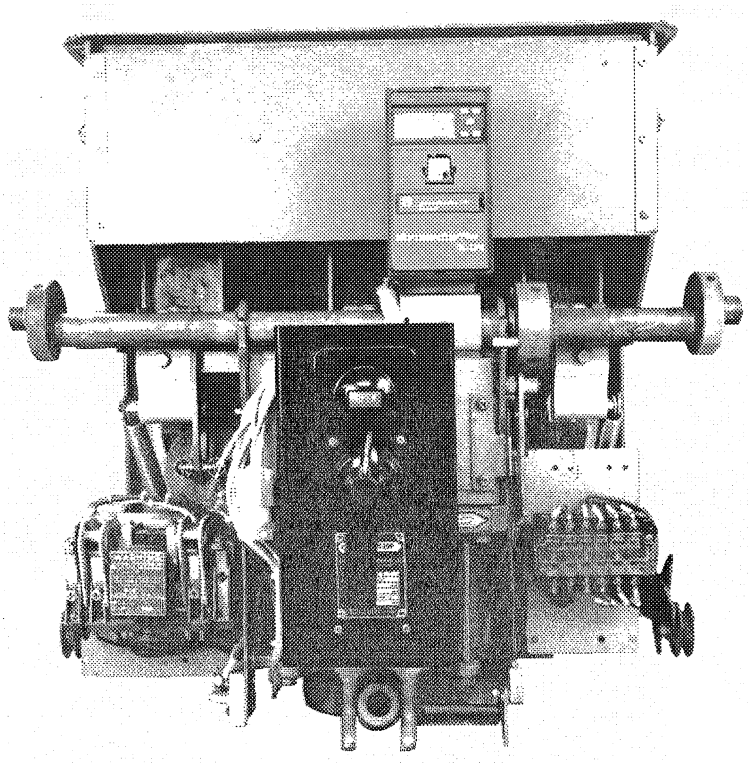
DEH-40019A Installation I/nstructions

Micro Versa Trip Plus™ and Micro Versa Trip PM™ Conversion Kits

For I-T-E® Types KD and KE Low-Voltage Power Circuit Breakers

INTRODUCTION

Conversion Kits are designed for upgrading existing I-T-E® low-voltage power circuit breakers, rather than replacing the entire breaker. The Conversion Kits include MicroVersaTrip Plus™ or MicroVersaTrip PM™ Trip Units, the latest technological advance in trip systems.



MicroVersaTrip Plus and MicroVersaTrip PM 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 MicroVersaTrip Plus and MicroVersaTrip PM Conversion Kits on I-T-E KD and KE 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

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 MicroVersaTrip Plus™ or MicroVersa- Trip 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. c

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 MicroVersaTrip Plus or 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 posi-tion 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.

SECTION 3. INSTALLING THE CONVERSION KIT

I-T-E® KO and KE breaker frames need not be separated front and back for installation of the Conversion Kit. The general procedure is to remove the existing parts, as necessary, then install the kit.

First, remove the breaker to a clean, well-lighted work bench and place it in the upright position, so that both the front and back are easily accessible.

Figure 1 shows a KE breaker before conversion.

Installing and Adjusting the Flux Shifter Assembly

1. Remove the three trip paddles on the common trip bar, as shown in Figure 2. The center trip paddle must be accessed from the bottom of the breaker.

WARNING: The old trip devices may be left in place. Without their trip paddles, they will still actuate but won't trip the circuit breaker. Removing the tdp devices requires separation of the breaker front and back frames. This is not necessary for this conversion.

2. Remove the two 1/4-20 bolts, nuts, and lock washers securing the trip arm adjusting bracket, shown in Figure 2, to the front frame.
3. Disconnect the opening spring, shown in Figure 2, along with any accessory connections, from the movable contact arm. Save all hardware removed for later re installation. Figure 3 shows the breaker with the trip paddle removed, the opening spring disconnected, and the other accessory links disconnected.

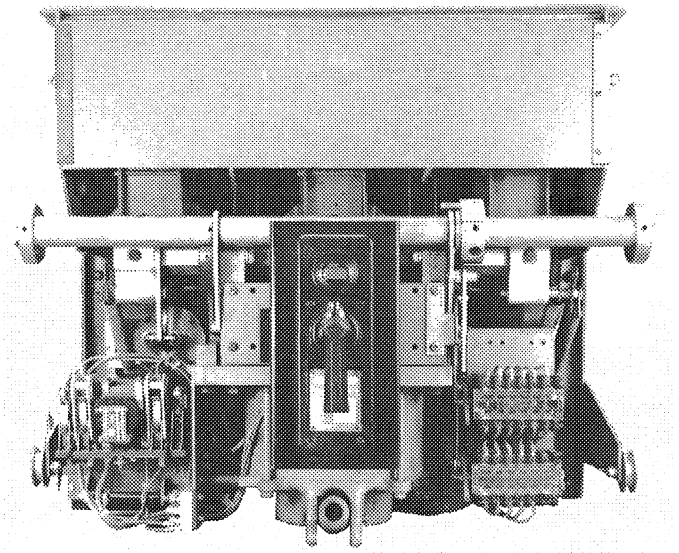

Figure 1. I-T-E® KE breaker before conversion to operation with a MicroVersaTrip Plus™ or MicroVersaTrip PM™trip unit.

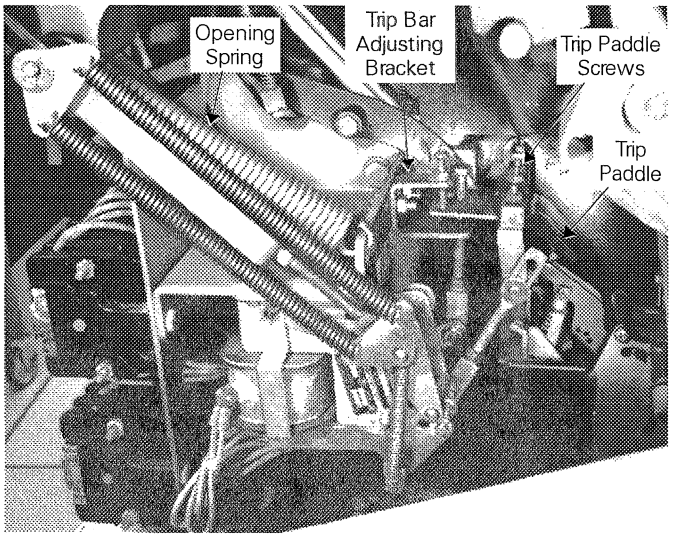

Figure 2. Existing trip device and trip paddle.

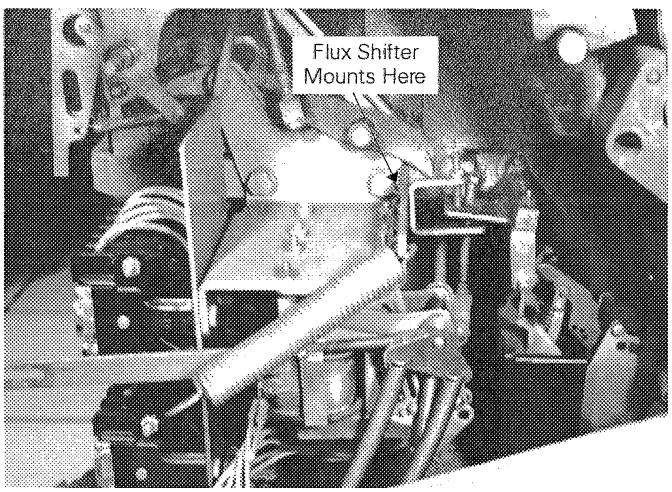

Figure 3 Breaker ready for installation of the fluxshifter assembly.

4. Attach the flux shifter assembly mounting plate to the front of the angle bracket, as indicated in Figure 3. Use the bolts, nuts, and lock washers removed in step 2, with the bolts going in order through the flux shifter mounting plate, the angle bracket, and the trip arm adjusting bracket, as shown in Figure 4.

5. Attach the new trip paddle to the trip arm with the two hex - head #8-32 x 1" screws and SEMS nuts supplied. The screws should go through the existing latch adjuster and trip bar, and the new trip paddle, as shown in Figure 4.

6. Attach the flux shifter reset arm to the flux shifter assembly by placing the following parts in sequence on the mounting pivot on the flux shifter assembly, as shown in Figures 5, 6, and 7:
   a. a 3/8" flat washer,
   b. the reset arm, as follows:
      - KD breaker - wider end at the pin,
      - KE breaker - chamfered corner above the pin,
   c. a 3/8" flat washer, and
   d. an E-ring in the slot on the pin.

7. Attach the flux shifter reset arm to the movable contact arm by placing the following parts in sequence on the opening spring shaft, at the opposite end from the opening spring, as shown in Figures 5, 6, and 7:
   a. a 3/8" flat washer,
   b. the reset arm,
   c. a 3/8" flat washer, and
   d. a spring clip in the slot on the pin.

If there is not enough clearance on the spring shaft to mount all the parts with enough play to allow the reset arm to rotate freely, tap the other end of the shaft to drive it through.

8. Reattach the opening spring and accessory links by placing the following parts onto the opening spring mounting pin, as shown in Figures 5, 6, and 7:
   a. the original spacer, removed in step 3,
   b. the opening spring,
   c. the large spacer,
   d. one or more 1/4" flat washers, as needed to take up any slack,
   e. the accessory link,
   f. a 1/4" flat washer, and
   g. the spring clip.

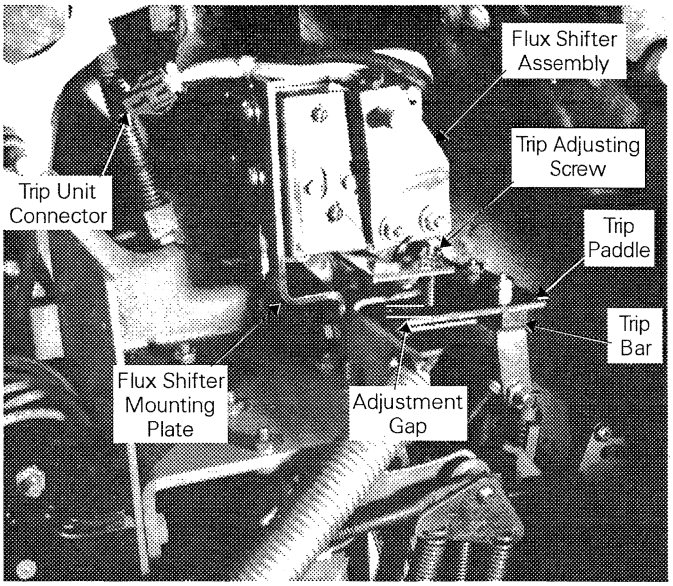

Figure 4. Mounting the flux shifter and new trip paddle.

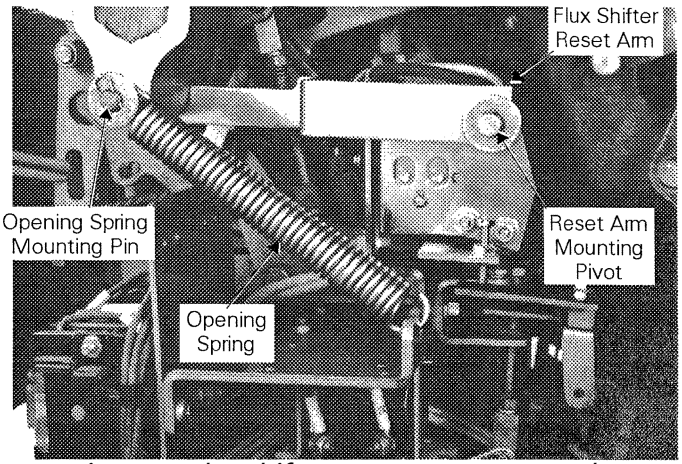

Figure 5. Flux shifter reset arm connected on a KD breaker.

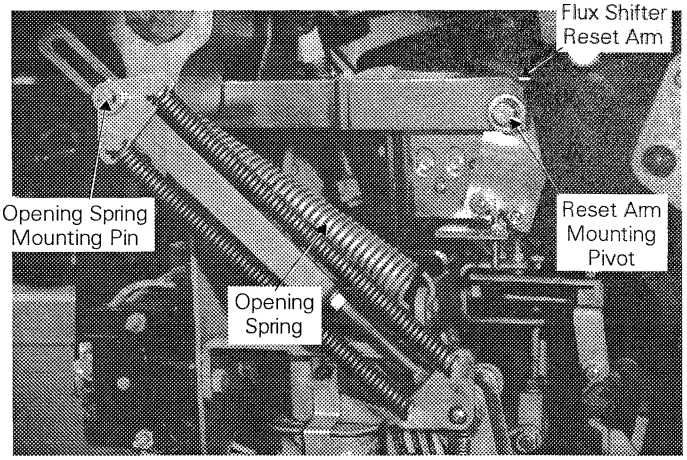

Figure 6. Flux shifter reset arm connected on a KE breaker.

9. Adjust the trip paddle by setting the gap, as shown in Figure 4, to 0.06 inch with the breaker OPEN.

CAUTION: Proper maintenance, lubrication, and setting of the trip latch engagement is essential for proper flux shifter operation. This procedure is described in the breaker manufacturer's maintenance manual.

Flux Shifter Test

Upon completion of flux shifter installation and before primary injection testing, a static trip test should be performed, as follows:

1. Close the breaker.
2. Restrain the flux shifter tripping arm with the flat blade of a screwdriver.
3. Apply 9 Vdc to the flux shifter leads (red lead is positive).
4. Slowly release the flux shifter tripping arm. The breaker should trip.

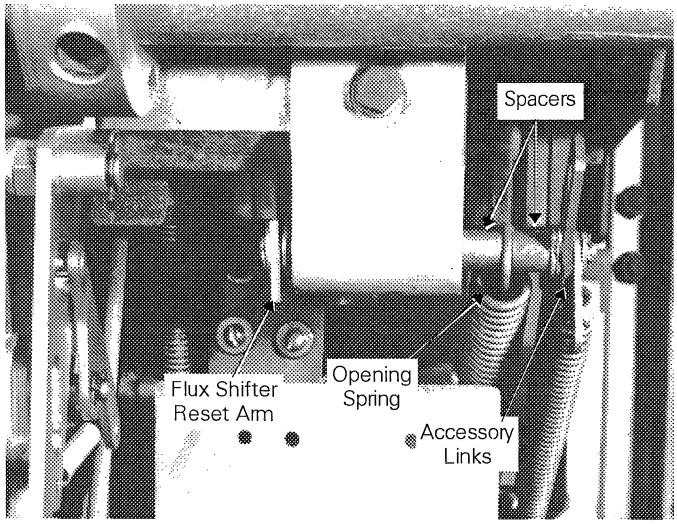

Figure 7. Flux shifter installation from the front of the breaker.

Installing the Trip Unit Wire Harness

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1. The wiring harness includes a 36-pin connector, shown in Figure 8, 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 9. 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 10.

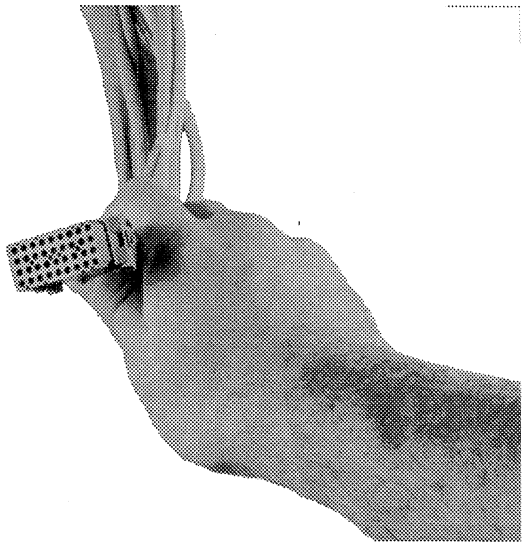

Figure 8. 36-pin trip unit connector.

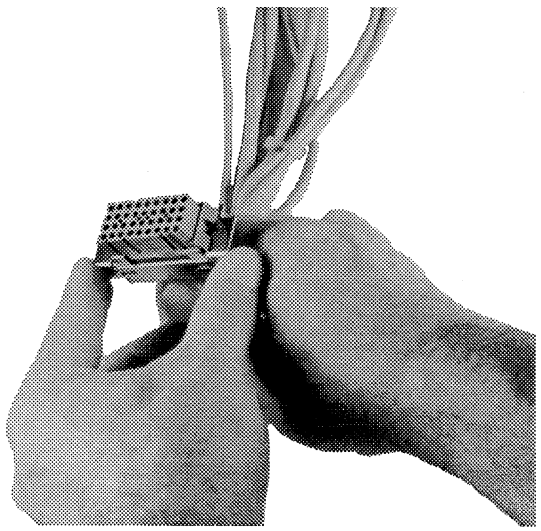

Figure 9 36-pin connector adapter bracket.

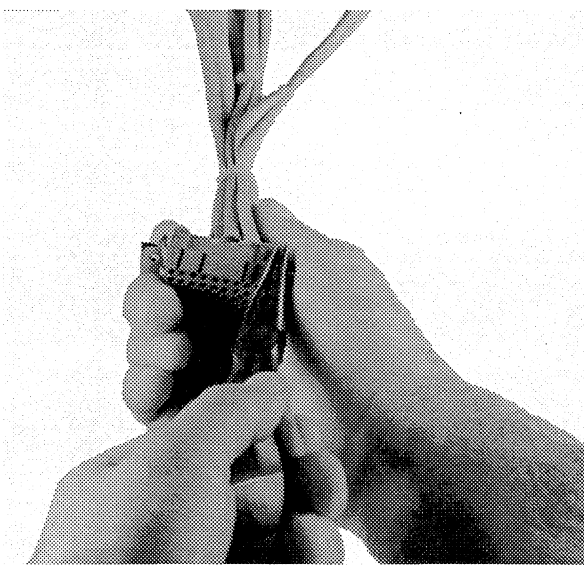

Figure 10. Adapter bracket locking tabs.

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 11, 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 12.

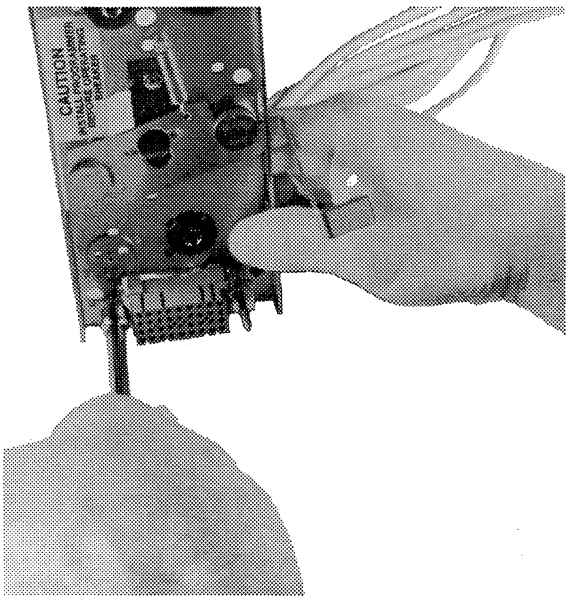

Figure 11. Installing the push nuts onto the guide pins.

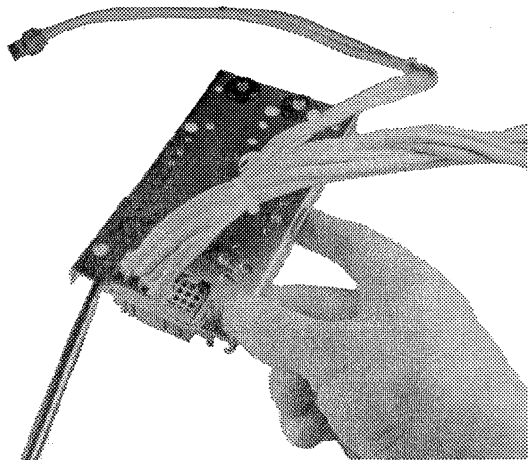

Figure 12. Locking tabs on mounting plate.

Installing the Trip Unit Mounting Plate

1. Attach the trip unit mounting plate to the support bracket, as shown in Figure 13.
   a. The two larger screws at the top attach to tapped holes in the support bracket.
   b. Pull out the locking lever, as shown, then insert the small screw through the hole.
   c. Secure the small screw with the flat washer, lock washer, and nut.
2. Remove and save the two Philips-head screws and lock washers securing the lockout bracket, shown in Figure 14, to the front of the breaker.
3. Place the trip unit mounting plate and support bracket in position on the front of the breaker, lining up the two holes in the support bracket with the two mounting holes for the lockout bracket removed in step 2. Replace the lockout bracket with its two screws and lock washers over the trip unit bracket to secure the trip unit mounting plate, as shown in Figure 15.

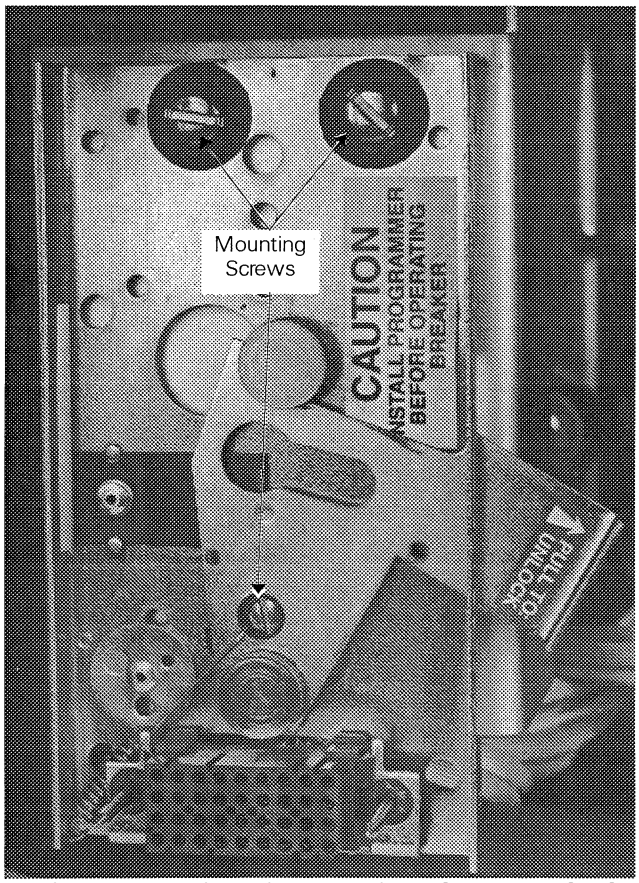

Figure 13. Trip unit mounting plate attached to the support bracket.

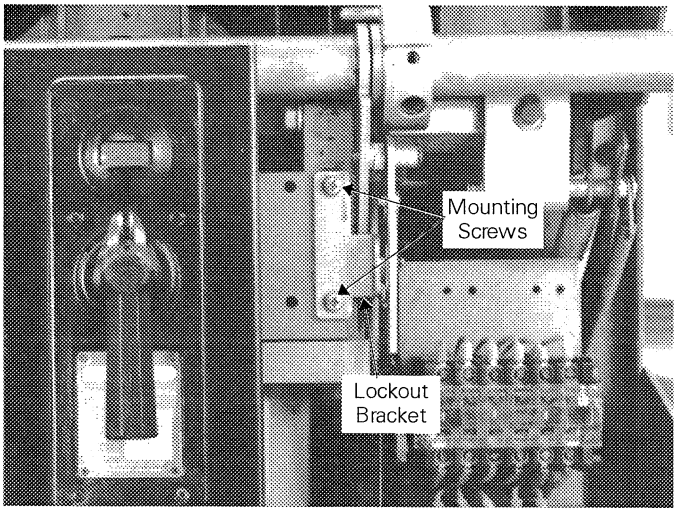

Figure 14. Lockout bracket on the front of the breaker.

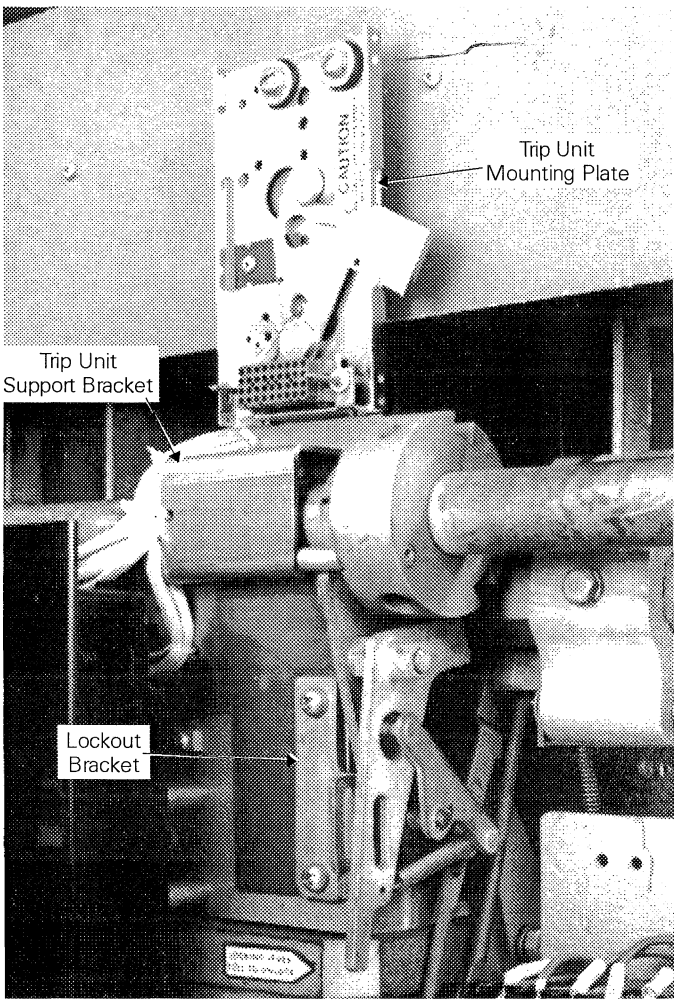

Figure 15. Trip unit mounting plate attached to the breaker.

4. Route the four-pin flux shifter connector behind the closing solenoid, out between the right side of the solenoid and the auxiliary switch, to the flux shifter assembly and mate it with the connector from the flux shifter. Secure the cable to the flux shifter bracket with wire ties so that the cable does not interfere with any moving parts.
5. Route the wiring harness down between the closing solenoid and closing contactor, as shown in Figure 16. Continue with the CT leads under the breaker, through the opening where the secondary control leads exit. Bring the leads up the right side of the breaker (looking from the rear) to the line-side primary disconnects. Secure the harness to the breaker frame with wire ties, as needed.
6. If the trip unit is to be connected to a communi-cation network, attach the communications connector, with its mounting bracket, to an accessible location. See "Installing the Communications Harness" below. Otherwise, secure the connector to some convenient point on the breaker frame with wire ties.
7. If a neutral sensor is to be used in the equipment, connect the two-pin connector to the connector from the neutral sensor. See "Section 5. Four-Wire Ground Fault Option." Otherwise, secure the connector to some convenient point on the breaker frame with wire ties (with the communication connector, iif also unused).

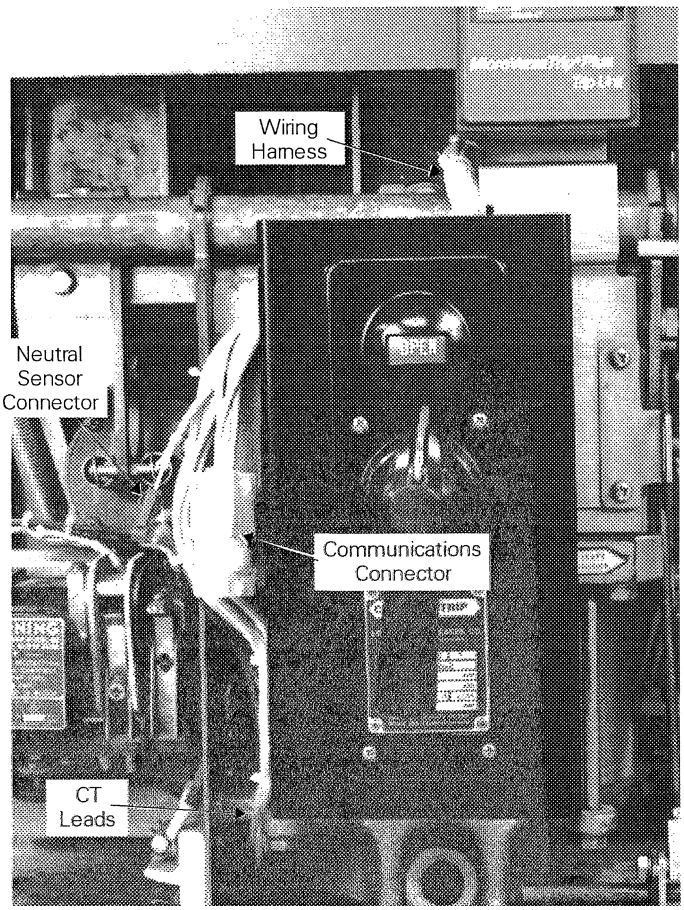

Figure 16. Routfog the trip unit wiring harness to the CTs.

Installing the Current Sensors

1. To remove the primary disconnect assemblies from the Ii ne-side stabs, as shown in Figures 17 and 18, do the following:
   a. Loosen the two bolts at the top of each set of fingers.
   b. Lift the locking plate over the tab on the top of the stab.
   c. Slide the top of the finger assembly away from the stab and lift it off.
2. Mount the new CTs onto the bare stabs with the terminals pointing down, as shown in Figure 19.
3. Connect the CT leads to the CTs, attaching the white lead to the terminal indicated by the white dot, as shown in Figure 19. The leads are labeled with the letter of the corresponding pole (A is the right pole from rear of the breaker, B is the center pole, C is the left pole), and are also cut to the appropriate lengths.
4. Secure the CT leads to the breaker frame with wire ties.
5. Reattach the primary disconnect assemblies to the stabs, as shown in Figure 20:
   a. Slide the mounting plate at the bottom of the disconnect into the slot on the bottom of the stab.
   b. Swing to the top of the disconnect in over the tab on the top of the stab.
   c. Tighten the two mounting bolts to secure the disconnect assembly to the stab.

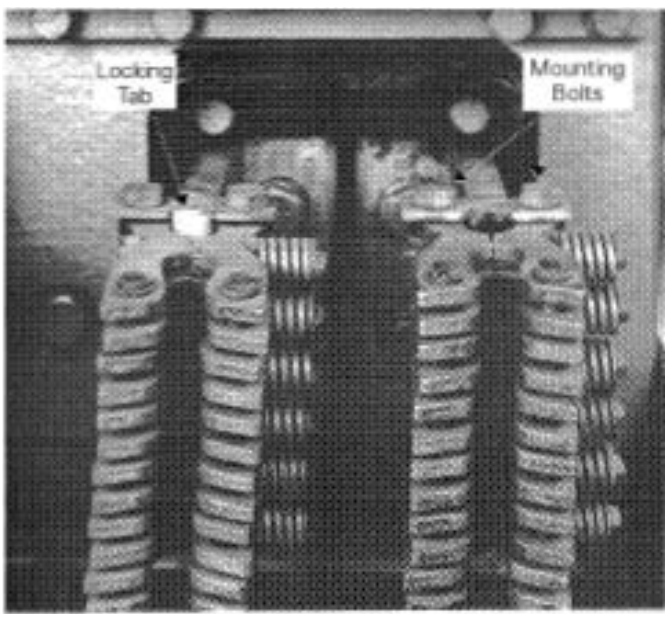

Figure 17. Primary disconnect assemblies.

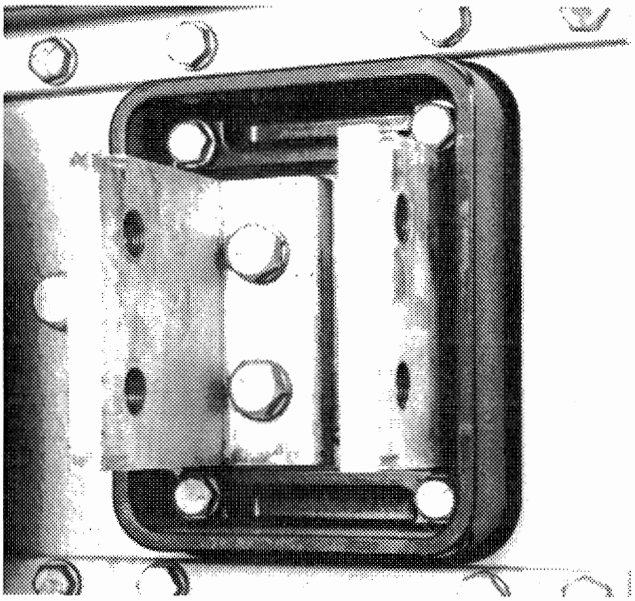

Figure 18. Primary disconnects removed from the line stabs.

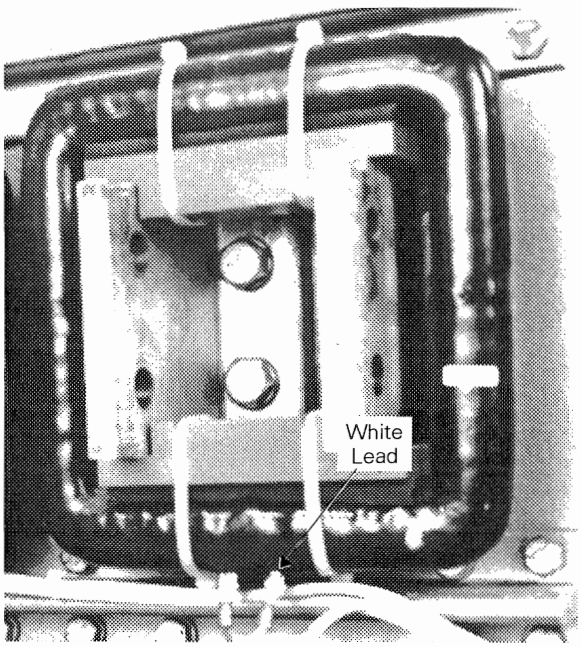

Figure 19. Mounting and wiring the current sensors.

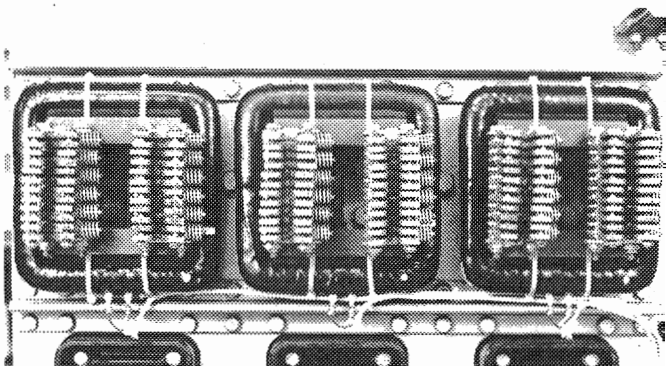

Figure 20. CTs installed on the breaker.

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 brackethas 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 21, to both the breaker and the compartment door as a warning to disconnect the communications harness before removing the breaker from the compartment.

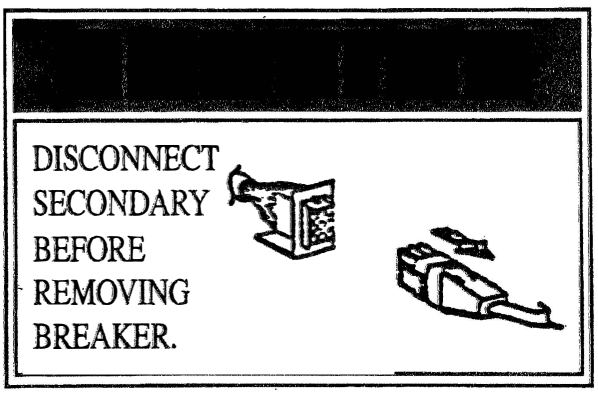

Figure 21 Caution label to be applied to the breaker and compartment door.

SECTION 4 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 15.
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 22 shows an installed.

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.

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.

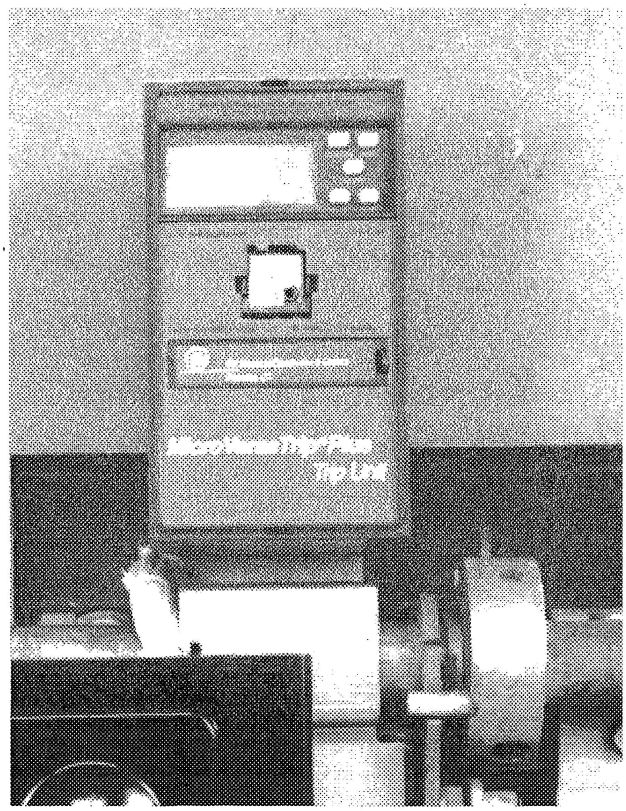

Figure 22. Trip unit installed on the breaker.

SECTION 5. 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 23 shows the sensor outlines for the 3000 A and 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. The wires should be tied to the breaker frame in an easily accessible location.

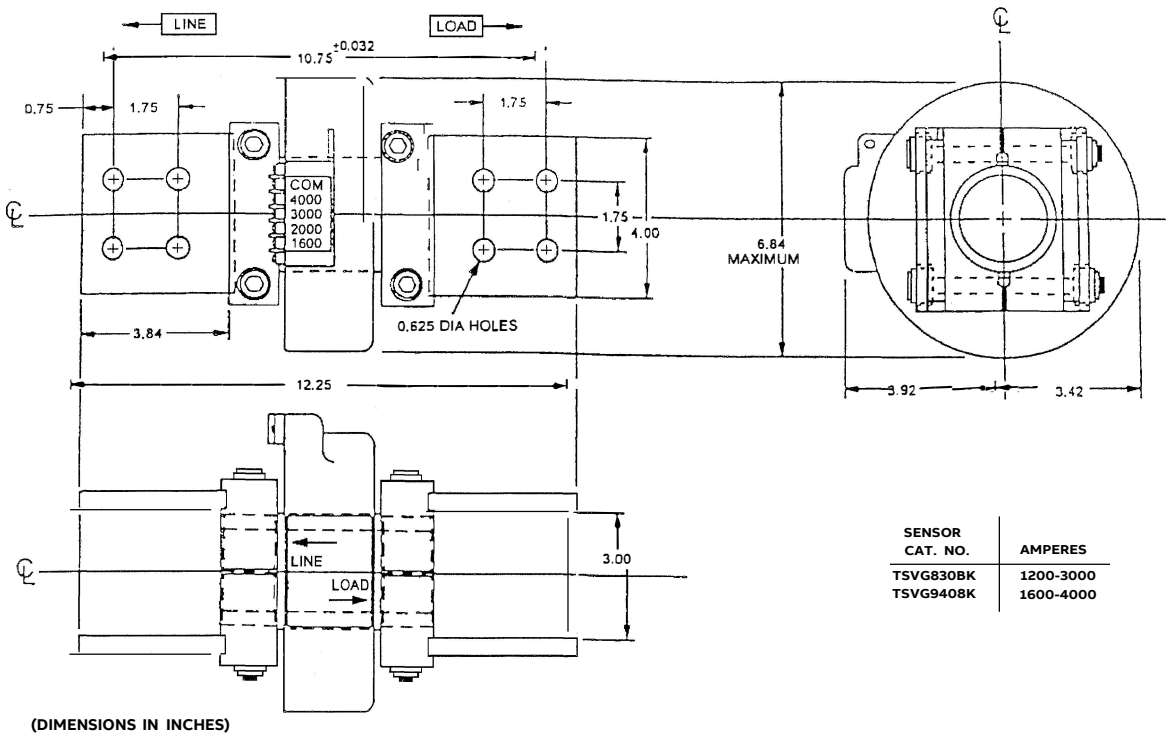

Figure 23. Neutral sensor outline for KD and KE breakers.

SECTION 6. 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 8 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 a cross 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 retro-fitted, 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.

CAUTION: Do not attempt to use ABB/GE brand Test Kit cat. no. TVTS1 or TVRMS on this 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 over-current 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 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 diagram in Figure 24.
4. on ground fault breakers serving four-wire loads, check that the neutral sensor is properly connected, as indicated in Figure 24. 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
KD	3000	49.4-66.8
KE	4000	65.6-88.8

Table 1. CT resistance values.

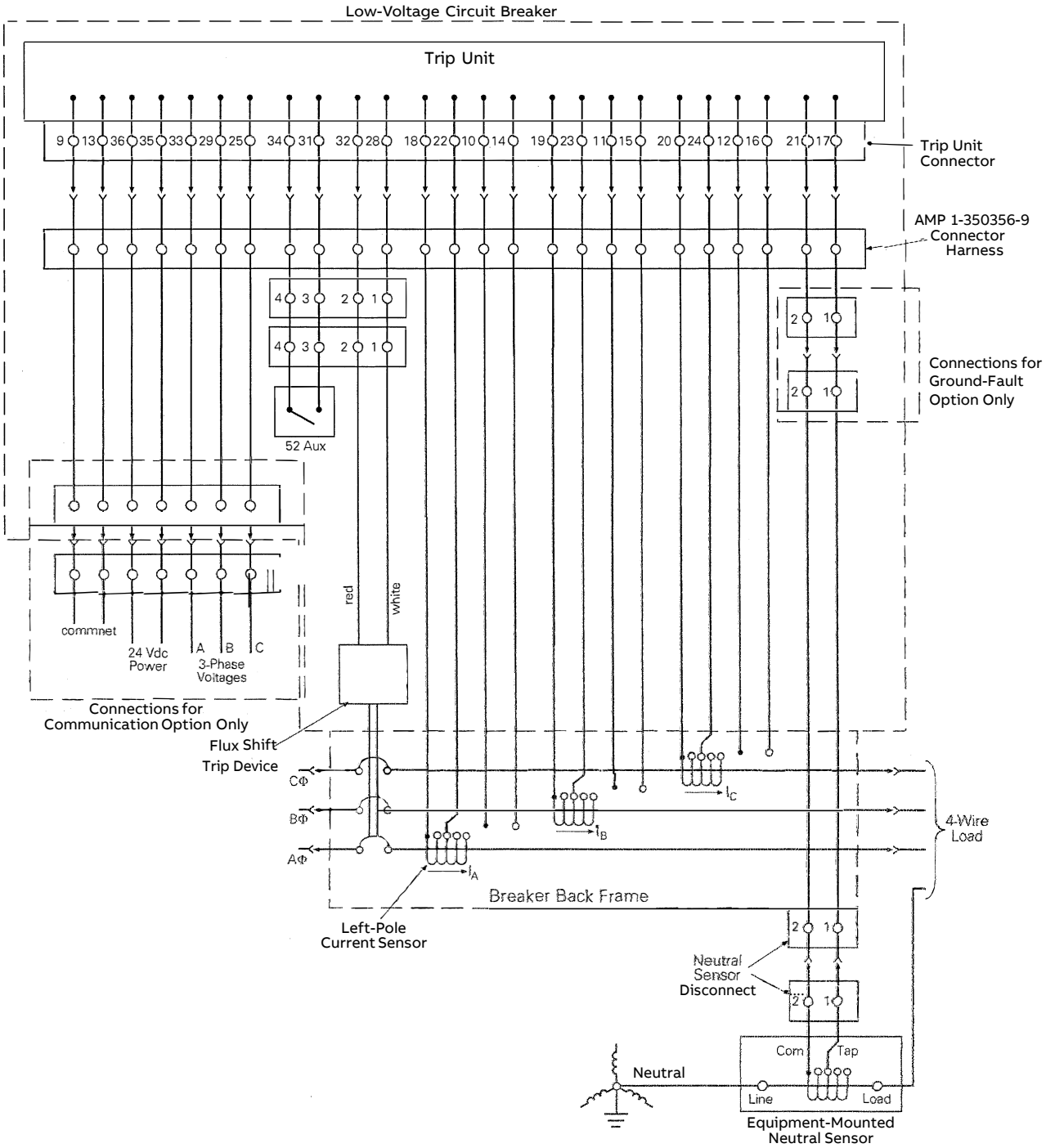

Figure 24. Cabling diagram for MicroVersaTrip Plus™ and MicroVersaTrip PM™ trip units with ground fault on four-wire loads.

NOTES

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 ABB Inc.

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