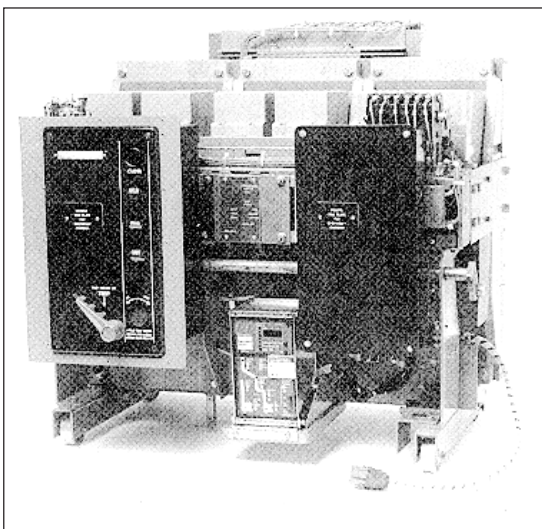




Digitrip Retrofit System for Federal Pacific FPS-75 (3000A) Breakers



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.**

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

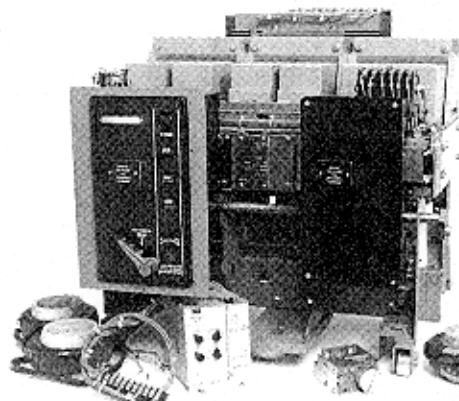
Components	510 Basic	510 with Zone Interlock	610	810	910
Trip Unit					
Rating Plug					
Auxiliary Current Transformer (CT) Module					
Auxiliary CT Harness					
Sensors					
Sensor Harness					
Direct Trip Actuator (DTA)					
Mounting Brackets and Hardware					
External Harness	Plug	1 Connector Harness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

Step 1: Trip the Breaker and remove it from the cell. Take the Breaker to a clean well lit work bench to perform the Retrofit.

Before attempting to perform the Retrofit, be sure to read and understand the Retrofit Application Data supplied with this kit.

Refer to the components listing at the rear of this Booklet. Lay out the components and hardware according to the steps as outlined. The components and hardware will be used to complete each assembly step that follows.

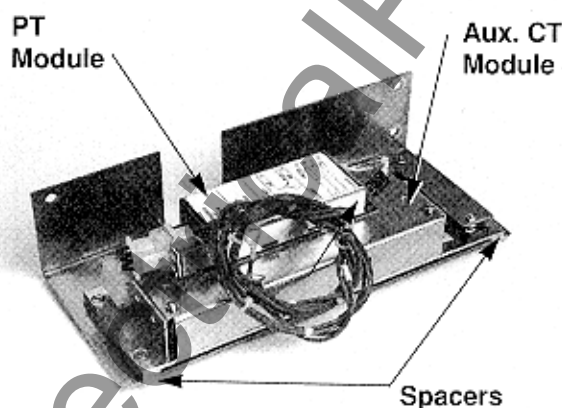
Step 2:



Overcurrent Relay, Actuator, Sensors, etc.

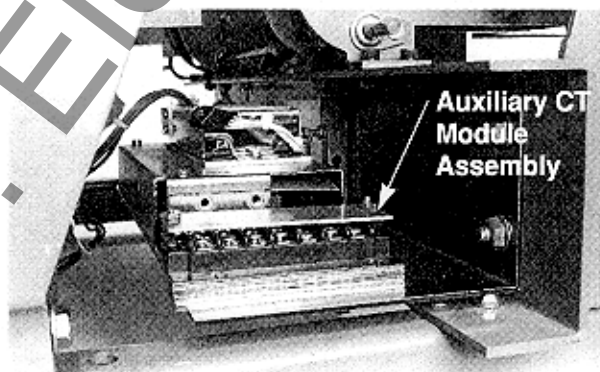
- A. Disconnect all wires going to the Terminal Strip and to the existing actuator.
- B. Remove and scrap the Overcurrent Relay from the Breaker Platform.
- C. Remove and scrap the actuator and mounting hardware from the Breaker.
- D. Remove and set aside the Finger Clusters that are retaining the existing Sensors.
- E. Remove and scrap the Sensors from the Breaker.
- F. Remove and scrap the Terminal Strip.

Step 3:

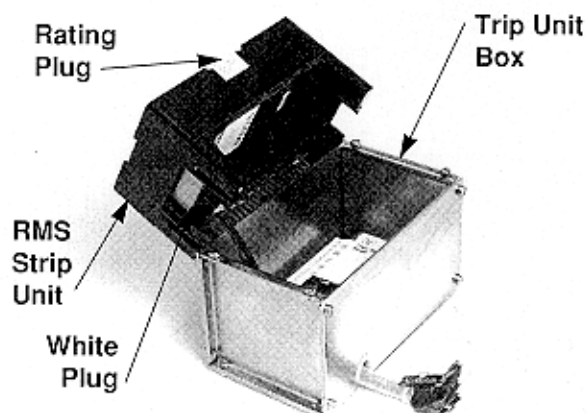


- A. Mount the Aux. CT Module on the Mounting Bracket using three spacers on each end and hardware provided as shown.
- B. *For RMS/R 810 & 910 Kits only.* Remove and scrap the Warning Nameplate from the PT Module. Mount the PT Module on top of the Aux. CT Module with the Insulation Piece between as shown using the thread forming screws provided. The White Plug of the PT Module should face away from the Terminal Block end of the Aux. CT Module.

Step 4:

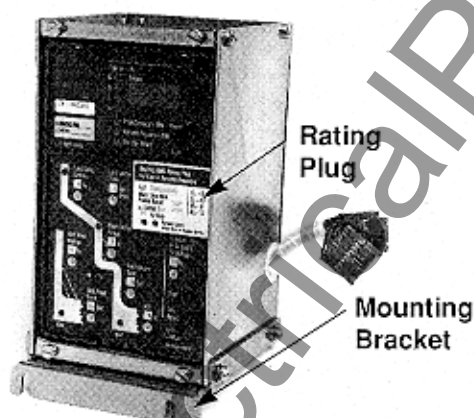


- A. Remove the two Bolts from the left side of the Breaker center support U-Channel.
- B. Position the Aux. CT Module Assembly as shown so that the Mounting Bracket is up against the U-Channel on the left side of the Breaker.
- C. Use the Bolts removed in 'A' above to fasten the Mounting Bracket to the left side of the Breaker. Do not tighten at this time.

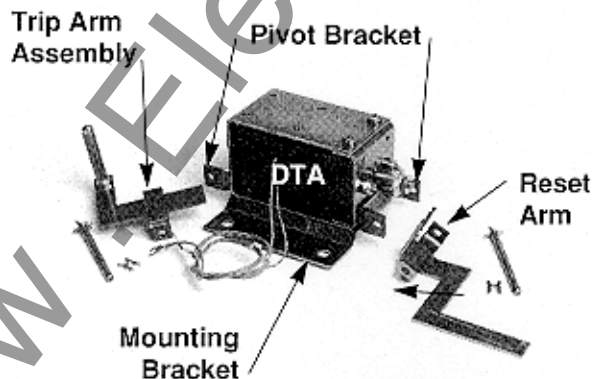
Step 5:

- A. Remove the cover from the Trip Unit Box.
- B. *For RMS 810 & 910 Kits only.* Carefully pull out the White Plug from the bottom of the Trip Unit Box. Plug the White Plug into the bottom of the RMS Trip Unit. The slots in the White Plug should face the Trip Unit and the solid side face down. Make certain the White Plug is fully engaged and properly oriented.

- C. Make certain the Jacking Screws on the back of the Trip Unit Box are fully retracted. Turn the Screws clockwise until they stop.
- D. Slide the RMS Trip Unit into the Trip Unit Box. Make certain that the edge card connector on the back of the Trip Unit seats fully into the receptacle in the Trip Box. The front of the Trip Unit will be approximately 1/16 inch lower than the front of the Trip Unit Box.
- E. Install the Rating Plug.
- F. Install the Trip Box Cover. The holes in the cover should expose the Trip Reset and Step buttons of the Trip Unit.

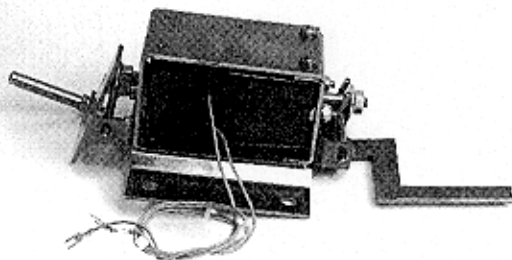
Step 6:

- A. Remove and scrap the screws from the bottom of the left and right sides of the Trip Unit Box.
- B. Mount the Trip Unit Box Mounting Bracket as shown to the bottom of the Trip Unit Box with the hardware provided.

Step 7:

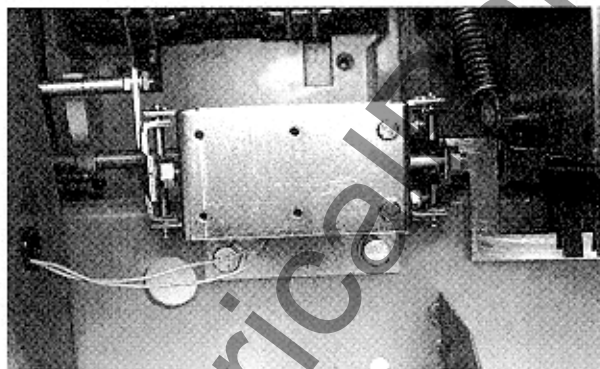
- A. Remove the Flange Nut from the end (Reset Side) of the DTA (Direct Trip Actuator) Shaft and apply Loc-tite to the threads of the Shaft. With the flat side of the Flange Nut towards the DTA. Tighten the nut all the way on the shaft.
- B. Apply Loc-tite to the threads on the opposite end (Trip Side) of the DTA Shaft. Install a Flange Nut flush with the end of the shaft. The flat side should face away from the DTA.

Step 7:
(continued)



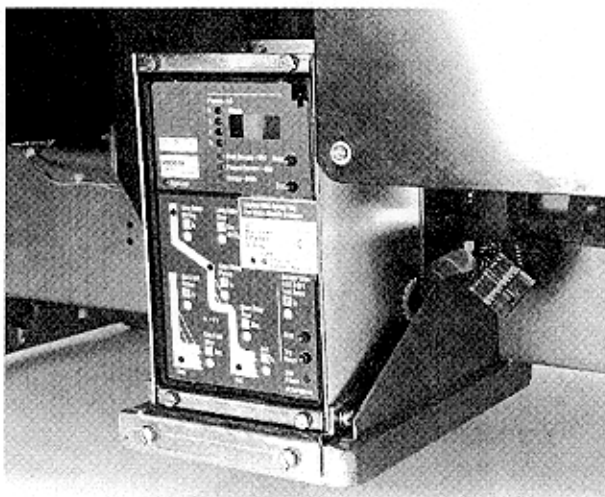
DTA Assembly

Step 8:

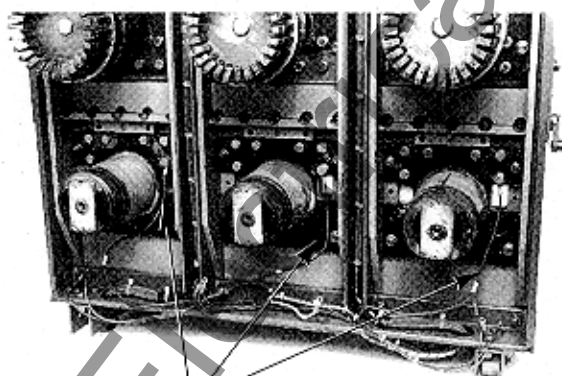
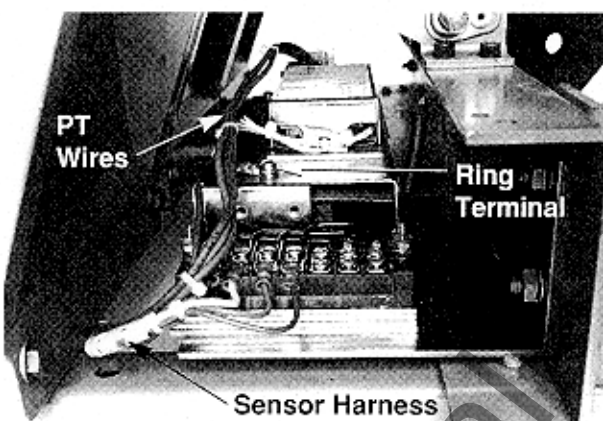


DTA Assembly

- C. Mount the Mounting Bracket on the DTA as shown with the hardware provided. The leg of the Mounting Bracket should be on the same side that the wires exit and with the offset away from the DTA.
- D. Mount the Pivot Brackets for both the Trip Assembly and the Reset Arms as shown with the hardware provided. Position the Tabs of the Trip Arm Assembly between the Tabs of the Pivot Mounting (Trip side of the DTA) and align the holes. Insert the Pivot Pin and secure in place with an X-Washer on each end of the Pin. Insert the fork of the Reset Arm as shown between the Flange Nut and the DTA of the DTA SHAFT. Position the Tabs of the Reset Arm between the Tabs of the Pivot Mounting (Reset side of the DTA) and align the holes. Insert the Pivot Pin and secure in place with an X-Washer on each end of the Pin.
- A. Position the DTA Assembly in the center front of the Breaker as shown and Bolt in place with the hardware provided. NOTE: At this time you will also align and Bolt the right side of the Aux. CT Mounting Bracket to the Breaker.
- B. Tighten the Bolts previously used in 'STEP 5-C' to attach the left side of the Aux. CT Mounting Bracket to the Breaker.
- C. Connect a 24V DC power supply to the DTA Terminals, Positive to Positive and Negative to Negative. Close the Breaker manually. Energize the DTA to trip the Breaker, de-energize the DTA when the Breaker trips. Make certain that the DTA resets. If the DTA fails to reset, adjust the position of the Reset Arm by adjusting the Flange Nut or by bending the Reset Arm slightly. If the DTA fails to trip, adjust the position of the Trip Arm by adjusting the Flange Nut or by bending the Trip Arm slightly. Repeat until the trips and resets are sure and positive every time.

Step 9:

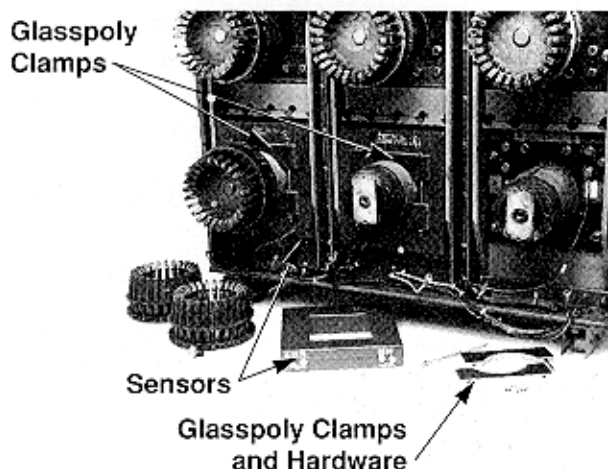
RMS/R Trip Unit Assembly

Step 10:

PT Wires

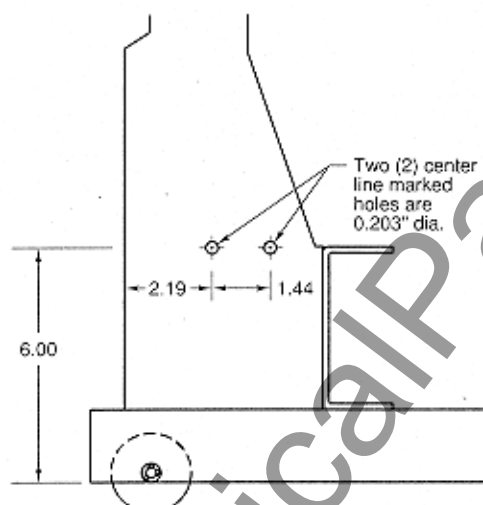
- A. Mount the Trip Unit Assembly to the Breaker Platform with the hardware provided.
- A. These instructions refer to the Wiring Diagrams in the Retrofit Application Data for proper connection and application.
- B. Remove the cover from the 7-point Terminal Block.
- C. Connect the Snap Spade Terminals of the Sensor Harness to the proper terminals on the 7 point Terminal Block on the left side of the Aux. CT Module. (the long tan and green wires are for a remote Neutral Sensor on a 4W Ground Breaker. They should be removed if not required.)
- D. Connect the green wire (Ring Terminal) to one of the threaded holes in the left side of the Aux. CT Module Cover as shown using the hardware provided.
- E. Route the DTA Wires over to the 7 point Terminal Block on the Aux. CT Module. Connect the wire with + to the 'OP' Terminal and the the unmarked wire to the 'ON' Terminal.
- F. Replace the Terminal Block cover.
- G. Route the Sensor Harness along the Breaker Frame Rail under the Back Plate and through the hole in the bottom back frame (between Phase 1 and Phase 2).
- H. *For RMS/R 810 & 910 Kits only.* Route the three wires from the PT Module back along the Sensor Harness and through the hole in the bottom back frame. Remove a Bolt that goes into the Copper Conductor of each Phase of the Breaker. Cut the wire marked with Red or 1 to Phase 1. Cut the wire marked with Yellow or 2 to Phase 2. Cut wire marked with Blue or 3 to Phase 3. Strip each wire 1/4 inch and install a .375 Ring Terminal on each. Connect each wire to the correct Copper Conductor as shown using the .375 Flat Washer supplied and the hardware just removed.

Step 11:

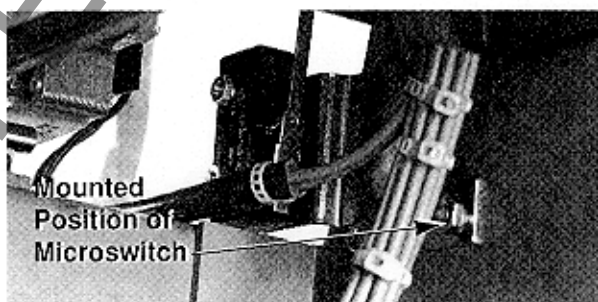


Step 12:

View from right side of breaker



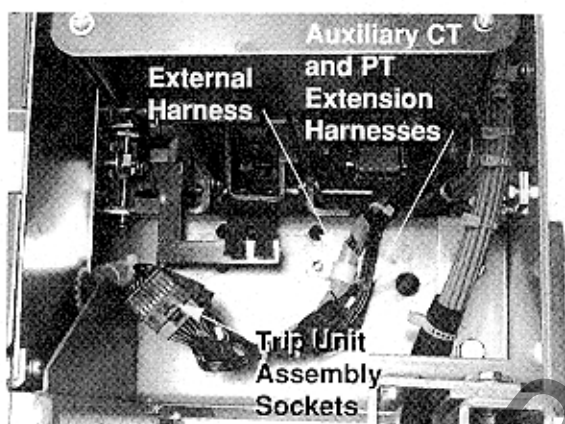
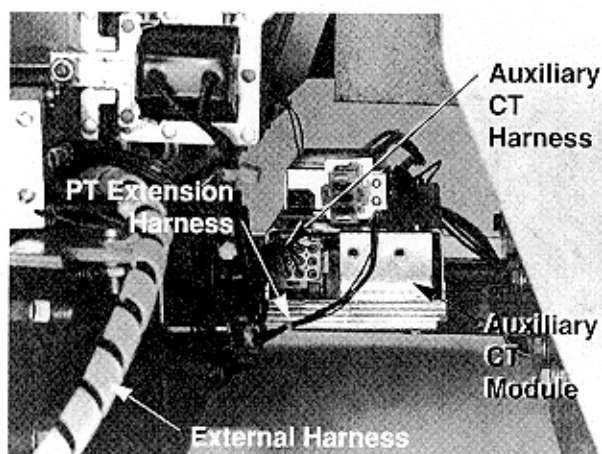
Microswitch and Mounting Bracket



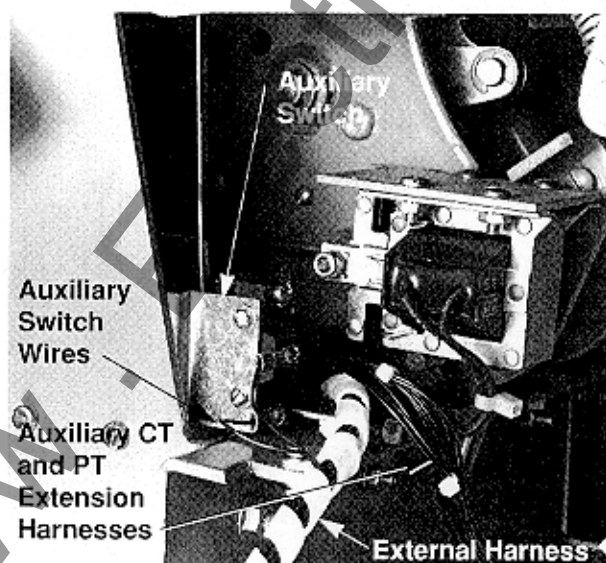
- Mount the Sensors over the Copper Studs with the name plates facing you as shown. With the hardware provided assemble and tighten the Glasspoly Clamps onto the Copper Studs. **NOTE:** Be sure to keep the Clamps tight against the Sensors so that they are flush with the back of the Breaker.
- Connect the proper Ring Terminals of the Sensor Harness to the correct Terminals of the Sensors.
- Replace the Finger Clusters removed in 'STEP 2 D' above.
- Use nylon wire ties provided to dress up the wiring and keep it away from any interference of the Breaker moving parts.

- For RMS/R 810 & 910 Kits only.* Drill the right front support bracket per Drilling Plan 'A'.
- For RMS/R 810 & 910 Kits only.* Mount the Microswitch on the Microswitch Mounting Bracket. Mount the Bracket to the right front support bracket as shown with the hardware provided.

NOTE: The Microswitch Lever operates off of the Pivot Linkage above the Microswitch.

Step 13:

Note: For RMS/R 510 Basic Retrofit Kits, the External Harness is the plug pictured at left. It is to be plugged into the right side of the Trip Unit



- A. Plug the White Plug of the Aux. CT Harness into the right side of the Aux. CT Module. Route the Harness over to the Trip Box. Plug the Harness into one of the Sockets at the right rear of the Trip Box.
- B. Plug the External Harness into the sockets at the right rear of the Trip Box. Route the harness across and attach it along the right side Breaker U-Channel using the nylon wire clamps and hardware provided.
- C. For RMS/R 810 & 910 Kits only. Connect the two wires with the Ring Terminals from the External Harness to the Aux. Switch. Connect one wire to the normally open terminal and the other wire to the common terminal.
- D. For RMS/R 810 & 910 Kits only. Plug the PT Extension Harness into the socket on the PT Module. Route the harness over to the Trip Box and plug it into the plug coming from the External Harness.
- E. Use nylon wire ties provided to dress up the wiring and to keep it away from any interference of the Breaker moving parts.

Step 14: The Cell Harness is to be mounted in the Breaker Cell. The Plug End is to be mounted on the right front side of the Cell. The Terminal Blocks can be mounted anywhere space is available in the Cell.

Step 15: The Retrofit is now complete and ready to be tested.

STEP 16: 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.

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.

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

DIGITRIP RETROFIT KIT INSTALLATION COMPONENTS FOR FEDERAL PACIFIC FPS-75 (3000A) BREAKERS

STEP	DESCRIPTION	STYLE NO.	QTY.	COMMENTS
STEP 3	AUX. CT MODULE ASSEMBLY PARTS	8153A76G04	1	
	AUX. CT MODULE MOUNTING PARTS	8153A76G05	1	
	PT MODULE	6502C82G01	1	810/910 KITS ONLY
	MOUNTING BRACKET		1	
	SPACERS		6	
	.190-32 X .750 LNG SCREW FH		4	
	.190 FLAT WASHER STL		4	
	.190 LOCK WASHER STL		4	
	.190-32 NUT HEX STL		4	
	.138-32 X .375 LNG SCREW TC		2	810/910 KITS ONLY
	INSULATION PIECE		1	810/910 KITS ONLY
STEP 5	RMS TRIP UNIT	1230C97G	1	
	TRIP BOX	6506C23G	1	
	RATING PLUG	3D86701G	1	
STEP 6	TRIP BOX MOUNTING PARTS	8153A76G06	1	
	MOUNTING BRACKET		1	
	.164-32 X .375 LNG SCREW PAN		4	
	.164 FLAT WASHER STL		4	
	.164 LOCK WASHER STL		4	
STEP 7	DTA ASSEMBLY PARTS	8153A76G07	1	
	DTA UNIVERSAL	6503C67G01	1	
	DTA RESET PARTS	8153A76G08	1	
	DTA TRIP ARM PARTS	8153A76G09	1	
	MOUNTING BRACKET		1	
	RESET ARM		1	
	TRIP ARM ASSEMBLY		1	
	PIVOT BRACKET		2	
	PIVOT PIN		2	
	X-WASHER		4	
	FLANGE NUT		2	
	.164-32 X .375 LNG SCREW FIL		2	
	.164-32 X .250 LNG SCREW PAN		8	
	.164 FLAT WASHER STL		10	
	.164 LOCK WASHER STL		10	
	LOC-TITE 243		1	

**DIGITRIP RETROFIT KIT INSTALLATION COMPONENTS
FOR FEDERAL PACIFIC FPS-75 (3000A) BREAKERS
(CONTINUED)**

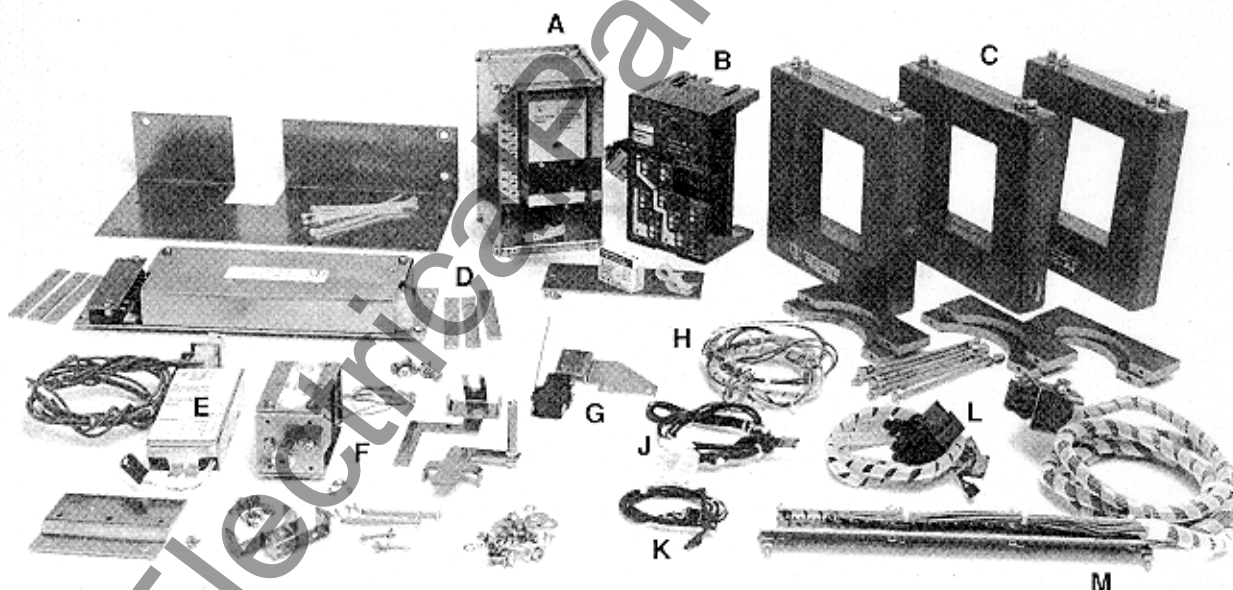
STEP	DESCRIPTION	STYLE NO.	QTY.	COMMENTS
STEP 8	DTA ASSEMBLY (FROM STEP 7)		1	
	DTA MOUNTING PARTS	8153A76G10	1	
	.312-18 X .750 LNG BOLT HEX		2	
	.312 FLAT WASHER STL		4	
	.312 LOCK WASHER STL		2	
	.312-18 NUT HEX STL		2	
STEP 9	TRIP UNIT ASSEMBLY (FROM STEP 6)		1	
	TRIP UNIT MOUNTING PARTS		1	
	.190-32 X .500 LNG SCREW PAN		2	
	.190 FLAT WASHER STL		2	
	.190 LOCK WASHER STL		2	
STEP 10	HARNESS MOUNTING PARTS	8153A76G11	1	
	SENSOR HARNESS		1	
	.190-32 X .375 LNG SCREW FIL		1	
	.190 FLAT WASHER STL		1	
	.190 LOCK WASHER STL		1	
	.164-32 X .375 LNG SCREW FIL		2	
	.164 FLAT WASHER STL		4	
	.164 LOCK WASHER STL		2	
	.164-32 NUT HEX STL		2	
	WIRE CLAMP NYLON		2	
	NYLON WIRE TIES		8	
	RING TERMINALS .375		3	810/910 KITS ONLY
STEP 11	SENSOR 3000/5	8184A43H01	3	
	SENSOR MOUNTING PARTS	8153A76G13	1	
	MOUNTING CLAMP		6	
	.190-32 X 5.00 LNG SCREW FIL		6	
	.190 FLAT WASHER STL		12	
	.190 LOCK WASHER STL		6	
	.190-32 NUT HEX STL		6	
STEP 12	AUX. SWITCH KIT	8153A76G02	1	810/910 KITS ONLY
	MICROSWITCH		1	810/910 KITS ONLY
	MOUNTING BRACKET		1	810/910 KITS ONLY
	.190-32 X .500 LNG SCREW FIL		2	810/910 KITS ONLY
	.190 FLAT WASHER STL		4	810/910 KITS ONLY
	.190 LOCK WASHER STL		2	810/910 KITS ONLY
	.190-32 NUT HEX STL		2	810/910 KITS ONLY
	.138-32 X 1.00 LNG SCREW FIL		2	810/910 KITS ONLY
	.138 FLAT WASHER STL		4	810/910 KITS ONLY
	.138 LOCK WASHER STL		2	810/910 KITS ONLY
	.138-32 NUT HEX STL		2	810/910 KITS ONLY

DIGITRIP RETROFIT KIT INSTALLATION COMPONENTS FOR FEDERAL PACIFIC FPS-75 (3000A) BREAKERS (CONTINUED)

STEP	DESCRIPTION	STYLE NO.	QTY.	COMMENTS
STEP 13	EXTERNAL HARNESS PARTS	8153A76G12	1	
	EXTERNAL HARNESS	6502C83G	1	
	AUX. CT HARNESS	6502C84G02	1	
	PT EXTENSION HARNESS	6502C85G01	1	810/910 KITS ONLY
	.164-32 X .625 LNG SCREW FIL		2	
	.164 FLAT WASHER WIDE STL		2	
	.164 FLAT WASHER STL		3	
	.164 LOCK WASHER STL		2	
	.164-32 NUT HEX STL		2	
	WIRE CLAMP NYLON		2	
	NYLON WIRE TIES		8	
STEP 14	CELL HARNESS	6503C57G	1	

NOTE: DUE TO THE WIDE VINTAGE OF BREAKERS AND MULTIPLE FUNCTIONS OF THE RETROFIT COMPONENTS SOME EXCESS HARDWARE MAY BE LEFT WHEN THE RETROFIT IS COMPLETE.

TYPICAL RMS/R 810 RETROFIT KIT



- A. Trip Box
- B. RMS/R Trip Unit Assembly
- C. Sensors
- D. Auxiliary CT Module
- E. PT Module (810 & 910 Kits Only)
- F. Direct Trip Actuator and Hardware

- G. Auxiliary Switch (810 & 910 Kits Only)
- H. Sensor Harness
- J. Auxiliary CT Harness
- K. PT Extension Harness (810 & 910 Kits Only)
- L. External Wire Harness
- M. Cell Harness

Table 1 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 2 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

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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