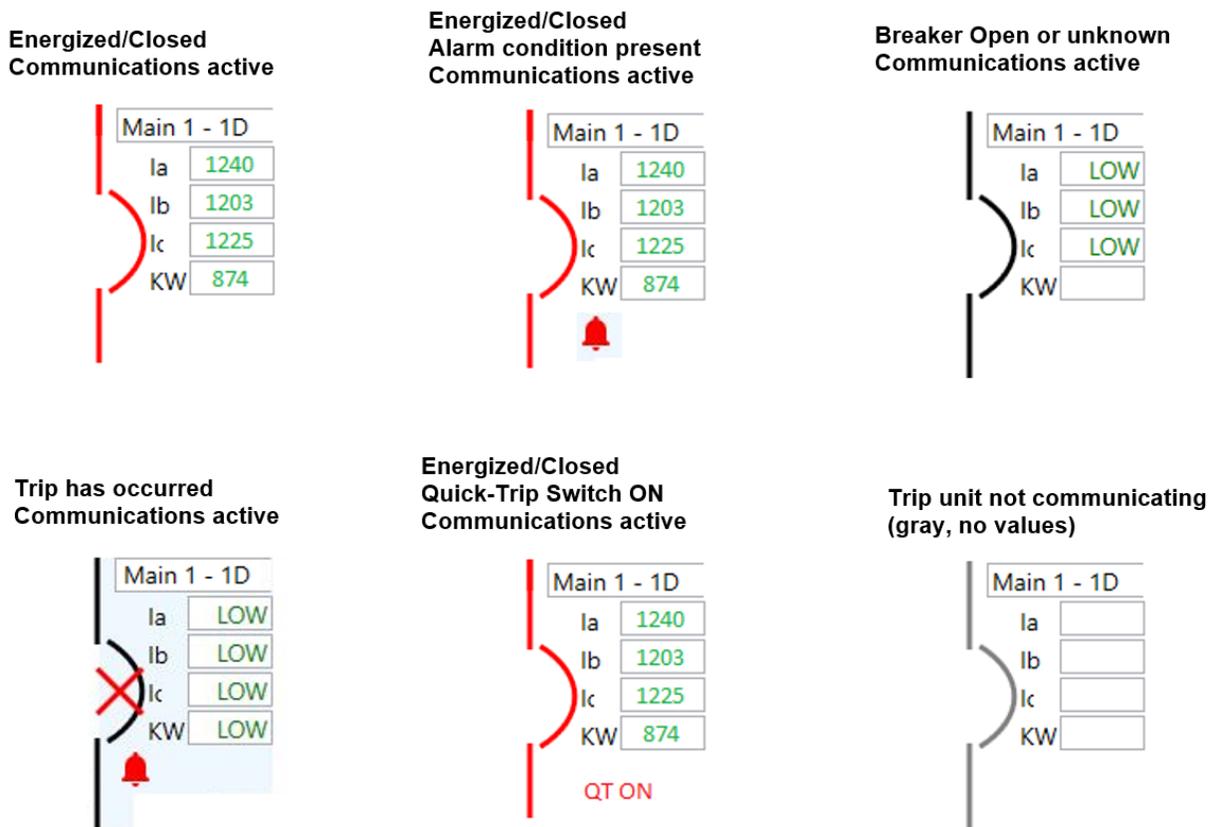


Figure 24: Breaker Block: example states

4.1.2 Detailed Breaker Data

While in Run Mode, any breaker that is actively communicating will have a Red symbol color or Black symbol color. If the breaker is in this state, you can tap or click on the breaker symbol to obtain additional information. See the Figure below for guidance on where to tap or click the symbol. Tap or click the curved portion of the symbol, see below.

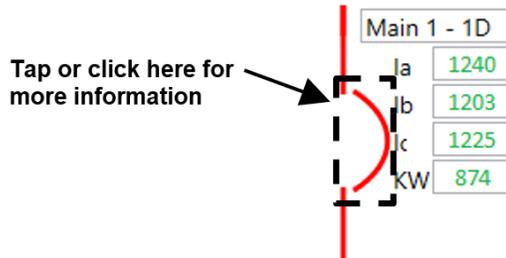


Figure 25: Breaker symbol - area to tap

After tapping or clicking on the breaker, an additional window will open.

Depending on which trip unit is present different software tabs will appear on the right side of the window that appears.

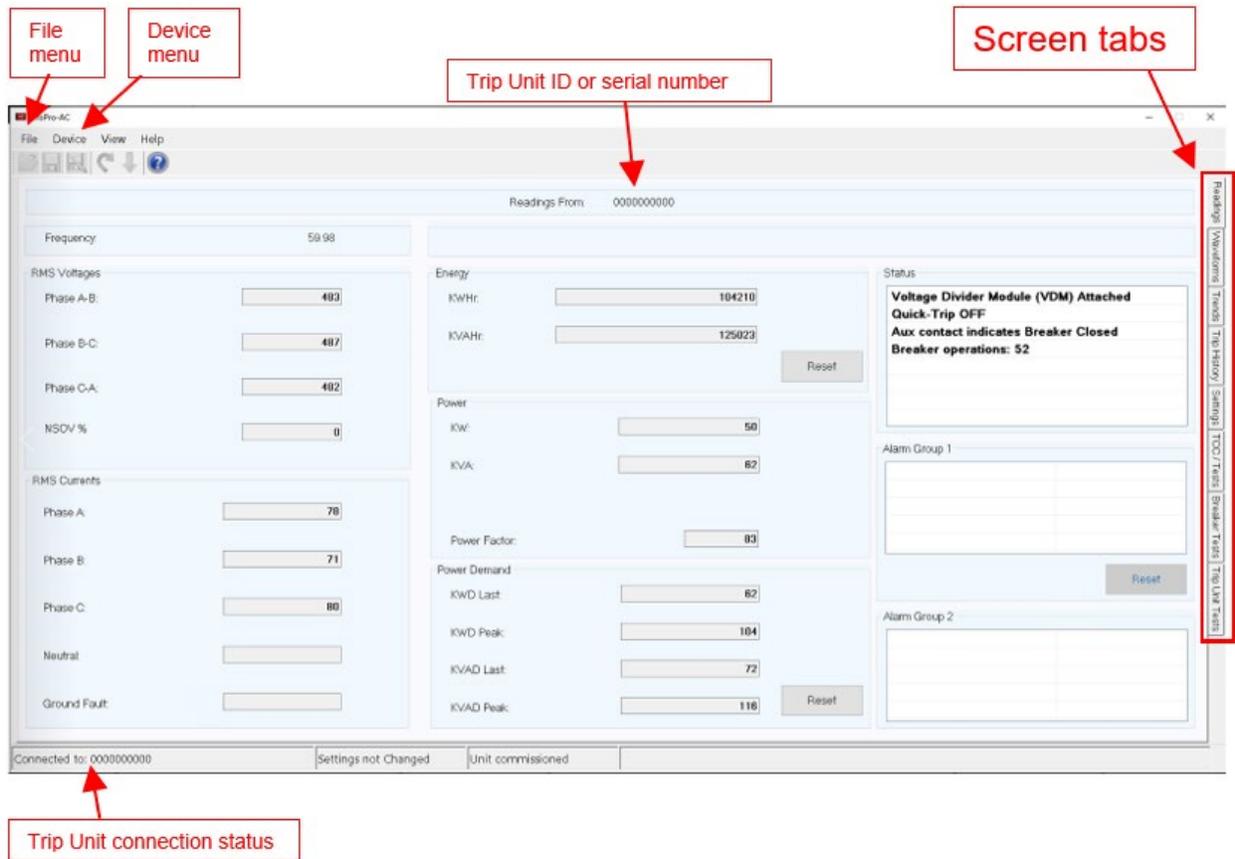


Figure 26: Breaker Data Window General Layout

4.1.2.1 Readings tab (AC-PRO-II only)

The Readings tab will appear on the right side of the window for AC-PRO-II trip units. It provides the following information, features, and capabilities:

- The following information will be retrieved automatically:
 1. RMS Current values: Phase A, B, C, Neutral, Ground
 2. Frequency
 3. *If the AC-PRO-II is equipped with a Voltage Divider Module:
 - RMS Voltage values:
 - Vab, Vbc, Vca (AC-PRO-II firmware v1.9 or later)
 - Van, Vbn, Vcn (AC-PRO-II firmware v1.2 – v1.8)
 - Power values
 - Real Power (KW)
 - Apparent Power (KVA)
 - Power Factor (PF)
 - Power Demand values
 - Real Power Demand Last (KWD Last)
 - Real Power Demand Peak (KWD Peak) – over chosen period
 - Apparent Power Demand Last (KVAD Last)
 - Apparent Power Demand Peak (KVAD Peak) – over chosen period
 - Energy values
 - Real Energy (KWH)
 - Apparent Energy (KVAH)
 4. Alarms and Status:
 - Trip occurred Alarm with reset capability
 - Quick-Trip Switch position
 - Breaker position (if equipped with URC limit switch)
 - Actuator Open circuit
 - Trip unit Alarm relay conditions (depend on trip unit version and customer settings)
 - UnderVoltage (can be reset by user)
 - OverVoltage (can be reset by user)
 - Phase Loss
 - Phase Current Unbalance
 - Reverse Power
 - LT (Long Time) Pickup (phase current exceeded LT Pickup setting)
 - Ground Fault (can be reset by user)
 - Sluggish Breaker (can be reset by user)
 - Trip (can be reset by user)
 - Internal Error
 - Actuator Open circuit
- Acknowledge Trip and Reset Trip Alarm
 1. To Acknowledge that you are aware a Trip occurred and reset the Trip Alarm, goto the Readings or AC-PRO tab, and tap/click the (Alarm) Reset button. This will clear the alarm in the trip unit, and it will remove the Red X from the breaker symbol in the Smart 1-Line. This reset button can also be used to reset some other alarms.
- The View menu can be used to access the “Save Screen” command, which saves an image of the screen.
- See the next section for how to trip a breaker.

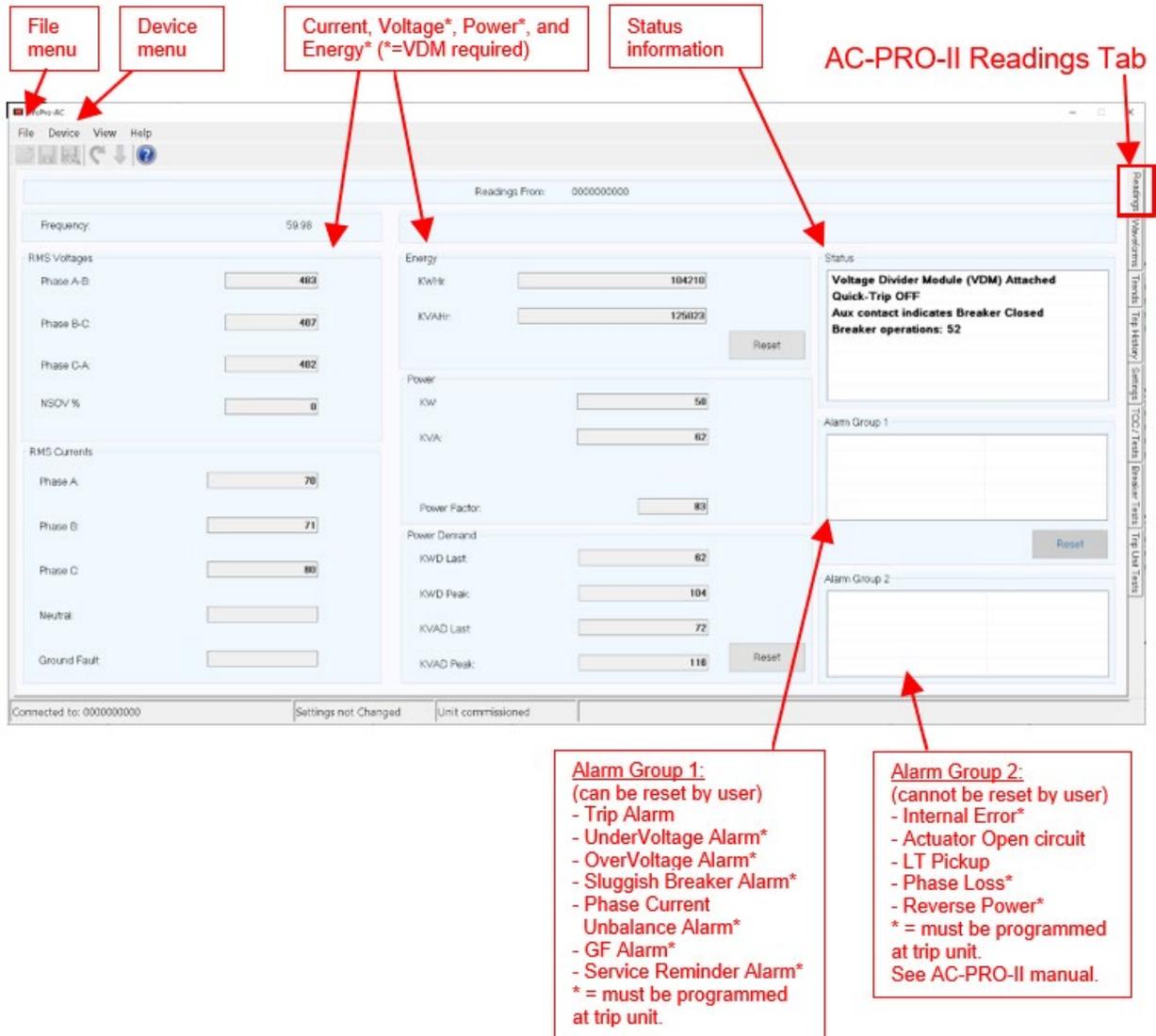


Figure 27: Readings Tab (AC-PRO-II only)

The View menu can be used to access the “Save Screen” command, which saves an image of the screen.

4.1.2.2 Breaker Control

4.1.2.2.1 Tripping a Breaker:

- The “Trip Breaker” option is accessible via the Device drop down menu. For the AC-PRO-II, use the Device menu in any tab and choose “Breaker Control”. Then choose the “Trip” button. For the AC-PRO, use the Device menu in the AC-PRO tab.
- In order to trip the breaker, the following is required:

The trip unit must be programmed locally to have “Forced Trips Enabled”. This is a permissive security setting that is accessed via the Settings menu on the AC-PRO-II screen.

1. First, use the Device “Breaker Control” Menu from the Smart 1-Line.
 2. Select the “Trip Breaker” menu item from the Breaker Control menu.
 3. Next, you will be prompted for the last four digits of the AC-PRO-II serial number.
 4. After the Security Code is entered, you will be prompted to confirm that you want to trip the breaker. Clicking or tapping on “Yes” will result in tripping the breaker.
- The trip will be logged by the AC-PRO-II as a “Forced Trip”. The AC-PRO-II will capture detailed trip data, including currents, voltages, waveforms, breaker mechanism time, and date/timestamp. This information can be viewed in the Trip History tab.
 - Utilizing this feature to open a breaker before taking it out of service is recommended, as the AC-PRO-II can record the breaker mechanism time for its important “First Operation”, which provides indication if the breaker requires service. This is URC’s patented Sluggish Breaker Detection feature. See the AC-PRO-II Instruction Manual for additional information.

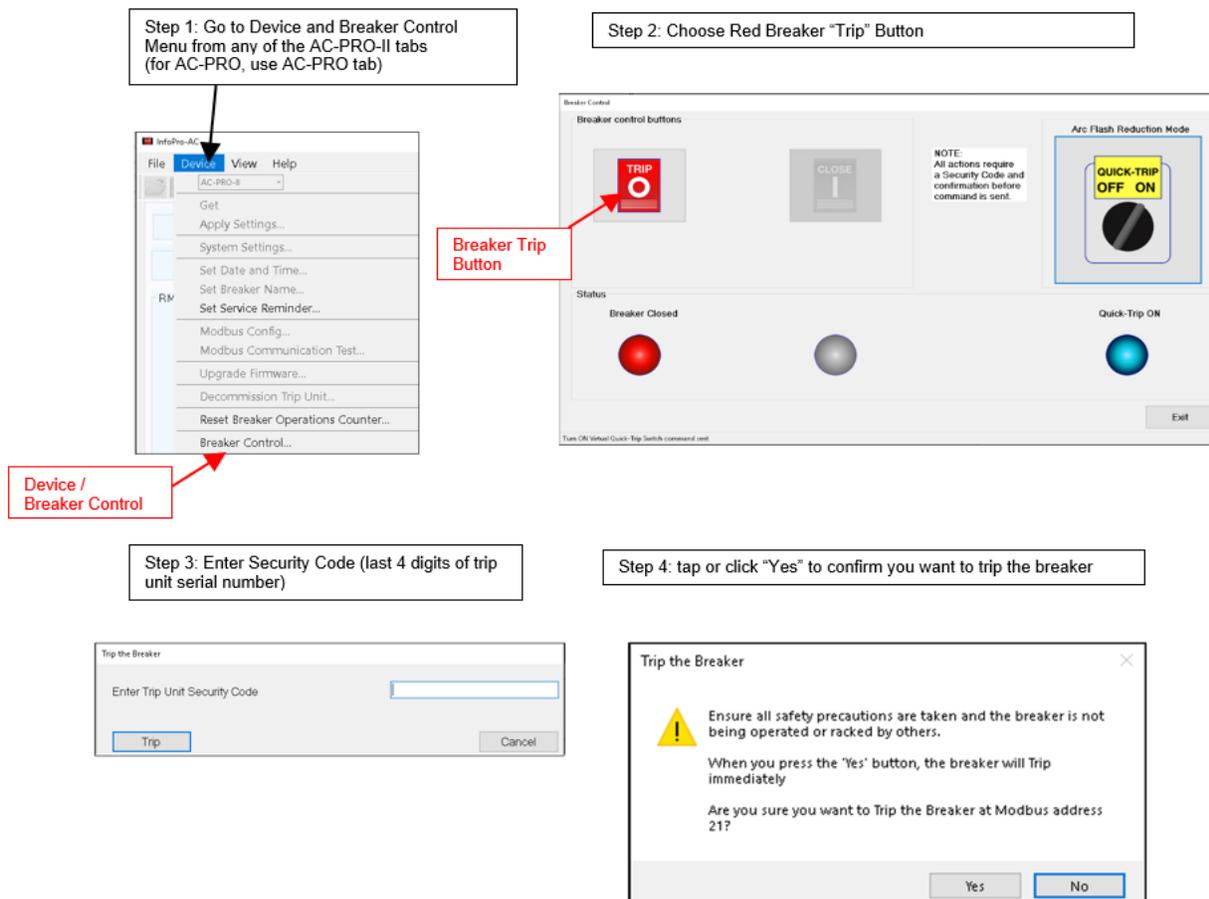


Figure 28: Trip Breaker steps

4.1.2.2 Closing a Breaker:

- The “Close Breaker” option is accessible via the Device drop down menu. For the AC-PRO-II, use the Device menu in any tab and choose “Breaker Control”. Then choose “Close” button. (This feature is not available for the AC-PRO.)
- To allow closing remotely, the Breaker needs to be an Electrically Operated (EO) breaker with a closing coil. In addition, URC supplies an additional closing relay for the closing circuit that is activated via the trip unit. The following is required:

The Programmable Alarm relay on the AC-PRO-II must be programmed for Close E/O Breaker” control. This is a permissive security setting that is accessed via the Settings menu on the AC-PRO-II screen.

1. First, use the Device “Breaker Control” Menu from the Smart 1-Line.
2. Select the “Close Breaker” menu item from the Breaker Control menu.
3. Next, you will be prompted for the last four digits of the AC-PRO-II serial number.
4. After the Security Code is entered, you will be prompted to confirm that you want to Close the breaker. Clicking or tapping on “Yes” will result in close signal to breaker.

- The close will be logged by the Smart 1-Line at the bottom of the Breaker Control window with “Close command sent”.

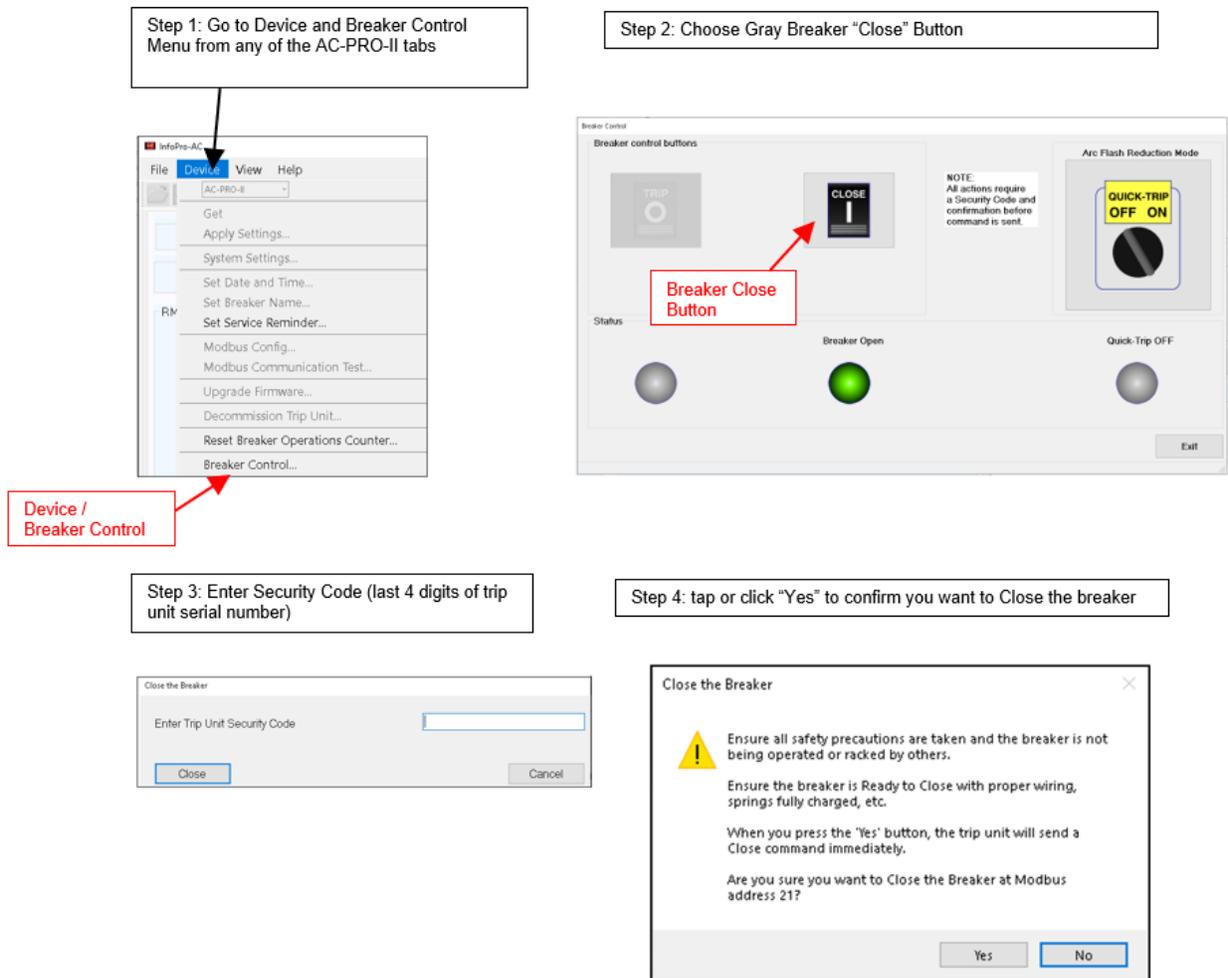


Figure 29: Close Breaker steps

4.1.2.2.3 QUICK-TRIP ON/OFF Control:

- The “QUICK-TRIP” virtual QT switch option is accessible via the Device drop down menu. For AC-PRO-II, use the Device menu in any tab and choose “Breaker Control”. Then you can choose to “QUICK-TRIP” ON or OFF. (This feature is not available for the AC-PRO.)
- In order to trip the breaker, the following is required:

The trip unit must be programmed locally to have “Soft QT Enabled”. This is a permissive security setting that is accessed via the Settings menu on the AC-PRO-II screen.

1. First, use the Device “Breaker Control” Menu from the Smart 1-Line.
2. Select the “QUICK-TRIP” virtual switch from the Breaker Control menu.
3. Next, you will be prompted for the last four digits of the AC-PRO-II serial number.
4. After the Security Code is entered, you will be prompted to confirm that you want to turn QUICK-TRIP ON or OFF for this breaker. Clicking or tapping on “Yes” will result in enabling QUICK-TRIP functionality. The Quick-Trip ON indicating light will illuminate and the Quick-Trip alarm will flash on the breaker HMI screen. (in addition, when in the 1-Line view, “QT ON” will display and flash).

- Note: If a hard-wired local QUICK-TRIP switch is in the ON position, the soft QUICK-TRIP switch will not be able to turn the QUICK-TRIP switch OFF. In addition, the same applies to the keypad-controlled QT switch on the AC-PRO-II trip unit.

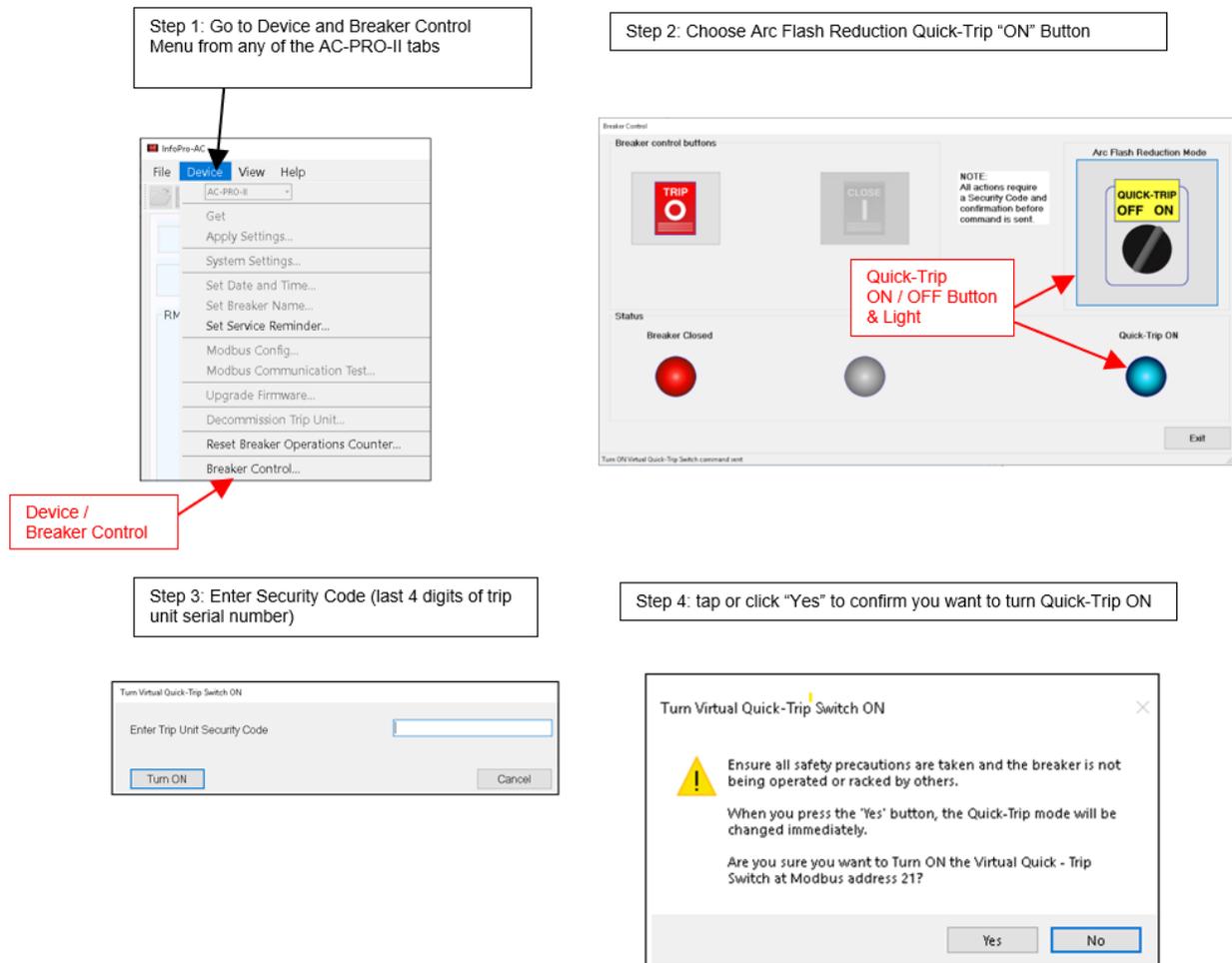


Figure 30: Soft QUICK-TRIP steps

4.1.2.3 Waveforms tab (AC-PRO-II only, FW v2.0.27 or higher)

The Waveforms tab will appear on the right side of the window for AC-PRO-II trip units. It provides the following information, features, and capabilities:

- Tap or click the blue arrow at the top of the screen to capture a waveform.
- On-demand waveform capture includes:
 - Current: Phase A, B, C, and Neutral
 - RMS values
 - Waveforms: (5 cycles)
 - Voltage: Vab, Vbc, Vca (applies to AC-PRO-II with Voltage Divider Module)
 - RMS values
 - Waveforms (5 cycles)
 - Date & Timestamp
- Waveforms can be saved to an electronic file by using the File menu, then selecting Save As. The electronic file can be saved to the Smart 1-Line or to a customer-supplied USB stick.
- Previously saved waveform files can be opened by using the File menu, then selecting Open.
- The View menu can be used to access the “Save Screen” command, which saves an image of the screen.

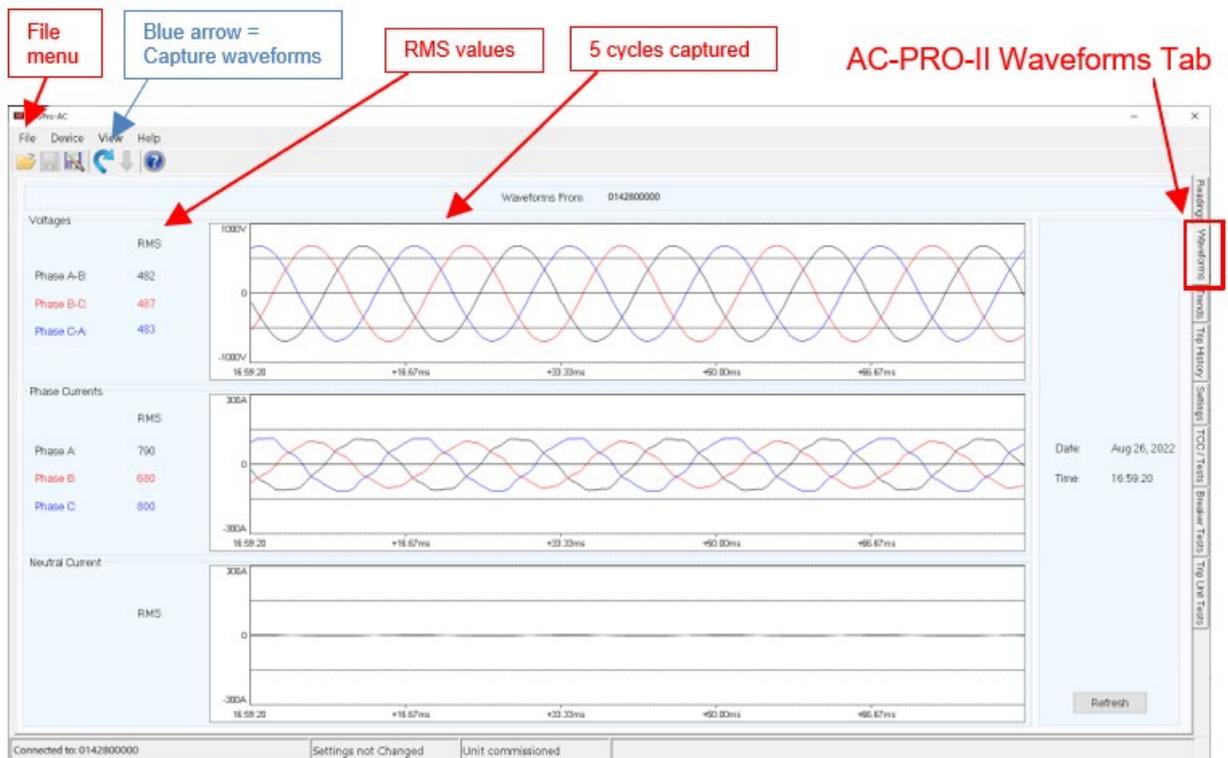


Figure 31: Waveforms Tab (AC-PRO-II only)

4.1.2.4 Trends tab (AC-PRO-II only)

The Trends tab will appear on the right side of the window for AC-PRO-II trip units. It provides the following information, features, and capabilities:

- Tap Trends Tab and then click the blue arrow at the top of the screen to Get Trends.
- Trends capture includes:
 - Voltages: (applies to AC-PRO-II with Voltage Divider Module)
 - L-N check-box: Va-n, Vb-n, Vc-n
 - L-L check-box: Va-b, Vb-c, Vc-a
 - Autoscaling – software automatically zooms data to max and min levels
 - Currents: Phase A, B, C, and Neutral
 - Autoscaling – software automatically sets max and min levels per data
 - Non Autoscaling – standard axis values are used
 - Power: Total KW, total KVA and Power Factor are displayed
 - Date & Timestamp – Cursor identifies currents, voltages and power quantities for particular data points
 - Arrows left < and right > keys will move cursor along axis like slider bar
 - Up/down keys will also move cursor left and right as well
- “Pan” bar allows user to view the entire length of the recorded waveforms as set using the Waveforms can be saved to an electronic file by using the File menu, then selecting “Save As”. The electronic file can be saved to the Smart 1-Line or to a customer-supplied USB stick.
- Previously saved waveform files can be opened by using the File menu, then selecting Open.
- The View menu can be used to access the “Save Screen” command, which saves an image of the screen.

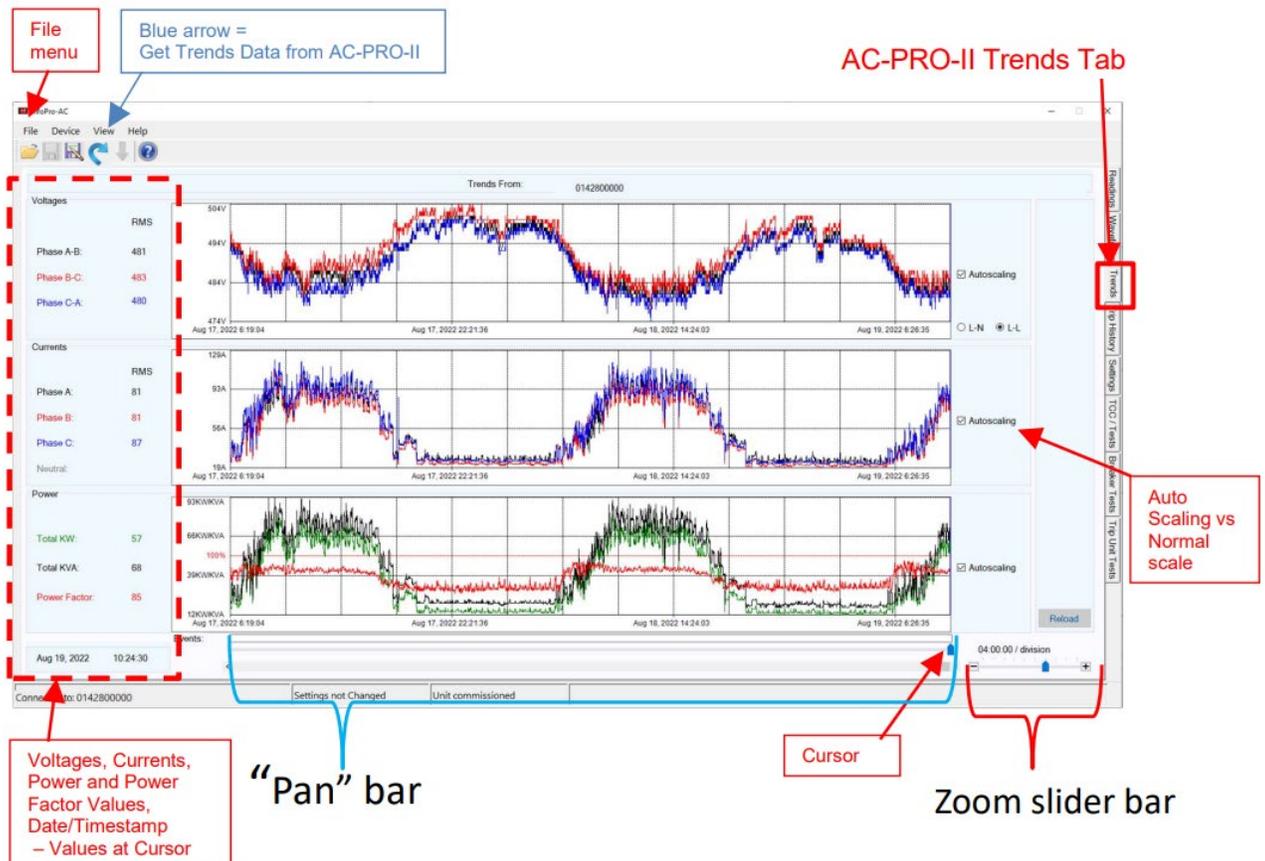


Figure 32: Trending Tab (AC-PRO-II only)

4.1.2.5 Trip History tab (AC-PRO-II only)

The Trip History tab will appear on the right side of the window for AC-PRO-II trip units. It provides the following information, features, and capabilities:

- Detailed Trip data for the last 8 trips:
 - Trip type (e.g. Long Time)
 - Date & Timestamp
 - RMS Currents: Phase A, B, C, Neutral, and Ground Fault
 - RMS Voltages:
 - Vab, Vbc, Vca (firmware v2.0 and later)
 - Van, Vbn, Vcn (firmware 1.2 – v1.9)
 - Breaker mechanism time(s) (Sluggish Breaker Detection)
 - Trip waveform capture (firmware v2.0.27 and later)
 - 1 cycle pre-trip and 4 cycles post-trip):
 - Current: Phase A, B, C, and Neutral
 - Voltage: Vab, Vbc, Vca or Van, Vbn, Vcn (depending on firmware version)
 - Total Trip Counts
- Trip data can be saved to an electronic file by using the File menu, then selecting Save As. The electronic file can be saved to the Smart 1-Line or to a customer-supplied USB stick.
- Previously saved waveform files can be opened by using the File menu, then selecting Open.
- The View menu can be used to access the “Save Screen” command, which saves an image of the screen.

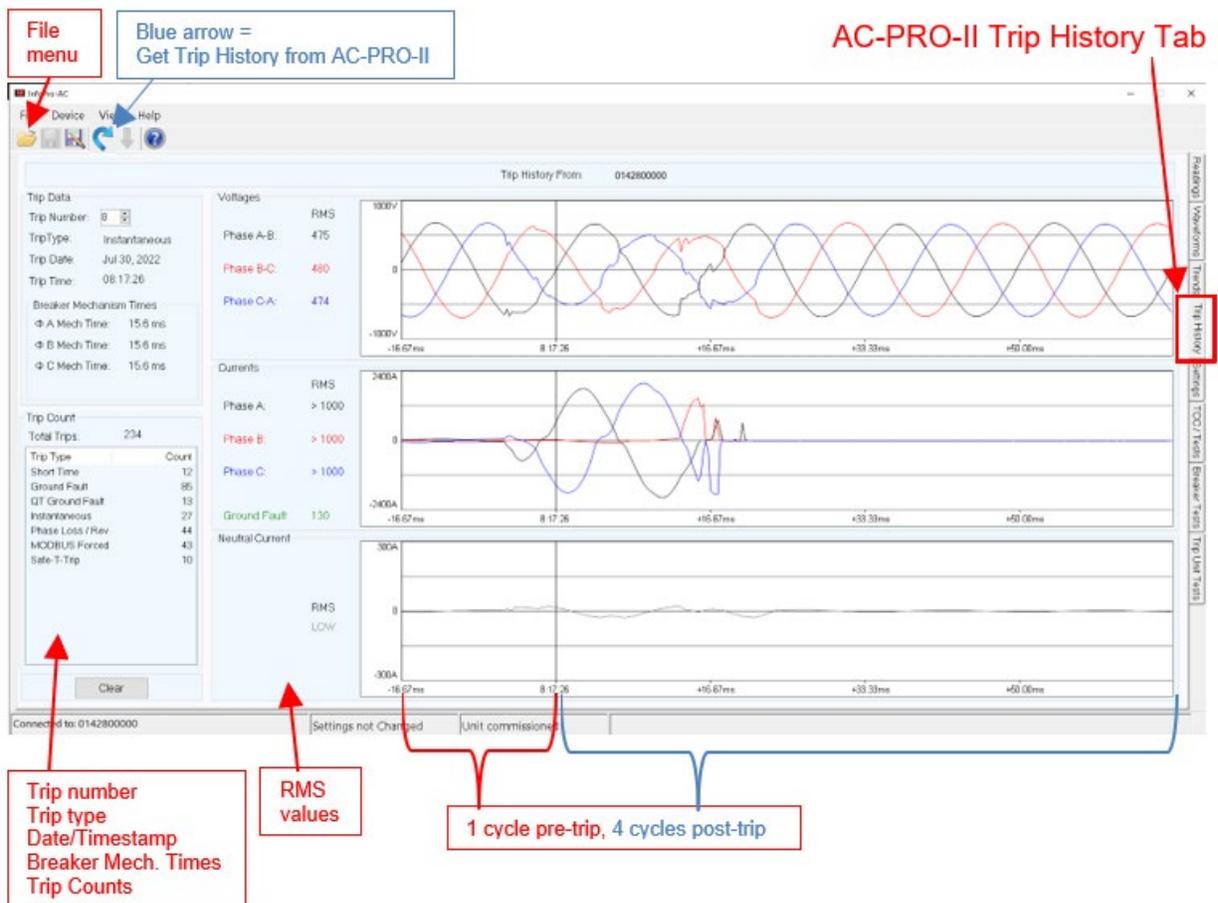


Figure 33: Trip History Tab (AC-PRO-II only)

4.1.2.6 Settings tab (AC-PRO-II only)

The Settings tab will appear on the right side of the window for AC-PRO-II trip units. It provides the following information, features, and capabilities:

- View all AC-PRO-II settings (Read-only)
- To view settings, tap or click the blue arrow

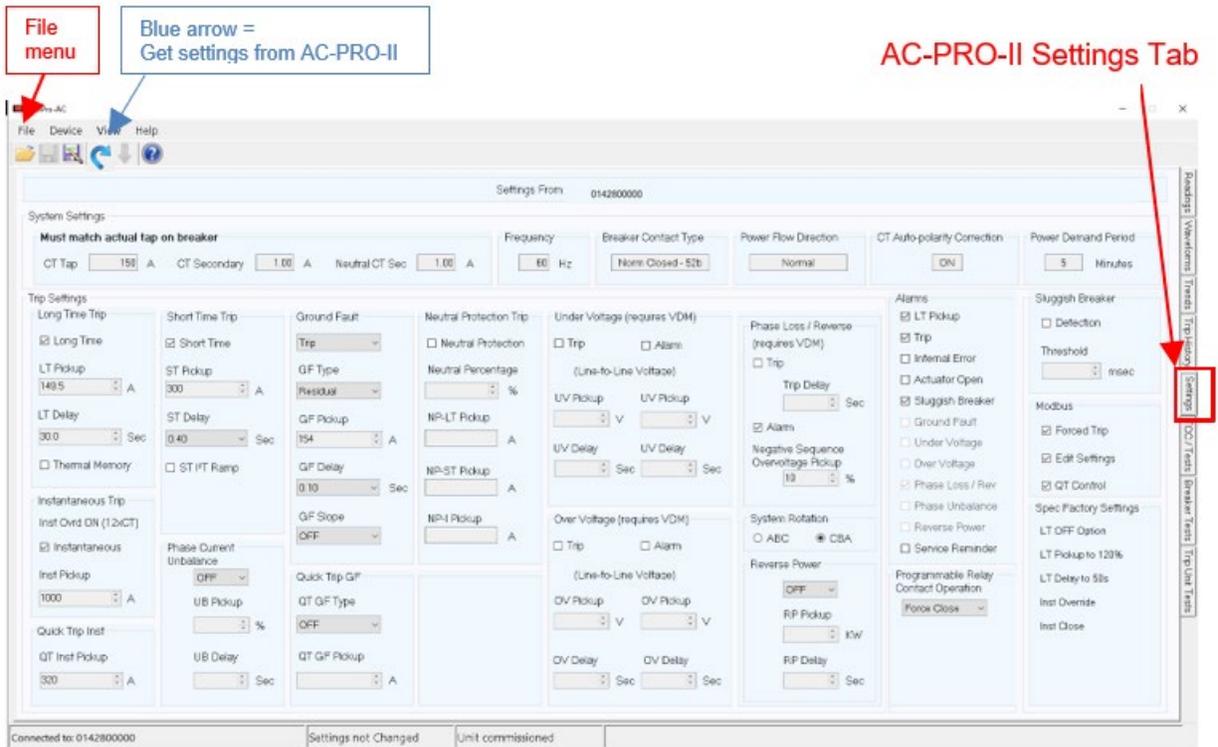


Figure 34: Settings Tab (AC-PRO-II only)

4.1.2.7 TCC/Tests tab (AC-PRO-II only)

The TCC/Tests tab will appear on the right side of the window for AC-PRO-II trip units. It provides the following information, features, and capabilities:

- Plot Phase Time Current Curve based on AC-PRO-II settings.
- Plot Ground Fault Time Current Curve based on AC-PRO-II settings
- Calculates expected specific trip time ranges based on current and settings
- Save TCC/Tests data to an electronic file by using the File menu, then selecting Save As. The electronic file can be saved to the Smart 1-Line or to a customer-supplied USB stick.
- Import previously saved TCC Test files (by using the File menu, then selecting Open).
 - Test trips are plotted on Time Current Curves.
- Enter TCC/Tests notes or import previously saved TCC Test file notes
- Enter or import previously saved Breaker Mechanism times, for benchmark purposes.
- The View menu can be used to access the “Save Screen” command, which saves an image of the screen.

To Plot a Time current curve (TCC):

1. Goto the Settings tab and use the blue arrow to “Get settings”.
2. Go back to the TCC/Tests tab and tap “Plot TCC”. Use the TCC pulldown to select your Phase or Ground.

To Plot test results:

1. First, follow the steps above to plot your TCC.
2. Enter test data in the Test Data tables. The trip tests table will automatically calculate trip times based on settings and test currents.
3. Tap or click the “Plot Test Data” button.

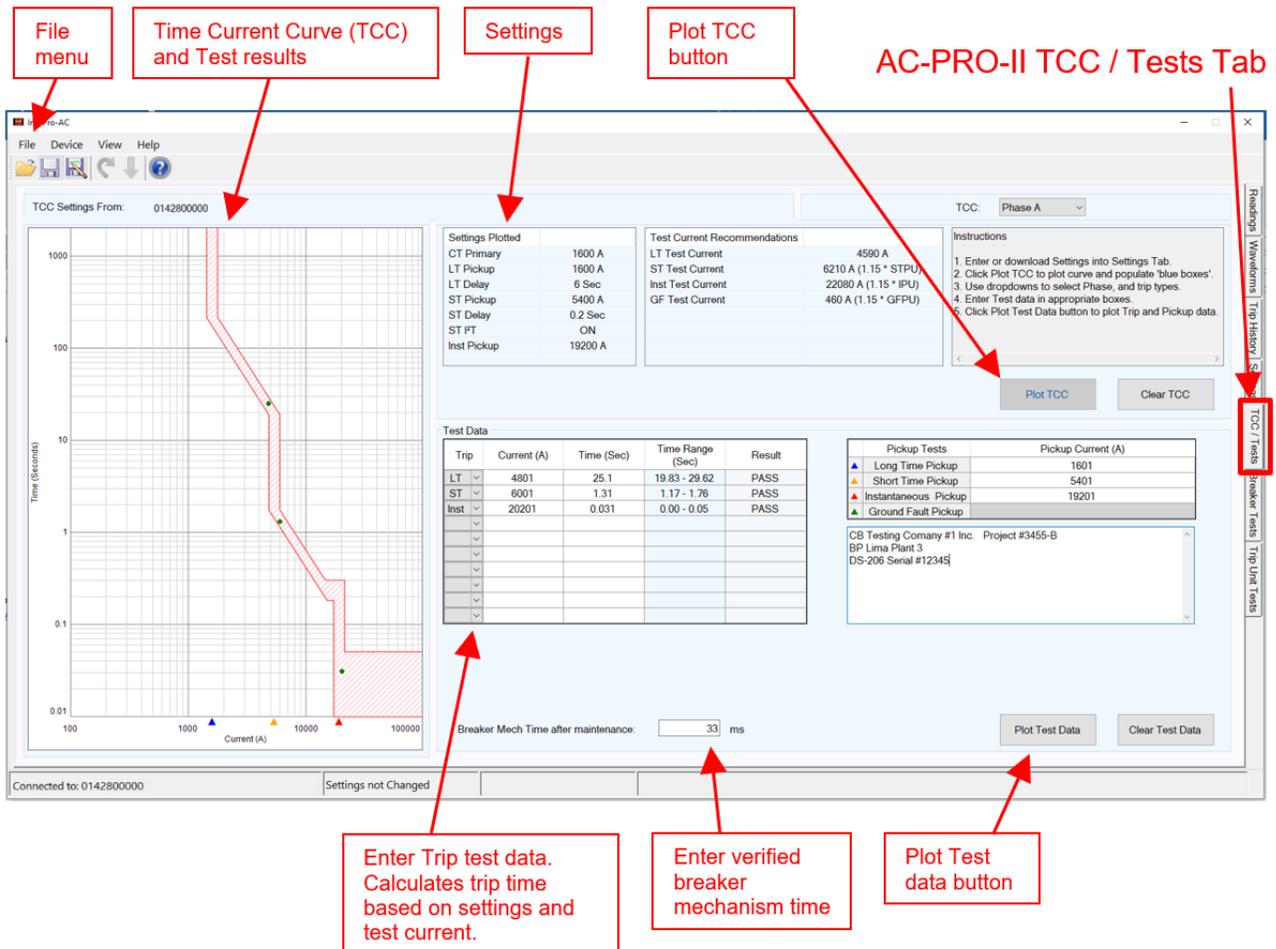


Figure 35: TCC/Tests Tab (AC-PRO-II only)

4.1.2.8 AC-PRO tab (includes Readings, Settings, Last Trip)

The AC-PRO tab includes all information on one tab and will appear on the right side of the window for AC-PRO trip units. It provides the following information, features, and capabilities:

- RMS Currents: Phase A, B, C, GF, % Unbalance
- RMS Voltages: Vab, Vbc, Vca (if equipped with PT Module)
- Power values (if equipped with PT Module):
 - Real Power (KW)
 - Apparent Power (KVA)
- Energy value (KWHr) (if equipped with PT Module)
- View Settings (read only)
- Last Trip data (Trip type & RMS currents)
- Quick-Trip switch position
- Breaker position status (if equipped with PT module and 52a contact wired in)
- Trip unit serial number
- The View menu can be used to access the “Save Screen” command, which saves an image of the screen.

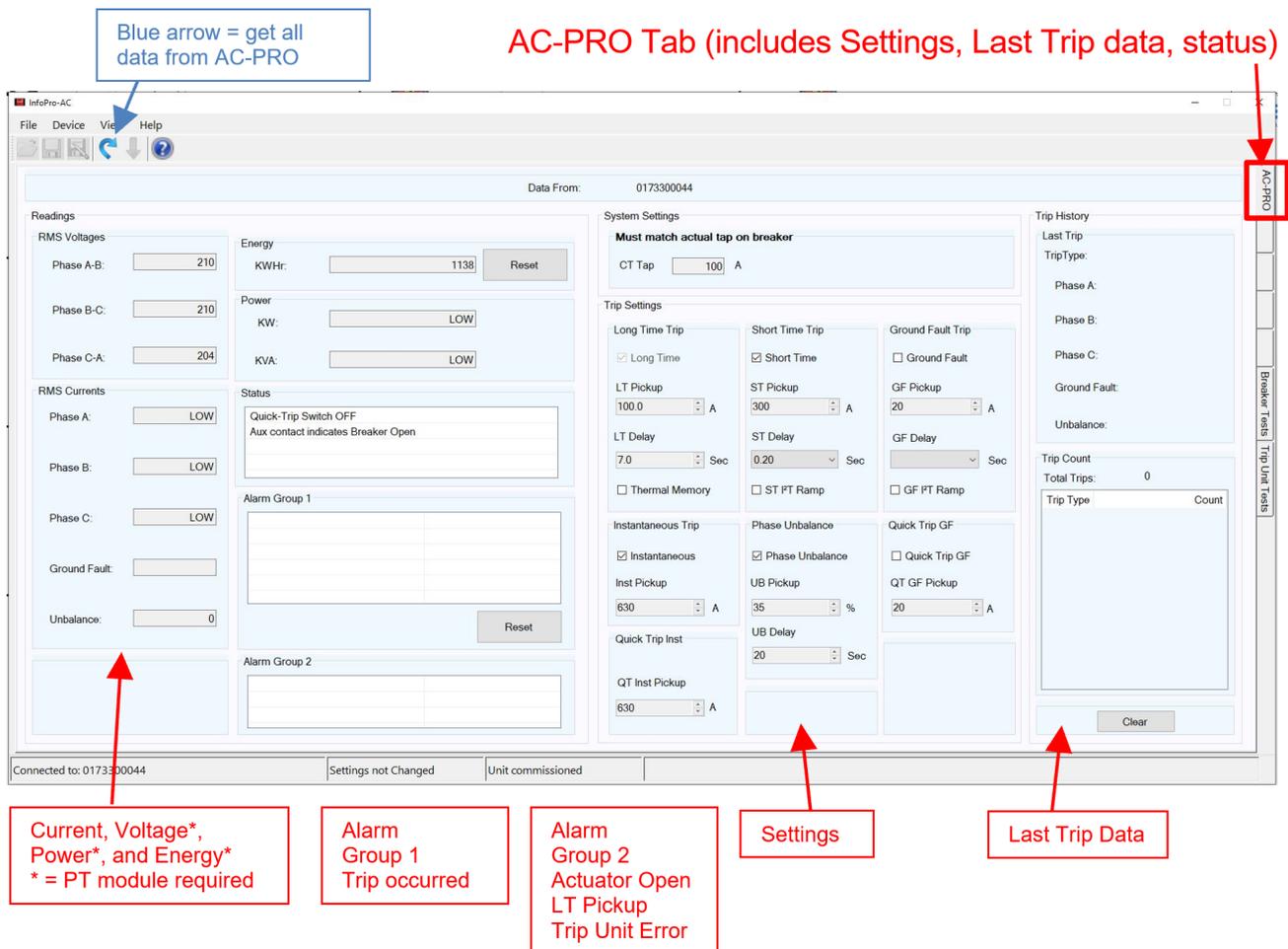


Figure 36: AC-PRO Tab

4.1.2.9 Breaker Tests tab

The Breaker Tests tab is provided for convenience for documenting and maintaining records of breaker data and breaker test data. This tab allows for text entry of breaker information and data. In addition, previously saved Breaker Tests files can be imported to the Smart 1-Line using a USB flash drive. Contact URC for additional information.

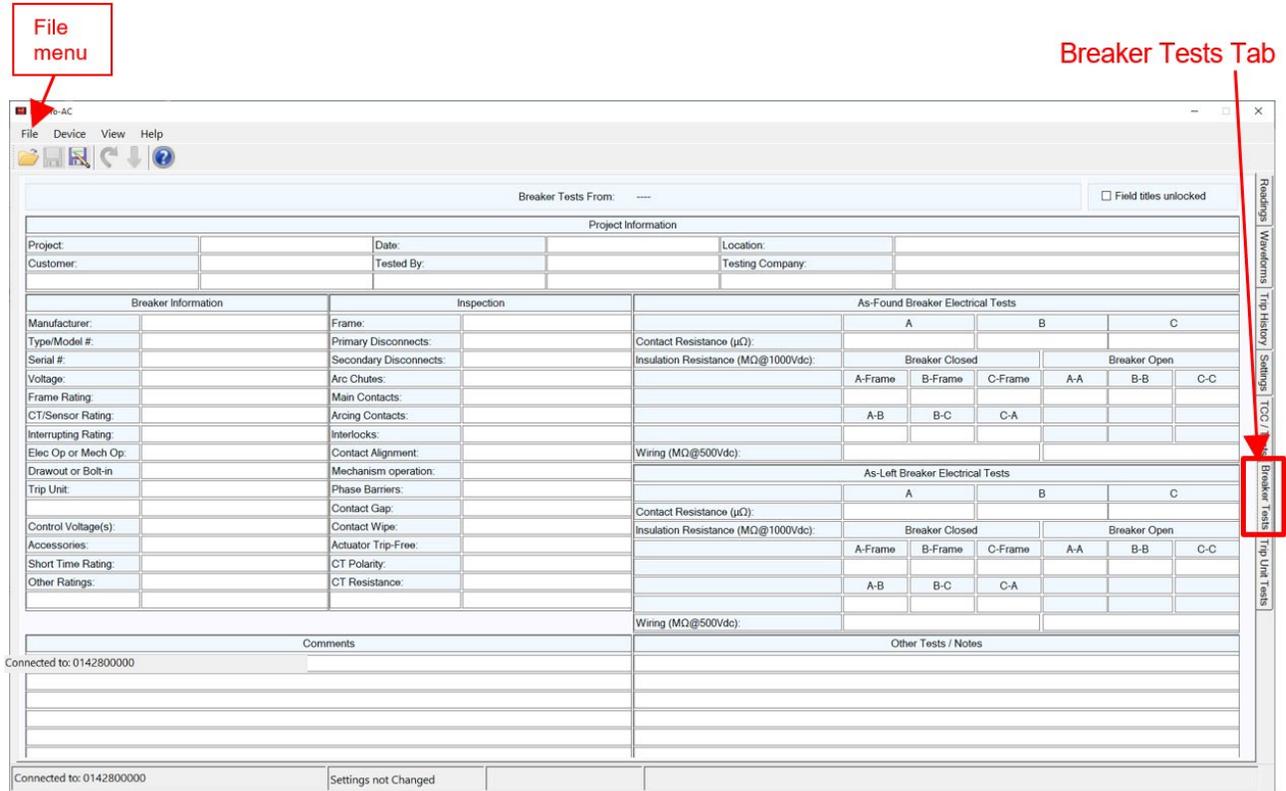


Figure 37: Breaker Tests Tab

4.1.2.10 Trip Unit Tests tab

The Trip Unit Tests tab is provided for convenience for documenting and maintaining records of trip unit test data. This tab allows for text entry of trip unit and trip unit test data. In addition, previously saved Trip Unit Tests files can be imported to the Smart 1-Line using a USB flash drive. Contact URC for additional information.

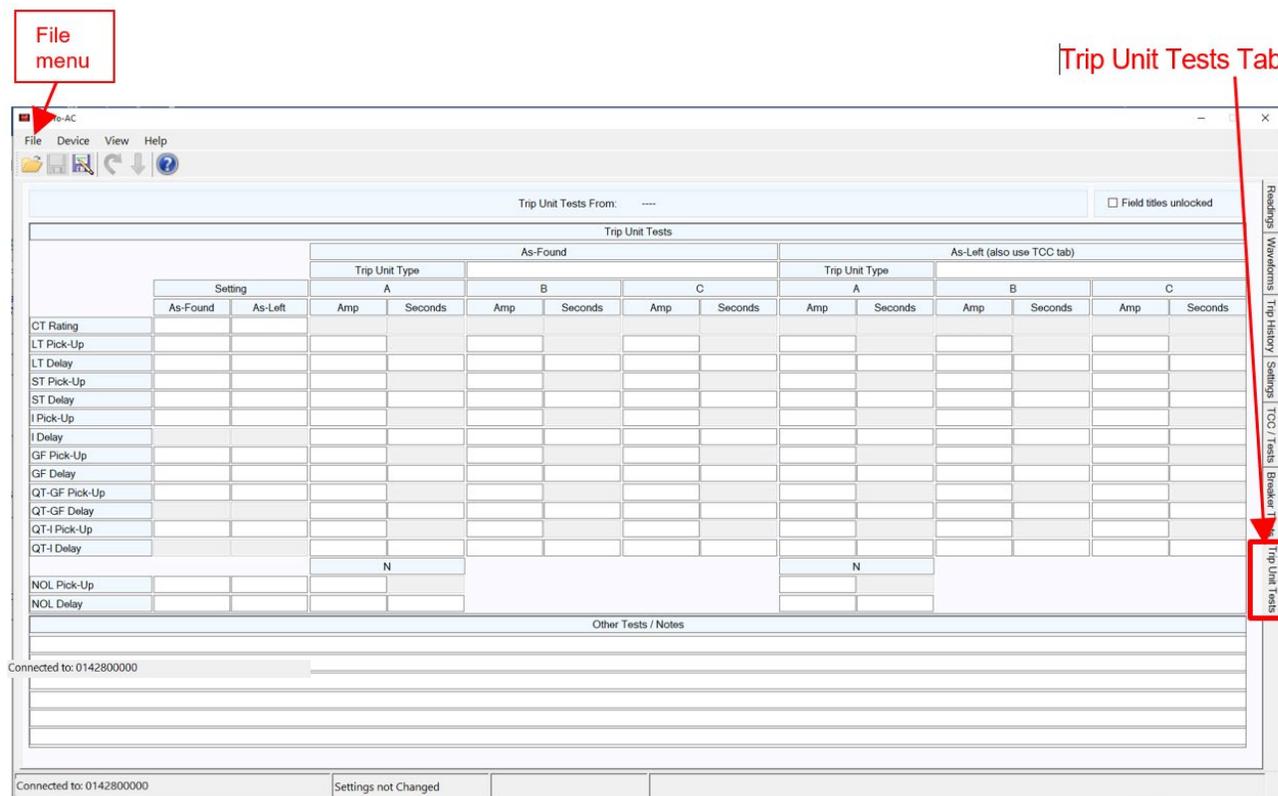


Figure 38: Trip Unit Tests Tab

4.1.3 Transformer



When in Run Mode, the transformer symbols will appear either Black, Red, or Gray. The color will “depend” on the communications and closed/energized status of the trip unit with the address that was entered into the transformer “Depends” field in Designer Mode.

- Black = associated trip unit is communicating, but energized status is not known. (see Section 3 for “Preference” setting)
- Red = associated trip unit is communicating and closed/energized. (see Section 3 for “Preference” setting)
- Gray = associated trip unit is not communicating.

4.1.4 Bus

When in Run Mode, the bus symbols will appear either Black, Red, or Gray.

The color will “depend” on the communications and closed/energized status of the trip unit with the address that was entered into the bus “Depends” field in Designer Mode.

Black = associated trip unit is communicating, but energized status is not known. (see Section 3 for “Preference” setting)

Red = associated trip unit is communicating and closed/energized.

(see Section 3 for “Preference” setting)

Gray = associated trip unit is not communicating.

4.1.5 Description Box

When in Run Mode, the text that appears in the Description boxes is read-only. This text can only be modified in Designer Mode.

The Description Box is a general-purpose block that can be used to display text in any area of the Smart 1-Line. Common uses are: Load names, Substation names, Transformer names, Address indication (if viewing addresses is desired in Run Mode), notes, etc.

4.1.6 Voltage data block

When in Run Mode, the Voltage data blocks will display voltage values from the trip unit with the address entered into the voltage blocks in Designer Mode.

For AC-PRO-II firmware v1.9 and later, the values will be Line-to-Line (Vab, Vbc, Vca).

For AC-PRO-II firmware v1.8 and earlier, the values will be Line-to-Neutral (Van, Vbn, Vcn).

For AC-PRO, the values will be Line-to-Line (Vab, Vbc, Vca).

A Voltage block example is below:

Vab	480
Vbc	479
Vca	480

4.1.7 Power data block

When in Run Mode, the Power data blocks will display power values from the trip unit with the address entered into the Power block in Designer Mode.

The Power Block contains:

- Instantaneous Real Power (KW) (Kilowatts)
- Instantaneous Apparent Power (KVA) (Kilovolt-amperes)
- Instantaneous Power Factor (PF) (%)

A Power block example is below:

KW	874
KVA	1018
PF	86

4.1.8 Energy data block

When in Run Mode, the Energy data blocks will display energy values from the trip unit with the address entered into the Energy block in Designer Mode.

The Energy Block contains:

- Real Energy (KWHr) (Kilowatt-Hours) or (MWHr) (Megawatt-Hours)
- Apparent Energy (KVAHr) (Kilovolt-ampere-Hours) or (MVAHr) (Megavolt-ampere-Hours)

Note: If the KWHr or KVAHr value exceeds 5-digits, these fields will change from (kilo) KWHr and KVAHr to (Mega) MWHr and MVAHr.

KWHr	10125
KVAHr	11773

4.1.9 Trip unit icons

When in Run Mode, the trip unit icons will change depending on the device at the address associated with the Icon block (entered in Designer Mode).



Appears if AC-PRO-II is detected (at the address in the Icon block in Designer Mode).



Appears AC-PRO is detected (at the address in the Icon block in Designer Mode).



Appears if no trip unit is detected (at the address in the Icon block in Designer Mode).

4.1.10 Communications Status Box

When in Run Mode, the Communications status box appears in the bottom left corner, to provide the following basic communications status information:

Modbus backlog: Indicates the number of trip unit data requests that are in the queue. Normally, this value should be zero. If this value is not zero, or is not decrementing to zero, this can indicate a Timing Setting may need to be adjusted. For example, the “Scan Period” setting may need to be increased.

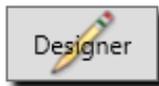
Units communicating: The first number indicates the total # of trip units that are successfully communicating. The second number indicates the total # of trip units that Smart 1-Line is trying to communicate with.

Modbus backlog:	0
Units communicating:	22 / 22

Figure 39: Communications Status Box

4.1.11 Designer Mode button

When in Run Mode, the ‘Designer’ (Mode) button is in the bottom right corner. Tap or click the button to make changes to the Smart 1-Line or its settings. See Section 3 for additional information.



4.1.12 Help button



The ‘Help’ button is in the bottom right corner.

The Help button provides access to

- “Contents” button: Help and Instructions Information
- “Get Logs” button: This command allows a software log (compressed/zip file, .zip file extension) to be saved to a file on the Smart 1-Line or to a USB drive. These logs can be sent to URC for analysis and troubleshooting purposes.
- “Save Screen”: This command allows saving a screenshot of the One Line diagram view
- “About”: This allows viewing of the various software version and driver version information

5.0 Software and Firmware

5.1 Features by product & version

Smart 1-Line: Features & functionality by trip unit product/version					
firmware version	AC-PRO-II				AC-PRO with PT Module Silver case + RS-485 option
	(with VDM strongly recommended. See Notes)				
	FW v1.2 - v1.5	FW v1.5- v2.0.21	FW v2.0.27 - v2.0.31.0	FW v4.0.65.0 and later (requires S1L v2 software)	
Feature					
Current **	✓	✓	✓	✓	✓
Voltage *	✓	✓	✓	✓	✓
Power *	✓	✓	✓	✓	✓
Energy *	✓	✓	✓	✓	✓
Trending (Data logging and Graphics) (S1L v2 software)	✓	✓	✓	✓	
Breaker position **	✓	✓	✓	✓	✓
Breaker position using URC limit switch **		✓	✓	✓	
Breaker tripped indication **	✓	✓	✓	✓	✓
Quick-Trip Switch status **	✓	✓	✓	✓	✓
Remote Quick-Trip control ** (S1L v2 software)				✓	
Settings (Read-only) **	✓	✓	✓	✓	✓
Remote Breaker Tripping **	✓	✓	✓	✓	✓
Remote Breaker Closing** (S1L v2 software)				✓	
Alarm indication **	✓	✓	✓	✓	✓
Current Waveforms			✓	✓	
Voltage Waveforms **			✓	✓	
Sluggish Breaker indication **	✓	✓	✓	✓	
Alarm Relay reset capability **	✓	✓	✓	✓	
Detailed Trip data **	✓	✓	✓	✓	
Timestamps for Trip Data & Waveforms **	✓	✓	✓	✓	
Trip Waveforms **			✓	✓	
Time Current Curves **	✓	✓	✓	✓	
Future features can be added by field firmware update	✓	✓	✓	✓	
trip unit clock sync (S1L v2 software)	✓	✓	✓	✓	
highest possible comm speed (baud rate)	19200	19200	19200	115200	9600

Notes:

* AC-PRO-II with VDM required for Voltage, Power, and Energy features.

** AC-PRO-II with VDM required for this feature (and any communications) if the breaker is open or zero current is flowing.

6.0 System performance & speed

AC-PRO and AC-PRO-II trip units use Modbus RTU serial communications. Communications performance and speed depends on several items. Some of the major items that can affect communications performance and speed are:

- Smart 1-Line settings
- Trip unit settings
- Baud Rate (of the trip units and Smart 1-Line)
- Power state of trip units

In general, the best speed performance will be achieved with AC-PRO-II with VDM (Voltage Divider Module). This is because the AC-PRO-II offers faster baud rate setting options, and the VDM provides continuous trip unit power, for uninterrupted communications.

6.1 Smart 1-Line Settings

The Smart 1-Line “Timing Settings” affect the speed performance. “Scan Period” is one Timing setting, which determines how often the Smart 1-Line requests data from each trip unit. For example, if the “Scan Period” setting is set to 10 seconds, then the information from each breaker will be requested (and should be updated) every 10 seconds. See Section 3 for additional information about the Smart 1-Line settings.

6.2 Baud Rate

The Baud Rate is the rate at which information is transferred. The Smart 1-Line and all connected trip units need to be set to the same Baud Rate. AC-PRO can operate at a Baud Rate of 9600. AC-PRO-II can operate at Baud Rates of 9600, 19200, 38400, 57600, and 115200, depending on the firmware version.

6.3 Power state of AC-PRO-II and/or AC-PRO trip units

Due to the nature of RS-485 network serial communications, the system communications performance is best if all trip units are powered continuously. Standard AC-PRO-II and AC-PRO trip units derive their power from the CTs (sensors) if current is flowing. The AC-PRO-II with VDM (Voltage Divider Module) option can also derive trip unit power from the energized line-side stabs of a racked-in breaker, even if the breaker is open and/or zero current is flowing.

Therefore, AC-PRO-II with VDM (Voltage Divider Module) trip units are recommended, because the system voltage (from the line-side stabs of a racked-in breaker) will power the AC-PRO-II continuously, even if the breaker is open and/or zero current is flowing.

Example if trip units are not powered up: If the Smart 1-Line is making data requests to trip units that aren't responding (because no current is flowing and/or they aren't powered up), then the communications system will become backed up. Communications to the trip units that aren't powered up will be interrupted, and communications to other trip units will be slowed down.

If AC-PRO-II or AC-PRO trip units (breakers) are known to be racked out or out of service for an extended period, URC recommends modifying the Smart 1-Line in Designer Mode. Specifically, the 'Address' and 'Depends' fields that have the particular out of service trip units' address(es) should be temporarily blank, or the breaker should be removed from the Smart 1-Line drawing until the breaker is placed back into service.

7.0 General and PC Items

The Smart 1-Line is factory-configured for easy and simple operation without the need to customize the PC or Windows. The following sections provide some additional information.

7.1 Operating System

The Smart 1-Line utilizes the Microsoft Windows IoT Enterprise Long Term Servicing (LTSC/C) Operating System. Visit Microsoft's web site or contact URC for additional information.

7.2 Internet and/or Server Connections

If the Smart 1-Line needs be connected to the Internet, or a Domain, URC recommends that an experienced IT Administrator be involved. Contact URC if you have questions.

7.3 PC & Windows Settings

The Smart 1-Line is specifically configured to optimize and simplify use of the PC for the purpose of the Smart 1-Line ONLY. Any other use is not supported.

URC does NOT recommend changing PC settings, unless absolutely necessary and coordinated with URC. This is because the Smart 1-Line was specifically designed and tested with the settings that it shipped with.

7.3.1 Windows Accounts and Passwords

The Smart 1-Line ships with two (2) Windows accounts accessible by customers:

- "Smart 1-Line" user account (for normal operation)
- "S1L-Administrator" account (ONLY for temporary use by experienced Windows users for changes identified in this manual).

7.3.1.1 "Smart 1-Line" user account

This is the "normal" account and the only account that should be used to run the Smart 1-Line.

IMPORTANT ! To change the "Smart 1-Line" user account Password:

1. Log into Windows as "S1L-Administrator". The S1L-Administrator account is only recommended if you are familiar with Microsoft Windows. See the next Section for additional information.
2. Double-click on the Password file on the Desktop and follow the instructions.
3. Restart PC or log out of S1L-Administrator account.

IMPORTANT ! Changing the "Smart 1-Line" user account password in any other way may result in computer lockup.

7.3.1.2 "S1L-Administrator" account

In situations where a customer MUST change PC settings, URC provided a Windows "S1L-Administrator" account login information in the shipping box. URC recommends using this S1L-Administrator account only if necessary. If this account must be used, it should only be used temporarily. Normal use of the Smart 1-Line should be with the "Smart 1-Line" user account.

URC recommends use of the "S1L-Administrator" account be performed ONLY by individuals that are familiar with Microsoft Windows.

Logging in as an S1L-Administrator is only recommended if you are familiar with Microsoft Windows. To log in as an S1L-Administrator, follow these steps:

To log in as S1L-Administrator, follow these steps:

1. Connect a USB keyboard.
2. Press Ctrl + Alt + Delete. (three keyboard keys at the same time)
3. Select "Switch user"
4. Select S1L-Administrator.
5. Enter the S1L-Administrator password. If logging in for the first time, use the password supplied by URC. Otherwise use the secure S1L-Administrator password that you or the Smart 1-Line owner has created.

IMPORTANT: Do not change or customize any Windows settings that are not specifically mentioned in this document. Doing so could put the Smart 1-Line in a state where it is mis-operating, not displaying information correctly, or completely unusable.

IMPORTANT: The Smart 1-Line was specifically designed and tested with specific Windows configuration / settings. Altering settings can affect appearance and performance.

To change a the S1L-Administrator password, follow these steps:

1. Connect a USB keyboard.
2. Press Ctrl + Alt + Delete. (three keyboard keys at the same time)
3. Select "Switch user".
4. Select S1L-Administrator.
5. Enter the S1L-Administrator password supplied by URC or your password if previously changed.
6. Click the Window symbol / button in the bottom left corner of the screen.
7. Type "Control Panel", and then tap on the Control Panel.
8. Select "User Accounts". Select "Manage another account".
9. Select "S1L-Administrator"

IMPORTANT ! Changing the Password should only be performed by the "Owner" of the Smart 1-Line. Customer is responsible for password management.

10. Follow the prompts/fields/instructions to change the password.

7.3.2 Screen Timeout and Brightness settings

Changing these settings requires logging into the S1L-Administrator account, which is only recommended if you are familiar with Microsoft Windows. See the previous for additional information.

To change the Screen Timeout of the Smart 1-Line Windows account, follow these steps:

1. Log in to the S1L-Administrator account. See previous section for instructions.
 2. Tap or Click the Windows icon in the bottom left.
 3. Type "brightness".
 4. Select "Adjust brightness level of the display".
- IMPORTANT: PAY ATTENTION TO WHICH BAR YOU ARE ADJUSTING. DO NOT ADJUST THE "SIZE BAR". THE SIZE BAR MUST BE LEFT UNMODIFIED, ALL THE WAY TO THE LEFT AT 100%. ANY SCALING ADJUSTMENTS WILL CREATE PROBLEMS WITH THE APPEARANCE OF THE SMART 1-LINE.**
5. Use the "Adjust brightness level" bar to adjust the brightness.
 6. **IMPORTANT:** Do not adjust any other settings.

To change the Screen Brightness of the Smart 1-Line Windows account, follow these steps:

1. Log in to the S1L-Administrator account. See previous section for instructions.
2. Tap or Click the Windows icon in the bottom left.
3. Type "Display".
4. On the left side, select "Display Settings".
5. At the top, select the desired Screen Timeout setting.
6. **IMPORTANT:** Do not adjust any other settings.

7.4 Other applications

The Smart 1-Line is specifically designed and tested to operate with URC software only. URC prohibits installation of other software applications on the Smart 1-Line.

7.5 Other Modbus devices

The Smart 1-Line is specifically designed and tested for use with AC-PRO-II and AC-PRO trip units. Connection and use of other trip units, meters, relays, prohibited.

7.6 Panel PC Specifications

Display	21.5" (Diagonal) Touchscreen
Resolution	1920 x 1080
Touchscreen Type	Projected Capacitive
CPU	Intel i5-6300U
Memory	8G DDR4
Storage	128GB SSD
Connections and Ports	COM 2: Serial RS-485 (DB9 connection) (2) LAN/Network: (RJ45) (2) USB 2.0 (can be used for saving files) (2) USB 3.0 (can be used for saving files) COM 1: Serial RS-232 (UNUSED) (1) HDMI (UNUSED) (send inquiry to URC if HDMI use is desired)
Power Input voltage	12 – 24VDC (120VAC to 17VDC Plug-in Power supply with cord is included)
Power consumption	~75W
Power button location	Rear, adjacent to power connections
Operating Temperature	0 ~ 50°C (32 ~ 104°F)
Safety and EMC	Safety: CE, UL, CCC, BSMI EMC: CE, FCC Class B, BSMI
Dimensions	21.9" x 13.7" x 2.4" (558.4 x 349.8 x 62.2mm)
Weight	15 lbs (6.8kg)
Enclosure	Industrial, Solid Aluminum Alloy
Cooling	Fanless
Mounting	Surface mount, VESA 100x100mm hole pattern. URC offers optional wall mount or mount can be supplied by customer. Panel mount hardware is also included. Customer is responsible for maintaining enclosure temperature. Panel cutout is 550.3mm x 341.8mm.

7.7 Warranty

The Smart-1-Line product features a 2-year warranty. See <http://www.utilityrelay.com/Warranty.html> for more information.

7.8 Software updates

Contact URC for information about available software updates.

7.9 Troubleshooting

7.10 General Troubleshooting items

The following items are important for general troubleshooting and/or common reasons for issues.

- Communications status box. This box appears in the lower left corner of the Smart 1-Line when it is in Run Mode. Refer to Section 4 for additional information.

Modbus backlog:	0
Units communicating:	22 / 22

- Trip unit power state: In order to provide RS-485 Modbus communications, trip units must be powered by breaker current, voltage (via VDM or PT module), or auxiliary power. Example: if an AC-PRO-II (without VDM) is installed, no current is flowing, and no external auxiliary power is present, then the trip unit is not capable of RS-485 Modbus communications.
- Address programming: Each trip unit must be programmed with a unique Modbus address. This Address is set at the trip unit. Two (2) trip units on the same RS-485 network cannot have the same address. The Smart 1-Line Designer Mode should be programmed to have one (1) breaker per trip unit address.
- Communications settings:
 - Baud rate: All connected trip units and the Smart 1-Line must be programmed/set to the same Baud Rate. AC-PRO-II trip units have an adjustable Baud Rate. AC-PRO units (that are equipped with optional Modbus communications) have a fixed Baud Rate of 9600.
 - Timing Settings, Modbus Settings, and Modbus Server Settings: The Smart 1-Line has several settings that affect communications. See Section 3 for additional information.
- RS-485 Network wiring
 - Network wiring integrity: If you are troubleshooting a network that is being tested / used for the first time or has been rewired, URC recommends functional testing of segments of the network. For example, test and confirm functionality with only the “first” trip unit connected, then add more trip units for subsequent testing.
 - No External End-of-Line termination needed: Ensure that no external RS-485 termination circuits or components are present. (the internal termination switch on AC-PRO-II can be used if it is the last device on the “loop”).
- Other devices on RS-485 network: Only AC-PRO-II and AC-PRO can be connected to the Smart 1-Line. Other devices cannot be on the same RS-485 network as AC-PRO-II.

7.11 Getting Logs

The “Get Logs” command is accessible via the Help button (See Section 4). It allows a software log file (compressed/zip file, .zip file extension) to be saved to a file on the Smart 1-Line or to a USB drive. These log files can be sent to URC for analysis and troubleshooting purposes.

Utility Relay Company
10100 Queens Way
Chagrin Falls, OH 44023
USA
www.utilityrelay.com
Phone 1.888-289-2864
Fax: 440-708-1177

For the latest version of Instruction Manuals, visit:
http://www.utilityrelay.com/Side_Bar/Instruction_Manuals.html



UTILITYRELAY.COM



I-SMART-1-LINE

URC Utility Relay Company

10100 QUEENS WAY
CHAGRIN FALLS, OH 44024
USA
888.289.2864