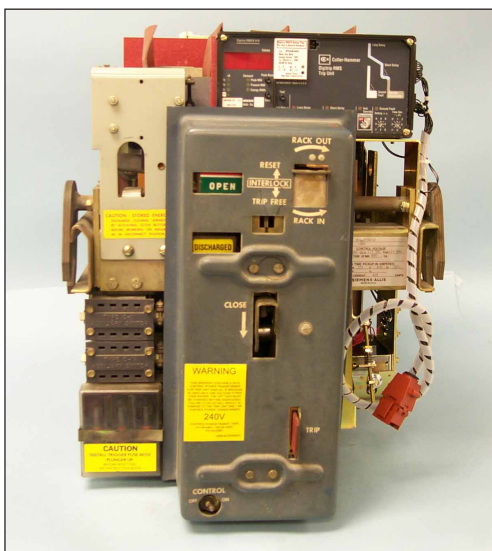




Digitrip Retrofit System for the Allis-Chalmers LA-600 F Electrically Operated Fused Breakers



SAFETY PRECAUTIONS



WARNING

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

- Only qualified persons, as defined in the National Electric Code, who are familiar with the installation and maintenance of power circuit breakers and their associated switchgear assemblies should perform any work associated with these breakers.

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



Digitrip Retrofit System for the Allis-Chalmers LA-600 F Electrically Operated Fused Breakers

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INTRODUCTION

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

The following table 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 the

table. It is important that the Retrofitter understands which level of Retrofit Kit is to be installed and which components are included with the Kit. The instructions contained in this manual cover the installation of all levels of Retrofit Kit. If the Kit you are installing does not contain a certain component, skip the instructions for that component and proceed to the next.

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

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

Table 1 Available Retrofit Kits

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

STEP 1: GENERAL BREAKER PREPARATION

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

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

Refer to the Allis-Chalmers LA-600 F Instruction Manual, originally supplied with the Breaker, to perform the following procedures.

- A. If equipped, remove and save the hardware securing the Manual Closing Handle to the Breaker. Remove and save the Manual Closing Handle.
- B. Remove and save the hardware securing the Front Cover to the Breaker. Remove and save the Front Cover.
- C. Remove and save the hardware securing the Primary Disconnect Fingers (Finger Clusters) to the bottom Breaker Studs. Remove and save the Finger Clusters.



Fig. 1 Original Components Removed from the Breaker and Saved for Reinstallation.

- D. Remove and scrap the hardware securing the Static DC Trip Device Assembly (Trip Unit Assembly) to the right Breaker Frame. Remove and scrap the Static DC Trip Device Assembly and associated wiring.
- E. Remove and scrap the hardware securing the Magnetic Latch Release Device Assembly (original DTA) to the Breaker. Remove and scrap the Magnetic Latch Release Device Assembly and associated wiring.
- F. Remove and scrap the CTs (Sensors), spacers, and associated wiring.

NOTE: Depending on the original configuration of the Breaker, it may be necessary to remove the Fuse Carriage Assembly in order to remove the CTs. If this is necessary, refer to the Allis-Chalmers LA-600 F Manual, originally supplied with the Breaker, for removal and installation instructions.

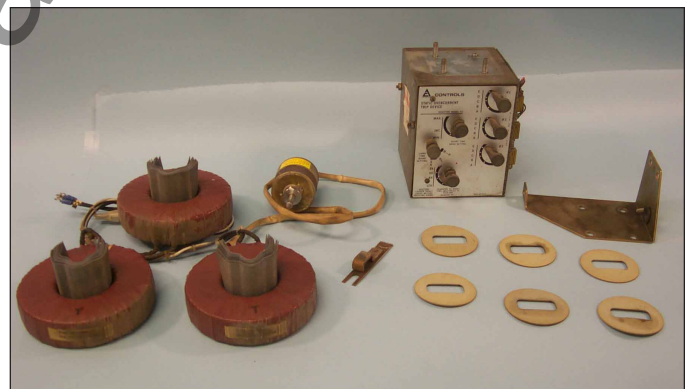


Fig. 2 Original Components Removed from the Breaker and Scrapped.

STEP 3: INSTALLING THE SENSORS

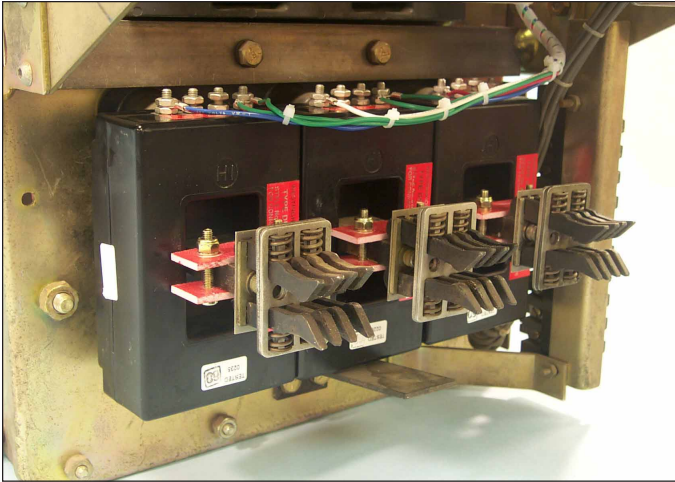


Fig. 3 Overview: Sensors Installed on the Breaker.

- A. Slide a Sensor over each bottom Breaker Stud, as shown. Note that the Sensor Terminals are at the top and that the Sensor Nameplates face the rear of the Breaker.

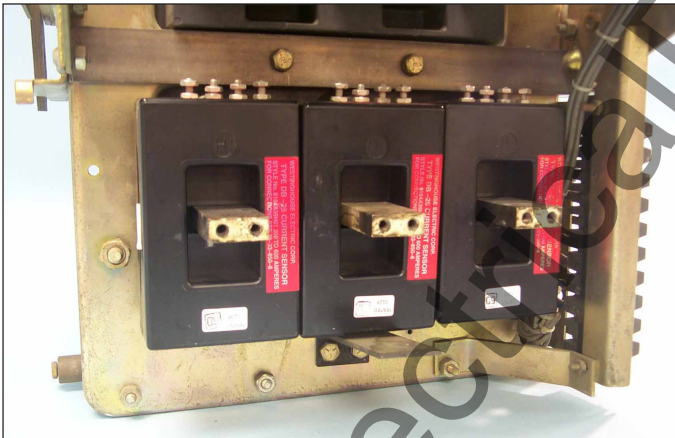


Fig. 4 Sensors Installed on the Bottom Breaker Studs.

- B. Position a Sensor Spacer at the top and bottom of each bottom Breaker Stud, as shown. Using the (6) .190-32 x 1.25" screws, (12) flat washers, and (6) Nylok nuts supplied secure the Sensor Spacers to the bottom Breaker Studs so they hold the Insulation Piece and Sensors against the Breaker Backplate. Do not over tighten the mounting hardware.



Fig. 5 Sensor Spacers Installed on the Bottom Breaker Studs.

- C. Connect the ring terminals of the Sensor Harness to the Sensors.

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

For LA-600 F Retrofits, the following conventions apply.

Table 2 Sensor Taps Rating

Sensor Style No.	Terminal Com.	Amps
8184A39H01	X1 - X2 =	200 A
	X1 - X3 =	400 A
	X1 - X4 =	600 A

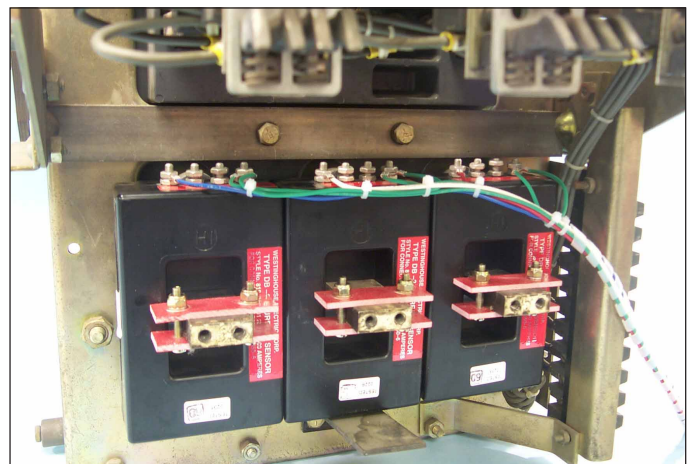


Fig. 6 Sensor Harness Connected to the Sensors.

- D. Temporarily route the Sensor Harness, as shown, up along the left side of the Breaker Backplate towards the top of the Breaker. Final Sensor Harness routing and connections will be made later in the Retrofit Process.

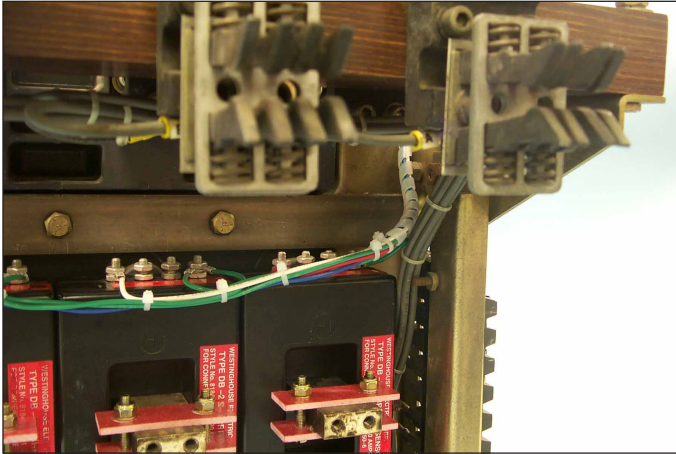


Fig. 7 Sensor Harness Routed Towards the Top of the Breaker.

- E. Using the original mounting hardware removed in Step 2-C, reinstall the Finger Clusters.

For Kits Supplied with a PT Module Only: Do not fully tighten the Finger Cluster hardware at this time. This hardware will be used to secure the PT Wires later in the Retrofit Process.



Fig. 8 Finger Clusters Reinstalled on the Bottom Breaker Studs.

STEP 4: INSTALLING THE AUX. CT MODULE ASSEMBLY



Fig. 9 Overview: Aux. CT Module Assembly Installed on the Breaker.

- A. Remove and save the mounting hardware securing the top of the Breaker Backplate to the rear Breaker Frame.



Fig. 10 Location of the Breaker Backplate Mounting Hardware.

- B. Align the right Aux. CT Module Mounting Bracket with the hole in the Breaker Backplate and rear Breaker Frame. Reinstall the mounting hardware removed in the previous step.

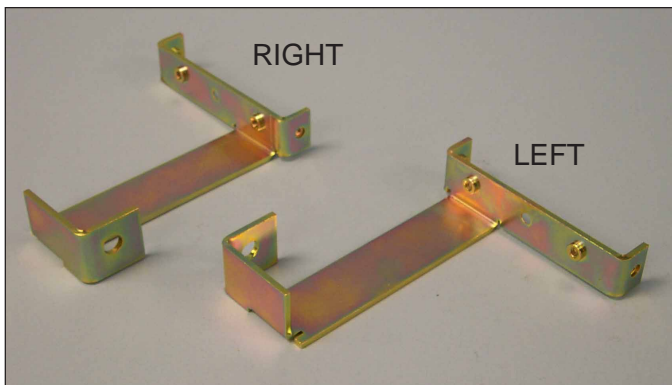


Fig. 11 Identifying the Aux. CT Module Mounting Brackets.

Once the mounting hardware is started, rotate the mounting bracket until it is level with the top of the Breaker. Fully tighten the mounting hardware.



Fig. 12 Right Aux. CT Module Mounting Bracket Installed on the Breaker.

- C. Repeat the procedure to install the left Aux. CT Module Mounting Bracket.

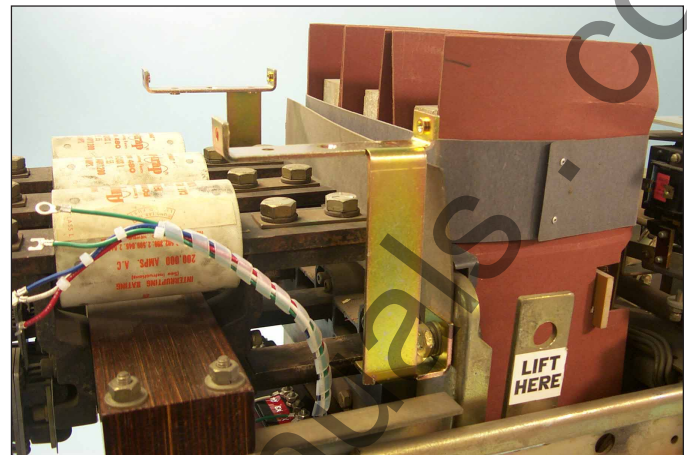


Fig. 13 Left Aux. CT Module Mounting Bracket Installed on the Breaker.

- D. Align the Insulation Barrier Mounting Brackets with the existing holes in the bottom Aux. CT Module Insulation Barrier, as shown. Secure the mounting brackets to the Insulation Barrier using the (4) .190-32 x .250" nylon screws supplied.

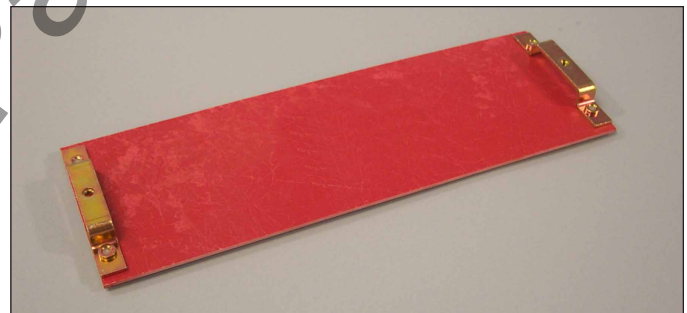


Fig. 14 Mounting Brackets Installed on the Bottom Aux. CT Module Insulation Barrier.

- E. Align the bottom Aux. CT Module Insulation Barrier Assembly with the existing center holes in the right and left Aux. CT Module Mounting Brackets, as shown. Secure the bottom Aux. CT Module Insulation Barrier Assembly to the Aux. CT Module Mounting Brackets using the (2) .190-32 x .375" flat head, counter sunk screws supplied.

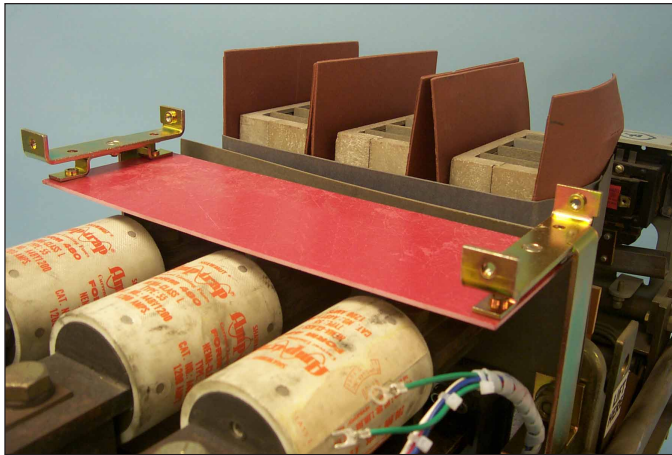


Fig. 15 Bottom Aux. CT Module Insulation Barrier Assembly Installed on the Aux. CT Module Mounting Brackets.

For Kits Supplied with a PT Module Only.

- F. Remove and scrap the "PT Label Flag" from the PT Module. Use the original hardware to reinstall the PT Harness Connector Bracket to the PT Module.



Fig. 16 PT Module Warning Label Bracket Removed from the PT Module.

- G. Align the Insulation Barrier (Fish Paper) and PT Module with the existing holes in the top of the Aux. CT Module, as shown. Secure the Insulation Barrier and PT Module to the Aux. CT Module using the (2) .138-32 x .375" thread cutting screws, (2) lock washers, and (2) flat washers supplied.

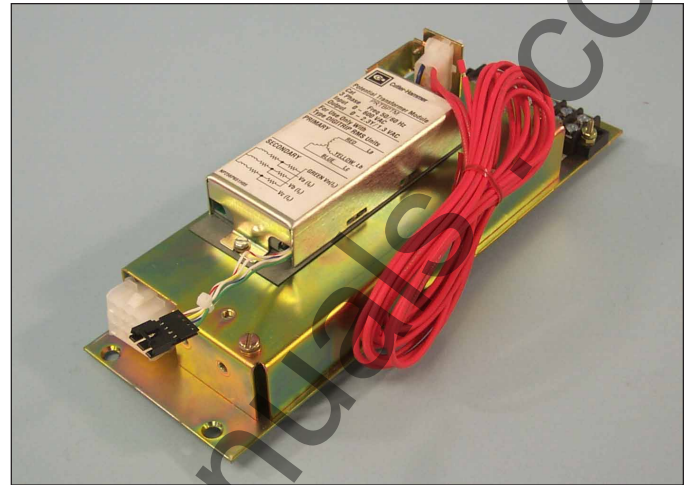


Fig. 17 PT Module and Insulation Barrier Mounted to the Aux. CT Module.

- H. Connect the PT Extension Harness to the PT Harness.

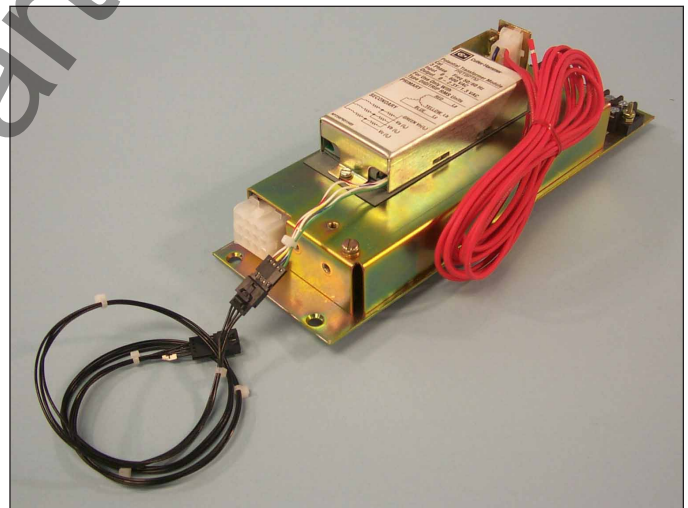


Fig. 18 PT Extension Harness Connected to the PT Harness.

For All Retrofit Kits.

- I. Align the Aux. CT Module Assembly with the existing holes in the Aux. CT Module Mounting Brackets. Secure the Aux. CT Module Assembly to the mounting brackets using the (4) .190-32 x .375" flat head, counter sunk screws supplied. Note that the Aux. CT Module Terminal Block should be oriented towards the left side of the Breaker

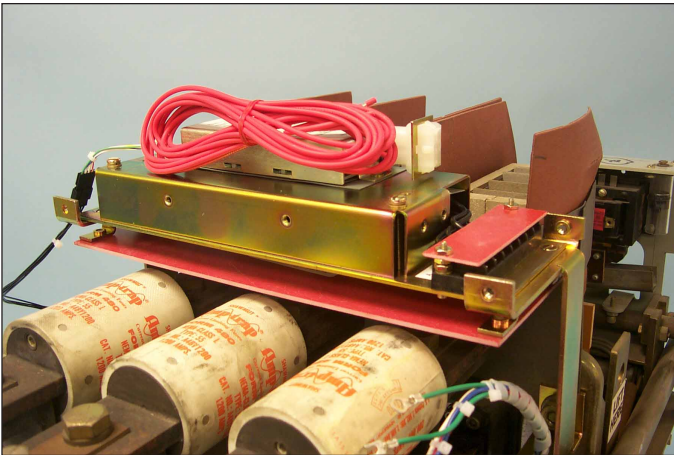


Fig. 19 Aux. CT Module Assembly Mounted to the Aux. CT Module Mounting Brackets.

- J. Align the front Aux. CT Module Insulation Barrier with the existing holes in the rear of the Aux. CT Module Mounting Brackets, as shown. Secure the front Insulation Barrier to the mounting Brackets using the (2) .190-32 x .500" nylon screws supplied.

NOTE: The front and rear Aux. CT Module Insulation Barriers are the same and, therefore, interchangeable.

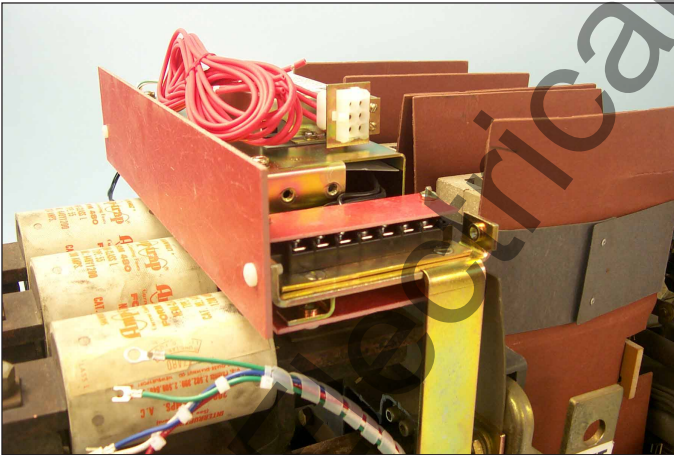


Fig. 20 Rear Aux. CT Module Insulation Barrier Installed on the Mounting Brackets.

- K. Repeat the procedure for the front Aux. CT Module Insulation Barrier.

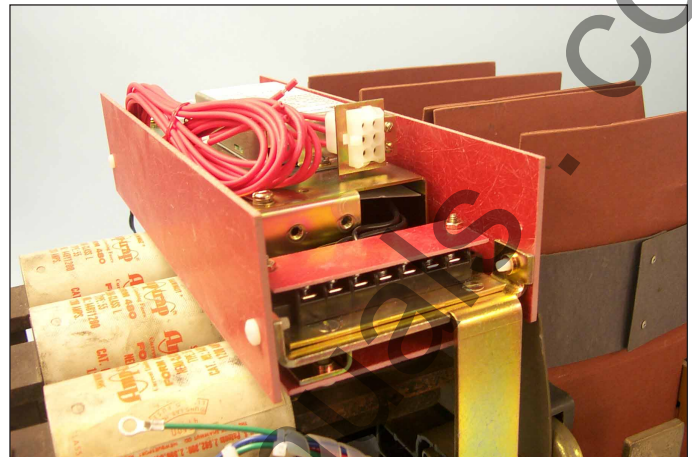


Fig. 21 Front Aux. CT Module Insulation Barrier Installed on the Mounting Brackets.

- L. Remove and save the Cover from the Aux. CT Module Terminal Block. Route the Sensor Harness along the outside of the left Aux. CT Module Mounting Bracket to the Terminal Block.

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

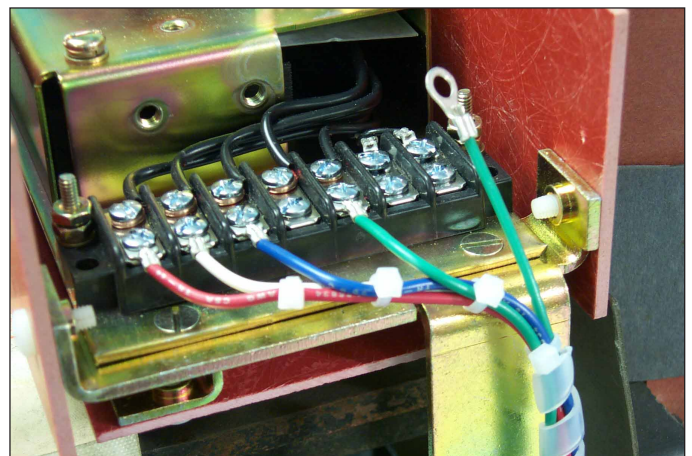


Fig. 22 Sensor Harness Connected to the Aux. CT Module Terminal Block.

- M. Remove one of the nuts from the front Terminal Block Cover Stud. Connect the Sensor Harness Ground Wire (with ring terminal) to the stud. Use the original nut to secure the ground wire.

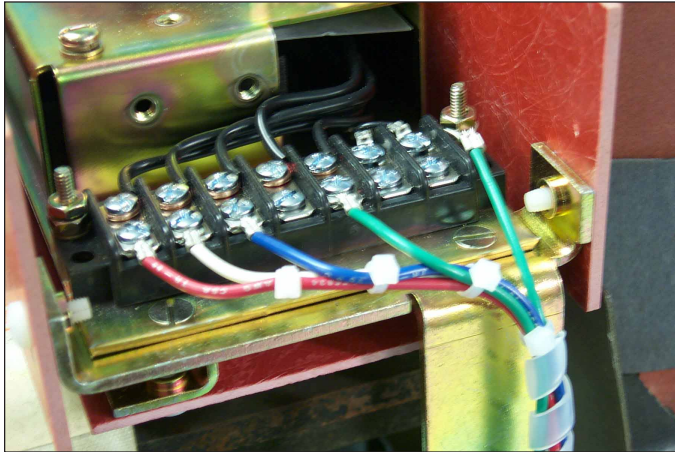


Fig. 23 Sensor Harness Ground Wire Connected to the Terminal Block Cover Stud.

- N. Secure the Sensor Harness to the outside of the left Aux. CT Module Mounting Bracket using the (1) self-adhesive mounting pad and (1) wire tie supplied.

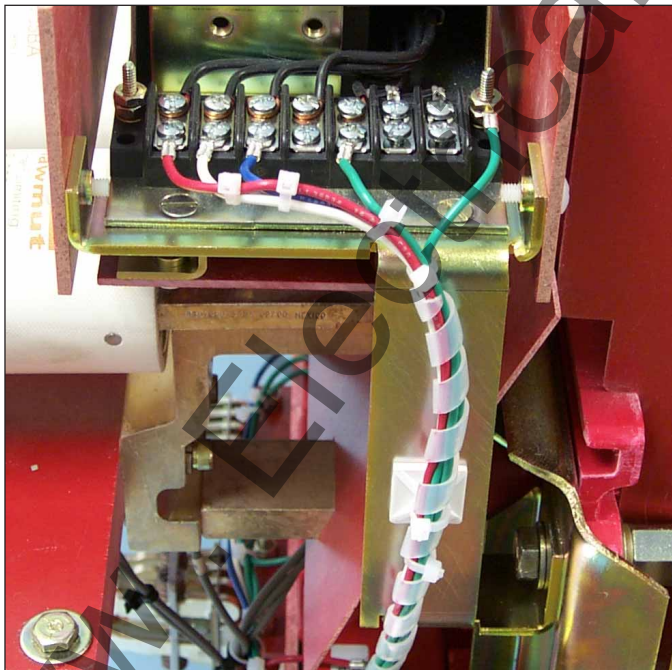


Fig. 24 Sensor Harness Secured to the Left Aux. CT Module Mounting Bracket.

NOTE: The Terminal Block Cover will be installed later in the Retrofit Process after the DTA Wires are connected to the Terminal Block.

For Kits Supplied with a PT Module Only.

- O. Install a PT Module Warning Label on the front and rear Aux. CT Module Insulation Barriers so they are clearly visible.

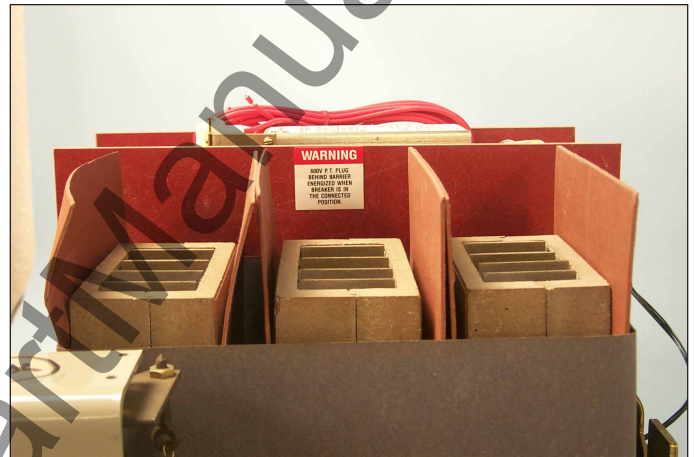


Fig. 25 PT Warning Label Installed on the Front Aux. CT Module Insulation Barrier.



Fig. 26 PT Warning Label Installed on the Rear Aux. CT Module Insulation Barrier.

- P. Refer to Section 7-3, Power Flow Convention of the Retrofit Application Data, supplied with the Retrofit Kit for additional wiring information and to verify the Phase Convention used on this Breaker Application.

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 the right side of the Breaker, then downward to a position suitable for attachment to the bottom Breaker Studs. 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 .250" ring terminal on each wire.

With one hex cap screw removed and the other loosened, insert the ring terminal of each PT Wire between the Finger Cluster and Stud of each corresponding bottom Phase. Insert the removed hex cap screws through the Finger Cluster and PT Wire ring terminals. Fully tighten all six (6) hex cap screws securing the Finger Clusters to the bottom Breaker Studs.

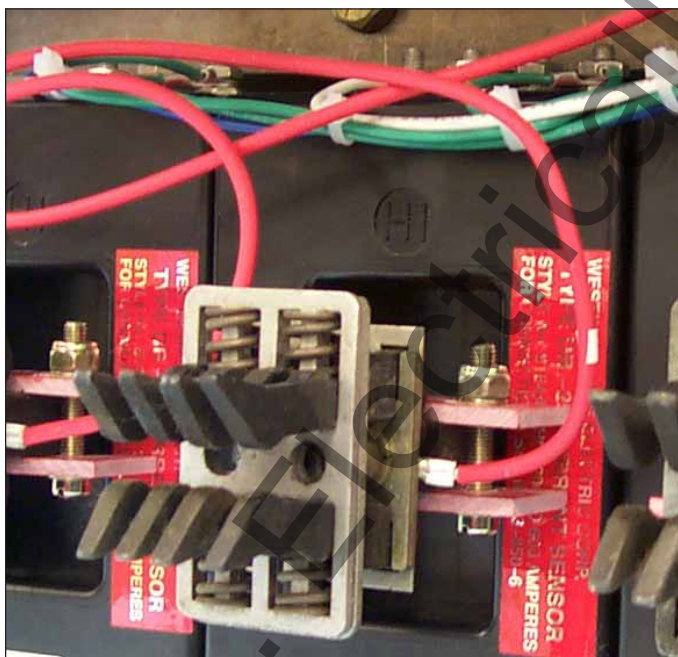


Fig. 27 PT Wires Connected to the Bottom Breaker Studs.

- Q. Secure the PT Wires to the top of the Aux. CT Module, right Aux. CT Module Mounting Bracket, right rear Breaker Frame, and Sensor Harness using the self-adhesive mounting pads and wire ties supplied.

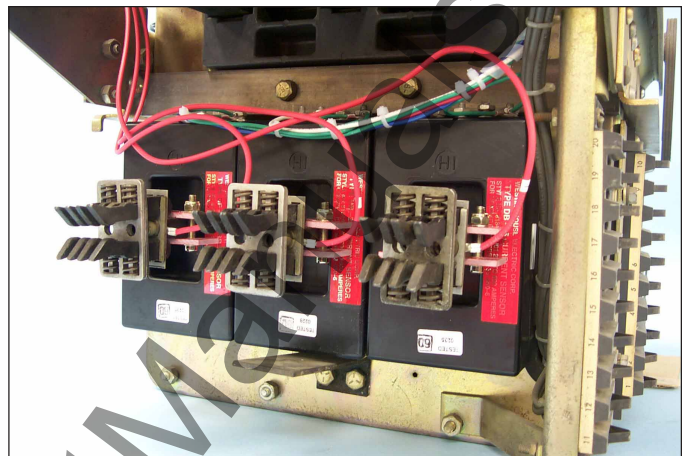


Fig. 28 PT Wires Secured to the Breaker and Sensor Harness.

NOTE: The PT Module is slightly higher the Breaker Arc Chutes. As the Retrofitted Breaker is being installed in the Cell, ensure that clearance exists between the top of the PT Module and the Breaker Cell. If sufficient clearance does not exist, contact Cutler-Hammer.

STEP 5: INSTALLING THE DTA ASSEMBLY

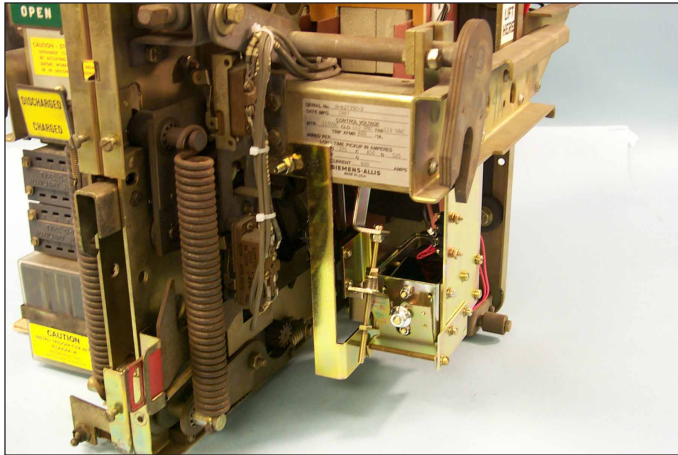


Fig. 29 Overview: DTA Assembly Installed in the Breaker.

- A. Using the specifications contained in Cutting Plan "A", cut the bottom front corner off of the right Arc Chute Insulation Barrier.

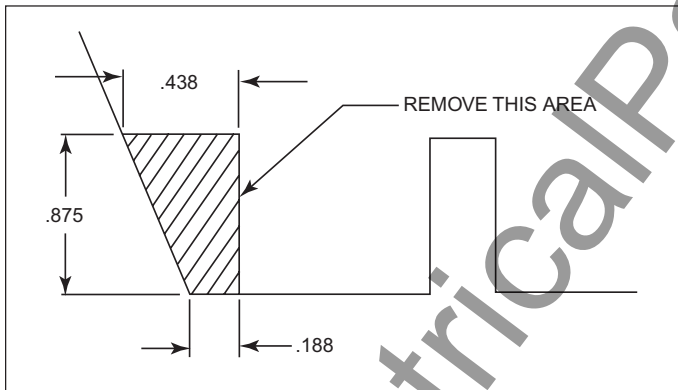


Fig. 30 Cutting Plan "A", Left Arc Chute Insulation Barrier.

- B. Connect the DTA Extension Harness, Positive to Positive and Common to Common, at the 2-Point Terminal Block on the DTA Assembly.

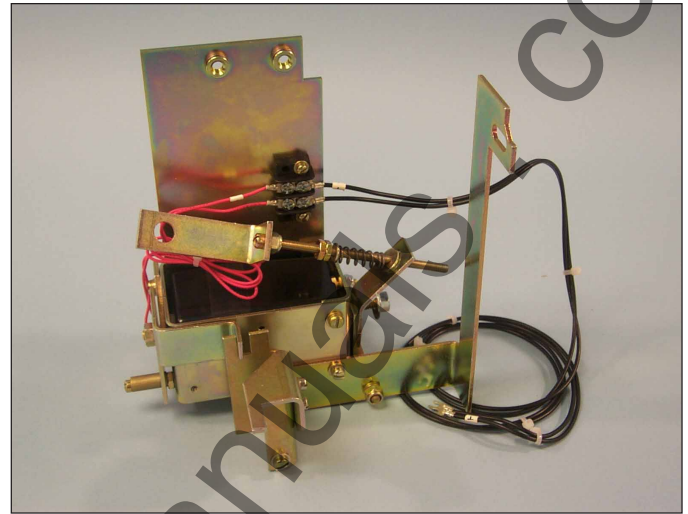


Fig. 31 DTA Extension Harness Connected to the 2-Point Terminal Block.

For Kits Supplied with an Auxiliary Switch Only.

- B. Cut 2.50" off the Microswitch Arm. Bend the Microswitch Arm according to the specifications contained in Bending Plan "A".

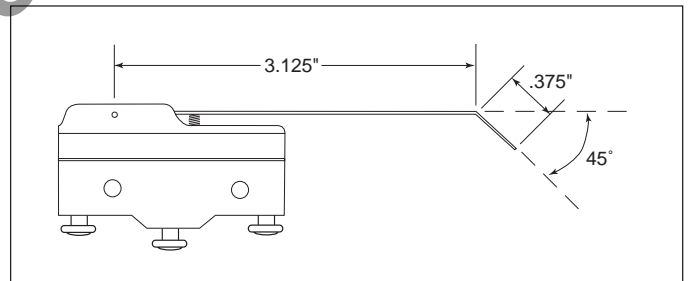


Fig. 32 Bending Plan "A", Microswitch Arm.

- C. Mount the Microswitch to the Auxiliary Switch Mounting Bracket, as shown, using the (2) .138-32 x 1.00 screws, (4) flat washers, (2) lock washers, and (2) .138-32 nuts supplied.

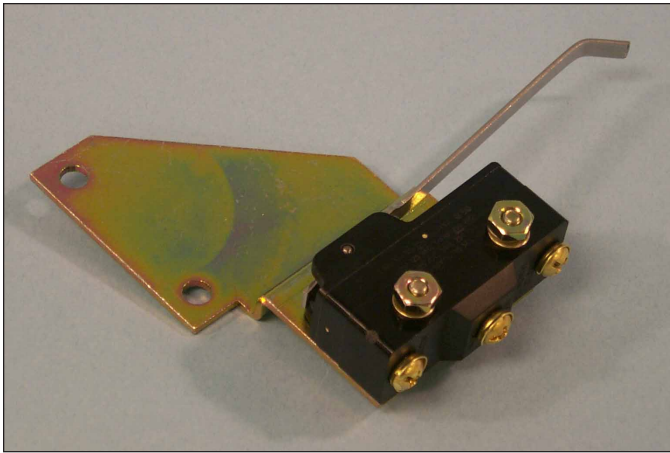


Fig. 33 Microswitch Installed on the Auxiliary Switch Mounting Bracket.

- D. Mount the Auxiliary Switch Assembly to the DTA Assembly, as shown, using the (1) .164-32 x .375 screw, (1) .164-32 x .250 screw, (2) lock washers, and (2) flat washers supplied. Note that the longer screw is used to secure the top of the Auxiliary Switch Assembly.

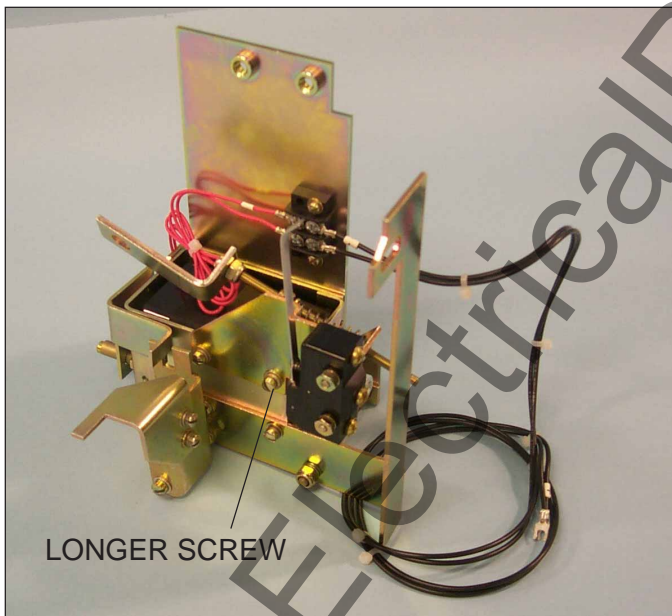


Fig. 34 Auxiliary Switch Assembly Installed on the DTA Assembly.

For All Retrofit Kits.

- E. Remove and scrap the Wrist Pin and hardware that connects the right Insulation Link to the Breaker Pole Shaft for Phase 3.



Fig. 35 Wrist Pin to be Removed from the Breaker.

- F. I insert the Wrist Pin into the Insulation Link and Breaker Pole Shaft from the right side. Install (1) Tru-arc lock ring on the left end of the new Wrist Pin.

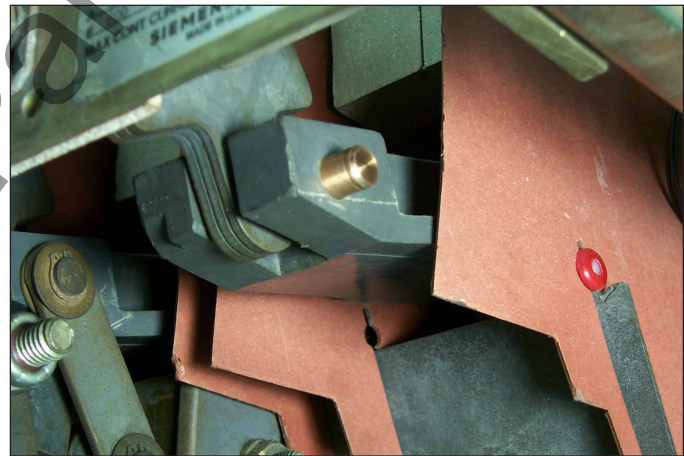


Fig. 36 New Wrist Pin Installed in the Breaker.

- G. The DTA is mounted to the Breaker using the two existing holes in the right Breaker Frame and a hole in the front Breaker Frame. In some cases, the hole needed to mount the DTA to the front Breaker Frame may not exist. In this case, use Drilling Plan "A" to drill the needed hole.

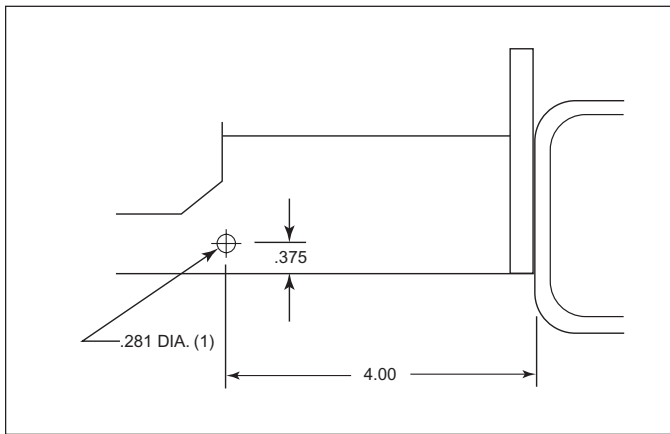


Fig. 37 Drilling Plan "A".

NOTE: Cover the region below the area to be drilled to prevent metal shavings from falling into the Breaker Mechanism.

- H. Position the External Harness near the top right front corner of the Breaker. Route the Auxiliary Switch Wires down through the Breaker to the front bottom right corner. With the DTA Assembly sitting on the work surface, connect the External Harness Auxiliary Switch Wires to the "Common" and "Normally Open terminals on the Auxiliary Switch.

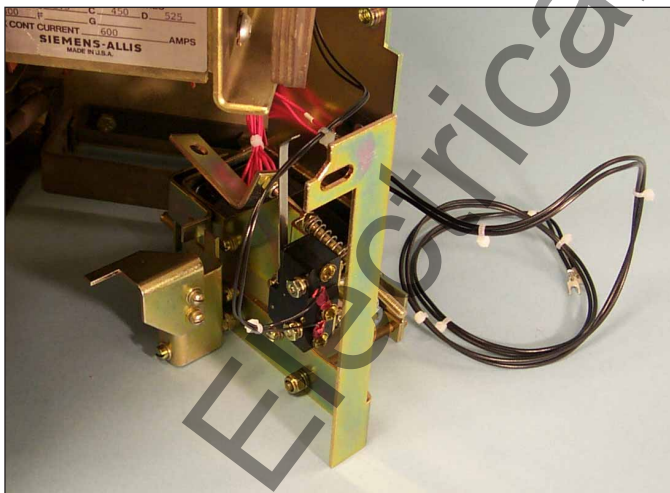


Fig. 38 Auxiliary Switch Wires Connected to the Auxiliary Switch.

- I. Mount the DTA Assembly, as shown, to the existing holes in the right Breaker Frame using the (2) .250-20 x .750 bolts, (2) lock washers, and (2) flat washers supplied.

NOTE: As the DTA Assembly is being mounted to the right Breaker Frame, the DTA Front Mounting Bracket **MUST** be on the **OUT-SIDE** of the front Breaker Frame, the DTA Trip Finger **MUST** be **IN FRONT** of the roll pin on the Breaker Trip Bar, and the Auxiliary Switch Arm, if applicable, **MUST** be **IN FRONT** of the Insulating Link as shown.

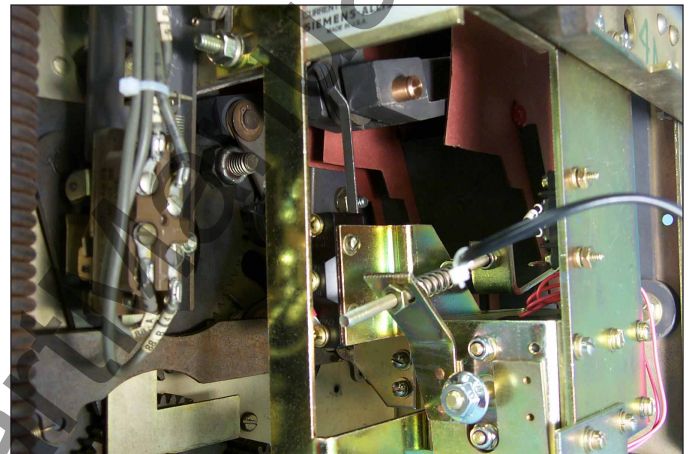


Fig. 39 Correct Positioning of the DTA Assembly Front Mounting Bracket and Auxiliary Switch Arm.

- J. Temporarily secure the DTA Assembly from mounting bracket, as shown, to the hole in the front Breaker Frame using the (1) .250-20 x 1.00 bolt, (1) flat washer, (1) lock washer, and (1) nut supplied. Note that the bolt must be inserted from the inside of the Breaker Front Frame.

NOTE: Do not tighten the hardware securing the DTA Assembly to the front Breaker Frame at this time. It will be used later in the Retrofit Process to secure the Trip Unit Assembly.

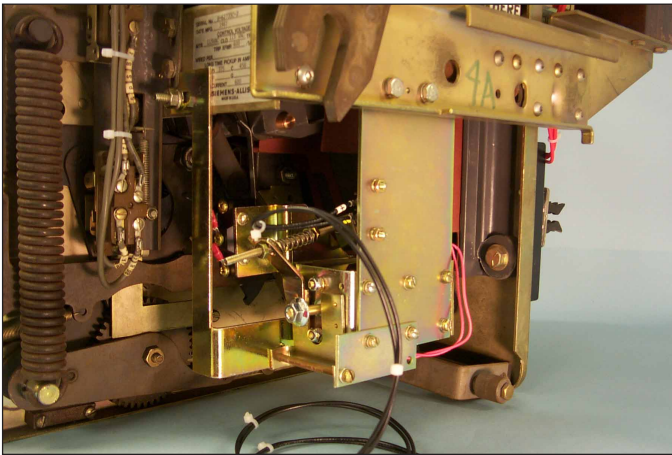


Fig. 40 DTA Assembly Front Mounting Bracket Temporarily Secured to the Front Breaker Frame.

- K. Compress the spring on the Reset Shaft. With the spring compressed, align and install the Reset Assembly on the Wrist Pin installed in Step 5-F. Install (1) flat washer supplied on the Wrist Pin. Install (1) Tru-arc lock ring on the Wrist Pin to secure the Reset Assembly.

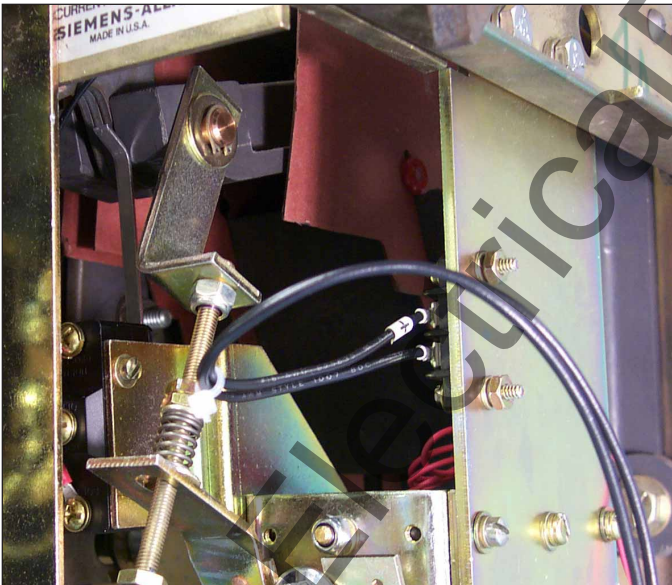


Fig. 41 Reset Assembly Installed on the Breaker Pole Shaft Wrist Pin.

- L. Route the DTA Extension Harness between the right Breaker Frame and the right Phase Barrier to the area on the Aux. CT Module Assembly. Use the self-adhesive mounting pads and wire

ties supplied to secure the DTA Extension Harness to the right Phase Barrier as shown.

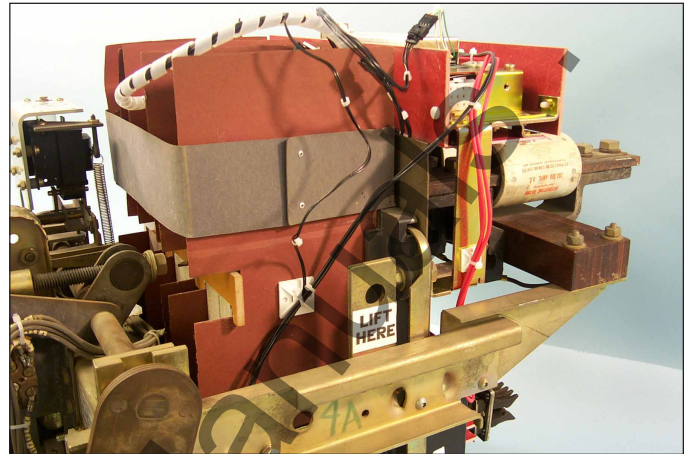


Fig. 42 DTA Extension Harness Secured to the Right Phase Barrier.

- M. Route the DTA Extension Harness to the Aux. CT Module Terminal Block. Connect the "+" DTA Wire to the "OP" terminal of the Aux. CT Module Terminal Block and the unmarked wire to the "ON" terminal.

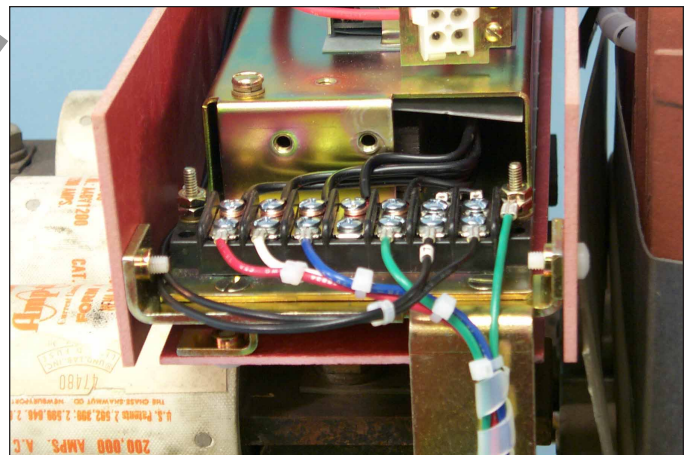


Fig. 43 DTA Extension Harness Connected to the Aux. CT Module Terminal Block.

- N. Reinstall the Aux. CT Module Terminal Block Cover removed in Step 4-L.

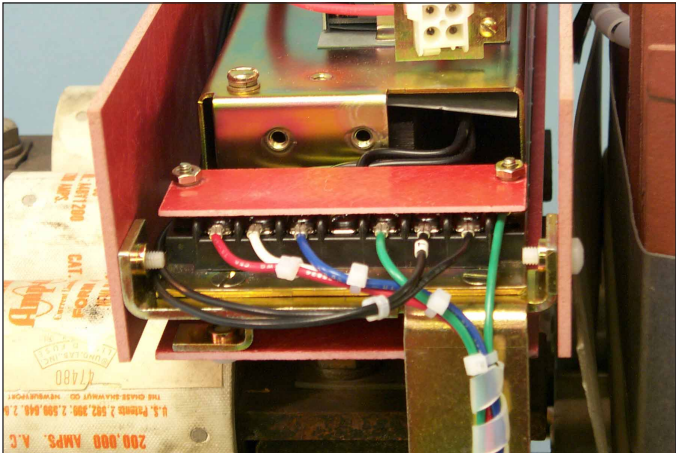


Fig. 44 Terminal Block Cover Installed on the Aux. CT Module Terminal Block.

STEP 6: INSTALLING THE TRIP UNIT

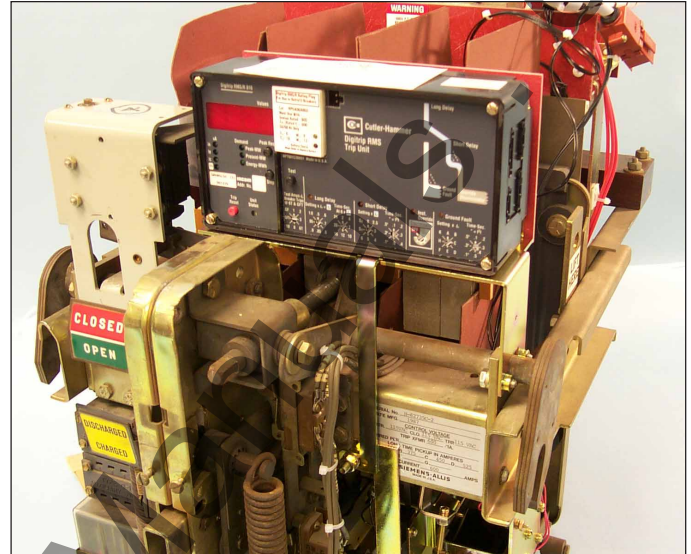


Fig. 45 Overview: Trip Unit Assembly Installed on the Breaker.

- A. Align the holes in the Trip Unit Insulation Barrier with the holes in the Trip Unit Mounting Bracket, as shown. Secure the Insulation Barrier to the Trip Unit Mounting Bracket using the (2) .190-32 × .500 nylon screws supplied.

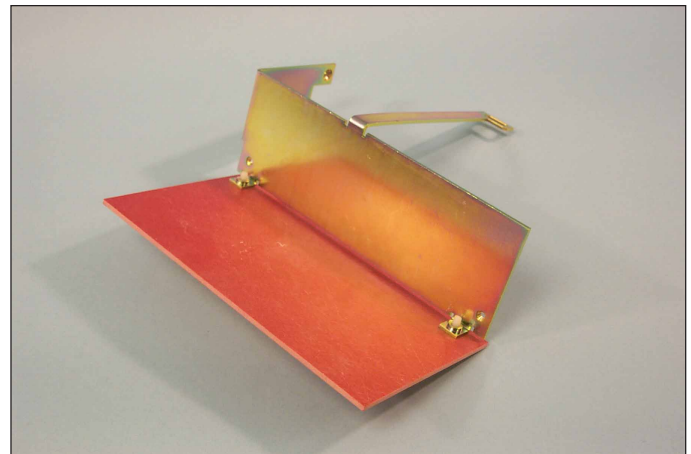


Fig. 46 Insulation Barrier Installed on the Trip Unit Mounting Bracket.

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

that the brass spacers are used between the bottom of the Trip Unit and the top of the Trip Unit Mounting Bracket.

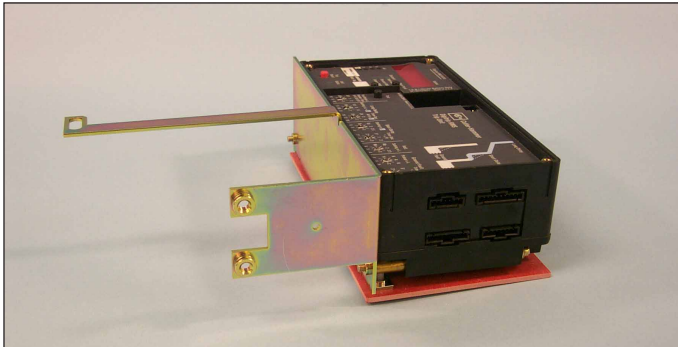


Fig. 47 Trip Unit Installed on the Mounting Bracket.

- C. Remove and scrap the hardware securing the right Racking Shaft Bearing Cap to the right Breaker Frame. Scrap the Bearing Cap.

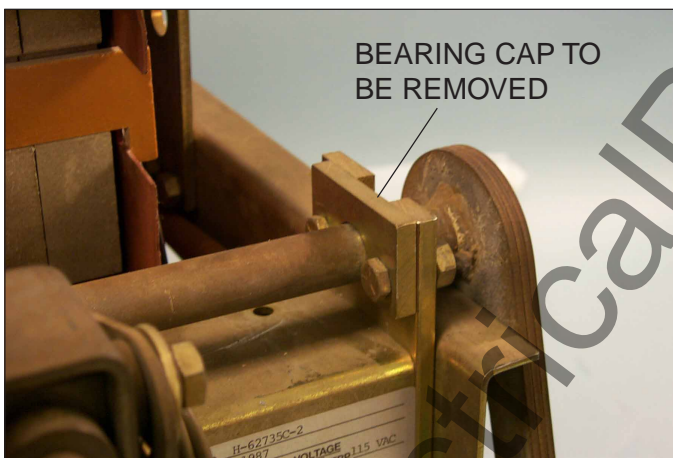


Fig. 48 Bearing Cap to be Removed.

- D. Remove and save nut, lock washer, and flat washer securing the front DTA Assembly Mounting Bracket to the front Breaker frame.
- E. Align the Trip Unit Assembly with the holes for the right Bearing Cap and the bolt used to mount the front DTA Assembly Mounting Bracket. Secure the Trip Unit Assembly to the Breaker using the (2) .250-20 x .750 bolts, (2) lock washers, and (2) flat washers supplied and the hardware removed in the previous step.

- F. Using the mounting hardware just removed in Step 6-D, secure the front Trip Unit Assembly mounting Bracket and front DTA Assembly Mounting Bracket to the front Breaker Frame.

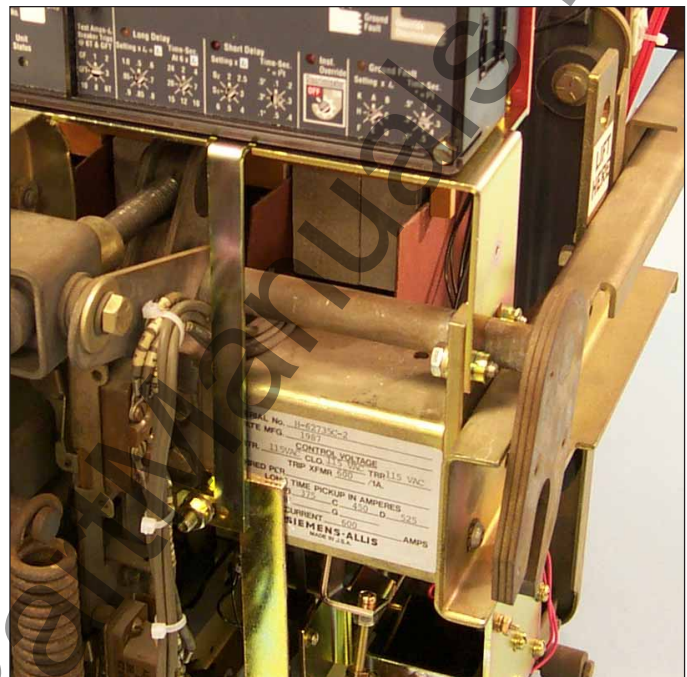


Fig. 49 Trip Unit Assembly Mounted to the Breaker.

- F. Remove the Trip Unit Cover. Install the Rating Plug. Reinstall the Trip Unit Cover using the original hardware.

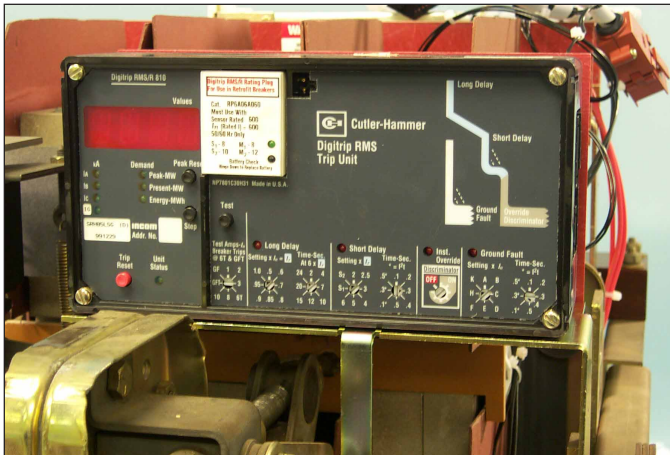


Fig. 50 Trip Unit Assembly with Rating Plug and Cover Installed on the Breaker.

- G. Install the Digitrip Retrofit Label on the top of the Trip Unit.

STEP 7: ADJUSTING THE DTA TRIP AND RESET FUNCTIONS

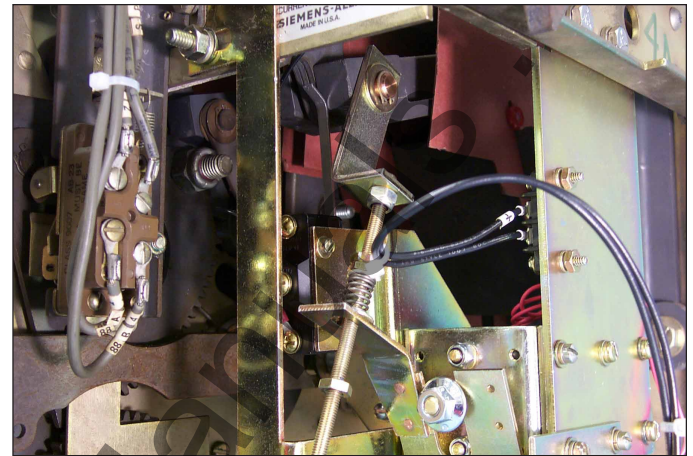


Fig. 51 Overview: Breaker Ready for DTA Adjustment.

- A. Back-off the top adjusting nut above the spring on the Reset Shaft. Apply Loc-Tite® 243 to the threads then turn the adjusting nut until a cage height of 0.50" (1/2") between inside surfaces on the washers at the top and bottom of the spring is achieved.

NOTE: The cage height is measured at the back of the spring (facing the rear of the Breaker).

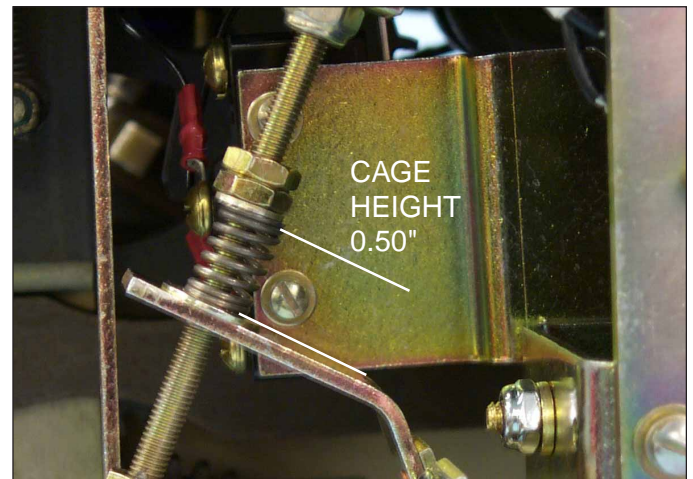


Fig. 52 Adjusting the Cage Height.

- B. Refer to the wiring diagram originally supplied with the Breaker to determine the correct Secondary Contacts to be used to charge and close the Breaker.

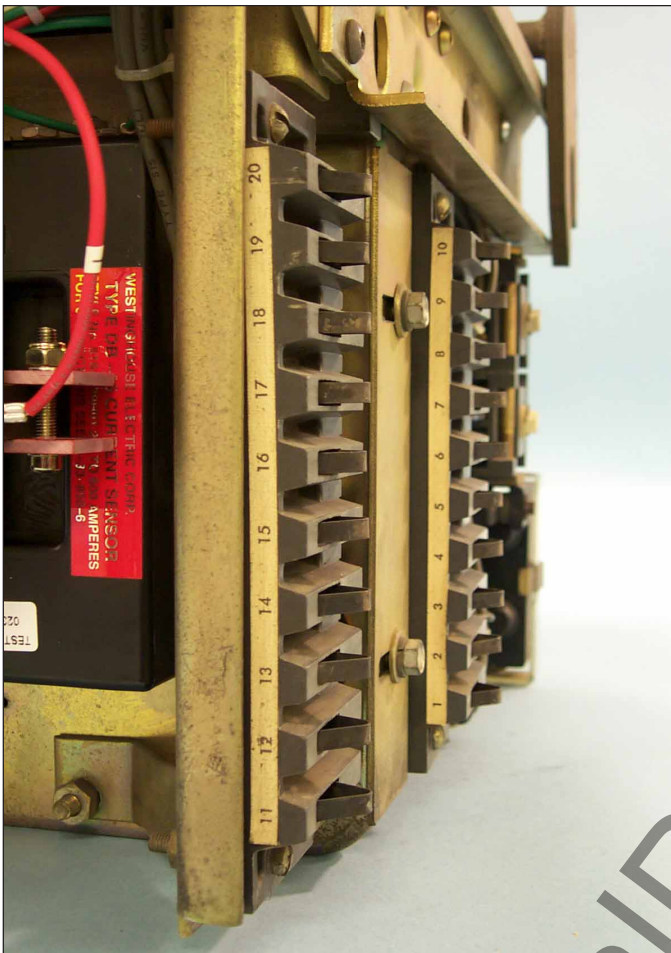


Fig. 53 Location of the Secondary Contacts.



WARNING

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

- C. Loosen the nut on the back end of the DTA Shaft and apply Loc-Tite® 243 to the threads. CHARGE and CLOSE the Breaker. While holding the nut just loosened, turn the DTA Shaft shoulder nut until a minimum gap of 0.060" to 0.090" exists between the DTA Trip Finger and the Trip Shaft Interlock Pin (roll pin) on the right end of the Breaker Trip Shaft. Tighten the nut on the back of the DTA Shaft.

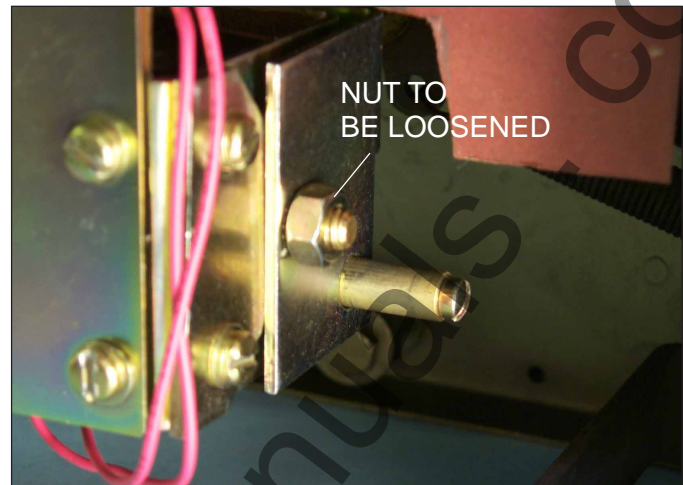


Fig. 54 Nut to Be Loosened to Adjust the Gap Between the DTA Trip Finger and the Trip Shaft Interlock Pin.

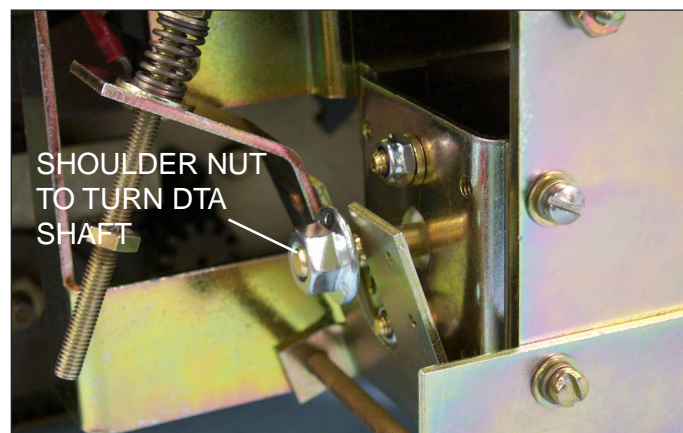
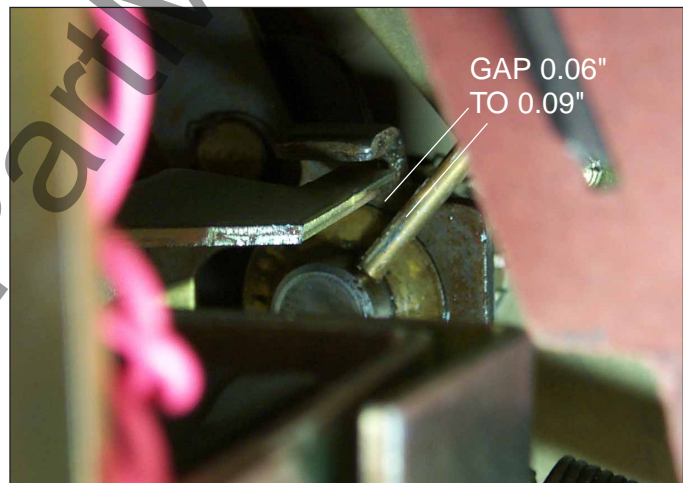


Fig. 55 Adjusting the Gap Between the DTA Trip Finger and the Trip Shaft Interlock Pin.

- D. Return the Breaker to the OPEN position and allow sufficient time for the Loc-Tite to set.
- E. Connect a 24 VDC power supply to the DTA terminals; positive to positive and negative to negative. Close the Breaker. Energize the DTA to trip the Breaker; de-energize when the Breaker trips. Make certain that the DTA resets. If the Breaker fails to properly trip insure that a minimum gap of 0.060" to 0.090" exists between the DTA Trip Finger and the Trip Shaft Interlock Pin. If the Breaker fails to properly reset or trip, readjust the DTA Assembly as described in the previous steps.

STEP 8: INSTALLING THE EXTERNAL HARNESS AND FINAL CONNECTIONS

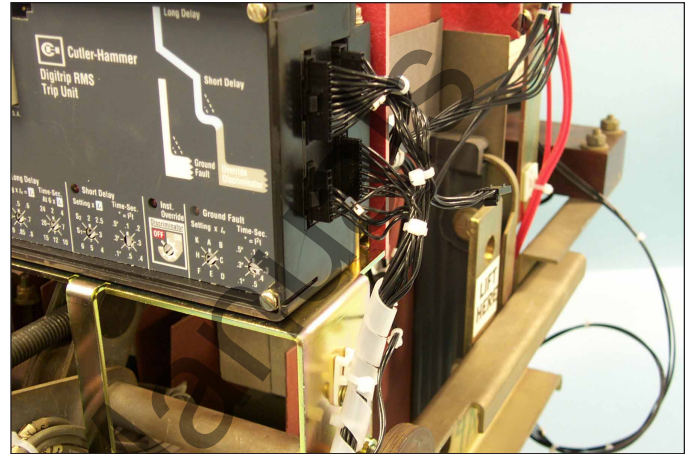


Fig. 56 Overview: Harnesses Connected to the Trip Unit.

- A. Plug the Aux. CT Harness into the connector on the Aux. CT Module Pigtail.
- B. Route the Aux. CT Harness across to the right side of the Breaker, then forward towards the Trip Unit. Connect the Aux. CT Harness to its receptacle in the Trip Unit. Use the self-adhesive mounting pad and wire tie supplied to secure the Aux. CT Harness to the right Phase Barrier, as shown. Note that the Aux. CT Harness is longer than necessary. The excess should be "coiled" as it is secured to the right Phase Barrier.

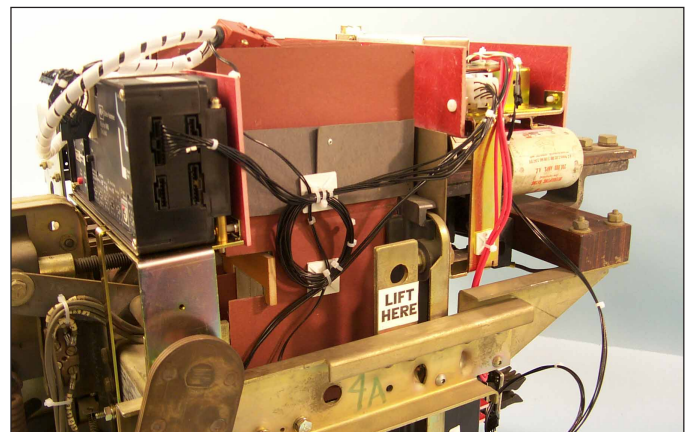


Fig. 57 Routing and Connection of the Aux. CT Harness to the Trip Unit.

- C. Connect the External Harness to the receptacles in the Trip Unit. Secure the External Harness to the Trip Unit Mounting Bracket, as shown, using the (1) Panduit tie mount and (1) .164-18 x .500 thread cutting screw, (1) lock washer, and (1) flat washer supplied.

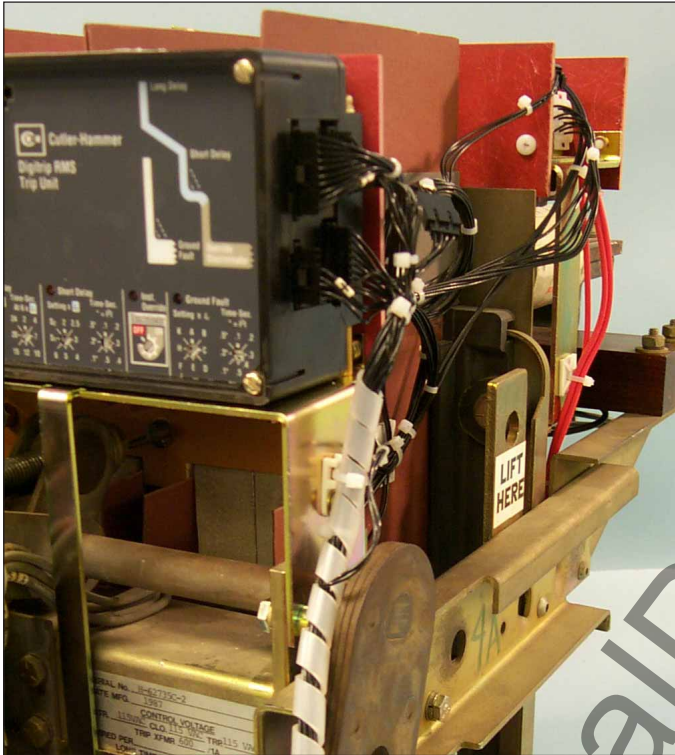


Fig. 58 External Harness Connected to the Trip Unit.

NOTE: For 510 Basic Kits, the External Harness is the Shorting Plug pictured below. It is to be plugged into the corresponding receptacle in the Trip Unit.

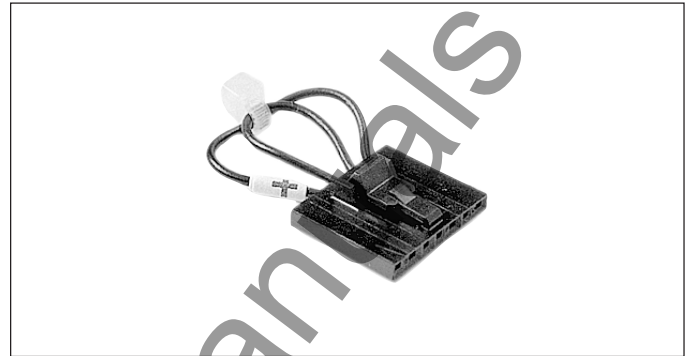


Fig. 59 510 Basic Kit External Harness Shorting Plug.

- D. *For Kits Supplied with a PT Module Only:* Route the PT Extension Harness across to the right side of the Breaker, then forward towards the Trip Unit. Connect the PT Extension to the corresponding plug on the External Harness. Use the self-adhesive mounting pad and wire tie supplied to secure the PT Extension Harness to the right Phase Barrier. Note that the PT Extension Harness is longer than necessary. The excess should be "coiled" as it is secured to the right Phase Barrier.

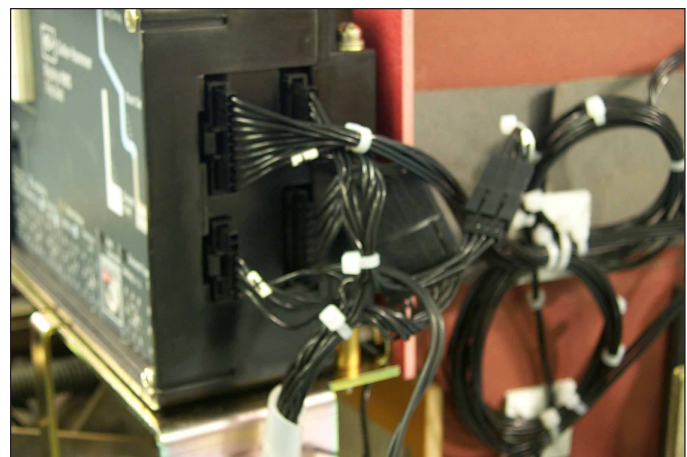


Fig. 60 Routing and Connection of the PT Extension Harness to the External Harness.

- F. *For Kits Supplied with an Auxiliary Switch Only:* Make sure that the External Harness's Auxiliary Switch Wires clear all moving parts within the Breaker as the pass from the External Harness to the Auxiliary Switch. Use the wire ties supplied to secure the Auxiliary Switch wires away from any moving parts.

For All Retrofit Kits.

- G. Use the wire ties supplied to secure all wires and harnesses away from any moving parts within the Breaker.

For Kits Supplied with a CPT Module Only.

STEP 9: INSTALLING THE CPT MODULE

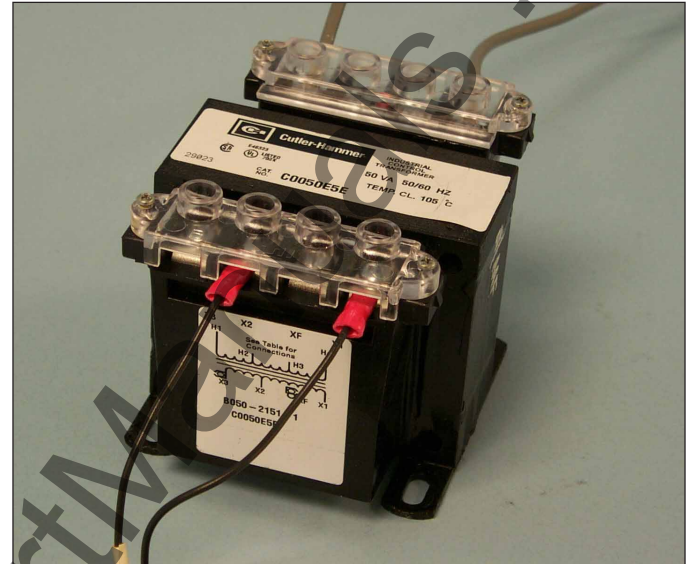


Fig. 61 Overview: CPT Module Ready for Installation in the Breaker Cell.

NOTE: Because of the compact nature of the Breaker, there is no room to mount the CPT Module to the Breaker. Therefore, the Retrofitter is required to find a location within the Breaker Cell to mount the CPT Module. The best possibilities are the top, bottom, or back of the Cell.



Fig. 62 The Inside of the Breaker Cell.



CAUTION

IF THE CPT MODULE IS MOUNTED IN THE BREAKER CELL, THE CPT HARNESS CONNECTION AT THE TRIP UNIT AND THE HV WIRE CONNECTIONS AT THE FUSE CRADLE WILL HAVE TO BE DISCONNECT AS THE BREAKER IS RACKED OUT OF THE CELL. FAILURE TO DO SO CAN RESULT IN DAMAGE TO THE TRIP UNIT, CPT MODULE, OR THE BREAKER ITSELF.

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

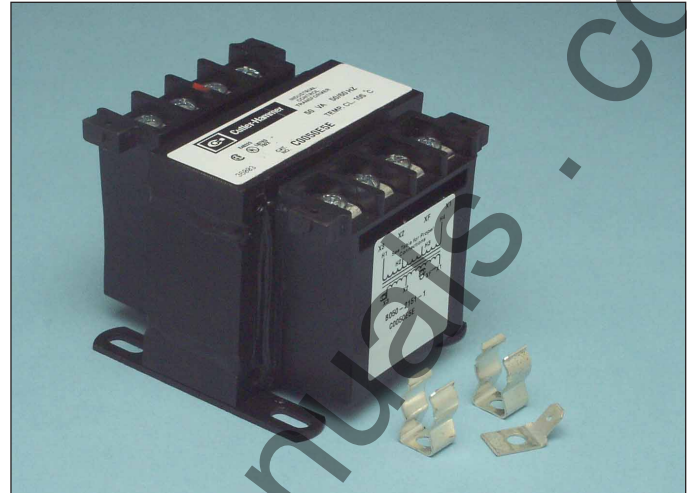


Fig. 63 Fuse Clips and Spade Connector Removed from the CPT.

NOTE: Depending on where the CPT Module is mounted in the Cell, the Load Side HV Wires may be longer than necessary. Before cutting the wires, be sure that sufficient length is left so that the HV Wire Fuses can be mounted in an accessible position and that the connections can be made to the correct "H" terminals on the CPT Module.

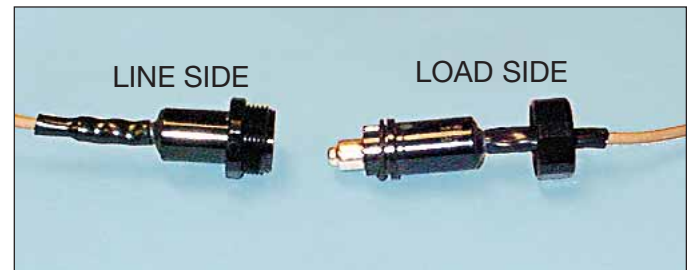


Fig. 64 Load and Line Sides of the HV Wires.

- B. Temporarily position the CPT Module and the HV Fuses in their desired locations. Route the Load Side HV Wires to the CPT Module. Mark and cut the Load Side of each HV Wire to an appropriate length for connection to the "H" terminals of the CPT. Strip approximately .250" of insulation from the Load Side HV Wires and attach a .190" ring terminal to each. Attach the HV Wires to the CPT "H" terminals to achieve the required voltage (see Table 3).

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.

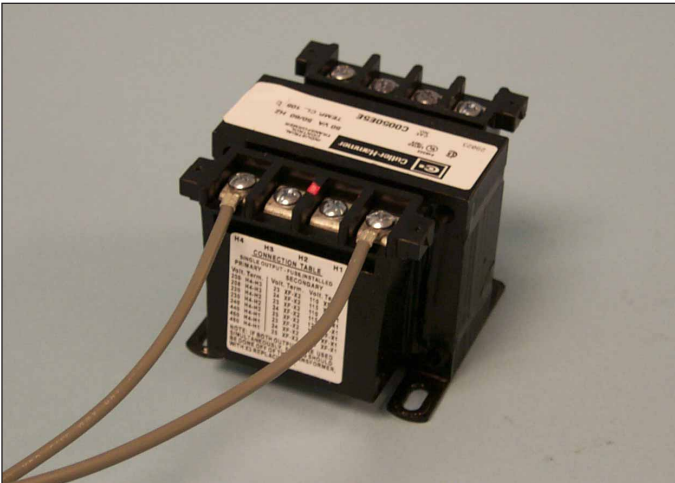


Fig. 65 Load Side HV Wires Connected to the "H" Terminals of the CPT Module.

Table 3 CPT High Voltage Taps for Standard and Special Order CPTs

Standard CPT (Style #9A10037G01 & G02)

Voltage Required	CPT Terminals Used
480 Volt Circuit	H1 & H4
240 Volt Circuit	H2 & H4
208 Volt Circuit	H3 & H4

Special Order 575 Volt CPT (Style #9A10037G03 & G04)

575 Volt Circuit	H1 & H4
460 Volt Circuit	H2 & H4
230 Volt Circuit	H3 & H4

C. Connect the CPT Harness wires to the appropriate "X" terminals of the CPT Module as shown. See Table 4 for Tap information.

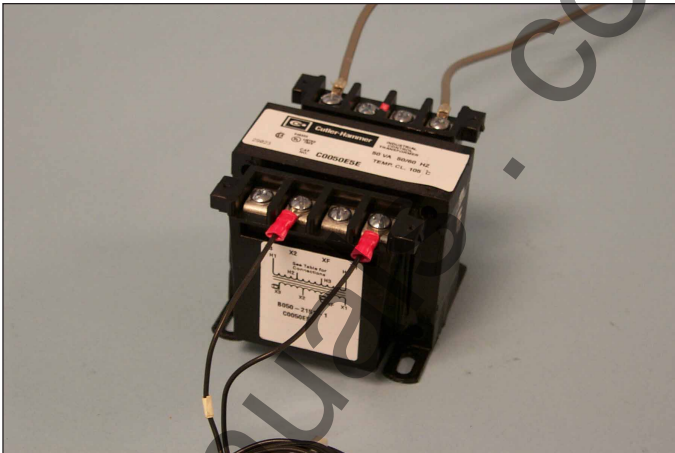


Fig. 66 CPT Harness Connected to the "X" Terminals of the CPT Module.

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

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

D. 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.

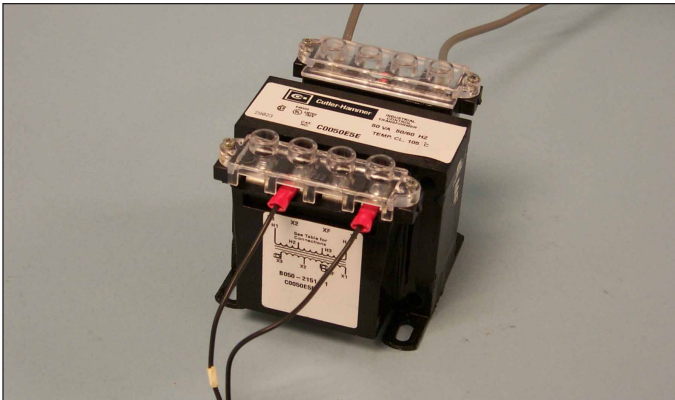


Fig. 67 Finger Safe Covers Installed on the CPT.

- E. Mount the CPT Module in the desired location within the Breaker Cell. Insure that the selected location allows the CPT to clear all Breaker Components as the Breaker is being Racked into the Cell.
- F. Secure the HV Fuses in their desired location within the Breaker Cell. Insure that the selected location allows the HV Fuses to clear all Breaker Components as the Breaker is being Racked into the Cell.
- G. Install the appropriate CPT Voltage Label on the Breaker Front Cover, as shown.



Fig. 69 CPT Voltage Label Installed on the Breaker Front Cover.



Fig. 68 CPT Voltage Labels Supplied with the CPT Kit.



WARNING

THE FOLLOWING STEPS CAN ONLY BE COMPLETED WHEN THE BREAKER IS ENGAGED IN THE RACKING MECHANISM AND IN THE DISCONNECTED POSITION.

NOTE: The power convention of Circuit Breakers is normally Top to Bottom, meaning the top Breaker Studs are on the Line Side of the Breaker and the bottom Breaker Studs 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 Studs. In the case of the Line Side being the bottom Breaker Studs, the HV Wires can be connected to the existing hardware on the bottom Studs. This will be similar to the procedure detailed earlier for connection of the PT Wires.

NOTE: The Line Side HV Wires may be longer than necessary. 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 hardware on the Fuse Cradle.

- H. With the Breaker engaged in the Racking Mechanism and in the DISCONNECTED position, route the HV Line Side Wires to the Phase 1 and 2 or the Phase 2 and 3 Fuse Cradles. Cut each HV Wire to an appropriate length for attachment to the Fuse Cradle hardware used to secure the existing Breaker Wires to the bottom of the rear Fuse Cradle. Strip .250" from each wire, then install a .190" ring terminal on each wire.
- I. Remove the existing hardware from the Phase 1 and 2 or Phase 2 and 3 rear Fuse Cradles. Secure the HV Line Side Wires and the original Breaker Wires to the rear Fuse Cradles using the hardware just removed.

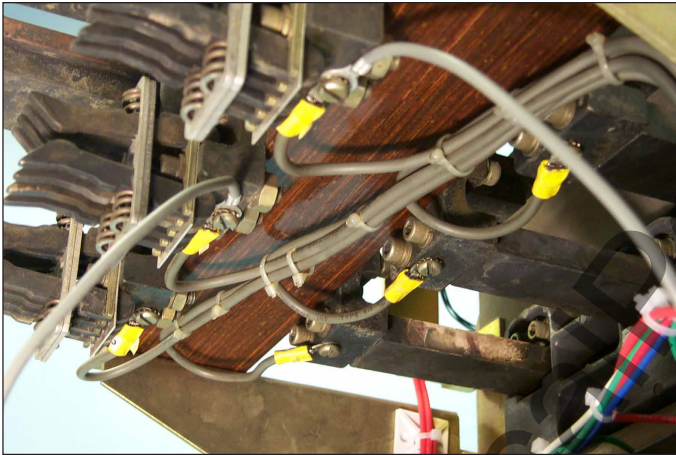


Fig. 70 HV Line Side Wires Connected to the Rear Fuse Cradle.

- J. Route the CPT Harness from the CPT Module to the right side of the Trip Unit. Remove the External Harness plug connected to the Trip Unit. Connect the black plug of the CPT Harness into the same receptacle in the Trip Unit from which the plug was removed. Reinsert the External Harness plug just removed into the female receptacle on the CPT Harness.

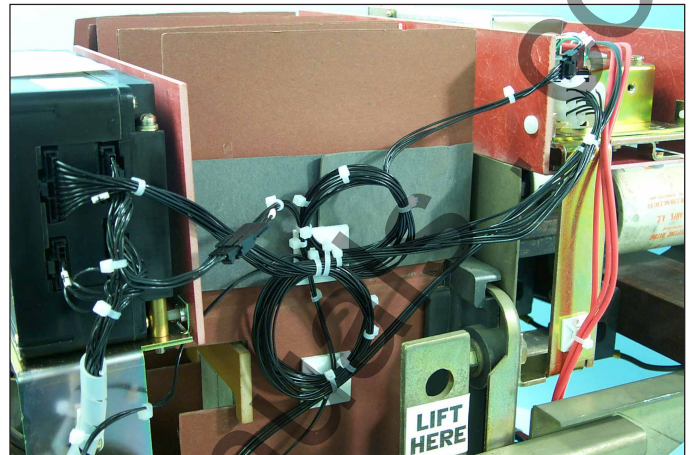


Fig. 71 CPT Harness Connected to the External Harness.

- K. Use the self-adhesive mounting pads and wire ties supplied to secure the HV Wires and CPT Harness to the Breaker Cell and Breaker Backplate, if applicable.

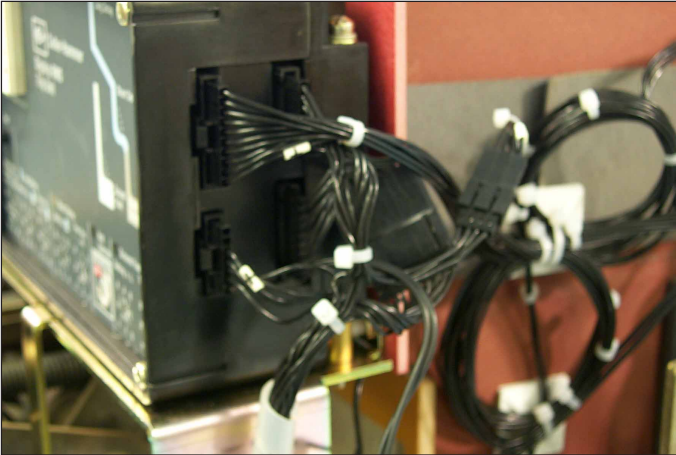
STEP 10: FINAL BREAKER PREPARATION

Fig. 72 Overview: Breaker Ready for Testing.

- A. Use the self-adhesive mounting pads and wire ties supplied to dress all wires and harnesses to keep them away from any moving parts within the Breaker.
- B. Reinstall the Breaker Front Cover using the original hardware removed in Step 2-B.
- C. If equipped, using the original mounting hardware removed in Step 2-A, reinstall the Manual Closing Handle.

STEP 11: TESTING THE BREAKER

- A. Measure the force necessary to trip the Breaker at where the DTA Adjusting Screw impacts the Breaker Trip Paddle. 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 12: MOUNTING THE CELL HARNESS

- A. The Cell Harness is to be mounted in the Breaker Cell. The connector end is to be mounted on the right side of the Cell, in a location suitable for connection with the External Harness. The Terminal Blocks can be mounted anywhere space is available in the Cell as long as connection to the External Harness can be made.
- B. Route the Cell Harness wiring to keep it away from any moving parts within the Cell Housing.

STEP 13: 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-600 F Breaker RMS/R Retrofits

Step	Description	Qty.	Comment
Step 3	Sensor	8184A39H01	3
	Sensor Mounting Parts	9A10151G04	1
	Spacer		6
	.190-32 × 1.25 Lng. Screw Stl. Fil.		6
	.190 Flat Washer Stl.		12
	.190-32 Nut Hex Stl. Nylok		6
	Sensor Harness Mounting Parts	9A10151G07	1
	Sensor Harness		1
	Mounting Pad - 1", Self-Adhesive		9
	Wire Tie Nylon		30
Step 4	Aux. CT Module	6503C59G__	1
	Aux. CT Module Mounting Parts	9A10151G08	1
	Mounting Bracket R. H.		1
	Mounting Bracket L. H.		1
	Mounting Bracket - Insulation Barrier		2
	Insulation Barrier Bottom		1
	Insulation Barrier Front & Rear		2
	.190-32 × .250 Lng. Screw Nylon P. H.		4
	.190-32 × .375 Lng. Screw Stl. F. H.		6
	.190-32 × .500 Lng. Screw Nylon P. H.		4
	Mounting Pad - 1", Self-Adhesive		2 From Step 3
	Wire Tie Nylon		2 From Step 3
	PT Module	6502C82G01	1
	Ring Terminal (.190, .250, .312, .375, .500 - Each Size)		3
	PT Module Mounting Parts	9A10151G10	1
	PT Extension Harness		1
	Insulation Barrier (Fish Paper)		1
	.138-32 × .375 Lng. Screw Stl. T. C.		2
	.138 Flat Washer Stl.		2
	.138 Lock Washer Stl.		2
	PT Warning Label		2
	Mounting Pad - 1", Self-Adhesive		4 From Step 3
	Wire Tie Nylon		4 From Step 3
Step 5	DTA Assembly	9A10151G33	1
	DTA Mounting Parts	9A10151G05	1
	.250-20 × 1.00 Lng. Hex Bolt Stl.		1
	.250-20 × .750 Lng. Hex Bolt Stl.		2
	.250 Flat Washer Stl.		3
	.250 Lock Washer Stl.		3
	.250-20 Nut Hex Stl.		1
	DTA Reset Parts	9A10151G06	1
	DTA Extension Harness		1
	Wrist Pin		1
	.375 Flat Washer Stl.		1

Digitrip Retrofit Kit Installation Components for Allis-Chalmers LA-600 F Breaker RMS/R Retrofits

Step	Description	Qty.	Comment
	.375 Tru-Arc Retaining Ring	2	
	Loc-Tite® 243	1	
	Auxiliary Switch Kit	1	
	Microswitch	1	
	Mounting Bracket	1	
	.164-32 × .375 Lng. Screw Stl. Fil.	1	
	.164-32 × .250 Lng. Screw Stl. Fil.	1	
	.164 Flat Washer Stl.	2	
	.164 Lock Washer Stl.	2	
	.138-32 × 1.00 Lng. Screw Stl. Fil.	2	
	.138 Flat Washer Stl.	4	
	.138 Lock Washer Stl.	2	
	.138-32 Nut Hex Stl.	2	
	Mounting Pad - 1", Self-Adhesive	1	From Step 3
	Wire Tie Nylon	2	From Step 3
Step 6	Trip Unit	1	See Pick List
	Rating Plug	1	See Pick List
	Trip Unit Mounting Parts	1	9A10151G09
	Mounting Bracket	1	
	Insulation Barrier	1	
	Digitrip Retrofit Label	1	
	.250-20 × .750 Lng. Hex Bolt Stl.	2	
	.250 Flat Washer Stl.	2	
	.250 Lock Washer Stl.	2	
	.190-32 × 4.00 Lng. Screw Fil.	2	
	.190-32 × .500 Lng. Screw Nylon P. H.	2	
	.190 Flat Washer Stl.	2	
	.190 Lock Washer Stl.	2	
	Spacer Brass	2	
Step 7	Loc-Tite® 243	1	From Step 5
Step 8	Auxiliary CT Harness	1	6502C84G02
	PT Extension Harness	1	6502C85G01
	External Harness	1	6503C83G
	External Harness Mounting Parts	1	9A10151G02
	.164-18 × .500 Lng. Screw Stl. T. C.	1	
	.164 Flat Washer Stl.	1	
	.164 Lock Washer Stl.	1	
	Panduit Cable Mount	1	
	Mounting Pad - 1", Self-Adhesive	3	From Step 3
	Wire Tie Nylon	3	From Step 3
Step 9	CPT Kit	1	See Pick List
	MTE Transformer	1	
	HV Fused Wires	2	
	CPT Wires	1	

Comm. Only

Comm. Only

CPT Only

Digitrip Retrofit Kit Installation Components for Allis-Chalmers LA-600 F Breaker RMS/R Retrofits

Step	Description	Qty.	Comment
	Mounting Hardware Kit	1	} CPT Only
	.190-32 × .750 Lng. Screw Stl. Fil.	4	
	.190 Flat Washer Stl.	8	
	.190 Lock Washer Stl.	4	
	.190-32 Nut Hex Stl.	4	
	Ring Terminal (.138, .190, .250, .312, .375, .500 - Each Size)	2	
	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 Stl. Fil.	4	
	Mounting Pad - 1", Self-Adhesive	2	
	Wire Tie Nylon	2	
Step 10	Mounting Pad - 1", Self-Adhesive		From Step 3
	Wire Tie Nylon		From Step 3
Step 12	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. 73 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. PT Extension Harness |

Notes

Notes

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

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

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

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

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