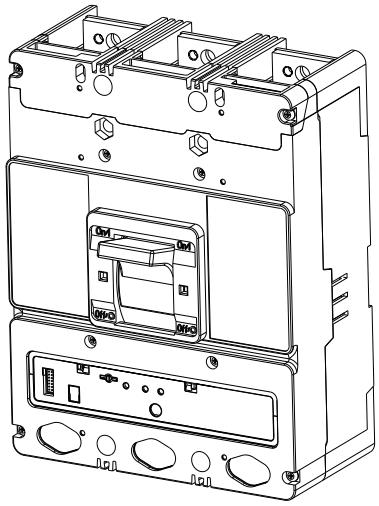
Instruction Leaflet **IL012062EN** Effective July 2015

Installation Instruction for Eaton LG 310+ Engine Generator Circuit Breakers



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Powering Business Worldwide

⚠ WARNING

CONTACT WITH ENERGIZED EQUIPMENT CAN RESULT IN DEATH, SEVERE PERSONAL INJURY, OR SUBSTANTIAL PROPERTY DAMAGE. DO NOT ATTEMPT TO INSTALL OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING THE TASK, AND ALWAYS FOLLOW GENERALLY ACCEPTED SAFETY PROCEDURES.

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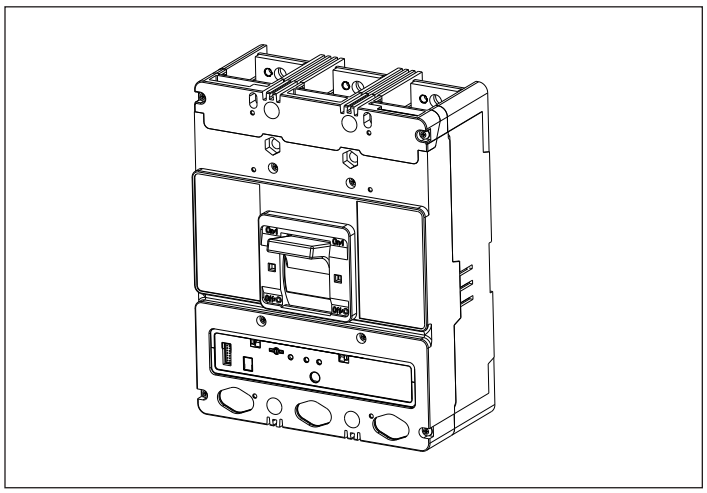

Figure 1. LG 310+ Engine Generator Circuit Breaker.

1. Introduction

As component leader for engine generator applications, Eaton provides circuit breakers for original equipment manufacturers (OEMs) who produce engine generator sets, paralleling gear and transfer switchgear, as well as system integrators who provide engine generator packages. Typical applications include diesel generator sets and portable or temporary power units providing a range of power ratings. Engine generator applications rely on circuit breakers to provide circuit protection for valuable assets and to keep critical facilities and processes running.

Eaton circuit protection solutions enable:

- Reliable operation
- Robust performance
- Enhanced safety

1.1 General Information

The L-frame Series C circuit breaker (see Figure 1) type LG is a 600 Vac maximum rated device with an electronic 310+ RMS trip unit rated 600 A maximum for continuous current. Molded case circuit breakers are listed in accordance with Underwriters Laboratories, Inc. Standard UL 489.

This instruction leaflet (IL) gives procedures for installation and field testing of L-frame Series C circuit breakers.

2. Installation

The installation procedure consists of inspecting the circuit breaker and, as applicable, installing accessories, and terminals; mounting the circuit breaker; connecting the line and load conductors; torquing terminals; and attaching terminal shields. Circuit breaker frames with trip units, accessories, mounting hardware, and unmounted terminals may be supplied in separate packages. To install the circuit breaker, perform the following steps.

Note: Internal accessory installation in any type of circuit breaker should be done before the circuit breaker is mounted and connected. Refer to individual accessory instruction leaflets for specific installation instructions on field installable accessories.

Step 1. Compare name plate data with existing equipment ratings and system requirements to make sure that the circuit breaker is suitable for the intended installation. Prior to mounting, confirm that the circuit breaker has not been damaged during transit or initial handling.

Step 2. To install any internal accessories, remove installed cover screws and cover.

Note: The circuit breaker handle must be in the tripped or OFF position to remove the cover. Instructions for installing the trip unit and accessories are supplied with the devices.

Step 3. If not already installed, mount accessories (if required) in circuit breaker frame.

Note: When required to be removed or replaced, stationary interphase barriers can only be installed or removed with circuit breaker in the tripped or open position.

Step 4. After any internal accessories are installed, and with the circuit breaker in the tripped position, make sure that stationary interphase barriers are properly installed in base. Install cover and secure with pan-head screws. Eight screws are used for two and three pole circuit breakers. Torque to 20-22 lb-in (2.26-2.49 N.m.).

Step 5. If not already installed, mount wire connecting terminals as shown in Figure 2. Secure the terminals to the circuit breaker using two pan-head slotted screws and lock washers. Torque to 6 to 8 lb-ft (8.14 to 10.85 N·m). With the circuit breaker mounted and before the conductors are installed and conductor clamping screws inserted, the terminal mounting screws may be checked for correct torque.

⚠ WARNING

THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE DEATH OR SEVERE PERSONAL INJURY. BEFORE MOUNTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT.

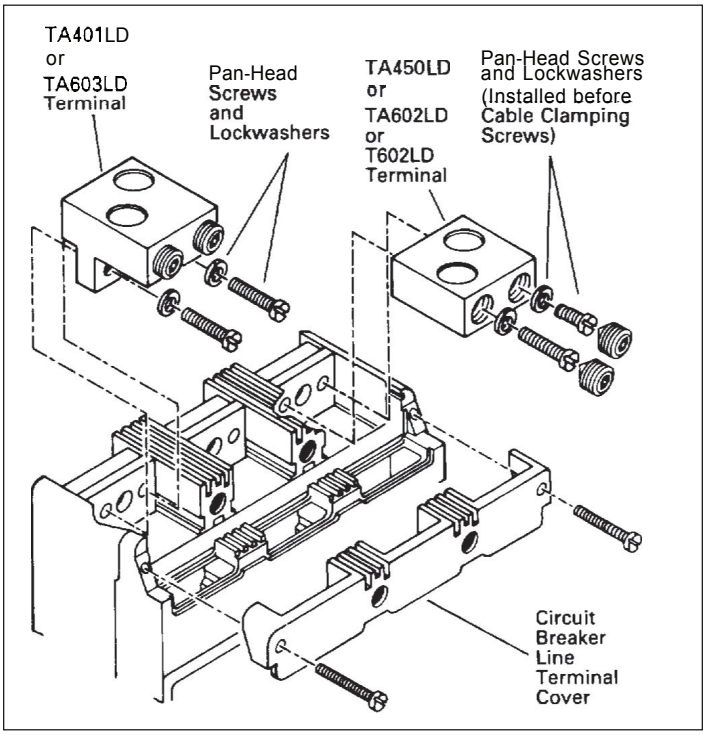

Figure 2. Terminal Installation

Note: Depending on the equipment configuration, the circuit breaker can be mounted using different styles of hardware. The following steps describe how to mount the circuit breaker using standard hardware. When special hardware is needed (for example, with the motor operator), the instruction leaflet describing the accessory also describes the special mounting arrangements.

Step 6. To mount the circuit breaker, perform the following steps:

a. For individual surface mounting, drill mounting panel using the drilling plan shown in Figure 3. For panel board mounting, only load end support mounting holes are required. For dead front cover applications, cut out cover to correct escutcheon dimensions (see Figure 4).

b. If circuit breaker includes factory or field installed internal accessories, make sure accessory wiring is accessible when the circuit breaker is mounted.

Note: Labels with accessory connection schematic diagrams are provided on the side of the circuit breaker.

c. Position circuit breaker on mounting surface.

d. Install circuit breaker mounting screws and washers. Tighten screws firmly, but do not exceed 28 lb-in (3 N·m).

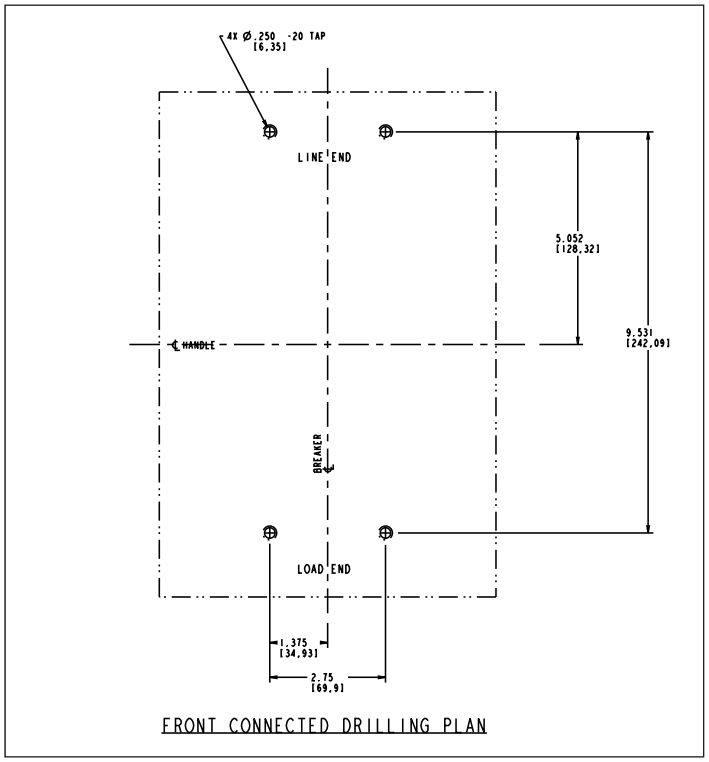

Figure 3. Circuit Breaker Mounting Bolt Drilling Plans.

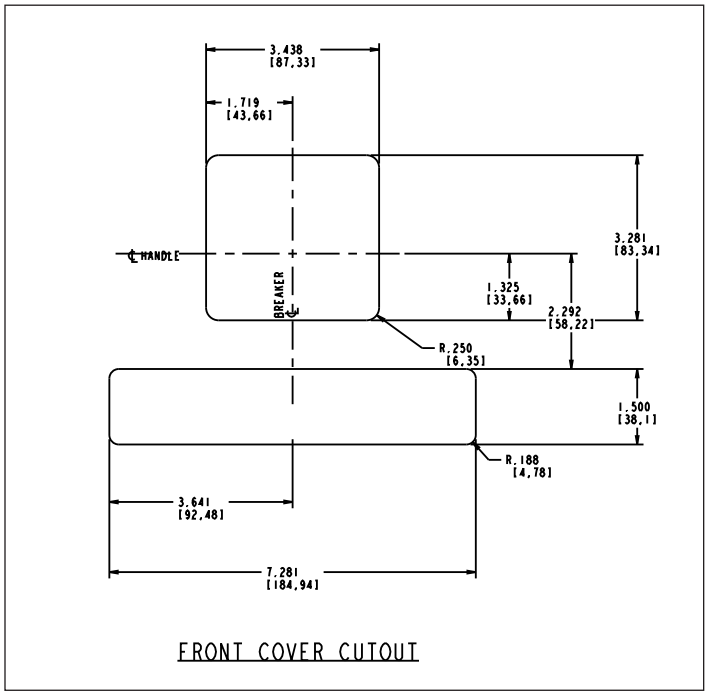

Figure 4. Circuit Breaker Escutcheon Cutout Dimensions.

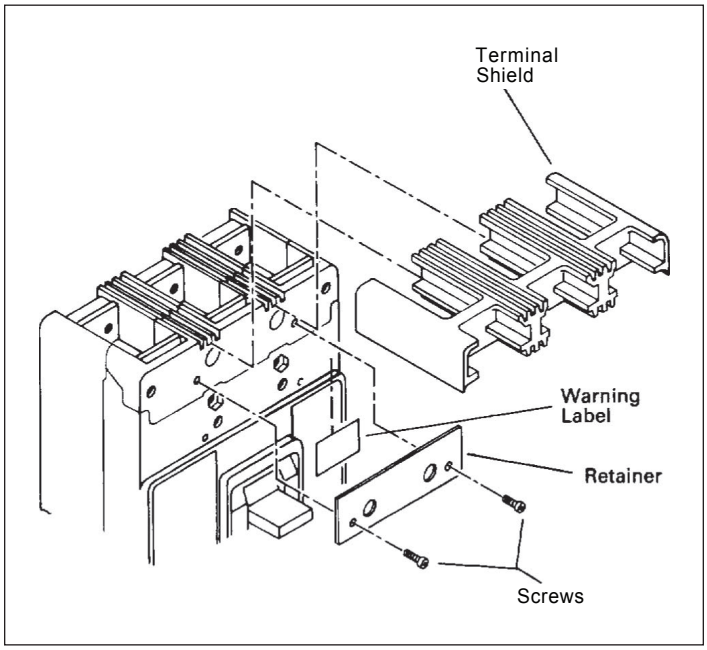

Figure 5. Installation of Terminal Shields and Warning Label.

⚠ CAUTION

WHEN ALUMINUM CONDUCTORS ARE USED, THE APPLICATION OF A SUITABLE JOINT COMPOUND IS RECOMMENDED TO REDUCE THE POSSIBILITY OF TERMINAL OVERHEATING. OVERHEATING CAN CAUSE NUISANCE TRIPPING AND DAMAGE TO THE CIRCUIT BREAKER.

Step 7. Connect line and load conductors and accessory.

Step 8. After the circuit breaker is installed, check all mounting hardware and terminal connecting hardware for correct torque loading. Torque values for line/load terminals are given in Table 1 and on the circuit breaker nameplate.

Step 9. Install line terminal cover on circuit breaker cover with mounting screws provided. Torque to 20-22 lb-in. (2.26-2.49 N·m).

Step 10. When step-type terminals (Cat. No. TA603LD or TA401LD) are used, terminal shields (supplied with terminals) must be installed on the circuit breaker (see Figure 5) and secured using retainer and screws included with the terminal shield kit. Warning label supplied with the kit must be attached to the circuit breaker cover.

⚠ WARNING

HAZARDOUS VOLTAGE CONDITIONS CAN CAUSE DEATH OR SEVERE PERSONAL INJURY. MAINTAIN ORIGINAL ELECTRICAL CLEARANCE AND CREEPAGE SPACINGS AT TERMINATIONS.

3. Manual Operation

⚠ WARNING

CONTACT WITH ENERGIZED EQUIPMENT CAN RESULT IN DEATH, SEVERE PERSONAL INJURY, OR SUBSTANTIAL PROPERTY DAMAGE. DO NOT ATTEMPT TO INSTALL OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING WITH THE TASK, AND ALWAYS FOLLOW GENERALLY ACCEPTED SAFETY PROCEDURES.

Note: When replacing an existing circuit breaker of the types listed, make sure the voltage, continuous current, and interrupting rating of the new circuit breaker are suitable.

Manual operation of the circuit breaker is controlled by the circuit breaker handle and the PUSH-TO-TRIP button in the trip unit. The circuit breaker handle has three positions, two of which are shown on the cover with raised lettering to indicate ON and OFF .On the handle, ON, OFF, and trip are also shown by a color-coded strip for each circuit breaker handle position: red for ON, white for tripped, and green for OFF (see Figure 6).

3.1 Circuit Breaker Reset

After a trip operation, the circuit breaker is reset by moving the circuit breaker handle to the Reset (extreme OFF) position.

Note: In the event of a thermal (overload) trip, the circuit breaker cannot be reset immediately. A circuit breaker with a DIGITRIP 310+ RMS trip unit simulates the thermal element of a thermal-magnetic type trip unit with an electronic "thermal memory" that also requires up to five minutes to "cool" before it can be re-energized. No circuit breaker should be reclosed until the cause of trip is known and the situation rectified.

3.2 PUSH-TO-TRIP Button

The PUSH-TO-TRIP button operates the circuit breaker tripping function and may be used to periodically exercise the operating mechanism.

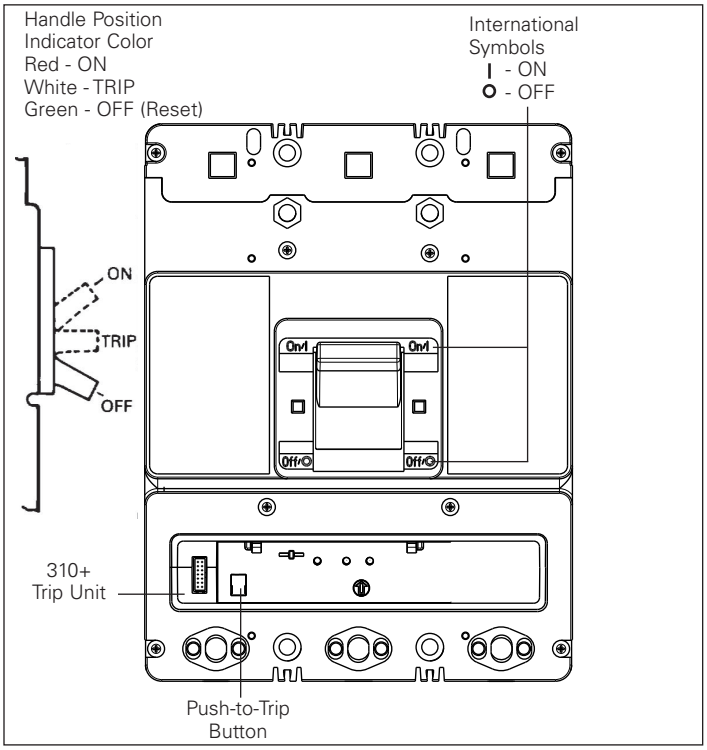

Figure 6. Circuit Breaker Manual Controls.

4. Inspection and Field Testing

Series C molded case circuit breakers are designed to provide years of almost maintenance-free operation. The following procedure describes how to do a limited amount of field inspection and testing of a circuit breaker.

4.1 Inspection

Circuit breakers in service should be inspected periodically. The inspection should include the following checks 1 through 8.

⚠ WARNING

THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. BEFORE INSPECTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THAT THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. PAY SPECIAL ATTENTION TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT.

⚠ CAUTION

SOME COMMERCIAL CLEANING AGENTS WILL DAMAGE THE NAMEPLATES OR MOLDED PARTS. MAKE SURE THAT CLEANING AGENTS OR SOLVENTS USED TO CLEAN THE CIRCUIT BREAKER ARE SUITABLE FOR THE JOB.

Step 1. Remove dust, dirt, soot, grease, or moisture from the surface of the circuit breaker using a lint-free dry cloth, brush, or vacuum cleaner. Do not blow debris into circuit breaker. If contamination is found, look for the source and eliminate the problem.

Step 2. Switch circuit breaker to ON and OFF several times to be sure that the mechanical linkages operate freely and do not bind. If mechanical linkages do not operate freely, replace circuit breaker.

Step 3. With the circuit breaker in the ON position, press the PUSH-TO-TRIP button to mechanically trip the circuit breaker. Trip, reset, and switch circuit breaker ON several times. If the mechanism does not reset each time the circuit breaker is tripped, replace the circuit breaker.

Step 4. Check base, cover, operating handle, and handle barrier for cracks, chipping, and discoloration. Circuit breakers should be replaced if cracks or severe discoloration is found.

Step 5. Check wire connecting terminals and other type bus bar connectors for looseness or signs of overheating. Overheating will show as discoloration, melting, or blistering of conductor insulation, or as pitting or melting of conductor surfaces due to arcing. If there is no evidence of overheating or looseness, do not disturb or tighten the connections. If there is evidence of overheating, terminations should be cleaned or replaced. Before re-energizing the circuit breaker, all terminations and cable should be refurbished to the originally installed condition.

Step 6. Check circuit breaker mounting hardware, and tighten if necessary.

Step 7. Exposure to certain types of chemicals can cause deterioration of electrical connections. Check area where circuit breaker is installed for any safety hazards, including personal safety and fire hazards and take required precautionary actions.

Step 8. The operation of circuit breakers with 310+ trip units can be field tested periodically using the Electronic test kit (See IL5721B13H05).

4.2 Field Testing

Any field testing should be done in accordance with applicable NEMA Standard.

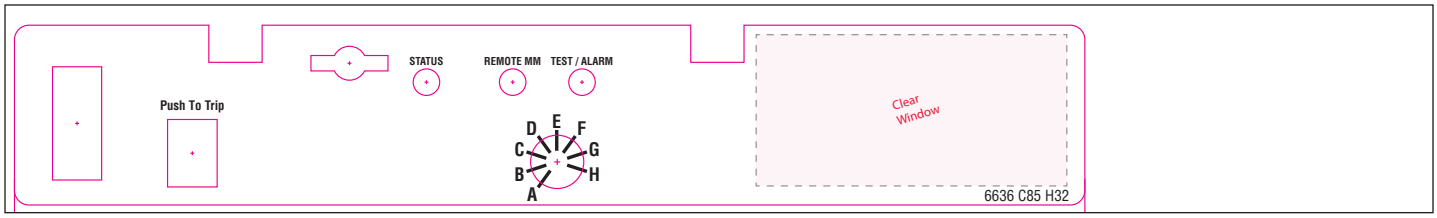

Figure 7. LG 310+ Trip Unit Settings.

Settings	
A = 500A	E = 1250A
B = 600A	F = 1500A
C = 800A	G = 2000A
D = 1000A	H = 2500A

Figure 8. Instantaneous Trip Settings.

5. Features

1. Remote Maintenance Mode (RMM) - Optional
   An option that allows a user to remotely lower the instantaneous pickup of the breaker to 2.5x the frame rating (In), and to bypass any programmed delays (tsd or tg). The purpose of the function is to reduce incident energy during a fault condition.

   For example, a 600A (In) LG breaker with the switch set to 2.5x would trip instantaneously when the current exceeded 1500 A.

   The RMM is enabled by applying 24VDC to the two wire cable that exits the left side of the breaker. The wires are color coded Yellow (+24V) and Black (common ground) - (see Figure 9). A blue colored LED on the trip unit lights when the breaker is in RMM (see Figure 7).

   The lighted blue LED indicates that RMM is enabled. This setting corresponds to 2.5x of In. Turning the Isd switch on the trip unit has no effect on either the Maintenance Mode or the tsd\tg settings while the blue LED is lit.

   Also, a relay contact closure indicates that the RMM has been enabled. The blue and red wires are the C and NO contacts of this relay. The relay has a dual function: 1) enable RMM and 2) provide a contact closure indication that RMM is enabled.

   Both the yellow and black set of wires and the red and blue set of wires exit on the left side of the breaker.

Note: The RMM contacts are rated at 2A at 30 VDC and 0.5A at 125 VAC.

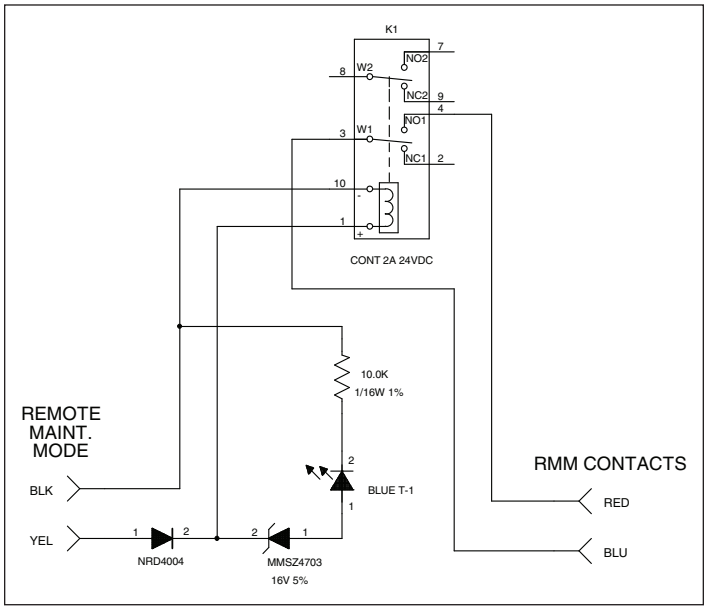

Figure 9. Remote Maintenance Mode Wiring Diagram.

2. Test/Alarm LED - Standard
   A dual function, bi-color (red-amber) LED. It is used as an amber no trip indicator when using the test port. In normal modes, the red LED indicates a high load alarm. For a high load alarm, it will blink ON-OFF if the continuous current is 105% of the Ir setting and is present for a duration over 38 seconds.

3. High Load Alarm Relay - Optional
   This option will provide a SPST contact closure when the trip unit current equals or is greater than 105% of In for a period of 38 seconds. If the current drops below the 105% value, the contact will open. The yellow and green wires that exit the right side of the breaker are the common (C) and normally open (NO) of this relay (see Figure 10).

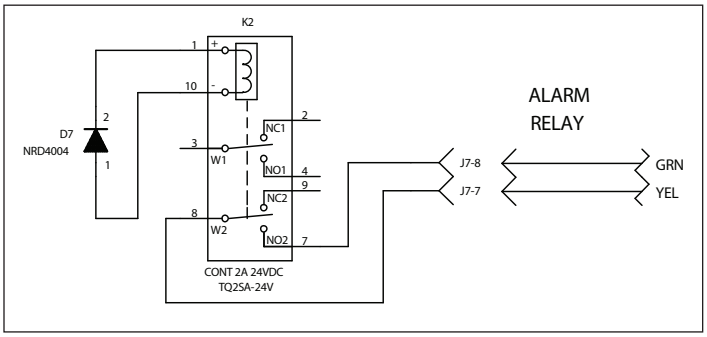

Figure 10. High Load Alarm Relay Wiring Diagram.

Table 1. Terminal Types ①②④

Terminal Cat. No. @	Terminal Material Body	Screw Head Type	AWG Wire Range	Wire Type	Torque Value Lb-in (N.m)
TA602LD	Aluminum	Socket	310-350 ②	Cu/Al	275 (31.1)
TA603LDK③	Aluminum	Socket	400-500 ②	Cu/Al	275 (31.1)
T602LD	Copper	Socket	250-350 ②	Cu	275 (31.1)
TA401LDK⑤	Aluminum	Socket	410-600	Cu/Al	400 (45.2)
TA450LD	Aluminum	Socket	4-4/0 ②	Cu/Al	275 (31.1)

① The maximum width non-standard wire connector (tang-type) or bus bar connector that can be used without reducing electrical clearance and creepage distances between phases is 1.690 in. (42.93 mm).

② No hardware or connector should be installed in a manner to reduce the electrical clearance between the underneath side of the phase termination (line or load) and ground without the addition of supplementary insulation.

③ Sold in 2-, 3-, and 4-pole kits only (2TA603LDK/3TA603LDK/4TA 603LDK).

④ All terminals can accommodate two cables, except TA 401LD.

⑤ Sold in 2-, 3-, and 4-pole kits only (2TA401LDK/3TA401LDK/4TA401LDK).

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