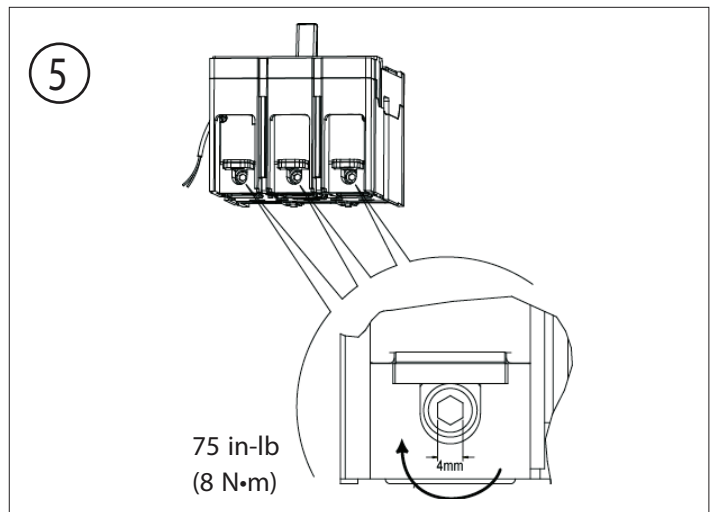
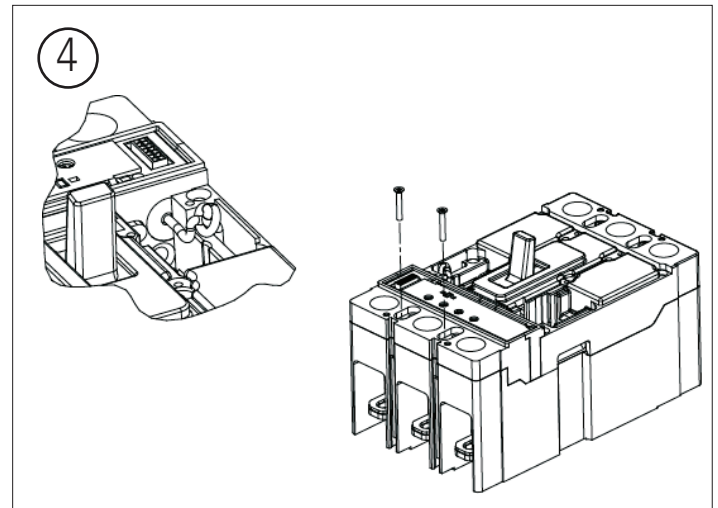
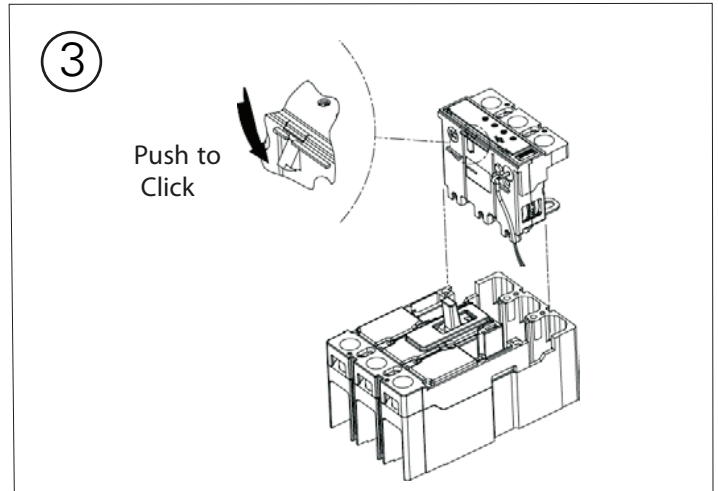
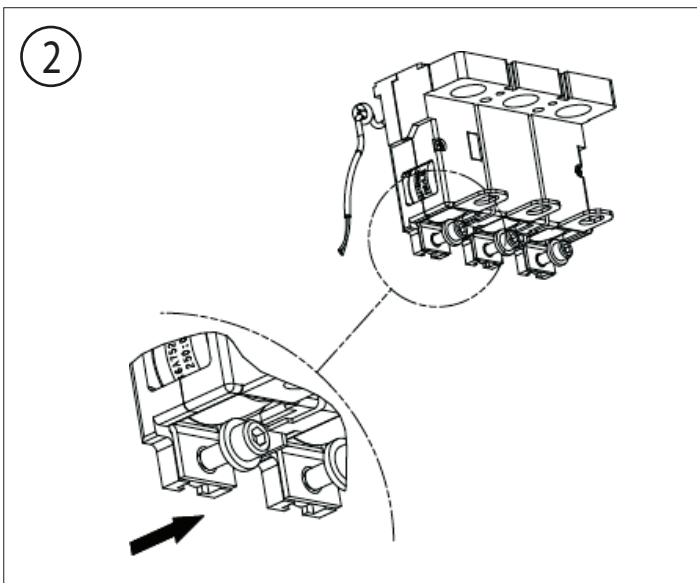
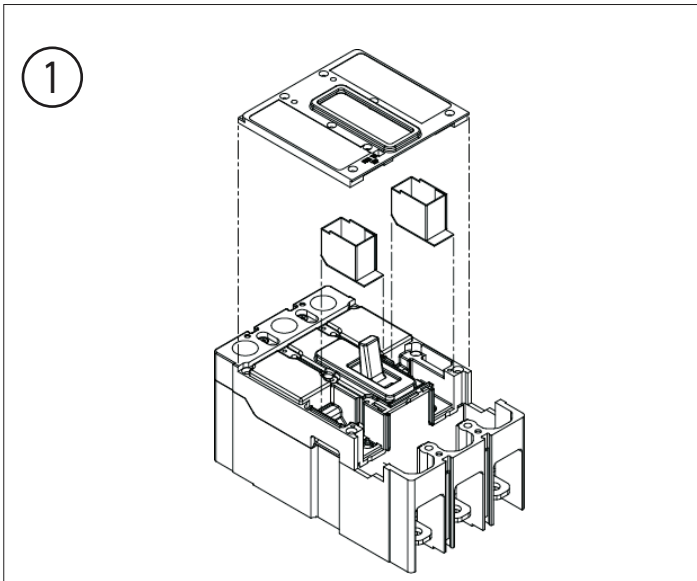


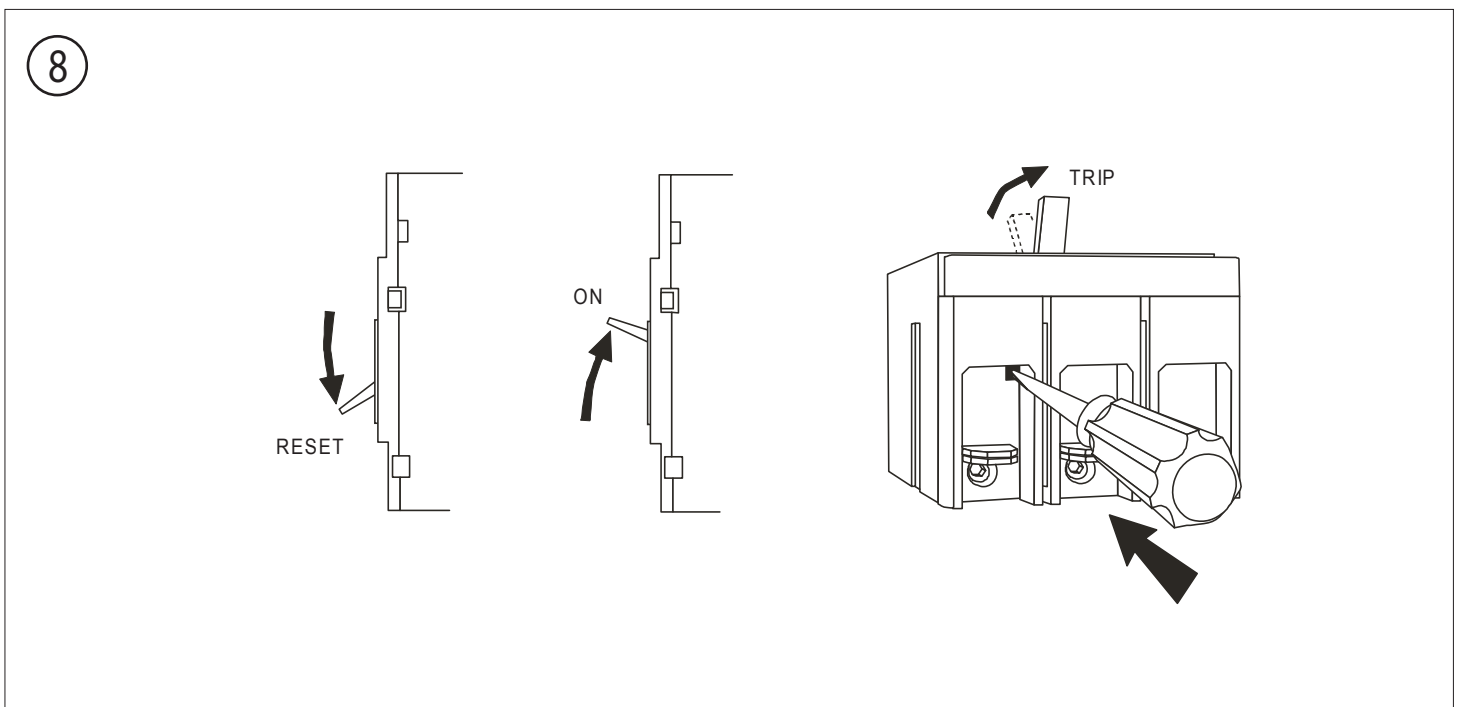
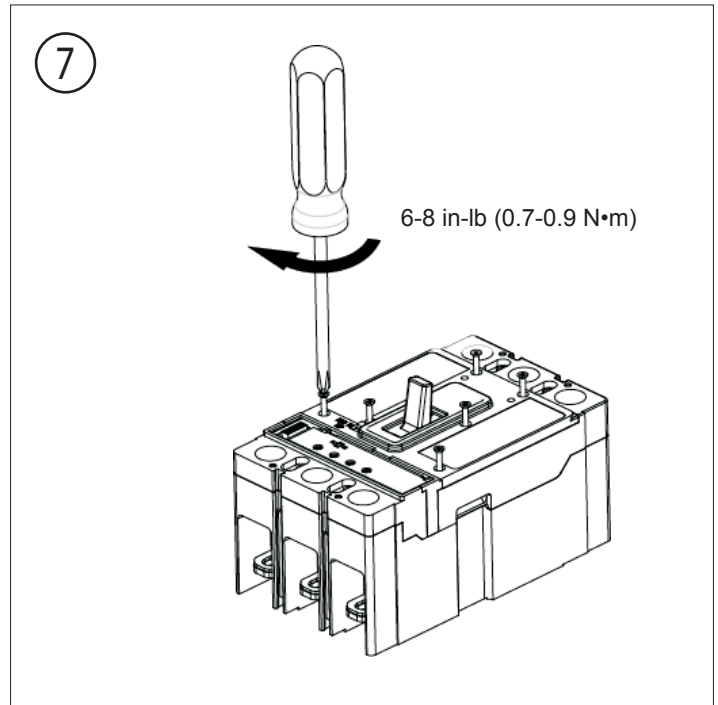
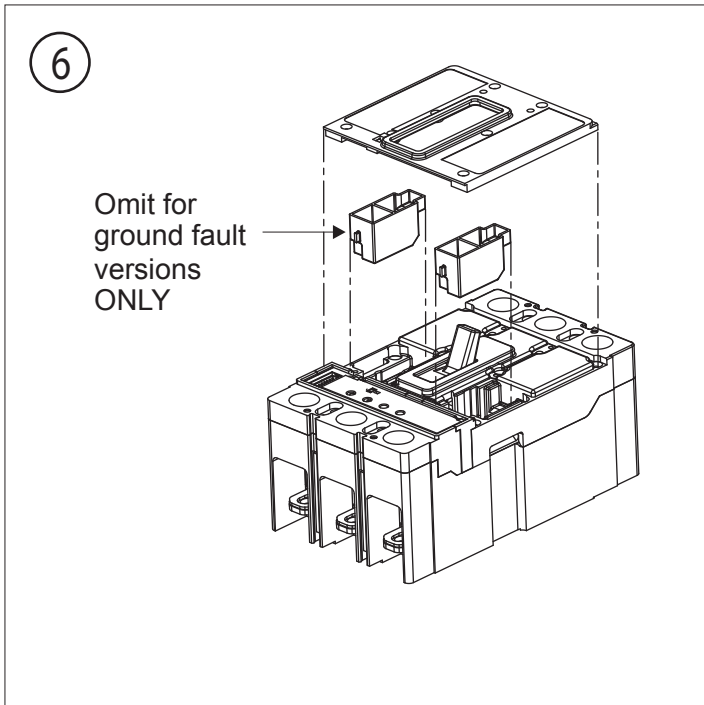
## Instruction Leaflet for Electronic Trip Units for J-Frame Circuit Breakers and Motor Circuit Protectors

 **WARNING**



DO NOT ATTEMPT TO INSTALL OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING.

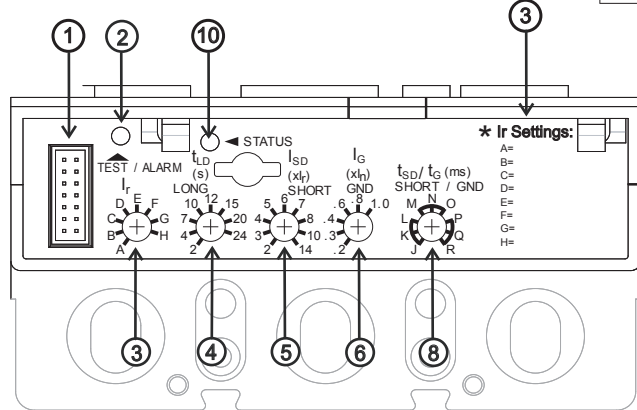




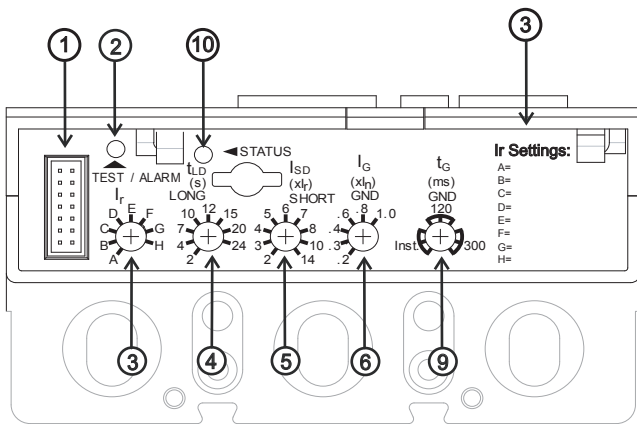
8a →

* Settings		t <sub>G</sub>		
		Inst.	120	300
t <sub>SD</sub> (ms)	120	J	K	L
	300	M	N	O
		P	Q	R

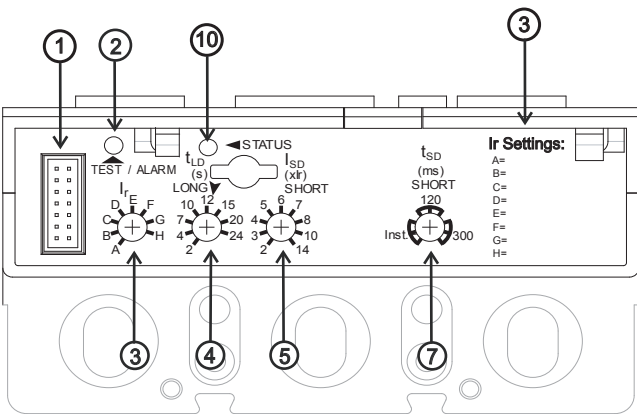
Trip Unit Controls and Functions



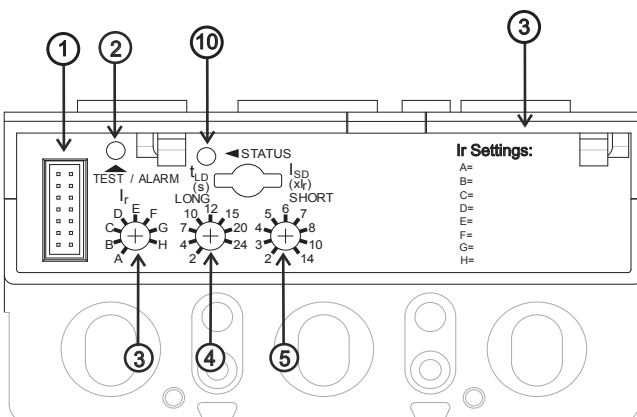
LSIG



LSG



LSI



LS

1. Test Port - A test port is built into each trip unit to allow use of a functional test kit. The test kit performs a test of the Long Delay, Short delay Ground Fault functions.

2. Test LED - To be used with a no trip functional test. This LED is a dual function light. As previously stated, the LED is used as a no trip indicator when using the test port. In normal modes, this LED indicates a high load alarm. It will light if the continuous current is 95% of the Ir Setting and must be present for a 38 second duration.

3. Ir - Continuous current setting . In accordance with standards requirements, the trip unit initiates a trip of the circuit breaker within 2 hours for an overload of 135% and will trip as a function of I<sup>2</sup>t for higher currents. Continuous current values for each lettered setting are indicated by the chart displayed on the right side of the trip unit label.

4. tLD - The number of seconds required to trip @ 6x Ir ., i.e. Ir-250A, tLD - 2 sec load current - 1500A (6X). The breaker will trip in 2 seconds.

5. tSD - Setting in multiples of Ir. For short circuit conditions that exceed the short delay pick-up setting, the trip unit initiates a trip after a predetermined delay.

6. The IG - (xIn) switch is the ground fault pick-up switch. It is used on the LSIG & LSG styles to set the ground fault pick-up as a percentage of In (frame current). For example, a 250A frame with an IG (xIn) setting of 0.4 will provide a ground fault pick-up at 100A.

7. For the LSI style , the short delay time is a flat response determined by the tSD switch settings of INST, the LED is used as a no trip indicator when using the 120ms, or 300ms. For the LS styles, the short delay time is an I<sup>2</sup>t function.

8. For the LSIG style , the short delay is a flat response determined by the tSD/tG switch settings of INST, 120ms or 300ms. This switch is a dual switch that also determines the ground fault time settings of INST, 120ms or 300ms. For example, if the tSD/tG switch is set at position J, then both short delay time and ground fault time are at INST flat. As another example, set the tSD/tG switch at position L; the short delay flat time is INST and the ground fault flat time is at 300ms. The LSIG label (see above 8a) should be used in conjunction with the tSD/tG switch to set any one of nine possible combinations of short delay and ground fault flat times. The LSIG label should be applied to the left side Breaker Frame Nameplate.

9. For the LSG style , the short delay time is an I<sup>2</sup>t function while the ground fault flat time is set by the tG switch.

10. Status LED - A green status light indicates the operational status of the trip unit. If the load current exceeds approximately 20% of the maximum current rating (In) the breaker, the status light will blink on and off once each second.

11 . The High Load Alarm Relay option or the Ground Fault Alarm Only option will provide a SPST contact closure when the trip unit current equals or is greater than 95% of  $I_n$  for a period of 38 seconds. If the current drops below the 95% value, the contact will open. The Ground Fault Alarm Only option operates in a similar fashion; the SPST contact will close if the ground fault pick-up setting is exceeded and will open when below the ground fault pick-up setting. The yellow and green wires that exit the right side of the breaker are the common (C) and normally (NO) of this relay.

12 . The Ground Fault Relay option will provide a SPST contact closure immediately before the breaker will trip on a ground fault over current detect. This closure is momentary (50ms) and the customer must provide the necessary external circuitry in order to latch this signal. The yellow and green wires that exit the right side of the breaker are the common (C) and normally (NO) of this relay.

NOTE: The High Load Alarm Relay can be selected with LS, LSI, and LSG, LSI, and LSG, LSI, and LSG trip units. For the LSG and LSI trip units, the High Load Alarm will function as normal. [16.] However, if the breaker trips due to a ground fault condition, the relay will respond with a ground fault alarm as indicated in [17.].

The Ground Fault Alarm Only can be selected for LSG and LSI trip units only. This selection has precedence over all other relay functions.

NOTE: The contact rating of the relay is: 250VAC@ 8 AMPS resistive load.

13 . The Zone Selective Interlock (ZSI) option provides a wired method of coordinating Upstream and Downstream breakers. The coordinating signals are provided by the White\Red stripe (Zin), White\Black stripe (Zout), and Black (common ground) wires that exit the right side of the breaker.

A typical connection (two breaker system) is accomplished by connecting the Zout wire of the Downstream breaker to the Zin of the Upstream breaker. The common black wires of both breakers must also be connected.

If a high current fault is sensed from the load on the Downstream breaker, both breakers will sense the fault. However, the Downstream breaker will send the interlock signal to the Upstream breaker informing it not to trip defined by the SD time settings of both breakers. This delay allows the Downstream breaker to clear the fault without the Upstream breaker tripping. However, if for some reason the Downstream breaker does not clear the fault in the set delay time, the Upstream breaker will then clear the fault.

NOTE: this option must be ordered from the factory.

NOTE: Please see Balloon 8A and refer to 4-14.

14. Zone selective interlocking is provided for the short delay and the ground fault delay tripping functions for improved system protection. The JG/LG310+ Trip Unit zone selective interlocking feature is compatible with OPTIM and Digitrip Trip Units, Model 510 and higher. It is also compatible with Series G NG Trip Units, as well as, with FDE breakers.

The zone selective interlocking feature is a means of communications over a pair of wires between two or more compatible trip units. Zone selective interlocking makes it possible for programmed trip unit settings to be altered automatically to respond to different fault conditions and locations, thereby localizing the effects of an interruption and providing positive coordination between circuit breakers.

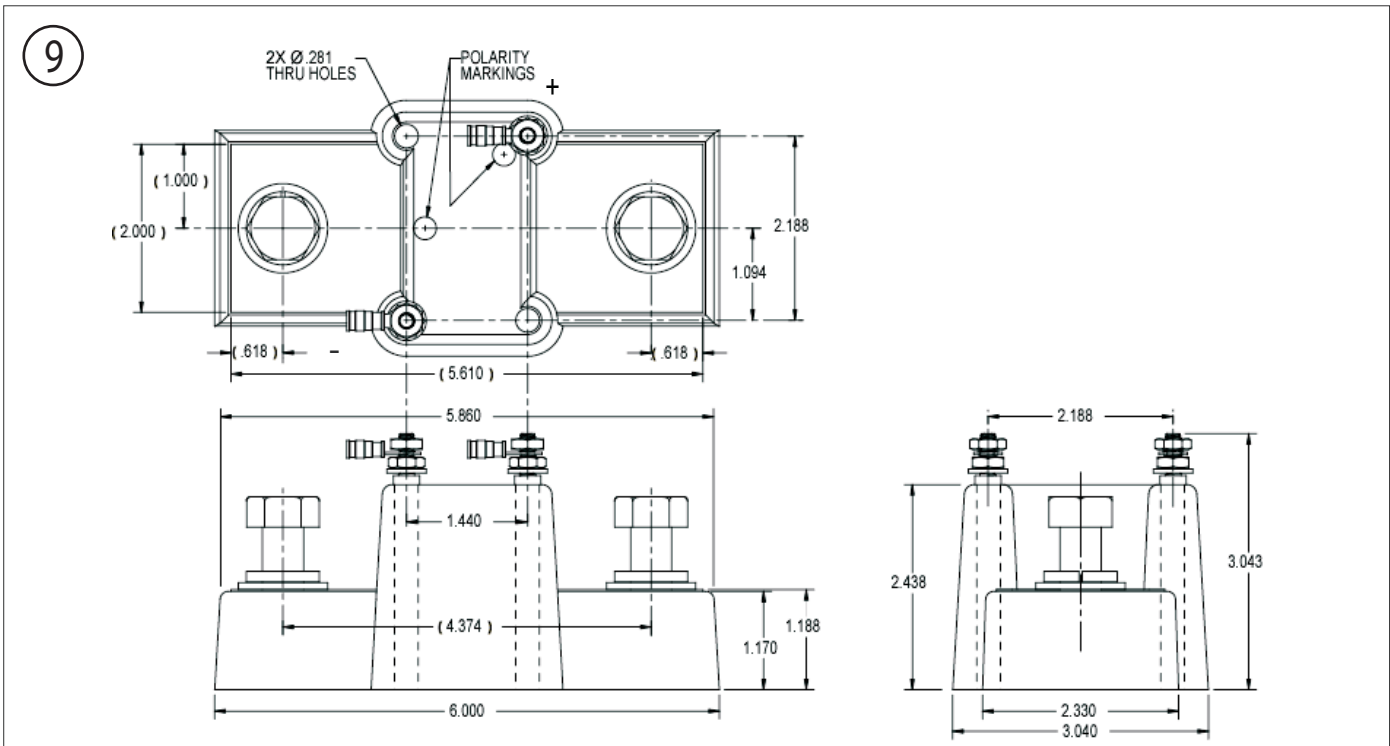
Three wires exit the breaker with the following color code and function: White/with Black Stripe=Zone Out, White/with Red Stripe=Zone In, and Black=Common.

An example of a Zone Interlock system would be a JG310+. A breaker used as the upstream breaker and a 225A FDE breaker used as the downstream breaker. The Zout wire (white/black stripe) of the 225A breaker would be connected to the Zin wire (white/red stripe) of the JG310+ breaker. Also both common wires (black) must be connected. There could be more breakers added in a similar fashion to form a zone of protection.

For faults outside the zone of protection, the trip unit of the circuit breaker nearest the fault sends an interlocking signal (Zout) to the trip unit of the up-stream circuit breaker. (Zin) This interlocking signal restrains immediate tripping of the upstream circuit breaker until its programmed coordination times is reached. Thus zone selective interlocking applied correctly can reduce damage due to circuit or ground fault conditions. A Table of the settings of the two breakers versus the outcomes (Both trip, Downstream (Dn) trips) of the breakers is indicated below for the conditions mentioned in the Table heading.

		Upstream		
		INST	120ms	300ms
Downstream	INST	Both 43ms	Dn 43ms	Dn 43ms
	120ms	Both 52ms	Dn 52ms	Dn 52ms
	300ms	Both 43ms	Dn 43ms	Dn 43ms

NOTE: A single Series G or FDE breaker with the Zone Interlocking feature enabled will not trip at the programmed time settings, unless **Self Interlocked**. That is, the Zout wire should be connected to the Zin wire.



**Neutral Current Sensor Installation**

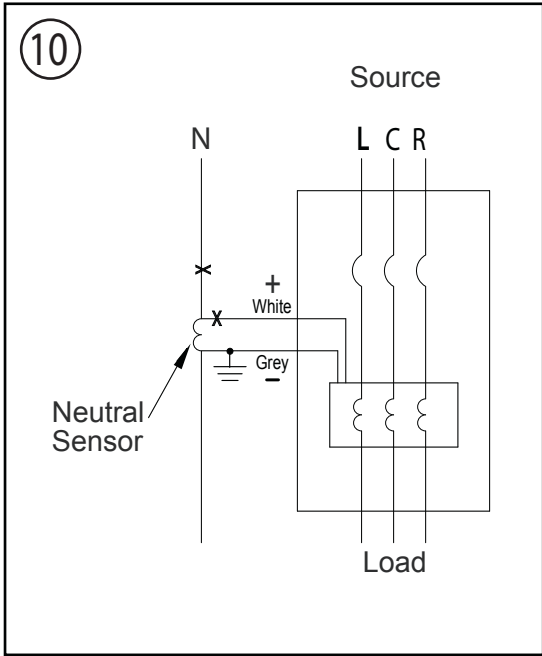
Ground fault trip units are supplied from the factory with pigtail lead connections for a neutral current sensor (white and grey wires). A neutral current sensor is available, but must be ordered separately.

Series G Ground Fault Trip Units detect ground fault currents through Residual Sensing. They are not designed to use source ground or zero sequence ground fault sensing methods. If the system neutral is grounded, but no phase to neutral loads are used, the neutral current sensor is not necessary. In that case, the white and grey leads on the trip should be cut off before installation.

If the system neutral is grounded and phase to neutral loads are used, then the neutral current sensor (see Figure 9) must be used. It should be connected to the breaker according to the diagram in Figure 10. It has the same turns ratio as the phase current sensors in the trip unit.

**100% Rated J-Frame Circuit Breakers**

JG-C circuit breakers are suitable for continuous operation at 100% of the frame rating if used with CU only 90°C insulated wire in an enclosure which measures at least 26" high x 18" wide x 8" deep.



**NOTICE**

The polarity of the sensor connections is critical. Always observe the polarity markings on the installation drawings. The polarity markings are identified as white dots on the transformers. To insure correct ground fault equipment performance, conduct field tests to comply with National Electric Code requirements under Article 230-95-C.

Eaton Corporation  
Electrical Sector  
1000 Cherrington Parkway  
Moon Township, PA 15108  
United States  
877-ETN-CARE (877-386-2273)  
Eaton.com

© 2014 Eaton Corporation  
All Rights Reserved  
Printed in USA  
Publication No. IL01204002EH07  
October 2014