DEH40015

Installation Instructions

R01

Entelliguard TU™, MicroVersaTrip Plus™ and PM™ Conversion Kits

for Allis Chalmers®, Siemens/Allis® LA-4000-Blue Low-Voltage Power Circuit Breakers

INTRODUCTION

GE Conversion Kits are designed for upgrading existing Allis Chalmers®, Siemens/Allis®, and Siemens® low-voltage power circuit breakers, rather than replacing the entire breaker. The Conversion Kits include Entelliguard TU™, MicroVersaTrip Plus™ or MicroVersaTrip PM™ Trip Units, the latest technological advance in GE trip systems.

Entelliguard, MicroVersaTrip Plus and MicroVersaTrip P Conversion Kits are designed and tested to conform to ANSI Standard C37.59, allowing the retrofitter to properly install the kit and acceptance test the breaker.

This publication covers installation of Entelliguard, MicroVersaTrip Plus and MicroVersaTrip PM Conversion Kits on Allis Chalmers®, Siemens/Allis®, and Siemens® LA-4000 low-voltage power circuit breakers. Each Conversion Kit contains all the components needed to convert from the existing trip system.

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SECTION 1. GENERAL INFORMATION

GE Conversion Kit installation is straightforward, but does require careful workmanship and attention to these instructions. Familiarity with the breaker is highly desirable. The general approach is to first remove the existing trip devices from the breaker, then install the Entelliguard, MicroVersaTrip Plus and MicroVersaTrip PM kit components. Following this procedure, the converted breaker is performance tested before it is returned to service.

The majority of trip unit kit installations do not require any customized assembly work. However, some conversions may involve unusual mounting conditions or accessory combinations that require minor modifications and/or relocation of components. In most instances, this supplementary work can be done on site.

In preparation for the conversion, the installer should verify that the appropriate current sensors and trip unit have been furnished. Whenever a ground-fault trip element is installed on a breaker with a four-wire system, an associated neutral sensor (CT) is required for separate mounting in the equipment.

Ensure that retrofitted breakers are applied within their short-circuit ratings. For example, when the trip elements of the breaker are to be changed from long-time instantaneous to long-time short-time, the short-time rating will govern the application.

As a service-related consideration, the installation of a Entelliguard, MicroVersaTrip Plus and MicroVersaTrip PM kit provides an excellent opportunity to perform normal maintenance on the breaker. Such procedures are described in the installation and maintenance manuals supplied with the breaker and equipment.

SECTION 2. BEFORE INSTALLATION

Before starting any work, turn off and lock out all power sources leading to the breaker, both primary and secondary. Remove the breaker to a clean, well-lighted work area.

WARNING: Low-voltage power circuit breakers use high-speed, stored-energy spring operating mechanisms. The breakers and their enclosures contain interlocks and safety features intended to provide safe, proper operating sequences. For maximum personnel protection during installation, operation, and maintenance of these breakers, the following procedures must be followed. Failure to follow these procedures may result in personal injury or property damage.

- Only qualified persons, as defined in the National Electrical Code, who are familiar with the installation and maintenance of low-voltage power circuit breakers and switchgear assemblies, should perform any work on these breakers.
- Completely read and understand all instructions before attempting any breaker installation, operation, maintenance, or modification.
- Turn off and lock out the power source feeding the breaker before attempting any installation, maintenance, or modification. Follow all lock-out and tag-out rules of the National Electrical Code and all other applicable codes.
- Do not work on a closed breaker or a breaker with the closing springs charged. Trip the breaker OPEN and be sure the stored-energy springs are discharged, thus eliminating the possibility that the breaker may trip open or the closing springs discharge and cause injury.
- Trip the breaker OPEN, then remove the breaker to a well-lighted work area before beginning work.
- Do not perform any maintenance that includes breaker charging, closing, tripping, or any other function that could cause significant movement of a draw-out breaker while it is on the draw-out extension rails.
- Do not leave the breaker in an intermediate position in the switchgear compartment. Always leave it in the CONNECTED, TEST, or DISCONNECTED position. Failure to do so could lead to improper positioning of the breaker and flashback.
- Refer to DEH-4567 for supplementary instructions of settings of the Entelliguard Electronic Trip Unit.
- Refer to DEH-3456 for supplementary instructions for wiring the RELT circuit.
- Refer to DEH-6273 for supplementary instructions of settings of the MicroVersaTrip Plus and MicroVersaTrip PM.

SECTION 3. BREAKER PREPARATION

The following steps are performed to prepare the breaker for installation of the new conversion kit. Unless otherwise indicated, the procedure is the same for LA-3000 Gold, LA-4000 Gold, RL-3200 and RL-4000 breakers.

WARNING: Before installing the conversion kit, turn the breaker OFF, disconnect it from all voltage sources, and discharge the closing springs.

1. Open the breaker and remove it from its enclosure. Carefully place the breaker on a suitable work surface so that the rear of the breaker is initially accessible.
2. If the conversion kit is to be installed on a fused breaker (LAF series), remove the fuse structure from the upper (line) studs to allow easier access to the load studs. Additional work may be required to install kit into fused breaker.
3. Loosen the three Allen-head screws securing each of the primary disconnects to the line (upper) and load (lower) studs and remove the primary disconnects.
4. Remove the wires from the original current sensors (CTs), if present, and slide off the CTs.
5. Remove manual charging handle. Remove the two bolts holding the escutcheon to the breaker frame and lift off the escutcheon.
6. Remove old flux shifter and mounting bracket. Also remove old trip unit and its mounting bracket along with its wire harness.

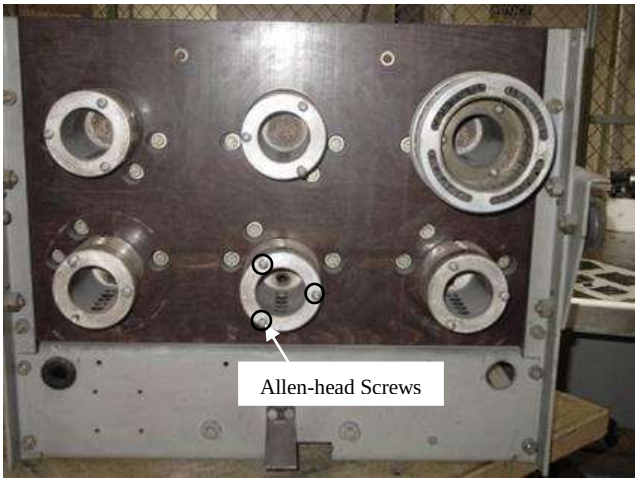
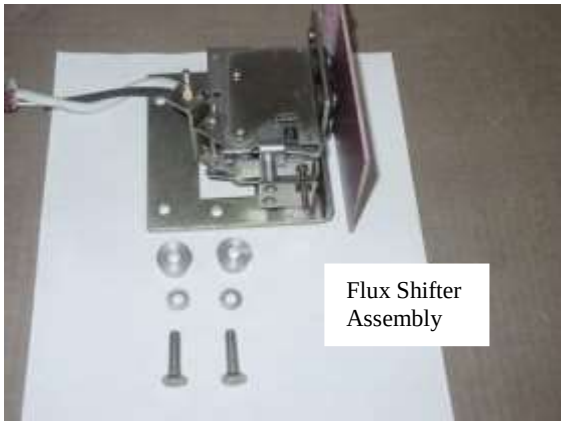
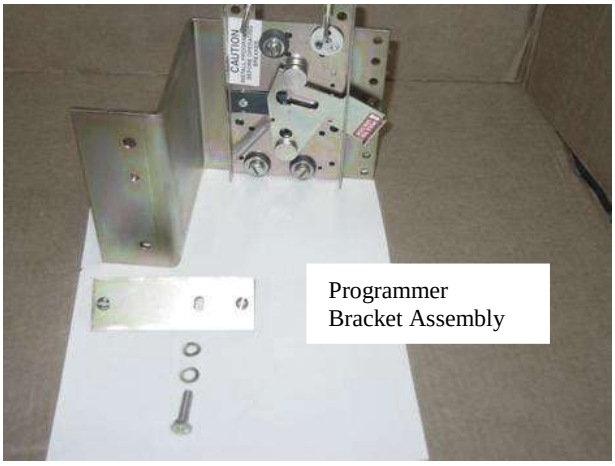


Figure 1: Primary disconnects removed from bottom studs

SECTION 4. INSTALLING THE CONVERSION KIT

This section describes the installation of the Entelliguard, MicroVersaTrip Plus and MicroVersaTrip PM and conversion kit. The components provided with the kit are shown in Fig 2.





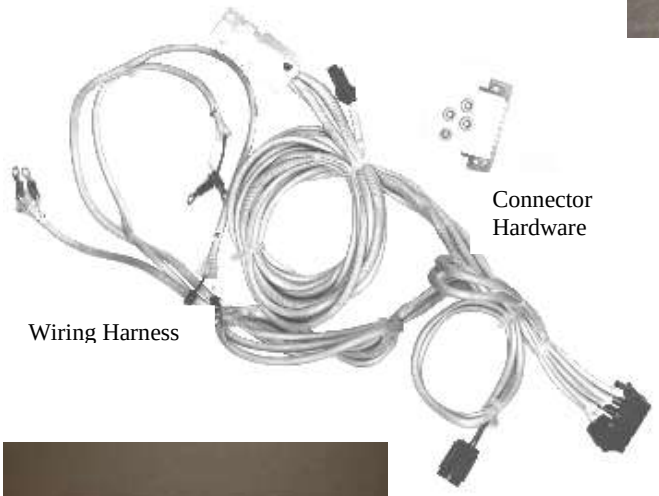


Figure 2: Components supplied with the conversion kit

Installing Flux Shifter Reset Bracket

Replace existing reset bracket with new bracket as shown in Figure 3 and Figure 4 below:

Figure 3: Old and New Reset Assembly

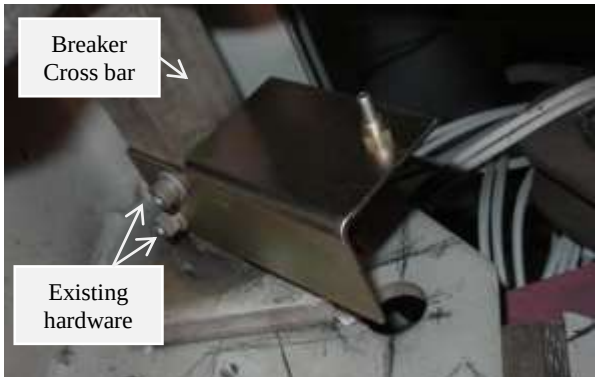


Figure 4: Installed Reset Assembly

Install Flux Shifter Asm

The Flux shifter mounting location is shown in Figure 5 below:

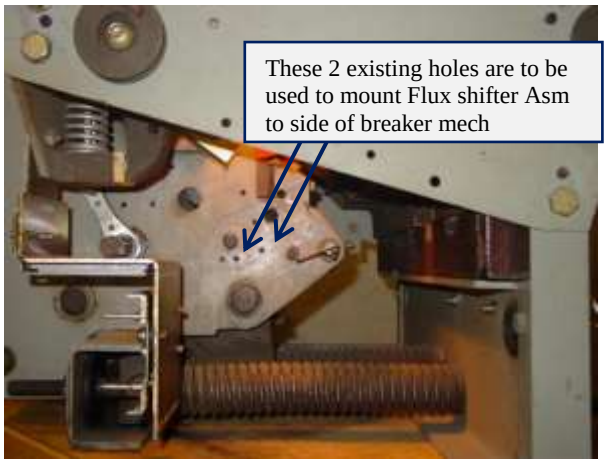


Figure 5: Flux Shifter mounting location

Mount Flux Shifter assembly to breaker frame as shown in figures 6 and 7.

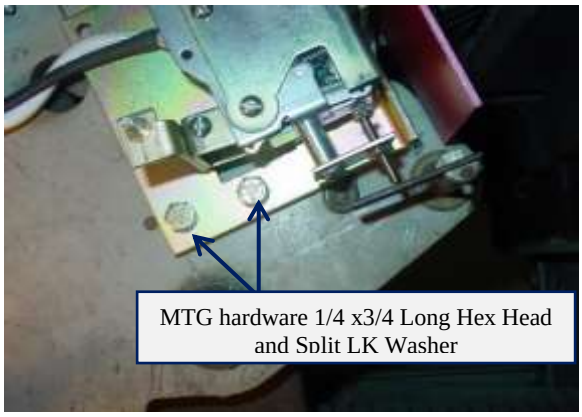


Figure 6: Flux Shifter mounting

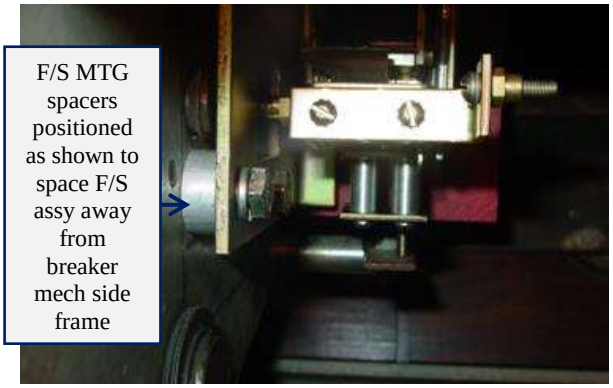


Figure 7: Flux Shifter mounting

Install the Reset Link between the reset Bracket and Flux Shifter Assembly as shown in Figure 8.

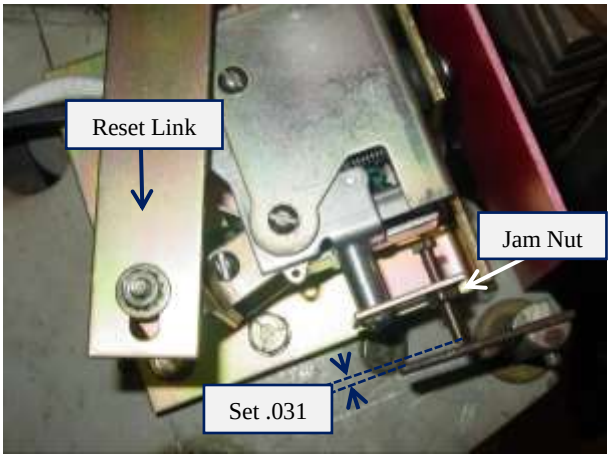


Figure 8: Installing Reset Link

Adjust Flux Shifter to breaker latch with breaker in the charged position. Set the .031 dimension as shown in figure 8 and lock with Jam nut.

Installing the Trip Unit Wiring Harness

CAUTION: Pins in the connectors may come loose in shipping. Check all wiring harness connectors to ensure that the pins are tight. Reseat pins as necessary.

Use the following procedure to install the trip unit wiring harness to the mounting plate.

1. The wiring harness includes a 36-pin connector, shown in Figure 9, that must be assembled and installed onto the trip unit mounting plate before the trip unit can be installed.

CAUTION: The adapter bracket must be installed onto the trip unit 36-pin connector and trip unit mounting plate as described below. Failure to do so will result in harness plug failure and the trip unit will not provide protection. If the converted breaker is energized or primary injected with the mounting plate not installed or installed improperly, damage will result to the trip unit, wire harness, 36-pin connector, and current sensors. Failure to adhere to these instructions will void all warranties.

2. Slide the adapter bracket onto the 36-pin connector, as shown in Figure 10. Be sure that the beveled corners of the trip unit connector are facing toward the right side, the adapter bracket slides are in place behind the notches on either side of the connector body, and the connector's tabs align with the notches on the bottom of the adapter bracket.
3. Hold the adapter bracket tight to the trip unit connector and bend the two locking tabs on the adapter bracket over the connector body, as shown in Figure 11.

Figure 9. 36-pin trip unit connector

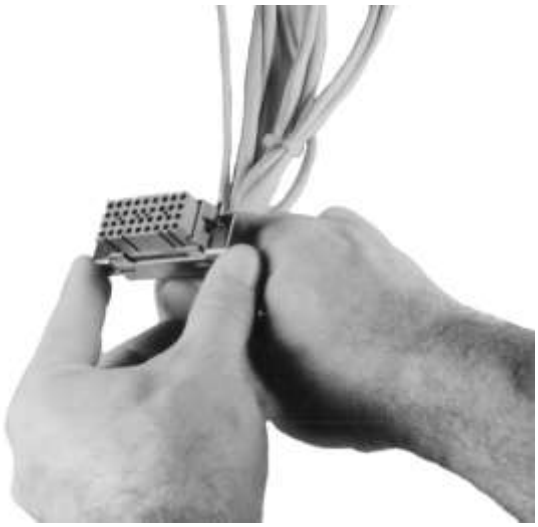


Figure 10 36-pin connector adapter bracket

Figure 11. Adapter bracket locking tabs

4. Slide the adapter bracket and connector assembly over the guide pins of the trip unit bracket. Press the two steel push nuts provided onto the guide pins using a nut driver, as shown in Figure 12, until the assembly is held firmly against the trip unit mounting plate.

5. While holding the adapter bracket and connector assembly firmly in place against the mounting plate, bend the two locking tabs on the mounting plate into the mating notches on the adapter bracket using a screwdriver, as shown in Figure 13.

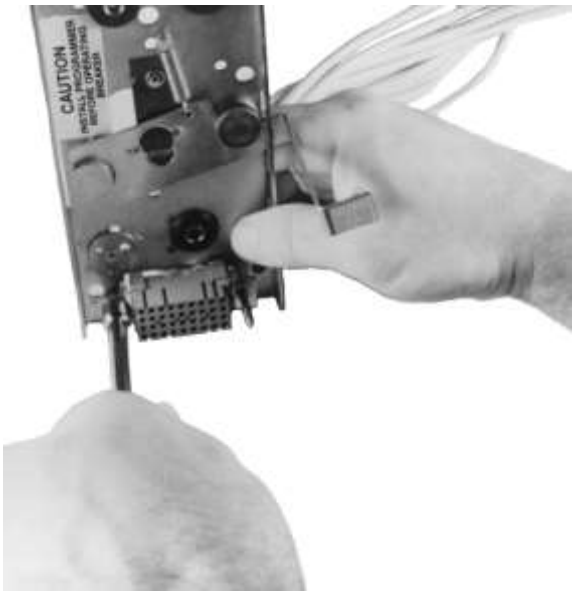


Figure 12. Installing the push nuts onto the guide pins

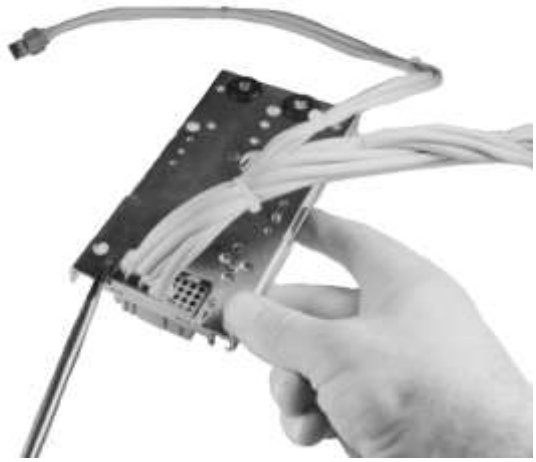


Figure 13. Locking tabs on mounting plate

Installing the Trip Unit Mounting Bracket

Install Trip Unit mounting bracket as shown in figure 14 and secure in this position with locking plate shown in Figure 15.

Figure 14: Trip Unit bracket mounting

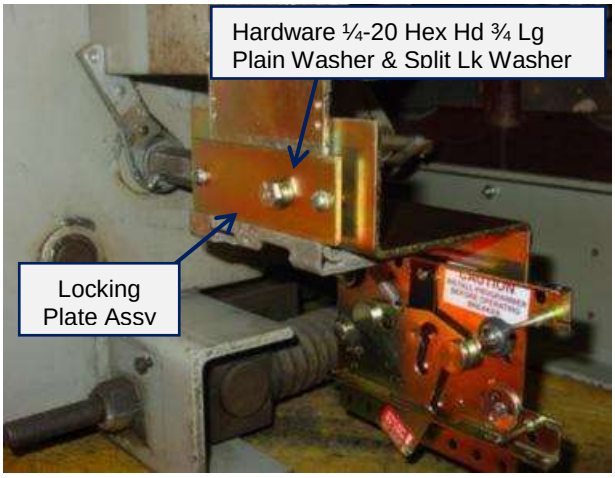


Figure 15: Securing Trip Unit bracket

Installing the Current Sensors

Install current sensors as shown in Figure 16 and 17.

Figure 16: Position of current sensors

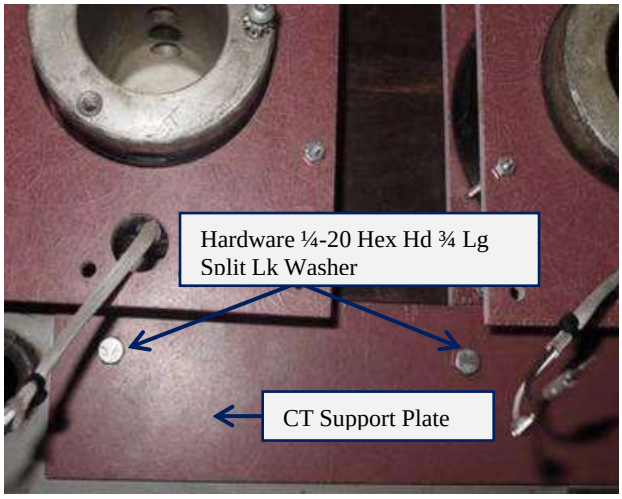


Figure 17: Installing Current sensors

Use existing holes in the breaker back frame to mount C/T support plate.

Next install the wire harness to the Current Sensors as shown in Figure 18 below:

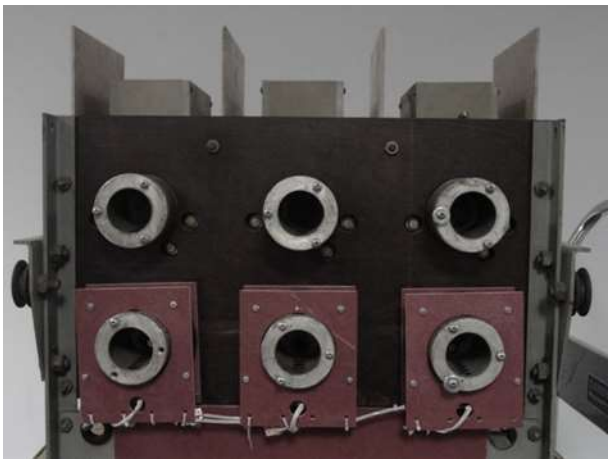


Figure 18: Installing Wire Harness

Connect the CT leads from the trip unit harness to each of the CT's. The leads are labeled with the letter of the corresponding pole (A is the right pole from the rear of the breaker, B is the center, C is the left), and are also cut to the appropriate lengths. Attached the white wire to the terminal marked white.

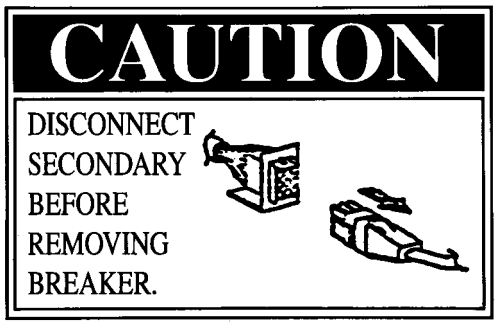
Reattach the primary disconnect assemblies to all the studs. To aid in reinstalling disconnect 3-1/4-20 ¾ long screws are supplied in hardware package. These screws are used (only) to help force disconnects onto their corresponding studs. Disconnects are to be secured in position using the original breaker hardware.

Installing the Communications Harness

The communications harness is used if the trip unit is to communicate with a power management control system. The communications connector, included in the trip unit wiring harness, is mounted with the supplied angle bracket. This bracket has two small holes on one arm for attaching with screws to a convenient spot on the breaker frame and a large rectangular hole in the other arm for mounting the connector.

The communications connector should be installed on the breaker on the same side as the breaker compartment's door hinge, to protect it from damage when the compartment door is opened or closed. Attach the supplied caution labels, shown in Figure 19, to both the breaker and the compartment door as a warning to disconnect the communications harness before removing the breaker from the compartment.

Figure 19. Caution label to be applied to the breaker and compartment door



Note: If communications is not required for this application, install the two pin wire harness (supplied with the kit) to provide 24V DC to the trip unit. Power supply of 24V DC is essential for advanced functions of the trip unit such as backlight display, status LED indicator, event log etc.

SECTION 5. INSTALLING THE TRIP UNIT

Use the following procedure to install the trip unit.

1. Pull out the locking lever on the trip unit mounting plate until it snaps into the open position, as shown in Figure 12.
2. Carefully line up the 36-pin connector mounting pins with the two holes on the sides of the connector cutout on the rear of the trip unit. The alignment pin on the rear of the trip unit must fit through the hole in the locking lever.
3. Push the trip unit against the mounting plate until it locks into position. The locking lever will automatically snap back to secure the trip unit. Figure 26 shows an installed trip unit.

CAUTION: Ensure that the trip unit connector is seated firmly into the 36-pin connector on the mounting plate. Improper mating of the connectors will cause damage to the trip unit, wire harness, connector, and current sensors.

4. The breaker escutcheon may now be reattached. To remove the trip unit, slide out the locking lever to release the alignment pin, then carefully pull the trip unit straight off the mounting plate.

Figure 20. Trip unit installed on the breaker

SECTION 6. FOUR-WIRE GROUND FAULT OPTION

The ground fault option for four-wire installations requires the installation of an additional current sensor on the neutral bus in the equipment. The sensor is connected to the trip unit through the connector provided in the wiring harness.

1. Mount the neutral sensor on the outgoing neutral lead, normally in the bus or cable compartment in the equipment. Figure 27 shows the sensor outlines for the 3000 A through 4000 A frame sizes.
2. Connect the neutral sensor wire harness to the correct taps on the sensor. To maintain the same polarity as the phase sensors, connect the white wire to the common terminal, black to the tap.
3. Route the wires through the equipment and connect to the two-pin connector on the trip unit wiring harness, routed through the rear of the breaker with the CT wires. The wires should be tied to the breaker frame in an easily accessible location.

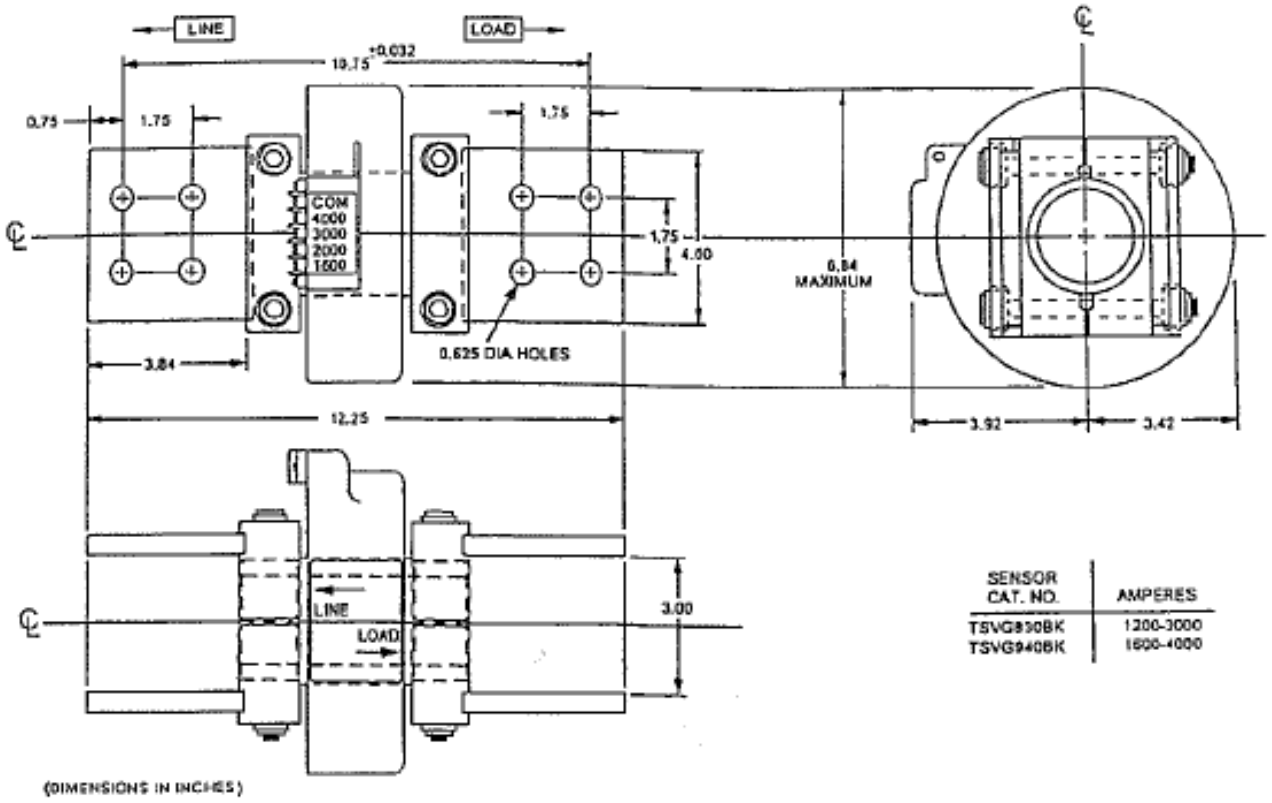


Figure 21. Neutral sensor outline for 3000A through 4000A breakers

SECTION 7. TESTING AND TROUBLE-SHOOTING

WARNING: Do not change taps on the current sensors or adjust the trip unit settings while the breaker is carrying current. Failure to adhere to these instructions will void all warranties.

Testing

1. Verify that the trip unit is securely installed by performing a continuity test on the CT wiring and the trip unit.
   - **a.** Disconnect the black CT wires at each phase sensor.
   - **b.** Check for continuity with a continuity tester or VOM from the white lead of the phase A CT to the white lead of the phase B CT.
   - **c.** Repeat this continuity test for the white leads of the phase A and phase C CTs.
   - **d.** Measure the resistance across each phase sensor and compare the values measured to the values listed in Table 1.
   - **e.** Reconnect the black CT leads to all of the phase sensors. Ensure that this is done before continuing with performance testing of the breaker.

CAUTION: In addition to the continuity test described in Step 1 and before performance testing of the converted breaker, each phase of the breaker should be primary injected with a current level of about 10%, but no more than 20%, of the CT rating. During the application of test current, activate the trip unit screen by depressing the battery button on the trip unit face and check that the test current is displayed on the screen for each phase tested. If the trip unit fails to display the test current, stop the test immediately and verify the installation of the trip unit and wire harness before proceeding with any additional testing.

WARNING: If the converted breaker is energized or tested by primary injection with a sufficiently high test current with a loose or open circuit between the CTs and the trip unit, damage will occur to the trip unit, wire harness, 36-pin trip unit connector, and CTs. Failure to adhere to these instructions will void all warranties.

2. Check the insulation on the primary circuit with a 1,000-volt Meggar.
3. Measure the resistance across the line and load terminals for each phase using a micro-ohmmeter or millivolt tester. If the resistance differs considerably from phase to phase,

the electrical connections may not be properly tightened or it could also indicate improper contact wipe.

4. To verify that the breaker has been properly retrofitted, perform a primary injection test on each phase. This test will check the CTs, bus, wiring harness, flux shifter, and trip unit as a complete system.
   a. A high-current, low-voltage power supply should be connected across each line and load terminal to simulate an overcurrent fault.
   b. Set the long-time trip at 0.5 to minimize the breaker stress.
   c. When ground fault is installed, the test can be performed by wiring two adjacent poles in series or by using the GE Digital Test Kit, cat. no. TVRMS2. This will prevent the breaker from tripping because of an unbalanced current flow. For Entelliguard TU use GTUTK20.

CAUTION: Do not attempt to use GE Test Kit cat. no. TVTS1 or TVRMS on Entelliguard trip unit and do not use GTUTK20 on MVT trip unit.

Trouble-Shooting

When malfunctioning is suspected, first examine the breaker and its power system for abnormal conditions such as the following:

- The breaker is not tripping in response to overcurrent conditions or incipient ground faults.
- The breaker is remaining in a trip-free state because of mechanical interference along its trip shaft.
- The shunt trip (if present) is activating improperly.

Nuisance Tripping on Ground Fault-Equipped Breakers

When nuisance tripping occurs on breakers equipped with ground fault trip, a probable cause is the existence of a false ground signal. Each phase sensor is connected to summing circuitry in the trip unit. Under no-fault conditions on three-wire load circuits, the currents add to zero and no ground signal is developed. This current sum is zero only if all three sensors have the same electrical characteristics. If one sensor differs from the others (such as by a different rating or wrong tap setting), the circuitry can produce an output sufficient to trip the breaker. Similarly, a discontinuity between any sensor and the trip unit can cause a false trip signal.

The sensors and their connections should be closely examined if nuisance tripping is encountered on any breaker whose Entelliguard, MicroVersaTrip Plus or MicroVersaTrip PM trip unit has previously demonstrated satisfactory performance. After disconnecting the breaker from all power sources, perform the following procedure:

1. Check that all phase sensors are the same type (current range).
2. Verify that the tap settings on all three phase sensors are identical.
3. Verify that the wiring harness connections to the sensors have the proper polarity (white lead to common, black lead to tap), as shown in the cabling diagrams1.
4. On ground fault breakers serving four-wire loads, check that the neutral sensor is properly connected, as indicated in Figure 27. In particular, check the following:
   a. Verify that the neutral sensor has the same rating and tap setting as the phase sensors.
   b. Verify continuity between the neutral sensor and its equipment-mounted secondary disconnect block. Also check for continuity from the breaker-mounted neutral secondary disconnect block through to the trip unit wiring harness connector.
   c. If the breaker's lower studs connect to the power source, then the neutral sensor must have its load end connected to the source.
   d. Verify that the neutral conductor is carrying only the neutral current associated with the breaker's load current (the neutral is not shared with other loads).
5. If the preceding steps fail to identify the problem, then measure the sensor resistances. The appropriate values are listed in Table 1. Since the phase and neutral sensors are electrically identical, their resistances should agree closely.

Breaker	CT Rating, A	Resistance, ohms
LA-4000-Blue	4000	29–39

Table 1. CT resistance values.

These instructions do not cover all details or variations in equipment nor do they provide for every possible contingency that may be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise that are not covered sufficiently for the purchaser's purposes, the matter should be referred to the GE Company.

GE Industrial Systems

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