



Installation Instructions for Low Energy Shunt Trip for EHD, FDB, FD, HFD, FDC, FW, HFW, FWC Circuit Breakers, Molded Case Switches, and Motor Circuit Protectors



WARNING

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

CUTLER-HAMMER IS NOT LIABLE FOR THE MISAPPLICATION OR MISINSTALLATION OF ITS PRODUCTS.

The user is cautioned to observe all recommendations, warnings, and cautions relating to the safety of personnel and equipment as well as all general and local health and safety laws, codes, and procedures.

The recommendations and information contained herein are based on Cutler-Hammer experience and judgement, but should not be considered to be all-inclusive or covering every application or circumstance which may arise. If any questions arise, contact Cutler-Hammer for further information or instructions.

1. INTRODUCTION

General Information

The low energy shunt trip (LEST) (Fig. 1-1) is designed to interface with a customer ground fault detection circuit. The LEST consists of an intermittent-rated solenoid with a plunger and a reset lever assembled to a plug-in module, which is mounted in the right or left accessory cavity. The reset lever resets the LEST when the trip signal is removed and the circuit breaker handle is moved to the reset (extreme OFF) position.

The LEST is rated at 24VDC and is designed to trip the circuit breaker when a 100 microfarad capacitor charged to 12 Vdc is discharged through the solenoid. Endurance for the LEST is 6000 electrical operations plus 4000 mechanical operations.

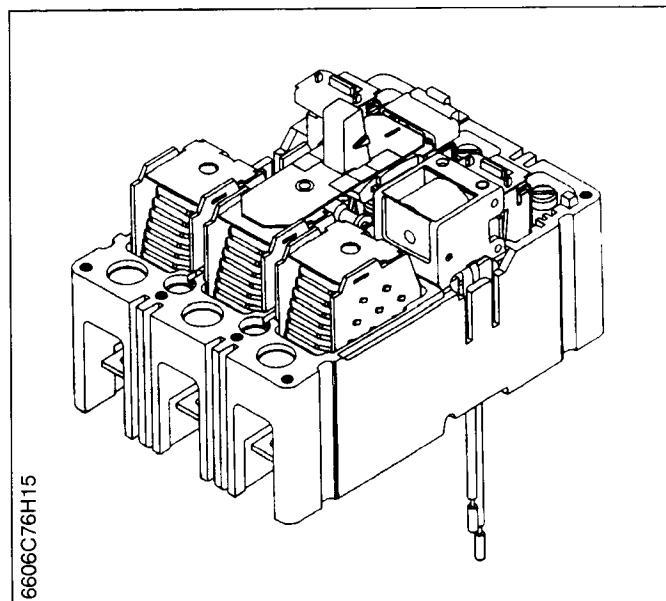


Fig. 1-1 Low Energy Shunt Trip Installed in F-Frame Circuit Breaker

For this publication, the term circuit breaker shall also include molded case switch and motor circuit protector.

Depending on the model ordered, connections for the low energy shunt trip are in one of four forms. The standard wiring configuration is pigtail leads exiting the rear of the base directly behind the LEST. Optional configurations include a terminal block mounted on the same side of the base as the accessory, leads exiting the side of the base where the accessory is mounted, and leads exiting the rear of the base on the side opposite the accessory. The 18-inch long pigtail leads are color coded for identification; the terminal block terminals are labeled. For allowable locations of all accessories, refer to Frame Book 29-101.

Note: When the walking beam interlock is used with the circuit breaker, the rear trough cannot be used for accessory pigtail leads.

This instruction leaflet (IL) gives detailed procedures to install the LEST.

2. INSTALLATION

Note: For sealed circuit breakers, Underwriters Laboratories, Inc. UL489 requires that internal accessories be installed at the factory. The LEST is listed only for factory installation under UL file E7819.

Where local codes and standards permit and UL listing is not required, internal accessories can be field-installed.

Before attempting to install the LEST, check that the catalog number is correct and that the rating of the accessory satisfies job requirements.

The LEST is shown in kit form in Fig. 2-1 and can be supplied as either a right- or left-hand assembly. Depending on the catalog number ordered, the LEST can be installed in the right accessory mounting cavity of a 2-pole circuit breaker, in the left or right cavity of a 3-pole circuit breaker, or in the left cavity only of a 4-pole circuit breaker. A LEST must be installed in the circuit breaker before the circuit breaker is mounted in an electrical system. To install the LEST, perform the following procedures:

Note: A circuit breaker that is mounted in an electrical system must be removed to install the accessory. To ensure correct accessory installation, the circuit breaker must be placed on a horizontal surface.



WARNING

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

Note: To install the LEST, the circuit breaker operating mechanism must be in the tripped position.

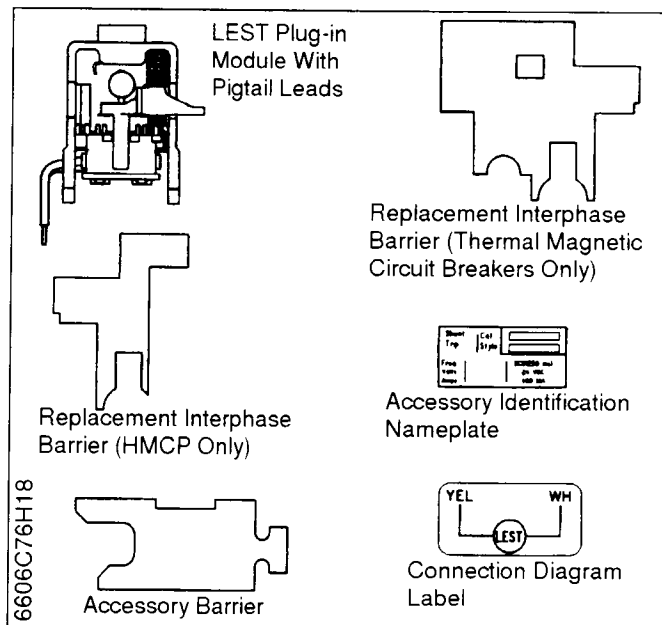


Fig. 2-1. Low Energy Shunt Trip Kit

- 2-1. Switch circuit breaker to the OFF position.
- 2-2. Disconnect and remove circuit breaker from installation and terminal connections.
- 2-3. Remove eight cover screws and cover. The handle must be in the OFF position if the circuit breaker has a cover interlock.



CAUTION

DURING INSTALLATION AND FUNCTIONAL CHECKS OF THE LEST, DO NOT TOUCH THE CIRCUIT BREAKER CALIBRATED TRIP MECHANISM. CONTACT WITH THE CALIBRATED TRIP MECHANISM COULD CHANGE TRIP CHARACTERISTICS.

Note: For a LEST having rear or opposite-side exiting pigtail leads, thread leads through trough in side of base before attempting to install the accessory. Pigtail leads exiting in this manner must be eased through trough as LEST is inserted into mounting cavity.

- 2-4. Press PUSH-TO-TRIP button below escutcheon to trip the operating mechanism.

2-5. Route wiring to meet installation requirements. (See Fig. 2-2.)

2-6. Insert LEST as described in the following steps (Fig. 2-3):

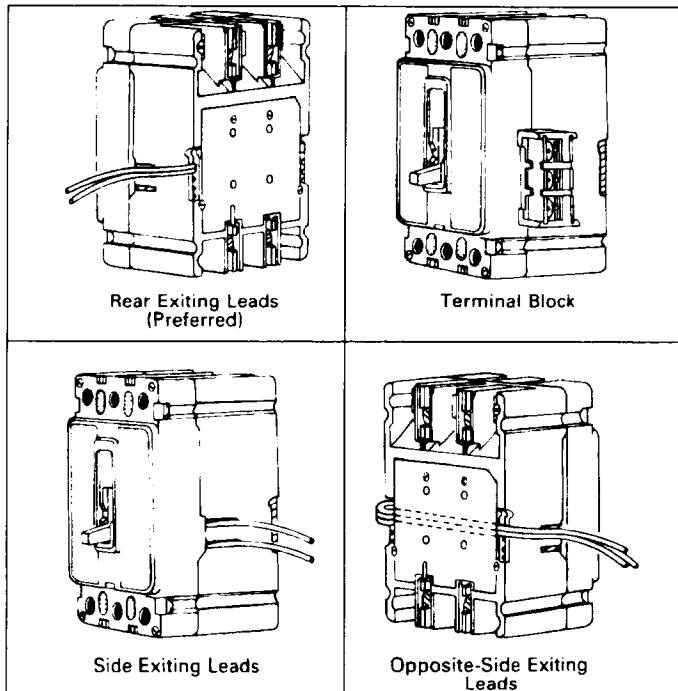


Fig. 2-2. Accessory Wiring Options

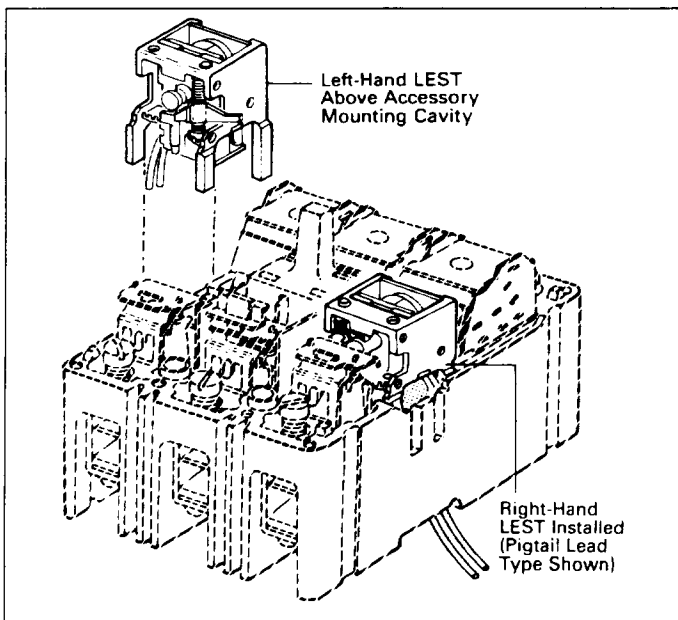


Fig. 2-3. LEST Installation Positions

- a. Remove interphase barrier between accessory mounting cavity and operating mechanism as shown in Fig. 2-4. For HMCP, remove outer portion only of 2-part interphase barrier.
- b. Lift out arc extinguisher located on the same side of the circuit breaker to be used for accessory installation.
- c. Slide accessory barrier into position between molded crossbar and trip bar. Long leg of barrier must go into slot in base. Bend barrier over and put T-shaped end into moving contact slot in base. (See Fig. 2-5.)
- d. Install arc extinguisher.
- e. Reset LEST by pushing solenoid plunger to fully retracted position.
- f. Put tip of LEST reset tab through square opening in replacement interphase barrier. (See Fig. 2-6.)
- g. Slide LEST plug-in module and replacement interphase barrier slowly into mounting slots in base. Gentle pressure on circuit breaker handle towards arc extinguishers will assist LEST reset lever past handle. For terminal block assemblies, slide terminal block into mounting slot in side of base as plug-in module is being positioned.
- h. For HMCP, LEST plug-in module can be inserted prior to installation of replacement interphase barrier.
- i. Before plug-in module seats fully in mounting slots, press circuit breaker trip bar back against magnet armature, and seat accessory. Make sure LEST trip lever touches flat surface of trip bar (Fig. 2-7) and reset tab is operated by the handle arm.
- j. If required, complete routing of opposite-side exiting leads.

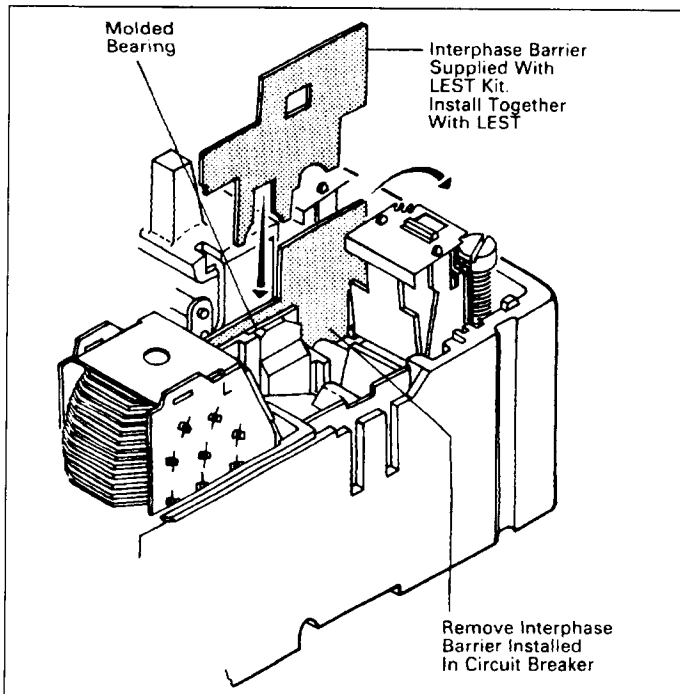


Fig. 2-4. Position of Interphase Barrier and Molded Bearing

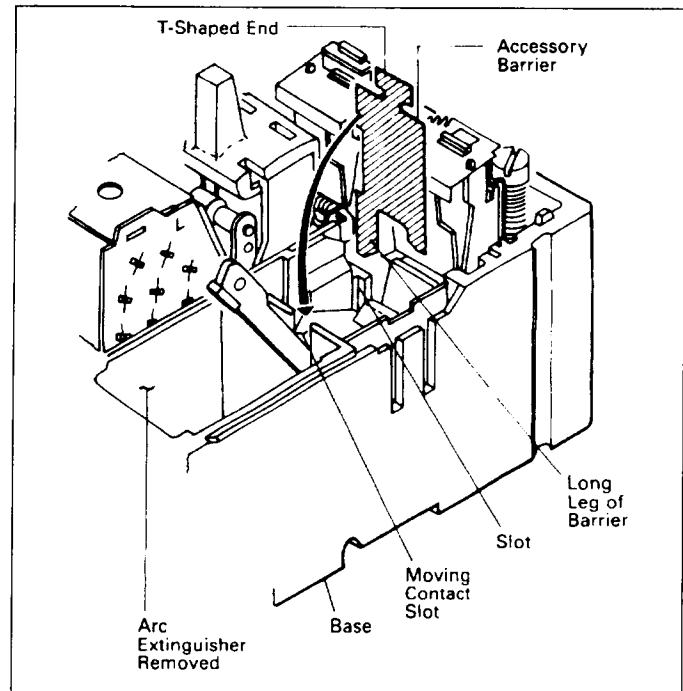


Fig. 2-5. Accessory Barrier Installation Position



WARNING

WHEN CHECKING THE ACCESSORY, DO NOT PUT FINGERS NEAR MOVING PARTS INSIDE THE CIRCUIT BREAKER CASE. SPRINGS CAUSE INTERNAL PARTS TO MOVE QUICKLY AND WITH FORCE. CONTACT WITH MOVING PARTS CAN CAUSE INJURY.

- 2-7. Perform a mechanical check of the LEST after installation.
- With circuit breaker still electrically isolated, reset the circuit breaker.
 - Hold LEST plug-in module firmly in position in the base. Reset circuit breaker handle. Check that LEST reset lever pushes plunger into solenoid and that plunger is held by magnet.

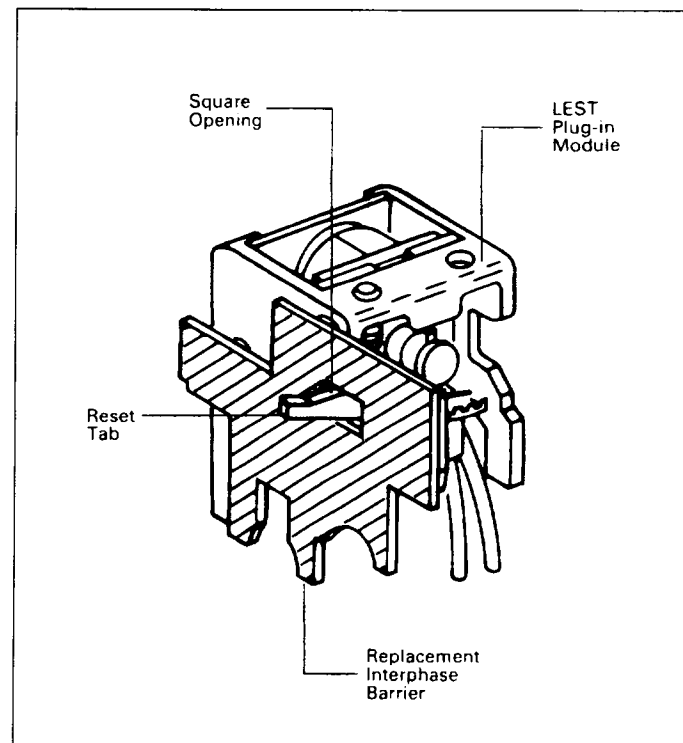


Fig. 2-6. LEST and Interphase Barrier Installation (Thermal magnet circuit breakers only)

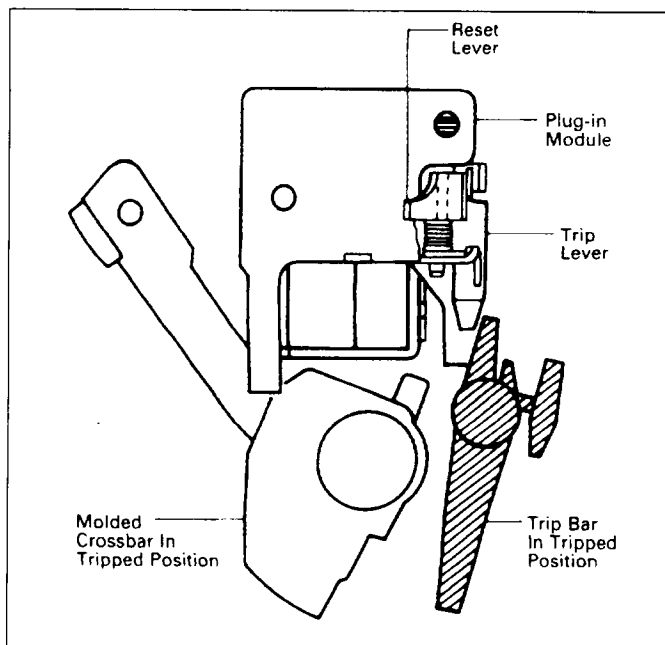


Fig. 2-7. Correct Position for Trip Lever and Trip Bar



CAUTION

THE SOLENOID PLUNGER IS HELD IN THE SEATED POSITION BY A PERMANENT MAGNET. LIGHT PRESSURE, NOT TO EXCEED TWO POUNDS, SHOULD BE USED TO MOVE PLUNGER FROM THE SEATED POSITION.

- c. Position a small flat-blade screwdriver (Fig. 2-8) under the head of the solenoid plunger. Pry the plunger free from the seated position inside the solenoid and check that circuit breaker trips.
- d. Reset circuit breaker handle and check that handle arm moves the reset lever, and that solenoid plunger is pushed into solenoid and held by magnet.
- e. If mechanical check does not work, make sure LEST is correctly installed. If LEST appears to be correctly installed and problem persists, contact Cutler-Hammer.



CAUTION

WHEN INSTALLING THE CIRCUIT BREAKER COVER, MAKE SURE THAT ALL INTERNAL PARTS ARE IN PLACE:

- ARC EXTINGUISHERS ARE IN EACH ARC EXTINGUISHER CAVITY.
- INTERPHASE BARRIER IS FULLY INSERTED IN BASE.
- SLIDING HANDLE BARRIER IS CORRECTLY INSTALLED WITH O ON BARRIER OVER ARC EXTINGUISHER.
- GUIDE *PUSH-TO-TRIP* BUTTON THROUGH HOLE IN COVER USING SMALL SCREWDRIVER.
- COVER BAFFLE(S) IS IN PLACE IN COVER.
- PIGTAIL LEADS ARE IN BASE SLOTS AND CLEAR OF THE COVER.

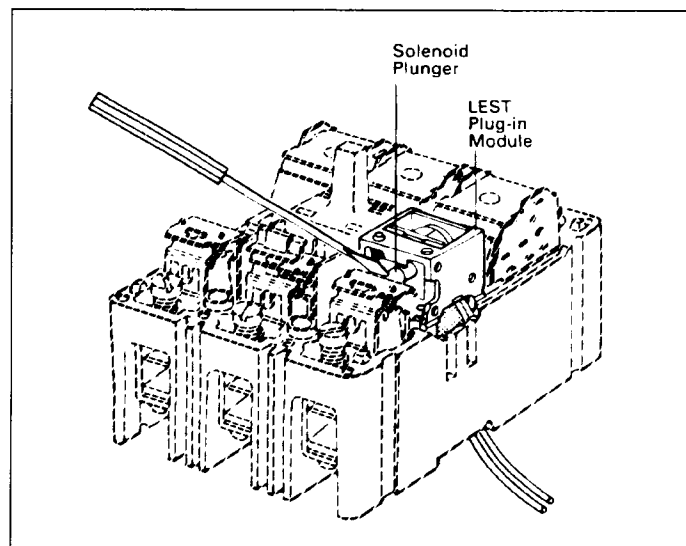


Fig. 2-8. Testing Operation of Solenoid Plunger

- 2-8. With circuit breaker handle in the OFF position and pigtail leads (if used) routed as required, install cover and eight cover screws.
- 2-9. When LEST is installed at an non-UL approved location remove and discard UL listing label.

Note: When installing LEST in 2-pole circuit breakers or circuit breakers with cover mounted accessories, select the alternate label mounting positions on side of circuit breaker.

2-10. Place labels supplied with kit on circuit breaker.
(See Fig. 2-9.)



CAUTION

SOLENOID IS RATED FOR INTERMITTENT DUTY. CONTINUOUS APPLICATION OF VOLTAGE WILL DAMAGE THE SOLENOID.

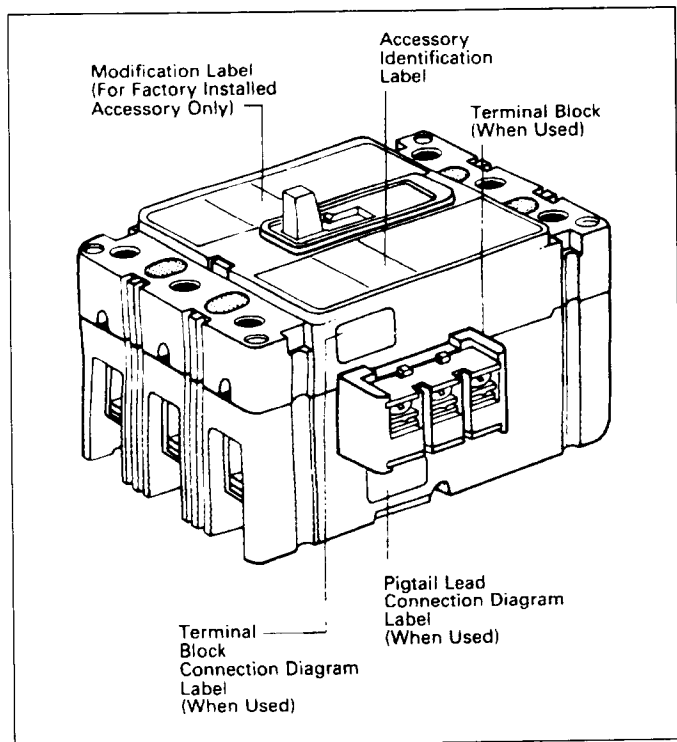


Fig. 2-9. Preferred Mounting Locations for Accessory Nameplate Labels

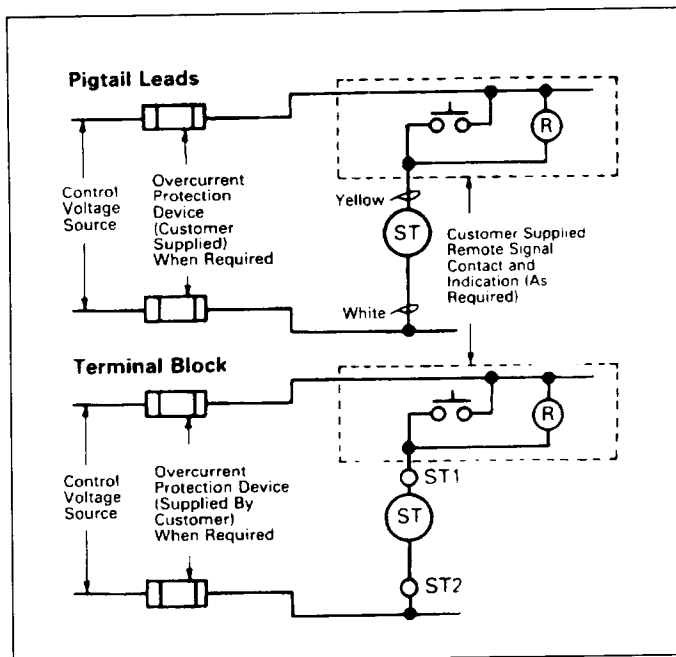


Fig. 2-10. Low Energy Shunt Trip Connection Diagram

2-11. Electrical check. Where practical and after taking all necessary safety precautions, connect yellow LEST lead to positive terminal of a DC power supply and white lead to ground. Reset and close circuit breaker. Confirm that circuit breaker trips when 24 Vdc (maximum pulse of one second) is applied to leads.

2-12. Install circuit breaker.

Note: Accessory labels show connection diagram for LEST contacts. Pigtail leads are color coded yellow and white.

2-13. Connect LEST to ground fault detection circuit to be monitored. (See Fig. 2-10.) Yellow lead is positive.

Cutler-Hammer assumes no responsibility for malfunctioning accessories installed by the customer.