EATON | Cutler-Hammer

Arcflash Reduction Maintenance Switch™ Application and Installation

Instructional Literature

New Information

SAFETY PRECAUTIONS

⚠ WARNING

POWER CIRCUIT BREAKERS ARE EQUIPPED WITH HIGH SPEED, HIGH ENERGY OPERATING MECHANISMS. THE BREAKERS AND THEIR ENCLOSURES ARE SIGNED 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.

- **Periodic testing of this devise is required (see Section 6 "Setting and Testing the RSM").**
- 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.**

1. Arcflash Reduction Maintenance Switch Applications

1.1 The Arcflash Reduction Maintenance Switch Is Used to Reduce Incident Energy

When the Arcflash Reduction Maintenance Switch is enabled and fault current causes its operation, the fault clearing time of the associated circuit breaker is very fast. Table 1 shows how incident energy varies with fault duration time for a work location where the bolted fault level is 40 kA.

Table 1. Incident Energy vs. Fault Duration Time.

BOLTED FAULT kA	ARCING FAULT kA	FAULT DURATION sec	INCIDENT ENERGY cal/cm^2
40.0	20.0	2.00	89.0
40.0	20.0	0.50	22.2
40.0	20.0	0.40	17.8
40.0	20.0	0.30	13.3
40.0	20.0	0.20	8.9
40.0*	20.0*	0.05*	2.2*

Table Notes:
Incident energy values shown in the table were calculated using the IEEE 1584 method for a 480 V system with a working distance of 24 in. (609.6 mm). Other parameters are:

Grounding Type = Solid Grounded, and

Equipment Type = Switchgear

* Typical fault clearing time using the Arcflash Reduction Maintenance Switch will be 0.05 seconds. Note that this time will vary slightly depending on the circuit breaker manufacturer and type.

1.2 Choosing the Reduction Setting

The Arcflash Reduction Maintenance Switch has five (5) reduction settings (RS) (see Figure 1) that are based on multiples of the per unit secondary current monitored by the trip unit of its associated circuit breaker:

(2.5 ×, 4.0 ×, 5.9 ×, 7.6 × or 9.8 × sensor rating).

One of these RSs must be determined and selected by a person who is experienced in power system analysis. Each application of an Arcflash Reduction Maintenance Switch will require power system analysis to determine the fault currents that flow through the circuit breaker associated with the Arcflash Reduction Maintenance Switch.

⚠ WARNING

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.

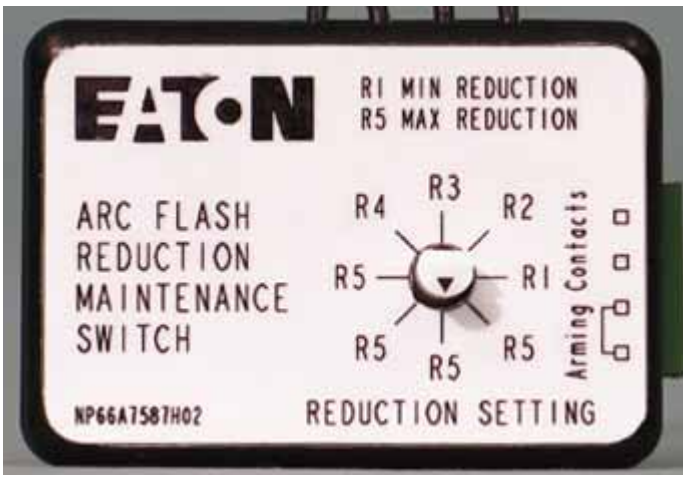
This setting choice normally does not change unless there are future system modifications that could increase or decrease fault levels at the circuit breaker location.

The RS is determined using the following steps:

1. Calculate the arcing fault current flowing through the circuit breaker associated with the Arcflash Reduction Maintenance Switch.

Note: Table 1 shows that arcing fault current can be much lower than of the bolted fault current for system voltages less than 1000 V. Formulas from NFPA 70E-2004, Annex D ©NFPA , and IEEE Std. 1584™-2002 can be used to calculate the arcing current.

2. Determine the total transient load current that can flow to loads fed by the circuit breaker equipped with the Arcflash Reduction Maintenance Switch. These can include motor in-rush and transformer in-rush.
3. Choose a RS for the Arcflash Reduction Maintenance Switch that is below the minimum arcing current (85% of calculated arcing current) and above the total transient load current (see Figure 1). Include the tolerance of the Arcflash Reduction Maintenance Switch pickup in the setting choice.



PICK UP SETTINGS	REDUCTION SETTING SWITCH POSITION
9.8	R1
7.6	R2
5.9	R3
4.0	R4
2.5	R5

Figure 1. Arcflash Reduction Maintenance Switch RS.

Arcflash Reduction Maintenance Switch Application and Installation

1.3 Example Calculation

The following is a calculation example for a 1600 A circuit breaker with a 1600 A sensor. The time current graph (Figure 2) shows the circuit breaker settings before and after the Arcflash Reduction Maintenance Switch installation.

In this example, the following power system conditions exist:

Bolted fault current through the reductive device to fault location	=	40.00	kA
Arcing fault current calculated using IEEE Std. 1584™-2002	=	19.98	kA
85% of arcing fault current per IEEE Std. 1584™-2002	=	16.98	kA
Running load current through circuit breaker	=	1.12	kA
Transient motor in-rush current through breaker (6 × 1.6 × 480 A)	=	4.80	kA
Total running load + transient motor in-rush load	**=**	**5.92**	**kA**

Setting choices for the RS are: 2.5 ×, 4.0 ×, 5.9 ×, 7.6 × or 9.8 × rating plug value with a pickup tolerance of ± 10%.

1. Setting 9.8 × 1600 A = 15.68 kA ± 10% = pickup range of 14.11 to 17.25 kA.
2. Setting 7.6 × 1600 A = 12.16 kA ± 10% = pickup range of 10.94 to 13.38 kA.
3. Setting 5.9 × 1600 A = 9.44 kA ± 10% = pickup range of 8.50 to 10.38 kA.
4. Setting 4.0 × 1600 A = 6.40 kA ± 10% = pickup range of 5.76 to 7.04 kA.
5. Setting 2.5 × 1600 A = 4.00 kA ± 10% = pickup range of 3.60 to 4.40 kA.

In this example, there are two appropriate setting choices (either 5.9 [R3] × or 7.6 [R2] ×). Either of these settings are above the total plus transient load (5.92 kA) and below the minimum arcing current (16.98 kA). Either of these settings reduces the incident energy from 10.7 to 2.2 cal/cm^2 (refer to the Table 2).

Table 2. Example Calculations for All RS Positions.

REDUCTION SETTING	BUS kV	REDUCTIVE DEV. BOLTED FAULT kA	REDUCTIVE DEV. ARCING FAULT kA	TRIP / DELAY TIME sec	ARCFLASH BOUNDARY in. (mm)	WORKING DISTANCE in. (mm)	INCIDENT ENERGY cal/cm^2	NFPA70E PPE CLASS
INACTIVE	0.48	40.00	19.98	0.24	106 (2692)	24 (610)	10.7	Class 3
[R5]	0.48	40.00	19.98	0.05	37 (940)	24 (610)	2.23	Class 1
[R4]	0.48	40.00	19.98	0.05	37 (940)	24 (610)	2.23	Class 1
[R3]	0.48	40.00	19.98	0.05	37 (940)	24 (610)	2.23	Class 1
[R2]	0.48	40.00	19.98	0.05	37 (940)	24 (610)	2.23	Class 1
[R1]	0.48	40.00	16.98	0.24	94 (2388)	24 (610)	8.97	Class 3*

Note:
* Arcing current low tolerances (85%) used.

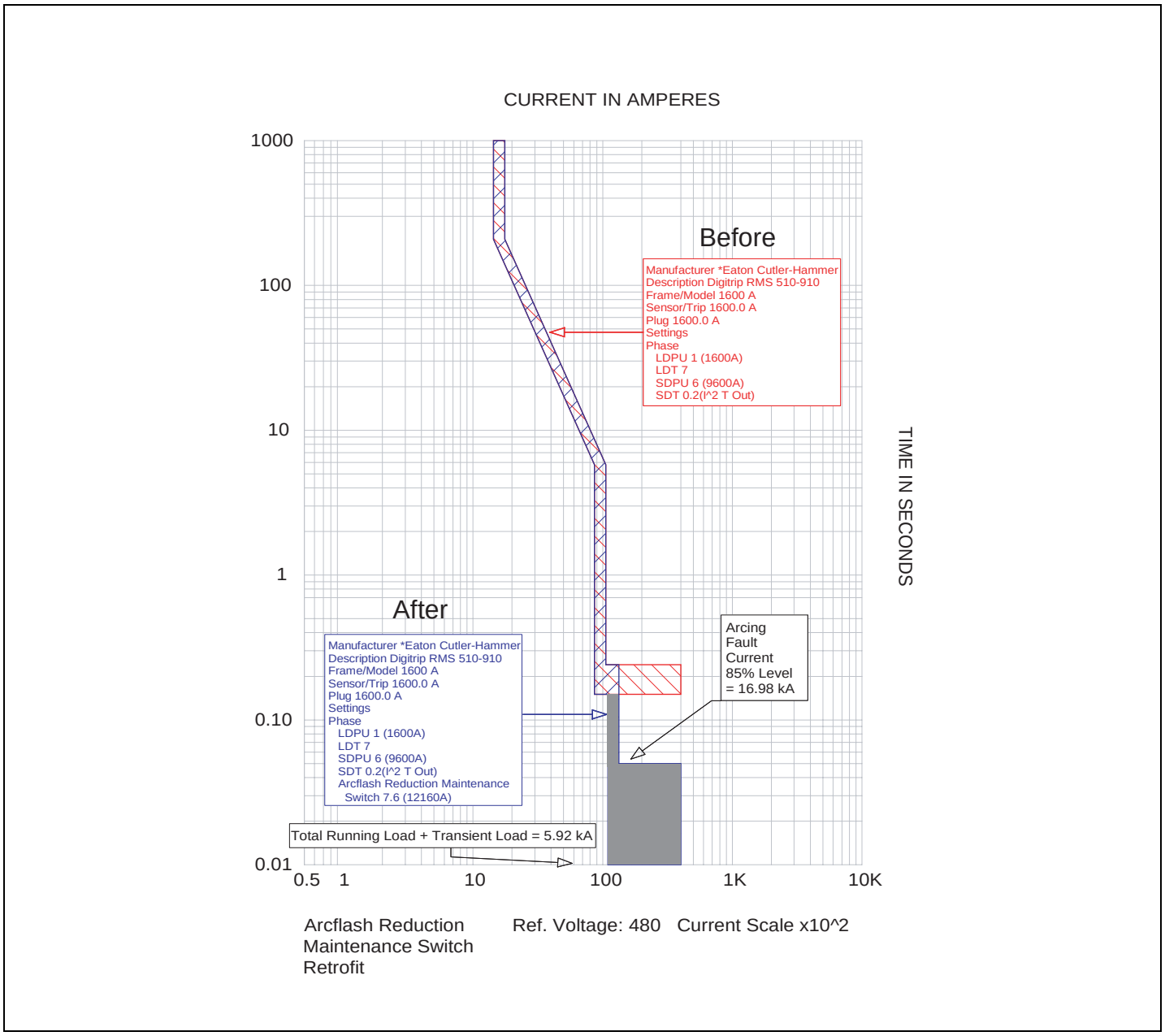


Figure 2. Time Current Graph Showing Circuit Breaker Settings Before and After the Arcflash Reduction Maintenance Switch Installation.

2. General Arcflash Reduction Maintenance Switch Installation

Note: The Arcflash Reduction Maintenance Switch is designed to work with Eaton "10" series Digitrip trip units (510, 610, 810, and 910). If the breaker has not been retrofitted with a "10" series trip unit, contact your Eaton Representative for more information.

Step 1: Recommended Specialty Tools for Arcflash Reduction Maintenance Switch Installation

Figure 3. Recommended Specialty Tools for Arcflash Reduction Maintenance Switch Installation.

1. Greenlee Slug Buster® Knock-out Punch kit (P/N 7238SB) and an additional 1.25" (31.8 mm) punch is required (P/N 730BB-1.25).
2. Eaton Octagonal Wrench (P/N E22CW).
3. Eaton Arcflash Reduction Maintenance Switch Bench Test Device (P/N 9A10164G01).

Step 2: General Breaker Preparation

Before attempting to remove the breaker from the cell or perform any retrofit / installation operation, be sure to read and understand the Safety Precautions section of your original Digitrip Retrofit manual. In addition, be sure to read and understand the "Instructions for the Application of Digitrip RMS Retrofit Kits on Power Circuit Breakers" (Retrofit Application Data - Publication AD 33-855-4), supplied with the original Digitrip Retrofit Kit.

⚠ WARNING

COMPLETELY READ AND UNDERSTAND ALL INSTRUCTIONS BEFORE ATTEMPTING ANY INSTALLATION, OPERATION, MAINTENANCE, OR MODIFICATION OF THESE BREAKERS.

⚠ WARNING

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.

⚠ 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.

⚠ WARNING

FOR DRAWOUT BREAKERS, TRIP (OPEN), AND THEN REMOVE THE BREAKER TO A WELL-LIT WORK AREA BEFORE BEGINNING WORK.

Note: It is the responsibility of the installer 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, secure the necessary replacement parts before beginning the Arcflash Reduction Maintenance Switch installation process.

To begin the Arcflash Reduction Maintenance Switch installation process, refer to the components list near the end of this manual. The components and hardware listed will be used to complete each step in the Arcflash Reduction Maintenance Switch installation process.

3. Installing the Arcflash Reduction Maintenance Switch in a DS Retrofitted Breaker

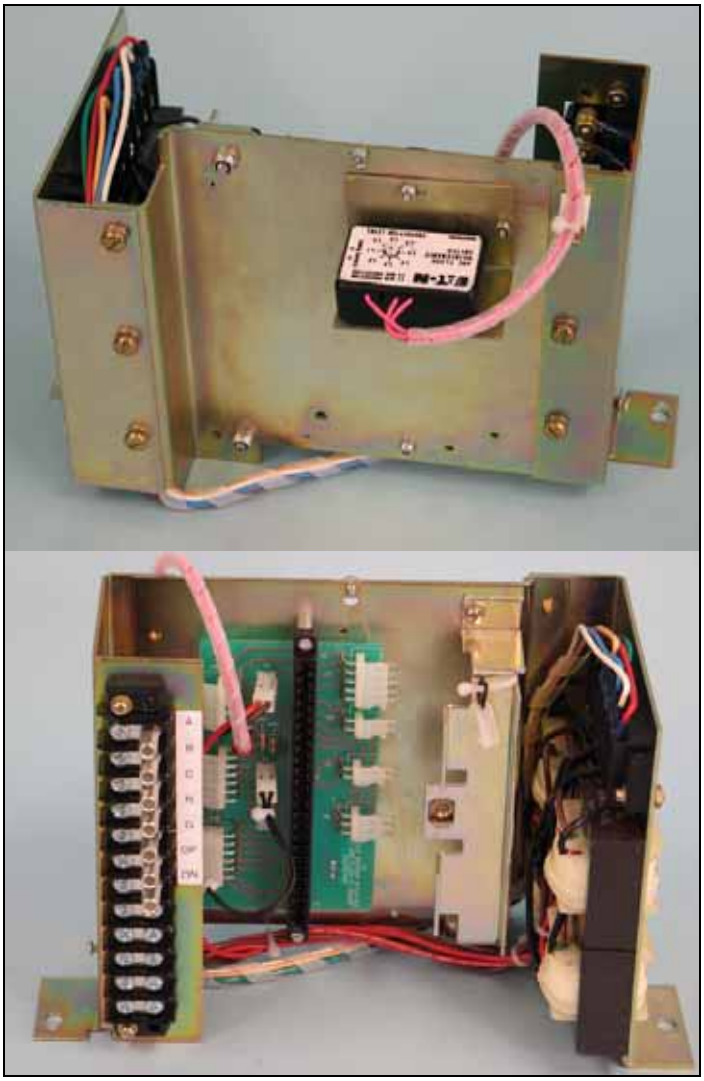


Figure 4. Overview: Arcflash Reduction Maintenance Switch Components Installed on a DS Breaker Trip Unit Mounting Frame.

Note: The Arcflash Reduction Maintenance Switch can be installed on any Retrofitted breaker using an Eaton "10" series Digitrip trip unit (510, 610, 810, and 910).

A. Following the instruction supplied with the original Retrofit kit, remove the Rating Plug from the Trip Unit, then remove the Trip Unit from Trip Unit Mounting Frame.

B. Following the instruction supplied with the original Retrofit kit, remove the Trip Unit Mounting Frame from the breaker.

If the Arcflash Reduction Maintenance Switch is being installed on a breaker that has been retrofitted with a DS Interface Board purchased after 06/05 (P/N 500P147H01), proceed to Section 3. If the breaker was retrofitted with a DS Interface Board purchased before 06/05 (P/N 256P726H04), follow the procedures detailed in Appendix A to install an updated DS Interface Board. See Figure 5 to help identify which DS Interface Board is installed in the breaker.

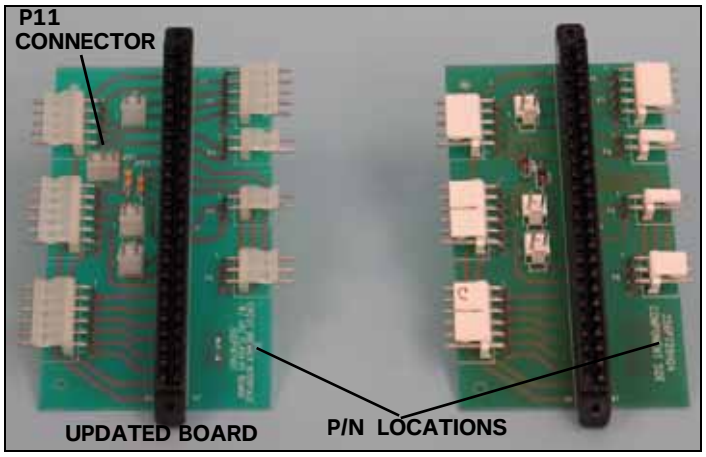


Figure 5. Identifying the DS Interface Board.

Note: If an updated DS Interface Board is needed and was not ordered with the Arcflash Reduction Maintenance Switch kit, contact your Eaton Representative to secure an updated DS Interface Board.

C. Align the holes in the Reduction Setting Module (RSM) with the existing holes in the RSM mounting bracket. Secure the RSM to the mounting bracket using the (2) .112-40 × 0.25" thread cutting pan head screws supplied.

D. Remove the (2) lock nuts near the top of the back of the trip unit mounting frame assembly that secure the top of the DS Interface Board. Align the holes in the RSM assembly with the circuit board screws. Secure the RSM assembly to the trip unit mounting frame by installing the lock nuts.

Figure 6. RSM Assembly Installed on the Trip Unit Mounting Frame.

E. Attach a wire tie mount to the back of the trip unit mounting frame, as shown, using the existing hardware. Install a tie wrap to secure the RSM harness. Route and connect the RSM harness, as shown, to the P11 receptacle on the DS Interface Board.

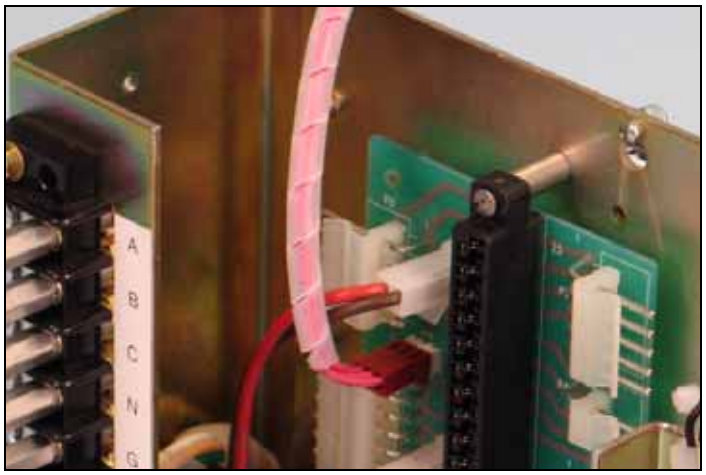


Figure 7. RSM Harness Connected to the P11 Receptacle.

F. Follow the procedures detailed in the original DS Retrofit manual (I.L. 33-DRC-1A) to reinstall the trip unit mounting frame assembly in the breaker.

G. Follow the procedures detailed in original the DS Retrofit manual (I.L. 33-DRC-1A) to reinstall the trip unit and rating plug.

4. Installing the Arcflash Reduction Maintenance Switch in a Non-DS Retrofitted Breaker

Figure 8. Overview: Arcflash Reduction Maintenance Switch Components Installed on a Non-DS Breaker.

Note: The Arcflash Reduction Maintenance Switch can be installed on any Retrofitted breaker using an Eaton "10" series Digitrip trip unit (510, 610, 810, and 910). The photos used for illustrations in this section are of the Arcflash Reduction Maintenance Switch installed on a G.E. "AK" breaker. However, the installation procedures apply to all non-DS breakers.

A. Remove the external harness's J-2 (7-position) connector from the receptacle on the right side of the trip unit.

B. Plug the male 7-position connector from the RSM harness into the J-2 receptacle on the trip unit.

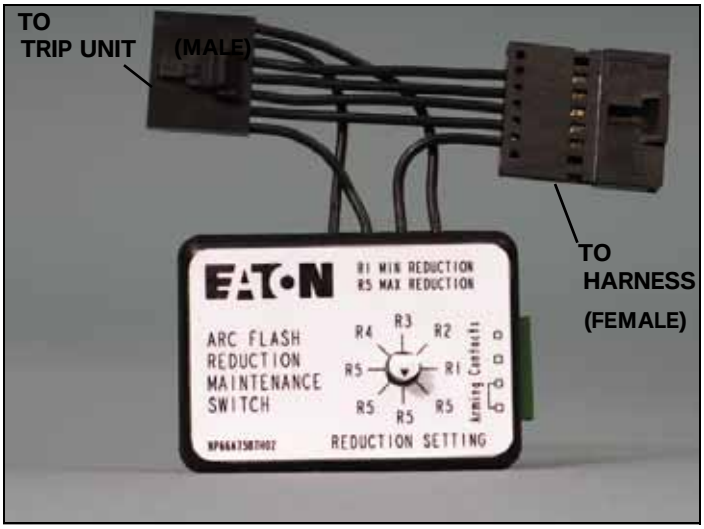


Figure 9. Connectors on the Arcflash Reduction Maintenance Switch Harness.

C. Plug the J-2 connector from the external harness (removed in step 3A) into the female receptacle on the RSM harness.

Note: On a 510 trip unit, the 7-position external harness interlocking shorting plus is considered the external harness. (See Figure 10).

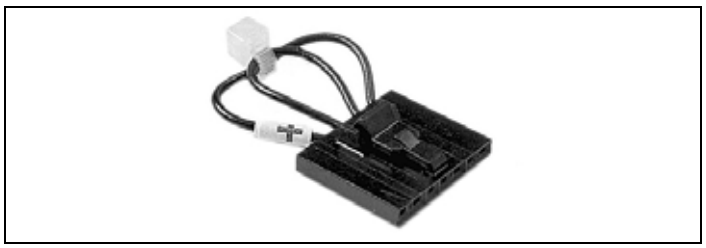


Figure 10. External Harness Plug.

Figure 11. RSM Connected to the Trip Unit and External Harness.

D. Use the wire ties supplied to secure the RSM to the wiring harnesses and / or trip unit to keep it away from any moving parts within the breaker or cell.

5. Completion of the Arcflash Reduction Maintenance Switch Installation

Step 1: Installing the Arcflash Reduction Maintenance Switch Mode Selector Switch, Indicator Light, and Battery Holder

Figure 12. Overview: Typical Installation of the Arcflash Reduction Maintenance Switch Mode Selector Switch, Indicator Light, and Battery Holder.

Each installation of the Arcflash Reduction Maintenance Switch mode selector switch, indicator light, and battery holder may vary due to the type of breaker, type of cell, or components / options mounted in or on the cell, etc. Because of these factors, the procedures in this section are general in nature. However, there are some basic guidelines that should be considered and followed during installation of the Arcflash Reduction Maintenance Switch mode selector switch, indicator light, and battery holder.

In most cases, mounting the mode selector switch, indicator light, and battery holder to the cell door, opposite to the cell door hinges, is the best alternative.

In certain DS applications, it may not be possible to mount the mode selector switch, battery holder, and indicator light on the cell door due to interference problems when the breaker is racked out in the “test” position and the cell door closed. In this case, it is necessary to mount the components to the “accessory panel” or drawer above the enclosure. See Figure 13.

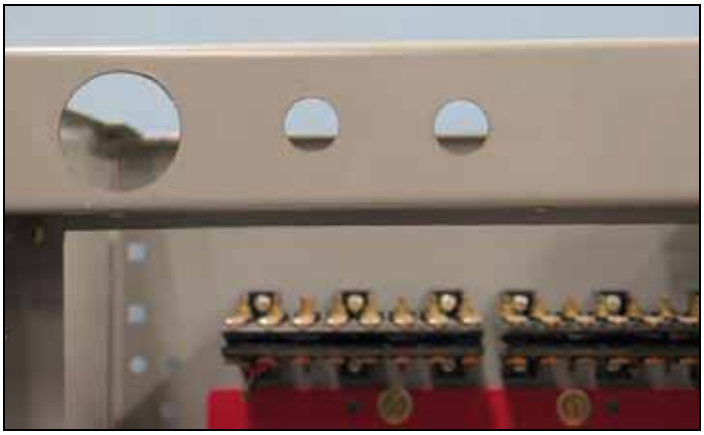


Figure 13. Alternate Mounting Location on Certain DS Applications.

Note: If the mode selector switch, indicator light, and battery holder will be mounted on the cell door, the door should be removed from the cell to prevent warping as the mounting holes are being created and to prevent metal fragments from falling into the cell.

Basic Guidelines for the Arcflash Reduction Maintenance Switch Mode Selector Switch, Indicator Light, and Battery Holder Installation

1. The mounting location should provide easy access to the mode selector switch and to lock out/tag out (LOTO) device when necessary.
2. The mounting location should provide ample clearance so the breaker can be racked out and in without damaging the mode selector switch, indicator light, or battery holder.

⚠ WARNING

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.

⚠ 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.

3. If the cell door is selected, the mounting location should allow the cell door to completely close without the mode selector switch, indicator light, or battery holder interfering with the breaker or other cell components.
4. The mounting location should be close enough to the breaker so that the mode selector switch harness can be routed and connected to the RSM while leaving a service loop for racking purposes. (If a longer mode selector switch harness is needed, contact your Eaton Representative.)
5. The mounting location should allow the mode selector switch harness to stay clear of the breaker during racking.

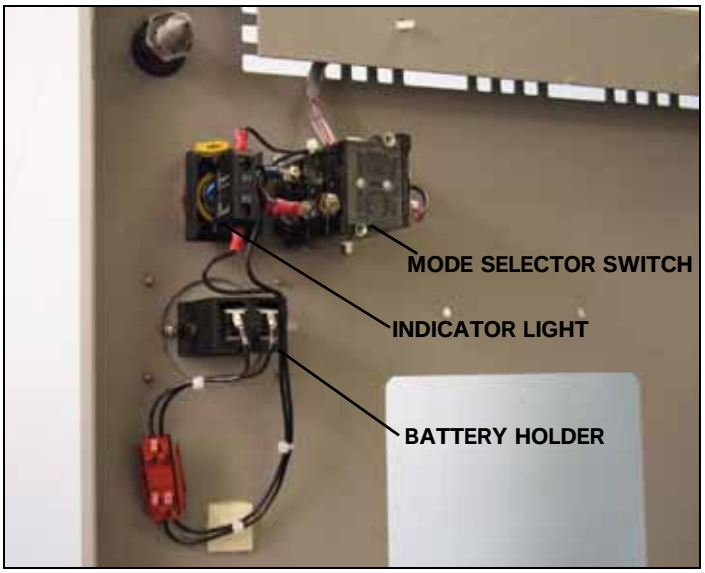


Figure 14. Typical Mounting Location Allowing for the Basic Guidelines.

A. Determine the best location for the mode selector switch. Note that the harness connecting the mode selector switch to the indicator light is short so the indicator light must be installed in close proximity to the mode selector switch.

   Mark the center of the mounting area, then drill a 0.886" (22.5 mm) hole through the mounting surface. Using a 1.25" (31.7 mm) Greenlee Slug Buster® Knock-out Punch, cut the mounting hole for the mode selector switch. Be sure to remove all metal shavings that have dropped into the breaker or cell.

Note: An appropriate hole saw can be used to cut the holes for the mode selector switch, indictor light, and battery holder if a Greenlee Slug Buster is not available. Be sure to remove all metal shavings that have dropped into the breaker or cell.

Figure 15. Arcflash Reduction Maintenance Switch Mode Selector Switch Hole Being Cut in the Mounting Surface.

B. Determine the best location for the indicator light. Mark the center of the mounting area, then drill a 0.406" (22.5mm) hole through the mounting surface. Using a 0.500" Greenlee Slug Buster® Knock-out Punch, cut the mounting hole for the mode selector switch. Be sure to remove all metal shavings that have dropped into the breaker or cell.

Note: The indicator light is pre-wired to the mode selector switch. Therefore, the hole for the indicator light must be close enough to the mode selector switch to accommodate the wiring.

C. Determine the best location for the battery holder. Note that the harness connecting the mode selector switch to the battery holder is short so the battery holder must be installed in close proximity to the mode selector switch.

Mark the center of the mounting area, then drill a 0.406" (22.5mm) hole through the mounting surface. Using a 0.500" Greenlee Slug Buster Knock-out Punch, cut the intermediate hole for the battery holder. Then use the 1.50" (49.6 mm) knock-out punch to cut the full mounting hole. Be sure to remove all metal shavings that have dropped into the breaker or cell.

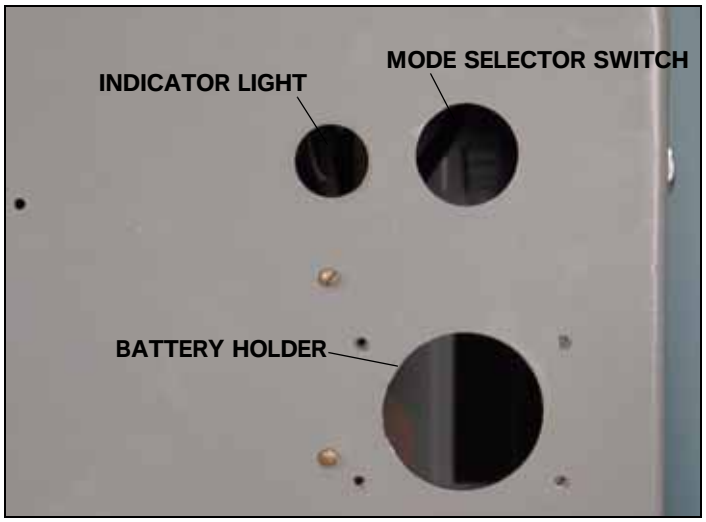


Figure 16. Mode Selector Switch, Indicator Light, and Battery Holder Holes Cut in the Mounting Surface.

D. Using the battery holder as a template, mark then drill four (4) 0.109" holes in the mounting surface to accept the battery holder mounting screws.

Figure 17. Marking the Battery Holder Mounting Holes.

E. Remove the backing from the self-adhesive mode selector switch label, center the label above the mode selector switch hole, then apply the label to the mounting surface as shown.

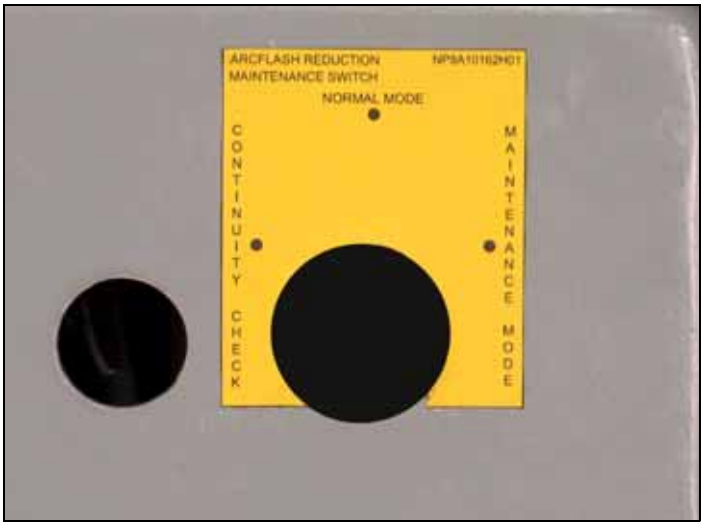


Figure 18. Mode Selector Switch Label Installed on the Mounting Surface.

F. Carefully remove the lock nut from the mode selector switch assembly. Leave the rubber grommet on the mode selector switch assembly.

Figure 19. Lock Nut Removed from the Mode Selector Switch Assembly.

G. Insert the mode selector switch assembly through the hole in the mounting surface. Install the lock nut (removed in Step F) on the mode selector switch assembly, then tighten the lock nut to secure the mode selector switch assembly to the mounting surface.

H. Loosen the clamping screw on the LOTO device. Place LOTO device onto mode selector switch housing, with the LOTO hinge towards the top, until it is flush with the mode selector switch's metal enclosure. Tighten the clamping screw securely. Ensure the LOTO cover closes over switch freely.

Figure 20. Mode Selection Switch and LOTO Installed on the Mounting Surface.

I. When viewed from the rear of the indicator light assembly, move the yellow locking tab to the right, then remove the indicator light body from the indicator light contact block. Remove the lock nut from the indicator light body.

J. Insert the indicator light through the hole in the mounting surface. Secure the indicator light to the mounting surface using the lock nut just removed. Next, align the indicator light contact block assembly with the indicator light housing. The contact block assembly is “self locking”. Insert the contact block assembly into the indicator light until the locking “click” is heard. Ensure it is locked into place.

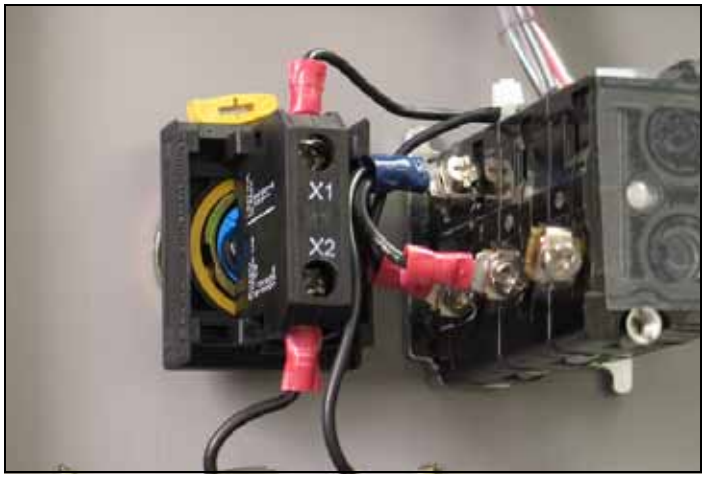


Figure 21. Indicator Light Contact Block Assembly “Locked” on the Indicator Light Housing.

Figure 22. Indicator Light Installed on the Mounting Surface.

K. Insert the battery holder through the hole in the mounting surface cut in Step C. Make sure the locking tab for the battery compartment is facing downward. Align the holes in the battery holder with the pilot holes drilled earlier in the mounting surface, then secure the battery holder to the mounting surface using the (4) .138-32 × .375" hex head/slotted thread cutting screws supplied.

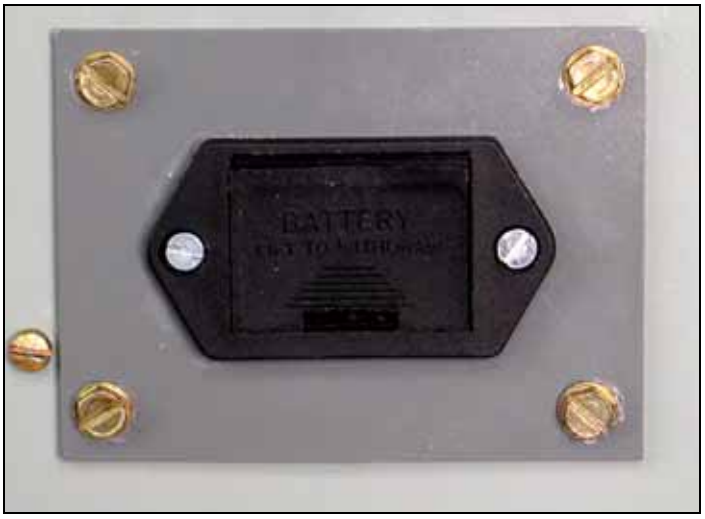


Figure 23. Battery Holder Secured to the Mounting Surface.

L. Install the “Warning” and “Circuit Active” labels on the mounting surface near the mode selector switch.

Figure 24. Warning and Circuit Active Labels installed on the Mounting Surface.

Step 2: Final Wiring and Breaker Preparation

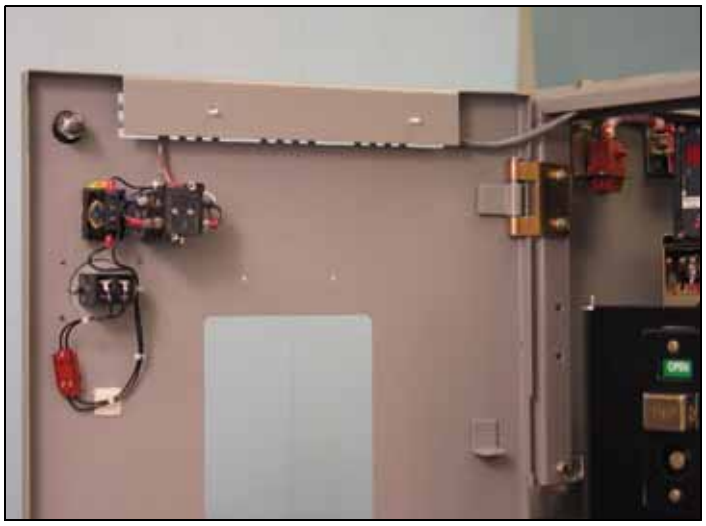


Figure 25. Overview: Final Wiring of the RSM, Mode Selector Switch, Indicator Light, and Battery Holder.

A. Plug the female connector on the mode selector switch battery harness onto the male receptacle at the back of the battery holder. Open the battery holder door and install the battery.

Figure 26. Connecting the Battery Holder to the Mode Selector Switch Battery Harness.

B. If the breaker was removed from the cell to install the Arcflash Reduction Maintenance Switch, temporarily place the breaker back into the cell.

⚠ CAUTION

MAKE SURE THE BREAKER IS IN THE RACKED-OUT POSITION AND REMAINS DE-ENERGIZED UNTIL FINAL WIRING IS COMPLETED.

⚠ CAUTION

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.

⚠ CAUTION

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

C. Route the mode selector switch harness from the switch location to the RSM making sure it is away from any moving parts within the breaker. In routing the harness, be sure to leave a service loop in the harness to facilitate racking the breaker in to and out of the cell. If the mode selector switch was mounted to the cell door, also provide a service loop at hinge to allow the door to fully open and close.

Figure 27. Routing of the Mode Selector Switch Harness and the Service Loop.

D. Plug the male connector on the end of the mode selector switch harness into the receptacle on the right side of the RSM

Figure 28. Mode Selector Switch Harness Connected to the RSM.

E. Using the tie mounts and wire ties supplied, secure the mode selector switch harness and battery harness to keep them in place and away from any moving parts within the breaker.

F. For more information on the RSM wiring and additional customer connections, refer to the wiring and connections drawing (Figure 29).

G. Disconnect the mode selector switch harness from the RSM and remove the breaker from the cell.

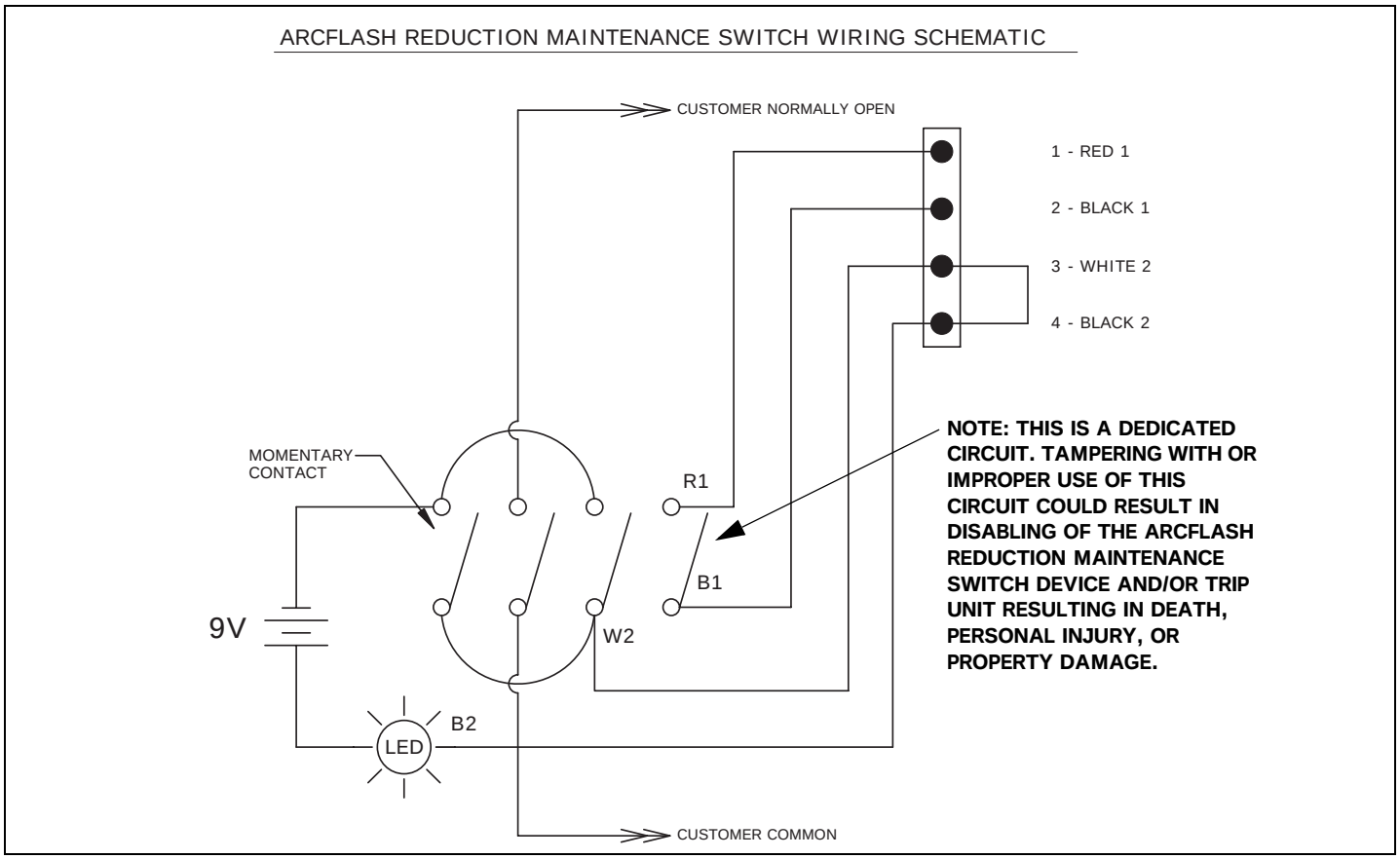


Figure 29. Arcflash Reduction Maintenance Switch Wiring and Connections.

6. Setting and Testing the RSM

Step 1: Setting the Reduction Setting

Note: For RSM actual settings, consult a qualified power systems engineer to determine the RS.

⚠ WARNING

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.

Sections 1.2 and 1.3 show the typical method used to calculate the RS.

A. All selected RS should be confirmed through primary injection testing.

B. See Appendix B for a Sample Test Data Sheet.

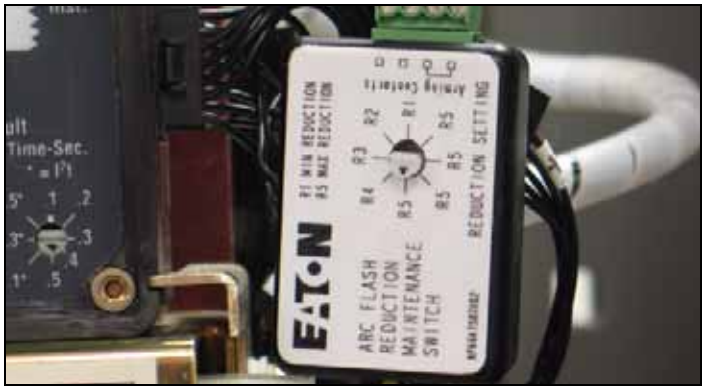


Figure 30. Selecting the RSM Reduction Setting. R1 = Min. Reduction, R5 = Max. Reduction.

Step 2: Testing

Turn the mode selector switch to the "Continuity Test" position. If the unit is wired correctly, the indicator light will illuminate while it is held in this position. Release the mode selector knob and it should automatically return to the "Normal" position.

⚠ WARNING

PERIODIC TESTING OF THIS DEVISE IS REQUIRED.

⚠ WARNING

THE CUSTOMER IS RESPONSIBLE FOR PERIODIC MAINTENANCE AND FUNCTIONALITY TESTING OF THIS DEVISE. TESTING SHOULD BE REPEATED AT A MINIMUM OF EVERY THREE YEARS TO INSURE PROPER OPERATION.

Step 3: Final Breaker and Cell Preparation

A. Insure that no metal chips or shavings have fallen into the breaker or cell during the installation process. If any have, remove them.

B. Carefully rack the breaker into and out of the cell to insure that the breaker and racking device clear all newly installed components and harnesses.

⚠ WARNING

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.

⚠ 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.

Step 4: Activating the RSM

A. To activate the RSM, turn the mode selector switch to the "Maintenance Mode" position. Close the LOTO cover, then follow your normal LOTO procedures.

7. The Arcflash Reduction Maintenance Switch Installation Components for DS and Non-DS Breakers

Note: Due to the wide variety of breakers with which the Arcflash Reduction Maintenance Switch Installation can be used, some excess hardware may remain when the Arcflash Reduction Maintenance Switch Retrofit is complete.

SECTION	STEP	DESCRIPTION	STYLE NO.	QTY.	COMMENT
3		DS - Reduction Setting Module	9A10168G01	1	
3 & Appendix A		DS - Reduction Setting Module with Board	9A10169G01	1	
4		Non DS - Reduction Setting Module	9A10167G01	1	
5	1, 2	Arming Sw. Assy./Harness Assy./Ind. Light Assy.	9A10165G01	1	
5	1	Battery Holder Assy.	9A10166G01	1	

Appendix A: DS Interface Board Installation Procedure

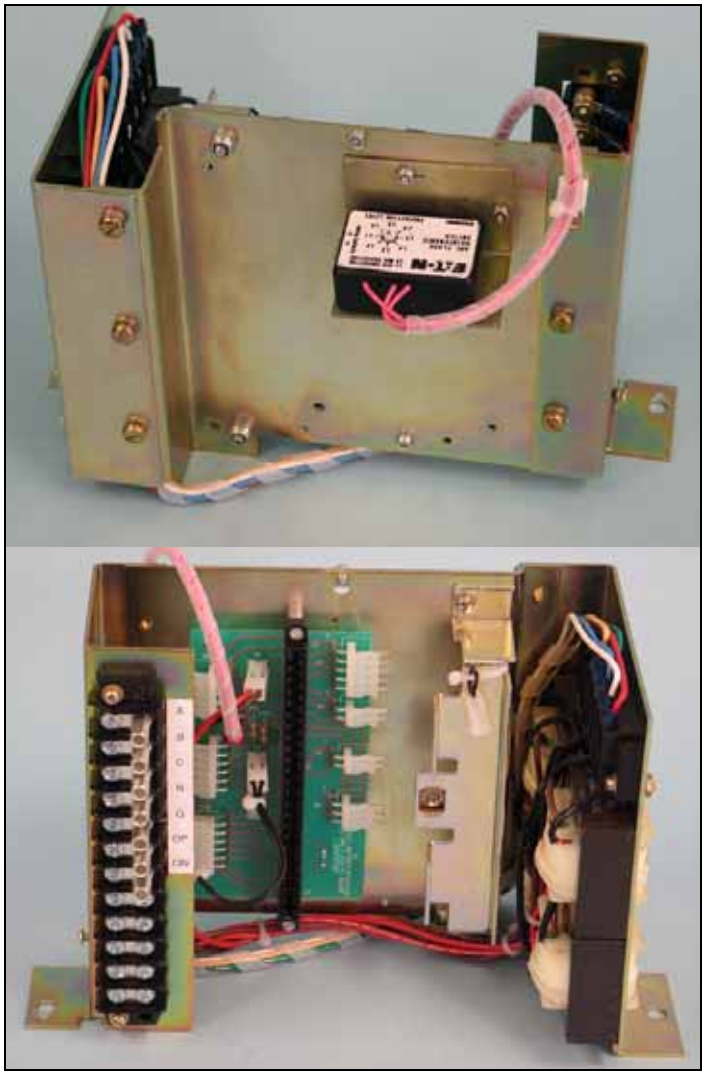


Figure 31. Overview: New DS Interface Board and RSM Installed on the DS Trip Unit Mounting Frame.

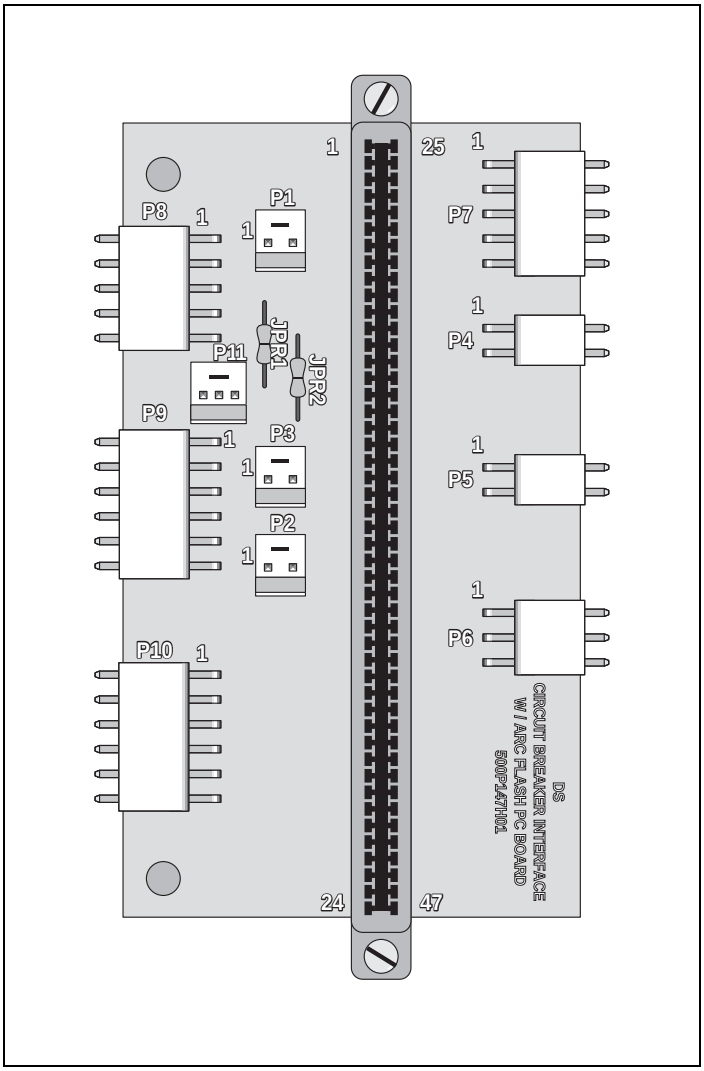


Figure 32. Connection on the DS Interface Board.

If you are installing the Arcflash Reduction Maintenance Switch on a DS breaker that was retrofitted with a Retrofit kit purchased before 06/05 (DS Interface Board P/N 256P726H04), follow the procedure detailed below to install the updated DS Interface Board.

Note: If an updated DS Interface Board is needed and was not ordered with the Arcflash Reduction Maintenance Switch kit, contact your Eaton Representative to secure an updated DS Interface Board.

A. Align the holes in the Reduction Setting Module (RSM) with the existing holes in the RSM mounting bracket. Secure the RSM to the mounting bracket using the (2) .112-40 × 0.25" thread cutting pan head screws supplied.

B. Note the connection point of each harness to the DS Interface Board (positions P1 through P10). Mark each harness for reconnection later in the installation process.

C. Disconnect each harness from the DS Interface Board.

D. Remove and save the four screws, spacers, and lock nuts securing the DS Interface Board to the trip unit mounting frame. Remove the DS Interface Board.

E. Align the RSM assembly and the new DS Interface Board with the two holes near the top of the trip unit mounting frame.

F. Using the original mounting hardware, spacers, and lock nuts removed in Step D or the supplied .112-40 hardware, secure the top of the new DS Interface Board and the RSM assembly to the trip unit mounting frame.

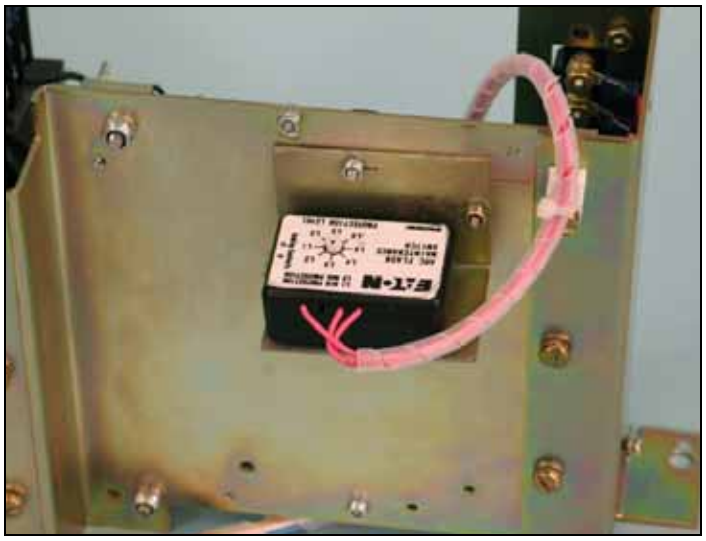


Figure 33. RSM Assembly Installed on the Trip Unit Mounting Frame.

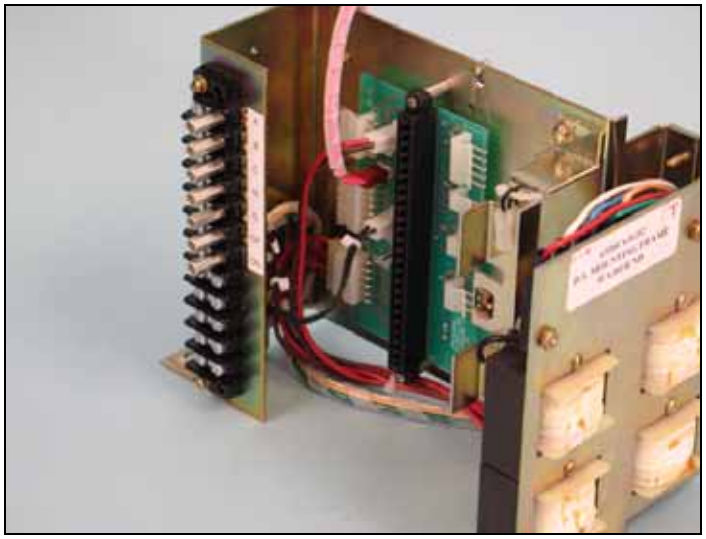


Figure 34. New DS Interface Board Installed on the Trip Unit Mounting Frame.

G. Using the remaining screws, spacers, and lock nuts removed in Step D or the supplied .112-40 hardware, secure the bottom of the new DS Interface Board the trip unit mounting frame.

H. Reconnect each harness disconnected in Step C to its original position.

I. Return to Steps E, F, and G in Section 3 of this manual to complete the installation.

Appendix B: Sample Text Data Sheet

SETTING	MULT	PICKUP
R1	9.8 X	
R2	7.6 X	
R3	5.9 X	
R4	4.0 X	
R5	2.5 X	

Note: Pickup = Mult x Rating Plug Value

CUSTOMER _____
DEVICE _____
DATE _____
RATING PLUG _____
TAP _____

NOTES:

Notes:

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 Eaton's experience and judgment 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, Eaton should be consulted.

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Eaton Electrical Inc.
1000 Cherrington Parkway
Moon Township, PA 15108-4312
USA
tel: 1-800-525-2000
www.EatonElectrical.com

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