

AC-PRO Retrofit Kit

Retrofit Kit Instructions for
GE

AKR-30/50

Low Voltage Breaker

Including Instructions for
AC-PRO⁺ Communications

Utility Relay Co.

Chagrin Falls, Ohio 44023

Phone: 888-289-2864 Fax: 440-708-1177

www.utilityrelay.com

LIMITED WARRANTY

Utility Relay Company warrants that every AC-PRO and ZERO-Hertz 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.

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 back of 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

Utility Relay Company will repair or replace the trip unit and/or retrofit component(s) at no cost to the customer. The customer is liable and shall pay for shipment of defective products back to Utility Relay Company.

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.

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GE AKR-30 & AKR-50
"Blue" Front & "Black" Front

1.0 General

All possible contingencies which may arise during the installation, operation or maintenance, and all details and variations of this equipment not necessarily covered by these instructions.

1.1 Inspection

Carefully inspect the retrofit kit on arrival. If any damage is found, file a claim with the carrier and contact Utility Relay Co. for replacement parts.

Verify that this is the correct kit for the circuit breaker being retrofitted.

Check the contents of the retrofit kit package against the kit bill of material to make sure that all the required parts are included.

Thoroughly read and understand these installation instructions as well as the AC-PRO trip unit instruction manual before proceeding with the retrofit.

2.0 Initial Breaker Tests

Before starting the retrofit, perform a visual/mechanical inspection and an electrical test of the breaker to determine its condition.

Refer to the breaker manufacturer's instruction manual and accepted test standards such as the NETA Maintenance Specifications or PEARL reconditioning standards to verify that the breaker is in acceptable mechanical and electrical operating condition.

As a minimum, perform the following:

- a) Close and trip operation of the breaker.
- b) Measure contact resistance of each pole.
- c) Measure insulation resistance from pole to pole, from pole to frame and across open contacts.
- d) Check contact compression.
- e) Check for sufficient finger cluster spring tension at the rear stabs.

Rectify any abnormalities found. Clean and lubricate the breaker as required.

3.0 Remove Existing Trip Unit

- 1) Remove the old trip unit.
- 2) Remove the CT wires. The CTs will be removed later.

4.0 Install CTs

4.1 Remove Existing CTs

Remove the existing CTs on each pole as follows:

- 1) Remove two (2) 3/8-16 X 2 socket head cap screws from the rear of the breaker.
- 2) Tip the breaker back and loosen the top shunt clamp screw.
- 3) Remove the top shunt.
- 4) Remove the CT and it's terminal block.

4.2 Install New CTs

Install the new CTs on each pole as follows
(See Figure 5):

- 1) Removing the four (4) 5/16-18 X 1 1/2 H.C. screws attaching the CT post assembly to the breaker and remove the CT post assembly.
- 2) Slide the new CT and related items on the CT post in the following order:
 - HW-9903-2 Collar Clamp
 - Current Transformer
 - (2) HW-2900-5 Silicone Rubber Washers
- 3) Locate the collar clamp so the rubber washers will be compressed by about 1/4" when the top shunt is in position. Tighten the set screw.
- 4) Remove the CT and rubber washers and replace the CT post on the breaker.
- 5) Slide the CT and rubber washers back on the CT post.
- 6) Replace the top shunt using the existing hardware.
- 7) Make sure the CT terminals are pointing down and have adequate clearance from the top shunt.
- 8) Securely tighten all hardware.

5.0 Reusing Existing Actuator

Either the existing actuator will be reused or a new actuator was ordered. If a new actuator is being installed, skip this section.

Check the condition of the existing actuator and verify that it operates freely and resets properly.

- 1) Close the breaker.
- 2) Briefly touch a fresh 9 Volt battery to the actuator wires. Red is "+" and black is "-".
- 3) The actuator should trip the breaker and the mechanism should reset the actuator.

6.0 Install Trip Paddle

If the existing actuator was reused, jump to Section 9.0. See Figure 6 for the following:

- 1) Remove the "A" & "C" phase trip paddles from the trip bar.
- 2) Attach the BR-218 trip paddle to the left side of the trip bar using the BR-215 trip paddle clamp and (2) 8-32 X 3/8 Phillips screws and lock washers. Do not tighten the screws at this time.

7.0 Manual Reset Actuator

The actuator is installed on the lower left side of the breaker. Skip this section and go to section 8.0 if the auto-reset module will be installed with the actuator.

On a "blue front" breaker, if the Actuator has to be mounted on the right side of the breaker the AC-Pro must be installed on the upper left side of the breaker as described in section 9.2 for the "black front" breaker.

7.1 Install Actuator

See Figure 6 for the following:

- 1) Remove the reset knob from the actuator.
- 2) Replace the 5" long rod in the Model A-100 actuator with the 8" rod provided. Transfer the 1/4-20 jam nuts and the plastic tip to the new rod.

Use caution since the plunger is spring loaded.

- 3) Attach the actuator to bracket BR-111 with three (3) 10-32 X 3/8 R.H. screws and lock washers.
- 4) Replace the reset knob on the end of the actuator rod and lock in place with the 1/4-20 jam nut.
- 5) Place the actuator/bracket assembly underneath the horizontal platform and mark the location of the two (2) mounting screws. Drill and tap two (2) 1/4-20 mounting holes where marked.
- 6) Attach the actuator/bracket assembly to the bottom of the horizontal platform using two (2) 1/4-20 X 1/2 H.C. screws and lock washers.
- 7) Align the trip paddle/clamp assembly with the end of the actuator rod and tighten the clamp screws.

7.2 Adjust Actuator

- 1) With the breaker closed, and the actuator reset, adjust the position of the actuator rod by screwing it in or out until the end of the rod is about 1/64" from the trip paddle.
- 2) Trip the breaker. Trip the actuator by striking the reset knob. Lock the actuator rod in position by tightening the 10-32 set screw with an Allen wrench.
- 3) Adjust the stop nuts as necessary to limit the actuator rod travel within the limits of the trip bar.
- 4) With the actuator reset, close the breaker. If the breaker will not close because the actuator rod is interfering with the trip paddle, re-adjust the position of the actuator rod.
- 5) Operate the actuator by lightly striking the reset knob. The breaker should trip. Verify that the trip paddle is not against its limit of travel.
- 6) Verify that the breaker is held trip free (in the event the actuator is not reset) by trying to close the breaker with the actuator in the trip position. Adjust the location of the stop nuts as necessary to positively assure that the breaker is held trip free with the actuator not reset.
- 7) Repeat the above until completely satisfied with the operation of the actuator.

IMPORTANT: WHEN THE ACTUATOR IS IN THE TRIP POSITION
(NOT RESET), THE BREAKER MUST BE TRIP-FREE.

THE SET SCREW IN THE PLUNGER MUST BE TIGHTENED
TO ENSURE THAT THE ACTUATOR ROD REMAINS IN
PROPER ADJUSTMENT.

8.0 Auto-Reset Module & Actuator

Skip this section if the auto-reset module will NOT be installed.

8.1 Install Actuator

See Figure 7 for the following:

- 1) Remove the reset knob from the actuator.
- 2) Replace the 5" long rod in the Model A-100 actuator with the 9" rod provided.

Transfer the plastic tip to the new rod.

Screw one of the 1/4-20 jam nuts on the actuator rod as a safety precaution.

Use caution since the plunger is spring loaded.

- 3) Attach the actuator to the BR-111 bracket using:
 - (3) #10 lock washers
 - (3) AR-012 spacers
 - (3) 10-32 X 1/2 P.H. Phillips screwsThe lock washers should be against the BR-111 bracket.
- 4) Place the actuator/bracket assembly underneath the horizontal platform and mark the location of the two (2) mounting screws. Drill and tap two (2) 1/4-20 mounting holes where marked.
- 5) Attach the actuator/bracket assembly to the bottom of the horizontal platform using two (2) 1/4-20 X 1/2 H.C. screws and lock washers.
- 6) Align the trip paddle/clamp assembly with the end of the actuator rod and tighten the clamp screws.

8.2 Adjust Actuator

- 1) With the breaker closed, and the actuator reset, adjust the position of the actuator rod by screwing it in or out until the end of the rod is about 1/64" from the trip paddle.
- 2) Adjust the location of the temporary 1/4-20 jam nut on the actuator rod so the actuator travel will be limited to about 1/2".
- 3) Trip the breaker. Trip the actuator by lightly striking the end of the actuator rod. Lock the actuator rod in position by tightening the 10-32 set screw with an Allen wrench.

<p>IMPORTANT: THE <u>SET SCREW</u> IN THE PLUNGER MUST BE TIGHTENED TO ENSURE THAT THE ACTUATOR ROD REMAINS IN PROPER ADJUSTMENT.</p>

8.3 Install Reset Module

- 1) Remove the temporary 1/4-20 nut and slide the reset module on the actuator rod with the 3 keyhole slots towards the actuator.
- 2) Push the reset module towards the actuator so the screw heads bottom out and rotate the reset module clockwise until the screw heads lock into position in the keyhole slots.
- 3) Try twisting the reset module to verify that it is fully locked in position.
- 4) Screw the AR-023-ASM brass push nut onto the end of the actuator rod so the "flats" on the push nut are accessible.

The split retainer on the push nut must bottom out on the back of the reset module but do NOT use a wrench to tighten.

- 5) Lock the push nut in position with a Belleville washer and the AR-027 brass nut. Hold the push nut with a wrench to keep it from turning while tightening the hex nut.

Make sure the split retainer on the push nut is still seated against the reset module.

- 6) Remove the split retainer by using a pair of pliers to squeeze the two ends together. This opens up the split retainer and it can be removed and discarded.

8.4 Adjust the Reset Module

- 1) Manually trip and reset the actuator a few times to verify that it operates smoothly without any binding or drag.
- 2) With the actuator in the trip position, verify that the trip paddle is not against its limit of rotation and is keeping the push nut from bottoming out inside the reset module.

The push nut must bottom out inside the reset module in the trip position for the reset module to operate properly.

If the trip paddle is against its limit of rotation and the push nut is still not bottomed out, reduce the travel by loosen the hex nut and screwing the push nut in slightly. Tighten the hex nut again.

Repeat the above if necessary for proper operation.

- 3) Verify trip-free operation of the actuator as follows:
 - a) With the actuator reset, close the breaker.
 - b) Manually trip the actuator or use a 9 Volt battery (Red is "+").
 - c) Attempt to close the breaker without resetting the actuator. The breaker must be trip-free.

<p>IMPORTANT: With the actuator in the trip position (not reset), the breaker MUST BE TRIP-FREE.</p>
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- 4) Electrically test the operation of the reset module after the installation is complete.

Follow the instructions as outlined in the "A-200 Auto-Reset Module" instructions.

8.5 Fuse Block Installation

Install the fuse block on the back of the breaker as follows:

- 1) Select a location close to the rear stabs to be tapped.
- 2) Using the fuse block as a template, mark the location of the two (2) mounting holes. Drill & tap two (2) 8-32 holes where marked.
- 3) Attach the fuse block to the breaker back using two (2) 8-32 X 3/8 Sems screws.

9.0 AC-PRO Installation

9.1 "Blue Front" Breaker

The "standard" mounting is on the lower right (see Figures 1 and 2), the "alternate" location is shown in Section 9-2.

- 1) Attach the mounting bracket BR-048-1 to the back of the trip unit with the short leg of the bracket pointing towards the rear.
- 2) Attach the trip unit/bracket assembly to the mechanism frame using the existing taped holes and two (2) 1/4-20 X 1/2 Phillips screws and lock washers.

9.2 "Black Front" Breaker

The trip unit mounts vertically on the upper left side of the frame as shown in Figures 3 and 4.

- 1) Attach the Trip Unit Shield BR-094 to the BR-059 bracket using two (2) 10-32 X 1/2 Pan head nylon screws.
- 2) Install the bracket and shield assembly from step #1 to the left breaker frame lip using two (2) 10-32 X 1/2 R.H. screws and lock washers in the two existing tapped holes.
- 3) Attach the BR-060 bracket to the back of the trip unit using two (2) 8-32 X 1/2 Phillips screws and lock washers.
- 4) Attach the trip unit/bracket assembly to the BR-059 bracket and the mechanism frame using the one (1) 10-32 X 5/16 R.H. screw and lock washer and one 1/4-20 X 5/8 H.C. screw, lock washer and hex nut.

10.0 Wiring

Use the wiring harness provided to make the connections to the CTs and the actuator. See Figure 8 for the wiring diagram.

The wiring harness plugs into the side of the AC-PRO. Be sure to tighten the two plug retaining screws after the wiring is complete.

Shorten the wires and tubing as required and use the cable ties and holders provided to make a clean installation. Make sure the wires will not be pinched, cut or chaffed by any moving parts or sharp edges.

10.1 Color Codes and Connections

The wiring harness connector color code and connections are as follows from left to right:

<u>Terminal #</u>	<u>Wire Color</u>	<u>Use</u>
1	Red (R)	Actuator "+"
2	Black (B)	Actuator "-"
3	Blue (L)	Phase "A" "Dot"
4	White (W)	Phase "A" Tap
5	Yellow (Y)	Phase "B" "Dot"
6	White (W)	Phase "B" Tap
7	Brown (N)	Phase "C" "Dot"
8	White (W)	Phase "C" Tap
9	Green (G)	Neutral "Dot" (4W & GF only)
10	White (W)	Neutral Tap (4W & GF only)

10.2 Current Transformer Connections

Each set of CT wires in the wiring harness is housed inside an individual PVC tube for added physical protection and to simplify the wiring process.

Connect to the #10-32 lugs using the ring tongue terminals provided. Make sure that the same tap is used on all three CTs.

10.3 Neutral Current Transformer

A neutral CT is only required on a 4-wire system with the ground fault function on.

On a 3-wire system, a neutral CT is not required even if the ground fault function is on.

The neutral CT and neutral wiring assembly are provided with the neutral CT kit.

When wiring to the neutral CT, make sure the same tap is used as the phase CTs.

10.4 Actuator Connection

Route the existing red and black wires from the actuator to the "ACTUATOR" terminals on the trip unit. Trim the wires to an appropriate length. Use the protective sleeving on the wires.

Connect the red actuator wire to the "+" terminal on the wiring harness trip unit connector. Similarly, connect the black actuator wire to other actuator terminal on the trip unit.

10.5 Auto-Reset Module

Determine the line side of the breaker and drill and tap a 10-32 hole in two of the line side stabs.

Use #14 SIS wire from the line side stabs to the fuse block.

Connect the varistor to the load side of the fuse block. The varistor provides voltage surge protection for the reset module.

Route the two orange wires from the reset module to the load side of the fuse block. Use the 3/8" mesh sleeving to protect the wires.

Also see the instructions in the "A-200 Auto-Reset Module" instruction manual.

11.0 Final Test

Perform a final electrical test of the breaker as in Section 1.

A primary injection test is recommended as the final test of the AC-PRO retrofit. See Section 9 "TESTING" in the AC-PRO instruction manual for complete details.

12.0 Communications

The following instructions are for the communications option using the AC-PRO⁺:

12.1 Install PT Module - "Blue Front" Breaker

The PT Module mounts on the lower left of the "blue front" breaker as shown in Figures 9 and 10.

- 1) Attach the BR-081 bracket to the PT Module using two (2) 8-32 X 3/8 Phillips screws and lock washers.
- 2) Attach the PT Module/bracket assembly to the breaker using two existing 1/4-20 HC screws.

12.2 Install PT Module - "Black Front" Breaker

The PT Module mounts on the lower right of the "blue front" breaker as shown in Figures 11 and 12.

- 1) Attach the BR-713 shield to the top of the PT Module using two (2) 8-32 X 3/8 Nylon R.H. screws.
- 2) Attach the BR-073-1 bracket to the PT Module using two (2) 8-32 X 3/8 Sems screws.
- 3) Attach the BR-0A017 bracket to the BR-073-1/PT Module assembly using two (2) 1/4-20 X 3/4 F.H. screws.
- 4) Remove the two (2) 1/4-20 H.C. screws holding the racking mechanism to the right side breaker frame.
- 5) Install the PT Module/bracket assembly using two (2) 1/4-20 X 1 HC screws, lock washers and hex nuts in the location of the previously removed 1/4-20 hardware.

12.3 Install Fuse Block for PT Module

Install the 3-pole fuse block on the back of the breaker as follows:

- 1) Find a suitable location close to the rear stabs that will be tapped.
- 2) Using the fuse block as a template, mark the location of the two (2) mounting holes.
- 3) Drill & tap two (2) 8-32 holes where marked.
- 4) Attach the fuse block to the breaker back using two (2) 8-32 X 3/8 P.H. screws and lock washers.

12.4 Communications Wiring

See figure 13 for the following:

A) Voltage Input

Determine the line side of the breaker and drill and tap a 10-32 hole in each of the three line side poles.

Use #14 SIS wire from the bus taps to the 3-pole fuse block. *It is very important to maintain the proper phasing.*

Use #18 MTW wire from the 3-pole fuse block to the PT Module. Use fiberglass sleeving to protect the wires.

B) Ground Input

Connect a #18 MTW wire from the "Ground" terminal of the PT Module to the breaker frame.

C) PT Module Harness

Plug the PT Module cable into the side of the AC-PRO⁺ trip unit and into the PT Module.

Use cable ties and holders to make a clean installation.

D) Breaker Position Indication

As an option, connect an unused "a" contact in the breaker auxiliary contacts to the two position input terminals on the PT Module.

This will provide the breaker open or closed information to the communications system.

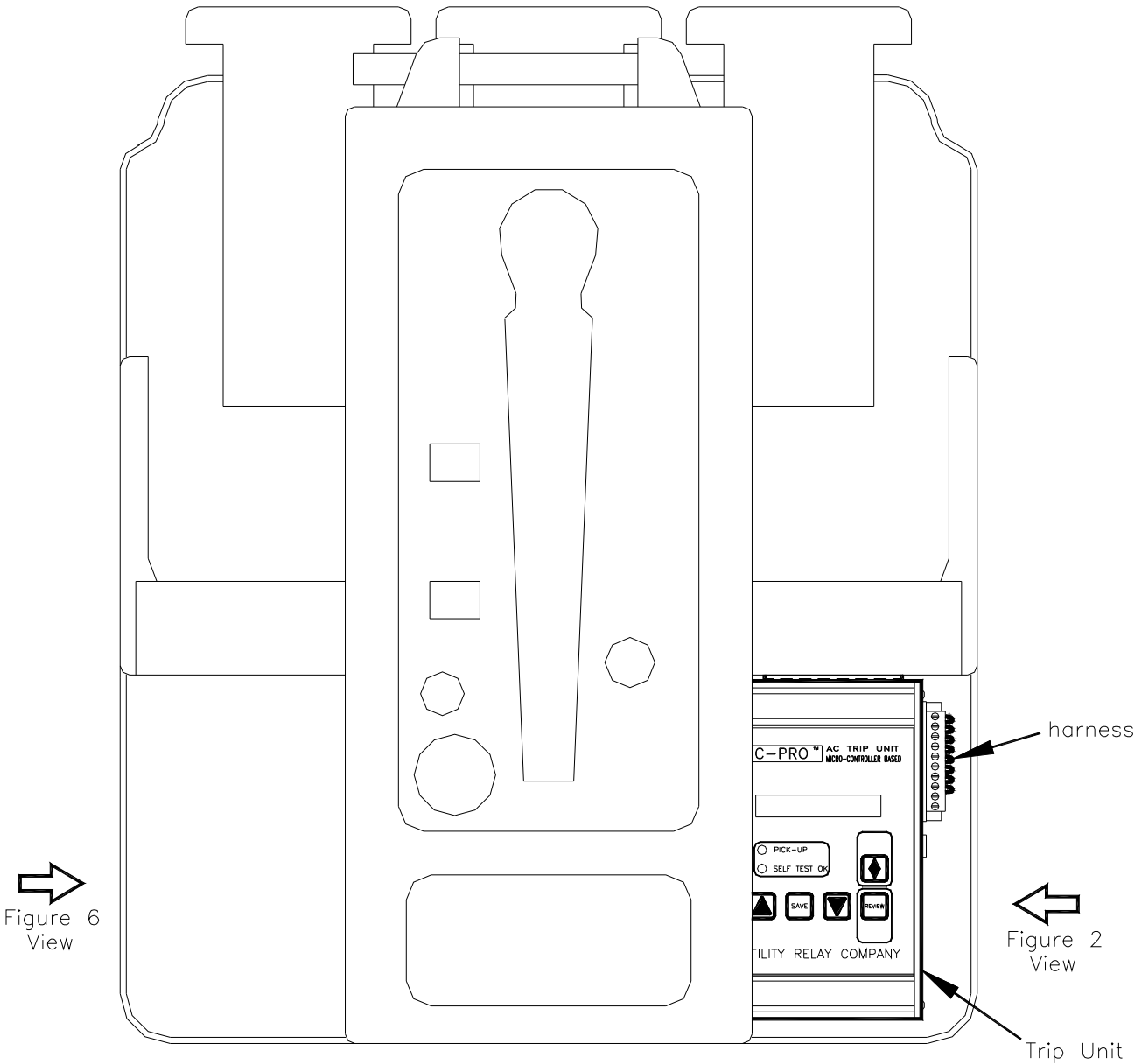


FIGURE 1
Front View
"Blue" Front Breaker
Page 17

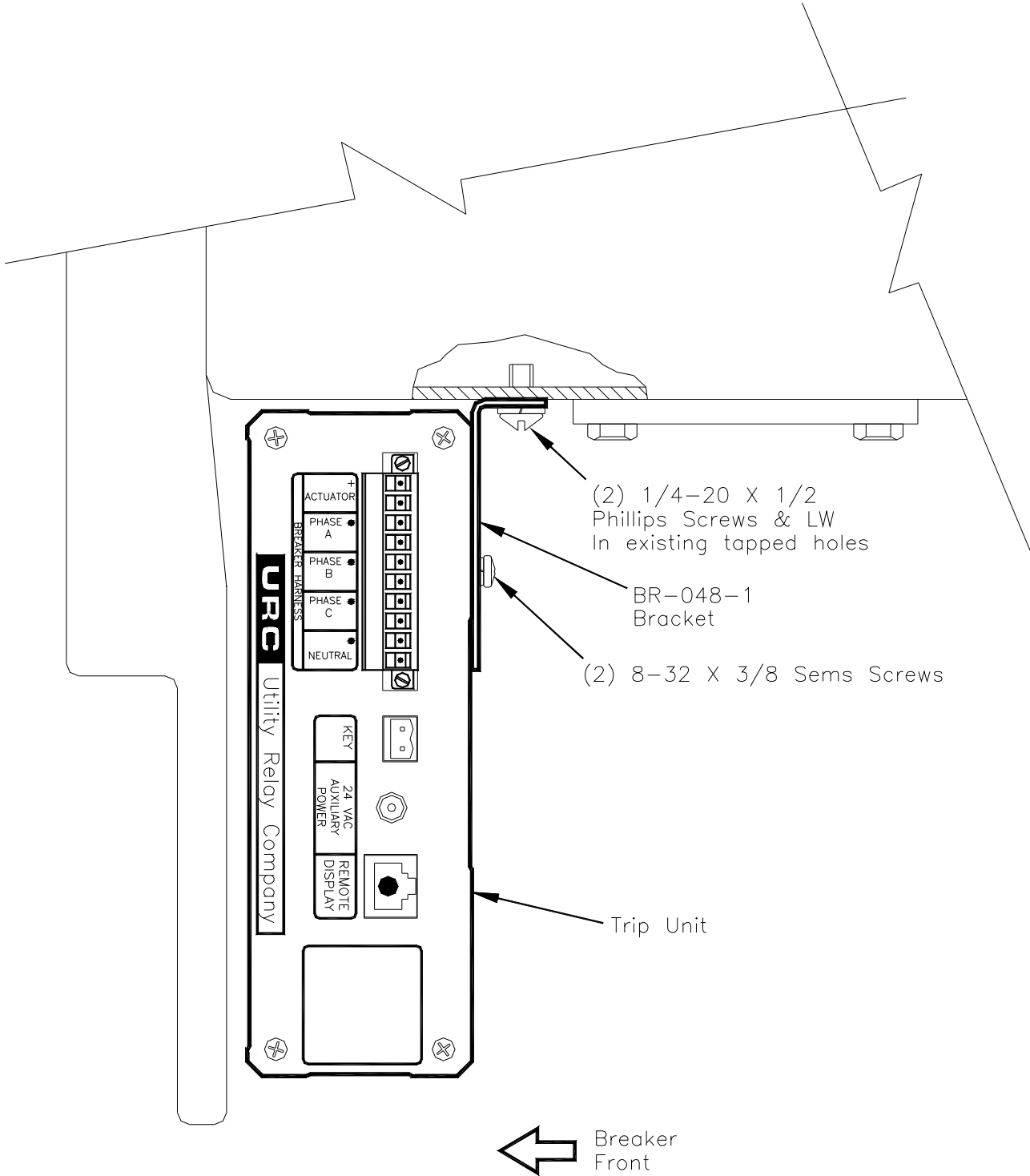


FIGURE 2
Trip Unit Mounting
"Blue" Front Breaker
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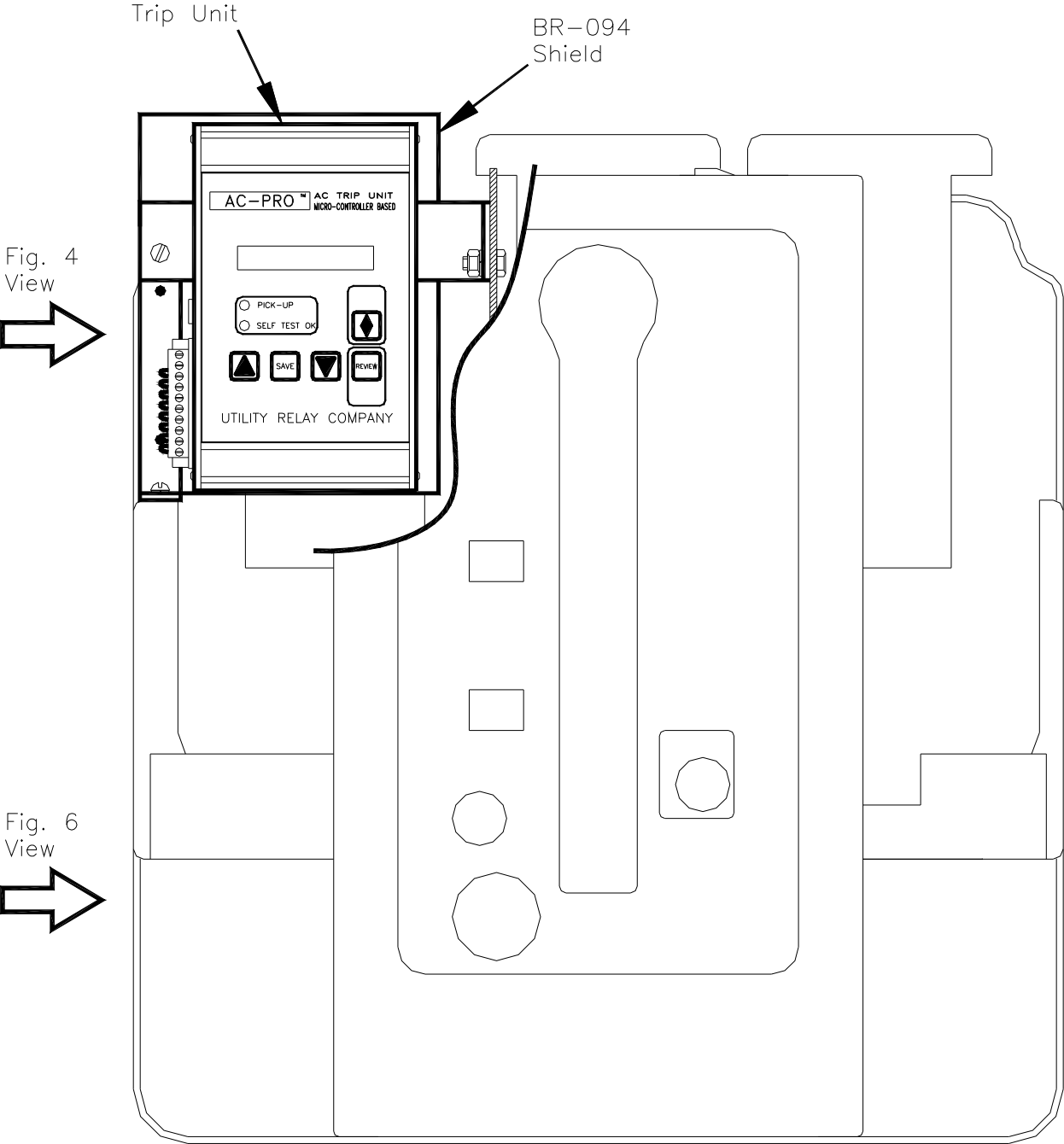


FIGURE 3
Front View
"Black" Front Breaker
Page 19

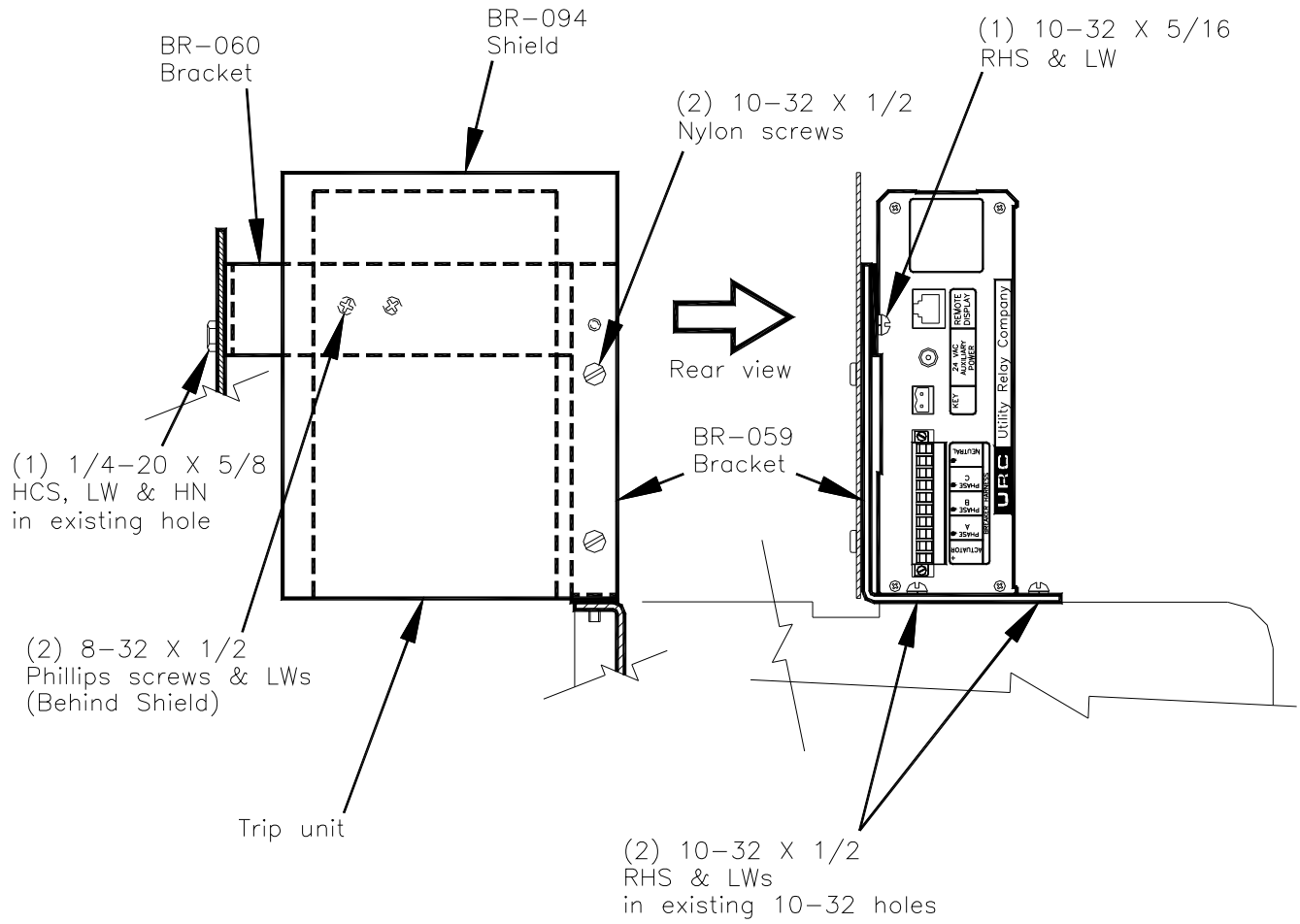


FIGURE 4
Trip Unit Mounting
"Black" Front Breaker

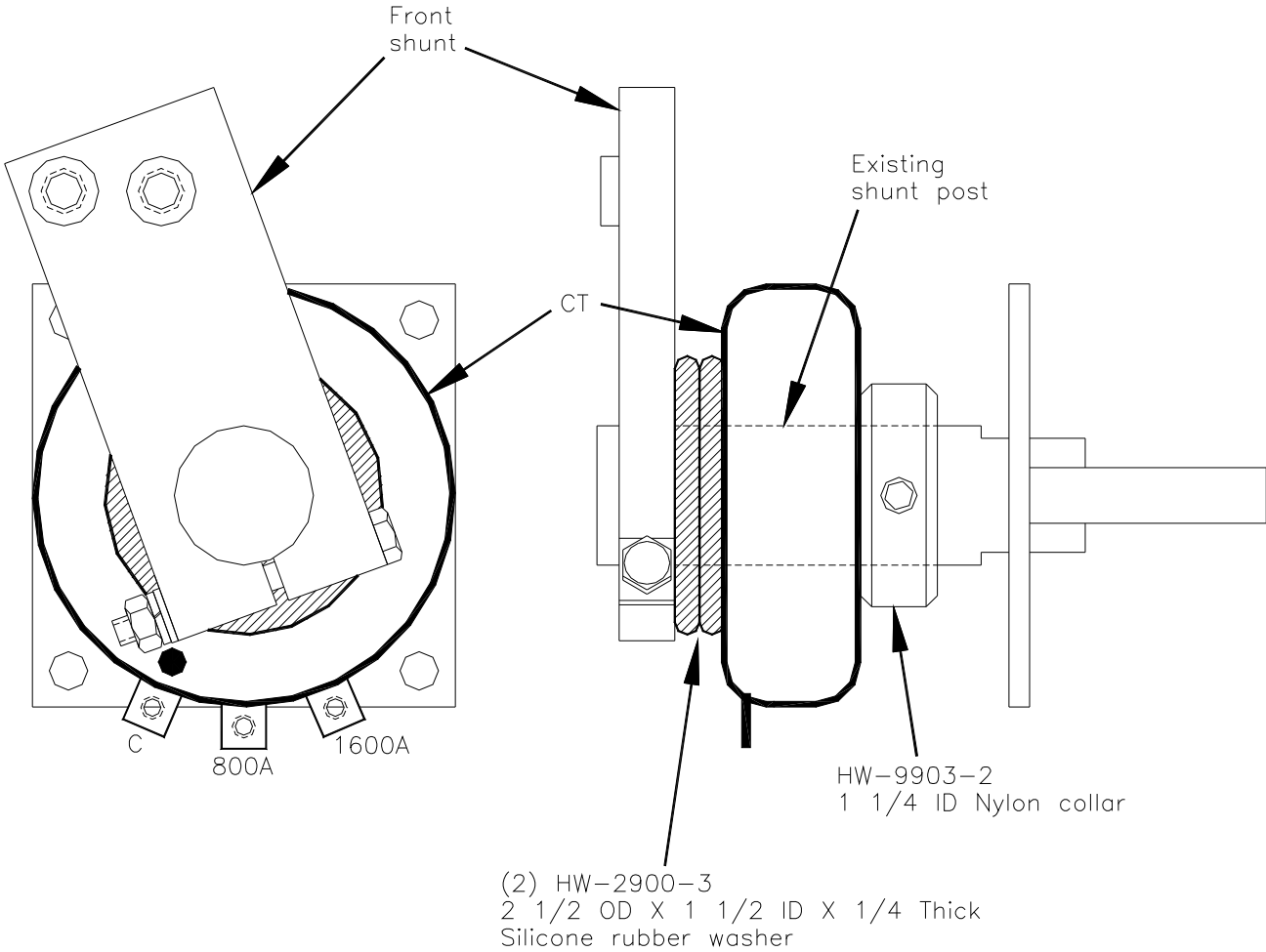


FIGURE 5
CT Installation
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BR-215
Trip paddle clamp
& (2) 8-32 X 3/8
Phillips screws & LWs

Trip bar

BR-218
Trip paddle

1/64

8" long
actuator
rod

(2) 1/4-20 X 1/2
HCS & LW

Stop nuts

BR-111
bracket

Model A-100 actuator
shown reset &
breaker closed

IMPORTANT:
Tighten 10-32 set screw
with an Allen wrench
after adjusting the
actuator rod position.

Breaker
Front →

FIGURE 6
Left Side View
Actuator Installation

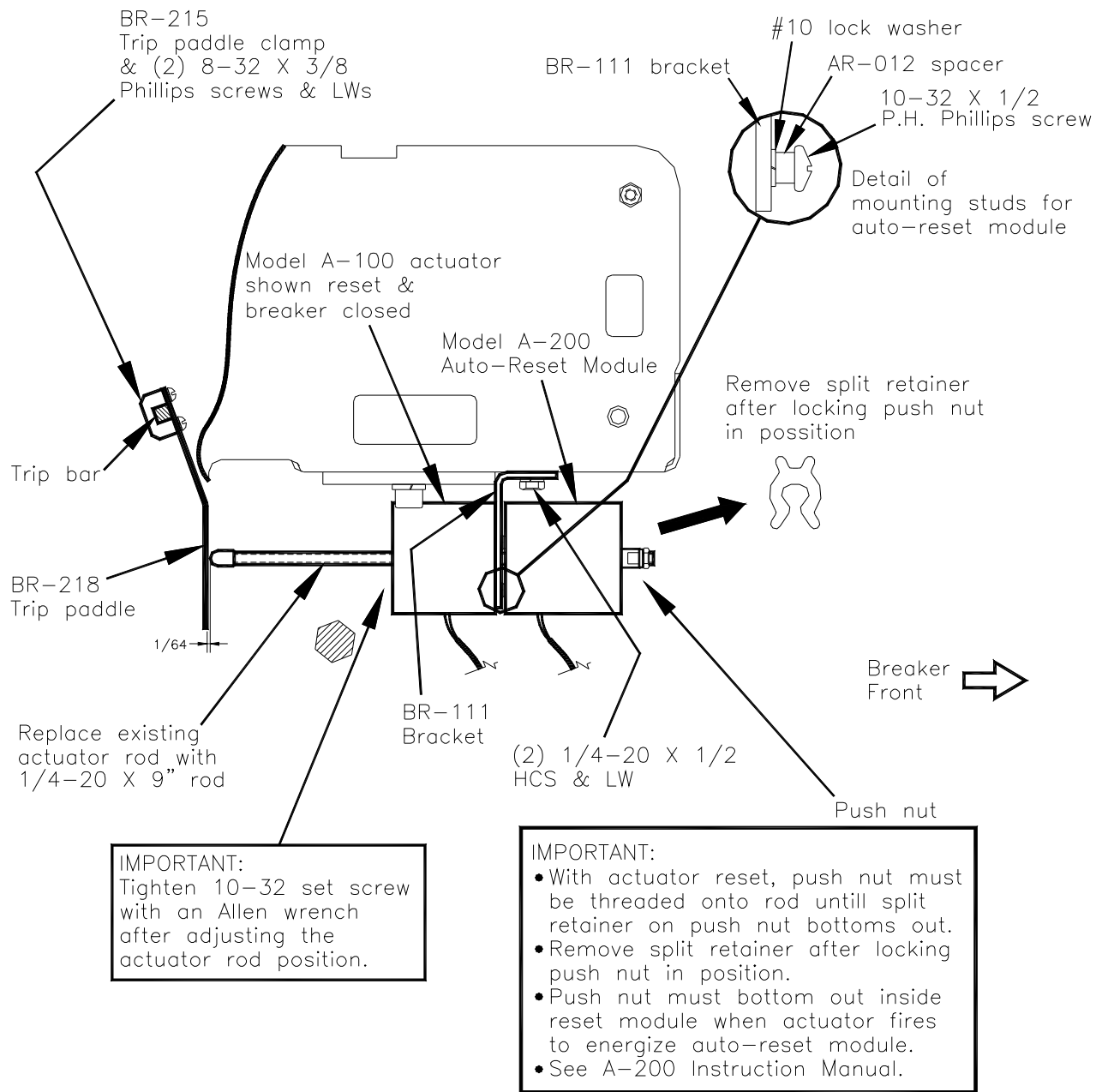


FIGURE 7
Left Side View
Auto-Reset Module/Actuator Installation

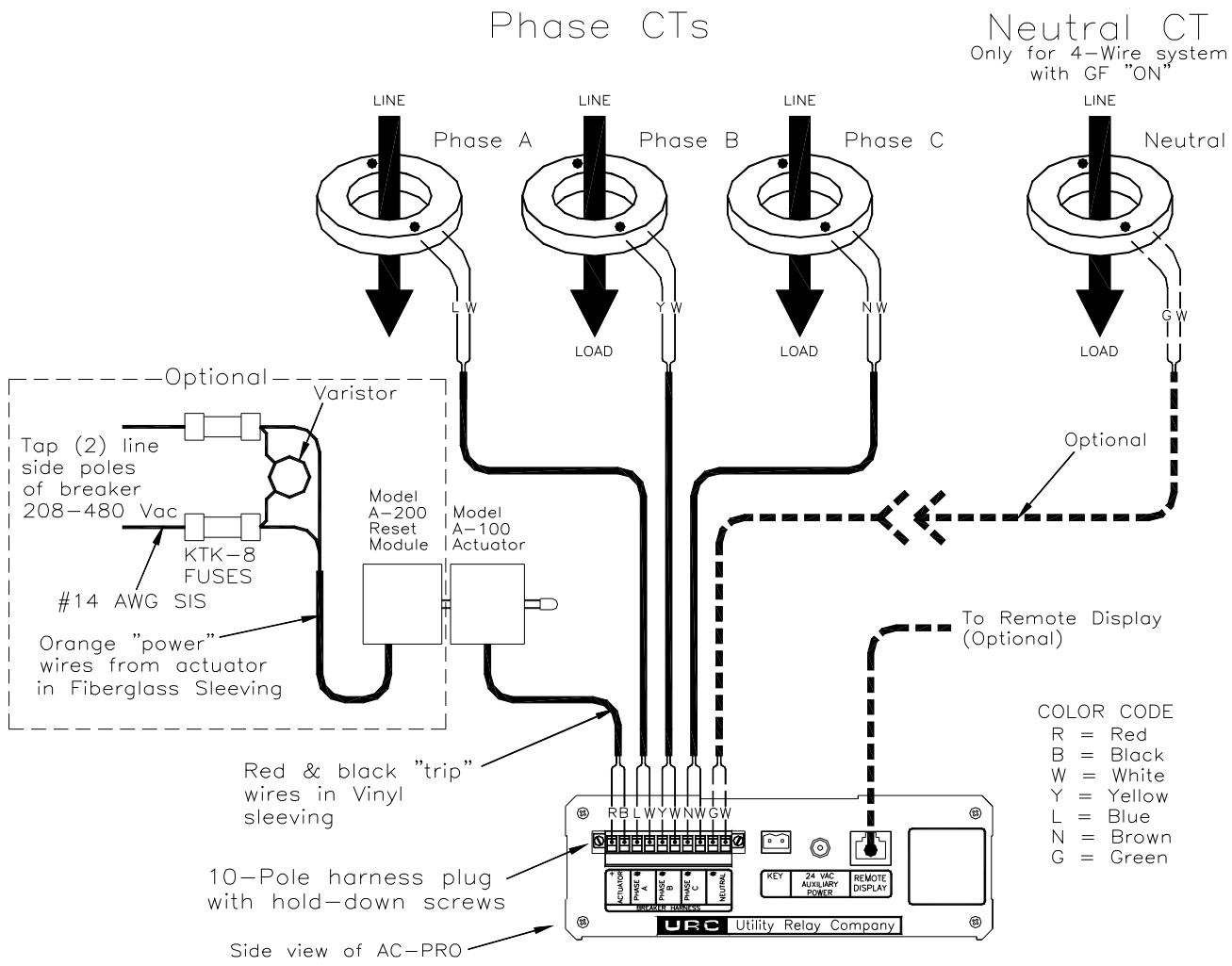


FIGURE 8
Wiring Diagram
Page 24

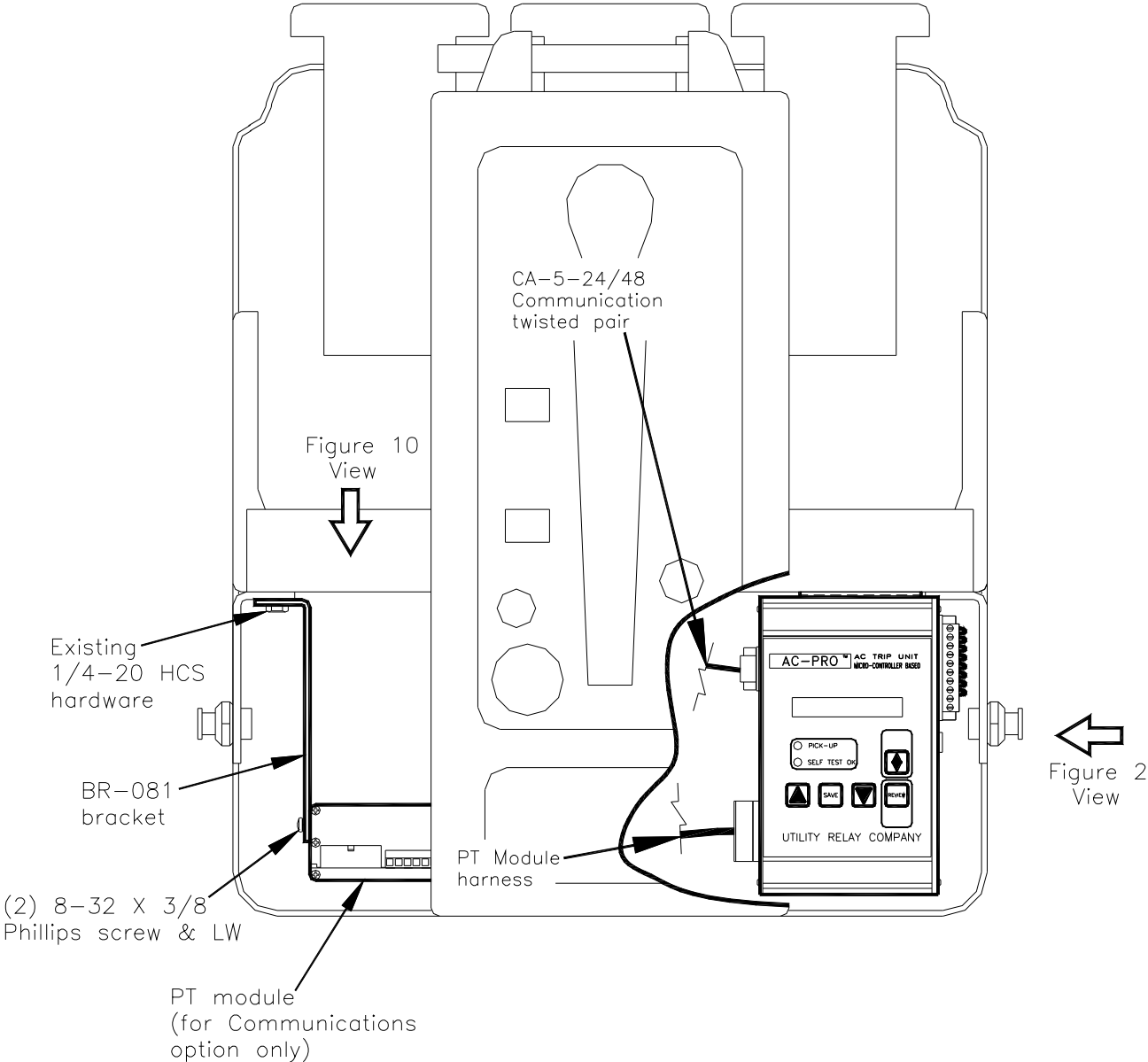


Figure 9
Front View - "Blue Front" Breaker
With Communications

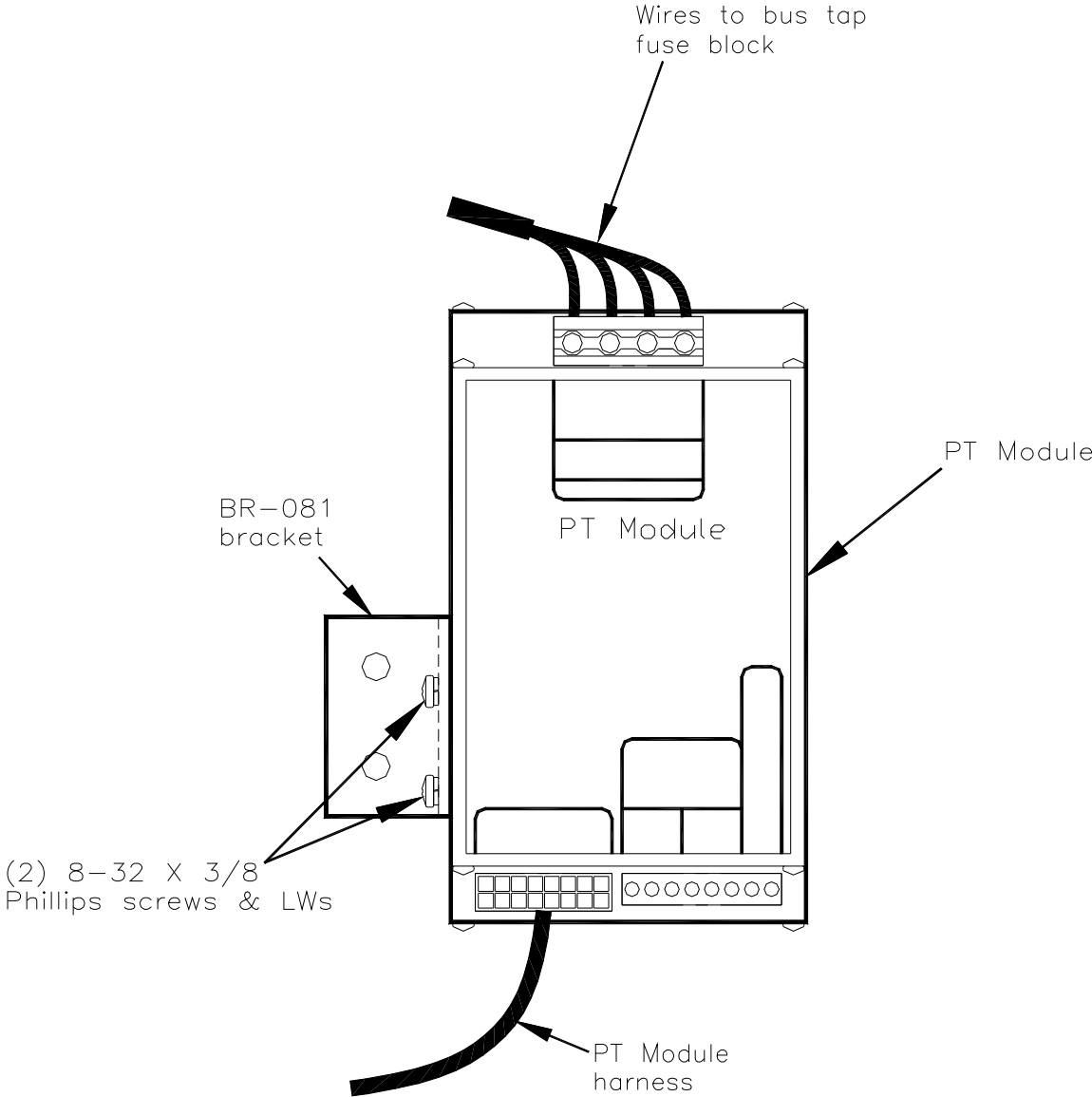


Figure 10
PT Module Installation
"Blue Front" Breaker

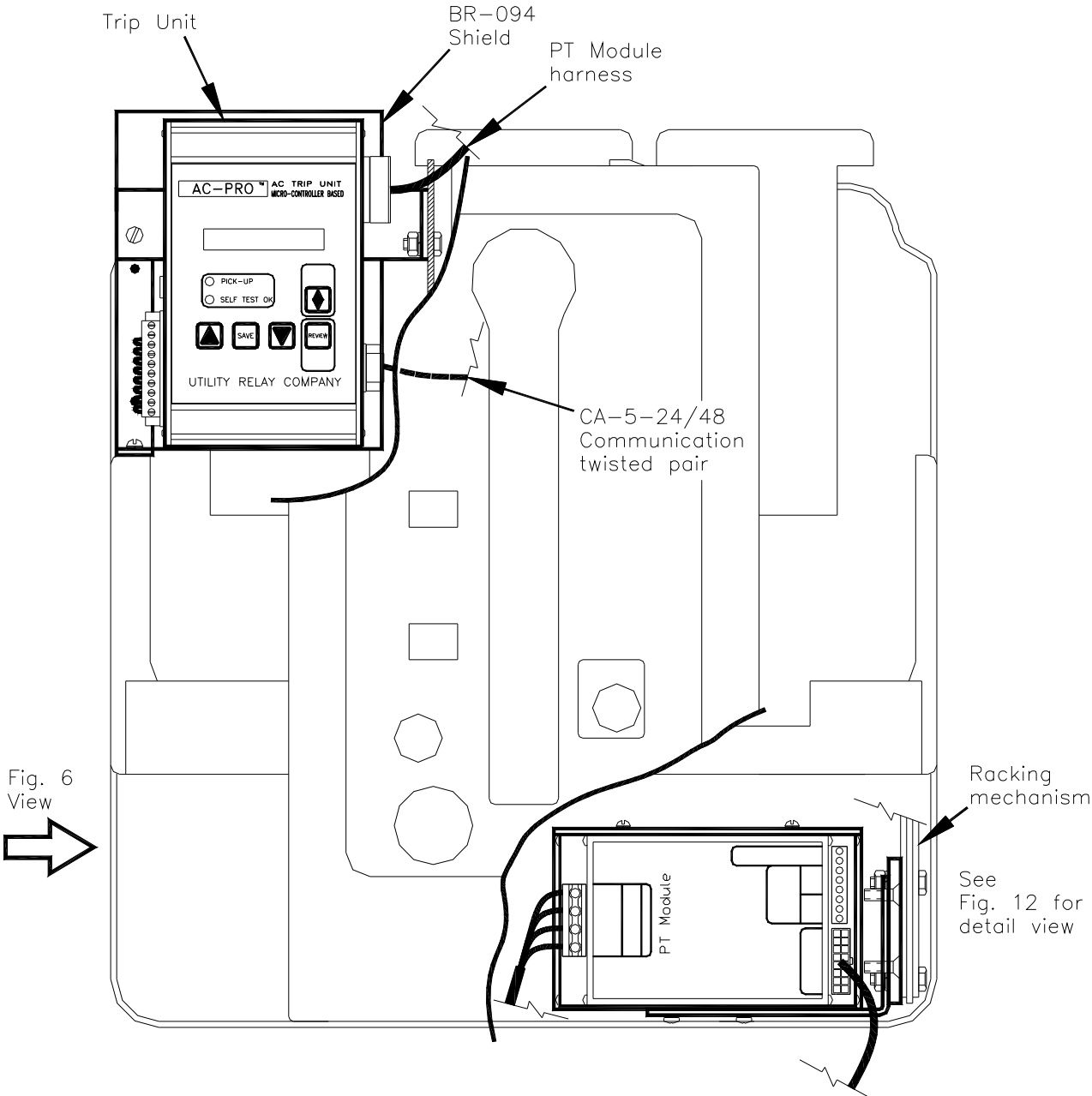


Figure 11
Front View - "Black Front" Breaker
With Communications
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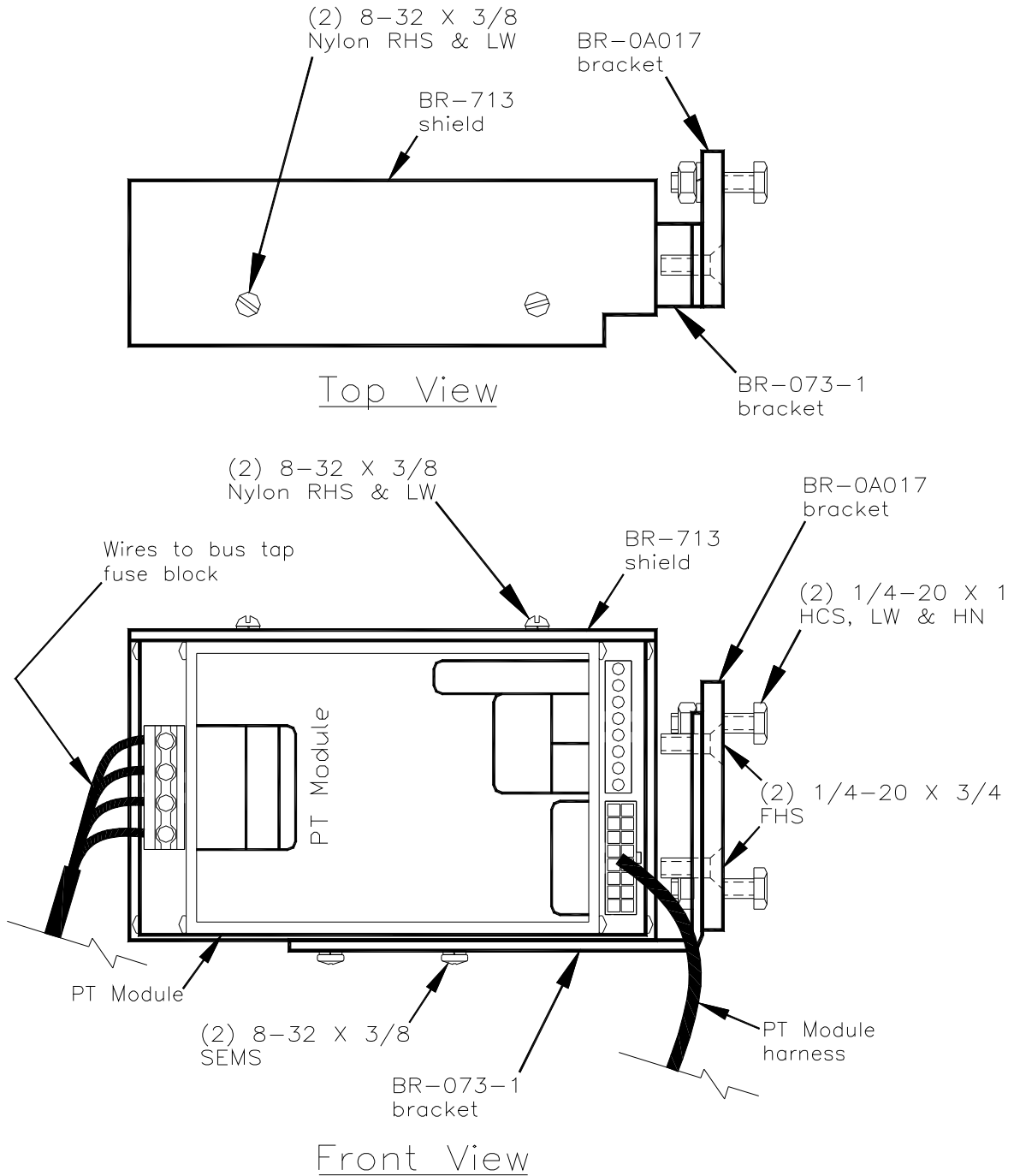


Figure 12
PT Module Installation
"Black Front" Breaker

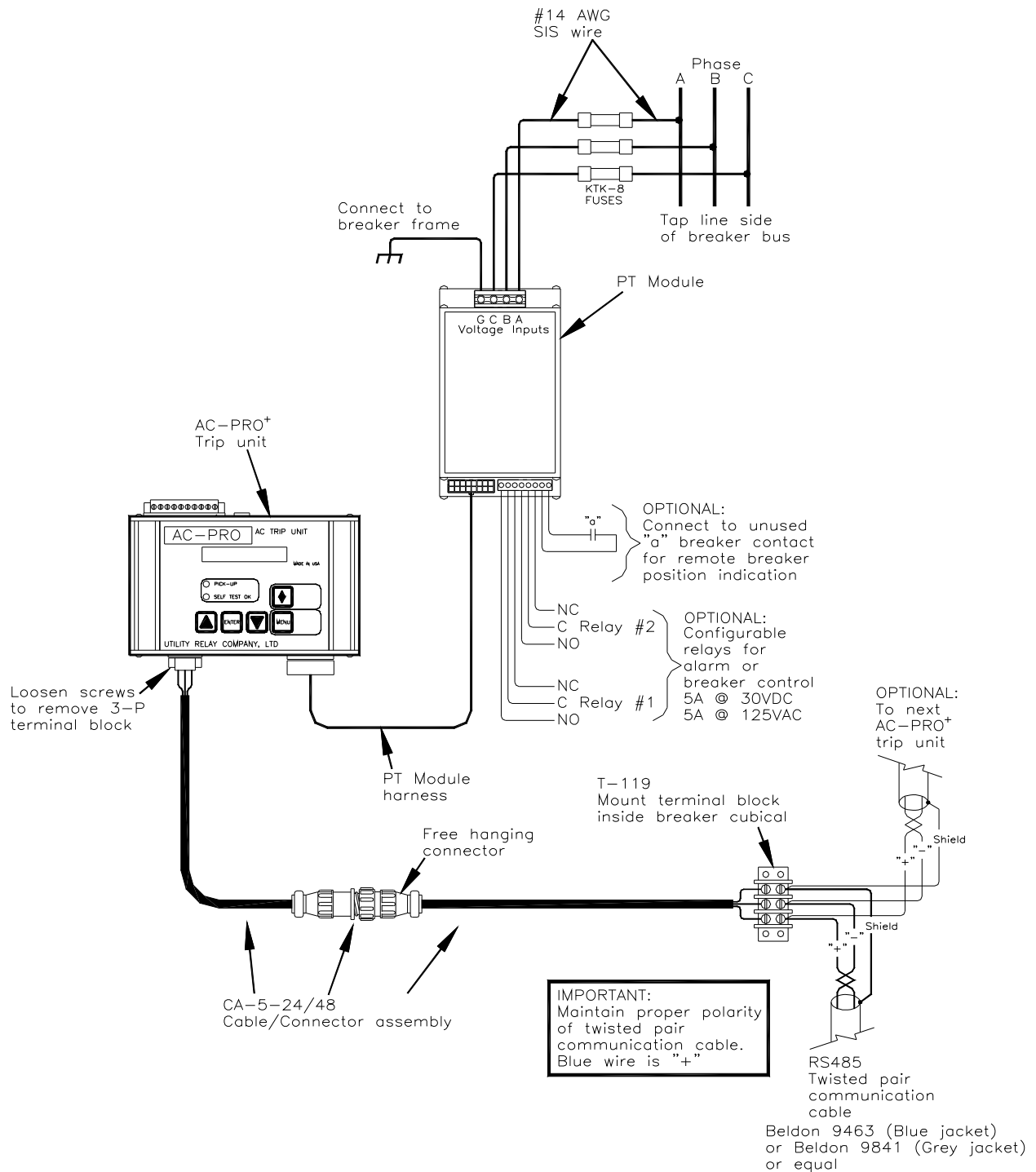


Figure 13
Wiring Diagram
For Communications