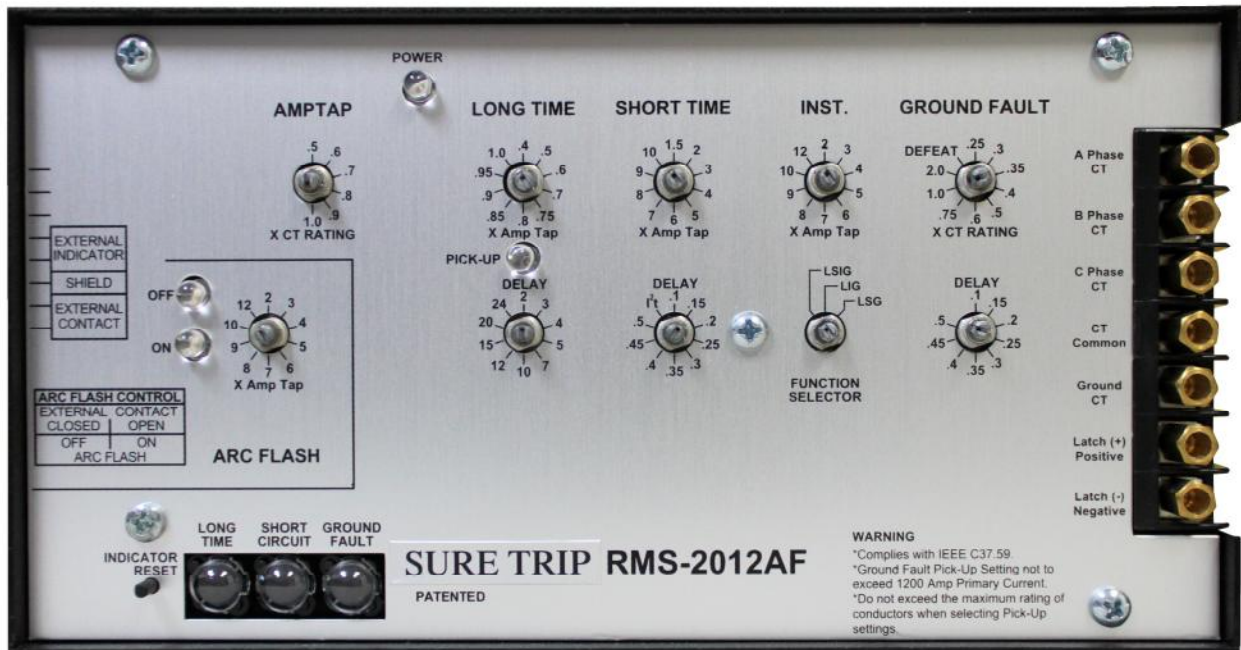


# SURE TRIP

## ARC FLASH PROTECTION

While concerns over Arc Flash injuries and deaths have been around for decades, in recent years new standards have been written to better protect employees and equipment. Personnel safety is a concern for all industrial facilities and risks are present in almost every electrical environment. NFPA, NEC, OSHA, and IEEE have made changes to their respective standards in regards to arc flash hazards. In an effort to help customers maintain compliance with these standards SURE TRIP introduced an 'Arc-Flash' option for its product lines in early 2005. In early models, the Arc Flash option included the ability to turn the Instantaneous Function On/Off with a Remote Switch.

The RMS-2012AF gives our customers more options for ARC FLASH. The ARC FLASH Pick-Up can now be set independently of the Long Time, Short Time, and Instantaneous Functions eliminating the possibility of user errors when the breaker is returned to normal operation. Internal and optional external indications are available making it even easier to know the status of the ARC FLASH protection.



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## Arc Flash

Arc Flash is described by NFPA 70E, as a “dangerous condition associated with the release of energy caused by an electrical arc.” It is measured in terms of Incident Energy which is used to determine the level of Personnel Protection Equipment, or PPE, that is required to be worn by personnel working in proximity to the equipment.

The following formula can be used to determine the incident energy for an “Arc in a Cubic Box”. This would be similar to a Circuit Breaker in a Cubicle.

$$E_{MB} = 1038.7 * D_A^{-1.4738} * t_A * [0.0093F^2 - 0.3453F + 5.9675]$$

Where:

$E_{MB}$  is Incident energy in cal/cm<sup>2</sup> in a 20in Cubic Box

$D_A$  is the distance from electrode in inches, 18” is generally used.

$t_A$  is the clearing time

F is the available short circuit current, from 16kA to 50kA.

Actual clearing time may vary depending on the type of Circuit Breaker and the condition of its mechanical and electrical parts. Lower pickup settings can also reduce the trip time of the SURE TRIP Logic thereby reducing the actual clearing time.

Using the above formula we can look at two situations and the effect of adding the protection of the instantaneous function of the SURE TRIP Logic. Using 20,000A as the available fault current, the standard distance of 18 inches, and a Sensor rating of 1200A,

### **Example 1:**

With Arc Flash P-Up defeated.

Sh/T Delay = .5

Incident Energy is calculated to be 20.4

According to the chart below, this would yield a Hazard/Risk Category of 3.

### **Example 2:**

With Arc Flash active (0.05 sec)

Sh/T Delay = .5

Incident Energy is calculated to be 2.04

According to the chart below, this would yield a Hazard/Risk Category of 1.

As indicated in the above examples, reducing the clearing times of a fault greatly reduces the incident energy generated. This significantly lowers the potential for injuries to personnel and damage to nearby equipment.

Hazard/Risk chart from the NFPA 70E Standard.

Category	Incident Energy (Cal/cm <sup>2</sup> )
1	0 - 4.000
2	4.001 - 8.000
3	8.001 - 25.00
4	25.01 - 40.00

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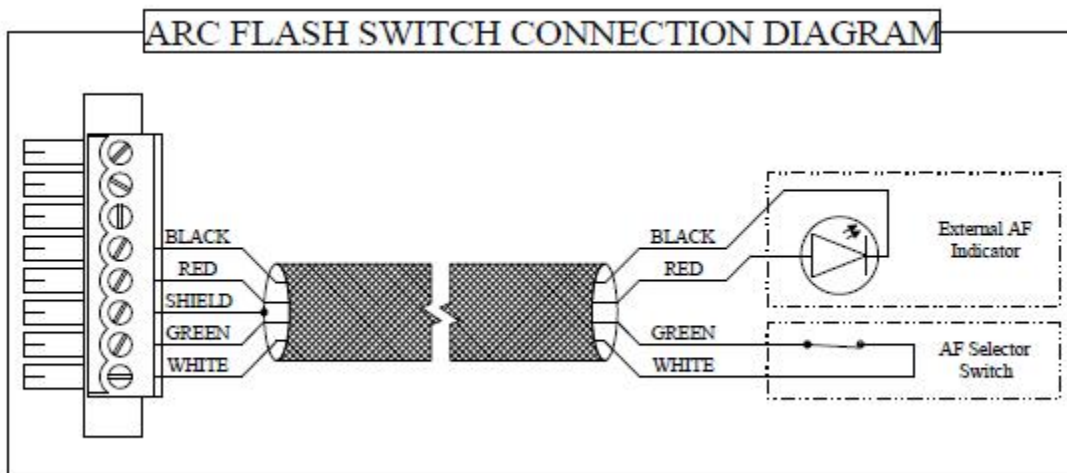
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## REMOTE ACTIVATION

An external contact can be used to control the state of the ARC FLASH function. A "CLOSED" connection will "DISABLE" the ARC FLASH function. When the connection is "OPEN", the ARC FLASH will function normally and trip the breaker when the Pick-UP Setting is exceeded. The remote activation feature allows employees to activate the Arc Flash function with the breaker door closed, thereby reducing or eliminating the level of protective equipment required. If the switch or any of the wiring connections are faulty, the open circuit would cause the Arc Flash to turn 'ON'.

## ARC FLASH SWITCH (OPTION)

The external contact can be an optional switch purchased with the logic as shown in the picture on page 1. The switch option includes an External LED Indicator, Switch Decal, Lock-Out Cover and 10' Shielded Cable. The switch will be connected to the Arc Flash connector (shown below) located on the left hand side of the RMS-2012AF using a 10' shielded cable. The length of shielded cable should be kept to a minimum. The length of wire connecting the switch to the logic should not exceed 10'. The switch has a Lockout cover to enhance personnel protection. Disabling the ARC FLASH would only occur when the lock/tag is removed from the cover allowing access to the switch.

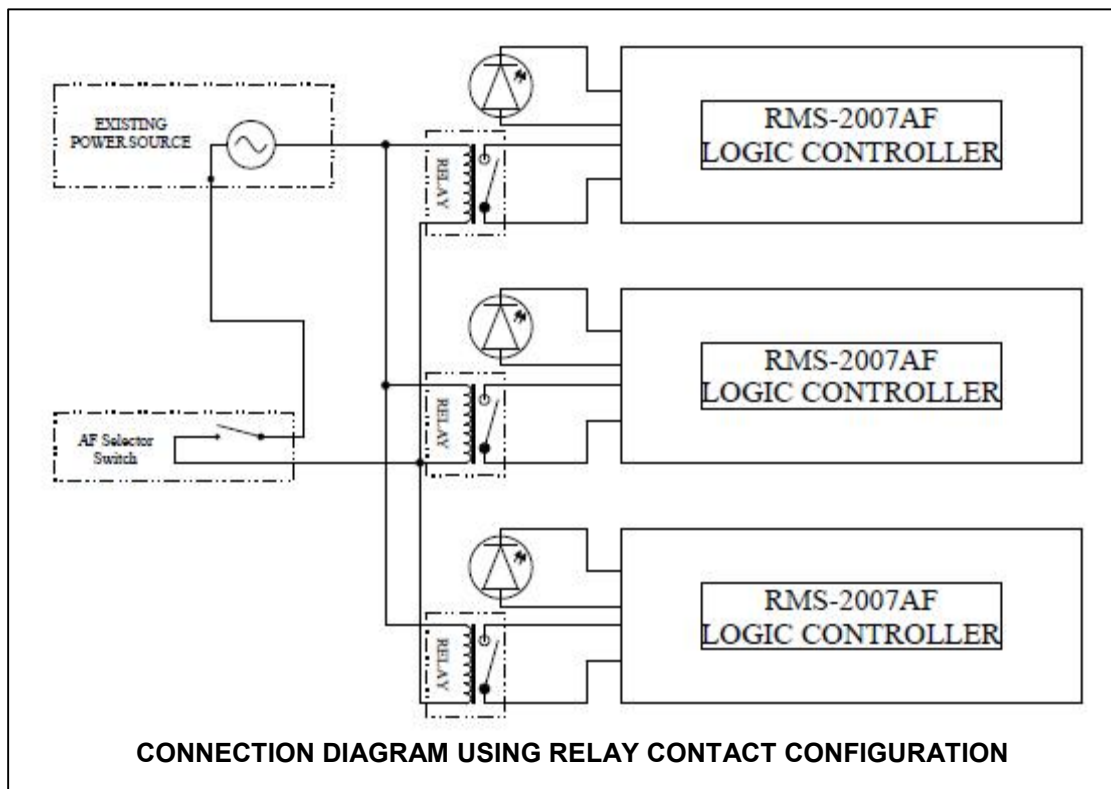


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## RELAY CONTACT CONTROL

Another option would be a customer supplied relay to enable the Arc Flash protection. This option allows the AF switch to be located further away from the breaker while the interposing relay is mounted near the logic. The relay power comes from an existing power source. The N/O Contacts would then be wired to the Logic for controlling the ARC FLASH Function. When the relay is on, ARC FLASH would be defeated. When the relay is off, the ARC FLASH protection would be active. Only the wire between the relay and the Logic would have to be Shielded Cable.

This configuration would also allow the user to configure a series of breakers to act on a single switch operation as shown in the following diagram.

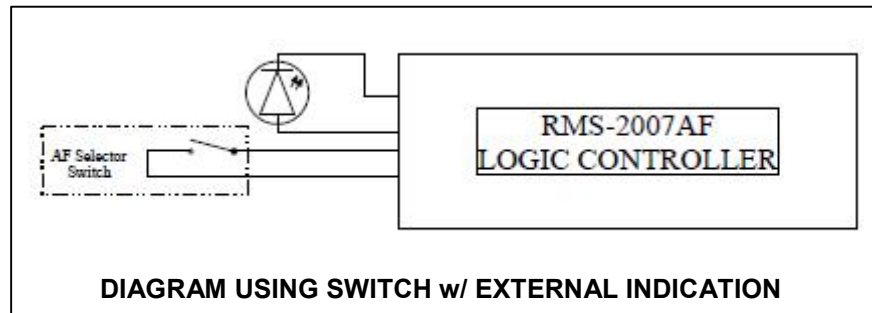


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## INDICATION

Internal indication shows the Arc Flash as “ON” or “OFF”. When no connection or open contact is present on the external connector, the Arc Flash is enabled and the “ON” LED will be lit. The “OFF” LED is lit when the external connection is shunted or closed.

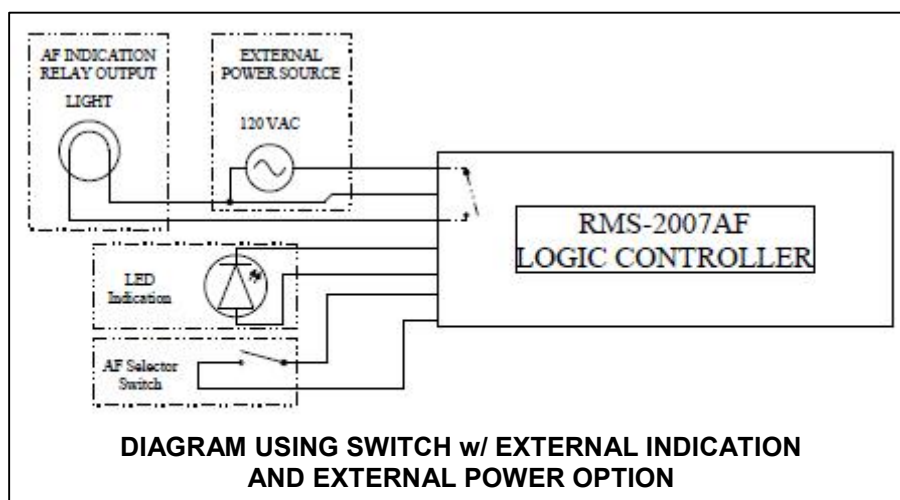
External indication is provided through a single LED that shows the Arc Flash is enabled. This LED will be dark when the Arc Flash is “OFF”. All LED’s are powered by the logic as long as a minimum current flow of about 15% of the breaker rating is maintained.



## EXTERNAL POWER & INDICATION (OPTION)

An option to utilize an existing external power source to provide indication is also available. As shown in the diagram below, a 120VAC source is connected to the logic using the Arc Flash connector. A Normally Open contact rated at 120VAC 4A is located in the logic. The relay output is also available on the connector and can be used to provide power to most types of indicators. The contacts close when the Arc Flash is enabled.

When necessary, the Arc Flash LED’s, internal and external, will draw power from the external source to remain lit whether or not the breaker has a load.



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## ARC FLASH SWITCH OPTION INSTALLATION GUIDE

The most common location for the Arc Flash Switch is in the breaker cell door. The LED mounts beside the plastic panel near the "ON" position as shown in the picture at right. The Switch and LED Indicator must be located so that Shielded Cable length does not exceed 10 feet.

>Choose a location to mount the switch that will not interfere with any wiring or moving parts of the breaker.

>Wiring will be completed using the shielded cable supplied with the kit. The Arc Flash connector is prewired and will plug directly into the logic. Secure the connector using the screws located at each end.

>Route the cable to the switch location. Avoid any moving parts and mechanisms that may damage the cable during normal operation or the movement of the breaker within the cell. The shielded cable length should be kept to a minimum.

>Using the drill pattern, mark and drill the mounting holes for the switch, plastic panel, and LED Indicator.

>Install the LED in the panel and tighten.

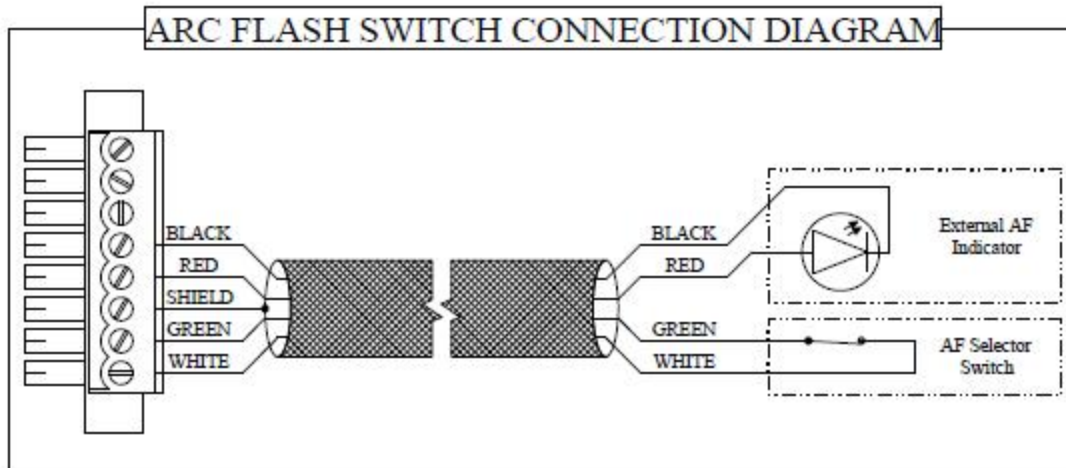
>Install the switch through the panel. Place lock-out cover over switch and install switch-nut into the cover. Excess tightening may cause the cover to crack. If necessary, adjust the switch-nut on the rear of the panel according to panel thickness.

>Install the plastic panel on the top of the switch cover. A strip of adhesive is available on the rear of the panel to temporarily secure it to the door. Once the location is confirmed, secure the panel using two 6-32 x 1/4" hardware.

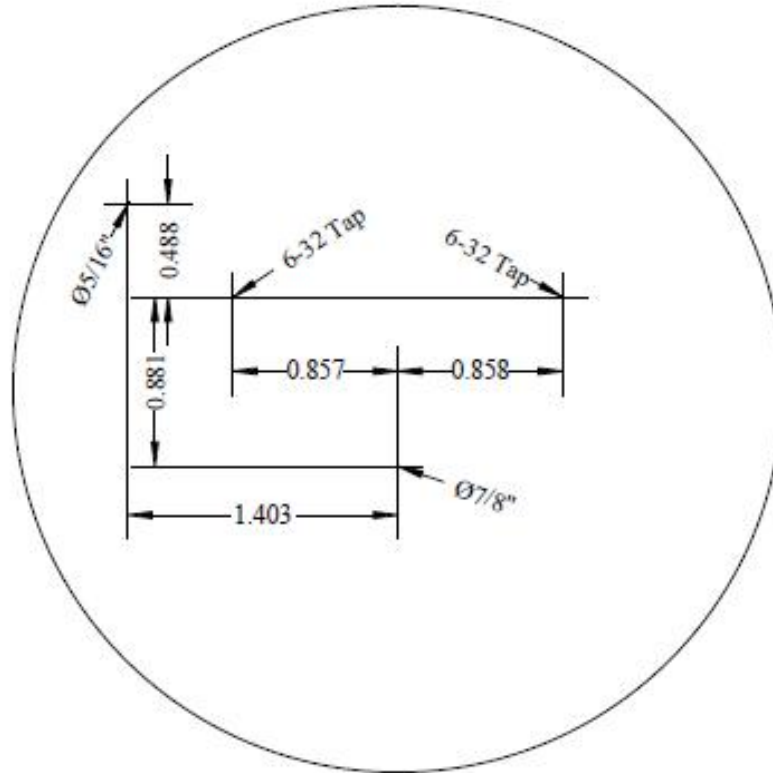
> Once install the wiring connections should be checked for damage.

>The switch wires to the 'Green' and 'White' wire as shown in the diagram.

> Use the butt connectors to join the LED wires to the Shielded cable. 'RED' wires and 'BLACK' wires must be kept separate when wiring the LED Indicator.



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Drill Pattern for Arc Flash Switch & LED Indicator