AC-PRO Retrofit Kit

Retrofit Kit Instructions for FPE
H1 33” Frames

Low Voltage Air Circuit Breaker

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

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I-ACM-Hx-33 **February, 2007** **Rev. 0**

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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FPE
75/100H1

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. LTD 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 Overloads

1) Remove the existing overloads and the trip links. One of the exiting trip paddles will be re-used.

4.0 CT Installation

4.1 Install 75H1

Note: This CT configuration is for single piece, horizontally oriented 6” x 3/4” stabs

1) **Remove the primary disconnects from the load side stabs.**

2) **Fit the CT into place on the stabs and reinstall the primary disconnects.**

3) **Fully tighten all hardware.**

4.2 Install 100H1

Note: This CT configuration is for multiple, vertically oriented stabs.

Refer to Figure 9 for the following:

1) **Remove the primary disconnects from the load side stabs.**

2) **Hold the CT assemblies in place over the stabs and mark the mounting hole locations. Remove the CT assemblies then drill and tap the mounting holes in the breaker’s back plate for the 1/4-20 mounting hardware.**

3) **Attach the CT assemblies to the breaker’s back plate using four (4) 1/4-20 X 1 R.H. machine screws and lock washers.**

4) **Replace the primary disconnects.**

5.0 Install Trip Paddle

Refer to Figure 8 for the following:

1) **Select the location for the actuator assembly. Remove the breaker's trip paddle; keep the hardware for reuse. Clamp the BR-200 to the breaker's original trip paddle and drill two (2) 3/16" holes as illustrated.**

2) **Attach the BR-200 trip paddle to the back of the original trip paddle using two (2) 10-32 X 3/8 Phillips screws, lock washers and hex nuts.**

3) **Reinstall the trip paddle assembly.**

6.0 Manual Reset Actuator

Skip this Section and go to Section 6 if the mechanical reset actuator configuration is going to be used.

6.1 Install Actuator

Refer to Figures 1, 3, & 4 for the following:

1) **Replace the standard actuator rod with the 7” rod then transfer all of the related hardware.**

   Use caution since the plunger is spring loaded.

2) **Attach the BR-1A007 bracket on the actuator using three (3) 10-32 X 3/8 Phillips screws and lock washers.**

3) **The actuator can be installed using either two (2) 1/4-20 H.C. screws and lock washers into threaded holes or a nut and bolt assembly using two (2) 9/32 clearance holes; hardware is provided for both methods. The BR-1A007 bracket should be aligned with the rear edge of the frame brace as illustrated. The mounting holes may have to be drilled from the bottom side of the frame brace.**

4) **Attach the actuator assembly to the frame using the hardware configuration selected.**

6.2 Adjust Actuator

Refer to Figure 4 for the following:

1) **Reset the actuator and charge the breaker. Adjust the position of the actuator rod by screwing it in or out until the end of the rod is 1/64" from the trip paddle.**

2) **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 actuator rod stop-nuts so, when tripped, the travel is within the limits of the trip bar movement.**

4) **Reset the actuator and close the breaker. If the breaker will not close re-adjust the position of the actuator rod for more clearance to the trip paddle.**

5) **Trip the actuator by lightly striking the reset knob. The breaker should trip.**

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

7) **Repeat the adjustments until completely satisfied with the operation of the actuator.**

IMPORTANT:	**WHEN THE ACTUATOR IS IN THE TRIP POSITION (NOT RESET), THE BREAKER MUST TRIP FREE.** **THE SET SCREW IN THE PLUNGER MUST BE TIGHTENED TO ENSURE THAT THE ACTUATOR ROD REMAINS IN PROPER ADJUSTMENT.**

7.0 Actuator Installation, Mechanical Reset

Refer to Section 6 for the manual reset actuator configuration instructions.

7.1 Install Actuator/Reset

Refer to Figures 1, 5 & 6 for the following:

1) **Replace the standard actuator rod with the 5-1/2 inch rod provided, only the plastic tip should be transferred from the old actuator rod. Install a single nylock stop-nut, adjust the nut to be approximately 1” from the end of the rod (reset end) with the actuator reset.**

   Use caution since the plunger is spring loaded.

2) **Attach the BR-256-1 bracket and BR-1A007 bracket to the actuator using three (3) 10-32 X 3/8 Phillips screws and lock washers.**

3) **Slide the BR-194 reset link into place on the actuator rod and install the second nylock nut (finger tight).**

4) **Push the “pin” of the reset link BR-194 into the reset lever BR-195 then install the reset lever in the pivot bracket as follows: fit the clevis pin into the pivot bracket from the left side and install three (3) HW-0203-4 spacers, next the reset lever and finally a single HW-0203-4 spacer on the right side of the reset lever. Install the “E” clip to complete the assembly.**

5) **Determine the best mounting location for the actuator on the breaker being retrofit. The actuator assembly may be located on the frame brace in any location where the reset lever can contact the connecting pin for the breaker’s movable contact links.**

6) **The actuator can be installed using either two (2) 1/4-20 H.C. screws and lock washers into threaded holes holes or a nut and bolt assembly using two (2) 9/32 clearance holes; hardware is provided for both methods.**

7) **Attach the actuator assembly to the frame using the hardware configuration selected.**

7.2 Adjust Actuator

Refer to Figure 7 for the following:

1) **Temporarily remove the reset nut (to allow adjustment of the actuator rod) and loosen the 10-32 set screw in the actuator's plunger. With the actuator reset, adjust the actuator rod to within 1/4" of the trip paddle.**

2) **Reset the actuator and charge the breaker. Adjust the trip paddle clearance to about 1/64". Trip the actuator and lock the actuator rod in position by tightening the 10-32 set screw with an Allen wrench.**

3) **Trip the actuator then attempt to close the breaker, it must trip free. If required, adjust the stop nut for additional travel. Test the trip free operation until satisfied with the function. Reinstall the reset link and reset nut (if removed).**

IMPORTANT: With the actuator in the tripped position (not reset), the breaker MUST TRIP FREE.

4) **With the breaker open, adjust the reset nut until the reset lever touches the pin for the breaker's movable contact links then tighten the nut approximately one additional revolution.**

5) **Reset the actuator and close the breaker. Trip the actuator using a fresh 9 Volt battery, the red wire is "+". The actuator should reset when the breaker opens (verify the plunger has reset). If the actuator didn't reset tighten the reset nut another full turn and re-test. After the final adjustment operate the breaker several times to verify reliable operation. To prevent damage *do not over-tighten the reset nut.***

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

8.0 Install AC-PRO

Refer to Figures 1 & 2 for the following:

1) **Attach BR-001 bracket to the back of the trip unit using two (2) 8-32 X 3/8 Phillips screws and lock washers.**

2) **Set the trip unit in position and mark the location of two (2) mounting holes.**

3) **Drill two (2) 3/16" holes in the location marked. Countersink at 82° for 8-32 F.H. screws.**

4) **Attach the trip unit/bracket assembly to the breaker frame using two (2) 8-32 X 3/4 F.H. screws, flat washers, lock washers and hex nuts in the two (2) previously drilled holes.**

9.0 Wiring

Use the wiring harness provided to make the connections to the CTs and the actuator. See Figure 10 for the wiring diagram.

The wiring harness plugs into the left 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 then 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.

9.1 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" Tap
4	White (W)	Phase "A" "Dot"
5	Yellow (Y)	Phase "B" Tap
6	White (W)	Phase "B" "Dot"
7	Brown (N)	Phase "C" Tap
8	White (W)	Phase "C" "Dot"
9	Green (G)	Neutral "Dot" (4W & GF only)
10	White (W)	Neutral Tap (4W & GF only)

9.2 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.

9.3 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.

9.4 Actuator Connection

Route the red and black wires from the actuator to the "ACTUATOR" terminal block 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 terminal on the trip unit.

10.0 Final Test

Perform a final electrical test of the breaker as indicated 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.

11.0 Communications

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

11.1 Install PT Module

The PT Module mounts on the left side of the frame as shown in Figures 11 and 12.

1) **Attach the BR-030-1 bracket to the PT Module using two (2) 8-32 X 3/8 Sems screws.**

2) **Using the PT Module/bracket assembly as a guide, mark the location of the two (2) mounting holes. Drill two 9/32" holes.**

3) **Attach the PT Module/bracket assembly to the breaker using two (2) 1/4-20 X 5/8 P.H. screws, flat washers, lock washers and hex nuts.**

11.2 Install Fuse Block for PT Module

1) **Attach the 3-pole fuse block to the breaker as close to the line side stabs as possible.**

2) **Drill and tap two (2) 8-32 holes using the fuse block as a guide.**

3) **Attach the fuse block to the back of the breaker using two (2) 8-32 X 1/2 P.H. Screws and lock washers.**

11.3 Communications Wiring

Refer to Figure 13 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

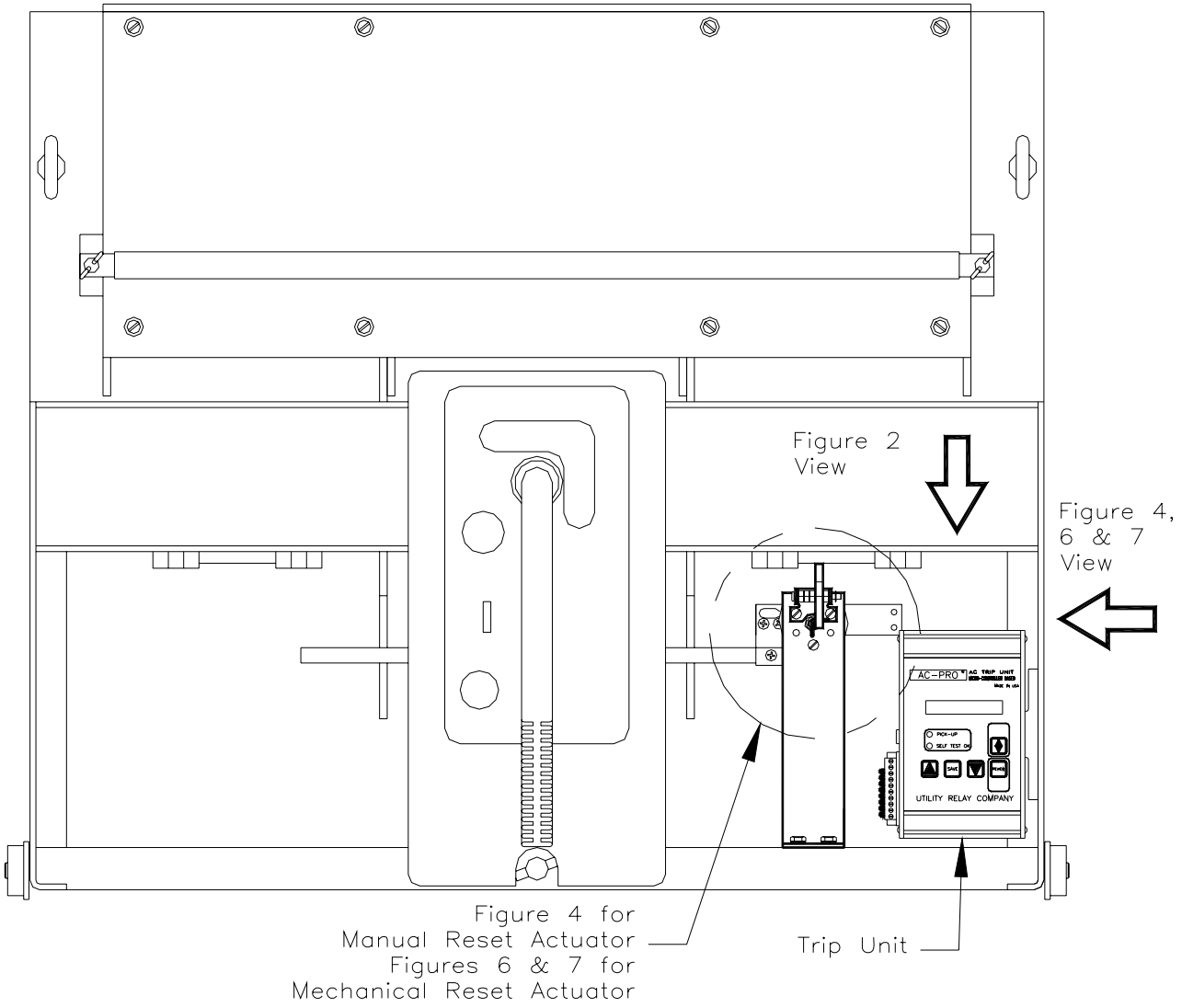
Plug the PT Module cable into the right side of the AC-PRO^{+} trip unit and the PT Module.

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.



Mechanical Reset Actuator is Illustrated

FIGURE 1
Front View

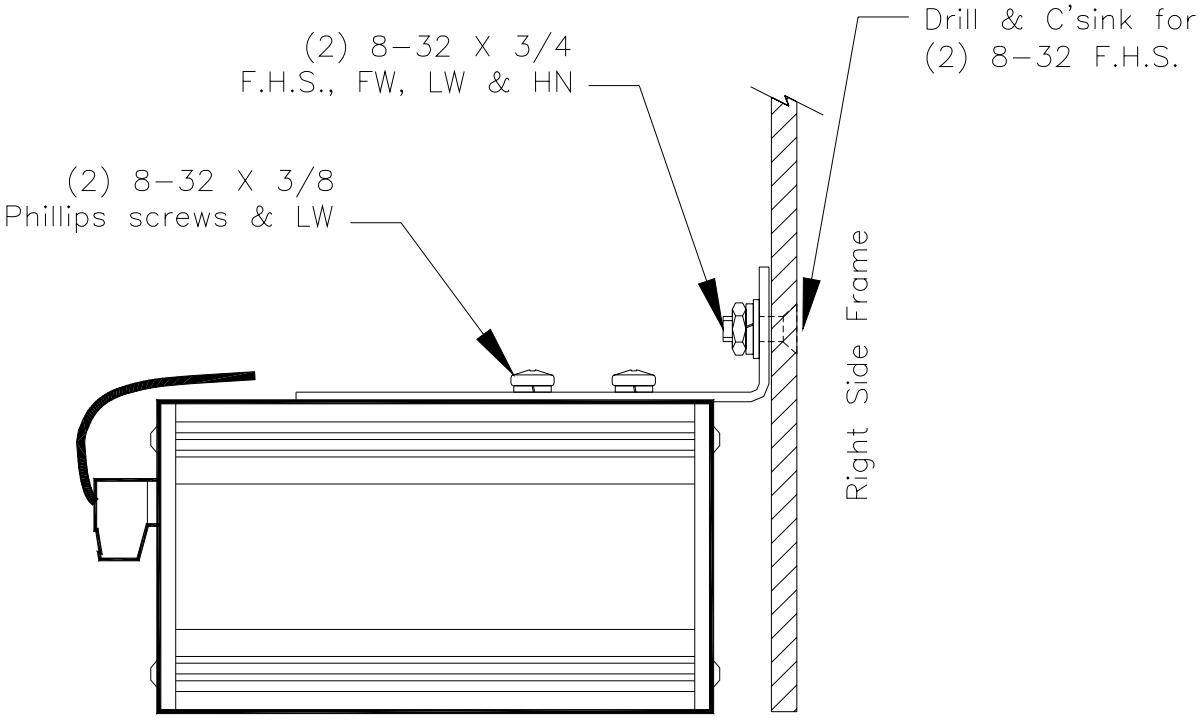


FIGURE 2
Trip Unit Mounting

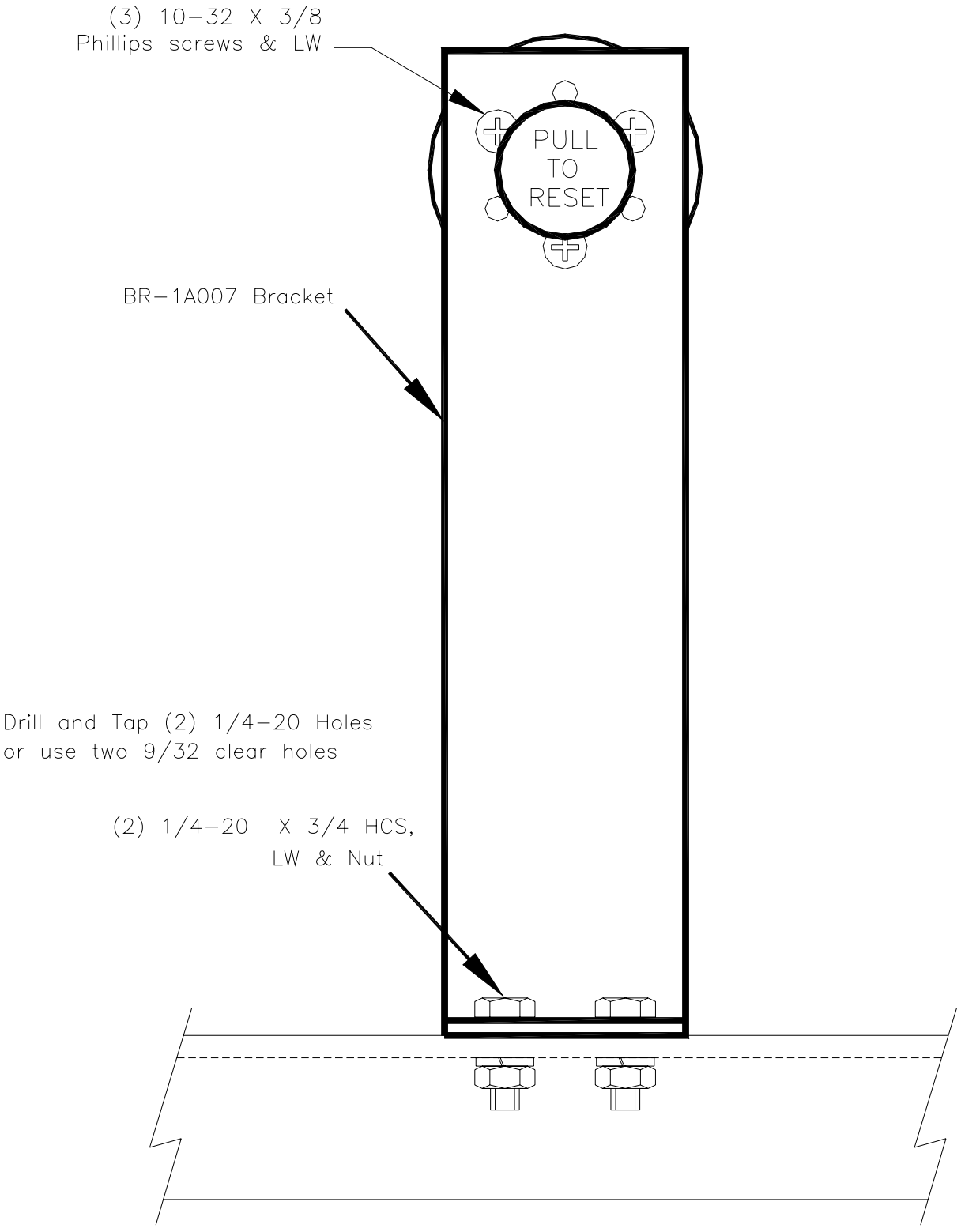


FIGURE 3
Manual Reset Actuator
Front View

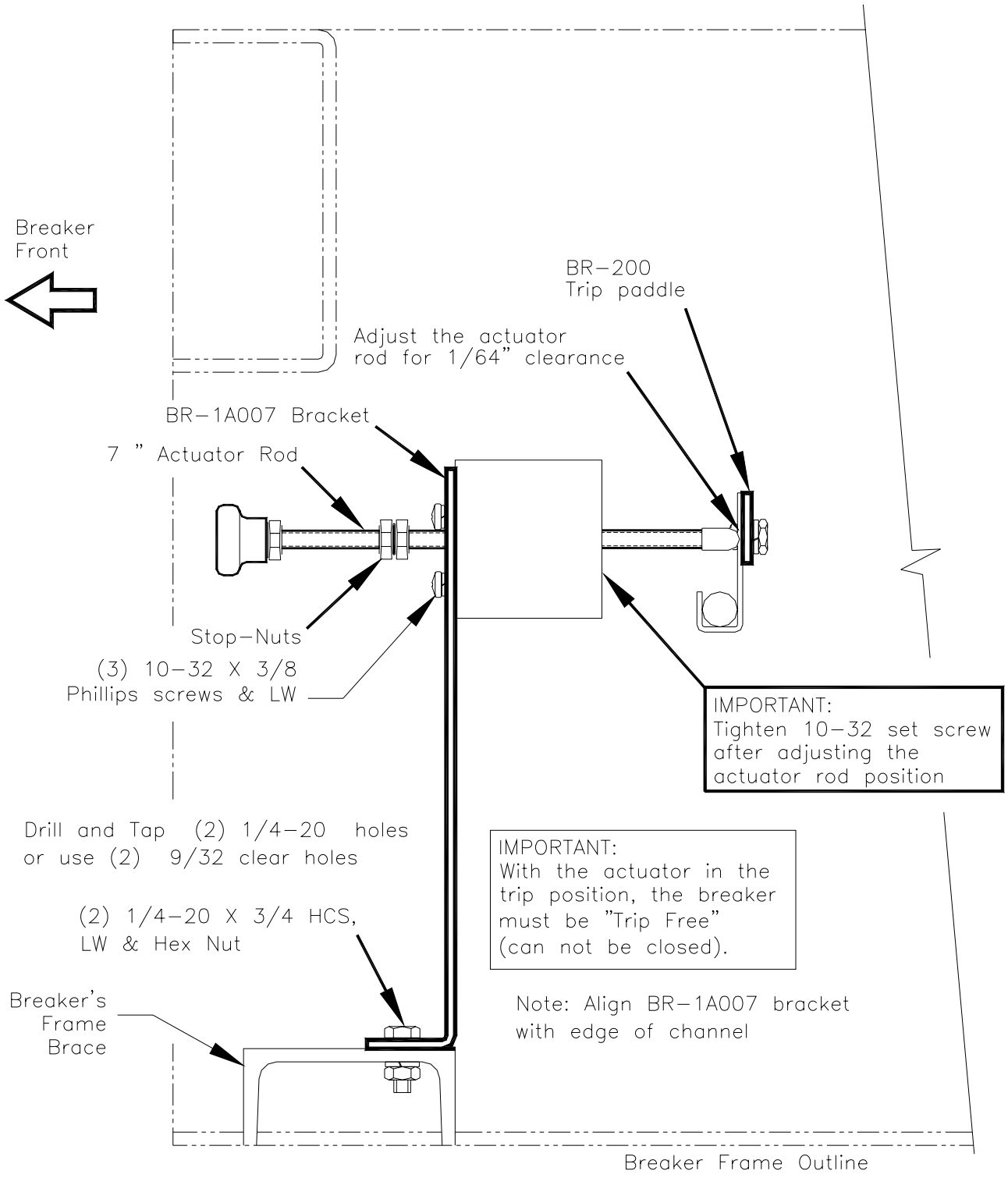


FIGURE 4
Manual Reset Actuator/Trip Paddle Installation
Right Side View

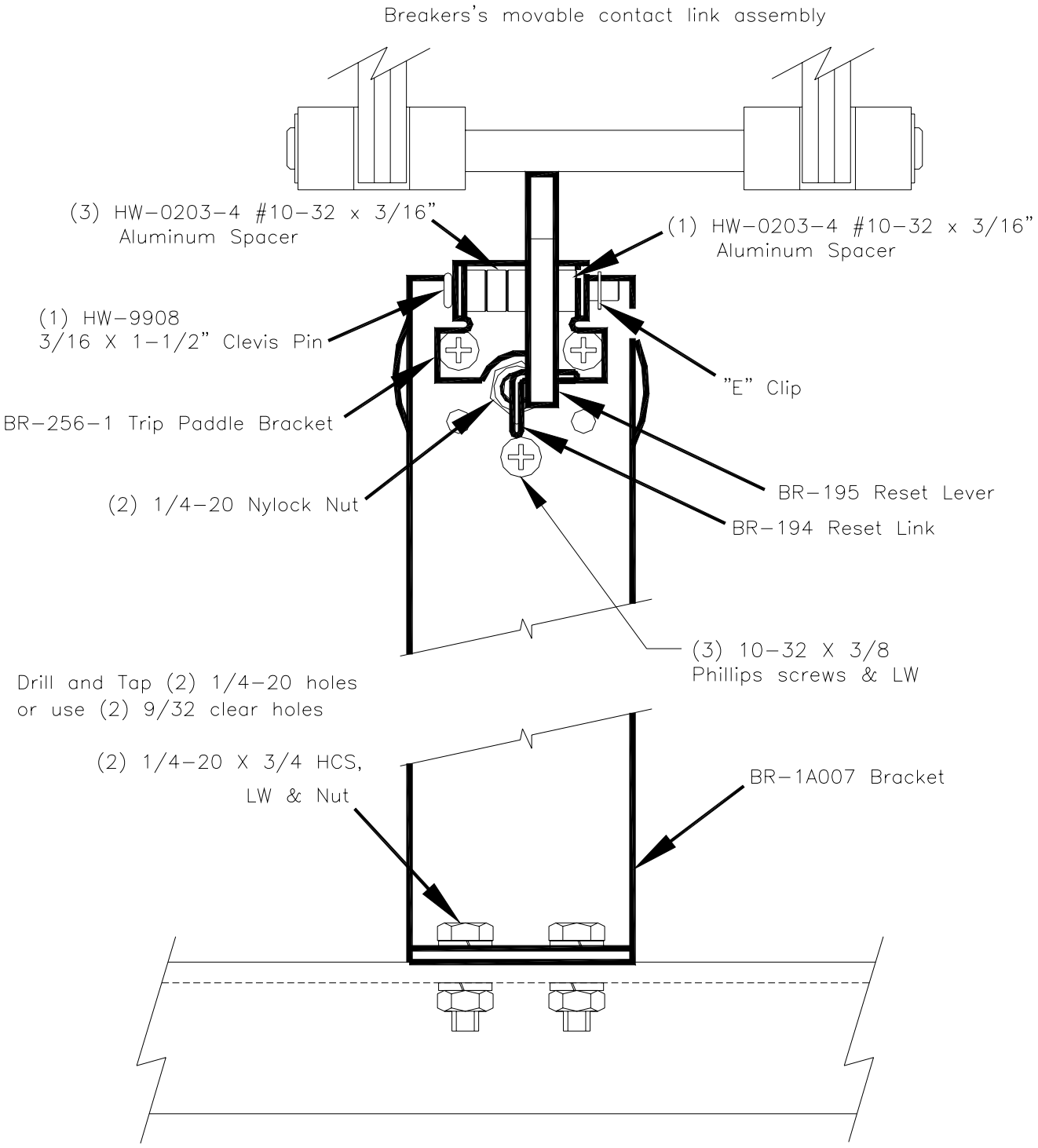


FIGURE 5
Mechanical Reset Actuator
Front View

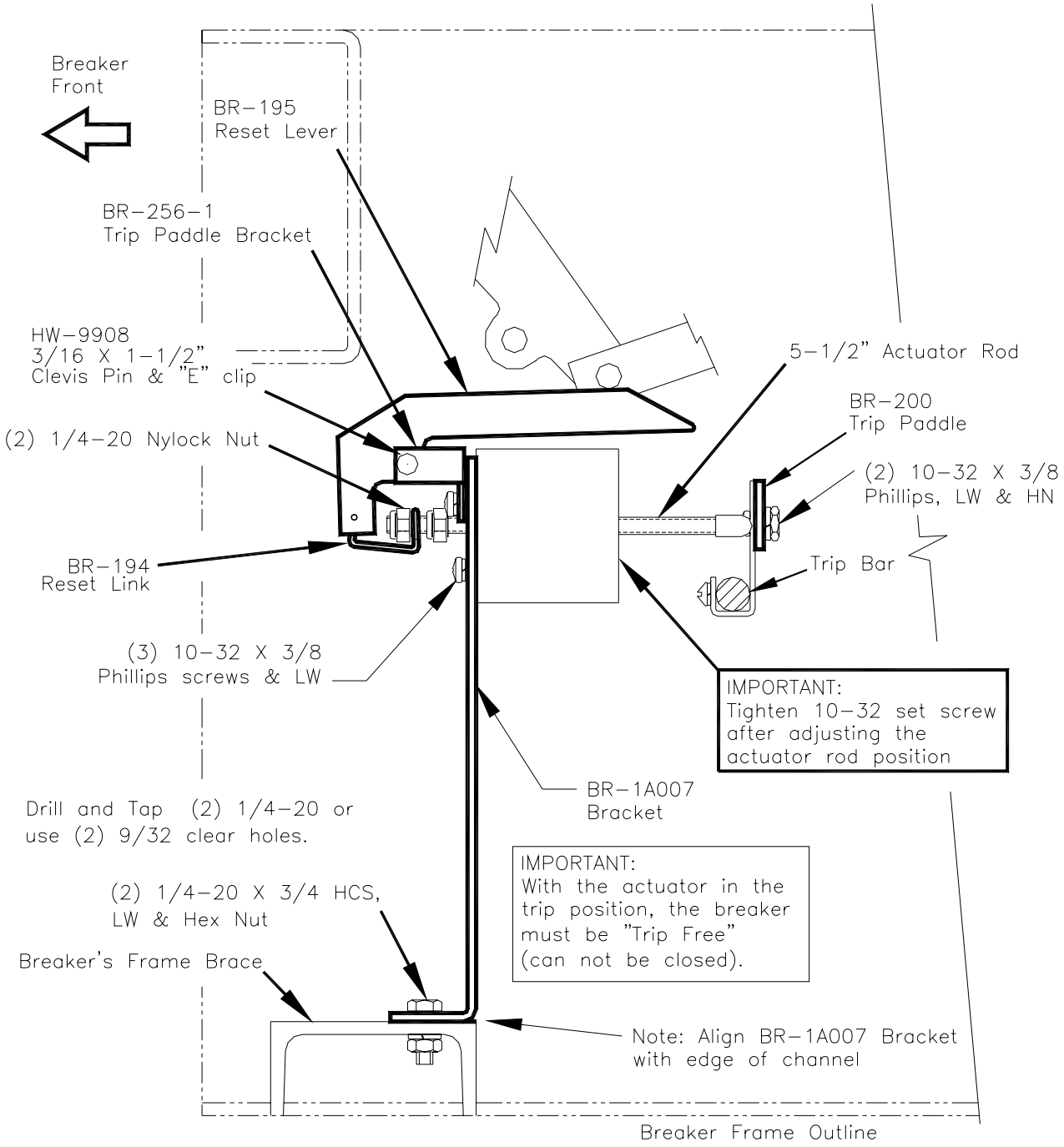


FIGURE 6
Mechanical Reset Actuator
Right Side View

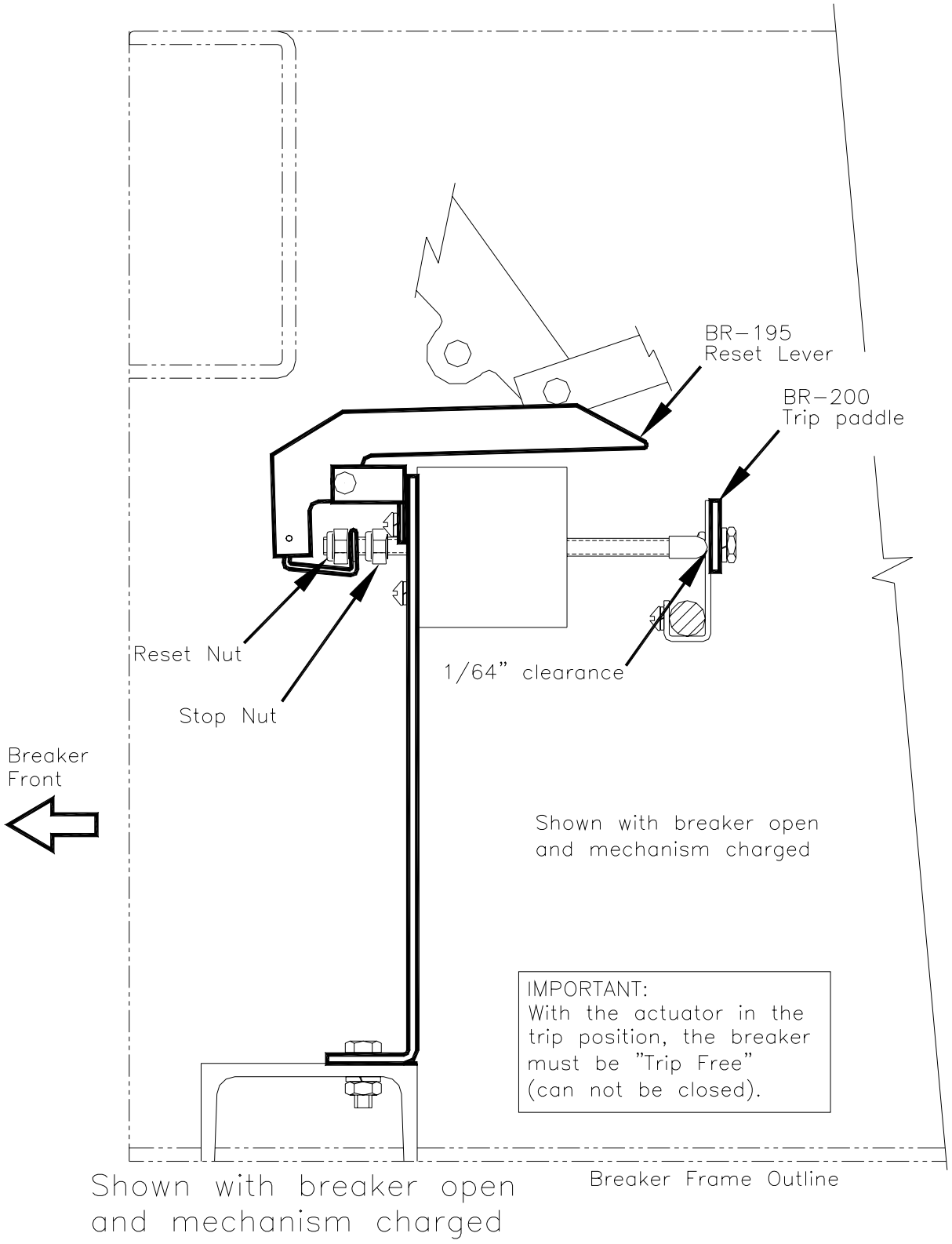


FIGURE 7
Mechanical Reset Actuator Adjustment

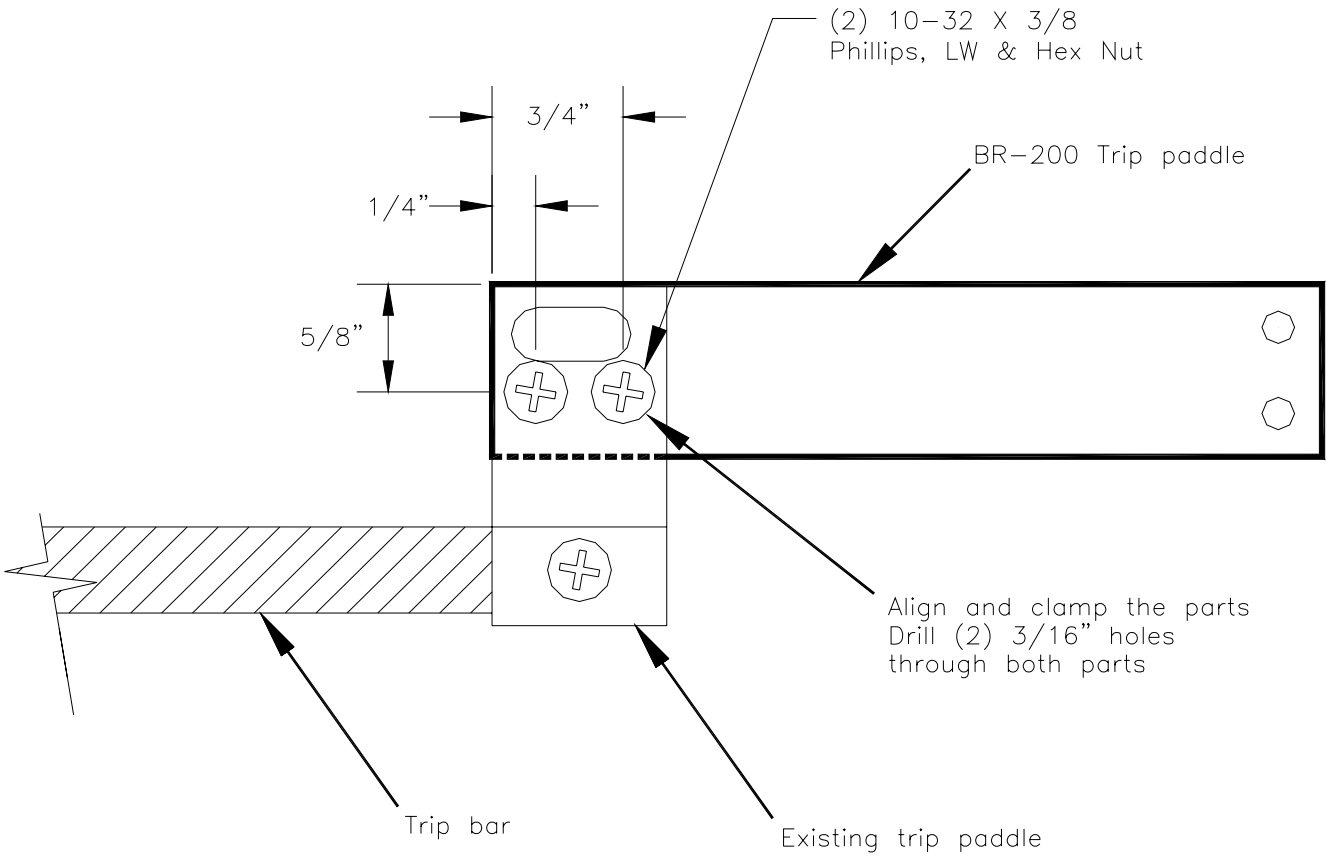
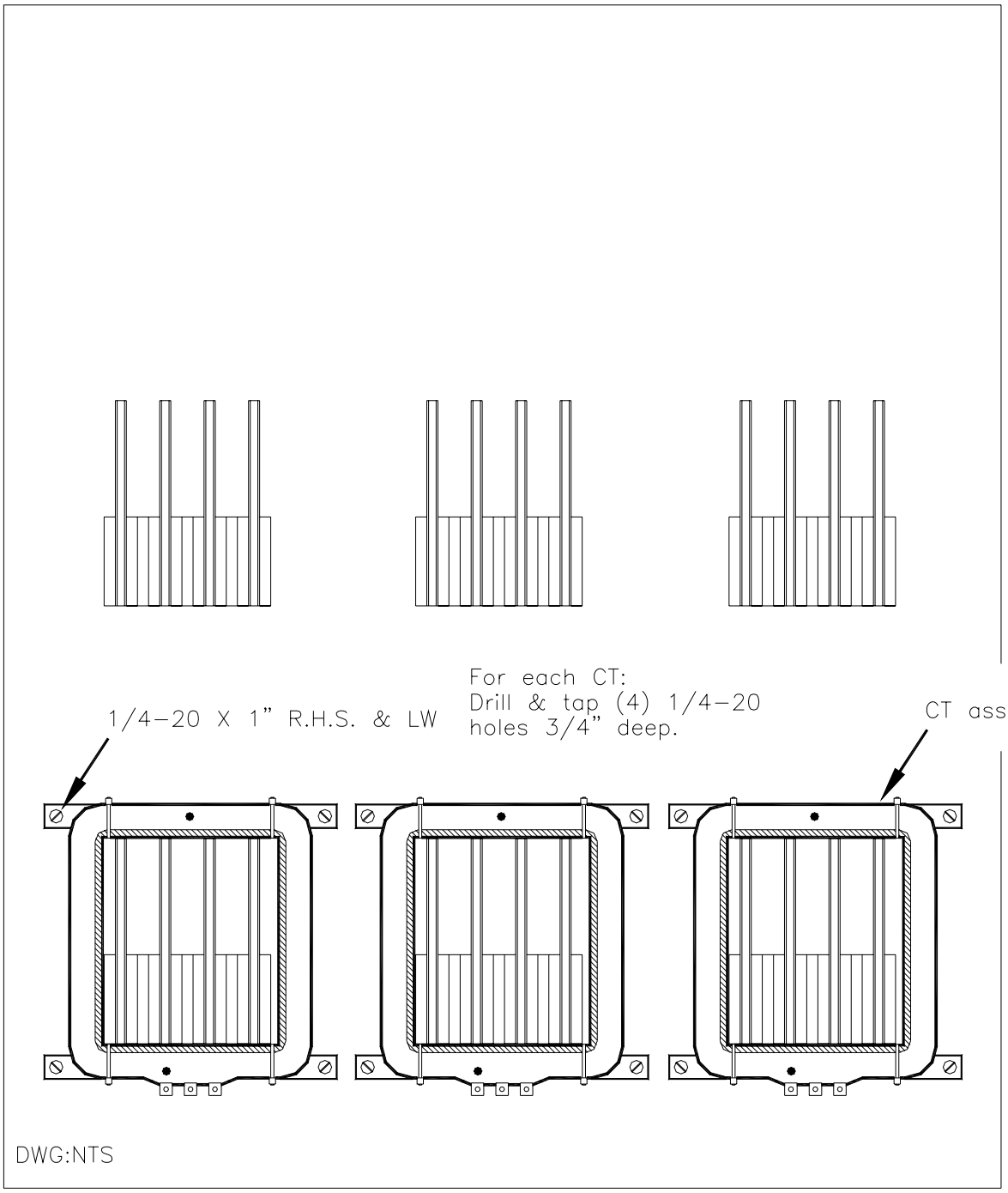


FIGURE 8
Trip Paddle Extension



Note: Breaker is shown without finger clusters
Orient the CT terminals so they point down.

FIGURE 9
100H-1 CT Installation
33" Wide Frame

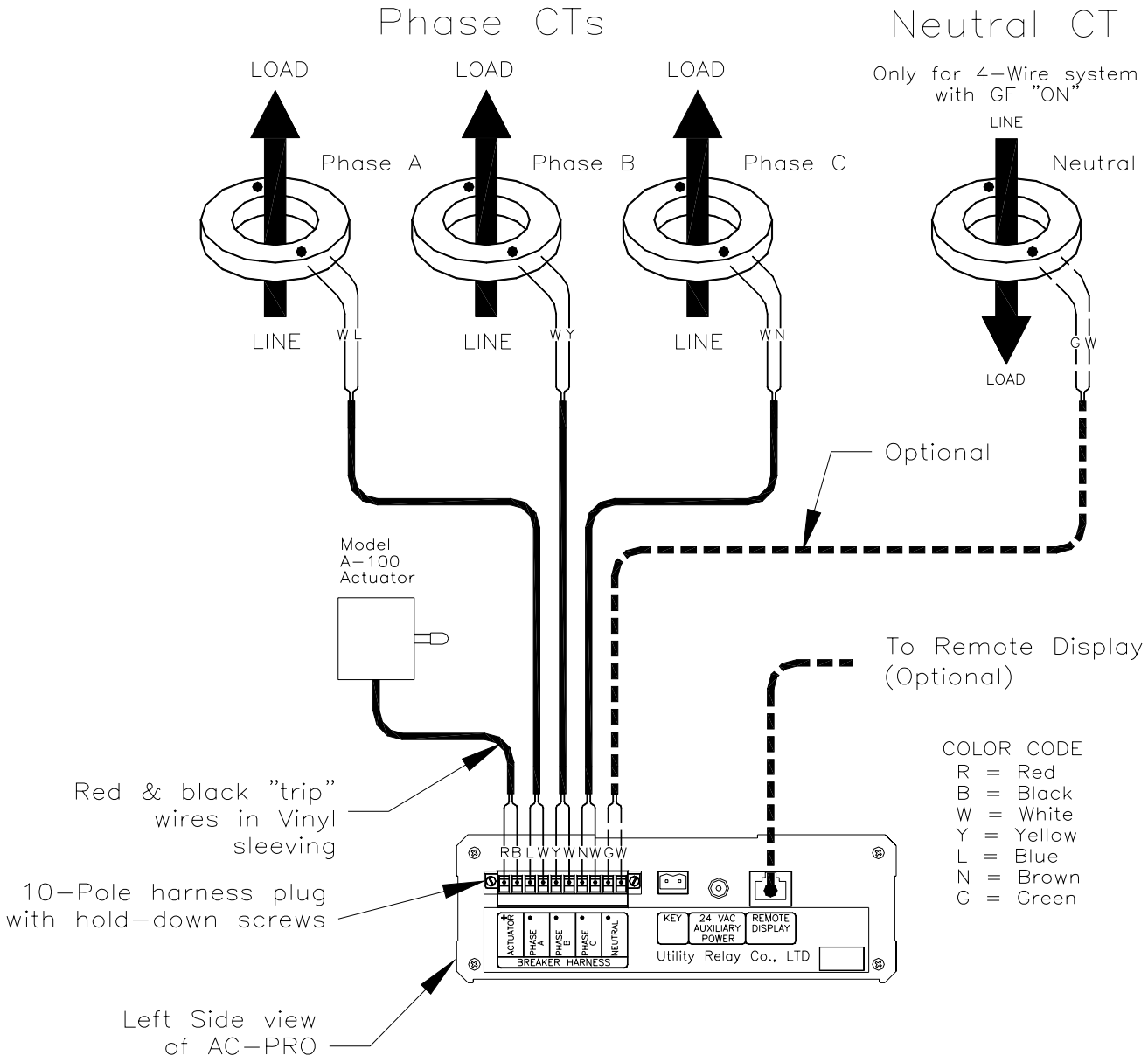
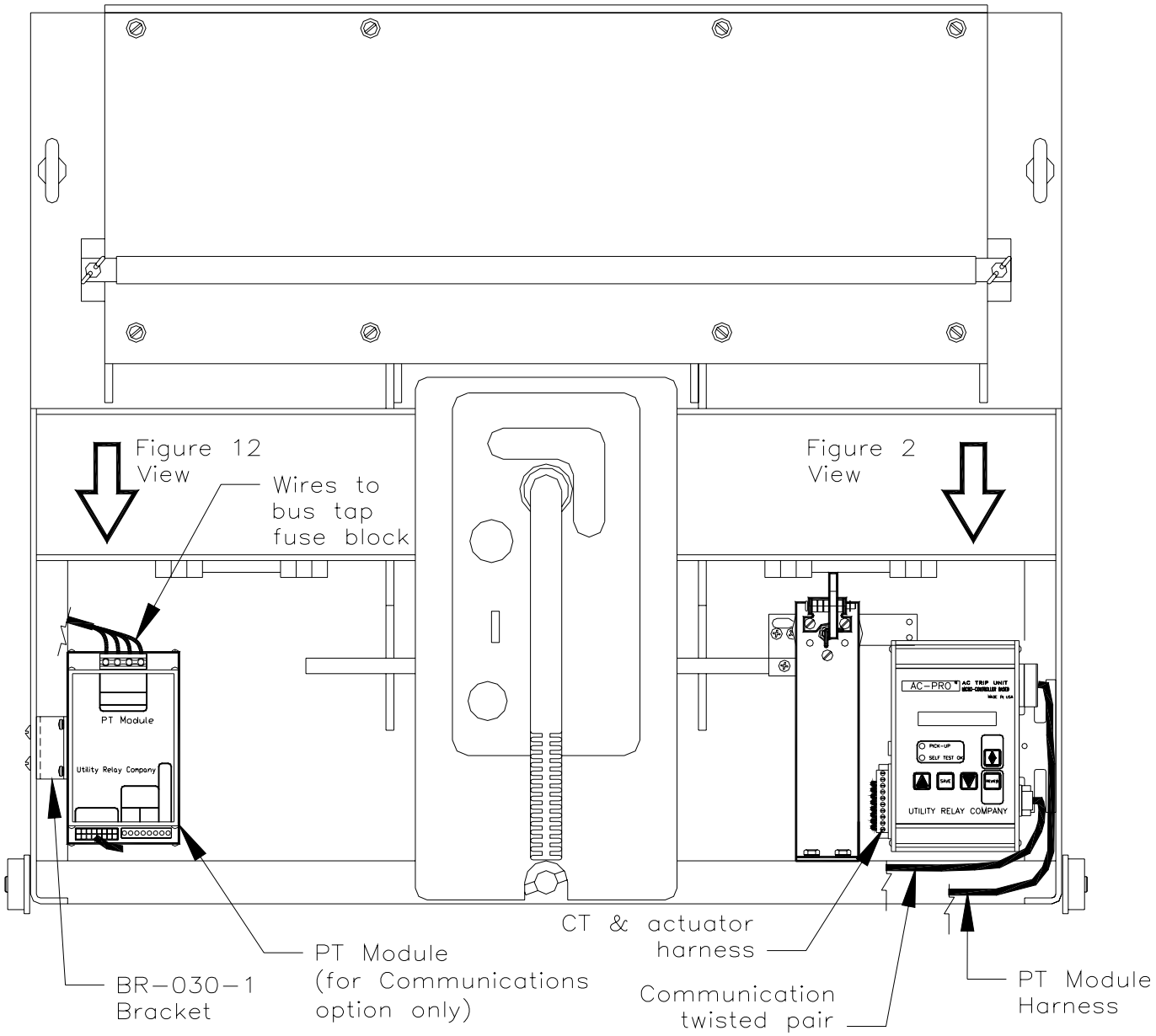


FIGURE 10
Wiring Diagram



Mechanical Reset Actuator is Illustrated

FIGURE 11
Front View with Communications

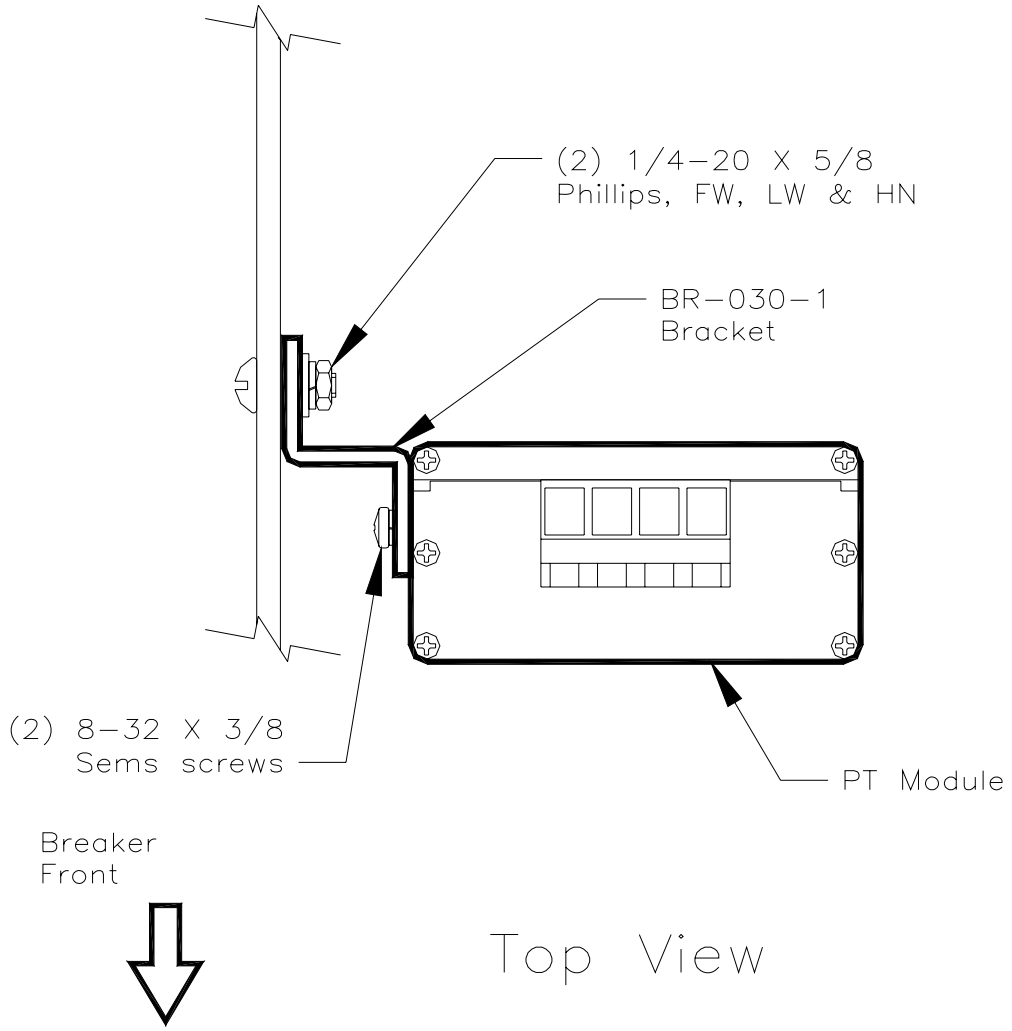


FIGURE 12
PT Module Installation

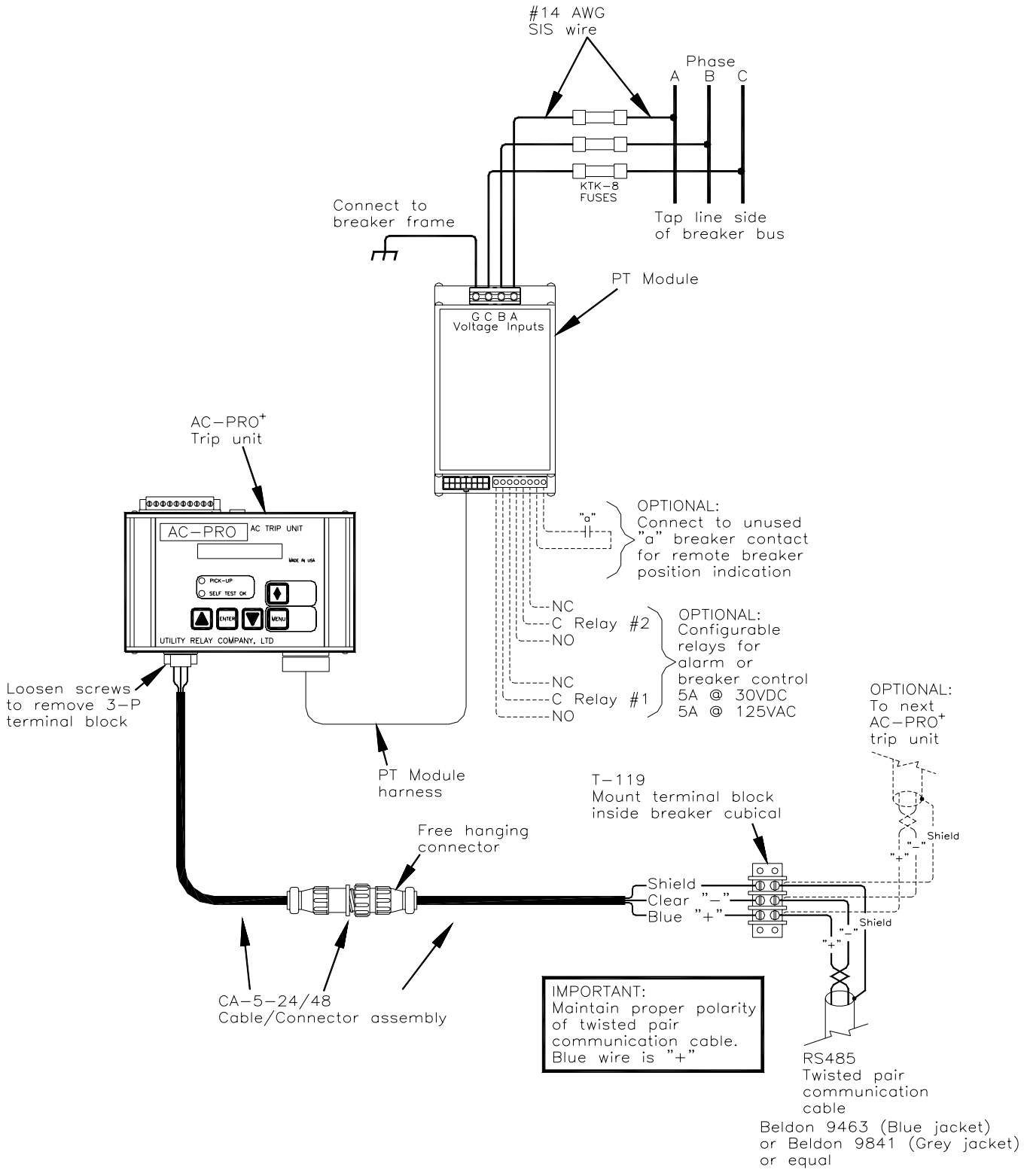


FIGURE 13
Wiring Diagram for Communications