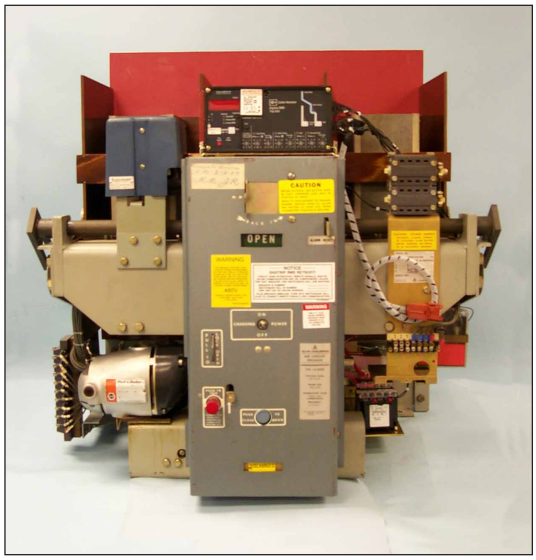
Digitrip Retrofit System for Allis-Chalmers LA-4000 F Fused Breakers



SAFETY PRECAUTIONS

⚠ WARNING

POWER CIRCUIT BREAKERS ARE EQUIPPED WITH HIGH SPEED, HIGH ENERGY OPERATING MECHANISMS. THE BREAKERS AND THEIR ENCLOSURES ARE DESIGNED WITH SEVERAL BUILT-IN INTERLOCKS AND SAFETY FEATURES INTENDED TO PROVIDE SAFE AND PROPER OPERATING SEQUENCES. TO PROVIDE MAXIMUM PROTECTION FOR PERSONNEL ASSOCIATED WITH THE INSTALLATION, OPERATION, AND MAINTENANCE OF THESE BREAKERS, THE FOLLOWING PRACTICES MUST BE FOLLOWED. FAILURE TO FOLLOW THESE PRACTICES MAY RESULT IN DEATH, PERSONAL INJURY, OR PROPERTY DAMAGE.

- Only qualified persons, as defined in the National Electric Code, who are familiar with the installation and maintenance of power circuit breakers and their associated switchgear assemblies should perform any work associated with these breakers.
- Completely read and understand all instructions before attempting any installation, operation, maintenance, or modification of these breakers.
- **Always turn off and lock out the power source feeding the breaker prior to attempting any installation, maintenance, or modification of the breaker. Do not use the circuit breaker as the sole means for isolating a high voltage circuit. Follow all lockout and tagging rules of the National Electric Code and all other applicable codes, regulations, and work rules.**
- Do not work on a closed breaker or a breaker with the closing springs charged. Trip (open) the breaker and be sure the stored energy springs are discharged before performing any work. The breaker may trip open or the charging springs may discharge, causing crushing or cutting injuries.
- For drawout breakers, trip (open), and then remove the breaker to a well-lit work area before beginning work.
- Do not perform any maintenance: including breaker charging, closing, tripping, or any other function which could cause significant movement of the breaker while it is on the extension rails. Doing so may cause the breaker to slip from the rails and fall, potentially causing severe personal injury to those in the vicinity.
- **Do not leave the breaker in an intermediate position in the switchgear cell. Always leave it in the connected, disconnected, or (optional) test position. Failure to do so could lead to improper positioning of the breaker and flashover, causing death, serious personal injury, and / or property damage.**
- **Do not defeat any safety interlock. Such interlocks are intended to protect personnel and equipment from damage due to flashover and exposed contacts. Defeating an interlock could lead to death, severe personal injury, and / or property damage.**

Digitrip Retrofit System for Allis-Chalmers LA-4000 F Fused Breakers

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INTRODUCTION

Cutler-Hammer Digitrip Retrofit Kits are available in a number of configurations that provide a wide range of features. The Digitrip System starts with the 510 Basic Kit which offers true RMS sensing, overcurrent protection, and self-testing features. Advanced Digitrip Retrofit Kits feature zone interlocking, digital alphanumeric displays, remote alarm signals, PowerNet communications, energy monitoring capabilities, power factors, and harmonic content measurements.

Table 1 provides a quick reference of the components supplied with each level of Retrofit Kit. Before beginning the Retrofit process, take a minute to review the information contained in Table 1. It is important that the Retrofitter understands which level of Retrofit Kit is to be installed and which components are included with the Kit.

The instructions contained in this manual cover the installation of all levels of Retrofit Kit. If the Kit you are installing does not contain a certain component, skip the instructions for that component and proceed to the next.

Throughout the Retrofit process, refer to the Torque Tables at the back of this manual for specific torque values.

If you have any questions concerning the Retrofit Kit and / or the Retrofit process, contact Cutler-Hammer at: 1-800-937-5487.

Table 1 Available Retrofit Kits

Components	510 Basic	510 with Zone Interlock	610	810	910
Trip Unit					
Rating Plug					
Auxiliary Current Transformer (CT) Module					
Auxiliary CT Harness					
Sensors					
Sensor Harness					
Direct Trip Actuator (DTA)					
Mounting Brackets and Hardware					
External Harness	Plug	1 Connector Harness	2 Connector Harness	4 Connector Harness	4 Connector Harness
Cell Harness					
Breaker Mounted Control Power Transformer (CPT)					
Potential Transformer (PT) Module					
Auxiliary Switch					

STEP 1: GENERAL BREAKER PREPARATION

Before attempting to remove the Breaker from the Cell or perform any Retrofit Operation, be sure to read and understand the Safety Precautions section of this manual. In addition, be sure to read and understand the Instructions for the Application of Digitrip RMS Retrofit Kits on Power Circuit Breakers (Retrofit Application Data - Publication AD 33-855-4), supplied with the Digitrip Retrofit Kit.

⚠ WARNING

DO NOT ATTEMPT TO INSTALL OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. SEVERE PERSONAL INJURY OR DEATH CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT. VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING.

A. Trip the Breaker and remove it from the Cell. Move the Breaker to a clean, well-lit work area.

NOTE: It is the responsibility of the Retrofitter to insure that the Breaker and all original components are in good condition. Visually inspect all Breaker components for signs of damage or wear. If any signs of damage or wear are detected for components not included in the Retrofit Kit, secure the necessary replacement parts before beginning the Retrofit Process.

The force necessary to trip the Breaker should not exceed three (3) lbs.

NOTE: It is the responsibility of the Retrofitter to insure that the proper, manufacturer's recommended crimping tools and terminals are used for each type of connector. It is also the responsibility of the Retrofitter to insure that all wire preparations, connections, strippings, terminations, and wiring techniques are performed according to the latest IEEE, NEC, and / or NEMA industry standards, specifications, codes, and guidelines.

To begin the Retrofit Process, refer to the components list at the end of this manual. Layout the components and hardware according to the steps outlined. The parts bags are labeled with the corresponding step number. The components and hardware will be used to complete each step in the Retrofit Process.

STEP 2: REMOVING THE ORIGINAL COMPONENTS

Fig. 1 Overview: Original Components Removed from the Breaker.

Refer to the Allis-Chalmers LA-4000 F Instruction Manual, originally supplied with the Breaker, to perform the following procedures.

A. If equipped, remove and save the hardware securing the Closing Handle to the Breaker. Remove and save the Closing Handle.

B. Remove and save the hardware securing the Face Plate to the Breaker. Remove and save the Face Plate.

C. Remove and save the hardware securing the Primary Disconnects (Finger Clusters) to the bottom Breaker Connectors (Stabs). Remove and save the Primary Disconnects and Insulating Rings.

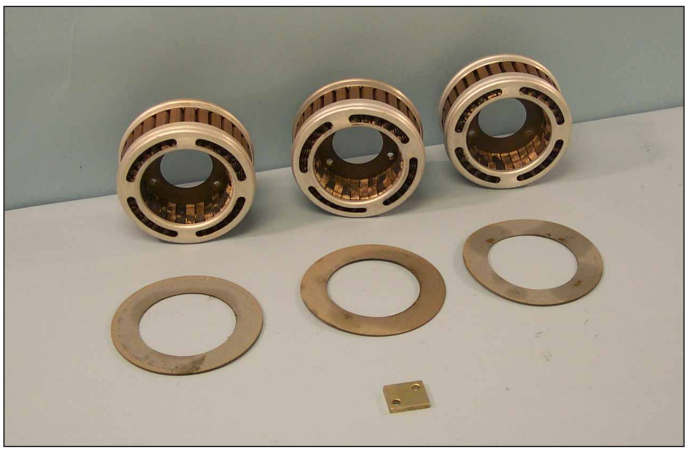

Fig. 2 Primary Disconnects, Insulating Rings, and Reset Finger Spacer Removed from the Breaker and Saved for Reinstallation.

D. Remove and scrap the hardware securing the Static Trip Device (Trip Unit) and mounting bracket to the Breaker. Remove and scrap the Static Trip Device, mounting bracket, spacer, and associated wiring.

E. Remove and scrap the hardware securing the Release Magnet Assembly (Direct Trip Actuator) and mounting bracket to the Breaker to the Breaker Center Frame. Remove and scrap the Release Magnet Assembly and mounting bracket.

F. Remove and scrap the hardware securing the Release Magnet Toggle Trip Arm to the Breaker Center Frame. Remove and scrap the Toggle Trip Finger.

G. Remove and scrap the hardware securing the Reset Finger to the Breaker Pole Shaft. Remove and scrap the Reset Finger but save the spacer.

H. Remove and scrap the hardware securing the Sensors to the Breaker. Remove and scrap the Sensors, Insulating Spacers, and associated wiring.

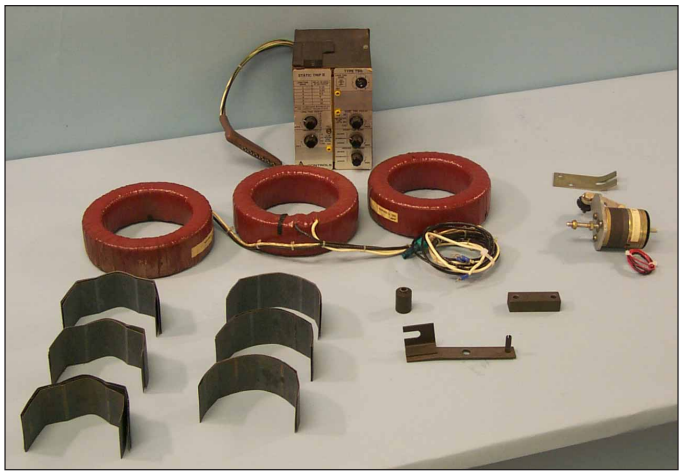

Fig. 3 Original Components Removed from the Breaker and Scrapped.

STEP 3: INSTALLING THE SENSORS

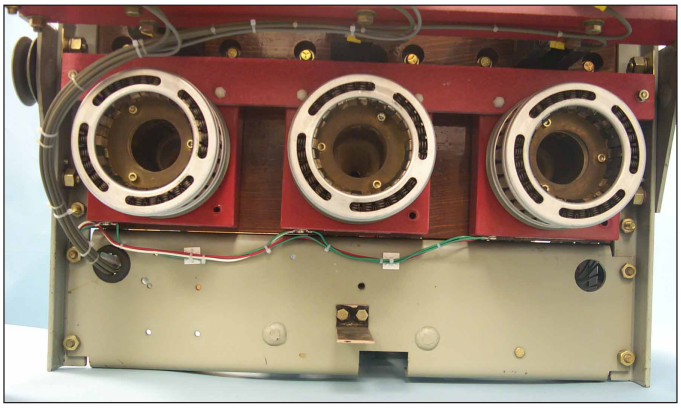

Fig. 4 Overview: Sensors Installed on the Breaker.

A. Align the Sensor Mounting Clips with the existing holes in the Glastic Sensor Mounting Bracket, as shown. Secure the Mounting Clips to the Mounting Bracket using the (2) .250-20 × 1.00" bolts, (4) flat washers, (2) lock washers, and (2) nuts supplied.

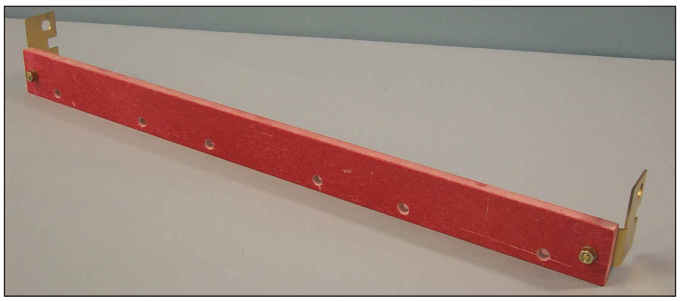

Fig. 5 Sensor Mounting Clips Installed on the Sensor Mounting Bracket.

B. Align the Sensors with the existing holes in the Sensor Mounting Bracket, as shown. Note that the Sensors should be oriented with the "H1" side facing upwards and the "X" terminals facing away from the Sensor Mounting Bracket. Secure the Sensors to the Sensor Mounting Bracket using the (6) .250-20 × 2.25" bolts, (6) flat washers, and (6) nylon acorn nuts supplied. Note that the bolts with flat washers are inserted through the Sensors, then through the Sensor Mounting Bracket. The nylon acorn nuts are then installed to secure the Sensors to the Sensor Mounting Bracket.

NOTE: Care should be taken to not over tighten the nylon acorn nuts that secure the Sensors to the Sensor Mounting Bracket.

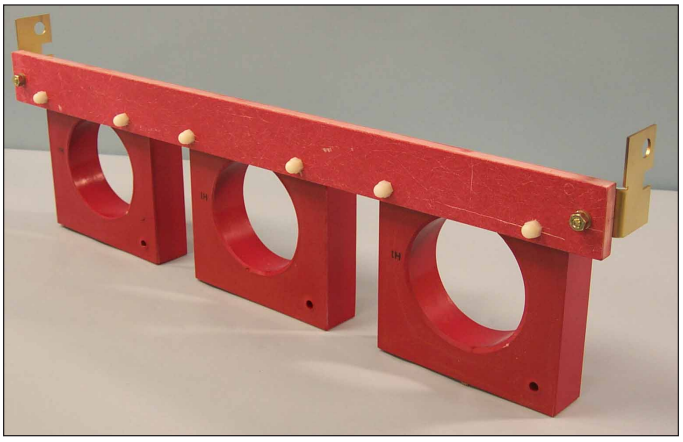

Fig. 6 Sensors Installed on the Sensor Mounting Bracket.

C. Connect the ring terminals of the Sensor Harness to the Sensor Terminals as shown.

Refer to Section 12 of the Application Data, supplied with the Retrofit Kit, for detailed wiring specifications.

For LA-4000 F Retrofits, the following convention applies.

Table 2 Sensor Tap Rating

Sensor Style No.	Terminal Com.	Amps
8153A86H01	X1 - X2 =	4000 A

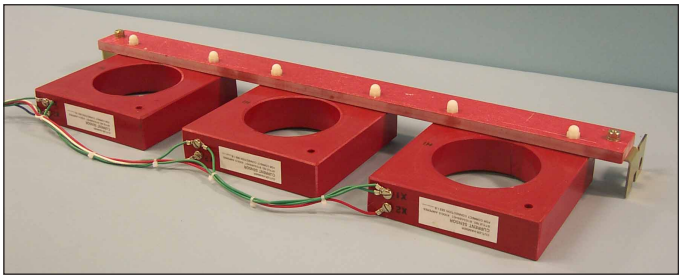

Fig. 7 Sensor Harness Connected to the Sensors.

D. Remove and save the existing hardware used to secure the back of the right and left Racking Roller Assemblies to the Breaker.

E. *For Kits Supplied with a PT Module Only:* Temporarily set the Sensor Assembly in place on the bottom Breaker Connectors (Stabs). Using Drilling Plan “A”, mark a point on each Breaker Connector approximately .125" to .187" out from each Sensor at roughly the five o’clock position when viewed from the rear of the Breaker.

Remove the Sensor Assembly and drill a .172" hole in each Breaker Connector. These holes will be used later in the Retrofit Process to connect the PT Wires to the Breaker Connectors.

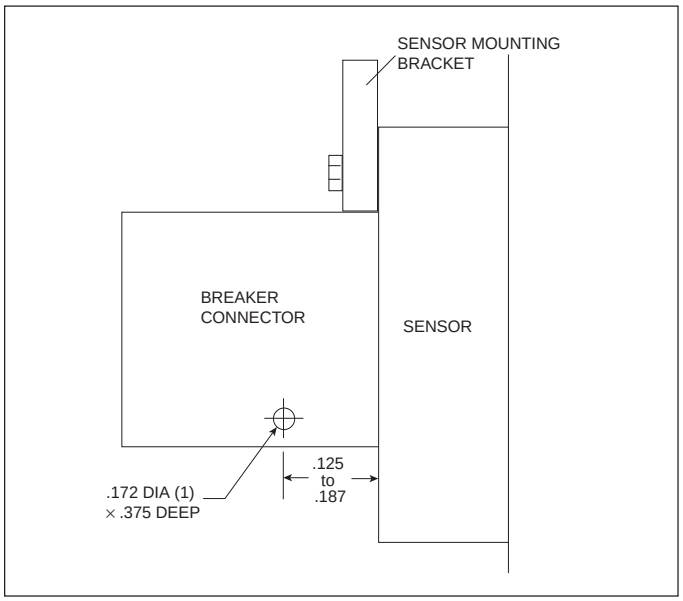

Fig. 8 Drilling Plan “A”.

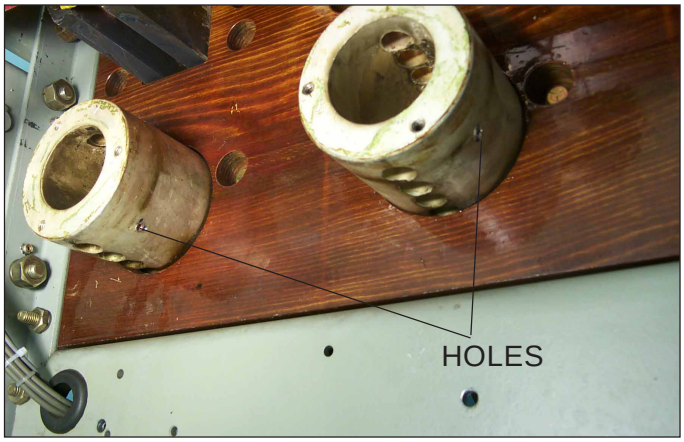

Fig. 9 Holes Drilled in the Breaker Connectors for PT Wire Connection.

F. Set the Sensor Assembly in place on the bottom Breaker Connectors. Align the holes in the Sensor Assembly Mounting Clips with the holes from which the existing hardware was removed in Step 3-D. Using the original mounting hardware, secure the Sensor Assembly to the Breaker.

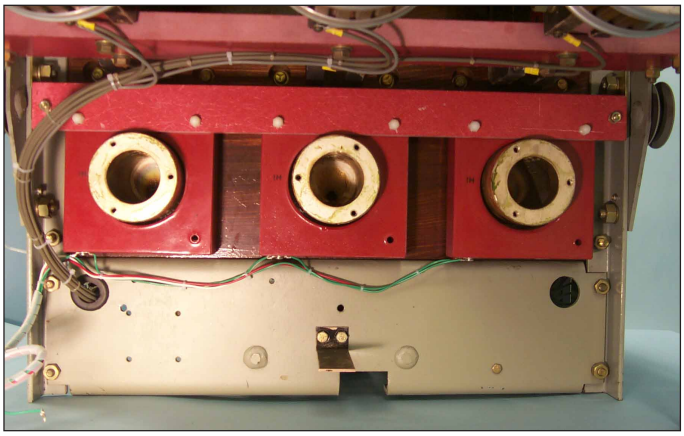

Fig. 10 Sensor Assembly Installed in the Breaker.

G. Route the Sensor Harness to the left side of the Breaker, when viewed from the back of the Breaker, then through the existing hole with rubber grommet towards the front of the Breaker. The final connection of the Sensor Harness to the Aux. CT Module will performed later in the Retrofit Process.

H. Secure the Sensor Harness to the Breaker Back Plate using the self-adhesive mounting pads and wire ties supplied.

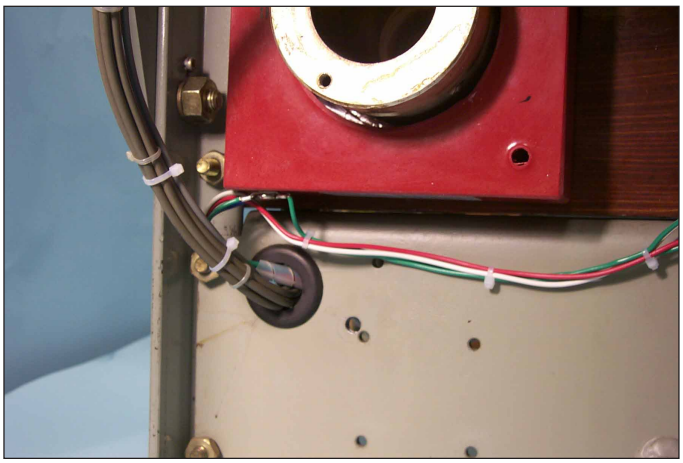

Fig. 11 Routing of the Sensor Harness.

I. Reinstall the original Insulation Rings on each Breaker Connector.

J. Reinstall the Primary Disconnects (Finger Clusters) on each Breaker Connector.

NOTE: The best way to reinstall the Primary Disconnects is to place each Primary Disconnect on each Breaker Connector, then use the original mounting hardware to "pull" each Primary Disconnect into place using an alternating tightening pattern. Be sure to tighten the mounting hardware to the original manufacturer specifications.

For Kits Supplied with a PT Module Only.

NOTE: To make it easier to connect the PT Wires, the Primary Disconnects can be left off the Breaker at this point and reinstalled after the PT Wires are connected later in the Retrofit Process.

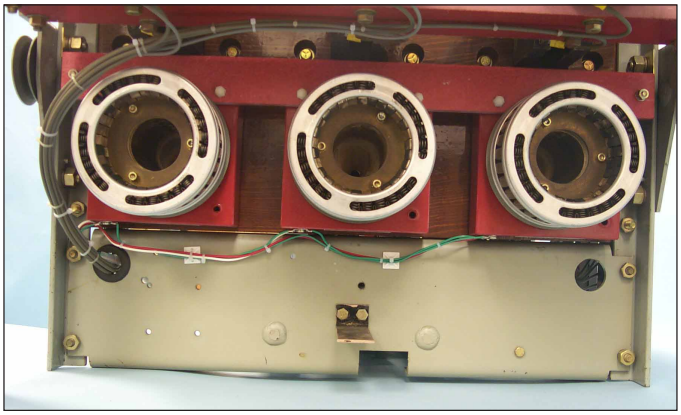

Fig. 12 Primary Disconnects Reinstalled on the Breaker Connectors.

STEP 4: INSTALLING THE AUX. CT MODULE

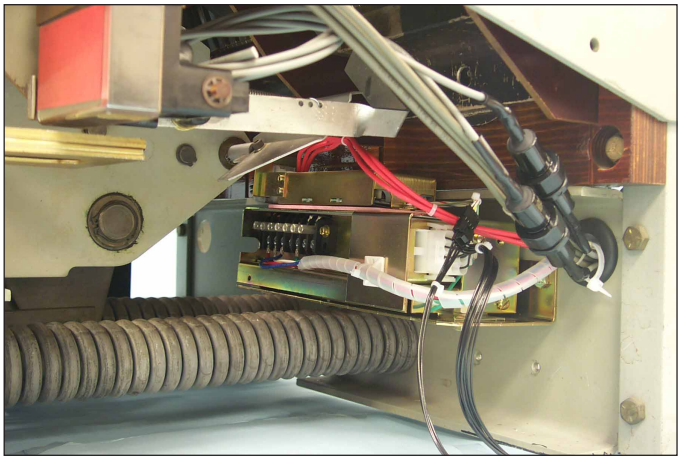

Fig. 13 Overview: Aux. CT Module Installed in the Breaker.

A. Align the Aux. CT Module Mounting Bracket with the holes in the sides of the Aux. CT Module, as shown. Secure the Aux. CT Module Mounting Bracket to the Aux. CT Module using the (2) .250-20 × .750" bolts, (4) flat washers, (2) lock washers, and (2) nuts supplied.

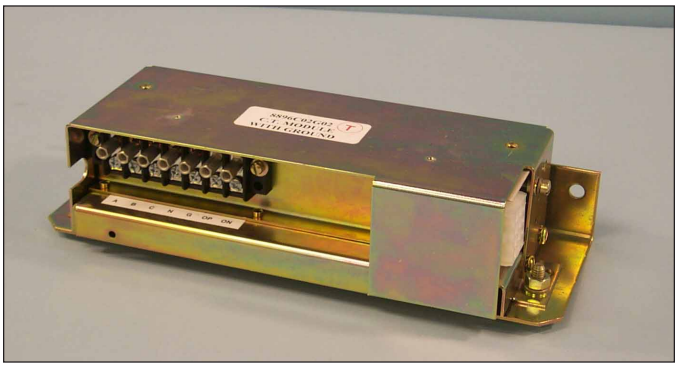

Fig. 14 Aux. CT Mounting Brackets Installed on the Aux. CT Module.

B. Connect the AUX. CT Harness to the Aux. CT Module Pigtail.

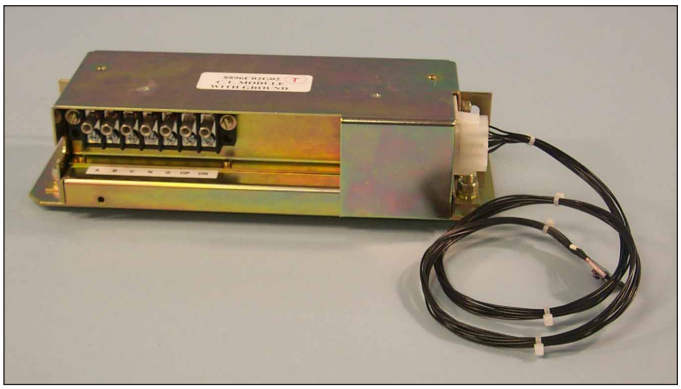

Fig. 15 Aux. CT Harness Connected to the Aux. CT Module.

C. *For Kits Supplied with a PT Module Only:* Align the PT Module Insulation Barrier and the PT Module with the existing holes in the top of the Aux. CT Module, as shown. Secure the PT Module and Insulation Barrier to the Aux. CT Module using the (2) .138-32 × .500" screws, (2) lock washers, and (2) flat washers supplied.

Connect the PT Extension Harness to the connector on the PT Harness.

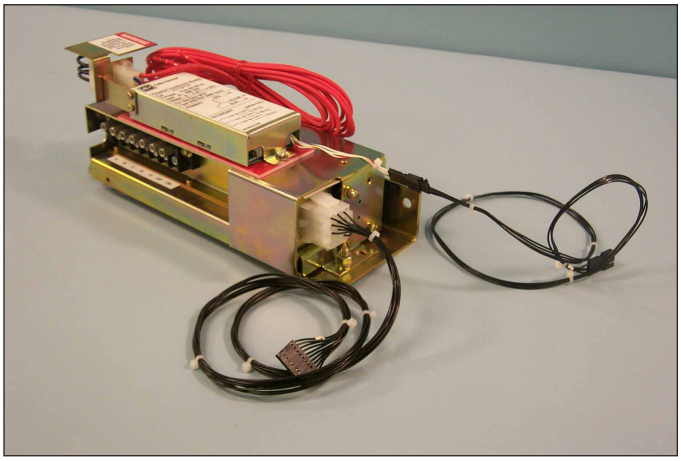

Fig. 16 PT Module and Insulation Barrier Installed on the Aux. CT Module.

Install the PT Warning Label in a prominent position on the Breaker Face Plate.

Fig. 17 PT Warning Label Installed on the Breaker Face Plate.

D. Using Drilling Plan “B”, drill two (2) .312" diameter holes in the Breaker Back Plate.

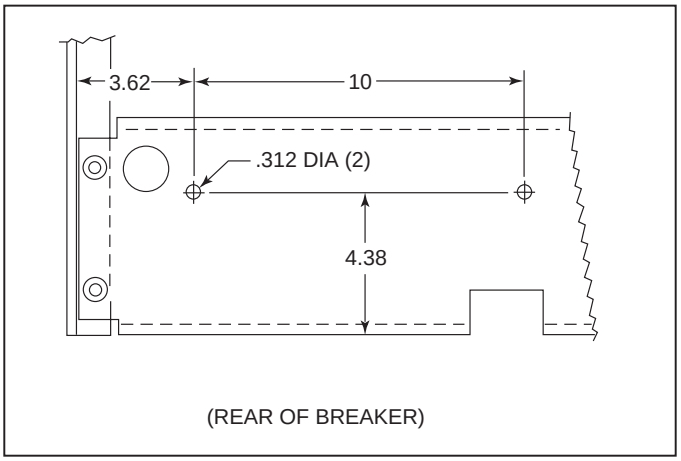

Fig. 18 Drilling Plan “B”.

E. Set the Aux. CT Module Assembly near the inside, right rear corner of the Breaker. Connect the Sensor Harness to the proper terminals of the Aux. CT Module Terminal Block. Refer to Section 12 of the Retrofit Application Data, supplied with the Retrofit Kit, for detailed wiring specifications. The long tan and green wires in the Sensor Harness are used for a remote Neutral Sensor on a 4W Ground Breaker. If these wires are not used in this application, they should be removed from the Sensor Harness.

Note that the Sensor Harness Ground Wire (with ring terminal) is connected to the left side of the Aux. CT Module using the (1) .190-32 × .375" screw, (1) lock washer, and (1) lock washer supplied.

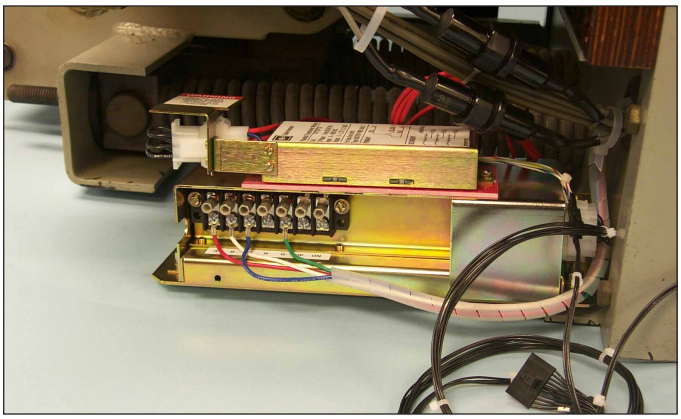

Fig. 19 Sensor Harness Connected to the Aux. CT Module.

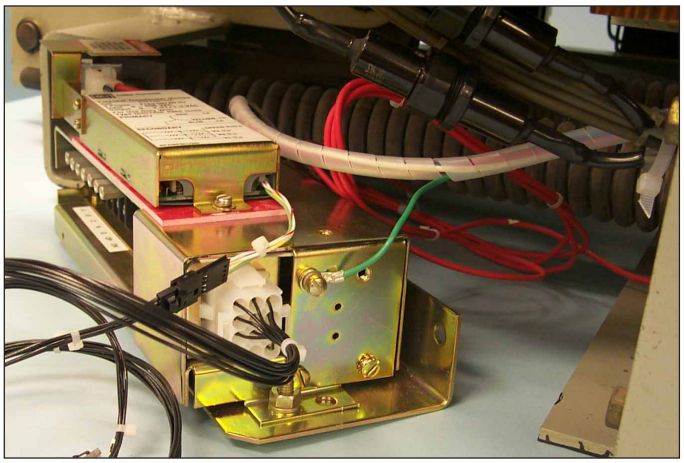

Fig. 20 Sensor Harness Ground Wire Connected to the Aux. CT Module.

F. *For Kits Supplied with a PT Module Only:* Route the PT Wires through the existing hole and rubber grommet near the right rear corner of the Breaker (also used for the Sensor Harness), then to the back of the Breaker. The final connection of the PT Wires will performed later in the Retrofit Process.

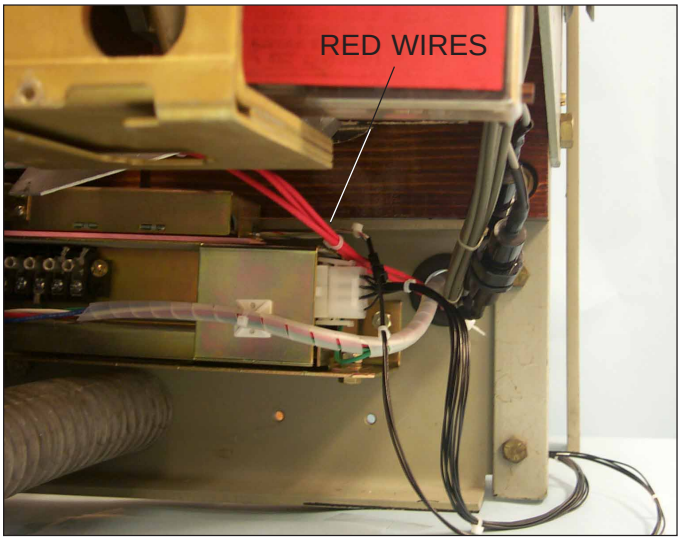

Fig. 21 PT Wires Routed Towards the Back of the Breaker.

G. Working from inside the Breaker, align the Aux. CT Module Assembly with the holes drilled in the Breaker Back Plate in Step 4-D, as shown. Secure the Aux. CT Module Assembly to the Breaker Back Plate using the (2) .250-20 × .750" bolts, (4) flat washers, (2) lock washers, and (2) nuts supplied. Secure the Sensor Harness to the front of the Aux. CT Module Assembly using the self-adhesive mounting pad and wire tie supplied.

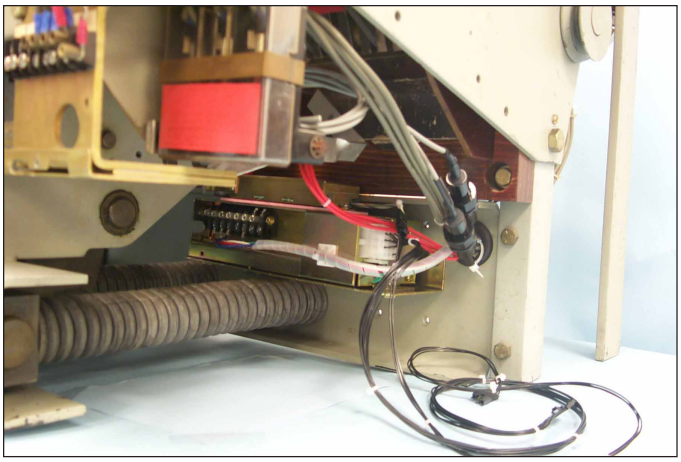

Fig. 22 Aux. CT Module Assembly Installed in the Breaker.

For Kits Supplied with a PT Module Only.

H. The PT Wires are marked for connection to Phases 1, 2, and 3 with corresponding numbers.

NOTE: Before cutting the PT Wires, verify the Phase Convention used on the Breaker Application.

Route the PT Wires to a position suitable for attachment to the holes drilled in the bottom Breaker Connectors (Stabs) in Step 3-E. Move the PT Wire markers to a position where they will still be attached to the wires after cutting. Cut the wires to the appropriate length, strip each wire .250", and install a .190" ring terminal on each wire.

Secure each PT Wire to the corresponding Breaker Connector using the (3) .190-16 × .312" thread cutting screws supplied. Secure the PT Wires to the Breaker Back Plate using the wire ties supplied and the self-adhesive mounting pads that secure the Sensor Harness.

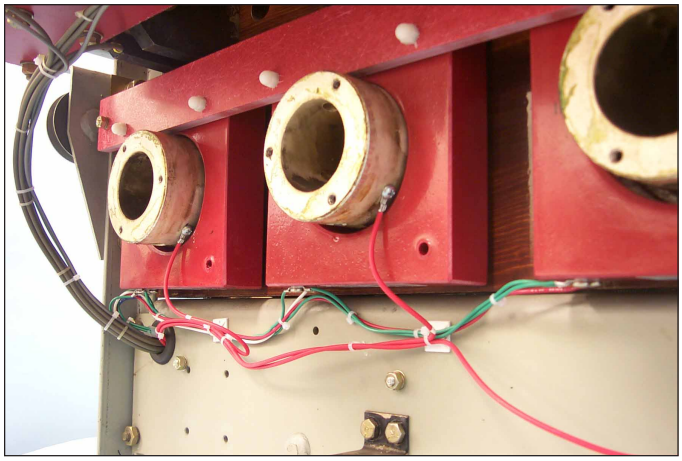

Fig. 23 PT Wires Attached to the Breaker Connectors.

If the Primary Disconnects were not reinstalled in Step 3-J, reinstall them now using the procedure detailed in Step 3-J.

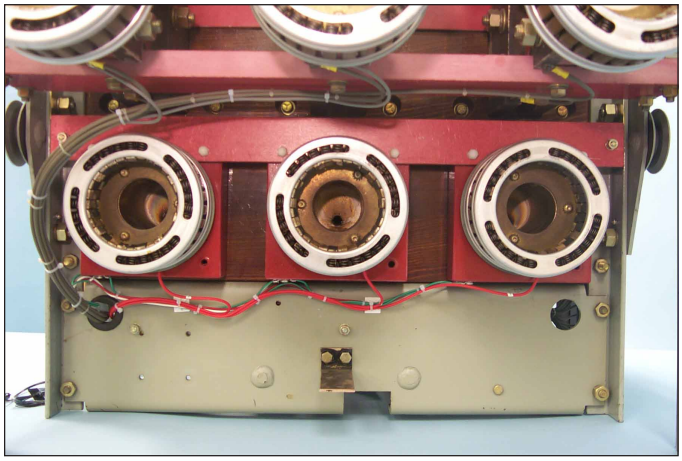

Fig. 24 Primary Disconnects Reinstalled on the Breaker and Routing of the PT Wires.

STEP 5: INSTALLING THE RESET FINGER AND DTA ASSEMBLY

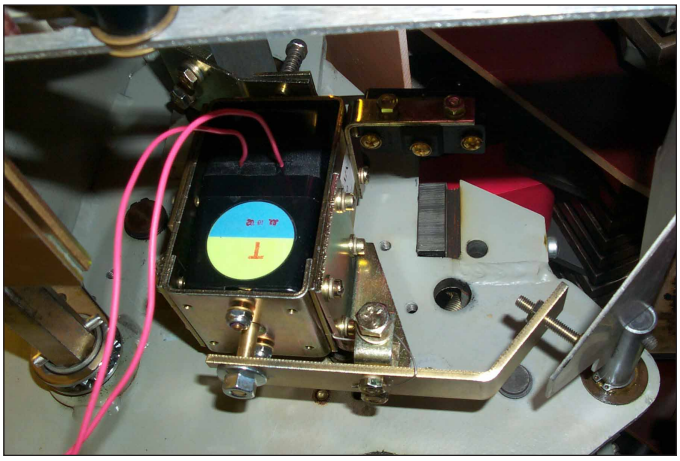

Fig. 25 Overview: Reset Finger and DTA Assembly Installed in the Breaker.

A. Align the Reset Finger and original spacer removed in Step 2-G with the existing holes in the Breaker Pole Shaft, as shown, from which the original Reset Finger was removed in Step 2-G. Secure the new Reset Finger and spacer to the Breaker Pole Shaft using the (2) .250-20 × .750" bolts, (2) lock washers, and (2) flat washers supplied.

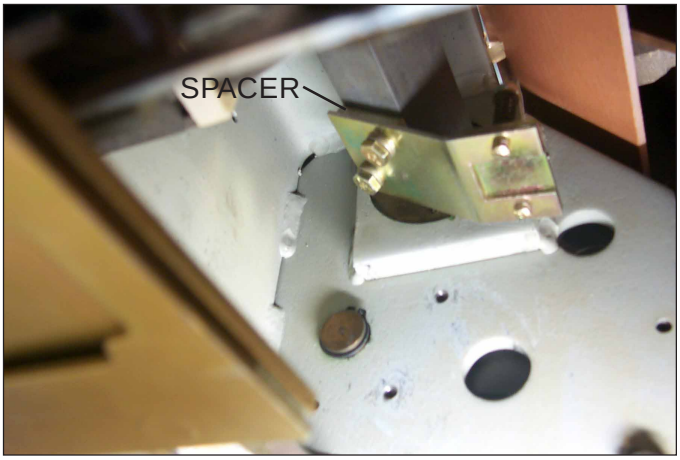

Fig. 26 Reset Finger Installed on the Breaker Pole Shaft.

For Kits Supplied with an Auxiliary Switch Only.

B. Align the Auxiliary Switch Mounting Bracket with the existing holes in the DTA Assembly, as shown. Secure the Auxiliary Switch Mounting to the DTA Assembly using the (2) .164-32 × .250" pan head screws and (2) lock washers supplied.

C. Cut 2.00" from the end on the Microswitch Arm. Align the Microswitch with the existing holes in the Auxiliary Switch Mounting Bracket, as shown. Secure the Microswitch to the Auxiliary Switch Mounting Bracket using the (2) .138-32 × 1.00" screws, (4) flat washers, (2) lock washers, and (2) nuts supplied.

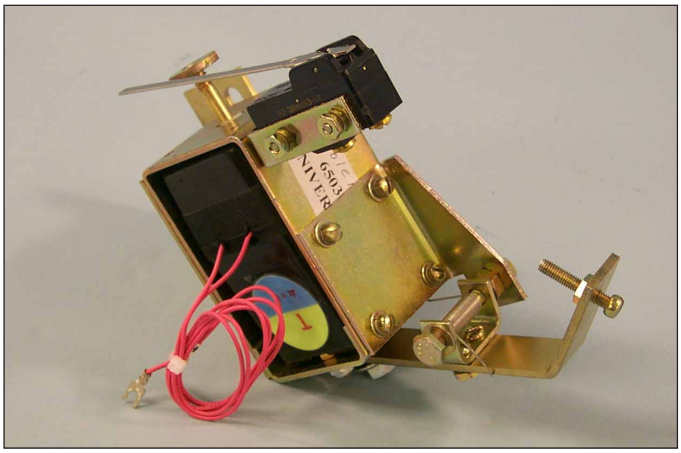

Fig. 27 Auxiliary Switch Installed on the DTA Assembly.

For All Breakers.

D. Align the DTA Assembly, as shown, with the existing holes in the Breaker Center Frame from which the Release Magnet Assembly was removed in Step 2-E. Secure the DTA Assembly to the Breaker Center Frame using the (2) .250-20 × .500" bolts, (2) lock washers, and (2) flat washers supplied. As the DTA Assembly is being mounted, insure that the DTA Trip Finger is above the existing Breaker Trip Plate and that the Auxiliary Switch Arm, if applicable, is engaging the Reset Finger.

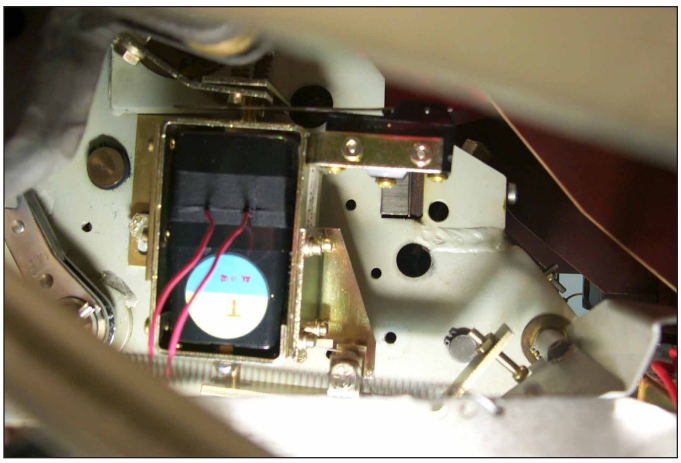

Fig. 28 DTA Assembly Installed on the Breaker Center Frame.

E. Route the DTA Wires from the DTA Assembly towards the back of the Breaker to the Aux. CT Module. Connect the "+" DTA Wire to the "OP" terminal of the Aux. CT Module Terminal Block and the unmarked wire to the "ON" terminal. Use the wire ties supplied to keep the DTA Wires away from any moving parts within the Breaker.

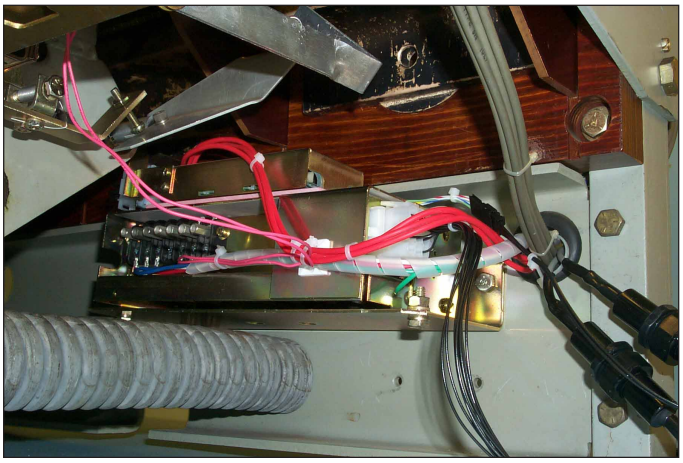

Fig. 29 DTA Wires Connected to the Aux. CT Module.

STEP 6: ADJUSTING AND TESTING THE DTA

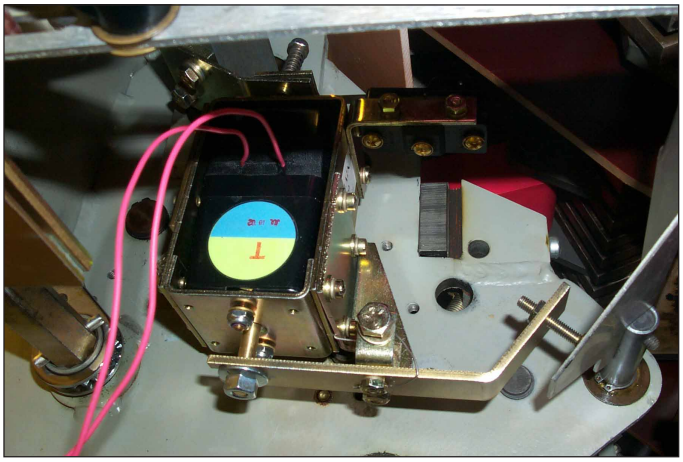

Fig. 30 Overview: DTA After Adjustment.

A. Refer to the Allis-Chalmers LA-1600 F Instruction Manual, originally supplied with the Breaker, for information on how to energize the Under Voltage Device to allow the Breaker to be "Closed" and "Tripped".

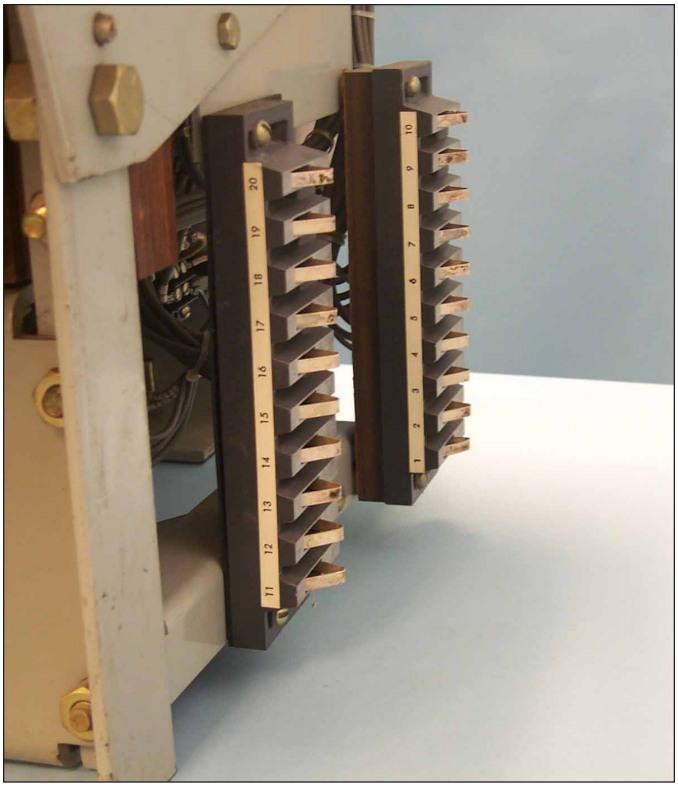

Fig. 31 Location of the Secondary Contacts for Energizing the Under Voltage Device.

B. Insure that the Trigger Fuse Arm is in the rear position to allow the Breaker to be closed.

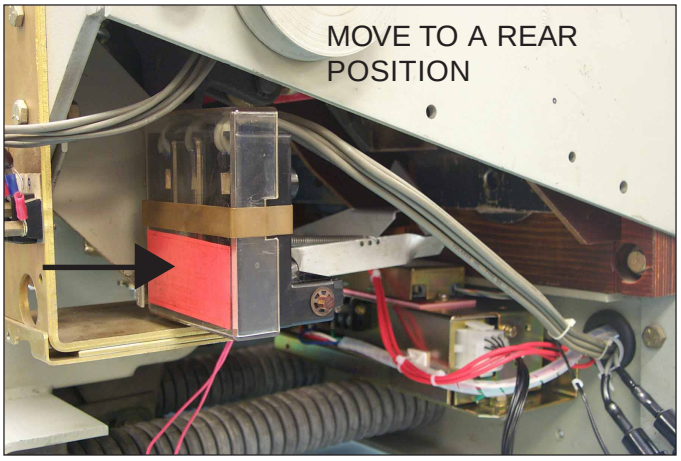

Fig. 32 Rear Position of the Trigger Fuse Arm.

⚠ WARNING:

TO ADJUST THE GAP BETWEEN THE DTA TRIP FINGER AND THE BREAKER TRIP PLATE, THE BREAKER MUST BE IN THE CLOSED POSITION. KEEP HANDS AND FINGERS AWAY FROM MOVING PARTS WITHIN THE BREAKER. FAILURE TO DO SO COULD RESULT IN SEVERE PERSONAL INJURY.

C. CLOSE the Breaker. Turn the loosen the lock nut on the DTA Trip Finger Adjusting Screw. Apply Loc-Tite 243® to the threads then turn the Adjusting Screw until a gap of 0.060" to 0.090" is achieved between the adjusting screw and the top of the Breaker Trip Plate. Tighten the Adjusting Screw lock Nut.

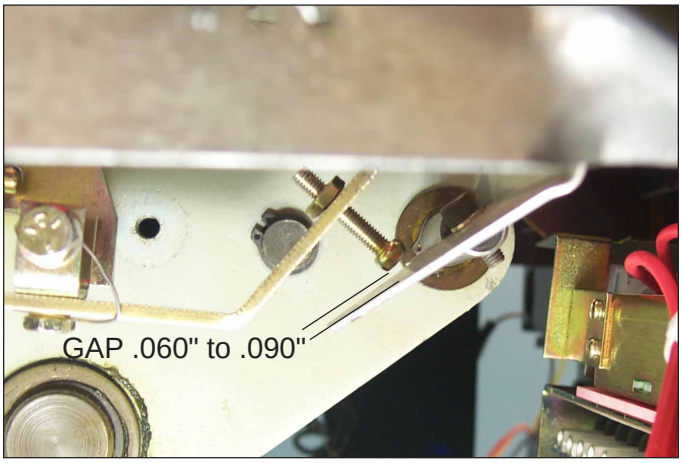

Fig. 33 Adjusting the DTA Trip Finger Gap.

D. Return the Breaker to the OPEN position.

E. Manually check the Trip and Reset functions of the Breaker. If the Breaker does not Trip correctly, insure that the gap between the DTA Trip Finger Adjusting Screw and the top of the Breaker Trip Plate is within the 0.060" to 0.090" range. If not, readjust the DTA Trip Finger Adjusting Screw.

F. Connect a 24 VDC power supply to the DTA terminals; positive to positive and negative to negative. Close the Breaker manually. Energize the DTA to trip the Breaker; de-energize when the Breaker trips. Make certain that the DTA trips and resets properly. If the Breaker does not Trip correctly, insure that the gap between the DTA Trip Finger Adjusting Screw and the top of the Breaker Trip Plate is within the 0.060" to 0.090" range.

   The Reset Function Cage Height is factory preset and should not need adjustment. However, if the Breaker fails to properly reset, loosen the DTA Assembly mounting hardware and move the DTA Assembly upwards. Check the Reset function again to insure that the Breaker properly resets. Continue making the necessary adjustments until the Breaker properly resets during each test.

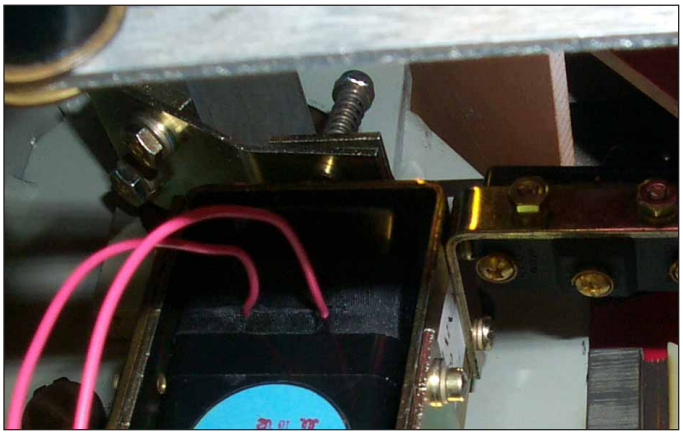

Fig. 34 Adjusting the Reset Cage Height.

G. Remove the power from the DTA Terminals and the Under Voltage Device.

For Kits Supplied with a Breaker Mounted CPT Only.

STEP 7: INSTALLING THE BREAKER MOUNTED CPT MODULE

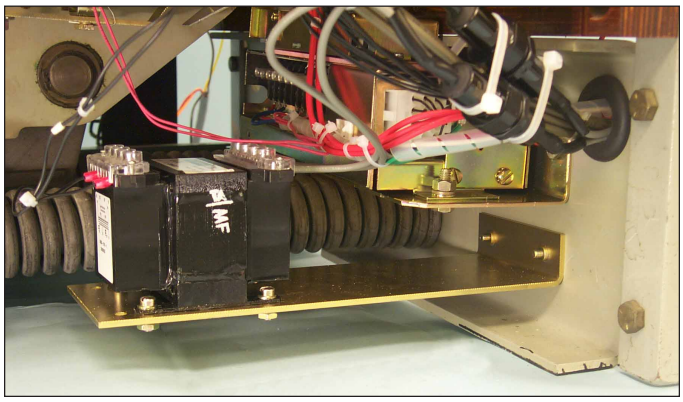

Fig. 35 Overview: Breaker Mounted CPT Module Installed in the Breaker.

A. Remove and save the (2) .190 - 32 × .250" screws securing the fuse clips and male spade connector installed on the CPT Module. Discard the fuse clips and spade connector, then reinstall the screws in the CPT Terminals.

Fig. 36 Fuse Clips and Spade Connector Removed from the CPT.

B. Align the CPT with the existing holes in the CPT Mounting Bracket, as shown. Note the orientation of the "H" Terminals of the CPT. The CPT must be installed on the mounting bracket in this orientation. Secure the CPT to the mounting bracket using the using the (4) .190-32 × .500" screws, (4) lock washers, (4) flat washers, and (4) nuts supplied.

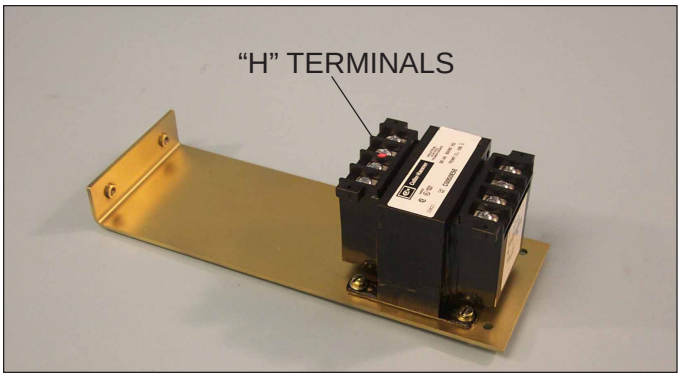

Fig. 37 Breaker Mounted CPT Installed on the CPT Mounting Bracket.

C. Connect the CPT Harness wires to the appropriate "X" terminals of the CPT Module as shown. See Table 3 for Tap information.

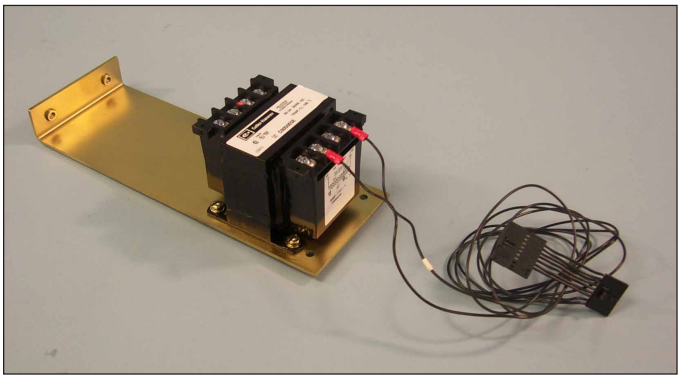

Fig. 38 CPT Harness Connected to the "X" Terminals of the CPT Module.

Table 3 CPT Low Voltage Taps for Standard and Special Order CPTs (After Removing Fuse Clips)

Standard CPT (Style #9A10037G01 & G02)	
120 Voltage Required	*CPT Terminals Used*
Secondary Circuit	X1 & X2
Special Order 575 Volt CPT (Style #9A10037G03 & G04)	
Secondary Circuit	X2 & X3

NOTE: The Load Side HV Wires are longer than necessary and are cut during the following steps. Before cutting the wires, be sure that sufficient length is left so that the HV Wire Fuses can be secured to the Secondary Harness on the right side of the Breaker and that the connections can be made to the correct "H" terminals on the CPT Module.

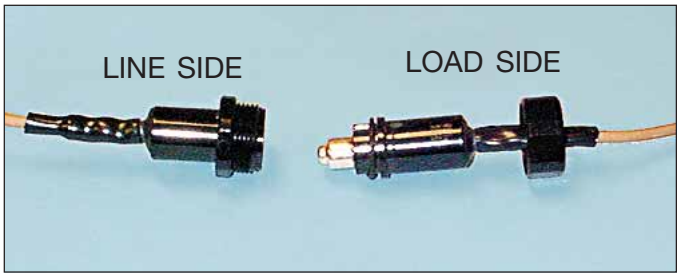

Fig. 39 Identification of the Line and Load Side HV Wires

NOTE: The terminals to which the Load Side HV wires are connected determine the voltage of the CPT. Verify that the line voltage of the circuit matches the CPT voltage BEFORE putting the Breaker into service.

Table 4 CPT High Voltage Taps for Standard and Special Order CPTs

Standard CPT (Style #9A10037G01 & G02)	
Voltage Required	*CPT Terminals Used*
480 Volt Circuit	H1 & H4
240 Volt Circuit	H2 & H4
208 Volt Circuit	H3 & H4
Special Order 575 Volt CPT (Style #9A10037G03 & G04)	
575 Volt Circuit	H1 & H4
460 Volt Circuit	H2 & H4
230 Volt Circuit	H3 & H4

D. Position the HV Fuses near the Secondary Harness in the right side of the Breaker. Route the Load Side HV Wires to the CPT Module. Mark and cut the Load Side of each HV Wire to an appropriate length for connection to the "H" terminals of the CPT. Strip approximately .250" of insulation from the Load Side HV Wires and attach a .190" ring terminal to each. Attach the HV Wires to the CPT "H" terminals to achieve the required voltage (see Table 4).

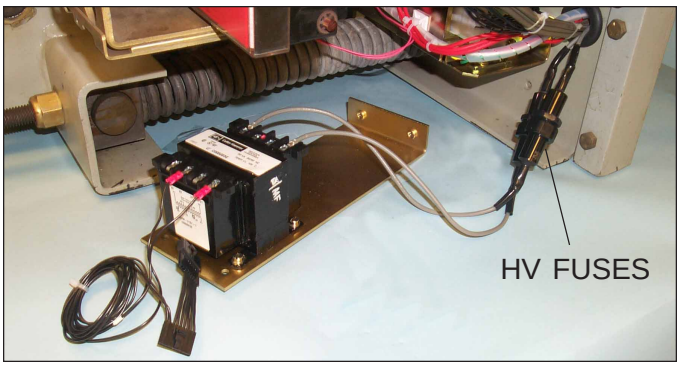

Fig. 40 Suggested Location for the HV Fuses and the HV Load Side Wires Connected to the "H" Terminals of the CPT Module.

E. Install the "A" and "B" Finger-Safe Covers over the CPT Terminals as shown. Secure the Finger-Safe Covers to the CPT using the (4) .098 - 28 × .375" screws supplied with the CPT Kit. Torque the screws to 8 - 10 in./lbs.

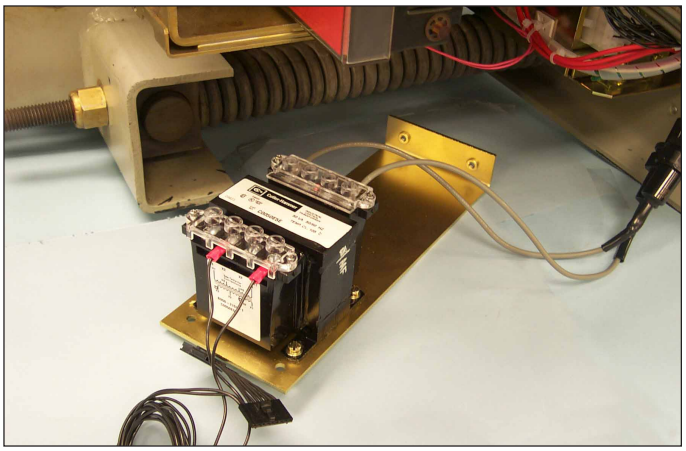

Fig. 41 Finger Safe Covers Installed on the CPT.

F. Align the CPT Assembly with the existing holes in the Breaker Black Plate, as shown. Secure the CPT Assembly to the Breaker Back Plate using the (2) .190-32 × .750" screws, (2) lock washers, and (2) wide flat washers nuts supplied.

NOTE: On some LA-4000 F Breakers, the holes to mount the CPT Assembly do not exist in the Breaker Back Plate. For these Breakers, use Drilling Plan "C" to determine the location and size of the holes needed for mounting the CPT Assembly.

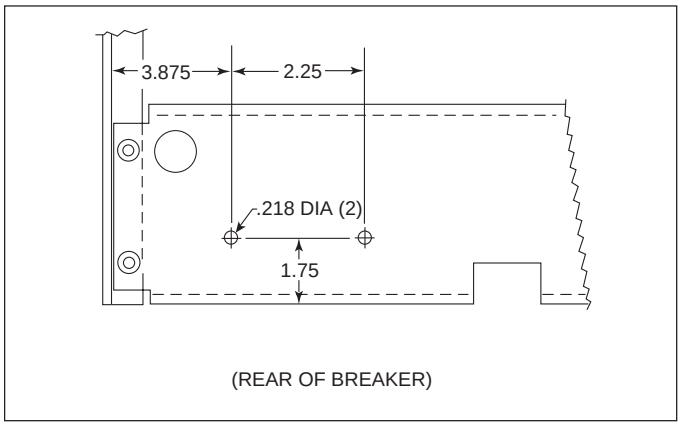

Fig. 42 Drilling Plan "C".

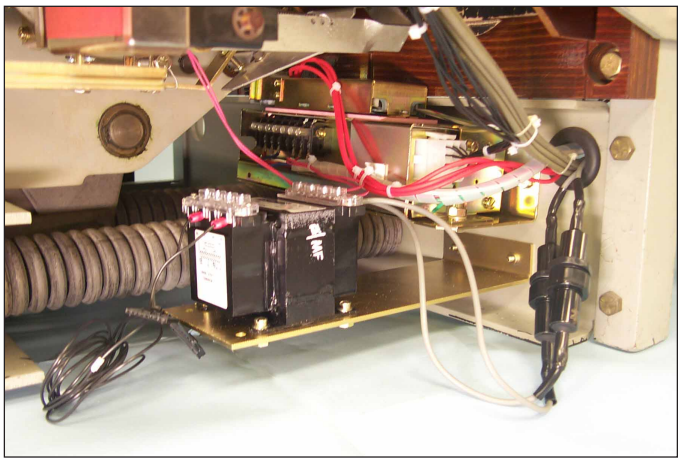

Fig. 43 CPT Assembly Installed in the Breaker.

NOTE: The power convention of Circuit Breakers is normally Top to Bottom, meaning the top Breaker Connectors (Stabs) are on the Line Side of the Breaker and the bottom Breaker Connectors are on the Load Side.

The HV Wires from the CPT MUST BE ATTACHED to the Line Side of the Breaker. If it is determined that the power flow for the Breaker application is opposite the normal convention, the HV Wires must be attached to the bottom Breaker Connectors. In the case of the Line Side being the bottom Breaker Connectors, the HV Wires can be connected to the existing hardware used to connect the PT wires to the bottom Breaker Connectors (Stabs). The procedure and HV Wire routing will be similar to the procedure detailed earlier for connection of the PT Wires.

NOTE: The Line Side HV Wires are longer than necessary and are cut during the following steps. Before cutting the wires, be sure that sufficient length is left so that the HV Wire Fuses are accessible and that the connections can be made to the same hardware used to connect the Blown Fuse Indicator wires to the Current Limiting Fuse Assembly.

G. Remove and save the mounting hardware securing the original Blown Fuse Indicator wires to the Phase 1 and 2 or the Phase 2 and 3 Fuse Connectors.

H. Route the Line Side HV Wires through the existing hole and grommet near the bottom right corner of the Breaker then up along the Breaker Back Plate to the Phase 1 and 2 or the Phase 2 and 3 Fuse Connectors. Cut each HV Wire to an appropriate length for attachment with the screws removed in the previous step. Strip .250" from each wire, then install a .190" ring terminal on each wire.

I. Use the original mounting hardware to connect the Line Side HV Wires and the Blown Fuse Indicator wires to the Current Limiting Fuse Connectors.

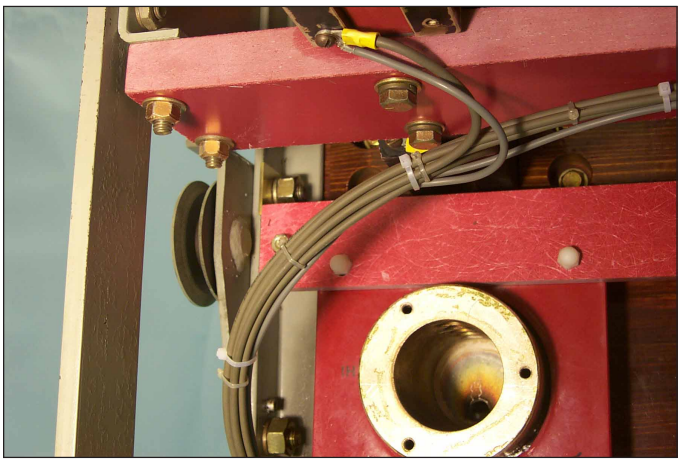

Fig. 44 HV Wires Connected to the Current Limiting Fuse Connectors.

J. Use the wire ties supplied to secure the HV Wires and Fuses to the Secondary Harness.

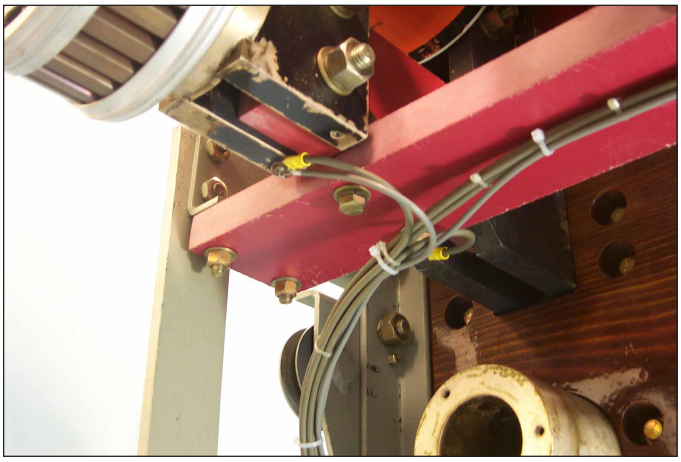

Fig. 45 HV Wires Secured to the Breaker.

K. Install the appropriate CPT Voltage Label in a prominent position on the Breaker Face Plate.

Fig. 46 CPT Voltage Labels Supplied with the CPT Kit.

Fig. 47 CPT Voltage Label Installed on the Breaker Face Plate.

STEP 8: INSTALLING THE TRIP UNIT

Fig. 48 Overview: Trip Unit Installed on the Breaker.

A. Align the Trip Unit Mounting Bracket with the existing holes in the Trip Unit Mounting Platform, as shown. Secure the Trip Unit Mounting Bracket to the Trip Unit Mounting Platform using the (2) .250-20 × .750" bolts, (4) flat washers, (2) lock washers, and (2) nuts supplied.

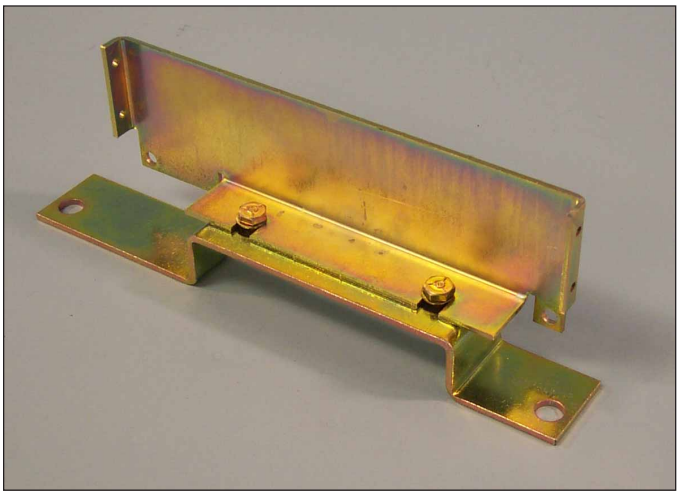

Fig. 49 Trip Unit Mounting Bracket Installed on the Trip Unit Mounting Platform.

B. Align the Trip Unit with the existing holes in the Trip Unit Mounting Platform, as shown. Secure the Trip Unit to the Mounting Platform using the (2) .190-32 × 4.00" screws, (2) brass spacers, (4) flat washers, (2) lock washers, and

(2) nuts supplied. Note that the brass spacers are positioned between the Mounting Platform and the bottom rear of the Trip Unit. Do not fully tighten the screws at this time.

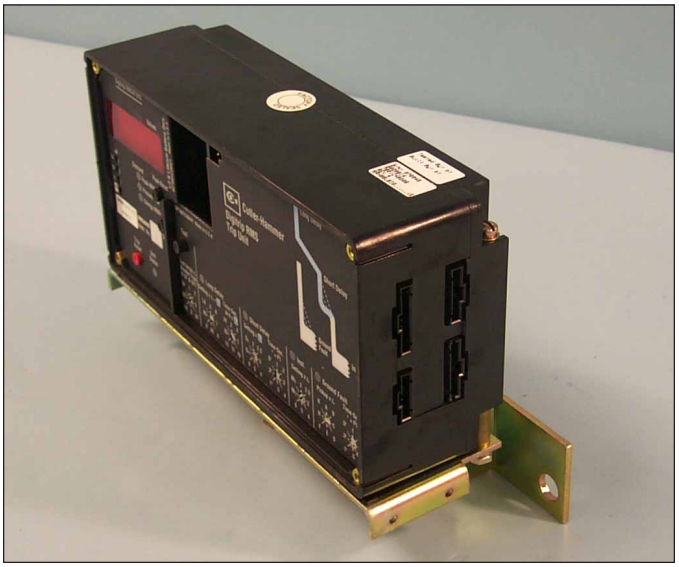

Fig. 50 Trip Unit Initial Installation on the Trip Unit Mounting Platform.

C. Align the Trip Unit Insulation Barrier Brackets with the holes in the Trip Unit Support Clips. Secure the Insulation Barrier Brackets to the Trip Unit Support Clips using the (2) .164-32 × .250" screws, (2) lock washers, and (2) flat washers supplied.

D. Align the right and left Trip Unit Support Clips with the existing holes in the Trip Unit Mounting Platform and the slots in the sides of the Trip Unit. Note that the Trip Unit Support Clips "pinch" in the slots on the sides of the Trip Unit as shown. Secure the Support Clips to the Trip Unit Mounting Platform using the (3) .138-32 × .375" screws, (6) flat washers, (3) lock washers, and (3) nuts supplied. Install a Panduit cable tie mount on the right front corner of the Trip Unit Assembly using the (1) .138-32 × .500" screw, (2) flat washers, (1) lock washer, and (1) nut supplied.

Once the Support Clips have been installed, fully tighten the (2) 4.00" screws, installed in Step 8-B, securing the Trip Unit to the Trip Unit Mounting Bracket.

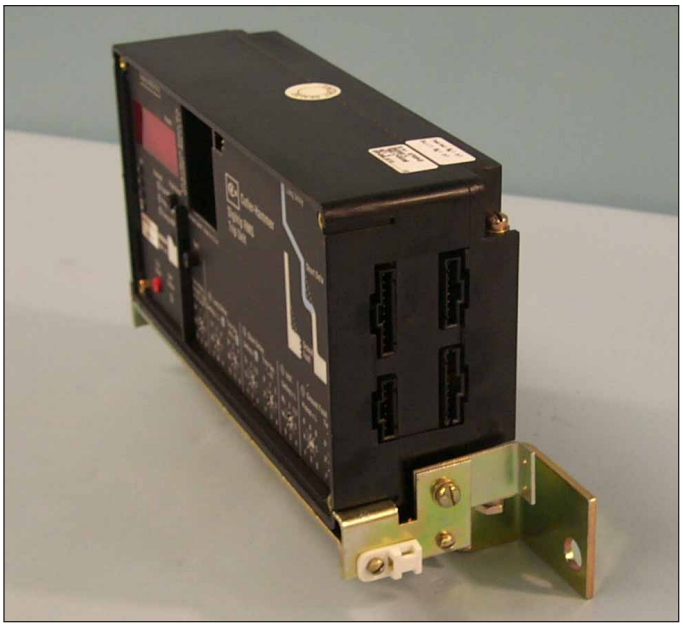

Fig. 51 Trip Unit Support Clips and Panduit Cable Tie Mount Installed on the Trip Unit Assembly.

E. Align the Trip Unit Insulation Barrier with the holes in the Insulation Barrier Brackets, as shown. Secure the Insulation Barrier to the mounting brackets using the (4) .112-40 × .250" screws, (4) lock washers, and (4) flat washers supplied.

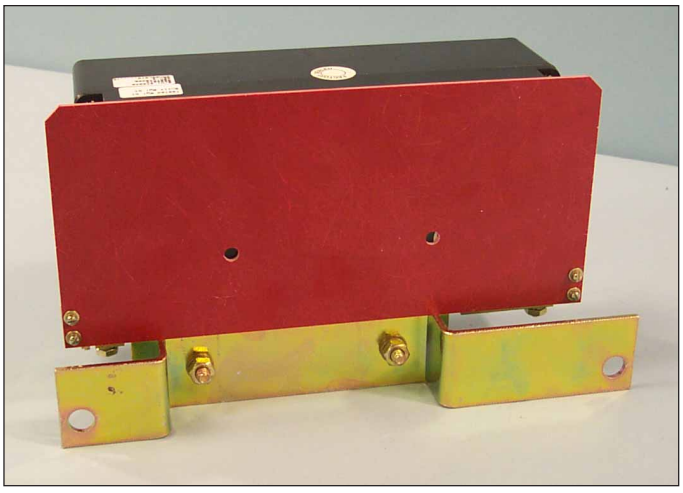

Fig. 52 Insulation Barrier Secured to the Mounting Brackets.

F. Remove the Trip Unit Cover and install the Rating Plug. Reinstall the cover.

Fig. 53 Trip Unit Assembly with Rating Plug Installed.

G. Remove and save the two (2) wing nuts and washers securing the Arc Chute Retaining Bracket. Align the holes in the Trip Unit Mounting Bracket with the Arc Chute Retaining Bracket Studs. Slide the Trip Unit Assembly onto the studs then secure the Trip Unit Assembly to the Breaker by reinstalling the original washers and wing nuts.

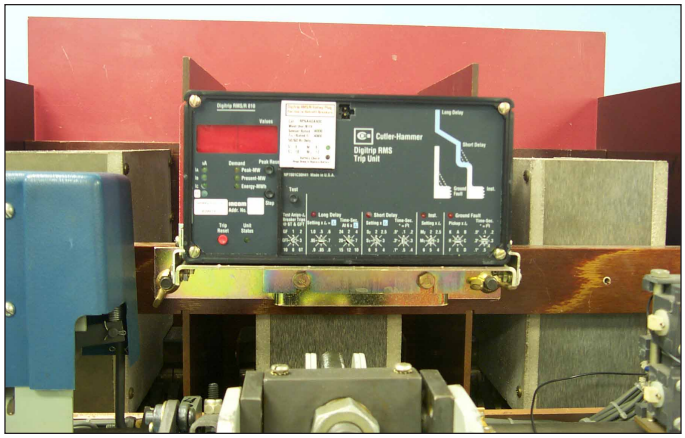

Fig. 54 Trip Unit Assembly Mounted on the Breaker.

H. Install the Digitrip Retrofit Label in a prominent position on the Breaker Face Plate.

Fig. 55 Digitrip Retrofit Label Installed on the Breaker Face Plate.

STEP 9: INSTALLING THE EXTERNAL HARNESS AND FINAL WIRING

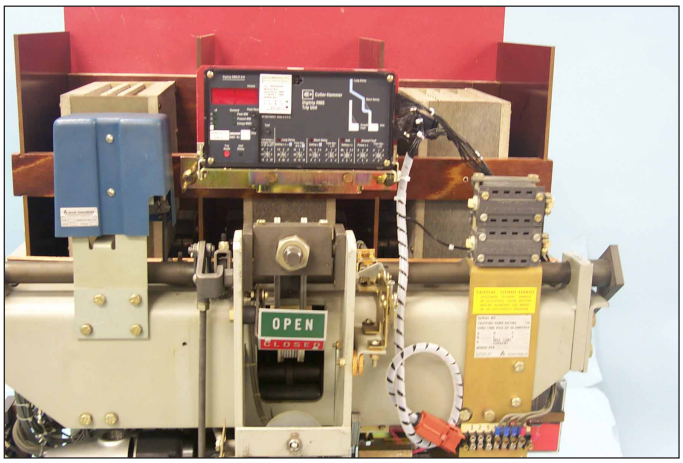

Fig. 56 Overview: External Harness Installed and Final Wiring of the Breaker.

A. Route the Aux. CT Harness up along the inside of the right Breaker Frame, following the path of the Secondary Harness, then towards the Trip Unit. Plug the connector from the Aux. CT Harness into its receptacle in the Trip Unit.

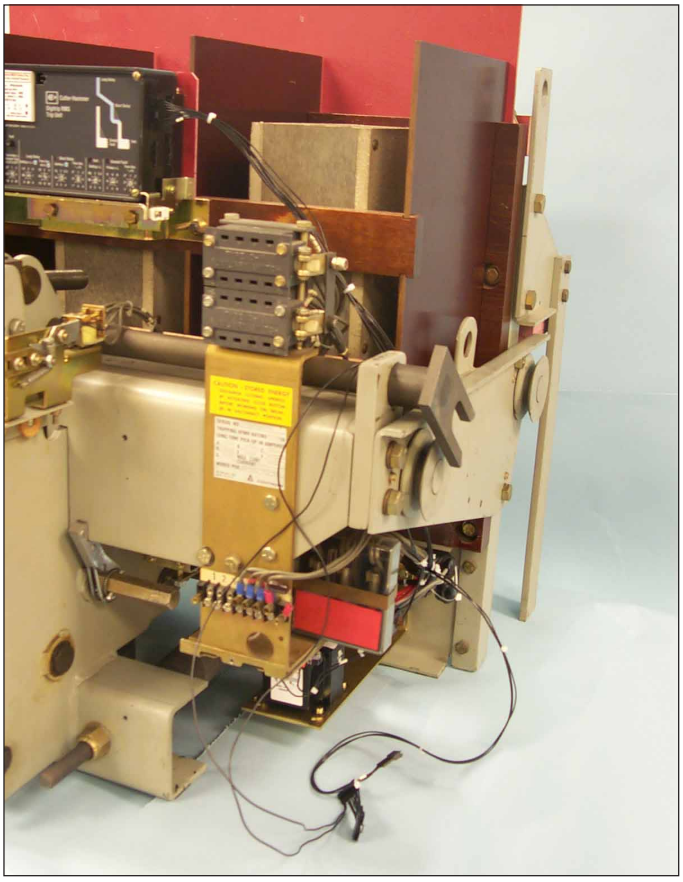

Fig. 57 Routing and Connection of the Aux. CT Harness.

B. Connect the External Harness to the Trip Unit.

NOTE: For 510 Basic Kits, the External Harness is the Shorting Plug pictured below. It is to be plugged into the right side of the Trip Unit.

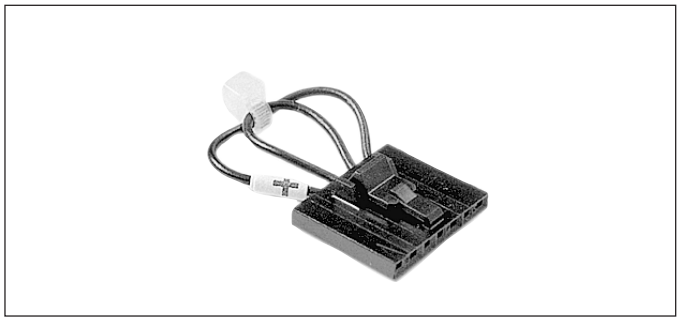

Fig. 58 510 Basic Kit External Harness Shorting Plug.

C. *For Kits Supplied with a PT Module Only:* Route the PT Extension Harness up along the inside of the right Breaker Frame, following the path of the Secondary Harness, then towards the Trip Unit. Connect the PT Extension Harness to its receptacle on the External Harness.

D. *For Kits Supplied with a Breaker Mounted CPT Only:* Route the CPT Wires Harness up along the inside of the right Breaker Frame, following the path of the Secondary Harness, then towards the Trip Unit. Remove the External Harness plug installed in the bottom rear socket of the Trip Unit. Insert the black plug of the CPT Harness into the same receptacle in the Trip Unit. Reinsert the External Harness Plug just removed into the female receptacle on the CPT Harness.

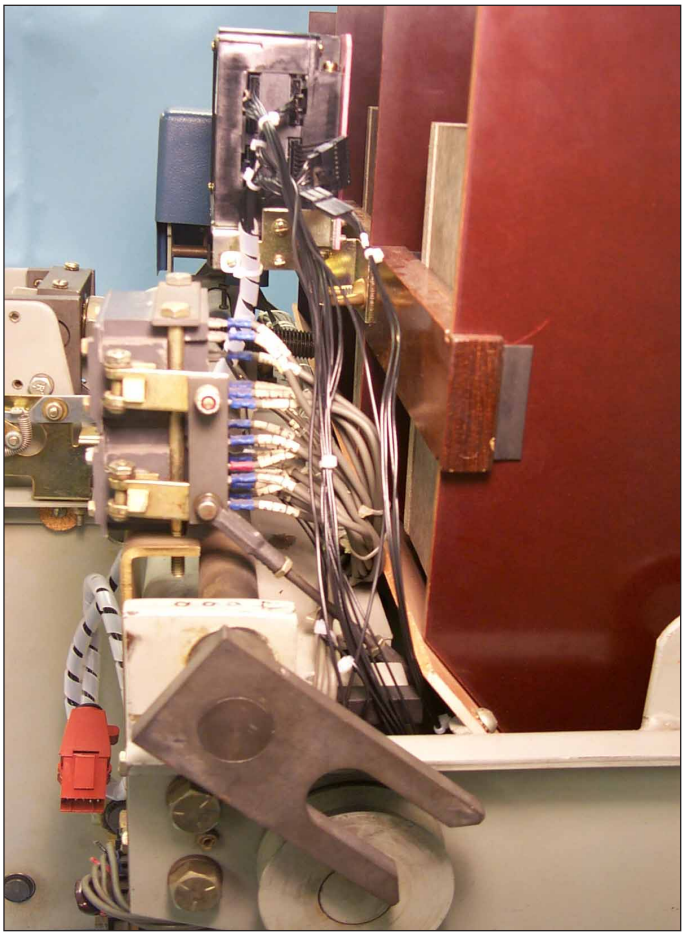

Fig. 59 External Harness Connections at the Trip Unit.

E. Secure the Aux. CT Harness and, if applicable, the PT Extension Harness and CPT Wires to the Secondary Harness using the wire ties supplied.

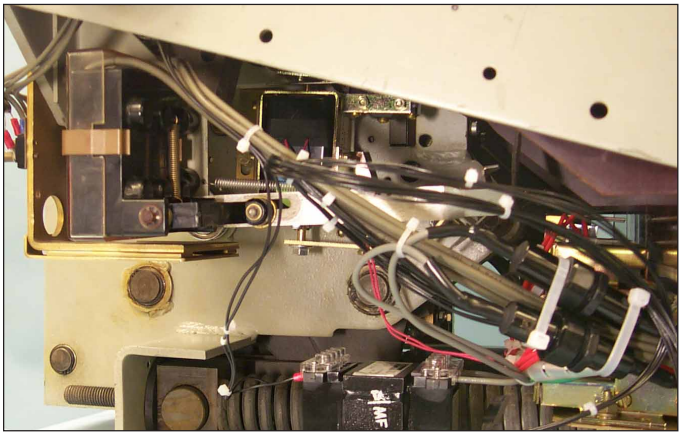

Fig. 60 Aux. CT Harness, PT Extension Harness, and CPT Wires Secured to the Secondary Harness.

F. *For Kits Supplied with an Auxiliary Switch Only:* Route the two (2) wires (with ring terminals) from the External Harness, down along the front Breaker Frame towards the DTA Assembly. Connect one (1) wire to the normally "Open" terminal and the other wire to the "Common" terminal of the Auxiliary Switch.

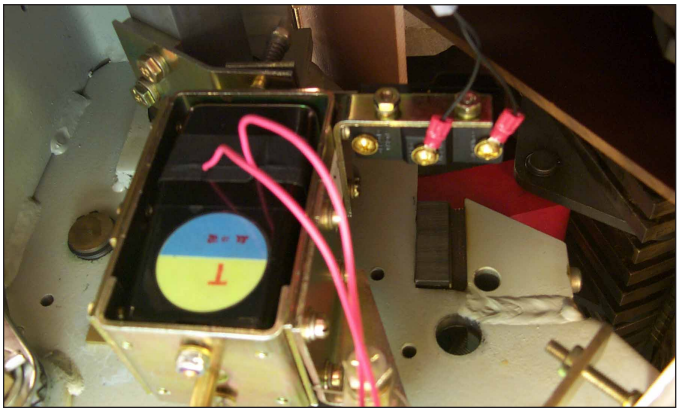

Fig. 61 External Harness Wires Connected to the Auxiliary Switch.

G. Using the wire ties supplied secure the External Harness to the Panduit cable tie mount on the Trip Unit Assembly, as shown.

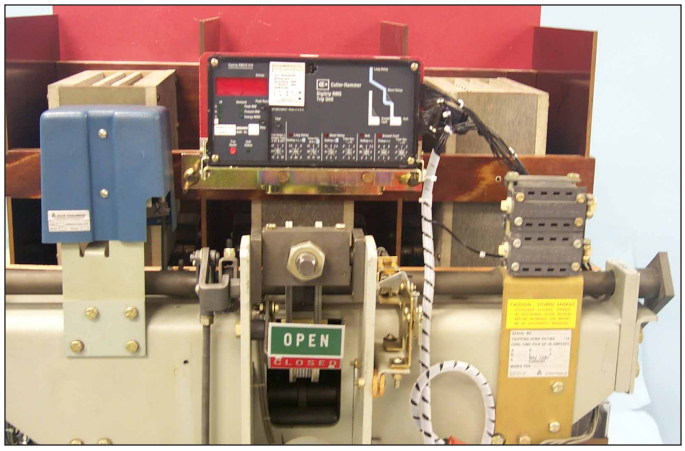

Fig. 62 Securing the External Harness to the Trip Unit.

H. Use the self-adhesive mounting pads and wire ties supplied to dress all wires and harnesses to keep them away from any moving parts within the Breaker.

I. Reinstall the Breaker Face Plate using the original mounting hardware.

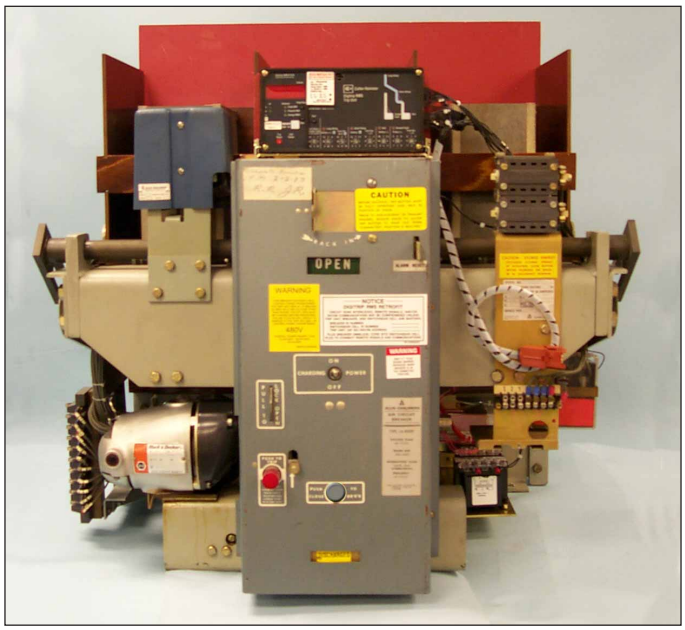

Fig. 63 Breaker Face Plate Reinstalled on the Breaker.

J. If equipped, reinstall the Closing Handle using the original mounting hardware.

STEP 10: TESTING THE BREAKER

A. Measure the force necessary to trip the Breaker at where the Trip Finger impacts the DTA Adjusting Disk. The force necessary to trip the Breaker MUST NOT EXCEED 3 lbs.

B. The Retrofit must be tested using primary injection. Refer to Section 8 of the Instructions for the *Application of Digitrip RMS Retrofit Kits on Power Circuit Breakers* (Publication AD 33-855-4, September 2001), supplied with the Retrofit Kit, for detailed testing procedures and specifications. For test information specific to the Trip Unit, refer to the IL publication supplied with the Retrofit Kit (see the Pick List for the IL number).

C. While Section 8 of the *Instructions for the Application of Digitrip RMS Retrofit Kits on Power Circuit Breakers* provides the information necessary for testing the Breaker, please keep the following notes in mind when reviewing other sections of the publication.

⚠ CAUTION:

WHEN ALL TESTING IS COMPLETE, THE TRIP UNIT MUST BE RESET. FAILURE TO DO SO MAY CAUSE THE BATTERY IN THE RATING PLUG TO RUN DOWN.

NOTES:

1. *For All Kits Other Than 510 Basic:* If testing the Breaker with Short Delay or Ground Fault functions, be sure to either plug in the Cell Harness Assembly or use the Zone Interlock Shorting Plug. Failure to do so may result in shorter than expected trip times.

2. For 810 and 910 Kits Only: Without any power applied to the system (neither the 120 volt power supply nor the Aux. Power Module connected), plug the External Harness into the Cell Harness and check the impedance between COM 1 and COM 2. The impedance should be between one (1) and three (3) ohms. If the impedance is not within this range, trace the

wiring and examine each connection to assure its integrity.

Confirm that the PowerNet communication wiring is correct by following the procedures detailed in Section 7.4 of the Instructions for the Application of Digitrip RMS Retrofit Kits on Power Circuit Breakers. Note that for 810 and 910 Kits, the impedance between COM 1 and COM 2 should be between one (1) and three (3) ohms.

When testing is complete, disconnect the External Harness from the Cell Harness. Final External Harness connection will be performed later in the Retrofit Process.

STEP 11: MOUNTING THE CELL HARNESS

A. The Cell Harness is to be mounted in the Breaker Cell. The connector end is to be mounted on the right side of the Cell, in a location suitable for connection with the External Harness. The Terminal Blocks can be mounted anywhere space is available in the Cell as long as connection to the External Harness can be made.

B. Route the Cell Harness wiring to keep it away from any moving parts within the Cell Housing.

STEP 12: INSTALLING THE RETROFITTED BREAKER IN THE CELL

⚠ WARNING:

DO NOT LEAVE THE BREAKER IN AN INTERMEDIATE POSITION IN THE SWITCHGEAR CELL. ALWAYS LEAVE IT IN THE CONNECTED, DISCONNECTED, OR (OPTIONAL) TEST POSITION. FAILURE TO DO SO COULD LEAD TO IMPROPER POSITIONING OF THE BREAKER AND FLASHOVER, CAUSING DEATH, SERIOUS PERSONAL INJURY, AND / OR PROPERTY DAMAGE.

NOTE: It is the responsibility of the Retrofitter to insure proper Breaker / Cell fit. When racking the Breaker into the Connected position, the Retrofitter MUST FOLLOW BOTH the manufacturer's instructions and the customer's safety standards and procedures for racking a Breaker into the Connected position.

A. With the Breaker in the Open position and the springs discharged, slowly rack the Breaker into the Connected position, making sure there is no interference or binding. The Breaker should rack smoothly and without mechanical interference between any Breaker and Cell parts. The Retrofitter will feel some resistance when the primary fingers connect onto the stabs of the Cell. This is normal.

   However, if any unusual resistance is detected that could be abnormal interference between the Breaker and Cell parts, stop immediately and move the Breaker out of the Connected position. Examine what is causing the interference and correct the situation.

Digitrip Retrofit Kit Installation Components for Allis-Chalmers LA-4000 F Fused Breaker RMS/R Retrofits

Step	Description		Qty.	Comment
Step 3	Sensor	8153A86H01	3	
	Sensor Mounting Parts	9A1013G07	1	
	Sensor Harness		1	
	Mounting Bracket		1	
	Mounting Clip R. H.		1	
	Mounting Clip L. H.		1	
	.250-20 × 2.50 Lng. Bolt Stl.		6	
	.250-20 × 1.00 Lng. Bolt Stl.		2	
	.250 Flat Washer Stl.		10	
	.250 Lock Washer Stl.		2	
	.250-20 Nut Hex Stl.		2	
	.250-20 Nut Cap Nylon		6	
	Mounting Pad - 1", Self-Adhesive		4	
	Wire Tie Nylon		24	
Step 4	Aux. CT Module Assembly Parts	9A1013G04	1	
	Mounting Pan		1	
	.250-20 × .750 Lng. Bolt Stl.		4	
	.250 Flat Washer Stl.		8	
	.250 Lock Washer Stl.		4	
	.250-20 Nut Hex Stl.		4	
	.190-32 × .375 Lng. Screw Fil.		1	
	.190 Flat Washer Stl.		1	
	.190 Lock Washer Stl.		1	
	Auxiliary CT Harness	6502C84G01	1	
	PT Module Kit	6502C82G01	1	
	.138-32 × .500 Lng. Screw Stl. P. H.		2	
	.138 Flat Washer Stl.		4	
	.138 Lock Washer Stl.		4	
	.138-32 Nut Hex Stl.		4	
	Ring Terminal (.190, .250, .312, .375, .500 -Each Size)		3	
	Wire Tie Nylon		5	
	PT Module Mounting Parts	9A10137G09	1	Comm. Only
	PT Extension Harness		1	
	Insulation Plate		1	
	.190-16 × .312 Lng. Screw Stl. T. C.		3	
	PT Warning Label		1	
	Mounting Pad - 1", Self-Adhesive		From Step 3	
	Wire Tie Nylon		From Step 3	
	PT Extension Harness	6502C85G01	1	
Step 5	DTA Reset Parts	9A1013G05	1	
	DTA Reset Assembly		1	
	.250-20 × .750 Lng. Bolt Stl.		2	
	.250 Flat Washer Stl.		2	
	.250 Lock Washer Stl.		2	
	DTA Assembly	9A10137G35	1	
	Auxiliary Switch Kit	9A10137G02	1	Comm. Only

Digitrip Retrofit Kit Installation Components for Allis-Chalmers LA-4000 F Fused Breaker RMS/R Retrofits

Step	Description		Qty.	Comment
	Microswitch		1	
	Mounting Bracket		1	
	.164-32 × .250 Lng. Screw P. H.		2	
	.164 Lock Washer Stl.		2	Comm. Only
	.138-32 × 1.00 Lng. Screw Stl. Fil.		2	
	.138 Flat Washer Stl.		4	
	.138 Lock Washer Stl.		2	
	.138-32 Nut Hex Stl.		2	
	DTA Mounting Hardware	9A10137G06	1	
	.250-20 × .500 Lng. Bolt Stl.		2	
	.250 Flat Washer Stl.		2	
	.250 Lock Washer Stl.		2	
	Loc-Tite® 243		1	
Step 6	Loc-Tite® 243		1	From Step 5
Step 7	Breaker Mounted CPT Kit	See Pick List	1	
	MTE Transformer		1	
	HV Fused Wires		2	
	CPT Wires		1	
	.190-32 × .500 Lng. Screw Fil.		4	
	.190 Flat Washer Stl.		4	
	.190 Lock Washer Stl.		4	
	.190-32 Nut Hex Stl.		4	
	Warning Label (208, 240, 480, & 575 Volt - Each)		1	
	Ring Terminal (.138, .190, .250, .312, .375, .500 -		2	CPT Only
	CPT Mounting Parts	9A10137G20	1	
	Mounting Bracket		1	
	.190-32 × .750 Lng. Screw P. H.		2	
	.190 Flat Washer Stl. Wide		2	
	.190 Lock Washer Stl.		2	
	Finger-Safe Cover Kit	FSK4	1	
	Cover (A, B, C, & D Each)		1	
	.098-28 × .375 Lng. Screw Fil.		4	
	Mounting Pad - 1", Self-Adhesive			From Step 3
	Wire Tie Nylon			From Step 3
Step 8	Trip Unit	See Pick List	1	
	Rating Plug	See Pick List	1	
	Trip Unit Assembly Parts	9A10137G08	1	
	Mounting Bracket		1	
	Breaker Support Bracket		1	
	Support Clip R. H.		1	
	Support Clip L. H.		1	
	Insulation Barrier		1	
	Mounting Clip		2	
	Name Plate Digitrip		1	
	Spacer Brass		2	
	.250-20 × .750 Lng. Bolt Stl.		2	

Digitrip Retrofit Kit Installation Components for Allis-Chalmers LA-4000 F Fused Breaker RMS/R Retrofits

Step	Description		Qty.	Comment
	.250 Flat Washer Stl.		4	
	.250 Lock Washer Stl.		2	
	.250-20 Nut Hex Stl.		2	
	.190-32 × 4.00 Lng. Screw Fil.		2	
	.190 Flat Washer Stl.		4	
	.190 Lock Washer Stl.		2	
	.190-32 Nut Hex Stl.		2	
	.164-32 × .250 Lng. Screw Stl. Fil.		2	
	.164 Flat Washer Stl.		2	
	.164 Lock Washer Stl.		2	
	.138-32 × .500 Lng. Screw Stl. Fil.		1	
	.138-32 × .375 Lng. Screw Stl. Fil.		3	
	.138 Flat Washer Stl.		8	
	.138 Lock Washer Stl.		4	
	.138-32 Nut Hex Stl.		4	
	.112-40 × .250 Lng. Screw Stl. Fil.		4	
	.112 Flat Washer Stl.		4	
	.112 Lock Washer Stl.		4	
	Cable Tie Mount Panduit		1	
Step 9	External Harness	6502C83G__	1	
	Wire Tie Nylon			From Previous Steps
	Mounting Pad - 1", Self-Adhesive			From Previous Steps
Step 11	Cell Harness	See Pick List	1	

NOTE: Due to the wide variety of Breakers and the multiple functions of the Retrofit components, some excess hardware may remain when the Retrofit is complete.

Table 5 Torque Values for General Mounting and Screw Size Conversion

Decimal Size (in)	*Standard Size*	*Torque (in-lbs)*	*Torque (ft-lbs)*
.112	4-40	10	0.8
.138	6-32	18	1.5
.164	8-32	36	3.0
.190	10-32	46	3.8
.250	1/4-20	100	8.3
.312	5/16-18	206	17.2
.375	3/8-16	356	29.7
.438	7/16-14	572	47.7
.500	1/2-13	856	71.3

Table 6 Torque Values for Copper BUS Connectors

Decimal Size (in)	*Standard Size*	*Torque (in-lbs)*	*Torque (ft-lbs)*
.250	1/4-20	60	5
.312	5/16-18	144	12
.375	3/8-16	240	20
.500	1/2-13	600	50

Fig. 64 Retrofit Components

A. Sensors
B. Trip Unit
C. Aux. CT Module
D. Direct Trip Actuator (DTA)
E. CPT Transformer
F. Rating Plug
G. HV Wires
H. Aux. CT Harness
I. Sensor Harness
J. External Harness
K. Cell Terminal Block
L. Aux. Switch
M. PT Module
N. CPT Harness
O. DTA Extension Harness
P. Reset Finger

Notes

Notes

We wish to thank you for purchasing the Digitrip Retrofit System. Digitrip Retrofit Kits are designed and manufactured in America with pride. All the components are engineered to fit the existing Circuit Breaker with little or no modifications to the existing Breaker. However due to the wide variety and vintage of Breakers in use today, an occasional problem may arise. Please contact us with any questions, comments or concerns.

Phone: **1-800-937-5487** Fax. (724) 779-5899

The instructions for installation, testing, maintenance, or repair herein are provided for the use of the product in general commercial applications and may not be appropriate for use in nuclear applications. Additional instructions may be available upon specific request to replace, amend, or supplement these instructions to qualify them for use with the product in safety-related applications in a nuclear facility.

The information, recommendations, descriptions, and safety notations in this document are based on Cutler-Hammer's experience and judgement with respect to Retrofitting of Power Breakers. This information should not be considered to be all inclusive or covering all contingencies. If further information is required, Cutler-Hammer should be consulted.

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Cutler-Hammer
Pittsburgh, Pennsylvania U.S.A.

Publication No. I.L. 33-A1K
October 2002
Printed in U.S.A./TBG00062