AC-PRO Retrofit Kit

Retrofit Kit Instructions for
GE
AKR-30/50
Low Voltage Breaker

Instructions for:
- **Manual Reset Actuator**
- **Mechanical Reset Actuator**

Including Instructions for
AC-PRO+ Communications

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LIMITED WARRANTY

Utility Relay Co., Ltd. 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. 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 CO., LTD. WITH REFERENCE TO THE PRODUCT.

Should any warranty claim arise within the warranty period, contact Utility Relay Co., Ltd. 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

As the sole and exclusive remedy, Utility Relay Co., Ltd. will repair or replace the trip unit and/or retrofit component(s) at no cost to the customer during the warranty period. The customer is liable and shall pay for shipment of defective products back to Utility Relay Co., Ltd. In no event shall Utility Relay Co., Ltd. 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.**

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Alternate Trip Unit Mounting for "Black" Front Breaker using MicroVersa Trip Bracket.

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 are 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.

3) Save the MicroVersa Trip mounting bracket and hardware if it is to be re-used to mount the new trip unit.

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 front 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.

Refer to Figures 6 or 8 for the following:

1) **Remove the "A" & "C" phase trip paddles from the trip bar.**

2) **Loosely install the BR-218 trip paddle to the left side of the trip bar using the BR-215 trip paddle clamp, (2) two 8-32 X 3/8 Phillips screws and lock washers and (1) one 8-32 X 1/4 set screw. 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 mechanical reset actuator will be installed.

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 Manual Reset Actuator

Refer to 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 Phillips 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 and 8-32 set screw.**

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.**

7.3 Verify Trip Free Operation of the Manual Reset Actuator

It is very important to verify that with the manual reset actuator in the trip position it will keep the breaker trip free.

1) **Attempt to close the breaker without resetting the actuator. The breaker should trip free, if not, increase the actuator rod travel.**

2) **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 Mechanical Reset Actuator Installation

Skip this section if the manual reset actuator was installed in Section 7.

8.1 Install Mechanical Reset Actuator Assembly

A-300C-AKR Actuator assembly has been pre-assembled. See Figure 7 for reference. Final adjustments will be made in Section 8.2

Refer to Figure 8 for the following:

1) **Using existing holes, attach the actuator assembly to the breaker using two (2) 10-32 X 1/2 Phillips screws and lock washers.**

2) **Align the trip paddle/clamp assembly with the end of the actuator rod and tighten the clamp screws and 8-32 set screw.**

8.2 Adjust Mechanical Reset Actuator

1) **With the breaker closed, and the actuator reset, adjust the position of the hex standoff by screwing it in or out until the end of the hex standoff is about 1/64" from the trip paddle.**

8.3 Verify Trip Free Operation of Mechanical Reset Actuator Assembly

It is very important to verify that the trip adjustment of the mechanical reset actuator assembly will keep the breaker trip free if the actuator fails to reset properly on breaker opening.

1) **Close the breaker. Trip the actuator using 18 volts (two 9 volt batteries in series.) (The Red wire is "+").**

2) **With the reset spring not connected to the breaker the actuator should not reset.**

3) **With the actuator still tripped, attempt to close the breaker, it should trip free.**

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

8.4 Adjust Reset of Mechanical Reset Actuator Assembly

Refer to Figure 8 for the following:

1) **With the breaker open, attach one end of the reset spring to the breaker arm. Attach the other end of the spring to BR-1A086 Reset Lever. This should reset the actuator. The spring should be extended approximately 1/4 inch. If this does not reset the actuator, loosen the two (2) 10-32 screws holding the actuator to the base plate and slide the actuator toward the reset lever. If the actuator position is changed, re-adjust the position of the hex standoff as outlined in Section 8.2 and verify trip free operation as outlined in Section 8.3.**

2) **Close the breaker and trip the actuator using 18 volts (two 9 volt batteries in series.) (The Red is "+"). The breaker should open and the linkage should reset the actuator.**

   Cycle the breaker several times to verify reliable trip and reset operation of the actuator.

IMPORTANT: The Actuator may not trip using just one 9 volt battery. To insure that the actuator will trip use two fresh 9 volt batteries in series.

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-0A030 to the BR-059 bracket using two (2) 10-32 X 1/2 Flat head screws.

2) Attach the trip unit to the Shield using four (4) 8-32 X 1/2 Phillips screws and lock washers. Use the set of holes that will orient the trip unit towards the right.

For the AC-PRO with the communications option, use the set of holes that will orient the trip unit towards the left as shown in Figure 11.

3) Install the trip unit, bracket and shield assembly to the left breaker frame lip using two (2) 10-32 X 1/2 Phillips screws and lock washers in the two existing tapped holes.

4) Ground the trip unit as described in Section 10.5.

9.3 Alternate Mounting for "Black Front" Breaker

The trip unit mounts vertically on the upper left side of the frame behind the closing spring as shown in Figure 15.

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.**

9.4 Alternate Mounting Using Existing MicroVersa Trip Bracket

Refer to Figures 16, 17 & 18 for the following:

1) **Use the Template on Figure 18 to mark and drill two (2) 3/16 Dia. holes in the existing mounting bracket.**

2) **Attach the Trip unit to the mounting bracket using two (2) 8-32 X 1/2 Phillips screws and lock washers.**

10.0 Wiring

Use the wiring harness provided to make the connections to the CTs and the actuator. See Figure 9 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:

Terminal #	Wire Color	Use
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 or new 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 Ground Trip Unit

If the trip unit is installed as shown in Figures 3 and 4, then an external wire is required to ground the trip unit.

Refer to Figure 4 for the following:

1) **Attach one end of the #14 SIS wire to the trip unit using a #10 ring terminal.**

2) **Attach the other end of the #14 SIS wire to the breaker frame using a #10 ring terminal. Make sure the wire will not be pinched, cut or chaffed by any moving parts or sharp edges.**

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 11 "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 10 and 11.

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 "black front" breaker as shown in Figures 12 and 13.

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

CAUTION: When selecting a mounting location for fuse block check the breaker cell for interference from existing devices. Check all cells for variations in applications where breakers may be "swapped".

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

Refer Figure 14 for the following:

1) 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.

2) Ground Input

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

3) 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.

4) 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.

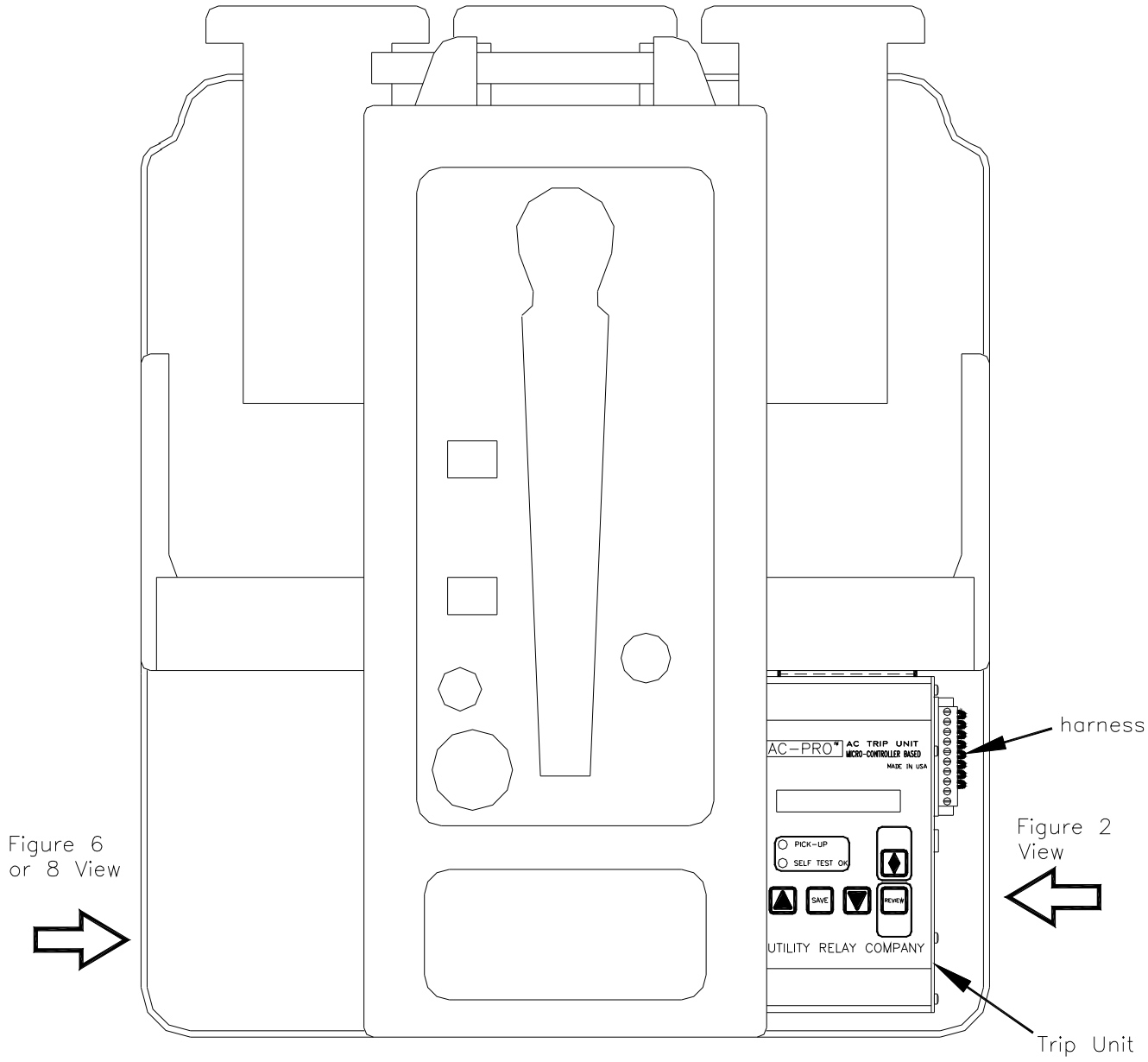

FIGURE 1
Front View
"Blue" Front Breaker

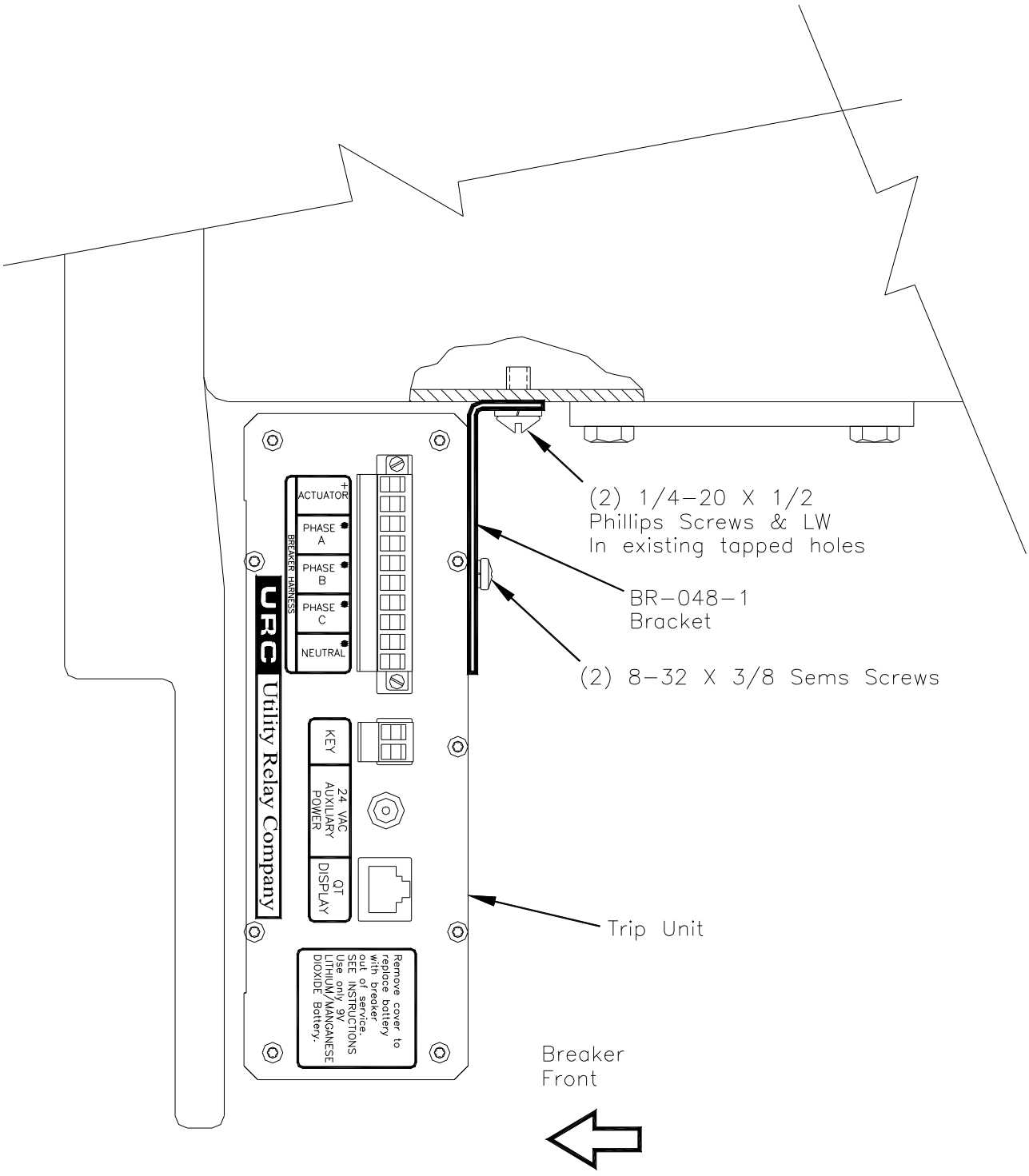

FIGURE 2
Trip Unit Mounting
"Blue" Front Breaker

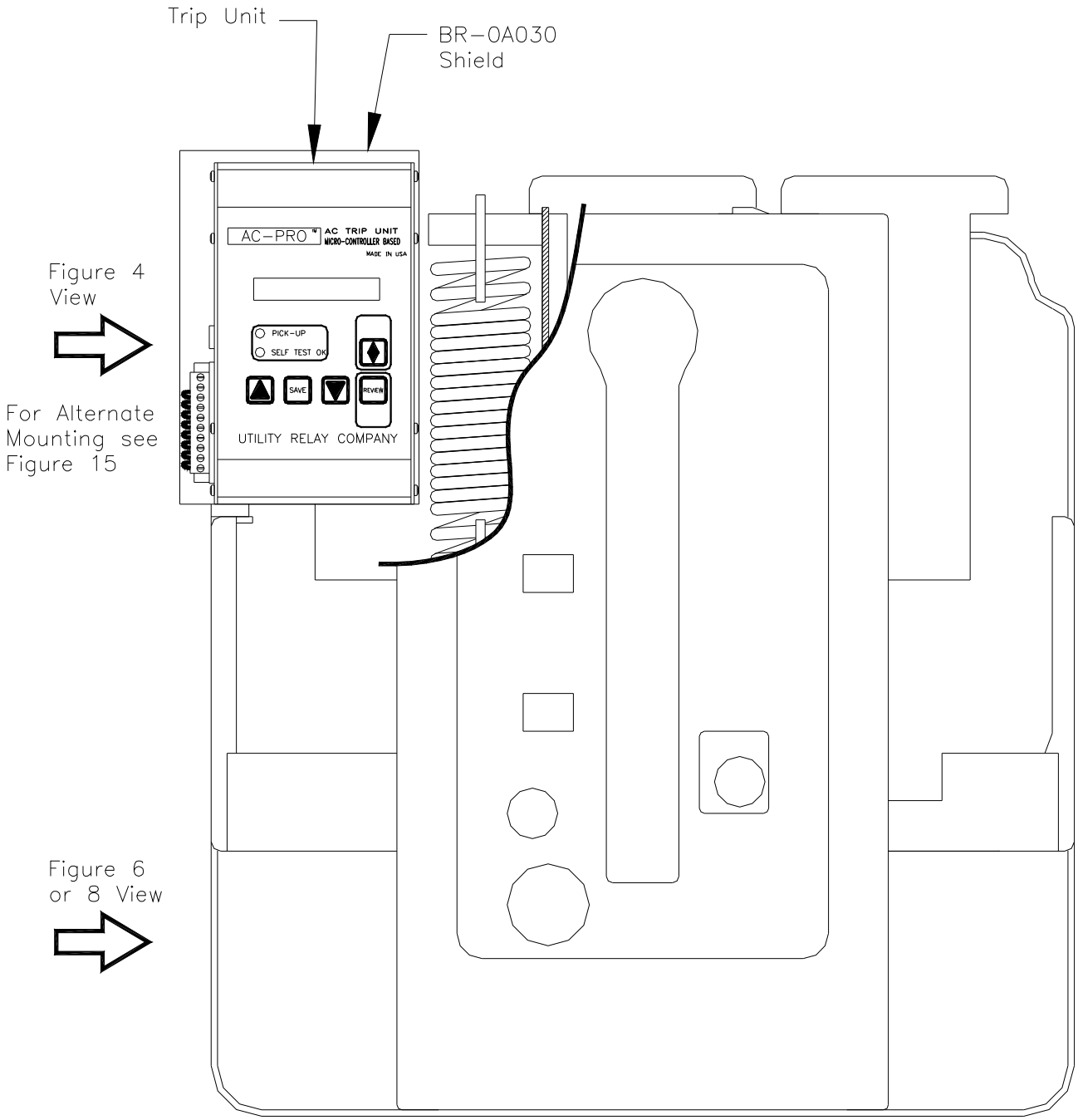

FIGURE 3
Front View
"Black" Front Breaker

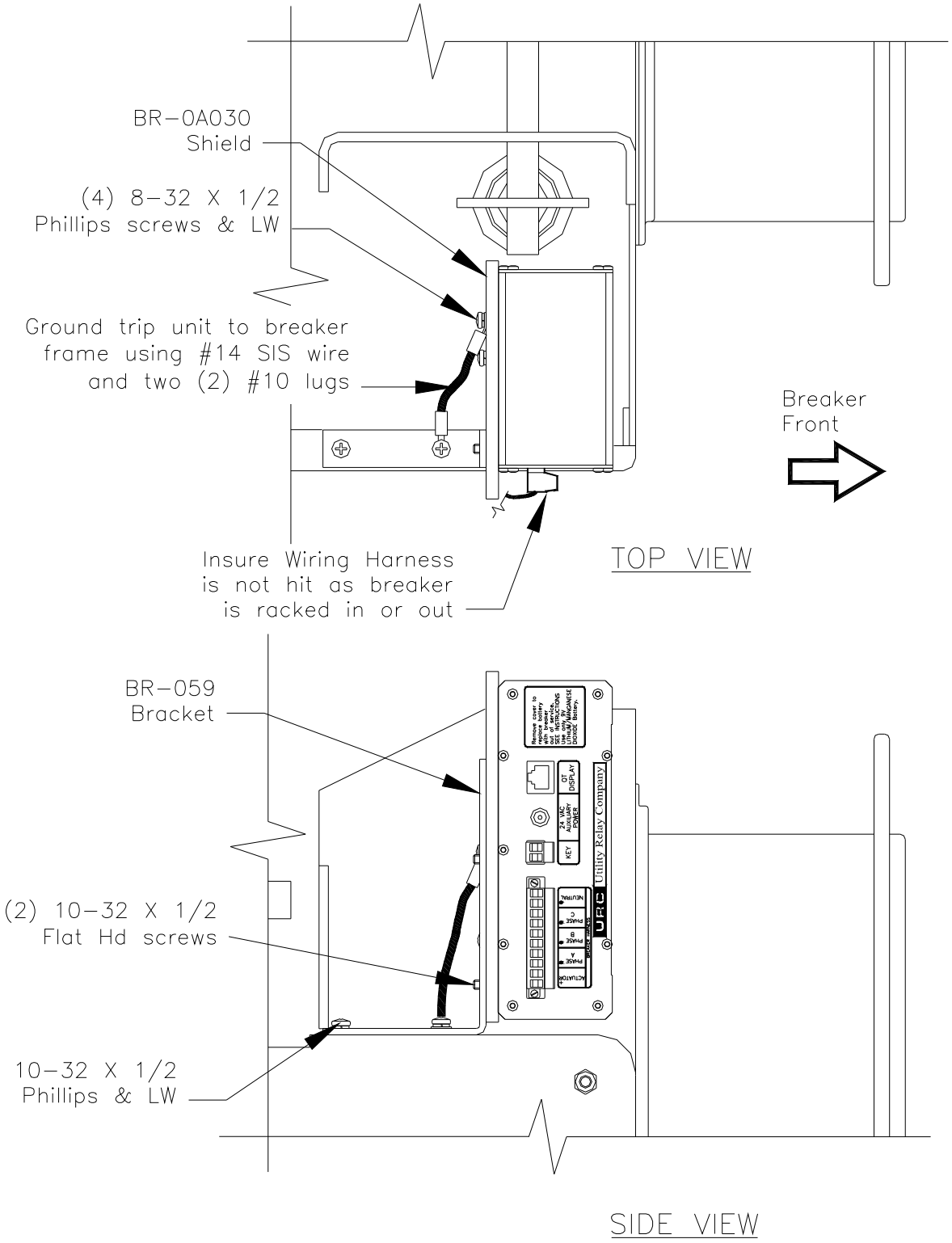

FIGURE 4
Trip Unit Mounting
"Black" Front Breaker

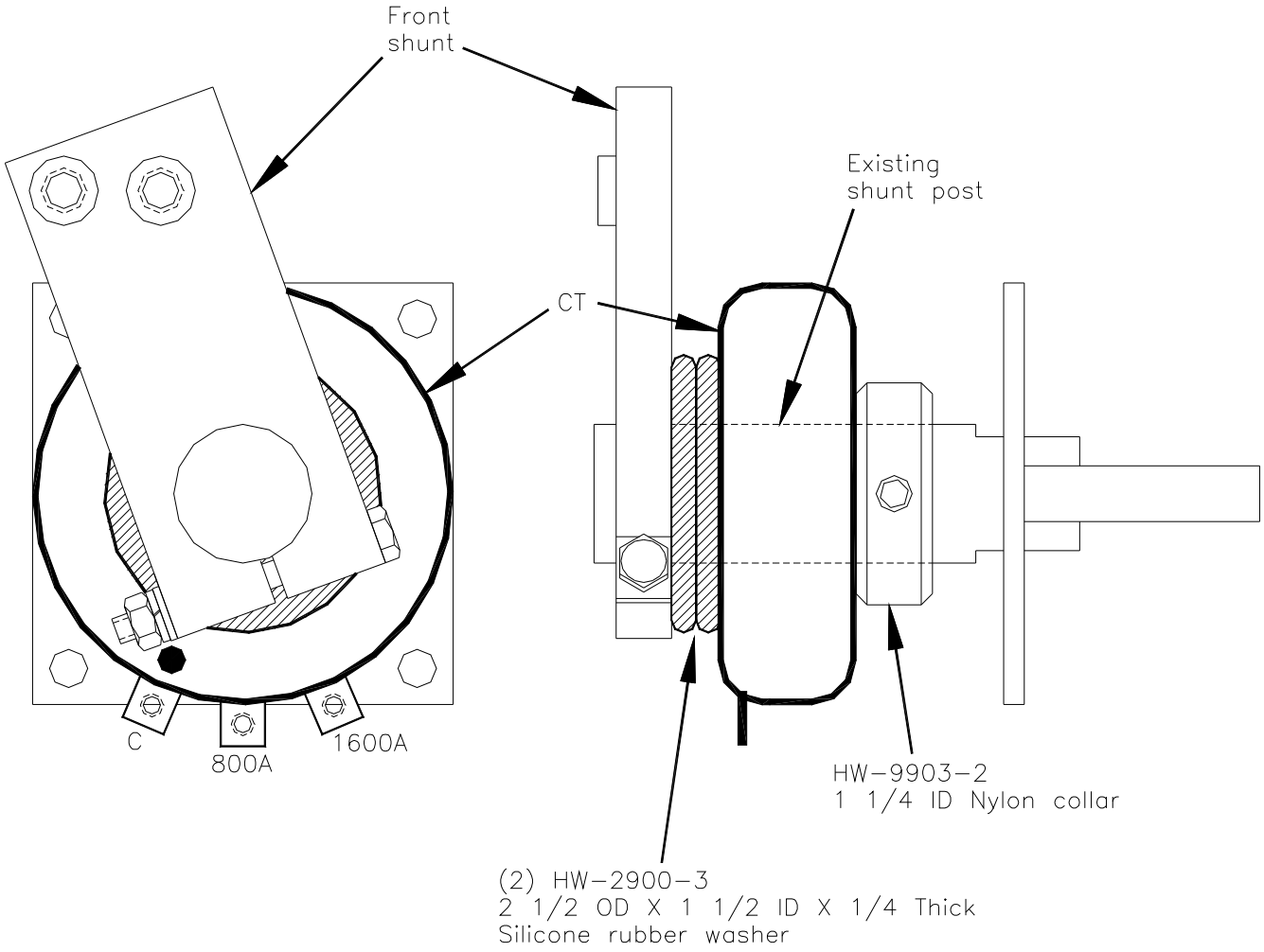

FIGURE 5
CT Installation

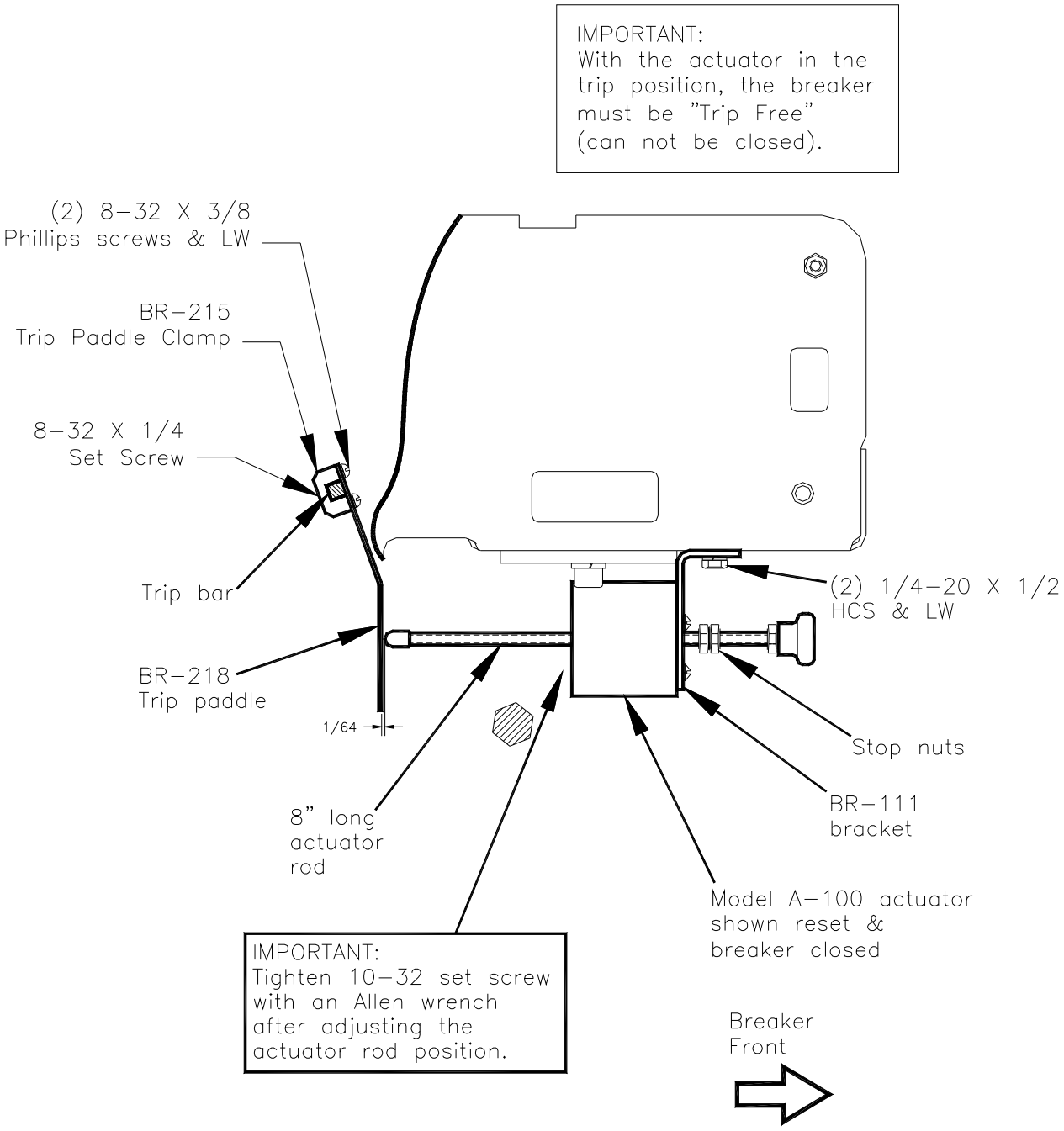

FIGURE 6
Left Side View
"Blue" & "Black" Front Breakers
Manual Actuator Installation

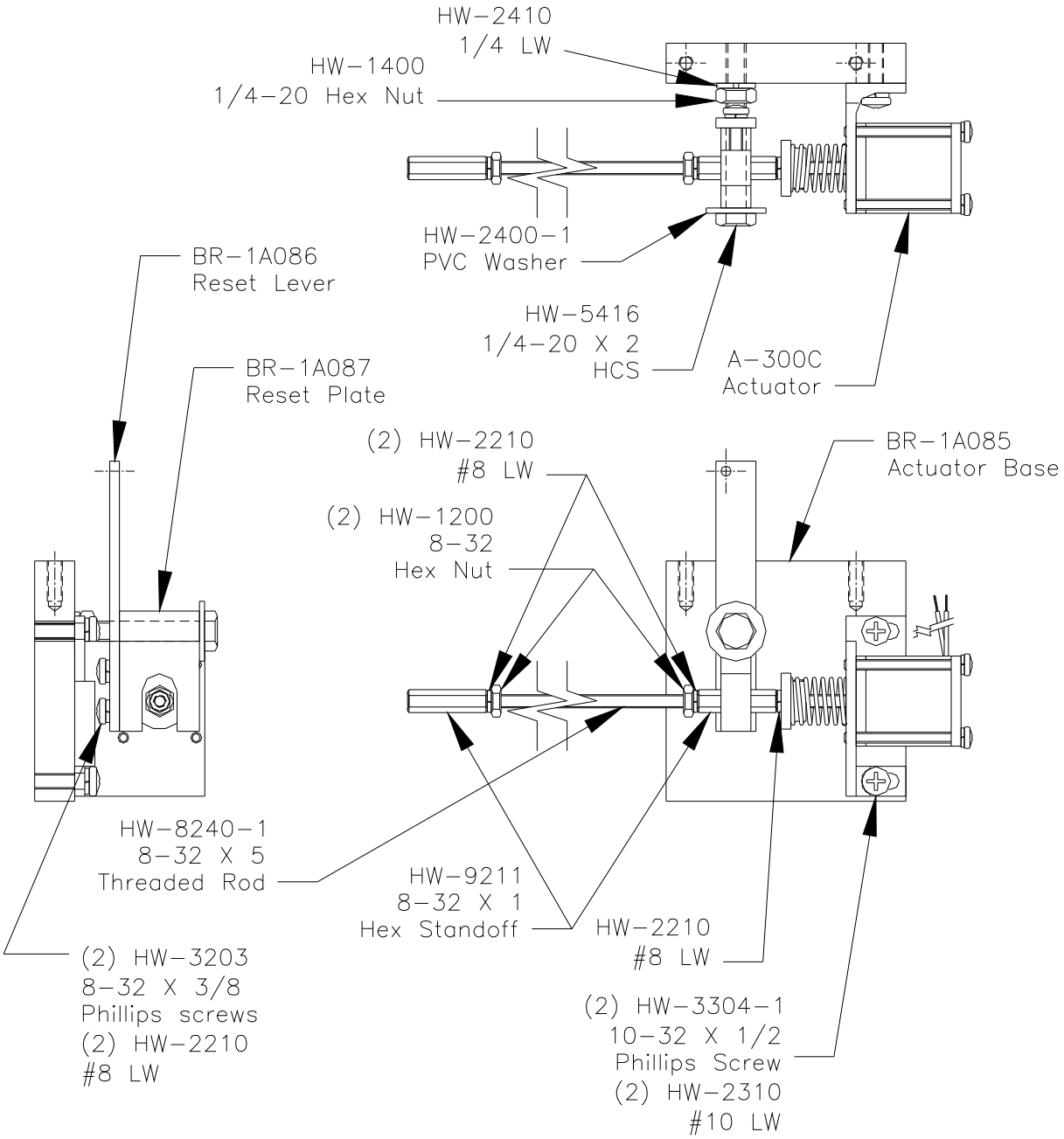

FIGURE 7
Mechanical Reset Actuator Pre-Assembly

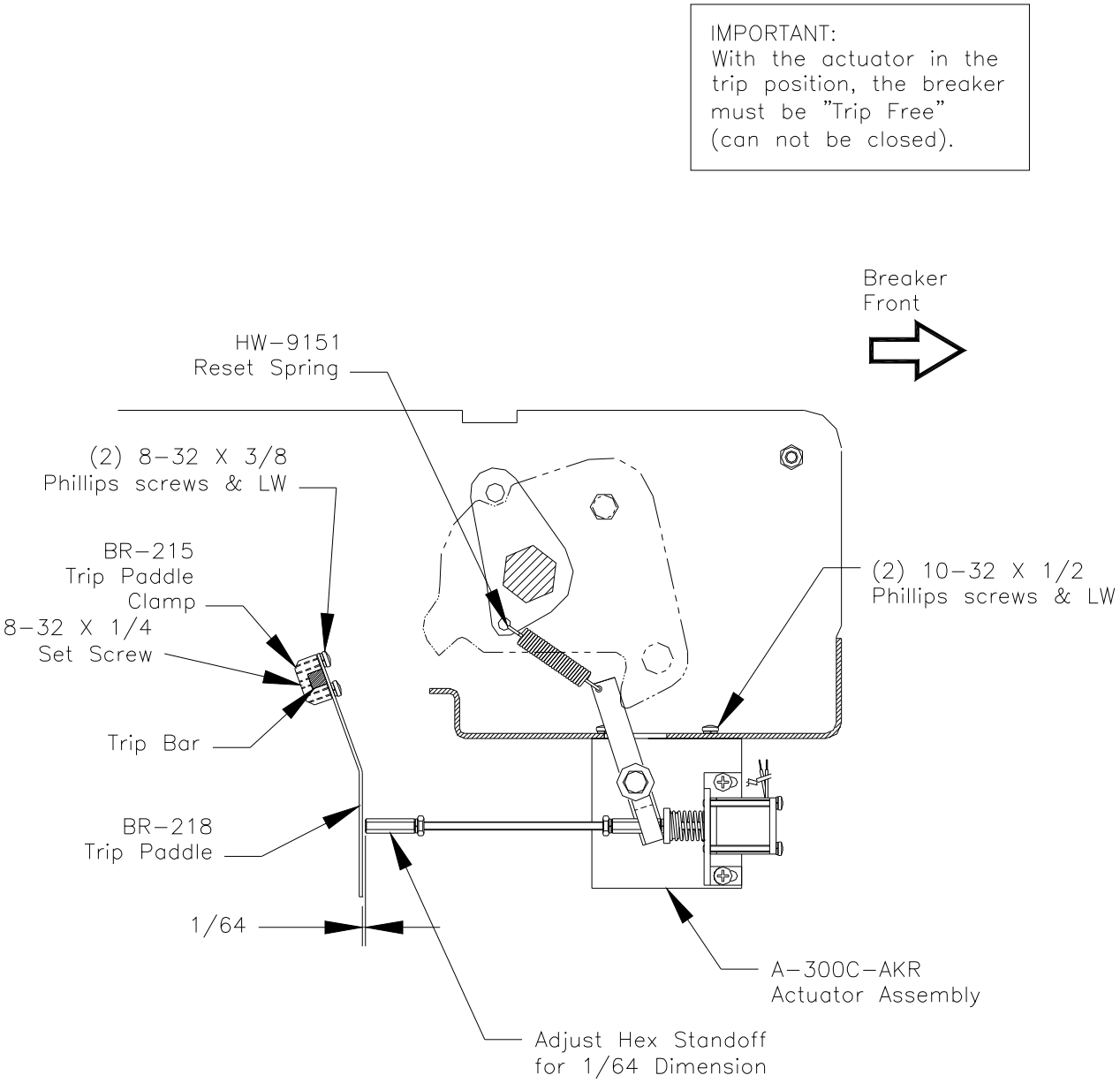

FIGURE 8
"Blue" & "Black" Front Breakers
Mechanical Reset Actuator Installation

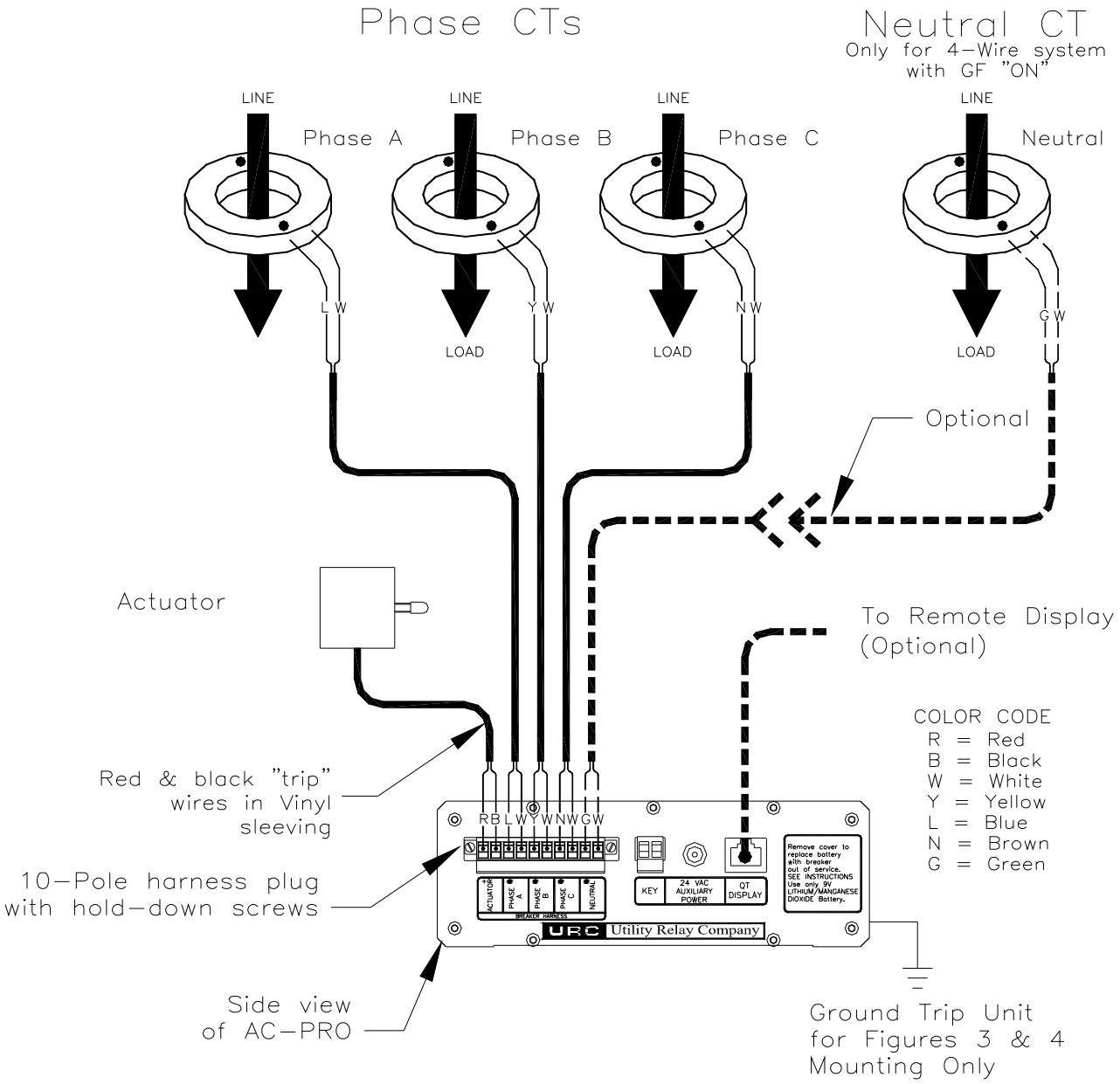

FIGURE 9
Wiring Diagram

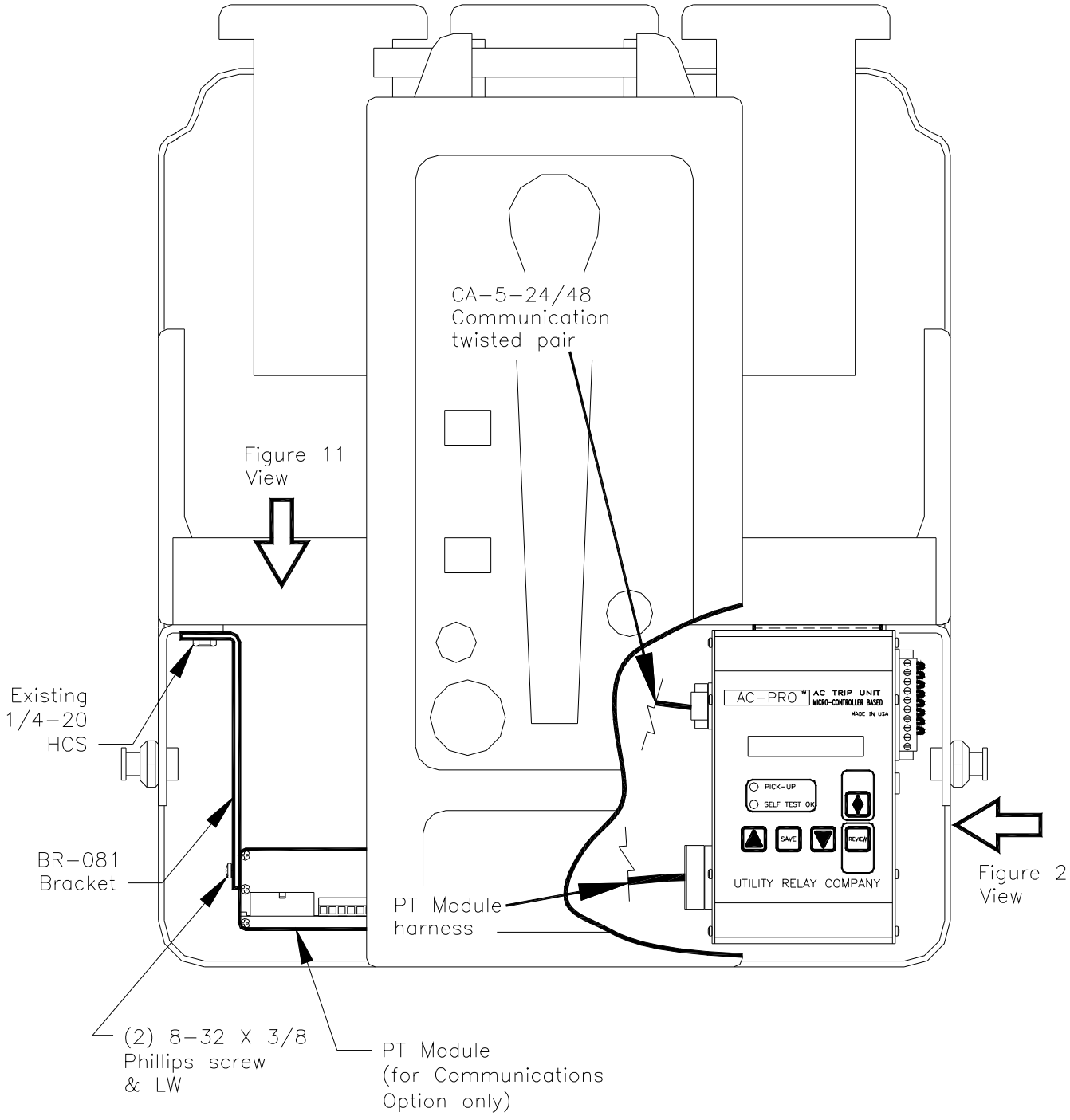

FIGURE 10
Front View – "Blue Front" Breaker
With Communications

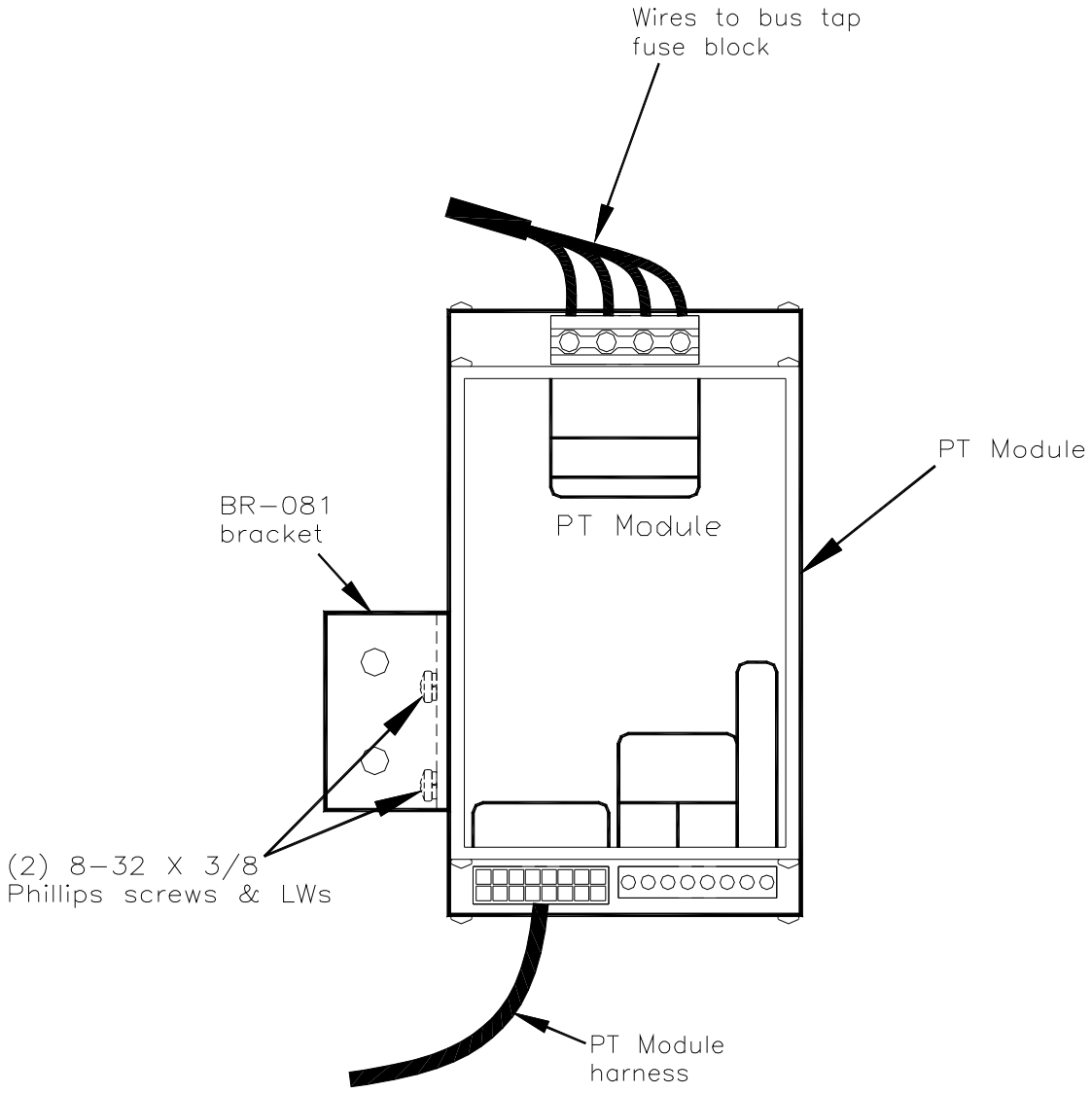

FIGURE 11
PT Module Installation
"Blue Front" Breaker

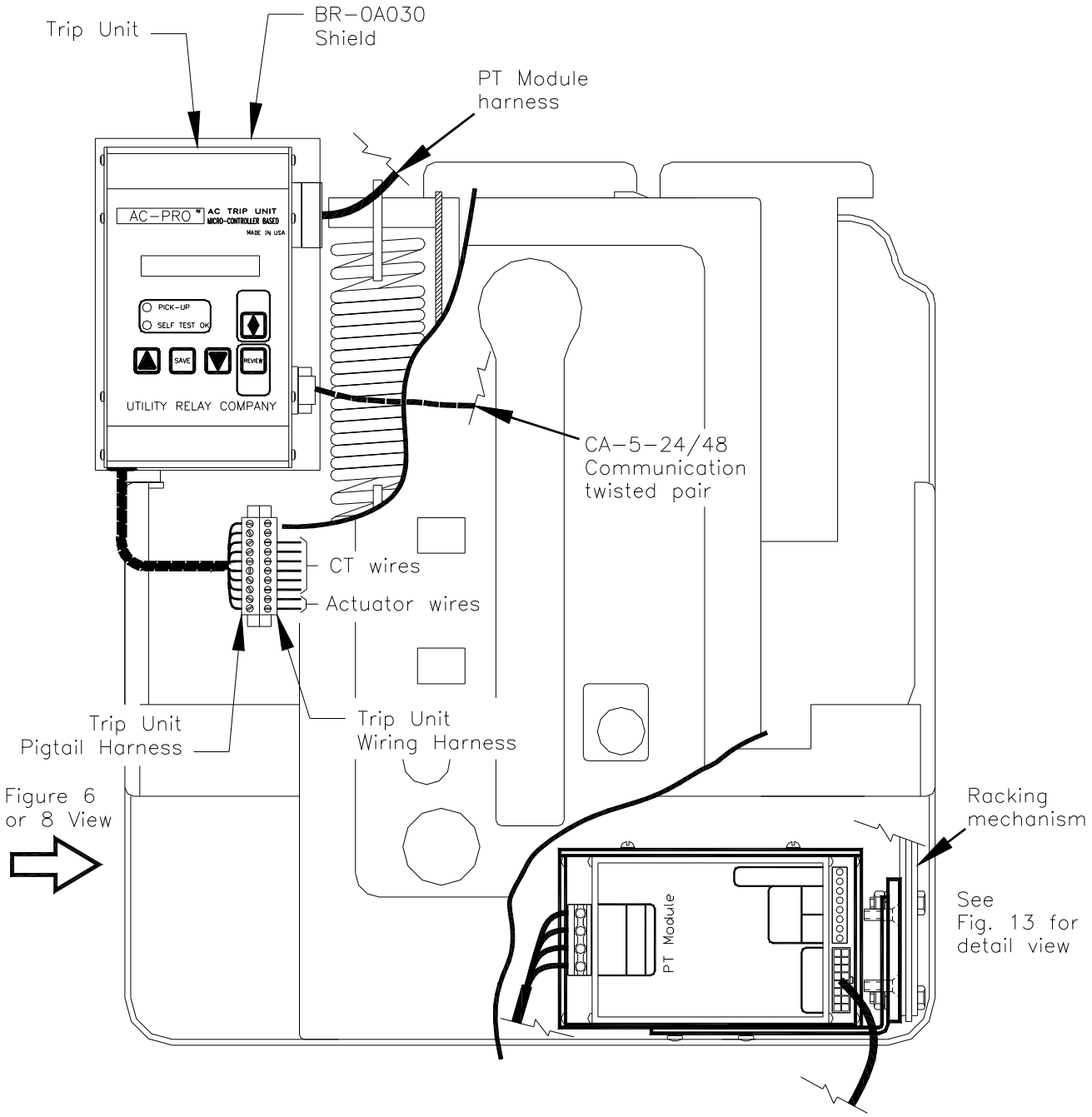

FIGURE 12
Front View – "Black Front" Breaker
With Communications

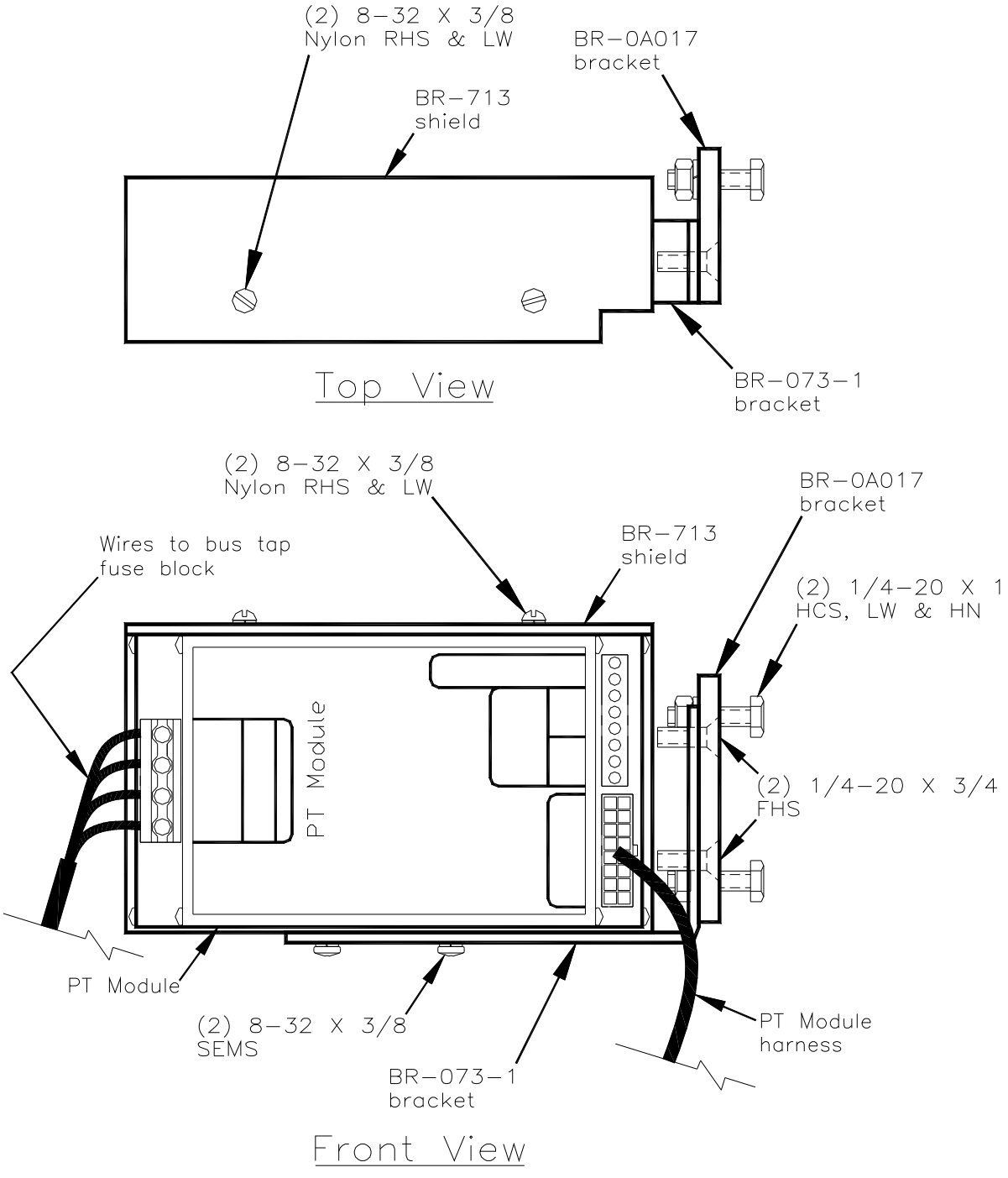

FIGURE 13
PT Module Installation
"Black Front" Breaker

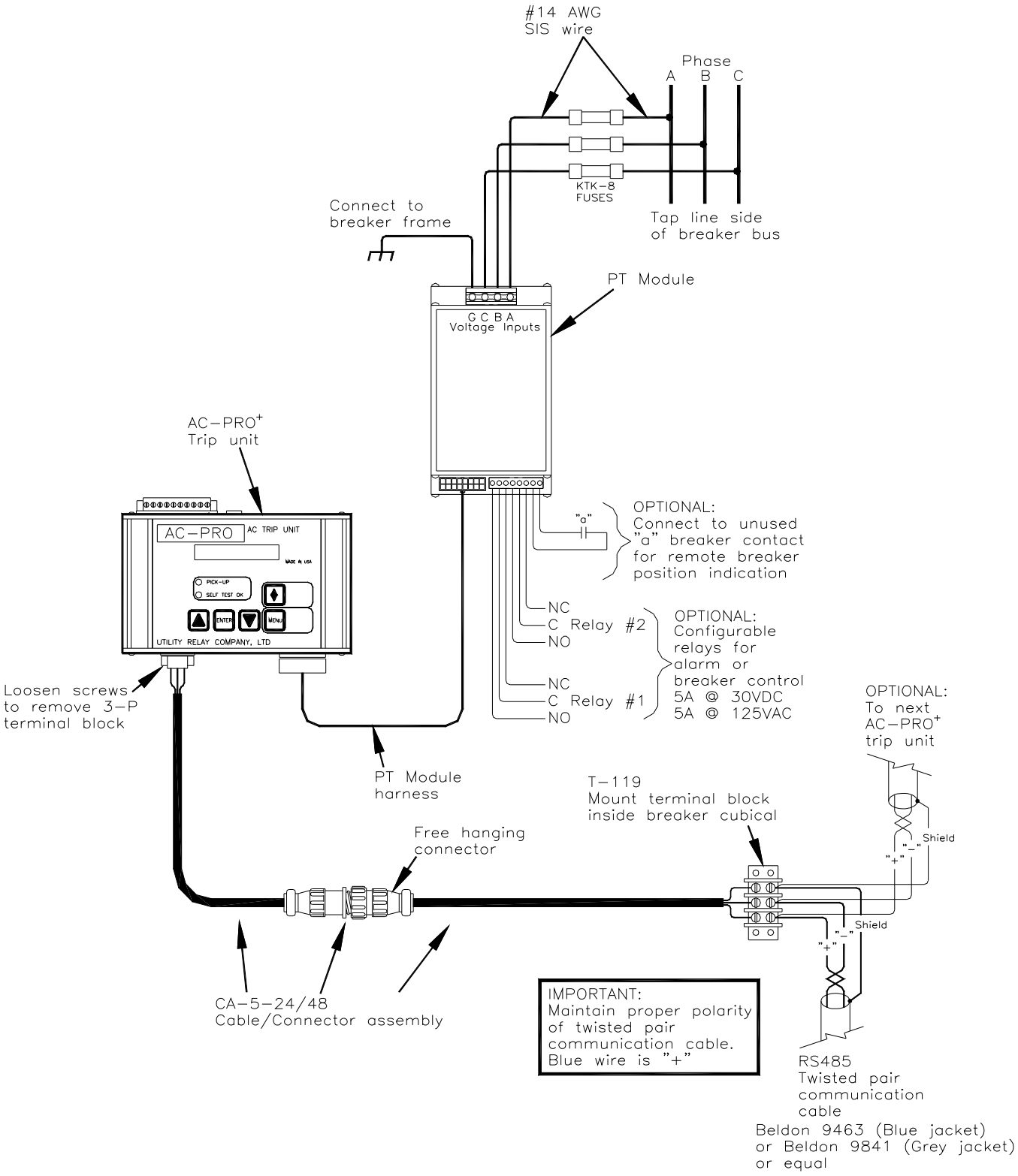

FIGURE 14
Wiring Diagram
For Communications

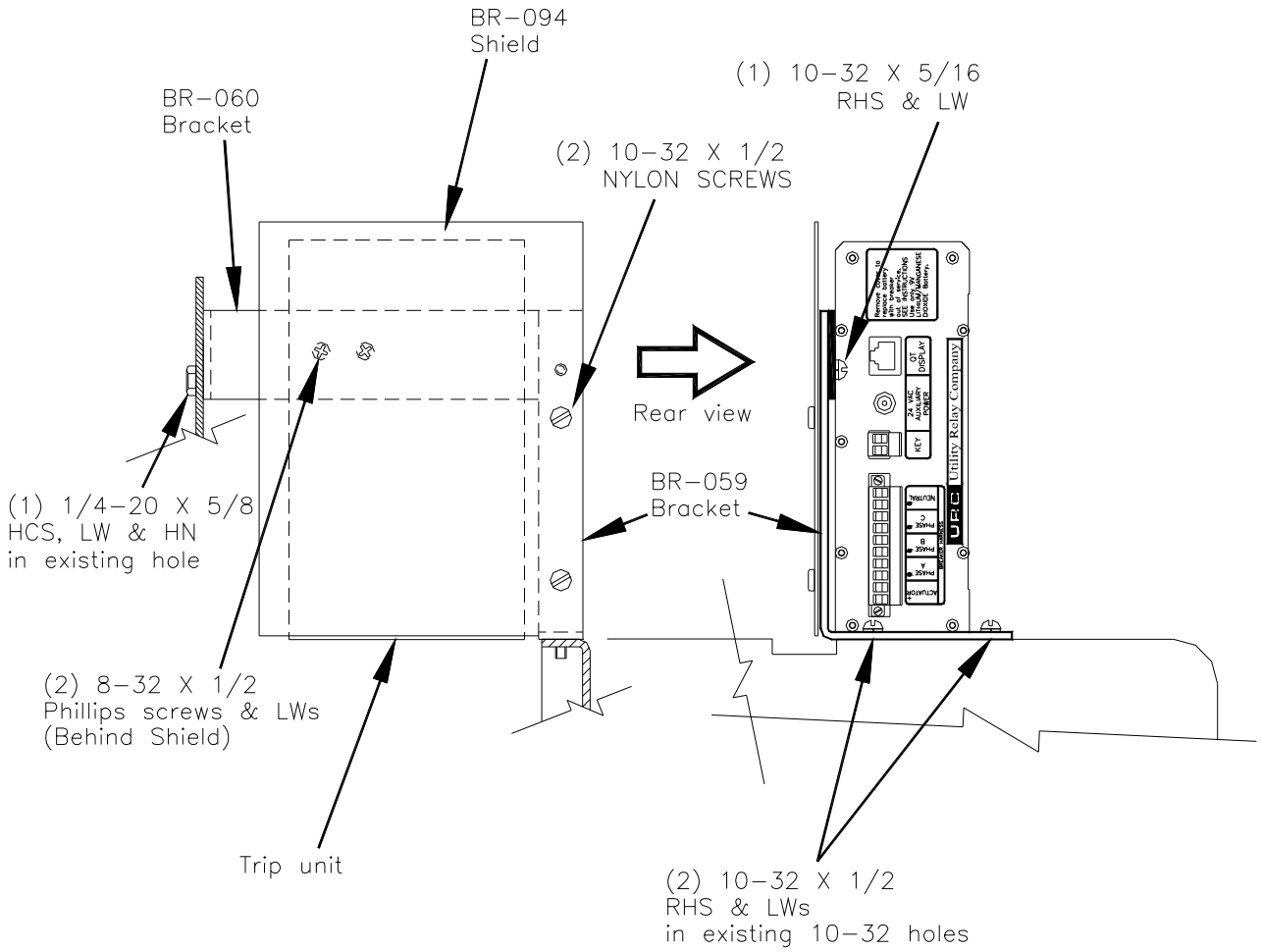

FIGURE 15
Side View Alternate Mounting
Trip Unit behind closing spring

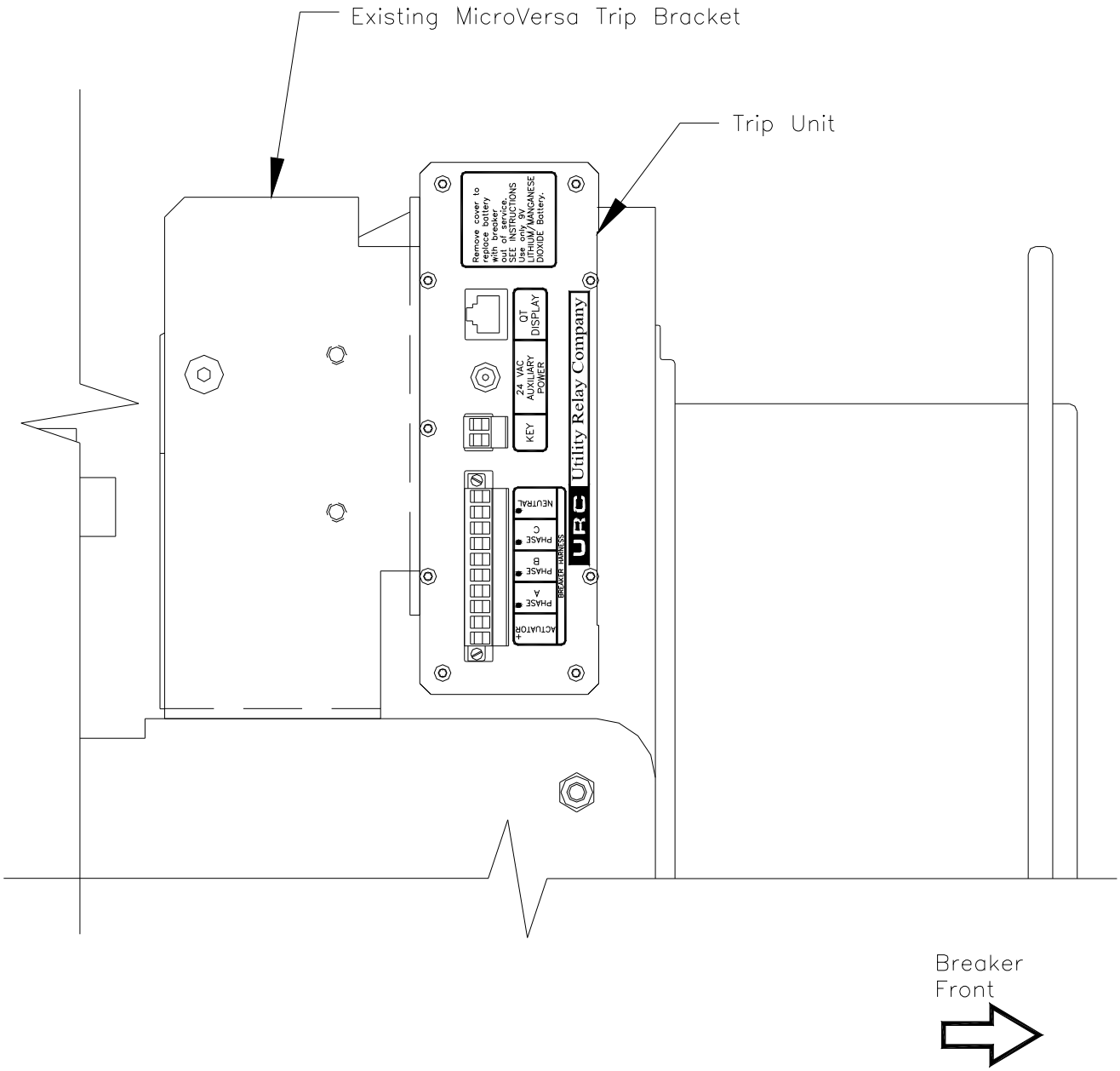

FIGURE 16
Side View Alternate Mounting
Using MicroVersa Trip Bracket

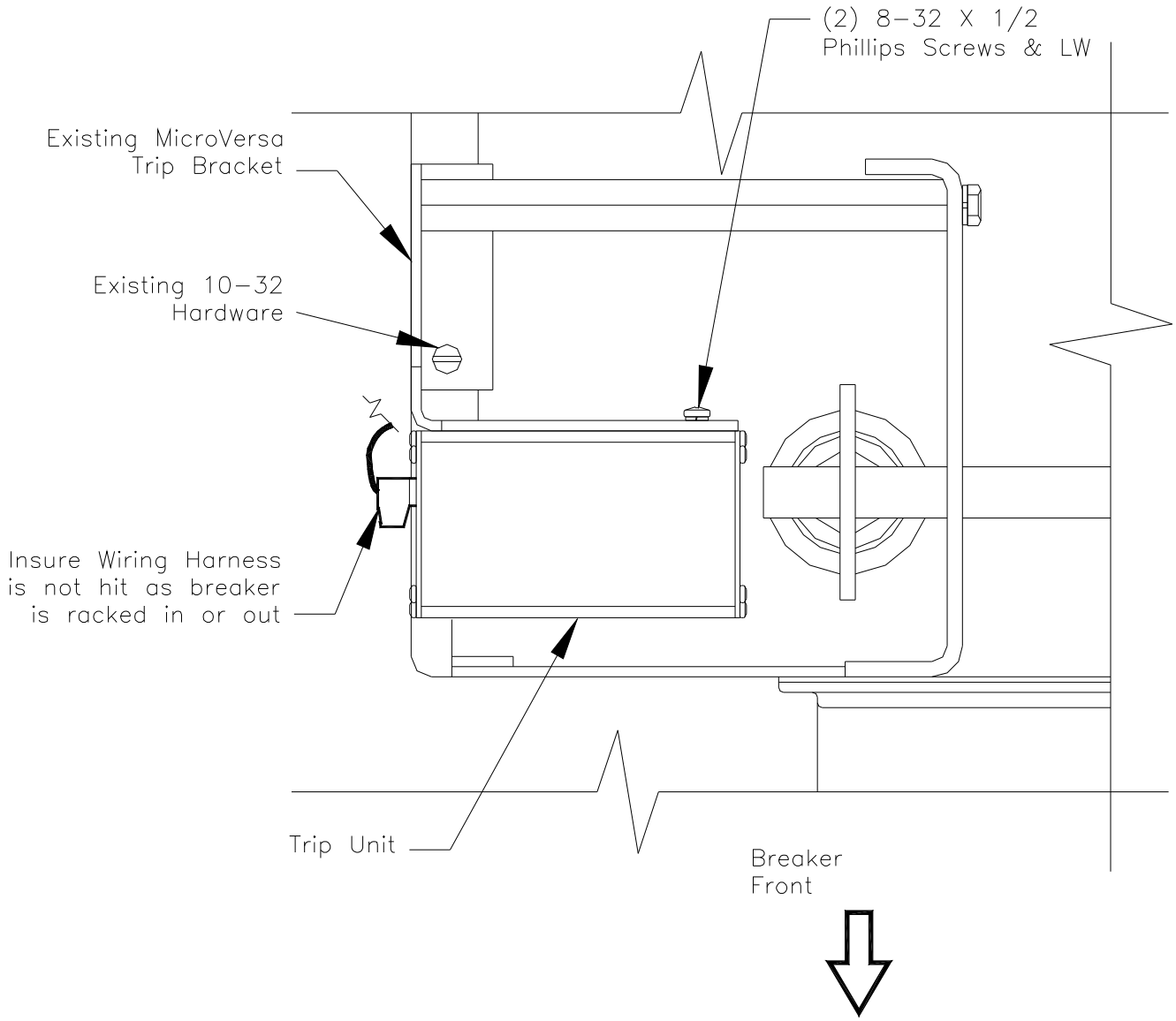

FIGURE 17
Top View Alternate Mounting
Using MicroVersa Trip Bracket

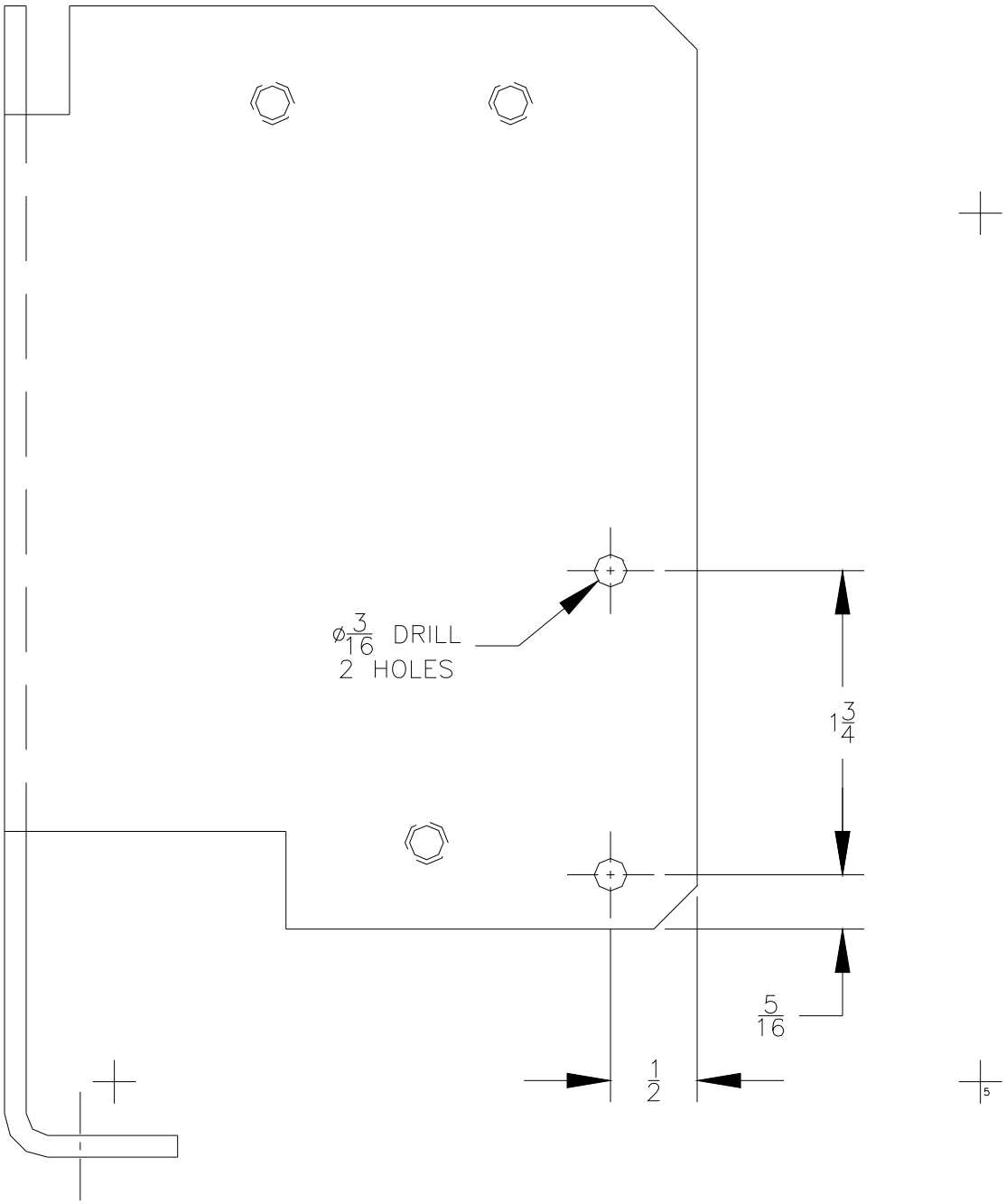

FIGURE 18
TEMPLATE: Modification to Existing
MicroVersa Trip Bracket
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