ETI FIELDPRO MNPR® INTERFACE SOFTWARE v10.XXX

Instruction Manual
Revision 1
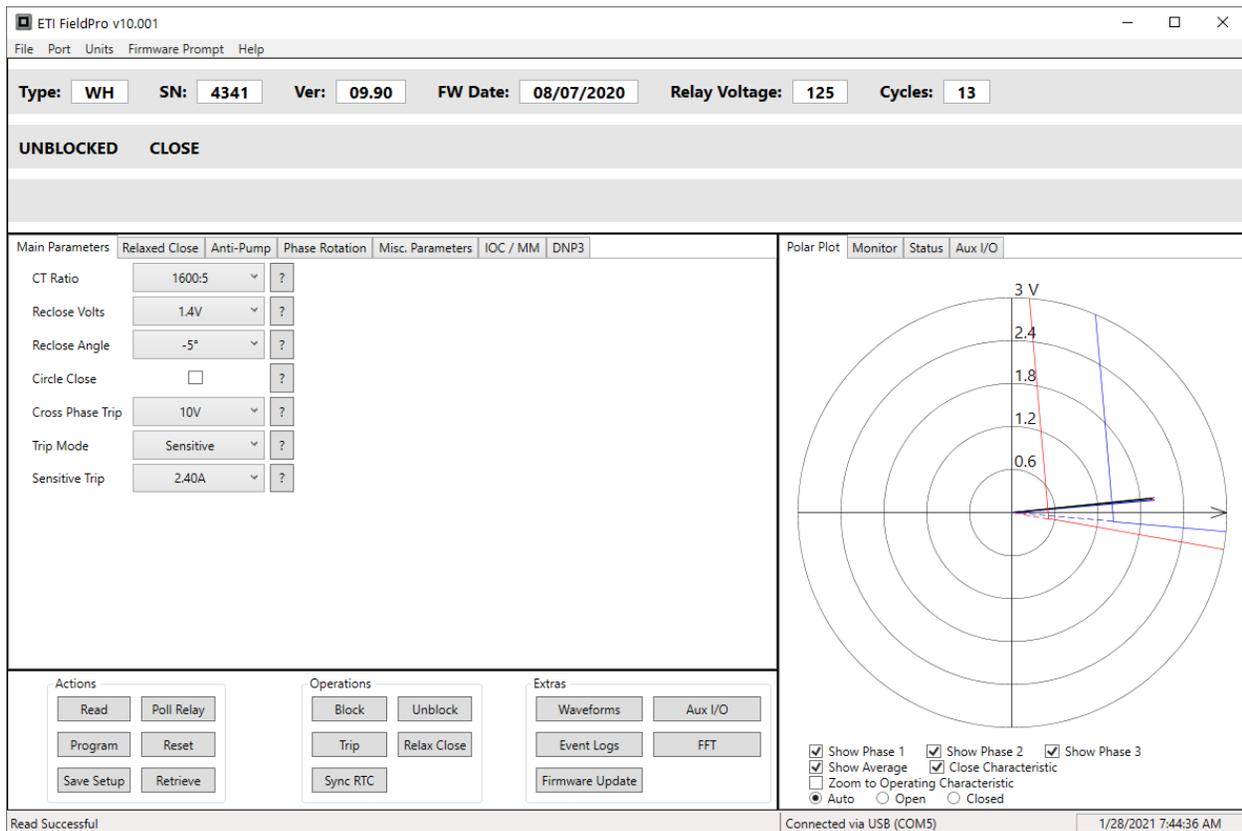
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REVISONS

Revision	Date	Details
1	02/08/2021	Initial Revision

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SAFETY PRECAUTIONS

WARNING

There are potentially dangerous/lethal voltages present in and around network protectors and associated equipment. Failure to follow safety precautions and wear proper PPE could result in personal injury and/or death as well as equipment damage.

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1. Initial Setup

When first starting the interface software, a blank main screen will appear as shown in Figure 1.
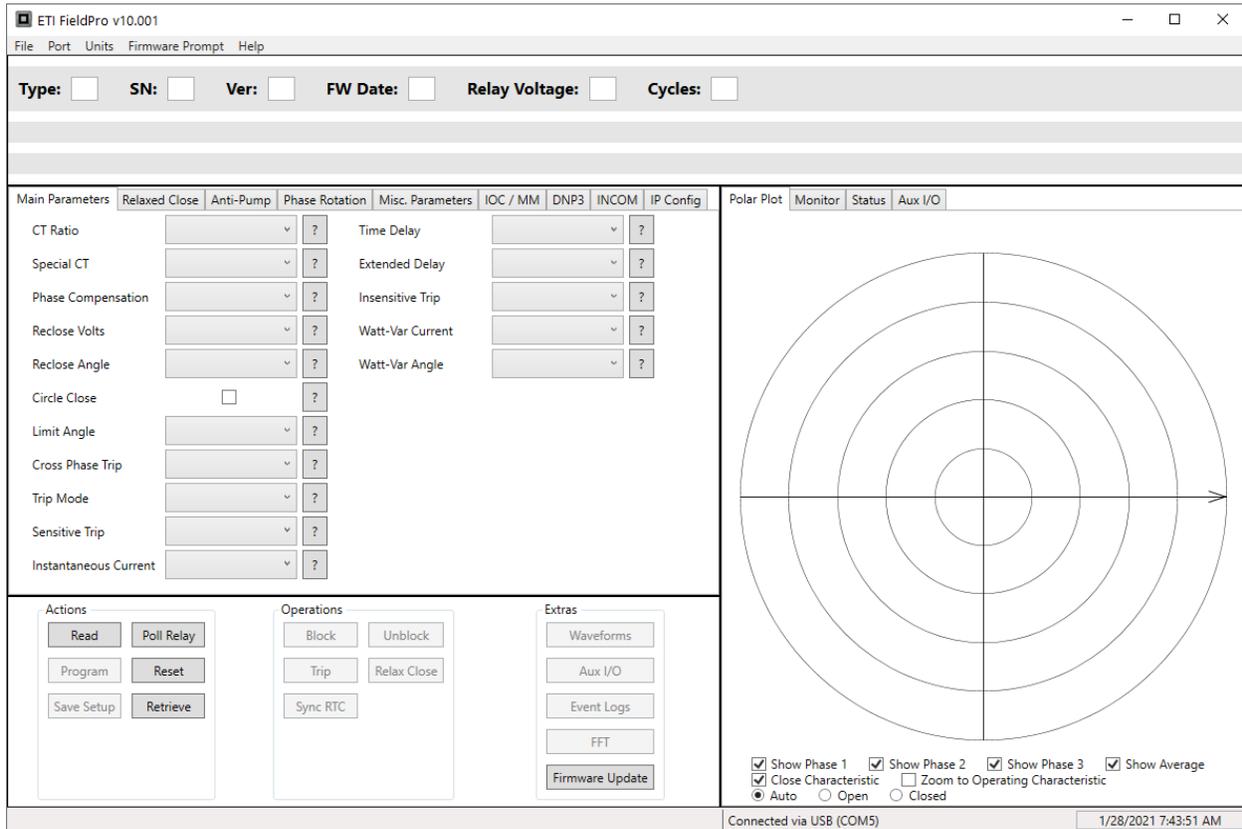

Figure 1

Before attempting to connect to the MNPR® the communications port must be selected. Under the Port menu, there are options for USB as well as any available COM ports. If the USB interface cable (ETI PN 521146-00) is being used select the USB option. For a serial connection using an RS232 interface cable (ETI PN 521120) select the COM port that corresponds to the physical port the cable is plugged into. If an RS232 serial cable is being used with a third party USB to serial converter, consult the documentation that came with that device on how to find out what serial port it is emulating and choose that in the ETI FieldPro software.

Verify that the MNPR® is powered up, either properly installed in a network protector or powered up on the bench using an ETI 131-1047-00 (GE) or 131-1048-XX (WH) Single Phase Power Block. Press the "Read" button, and the form should populate with the relay's settings. If you get a communications failure or other message please refer to the Troubleshooting section of this manual.

The Units dropdown menu allows the user to select whether the settings for current are displayed in Relay Current (based off the 5 Amp secondary of the network protector CT), Protector Current (the actual current through the bus), or as a Percentage of the CT rating. For example on a protector with a 1600:5 Amp CT Ratio, 2.5A (Relay Units) is equivalent to 800A (Protector Units) and 50% (Percent).

2. Main Screen

Once the FieldPro software is started, only a few options are available to the user as shown in Figure 2:

<u>Read</u> – Reads the current state of the connected MNPR®.

<u>Poll Relay</u> – Reads the current state of the connected MNPR® repeatedly until stopped.

<u>Reset</u> - Resets the MNPR® to its factory default settings (useful if the MNPR® is doing something unexpected or there is some uncertainty to the state of the programming).

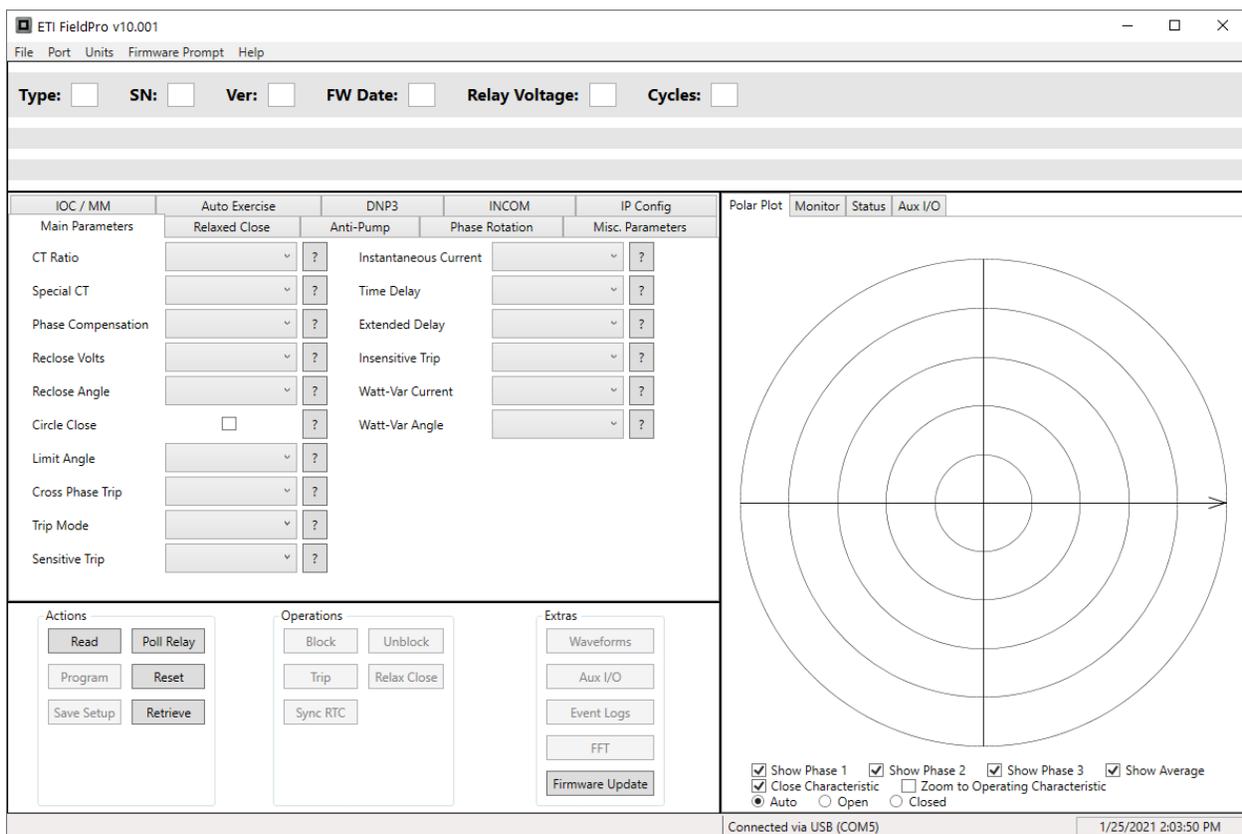<u>Retrieve</u> – Retrieves saved settings from a file for viewing.

Figure 2

Once the MNPR® has been read the settings can be viewed and modified (as shown in Figure 3).

Certain versions of the MNPR® (part numbers part numbers 5XX9X3, 5XX9X8, and 5XX975) are capable of having their firmware flash updated. The FieldPro software is distributed with the latest firmware for the MNPR®. If upon reading, it detects that a compatible MNPR® is running an older version of firmware, it will show a message like that shown in Figure 17 in the "MNPR® Firmware Updates" section. Please see Section 6 for additional information about firmware updates.

Please note that not all parameters/options are available on all types and styles of MNPR®. If a parameter described in this manual does not appear in the interface software, that simply means it is not supported on the connected MNPR®.
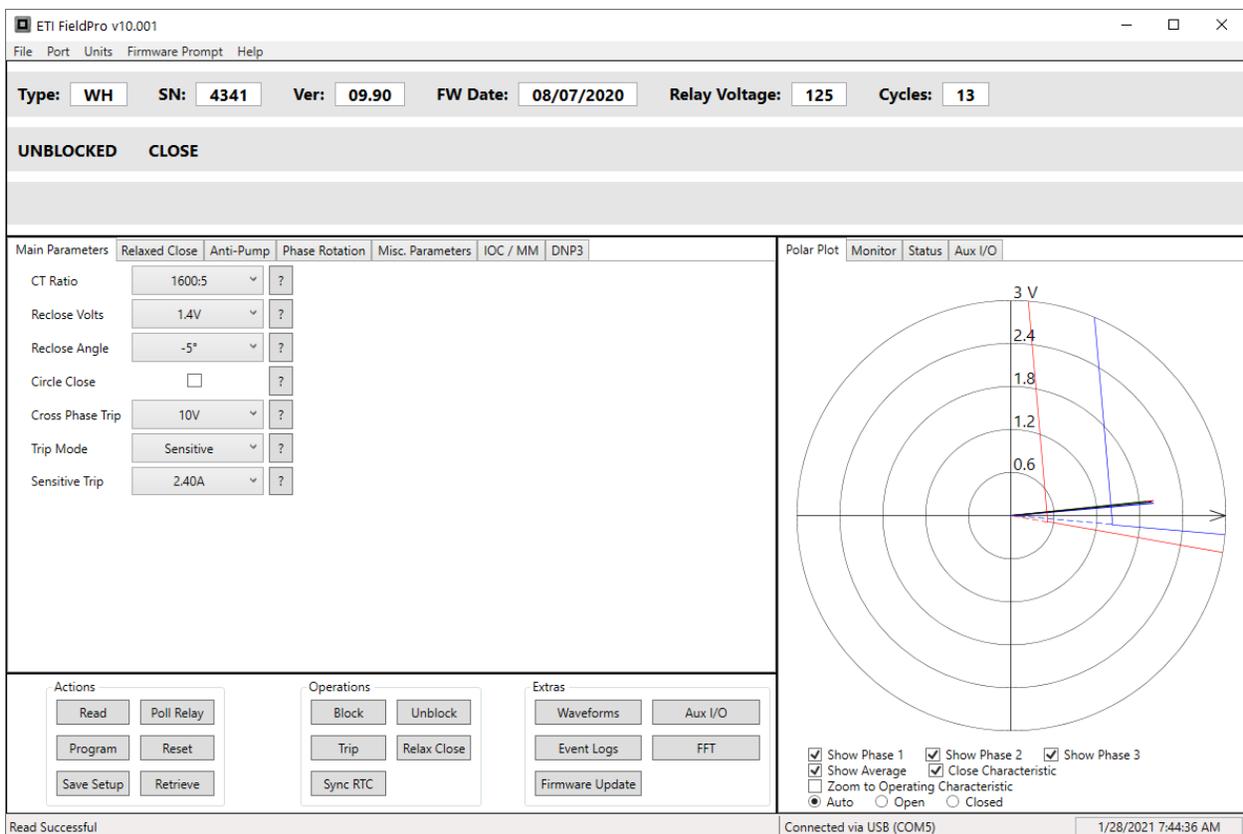

Figure 3

Read only parameters:

Type – Displays the style of MNPR® (General Electric (GE) or Westinghouse (WH)).

Serial Number (SN) – Displays the serial number of the MNPR®

Version (Ver) – Displays the version of the MNPR® firmware

Firmware Date – Displays the release date of the MNPR® firmware

Relay Voltage – Displays the nominal working voltage of the MNPR®. Most network protectors have potential transformers (PTs) to provide the relay with 125V regardless of system voltage. Some older protectors may not contain PTs and operate at higher voltages.

Cycles – Displays the number of trip cycles the MNPR® has undergone in its lifetime

Status Bars:

Below the read only parameters are two status bars. These display pertinent information about the current state of the relay, such as its blocked state (blocked/unblocked), operational state (trip/close/float), etc.

Relay Parameters Tabs:

There are a number of tabs that contain parameters that effect the operation of the relay. These are explained in detail in the Section 4.

Relay Status Tabs:

There are a number of tabs that contain status information about the current state of the relay. These are explained in detail in Section 5.

Button Groups:

There are several groups of buttons toward the bottom of the FieldPro application.

Actions Group: The buttons in this group perform programming actions regarding the relays settings.

Read – Reads the current state of the connected MNPR®.

Poll Relay – Reads the current state of the connected MNPR® repeatedly until stopped.

Program – Programs the MNPR® with the settings that are currently shown on the interface software. If you do not press this button, any changes that were made to the settings will not take effect.

Reset - Resets the MNPR® to its factory default settings (useful if the MNPR® is doing something unexpected or there is some uncertainty to the state of the programming).

Save Setup – Saves the settings to a file.

Retrieve – Loads a file that was previously saved using the "Save Settings" function

Operations Group: The buttons in this group perform programming actions regarding the relays settings.

Block – Instructs the MNPR® to inhibit the closing of the network protector

Unblock – Removes the block that was issued with the block command, thus allowing the network protector to close if the conditions are proper.

Trip – Causes the MNPR® to call for an immediate trip. (Note: Unless a block is issued prior to a trip, the network protector will likely reclose immediately)

Relax Close – Causes the MNPR® to operate from it's relaxed close parameters (set in the relaxed close tab).

Close – Causes the MNPR® close the network protector. Prior to using this feature the open protector should be manually phased out following all utility safety procedures. This feature is disabled by default and requires a code from ETI to unlock.

Sync RTC – Synchronizes the real time clock in the MNPR® with the computer clock. (Note: The real time clock may also be set via DNP3 or INCOM communications)

Extras Group: The buttons in this group perform programming actions regarding the relays settings. These functions are explained in more detail in subsequent sections.

Waveforms – Allows for the download of real time oscillography from the MNPR® (see Section 9).

Event Logs – Allows for the download of historical oscillography from the MNPR® (see Section 10).

Aux I/O – Displays the auxiliary I/O in a graphical gauge format.

FFT – Displays Fast Fourier Transform information for analyzing harmonic information (see Section 11).

Firmware Update – Performs a firmware update on supported MNPR® versions (see Section 6).

Additional Menu Items:

File – Contains an Exit command that closes the FieldPro software. Any setting changes that had not been written to the MNPR® by pressing "Program" will be lost. This menu also contains a setup item for the Aux I/O configuration (See Section 7 for more information).

Port – Configures the communications port (USB or serial COM port) for the optical interface cable. If using a USB interface cable (ETI PN 521146-00) select the USB option. For a serial connection using an RS232 interface cable (ETI PN 521120) select the COM port that corresponds to the physical port the cable is plugged into (usually COM1 on most laptops). If using the RS232 serial cable with a third party USB to serial converter, consult the documentation that came with that device on how to find out what serial port it is emulating and choose that in the Port menu.

Units – Selects whether the settings for current are displayed in Relay Current (based off the 5 Amp secondary of the network protector CT), Protector Current (the actual current through the bus), or as a Percentage of the CT rating. For example on a protector with at 1600:5 Amp CT Ratio 2.5A (Relay Units) is equivalent to 800A (Protector Units) and 50% (Percent).

Firmware Prompt – Contains an option to enable/disable prompts asking about upgrading the relay firmware (See Section 6 for more information).

Help – Displays various helpful information such as this manual and relay pinout information. The about screen will also give detailed version information about FieldPro.

Enable / Disable Close – Enables or disables the "Close" button in the Operations button group. This requires a code from ETI to enable.

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3. Basic Setup Procedure

The following describes the minimum configuration necessary to setup a MNPR®. Depending upon the specific needs of the utility this may vary.

1. Press the "Read" button on the main screen. This will retrieve the current MNPR® settings.

2. If unsure about the state of the MNPR®, press the "Reset" button on the main screen to reset all of the settings to factory defaults.

3. Set the CT Ratio, Trip mode and associated settings, and reclose parameters to the desired values.

4. Press the "Program" button to program the MNPR®.

5. Press the "Read" button again, and verify that the settings programmed in step 3 are correct.

6. The relay should then be tested to verify that the trip and close characteristic perform as desired.

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4. MNPR® Operating Parameters

A series of tabs in the main part of the application screen contain the operating parameters for the MNPR®. Graphical plots of the MNPR® operating characteristics are provided for reference in Appendix A. Many of the following settings alter the operating regions shown on those plots. The settings are also reflected on the Polar Plot tab displayed in the Status Information area.
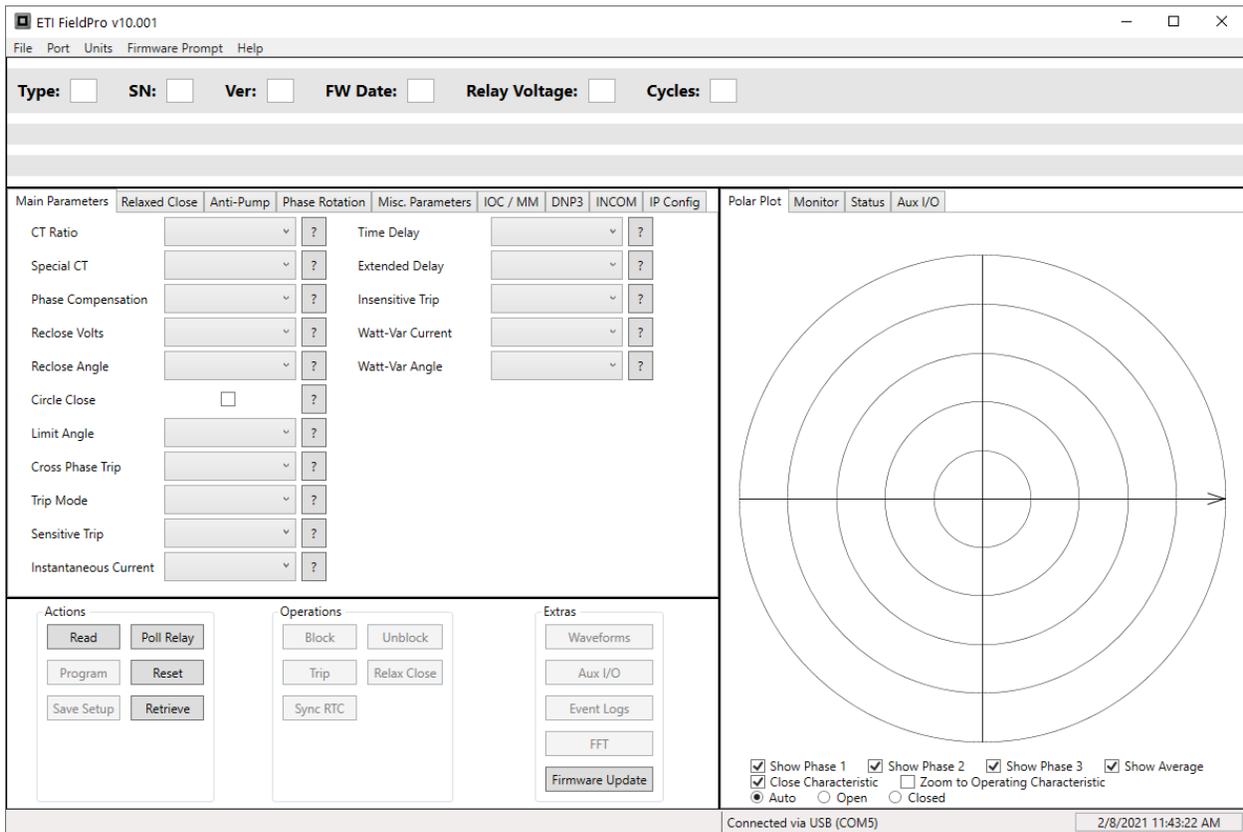
Main Parameters Tab

Figure 4

CT Ratio – The ratio of input current to output current. Select the CT Ratio that matches the network protector.

Special CT – The ratio of input current to output current. Allows for non-standard values to be selected.

Phase Compensation (PC) – For GE relays, the phase compensation is set automatically for standard CT ratios, or manually by selecting Special for the CT Ratio setting.

Standard PC values are as follows:
    5° for 800:5, 1200:5, and 1600:5
    10° for 2000:5 and 2500:5
    15° for 3000:5 and 3500:5

Reclose Volts (RV) – Minimum three phase average differential voltage necessary to close the protector. The three phase average of the real part of the differential voltages (V_{TN}*COS θ) must exceed this set point.

In Circle Close mode the three phase average of the magnitude of the differential voltages (V_{TN}) must exceed this value.

Reclose Angle (RA) – Reclose curve lower limit. The protector will not close if the angle between the network voltage and the differential voltage is below this setting. See Figure 34.

Circle Close – Selects the circle close characteristic. See Figure 35.

Limit Angle (LA) – (Only available if Circle Close is enabled) Reclose curve upper limit in circle close mode. The protector will not close if the angle between the network voltage and the differential voltage is above this setting. See Figure 35.

Cross Phase Trip – This setting allows the user to set a threshold of **negative differential** that will cause the MNPR® to engage its trip contact. This contact will remain engaged until the negative differential is removed. The setting is compared to the real part of the differential voltage on each phase. Typical situations that would activate the Hard Trip are: Feeder outage, rolled phases and crossed phases.

This feature should **NOT** be used in place of safe work practices. This is **NOT** a safety feature; it is a program feature only.

Trip Mode – Selects which of the five trip modes the MNPR® is to use:

1. Sensitive Mode – In this mode the MNPR® will trip the protector when the net reverse power flow exceeds the set point. The three phase average of the signed vector sum of the network voltages multiplied by the currents (V_N*I*COS θ)/ V_{Nrms} must exceed the set point. See Figure 36 and.

2. Time Delay – In this mode the Sensitive criteria must be met for the duration of the time delay period before the network protector will open. However, if during the delay period the "Instant Current" set point is ever exceeded on one or more phases (such as a fault condition) the network protector will trip immediately (unless an Extended Delay is set, see below). See Figure 38.

3. Insensitive Trip – This mode is analogous to Time Delay mode if the delay time could be set to infinity. The network protector will not open during normal system conditions (feeder outage, etc).   It will only open when the "Insensitive Current" set point is exceeded on one or more phases (such as a fault condition). (The Sensitive criteria must also be satisfied for a trip to take place). See Figure 39.

4. Watt-Var – In this mode the MNPR® will rotate the trip region to ensure that the network protector will open under certain circumstances. Both the current at which to rotate and the amount of rotation can be set. See Figure 40 and Figure 41.

5. Delayed Watt-Var– In this mode the MNPR® will rotate the trip region to ensure that the network protector will open under certain circumstances. Both the current at which to rotate

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and the amount of rotation can be set. This mode allows a delayed and instant region to be set similar to the Time Delay mode while retaining the Watt-Var characteristic. See Figure 42.

Sensitive Trip (ST) – This is the minimum reverse current necessary to open the protector. The three phase average of the signed vector sum of the network voltages multiplied by the currents $(V_N*I*COS\ \theta)/\ V_{Nrms}$ must exceed the set point.

Instantaneous Trip Current (IT) – This is the current that must be exceeded on one or more phases in order for the MNPR® to bypass the delayed portion of time delay mode.

Time Delay (TD) – This is the time in seconds that the sensitive trip conditions must persist for prior to the MNPR® calling for a trip in time delay mode.

Extended Delay (XD) – This is the time in seconds that the trip conditions must persist for prior to the MNPR® calling for a trip. This applies to the Instant portion of the Time Delay mode, the Insensitive Trip, and the Delayed Watt-Var.

Insensitive Trip Current (IC) – This is the current that must be exceeded on one or more phases in order for the MNPR® to open in Insensitive mode.

Watt-Var Current (WC) – This is the current that must be exceeded before the MNPR® will rotate the trip region in Watt-Var Mode.

Watt-Var Angle (WA) – This is the angle that the MNPR® will rotate the trip region when the Watt-Var Current is exceeded. A negative setting rotates the trip line clockwise into the first quadrant.
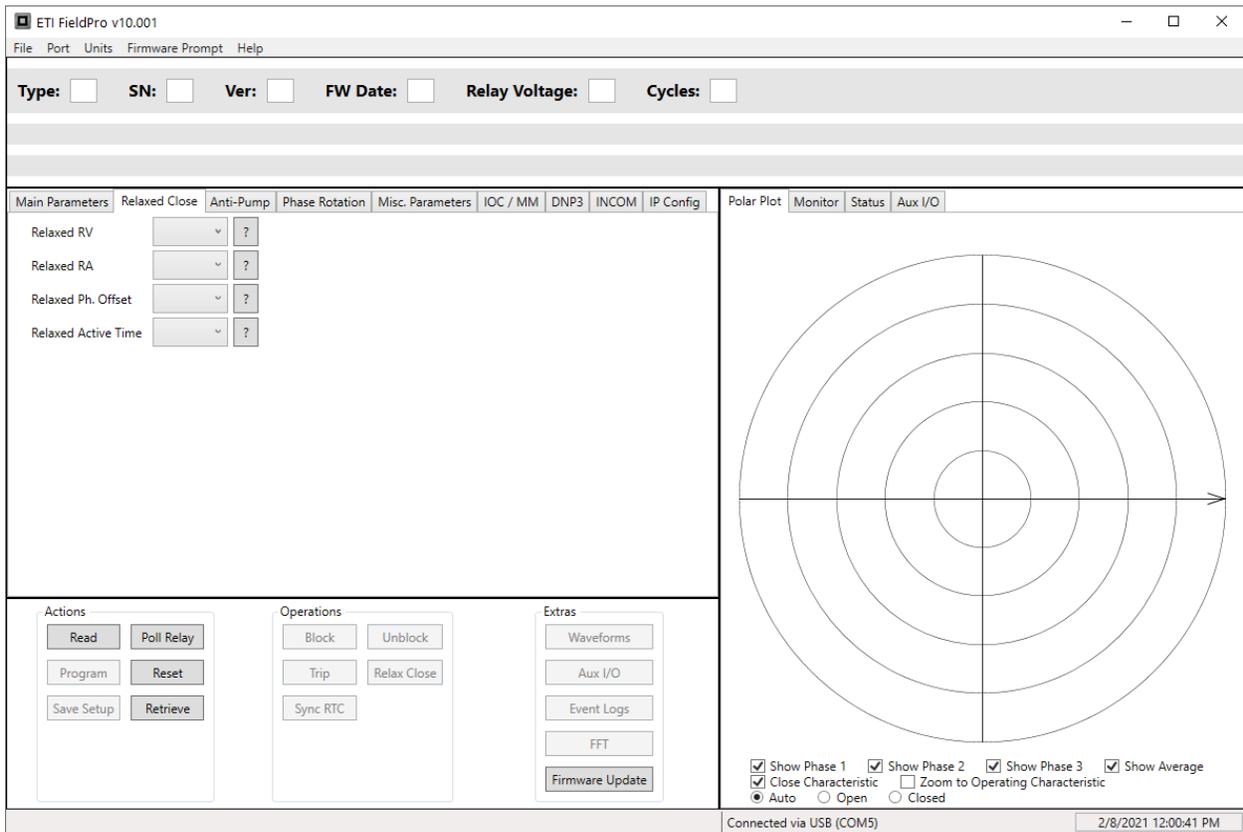
Relaxed Close Tab

Figure 5

The MNPR® allows a second set of reclose parameters to be preset that can be activated for a preset amount of time. This allows a simple method to safely coerce a network protector to close by reducing the thresholds required for closing.

Relaxed Reclose Volts (RV) – The reclose volts setting to be used in relaxed close mode

Relaxed Reclose Angle (RA) – The reclose angle setting to be used in relaxed close mode

Relaxed Phasing Offset – The phasing offset voltage that will be will be in effect after activation

Relaxed Active Time – The time in seconds that the relaxed settings will be in effect after activation

Anti-Pump Tab
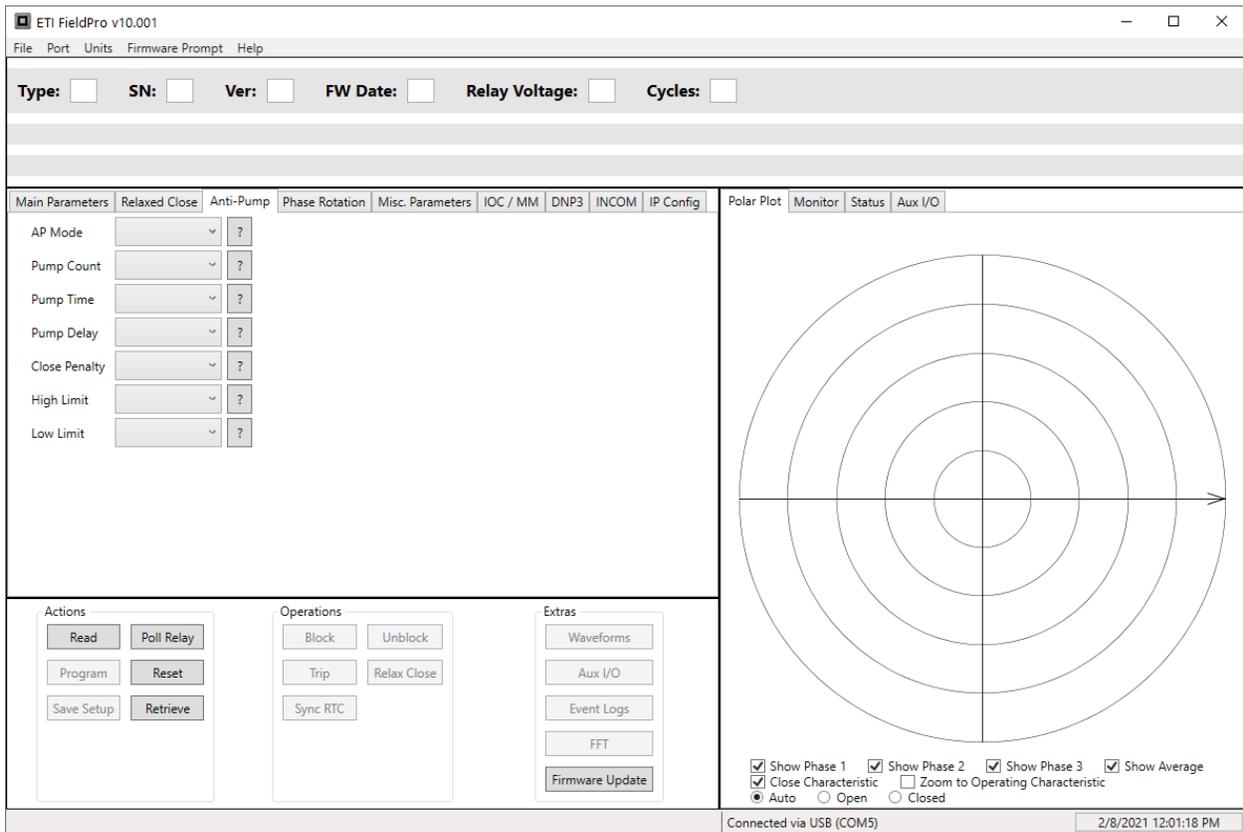
Figure 6

The MNPR® has two different Anti-Pump algorithms.

Smart Anti-Pump – If the "Pump Count" is exceeded within the "Pump Time" further closing will be inhibited for the duration of the "Pump Delay", which can also be set to infinite.

Pump Count – Number of cycles to occur during the "Pump Time" before initiating anti-pump lockout

Pump Time – Amount of time during which the "Pump Count" must be exceeded before initiating anti-pump lockout

Pump Delay – Time to wait after lockout before allowing the NWP to close again

Motor Cutoff – This anti-pump algorithm is analogous to a bucket with a small hole in the bottom. Every time the protector closes a "Close Penalty" is added to the bucket. If the "Upper Limit" is reached the protector will not close again until the "Lower Limit" is reached. The hole in the bucket will leak one unit every second.

Close Penalty – Penalty amount added for each close

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<u>High Limit</u> – When the penalty level exceeds this limit the NWP will not close

<u>Low Limit</u> – After exceeding the high limit, the penalty level must fall below this limit before allowing a close
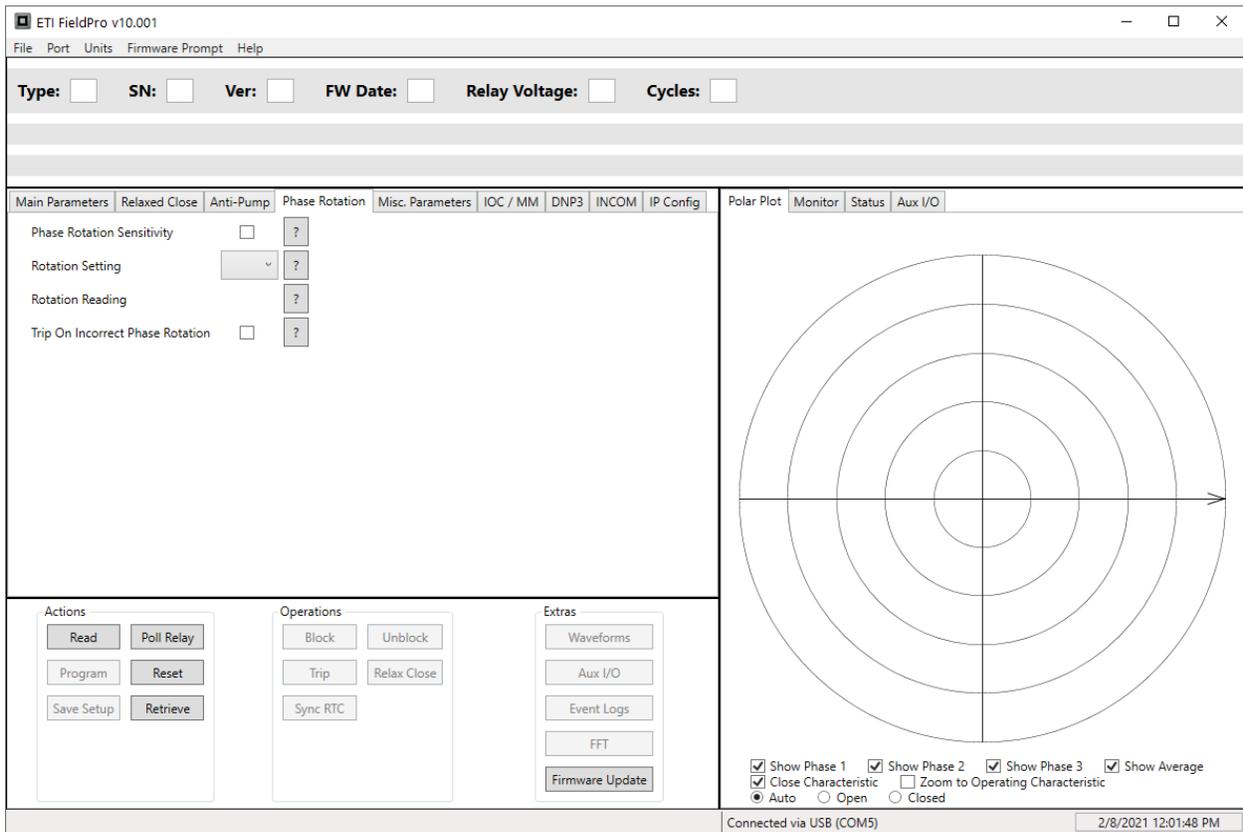
Phase Rotation Tab

Figure 7

Phase Rotation Sensitivity – When this option is enabled the MNPR® will only close if the phase rotation currently applied matches the setting.

Rotation Setting – Phase rotation required to close (ABC or CBA).

Rotation Reading – Phase rotation currently detected by the MNPR® (ABC or CBA).

Trip on Incorrect Phase Rotation – When this option is enabled the MNPR® will trip when the measured phase rotation does not match the setting or when the phase rotation cannot be determined.

Misc. Parameters Tab
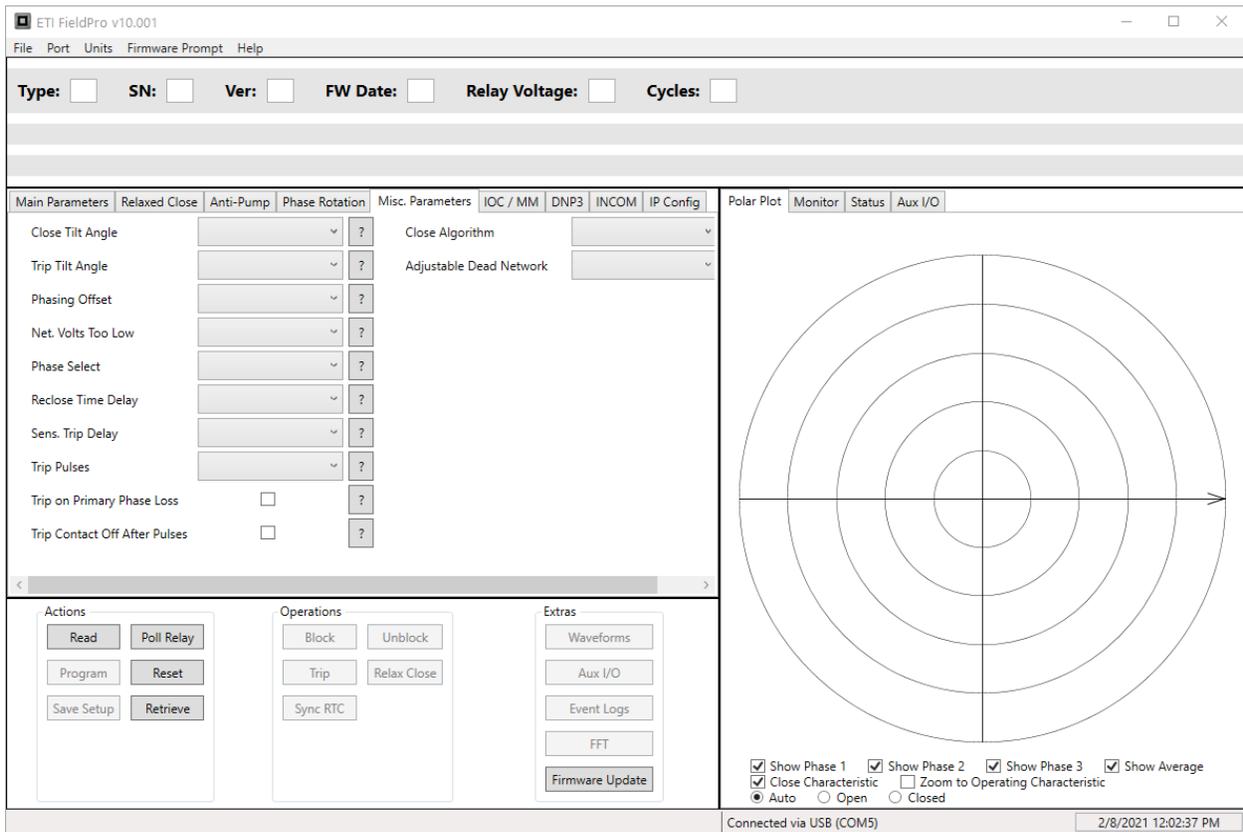
Figure 8

Close Tilt Angle – This setting allows the angle, in degrees, of the close characteristic to be modified.

Trip Tilt Angle – This setting allows the angle, in degrees, of the trip line of the sensitive trip characteristic to be modified.

Phasing Voltage Offset – This setting allows the phasing offset on the close characteristic to be adjusted (See Figure 34 - Reclose Characteristic in Appendix A).

Net. Volts too Low – Lower limit for network voltage to allow closing.

Phase Select – Allows the phase order of the network protector to be matched to that of the MNPR®. Many styles and vintages of network protectors are wired differently and it is not always the case that the MNPR® "Phase 1" will be wired to the network protector "Phase A". The purpose of this setting is to allow the display of all measured per phase values in the desired order, both on the scrolling display and in the View Data screen, irrespective of the physical protector wiring. For an example of how to set this properly please see Appendix E.

Care should be taken when adjusting this setting when used in conjunction with phase rotation sensitivity. The "Phase Select" setting is applied before the phase rotation is calculated and thus it could alter the rotation measured by the MNPR®. Other than the phase rotation sensitivity, this setting will have no other effect on relay operation or programming.

Reclose Time Delay – Time delay in cycles to reclose.

Sens. Trip Delay – Time delay in cycles to allow relay tripping in sensitive mode.

Trip Pulses – The number of times the MNPR® will pulse its trip contact upon calling for a trip (one second on, one second off). After the required number of pulses the contact will remain active until the network protector opens unless the parameter "Trip off after Pulses" is checked. A setting of zero will simply turn the output on and hold it until the network protector opens.

Trip Contact Off After Pulses – When the relay calls for a trip, the trip contact will pulse the number of times specified in the "Trip Pulses" setting. If the network protector fails to open, the contact can either be maintained or released depending on the state of this checkbox.

Trip on Primary Phase Loss – If this feature is enabled, the relay will trip upon loss of any primary phase to the transformer.

Close Algorithm – Select between Average All Phases, All Phases AND'd, Average All Angle 1, Average All Angle 2, Average All Angle 3, Circle Close and All Phases OR'd.

Adjustable Dead Network – If enabled, the MNPR® will assert the close contact until the set point voltage is reached on any single phase. When set to "OFF", the close contact will de-assert at 13 Volts on any single phase.

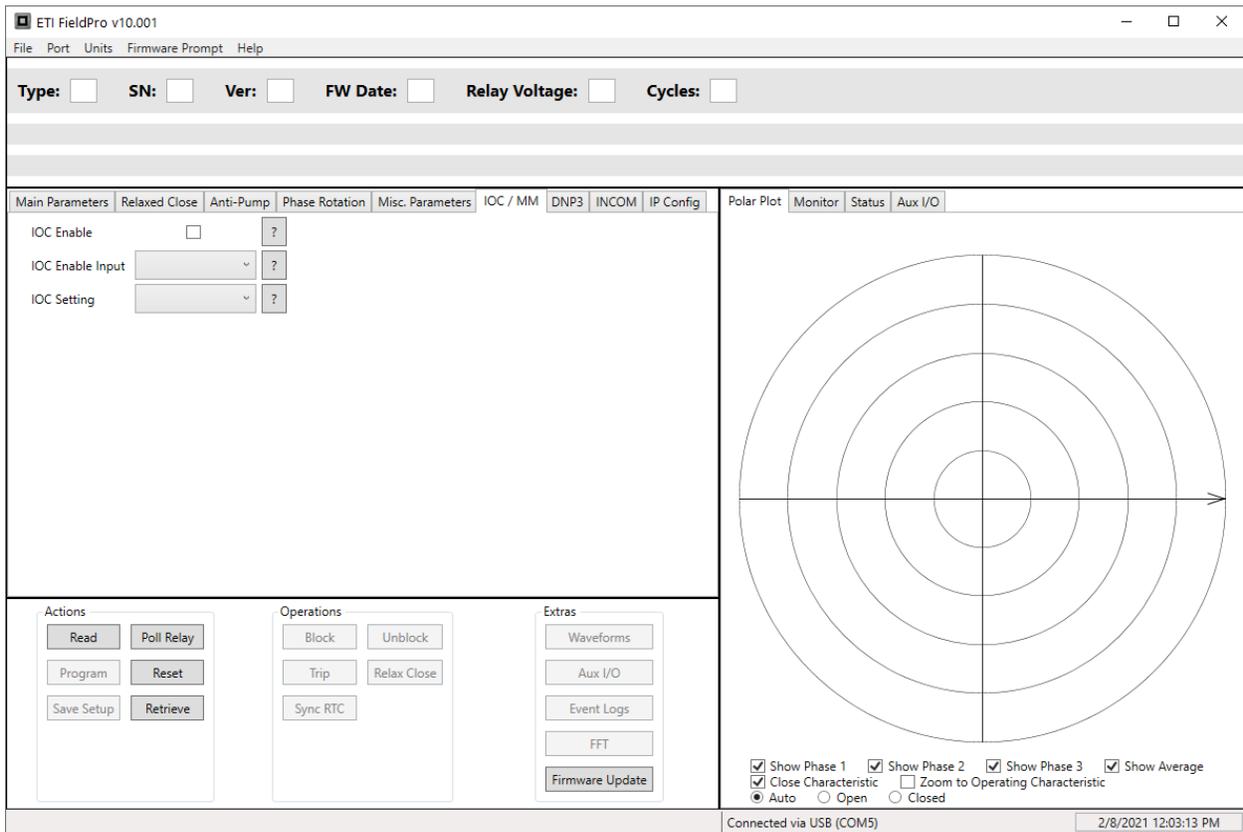# Instantaneous Over Current / Maintenance Mode (IOC/MM) Tab

Figure 9

IOC Mode is a non-directional overcurrent trip characteristic that will trip and block the network protector when the ¼ cycle RMS current on any phase exceeds the IOC Setting. The relay will continue to issue a trip until a local unblock command is issued via the relays optical port (remote unblock via DNP will NOT override this lockout).

  IOC Enable – Enables the Instantaneous Over Current characteristic

  IOC Enable Input – Selects the auxiliary input channel that the relay will monitor to determine if Instantaneous Over Current mode is enabled.

  IOC Setting – Sets the threshold for the non-directional overcurrent trip characteristic.

DNP3 Tab
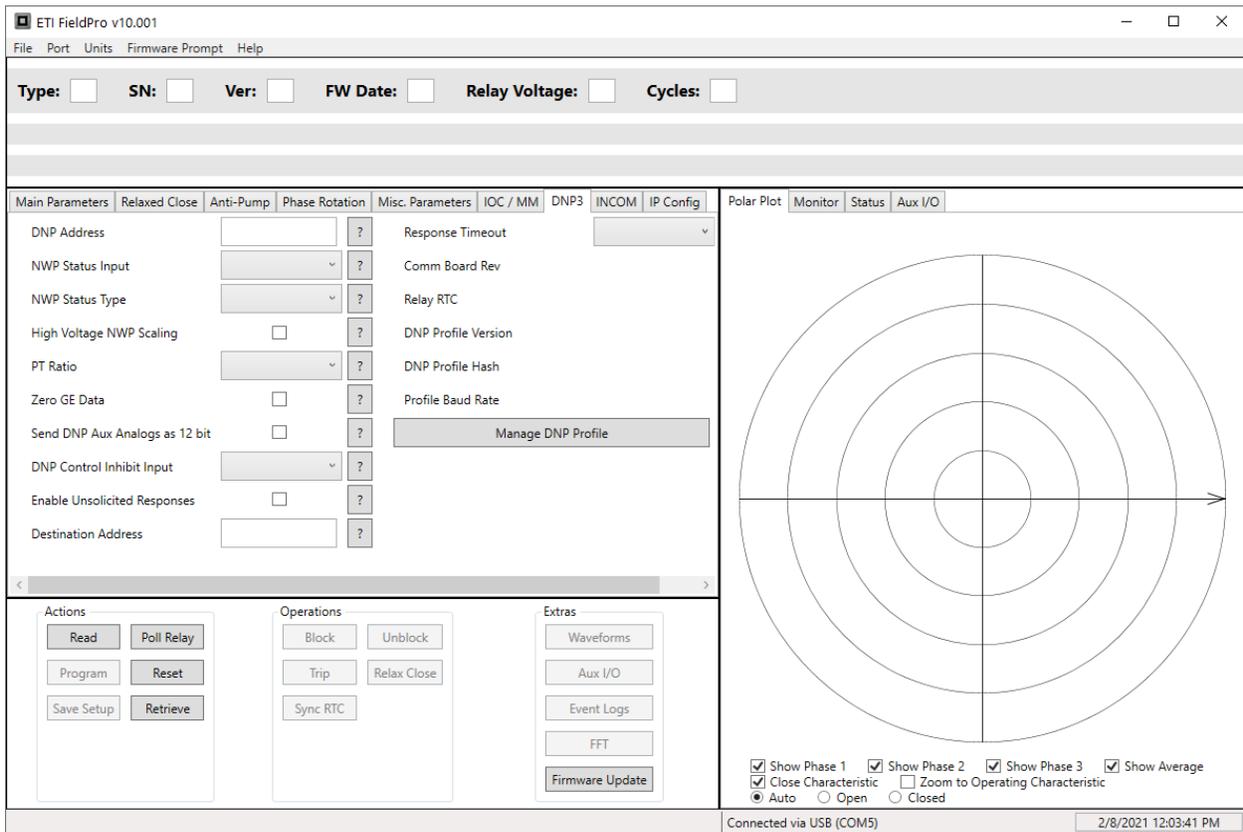
Figure 10

DNP3 Address – DNP3 Address of the MNPR®

NWP Status Input – Selects the auxiliary input channel that the relay will monitor to determine the network protector status (Open/Closed)

NWP Status Type – Controls the sense of the selected status input channel. An "A Contact" is closed when NWP is closed. A "B Contact" is open when network protector is closed.

Do High Voltage NWP Scaling – If this box is checked, the voltages reported via DNP3 on a communicating MNPR® will be scaled up by a factor to account for the potential transformers (PT's) in the high voltage network protector. Some versions of relay firmware allow the PT ratio to be selected as shown above. Older versions will just display a checkbox, which will scale the voltage by a factor of 2.2 for a 277/480V network protector when selected.

PT Ratio – Potential Transformers (PT) ratio used for scaling DNP3 data.

Zero GE Data – If checked, the current (as transmitted via DNP) will be zeroed out when the network protector is open and the differential voltage (as transmitted via DNP) will be zeroed

when closed. (Protector status is derived from the previously described status input. This option is available on GE relays only)

Send DNP Aux Analogs as 12 bit – If this box is checked, the auxiliary analog inputs will be reported as 12 bit via DNP3. If left unchecked the data will be sent as 8 bit. If the box is checked and the hardware only supports 8-bit inputs, the data will be shifted to 12 bit before sending.

DNP Control Inhibit Input – Selects the auxiliary input channel that the relay will monitor to determine if DNP control commands shout be ignored (local operation of relay only).

Enable Unsolicited Responses – Enables the MNPR® to send unsolicited response messages.

Destination Address – The DNP3 address that the MNPR® will send the unsolicited response message to.

Response Timeout – The total length of time that the MNPR® will wait for an acknowledgement of an unsolicited response.

Comm Board Rev – This is the revision of the communications and aux I/O hardware inside the MNPR®.

Relay RTC (Real Time Clock) – This is the date and time from the real time clock inside the MNPR®.

DNP Profile Version – The User Version is a user provided version number that is assigned when the profile is created. It is useful for tracking different profile versions, if changes are required.

DNP Profile Hash – The Hash is a computer-generated signature that identifies the profile. If any changes are made to the profile it will generate a different hash. This is useful to verify that the profile in question matches the desired profile.

Profile Baud Rate – This is the baud rate set in the DNP3 profile used for RS-485 communications.

Manage DNP Profile – Opens the DNP Profile Management Window (described in Section 8).
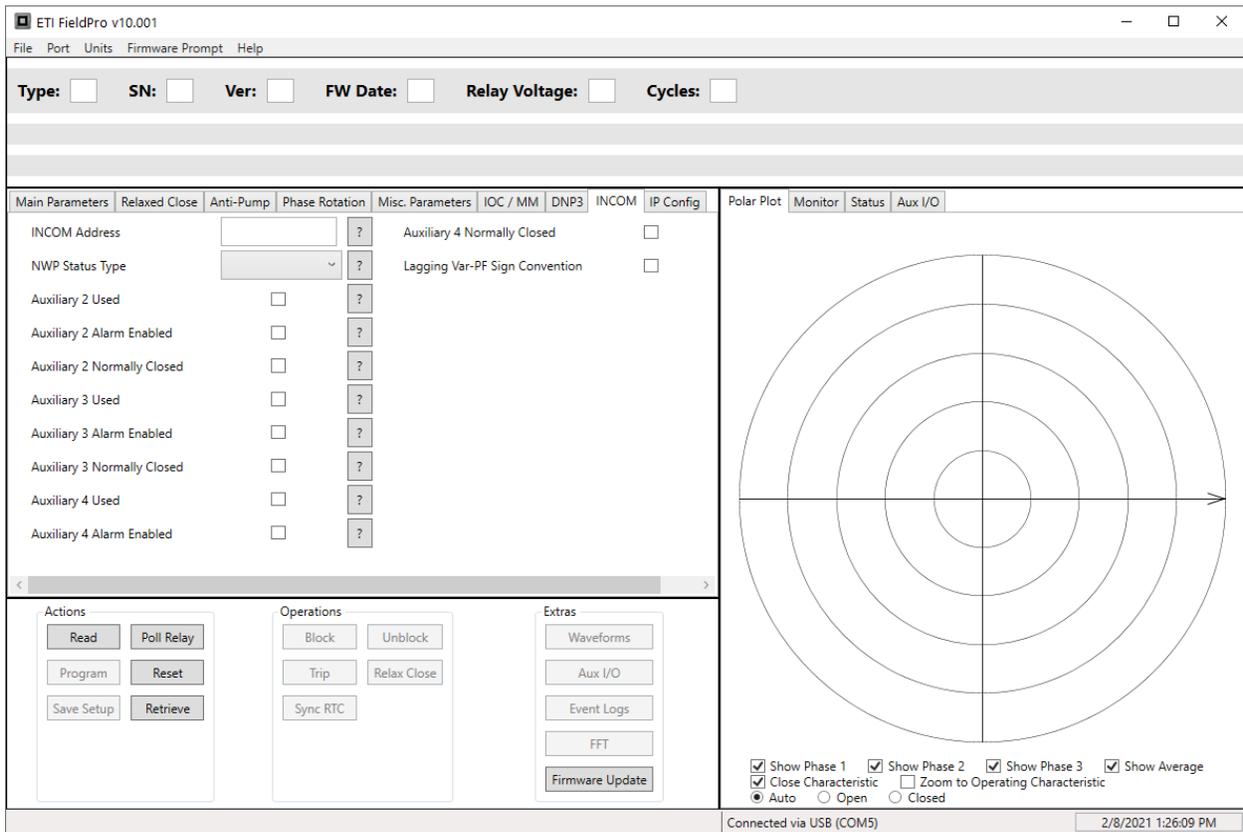
INCOM Tab

Figure 11

INCOM Address – INCOM Address of the MNPR® (In hexadecimal between 001 and FFF)

NWP Status Type – Controls the sense of the selected status input channel. An "A Contact" is closed when NWP is closed. A "B Contact" is open when network protector is closed.

Auxiliary 2/3/4 Used – Enables the specified Auxiliary Digital Input.

Auxiliary 2/3/4 Alarm Enabled – If checked, the activation of this input will trigger an alarm condition.

Auxiliary 2/3/4 Normally Closed – If checked, the input will be activated when the contact is opened. If unchecked, it will activate when contact is closed.

Lagging Var-PF Sign Convention – Inverts the sign of the power factor and vars transmitted via INCOM.

IP Config Tab (Ethernet Relay Only)
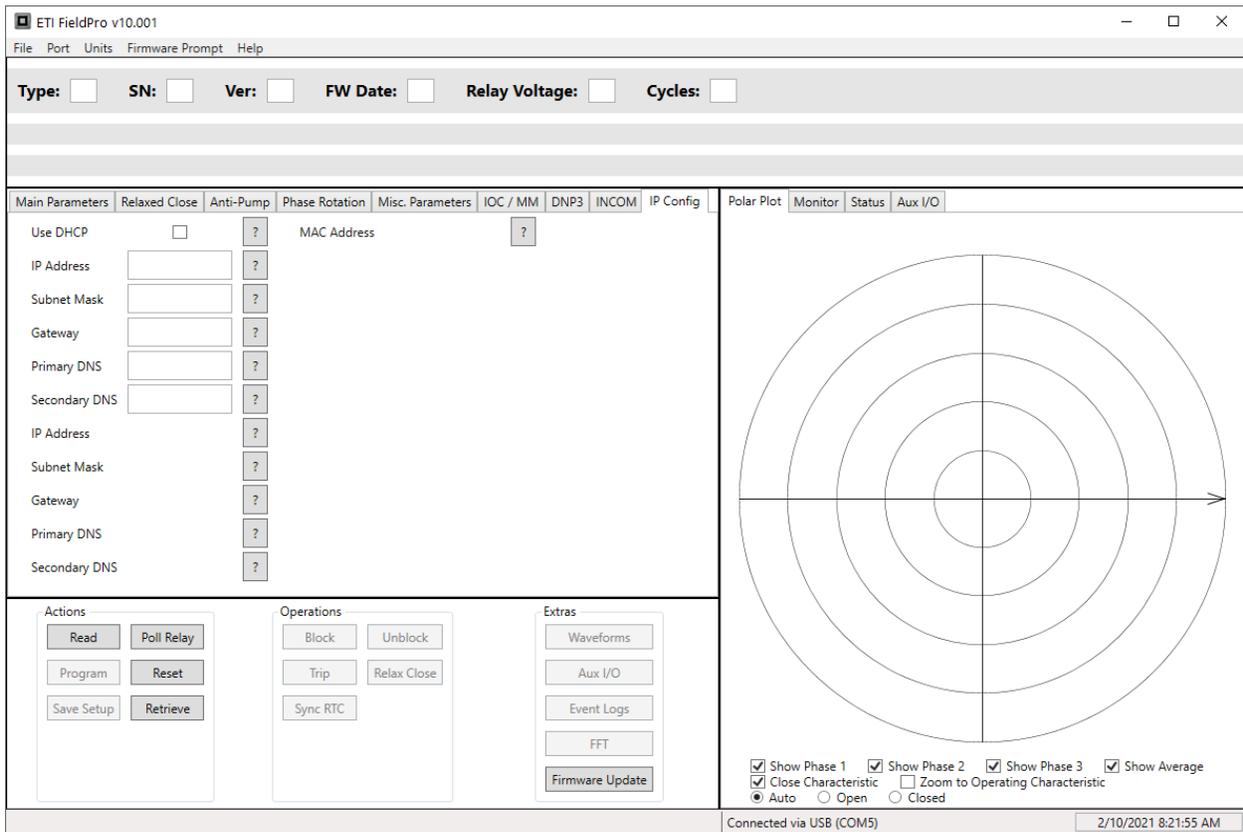
Figure 12

Use DHCP – Configures the relay to obtain IP address automatically via DHCP.

IP Address – IP Address of the MNPR®.

Subnet Mask – Subnet mask of the MNPR®.

Gateway – IP Address of the default gateway.

Primary DNS – IP Address of the primary DNS server.

Secondary DNS – IP Address of the secondary DNS server.

Several of these parameters are duplicated again in a read only fashion showing the current operating address information. This is especially helpful when using DHCP.

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5. MNPR® Status Information

To the right of the MNPR® Operating Parameters there is another set of tabs which display the currently measured values as well as status information reported by the MNPR®.

Polar Plot Tab
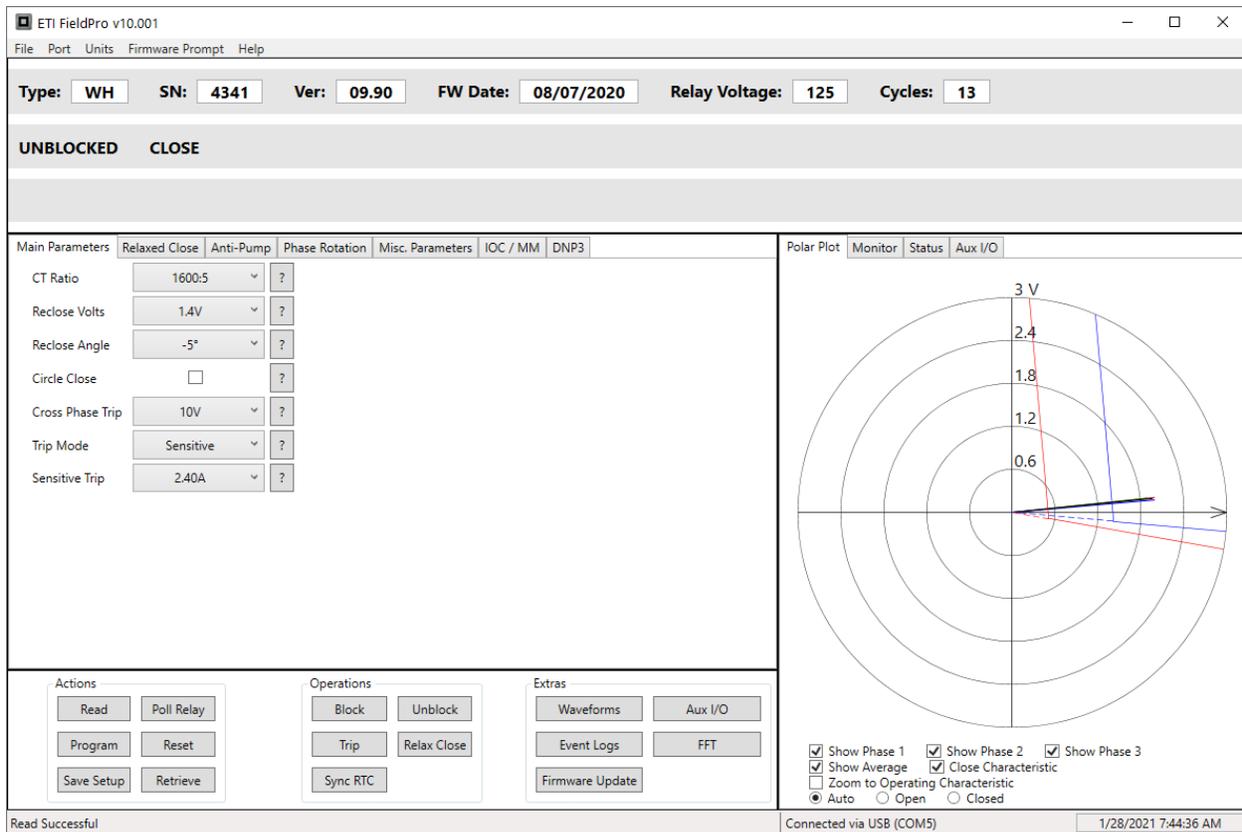
Figure 13

The Polar Plot Tab shows the currently measure voltages or currents along with a graphical representation of the operating characteristic.

There are controls below the plot to control the display:

Show Phase 1/2/3/Average – Shows/Hides the individual and average phase vectors.

Close Characteristic / Trip Characteristic – Show/Hides the trip or close characteristic.

Zoom to Operating Characteristic – Zoom in to show a relevant portion of the operating characteristic regardless of the magnitude of the phase vectors.

Auto/Open/Closed –

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Auto: Automatically determines the protector position and displays the relevant information on the polar plot.

Open: Forces the display of the close characteristic and differential voltages regardless of the actual protector position.

Closed: Forces the display of the trip characteristic and phase currents regardless of the actual protector position.

Monitor Tab
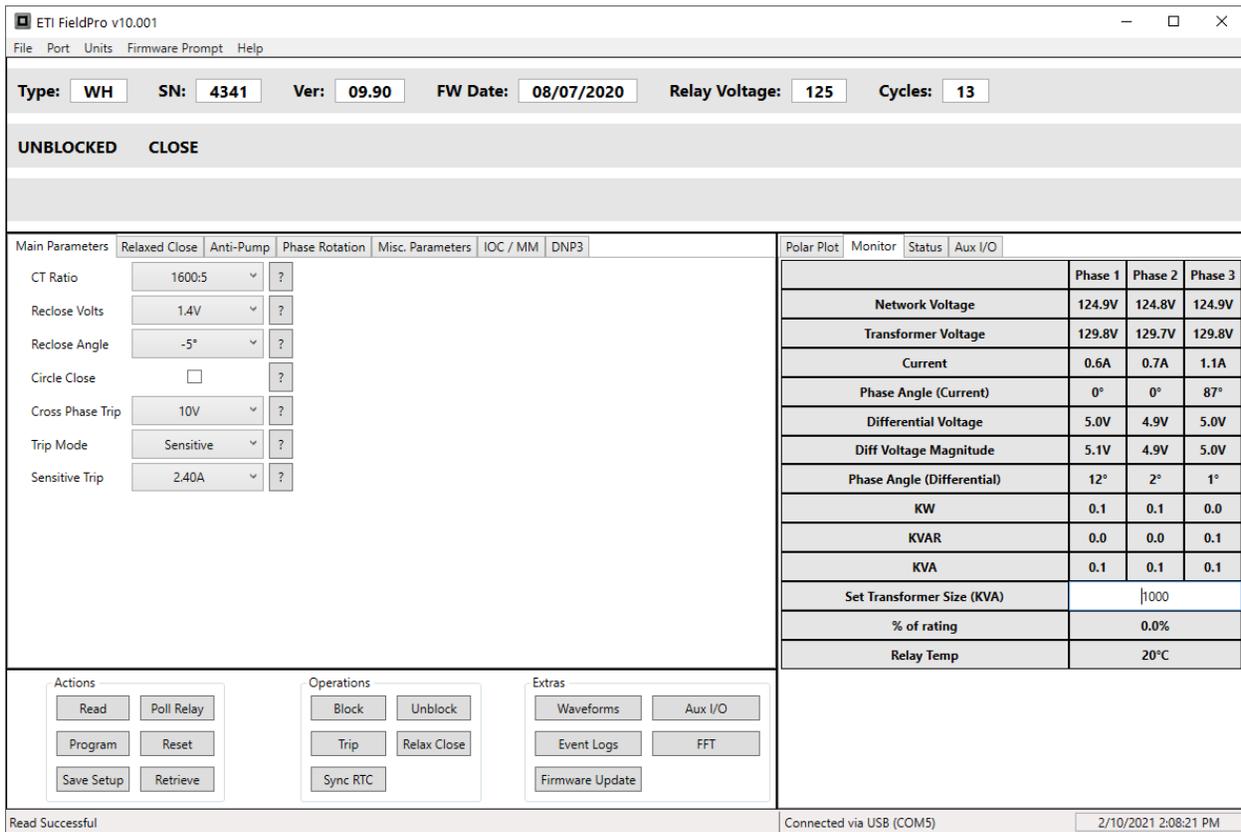
Figure 14

The Monitor Tab shows the most recently measured voltages, currents, angles, and calculated power values.

Network Voltage – The voltage measured at the relay N1, N2, N3 terminals with respect to ground. Note that on a high voltage network protector with potential transformers (PT's), this will not match the voltage on the network protector bus.

Transformer Voltage – Depending on the relay type, this will display one of three possibilities:

1. Not available.

2. The voltage measured at the relay T1, T2, T3 terminals with respect to ground. Note that on a high voltage network protector with potential transformers (PT's) this will not match the voltage on the network protector bus.

3. The network voltage + the differential voltage. This will be equivalent to the transformer voltage assuming the differential voltage does not reach its maximum value (about 18V on a Westinghouse style relay).

Current - The load current measured by network protector relay. It can be displayed in either of three units:

Relay Units (shown in mA, based off the 5 Amp secondary of the network protector CT)

Protector Units (shown in Amps, the actual current through the bus)

Percent Units (shown as a percentage of the CT rating)

For example on a protector with at 1600:5 Amp CT Ratio 2.5A (Relay Units) is equivalent to 800A (Protector Units) and 50% (Percent Units).

Phase Angle – Depending on the state of the network protector (open/closed) this will either show the angle between the network voltage and differential voltage or the angle between the network voltage and current on each phase.

Differential Voltage – On a Westinghouse style relay, this is the real part (multiplied by the cosine of the angle) of the voltage difference measured between the relay N and T pins.

On a GE style relay, this value is obtained by measuring the current produced through a tertiary winding on the network protector CT, which is proportional to the difference between the N and T bus.

Note that this quantity will not match the voltage difference measured by a voltmeter placed across the relays N and T pins.

Diff Voltage Magnitude – On a Westinghouse style relay, this is the voltage difference measured between the relay N and T pins. Note that on a high voltage network protector with potential transformers (PT's) this will not match the voltage difference measured across the network protector. On a GE style relay this value is obtained by measuring the current produced through a tertiary winding on the network protector CT, which is proportional to the difference between the N and T bus.

KW/KVAR/KVA – Calculated values for power based on network voltage, current, and angle reported by relay.

Set Transformer Size (KVA) – The value set here is used to calculate the % of rating.

% of Rating – The calculated percent loading on the transformer.

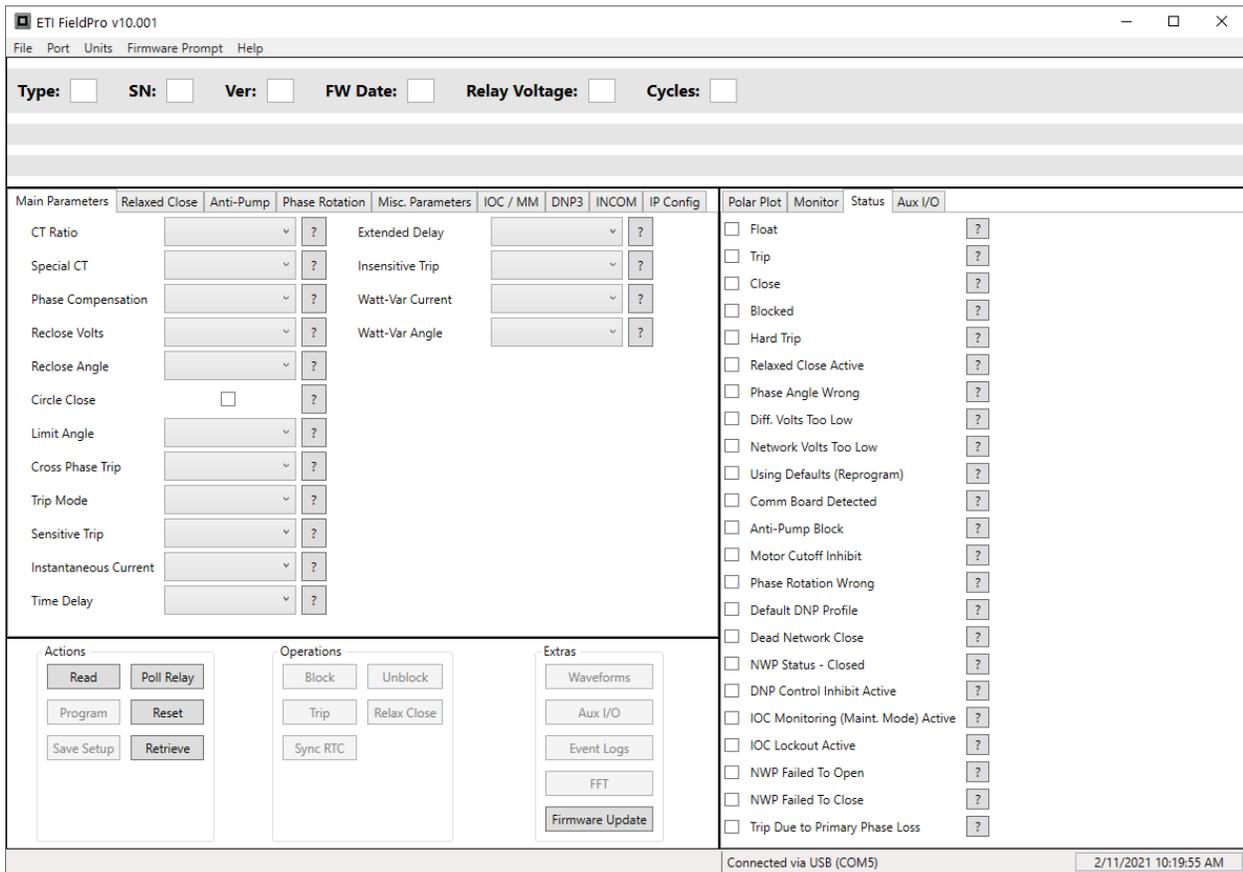Relay Temp – Internal Relay Temperature

Status Tab

Figure 15

The Status Tab shows a series of checkboxes that indicate the current state of the MNPR®.

Float – The MNPR® is not calling for a trip or close. The network protector should maintain its current position.

Trip – The MNPR® is calling for a trip.

Close – The MNPR® is calling for a close.

Blocked – The MNPR® is blocked (using the block button on the main screen). It will not call for a close even if system conditions permit.

Hard Trip – The MNPR® will hold the trip contact on, even if the network protector is open during a cross phase condition (if cross phase trip is enabled).

Relaxed Close Active – This box will be checked when the MNPR® is currently operating using the Relaxed Close parameters.

Phase Angle Wrong – This indicates that the reason the MNPR® is not calling for a close at the moment is due to the phase angle not being inside the close region.

Diff. Volts Too Low – This indicates that the reason the MNPR® is not calling for a close at the moment is due to the magnitude of the differential volts being below the Reclose Volts setting.

Network Volts Too Low – This indicates that the MNPR® will not close because the three phase average of the network voltage does not exceed the Network Volts Too Low To Close setting.

Using Defaults (Reprogram) – The internal memory in which the MNPR® stores its operating settings has become corrupt. The MNPR® is operating using the default settings. You should perform a reset and reprogram the MNPR®.

Comm Board Detected – This indicates whether or not the MNPR® has an internal communications board.

Anti-Pump Block – This indicates that the anti-pump algorithm has been triggered and the MNPR® will be blocked from closing.

Motor Cutoff Inhibit – This indicates that the motor cutoff algorithm has been triggered and the MNPR® will be blocked from closing.

Phase Rotation Wrong – The MNPR® will not close because the phase rotation reading does not match the setting.

Default DNP Profile – This indicates that the MNPR® is not using a custom DNP3 Profile. It will use a standard DNP Point List and manually configured parameters. (See the DNP3 Setup and DNP3 Profiles Sections for additional information)

Dead Network Close – Indicates that the MNPR® is asserting the CLOSE contact because the network voltage is below the Adjustable Dead Network set point.

NWP Status – Closed – A check in this box indicates that the Network Protector Status is closed.

DNP Control Inhibit Active – This indicates that the auxiliary input channel selected for the DNP Control Inhibit function is in the active state and remote commands will be ignored.

IOC Monitoring (Maint. Mode) Active – This indicates that the auxiliary input channel selected for the instantaneous overcurrent function is in the active state and a lockout (Trip & Block) will be initiated if the overcurrent setting is exceeded.

IOC Lockout Active - This indicates that the instantaneous overcurrent setting was exceeded and a lockout (Trip & Block) was triggered. The relay will continue to issue a trip until a local unblock command is issued via the relay optical port (remote unblock via DNP or INCOM will NOT override this lockout).

<u>NWP Failed To Open</u> - This indicates that the relay commanded the protector to open, but the protector status input indicates it remained closed.

<u>NWP Failed To Close</u> - This indicates that the relay commanded the protector to close, but the protector status input indicates it remained open.

<u>Trip Due to Primary Phase Loss</u> - Indicates that the relay has tripped due to primary phase loss.

Aux I/O Tab

Figure 16

The Aux I/O Tab shows the values of any auxiliary inputs and outputs available on the MNPR®. The number and type of I/O available will vary depending on the particular model of relay.

Setup for naming and selecting connected sensor type is described in Section 7.

Raw – The raw ADC value that is being read by the relay. This can be either an 8 or 12 bit value depending on the relay hardware and settings.

Volts – The voltage value that would be measured at the sensor input.

Scaled – The actual real world value scaled appropriately for the connected sensor (PSI, °C, etc).

DO1/2/3 Checkbox – Indicates the current state of the digital output.

Toggle DO1/2/3 – Toggles the state of the digital output.

6. MNPR® Firmware Updates

Certain versions of the MNPR® (part numbers 5XX9X3, 5XX9X8, and 5XX975) are capable of having their firmware flash updated.

Automatic Update:

The FieldPro software is distributed with the latest firmware for the MNPR®. If upon reading, it detects that a compatible MNPR® is running an older version of firmware, it will show a message like that shown in Figure 17.
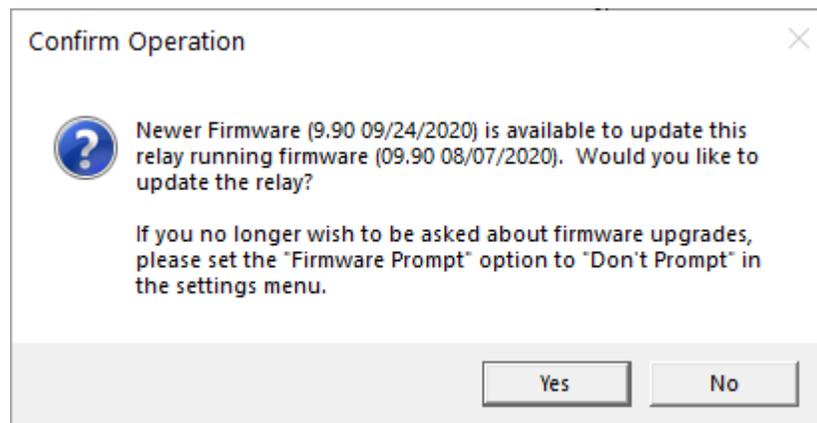
Figure 17

It is recommended that the update be allowed to proceed so that the MNPR® will be running the latest available software.

After pressing "Yes" the dialog box shown in Figure 18 will appear**. It is imperative that the network protector be blocked open before proceeding.** Since the MNPR®'s internal operating software (firmware) is being updated, it will be nonfunctional during this time.

After verifying that the handle is in the open position and that the network protector is open, check the confirmation box and press "OK".
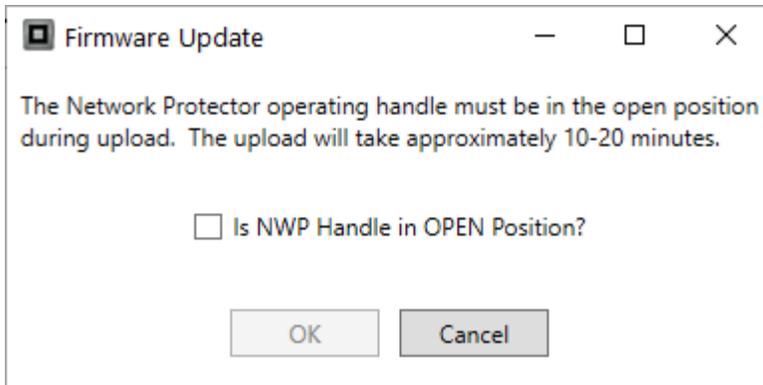
Figure 18

The upload will then proceed as shown in Figure 19. Upon completion, FieldPro will attempt to preserve the current operating parameters of the MNPR®. If the parameters were not valid prior to the update, the user will be notified. The settings will then be reset to factory defaults and will need to be reprogrammed appropriately. If the upload and settings check/reset are successful, the message shown in Figure 20 will appear.
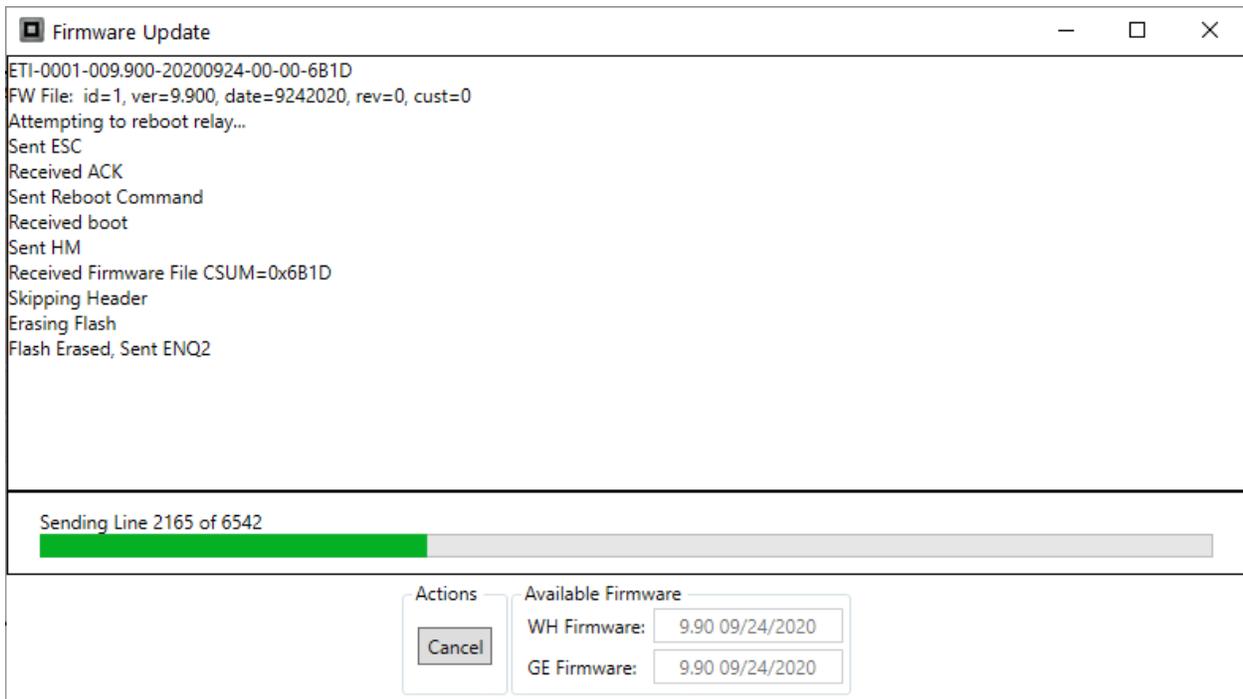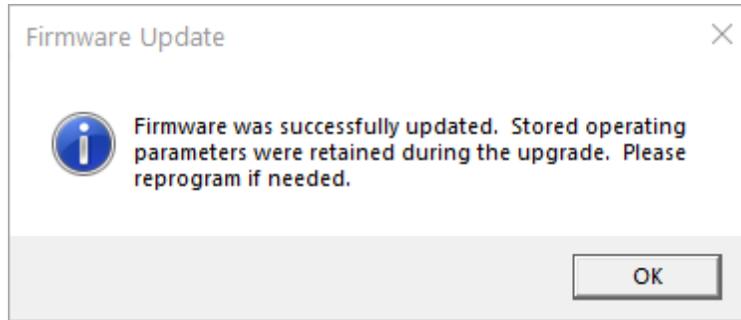

Figure 19

Figure 20

If the upload fails to complete, an error similar to those shown as in Figure 21 / Figure 22 will be displayed.
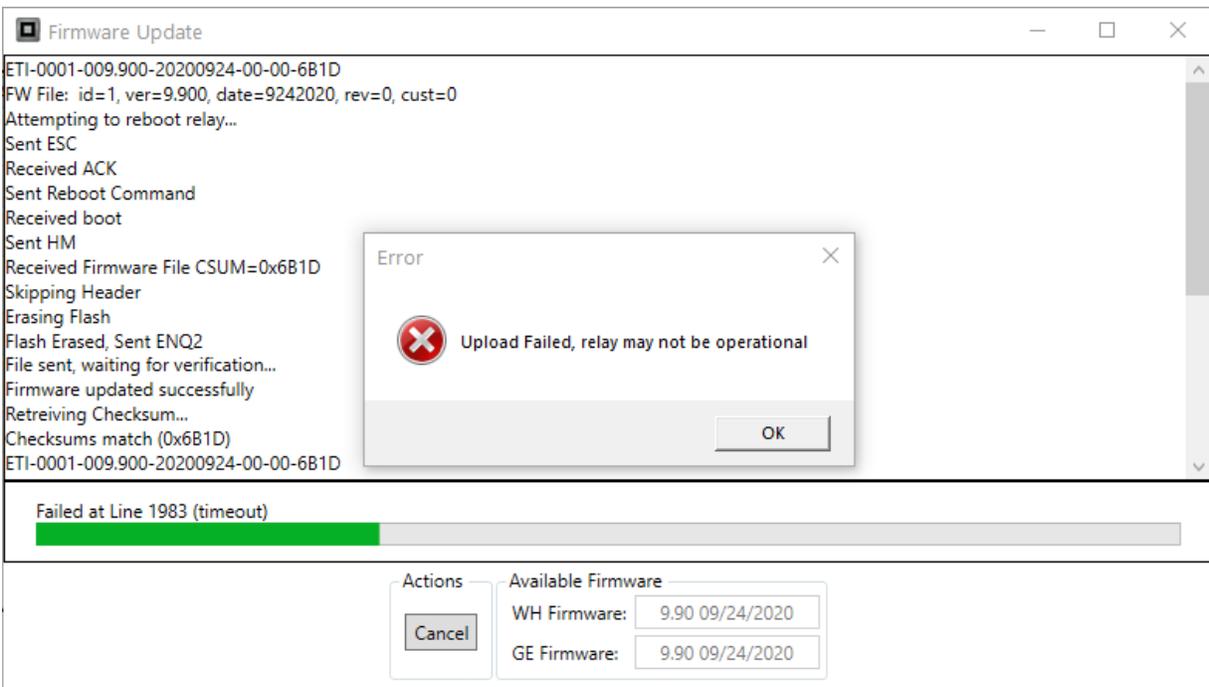
Figure 21
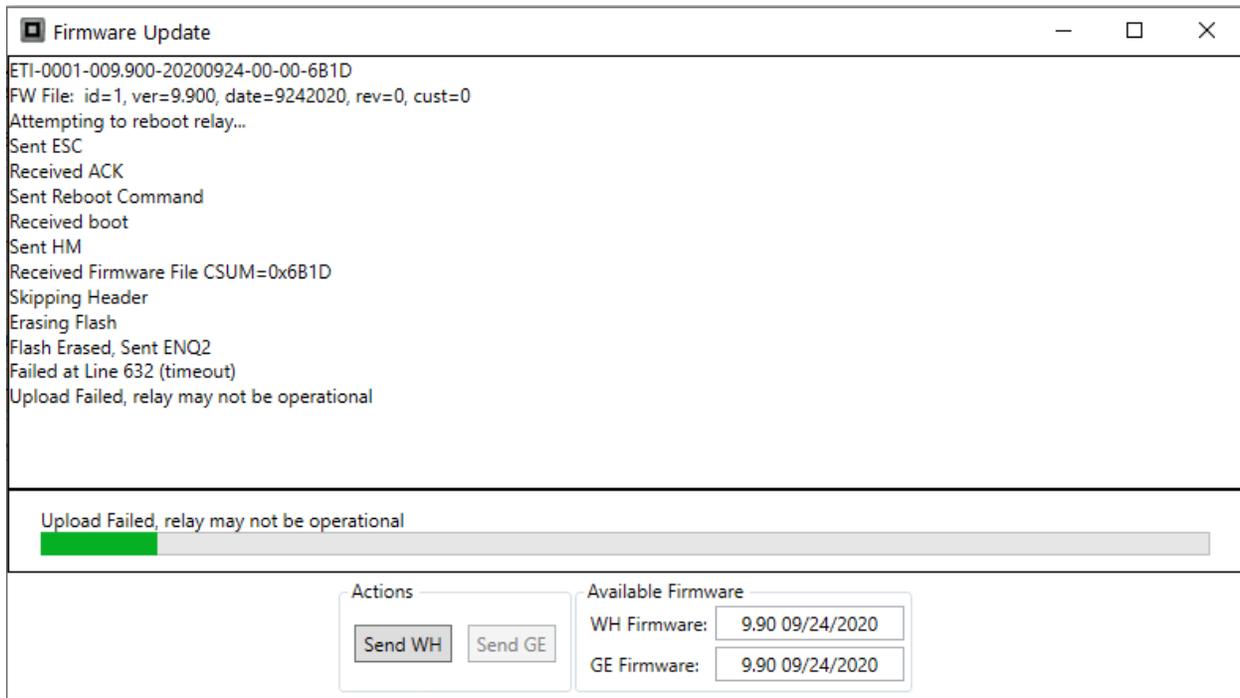
Figure 22

Depending on what type of relay was detected prior to failure, only one of the "Send" buttons will be available. Pressing this button will restart the upload.

Manual Update:

There are a few rare instances where it might be necessary to perform a manual firmware update (perhaps FieldPro was closed accidentally or the computer lost power during the automatic upload process).

This can be accomplished from the main screen shown in Figure 2. Press the "Firmware Update" button and the screen shown in Figure 23 will appear.
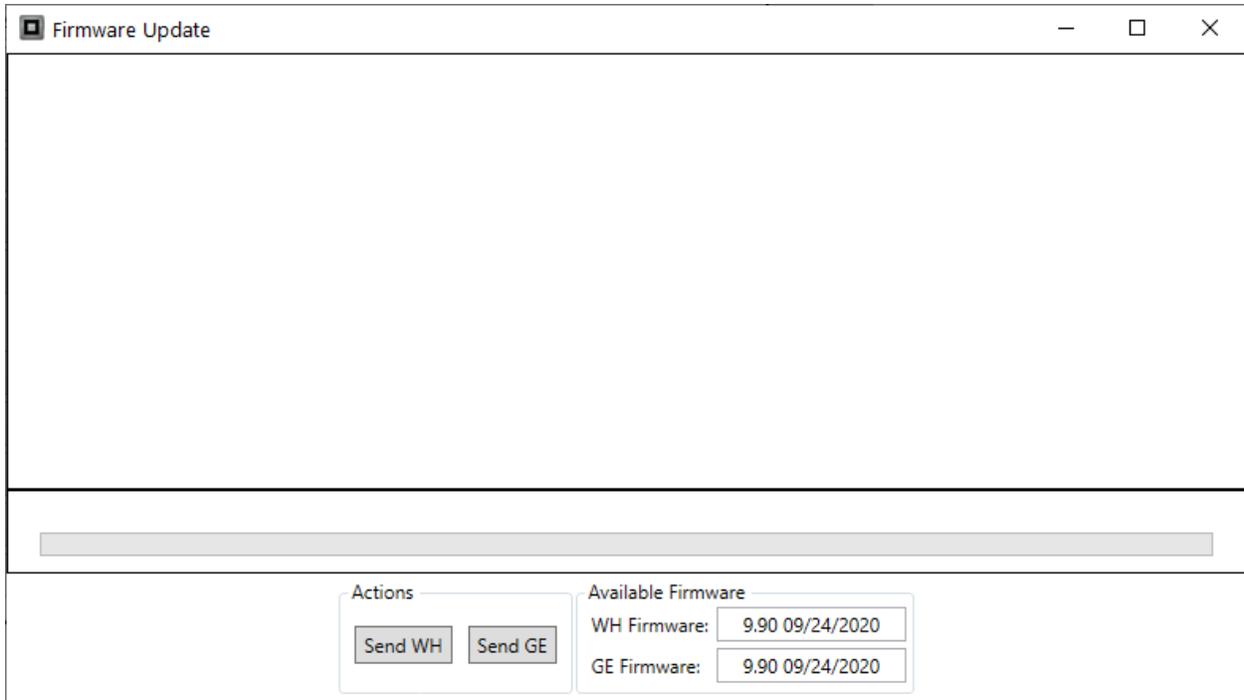
Figure 23

Since the relay may not have any firmware running on it, the type of relay (WH/GE) must be selected manually. **It is very important to select the correct relay type. Loading the wrong firmware will cause improper and possibly unsafe operation of the relay**. Press the appropriate button for the relay currently connected. A dialog box will pop up asking to confirm the relay type (Figure 24 / Figure 25). Pressing OK will start the upload in a manner similar to the automatic process previously described.
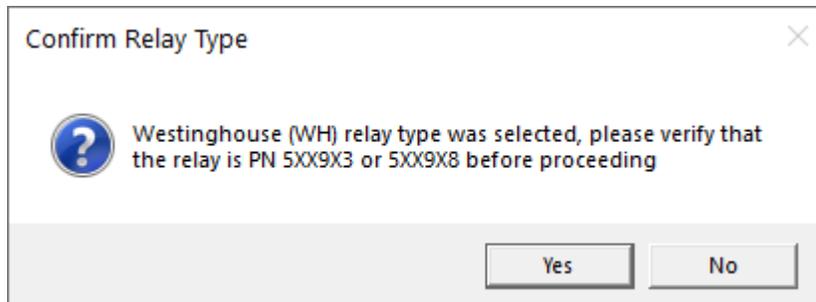
Figure 24
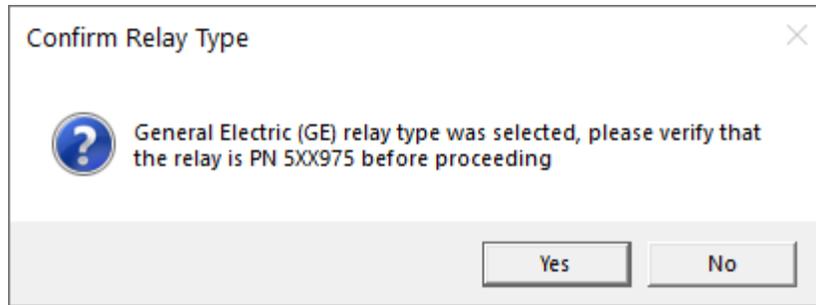
Figure 25

7. Aux I/O (Communicating MNPR® only)

Selecting the "Aux I/O Config" menu item from the File menu on the main screen will display the Aux I/O Configuration screen shown in Figure 26.

Figure 26

Relay I/O Type – Select the I/O configuration of your relay. More information about the various I/O configurations is available in Appendix D. Any I/O not available in the selected configuration will be grayed out in the configuration screen.

<u>Name</u> – Allows a user friendly name to be assigned to each input or output which will be displayed on the view I/O screen.

<u>Sensor Type</u> – Select the type of sensor that will be attached to each analog input (Temperature/Pressure/Oil Level/NWP Status/Other)

<u>Sensor</u> – Select specific model of ETI sensor that is attached. If another type of sensor is used, select None/Other for Sensor Type and None/Other for sensor and the raw voltage will be displayed.

The actual I/O data is viewed by pressing the "Aux I/O" button on the main screen. A screen similar to that shown in Figure 27 will appear (exact screen layout is dependent on the configuration described above).

Figure 27

Each of the meters displays the analog input scaled appropriately for the sensor selected in the configuration.

8. DNP3 Profiles (Communicating MNPR® only)

Recent versions of MNPR® firmware (01/30/2012 or newer) may be equipped with DNP Profiles. The purpose of these profiles is to encapsulate the rarely changed DNP3 communication parameters (points list, scaling, unsolicited response setup, etc) into a single profile that can be loaded onto an MNPR® without having to manually select and program these settings every time.

If the MNPR® firmware supports DNP Profiles, the "Manage DNP Profile" button will appear on the DNP3 tab on the main screen.

The DNP Profile is either provided by ETI or can be generated using the ETI DNPPro® software to meet specific customer requirements. The FieldPro software loads this profile from a file called "profile.dnp" which must be copied into the FieldPro installation directory (usually "C:\Program Files (x86)\ETI\FieldPro v10\").

As seen in Figure 28 and Figure 29, depending on if a profile is loaded onto the relay or not some settings may become unavailable on the DNP3 tab as they are managed within the profile.
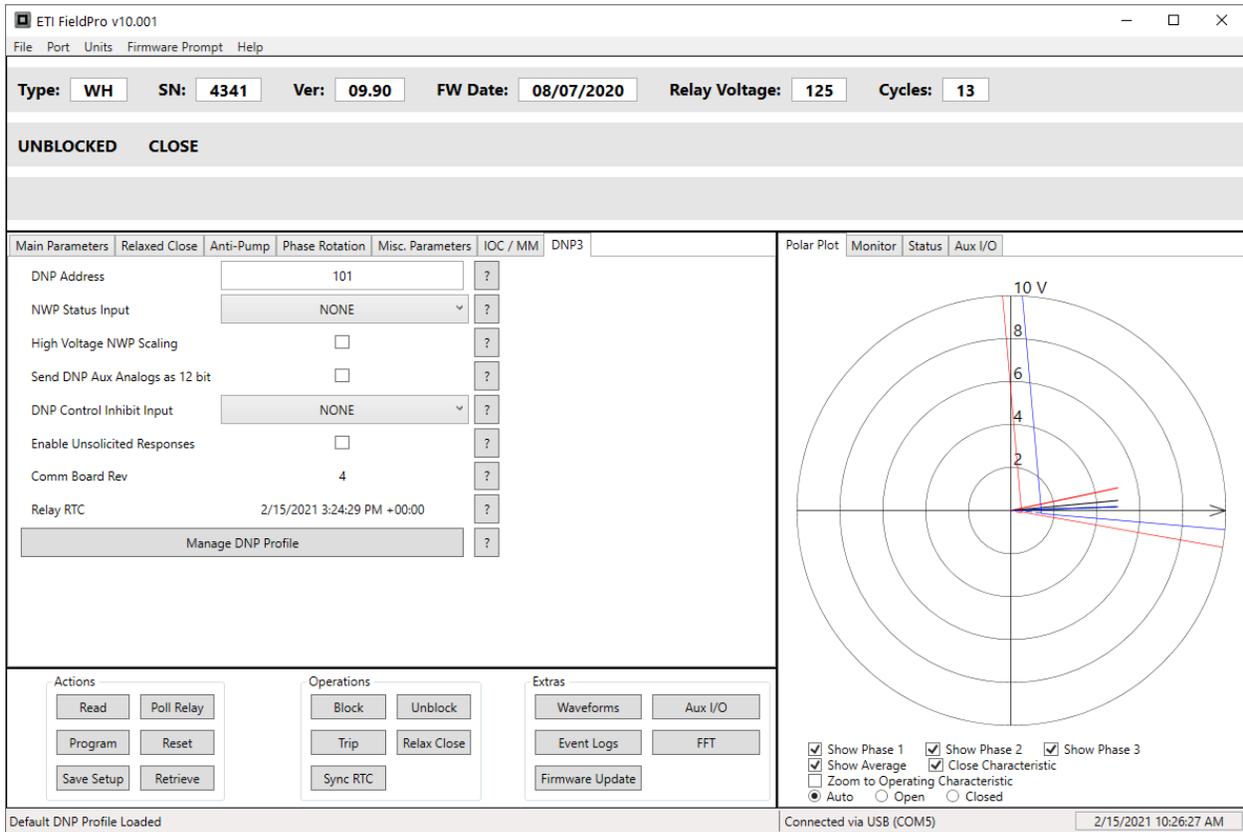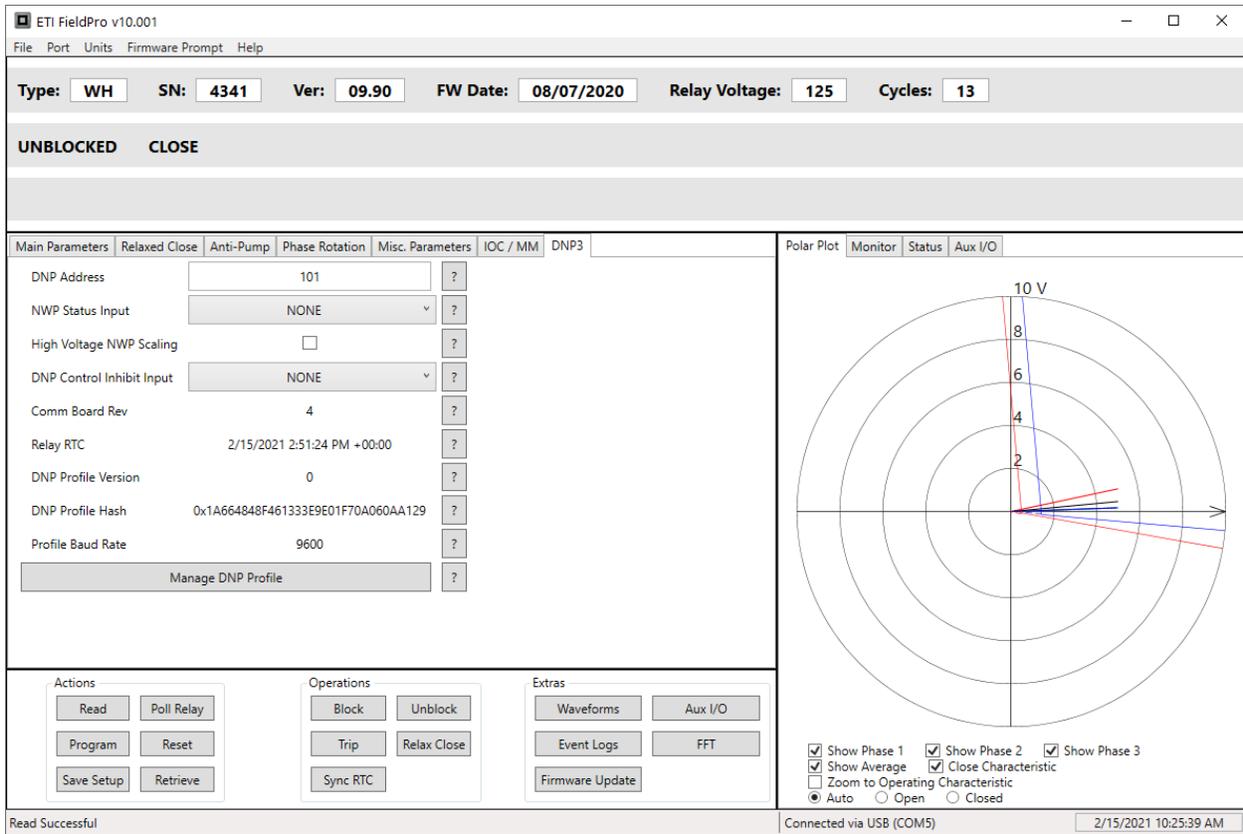

Figure 28

Figure 29

In the event the MNPR® firmware has support for profiles, but one is not currently loaded the relay will operate off the standard DNP Point List (see Appendix C) and manually configured parameters (as described in the previous section).
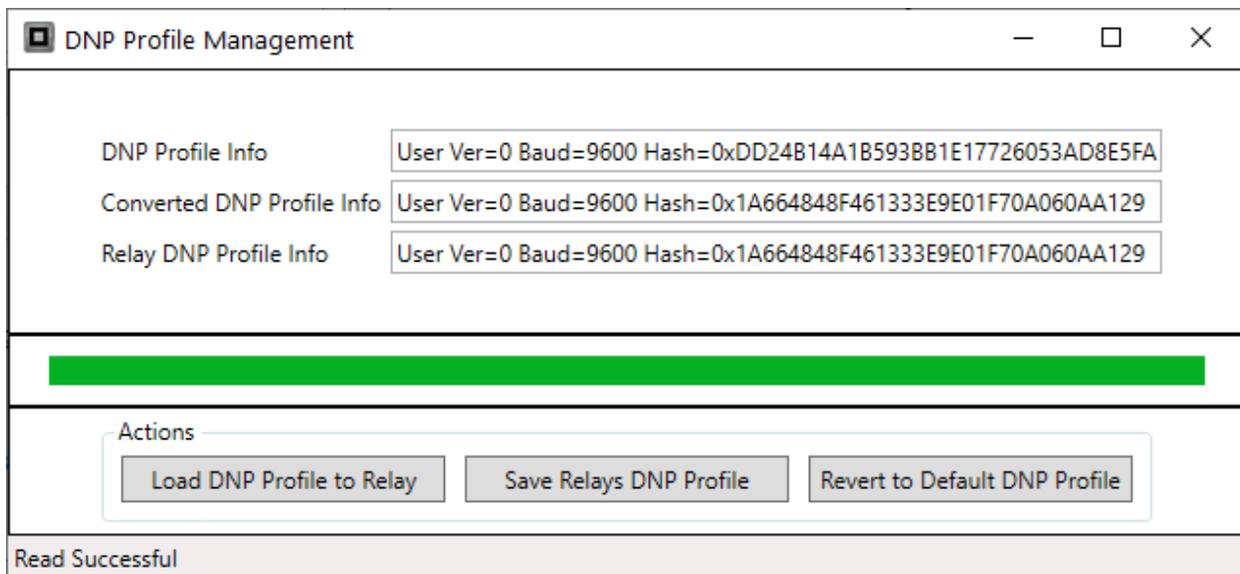
Figure 30

The DNP Profile Management screen shows above in Figure 30, allows the profile to be changed.

DNP Profile Info – Provides information about the DNP Profile file that is available to be loaded to the relay.

Converted DNP Prof – If the DNP Profile file needs to be converted to work with the currently connected relay, this field provides information about the converted profile.

Relay DNP Profile Info – Provides information about the DNP Profile that is currently loaded on the relay.

The User Version is a user provided version number that is assigned when the profile is created. It is useful for tracking different profile versions if changes are required.

The Baud is the serial data rate for RS-485 communications.

The Hash is a generated signature that identifies the profile. If any changes are made to the profile it will generate a different hash. This is useful to verify that the profile in question matches the desired profile.

Load DNP Profile to Relay – Pressing this button will load the profile onto the relay.

Save Relays DNP Profile – Pressing this button will allow the user to save the relays current DNP profile to a file.

Revert to Default DNP Profile – Pressing this button will delete the stored profile on the relay and cause it to operate off the standard DNP Point List and manually configured settings.

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9. View Waveforms

Pressing the "Waveforms" button on the main screen will display the Waveforms window as shown below in Figure 31.
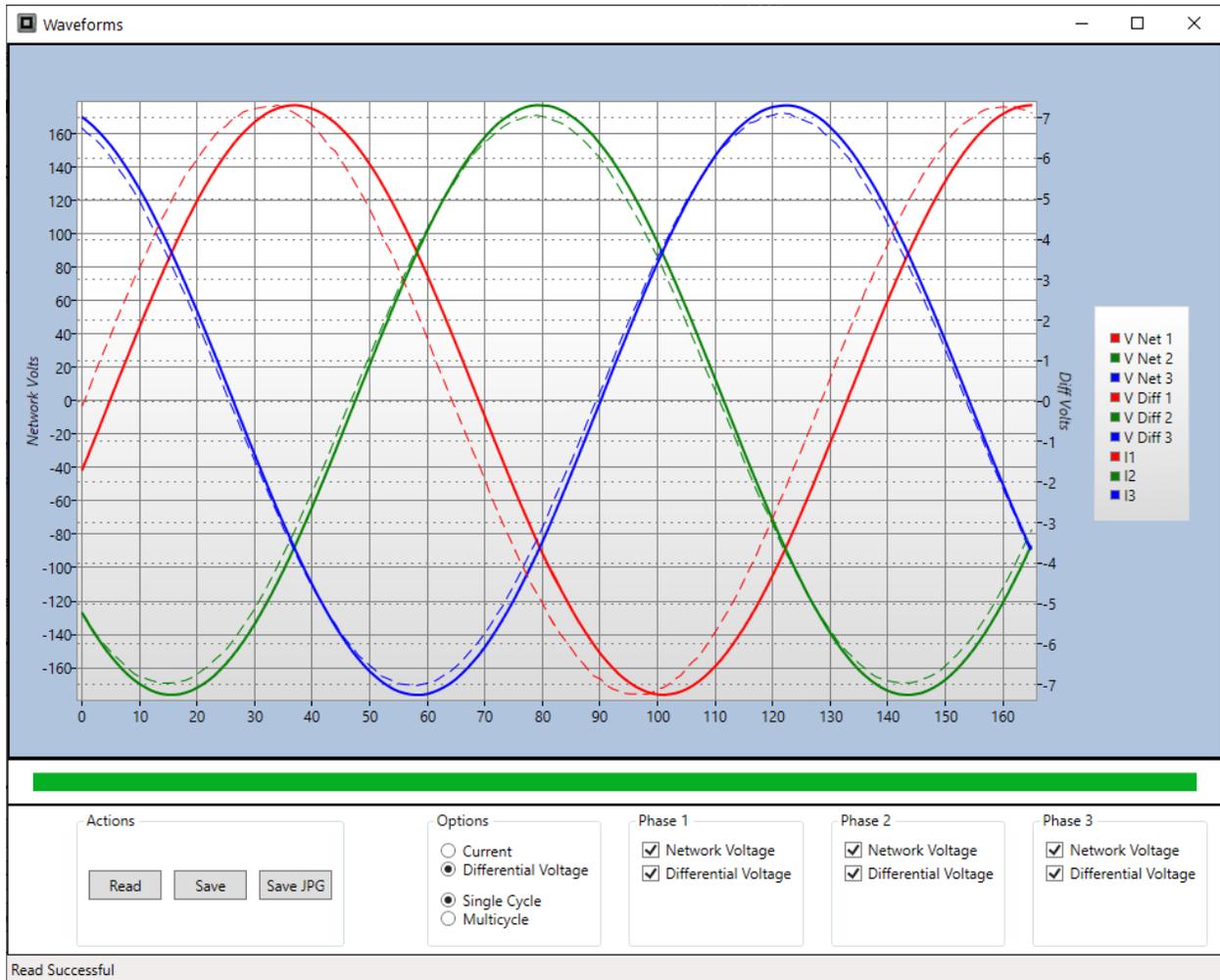

Figure 31

Select either Current or Differential Volts using the radio button control (network voltage will be retrieved in either case).

Select Single or Multiple Cycles to be retrieved from the MNPR® using the radio button control. If Multicycle is selected, the number of cycles to download may be chosen in the dropdown box.

Press the "Read" button to fetch waveform data from the MNPR® and display it graphically.

Using the checkboxes next to each item, the traces can be turned on or off to un-clutter the display. If multiple cycles are retrieved a scroll bar will be available beneath the chart to move between them.

The "Save" button will save the waveform data into either a comma delimited file that can be imported into other programs such as Excel or an IEEE COMTRADE format.

Pressing the "Save JPG" button will save an image of the waveforms screen to a file.

10. Event Logs

Pressing the "Event Logs" button on the main screen will display the Event Logs window as shown below in Figure 32.

Certain MNPR® models are capable of storing several cycles before and after a trip of close event.

Pressing the "Read" button will retrieve any available log data from the MNPR®. Once the logs are retrieved into FieldPro they will be removed from the MNPR®.

Checkboxes allow individual items (voltages/currents) to be turned off to make the output easier to read.

The "Save" button will save the currently selected log data into either a comma delimited file that can be imported into other programs such as Excel or an IEEE COMTRADE format.

The "Save All" button will save all available log data in a single operation.

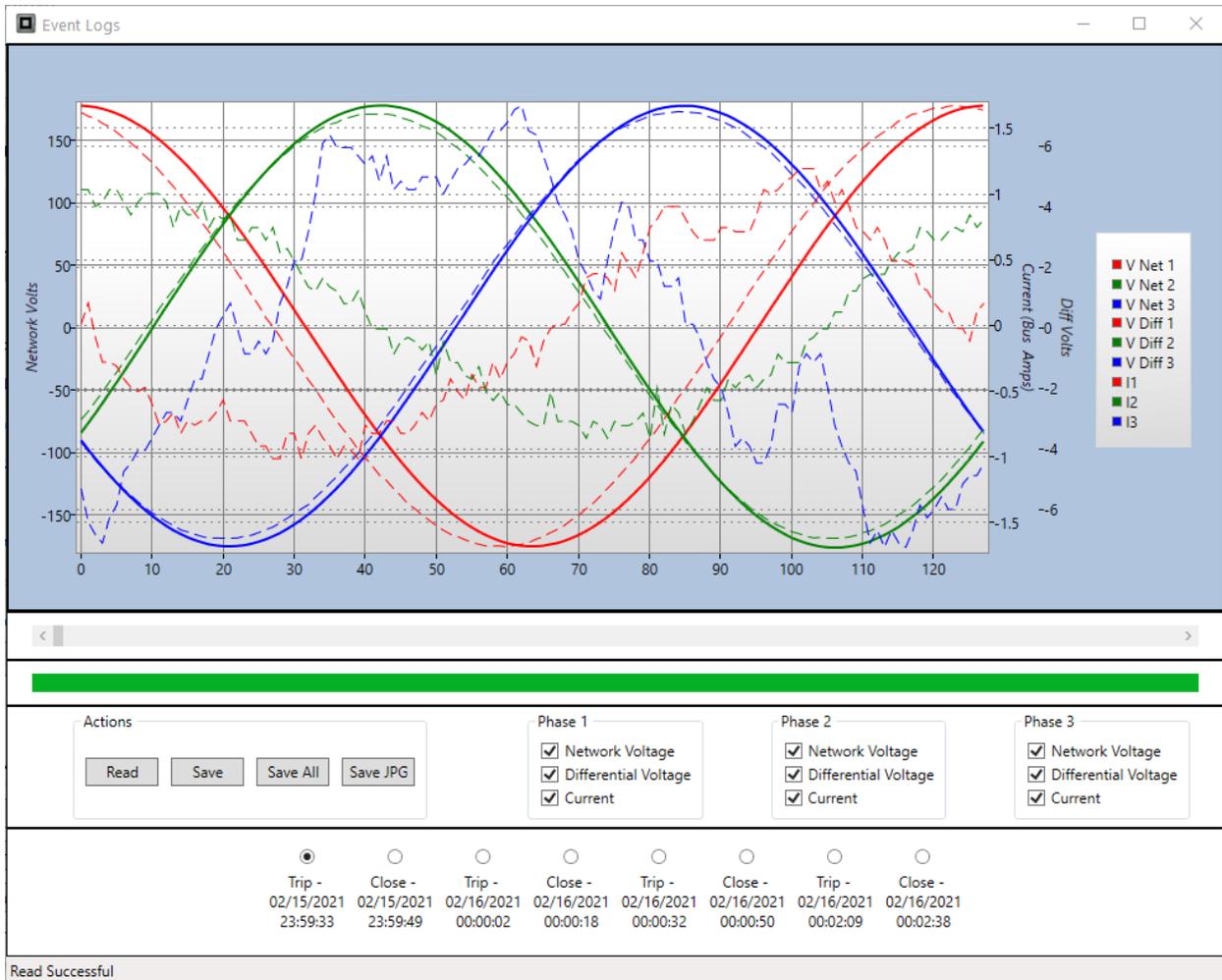Pressing the "Save JPG" button will save an image of the waveforms screen to a file.

Figure 32

11. FFT (Fast Fourier Transform)

Pressing the "FFT" button on the main screen will display the FFT window as shown below in Figure 33.
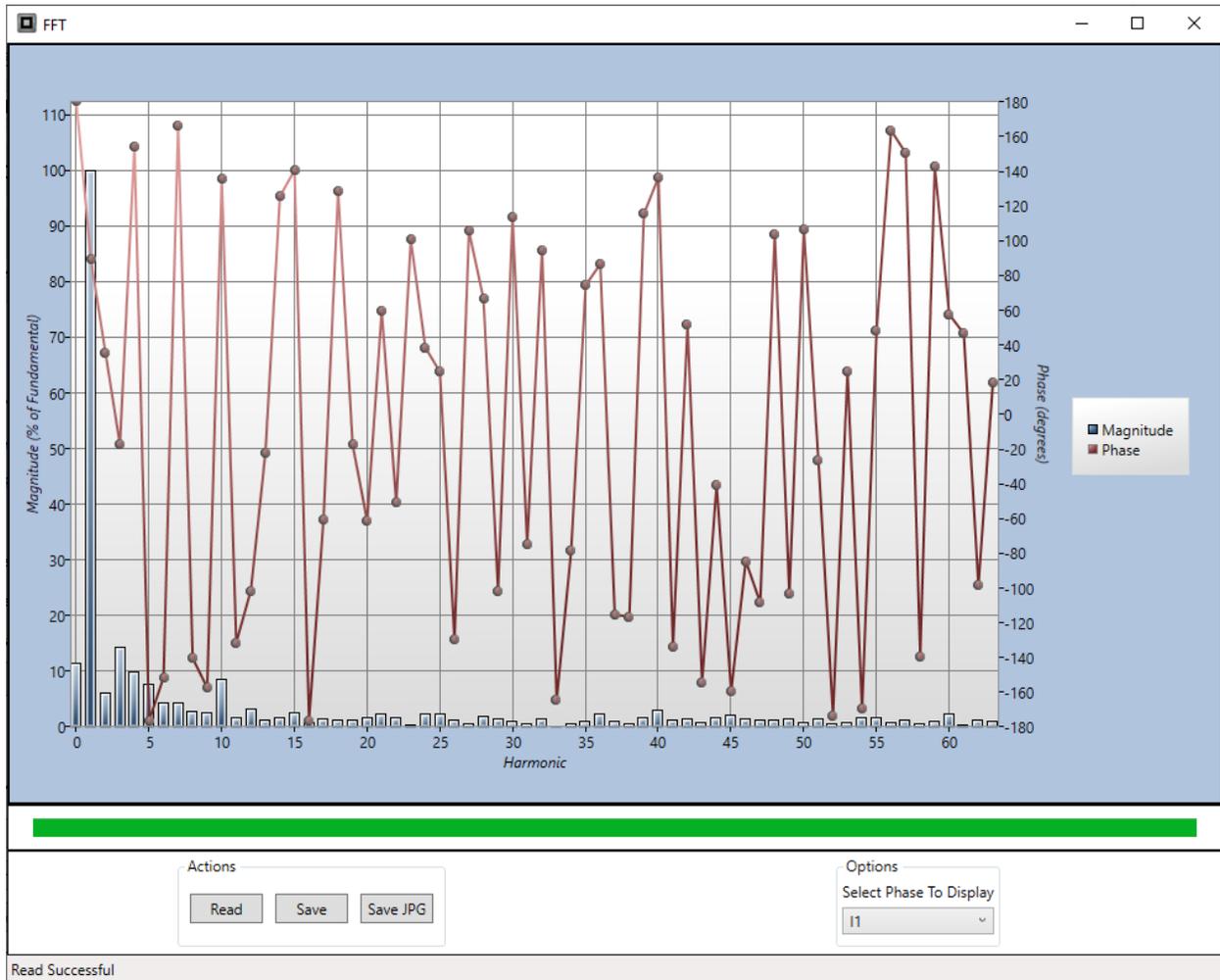

Figure 33

Pressing the "Read" button will retrieve harmonic information from the MNPR®.

The "Save" button will save the currently selected log data into a comma delimited file that can be imported into other programs such as Excel.

Pressing the "Save JPG" button will save an image of the waveforms screen to a file.

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12. Troubleshooting

If at any time there is a communication failure verify the following:

- MNPR® is powered, either with a power block or by being installed in an energized network protector

- Communications cable is connected to both the PC and MNPR®

- Proper communications port is selected in the Port menu. (Either COMx or USB)

- Ensure that the optical head is oriented correctly on the MNPR®. One side of the head had the word "TOP" molded into it. This should face the top of the MNPR® (the top is the side closest to the optical port). (Note that in some network protectors the MNPR® may be mounted sideways)

- When FieldPro is communicating with the MNPR® the words "Remote Login" should be scrolling on the display of the MNPR®

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Appendix A. MNPR® Characteristics
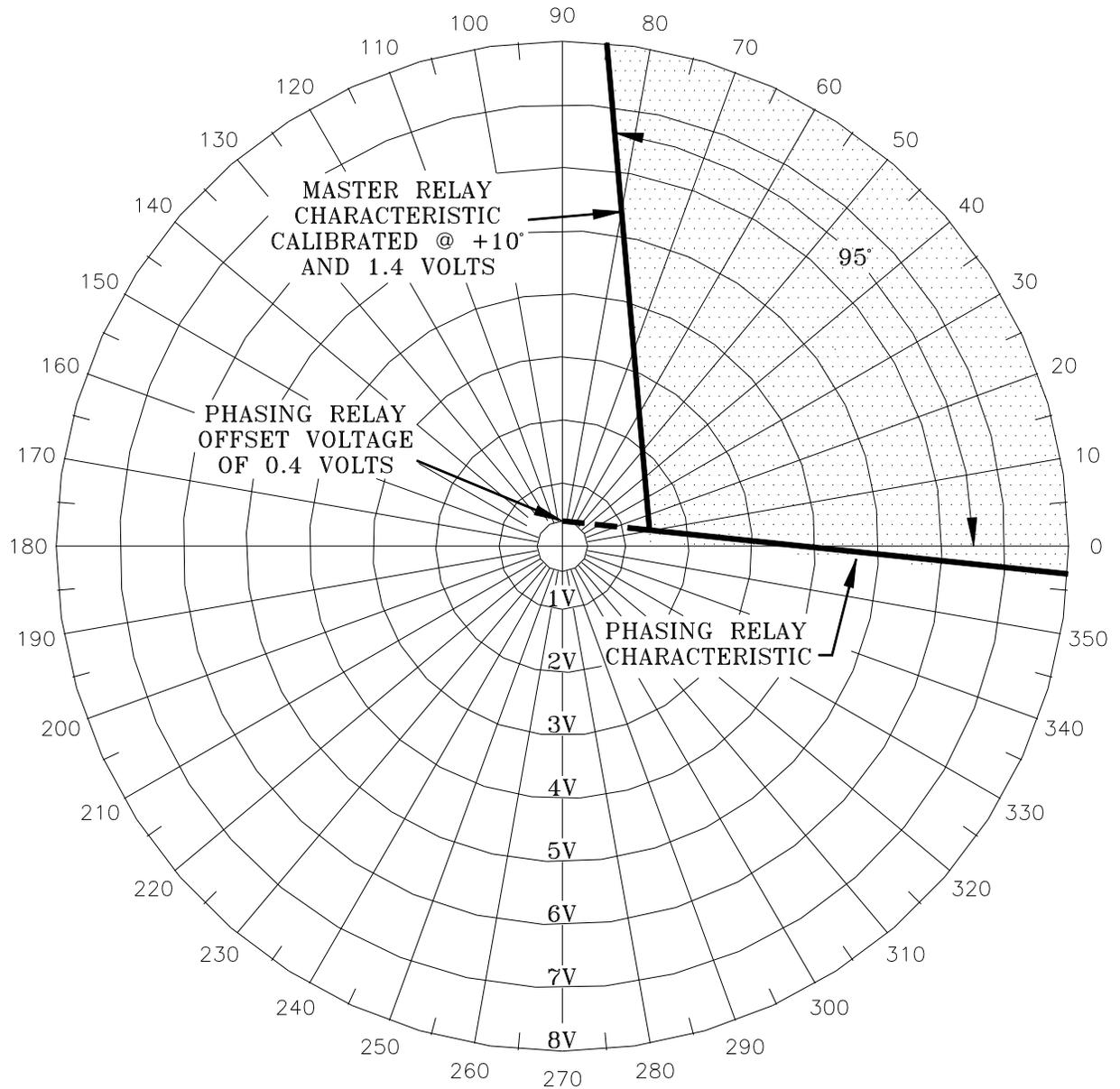
NOTE: Shaded area is a MUST CLOSE REGION
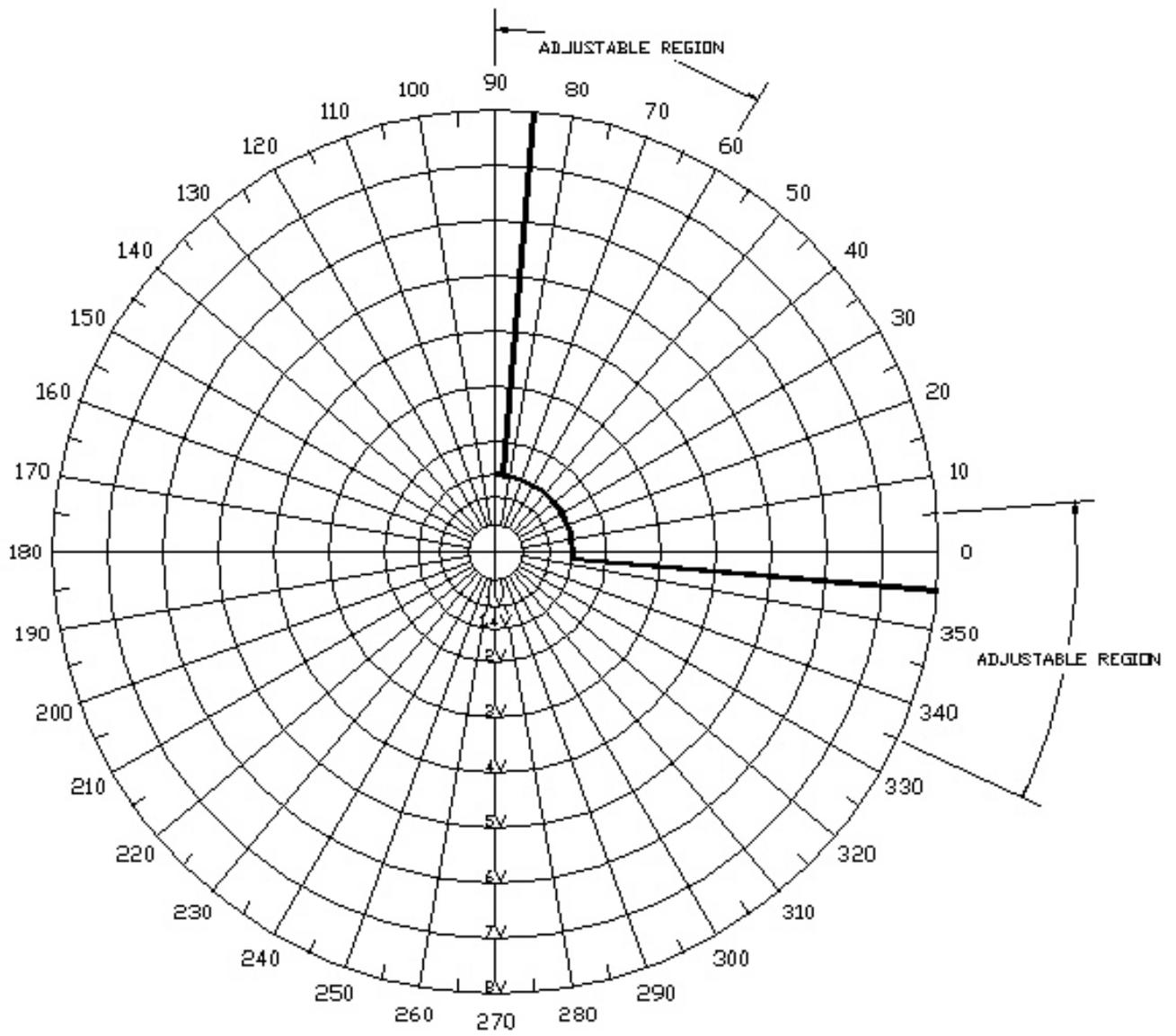
Figure 34 - Reclose Characteristic

55

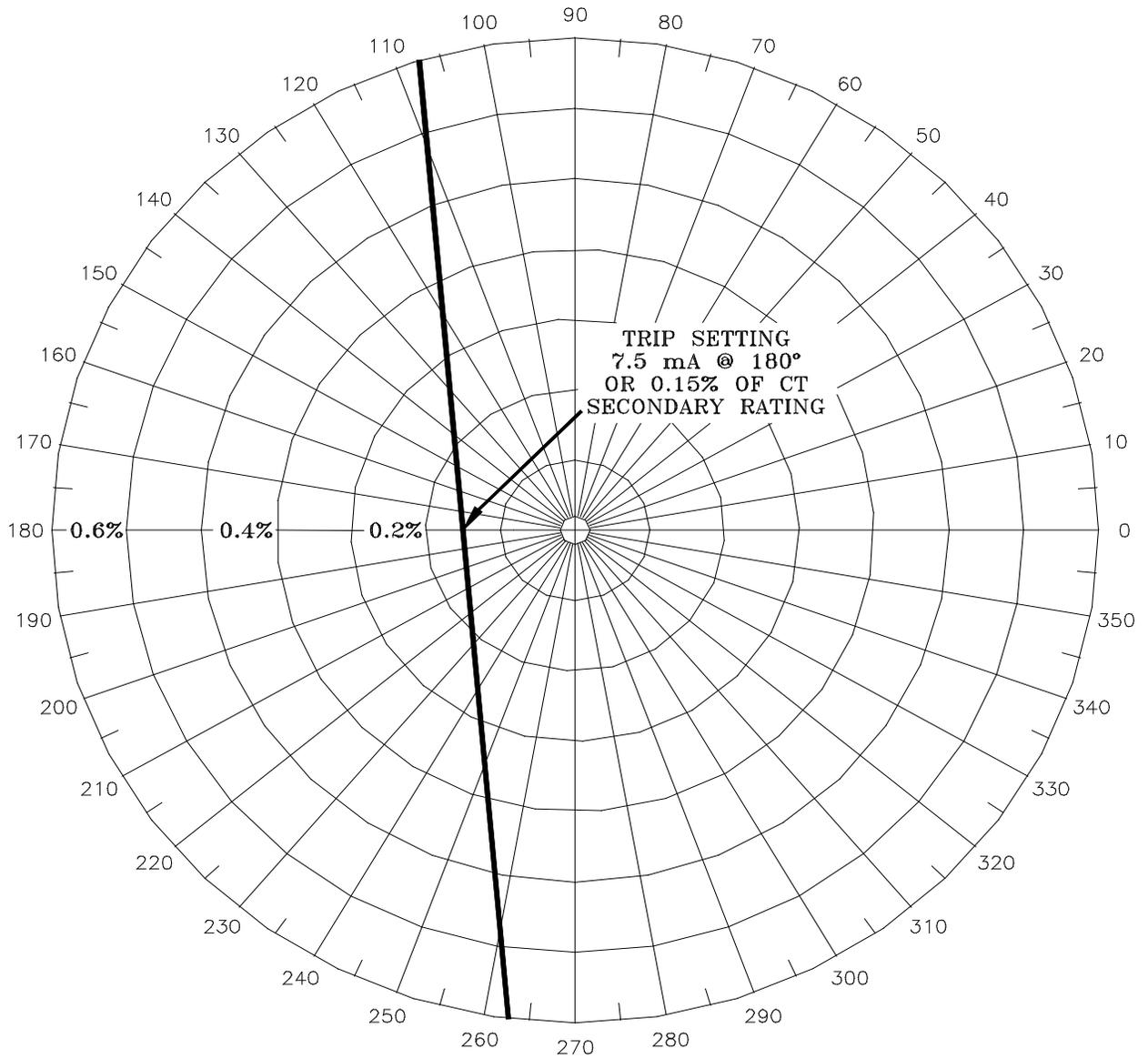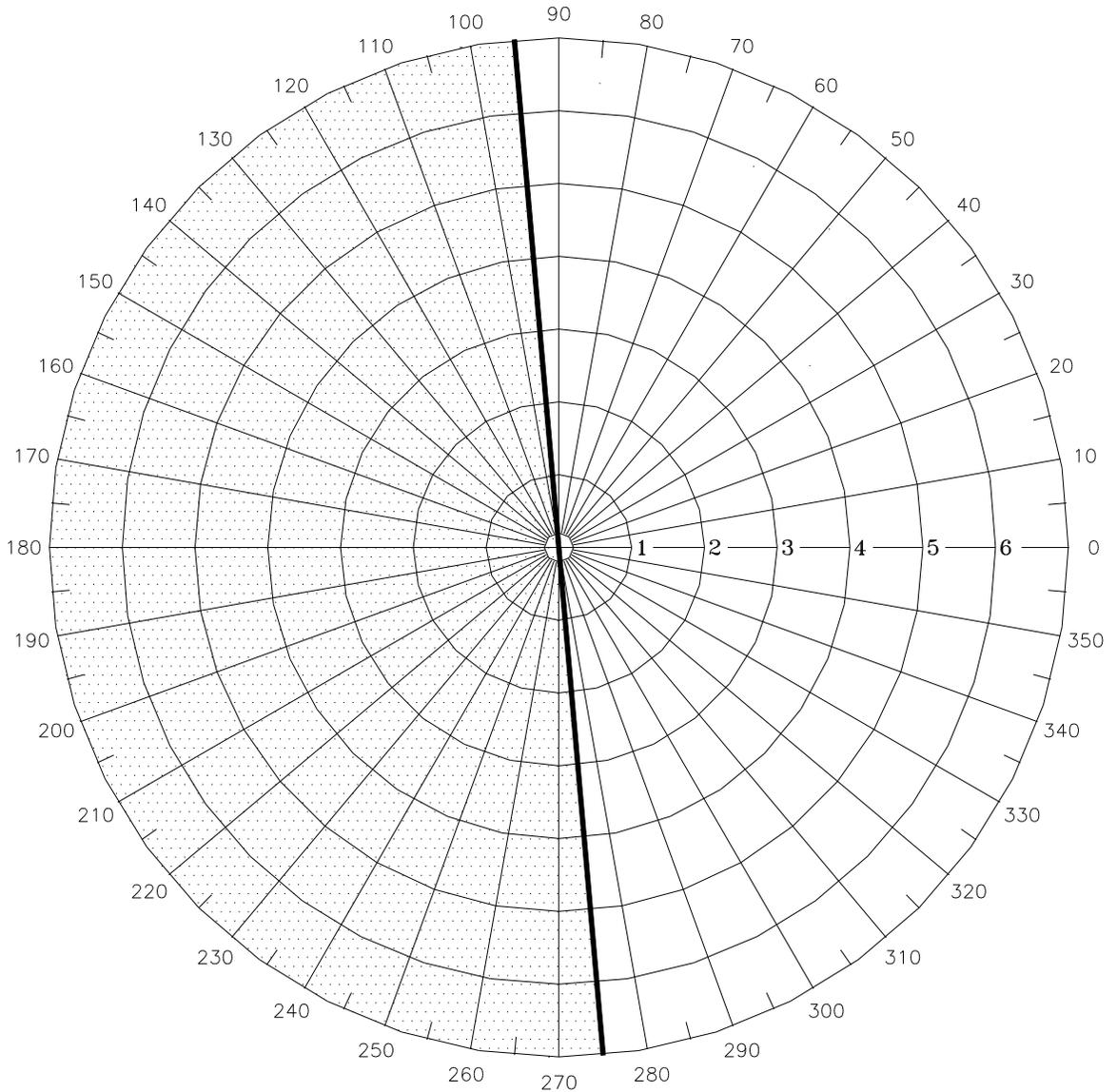**Figure 35 - Circle Close Characteristic**

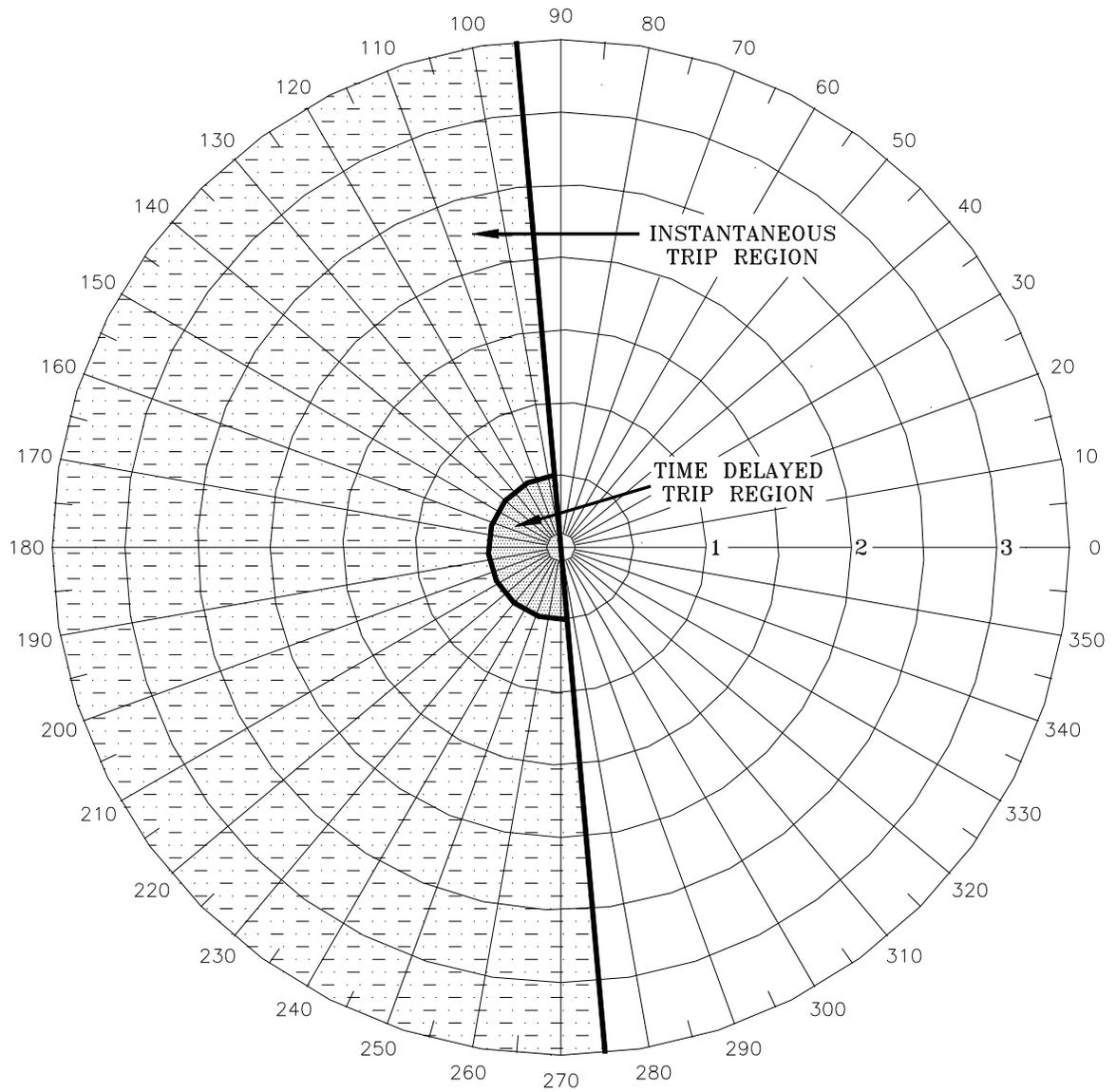**Figure 36 - Sensitive Trip Characteristic (Low Current Region)**

NOTES:
1. Divisions are in percentage of 5 amp Current Transformer rating.

NOTES:
1. Shaded area is a MUST TRIP REGION
2. Divisions are in multiples of 5 amp Current Transformer rating

Figure 37 - Sensitive Trip Characteristic (High Current Region)

58

INSTANTANEOUS TRIP REGION

TIME DELAYED TRIP REGION

NOTES:
1. Shaded areas are MUST TRIP REGIONS
2. Divisions are in multiples of 5 amp Current Transformer rating

Figure 38 - Time Delay Trip Characteristic

NOTES:
1. Shaded area is a MUST TRIP REGION
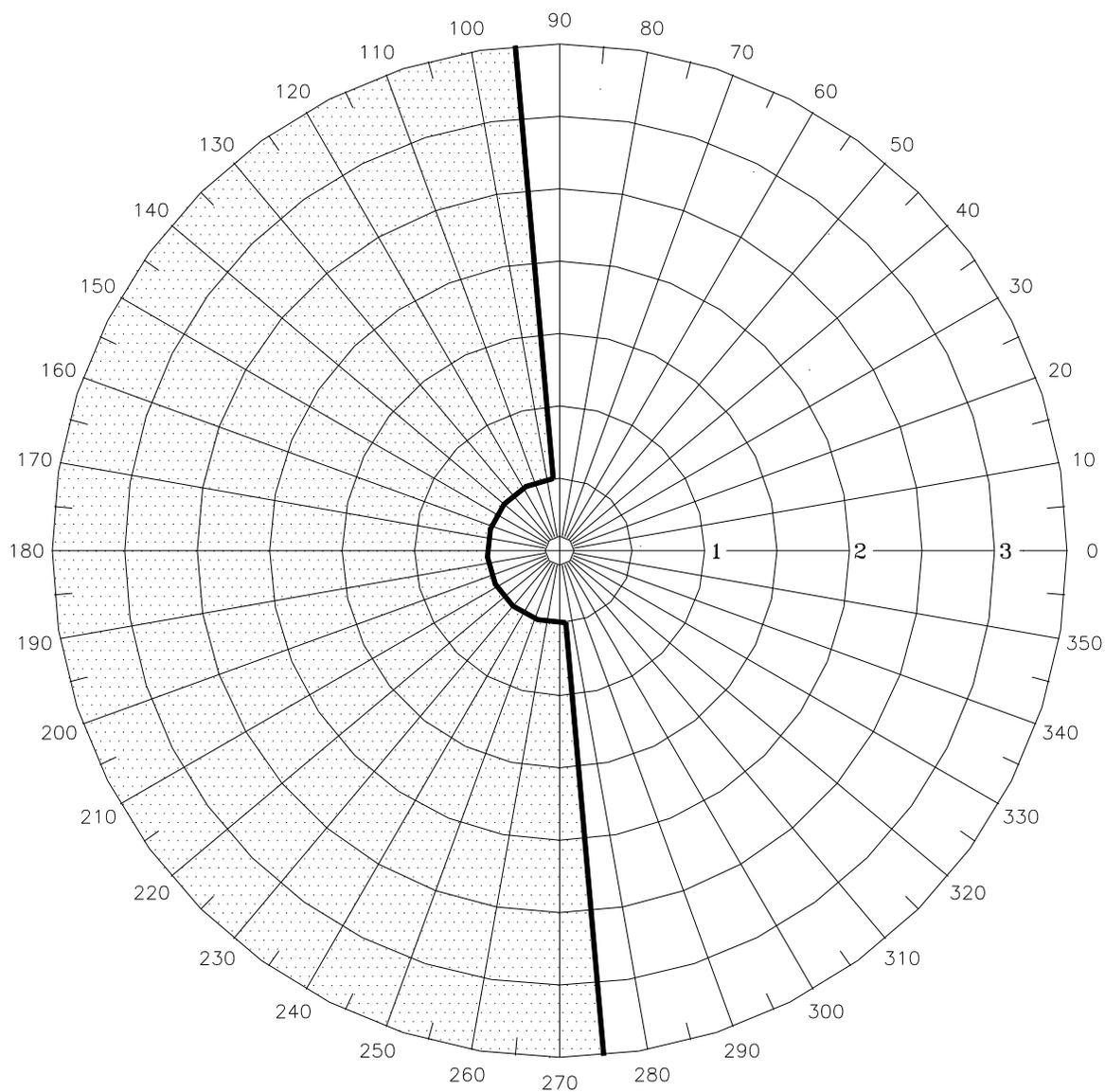2. Divisions are in multiples of 5 amp Current Transformer rating

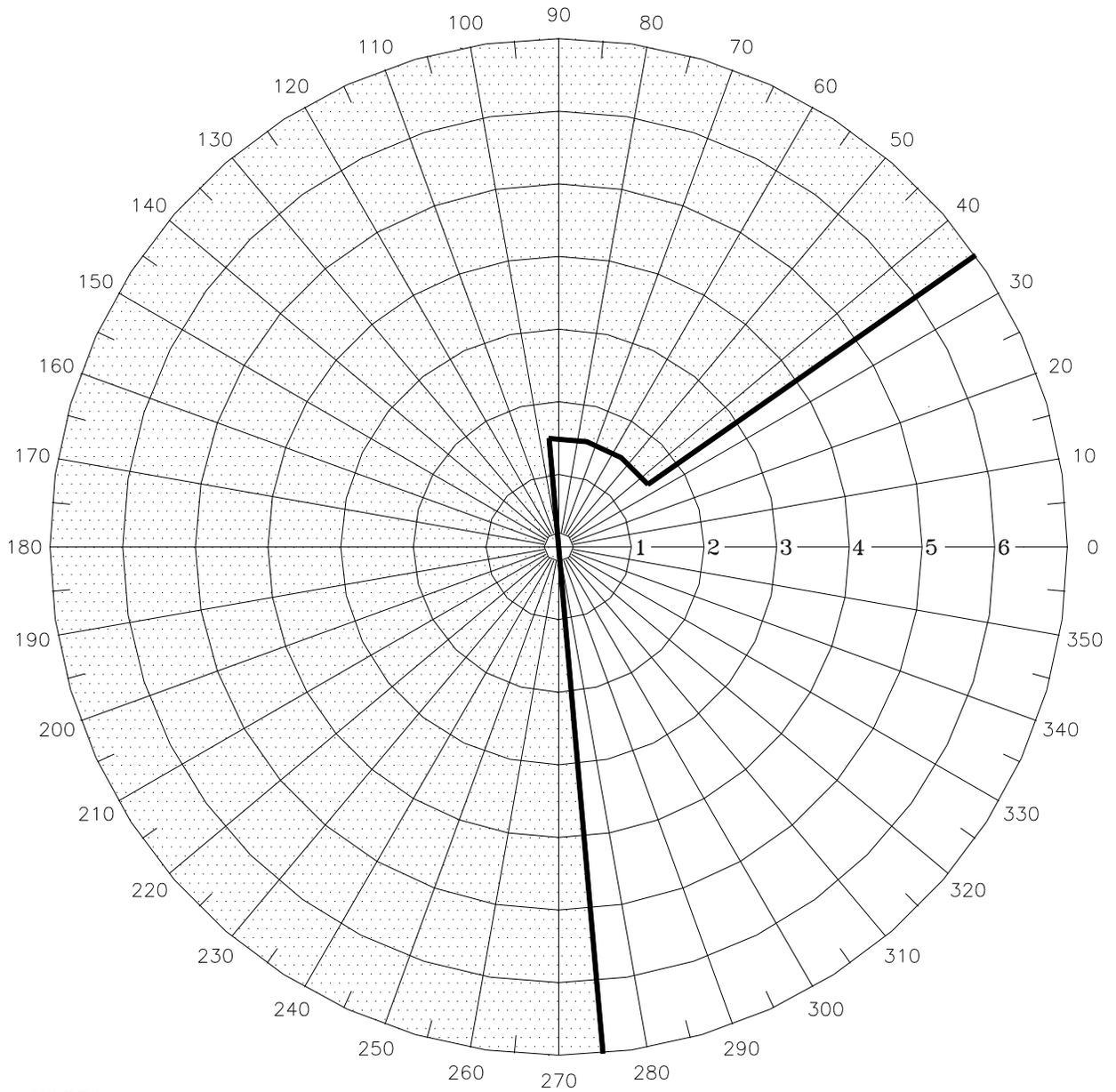**Figure 39 - Insensitive Trip Characteristic**

60

NOTES:
1. Shaded area is a MUST TRIP REGION
2. Divisions are in multiples of 5 amp Current Transformer rating

Figure 40 - WattVar Trip Characteristic (WA=-60°)
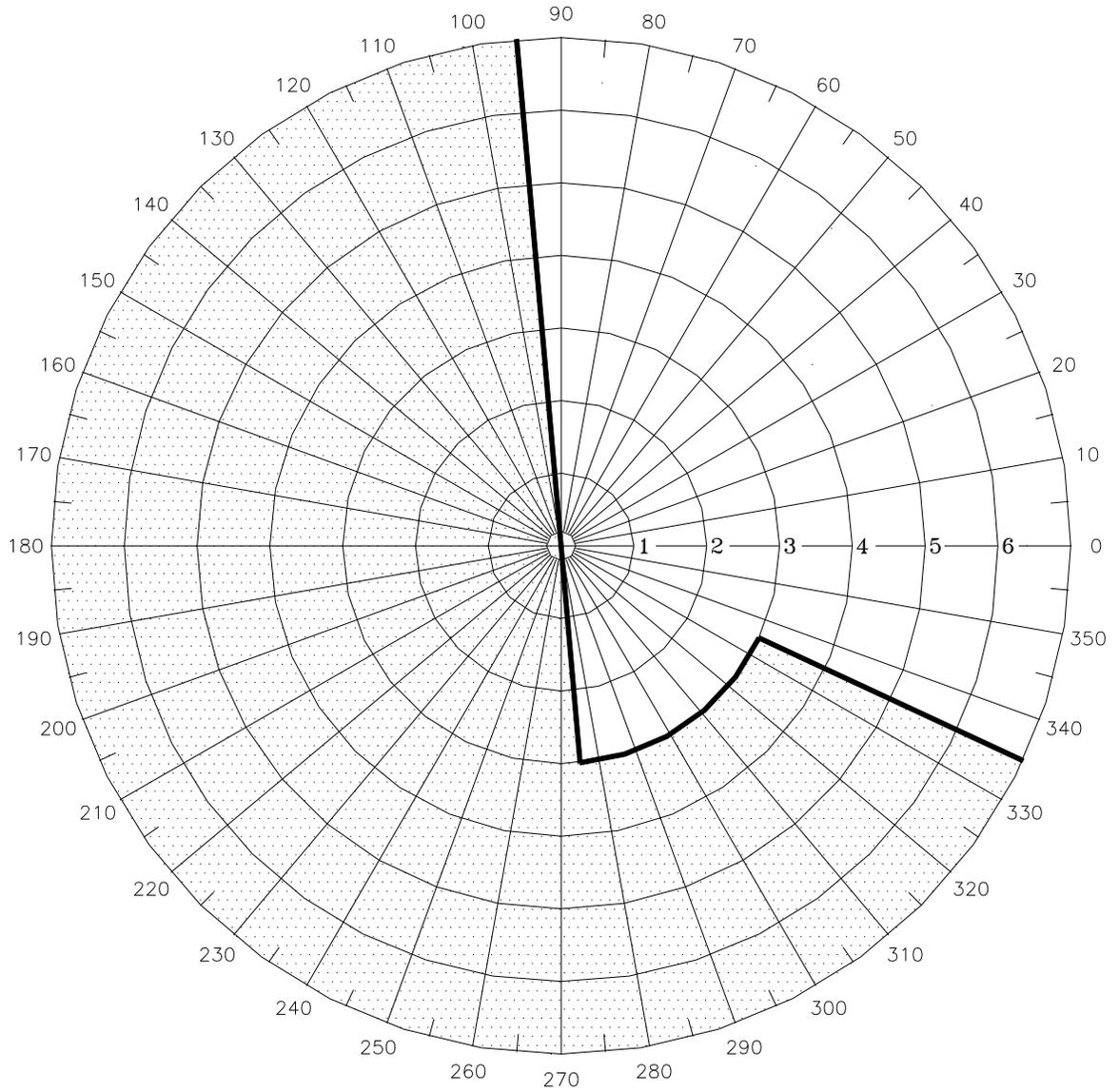
61

NOTES:
1. Shaded area is a MUST TRIP REGION
2. Divisions are in multiples of 5 amp Current Transformer rating

Figure 41 - Inverse WattVar Trip Characteristic (WA=+60°)
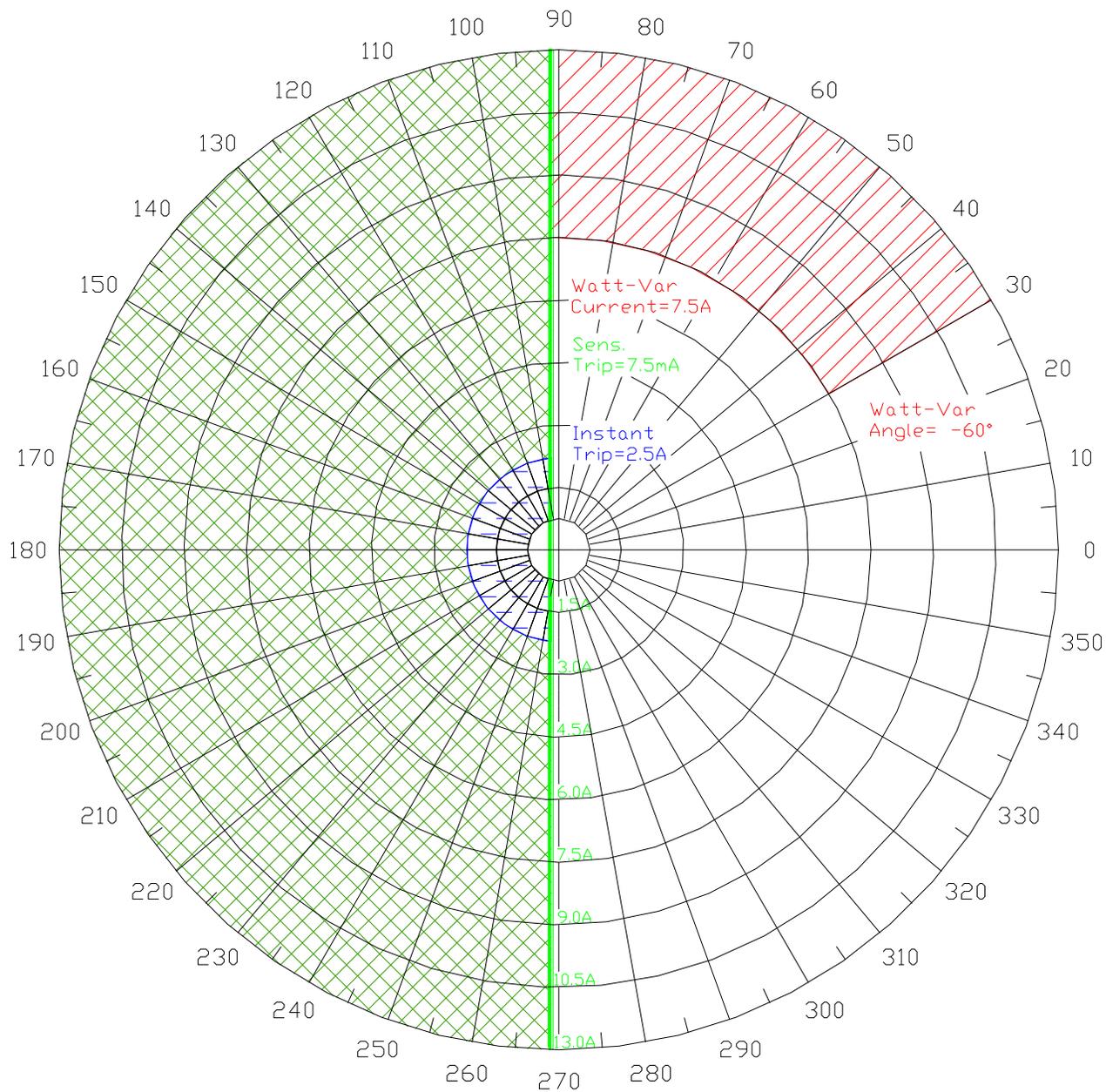
Figure 42 - Delayed Watt-Var Characteristic

Watt-Var
Current=7.5A

Sens.
Trip=7.5mA

Instant
Trip=2.5A

Watt-Var
Angle= -60°

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Appendix B. MNPR® Pinouts

Figure 43 - WH Relay

Figure 44 - GE Relay

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Appendix C. MNPR® Default DNP3 Profile

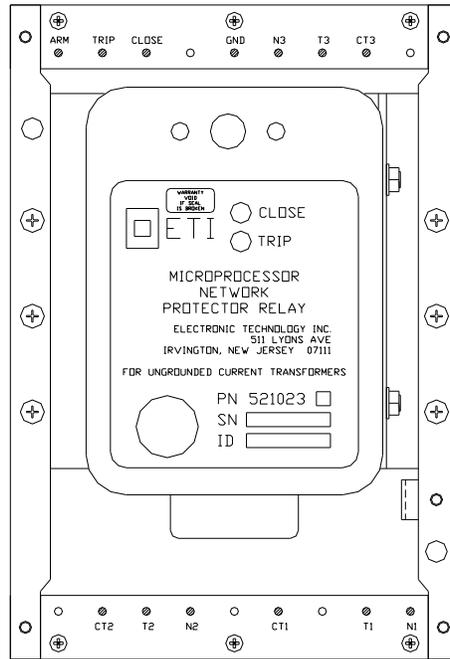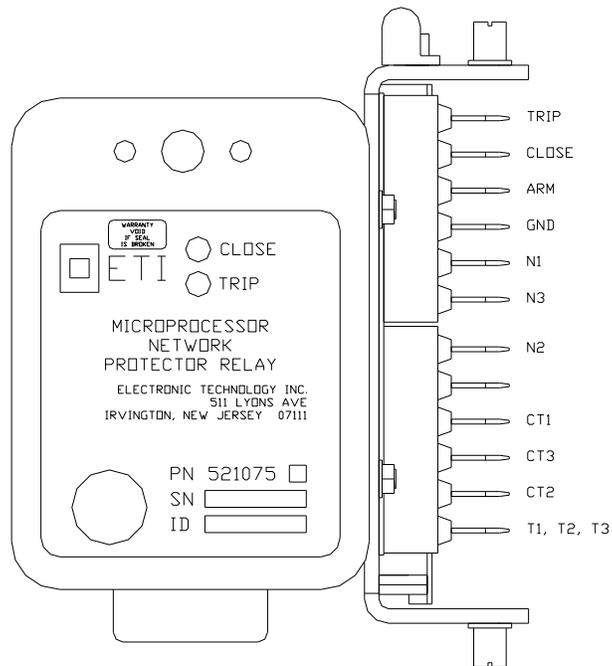An MNPR® with DNP3 profile support that does not have a valid profile loaded will use the following default profile. NOTE: All currents listed under Analog Inputs are in NWP Bus Amps. All currents listed under Analog Outputs are in Relay mA. All Scale Factors are multipliers.

Analog Inputs				
Index	Description	Class	Deadband	Scale Factor
0	Reclose Volts	0	0	0.1
1	Reclose Angle	0	0	1
2	Sensitive Trip (Bus Amps)	0	0	0.01
3	Time Delay	0	0	10
4	Instant Trip (Bus Amps)	0	0	0.1
5	Insensitive Trip (Bus Amps)	0	0	0.1
6	CT	0	0	1
7	Phase Compensation	0	0	1
8	Extended Delay	0	0	1
9	Reclose Time Delay	0	0	1
10	Sensitive Trip Delay	0	0	1
11	I1 (Bus Amps)	2	250	0.1
12	I2 (Bus Amps)	2	250	0.1
13	I3 (Bus Amps)	2	250	0.1
14	VN1	2	5	0.1
15	VN2	2	5	0.1
16	VN3	2	5	0.1
17	Diff Volts 1	2	5	0.1
18	Diff Volts 2	2	5	0.1
19	Diff Volts 3	2	5	0.1
20	Current Angle 1	2	5	1
21	Current Angle 2	2	5	1
22	Current Angle 3	2	5	1
23	Analog 2	2	5	1
24	Analog 1	2	5	1
25	Analog 3	2	5	1
26	Analog 4	2	5	1
27	Relay Temperature	2	5	1
28	Relay Cycle Counter	2	0	1
29	Relay Serial Number	2	1	1
30	Version	0	0	1
31	Comm S/W Version	2	0	1

Analog Inputs (continued)

Index	Description	Class	Deadband	Scale Factor
32	KW 1	2	312	0.01
33	KW 2	2	312	0.01
34	KW 3	2	312	0.01
35	Kvar 1	2	312	0.01
36	Kvar 2	2	312	0.01
37	Kvar 3	2	312	0.01
38	KVA 1	2	312	0.01
39	KVA 2	2	312	0.01
40	KVA 3	2	312	0.01
41	Total KW	2	312	0.01
42	Total Kvar	2	312	0.01
43	Total KVA	2	312	0.01
44	Analog 5	2	5	1
45	Analog 6	2	5	1
46	Analog 7	2	5	1
47	Analog 8	2	5	1
48	Differential Angle 1	2	5	1
49	Differential Angle 2	2	5	1
50	Differential Angle 3	2	5	1
51	Differential Magnitude 1	2	5	0.1
52	Differential Magnitude 2	2	5	0.1
53	Differential Magnitude 3	2	5	0.1
54	Trip Tilt Angle	0	0	1
55	Close Tilt Angle	0	0	1
56	Zero Currents on open GE Relay	0	0	1
57	VT1	2	5	0.1
58	VT2	2	5	0.1
59	VT3	2	5	0.1
Static Analog Inputs Variation 0x01				
Analog Events Variation 0x01				

Analog Outputs

Index	Description	Scale Factor
0	Reclose Volts	201
1	Reclose Angle	1
2	Sensitive Trip (Relay mA)	20.8
3	Time Delay	10
4	Instant Trip (Relay Amps)	5840
5	Insensitive Trip (Relay Amps)	5840
6	CT	0.02
7	Phase Compensation	1
8	Extended Delay	1
9	Reclose Time Delay	1
10	Sensitive Trip Delay	1

Digital Inputs

Index	Description	Class
1	Factory Defaults	1
2	Network Volts Too Low To Close	1
5	Watt-Var Trip Mode	1
6	Time Delay Trip Mode	1
7	Insensitive Trip Mode	1
8	Phase Angle Wrong for Closing	1
9	Differential Volts Too Low to Close	1
10	Digital Input 1	1
11	Digital Input 2	1
12	Digital Output 1	1
13	Digital Output 2	1
14	Blocked from Closing	1
16	GE Style Relay	1
17	Float	1
18	Calling for Trip	1
19	Calling for Close	1
20	Breaker Status	1
21	Relaxed Close Active	1
22	Digital Input 3	1
23	Digital Input 4	1
24	Failure to Close	1
25	Failure to Trip	1
Static Digital Inputs Variation 0x01		
Digital Events Variation 0x02		

Digital Outputs (CROB)		
Index	Code	Description
0	Trip	Trip Relay
0	Close	Trip Relay
1	Trip	Block Relay
1	Close	Block Relay
2	Trip	Auto
2	Close	Auto
3	Trip	Open Digital Output 1
3	Close	Close Digital Output 1
4	Trip	Open Digital Output 2
4	Close	Close Digital Output 2
5	Trip	Program Relay Settings
5	Close	Program Relay Settings
6	Trip	Clear Relay Settings Buffer
6	Close	Clear Relay Settings Buffer
7	Trip	Activate Relaxed Close
7	Close	Activate Relaxed Close
8	Trip	De-activate Relaxed Close
8	Close	De-activate Relaxed Close
Functions		
Select Before Operate		
Direct Operate		
Direct Operate, No Acknowledge		

Appendix D. MNPR® Aux I/O Pinouts

FUNCTION	COLOR	PIN
AI1	WHT/RED	2
AI2	WHT/GRN	6
AI3	WHT/BLK	11
AI4	WHT/RED/GRY	15
GND	BRN	18
DI1	BLK	16
DI2	RED	12
DO1	ORG	14
DO1	GRY	9
DO2	VIO	17
DO2	BLU	13
DATA	WHT	1
DATA	YEL	3
ISO_GND	GRN	7

FUNCTION	COLOR	PIN
AI1	WHT/RED	2
AI2	WHT/GRN	6
AI3	WHT/BLK	11
AI4	WHT/RED/GRY	15
GND	BRN	18
DO1	ORG	14
DO1	GRY	9
DO2	VIO	17
DO2	BLU	13
-5V@25mA	BLK	16
+5V@50mA	RED	12
DATA	WHT	1
DATA	YEL	3
ISO_GND	GRN	7

AI1 ② WHT/RED 200K 200K 100K -5VDC 40.2K

AI2 ⑥ WHT/GRN 200K 200K 100K -5VDC 40.2K

AI3 ⑪ WHT/BLK 200K 200K 100K -5VDC 40.2K

AI4 ⑮ WHT/RED/GRY 200K 200K 100K -5VDC 40.2K

ORG ⑭ DO1
GRY ⑨ DO1
FORM B, 216VAC/100mA MAX

VIO ⑭ DO2
BLU ⑨ DO2
FORM B, 216VAC/100mA MAX

DATA ① WHT RS485 COMM
DATA ③ YEL
ISO COM ⑦ GRN

+5VDC RED ⑫ +5VDC, 50mA MAX
BRN ⑱ GND
BLK ⑯ -5VDC, 25mA MAX
-5VDC

MATERIAL - AS NOTED
FINISH - NONE
QUANTITY PER UNIT - 1
OEM P/N-
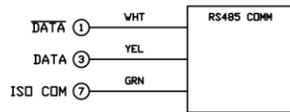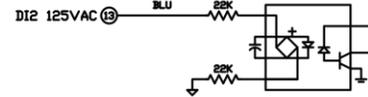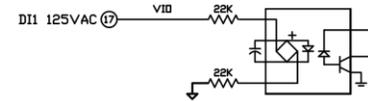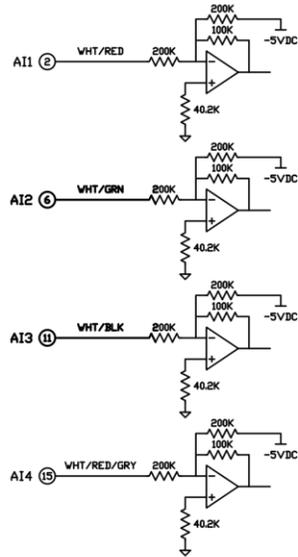SCALE - 1:1
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DIMENSION TOLERANCES
FRACTIONAL = ±1/64
DECIMAL 0.XX = ±0.010
DECIMAL 0.XXX = ±0.005
ANGULAR ±0.5°

FILENAME: EC50896-H2 ISO RS485_customer

0	06/12/15	DTD	RELEASE
REV	DATE	BY	DESCRIPTION

ELECTRONIC TECHNOLOGY INCORPORATED CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HEREIN. IT MAY NOT BE DISCLOSED TO OTHERS NOR USED FOR ANY PURPOSE WITHOUT WRITTEN PERMISSION.

ELECTRONIC TECHNOLOGY INC.
511 LYONS AVENUE IRVINGTON, N.J. 07111

MNPR37 - REV7
AUXI/O-H2 RS485
AUX I/O CONNECTIONS

DSGND	DATE		
DRFTD DTD	DATE 06/12/15		
CHKD	DATE	ID NO.	DWG NO.
APPVD	DATE	REV	EC50896

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FUNCTION	COLOR	PIN
AI1	WHT/RED	2
AI2	WHT/GRN	6
AI3	WHT/BLK	11
AI4	WHT/RED/GRY	15
GND	BRN	18
DI1	VIO	17
DI2	BLU	13
DO1	ORG	14
DO1	GRY	9
-5V@25mA	BLK	16
+5V@50mA	RED	12
DATA	WHT	1
DATA	YEL	3
ISO_GND	GRN	7

AI1 ② WHT/RED 200K 200K 100K -5VDC 40.2K

AI2 ⑥ WHT/GRN 200K 200K 100K -5VDC 40.2K

AI3 ⑪ WHT/BLK 200K 200K 100K -5VDC 40.2K

AI4 ⑮ WHT/RED/GRY 200K 200K 100K -5VDC 40.2K

DI1 125VAC ⑰ VIO 22K 22K 22K

DI2 125VAC ⑬ BLU 22K 22K 22K

DATA ① WHT   RS485 COMM
DATA ③ YEL
ISO COM ⑦ GRN

+5VDC RED ⑫ +5VDC, 50mA MAX
BRN ⑱ GND
BLK ⑯ -5VDC, 25mA MAX
-5VDC

ORG ⑭ DO1
GRY ⑨ DO1
FORM B, 216VAC/100mA MAX

MATERIAL - AS NOTED
FINISH - NONE
QUANTITY PER UNIT - 1
OEM P/N-
SCALE - 1:1
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DIMENSION TOLERANCES
FRACTIONAL = ±1/64
DECIMAL 0.XX = ±0.010
DECIMAL 0.XXX = ±0.005
ANGULAR ±0.5°

FILENAME: EC50893-H3 ISO RS485_customer

0	06/12/15	DTD	RELEASE
REV	DATE	BY	DESCRIPTION

ELECTRONIC TECHNOLOGY INCORPORATED CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HEREIN. IT MAY NOT BE DISCLOSED TO OTHERS NOR USED FOR ANY PURPOSE WITHOUT WRITTEN PERMISSION.
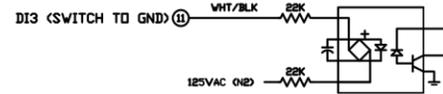
ELECTRONIC TECHNOLOGY INC.
511 LYONS AVENUE IRVINGTON, N.J. 07111
MNPR37 - REV7
AUXI/O-H3 RS485
AUX I/O CONNECTIONS

DSGND DATE
DRFTD DTD DATE 06/12/15
CHKD DATE   ID NO.   DWG NO.
APPVD DATE   REV   EC50893

FUNCTION	COLOR	PIN
AI1	WHT/RED	2
AI2	WHT/GRN	6
DI3	WHT/BLK	11
DI4	WHT/RED/GRY	15
GND	BRN	18
DI1	VIO	17
DI2	BLU	13
DO1	ORG	14
DO1	GRY	9
-5V@25mA	BLK	16
+5V@50mA	RED	12
DATA	WHT	1
DATA	YEL	3
ISO_GND	GRN	7

AI1 ② WHT/RED 200K 200K 100K -5VDC 40.2K

AI2 ⑥ WHT/GRN 200K 200K 100K -5VDC 40.2K

DI1 (SWITCH TO GND) ⑰ VIO 22K
125VAC (N2) 22K

DI2 (SWITCH TO GND) ⑬ BLU 22K
125VAC (N2) 22K

DI3 (SWITCH TO GND) ⑪ WHT/BLK 22K
125VAC (N2) 22K

DI4 (SWITCH TO GND) ⑮ WHT/RED/GRY 22K
125VAC (N2) 22K

DATA ① WHT | RS485 COMM
DATA ③ YEL
ISO COM ⑦ GRN

+5VDC RED ⑫ +5VDC, 50mA MAX
BRN ⑱ GND
BLK ⑯ -5VDC, 25mA MAX
-5VDC

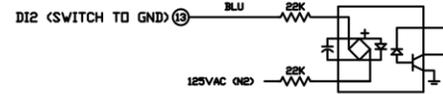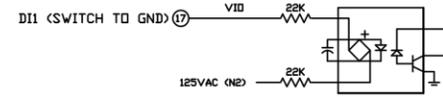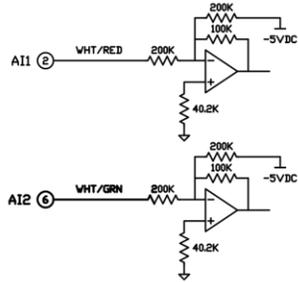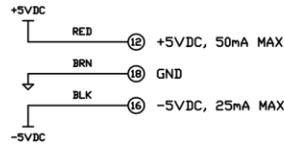ORG ⑭ DO1
GRY ⑨ DO1
FORM B, 216VAC/100mA MAX
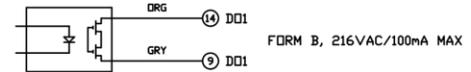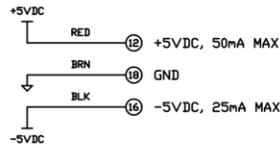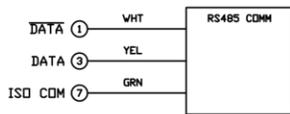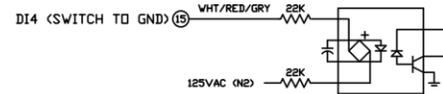
MATERIAL - AS NOTED
FINISH - NONE
QUANTITY PER UNIT - 1
OEM P/N-
SCALE - 1:1
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DIMENSION TOLERANCES
FRACTIONAL = ±1/64
DECIMAL 0.XX = ±0.010
DECIMAL 0.XXX = ±0.005
ANGULAR ±0.5°

FILENAME: EC50897-H4 ISO RS485_customer

0	06/12/15	DTD	RELEASE
REV	DATE	BY	DESCRIPTION

MNPR37 - REV7
AUXI/O-H4 RS485
DSGND | DATE
DRFTD DTD | DATE 06/12/15 | AUX I/O CONNECTIONS
CHKD | DATE | ID NO. | DWG NO.
APPVD | DATE | REV | EC50897

FUNCTION	COLOR	PIN
AI1	WHT/RED	2
AI2	WHT/GRN	6
AI3	WHT/BLK	11
AI4	WHT/RED/GRY	15
GND	BRN	18
DI1	VIO	17
DI2	BLU	13
DI3	ORG	14
DI4	GRY	9
-5V@25mA	BLK	16
+5V@50mA	RED	12
DATA	WHT	1
DATA	YEL	3
ISO_GND	GRN	7

AI1 (2) WHT/RED 200K 200K 100K -5VDC 40.2K

AI2 (6) WHT/GRN 200K 200K 100K -5VDC 40.2K

AI3 (11) WHT/BLK 200K 200K 100K -5VDC 40.2K

AI4 (15) WHT/RED/GRY 200K 200K 100K -5VDC 40.2K

DI1 +5V (17) VIO 100 -5VDC

DI2 +5V (13) BLU 100 -5VDC

DI3 +5V (13) ORG 100 -5VDC

DI4 +5V (13) GRY 100 -5VDC

DATA (1) WHT RS485 COMM
DATA (3) YEL
ISO COM (7) GRN

+5VDC
RED (12) +5VDC, 50mA MAX
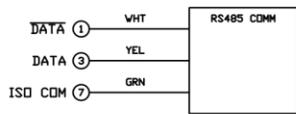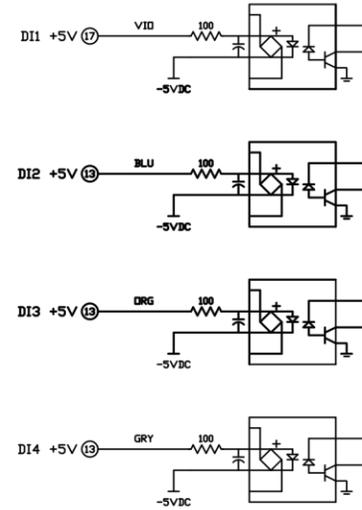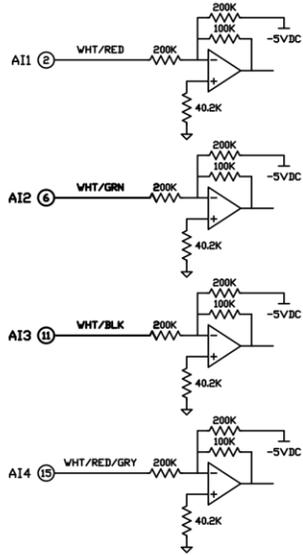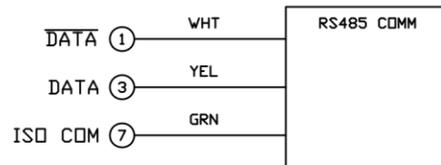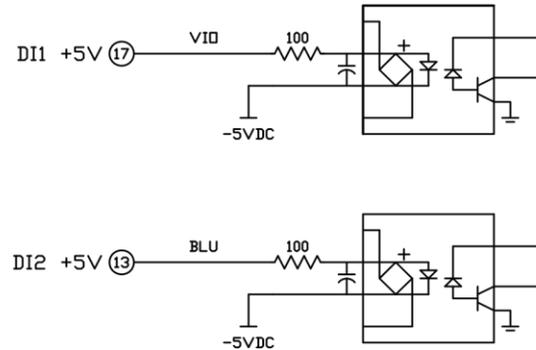BRN (18) GND
BLK (16) -5VDC, 25mA MAX
-5VDC

MATERIAL - AS NOTED
FINISH - NONE
QUANTITY PER UNIT - 1
OEM P/N-
SCALE - 1:1
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DIMENSION TOLERANCES
FRACTIONAL = ±1/64
DECIMAL 0.XX = ±0.010
DECIMAL 0.XXX = ±0.005
ANGULAR ±0.5°

0	06/12/15	DTD	RELEASE
REV	DATE	BY	DESCRIPTION

ELECTRONIC TECHNOLOGY INCORPORATED CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HEREIN. IT MAY NOT BE DISCLOSED TO OTHERS NOR USED FOR ANY PURPOSE WITHOUT WRITTEN PERMISSION.

ELECTRONIC TECHNOLOGY INC.
511 LYONS AVENUE IRVINGTON, N.J. 07111
MNPR37 - REV7
AUXI/O-H5 RS485
AUX I/O CONNECTIONS

DSGND	DATE	
DRFTD	DTD	DATE 06/12/15
CHKD	DATE	
APPVD	DATE	

ID NO. | DWG NO.
REV
EC50894

FILENAME: EC50894-H5 ISO RS485_customer

FUNCTION	COLOR	PIN
AI1	WHT/RED	2
AI2	WHT/GRN	6
AI3	WHT/BLK	11
AI4	WHT/RED/GRY	15
GND	BRN	18
AI5	ORG	14
AI6	GRY	9
DI1	VIO	17
DI2	BLU	13
−5V@25mA	BLK	16
+5V@50mA	RED	12
DATA	WHT	1
DATA	YEL	3
ISO_GND	GRN	7
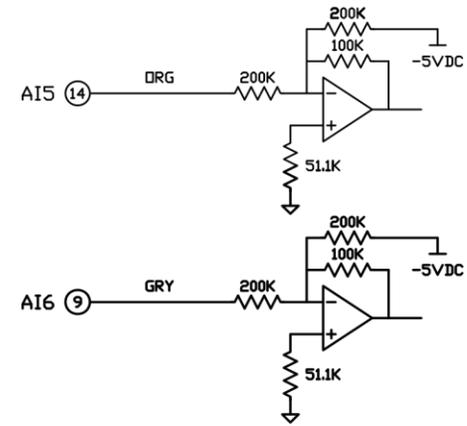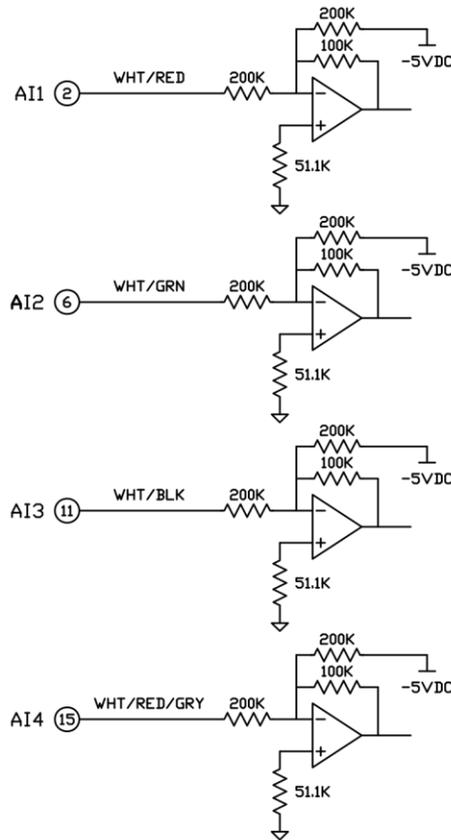
NOTES:

1. +5V MAX CURRENT 50MA
2. −5V MAX CURRENT 25MA

FILENAME: EA50647-H6 ISO RS485_customer

0	12/26/12	JD	RELEASE	
REV	DATE	BY	DESCRIPTION	

ELECTRONIC TECHNOLOGY INCORPORATED CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HERON. IT MAY NOT BE DISCLOSED TO OTHERS NOR USED FOR ANY PURPOSE WITHOUT WRITTEN PERMISSION.

ELECTRONIC TECHNOLOGY INC.
511 LYONS AVENUE IRVINGTON, N.J. 07111

MNPR37

DSGND FILE	DATE 12/19/12	AUX I/O-H6 ISOLATED RS485
DRFTD	DATE	AUX I/O CONNECTIONS
CHKD	DATE	ID NO.	DWG NO.
APPVD	DATE	REV 0	EB50647

FUNCTION	COLOR	PIN
AI1	WHT/RED	2
AI2	WHT/GRN	6
AI3	WHT/BLK	11
AI4	WHT/RED/GRY	15
GND	BRN	18
DI1	VIO	17
DI2	BLU	13
DI3	ORG	14
DI4	GRY	9
+5V@50mA	RED	12
-5V@25mA	BLK	16
DATA	WHT	1
DATA	YEL	3
ISO_GND	GRN	7
DO1	WHT/BRN	4
DO1	WHT/ORG	5
GND	WHT/VIO	8
DO3	WHT/BLU	10

AI1 ② WHT/RED 200K 200K 100K -5VDC 40.2K

AI2 ⑥ WHT/GRN 200K 200K 100K -5VDC 40.2K

AI3 ⑪ WHT/BLK 200K 200K 100K -5VDC 40.2K

AI4 ⑮ WHT/RED/GRY 200K 200K 100K -5VDC 40.2K

DI1 +5V ⑰ VIO 100 -5VDC

DI2 +5V ⑬ BLU 100 -5VDC

DI3 +5V ⑭ ORG 100 -5VDC

DI4 +5V ⑨ GRY 100 -5VDC

WHT/BRN ④ DO1
WHT/ORG ⑤ DO1 FORM B, 100mA MAX

+5VDC
WHT/BLU ⑩ DO3 FORM A, 100mA MAX

WHT/VIO ⑧ GND

DATA ① WHT RS485 COMM
DATA ③ YEL
ISO COM ⑦ GRN

+5VDC RED ⑫ +5VDC, 50mA MAX
BRN ⑱ GND
BLK ⑯ -5VDC, 25mA MAX
-5VDC

MATERIAL - AS NOTED
FINISH - NONE
QUANTITY PER UNIT - 1
OEM P/N-
SCALE - 1:1
UNLESS OTHERWISE SPECIFIED
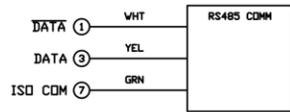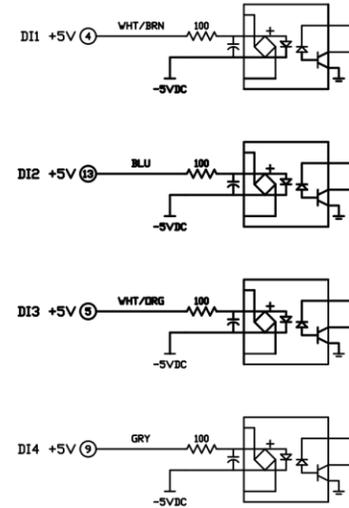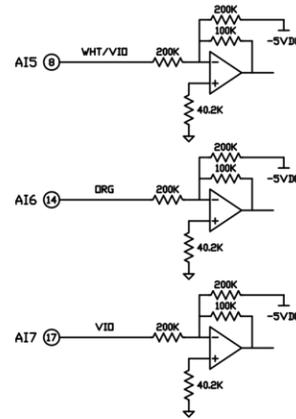DIMENSIONS ARE IN INCHES
DIMENSION TOLERANCES
FRACTIONAL = ±1/64
DECIMAL 0.XX = ±0.010
DECIMAL 0.XXX = ±0.005
ANGULAR ±0.5°

0	10/7/13	JD	RELEASE
REV	DATE	BY	DESCRIPTION

ELECTRONIC TECHNOLOGY INC.
511 LYONS AVENUE IRVINGTON, N.J. 07111

MNPR37 - REV7
AUXI/O-H8 RS485

DSGND	DATE	AUX I/O CONNECTIONS
DRFTD JD	DATE 10/7/03	
CHKD	DATE	ID NO.	DWG NO.
APPVD	DATE	REV	EC50740

FILENAME: EC50740-H8 ISO RS485_customer

77

FUNCTION	COLOR	PIN
AI1	WHT/RED	2
AI2	WHT/GRN	6
AI3	WHT/BLK	11
AI4	WHT/RED/GRY	15
GND	BRN	18
AI5	WHT/VIO	8
AI6	ORG	14
AI7	VIO	17
DI1	WHT/BRN	4
DI2	BLU	13
DI3	WHT/ORG	5
DI4	GRY	9
DO1	WHT/BLU	10
−5V@25mA	BLK	16
+5V@50mA	RED	12
DATA	WHT	1
DATA	YEL	3
ISO_GND	GRN	7

AI1 ② WHT/RED 200K 200K 100K −5VDC 40.2K

AI2 ⑥ WHT/GRN 200K 200K 100K −5VDC 40.2K

AI3 ⑪ WHT/BLK 200K 200K 100K −5VDC 40.2K

AI4 ⑮ WHT/RED/GRY 200K 200K 100K −5VDC 40.2K

AI5 ⑧ WHT/VIO 200K 200K 100K −5VDC 40.2K

AI6 ⑭ ORG 200K 200K 100K −5VDC 40.2K

AI7 ⑰ VIO 200K 200K 100K −5VDC 40.2K

DI1 +5V ④ WHT/BRN 100 −5VDC

DI2 +5V ⑬ BLU 100 −5VDC

DI3 +5V ⑤ WHT/ORG 100 −5VDC

DI4 +5V ⑨ GRY 100 −5VDC

DATA ① WHT RS485 COMM
DATA ③ YEL
ISO COM ⑦ GRN

+5VDC RED ⑫ +5VDC, SEE NOTE 1
BRN ⑱ GND
BLK ⑯ −5VDC, 25mA MAX
−5VDC

+5VDC WHT/BLU ⑩ DO1 FORM B, SEE NOTE 1

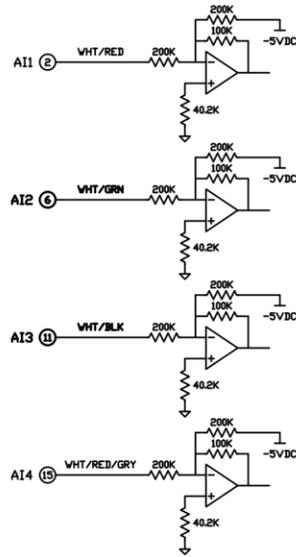NOTE 1: +5VDC, 50mA MAX COMBINED ON PINS 10 AND 12

MATERIAL − AS NOTED
FINISH − NONE
QUANTITY PER UNIT − 1
OEM P/N−
SCALE − 1:1
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DIMENSION TOLERANCES
FRACTIONAL = ±1/64
DECIMAL 0.XX = ±0.010
DECIMAL 0.XXX = ±0.005
ANGULAR ±0.5°

FILENAME: EC50738−H9 ISO RS485_customer_R2

2	10/19/15	DTD	FIX MAX CURRENT ON DO1
1	06/12/15	DTD	FIX DO1 (WAS FORM A)
0	10/1/13	JD	RELEASE
REV	DATE	BY	DESCRIPTION

ELECTRONIC TECHNOLOGY INC.
511 LYONS AVENUE IRVINGTON, N.J. 07111
MNPR37 − REV7
AUXI/O−H9 RS485
AUX I/O CONNECTIONS

DSGND   DATE
DRFTD JD   DATE 10/1/03
CHKD   DATE   ID NO   DWG NO.
APPVD   DATE   REV 2

EC50738

Appendix E. "Phase Select" Details

The "Phase Select" setting found in the "Advanced" settings menu allows the phase order of the network protector to be matched to that of the MNPR®. Many styles and vintages of network protector's are wired differently and it is not always the case that the MNPR®'s "Phase 1" will be wired to the network protectors "Phase A". The purpose of this setting is to allow the display of all measured per phase values in the desired order, both on the scrolling display and in the View Data screen, irrespective of the physical protector wiring.

Care should be taken when adjusting this setting when used in conjunction with phase rotation sensitivity. The "Phase Select" setting is applied before the phase rotation is calculated and thus it could alter the rotation measured by the MNPR®. Other than the phase rotation sensitivity, this setting will have no other effect on relay operation or programming.

Referring to the partial Westinghouse network protector schematic shown in Figure 45, it can be seen that the wiring from the left bus bar goes to the MNPR®'s Phase C input, the middle bus bar goes to the Phase A input, and the right bus bar goes to the Phase B input.

In this example, in order for the MNPR® to display the phases in the proper left to right order, the "Phase Select" should be set to "CAB".
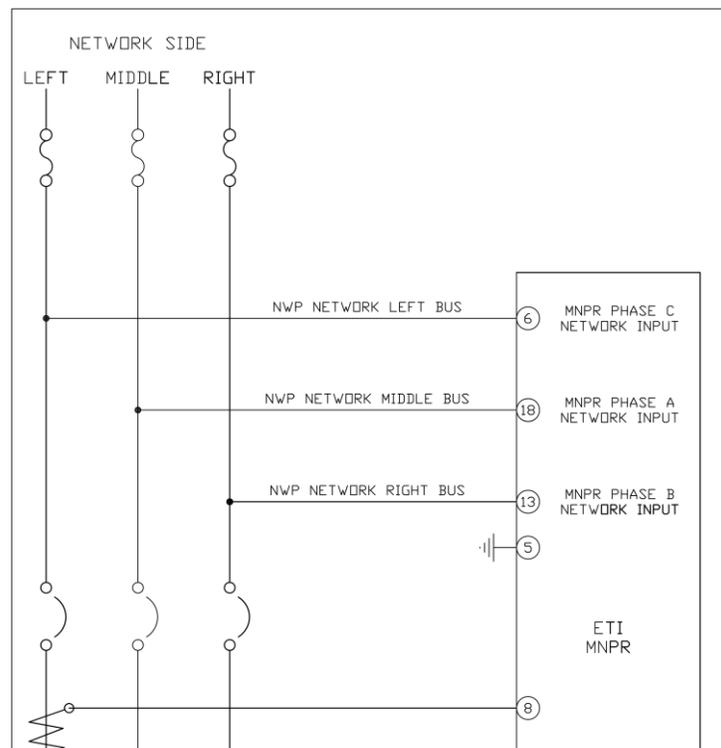

Figure 45