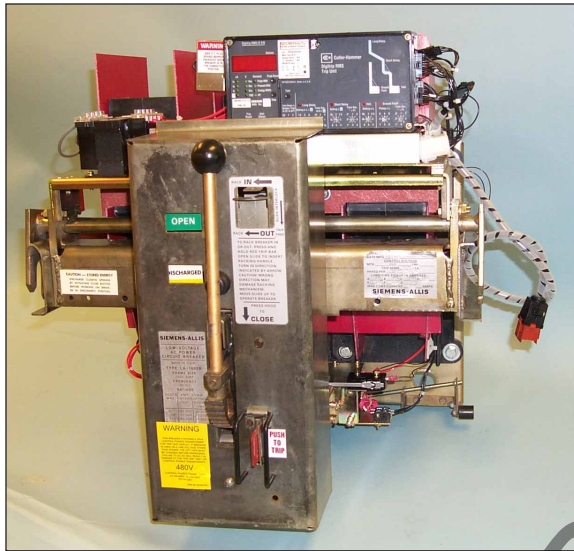




Digitrip Retrofit System for Allis-Chalmers LA-1600 Gold Breakers



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-1600 Gold Breakers

CONTENTS

Description

- Introduction** 4
- Step 1: General Breaker Preparation** 5
- Step 2: Removing the Original Components and Preparing the Breaker for Retrofitting** 6
- Step 3: Installing the Sensors** 7
- Step 4: Preparing the Trip Unit / Aux. CT Module Assembly** 8
- Step 5: Installing the Trip Unit / Aux. CT Module Assembly** 12
- Step 6: Installing the DTA Assembly** 16
- Step 7: Installing the External Harness and Final Wiring** 19
- Step 8: Testing the Breaker** 21
- Step 9: Mounting the Cell Harness** 22
- Step 10: Installing the Retrofitted Breaker in the Cell** 23

Figures

- 1. Overview: Original Components Removed from the Breaker. 6
- 2. Original CTs Removed from the Breaker with Bottom Finger Clusters Reinstalled. 6
- 3. Original Trip Unit, Reset Lever, Reset Rod and Retaining Clip, and Trip Actuator Removed from the Breaker. 6
- 4. Overview: Sensors Installed on the Breaker. 7
- 5. Primary Disconnects Removed from the Top Phase Connectors. 7

- 6. Correct Positioning of the Sensors and Spacers. 7
- 7. Sensor Harness Connected to the Sensors and Secured to the Left Phase Insulation Barrier. 8
- 8. Overview: Trip Unit / Aux. CT Module Assembly Ready for Installation. 8
- 9. PT Module Installed on the Insulation Barrier. 8
- 10. Insulation Barrier Mounted to the Aux. CT Module. 9
- 11. Location of the Spacers and Installation of the Support Clips and Aux. CT Harness. 9
- 12. Rating Plug Installed in the Trip Unit. 9
- 13. Correct Positioning of the Spacers. 10
- 14. Trip Unit / Aux. CT Module Assembly Installed on the Mounting Bracket. 10
- 15. Fuse Clips and Spade Connector Removed from the CPT. 10
- 16. CPT Secured to the Trip Unit / Aux. CT Module Assembly Mounting Bracket. 11
- 17. Connection and Routing of the CPT Wires. 11
- 18. Overview: Trip Unit / Aux. CT Module Assembly Installed in the Breaker. 12
- 19. Correct Orientation of the Bearing Caps and Trip Unit / Aux. CT Module Assembly Mounting Bracket. 12
- 20. Sensor Harness and Ground Wire Connected to the Aux. CT Module Terminal Block. 12



21. DTA Extension Harness Connected to the Aux. CT Module Terminal Block. 13

22. DTA Extension Harness Routed towards the Bottom of the Breaker. 13

23. PT Wires Secured to the Left Phase Barrier. 13

24. PT Wires Connected to the Bottom Primary Connectors. 14

25. Load and Line Sides of the HV Wires. 14

26. HV Fuses Mounted to the Left Phase Barrier. 14

27. HV and CPT Wires Connected to the CPT Module. 15

28. Finger-Safe Covers Installed on the CPT. 15

29. HV Wires Connected to Top Phase Connectors. 16

30. Overview: DTA Assembly Installed in the Breaker. 16

31. Microswitch Installed on the Auxiliary Switch Mounting Bracket. 16

32. Auxiliary Switch Assembly Mounted to the DTA Assembly. 17

33. DTA Assembly Installed in the Breaker. 17

34. Reset Arm Installed in the Breaker. 17

35. Correct Gap between the DTA Trip Finger Plate and Bearing Plate. 17

36. Correct Gap between the DTA Trip Finger and the Breaker trip Plate. 18

37. Correct Cage Height on the Reset Arm Adjusting Screw. 18

38. Connection and Routing of the DTA Extension Harness. 18

39. Overview: External Harness Installed on the Breaker. 19

40. 510 Basic Kit External Harness Shorting Plug. 19

41. External Harness Wires Connected to the Auxiliary Switch. 19

42. External Harness Connections at the Trip Unit. 19

43. External Harness Secured to the Aux. CT Module. 20

44. Supplied CPT Voltage Labels. 20

45. CPT Voltage Label Installed on the Breaker Cover. 21

46. Retrofit Components 28

Tables

1. Available Retrofit Kits 4

2. Sensor Taps Rating 8

3. CPT Low Voltage Taps for Standard and Special Order CPTs (After Removing Fuse Clips) 11

4. CPT High Voltage Taps for Standard and Special Order CPTs 15

5. Torque Values for General Mounting and Screw Size Conversion 27

6. Torque Values for Copper BUS Connectors 27

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 33-855-2), 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 AND PREPARING THE BREAKER FOR RETROFITTING

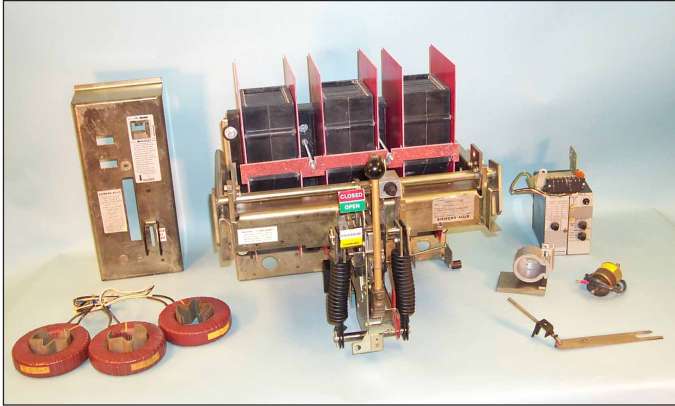


Fig. 1 Overview: Original Components Removed from the Breaker.

Refer to the Allis-Chalmers LA-1600 Gold Instruction Manual, originally supplied with the Breaker, to perform the following procedures.

- A. Remove the hardware securing the Breaker Cover to the Breaker. Remove and save the Breaker Cover and mounting hardware.
- B. Remove and save the bottom Primary Disconnects (Finger Clusters) and mounting hardware.
- C. Remove and scrap the original CT's (Sensors) and associated wiring. Reinstall the bottom Finger Clusters removed in Step 2-B.

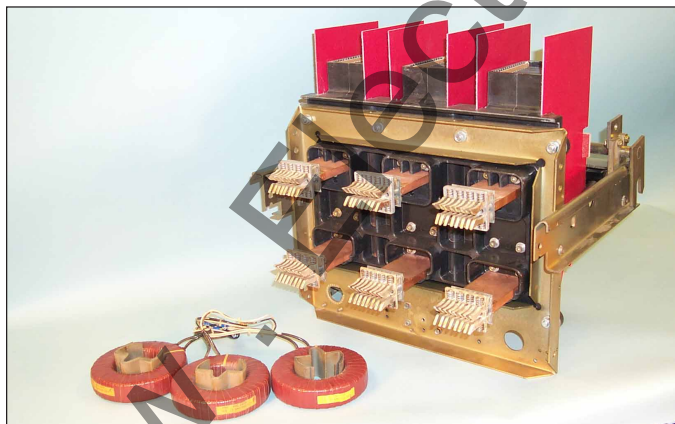


Fig. 2 Original CTs Removed from the Breaker with Bottom Finger Clusters Reinstalled.

- D. Remove and scrap the original Trip Unit, mounting bracket, and all associated wiring and mounting hardware.
- E. Remove and scrap the original "X" washer securing the Reset Lever to the Breaker. Remove and scrap the Reset Lever, Reset Rod, and Retaining Clip.
- F. Remove and scrap the original Trip Actuator, mounting bracket, and hardware.

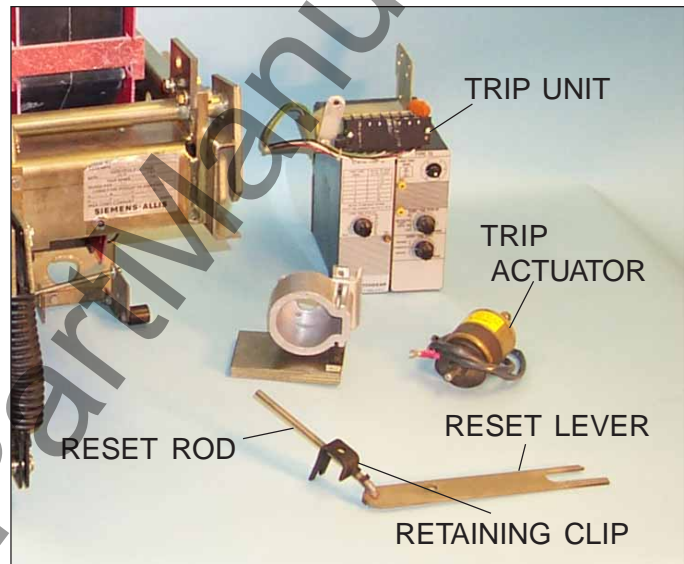


Fig. 3 Original Trip Unit, Reset Lever, Reset Rod and Retaining Clip, and Trip Actuator Removed from the Breaker.

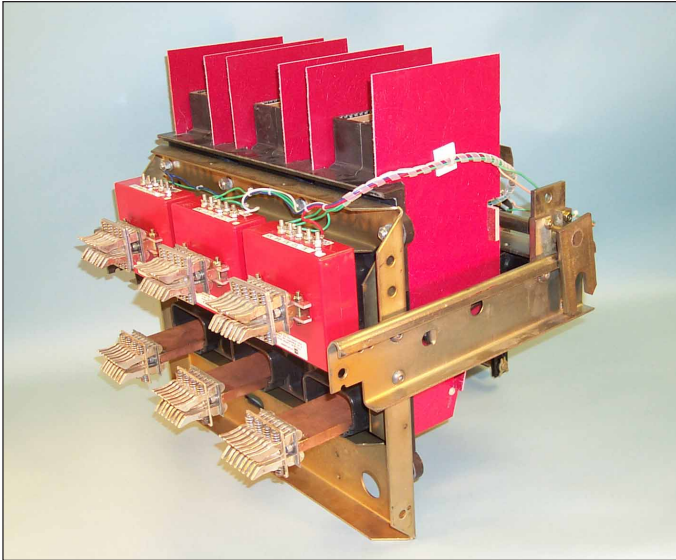
STEP 3: INSTALLING THE SENSORS

Fig. 4 Overview: Sensors Installed on the Breaker.

- A. Remove and save the cap bolts securing the Primary Disconnects (Finger Clusters) to the top Phase Connectors.

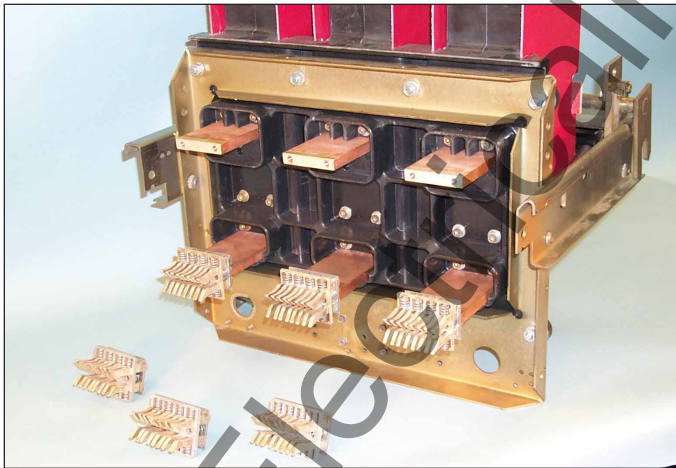


Fig. 5 Primary Disconnects Removed from the Top Phase Connectors.

- B. Slide a Sensor over each Phase Connector. The Sensors must be installed with the Terminals at the top and the Nameplate facing outwards.
- C. Insert a Sensor Spacer between the top and

bottom of each Phase Connector and the opening in the Sensor as shown. Using the (6) .190-32 x 1.25" screws, (12) flat washers, and (6) Nyloc nuts supplied, "pinch" the spacers together so they secure the Sensor against the Breaker. Note the Nyloc nuts should be installed facing the top of the Breaker.

NOTE: The hardware securing the Sensor Spacer should only be "snugged". Over tightening may crack the Spacers.



Fig. 6 Correct Positioning of the Sensors and Spacers.

- D. Using the original hardware, reinstall the Primary Disconnects removed in Step 3-A.
- E. *For Kits supplied with a Breaker Mounted CPT Only:* Do not fully tighten the Primary Disconnect mounting hardware on Phases 1 and 2, or 2 and 3 at this time. They will be used later in the Retrofit Process to secure the HV wires.
- F. Connect the ring terminals of the Sensor Harness to the Sensor Terminals. Refer to Section 12 of the Application Data, supplied with the Retrofit Kit, for detailed wiring specifications.

For LA-1600 Gold Retrofits, the following conventions apply.

Table 2 Sensor Taps Rating

Sensor Style No.	Terminal Com.	Amps
8184A38H01	X1 - X2 =	400 A
8184A38H01	X1 - X3 =	600 A
8184A38H01	X1 - X4 =	800 A
8184A38H01	X2 - X5 =	1,200 A
8184A38H01	X1 - X5 =	1,600 A
<i>Optional Sensors</i>		
8184A45H01	X1 - X2 =	200 A

- G. Install a self-adhesive mounting pad supplied with the Retrofit Kit to the outside surface of the left Phase Insulation Barrier as shown. Secure the Sensor Harness to the mounting pad and top Breaker Crossbar using wire ties supplied.

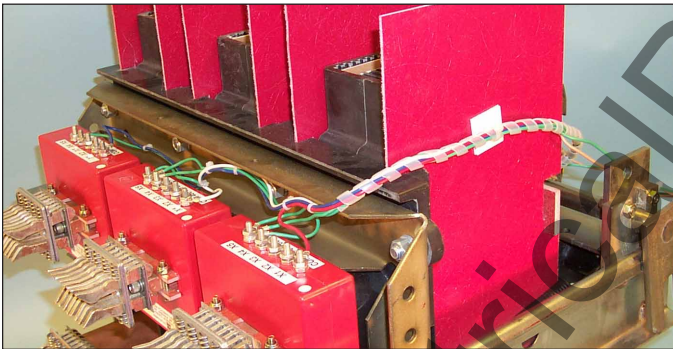


Fig. 7 Sensor Harness Connected to the Sensors and Secured to the Left Phase Insulation Barrier and Breaker Crossbar.

STEP 4: PREPARING THE TRIP UNIT / AUX. CT MODULE ASSEMBLY

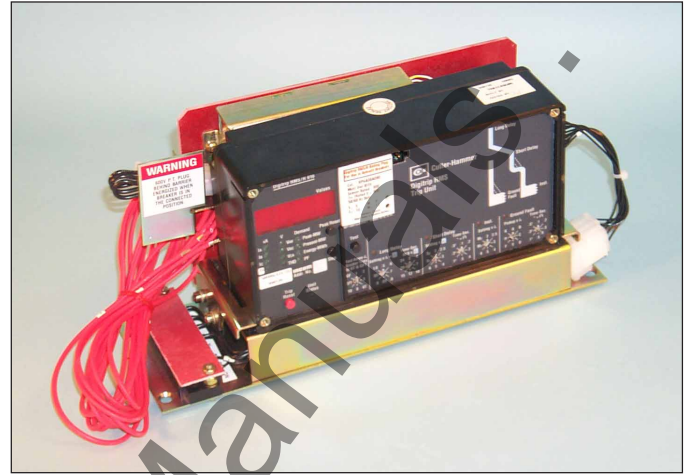


Fig. 8 Overview: Trip Unit / Aux. CT Module Assembly Ready for Installation.

- A. For Kits Supplied with a PT Module Only: Align the PT Module with the existing holes in the Trip Unit Insulation Barrier as shown. Secure the PT Module to the Insulation Barrier using the (2) .138-32 x .500" screws, (4) flat washers, (2) lock washers, and (2) nuts supplied.

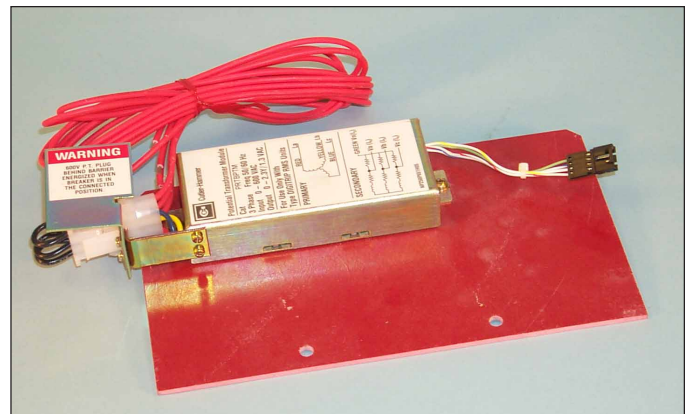


Fig. 9 PT Module Installed on the Insulation Barrier.

- B. Align the Trip Unit Insulation Barrier with the existing holes in the back of the Aux. CT Module. Secure the Insulation Barrier to the Aux. CT Module using the (2) .190-32 x .375" screws, (2) lock washers, and (2) flat washers supplied.

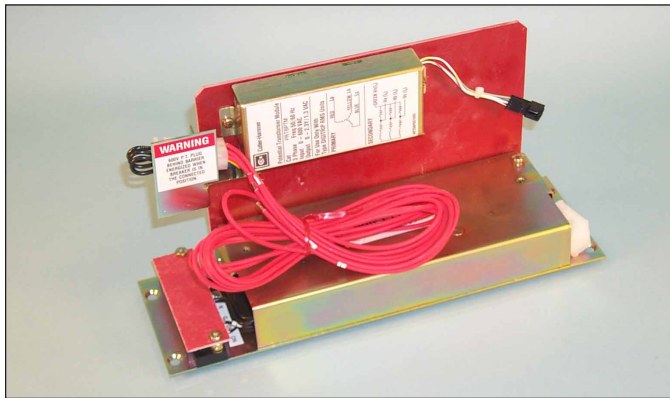


Fig. 10 Insulation Barrier Mounted to the Aux. CT Module.

- C. Mount the Trip Unit to the top of the Aux. CT Module as shown using the (2) .190-32 x 4.00" screws, (2) lock washers, (2) flat washers, and (2) spacers supplied. Note that the brass spacers are positioned between the top of the Aux. CT Module and the bottom rear of the Trip Unit. Do not fully tighten the screws at this time.
- D. Mount the left and right Trip Unit Support Clips to the sides of the Aux. CT Module and into the bottom front slots in the Trip Unit as shown. Secure the Support Clips using the (4) .190-32 x .375" screws, (4) lock washers, and (4) flat washers supplied. Secure the Trip Unit by tightening the 4.00" screws installed in Step 4-C.

Install the Aux. CT Harness between the Trip Unit and the Aux. CT Module.

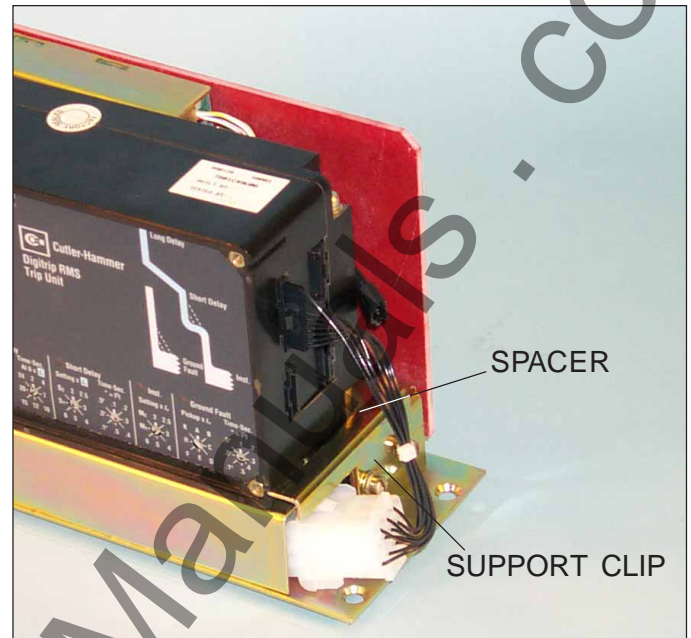


Fig. 11 Location of the Spacers and Installation of the Support Clips and Aux. CT Harness.

- E. Remove the Trip Unit Cover and install the Rating Plug supplied with the Retrofit Kit. Reinstall the Cover.

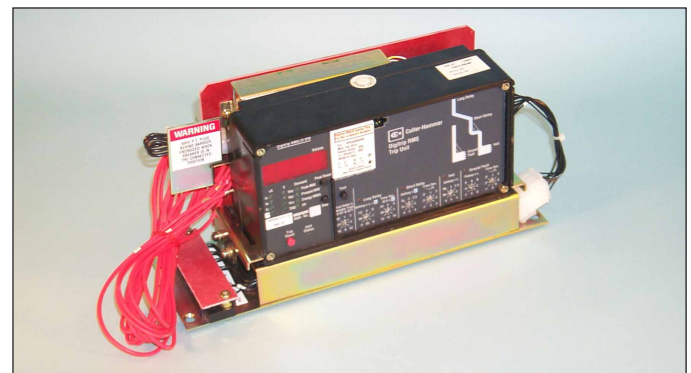


Fig. 12 Rating Plug Installed in the Trip Unit.

- F. When the Trip Unit / Aux. CT Module Assembly is mounted to the Aux. CT Module Mounting Bracket, six (6) spacers are used to provide clearance between the bottom of the Aux. CT Module and the Mounting Bracket. Using three (3) spacers on each side, align the holes in the spacers and Trip Unit / Aux. CT Module Assembly with the existing holes in the Mounting Bracket as shown.

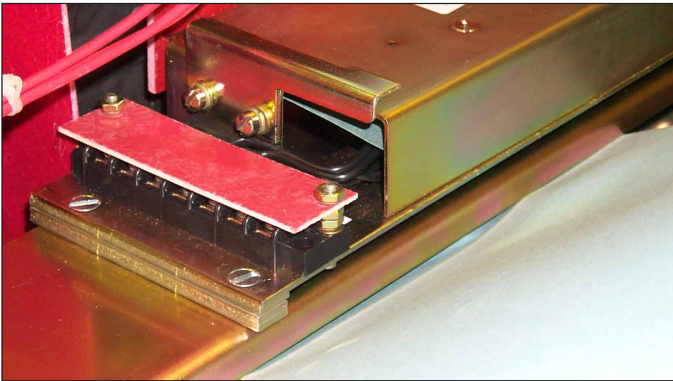


Fig. 13 Correct Positioning of the Spacers.

Secure the Trip Unit / Aux. CT Module Assembly and the spacers to the mounting Bracket using the (4) .190-32 x 1.00" flat head screws, (4) flat washers, (4) lock washers, and (4) nuts supplied.

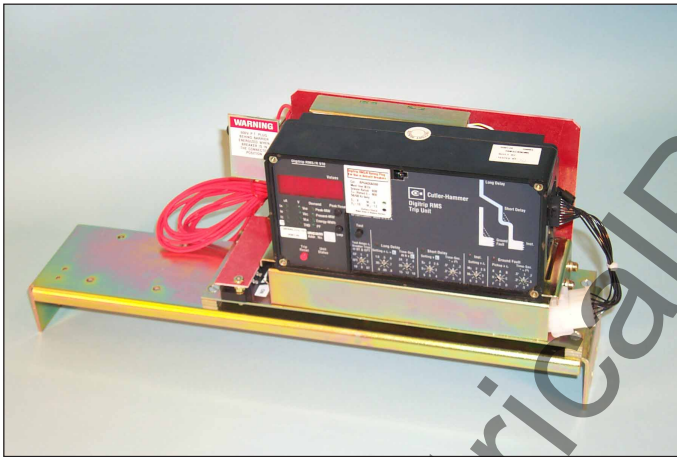


Fig. 14 Trip Unit / Aux. CT Module Assembly Installed on the Mounting Bracket.

For Kits Supplied with a Breaker Mounted CPT Only.

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



Fig. 15 Fuse Clips and Spade Connector Removed from the CPT.

- H. Align the CPT with the existing holes in the Trip Unit / Aux. CT Module Mounting Bracket, as shown. Note that the "X" Terminals should be oriented towards the Trip Unit / Aux. CT Module Assembly. Secure the CPT to the Mounting Bracket using the (4) .190-32 x .750" screws, (8) flat washers, (4) lock washers, and (4) nuts supplied.

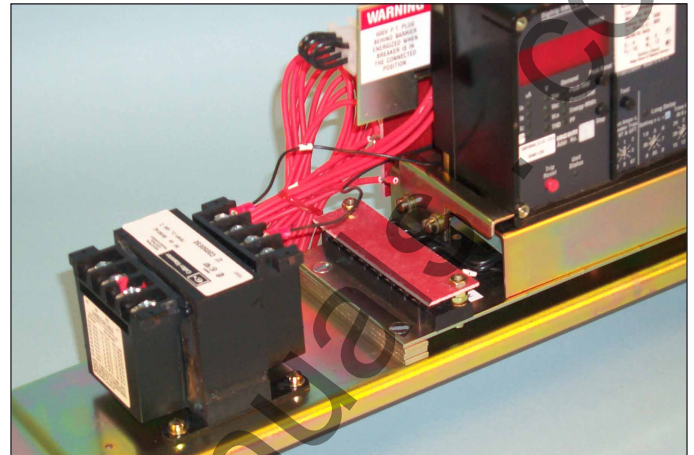
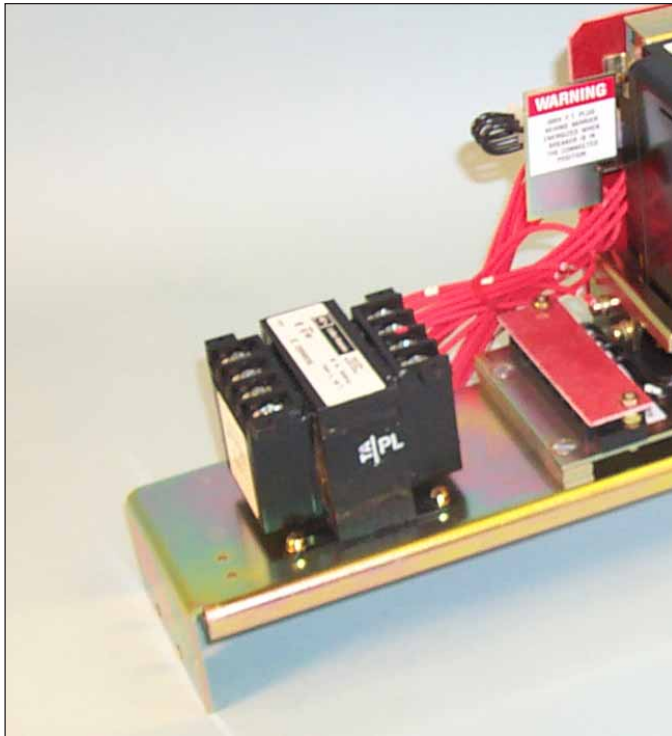


Fig. 17 Connection and Routing of the CPT Wires.

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



Fig. 16 CPT Secured to the Trip Unit / Aux. CT Module Assembly Mounting Bracket.

- I. Connect the CPT Wires to the appropriate “X” terminals of the CPT Module as shown. See Table 3 for Tap information. Route the CPT Wires towards the right side of the of the Trip Unit, between the Trip Unit and the Insulation Barrier.

STEP 5: INSTALLING THE TRIP UNIT / AUX. CT MODULE ASSEMBLY

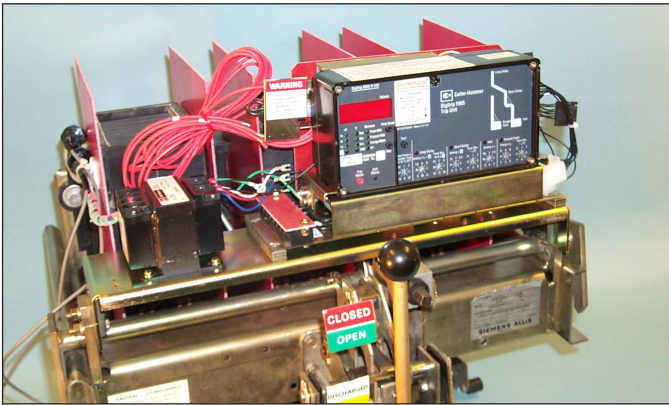


Fig. 18 Overview: Trip Unit / Aux. CT Module Assembly Installed in the Breaker.

- A. Remove and scrap the mounting hardware from the Levering Shaft Bearing Caps.
- B. Install the Trip Unit / Aux. CT Module Assembly on the Breaker by aligning the holes in the Mounting Bracket with the existing holes in the Breaker Side Frames. "Sandwich" the two legs of the Trip Unit / Aux. CT Module Assembly Mounting Bracket between the Breaker Side Frames and Levering Shaft Bearing Caps, as shown. Secure the Bearing Caps and Trip Unit / Aux. CT Module Assembly Mounting Bracket to the Breaker using the (4) .250-20 x 1.25" bolts, (4) lock washers, and (4) nuts supplied.



Fig. 19 Correct Orientation of the Bearing Caps and Trip Unit / Aux. CT Module Assembly Mounting Bracket.

- C. Remove and save the Aux. CT Module Terminal Block Cover and mounting hardware. Route the Sensor Harness to the Aux. CT Module Terminal Block. Connect the Sensor Harness to the proper terminals of the 7-Point Terminal Block. Refer to Section 12 of the Retrofit Application Data, supplied with the Retrofit Kit, for detailed wiring specifications.

Remove the nuts from the rear Terminal Block Cover post. Connect the green Sensor Harness Ground Wire (with ring terminal) to the post. Reinstall the nut to secure the Ground Wire to the post.

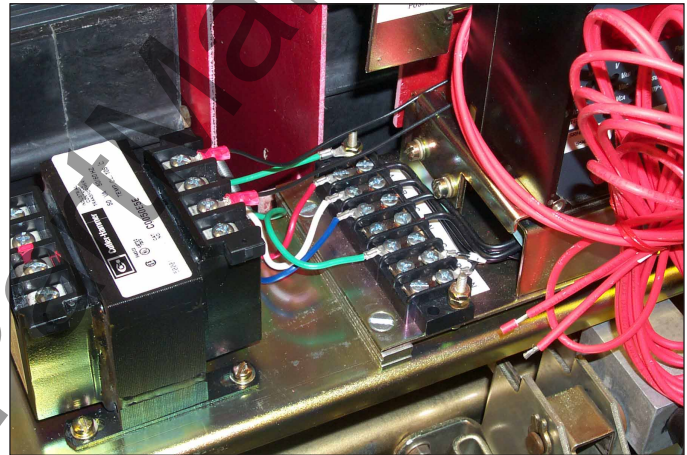


Fig. 20 Sensor Harness and Ground Wire Connected to the Aux. CT Module Terminal Block.

- D. Connect the DTA Extension Harness to the Aux. CT Module Terminal Block by connecting the "+" DTA Wire to the "OP" terminal and the unmarked wire to the "ON" terminal.

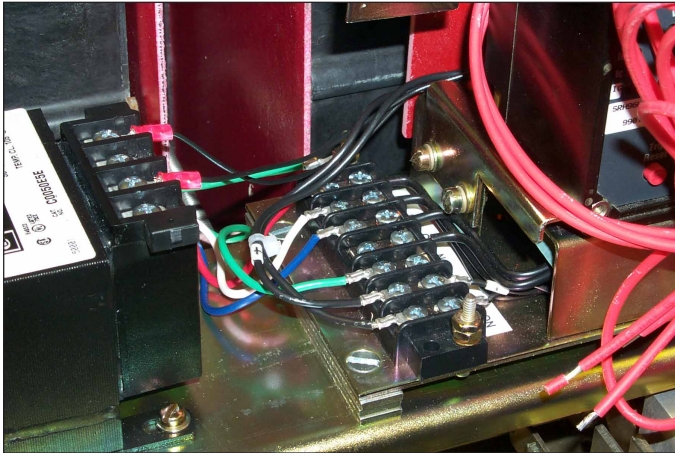


Fig. 21 DTA Extension Harness Connected to the Aux. CT Module Terminal Block.

- E. Reinstall the Aux. CT Module Terminal Block Cover using the original hardware.
- F. Route the DTA Extension Harness between the Trip Unit and Insulation Barrier to the right side of the Breaker, then along the outside of the right Phase Barrier towards the bottom of the Breaker. Using the (1) self-adhesive mount pad and (1) wire tie supplied, secure the DTA Extension Harness to the Right Phase Barrier to ensure that the Extension Harness clears the spring and all moving parts within the Breaker.

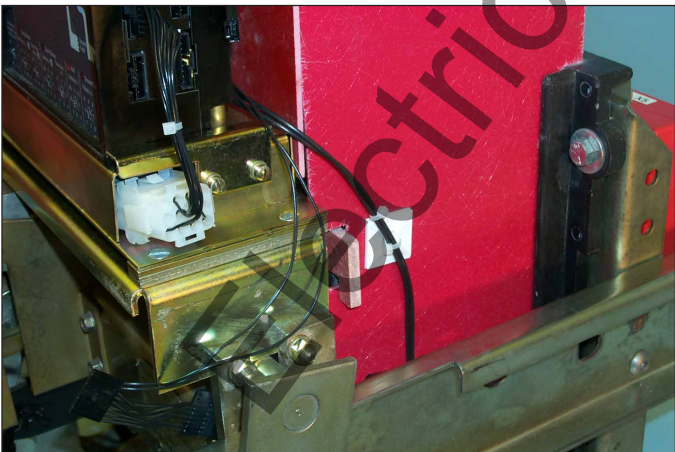


Fig. 22 DTA Extension Harness Routed towards the Bottom of the Breaker.

For Kits Supplied with a PT Module Only.

- G. Route the PT Wires to the left side of the Breaker, then down along the outside of the left Phase Barrier towards the bottom of the Breaker. Using the (2) self-adhesive mounting pads and (2) wire ties supplied, secure the PT Wires to the outside of the left Phase Barrier. Note that the PT Wires can be secured along the same path as the Sensor Harness.

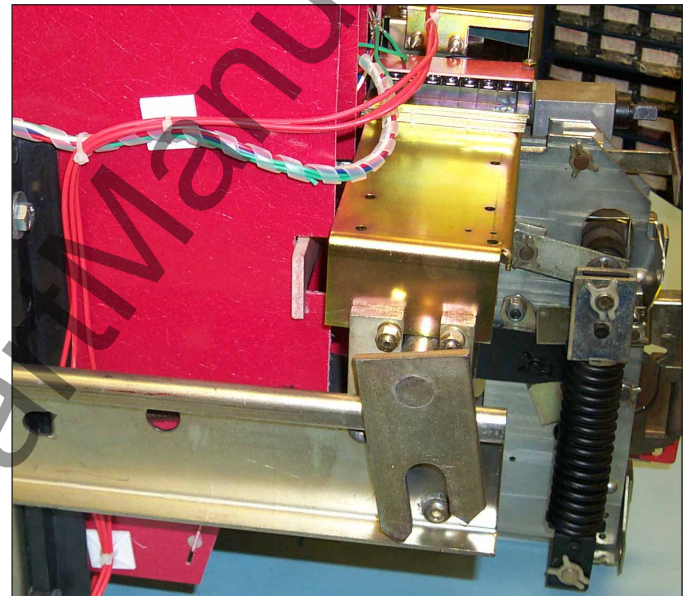


Fig. 23 PT Wires Secured to the Left Phase Barrier.

- H. Tilt the breaker towards the back until it rests on the bottom Primary Disconnects (Finger Clusters). Route the PT wires towards the bottom Primary Connectors. Remove and save one (1) bolt from each bottom Primary Connector.
- I. 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 bolts just removed from the bottom Primary Connectors. 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 .375" ring terminal on each wire. Using the original hardware, connect the PT Wires to the appropriate bottom Primary Connectors.

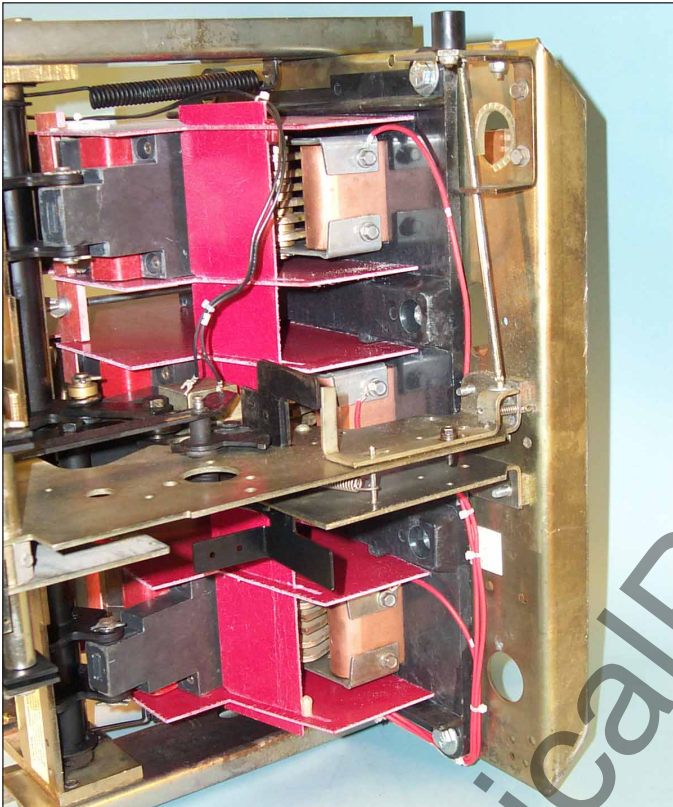


Fig. 24 PT Wires Connected to the Bottom Primary Connectors.

- J. Use the self-adhesive mounting pads and wire ties supplied to secure the PT Wires away from any moving parts within the Breaker.

For Kits Supplied with a Breaker Mounted CPT Only.

NOTE: The Load Side HV Wires are longer than necessary and are cut during the following step. 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 correct "H" terminals on the CPT.

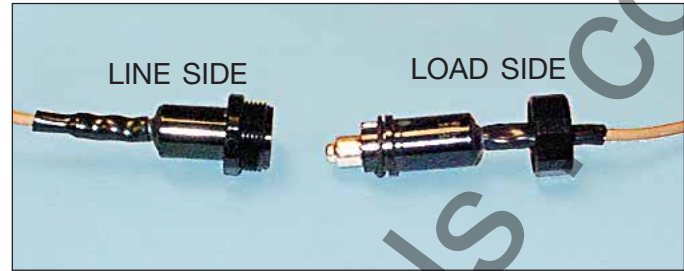


Fig. 25 Load and Line Sides of the HV Wires.

- K. Position the HV Fuses along the outside of the left Phase Barrier, as shown. Using the (1) self-adhesive pad and wire tie supplied, secure the HV Fuses to the Phase Barrier. Note that the HV Wires can be secured along the same path as the Sensor Harness.

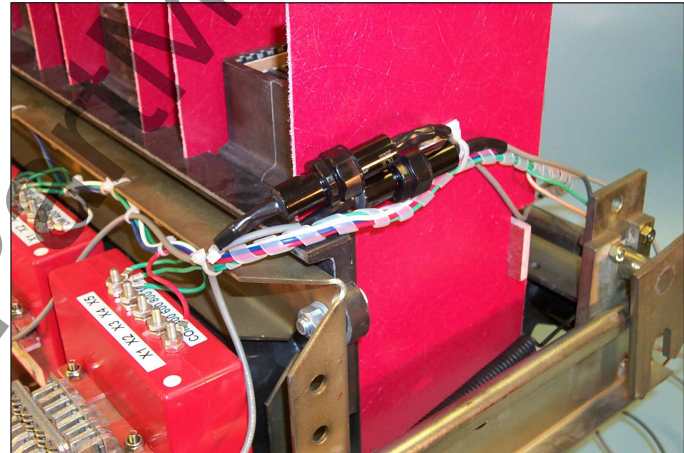


Fig. 26 HV Fuses Mounted to the Left Phase Barrier.

- L. Mark and cut the Load Side of each HV Wire to an appropriate length for connection to the "H" terminals of the CPT. Strip an appropriate length of insulation from the Load Side HV Wires and attach a .138" ring terminal to each. Attach the HV Wires to the CPT terminals to achieve the required voltage (see Table 4).

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)	
<i>Voltage Required</i>	<i>CPT Terminals Used</i>
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

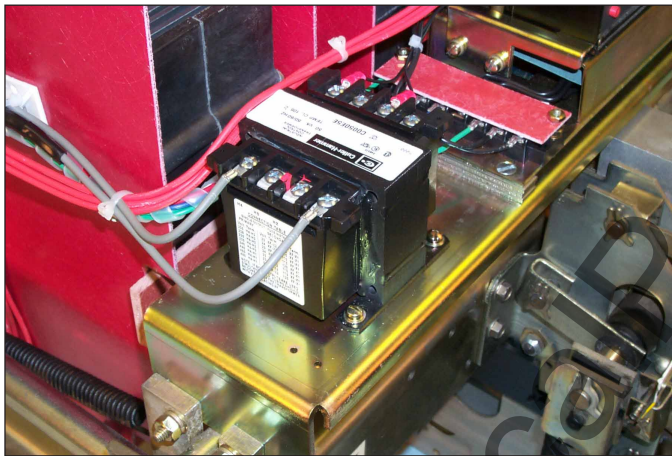


Fig. 27 HV and CPT Wires Connected to the CPT Module.

M. After the HV Wires have been connected to the proper terminals of the CPT, 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 x .375" screws supplied with the CPT Kit. Torque the screws to 8 - 10 in./lbs.

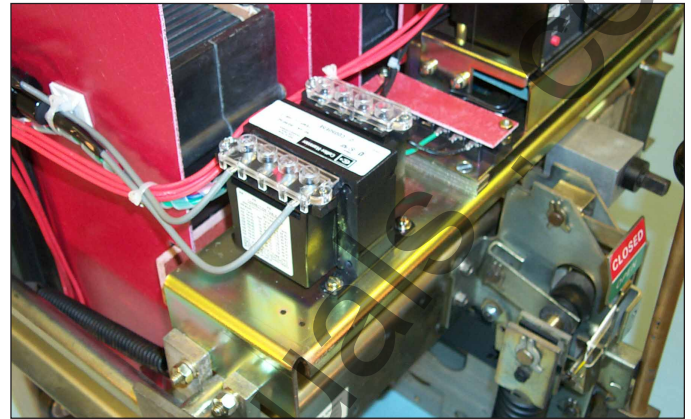


Fig. 28 Finger-Safe Covers Installed on the CPT.

NOTE: The “C” and “D” Finger-Safe Covers supplied with the CPT Kit are not used in this application and should be discarded.

NOTE: The power convention of Circuit Breakers is normally Top to Bottom, meaning the Top Breaker Stabs (Load Terminals) are on the Line Side of the Breaker and the Bottom Breaker Stabs 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 Stabs. In the case of the Line Side being the Bottom Breaker Stabs, the cap screws that secure the Primary Disconnects to the bottom Phase Connectors can be used for HV Wire attachment.

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 correct Load Terminals.

N. Route the HV Line Side Wires towards the appropriate top Primary Disconnects (Finger Clusters). Cut each HV Wire to an appropriate length, then strip .250" from each wire and install a .375" ring terminal.

- O. Remove the Primary Disconnect mounting hardware left loose in Step 3-E. Insert the ring terminal of each HV wire between the Primary Disconnects and the top Phase Connectors. Using the original mounting hardware, secure the HV Wires.

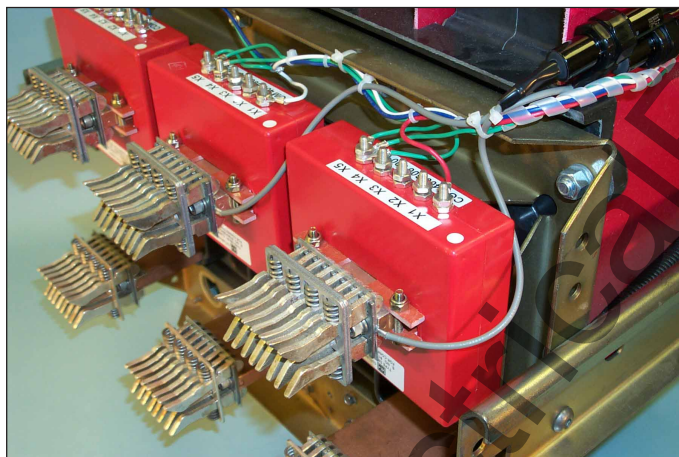
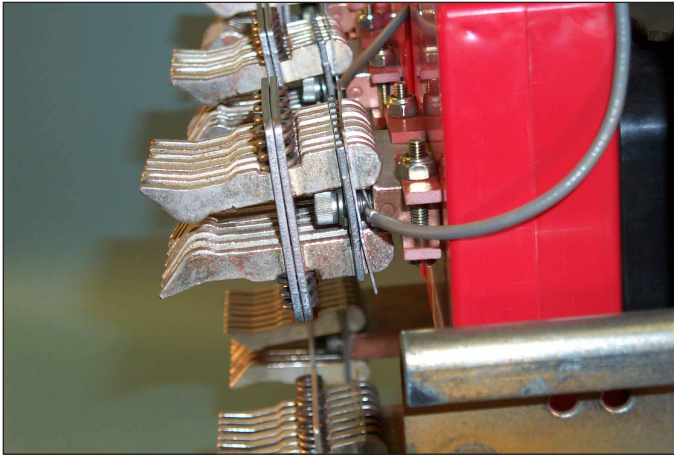


Fig. 29 HV Wires Connected to Top Phase Connectors.

- P. Use the nylon wire ties supplied to secure the HV Wires to the Sensor Harness.

STEP 6: INSTALLING THE DTA ASSEMBLY

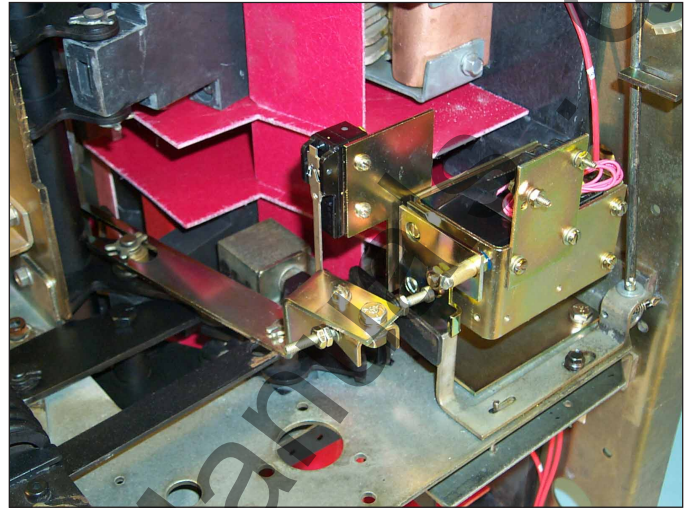


Fig. 30 Overview: DTA Assembly Installed in the Breaker.

For Kits Supplied with an Auxiliary Switch Only.

- Using a set of Diagonals, cut 2.375" from the end of 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 x 1.00" screws, (4) flat washers, (2) lock washers, and (2) nuts supplied.



Fig. 31 Microswitch Installed on the Auxiliary Switch Mounting Bracket.

- Remove and scrap the two existing screws from the top, front of the DTA Assembly. Align the Auxiliary Switch Assembly with the holes

as shown, then secure the Auxiliary Switch Assembly to the DTA using the (2) .164 - 32 x .375" screws, (2) lock washers, and (2) flat washers supplied.

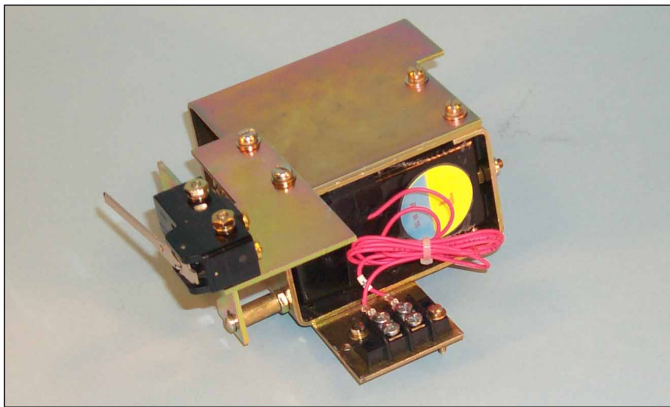


Fig. 32 Auxiliary Switch Assembly Mounted to the DTA Assembly.

For All Retrofit Kits.

D. Lay the Breaker on its left side. Align the DTA Assembly with the existing tapped holes in the Breaker Middle Frame that were used to mount the original Trip Actuator. Apply Loctite® 243 to the threads then secure the DTA Assembly to the Breaker Middle Frame using the (2) .250 - 20 x .750" bolts, (2) lock washers, and (2) flat washers supplied.

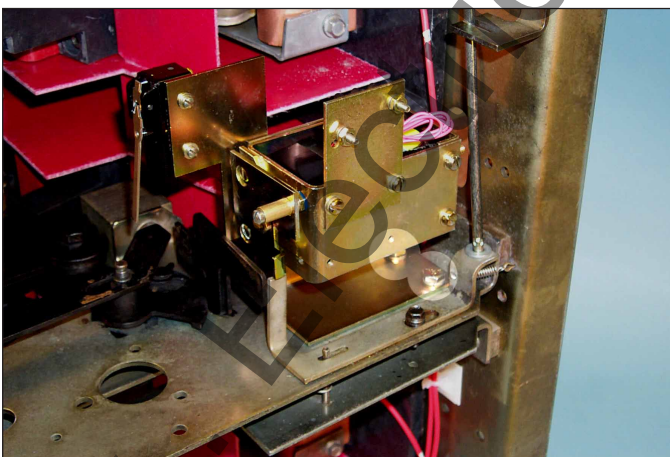


Fig. 33 DTA Assembly Installed in the Breaker.

E. Align the Reset Arm with the Phase 2 Insulating Link Pin and the pivot pin from which the original Reset Lever was removed. Secure the Reset Arm to the pivot pin using the (1) .250" flat washer and (1).312" "X" washer supplied. Make sure the Reset Arm properly engages the Insulating Link Pin and is installed under the existing "X" washer.

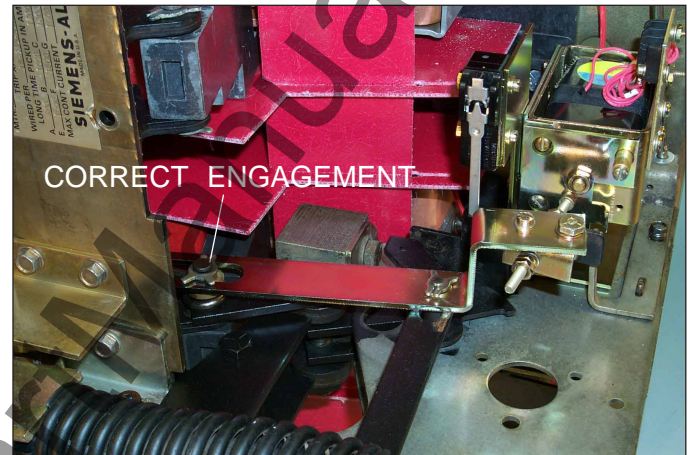


Fig. 34 Reset Arm Installed in the Breaker.

F. Measure the gap between the back of the DTA Trip Finger Plate and the Bearing Plate. The gap should be .055". Also measure the gap between the lip of the Trip Finger and the Breaker Trip Plate. The gap should be .281" with the Breaker in the "Open" position. If the gaps are incorrect, turn the Trip Finger adjusting nut until the correct gaps are achieved.

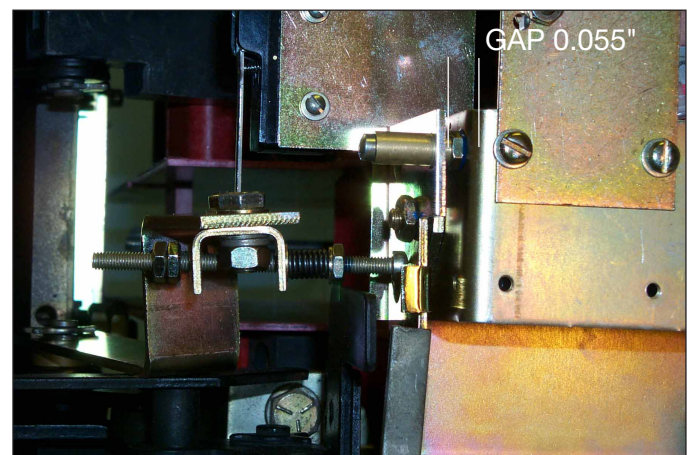


Fig. 35 Correct Gap between the DTA Trip Finger Plate and Bearing Plate.

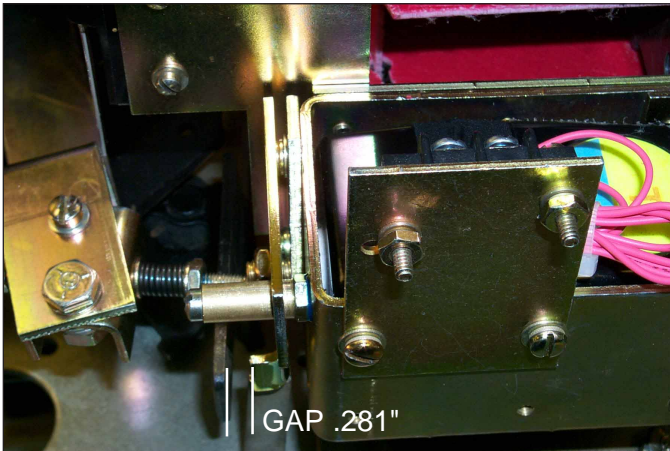


Fig. 36 Correct Gap between the DTA Trip Finger and the Breaker Trip Plate.

Once the correct gaps are achieved, back off the adjusting nut on the DTA Shaft, apply Loc-Tite 243 to the threads, then reset the adjusting nut. Verify that the correct gaps have again been achieved.

NOTE: The nut nearest to the head of the Reset Adjustment Screw has been factory set and locked. During the following adjustment procedure, if proper adjustment can not be achieved, the Retrofitter may have to break this nut loose. If this case occurs, the nut will have to be “re-locked” with Loc-Tite 243.

- G. Using the adjusting nuts on the end of the Reset Arm adjusting screw, turn the adjusting nuts until a cage height on 0.50" is achieved.

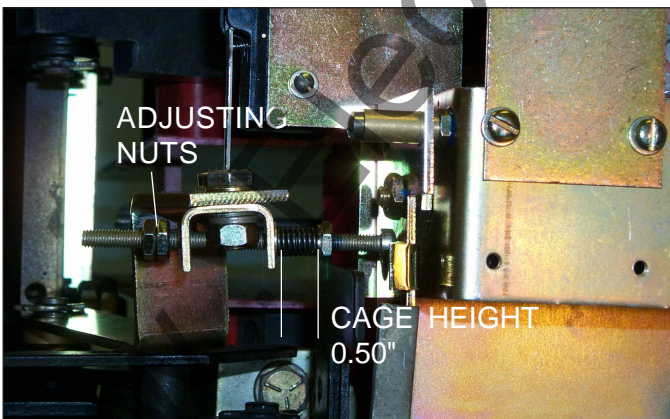


Fig. 37 Correct Cage Height on the Reset Arm Adjusting Screw.

Once the correct cage height is achieved, back off the adjusting nuts, apply Loc-Tite 243 to the threads, then reset the adjusting nuts. Verify that the correct cage height has again been achieved.

- NOTE:** The Reset Arm adjusting screw is longer than necessary. After all adjustments have been made and verified, the excess length of the adjusting screw can be removed to provide clearance within the Breaker.
- H. Connect the DTA Extension Harness wires to the DTA Terminal Block, positive (+) to positive and unmarked to negative.
- I. Secure the DTA Extension Harness away from any moving parts or springs within the Breaker using the self-adhesive mounting pad and wire ties supplied.

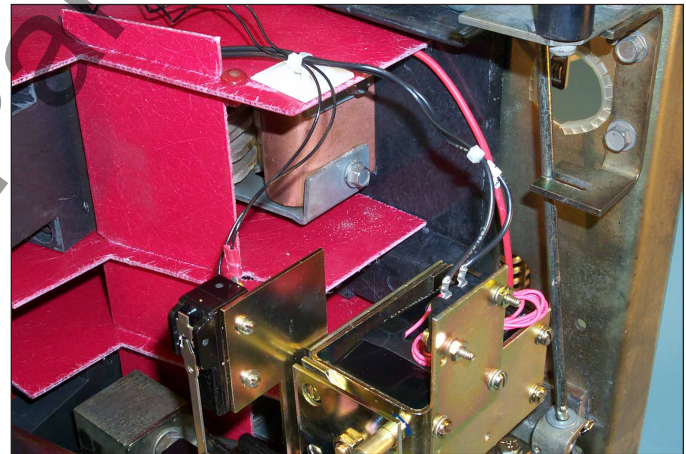


Fig. 38 Connection and Routing of the DTA Extension Harness.

STEP 7: INSTALLING THE EXTERNAL HARNESS AND FINAL WIRING

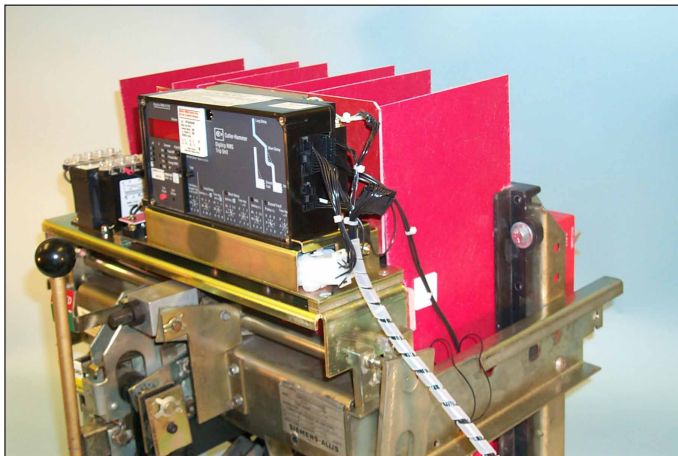


Fig. 39 Overview: External Harness Installed on the Breaker.

A. 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.

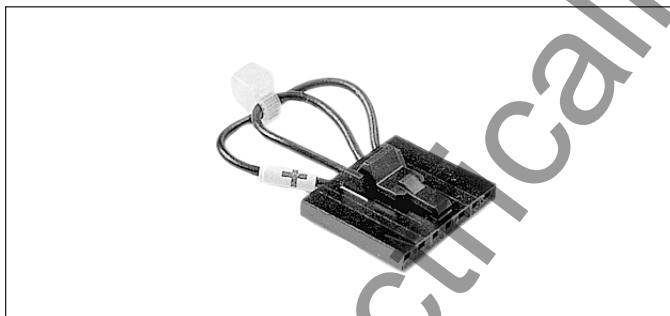


Fig. 40 510 Basic Kit External Harness Shorting Plug.

B. For Kits Supplied with a PT Module Only: Plug the connector from the PT Module into its receptacle on the External Harness.

C. For Kits Supplied with an Auxiliary Switch Only: Route the two (2) wires (with ring terminals) from the External Harness, down through the Breaker, along the outside of the right Phase Insulation Barrier, to the Auxiliary Switch. Connect one (1) wire to the normally “Open”

terminal and the other wire to the “Common” terminal of the Auxiliary Switch (middle terminal and terminal closest to the right side of the Breaker).

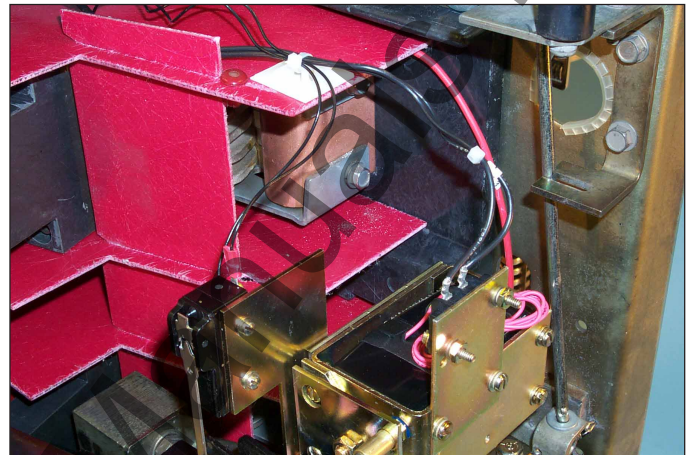


Fig. 41 External Harness Wires Connected to the Auxiliary Switch.

D. For Kits Supplied with a Breaker Mounted CPT Only: 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.

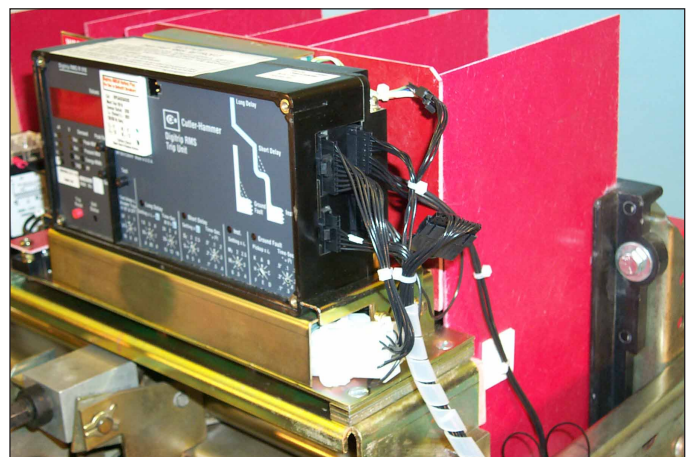


Fig. 42 External Harness Connections at the Trip Unit.

- E. Remove and scrap the rear screw that secures the right Trip Unit Support Clip to the Aux. CT Module. Secure the External Harness to the right rear corner of the Aux. CT Module using the (1) wire clamp, (1) .190 - 32 x .500" screw, (1) lock washer, and (1) flat washer supplied.

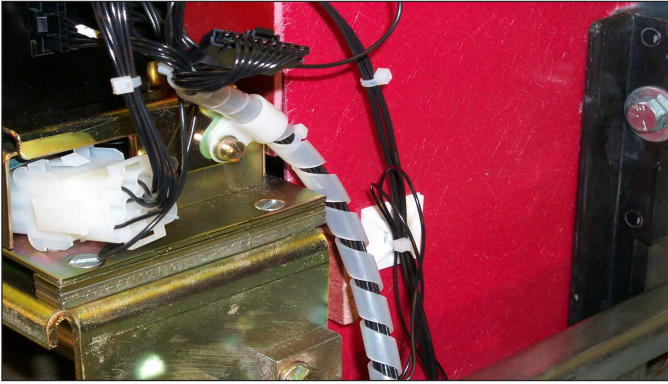


Fig. 43 External Harness Secured to the Aux. CT Module.

- F. Use the self-adhesive mounting pads and wire ties supplied to dress all wires and harnesses to keep them away from any moving parts or springs within the Breaker.
- G. Install the Digitrip Retrofit Label on the top of the Trip Unit. ♦
- H. Reinstall Breaker Cover using the original hardware removed in Step 2-A.

- I. *For Kits Supplied with a Breaker Mounted CPT Only:* Attach the appropriate CPT Voltage Warning Label for the Breaker on the outside of the Breaker Cover. If the Retrofitter opts to attach this label in a different position, it must be in a prominent position.

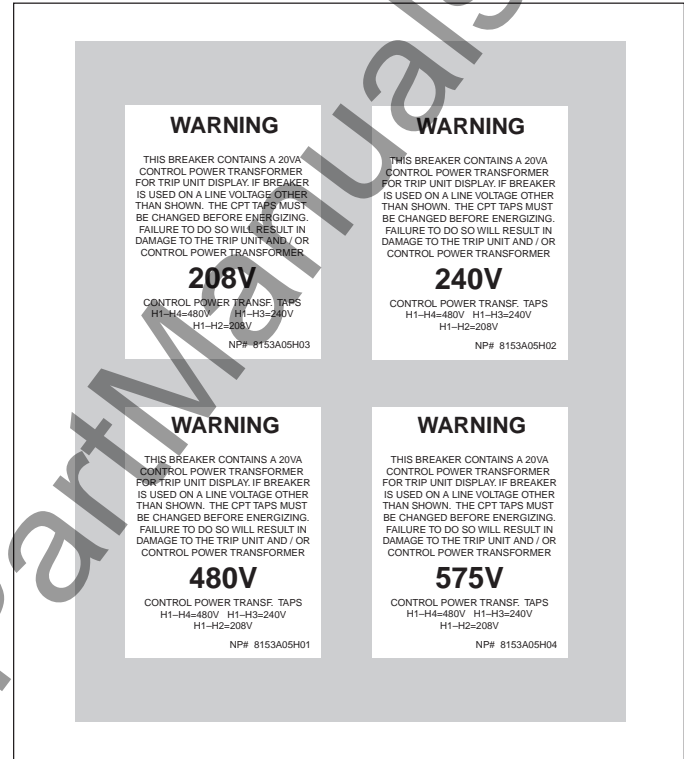


Fig. 44 Supplied CPT Voltage Labels.



Fig. 45 CPT Voltage Label Installed on the Breaker Cover.

STEP 8: 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 9: MOUNTING THE CELL HARNESS

- A. The Cell Harness is to be mounted in the Breaker Cell. The connector end is to be mounted in 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 10: INSTALLING THE RETROFITTED
BREAKER IN THE CELL**

 **WARNING**

DO NOT LEAVE THE BREAKER IN AN INTER-MEDIATE 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-1600 Gold Breaker RMS/R Retrofits

Step	Description	Qty.	Comment	
Step 3	Sensor	8184A38H01	3	
	Sensor	8184A45H01	3	Optional Sensor
	Sensor Harness	See Pick List	1	
	Sensor Harness Parts	9A10120G10	1	
	Mounting Pad - 1 ", Self Adhesive		3	
	Wire Tie Nylon		5	
	Sensor Mounting Parts	9A10120G04	1	
	Spacer		6	
	.190-32 × 1.25 Lng. Screw Fil.		6	
	.190 Flat Washer Stl.		12	
	.190-32 Nut Hex Nyloc		6	
	Mounting Pad - 1 ", Self Adhesive		6	
	Wire Tie Nylon		11	
	Step 4	PT Module	6502C82G01	1
Ring Terminal (.190, .250, .312, .375, .500 - Each Size)			3	
.138-32 × .500 Lng. Screw Fil.			2	
.138 Flat Washer Stl.			4	
.138 Lock Washer Stl.			2	
.138-32 Nut Hex Stl.			2	
Trip Unit		See Pick List	1	
Rating Plug		See Pick List	1	
Aux. CT Module		6506C59G__	1	
Trip Unit Assembly Parts		9A10120G08	1	
Support Clip R. H.			1	
Support Clip L. H.			1	
Insulation Barrier			1	
Spacer Brass			2	
.190-32 × 4.00 Lng. Screw Fil.			2	
.190-32 × .375 Lng. Screw Fil.			6	
.190 Flat Washer Stl.			8	
.190 Lock Washer Stl.			8	
Nameplate Digitrip Retrofit			1	
Trip Unit Mounting Parts		9A10120G09	1	
Mounting Bracket			1	
Spacer Aux. CT Module			6	
.250-20 × 1.25 Lng. Bolt Stl.			4	
.250 Flat Washer Stl.			4	
.250 Lock Washer Stl.			4	
.250-20 Nut Hex Stl.			4	
.190-32 × 1.00 Lng. Screw F. H.			4	
.190 Flat Washer Stl.			4	
.190 Lock Washer Stl.			4	
.190-32 Nut Hex Stl.			4	

Step	Description	Qty.	Comment
	Breaker Mounted CPT Kit	1	CPT Only
	MTE Transformer	1	
	HV Fused Wires	2	
	CPT Wires	1	
	Ring Terminal (.138, .190, .250, .312, .375, .500 - Each Size)	2	
	Warning Label (208, 240, 480, & 575 Volt - Each)	1	
	CPT Mounting Parts	1	
	.190-32 × .750 Lng. Screw Fil.	4	
	.190 Flat Washer Stl.	8	
	.190 Lock Washer Stl.	4	
	.190-32 Nut Hex Stl.	4	
Step 5	.250-20 × 1.25 Lng. Bolt Stl.	4	From Step 4
	.250 Flat Washer Stl.	4	
	.250 Lock Washer Stl.	4	
	.250-20 Nut Hex Stl.	4	
	DTA Extension Harness	1	From Step 6
	Ring Terminal (.190, .250, .312, .375, .500 - Each Size)	3	Comm. Only, From Step 4
	HV Fused Wires	2	CPT Only, From Step 4
	Ring Terminal (.138, .190, .250, .312, .375, .500 - Each Size)	2	
	Finger-Safe Cover Kit	1	CPT Only
	Cover (A, B, C, & D Each)	1	
	.098-28 × .375 Lng. Screw Fil.	4	
	Mounting Pad - 1", Self Adhesive	2	From Step 3
	Wire Tie Nylon	4	
Step 6	Auxiliary Switch Kit	1	Comm. Only
	Microswitch	1	
	Mounting Bracket	1	
	.164-32 × .375 Lng. Screw P. H.	2	
	.164 Flat Washer Stl.	2	
	.164 Lock Washer Stl.	2	
	.138-32 × 1.00 Lng. Screw Fil.	2	
	.138 Flat Washer Stl.	4	
	.138 Lock Washer Stl.	2	
	.138-32 Nut Hex Stl.	2	
	DTA Assembly Parts	1	From Step 3
	DTA Assembly	1	
	DTA Extension Harness	1	
	.250-20 × .750 Lng. Bolt Stl.	2	
	.250 Flat Washer Stl.	2	
	.250 Lock Washer Stl.	2	
	Loc-Tite® 243	1	
	DTA Reset Parts	1	
	Reset Arm Assembly	1	
	.312 "X" Washer Stl.	1	
	.250 Flat Washer Stl.	1	
	Mounting Pad - 1", Self Adhesive	2	From Step 3

Step	Description	Qty.	Comment
	Wire Tie Nylon	2	From Step 3
Step 7	External Harness	6502C83G__	1
	External Harness Mounting Parts	9A10120G12	1
	.190-32 x .500 Lng. Screw Fil.	1	} Comm. Only
	.190 Flat Washer Stl.	1	
	.190 Lock Washer Stl.	1	
	Wire Clamp Nylon	1	
	Warning Label (208, 240, 480, & 575 Volt - Each)	1	CPT Only, From Step 4
	Mounting Pad - 1", Self Adhesive	9	} From Step 3 & 4
	Wire Tie Nylon	16	
Step 9	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

<i>Decimal Size (in)</i>	<i>Standard Size</i>	<i>Torque (in-lbs)</i>	<i>Torque (ft-lbs)</i>
.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

<i>Decimal Size (in)</i>	<i>Standard Size</i>	<i>Torque (in-lbs)</i>	<i>Torque (ft-lbs)</i>
.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. 46 Retrofit Components

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

Notes

www.ElectricalPartManuals.com

Notes

www.ElectricalPartManuals.com

Notes

www.ElectricalPartManuals.com

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.

NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, OR WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE, ARE MADE REGARDING THE INFORMATION, RECOMMENDATIONS AND DESCRIPTIONS CONTAINED HEREIN. In no event will Cutler-Hammer be responsible to the user in contract, in tort (including negligence), strict liability or otherwise, for any special, indirect, incidental, or consequential damage or loss whatsoever, including but not limited to damage to or loss of use of equipment, plant or power system, cost of capital, loss of profits or revenues, cost of replacement power, additional expenses in the use of existing power facilities, or claims against the user by its customers resulting from the use of the information, recommendations, and descriptions contained herein.

Cutler-Hammer

Pittsburgh, Pennsylvania U.S.A.

Publication No. I.B. 33-A2C-1
November 2001
Printed in U.S.A./TBG00052

EATON