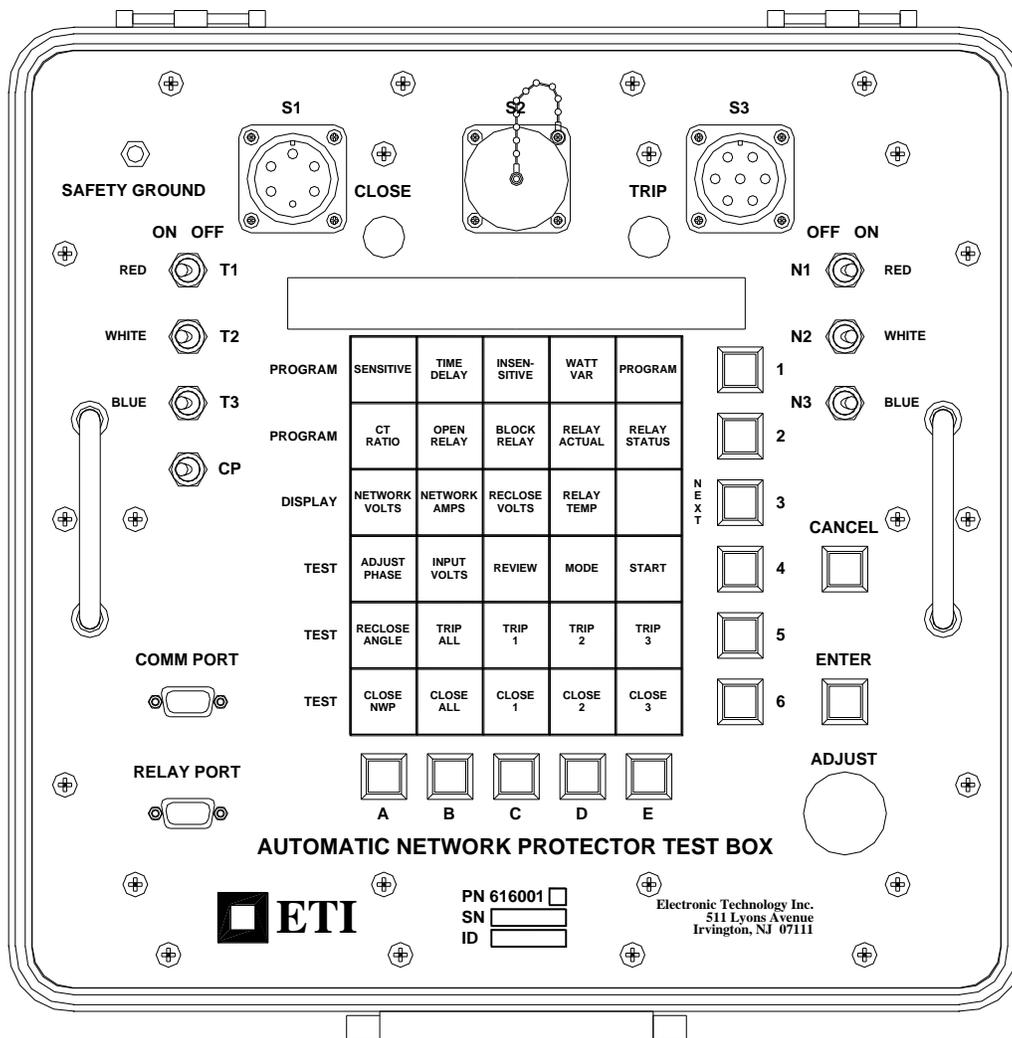


# ETI MODEL 616001 AUTOMATIC NETWORK PROTECTOR RELAY TEST BOX

## Instruction Manual

Revision 11



Electronic Technology Incorporated  
 511 Lyons Avenue, Irvington, NJ 07111  
 (973) 371-5160 FAX (973) 371-1929  
 www.eti-nj.com sales@eti-nj.com

THIS PAGE INTENTIONALLY LEFT BLANK

# REVISIONS

<b>Revision</b>	<b>Date</b>	<b>Details</b>
1	03/01/2004	Initial Revision
2	03/16/2004	Converted to MS Word
3	03/31/2004	Added Time Delay Test Instructions
4	06/22/2004	Fixed Error in Setup/Connections Section
5	12/02/2004	Updated for Rev4 Hardware
7	06/27/2006	Add Reset Relay command
8	03/03/2011	Add Firmware Update section - Formatting fixes - Remove Relay Cradle
9	07/11/2011	Added Fuse Information -- Added section for Input Volts feature (3.IV)
10	02/14/2012	Revised Firmware Update Section
11	11/17/2020	Added 50 foot cable option

THIS PAGE INTENTIONALLY LEFT BLANK

# SAFETY PRECAUTIONS

## WARNING

**There are potentially dangerous/lethal voltages present during the operation of this test equipment. Failure to follow the instructions in this manual could result in serious injury or death.**

The following safety precautions should be followed at all times to prevent personal injury or equipment damage:

1. Always wear proper safety equipment (properly rated gloves, safety glasses, etc) when working with the ETI Automatic Network Protector Test Box.
2. Ensure that all the front panel circuit breakers are all in the off position prior to making any connections to a protector or network bus.
3. No relay is to be either removed or installed while the network protector is energized.
4. Use only recommended fuses.
5. Inspect all cables prior to use.

THIS PAGE INTENTIONALLY LEFT BLANK

# TABLE OF CONTENTS

1. Overview .....	1
2. Setup/Connections .....	5
3. General Operating Procedures .....	7
4. Manual Operating Procedures.....	9
5. Automatic Operating Procedures .....	13
6. ETI MNPR <sup>®</sup> Programming Instructions .....	15
7. Troubleshooting .....	21
8. Fuse Replacement .....	23
Appendix A - Specification Sheet.....	25
Appendix B - Firmware Update.....	27
Appendix C - Fused Input Power Leads - P/N 131-1115-30(40) .....	29

THIS PAGE INTENTIONALLY LEFT BLANK

# 1. Overview

## I. SCOPE

This specification describes the operation of the ETI Automatic Network Protector Test Box Model 616001 (henceforth referred to as the “Test Box”) and the testing of network protectors and relays in the field.

## II. ABOUT THIS DOCUMENT

The various fonts used throughout this document have the following meanings:

- A. Items that are printed on the front panel of the Test Box are shown in boldface italics, for example ***TRIP ALL***.
- B. Text that appears on the Test Box’s display is printed in typewriter font and enclosed in quotes. For example “**Enter Selection: \_\_\_**”.
- C. Controls, such as buttons and breakers are shown in boldface, for example **CANCEL**.
- D. A button sequence used to select a particular function (described in detail in Section V.B.2.c) are shown in boldface between angle brackets, for example **<B,5>**.

## III. GENERAL

- A. The Test Box is used to determine network protector electro-mechanical master and phasing relay settings, solid state relay settings or microprocessor relay settings under field conditions without removing the relays from the protector.
- B. This Test Box also has the capability to display and modify the status and settings of the ETI MNPR®.
- C. The Test Box can be used in all locations on both 216 and 480 volt network protectors. The Test Box is capable of auto-sensing the input voltage.
- D. The Test Box is available in two models
  - 1. P/N 616001-10 – 1/4 Turn Connectors
  - 2. P/N 616001-20 – Fully Threaded Connectors

## IV. SUPPLIED EQUIPMENT

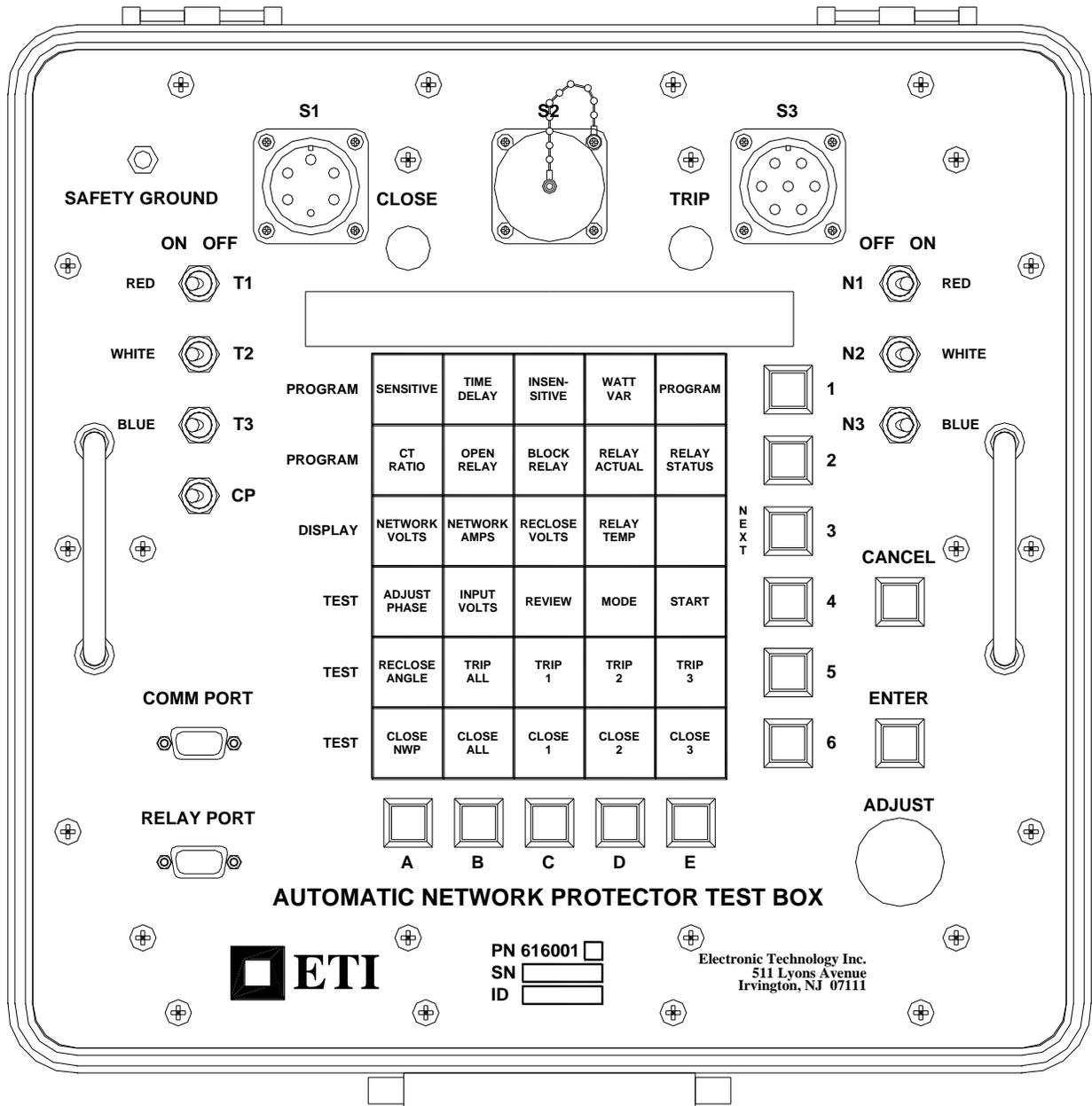
The following accessories are included with the Test Box:

- A. A copy of this manual
- B. Fused Input Power Leads P/N 131-1115-30 (1/4 Turn) or 131-1115-40 (Threaded)
- C. Network Protector Connection Leads P/N 131-1114-10 (1/4 Turn) or 131-1114-20 (Threaded)
- D. A Green/Yellow grounding cable P/N 131-1116-00
- E. Relay Optical Cable P/N 521129
- F. Serial cable for PC interface P/N 131-1263-00

## V. DESCRIPTION OF THE TEST BOX

- A. The Test Box is a portable unit provided with a removable cover in which associated cables are stored. Figure 1 shows the main panel and the location of the various controls and operating parts.
- B. The following controls and indicators are referred to throughout this manual and are listed below in order to acquaint the operator of the Test Box with their location and function.

1. The variable adjust knob is located on the lower right side. This control is used to vary the voltage, current or angle applied when testing. The knob is an electronic encoder, so there is no need to return it to zero (there are no stops, it spins freely) after every test.
2. The function pushbuttons are arranged in a x-y grid in the center of the panel.
  - a. The top 5 x 3 grid perform programming functions for ETI MNPR<sup>®</sup> relays.
  - b. The bottom 5 x 3 grid provide manual and automatic control of the Test Box.
  - c. To select a function, find the desired item on the faceplate's function grid (for example **TRIP ALL**). Follow down from the desired function to get the letter associated with it (in this case press **B**). Then follow right from the desired function to obtain the corresponding number (in this case press **5**). Thus, to start a **TRIP ALL** test, you would select **<B,5>**.
  - d. Note that the **3** button serves a double function as **NEXT**.
  - e. There are two other buttons on the panel which are not part of the grid.
    - i. **ENTER** – This button is used to acknowledge a prompt from the Test Box, effectively saying yes to any question it may be asking you.
    - ii. **CANCEL** – This button is used to cancel what the Test Box is currently doing. If a test is being run, pressing **CANCEL** will stop it. If the Test Box is asking you to acknowledge something, pressing **CANCEL** is how you say no. If at any time you find yourself in an unwanted mode, simply press **CANCEL** until the Test Box returns to the "**Enter Selection: \_\_**" prompt.
3. The three network circuit breakers (20 Amp) are located on the upper right hand side of the panel. These are used to connect and disconnect the Test Box from the network side of the protector.
4. The three transformer circuit breakers (20 Amp) are located on the upper left hand side of the panel. These are used to connect and disconnect the Test Box from the transformer side of the protector.
5. One 5 Amp circuit breaker (labeled **CP**) is located on the left hand side of the panel. This breaker is used to power and protect the control circuits.
6. The red **CLOSE** and green **TRIP** indicator lights are located above display. These lights are used to indicate in which position the microprocessor or solid state relay is in when testing the relay off the protector with optional relay cradle (unavailable at this time).



**Figure 1: ETI Automatic Protector Test Box Faceplate**

THIS PAGE INTENTIONALLY LEFT BLANK

## 2. Setup/Connections

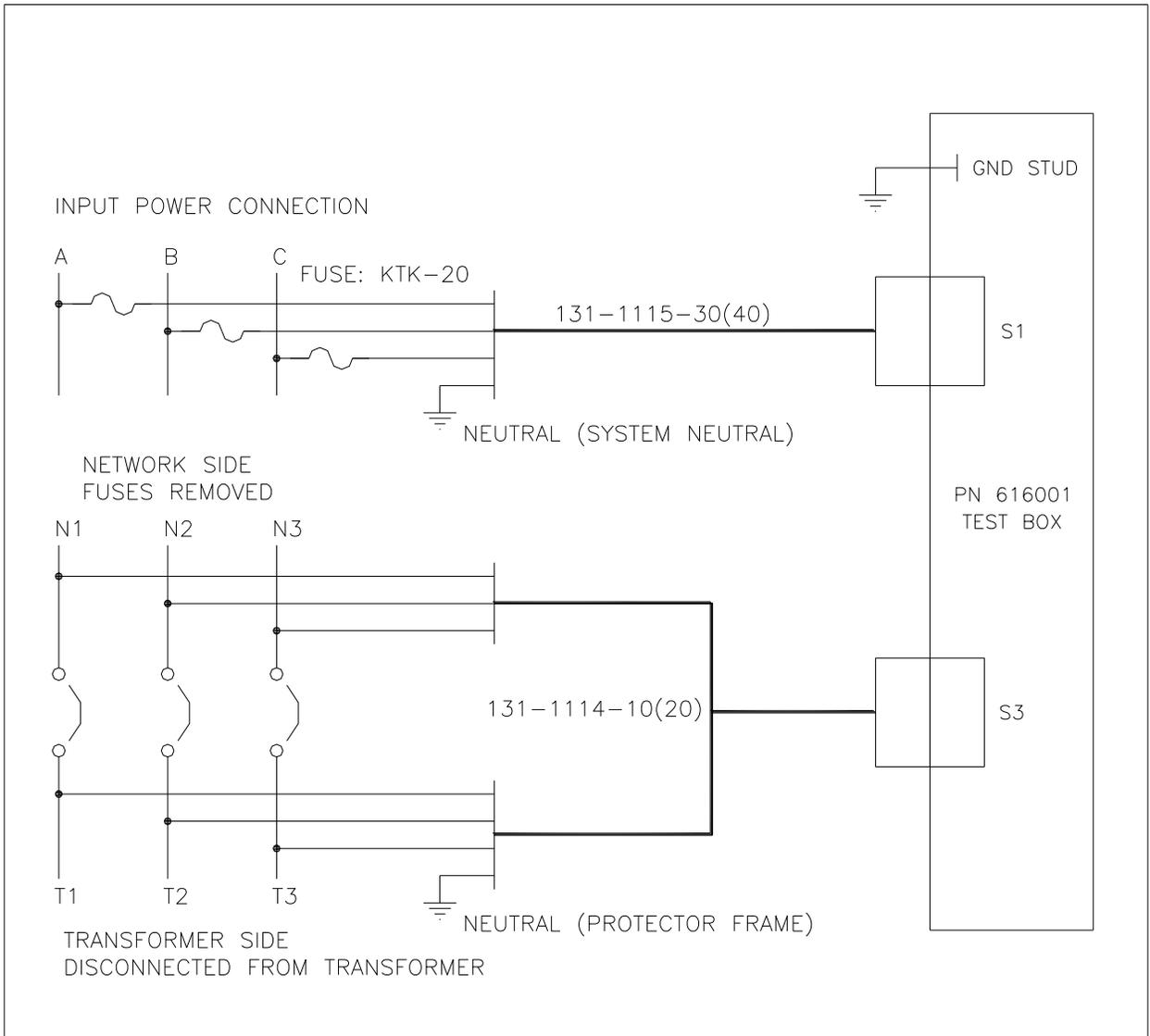
### I. PRELIMINARY OPERATING PROCEDURE

- A. De-energize and rack out the protector.
- B. After opening the Test Box, remove and inspect all cables.
- C. Ensure all Test Box circuit breakers (**CP**, **T1**, **T2**, **T3**, **N1**, **N2**, **N3**) are in the *OFF* position.
- D. Attach the two sets of test leads to the connectors labeled *SI* and *S3*. *SI* is the input power to the Test Box. *S3* provides a connection to the protector under test.
- E. Connect the Test Box to the protector and system power as shown in Figure 2
  1. Connect the three transformer leads of the Test Box to the transformer side of the network protector as follows: T1 (red) to phase 1, T2 (white) to phase 2, and T3 (blue) to phase 3.
  2. Connect the three network leads of the Test Box to the network side of the protector as follows: N1 (red) to phase 1, N2 (white) to phase 2, and N3 (blue) to phase 3.
  3. Connect the ground lead (black) from the *S3* connector to the frame of the protector.
  4. Connect the ground lead (black) from the *SI* connector of the Test Box to a convenient system neutral.
  5. Connect the Green and Yellow ground cable to the provided stud on the top left corner of the Test Box's faceplate. Connect the ground clip (black boot) at the other end of this cable to a convenient system ground.

**Note: The ground stud and both neutral connections (from *SI* and *S3*) are connected internally to the metal chassis of the Test Box. Do NOT connect the ground clip to a different ground potential than the neutral clips.**
  6. Connect the input power cables to a source of power as follows: A (red) to phase 1, B (white) to phase 2, and C (blue) to phase 3.
- F. Switch the control power (**CP**) breaker on, the Test Box should now start up.
- G. Switch on the three network and three transformer breakers.

### II. DISCONNECTING INSTRUCTIONS

- A. Block the protector in the OPEN position using the handle.
- B. Switch the three network and the three transformer breakers to the *OFF* position.
- C. Switch the **CP** breaker to the *OFF* position.
- D. Remove the A, B, and C leads from the source of power.
- E. Remove the three network leads (N1, N2, N3) and the three transformer leads (T1, T2, T3) from the network protector.
- F. Remove the ground and neutral leads.
- G. Disconnect the *SI* and *S3* connectors from the Test Box.
- H. Pack all the leads neatly into the Test Box cover.
- I. If the relays and the network protector operated satisfactorily, put the network protector back on the system in the prescribed manner and leave network protector in the AUTO position unless otherwise directed.



**Figure 2: Test Box Connections**

# 3. General Operating Procedures

## I. CHOOSING AN OPERATING MODE

A mode is chosen by pressing **<D,4>**, rotating the **KNOB** until the desired mode is displayed, and pressing **ENTER** to select it.

### A. "Manual Mode"

This mode allows the user to manually vary the test variable (voltage, current, or angle depending on the chosen test) by turning the **KNOB** until the protector operates. Care should be taken not to advance the test variable faster than the relay/protector combination can respond, otherwise the setting may be advanced past where the protector would actually operate and erroneous values will be recorded. (The following two automatic modes will eliminate this possibility by automatically increasing the test variable)

### B. "Automatic Mode"

In this mode, the Test Box will automatically vary the test variable (voltage, current, or angle depending on the chosen test) in slow consistent increments until the protector operates, or the operating limits of the Test Box are reached.

### C. "ETI Auto Mode"

This mode is similar to the "Automatic Mode", except that communications are established with the MNPR<sup>®</sup> under test. This enables the Test Box to determine the expected operating parameters and quickly bring the test variable close to the set-point. It will then continue to increase the variable slowly until the protector operates or the operating limits of the Test Box are reached.

## II. STARTING THE TEST

A. Choose the test you would like to run, and enter its corresponding button sequence at the "Enter Selection: \_\_\_" prompt. (See Chapter 1 Section V.B.2.c for details)

B. The Test Box will now say "Verifying Connections...". During this time, the Test Box is checking for possible misconnections or improper switch position. The Test Box cannot detect all possible combinations of misconnections. If something wrong is detected one of the following messages will be displayed:

1. "No T1, Check BREAKER/FUSE/CLIP" – This indicates that the Test Box is not detecting any voltage on its T1 lead. Possible reasons for this include, a blown fuse on the input power leads, an alligator clip on the incoming power leads (those connected to **SI**) not making good contact, or simply a breaker left in the **OFF** position. Once this problem is resolved, the box should continue.
2. "No T2, Check BREAKER/FUSE/CLIP" – See 1 above, but check the fuse, clips, and breakers for phase 2.
3. "No T3, Check BREAKER/FUSE/CLIP" – See 1 above, but check the fuse, clips, and breakers for phase 3.
4. "Reverse Phase 2 and 3 Clips" – This indicates that the phase rotation is incorrect. As discussed in Chapter 1 Section III the Test Box is preset from the factory for a particular phase rotation. To continue testing, the phase 2 (white) and phase 3 (blue) clips on the incoming power leads (**SI**) can be swapped to reverse the rotation being presented to the Test Box.

5. "**Protector Already Closed**" – You are trying to perform a *CLOSE* or *RECLOSE ANGLE* test on a protector that is already closed. Manually open the protector and restart the test (be sure to leave the handle in AUTO after opening).
6. "**Protector Already Open**" – You are trying to perform a TRIP test on a protector that is already open. Manually close the protector and restart the test (be sure to leave the handle in AUTO after manual closure).
7. "**Bad Relay Setting for Test**" – This message only appears in "**ETI Auto Mode**". It indicates that one of the relay parameters are outside the testable range of the Test Box. For example, the relay is set for a higher trip current than the Test Box's maximum of 20.0 Amps.

### III. COMPLETING THE TEST

- A. If no error messages appeared after "**Verifying Connections...**", the selected test will begin.
- B. If for any reason you need to stop the test, press **CANCEL**. The Test Box will turn off its amplifiers and display "**Test Canceled**".
- C. If testing in "**Manual Mode**":
  1. Slowly turn the **KNOB** until the protector operates. The Test Box will detect the switch operation, and freeze the display with the result. Once this value is noted, press any key to return to the "**Enter Selection: \_\_**" prompt.
  2. If setting is turned up all the way and the protector still does not operate, there may be a problem with the protector. Press **CANCEL** to stop the test.
- D. If testing in "**Automatic Mode**" or "**ETI Auto Mode**":
  1. The Test Box will automatically increase the test variable with no user intervention until the protector operates. At this point, the Test Box will freeze the display with the test result. Once this value is noted, press any key to return to the "**Enter Selection: \_\_**" prompt.
  2. If there is a problem with the protector and it fails to operate, the Test Box will eventually reach its maximum possible output and either display "**Protector did Not Open**" or "**Protector Did Not Close**" depending on the type of test being run. To acknowledge this message and return to the "**Enter Selection: \_\_**" prompt, press any key.

### IV. Checking Input Voltage

- A. Put the Test Box into Voltage Display Mode
  1. Press **<B,4>**. The three phase to phase voltages should display on screen. They are displayed as **T12** (Phase 1 to Phase 2), **T23** (Phase 2 to Phase 3), and **T13** (Phase 1 to Phase 3).
  2. If desired, press **NEXT (3)** to switch the display between Phase to Phase and Phase to Neutral voltages.

# 4. Manual Operating Procedures

## I. ELECTRO-MECHANICAL RELAYS

- A. If you have not already done so, connect the Test Box as described in Chapter 2 Section I (Preliminary Operating Procedure)
- B. Press **<D,4>** and then rotate the **KNOB** until "**Manual Mode**" is displayed. Press **ENTER** to continue.
- C. For tests D through L (unless otherwise specified), the network protector shall be in the AUTO position and open.
- D. Press **<A,4>** *ADJUST PHASE* and then rotate **KNOB** until "+60°" phase is displayed. Press **ENTER** to continue.
- E. Press **<C,6>** *CLOSE 1*. Rotate the **KNOB** clockwise while watching the movable contact of the phasing relay. Record the voltage as the contacts make. This is the lead-voltage or reclose voltage of the phasing relay. If the movable contact moves away from the stationary close contact as the **KNOB** is advanced, or makes no attempt to close when a voltage of 1.0 volt is reached, do not continue with this test any further and proceed to step F.
- F. Press **<A,4>** *ADJUST PHASE* and then rotate the **KNOB** until "-60°" phase is displayed. Press **ENTER** to continue. Repeat the procedure as outlined in step E. Be sure to record the voltage reading as a lag-voltage.
- G. Press **<A,4>** *ADJUST PHASE* and then rotate the **KNOB** until "+0°" phase is displayed. Press **ENTER** to continue.
- H. Press **<C,6>** *CLOSE 1*. Rotate the **KNOB** clockwise while watching the movable contact of the master relay. The movable contact must move toward the close stationary contact for acceptable operation.
- I. Press **<D,6>** *CLOSE 2*. Rotate the **KNOB** clockwise while watching the movable contact of the master relay. The movable contact must move toward the close stationary contact for acceptable operation.
- J. Press **<E,6>** *CLOSE 3*. Rotate the **KNOB** clockwise while watching the movable contact of the master relay. The movable contact must move toward the close stationary contact for acceptable operation.
- K. Press **<B,6>** *CLOSE ALL*. Rotate the **KNOB** clockwise while watching the movable contact of the master relay. Record the voltage reading when the movable contact and the close stationary contact just make. The voltage reading obtained is the reclose voltage setting of the master relay.
- L. Press **<A,6>** *CLOSE NWP*. Put the network protector in the AUTO position. Rotate the **KNOB** clockwise while watching the movable contact of the master relay. Record the voltage reading when the network protector closes. The phase angle is automatically set to +10 degrees for this test.
- M. For tests N through Q (unless otherwise specified), the network protector shall be in the AUTO position and closed.
- N. For master relays set for sensitive operation
  1. Press **<C,5>** *TRIP 1*. Rotate the **KNOB** clockwise while watching the movable contact of the master relay. The movable contact must move towards the trip stationary contact for acceptable operation.

2. Press **<D,5> TRIP 2**. Rotate the **KNOB** clockwise while watching the movable contact of the master relay. The movable contact must move towards the trip stationary contact for acceptable operation.
  3. Press **<E,5> TRIP 3**. Rotate the **KNOB** clockwise while watching the movable contact of the master relay. The movable contact must move towards the trip stationary contact for acceptable operation.
  4. Press **<B,5> TRIP ALL**. Rotate the **KNOB** clockwise while watching the movable contact of the master relay. Record the current reading when the network protector trips. The current reading obtained is the reverse current setting of the master relay.
- O. For master relays with insensitive settings perform test N. The master relay contacts must move toward the TRIP stationary contact as the **KNOB** is advanced for acceptable relay operation.
- P. For network protectors with the 2AW-H, D1 or D2 desensitizing relay, remove the desensitizing relay, insert the 10 prong continuity plug in its place and test per step N.
- Q. For network protectors with a desensitizing relay other than the 2AW-H, D1, or D2 relays.
1. Press **<B,5> TRIP ALL**. Rotate the **KNOB** clockwise while watching the movable contact of the master relay. Record the current reading when the moving contact and stationary trip contact of the master relay just make. The current reading obtained is the reverse current setting of the master relay.
  2. If the desensitizing relay has time delay operative, determine and record the interval between the time when the master relay's movable contact and stationary trip contact make and the time when the protector trips.
- R. Disconnect the Test Box as described in Chapter 2 Section II (Disconnecting Instructions).

## II. SOLID STATE OR MICROPROCESSOR RELAYS

- A. If you have not already done so, connect the Test Box as described in Chapter 2 Section I (Preliminary Operating Procedure).
- B. Press **<D,4>** and then rotate the **KNOB** until "**Manual Mode**" is displayed. Press **ENTER** to continue.
- C. Reclose Voltage Test  
Ensure that the network protector is OPEN and in the AUTO position. Press **<A,6> CLOSE NWP**. Rotate the **KNOB** clockwise. Record the voltage reading when the network protector closes. The phase angle is automatically set to +10 degrees for this test.
- D. Reclose Angle Test  
Ensure that the network protector is OPEN and in the AUTO position. Press **<A,5> RECLOSE ANGLE**. Rotate the **KNOB** clockwise. Record the angle reading when the network protector closes.
- E. Trip Current  
Ensure that the network protector is CLOSED and in the AUTO position. Press **<B,5> TRIP ALL**.
1. Non Time Delay Relays  
Rotate the **KNOB** clockwise. Record the current reading when the network protector trips. The current reading obtained is the reverse current setting of the relay.
  2. Time Delay Relays
    - a. Rotate the **KNOB** clockwise to obtain a reverse current of twice the relay's expected sensitive trip setting.
    - b. Press the **ENTER** button to start the timer.

- c. When the protector trips, the elapsed time will be displayed.
- F. Disconnect the Test Box as described in Chapter 2 Section II (Disconnecting Instructions).

THIS PAGE INTENTIONALLY LEFT BLANK

# 5. Automatic Operating Procedures

## I. ELECTRO-MECHANICAL, SOLID STATE, AND NON-MNPR® RELAYS

**NOTE: Time Delay Relays CAN NOT be tested in this mode. Manual Mode must be used.**

- A. If you have not already done so, connect the Test Box as described in Chapter 2 Section I (Preliminary Operating Procedure)
- B. Press **<D,4> MODE** and then rotate **KNOB** until "**Automatic Mode**" is displayed. Press **ENTER** to continue.
- C. Switch the three network and three transformer breakers to the **ON** position.
- D. Press **<E,4> START**, the display will indicate testing status.
- E. At end of the test the display will indicate the results or any errors.
- F. Press **<C,4> REVIEW**, rotate the **KNOB** to scroll through the results of the last test.
- G. Disconnect the Test Box as described in Chapter 2 Section II (Disconnecting Instructions).

## II. ETI MNPR® RELAYS

- A. If you have not already done so, connect the Test Box as described in Chapter 2 Section I (Preliminary Operating Procedure)
- B. Press **<D,4> MODE** and then rotate the **KNOB** until "**ETI Auto Mode**" is displayed. Press **ENTER** to continue.
- C. Connect communication cable between Test Box's **RELAY PORT** and the MNPR®'s Programming Port.
- D. Switch the three network and three transformer breakers to the ON position.
- E. Press **<E,4> START**, the display will indicate testing status.
- F. At end of the test the display will indicate the results or any errors.
- G. Press **<C,4> REVIEW**, rotate the **KNOB** to scroll through the results of the last test.
- H. Disconnect the Test Box as described in Chapter 2 Section II (Disconnecting Instructions).

THIS PAGE INTENTIONALLY LEFT BLANK

# 6. ETI MNPR<sup>®</sup> Programming Instructions

## I. MNPR<sup>®</sup> PROGRAMMING SUMMARY

The following are the steps necessary to program the MNPR<sup>®</sup>. This manual describes each step in detail.

- A. If you have not already done so, connect the Test Box as described in Chapter 2 Section I (Preliminary Operating Procedure)
- B. Connect the MNPR<sup>®</sup> to the Test Box's **RELAY PORT** using the optical cable. **Make sure the word TOP on the optical connector is facing up.**
- C. Turn on all circuit breakers (**CP, T1, T2, T3, N1, N2, N3**)
- D. Use **RELAY STATUS <E,2>** to view all settings and compare them to your desired values.
- E. Select the desired operating mode (**SENSITIVE <A,1>**, **TIME DELAY <B,1>**, **INSENSITIVE <C,1>**, **WATTVAR <D,1>**) from the Test Box's top row.
- F. Set the **CT RATIO <A,2>**.
- G. If necessary change settings using **RELAY ACTUAL <D,2>**.
- H. Verify that the settings are correct using **RELAY STATUS <E,2>**.
- I. Turn off all circuit breakers (**CP, T1, T2, T3, N1, N2, N3**)
- J. Disconnect the Test Box as described in Chapter 2 Section II (Disconnecting Instructions)

## II. BASIC PROGRAMMING

### A. Relay Status

To determine the current settings of the MNPR<sup>®</sup>, simply press **<E,2>** to select **RELAY STATUS**. Use **NEXT** or the **KNOB** to scroll through the current MNPR<sup>®</sup> settings.

**RELAY STATUS** will provide the following information:

1. **Relay Status** - Displays if the MNPR<sup>®</sup> is calling for the network protector to "OPEN" or "CLOSE". If the MNPR<sup>®</sup> is calling for neither, the Test Box will display "FLOAT". If the MNPR<sup>®</sup> is blocked from closing, the Test Box will display "BLOCKED".
2. **Serial Number** - Displays the MNPR<sup>®</sup> original factory serial number for easy identification.
3. **Odometer (Cycle Counter)** - Displays the number of Open/Close operations performed by the MNPR<sup>®</sup>.
4. **Software Version** - Displays the version of the MNPR<sup>®</sup> software.
5. **Mode** - Displays which of the four MNPR<sup>®</sup> modes is currently active Sensitive (standard), Time Delay, Insensitive or Watt-Var.
6. **Reclose Voltage (RV)** - Displays the present setting in volts.
7. **Reclose Angle (RA)** - Displays the present setting in degrees.
8. **Sensitive Trip (ST)** - Displays the present setting in relay milliamps or protector amps depending on mode of Test Box (see Section V.B, Advanced Programming Level 2 for details).
9. **CT Ratio** - Displays the present CT Ratio setting.
10. If the MNPR<sup>®</sup> is set for a mode other than Sensitive (standard), **RELAY STATUS** will also display those variables unique to the present setting. Depending on the mode, **RELAY STATUS** will also display:

- a. **Time Delay Mode** - Displays the Time Delay (TD), Instant Current (IC), and Extended Delay (XD).
  - b. **Insensitive Trip Mode** - Displays the Insensitive Trip Current (IT) and Extended Delay (XD).
  - c. **Watt-Var Mode** - Displays the Watt-Var Current (WC) and Watt-Var Angle (WA).
- B. **MNPR<sup>®</sup> Operating Modes** The MNPR<sup>®</sup> can operate in many different modes. The top row of the Test Box allows you to select the four common operation modes of the MNPR<sup>®</sup>. Selecting any position of the top row, and pressing **ENTER** will revert the MNPR<sup>®</sup> to preset settings corresponding to each of the four modes.
1. **Sensitive (standard)** - Press **<A,1>** -This is the most common mode. The MNPR<sup>®</sup> will open the protector when reverse net power exceeds the Sensitive Trip setting. It will close the protector when the transformer voltage exceeds the network voltage by the Reclose Voltage setting, the phase angle of that differential voltage is greater than the Reclose Angle and within the close region.
  2. **Time Delay** - Press **<B,1>** -The MNPR<sup>®</sup> closes the protector identically to Sensitive Mode. The open process is different. Once the specified reverse net power, the Sensitive Trip, is detected the MNPR<sup>®</sup> will wait the Time Delay setting before opening the protector. If, during that period, the absolute value of current of any phase exceeds the Instant Current setting, the MNPR<sup>®</sup> will immediately open the protector. The user can also program a delay for the Instant Current called the Extended Delay. To program the relay for the Extended Delay, press **NEXT** before pressing **ENTER** to program the relay.
  3. **Insensitive Trip** - Press **<C,1>** -the MNPR<sup>®</sup> closes the protector identically to Sensitive and Time Delay Mode. The MNPR<sup>®</sup> will open the protector only when the net power flow of the sensitive mode is met and the absolute value of the current of any phase exceeds the Insensitive Trip Current setting. The user can also program a delay for the Insensitive Trip Current called the Extended Delay. To program the relay for the Extended Delay, press **NEXT** before pressing **ENTER** to program the relay.
  4. **Watt-Var** - Press **<D,1>** -the MNPR<sup>®</sup> closes the protector identically to the other three modes. The MNPR<sup>®</sup> trip region is rotated counter-clockwise to ensure that the network protector will open under certain circumstances. The user can program the current at which the MNPR<sup>®</sup> will rotate the trip region, the Watt-Var Current. In addition, the user can program the number of degrees to shift the MNPR<sup>®</sup> trip region the Watt-Var Angle.
- C. **Programming the MNPR<sup>®</sup> CT Ratio**
1. The CT Ratio allows the MNPR<sup>®</sup> to properly display network currents during operation. For the MNPR<sup>®</sup> to close a General Electric network protector properly, it must know the CT Ratio of the network protector.
  2. To program the MNPR<sup>®</sup> **CT RATIO**, press **<A,2>**. The Test Box will read the current CT Ratio setting from the relay and display it. Use either the **KNOB** or the **NEXT** button to select the new setting. When the proper CT Ratio appears on the display, press **ENTER** to program the MNPR<sup>®</sup>. To verify CT Ratio on the relay use **RELAY STATUS**.
- D. **Changing MNPR<sup>®</sup> Settings** In addition to the preset modes located on the top row of the Test Box, the user can use the Test Box to manually change the settings of an individual MNPR<sup>®</sup>. Press **<D,2>** to select **RELAY ACTUAL**. Use **NEXT** to scroll through the MNPR<sup>®</sup> variables then use the **KNOB** to change the setting to the desired values.

When finished, press **ENTER** to download the new settings to the MNPR<sup>®</sup>. The MNPR<sup>®</sup> will display **"REMOTE LOGIN"** and then four dots to indicate that it has been programmed. The present MNPR<sup>®</sup> mode will appear on the MNPR<sup>®</sup>'s scrolling display.

**NOTE: Failure to press ENTER may not download the new settings.**

**NOTE: If you press *RELAY ACTUAL* and nothing happens, your Test Box may be set with the Actual Mode turned off. (See section V.B (Advanced Programming, Level 2) for details)**

**NOTE: Using *RELAY ACTUAL* to program the MNPR® settings will not change the Test Box's stored settings.**

1. If the relay is set to operate in Sensitive (standard) mode, the user can program three different values.
    - a. **Reclose Voltage** - This value sets the minimum three phase average differential voltage necessary to close the protector.  
**Note: The Reclose Voltage sets the minimum closing voltage at +10 degrees phase angle.**
    - b. **Reclose Angle** - This value specifies the lower limit of the reclose region. The protector will not close if the phase angle is below this value regardless of the magnitude of the differential voltage.
    - c. **Sensitive Trip Current** - This value tells the MNPR® the minimum reverse current necessary to open the protector. Depending on the setup of the Test Box, this value can be displayed as milliamperes into the MNPR® or amperes into the protector. (see fig. 7.5 milliamperes through the MNPR® is the same as 2.4 amperes through the network protector bus on a 1600 Amp Network Protector).
  2. If the MNPR® is operating in a mode other than Sensitive (standard), then the Test Box will display the variables unique to the present operating mode:
    - a. **Time Delay Mode** - In addition to RV, RA and ST, *RELAY ACTUAL* will allow the user to set the Time Delay, Instant Current and Extended Delay.
    - b. **Insensitive Mode** - In addition to RV, RA and ST, the user will be able to program the Insensitive Trip Current and Extended Delay.
    - c. **Watt-Var Mode** - In addition to RV, RA and ST, the user may program the Watt-Var Current as well as the Watt-Var Angle.
- E. Resetting the MNPR® to its internal factory default settings
1. At the "**Enter Selection: \_\_**" prompt press the **A** and **B** buttons simultaneously. The Test Box will display the prompt "**Reset Relay?**". To reset the relay press **ENTER**. To abort the without modifying the relay settings press **CANCEL**.

### III. DETERMINING THE NETWORK'S SYSTEM CONDITIONS

In addition to programming the MNPR®, the Test Box can be used to gain valuable information about the status of the network. These functions are located on the third row from the top.

- A. **Network Volts (Va:, Vb:, Vc:)** - Press **<A,3>**. This will tell the user the voltage present on the network side of the network protector as measured by the relay.  
**Note:** On some 480-volt network protectors, the MNPR® may be on the 120-volt side of the potential transformers. In this case, the display should be multiplied by 2.2 to calculate the actual network voltage.
- B. **Network Amps (Ia:, Ib:, Ic:)** - Press **<B,3>**. This will tell the user the current flowing through the network protector as measured by the relay.
- C. **Reclose Volts (Da:, Db:, Dc:)** - Press **<C,3>**. This will tell the user the present differential voltage between the transformer and network sides of the network protector as measured by the relay.
- D. **Relay Temp** - Press **<D,3>**. This will tell the user the temperature inside the relay casing.

**Note: This temperature will generally be higher than the ambient temperature because the MNPR<sup>®</sup> does generate some internal heat.**

#### IV. DIRECT ORDERS TO THE MNPR<sup>®</sup>

The Test Box is capable of ordering the MNPR<sup>®</sup> to Open and of ordering the MNPR<sup>®</sup> to Block the network protector from closing. From the "Enter Selection: \_\_" prompt:

- A. **Block Relay** - Press <C,2>. This will prevent the MNPR<sup>®</sup> from closing the protector. If the protector is already closed, this feature will not cause it to open.

**Note: If the MNPR<sup>®</sup> is removed from the network protector in the Blocked state, it will still be Blocked from closing when re-installed.**

2. If the MNPR<sup>®</sup> was already blocked, pressing <B,4> will cause the Test Box to display "Unblock Relay?". Again, pressing ENTER will send the appropriate command to the MNPR<sup>®</sup>. To exit this mode without changing the state of the MNPR<sup>®</sup> press the CANCEL button. This will return you to the "Enter Selection: \_\_" prompt.

- B. **Open Relay** - Press <B,2>. The Test Box will display the prompt "Trip Relay?". Pressing ENTER will cause the MNPR<sup>®</sup> to issue an Open command to the network protector. Once the open signal is set, the MNPR<sup>®</sup> will immediately return to normal operation. Pressing CANCEL at the "Trip Relay?" prompt will return you to the "Enter Selection: \_\_" prompt without sending the Open command to the relay.

**Note: If the user wants the MNPR<sup>®</sup> to open the protector and not allow it to close, it is necessary to use the Block command (see above) before an Open Relay command is issued.**

#### V. ADVANCED PROGRAMMING

The *PROGRAM* command does not program the MNPR<sup>®</sup>. It programs the Test Box.

- A. Level 1 Programming

Pressing <E,1> at the "Enter Selection: \_\_" prompt will cause the MNPR<sup>®</sup> to display "Enter Password:". Because misuse of the *PROGRAM* command can result in damage to the MNPR<sup>®</sup> and the network protector, the password for Level 1 is **CAB4DAD2**.

**NOTE: If you pressed <E,1> and do not want to change settings, simply press CANCEL to return to the "Enter Selection: \_\_" prompt.**

Entering the correct password allows the user to program the preset variables for each of the modes present on the top row of the Test Box. As usual, pressing NEXT will toggle through individual variables; the KNOB will adjust each variable. It is possible to adjust multiple variables before pressing ENTER to save them to the Test Box's internal memory.

Setting these variables and pressing ENTER does not program the MNPR<sup>®</sup>. Selecting any of the top row from the "Enter Selection: \_\_" prompt will program the MNPR<sup>®</sup> to those settings.

The variables appear in the following order:

1. **Reclose Volts (RV)** - This variable programs the reclose voltage for all of the presets located on the top row Sensitive (standard), Time Delay, Insensitive and Watt-Var.
2. **Reclose Angle (RA)** - This variable programs the lower limit of the reclose region for all of the presets located on the top row.
3. **Reclose Time (RT)** - This variable programs the time between the detection of proper conditions for closing and the issuance of the close signal.
4. **Sensitive Trip (ST)** - This variable programs the Sensitive Trip current for the Sensitive (standard), Time Delay, Insensitive and Watt-Var modes on the top row.

5. **Sensitive Trip Delay (STD)** -This variable programs the time between the detection of proper conditions for tripping and the issuance of the open signal.
6. **Instant Current (IC)** -This variable programs the instant current for the Time Delay modes.
7. **Time Delay (TD)** - This variable programs the Time Delay used in Time Delay Mode. If the MNPR<sup>®</sup> senses reverse current that exceeds the Sensitive Trip (ST) setting, it will wait this amount of time before issuing a open command.
8. **Extended Delay (XD)** - This variable programs the Extended Delay used in Time Delay Mode and Insensitive Mode. When the MNPR<sup>®</sup> senses a trip condition, it will wait this amount of time before issuing an open command.
9. **Insensitive Trip (IT)** - This variable sets the trip current to be used in Insensitive Mode.
10. **Watt-Var Current (WC)** - This variable sets the Watt-Var Current. Note -This variable will only appear if Watt-Var is active -See Level 2 Programming.
11. **Watt-Var Angle (WA)** - This variable sets the Watt-Var Angle. Note -This variable will only appear if Watt-Var is active - See Level 2 Programming.

#### B. Level 2 Programming

Pressing **<E,1>** again after the first level password has been entered the Test Box again prompts "**Enter Password**". The password for Level 2 is **ADAB4AD2**.

The second level of programming involves further adjustment to the operation of the Test Box. Once again, **NEXT** can be used to scroll through the different variables; the **KNOB** can be used to adjust the variables; and **ENTER** is used to program the Test Box.

The following variables are adjustable using the second level of programming:

1. **Display Units (DU)** - This setting determines whether the Test Box displays currents as Milliamps through the MNPR<sup>®</sup> or as Amps through the network protector bus. This setting does not affect the operation of the MNPR<sup>®</sup>, and is determined entirely by the preference of the user.
2. **Network Voltage (NV)** - This variable sets a three-phase average network voltage below which, the network protector will not close. This value is usually set to 60 volts. This feature prevents the network protector from closing when there is a severe, low impedance fault on the network. If the MNPR<sup>®</sup> sees an average network voltage below this setting, the MNPR<sup>®</sup> will scroll "**NETWORK VOLTAGE TOO LOW TO CLOSE**".
3. **Odometer Reset (OD)** - Pressing **ENTER** at this point will reset the MNPR<sup>®</sup> cycle counter. The Test Box will ask you to "**Press Enter to Confirm**" that you want to reset the cycle counter. Upon pressing **ENTER**, the Test Box will proceed to the next variable.
4. **Actual Mode (ACT)** -This security feature allows the user to prevent the manual alteration of the settings of a MNPR<sup>®</sup>. If this variable is changed to off, the **RELAY ACTUAL** feature will not operate. The user will only be able to choose from the preset buttons on the top row of the Test Box.
5. **Watt-Var (WV)** -This variable enables the **WATTVAR** mode of the Test Box.
6. **Brightness (LED)** -This variable controls the brightness of the Test Box's LED display. The brightness can range from 0-7. Zero is the brightest.
7. **Cable Length** -This variable controls the maximum output current of the Test Box. Options are "**20 FT**" which is limited to 20A max, and "**50 FT**" which is limited to 15A max.

THIS PAGE INTENTIONALLY LEFT BLANK

# 7. Troubleshooting

## I. The Test Box displays “Communications Failure”

- A. This messages appears when the Test Box is unable to communicate with the MNPR<sup>®</sup>. Communication is only attempted when using the Test Box’s programming functions and when running a test in “**ETI Auto Mode**”. If you are not trying to test an ETI MNPR<sup>®</sup> please select another mode as described in the relevant section of this document for the test you are trying to run.
- B. Make sure the relay optical connector is securely mounted on front of the MNPR<sup>®</sup> with the word TOP facing up and that the other end is securely plugged into the **RELAY PORT** on the Test Box and that the MNPR<sup>®</sup> is properly powered (display should be scrolling).

THIS PAGE INTENTIONALLY LEFT BLANK

# 8. Fuse Replacement

## I. 131-1115-30/40 Fused Input Power Cables

- A. Disconnect TestBox (and Variac if used) per section 2.II.A-G DISCONNECTING INSTRUCTIONS
- B. Unscrew retaining nut on fuse holders FU1, FU2, and FU3 as necessary
- C. Separate holder(s) to remove blown fuse(s). Replace with KTK-20 only.
- D. Reassemble fuse holders

THIS PAGE INTENTIONALLY LEFT BLANK

# Appendix A - Specification Sheet

1. **INPUT VOLTAGE:** 125/216 VAC  $\pm 10\%$  or 277/480 VAC  $\pm 10\%$ , 60Hz, 3 Phase Wye
2. **OUTPUT VOLTAGE:** Adjustable from 0.0 to 20.0 VAC between transformer and network leads on all three phases.
3. **OUTPUT CURRENT:** Adjustable from 0 to 20 AMPS AC between transformer and network leads on all three phases. Note: Limited to 15 AMPS when used with optional 50 foot cables.
4. **METER ACCURACY:**  $\pm 1\%$  of full scale reading in either voltage or current mode.
5. **TIMING ACCURACY:**  $\pm 1\%$  of reading
6. **OVERCURRENT PROTECTION:** Both the network and transformer leads are individually protected against current in excess of 20 AMPS
7. **TEMPERATURE RANGE:**  $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$
8. **ENVIRONMENTAL:** The Test Box is protected from damage caused by rain or high humidity. The Test Box is not submersible.
9. **WEIGHT:** Approximately 60 lbs including cables
10. **SIZE:** 16 x 16 x 14 inches.
11. **FUSES:**  
KTK-20 in Fused Input Power Leads P/N 131-1115-30(40)

THIS PAGE INTENTIONALLY LEFT BLANK

# Appendix B - Firmware Update

1. Install the ETI Testbox Firmware Uploader software on a computer. The software is available for download at <http://www.eti-nj.com/eti-downloads.html>
2. Using the supplied serial cable, connect the **COMM PORT** on the front of the Test Box to a serial port on the computer. If the computer does not have a serial port (many modern laptops do not) use a suitable USB to serial converter (ETI recommends the Keyspan USA-19HS).
3. Start the ETI Testbox Firmware Uploader program. A screen similar to that shown in Figure 3 should appear.



Figure 3

4. From the "Com Port" dropdown select the port used in step 2.
5. After the upload completes, the testbox needs to be reset to defaults. The Updater program will automatically perform this action. Please note that any custom settings made under the **PROGRAM** menu (See Section 6.V) will be reset.
6. Press the "Send File" button. A dialog box will appear to confirm that the defaults will be reset as described in step 5 above. Once "Yes" is pressed, the upload should start.
7. After the upload completes the testbox should restart and be ready to use again.
8. Pressing buttons **A** and **C** at the same time from the "**Enter Selection: \_\_**" prompt will show version and date information about the firmware running on the Test Box.

THIS PAGE INTENTIONALLY LEFT BLANK

# Appendix C - Fused Input Power Leads - P/N 131-1115-30(40)

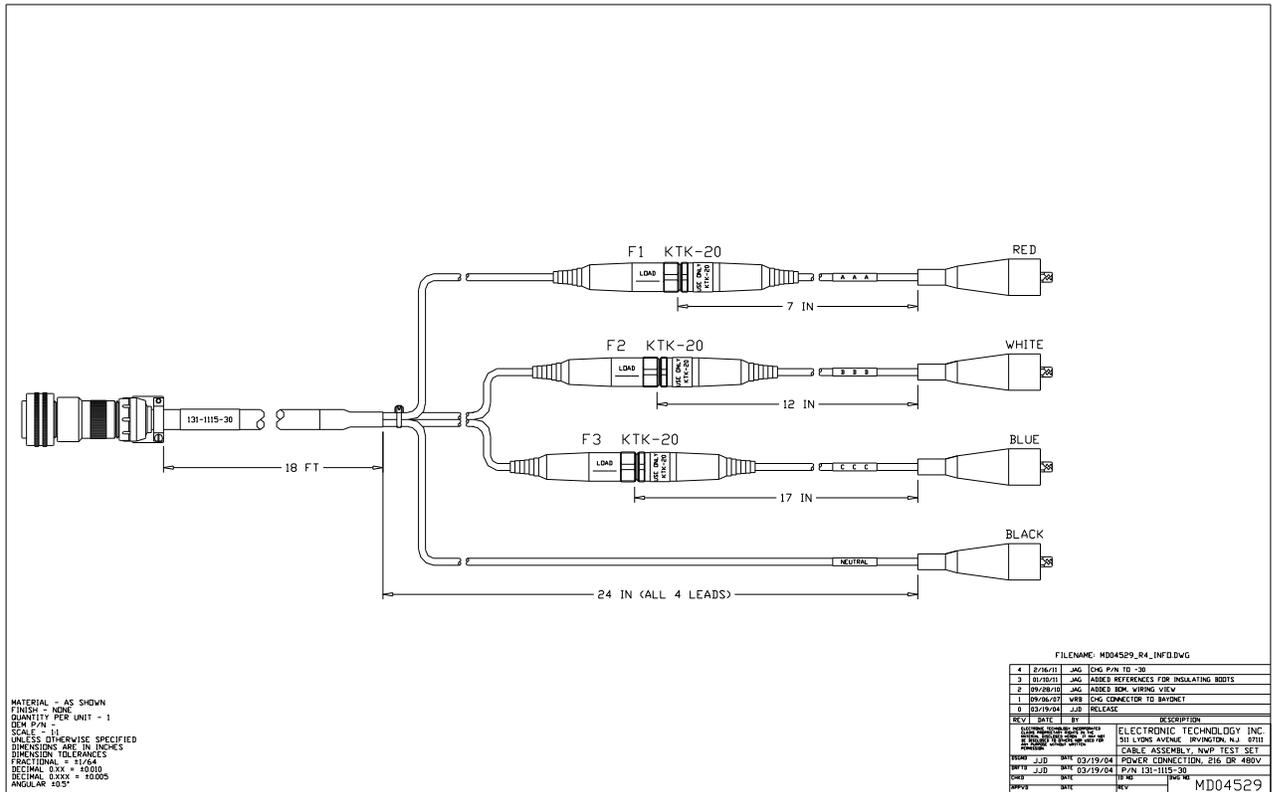


Figure 4: Fused Input Power Leads - P/N 131-1115-30(40)