



Digitrip Retrofit System for the General Electric AKR 6D/7D-30/50 and AKRT 6D/7D-50 Series 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 the General Electric AKR 6D-50 and AKRT 6D-50 Series Breakers

CONTENTS

Description

- Introduction 4
- Step 1: General Breaker Preparation 5
- Step 2: Removing the Original Components 6
- Step 3: Installing the Sensors and Sensor Harness (Partial) 6
- Step 4: Installing the Breaker Mounted CPT ... 8
- Step 5: Installing the Aux. CT Module and PT Module (If Applicable) 12
- Step 6: Installing the Auxiliary Switch 15
- Step 7: Installing the DTA and Reset Assemblies 17
- Step 8: Installing the Trip Unit 21
- Step 9: Final Wire Dressing and Label Installation 24
- Step 10: Testing the Breaker 25
- Step 11: Mounting the Cell Harness 26
- Step 12: Installing the Retrofitted Breaker in the Cell 27

Figures

- 1. Original Components Removed from the Breaker. 6
- 2. Overview: Sensors and Sensor Harness Installed in the Breaker. 6
- 3. Sensor Harness Connected to the Sensors. 7
- 4. Shields Installed Over the Sensors. 7

- 5. Copper Connectors Reinstalled in the Breaker. 7
- 6. Overview: Breaker Mounted CPT Installed in the Breaker. 8
- 7. Fuse Clips and Spade Connector Removed from the CPT. 8
- 8. Correct Orientation of the CPT "H" and "X" Terminals. 8
- 9. Load and Line Sides of the HV Wires. 9
- 10. HV and CPT Wires Connected to the CPT. ... 9
- 11. Hardware to be Removed from the Right Side of the Breaker. 10
- 12. CPT Assembly Mounted in the Breaker and Location of the HV Fuses. 10
- 13. Breaker Stabs Drilled and Tapped for HV Wire Connection. 11
- 14. Routing of the HV Line Side Wires. 11
- 15. Overview: Aux. CT Module Installed in the Breaker. 12
- 16. Aux. CT Module Mounting Bracket Secured to the Aux. CT Module. 12
- 17. PT Module Assembly Ready for Installation. 13
- 18. PT Module Assembly Mounted to the Aux. CT Module Assembly. 13
- 19. Aux. CT Module Installed in the Breaker. 13
- 20. Correct Location of the Aux. CT Module Pigtail. 14
- 21. Sensor Harness Connected to the Aux. CT Module. 14



22. Ground Wire Connected to the Aux. CT Module.	14	46. Auxiliary Switch Wires Connected to the Auxiliary Switch.	23
23. PT Wires Attached to the Copper Connectors.	15	47. Trip Unit Assembly Mounted to the Left Breaker Frame.	24
24. Overview: Auxiliary Switch Installed on the Breaker.	15	48. Overview: Final Wiring Dressing.	24
25. Microswitch Attached to the Auxiliary Switch Mounting Bracket.	15	49. Suggested Locations for the Digitrip, PT Module, and CPT Labels on the Breaker Cover.	25
26. Drilling Plan "A".	16	50. Retrofit Components.	32
27. Auxiliary Switch Assembly Mounted to the Breaker.	16		
28. DTA and Reset Assemblies Installed in the Breaker.	17		
29. Trip Finger Extension Plate Installed on the Trip Finger.	17		
30. Reset Pivot Assembly Screw Locations.	17		
31. Reset Pivot Assembly Arm Attached to the Breaker Jack Shaft Pin.	18		
32. DTA Assembly Mounted to the Breaker Shelf.	18		
33. Correct Orientation of the DTA Gap Adjustment Screw to the Trip Finger.	18		
34. Reset Link Installed in the Breaker.	19		
35. Adjusting the Gap Between the Trip Finger and DTA Gap Adjusting Screw.	19		
36. Adjusting the Cage Height.	20		
37. DTA Extension Harness Connected to the DTA Terminal Block.	20		
38. DTA Extension Harness Connected to the Aux. CT Module.	20		
39. Overview: Trip Unit Installed on the Breaker.	21		
40. Drilling Plan "B".	21		
41. Trip Unit Mounting Bracket Mounted to the Trip Unit Box.	21		
42. Location of the Edge Card Receptacle, Communications Harness Connector, and ATR in the Trip Unit Box.	22		
43. Trip Unit Installed in the Trip Unit Box.	22		
44. 510 Kits External Harness Shorting Plug.	22		
45. Harnesses Connected to the Trip Unit and External Harness.	23		

Tables

1. Available Retrofit Kits	4
2. Sensor Taps Rating	7
3. CPT High Voltage Taps for Standard and Special Order CPTs	9
4. CPT Low Voltage Taps for Standard and Special Order CPTs (After Removing Fuse Clips)	9
5. Torque Values for General Mounting and Screw Size Conversion	31
6. Torque Values for Copper BUS Connectors	31

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.

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.

 **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.

STEP 2: REMOVING THE ORIGINAL COMPONENTS

Follow the G.E. Instruction Manual, originally supplied with the Breaker, to perform the following procedures.

- A. Remove and scrap the original Trip Unit, associated wiring, and all mounting hardware.
- B. Remove and scrap the original Trip Actuator, Trip Components, associated wiring, and all the mounting hardware.

NOTE: Do not remove the original Trip Finger. It will be used in the Retrofit Process.

- C. Remove and save the original Copper Connectors, Spacers, and all mounting hardware.
- D. Remove and scrap the original Sensors and Sensor Harness.



Fig. 1 Original Components Removed from the Breaker.

NOTE: While it is not necessary for the Retrofit, removing the Breaker Front Covers will make the Retrofit Process easier.

STEP 3: INSTALLING THE SENSORS AND SENSOR HARNESS (PARTIAL)



Fig. 2 Overview: Sensors and Sensor Harness Installed in the Breaker.

- A. Tilt the Breaker towards the back until it rests on the bottom Finger Clusters. This will provide access to the bottom of the Breaker.
- B. Set the three (3) Sensors in front of the Breaker, roughly positioned near each bottom Breaker Stab.

NOTE: The Sensor Terminals must be positioned as shown to reduce the possibility of Arcing to the Breaker Frame.

- C. Place the Sensor Harness near the Sensors, then connect the ring terminals of the Sensor Harness to the Sensor Terminals. Refer to Section 12 of the Retrofit Application Data, supplied with the Retrofit Kit, for detailed wiring specifications.



Fig. 3 Sensor Harness Connected to the Sensors.

For AKR 6D/7D and AKRT 6D/7D Retrofits, the following conventions apply.

Table 2 Sensor Taps Rating

Sensor Style No.	Terminal Com.	Amps
4A35745H01	X1-X2 =	400A
	X1-X3 =	800A
4A35746H01	X1-X2 =	800A
	X1-X3 =	1,600A
8259A59H01	X1-X2 =	2,000A

- D. Slide one Sensor over each Breaker Stab and route the Sensor Harness towards the bottom of the Breaker
- E. Slide a Sensor Shield over each Breaker Stab, positioned as shown.



Fig. 4 Shields Installed Over the Sensors.

- F. Using the original hardware removed in Step 2-C, reinstall the Spacers and Copper Connectors.

For Kits Supplied with a PT Module Only: Do not tighten the pinch bolts that secure the Copper Connectors to the Breaker Stabs. They will be used later in the Retrofit process to connect the PT Wires.

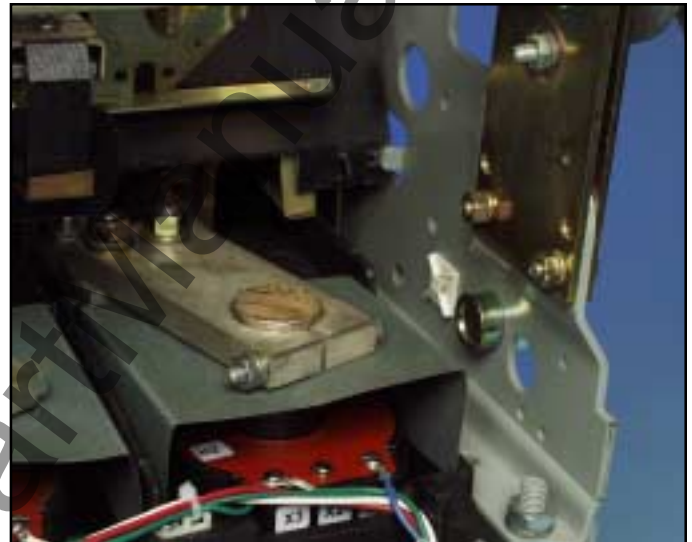


Fig. 5 Copper Connectors Reinstalled in the Breaker.

For Kits Supplied with a Breaker Mounted CPT Only.

STEP 4: INSTALLING THE BREAKER MOUNTED CPT

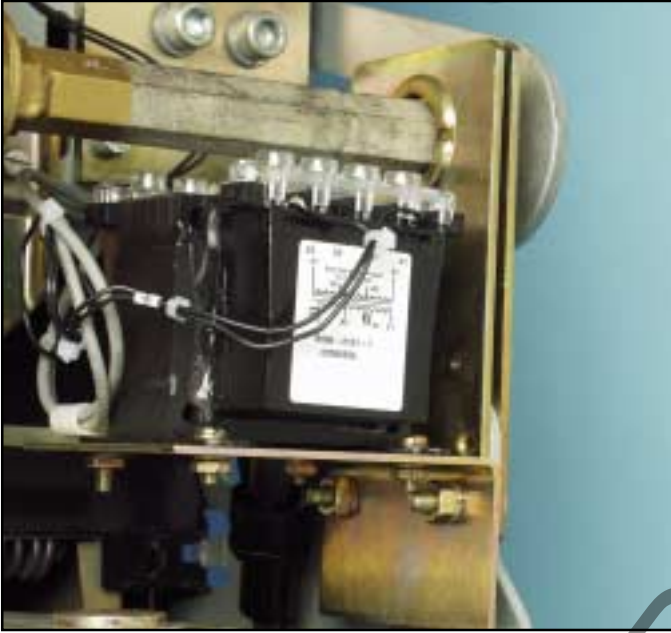


Fig. 6 Overview: Breaker Mounted CPT Installed in the Breaker.

- A. 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. 7 Fuse Clips and Spade Connector Removed from the CPT.

- B. Align the CPT with the holes in the CPT Mounting Bracket, as shown. Note the orientation of the "H" terminals and the "X" terminals to the CPT Mounting Bracket. The CPT must be installed on the Mounting Bracket in the same manner.



Fig. 8 Correct Orientation of the CPT "H" and "X" Terminals.

Secure the CPT to the CPT Mounting Bracket using the (4) .190-32 x .750" screws, (8) flat washers, (4) lock washers, and (4) nuts supplied.

NOTE: Leave the mounting hardware closest to the "X1" terminal loose at this time. It will be used to secure the HV and CPT Wires in the next steps.

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.

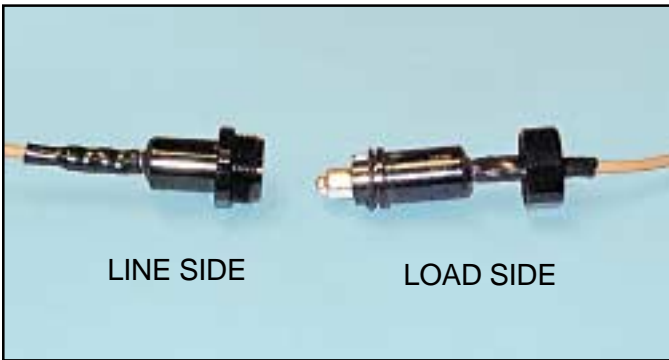


Fig. 9 Load and Line Sides of the HV Wires.

C. During installation of the CPT Assembly in the Breaker, the HV Fuses will be located behind the CPT Assembly (“H” Terminal Side) between the CPT and back of the Breaker. Temporarily place the HV Fuses on the “H” terminal side of the CPT. Route the Load Side HV Wires to the “H” terminals on the CPT. Mark and cut the Load Side of each HV Wire to an appropriate length for connection to the CPT. Strip an appropriate length of insulation from the Load Side HV Wires and attach a .190” ring terminal to each. Attach the HV Wires to the CPT terminals to achieve the required voltage (see Table 3 & 4).

Table 3 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

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.

D. Connect the CPT Wires to the appropriate “X” terminals of the CPT Module as shown. See Table 4 for Tap information.

Table 4 CPT Low Voltage Taps for Standard and Special Order CPTs (After Removing Fuse Clips)

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

E. Using the hardware left loose in Step 4-B and the cable clamp and wire ties supplied, secure the Load Side HV Wires and the CPT Wires to the CPT Assembly.



Fig. 10 HV and CPT Wires Connected to the CPT.

- F. After the HV and CPT 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 × .375" screws supplied with the CPT Kit. Torque the screws to 8 - 10 in./lbs.

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

- G. Remove and discard the existing hardware securing the Racking Shaft Bracket to the right side of the Breaker.



Fig. 11 Hardware to be Removed from the Right Side of the Breaker.

- H. Temporarily route the Line Side HV Wires through the existing hole near the bottom left corner of the molded Breaker Back Plate.
- I. Align the CPT Assembly and the Racking Shaft Bracket with the holes in the right side of the Breaker. Secure the CPT Assembly and the Racking Bar Bracket to the Breaker using the (2) .250-20 × 1.00" bolts, (2) lock washers, and (2) nuts supplied.



Fig. 12 CPT Assembly Mounted in the Breaker and Location of the HV Fuses.

NOTE: The power convention of Circuit Breakers is normally Top to Bottom, meaning the Top Breaker Stabs 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 pinch bolts that secure the Copper Connectors can be used for HV Wire attachment.

- J. Using a #19 (.166") drill bit, drill and tap two (2) of the Phase 1, 2, or 3 Breaker Stabs to accept a .190-32 × .375" screw. The holes should be drilled approximately one (1) inch from the end of the Breaker Stab. As you are drilling, insure that no drill shavings fall into the Breaker

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 Breaker Stabs.



Fig. 13 Breaker Stabs Drilled and Tapped for HV Wire Connection.



Fig. 14 Routing of the HV Line Side Wires.

- K. Route the HV Line Side Wires up towards the appropriate top Breaker Stabs. Cut each HV Wires to an appropriate length, then strip .250" from each wire and attach a .190" ring terminal to each.
- L. Connect the Line Side HV Wires to the appropriate Breaker Stabs using the (2) .190-32 x .375" screws, (2) lock washers, and (2) flat washers supplied.
- M. Use the nylon wire ties provided to dress all the HV Wires to keep them away from the Finger Clusters and any moving parts within the Breaker.

STEP 5: INSTALLING THE AUX. CT MODULE AND PT MODULE (IF APPLICABLE)

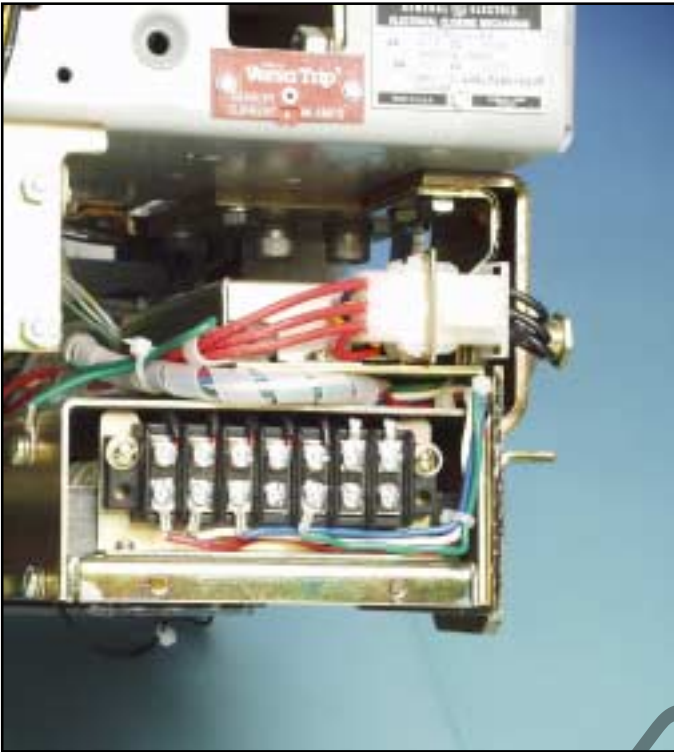


Fig. 15 Overview: Aux. CT Module Installed in the Breaker.

- A. Remove and save the two (2) screws from the bottom right side of the Aux. CT Module.
- B. Align the holes in the Aux. CT Module Mounting Bracket with the holes in the right side of the Aux. CT Module as shown.
- C. Secure the Mounting Bracket to the Aux. CT Module using the (4) .190-16 × .500" thread cutting screws and (4) lock washers supplied.



Fig. 16 Aux. CT Module Mounting Bracket Secured to the Aux. CT Module.

For Kits Supplied with a PT Module Only.

- D. Remove and save the hardware securing the PT Module Warning Label Plate to the PT Module.
- E. Remove and scrap the hardware securing the PT Module Connector Bracket to the PT Module Warning Label Plate. Scrap the PT Module Warning Label Plate.
- F. Using the hardware removed in Step 5-D, secure the PT Module Connector Bracket to the left side of the PT Module, as shown.
- G. Align the PT Module with the holes in the PT Module Mounting Bracket, as shown. Secure the PT Module to the mounting Bracket using the (2) .138-32 × .375" screws, (2) flat washers, (2) lock washers, and (2) nuts supplied.
- H. Secure the PT Wires to the PT Module Mounting Bracket, as shown using the (2) wire clamps, (2) .164-32 × .500" screws, and (2) Nylock nuts supplied.



Fig. 17 PT Module Assembly Ready for Installation.

- I. Align the PT Module Assembly with the existing holes in the Aux. CT Module Mounting Bracket, as shown. Secure the PT Module Assembly to the Aux. CT Assembly using the (2) .250-20 x .500" bolts and (2) lock washers supplied.

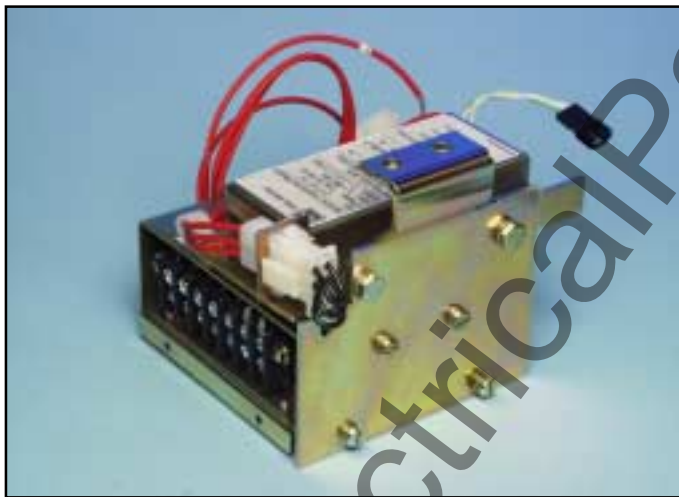


Fig. 18 PT Module Assembly Mounted to the Aux. CT Module Assembly.

- J. Plug the PT Extension Harness into the receptacle on the PT Harness.

For All Kits.

- K. Temporarily route the Aux. CT Extension Harness down from the top right corner of the Breaker to the bottom right corner near the existing cutout.

For Kits Supplied with a PT Module Only: Temporarily route the PT Extension Harness up the right side of the Breaker, then along the bottom of the Breaker Shelf towards the left side of the Breaker.

NOTE: The Aux. CT Harness and, if applicable, the PT Extension Harness will be connected to the Trip Unit later in the Retrofit Process.

- L. Remove and scrap the two (2) bolts, washers, and nuts from the right front corner of the Breaker Shelf that secure the right Racking Pin Assembly to the Breaker.
- M. Set the Aux. CT Module near the bottom front right corner of the Breaker. Connect the Aux. CT Extension Harness to the Aux. CT Module Pigtail. Align the holes in the Aux. CT Module Mounting Bracket and the original Racking Pin Assembly, as shown, with the holes from which the bolts were just removed. Secure the original Racking Pin Assembly and the Aux. CT Module Assembly to the Breaker using the (2) .250-20 x 1.00" bolts, (2) flat washers, (2) lock washers, and (2) nuts supplied. As you are mounting the Aux. CT Module Assembly to the Breaker, insure that the Aux. CT Pigtail Connector is located as shown in Fig. 20 and that the Aux. CT Extension Harness is clear of all moving parts within the Breaker.

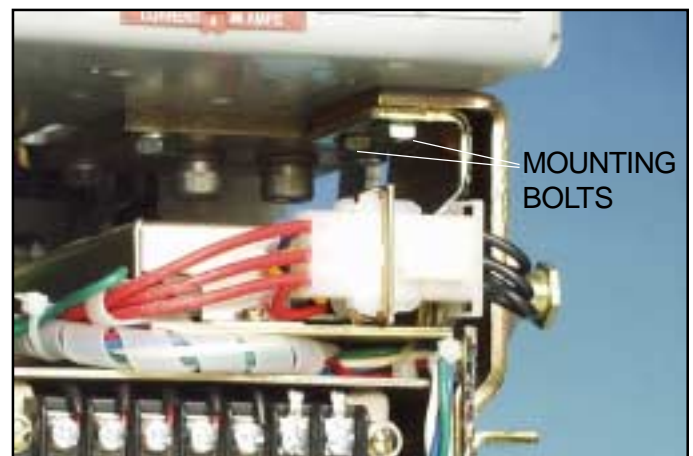


Fig. 19 Aux. CT Module Installed in the Breaker.

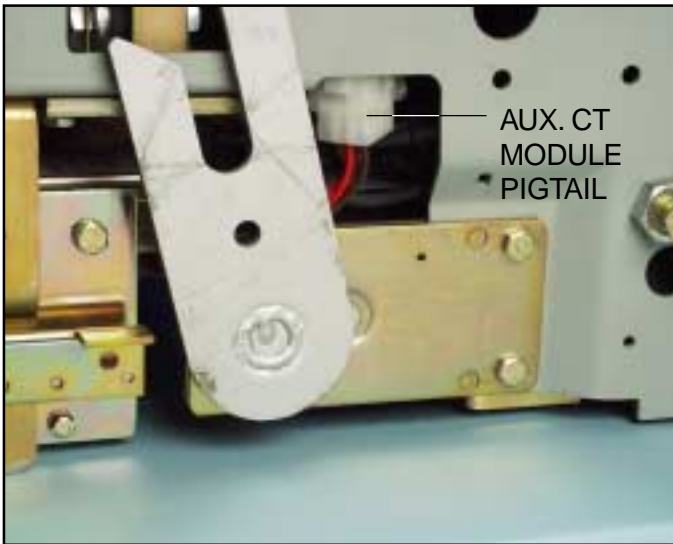


Fig. 20 Correct Location of the Aux. CT Module Pigtail.

- N. Connect the Sensor Harness to the proper terminals on the Aux. CT Module. Refer to Section 12 of the Retrofit Application Data, supplied with the Retrofit Kit, for detailed wiring specifications.

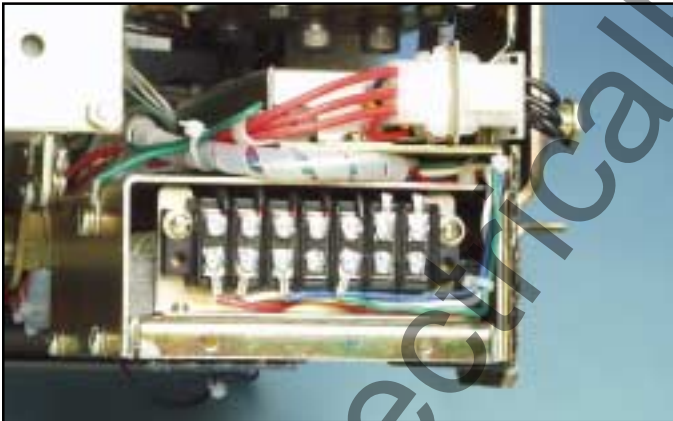


Fig. 21 Sensor Harness Connected to the Aux. CT Module.

- O. Using the (1) .190-16 x .500" thread cutting screw, connect the green ground wire from the Sensor Harness (with ring terminal) to the Aux. CT Module. Fig. 22 Ground Wire Connected to the Aux. CT Module

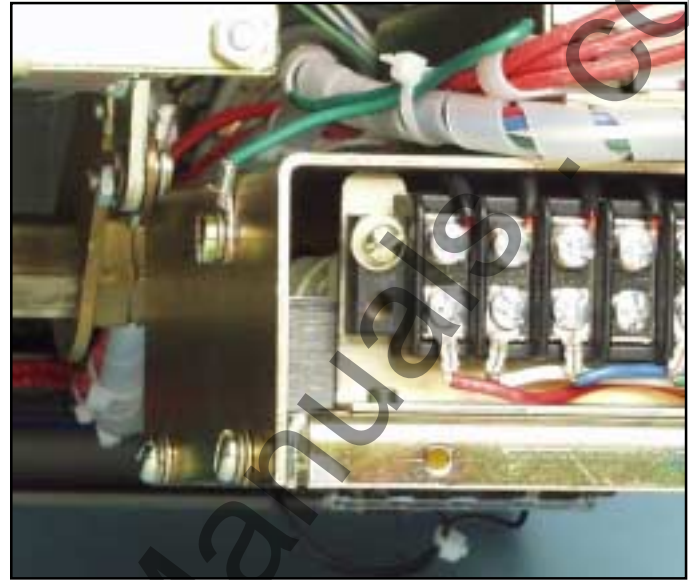


Fig. 22 Ground Wire Connected to the Aux. CT Module.

- P. For Kits Supplied with a PT Module Only: 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 pinch bolts, left loose in Step 3, securing each Copper Connector. Move the PT Wire markers to a position where they will still be attached to the wires after cutting. Cut the wires to length, strip each wire .250", and install a .250" ring terminal on each wire. Remove the nuts and washers from the pinch bolts. Using the hardware just removed, connect the PT Wires to the Copper Connectors.



Fig. 23 PT Wires Attached to the Copper Connectors.

- Q. Use the wire ties supplied to secure the Sensor Harness and, if applicable, PT Wires clear of any moving parts within the Breaker.

For Kits Supplied with an Auxiliary Switch Only.

STEP 6: INSTALLING THE AUXILIARY SWITCH



Fig. 24 Overview: Auxiliary Switch Installed on the Breaker.

- A. Using a pair of diagonals, cut 1.50" off the end of the Microswitch Arm.
- B. Attach the Microswitch to the Auxiliary Switch Mounting Bracket, as shown, using the (2) .138-32 x 1.00" screws, (2) lock washers, (4) flat washers, and (2) nuts supplied.

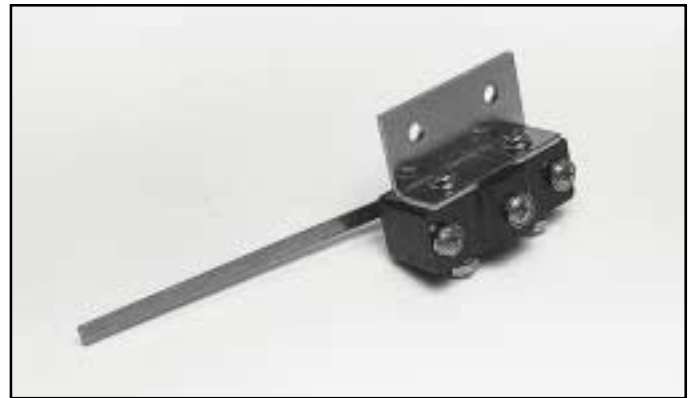


Fig. 25 Microswitch Attached to the Auxiliary Switch Mounting Bracket.

- C. If the holes do not already exist in the top of the right Breaker Frame, use Drilling Plan "A" to drill two (2) .140" holes in the right Breaker Frame. After drilling, tap these holes to accept .164-32 screws. Care should be taken during drilling and tapping to insure that no metal shavings fall into the Breaker.

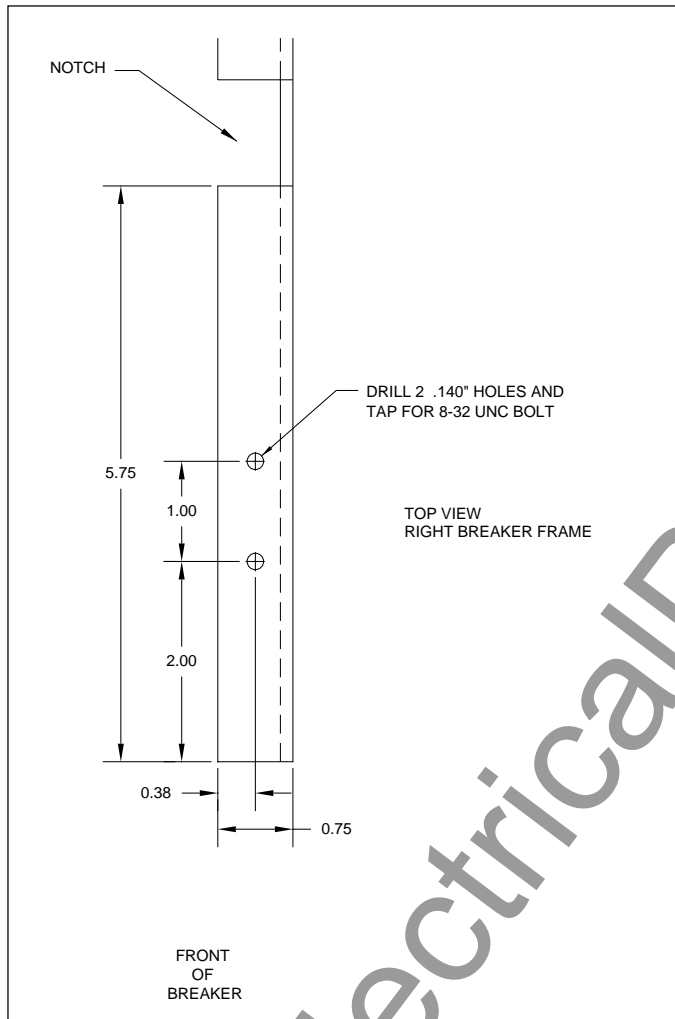


Fig. 26 Drilling Plan "A".

- D. Align the Aux. Switch Assembly with the holes in the top of the right Breaker Frame. Secure the Aux. Switch Assembly, in the position shown, to the Breaker using the (2) .164-32 .375" screws and (2) lock washers supplied.

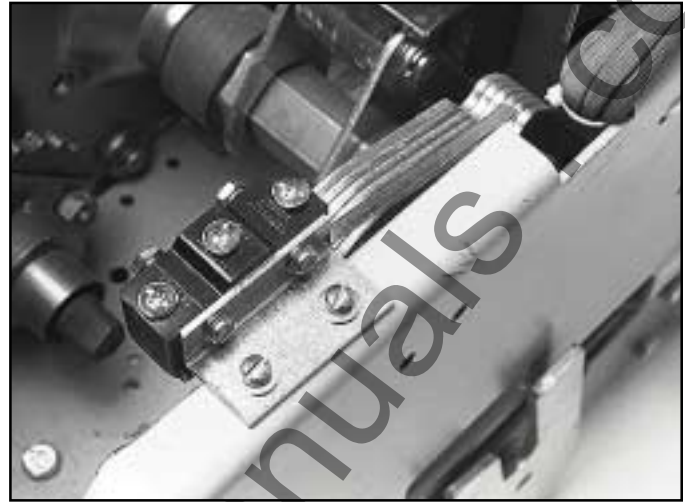


Fig. 27 Auxiliary Switch Assembly Mounted to the Breaker.

STEP 7: INSTALLING THE DTA AND RESET ASSEMBLIES



Fig. 28 DTA and Reset Assemblies Installed in the Breaker.

A. Remove the cap screw securing the existing Trip Finger to the Breaker Cross Bar. Align the Trip Finger Extension Plate with the hole in the existing Trip Finger. Secure the Trip Finger Extension Plate to the Trip Finger using the original hardware.



Fig. 29 Trip Finger Extension Plate Installed on the Trip Finger.

B. Align the threaded holes in the Reset Pivot Assembly with the existing holes in the top of the Breaker Shelf. Apply Loc-Tite® 243 to the threads then, working from the bottom of the Breaker Shelf, mount the Reset Pivot Assembly using the (2) .164-32 x .375" screws, (2) lock washers, and (2) flat washers supplied.

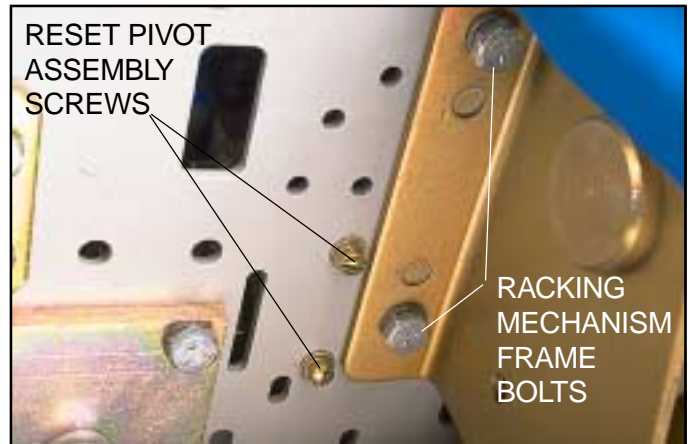


Fig. 30 Reset Pivot Assembly Screw Locations.

C. Connect the Reset Pivot Assembly Arm to the existing pin on the Breaker Jack Shaft, as shown. Secure the Reset Pivot Assembly Arm to the pin using the .250" "E-clip" supplied.



Fig. 31 Reset Pivot Assembly Arm Attached to the Breaker Jack Shaft Pin.

- D. Remove and scrap the original hardware securing the left side Racking Mechanism Frame to the bottom of the Breaker Shelf. (See Fig. 30 for bolt location.)

Align the DTA Assembly and the Racking Mechanism Frame with the existing threaded holes in the bottom of the Breaker Shelf. Apply Loc-Tite® 243 to the threads then secure the DTA Assembly to the Breaker Shelf using the (2) .250-20 × .750" bolts, (2) lock washers, and (2) flat washers supplied. Note the orientation of the DTA Gap Adjustment Screw to the Trip Finger.



Fig. 32 DTA Assembly Mounted to the Breaker Shelf.

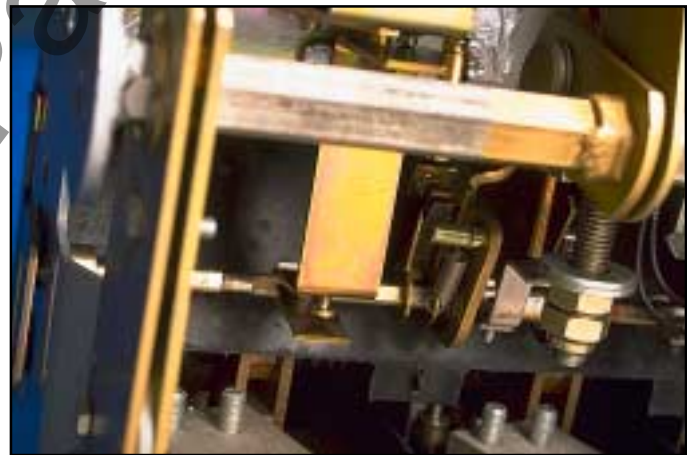


Fig. 33 Correct Orientation of the DTA Gap Adjustment Screw to the Trip Finger.

- E. Remove the flange nut from the end of the DTA Shaft. Insert the Reset Arm through the existing rectangular cut-out in the Breaker Shelf then attach the Reset Arm to the DTA Assembly using the pivot pin and (2) .188 "X" washers supplied. Apply Loc-Tite 243® to the threads of the DTA Shaft then reinstall the flange nut.

- F. Install the Reset Link through the Reset Pivot Assembly, as shown. Secure the Reset Arm to the Reset Pivot Assembly using the cotter pins, flat washers, and lock nut supplied. Note that the flat washers must be installed on both ends of the spring.



Fig. 34 Reset Link Installed in the Breaker.

- G. Adjust the DTA Gap Adjustment Screw to achieve a gap between the screw head and the Trip Finger of approximately .09" to .12".

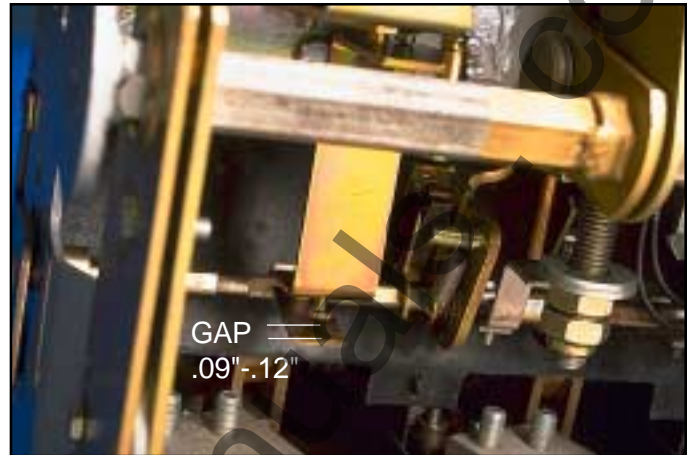


Fig. 35 Adjusting the Gap Between the Trip Finger and DTA Gap Adjusting Screw.

- H. Turn the adjusting nuts on the Reset Link until the cage height (compressed spring length) is .690". This should create a reset force of 12 to 15 lbs. when measured on the Reset Arm near the DTA flange nut. If either of these specifications are not met, adjust the nuts on the Reset Link until these specifications are achieved.



Fig. 36 Adjusting the Cage Height.

- I. Connect the DTA Extension Harness to the Terminals on the DTA Terminal Block.

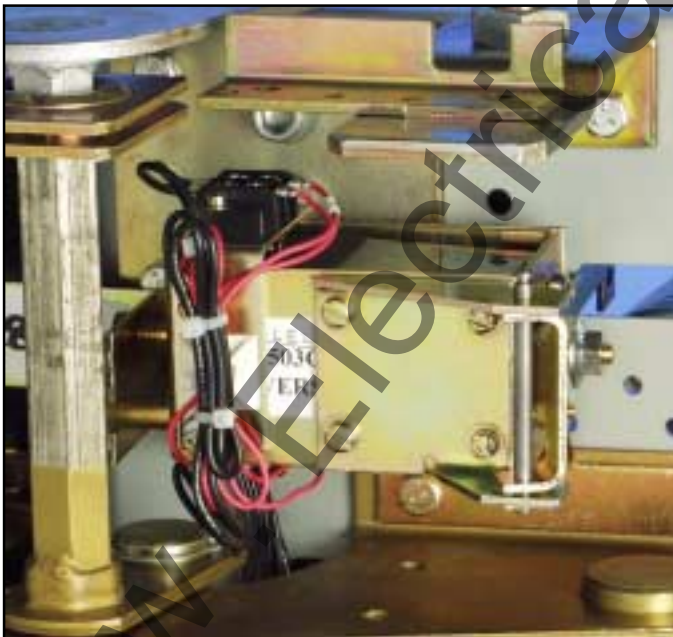


Fig. 37 DTA Extension Harness Connected to the DTA Terminal Block.

- J. Route the DTA Wires through the Breaker towards the Aux. CT Module.
- K. Connect the "+" or "P" DTA Wire to the "OP" terminal of the Aux. CT Module and the un-marked wire to the "ON" terminal.
- L. Use the wire ties and self-adhesive mounting blocks supplied to dress the DTA Wires to keep them away from any moving parts within the Breaker.

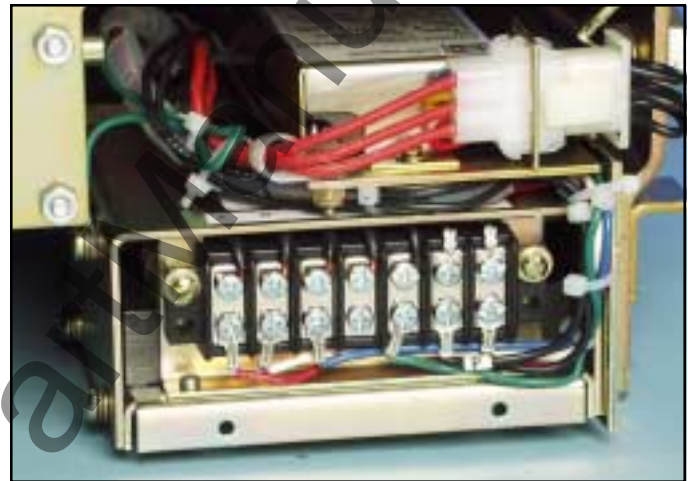


Fig. 38 DTA Extension Harness Connected to the Aux. CT Module.

STEP 8: INSTALLING THE TRIP UNIT



Fig. 39 Overview: Trip Unit Installed on the Breaker.

- A. Using Drilling Plan "B", drill two (2) .281" holes in the left Breaker Frame. Care should be taken to insure that no drill shavings fall into the Breaker.

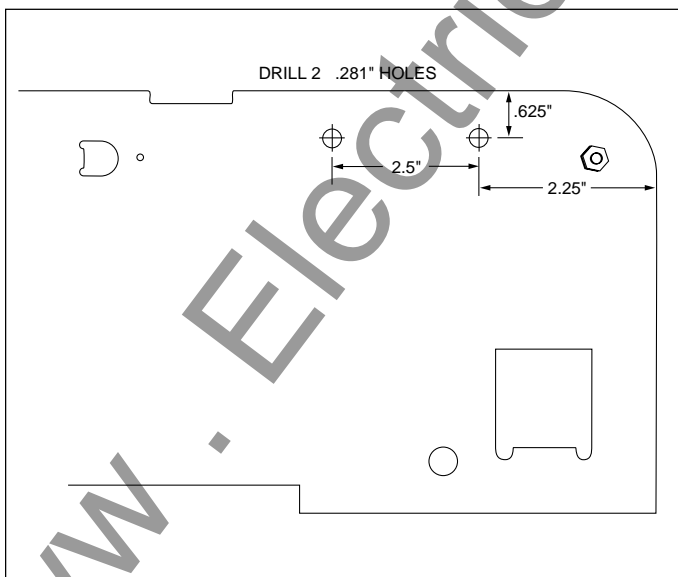


Fig. 40 Drilling Plan "B".

- B. Remove and save the (2) screws from the bottom left side of the Trip Unit Box (Minibox).
- C. Align the smaller holes in the Trip Unit Mounting Bracket with the holes from which the screws were just removed. Secure the Trip Unit Mounting Bracket to the Trip Unit Box, as shown, using the original hardware.

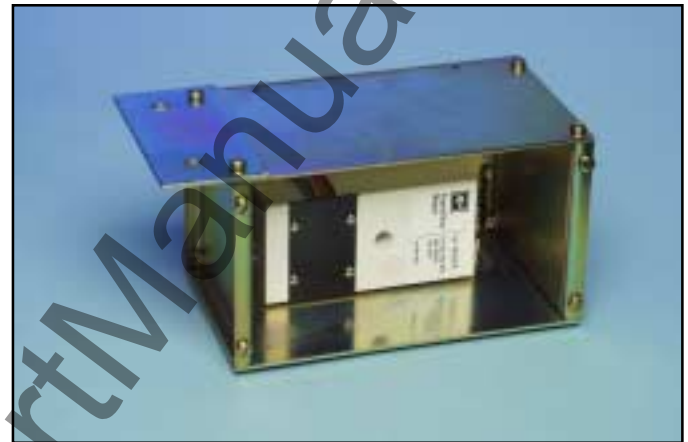


Fig. 41 Trip Unit Mounting Bracket Mounted to the Trip Unit Box.

- D. For 810 & 910 Kits Only: Position the Trip Unit near the front of the Trip Unit Box. Insert the male Communications Harness Connector into the female receptacle in the back of the Trip Unit. Note that the metal pins on the Communications Harness Connector must face upward.

CAUTION

IF THE COMMUNICATIONS HARNESS CONNECTOR IS INSERTED UPSIDE DOWN (METAL PINS FACING DOWNWARD), COMMUNICATIONS PROBLEMS WILL OCCUR.

- E. Align the Trip Unit Edge Card with the Receptacle in the Trip Unit Box. Plug the Trip Unit into the Trip Unit Box.

⚠ CAUTION

DO NOT APPLY UNDUE FORCE TO THE TRIP UNIT. IF IT DOES NOT PLUG EASILY INTO THE TRIP UNIT BOX, MAKE SURE THE EDGE CARD IS PROPERLY ALIGNED WITH THE RECEPTACLE AND THAT THE JACKING ("J") SCREWS ARE FULLY RETRACTED (SEE INSTRUCTIONS ON THE REAR OF THE TRIP UNIT BOX). APPLYING UNDUE FORCE CAN DAMAGE THE TRIP UNIT.

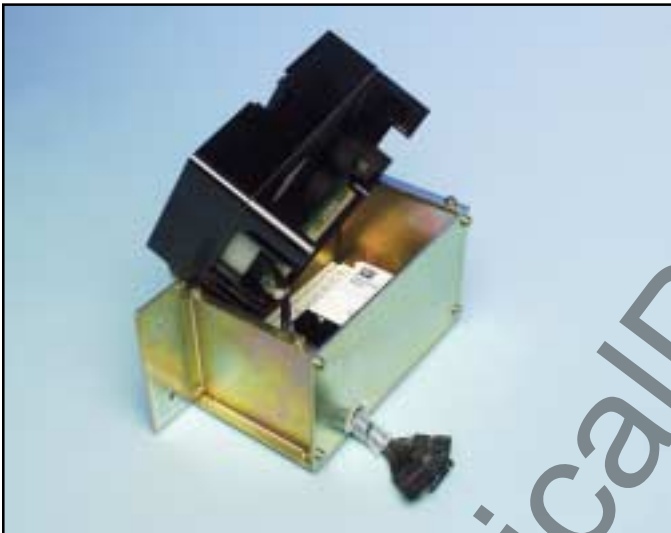


Fig. 42 Location of the Edge Card Receptacle, Communications Harness Connector, and ATR in the Trip Unit Box.



Fig. 43 Trip Unit Installed in the Trip Unit Box.

- E. Install the Rating Plug in its receptacle in the Trip Unit.
- F. Align then secure the Trip Unit Box Cover to the Trip Unit Box using the (4) .164-32 x .250" screws supplied.
- G. Connect the Aux. CT Harness to the pigtail at the rear of the Trip Unit Box.
- H. Connect the External Harness to the pigtail at the rear of the Trip Unit Box. Temporarily route the External Harness over the top of the box.

NOTE: For 510 Basic Kits, the External Harness is the shorting plug pictured below. It is to be plugged into the corresponding receptacle on the Trip Unit Box Pigtail.



Fig. 44 510 Kits External Harness Shorting Plug.

NOTE: Steps I through L should be performed before the Trip Unit Assembly is mounted to the Breaker. The procedures can be performed with the Trip Unit Assembly carefully positioned on the top of the Left Breaker Frame. Care should be taken to insure that the Trip Unit is not dropped or damaged during the procedures.

- I. Plug the Aux. CT Harness into the appropriate connector in the Trip Unit Box Pigtail.
- J. *For Kits Supplied with a PT Module Only:* Connect the PT Extension Harness to the corresponding plug on the External Harness.
- K. *For Kits Supplied with a Breaker Mounted CPT Only:* Remove the External harness plug installed in the Trip Unit Pigtail. Connect the black plug of the CPT Harness into the same receptacle in the Pigtail. Reinsert the External Harness plug just removed into the female receptacle on the CPT Harness.



Fig. 45 Harnesses Connected to the Trip Unit and External Harness.

- L. *For Kits Supplied with an Auxiliary Switch Only:* Route the two (2) wires with ring terminals from the External Harness across the top of the Breaker to Auxiliary Switch Assembly. Connect one (1) wire to the normally "Closed" terminal and the other wire to the "Common" terminal.

NOTE: Depending on the exact routing of the Aux. Switch Wires, it may be necessary to cut the last wire tie on the External Harness and remove more of the Auxiliary Switch Wires from the spiral wrap to provide sufficient length.



Fig. 46 Auxiliary Switch Wires Connected to the Auxiliary Switch.

- M. Align the Trip Unit Assembly with the holes drilled in the left Breaker Frame in Step 6-A. Secure the Trip Unit Assembly to the Breaker using the (2) .250-20 x .625" bolt, (2) flat washers, (2) lock washers, and (2) nuts supplied. As the Trip Unit Assembly is being installed, the External Harness should be routed behind the Trip Unit Assembly and towards the left of the Breaker. The Aux. CT Harness should be routed towards the right side of the Breaker.

Use an existing hole, or drill a .188" hole in the top of the Left Breaker Frame. Secure the External Harness to the top of the Left Breaker Frame using the (1) wire clamp, (1) .164-32 x .500" screw, and (1) Nylok nut supplied.



Fig. 47 Trip Unit Assembly Mounted to the Left Breaker Frame.

- N. Use the nylon wire ties supplied to dress all wires and harnesses to keep them away from any moving parts within the Breaker.

STEP 9: FINAL WIRE DRESSING AND LABEL INSTALLATION

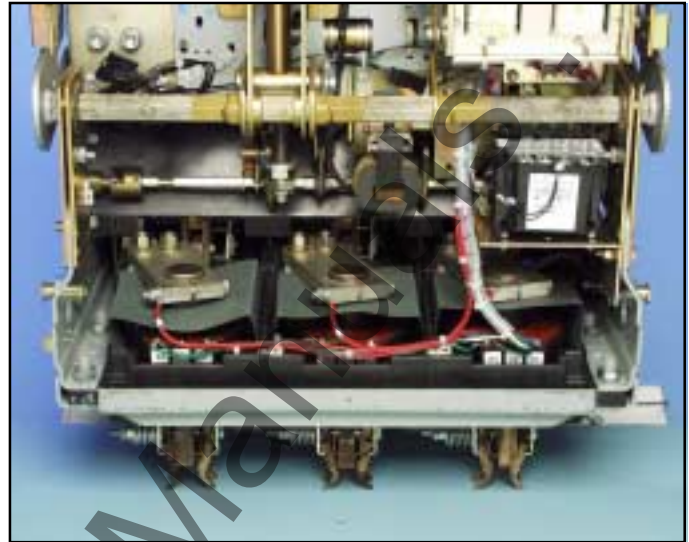


Fig. 48 Overview: Final Wire Dressing.

- A. Use the wire ties and self-adhesive mounting blocks supplied to dress all wires and harnesses to keep them away from any moving parts within the Breaker.
- B. Install the Digitrip Retrofit Label in a clearly visible location on the Breaker Cover.
- C. *For Kits Supplied with a PT Module Only:* Install the PT Warning Label in a clearly visible location on the Breaker Cover.
- D. *For Kits Supplied with a Breaker Mounted CPT Only:* Install the appropriate CPT Voltage Label in a clearly visible location on the Breaker Cover.



Fig. 49 Suggested Locations for the Digitrip, PT Module, and CPT Labels on the Breaker Cover.

- E. If the Breaker Covers were removed in Step 2, reinstall the covers using the original mounting hardware.

STEP 10: TESTING THE BREAKER

- A. Measure the force necessary to trip the Breaker at the point where the Trip Finger contacts the adjusting screw. 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 33-855-1, June 1997), 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. Publication AD 33-855 was created specifically for the "hundred" series (500, 600, 700, etc.) Retrofit Kits. Therefore certain sections and figures do not apply to the "ten" series (510, 610, 810, etc.) Retrofit Kits. Specifically, these are Sections 13 and 14, as well as Figures 3-2, 3-3, and 3-4.
2. *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.

3. *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 in Step 11.

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 front 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 moveable 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 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 the General Electric AKR 6D/7D-30/50 and AKRT 6D/7D-50 Series Breakers:

Step	Description	Style No.	Qty.	Comment
Step 3	Sensor		3	See Pick List
	Sensor Harness Parts	9A10100G04	1	
	Sensor Harness		1	
	Sensor Shield		3	
	164-32 × .500 Lng. Screw P. H.		4	
	.164 Flat Washer Stl.		4	
	.164 Lock Washer Stl.		4	
	.164-32 Nut Hex Stl.		4	
	Wire Tie Nylon		12	
	Mounting Pad 1" Nylon		3	
Step 4	Cable Tie Mount		4	
	Breaker Mounted CPT Kit	See Pick List	1	} CPT Only
	MTE Transformer		1	
	HV Fused Wires		2	
	CPT Wires		1	
	Mounting Hardware Kit		1	
	.190-32 × .750 Lng. Screw Fil.		4	
	.190-32 × .375 Lng. Screw Fil.		2	
	.190 Flat Washer Stl.		10	
	.190 Lock Washer Stl.		6	
	.190-32 Nut Hex Stl.		4	
	Ring Terminal (.138, .190, .250, .312, .375, .500 - Each Size)		1	
	Wire Tie Nylon		12	
	Warning Label (208, 240, 480, & 575 Volt Each)		1	
	Finger-Safe Cover Kit	FSK4	1	
	Cover (A, B, C, & D Each)		1	
	.098-28 × .375 Lng. Screw Fil.		4	
	CPT Mounting Parts	9A10100G20	1	
	Mounting Bracket		1	
	.250-20 × 1.00 Lng. Hex Bolt		2	
.250 Lock Washer Stl.		2		
.250-20 Nut Hex Stl.		2		
Wire Clamp Nylon		1		
Step 5	Aux. CT Module	6506C44G__	1	
	Aux. CT Module Mounting Parts	9A10100G09	1	
	Aux. CT Module Mounting Bracket		1	
	.250-20 × 1.00 Lng. Hex Bolt		2	
	.250 Lock Washer Stl.		2	
	.250-20 Nut Hex Stl.		2	
	.190-16 × .500 Lng. T.C. Screw		4	
	.190 Flat Washer Stl.		1	
	.190 Lock Washer Stl.		4	
	Wire Tie Nylon	From Step 3	12	
Mounting Pad 1" Nylon	From Step 3	3		

Digitrip Retrofit Kit Installation Components for the General Electric AKR 6D-50 and AKRT 6D-50 Series Breakers: (Cont.)

Step	Description	Style No.	Qty.	Comment
Step 5 (cont.)	PT Module	6502C82G01	1	} Comm. Only
	Ring Terminal (.190, .250, .312, .375, .500 - Each Size)		3	
	PT Module Mounting Parts	9A10100G06	1	
	PT Module Mounting Bracket		1	
	Warning Label		1	
	.250-20 x .500 Lng. Hex Bolt		2	
	.250 Lock Washer Stl.		2	
	.164-32 x .500 Lng. Screw P. H.		2	
	.164-32 Nut Hex Nylok		2	
	.138-32 x .375 Lng. Screw Fil.		2	
	.138 Flat Washer Stl.		2	
	.138 Lock Washer Stl.		2	
	.138-32 Nut Hex Stl.		2	
	Wire Clamp		2	
	Wire Tie Nylon		5	
	Aux. CT Harness	6502C84G02	1	
PT Module Extension Harness	From Step 6	1		
Step 6	Auxiliary Switch Kit	9A10100G02	1	} Comm. Only
	Microswitch		1	
	Auxiliary Switch Mounting Bracket		1	
	.164-32 x .375 Lng. Screw Fil.		2	
	.164 Lock Washer Stl.		2	
	.138-32 x 1.00 Lng. Screw Fil.		2	
	.138 Flat Washer Stl.		2	
	.138 Lock Washer Stl.		2	
	.138-32 Nut Hex Stl.		2	
PT Module Extension Harness		1		
Step 7	DTA Assembly	9A10100G35	1	
	Reset Arm Mounting Parts	9A10100G08	1	
	Trip Finger		1	
	Reset Pivot Assembly		1	
	Reset Assembly		1	
	Pivot		1	
	Pivot Pin		1	
	.188 X-Washers Stl.		2	
	.250 E-Clip		1	
	.164-32 x .375 Lng. Screw Fil.		2	
	.164 Flat Washer Stl.		2	
	.164 Lock Washer Stl.		2	
	Loc-Tite 243®		1	
	DTA Mounting Parts	9A10100G07	1	
	.250-20 x .750 Lng. Hex Bolt		2	
.250 Lock Washer Stl.		2		
Wire Tie Nylon	From Step 3	12		

Digitrip Retrofit Kit Installation Components for the General Electric AKR 6D-50 and AKRT 6D-50 Series Breakers: (Cont.)

Step	Description	Style No.	Qty.	Comment
Step 7	Mounting Pad 1" Nylon	From Step 3	3	
Step 8	Trip Unit		1	See Pick List
	Rating Plug		1	See Pick List
	Trip Unit Box (Minibox)	6506C26G__	1	
	Cover		1	
	.164-32 x .250 Lng. Screw Fil.		4	
	Trip Unit Mounting Parts	9A10100G05	1	
	Trip Unit Mounting Bracket		1	
	.250-20 x .625 Lng. Hex Bolt		2	
	.250 Lock Washer Stl.		2	
	.250-20 Nut Hex Stl.		2	
	.164-32 x .375 Lng. Screw P. H.		2	
	.164 Lock Washer Stl.		2	
	Digitrip Retrofit Label		1	
	External Harness	6502C83G__	1	Except 510 Basic
	External Harness Parts	9A10100G10	1	
	.164-32 x .500 Lng. Screw P. H.		1	
.164-32 Nut Hex Nylok		1		
Wire Clamp Nylon		1		
Step 9	Wire Tie Nylon	From Step 3	12	
	Mounting Pad 1" Nylon	From Step 3	4	
	Digitrip Retrofit Label	From Step 8	1	
	PT Warning Label	From Step 5	1	Comm. Only
	Warning Label (208, 240, 480, & 575 Volt Each)	From Step 4	1	CPT Only

NOTE: Due to the wide vintage of Breakers and the multiple functions of the Retrofit Components, some excess hardware may be left 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

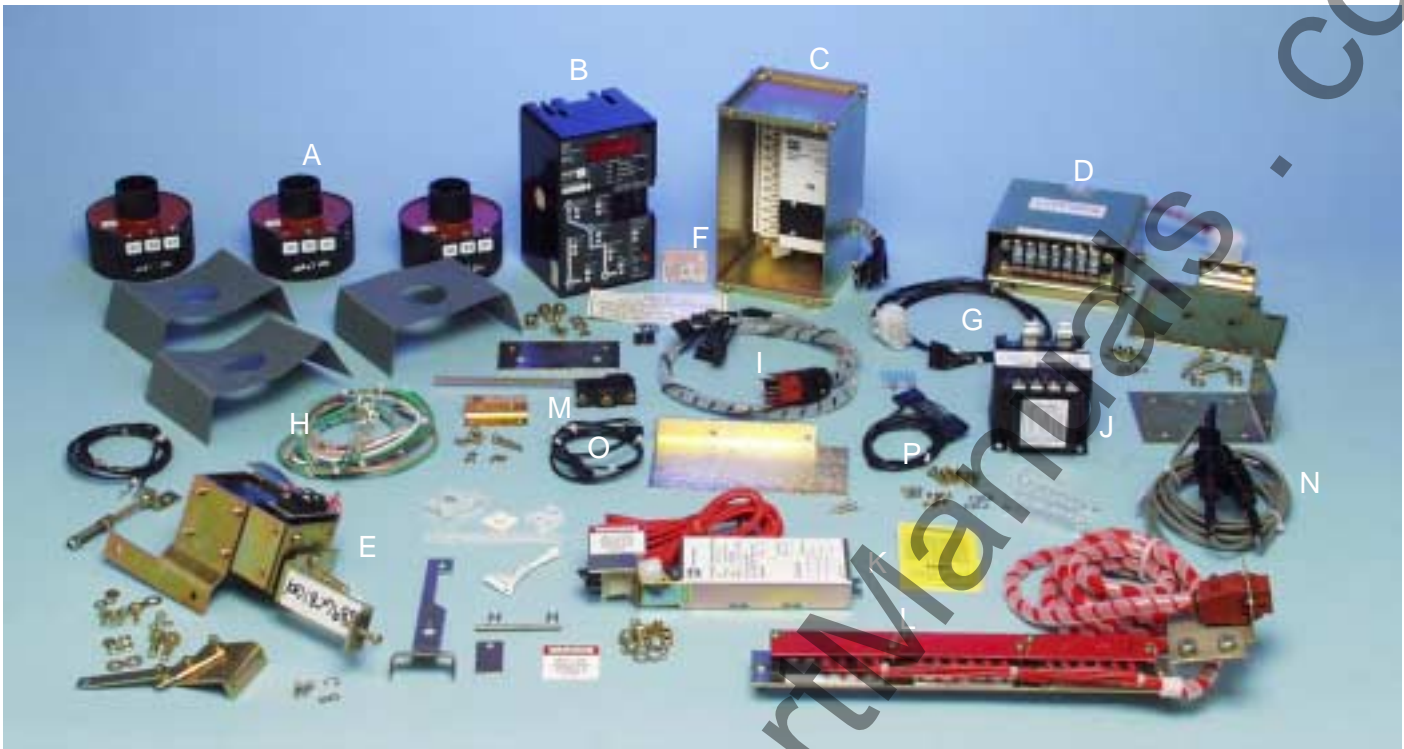


Fig. 50 Retrofit Components.

- | | |
|-------------------------------|-------------------------|
| A. Sensors | I. External Harness |
| B. Trip Unit | J. Breaker Mounted CPT |
| C. Trip Unit Box | K. PT Module |
| D. Aux. CT Module | L. Cell Harness |
| E. Direct Trip Actuator (DTA) | M. Auxiliary Switch |
| F. Rating Plug | N. H V Wires |
| G. Aux. CT Harness | O. PT Extension Harness |
| H. Sensor Harness | P. CPT wires |

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.L. 33-GDC-3
September 2001
Printed in U.S.A./TBG00046

EATON