# Digitrip Retrofit System for the Brown Boveri MB-16 Series Breakers

## SAFETY PRECAUTIONS

### WARNING

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

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

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, IMPACC 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 understand 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.

| 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 33-855-1), 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 bench.

**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.**

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

### Step 2: Removing the Original Components

Follow the Brown Boveri MB-16 Instruction Manual, originally supplied with the Breaker, to perform the following procedures.

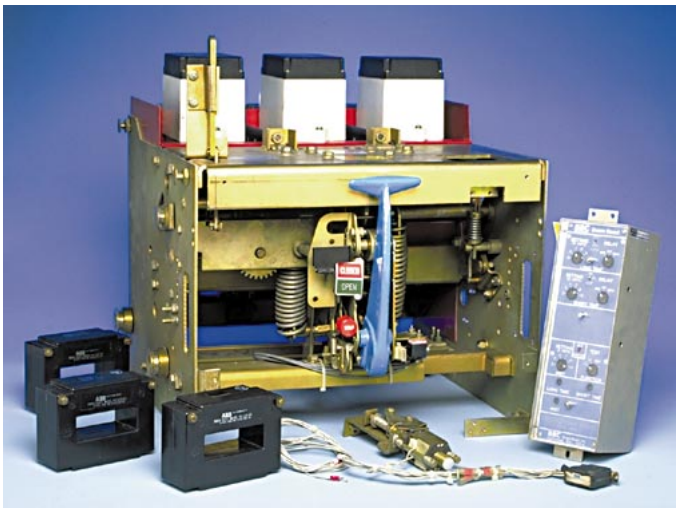
A. Remove and save the Front Cover and mounting hardware. These will be reinstalled later in the Retrofit process.

B. Remove and scrap the original Trip Actuator and mounting bracket.

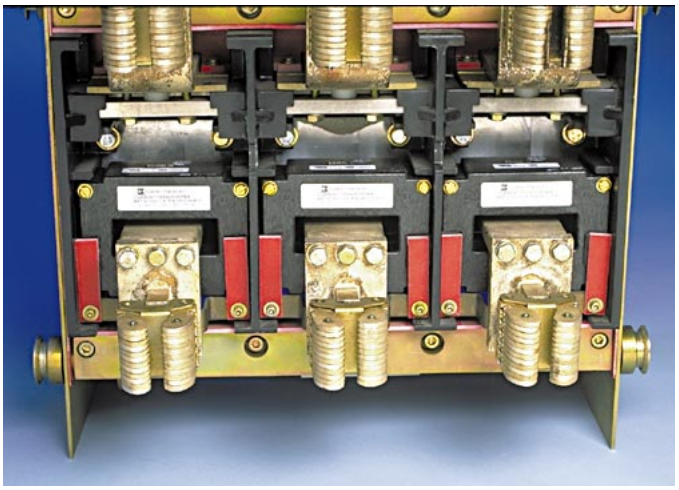
C. Remove and scrap the original Trip Unit and mounting hardware.

D. Remove and save the bottom finger cluster assemblies, mounting hardware, and glass poly sensor retaining fingers. These will be reinstalled later in the Retrofit process.

E. Remove and scrap the original Sensors and Sensor Harness.

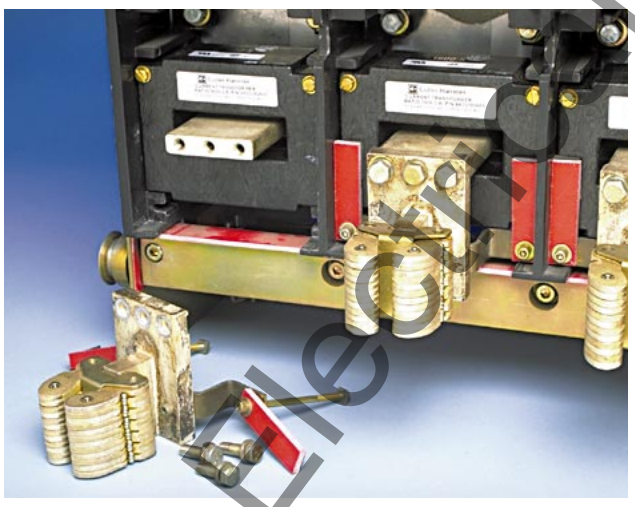


## Step 3: Installing the Sensors



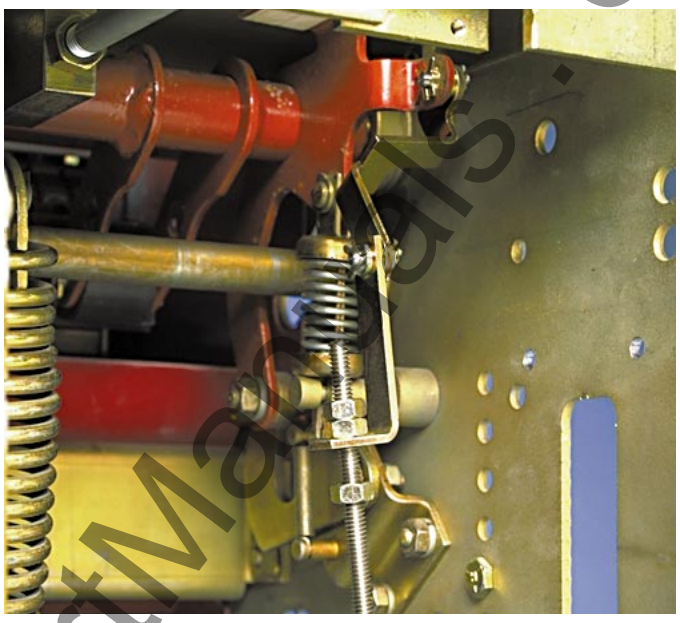
A. Slide a Sensor over each bottom Breaker Stab. Note that the Sensor Terminals must be positioned at the top and face outwards.

B. Using the original mounting hardware and glass poly retaining fingers removed in Step 2-D, reinstall a Finger Cluster assembly onto each Breaker Stab.



**NOTE: *For Kits Supplied with a PT Module Only.* Do not reinstall the top left bolts securing the Finger Cluster Assemblies at this time. They will be installed later in the Retrofit Process.**

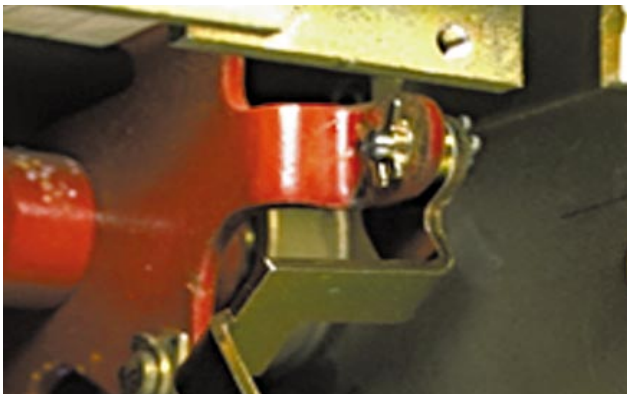
## Step 4: Installing the Reset Linkage



A. Remove the lock nut, flat washer, spring, brass spacer, and second flat washer from the Reset Shaft. Save these for use during Step 6 of the retrofit process.

B. Install an “X” washer on one side of the Reset Pivot Pin provided.

C. Slide (1) .190" flat washer onto the pin, then slide the pin through the existing hole in the Phase 3 Pole Shaft, as shown.



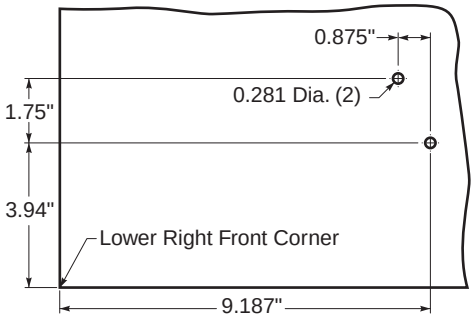
D. Install another (2) .190" flat washers, then the Reset Linkage, (1) .190" flat washer, and then another “X” washer onto the Pivot Pin.

**Step 5: Drilling the Breaker Frame**

**NOTE: Throughout this step, care should be taken to insure that drilling shavings do not fall into the Breaker.**

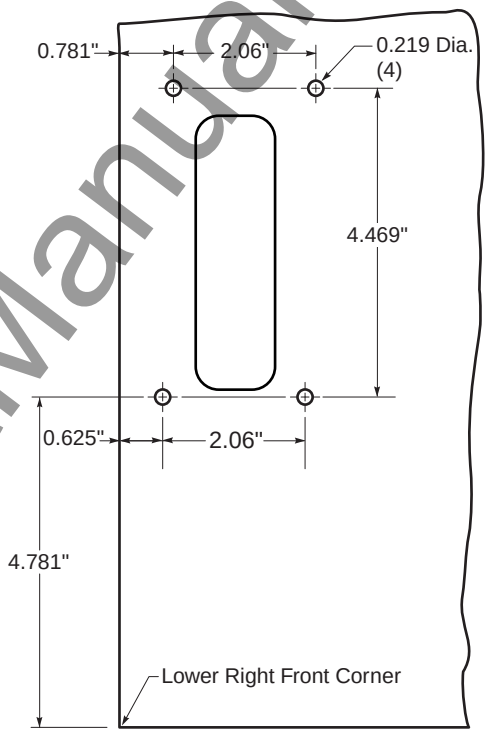
A. Using Drilling Plan “A”, drill two (2) .281" diameter holes in the right Breaker Frame. These will be used to mount the DTA Assembly later in the Retrofit process.

**Drilling Plan “A”**
**DTA Mounting Hole Pattern**



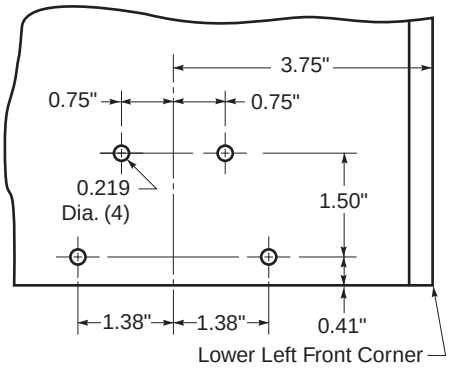

B. Using Drilling Plan “B”, drill four (4) .219" diameter holes in the right Breaker Frame. These will be used to mount the Trip Unit Mini-box later in the Retrofit process.

**Drilling Plan “B”**
**Mini-box / Trip Unit Mounting Hole Pattern**

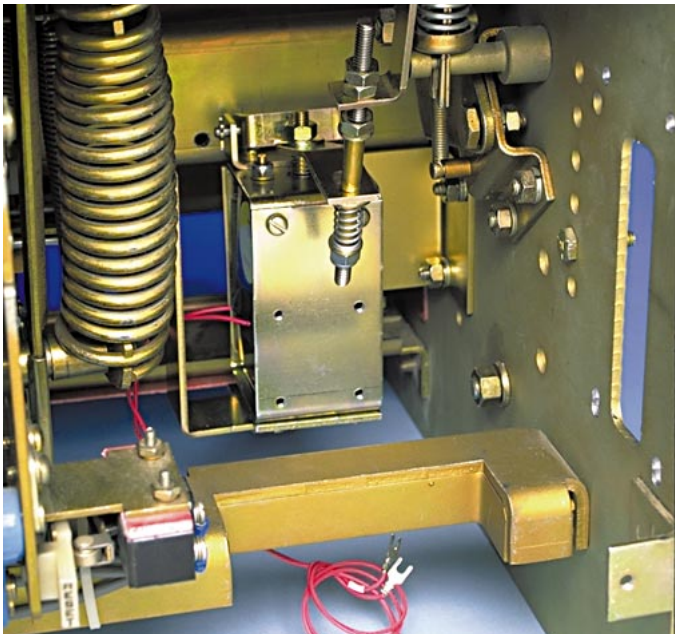



C. Using Drilling Plan “C”, drill four (4) .219" diameter holes in the left Breaker Frame. These will be used to mount the Aux. CT Module Assembly later in the Retrofit process.

**Drilling Plan “C”**
**Aux. CT Module Hole Pattern**



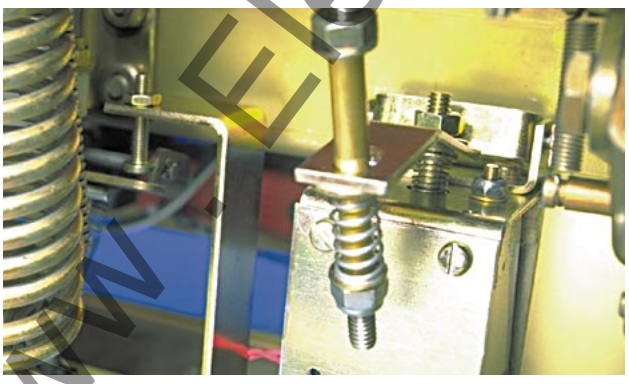
**Step 6: Installing the DTA Assembly**



A. Reinstall one of the flat washers, removed during Step 4-A, onto the Reset Assembly Shaft.

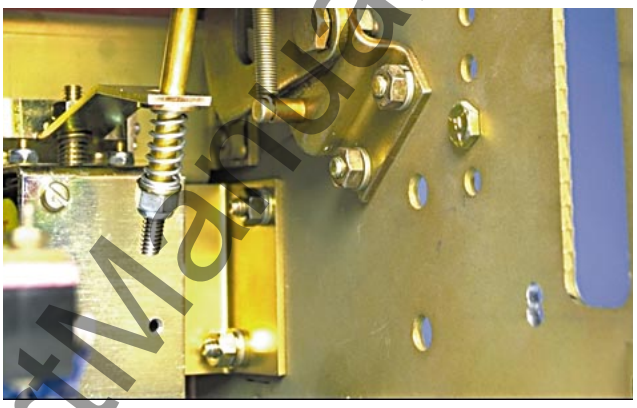
B. Position the DTA Assembly into the Breaker near the right rear corner. As the DTA Assembly is being positioned and while holding the flat washer on the Reset Assembly Shaft, insert the Reset Shaft through the cutout in the DTA Reset Arm.

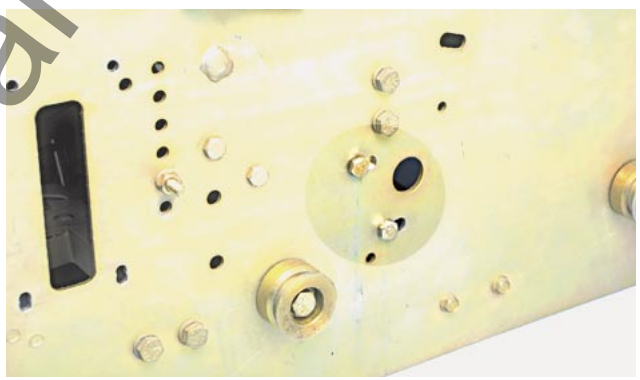
C. Reinstall the brass spacer, spring, flat washer, and lock nut (removed during Step 4-A) onto the Reset Shaft. Do not tighten the lock nut at this time.



D. Align the DTA Assembly with the holes drilled in the right Breaker Frame during Step 5-A.

E. Secure the DTA Assembly to the right Breaker Frame, as shown, using the (2) .250-20 × .750" bolts, (4) flat washers, (2) lock washers, and (2) nuts provided.

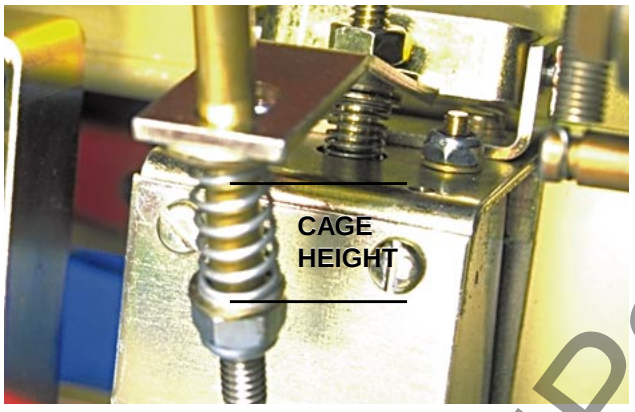




**Step 7: Adjusting the DTA**

A. Loosen the nut above the brass spacer on the Reset Assembly Shaft.

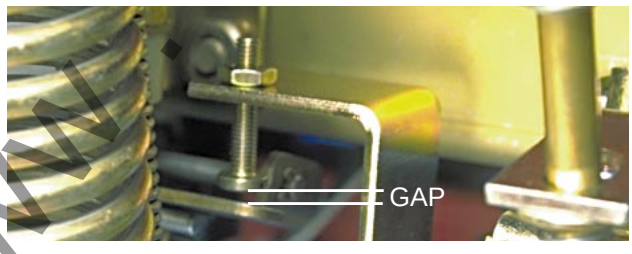
B. With the Breaker in the OPEN position, adjust the nuts above and below the brass spacer until a cage height of .89" is achieved. Back off the top nut, apply Loc-Tite® 242 to the threads in the area where the top nut was seated, then readjust and tighten the nut. Double check the gap.




**WARNING**

**The following steps must be performed with the Breaker in the CLOSED position. Guard against the Breaker unintentionally OPENING during these steps. Keep hands and fingers away from moving parts within the Breaker.**

C. CLOSE the Breaker. With the Breaker in the CLOSED position, loosen the lock nut on the adjusting screw in the Trip Arm. Turn the adjusting screw until a gap of .06" is achieved between the head of the screw and the Trip Lever.

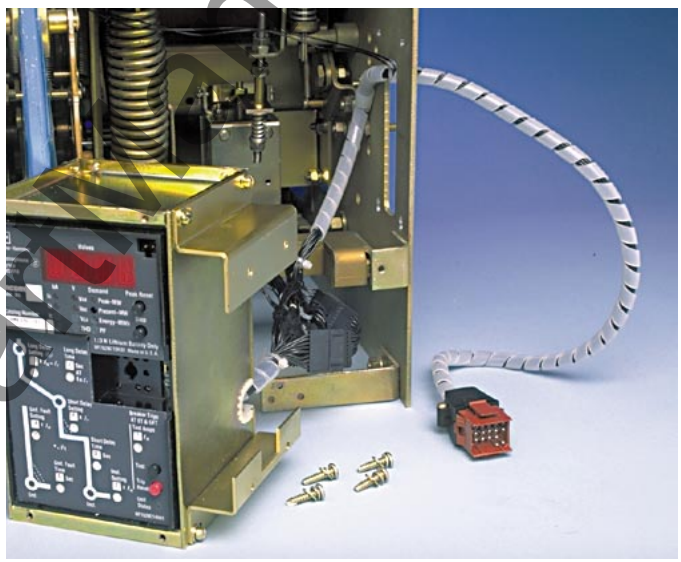



D. Apply Loc-Tite® 242 to the threads of the adjusting screw then tighten the lock nut.

E. Return the Breaker to the OPEN position.

F. Temporarily route the DTA wires towards the left side of the Breaker. The DTA Wires will be connected later in the Retrofit Process.

**Step 8: Installing the External Harness, Mini-box, and Trip Unit**



A. Remove and scrap the clear Mini-box Cover.

B. Remove and scrap the hardware securing the right side plate to the Mini-box.

C. Align then secure the right side plate and top and bottom Mini-box Mounting Brackets to the Mini-box, as shown, using the (4) .164-32 × .500" screws, (4) lock washers, and (4) flat washers provided.

D. *For Communicating Breakers Only.* Position the Trip Unit near the front of the Mini-box. Insert the male Communications Harness Connector into the female receptacle in the back of the Trip Unit as shown. Note that the metal pins on the Communications Harness Connector must face upward.

**CAUTION: If the Communications Harness Connector is inserted upside down (metal pins facing downward), communications problems will occur.**

E. Insure that the “Jacking” screws are fully retracted into the Mini-box. For detailed instructions on the use of the “Jacking” screws, refer to the directions on the back of the Mini-box.

F. Align the Trip Unit Edge Card with the receptacle in the Mini-box. Plug the Trip Unit into the Mini-box.

**Caution: Do not apply undue force to the Trip Unit. If it does not plug easily into the Mini-box, make sure the edge card is properly aligned with its receptacle. Applying undue force can damage the Trip Unit and / or the Mini-Box.**

G. Connect the External Harness to the Mini-box Wiring Harness.

**NOTE: For 510 Basic Retrofit Kits, the External Harness is the plug pictured here. It is to be plugged into the Mini-box Wiring Harness.**

H. Route the External Harness through the existing slot in the right Breaker Frame as shown.

I. Secure the External Harness to the right Breaker Frame, as shown, using the existing hole and the (1) cable clamp, (1) .164-32 × .625" screw, (2) flat washers, (1) lock washer, and (1) nut provided.

J. *For Kits Supplied With An Auxiliary Switch Only*. Temporarily route the two (2) wires (with ring terminals) from the External Harness towards the left side of the Breaker. These will be connected later in the Retrofit process.

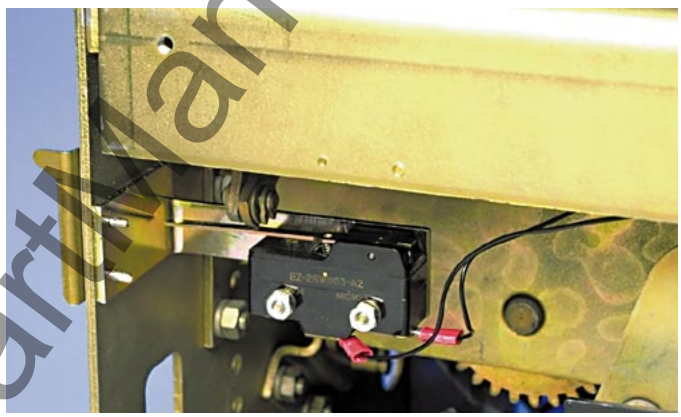
K. Align the Trip Unit / Mini-box Assembly with the holes drilled in the right Breaker Frame in Step 5-B. Mount the Trip Unit / Mini-box Assembly, as shown, using the (4) .190-16 × .750" thread cutting screws, (4) lock washers, and (4) flat washers provided.


L. Remove any slack in the External Harness by gently pulling the External Harness through the cable clamp.

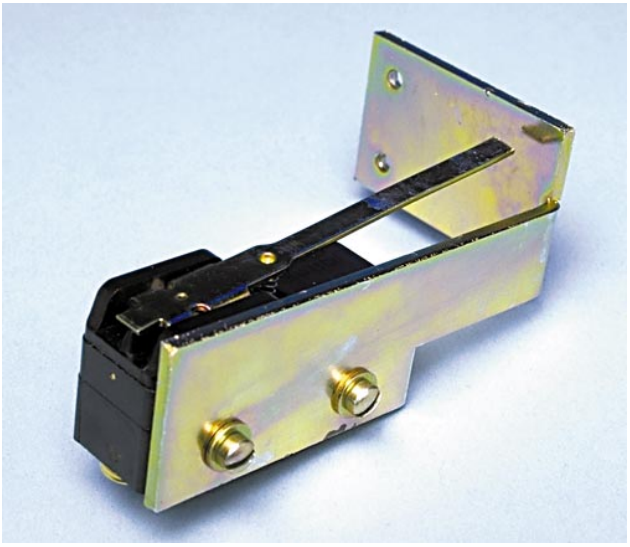
M. Install the Rating Plug provided with the Retrofit kit into the Trip Unit.

*For Kits Supplied With An Auxiliary Switch Only.*

**Step 9: Installing the Auxiliary Switch**



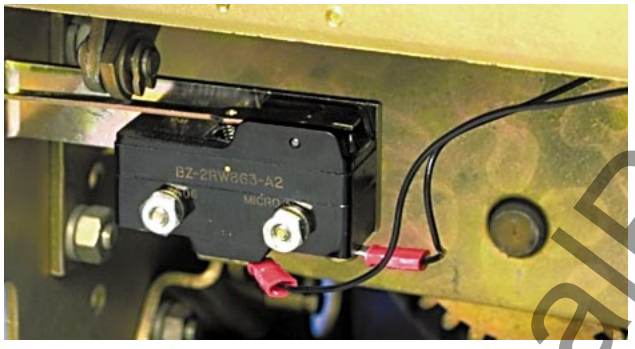
A. Cut 3.44" off the end of the Microswitch arm. Align the Microswitch with the holes in the Aux. Switch Mounting Bracket, as shown, then secure the Microswitch to the bracket using the (2) .138-32 × 1.00" screws, (4) flat washers, (2) lock washers, and (2) nuts provided.



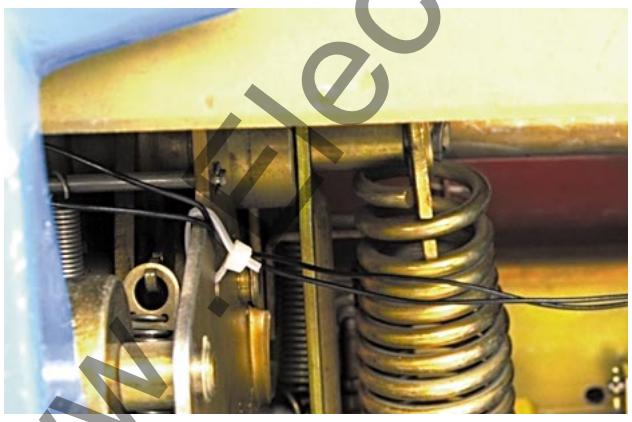
B. Remove and save the Coding Plate from the left side of the Breaker. Scrap the original mounting hardware.

C. Align the Coding Plate and the Aux. Switch Assembly with the holes that originally were used to mount the Coding Plate. Secure the Coding Plate and Aux. Switch Assembly to the left Breaker Frame, as shown, using the (2) .138-20 × .500" thread cutting screws, (2) lock washers, and (2) flat washers provided.

D. Route the two (2) wires (with ring terminals) from the External Harness to the Auxiliary Switch. Connect one (1) wire to the normally "Open" terminal and the other wire to the "Common" terminal.

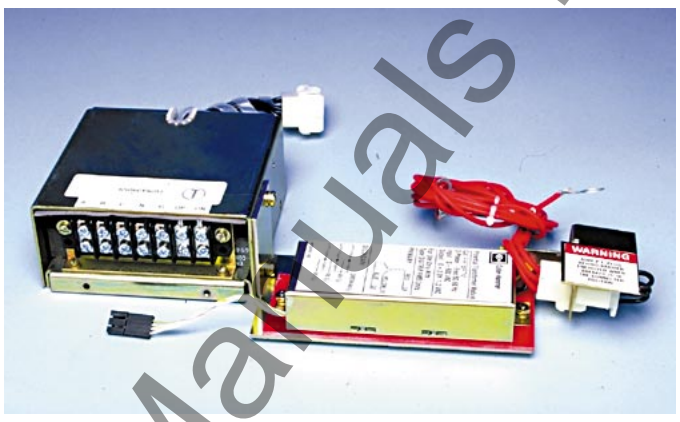


E. Using the wire ties provided, secure the Aux. Switch Wires to the right center Breaker Frame, as shown. Insure that the Aux. Switch Wires are clear of any moving parts within the Breaker.



*For Kits Supplied With A PT Module Only.*

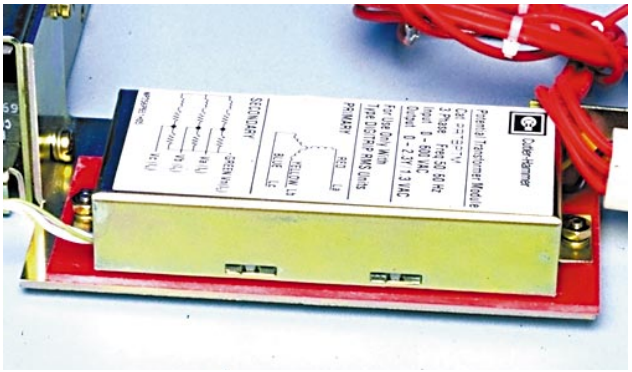
**Step 10: Preparing the PT Module Assembly**




A. Remove and scrap the screw from the front right corner of the Aux. CT Module.

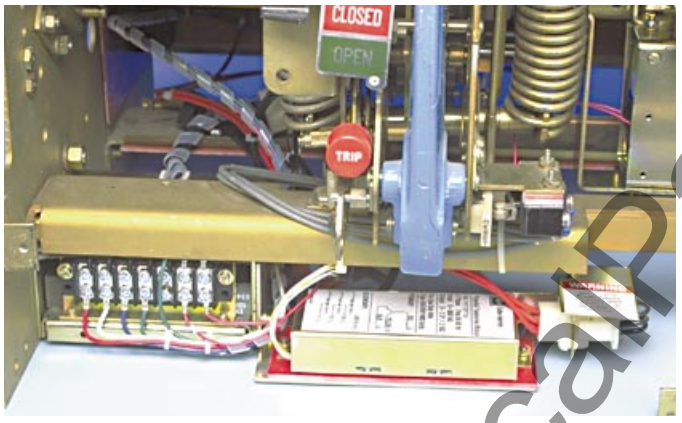
B. Align the PT Module Mounting Bracket with the holes near the right front of the Aux. CT Module. Secure the PT Module Mounting Bracket to the side of the Aux. CT Module, as shown, using the (2) .190-16 × .500" thread cutting screws, (2) lock washers, and (2) flat washers provided.

C. Align the Glass Poly Insulation and the PT Module with the holes in the PT Module Mounting Bracket. Secure the Insulation and PT Module to the PT Module Mounting Bracket using the (2) .138-32 × .500" screws, (4) flat washers, (2) lock washers, and (2) nuts provided. Note that the screws should be inserted from the bottom of the PT Module Mounting Bracket.



D. Remove the protective backing then install the new Warning Label over the existing Warning Label on the PT Module.


**Step 11: Installing the Auxiliary CT. Module Assembly**




A. 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.

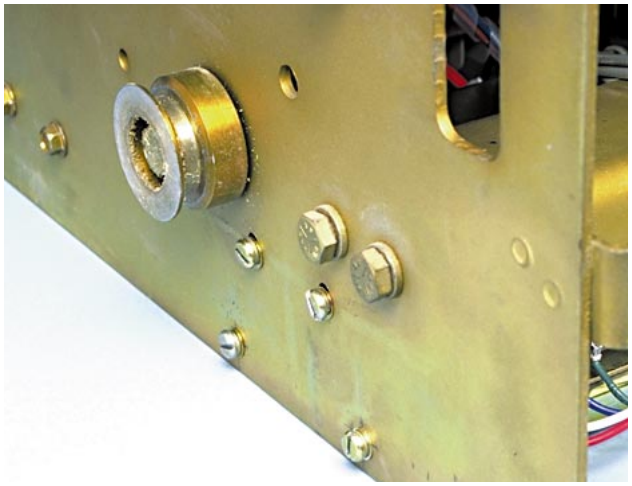
B. Remove the rear bottom screw from the right side of the Aux. CT Module. Using the screw just removed, connect the green ground wire from the Sensor Harness (with ring terminal) to the side of the Aux. CT Module.

C. Secure the Sensor Harness to the right side of the Aux. CT Module, as shown, using the (1) cable clamp, (1) .190-16 × .750" thread cutting screw, (1) lock washer, and (1) flat washer provided.

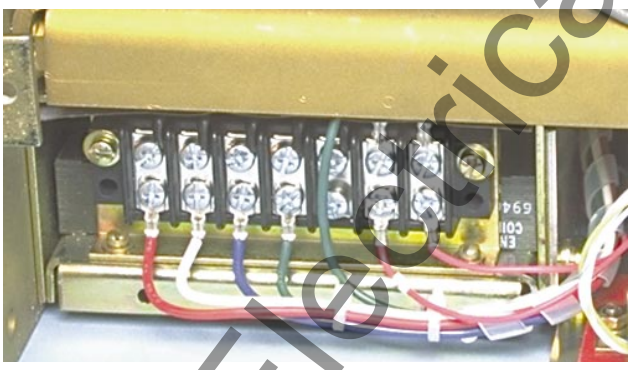
D. Position the Aux. CT Assembly in the front left corner of the Breaker. Temporarily route the Sensor Harness toward the rear of the Breaker. The Sensor Harness will be connected later in the Retrofit process.

E. *For Kits Supplied With A PT Module Only.* Temporarily route the PT Wires toward the rear of the Breaker. The PT Wires will be connected later in the Retrofit process.

F. Align the Aux. CT Module Assembly with the holes drilled in the left Breaker Frame in Step 5-C. Secure the Aux. CT Module Assembly to the left Breaker Frame using the (4) .190-16 × .750" thread cutting screws, (4) lock washers, and (4) flat washers provided.



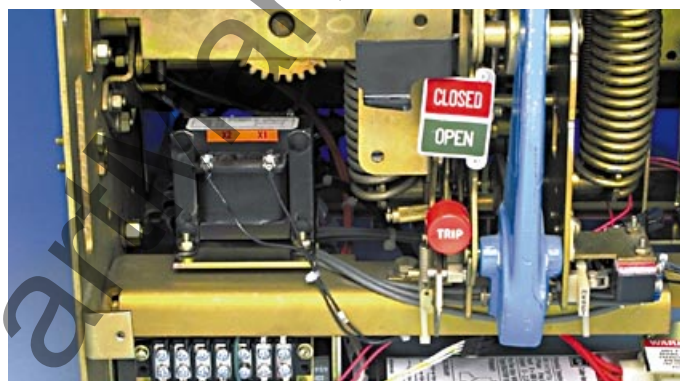
G. Route the DTA Wires along the bottom Breaker Shelf to the Aux. CT Module. Connect the DTA Wires marked with a “+” to the “OP” terminal of the Aux. CT Module and the unmarked wire to the “ON” terminal.



**Note: Final Sensor Harness connection, final Retrofit wiring, and the optional installation of the Breaker Mounted CPT is most easily accomplished with the Breaker on its left side. Once positioned, leave the Breaker on its left side until you reach Step 15 - Testing the Breaker.**

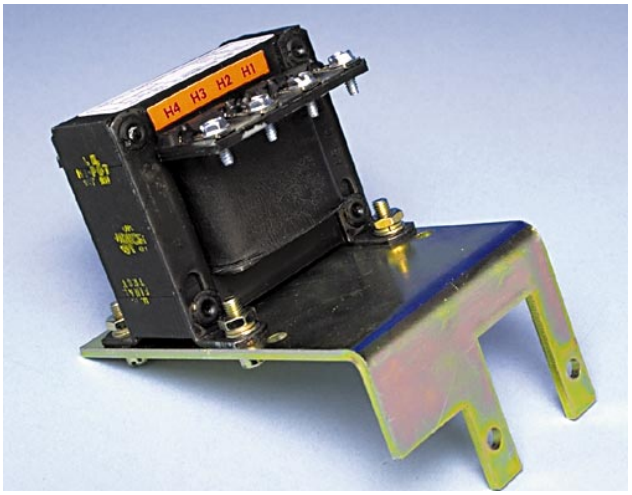
*For Kits Supplied With A Breaker Mounted CPT Only.*

**Step 12: Installing the Breaker Mounted CPT**



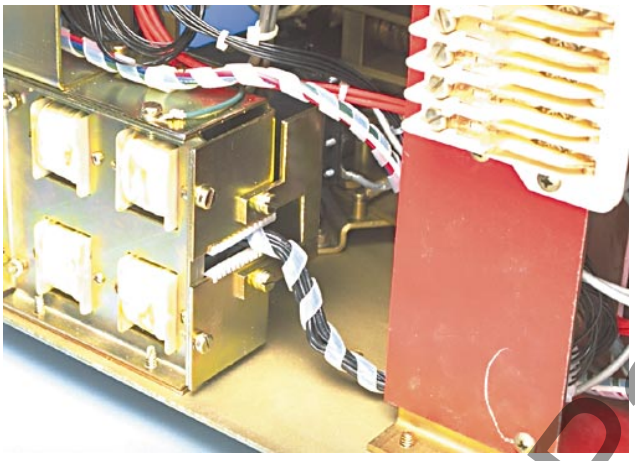

A. Carefully lay the Breaker over on its left side.

B. Align the Breaker Mounted CPT with the holes in the CPT Mounting Bracket, as shown. Secure the Breaker Mounted CPT to the CPT Mounting Bracket using the (4) .190-32 × .625" screws, (8) flat washers, (4) lock washers, and (4) nuts provided.

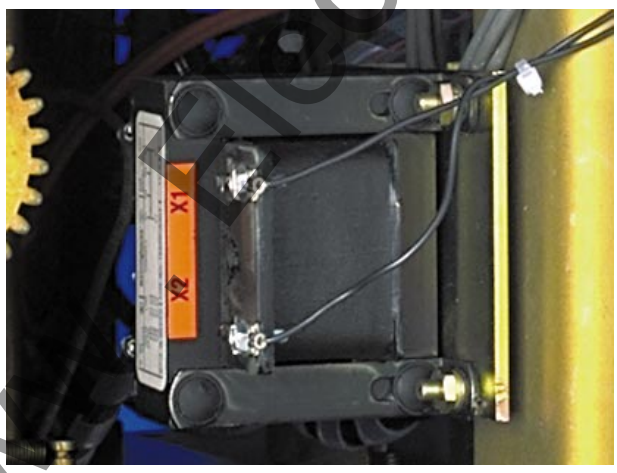


**NOTE: The CPT terminals (X1 and X2) should be oriented away from the "forked" side of the CPT Mounting Bracket.**

C. Align the CPT Assembly with the holes on the back of the Aux. CT Module. Secure the CPT Assembly to the back of the Aux. CT Module, as shown, using the (2) .190-16 × .500" thread cutting screws, (2) lock washers, and (2) lock washers provided.

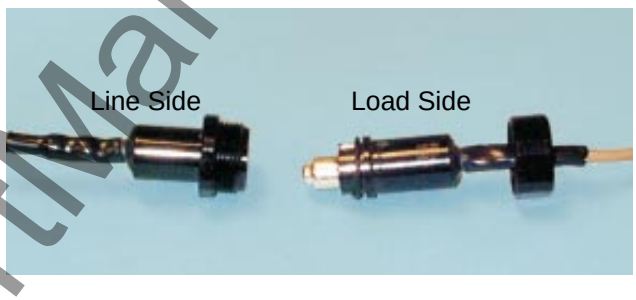


D. The CPT Harness will connect the CPT to the Trip Unit. Temporarily position the plug-in connection of the CPT Harness in front of the Breaker. Route the CPT Harness along the bottom front of the Breaker Frame, then to the back of the Trip Unit / Mini-box Assembly. With the CPT connector near the Mini-box Wiring Harness, cut the harness to a suitable length for attachment to the CPT.




E. Strip .250" of insulation and attach a .138" ring terminal to each wire of the CPT Harness. Connect the wires to the X1 and X2 terminals of the CPT.

**NOTE: The 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.**



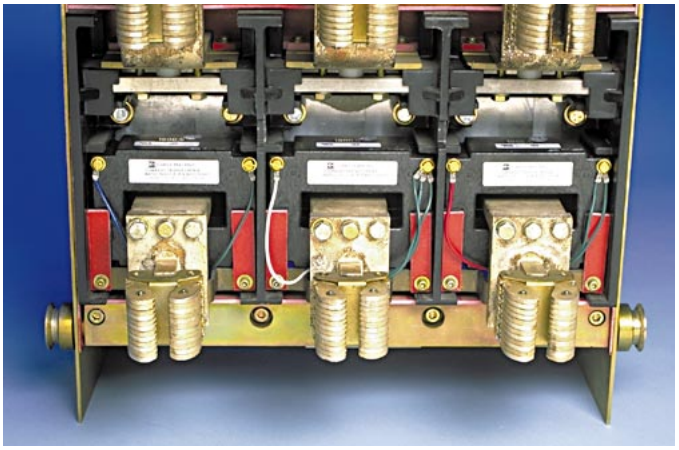

F. Strip .250" of insulation and attach a .138" ring terminal to each Load Side HV Wire. Attach the Load Side HV Wires to the CPT terminals to achieve the required voltage. (See the following table.)

| 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.**

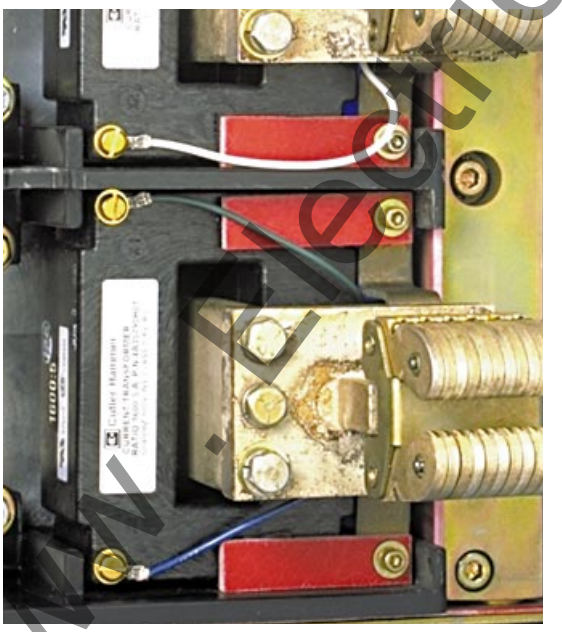
G. Temporarily position the HV Fuses and Line Side Wires inside the Breaker, behind the Aux. CT Module, in an accessible location. They will be connected later in the Retrofit process.

## Step 13: Connecting the Sensor Harness to the Sensors

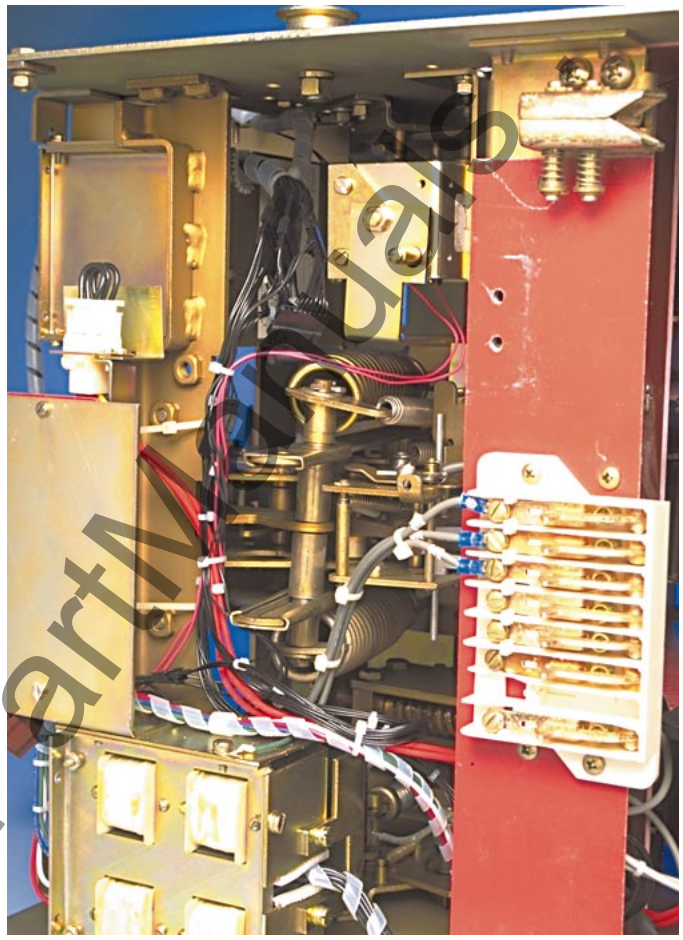


A. Route the Sensor Harness from the Aux. CT. Module towards the back of the Breaker, then through the openings between the Sensors and the Breaker Back Plate. Insure that the Sensor Harness is clear of any moving parts within the Breaker.

B. Connect the ring terminals of the Sensor Harness to the Sensors as shown. Refer to Section 12 of the Retrofit Application Data, supplied with the Retrofit Kit, for detailed wiring specifications.



## Step 14: Final Wiring and Harness Connection



A. Connect the Aux. CT Harness to the pigtail on the Aux. CT Module and to its receptacle on the Mini-box Wiring Harness.

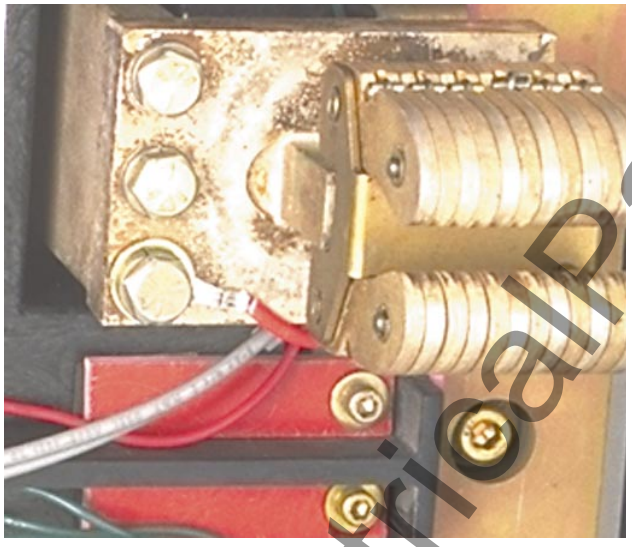
B. *For Kits Supplied With A PT Module Only.* Route the PT Wires from the PT Module towards the back of the Breaker, then through the openings between the Sensors and the Breaker Back Plate. Insure that the PT Wires are clear of any moving parts within the Breaker.

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.**

The PT Wires are to be mounted to the left bolts securing the Finger Cluster Assemblies to the Breaker Stabs. These bolts were left loose during Step 3. Move the PT Wire markers to a position where they will still be attached to the wires after cutting. Cut the wires to length, strip each wire .250", and install a .250" ring terminal on each wire.

Using the left Finger Cluster Assembly mounting bolts, secure the PT Wires to each Finger Cluster Assembly.



C. *For Kits Supplied With A Breaker Mounted CPT Only.* Route the Line Side HV Wires from the CPT towards the back of the Breaker, then through the openings between the Sensors and the Breaker Back Plate. Insure that the Line Side HV Wires are clear of any moving parts within the Breaker.

**Note: The power convention of the MB-16 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 Line Side 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 Line Side HV Wires must be attached to the Bottom Breaker Stabs.**

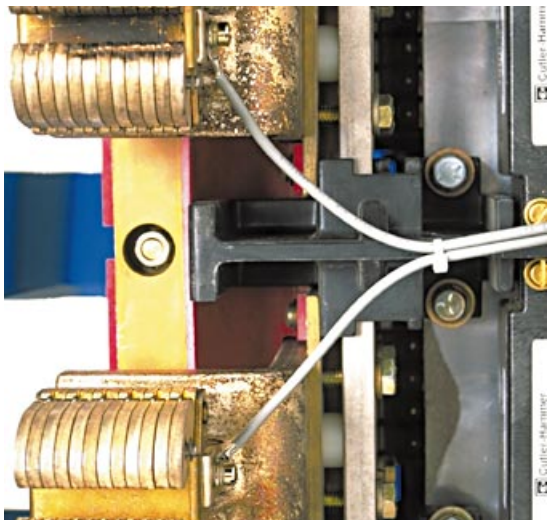
**NOTE: The Line Side HV Wires are longer than necessary and are cut during the following steps. Before cutting the wires, be sure that sufficient length is left so that the connections can be made to the correct Breaker Stabs.**

Drill and tap the Phase 1 & 2 or Phase 2 & 3 top Breaker Stabs to accept a .190-32 × .375" screw.

**NOTE: Care should be taken to insure that no drill shavings fall into the Breaker.**

Cut the Line Side HV Wires to the appropriate length for attachment to the appropriate top Breaker Stabs. Strip .250" from each Line Side HV Wire and attach a .190" ring terminal.

Connect the Line Side HV Wires to the Phase 1 & 2 or Phase 2 & 3 Breaker Stabs, using the holes just drilled and tapped and the (2) .190-32 × .375" screws, (2) lock washers, and (2) flat washers provided.

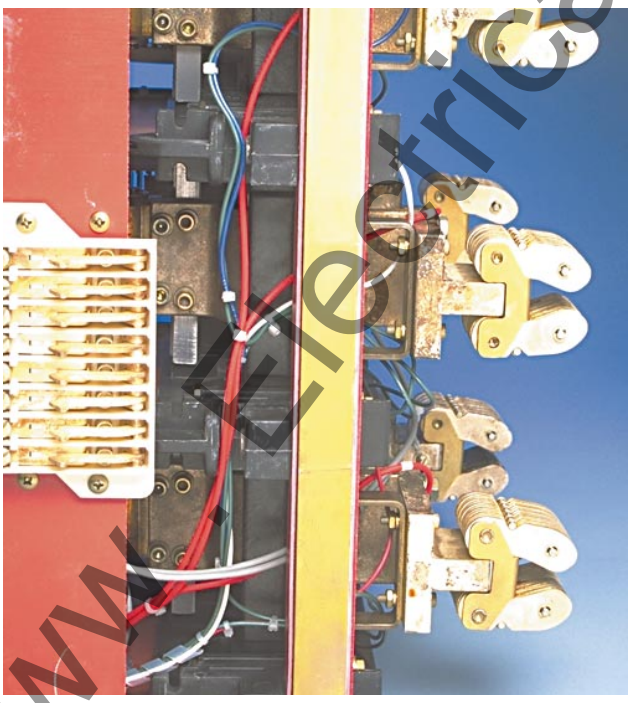


D. Using the wire ties provided, secure the Sensor Harness, PT Wires, and HV Wires (if applicable) so they are positioned within the cutouts in the Phase Insulation Barriers.

E. *For Kits Supplied With A Breaker Mounted CPT Only.* Remove the External Harness plug installed in the Mini-box Wiring Harness. Route the CPT Harness along the bottom Breaker Shelf to the back of the Mini-box. Insert the black plug of the CPT Harness into the same receptacle on the Mini-box Wiring Harness. Reinsert the External Harness Plug just removed into the female receptacle on the CPT Harness.

F. Secure the DTA Wires and CPT Harness (if applicable) to the bottom Breaker Shelf using the wire ties provided and the existing holes in the Breaker Shelf.

G. Use the wire ties and cable clamps provided to secure all wires and harnesses away from any moving parts within the Breaker. If excess wiring or harness is present, loop and secure them so they are away from any moving parts within the Breaker.



**Step 15: Testing the Breaker**

A. Return the Breaker to its upright position.

B. Measure the force necessary to trip the Breaker at the point where the Trip Finger contacts the adjusting screw. The force necessary to trip the Breaker **MUST NOT EXCEED** 3 lbs.

C. The Retrofit must be tested using primary injection. Refer to Section 8 of the *Instructions for the Application of Digitrip RMS Retrofit Kits on Power Circuit Breakers* (Publication AD-33-855-1, June 1997), supplied with the Retrofit Kit, for detailed testing procedures and specifications. For test information specific to the Trip Unit, refer to the IL publication supplied with the Retrofit Kit (see the Pick List for the IL number).

D. While Section 8 of the *Instructions for the Application of Digitrip RMS Retrofit Kits on Power Circuit Breakers* provides the information necessary for testing the Breaker, please keep the following notes in mind when reviewing other sections of the publication.

**Caution: When all testing is complete, the Trip Unit must be reset. Failure to do so may cause the Battery in the Rating Plug to run down.**

**Notes:**

1. **Publication AD-33-855-1 was created specifically for the "hundred" series (500, 600, 700, etc.) Retrofit Kits. Therefore certain sections and figures do not apply to the "ten" series (510, 610, 810, etc.) Retrofit Kits. Specifically, these are Sections 13 and 14, as well as Figures 3-2, 3-3, and 3-4.**

2. ***For All Kits Other Than 510 Basic.*** **If testing the Breaker with Short Delay or Ground Fault functions, be sure to either plug in the Cell Harness Assembly or use the Zone Interlock Shorting Plug. Failure to do so may result in shorter than expected trip times.**

3. ***For 810 and 910 Kits Only.*** **Without any power applied to the system (neither the 120 volt power supply nor the Aux. Power Module connected), plug the External Harness into the Cell Harness and check the impedance between COM 1 and COM 2. The impedance should be between one (1) and three (3) ohms. If the impedance is not within this range, trace the wiring and examine each connection to assure its integrity.**

   **Confirm that the IMPACC communication wiring is correct by following the procedures detailed in Section 7.4 of the Instructions for the Application of Digitrip RMS Retrofit Kits on Power Circuit Breakers. Note that for 810 and 910 Kits, the impedance between COM 1 and COM 2 should be between one (1) and three (3) ohms.**

   **When testing is complete, disconnect the External Harness from the Cell Harness. Final External Harness connection will be performed in Step 18.**

**Step 16: Reinstalling the Front Cover**

A. Follow the Brown Boveri MB-16 Instruction Manual, originally supplied with the Breaker to reinstall the Front Cover.

B. Attach the appropriate label for the Breaker in a clearly visible position. Three (3) labels are included with the CPT, one (1) for 480 Volt, one (1) for 240 Volt, and one (1) for 208 Volt systems.

**Step 17: Installing the Trip Unit Cover**

A. Align the Trip Unit Cover with the holes in the Mini-box. Secure the Trip Unit Cover to the Mini-box using the (4) .164-32 × .375" screws, (4) lock washers, and (4) flat washers provided. Do not over tighten the screws securing the cover to the Mini-box. Over tightening the screws may cause the cover to crack.

**Step 18: Mounting the Cell Harness**

A. The Cell Harness is to be mounted in the Breaker Cell. The connector end is to be mounted on the right front side of the Cell, in a location suitable for connection with the External Harness. The Terminal Blocks can be mounted anywhere space is available in the Cell as long as connection to the External Harness can be made.

B. Route the Cell Harness wiring to keep it away from any moveable parts within the Cell Housing.

**Step 19: Installing the Retrofitted Breaker in the Cell**

**WARNING**

**Do not leave the Breaker in an intermediate position in the switchgear cell. Always leave it in the CONNECTED, DISCONNECTED, or (Optional) TEST position. Failure to do so could lead to improper positioning of the Breaker and flashover, causing death, serious personal injury, and / or property damage.**

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

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

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

**Digitrip Retrofit Kit Installation Components for Brown Boveri MB - 16 Breakers**

| Step | Description | Style No. | Qty. | Comment |
|---|---|---|---|---|
| Step 3 | Sensor | | 3 | See Pick List |
| Step 4 | DTA Reset Assembly | 4A35811G11 | 1 | |
| | DTA Reset Linkage | | 1 | |
| | Reset Pivot Pin | | 1 | |
| | .190 Flat Washer Stl. | | 4 | |
| | X Washer | | 2 | |
| | Loc-Tite® 242 | | 1 | |
| Step 6 | DTA Assembly | 4A35811G33 | 1 | |
| | DTA Mounting Hardware | 4A35811G10 | 1 | |
| | .250-20 × .750 Lng. Hex Bolt | | 2 | |
| | .250 Flat Washer Stl. | | 4 | |
| | .250 Lock Washer Stl. | | 2 | |
| | .250-20 Nut Hex Stl. | | 2 | |
| Step 7 | Loc-Tite® 242 (From Step 4) | | 1 | |
| Step 8 | Trip Unit | | 1 | |
| | Rating Plug | | 1 | See Pick List |
| | Mini-box | | 1 | |
| | Trip Unit Assembly Parts | 4A35811G05 | 1 | |
| | Mounting Bracket Top | | 1 | |
| | Mounting Bracket Bottom | | 1 | |
| | .164-32 × .500 Lng. Screw | | 4 | |
| | .164 Flat Washer Stl. | | 4 | |
| | .164 Lock Washer Stl. | | 4 | |
| | External Harness | 6502C83G__ | 1 | |
| | External Harness Parts | 4A35811G13 | 1 | |
| | .164-32 × .625 Lng. Screw Fil. | | 1 | |
| | .164 Flat Washer Stl. | | 2 | |
| | .164 Lock Washer Stl. | | 1 | |
| | .164-32 Nut Hex Stl. | | 1 | |
| | Cable Clamp, Nylon | | 1 | |
| | Trip Unit Mounting Parts | 4A35811G08 | 1 | |
| | .190-16 × .750 Lng. Screw T. C. | | 4 | |
| | .190 Lock Washer Stl. | | 4 | |
| | .190 Flat Washer Stl. | | 4 | |

**Digitrip Retrofit Kit Installation Components for Brown Boveri MB - 16 Breakers (Continued)**

| Step | Description | Style No. | Qty. | Comment |
|---|---|---|---|---|
| Step 9 | Aux. Switch Kit | 4A35811G02 | 1 | |
| | Microswitch | | 1 | |
| | Mounting Bracket | | 1 | |
| | .138-32 × 1.00 Lng. Screw Fil. | | 2 | |
| | .138-20 × .500 Lng. Screw T. C. | | 2 | Comm. Only |
| | .138 Flat Washer Stl. | | 6 | |
| | .138 Lock Washer Stl. | | 4 | |
| | .138-32 Nut Hex Stl. | | 2 | |
| | Wire Ties, Nylon | | 4 | |
| Step 10 | Aux. CT Module (From Step 11) | | 1 | |
| | PT Module | 6502C82G01 | 1 | |
| | PT Module Mounting Parts | 4A35811G07 | 1 | |
| | PT Mounting Bracket | | 1 | |
| | Glass Poly Insulation | | 1 | |
| | PT Warning Label | | 1 | |
| | .312 Line Flat Washers | | 3 | |
| | .190-16 × .500 Lng. Screw T. C. | | 2 | Comm. Only |
| | .190 Flat Washer Stl. | | 2 | |
| | .190 Lock Washer Stl. | | 2 | |
| | .138-32 × .500 Lng. Screw Fil. | | 2 | |
| | .138 Flat Washer Stl. | | 4 | |
| | .138 Lock Washer Stl. | | 2 | |
| | .138-32 Nut Hex Stl. | | 2 | |
| | Ring Terminals (.190, .250, .312, .375, .500 - Each Size) | | 3 | |
| Step 11 | Aux. CT Module | 6503C59G__ | 1 | |
| | Aux. CT Module Mounting Parts | 4A35811G06 | 1 | |
| | .190-16 ×.750 Lng. Screw T. C. | | 4 | |
| | .190 Flat Washer Stl. | | 4 | |
| | .190 Lock Washer Stl. | | 4 | |
| | Sensor Harness Parts | 4A35811G12 | 1 | |
| | Sensor Harness | | 1 | |
| | .190-16 × .750 Lng. Screw T. C. | | 1 | |
| | .190 Flat Washer Stl. | | 1 | |
| | .190 Lock Washer Stl. | | 1 | |
| | Cable Clamp, Nylon | | 4 | |
| | Wire Ties, Nylon | | 20 | |

**Digitrip Retrofit Kit Installation Components for Brown Boveri MB - 16 Breakers (Continued)**

| Step | Description | Style No. | Qty. | Comment |
|---|---|---|---|---|
| Step 12 | Breaker Mounted CPT Kit | 8259A91G05 | 1 | |
| | Ring Terminals (.138, .190, .250, .312, .375, .500 - Each Size) | | 2 | |
| | CPT Mounting Parts | 4A35819G20 | 1 | |
| | CPT Mounting Bracket | | 1 | |
| | .190-32 × .625 Lng. Screw Fil. | | 4 | CPT Only |
| | .190-16 × .500 Lng. Screw T. C. | | 2 | |
| | .190-32 × .375 Lng. Screw Fil. | | 2 | |
| | .190 Flat Washer Stl. | | 12 | |
| | .190 Lock Washer Stl. | | 8 | |
| | .190-32 Nut Hex Stl. | | 4 | |
| Step 14 | Aux. CT Harness | 6502C84G__ | 1 | |
| | Cable Clamp, Nylon (From Step 11) | | 2 | |
| | Wire Ties, Nylon (From Step 11) | | 18 | |
| | .190-32 × .375 Lng. Screw Fil. (From Step 12) | | 2 | |
| | .190 Flat Washer Stl. (From Step 12) | | 2 | CPT Only |
| | .190 Lock Washer Stl. (From Step 12) | | 2 | |
| Step 17 | Plastic Cover Mounting Parts | 4A35811G09 | 1 | |
| | Plastic Cover Painted | | 1 | |
| | .164-32 × .375 Lng. Screw P. H. | | 4 | |
| | .164 Lock Washer Stl. | | 4 | |
| | .164 Flat Washer Stl. | | 4 | |
| Step 18 | Cell Harness | 6503C57G__ | 1 | |

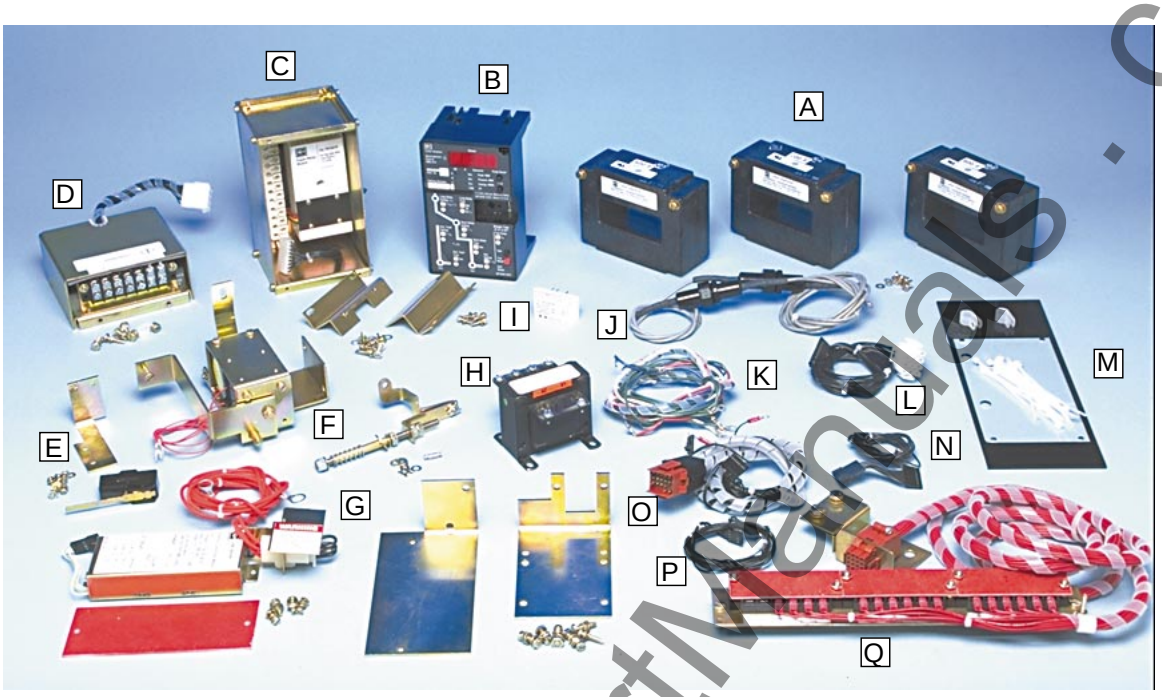
NOTE: Due to the wide vintage of breakers and multiple functions of the Retrofit components, some excess hardware may be left when the Retrofit is complete.

## Torque Values for General Mounting

| 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 |

## 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 |




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

*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

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