AC-PRO-MP® & AC-PRO-MP-II®

I-AC-PRO-MP

MASTERPACT MP DIRECT
REPLACEMENT TRIP UNIT

INSTRUCTION MANUAL

*Plug-in Replacement Trip Unit for Masterpact MP
Type STR-18M, 28D, 38S, or 58U*

URC Utility Relay Company

Chagrin Falls, OH 44023
Phone: 888.289.2864
www.utilityrelay.com

⚠ WARNING

WARNING: Low voltage power circuit breakers contain stored energy spring operating mechanisms. For maximum personnel protection when installing and testing this retrofit kit, the following procedures must be followed. Failure to follow these procedures could result in property damage, personal injury, or death.

NO work shall be performed on an energized breaker.

Only qualified persons, as defined by the National Electric Code, and preferably NETA Certified or Pearl Certified Technicians, who are familiar with the operation and maintenance of low voltage power circuit breakers and their associated switchgear assemblies should perform the installation of this retrofit kit.

Completely read and understand all instructions before attempting the installation and testing of this retrofit kit. Personnel are available at Utility Relay Company during normal working hours (Eastern Standard Time) to answer any questions.

Turn off and lockout the power source(s) supplying the breaker prior to removing the breaker and attempting any work on the breaker. Follow all lockout and tagging rules of the National Electric Code and all other applicable codes, regulations and work rules.

Do not perform any work including charging, closing or tripping or any other function that could cause significant movement of a draw out breaker while it is on the extension rails.

For both draw out and bolt-in breakers, trip open and then move the breaker to a well-lighted work area with a sturdy workbench before starting the retrofit.

Do not work on a closed breaker or a breaker with the closing springs charged. Trip open the breaker and make sure any stored energy springs are discharged before performing any work. If this is disregarded, the breaker may unexpectedly trip open or the charging springs may discharge, causing severe injuries.

Under some circumstances it may be necessary to charge the springs and close the breaker to make/verify certain retrofit adjustments. In those instances, use extreme caution to stay clear of any moving components in case the breaker either purposely or unexpectedly trips open or the charging springs discharge.

Refer to the latest edition of the ANSI/NETA Standard for Maintenance Testing Specifications for bolt tightening torque specifications.

01/01/15

LIMITED WARRANTY

Utility Relay Company warrants that every AC-PRO, ZERO-Hertz, AC-PRO-MP, AC-PRO-MP-II, and AC-PRO-II trip unit and related retrofit kit components (herein collectively referred to as "product") shall be free from defects in material and workmanship, and will perform as described in Utility Relay Company's sales literature and Instruction Manuals, under normal use and service for a period of (2) two years from date of invoice. EXCEPT AS SET FORTH HEREIN, IT IS EXPRESSLY AGREED THAT THERE IS NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND THERE IS NO OTHER WARRANTY, EXPRESS, IMPLIED OR STATUTORY, BY UTILITY RELAY COMPANY WITH REFERENCE TO THE PRODUCT.

Should any warranty claim arise within the warranty period, contact Utility Relay Company at 888-289-2864 and do the following:
1.) Provide a complete description of the problem with the trip unit or retrofit kit component.
2.) Provide the Serial Number located on the trip unit from the warranted retrofit kit.
3.) Obtain a Returned Materials Authorization number (RMA) and return shipping instructions.
4.) Promptly return the defective material to Utility Relay Company.

Warranty Disclaimer and Liability Limitation

As the sole and exclusive remedy, Utility Relay Company will repair or replace the trip unit and/or retrofit component(s) at no cost to the customer during the warranty period. Removal or reinstallation of a warrantied trip unit and/or retrofit component(s) are the responsibility of the customer. The customer is liable and shall pay for shipment of defective products back to Utility Relay Company. In no event shall Utility Relay Company be liable for any special, incidental or consequential damages.

Excluded from this warranty and not warranted by Utility Relay Company in any fashion, either expressed or implied are:
1.) Any product which has been disassembled (except to replace batteries), repaired, tampered with, altered, changed, or modified by persons other than Utility Relay Company's own authorized service personnel unless repair by others is made with the written consent of Utility Relay Company.
2.) Defects or damage to the Product resulting from wear, tear, misuse, negligence, improper storage, improper testing, impacts, or use with non-approved accessories.
3.) Products used for any other purpose other than originally intended by Utility Relay Company.

Visit www.utilityrelay.com or call 888-289-2864 for latest warranty information.

10/13/15

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For latest version, visit:
http://www.utilityrelay.com/Side_Bar/Instruction_Manuals.html

1.0   Introduction

The AC-PRO-MP & AC-PRO-MP-II are plug-in, direct replacement trip units for the ST & STR trip units on the Merlin Gerin & Square D Masterpact M & MP breakers, as well as other rebranded breakers such as the Moeller IZM.

The AC-PRO-MP & MP-II offer the following features:

o User programmed to replace any of the versions of STR-18M, 28D, 38S or 58U trip units on IEC or UL rated Masterpact M & MP breakers.

o A security code system protects against unauthorized changes to the settings.

o Includes the exact trip unit functions, settings and time-current-curves as the original STR trip unit.

o Includes the same information and alarm features as the original STR trip unit.

o Includes additional self-test features.

o No physical rating plug is required. The required rating plug value is a programmed setting.

o Includes the QUICK-TRIP® arc flash reduction settings with an On/Off switch and LED on the front of the trip unit as a standard feature.

o Remote QUICK-TRIP control and indication capabilities.

o Easy access to the settings and last trip data is provided with an OLED display and "smart" push buttons.

o A USB port on the front of the trip unit provides for connection to a laptop computer for easy access to the settings and last trip data using InfoPro-MP or MP-II software.

o The USB port also supports the SAFE-T-TRIP® remote hand-held trip device.

o A test port for connection to a secondary injection test set that performs actual Phase and Ground Fault tests, not simulated tests.

o Patented SLUGGISH BREAKER® detection captures mechanism time. It provides a warning if the time is over 33 milli-seconds. The alarm relay can also be set to operate for this condition.

o Detailed Trip data for the last 8 trips, including timestamps.

AC-PRO-MP & AC-Pro-MP-II trip units shipped December 2016 & later include the following additional features/updates:

o Secondary Injection Test port is located on front of unit.

o Waveform capture (on-demand and for the last 8 trips)

o A breaker limit switch is used for SLUGGISH BREAKER detection.

o Neutral protection: Units shipped June 2020 and later include Neutral protection, which provides Long Time, Short Time, and Instantaneous protection for the Neutral conductor based on a Neutral percentage (size) setting. Units shipped between December 2016 to June 2020 include Neutral Overload protection, which is based on Long Time Settings.

o Remote QUICK-TRIP control and indication capabilities is available over Modbus RTU communications instead of hardwired connections.

o InfoPro-MP-II software is used.

o The firmware in these units is different than the firmware in units shipped before December 2016 (units shipped before December 2016 have a side secondary injection test port).

The AC-PRO-MP-II includes the following additional features (24VDC control power required):

o Voltage metering (line-to-line)
   (rated for up to 600V three-phase systems)

o Power and energy metering
   (KW, KVA, KWhrs, KVAHrs, Power Factor)

o Modbus RTU communications via RS-485 network

Zone Select Interlocking (ZSI) is not currently available. Wi-Fi Communications is not currently available.

AC-PRO-MP with front test port (shipped December 2016 or later)

AC-PRO-MP-II with front test port (released December 2016)
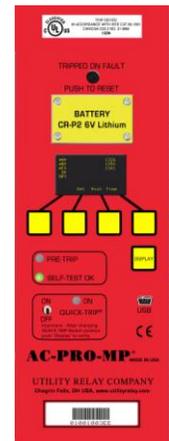
AC-PRO-MP (shipped prior to December 2016)

2.0   General

2.1 Front View

A. Pop-out tripped indicator
This indicator is mechanically interlocked to the breaker mechanism and pops out when the breaker is tripped by the trip unit.

After a trip, the pop-out indicator must be pushed to the flush position before the breaker can be closed.

B. Battery Cover
To replace the battery, remove the four (4) 2-56 screws and battery cover, remove the old battery and insert a new CR-P2, 6 Volt Lithium battery. Replace the battery cover and screws.
See Section 10.0.

C. OLED Display
The display is normally off. Pushing the DISPLAY button (E) turns on the display.

D. "Smart" Push Buttons
These push buttons perform the functions indicated on the bottom of the OLED display.

E. DISPLAY Push Button
Pushing the DISPLAY button will turn on the display. If no buttons are pushed for 30 seconds, the display will turn off.

F. Red Pre-Trip LED
Depending on the magnitude of the largest Phase current, this LED will be:
a. Off if less than 90% of LT Pick-Up
b. Solidly on if greater than 90% but less than 105% of LT Pick-Up
c. Flashing if greater than 105% of LT Pick-Up

G. Green Self Test OK LED
When the trip unit is powered up, this LED is on unless a problem is detected.

H. USB Connector
USB 2.0 Mini-B connector for use with InfoPro-MP or InfoPro-MP-II software and SAFE-T-TRIP® device.

I. QUICK-TRIP® on/off Switch
When this switch is in the on position, the QT-I and QT-GF functions are active for reduction of arc flash hazard.

J. Secondary Injection Test Port
Removing the test port cover on the front of the trip unit allows connection of the secondary injection test set

K. Red QUICK-TRIP® on LED
When this LED is on, the QT-I and QT-GF functions are active because either the local (J) or remote QUICK-TRIP function is on.

L. Serial Number
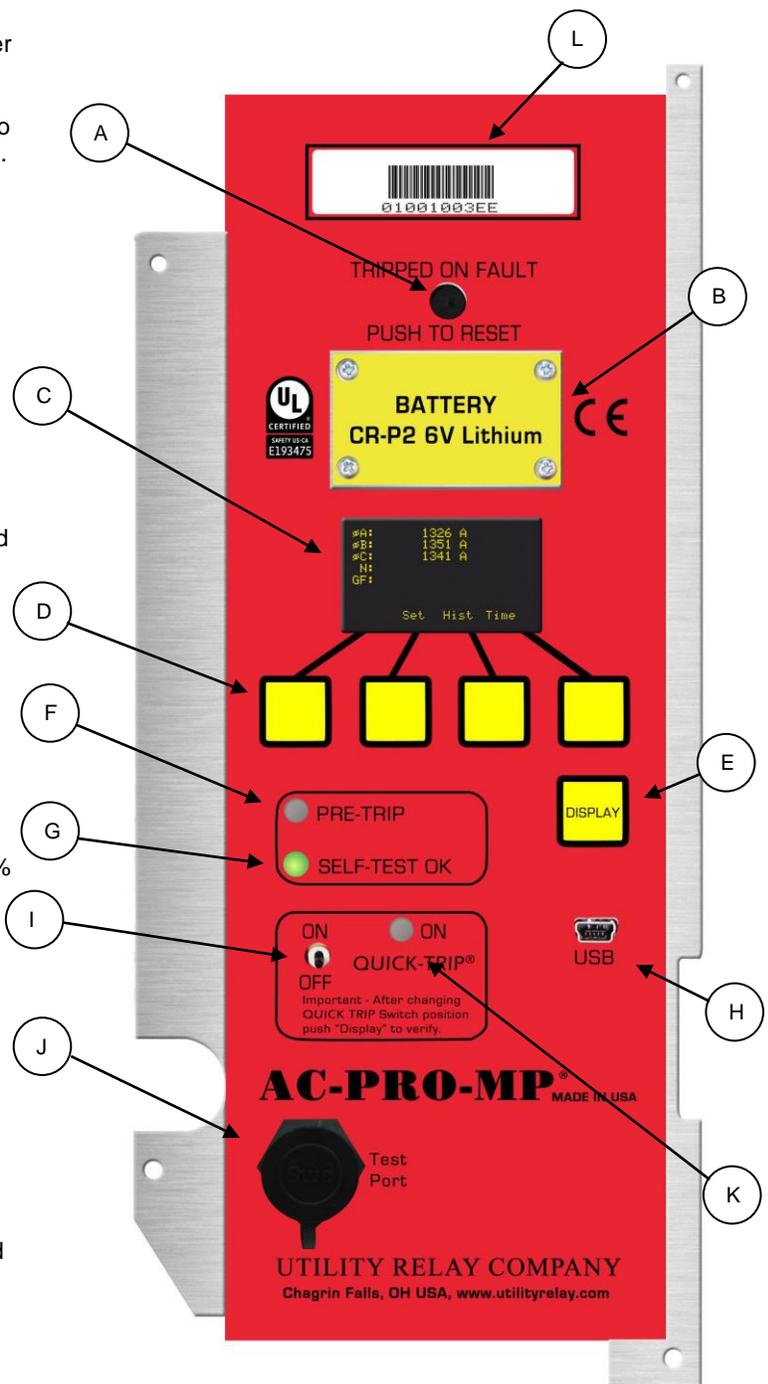
2.2 Rear View

A. DINF Instantaneous Connector
Not on all breakers.
The DINF Instantaneous trip function is lower than the standard Instantaneous settings allowed for a particular CT rating. The DINF Instantaneous trip function is only enabled for a short time while the breaker is closing. After the breaker is fully closed and latched, the DINF micro-switch defeats the DINF Instantaneous function.
Remove and discard the jumper when connecting the DINF cable.

Important:
If the breaker does not have a DINF cable, leave the jumper in place or DINF Instantaneous will always be on.

B. 24 Vdc ALIM EX Connector
Not on all breakers.
This connector brings the auxiliary 24 Vdc control power to the trip unit.

C. MITOP Connector
This is the actuator connector. If required, use the extension cable (item I) to connect to the breaker cable.

D. TH Connector
Not on all breakers.
This is the thermistor connector. If the breaker temperature as measured by the thermistor exceeds 105°C, an over temperature trip is initiated by the trip unit. Use the extension cable (Item I) to connect to the breaker cable.

E. N Connector - Neutral CT connector

F. PH1 Connector
Phase "A" CT connector.

G. PH2 Connector
Phase "B" CT connector.

H. PH3 Connector.
Phase "C" CT connector.

I. Extension cable for TH and MITOP connection.

J. Voltage wire leads (AC-PRO-MP-II only)
Phase C, B, A (rear view, left to right)
(See Section 3.4)

2.3 Top View

K. RS-485 connector (AC-PRO-MP-II only).
See Section 3.12.
(For units shipped before December 2016, this connector is used for Remote QUICK-TRIP. See Section 6.2)

L. Auxiliary Wiring Connector.
See Section 3.8.
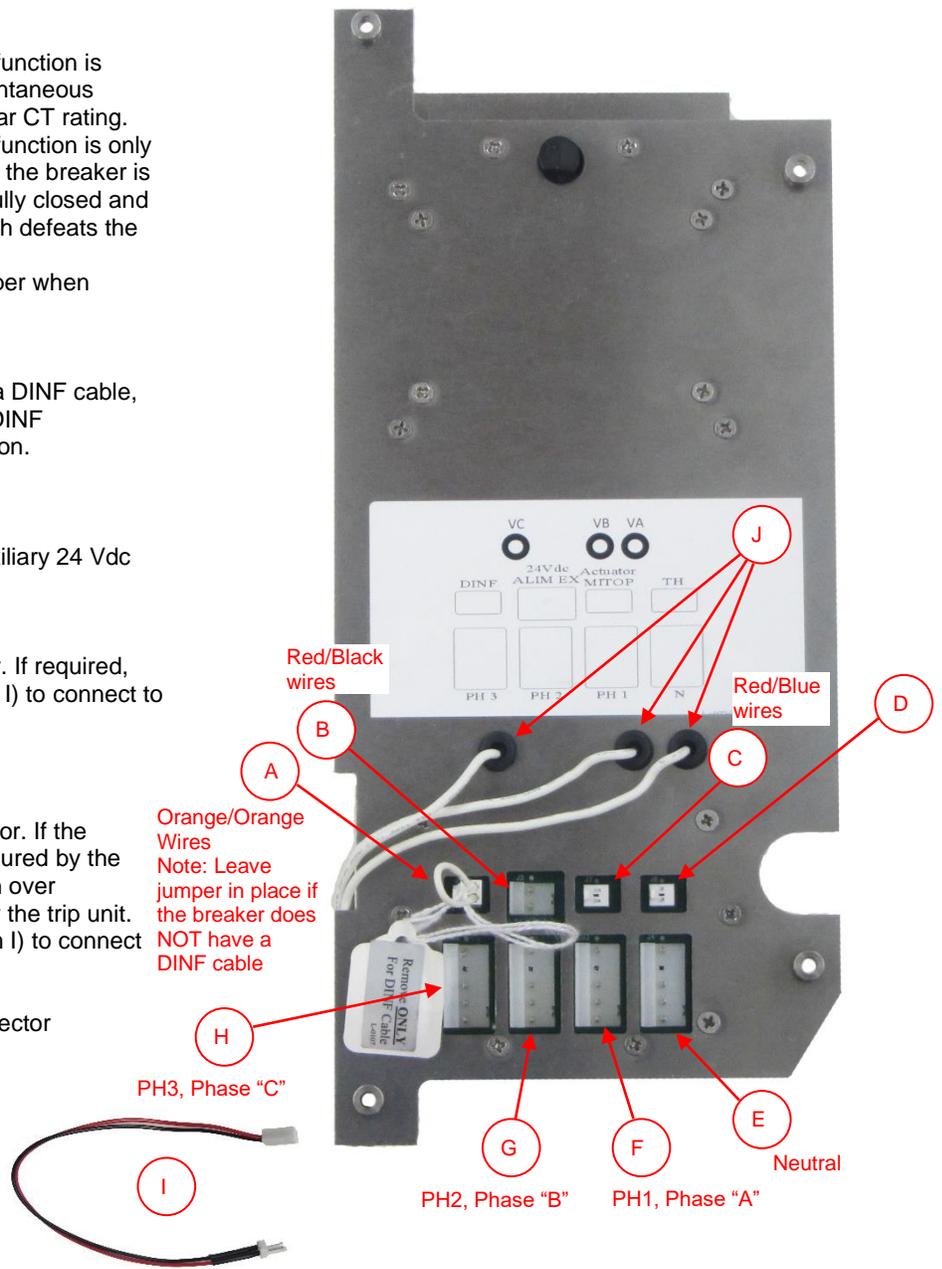
Rear View
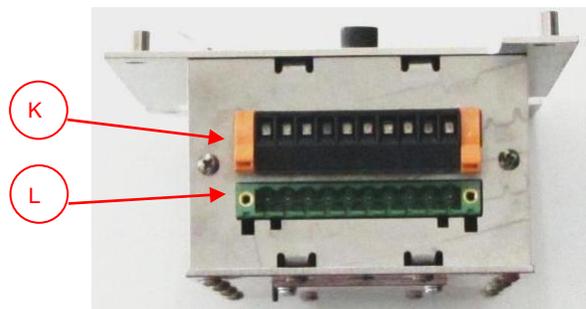
Top View

3.0   Installation

3.1   Remove Front Cover

Remove the five cover screws and remove the front cover.
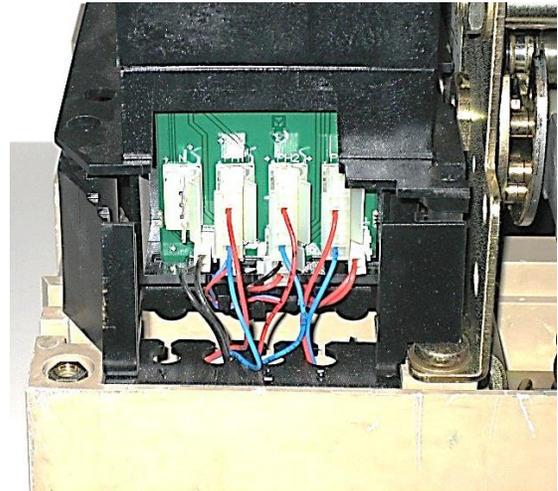
Remove the bottom wire cover.

3.2   Disconnect STR Wiring
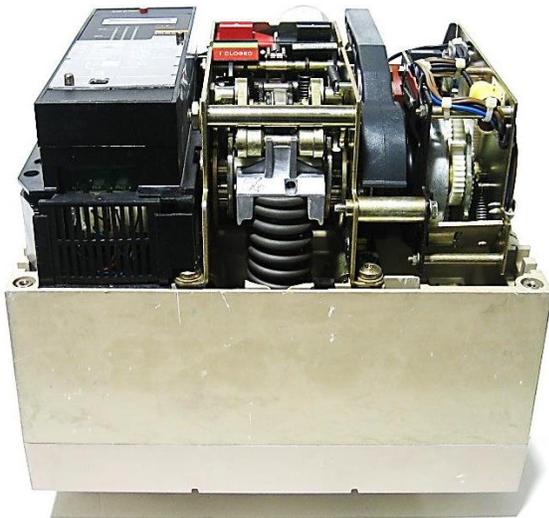
Lay breaker down onto the rear stabs.
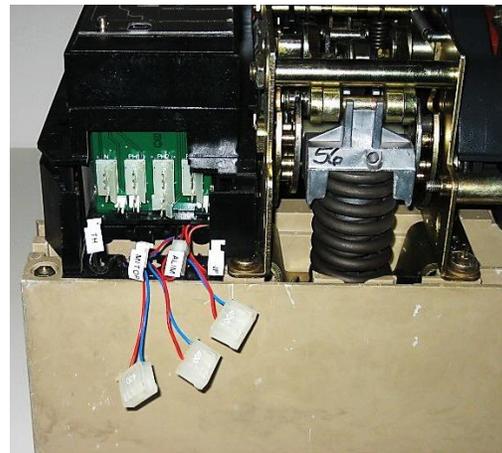
Unplug the three (3) Phase CT connectors.
Unplug the Neutral CT connector if applicable.
Unplug the other connectors.
Label all connectors to avoid confusion.

3.3 Remove the STR Trip Unit
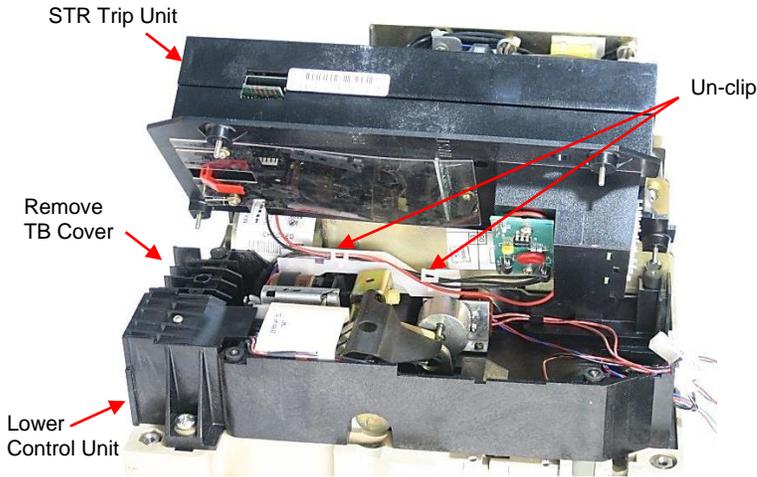
Remove the four (4) screws attaching the STR trip unit to the lower control unit.

Un-clip the two (2) wire-way latches and pull out the wires.

Remove the right terminal block cover.

Slide out the three terminal blocks from the lower control unit.

3.4 Installing the Voltage Connections (AC-PRO-MP-II)

Locate the 3-pole fuse block on the existing trip unit mounting carriage as shown. Using the two (2) round holes in the fuse block as a guide, mark the location of the two (2) round holes on the trip unit carriage.

Drill and tap two (2) 8-32 holes in the trip unit carriage where marked.

Mount the 3-pole fuse block to the trip unit carriage using two (2) 8-32 x 1-1/8 Male/Female standoffs and lock washers as shown.

Fuse Block Installation (AC-PRO-MP-II only)

Run #20 AWG SIS wire from the 3-pole fuse block thru the breaker using the same path as the existing CT wires. Connect to the line side of the breaker existing screws as shown using the ring tongue terminals provided. Connect to the 3-pole fuse block using the ring tongue terminals provided. It is very important to maintain proper phasing.

NOTICE

It is VERY important to maintain the proper phasing of the voltage wiring

Fuse Block to Breaker Wiring (AC-PRO-MP-II)

Connect the wires from the rear of the trip unit to the 3-pole fuse block using the ring tongue terminals provided.

Install the three (3) T-306-4 Fuses (Buss KTK-R-1) into the 3-pole fuse block.

After the wiring to the 3-pole fuse block is complete, attach the fuse block cover to the 3-pole fuse block using two (2) 8-32 x 3/8 Phillips HD SEMS screws as shown.

Trip Unit to Fuse Block Wires

(2) 8-32 x 3/8 Phillips SEMS screws

Fuse Block Cover

Fuse Block to Breaker Line Side Wires
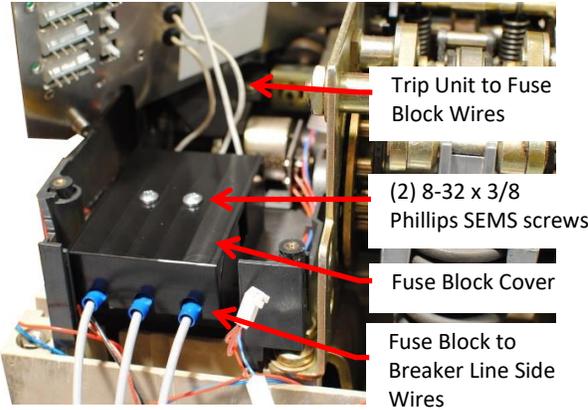
**Trip Unit to Fuse Block Wiring
(AC-PRO-MP-II)**
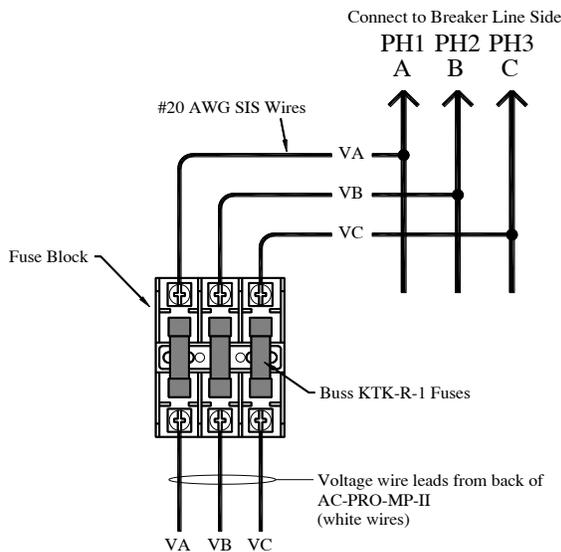
**Voltage Connections Diagram
(AC-PRO-MP-II)**

3.5   Connect CT Connectors

Back of AC-PRO-MP
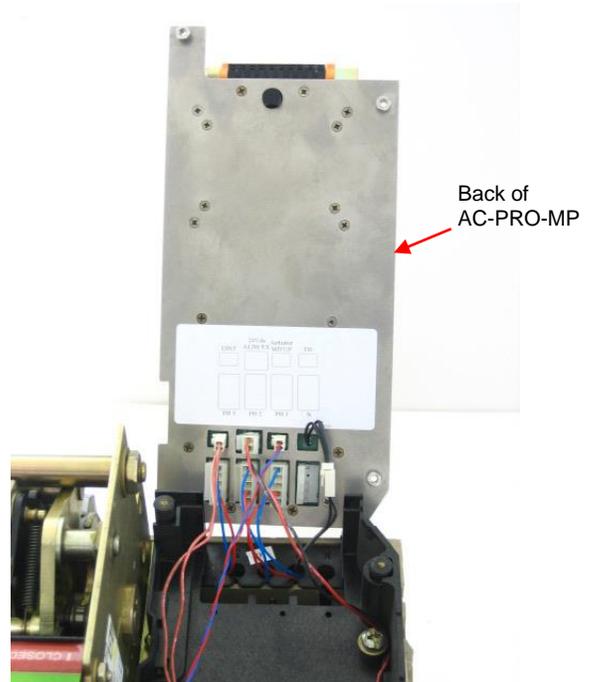
Connect the three (3) Phase CT connectors. Connect the Neutral CT connector if applicable. Connect the other connectors being very careful not to mix up the connectors. If necessary, use the extension cables for the TH and MTOP connections.

See the wire color codes in Section 3.2.

DINF Jumper
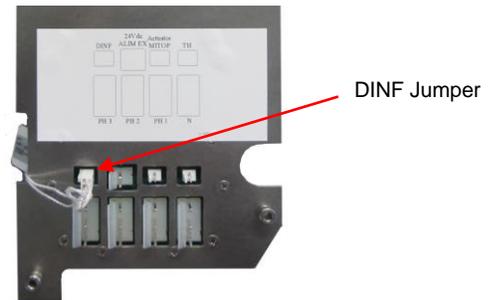
For those breakers that do not have a DINF Switch and inertial mass, leave the jumper in the DINF connector. Without the jumper DINF Instantaneous will always be on.

Otherwise, remove and discard the jumper and connect the DINF cable to the DINF connector.

3.6 Attach the AC-PRO-MP® to Breaker.

Set the AC-PRO-MP® in place and attach using four (4) M3 X 16 Phillips screws.

3.7 Check Alignment of "Push-to-Reset" Rod.

Check alignment with mechanism

Check for proper alignment of the back of the "Push-to-Reset" rod with the small reset piece in the lower control unit.

3.8 Auxiliary Wiring Connections.
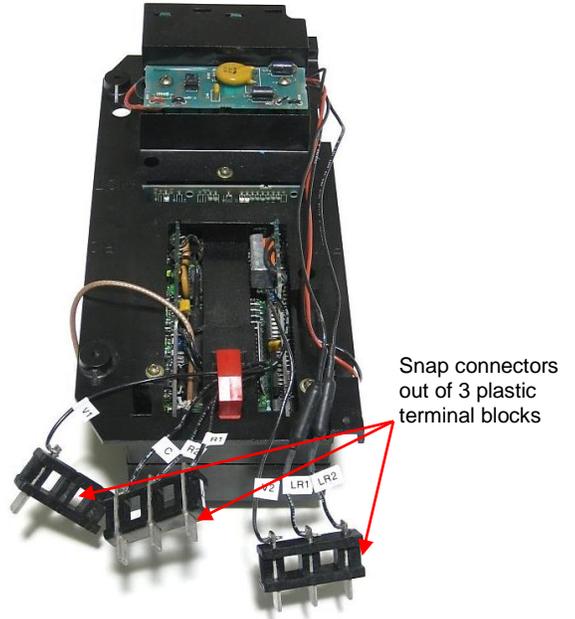
Snap connectors out of 3 plastic terminal blocks

Snap the connectors out of the three (3) plastic terminal blocks. The plastic terminal blocks will be reused. Do not remove the Neutral CT terminals T1 & T2 if installed. See Auxiliary Terminal Block Wiring on next page.

Auxiliary Wiring connector shown without wires
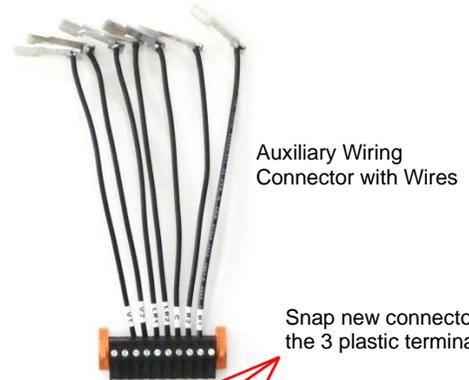
Auxiliary Wiring Connector with Wires

Snap new connectors into the 3 plastic terminal blocks

Insert Auxiliary Wiring connector in AC-PRO-MP
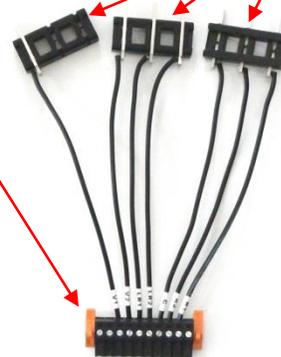
Snap the new terminals into the existing slide in plastic terminal blocks. Follow the connection diagram on Page 8. Make sure the terminals are fully seated in the plastic terminal blocks.

Insert the assembled auxiliary wiring connector into position on top of the AC-PRO-MP.

3.9 Insert the Auxiliary Terminal Blocks into the Lower Control Unit.
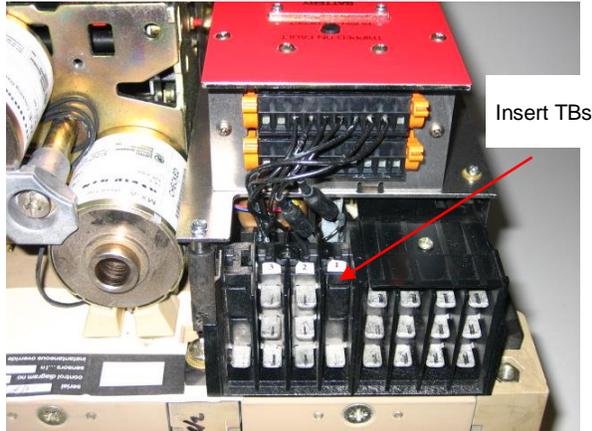
Insert TBs

Insert the terminal blocks into their proper location in the lower control unit.

Follow the diagram below.

3.10 Modify and Install Terminal Block Cover.

Before

Cut

After
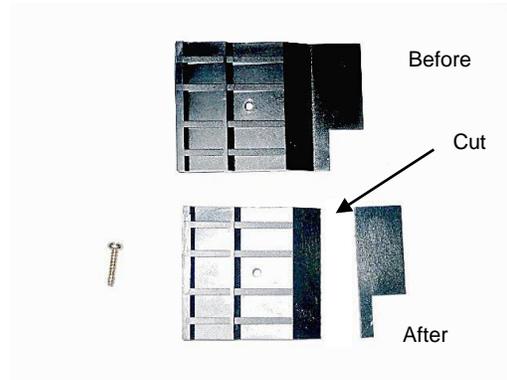
Cut off the bottom portion of the right terminal block cover previously removed.

Replace TB cover

Replace the terminal block cover using the existing screw.
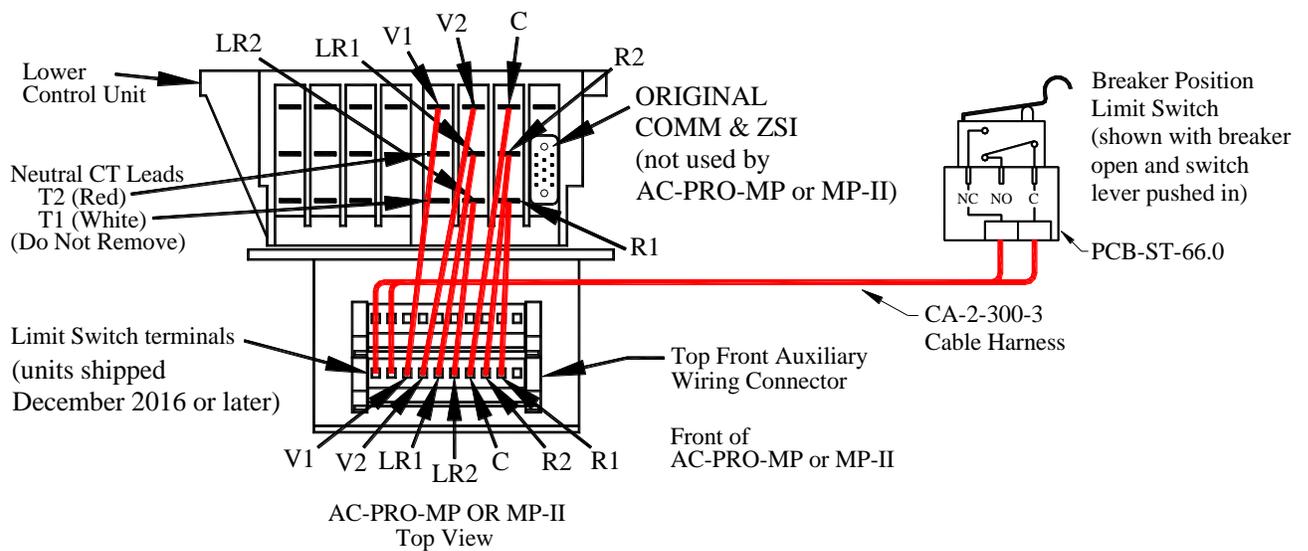
Auxiliary Terminal Block Wiring

3.11 Installing the Breaker Position Limit Switch

A limit switch is provided as a breaker position input, for AC-PRO-MP or MP-II trip units shipped in December 2016 or later.

This limit must be installed for the following:

1) To provide breaker open or closed information to the communications system.

2) To enable "SLUGGISH BREAKER" detection.

The patented "SLUGGISH BREAKER" detection feature measures the breaker mechanism operating speed for every trip operation initiated by the trip unit including the important "First Operation". If the mechanism operation time is longer than the programmed time, the trip unit will provide a **SLUGGISH BREAKER (MAINTENANCE REQUIRED)** alarm.

Install the limit switch on the breaker as follows:

Make sure the breaker is open.

Attach the MP-101 Limit Switch Mounting Bracket to the MP-100 Adapter Bracket using two (2) 4-40 x ¾ Socket HD Cap screws and lock washers.

The limit switch mounting bracket assembly mounts on the right side of the breaker mechanism using an existing hole in the breaker mechanism horizontal support plate. Slide the limit switch mounting bracket assembly onto the breaker mechanism horizontal support plate so that the support plate goes thru the gap in the bracket assembly as shown. Attach the bracket assembly to the support plate using one (1) 4-40 x 3/8 Phillips HD screw and lock washer.

Breaker Mechanism
Horizontal Support Plate

MP -101
Limit Switch
Mounting
Bracket Assembly

MCH - M
Motor Mechanism

MP-100
Adapter Plate
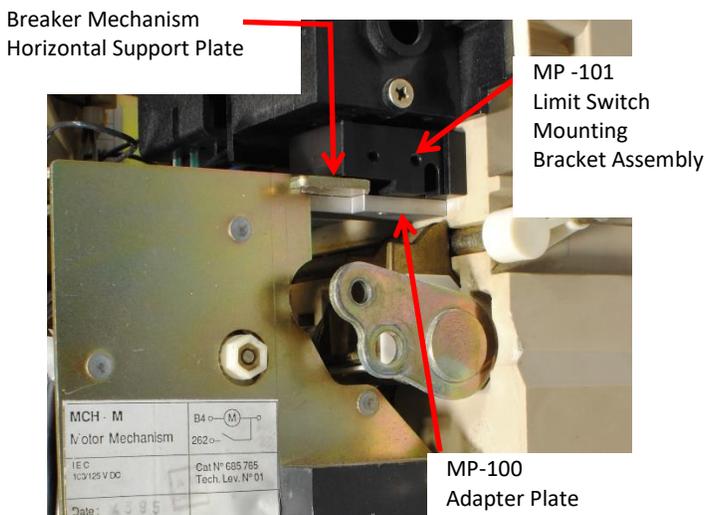
Limit Switch Mounting Bracket Installation

The breaker mechanism may have an existing connecting arm to the auxiliary contacts. Follow the appropriate instructions below for the breaker type being retrofitted.

If the breaker does NOT have an auxiliary contact connecting arm:

The limit switch flag mounts to an existing hole in the breaker mechanism. Place one (1) 6mm dia. x 6mm lg. Shoulder screw thru the hole and lock the shoulder screw in place using one (1) Nylon spacer, one (1) M6 lock washer and one (1) Black Delrin Rod as shown below. Securely tighten the flag assembly.

Black Delrin Rod and Lock washer

Nylon Spacer

6mm dia. x 6mm Lg. Shoulder screw
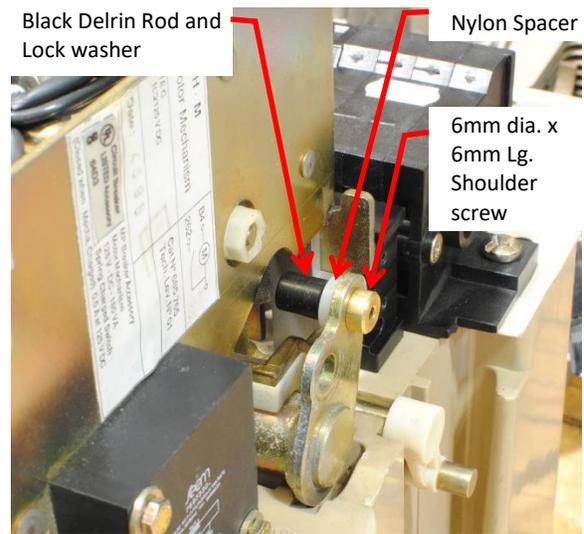
Limit Switch Flag Installation (breaker WITHOUT Auxiliary contact arm)

If the breaker DOES have an auxiliary contact connecting arm:

Remove the existing auxiliary contact connecting arm by removing the e-rings holding the arm in place.

Remove the pin from the end of the connecting arm that connects to the breaker mechanism and use a 6mm diameter drill to enlarge the hole in the end of the connecting arm that the pin was removed.

Reattach the connecting arm to the auxiliary contact using the existing e-ring.

The limit switch flag mounts in an existing hole in the breaker mechanism.

Place one (1) 6mm dia. x 6mm lg. Shoulder screw thru the hole in the breaker mechanism and the connecting arm. Lock the shoulder screw in place using one (1) M6 lock washer and one (1) Black Delrin Rod as shown. Securely tighten the flag assembly.
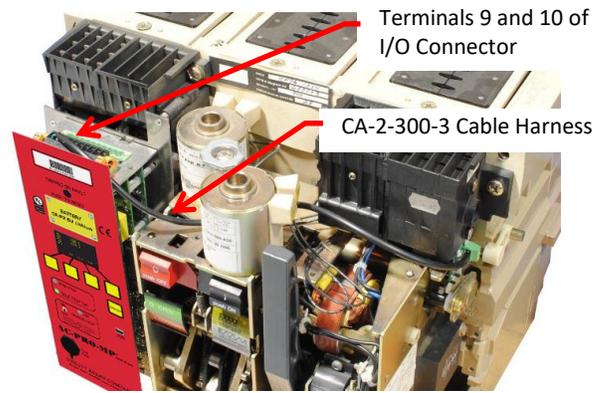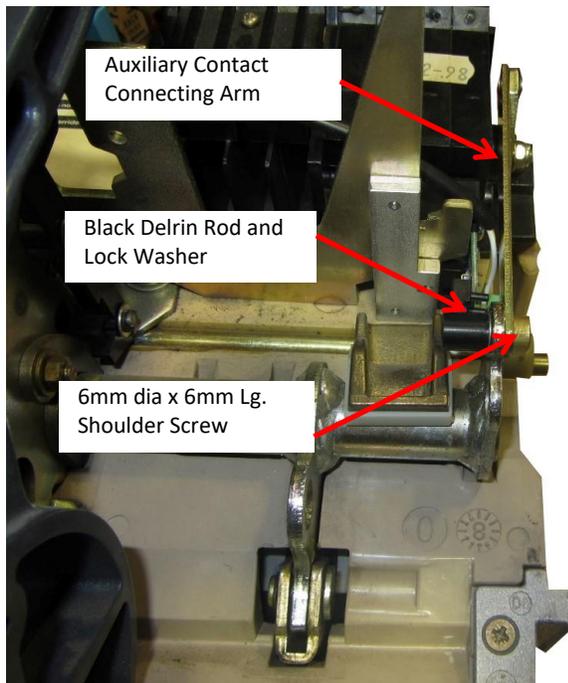
**Limit Switch Flag Installation
(breaker WITH Auxiliary contact arm)**

Attach the limit switch circuit board to the mounting bracket assembly using two (2) 6-32 x 3/8 Phillips HD Cap screws and lock washers. See the photo.

Adjust the location of the circuit board left or right until the limit switch changes state or "clicks" against the limit switch flag. Securely tighten the hardware to hold the circuit board in location.
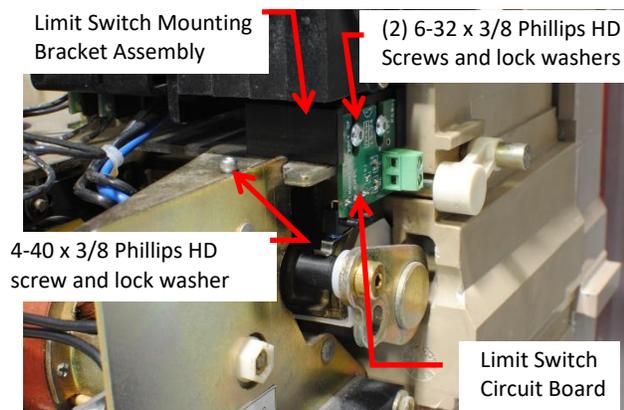
**Limit Switch Circuit
Board Installation**

Wire the 2-pole terminal block on the limit switch circuit board to terminals 9 and 10 of the TRIP UNIT I/O connector as shown on page 8. Polarity is NOT important. Use the CA-2-300-3 Cable Harness provided with two (2) 22 AWG wires in a PVC tube.

Limit Switch Wiring

3.12 Installing Communications Connections (AC-PRO-MP-II)

The AC-PRO-MP-II kit includes a 2-segment communications cable with quick disconnect, and a 3-point terminal block. The short segment of the cable is attached to the AC-PRO-MP-II harness that plugs into the trip unit. The other (longer) segment of the cable is attached to the 3-point terminal block in the switchgear cubicle. The quick-disconnect must be disconnected before the breaker is completely removed from the switchgear.

The communications cable will be routed through the top of the breaker as shown in the photos below.

Notch a 3/8" wide x 5/16" opening in breaker cover as shown in photo for communications cable clearance.

**Communications Cable Installation
(with cover removed)
(AC-PRO-MP-II)**

3.13 Replace Breaker Front Cover.

Replace the breaker front cover using the existing hardware.
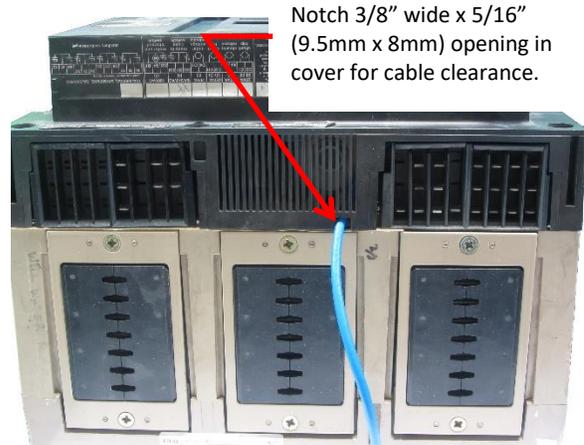
Notch 3/8" wide x 5/16" (9.5mm x 8mm) opening in cover for cable clearance.

**Communications Cable Installation
(notch in top of breaker cover)
(AC-PRO-MP-II)**
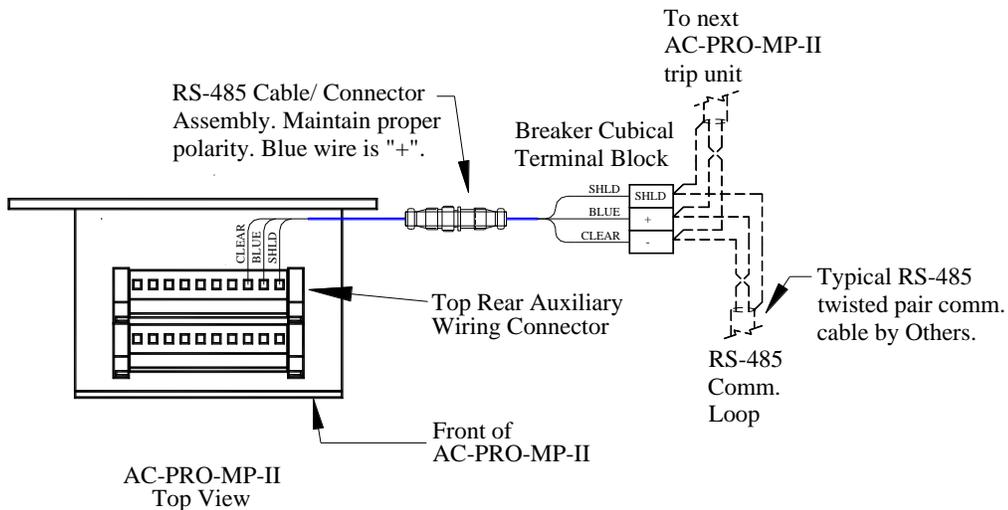
Communications Connections (AC-PRO-MP-II only)

4.0   Settings

The trip unit is shipped un-commissioned and must be commissioned before placing in service.

The push buttons and display on the front panel or the USB Interface with a laptop computer can be used to make the initial settings or change existing settings.

```
                **** IMPORTANT ****
    The trip unit will NOT FUNCTION as it is shipped
    from the factory. The user must first
    COMMISSION the unit as outlined in this Section
    to make it functional.
```

4.1   Change Settings Using the Front Panel

Push the "DISPLAY" button to power up the trip unit. The following is displayed if the unit has not been commissioned yet:

```
        ** "WARNING" **
    Enter Settings Before
      Placing In Service
          Push "Set"

            Set
```

If the unit was already commissioned, the following screen will be displayed:

```
        ** SETTINGS **

    "Rev"  to Review
    "Chng" to Change
    "Exit" to Cancel

    Rev   Chng       Exit
```
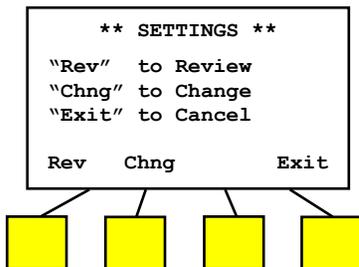
Push the "Set" button at the "**WARNING** – Enter settings" screen.
Or push the "Chng" button at the "**SETTINGS**" screen to display the security window:

```
        Security Code
    To change settings
    enter 4 digit code
           0 _ _ _
    Up Dwn   Next Exit
```
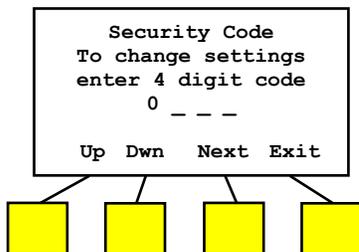
The Security Code is the last four (4) digits of the Serial Number. See Section 2.1 for the location of the Serial Number.

Push the "Up" or "Down" button to select the value of each digit.
Use the "Next" button to advance to the next digit.

For the last digit, the following is displayed:

```
        SECURITY CODE
     To Change Settings
     Enter 4 Digit Code
           X X X X

    Up  Dwn        Enter
```
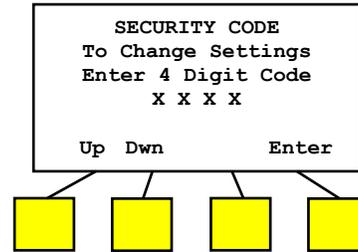
Push the "Enter" button after the last digit of the Security Code is entered.

The following is displayed:

```
      SELECT STR TYPE:
    STR 38S RatingPlug
    STR 58U NoRatingPlug
    STR 58U RatingPlug

    Up  Dwn   Exit Enter
```
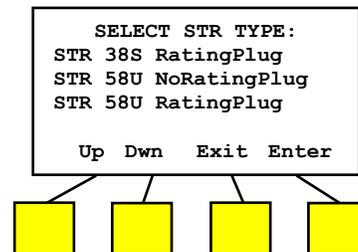
Push the "Up" or "Down" buttons until the desired STR trip unit type is flashing.

The other STR types are displayed by pushing the "Up" button several times.

```
      SElECT STR TYPE:
    STR 18M
    STR 28D NoRatingPlug
    STR 28D RatingPlug
    STR 38S NoRatingPlug
     Up Dwn   Exit Enter
```

After pushing "Enter", the following is displayed:

```
       ** Frequency **
    Frequency:  60 Hz



     60   50   Back  Enter
```
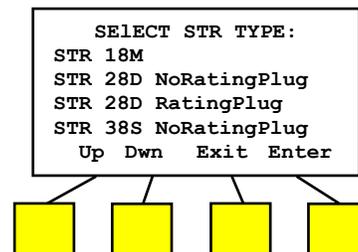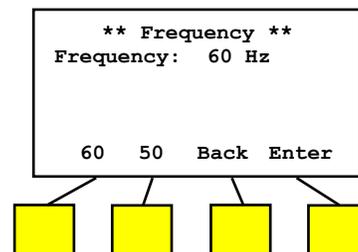
Select the system frequency (50 or 60 Hz).

After pushing "Enter", the following is displayed:
(Not for 18M or 28D)

```
┌─────────────────────────────┐
│                             │
│     Breaker Type: H2        │
│                             │
│                             │
│   H1/N1 H2  Back  Enter     │
└─────────────────────────────┘
```
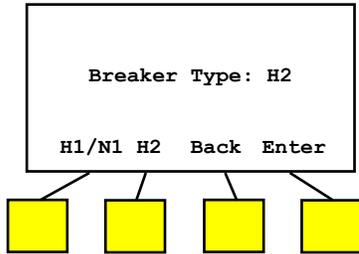
The H1/N1 breakers have standard or special interrupting rating and the H2 breakers have high interrupting rating.

After pushing "Enter", the following is displayed:

```
┌─────────────────────────────┐
│  CT Rating:                 │
│  XXXX Amp                   │
│     ** IMPORTANT **         │
│   Must match actual         │
│   Tap on breaker CTs        │
│   Up   Dwn  Back  Enter     │
└─────────────────────────────┘
```
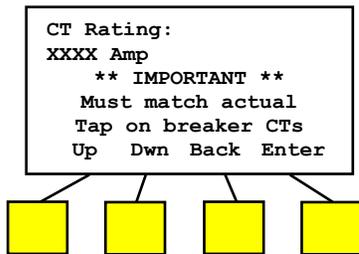
Use the "Up" and "Down" buttons to enter the correct CT Rating.

```
┌─────────────────────────────────────┐
│       **** IMPORTANT ****            │
│  The CT Rating entered MUST match the│
│  rating of the CTs in the breaker.   │
└─────────────────────────────────────┘
```

After pushing "Enter", the following is displayed:
(Not for 18M or non-rating plug versions)

```
┌─────────────────────────────┐
│  Select                     │
│  Virtual Rating Plug:       │
│  XXXX Amp                   │
│                             │
│   Up   Dwn  Back  Enter     │
└─────────────────────────────┘
```
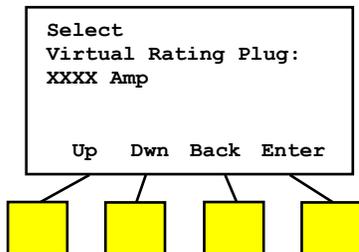
Use the "Up" and "Down" buttons to enter the desired Virtual Rating Plug rating.

After pushing "Enter", the following is displayed:
(Not for 18M)

```
┌─────────────────────────────┐
│  Long Time (LT):            │
│  Pick-Up: XXXX Amp          │
│  Delay: XXX Sec             │
│  Neutral OL: XXX            │
│                             │
│   Up   Dwn  Back  Enter     │
└─────────────────────────────┘
```
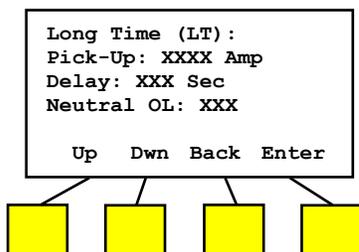
Use the "Up" and "Down" buttons to enter the desired Long Time Pick-Up (LTPU) value.

After pushing "Enter", use the "Up" and "Down" buttons to enter the desired Long Time Delay (LTD).

After pushing "Enter":

> For trip units (firmware) shipped June 2020 & later: Neutral protection can be enabled to match Long Time, Short Time, and Instantaneous protection settings. See subsequent pages of this manual for additional information.

> For trip units (firmware) shipped between December 2016 - June 2020: Neutral Overload protection can be enabled to match Long Time protection settings. The Neutral Overload Protection On/Off setting will appear: use the "On" and "Off" buttons that appear to turn Neutral Overload on or off. (does not apply to 18M). If Neutral Overload is turned on, "(Requires Neutral CT)" will appear.

> For AC-PRO-MP trip units shipped before December 2016:
> After setting the Long Time Delay, the next screen will be Short Time settings.

Next, for Short Time Settings, the following is displayed:
(Not for 18M or 28D)

```
┌─────────────────────────────┐
│  Short Time (ST):           │
│  Pick-Up: XXXX Amp          │
│  I2T Ramp: OFF              │
│  Delay: X.XX Sec            │
│                             │
│   Up   Dwn  Back  Enter     │
└─────────────────────────────┘
```
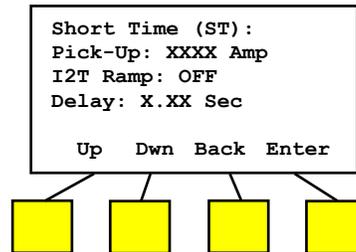
Use the "Up" and "Down" buttons to enter the desired Short Time Pick-Up (STPU) value.

After pushing "Enter", use the "On" and "Off" buttons that appear to enter I^2T ramp on or off.

After pushing "Enter", use the "Up" and "Down" buttons to select the desired Short Time Delay (STD).

After pushing "Enter", the following is displayed:

```
┌─────────────────────────────┐
│  Instantaneous (I):         │
│  Pick-Up: XXXXX Amp         │
│                             │
│                             │
│   Up   Dwn  Back  Enter     │
└─────────────────────────────┘
```
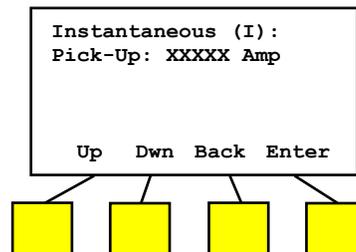
Use the "Up" and "Down" buttons to enter the desired Instantaneous Pick-Up (IPU) value.

After pushing "Enter", the following is displayed: (Not for 18M or 28D)

```
┌─────────────────────────────┐
│                             │
│  Ground Fault (GF)          │
│  Type: T (Residual)         │
│                             │
│                             │
│   T/W  Off  Back  Enter     │
│                             │
└─────────────────────────────┘
      ▢     ▢     ▢     ▢
```
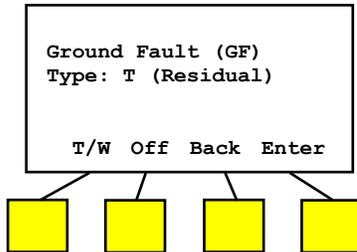
Use the "T/W" button to switch between the two types of Ground Fault protection.

   "T" is for the normal 3-Wire or 4-Wire residual Ground Fault.

   "W" is for source ground return Ground Fault.

   Note: if type "W" is selected, Neutral Overload will automatically be turned OFF and "(Disables Neutral OL)" will be displayed.

After pushing "Enter", the following is displayed: (Not for 18M or 28D)

```
┌─────────────────────────────┐
│                             │
│  Ground Fault (GF):         │
│  Pick-Up: XXXX Amp          │
│  I2T Ramp: OFF              │
│  Delay: X.XX Sec            │
│                             │
│   Up   Dwn  Back  Enter     │
│                             │
└─────────────────────────────┘
      ▢     ▢     ▢     ▢
```
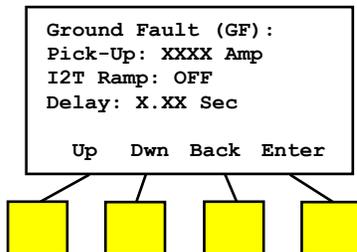
Use the "Up" and "Down" buttons to enter the desired Ground Fault (GFPU) Pick-Up value. The maximum GFPU is 1200 Amp.

A GFPU setting less than 25% of the CT rating requires 24Vdc external power.

After pushing "Enter", use the "On" and "Off" buttons that appear to enter I^{2}T ramp on or off.

After pushing "Enter", use the "Up" and "Dwn" buttons to select the desired Ground Fault Delay (GFD).

For units shipped June 2020 & later, Neutral Protection is available. There are three (3) options – 3 Pole (3P) / 4 Pole (4P) or OFF. After pushing "Enter", the following is displayed:

```
┌─────────────────────────────┐
│                             │
│  Neutral Protection:        │
│  OFF                        │
│                             │
│                             │
│   3P/4P Off   Back  Enter   │
│                             │
└─────────────────────────────┘
```
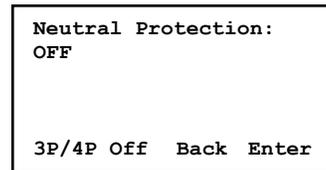
Use the "Off" button to turn Neutral Protection Off. If you selected "OFF", press "Enter". (The following two screens are not displayed if you choose OFF.)

```
┌─────────────────────────────┐
│  Neutral Protection:        │
│  3-POLE          XXX%       │
│  NP-LT Pickup:    XXXXA     │
│  NP-ST Pickup:    XXXXXA    │
│  NP-Inst Pickup: XXXXXA     │
│  (Requires Neutral CT)      │
│   3P/4P Off  Back  Enter    │
└─────────────────────────────┘
```

```
┌─────────────────────────────┐
│  Neutral Protection:        │
│  4-POLE          XXX%       │
│  NP-LT Pickup:    XXXXA     │
│  NP-ST Pickup:    XXXXXA    │
│  NP-Inst Pickup: XXXXXA     │
│  (Requires Neutral CT)      │
│   3P/4P Off  Back  Enter    │
└─────────────────────────────┘
```
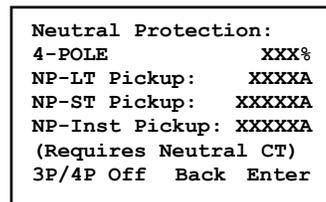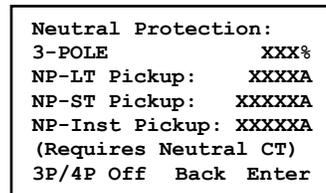
To turn Neutral protection ON, use the "3P/4P" button to select 3-POLE or 4-POLE. Select 3-POLE if the trip unit will be connected to an off-breaker Neutral CT.

Select 4-POLE if the trip unit is installed on a 4-pole breaker with internal Neutral CT.

If you selected 3-Pole or 4-pole, use the up and down buttons to select the Neutral percentage. The Neutral percentage can be set between 40%-200%. The respective Long Time, Short Time, and Instantaneous protective functions will be scaled based on the percentage setting and are applied to the Neutral conductor.

For example, if the neutral conductor is the same size as the phase conductors, select 100%. If the neutral conductor size is 50% of the phase conductors, select 50%.

Note: Regardless of Neutral percentage settings, the Neutral Pickup limits are as follows:
1.   Neutral Protection Long Time Pickup cannot be set below 40% of the CT rating.
2.   Neutral Protection Short Time Pickup and Instantaneous Pickup cannot be set above 1000% of the CT rating.

After pushing "Enter", the following is displayed:

```
Quick-Trip (QT):

QT-I: XXXXX Amp


  Up   Dwn  Back  Enter
```
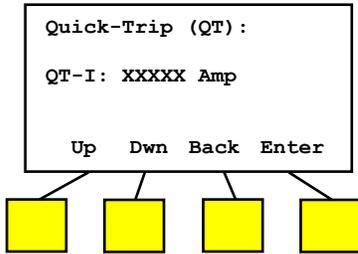
Use the "Up" and "Down" buttons to enter the desired QUICK-TRIP Instantaneous Pick-Up (QT-I) value. An off setting is not available.

After pushing "Enter", the following is displayed:
(Not for 18M or 28D)

```
QT Ground Fault (GF):
Type: T (Residual)



   On/Off Back  Enter
```
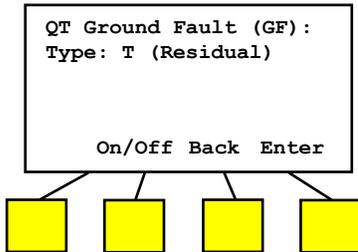
Use the "On/Off" button to toggle between "On" or "Off" for the QUICK-TRIP® Ground Fault function.

If the normal GF was previously set to "Off", the following will be displayed instead of the above display.
(Not for 18M or 28D)

```
QT Ground Fault (GF):
Type: T (Residual)



  T/W  On/Off Back Enter
```
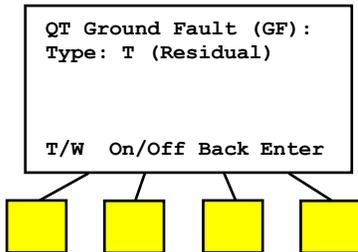
Use the "On/Off" button to turn the QUICK-TRIP® Ground Fault function on or off.

Use the "T/W" button to select the type of Ground Fault.

"T" is for the normal 3-Wire or 4-Wire residual Ground Fault.

"W" is for source ground return Ground Fault.

After pushing "Enter", the following is displayed:
(Not for 18M or 28D)

```
Quick-Trip (QT):
QT-I: XXXXX Amp
QT-GF: XXXX Amp


  Up   Dwn  Back  Enter
```
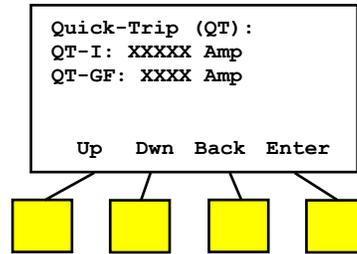
Use the "Up" or "Down" buttons to select the desired QUICK-TRIP Ground Fault (QT-GF) Pick-Up value.

A QT-GF setting less than 25% of the CT rating requires 24Vdc external power.

After pushing "Enter", the following is displayed:
(Not for 18M, 28D or 38S)

```
    Load Monitoring
Ic1: XXXX Amp

Ic2: XXXX Amp

  Up   Dwn  Back  Enter
```
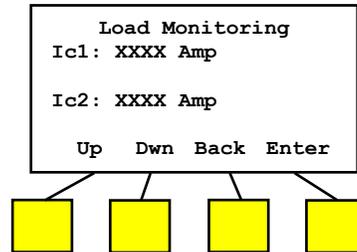
See Section 16.0 for more information on the Load Monitoring relays.

Use the "Up" or "Down" buttons to select the desired Load Monitoring 1 (Ic1) Pick-Up or scroll down to off.

Push the "Enter" button to go to Load Monitoring 2 (Ic2).

Use the "Up" or "Down" buttons to select the desired Ic2 Pick-Up or scroll down to off.

After pushing "Enter", the following is displayed:

```
  FV Segregated Trip
  Relay Operation On:
LT Trip:        XXX
ST Trip:        XXX
I Trip:         XXX
GF Trip:        XXX
   Yes  No   Up   Dwn
```
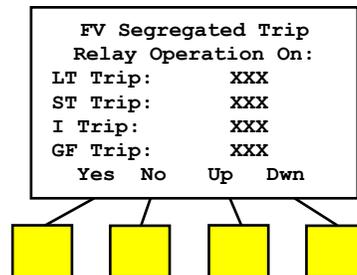
See Section 14.0 for more information on the FV Segregated Trip relay.

Use the "Yes" or "No" buttons to select which combinations of protective functions will operate the FV Segregated Trip Relay.

The FV Segregated Trip Relay requires 24Vdc external power to operate.

Use the "Down" button to move to the next function.

When the "Down" button is pushed after the "GF Trip" FV Segregated Trip Relay operation is selected, the following is displayed:

```
┌─────────────────────────────┐
│     FV Segregated Trip       │
│  QT-I Trip:      XXX         │
│  QT-GF Trip:     XXX         │
│  OverTemp Trip: XXX          │
│  Sluggish Brkr: XXX          │
│  Neutral OL:    XXX          │
│    Yes  No   Up   Dwn        │
└─────────────────────────────┘
```
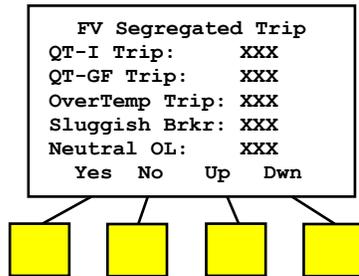
Use the "Yes" or "No" buttons to select which combinations of functions will operate the FV Segregated Trip Relay.

Use the "Down" button to move to the next function.

After setting the "Neutral OL" function, pushing the "Down" button will display the following:
(this screen only applies to AC-PRO-MP-II)

```
┌─────────────────────────────┐
│   RS-485 Communications      │
│  Enabled:        OFF         │
│  Address:          1         │
│  Baud Rate:    19200         │
│  Parity:        None         │
│  Reply Delay:   5 ms         │
│   On   Off  Back  Enter      │
└─────────────────────────────┘
```
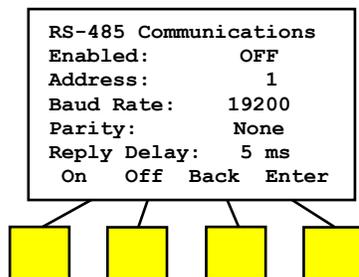
The AC-PRO-MP-II is capable of communicating over an RS485 network via Modbus RTU protocol. The RS485 communications settings are as follows:

Communications Enabled: Set to ON if RS485 communications will be used.

Address: Each trip unit that shares the same twisted pair must have a unique address. The address identifies each individual trip unit.

Note: two trip units can have the same Address as long as they are not connected to the network via the same twisted pair cable.

The address is selectable from 1 to 247, in increments of 1. In most applications, only addresses 1 through 32 will be used due to the limitations of RS485 communications.

Baud Rate should be selected to match the baud rate of the master communicating device (i.e. PC, gateway, etc.).

Parity should be set to match the parity of the master communicating device (i.e. PC, gateway, etc.).

Reply Delay is the minimum delay between the trip unit's receipt of a Modbus packet and its reply. It can be set to 5 or 10 milliseconds.

After setting the Reply Delay, pushing the "Enter" button will display the following:
(this screen only applies to AC-PRO-MP-II)

```
┌─────────────────────────────┐
│  Controls Over Comm:         │
│  Forced Trip:        OFF     │
│  Settings Change:   OFF      │
│  QT Control:         OFF     │
│                              │
│   On    Off   Back   Enter   │
└─────────────────────────────┘
```
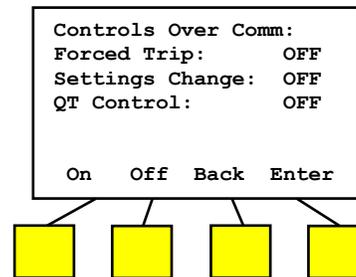
The AC-PRO-MP-II "Controls Over Comm" settings are locally set "permissive settings", which should normally be set to OFF, unless there is a communications master device in place that is specifically intended and capable of performing these functions.

Forced Trip: If enabled, this feature permits tripping of the breaker via a forced trip command over RS485 communications.

Settings Change: If enabled, this feature permits the user to make settings changes via the communications network. Otherwise, settings can only be changed at the AC-PRO-MP-II using the smart buttons or using the local USB connection. NOTE: The CT settings can only be changed at the AC-PRO-MP-II.

QT Control: If enabled, this permits turning QUICK-TRIP settings ON over RS485 communications.

After setting QT Control, pushing the "Enter" button will display the following:

```
Save Settings

Or

Review Settings

Exit Review      Save
```
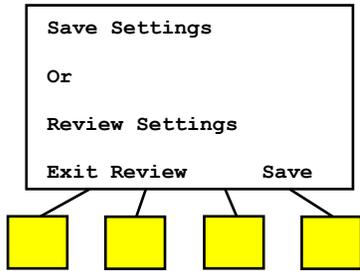
Pushing the "Review" button will review the settings just made and will allow changes to be made.

Pushing the "Save" button will save the settings into non-volatile memory and the following will be displayed for a short time:

```
USER SETTINGS UPDATE

….Successful
```
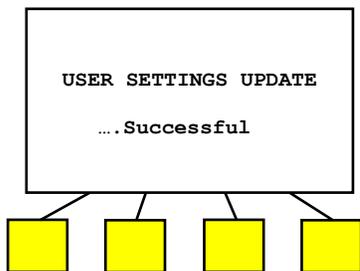
4.2   Reviewing Settings

The trip unit settings and information can be reviewed in a "read only" manner, using the Review Settings button.

```
** SETTINGS **

"Rev"  to Review
"Chng" to Change
"Exit" to Cancel

Rev   Chng       Exit
```
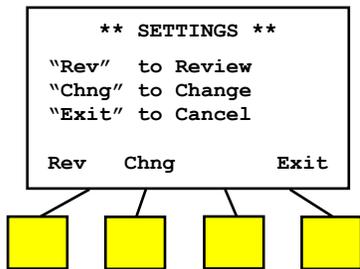
Push the "Rev" button at the "**SETTINGS**" screen to start reviewing the trip unit information and settings. After pushing "Rev", the following will be displayed:

```
Serial No: xxxxxxxxxx
Firmware:  Vx.xx.xxx
STR TYPE:  STR xxx
Frequency: 60 Hz
Breaker:   Hx

 Next            Exit
```
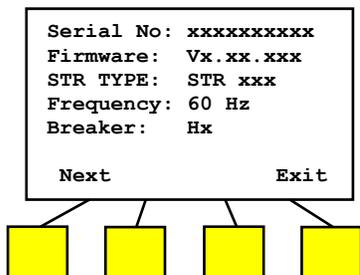
Push the "Next" button to continue reviewing trip unit settings. The subsequent screens will display all settings, along with the "Next", "Back", and "Exit" buttons.

4.3   Setting the Time & Date

The AC-PRO-MP & MP-II include an internal clock that is powered by the 6V CR-P2 battery. The time and date setting is important, as trip events and on-demand waveforms are time stamped.

The time and date must be set after commissioning the trip unit or after replacing the battery

The clock does not automatically update for daylight savings time.

To view or change the time, push the "Display" button (and possibly the "Exit" button) to view the main screen:

```
φA   XXXX A     XXX Vab
φB   XXXX A     XXX Vbc
φC   XXXX A     XXX Vca
N:   XXXX A
GF:  XXXX A
   Pwr  Set Hist  Time
```
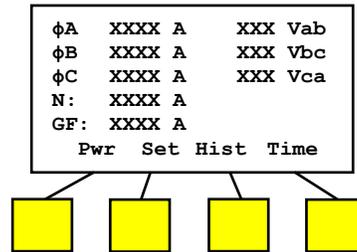
Push the "Time" button to display the time and date:

```
Time & Date:

hh:mm:ss AM/PM

MM/DD/YYYY

     Chng       Exit
```
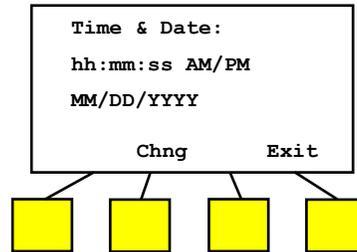
Where "hh:mm:ss" is the time of day in hour, minutes and seconds.

Where "MM/DD/YYYY" is the date in month, day and year.

To change the time, push the "Chng" button and follow the prompts.

4.4   Using the USB Interface

A USB 2.0, Mini-B connector on the front of the AC-PRO-MP & MP-II trip units is used to transfer information, including settings, between the trip unit and a computer, using InfoPro software. See Section 18.0.

The USB port also supports the SAFE-T-TRIP© remote hand-held device. See Section 7.0 for additional information.

```
KWHr:            XXXXXXXX
KVAHr:           XXXXXXXX

KW:                  XXXX
KVA:                 XXXX
PF:                   XX%
 Back   Reset
```


Power & Energy Screen
(AC-PRO-MP-II only)

5.0   Normal Operations & Readings

5.1   Current & Voltage Readings

During normal operation, the trip unit display screen will be off and in its power saving mode. When the "DISPLAY" button is pressed during normal operation (no trips, errors, alarms, etc), the trip unit will display currents and voltages. The voltages will be displayed if 24VDC control power is present, and if the voltage hardware is present. The neutral and GF currents will only be displayed if neutral or GF protective functions are turned on. See below. The "XXXX" digits will display actual readings.

```
φA    XXXX A      XXX Vab
φB    XXXX A      XXX Vbc
φC    XXXX A      XXX Vca
N:    XXXX A
GF:   XXXX A
    Pwr  Set  Hist  Time
```


Main ("Readings") Screen
(voltages appear on AC-PRO-MP-II only)

- The left column displays Currents in Amps for Phases A, B, C, Neutral and Ground Fault.
- The right column displays Line-to-Line Voltages "Vab", "Vbc", and "Vca". These values appear for AC-PRO-MP-II only.

Breaker Current Less than 10% of CT Rating:
When the currents are less than about 10% of the CT rating, the display will display "LOW" for currents.

Breaker Current Greater than 10% of CT Rating:
If the breaker current is greater than about 10% of the CT rating, the current readings will be displayed.

Line-to-Line Voltages (if AC-PRO-MP-II and powered with 24VDC):
"LOW" will be displayed if the Line-to-Line voltage is 50V or below.
"N/A" will be displayed if the Voltage cannot be determined, most likely because system voltage (i.e. 480V) is not present at the AC-PRO-MP-II, or if 24VDC control power is not present.

The AC-PRO-MP-II is rated for up to 600V three-phase power systems.

5.2   Power and Energy Values
   (AC-PRO-MP-II powered by 24VDC):

- KWHr = KiloWatt-Hours (real power usage)
- KVAHr = KiloVolt-Ampere-Hours (apparent power usage)
- KW = KiloWatts (instantaneous real power)
- KVA = KiloVolt-Amperes (instantaneous apparent power)
- PF = total instantaneous Power Factor
- "LOW" is displayed for the per-phase KW and KVA values if an associated phase current or voltage is "LOW".
- "N/A" will be displayed for KW and KVA values if the Voltage on the associated phase cannot be determined, most likely because system voltage (i.e. 480V) is not present at the trip unit, or 24VDC is not available.
- Energy values increment if the current for a particular phase is above 3% of the CT rating and the phase voltage is above 50V.
- The KWHr value increments (up) and decrements (down) depending on the power flow direction.
- The KVAHr value only increments (up).
- Note: Energy values can increment (up) even when the Instantaneous Power values displayed are "LOW"

6.0   QUICK-TRIP Arc Flash Reduction

The QUICK-TRIP® system (patents 7,646,575 & 7,889,474) is a manually controlled arc flash hazard reduction system. It can reduce trip times when turned on and allows selective coordination between circuit breakers when turned off.

If maintenance personnel must work on energized equipment, they will first turn the QUICK-TRIP system on at the breaker feeding the equipment. If a fault now occurs, the upstream breaker will trip quickly based on the QUICK-TRIP settings **reducing the Arc Flash Hazard to personnel.**

When the work is finished, the QUICK-TRIP® system is turned off and the original selective coordination is back in effect.

When QUICK-TRIP® is **on**, the following settings are enabled:
- QUICK-TRIP Instantaneous (QT-I)
- QUICK-TRIP Ground Fault (QT-GF)

All other settings remain in effect.

The "QUICK-TRIP ON LED" provides positive indication that the QUICK-TRIP settings are active if the LED is on.

**** IMPORTANT ****

A qualified engineer must determine the QUICK-TRIP® settings, calculate the incident energy levels and determine the Hazard Risk Categories (HRC) with QUICK-TRIP® both on and off.

6.1   QUICK-TRIP® Switch

The QUICK-TRIP switch on the front of the AC-PRO-MP can be used to turn the QUICK-TRIP functions on or off.

  J. QUICK-TRIP on/off Switch
      Move this switch to the on position to make the QT-I and QT-GF functions active for reduction of arc flash hazard.

  K. Red QUICK-TRIP on LED
      When this LED is on, the QT-I and QT-GF functions are active because either the local (J) or remote QUICK-TRIP switch is in the on position.

If the trip unit is not powered-up because of low breaker current and no 24Vdc auxiliary control power to the breaker, the QUICK-TRIP on LED will not be illuminated with the switch in the on position.

To verify that the QUICK-TRIP function will be active as soon as the trip unit powers up with breaker current, push the "Display" button (E) to power the trip unit using the battery. The QUICK-TRIP on LED will illuminate.
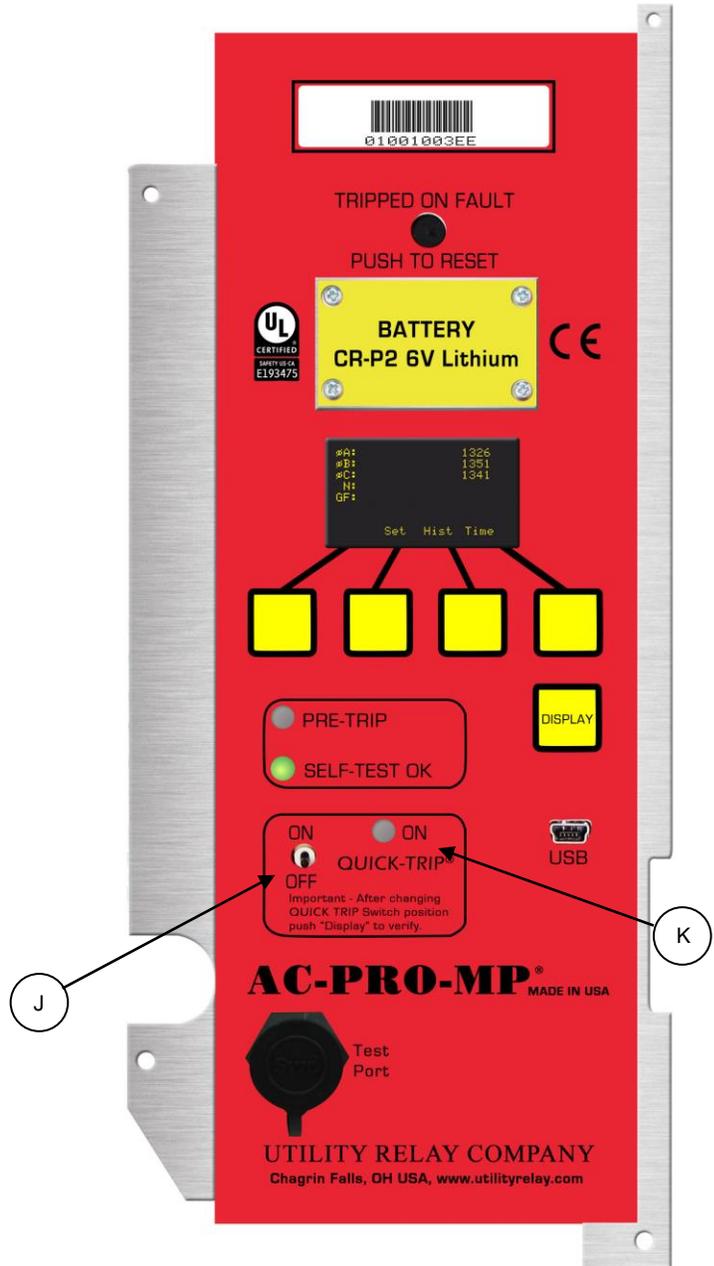
6.2   Remote QUICK-TRIP®

The QUICK-TRIP system can also be controlled remotely.

Either the local QUICK-TRIP switch on the front of the AC-PRO-MP or MP-II or the remote QUICK-TRIP switch/function can turn on QUICK-TRIP. Both must be in the off position to turn QUICK-TRIP off.

Remote QUICK-TRIP indication is also possible. This lamp will be energized whenever QUICK-TRIP is on, either by the local on/off switch or the remote QUICK-TRIP switch/function.

NOTE: Hardwired remote QUICK-TRIP® is not available in the AC-PRO-MP & MP-II units with the front test port (shipped December 2016 and later).

For trip units sold in December 2016 or later:

Remote QUICK-TRIP control and indication can only be accomplished using Modbus Communications with AC-PRO-MP-II. For details see the AC-PRO-MP-II Modbus Communications Register Map.

Note: The "QT Control over Comm" (permissive) setting must be enabled at the trip unit locally before Remote QUICK-TRIP over communications can be utilized.

For AC-PRO-MP trip units sold prior to December 2016:

Remote QUICK-TRIP is accomplished with wiring, as shown in the diagram below.
The remote indication lamp must use 150 milli-Amp or less current.
A 40 to 125 Volt, AC or DC source is required for the remote QUICK-TRIP switch and the remote indication lamp.
Connections for the remote QUICK-TRIP switch and the remote indication lamp are made to the remote QUICK-TRIP connector on the top of the AC-PRO-MP.

Remote Quick-Trip™ on/off Switch & Indication Light

40-125 Volt AC/DC 150 mA Max

ON/OFF

40-125 Volt AC/DC

Remote Quick-Trip™ Connector

Note: This wiring does not apply to units that have the front test port. Miswiring WILL result in damage.

AC-PRO-MP Front
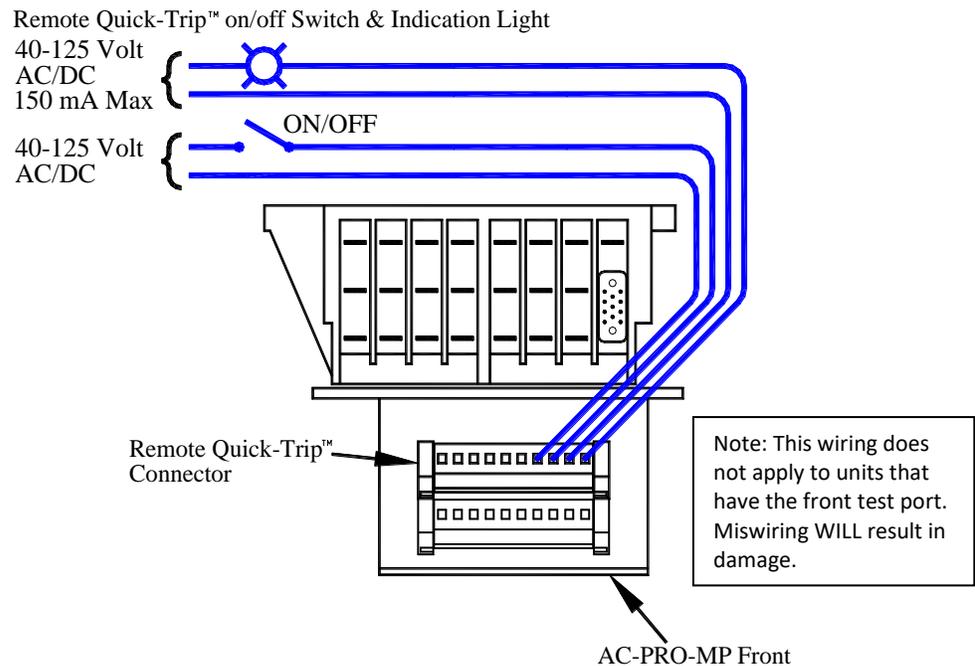
Remote QUICK-TRIP wiring
(only applies to units shipped prior to December 2016)

7.0   SAFE-T-TRIP

The SAFE-T-TRIP remote hand-held trip device allows an operator to trip open a breaker without standing in front of the breaker. It also provides a way to obtain the breaker mechanism operation speed for the important **first operation**. This is accomplished using the patented SLUGGISH BREAKER Detection feature in the AC-PRO-MP and MP-II.

The SAFE-T-TRIP device is furnished with a permanently connected USB cable, allowing the breaker to be tripped without standing directly in front of the breaker, thus reducing the arc flash hazard risk.

⚠ **CAUTION**

The SAFE-T-TRIP device should not be operated while standing in front of a racked in breaker or breaker cubicle. The SAFE-T-TRIP is supplied with a 9V lithium battery, the attached USB cable with magnetic cable wrap, and instructions, in a durable, waterproof case.

SAFE-T-TRIP

SAFE-T-TRIP in case

8.0   SLUGGISH BREAKER Detection

The AC-PRO-MP and MP-II feature a patented SLUGGISH BREAKER Detection feature that captures the breaker mechanism time when a trip occurs that was initiated by the trip unit. If the breaker mechanism time is in excess of 33 milli-seconds, an alarm message will appear after the "Display" button is pressed. Also, the FV segregated trip relay can be set to operate if a SLUGGISH BREAKER Detection trip occurs. See the alarm message below:
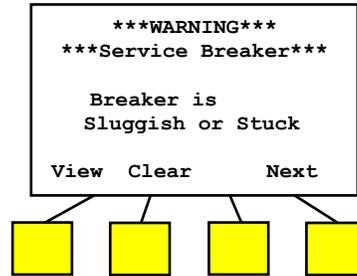
If a "sluggish" trip occurs, breaker mechanism maintenance is required.
Press "View" to view the breaker clearing times. See Section 9.0.
Press "Clear" to clear the SLUGGISH BREAKER Detection alarm message after maintenance is performed.
Pressing "Next" will advance to the next alarm screen if additional alarms are present, or it will advance to the Main readings screen if no additional alarms are present.

When the AC-PRO-MP & MP-II send a trip pulse to the breaker actuator, the SLUGGISH BREAKER Detection timer starts.

Units shipped prior to December 2016 use the zero current method. The trip unit determines the breaker clearing time by monitoring the current values. The SLUGGISH BREAKER Detection timer stops when the current is zero. The breaker clearing time for each breaker pole is recorded.

Units shipped in December 2016 and later use the limit switch method. The trip unit determines the breaker clearing time by monitoring the breaker position limit switch (which was supplied with the AC-PRO-MP or MP-II retrofit kit). The SLUGGISH BREAKER Detection timer stops when the limit switch input to the trip unit changes state, confirming the breaker is fully open. One breaker clearing time is recorded.

**** IMPORTANT ****
24VDC auxiliary control power or a fresh battery must be present to guarantee the breaker clearing time is captured.

9.0   Last Trip Data

Push the "Display" button to power up the trip unit. The following is displayed:

```
Trip Tallies:
LT:          XXX
ST:          XXX
GF:          XXX
QTGF:        XXX
Rev   Clear  More  Exit
```
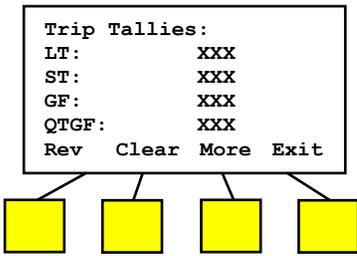
Push the "More" button to display the remaining trip functions:

```
Inst:        XXX
QT-I:        XXX
SAFE-T:      XXX
OverTemp:    XXX
Neut OL:     XXX
Forced:      XXX
Rev   Clear  Back  Exit
```
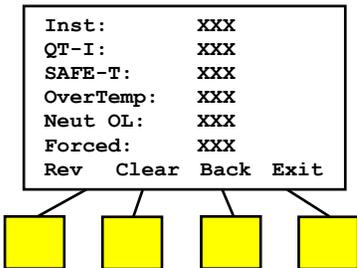
Pushing the "Clear" button will start the procedure to clear all the last trip data.

Pushing the "Review" button to review the details of the latest trip:

```
Trip History:
Last Trip:  #X
Trip Type:  XXXXXX
hh:mm:ss AM/PM
MM/DD/YYYY
Next  Prev   Info  Exit
```
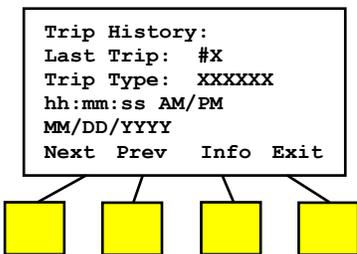
Where "hh:mm:ss" is the time of day of this trip in hour, minutes and seconds.

Where "MM:DD:YYYY" is the date of this trip in month, day and year.

Push the "Previous" button to display the prior trip.

Push the "Information" button to display the detailed information of the Phase, neutral & ground fault currents for this trip:

```
φA:  XXXXX A    xxx Vab
φB:  XXXXX A    xxx Vbc
φC:  XXXXX A    xxx Vca
N:   XXXXX A
GF:  XXXXX A
BrkTme          xx.x ms
                   Back
```
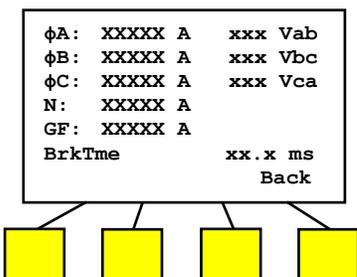
The trip history data can be viewed, saved, and printed using the InfoPro software application. Refer to Section 18.0 for more information.

For units shipped in December 2016 or later, waveforms are captured for the last 8 trips. These waveforms can be viewed with InfoPro-MP-II. Additionally, AC-PRO-MP-II units communicate trip data via RS-485 Modbus RTU communications.

> **** IMPORTANT ****
> 24VDC auxiliary control power or a fresh battery must be present to ensure the breaker clearing time and waveform data is captured.
>
> A fresh battery must be in place to maintain accurate clock time and for accurate date/time stamps in Trip History.

10.0   Replacing the Battery

The battery can be easily replaced.

Remove the four (4) 2-56 screws attaching the battery cover.

Remove (4) 2-56 Screws

Remove the old battery and install a new CR-P2, 6 Volt Lithium battery. Replace the battery cover.

11.0   Self-Test Feature

The AC-PRO-MP and AC-PRO-MP-II continually perform self tests in the background.

If an internal problem is detected, the "Self Test OK" LED is turned off.

The internal self tests include:
- Watch dog timer
- Memory check sum
- Memory access error
- Low battery voltage
- Actuator connected
- Setting problem

12.0   Primary & Secondary Injection

12.1 Primary Injection Testing

A primary injection test is recommended as the final test of the AC-PRO-MP or MP-II. This tests the complete system.

If Ground Fault with the "T" option (residual) is used, GF must be temporarily turned off when single phase testing the other trip functions with a primary injection test set.

12.2 Secondary Injection Testing

Secondary injection test set

Side Secondary injection test port (units shipped prior to December 2016)

Front Secondary injection test port (units shipped December 2016 or later)
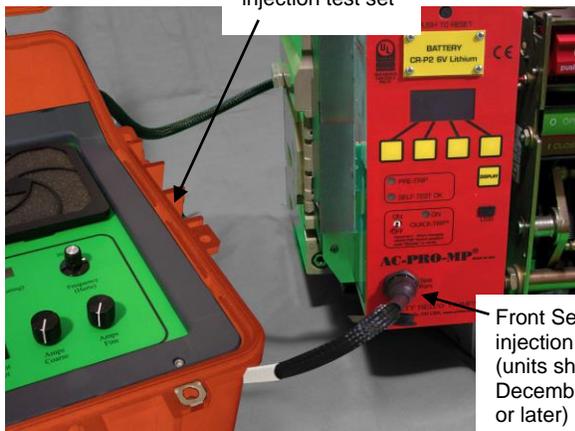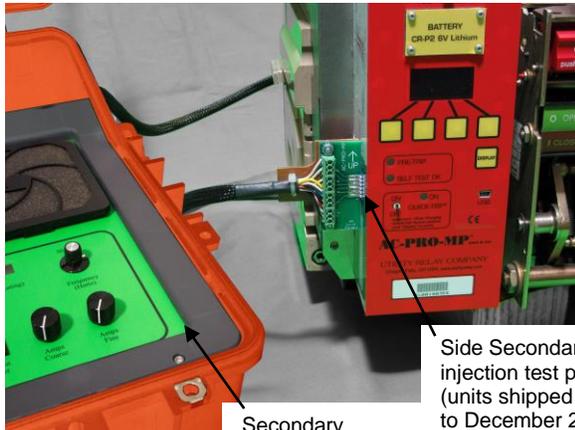
The AC-PRO-MP secondary injection test set provides a quick and easy way to test the AC-PRO-MP and AC-PRO-MP-II trip units.

The test set performs a true test of each Phase and can also test the Ground Fault function.

For units shipped prior to December 2016: The test set harness plugs into a port on the left side of the trip unit.

For units shipped in December 2016 and later: The test set harness plugs into a port on the front of the trip unit.

The same test set can be used for all AC-PRO-MP and MP-II trip units. If you do not have a test set harness for trip units that have a front test port, contact Utility Relay Company.

Refer to the MP Test Set Instruction Manual for testing instructions and information.

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

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13.0   DINF Instantaneous Trip

Some Masterpact MP breakers have a DINF Instantaneous (DINF-I) feature. The DINF-I trip function is only enabled for a short time while the breaker is closing. After the breaker is fully closed and latched, the DINF-I trip function is disabled by the DINF micro-switch.

The DINF-I function is controlled with a micro-switch and inertial mass. They are located in the lower control unit as shown in Section 3.3. The connection to the AC-PRO-MP or MP-II trip unit is via connector "A" as shown in in Section 2.2.

Not all Masterpact MP breakers are equipped with the DINF micro-switch and, therefore, the DINF-I trip functison is never active.

The DINF-I Pick-Up settings are fixed depend on the CT rating as shown below.

CT Rating (Amp)	DINF-I Pick-Up (Amp)
200	2200
250	2700
320	3400
400	4300
500	5400
600	6500
630	6800
800	8600
1000	10,800
1200	12,900
1250	12,900
1600	16,700
2000	20,800
2500	26,900
3000	32,300
3200	19,200
4000	24,000
5000	30,000
6000	36,000
6300	37,800

The DINF-I Pick-Up setting is not adjustable and is also not shown on the OLED display.

If the breaker does NOT have a DINF cable, leave the DINF jumper in place. See Section 3.5. Without the DINF jumper, DINF Instantaneous will always be on.
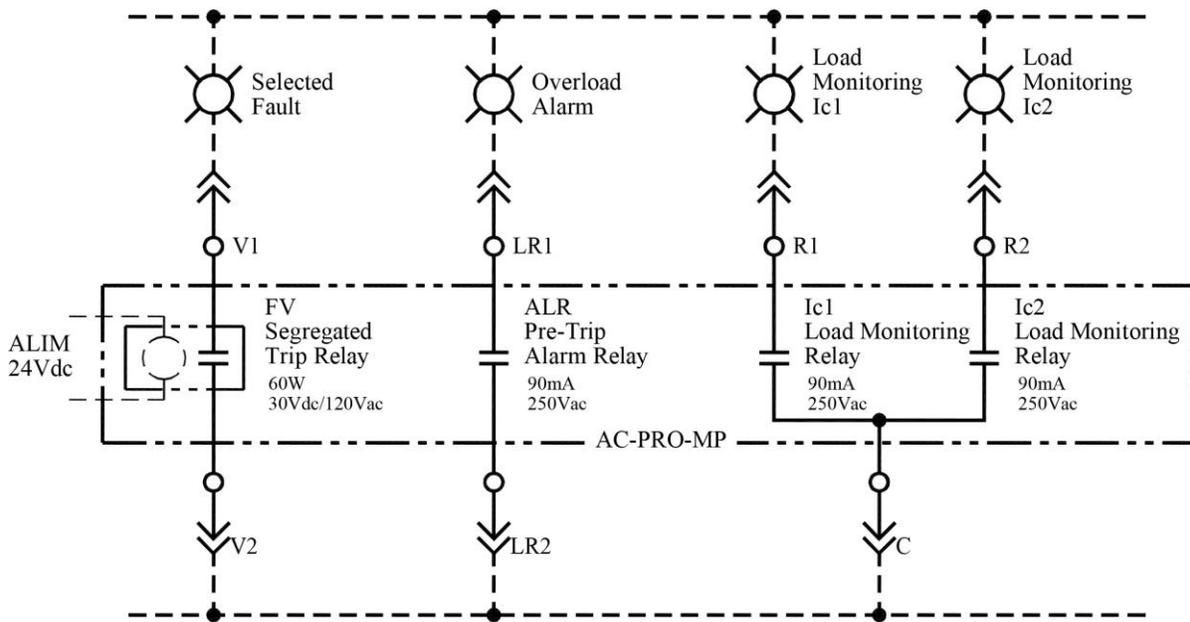
FV, ALR, Ic1 and Ic2 Wiring

14.0 FV Segregated Trip Relay

The FV Segregated Trip relay is a latching relay that is latched when a trip event occurs that is programmed to operate this relay.

None or one or more of the following trip events can be programed to latch this relay:
Long Time
Short Time
Instantaneous
Ground Fault
QUICK-TRIP Instantaneous
QUICK-TRIP Ground Fault
Over Temperature
SLUGGISH BREAKER

If the FV Segregated trip relay is latched by a programmed trip event, it will stay latched until the next time the "Display" button is pushed. The operator then has the option to un-latch the relay as shown below:

```
Unlatch FV Segregated
Trip Relay?



No            Yes
```
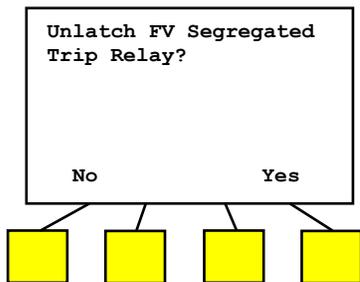
The FV Segregated Trip Relay requires 24Vdc external power to operate.

The FV Segregated trip relay contact is normally open and is brought out to terminals V1 & V2 as shown in the wiring diagram on Page 8 as well as above.

15.0 ALR Pre-Trip Alarm Relay

The ALR Pre-Trip alarm relay signals the fact that the breaker current is greater than 105% of the Long Time Pick-Up setting. This indicates that a Long Time overload trip is in process.

When the breaker current drops below 105% of the Long Time Pick-Up setting or a trip occurs, the relay is de-energized and the contact opens.

The ALR Pre-Trip alarm relay contact is normally open and is brought out to terminals LR1 & LR2 as shown in the wiring diagram on Page 8 as well as above.

16.0 Ic1 & Ic2 Load Monitoring Relays

If the STR 58U version is selected, the load monitoring relays Ic1 and Ic2 are active. These are independent relays that can be used for load sheading or alarms.

These relays have independent pick-up and time delay settings as shown in the TCC in Section 21.6.

Once energized, the relays stay energized until the breaker trips or for 10 seconds after the breaker current drops below the pick-up setting.

The Ic1 relay contact is normally open and is brought out to terminal R1. The Ic2 relay contact is also normally open and is brought out to terminal R2. Both relays share the "C" common output as shown in the wiring diagram on Page 8 as well as above.

17.0   Communications

Creating a complete power monitoring and communications system for a low voltage power distribution system is easy with AC-PRO-MP-II. The standard AC-PRO-MP-II trip unit communicates using industry standard Modbus RTU protocol through a single shielded twisted pair wire connected to the RS485 port. A number of trip units can be daisy-chained together to simplify installation.

AC-PRO-MP-II communications features and information:
- Currents, 3-phase
- Review and change all settings ("Changing settings over Comm" user setting must be enabled at trip unit).
- Voltages, 3-phase
- KW, total
- KWHr, total
- KVA, total
- KVAHr, total
- Power Factor data
- Breaker position status (open or closed)
- Trip unit alarms and status information
- Sluggish-Breaker indication
- QUICK-TRIP ON /OFF status
- Trip unit time and date
- Trip unit Information: serial number, firmware revision.
- Forced trip ("Forced trip over Comm" user setting must be enabled at trip unit).
- Trip history data for the last 8 trips
  - Trip counts
  - Trip type (reason for trip)
  - Trip dates & timestamps
  - Trip currents & voltages
  - Breaker clearing times

A host PC running HMI software with Modbus device drivers collects information from the trip units. The driver interrogates each trip unit individually and reports that information back to the host PC applications on a continual basis. Additional trip units can be added to the system by simply providing the new trip unit's ADDRESS to the HMI software.

AC-PRO-MP-II trip units are compatible with the Modbus RTU communication protocol supplied with most HMI systems.

Note: 24VDC control power is required for communications.

17.1 Communications Components

An AC-PRO-MP-II Modbus Communications system consists of the following hardware components:
1. AC-PRO-MP-II trip unit and breaker retrofit components.
2. Host PC (supplied by others).
3. Cabling topology (supplied by others).

Additional components to consider include:
1. OPC software with Modbus device drivers (supplied by others).
2. Modbus RTU/Ethernet converter (supplied by others).
3. Human-Machine Interface (HMI) System (supplied by others). These systems are used to view trip unit information graphically and often contain their own compatible Modbus Driver.

17.2 Communications Wiring

All AC-PRO-MP-II trip units are furnished with quick-disconnect communications cable assemblies. The cable assembly features a heavy-duty twist-lock connector and a terminal block, which mounts inside the switchgear.

The purpose of the terminal block is to provide a connection location for the twisted pair wire as it is daisy-chained from cell to cell in a switchgear lineup. This enables any individual communicating AC-PRO-MP-II (mounted on a circuit breaker) to be removed without disrupting communications between the other communicating AC-PRO-MP-II trip units.

17.3 System Components & Computer Hardware

AC-PRO-MP-II communicates over the RS485 interface at 9600 or 19200 Baud, with 8 data bits, 1 stop bit and no parity using the Modbus RTU communications protocol.

17.4 Ethernet

With the addition of an RS485 to Ethernet Converter an existing Local Area Network (LAN) can be used to carry data between trip units and the PC. Converters are widely available from a variety of industrial manufacturers.

RS485 to Ethernet Converters are designed to be compatible with a TCP/IP network environment and typically connect to a LAN using standard 10Base-T modular CAT-5 cabling. These converters offer a relatively inexpensive means of connecting to a LAN.

17.5 Modbus Communications Register Map

The AC-PRO-MP-II Modbus Communications Register Map is included in a separate document. This document can be found at the web page below:
http://www.utilityrelay.com/Side_Bar/Instruction_Manuals.html

17.6 Communications Settings

Refer to Section 4.1 for information about Communications settings.

18.0   InfoPro Software

InfoPro-MP a software application that can be used with AC-PRO-MP units that shipped prior to December 2016. It offers the following capabilities:
- Settings – upload, download, view, and save.
- Trip unit info: serial number, firmware versions, breaker name.
- Firmware updates

InfoPro-MP-II software is for AC-PRO-MP & MP II units that shipped in December 2016 or later (these units can easily be identified by their front test port). In addition to the above features, InfoPro-MP-II includes the following:
- Waveform capture ***
  (on-demand and for the last 8 trips)
- Current readings
- Voltage, power, & energy readings
  (AC-PRO-MP-II only)

***24VDC auxiliary power or fresh battery required for trip waveforms and clearing times. Fresh battery required for timestamps.

| AC-PRO-MP with front test port (shipped December 2016 or later) | AC-PRO-MP-II with front test port (released December 2016) | AC-PRO-MP (shipped prior to December 2016) |

Operating System:
    Microsoft Windows (10 recommended)

Connection:
    mini-USB (cable not included)

The InfoPro software applications are available for download at:
http://www.utilityrelay.com/Side_Bar/Downloads.html

Open the downloaded file and follow the instructions to install the application.

**** IMPORTANT ****

InfoPro software needs the correct USB device driver to communicate with AC-PRO-MP and MP-II trip units. Microsoft Windows often already includes these drivers. However, if this driver is not already installed:
1) Ensure your PC is connected to the Internet.
2) Connect the trip unit to your PC with the USB cable.
3) Automatic driver update process:
    a) After you connect the trip unit, if you have an internet connection and administrative rights on your PC, Microsoft Windows should install the driver automatically after a few minutes.
4) Manual driver update process:
    a) Open Windows Device Manager
    b) Right click on the trip unit device. It will be located under Ports or under Other Devices.
    c) Choose the "Update Driver Software" option.
    d) Choose the "Search automatically" option.
    e) After the driver is installed, close and then reopen the InfoPro Application.

NOTE: Any pending Microsoft Windows updates can interfere with the driver installation process.

For more detailed instructions with screenshots, contact URC.

Refer to the InfoPro Help Guide within the application for specific information and instructions.

18.1 Firmware Updates

To determine which firmware version is currently installed on your trip unit, use the Settings menu. See Section 4.2.

The InfoPro application can be used to update firmware in the field using the USB port. Firmware update instructions can be found in the InfoPro Help Menu.

Note: Units with the front test port (shipped December 2016 or later) accept different firmware than units shipped prior to December 2016.

Contact URC for additional information.
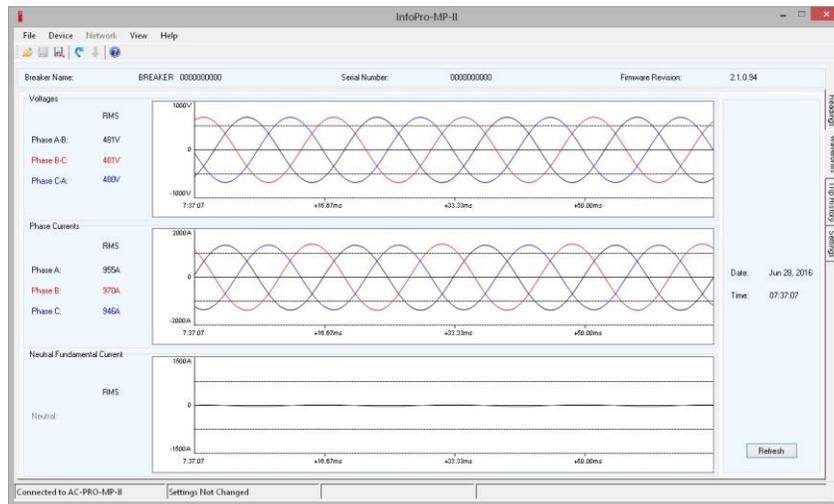
InfoPro-MP-II Waveform Tab Screenshot

19.0   Warranty

The AC-PRO-MP & AC-PRO-MP-II have a conditional 2-year warranty.

Please view the warranty page at the beginning of this manual for the full details.

Visit www.UtilityRelay.com or call 888-289-2864 for the latest information.

20.0   Environmental Ratings

Ambient Temperature:
  Trip Unit Electronics:
    -4°F (-20°C) to 158°F (70°C)
  OLED Display:
    -22°F (-30°C) to 158°F (70°C)
  Battery:
  -4°F (-20°C) to 140°F (60°C)

Humidity:
  95% non-condensing

Conformal Coating:
  Acrylic conformal coating,
   HumiSeal type 1A33
   UL Component File #E105698

Enclosure:
  14 Gauge, type 304 stainless steel

Battery:
  Panasonic CR-P2
  6 Volt, 1400 mAh Lithium
  Non-Rechargeable

21.0   Time Current Curves

The pages to follow include the Time Current Curves for the AC-PRO-MP and AC-PRO-MP-II.

Neutral Protection Notes:

1. Units shipped June 2020 & later: Neutral Protection (based on user-set Neutral Percentage), can be enabled. If enabled, this feature applies Long Time, Short Time, and Instantaneous protection to the Neutral conductor, by using the Neutral percentage setting to scale each respective Neutral pickup. Utilize Figures 21.1 through 21.4, and scale pickups accordingly. Also see Section 4.1.

2. Units shipped between December 2016 to June 2020: Neutral Overload protection (matches Phase Long Time protection) can be enabled. See Figure 21.9 for TCC.

21.1   STR-18M Time-Current-Curve

Instantaneous Pick-Up (IPU)
Multiple of CT Rating
2, 4, 8, 12, 14, 19, 22, & 28 for CT 1000A or Less
2, 4, 8, 12, 14, 17, 22 & 24 for 1200A CT
2, 4, 8, 12, 14, 17, 22 & 24 for 1250A CT
2, 4, 8, 12, 14, 17, 22 & 24 for 1600A CT
2, 4, 8, 10, 12, 14, 17 & 20 for 2000A CT
2, 4, 6, 8, 10, 12 & 14 for 2500A CT
2, 4, 6, 8, 10 & 12 for 3000 & 3200A CT
2, 4, 6, 8 & 10 for 4000, 5000, 6000, & 6300A CT
No OFF

IPU Shown at 2 X CT   IPU Shown at 28 X CT

+/- 15%

Current in Multiples of CT Rating

AC-PRO-MP & AC-PRO-MP-II with STR-18M setting

21.2   STR-28D Time-Current-Curve

Long Time Pick-Up (LTPU)
1.1 X LTPU Setting
STR 28D no Virtual Rating Plug, LTPU Setting =
0.4, 0.425, 0.44, 0.45, 0.46, 0.475,
0.49, 0.5, 0.504, 0.536, 0.554, 0.567,
0.58, 0.599, 0.617, 0.63, 0.64, 0.68,
0.704, 0.72, 0.736, 0.76, 0.784, 0.8,
0.85, 0.88, 0.9, 0.92, 0.95, 0.98,
& 1.00 X CT Rating
STR 28D with Virtual Rating Plug, LTPU Setting =
0.8, 0.85, 0.88, 0.9, 0.92, 0.95, 0.98
& 1.0 X Rating Plug

Boundary	I²T
E	311
F	219

Long Time Delay (LTD) Fixed

CT	Virtual Rating Plug Setting
200A:	100A, 120A, 160A, 200A
250A:	125A, 150A, 200A, 250A
320A:	160A, 200A, 240A, 320A
400A:	200A, 250A, 300A, 400A
500A:	250A, 300A, 400A, 500A
600A:	300A, 400A, 500A, 600A
630A:	315A, 420A, 525A, 630A
800A:	400A, 500A, 600A, 800A
1000A:	500A, 600A, 800A, 1000A
1200A:	600A, 800A, 1000A, 1200A
1250A:	600A, 800A, 1000A, 1250A
1600A:	800A, 1000A, 1200A, 1250A, 1600A
2000A:	1000A, 1200A, 1600A, 2000A
2500A:	1200A, 1600A, 2000A, 2500A
3000A:	1600A, 2000A, 2500A, 3000A
3200A:	1600A, 2000A, 2500A, 3000A, 3200A
4000A:	2000A, 2500A, 3000A, 3200A, 4000A
5000A:	2500A, 3000A, 3200A, 4000A, 5000A
6000A:	3000A, 3200A, 4000A, 5000A, 6000A
6300A:	3000A, 3200A, 4000A, 5000A, 6000A, 6300A

Instantaneous Pick-Up (IPU)
1.5, 2, 3, 4, 5, 6, 8 & 10 X LTPU
No OFF

IPU Shown at 1.5 X LTPU

IPU Shown at 10 X LTPU

+/- 5%

+/- 15%

120 Sec.

Current in Multiples of Long Time Pick-Up

AC-PRO-MP & AC-PRO-MP-II with STR-28D setting

21.3   STR-38S Time-Current-Curve

AC-PRO-MP & AC-PRO-MP-II with STR-38S setting

Text labels within the figure:

1X 2X 4X 6X 10X 20X 40X
1000

+/- 5%
Long Time Pick-Up (LTPU)
1.1 X LTPU Setting
STR 38S no Vitual Rating Plug, LTPU Setting =
0.4, 0.425, 0.44, 0.45, 0.46, 0.475,
0.49, 0.5, 0.504, 0.536, 0.554, 0.567,
0.58, 0.599, 0.617, 0.63, 0.64, 0.68,
0.704, 0.72, 0.736, 0.76, 0.784, 0.8,
0.85, 0.88, 0.9, 0.92, 0.95, 0.98,
& 1.00 X CT Rating
STR 38S with Virtual Rating Plug, LTPU Setting =
0.8, 0.85, 0.88, 0.9, 0.92, 0.95, 0.98
& 1.0 X Virtual Rating Plug

Boundary	I^2T
E	311
F	219
W	22.4
X	15.36
Y	8.96
Z	5.12

CT	Virtual Rating Plug Setting
200A:	100A, 120A, 160A, 200A
250A:	125A, 150A, 200A, 250A
320A:	160A, 200A, 240A, 320A
400A:	200A, 250A, 300A, 400A
500A:	250A, 300A, 400A, 500A
600A:	300A, 400A, 500A, 600A
630A:	315A, 420A, 525A, 630A
800A:	400A, 500A, 600A, 800A
1000A:	500A, 600A, 800A, 1000A
1200A:	600A, 800A, 1000A, 1200A
1250A:	600A, 800A, 1000A, 1250A
1600A:	800A, 1000A, 1200A, 1250A, 1600A
2000A:	1000A, 1200A, 1600A, 2000A
2500A:	1200A, 1600A, 2000A, 2500A
3000A:	1600A, 2000A, 2500A, 3000A
3200A:	1600A, 2000A, 2500A, 3000A, 3200A
4000A:	2000A, 2500A, 3000A, 3200A, 4000A
5000A:	2500A, 3000A, 3200A, 4000A, 5000A
6000A:	3000A, 3200A, 4000A, 5000A, 6000A
6300A:	3000A, 3200A, 4000A, 5000A, 6000A, 6300A

Long Time Delay (LTD)
Fixed at 120 Sec
at 1.5 X LTPU

120 Sec

0.30 Sec I^2T ON
0.20 Sec I^2T ON
0.10 Sec I^2T ON

Short Time Pick-Up (STPU)
1.5, 2, 3, 4, 5, 6, 8 & 10 X LTPU
No OFF

STPU
10 X LTPU

Short Time Delay (STD)
with & without I^2T

0.40 Sec   0.40 Sec
0.30 Sec   0.30 Sec
I^2T OFF
0.20 Sec   0.20 Sec
I^2T OFF

STPU
1.5 X LTPU
+/- 15%

0.10 Sec   0.10 Sec
I^2T OFF

IPU Shown at 28 X CT
+/- 15%

0.00 Sec STD   0.00 Sec STD

Instantaneous Pick-Up (IPU)
Fixed Based on CT Rating
28 X SR for 200A to 1000A CT
24 X SR for 1200 to 1600A CT
20 X SR for 2000A CT
14 X SR for 2500A CT
12 X SR for 3000 & 3200A CT
10 X SR for 4000 to 6300A CT
No OFF for "H2" type Breaker
With OFF for "H1/N1" type Breaker

SECONDS

Current in Multiples of Long Time Pick-Up for Short Time
Current in Multiples of CT Rating for Instantaneous

21.4 STR-58U Time-Current-Curve

Boundary	I²T
A	1242
B	875
C	621
D	437
E	311
F	219
G	155
H	109
I	77.6
J	54.7
K	38.8
L	27.3
W	22.4
X	15.36
Y	8.96
Z	5.12

Long Time Pick-Up (LTPU)
1.1 X LTPU Setting
STR 58U no Virtual Rating Plug, LTPU Setting =
0.4, 0.425, 0.44, 0.45, 0.46, 0.475,
0.49, 0.5, 0.504, 0.536, 0.554, 0.567,
0.58, 0.599, 0.617, 0.63, 0.64, 0.68,
0.704, 0.72, 0.736, 0.76, 0.784, 0.8,
0.85, 0.88, 0.9, 0.92, 0.95, 0.98,
& 1.00 X CT Rating
STR 58U with Virtual Rating Plug, LTPU Setting =
0.8, 0.85, 0.88, 0.9, 0.92, 0.95, 0.98
& 1.0 X Virtual Rating Plug

Long Time Delay (LTD)
15, 30, 60, 120, 240, 480 Sec
at 1.5 X LTPU

CT	Virtual Rating Plug Setting
200A:	100A, 120A, 160A, 200A
250A:	125A, 150A, 200A, 250A
320A:	160A, 200A, 240A, 320A
400A:	200A, 250A, 300A, 400A
500A:	250A, 300A, 400A, 500A
600A:	300A, 400A, 500A, 600A
630A:	315A, 420A, 525A, 630A
800A:	400A, 500A, 600A, 800A
1000A:	500A, 600A, 800A, 1000A
1200A:	600A, 800A, 1000A, 1200A
1250A:	600A, 800A, 1000A, 1250A
1600A:	800A, 1000A, 1200A, 1250A, 1600A
2000A:	1000A, 1200A, 1600A, 2000A
2500A:	1200A, 1600A, 2000A, 2500A
3000A:	1600A, 2000A, 2500A, 3000A
3200A:	1600A, 2000A, 2500A, 3000A, 3200A
4000A:	2000A, 2500A, 3000A, 3200A, 4000A
5000A:	2500A, 3000A, 3200A, 4000A, 5000A
6000A:	3000A, 3200A, 4000A, 5000A, 6000A
6300A:	3000A, 3200A, 4000A, 5000A, 6000A, 6300A

Short Time Pick-Up (STPU)
1.5, 2, 3, 4, 5, 6, 8 & 10 X LTPU
No OFF

STPU
10 X LTPU

Short Time Delay (STD)
with & without I²T

IPU Shown at 28 X CT (+/- 15%)

Instantaneous Pick-Up (IPU)
Type "H1/N1" Breakers
2, 4, 8, 12, 14, 19, 22 X CT for 200A to 1000A CT
2, 4, 8, 12, 14, 17, 22 X CT for 1200 & 1600A CT
2, 4, 8, 10, 12, 14, 17 X CT for 2000A CT
2, 4, 6, 8, 10, 12 X CT for 2500A CT
2, 4, 6, 8, 10 X CT for 3000 & 3200A CT
2, 4, 6, 8 X CT for 4000 to 6300A CT
With OFF for "H1/N1" type Breaker

Type "H2" Breakers
2, 4, 8, 12, 14, 19, 22, 28 X CT for 200A to 1000A CT
2, 4, 8, 12, 14, 17, 22, 24 X CT for 1200 & 1600A CT
2, 4, 8, 10, 12, 14, 17, 20 X CT for 2000A CT
2, 4, 6, 8, 10, 12, 14 X CT for 2500A CT
2, 4, 6, 8, 10, 12 X CT for 3000 & 3200A CT
2, 4, 6, 8, 10 X CT for 4000 to 6300A CT
No OFF for "H2" type Breaker

STPU
1.5 X LTPU
+/- 15%

Current in Multiples of Long Time Pick-Up for Short Time
Current in Multiples of CT for Instantaneous

AC-PRO-MP & AC-PRO-MP-II with STR-58U setting

21.5   STR-38S & 58U Ground Fault Time-Current-Curve

Boundary	I^2T
M	0.320
N	0.224
O	0.1536
P	0.0960
Q	0.0384

GFPU Settings

CT	STR 38S & 58U with or without Rating Plug
200A:	20A*, 40A*, 60A, 80A, 100A, 126A, 160A, 200A
250A:	25A*, 50A*, 75A, 100A, 125A, 157.5A, 200A, 250A
320A:	32A*, 64A*, 96A, 128A, 160A, 201.6A, 256A, 320A
400A:	40A*, 80A*, 120A, 160A, 200A, 252A, 320A, 400A
500A:	50A*, 100A*, 150A, 200A, 250A, 320A, 400A, 500A
600A:	60A*, 120A*, 180A, 240A, 300A, 378A, 480A, 600A
630A:	63A*, 126A*, 189A, 252A, 315A, 396.9A, 504A, 630A
800A:	80A*, 160A*, 240A, 320A, 400A, 504A, 640A, 800A
1000A:	100A*, 200A*, 300A, 400A, 500A, 640A, 800A, 1000A
1200A:	120A*, 240A*, 360A, 480A, 600A, 756A, 960A, 1200A
1250A:	120A*, 240A*, 360A, 480A, 600A, 756A, 960A, 1200A
1600A:	250A*, 320A*, 400A, 500A, 600A, 800A, 1000A, 1200A
2000A:	250A*, 320A*, 400A*, 500A*, 600A, 800A, 1000A, 1200A
2500A:	250A*, 320A*, 400A*, 500A*, 600A*, 800A, 1000A, 1200A
3000A:	400A*, 500A*, 600A*, 800A, 1000A, 1200A
3200A:	400A*, 500A*, 600A*, 800A*, 1000A, 1200A
4000A:	400A*, 500A*, 600A*, 800A*, 1000A*, 1200A
5000A:	630A*, 800A*, 1000A*, 1200A*
6000A:	600A*, 800A*, 1000A*, 1200A*
6300A:	630A*, 800A*, 1000A*, 1200A*

IMPORTANT: Settings with "*" require 24Vdc ALIM control power

Ground Fault "Option T":
Uses breaker mounted CTs in Residual connection.
(4-wire requires external Neutral CT)

Ground Fault "Option W":
Uses an external Ground Return CT to directly measure GF current.

Ground Fault "Option T" (Residual): TCC ends at 12xCT

AC-PRO-MP & AC-PRO-MP-II with STR-38S or STR-58U setting

21.6   STR-58U Load Monitoring Time-Current-Curve

Ic1 = Load Monitoring Relay R1
Ic1PU Setting = OFF &
.8, .85, .88, .9, .93 .95, .98,
& 1.0 X LTPU
Ic1PU = 1.1 X Ic1PU Setting
(Shown at .8 X LTPU)

Ic2 = Load Monitoring Relay R2
Ic2PU Setting = OFF &
.5, .6, .7, .8, .85, .9, .95,
& 1.0 X LTPU
Ic2PU = 1.1 X Ic2PU Setting
(Shown at .6 X LTPU)

+/- 5%

Boundary		I²T
*	LTD Upper	See STR-58U TCC
**	LTD Lower	See STR-58U TCC
R	Ic1 Upper	0.5 X LTD Upper I²T
S	Ic1 Lower	0.5 X LTD Lower I²T
T	Ic2 Upper	0.25 X LTD Upper I²T
U	Ic2 Lower	0.25 X LTD Lower I²T

Long Time Delay (LTD) setting
shown set to 60 Sec

Ic1 Delay

Ic2 Delay

60 Sec

Ic1 & Ic2 are two independent relays with TCCs.
They can be used for load shedding, alarms, etc.
Once energized, the relays stay energized
until the breaker trips or for 10 seconds
after the current drops below the
Ic1 or Ic2 Pick-Up setting.

SECONDS

Current in Multiples of Long Time Pick-Up (LTPU)

AC-PRO-MP & AC-PRO-MP-II with STR-58U setting

21.7   QUICK-TRIP® Instantaneous Time-Current-Curve

0.1X   0.2X   0.5X   1X   2X   4X 6X 10X   20X

Max QT-IPU Setting

Test port location

Min QT-IPU Setting

CT	STR-18M, 38S & 58U
200A	400A
250A	500A
320A	700A
400A	800A
500A	1000A
600A	1200A
630A	1300A
800A	1600A
1000A	2000A
1200A	2,400A
1250A	2,400A
1600A	3,200A
2000A	4,000A
2500A	5,000A
3000A	6,000A
3200A	6,400A
4000A	8,000A
5000A	10,000A
6000A	12,000A
6300A	12,600A

CT	Side STR-18M, 38S, & 58U	Front STR-18M, 38S, & 58U
200A	2,300A	2,200A
250A	2,900A	2,700A
320A	3,700A	3,500A
400A	4,600A	4,400A
500A	5,800A	5,500A
600A	7,000A	6,700A
630A	7,300A	7,000A
800A	9,300A	8,800A
1000A	11,600A	11,000A
1200A	13,900A	13,300A
1250A	14,400A	13,800A
1600A	17,800A	17,000A
2000A	21,500A	20,600A
2500A	26,000A	24,900A
3000A	31,100A	29,800A
3200A	33,200A	31,800A
4000A	40,000A	40,000A
5000A	50,000A	48,400A
6000A	57,700A	55,600A
6300A	60,500A	58,400A

STR-28D 1.5 Times LTPU

STR-28D 10 Times LTPU

+/- 15%

QT-IPU Shown at 0.6 X CT

Quick-Trip Inst. Pick-Up (QT-IPU) Multiple of CT Rating In even 100A Steps

QT-IPU Shown at 10 X CT

Fixed power-up time allowance

SECONDS

.1X .2X .4X .6X 1X 2X 4X 6X 10X 20X

Current in Multiples of CT Rating

AC-PRO-MP & AC-PRO-MP-II with STR-58U setting

21.8 QUICK-TRIP® Ground Fault Time-Current-Curve

.1 X CT

+/- 15%

0.25 X CT

Quick-Trip Ground Fault (QT-GF) Pick-Up
With 24Vdc ALIM auxiliary control power
Minimum 0.1 X CT Rating
Maximum 1200A in 10A steps

Quick-Trip Ground Fault (QT-GF) Pick-Up
Without 24Vdc ALIM auxiliary control power
Minimum 0.25 X CT Rating
Maximum 1200A in 10A steps

Fixed power-up
time allowance

QT-GF "Option T" (Residual):
  TCC ends at 12xCT

SECONDS

Current in Multiples of CT Rating

AC-PRO-MP & AC-PRO-MP-II

21.9 **Neutral Overload Time-Current-Curve**
(ONLY applies to AC-PRO-MP shipped December 2016 to June 2020)

+/- 5%
Neutral Overload Pickup setting = Long Time Pick-Up (LTPU) setting
Long Time Settings (shown for reference)
1.1 X LTPU Setting
STR 58U no Virtual Rating Plug, LTPU Setting =
0.4, 0.425, 0.44, 0.45, 0.46, 0.475,
0.49, 0.5, 0.504, 0.536, 0.554, 0.567,
0.58, 0.599, 0.617, 0.63, 0.64, 0.68,
0.704, 0.72, 0.736, 0.76, 0.784, 0.8,
0.85, 0.88, 0.9, 0.92, 0.95, 0.98,
& 1.00 X CT Rating
STR 58U with Virtual Rating Plug, LTPU Setting =
0.8, 0.85, 0.88, 0.9, 0.92, 0.95, 0.98
& 1.0 X Virtual Rating Plug

Neutral Overload Delay setting = Long Time Delay (LTD) setting
Long Time Settings (shown for reference)
STR-28D & 38S: fixed at 120 Sec at 1.5 X LTPU
STR-58U: 15, 30, 60, 120, 240, 480 Sec at 1.5 X LTPU

STR-58U		STR-28D & 38S	
Boundary	I,T	Boundary	I²T
A	1242	E	311
B	875	F	219
C	621		
D	437		
E	311		
F	219		
G	155		
H	109		
I	77.6		
J	54.7		
K	38.8		
L	27.3		

NOTE:
1. The only dedicated Neutral Overload setting is ON or OFF. If Neutral Overload is turned ON, then the Long Time Pickup and Delay settings are applied to Neutral Overload Protection.

480 Sec
240 Sec
120 Sec
60 Sec
30 Sec
15 Sec

Definite Time Above
12 X LTPU

SECONDS

Current in Multiples of Long Time Pick-Up

AC-PRO-MP & AC-PRO-MP-II

URC Utility Relay Company

I-AC-PRO-MP