Reclosers

COOPER Power Systems

Kyle Form 6 Microprocessor-Based Recloser Control Programming Guide

Service Information

S280-70-4

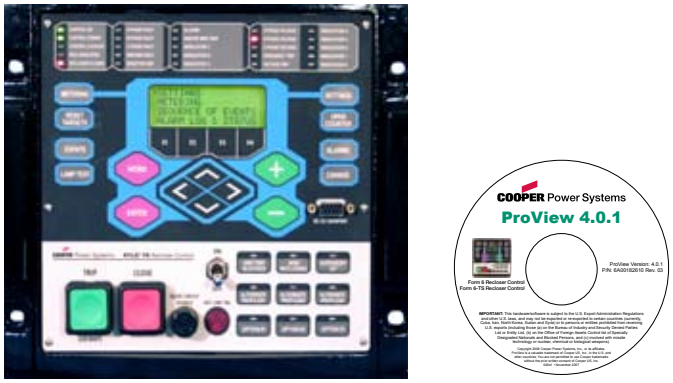

Figure 1.
Kyle Form 6 microprocessor-based recloser control front panel and ProView CD-ROM.

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SAFETY FOR LIFE

Cooper Power Systems products meet or exceed all applicable industry standards relating to product safety. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Cooper Power Systems employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment and support our “Safety For Life” mission.

SAFETY INFORMATION

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians who are familiar with this equipment should install, operate, and service it.

A competent technician has these qualifications:

- *Is thoroughly familiar with these instructions.*
- *Is trained in industry-accepted high- and low-voltage safe operating practices and procedures.*
- *Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.*
- *Is trained in the care and use of protective equipment such as flash clothing, safety glasses, face shield, hard hat, rubber gloves, hotstick, etc.*

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual may contain four types of hazard statements:

DANGER: Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

Safety Instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

DANGER: Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low-voltage lines and equipment.

G103.3

WARNING: Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage.

G101.0

WARNING: This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury and equipment damage.

G102.1

WARNING: Power distribution and transmission equipment must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install, or maintain power distribution and transmission equipment can result in death, severe personal injury, and equipment damage.

G122.3

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Section 1: Introduction

IMPORTANT: Do not open a ProView 4.0 Form 6 control scheme with ProView 4.0.1 software. ProView 4.0.1 software will only operate correctly with ProView 4.0.1 schemes.

If it is desired to use a ProView 4.0 scheme with ProView 4.0.1 software, convert the scheme with the ProView 4.0.1 F6-F6TS Upgrade Wizard included on your ProView 4.0.1 software CD.

Thank you for purchasing the Kyle Form 6 Microprocessor-based Recloser Control. Offered in a rack mount, yard mount, and pole mount design, the Form 6 Recloser Control provides a universal platform that can be programmed for many protective applications. The Form 6 control supports customization of features to permit design and manufacture of customer-specific configuration and operating logic.

The Form 6 recloser control provides phase and ground current sensing and three-phase voltage sensing. The Form 6 control can compute power, energy, power factor, and power flow direction from the current and voltage sensing.

The Form 6 control can be programmed and interrogated from the front panel. The front panel also displays metering and alarm information.

In addition to front panel programming, control parameters can be programmed via personal computer using the ProView interface software. Temporary connection to the control is made through the operator front panel RS-232 port. The back panel RS-232, as well as the optional fiber-optic, ethernet, and RS-485 ports are available for SCADA or interconnections to other devices. The interface program includes functions used to create, modify, and graphically display time-current curves (TCCs) and provide diagnostic information. The Form 6 control analysis tools include fault locating, event recording, data profiler, recloser replay, application one-line diagram, and oscillography functions. Customization tools include TCC Editor II, a time-current curve modification program, and the Idea Workbench, a complete software customization program that enables you to design your distribution system to your specific application. Verification of settings and customized logic are easily obtained with the Virtual Test Set feature.

Important User Information

IMPORTANT: This hardware/software is subject to the U.S. Export Administration Regulations and other U.S. laws, and may not be exported or re-exported to certain countries (currently, Cuba, Iran, North Korea, Sudan and Syria) or to persons or entities prohibited from receiving U.S. exports (including those (a) on the Bureau of Industry and Security Denied Parties List or Entity List, (b) on the Office of Foreign Assets Control list of Specially Designated Nationals and Blocked Persons, and (c) involved with missile technology or nuclear, chemical or biological weapons).

The Form 6 recloser control offers the user the ability to apply it in a variety of applications, to program its operation over a wide range of parameters, and to customize its operating logic. Those responsible for the application of the Form 6 control must satisfy themselves that the programmed operating parameters and the installed software scheme have been tested to verify that they meet all performance and safety requirements, including any applicable regulations, codes, and standards.

Since there are many variables and user-selected operating characteristics associated with any particular installation, the user should take the necessary steps to ensure that the design, configuration, installation, and use of operating software (schemes) are maintained in a secure and controlled manner by properly trained personnel.

What's In This Manual

This manual describes the basic function and features involved in programming and operating the Form 6 Rack Mount, Yard Mount and Pole Mount recloser controls. It provides brief descriptions of the functions of the operator panel.

Note: This manual does not describe Form 6 Triple-Single control functionality.

This manual is divided into five sections:

1. Introduction
2. Front Panel Operation
3. Using ProView Software
4. Form 6 Control Schemes
5. Idea Workbench

This manual is to be used in conjunction with the appropriate installation and operation instructions that were provided with the Form 6 recloser control:

- *Service Information S280-70-1 Form 6 Rack Mount Microprocessor-Based Recloser Control Installation and Operation Instructions*
- *Service Information S280-70-2 Form 6 Yard Mount Microprocessor-Based Recloser Control Installation and Operation Instructions*
- *Service Information S280-70-3 Form 6 Pole Mount Microprocessor-Based Recloser Control Installation and Operation Instructions*
- *Service Information S280-70-10 Form 6-LS Pole Mount Microprocessor-Based Recloser Control Installation and Operation Instructions*

Upgrading Form 6 Control Firmware

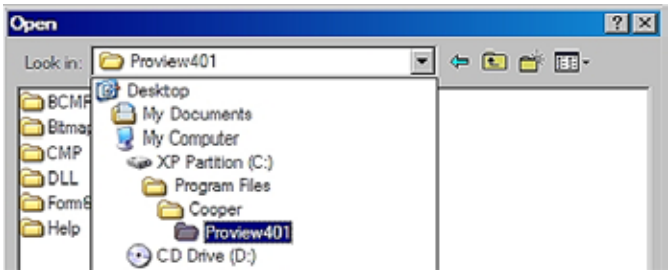
Upgrading from ProView 4.0 or 3.2.2 Software Version to ProView 4.0.1 Software Version

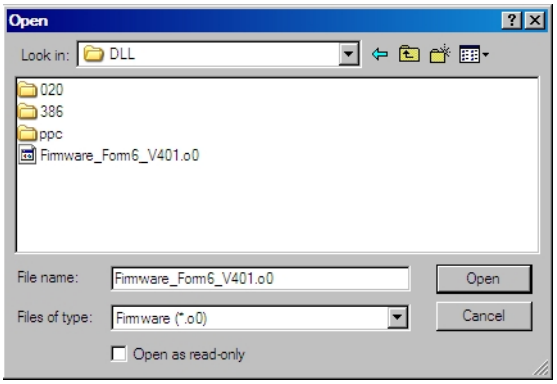
CAUTION: System misoperation. Bypass the recloser prior to downloading new firmware to an in-service control. The process of downloading new firmware will cause the control to stop operating as a protective device until a new Scheme Structure file is downloaded to the control. Failure to bypass the recloser connected to an in-service control prior to a firmware download can result in system misoperation. T355.0

1. Bypass the recloser, adhering to your standard utility safety practices, if you are upgrading the firmware on an installed recloser control. Refer to the appropriate Form 6 Service Information.
2. Establish a physical connection to the control via the front panel RS-232 port.
3. Disconnect digital SCADA connections from the Form 6 control.
4. Launch your ProView 4.0 application software and open any Form 6 recloser control scheme. (Refer to Section 4 for additional information.)

Note: If your Form 6 control is running ProView 3.2.2 software, you must launch ProView 3.2.2 software version.

5. Click the CONNECT button. The ProView software will display a list of connection options.
6. Click on the Connect using Com 1 option - as this is the communication port typically configured for serial communications on your PC.
7. When the Enter password dialog is displayed, type *Modify* (case-sensitive) and click OK.
8. After the ProView software compares the scheme on the PC to the scheme in the connected Form 6 control, the Connect using Com ? dialog will be displayed. Click the Done button.
9. Select Manage>Device>Download firmware… from the main menu.
10. Read the Caution statement. Click OK only if you have read and understand the Caution statement.
11. Click the down arrow in the “Look in:” field and navigate to the ProView 4.0.1 Folder. C:\Program Files\Cooper\ProView401\





12. Locate the DLL folder from within the folder list and open it. The firmware will be displayed in the list: Firmware_Form6_V401.o0
13. Click on the “Firmware_Form6_V401.o0” file to select it. Click the Open button.
14. Read the Caution statement. Click OK only if you have read and understand the Caution statement.
15. After completing the ProView 4.0.1 firmware download, all of the Form 6 control front panel LEDs will illuminate and the firmware version will be displayed on the LCD. Disconnect Form 6 dataport-to-laptop communications.
16. Close the version of ProView software that was used to perform the Firmware Upgrade.
17. Launch ProView 4.0.1 application software.
18. Select File>Open Scheme from File... from the main menu.
19. When the “Open” dialog appears, double-click on the Form 6 folder.
    C:\Program Files\Cooper\ProView401\Form6
20. Select the appropriate default Form 6 recloser control scheme file from within the Form 6 folder:
    - F6-4.0.1 default (read only).f6e
    - F6TS-4.0.1 default (read only).f6e (for triple-single controls)
21. Click the CONNECT button.
22. Select the communication port used for serial communications on your PC. Click OK.
23. When the Enter password dialog is displayed, type *Modify* (case-sensitive) and click OK.
24. After the ProView software compares the scheme on the PC to the scheme in the connected Form 6 control, the Connect using Com ? dialog will be displayed. Click the Done button.
    Note: Firmware and software versions must match.
25. Select Manage>Device>Download structure and settings from the main menu.
26. After successfully completing the scheme download, you will have a fully functional ProView 4.0.1 Form 6 control. At this point, you can modify the settings or download a custom scheme.

Password Access

A password is required to access the appropriate user level necessary to initiate any scheme setting and structure modifications to the Form 6 recloser control. A password is also required to connect to the Form 6 recloser control.

ProView Registration

ProView 4.0 (or greater) does not require a software authorization key, but registration is still recommended.

Register online at *www.cooperpowercentral.com/software/proview/*

Three Levels of Access

ProView Access Level	Access Level Code
Modify	4
Operate	2
View	1

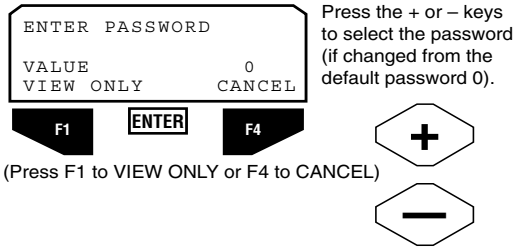
ProView 4.0 (or greater) has three levels of access available.

Each level defines user privileges: View, Operate, and Modify.

The Modify level user assigns the level of access to the Form 6 recloser control users.

Additional password and access information is available in the **Login/Logout** section of the **Using ProView Software** section of this manual.

Front Panel Password



The default password on the Form 6 recloser control front panel is zero (0). Press the ENTER key to enable the password to view or change settings from the front panel LCD.

Refer to **Settings>MMI Setup and Password** in **Form 6 Control Schemes** section of this manual for additional password information.

Note: Most common settings, metering, alarms, and counters can be viewed without entering a password. Refer to **Front Panel Operation** section of this manual for additional information.

Connecting ProView to the Control Password

CAUTION: Security Hazard. Security features must be user-configured for implementation. Failure to implement security features may result in unauthorized access to unit. G151.0

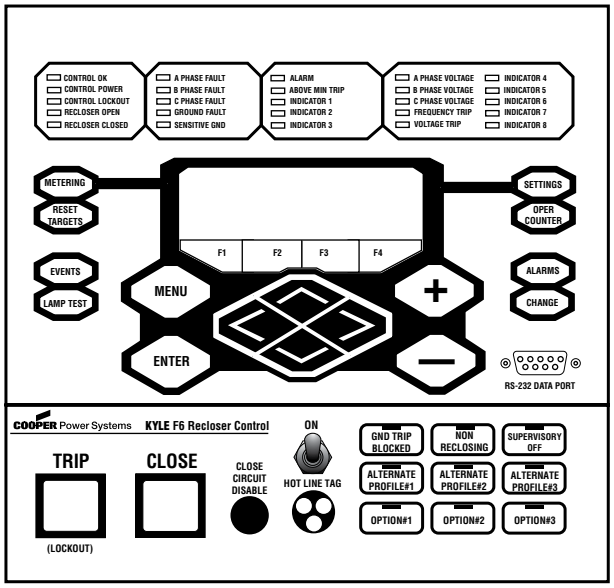
The default password for the View level user is *View* (Upload level password).

The default password for the Operate and Modify level users is *Modify* (Download level password).

Note: Once you are connected to the control, you can change your password through the Manage>Device>Change password dialog box.

Refer to **Communicating with the Form 6 Recloser Control>Connecting to the Form 6 Control** in **Form 6 Control Schemes** section of this manual for additional password information.

Front Panel



The Form 6 recloser control front panel offers extensive operation capabilities:

- View instantaneous and demand metering quantities
- View and reset targets
- View and reset trip counters
- View fault locator results
- Change setting group
- Operate function keys
- Operate the recloser

Note: The default settings are programmed to turn off the front panel after ten minutes of inactivity. Except, if Hot Line Tag is ON, the Hot Line Tag LEDs will remain illuminated.

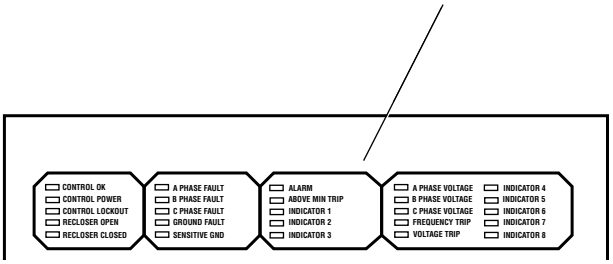
Note: Pressing the ENTER button while in any menu with a setting change option (even if a setting change had not actually been made) will disable the MMI Menu resetting functionality until a settings change is confirmed via the front panel by selecting USE (F1), a setting change or scheme is downloaded from the PC to the control, or the Protection Profile is changed.

Selecting REVERT (F2) does not re-enable the MMI Menu resetting functionality.

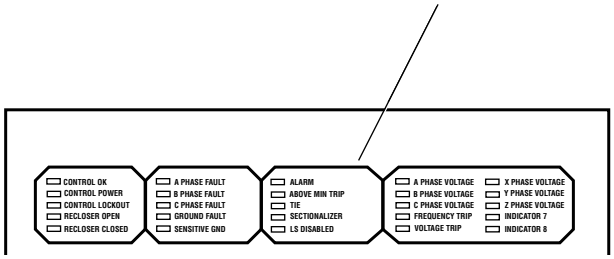
This section of the manual is designed to familiarize you with the structure and operation of the front panel of the Form 6 control.

Status Indication and Control Programming

Form 6
25 Status Indicator LEDs



Form 6-LS
25 Status Indicator LEDs



The top section of the front panel provides the status and interrogation tools to access Form 6 recloser control information. Twenty-five status indicator LEDs provide instant information on the control and recloser status.

CONTROL OK: Indicates the control is operating normally and not in a control alarm state.

CONTROL POWER: Indicates there is adequate VTC voltage to trip the recloser. *Does not indicate the presence of AC or battery power.*

CONTROL LOCKOUT: The green LED indicates the control is in a locked out state, i.e. a reclosing sequence is not in progress. This LED does not indicate that the recloser is open.

RECLOSER OPEN: Indicates the recloser is in the open position.

RECLOSER CLOSED: Indicates the recloser is in the closed position.

Note: There are several conditions that will cause the alternate blinking of the CONTROL LOCKOUT, RECLOSER OPEN, and RECLOSER CLOSED LEDs: Failure to Trip, Failure to Close, Interrupter Malfunction, and 52a/b Disagreement.

The LED blinking pattern for these conditions is the CONTROL LOCKOUT green LED and RECLOSER CLOSED red LED alternating with the RECLOSER OPEN green LED. In addition to the above LED blinking pattern, the red ALARM LED will also be illuminated for these alarms: Failure to Trip, Failure to Close, and Interrupter Malfunction.

A PHASE FAULT, B PHASE FAULT, C PHASE FAULT: Indicates A, B, and/or C phase current was either the maximum phase current or within 20% of the maximum when a trip signal was issued.

GROUND FAULT, SENSITIVE GROUND FAULT: Indicates that a Ground and/or Sensitive Earth Fault overcurrent element was active at the time the trip signal was issued.

ALARM: Indicates an alarm has been asserted. Review the Alarm Log & Status submenu on the front panel LCD display.

ABOVE MINIMUM TRIP: Current detected is above an overcurrent minimum trip setting.

A PHASE VOLTAGE, B PHASE VOLTAGE, C PHASE VOLTAGE: Indicates a presence of source-side voltage on the respective phases. The “V present (kV pri)” setting controls the voltage indication for these front panel LEDs as defined in the System Configuration setting dialog box. Refer to **Configure - System Configuration** section of this manual.

Note: For a Form 6-LS control, these LEDs are controlled by the Voltage Controls settings in the Loop Scheme Settings dialog box. A, B, and C phase is Source I for the Form 6-LS control. Refer to **Form 6 Loop Scheme Control** in **Section 5** for additional information.

FREQUENCY TRIP: Indicates the recloser tripped due to an under or overfrequency condition.

VOLTAGE TRIP: Indicates the recloser tripped due to an under or over voltage condition.

These statuses are only indicated on the standard Form 6 Control:

INDICATOR 1, INDICATOR 2, INDICATOR 3, INDICATOR 4, INDICATOR 5, INDICATOR 6, INDICATOR 7, INDICATOR 8: Customizable LEDs that are used with functions programmed through the Idea Workbench customizing software.

These statuses are only indicated on the Form 6-LS Control:

TIE: Indicates the control is in tie mode and responding to voltage conditions on Source I and Source II.

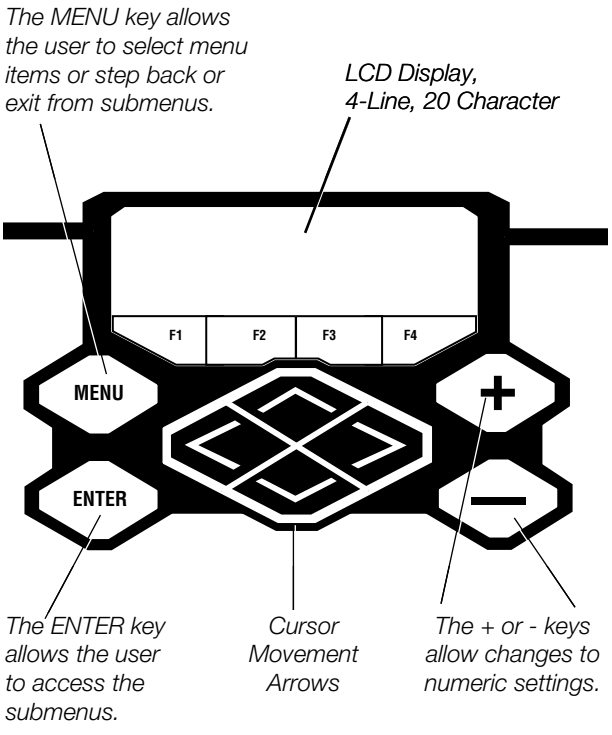
SECTIONALIZER: Indicates the control is in sectionalizing mode and is responding to voltage conditions on Source I.

LS DISABLED: Indicates the LS accessory is not active.

X PHASE VOLTAGE, Y PHASE VOLTAGE, Z PHASE VOLTAGE: For a Form 6-LS control, these LEDs are controlled by the Voltage Controls settings in the Loop Scheme Settings dialog box. These LEDs indicate Source II (load) voltage is present on X, Y, or Z phase and indicate the phase(s) that initiated the LS functionality.

INDICATOR 7, INDICATOR 8: Customizable LEDs that are used with functions programmed through the Idea Workbench customizing software.

LCD Menu Display



The LCD display is a 4 line, 20-character wide display with dedicated cursor control and menu maneuvering buttons that provide the user access to all settings, targets, and measurements. Most settings can be changed directly from the operator panel without the interface software.

Note: Only four line items appear on the LCD display at one time. Moving the cursor down from the fourth line will shift the line items up one line at a time.

LCD Display: A 4-line, 20-character display. The LCD display panel contrast is field-adjustable to allow for various mounting heights and applications: Press the MENU key and then press (+) or (–) key to increase or decrease contrast.

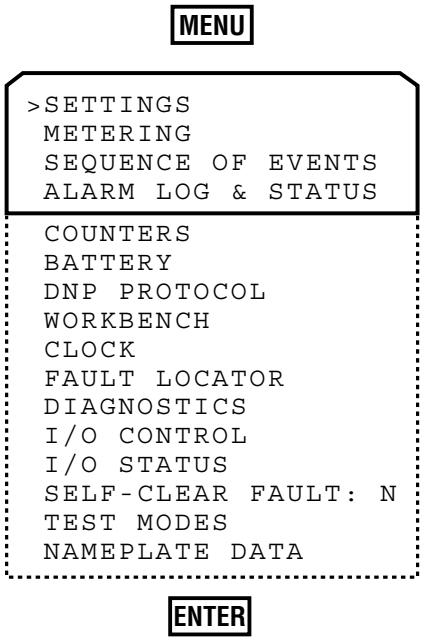
Four LCD Navigation Buttons: **MENU, ENTER, +, –**

LCD Menu Command Selection Keys **(F1, F2, F3, F4)**: Select, accept, or cancel LCD menu commands.

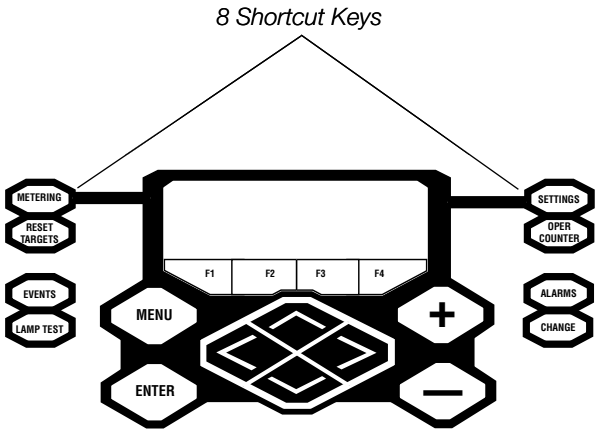
Four Cursor Movement Arrows: Move the cursor left <, right >, up ^, down v.

The current location on the menu is indicated by a cursor (>). To choose a menu item, shift the cursor to the item and press the **ENTER** key. The appropriate submenu opens.

Refer to the **Front Panel Operation** section of this manual for information regarding each Menu item.



LCD Menu Shortcut Keys



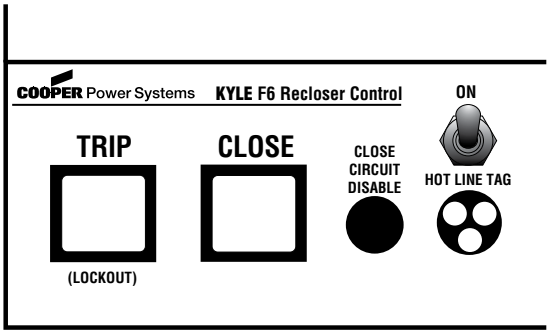
Eight “one-touch” shortcut keys for one-button access to a variety of control and monitoring functions that appear in the LCD display. Pressing these buttons is a shortcut to accessing functions without scrolling through the LCD menus.

- METERING: Displays the systems instantaneous metering values for current and voltage.
- RESET TARGETS: Resets fault targets immediately (regardless of any programmed intentional time delay).

  Note: If the fault resulting in the target is still present, the target resets and immediately indicates again.
- EVENTS: Displays the last 25 SOE events.
- LAMP TEST: Illuminates all operator panel LEDs for verification of proper operation. Enables the text message display feature.
- SETTINGS: Modify or View settings on the LCD display.
- OPER COUNTER: Displays the total number of trip operations, target operations, and resets all counters.
- ALARMS: Provides status for all recloser alarms.
- CHANGE: Must be pressed to enable the nine function keys (OPTION pushbuttons).

  Note: The CHANGE mode is a 10 second period in which one function setting can be changed. If no change is made in that time, the control front panel returns to the root menu.

Recloser Operation and Function Keys



The bottom section of the front panel contains operation and function tools for the Form 6 recloser control:

- TRIP Pushbutton: Trips the recloser from the operator panel. The recloser opens and the control enters a lockout state, preventing any further automatic reclosing operations.
- CLOSE Pushbutton: Returns the control to the initial or home sequence position and closes the recloser. The control is ready for a new trip/reclose sequence.

  Note: Pressing the CLOSE pushbutton from the Lockout position initiates Cold Load Pickup (CLPU) protection, if the feature is enabled.

  The user does have the ability to block COLD LOAD PICKUP through the LCD menu or by configuring one of the Option one-touch function keys via the Idea Workbench feature in ProView.

  If the recloser is closed, pushing and holding the CLOSE pushbutton does not activate the Cold Load Pickup feature.
- CLOSE CIRCUIT DISABLE: Provides a visible disconnect in the closed circuit. Removing the 15 Amp fuse disables all electrical closing of the recloser. Refer to the appropriate Form 6 control installation manual for additional information on Close Circuit Disable.

WARNING: Hazardous voltage. Do not use Hot Line Tag as a substitute for a visible disconnect. Always establish a visible disconnect prior to performing any work requiring a de-energized line. Failure to comply may cause death, severe personal injury, or equipment damage. T276.0

IMPORTANT: Hot Line Tag activation does not cause the recloser to trip open. It only prevents the recloser from closing.

IMPORTANT: Hot Line Tag is intended solely for live-line work applications, such as maintenance, repairs or improvements to the distribution system, that occur while the line remains energized.

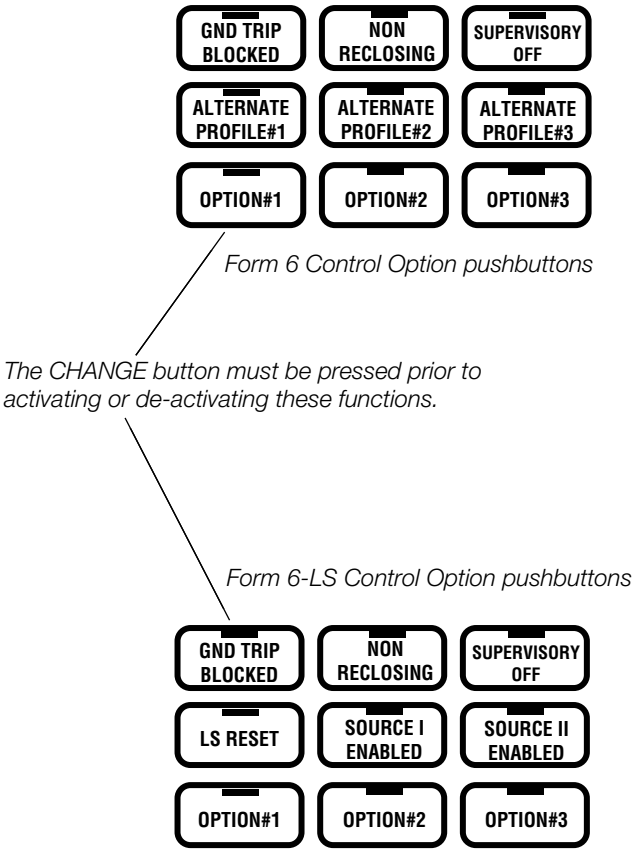
- HOT LINE TAG: Hot Line Tag is provided for live-line work applications. All closing operations are disabled when the Hot Line Tag feature is activated.

  Hot Line Tag prevents all closing attempts and shifts protection to one trip-to-lockout on the composite curve of the Hot Line Tag definite time and the TCC1 curve (which ever is faster). Hot Line Tag takes precedence over Cold Load Pickup and Fast Trips Disabled.

  Hot Line Tag can be enabled from multiple sources (front panel switch, SCADA, or Hardware Workbench); all must be in a de-asserted (OFF) state to de-activate Hot Line Tag.

  Refer to the appropriate Form 6 control installation manual for additional information on Hot Line Tag.

Nine Option Pushbuttons



- GROUND TRIP BLOCKED: Blocks ground trip fault operation.

  Note: When the Ground Trip Blocked feature is Enabled, the Sensitive Earth Fault feature is Disabled.

- NON-RECLOSING: Disables any automatic reclosing operations. Non-reclosing does not alter the active time-current curve (TCC).
- SUPERVISORY OFF: Blocks the ability of the recloser to respond to supervisory commands sent by serial communication ports or hardwired inputs. In the default Form 6 control scheme, Hot Line Tag can still be activated when Supervisory is active.
- OPTION 1 through OPTION 3: These option pushbuttons are customizable through the Idea Workbench. Refer to the appropriate Form 6 control installation manual for instructions on labeling customized options.

These option pushbuttons are only available on the standard Form 6 Control:

- ALTERNATE PROFILES 1, 2, 3: The Form 6 control has a "Normal" profile and three “Alternate” profiles that change all protection parameters for the control. If Alternate profile 1, 2, or 3 is active, the corresponding option pushbutton LED illuminates. Normal profile is active, when all of the Alternate profile option pushbutton LEDs are not illuminated. Only one profile is active at any time.

These option pushbuttons are only available on the Form 6-LS Control:

Note: Refer to **Form 6 Loop Scheme Control** in **Section 5** for additional information.

- LS RESET: Resets the LS function, so the control is ready to respond to the next loss of voltage occurrence.
- SOURCE I ENABLED: The control is in LS mode and responding to voltage conditions on Source I (Source side - Phases A, B, and C).
- SOURCE II ENABLED: The control is in LS mode and responding to voltage conditions on Source II (Load side - Phases X, Y, and Z).

IMPORTANT: If the power save feature is enabled (default), and more than five minutes elapses since the last panel operation, all the LEDs, except HOT LINE TAG (if active), will turn off.

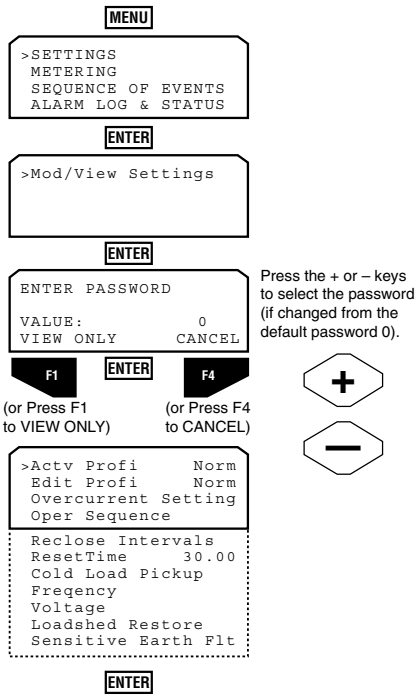
Section 2: Front Panel Operation

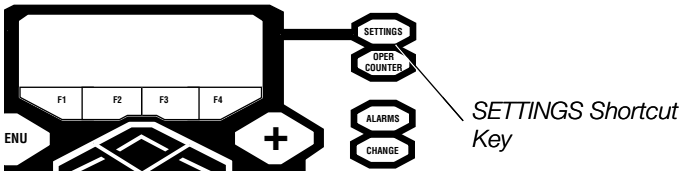
This section describes front panel programming only. Refer to **Section 4: Form 6 Control Schemes** for descriptions of the full complement of programmable functions.

CAUTION: System misoperation. The process of downloading a new scheme or settings will cause this device to stop functioning as a protective device for a period of approximately 8 seconds. Safe operating practices must be observed while downloading schemes or settings. Failure to comply can result in system misoperation. T299.1

CAUTION: Protective equipment misoperation. Before downloading configuration files or settings to the equipment, verify that the files and settings are correct for the location and application. Downloading configuration files or settings designed for a different location or application can result in severe personal injury and equipment damage. G133.1

Settings Menu





Note: Pressing the ENTER button while in any menu with a setting change option (even if a setting change had not actually been made) will disable the MMI Menu resetting functionality until a settings change is confirmed via the Front Panel by selecting USE (F1), a setting change or scheme is downloaded from the PC to the control, or the Protection Profile is changed.

Selecting REVERT (F2) does not re-enable the MMI Menu resetting functionality.

The Settings menu allows viewing and modification of settings for all protection profiles in the Form 6 recloser control.

Note: The Active Profile and the profile to be edited are both displayed. Changes are made to the profile displayed in the Edit Profile line of the LCD.

If Alternate profile 1, 2, or 3 is active, the corresponding option pushbutton LED illuminates. Normal profile is active when none of the Alternate profile option pushbutton LEDs are illuminated.

Only one profile is active at any time.

To access the SETTINGS Menu in VIEW ONLY mode:

1. Move the cursor (>) to SETTINGS or press the SETTINGS shortcut key.
2. Press ENTER.
3. The >MOD/VIEW SETTINGS screen appears. Press ENTER.
4. The ENTER PASSWORD screen appears. Press F1 to enter VIEW ONLY mode.
5. Choose the applicable setting to View.
6. Press ENTER.

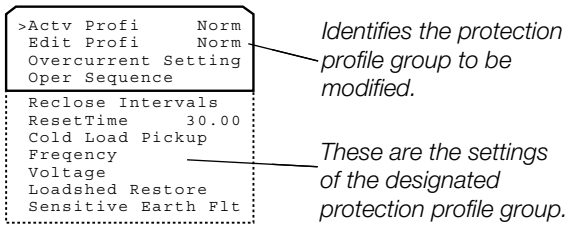
To access the SETTINGS Menu in MODIFY mode:

1. Move the cursor (>) to SETTINGS or press the SETTINGS shortcut key.
2. Press ENTER.
3. The >MOD/VIEW SETTINGS screen appears. Press ENTER.
4. Press ENTER.
5. The ENTER PASSWORD screen appears. Press ENTER.

   Note: Password default is zero (0). Refer to **MMI Setup and Password** section of this manual to change the password.
6. Choose the applicable setting to Modify.
7. Press ENTER.

Note: As a shortcut, the SETTINGS menu can also be accessed from the SETTINGS shortcut key on the front panel.

Modify Protection Profile Group



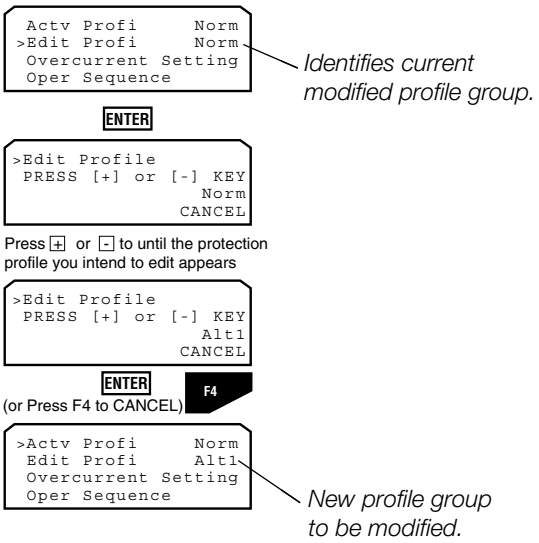
The EDIT PROFI setting shows the protection profile to be modified in the control. You can toggle between the different protection profiles available in the Form 6 control. Each protection profile group (Normal, Alternate Profile #1, Alternate Profile #2, Alternate Profile #3) contains the settings shown in the SETTINGS>MOD/VIEW SETTINGS submenu. The line items listed under EDIT PROFI are the settings of the profile group to be modified.

Note: Only four line items appear on the LCD display at one time. Moving the cursor down from the fourth line will shift the line items up one line at a time.

To change the protection profile group to be modified:

1. Use the cursor movement key (^ or v) and place the cursor (>) next to the EDIT PROFI line item in the LCD display.
2. Press ENTER.
3. Press **(+)** or **(–)** keys to toggle to the appropriate protection profile.
4. Press ENTER to accept the change or press F4 to CANCEL the command.

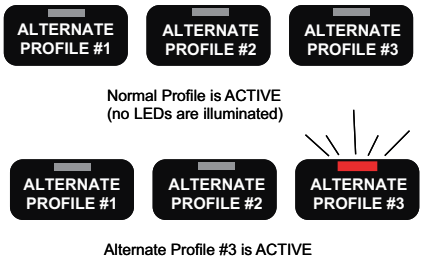
You have returned to the SETTINGS list.



IMPORTANT: The settings displayed on the front panel LCD are the Edit Profile Group settings. To view the Active Profile Group settings, the EDIT PROFI line must be set to match the ACTV PROFI line on the LCD.

The EDIT PROFI line item now displays the new profile group to be modified.

Overcurrent Protection Settings

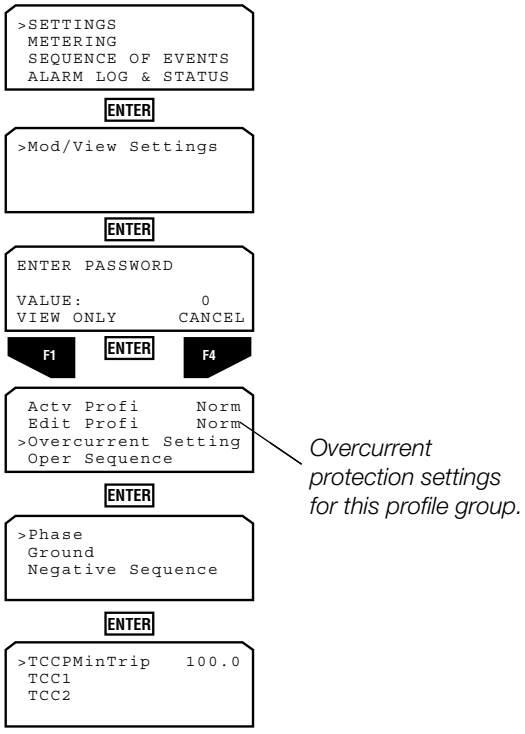


Normal profile is active, when none of the Alternate Profile option pushbutton LEDs are illuminated.

To activate an Alternate Overcurrent Protection profile:

1. Press CHANGE key on front panel.
2. Select either ALTERNATE PROFILE 1, 2, or 3.

Within approximately three seconds, the selected Alternate Profile LED illuminates.



The Overcurrent Settings submenu displays the Phase, Ground, and Negative Sequence overcurrent protection settings for TCC1 and TCC2.

IMPORTANT: The settings displayed on the front panel LCD are the Edit Profile Group settings. To view the Active Profile Group settings, the EDIT PROFI line must be set to match the ACTV PROFI line on the LCD.

Each of these submenus (phase ground, and negative sequence) shows:

- The overcurrent minimum trip value
- Provides access to submenus TCC1 and TCC2, and their respective operation parameters:
  - Selected TCC
  - Multiplier Settings
  - Adder Settings
  - Minimum Response Time Adder Settings
  - High Current Trip Settings

These settings can be modified from the front panel or the interface software. Following is a brief description of each.

Note: The Form 6 recloser control is a three-phase device; all three phases trip simultaneously on the settings programmed.

Minimum Trip (for Phase, Ground, and Negative Sequence)

Minimum Trip defines the minimum current necessary to begin timing on the programmed time-current curve.

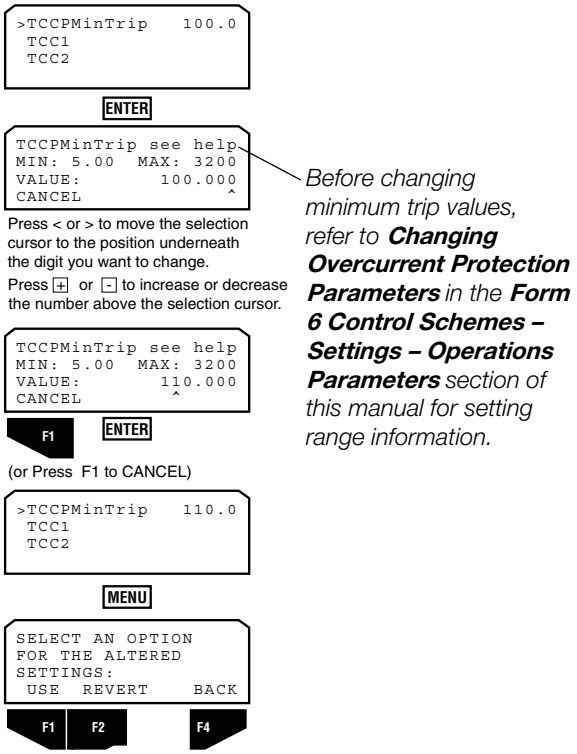
Note: "P" applies to Phase, "G" applies to Ground, and "Q" applies to Negative Sequence.

Each Minimum Trip LCD screen will show:

- the unit of measurement in primary Amperes
- the minimum to maximum input value range
- the Minimum Trip setting value (can be changed from the front panel)

Note: Phase, Ground, and Negative Sequence Tripping can be independently disabled with the ProView interface software.

CAUTION: Equipment damage. Verify the maximum short time recloser limit for the recloser type prior to changing minimum trip values. Refer to *Reference Data R280-91-34*. Failure to do so can cause damage to the recloser under load conditions. T310.0

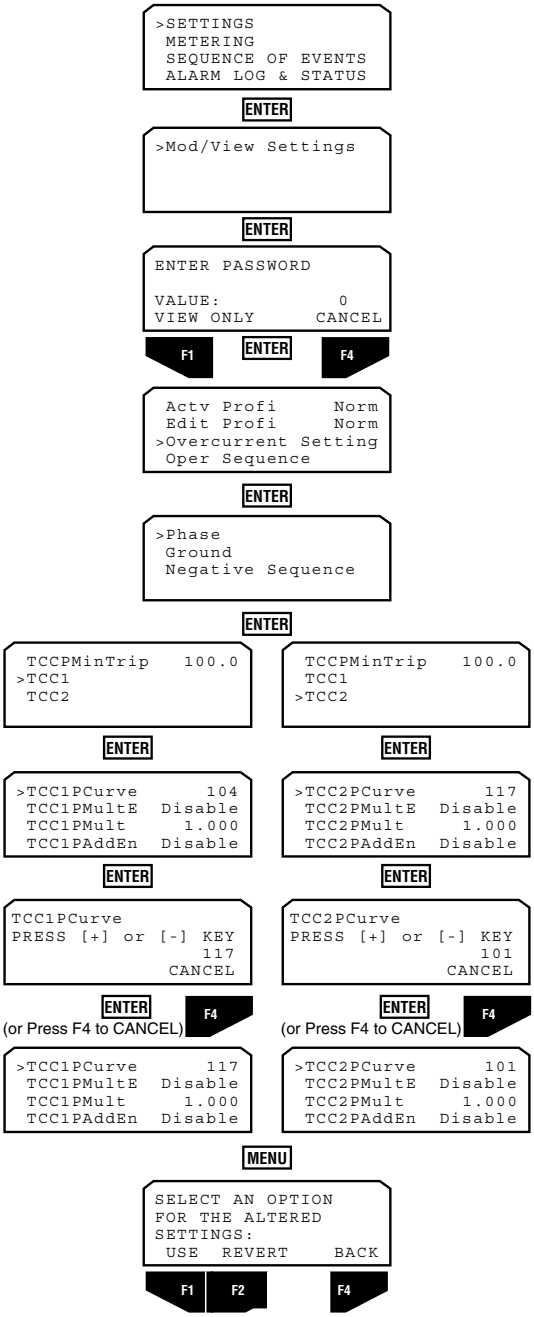


The diagram at the left shows the screen process of setting the applicable Minimum Trip for phase.

IMPORTANT: Always verify the minimum trip values are appropriate for the programmed CT Ratio.

Note: The screen setup is the same for Phase, Ground, and Negative Sequence.

Curve Selection for TCC1 and TCC2



IMPORTANT: Pressing the ENTER button while in any menu with a setting change option (even if a setting change had not actually been made) will disable the MMI Menu resetting functionality until a settings change is confirmed via the front panel by selecting USE (F1), a setting change or scheme is downloaded from the PC to the Form 6 control, or the Protection Profile is changed.

Selecting REVERT (F2) does not re-enable the MMI Menu resetting functionality.

The TCC1 and TCC2 series of screens allow you to program the Form 6 control with the settings associated with specific curve characteristics for the TCC1 and TCC2 curve shapes. These screens give the user access to 45 standard time-current curves, plus five custom curves and curve modifiers.

The Form 6 control ProView interface software contains dialog boxes where you can launch TCC Editor II and customize these curves. Refer to **Using TCC Editor II** section of this manual.

Screens TCC1 and TCC2 (Phase, Ground, and Negative Sequence) settings define the characteristics of the following time-current curves: Kyle TCCs 101 through 202, along with a Constant (1 second definite time) TCC; ANSI Moderately Inverse, Very Inverse, Extremely Inverse; IEC Inverse, Very Inverse, Extremely Inverse; and 5 custom curves identified as USER1 through USER5.

Note: The user curves are definable using the TCC Editor II through the interface software.

Note: "P" applies to Phase, "G" applies to Ground, and "Q" applies to Negative Sequence.

The diagram at the left shows the screen process of selecting a phase curve for use as TCC1 or TCC2. This process is the same for selecting ground and negative sequence curves for TCC1 and TCC2.

Inverse Time Characteristics

The ANSI and IEC Form 6 control curves are derived based on the following equations:

Trip Time:

$$T_t = TM \times \left(\frac{A}{M^P - 1} + B \right)$$

When Disk-like reset is selected for the ANSI curve shapes, the reset time is determined by the following formula:

$$T_r = TM \times \left(\frac{RCC}{M^2 - 1} \right)$$

Where:

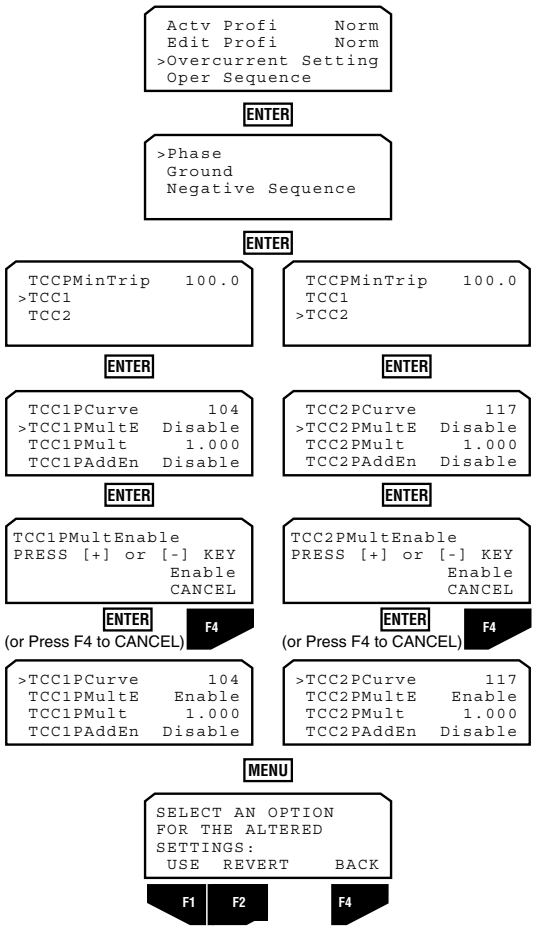
M = Multiples of pickup

TM = Time multiplier setting

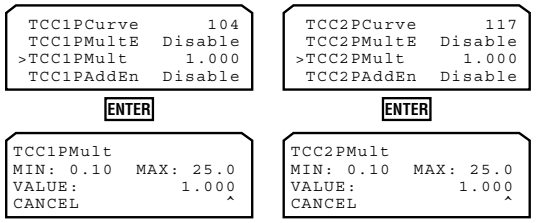
Curve Type	A	B	P	RCC
ANSI MI	0.0515	0.114	0.02	4.85
ANSI VI	19.61	0.491	2.0	21.6
ANSI EI	28.2	0.1217	2.0	29.1
IEC INV	0.14	0	0.02	N/A
IEC VI	13.5	0	1.0	N/A
IEC EI	80.0	0	2.0	N/A

Multiplier for TCC1 and TCC2

To Enable Multiplier:

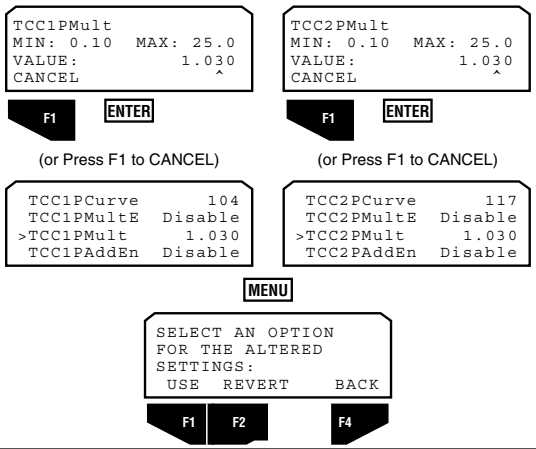


To Set Multiplier:



Press < or > to move the selection cursor to the position underneath the digit you want to change.

Press + or - to increase or decrease the number above the selection cursor.



The Multiplier settings define a Time Multiplier to modify the position of the original TCC in time-current space and the ability to enable the multiplier. With the Time Multiplier enabled, the trip time of a given TCC at the measured current is shifted vertically in time by the specific multiplier.

For example, if a curve has an operation time of 40 milliseconds, and a multiplier of 2, the “modified” operation time would be 80 milliseconds.

40 ms x 2 = 80 ms

Similarly, if the same curve has an operation time of 5 seconds, the Multiplier produces a modified time of 10 seconds.

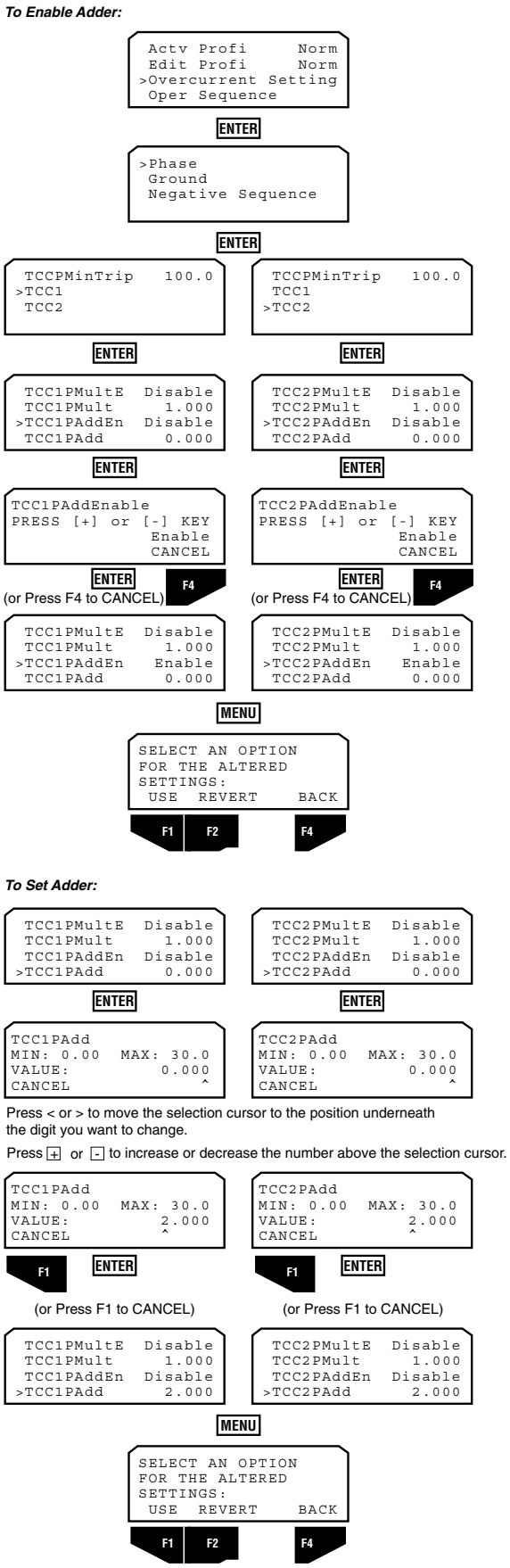
5 seconds x 2 = 10 seconds

Note: These curve modifications can be predefined and viewed in TCC Editor II and imported using the ProView interface software included with the Form 6 control.

The diagram at the left shows the screen process of selecting a Multiplier for the phase curves selected as TCC1 or TCC2. This process is the same for selecting a Multiplier for the ground and negative sequence curves selected as TCC1 and TCC2.

When you select the Multiplier parameter, the minimum and maximum selection limits of the setting are displayed.

Adder for TCC1 and TCC2



The Adder settings define a Time Adder to modify the position of the original TCC in time-current space and the ability to enable the Adder. With the Adder enabled, the trip time of a given TCC at a measured current is shifted in time by the specified additional time. In contrast to the Time Multiplier, the Adder adds a constant time to the curve, regardless of the unmodified curve operating time.

For example, if a curve has an operate time of 40 ms and a 1 second time adder, the modified operate time is 1.040 seconds.

0.040 seconds + 1 second = 1.040 seconds

Similarly, if the same curve has a multiplier of 2 producing an operate time of 5 seconds, the one second time adder produces a modified time of 6 seconds.

5 seconds (2.5 seconds x 2) + 1 second = 6 seconds

Note: The Time Multiplier takes precedence over the Time Adder.

Note: These curve modifications can be predefined and viewed in TCC Editor II and imported using the ProView Interface software included with the Form 6 control.

The diagram at the left shows the screen process of selecting an Adder for the phase curves selected as TCC1 and TCC2. This process is the same for selecting an Adder for the ground and negative sequence curves selected as TCC1 and TCC2.

When you select the Adder parameter, the minimum and maximum selection limits of the setting are displayed.

Minimum Response Time Adder for TCC1 and TCC2

To Enable MRTA:

```
 Actv Profi     Norm
 Edit Profi     Norm
>Overcurrent Setting
 Oper Sequence
```

ENTER

```
>Phase
 Ground
 Negative Sequence
```

ENTER

```
 TCCPMinTrip   100.0
>TCC1
 TCC2
```

ENTER

```
 TCC1PAddEn  Disable
 TCC1PAdd      0.000
>TCC1PMRTAE  Disable
 TCC1PMRTA     0.013
```

ENTER

```
TCC1PMRTAEnable
PRESS [+] or [-] KEY
               Enable
               CANCEL
```

ENTER (or Press F4 to CANCEL) F4

```
 TCC1PAddEn  Disable
 TCC1PAdd      0.000
>TCC1PMRTAE   Enable
 TCC1PMRTA     0.013
```

```
 TCCPMinTrip   100.0
 TCC1
>TCC2
```

ENTER

```
 TCC2PAddEn  Disable
 TCC2PAdd      0.000
>TCC2PMRTAE  Disable
 TCC2PMRTA     0.013
```

ENTER

```
TCC2PMRTAEnable
PRESS [+] or [-] KEY
               Enable
               CANCEL
```

ENTER (or Press F4 to CANCEL) F4

```
 TCC2PAddEn  Disable
 TCC2PAdd      0.000
>TCC2PMRTAE   Enable
 TCC2PMRTA     0.013
```

MENU

```
SELECT AN OPTION
FOR THE ALTERED
SETTINGS:
 USE  REVERT    BACK
```

F1 F2 F4

To Set MRTA:

```
 TCC1PAddEn  Disable
 TCC1PAdd      0.000
 TCC1PMRTAE  Disable
>TCC1PMRTA     0.013
```

ENTER

```
TCC1PMRTA
MIN: 0.01  MAX: 1.00
VALUE:          0.013
CANCEL               ^
```

```
 TCC2PAddEn  Disable
 TCC2PAdd      0.000
 TCC2PMRTAE  Disable
>TCC2PMRTA     0.013
```

ENTER

```
TCC2PMRTA
MIN: 0.01  MAX: 1.00
VALUE:          0.013
CANCEL               ^
```

Press < or > to move the selection cursor to the position underneath the digit you want to change.

Press [+] or [-] to increase or decrease the number above the selection cursor.

```
TCC1PMRTA
MIN: 0.01  MAX: 1.00
VALUE:          0.015
CANCEL               ^
```

F1 ENTER (or Press F1 to CANCEL)

```
TCC2PMRTA
MIN: 0.01  MAX: 1.00
VALUE:          0.015
CANCEL               ^
```

F1 ENTER (or Press F1 to CANCEL)

```
 TCC1PAddEn  Disable
 TCC1PAdd      0.000
 TCC1PMRTAE  Disable
>TCC1PMRTA     0.015
```

```
 TCC2PAddEn  Disable
 TCC2PAdd      0.000
 TCC2PMRTAE  Disable
>TCC2PMRTA     0.015
```

MENU

```
SELECT AN OPTION
FOR THE ALTERED
SETTINGS:
 USE  REVERT    BACK
```

F1 F2 F4

The Minimum Response Time Adder (MRTA) settings define a minimum response time that modifies the shape of the original TCC in time-current space and the ability to enable the MRTA.

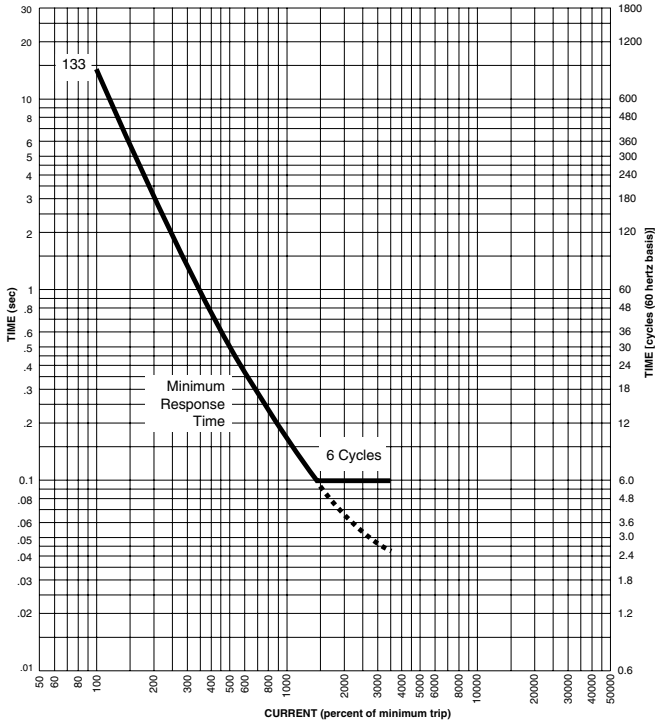
When enabled, the minimum response time of a given TCC can be no less that the value of the MRTA.

Note: These curve modifications can be predefined and viewed in TCC Editor II and imported using the ProView Interface software included with the Form 6 control.

The diagram at the left shows the screen process of selecting a MRTA for the phase curves selected as TCC1 and TCC2. This process is the same for selecting a MRTA for the ground and negative sequence curves selected as TCC1 and TCC2.

When you select the MTRA parameter, the minimum and maximum selection limits of the setting are displayed.

Note: The Minimum Response Time Adder (MRTA) takes precedence over both the Time Multiplier and Time Adder.



High Current Trip Settings for TCC1 and TCC2

The High Current Trip (HCT) settings define a high current trip multiplier, a time delay and an enable setting to modify the shape of the original TCC in time-current space. If HCT is enabled, the shape of the TCC at currents beyond the HCT pickup value is definite time as defined by the HCT time delay.

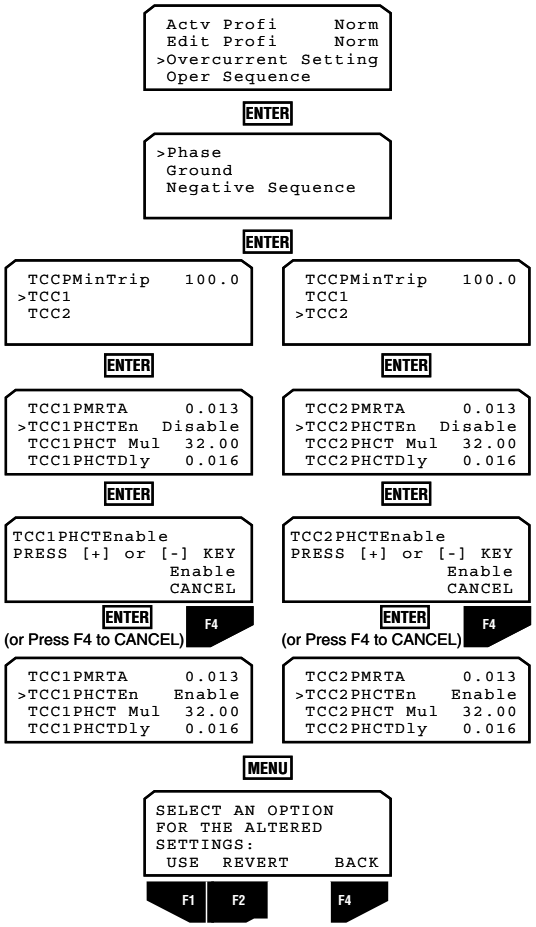
Note: These curve modifications can be predefined and viewed in TCC Editor II and imported using the ProView Interface software included with the Form 6 control.

The diagrams on this page show the screen process of selecting a HCT for the phase curves selected as TCC1 and TCC2. This process is the same for selecting a HCT for the ground and negative sequence curves selected as TCC1 and TCC2.

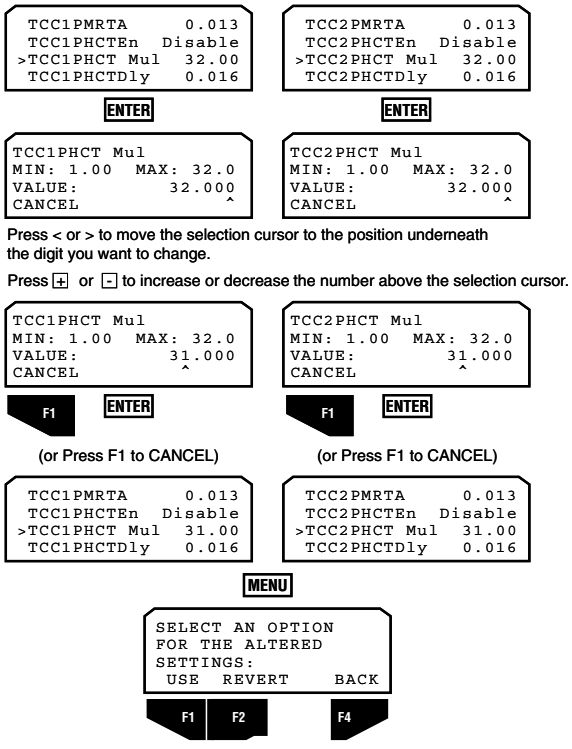
When you select the HCT parameters, the minimum and maximum selection limits of the settings are displayed.

Note: The High Current Trip (HCT) time delay takes precedence over the Time Multiplier, Time Adder, and Minimum Response Time Adder (MRTA).

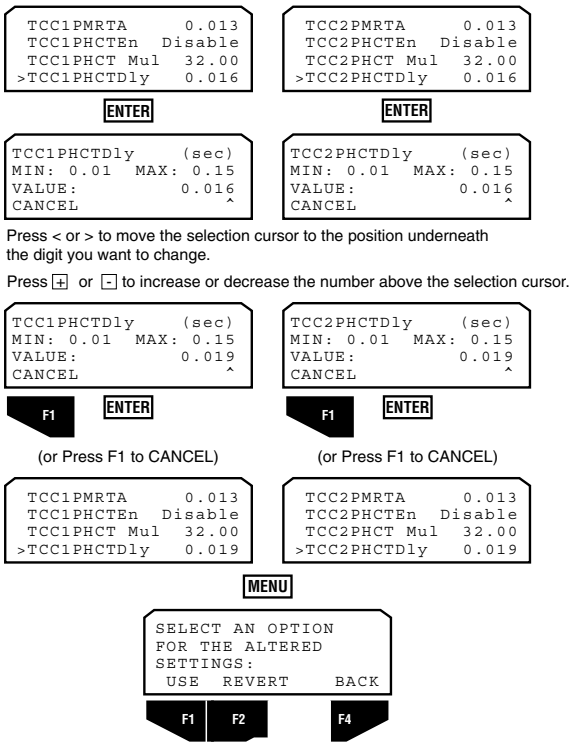
To Enable HCT:



To Set HCT Multiplier:



To Set HCT Time Delay:



Operation Sequence

The Operation Sequence submenu lets you program:

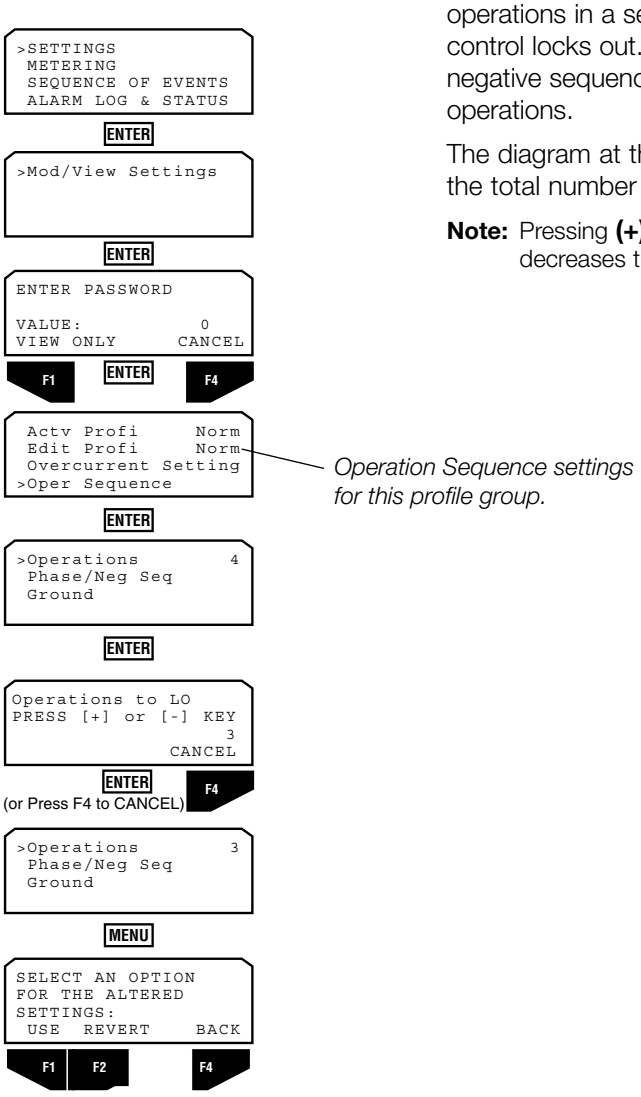
- the operations-to-lockout
- the sequence of overcurrent trip operations for phase/ negative sequence, and ground

Operations-to-Lockout

Operations-to-Lockout defines the maximum number of trip operations in a sequence before the recloser opens and the control locks out. The count includes phase, ground, and negative sequence trips as well as sequence coordination operations.

The diagram at the left shows the screen process of setting the total number of *operations-to-lockout.*

Note: Pressing **(+)** increases the number of operations; pressing **(–)** decreases the number.

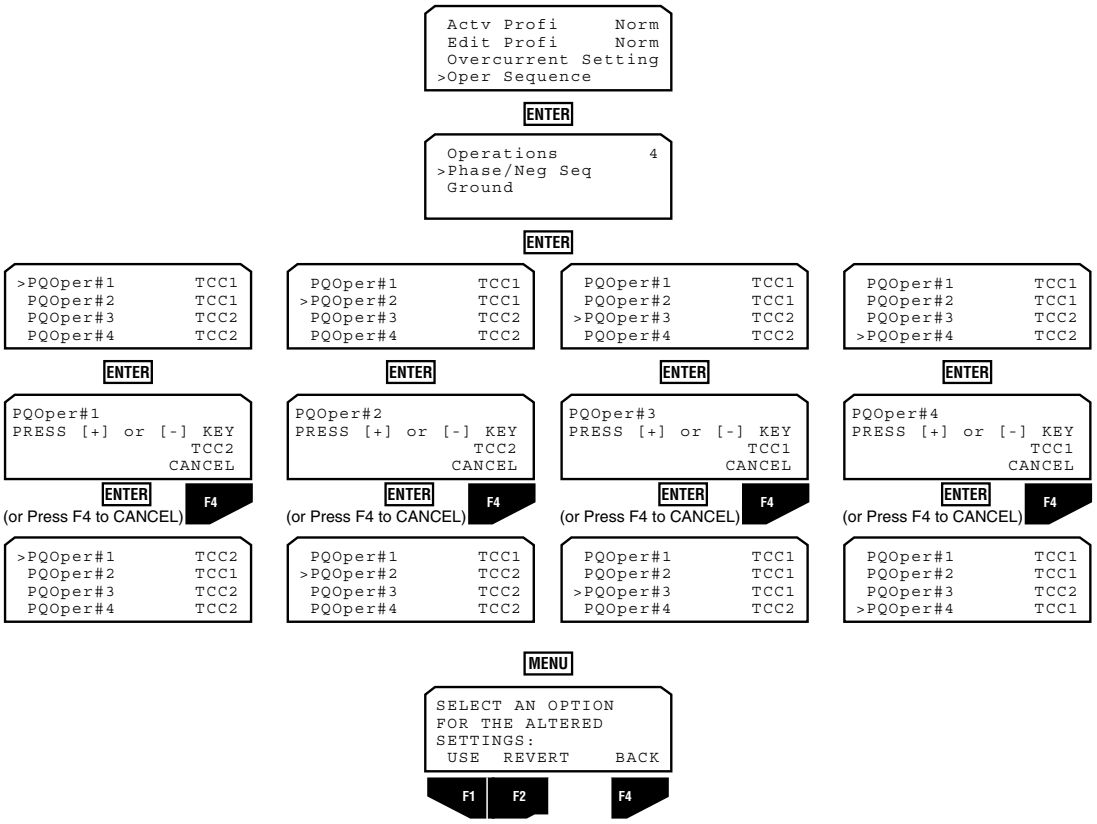


Operation Sequence - Phase/Negative Sequence

Operations Sequence settings for Phase and Negative Sequence define the order in which phase and negative sequence curves designated as TCC1 and TCC2 will trip.

The diagram shows the screen process of selecting the Operation Sequence for Phase/Negative Sequence.

Note: Pressing **(+)** or **(-)** toggles between TCC1 and TCC2.

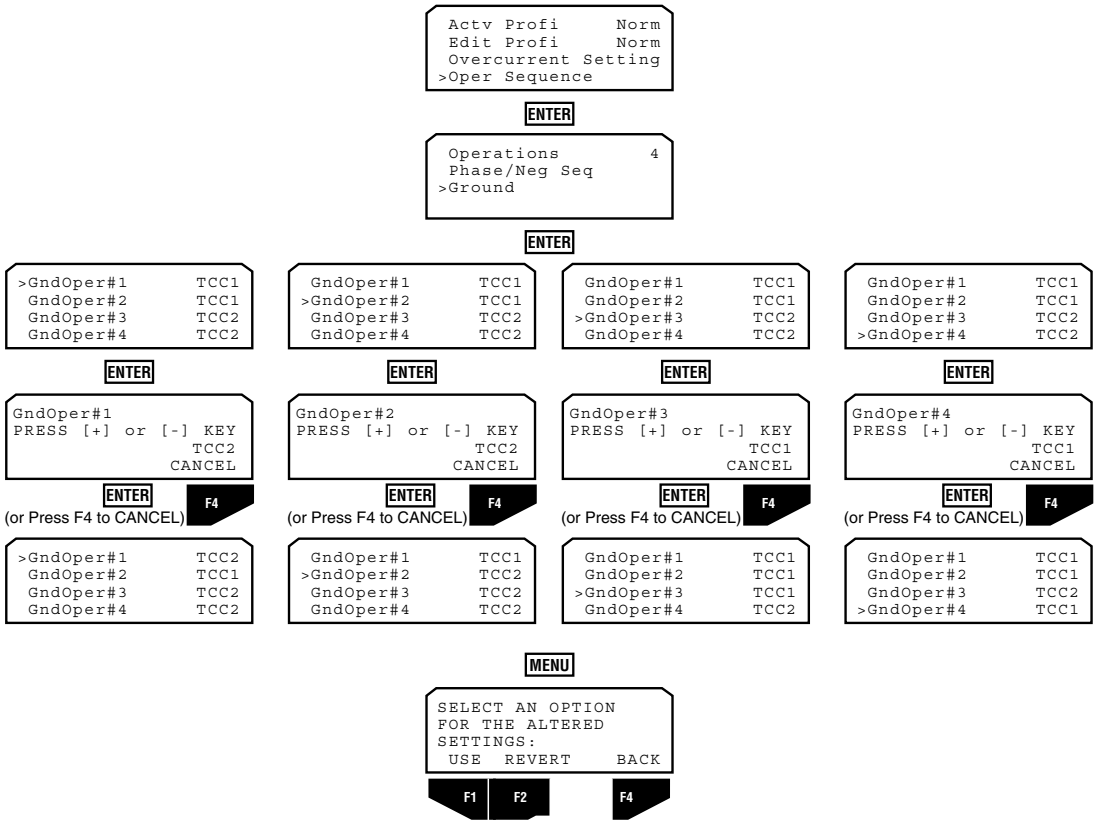


Operation Sequence - Ground

Operations Sequence settings for Ground define the order in which ground curves designated as TCC1 and TCC2 will trip.

The diagram shows the screen process of selecting the Operation Sequence for Ground.

Note: Pressing **(+)** or **(-)** toggles between TCC1 and TCC2.



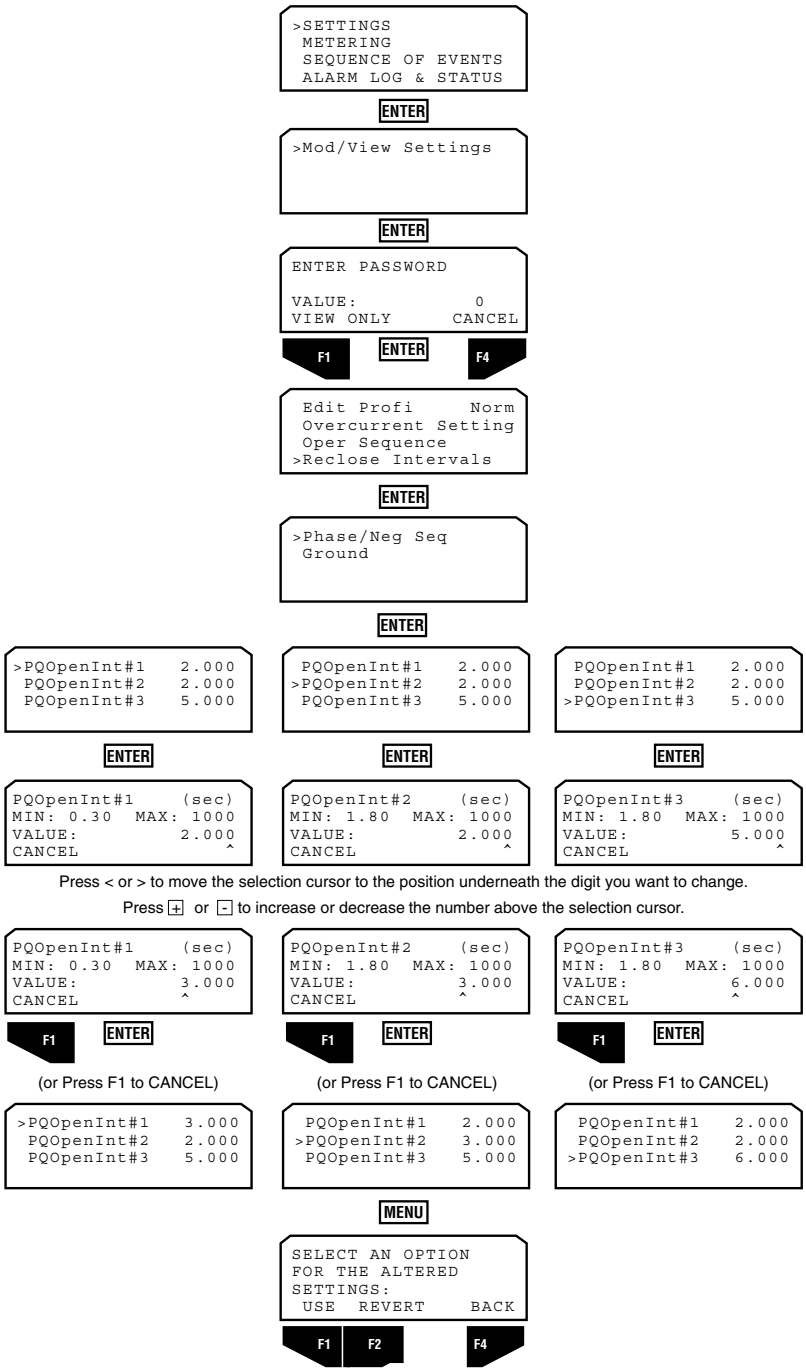
Reclose Intervals

Reclose interval settings define the time the recloser is open following a trip operation, prior to reclosing.

The diagram shows the screen process of setting the Reclose Intervals for Phase/Negative Sequence.

When you select the Phase/Negative Sequence Reclose Interval parameter, the minimum and maximum selection limits of the setting are displayed.

Phase/Negative Sequence

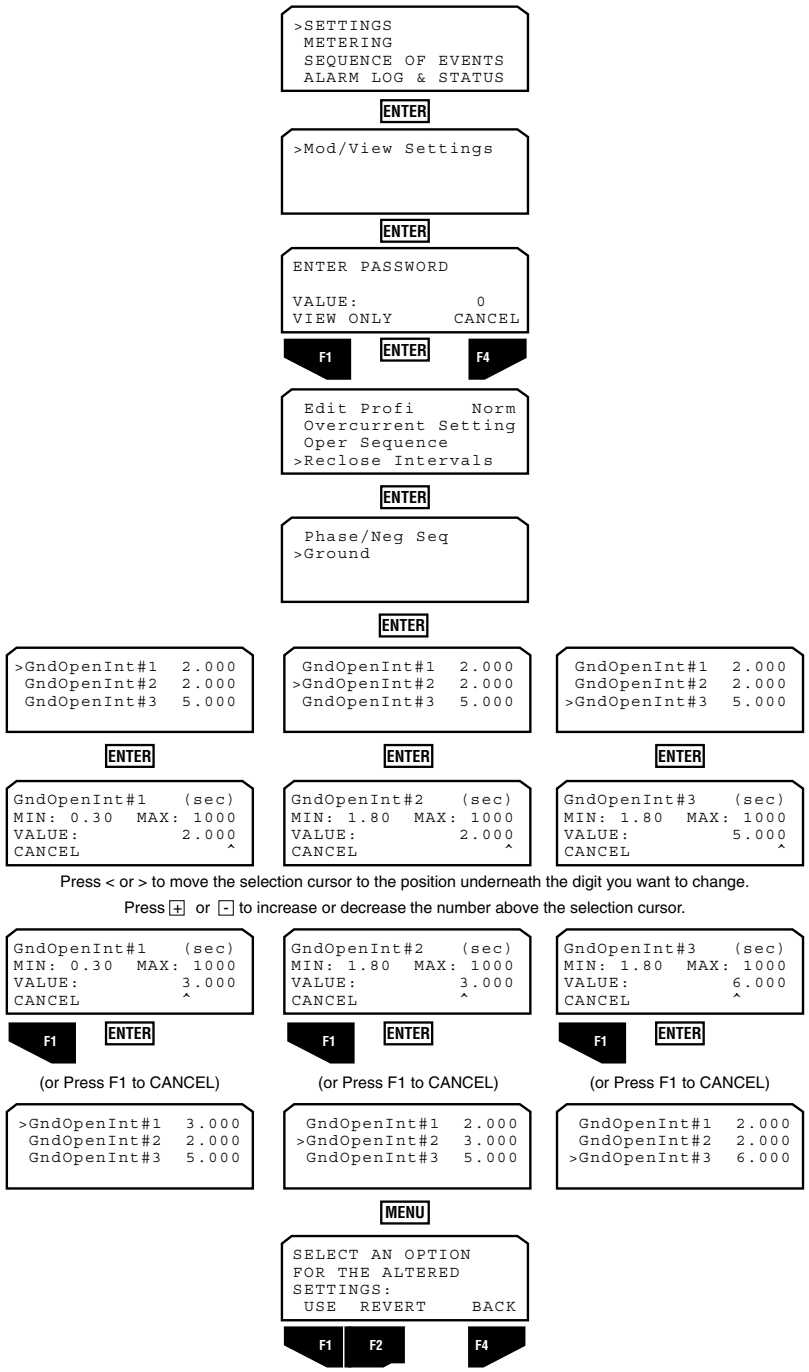


Ground

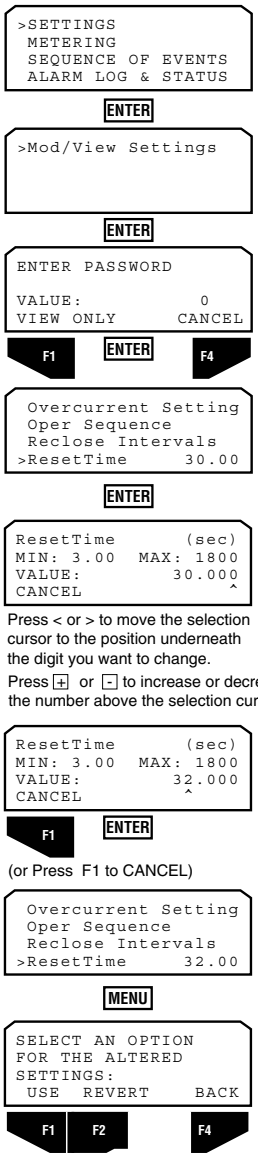
The Reclose Intervals for Ground operation are programmed independent of the Phase/Negative Sequence Reclose Settings.

The diagram shows the screen process of setting the Reclose Intervals for Ground.

When you select the Ground Reclose Interval parameter, the minimum and maximum selection limits of the setting are displayed.



Reset Time

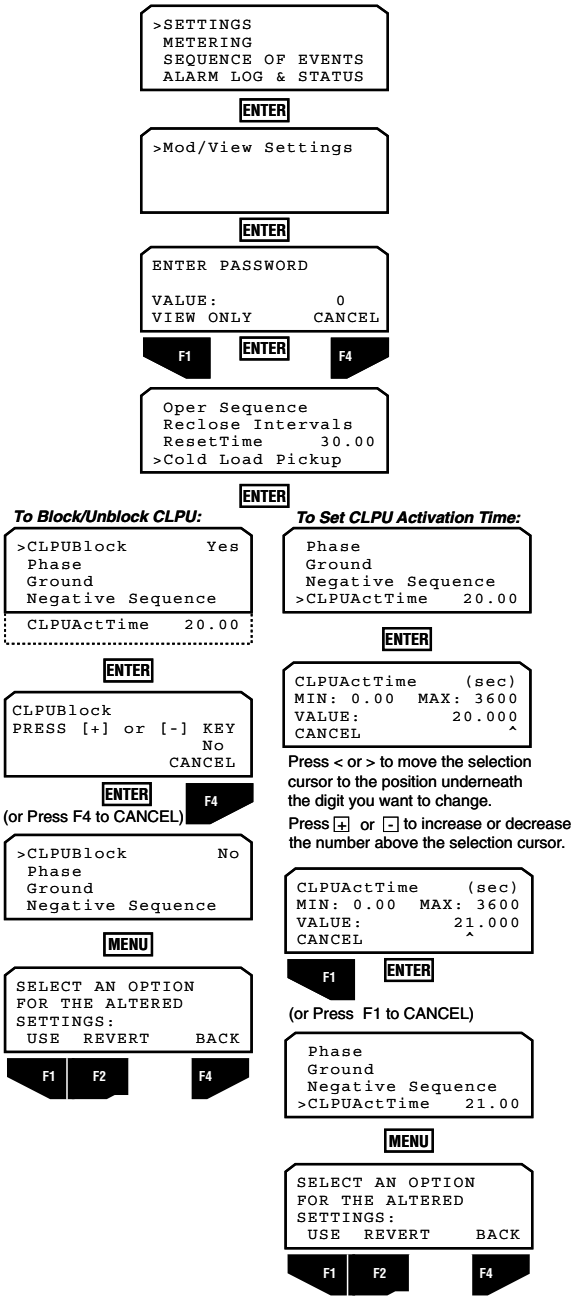


Reset Time is the user-settable time delay that is used by the Form 6 control after a successful reclose to reset the sequence position to zero (“Home” position). Reset after successful reclose occurs when the recloser is closed and no current above an overcurrent minimum trip setting is detected.

The diagram at the left shows the screen process of setting the Reset Time.

When you select the Reset Time parameter, the minimum and maximum selection limits of the setting are displayed.

Cold Load Pickup



Activating Cold Load Pickup

Cold Load Pickup (CLPU) is used to prevent inadvertent trips from occurring during pickup of load current after a sustained outage. The CLPU feature is activated when a CLOSE request is issued to the Form 6 control. The CLPU feature is active for a programmed amount of time. During this activation time, the control will operate on the CLPU settings for minimum pickup and follow the CLPU TCC settings, CLPU reclose interval, and CLPU operations-to-lockout.

Cold Load Pickup LCD screens allows the user to program the Form 6 control with the settings associated with specific curve characteristics when CLPU is active.

Just as in the Overcurrent Protection functions for TCC1 and TCC2, CLPU allows you to modify the minimum trip settings and all TCCs within the curve library (Kyle, ANSI, IEC, and 5 User curves).

Cold Load Pickup modification categories include:

- Minimum Trip
- Selected TCC
- Multiplier Settings
- Adder Settings
- Minimum Response Time Adder Settings
- High Current Trip Settings
- Activation Time Settings

These settings can be modified from the front panel or the interface software. Following is a brief description of each.

Note: The CLPU Operations-to-Lockout, Reclose Interval, Reset Coefficient settings, and High Current Lockout settings can only be modified via the ProView interface software.

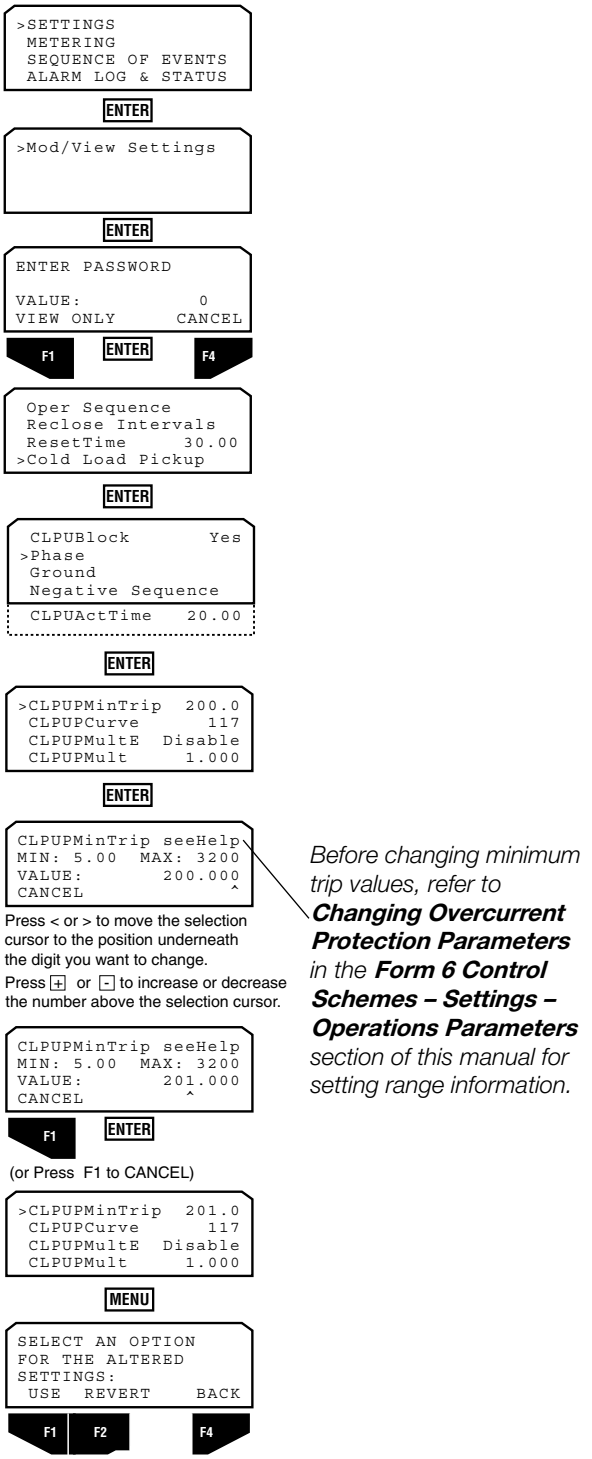
Cold Load Pickup *Blocked* is the default setting from the factory. The above left diagram shows the screen process of *unblocking* CLPU.

CLPU Activation Time

The above left diagram shows the screen process of setting the CLPU Activation Time.

When you select the CLPU Activation Time parameter, the minimum and maximum selection limits of the setting are displayed.

CLPU Minimum Trip (for Phase, Ground, and Negative Sequence)



Before changing minimum trip values, refer to ***Changing Overcurrent Protection Parameters*** *in the* ***Form 6 Control Schemes – Settings – Operations Parameters*** *section of this manual for setting range information.*

The CLPU Minimum Trip defines the minimum CLPU current necessary to begin timing on the programmed CLPU time-current curve when CLPU is active.

Note: "P" applies to Phase, "G" applies to Ground, and "Q" applies to Negative Sequence.

Each CLPU Minimum Trip LCD screen will show:

- the unit of measurement in primary Amperes
- the minimum to maximum input value range
- the Minimum Trip setting value (can be changed from the front panel)

> **CAUTION:** Equipment damage. Verify the maximum short time recloser limit for the recloser type prior to changing minimum trip values. *Refer to Reference Data R280-91-34.* Failure to do so can cause damage to the recloser under load conditions. T310.0

Note: When Hot Line Tag and CLPU are both active the Form 6 control reverts back to the original minimum pick-up values (i.e. disables CLPU settings).

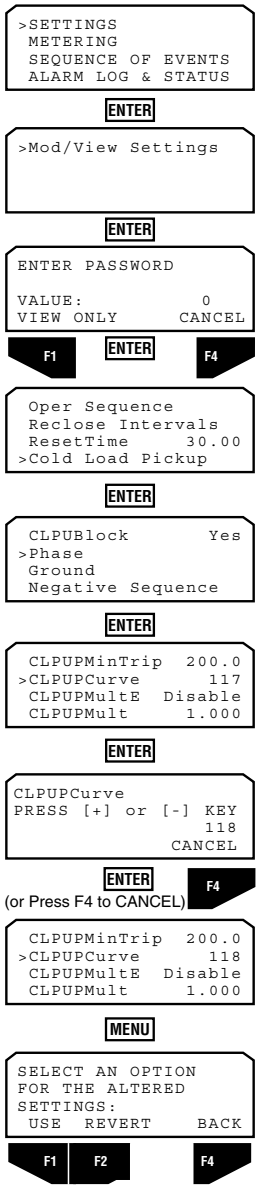
The diagram at the left shows the screen process of setting the applicable CLPU Minimum Trip for phase.

> **IMPORTANT:** Always verify the minimum trip values are appropriate for the CT Ratio.

Note: The screen setup is the same for Phase, Ground, and Negative Sequence.

When you select the CLPU Minimum Trip parameter, the minimum and maximum selection limits of the setting are displayed.

CLPU Curve Selection Screen



The CLPU curve selection screens allow you to program the Form 6 control with the settings associated with specific curve characteristics when Cold Load Pickup is active. These screens give the user access to 45 standard time-current curves, plus five custom curves and curve modifiers.

The Form 6 ProView interface software contains dialog boxes where you can launch TCC Editor II and customize these curves. Refer to **Using TCC Editor II** section of this manual.

Screens Phase, Ground, and Negative Sequence settings define the characteristics of the following time-current curves: Kyle TCCs 101 through 202, along with a Constant (definite time) TCC; ANSI Moderately Inverse, Very Inverse, Extremely Inverse; IEC Inverse, Very Inverse, Extremely Inverse; and 5 custom curves identified as USER1 through USER5.

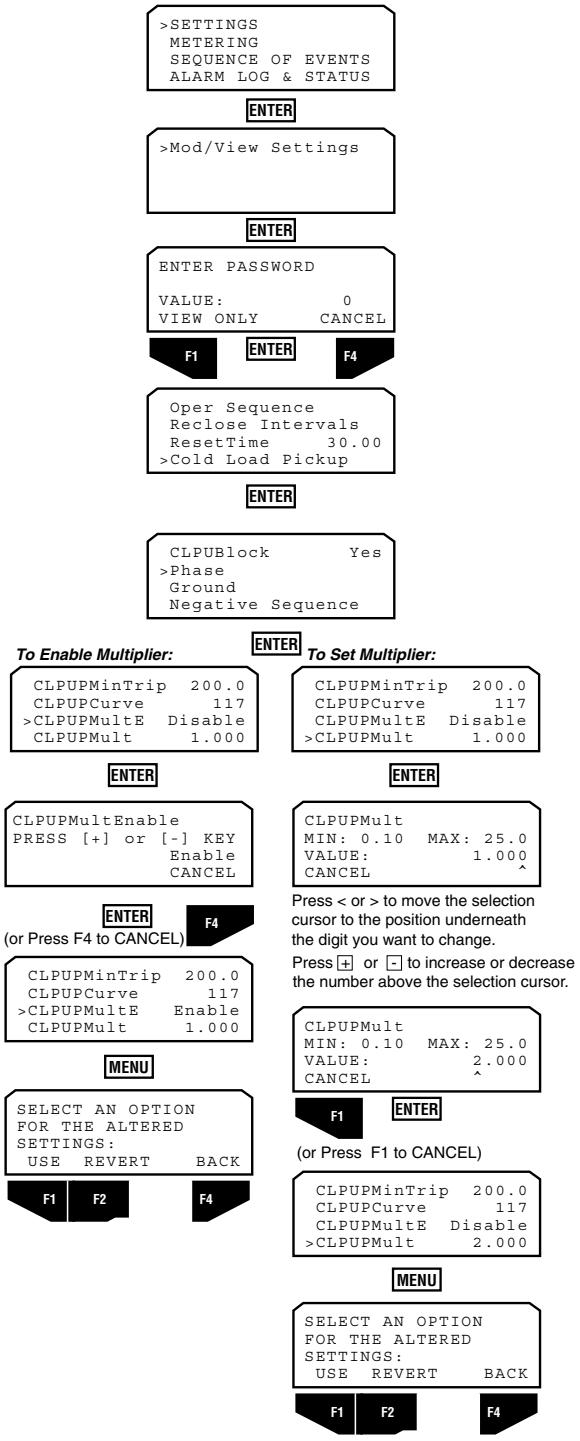
Note: The user curves are definable using the TCC Editor II through the interface software.

Note: "P" applies to Phase, "G" applies to Ground, and "Q" applies to Negative Sequence.

The diagram at the left shows the screen process of selecting a phase CLPU TCC. This process is the same for selecting ground and negative sequence curves for CLPU TCCs.

Time-current curves selected for TCC1 and TCC2 can also be used as Cold Load Pickup curves.

CLPU Multiplier



The CLPU Multiplier settings define a Time Multiplier to modify the position of the original TCC in time-current space and the ability to enable the multiplier. With the CLPU Time Multiplier enabled, the trip time of a given TCC at the measured current is shifted in time by the specific multiplier.

For example, if a curve has an operation time of 40 milliseconds, and a multiplier of 2, the “modified” operation time would be 80 milliseconds.

40 ms x 2 = 80 ms

Similarly, if the same curve has an operation time of 5 seconds, the multiplier produces a modified time of 10 seconds.

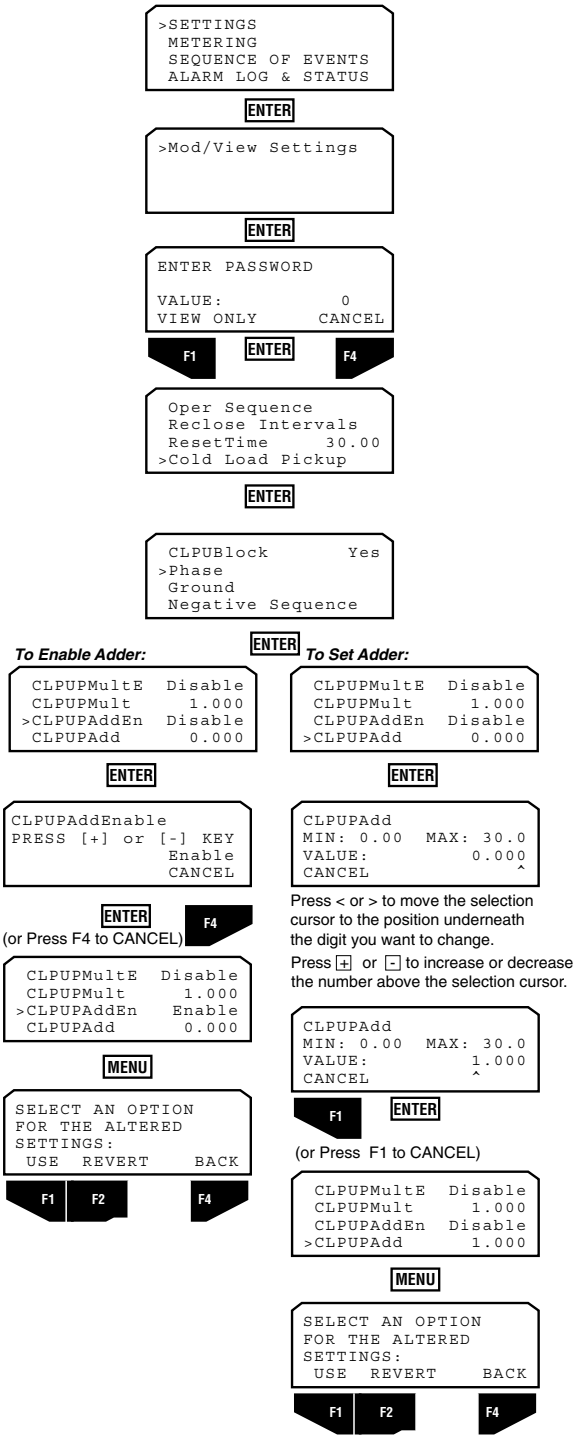
5 seconds x 2 = 10 seconds

Note: These curve modifications can be predefined and viewed in TCC Editor II and imported using the ProView Interface software included with the Form 6 control.

The diagram at the left shows the screen process of selecting a Multiplier for the phase CLPU TCC. This process is the same for selecting a Multiplier for the ground and negative sequence CLPU TCC.

When you select the CLPU Multiplier parameter, the minimum and maximum selection limits of the setting are displayed.

CLPU Adder



The CLPU Adder settings define a Time Adder to modify the position of the original TCC in time-current space and the ability to enable the Adder. With the CLPU Adder enabled, the trip time of a given TCC at a measured current is shifted in time by the specified additional time. In contrast to the CLPU Time Multiplier, the CLPU Adder adds a constant time to the curve, regardless of the unmodified curve operating time.

For example, if a curve has an operate time of 40 ms. and a 1 second time adder, the modified operate time is 1.040 seconds.

0.040 seconds + 1 second = 1.040 seconds

Similarly, if the same curve has a multiplier of 2 producing an operate time of 5 seconds, the one second time adder would produce a modified time of 6 seconds.

5 seconds (2.5 seconds x 2) + 1 second = 6 seconds

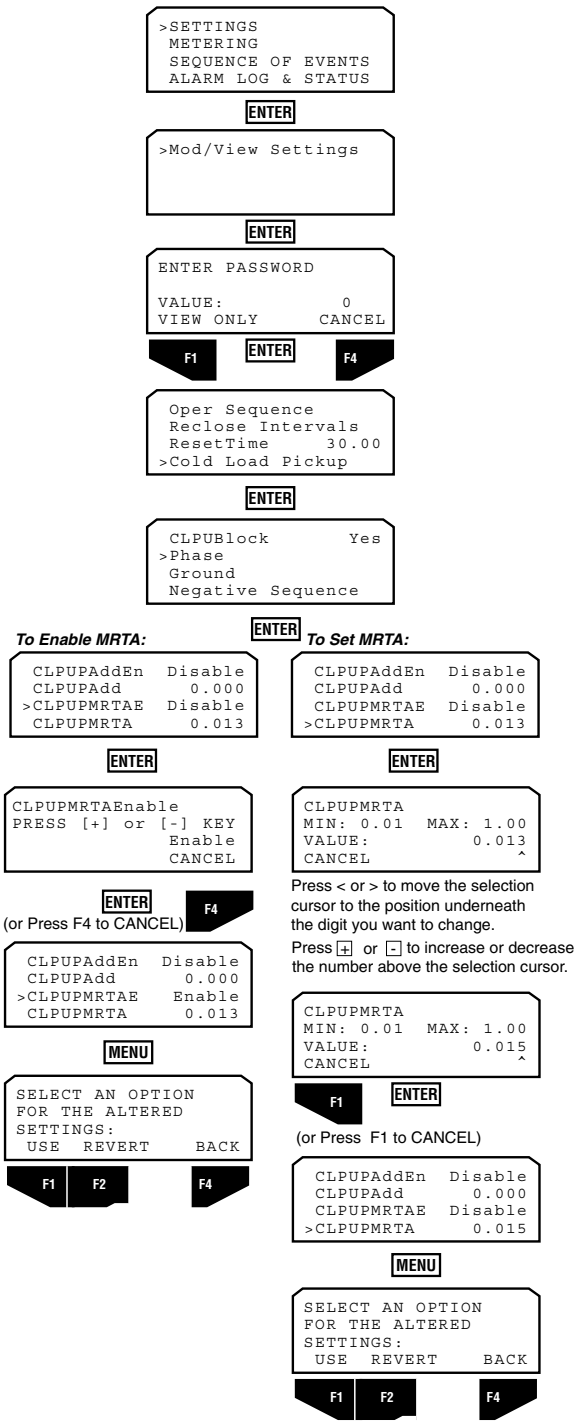
Note: The CLPU Time Multiplier takes precedence over the CLPU Time Adder.

Note: These curve modifications can be predefined and viewed in TCC Editor II and imported using the ProView Interface software included with the Form 6 control.

The diagram at the left shows the screen process of selecting an Adder for the phase CLPU TCC. This process is the same for selecting an Adder for the ground and negative sequence CLPU TCC.

When you select the CLPU Adder parameter, the minimum and maximum selection limits of the setting are displayed.

CLPU Minimum Response Time Adder



The CLPU Minimum Response Time Adder (MRTA) settings define a minimum response time that modifies the shape of the original TCC in time-current space, and the ability to enable the CLPU MRTA.

When enabled, the CLPU minimum response time of a given TCC can be no less that the value of the CLPU MRTA.

Note: These curve modifications can be predefined and viewed in TCC Editor II and imported using the ProView interface software included with the Form 6 control.

The diagram at the left shows the screen process of selecting a CLPU MRTA for the phase CLPU TCC. This process is the same for selecting a CLPU MRTA for the ground and negative sequence CLPU TCC.

When you select the CLPU MTRA parameter, the minimum and maximum selection limits of the setting are displayed.

Note: The CLPU Minimum Response Time Adder (MRTA) takes precedence over both the CLPU Time Multiplier and CLPU Time Adder.

CLPU High Current Trip

The CLPU High Current Trip (HCT) settings define a high current trip multiplier, a time delay and an enable setting to modify the shape of the selected TCC in time-current space. If CLPU HCT is enabled, the shape of the TCC at currents beyond the CLPU HCT pickup value is definite time as defined by the CLPU HCT time delay.

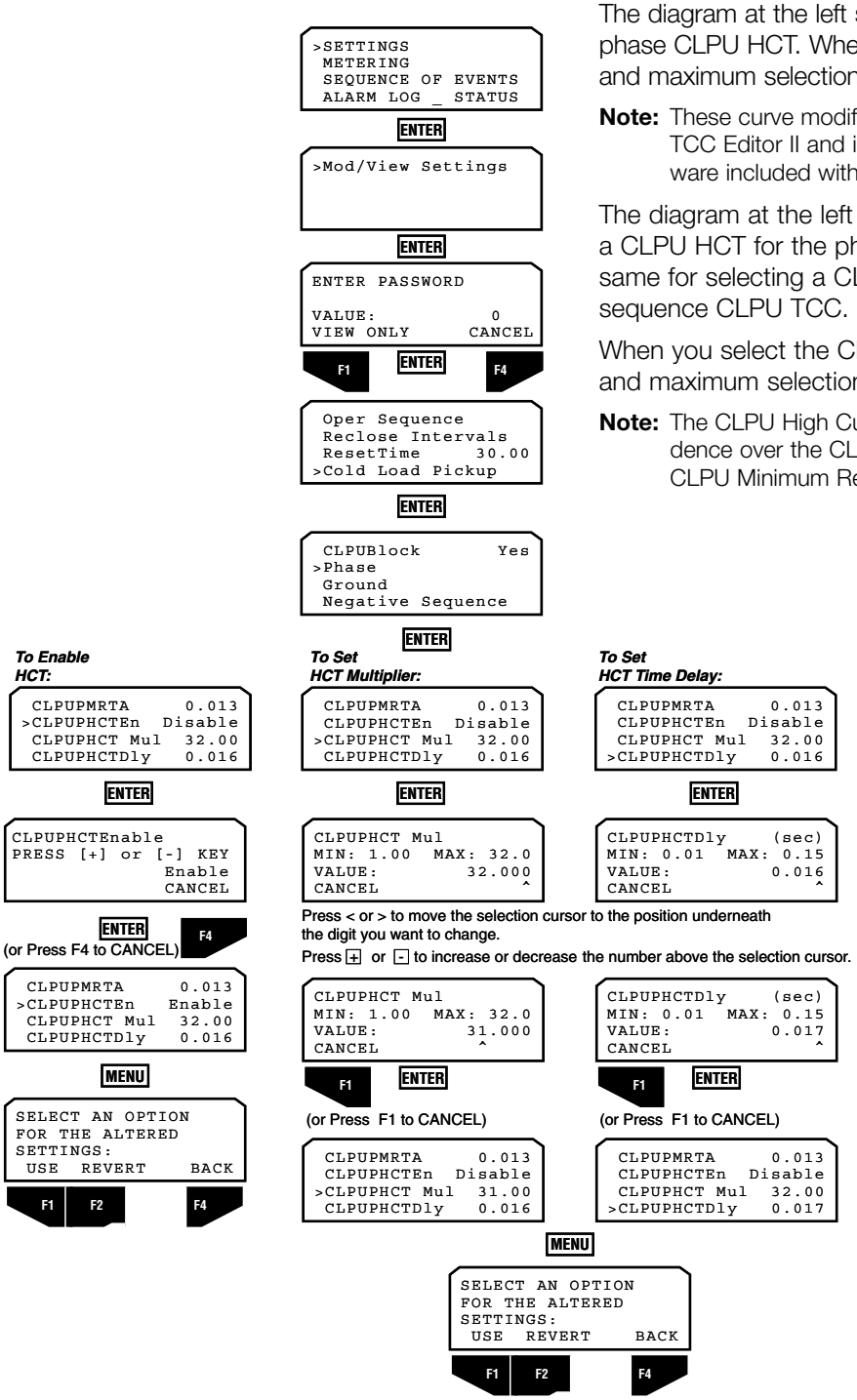
The diagram at the left shows the screen process of selecting phase CLPU HCT. When you select CLPU HCT, the minimum and maximum selection limits of the setting are displayed.

Note: These curve modifications can be predefined and viewed in TCC Editor II and imported using the ProView Interface software included with the Form 6 control.

The diagram at the left shows the screen process of selecting a CLPU HCT for the phase CLPU TCC. This process is the same for selecting a CLPU HCT for the ground and negative sequence CLPU TCC.

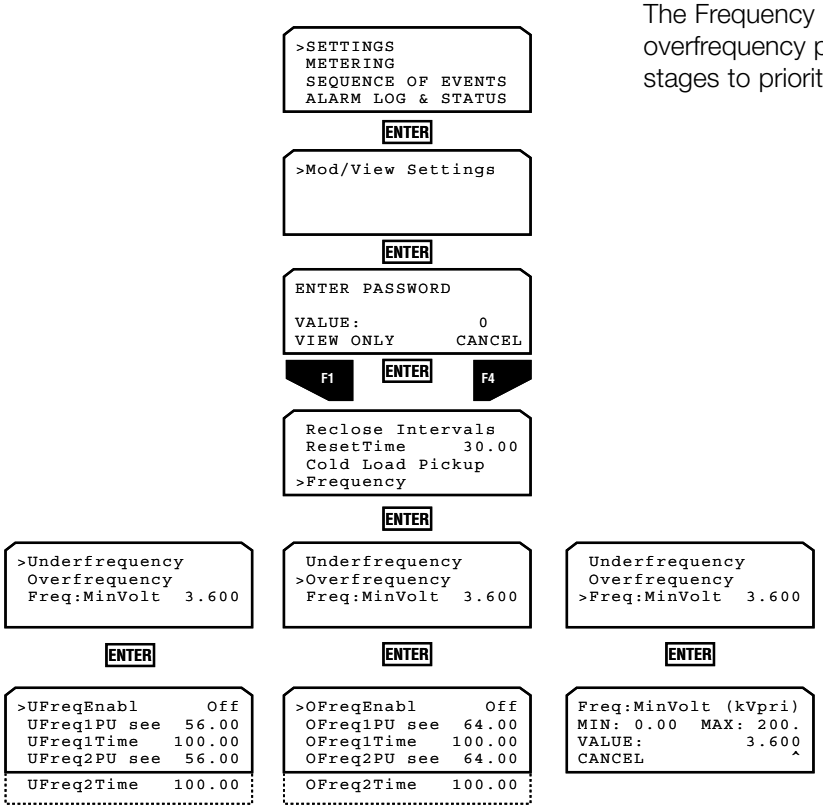
When you select the CLPU HCT parameters, the minimum and maximum selection limits of the settings are displayed.

Note: The CLPU High Current Trip (HCT) time delay takes precedence over the CLPU Time Multiplier, CLPU Time Adder, and CLPU Minimum Response Time Adder (MTRA).



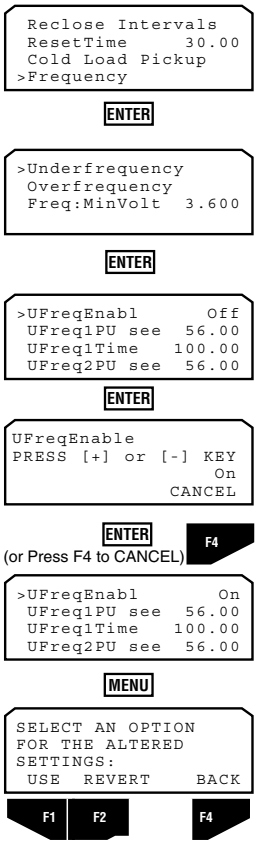
Frequency

The Frequency Protection feature provides both under and overfrequency protection. Frequency protection includes two stages to prioritize loadshedding feeders.

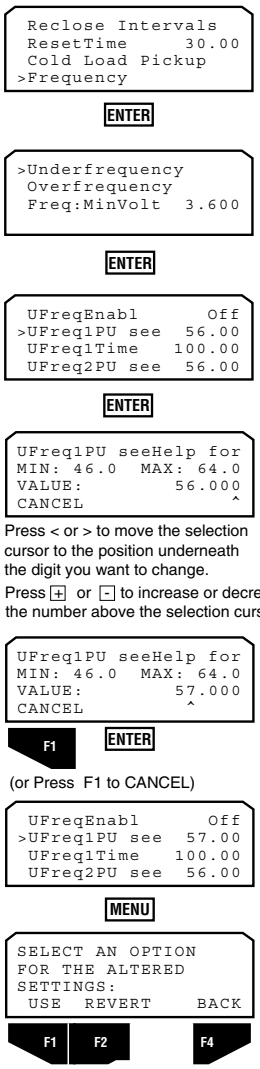


Activating Frequency Protection

The diagram at the left shows the screen process to activate the underfrequency protection feature. The same process is used to activate overfrequency protection.



Frequency Pickup



The Frequency Pickup settings define the frequency at which the frequency elements begin to operate.

For *Under*frequency, the function operates if the measured frequency is *less* than the pickup frequency.

For *Over*frequency, the function operates if the measured frequency is *greater* than the pickup setting.

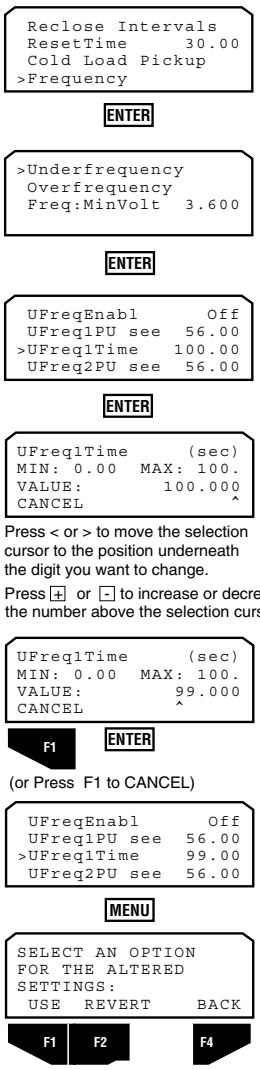
Note: The front panel (as well as the ProView Interface software) allows you to program two under and two overfrequency protection elements. Additionally, the interface software allows programming of a single underfrequency and a single overfrequency alarm.

The diagram at the left shows the screen process to set the Frequency Pickup settings for Underfrequency Protection. The same process is followed for Overfrequency Protection.

When you select the Frequency Pickup parameter, the minimum and maximum selection limits of the setting are displayed.

IMPORTANT: Always verify the pickup values are appropriate for the system frequency.

Frequency Protection Time Delay

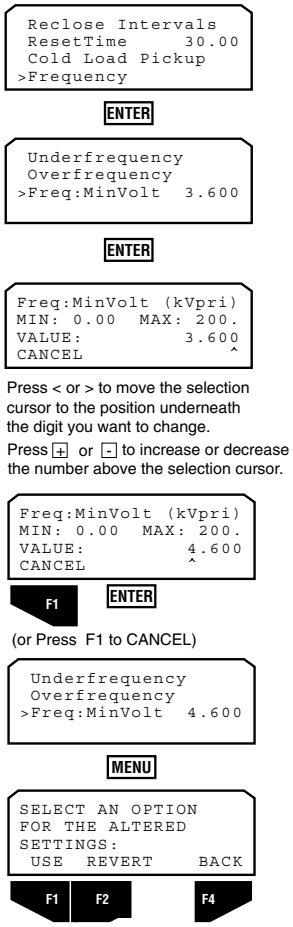


Each Frequency element has a user-settable, definite time delay function. A time delay is provided for both of the under and overfrequency elements.

The diagram at the left shows the screen process to set the Time Delay settings for the Underfrequency Protection. The same process is followed for the Overfrequency Protection.

When you select the Frequency Time Delay parameter, the minimum and maximum selection limits of the setting are displayed.

Frequency Minimum Voltage



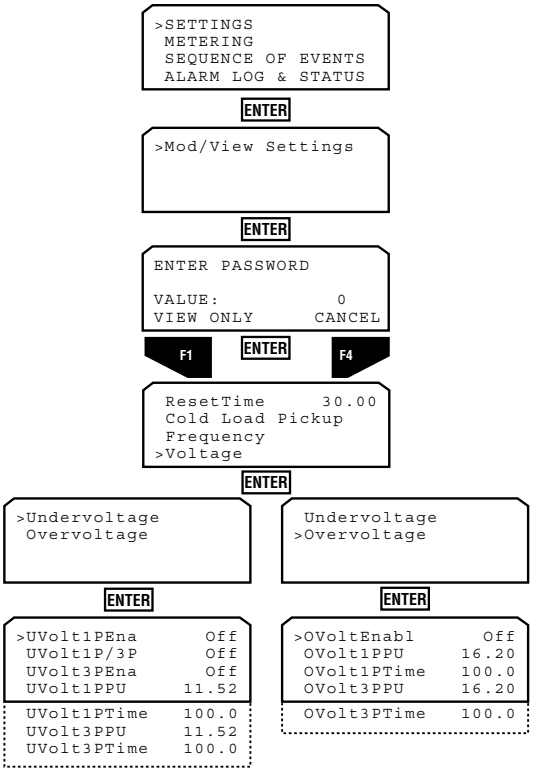
Frequency Minimum Voltage establishes a minimum voltage threshold below which frequency tripping is blocked. Frequency measurement and metering will still occur below this voltage threshold assuming this threshold is above the minimum voltage level needed by the scheme to accurately measure frequency. The setting for minimum voltage threshold is the Minimum Voltage for Frequency Tripping.

Note: The voltage restraint threshold setting is applied to each available source-side voltage magnitude independently. If one or more of the available source-side voltage magnitudes drop below this voltage restraint threshold setting, all frequency tripping is blocked. Frequency tripping is only allowed (not blocked) when all available source-side voltage magnitudes are above this voltage restraint threshold setting. Availability of source-side voltage magnitudes is determined by the "Connected PT's (Wye/Delta)" settings in the Configure>System Configuration dialog box.

The diagram at the left shows the screen process of setting the minimum voltage threshold below which frequency tripping is blocked.

When you select the Frequency Minimum Voltage parameter, the minimum and maximum selection limits of the setting are displayed.

Voltage



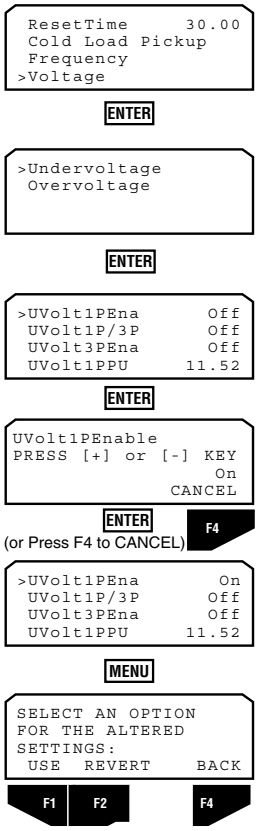
The Under and Overvoltage settings are used for loss of voltage detection and/or overvoltage protection applications.

Undervoltage protection includes both single-phase or three-phase loss of sensing and single-phase trip with three-phase inhibit.

- Single-phase undervoltage sensing responds when one or more phases is below the pickup setting. The UVolt1PEnable setting must be ON to enable this feature.
- Three-phase sensing will only respond when all three phases are below the pickup setting. The UVolt3PEnable setting must be ON to enable this feature.
- Single-phase sensing with three-phase inhibit will respond like single-phase sensing, except it will not react to a three-phase condition. Both the UVolt1PEnable and UVolt1P/3Pinhibit settings must be ON to enable this feature.

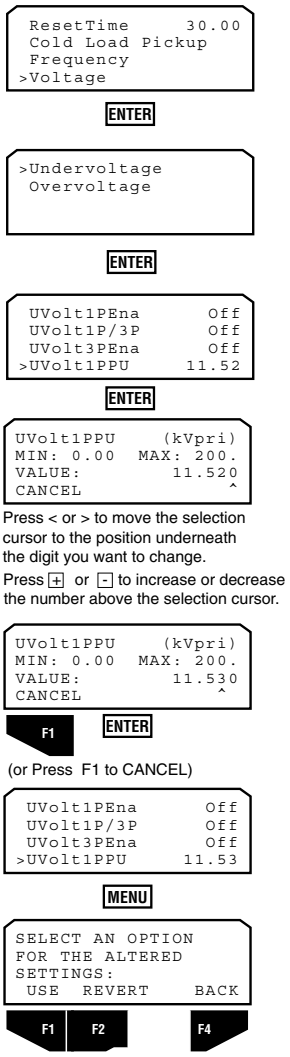
Overvoltage sensing includes both single-phase and three-phase sensing.

Activating Voltage Protection



The diagram at the left shows the screen process to activate the single-phase sensing undervoltage protection feature. The same process is used to activate the three-phase sensing undervoltage protection feature, the single-phase sensing with three-phase inhibit undervoltage protection feature, and the overvoltage protection.

Voltage Pickup



The Voltage Pickup settings define the primary voltage (kV) at which the voltage elements begin to operate.

For *Under*voltage, the function operates if the measured primary voltage (kV) is *less* than the pickup voltage.

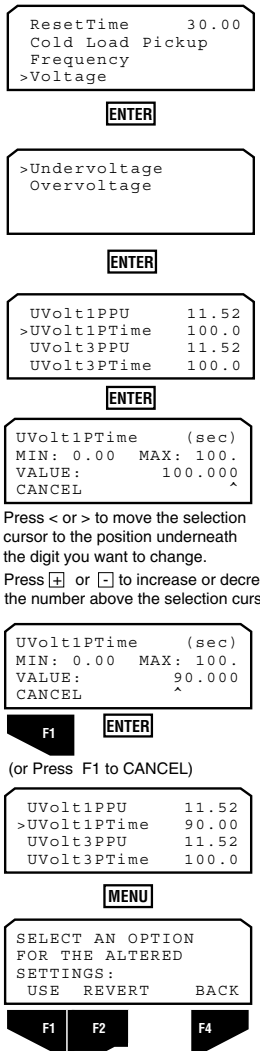
For *Over*voltage, the function operates if the measured primary voltage (kV) is *more* than the pickup voltage.

Note: The front panel (as well as the software) allows you to program single-phase and three-phase under and overvoltage pickup settings. Additionally, the interface software allows programming of a single undervoltage and overvoltage alarm.

The diagram at the left shows the screen process to set the Pickup settings for the Undervoltage Protection. The same process is followed for the Overvoltage Protection.

When you select the Voltage Pickup parameter, the minimum and maximum selection limits of the setting are displayed.

Voltage Protection Time Delay

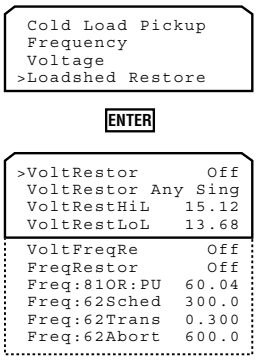


Each Voltage element has a user-settable, definite time delay function. Single-phase and three-phase time delays are provided for each over and undervoltage function.

The diagram at the left shows the screen process to set the Time Delay settings for the Undervoltage Protection. The same process is followed for the Overvoltage Protection.

When you select the Voltage Time Delay parameter, the minimum and maximum selection limits of the setting are displayed.

Loadshed Restore

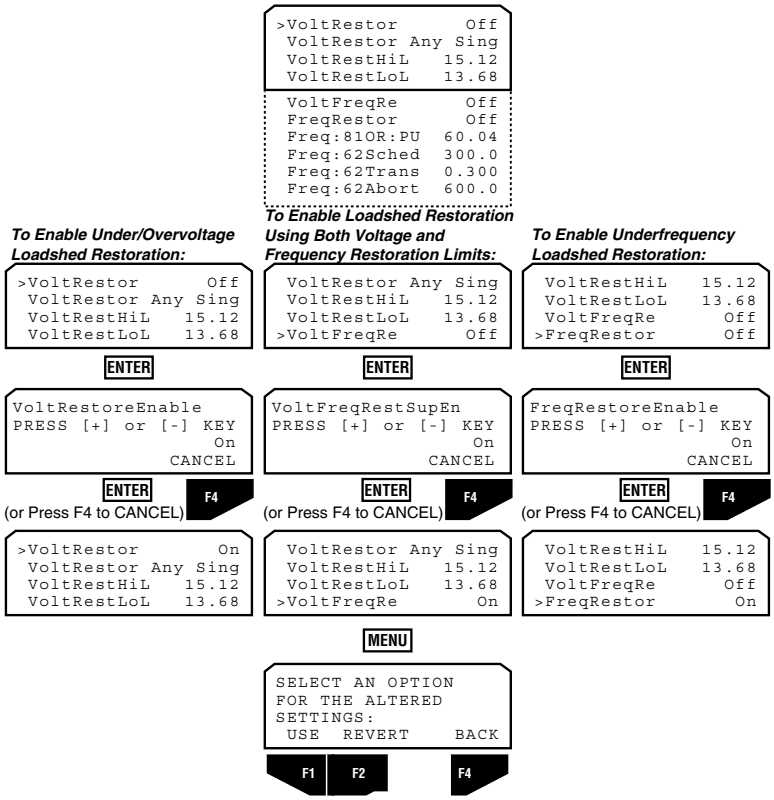


The Form 6 control provides an Undervoltage, Overvoltage, and Underfrequency loadshed restoration feature to allow the recloser to automatically close when voltage and/or frequency returns to within configured settings.

Loadshed Restore allows for restoration after an undervoltage, overvoltage, or underfrequency trip condition. The restoration function can be enabled and restoration parameters can be adjusted and set.

Activating Loadshed Restoration

The diagram below shows the screen process to activate the Voltage and Frequency Restoration features as well as the feature that allows supervision using both Voltage and Frequency Restoration limits.

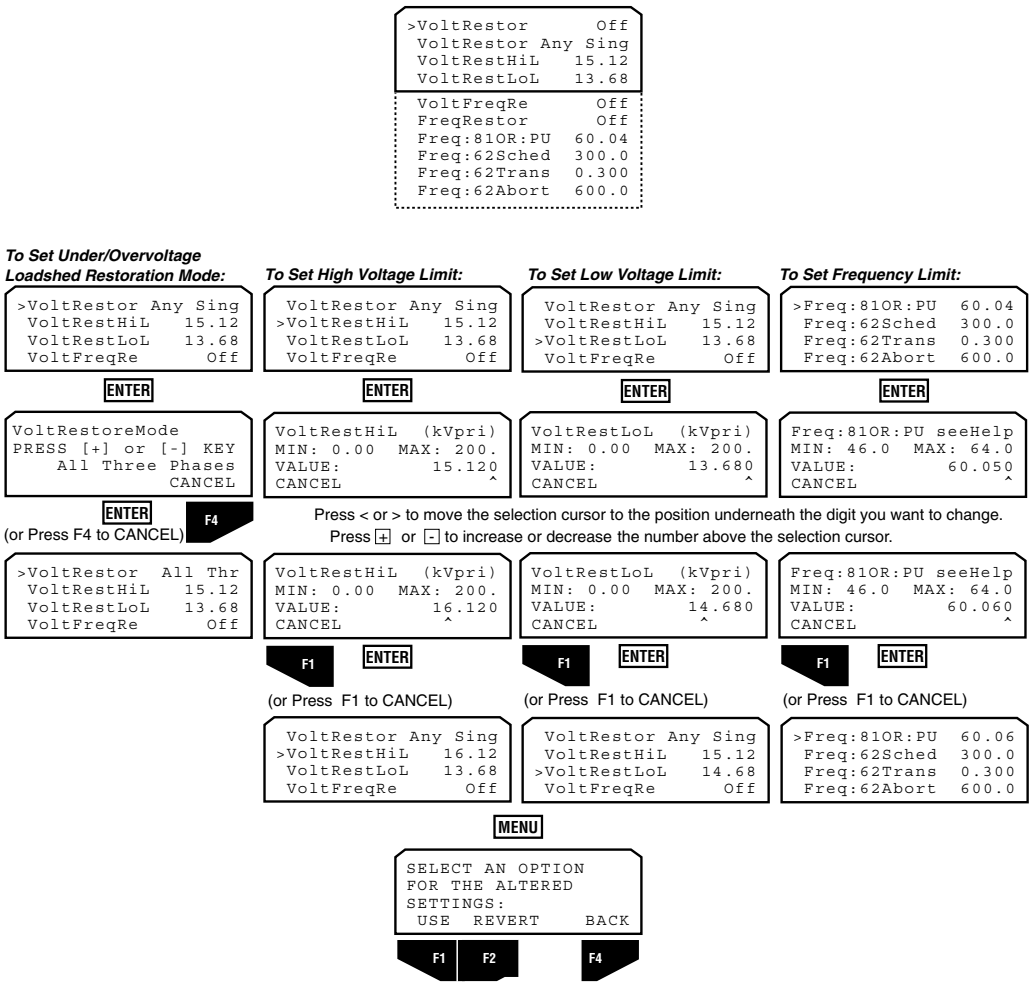


Voltage and Frequency Restoration Limits

The diagram below shows the screen process to program the Under and Overvoltage Restoration limits including the voltage restoration mode (Any Single Phase or All Three Phases). This diagram also shows the process to program the Underfrequency Restoration limit.

When you select the various limit parameters, the minimum and maximum selection limits of the settings are displayed.

IMPORTANT: Always verify the Frequency pickup value is appropriate for System Frequency.

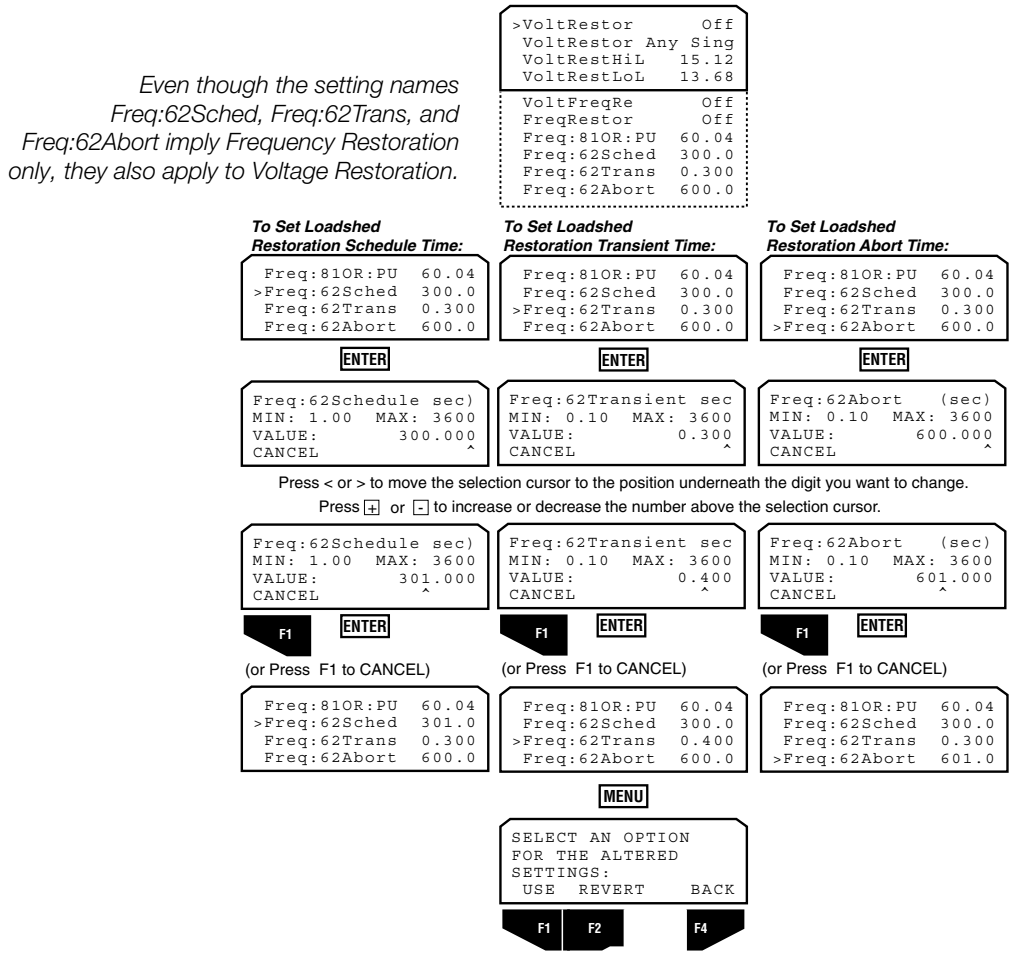


Loadshed Restoration Time Delay Settings

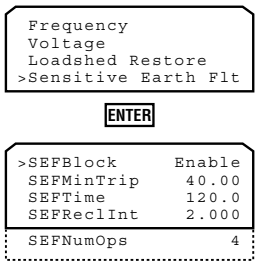
The diagram below shows the screen process to program the Loadshed Restoration time delay settings.

When you select the Loadshed Restoration Time Delay parameters, the minimum and maximum selection limits of the settings are displayed.

Even though the setting names Freq:62Sched, Freq:62Trans, and Freq:62Abort imply Frequency Restoration only, they also apply to Voltage Restoration.



Sensitive Earth Fault (SEF)



The Sensitive Earth Fault (SEF) feature is used on 3-wire systems that require lower, independent minimum trip values than normal ground sensing 4-wire systems.

Sensitive Earth Fault (SEF) allows the Form 6 control to detect and trip after a selectable, definite time for ground currents above the SEF minimum trip setting. Sensitive Earth Fault has programmable lockout settings and reclose intervals. Like all the features in the SETTINGS menu, Sensitive Earth Fault is independently selectable for each protection profile.

Sensitive Earth Fault feature requires four settings once it is enabled. These settings include Minimum Trip, Trip Time, the Reclose (Open) intervals, and the number of operations-to-lockout.

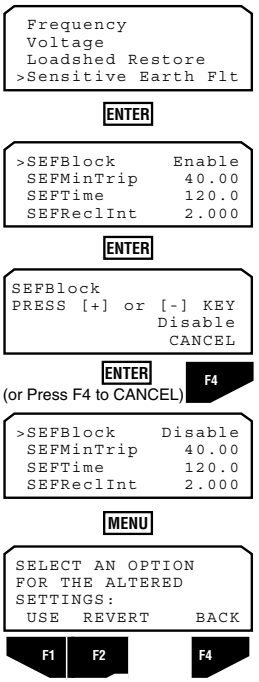
Note: When the Ground Trip Blocked feature is Enabled, the Sensitive Earth Fault feature is Disabled.

The SEF Minimum Trip, Trip Time, and Reclose Interval LCD screens show:

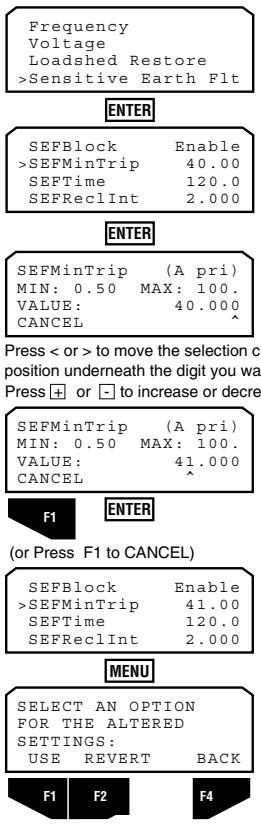
- Block (Enable/Disable) Setting
- Minimum Trip Current Setting
- Trip Time Setting
- Reclose Interval Time Setting
- Number of Operations-to-Lockout Setting

Activating Sensitive Earth Fault

The diagram at the left shows the screen process to activate the Sensitive Earth Fault feature.



SEF Minimum Trip

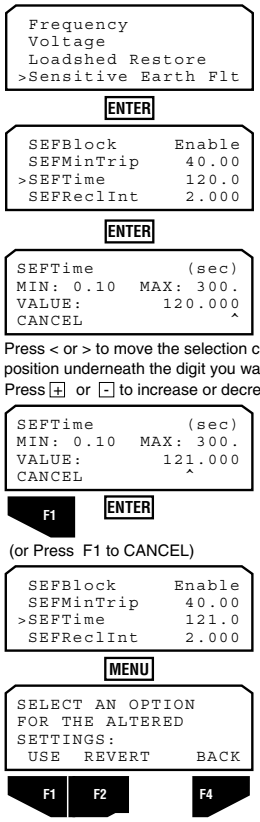


The Minimum Trip for Sensitive Earth Fault defines the pickup setting in Amperes.

The diagram at the left shows the screen process of setting the Minimum Trip for Sensitive Earth Fault.

When you select the SEF Minimum Trip parameter, the minimum and maximum selection limits of the setting are dis played.

SEF Trip Time

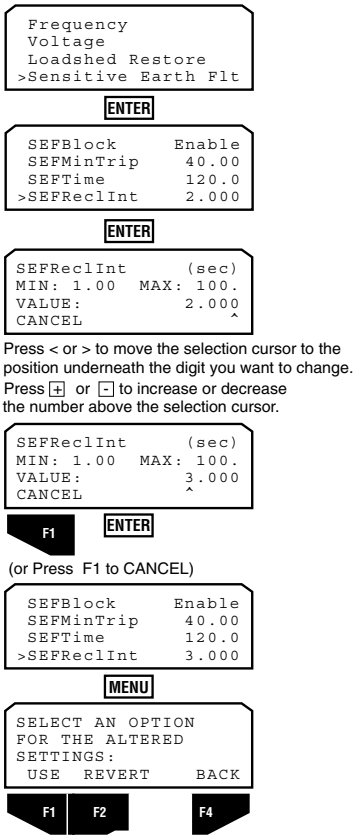


Trip Time is the actual, definite time at which the sensitive earth fault trips the recloser.

The diagram at the left shows the screen process of setting the Trip Time for Sensitive Earth Fault.

When you select the SEF Trip Time parameter, the minimum and maximum selection limits of the setting are displayed.

SEF Reclose Interval



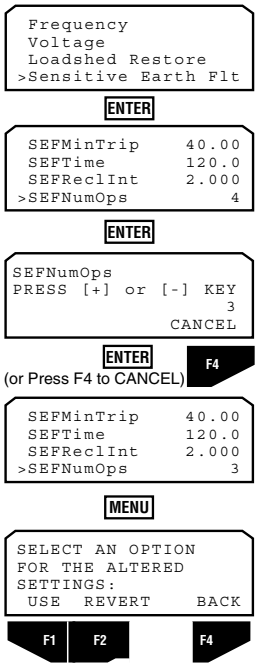
Reclose Interval settings define the time delay introduced prior to issuing a reclose command.

Note: Sensitive Earth Fault reclose intervals are defined for sensitive, earth-only initiated reclosing operations.

The diagram at the left shows the screen process of selecting the Reclose Interval for Sensitive Earth Fault.

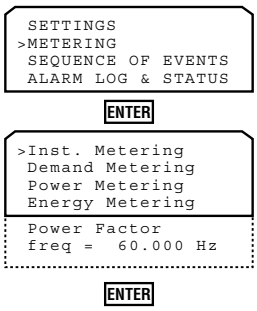
When you select the SEF Reclose Internal parameter, the minimum and maximum selection limits of the setting are displayed.

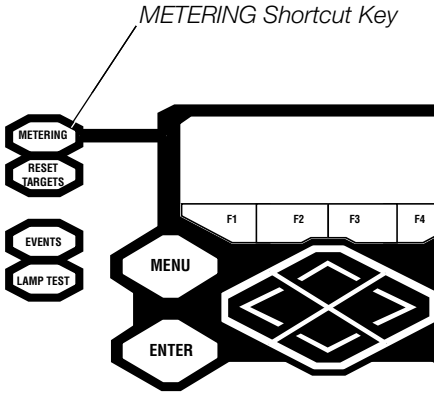
SEF Number of Operations-to-Lockout



The diagram at the left shows the screen process of selecting the number of Operations-to-Lockout (maximum 4) for Sensitive Earth Fault.

Metering Menu





The Form 6 control displays metering data on the front panel LCD as well as through the ProView interface software.

Note: The Metering menu LCD displays Metering Data only. All metering programming is done via the ProView interface software included with the Form 6 recloser control.

The Metering menu shows:

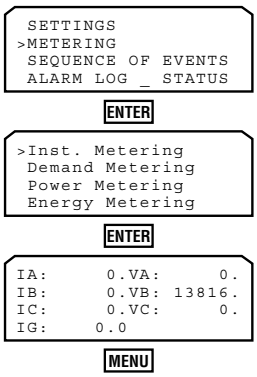
- Instantaneous Phase and Ground Currents and Source-Side Primary Voltages
- Primary Demand and Peak Phase and Ground Currents
- Primary Demand and Peak Power Values (kW and kvar)
- Instantaneous Power Values (kW and kvar)
- Energy Values (kWH and kvarH)
- Instantaneous Power Factor Values
- Frequency

The Metering module calculates and maintains the power-related parameters for the forward (out) and reverse (in) metering directions.

Detailed information on programming Metering data via the interface software is available in the **Form 6 Control Schemes** section of this manual.

Note: As a shortcut, the Instantaneous Metering display can be accessed from the front panel METERING shortcut key.

Instantaneous Metering

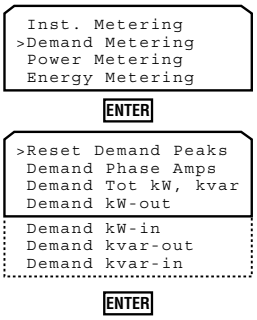


The front panel LCD display for instantaneous metering shows the Primary Current values for A, B, C phase and Ground.

The Instantaneous Voltage for each source-side phase is displayed as Primary voltages.

The primary voltage values displayed in the Instantaneous Metering menu will always be line-to-neutral values regardless of the configuration (Wye or Delta) of the connected PTs. Regardless of the number of connected PTs, as defined in the System Configuration setting dialog box, all three primary voltage values will be displayed if the Phantom Phase functionality is enabled.

Demand Metering



The Demand Metering display shows the calculated:

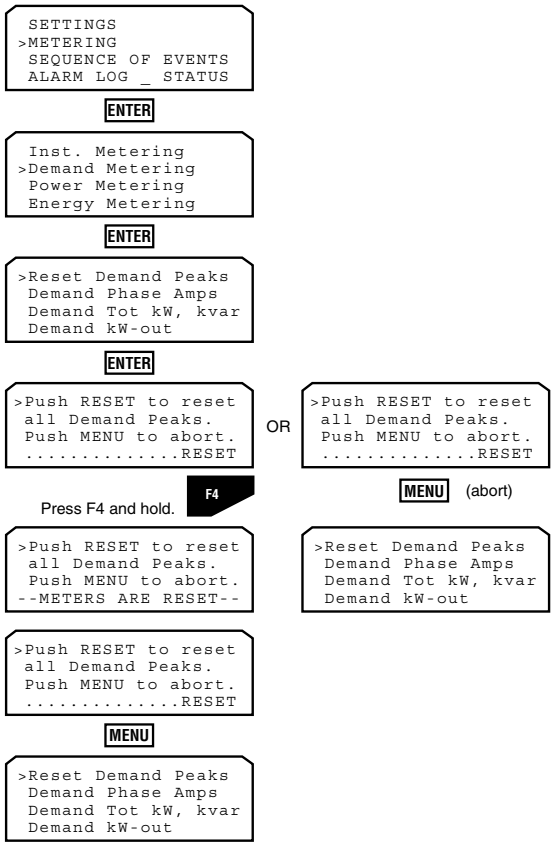
- Primary Demand and Peak Currents (A, B, C Phase and Ground)
- Total Demand and Peak real and reactive power values
- Per phase Demand and Peak real and reactive power values

All demand-metered power values include measurements in the forward (out) or reverse (in) direction. As an example, Demand kW-out displays demand kilowatts in the forward direction for loads with no co-generation, while forward kW-in displays demand kilowatts in the reverse direction when supplied from the co-generator.

Note: Demand Metering values are automatically reset when a protection profile is changed, a new setting is downloaded from the PC, or when a scheme is downloaded from the PC.

Detailed Demand Metering programming information is found in the **Form 6 Control Schemes** section of this manual.

Resetting Demand Peak Values

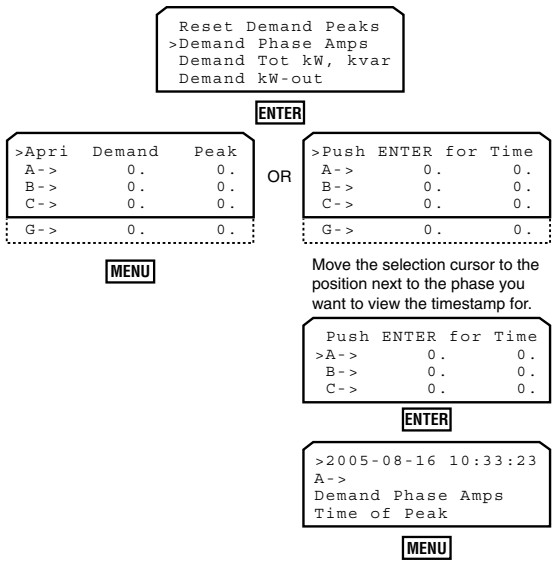


All Demand Peak Values can be reset simultaneously from the front panel.

The diagram at the left shows the screen process for resetting Demand Peak Values.

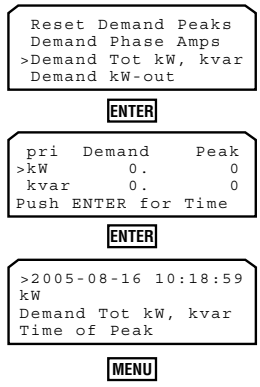
Note: After F4 (RESET) is pressed, the phrase "--METERS ARE RESET--" appears in the LCD display for approximately 2 seconds.

Demand Amps per Phase



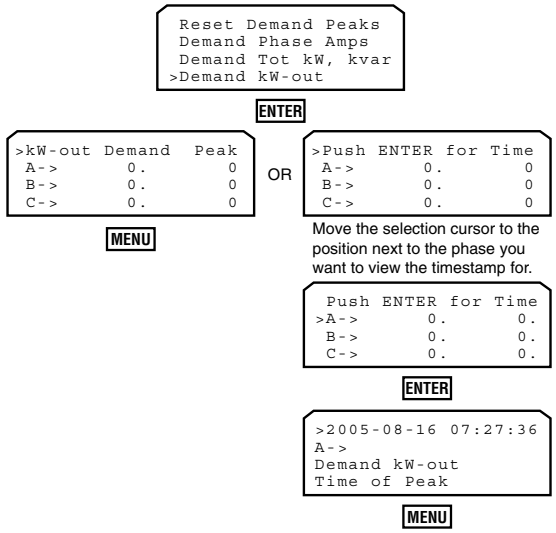
The diagram at the left shows the screen process for viewing the Demand Phase Amps (Demand and Peak) and the Demand Phase Amps Time of Peak for each phase and ground.

Demand and Total Power Values



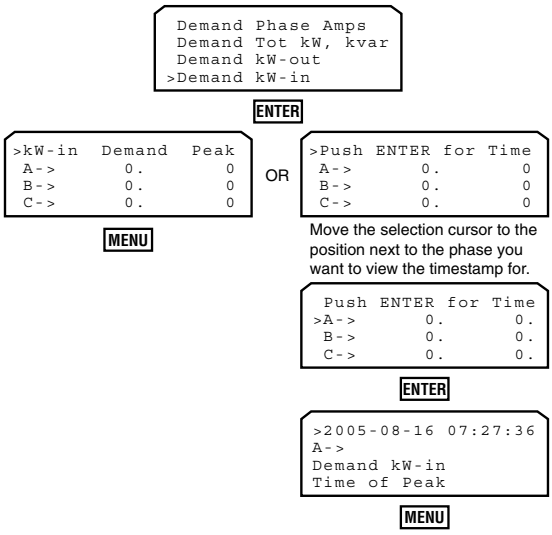
The diagram at the left shows the screen process for viewing the Demand Tot kW, kvar (Demand and Peak) and the Demand Tot kW, kvar Time of Peak for Total kW, and kvar.

Demand Real Power-Out



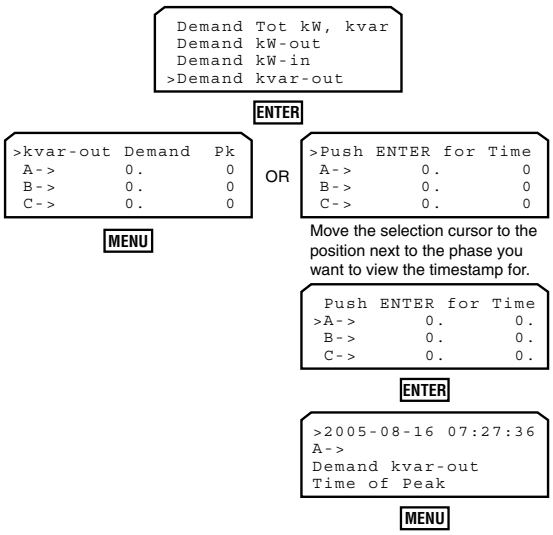
The diagram at the left shows the screen process for viewing the Demand kW-out (Demand and Peak) and the Demand kW-out Time of Peak for each phase.

Demand Real Power-In



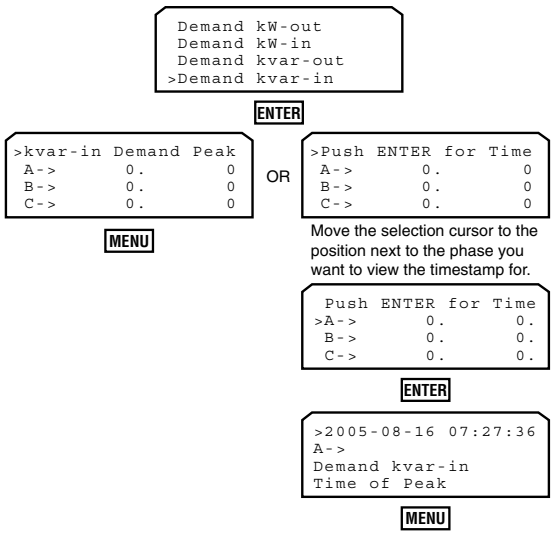
The diagram at the left shows the screen process for viewing the Demand kW-in (Demand and Peak) and the Demand kW-in Time of Peak for each phase.

Demand Reactive Power-Out



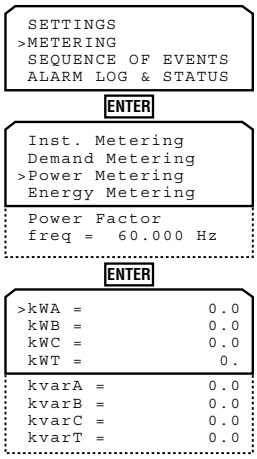
The diagram at the left shows the screen process for viewing the Demand kvar-out (Demand and Peak) and the Demand kvar-out Time of Peak for each phase.

Demand Reactive Power-In



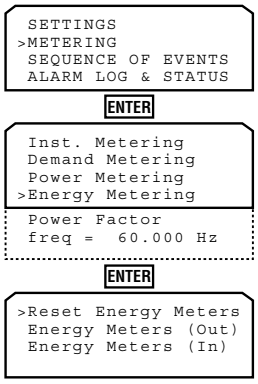
The diagram at the left shows the screen process for viewing the Demand kvar-in (Demand and Peak) and the Demand kvar-in Time of Peak for each phase.

Power Metering



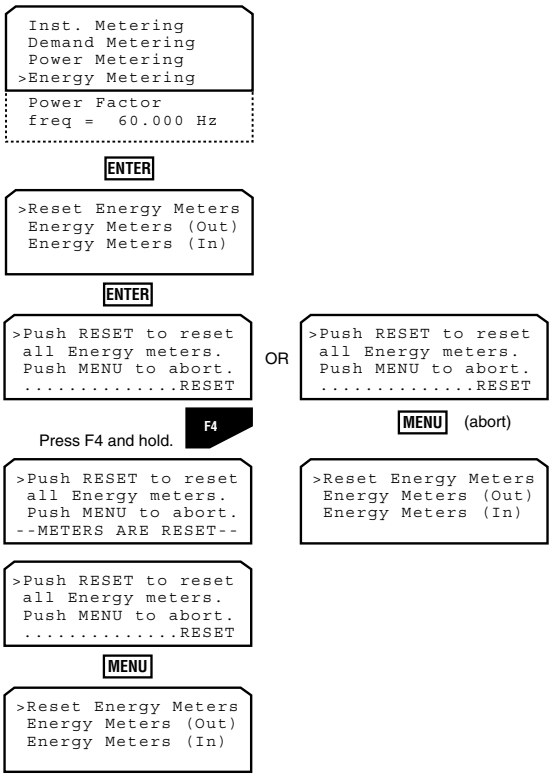
The Power Metering LCD screen shows the calculated instantaneous Real Power (kW) and Reactive Power (kvar) values for each phase and the Total Instantaneous Real and Reactive power value of all three phases.

Energy Metering



The Energy Metering LCD screen shows the calculated Real Energy (kWH) and Reactive Energy (kvarH) values for each phase and the Total Real and Reactive Energy value of all three phases.

Resetting Energy Meters

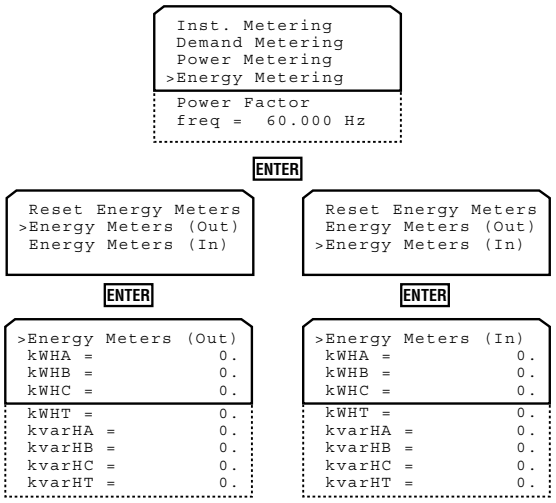


Both Energy Meters (Out) and (In) can be reset simultaneously from the front panel.

The diagram at the left shows the screen process for resetting the Energy Meters.

Note: After F4 (RESET) is pressed, the phrase "--METERS ARE RESET--" appears in the LCD display for approximately 2 seconds.

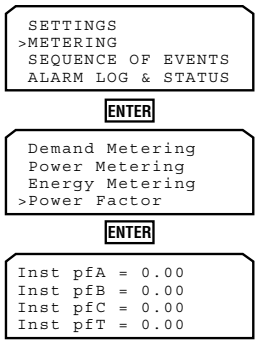
Energy Meters (Out) and (In)



The Energy Meters (Out) and (In) LCD screen shows the calculated Real energy (kWH) and Reactive energy (kvarH) measurements for each phase and the total Real and Reactive energy measurement of all three phases.

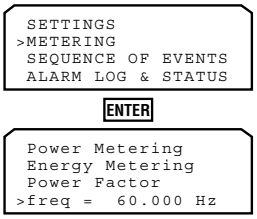
The Total Phase value updates automatically when the three individual phases are updated.

Power Factor



The front panel read-only Power Factor screen shows the Instantaneous power factor (pf) of each individual phase and the Total power factor (pfT) of all three phases.

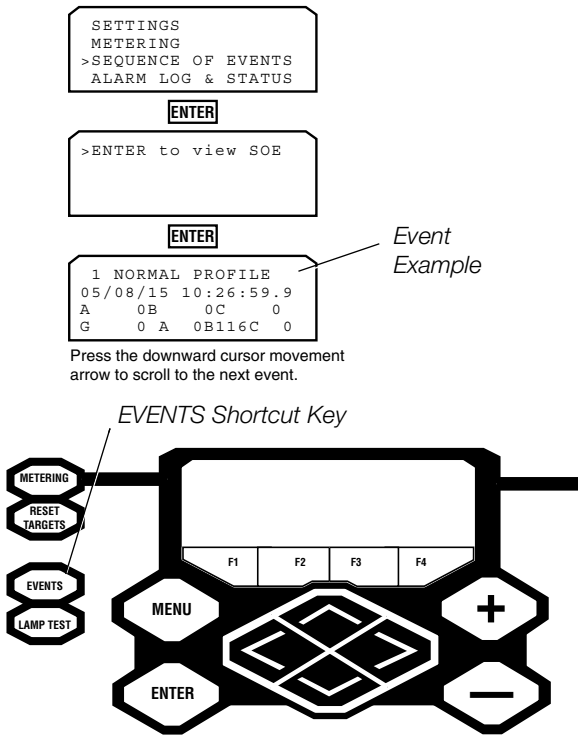
Frequency



Frequency, a read-only display, is automatically updated and displayed in the METERING menu. The phase or phases are selected via the ProView interface software in the Configure>System Configuration dialog box.

When “freq = (n/a) Hz” is displayed, no voltage is present on the selected phase or phases.

Sequence of Events Menu



The Form 6 recloser control displays the last 25 events in the Sequence of Events log on the front panel LCD. The complete sequence of events record is available through the ProView interface software.

The Sequence of Events menu shows:

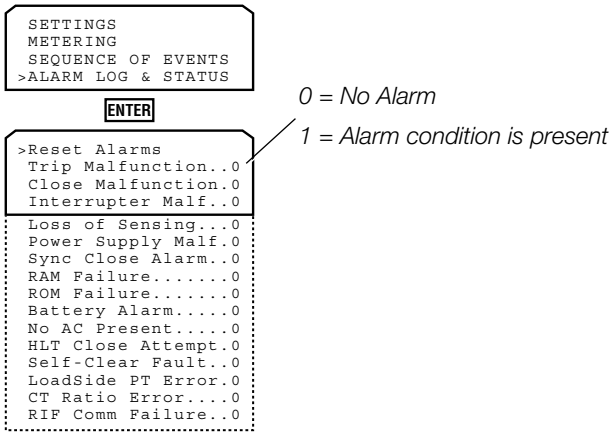
- Event Definition
- Date of Event Year/Month/Day
- Time of Event
- A, B, and C Phase Current
- Ground Current
- A, B, and C Phase Secondary Voltage

  The secondary voltage values displayed in the Sequence of Events menu will either be line-to-neutral values if the PTs are connected in a Wye configuration or simulated, equivalent, line-to-neutral values if the PTs are connected in a Delta configuration. Only the secondary voltage values of the connected PTs, as defined in the System Configuration setting dialog box, will be displayed. The Phantom Phase setting does not apply to the voltage values displayed in the Sequence of Events menu.

Sequence of Events (SOE) definitions are available in the **Form 6 Control Schemes - Display** section of this manual.

Note: As a shortcut, the Sequence of Events Log can also be accessed from the EVENTS shortcut key on the front panel.

Alarm Log and Status Menu



The Alarm Log and Status Menu is a read-only display showing if an alarm is active for the following settings:

- Trip Malfunction (Failure to Trip) – The recloser fails to open due to an overcurrent condition or a manual or remote signal. The control detects a trip malfunction by the use of status switches in the recloser.
- Close Malfunction (Failure to Close) – Once the condition that caused the initial CLOSE MALFUNCTION Alarm is corrected, the CLOSE MALFUNCTION alarm must be reset before another CLOSE can be attempted.
- Interrupter Malfunction – This alarm asserts if the recloser mechanism is in the open position and the control detects the presents of line current.
- Loss of Sensing – This occurs when all three phase currents are greater than 15-Amps primary on the distribution system and the voltage applied to any one connected PT is below approximately 12% of V expected. Loss of sensing resets when voltage applied to all connected PTs are above the undervoltage phase pickup threshold set in the Settings>Voltage dialog box.
- Power Supply Malfunction
- Sync Close Alarm

- RAM Failure
- ROM Failure
- Battery Alarm (Only valid on Form 6 pole mount controls.) The Pole Mounted Control box in the ProView System Configuration screen must be selected.

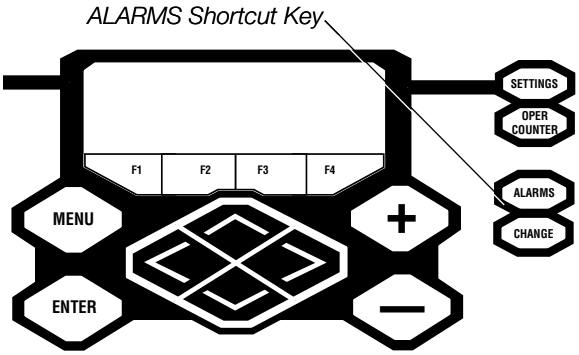
Note: If the Battery Alarm is asserted for a rack or yard mount control, verify that the Pole Mounted Control checkbox is deselected in the Configure>System Configuration dialog box.

IMPORTANT: There are several alarms that will cause the alternate blinking of the CONTROL LOCKOUT, RECLOSER OPEN, and RECLOSER CLOSED LEDs: Failure to Trip, Failure to Close, Interrupter Malfunction, and 52a/b Disagreement.

The LED blinking pattern for these conditions is the CONTROL LOCKOUT green LED and RECLOSER CLOSED red LED alternating with the RECLOSER OPEN green LED.

In addition to the above LED blinking pattern, the red ALARM LED will also be blinking for these alarms: Failure to Trip, Failure to Close, and Interrupter Malfunction.

- No AC Present (Only available for Form 6 pole mount controls. The Pole Mounted Control box in the ProView System Configuration screen must be selected. Refer to **Configure - System Configuration** section for additional information.)
- Hot Line Tag Close Attempt
- Self-Clear Fault
- Load Side PT Error
- CT Ratio Error – This alarm will assert if the current sensing hardware option in your Form 6 control does not match the CT Type setting in the ProView application software. For instance, your Form 6 control has a current sensing option intended for a 1 Amp CT and you downloaded settings that are only compatible with a 5 Amp CT type by selecting X:5 CT in the System Configuration dialog box.
- RIF Comm Failure

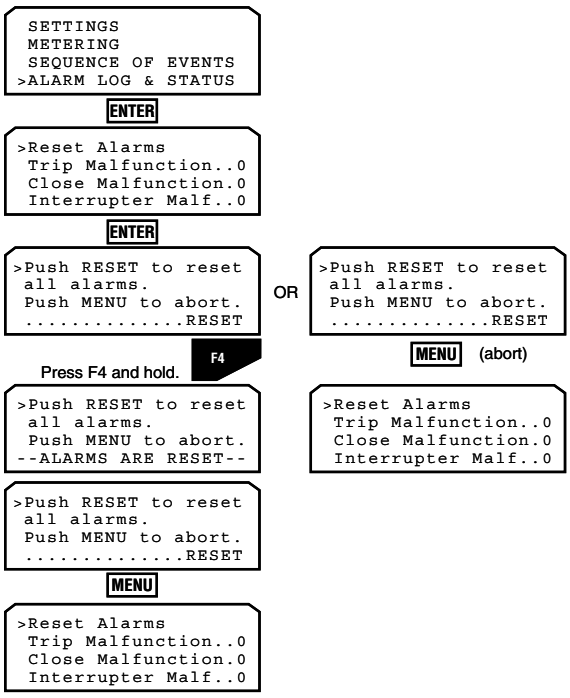


There are two types of Status Alarms:

- Control Alarm – Signified by the continuous illumination of the Alarm LED. These are Control Alarms:
  - Power Supply Malfunction
  - RAM Failure
  - ROM Failure
  - Battery Alarm
  - Load side PT Error
  - CT Ratio Error
  - No AC Present (pole mount only)
  - RIF Comm Failure
- System Alarm – Signified by the flashing Alarm LED. These are System Alarms:
  - Trip Malfunction (Failure to Trip)
  - Close Malfunction (Failure to Close) (Refer to **Resetting Alarms**.)
  - Interrupter Malfunction
  - Loss of Sensing
  - Sync Close Alarm
  - Hot Line Tag Close Attempt
  - Self-Clear Fault

Note: As a shortcut, the ALARM menu can be accessed from the ALARMS shortcut key on the front panel.

Resetting Alarms



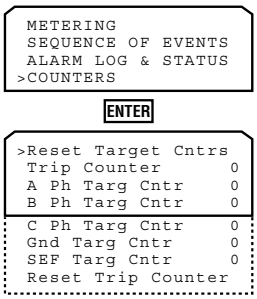
The Alarm settings listed in the LCD display can be reset from the front panel. The diagram shows the screen process to reset control parameter alarms.

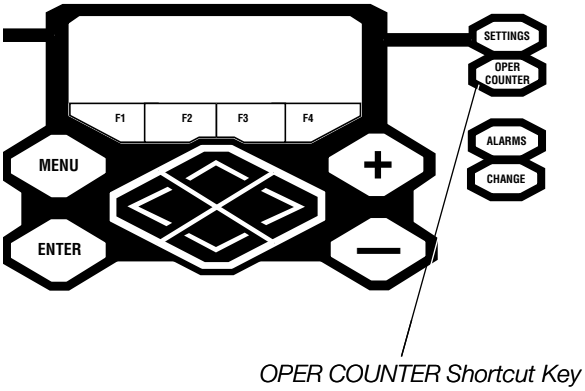
Note: After F4 (RESET) is pressed, the phrase "--ALARMS ARE RESET--" appears in the LCD display for approximately 2 seconds.

The alarm will only reset if the condition that triggered the alarm is no longer present.

Note: The Close Malfunction alarm must be reset before Closing will be allowed.

Counters Menu





Counters are part of the historical data record within the Form 6 Recloser control. The Form 6 control contains counter data saved in non-volatile memory, and is resettable from the front panel. Counters display the cumulative number of operations for specific functions.

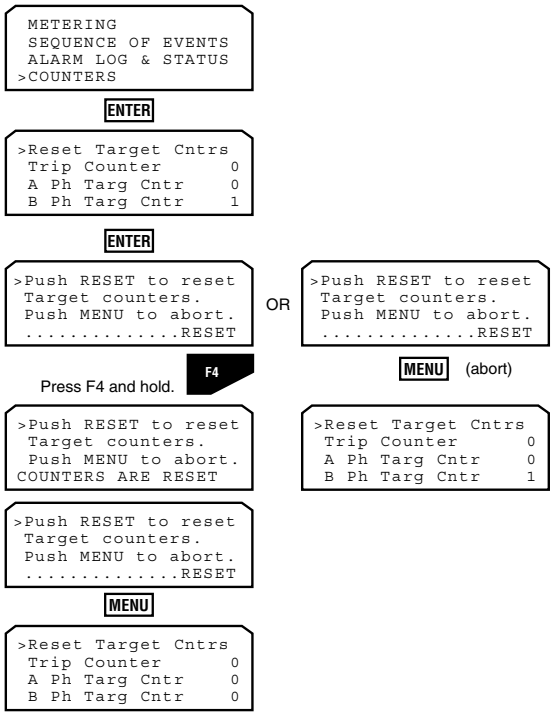
The counters increment each time an operation takes place, independent of any time interval. Counters can be reset locally from the front panel or through the Form 6 ProView Interface software.

The counters are:

- Trip Operations Counter
- A-Phase, B-Phase, C-Phase, Ground, and Sensitive Earth Fault Target Counters

Note: As a shortcut, the COUNTERS menu can be accessed from the OPER COUNTER shortcut key on the front panel.

Resetting Counters

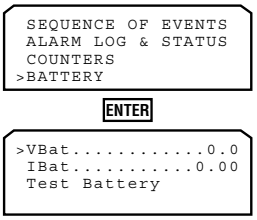


If the Form 6 recloser control is replacing another Cooper Power Systems control, the counters can be set to match the counter of the current control.

Target and Operations (Trip) Counters programming information is found in the **Form 6 Control Schemes>Settings>Presets** section of this manual.

The diagram at the left shows the screen process for resetting Target Counters. The same process is followed for the Trip Counter, which is the last sub-menu item.

Battery Menu (Pole-Mount Control Only)

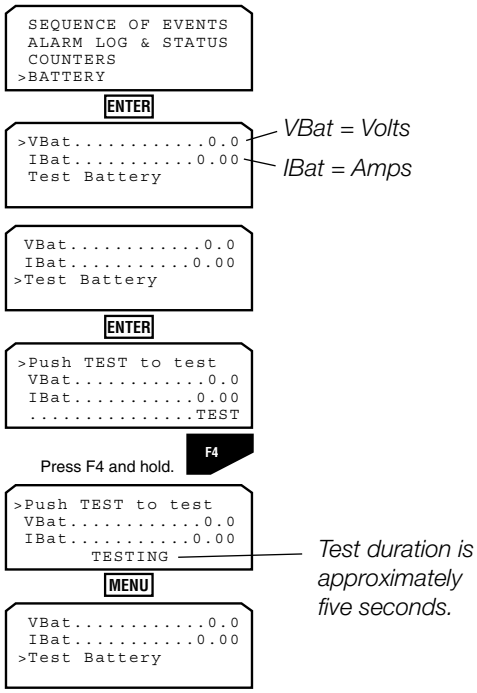


The Form 6 Pole-Mounted Recloser control contains a battery. The Battery LCD shows the following information:

- Battery Voltage
- Battery Current
- Battery Test Command

For battery testing to function, the Pole Mounted Control box in the ProView System Configuration screen must be selected (and the control must be equipped with a battery). Refer to **Configure - System Configuration** section for additional information.

Test the Battery



The condition of the Form 6 pole-mount control battery can be determined by using the Battery Test function in the BATTERY MENU. No external current/voltage meter is necessary for testing.

Note: The battery test is blocked for 30 seconds upon power up of the control or any setting changes.

Note: AC power can be either connected or disconnected for battery test.

1. Press the MENU button on the front panel.
2. Using the down arrow key, navigate to the BATTERY menu and press ENTER.
3. Using the down arrow key, navigate to the TEST BATTERY menu and press ENTER.
4. Press the F4 button to test the battery.

   Note: This message will appear on the programming panel LCD display: ----TESTING----

   The battery test results will display in the battery metering menu.

   Note: Voltage should be between 25–31 Vdc with the higher voltage at colder temperatures.

   Under normal conditions, with AC connected and a fully charged battery, the charging current should be less than 20 mA.

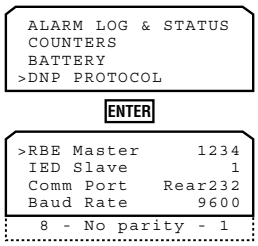
   With AC connected and a discharged battery the current range should be between 20 and less than 450mA. Current of 450 mA or greater indicates a problem with the charging circuit on the pole mount power supply.

   With AC disconnected and the control operating on battery power alone, current will read -400 to -600 mA depending on connected accessories. (On the LCD it will display as **-0.40 to -0.60**.)

Note: When the Form 6 pole mount control is disconnected from AC power and the control battery drops below 23.5 Vdc for 60 seconds, the ALARM LED will illuminate. If the battery voltage continues to decay and drops below 22 Vdc, the Form 6 control will shut down.

Note: During a manual battery test a 5Ω, 55 watt resistor is placed across the battery terminals for approximately 5 seconds. The Form 6 control measures the battery voltage, if the voltage drops below 22.8 Vdc for one full second, the ALARM LED (battery alarm) is illuminated.

DNP Protocol Menu



The DNP Protocol Menu is a read-only display showing the communication settings for the following categories:

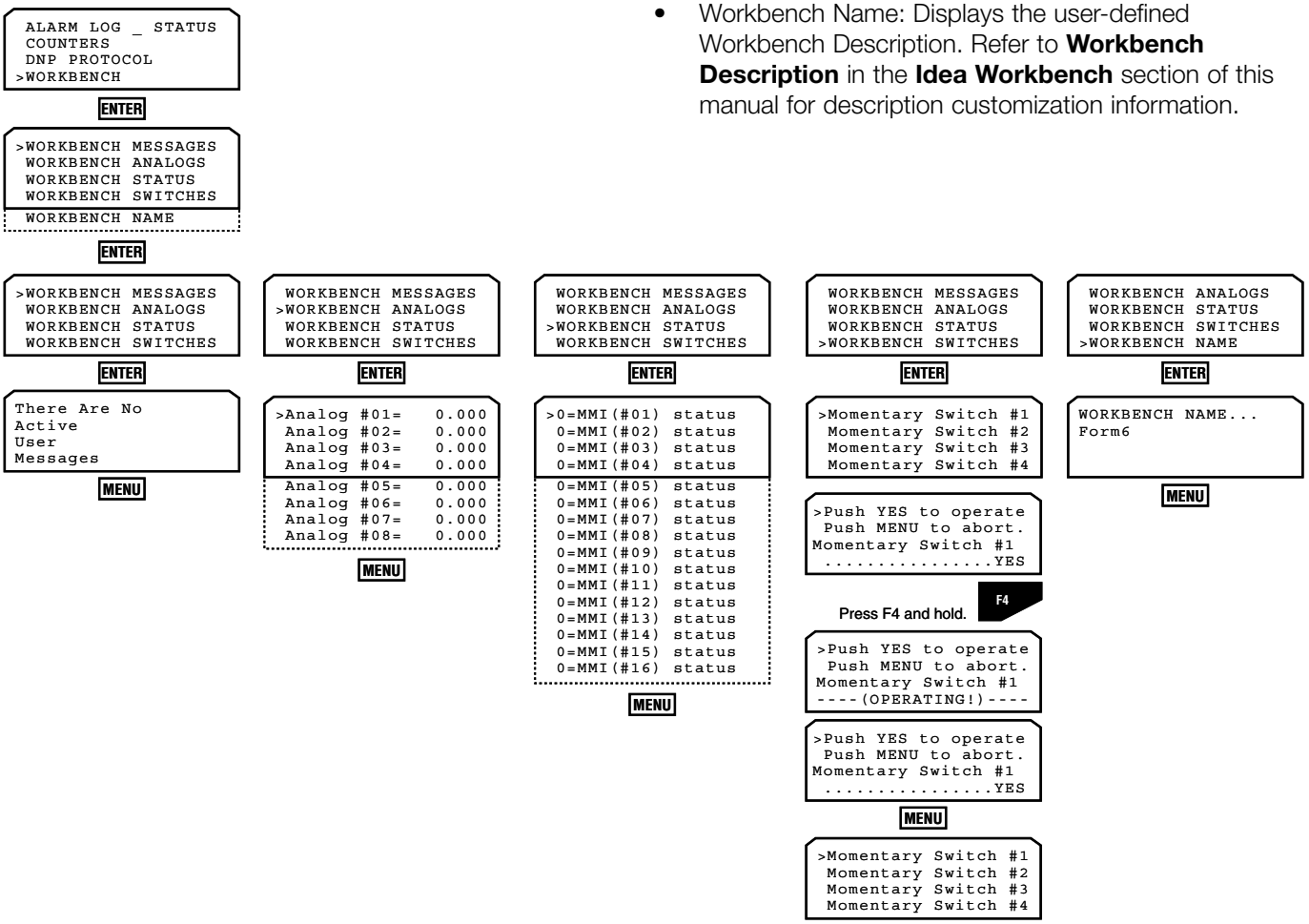
- RBE Master: Displays the address of the dedicated Unsolicited Master. This is the only master that will be addressed while the Form 6 control is in USR mode.
- IED Slave: Displays the DNP3 communications address of the Form 6 control.
- Comm Port: Identifies the selected Form 6 control rear communications port.
- Baud Rate: Displays the DNP3 protocol baud rate. This is the Form 6 control communications port speed (data transmission in Bits per second).
- Serial Line Configuration

The name of this menu, the menu options, and the information displayed can vary depending on the active communication protocol (i.e. DNP-TCP-IP, 2179, IEC870-5-101, Modbus).

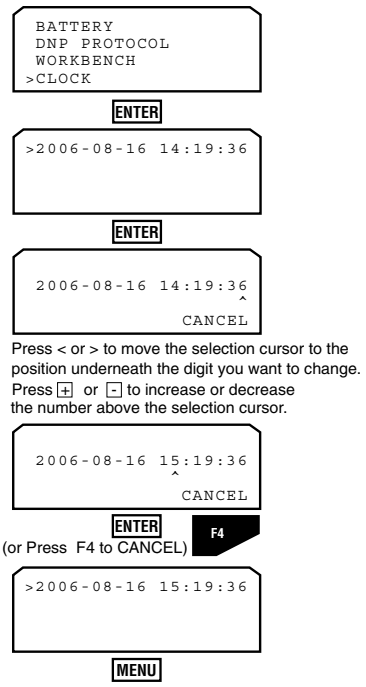
Workbench Menu

The Workbench screen provides access to custom user messages, custom analog data, status data, virtual switches, and Workbench name information that is configured as part of the Idea Workbench.

- Workbench Messages: Displays user-configured messages. Refer to **Workbench Message Outputs to MMI** in the **Idea Workbench** section of this manual for message customization information.
- Workbench Analogs: Displays Workbench configured analog measurements. Refer to **Workbench Analog Outputs to MMI** in the **Idea Workbench** section of this manual for description customization information.
- Workbench Status: Displays Workbench configured status points for user-defined Sequence of Events. Refer to the **Workbench Status Outputs to MMI and SOE** and **Workbench Outputs Toolbox** sections of this manual for additional information.
- Workbench Switches: Accesses Workbench configured virtual switches. Refer to **Workbench MMI Softkey Switches** in the **Idea Workbench** section of this manual for description customization information.
- Workbench Name: Displays the user-defined Workbench Description. Refer to **Workbench Description** in the **Idea Workbench** section of this manual for description customization information.



Clock Menu



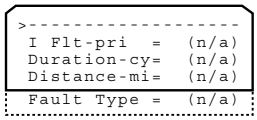
The LCD display shows the year, month, date, hour, minutes, and seconds.

The diagram at left shows the screen process for setting/changing the clock.

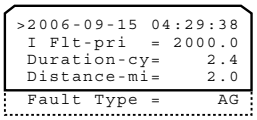
Note: The time/date clock will continue to operate for approximately 30 days after loss of control power.

Fault Locator Menu

ENTER



Appearance prior to a fault occurrence.



Example of information displayed after a fault occurrence.

Fault Locator provides the following information:

- Date and Time Stamp
- Primary fault current
- Fault duration
- Approximate distance of a fault from the Form 6 recloser control (kilometers or miles)
- Type of fault

Note: The Fault Locator will only provide the Distance and Fault Type information when three voltages are supplied and all three boxes for Source-Side Connected PTs (Wye/Delta) are checked in the Form 6 control ProView software *Configure>System Configuration* dialog box.

This menu will display the information from the last fault.

Note: The fault locator information is stored in volatile memory and cannot be manually cleared.

The fault location algorithm performs the fault location calculation based on system quantities set in the ProView software *System Configuration* dialog box. Refer to **Configure / System Configuration** in the **Form 6 Control Schemes** section of this manual for fault locator setting information.

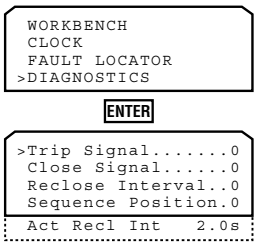
These fault location algorithms are used:

- Takagi[1]
- Takagi (No Preflt)
- Reactance

If a fault location cannot be determined, the fault locator still displays fault current and duration, but not fault distance and type.

[1] T. Takagi, Y. Yamakoshi, J. Baba, K. Uemura, T. Sakaguchi, "A New Algorithm of an Accurate Fault Location for EHV/UHV Transmission Lines: Part I - Fourier Transformation Method", IEEE Trans. on PAS, Vol. PAS-100, No. 3, March 1981, pp 1316-1323.

Diagnostics Menu



The Diagnostics screen displays the current status of the recloser connected to the Form 6 recloser control.

These are specific signals displayed to the user in real time.

- Trip Signal

  0 = Recloser is not in the process of issuing a trip signal.

  1 = Recloser is in the process of issuing a trip signal.

- Close Signal

  0 = Recloser is not in the process of issuing a close signal.

  1 = Recloser is in the process of issuing a close signal.

- Reclose Interval (time between fault interruptions)

  0 = Control is not in the reclosing interval.

  1 = Control is in the reclosing interval.

- Sequence Position

  0 = Recloser is at the HOME position.

  1 = Recloser tripped once in the sequence.

  2 = Recloser tripped twice in the sequence.

  3 = Recloser tripped three times in the sequence.

  4 = Recloser tripped four times in the sequence.

- Actual Reclose Interval

  #s = Next reclose interval as configured by the user.

I/O Control Menu

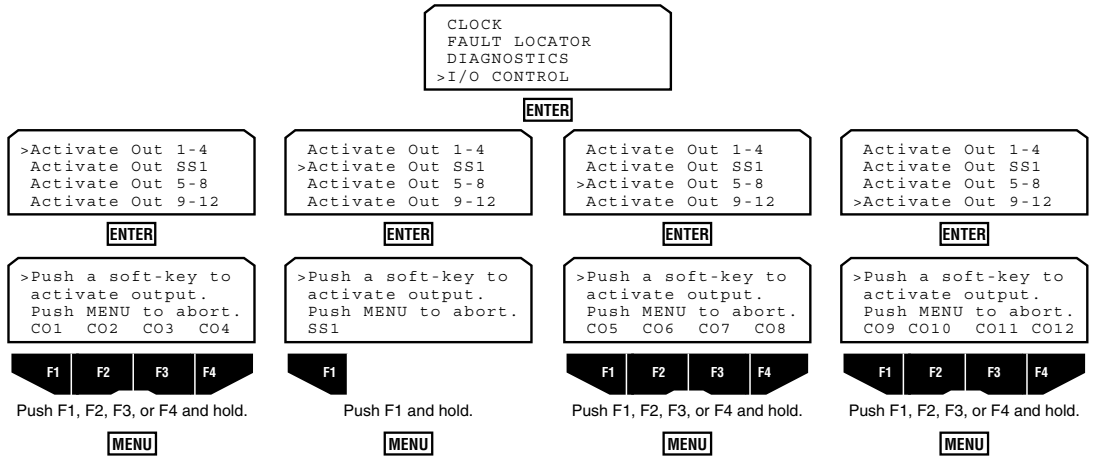
The I/O Control screens let you verify the operation of the output contacts of the Form 6 recloser control. The back panel of the Form 6 control contains output connections (CO1 through CO12, and SS1). These contacts can be activated from the front panel LCD display through the I/O Control menu.

The diagram below shows the screen process of activating contact outputs 1 through 12 and the Solid State Contact (SS1) for testing.

Pressing the applicable soft-key (F1, F2, F3, F4) opens and closes the contact.

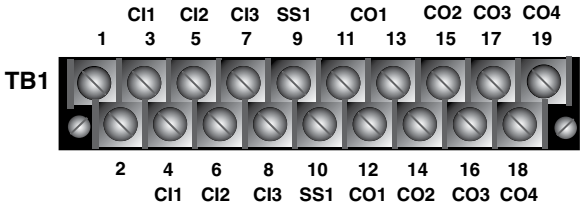
Note: If the active scheme is driving one of these outputs, the contact will remain in the Active condition.

Pressing MENU returns the display to the previous screen.

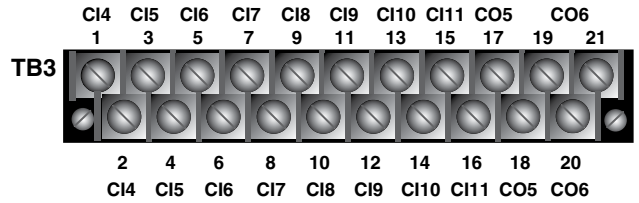


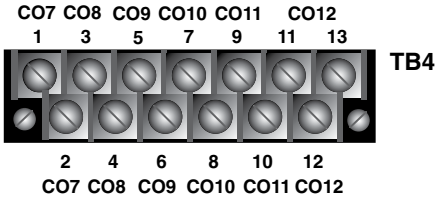
CAUTION: System misoperation. Check the output contacts wiring on the back panel prior to operating I/O Control from the LCD panel. Verify that operation of the contact outputs will not cause a system misoperation. T309.0

Control Output Connections

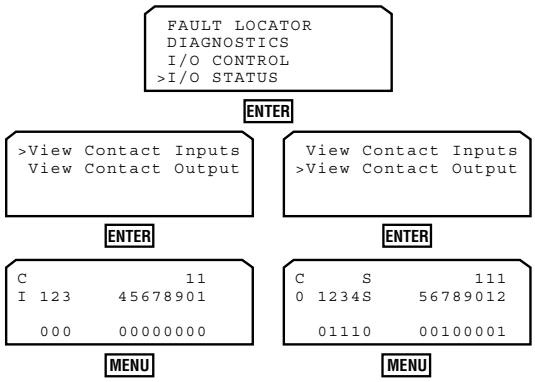


Note: TB3 and TB4 are optional I/Os.



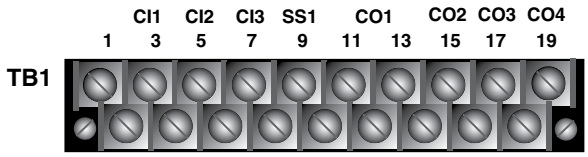


I/O Status Menu



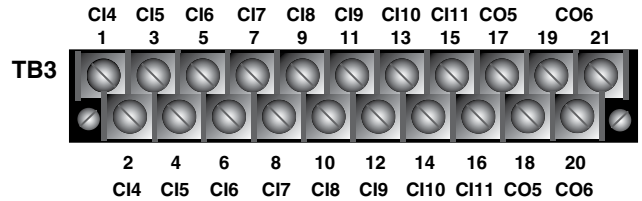
The I/O Status screen displays the contact status of the input connections and output contacts. The back panel of the Form 6 recloser control contains input connections (CI1 through CI11) and output contacts (CO1 through CO12, plus SS1) that can be monitored from the front panel LCD display.

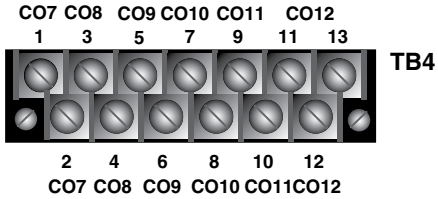
- 1 = Active
- 0 = Inactive



Note: CO1 (TB1-11, -12, -13) is a Form-C contact.

CO2 (TB1-14, -15) is a Form-B (normally closed) contact. Therefore, an active (energized) state will provide an open contact.

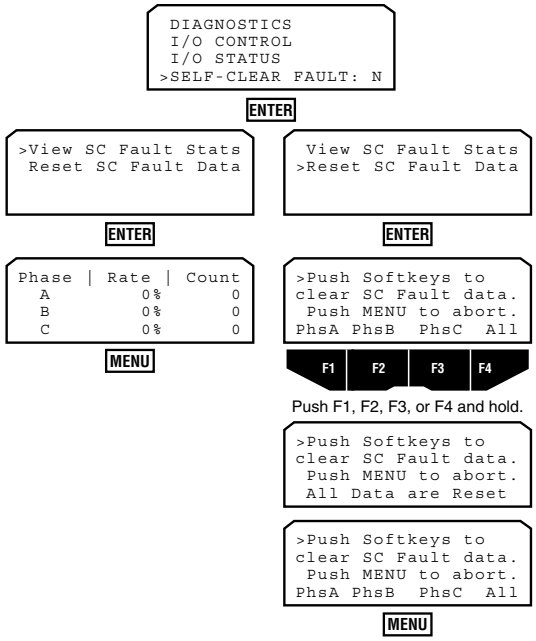




Note: TB3 and TB4 are optional I/Os.

CO6 (TB3-19, -20, -21) and CO12 (TB4-11, -12, -13) are Form-C contacts.

Self-Clear Fault Menu



The Self Clear Fault menu provides access to the following information (per phase) used for monitoring incipient cable splice failures due to moisture ingress:

SELF-CLEAR FAULT: N or Y (N = No, Y = Yes) This indicates if there is any self-clear fault data.

Rate % = Self clear fault occurrence rate. This indicates how close the device is towards an alarm condition. 100% would indicate that an alarm condition has been reached.

Count = Total number of characteristic waveform signatures detected.

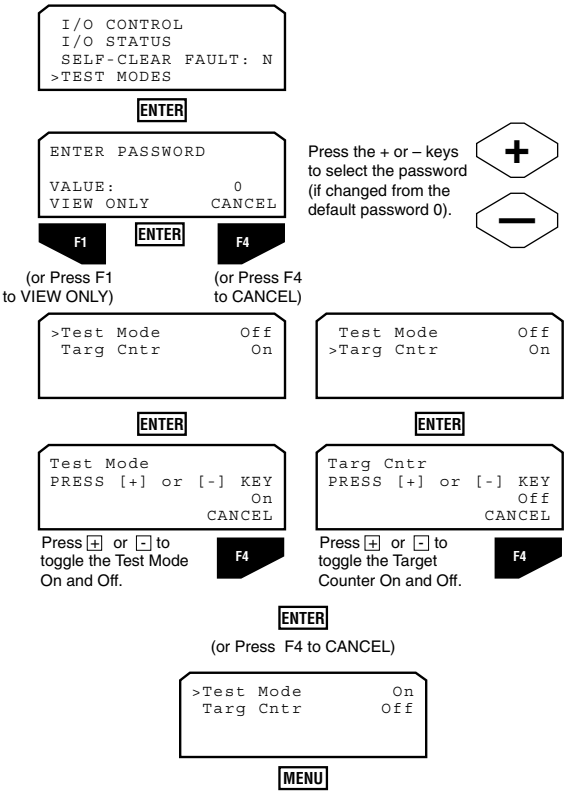
The incipient cable splice fault detector algorithm recognizes the unique waveform characteristics that occur in the days preceding a pending cable splice failure due to water ingress. By monitoring how often this waveform footprint occurs over time, the user can obtain a highly reliable indicator of impending cable splice faults.

Before a cable splice fails, water seeps into the splice causing a line-to-ground fault. The resulting fault current causes a sudden burst of gas that extinguishes the fault. The result is a waveform characteristic of an approximate 1/4 cycle self-extinguishing fault.

The second characteristic of incipient cable splice faults is that they occur with increasing frequency over time. The incipient cable splice fault detector algorithm provides the ability to sense the total number of occurrences as well as the number of occurrences that occur during a programmable time period.

Note: Occasionally, a current limiting fuse operation can generate a waveform that will be counted by the incipient cable splice fault detector. However, these events will be very limited in number compared to the number of counts that will occur prior to an actual cable splice failure.

Test Modes Menu



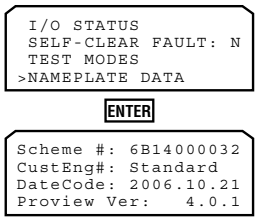
The Test Modes menu allows the user to conduct tests on the Form 6 control.

Enabling Test Mode and Disabling the Target Counter prevents the control from counting test operations and recording tests as actual recloser operations.

The diagram shows the screen process to enable and disable the accumulators and/or targets.

Note: When in Test Mode, the Sequence of Events recorder will continue to record any Events.

Nameplate Data Screen



The Nameplate screen displays the following Form 6 recloser control information:

- Scheme Identification Number
- Custom Engineered Scheme Number
- Form 6 Scheme Date Code
- ProView Version Number

Section 3: Using ProView Software

Introduction

WARNING: Equipment misoperation. Use of an incompatible or inappropriate settings file, scheme file, or custom software file in a control, relay, recloser, or switch can result in equipment misoperation leading to equipment damage, severe personal injury, or death. G140.1

CAUTION: Equipment misoperation. Use of the ProView operating system may result in the creation of many combinations of setting files, scheme files, and custom software files. Many of these combinations can be downloaded into any device using the ProView operating system. The user must ensure that the proper combination of software modules is created and downloaded to the correct device for the application. G148.0

CAUTION: System misoperation. The process of downloading a new scheme or settings will cause this device to stop functioning as a protective device for a period of approximately 8 seconds. Safe operating practices must be observed while downloading schemes or settings. Failure to comply can result in system misoperation. T299.1

CAUTION: Protective equipment misoperation. Before downloading configuration files or settings to the equipment, verify that the files and settings are correct for the location and application. Downloading configuration files or settings designed for a different location or application can result in severe personal injury and equipment damage. G133.1

Just as the Kyle Form 6 recloser control is a modular, updatable product, so is the ProView application software. ProView provides an integrated environment for the configuration and operation of your Form 6 control(s), as well as a complete programming system for developing power system applications. Cooper Power Systems offers development services for customer applications. The advanced nature of ProView application software and the Form 6 control allow custom configuration of control algorithms. Programming courses for those interested in learning how to go beyond configuration and operation of the Form 6 control are available. ProView is the most sophisticated operating system available for a microprocessor-based recloser control.

Requirements

ProView will give optimal performance for the Form 6 recloser control if run on a computer with the following specifications:

- Windows® 2000 or Windows® XP Professional operating system
- Intel® Pentium® IV processor (or equivalent) with a 1.8 GHz minimum speed
- 512 MB of RAM
- 130 MB of free hard-disk storage space
- Monitor screen resolution of 1024 x 768 pixels (or higher)

These are the minimum PC requirements for this software:

- Microsoft® Windows® 95 OSR2, Windows® 98 SE, Windows® Me, Windows NT® SP6, Windows® 2000, Windows® XP Professional, or Windows Vista™ operating system
- Intel® Pentium® II processor (or equivalent) with a 300 MHz minimum speed
- 128 MB of RAM
- 130 MB of free hard-disk storage space
- Monitor screen resolution of 1024 x 768 pixels

Installing ProView Software

Installing from a CD-ROM

This could be displayed for approximately 90 seconds.

ProView application software installs like most other Microsoft® Windows®-based applications. If you are not familiar with installing Microsoft® Windows®-based applications, you may want to seek assistance with this installation.

Note: Verify that your computer meets the specified minimum PC requirements prior to beginning the installation process.

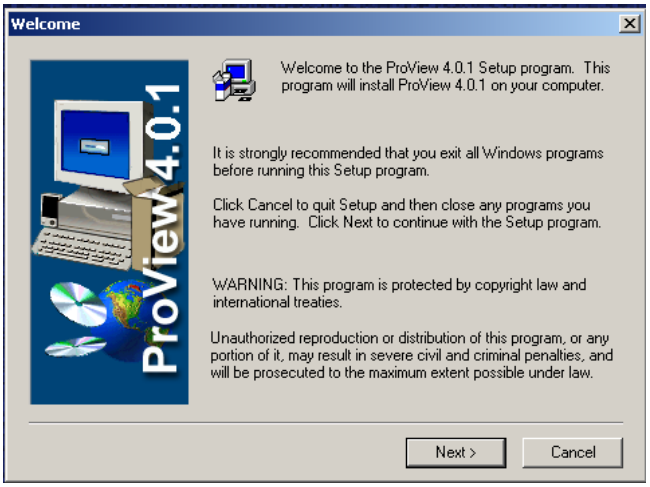
Insert the ProView CD into the drive. The Setup program should start automatically.

Note: If the Setup program doesn't start automatically, complete the following steps:

1. Select RUN from the Start Menu.
2. Type d:/setup.exe (d=CD-ROM drive letter).
3. Click OK.

The initial setup screen should be displayed.

Launching the Setup Program

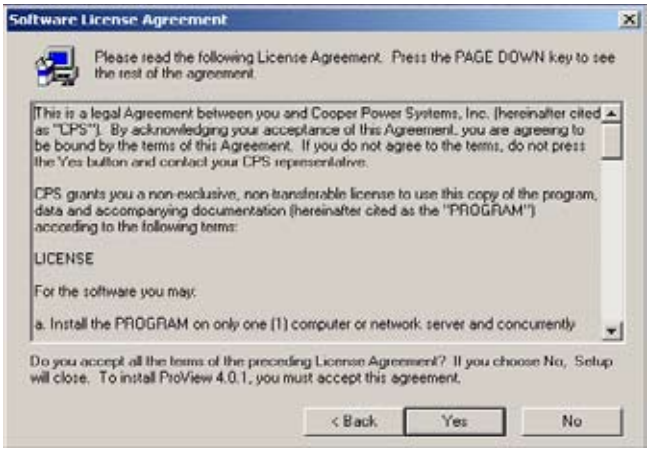


The first screen you see is the Setup WELCOME screen. Follow the instructions in the screen.

1. Click NEXT to continue.

Read the Export Restrictions.

2. Click OK to continue.



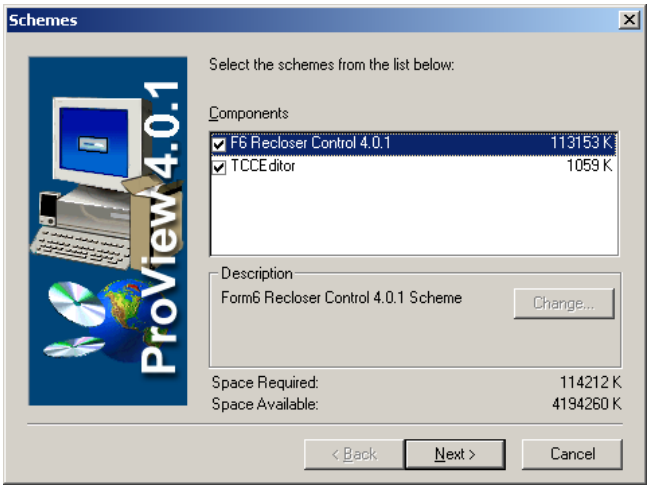
Read the Software License Agreement.

3. Click YES to continue.

The destination folder for ProView is located at the bottom of the screen. It is recommended that the default destination folder be used.

4. Click Next to continue.

Installing ProView Components



This dialog box allows you to select the components that will be installed.

5. Select the applicable schemes and components.

   It is recommended that you install all items in this list.

   Note: If TCC Editor is already installed on your PC with an older version of ProView, it must be selected and reinstalled.

6. Click Next to continue.

Installation will begin.

A progress status window appears.

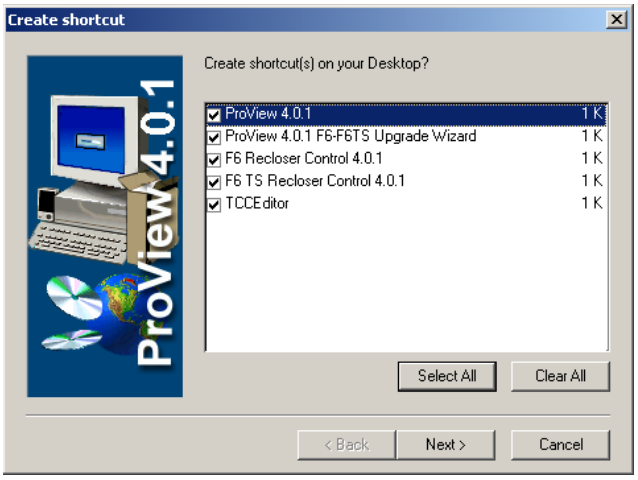
Note: At this time, ProView will check the HTML Help file version currently open.

If the version on the PC is older, the Help files will automatically be updated.

If the version on the PC is newer, the following message will appear: This computer already has a newer version of HTML Help. Click OK.

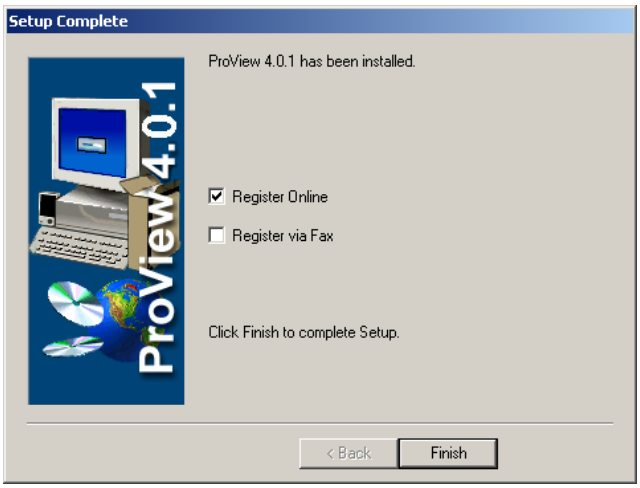
Note: If Acrobat® Reader® software is not already installed on your computer, a screen will appear asking if you want to install it. Acrobat® Reader® software is used to view the electronic version of the Form 6 *Service Information* manuals available in the Cooper/Proview401/Form6 folder.

Completing ProView Installation



After successful installation, a Create Shortcut screen appears asking if you want to create shortcut(s) on your Desktop.

7. Select the appropriate options.
8. Click NEXT.



A Setup Complete screen appears.

Note: ProView 4.0.1 does not require a software authorization key, but registration is still recommended.

9. Select the appropriate registration option.

   If you do not de-select (uncheck) the defaulted "Register Online" checkbox, you will be linked to the online ProView software registration site.

   or

   Select (check) the "Register via Fax" checkbox and de-select (uncheck) the "Register Online" checkbox. Print the registration form. Complete the form and fax it to the number shown at the bottom of the form.

   or

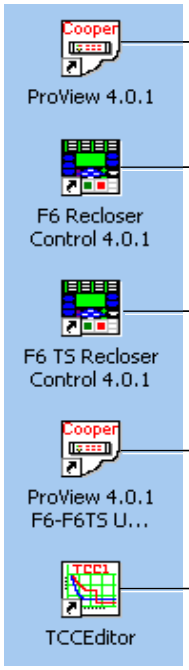
   De-select (uncheck) both fields and register later.

10. Select FINISH.
11. Remove the CD from the drive.

Continue on to the **Login/Logout** sections of this manual.

If you did not change the default destination folder, ProView was installed in the PROGRAMS folder of your Microsoft® Windows® START MENU: Program Files/Cooper/Proview401

It is not necessary to reboot your computer after ProView installs.



Click this icon to access ProView without a scheme.

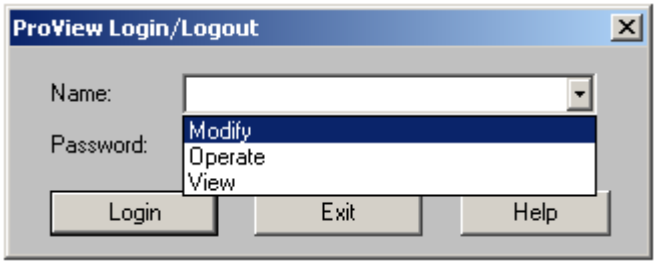
Click this icon to access the Form 6 control factory default scheme.

Click this icon to access the Form 6 Triple-Single control factory default scheme.

Click this icon to start the ProView 4.0.1 Form 6 Upgrade Wizard. The Upgrade Wizard will only upgrade Form 6 Control ProView Version 4.0 to ProView Version 4.0.1. The Upgrade Wizard will not upgrade any other Form 6 ProView versions.

Click this icon to access TCC Editor II.

Login / Logout



When the Login/Logout screen appears:

1. Click on the arrow next to the NAME box.
2. Select the name of the appropriate access level.

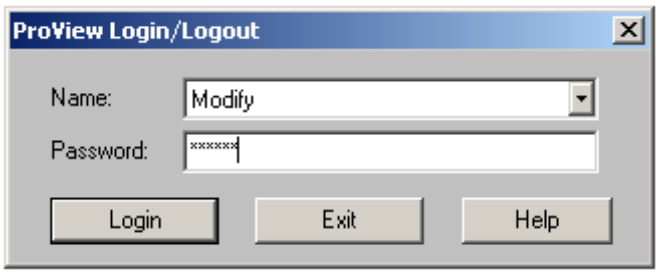
   MODIFY: User has all the capabilities of the OPERATE level, plus the ability to make scheme setting and structure modifications.

   OPERATE: User has all the capabilities of the VIEW level, plus the ability to download schemes, settings, and firmware; delete events, and complete other scheme-dependent operations. No scheme setting or structure modifications are allowed at the OPERATE level.

   VIEW: User can view metering and event data, check settings, print and print preview, and other read-only operations. No changes are allowed at the VIEW level.

   Shortcut: *Type the first letter of the access level you wish to enter; the name will appear in the box (i.e. "V" for View).*

3. Select the PASSWORD box.



4. Type in the password. The default password is the same as what you selected in the NAME box.

   Note: Passwords are case-sensitive. Therefore, type the name in the PASSWORD box exactly the way it appears. Capitalize the first letter of the word. The password is disguised with asterisks (*).

5. Select LOGIN.

   Note: If you choose not to login, select EXIT to exit ProView.

You are now ready to load a scheme.

Note: If you double-clicked on the Form 6 recloser control scheme icon located on your desktop, the scheme will automatically open.

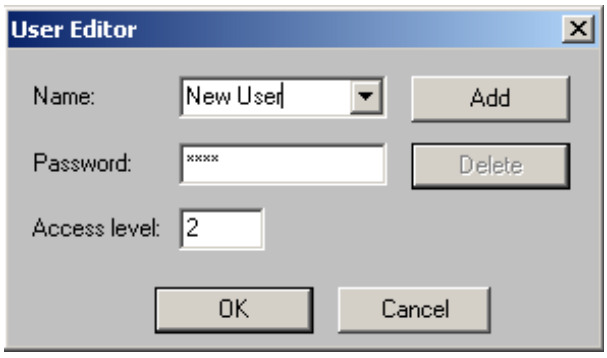
Refer to the **Loading Schemes** section of this manual for additional information.

Adding/Deleting Users and Changing Passwords

The ProView USER>EDIT drop-down menu opens the USER EDITOR dialog box that is used to add or remove users and change passwords.

Access Level Codes: View = 1
Operate = 2
Modify = 4

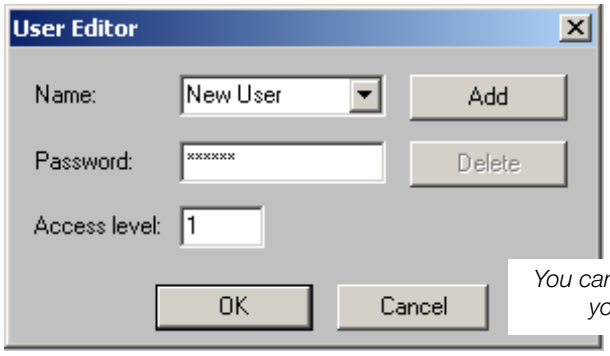
Note: Contact the Kyle Switchgear Support Group (1-800-497-5953) if the password is misplaced.



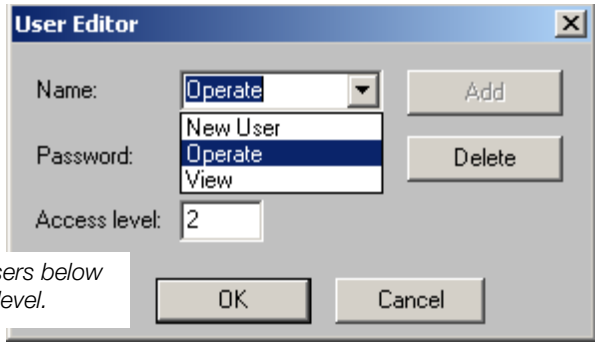
MODIFY level users can access the User Editor screen while in ProView only (no scheme opened) or after a scheme is opened.

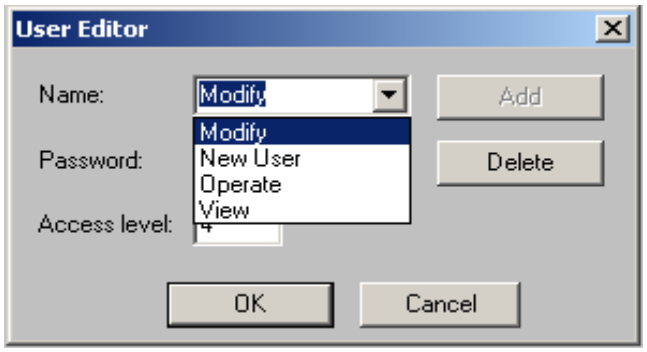
OPERATE and VIEW level users can only access the User Editor screen while in ProView only (no scheme opened).

CAUTION: Security Hazard. Security features must be user-configured for implementation. Failure to implement security features may result in unauthorized access to unit. G151.0



You can only view users below your own user level.





Follow this procedure to add a new user.

1. Type in a new Name and Password.
2. Assign the Access level.

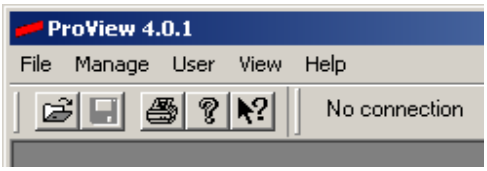
   Note: You can only add, edit, and delete users *below* your own user level.
3. Click Add to add the new user.

Follow this procedure to change a password:

1. After log-in, type the new case-sensitive Password in the Password field of the User Editor dialog box.
2. Click OK. Your password has been changed.

   Note: You will not be prompted to re-type your password.

Main ProView Menus



After login, the main ProView software screen appears. It contains five drop-down menus:

FILE, MANAGE, USER, VIEW, HELP

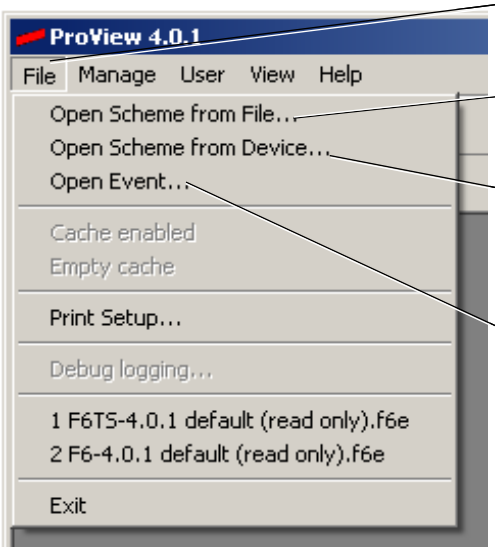
Note: Some menu options expand when a scheme is open.

Below is a brief description of each of these menus.

File Menu

Use the Main FILE drop down menu to OPEN a Form 6 scheme in a new window. You can open multiple schemes at one time.

The FILE menu is where you EXIT the ProView session.

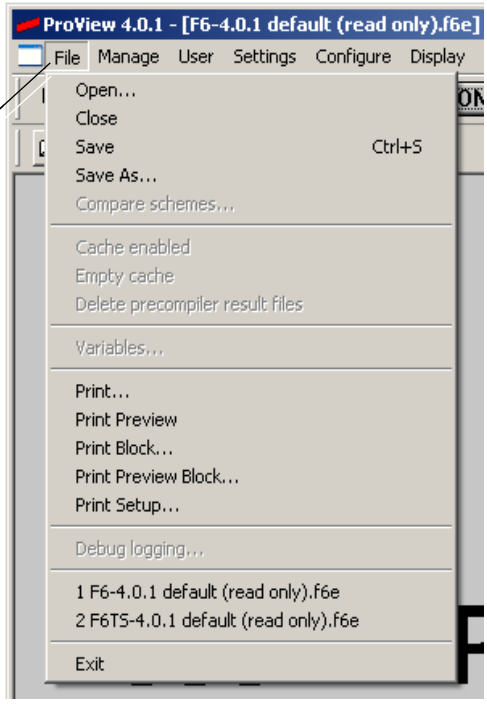


*File Menu options when a scheme **is not** open.*

Open a scheme from the PC hard drive.

Open a scheme from a Form 6 control.

Only Events saved to the default Form 6 application folder where the HelpFiles and LibFiles reside will open.

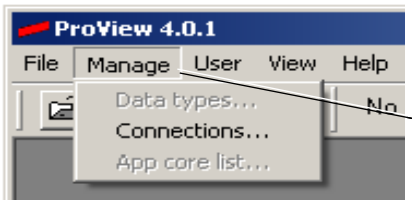


*File Menu options when a scheme **is** open.*

The name of the scheme appears at the top of the menu bar.

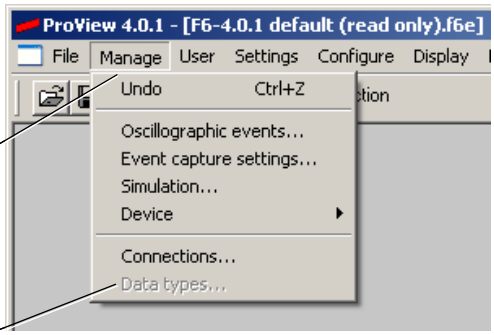
The read only attribute prevents users from making changes to the official released scheme. After changes are made the user must save the scheme with a new name.

Manage Menu



*Manage Menu options when a scheme **is not** open.*

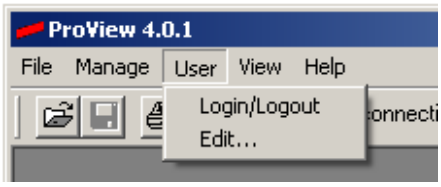
When a scheme is not open, the ProView MANAGE drop-down menu only lets you open the MANAGE CONNECTIONS dialog box, which is used for editing the characteristics of the PC communication connections.



*Manage Menu options when a scheme **is** open. The name of the scheme appears at the top of the menu bar.*

Data types is always grayed out. This menu is reserved for Factory access.

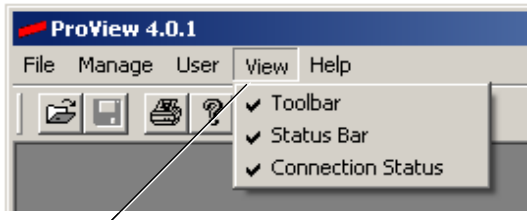
User Menu



The ProView USER drop-down menu lets you login and log out of the ProView session.

This menu also accesses the User Editor dialog box that is used to add/remove users and change passwords. Refer to **Adding / Deleting Users and Changing Passwords** in the **Login / Logout** section of this manual for additional information.

View Menu



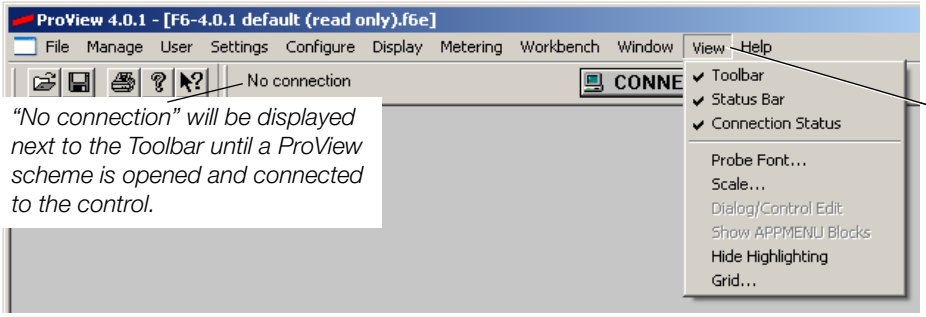
*View Menu options when a scheme **is not** open.*

The ProView VIEW drop-down menu lets you display the Toolbar, the Status bar, and the Connection Status.

The Toolbar consists of the icons below the main ProView menu.

The Status Bar displays information at the bottom of the ProView window when you highlight menu items with the cursor.

The Connection Status (displayed next to the Toolbar) shows the connection status between ProView and the Form 6 recloser control.



"No connection" will be displayed next to the Toolbar until a ProView scheme is opened and connected to the control.

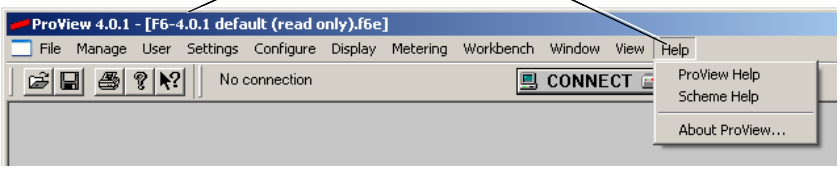
*View Menu options when a scheme **is** open. The name of the scheme appears at the top of the menu bar.*

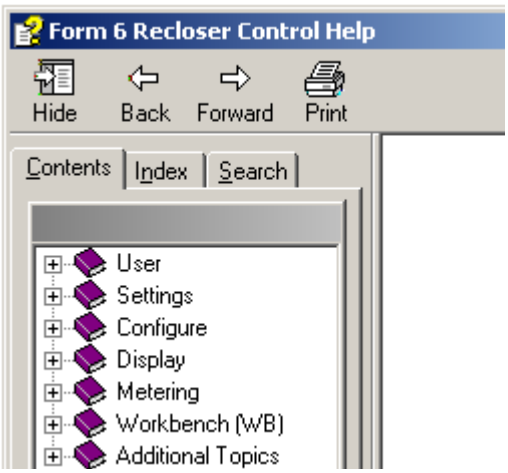
Help Menu

The HELP drop-down menu accesses ProView Online Help and Scheme Help. Scheme Help is only available when a scheme is open.

*Help Menu options when a scheme **is not** open.*

Help Menu options when a scheme is open. The name of the scheme appears at the top of the menu bar.





Section 4: Form 6 Control Schemes

CAUTION: Equipment misoperation. Use of the ProView operating system may result in the creation of many combinations of setting files, scheme files, and custom software files. Many of these combinations can be downloaded into any device using the ProView operating system. The user must ensure that the proper combination of software modules is created and downloaded to the correct device for the application. G148.0

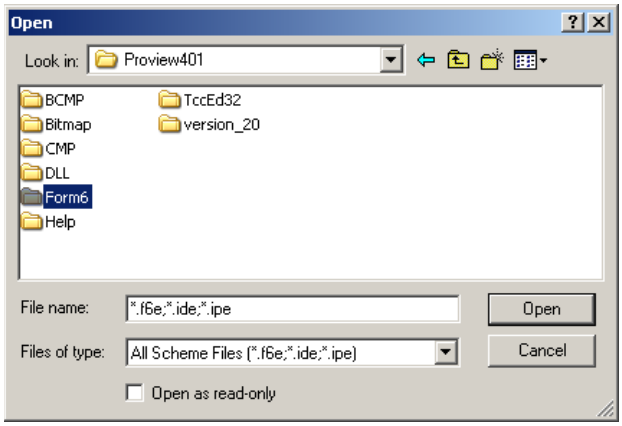
WARNING: Equipment misoperation. Use of an incompatible or inappropriate settings file, scheme file, or custom software file in a control, relay, recloser or switch can result in equipment misoperation leading to equipment damage, severe personal injury, or death. G140.0

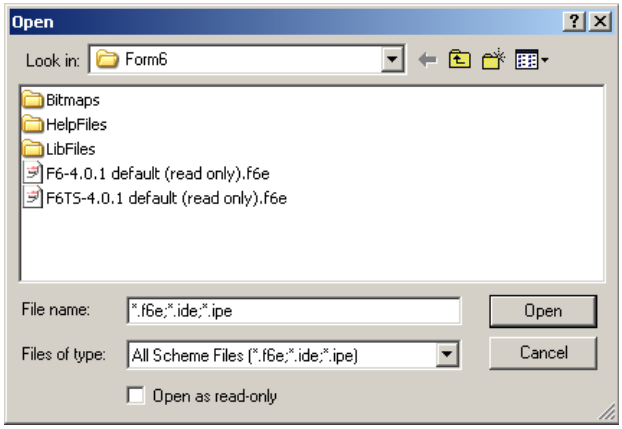
The Form 6 Recloser Control utilizes schemes of logical operations that make up the protection functionality of the control.

Schemes contain the programming tools of the Form 6 control to provide comprehensive protection, control, and monitoring of reclosers within a power distribution application.

Loading Schemes

CAUTION: Protective equipment misoperation. Before downloading configuration files or settings to the equipment, verify that the files and settings are correct for the location and application. Downloading configuration files or settings designed for a different location or application can result in severe personal injury and equipment damage. G133.1





The FILE menu dropdown lists the Form 6 control schemes at the bottom. Schemes can be opened by selecting one from the list or by using the OPEN command at the top of the FILE menu.

CAUTION: System misoperation. The process of downloading a new scheme or settings will cause this device to stop functioning as a protective device for a period of approximately 8 seconds. Safe operating practices must be observed while downloading scheme files or settings. Failure to comply can result in system misoperation. T299.0

Multiple schemes can be open at one time. Switch between schemes by selecting different schemes listed in the Form6 folder.

Follow these steps to open a scheme from the Form6 folder:

1. Select OPEN from the ProView Main Menu.
2. Select the computer drive where ProView resides.
3. Open the Form6 folder.
4. Select the appropriate scheme.
5. Click on OPEN.

The scheme will load.

Note: The process of loading takes approximately 30 to 45 seconds. The lower left corner of the screen will show the number of elements loading as the scheme loads.

IMPORTANT: The factory default scheme file is read only.

If the factory default scheme is modified, ProView 4.0.1 will require you to save the scheme with a new name.

The .f6e scheme file must be saved to the default Form 6 application folder where the HelpFiles and LibFiles folders reside. Scheme files cannot be nested in subfolders.

Communicating with the Form 6 Recloser Control

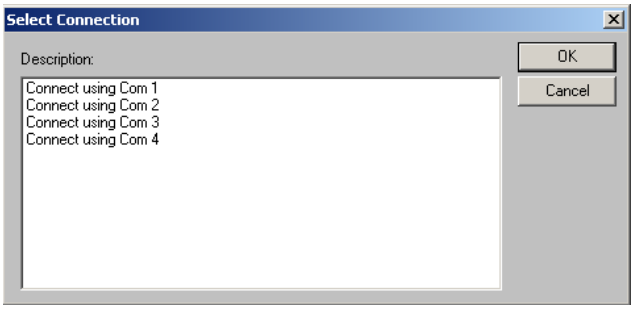
Connecting to the Form 6 Control

CAUTION: Recloser misoperation. The control must be removed from service prior to performing any maintenance or testing or programming changes. Failure to comply can result in misoperation (unintentional operation) of the recloser. T216.2

CAUTION: Equipment misoperation. Do not connect this control to an energized recloser until all control settings have been properly programmed and verified. Refer to the programming information for this control. Failure to comply can result in control and recloser misoperation, equipment damage, and personal injury. G110.3

1. Open the F6-4.0.1 default (read only).f6e scheme in ProView.
2. Connect the 9-pin RS-232 straight-through cable between the PC and the front panel RS-232 communication port.
3. Click on CONNECT in the center of the ProView menu bar.

The Select Connection dialog box will appear.



4. Select the appropriate connection and click OK.

   Note: Verify that no additional software (i.e. hand-held PDA devices) requires the same serial communication port (COM port) as the designated ProView software.

   Note: Additional connections can be added to this list. Refer to **Adding ProView Connection Profiles** section in this manual for additional information.

5. You will be prompted to enter the control password.

   There are two control password levels:

   - The first level is the *Upload Level*, which only allows you to upload items from the control (i.e. SOE, Oscillographic Events, Settings).

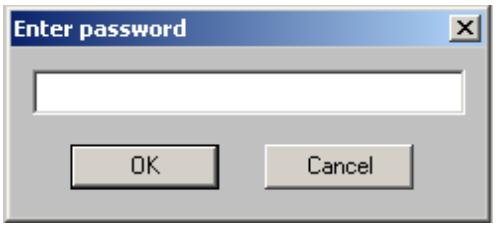
     The default password for the *Upload Level* is *View*.

   - The second level is the *Download Level*, which allows you to upload items from the control (i.e. SOE, Oscillographic Events, Settings) and download items to the control (i.e. Scheme, Settings, Operate via Application Diagram, Firmware).

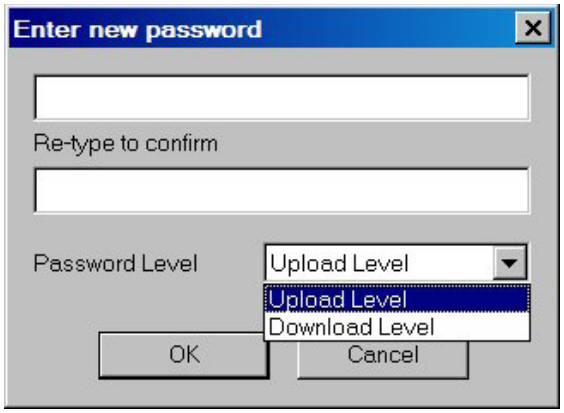
     The default password for the *Download Level* is *Modify.*

   Note: If you typically login to ProView using the *View* access level, you should connect to the control using the *Upload Level* password.

   If you typically login to ProView using the *Modify* or *Operate* access level, you should connect to the control using the *Download Level* password.



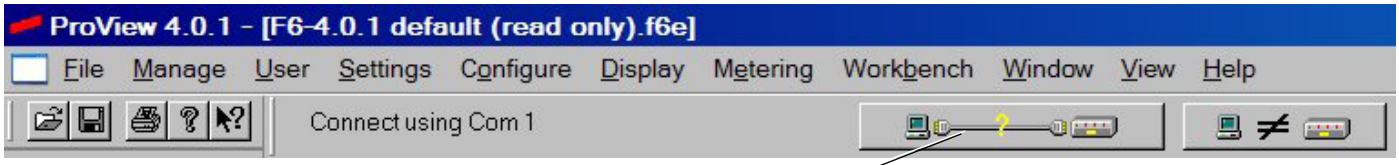
Note: If you forget the control password, contact the Switchgear Support Group at 1-800-497-5953.



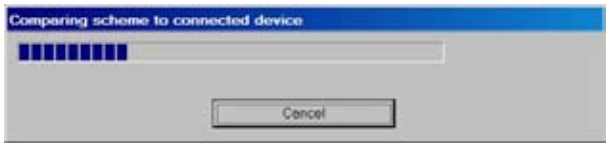
After you enter your password, ProView will attempt to locate a Form 6 control via the selected port.

Note: Once you are connected to the control, you can change the control password through the Manage>Device>Change password dialog box.

Note: If you attempt to connect via the wrong port, you can abort the connection attempt by clicking on CONNECT anytime it appears with the yellow question mark (?) symbol. Clicking on CONNECT after communication has been established will disconnect the PC from the control.



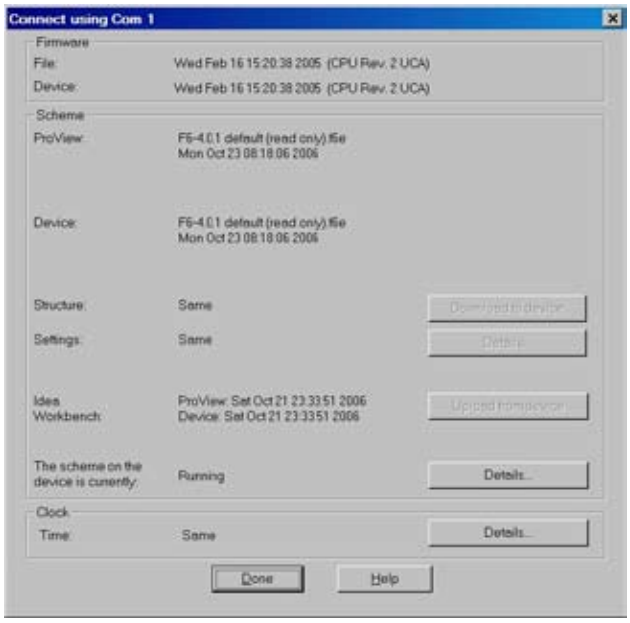
The yellow question mark (?) symbol can occur for the following reasons: incompatible version of ProView, incorrect communication port, or no cable connected.



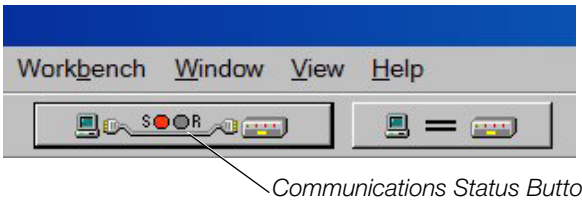
After successfully connecting to the control, the Comparing Scheme to Connected Device box will appear. The progress bar indicates that ProView is comparing the contents of the connected Form 6 control to the Form 6 control scheme currently open on the PC.

Note: This process depends on your computer's speed and RAM and can take several minutes. Refer to **Using ProView Software Introduction** section for minimum PC hardware requirements.

6. After the comparing process is complete, the Compare dialog box appears. This summarizes the comparison of the firmware, scheme, and clock settings between the ProView scheme file and the Form 6 Control.

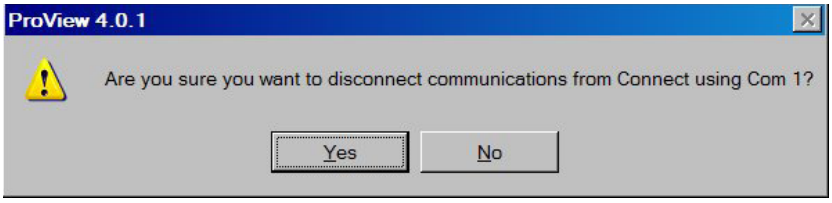


Disconnecting from the Control



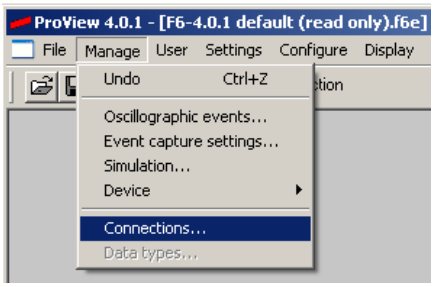
1. Click on the Communications Status Button to disconnect from the Form 6 recloser control.

2. Click the YES button.



3. Click the OK button.

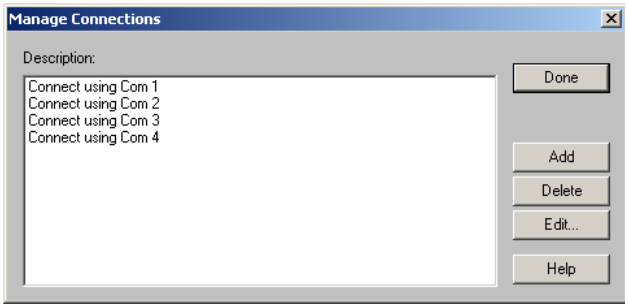
Adding ProView Connection Profiles

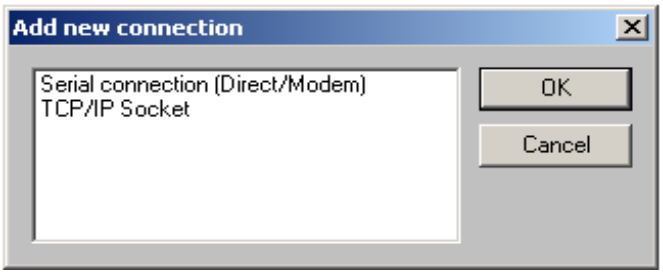


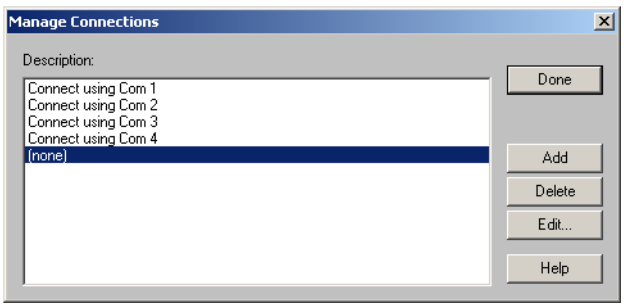
Additional connections can be added to the Manage Connections list. Add a new connection as follows:

1. Select Manage, then select Connections. The Manage Connections dialog box opens.

Note: A connection to the control is not necessary when setting up the manage connections dialog.





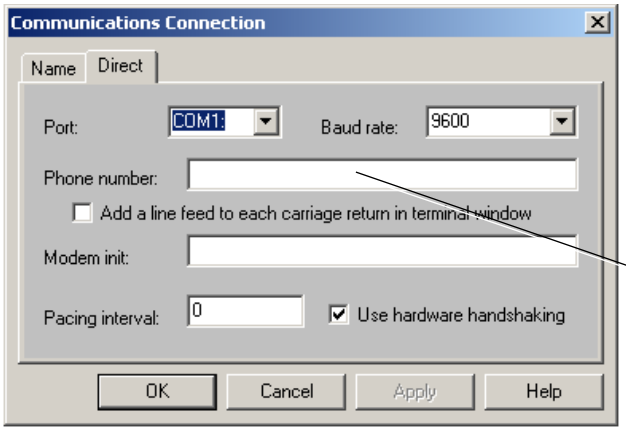


2. Click on ADD. The Add new connection box appears.

3. Select the connection type. Click OK.

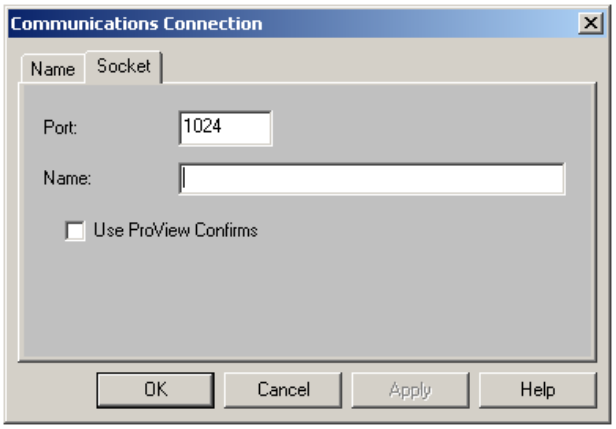
Note: Select serial connection for typical RS-232 PC to Form 6 connections.

A new Description labeled “(none)” will be added to the Manage Connections dialog box list.



4. Click on "(none)" to select it and then click on EDIT.
   - If you are adding a Serial (Direct/Modem) connection the Communications Connection Direct dialog box will appear.
     A. Select the communication port that the computer will use to connect to the control.

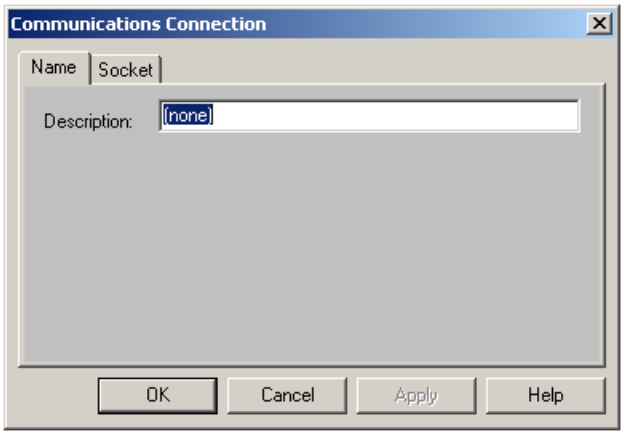
The option to enter a phone number is available. If a phone number is entered, it is automatically dialed when that connection is selected. Upon connecting, an ASCII terminal emulator window will open providing the opportunity to enter an ASCII command string to an intermediate device, such as a communications port switcher. When done entering any required ASCII commands needed to finish connection to the control, close the terminal emulator.



B. Select the baud rate.

- If you are adding an (Ethernet) TCP/IP Socket connection the Communications Connection Socket dialog box will appear: Enter the IP address allocated to the Form 6 control in the Name field.

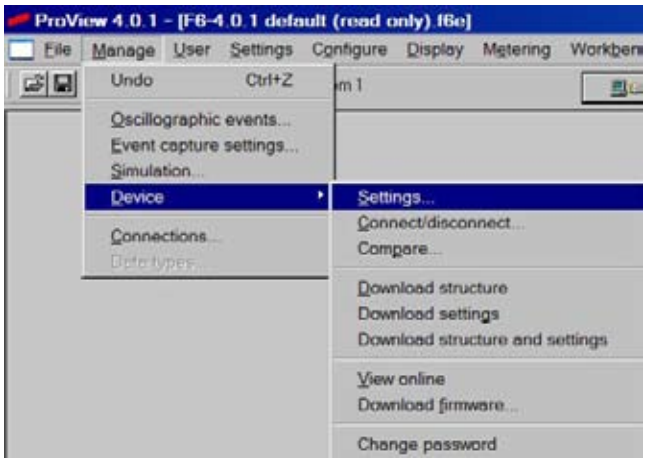
  Note: Refer to next page for additional Ethernet Configuration information.

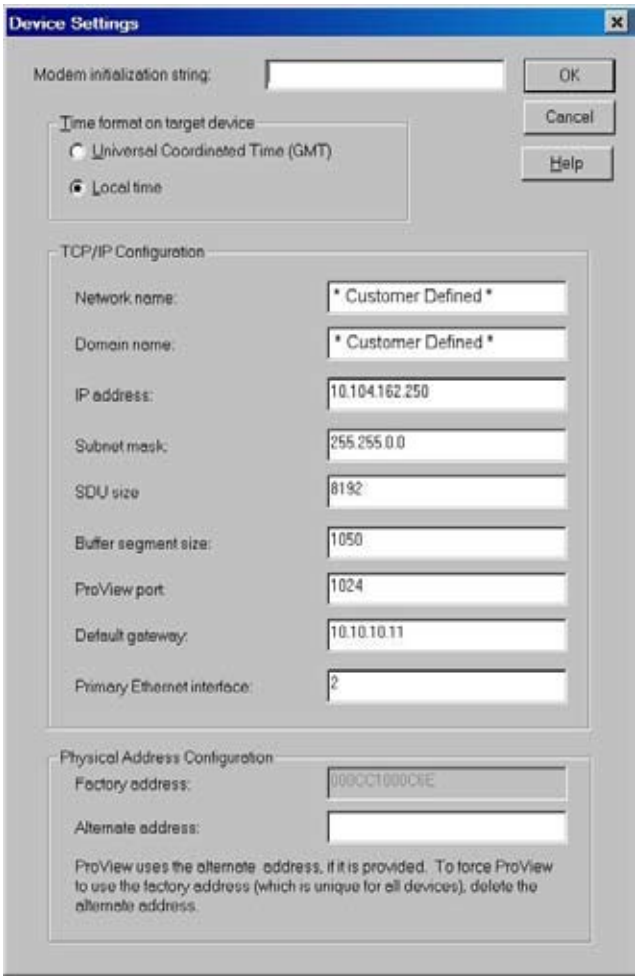


5. Click on the NAME tab in the Communications Connection dialog box.
6. If desired, change the connection name from "(none)".
7. Click on OK to return to the Manage Connections Dialog Box.
8. Click on DONE.

The connection has been successfully added.

Ethernet Configuration





Device settings can only be changed once a connection is made to the Form 6 control via the RS-232 port. Connect to the front panel for initial network setup.

Complete the fields in the Device Settings dialog box:

Modem initialization string – If the control is being connected through a modem and it is necessary to setup the modem upon power up, this field allows you to setup the modem upon power up.

TCP/IP Configuration

Network name: This setting is user-defined.

Domain name: This setting is user-defined.

IP Address: A static IP address must be allocated to function. This address is provided by the user IT Department.

Subnet Mask: A static subnet mask must be allocated to function. This address is provided by the user IT Department.

SDU (Session Data Unit) size: This value must remain set to 8192.

Buffer segment size: This value must remain set at 1050.

Note: The above two variables might change in the future as UCA develops.

ProView port: This value can be any valid IP port setting, but must match ProView and the Form 6 control. 1024 is the default setting and can be changed as necessary to match individual network settings. Contact your IT department for further consultation.

Default gateway: If the device you are connecting to is on a different network segment (defined by the subnet mask) a default gateway must be entered in this field.

Primary Ethernet interface: This specifies which of the two ports on the Ethernet card is the primary communications port. Value '1' denotes the port nearest to the edge of the control and '2' denotes the port closest to the RS-232 port.

Note: The Ethernet Interface will not automatically change between primary and secondary ports in the event of network failure.

Physical Address Configuration

Factory address: This is the MAC (media access controller) address or physical address of the card. This address is unique to this piece of hardware and cannot be changed by the user.

Alternate address: This field must be empty for normal operation. When retrofitting new equipment into an existing network entering the old factory MAC address in this field is required for the network to function properly.

Note: All settings in this dialog box are maintained within the Form 6 control when downloading firmware or scheme files. This allows for Ethernet-based connections to be preserved when downloading files from remote locations.

Comparing PC Schemes and Settings to the Form 6 Recloser Control

IMPORTANT: The factory default scheme file is read only. If the factory default scheme is modified, ProView 4.0.1 will require you to save the scheme with a new name.

After the scheme is opened in ProView, connection to the control via a communications port must be accomplished before settings or event data can be sent to or from the control, or before the View Online mode can be activated. ProView has more features enabled when "Connected."

Note: If a function you want to use is "grayed out" in a menu or dialog box, it may be because you have not successfully connected to a control.

Once the connection is made, the Connection to Device Message Box will be displayed.

After connection is successfully established, the COMPARISON STATUS button on the toolbar will appear in one of several possible modes.

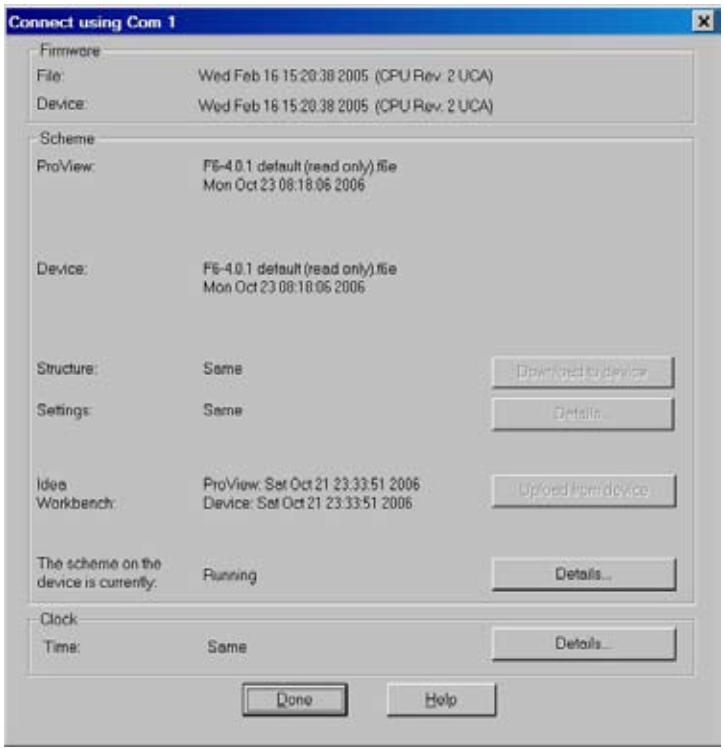
Whenever the COMPARISON STATUS button is clicked on, the comparison dialog box will appear.

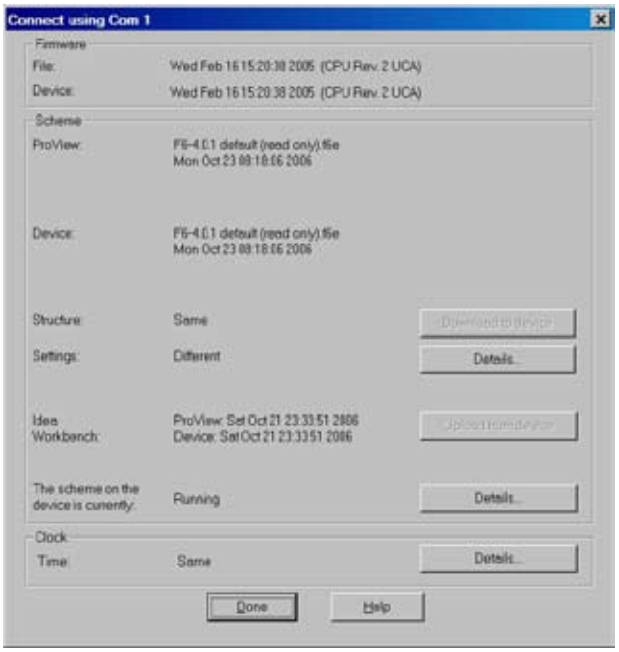
Appearance of Comparison Status button when the control contains a different scheme (Workbench).

Appearance of Comparison Status button when the control contains different settings.

Appearance of Comparison Status button when settings and scheme (Workbench) are identical between control and PC.

Appearance of Comparison Status button when settings, scheme, and non-volatile variables (i.e. Sequence of Events, Counters) are identical between control and PC.

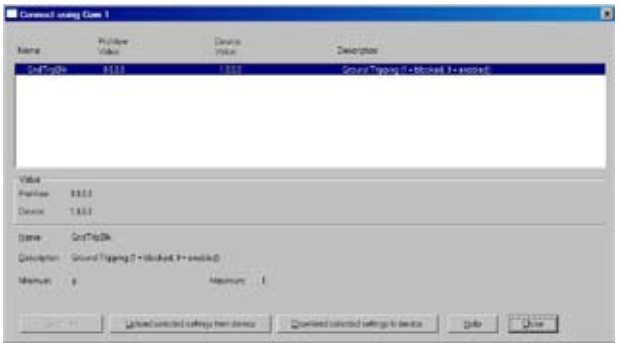




The "Connect using <connection type>" dialog box allows you to see what is different between the PC and the control, and either upload (receive) information from the control or download (send) information to the control. The structure in the PC must match the control for “Go Online” functionality to operate.

Where information is identical between the PC and the control, the action button(s) will be disabled (grayed out). If settings information differs, the action button will be enabled.

Clicking on DETAILS will bring up a dialog box that enables you to compare the value of the control settings to the PC settings. Discrepancies can then be corrected by uploading or downloading individual settings, selected settings, or all settings.



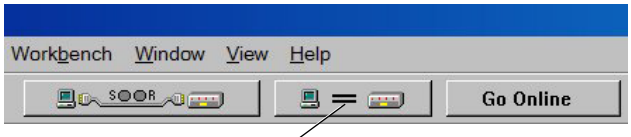
This dialog box only shows the values of the settings that are different between the control and the PC. The comma-delimited values represent the setting for each setting group.

To change the setting on the control to a new value you have entered on your PC, simply select the line(s) of interest and click “Download selected settings to device” to send the revised setting(s) to the control.

IMPORTANT: Downloading settings to the control will erase any unsaved oscillography records. Ensure that all oscillography records are saved before downloading schemes or settings.

If the control settings are correct, you should upload them from the control to ensure that your PC has the correct information. Do this by first clicking on SELECT ALL, and then clicking on UPLOAD SELECTED SETTINGS FROM DEVICE.

Progress Bar indicates downloading status.



After you correct any mismatches, the COMPARISON STATUS button should revert to the "Equal" mode.

Appearance of Comparison Status button in “Equal” mode.

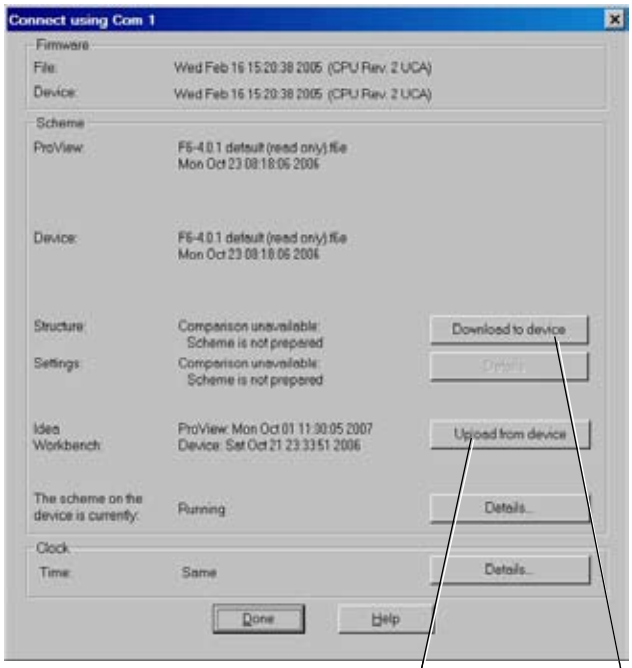
Downloading the Scheme Structure, Idea Workbench, and Settings

WARNING: Equipment misoperation. Use of an incompatible or inappropriate settings file, scheme file, or custom software file in a control, relay, recloser or switch can result in equipment misoperation leading to equipment damage, severe personal injury, or death. G140.1

CAUTION: Protective equipment misoperation. Before downloading configuration files or settings to the equipment, verify that the files and settings are correct for the location and application. Downloading configuration files or settings designed for a different location or application can result in severe personal injury and equipment damage. G133.1

CAUTION: Equipment misoperation. Use of the ProView operating system may result in the creation of many combinations of setting files, scheme files, and custom software files. Many of these combinations can be downloaded into any device using the ProView operating system. The user must ensure that the proper combination of software modules is created and downloaded to the correct device for the application. G148.0

CAUTION: System misoperation. The process of downloading a new scheme or settings will cause this device to stop functioning as a protective device for a period of approximately 8 seconds. Safe operating practices must be observed while downloading scheme files or settings. Failure to comply can result in system misoperation. T299.1



Workbench "Upload" button (Upload Workbenches to PC)

In addition to uploading and downloading settings, ProView also allows the entire protection scheme to be downloaded from the PC to the Form 6 control. This download is accomplished by clicking on Structure *Download to device* in the Compare dialog box. This selection is only enabled if there are differences in the structure (Workbenches) of the scheme on the control as compared to the PC scheme.

You can also upload the Idea Workbench from the control to the PC by clicking on Idea Workbench *Upload from device*.

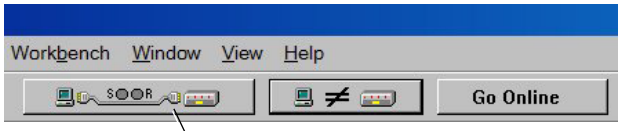
IMPORTANT: The factory default scheme file is read only. If the factory default scheme is modified, ProView 4.0.1 will require you to save the scheme with a new name.

If the control and PC are not equal, proceed as follows:

1. Upload Idea Workbenches.
2. If you are still not equal, Upload the Settings.
3. If you are still not equal, Download the Structure.

IMPORTANT: Downloading structure to the control will erase any unsaved oscillography records. Ensure that all oscillography records are saved before downloading schemes or settings.

Structure "Download" button (Download scheme to control)



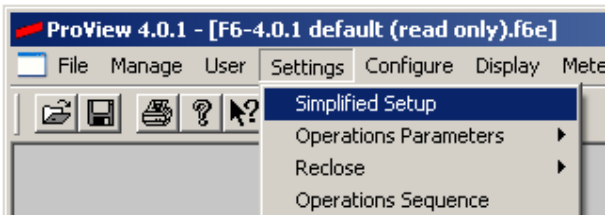
Progress Bar indicates uploading and downloading status.

Settings

Just as in Form 6 Recloser Control front panel programming, the SETTINGS menu allows viewing and modification of function settings. There are additional functions in ProView that are not available in the LCD displays from the front panel. The illustration at the left shows the functions available in ProView.

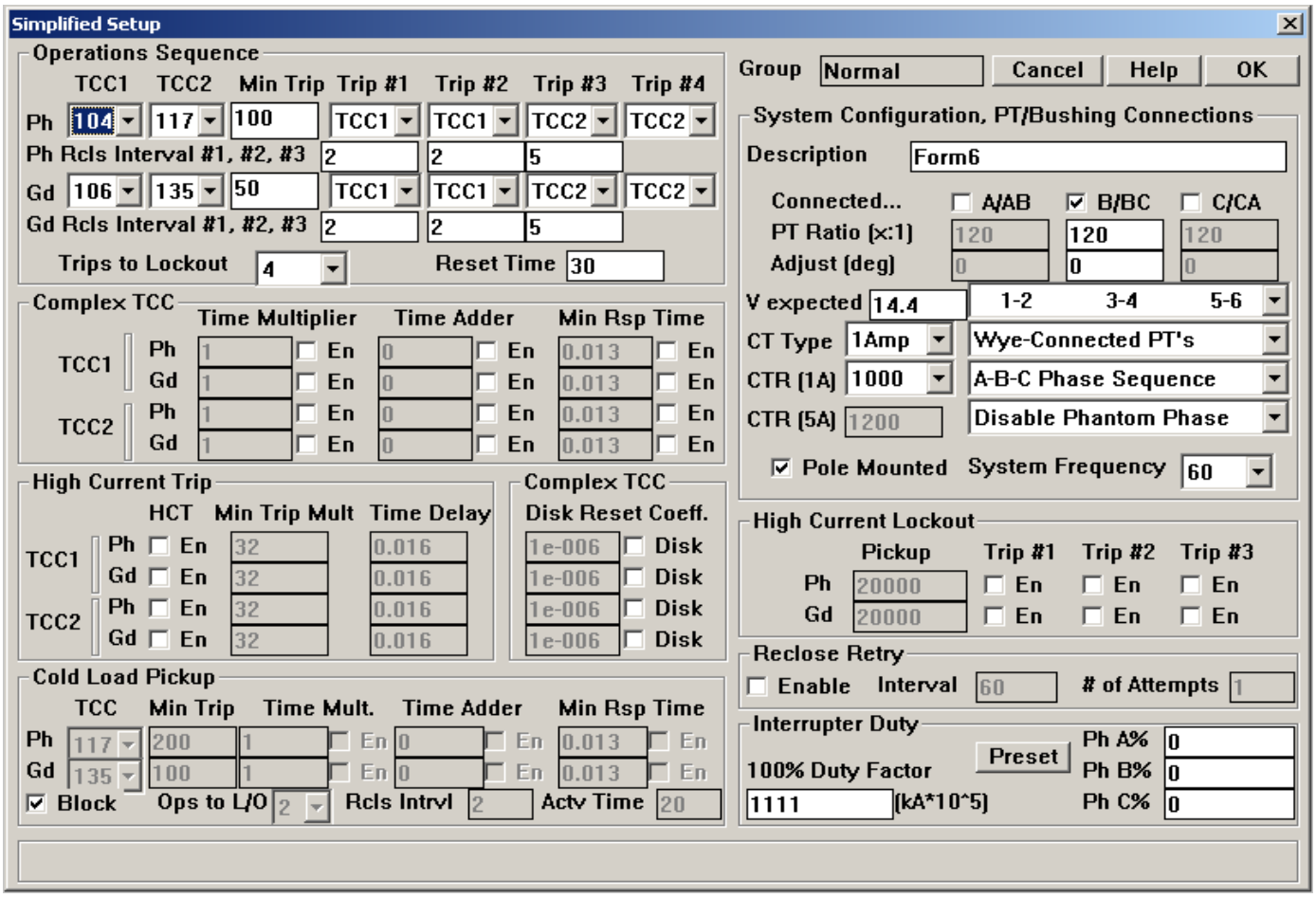
Each function of the SETTINGS menu and detailed instruction on accessibility and programming are described in this section.

Simplified Setup

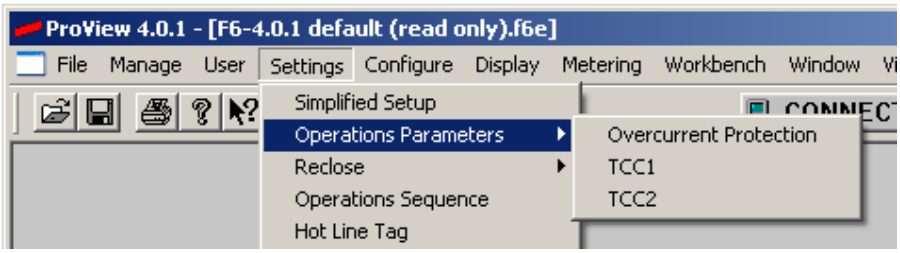


The Simplified Setup dialog box provides one summarized screen to view and modify commonly used settings for the current protection profile.

Changes made to this screen will also be reflected in the appropriate drop-down menu for the same setting.

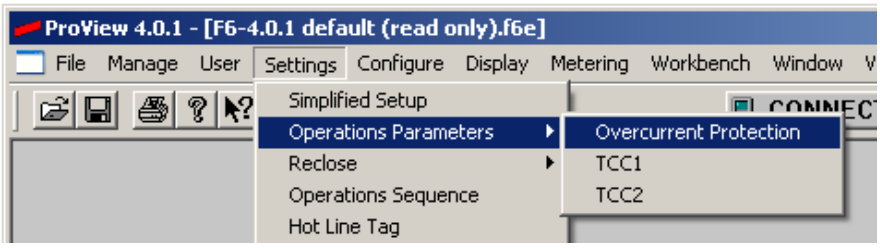


Operations Parameters



The Operations Parameters menu provides access to dialog boxes that let you view and modify overcurrent protection settings for all protection profiles and program the Form 6 control with specific curve characteristics for TCC1 and TCC2 time-current curves and their associated settings.

Overcurrent Protection Profiles

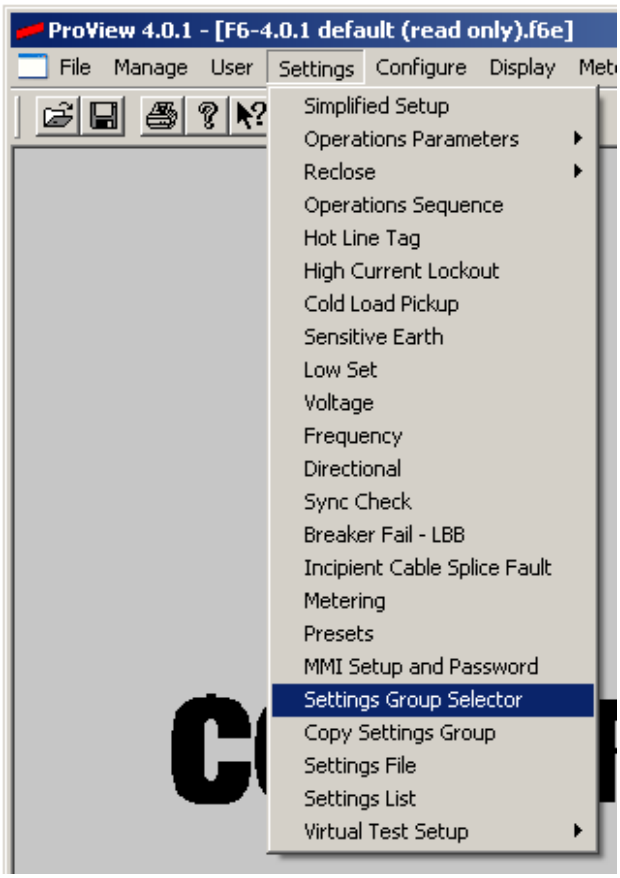


The Form 6 recloser control provides four Overcurrent Protection profiles:

- Normal Profile
- Alternate Profile #1
- Alternate Profile #2
- Alternate Profile #3

Each overcurrent protection profile has its own settings.

Changing Overcurrent Protection Profile



Changes to overcurrent protection profiles are made in the SETTINGS GROUP SELECTION box.

IMPORTANT: Program all protection profiles for appropriate system application. Unused alternate profiles (Alternate Profile #1, Alternate Profile #2, Alternate Profile #3) should be programmed with the same settings as one of the applicable profiles. The default settings on unused alternate profiles can cause unnecessary outages if they are left at the default levels.

There are two methods available to select or change the overcurrent protection profile within the SETTINGS menu.

The first way is to select SETTINGS GROUP SELECTOR. Upon activation, the SETTINGS GROUP SELECTION dialog box appears.

The second way is to select CHANGE SETTING GROUP (from one of several Settings menus) to activate the SETTINGS GROUP SELECTION box.

When you select *Active Profile* or *Edit Profile*, all four overcurrent protection profiles are listed. Select the profile for your application.

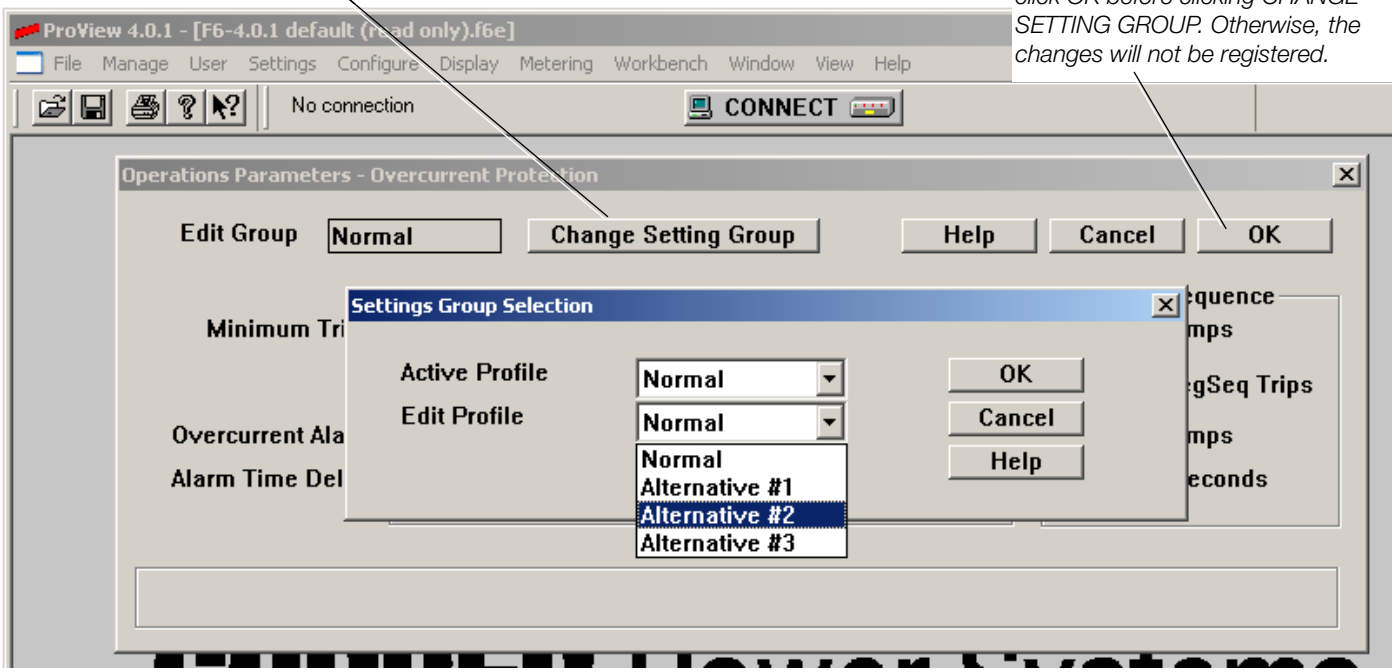
Active Profile is the protection profile that is currently running in the Form 6 recloser control. Use it when you are connected to the Form 6 control and alternate profile changes are required.

Edit Profile is the protection profile selected for modification.

Note: The selected profile(s) appears in the EDIT PROFILE box once the command is accepted.

Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

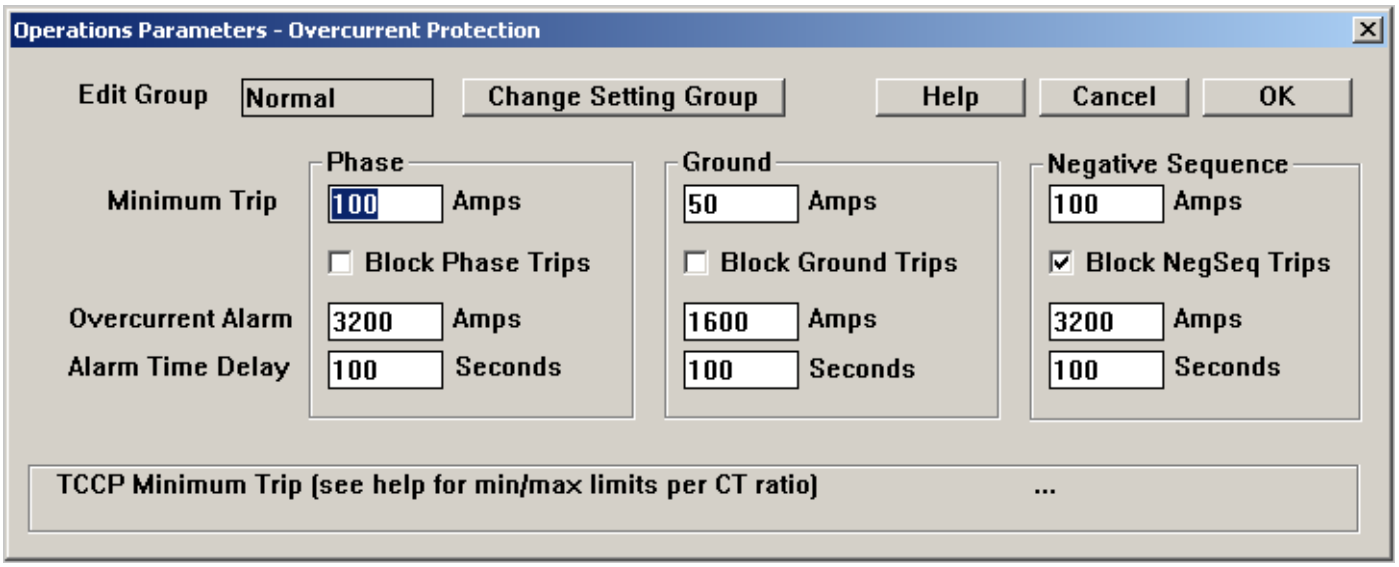
After making changes, always click OK before clicking CHANGE SETTING GROUP. Otherwise, the changes will not be registered.



Changing Overcurrent Protection Parameters

The Overcurrent Protection dialog box lets you program the control with the settings associated with the phase, ground, and negative sequence overcurrent elements that are common to both TCC1 and TCC2.

Note: The Form 6 recloser control is a three-phase device; all three phases trip on the settings programmed.



Minimum Trip

Minimum Trip is the threshold setting for overcurrent protection. Once the threshold is exceeded, the control begins timing on the programmable time-current curve.

CAUTION: Equipment damage. Verify the maximum short time recloser limit for the recloser type prior to changing minimum trip values. Refer to *Reference Data R280-91-34*. Failure to do so can cause damage to the recloser under load conditions. T310.0

CAUTION: Equipment misoperation. Check minimum trip values prior to changing an alternate profile. Failure to do so may cause misoperation of the recloser under load conditions. T280.1

The Minimum Trip values and ranges are:

Phase and Negative Sequence (3I2)

Units: Primary Amps (3I2 for Negative Sequence)

Range: 20 to 3200 A (2000:1 CT Ratio)
10 to 1600 A (1000:1 CT Ratio)
5 to 800 A (500:1 CT Ratio)

Accuracy: ±5% and ±1mA secondary for settings greater than 10mA secondary

Front Panel LCD display designation: TCCPMinTrip
TCCQMinTrip

IMPORTANT: Always verify the minimum trip values are appropriate for the CT Ratio.

Ground

Units: Amps

Range: 10 to 1600 A (2000:1 CT Ratio)

5 to 800 A (1000:1 CT Ratio)

2 to 400 A (500:1 CT Ratio)

Accuracy: ±5% and ±1mA secondary for settings greater than 10mA secondary

Front Panel LCD display designation: TCCGMinTrip

Block <Element> Trip

Block Trip disables the Phase, Ground, or Negative Sequence tripping functions.

Note: Ground tripping can be blocked from the front operator panel function key GND TRIP BLOCKED. When the Ground Trip Blocked feature is enabled, the Sensitive Earth Fault feature is disabled.

Note: Block settings can also be programmed through the Idea Workbench.

Overcurrent Alarm and Alarm Time Delay

Overcurrent alarms are active when the user-programmed alarm threshold and time delay settings have been reached.

Overcurrent alarms automatically reset (without any intentional time delay) when the condition is below the setting point.

If the user wants an Overcurrent Alarm to be recorded in the Event Recorder or perform any additional functions, the alarm must be configured via the Hardware Workbench or the Communications Workbench.

The alarm will only be recorded as an event-type if the user configures it as a user-defined SOE event.

Note: Refer to **Workbench Outputs Toolbox** in the **Idea Workbench** section and **Sequence of Events** in the **Display** section of this manual for additional event recorder information.

The values and ranges of Overcurrent Alarm and Alarm Time Delay are:

Overcurrent Alarm for Phase and Negative Sequence (3I2)

Units: Amps

Range: 5 to 3200 A

Accuracy: ±5% and ±1mA secondary for settings greater than 10mA secondary

Overcurrent Alarm for Ground

Units: Amps

Range: 2 to 1600 A

Accuracy: ±5% and ±1mA secondary for settings greater than 10mA secondary

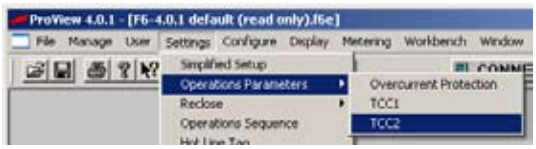
Alarm Time Delay

Units: seconds

Range: 0 to 3600 seconds

Accuracy: ±1% and ±10 ms

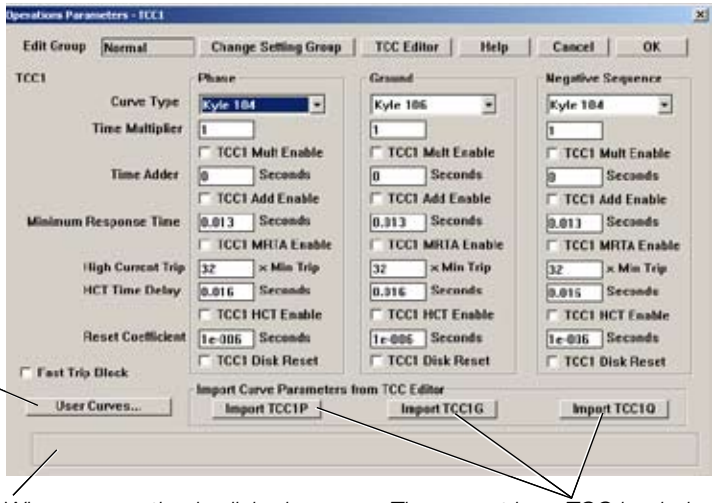
Changing TCC1, TCC2 Parameters



User Curves are user-defined, custom curves created in TCC Editor II for the Form 6 recloser control. The User Curves dialog box enables user curve data to be read from the respective setting files (User1 settings.txt through User5 settings.txt). These files, located in the Form 6 folder, can be viewed with any text editor.

The curve(s) last accessed in TCC Editor will load.

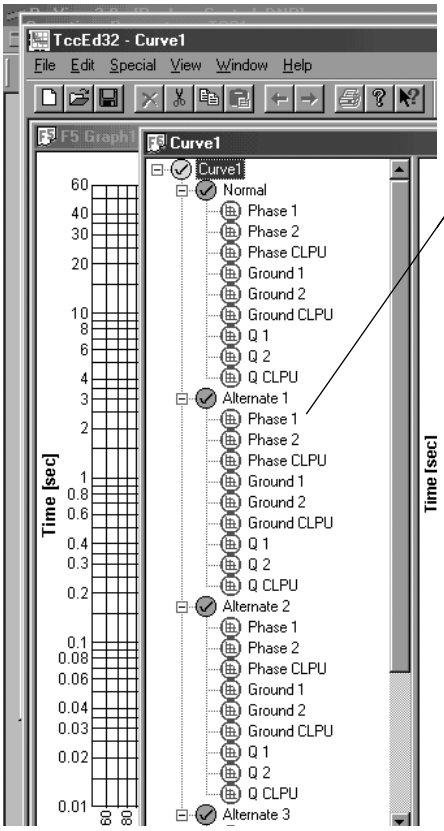
The TCC1 and TCC2 dialog boxes allow you to program the control with the settings associated with the specific curve characteristics for the TCC1 and TCC2 curve shapes. All TCCs can be modified for Phase, Ground, or Negative Sequence. These dialog boxes provide access to the standard time-current curve shapes, plus the five custom User curves and modifiers.



When any section is clicked on, the parameter descriptions and their allowable setting ranges are displayed at the bottom of the dialog box.

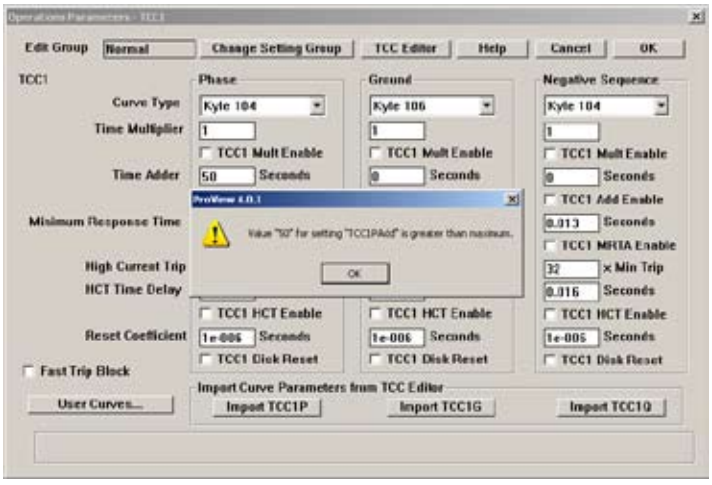
There must be a TCC loaded (in each profile) for the curve parameter you want to import prior to Importing Curve Parameters from TCC Editor.

For instance, if you want to import a Phase Operation Number 1 custom user curve, a Phase 1 curve must be loaded in Normal, Alternate 1, Alternate 2, and Alternate 3 profiles.

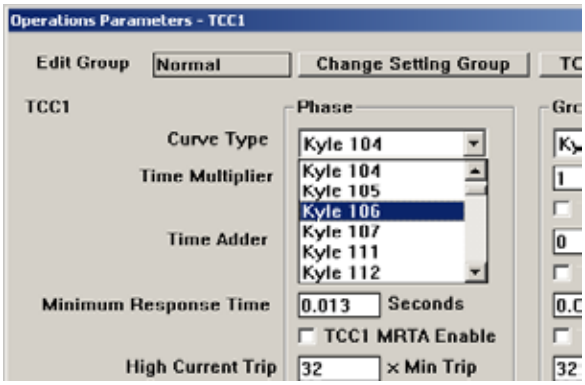


IMPORTANT: When importing curve parameters from TCC Editor, the curve(s) last accessed in TCC Editor will load.

IMPORTANT: Verify where you are saving the curve. The curve must be saved to the same folder the scheme file (.f6e) resides in.



Note: An error message appears if the setting entered is outside the value limits of the setting.



Curve Type

The Curve Type defines the shape of the TCC. There are fifty unique curves available in the Form 6 recloser control. The available curve types are:

- Kyle Curves 101 through 202.
- Constant (1 second definite time) Curves
- ANSI Moderately Inverse, Very Inverse, Extremely Inverse; IEC Inverse, Very Inverse, Extremely Inverse; and five custom curves (User 1 through 5).

Note: All curves, including User curves, can be viewed and modified using the TCC Editor II.

Below are the available curve types and their associated index identification within the recloser scheme settings file.

F6 Curve* Name	F3 Cross Reference	Index
Kyle 101	A	0
Kyle 102	1	1
Kyle 103	17	2
Kyle 104	N	3
Kyle 105	R	4
Kyle 106	4	5
Kyle 107	L	6
Kyle 111	8*, 8+	7
Kyle 112	15	8
Kyle 113	8	9
Kyle 114	5	10
Kyle 115	P	11
Kyle 116	D	12
Kyle 117	B	13
Kyle 118	M	14
Kyle 119	14	15
Kyle 120	Y	16
Kyle 121	G	17
Kyle 122	H	18
Kyle 131	9	19
Kyle 132	E	20
Kyle 133	C	21
Kyle 134	Z	22
Kyle 135	2	23
Kyle 136	6	24
Kyle 137	V	25
Kyle 138	W	26
Kyle 139	16	27
Kyle 140	3	28
Kyle 141	11	29
Kyle 142	13	30

F6 Curve* Name	F3 Cross Reference	Index
Kyle 151	18	31
Kyle 152	7	32
Kyle 161	T	33
Kyle 162	K-Phase	34
Kyle 163	F	35
Kyle 164	J	36
Kyle 165	K-Ground	37
IEC Inv (200)	n/a	38
IEC VI (201)	n/a	39
IEC EI (202)	n/a	40
Constant	n/a	41
ANSI MI	n/a	42
ANSI VI	n/a	43
ANSI EI	n/a	44
USER1	n/a	45
USER2	n/a	46
USER3	n/a	47
USER4	n/a	48
USER5	n/a	49

Refer to **Section 2: Front Panel Operation, Overcurrent Protection Settings - Curve Selection for TCC1 and TCC2** section for Inverse Time Characteristics.

* These curve names also apply to the following Cooper Power Systems recloser controls: Form 4A, Form 4C, and Form 5.

Time Multiplier

This setting defines the Time Multiplier and the TCC Multiplier Enable to modify the position of the original TCC in time-current space. If the TCC Multiplier is Enabled, the trip time of a given TCC at a measured current is shifted in time by the specified multiple.

For example, if a curve has an operate time of 40 ms and a multiplier of 2, the "modified" operate time would be 80 ms.

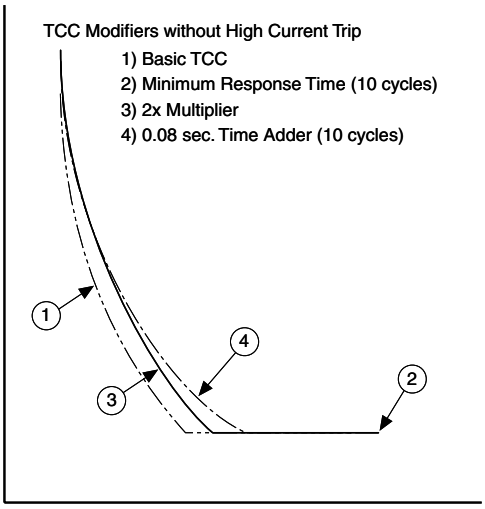
40 ms x 2 = 80 ms

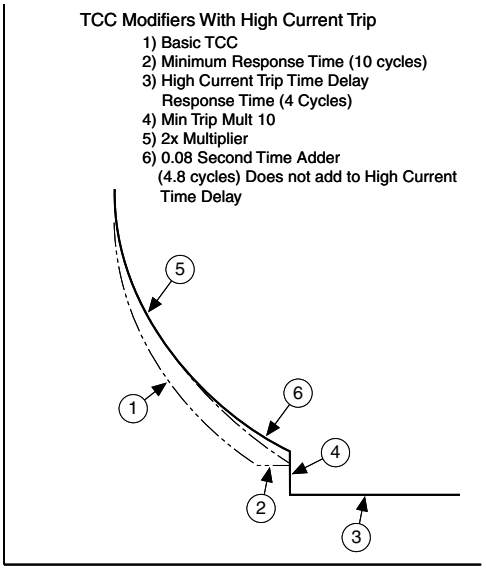
Similarly, if the same curve has an operate time of 5 seconds, the "modified" operate time would be 10 seconds.

5 seconds x 2 = 10 seconds

These diagrams show modified TCCs with and without the effects of high current trip.

They also show the precedence when more than one modifier is used.





Time Adder

The adder settings define a Time Adder and a TCC Add Enable to modify the position of the original TCC in time-current space. If the Time Adder is enabled, the trip time of a given TCC at a measured current is shifted in time by the specified additional time. In contrast to the time multiplier, the Time Adder adds a constant time to the curve, regardless of the unmodified curve.

For example, if a curve has an operate time of 40 ms and a 1 second time adder, the modified operate time is 1.040 seconds.

Minimum Response Time

The Minimum Response Time (MRT) settings define a Minimum Response Time and a TCC MRTA Enable to modify the shape of the original TCC in time-current space. If the MRT is Enabled, the minimum trip time of a given TCC is defined to be no less than the value of MRT.

High Current Trip

High Current Trip (HCT) settings define a HCT Minimum Trip Multiplier, a HCT Time Delay, and a HCT Enable to modify the shape of the original TCC in time-current space. If HCT is Enabled, the shape of the TCC at currents beyond the HCT Minimum Trip Multiplier setting will be definite time, as defined by the HCT Time Delay.

Reset Coefficient

The Reset Coefficient settings define the rate at which the control resets the TCC if a non-instantaneous reset is specified. The reset coefficient is the equivalent of the mechanical reset of induction disk controls. The TCC reset time is determined by the following equation:

- TCC Reset Time = $(TM*RCC)/(M^2-1)$ where TM equals the TCC Time Multiplier setting from the TCC Modifiers, RCC is the reset coefficient setting, and M is the ratio of the applied current to the minimum trip setting of the TCC type.

Note: When Disk Reset is used, the reclose interval must be long enough to allow the disk to fully reset to avoid faster than expected tripping times encountered on successive shots.

Fast Trip Block

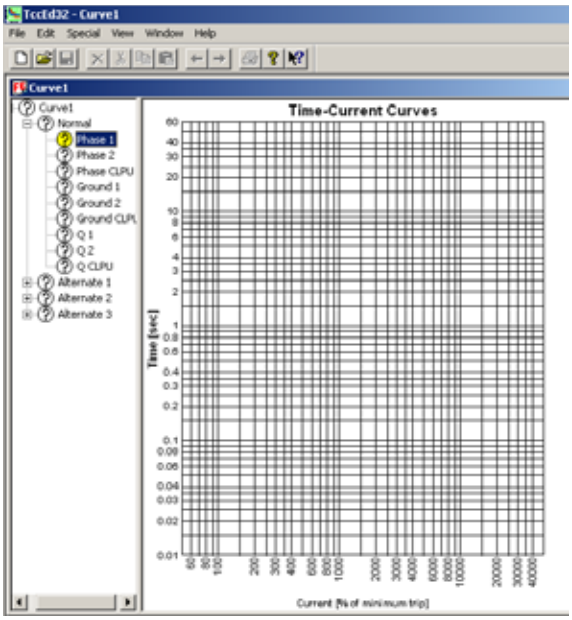
Fast Trip Block appears only in the TCC1 operation parameters dialog box. The function of Fast Trip Block is to eliminate the fast TCC1 tripping curve.

TCC Editor

TCC Editor is activated from the TCC1 and TCC2 dialog boxes, enabling you to read or write to the TCC Editor linked to the associated curve shape modifier. See **Using TCC Editor II** section of this chapter.

Note: Modifications to the operation parameters can be pre-defined in and viewed by the TCC Editor and imported using the controls in the TCC1 and TCC2 dialog boxes.

Using TCC Editor II



The TCC Editor II is used to modify time-current curves programmed into the Form 6 recloser control. By using modifiers, you can design a new TCC to better coordinate the reclosers on your distribution system.

The TCC Editor II can also be used to create custom curves. The Custom Curve Editor gives you complete control over the shape of the TCC.

The TCC Editor II is accessible from the Operations Parameter TCC1 or TCC2 dialog boxes. The illustration at the left is the initial TCC Editor screen that appears when TCC Editor II is selected.

The toolbar of the TCC Editor contains its own FILE, EDIT, SPECIAL, VIEW, and WINDOW menus.

FILE: Lets you open, close, print, and create TCCs. The menu is also used to exit the program.

EDIT: Lets you insert, copy, paste and modify TCCs.

Note: The INSERT function is used to assign a TCC to a specific phase, ground, or negative sequence TCC trip operation.

SPECIAL: Lets you find information about the TCCs, configure the TCC Editor II program, invoke the Custom Curve Editor, and change the aspect ratio of graphs.

VIEW: Lets you control the TCC Editor toolbar and status bar.

WINDOW: Helps you control the TCC Editor document viewing windows.

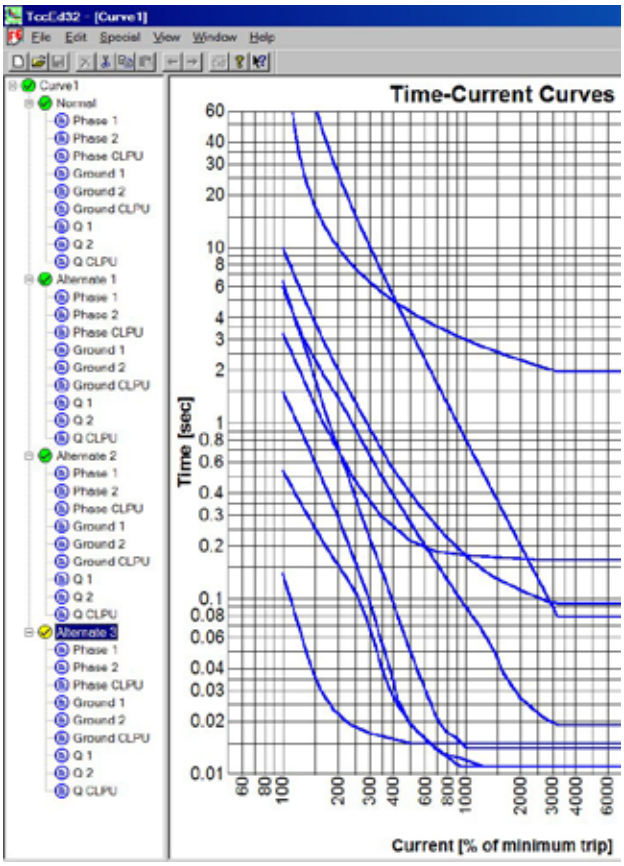
Cascade: Aligns the curve viewing windows from top-to-bottom and left-to-right.

Tile: Arranges the curve windows so that they are all visible within the TCC Editor window.

Arrange: Places icons of all the curve windows at the bottom of the screen.

The TCC Editor II HELP menu provides detailed information on the individual commands within the main toolbar.

Form 6 Recloser Control Tree View



The Form 6 recloser control Tree View feature of the TCC Editor allows you to view the TCCs as well as see the organization of the groups of TCCs in a "tree" arrangement. The Tree appears on the left side of the TCC Editor II screen.

Access the Form 6 control Tree as follows:

1. Select CURVE1.
2. To expand the curve, click on the plus sign **(+)** next to "Curve1".

To expand the four protection profiles that appear, click on the plus sign of each profile. A minus sign **(–)** will replace the plus sign **(+)**.

Each curve has its Phase, Ground, and Negative Sequence parameters displayed for Normal and Alternate 1, 2, and 3 protection profiles.

Each profile holds 9 TCCs:

- Phase TCC1 and Phase TCC2 and Cold Load Pickup
- Ground TCC1, Ground TCC2 and Cold Load Pickup
- Negative Sequence (Q) 1, 2, and Cold Load Pickup

Note: Phase 1 represents TCC1 for Phase (fast curve).

Phase 2 represents TCC2 for Phase (slow curve).

Ground 1 represents TCC1 for Ground.

Ground 2 represents TCC2 for Ground.

The right-hand side of the screen plots the TCCs on a log-log graph.

Copying Profiles

Entire profiles can be copied from one to another:

1. Click on the profile you want to copy.
2. Select COPY from the EDIT drop-down menu.
3. Click on the profile you want to copy to.
4. Select PASTE from the EDIT drop down menu.

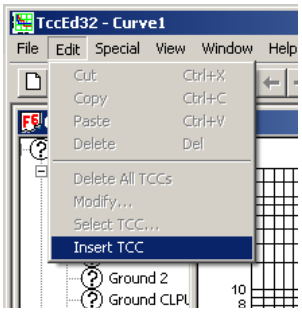
Tree Icons

These icons define TCC status:

white icon
yellow icon
green icon
yellow icon
blue icon
red icon

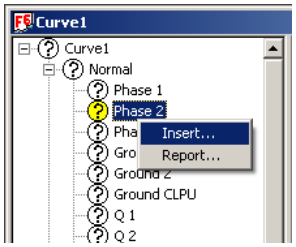
Icon	Node Selected	Description
	No	Some TCC or TCCs remain undefined.
	Yes	
	No	TCC, or all TCCs in a profile, or all TCCs in the file defined. If this is a TCC node, then this means the TCC is not marked to plot.
	Yes	
	No	TCC defined, will plot on graph.
	Yes	

Insert TCCs in TCC Editor II



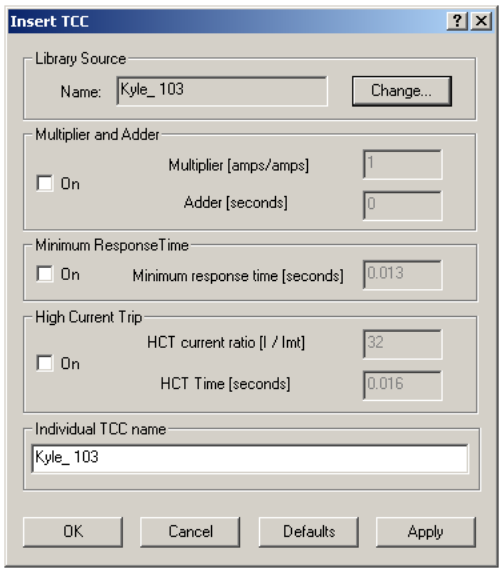
There are two ways to insert TCCs. The first way is through the EDIT menu of TCC Editor II.

1. Select EDIT menu.
2. Select Insert TCC.



The second way is through the *Form 6 Recloser Control Tree View* section of the TCC Editor II screen. From the appropriate protection profile group, complete the following steps:

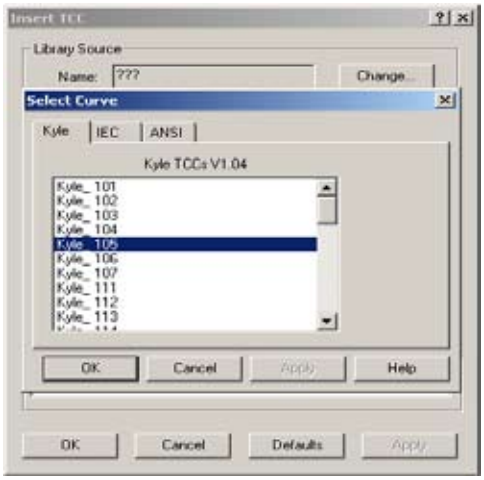
1. Left-click to select the applicable TCC node.
2. Right-click on the node.
3. Select and left-click on INSERT.



The INSERT TCC dialog box appears from the EDIT menu of the Form 6 tree.

Note: If you have selected a TCC node that does not have a TCC assigned to it, the Name box in the Library Source section will show three question marks (???) when the Insert TCC dialog box appears.

4. Click CHANGE to access the applicable Time-Current Curve library.



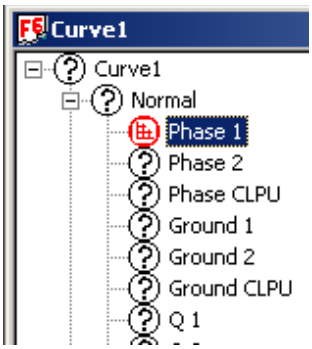
The program allows you to select TCCs from the Kyle library of curves or the ANSI and IEC standard curves.

5. Select the desired curve.
6. Click OK.

The INSERT TCC dialog box appears with the name of the TCC in the Library Source section of the box.

At this point, you can elect to modify or use the selected TCC with its current parameters.

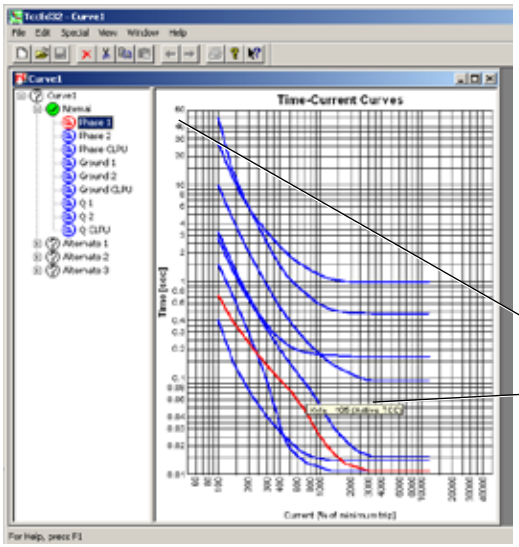
TCC Selection



There are two ways to select an individual Form 6 control TCC.

One way is to expand the tree nodes and click on a TCC icon as shown at the left.

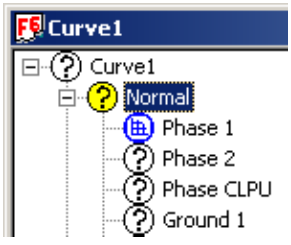
- Phase 1 represents TCC1 for Phase (fast curve).
- Phase 2 represents TCC2 for Phase (slow curve).
- Ground 1 represents TCC1 for Ground.
- Ground 2 represents TCC2 for Ground.



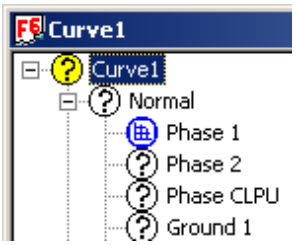
The second way is to click on the desired TCC plotted on the graph. The TCC will turn red to show it is active.

PHASE 1 TCC (Kyle 105) is selected from the graph. The label in the Curve Tree is also highlighted.

TCC Group Selection



Highlight Profile Group name to Select all TCCs in the group.

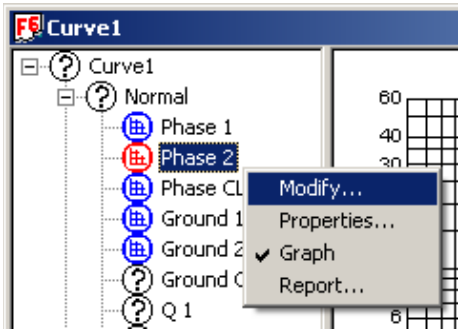


Highlight the root node to select all TCCs within all Profile groups of that curve root.

To select the entire profile group, select the profile name within the TCC tree.

Or, you can select the entire Form 6 control TCC file by clicking the root node as shown at left.

Modifying Curves



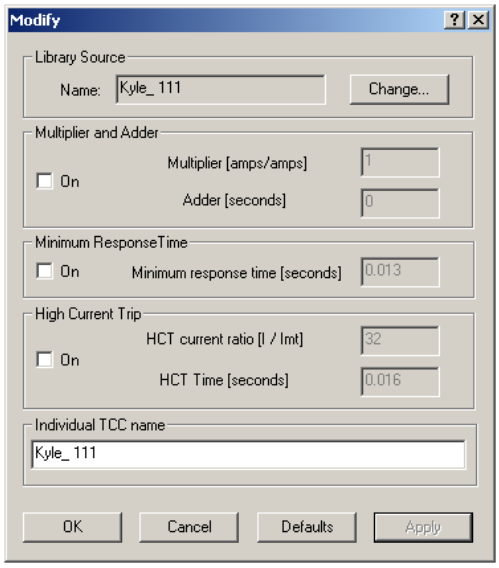
Once a TCC is assigned to a protection profile element (Phase, Ground, Negative Sequence, Cold Load Pickup), you will be able to modify that TCC.

To select a TCC for modification proceed as follows:

1. Left-click on the applicable TCC node.
2. Right-click on the node.
3. Select and left-click on MODIFY.

   Note: The selected curve turns red on the graph.

Shortcut: *You can modify a selected curve from the TCC Editor EDIT menu.*



The MODIFY dialog box is used to apply modifiers to TCCs picked from a library. The MODIFY and INSERT TCC dialog boxes are identical. The CHANGE button is used to select a curve from the library of curves. You can apply modifiers to the selected curve.

Note: The MODIFY feature lets you see the results of the modifications before committing them to memory.

The table below describes how a curve can be modified.

Library Source	Name:	Displays the library name of the TCC.
	Change...	Lets you pick a new TCC from the libraries.
Multiplier and Adder	On:	Toggles multipliers on and off.
	Multiplier	Enter the curve multiplier here.
	Adder	Enter the curve adder here (in seconds)
Minimum Response Time	On:	Toggles minimum response time on and off.
	Min Resp Time	Enter the minimum response time here.
High Current Trip	On:	Toggles high current trip on and off.
	Current ratio	Enter the current ratio where high current trip becomes active here.
	Time	Enter the trip time when high current trip is active here (in seconds)

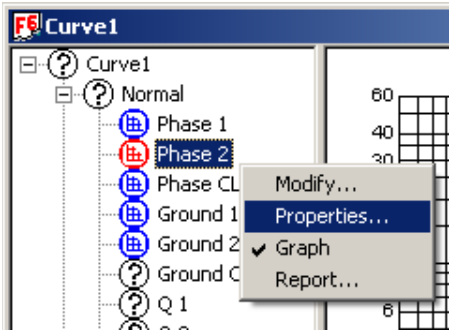
Form 6 TCC Modifier Limits

Multiplier	10.0
Adder (sec)	0.2
Minimum Response Time (sec)	1
HCT Current Ratio	32
HCT Time Value (sec)	0.150

This is the order of operation to modify a TCC:

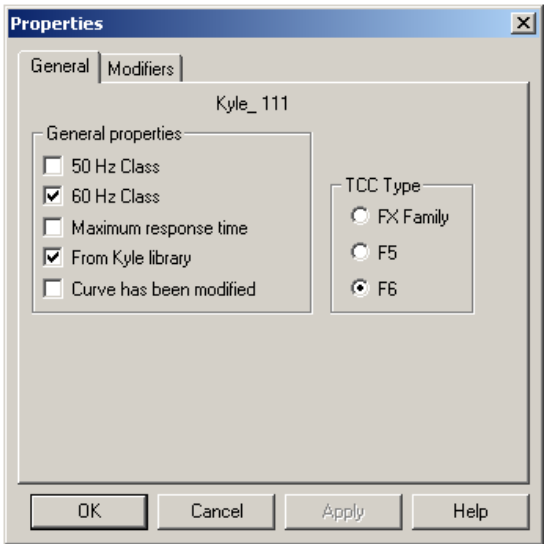
1. Multiply
2. Add
3. Set the time value to the MRT time if the Minimum Response Time (MRT) is enabled and if the current TCC time value is below the MRT.
4. Set the time value to the HCT time value if High Current Trip (HCT) is enabled, and if the current ratio (I/Imt) for this point equals or is above the HCT ratio, and if the current TCC time value is above the HCT time value.

Time-Current Curve Properties



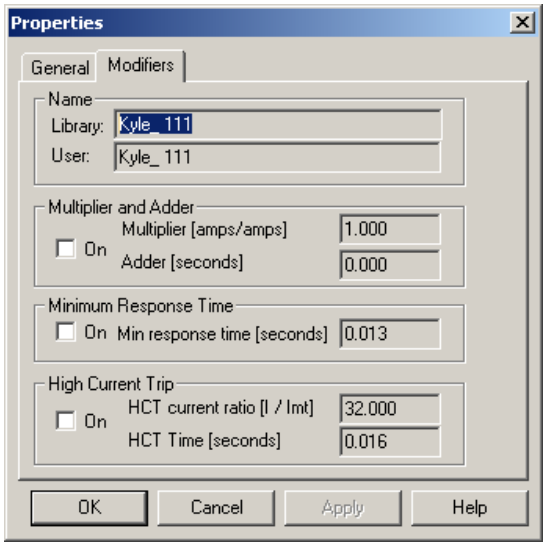
The Curve Properties dialog box displays general properties about the TCC. The Properties box is divided into three categories, each in its own tabbed dialog box.

- General
- Modifiers



The General curve properties page of the dialog box has the following information:

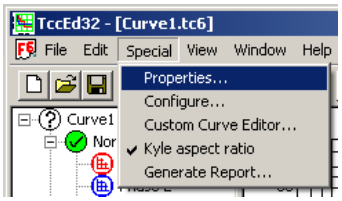
- Displays Frequency Class of the curve
- Displays if the curve is a Maximum Response Time curve
- Indicates if the curve is from the Kyle Library of curves
- Indicates if the curve has been modified



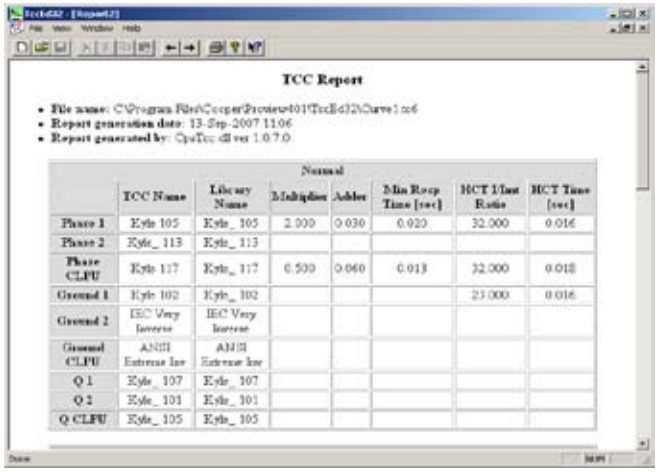
The Modifiers page of the dialog box displays the following information:

- The library and user name of the curve
- The state and value of the curve multiplier and adder
- The state and value of the minimum response time
- The state and value of the high current trip (HCT) current ratio and time value

Note: Curve properties and modifiers can be viewed (not changed) from the SPECIAL/PROPERTIES TCC Editor II menu.

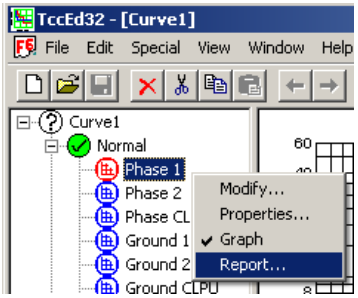


TCC Report



The TCC Report displays all the modifications made to the TCCs in each protection profile group. The report provides the following information:

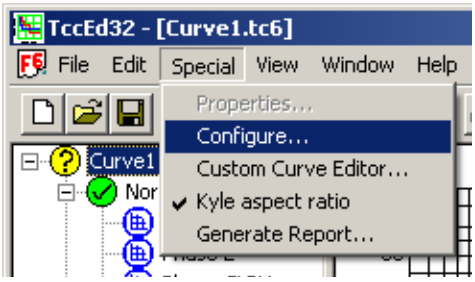
- The exact location of the root curve grouping (i.e. Curve1)
- The date the report was generated
- How the report was generated

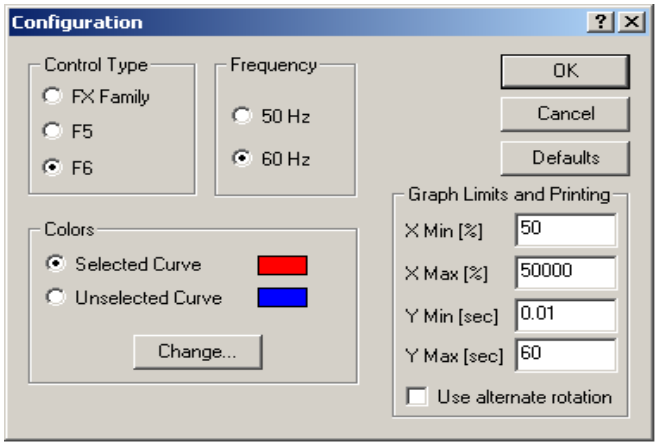


To access the TCC Report, proceed as follows:

1. Left-click on the applicable TCC node.
2. Right-click on the node.
3. Select and left-click on REPORT.

TCC Editor II Configuration Dialog Box





The Configuration dialog box is used to configure the TCC Editor II program.

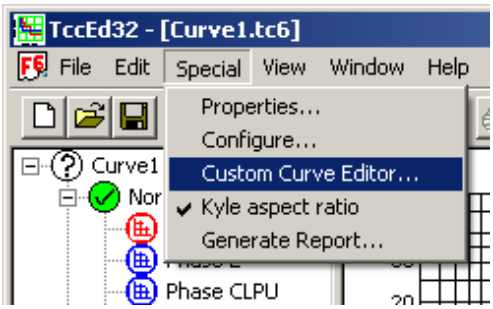
CONTROL TYPE: Picks the default graph type for TCC creation.

FREQUENCY: Selects the default frequency to which the TCCs are generated.

GRAPH LIMITS AND PRINTING: Used to rotate the graph for use with older Microsoft® Windows® 95 print drivers. The default setting is OFF.

Note: New operating systems should not use this box.

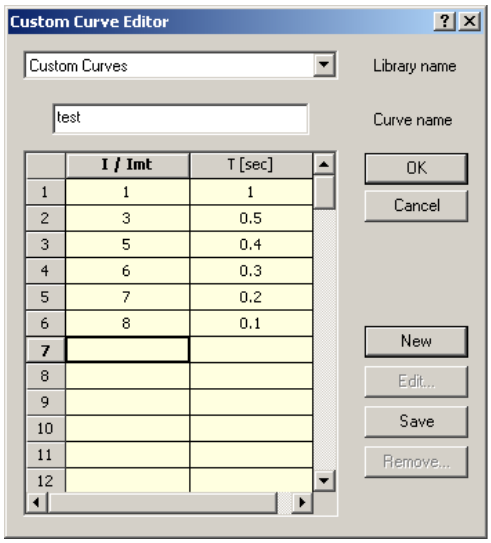
All printing is accomplished via the standard printer icon button.



To edit an existing time-current curve (TCC), proceed as follows:

1. Select the CUSTOM CURVE EDITOR from the SPECIAL menu.
2. Select EDIT.

IMPORTANT: A curve created in the Custom Curve Editor and implemented in a scheme sent to another user cannot be edited unless the actual curve file is included.



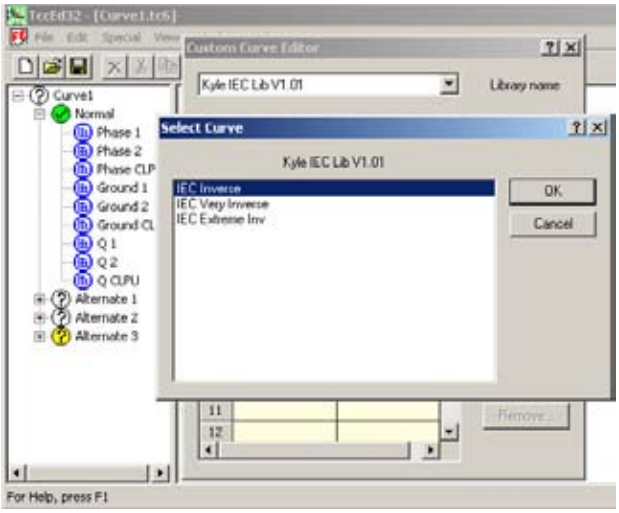
The Custom Curve Editor contains libraries of different TCCs.

- Custom Curves
- Kyle library of curves per IEC standard
- Kyle library of curves per ANSI standard

The IEC standard curves are defined as Inverse, Very Inverse, and Extremely Inverse.

The ANSI standard curves are defined as Moderately Inverse, Very Inverse, and Extremely Inverse.

3. Select and click on the library that contains the desired curve to be modified.
4. Click on VIEW.



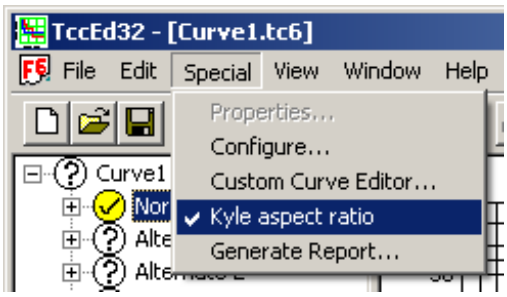
A list of the TCCs in the selected library appears.

5. Select the applicable TCC and click OK.
6. The Custom Curve Editor screen now contains all the values of the selected TCC.
7. Change the values to fit your application.
8. Click on SAVE.

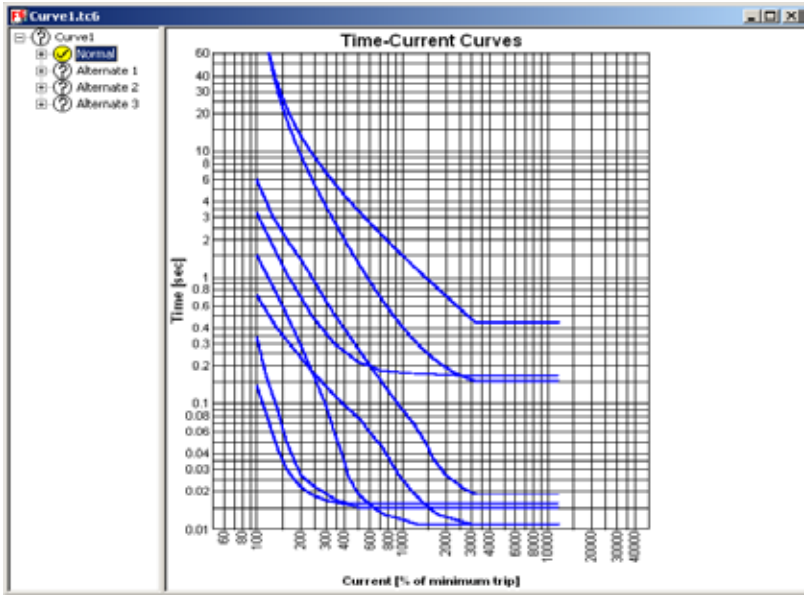
Note: Verify where you are saving the curve. The curve must be saved to the same folder the scheme file (.f6e) resides in.

IMPORTANT: When importing curve parameters from TCC Editor, the curve(s) last accessed in TCC Editor will load.

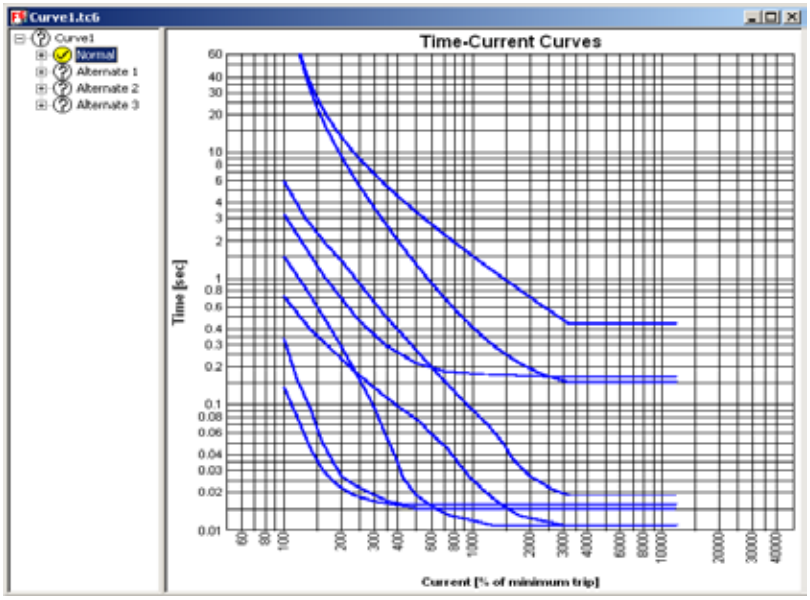
Kyle Aspect Ratio



The Kyle Aspect Ratio is used to view the TCC graph in a Kyle standard 1:1 ratio or a full window view.

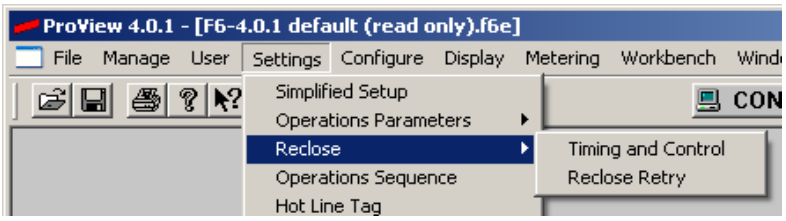


Kyle Aspect Ratio active



Kyle Aspect Ratio inactive
(Full window view)

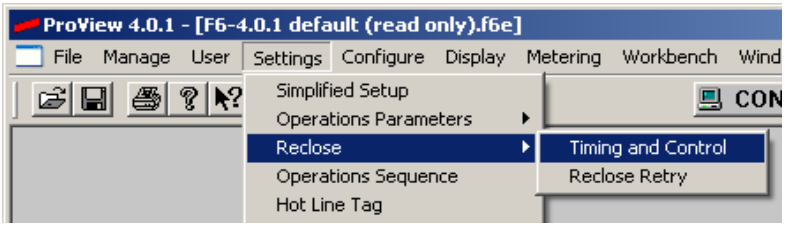
Reclose



The Reclose menu provides access to dialog boxes that let you program the following:

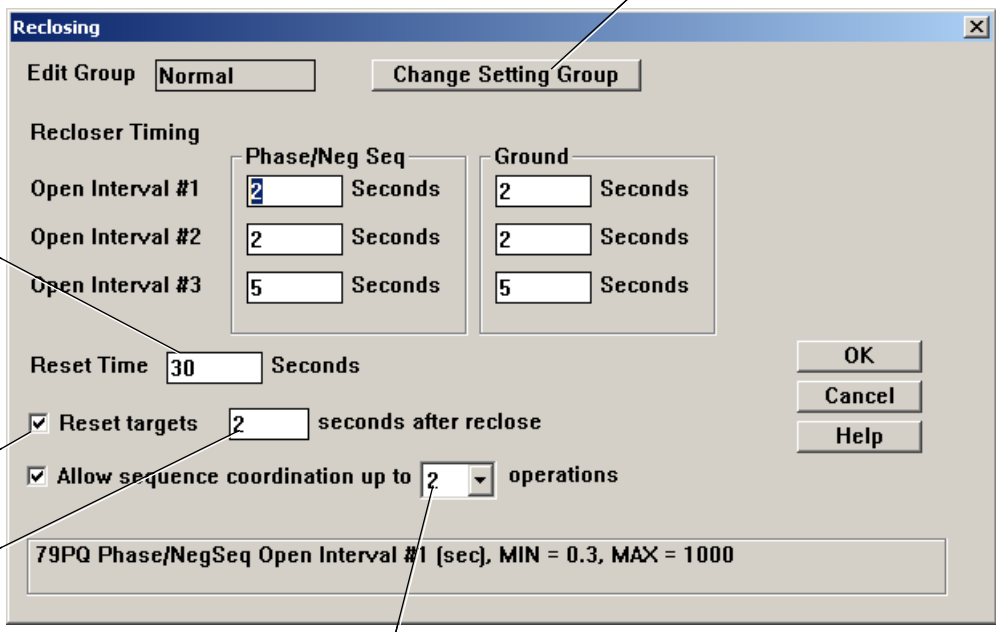
- Timing and Control
  - Reclose Open Intervals
  - Reset Intervals
  - Sequence Coordination
  - Target Control
- Reclose Retry Settings

Modify the Reclose settings of a specific protection profile group by selecting CHANGE SETTING GROUP to activate the SETTINGS GROUP SELECTION box.



Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

After making changes, always click OK before clicking CHANGE SETTING GROUP. Otherwise, the change will not be registered.



RESET TIME is the intentional time delay introduced by the control after a successful reclose, before the control resets the sequence position counter.

When RESET TARGETS is enabled, targets reset automatically after expiration of Reset Targets Time Delay.

RESET TARGETS Time Delay

When SEQUENCE COORDINATION is enabled, the Form 6 recloser control sequences for a fault up to the maximum operations programmed on sequence coordination.

Open Intervals

Reclose (Open) interval settings define the time the recloser is open following a trip operation, prior to issuing a reclose command to the recloser.

Open Interval settings and allowable setting limits are listed below.

Phase/Negative Sequence Reclose (Open) Interval Time

Units: Seconds

Range: 1st Open Interval – 0.3 to 1000
2nd Open Interval – 1.8 to 1000
3rd Open Interval – 1.8 to 1000

Accuracy: ±1% and ±30 ms

Front Panel LCD display designation:
PQOpenInt#1, PQOpenInt#2, PQOpenInt#3

Ground Reclose (Open) Interval Time

Units: Seconds

Range: 1st Open Interval – 0.3 to 1000
2nd Open Interval – 1.8 to 1000
3rd Open Interval – 1.8 to 1000

Accuracy: ±1% and ±30 ms

Front Panel LCD display designation:

GndOpenInt#1, GndOpenInt#2, GndOpenInt#3

Reset Time

Reset Time is the intentional time delay introduced by the control after a successful reclose, before the control resets the sequence position counter to zero. Reset after successful reclose occurs when the recloser is closed and no overcurrent is detected.

Reset Time

Units: Seconds
Range: 3 to 1800
Accuracy: ±1% and ±10 ms
Front Panel LCD display designation: ResetTime

Reset Targets

If RESET TARGETS box is checked, the front panel LED targets reset automatically after expiration of Reset Targets Time Delay.

Reset Targets Time

Units: Seconds
Range: 2 to 3600
Accuracy: ±1% and ±10 ms

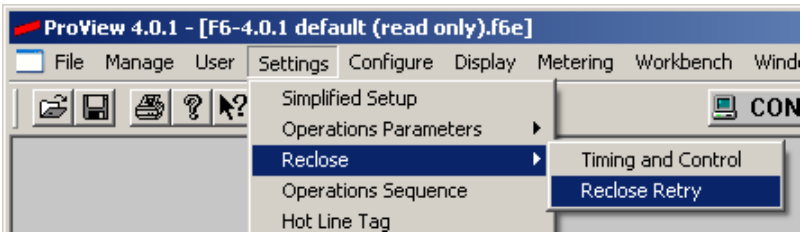
Sequence Coordination

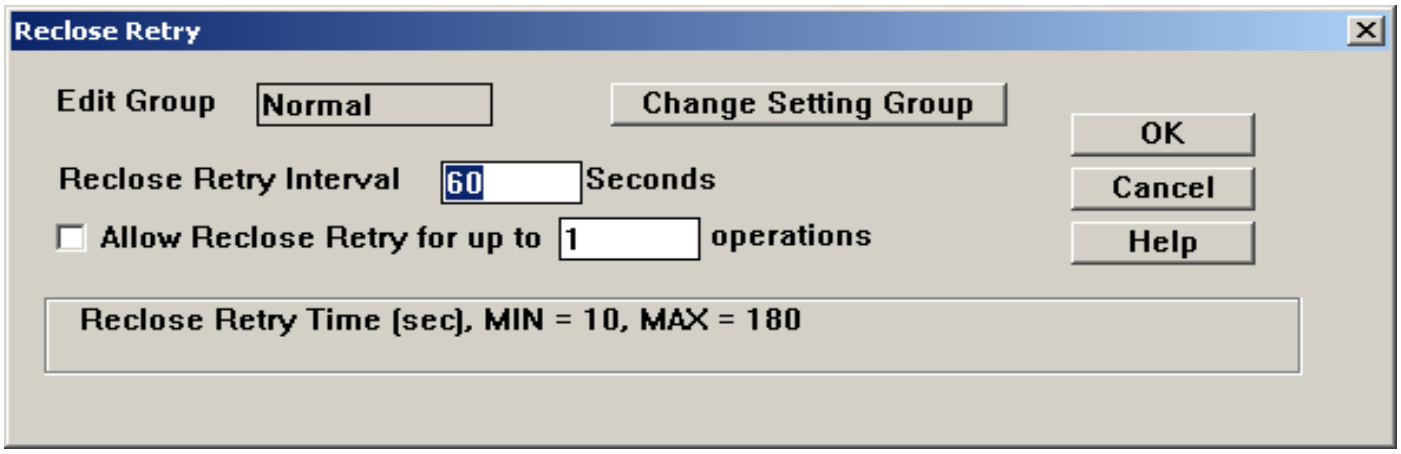
If ALLOW SEQUENCE COORDINATION BOX is checked, the Form 6 recloser control sequences for a fault up to the maximum operations programmed on sequence coordination.

Sequence Coordination Operations

Units: none
Range: 1 to 3
No LCD display designation

Note: For an operating sequence of 2 fast and 2 delayed operations, the Sequence Coordination Operations should be set to 2.





Reclose Retry Interval

The Reclose Retry interval setting defines the interval delay between Reclose Retry attempts.

Reclose Retry Interval

Units: Seconds
Range: 10 to 180
Accuracy: ±1% and ±10 ms
No LCD display designation

Reclose Retry Attempts

The Reclose Retry setting controls the number of times that a Reclose Retry is attempted. If the device fails to close after attempting a Reclose Retry operation for the total number of Reclose Retry attempts, the control will go to lockout.

Reclose Retry Attempts

Range: 1 to 10
No LCD display designation

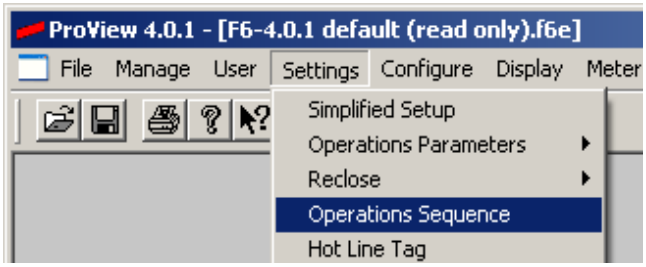
Reclose Retry Enable

If the Allow Reclose Retry box is checked, the Form 6 control will attempt a Reclose Retry operation for unsuccessful recloses, up to the maximum programmed number of Reclose Retry attempts.

Reclose Retry Attempts

Range: Enabled or Disabled
No LCD display designation

Operations Sequence

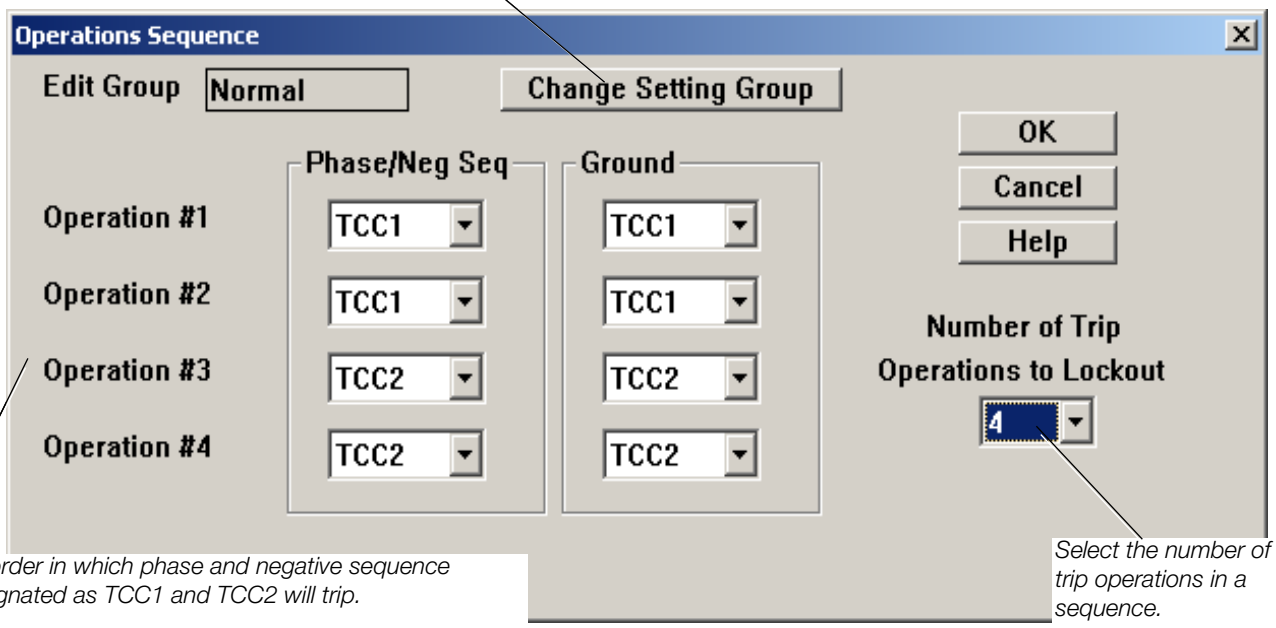


The Operation Sequence lets you program these settings:

- Number of Trip Operations-to-Lockout
- Sequence of Overcurrent Trip Operations for Phase/ Negative Sequence, and Ground

Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

After making changes, always click OK before clicking CHANGE SETTING GROUP. Otherwise, the change will not be registered.



Define the order in which phase and negative sequence curves designated as TCC1 and TCC2 will trip.

Select the number of trip operations in a sequence.

Operations-to-Lockout

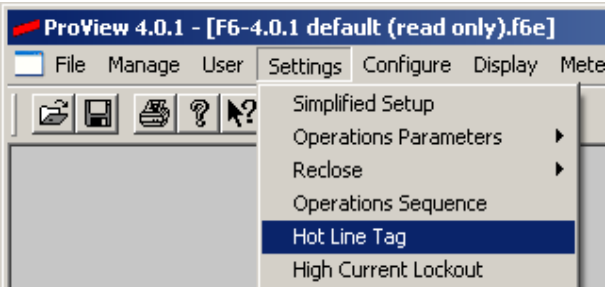
Operations-to-Lockout defines the maximum number of trip operations in a sequence before the control opens and locks out. The count includes phase, ground, and negative trips as well as sequence coordination operations.

Operation Sequence (Phase/Negative Sequence and Ground)

Operations Sequence settings for Phase/Negative Sequence define the order in which phase and negative sequence curves designated as TCC1 and TCC2 will trip.

Operations Sequence settings for Ground define the order in which Ground curves designated as TCC1 and TCC2 will trip.

Hot Line Tag



Hot Line Tag prevents all closing attempts and shifts protection to one trip-to-lockout on the composite curve of the Hot Line Tag definite time and the TCC1 curve (whichever is faster).

Note: When Hot Line Tag and CLPU are both active the Form 6 control reverts back to the original minimum pick-up values (i.e. disables CLPU settings).

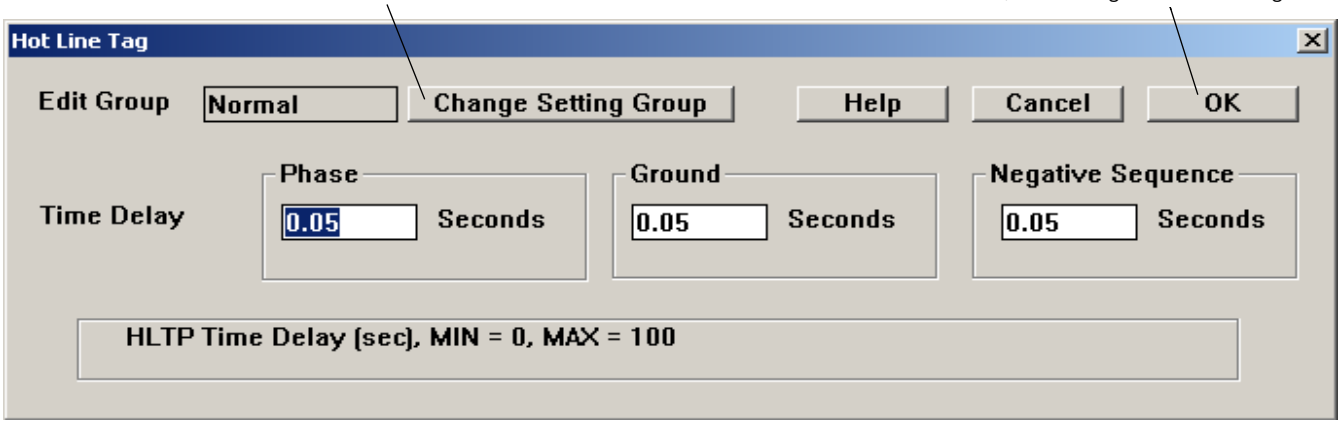
There are three dedicated Hot Line Tag settings, one each for phase, ground, and negative sequence current. They are non-directional overcurrent elements, operating on a fixed time delay as set in this dialog box. The minimum trip value is automatically set to be equal to that of the corresponding TCC1 and TCC2 overcurrent protection elements.

Note: For instance, the Hot Line Tag ground element uses the same minimum trip current setting as the ground TCC1 and TCC2 overcurrent protection elements. The minimum trip settings are located in the Settings>Operations Parameters>Overcurrent Protection dialog box.

The Hot Line Tag overcurrent elements will be blocked by the same user settings and Workbench Outputs that block the phase, ground, and negative sequence TCC1 and TCC2 overcurrent protection elements. The user settings (Block Phase Trips, Block Ground Trips, and Black NegSeq Trips) are located in the Settings>Operations Parameters>Overcurrent Protection dialog box. The Workbench Outputs (Block Phase Trips, Ground Trip Blocked, and Block Neg Seq Trips) can be controlled by customized logic in the Hardware Workbench.

Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

After making changes, always click OK before clicking CHANGE SETTING GROUP. Otherwise, the change will not be registered.



Time Delay (Phase, Ground, and Negative Sequence)

When Hot Line Tag is activated, Time Delay settings define the intentional delay, after a Phase, Ground, or Negative Sequence Minimum Trip is exceeded, before issuing a Trip command to the recloser.

Note: When Hot Line Tag is enabled, TCC1 elements also remain active, so that the definite time Hot Line Tag elements have an effect only if they are faster than the programmed TCC1 curves.

Phase, Negative Sequence, and Ground Time Delay

Units:	seconds
Range:	0 to 100
Accuracy:	±1% and ±10 ms

Precedence over Cold Load Pickup (CLPU)

If CLPU is enabled (not blocked) and Hot Line Tag is SET then CLPU effectively becomes disabled (blocked).

For instance, if CLPU is enabled and the user initiates a Close command, after the Close occurs, CLPU will be active for thespecified activation time period.

- If during this specified activation time period, Hot Line Tag is SET, then CLPU will immediately be disabled.
- Later, if still during this specified activation time period, Hot Line Tag is RESET, then CLPU will immediately be enabled and active for the remainder of the specified activation time period.

Note: The status (blocked or not blocked) of phase, ground, and negative sequence tripping directly supervises (disables or enables) Hot Line Tag phase, ground, and negative sequence tripping.

Phase Tripping

Hot Line Tag phase tripping will occur (after the user-defined delay) if the maximum phase current (maximum of all three phases) is above phase minimum trip and phase tripping is not blocked and Hot Line Tag is SET and the recloser is closed.

Ground Tripping

Hot Line Tag ground tripping will occur (after the user-defined delay) if the calculated 3I0 current is above ground minimum trip and ground tripping is not blocked (normal ground trip) and Hot Line Tag is SET and the recloser is closed.

Negative Sequence Tripping

Hot Line Tag negative sequence tripping will occur (after the user-defined delay) if the calculated 3I2 current is above negative sequence minimum trip and negative sequence tripping is not blocked and Hot Line Tag is SET and the recloser is closed.

Note: Typical user curve selections have TCC1 curves tripping faster than TCC2 curves.

Precedence Over Fast Trip Block Functionality

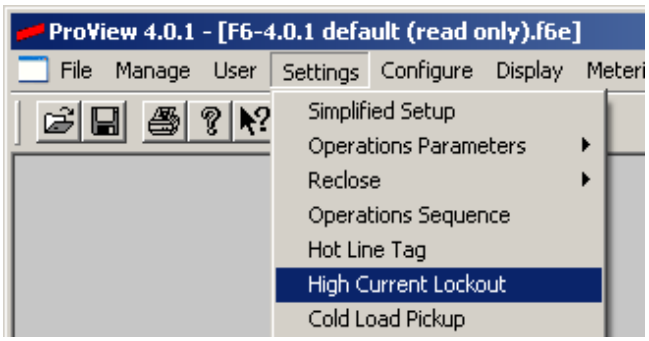
When Hot Line Tag is SET it overrides the Fast Trip Block functionality allowing phase, ground, and negative sequence tripping to occur on the user-defined TCC1P, TCC1G, and TCC1Q curves.

Directional Supervision

The activation of Hot Line Tag does not affect the phase, ground, or negative sequence TCC1 overcurrent protection elements, regardless of their directionality setting and the directionality of a given fault. The TCC1 directional overcurrent protection elements continue to operate the same whether or not Hot Line Tag is active.

The activation of Hot Line Tag does enable dedicated non-directional overcurrent elements which operate in parallel with any active TCC1 overcurrent protection elements. If the dedicated Hot Line Tag non-directional overcurrent elements operate before the active TCC1 overcurrent protection elements, then the operation of the active TCC1 overcurrent protection elements will not be observed, even though they were timing towards a trip. In this situation, sole operation on a Hot Line Tag overcurrent element, only a Control Lockout entry will be recorded in the SOE record. For an operation on a TCC1 overcurrent protection element, while Hot Line Tag is active, or a near simultaneous operation both the Hot Line Tag overcurrent element and TCC1 overcurrent protection element, the SOE record will show a Control Lockout, Overcurrent Trip, and Fault Data entry.

High Current Lockout



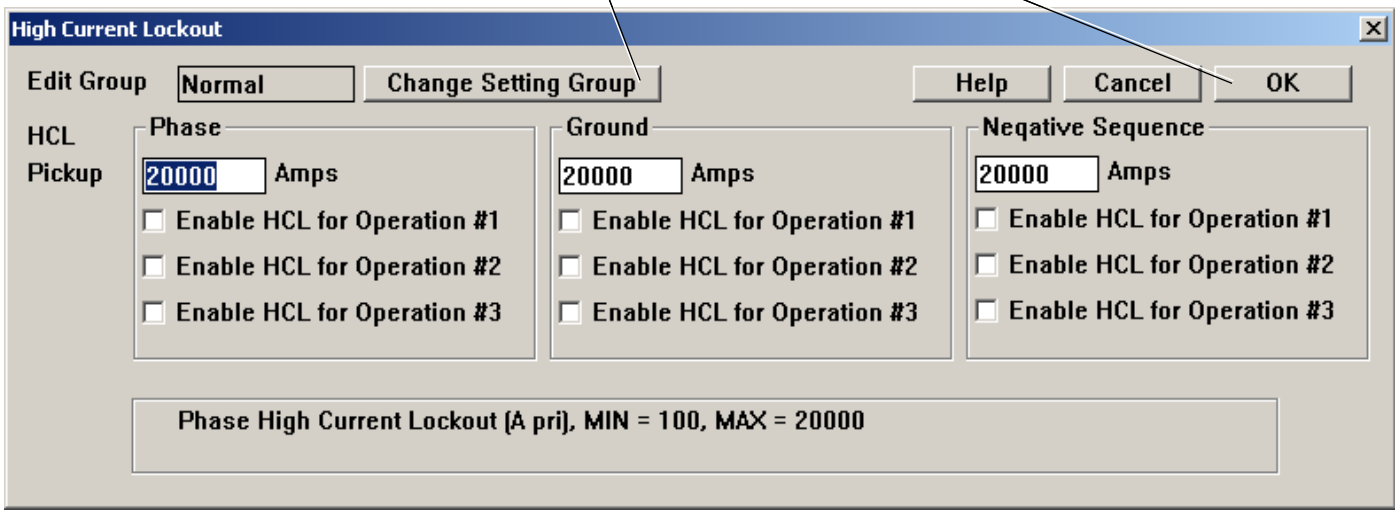
High Current Lockout (HCL) defines which operations will lockout the recloser (allow no reclosing) when the specified current threshold is exceeded and a trip occurs.

The HCL setting dialog box defines the phase, ground, and negative sequence pickup settings and the operations that will act on a specific setting.

Note: If HCL operates, subsequent reclosing occurs in that sequence.

Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

After making changes, always click OK before clicking CHANGE SETTING GROUP. Otherwise, the change will not be registered.



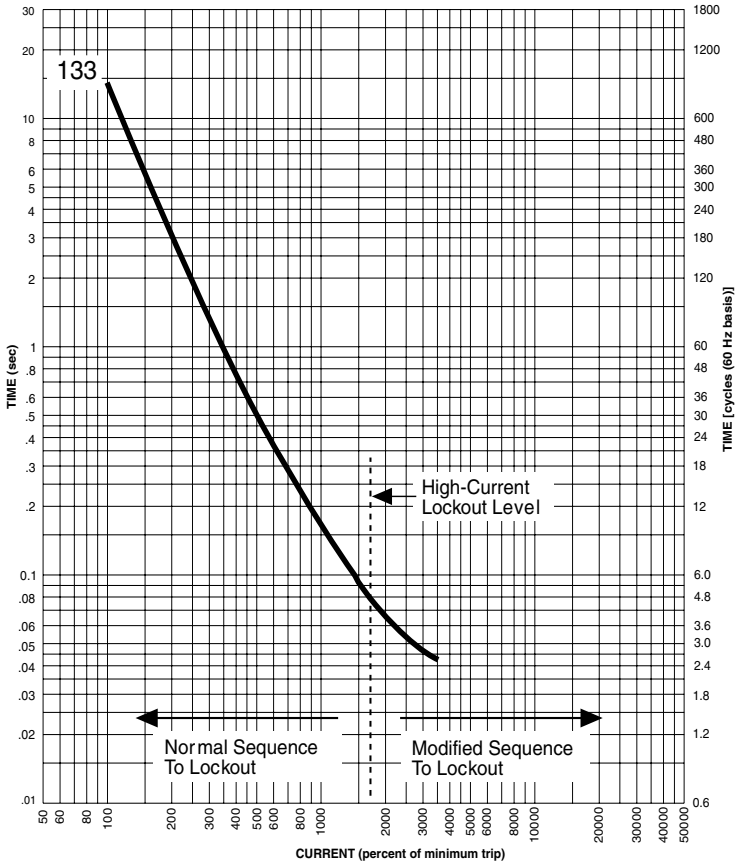
High Current Lockout (Phase, Neg. Sequence, and Ground)

Units: Amps

Range: 100 to 20000

Accuracy: ±5% and ±1 mA (secondary)

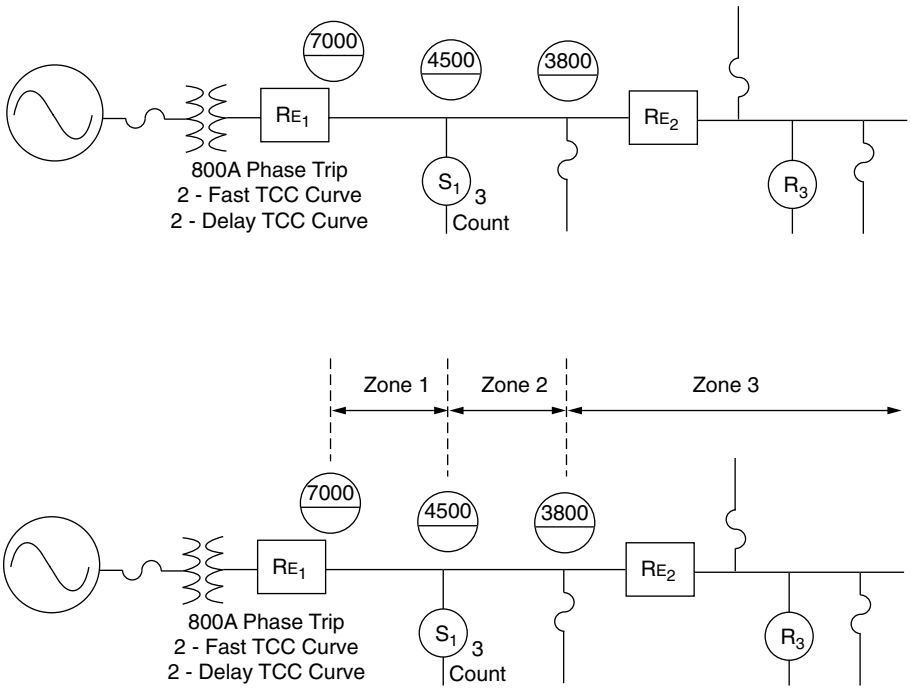
The high current lockout feature can be used to shorten the control programmed operating sequence whenever fault current exceeds a programmed level. This feature is used to modify the operating sequence to allow for reduced through-faults on substation transformers and connected equipment. The high current lockout feature is available for phase, ground, and negative sequence elements. When activated, this feature can be set to lockout the recloser after 1, 2, or 3 operations.



Using the High Current Trip and High Current Lockout Features

In certain situations the high current trip and high current lockout features can be used to reduce transformer through-faults. These features can also be utilized together to provide overall feeder coordination tailored to provide overcurrent protection characteristics suited for individual sections of a feeder.

The Example Feeder shown below can explain the benefits of using the high current trip and high current lockout features.



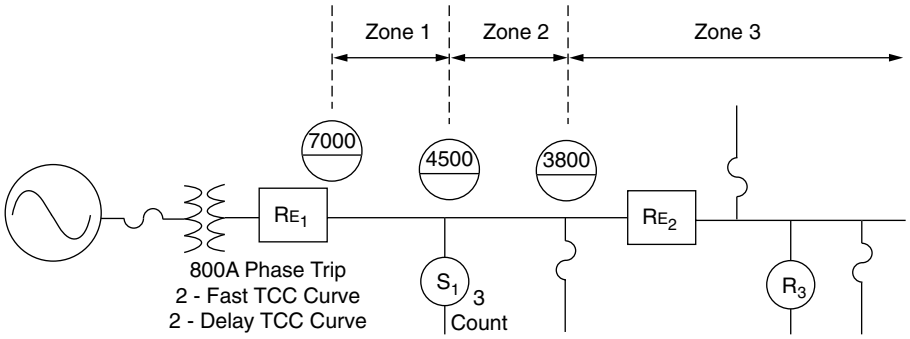
This feeder can be divided into three sections (zones), each of which has different overcurrent protection requirements.

The protection requirements for recloser RE_1 are different for each zone.

Zone 3: Conventional settings for recloser RE_1 are required here. One or more fast TCC curve operations to clear temporary faults followed by delayed TCC curve operations to allow downline recloser or fuse clearing of permanent faults. Also, sequence coordination is required on recloser RE_1 for the proper coordination with RE_2.

Zone 2: Modified settings for recloser RE_1 can be used here. Since there are no time sensitive protective devices in this zone, faults that occur here do not require RE_1 to have any intentional time delay in its operation. However, with the sectionalizer being used for permanent fault protection for faults on the tap four operations of RE_1 are required. Thus, in this zone recloser RE_1 could be set for four high current trip operations, minimizing any coordination problem with the source side protective fuse and reducing total through-fault current time exposure on the substation transformer.

Zone 1: Again, modified settings for recloser RE_1 can be used here. For the high magnitude close in faults, a four operation sequence subjects the substation transformer to an undesirable number of high through-fault currents. Temporary faults are normally less likely, since this part of the feeder has fewer trees (thus less wildlife), with more frequent inspections and maintenance. Thus reclosing operations are not as critical, although one reclosing operation could be selected in the event that temporary fault protection was deemed necessary. In this zone recloser RE_1 could be set for high current lockout after one or two high current trip operations.



Zone 1: High Current Lockout after 1 or 2 High Current Trip Operations
Zone 2: 4 High Current Trip Operations to Lockout
Zone 3: 2 Fast and 2 Delayed TCC Curve Operations to Lockout

The actual settings for the high current trip and high current lockout will be dependent on the maximum available fault current at various locations along the feeder.

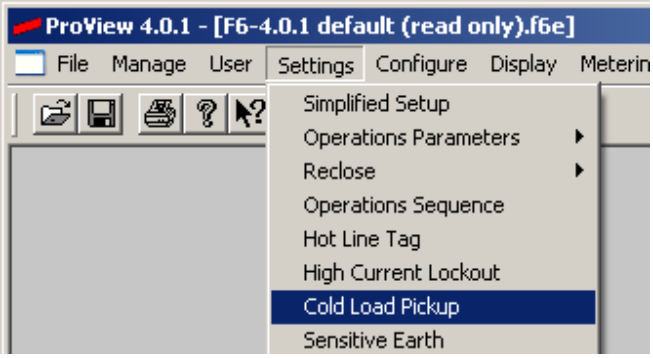
High Current Trip

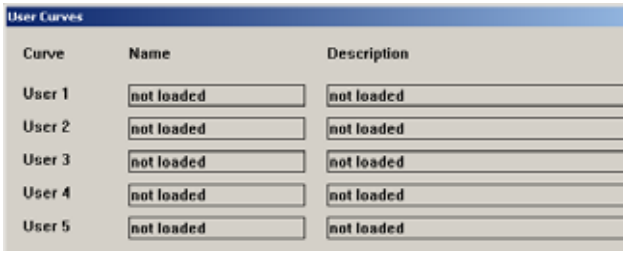
The downline fuse (the fuse just upline of recloser RE_2) is at a location where the available fault current is 3800 amps, the high current trip on the RE_1 recloser control must be set higher than this level. 4.75 (3800 A ÷ 800 A) is the minimum setting for the high current trip, 5.0 is selected. For fault currents above 4000 amps (5.0 x 800 A) recloser RE_1 will operate instantaneously with four operations to lockout. The fuse should operate properly since it is outside the high current trip zone.

High Current Lockout

The downline sectionalizer (S1) is at a location where the available fault current is 4500 amps, the high current lockout on the RE_1 recloser control must be set higher than this level. 4800 amps is selected to allow a margin and keep faults of 4500 amps or lower from activating the high current lockout. For fault currents above 4800 amps, recloser RE_1 will operate instantaneously and lockout immediately after one or two operations. The sectionalizer should operate properly since it is outside the high current lockout zone.

Cold Load Pickup





Cold Load Pickup (CLPU) is used to prevent inadvertent trips from occurring during pickup of load current.

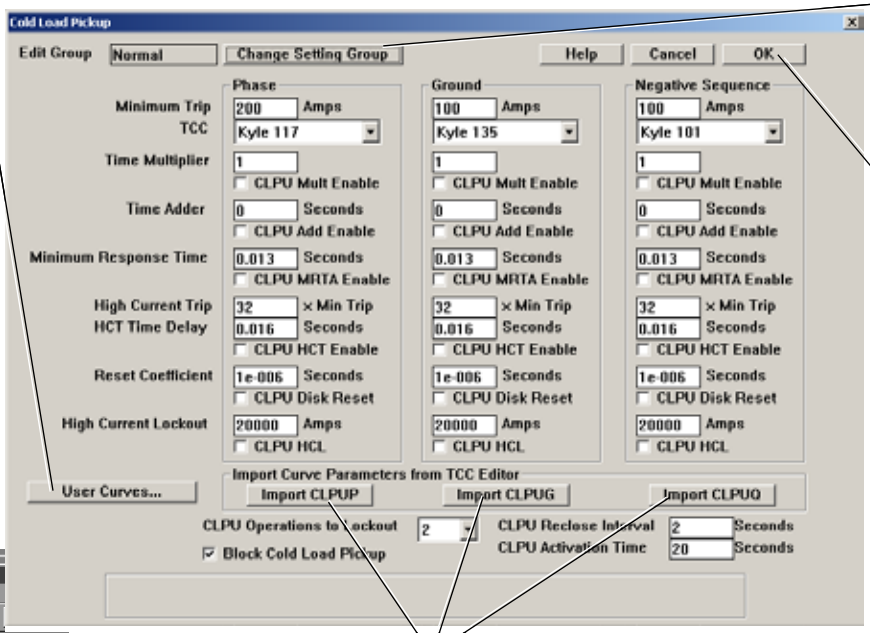
The Cold Load Pickup dialog box enables you to program the Form 6 recloser control with settings associated with the specific curve characteristics when CLPU is active.

Just as in front panel programming, ProView application software lets you modify minimum trip settings and all TCCs within the curve library.

Cold Load Pickup modification categories include the following:

- Minimum Trip
- Selected TCC
- Time Multiplier
- Time Adder
- Minimum Response Time
- High Current Trip
- HCT Time Delay
- Reset Coefficient
- High Current Lockout

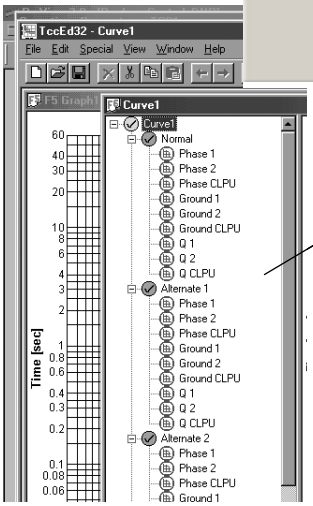
The curve(s) last accessed in TCC Editor will load.



Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

After making changes, always click OK before clicking CHANGE SETTING GROUP. Otherwise, the change will not be registered.

Note: *An error message appears if the setting entered is outside the value limits of the setting.*



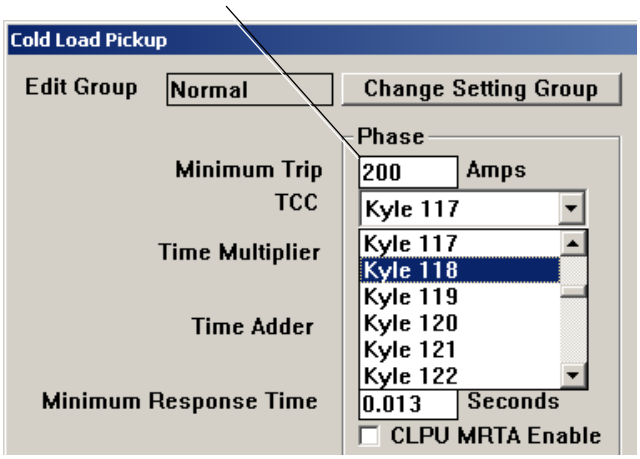
There must be a TCC loaded (in each profile) in the parameter you want to import prior to Importing Curve Parameters from TCC Editor.

For instance, if you want to import a Phase Operation Number 1 custom user curve, a Phase 1 curve must be loaded in Normal, Alternate 1, Alternate 2, and Alternate 3 profiles.

IMPORTANT: When importing curve parameters from TCC Editor, the curve(s) last accessed in TCC Editor will load.

Curve Type

Highlight current setting and type in new setting.



The CLPU curve defines the shape of the TCC. There are fifty unique curves available in the Form 6 recloser control. The available curve types are:

- Kyle Curves 101 through 202
- Constant (1 second definite time) Curves
- ANSI Moderately Inverse, Very Inverse, Extremely Inverse; IEC Inverse, Very Inverse, Extremely Inverse; and five custom curves (User 1 through 5)

Note: All curves, including User curves, can be viewed and modified using TCC Editor II.

Note: The Form 6 recloser control is a three-phase device; all three phases trip on the settings programmed.

Front Panel LCD display designation:
CLPUPCurve, CLPUQCurve, CLPUGCurve

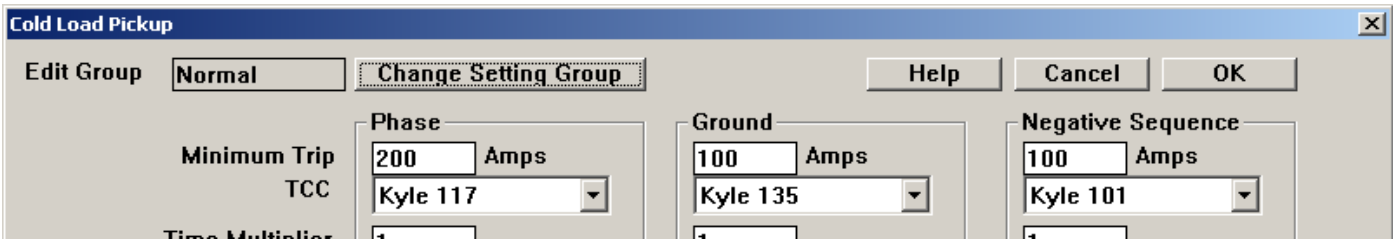
F6 Curve* Name	F3 Cross Reference	Index
Kyle 101	A	0
Kyle 102	1	1
Kyle 103	17	2
Kyle 104	N	3
Kyle 105	R	4
Kyle 106	4	5
Kyle 107	L	6
Kyle 111	8*, 8+	7
Kyle 112	15	8
Kyle 113	8	9
Kyle 114	5	10
Kyle 115	P	11
Kyle 116	D	12
Kyle 117	B	13
Kyle 118	M	14
Kyle 119	14	15
Kyle 120	Y	16
Kyle 121	G	17
Kyle 122	H	18
Kyle 131	9	19
Kyle 132	E	20
Kyle 133	C	21
Kyle 134	Z	22
Kyle 135	2	23
Kyle 136	6	24

F6 Curve* Name	F3 Cross Reference	Index
Kyle 137	V	25
Kyle 138	W	26
Kyle 139	16	27
Kyle 140	3	28
Kyle 141	11	29
Kyle 142	13	30
Kyle 151	18	31
Kyle 152	7	32
Kyle 161	T	33
Kyle 162	K-Phase	34
Kyle 163	F	35
Kyle 164	J	36
Kyle 165	K-Ground	37
IEC Inv (200)	n/a	38
IEC VI (201)	n/a	39
IEC EI (202)	n/a	40
Constant	n/a	41
ANSI MI	n/a	42
ANSI VI	n/a	43
ANSI EI	n/a	44
USER1	n/a	45
USER2	n/a	46
USER3	n/a	47
USER4	n/a	48
USER5	n/a	49

Refer to **Section 2: Front Panel Operation, Overcurrent Protection Settings - Curve Selection for TCC1 and TCC2** section for Inverse Time Characteristics.

* These curve names also apply to the following Cooper Power Systems recloser controls: Form 4A, Form 4C, and Form 5.

CLPU Minimum Trip (Phase, Negative Sequence, and Ground)



The CLPU Minimum Trip setting defines the Amperes at which the TCC begins to time towards a time delayed trip when CLPU is active.

CAUTION: Equipment damage. Verify the maximum short time recloser limit for the recloser type prior to changing minimum trip values. Refer to *Reference Data R280-91-34*. Failure to do so can cause damage to the recloser under load conditions. T310.0

IMPORTANT: Always verify the minimum trip values are appropriate for the CT Ratio.

Note: When Hot Line Tag and CLPU are both active the Form 6 control reverts back to the original minimum pick-up values (i.e. disables CLPU settings).

CLPU Phase/Negative Sequence

Units: Amps

Range: 20 to 3200 (2000:1 CT Ratio)

10 to 1600 (1000:1 CT Ratio)

5 to 800 (500:1 CT Ratio)

Accuracy: ±5% and ±1 mA secondary for settings greater than 10mA secondary

Front Panel LCD display designation: CLPUPMinTrip, CLPUQMinTrip

CLPU Ground

Units: Amps

Range: 10 to 1600 (2000:1 CT Ratio)

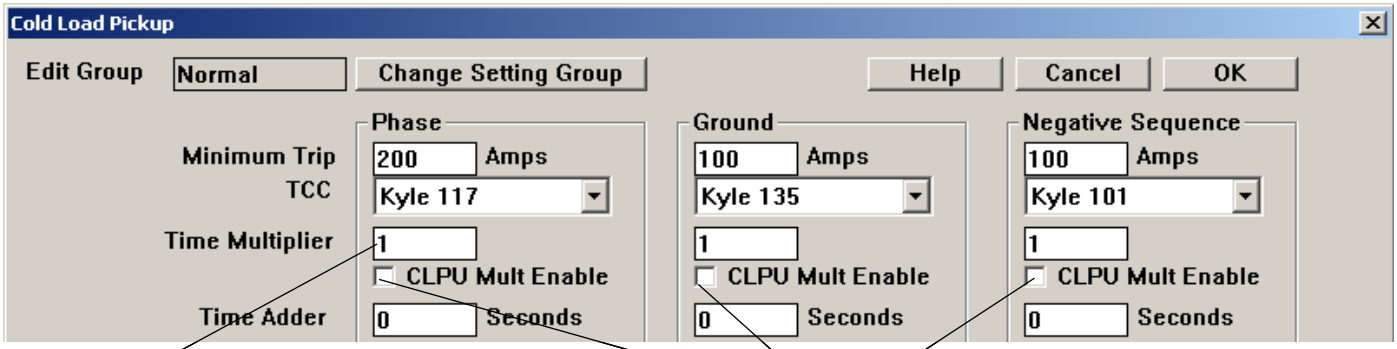
5 to 800 (1000:1 CT Ratio)

2 to 400 (500:1 CT Ratio)

Accuracy: ±5% and ±1 mA secondary for settings greater than 10mA secondary

Front Panel LCD display designation: CLPUGMinTrip

CLPU Multiplier



Highlight current setting and type in new setting.

Check boxes to activate Multiplier.

The CLPU Multiplier defines a Time Multiplier to modify the position of the original TCC in time-current space and the ability to enable the multiplier. With the CLPU Time Multiplier enabled, the trip time of a given TCC at the measured current is shifted in time by the specific multiplier.

For example, if a curve has an operation time of 40 milliseconds and a multiplier of 2, the “modified” operation time would be 80 milliseconds.

40 ms x 2 = 80 ms

Similarly, if the same curve has an operation time of 5 seconds, the multiplier produces a modified time of 10 seconds.

5 sec x 2 = 10 seconds

CLPU Multiplier

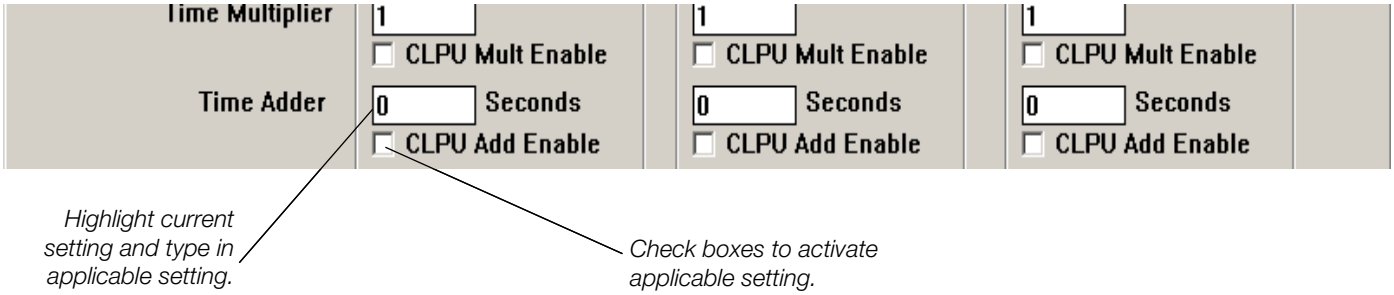
Units: Multiples of Min Trip

Range: 0.1 to 25

Accuracy: ±5% and ±1mA secondary for settings greater than 10mA secondary

Front Panel LCD display designation: CLPUPMult
CLPUQMult
CLPUGMult

CLPU Adder



The CLPU Adder settings define a Time Adder to modify the position of the original TCC in time-current space and the ability to enable it. With the CLPU time adder enabled, the trip time of a given TCC at a measured current is shifted in time by the specified additional time. In contrast to the CLPU time multiplier, the CLPU time adder adds a constant time to the curve, regardless of the unmodified curve.

For example, if a curve has an operate time of 40 ms and a 1 second time adder, the modified operate time is 1.040 seconds.

0.040 seconds + 1 second = 1.040 seconds

Similarly, if the same curve has a multiplier of 2 for an operate time of 5 seconds, the one second time adder would produce a modified time of 6 seconds.

5 seconds (2.5 seconds x 2) + 1 second = 6 seconds.

Note: The CLPU time multiplier takes precedence over the time adder.

CLPU Adder (Phase, Neg. Sequence, and Ground)

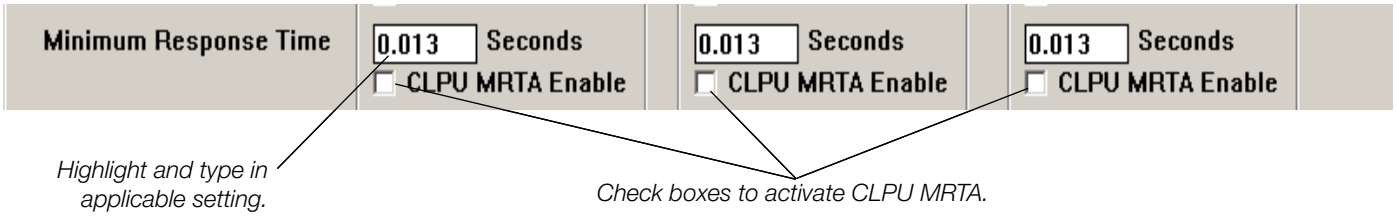
Units: seconds

Range: 0 to 30

Accuracy: ±1% and ±10 ms

Front Panel LCD display designation: CLPUPAdd
CLPUQAdd
CLPUGAdd

CLPU Minimum Response Time Adder (MRTA)



The CLPU Minimum Response Time Adder (CLPUMRTA) defines a minimum response time that modifies the shape of the original TCC in time-current space for Cold Load Pickup and the ability to enable the MRTA.

When enabled, the CLPU minimum response time of a given TCC can be no less that the value of the MRTA.

Note: These curve modifications can be predefined and viewed in TCC Editor II and imported using Form 6 ProView application software. See **Using TCC Editor II** section of this manual.

CLPU MRTA (Phase, Neg. Sequence, and Ground)

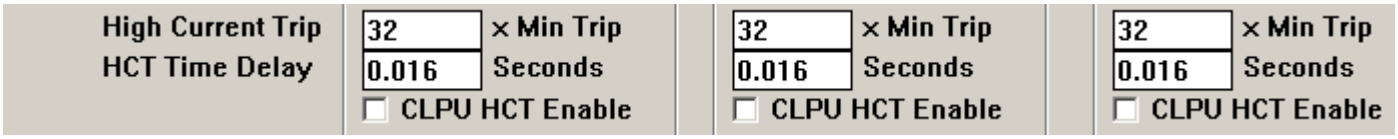
Units: seconds

Range: 0.01 to 1.0

Accuracy: ±1% and ±10 ms

Front Panel LCD display designation: CLPUPMRTA
CLPUQMRTA
CLPUGMRTA

CLPU High Current Trip



The CLPU High Current Trip (HCT) settings define a cold load pickup high current trip setting, a time delay, and an enable setting to modify the shape of the selected CLPU TCC in time-current space. If Cold Load Pickup HCT is enabled, the shape of the TCC at currents beyond the HCT setting is definite time as defined by the CLPU HCT time delay.

CLPU HCT (Phase, Neg. Sequence, and Ground)

Units: Multiples of Minimum Trip

Range: 1 to 32

Accuracy: ±5% and ±1mA secondary for settings greater than 10mA secondary

Front Panel LCD display designation: CLPUPHCT
CLPUQHCT
CLPUGHCT

CLPU HCT Time Delay (Phase, Neg. Sequence, and Ground)

Units: seconds

Range: 0.01 to 0.15

Accuracy: ±1% and ±10 ms

Front Panel LCD display designation: CLPUPHCTDly
CLPUQHCTDly
CLPUGHCTDly

CLPU Reset Coefficient

The Reset Coefficient settings define the rate at which the control resets if a non-instantaneous reset is specified. The reset coefficient is the equivalent of the mechanical reset of induction disk controls. The reset time is determined by the following equation:

- Reset Time = (TM*RCC)/(M^2-1) where TM equals the TCC Time Multiplier setting from the TCC Modifiers, RCC is the reset coefficient setting, and M is the ratio of the applied current to the minimum trip setting of the TCC type.

Note: When Disk Reset is used, the reclose interval must be long enough to allow the disk to fully reset to avoid faster than expected tripping times encountered on successive shots.

CLPU High Current Lockout

Cold Load Pickup High Current Lockout (CLPU HCL) defines HCL settings and a HCL Enable. If CLPU is enabled, it will be enabled for the entire CLPU sequence.

The CLPU HCL settings define the phase, negative sequence, and ground pickup settings.

Note: If CLPU HCL is active no subsequent reclosing occurs in that sequence.

CLPU HCL (Phase, Neg. Sequence, and Ground)

Units: Amps

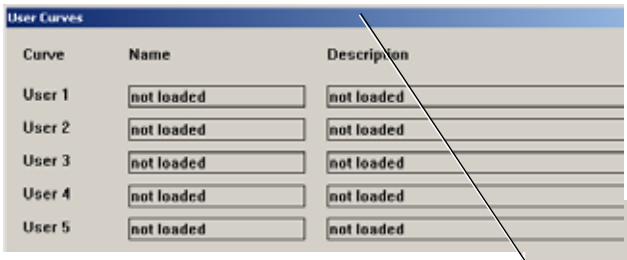
Range: 100 to 20000

Accuracy: ±5% and ±1 mA (secondary)

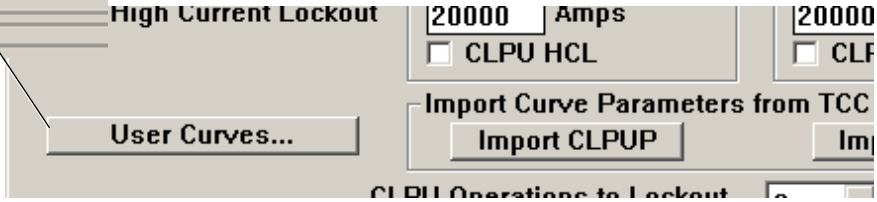
IMPORTANT: When importing curve parameters from TCC Editor, the curve(s) last accessed in TCC Editor will load.

User Curves

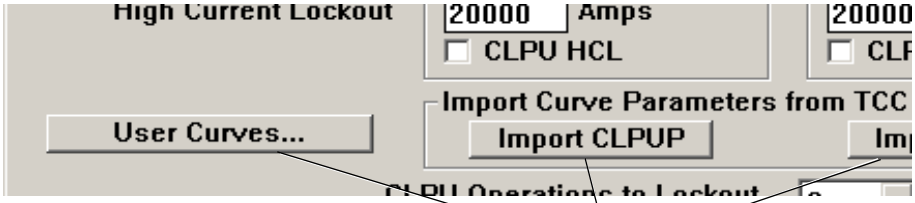
User Curves are user-defined, custom curves created in TCC Editor II for the Form 6 recloser control. The User Curves dialog box enables user curve data to be read from the respective setting files (User1 settings.txt through User5 settings.txt). These files can be viewed with any text editor. Setting files are located: Program Files/Cooper/Proview401/Form6.

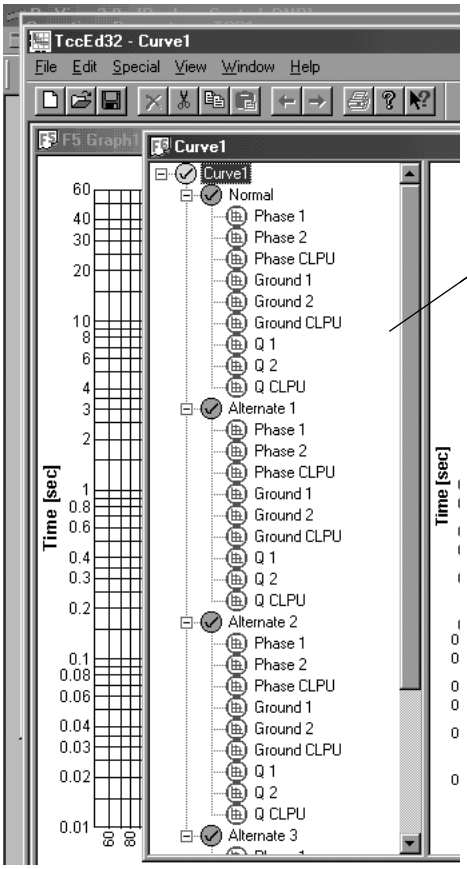


The curve(s) last accessed in TCC Editor will load.



Import Curve Parameters from TCC Editor



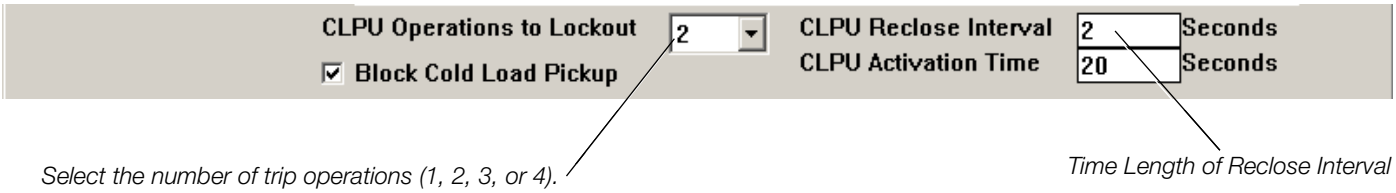


There must be a TCC loaded (in each profile) in the parameter you want to import prior to Importing Curve Parameters from TCC Editor.

For instance, if you want to import a Phase Operation Number 1 custom user curve, a Phase 1 curve must be loaded in Normal, Alternate 1, Alternate 2, and Alternate 3 profiles.

IMPORTANT: Fault currents that extend beyond the CLPU activation time will result in a composite TCC based upon the active profile and CLPU TCC settings.

CLPU Reclosing Interval



Cold Load Pickup Reclosing defines the reclose interval for CLPU trips and the number of CLPU Trip Operations to Lockout.

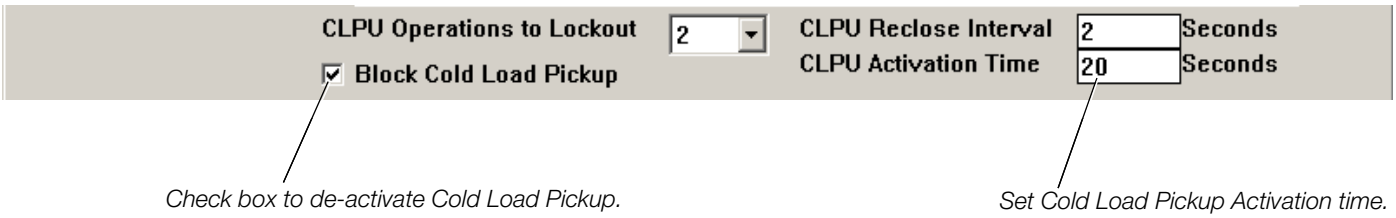
CLPU Reclosing Interval

Units: Seconds

Range: 1.8 to 100

Accuracy: ±1% and ±30 ms

CLPU Control



Set the Cold Load Pickup activation time or the CLPU Block feature.

CLPU Activation Time

Units: Seconds

Range: 0 to 3600

Accuracy: ±1% and ±10 ms

Front Panel LCD display designation: CLPUActTime

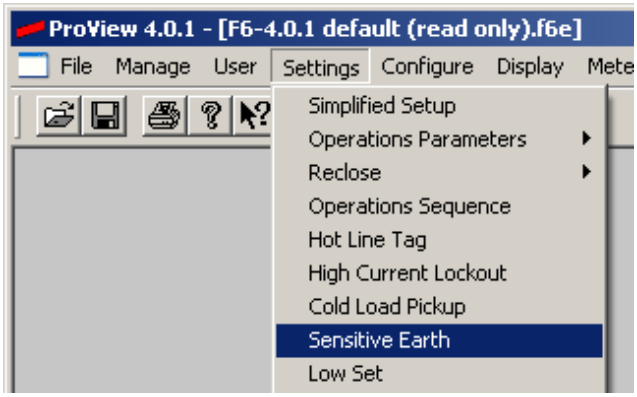
CLPU Block

Front Panel LCD display designation: CLPUBlock

Range: Yes or No

Note: When Hot Line Tag and CLPU are both active the Form 6 control reverts back to the original minimum pick-up values (i.e. disables CLPU settings).

Sensitive Earth



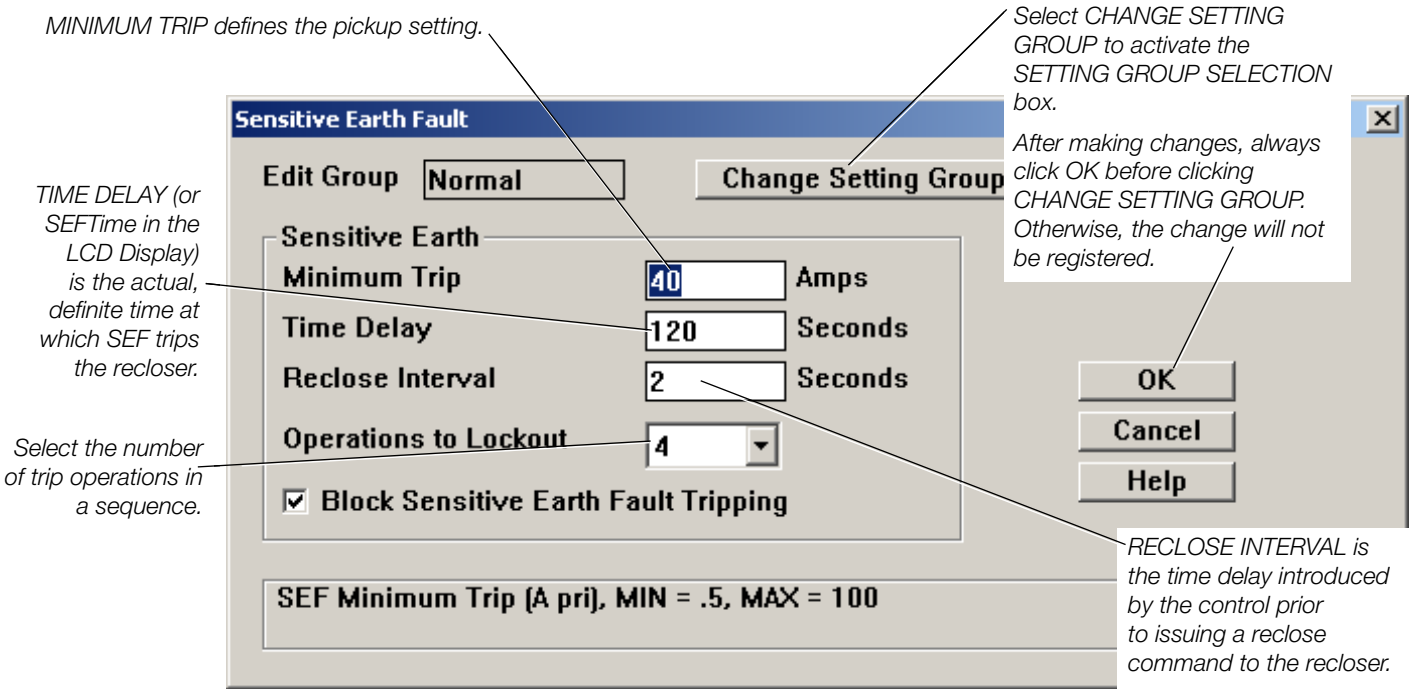
The Sensitive Earth Fault (SEF) feature is used on 3-wire systems that require lower, independent minimum trip values than normal ground sensing.

Sensitive Earth Fault (SEF) allows the Form 6 recloser control to detect and authorize the recloser to trip after a selectable, definite time for ground currents above SEF minimum trip levels. Sensitive Earth Fault has programmable lockout settings and reclose intervals. Like all the features in the Settings menu, Sensitive Earth Fault is independently selectable for each protection profile.

Note: When the Ground Trip Blocked feature is Enabled, the Sensitive Earth Fault feature is Disabled.

Sensitive Earth Fault feature requires four settings once it is enabled:

- SEF Minimum Trip
- SEF Time Delay
- SEF Reclose Interval
- SEF Operations-to-Lockout



SEF Minimum Trip

IMPORTANT: Always verify the SEF minimum trip values are appropriate for the CT Ratio.

Minimum Trip for Sensitive Earth Fault defines the pickup setting.

SEF Minimum Trip

Units: Primary Amps

Range: 0.5 to 100A (2000:1 CT Ratio)
0.5 to 100A (1000:1 CT Ratio)
0.5 to 100A (500:1 CT Ratio)

Accuracy: ±5% or ±0.1mA secondary for settings greater than 1mA secondary

Front Panel LCD display designation: SEFMinTrip

SEF Time Delay

Time delay for SEF is the actual, definite time at which the sensitive earth fault trips the recloser.

SEF Time Delay

Units: seconds

Range: 0.1 to 300

Accuracy: ±1% and ±10 ms

Front Panel LCD display designation: SEFTime

SEF Reclose Interval

Reclose or Open Interval settings define the intentional time delay introduced by the control prior to issuing a reclose command to the recloser.

Note: Sensitive Earth Fault reclose intervals are defined for sensitive ground-only initiated reclosing operations.

SEF Reclose Interval

Units: seconds

Range: 1 to 100

Accuracy: ±1% and ±30 ms

Front Panel LCD display designation: SEFRclInt

SEF Operations-to-Lockout

Operations-to-Lockout defines the maximum number of trip operations in a sequence before the control opens and locks out. The count includes phase, ground, and negative trip operations.

SEF Operations to Lockout

Range: 1 to 4

Front Panel LCD display designation: SEFNumOps

Block SEF Tripping

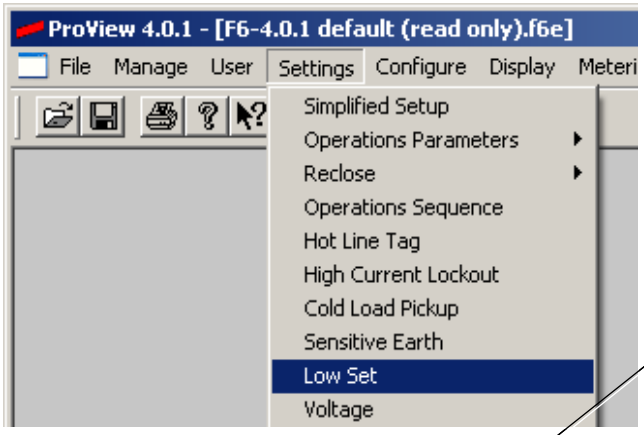
Set the Block Sensitive Earth Fault Tripping feature.

SEF Tripping Block

Range: Enable or Disable

Front Panel LCD display designation: SEFBlock

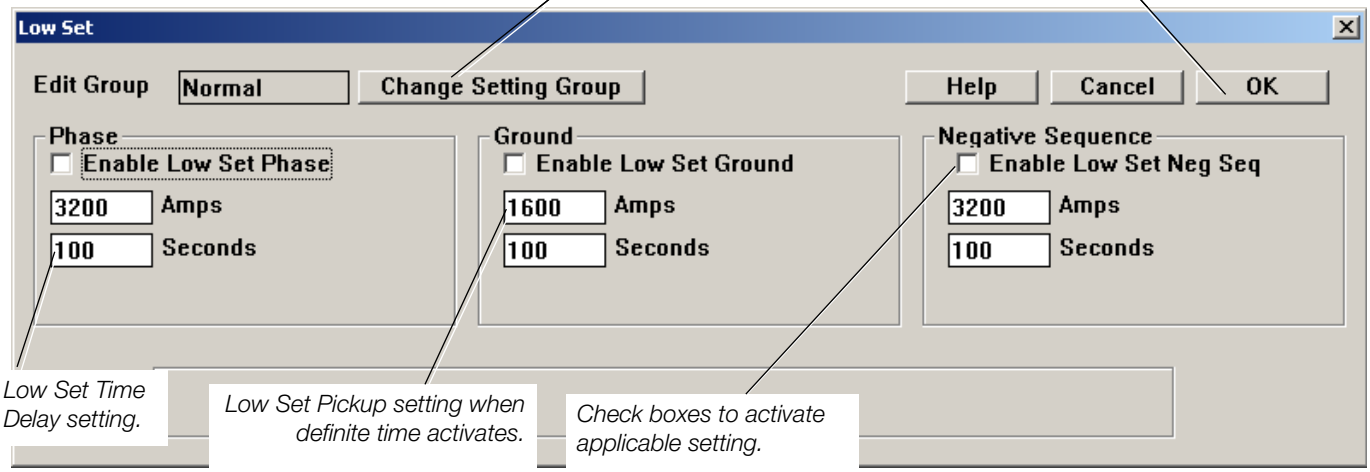
Low Set



Low Set Overcurrent Protection is for programming and enabling settings associated with the low-set definite-time overcurrent. A separate pickup and time delay threshold is provided for phase, negative sequence, and ground.

Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

After making changes, always click OK before clicking CHANGE SETTING GROUP. Otherwise, the change will not be registered.



Low Set Time Delay setting.

Low Set Pickup setting when definite time activates.

Check boxes to activate applicable setting.

Pickup

IMPORTANT: Always verify the pickup values are appropriate for the CT Ratio.

Pickup defines the setting at which the definite time activates.

Phase and Negative Sequence Pickup

Units: Amps

Range: 20 to 3200 (2000:1 CT Ratio)
10 to 1600 (1000:1 CT Ratio)
5 to 800 (500:1 CT Ratio)

Accuracy: ±5% and ±1mA secondary for settings greater than 10mA secondary

Ground Pickup

Units: Amps

Range: 10 to 1600 (2000:1 CT Ratio)
5 to 800 (1000:1 CT Ratio)
2 to 400 (500:1 CT Ratio)

Accuracy: ±5% and ±1mA secondary for settings greater than 10mA secondary

Time Delay

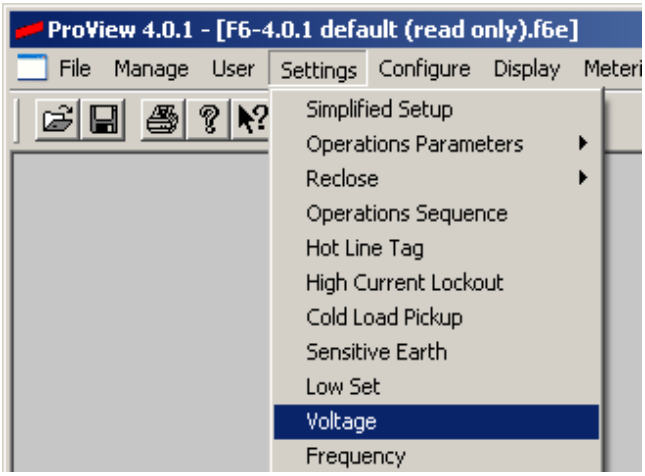
Phase, Negative Sequence, and Ground Time Delay

Units: seconds

Range: 0 to 100

Accuracy: ±1% and ±10 ms

Voltage



The Voltage dialog box enables you to program the Form 6 recloser control under and overvoltage protection settings for alarm and trip on system excursions from nominal.

Under and overvoltage settings are used for loss of voltage detection and/or overvoltage applications.

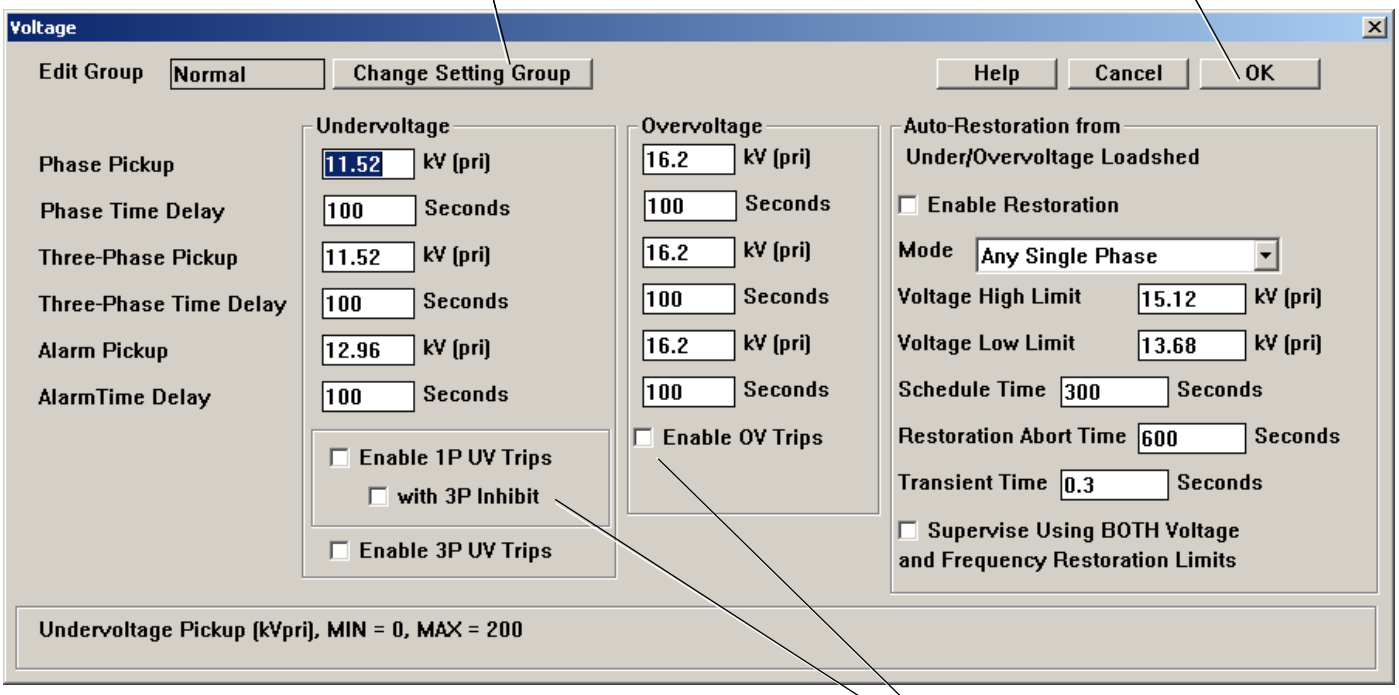
- Undervoltage can be enabled for single-phase, three-phase, or single-phase with three-phase inhibit mode.
- Overvoltage, when enabled, will automatically assert for both single-phase and three-phase detection.

The overvoltage and undervoltage alarms must be configured through the Workbench Inputs – Alarms toolbox.

Note: Non-latched system alarms will not illuminate the Alarm LED on the front panel. Non-latched system alarms must be programmed via the Idea Workbench to associate with a front panel Indicator LED.

Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

After making changes, always click OK before clicking CHANGE SETTING GROUP Otherwise, the change will not be registered.



Voltage settings have no effect on protection modes until asserted by checking the appropriate checkbox.

The settings and dialog control descriptions and their allowable setting limits are listed below.

Undervoltage Settings

The Undervoltage settings define the single and three-phase tripping thresholds and delay times, as well as the alarm pickup and time delay.

Checkboxes are provided to allow the user to enable single- and three-phase undervoltage tripping. When single-phase UV tripping is enabled the user can select 3-Phase Inhibit.

Checking "Enable 1P UV Trips" will allow tripping based on the phase settings. Tripping will occur regardless if any one phase, any combination of two phases, or all three phases are involved.

Checking both "Enable 1P UV Trips" and "with 3P Inhibit" or checking only "with 3P Inhibit" and properly utilizing the "1P UV Trips Enable" Workbench output will allow tripping based on the phase settings. Tripping will occur regardless if any one phase or any combination of two phases are involved. Tripping will not occur if all three phases are involved.

Note: Checking only "with 3P Inhibit" will have no effect on tripping unless single-phase undervoltage trips is enabled.

Checking "Enable 3P UV Trips" will allow tripping based on the three-phase settings. Tripping will only occur if all three phases are involved.

Checking both "Enable 1P UV Trips" (with or without checking "with 3P Inhibit") and "Enable 3P UV Trips" will allow tripping based on both the phase and three-phase settings.

Note: The Single-Phase Undervoltage Pickup setting controls the voltage indication for the front panel voltage present target LEDs.

For a Form 6-LS control, the front panel voltage present LEDs are controlled by the Voltage Controls settings in the Loop Scheme Settings dialog box. A, B, and C phase is Source I for the Form 6-LS control.

Refer to **Form 6 Loop Scheme Control** in **Section 5** for additional information.

Single-Phase Undervoltage Pickup

Units: kV (Primary)
Range: 0 to 200
Accuracy: ±1% and ±1 V secondary
Front Panel LCD display designation: UVolt1PPU

Single-Phase Undervoltage Time Delay

Units: Seconds
Range: 0 to 100
Accuracy: ±1% and ±10 ms
Front Panel LCD display designation: UVolt1PTime

Three-Phase Undervoltage Pickup

Units: kV (Primary)
Range: 0 to 200
Accuracy: ±1% and ±1 V secondary
Front Panel LCD display designation: UVolt3PPU

Three-Phase Undervoltage Time Delay

Units: Seconds
Range: 0 to 100
Accuracy: ±1% and ±10 ms
Front Panel LCD display designation: UVolt3PTime

Undervoltage Alarm Pickup

Units: kV (Primary)
Range: 0 to 200
Accuracy: ±1% and ±1 V secondary
No LCD Display designation

Undervoltage Alarm Time Delay

Units: Seconds
Range: 0 to 3600
Accuracy: ±1% and ±10 ms
No LCD Display designation

Overvoltage Settings

The Overvoltage settings define the single and three-phase tripping thresholds and delay times, as well as the alarm pick-up and time delay.

Single-Phase Overvoltage Pickup

Units: kV (Primary)
Range: 0 to 200
Accuracy: ±1% and ±1 V secondary
Front Panel LCD display designation: OVolt1PPU

Single-Phase Overvoltage Time Delay

Units: Seconds
Range: 0 to 100
Accuracy: ±1% and ±10 ms
Front Panel LCD display designation: OVolt1PTime

Three-Phase Overvoltage Pickup

Units: kV (Primary)
Range: 0 to 200
Accuracy: ±1% and ±1 V secondary
Front Panel LCD display designation: OVolt3PPU

Three-Phase Overvoltage Time Delay

Units: Seconds
Range: 0 to 100
Accuracy: ±1% and ±10 ms
Front Panel LCD display designation: OVolt3PTime

Overvoltage Alarm Pickup

Units: kV (Primary)
Range: 0 to 200
Accuracy: ±1% and ±1 V secondary

Overvoltage Alarm Time Delay

Units: Seconds
Range: 0 to 3600
Accuracy: ±1% and ±10 ms

Auto-Restoration from Under/Overvoltage Loadshed Settings

The Auto-Restoration from Under/Overvoltage Loadshed settings define the high and low voltage thresholds as well as the timers for the selected mode and limits.

Enable Restoration

Range: Checkbox (Enable or Disable)

Front Panel LCD display designation: VoltRestor

Range: Selection Box (Any Single Phase or All Three Phases)

Front Panel LCD display designation: VoltRestor

Voltage High Limit

Units: kV (Primary)

Range: 0 to 200

Accuracy: ±1% and ±1 V secondary

Front Panel LCD display designation: VoltRestHiL

Voltage Low Limit

Units: kV (Primary)

Range: 0 to 200

Accuracy: ±1% and ±1 V secondary

Front Panel LCD display designation: VoltRestLoL

Schedule Time*

Units: seconds

Range: 1.0 to 3600

Accuracy: ±1% and ±10 ms

Front Panel LCD display designation: Freq:62Sched

Restoration Abort Time*

Units: seconds

Range: 0.1 to 3600

Accuracy: ±1% and ±10 ms

Front Panel LCD display designation: Freq:62Abort

Transient Time*

Units: seconds

Range: 0.1 to 3600

Accuracy: ±1% and ±10 ms

Front Panel LCD display designation: Freq:62Trans

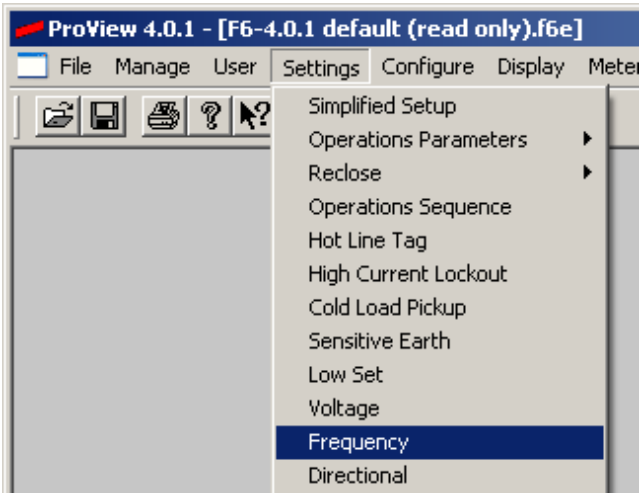
Supervise Using BOTH Voltage and Frequency Restoration Limits*

Range: Checkbox (Enable or Disable)

Front Panel LCD display designation: VoltFreqRe

** This setting is also available in the Frequency dialog box. If the setting is changed in this dialog box, it is also changed in the Frequency dialog box.*

Frequency

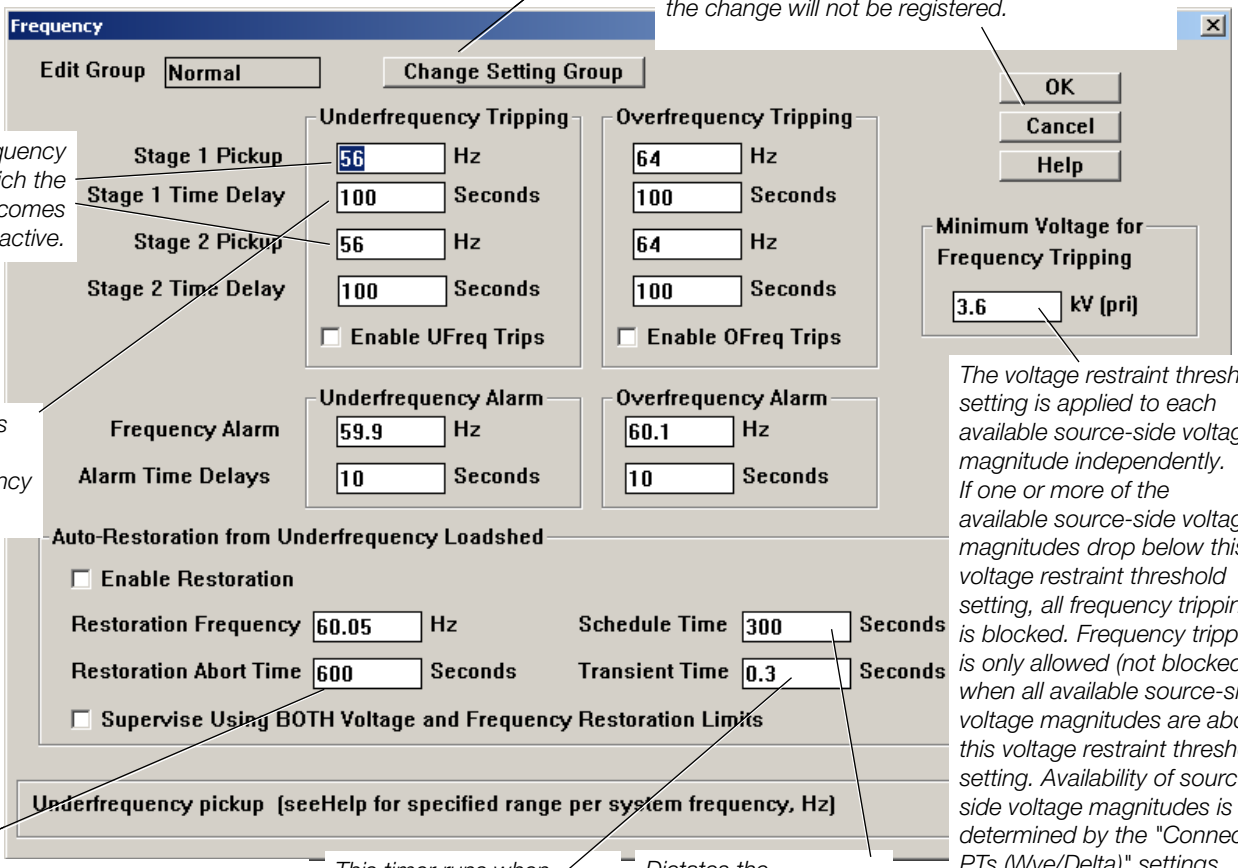


Frequency provides over and underfrequency protection as well as a frequency restoration feature to allow the recloser to automatically close when frequency returns within configured settings for a user-settable time.

Any phase can be used for Frequency measurement and protection as long as that phase is enabled in the Configure: System Configuration dialog box.

Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

After making changes, always click OK before clicking CHANGE SETTING GROUP. Otherwise, the change will not be registered.



Define the frequency level at which the protection becomes active.

Set time delays to coordinate system frequency functionality.

The voltage restraint threshold setting is applied to each available source-side voltage magnitude independently. If one or more of the available source-side voltage magnitudes drop below this voltage restraint threshold setting, all frequency tripping is blocked. Frequency tripping is only allowed (not blocked) when all available source-side voltage magnitudes are above this voltage restraint threshold setting. Availability of source-side voltage magnitudes is determined by the "Connected PTs (Wye/Delta)" settings in the Configure>System Configuration dialog box.

***Note**: Even though the minimum voltage for frequency tripping can be set to "0", the minimum required voltage must not drop below 10.5VAC (sec) for PT inputs [where V expected/PT ratio >20] or 1.05VAC (sec) for internal voltage sensors or Lindsey inputs [where V expected /PT ratio ≤ 20].*

This timer runs when an Underfrequency action occurs until the Restoration Abort Time setting expires. This timer will stop running as a CLOSE occurs or an overcurrent fault occurs.

Set Schedule Time faster than the Restoration Abort Time.

This timer runs when Schedule Timer elapses and ensures the required frequency is stable prior to closing. The Schedule Timer can stop-and-start if frequency fluctuates. For the Transient Timer, the frequency must be within the limits for the entire time in order to close.

Dictates the restoration schedule for the feeder in relation to other feeders on the system.

Under/Overfrequency Pickup

IMPORTANT: Always verify the pickup and alarm values are appropriate for the system frequency.

The Stage 1 and Stage 2 underfrequency and overfrequency pickup settings define the frequency level at which the protection becomes active. For underfrequency protection to become active, the frequency level must be less than the pickup setting. For overfrequency protection to become active, the frequency level must be greater than the pickup setting.

The Frequency dialog box enables you to set two overfrequency and two underfrequency pickup settings (Stage 1 and Stage 2). You can also set a single overfrequency alarm and a single underfrequency alarm.

Stage 1 and 2 Alarm and Over/Underfrequency

Units: Hertz (Hz)

Range: 46 to 54 (50 Hz)
56 to 64 (60 Hz)

Accuracy: ± 0.005 Hz

Front Panel LCD display designation: UFreq1PU, UFreq2PU, OFreq1PU OFreq2PU

Time Delays

Each under and overfrequency setting has a settable time delay to coordinate system frequency functionality.

Stage 1 and 2 Time Delays

Units: seconds

Range: 0 to 100

Accuracy: ±1% and ±10 ms

Front Panel LCD Display Designation: UFreq1Time UFreq2Time OFreq1Time OFreq2Time

Under and Overfrequency Time Delay Alarm

Units: seconds

Range: 0 to 3600

Accuracy: ±1% and ±10 ms

Note: The over and underfrequency alarms have a factory-defined 50 ms delay programmed into the feature to minimize nuisance alarming.

Underfrequency Restoration

Underfrequency Restoration settings allow the user to specify if and when the feeder will automatically restore following an underfrequency trip event. As long as the frequency remains above the restoration frequency setting, the restoration logic runs the Schedule Timer. The Schedule Timer is an accumulated timer to provide coordination with multiple devices. This timer dictates the restoration schedule for the feeder in relation to other feeders on the system.

Following an underfrequency loadshedding event, the Form 6 control continues to monitor system frequency. As long as the frequency remains above the Restoration Frequency setting, the restoration logic runs the schedule timer. If the measured frequency drops below the Restoration Frequency setting, the schedule timer will pause, but not reset. The accumulated schedule time to this point is retained and when system frequency once again rises above the restoration frequency, the schedule timer resumes its count from the point it left off.

All feeders on the system pause their own schedule timers when the restoration of load elsewhere on the system results in a momentary frequency decline, until system frequency is restored to greater than the Restoration Frequency setting. However, if while the schedule timer is running, the system frequency again drops to below the Stage 1 Underfrequency Pickup setting for the Stage 1 Time Delay setting or the Stage 2 Underfrequency Pickup setting for the Stage 2 Time Delay setting, the corresponding underfrequency loadshedding stage has again operated system-wide. In this case, the schedule timer resets, so that the orderly restoration of all open feeders can once again commence as the system recovers.

When the schedule timer times out, the feeder is scheduled to be restored. However, prior to actual restoration, the frequency must also remain above the Restoration Frequency setting continuously for the Transient Time setting. The requirement for this final interval of continuous in-band frequency is to ensure that the system has achieved relative stability before additional load is restored. This postpones restoration as long as momentary instabilities prevent the transient timer from timing out. Such momentary instabilities can be due to other, closely scheduled restorations occurring elsewhere on the system, or due to other unpredicted generation or switching events causing a momentary drop in frequency.

If the Form 6 control is not able to successfully restore the feeder within the Schedule Timer setting following an Underfrequency Loadshed event, further restoration attempts are abandoned at the conclusion of the Restoration Abort Timer. This ensures that feeders are not automatically restored during situations that prevent system recovery within the Schedule Time setting.

Note: Even if the transient timer times out, restoration will be inhibited if Overfrequency tripping is enabled and the frequency is above the Stage 1 or Stage 2 Overfrequency Pickup settings. If a fault trip occurs, the Form 6 control will not participate in automated loadshed restoration, even though frequency conditions and schedules may otherwise dictate restoration.

Refer to the end of this section for an example of underfrequency restoration scheduling functionality.

Restoration Frequency

Units: Hertz (Hz)

Range: 46 to 54 (50 Hz)
56 to 64 (60 Hz)

Accuracy: ± 0.005 Hz

Front Panel LCD display designation: Freq:810R:PU

Restoration Abort Time

Units: seconds

Range: 0.1 to 3600

Accuracy: ±1% and ±10 ms

Front Panel LCD display designation: Freq:62Abort

Schedule Time

Units: seconds

Range: 1.0 to 3600

Accuracy: ±1% and ±10 ms

Front Panel LCD display designation: Freq:62Sched

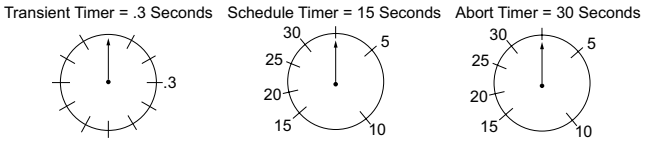
Transient Time

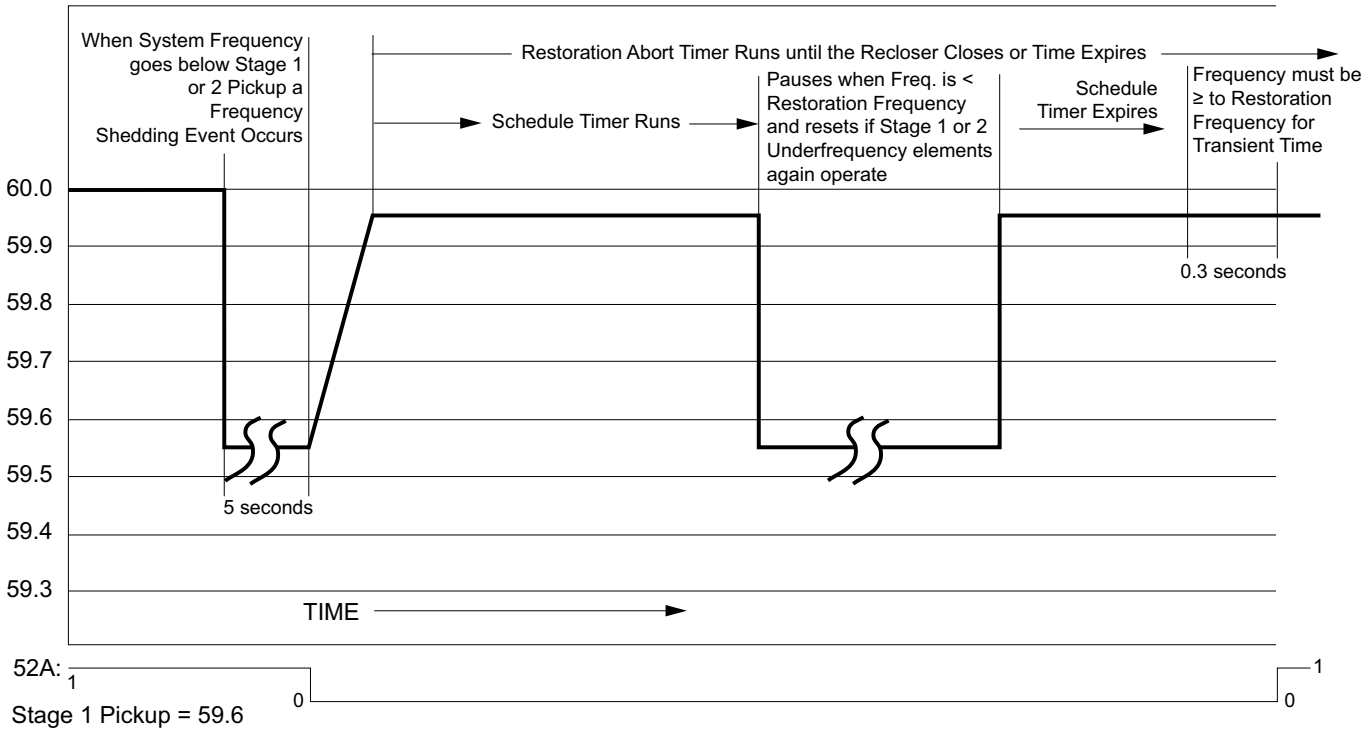
Units: seconds

Range: 0.1 to 3600

Accuracy: ±1% and ±10 ms

Front Panel LCD display designation: Freq:62Trans

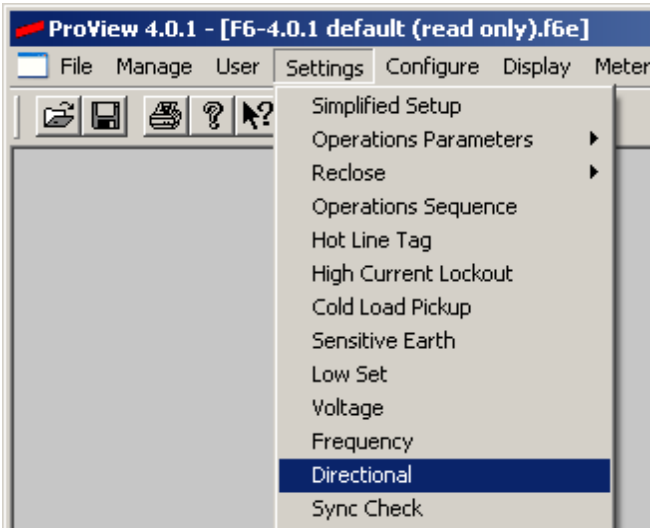




Stage 1 Pickup = 59.6
Stage 1Time Delay = 5 seconds
Stage 2 Pickup = 59.3
Stage 2 Time Delay = 0.5 seconds
Restoration Frequency = 59.9

This is only an example of the Underfrequency Restoration Scheduling functionality. Actual pick-up and time values will vary based on system requirements.

Directional



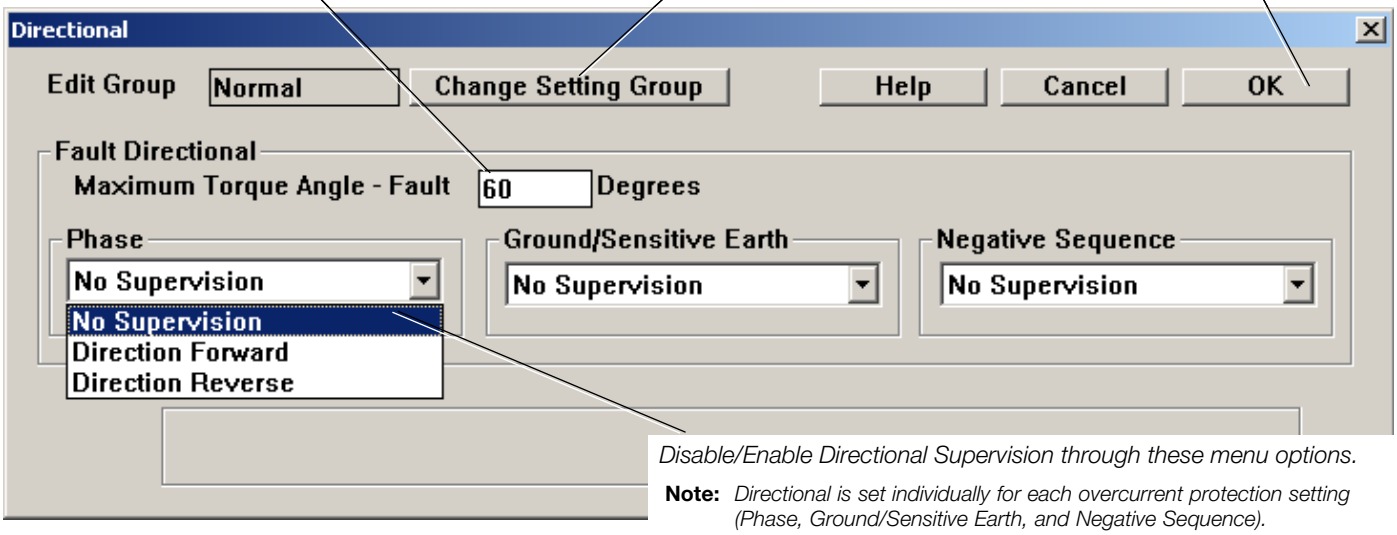
The Directional Supervision feature maintains system coordination from either direction (forward or reverse), as well as circuit reconfiguration for each protection profile. The Directional feature applies to phase, ground, and negative sequence protection.

The Form 6 recloser control contains two directional functions: a *positive sequence* function to provide directional measurement for balanced three-phase faults, and a *negative sequence* function to provide directional measurement for all unbalanced faults (phase-phase, phase-phase-ground, and ground).

Maximum Torque Angle applies to all Directional elements: Phase, Ground/SEF, and Negative Sequence.

Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

After making changes, always click OK before clicking CHANGE SETTING GROUP. Otherwise, the change will not be registered.



Disable/Enable Directional Supervision through these menu options.

Note: *Directional is set individually for each overcurrent protection setting (Phase, Ground/Sensitive Earth, and Negative Sequence).*

When Directional Supervision is enabled it allows for overcurrent tripping only for the direction that is enabled. The direction that is not enabled will not allow for an overcurrent trip.

Maximum Torque Angle

The Maximum Torque Angle (MTA) defines the setting at which the relative angle between the current and the voltage produce the greatest operate signal (or torque) from the directional functions.

Note: One MTA is defined and applies to all Directional elements.

Maximum Torque Angle (MTA)

Units:	Degrees
Range:	0 to 90
Accuracy:	±1 degree

Directional Supervision

Note: Current measuring functions for Phase, Ground, and Negative Sequence are only supervised when DIRECTION FORWARD or DIRECTION REVERSE is enabled.

Phase Directional Supervision

The Phase directional torque feature provides accurate directional supervision for both balanced (*positive sequence)* and unbalanced (*negative sequence)* faults.

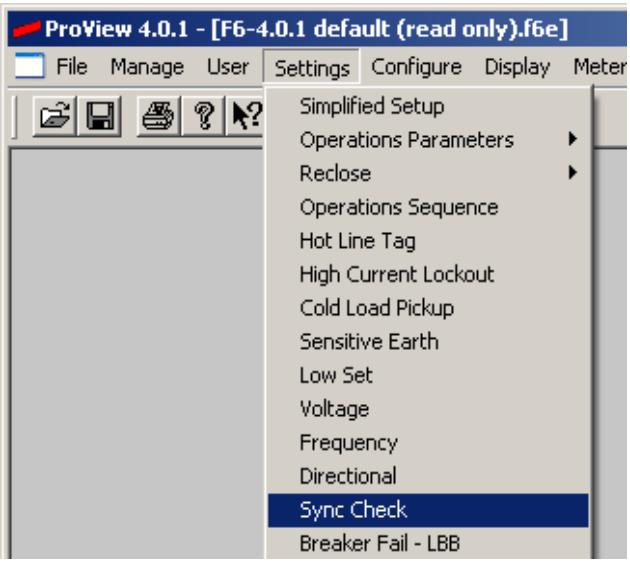
Ground/Sensitive Earth Directional Supervision

Ground/Sensitive Earth directional torque feature provides accurate directional supervision for unbalanced (zero sequence) faults.

Negative Sequence Directional Supervision

Negative Sequence directional torque feature provides accurate directional supervision for unbalanced (negative sequence) faults.

Sync Check



The Form 6 recloser control contains capabilities to sync check based on source and line-side PTs. The PTs are assumed to be accurate and phase and magnitude supply the control with a true sinusoidal signal. Sync Check is a frequency measuring anticipatory close feature, with accommodation for static angles.

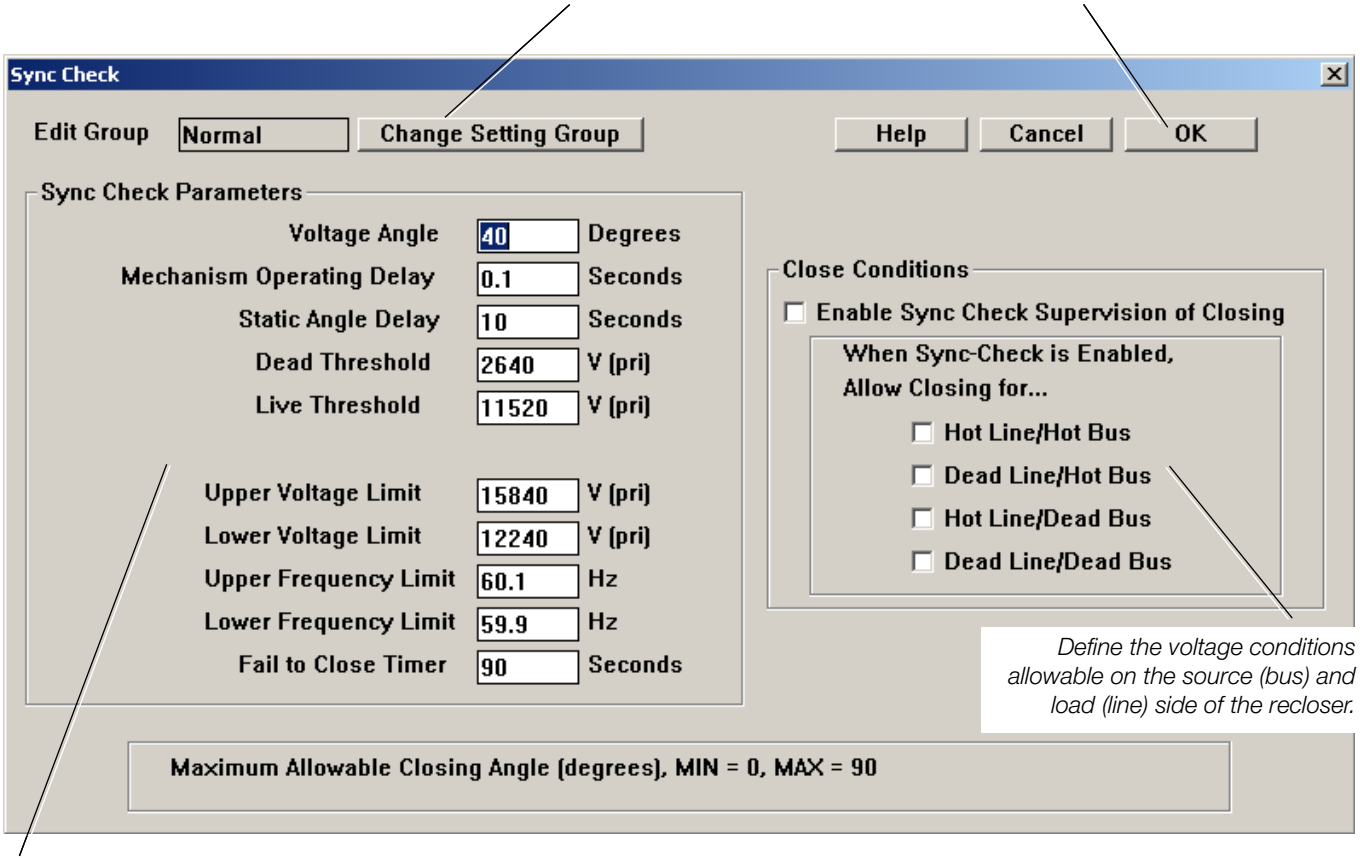
Review sync check parameters for the application.

The sync check system is a permissive system used to qualify any close signal to the mechanism, when the system is enabled via the sync check settings. The sync check has the ability to close for any combination of dead/live bus/line condition and to perform anticipatory closing for a live bus/live line condition by calculating the slip and leading the close based on the mechanism closing delay.

The system slip is measured by comparing the sync PT (Vs) (line) to the selected phase of the three phase BUS PTs. The slip is then converted to an angular velocity, measured in degrees/second. The mechanism operating delay setting is utilized to calculate the "lead angle" or the angle prior to top dead center (TDC) at which the close will be permitted.

Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

After making changes, always click OK before clicking CHANGE SETTING GROUP. Otherwise, the change will not be registered.



Define the voltage conditions allowable on the source (bus) and load (line) side of the recloser.

Sync check parameter settings define the conditions required to close a mechanism that has two (potentially) independent systems on either side of it.

In addition to the anticipatory close calculation, the sync check system performs verification on the line and bus voltage magnitudes and frequencies to determine that they are within pre-determined ranges, and that the angular difference between the two systems is also within a predetermined range.

For a Hot Line/Hot Bus close, where there is no slip between the systems, the sync check system allows for permissive closing after the two systems are within frequency and voltage limits, and the angular difference between the systems has been within the allowable limits for a settable time.

Close Conditions

Close Conditions settings define the voltage conditions allowable on the source (bus) and load (line) side of the recloser for a close to occur.

For example, by enabling DEAD LINE/HOT BUS CLOSING, the recloser allows a close when the source side of the mechanism is live and the load side is dead. If HOT LINE/HOT BUS is enabled (and Sync Check) is enabled, the programmed synchronizing parameters are activated.

Sync Check Parameters

Sync Check parameters define the conditions required to close a mechanism that has two potentially independent systems on either side of it.

Voltage Angle

Voltage Angle defines the angle proximity of two voltage phasors (line and bus) required for closing to activate.

Units: Degrees

Range: 0 to 90

Accuracy: ±1%

Mechanism Operating Delay

Mechanism Operating Delay specifies the expected delay in closing the mechanism. This delay “anticipates” the actual contact closing, and allows the sync close to “lead” the actual close when phasors are exactly in sync.

Note: Refer to chart at left for Kyle Recloser Type Close Times.

Units: Seconds

Range: 0.0167 to 0.5

Accuracy: ±1% and ±10 ms

Static Angle

Static Angle Delay defines the time a close signal is permitted if the line and bus phasors are within closing parameters, and their angular relationship is not changing.

Units: Seconds

Range: 0 to 3600

Accuracy: ±1% and ±10 ms

Kyle Recloser Type Close Times

Recloser Type	Closing Time (seconds)
WE, WVE27, VWE, VWVE27, WVE38X, VWVE38X	
with Standard Line-to-Line Closing Coil	0.100
with Low Voltage Closing Coil Accessory	0.165
VSA12, VSA16, VSA20, VSA12B, VSA20A	0.032
VSO12, VSO16	0.050
NOVA	0.045

Dead Threshold

Dead Threshold is the voltage used to compare to the line and bus voltages to determine if the voltage should be considered “dead”. If the measured voltage is less than the Dead Threshold, the line/bus is dead.

Units: Volts

Range: 0 to 200000

Accuracy: ±1% and ±1 V secondary

Live Threshold

Live Threshold is the voltage used to compare to the line and bus voltages to determine if the voltage should be considered “live”. If the measured voltage is greater than the live threshold, the line/bus is live.

Units: Volts

Range: 0 to 200000

Accuracy: ±1% and ±1 V secondary

Upper Voltage Limit

Upper Voltage Limit defines the upper voltage closing limit.

Units: Volts

Range: 0 to 200000

Accuracy: ±1% and ±1 V secondary

Lower Voltage Limit

Lower Voltage Limit defines the lower voltage closing limit.

Units: Volts

Range: 0 to 200000

Accuracy: ±1% and ±1 V secondary

IMPORTANT: Always verify the frequency closing limit values are appropriate for the system frequency.

Upper Frequency Limit

Upper Frequency defines the upper frequency closing limit.

Units: Hertz

Range: 56 to 64 (60 Hz)
46 to 54 (50 Hz)

Accuracy: ±0.005 Hz

Lower Frequency Limit

Lower Frequency defines the lower frequency closing limit

Units: Hertz

Range: 56 to 64 (60 Hz)
46 to 54 (50 Hz)

Accuracy: ±0.005 Hz

Fail to Close Timer

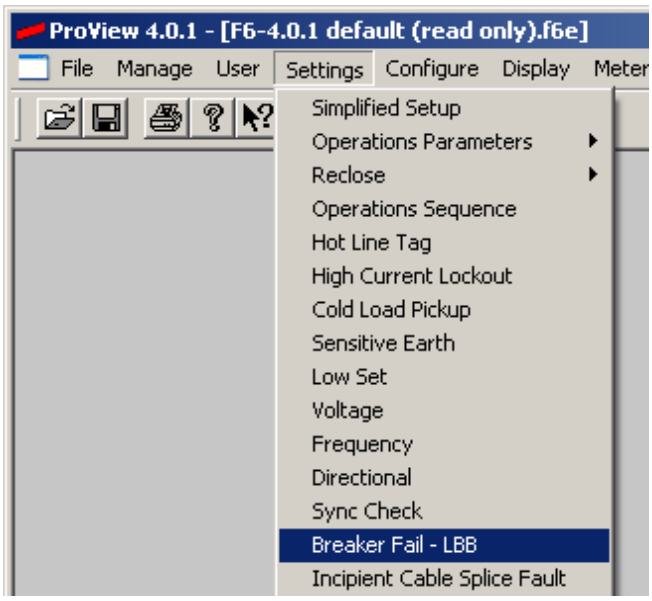
The Fail to Close Timer defines the length of time a sync close is maintained. After the expiration of the Fail to Close Timer, the close deactivates, and an alarm is activated.

Units: Seconds

Range: 0 to 3600

Accuracy: ±1% and ±10 ms

Breaker Fail - LBB



The Form 6 control contains a Breaker Fail Indication/Local Breaker Backup (BFI-LBB) for mechanism monitoring. LBB is used for applications with a local backup breaker or recloser in case the recloser is unable to clear the circuit after a trip command.

The Breaker Fail-LBB dialog box contains a Pickup Delay timer, a Dropout Delay timer, and an enable setting.

If lockout is enabled for the BFI-LBB logic, then the control will issue a trip signal (BFI:Trip), and lockout.

The BFI:Trip signal is available in the Idea Workbench Inputs Targets toolbox to allow the user to configure an output contact I/O.

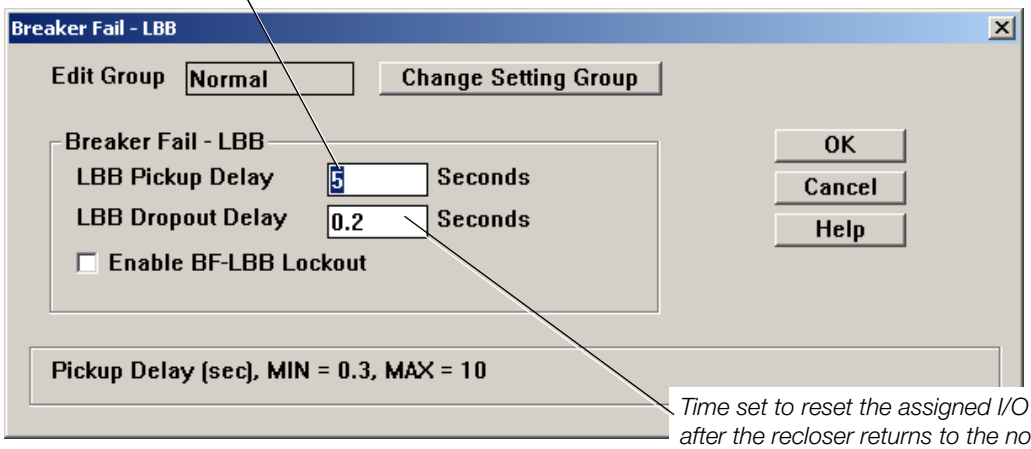
LBB Pickup Delay

Units: Seconds
Range: 0.3 to 10
Accuracy: ±1% and ±10 ms

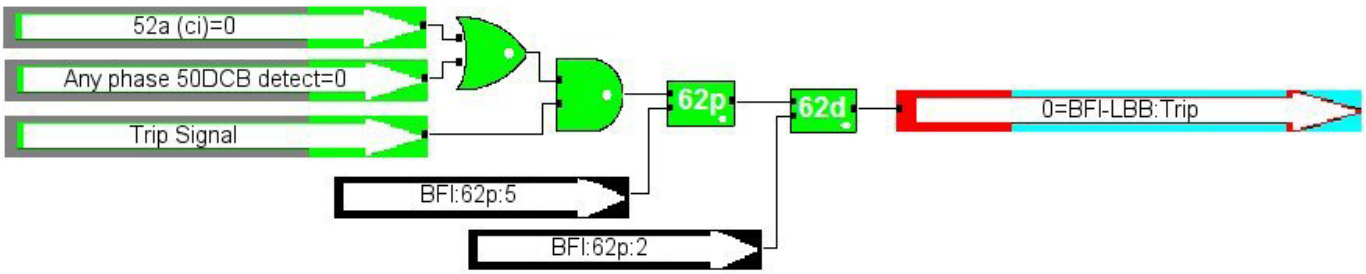
LBB Dropout Delay

Units: Seconds
Range: 0.2 to 10
Accuracy: ±1% and ±10 ms

Time set to delay the assigned I/O contact closure.

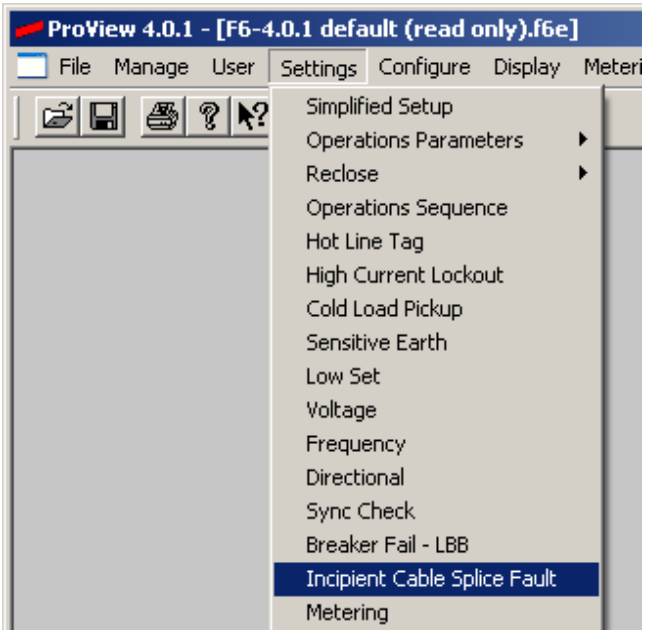


Time set to reset the assigned I/O contact closure after the recloser returns to the normal state.



Example of basic logic for Breaker Fail - LBB.

Incipient Cable Splice Fault



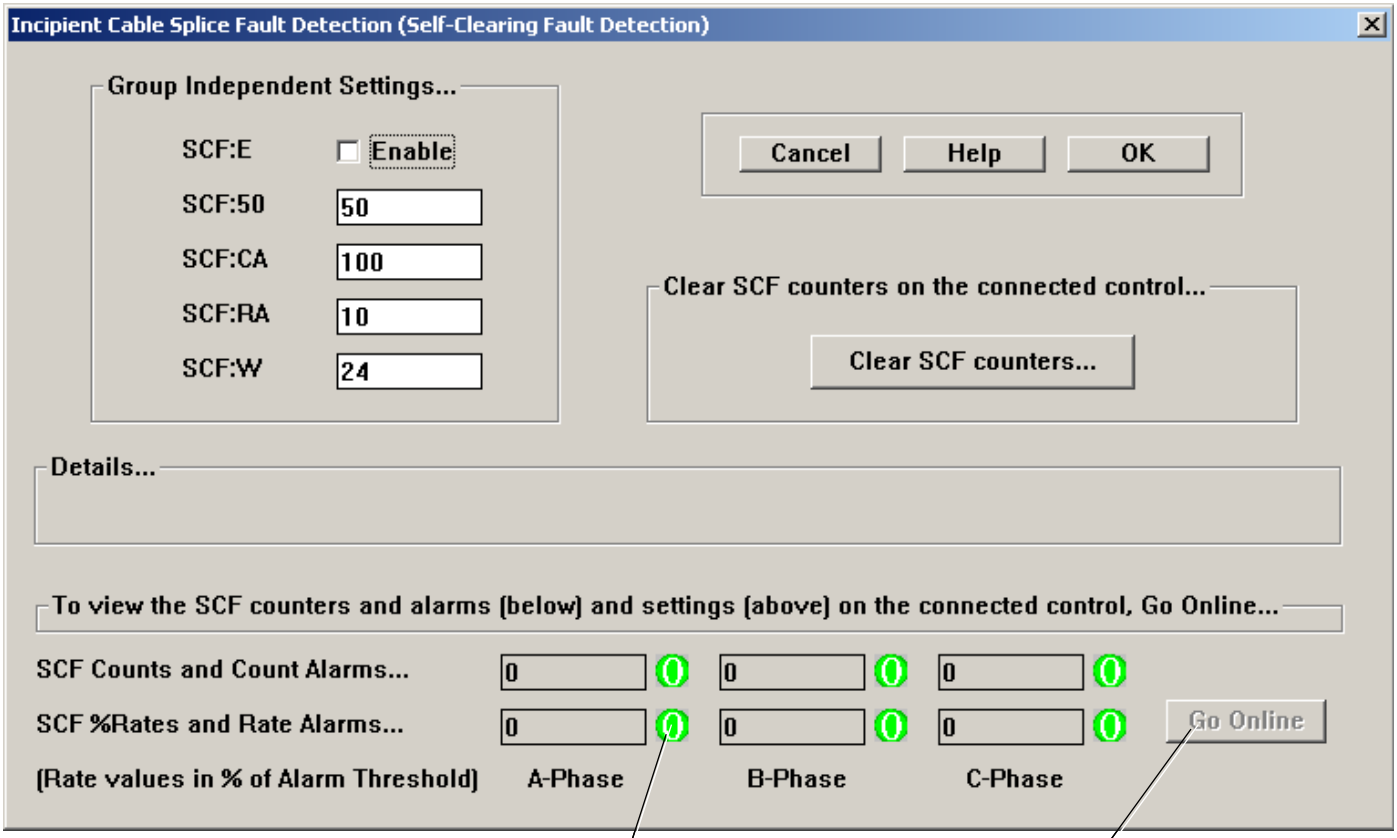
The incipient cable splice fault (ICSF) detector algorithm recognizes the unique waveform characteristics that occur in the days preceding a pending cable splice failure due to water ingress. By monitoring how often this waveform footprint occurs over time, the user can obtain a highly reliable indicator of impending cable splice faults.

Before a cable splice fails, water seeps into the splice causing a line-to-ground fault. The result is a waveform that is best described as a 1/4 cycle self-extinguishing fault.

The second characteristic of incipient cable splice faults is that they occur with increasing frequency over time. The Form 6 control ICSF algorithm provides the ability to sense the total number of occurrences as well as the number of occurrences that occur during a programmable time period.

Note: Current limiting fuse operations can occasionally generate a waveform that will be counted by the ICSF detector. However, these events are very limited in number compared to the number of counts that will occur prior to an actual cable splice failure.

Refer to **Front Panel Operation - Self-Clear Fault Menu** section of this manual for additional information.



These green 0 alarm status indicators will display as a red 1 if an SCF alarm is present.

Go Online to view SCF counters, rates, and alarms.

Self-Clearing Fault Detection Enable

SCF:E

Range: 0 = N (Disable)
1 = Y (Enable)

Self-Clearing Fault Current Threshold

SCF:50

The fault current must exceed this level to initially arm the ICSF logic. This would typically be set to 80% of the available short circuit current on the feeder. This prevents the logic from registering excessive fault counts.

Units: Amps

Range: 1 to 10000

Self-Clearing Fault Alarm Pick-Up

SCF:CA

This is an absolute counter of the number of characteristic waveform signatures detected.

Units: Counts

Range: 1 to 100

Self-Clearing Fault Rate Alarm Pickup

SCF:RA

This alarm will pick up and latch when Self-Clearing Fault Rate Alarm Pickup (SCF:RA) faults are detected in the SCF:W user-specified period of time.

Units: Counts per time period specified in the Self-Clearing Fault Occurrence Rate Window (SCF:W)

Range: 1 to 100 per SCF:W

Self-Clearing Fault Occurrence Rate Window

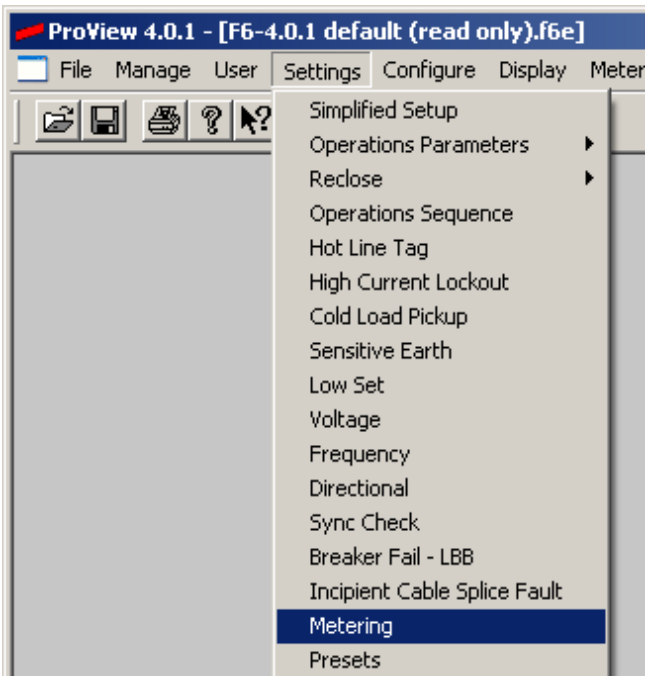
SCF:W

This is the time period over which the number of counts is evaluated. This is a sliding window.

Units: Hours

Range: 1 to 168

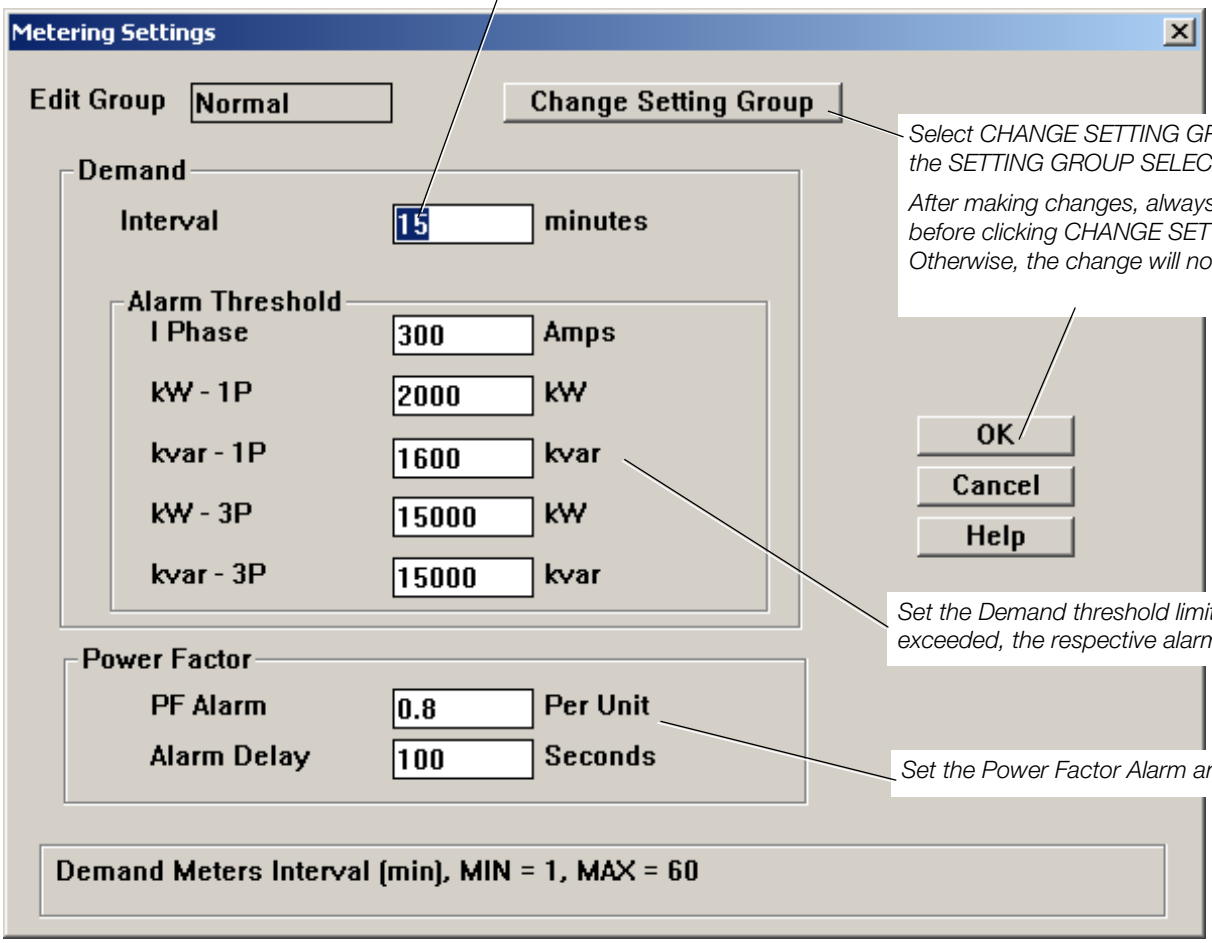
Metering



The Metering Settings dialog box enables the user to program Demand Metering, Alarm Data, and Power Factor Setup.

The metering module of the control calculates and maintains the power-related settings for the demand integration, alarm thresholds, and power factor alarms. All metering information is programmed from the ProView interface software. Information is viewed from the Form 6 recloser control front panel LCD display.

Set the time interval over which the peak demand current is calculated.



Select CHANGE SETTING GROUP to activate the SETTING GROUP SELECTION box.

After making changes, always click OK before clicking CHANGE SETTING GROUP. Otherwise, the change will not be registered.

Set the Demand threshold limits. If any limit is exceeded, the respective alarm is activated.

Set the Power Factor Alarm and Alarm Delay.

Demand Metering

Demand-metered values are programmed for a specific forward or reverse metering direction.

The Demand Interval setting defines the time interval over which the demand value is calculated.

Demand Interval

Units: Minutes

Range: 1 to 60

Accuracy: ±1% and ±10 ms

The Demand Alarm Threshold settings define the measured demand values. If any value limit is exceeded, the respective demand alarm activates.

Phase Current Threshold

Units: Primary Amps

Range: 10 to 2000

Accuracy: ±1%

Single-Phase Real Power (kW-1P) Threshold

Units: kW

Range: 10 to 15000

Accuracy: ±1%

Single-Phase Reactive Power (kVAr - 1P) Threshold

Units: kVAr

Range: 10 to 15000

Accuracy: ±1%

Three-Phase Real Power (kW - 3P) Threshold

Units: kW

Range: 10 to 15000

Accuracy: ±1%

Three-Phase Reactive Power (kVAr - 3P) Threshold

Units: kVAr

Range: 10 to 15000

Accuracy: ±1%

Power Factor Alarm Threshold

Units: per unit

Range: 0 to 1

Accuracy: ±1%

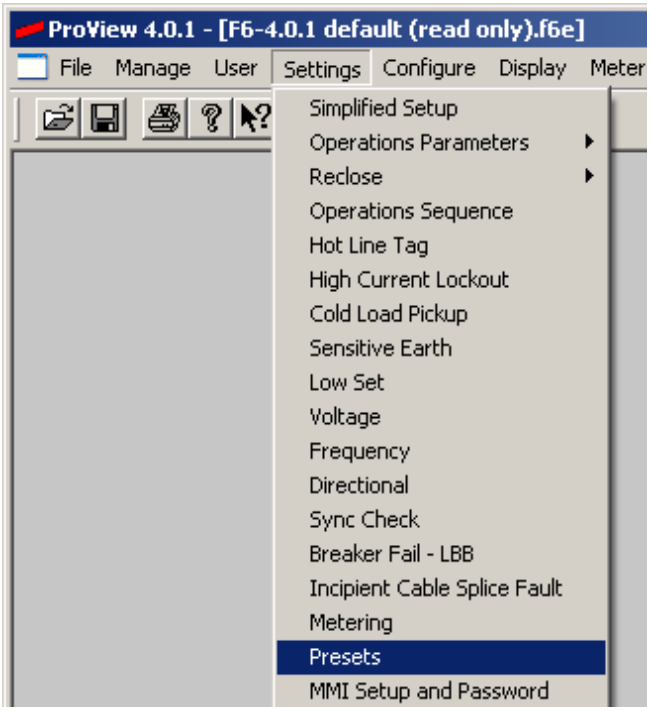
Power Factor Alarm Time Delay

Units: seconds

Range: 0 to 3600

Accuracy: ±1% and ±10 ms

Presets

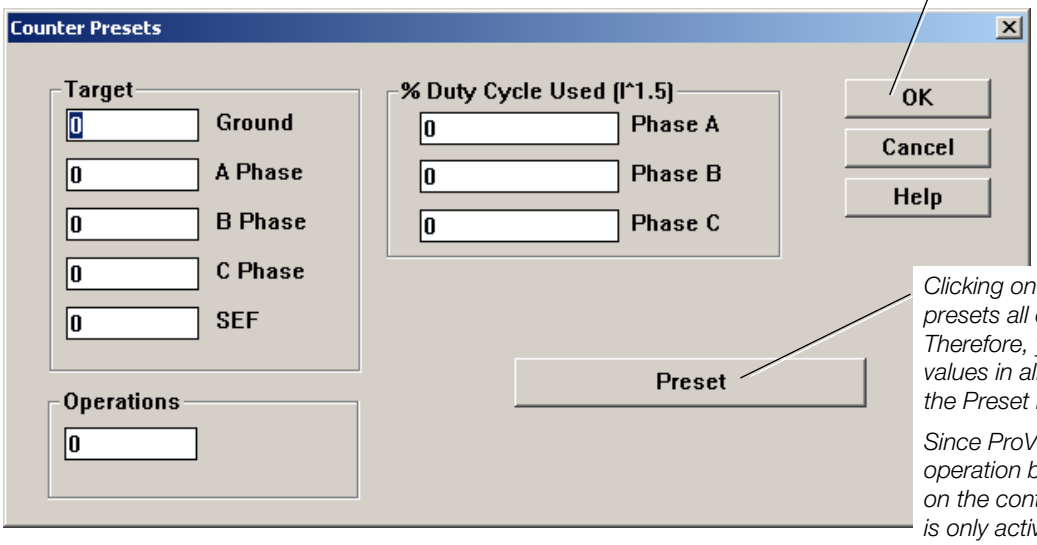


Counter Presets are the operation counter and trip counter settings preset on a per-phase basis. Counters include:

- Ground and A, B, C Phase Targets
- Sensitive Earth Fault (SEF) Target
- Recloser Interrupting % Duty Cycle Used

Upon setting the counters or duty cycle information, clicking on the Preset button will immediately download the values to the control (provided the PC is connected to the control). These items are not part of the setting file and are not updated when a setting file is sent to the control from the PC. This allows the user to make setting changes independent of the counters.

Clicking OK will only save changes until ProView goes online with the control. At that time, any changes will be overridden by the active scheme.



Clicking on the Preset button immediately presets all of the counters to the values. Therefore, you must enter the intended values in all of the fields before clicking on the Preset button.

Since ProView executes the preset operation by modifying the values directly on the control hardware, the Preset button is only active if you have a communications connection established with the control.

Trip and Target Counters

Trip and Target Counters are preset to zero for a new recloser.

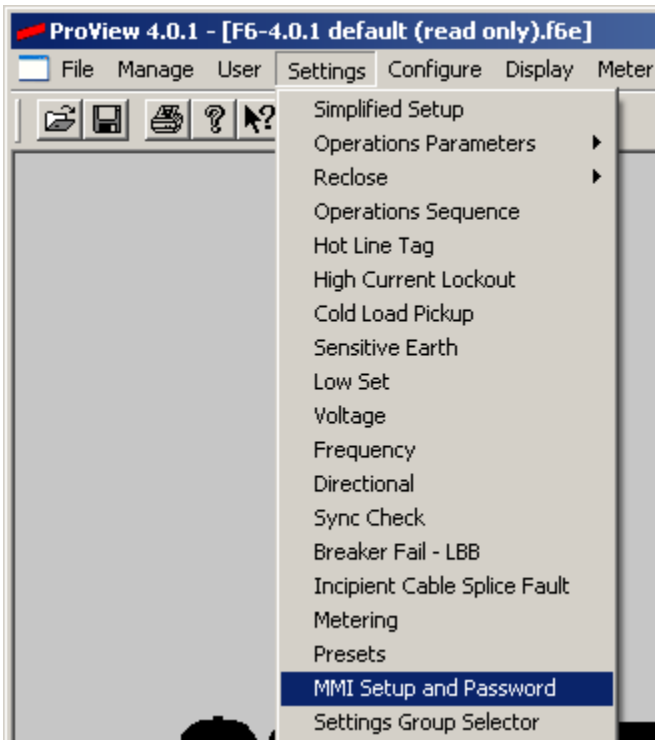
Note: If retrofitting an existing recloser, preset the control counters to match the recloser counters.

Recloser Interrupting Duty Cycle

Each phase of the recloser incurs wear based on the current interrupted and the number of times the interruption occurs. The measurement of this wear is $I^{1.5}$. The Counter Presets are set to zero when used with a new recloser.

Note: If retrofitting an existing recloser, preset the control counters to match the recloser counters.

MMI Setup and Password



The MMI Setup and Password dialog box is used to set the Form 6 recloser control with the Settings password required to access secured device settings through the control front panel (MMI).

Password

Units: Up to four digits

Range: 0 to 9999

CAUTION: Security Hazard. Security features must be user-configured for implementation. Failure to implement security features may result in unauthorized access to unit.

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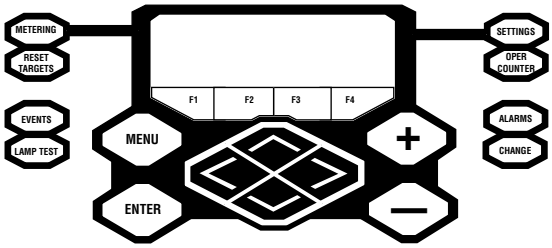
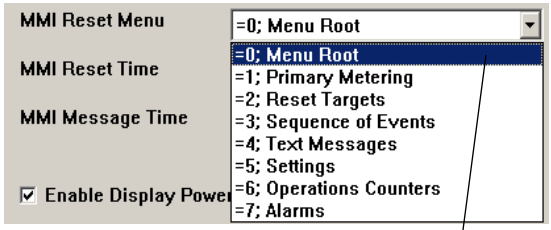
MMI Reset Menu

This menu lets the user choose what screen the Form 6 control front panel will revert to after a defined period of inactivity. These choices are the same as some of the front panel shortcut keys.





Check box to enable Display Power Saving Timer.

MMI Reset Time

Front panel MMI auto-reset time after front panel inactivity.

Units: seconds

Range: 0 to 100000

MMI Message Time

Display time for Workbench-generated MMI text messages.

Units: seconds

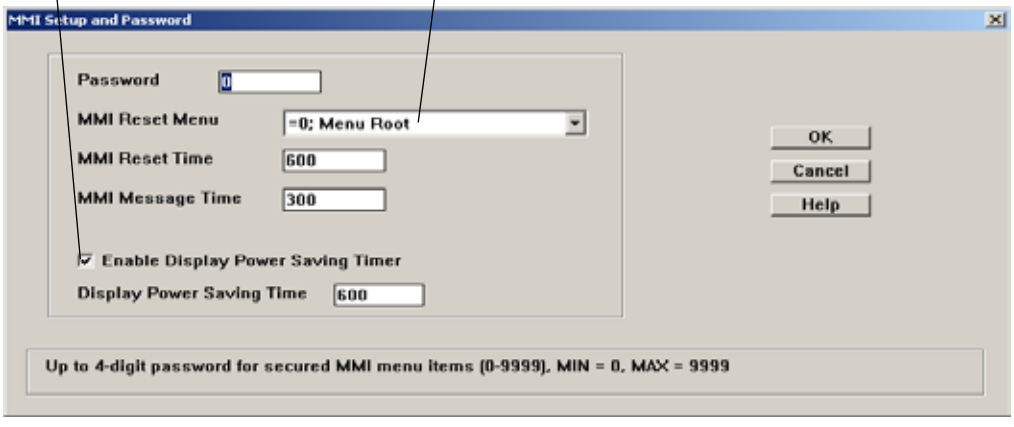
Range: 0 to 50000

Display Power Saving Time

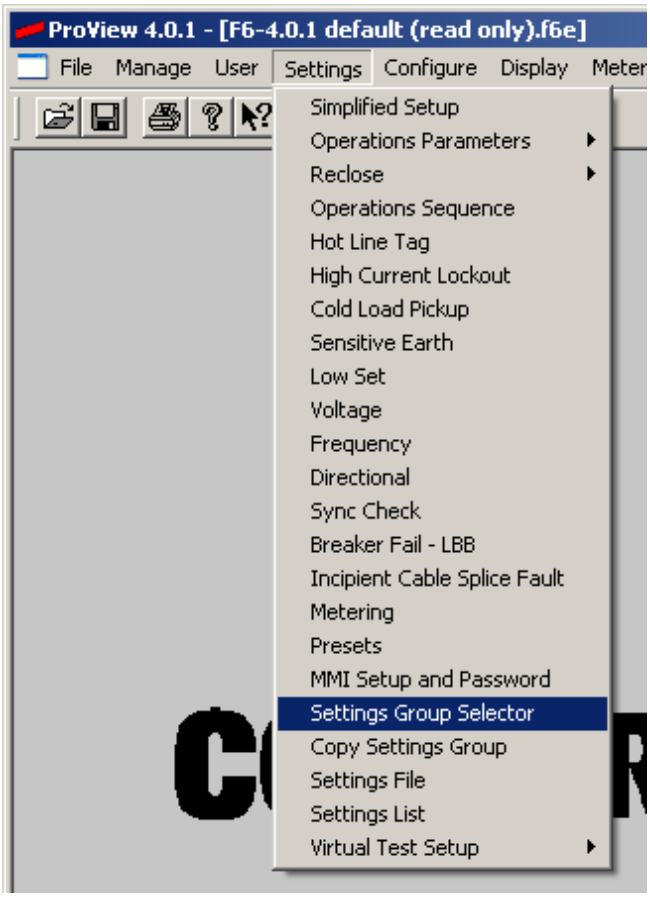
Inactivity time after which MMI backlight is dimmed (if power saving is enabled).

Units: seconds

Range: 0 to 100000



Setting Groups Selector

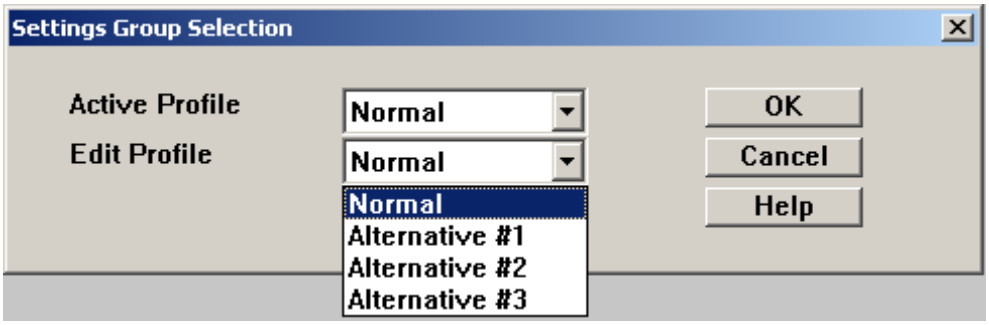


The Setting Groups Selector dialog box enables the user to Modify or View any of the four settings groups and program the active group. This is accomplished via the Settings Group Selection dialog box.

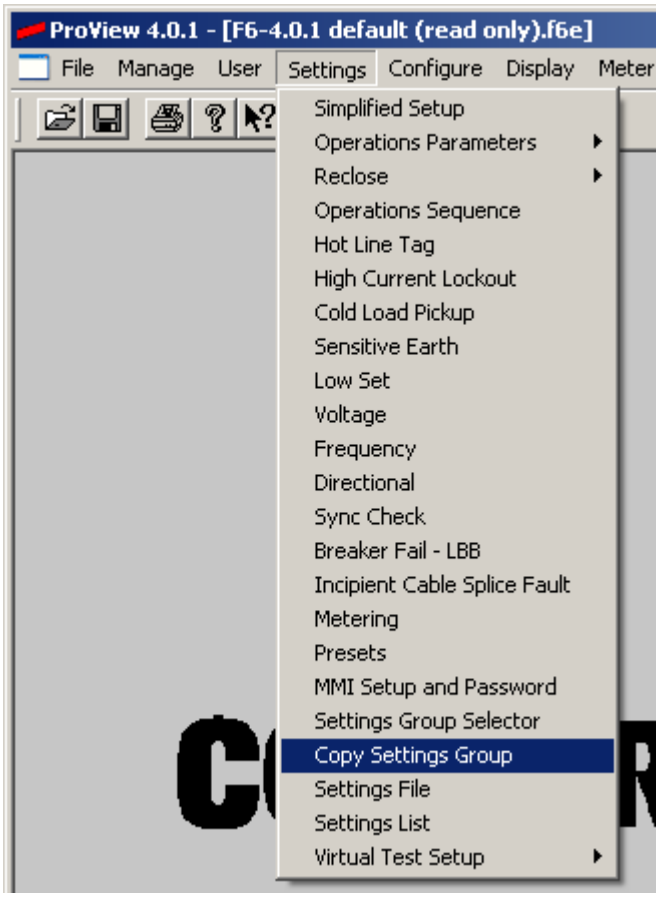
Active Profile is the setting (Normal, Alternative #1, Alternative #2, Alternative #3) that is in use after it has been downloaded to the control.

Edit Profile allows the user to view and change any of the four setting profiles (Normal, Alternative #1, Alternative #2, Alternative #3), including the active profile.

Note: Changes to the active profile will not become active until the edited profile is downloaded to the control.



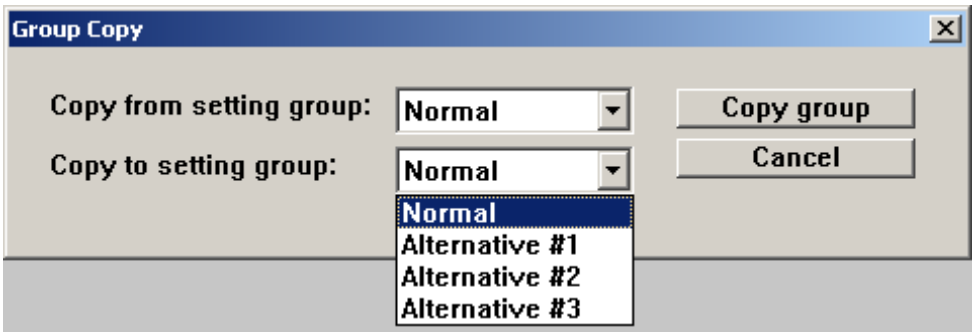
Copy Settings Group



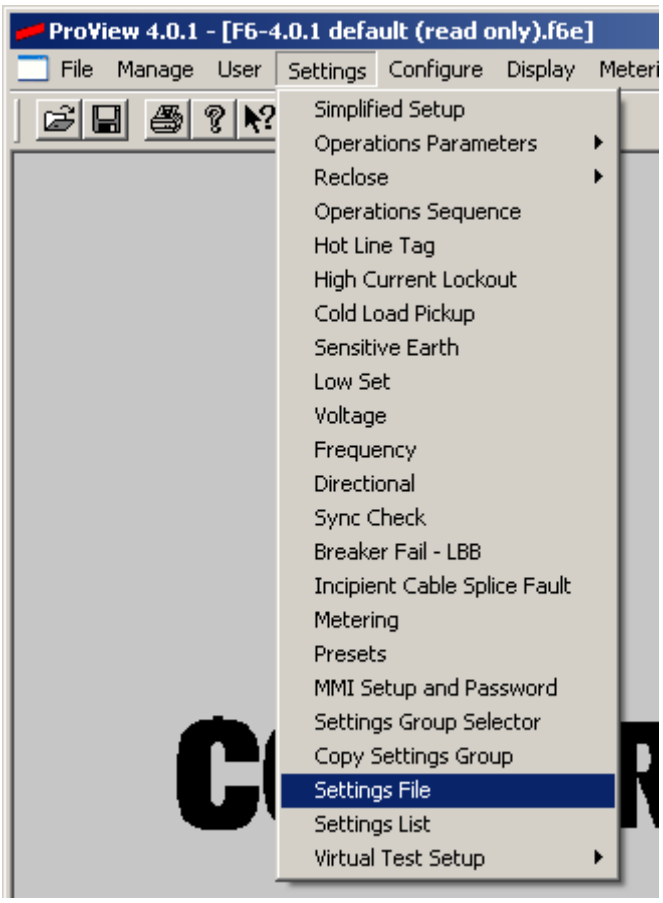
CAUTION: Equipment misoperation. Copying a setting group overwrites all settings in the "Copy to Group" setting group. Unplanned or inadvertent changes to all of the settings in a setting group can result in equipment misoperation, equipment damage, and personal injury. T296.0

The Copy Settings Group dialog box enables the user to copy profile settings from one setting group (Normal, Alternative #1, Alternative #2, Alternative #3) to another.

IMPORTANT: Program all protection profiles for appropriate system application. Unused alternate profiles (Alternate Profile #1, Alternate Profile #2, Alternate Profile #3) should be programmed with the same settings as one of the applicable profiles. The default settings on unused alternate profiles can cause unnecessary outages if they are left at the default levels.

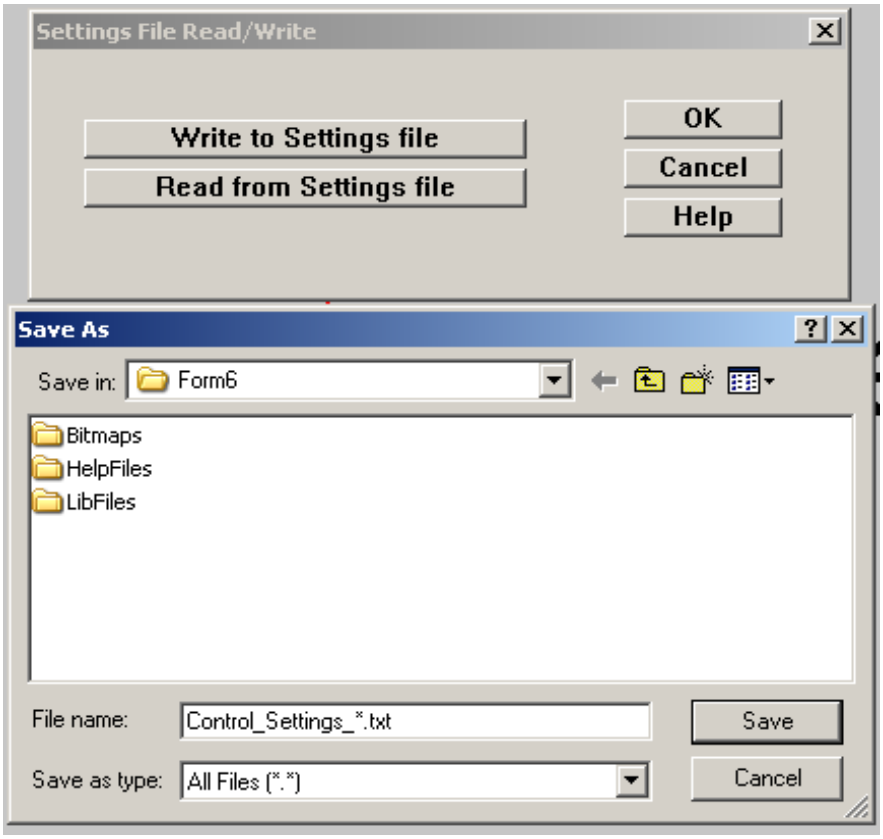


Settings File

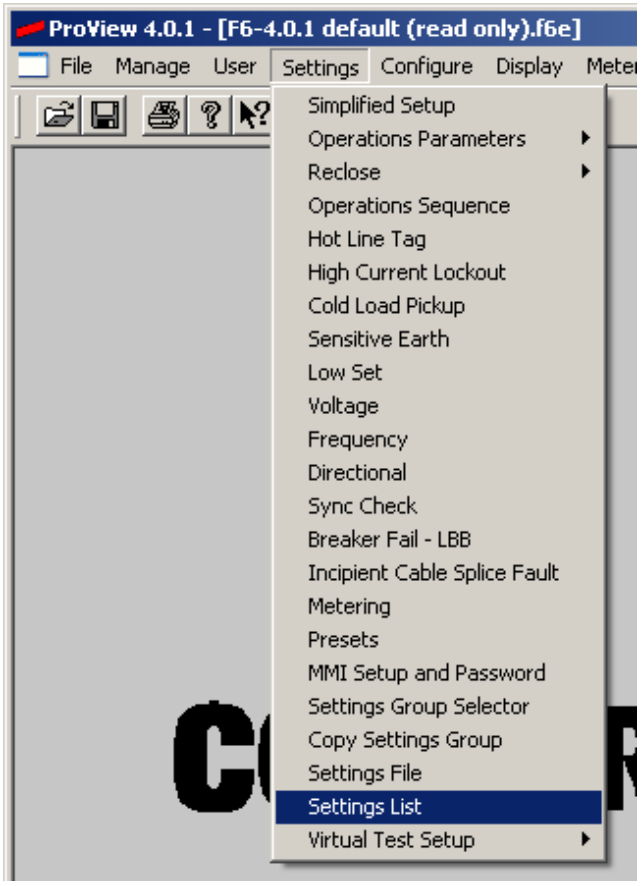


The Settings File Read/Write dialog box allows the user to read from a setting file or write the current user settings from the control into a file.

All user settings can be read from and written to the software files. The scheme stores these User Settings files with the name Control_Settings_*.txt. Replace the * with a unique name for the setting file.



Settings List



The Settings List screen enables the user to view and print the Key Settings List for the Form 6 control. This list shows the following settings for each profile:

Overcurrent Settings

- Phase
- Ground
- Negative Sequence
- User Curve

Operations Sequence

- Phase/Neg Sequence
- Ground

Reclose Intervals

- Phase/Neg Sequence
- Ground

Cold Load Pickup

- Phase
- Ground
- Negative Sequence

Frequency

- Underfrequency
- Overfrequency
- UF Loadshed Restore

ReclsTime and Control

Reclose Retry

Voltage

- Undervoltage
- Overvoltage

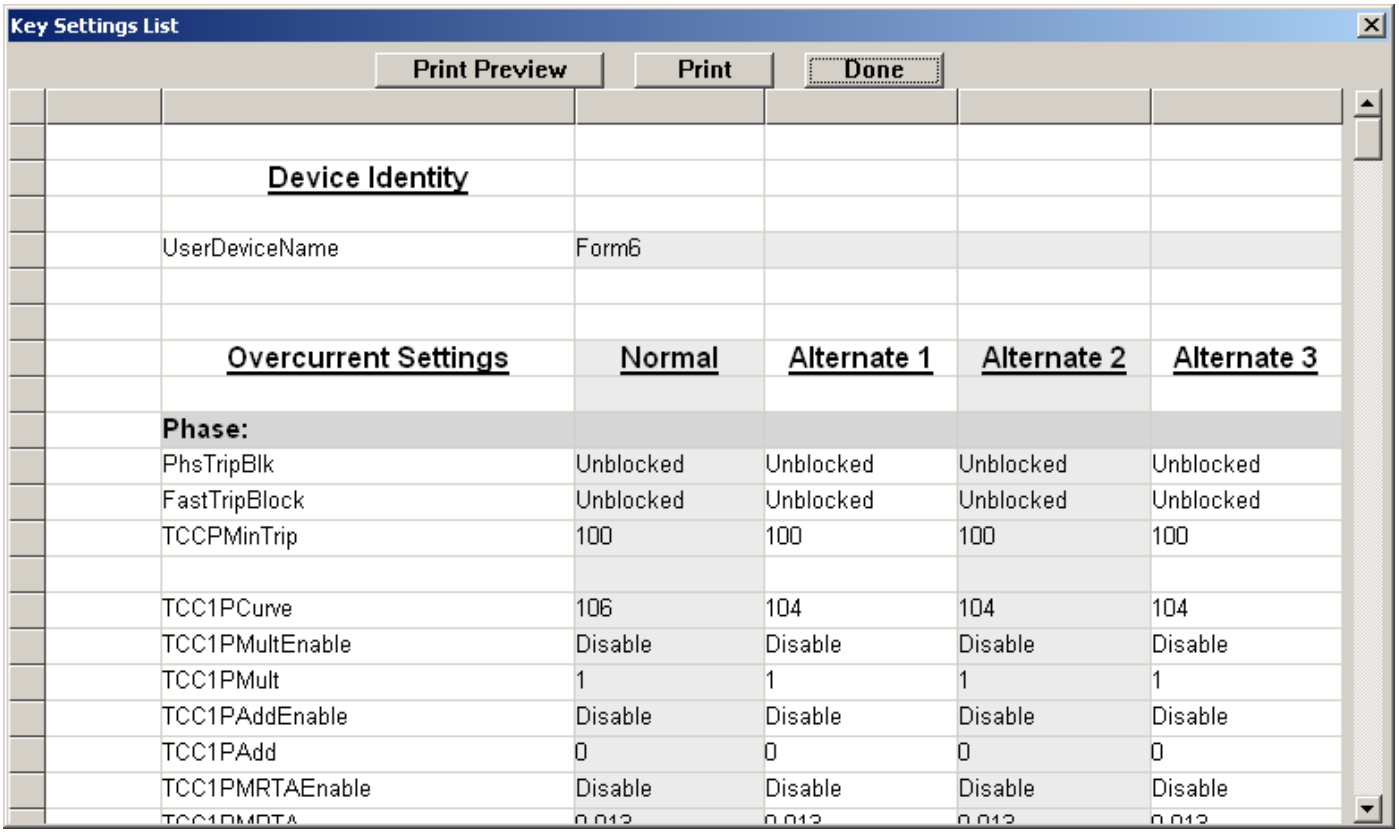
Sensitive Earth Fault

Directional Control

Low Set

- Phase
- Ground
- Negative Sequence

Sync Check

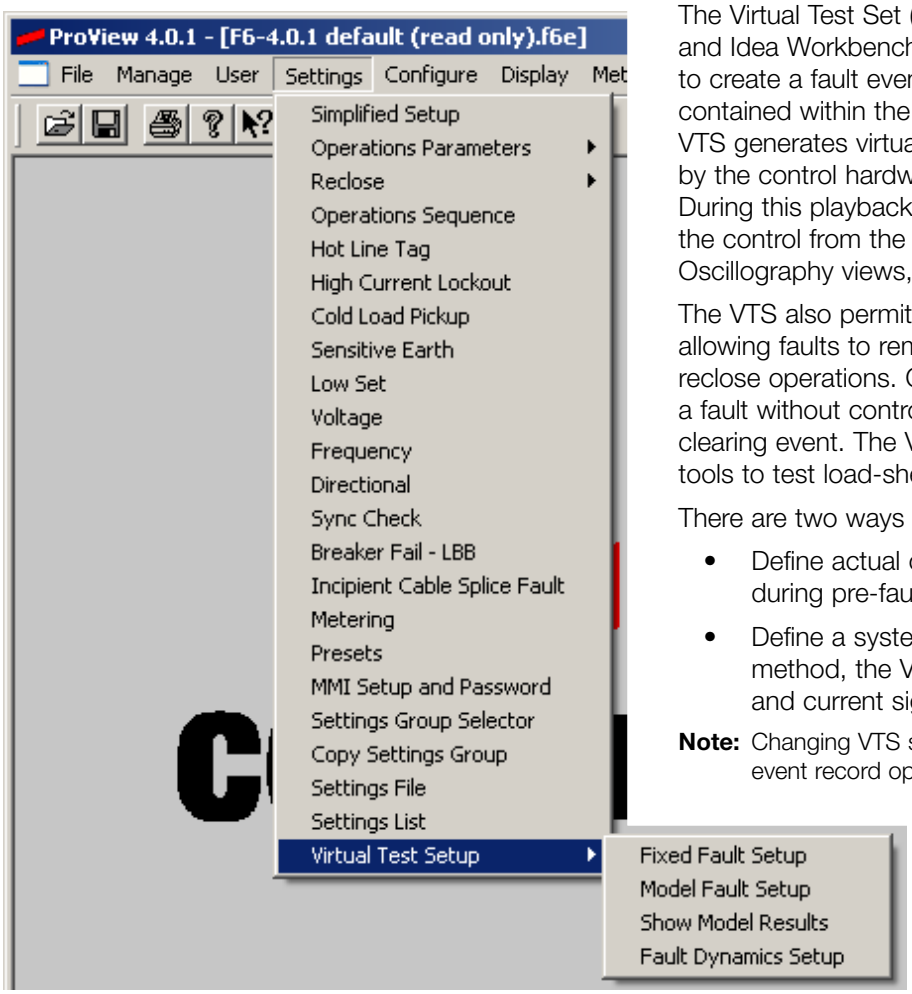


Key Settings List

Print Preview | Print | Done

	Device Identity				
	UserDeviceName	Form6			
	Overcurrent Settings	**Normal**	**Alternate 1**	**Alternate 2**	**Alternate 3**
	Phase:				
	PhsTripBlk	Unblocked	Unblocked	Unblocked	Unblocked
	FastTripBlock	Unblocked	Unblocked	Unblocked	Unblocked
	TCCPMinTrip	100	100	100	100
	TCC1PCurve	106	104	104	104
	TCC1PMultEnable	Disable	Disable	Disable	Disable
	TCC1PMult	1	1	1	1
	TCC1PAddEnable	Disable	Disable	Disable	Disable
	TCC1PAdd	0	0	0	0
	TCC1PMRTAEnable	Disable	Disable	Disable	Disable
	TCC1PMRTA	0.013	0.013	0.013	0.013

Virtual Test Setup



The Virtual Test Set (VTS) enables the user to test Settings and Idea Workbench programming. The VTS permits the user to create a fault event and literally "play it" through the logic contained within the Form 6 recloser control scheme file. The VTS generates virtual data as it would normally be produced by the control hardware's analog-to-digital converter circuitry. During this playback, it is possible to view the behavior of the control from the Application Diagram view, any of the Oscillography views, or in the Idea Workbench.

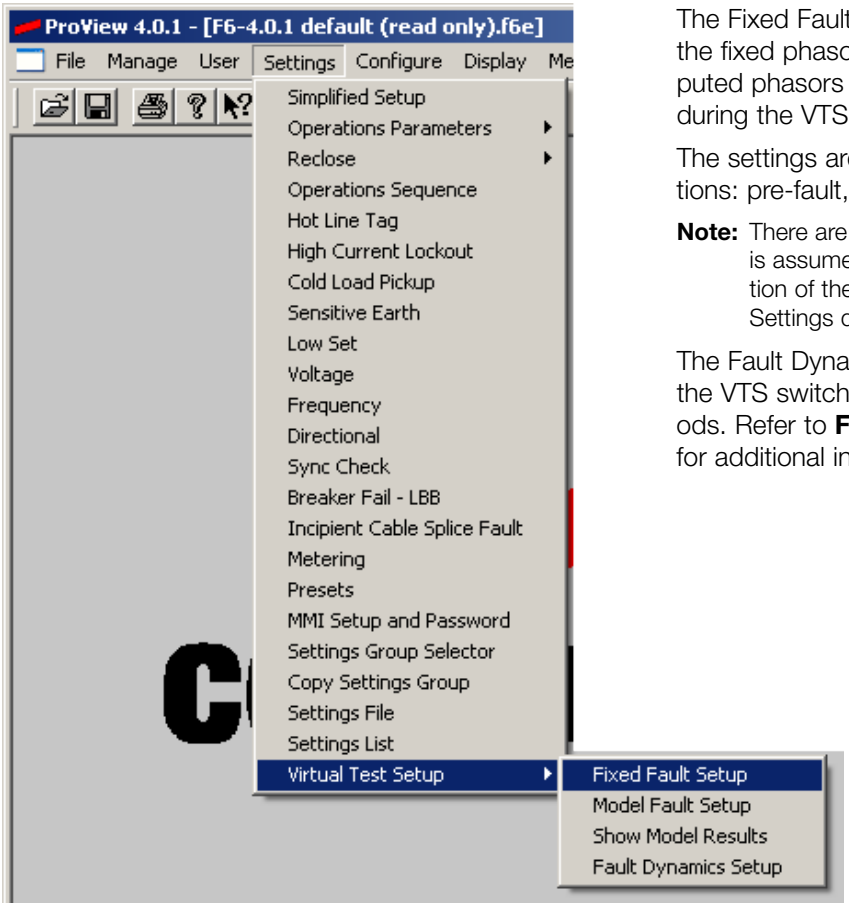
The VTS also permits the testing of multi-shot reclosing by allowing faults to remain permanent for a given number of reclose operations. Conversely, the VTS can be set to clear a fault without control intervention, to simulate a remote fault clearing event. The VTS also contains a full set of frequency tools to test load-shedding algorithms.

There are two ways to configure the Virtual Test Set.

- Define actual current voltage and current magnitudes during pre-fault, fault, and post fault conditions.
- Define a system model and initiate a fault. With this method, the VTS computes the appropriate voltage and current signals to generate.

Note: Changing VTS settings is not permitted while viewing an event record opened from a file.

Fixed Fault Setup

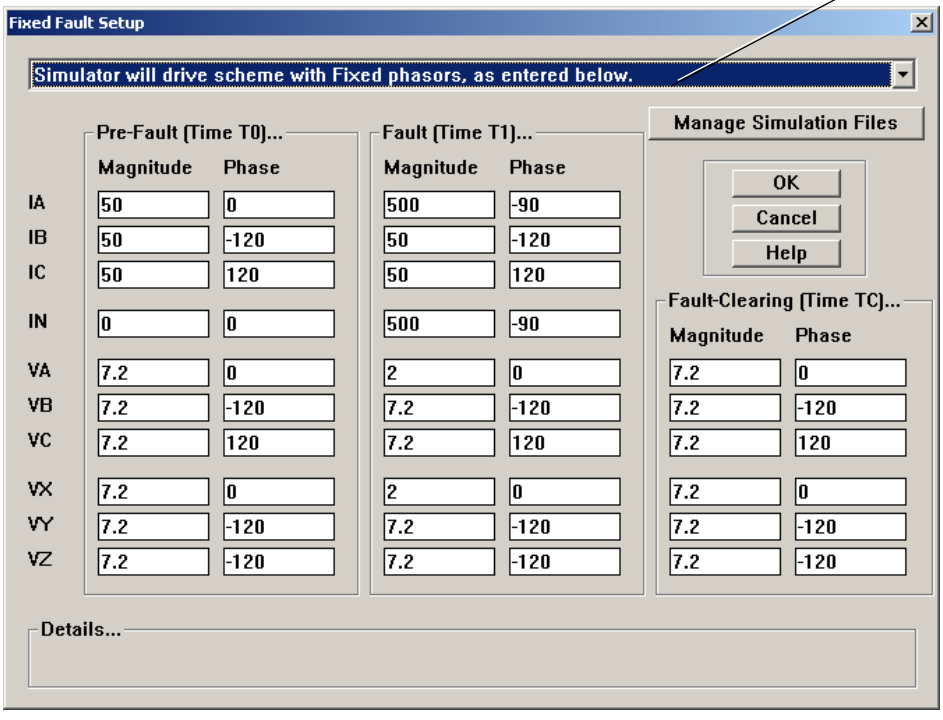


The Fixed Fault Setup box permits the user to select whether the fixed phasors as defined in the dialog box or the computed phasors resulting from the model method will be used during the VTS event.

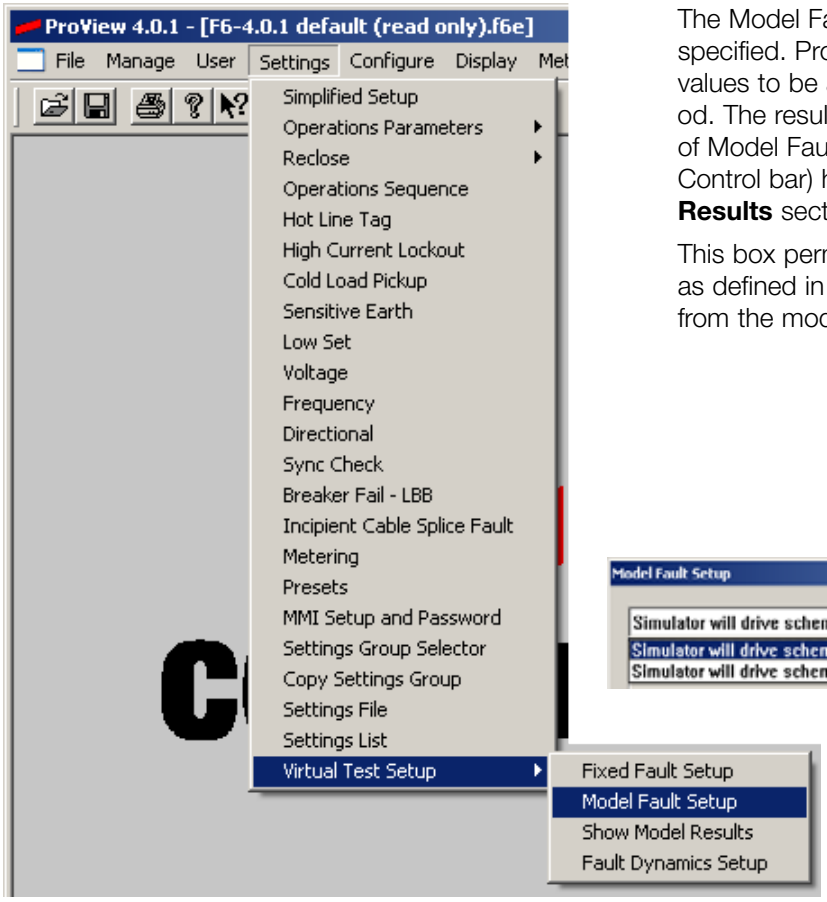
The settings are divided into three voltage and currents sections: pre-fault, fault, and post-fault periods.

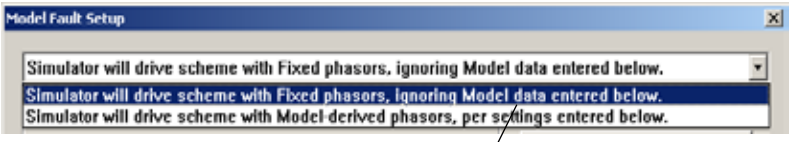
Note: There are no currents to define for the post-fault period as it is assumed the breaker has cleared the fault. The time duration of the pre-fault period is defined in the Fault Dynamics Settings dialog box.

The Fault Dynamics dialog box controls the timing of when the VTS switches from the pre-fault, fault, and post-fault periods. Refer to **Fault Dynamics Setup** section of this manual for additional information.



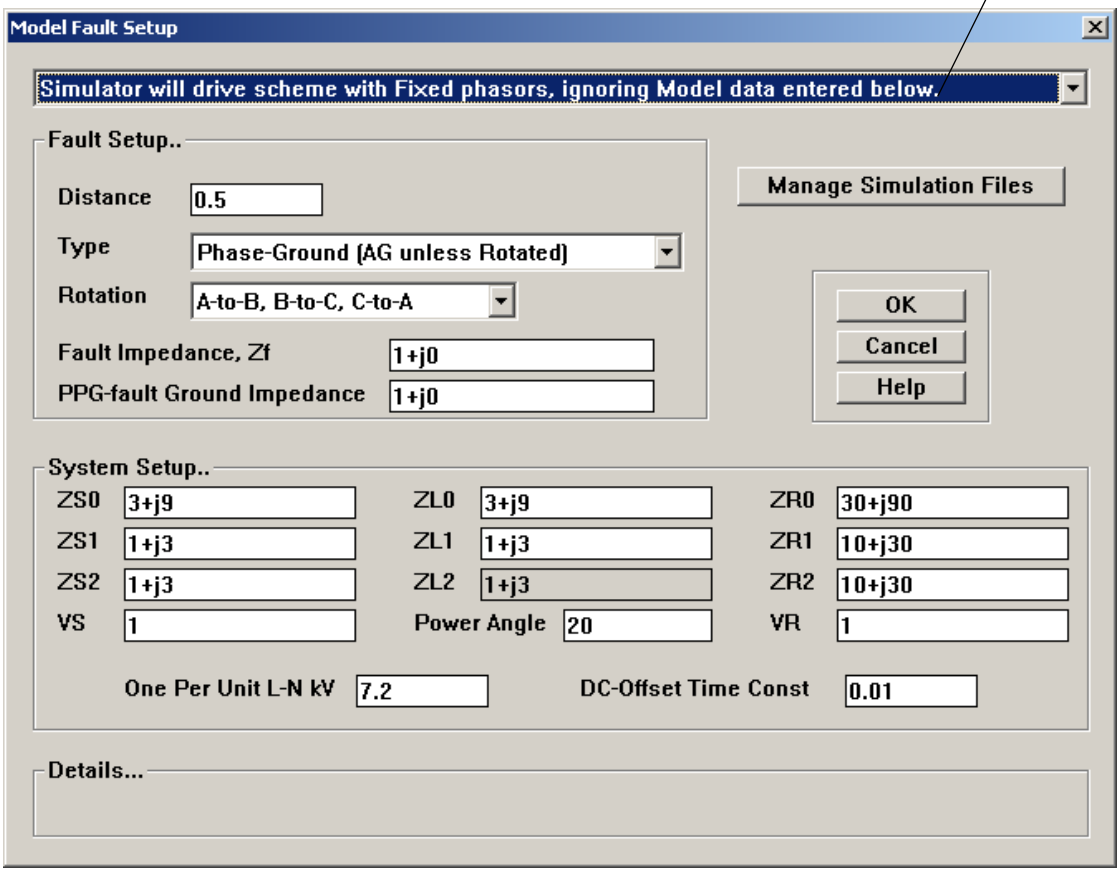
Model Fault Setup

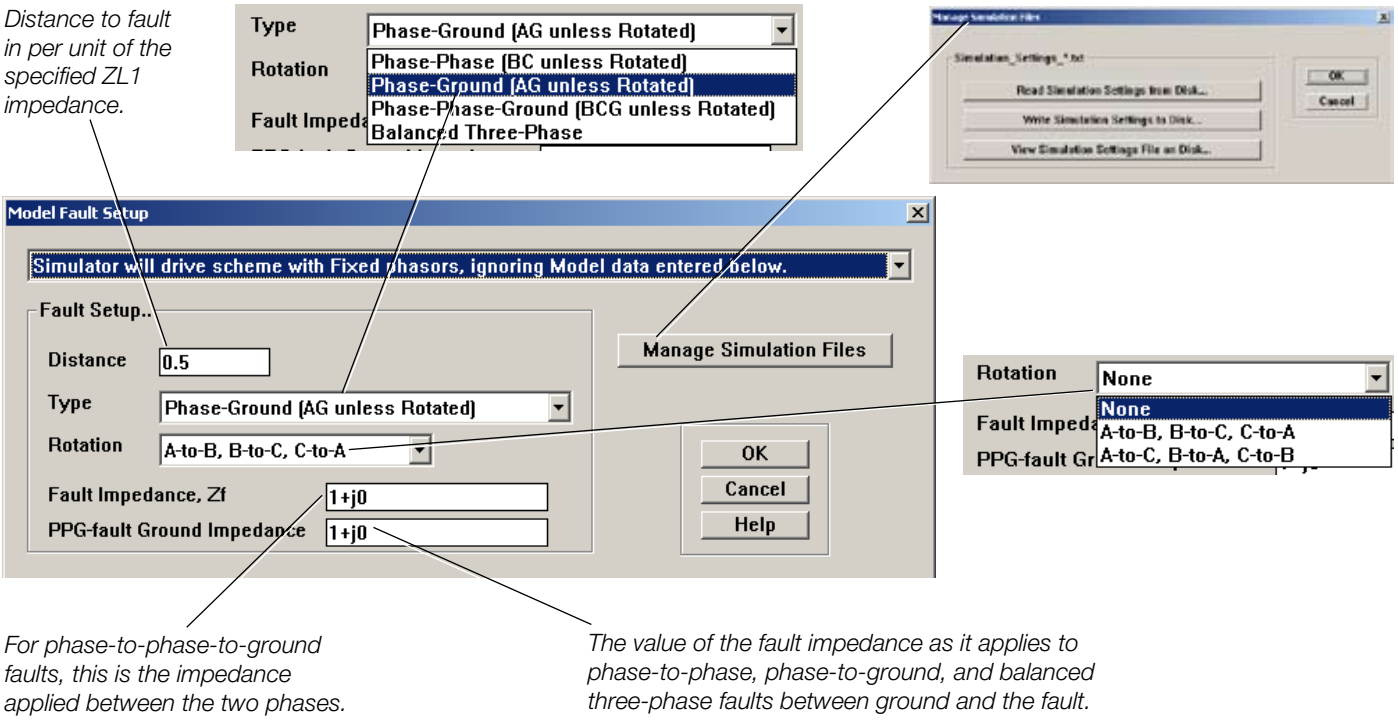


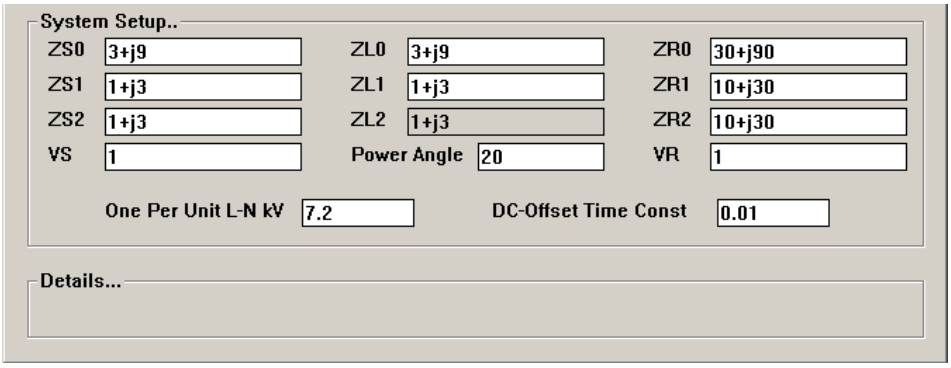


The Model Fault Setup dialog box permits a fault type to be specified. ProView will then calculate the appropriate phasor values to be applied before (pre-fault) and during the fault period. The result of these calculations can be seen in the Results of Model Fault Calculation box after INIT (on the Simulator Control bar) has been clicked on. Refer to **Show Model Results** section of this manual for additional information.

This box permits the user to select whether the fixed phasors as defined in the dialog box or the computed phasors resulting from the model method will be used during the VTS event.







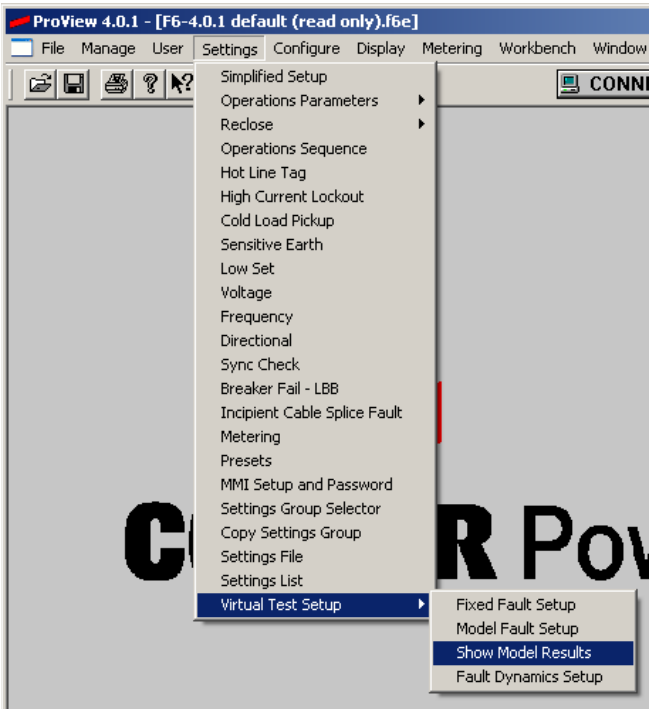
System Setup

This section of the Model Fault Setup box contains all of the settings necessary to define the system impedance characteristics.

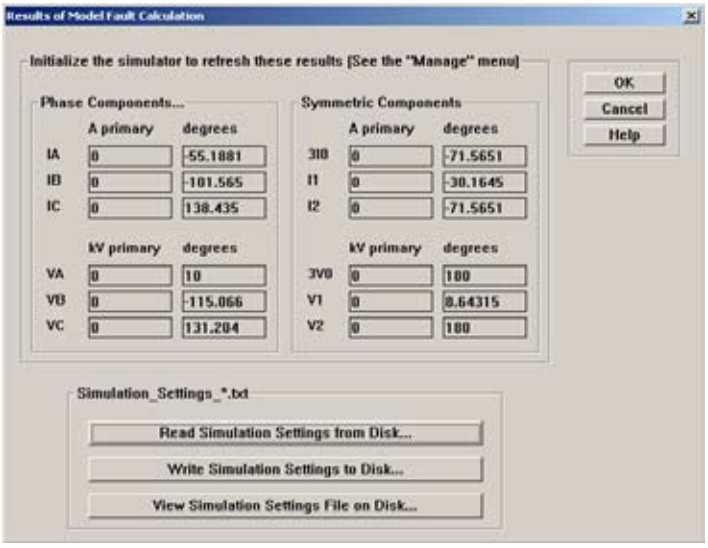
Note: All impedances are per unit. The actual base unit is not required, just that all quantities are on the same base.

Setting	Description	Range
ZS0	Zero Sequence Source Impedance	No limit
ZS1	Positive Sequence Source Impedance	No limit
ZS2	Negative Sequence Source Impedance	No limit
VS	Voltage Source	0.5 - 2
ZL0	Zero Sequence Line Impedance	No limit
ZL1	Positive Sequence Line Impedance	No limit
ZL2	Negative Sequence Line Impedance No limit	No limit
Power Angle	The angular difference between the local and remote bus Thevinen voltages.	0-0360 degrees
ZR0	Zero Sequence Remote End Impedance	No limit
ZR1	Positive Sequence Remote End Impedance	No limit
ZR2	Negative Sequence Remote End Impedance	No limit
VR	Remote Source	0.5 -2
One Per Unit L-N kV	Value in Primary Volts for One Per Unit	1-25
DC-Offset Time Const	The model parameters and fault incidence angle chosen may result in a DC offset occurring during fault initiation. This setting defines the DC decay time constant for fault currents.	1e-12 minimum

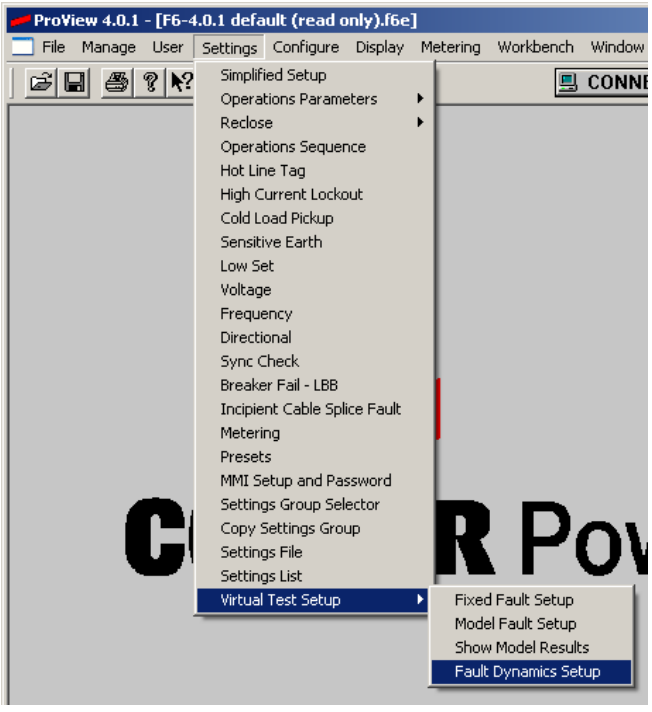
Show Model Results



The Model Fault Calculation dialog box shows the results of the calculations from the values entered into the Model Fault Setup dialog box.



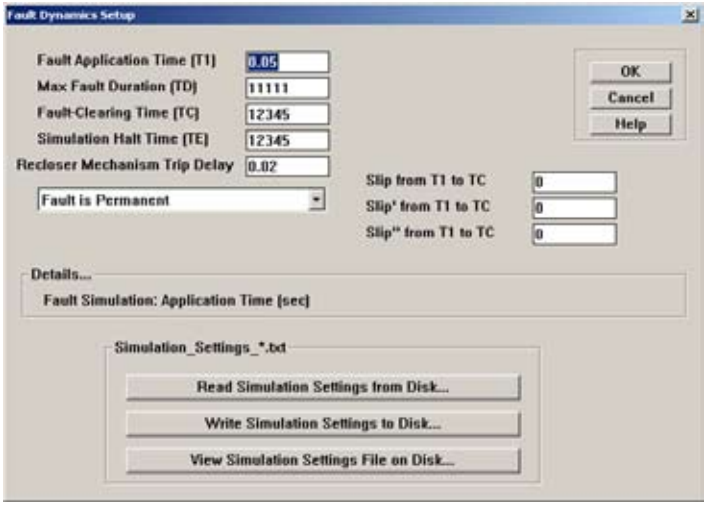
Fault Dynamics Setup



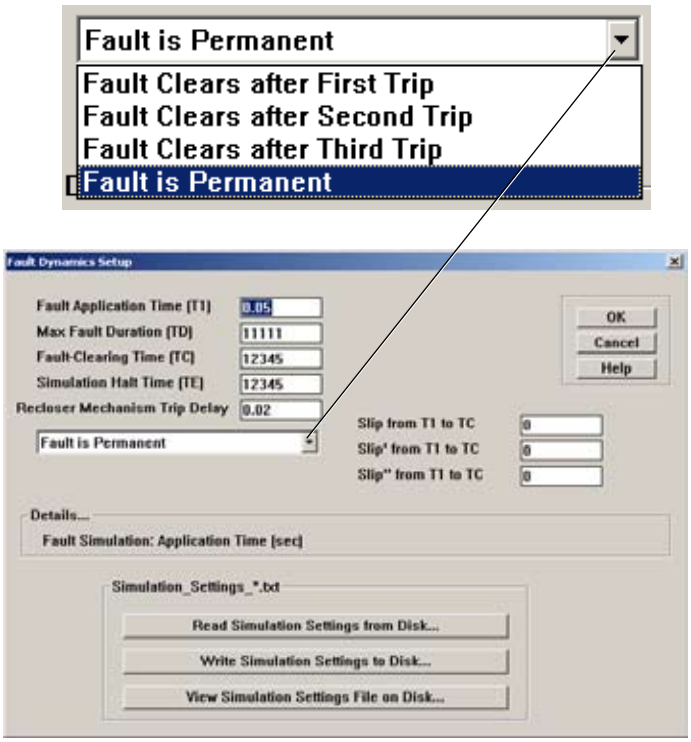
The Fault Dynamics Setup dialog box contains the settings that define how the Virtual Test Set progresses from the pre-fault to fault, and then from fault to post-fault conditions.

The settings available in this dialog box are used for two purposes:

- To control the pre-fault, fault, and post-fault transitions.
- To simulate system frequency shifts.



Fault Dynamics Setup Dialog Box		
Setting	**Description**	**Range**
Fault Application Time (T1)	This is the number of seconds into the simulation that the VTS transitions from the pre-fault to fault conditions. This should be long enough for any control algorithms to stabilize (approximately 0.1 sec).	No limit
Maximum Fault Duration (TD)	Maximum fault duration in seconds. This timer starts when the fault initiates. After it expires, the VTS jumps to the post-fault phasors. This timer resets with each reclose event.	No limit
Fault Clearing Time (TC)	Maximum clearing time. Similar to Maximum Fault Duration, except this timer starts running at the beginning of the entire simulation and continues running through all reclose events.	No limit
Simulation Halt Time (TE)	This defines the maximum amount of time the simulation will free-run before automatically stopping. Counting starts at the beginning of the whole simulation.	No limit
Recloser Mechanism Trip Delay	The time delay that occurs before the virtual recloser in the VTS trips 0 –3600 seconds Trip Delay after the scheme initiates a TRIP command. This time delay appears in the time it takes for the current to stop flowing and for the simulated 52a contact to change status.	0 –3600 seconds
Slip from T1 to TC	Change in system frequency that occurs at time T1 (fault). Frequency restores to original frequency at time TC.	Delta Hz
Slip' from T1 to TC	Rate of change of the system frequency that occurs at time T1.	Hz/second
Slip" from T1 to TC	Rate of acceleration of the rate of change of the system frequency that occurs at time T1.	Hz/sec2

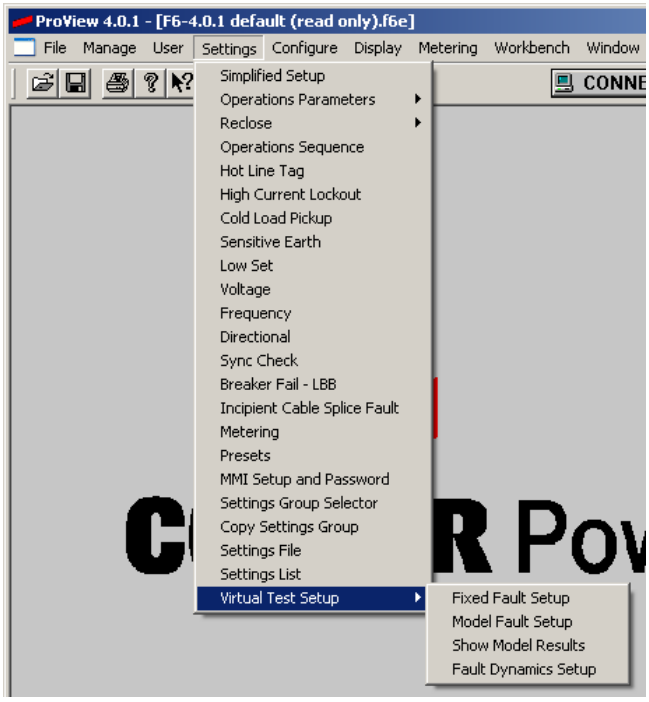


Fault Box Settings

This drop down box enables the user to control how the simulator interacts with the recloser scheme. Select from the following settings:

- Fault Clears after First Trip: After trip, the Virtual Test Set goes immediately to post-fault phasors.
- Fault Clears after Second Trip: Upon reclosing after first trip, the VTS returns to the fault condition phasors. After the second trip, the VTS goes to post-fault phasors.
- Fault Clears after Third Trip: Upon reclosing after first and second trips, the VTS returns to the fault condition phasors. After the third trip, the VTS goes to post-fault phasors.
- Fault is Permanent: Upon any reclosing operation, the VTS returns to fault condition phasors regardless of how many times the control has tripped.

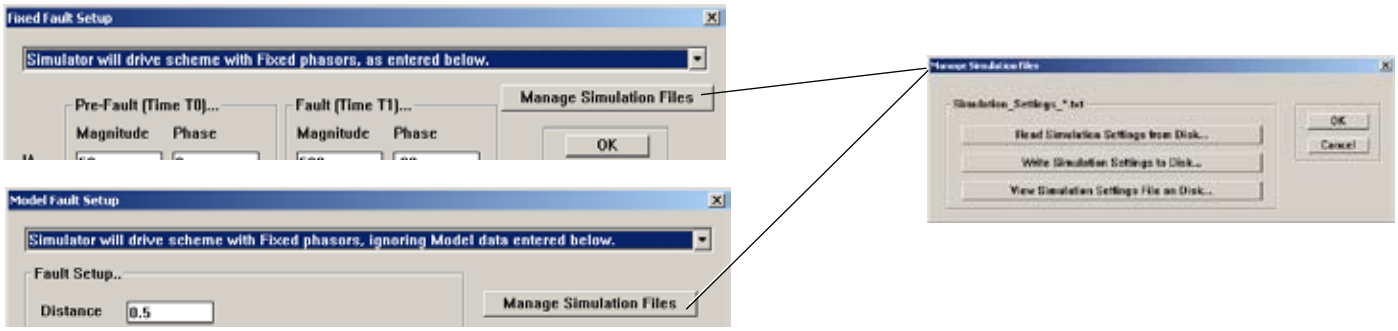
Simulation Settings



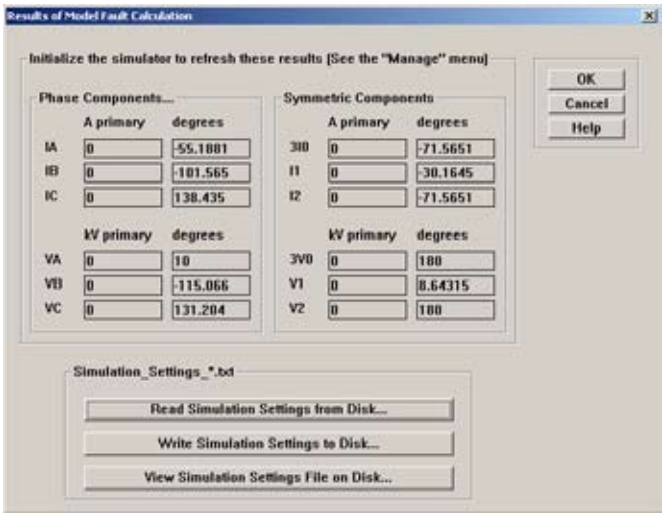
The user can save and/or restore all of the simulation settings and create a whole library of standard simulations to load and run as needed.

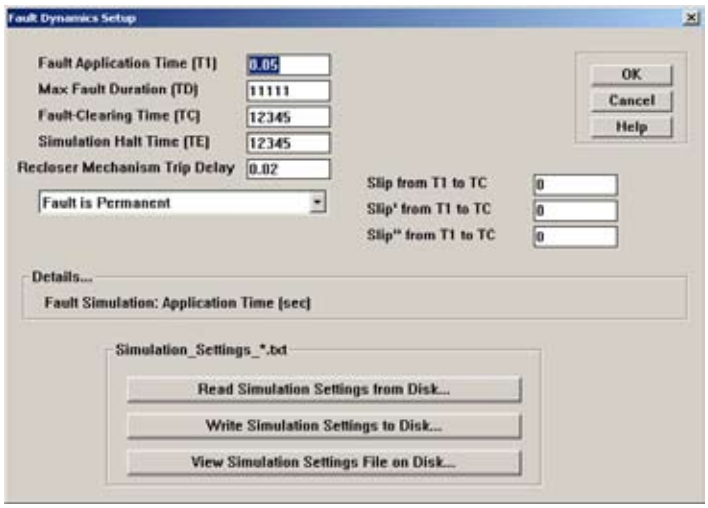
To save, view or load simulator settings, go to any of the four options available in the Virtual Test Setup dropdown menu.

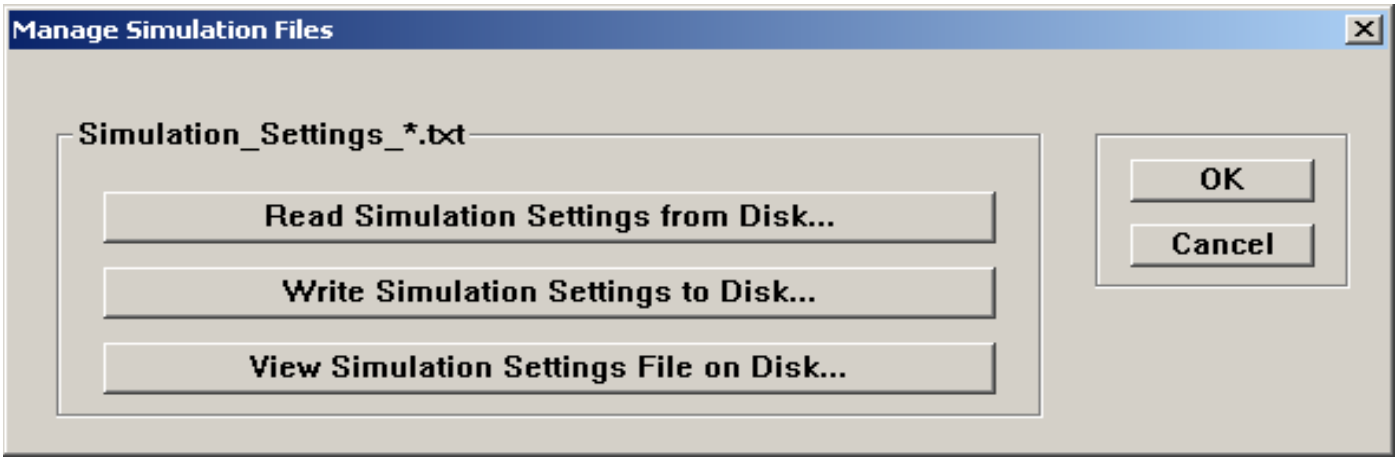
Access the Simulation Settings from the Fixed Model Setup or Model Fault Setup dialog boxes by clicking on MANAGE SIMULATION FILES.



Access the Simulation Settings directly from the Show Model Results or Fault Dynamics Setup dialog box.







Read Simulation Settings

1. Click on READ SIMULATION SETTINGS FROM DISK.

A standard Microsoft® Windows® Open File dialog box will appear.

2. Select the file to read.

The file will open and the settings in this file will overwrite any settings in the existing Fixed Fault Setup, Model Fault Setup, and Fault Dynamics settings dialog boxes.

Save Simulation Settings

1. Click on WRITE SIMULATION SETTINGS TO DISK.

A standard Microsoft® Windows® Save As settings dialog box will appear.

2. Assign a long, descriptive file name.

Note: It is recommended that the file name begin with the string "Simulation_Settings_". This will result in showing only VTS files when using the Read or View buttons.

For example, a file name of "Simulation_Settings_Close-in Fault without reclosing.txt" is more descriptive than "Simulation_Settings_Fault001.txt".

View Simulation Settings

1. Click on VIEW SIMULATION SETTINGS TO DISK.

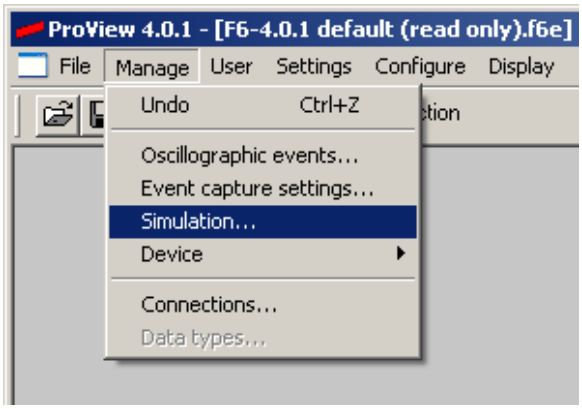
A standard Microsoft® Windows® OPEN FILE dialog box will appear.

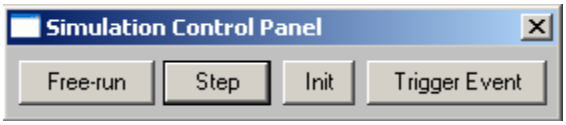
2. Select the file to view.

The file will open with the program you have defined to open *.txt files.

Note: For most systems this will be the Microsoft® Windows® Notepad application, but it is possible to open and view this file with any word processor or text editor.

Running a Simulation





After setting up the simulation parameters, select Simulation from the Manage menu. The Simulation Control Panel toolbar will appear.

To prepare the PC for the simulation, click INIT to begin initialization. If the scheme is not ready, a progress bar will appear with the preparation status. When ready, the Simulation Control Panel toolbar will reappear.

A simulation can now be run.

Note: It is recommended to run the simulation while viewing a screen displaying oscillography, the Application Diagram, or the Idea Workbench. Refer to the **Display** or **Application Diagram** sections in this manual for viewing information.

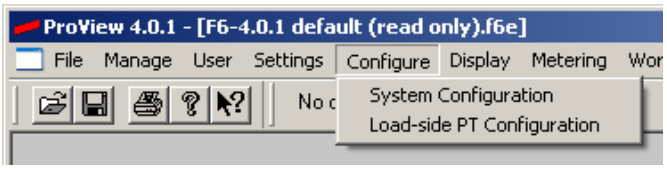
The entire system becomes "live" during event playback just as if the PC were connected to the Form 6 control in View Online mode.

Click on STEP. Each click will play into the system one data point for each voltage and current. The data points represent simulated output from the control's analog input channels.

Click on FREE-RUN to continuously generate signals until a PC event record is generated. A PC event can be saved to disk and reloaded at any time. Once the VTS has been started and initialized, clicking TRIGGER EVENT will cause a 200-sample event record to be recorded as a PC Event in the Oscillographic Event Manager.

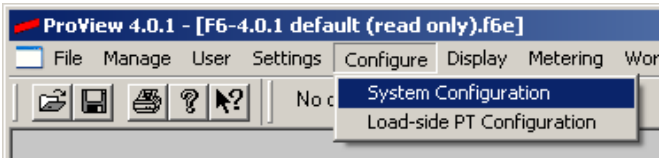
Note: PC Events triggered by the Virtual Test Set do not trigger an event within the Form 6 control; however, they can be saved and recalled as any other event.

Configure



The Configuration Menu allows access to the following System and Load-side PT Configuration functions.

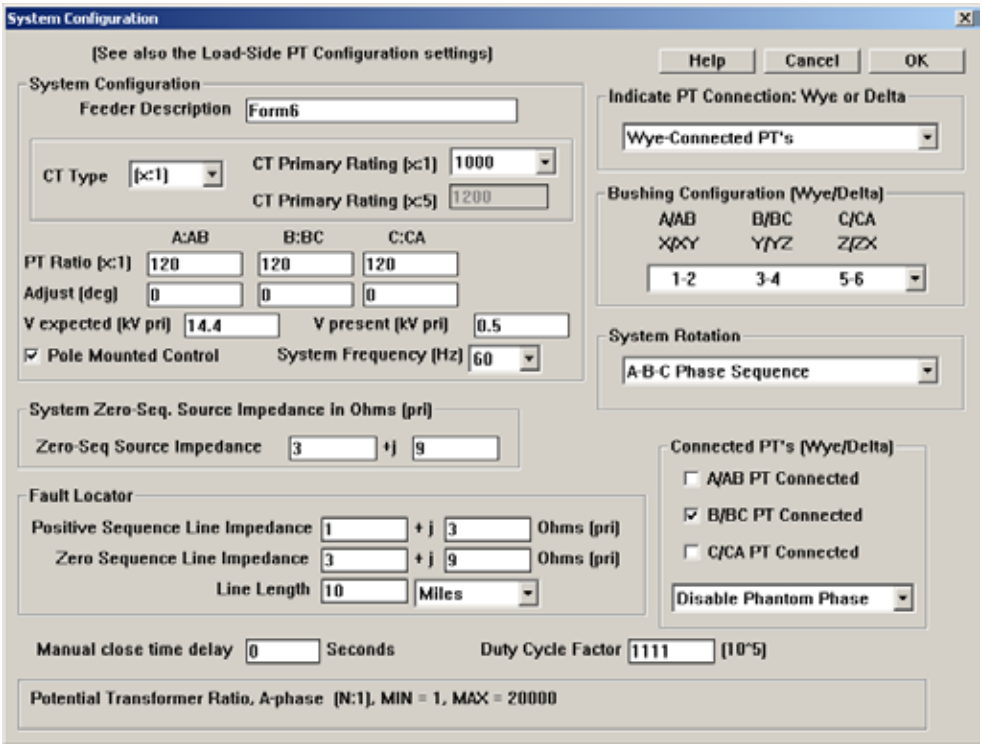
System Configuration



System Configuration allows the user to program the control with the settings associated with the general system arrangement and configuration. This dialog box lets you program the following:

- System Configuration (includes Type and Primary Rating for CT and PT)
- System Zero-Sequence Source Impedance
- Fault Locator (only available when three voltages are supplied and all three Connected PT boxes are checked)
- Manual Close Time Delay
- Duty Cycle Factor
- PT Connection (for BUS or Source-Side-PTs)
- Bushing Configuration (for both Source and Load-Side PTs)
- System Rotation
- Connected PTs (on Bus or Source-Side)

The PT connection should be consistent with the Load-side PT connection.



Refer to **Customer Connections** *section of appropriate Form 6 Recloser Control Installation and Operation Instructions* for additional information.

IMPORTANT: Always verify the overcurrent protection minimum trip values are appropriate for the CT Ratio.

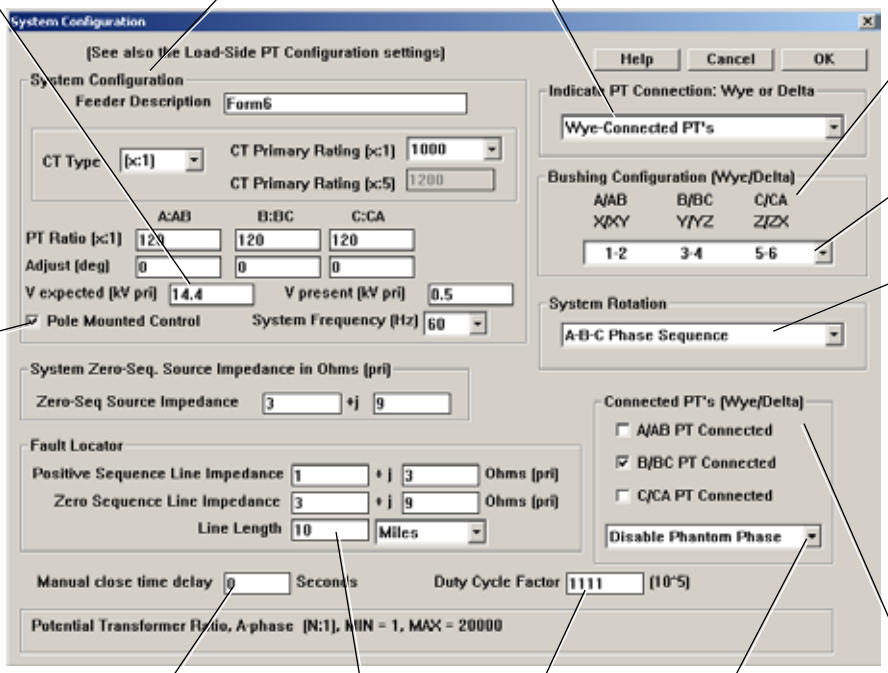
If the PTs are connected in a Wye configuration the V expected should be entered as a line-to-neutral value.

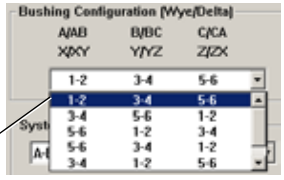
If the PTs are connected in a Delta configuration, the V expected should be entered as a line-to-line value.

The System Configuration settings allow the user to configure the control with the system frequency, CT and PT type, ratio, and rating.

The PT Connection section allows the user to indicate whether the Connected PTs are Wye or Delta.

The Bushing Configuration settings allow the user to specify which phase is physically connected to which set of bushings on the mechanism. A unique set of bushing designations must be selected for each phase.





The Pole Mounted Control checkbox must be selected for all Form 6 Pole Mount Recloser Controls. This includes both pole and substation applications.*

The System Rotation section allows the user to specify the system rotation (ABC - phase rotation) or (ACB - phase rotation). This data is used when calculating the proper inputs to the sequence filters, and affect the negative sequence directional and overcurrent elements.

The intentional closing time delay after the Form 6 front-panel CLOSE pushbutton is pressed is defined here.

During the time delay a Countdown-to-Close will appear on the LCD display.

Set Duty Cycle Factor here.

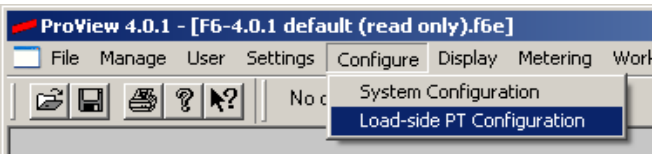
Enable or disable Phantom Phase here.

The line impedances and length are entered here.

The Connected PT's section allows the user to specify which phases have PTs physically connected to the control. For directional operation of the Form 6 control, all three PTs must be connected.

**Verify the Pole Mounted Control checkbox is de-selected for Form 6 Rack and Yard Mount controls. If this box is not de-selected, the Battery Alarm will be asserted on the control.*

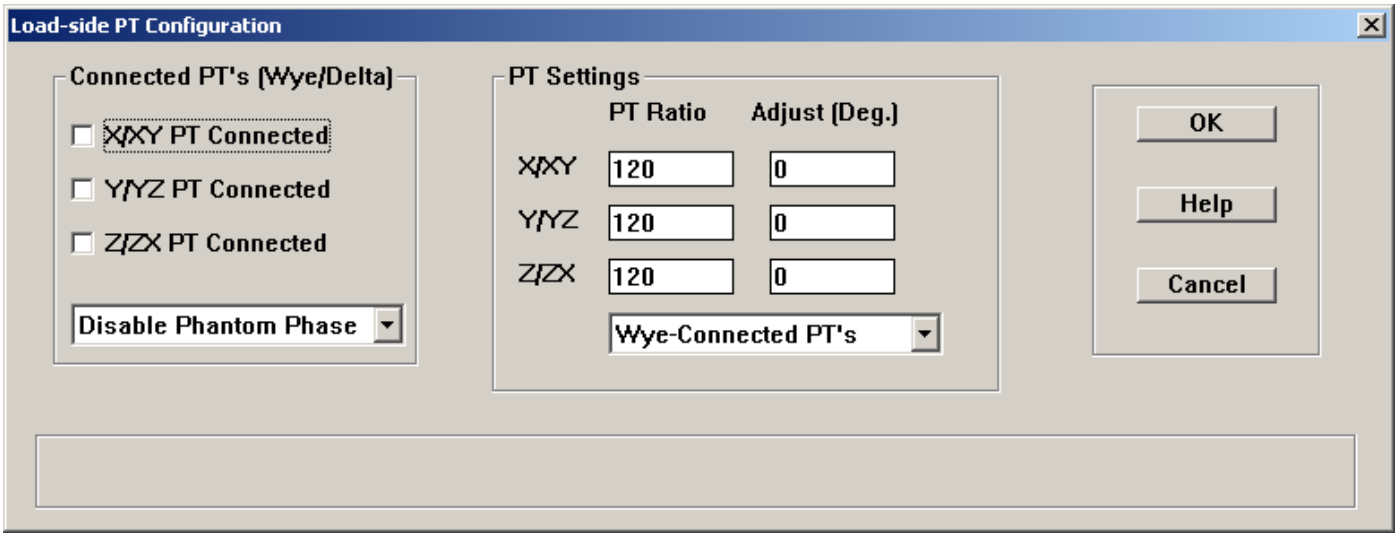
Load-side PT Configuration



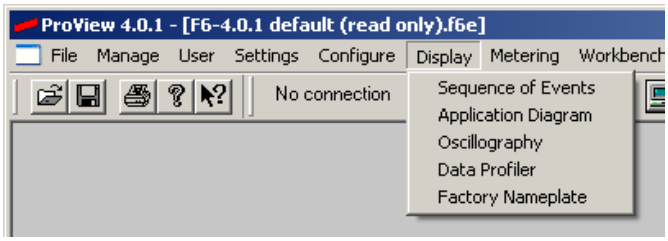
The Load-side PT Configuration dialog box enables the user to select the Connected PTs, set the PT Ratio and PT connection (Wye or Delta), and enable or disable phantom phase.

The Load-side PT connection should be consistent with the Source-side PT connection in the System Configuration dialog.

Note: *(This note only applies to Form 6 Pole Mount controls under Serial Number 10,000 and all Form 6 Rack and Yard Mount controls)*: Do not select more than one Load-side input. Doing so will result in a Load-Side PT Error alarm.



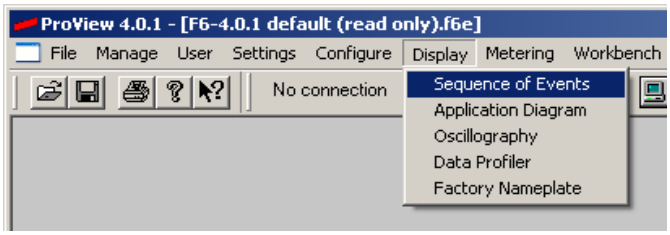
Display



The Display Menu allows access to the following features:

- Sequence of Events
- Application Diagram
- Oscillography
- Data Profiler
- Factory Nameplate

Sequence of Events



The Form 6 recloser control contains capabilities to perform Sequence of Events time-stamping for up to 32 event types. This event recorder includes the date and time of the event and metering analogs for each event type. Sixteen additional event types are user-defined through the Idea Workbench.

The Sequence of Events Recorder maintains a minimum of 90 events.

The Sequence of Events screen provides date and time stamped event data along with the instantaneous voltage (secondary volts) and current magnitudes for each phase at the time of the event.

Note: The displayed A, B, and C phase secondary voltage values are normalized by dividing the corresponding primary voltage value by the A:AB PT ratio shown on the Configure>System Configuration screen.

Green signal indicates event is de-asserted (i.e. gnd trip blk off).

Red signal indicates signal is asserted (i.e. GND TRIP BLK ON).

Sequence of Events

Evt	Date	Time	Type	IA	IB	IC	3I0	VA	VB	VC
001	07/10/01	13:28:33.769	FAULT DATA (pri)	0	1353	0	1353	0	16	0
002	07/10/01	13:28:33.731	OVERCURRENT TRIP	0	1353	0	1353	0	16	0
003	07/10/01	13:28:33.731	CONTROL LOCKOUT	0	1353	0	1353	0	16	0
004	07/10/01	13:28:28.696	FAULT DATA (pri)	0	1355	0	1355	0	16	0
005	07/10/01	13:28:28.660	OVERCURRENT TRIP	0	1354	0	1355	0	16	0
006	07/10/01	13:28:26.622	FAULT DATA (pri)	0	1351	0	1352	0	16	0
007	07/10/01	13:28:26.591	OVERCURRENT TRIP	0	382	0	384	0	16	0
008	07/10/01	13:28:24.599	FAULT DATA (pri)	0	1345	1	1345	0	16	0
009	07/10/01	13:28:24.567	OVERCURRENT TRIP	0	245	1	246	0	16	0
010	07/10/01	13:28:23.940	SEQUENCE RESET	0	0	0	0	0	16	0
011	07/10/01	13:28:23.940	MANUAL/EXT CLOSE	0	0	0	0	0	16	0
012	07/10/01	13:28:21.601	gnd trip blk off	0	0	0	0	0	16	0
013	07/10/01	13:28:18.239	FAULT DATA (pri)	0	1350	1	1350	0	16	0
014	07/10/01	13:28:18.201	OVERCURRENT TRIP	0	1343	1	1345	0	16	0
015	07/10/01	13:28:18.201	CONTROL LOCKOUT	0	1343	1	1345	0	16	0
016	07/10/01	13:28:13.168	FAULT DATA (pri)	0	1351	0	1352	0	16	0
017	07/10/01	13:28:13.130	OVERCURRENT TRIP	0	1351	0	1352	0	16	0
018	07/10/01	13:28:11.100	FAULT DATA (pri)	0	1352	1	1352	0	16	0
019	07/10/01	13:28:11.062	OVERCURRENT TRIP	0	923	1	924	0	16	0
020	07/10/01	13:28:09.062	FAULT DATA (pri)	0	1344	1	1344	0	16	0
021	07/10/01	13:28:09.031	OVERCURRENT TRIP	0	387	1	388	0	16	0
022	07/10/01	13:28:08.101	GND TRIP BLK ON	0	0	1	1	0	16	0
023	07/10/01	13:28:01.392	SEQUENCE RESET	0	0	0	0	0	16	0
024	07/10/01	13:28:01.392	MANUAL/EXT CLOSE	0	0	0	0	0	16	0
025	07/10/01	13:27:55.163	FAULT DATA (pri)	0	900	1	901	0	16	0
026	07/10/01	13:27:55.125	OVERCURRENT TRIP	0	900	0	900	0	16	0
027	07/10/01	13:27:55.125	CONTROL LOCKOUT	0	900	0	900	0	16	0

OK | Write to file... | Reset SOE | Go Offline

The secondary voltage values displayed in the Sequence of Events screen will either be line-to-neutral values if the PTs are connected in a Wye confirmation or line-to-line values if the PTs are connected in a Delta configuration. Only the secondary voltage values of the connected PTs, as defined in the System Configuration setting dialog box, will be displayed. The Phantom Phase setting does not apply to the voltage values displayed in the Sequence of Events screen.

Sequence of Events: Event Definitions

The Form 6 recloser control contains capabilities to perform Sequence of Events (SOE) time-stamping for more than 33 event types (binary inputs). Sixteen additional event types can be user-defined through the ProView Workbench.

A minimum of 90 events will be available in the event recorder. The most recent event appears at the top of the event recorder. The event recorder uses a first in, first out protocol.

NORMAL PROFILE: The Normal Protection profile is active. Remains asserted while the control is in the Normal Protection Profile.

ALT PROFILE #1: The Alternative #1 Protection profile is active. Remains asserted while the control is in the Alternative #1 Protection Profile.

ALT PROFILE #2: The Alternative #2 Protection profile is active. Remains asserted while the control is in the Alternative #2 Protection Profile.

ALT PROFILE #3: The Alternative #3 Protection profile is active. Remains asserted while the control is in the Alternative #3 Protection Profile.

BLOCK OF CLOSE: Asserts when all control closing attempts are prohibited.

CLOSE FAILURE: Asserts if the recloser does not close upon receiving a close command from any source.

CLOSE FAIL: SYNC: Asserts when sync check supervision of closing is enabled and a close did not occur.

CONTROL ALARMS: The Control Alarm is asserted if a Battery Alarm or No AC Power Alarm is asserted (Pole Mount), or if a Memory Test or Internal Power Failure alarm is detected. Remains asserted while the control has a control alarm asserted.

Note: If the Battery Alarm is asserted for a Rack or Yard mount control, verify that the Pole Mounted Control checkbox is de-selected in the Configure>System Configuration dialog box.

CONTROL LOCKOUT: Asserts when the control is locked-out. Remains asserted while the control is in the lockout state.

CTL CKT INTRRUPT: Asserts when the control senses control circuit interruption (i.e. a disconnected or severed cable).

FAULT DATA (pri): Asserts after an overcurrent trip signal is given. Displays the maximum current two cycles after this signal.

FREQUENCY TRIP: Asserts when an underfrequency or overfrequency trip occurs.

GND TRIP BLK OFF: Asserts when Ground Trip Blocked transitions from enabled to disabled.

GND TRIP BLK ON: Asserts when Ground Trip Blocked is enabled.

HOT-LINE TAG OFF: Asserts while the control is not in Hot Line Tag mode.

HOT-LINE TAG ON: Asserts while the control is in Hot Line Tag mode.

MAN/EXT TRIP/LO: A Trip signal originating from an External action, such as pressing the TRIP button, a DNP/Modbus Trip command, or a Contact Input programmed to trip.

MANUAL/EXT CLOSE: A Close signal originating from an External action, such as pressing the CLOSE button, a DNP/Modbus Close command, or a Contact Input programmed to close.

NO CONTROL ALARM: Asserts after a Control Alarm resets.

NO CLOSE: FREQ: Close is inhibited because frequency is not within the selected setting range.

NON-RECLOSE OFF: Asserts when Non-Reclosing transitions from active to inactive

NON-RECLOSE ON: Asserts when Non-Reclosing is active.

OVERCURRENT TRIP: Asserts when the Trip signal originates from an overcurrent protective element action.

RAM REFRESH: Indicates the control reset (reloaded the scheme in RAM and refreshed the memory) because a Memory Test control alarm was asserted.

RCLS RETRY FAIL: Indicates the control failed to reclose from Reclose Retry mode.

RECLOSE RETRY: Indicates a reclose signal was issued by the control in a reclose retry attempt. Reclose retry attempts subsequent reclose operations should a reclose attempt fail.

SEF TRIP: A Trip signal originating from a Sensitive Earth Fault protective element action.

SELF-CLEAR FAULT: Asserts when an incipient cable splice fault occurs.

SEQUENCE COORD.: The current displayed is the fault current immediately prior to the sequence coordination event. Remains asserted while the control records a sequence coordination event.

SEQUENCE RESET: Indicates the fault was removed, the recloser closed in and the operations-to-lockout count restarted.

Note: This event only occurs for an actual recloser trip. It will not be displayed for a Sequence Reset due to a sequence coordinated event.

TRIP FAILURE: Asserts if the recloser does not trip upon receiving a trip command from any source.

Note: This event will be triggered when the Trip Malfunction alarm or an Interrupter Malfunction alarm occur (See “Alarm Log and Status Menu” section.

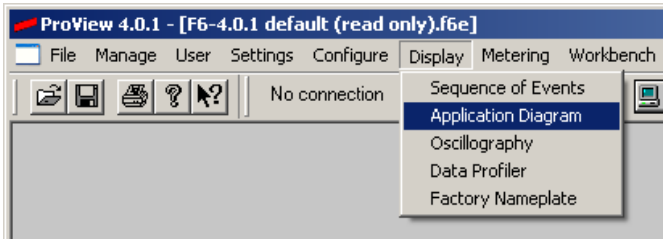
VOLTAGE TRIP: Asserts when an undervoltage or overvoltage trip occurs.

The status of the 16 user-defined events are displayed on the Form 6 front panel LCD in the WORKBENCH STATUS menu display.

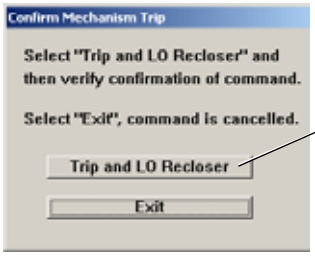
Refer to the **Workbench Status Outputs to MMI and SOE** and **Workbench Outputs Toolbox** sections of this manual for additional user-defined event information.

Refer to **Sequence of Events** in the **Display** section of this manual for additional event recorder information.

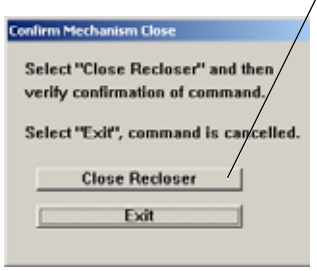
Application Diagram

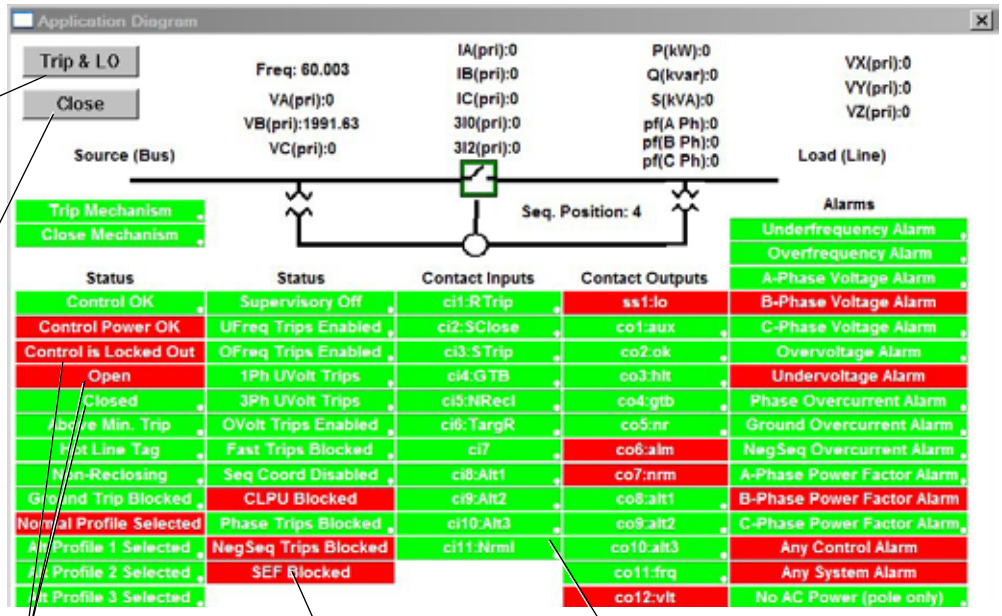


The Application Diagram provides a display of all logic elements, voltages, currents, watts, and vars of the Form 6 recloser control. This live display of the connected recloser provides a quick summary of the distribution system and the active control functions. The application program is also ideal for testing or for providing a quick system overview via modem connection.



Confirm Before Operate Screens



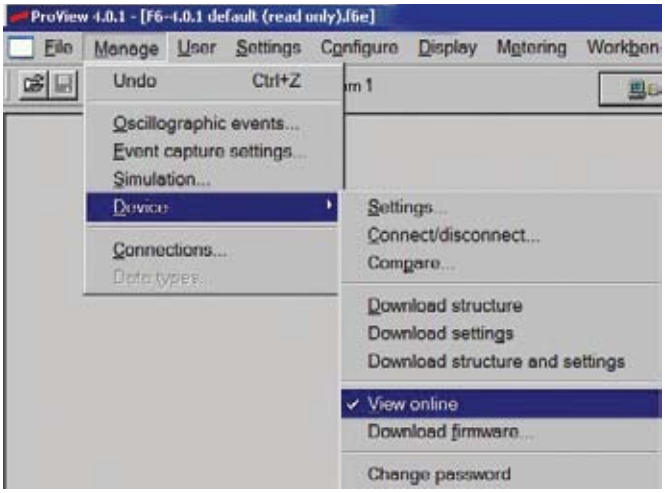


IMPORTANT: When ProView is connected to the Form 6 control the recloser will respond to any command issued from the Mechanism Trip & LO and Close Confirm Before Operate screens regardless of the Online or Offline status of ProView.

If recloser status is unknown (no control cable), these three statuses will be grayed out and displayed as inactive.

Active *features are indicated by shaded, solid boxes. (The box color will be red on the PC monitor.)*

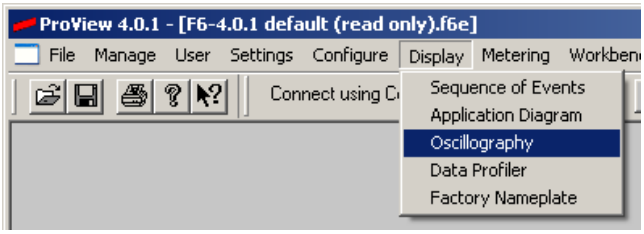
Inactive *features are indicated by lighter boxes with a white circle in the lower-right corner. (The box color will be green on the PC monitor.)*

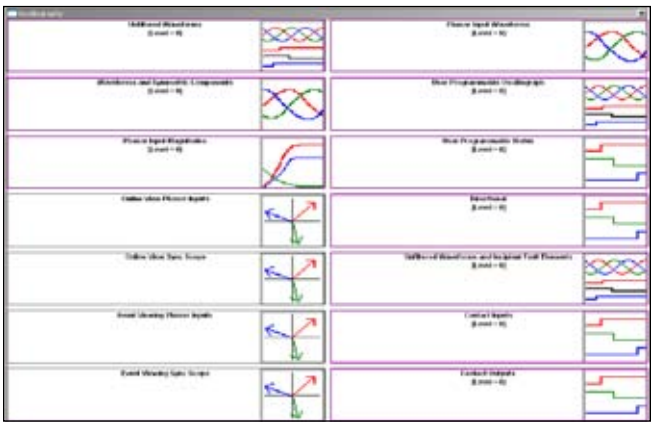


The Application Diagram screen shows the following views under the following conditions:

- View Online Mode: Shows actual control data and status. The display is continuously updated with live, streaming data coming from the control.
- Event Playback Mode: Shows the status of the control at the time the oscillography event playback cursor is set to. The display will change appropriately as the event cursor is moved back and forth. Refer to **Oscillography** in the **Display** section of this manual for additional information.
- Simulation Mode: Shows the status of the simulated control performance as the simulated event is advanced. Refer to **Virtual Test Set** in the **Settings** section in this manual for additional information.

Oscillography





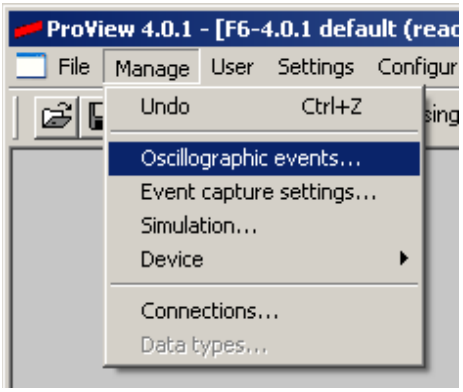
The Display Oscillography feature enables oscillography events to be played back through the control scheme, even with altered settings. This feature allows the user to determine how the Form 6 recloser control would have behaved for the same fault under different settings.

- Save future fault incidences with past fault performance analysis.
- View accurate graphical events to compare actual control performance against expected results.

Users can view event records using pre-defined oscillographic views or those from the Sequence of Events recorder. Both actual event records and those created with the Virtual Test Set (VTS) can be downloaded and viewed.

Note: A maximum of twelve 8-cycle events can be captured.

Generating Oscillographic Events



Oscillographic events are automatically generated under the following conditions:

- When any fault current is detected.
- When the control sends a trip command to the recloser.
- When the recloser goes to lockout.
- When optional signals are driven high from the Idea Workbench.

Manually Triggering an Oscillography Event

Events can also be manually triggered from ProView as follows:

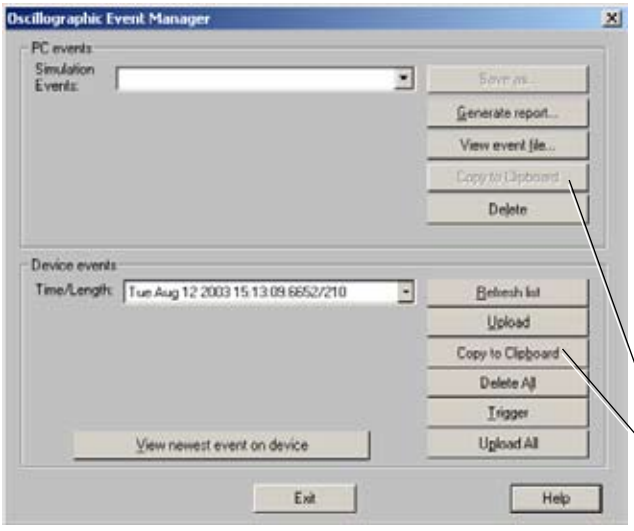
1. Establish communication with the control. Refer to **Connecting to the Form 6 Control** section in this manual.
2. Select OSCILLOGRAPHIC EVENTS from the MANAGE menu.

The Event Manager window will be displayed.

3. Click on TRIGGER to initiate a recording.

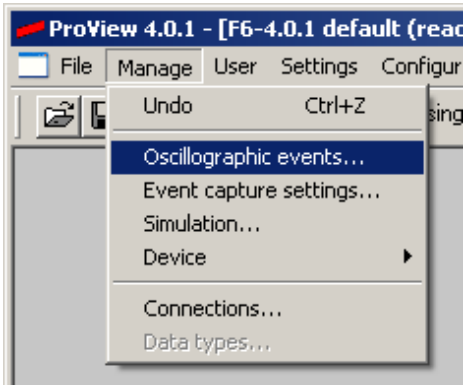
After the event is triggered on the control, transfer it to the PC for viewing.

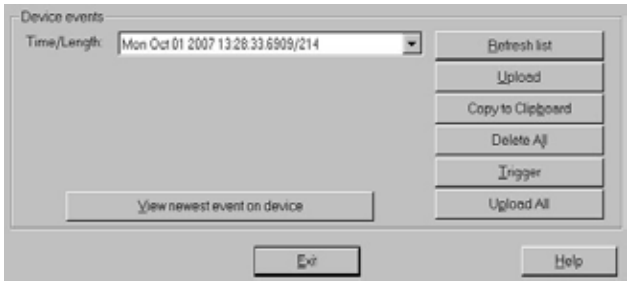
Note: You can also click on VIEW NEWEST EVENT ON DEVICE to quickly transfer and view the event you just triggered.

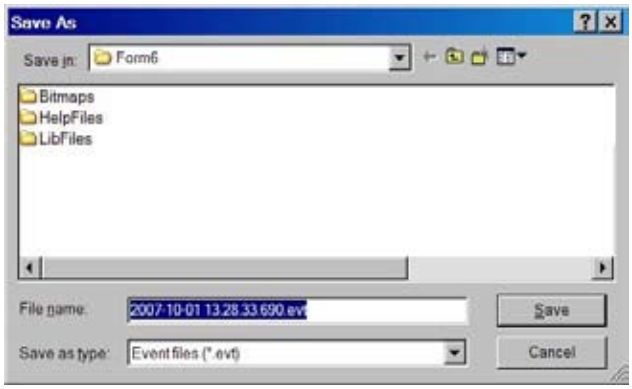


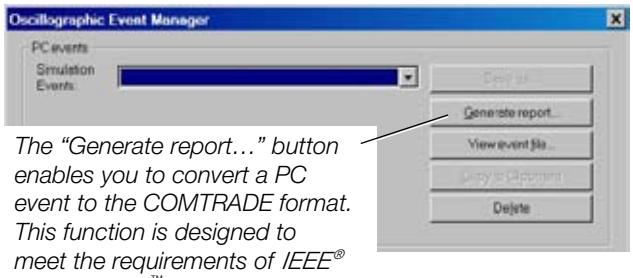
Click on the Copy to Clipboard button to copy the Time/Length and Event information text for pasting into reports, etc.

Viewing an Oscillography Event









The "Generate report…" button enables you to convert a PC event to the COMTRADE format. This function is designed to meet the requirements of IEEE® Std C37.111™-1999 Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems.

To view oscillographic information, you must first load an event record.

To load an event from the control:

1. Establish communication with the control. Refer to **Connecting to the Form 6 Control** section in this manual.
2. Select OSCILLOGRAPHIC EVENTS from the MANAGE menu.

The Event Manager window will be displayed. The lower portion of the window, titled Device Events, will allow the downloading of events from the control when connected to the PC.

3. Click on the selected event from the DEVICE EVENTS TIME/LENGTH drop-down menu.
4. Click on the UPLOAD button.

   Note: To load all of the events, click on the UPLOAD ALL button.

5. If you are only saving one event, the SAVE AS dialog box will automatically open allowing you to rename the event. Click OK to save the event file to disk.

   Note: The .evt event file(s) must always be saved to the Form6 folder.

   If you are saving all the events (via the UPLOAD ALL button), the event files will be named according to the date/time stamp of each event.

   When saving events from the control, the following file types will automatically be created: .evt, .dat, .cfg, and .txt for each event.

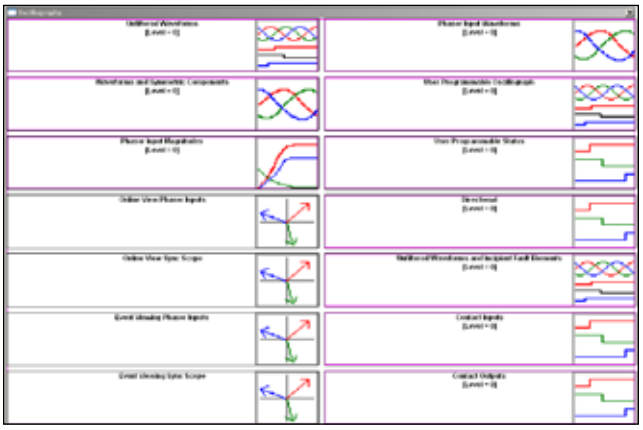
To load and view an event from a file:

1. Select OSCILLOGRAPHIC EVENTS from the MANAGE menu.
2. Click on VIEW EVENT FILE to bring up a list of events stored on disk.

The Event Manager window will be displayed. The top portion of the Event Manager is titled PC Events, and provides the ability to load any event record that has previously been saved to disk, or of any event records as created in the Virtual Test Set (VTS) within ProView.

3. Select the file to open.

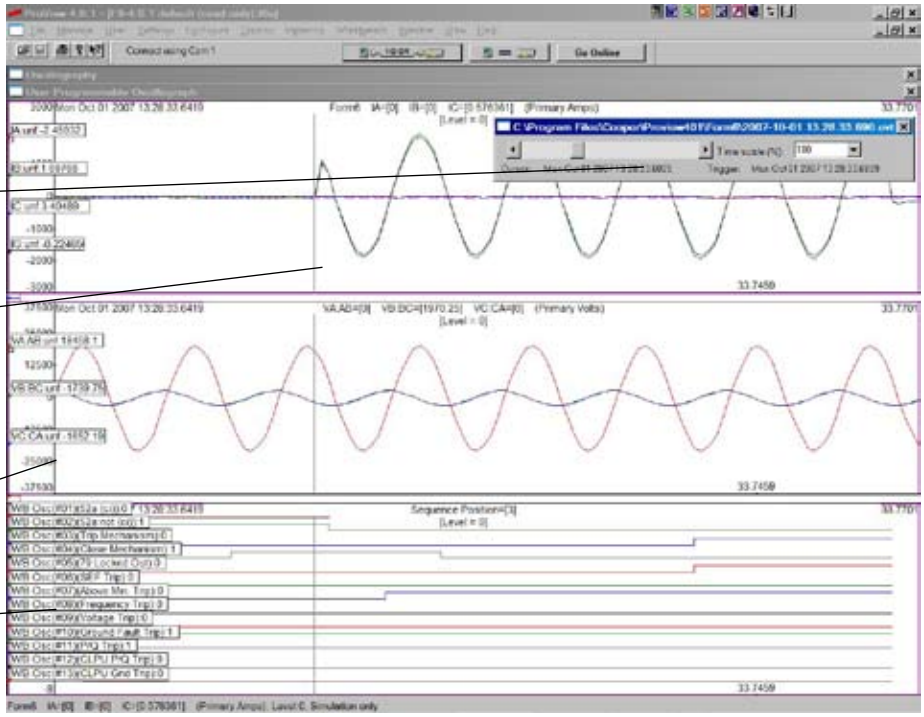
The event will be open and the Cursor Control Panel will appear.



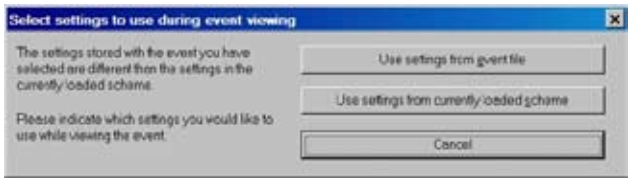
4. Click on the title bar, left-click-and-hold, and move the Cursor Control Panel to a convenient location on the screen.
5. To view any of the oscillographic views described, click on the appropriate box on the Oscillography Selection screen.

The oscillography view will appear.

6. Click and hold the time cursor in the Cursor Control Panel and slide it through the entire oscillographic event to accurately measure all analogs and determine function status.



Oscillography Replay



Oscillography Replay enables the user to see how the Form 6 recloser control would behave for a open event record if the settings were different. Use this feature as follows:

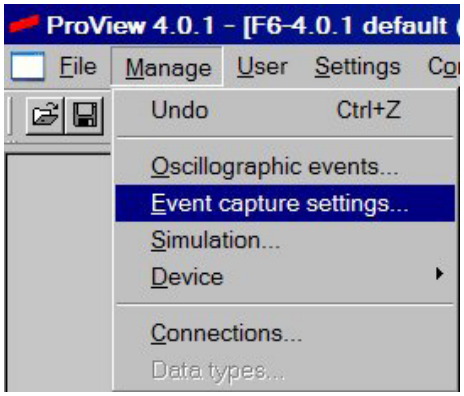
1. Change the settings and reload the event record. Refer to **Viewing an Oscillography Event** in this section for information on loading an event record.

The SELECT SETTINGS TO USE DURING EVENT VIEWING dialog box will appear.

2. Click on USE SETTINGS FROM CURRENTLY OPEN SCHEME.

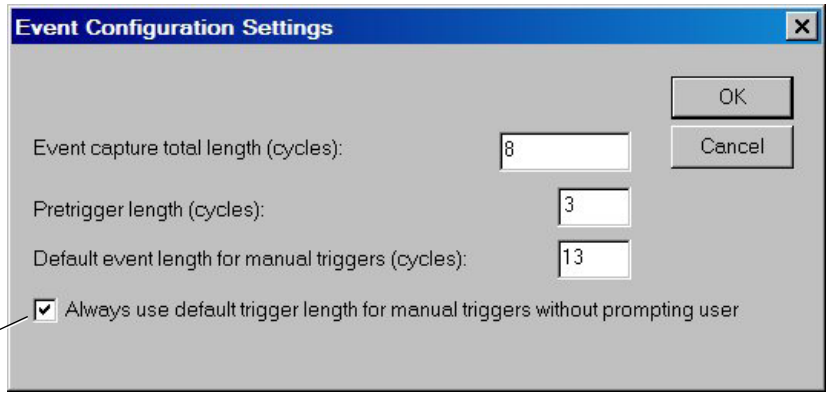
Any changes made to settings in ProView will force it to display the same voltage and current waveforms and how they interact with the new, current settings.

Event Capture Settings



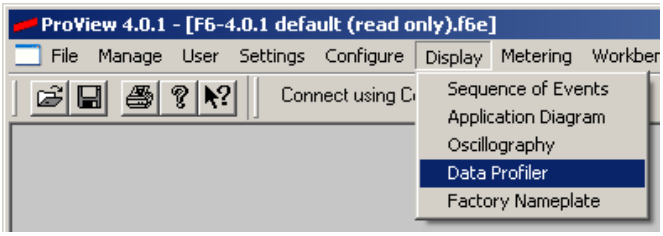
The Event Configuration Settings dialog box enables the user to manually configure event setup parameters to use when triggering events from the Oscillographic Event Manager.

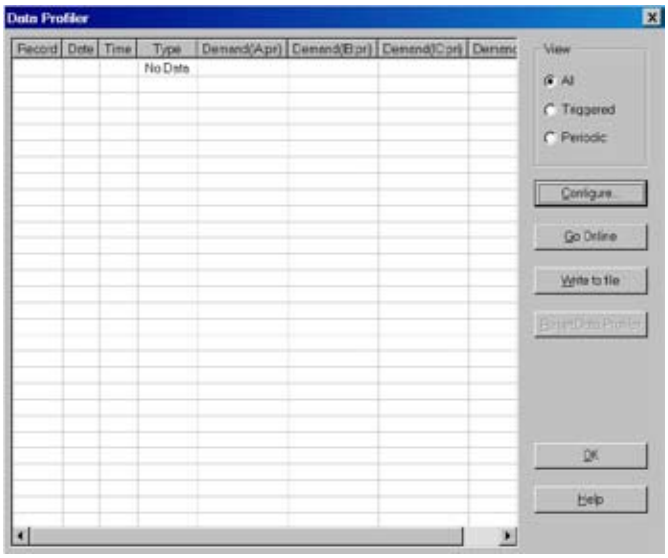
This dialog allows you to set the total and the pretrigger length of non-manually triggered events as well as the default event length for manual triggers from the Oscillographic Event Manager.

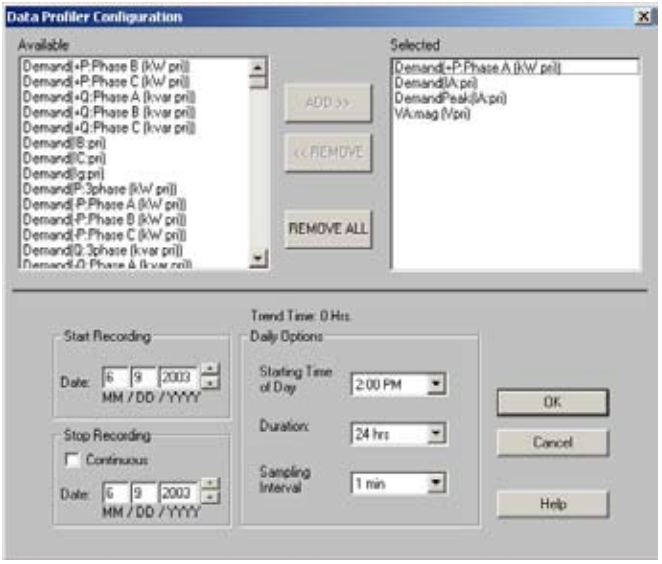


If you uncheck the check box and do a manual trigger a dialog box will appear showing the default manual trigger event length setting allowing you to change it.

Data Profiler







The Data Profiler is used for acquiring metering data for a specific period of time. The Data Profiler is not automatic; it must be manually configured. The Data Profiler is capable of retaining metering data for each phase. The number of data samples that can be retained is dependent upon the number of metering forms used and the sample rate interval.

By selecting the fewest and most appropriate metering forms at a high sample rate, a large amount of metering data can be acquired to determine the cause of many line and power quality issues.

1. Select Data Profiler dialog box from the Display menu.

2. Click the Configure button to display the Data Profiler Configuration dialog box.

   The metering options are listed on the left of the screen. Use the scroll bar to view all of the options.

   The Selected metering options listed on the right are the active options. A metering option must be listed in this field to be enabled.

3. Select metering options. Click the desired metering option in the Available list, then click ADD >> or double-click the metering option in the Available list.

   Note: To remove a metering option from the selected list, click on the metering option, then click << Remove.

4. Set the date the recordings are to start.

   A Trend Time will be given in days and hours when the Continuous feature is enabled. If 0 Hrs. is displayed, the start/stop times are set before the current date.

   Trend Time is the total amount of time the Data Profiler can record. This time will vary and is dependent on the sample rate and the number of metering options selected.

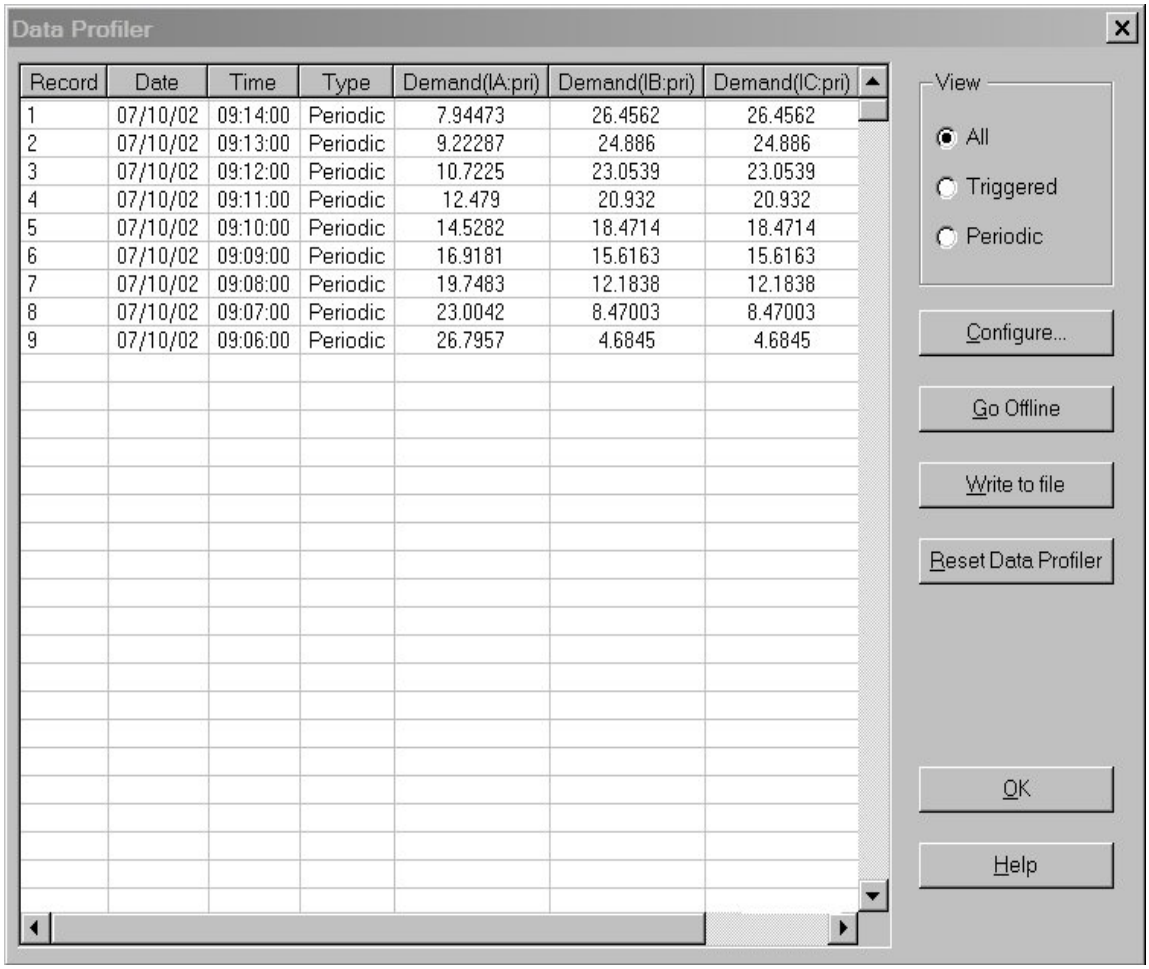
   Note: It is recommended to enable the Continuous feature and check the Trend Time available.

   A. Click the Continuous box if the recordings are not to be stopped. A check mark appears when enabled.

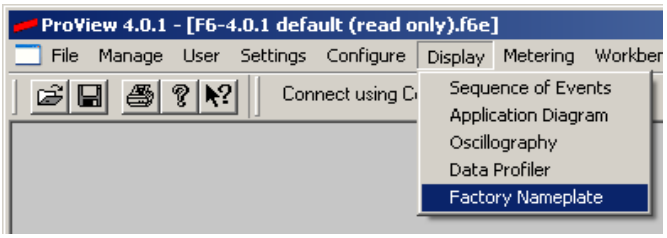
   B. Set the stop date if Continuous is not enabled. Make sure there is enough Trend Time available.

5. Set the Starting Time of Day the recordings are to begin from the drop down menu.
6. Set the Duration of time the Profiler is to run each day, beginning at the Starting Time of Day, from the drop down menu.
7. Set the Sampling Interval from the drop down menu. Frequent sampling rates decrease the amount of Trend Time available.
8. Click OK to return to the Data Profiler screen.

   The Data Profiler will display data only after the first sampling interval.
9. Click the Write to File button to save the Data Profiler data.
10. Select a profile view by clicking in a View selection button.
    - The All view displays both the triggered and periodic data.
    - The Triggered view displays data initiated by an alarm(s).
    - The Periodic view displays data from periodic sampling.

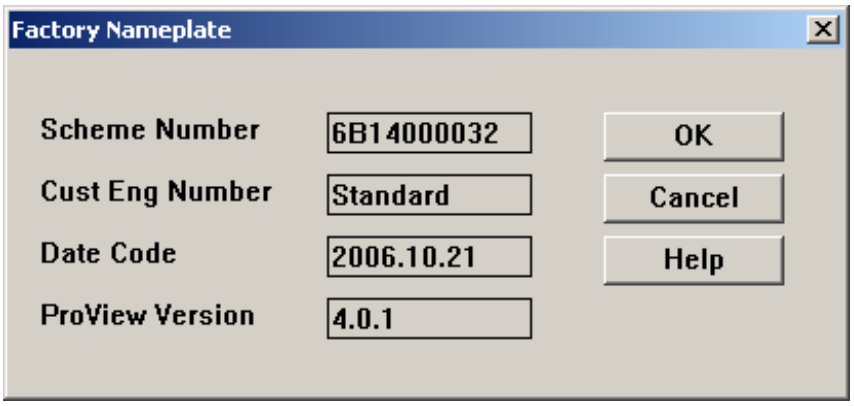


Factory Nameplate

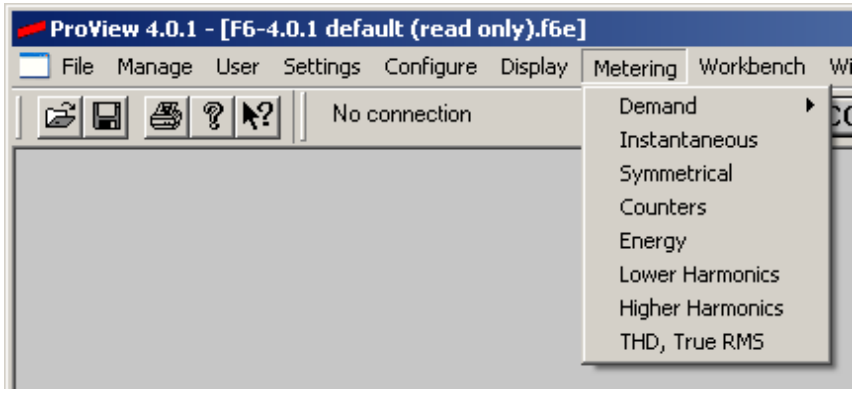


The Factory Nameplate dialog box displays the following information:

- Scheme Number
- Custom Engineered Scheme Number
- Date Code
- ProView Version



Metering

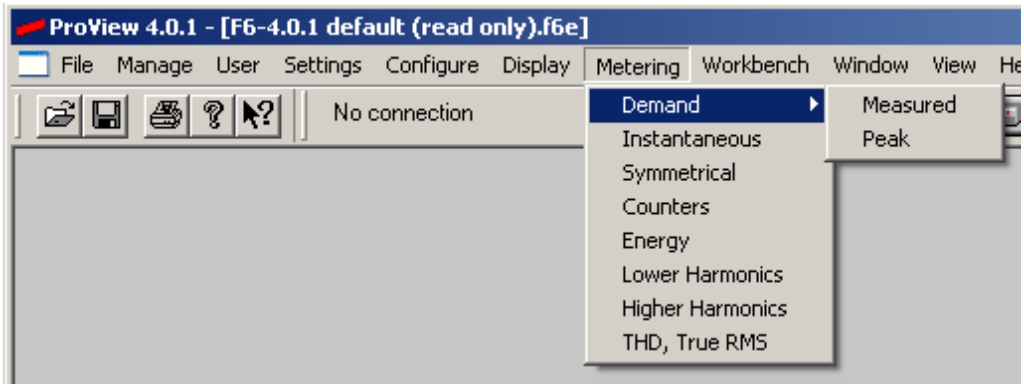


The Metering Menu provides access to the following functions:

- Demand: Measured & Peak
- Instantaneous with primary values
- Symmetrical
- Counters
- Energy
- Lower Harmonics
- Higher Harmonics
- THD, True RMS

ProView must be connected to and online with the Form 6 control in order to view Metering values. Refer to the **Communicating with the Form 6 Recloser Control** section of this manual for the connection procedure.

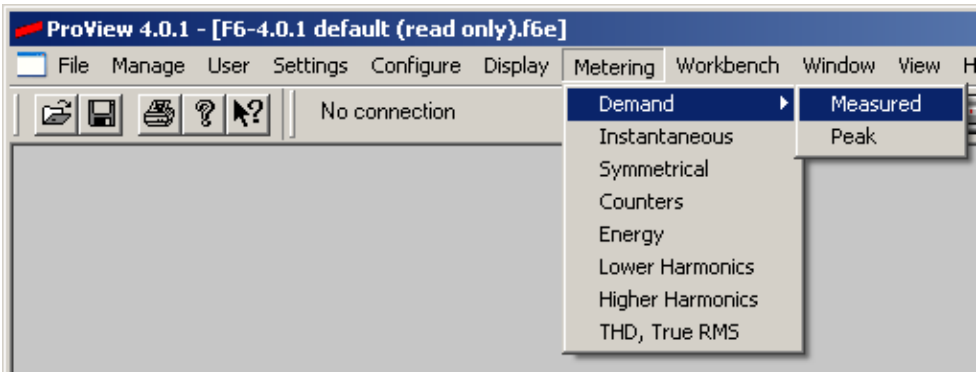
Demand



Two Metering Demand options are available:

- Measured Demand
- Peak Demand

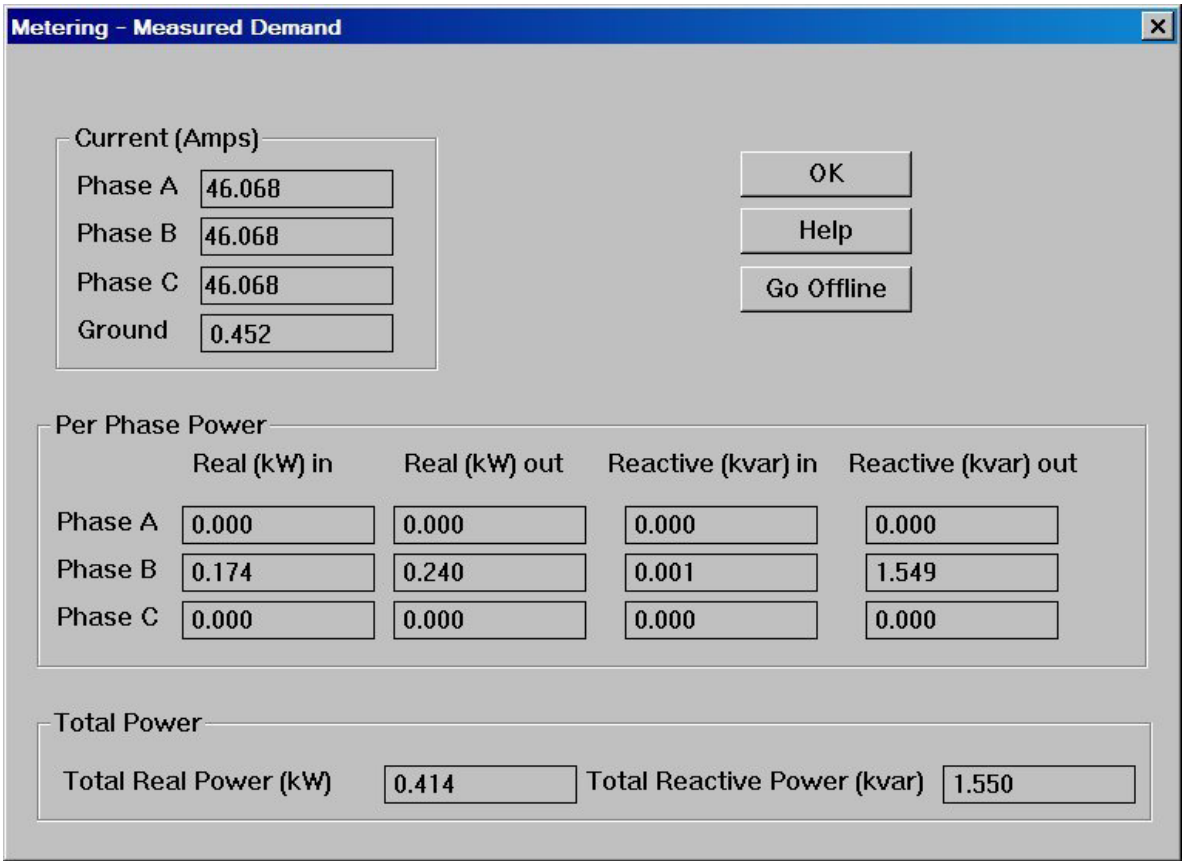
Measured Demand



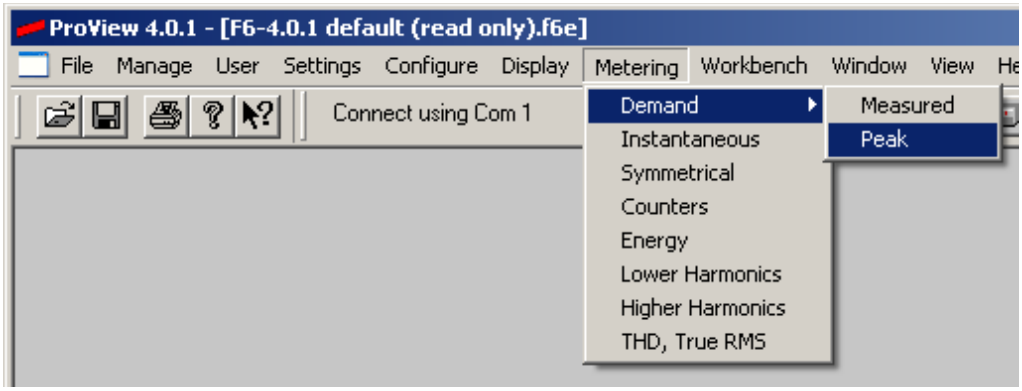
The Measured Demand dialog box allows the user to view the current and power (real and reactive) demands, based on the Demand Interval Time setting in the Metering Settings dialog box. Refer to **Metering** in the **Settings** section of this manual for Demand Interval Time setting information.

The user must be online to view the demands in the control. The values displayed are the current period demand readings.

Click the Go Online button. The current period demand readings are displayed.



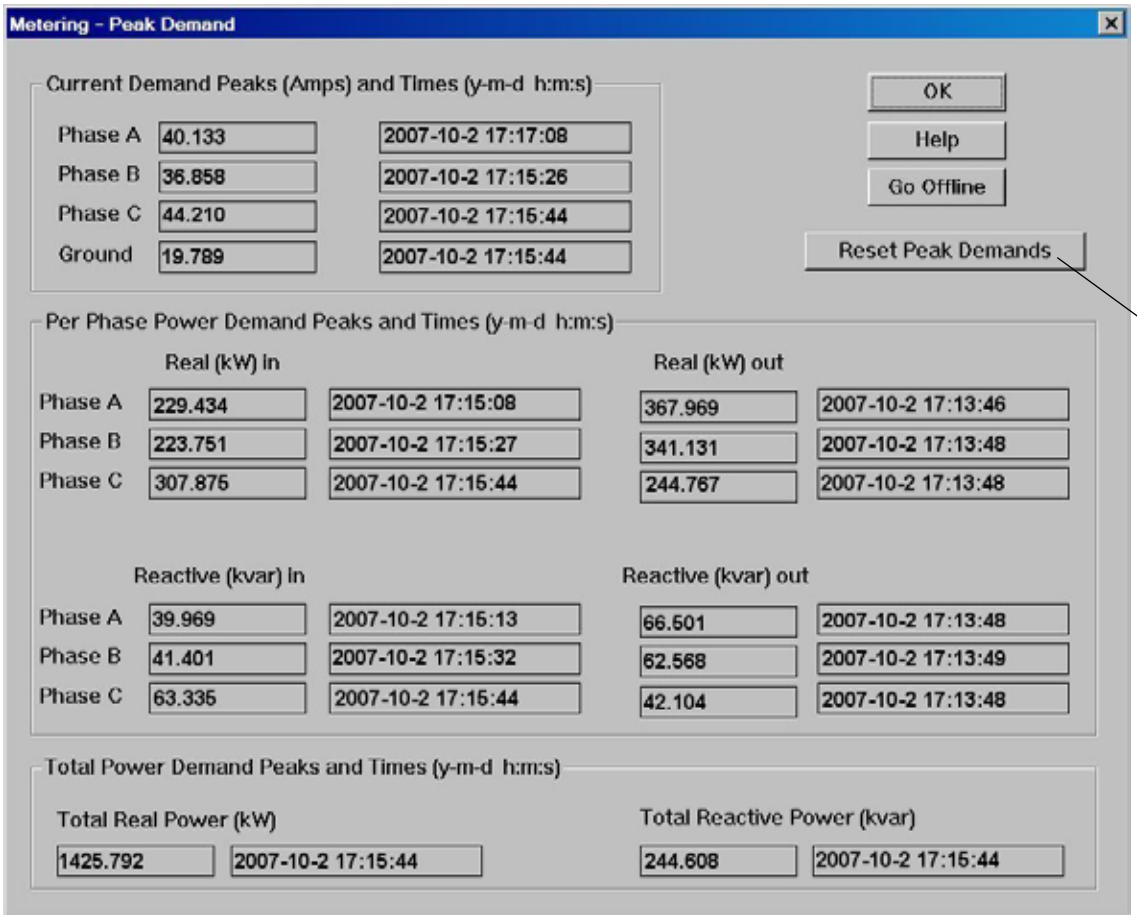
Peak Demand



The Peak Demand dialog box allows the user to view the current and power (real and reactive) peak demands and times, based on the Demand Interval Time setting in the Metering Settings dialog box, as measured since the last reset. Refer to **Metering** in the **Settings** section of this manual for Demand Interval Time setting information.

The user must be online to view the peak demands in the control. The values displayed are the current peak demand readings.

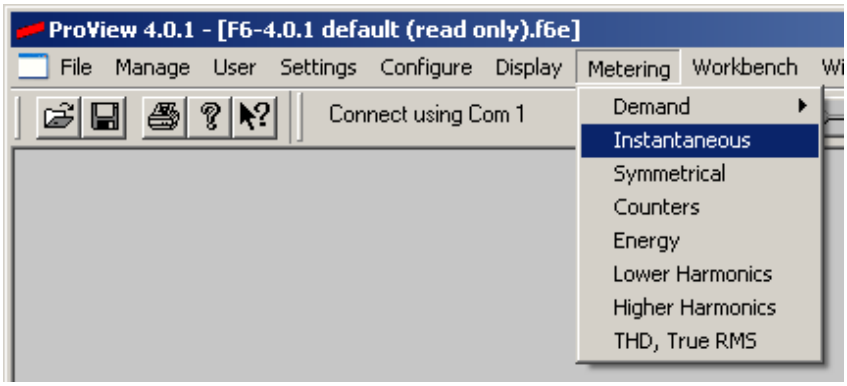
Click the Go Online button. The current peak demand readings and times are displayed.



Click on RESET PEAK DEMANDS to reset the demands and times from ProView.

This can also be accomplished via the Form 6 control front panel MMI. Refer to **Metering** ***Menu*** *in the* ***Front Panel Operation*** *section of this manual.*

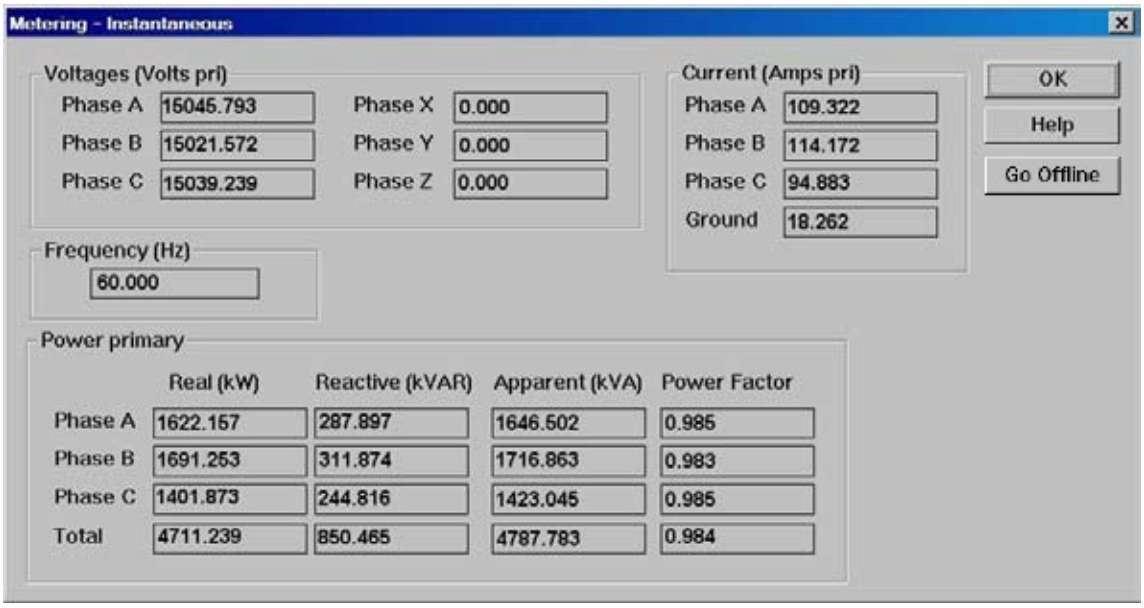
Instantaneous



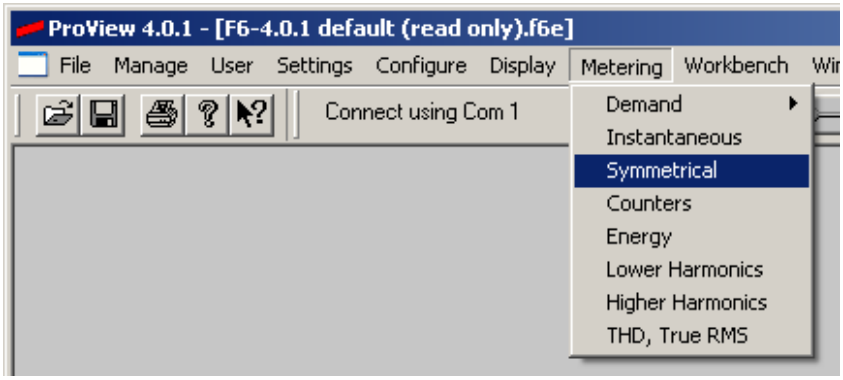
The Instantaneous Metering dialog box allows the user to view the primary voltage, current, frequency, and power (real and reactive) values measured by the Form 6 control.

The user must be online to view the instantaneous values in the control.

Click the Go Online button. The instantaneous values are displayed.



Symmetrical

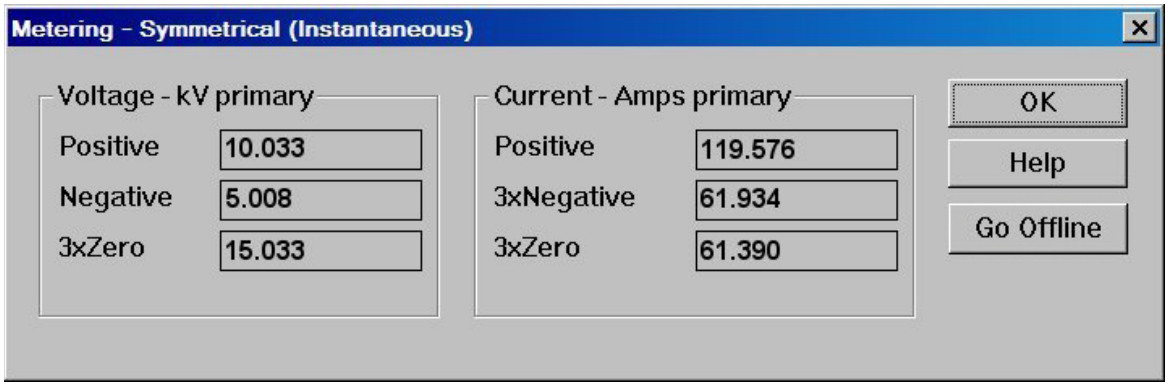


The Symmetrical Metering dialog box allows the user to view the voltage and current symmetrical component values measured by the Form 6 recloser control.

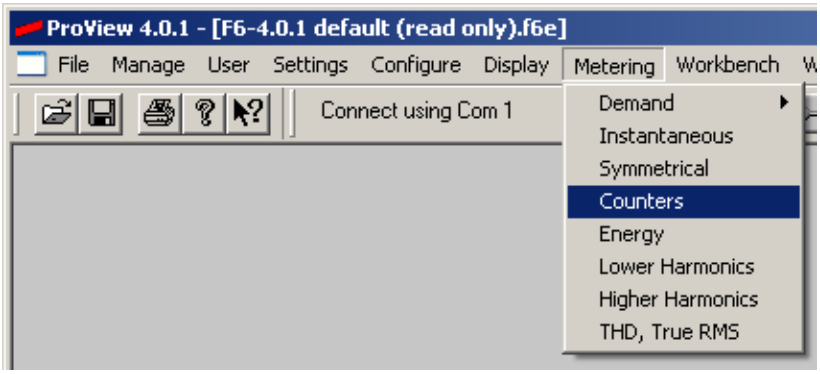
The user must be online to view the symmetrical component values in the control

Click the Go Online button. The current symmetrical components values are displayed.

The primary voltage values displayed in the Instantaneous Metering dialog box will always be line-to-neutral values regardless of the confirmation (Wye or Delta) of the connected PTs. Regardless of the number of connected PTs, as defined in both the System Confirmation setting dialog box and the Load-side PT Configuration setting dialog box, all three primary source-side or load-side voltage values will be displayed if the Phantom Phase functionality (source-side or load-side) is enabled.



Counters

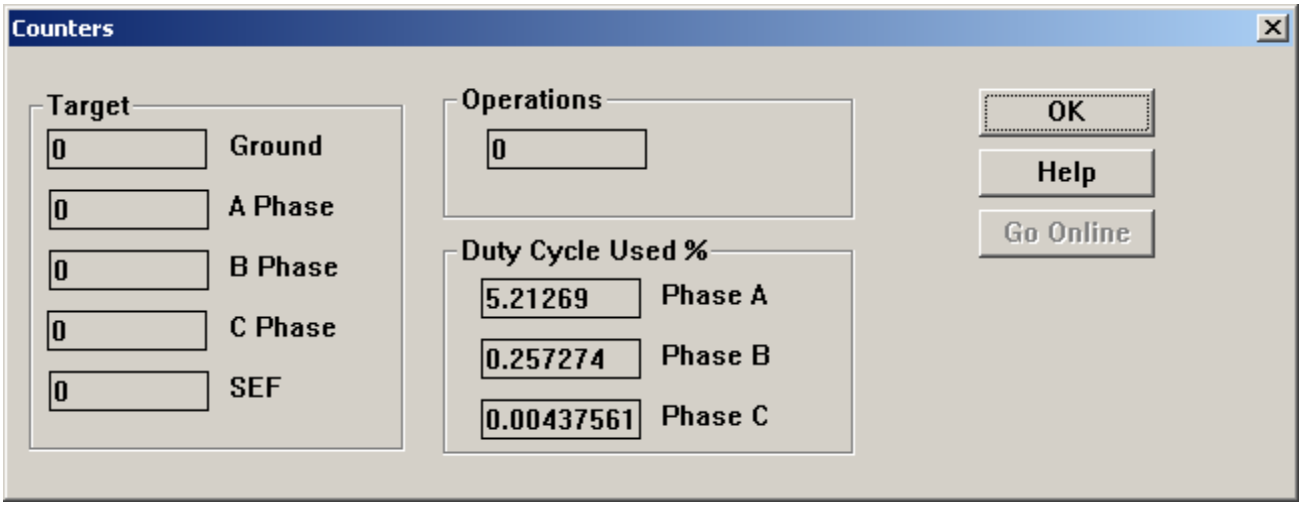


The Counters dialog box allows the user to view the counters retained by the Form 6 control.

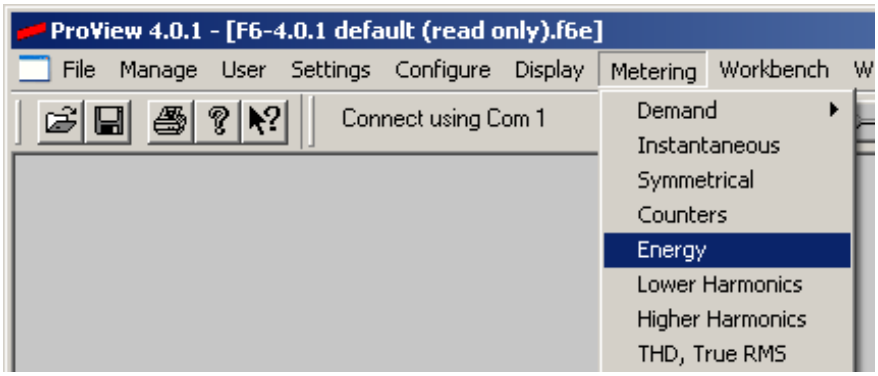
The user must be online to view the counters in the control.

Click the Go Online button. The counter values maintained by the control are displayed.

- Trip and Target Counters are preset to zero for a new recloser.
- If retrofitting an existing recloser, preset the control counters to match the recloser counters. If a Form 6 control is attached to a mechanism that has a known operating history, the trip and target counters and duty cycle information can be pre-programmed into the control via the Presets dialog box. Refer to **Settings - Presets** in the **ProView Form 6 Control Schemes** section in this manual for additional information.



Energy



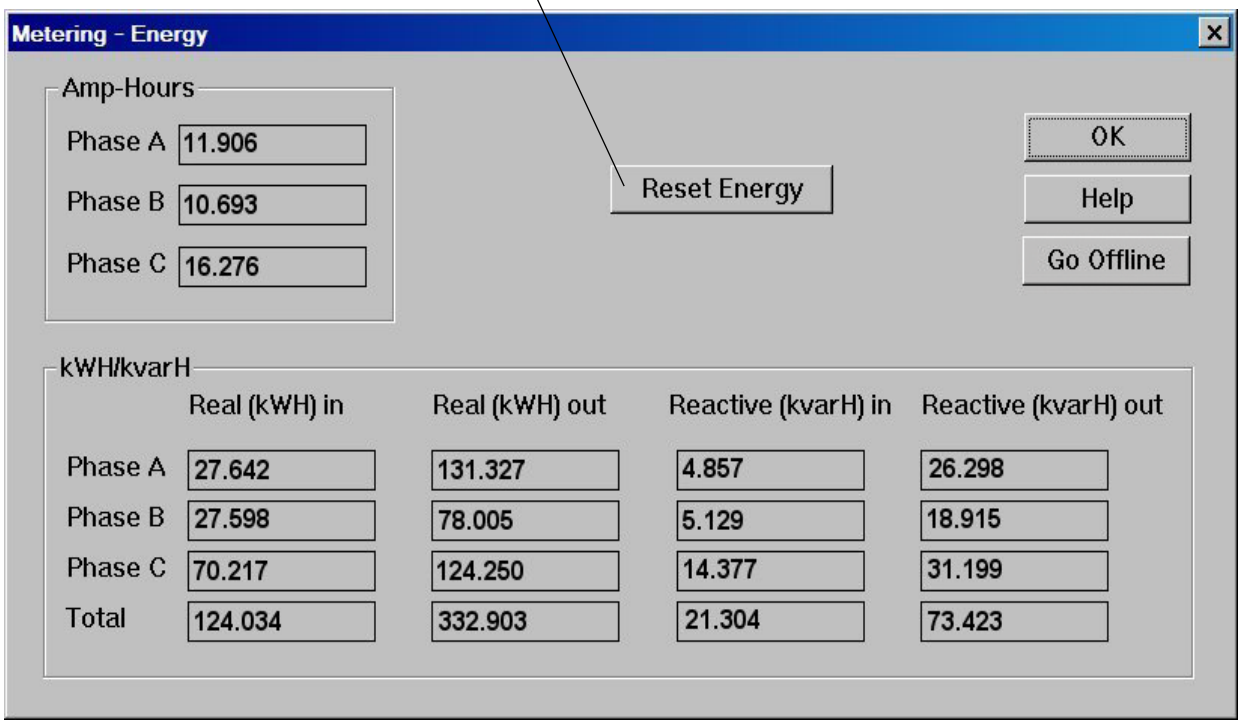
The Energy dialog box allows the user to view the current and power (real and reactive) energy values measured by the Form 6 recloser control.

The user must be online to view the energy values in the control.

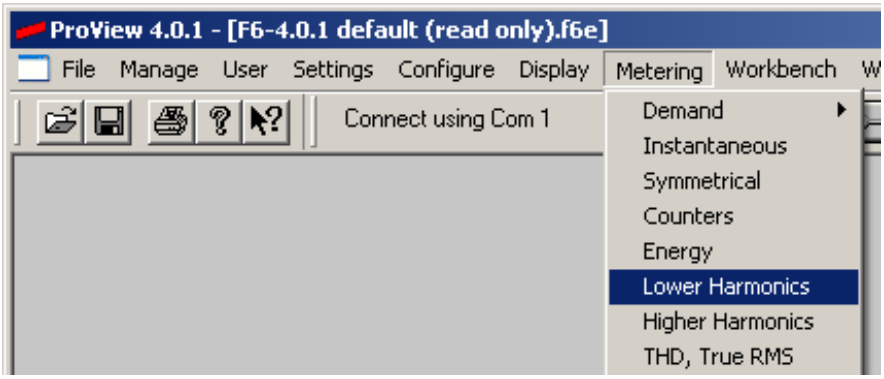
Click the Go Online button. The energy values are displayed.

Click the Reset Energy button to reset the accumulated energy from ProView.

This can also be accomplished via the Form 6 control front panel MMI. Refer to **Metering** ***Menu*** *in the* ***Front Panel Operation*** *section of this manual.*



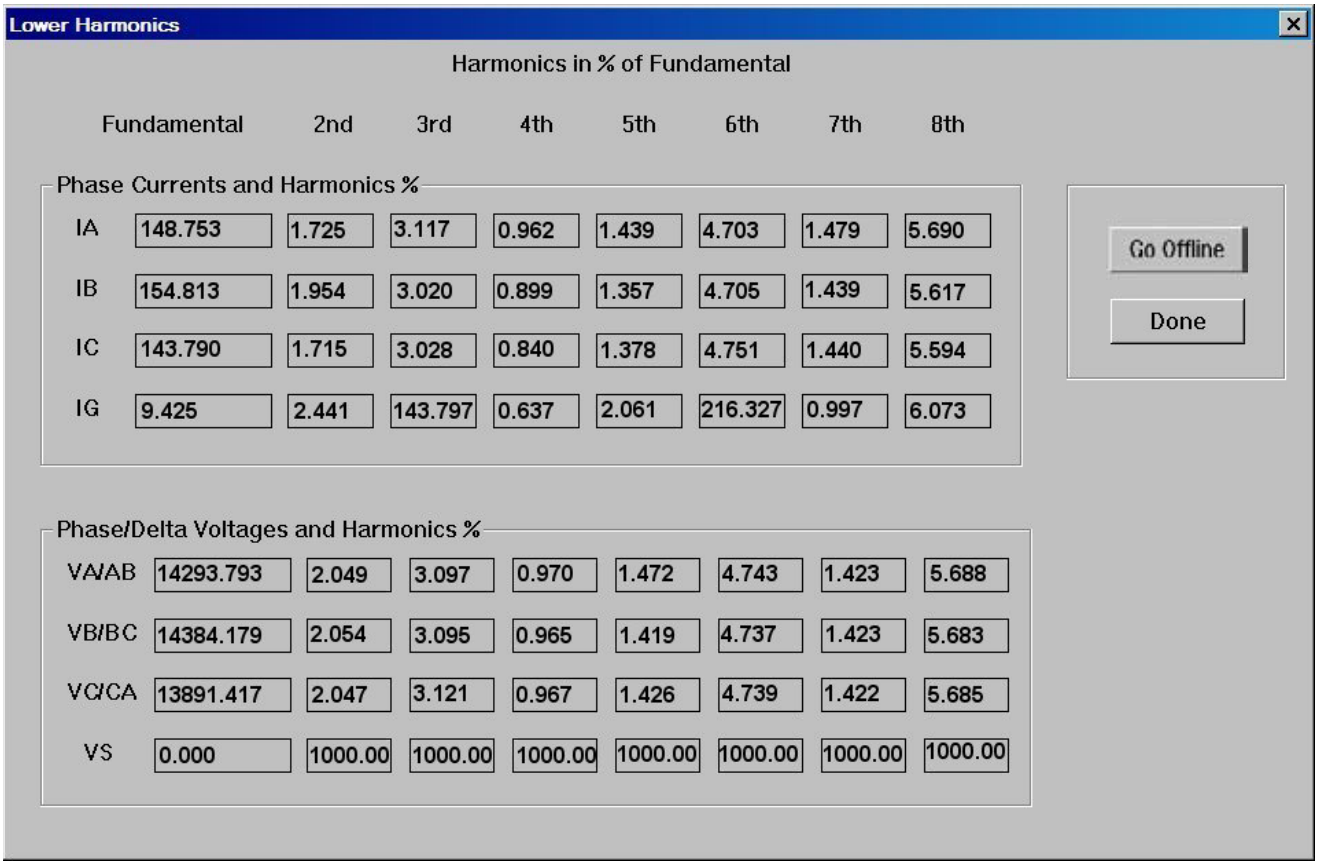
Lower Harmonics



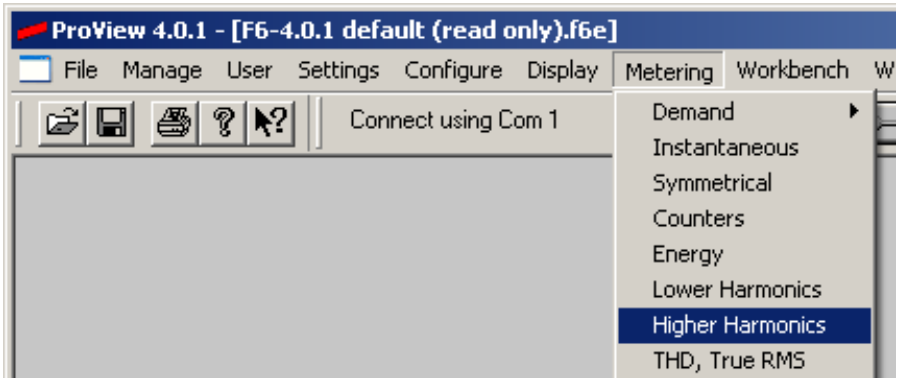
Comprehensive harmonic information is included for three-phase voltages and currents plus neutral current. This analysis includes the second through eighth harmonics in % of fundamental.

The user must be online to view the lower harmonic values in the control.

Click the Go Online button. The lower harmonic values are displayed.



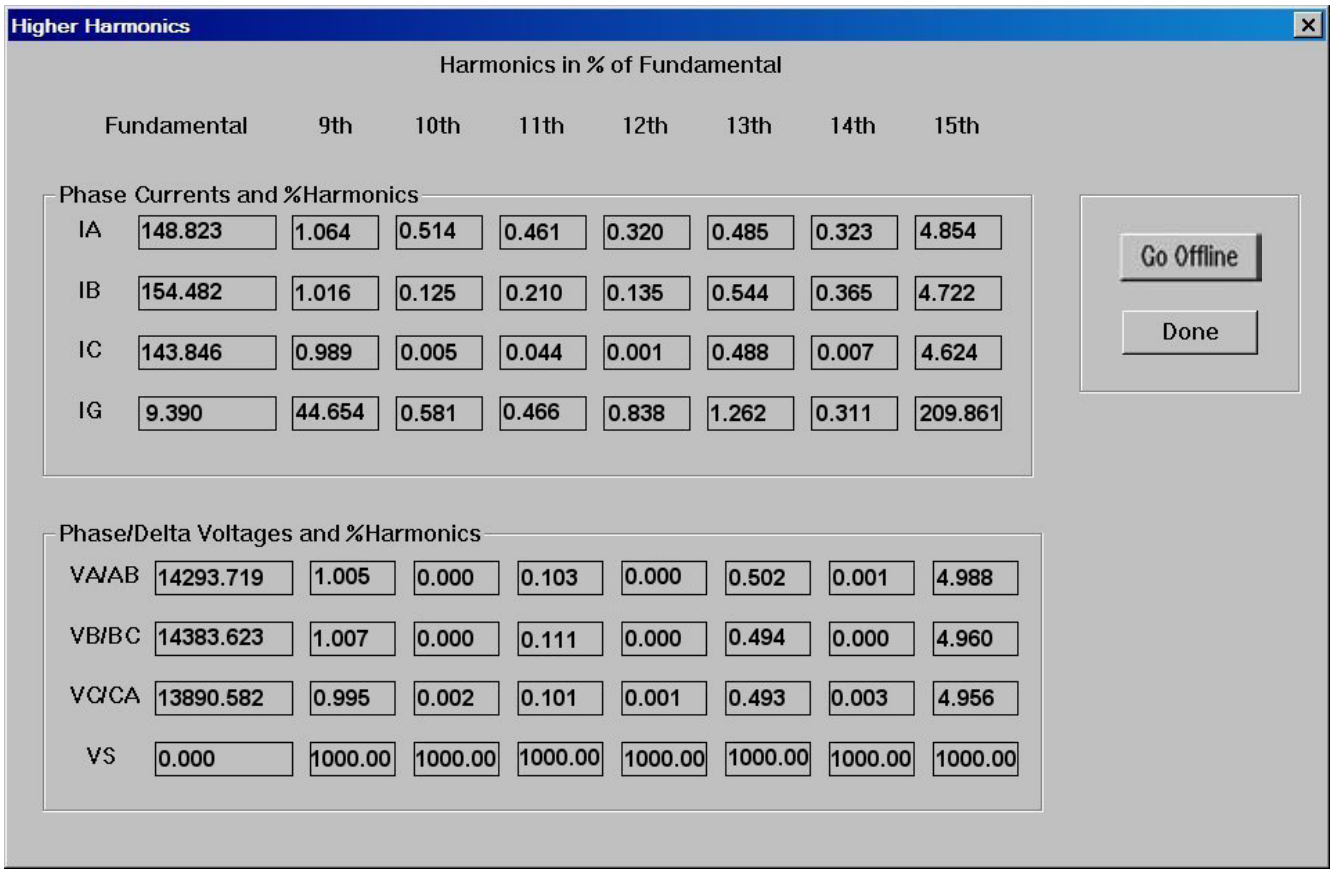
Higher Harmonics



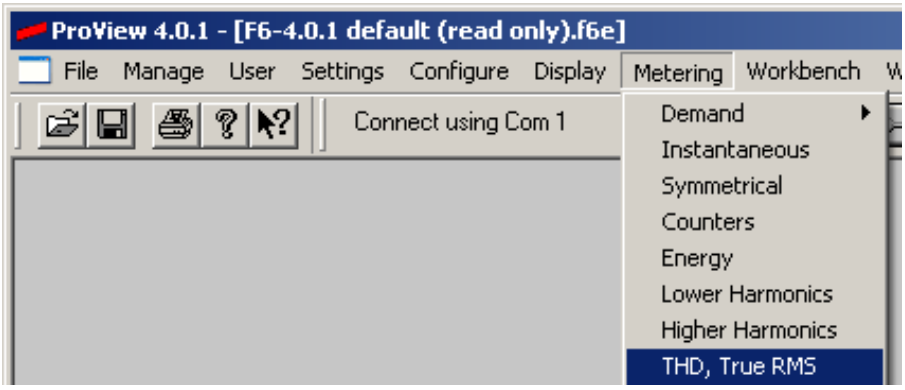
Comprehensive harmonic information is included for three-phase voltages and currents plus neutral current. This analysis includes the ninth through fifteenth harmonics in % of fundamental.

The user must be online to view the higher harmonic values in the control.

Click the Go Online button. The higher harmonic values are displayed.



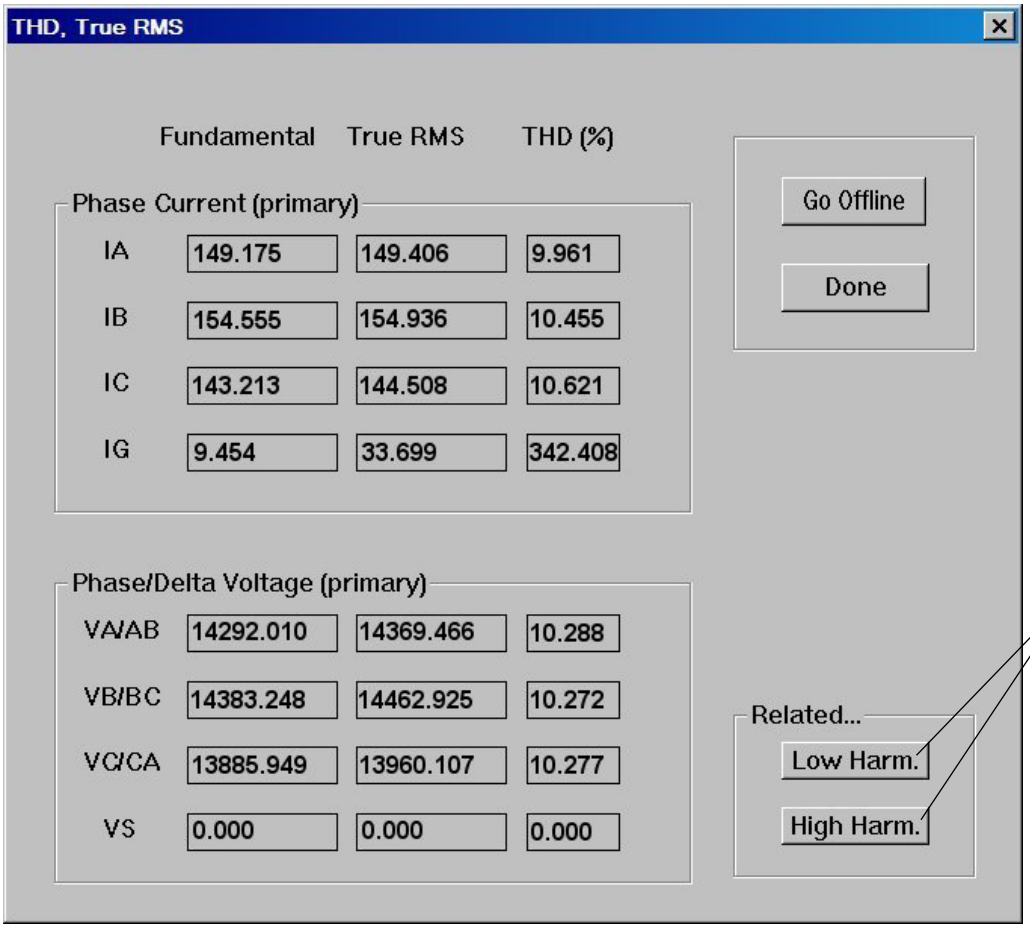
THD, True RMS



Comprehensive harmonic information is included for three-phase voltages and currents plus neutral current. This analysis includes total harmonic distortion in % of fundamental.

The user must be online to view the total harmonic distortion values in the control.

Click the Go Online button. The Fundamental, True Root Mean Square (RMS), and Total Harmonic Distortion (THD) calculations are displayed.



Click the Related Low Harm or High Harm buttons to access the Metering Lower Harmonics or Higher Harmonics screens.

Section 5: Idea Workbench

Introduction

WARNING: Equipment misoperation. Use of an incompatible or inappropriate settings file, scheme file, or custom software file in a control, relay, recloser, or switch can result in equipment misoperation leading to equipment damage, severe personal injury, or death. G140.1

CAUTION: Protective equipment misoperation. Before downloading configuration files or settings to the equipment, verify that the files and settings are correct for the location and application. Downloading configuration files or settings designed for a different location or application can result in severe personal injury and equipment damage. G133.1

CAUTION: System misoperation. The process of downloading a new scheme or settings will cause this device to stop functioning as a protective device for a period of approximately 8 seconds. Safe operating practices must be observed while downloading scheme files or settings. Failure to comply can result in system misoperation. T299.1

CAUTION: Equipment misoperation. Use of the ProView operating system may result in the creation of many combinations of setting files, scheme files, and custom software files. Many of these combinations can be downloaded into any device using ProView operating system. The user must ensure that the proper combination of software modules is created and downloaded to the correct device for the application. G148.0

ProView software includes the Idea Workbench to customize hardware control and status points, serial communication points, front panel function keys, and LED status indicators.

- Select and visualize a multiple logic gate connected to multiple arrays of functions by clicking and dragging.
- Save your Idea Workbench files to be used again as needed, independent of your scheme.
- Quickly program your operating settings with standardized dialog boxes, yet customize your applications with the Idea Workbench.
- Default settings for the control and status points include common functions such as Recloser Lockout, Open, Close, Ground Trip Block, etc.
- Simple user-customization for Supervisory Inputs/ Outputs, LEDs, and Operating functions
- Quick-connect graphic wiring
- Full SCADA input/output availability
- Operational I/O capability

The Workbench menu includes the following screen selections:

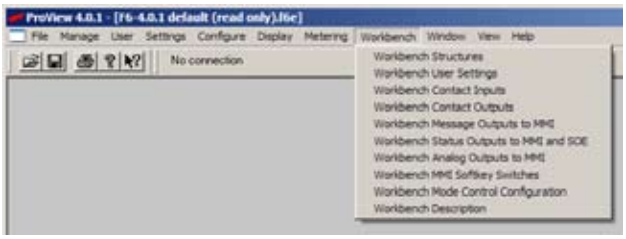
- Workbench Structures
- Workbench User Settings
- Workbench Contact Inputs
- Workbench Contact outputs
- Workbench Message Outputs to MMI
- Workbench Status Outputs to MMI and SOE
- Workbench Analog Outputs to MMI
- Workbench MMI Softkey Switches
- Workbench Mode Control Configuration
- Workbench Description

Important User Information

The Form 6 control offers the user the ability to apply it in a variety of applications, to program its operation over a wide range of parameters, and to customize its operating logic. Those responsible for the application for the Form 6 control must satisfy themselves that the programmed operating parameters and the installed software scheme have been tested to verify that they meet all performance and safety requirements, including any applicable regulations, codes, and standards.

Since there are many variables and user-selected operating characteristics associated with any particular installation, the user should take the necessary steps to assure that the design, configuration, installation, and use of operating software (schemes) are maintained in a secure and controlled manner by properly trained personnel.

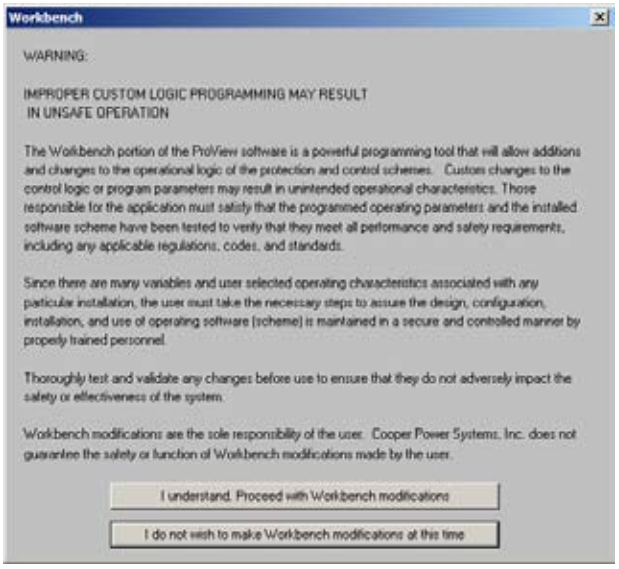
Accessing a Workbench Menu Item



Note: You must be logged in at the Modify access level to create or modify the Idea Workbench. Refer to **Login/Logout** section of this manual.

1. Click on the Workbench main dropdown menu and select a menu item.

   Note: The Workbench Menu is only available when a scheme is open.



A Workbench Warning screen will appear.

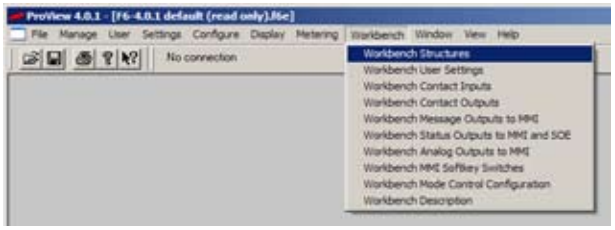
2. Read the contents of the WARNING screen and proceed as follows:
   - Clicking on “I understand. Proceed with Workbench modifications” causes the selected Workbench screen to appear and enables you to have full access to Workbench menu items.
   - Clicking on “I do not wish to make Workbench modifications at this time” returns you to the main menu options with no access to any Workbench menu items.

Each function of the Workbench menu and detailed instructions on accessibility and programming is described in this section of the manual.

Hardware Idea Workbench

The Idea Workbench allows the user to implement any type of custom logic or algorithm with a simple and intuitive drag and drop construction. The user can access any internal signal, any contact input or output, values of analog inputs, or communications inputs. Once the logic or algorithm has been constructed, the result can be used to operate output contacts or have other effects on the Form 6 recloser control. This logic can be analyzed during event playback or with the Virtual Test Set (VTS) feature of ProView.

Loading the Hardware (Form6) Idea Workbench



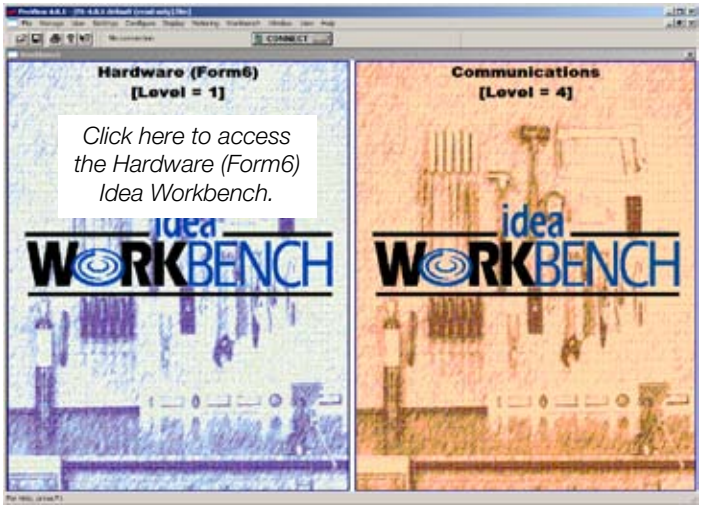
All custom logic is part of the Hardware Idea Workbench.

Open the Hardware Idea Workbench by following the Workbench>Workbench Structures menu path.

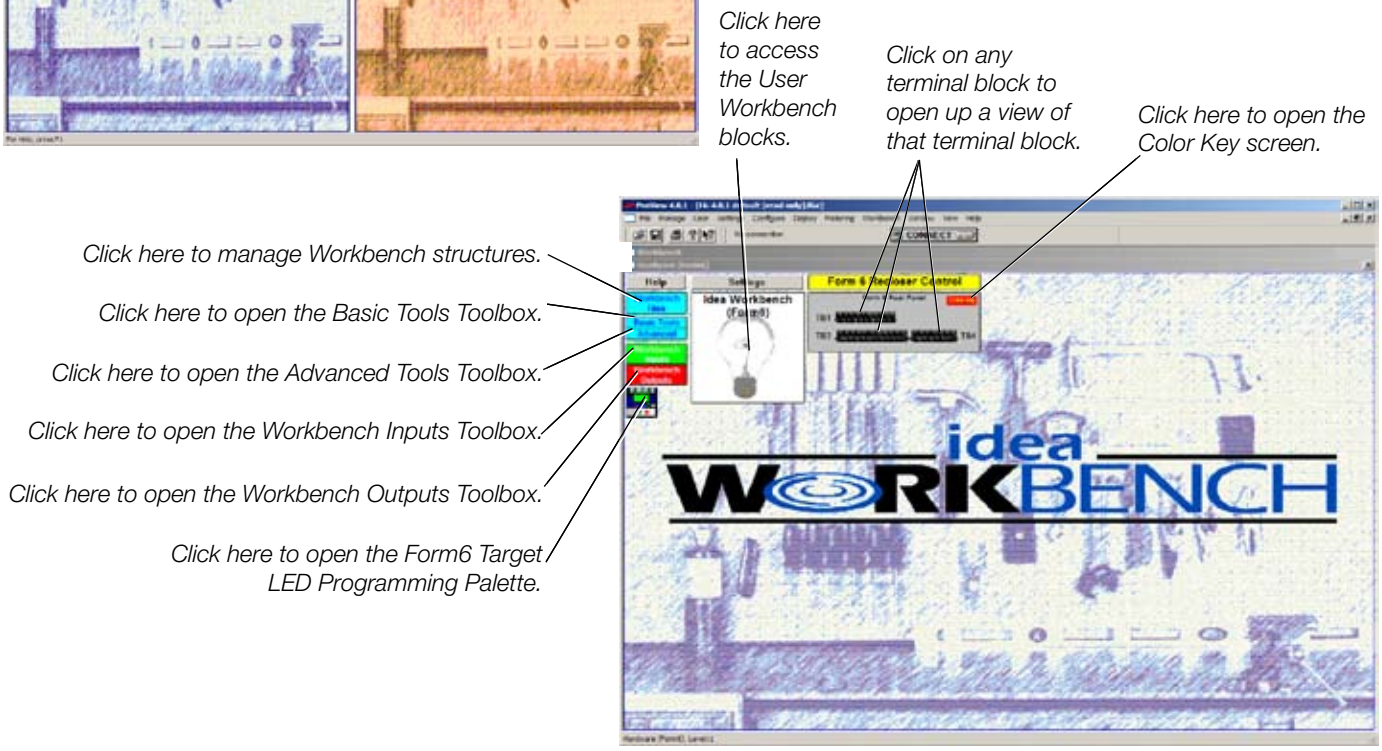
The Idea Workbench split screen will appear.

Click on the Hardware (Form6) Idea Workbench.

The Hardware (Form6) Idea Workbench will appear.



IMPORTANT: When you load a factory-supplied Idea Workbench Structure from disk, you must also read the corresponding Idea Workbench Setting from disk.

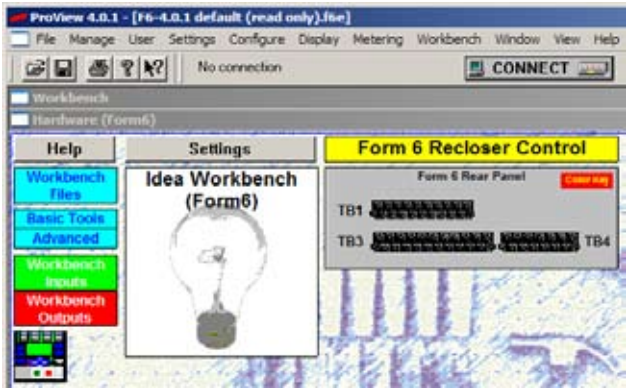


Idea Workbench Structures

CAUTION: Equipment misoperation. Use of the ProView operating system may result in the creation of many combinations of setting files, scheme files, and custom software files. Many of these combinations can be downloaded inot any device using ProView operating system. The user must ensure that the proper combination of software modules is created and downloaded to the correct device for the application. G148.0

WARNING: Equipment misoperation. Use of an incompatible or inappropriate settings file, scheme file, or custom software file in a control, relay, recloser, or switch can result in equipment misoperation leading to equipment damage, severe personal injury, or death. G140.1

CAUTION: Protective equipment misoperation. Before downloading configuration files or settings to the equipment, verify that the files and settings are correct for the location and application. Downloading configuration files or settings designed for a different location or application can result in severe personal injury and equipment damage. G133.1



All custom logic must be placed in one of the User Workbench blocks.

Access the User Workbench blocks as follows:

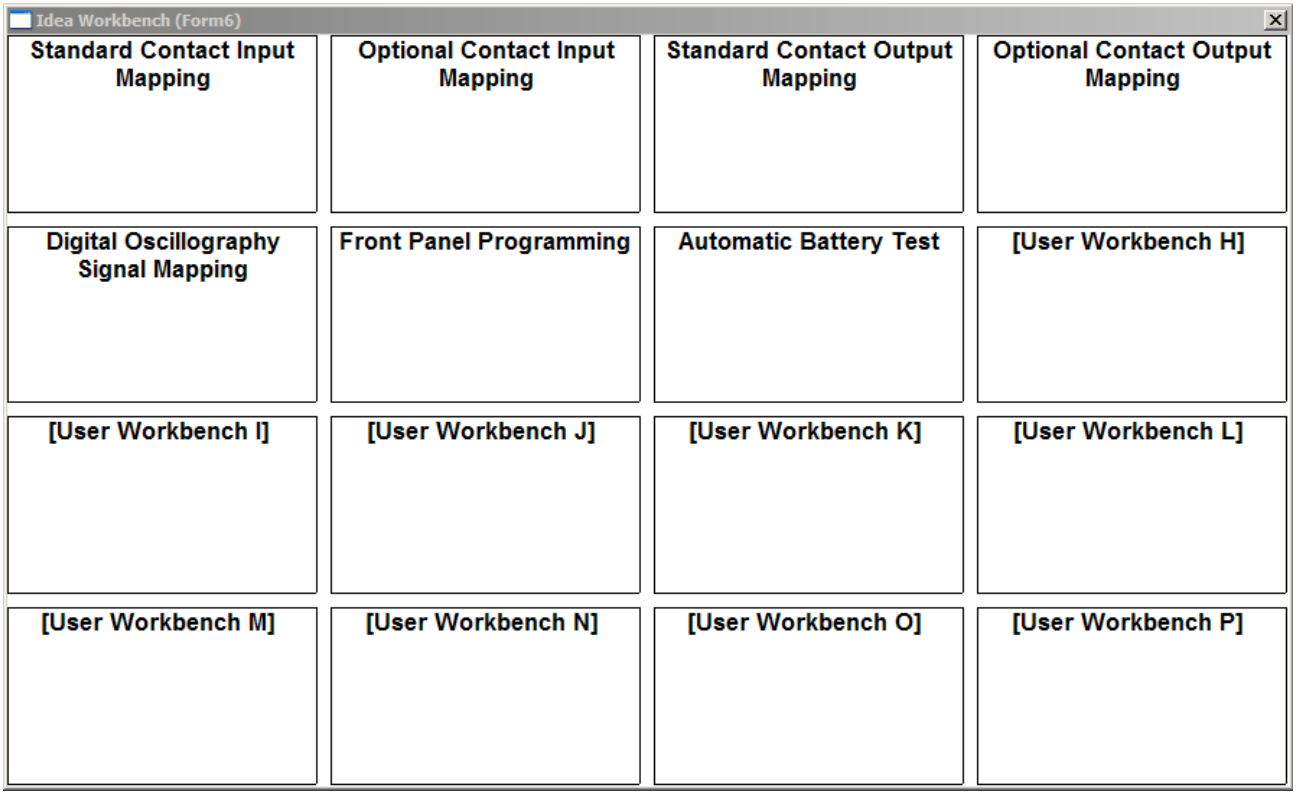
1. Click on the Idea Workbench lightbulb graphic.

This will display the 16 separate blocks where the user can design and segregate custom logic according to function.

2. Click on a block to open the User Workbench for that block.

Custom logic can be placed in one block or divided across many blocks.

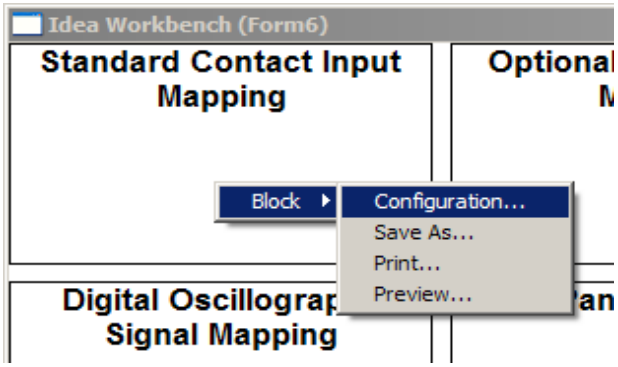
Note: If complex logic is to be developed, the logic should be distributed across more than one User Workbench to maximize the readability of the logic.



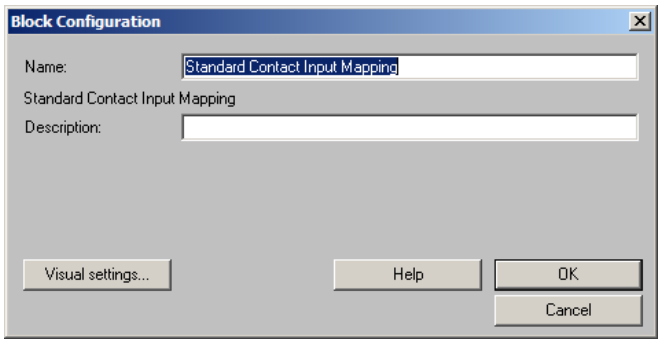
Changing User Workbench Block Names

The User Workbench block names can be changed to easier identify the type of logic contained within that block.

Change the name of a User Workbench block as follows:

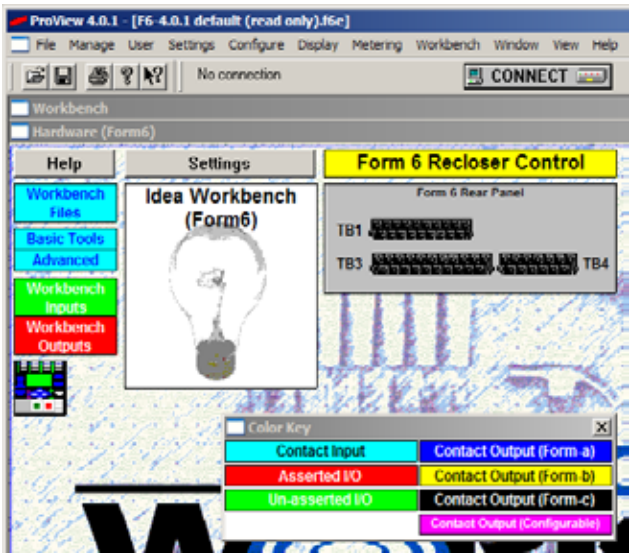


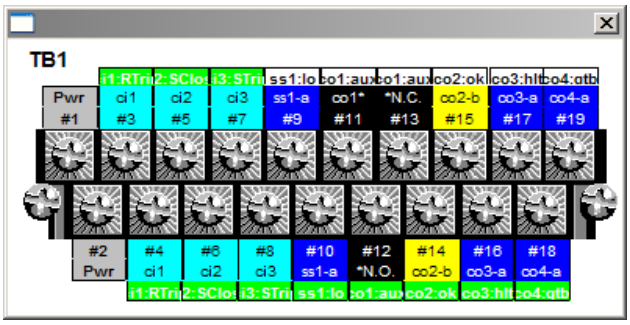
1. Right-click on the block whose name you want to change.
2. Select Block>Configuration from the pop-up menu.



3. In the Name field of the resulting dialog box, enter the new name.
4. Click on OK when done.

Contacts Inputs and Outputs





The Idea Workbench screen includes a representation of the three terminal blocks on the rear panel of the Form 6 recloser control. Clicking on any of the terminal block representations opens up a view of that terminal block.

- Contacts designated "ci" are contact inputs.
- Contacts designated "co" are contact outputs.

Contact outputs can only be used once in the Idea Workbench. This prevents any potential misoperation of the control that would result if an output contact were driven by custom logic in two or more User Workbenches.

The background color of the labels on the contact inputs and outputs reflect their current status. Refer to the Color Key for contacts status.

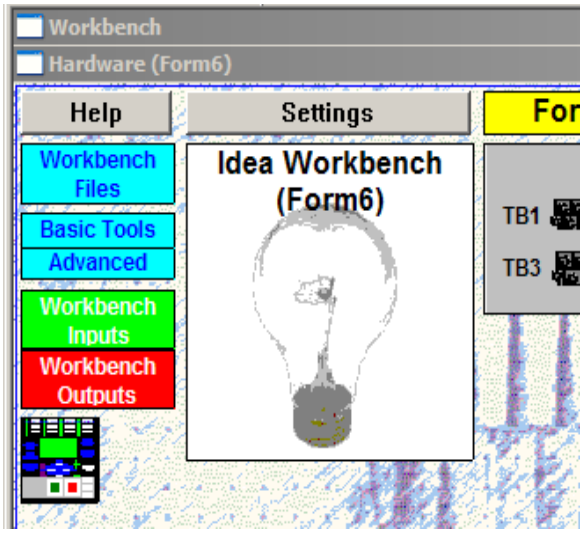
Note: One contact output is designated as SS1, which is a high-speed solid state contact that operates in less than 2 ms. This is pre-assigned to be used to lockout the control.

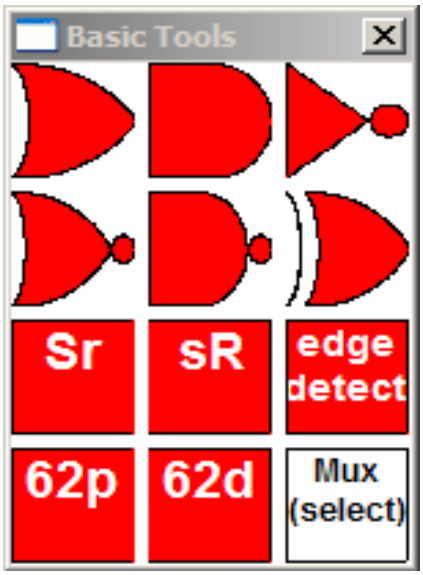
The user can change the name designation of the contact inputs and outputs. A short name can be assigned to the contacts for use in the Idea Workbench view and a longer name can be assigned for use in displaying the name of the contact on the Form 6 control front panel MMI. Refer to **Workbench Contact Inputs and Outputs** section in this manual for additional information.

ProView Idea Workbench capabilities allow the user to custom configure the outputs of the Form 6 control for communications preferences, local targeting, and other user-defined local or remote control.

Contact outputs are provided as Form A (normally open), Form B (normally closed), or Form C (both normally open / normally closed) contacts. Refer to the color key for contact output types.

Basic Tools Toolbox





At the upper-left corner of the Idea Workbench is the Basic Tools toolbox. Click on the Basic Tools toolbox to open and reveal the set of commonly used custom logic-building tools.

Note: All custom logic must be placed in one of the User Workbench blocks.

Access the User Workbench blocks as follows:

1. Click on the Idea Workbench lightbulb graphic.

This will display the 16 separate blocks where the user can design and segregate custom logic according to function.

2. Click on a block to open the User Workbench for that block.

Custom logic can be placed in one block or divided across many blocks.

Note: If complex logic is to be developed, the logic should be distributed across more than one User Workbench to maximize the readability of the logic.

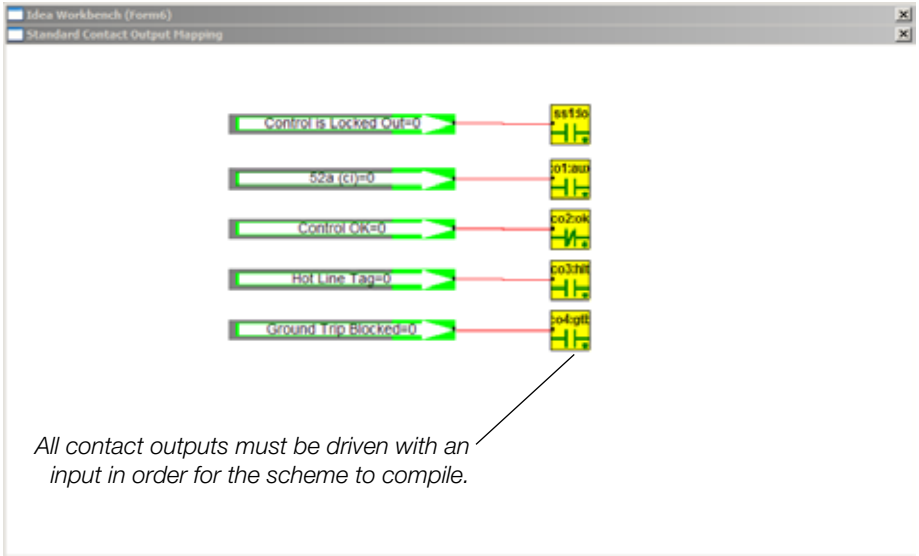
Place a copy of any of these tools into the Idea Workbench white space as follows:

Click on the tool icon and, while holding the left mouse button down, drag the tool icon off of the menu and move the resulting cursor (a small black square) to the white space, and then release the mouse button.

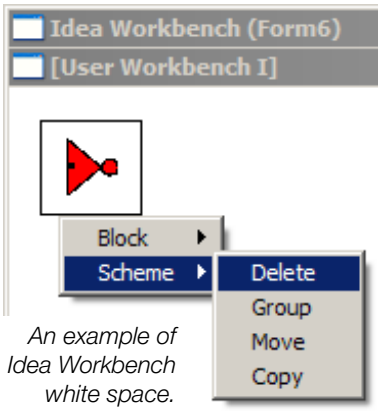
A copy of the tool will be placed in the Idea Workbench as a ProView block.

Move the resulting block by using a left-click-and-hold to grab the block and then move it. Release the left mouse button to stop moving the block.

Delete the resulting block by using a left-click-and-hold to draw a box around the tool. A menu will pop-up. Select Scheme > Delete.

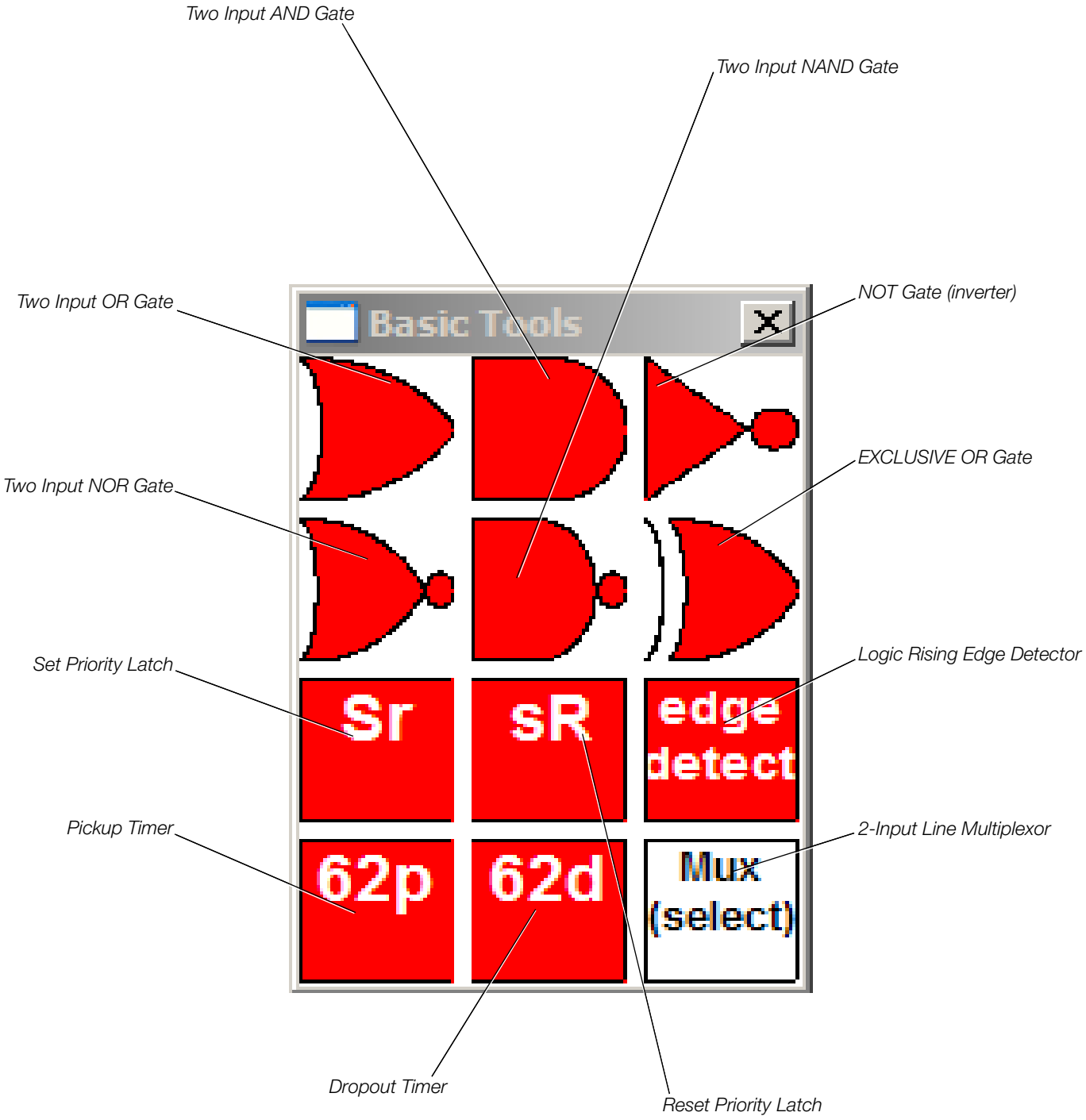


All contact outputs must be driven with an input in order for the scheme to compile.

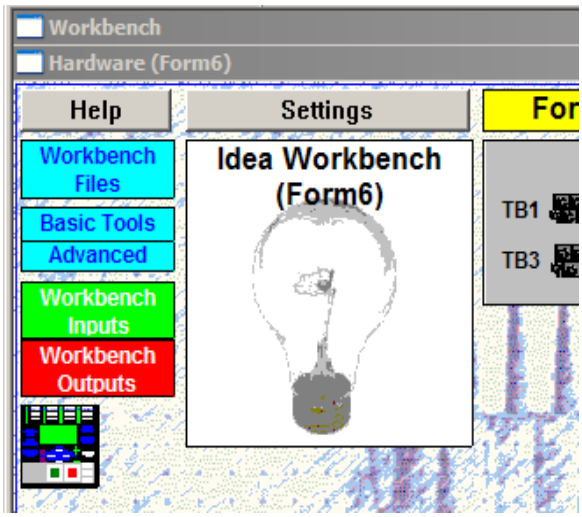


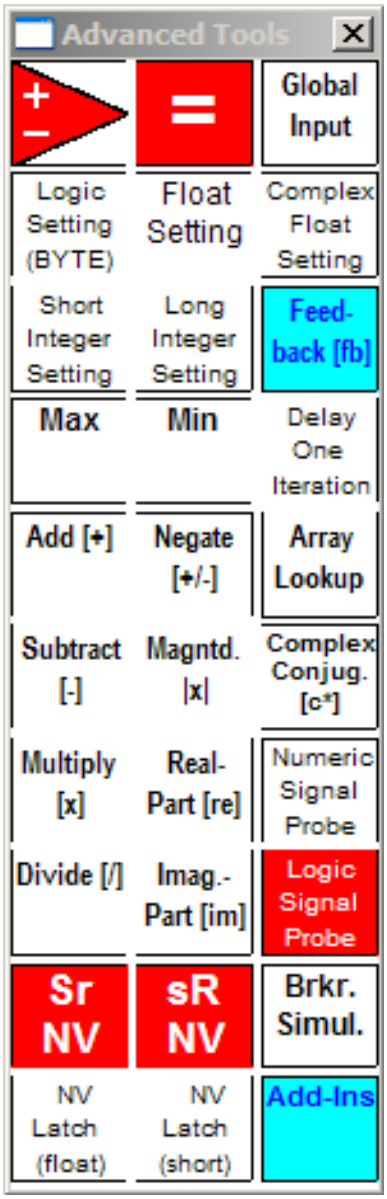
An example of Idea Workbench white space.

Basic Tools Toolbox



Advanced Tools Toolbox





At the upper-left corner of the Idea Workbench is the Advanced Tools toolbox. Click on the Advanced Tools toolbox to open and reveal an advanced set of custom logic building tools, including most mathematical operators.

Note: All custom logic must be placed in one of the User Workbench blocks.

Access the User Workbench blocks as follows:

1. Click on the Idea Workbench lightbulb graphic.

This will display the 16 separate blocks where the user can design and segregate custom logic according to function.

2. Click on a block to open the User Workbench for that block.

Custom logic can be placed in one block or divided across many blocks.

Note: If complex logic is to be developed, the logic should be distributed across more than one User Workbench to maximize the readability of the logic.

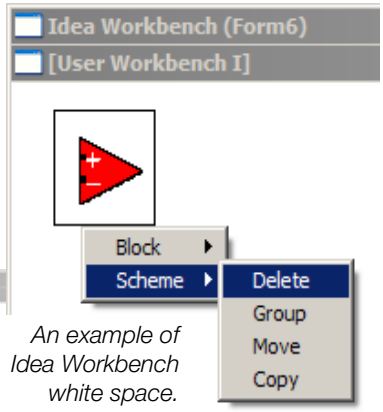
Place a copy of any of these tools into the Idea Workbench white space as follows:

Click on the tool icon and, while holding the left mouse button down, drag the tool icon off of the menu and move the resulting cursor (a small black square) to the white space, and then release the mouse button.

A copy of the tool will be placed in the Idea Workbench as a ProView block.

Move the resulting block by using a left-click-and-hold to grab the block and then move it. Release the left mouse button to stop moving the block.

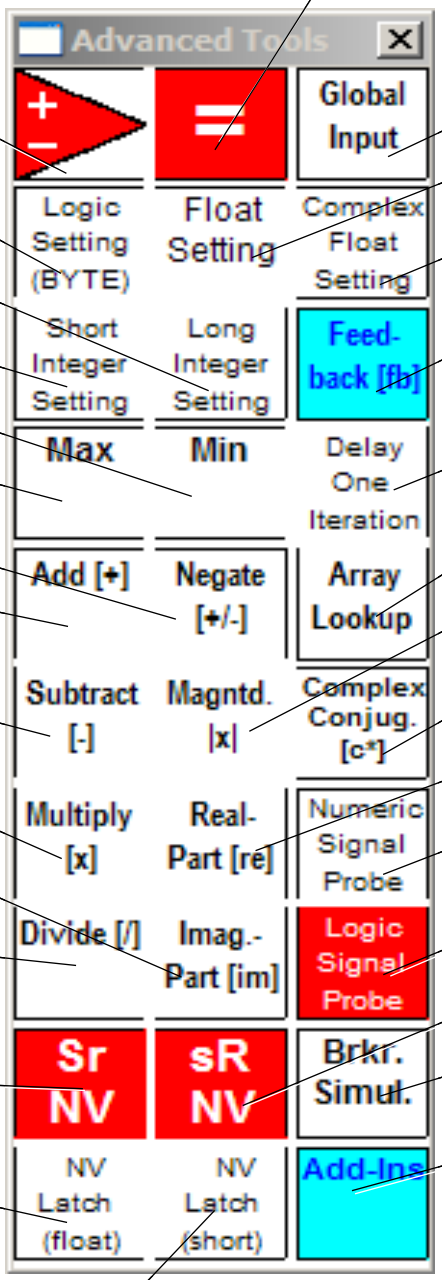
Delete the resulting block by using a left-click-and-hold to draw a box around the tool. A menu will pop-up. Select Scheme > Delete.



An example of Idea Workbench white space.

All contact outputs must be driven with an input in order for the scheme to compile.

Advanced Tools Toolbox



Two Input Equality Operator

Two Input Comparator

Creates a Global Input Variable

Creates a Logic Setting

Creates a Floating Point Setting

Creates a Long Integer Setting

Creates a Complex Setting

Creates a Short Integer Setting

Feedback Operator

Minimum Operator

Delay One Iteration

Maximum Operator

Array Lookup Operator

Negation Operator

Absolute Value Operator

Addition Operator

Complex Conjugate Operator

Subtraction Operator

Real-Part Operator

Multiplication Operator

Numeric Probe (shows numeric value)

Imaginary-Part Operator

Logic Signal Probe

Division Operator

Non-Volatile sR Latch

Breaker Simulator (not for use with the Form 6 control)

Non-Volatile Sr Latch

Non-Volatile Floating Point Numeric Latch

Designated for future add-ins. PeerComm is available as an add-in. Contact your Cooper Power Systems representative for additional information.

PeerComm is covered by United States patent 6,754,789 and pending international patents.

Non-Volatile Short Integer Numeric Latch

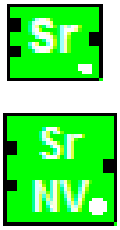
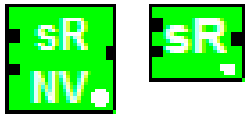
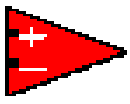
Basic and Advanced Tools Characteristics

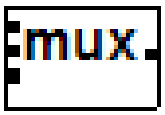
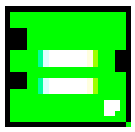
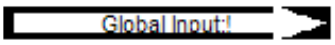
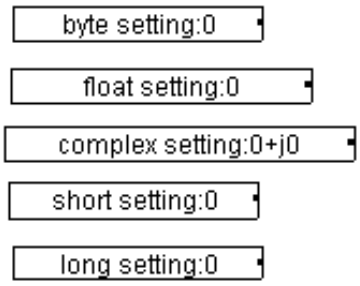
Once a tool is placed in the scheme, it will appear either as a graphic image or as a box with text. The appearance of the input and output terminals for the blocks vary between these types.

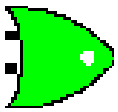
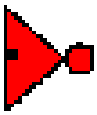
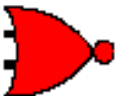
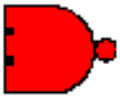
For the logic gates, the input and output terminals can be located by passing the mouse over the gate until the pointer changes from an arrow to a square. Or, for example, a box like :! or :# will appear.

- The :! indicates an input terminal.
- The :# indicates the output terminal.

For the latches and timers, small black squares on the block indicate the terminals. The squares on the left are inputs, and those on the right are outputs. The terminals can be located by passing the mouse over the gate until a box like :! or :# appears.

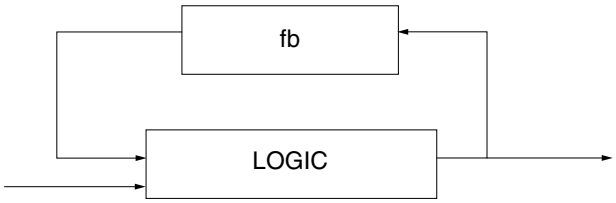
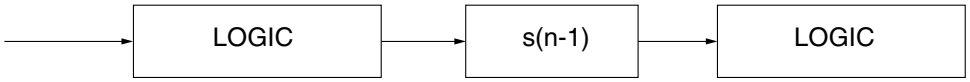
Workbench Icon	Description
	Name: Sr is a Set Priority latch NV Sr is a Non-Volatile Set Priority Latch Function: The single output terminal goes to a Logical 1 whenever the upper-most input terminal (terminal 0) goes to a Logical 1. This Logical 1 output state will be maintained until the input terminal 1 is set high.Input terminal 0 (upper): Sets the latch output to 1. Input terminal 1 (lower): Resets the latch output to 0. If input terminals 0 and 1 are both at a Logical 1, the latch output is SET to a 1. This is SET priority. NV blocks have a limited number of write functions. Use them with discretion and not in frequently executed logic.
	Name: sR is a Reset Priority Latch NV sR is a Non-Volatile Reset Priority Latch Function: The function is the same as the Set Priority Latch except that when input terminals 0 and 1 are both at a Logical 1, the latch output is RESET to a 0. This is RESET priority. NV blocks have a limited number of write functions. Use them with discretion and not in frequently executed logic.
	Name: Edge Detector Function: Creates a Logical one pulse whenever its input transitions from a Logical 0 to a Logical 1. The pulse disappears after 1/16 cycle.
	Name: Magnitude Comparator Function: Compares the value of the two inputs. Input terminal 0 “+” (upper): One of the input quantities should be connected here. Input terminal 1 “-” (lower): The other input quantity should be connected here. Output: The output goes to a Logical 1 if Input terminal 0 “+” is greater than Input terminal 1 “-” (“+”>“-”). The output goes to a logical 0 if Input Terminal 0 “+” is less than or equal to the Input Terminal 1 “-” (“+”≤“-”).
	Name: Pickup Timer Function: Timer starts timing when input transitions from a Logical 0 to a Logical 1. The timer resets whenever the input drops back to a Logical 0 state. Input terminal 0 (upper): When driven by a Logical 1, the timer starts running. When the input changes to a Logical 0, the timer immediately resets to 0. Input terminal 1 (lower): The value of the desired timer duration should be connected here. Do this by dragging a "float setting" from the Advanced Tools Toolbox into the User Workbench and connecting its output to this terminal. Output terminal 0: Goes to a Logical 1 when the timer reaches its setting.

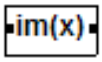
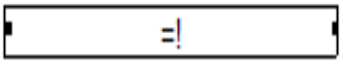
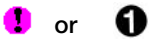
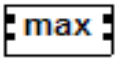
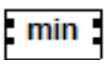
Workbench Icon	Description
	Name: Dropout Timer Function: Output goes to a Logical 1 as soon as Input 0 goes to a Logical 1. The timer starts timing when Input terminal 0 transitions from a Logical 1 to a Logical 0. The output drops to a Logical 0 only after the timer expires. Input terminal 0 (upper): When driven by a Logical 1, the timer is armed. When the input changes to a Logical 0, the timer begins to count down to 0. Input terminal 1 (lower): The value of the desired timer duration should be connected here. Do this by dragging a "float setting" from the Advanced Tools Toobox into the User Workbench and connecting its output to this terminal. Output terminal 0: Goes to a Logical 1 when Input 0 goes to a Logical 1. After Input 0 goes to a Logical 0 the output stays at a Logical 1 until the timer reaches 0.
	Name: Two Input Multiplexor (This function can't be used to drive timer durations.) Function: Passes one of two inputs to its output depending upon the state of the third input. Input terminal 0 (upper): First input signal. Input terminal 1 (middle): Second input signal. Input terminal 2 (lower): Selector input. If a Logical 0, the first input is passed to the output. If a Logical 1, the second input is passed to the output.
	Name: Equality Operator Function: Determines if the two inputs are equal. Both inputs must be of the same data type (integer to integer, float to float, etc). Otherwise, it will cause an error message when ProView prepares to download the logic to the control. Input terminal 0 (upper): Value of first input quantity. Input terminal 1 (lower): Value of second input quantity. Output terminal 0: Goes to a Logical 1 when the values of the two inputs are equal. Otherwise, a Logical 0 is output.
	Name: Global Input Function: To input the value of a global system variable to the Idea Workbench. This is for the advanced user who is developing specific schemes that require low-level operating signals. Usage: **1.** To use the Global input, first drag one into the scheme. **2.** Use the mouse to point to the Global input block and right-click. **3.** Select Block Configuration from the resulting pop-up menu. The Block Configuration dialog box will appear. The text "Global Input" will be in the Name field. **4.** Replace this text with information as directed from the factory. As an example: • "ExecSetup1": This is a binary output that changes to a Logical "1" at the exact moment the control boot-up procedure has ended and the algorithms start running. This signal indicates that the control has started functioning as a control following start-up or a setting group change. An exclamation point in the value means that the signal is not configured correctly. The output is case sensitive.
	Function: All of these blocks provide the ability to introduce settings into the User Workbenches. The name of each block describes the data type created for that setting. Output (0): The value of the setting. This produces a binary setting that can be set to a 0 or 1 only. This is used to drive logic gates, etc. This is a floating point setting. This is used to drive inputs such as timers, comparators, etc. This is a complex, floating point setting. This is typically used to provide settings that are involved in phasor math operations. This is a 16-bit integer setting. The range goes from -32,768 to +32,768. This is a 32-bit integer setting. It is used when an integer setting is required where the setting range goes beyond +32,768.

Workbench Icon	Description
	Name: Two Input AND Gate Function: When both of the inputs at the left side of the AND gate are a Logical 1, the output will be a Logical 1.
	Name: Two Input OR Gate Function: If either, or both, of the inputs at the left side of the OR gate are a Logical 1, the output will be a Logical 1.
	Name: NOT Gate (inverter) Function: The output of this Logic function is inverted from the input signal.
	Name: Two Input NOR Gate Function: OR followed by an inverter. If either, or both, of the inputs at the left side of the OR gate are a Logical 1, the output will be a Logical 0.
	Name: Two Input NAND Gate Function: AND followed by an inverter. When both of the inputs at the left side of the AND gate are a Logical 1, the output will be a Logical 0.
	Name: EXCLUSIVE OR Gate Function: If either of the inputs at the left side of the EXCLUSIVE OR Gate are a Logical 1, the output will be a Logical 1. If both of the inputs are a Logical 1 or both inputs are a Logical 0, the output will be a Logical 0.

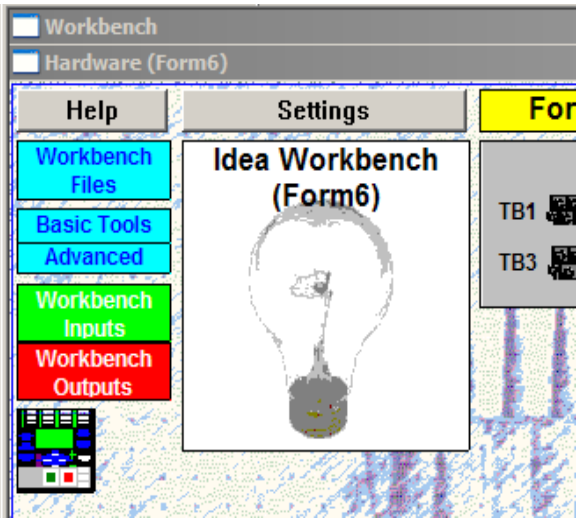
Using the Non-Volatile Analog Latches

The NV Latch Short and NV Latch Float blocks allow the user to create logic to keep track of analog values even in the event the control loses control power.

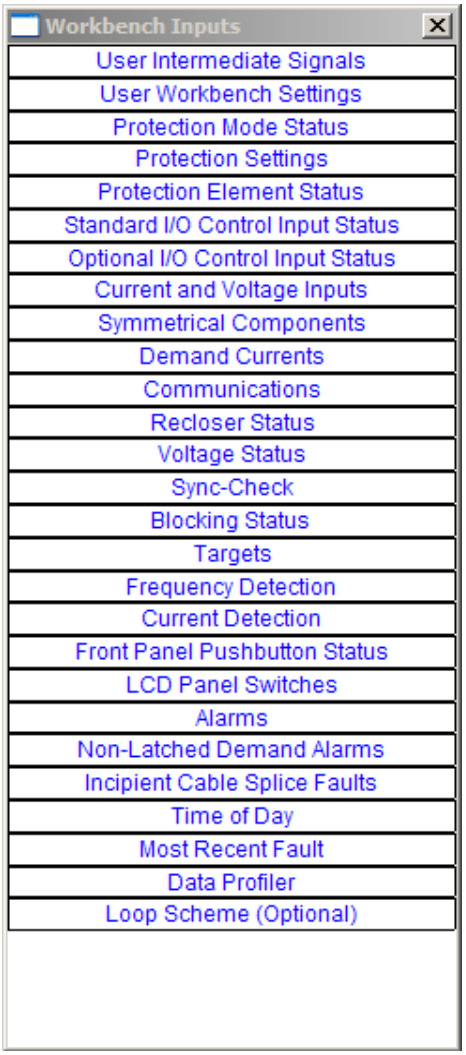
Workbench Icon	Description
fb:byte fb:float fb:long fb:short fb:str21	Name: Feedback Function: This block is used to feed the output of a block to a part of the scheme that is evaluated before the block the signal is taken from. This effectively passes the value of the evaluated variable from the previous computation iteration and uses it in the current iteration. Feedback is data type specific. The usage is as follows: 
s(n-1)	Name: Delay One Iteration Function: This block is used to feed the output of a block to a part of the scheme that is evaluated after the block the signal is taken from. This effectively passes the value of the evaluated variable from the previous computation iteration and uses it in the current iteration. The usage is as follows: 
NV Latch (float)	Name: Non-Volatile Floating Point Latch Function: This module latches the value of the floating point signal driving its upper terminal, input(0), while the BYTE Logic signal connected to the lower terminal Input (1) remains asserted. The module output always shows the last value presented to Input (0) from the most recent time that the capture input Input (1) was in the asserted (i.e. Logical 1) state. This latching function is non-volatile, retaining the most recently latched value through power cycling of the control.
NV Latch (short)	Name: Non-Volatile Short Integer Latch Function: This module latches the value of the short integer signal driving its upper terminal, input(0), while the BYTE Logic signal connected to the lower terminal, input(1) remains asserted. The module output always shows the last value presented to Input(0) from the most recent time that the capture input, Input(1) was in the asserted (i.e. Logical 1) state. The rest of the blocks' behavior is the same as for the non-volatile float latch.
I2[I1]	Name: Array Lookup Function: This module allows you to extract a single value from a one-dimensional array variable. This is used primarily with the Global Input block where the Global signal being accessed is an array. Input (0): This is the top input port. Connect to this a short integer which indicates which individual data point from the array is to be extracted. Note that the first value of the array is index 0, not 1. So an array with 10 values is accessed by using index numbers 9 through 0. Input (1): This is the bottom input port and the port to which the array variable is connected. This can be of any data type.

Workbench Icon	Description
	Name: Addition Operator Function: The output is the addition of the two inputs. The input data types must be the same.
	Name: Negation Operator Function: The output is the same magnitude as the input; however, of a different sign.
	Name: Subtraction Operator Function: The output is the subtraction of the bottom input from the top input. The input data types must be the same.
	Name: Absolute Value Operator Function: The output is the absolute value of the input (magnitude only, no sign).
	Name: Multiplication Operator Function: The output is the multiplication of the values of the two inputs. The input data types must be the same.
	Name: Division Operator Function: The output is the division of the top input by the bottom input. The input data types must be the same.
	Name: Complex Conjugate Operator Function: This operator outputs the complex conjugate of the input. The input must be a complex (x+j y) value. This operator will only be used when dealing with current or voltage phasors.
	Name: Real-Part Operator Function: The output of this operator provides the real part of the input. The input must be a complex value.
	Name: Imaginary-Part Operator Function: The output of this operator provides the imaginary part of the input. The input must be a complex value.
	Name: Numeric Probe (shows numeric value) Function: This block displays the analog value of a signal.
	Name: Logic Signal Probe Function: This block displays the binary status value of a signal.
	Name: Maximum Operator Function: Two outputs - The top output displays the maximum value of the two inputs and the bottom output displays a Logical 1 if the top input is greater than the bottom input. If the top input is less than the bottom input or if the inputs are equal, the bottom output is a Logical 0. The input data types must be the same.
	Name: Minimum Operator Function: Two outputs - The top output displays the minimum value of the two inputs and the bottom output displays a Logical 1 if the top input is greater than the bottom input. If the top input is less than the bottom input or if the inputs are equal, the bottom output is a Logical 0. The input data types must be the same.

Workbench Inputs Toolbox



At the upper-left corner of the Idea Workbench is the Workbench Inputs toolbox. Click on the Workbench Inputs toolbox to display all the possible input signals that can be used in the Idea Workbench.



The Workbench Inputs toolbox gives the user access to various physical and communications system inputs as well as the ability to perform logical functions with the Basic and Advanced Tools.

To access the menu function in a user-defined Workbench scheme, click the desired Workbench input, drag it off the menu, and place it in the Workbench area. Use this Workbench input to create the desired logic functions.

The Menu options are described below:

User Intermediate Signals

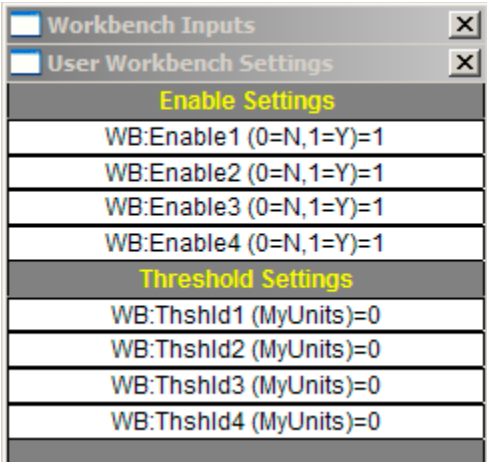
Twenty-five intermediate variables are provided to allow signals to be sent between Workbench blocks. Intermediate variables are defined (driven) from the User Intermediate Signals menu of the Workbench Outputs toolbox. Once defined, the intermediate variables can be used by dragging them out of the User Intermediate Signals menu of the Workbench Inputs toolbox.

User Workbench Settings

Enable Settings

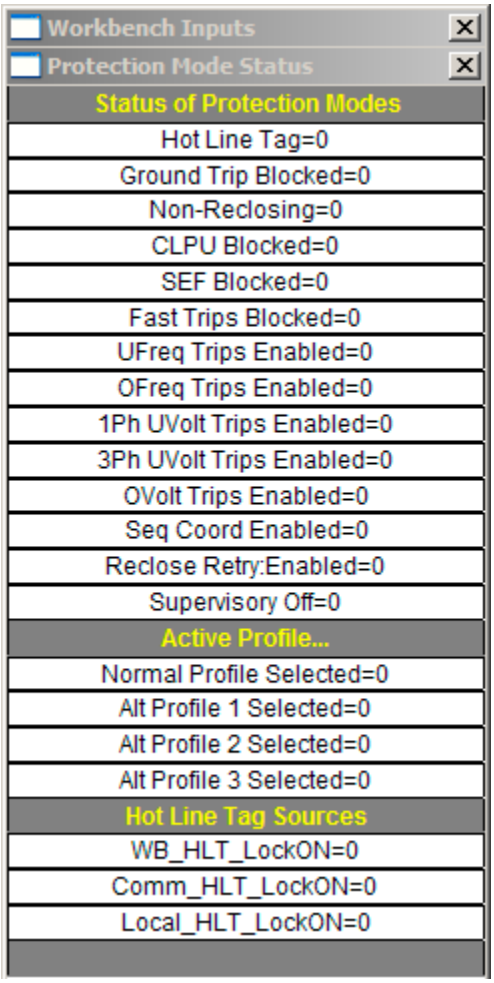
WB enable settings 1 - 4 allow the user to create logic functions within the workbench that can be enabled/disabled via the Workbench User Settings dialog. Separate settings can be entered for each of the four profiles (Normal, Alternate 1, Alternate 2, Alternate 3). A WB Enable is a byte setting identical in function to the "Advanced Tools" "Logic Setting - BYTE", although the WB Enable can be enabled/disabled from outside of the workbench environment.

For example, a user could enable/disable a user created logic function by ANDing the function with one of the WB enables. Then the user can enable/disable the function from within the Workbench User Settings dialog.



Threshold Settings

WB threshold settings 1–4 allow the user to create thresholds whose values will be used in mathematical functions within the workbench. Once the function is created, the threshold value can be changed within the Workbench User Settings dialog. Separate settings can be entered for each of the four profiles (Normal, Alternate 1, Alternate 2, Alternate 3). A WB Threshold is a floating point setting identical in function to the "Advanced Tools" "Float Setting", although the WB threshold value can be modified from outside of the Workbench environment.

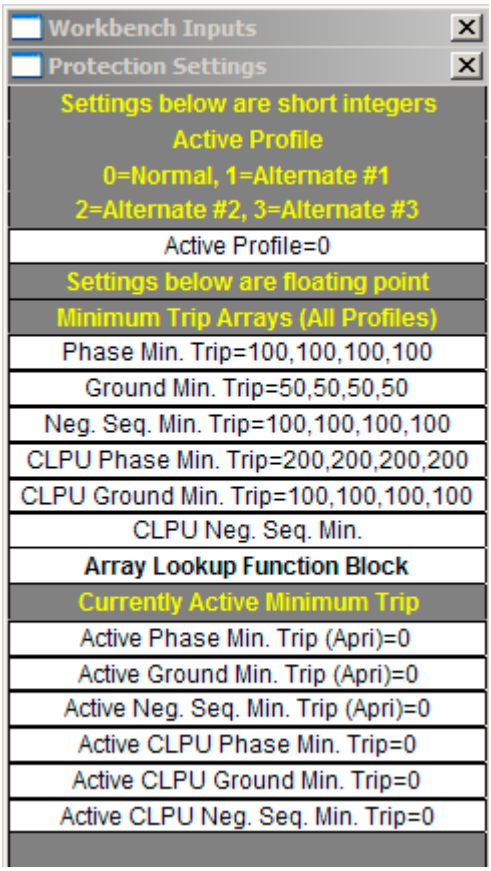


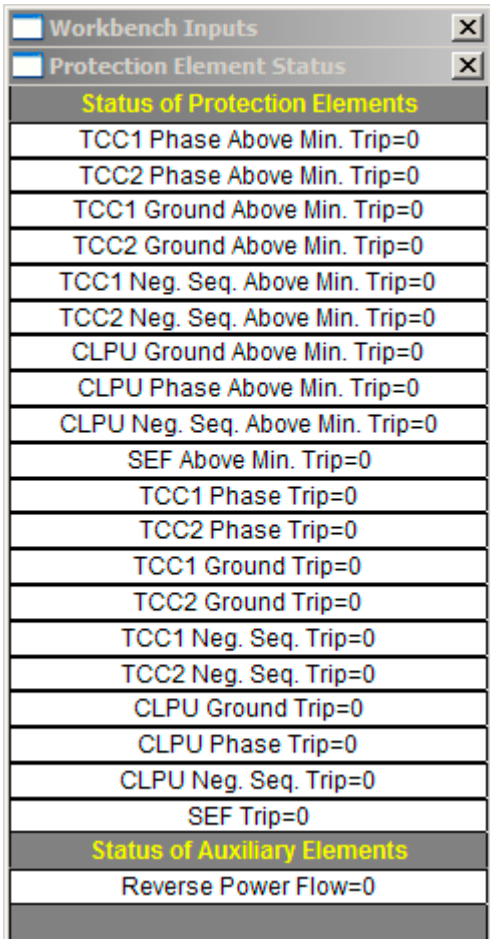
Protection Mode Status

Protection Mode Status menu elements provide annunciation of all Form 6 recloser control protection mode enables. Additionally, this menu provides four individual elements to annunciate the active status of the four protection profiles. Status is shown when On-Line or during event playback.

Protection Settings

Protection Settings menu elements annunciate the active profile, provide minimum trip settings for all four profiles, and provide active minimum trip settings.





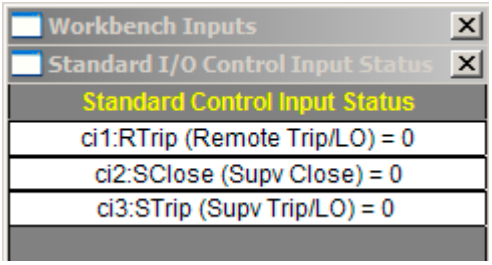
Protection Element Status

Protection Element Status menu elements provide annunciation for 20 TCC, CLPU, SEF, Phase, and Ground timing and trip status indicators. The first 10 logic elements indicate the Timing Active status of the individual protection elements and the last 10 logic elements indicate the Tripped Due To status of the individual protection elements.

Additionally, this menu provides a Reverse Power Flow element that becomes a logical when the Form 6 control senses a Reverse Power Flow condition.

Standard I/O Control Input Status

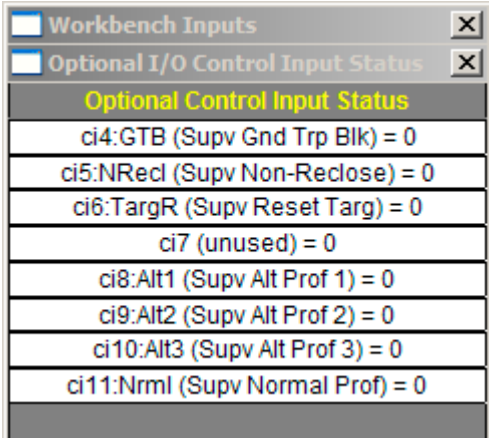
The Standard I/O Control Input Status menu provides elements to annunciate the status of contact inputs CI1, CI2, and CI3 on TB1.

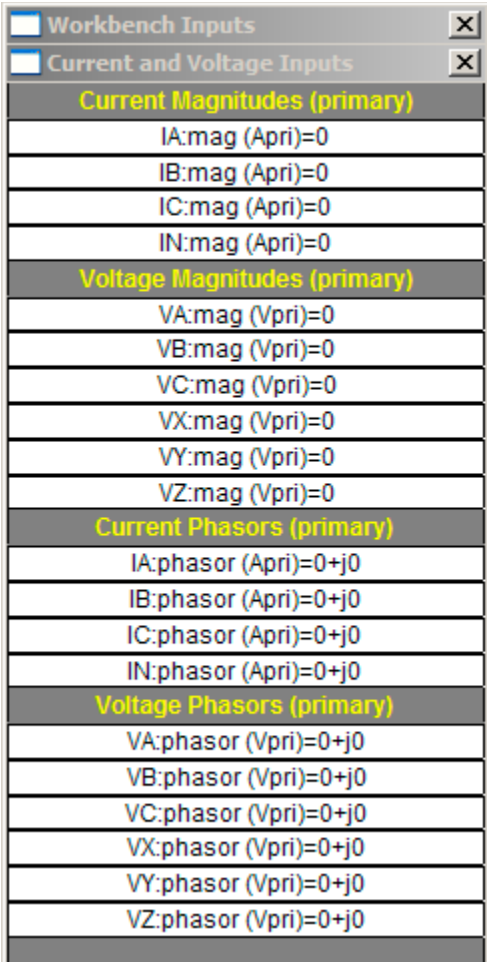


Optional I/O Control Input Status

The Optional I/O Control Input Status menu provides eight additional elements to annunciate the status of Contact Inputs CI4 through CI11 on TB3.

Note: The Optional I/O Control Input Status elements are only valid when an Optional I/O accessory is installed in the Form 6 control.



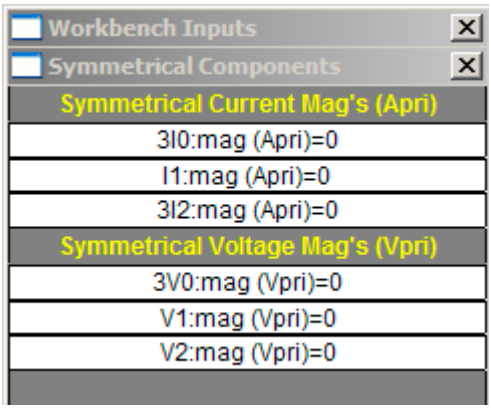


Current and Voltage Inputs

The Current and Voltage Inputs menu contains 20 elements that provide Current and Voltage magnitudes and Current and Voltage Phasors.

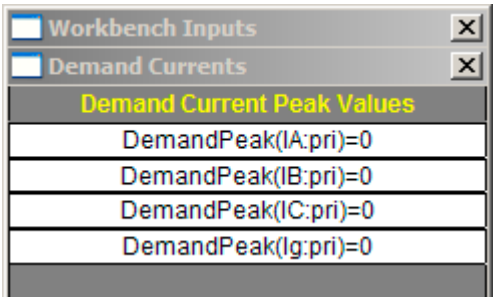
Symmetrical Components

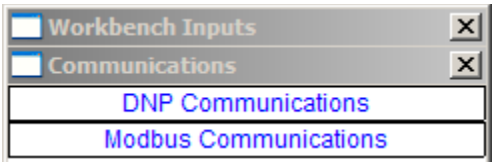
The Symmetrical Components menu provides a total of six analog elements. three elements for Symmetrical Current in primary units, 3I0, I1, 3I2, and three elements for Symmetrical Voltage in secondary units 3V0, V1, and V2.

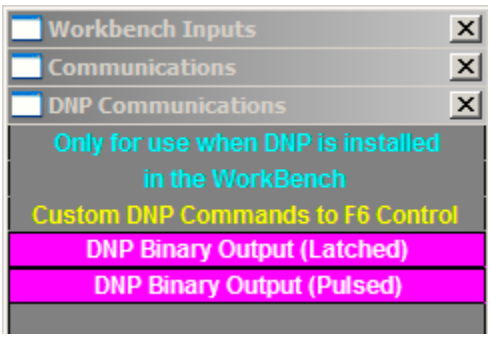


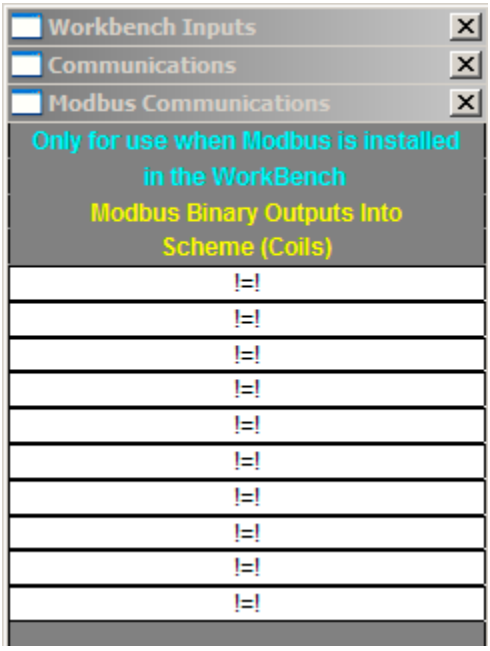
Demand Currents

The Demand Currents menu provides four elements to annunciate demand current peak values for A, B, and C Phase and Ground.









Communications

The Communications menu is divided into two categories:

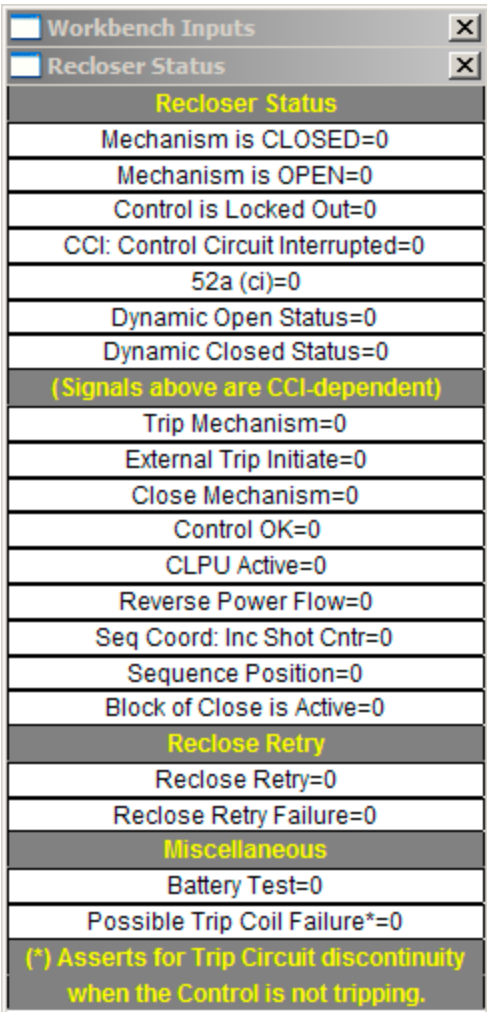
- The DNP Communications menu provides two elements, one for Pulsed Binary Outputs and one for Latched Binary Outputs. These outputs can be used multiple times.

  Note: DNP elements are only active and for use when DNP is installed on the Workbench.

IMPORTANT: The user must ensure the appropriate Binary Output type (latched or pulsed) is applied to the desired Workbench Output function.

- The MODBUS Communications menu provides ten elements representing Modbus Binary Output registers 00023 - 00032. These Binary Outputs can be used only once and are user-defined. Modbus Binary Outputs 1 - 17 are factory-defined, 18 - 22 are not available, and 23 - 32 are user-definable.

  Note: Modbus elements are only active and for use when Modbus is installed on the Workbench.

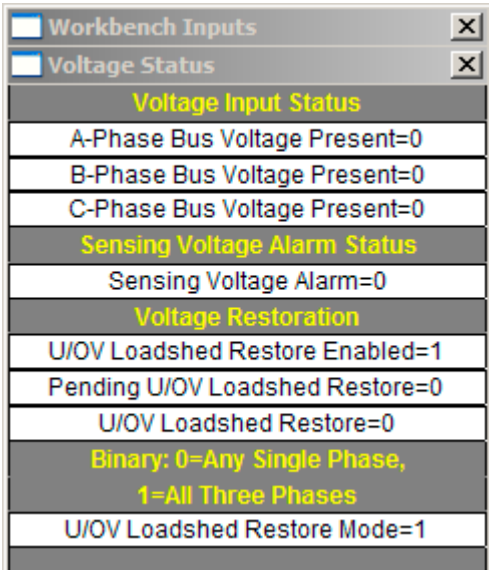


Recloser Status

The Recloser Status menu provides 14 elements to annunciate recloser status, an additional 2 elements to annunciate Reclose Retry Active and Reclose Retry Lockout, and one Battery Test Active element.

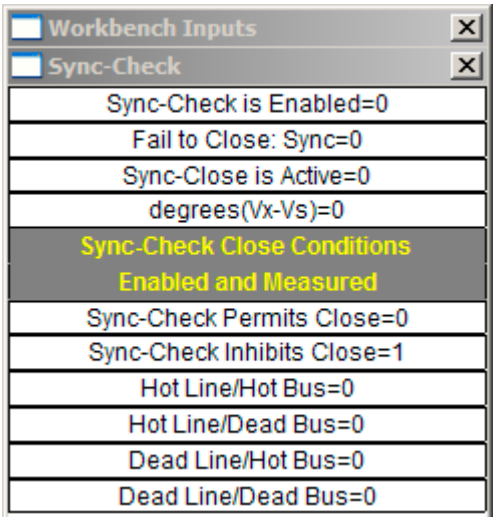
Voltage Status

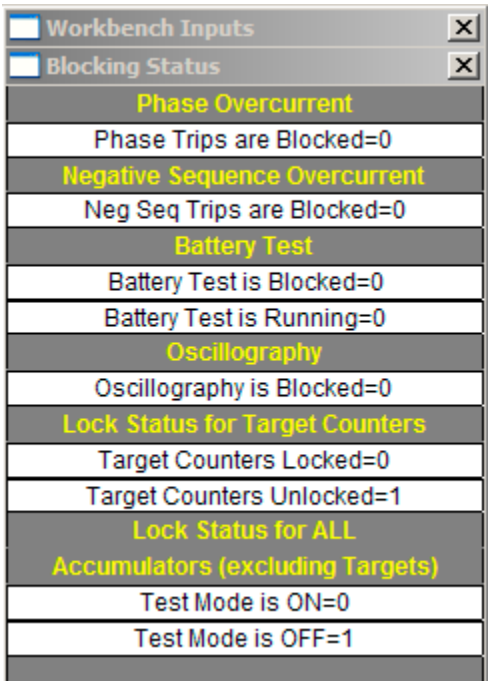
The Voltage Status menu contains three elements to annunciate the presence of Bus Voltage for A, B, and C phases and one logic element to annunciate the Sensing Voltage Alarm Status.

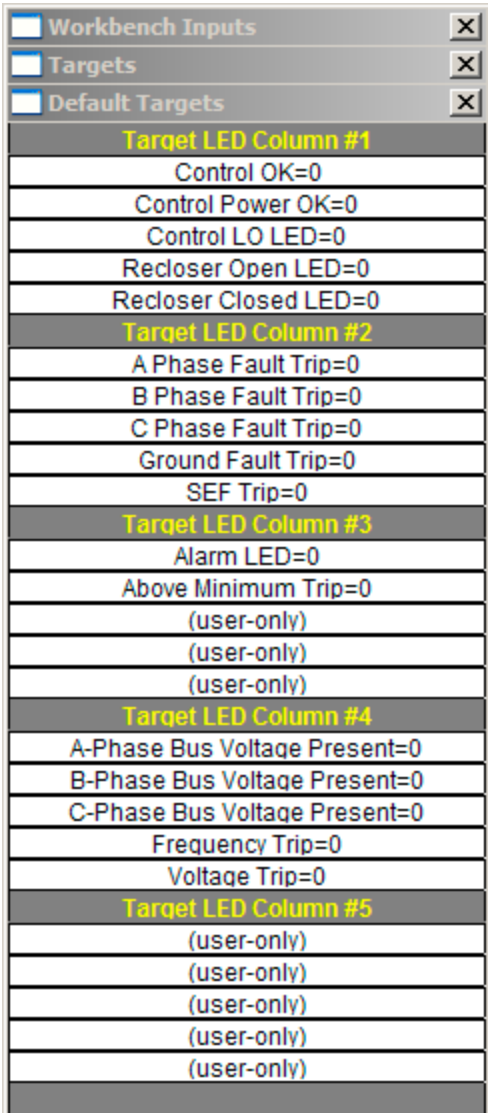


Sync-Check

The Sync-Check menu provides four elements to annunciate sync-check statuses and six elements to annunciate enabled and measured sync-check Close conditions.





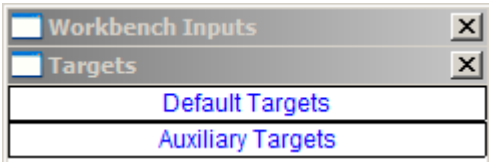


Blocking Status

The Blocking Status menu provides elements to annunciate the blocking status of Phase Overcurrent, Negative Sequence Overcurrent, Battery Test, Oscillography, Lock Status for Target Counters, and Lock Status for All Accumulators (excluding Targets).

Targets

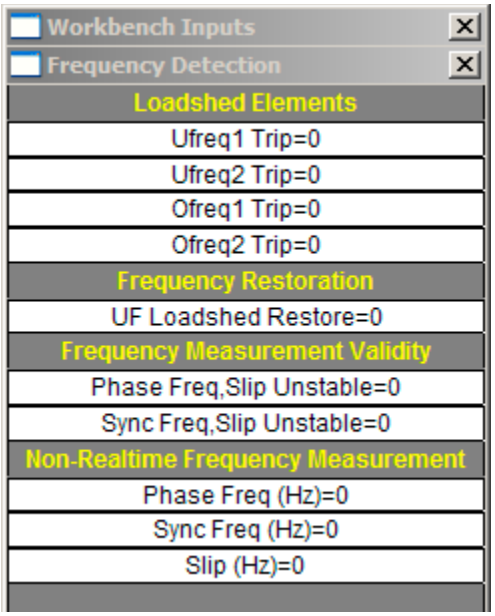
The Targets menu provides elements that annunciate the status of various protective functions.



All targets are latched until an unlatching event occurs (unless otherwise noted). Targets can be de-asserted either manually (via a remote or local target reset signal) or automatically, based on a user-settable time delay after a successful close operation. Targets are also superseded by any subsequent tripping action of the control.

The Default Targets menu provides elements to annunciate the status of the 25 Form 6 control front panel LEDs.

Refer to **Auxiliary Targets** in this section for information regarding the 23 auxiliary targets.



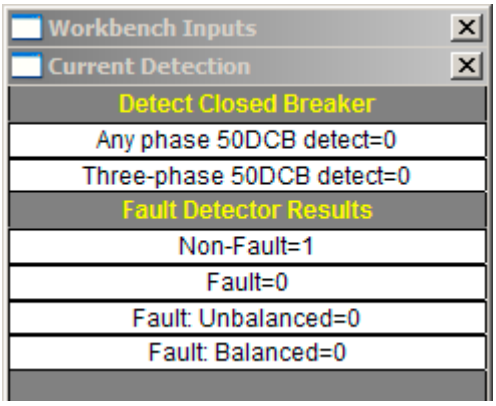
Frequency Detection

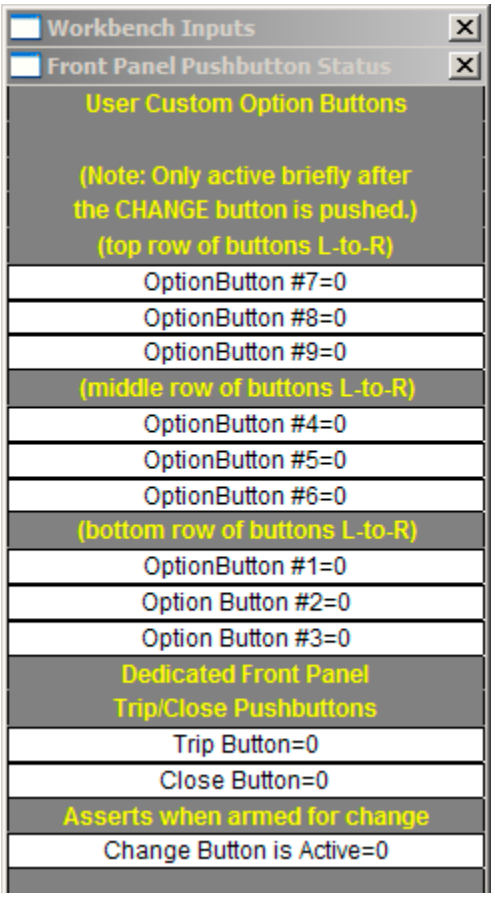
The Frequency Detection menu provides 10 elements to indicate Frequency related quantities and status.

Four elements annunciate the status of under and overfrequency loadshed, one provides Frequency Restoration status, three provide Frequency Measurement analogs, and two validate Frequency Measurement.

Current Detection

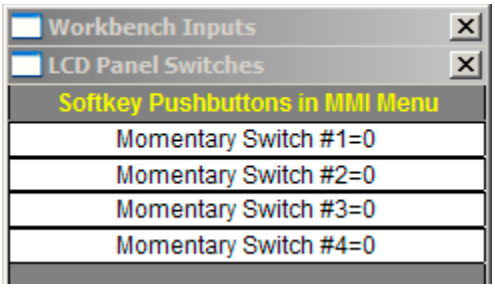
The Current Detection menu provides a total of six elements, two of the elements annunciate detection of any single or three phase current. The remaining four elements annunciate Fault Detection results.





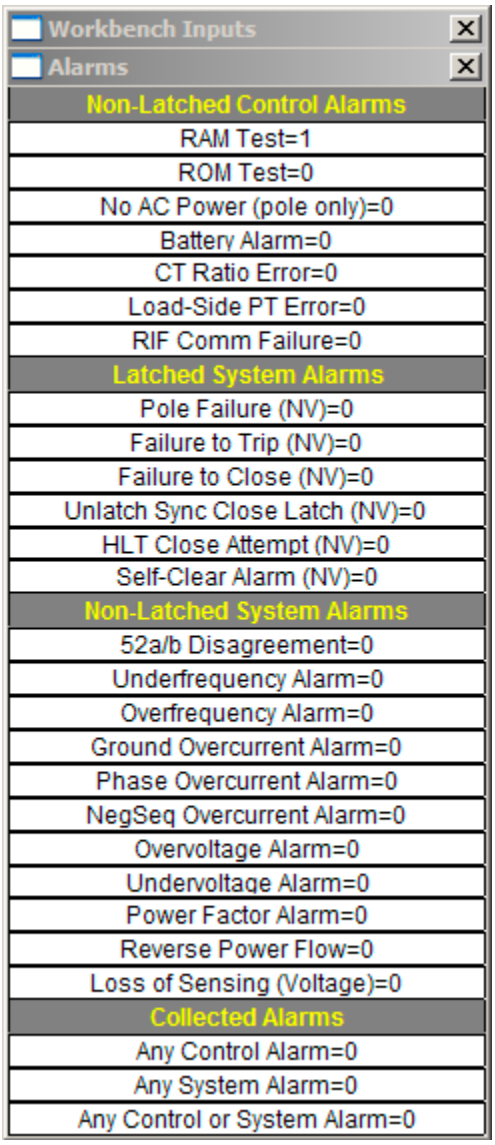
Front Panel Pushbutton Status

The Front Panel Pushbutton Status menu provides a total of 12 elements. The first nine elements indicate actuation of the User Configured Option Buttons located on the Form 6 recloser control MMI. Two elements indicate actuation of the Trip and Close front panel pushbuttons. One element indicates the Change button is active.



LCD Panel Switches

The LCD Panel Switches menu provides four elements to indicate actuation of the MMI Softkey Pushbuttons.

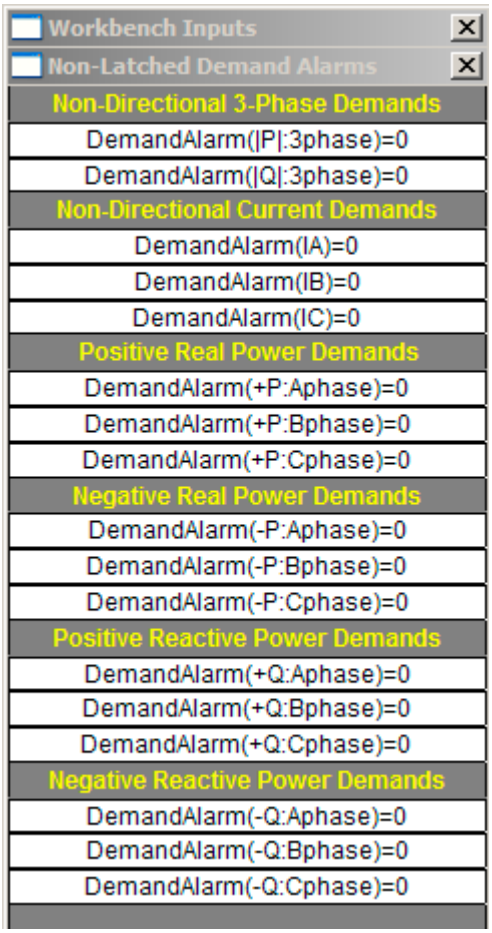


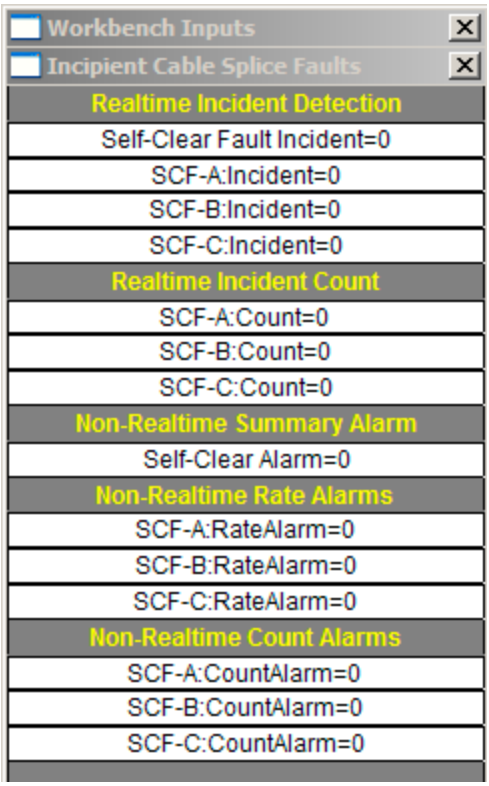
Alarms

The Alarms menu provides a total of 27 elements to annunciate Control, System, and Collected alarms.

Non-Latched Demand Alarms

The Non-Latched Demand Alarms menu provides a total of 17 elements to annunciate Demand alarms.





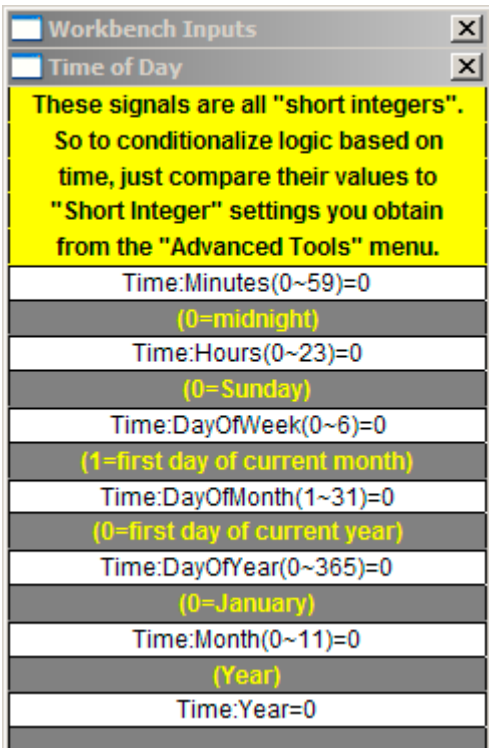
Incipient Cable Splice Faults

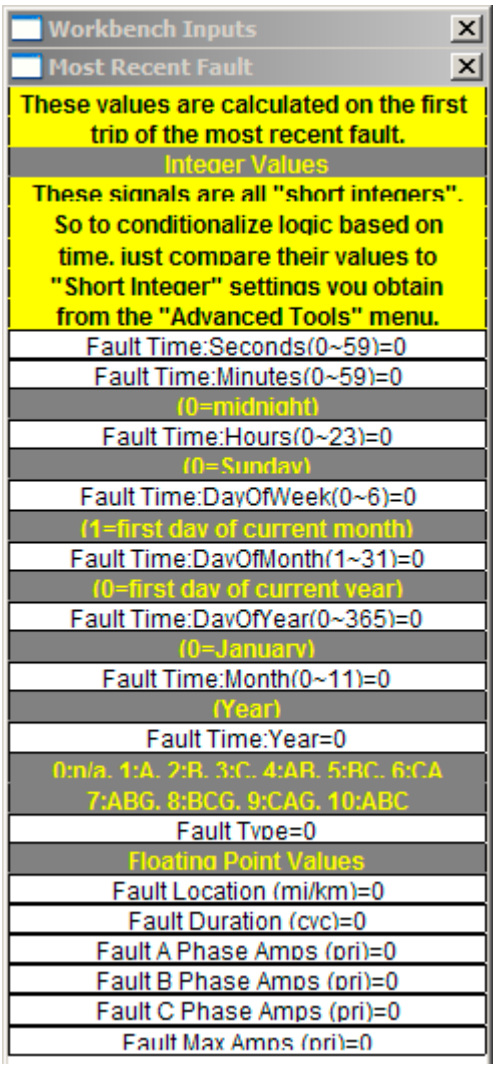
The Incipient Cable Splice Faults menu provides a total of 14 elements to annunciate A, B, and C phase Realtime Incident Detection and Count and Non-Realtime Summary, Rate, and Count Alarms.

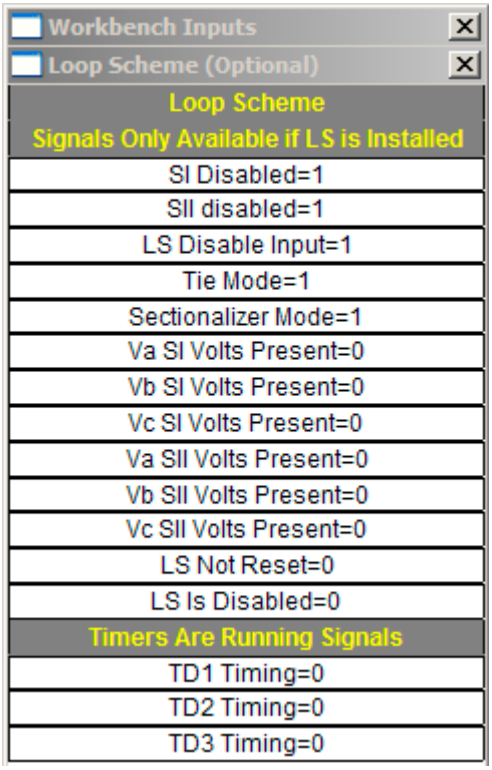
Time of Day

The Time of Day menu provides seven elements to indicate Minutes, Hours, Day of Week, Day of Month, Day of Year, Month, and Year.

Note: The values represented by these elements are all Short Integers. Short Integers are any number between 0 and 32,000. To conditionalize custom logic based on time, you must compare their values to Short Integer settings obtained from the Advanced Tools toolbox.







Most Recent Fault

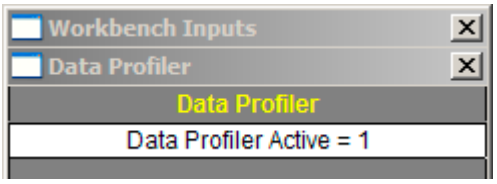
The Most Recent Fault menu provides a total of 15 elements to annunciate the time, type duration, location and magnitude of the first trip of the most recent fault. All values are generated by fault locator algorithms.

Note: The values represented by these elements are all Short Integers. Short Integers are any number between 0 and 32,000. To conditionalize custom logic based on time, you must compare their values to Short Integer settings obtained from the Advanced Tools toolbox.

Note: The fault locator requires three voltages to be present for proper calculation of the fault location. Refer to **System Configuration** in **Configure** section for additional information.

Data Profiler

The Data Profiler menu provides one element to annunciate the Data Profiler status.

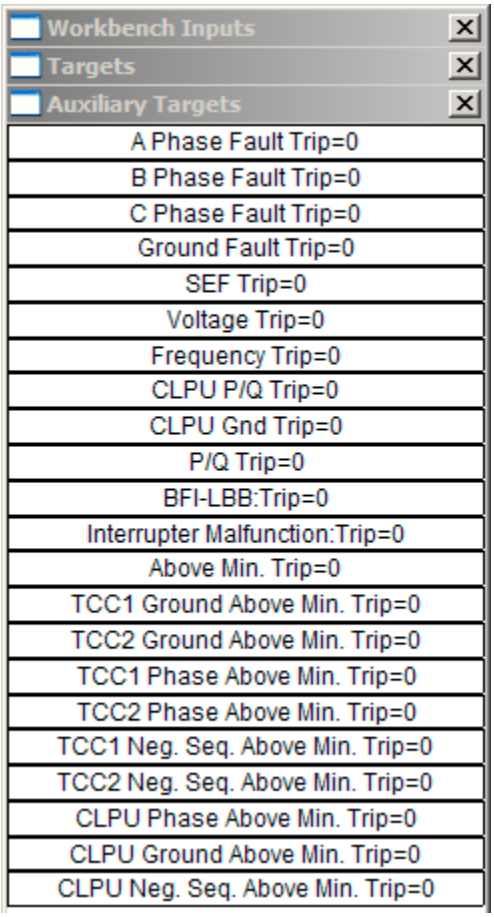


Loop Scheme (Optional)

The signals in this menu are only available for Form 6 controls with the LS option installed. The Loop Scheme menu provides 13 intermediate variables to allow signals to be sent between Workbench blocks. There are also three Timers Are Running Signals.

Note: Form 6-LS control users must load the Form 6-LS default Workbench scheme. Refer to **Form 6 Loop Scheme Control** in **Section 5** for additional information.

Auxiliary Targets



A Phase Fault Trip

A target indicating that the A-phase current was either the maximum phase current or within 80% of the maximum when a trip signal was issued.

1 = An A-phase trip occurred.

B Phase Fault Trip

A target indicating that the B-phase current was either the maximum phase current or within 80% of the maximum when a trip signal was issued.

1 = A B-phase trip occurred.

C Phase Fault Trip

A target indicating that the C-phase current was either the maximum phase current or within 80% of the maximum when a trip signal was issued.

1 = A C-phase trip occurred.

Ground Fault Trip

A target indicating that a Ground tripping function was asserted at the time the trip signal was asserted.

1 = A ground involved trip occurred.

SEF Trip

A target indicating that the sensitive Earth fault tripping function was asserted at the time the trip signal was asserted.

1 = An SEF trip occurred.

Voltage Trip

A target indicating that an overvoltage or undervoltage tripping function was asserted at the time the trip signal was asserted.

1 = A voltage involved trip occurred.

Frequency Trip

A target indicating that an overfrequency or underfrequency tripping function was asserted at the time the trip signal was asserted.

1 = A frequency involved trip occurred.

CLPU P/Q Trip

A target indicating that Cold Load Pickup Phase or Negative Sequence function was asserted at the time the trip signal was asserted.

1 = A Cold Load Pickup phase or negative sequence trip occurred.

CLPU Gnd Trip

A target indicating that a Cold Load Pickup Ground tripping function was asserted at the time the trip signal was asserted.

1 = A Cold Load Pickup ground involved trip occurred.

P/Q Trip

A target indicating that Phase or Negative Sequence function was asserted at the time the trip signal was asserted.

1 = A phase or negative sequence trip occurred.

BFI-LBB: Trip

A Breaker Failed/Initiate Local Breaker Backup condition was detected because the local mechanism did not trip in the desired time after issuing a trip signal to the mechanism. Breaker fail action should be initiated.

1 = A breaker fail condition exists, and a trip and lockout signal has been sent to the connected mechanism.

Note: This is not a maintained signal and is only active while the condition exists.

Interrupter Malfunction: Trip

An Interrupter malfunction has been detected in the connected mechanism. Current did not extinguish within five seconds of the trip signal being issued. Breaker fail action should be initiated.

1 = An Interrupter malfunction condition exists, and a trip and lockout signal has been sent to the connected mechanism.

Note: This is not a maintained signal and is only active while the condition exists.

Above Minimum Trip

A target indicating one of the currents through the recloser are above one of the Minimum Trip (phase, ground, or negative sequence, or CLPU thresholds, if CLPU is active) settings.

1 = The measured current is above one of the minimum trip thresholds.

Note: This is not a maintained signal and is only active while the condition exists.

TCC1 Ground Above Min. Trip

A target indicating the calculated residual current through the recloser is above the TCCG Minimum Trip setting and that TCC1 is the active TCC.

1 = The calculated residual current is above the TCCG threshold and TCC1 is timing.

Note: This is not a maintained signal and is only active while the condition exists.

TCC2 Ground Above Min. Trip

A target indicating the calculated residual current through the recloser is above the TCCG Minimum Trip setting and that TCC2 is the active TCC.

1 = The calculated residual current is above the TCCG threshold and TCC2 is timing.

Note: This is not a maintained signal and is only active while the condition exists.

TCC1 Phase Above Min. Trip

A target indicating one of the currents through the recloser is above the TCCP Minimum Trip setting and that TCC1 is the active TCC.

1 = The measured current is above the TCCP threshold and TCC1 is timing.

Note: This is not a maintained signal and is only active while the condition exists.

TCC2 Phase Above Min. Trip

A target indicating one of the currents through the recloser is above the TCCP Minimum Trip setting and that TCC2 is the active TCC.

1 = The measured current is above the TCCP threshold and TCC2 is timing.

Note: This is not a maintained signal and is only active while the condition exists.

TCC1 Neg. Seq. Above Min. Trip

A target indicating the calculated negative sequence current through the recloser is above the TCCQ Minimum Trip setting and that TCC1 is the active TCC.

1 = The calculated negative sequence current is above the TCCQ threshold and TCC1 is timing.

Note: This is not a maintained signal and is only active while the condition exists.

TCC2 Neg. Seq. Above Min. Trip

A target indicating the calculated negative sequence current through the recloser is above the TCCQ Minimum Trip setting and that TCC2 is the active TCC.

1 = The calculated negative sequence current is above the TCCQ threshold and TCC2 is timing.

Note: This is not a maintained signal and is only active while the condition exists.

CLPU Phase Above Min. Trip

A target indicating one of the currents through the recloser is above the CLPUP Minimum Trip setting and that Cold Load Pickup is active.

1 = The measured current is above the CLPUP threshold and the CLPUP TCC is timing.

Note: This is not a maintained signal and is only active while the condition exists.

CLPU Ground Above Min. Trip

A target indicating the calculated residual current through the recloser is above the CLPUG Minimum Trip setting and that Cold Load Pickup is active.

1 = The calculated residual current is above the CLPUG threshold and the CLPUG TCC is timing.

Note: This is not a maintained signal and is only active while the condition exists.

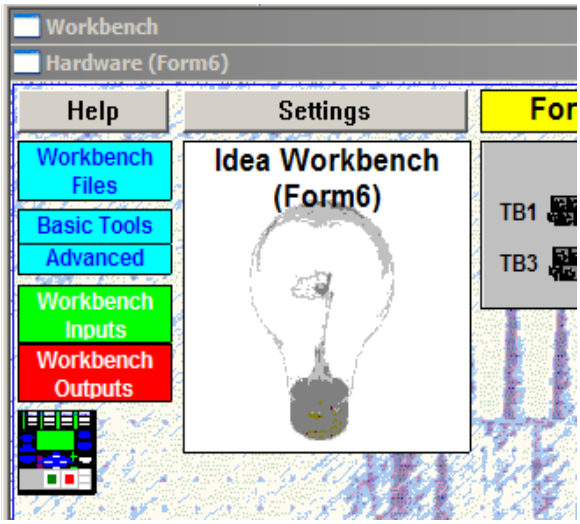
CLPU Neg. Seq. Above Min. Trip

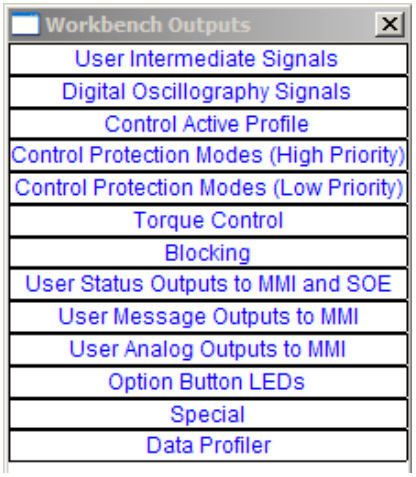
A target indicating the calculated negative sequence current through the recloser is above the CLPUQ Minimum Trip setting and that Cold Load Pickup is active.

1 = The calculated residual current is above the CLPUQ threshold and the CLPUQ TCC is timing.

Note: This is not a maintained signal and is only active while the condition exists.

Workbench Outputs Toolbox





At the upper-left corner of the Idea Workbench is the Workbench Outputs toolbox. Click on the Workbench Outputs toolbox to display all the possible output signals that can be used in the Idea Workbench.

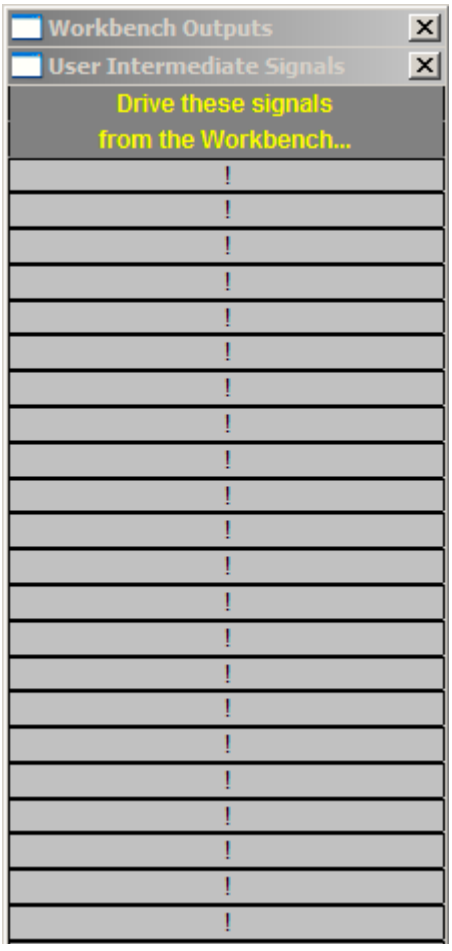
The output variables are those elements, modes or functions other than contact outputs that can be changed and/or driven by custom logic.

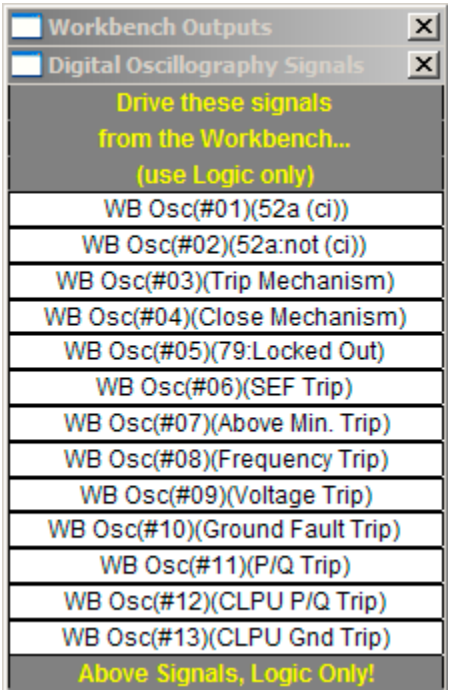
Note: These outputs can only be driven once. All logic used to drive these outputs must be in a common User Workbench. Unused signals appear on a gray background in the Workbench Output Toolbox. Once they have been dragged into the scheme, the box background changes to white.

The Workbench Outputs toolbox gives the user access to various inputs, intermediate variables, and internal Form 6 recloser control alarms, statuses, and targets, and gives the user the ability to perform logical functions with these variables.

User Intermediate Signals Menu

Twenty-five Intermediate Variables are provided to allow easy use of signals from one Workbench block to another. The Intermediate Variables are available as inputs to the Outputs Workbench, but can also be driven as outputs from the Input Contact Workbench.





Digital Oscillography Signals

These are the factory default oscillography signals. Drive them from the Workbench, Logic only. Other Workbench Inputs can be used.

52a – Status of the connected mechanism (0=open, 1=closed).

52a: not – Status of the connected mechanism (52 b contact) (1=open, 0=closed).

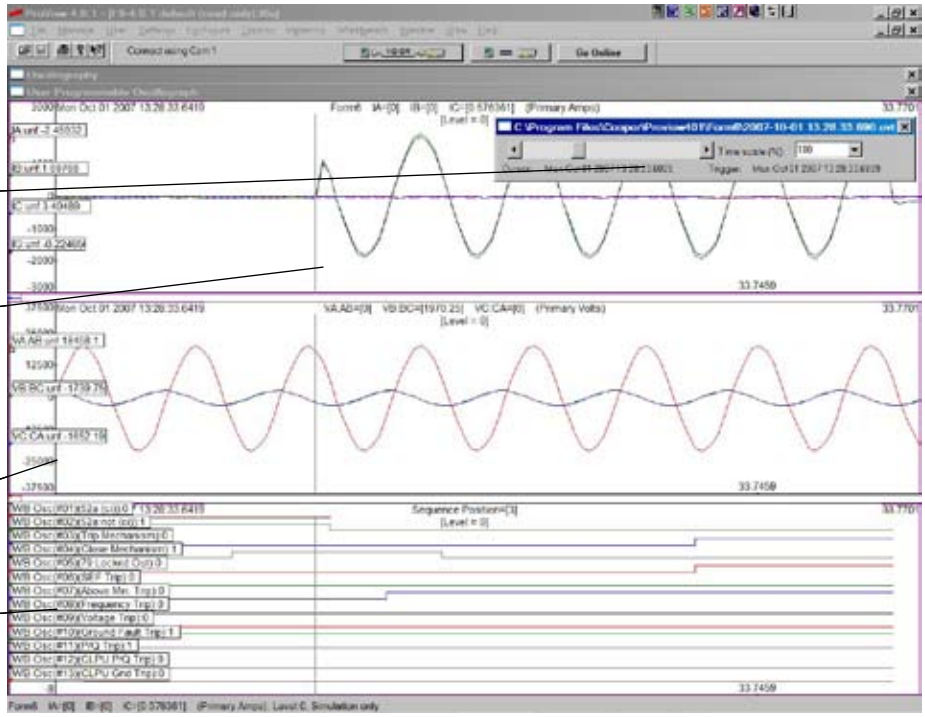
Trip Mechanism – Trip signal to the mechanism (1=Trip). This signal is asserted for a minimum of 76 ms, and remains asserted while the tripping condition is in place.

Close Mechanism – Close signal to the mechanism (1=Close) This signal is asserted for a minimum of 25 ms, and remains asserted until the unit successfully closes (after 5 seconds), times out, or receives a trip signal (1=Close).

79:Locked Out – Lockout signal to the recloser (1=Lockout). Signal is asserted upon receiving a lockout command from any source.

SEF Trip – A target indicating that the sensitive Earth fault tripping element was asserted at the time the trip signal was asserted (1=An SEF trip occurred).

Above Min. Trip – A target Indicating that one of the currents sampled by the Form 6 recloser control is at, or above, one of the following minimum trip settings (Phase, Ground, Negative Sequence, or CLPU).



Frequency Trip – A target indicating that an overfrequency or underfrequency tripping element was asserted at the time the trip signal was asserted (1=A frequency involved trip occurred).

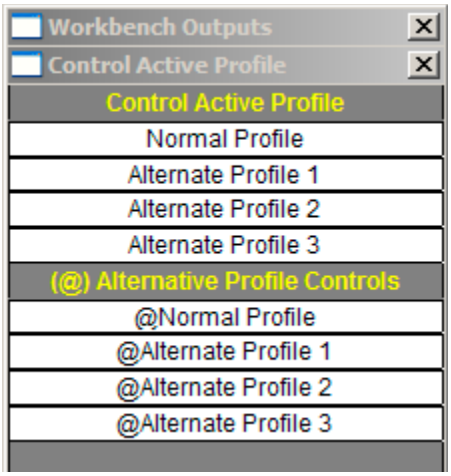
Voltage Trip – A target indicating that an overvoltage or undervoltage tripping element was asserted at the time the trip signal was asserted (1=A voltage involved trip occurred).

Ground Fault Trip – A target indicating that a Ground tripping element was asserted at the time the trip signal was asserted (1=A ground-involved trip occurred).

P/Q Trip – A target indicating a Phase or Negative Sequence element was asserted at the time the trip signal was asserted. (1=A phase or negative sequence trip occurred.)

CLPU P/Q Trip – A target indicating that Cold Load Pickup Phase or Negative Sequence element was asserted at the time the trip signal was asserted (1=A Cold Load Pickup phase or negative sequence trip occurred).

CLPU Gnd Trip – A target indicating that a Cold Load Pickup Ground tripping element was asserted at the time the trip signal was asserted (1=A Cold Load Pickup ground involved trip occurred).



Control Active Profile

Control Active Profile Controls

If Multiple profiles are requested to be active through Workbench programming, the Form 6 scheme will default to Normal Profile or the Alternate Profile with the highest priority (Alternate Profile #1 has priority over Alternate Profile #2, etc.).

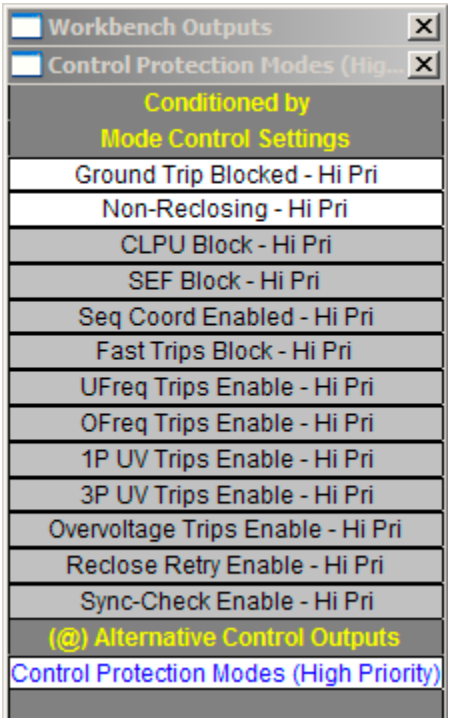
Normal Profile – Setting this output to a Logical 1 will change the active profile to Normal Group (or Profile) (1=Normal setting group is active).

Alternate Profile 1 – Setting this output to a Logical 1 will change the active profile to Alternative 1 Group (or Profile) (1=Alternative 1 setting group is active).

Alternate Profile 2 – Setting this output to a Logical 1 will change the active profile to Alternative 2 Group (or Profile) (1=Alternative 2 setting group is active).

Alternate Profile 3 – Setting this output to a Logical 1 will change the active profile to Alternative 3 Group (or Profile) (1=Alternative 3 setting group is active).

The @Alternative Profile Controls menu provides alternative access to the same above-referenced functions.



Control Protection Modes (High Priority)

Note: The Form 6 recloser control modes of operation can be modified from within the Idea Workbench. Refer to **Workbench Mode Control Configuration** section of this manual for additional information.

The following Outputs are Conditioned by Precedence settings:

Ground Trip Blocked – Hi Pri – Setting this output to a logical 1 sets the control in Ground Trip block mode.

Non-reclosing – Hi Pri – Setting this output to a logical 1 sets the control in non-reclosing mode.

CLPU Block – Hi Pri – Setting this output to a logical 1 sets the control in Cold Load PickUp mode.

SEF Block – Hi Pri – Setting this output to a logical 1 sets the control in Sensitive Earth Fault Mode.

Seq Coord Enabled – Hi Pri – Setting this output to a logical 1 turns on the Sequence Coordination feature.

Fast Trips Block – Hi Pri – Setting this output to a logical 1 turns on the Fast Trips Blocked Feature -TCC1 curves are removed from service and inverse time tripping will occur based on the TCC2 curves.

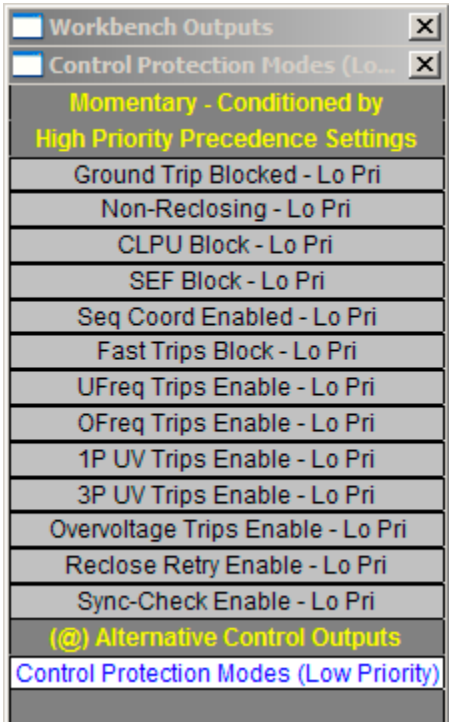
UFreq Trips Enable – Hi Pri – Setting this output to a logical 1 enables underfrequency tripping.

OFreq Trips Enable – Hi Pri – Setting this output to a logical 1 enables overfrequency tripping.

1P UV Trips Enable – Hi Pri – Setting this output to a logical 1 enables single-phase undervoltage tripping.

3P UV Trips Enable – Hi Pri – Setting this output to a logical 1 enables three-phase undervoltage tripping.

Overvoltage Trips Enable – Hi Pri – Setting this output to a logical 1 enables overvoltage tripping.



Reclose Retry Enable – Hi Pri – Setting this output to a logical 1 enables the Reclose Retry feature.

Sync-Check Enable – Hi Pri – Setting this output to a logical 1 enables sync-check.

The @Alternative Control Outputs Control Protection Modes (High Priority) menus provides alternative access to the same above-referenced functions.

Control Protection Modes (Low Priority)

Note: The Form 6 recloser control modes of operation can be modified from within the Idea Workbench. Refer to **Workbench Mode Control Configuration** section of this manual for additional information.

The following signals are Conditioned by Precedence settings:

Ground Trip Blocked – Lo Pri – Setting this output to a logical 1 sets the control in Ground Trip block mode.

Non-Reclosing – Lo Pri – Setting this output to a logical 1 sets the control in non-reclosing mode.

CLPU Block – Lo Pri – Setting this output to a logical 1 sets the control in Cold Load PickUp mode.

SEF Block – Lo Pri – Setting this output to a logical 1 sets the control in Sensitive Earth Fault Mode.

Seq Coord Enabled – Lo Pri – Setting this output to a logical 1 turns on the Sequence Coordination feature.

Fast Trips Block – Lo Pri – Setting this output to a logical 1 turns on the Fast Trips Blocked Feature -TCC1 curves are removed from service, and inverse time tripping will occur based on the TCC2 curves.

UFreq Trips Enable – Lo Pri – Setting this output to a logical 1 enables underfrequency Tripping.

OFreq Trips Enable – Lo Pri – Setting this output to a logical 1 enables overfrequency tripping.

1P UV Trips Enable – Lo Pri – Setting this output to a logical 1 enables single-phase undervoltage tripping.

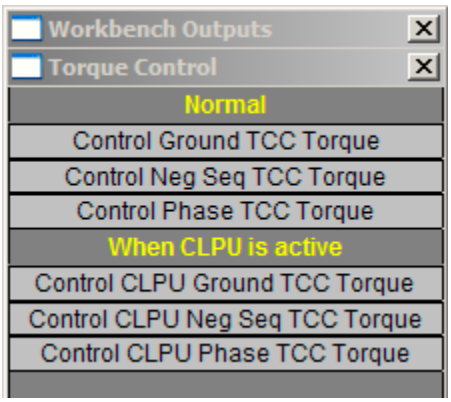
3P UV Trips Enable – Lo Pri – Setting this output to a logical 1 enables three-phase undervoltage tripping.

Overvoltage Trips Enable – Lo Pri – Setting this output to a logical 1 enables overvoltage tripping.

Reclose Retry Enable – Lo Pri – Setting this output to a logical 1 enables the Reclose Retry feature.

Sync-Check Enable – Lo Pri – Setting this output to a logical 1 enables sync-check.

The @Alternative Control Outputs Control Protection Modes (Low Priority) menus provides alternative access to the same above-referenced functions.



Torque Control

The operation of these output signals is intended to be analogous to the like-named input contacts on electromechanical relays. When the torque control signal is asserted, operating torque is then passed to the rotating "disk" (TCC timing begins). But when the signal is unasserted, the disk is allowed to rotate back to its initial position, acting only under the force of the spring (TCC reset occurs).

These signals act differently than simple supervision of the trip output. In the typical application, this output signal could be driven by directional elements. The TCC timing is not even allowed to start unless the measured fault direction is correct. Since directional determination can be subject to transient effects, placing such a restriction on TCC timing increases tripping security, helping to avoid misoperation until the directional measurement is no longer subject to transient error.

Normal

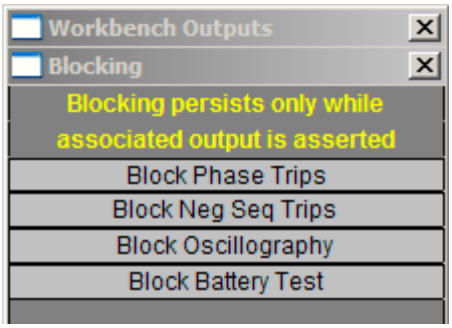
- Control Ground TCC Torque
- Control Neg Seq TCC Torque
- Control Phase TCC Torque

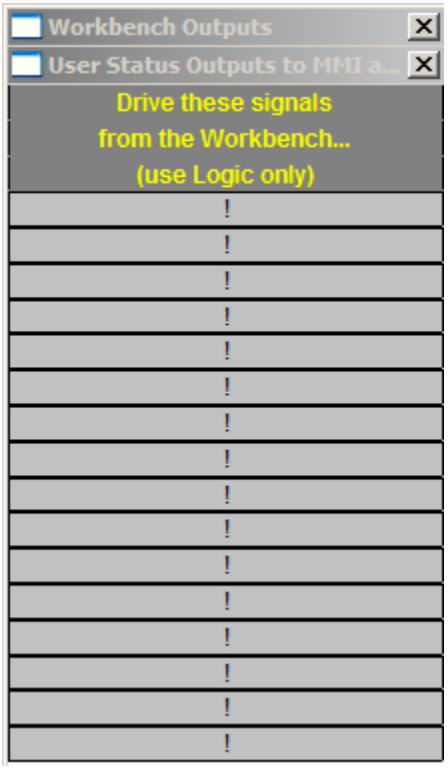
When CLPU is Active

- Control CLPU Ground TCC Torque
- Control CLPU Neg Seq TCC Torque
- Control CLPU Phase TCC Torque

Blocking

These outputs block Phase Trips, Negative Sequence Trips, Oscillography, and Battery Testing. Blocking persists only while associated output is asserted (set to a Logical 1).



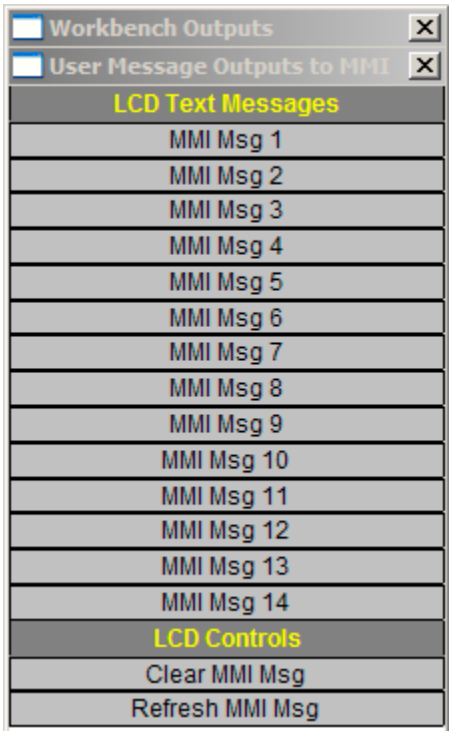


User Status Outputs to MMI and SOE

Sixteen events can be user-defined. Drive the signals from the Workbench (use Logic only). The event names can be customized for the Form 6 front panel LCD and the Sequence of Events recorder.

Note: Refer to **Workbench Status Outputs to MMI and SOE** in the **Idea Workbench** section of this manual for additional event renaming information.

Note: Refer to **Sequence of Events** in the **Display** section of this manual for additional event recorder information.



User Message Outputs to MMI

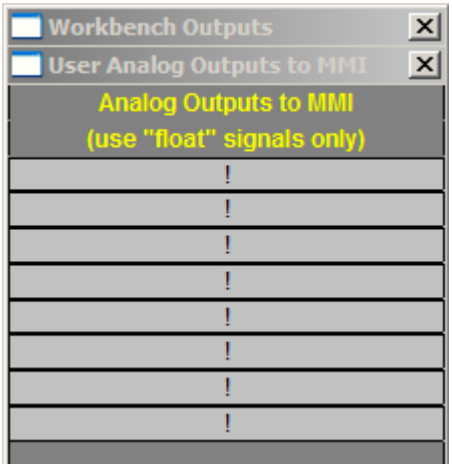
Fourteen text messages can be user-defined. Messages can also be cleared and refreshed.

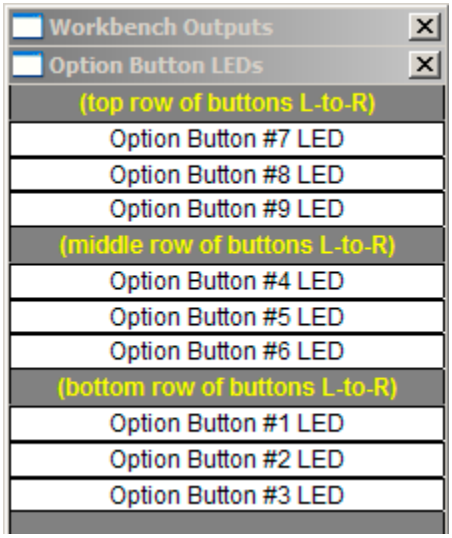
Note: Refer to **Workbench Message Outputs to MMI** section of this manual for customization information.

User Analog Outputs to MMI

Use "float" signals only.

Note: Refer to **Workbench Analog Outputs to MMI** section of this manual for customization information.





Option Button LEDs

Operator Panel One-Touch Function Keys

(top row of buttons L-to-R)

- Option Button #7 LED – Setting this output to a logical 1 turns on the LED for Option Button #7.
- Option Button #8 LED – Setting this output to a logical 1 turns on the LED for Option Button #8.
- Option Button #9 LED – Setting this output to a logical 1 turns on the LED for Option Button #9.

(middle row of buttons L-to-R)

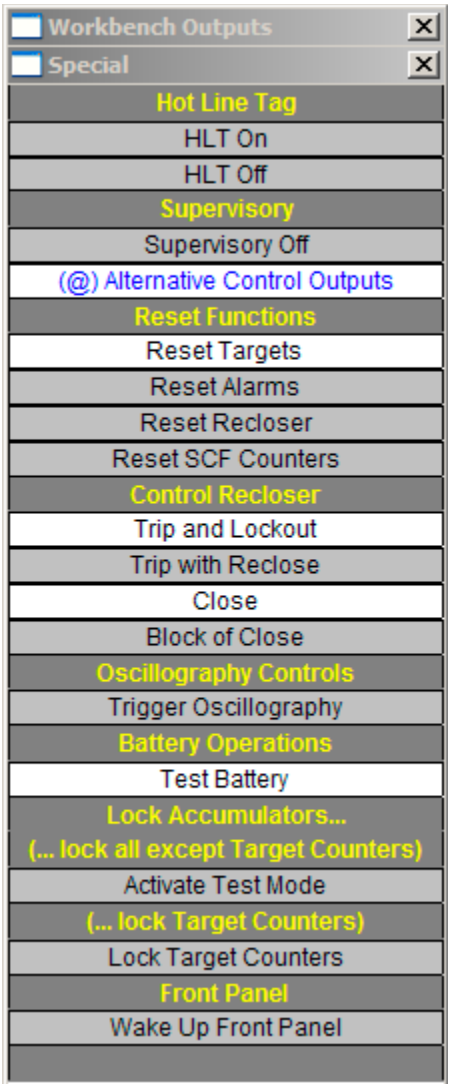
- Option Button #4 LED – Setting this output to a logical 1 turns on the LED for Option Button #4.
- Option Button #5 LED – Setting this output to a logical 1 turns on the LED for Option Button #5.
- Option Button #6 LED – Setting this output to a logical 1 turns on the LED for Option Button #6.

(bottom row of buttons L-to-R)

- Option Button #1 LED – Setting this output to a logical 1 turns on the LED for Option Button #1.
- Option Button #2 LED – Setting this output to a logical 1 turns on the LED for Option Button #2.
- Option Button #3 LED – Setting this output to a logical 1 turns on the LED for Option Button #3.

IMPORTANT: Each Option LED indicator can be configured for multiple tasks.

When investigating the cause of an illuminated Option LED indicator always verify if it has been configured to indicate more than one type of event, state, alarm, etc.



Special

Hot Line Tag

- HLT On – Setting this output to a logical 1 turns on the Hot Line Tag function.
- HLT Off – Setting this output to a logical 1 turns off the Hot Line Tag function.

Supervisory

- Supervisory Off – Setting this output to a logical 1 turns on the Supervisory Off function.
- @Alternative Control Outputs – Accomplishes the same as above.

Reset Functions

- Reset Targets – Setting this output to a logical 1 resets all targets.
- Reset Alarms – Setting this output to a logical 1 resets all alarms.
- Reset Recloser – Setting this output to a logical 1 gives the user the ability to immediately reset the sequence position back to zero.

  Note: The default logic will prevent a reset if there is fault current present.

  Note: The front panel LCD Diagnostics menu screen displays the sequence position of the recloser connected to the Form 6 control.

  Note: This output provides the same type of function as Reset Time through the ProView Settings menu. Refer to the **Reclose** in the **Settings** section in this manual for additional information.
- Reset SCF Counters – Setting this output to a logical 1 gives the user the ability to immediately reset the SCF Counters back to zero.

  Note: The front panel LCD Self-Clear Fault menu screen also allows the user to Reset Fault Data.

  Note: This output provides the same type of function as Clear SCF counters through the ProView Settings menu. Refer to the **Incipient Cable Splice Fault** in the **Settings** section in this manual for additional information.

Control Recloser

- Trip and Lockout – Setting this output to a logical 1 will initiate a Trip and Lockout signal.
- Trip with Reclose – Setting this output to a logical 1 will initiate a Trip signal (Control may issue a reclose signal dependent on sequence position and control OCP programming).
- Close – Setting this output to a logical 1 will initiate a Close signal.
- Block of Close – Setting this output to a logical 1 will initiate a Block of Close signal.

Oscillography Controls

- Trigger Oscillography – Setting this output to a logical 1 will initiate an Oscillographic event.

Battery Operations

- Test Battery – Setting this output to a logical 1 will initiate a Battery Test.

Lock Accumulators...(...lock all except Target Counters)

- Activate Test Mode – Setting this output to a logical 1 will initiate Test Mode.

  Note: The front panel Test Modes menu screen also allows the user to activate Test Mode (except for Targets).

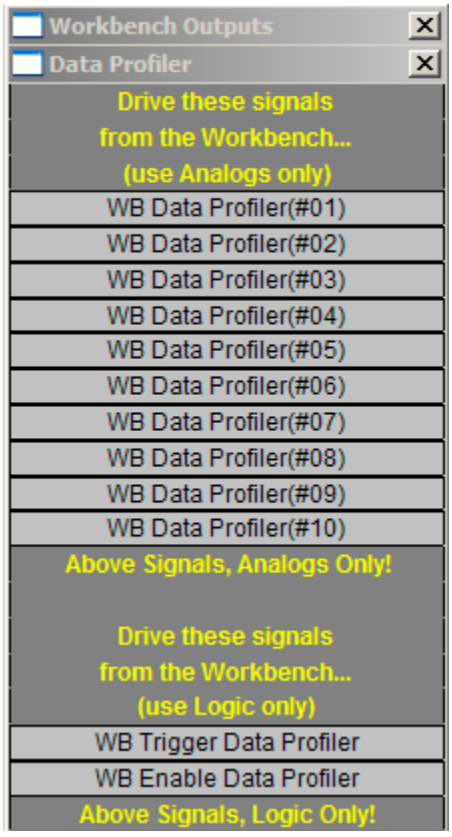
(...lock Target Counters)

- Lock Target Counters – Setting this output to a logical 1 will lock the target counters.

  Note: The front panel Test Modes menu screen also allows the user to lock the target counters.

Front Panel

- Wake Up Front Panel – Setting this output to a logical 1 will illuminate active Front Panel LEDs and turn on the LCD Display Backlight.



Data Profiler

Configure up to ten metering options not already available with the Data Profiler. Drive the signals from the Workbench, use Analogs only:

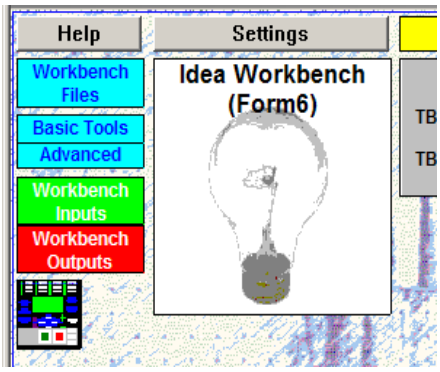
- WB Data Profiler (#01) through (#10)

Refer to **Data Profiler** in the **Display** section of this manual for additional information regarding available metering options.

Drive the following signals from the Workbench, Logic only:

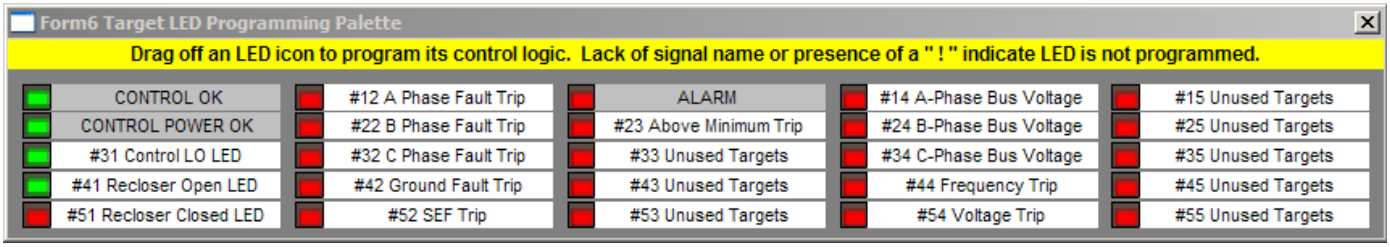
- WB Trigger Data Profiler
- WB Enable Data Profiler

Form6 Target LED Programming Palette



Click on the Form 6 control icon to access the Form 6 Target LED Programming Palette. This palette enables you to drag off any LED icon that is not already driven and program its control logic.

Note: All Target LEDs are already driven in the default scheme. Delete unused targets from the Target LED Programming Workbench before attempting to drive targets from the Programming Palette.



Building Custom Logic

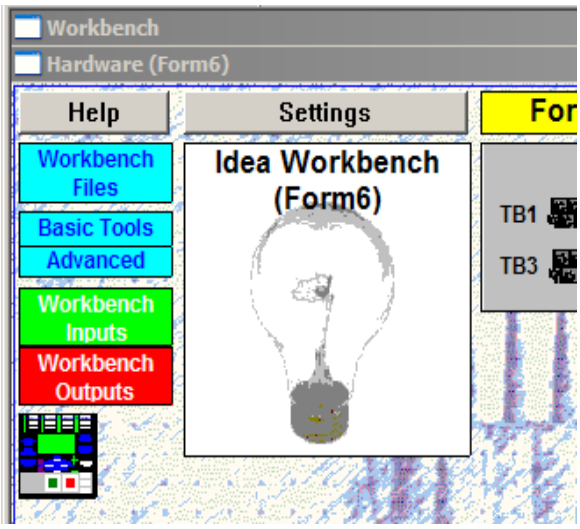
Note: You must be logged in at the Modify access level to create or modify the Idea Workbench. Refer to **Login/Logout** section of this manual.

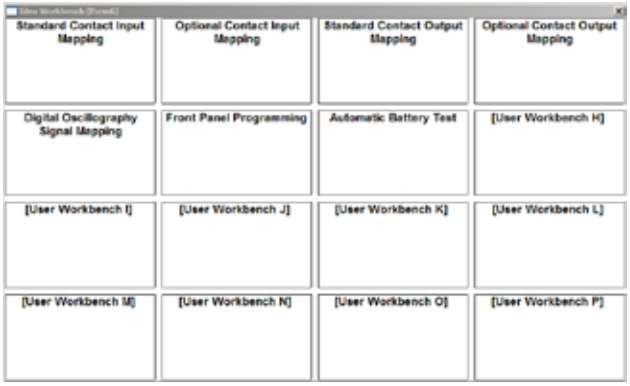
To build custom logic, a collection of input signals and logic blocks are gathered into a User Workbench white space. Connections are made between these blocks by drawing "wires" between the desired blocks outputs and inputs through normal click-and-drag movements.

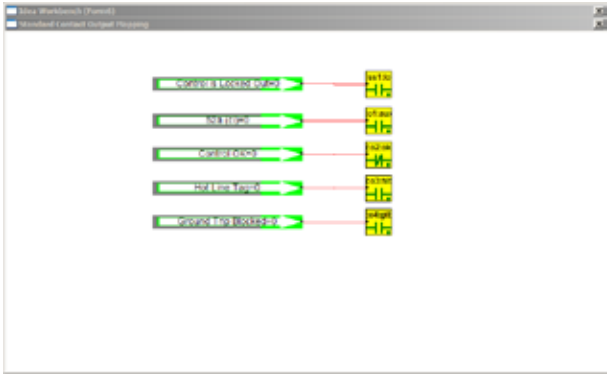
Custom logic can be placed in one block or divided across many blocks.

Note: If complex logic is to be developed, the logic should be distributed across more than one User Workbench to maximize the readability of the logic.

Adding Elements to the Idea Workbench

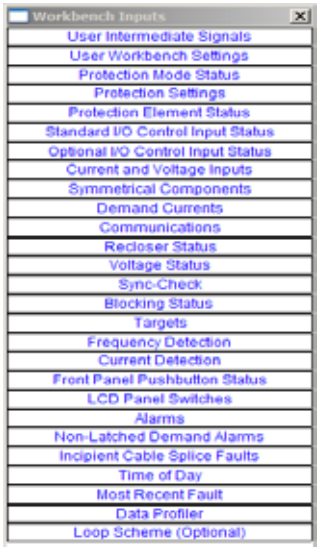


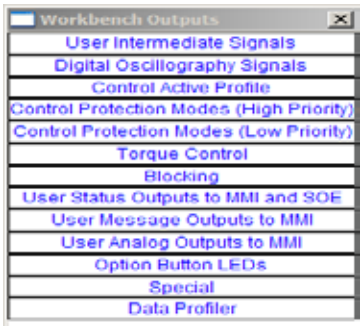




1. Open an unused User Workbench:
   - **A.** Click on the Idea Workbench lightbulb graphic.

     This will display the 16 separate User Workbench blocks where the user can design and segregate custom logic according to function.
   - **B.** Click on a block to open the User Workbench for that block.
2. Click on the Workbench Inputs button to gain access to all of the input signals available in the Idea Workbench.
3. Click on the Workbench Outputs button to gain access to all of the output signals available in the Idea Workbench.





The inputs and outputs of ProView blocks are represented as small black dots on the right edge (inputs) or left edge (outputs) of the block.

Every output must be driven by an input.

4. Connect inputs to outputs as follows:
   - **A.** Place the mouse pointer above an input dot until a small text appears. This indicates that you are ready to make a connection.
   - **B.** Left-click and drag the connection (forming a virtual wire) to the output terminal of the desired ProView block.

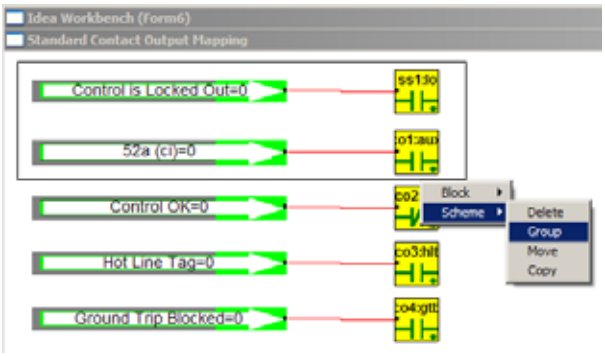
     Note: You will know you are properly on top of a ProView output terminal when the text box appears.
   - **C.** Release the mouse button.

The connection will now be represented on the screen by a virtual wire between the input and output blocks.

Organizing the Idea Workbench

If extensive custom logic is to be created, even dividing the custom logic into all 16 of the available User Workbench block can result in some very complex screens when dozens or hundreds of logic elements are added.

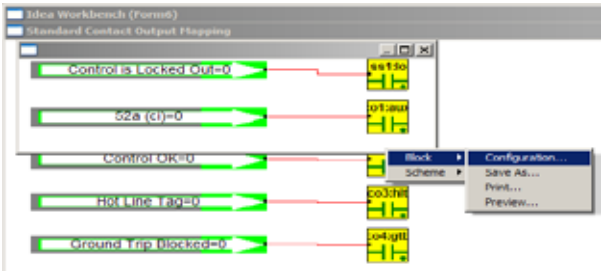
To decrease this clutter, and thereby increase the ability to trace the custom logic, blocks can be created to hold the logic:



1. Draw a box around the custom logic added to the Idea Workbench.
   - **A.** Place the mouse in the white-space of the Idea Workbench, left-click-and-hold, and draw a box around the logic.
   - **B.** Release the left mouse button.

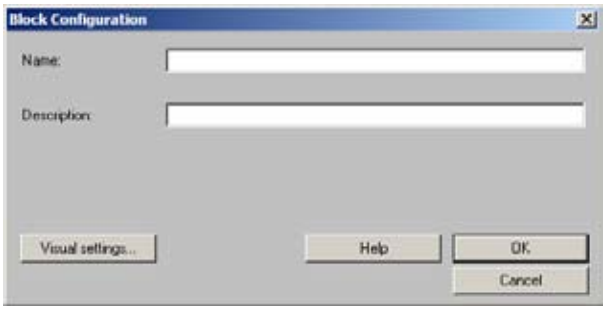
The box remains and a menu will appear.

2. Select Scheme>Group from this menu.



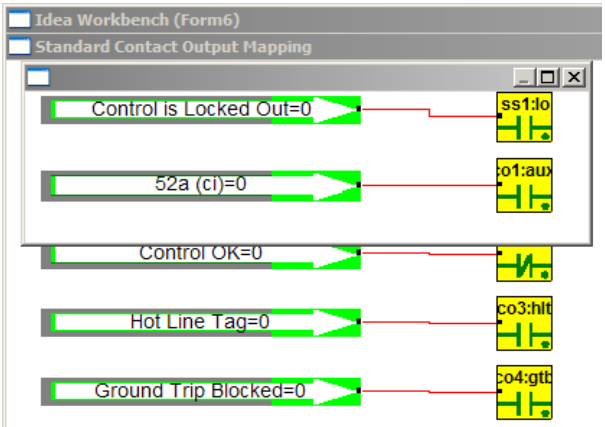
This will create a new block that contains the logic enclosed in the original box.

3. Right-click on the block (in either its open or closed condition) and select Block>Configuration from the pop-up menu.



The Block configuration screen will appear.

4. Enter a name in the Name field and click OK.



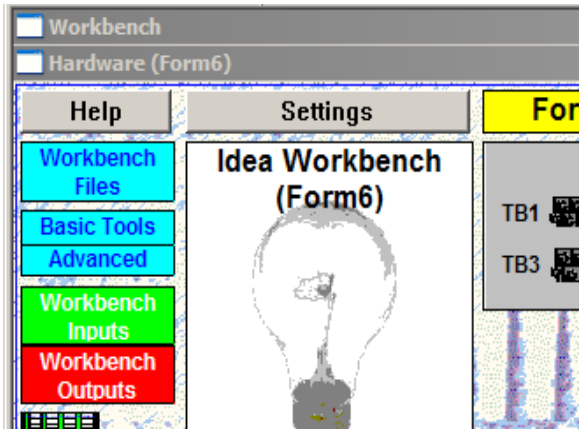
5. Close this new block by clicking on the standard Microsoft® Windows® application close button (X) in the upper-right hand corner of the block.

Left-clicking on the closed block will open the block.

Right-clicking on the closed block allows you to select Scheme>Ungroup, if desired.

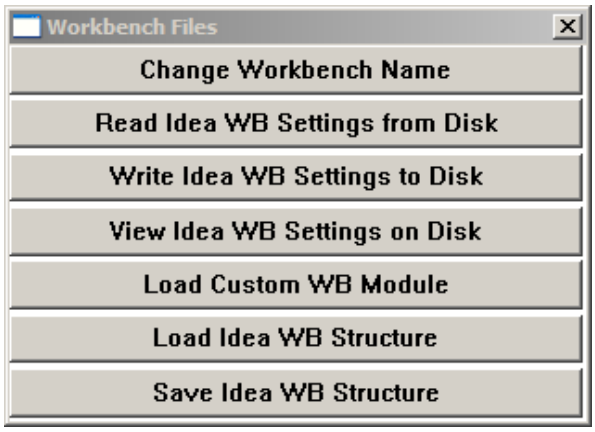
Note: If some of the wires or blocks only partially appear on the screen after extensive customization, left-click in the white space to refresh the graphics.

Workbench Files



At the upper-left corner of the Idea Workbench is a button labeled Workbench Files. Click on this button to display the menu options.

Manage Multiple Idea Workbenches and Setting Files

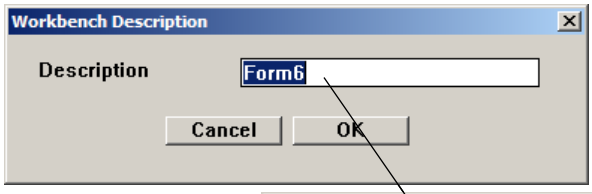


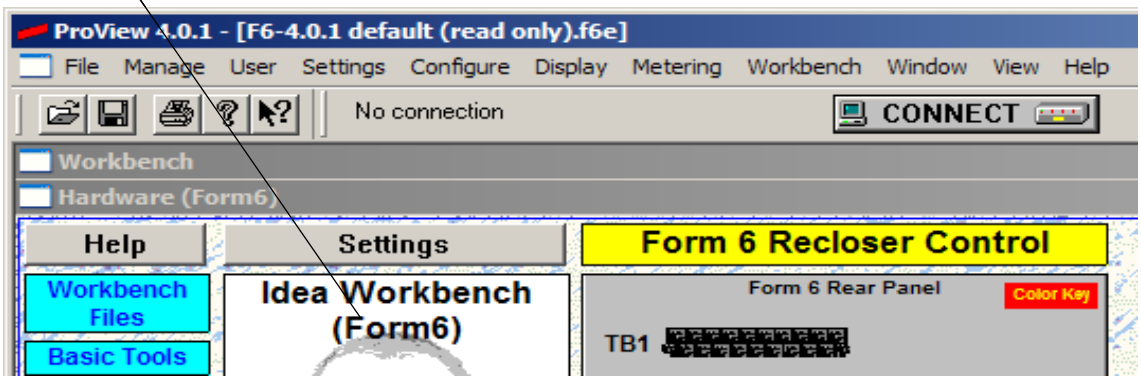
It is possible to maintain multiple Idea Workbenches that can be loaded into ProView at any time. This feature provides the ability to reuse Idea Workbench constructions or to build up a library of standard constructions. Additionally, multiple setting files for all of the settings in a Workbench can also be maintained.

Customize a Workbench Description

Click on Change Workbench Name to customize a Workbench description.

Note: This feature is also available via the Workbench>Workbench Description menu or the Settings>Simplified Setup screen.





Load, Save, and View Workbench Settings

All settings created in the Idea Workbench are kept separate from the Form 6 control settings. These settings can be saved to and loaded back from an ASCII text file of the form "WBI_Form6_Settings_*.txt".

- Click on READ IDEA WB SETTINGS FROM DISK to load settings from a previously created file.

  Note: Form 6-LS control users must load the Form 6-LS default settings from here. Refer to **Form 6 Loop Scheme Control** in **Section 5** for additional information.

- Click on WRITE IDEA WB SETTINGS TO DISK to save settings to an ASCII file.
- Click on VIEW IDEA WB SETTINGS ON DISK to open the ASCII settings file with the default Microsoft® Windows® text editor.

Load Custom Workbench Modules

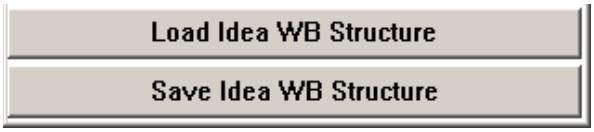
Cooper Power Systems or other third party developers may create custom Workbench modules to load into a Workbench.

- Click on LOAD CUSTOM WB MODULE and browse to the name of the custom Workbench module to load a custom module.

Custom Workbench modules are available to *registered* ProView users at *http://www.cooperpowercentral.com.* Log in and click on the Software link on the left side of the screen. Select the ProView link from the next screen.

IMPORTANT: Save the Workbench with the loaded custom module(s) as a new Workbench file name.

Load and Save Workbench Structures

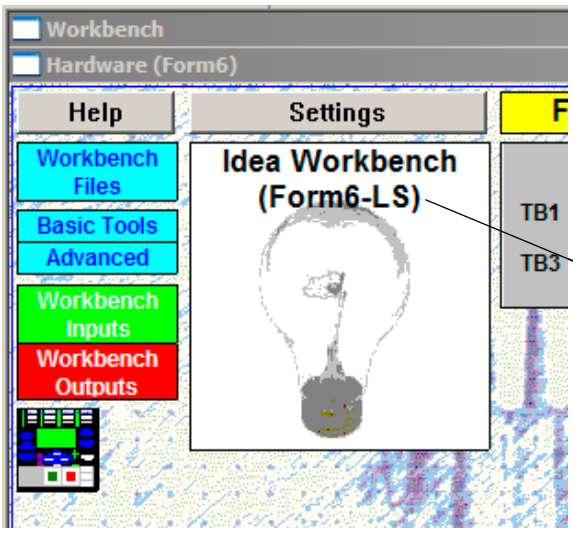


All of the custom logic structures created in the Idea Workbench can also be saved and stored separately from the main control file itself. These structures can be saved to and loaded back from a *.sch file of the form "WBI-Form6-*.sch".

- Click on LOAD IDEA WB STRUCTURE to load settings from a previously created file.

  Note: Form 6-LS control users must load the Form 6-LS default Workbench scheme from here. Refer to **Form 6 Loop Scheme Control** in **Section 5** for additional information.

- Click on SAVE IDEA WB STRUCTURE to save settings to a file.



This is the appearance of the default Form 6-LS Workbench when the LS structure is loaded and the LS settings have been read from disk.

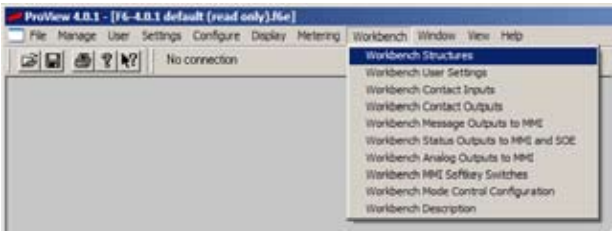
Communications Workbench

Configuring Protocol Communications

The Form 6 recloser control has user-selectable implementation of ProView-based DNP3, Modbus, IEC870-5-101, 2179, and DNP TCP/IP communications.

Communication protocols are configured via a Communications Workbench. General use of the Communications Workbench follows the concept of the Idea Workbench. Refer to the **Hardware Idea Workbench** section of this manual for additional menu and screen information.

Loading a Communications Workbench



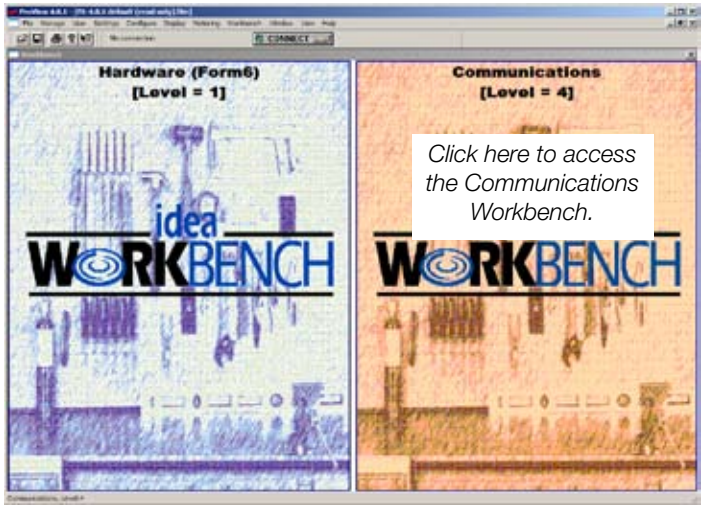
Communication Protocols are loaded as part of the Communications Workbench.

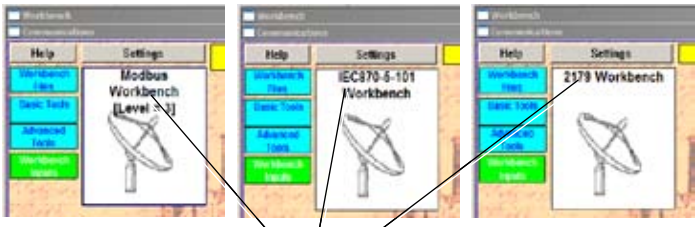
Open the Communications Workbench by following the Workbench>Workbench Structures menu path.

The Idea Workbench screen will appear.

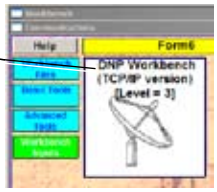
Click on the Communications Idea Workbench.

The Communications Workbench will appear.





The name of the active protocol appears above the icon.



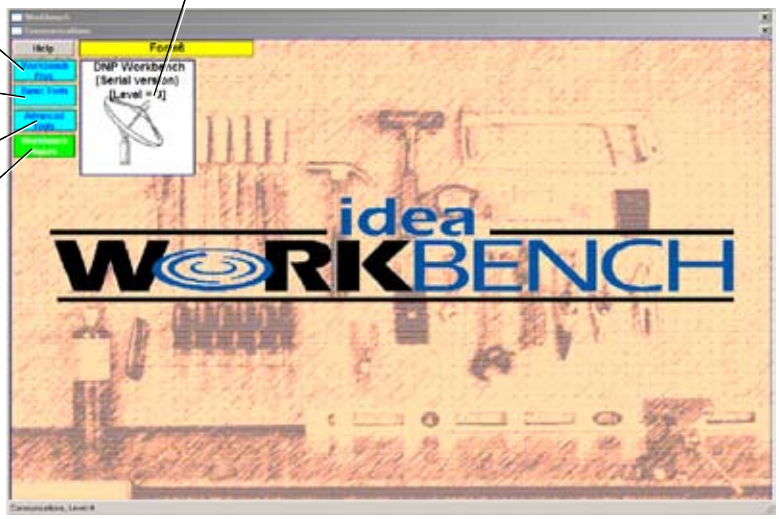
Click here to access the DNP3 Communications Workbench blocks. (DNP3 is the default protocol.)

Click here to manage Workbench structures.

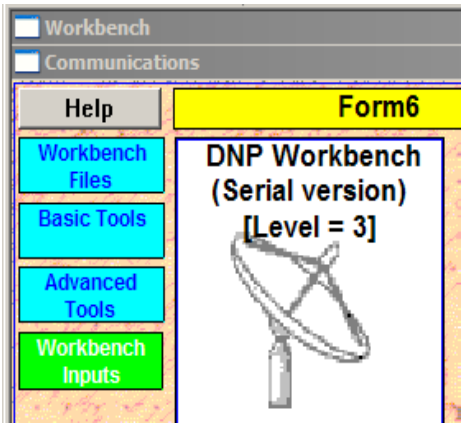
Click here to open the Basic Tools Toolbox.

Click here to open the Advanced Tools Toolbox.

Click here to open the Workbench Inputs Toolbox.

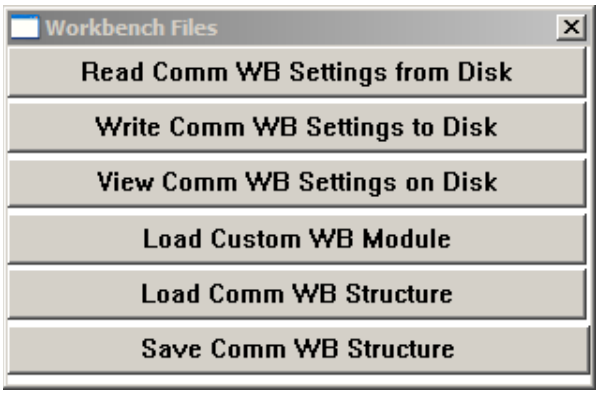


Workbench Files



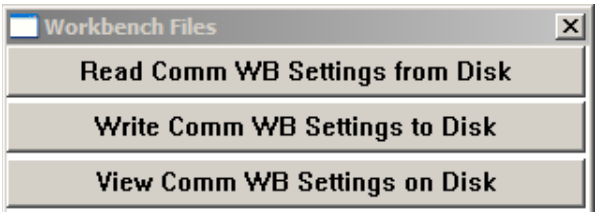
At the upper-left corner of the Communications Workbench is a button labeled Workbench Files. Click on this button to display the menu options.

Manage Multiple Communications Workbenches and Setting Files



It is possible to maintain multiple Communications Workbenches that can be loaded into ProView at any time. This feature provides the ability to reuse Communication Workbench constructions to build up a library of standard constructions. Additionally, multiple setting files for all of the settings in a given workbench can also be maintained.

Read, Write, and View Communications Workbench Settings



All settings created in the Communications Workbench are kept separate from the Form 6 control settings. These set tings can be saved to and loaded back from an ASCII text file of the form “WBC_Form6_Settings_*.txt”.

- Click on READ COMM WB SETTINGS FROM DISK to load settings from a previously created file.
- Click on WRITE COMM WB SETTINGS TO DISK to save settings to an ASCII file.
- Click on VIEW COMM WB SETTINGS ON DISK to open the ASCII settings file with the default Microsoft® Windows® text editor.

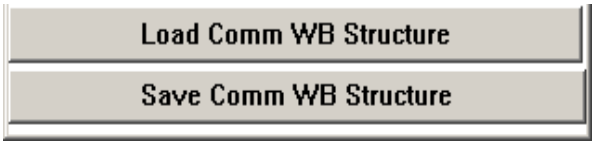
Load Custom Workbench Modules

Cooper Power Systems or other third party developers may create custom Workbench modules to load into a Workbench.

- Click on LOAD CUSTOM WB MODULE and browse to the name of the custom Workbench module to load a custom module.

IMPORTANT: Save the Workbench with the loaded custom module(s) as a new Workbench file name.

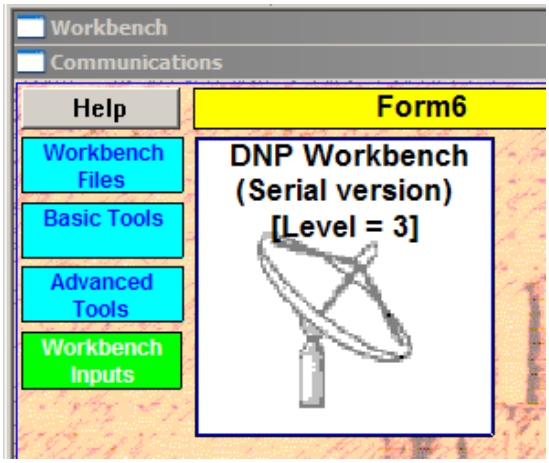
Load and Save Communications Workbench Structures



All of the custom logic structures created in the Communications Workbench can also be saved and stored separately from the main control file itself. These structures can be saved to and loaded back from a *.sch file of the form "WBC-Form6*.sch".

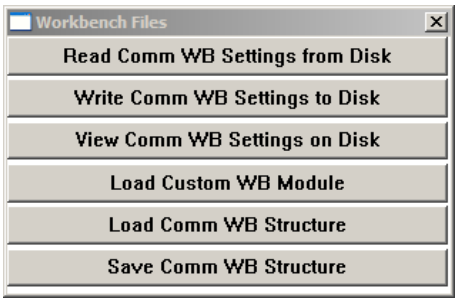
- Click on LOAD COMM WB STRUCTURE to load settings from a previously created file.
- Click on SAVE COMM WB STRUCTURE to save settings to a file.

Change the Active Communication Workbench Protocol

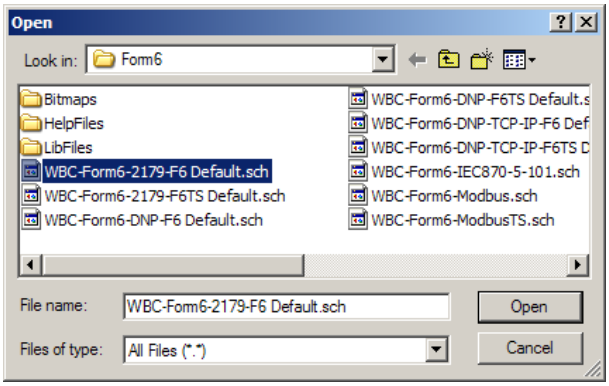


Change the active communication protocol as follows:

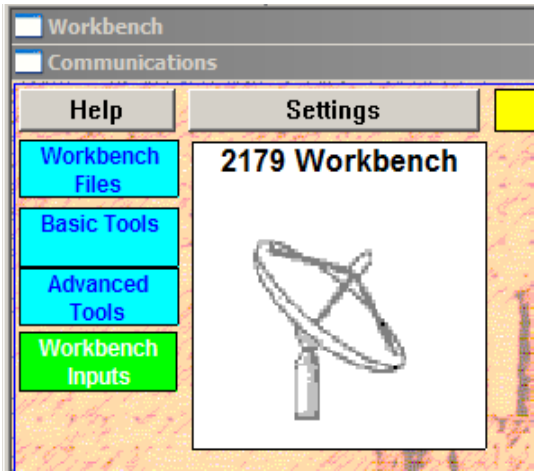
1. Click on the Workbench Files button.



2. Click on LOAD COMM WB STRUCTURE.

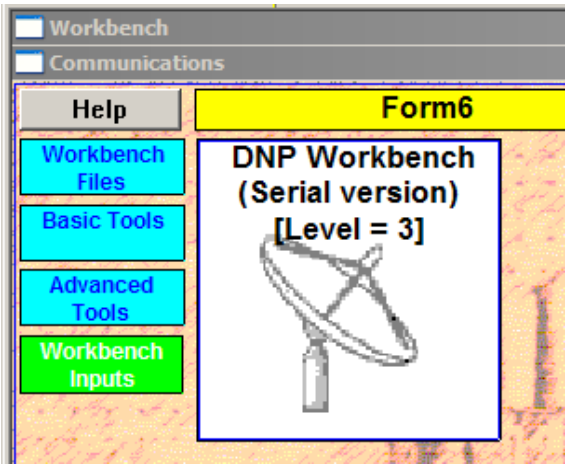


3. Select and open a protocol from the menu options.



The selected Communications Workbench protocol will become active.

DNP Workbench



All Communications changes must take place in the appropriate Workbench. The Form 6 control allows users to custom configure DNP3 points and settings.

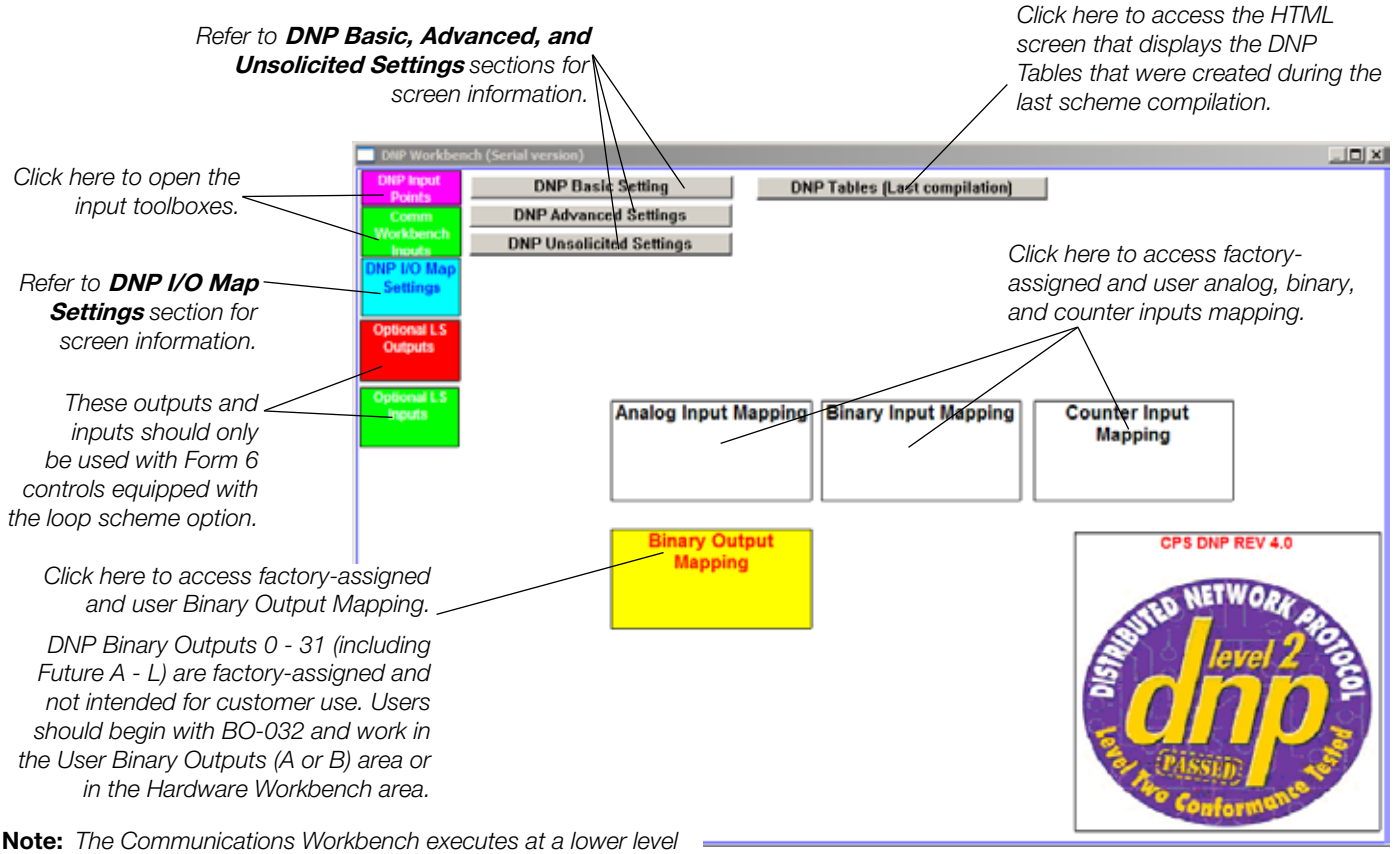
Access the DNP Workbench as follows:

1. Click on the DNP Workbench graphic.

The DNP Workbench blocks will appear.

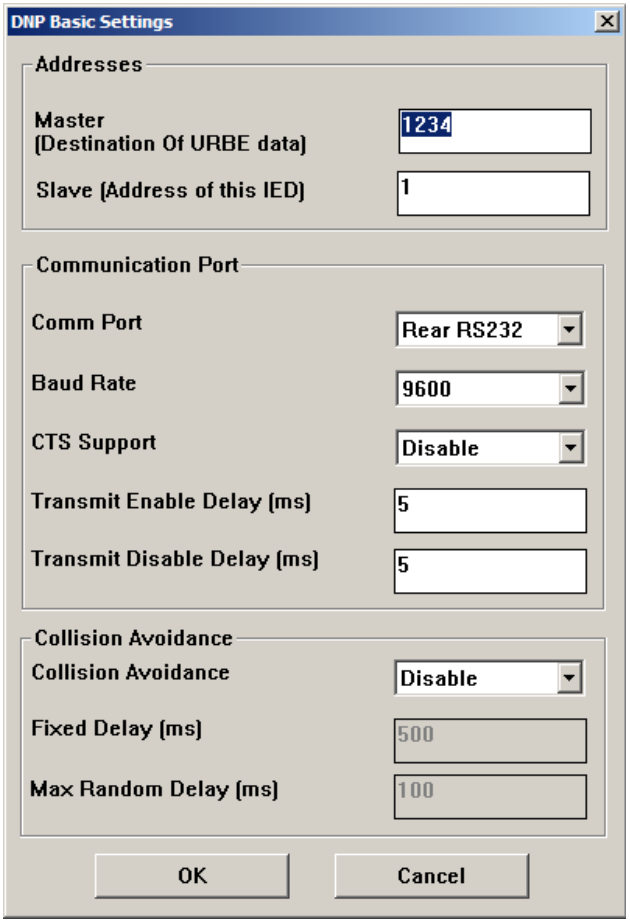
2. Click on the applicable block.

Note: The DNP default point database is in the Cooper/ProView401/Form6 folder. The document title is dnpf6dat.xls.

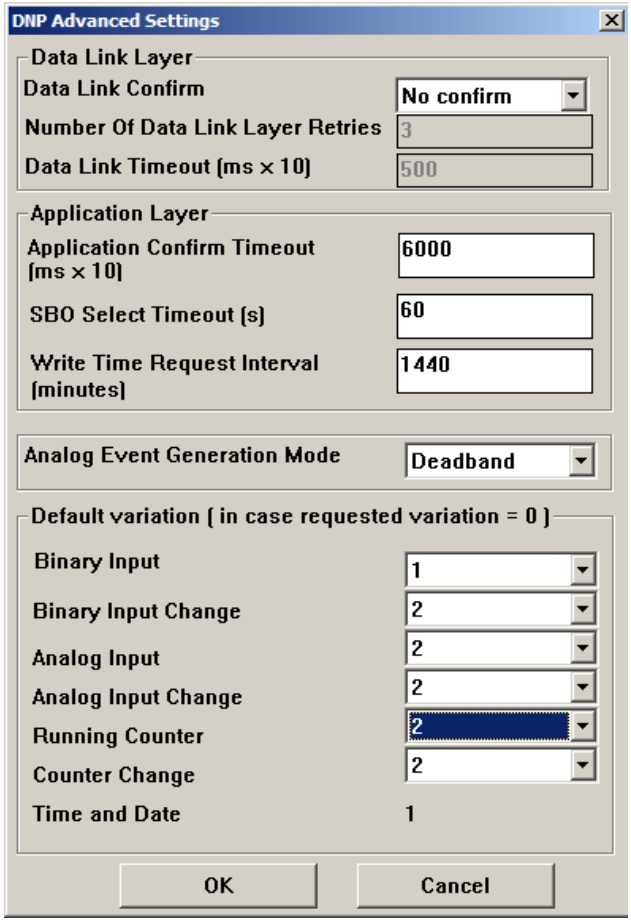


Note: *The Communications Workbench executes at a lower level than the Hardware Workbench. Users should implement realtime functions entirely in the Hardware Workbench where all control actions are traceable. Communications can be brought traceably into the Hardware Workbench via the Workbench Inputs/Communications menu. Other transfers of Communication signals to the Hardware Workbench are not explicitly provided for.*

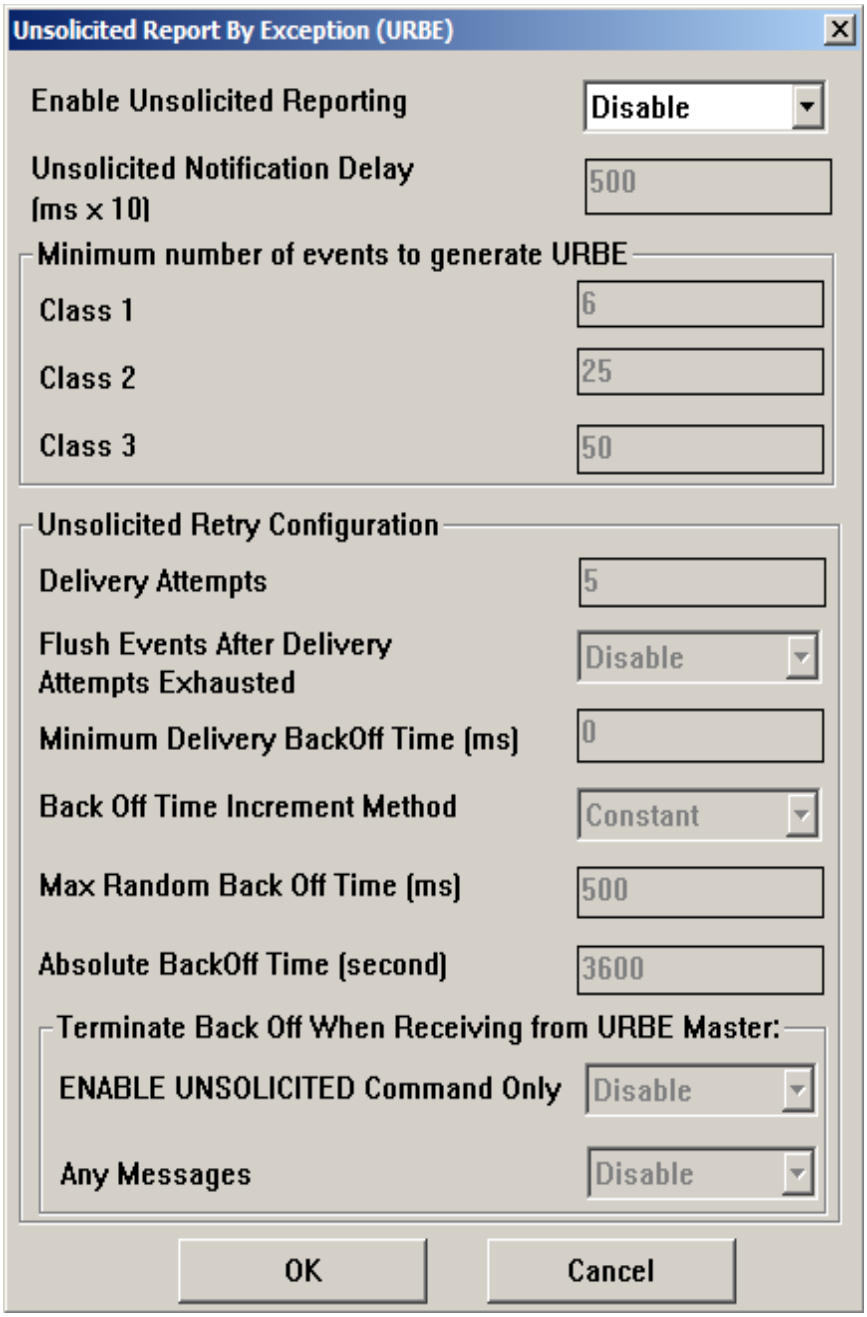
DNP Basic Settings



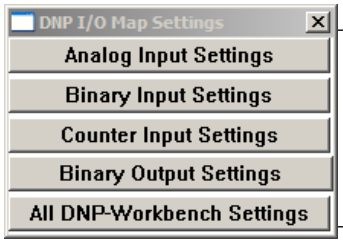
DNP Advanced Settings



DNP Unsolicited Settings

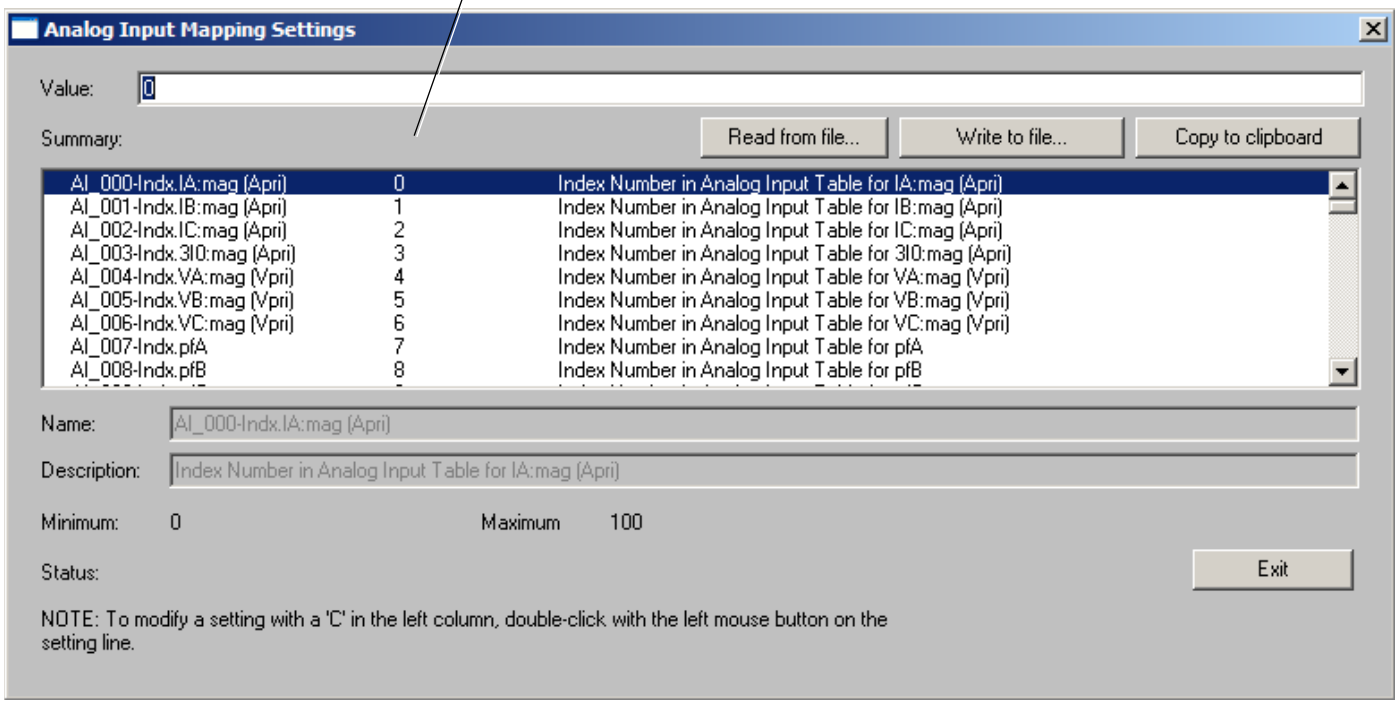


DNP I/O Map Settings



The new settings available from these menu options will only become active if they are assigned the next contiguous number.

SUPERVISORY OFF blocks the ability of the control to respond to supervisory commands sent by serial communications or hardwired inputs. Supervisory commands are defined in the communication workbench on an individual binary output level. The DNP protocol setting BO- #:Name: SupEn set equal to logical "1" will block operation of associated binary output under Supervisory OFF conditions. The setting BO- #:Name:SupEn set equal to logical "0" will allow operation under Supervisory OFF conditions. All binary outputs are supervised (set to logical 1) by factory default except for BO-015(p)-Hot Line Tag Set:SupEn =0.



Optional LS Outputs

Optional Loop Scheme outputs are available for Form 6 controls equipped with the LS option. The LS scheme and Workbenches must be loaded.

Setting these outputs to a logical 1 will activate these loop scheme-specific communication functions:

- Comm LS Disable
- Comm SI Disable
- Comm SII Disable
- Reset LS

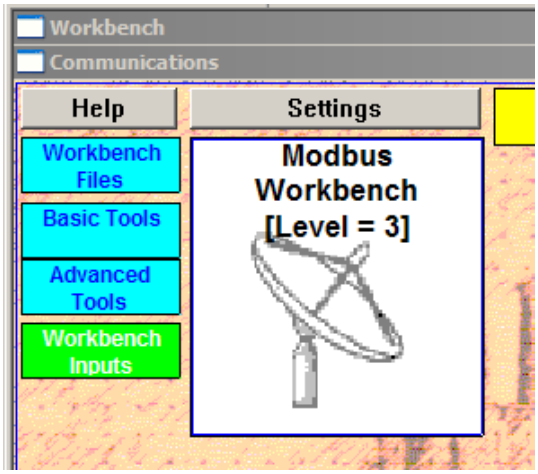
Optional LS Inputs

Seventeen intermediate variables are provided to allow signals to be sent between Workbench blocks.

The Voltage Level Indicators menu provides three intermediate variables for Source I and Source II.

Once defined, the intermediate variables can be used by dragging them out of the Optional LS Inputs menu.

Modbus Workbench



All Communications changes must take place in the appropriate Workbench. The Form 6 control allows users to custom configure Modbus points and settings.

The user should be familiar with SCADA control and have a basic understanding of Modbus.

The default Workbench structures provides the user access to analog and control parameters within the scheme. The flexibility of the Modbus system allows the user to modify the structure via the Communications Workbench.

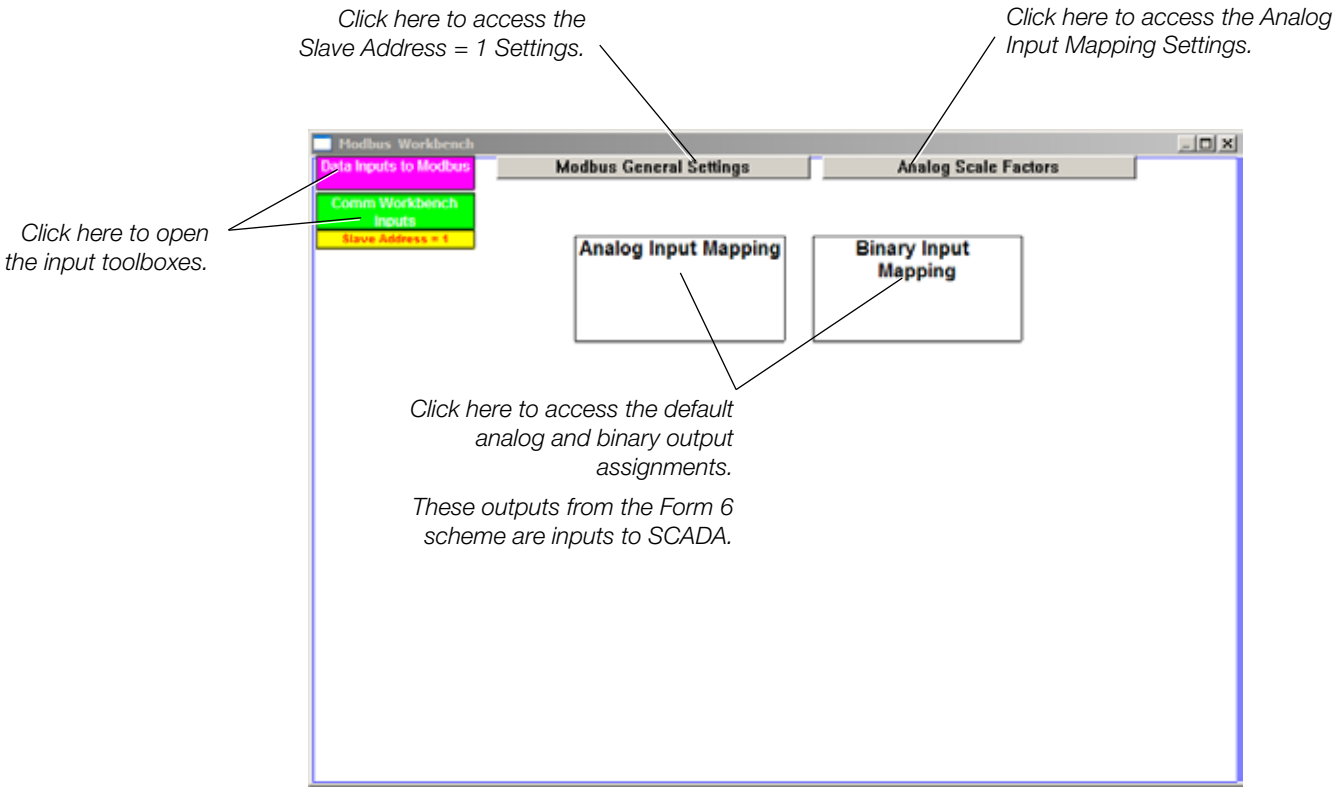
Access the Modbus Workbench as follows:

1. Click on the Modbus Workbench graphic.

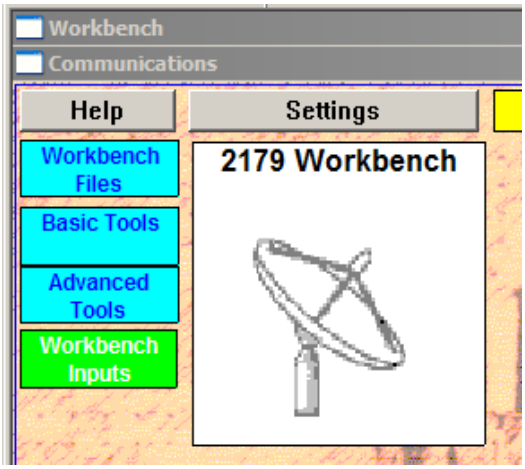
The Modbus Workbench blocks will appear.

2. Click on the applicable block.

Note: The Modbus default point database is in the Cooper/ProView401/Form6 folder. The document title is modbusf-6dat.xls.



2179 Workbench



All Communications changes must take place in the appropri ate Workbench. The Form 6 control allows users to custom configure 2179 protocol points and settings.

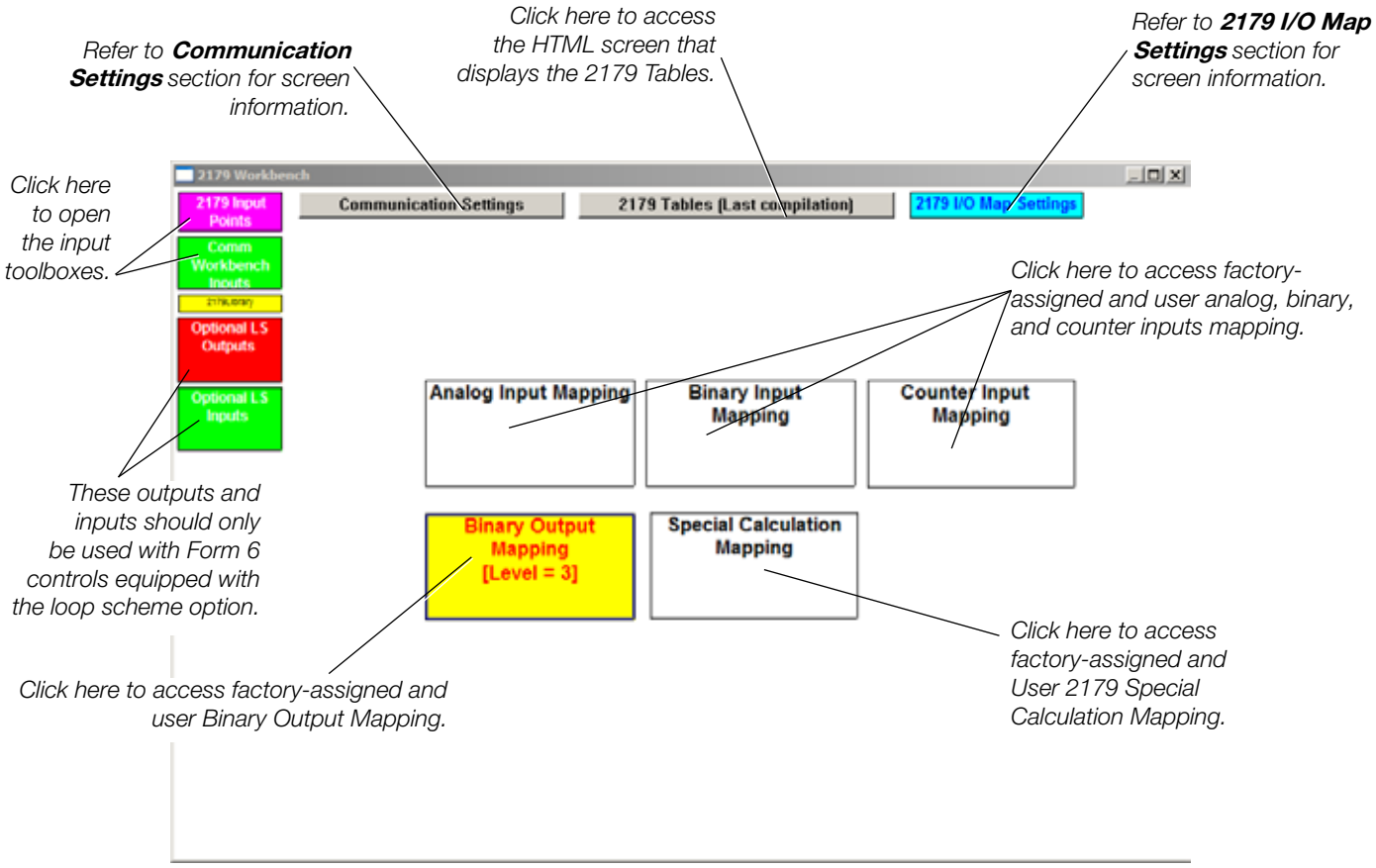
Access the 2179 Workbench as follows:

1. Click on the 2179 Workbench graphic.

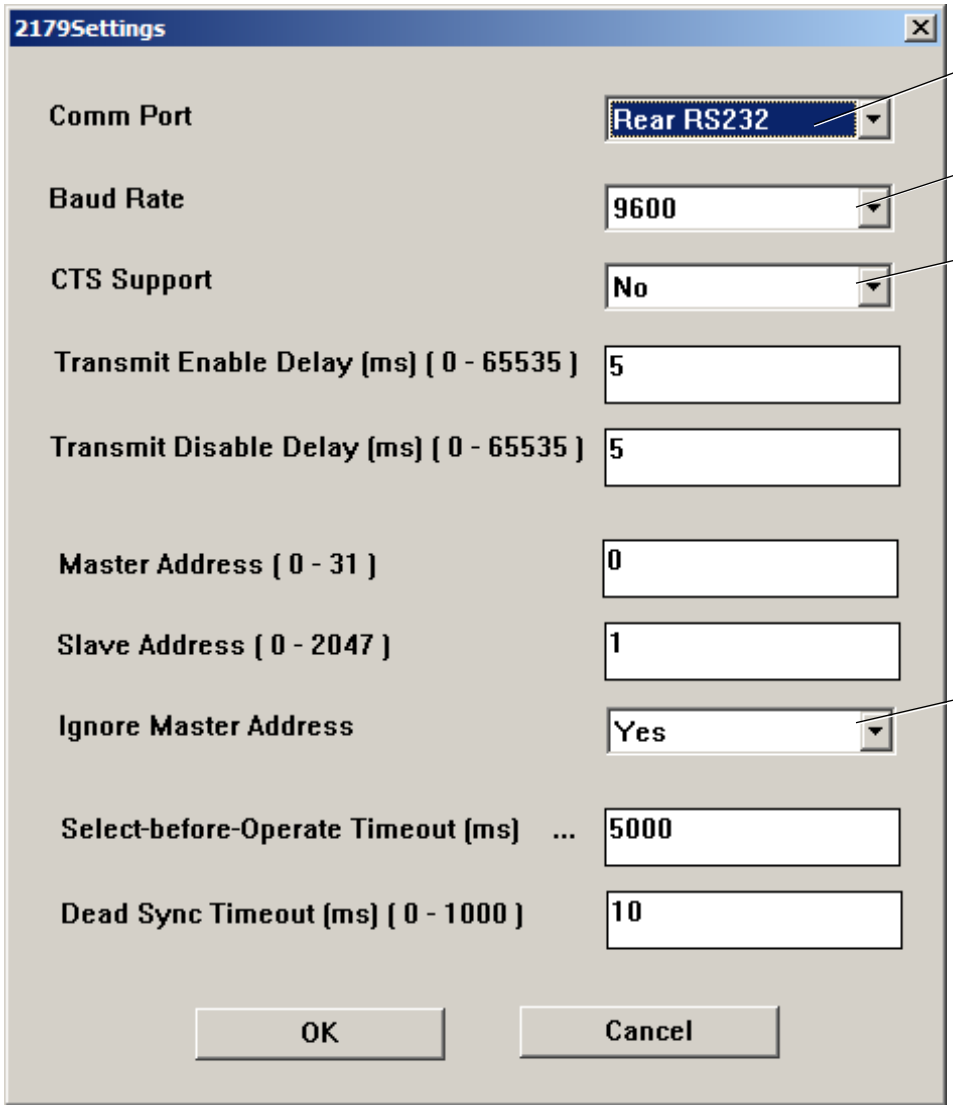
The 2179 Workbench blocks will appear.

2. Click on the applicable block.

Note: The 2179 default point database is in the Cooper/ ProView401/Form6 folder. The document title is 2179F6dat. xls.



Communication Settings



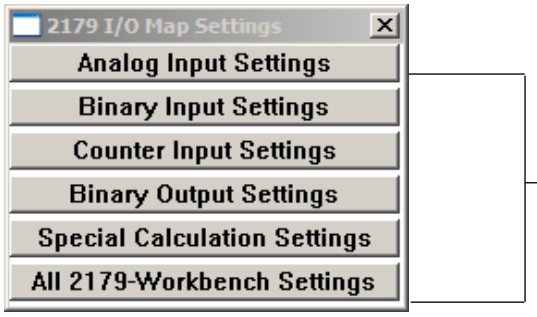
Select either the rear RS-232 or rear RS-485 communication port here.

Select the appropriate baud rate here.

Select Yes or No for Clear to Send support here.

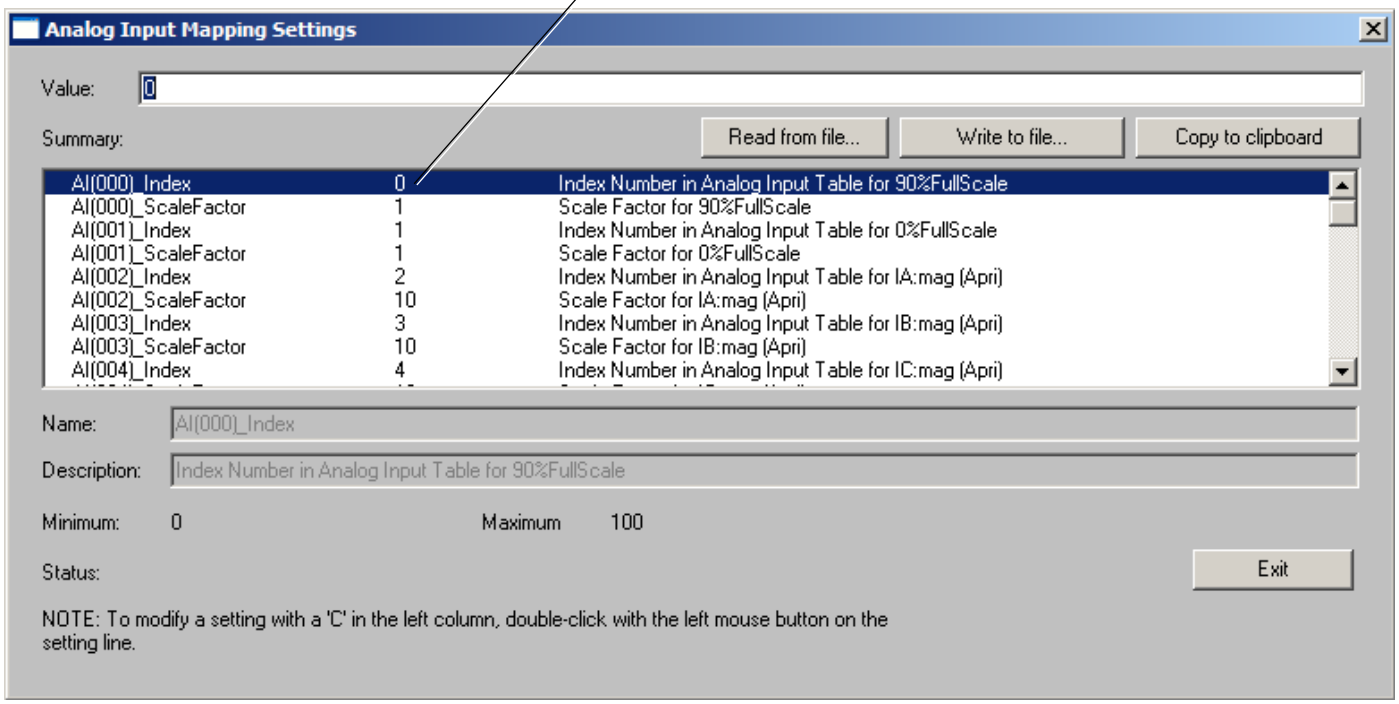
Select whether or not to ignore the Master Address here.

2179 I/O Map Settings



Supervisory off disables all Binary Outputs and can not be set individually like DNP or IEC870.

The new settings available from these menu options will only become active if they are assigned the next contiguous number.



Optional LS Outputs

Optional Loop Scheme outputs are available for Form 6 controls equipped with the LS option. The LS scheme and Workbenches must be loaded.

Setting these outputs to a logical 1 will activate these loop scheme-specific communication functions:

- Comm LS Disable
- Comm SI Disable
- Comm SII Disable
- Reset LS

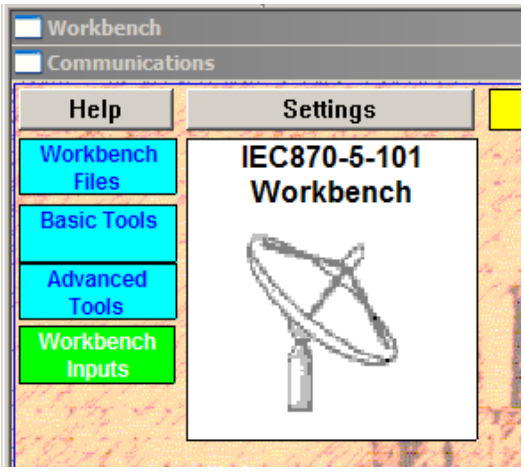
Optional LS Inputs

Seventeen intermediate variables are provided to allow signals to be sent between Workbench blocks.

The Voltage Level Indicators menu provides three intermediate variables for Source I and Source II.

Once defined, the intermediate variables can be used by dragging them out of the Optional LS Inputs menu.

IEC870-5-101 Workbench



All Communications changes must take place in the appropri ate Workbench. The Form 6 control allows users to custom configure IEC870-5-101 protocol points and settings.

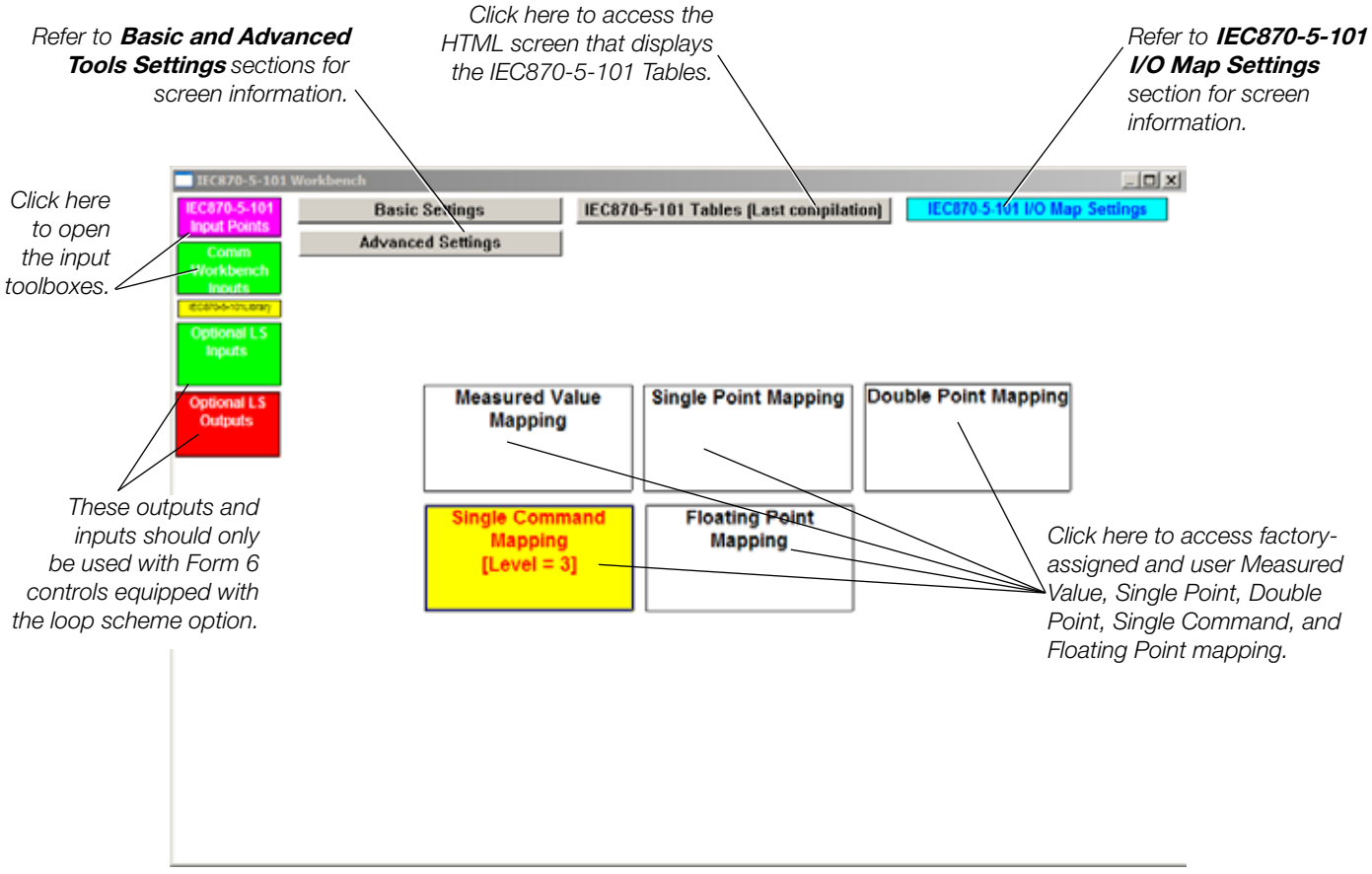
Access the IEC870-5-101 Workbench as follows:

1. Click on the IEC870-5-101 Workbench graphic.

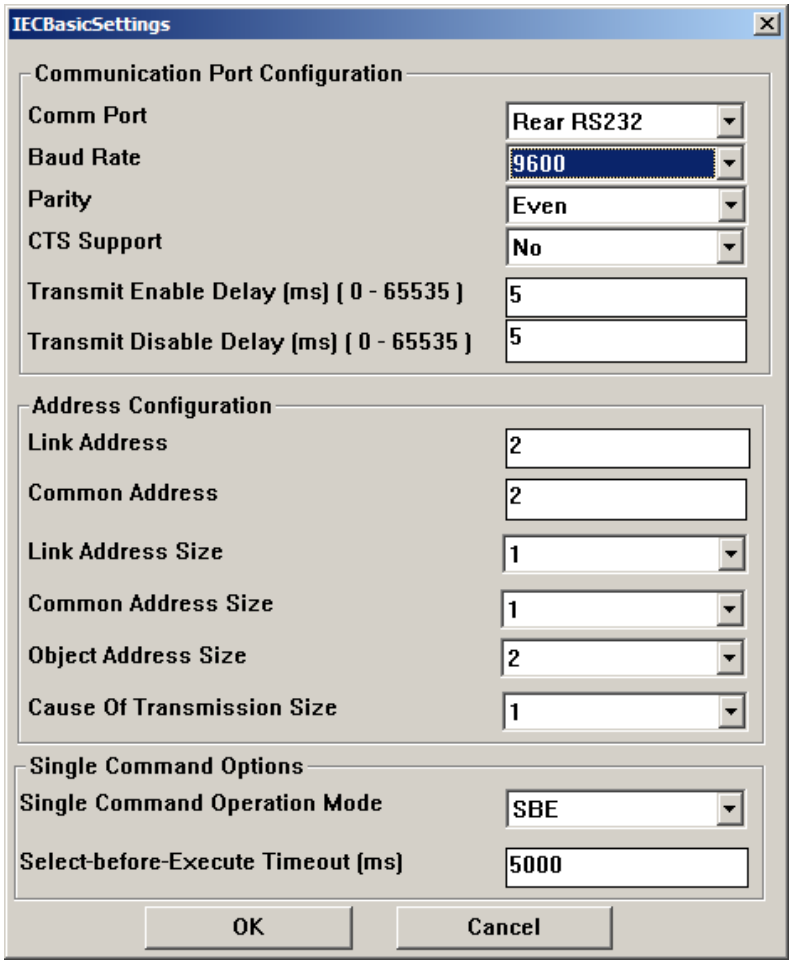
The IEC870-5-101 Workbench blocks will appear.

2. Click on the applicable block.

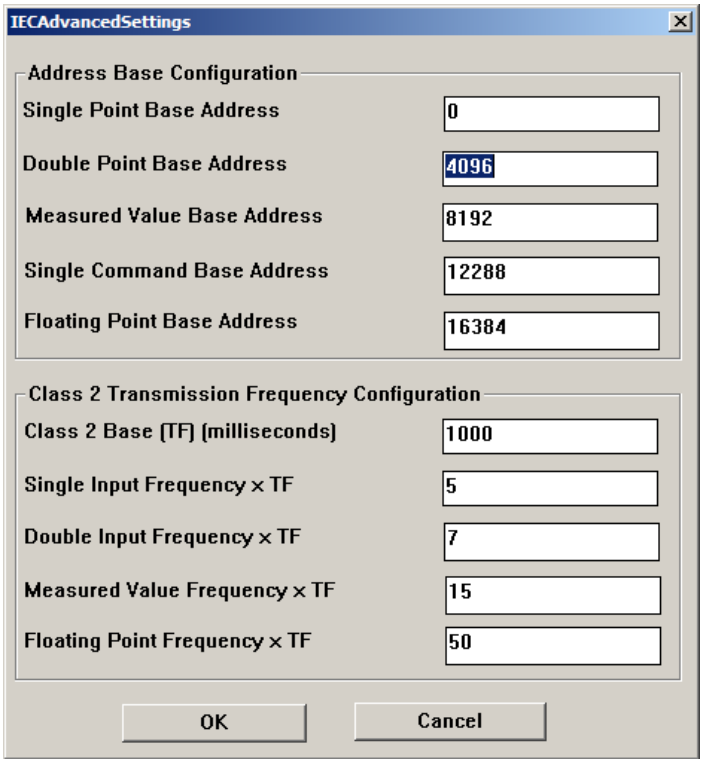
Note: The IEC60870-5-101 default point database is in the Cooper/ProView401/Form6 folder. The document title is iec608705f6dat.xls.



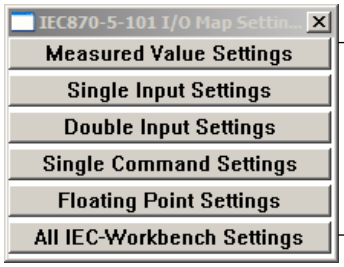
IEC870-5-101 Basic Settings



IEC870-5-101 Advanced Settings

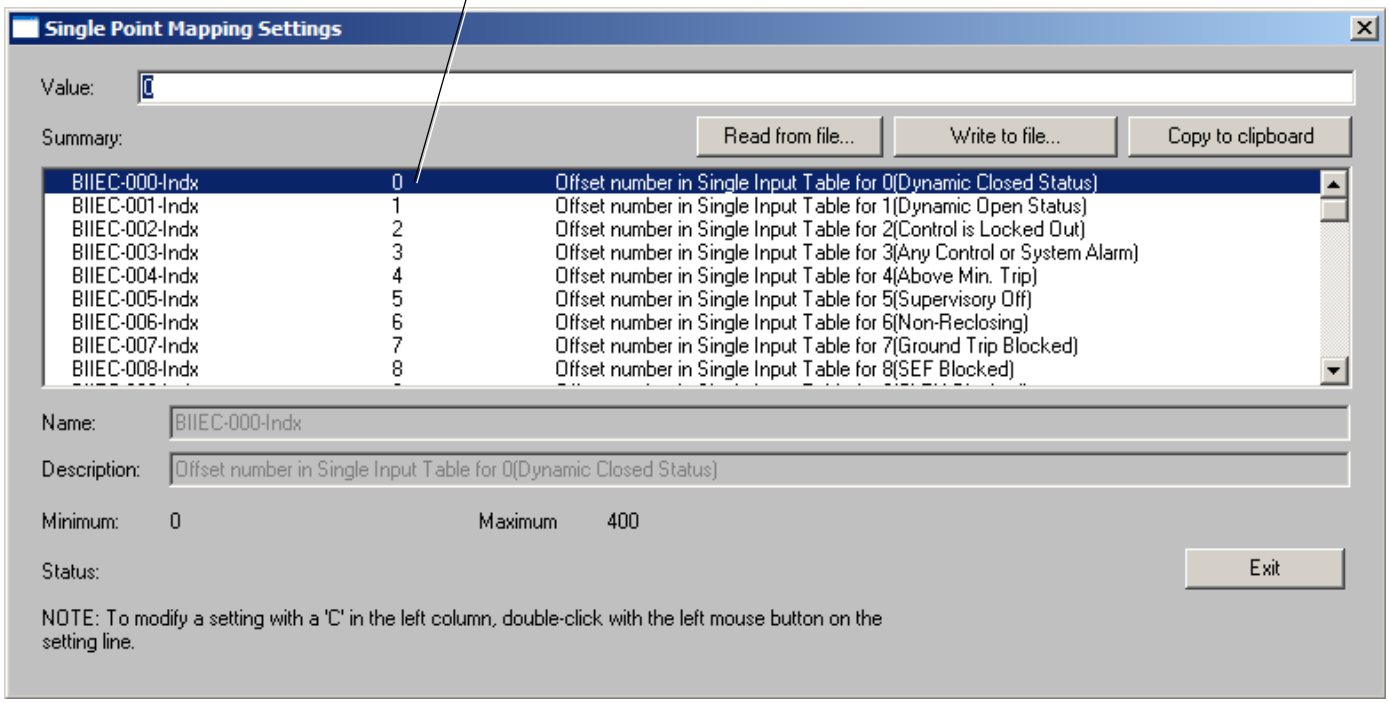


IEC870-5-101 I/O Map Settings



The new settings available from these menu options will only become active if they are assigned the next contiguous number.

SUPERVISORY OFF blocks the ability of the control to respond to supervisory commands sent by serial communications or hardwired inputs. Supervisory commands are defined in the communication workbench on an individual binary output level. The IEC-870 protocol setting BO- #: Name:SupEn set equal to logical "1" will block operation of associated binary output under Supervisory OFF conditions. The setting BOIEC-#-SupEn set equal to logical "0" will allow operation under Supervisory OFF conditions. All binary outputs are supervised (set to logical 1) by factory default except for BOIEC-015(p)-SupEn =0.



Optional LS Inputs

Seventeen intermediate variables are provided to allow signals to be sent between Workbench blocks.

The Voltage Level Indicators menu provides three intermediate variables for Source I and Source II.

Once defined, the intermediate variables can be used by dragging them out of the Optional LS Inputs menu.

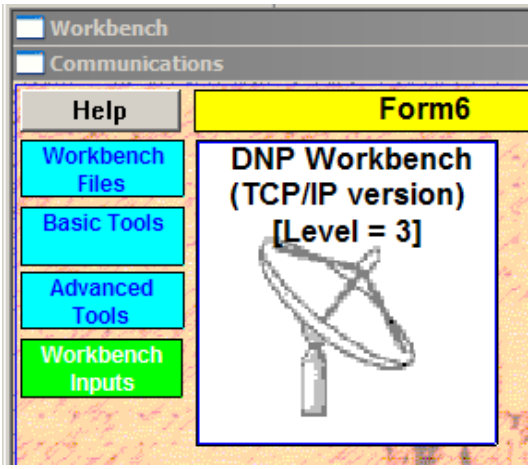
Optional LS Outputs

Optional Loop Scheme outputs are available for Form 6 controls equipped with the LS option. The LS scheme and Workbenches must be loaded.

Setting these outputs to a logical 1 will activate these loop scheme-specific communication functions:

- Comm LS Disable
- Comm SI Disable
- Comm SII Disable
- Reset LS

DNP TCP/IP Workbench



All Communications changes must take place in the appropri ate Workbench. The Form 6 control allows users to custom configure DNP TCP/IP points and settings.

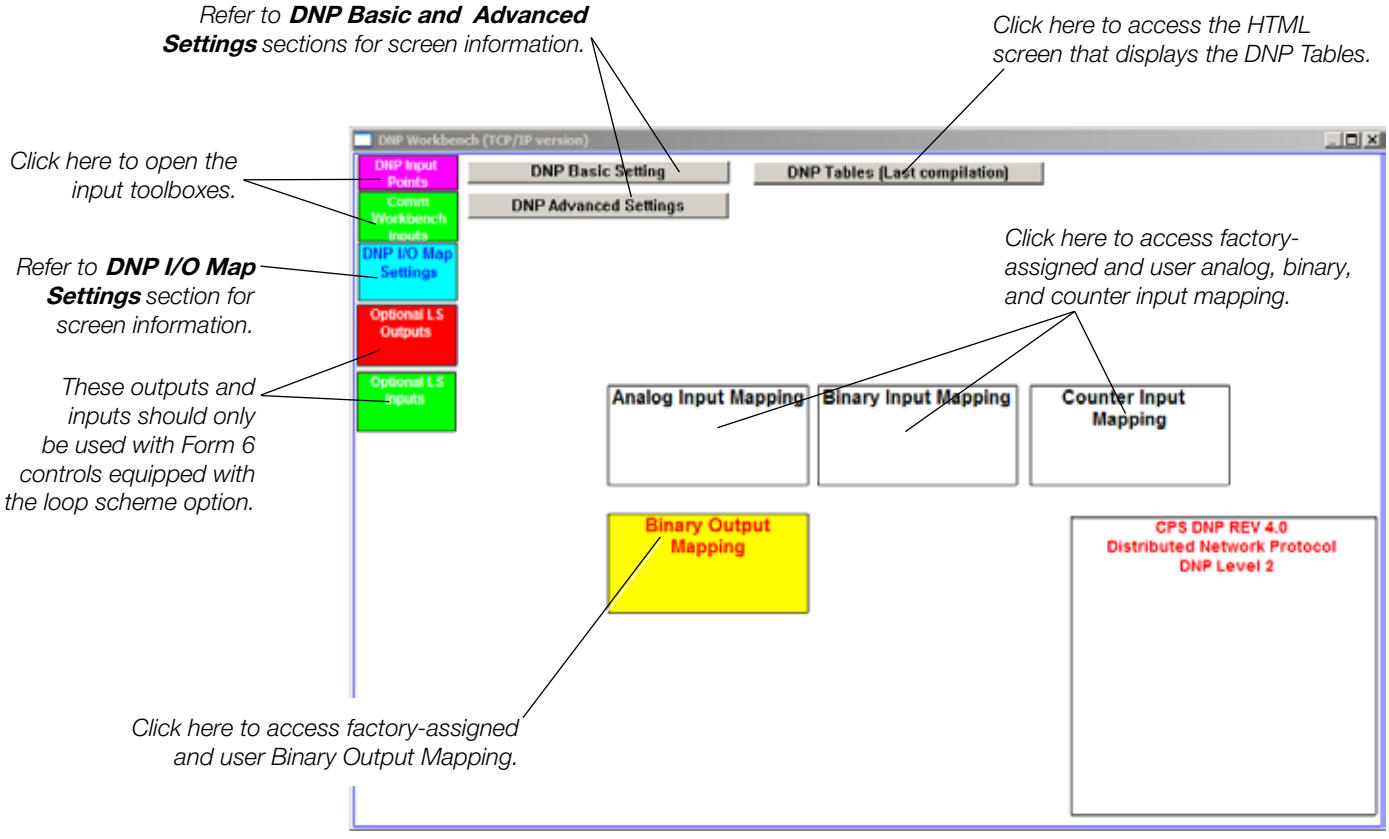
Access the DNP TCP/IP Workbench as follows:

1. Click on the DNP TCP/IP Workbench graphic.

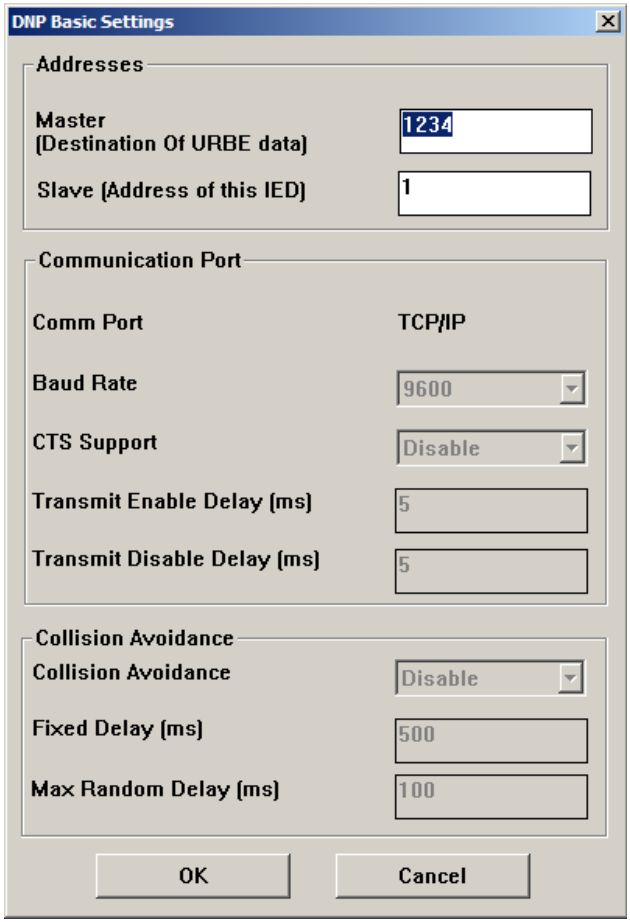
The DNP TCP/IP Workbench blocks will appear.

2. Click on the applicable block.

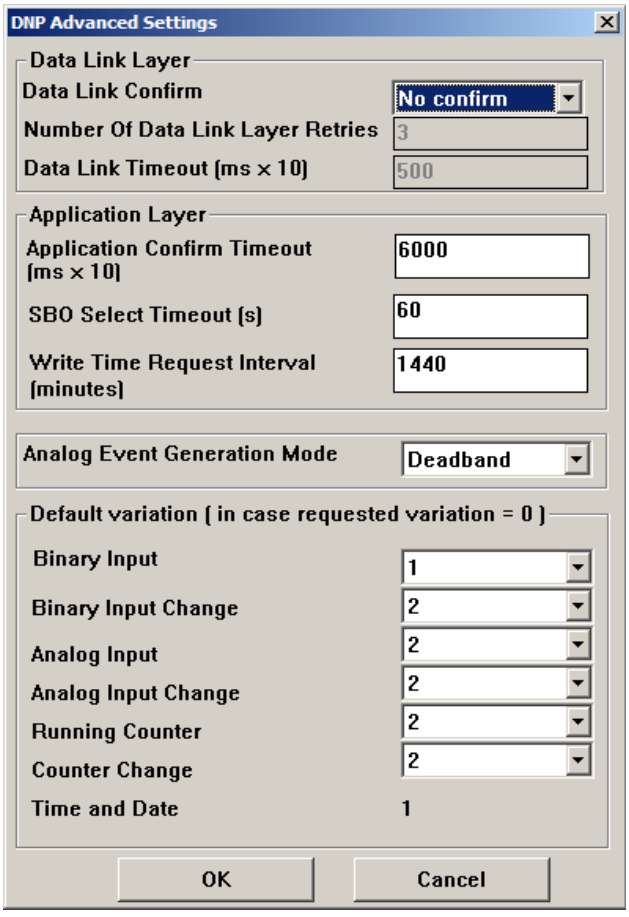
Note: The DNP default point database is in the Cooper/ ProView401/Form6 folder. The document title is dnpf6dat.xls.



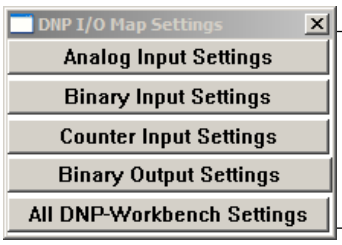
DNP TCP/IP Basic Settings



DNP TCP/IP Advanced Settings

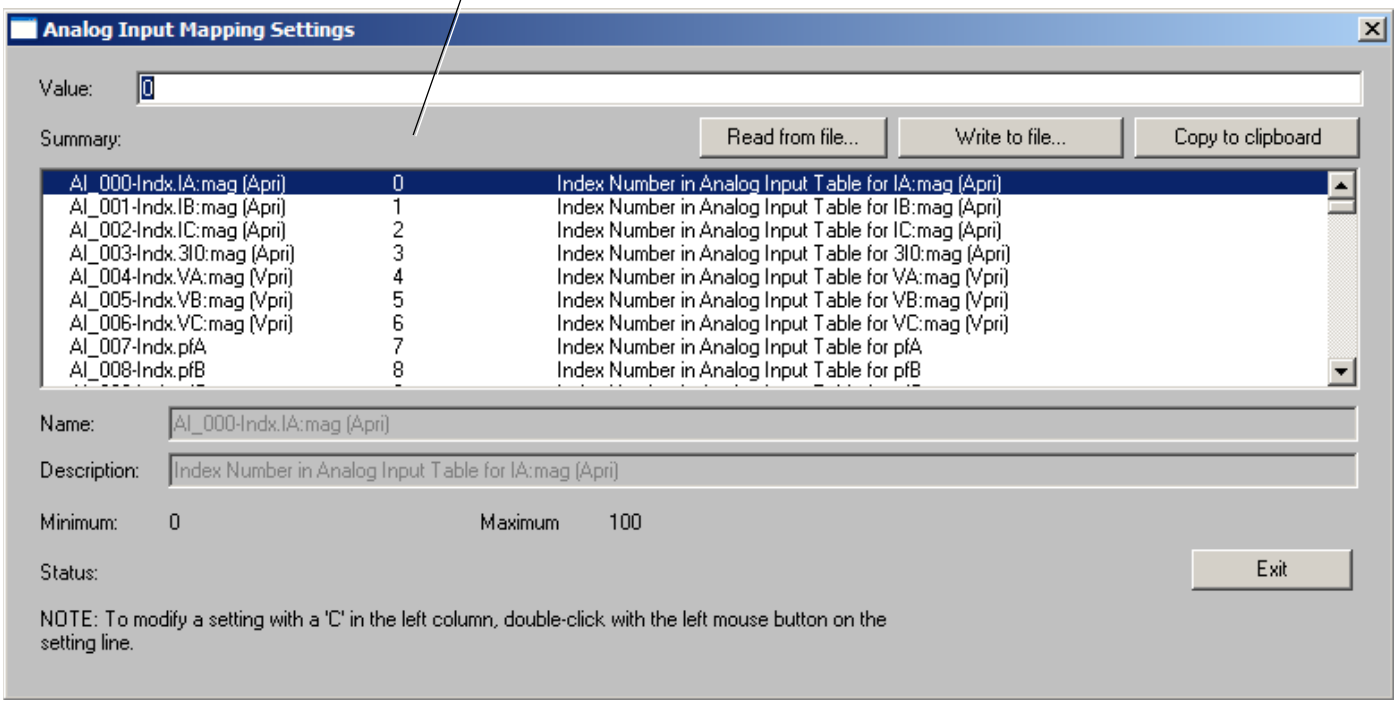


DNP I/O Map Settings



The new settings available from these menu options will only become active if they are assigned the next contiguous number.

SUPERVISORY OFF blocks the ability of the control to respond to supervisory commands sent by serial communications or hardwired inputs. Supervisory commands are defined in the communication workbench on an individual binary output level. The DNP protocol setting BO- #:Name: SupEn set equal to logical "1" will block operation of associated binary output under Supervisory OFF conditions. The setting BO- #:Name:SupEn set equal to logical "0" will allow operation under Supervisory OFF conditions. All binary outputs are supervised (set to logical 1) by factory default except for BO-015(p)-Hot Line Tag Set:SupEn =0.



Optional LS Outputs

Optional Loop Scheme outputs are available for Form 6 controls equipped with the LS option. The LS scheme and Workbenches must be loaded.

Setting these outputs to a logical 1 will activate these loop scheme-specific communication functions:

- Comm LS Disable
- Comm SI Disable
- Comm SII Disable
- Reset LS

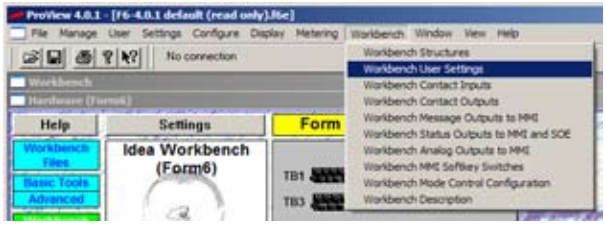
Optional LS Inputs

Seventeen intermediate variables are provided to allow signals to be sent between Workbench blocks.

The Voltage Level Indicators menu provides three intermediate variables for Source I and Source II.

Once defined, the intermediate variables can be used by dragging them out of the Optional LS Inputs menu.

Workbench User Settings

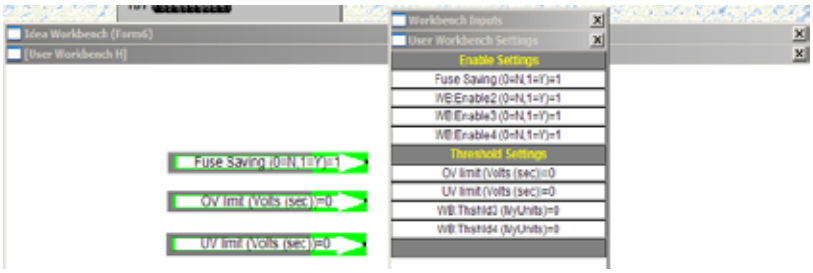


Group dependent settings can be configured and added to the Idea Workbench. These values can change with the active setting group (profile).

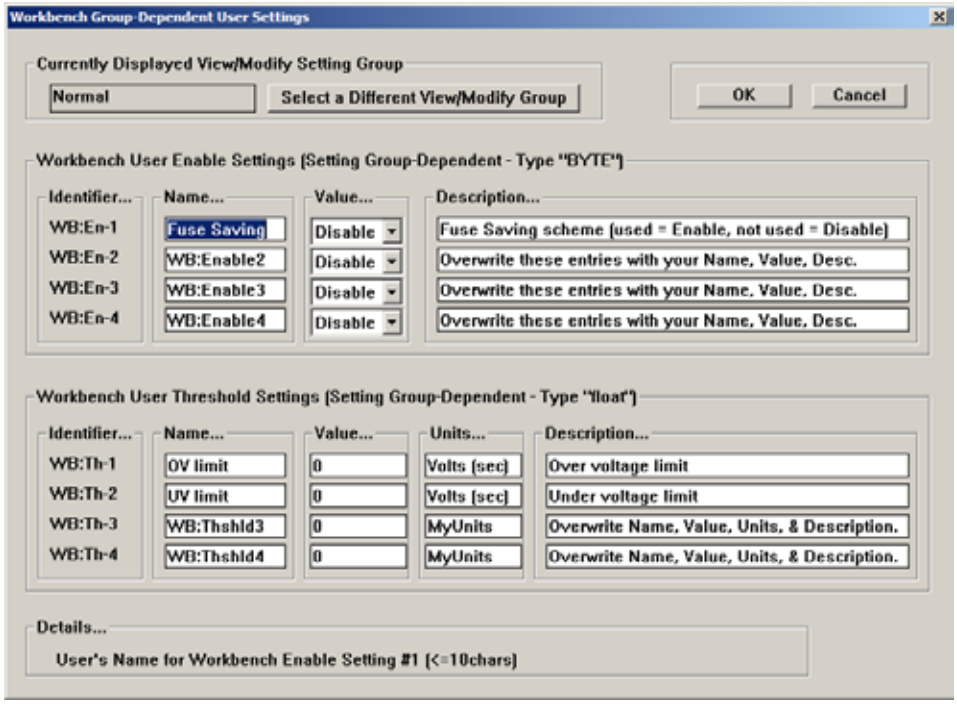
These settings can be added to the Idea Workbench from the Workbench Inputs > User Workbench Settings toolbox.

WARNING: Equipment misoperation. Use of an incompatible or inappropriate settings file, scheme file, or custom software file in a control, relay, recloser, or switch can result in equipment misoperation leading to equipment damage, severe personal injury, or death. G140.1

CAUTION: Protective equipment misoperation. Before downloading configuration files or settings to the equipment, verify that the files and settings are correct for the location and application. Downloading configuration files or settings designed for a different location or application can result in severe personal injury and equipment damage. G133.1



Examples of configured Group Dependent User Settings added to the Idea Workbench.



Workbench User Enable Settings

The upper portion of the Workbench Group Dependent Settings dialog box provides access to the four Workbench Enable Settings, WB:Enable1, WB:Enable2, WB:Enable3 and WB:Enable4. These settings are binary inputs, which are to be used to enable or disable custom logic sections (by logically ANDing with the logic).

Each variable can be given a name as it will appear in the Idea Workbench. This dialog box is where the setting is made for these variables.

Note: These settings will not be visible using the settings browser in the Idea Workbench but must be made here. These settings are still included as part of the Idea Workbench Settings text file.

The available settings are as follows:

- Name: A 10 character or less string to be used as a mnemonic for the variable.
- Value: A selection of either Disabled (logical 0) or enabled (logical 1) must be chosen here.
- Description: A 128 character or less text string that can be used to describe the setting in more detail.

Workbench User Threshold Settings

The Workbench provides four special "WBThshld" settings whose values can change with the active setting group (profile).

The lower portion of this dialog box provides access to the four Workbench User Threshold Settings, WB:Thshld1, WB:Thshld2, WB:Thshld3 and WB:Thshld4 from the Workbench inputs. Each variable can be given a name as it will appear in the Idea Workbench. In this dialog box is where the setting is made for these variables.

Note: These settings will not be visible using the settings browser in the Idea Workbench. They must be made here. These settings are still included as part of the Idea Workbench Settings text file.

The available settings are as follows:

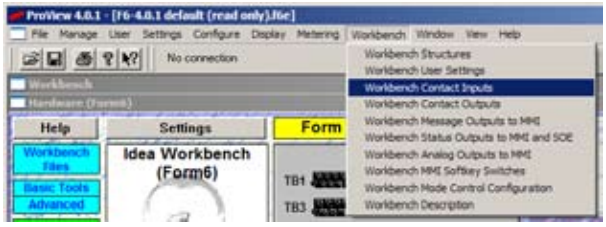
- Name: A 10 character or less string to be used as a mnemonic for the variable.
- Value: The value of the setting.

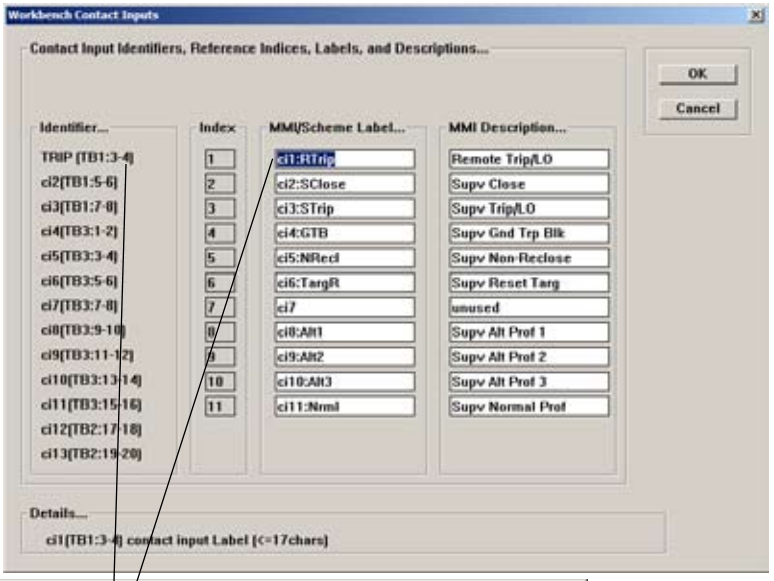
  Note: The value displayed is applicable only to the setting group currently being viewed. The displayed setting group is shown at the top of the dialog box.
- Units: The unit of measure of the setting. This is a text field only and is to be used as a reminder.
- Description: A 128 character or less text string that can be used to describe the setting with more detail.

Workbench Contact Inputs and Outputs

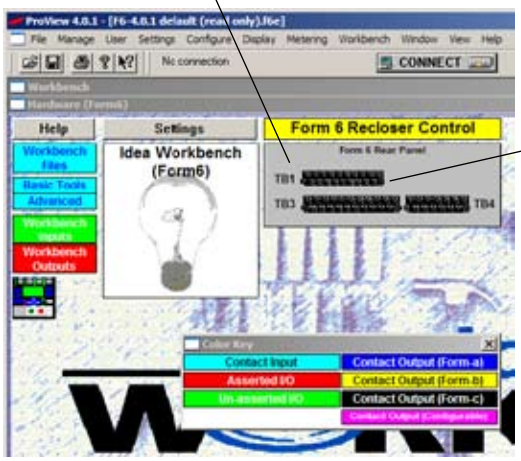
The user can change the name designation of the contact inputs and outputs. A short name can be assigned to the contacts for use in the Idea Workbench view.

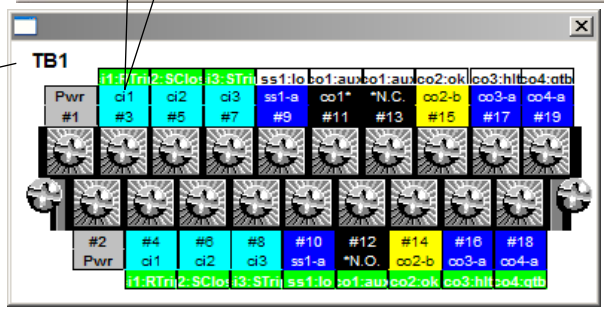
The Workbench>Workbench Contact Inputs and Workbench>Workbench Contact Outputs menu paths provide access to the appropriate dialog boxes.

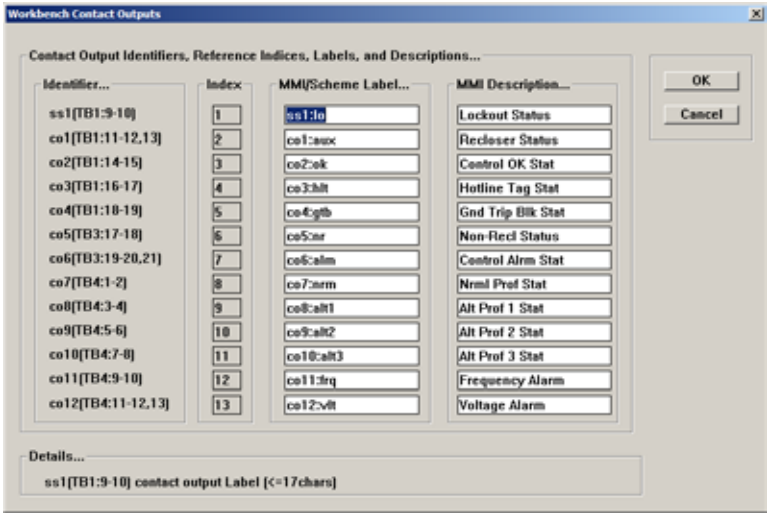


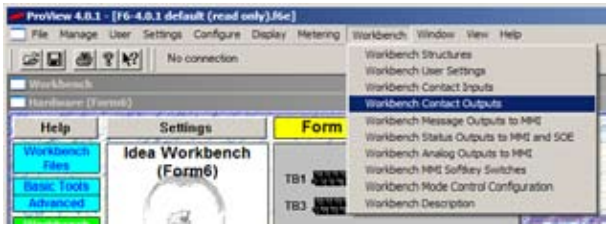


Click on a terminal block to open up a view of that terminal block.

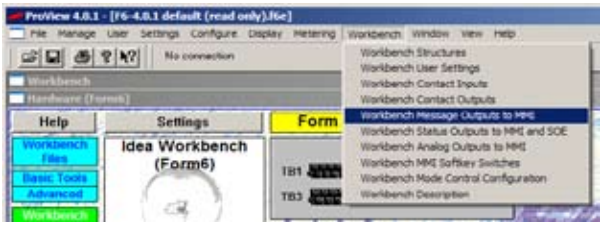








Workbench Message Outputs to MMI

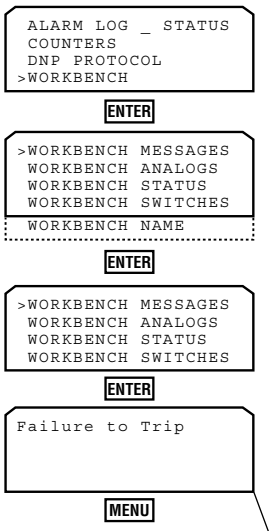


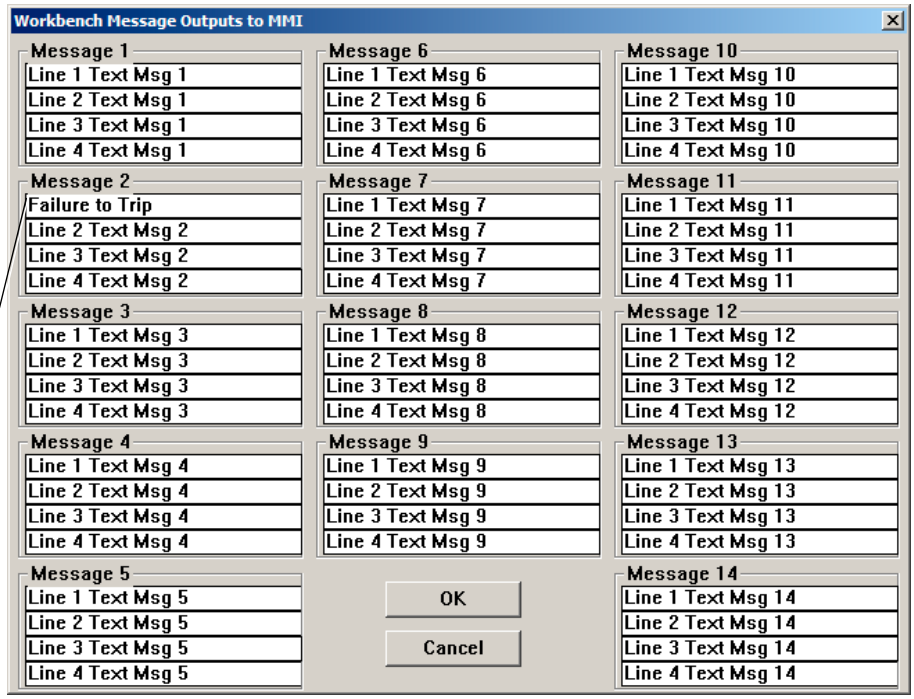
The user can configure a text message to be displayed on the Form 6 control front panel MMI whenever a specific event or action occurs.

If blank line(s) are desired in a customized text message, fill the line(s) intended to be blank with at least one space character.

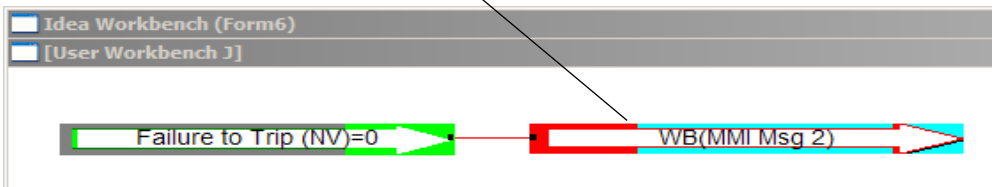
When customizing text messages keep in mind that if more than one LCD Text Message is attempting to be sent to the front panel MMI at the same time, the lower number priority message will be displayed, i.e. if Message 1 and Message 14 are both driven to a logical 1 at the exact same time only Message 1 will display. But, if one message is triggered after another, they will appear in the order they are triggered, regardless of the message number, i.e. if Message 14 is triggered first and then Message 1 is triggered, Message 14 will display until Message 1 is triggered and then Message 1 will display.

The text message display and timing can be set in the MMI Setup and Password box accessed via the Settings>MMI Setup and Password menu path in ProView.

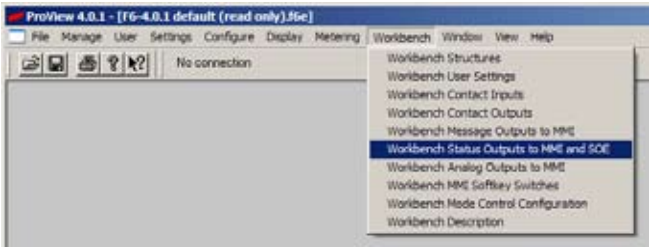




For example, the user can configure a message to assert when a Failure to Trip occurs.



Workbench Status Outputs to MMI and SOE

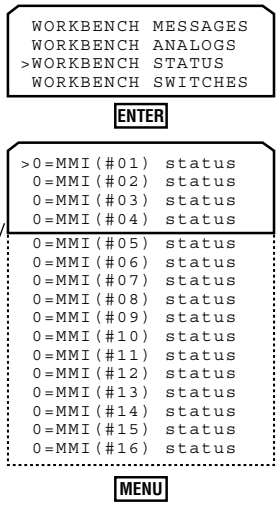


The Idea Workbench provides the ability to trigger up to 16 custom sequence of events (SOE) event types. To set up the appearance of the messages in the SOE log, open the Workbench Status Outputs to MMI and SOE dialog box by following the Workbench>Workbench Status Outputs to MMI and SOE menu path.

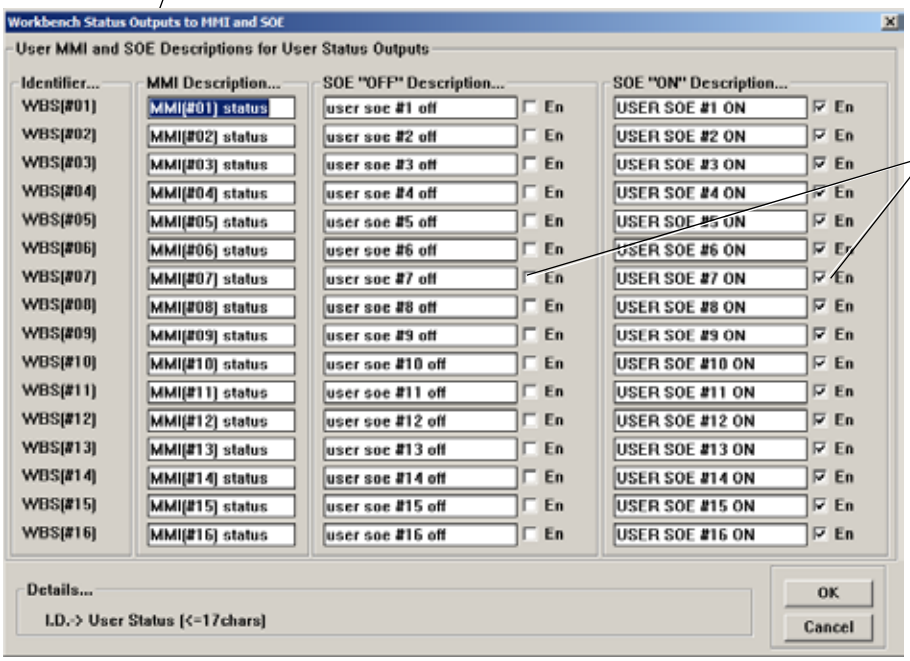
There are 16 Workbench outputs, WBS(#01) through WBS(#16), which when driven to a logical "1" state will trigger a SOE record using the "SOE ON Description" text string. Similarly, when the Workbench output drops from a logical "1" to a logical "0", an SOE event using the "SOE OFF Description" text string will be triggered.

There are three settings for each output:

- MMI Description – How the event is displayed on the control front panel LCD (17 character maximum)
- SOE “OFF” Description – The SOE text that appears when the SOE event transitions to a logical “0” state (16 character maximum)
- SOE “ON” Description – The SOE text that appears when the SOE event transitions to a logical “1” state (16 character maximum)



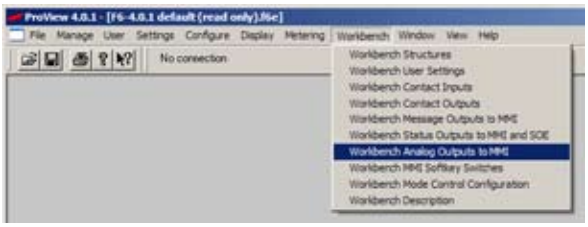
Appearance of the event status on the Form 6 control front panel.

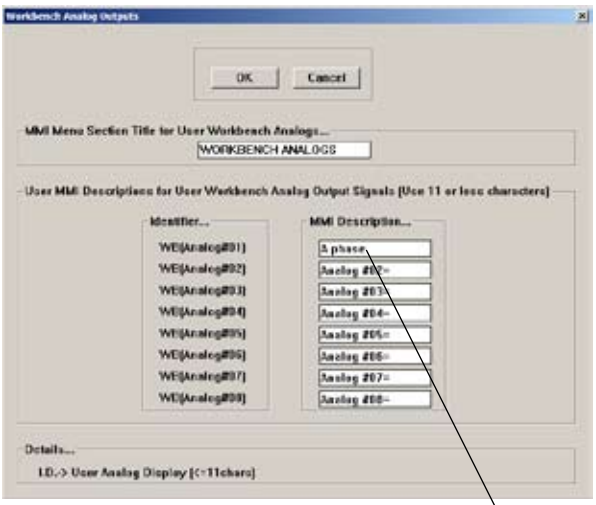


Check the appropriate box to specify which event transition(s) you want recorded in the SOE log:

- *Only the transition from OFF to ON*
- *Only the transition from ON to OFF*
- *Both transitions*

Workbench Analog Outputs to MMI





The function of these signals is to route up to eight custom analog values to the Form 6 control front panel MMI. These analog values can be any quantity and accessed or created in the Idea Workbench including metering data, counter, timers.

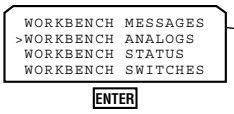
The eight variables in this section all appear as an exclamation point (" ! ") until they are dragged off of the User Analog Outputs to MMI toolbox and into a User Workbench. At that time they are named in the form of "WB(Analog#0X)". The #0X is replaced by the actual number of the analog value when ProView is communicating with the Form 6 control. Only floating point signals can be connected to these outputs.

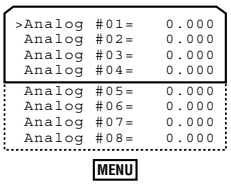
The analog values are accessed from the front panel by following the Workbench>Workbench Analogs menu path. Refer to **Workbench Menu** section in **Front Panel Operation** section of this manual.

Note: While it is possible to change the name of the custom analog measurements as they appear on the Form 6 recloser control LCD display, it does not change the measurement names as they appear in the Idea Workbench.

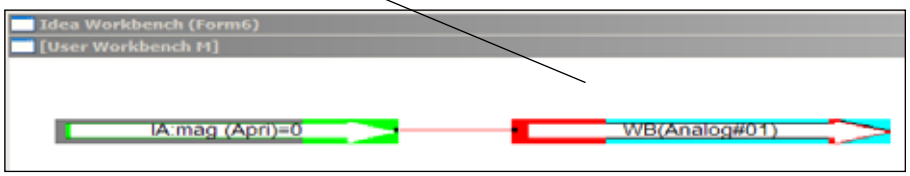
Change the measurement names as they appear on the Form 6 control LCD display as follows:

1. Open the Workbench Analog Outputs dialog box.
2. Enter the custom names.
3. Click on OK.
4. Connect and download to the control.



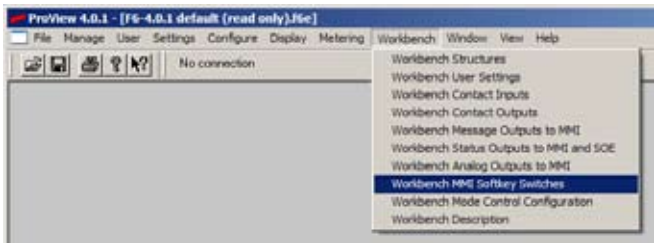


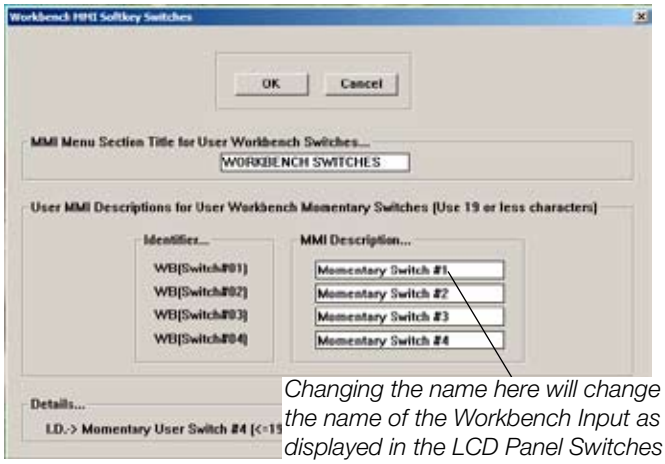
Example of custom analog value routed to the Form 6 control front panel MMI.



Name of Workbench Outputs Listing	Result of Driving the Block Input
Analog Outputs to MMI (use "float" signals only)	Displays the connected floating point analog signal as the:
WB(Analog#01)	1st Workbench Analog signal on the Form 6 Recloser Control MMI.
WB(Analog#02)	2nd Workbench Analog signal on the Form 6 Recloser Control MMI.
WB(Analog#03)	3rd Workbench Analog signal on the Form 6 Recloser Control MMI.
WB(Analog#04)	4th Workbench Analog signal on the Form 6 Recloser Control MMI.
WB(Analog#05)	5th Workbench Analog signal on the Form 6 Recloser Control MMI.
WB(Analog#06)	6th Workbench Analog signal on the Form 6 Recloser Control MMI.
WB(Analog#07)	7th Workbench Analog signal on the Form 6 Recloser Control MMI.
WB(Analog#08)	8th Workbench Analog signal on the Form 6 Recloser Control MMI.

Workbench MMI Softkey Switches





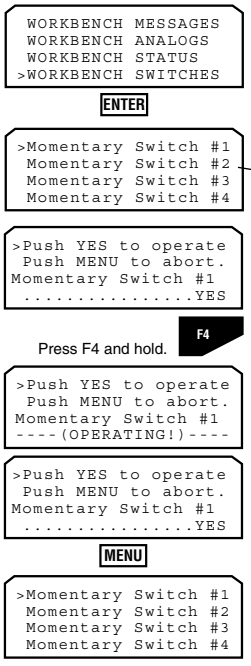
Changing the name here will change the name of the Workbench Input as displayed in the LCD Panel Switches toolbox and subsequently on the Form 6 control front panel display.

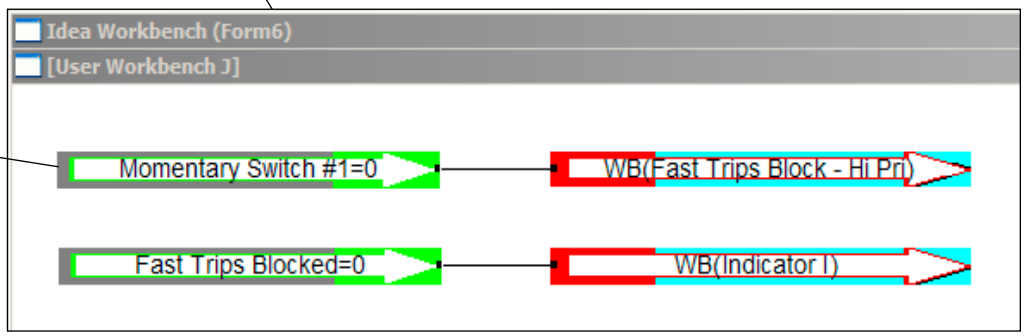
The function of these signals is to route the status of four virtual pushbuttons accessible from the control's front panel MMI to the Idea Workbench.

The virtual switches are accessed from the front panel by following the Workbench>Workbench Switches menu path. Refer to **Workbench Menu** in **Front Panel Operation** section of this manual.

Change the momentary switch names as they appear on the Form 6 control LCD display as follows:

1. Open the Workbench MMI Softkey Switches dialog box.
2. Enter the custom names and, if desired, change the name of the MMI Menu Section Title for User Workbench Switches.
3. Click on OK.
4. Connect and download to the control.

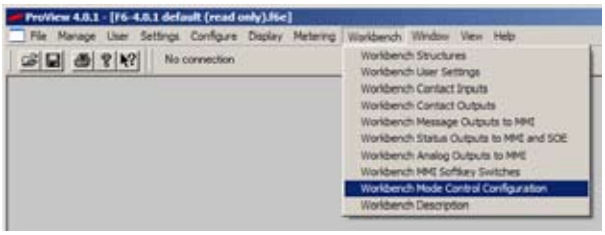




Example of configured MMI Softkey switch (without a name change).

Name of Workbench Inputs Listing	Result of Driving the Blocks Output
Softkey Pushbuttons from MMI	**Output is logical 1 if the:**
Momentary Switch #1=0	Momentary Switch #1 on the front panel MMI is pressed.
Momentary Switch #2=0	Momentary Switch #2 on the front panel MMI is pressed.
Momentary Switch #3=0	Momentary Switch #3 on the front panel MMI is pressed.
Momentary Switch #4=0	Momentary Switch #4 on the front panel MMI is pressed.

Workbench Mode Control Configuration



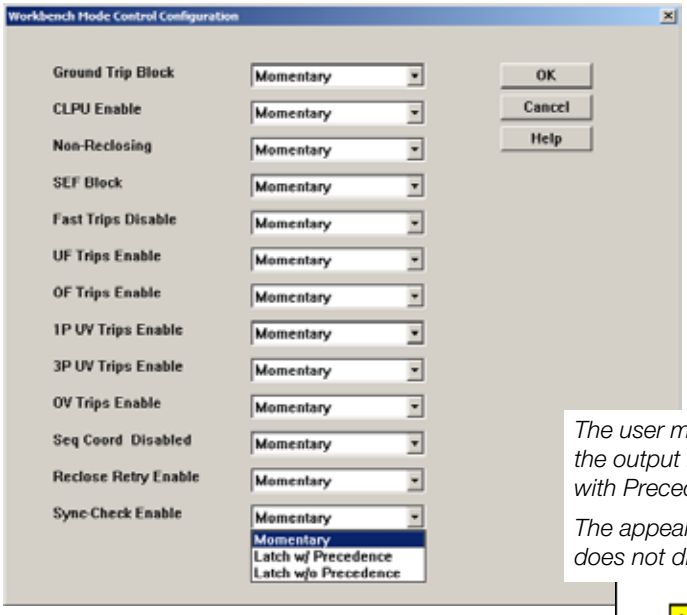
The Workbench Mode Control Configuration dialog box allows the user to modify Form 6 recloser control modes of operation from within the Idea Workbench. The user can choose from the following configurations:

- Momentary: A momentary contact acts as a toggle input to the control. For momentary contacts, if a state is set by the momentary contact input, it can be reset by DNP, a front panel control button, or a settings change. Conversely, if a state change is set by DNP, a settings change, or front panel control, it can be reset by an appropriately configured contact input.

  Control functions that act simply to toggle the current state are "without precedence", which indicates that if a state was set by the contact input, it can be subsequently reset by the other sources of state modification (DNP, pushbutton, or settings).

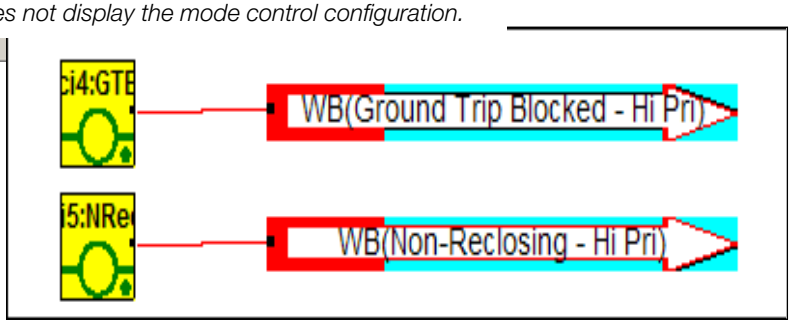
- Latched with Precedence: For a latched contact input with precedence, if the state of the contact input is maintained, the state will be maintained, and cannot be changed by the local front panel pushbutton. A setting change or Communications control point assertion cannot override a contact input with precedence. However, if the positive state is not maintained at the contact input, any of the other settings methods can act to modify the state.

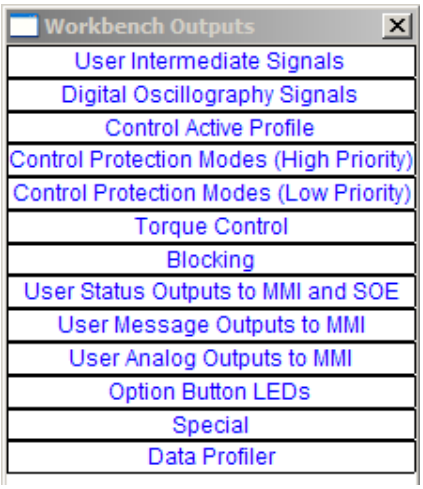
- Latched without Precedence: For a latched contact without precedence, the state is set when the contact is asserted, and reset when the contact input is deasserted. The contact input can be asserted, and a subsequent DNP, front panel pushbutton, or setting can reset the state, while the contact input remains asserted.



The user must refer to this screen to determine if the output is configured for Momentary, Latched with Precedence, or Latched without Precedence.

The appearance of the output in the Workbench does not display the mode control configuration.





For any of the mode controls to effect the state of a mode, the following must be accomplished:

1. The control protection mode must be selected from the Workbench Outputs Control Protection Modes toolbox (high or low priority).
2. It must be placed within the Idea Workbench.
3. It must be driven by a signal.

If you do not place any mode control blocks within the Idea Workbench, only downloading new settings from ProView, completing front panel MMI operations, or controlling via communications can modify the mode.

Note: The Hot Line Tag switch on the Form 6 control front panel, when in the ON position, overrides any mode control operating within the Idea or Communications Workbenches.

Note: The high priority mode controls take priority over low priority mode controls.

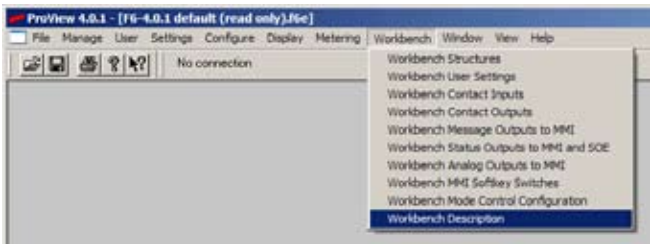
If a high-priority mode is being driven to the active state from within the Idea Workbench, and the high priority control for the subject mode is set to Latch w/ Precedence in the Mode Control Configuration dialog box, the mode will remain in the Enabled state regardless of transitions on the low priority mode control or operation of the Ground Trip Block or Non-reclosing front panel buttons.

Note: The mode can be modified by a communication master if supervisory control is enabled.

If a Latch w/Precedence high priority control is driven to the inactive state from within Idea Workbench, or is not used in the Idea Workbench at all, the mode can be changed by any of the following means and according to the following conditions:

- A remote master communicating through the communications protocol installed in the Communications Workbench can set the mode to either Enabled or Disabled.
- A rising edge at the input of a low priority control for the mode placed within the Idea Workbench will toggle the state of the mode.
- A rising edge of the high priority mode control will toggle the state of the mode, if that mode control is configured for Momentary operation.
- A rising edge of the high priority mode control will set the mode to the enabled state, if that mode control is configured for Latch w/o Precedence operation.
- A falling edge of the high priority mode control will set the mode to the disabled state, if that mode control is configured for Latch w/o Precedence operation.
- If the mode is one of Ground Trip Block or Non-reclosing, operation of the associated front panel buttons will toggle the state of the mode.
- If a user downloads ProView settings to the control, the settings in the downloaded scheme will take effect when the download is complete.

Workbench Description



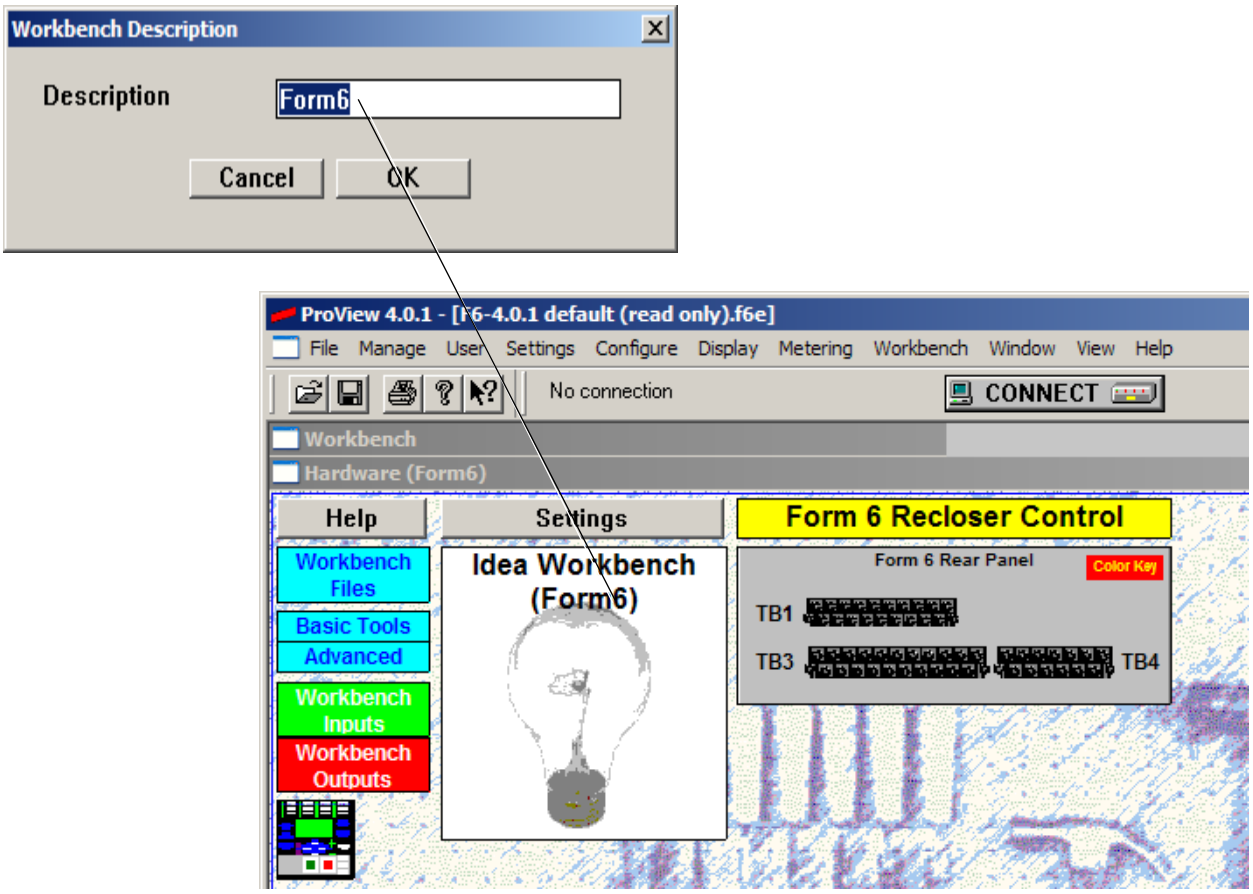
The Workbench Description dialog box enables the user to change a Workbench name.

Note: This feature is also available via the Workbench Files menu or the Settings>Simplified Setup screen.

1. Open the Workbench Description dialog box.

The Description text will be highlighted.

2. Type in the new Description text.
3. Click on OK.



Form 6 Loop Scheme (LS) Control

Note: The formation contained in this section applies to the Form 6-LS control only.

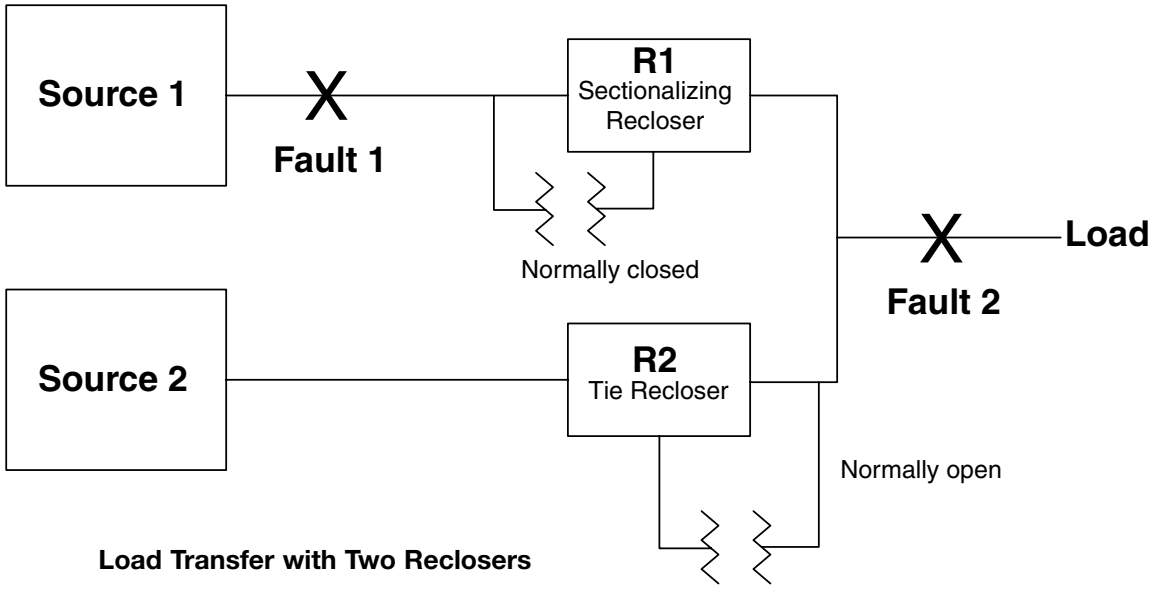
The Form 6-LS Control improves distribution system continuity through load-transfer and loop-sectionalizing schemes. The Form 6 can change the protection scheme upon an LS action. Each protection profile can be configured differently, so programming an LS scheme can be easily accomplished for sectionalizing or tie applications. The Form 6-LS Control senses the loss of source- and/or load-side voltage with customer supplied potential transformers or internal voltage sensors. The control will perform its programmed LS functions after a programmable time delay when loss of voltage occurs. The control can be in either the sectionalizing or the tie mode of operation.

- The sectionalizing mode senses voltage on the source-side of a normally closed recloser and is activated upon loss of source-side voltage. The ability to change the profile in this application enhances the loop scheme's capabilities.
- The tie mode senses voltage on both sides of a normally open recloser and is activated upon loss of voltage on either side.

Load Transfer / Manual Return-to-Preferred Service

A simple load-transfer scheme using two electronic reclosers with LS sectionalizing controls is diagrammed below. The normally closed R1 senses the source side voltage. When S1 voltage is lost (for example, when a fault occurs at Fault 1), the LS application begins timing.

R1 will open before R2 closes to restore service from the alternate Source 2. To return to preferred source S1, the controls can be operated manually or through SCADA. In the event of fault at Fault 2, R1 sequences to lockout. Upon loss of load side voltage, R2 closes and would normally sequence to lockout. However, this can be reduced to one trip operation to lockout by using a momentary non-reclose After LS Action option to prevent reclosing if a fault operation occurs within a preset time of closing. The momentary on time of the LS action options is programmable from 1 to 1000 seconds.

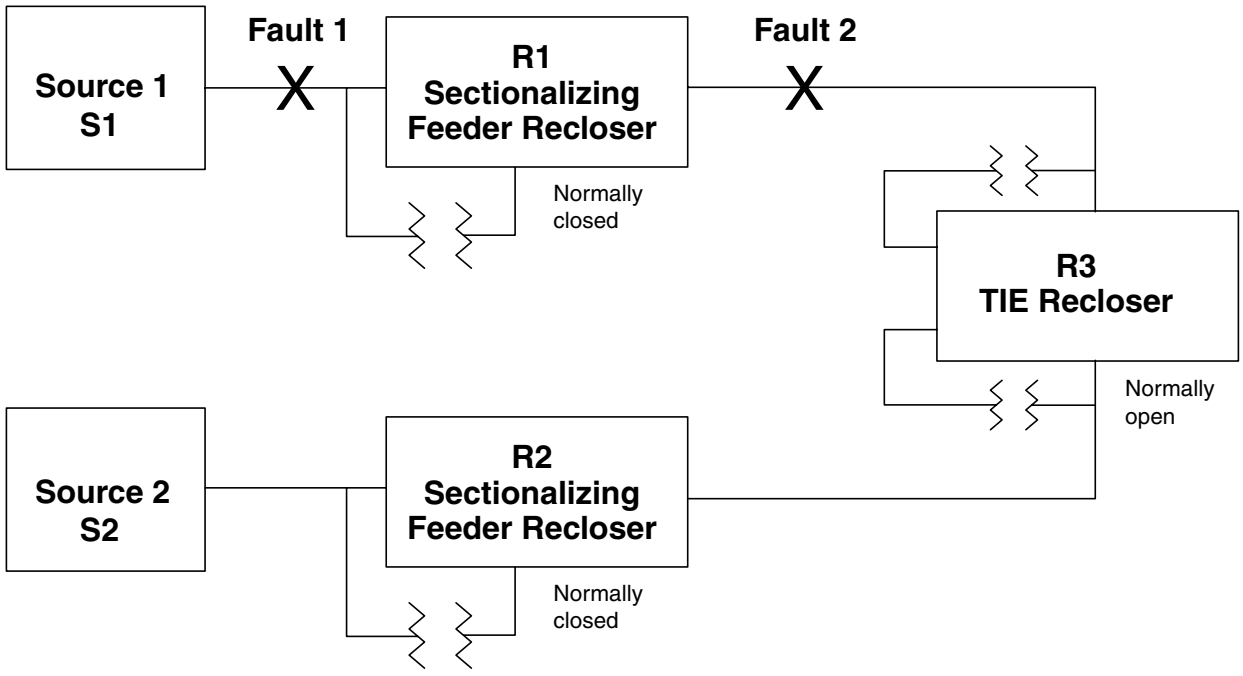


Load Transfer with Two Reclosers

Typical Loop Scheme, 3 Reclosers

Below is a diagram of a typical three recloser loop sectionalizing scheme. Feeder Reclosers R1 and R2 are located at the approximate midpoint of the load on two feeders. The ends of the feeders are joined by a normally open recloser (TIE), R3. Feeder Reclosers R1 and R2 are programmed to perform the sectionalizing LS function. R3 is programmed with the LS TIE functionality. As an example, R1 and R2 are set for a 560 A phase minimum trip and are after LS Action programmed to change profiles, which provides the appropriate minimum trip (280 A in this example), or, depending on system requirements, can be set to lockout.

Recloser R3 is set for a 400 A minimum trip. Upon loss of source side voltage for 25 seconds (programmable value), the profile of R1 is changed and the LS is now programmed for one trip operation to lockout and its minimum trip setting is reduced to 280 A. Recloser R3 closes 30 seconds (programmable value) after the loss of voltage. In the event of a fault at Fault 1, R1 would operate one trip operation to lockout. Again, under normal conditions (S1 energized), a fault at Fault 2 would cause R1 to sequence to lockout. After 30 seconds, R3 would close in on the fault and lock out on its one operation. In all cases, the fault is isolated to the smallest section.



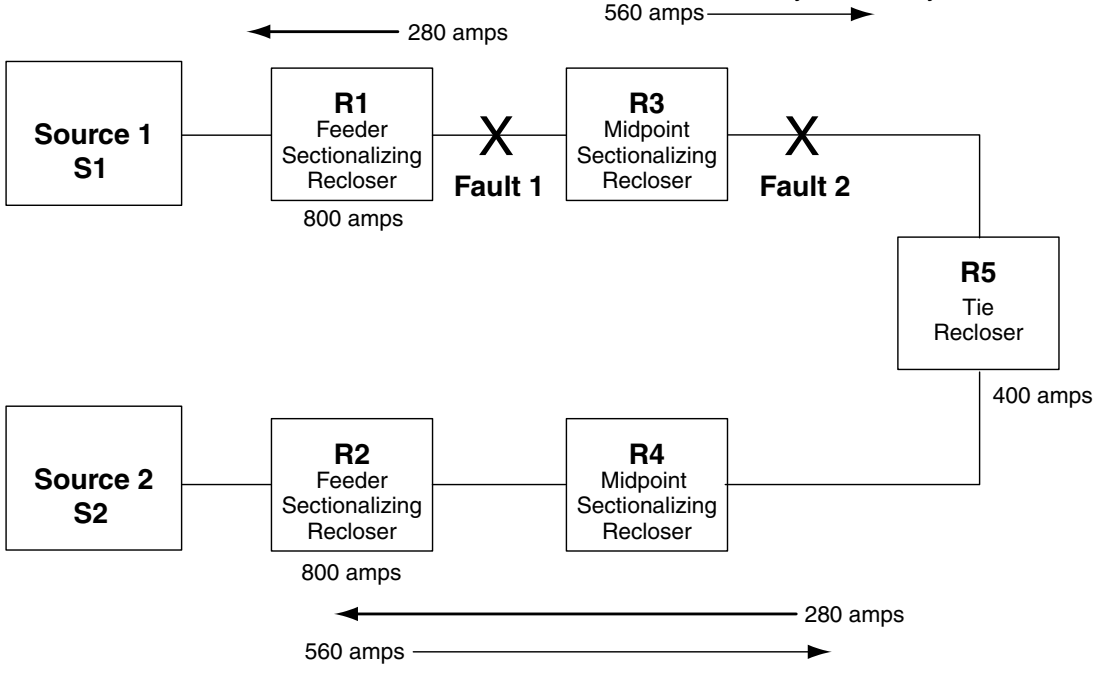
Loop Sectionalizing with Three Reclosers

Loop-Sectionalizing Scheme with Five Reclosers

A loop-sectionalizing scheme involving five reclosers confines a permanent fault to smaller portions of the distribution circuit while maintaining service to the remaining unfaulted sections. In this scheme, each distribution circuit is divided into three sections of equal load with normally closed reclosers R1, R3 and R2, R4. The two circuits are connected at the tie point with a normally open recloser, R5. The Form 6-LS controls for Feeder Reclosers R1 and R2 are programmed with LS sectionalizing capabilities, which will lock out the reclosers upon loss of source voltage after a programmable time delay. The Form 6-LS controls for Midpoint Reclosers R3 and R4 are also programmed with sectionalizing capabilities which, upon loss of source voltage and after a programmable time delay (longer than R1 and R2), change the profile to provide a different minimum trip value and number of operations to lockout. The R5 recloser control is programmed as a LS tie recloser, which will close the recloser upon loss of voltage on either side after a programmed time delay longer than that of Midpoint Reclosers R3 or R4.

As an example (see the diagram below), upon loss of S1 voltage, reclosers R1, R3, and R5 sense the voltage loss and start timing. Feeder Recloser R1 times out first and opens. Next, the active profile of R3 is changed and its minimum trip value becomes 280 A to coordinate with the tie recloser. The non-reclose feature is also momentarily enabled (an After LS Action option). Finally, the tie recloser closes. The major portion of the loop, up to R1, is now fed from S2. After restoration of S1, the return to normal system operation is accomplished manually or through SCADA commands.

If a permanent fault occurs a Fault 1, R1 operates to lockout normally. R3 and R5 sense the loss of voltage and start timing. Midpoint Recloser R3 times out and changes its active profile to provide a new minimum trip of 280 A and its operating sequence is momentarily modified by the LS Action, non-reclosing.



Loop Sectionalizing with Five Reclosers

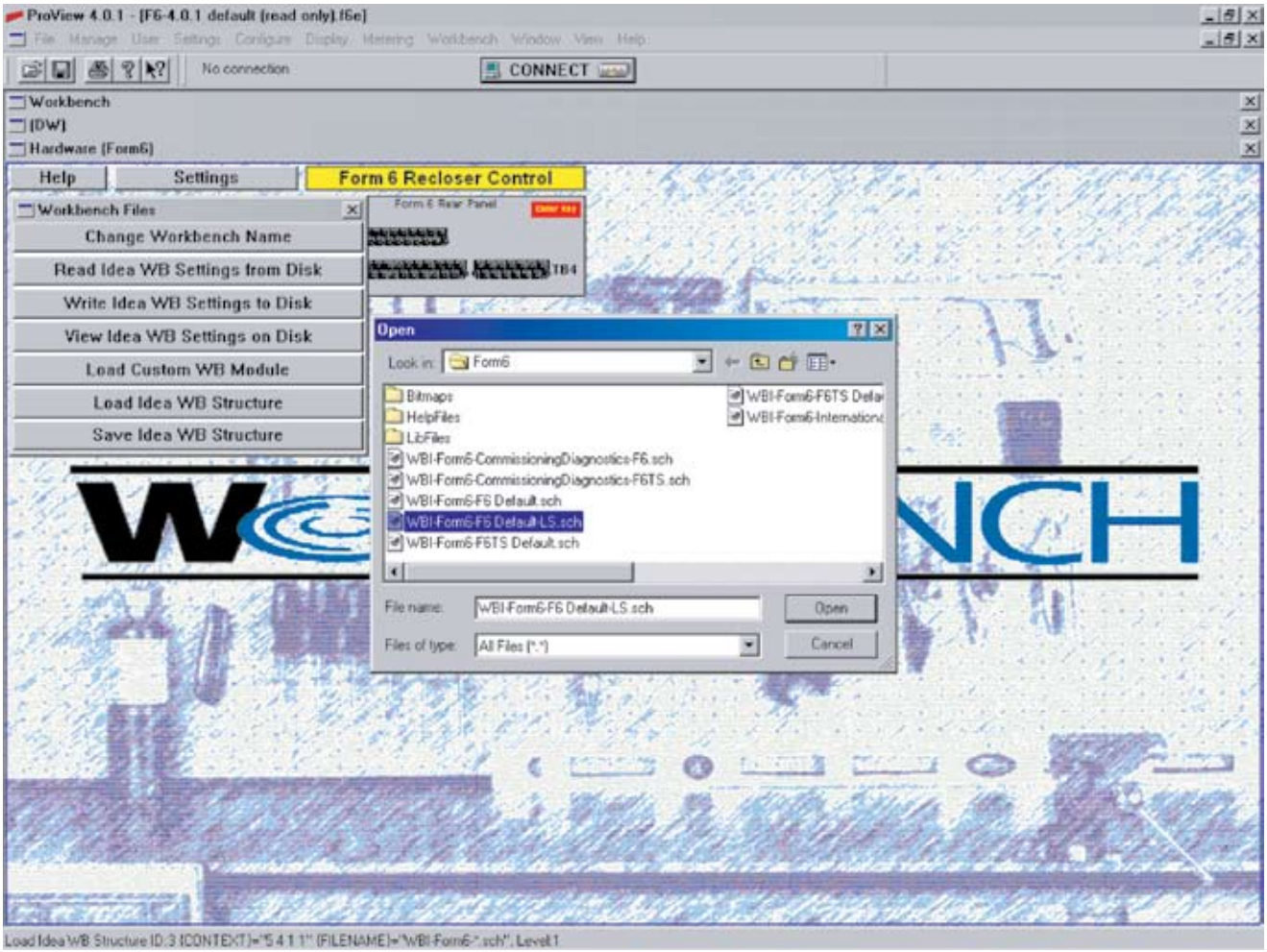
Next, Tie Recloser R5 times out, closes in the fault, and R3 will lock out. The fault is isolated between R1 and R3. Service is maintained to the remaining major portion of the loop. If a permanent fault occurs at Fault 2, R3 operates to lockout normally, R5 senses the loss of voltage after its programmed time delay, R5 closes into the fault and operates to lockout. The fault is isolated between R3 and R5. Service is maintained to the remaining major portion of the loop.

Loading the Loop Scheme

Note: Refer to Section 4 for additional information regarding schemes.

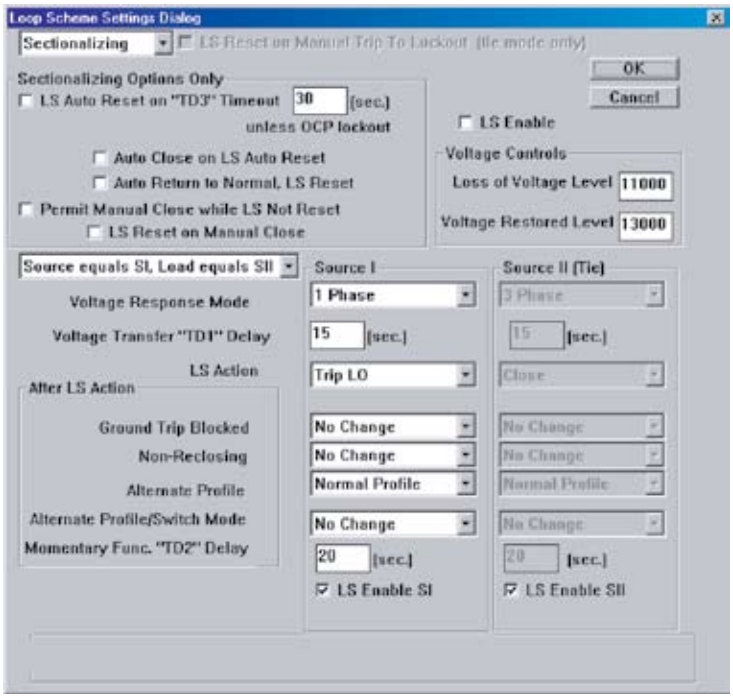
1. Open Default F6-4.0.1 scheme file and navigate to Workbench structures from menu options.
2. Select Hardware Workbench and open the Workbench Files pallet.
3. From the Workbench Files pallets select Load Idea WB Structure.
4. The ProView software should open the Form6 folder as shown below.
5. Open the file labeled WBI-Form6-F6 Default-LS.sch.

Note: For Triple-Single applications use WBI-Form6-F6TS Default-LS.sch.



Loading LS Workbench Structure

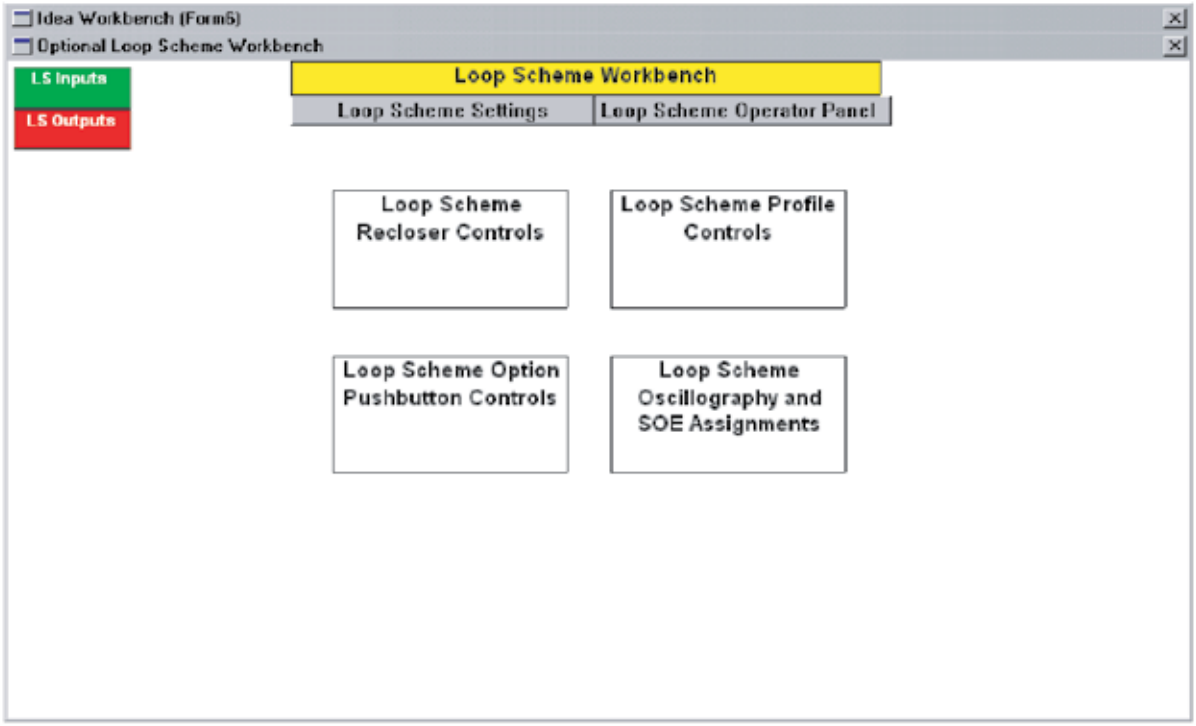
Programming the Loop Scheme



Loop Scheme Setting Dialog

The Form 6 Loop Scheme control uses a single dialog box for Feeder Sectionalizing, Midpoint Sectionalizing, Radial Sectionalizing and One or Two Way Tie applications.

1. Navigate to the Idea Workbench (Light bulb) of the Hardware Workbench and open the Optional Loop Scheme Workbench (shown below).
2. Click on the Loop Scheme setting dialog button to view settings.
3. Select a LS Type by selecting Tie or Sectionalizing from the drop down options.
4. Use the Enable LS checkbox to turn the LS scheme on and off and use default loop scheme settings.
5. Define Voltage Control settings for Loss of Voltage and Voltage Restoration Level in primary line to neutral volts.
6. Define other parameters per application.



Loop Scheme Workbench

Loop Scheme Setting Dialog

Setting	Default Value	Range	Description
Auto Return to Normal	0	0=Disabled, 1=Enabled	Reset LS on a manual close
LS Auto Close	0	0=Disabled, 1=Enabled	Auto close of voltage restoration
LS Auto Reset	0	0=Disabled, 1=Enabled	Auto reset LS on TD3 timeout
LS Enable SI	1	0=Disabled, 1=Enabled	Enable LS operation on SI (typically source)
LS Enable SII	1	0=Disabled, 1=Enabled	Enable LS operation on SII (typically load)
LS Enable	0	0=Disabled, 1=Enabled	Enable LS operation
LS Loss of Volts Level	11000	-99,999-99,999	Voltage level below which a LS loss of voltage is issued (V pri)
LS Permit Manual Close	0	0=Disabled, 1=Enabled	Allow manual close while LS is not reset
LS Reset on Manual Close	0	0=Disabled, 1=Enabled	Reset LS on a manual close
LS Reset on Manual trip to Lockout	0	0=Disabled, 1=Enabled	LS Resets on Manual trip to Lockout
LS Restore Volts Level	13000	-99,999-99,9999	Voltage level above which a LS loss of voltage is resended (V pri)
LS Reverse Voltages	0	0=Source is SI, 1=Source is SII	Reverse SI and SII
LS SI Alt Profile Mode	0	0=No Change, 1=Latch, 2=Momentary	Cause a change of profile on loss of S1
LS SI Alt Profile	0	0=Normal Profile, 1=Alt Profile 1, 2=Alt Profile 2, 3=Alt Profile 3	Profile to switch to on S1 loss
LS SI GTB	0	0=No Change, 1=Latch, 2=Momentary	Turn on Ground Trip block on LS active for S1
LS SI LSA	1	0=Disabled, 1=Enabled	LS Action, Trip or Close for S1
LS SI No Reclose	0	0=No Change, 1=Latch, 2=Momentary	Turn on Non-reclose on LS active for S1
LS SI TD1	15	1-1000	Source 1 Voltage Transfer Time Delay (Seconds)
LS SI TD2	20	1-1000	Source 1 Momentary Function Time Delay (Seconds)
LS SI VRM	1	1=Single Phase, 0=Three Phase	S1 Voltage Response Mode
LS SII Alt Profile Mode	0	0=No Change, 1=Latch, 2=Momentary	Profile to switch to on S1 loss
LS SII Alt Profile	0	0=Normal Profile, 1=Alt Profile 1, 2=Alt Profile 2, 3=Alt Profile 3	Profile to switch to on S2 loss

Setting	Default Value	Range	Description
LS SII GTB	0	0=No Change, 1=Latch, 2=Momentary	Turn on Ground Trip block on LS active for S2
LS SII LSA	2	0=No Action, 1=Trip LO, 2=Close	LS Action, Trip or Close for S2
LS SII No Reclose	0	0=No Change, 1=Latch, 2=Momentary	Turn on Non-reclose on LS active for S2
LS SII TD1	15	1-1000	Source 2 Voltage Transfer Time Delay (Seconds)
LS SII TD2	20	1-1000	Source 2 Momentary Function Time Delay (Seconds)
LS SII VRM	0	1=Single Phase, 0=Three Phase	S2 Voltage Response Mode
LS TD3 30	30	1-1000	Auto Restore Time Delay
LS Type	1	1=Sectionalize, 0=Tie	Sectionalize or Tie

Tie Options

These options are only available when LS is configured in tie mode from drop down dialog.

1. LS Reset on Manual Trip to Lockout allows automatic LS reset when LS is tripped locally via front panel. This eliminates an extra step of resetting after manual trip.

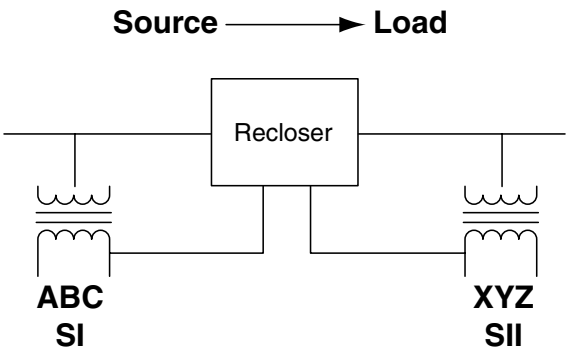
Sectionalizing Options

These options are only available when LS is configured in sectionalizing mode from drop down dialog.

1. LS Auto Reset applies to feeder and midpoint only with TD3 timer. An LS sectionalizer control may be in the closed position and trip and lock out on loss of voltage for Source 1. With LS Auto Reset on TD3 Timeout selected, the LS will reset after the Source 1 voltage returns and the programmed TD3 time has expired.
2. TD3 is the Auto Reset Time Delay interval during which restoration of voltage must be continuously detected before an automatic LS reset will occur.
3. Auto Close on LS Auto Reset will allow feeder reclosers to automatically close back in upon LS Auto Reset.
4. Auto Return to Normal, LS Reset will automatically return the midpoint or feeder to normal profile when forward power flow direction occurs.
5. Permit Manual Close while LS Not Reset allows front panel close operation if loop scheme is not reset.
6. LS Reset on Manual Close allows automatic LS reset when LS is closed locally via front panel. This eliminates an extra step of resetting after manual close.

Note: The LS Auto Reset will not reset and close if the loss of voltage was preceded by fault current.

Source Options



Sectionalizing applications will use one source for voltage sensing and tie applications may use one or two sources.

1. Source II is always disabled when LS type is set to Sectionalizing. LS Enable SI and LS Enable SII checkboxes enable use of voltage restoration mode and after LS Actions for respective source input. User Option Buttons #5 & #6 are programmed to enable Source 1 and 2 respectively via front panel.
2. Define load and source side voltage inputs from drop down menu.
3. Voltage Response Mode define whether voltage source is three- or single-phase sensing.
4. Voltage Transfer TD1 Delay is loss of voltage timer to initiate loop scheme.
5. LS Action define what action the loop scheme takes after satisfying TD1 timer supervision: No Action, Trip to Lock Out, or Close.

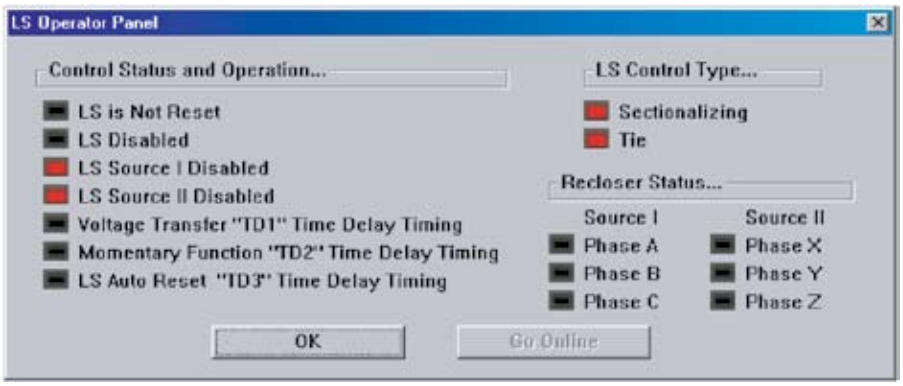
After LS Action

The Form 6-LS control can change profiles when an LS action occurs.

1. Select whether Ground Trip Blocked mode will make No Change, Latch On until LS Reset or Toggle On for given momentary function delay TD2.
2. Select whether Non-Reclosing mode will make No Change, Latch On until LS Reset or Toggle On for given momentary function delay TD2.
3. Select the protective profile control should activate after LS action: Normal Profile, Alternate Profile 1, Alternate Profile 2, or Alternate Profile 3.
4. Alternate Profile/Switch Mode allows user to select whether control makes No Change, latches onto alternate profile or momentarily switches to the alternate profile setting for duration of momentary function delay TD2.

Monitoring the Loop Scheme

The Loop Scheme Workbench module provides an operator panel shown below for use when connected to control through On-Line viewing or during event playback/simulations. Refer to the **Front Panel MMI** section for description of Loop Scheme target LEDs and User Option pushbuttons.



Loop Scheme Operator Panel

LS Operator Panel Target	Description
LS is Not Reset	Loop Scheme has not reset
LS Disabled	Loop Scheme has been disabled because either enough sources have been enabled or LS enable checkbox is unmarked
LS Source I Disabled	Source I disabled through front panel via Workbench, setting or communications (SCADA)
LS Source II Disabled	Source I disabled through front panel via Workbench, setting or communications (SCADA)
Voltage Transfer “TD1” Time Delay Timing	Source Voltage is below Loss of Volts Level and Loop Scheme is timing towards action
Momentary Function “TD2” Time Delay Timing	Momentary Action After LS is active
LS Auto Reset “TD3” Time Delay Timing	Source Voltage on sectionalizing recloser is above voltage restoration level and scheme is timing towards Auto Reset
LS Control Type – Sectionalizing	LS Scheme Configured as Sectionalizer
LS Control Type – Tie	LS Scheme Configured as Tie
Recloser Status Source I Phase A	Source I A Phase Voltage Present
Recloser Status Source I Phase B	Source I B Phase Voltage Present
Recloser Status Source I Phase C	Source I C Phase Voltage Present
Recloser Status Source II Phase X	Source II X Phase Voltage Present
Recloser Status Source II Phase Y	Source II Y Phase Voltage Present
Recloser Status Source II Phase Z	Source II Z Phase Voltage Present

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