

ETI 521125 FIELDPRO MNPR[®] INTERFACE SOFTWARE

Instruction Manual Revision 19

ETI MNPR Field Programmer v9.15

File Port Units Aux I/O DNP Firmware Update Help

UNBLOCKED TRIP

Model: **WH** Serial Number: **105003** Revision Number: **9.00**
CT Ratio: **1600** : **5** Reclose Volts: **1.4** Reclose Angle: **-5**
Rev Date: **11/01/10**
 Circle Close

Trip Mode:
 Sensitive Sensitive (mA) **7.5** Cross Phase: **Off**
 Time Delay
 Insensitive
 Watt Var
 Delayed Watt Var

Reset Relax Close Load Settings Read Settings Status
Block Unblock Trip Waves Advanced
Save Settings Retrieve Comments View Data Exit

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Connected via Serial (COM1)



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REVISIONS

| Revision | Date | Details |
|-----------------|-------------|---|
| 1 | 01/11/2010 | Initial Revision |
| 2 | 01/12/2010 | Updated screenshots and minor revisions |
| 3 | 01/25/2010 | Updated screenshots, added offset voltage and print buttons |
| 4 | 03/08/2010 | Added WV+TD, XD, new screenshots |
| 5 | 03/18/2010 | Updated screenshots, Fixed WV+TD plot, fixed XD description |
| 6 | 04/23/2010 | Update screenshots, add closing algo All Phases OR'd |
| 7 | 09/08/2010 | Update screenshots, USB driver instructions, added 8/12 bit DNP Analogs, added Relaxed Trip |
| 8 | 11/01/2010 | Added DNP Setup, Firmware Update, Update screenshots/descriptions for Advanced and View Data Screens, Update WV+TD plot |
| 9 | 11/30/2010 | Update I/O Config |
| 10 | 08/11/2011 | Update Watt-Var Section |
| 11 | 01/30/2012 | Update for DNP Profiles, Update I/O Config Drawings |
| 12 | 02/20/2013 | Add Soft Dead Network |
| 13 | 04/09/2013 | Add trip on incorrect phase rotation setting |
| 14 | 08/12/2013 | Update firmware update section |
| 15 | 09/09/2013 | Update DNP Setup, Add IOC Settings, Update Status Screen |
| 16 | 11/18/2013 | Fix Errors in DNP Default Profile, Update Aux I/O Diagrams |
| 17 | 07/14/2015 | Update DNP Default Profile, Update Aux I/O Diagrams |
| 18 | 08/06/2015 | Add more detail for the Phase Select setting |
| 19 | 09/02/2015 | Fix errors in Phase Select setting Appendix |

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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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TABLE OF CONTENTS

| | |
|--|----|
| 1. Software Installation | 1 |
| 2. Initial Setup | 7 |
| 3. Main Screen | 9 |
| 4. MNPR [®] Firmware Updates..... | 15 |
| 5. Basic Setup Procedure | 19 |
| 6. Relay Status Screen..... | 21 |
| 7. Advanced Setup Screen | 25 |
| 8. More Advanced Parameters Screen | 29 |
| 9. View Data Screen | 33 |
| 10. Aux I/O (Communicating MNPR [®] only) | 35 |
| 11. DNP3 Setup (Communicating MNPR [®] only)..... | 37 |
| 12. DNP3 Profiles (Communicating MNPR [®] only) | 39 |
| 13. View Waveforms | 43 |
| 14. Troubleshooting | 45 |
| Appendix A. MNPR [®] Characteristics..... | 47 |
| Appendix B. MNPR [®] Pinouts..... | 57 |
| Appendix C. MNPR [®] Default DNP3 Profile..... | 59 |
| Appendix D. MNPR [®] Aux I/O Pinouts | 63 |
| Appendix E. “Phase Select” Details | 71 |

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1. Software Installation

Insert the ETI FieldPro Software CD into the CD-ROM drive (or locate the installation file that was downloaded from our website www.eti-nj.com).

Before beginning the install, please uninstall any previous version of this software that you may have had installed.

Click on the install program as shown in Figure 1 (filename and version numbers might not match exactly).

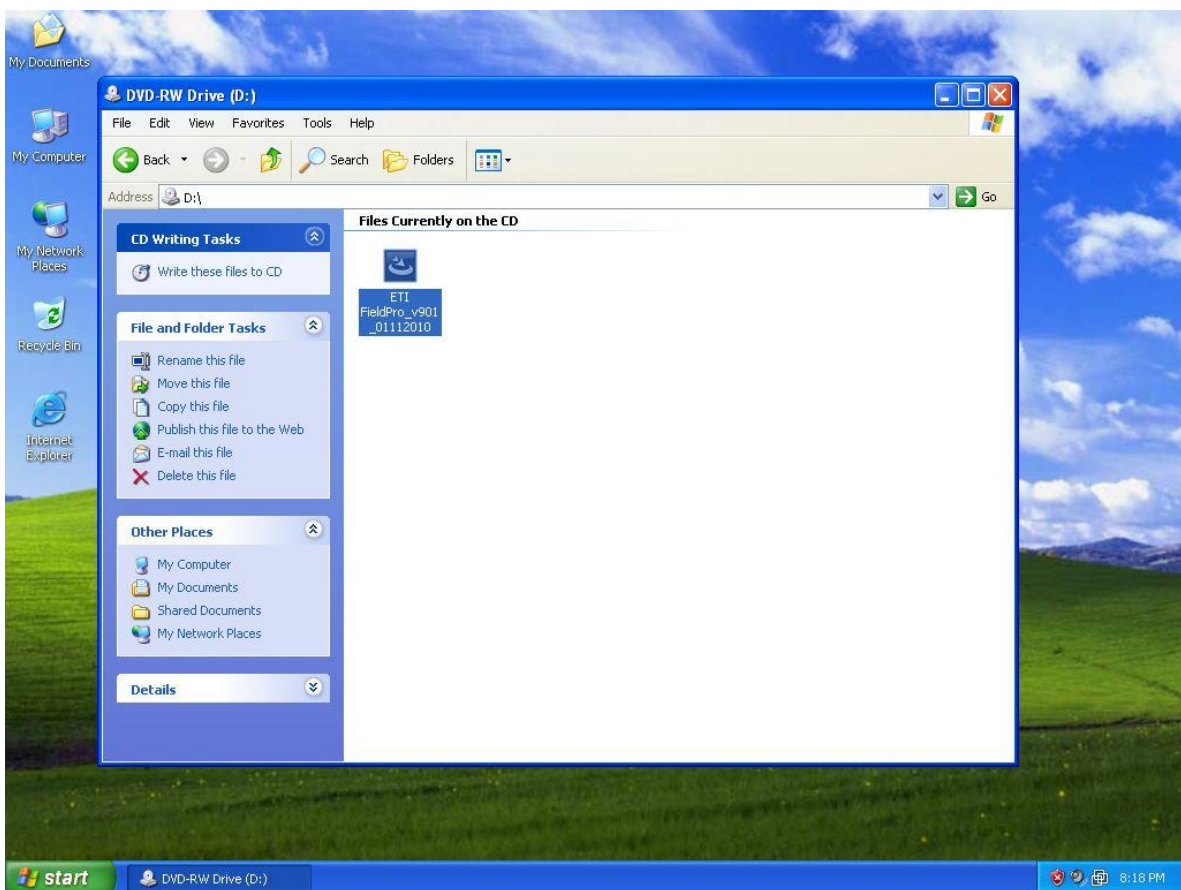


Figure 1

A box will pop up as shown in Figure 2. Click the Next button.

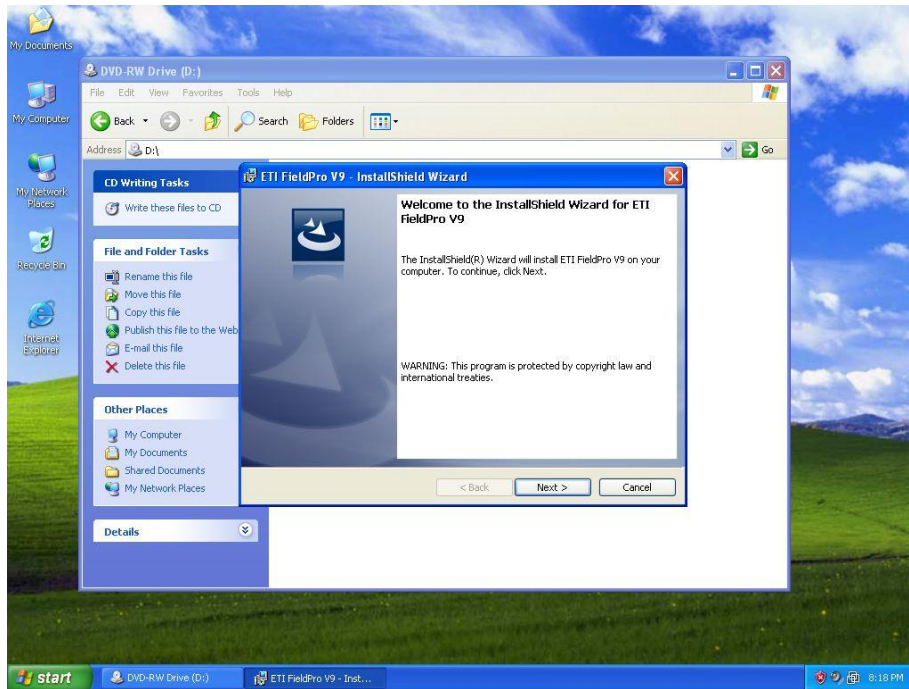


Figure 2

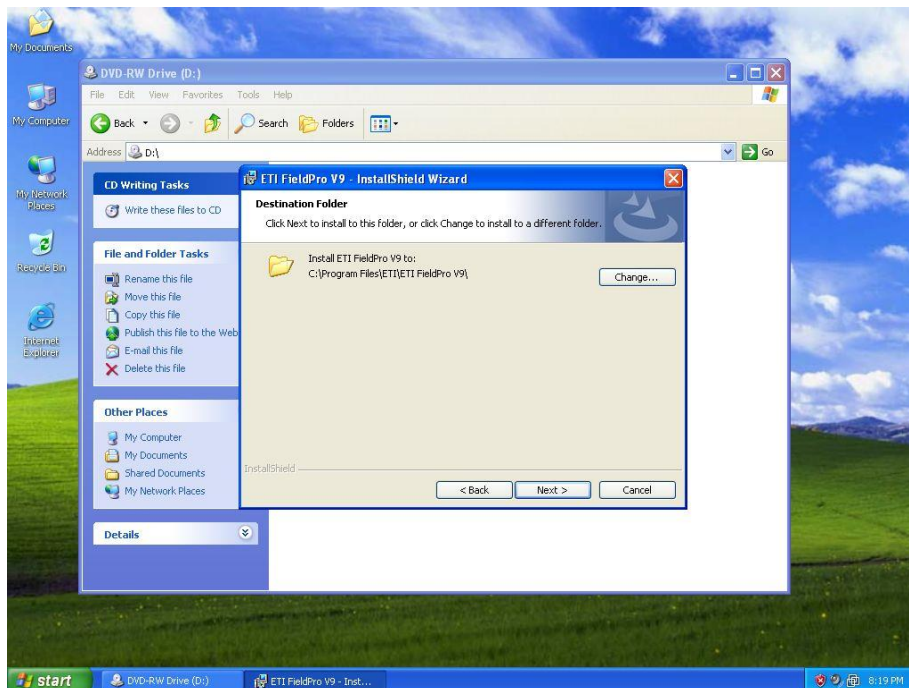


Figure 3

To accept the default installation path (recommended) click Next on the screen shown in Figure 3.

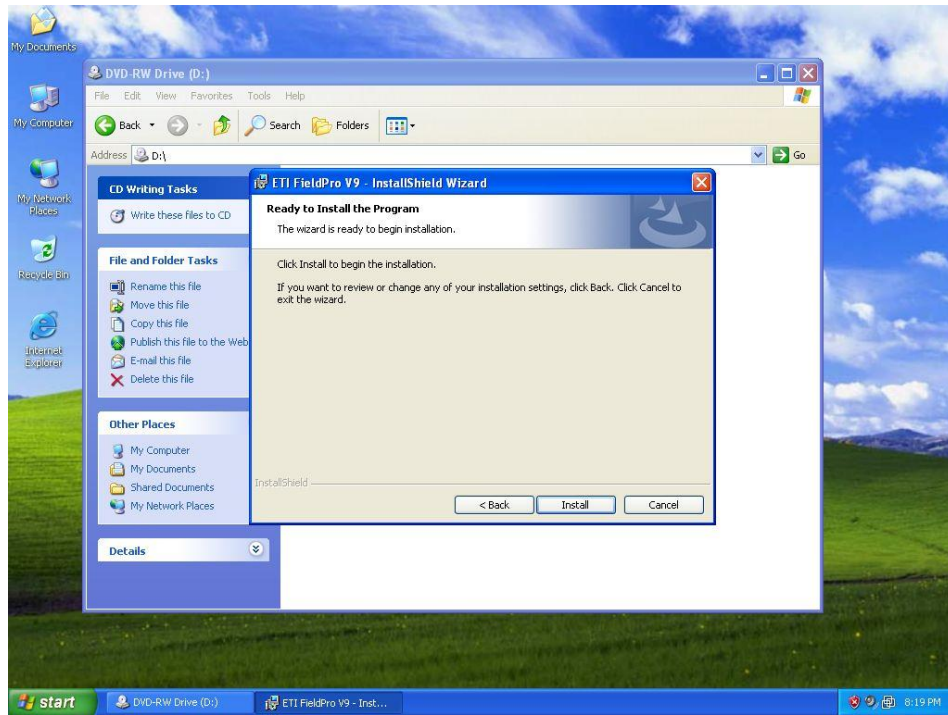


Figure 4

On the screen shown in Figure 4, click Install to begin and a screen like that shown in Figure 5 will appear as the install progresses.

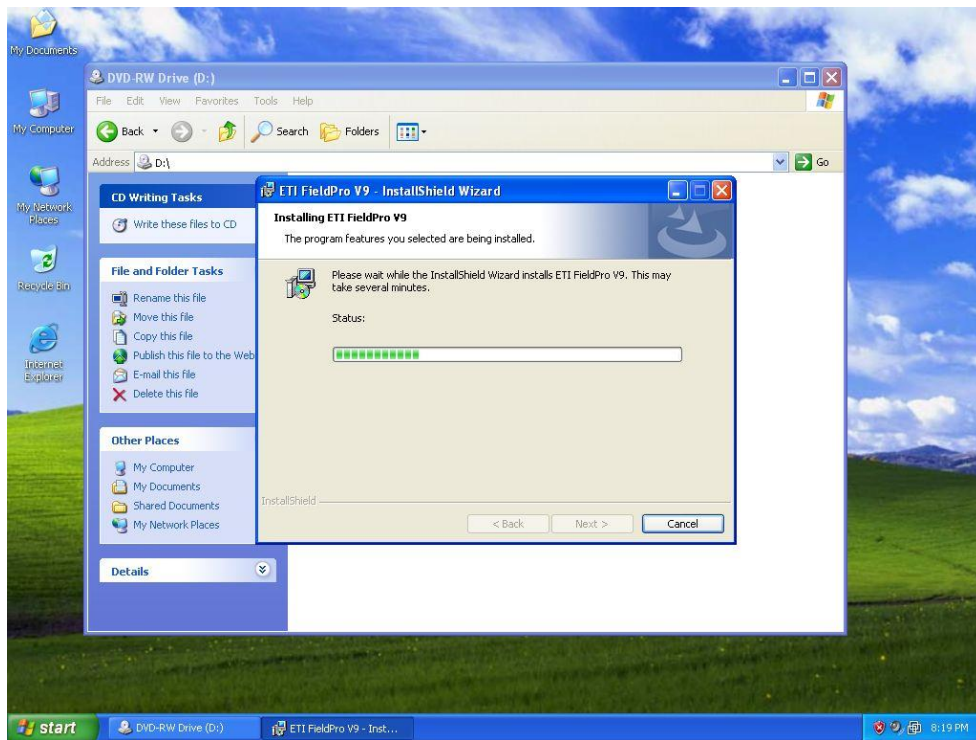


Figure 5

Once installation is complete, the screen shown in Figure 6 will appear. Click Finish.

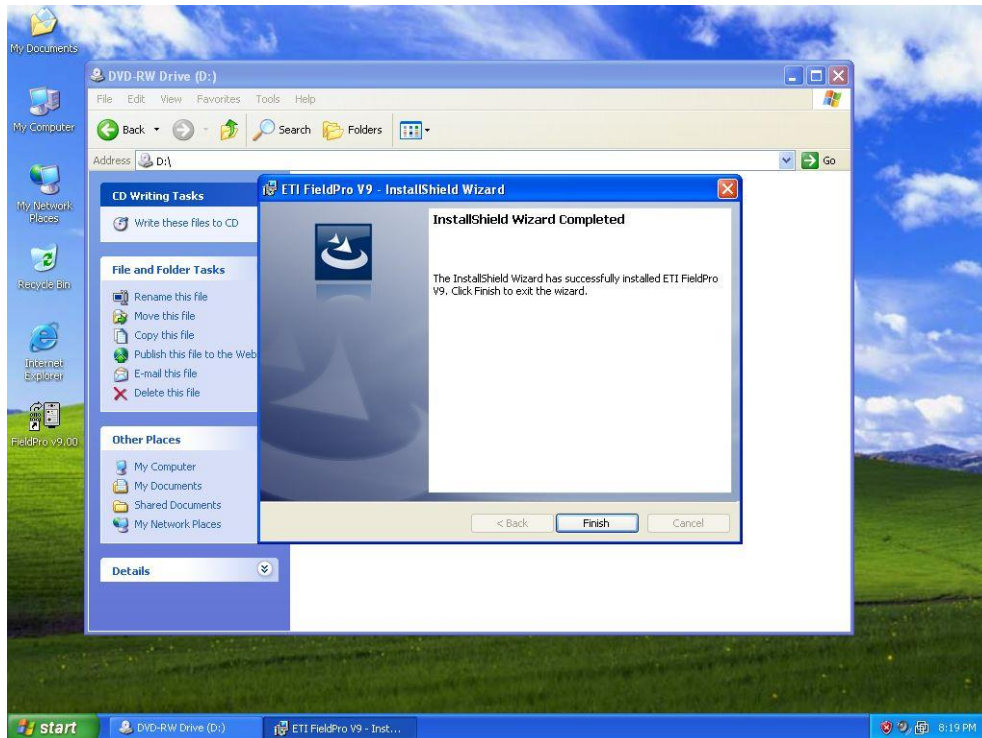


Figure 6

If the ETI USB Optical Interface Cable (ETI PN 521146-00) is to be used there are two methods to install it.

1. If an internet connection is available the driver is available through Microsoft Windows Update. Simply plug the Optical Interface Cable into a free USB port and follow the prompts to install automatically.
2. Click "Install USB Drivers" from the Start menu as shown in Figure 8 (under All Programs -> ETI -> FieldPro V9). The driver installation will begin. Once this is complete, plug the Optical Interface Cable into a free USB port. It is only necessary to run USB Installer once.

Windows should detect the USB cable and display a series of bubbles in the lower right hand corner of the screen. Once it is finished initializing the driver, a message similar to that shown in Figure 7 should appear.

These steps are not necessary for the RS-232 cable (ETI PN 521120).

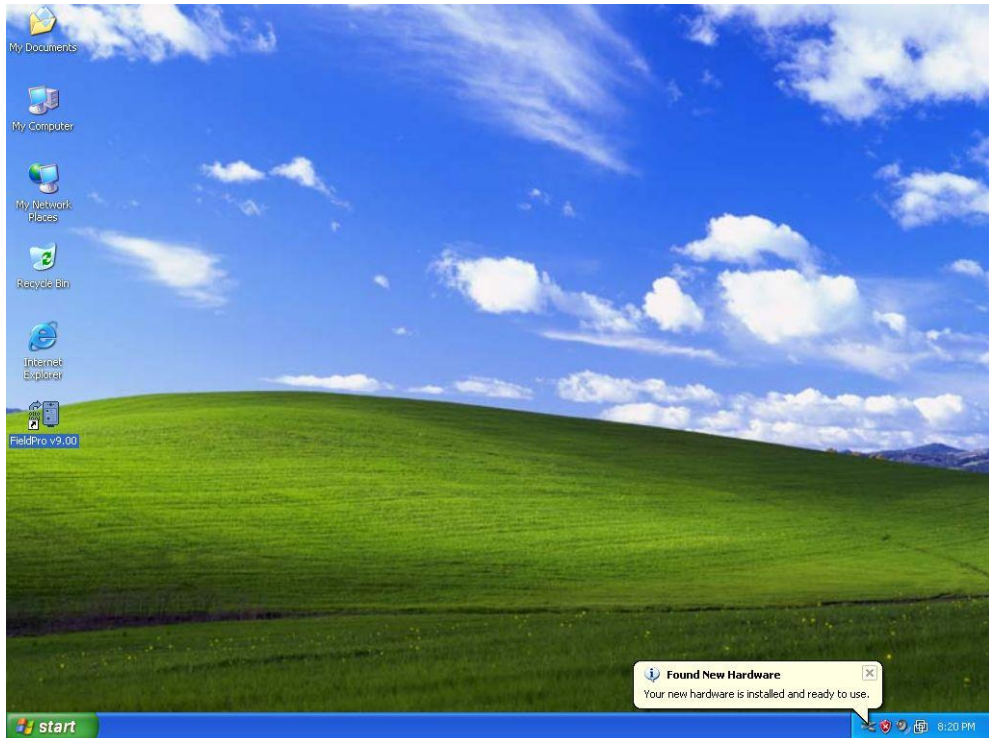


Figure 7



Figure 8

The program can be started either from the Start menu as shown in Figure 8 or from the icon on the Desktop (seen in Figure 7).

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2. Initial Setup

When first starting the interface software, a blank main screen will appear as shown in Figure 9.



Figure 9

Before attempting to connect to the MNPR[®] the communications port must be selected. Under the Port menu, there are options for COM1-COM16 as well as USB. If you are 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) you must select the COM port that corresponds to the physical port you plugged the cable into (usually COM1 on most laptops). If you are using the

RS232 serial cable with your own 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 131-1048-00 (WH) Single Phase Power Block. Press the “Read Settings” button, and the form should populate with the units 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 at 1600:5 Amp CT Ratio 2.5A (Relay Units) is equivalent to 800A (Protector Units) and 50% (Percent).

3. Main Screen

Once the FieldPro software is started, only a few options are available to the user as shown in Figure 10:

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 it's programming).

Retrieve – Retrieves saved settings from a file for viewing.

Read Settings – Reads the current state of the connected MNPR[®].

Exit – Exits the software.

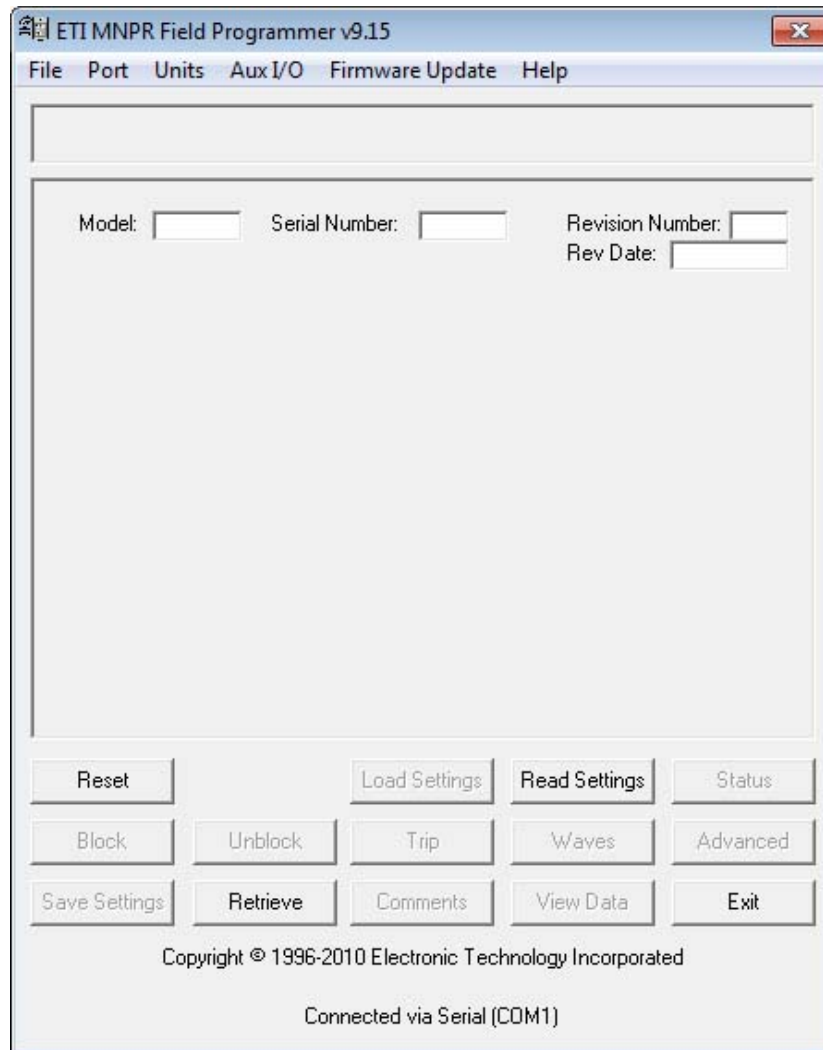


Figure 10

Once the MNPR[®] has been read the settings can be viewed and modified (as shown in Figure 11).

Certain versions of the MNPR[®] (part numbers 521923, 521938, 531923, and 521975) 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 12 in the "MNPR[®] Firmware Updates" section. Please see this section 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[®].

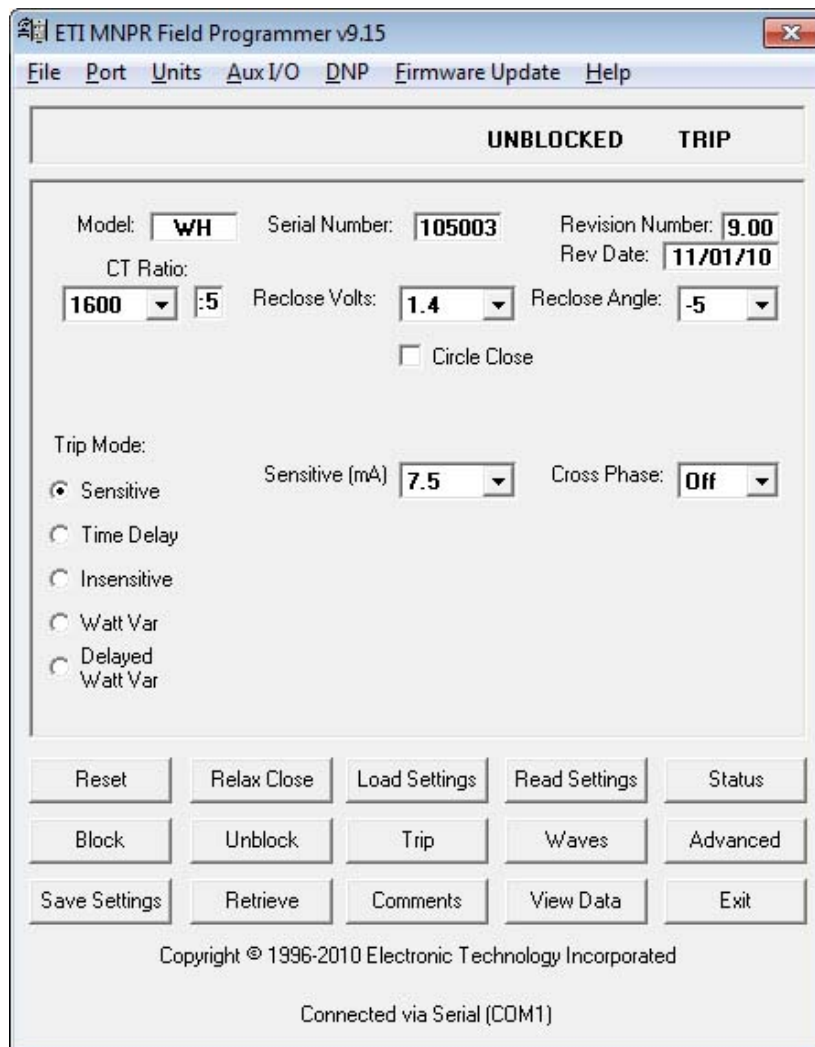


Figure 11

Read only parameters:

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

Serial Number – Displays the serial number of the MNPR®

Revision Number – Displays the version of the MNPR® firmware

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

Modifiable parameters:

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.

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 ($V_{TN} * \cos \theta$) 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.

Circle Close – Selects the circle close characteristic

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.

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 three phase sum of the differentials. 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.

CT Ratio – Select the CT Ratio that matches the network protector.

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

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 ($V_N * I * \cos \theta$) / $V_{N_{rms}}$ must exceed the set point.

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).

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).

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.

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 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.

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 ($V_N * I * \cos \theta$) / $V_{N_{rms}}$ must exceed the set point.

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.

Instant 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.

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.

Additional Function Buttons:

Load Settings – 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.

Save Settings – Saves the current settings of the MNPR[®] and a current snapshot of data for later review

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

Comments – Allows the user to enter a small amount of text that will be saved along with the MNPR[®] settings when the “Save Settings” function is used.

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 advanced).

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.

Status – Displays the “Relay Status” screen which provides additional information pertaining to the relay’s operation.

View Data – This screen displays the status of all the inputs that are connected to the MNPR[®] allowing the operator to verify that everything is connected and working properly. The “View Data” screen is further documented in the “View Data” section.

Advanced – Displays an additional screen with advanced options and MNPR[®] settings. These advanced parameters are further described in the “Advanced Setup” section. NOTE: Modification of the advanced parameters can possibly cause undesired operation of the MNPR[®]. Please be sure that any changes to be made are fully understood before proceeding.

Waves – Displays an additional screen that allows viewing of the three phase voltage and current waveforms as well as log data. This is further explained in the “View Waveforms” section.

Exit – Closes the FieldPro software. Any setting changes that had not been written to the MNPR[®] by pressing “Load Settings” will be lost.

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 “Load Settings” will be lost. There is also a Print feature that will print the main FieldPro screen.

Port – Configures the port (USB or COM1-COM16) 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).

Aux I/O – Configures the Aux I/O of a communicating MNPR[®]. See the Section 10, Aux I/O for more information.

DNP – Setup for DNP3 communications parameters on a communicating MNPR[®]. (See Sections 11 and 12, DNP3 Setup and DNP3 Profiles)

Firmware Update – Allows manual operation of the firmware update process. See the "MNPR[®] Firmware Updates" section 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.

4. MNPR[®] Firmware Updates

Certain versions of the MNPR[®] (part numbers 5XX9X3, 5XX9X3, 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 12.

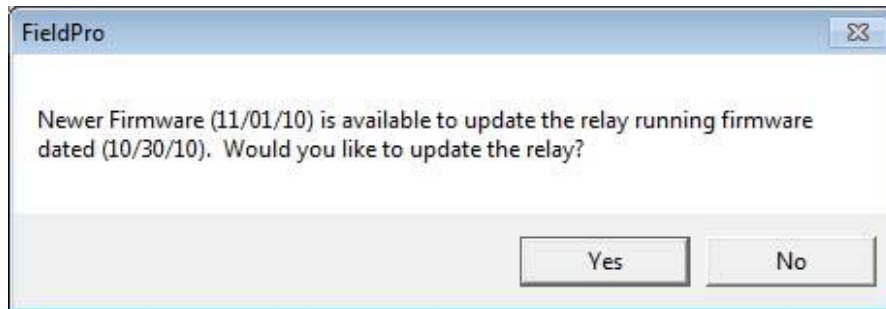


Figure 12

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 13 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".

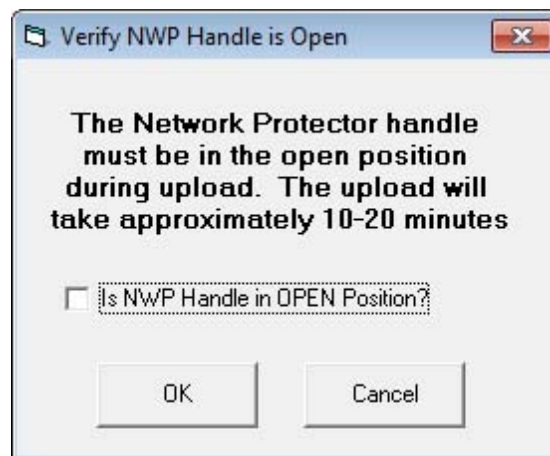


Figure 13

The upload will then proceed as shown in Figure 14. 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 as shown in Figure 15. 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 16 will appear.

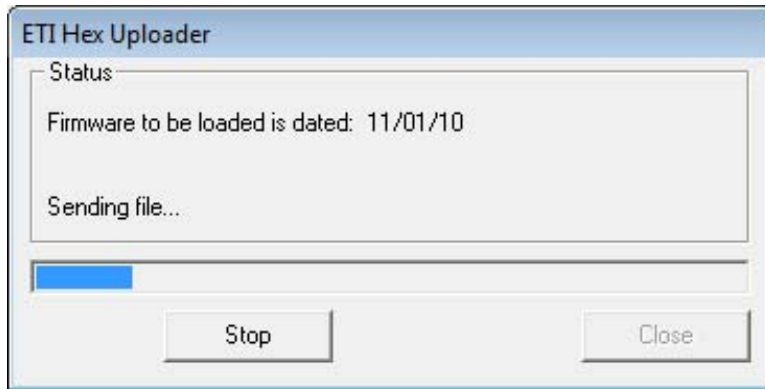


Figure 14

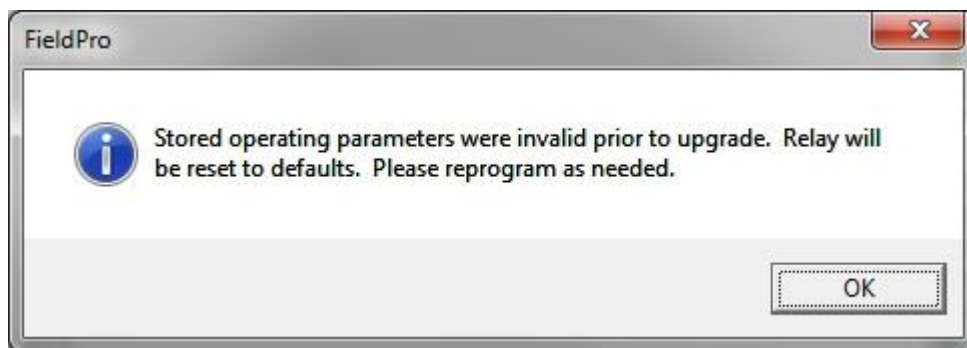


Figure 15

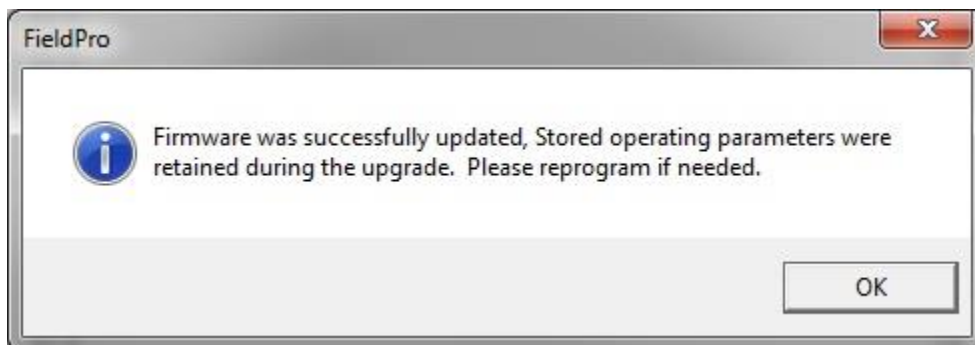


Figure 16

If the upload fails to complete, an error similar to that shown as in Figure 17 will be displayed.

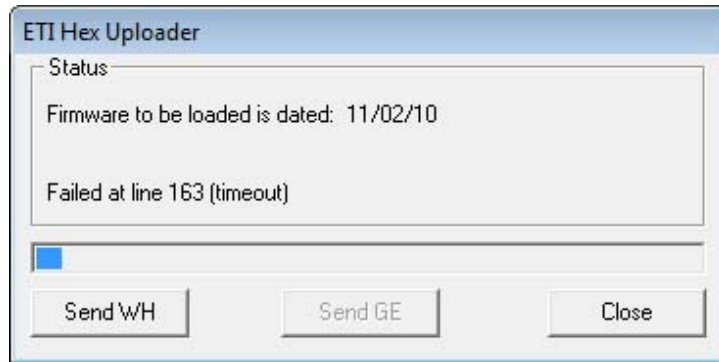


Figure 17

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.

If the upload is unable to automatically restart, the MNPR[®] may need to be power cycled. If FieldPro detects this, the message shown in Figure 18 will be shown.

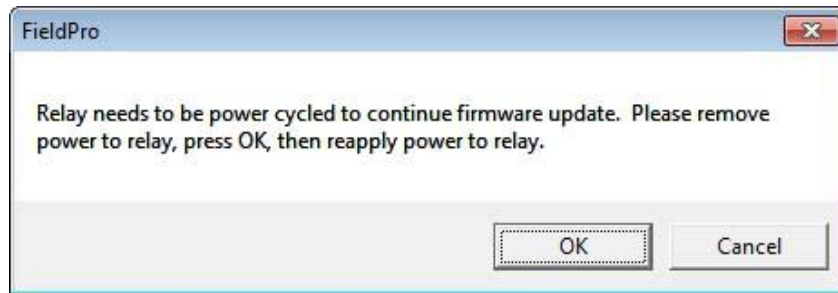


Figure 18

Safely remove power to the MNPR[®] and press OK. When the screen shown in Figure 19 appears, safely reapply power to the MNPR[®] and the firmware upload should start.

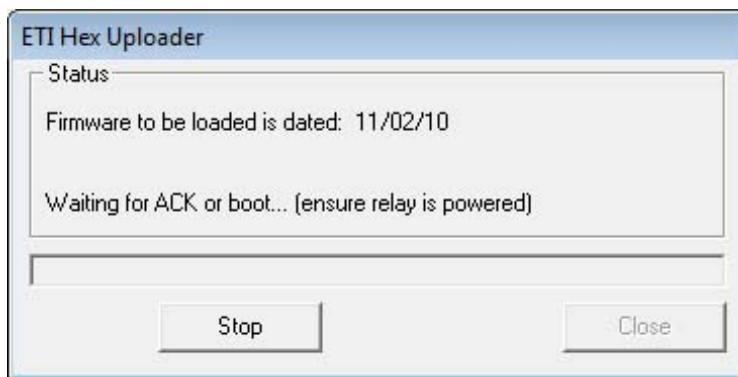


Figure 19

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 10. Select "Firmware Update" then "Manual" from the menu bar. The screen shown in Figure 20 will appear.



Figure 20

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 21/Figure 22). Pressing OK will start the upload in a manner similar to the automatic process previously described.

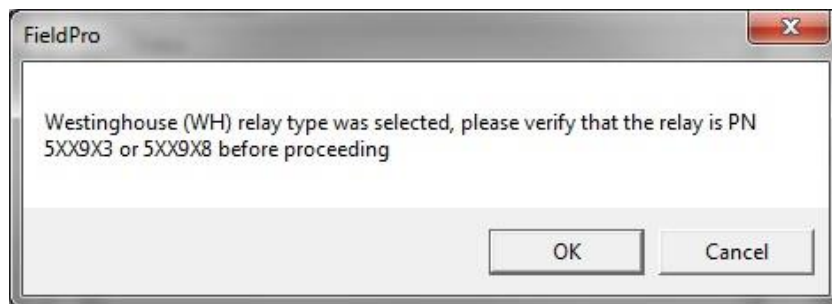


Figure 21

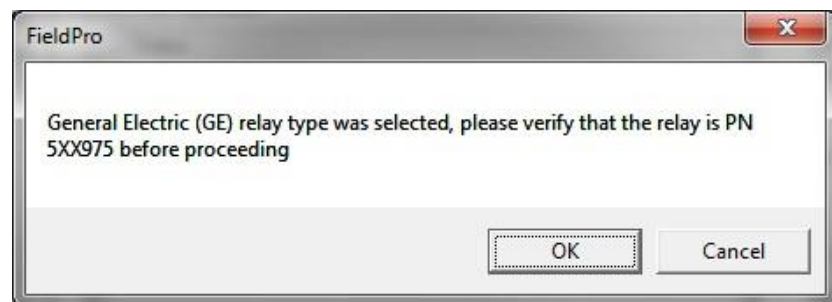


Figure 22

5. Basic Setup Procedure

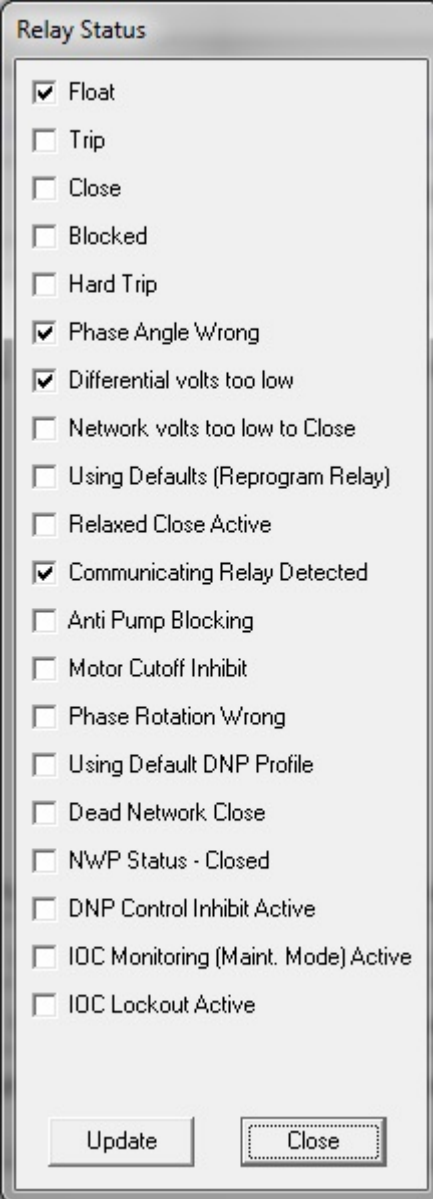
The following describes the minimum configuration necessary to setup a MNPR[®]. Depending upon the specific needs of the utility this may vary.

1. Press the “Read Settings” button on the main screen. This will retrieve the current MNPR[®]s 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 “Load Settings” button to program the MNPR[®].
5. Press the “Read Settings” 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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6. Relay Status Screen

Pressing the “Status” button on the main screen will display the Relay Status Screen as shown in Figure 23 below.



The image shows a software window titled "Relay Status". It contains a list of 20 status indicators, each with a checkbox. The indicators are: Float (checked), Trip (unchecked), Close (unchecked), Blocked (unchecked), Hard Trip (unchecked), Phase Angle Wrong (checked), Differential volts too low (checked), Network volts too low to Close (unchecked), Using Defaults (Reprogram Relay) (unchecked), Relaxed Close Active (unchecked), Communicating Relay Detected (checked), Anti Pump Blocking (unchecked), Motor Cutoff Inhibit (unchecked), Phase Rotation Wrong (unchecked), Using Default DNP Profile (unchecked), Dead Network Close (unchecked), NWP Status - Closed (unchecked), DNP Control Inhibit Active (unchecked), IDC Monitoring (Maint. Mode) Active (unchecked), and IDC Lockout Active (unchecked). At the bottom of the window are two buttons: "Update" and "Close".

| Status Indicator | Checked |
|-------------------------------------|---------|
| Float | Yes |
| Trip | No |
| Close | No |
| Blocked | No |
| Hard Trip | No |
| Phase Angle Wrong | Yes |
| Differential volts too low | Yes |
| Network volts too low to Close | No |
| Using Defaults (Reprogram Relay) | No |
| Relaxed Close Active | No |
| Communicating Relay Detected | Yes |
| Anti Pump Blocking | No |
| Motor Cutoff Inhibit | No |
| Phase Rotation Wrong | No |
| Using Default DNP Profile | No |
| Dead Network Close | No |
| NWP Status - Closed | No |
| DNP Control Inhibit Active | No |
| IDC Monitoring (Maint. Mode) Active | No |
| IDC Lockout Active | No |

Figure 23

The status screen lists various items that pertain to the operation of the MNPR®.

The first few display the current state of the MNPR®. This is the current state of the MNPR®, not the network protector.

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).

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.

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

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

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

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

Anti Pump Blocking – 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.

Using 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. (Note: This indication is not available when the network voltage is below 13 Volts)

NWP Status - Closed – This indicates that the auxiliary input channel selected for the protector status is reading 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.

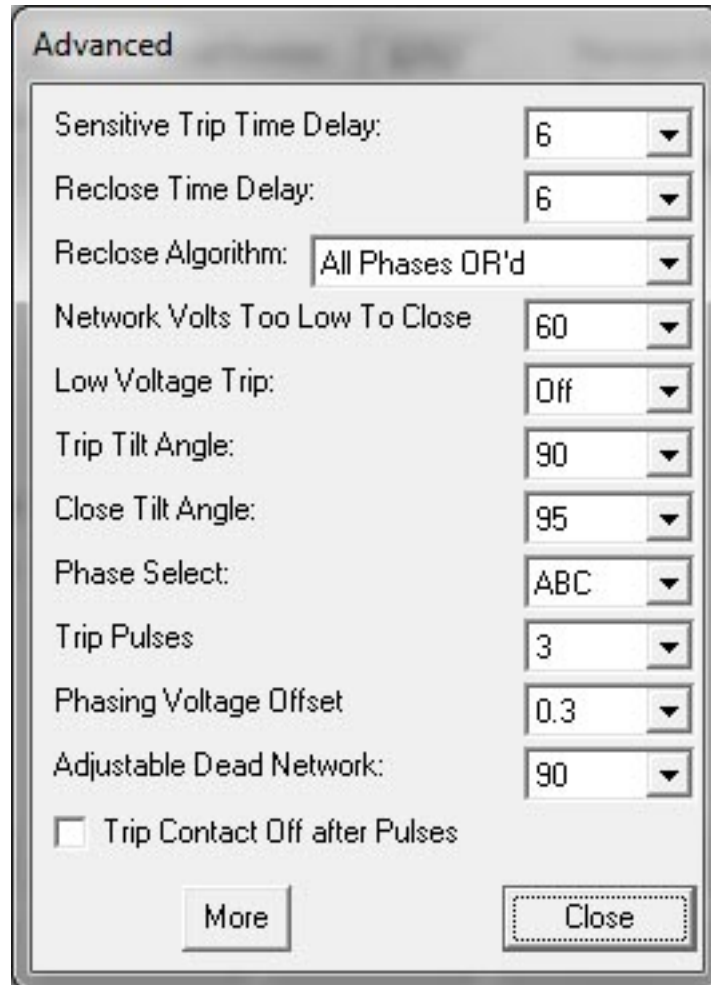
IOC Monitoring (Maintenance Mode) Active – This indicates that the auxiliary input channel selected for the instantaneous overcurrent function is in the active state and a lockout (Trip & Block) will be initiated if the overcurrent setting is exceeded.

IOC Monitoring 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 relays optical port (remote unblock via DNP will NOT override this lockout).

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7. Advanced Setup Screen

Pressing the “Advanced” button on the main screen will display the Advanced Setup Screen as shown in Figure 24 below.



The screenshot shows a window titled "Advanced" with the following settings:

| Parameter | Value |
|--|-----------------|
| Sensitive Trip Time Delay: | 6 |
| Reclose Time Delay: | 6 |
| Reclose Algorithm: | All Phases OR'd |
| Network Volts Too Low To Close | 60 |
| Low Voltage Trip: | Off |
| Trip Tilt Angle: | 90 |
| Close Tilt Angle: | 95 |
| Phase Select: | ABC |
| Trip Pulses | 3 |
| Phasing Voltage Offset | 0.3 |
| Adjustable Dead Network: | 90 |
| <input type="checkbox"/> Trip Contact Off after Pulses | |

Buttons: More, Close

Figure 24

The advanced parameters are described below:

Sensitive Trip Time Delay (cycles) - The minimum duration that the Sensitive Trip criteria must be satisfied for before the MNPR[®] will trip the network protector.

Reclose Time Delay (cycles) - The minimum duration that the Reclose criteria must be satisfied for before the MNPR[®] will close the network protector.

Algorithm – This setting allows the source of angle information for reclose to be selected.

1. Average All Phases – This MNPR[®] will use the average of all three phases (both magnitude and angle) to determine if the system conditions fall within the reclose characteristic.
2. All Phases AND'd – This MNPR[®] will use the average magnitude of all three phases, but will look at the angle of each phase individually to determine if the system conditions fall within the reclose characteristic. All three angles must fall in the close region in order to close the network protector.
3. Average All, Angle 1 – This MNPR[®] will use the average magnitude of all three phases, but will only look at the angle of phase 1 to determine if the system conditions fall within the reclose characteristic. This is the default setting as it most closely emulates the operation of Electro-Mechanical MNPR[®]s -- the master MNPR[®] takes into account all three phases for magnitude but the phasing MNPR[®] only looks at a single phase (phase 1).
4. Average All, Angle 2 – This MNPR[®] will use the average magnitude of all three phases, but will only look at the angle of phase 2 to determine if the system conditions fall within the reclose characteristic.
5. Average All, Angle 3 – This MNPR[®] will use the average magnitude of all three phases, but will only look at the angle of phase 3 to determine if the system conditions fall within the reclose characteristic.
6. Circle Close – This selects the circle close characteristic (same as checking the Circle Close checkbox on the main screen).
7. All Phases OR'd – This MNPR[®] will use the average magnitude of all three phases, but will look at the angle of each phase individually to determine if the system conditions fall within the reclose characteristic. If any of the three angles fall in the close region the MNPR[®] close the network protector.

Network Volts Too Low to Close (Volts) – The threshold below which the MNPR[®] will not attempt to close the network protector. (NOTE: This setting has no effect on the “Dead Network” close operation of the MNPR[®])

Low Voltage Trip (Volts) – If the three phase average of network volts falls below this threshold, the MNPR[®] will call for a trip of the network protector. (NOTE: This setting has no effect on the “Dead Network” close operation of the MNPR[®])

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

Close Tilt Angle (degrees) – This setting allows the angle of the close line of the close characteristic to be modified.

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®'s "Phase 1" will be wired to the network protector's "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.

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. 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.

Phasing Voltage Offset – This setting allows the phasing offset on the close characteristic to be adjusted (See Figure 36 in Appendix A).

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 deassert at 13 Volts on any single phase.

More – Opens another dialog box with additional advanced settings (described in the next section).

Logo String – Opens another dialog box which allows entry of arbitrary text which will scroll across the display of the relay. This text area is also used to store the address of a Version 2 or Version 3 communicating relay.

Close – Closes the Advanced window and returns to the Main screen. Any settings changed will not be applied until "Load Settings" is pressed on the Main screen.

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8. More Advanced Parameters Screen

Pressing the “More” button on the Advanced screen will display the More Advanced Parameters Screen as shown in Figure 25 below.

The screenshot shows a window titled "More Advanced Parameters" with the following settings:

- Trip On Power Up
- Scrolling Disabled
- Phase Rotation Sensitivity
 - Phase Rotation Setting: ABC CBA
 - Phase Rotation Reading: ABC CBA N/A
 - Trip On Incorrect Phase Rotation
- Relaxed Reclose Volts: 0.5
- Relaxed Reclose Angle: -10
- Relaxed Active Time: 60
- Relaxed Phasing Offset: 0
- Relaxed Close Active
- Anti-Pump Mode: Smart Anti-Pump Enabled
- Pump Count: 3
- Pump Time (sec): 30
- Pump Delay (min): 15
- Instantaneous Over Current Trip - Maintenance Mode
 - IOC Enable Input: DIG 3
 - IOC Trip Setting (A): 1600

A "Close" button is located at the bottom right of the window.

Figure 25

These additional advanced parameters are described below:

Trip On Power Up – When this option is enabled the MNPR[®] will trip the network protector upon the application of power. The MNPR[®] will then trip or close based upon system conditions

Scrolling Disabled – This will inhibit the MNPR[®]'s scrolling display. Instead of scrolling information about the MNPR[®] and system conditions, it will simply display the MNPR[®]'s status (TRIP, CLOS, or FLOT).

Phase Rotation Sensitivity – When this option is enabled the MNPR[®] will only close if the phase rotation currently applied matches the setting. (The selected value appears under “Phase Rotation Setting” and the currently read value is displayed under “Phase Rotation Reading”)

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

Relaxed Reclose Parameters – 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. Three parameters are available:

1. Relaxed Reclose Volts – The reclose volts setting to be used in relaxed close mode
2. Relaxed Reclose Angle – The reclose angle setting to be used in relaxed close mode
3. Relaxed Reclose Time – The time in seconds that the relaxed settings will be in effect after activation
4. Relaxed Phasing Offset – The phasing offset voltage that will be in effect after activation
5. Relaxed Close Active – This box will be checked when the MNPR[®] is currently operating off of the Relaxed Close parameters

Anti-Pump Mode – Enables one of the two “anti-pump” algorithms

1. 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.
2. 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.

Instantaneous Over Current Trip – Maintenance Mode – This mode can be enabled to provide a non-directional overcurrent trip characteristic that will trip and block the network protector when the current on any phase exceeds the IOC Trip 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).

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

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

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9. View Data Screen

Pressing the “View Data” button on the main screen will display the Data Screen as shown below in Figure 26.

The screenshot shows a 'View Data' window with the following fields and table:

S/N: 105003 Date Read: 11/01/10 Counter: 3
 Temperature: 47 °C Relay Code Date: 11/01/10

| | Phase 1 | Phase 2 | Phase 3 |
|-----------------|---------|---------|---------|
| Current (mAmps) | 0.0 | 0.0 | 0.0 |
| V Net | 118.6 | 118.6 | 118.7 |
| V Diff | -17.1 | -17.2 | -17.3 |
| V Diff Mag | 20.3 | 20.2 | 20.4 |
| Phase (Degrees) | 176 | 176 | 176 |
| V Trans | 124.9 | 125.2 | 125.7 |

Buttons on the right side of the window: Close, Update, Save Data, Retrieve Data, I/O, FFT, Print.

Figure 26

This screen displays information about what the MNPR[®] is seeing on it’s various inputs (voltage, current, phase angles, etc).

S/N – Displays the serial number of the MNPR[®]

Date Read – Displays the date on which the data was read from the MNPR[®]

Counter – Displays the number of trip cycles the MNPR[®] has undergone in its lifetime

Temperature – Displays the internal temperature of the MNPR[®] (usually several degrees over the ambient temperature due to internal heating)

Main Data Table – Displays the current, voltage, differential voltage projection onto the network voltage axis, differential voltage magnitude, phase angle, and transformer side voltage for each of the three phases.

Update – Reloads a current snapshot of data from the MNPR[®]

Save Data – Saves the current data to a file for later retrieval

Retrieve Data – Loads the data that was saved with the “Save Data” button

I/O – Opens the I/O window to show the auxiliary inputs available on communicating relays. See the Aux I/O section for more information.

Print – Prints the current form to the printer.

FFT – Opens the Fast Fourier Transform window for analyzing harmonic information, shown in Figure 27.

Close – Returns to the main screen

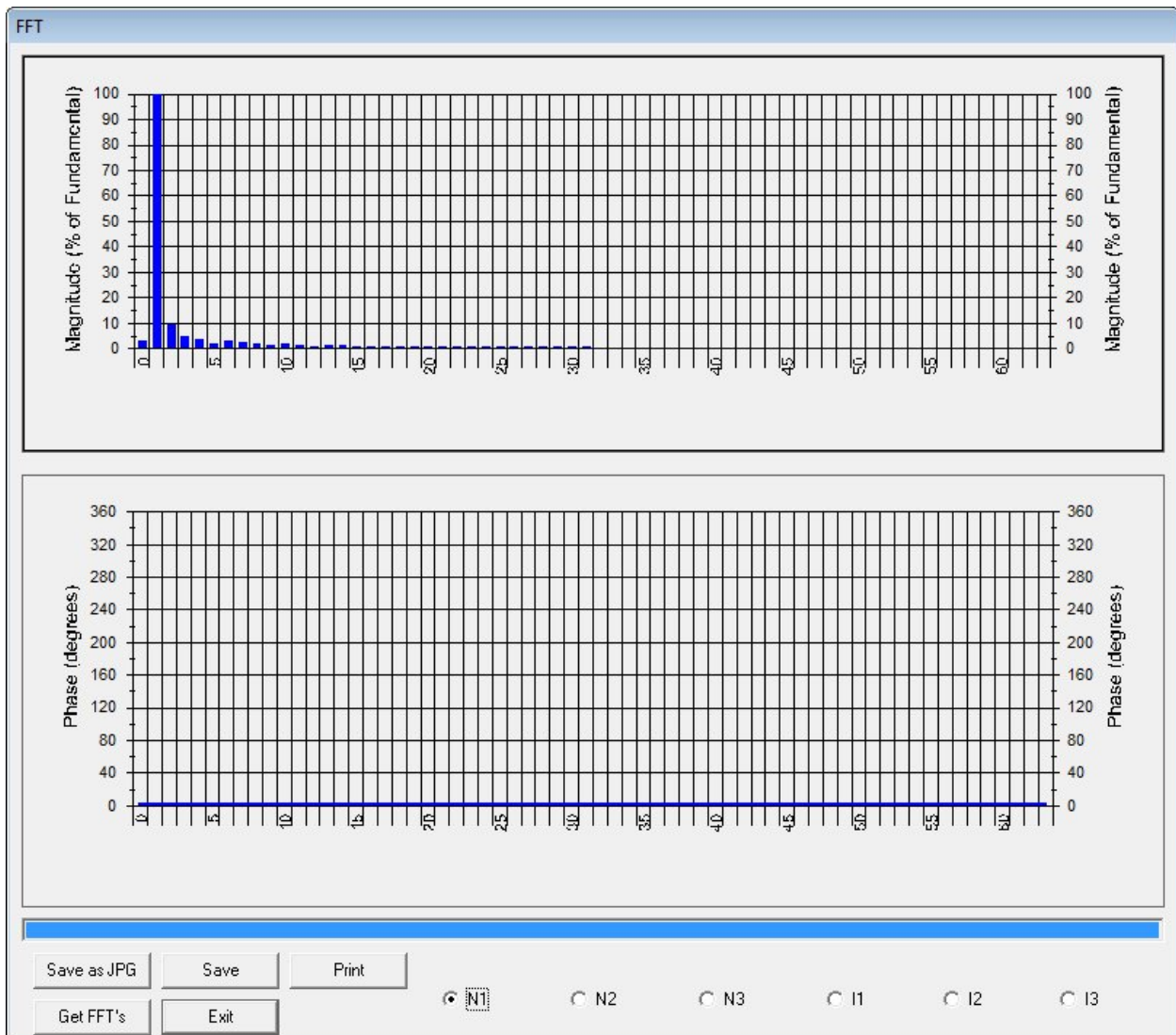


Figure 27

10. Aux I/O (Communicating MNPR[®] only)

Selecting the “Aux I/O” menu item from the main screen will display the Aux I/O configuration screen shown in Figure 28.

| I/O | Name | Sensor Type | Sensor |
|---------------|------------------|-------------|----------------------------------|
| Analog In 1 | Pressure | Pressure | 131-1106-30 -2-20 PSI |
| Analog In 2 | Temperature | Temperature | 131-1075-XX 0-200° C (unipolar) |
| Analog In 3 | Oil Level | Oil Level | 131-0360-88 Side Mount Oil Level |
| Analog In 4 | NWP Status | NWP Status | B Contact |
| Analog In 5 | Analog 5 | None/Other | None/Other (Voltage Display) |
| Analog In 6 | Analog 6 | None/Other | None/Other (Voltage Display) |
| Analog In 7 | Analog 7 | None/Other | None/Other (Voltage Display) |
| Analog In 8 | Analog 8 | None/Other | None/Other (Voltage Display) |
| Digital In 1 | Digital Input 1 | | |
| Digital In 2 | Digital Input 2 | | |
| Digital In 3 | Digital Input 3 | | |
| Digital In 4 | Digital Input 4 | | |
| Digital Out 1 | Digital Output 1 | | |
| Digital Out 2 | Digital Output 2 | | |

Figure 28

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.

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

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

Sensor – 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 I/O button on the View Data screen. A screen similar to that shown in Figure 29 will appear (exact screen is dependent on the configuration described above)

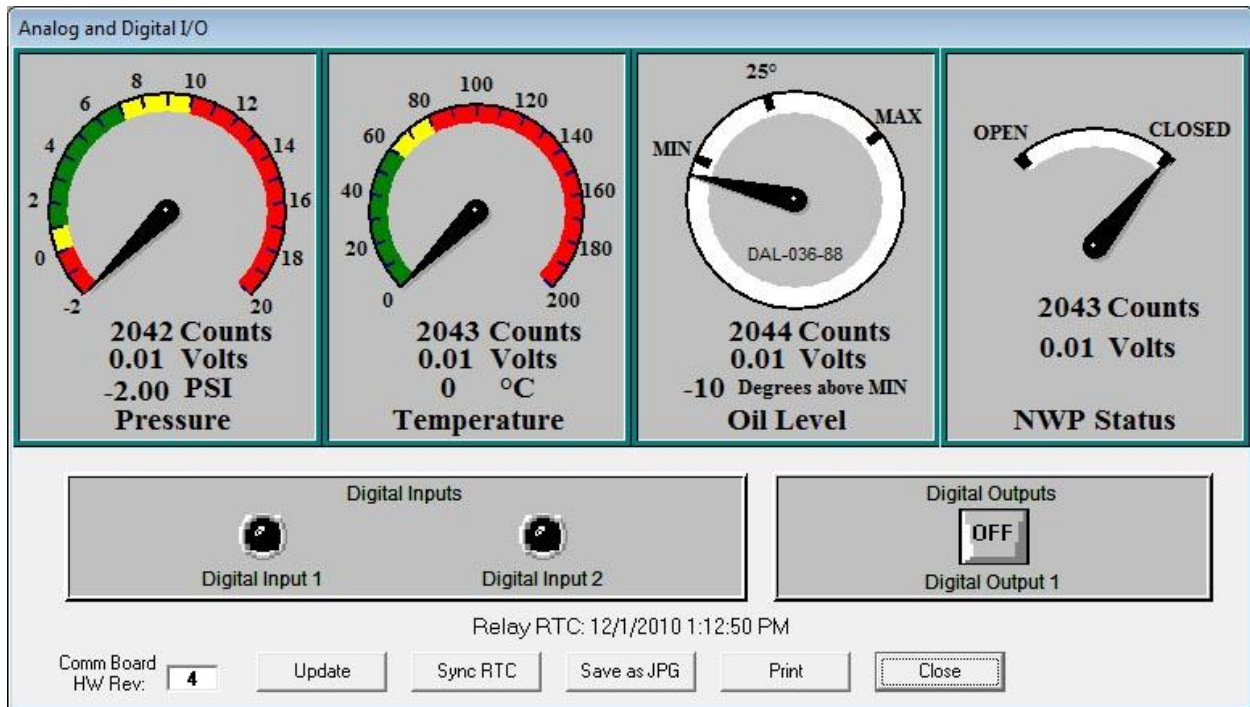


Figure 29

Each of the meters displays the analog input scaled appropriately for the sensor selected in the configuration. The digital inputs are displayed as lamps which illuminate in red when the input is active. The current state of the digital outputs are represented by a toggle switch. The output state can be toggled by clicking the switch.

Comm Board HW Rev reports the hardware revision of the communications and aux I/O hardware inside the MNPR®.

The current setting (as of the last time the “Update” button was pressed) of the internal real time clock (RTC) is shown at the bottom of the screen. The real time clock can be synchronized to the PC’s clock by pressing the Sync RTC button. Pressing the “Save as JPG” button will save an image of the I/O screen to a file. Pressing the “Print” button will send an image of the screen to a printer.

11. DNP3 Setup (Communicating MNPR[®] only)

Selecting the “DNP” menu item from the main screen will display the DNP3 configuration screen shown in Figure 30. Newer versions of MNPR[®] firmware may support "DNP Profiles" and this screen may look like the one shown in Figure 32 or Figure 33. In this case skip to the following section "DNP3 Profiles".

DNP Setup

DNP3 Address: 101 NWP Status Input : DIG 1

Do High Voltage NWP Scaling NWP Status Type: B Contact

PT Ratio: 277 :125V DNP Control Inhibit Input: NONE

Send DNP Aux Analogs as 12 bit Zero GE Currents when Open / Diff when Closed

Unsolicited Response Setup

Enable Unsolicited Responses

Destination Address: 0

Response Timeout: 15

Close

Figure 30

DNP3 Address – DNP3 Address of the MNPR[®]

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.

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.

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.

Zero GE Currents when Open / Diff when Closed – 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. Option is available on GE relays only)

DNP Control Inhibit Input – Selects the auxiliary input channel that the relay will monitor to determine if DNP control commands should 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.

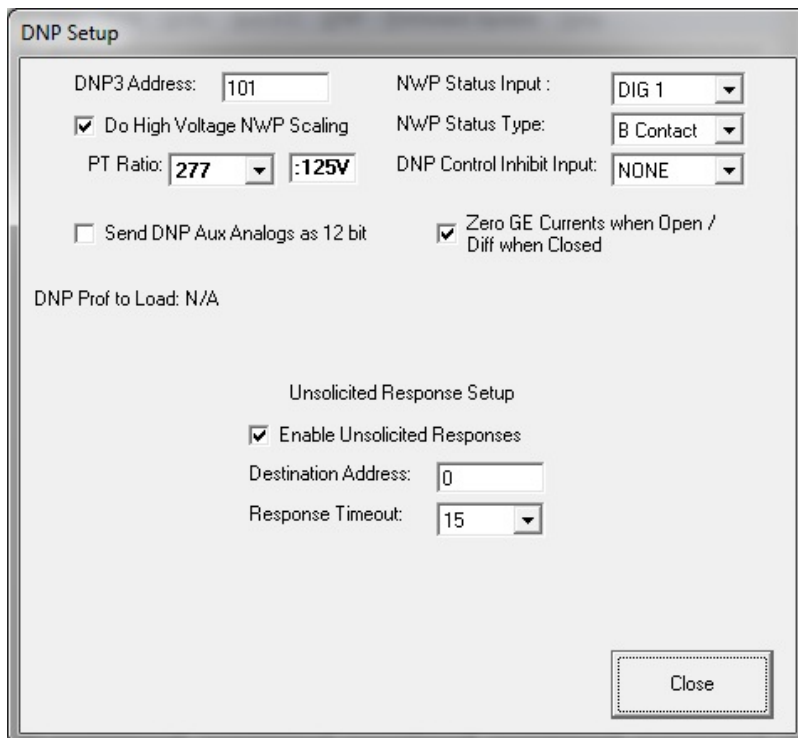
Unsolicited Response Timeout (seconds) – The total length of time that the MNPR[®] will wait for an acknowledgement of an unsolicited response.

12. 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, selecting the “DNP” menu item from the main screen will display the DNP3 configuration screen shown in Figure 31, Figure 32, or Figure 33. If it looks like the screen shown in Figure 30, this relay does not support DNP Profiles. It can either be configured manually as described in the previous section, or the firmware can be updated to a version with profile support.

The DNP Profile is either provided by ETI or can be generated using the ETI DNPro[®] 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 V9\"). If this file is not found, the DNP Setup screen will look like Figure 31. If a profile is found, the screen will look like either Figure 32 or Figure 33 depending on whether a profile is already loaded on the relay or not.



The screenshot shows a 'DNP Setup' dialog box with the following fields and options:

- DNP3 Address: 101
- NWP Status Input: DIG 1
- Do High Voltage NWP Scaling
- NWP Status Type: B Contact
- PT Ratio: 277 : 125V
- DNP Control Inhibit Input: NONE
- Send DNP Aux Analogs as 12 bit
- Zero GE Currents when Open / Diff when Closed
- DNP Prof to Load: N/A
- Unsolicited Response Setup
 - Enable Unsolicited Responses
 - Destination Address: 0
 - Response Timeout: 15
- Close button

Figure 31

DNP Setup

DNP3 Address: NWP Status Input :

Do High Voltage NWP Scaling NWP Status Type:

PT Ratio: : DNP Control Inhibit Input:

DNP Prof: User Ver=1 Hash=0x1E5A0953404E10CE4EB9E6FCEE4B592
 Converted DNP Prof Hash=0x1E5A0953404E10CE4EB9E6FCEE4B592
 DNP Prof on Relay: User Ver=1 Hash=0x1E5A0953404E10CE4EB9E6FCEE4B592

Figure 32

In the event that 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). The DNP Setup screen will look similar to that shown in Figure 33.

Figure 33

DNP3 Address – DNP3 Address of the MNPR[®]

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.

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.

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

DNP Prof – 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.

DNP Prof on Relay – 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 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 parameters (as described in the previous section).

13. View Waveforms

Pressing the “Waves” button on the main screen will display the Waveforms as shown below in Figure 34.

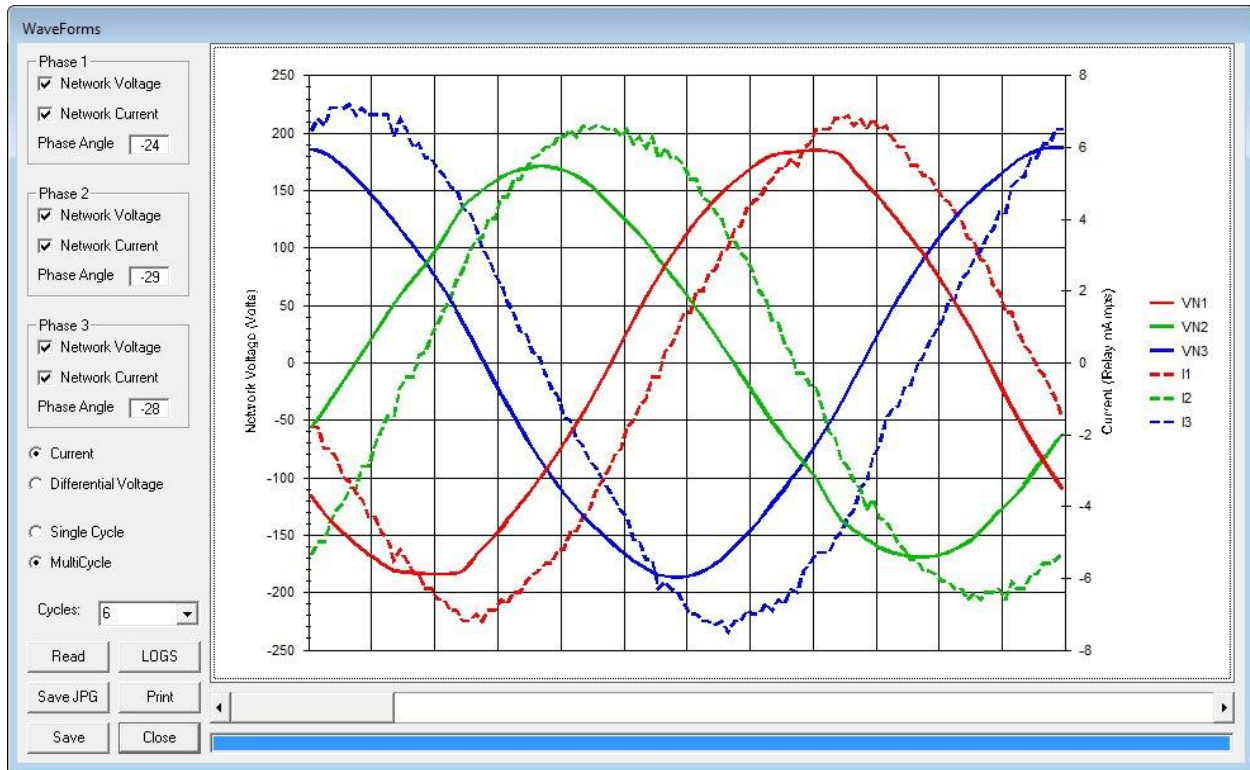


Figure 34

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 a sample of 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 unclutter 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 a comma delimited file that can be imported into other programs such as Excel.

Pressing the “Save as JPG” button will save an image of the waveforms screen to a file. Pressing the “Print” button will send an image of the screen to a printer.

Pressing the “Done” button will return to the main screen.

Certain MNPR[®] models are capable of storing several cycles before and after a trip of close event. These logs can be accessed via the “LOGS” button.

Pressing the “Get Logs” button will retrieve any available log data from the MNPR[®]. Once the logs are retrieved into FieldPro they will be removed from the MNPR[®].

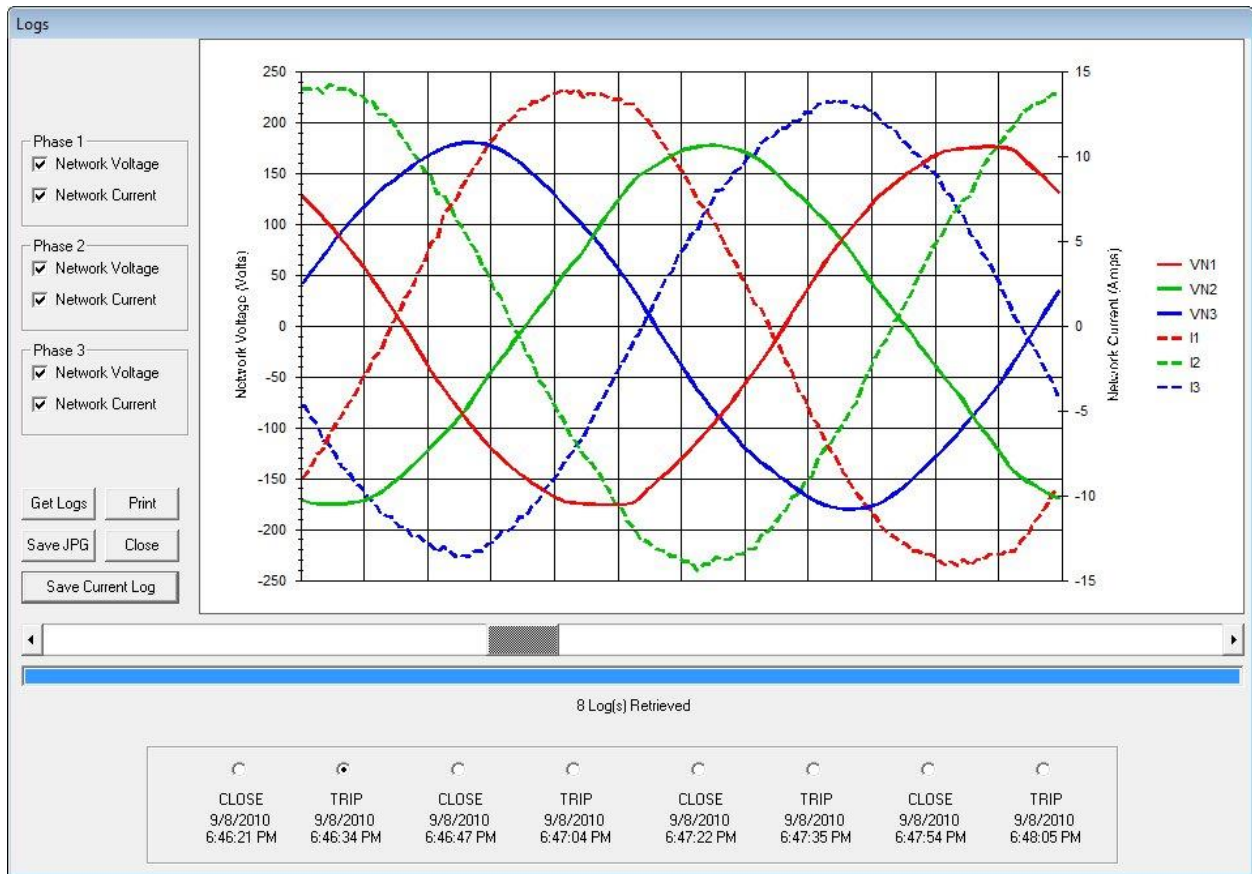


Figure 35

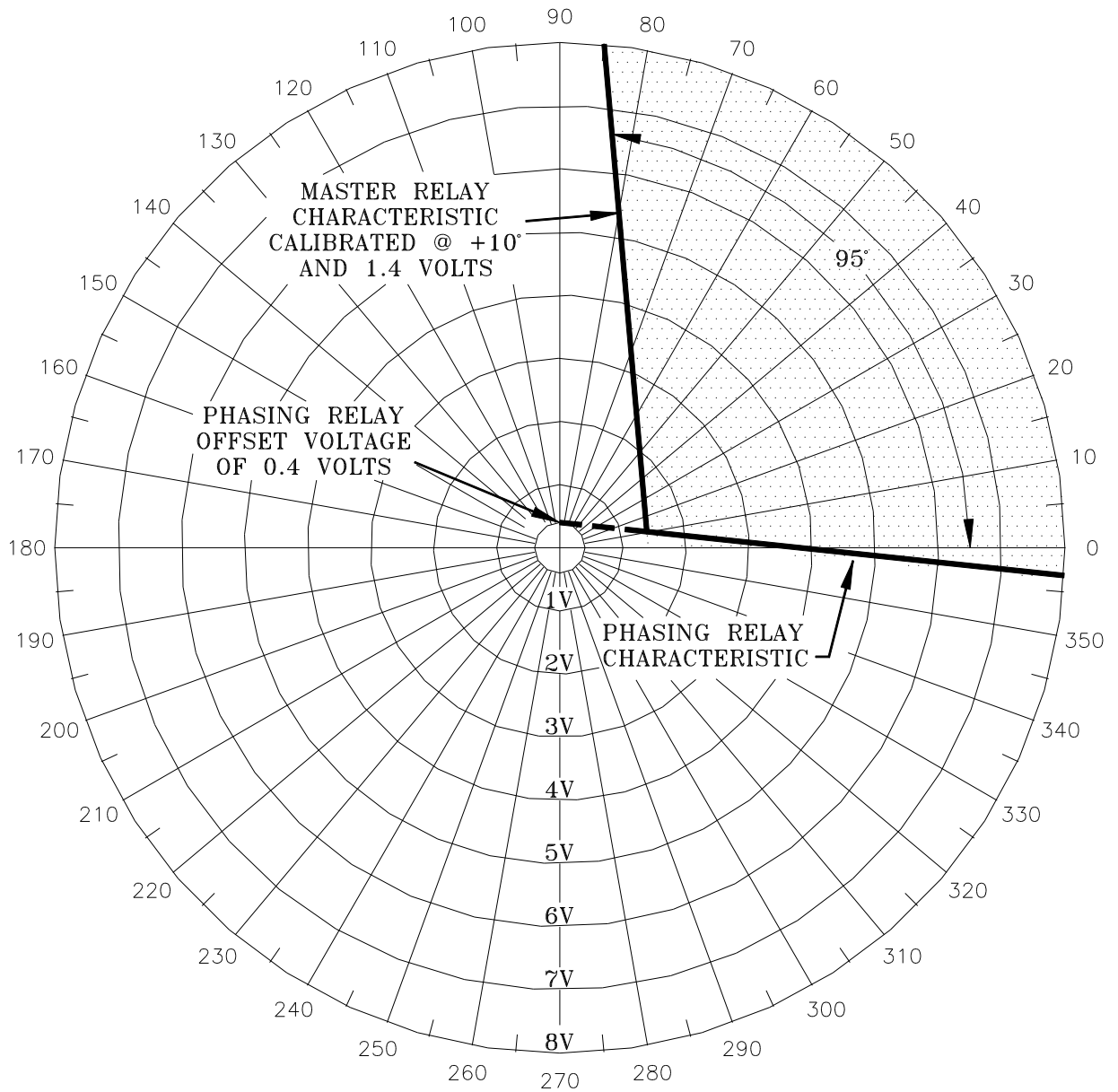
14. Troubleshooting

If at any time a “Communication Failure” message is displayed 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 36 - Reclose Characteristic

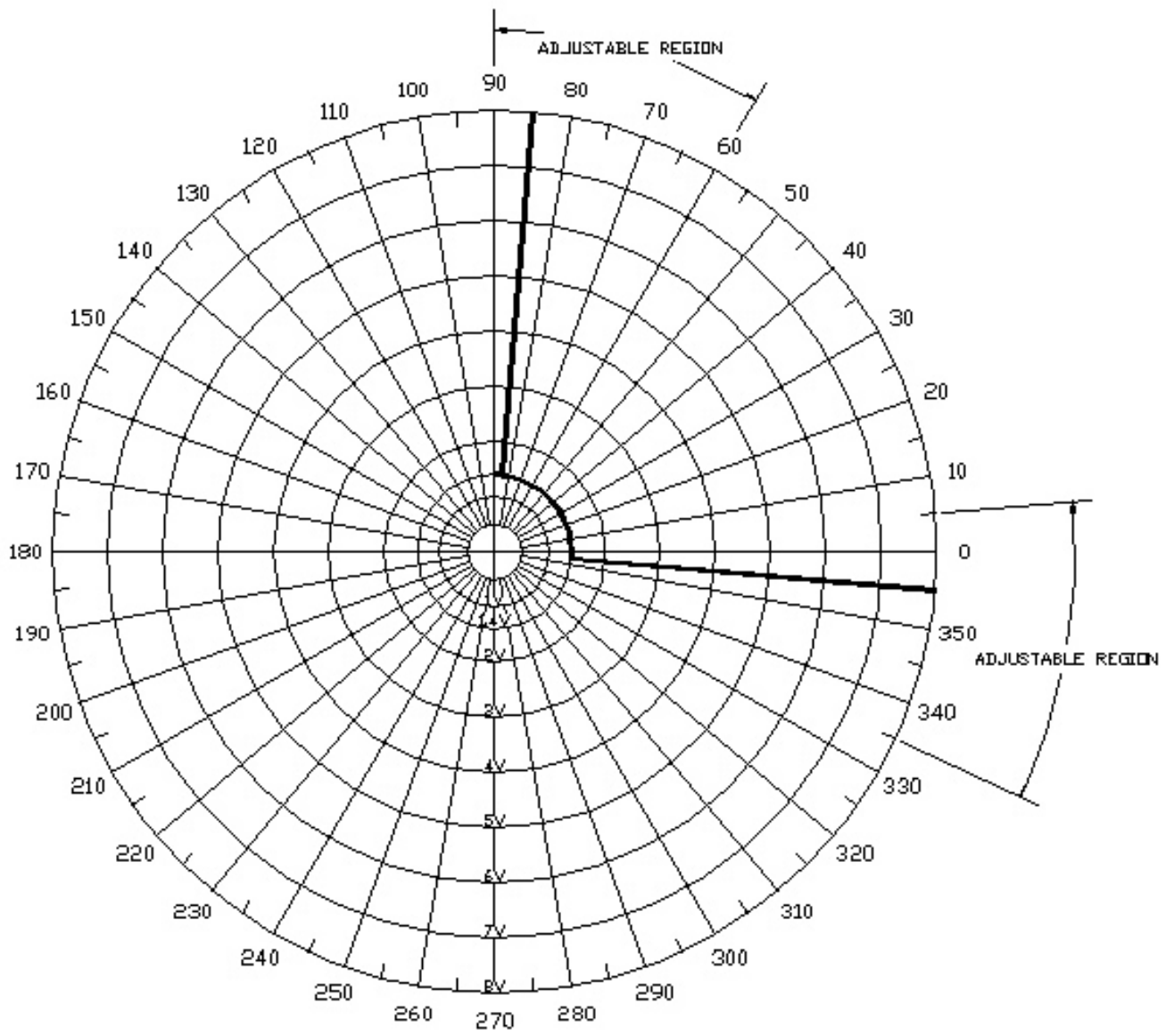


Figure 37 - Circle Close Characteristic

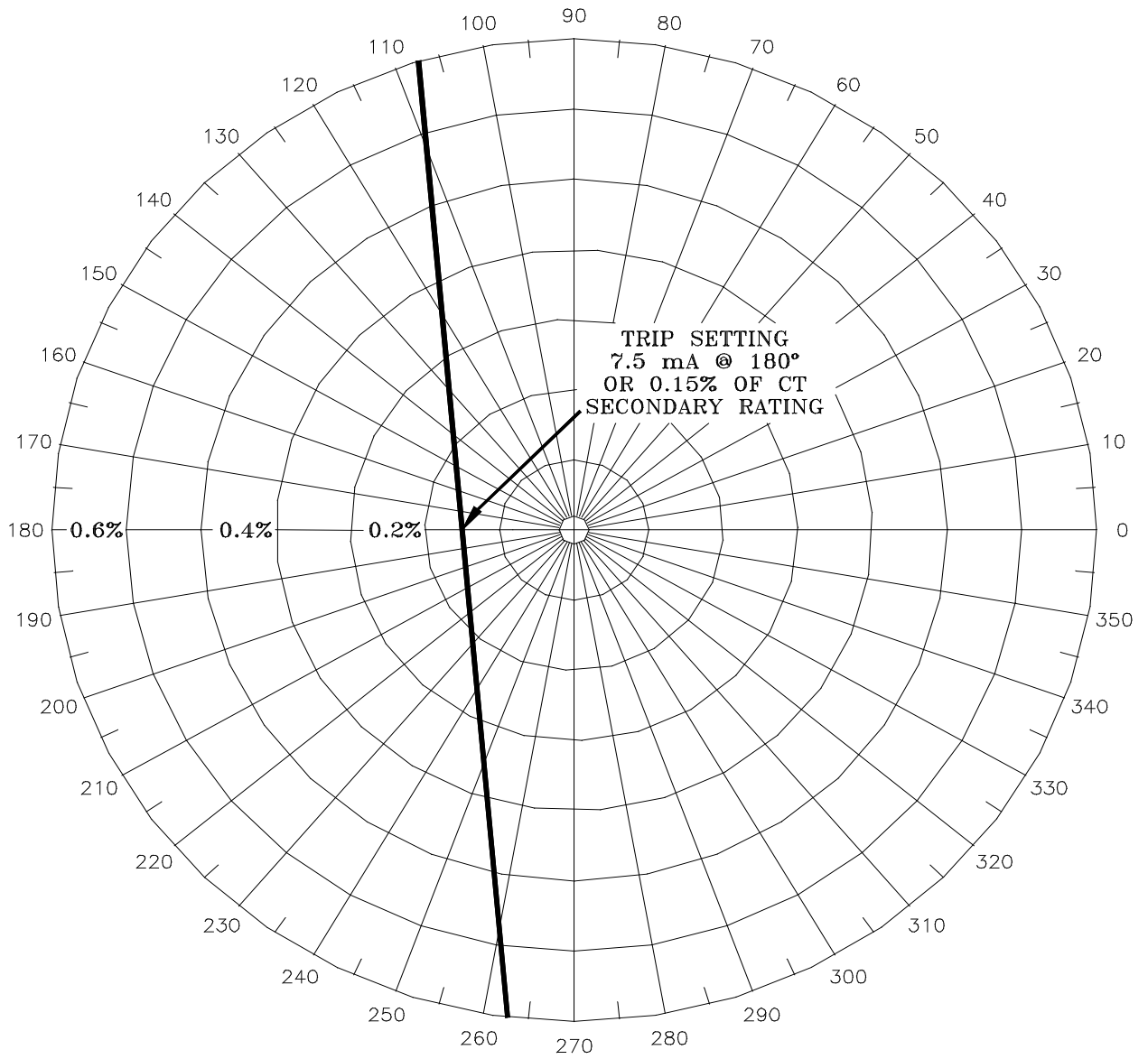
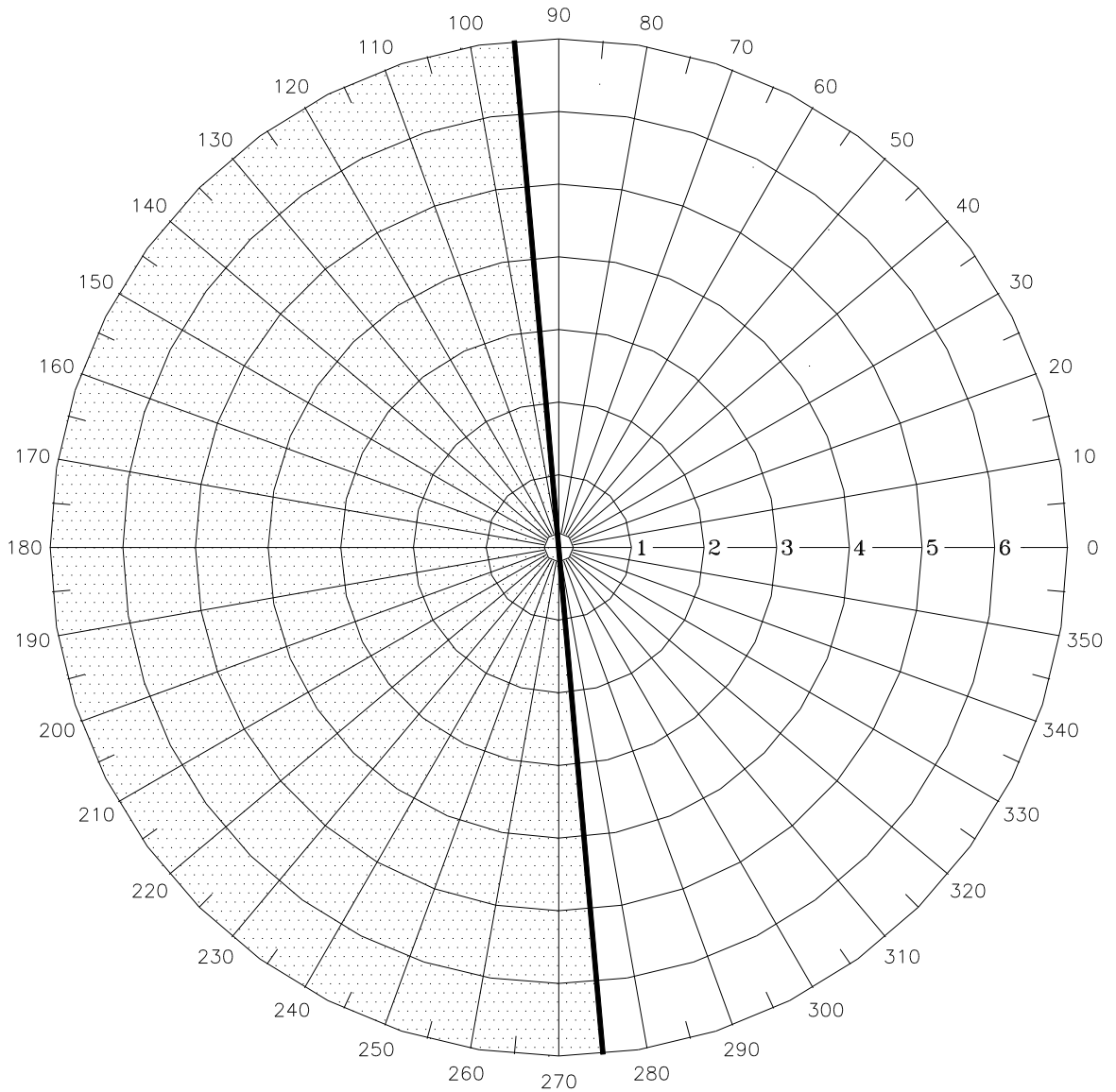


Figure 38 - Sensitive Trip Characteristic (Low Current Region)

NOTES:

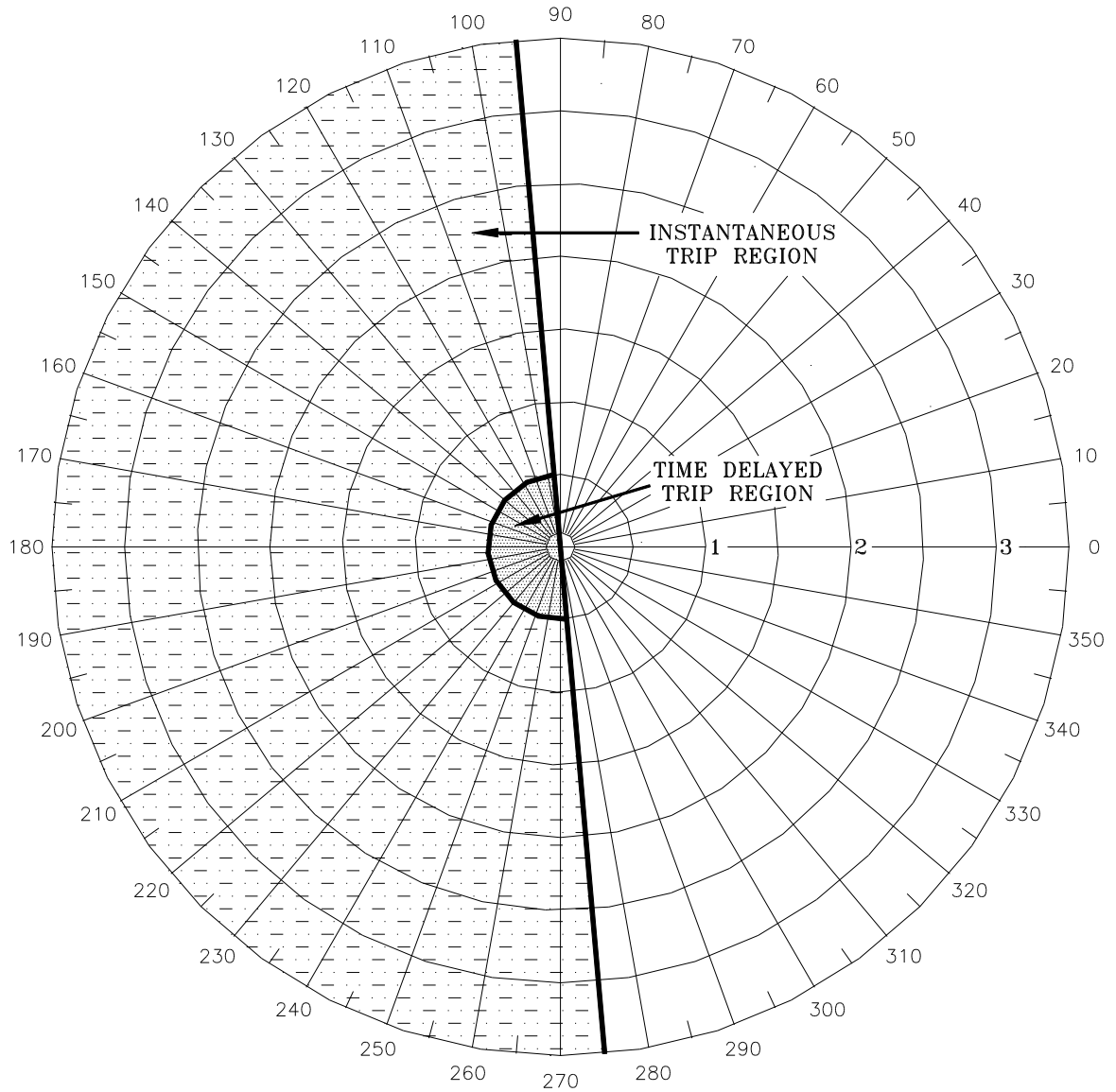
1. Divisions are in percentage of 5 amp Current Transformer rating.



NOTES:

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

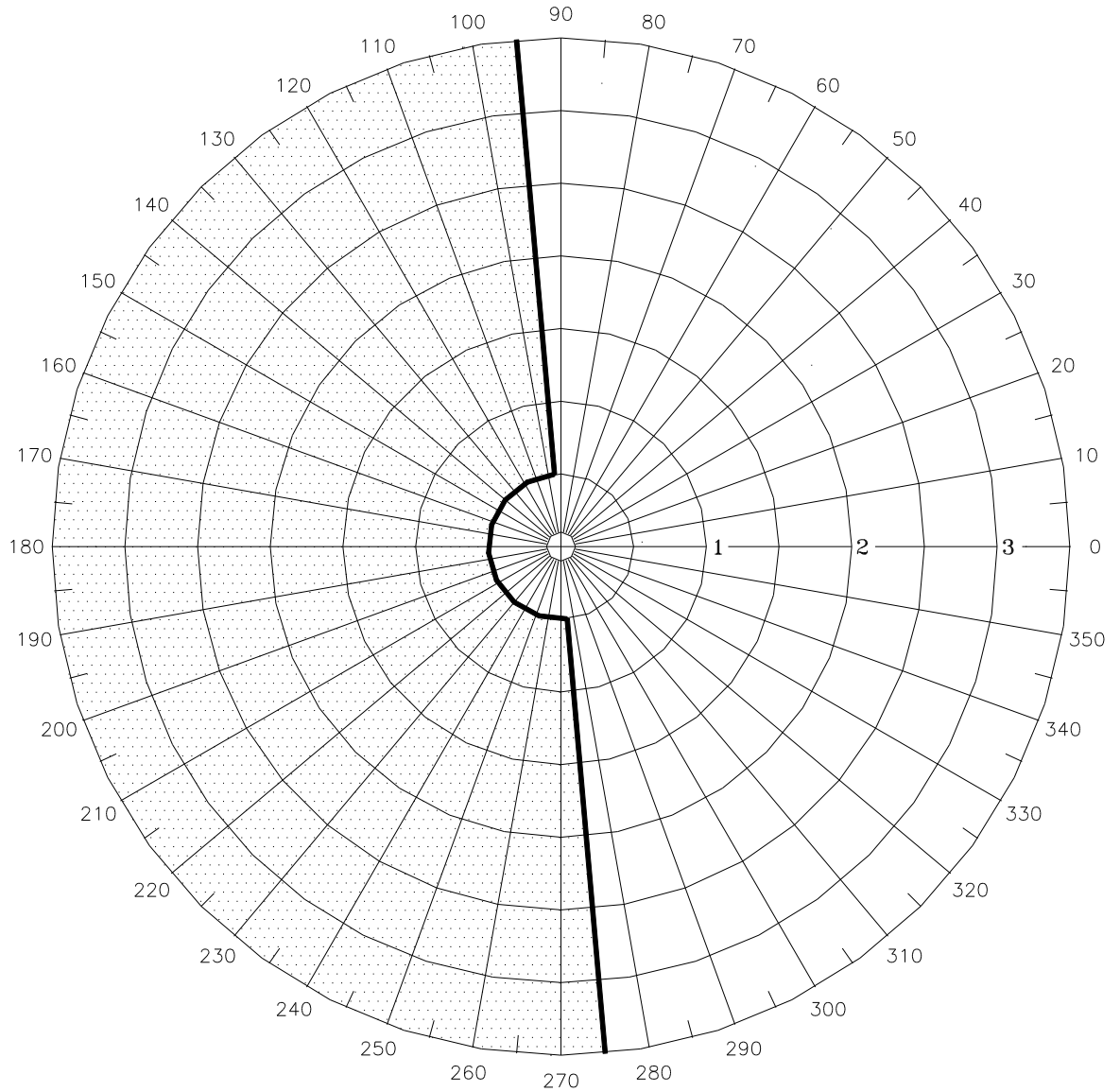
Figure 39 - Sensitive Trip Characteristic (High Current Region)



NOTES:

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

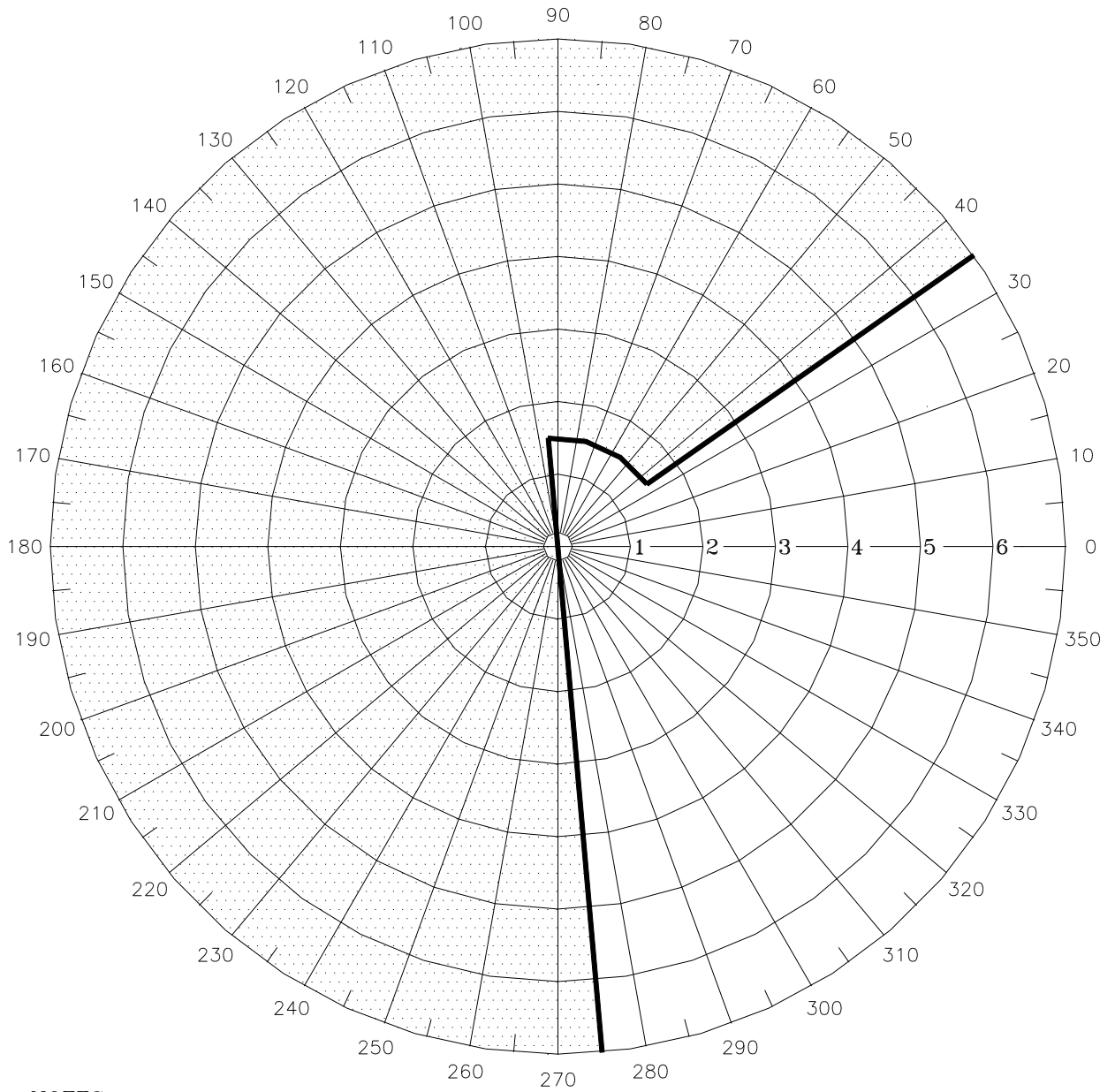
Figure 40 - Time Delay Trip Characteristic



NOTES:

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

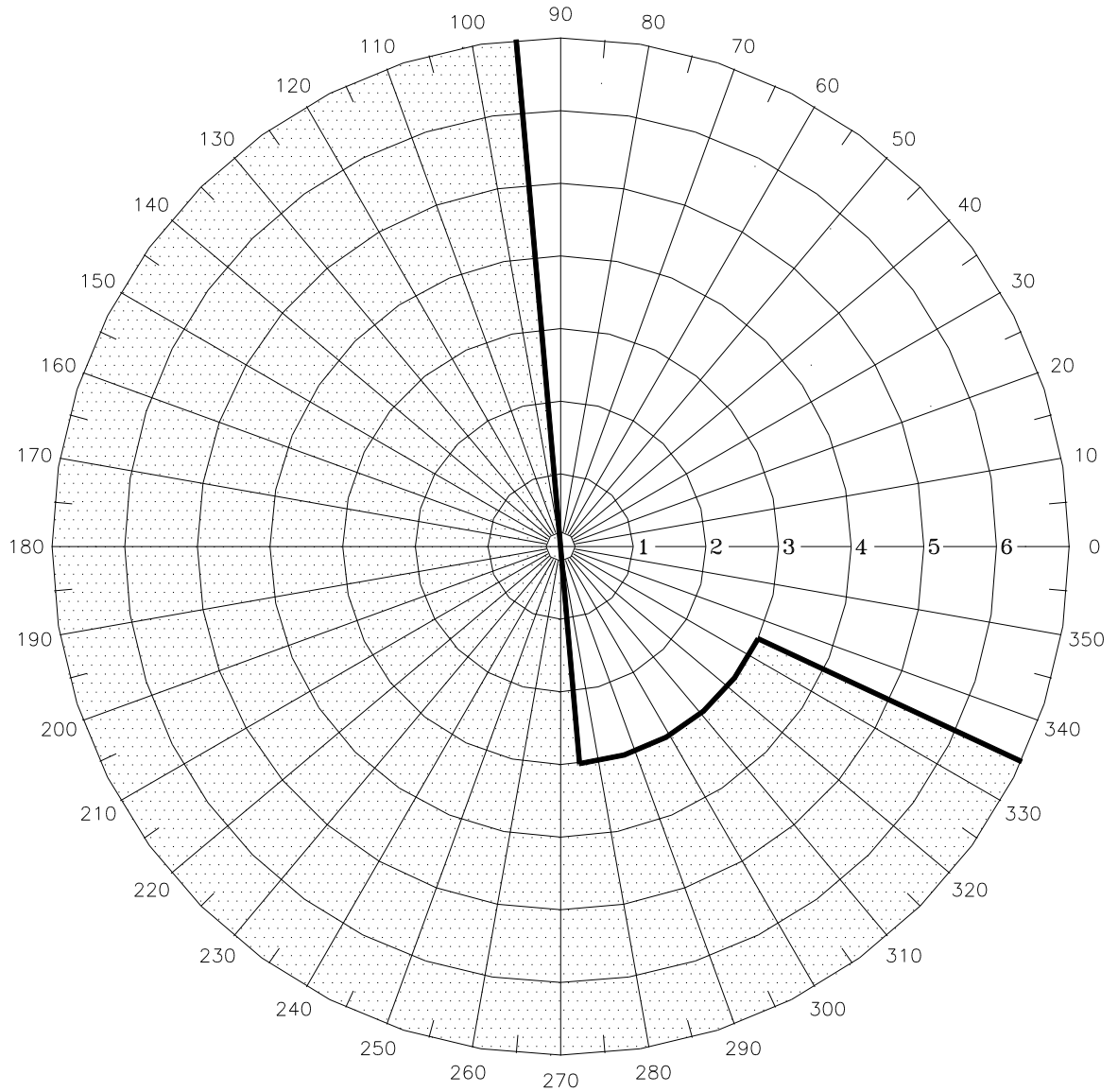
Figure 41 - Insensitve Trip Characteristic



NOTES:

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

Figure 42 - WattVar Trip Characteristic (WA=-60°)



NOTES:

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

Figure 43 - Inverse WattVar Trip Characteristic (WA=+60°)

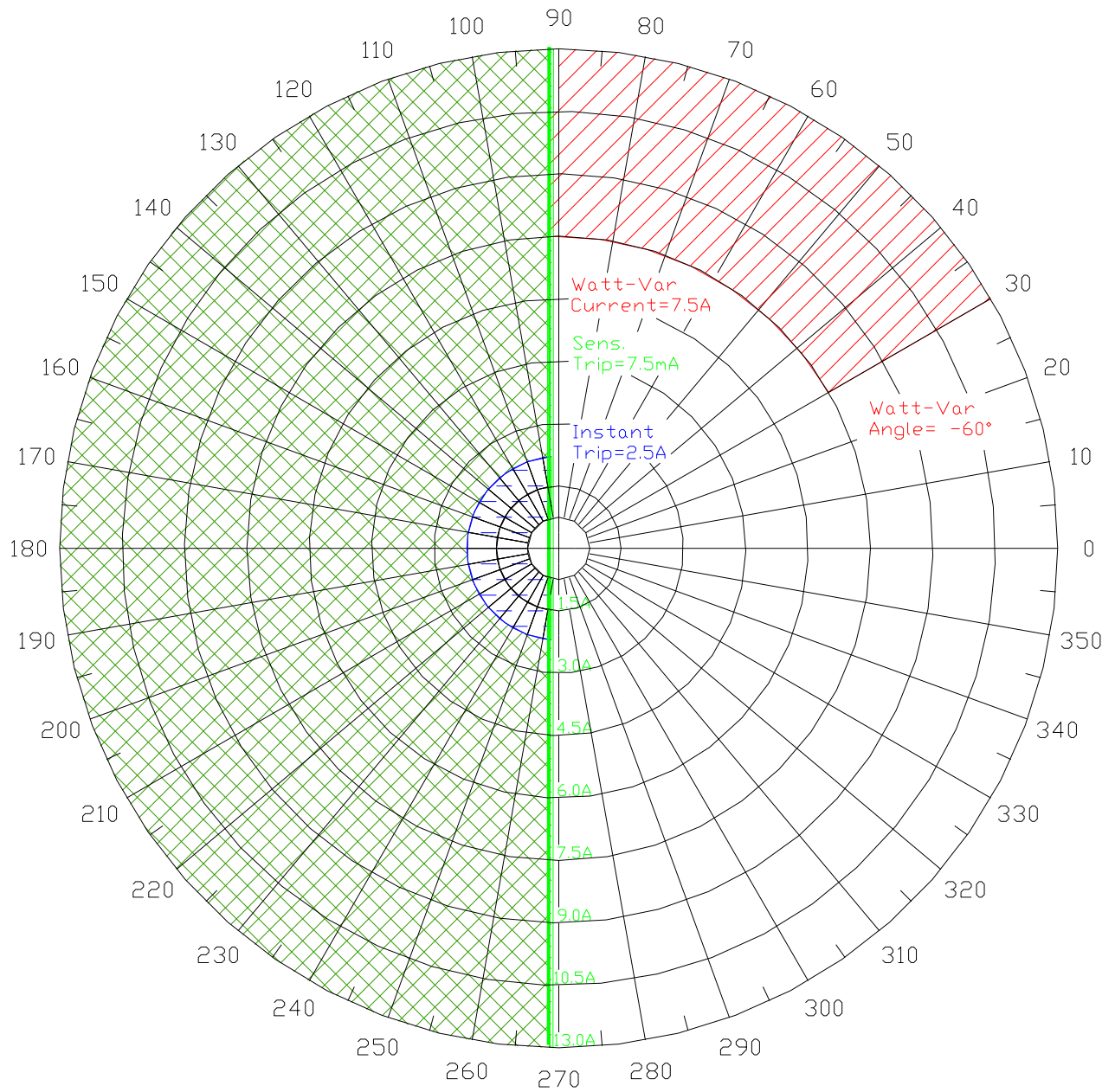


Figure 44 - Delayed Watt-Var Characteristic

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Appendix B. MNPR[®] Pinouts

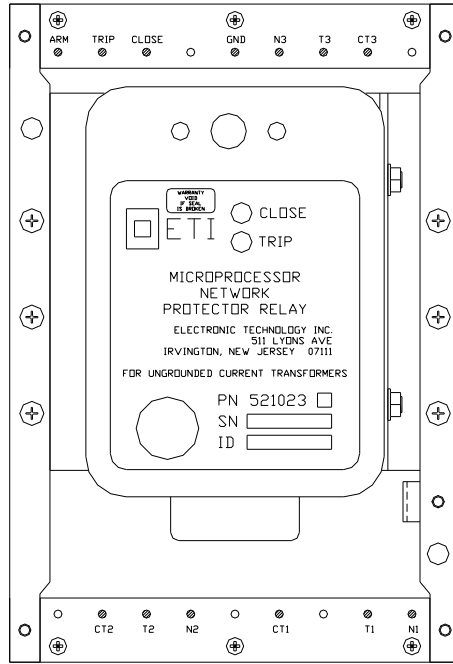


Figure 45 - WH Relay

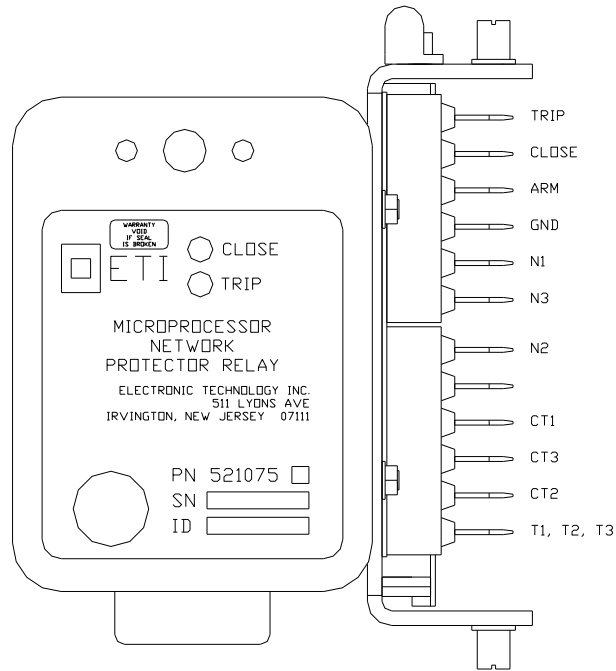


Figure 46 - GE Relay

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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 |

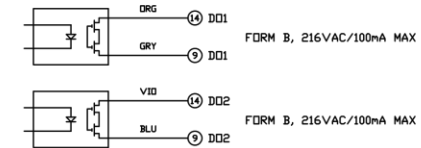
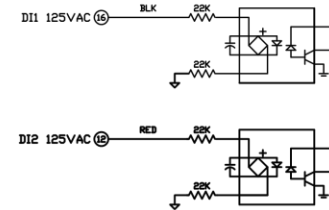
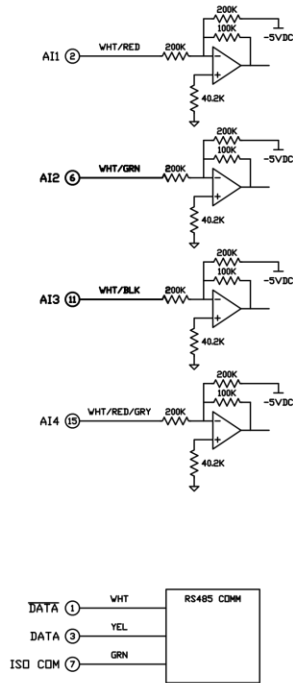
| Digital Inputs | | |
|--------------------------------------|-------------------------------------|--------------|
| Index | Description | Class |
| 1 | Factory Defaults | 1 |
| 2 | Network Volts Too Low To Close | 1 |
| 5 | Watt-Var Trip Mode | 1 |
| 6 | Time Delay Trip Mode | 1 |
| 7 | Insensitive 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 |

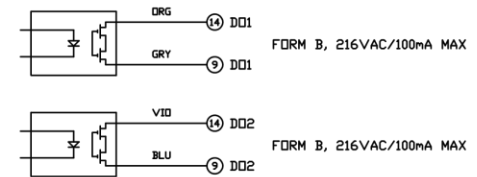
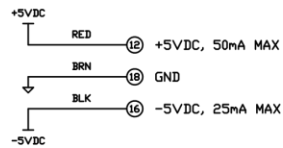
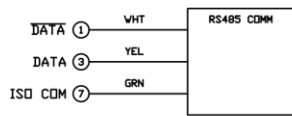
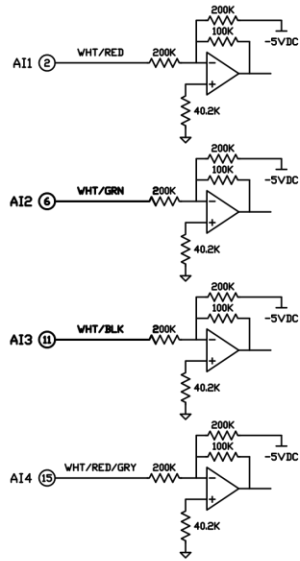


MATERIAL - AS NOTED
 FINISH - NONE
 QUANTITY PER UNIT - 1
 QEM P/N-
 SCALE - 1:1
 UNLESS OTHERWISE SPECIFIED
 DIMENSIONS ARE IN INCHES
 DIMENSION TOLERANCES
 FRACTIONAL = ±1/64
 DECIMAL 0.XX = ±0.010
 DECIMAL 0.XXX = ±0.005
 ANGULAR ±0.5°

FILENAME: EC50893-H ISO RS485_customer

| REV | DATE | BY | DESCRIPTION |
|---|----------|-----------------|---------------------|
| 0 | 06/12/15 | DTD | RELEASE |
| ELECTRONIC TECHNOLOGY INCORPORATED CLAIMS PROPRIETARY RIGHTS IN THE MATERIALS ENCLOSED HEREIN. IT MAY NOT BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT WRITTEN PERMISSION. | | | |
| ELECTRONIC TECHNOLOGY INC. 511 LYONS AVENUE IRVINGTON, N.J. 07111 | | | |
| MNPR37 - REV7 | | | |
| ISSRD | DATE | AUX I/O-H RS485 | |
| DRPTD | DATE | 06/12/15 | AUX I/O CONNECTIONS |
| CRKD | DATE | DB NLI | DWG NLI |
| APPVD | DATE | REV | EC50895 |

| FUNCTION | COLOR | PIN |
|----------|-------------|-----|
| AI1 | WHT/RED | 2 |
| AI2 | WHT/GRN | 6 |
| AI3 | WHT/BLK | 11 |
| AI4 | WHT/RED/GRY | 15 |
| GND | BRN | 18 |
| DD1 | DRG | 14 |
| DD1 | GRY | 9 |
| DD2 | VID | 17 |
| DD2 | BLU | 13 |
| -5V@25mA | BLK | 16 |
| +5V@50mA | RED | 12 |
| DATA | WHT | 1 |
| DATA | YEL | 3 |
| ISO_GND | GRN | 7 |

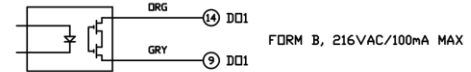
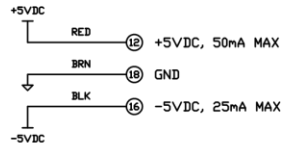
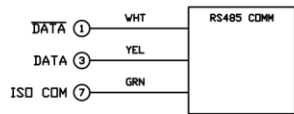
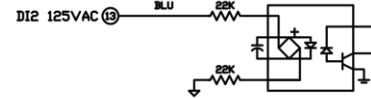
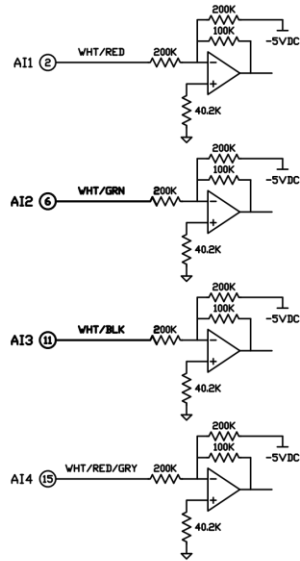


MATERIAL - AS NOTED
 FINISH - NONE
 QUANTITY PER UNIT - 1
 OEM P/N-
 SCALE - 1:1
 UNLESS OTHERWISE SPECIFIED
 DIMENSIONS ARE IN INCHES
 DIMENSION TOLERANCES
 FRACTIONAL = ±1/64
 DECIMAL 0.XX = ±0.010
 DECIMAL 0.XXX = ±0.005
 ANGULAR ±0.5°

FILENAME: EC50896-H2 ISO RS485_customer

| REV | DATE | BY | DESCRIPTION |
|--|----------|------------------|---------------------|
| 0 | 06/12/15 | DTD | RELEASE |
| ELECTRONIC TECHNOLOGY INCORPORATED CLAIMS PROPRIETARY RIGHTS IN THE MATERIALS DISCLOSED HEREIN. IT MAY NOT BE DISCLOSED TO OTHERS NOR USED FOR ANY PURPOSES WITHOUT WRITTEN PERMISSION. | | | |
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| DSGND | DATE | AUX I/O-H2 RS485 | |
| DRFTD | DTD | DATE 06/12/15 | AUX I/O CONNECTIONS |
| CHKD | DATE | ID NO. | DRWG NO. |
| APPVD | DATE | REV | EC50896 |

| 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 |
| DD1 | DRG | 14 |
| DD1 | GRY | 9 |
| -5V@25mA | BLK | 16 |
| +5V@50mA | RED | 12 |
| DATA | WHT | 1 |
| DATA | YEL | 3 |
| ISO_GND | GRN | 7 |

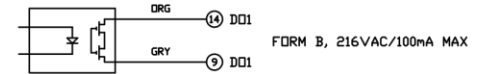
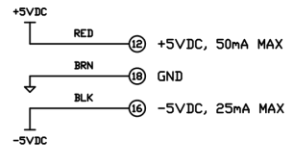
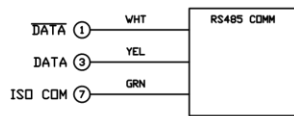
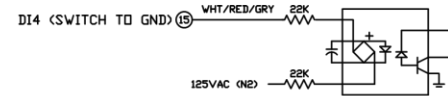
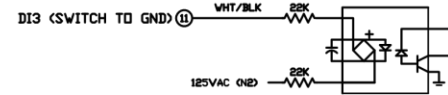
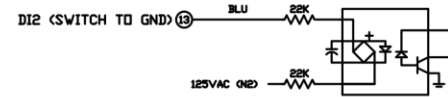
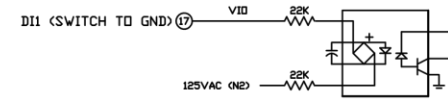
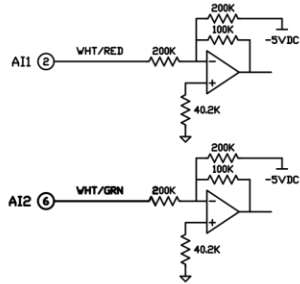


MATERIAL - AS NOTED
 FINISH - NONE
 QUANTITY PER UNIT - 1
 DEM P/N-
 SCALE - 1:1
 UNLESS OTHERWISE SPECIFIED
 DIMENSIONS ARE IN INCHES
 DIMENSION TOLERANCES
 FRACTIONAL = ±1/64
 DECIMAL 0.XX = ±0.010
 DECIMAL 0.XXX = ±0.005
 ANGULAR ±0.5°

FILENAME: EC50893-H3 ISO RS485_customer

| REV | DATE | BY | DESCRIPTION |
|--|----------|------------------|---------------------|
| 0 | 06/12/15 | DTD | RELEASE |
| 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 | | | |
| DSGND | DATE | AUX I/O-H3 RS485 | |
| DRP TD | DATE | 06/12/15 | AUX I/O CONNECTIONS |
| CHKD | DATE | ID NDL | DRG NDL |
| APPVD | DATE | REV | EC50893 |

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



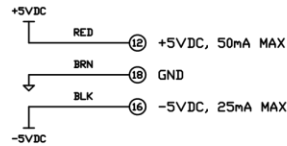
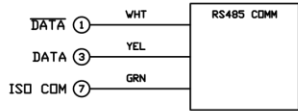
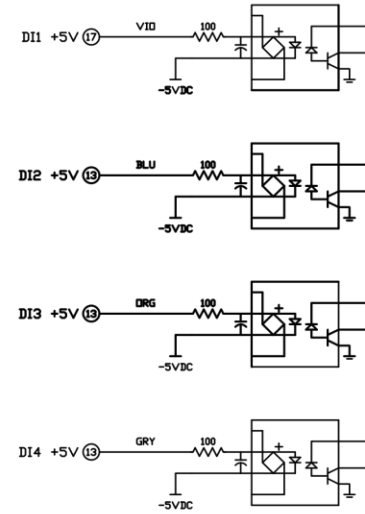
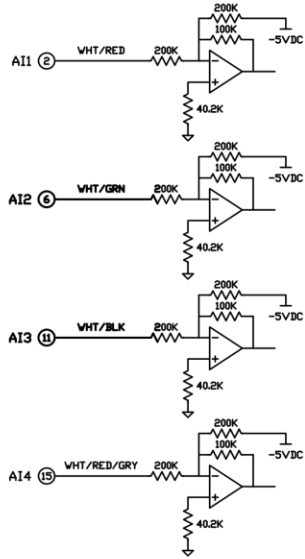
FORM B, 216VAC/100mA MAX

MATERIAL - AS NOTED
 FINISH - NONE
 QUANTITY PER UNIT - 1
 DEM 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

| REV | DATE | BY | DESCRIPTION |
|--|----------|------------------|--|
| 0 | 06/12/15 | DTD | RELEASE |
| ELECTRONIC TECHNOLOGY INCORPORATED CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HEREIN. IT MAY NOT BE REPRODUCED TO OTHERS NOR USED FOR ANY PURPOSES WITHOUT WRITTEN PERMISSION. | | | |
| ELECTRONIC TECHNOLOGY INC. | | | 511 LYONS AVENUE IRVINGTON, N.J. 07111 |
| MNP37 - REV7 | | | |
| ISSND | DATE | AUX I/O-H4 RS485 | |
| DRFTD | DTD | DATE | 06/12/15 |
| 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 | DRG | 14 |
| DI4 | GRY | 9 |
| -5V@25mA | BLK | 16 |
| +5V@50mA | RED | 12 |
| DATA | WHT | 1 |
| DATA | YEL | 3 |
| ISO_GND | GRN | 7 |

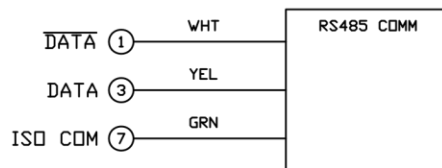
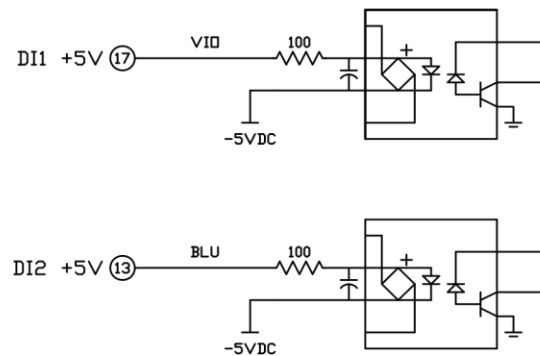
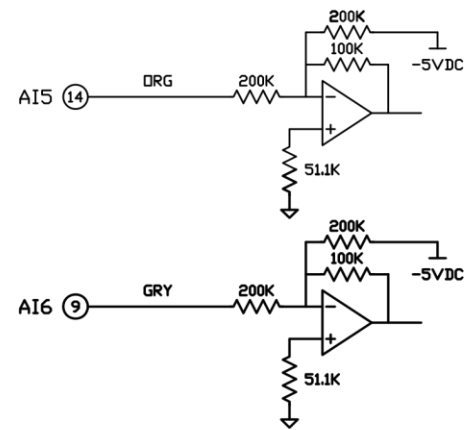
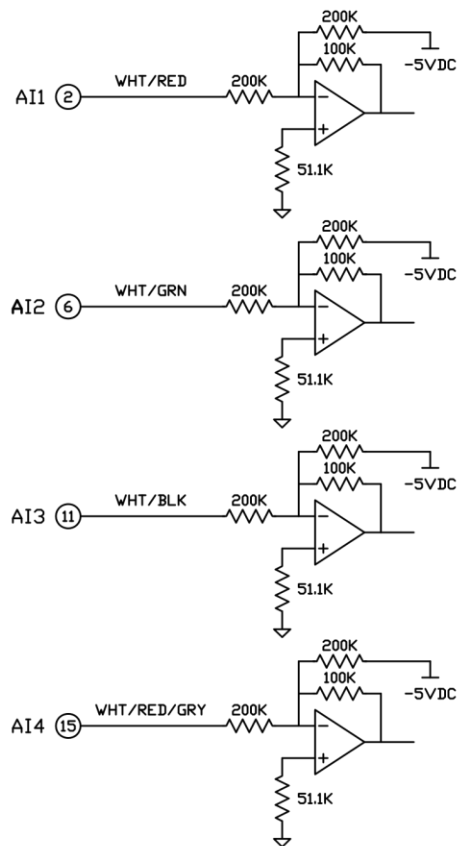


MATERIAL - AS NOTED
 FINISH - NONE
 QUANTITY PER UNIT - 1
 OEM P/N -
 SCALE - 1:1
 UNLESS OTHERWISE SPECIFIED
 DIMENSIONS ARE IN INCHES
 DIMENSION TOLERANCES
 FRACTIONAL = ±1/64
 DECIMAL 0.XX = ±0.010
 DECIMAL 0.XXX = ±0.005
 ANGULAR ±0.5°

FILENAME: EC50894-H5 ISO RS485_customer

| REV | DATE | BY | DESCRIPTION |
|---|----------|------------------|---------------|
| 0 | 06/12/15 | DTD | RELEASE |
| ELECTRONIC TECHNOLOGY INCORPORATED <small>CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HEREIN. IT MAY NOT BE DISCLOSED TO OTHERS NOR USED FOR ANY PURPOSE WITHOUT WRITTEN PERMISSION.</small> | | | |
| ELECTRONIC TECHNOLOGY INC. 511 LYONS AVENUE IRVINGTON, N.J. 07111 | | | MNPR37 - REV7 |
| DSGND | DATE | AUX I/O-H5 RS485 | |
| DRFTD | DTD | DATE | 06/12/15 |
| CHKD | DATE | ID NO. | DWG NO. |
| APPVD | DATE | REV | EC50894 |

| 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 |



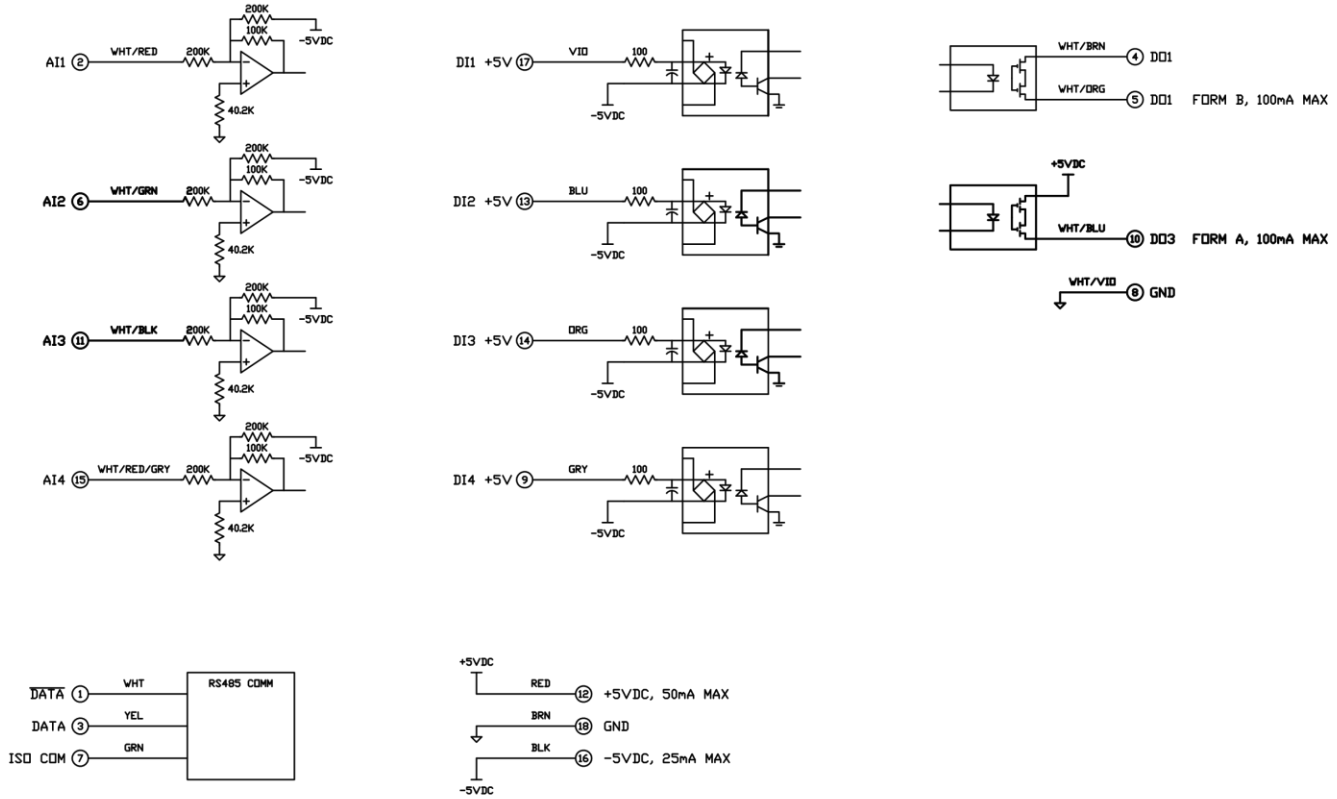
NOTES:

- +5V MAX CURRENT 50MA
- 5V MAX CURRENT 25MA

FILENAME: EA50647-H6 ISO RS485_customer

| REV | DATE | BY | DESCRIPTION |
|--|----------|---------------|---------------------------|
| 0 | 12/26/12 | JD | RELEASE |
| ELECTRONIC TECHNOLOGY INCORPORATED CLAIMS PROPRIETARY RIGHTS IN THE MATERIAL DISCLOSED HEREON. 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 | DRG | 14 |
| DI4 | GRY | 9 |
| +5V@50mA | RED | 12 |
| -5V@25mA | BLK | 16 |
| DATA | WHT | 1 |
| DATA | YEL | 3 |
| ISO_GND | GRN | 7 |
| DD1 | WHT/BRN | 4 |
| DD1 | WHT/DRG | 5 |
| GND | WHT/VIO | 8 |
| DD3 | WHT/BLU | 10 |

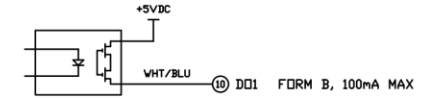
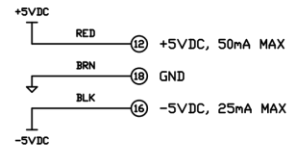
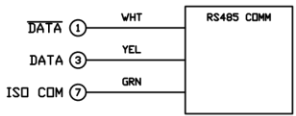
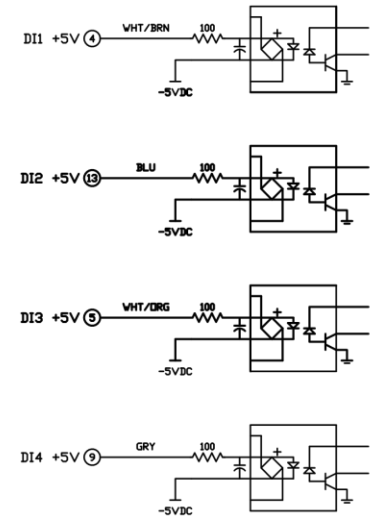
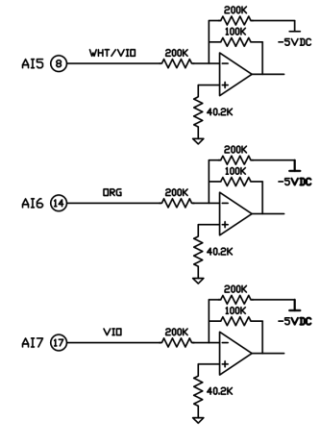
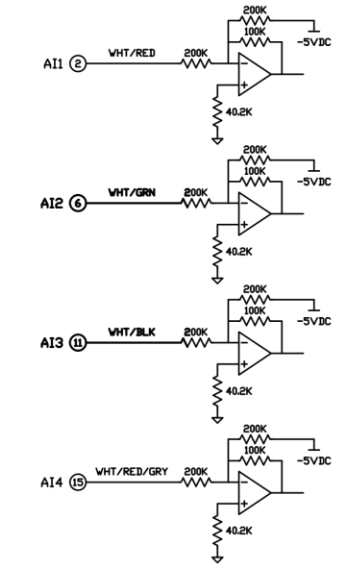


MATERIAL - AS NOTED
 FINISH - NONE
 QUANTITY PER UNIT - 1
 DEM P/N-
 SCALE - 1:1
 UNLESS OTHERWISE SPECIFIED
 DIMENSIONS ARE IN INCHES
 DIMENSION TOLERANCES
 FRACTIONAL = ±1/64
 DECIMAL 0.XX = ±0.010
 DECIMAL 0.XXX = ±0.005
 ANGULAR ±0.5°

FILENAME: EC50740-H8 ISO RS485_customer

| REV | DATE | BY | DESCRIPTION |
|--|---------|---------|--|
| 0 | 10/7/13 | JD | RELEASE |
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| DRPFD | DATE | 10/7/03 | AUX I/O-H8 RS485 |
| CHKD | DATE | | ID NO. |
| APPVD | DATE | | DWG NO. EC50740 |

| 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 | DRG | 14 |
| AI7 | VIO | 17 |
| DI1 | WHT/BRN | 4 |
| DI2 | BLU | 13 |
| DI3 | WHT/DRG | 5 |
| DI4 | GRY | 9 |
| DD1 | WHT/BLU | 10 |
| -5V@25mA | BLK | 16 |
| +5V@50mA | RED | 12 |
| DATA | WHT | 1 |
| DATA | YEL | 3 |
| ISO_GND | GRN | 7 |



MATERIAL - AS NOTED
FINISH - NONE
QUANTITY PER UNIT - 1
DEM 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_R1

| REV | DATE | BY | DESCRIPTION |
|--|----------|------------------|--|
| 1 | 06/12/15 | DTD | FIX DD1 (WAS FORM A) |
| 0 | 10/1/13 | JD | RELEASE |
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| MNP37 - REV7 | | | |
| ISSND | DATE | AUX I/O-H9 RS485 | |
| DRFTD | JD | DATE | 10/1/03 |
| CHKD | DATE | ID NO. | DDWG NO. |
| APPVD | DATE | REV | 1 |

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 protector’s “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 47, 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”.

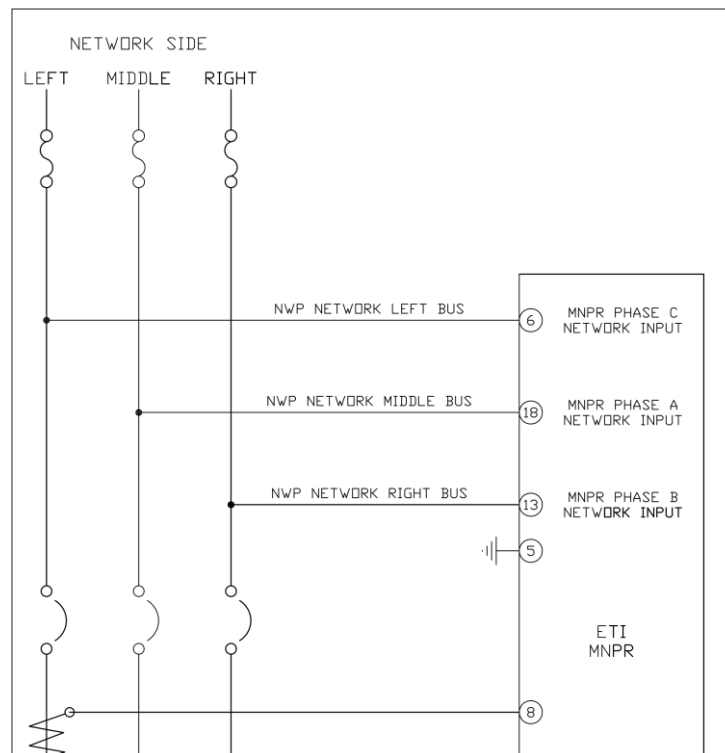


Figure 47