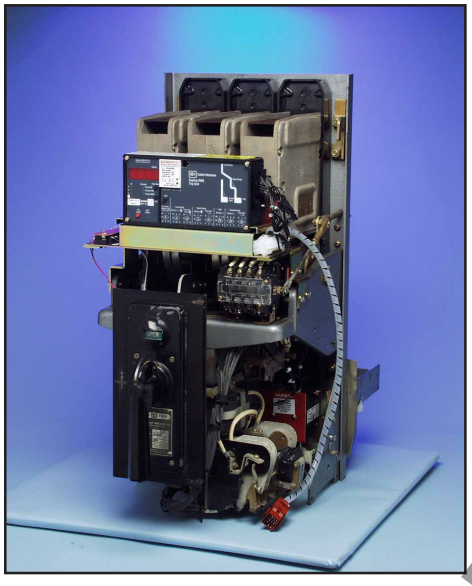
Digitrip Retrofit System for ITE KB-600 E Breakers



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 ITE KB-600 E Breakers

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INTRODUCTION

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

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

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

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

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

Table 1 Available Retrofit Kits

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

STEP 1: GENERAL BREAKER PREPARATION

Before attempting to remove the Breaker from the cell or perform any Retrofit Operation, be sure to read and understand the Safety Precautions section of this manual. In addition, be sure to read and understand the Instructions for the Application of Digitrip RMS Retrofit Kits on Power Circuit Breakers (Retrofit Application Data - Publication AD 33-855-2), supplied with the Digitrip Retrofit Kit.

⚠ WARNING

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

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

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

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

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

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

STEP 2: REMOVING THE ORIGINAL TRIP SYSTEM AND PREPARING THE BREAKER FOR RETROFITTING

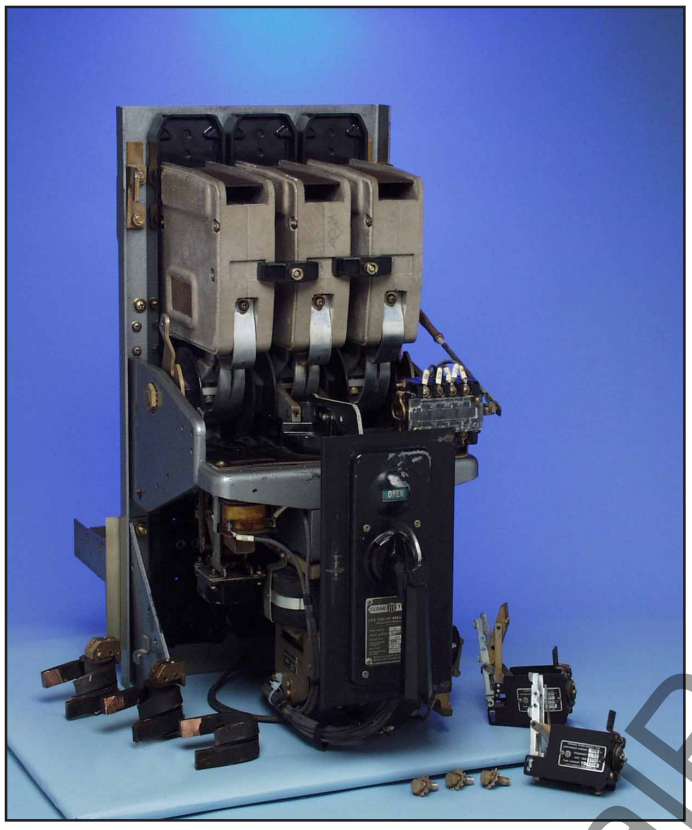

Fig. 1 Overview: Removed Components

NOTE: This Retrofit Kit is for ITE KB-600 E Breakers manufactured AFTER August, 1955. If the Breaker being Retrofitted was manufactured before this date, contact Cutler-Hammer to secure the correct Retrofit Kit for the Breaker.

A. Remove and scrap the Electromechanical Trip Units.

Fig. 2 Electromechanical Trip Units

B. Remove and save the mounting hardware securing the Copper Connectors to the Breaker Back Plate. Remove the Copper Connectors.

C. Remove and scrap the Trip Finger and mounting hardware.

STEP 3: MODIFYING AND REINSTALLING THE COPPER CONNECTORS

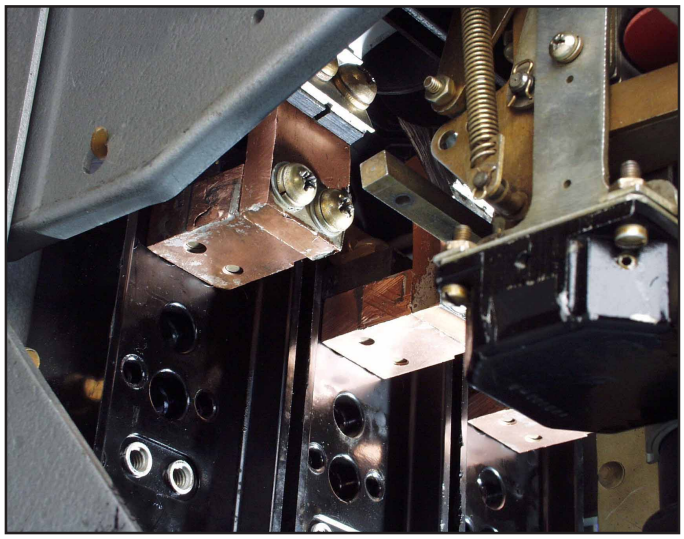

Fig. 3 Overview: Copper Connectors Reinstalled in the Breaker

A. The Trip Coils are brazed to the Copper Connectors. Using a hacksaw or appropriate cutting tool, cut the Trip Coils from the Copper Connectors at the braze lines. Scrap the Trip Coils.

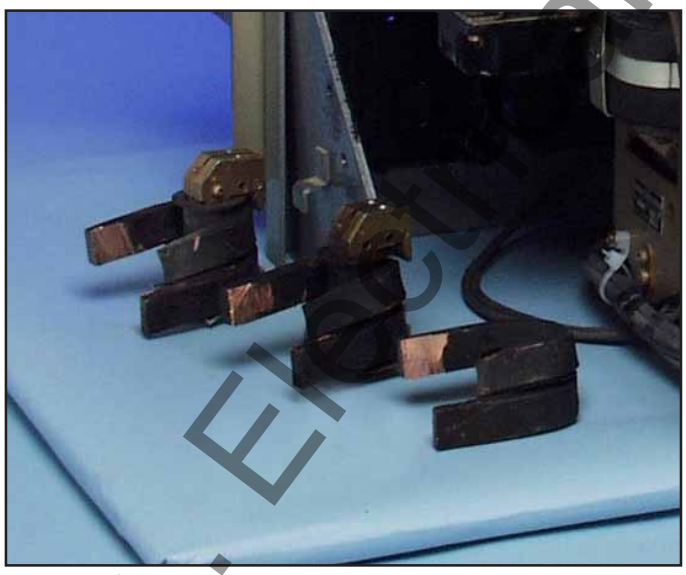

Fig. 4 Trip Coils Removed from the Copper Connectors

B. Using the hardware removed in Step 2-B, reinstall the Copper Connectors to the Breaker in their original location.

For Kits Supplied with a PT Module and / or Breaker Mounted CPT.

STEP 4: INSTALLING THE PT MODULE AND BREAKER MOUNTED CPT

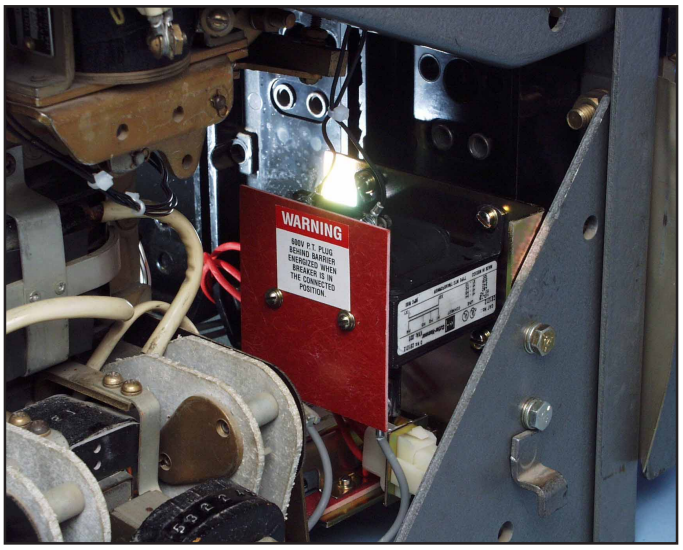

Fig. 5 Overview: PT Module and Breaker Mounted CPT Installed in the Breaker

NOTE: Throughout the drilling process detailed in this step, insure that no drill shavings fall into the Breaker.

A. Using Drilling Plan "A", drill two (2) 0.281" diameter holes in the right Breaker Support. These will be used later in the Retrofit process to mount the PT Module and / or CPT Assembly.

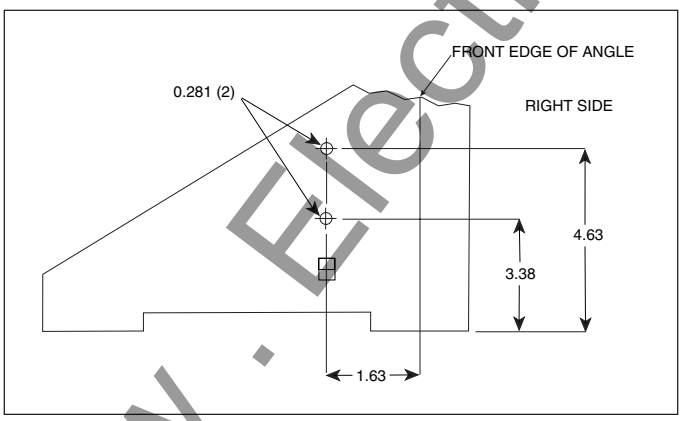

Fig. 6 Drilling Plan "A"

For Kits Supplied with a PT Module Only.

B. Remove and scrap the existing PT Module Label Plate.

C. Align the Insulation Barrier and PT Module with the holes in the PT Module / CPT Mounting Bracket as shown. Using the two (2) .138-32 × .500" screws, (4) flat washers, (2) lock washers, and (2) nuts supplied, secure the PT Module and the Insulation Barrier to the PT Module / CPT Mounting Bracket.

Fig. 7 PT Module and Insulation Barrier Secured to Mounting Bracket

D. Place the PT Module Warning Label in a prominent location on the PT Module Mounting Bracket.

NOTE: If a Breaker Mounted CPT was ordered with the Retrofit Kit, the PT Module Warning Label will be installed later in this step.

E. *For Kits Supplied with a Breaker Mounted CPT Only:* Align the CPT Module with the holes in the PT Module / CPT Mounting Bracket as shown. Using the four (4) .190-32 × .500" screws, (8) flat washers, (4) lock washers, and (4) nuts supplied, secure the CPT Module to the PT Module / CPT Mounting Bracket.

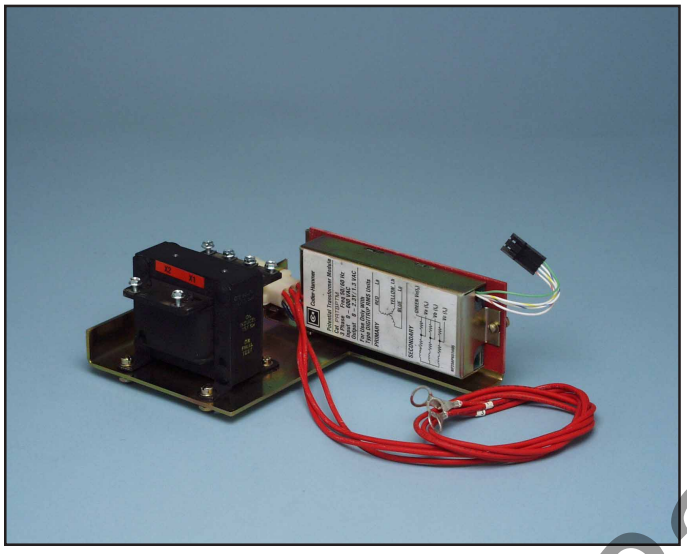

Fig. 8 Breaker Mounted CPT Secured to the PT Module / CPT Mounting Bracket

F. *For Kits Supplied with a PT Module and / or Breaker Mounted CPT:* Align the holes in the PT Module / CPT Mounting Bracket with the holes drilled in Step 4-A. Using the two (2) .250-20 × .750" bolts, (2) lock washers, and (2) flat washers supplied, secure the PT Module / CPT Mounting Bracket to the right Breaker Support as shown.

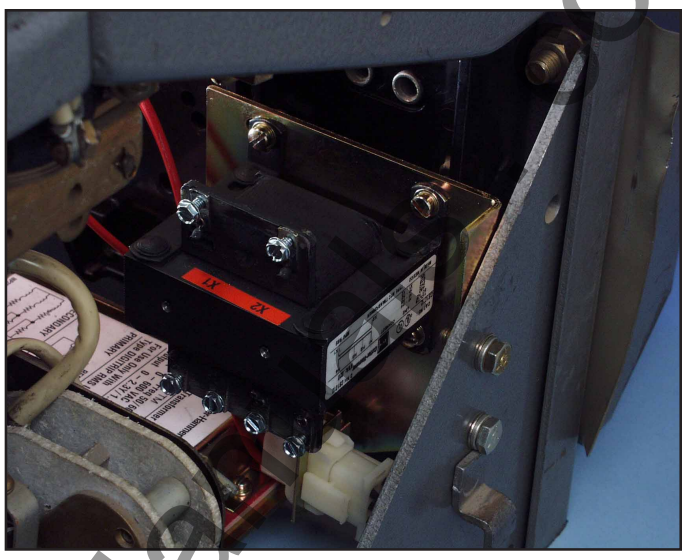

Fig. 9 PT Module / CPT Mounting Bracket Mounted to the Right Breaker Support

G. *For Kits Supplied with a PT Module Only:* Temporarily route the PT Wires behind the PT Module towards the left side of the Breaker, then through the existing hole in the Breaker Back Plate.

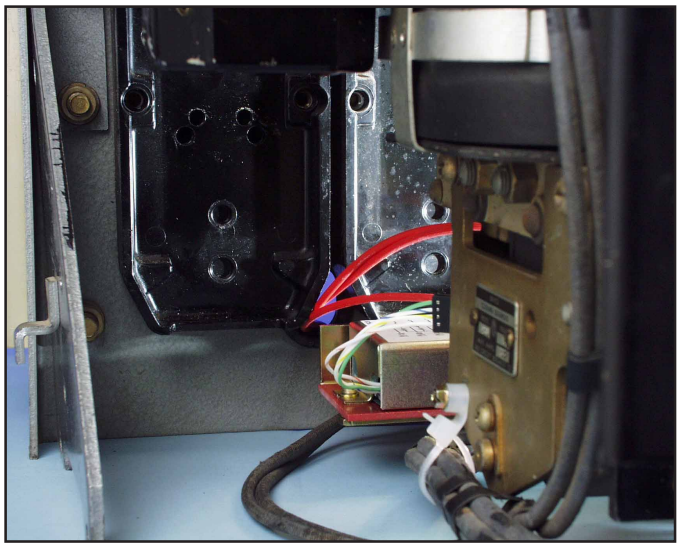

Fig. 10 Routing of the PT Wires

H. Attach the PT Extension Harness to the PT Harness. Temporarily route the PT Extension Harness to the right side of the Breaker, then up towards the top of the Breaker.

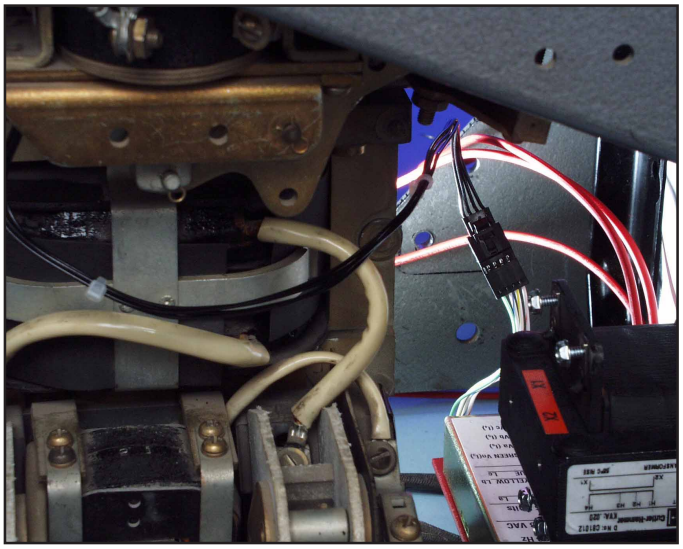

Fig. 11 Connection and Routing of the PT Extension Harness

For Kits Supplied with a Breaker Mounted CPT Only.

NOTE: The High Voltage (HV) Wires have a LOAD Side and a LINE Side. The HV Wires must be installed in the correct orientation during the following procedure. For the purpose of identification, the words "Load Side" are marked on the female fuse receptacle of each HV Wire.

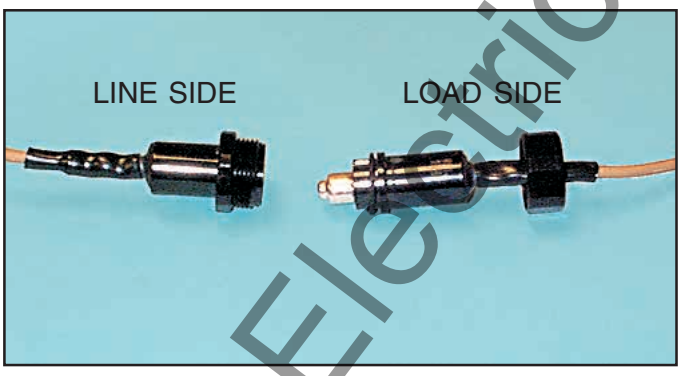

Fig. 12 Identification of the Line and Load Side HV Wires

NOTE: The Load Side HV Wires are longer than necessary and are cut during the following steps. Before cutting the wires, be sure that sufficient length is left so that the connections can be made to the correct terminals on the CPT.

I. Temporarily place the HV Fuses near the front left corner of the PT Module. 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 .138" ring terminal to each. Attach the HV Wires to the CPT terminals to achieve the required voltage (see Table 2).

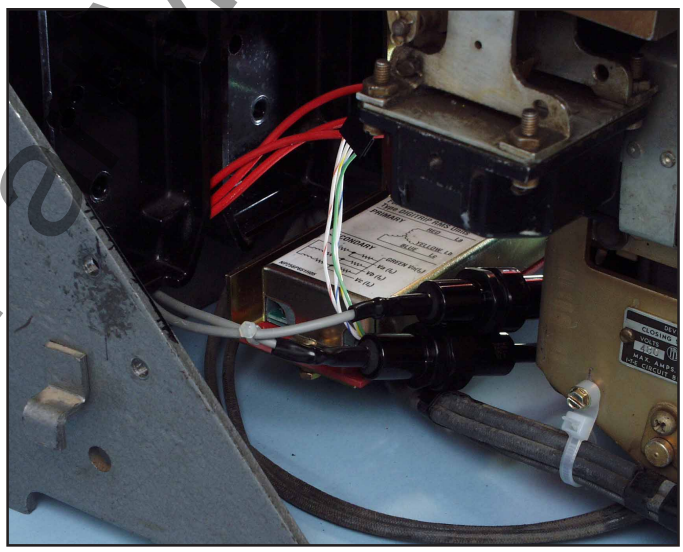

Fig. 13 Correct Positioning of the HV Fuses

Table 2 CPT Voltage Taps

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

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

J. Connect the CPT Wires to the X1 and X2 terminals of the CPT Module as shown.

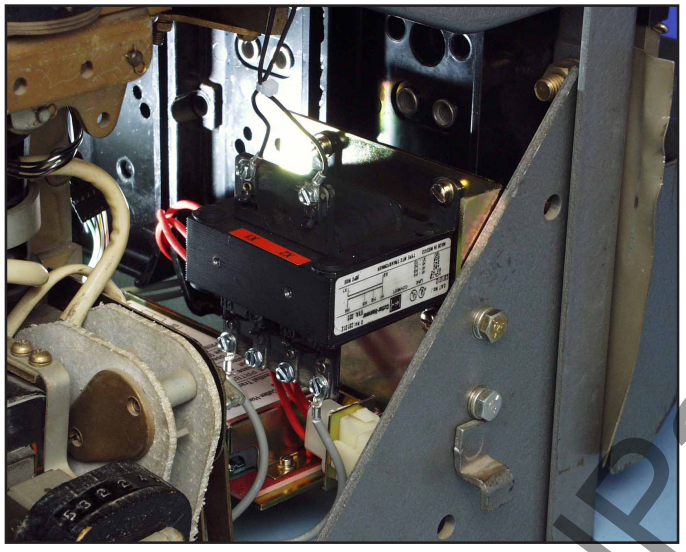

Fig. 14 HV and CPT Wires Connected to the CPT

K. Route the Line Side HV Wires through the existing hole near the bottom left corner of the molder Breaker Back Plate.

L. Attach the Glass Poly Insulation Plate to the top of the CPT, as shown, using the (2) .138-20 × .375" thread cutting screws and (4) flat washers supplied.

M. *For Kits Supplied with a PT Module Only:* Place the PT Module Warning Label prominently on the CPT Insulation Barrier.

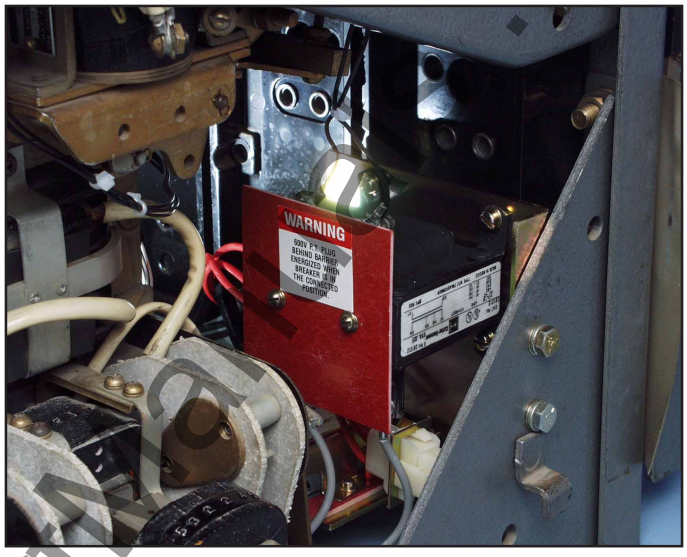

Fig. 15 Insulation Plate Mounted to the CPT

STEP 5: INSTALLING THE TRIP FINGER

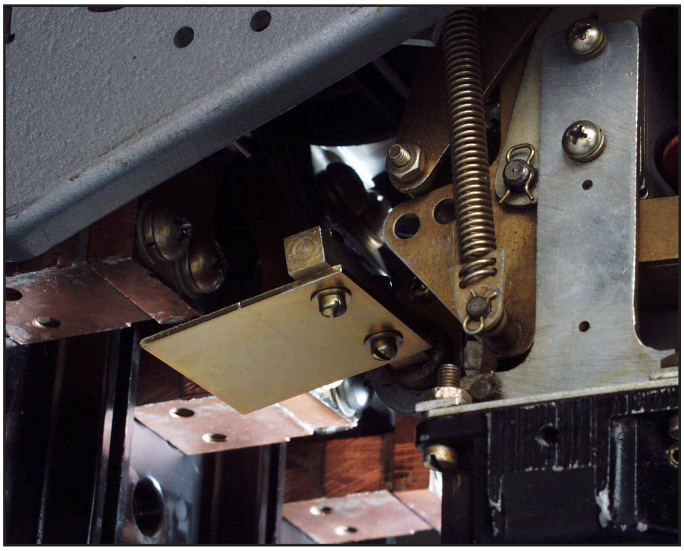

Fig. 16 Overview: Trip Finger Installed in the Breaker

A. Align the holes in the Trip Finger with the existing holes in the Breaker Crossbar. Using the two (2) .164-32 × .750" screws, (4) flat washers, (2) lock washers, and (2) nuts supplied, secure the Trip Finger to the Breaker Cross Bar as shown.

STEP 6: INSTALLING THE RESET ASSEMBLY AND RESET ROD

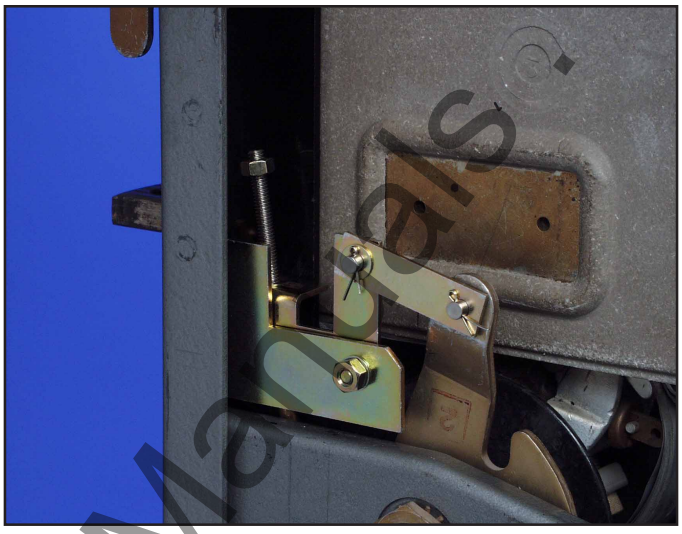

Fig. 17 Overview: Reset Assembly and Reset Rod Installed in the Breaker

A. Remove and save the top two of the three existing screws, lock washers, and nuts located on the left side of the Breaker Back Plate, directly above the left Breaker Frame. The holes and hardware will be used to mount the Reset Assembly to the Breaker.

B. Secure the Reset Assembly to the Breaker Back Plate, as shown, using the original hardware removed in Step 6-A.

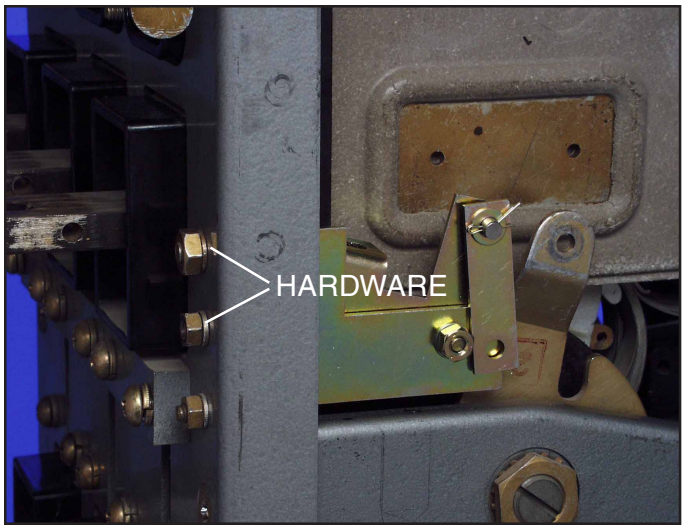

Fig. 18 Reset Assembly Secured to the Breaker Back Plate

NOTE: It may be necessary to tilt the Breaker to perform the following steps.

C. Remove and save the nut and flat washer from the end of the Reset Rod that does not have the spring. Working from the bottom of the Breaker, guide the end of the Reset Rod, from which the nut and washer were just removed, towards the top of the Breaker, and through the slotted hole in the Reset Assembly, as shown. Once the Reset Rod has been placed through the slotted hole, reinstall the washer and nut to prevent the Reset Rod from falling out of the Reset Assembly.

Fig. 19 Reset Rod Inserted through Slotted Hole in Reset Assembly

D. Using the hardware supplied, place (1) flat washer on the .250 × .750" pin. Insert the pin through the hole on the Breaker Trip Bar. Place the other flat washer, then the Reset Assembly Linkage onto the pin and secure it with the cotter pin as shown.

Fig. 20 Reset Assembly Linkage Secured to the Breaker Trip Bar

STEP 7: MOUNTING THE DTA ASSEMBLY

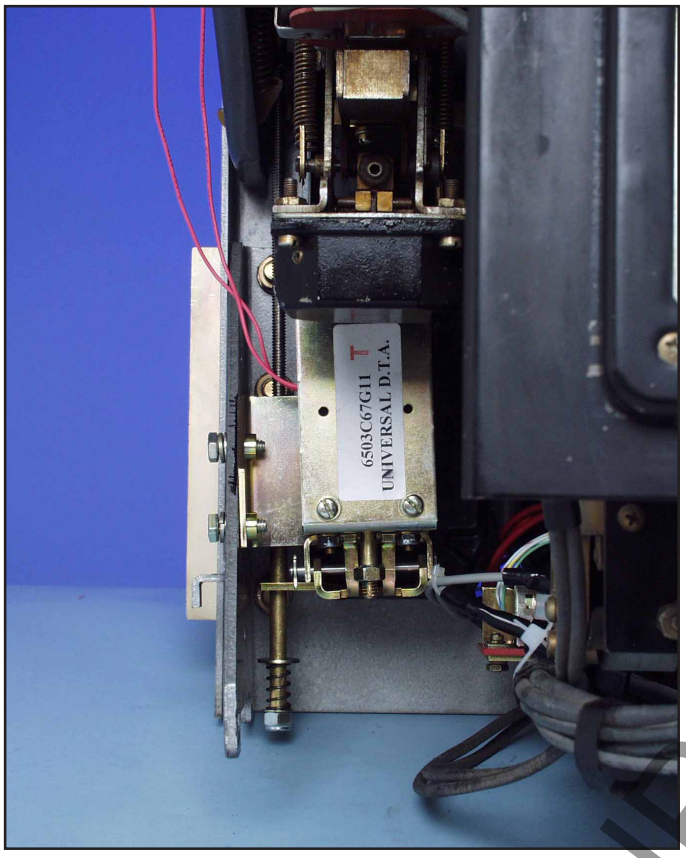

Fig. 21 Overview: DTA Assembly Installed in the Breaker

NOTE: Throughout the drilling process detailed in this step, insure that no drill shavings fall into the Breaker.

A. Using Drilling Plan “B”, drill two (2) 0.281" diameter holes in the Left Breaker Support. These holes will be used to mount the DTA Assembly to the Breaker in Step 7-D.

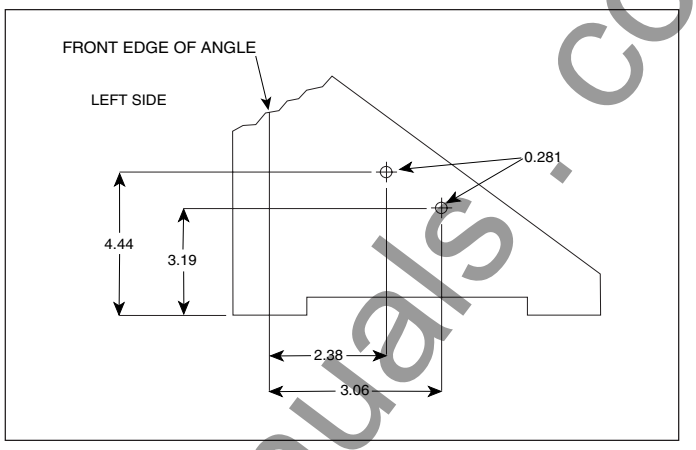

Fig. 22 Drilling Plan “B”

NOTE: It may be necessary to tilt the Breaker to perform Steps 7-B through 7-D.

B. Remove and save the nylon lock nut, washer, spring, oversized flat washer, and copper sleeve from the bottom of the Reset Rod.

C. Place the Reset Rod through the cutout in the DTA Reset Arm. While holding the remaining flat washer in place, reinstall the oversized flat washer, copper sleeve, spring, flat washer, and nylon lock nut on the end of the Reset Rod. Turn the nylon lock nut until it is flush with the end of the Reset Rod.

D. Align the DTA Assembly with the holes drilled in Step 7-A. Using the two (2) .250-20 × .750" bolts, (2) lock washers, and (2) flat washers, mount the DTA to the Breaker as shown.

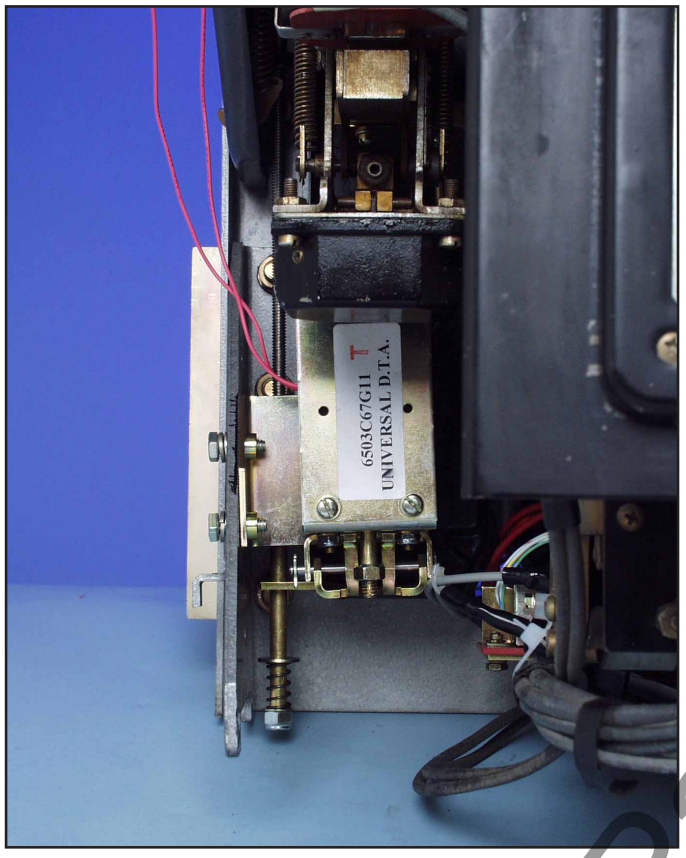

Fig. 23 DTA Mounted to the Left Breaker Support

STEP 8: ADJUSTING THE DTA

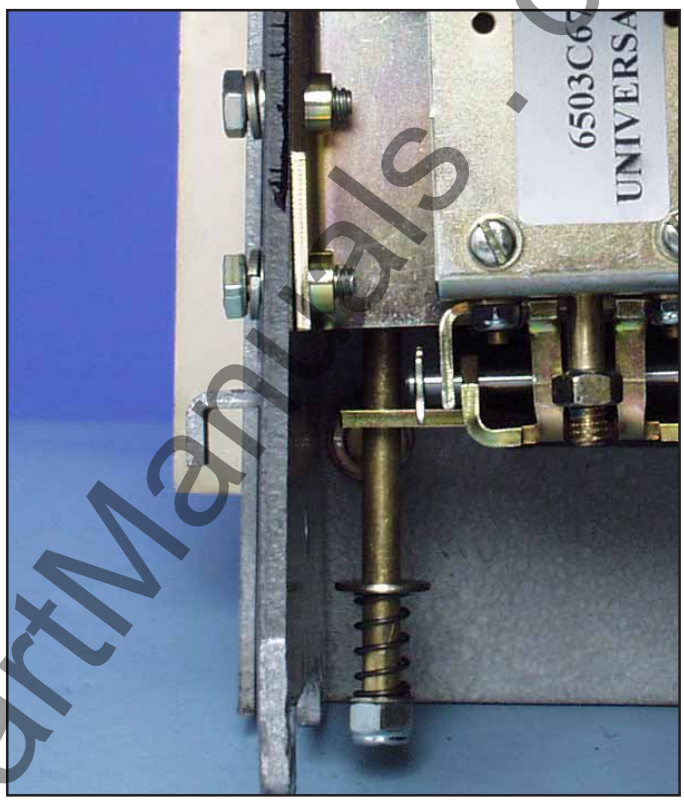

Fig. 24 Overview: Adjusting the DTA

A. Turn the top adjusting nut down the Reset Rod until approximately 2.88" of the Reset Rod are above the adjusting nut.

B. While holding the Reset Rod to prevent it from turning, turn the top nut until a cage height of .30" - .32" is achieved. With a permanent marker, mark the Reset Rod directly above the nut, then back the nut off approximately six or seven threads.

C. Apply Loc-Tite® 243 to the Reset Rod, at the marking made in Step 8-B, and turn the nut until a cage height of .30" - .32" is again achieved.

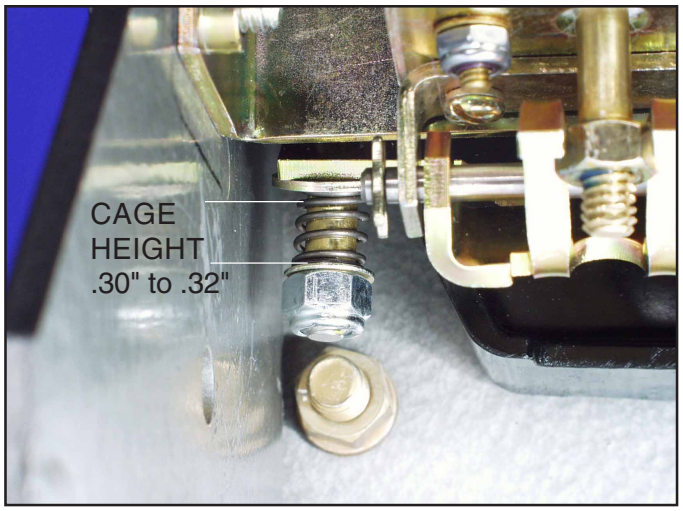

Fig. 25 Adjusting the Reset Cage Height

D. **Close** the Breaker.

⚠ WARNING

GUARD AGAINST THE BREAKER UNINTENTIONALLY OPENING DURING THE FOLLOWING STEP. KEEP HANDS AND FINGERS AWAY FROM MOVING PARTS WITHIN THE BREAKER. FAILURE TO DO SO COULD RESULT IN SEVERE PERSONAL INJURY.

E. Apply Loc-Tite® 243 to the threads of the DTA adjusting screw. Turn the DTA adjusting screw until a gap of .06" to .09" is achieved between the head of the adjusting screw and the bottom of the Trip Finger.

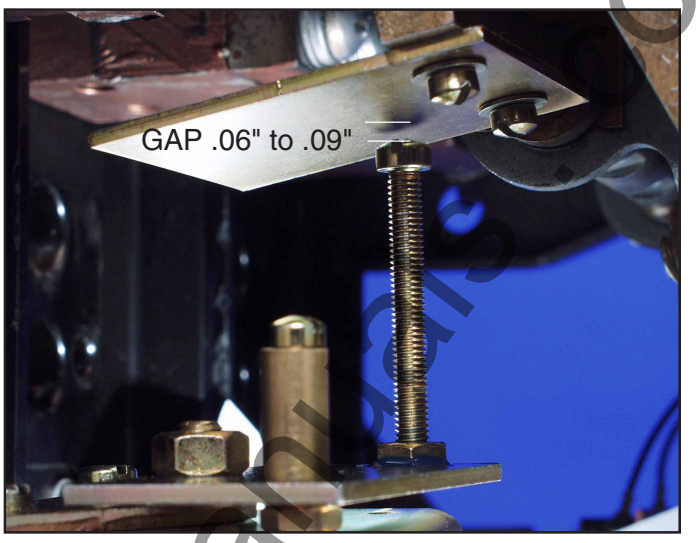

Fig. 26 Adjusting the DTA Trip Gap

F. Return the Breaker to the **Open** position.

G. Connect a 24 VDC power supply to the DTA Wires; positive to positive and negative to negative. Close the Breaker manually. Energize the DTA to trip the Breaker; de-energize when the Breaker trips. Make certain that the DTA resets. If the Breaker fails to properly trip or reset, make the necessary adjustments to insure a .06" to .09" gap between the top of the DTA Trip Screw and the Breaker Trip Finger (for Trip function) and .30" - .32" cage height on the Reset Spring (for Reset function). Repeat the procedure until proper trip and reset is achieved.

STEP 9: PREPARING THE TRIP UNIT / AUX. CT MODULE ASSEMBLY

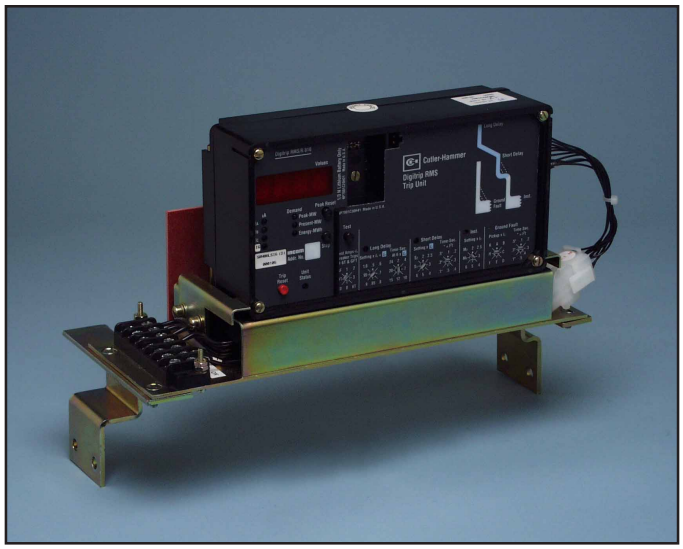

Fig. 27 Overview: Trip Unit / Aux. CT Module Assembly Prepared for Installation

A. Cut the two (2) .190-32 × .625" nylon screws supplied to a length of .400". Using the (2) nylon screws, secure the Spacer and the Insulation Barrier to the back of the Aux. CT Module as shown.

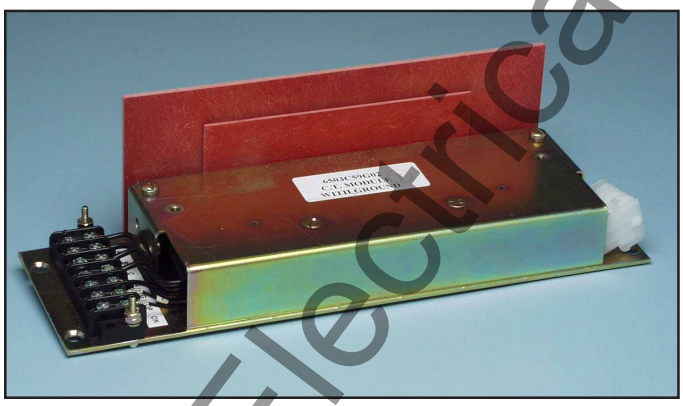

Fig. 28 Spacer and Insulation Barrier Secured to the Aux. CT Module

B. Secure the Trip Unit Support Brackets to the Aux. CT Module using the (4) .190-32 × .625" flat head screws supplied as shown.

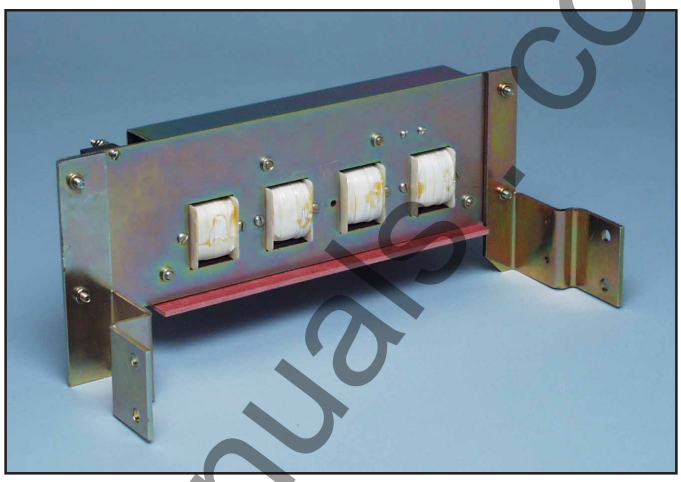

Fig. 29 Trip Unit Support Brackets Mounted to the Aux. CT Module

C. Secure the Trip Unit to the Aux. CT Module as shown, using the (2) .190-32 × 4.00" screws, (2) lock washers, (2) flat washers, and (2) brass spacers supplied. The spacers are placed between the top of the Aux. CT Module and bottom rear of the Trip Unit.

D. Position the Trip Unit Support Clips on the sides of the Trip Unit so they “pinch” the front of the Trip Unit in place. Secure the Trip Unit Support Clips to the Aux. CT Module using the (2) .190-32 × .375" screws on the left side of the Trip Unit, (2) .190-32 × .500" screws on the right side of the Trip Unit, (4) lock washers, and (4) flat washers supplied.

E. Connect the Auxiliary CT Harness to Trip Unit.

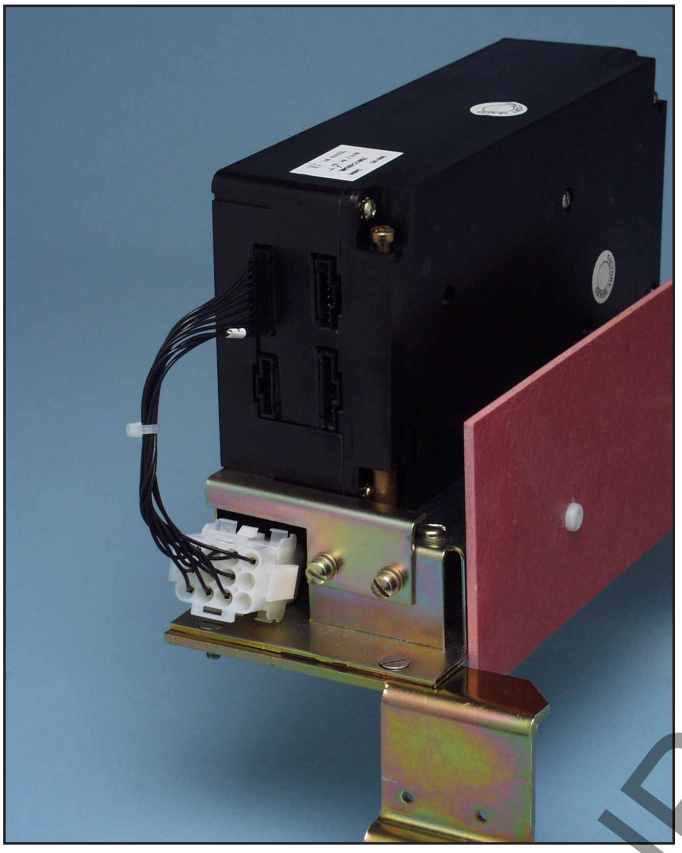

Fig. 30 Trip Unit Secured to the Aux. CT Module with Aux. CT Harness Connected

For Kits Supplied with an Auxiliary Switch Only.

STEP 10: MOUNTING THE AUXILIARY SWITCH TO THE TRIP UNIT / AUX. CT MODULE ASSEMBLY

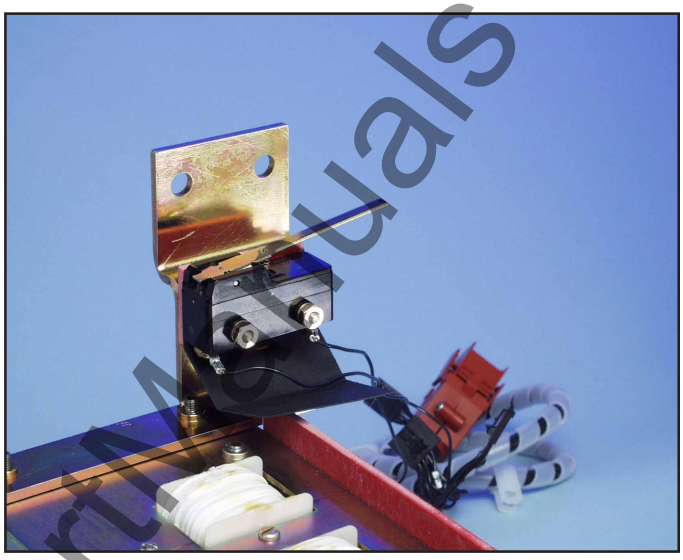

Fig. 31 Overview: Auxiliary Switch Mounted to the Trip Unit / Aux. CT Module Assembly

A. Secure the (1) .250-20 × .750" bolt, (2) flat washers, (1) lock washer, and (1) nut supplied into the existing hole in the right plate of the Breaker trip Bar as shown. This bolt will be used to activate the Auxiliary Switch.

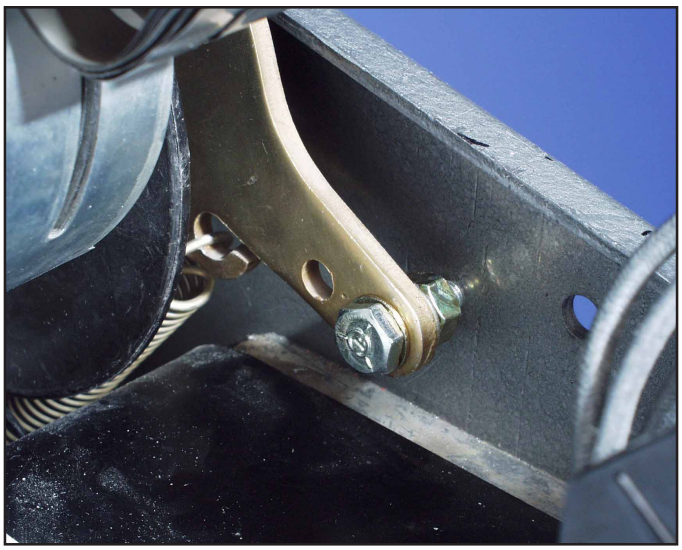

Fig. 32 Hardware to Activate the Auxiliary Switch

B. Cut 3.50" off the end of the Microswitch arm.

C. Insert the (2) .138-32 × 1.25" screws and (2) flat washers supplied through the existing holes in the right Trip Unit Support Bracket.

D. Place the glass poly spacer, fish paper, then Auxiliary Switch over the screws.

E. Secure the glass poly spacer, fish paper, and Auxiliary Switch to the Trip Unit Support Bracket, as shown, using the (2) flat washers, (2) lock washers, and (2) nuts supplied.

F. Connect the Auxiliary Switch wires of the External Harness to the COMMON and normally CLOSED terminals on the Auxiliary Switch.

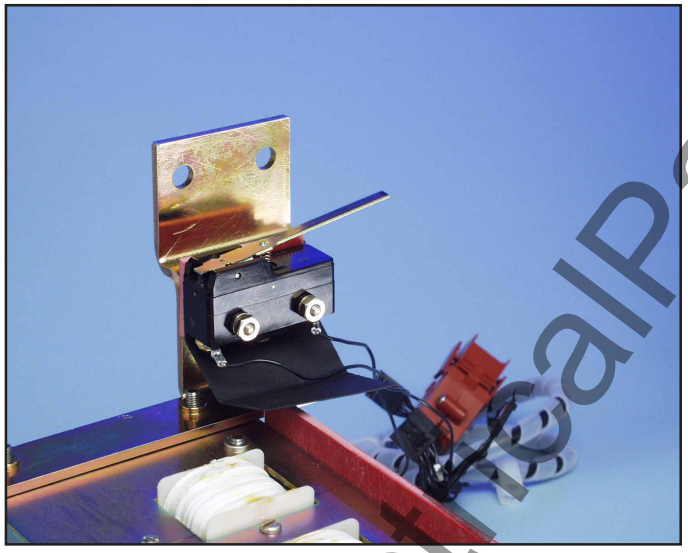

Fig. 33 Auxiliary Switch Mounted to the Trip Unit Support Bracket with External Harness Connections

NOTE: Until final External Harness connections in Step 13, care should be taken not to damage the External Harness.

STEP 11: MOUNTING THE TRIP UNIT / AUX. CT MODULE ASSEMBLY ON THE BREAKER

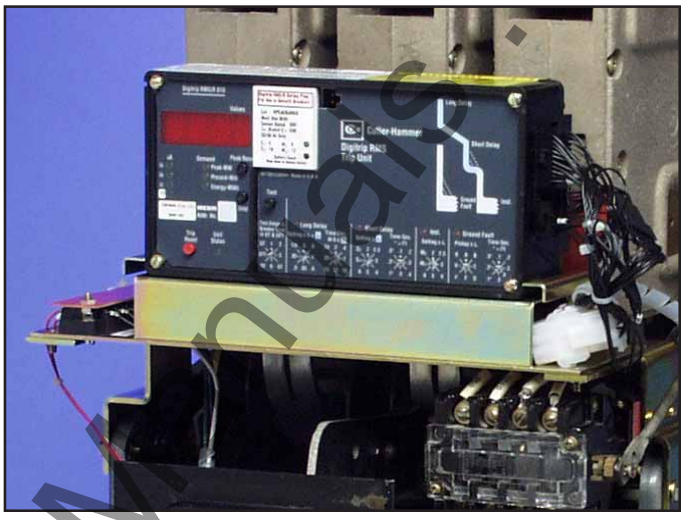

Fig. 34 Overview: Trip Unit / Aux. CT Module Assembly Installed in the Breaker

A. Remove the Terminal Block Cover from the Aux. CT Module.

B. Align the Trip Unit / Aux. CT Module Assembly with the existing holes in the right and left Breaker Frames. Secure the Trip Unit / Aux. CT Module Assembly, as shown, using the existing holes and the (4) .250-20 × .750" bolts, (8) flat washers, (4) lock washers, and (4) nuts supplied.

Fig. 35 Trip Unit / Aux. CT Module Assembly Mounted on Breaker

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

D. Place the Digitrip Retrofit Label on top of the Trip Unit as shown.

E. *For Kits Supplied with a Breaker Mounted CPT Only:* Attach the appropriate CPT Voltage Warning Label for the Breaker to the top of the Trip Unit. If the Retrofitter opts to attach this label in a different position, it must be in a prominent position.

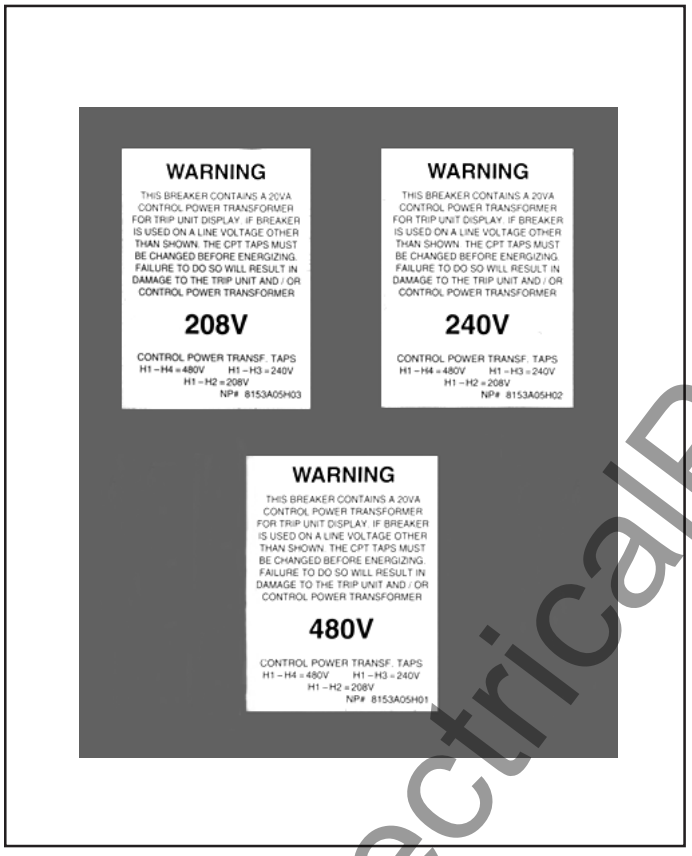

Fig. 36 Supplied CPT Voltage Labels

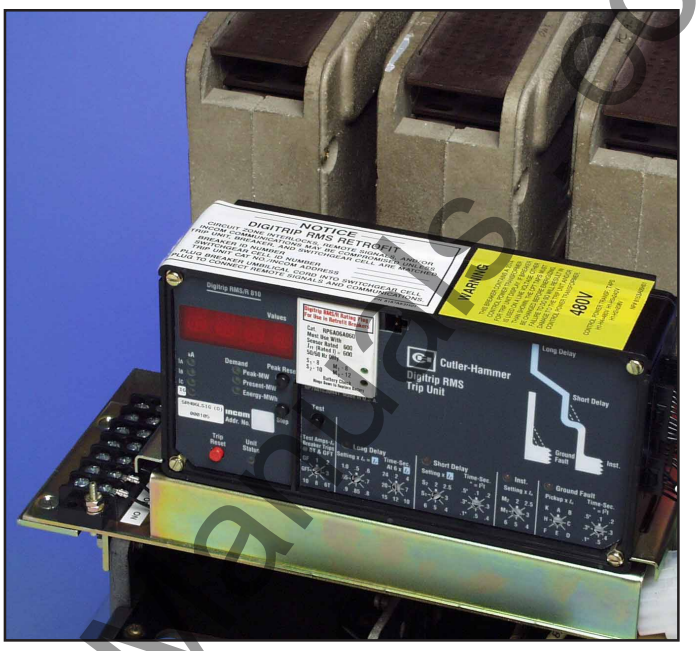

Fig. 37 Trip Unit with Rating Plug and Labels Installed

F. 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.

Connect the green ground wire from the Sensor Harness (with the ring terminal) to the left side of the Aux. CT Module, as shown, using the same hardware used to secure the left trip Unit Support Clip.

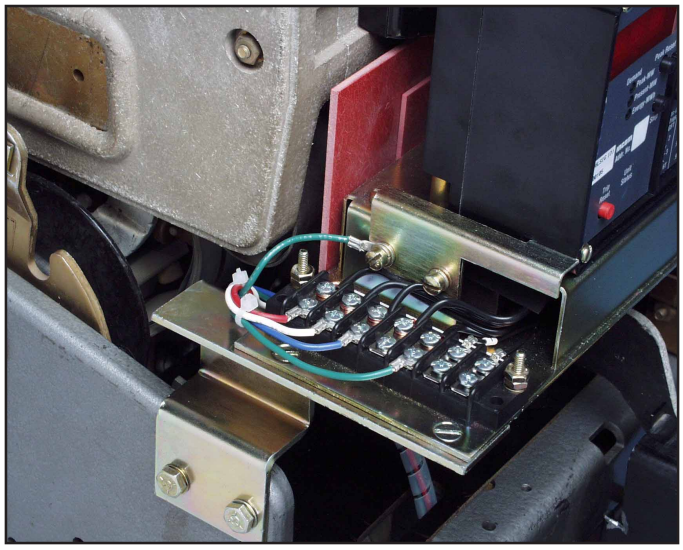

Fig. 38 Sensor Harness Connections

G. Route the Sensor Harness behind the left rear corner of the Trip Unit / Aux. CT Module Assembly, down towards the bottom of the Breaker, then through the existing hole in the Breaker Back Plate.

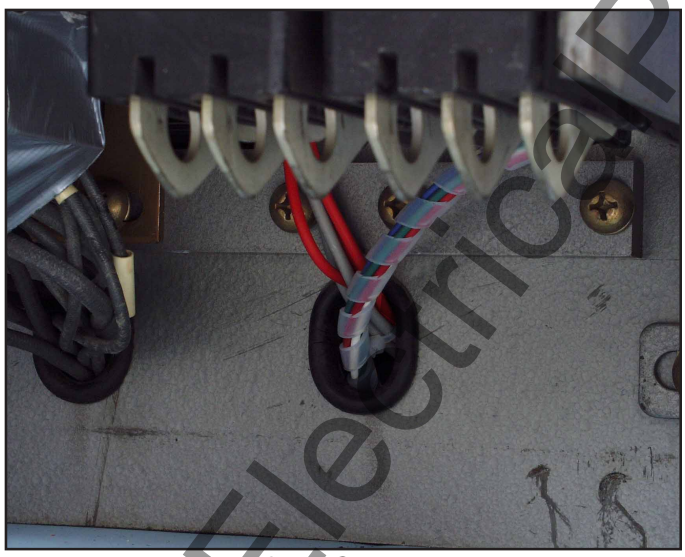

Fig. 39 Routing of the Sensor Harness

H. Connect the "+" DTA Wire to the "OP" terminal of the Aux. CT Module's 7-Point Terminal Block and the unmarked wire to the "ON" terminal.

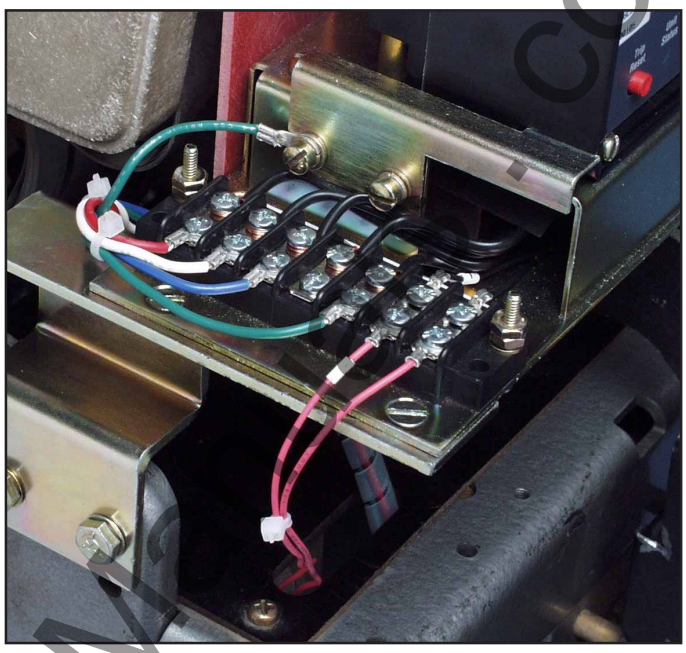

Fig. 40 DTA Wires Connected to the 7-Point Terminal Block

I. Reinstall the 7-Point Terminal Block Cover removed in Step 11-A.

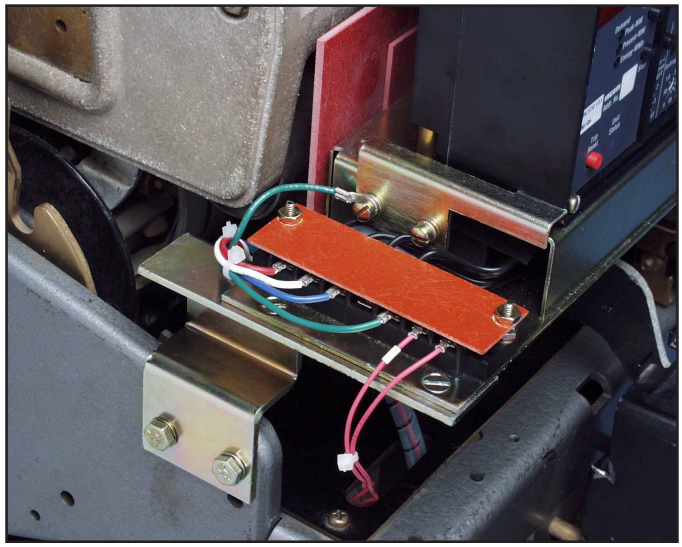

Fig. 41 Terminal Block Cover Installed on the Aux. CT Module

STEP 12: INSTALLING THE SENSORS

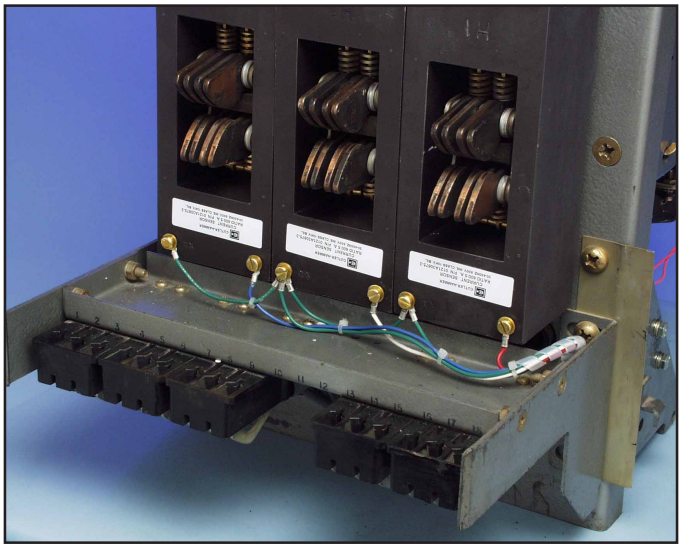

Fig. 42 Overview: Sensors Installed on the Breaker

A. Remove and save the two (2) end screws and washers securing the top Glastic Moldings to the Breaker Back Plate.

B. Align the Sensor Mounting Bracket with the holes. Secure the Sensor Mounting Bracket to the Breaker Back Plate using the hardware removed in Step 12-A, as shown.

Fig. 43 Sensor Mounting Bracket Mounted to the Breaker

C. Flatten the two cotter pins on the Breaker Interlock Linkage, near the bottom left side of the Breaker, as shown. Replace the two (2) existing screws in the Breaker Interlock Linkage with the (2) .190 - 32 × .500" flat head screws supplied.

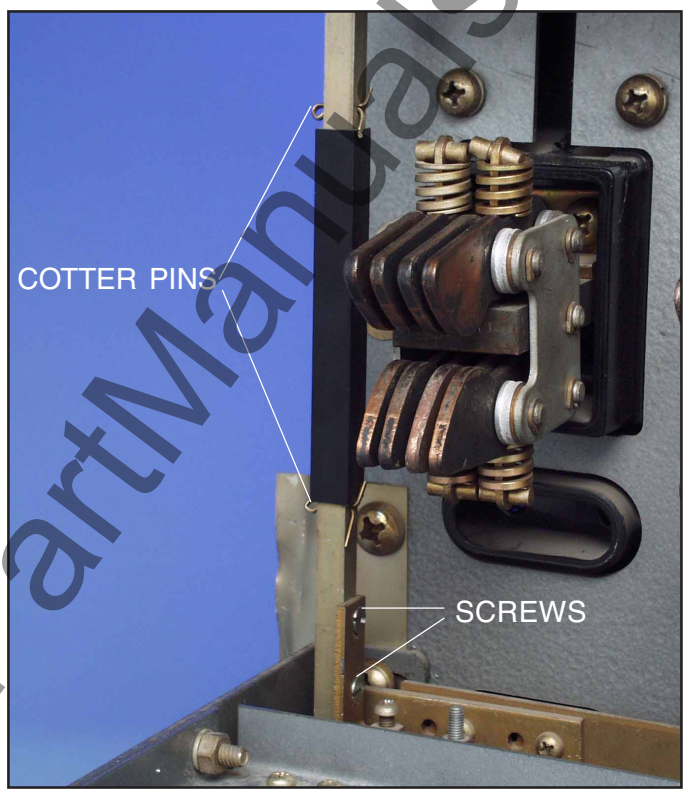

Fig. 44 Modified Breaker Interlock Linkage

NOTE: The Sensors, which will be installed later in this step, can not be installed properly if the cotter pins are not adequately flattened and the screws are not replaced.

D. Remove the clips that secure the top Finger Cluster Pins. Remove and save the pins and Finger Clusters from the top three Breaker Stabs. Scrap the clips just removed.

Fig. 45 Removed Finger Cluster

For Kits Supplied with a PT Module Only.

E. Remove and scrap the bolts and hardware securing each top Breaker Stab to the Copper Connectors.

F. Route the PT Wires up between the Phase 2 & 3 bottom Finger Clusters, then through the existing hole in the Sensor Mounting Bracket, as shown.

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.

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 top Breaker Stabs. 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 an appropriate length of insulation from each wire, and install a .375" ring terminal on each wire.

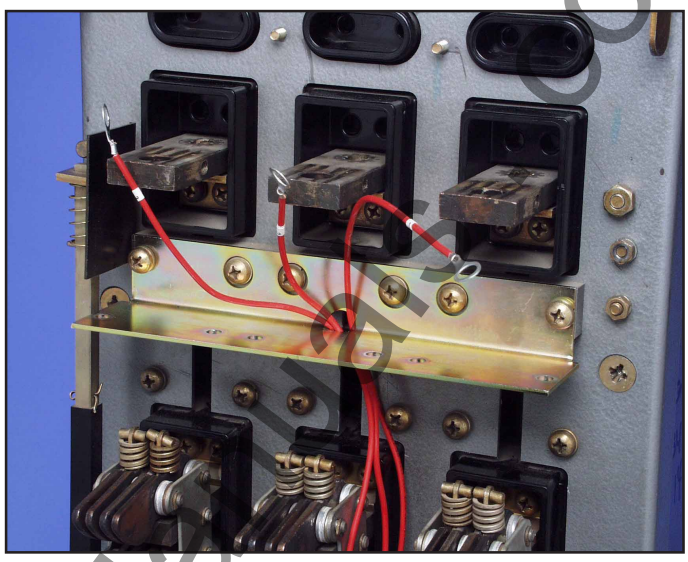

Fig. 46 Routing of the PT Wires

G. Connect the PT Wires to the appropriate top Breaker Stabs using the (3) .375-16 × 1.00" bolts, (3) lock washers, and (3) flat washers supplied.

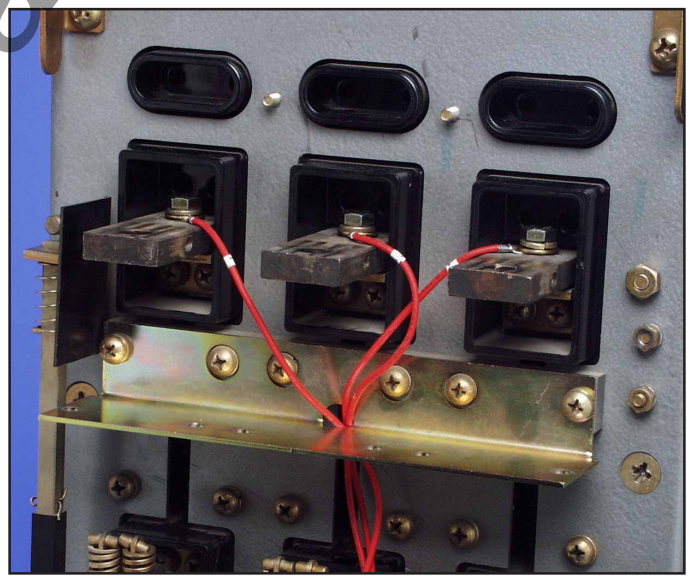

Fig. 47 PT Wires Connected to the Top Breaker Stabs

For Kits Supplied with a Breaker Mounted CPT Only.

NOTE: The power convention of the ITE KB-600 E 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 Copper Connectors. The bolts used to install the Copper Connectors in Step 3-B can be used to connect the HV Wires.

NOTE: The *Line Side* HV Wires are longer then necessary and are cut during the following steps. Before cutting the wires, be sure that sufficient length is left so that the connections can be made to the correct Breaker Stabs.

H. Route the Line Side HV Wires up between the Phase 2 & 3 bottom Finger Clusters, through the existing hole in the Sensor Mounting Bracket, then to the Phase 1 and 2 or Phase 2 and 3 top Breaker Stabs, as shown. Cut each wire to a suitable length for connection.

I. Strip an appropriate length of insulation then attach a .375" ring terminal to each HV Wire.

J. Remove and scrap the bolts and hardware securing the Phase 1 and 2 or Phase 2 and 3 top Breaker Stabs to the Copper Connectors.

NOTE: If a PT Module was supplied with the Retrofit Kit, the same bolts used to secure the PT Wires should be used to connect the HV Wires.

K. Connect a HV Wires to the Phase 1 and 2 or Phase 2 and 3 Breaker Stabs using the (2) .375-16 × 1.00" bolts, (2) lock washers, and (2) flat washers supplied.

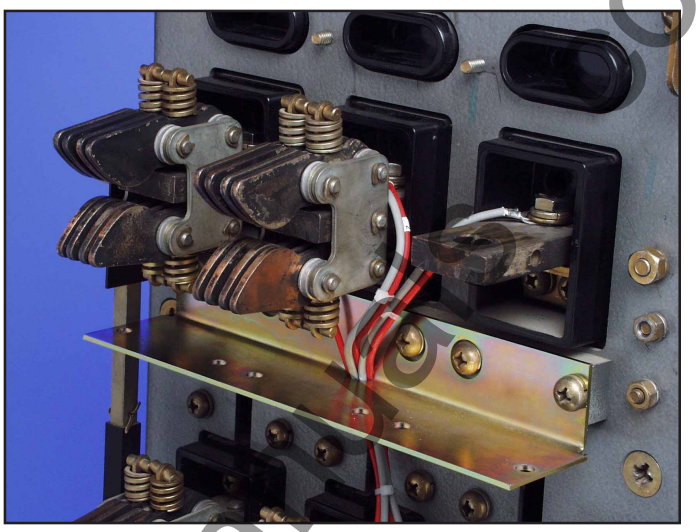

Fig. 48 HV Wires Connected to the Top Breaker Stabs

For Kits Supplied with a PT Module and / or Breaker Mounted CPT.

L. Use the wire ties supplied to secure the PT Wires and / or HV Wires so they are snug against the Phase 2 bottom Glastic Molding.

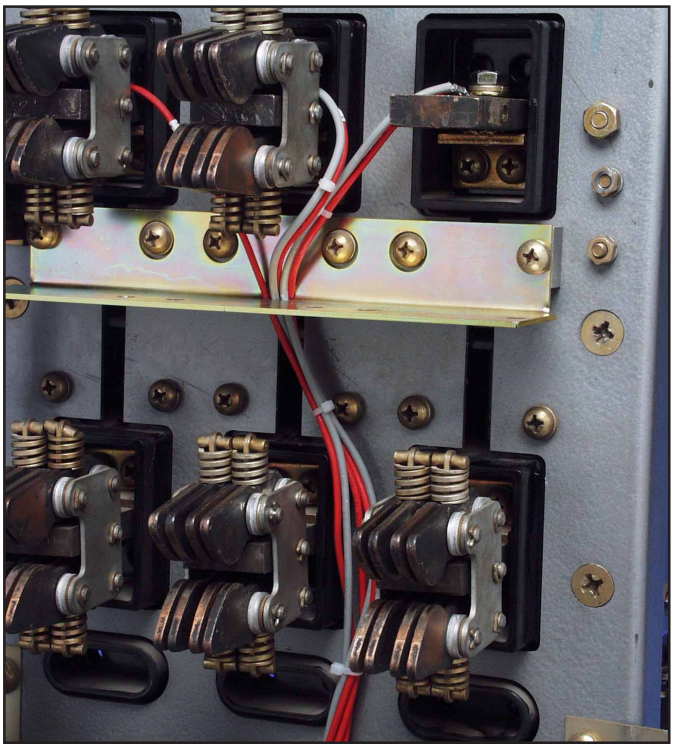

Fig. 49 Proper Routing of the PT Wires and / or HV Wires

M. Using the original pins and the (3) .250 “X” washers supplied, reinstall the top Finger Clusters.

For All Breakers.

N. Slide a Sensor over each bottom Finger Cluster.

NOTE: When viewed from the back of the Breaker, insure that the PT Wires and /or HV Wires, if applicable, are positioned against the right side of the Phase 2 Glastic Molding (see Fig. 49). These wires must not be “pinched” by the Phase 2 Sensor.

O. Secure the Sensors to the Sensor Mounting Bracket using the (6) .250-20 × .500" bolts, (6) lock washers, and (6) flat washers supplied.

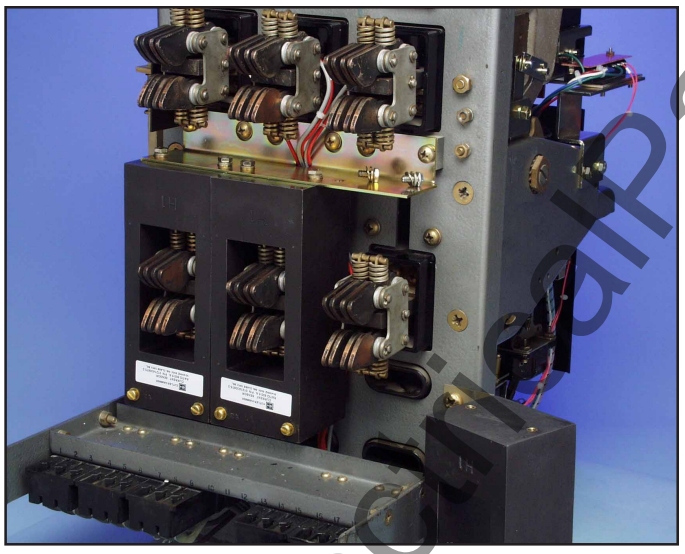

Fig. 50 Sensors Mounted to the Sensor Mounting Bracket

P. Route the Sensor Harness to the Sensors. 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.

Depending on the Sensors supplied with the Retrofit Kit, the following Ratings apply.

Table 3 Sensor Taps Rating

Sensor Style No.	*Terminal Com.*	*Amps*
9A10014H01	X1 - X2 =	600 A
9A10015H01	X1 - X2 =	400 A
9A10016H01	X1 - X2 =	200 A

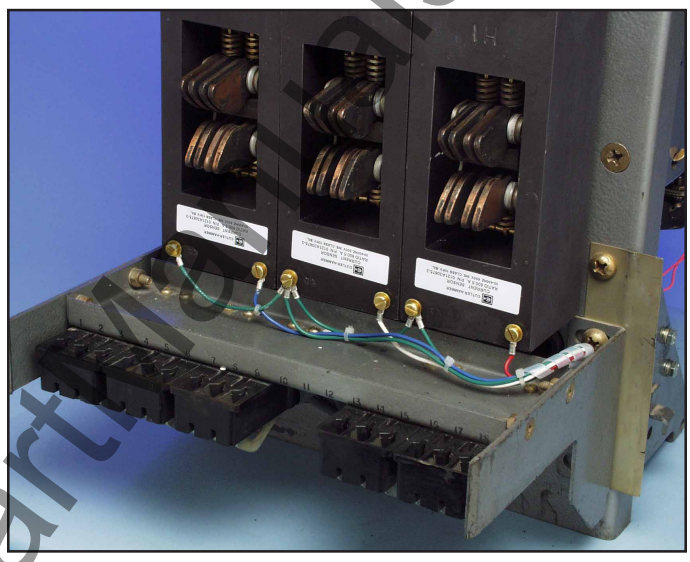

Fig. 51 Sensors Harness Connected to the Sensors

STEP 13: CONNECTING THE EXTERNAL HARNESS AND FINAL WIRING

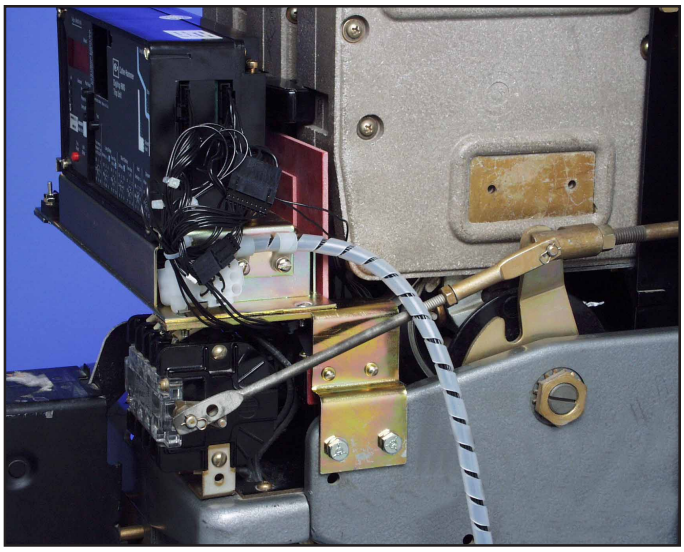

Fig. 52 Overview: Final Harness and Wire Connection

A. Connect the External Harness to the Trip Unit.

NOTE: For 510 Basic Retrofit Kits, the External Harness is the plug pictured here. It is to be plugged into the right side of the Trip Unit.

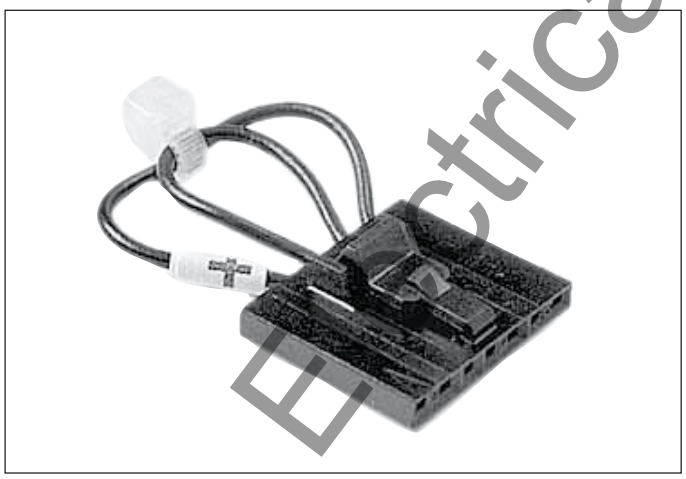

Fig. 53 510 Basic Kit External Harness Plug

B. Secure the External Harness to the Trip Unit / Aux. CT Module Assembly, as shown, using the (2) wire clamps, (2) .190-32 × .500" screws, (2) lock washers, and (2) flat washers supplied.

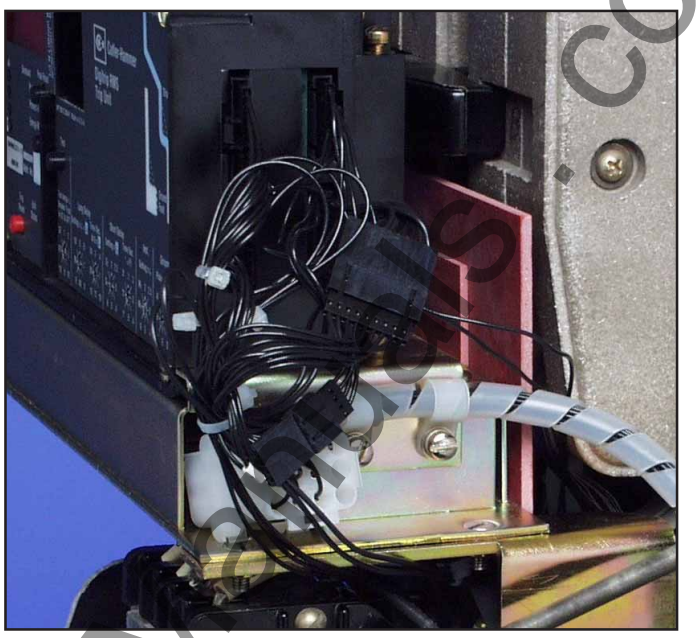

Fig. 54 External Harness Secured to the Trip Unit / Aux. CT Module Assembly

C. *For Kits Supplied with a PT Module Only:* Connect the PT Extension Harness to the External Harness.

D. *For Kits Supplied with a Breaker Mounted CPT Only:* Remove the 9-position External Harness plug from the female receptacle on the Trip Unit. Insert the black plug from the CPT Harness into the same female receptacle. Reinsert the External Harness Plug just removed into the female receptacle on the CPT Harness.

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

STEP 14: TESTING THE BREAKER

A. Measure the force necessary to trip the Breaker at the point where the Trip Adjusting Screw Finger impacts the Breaker trip Plate. The force necessary to trip the Breaker MUST NOT EXCEED THREE (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 33-855-2), 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.

For Kits Supplied with a Cell Harness Only.

STEP 15: 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 moving parts within the Cell Housing.

STEP 16: INSTALLING THE RETROFITTED BREAKER IN THE CELL

⚠ WARNING

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

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

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

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

Digitrip Retrofit Kit Installation Components for KB600 E RMS/R Retrofit

Step	Description	Style No.	Qty.	Comment
Step 4	PT/CPT Mounting Parts	9A10012G08	1	
	PT/CPT Mounting Bracket		1	
	.250-20 × .750 Lng. Hex Bolt		2	CPT / Comm. Only
	.250 Flat Washer Stl.		2	
	.250 Lock Washer Stl.		2	
	PT Module Kit	6502C82G01	1	
	PT Module		1	
	.138-32 × .500 Lng. Screw Fil.		2	
	.138 Flat Washer Stl.		4	
	.138 Lock Washer Stl.		2	
	.138-32 Nut Hex Stl.		2	Comm. Only
	Ring Terminal (.190, .250, .312, .375, .500) Each Size		3	
	PT Mounting Parts	9A10012G07	1	
	Glass Poly Insulation		1	
	PT Module Nameplate		1	
	PT Extension Harness	6502C85G01	1	
	Breaker Mounted CPT Kit	8259A91G05	1	
	HV Wires		2	
	CPT Harness		1	
	.138-20 × .375 Lng. Screw T.C.		2	
	Ring Terminal (.138, .190, .250, .312, .375, .500) Each Size		2	
	CPT Mounting Parts	9A10010G20	1	CPT Only
	.190-32 × .500 Lng. Screw Fil.		4	
	.190 Flat Washer Stl.		8	
	.190 Lock Washer Stl.		4	
	.190-32 Nut Hex Stl.		4	
	.138 Flat Washer Stl.		4	
Step 5	Trip Finger Parts	9A10012G10	1	
	Trip Finger		1	
	.164-32 × .750 Lng. Screw Fil.		2	
	.164 Flat Washer Stl.		4	
	.164 Lock Washer Stl.		2	
	.164-32 Nut Hex Stl.		2	
Step 6	Reset Mounting Parts	9A10012G11	1	
	Reset Assembly		1	
	.250 × .750 Lng. Rivet (Pin)		1	
	.250 Flat Washer Stl.		2	
	Cotter Pin		1	
	Reset Rod Assembly	9A10012G12	1	
	Reset Rod		1	
	LocTite® 243		1	

Digitrip Retrofit Kit Installation Components for KB600 E RMS/R Retrofit (Continued)

Step	Description	Style No.	Qty.	Comment
Step 7	DTA Assembly	9A10012G33	1	
	DTA Mounting Parts	9A10012G09	1	
	.250-20 × .750 Lng. Hex Bolt		2	
	.250 Flat Washer Stl.		2	
	.250 Lock Washer Stl.		2	
Step 8	LocTite® 243		1	From Step 6
Step 9	Aux. CT Module	6503C59G__	1	
	Trip Unit Assembly Mounting Parts	9A10012G06	1	
	.190-32 × .625 Screw Flat Head		4	
	Trip Unit Mounting Parts	9A10012G15	1	
	Mounting Backet L.H.		1	
	Mounting Backet R.H.		1	
	.250-20 × .750 Lng. Hex Bolt		4	
	.250 Flat Washer Stl.		8	
	.250 Lock Washer Stl.		4	
	.250-20 Nut Hex Stl.		4	
	Trip Unit	See Pick List	1	
	Rating Plug	See Pick List	1	
	Trip Unit Assembly Parts	9A10012G05	1	
	Trip Unit Support Bracket R.H.		1	
	Trip Unit Support Bracket L.H.		1	
	Insulation Barrier		1	
	Glass Poly Spacer		1	
	Digitrip Nameplate		1	
	.190-32 × 4.00 Lng. Screw.Fil. Stl.		2	
	.190-32 × .500 Screw Fil. Stl.		2	
	.190-32 × .375 Screw Fil. Hd.		2	
	.190-32 × .625 Screw Nylon		2	
	.190 Flat Washer Stl.		8	
	.190 Lock Washer Stl.		8	
	Brass Spacer		2	
	Aux. CT Harness	6502C84G02	1	
Step 10	Aux. Switch Kit	9A10012G02	1	Comm. Only
	Microswitch		1	
	Glass Ploy Spacer		1	
	Insulation Fish Paper		1	
	.250-20 × .750 Lng. Hex Bolt		1	
	.250 Flat Washer Stl.		2	
	.250 Lock Washer Stl.		1	
	.250-20 Nut Hex Stl.		1	
	.138-32 × 1.250 Fil. Screw		2	
	.138 Flat Washer Stl.		4	
	.138 Lock Washer Stl.		2	

Digitrip Retrofit Kit Installation Components for KB600 E RMS/R Retrofit (Continued)

Step	Description	Style No.	Qty.	Comment
Step 10	.138-32 Nut Hex Stl.		2	Comm. Only
(cont.)	External Harness	6502C83G__	1	
Step 11	.250-20 × .750 Lng. Hex Bolt		4	From Step 9
	.250 Flat Washer Stl.		4	
	.250 Lock Washer Stl.		4	
	.250-20 Nut Hex Stl.		4	
	Sensor Harness Parts	9A10012G13	1	
	Sensor Harness	See Pick List	1	
	Wire Tie Nylon		6	
Step 12	Sensors	See Pick List	3	
	Sensor Mounting Parts	9A10012G04	1	
	Mounting Angle		1	
	.250-20 × .500 Lng. Bolt		6	
	.250 Flat Washer Stl.		6	
	.250 Lock Washer Stl.		6	
	.250 “X” Washer		3	
	.190-32 × .500 Lng. Screw Flat Head		2	
	Harness Mounting Parts	9A10012G14	1	
	.375-16 × 1.00 Hex Bolt		3	
	.375 Flat Washer Stl.		3	
	.375 Lock Washer Stl.		3	
	.190-32 × .500 Lng. Screw Fil.		2	
	.190 Flat Washer Stl.		2	
	.190 Lock Washer Stl.		2	
	Clamp Nylon		2	
	Wire Tie Nylon		6	
Step 13	External Harness		1	From Step 10
	.190-32 × .500 Lng. Screw Fil.		2	From Step 12
	.190 Flat Washer Stl.		2	
	.190 Lock Washer Stl.		2	
	Clamp Nylon		2	
	Wire Tie Nylon		6	
	Wire Tie Nylon		6	From Step 11
Step 15	Cell Harness	6503C57G__	1	Except 510 Basics

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 4 Torque Values for General Mounting and Screw Size Conversion

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

Table 5 Torque Values for Copper BUS Connectors

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

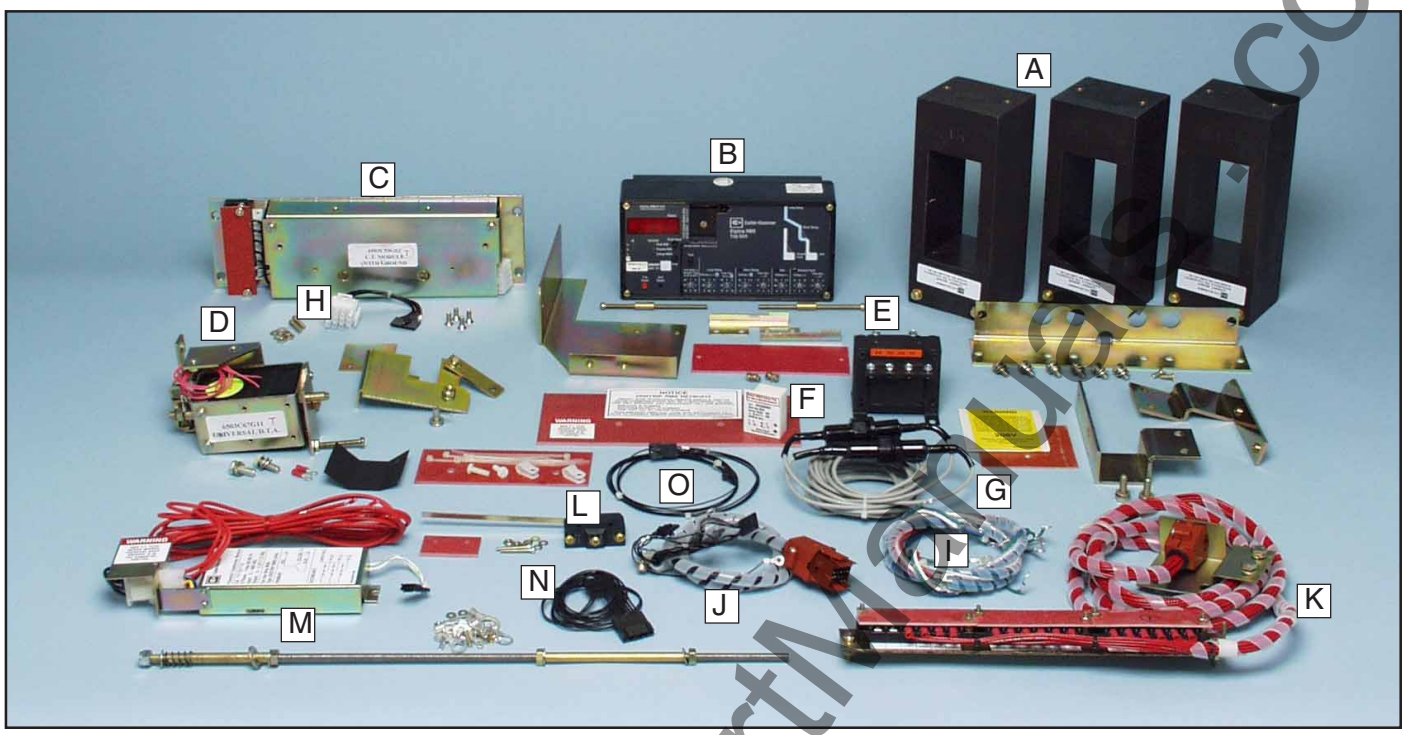

Fig. 55 Retrofit Components

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

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

Publication No. IL 33-KY6-2
October, 2000
Printed in U.S.A./TBG00007