

# QUICK-TRIP®

## ARC FLASH REDUCTION SYSTEM FOR AC-PRO-II® TRIP UNITS

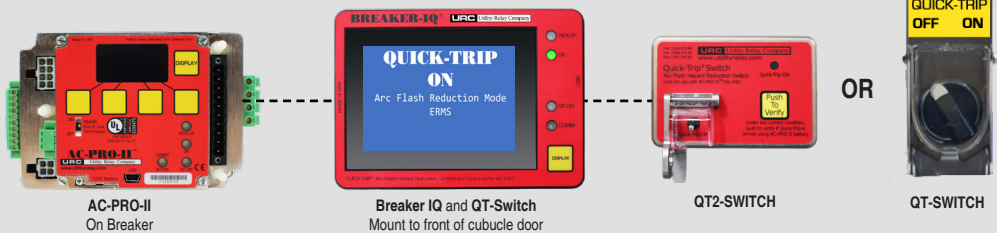
QUICK-TRIP® is a manually controlled arc flash reduction system designed to reduce trip times when turned on and to allow for selective coordination between circuit breakers when turned off. QUICK-TRIP® can be viewed as an energy reduction maintenance switch (ERMS) or as a reduced energy let-through (RELT) function.

QUICK-TRIP® improves worker safety, reduces equipment damage, reduces PPE requirements, and strengthens infrastructure preservation. Physical QUICK-TRIP® switches are pad-lockable and soft QUICK-TRIP® controls via AC-PRO®, BREAKER-IQ®, Smart 1-Line™ and InfoPro® are password protected.



**Option 1:**

**QUICK-TRIP® with BREAKER-IQ® with or without choice of physical switch**

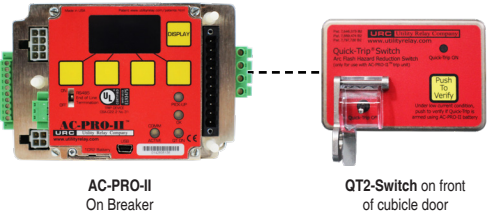


Ideal for circuit breakers that are behind a cubicle door and cubicles where circuit breakers with AC-PRO® could be racked in. A QT-SWITCH is only needed if a physical switch is desired or required by safety policies and practices.

**Option 2:**

**QUICK-TRIP® with with physical QT2-SWITCH**

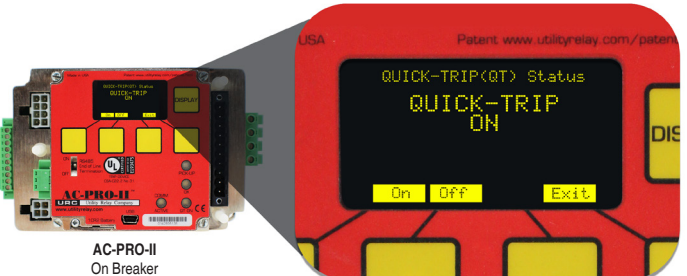
Only controls QUICK-TRIP® arc flash reduction and does not provide status visibility or any other control functionality without opening the cubicle door.



**Option 3:**

**QUICK-TRIP® without BREAKER-IQ® and no physical switch**

QUICK-TRIP® is engaged and disengaged directly via the AC-PRO® trip unit. Only for use on through-door breakers where a physical switch is not desired or required by safety policies and practices.



## System Operation and Settings

Operation is simple and can be controlled either by using BREAKER-IQ®, QT/QT2-SWITCH, or simply the AC-PRO® trip unit itself. When enabled, two additional settings are activated in the AC-PRO-II® trip unit to provide enhanced protection:

- QT-Instantaneous
- QT-Ground Fault

These two individually programmable settings are designed to provide faster clearing times in the event of a fault.

Since arc flash potential is directly related to breaker clearing time, the addition of the QUICK-TRIP® allows a reduced fault-clearing time without opening the cubicle door to reprogram the trip unit.

Reduced breaker clearing time can mean significantly reduced arc flash potentials on downstream electrical equipment.

**QT-Instantaneous:** ranges from 150% to 1200% of the long-time PICK-UP setting and is adjustable in 100 amp steps.

**QT-Ground Fault:** ranges from a minimum of 20% to 200% of the CT rating with a maximum of 1200 amps and is adjustable in 10 amp steps. This setting is also selectable OFF.

This function adds ground fault protection to the breaker. Although this function may not be desirable during normal operating conditions, it can provide a critical layer of protection during maintenance periods due to many phase-to-phase faults often starting as phase-to-ground faults.

## Incident Energy of an Arc Flash (cal/cm<sup>2</sup>)

The intensity of an arc is based on the following data:

- F = Amount of available fault current in kA (for the range of 15 to 50 kA)
- D = Distance from the electrode in inches (for distances 18 in and greater)
- t = Arc duration in seconds

NFPA-70E provides an equation as one method of determining the amount of incident energy (heat) a person would receive if an arc flash were to occur in a cubic box, such as a circuit breaker cubicle:

$$E_i = 1038.7 \times D^{-1.4738} \times t \times (.0093 \times F^2 - .3453 \times F + 5.9675)$$

- $E_i$  = Incident Energy Level (cal/cm<sup>2</sup>) in a box not larger than 20 inches (much like a circuit breaker cubicle)

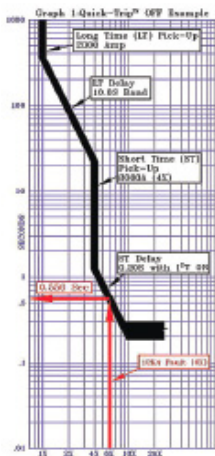
The Incident Energy Level determines the hazard risk category shown in the table to the right which further determines the PPE requirements for personnel working on the affected electrical equipment.

INCIDENT ENERGY LEVEL ( $E_i$ )	HAZARD RISK CATEGORY
0 to <4 cal/cm <sup>2</sup>	1
4 to <8 cal/cm <sup>2</sup>	2
8 to <25 cal/cm <sup>2</sup>	3
25 to <40 cal/cm <sup>2</sup>	4
>40 cal/cm <sup>2</sup>	Dangerous

## Practical Example

A technician needs to rack out a feeder breaker for maintenance. He or she is the minimum 18" away from any potential arc flash source in the cubicle. As the breaker is being racked out, a 12,000 amp arcing fault occurs inside the cubicle. The 2000A main breaker sees the fault and trips, clearing the fault in the feeder breaker cubicle. The two graphs illustrate the dramatic impact that the arc-clearing time has on the incident energy levels. Given that **F = 12kA** and **D = 18 in**.

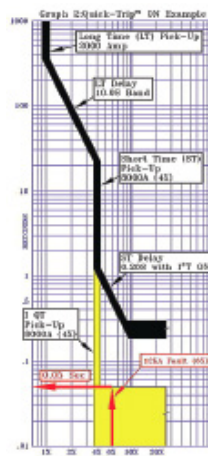
### QUICK-TRIP Off



**Graph 1:** QUICK-TRIP® is OFF & shows the trip time characteristics of the main breaker

- The AC-PRO® will cause the main breaker to clear the 12kA fault in .556 seconds (based on a short-time delay of .2 seconds with I<sup>2</sup>T ON). The resulting arc duration will be t = .556
- The resulting incident energy is  $E_i = 25.8022$
- The hazard risk category is a 4

### QUICK-TRIP On



**Graph 2:** QUICK-TRIP® is ON & shows the trip time characteristics of the main breaker

- The AC-PRO® will now cause the main breaker to clear the 12kA fault in .05 seconds (based on the QT-Instantaneous PICK-UP setting of 8000 amps). The resulting arc duration will be t = .05
- The resulting incident energy is  $E_i = 2.3203$
- The hazard risk category is a 1