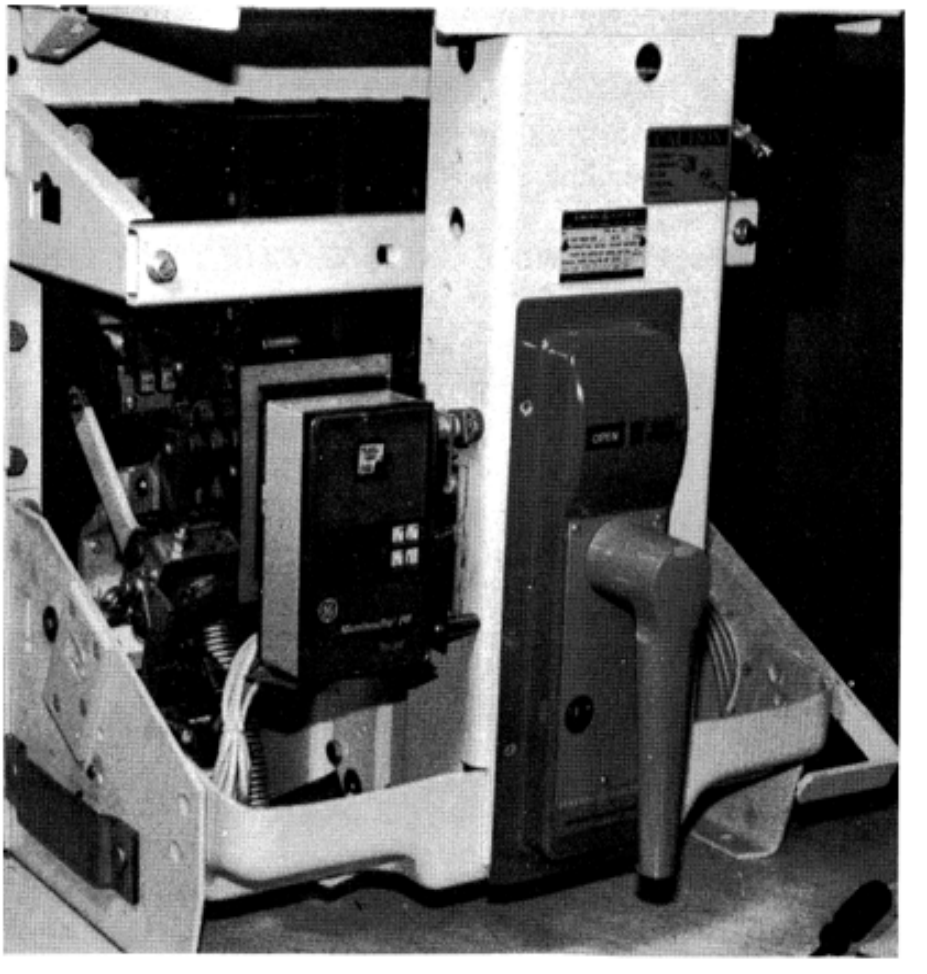
GEH-5965A Installation Instructions

MicroVersaTrip Plus™ and MicroVersaTrip PM™ Conversion Kits

For GE Types AK-50, AKU-50, AKS-50, AKT-50, AK-75, AKU-100 Low Voltage Power Circuit Breakers

Introduction

ABB owned GE Conversion Kits are designed to upgrade existing GE Low Voltage Power Circuit Breakers, rather than replace the entire breaker. The Con- version Kits contain enhanced solid- state MicroVersaTrip® Plus or MicroVersaTrip® PM trip units, representing the latest technological advancements in ABB trip systems



MicroVersaTrip Plus and MicroVersaTrip PM Conversion Kits are designed and breaker tested to con- form with ANSI Standard C37.59, allowing the retrofitter to properly in- stall and acceptance test the breaker.

This publication covers installation of MicroVersaTrip Plus or PM Conversion Kits on GE types AKR-75 and AKR-100 Low Voltage Power Circuit Breakers. Each Conversion Kit contains all appropriate material to convert from an existing GE Type EC, Power Sensor, ECS or SST 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 itself is highly desirable. The general approach is to first strip the breaker of its existing trip devices, then install the MicroVersaTrip® Plus or PM Kit components. Following this procedure, the converted breaker is performance tested, prior to restoring the breaker to service

The majority of breaker kit installations do not require any customized assembly work. However, some conversions may involve unusual mounting circumstances or accessory combinations which necessitate minor modification and/or relocation of a component(s). In most instances this supplementary work can be done on site.

Preparatory to the conversion, the installer should verify that the appropriate current sensors and Programmable trip unit have been furnished. When ever the ground fault trip element is furnished for breakers applied on 4-wire systems, note that an associated neutral sensor (CT) is required for separate mounting in the equipment. Make sure that retrofitted breakers are applied within their short circuit rating. 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 would govern the application. As a service- re- lated consideration, the installation of the MicroVersaTrip Plus or PM kits provides an excel- lent opportunity to perform normal maintenance on the breaker, particularly when the front and back frames are separated. Such procedures are de-scribed in the installation and maintenance manuals supplied with the breakers and equipment.

SECTION 2 - PRIOR TO INSTALLATION

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

> WARNING: Low Voltage Power Circuit Breakers utilize 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 associated with 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 associated with 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 prior to attempting any installation, maintenance, or modification. Follow all lockout and tagging 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 OPEN the breaker and be sure the stored energy springs are discharged avoiding the possibility that the breakers may trip OPEN or the charging springs discharge, causing injuries.
- For both stationary and draw out breakers, trip OPEN, then remove the breaker to a well lighted work area before beginning work.
- Do not perform any maintenance including breaker charging, closing, tripping, or any other function which could cause significant movement of the 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.

SECTION 3 FRONT FRAME BREAKER CONVERSION

The front frame conversion consists of the following:

1. Separation of the front and back breaker frames. Refer to the appropriate installation and maintenance manuals supplied with the breakers and equipment for instructions on accomplishing the separation. Copies of these publication may be obtained from your local ABB sales office. NOTE that AK-75 and AK-100 breakers do not need to be separated to complete the conversion.
2. Relocating and remounting the W and X relays on AK-50, AK-75, AK-100 electrically operated breakers with EC trip devices.
3. Installing the flux shifter and trip paddle.
4. Installing the programmer mounting bracket.
5. Installing the programmer wire harness.
6. Installing the communication wire harness (when required).

Relocating, remounting Wand X Relays

a. Remove the W Relay and install the mounting bracket supplied with the conversion kit to the upper left side of the front frame. See Fig. 3-1.

b. Remove the X Relay and its mounting bracket. Use the new bracket supplied with the conversion kit to remount the X Relay in its existing position. See Fig. 3-1 and 3-2.

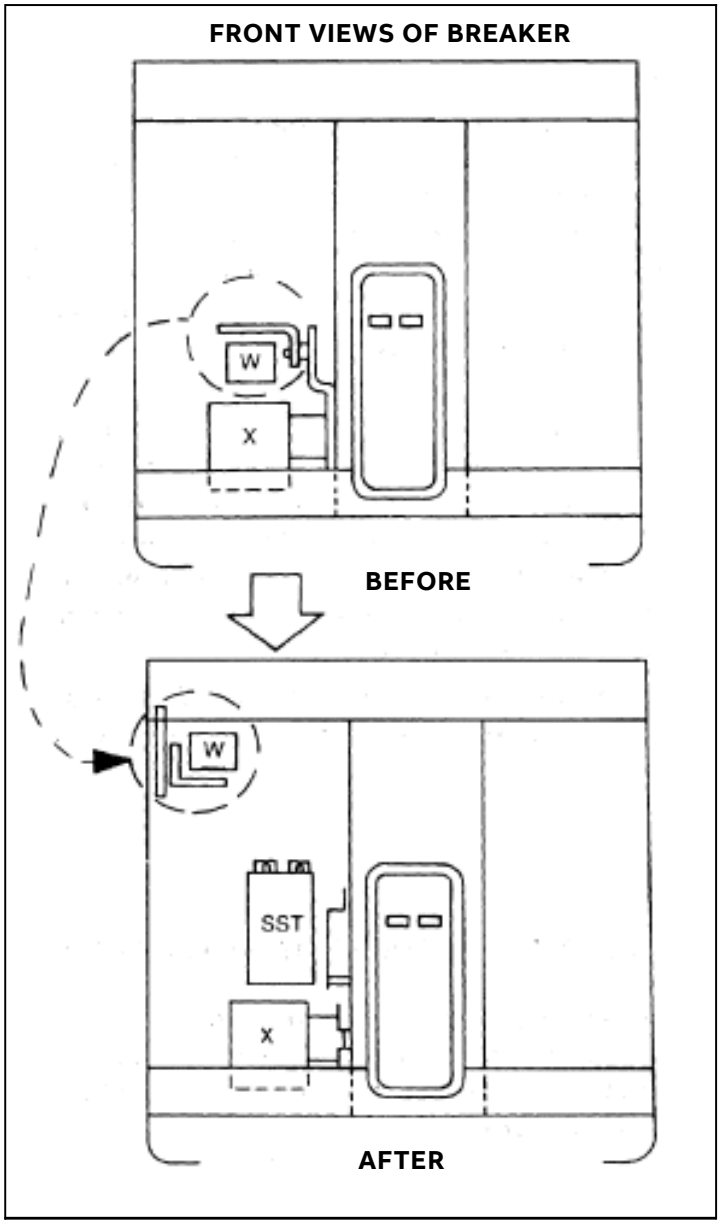


Fig. 3-1. Relocating W Relay and Remounting X Relay

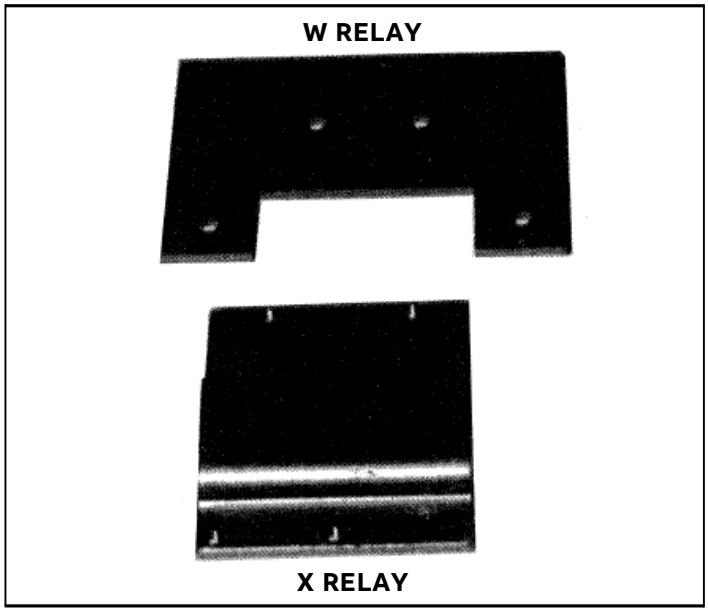


Fig. 3-2. New Wand X Relay Mounting Bracket Installation

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Flux Shifter

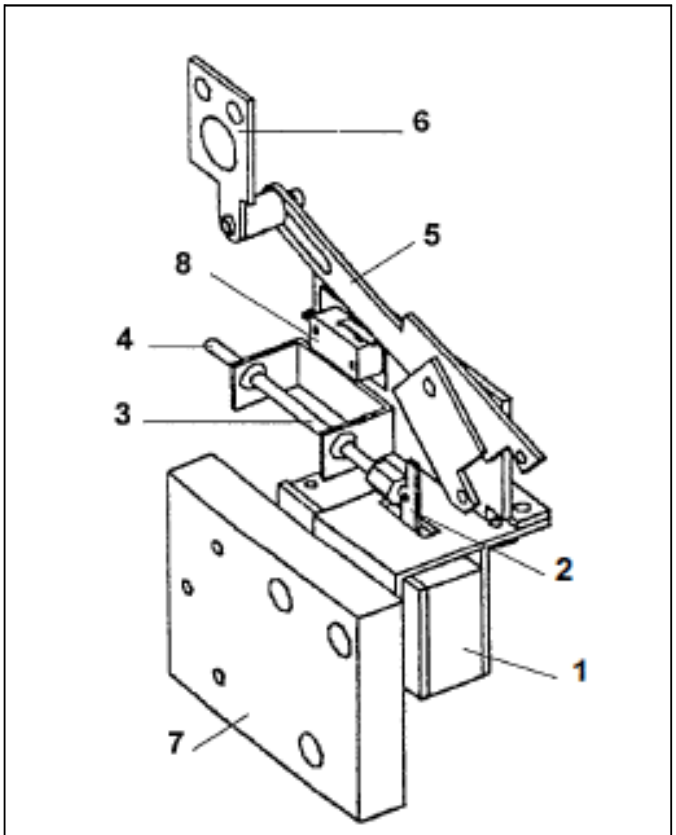
The installation procedure of the flux shifter will vary depending on the type of breaker and trip device involved. In some cases mounting holes must be added, terminal blocks relocated or breaker side rails removed.

BREAKERS WITH EC OR POWER SENSOR TRIP SYSTEMS

1. Add the flux shifter mounting holes to the left side of the front frame. The drill pattern for the required three (3)½2" diameter holes is given in Fig. 3-4
2. Install the new flux shifter, position the insulator and programmer connector bracket as shown in Fig. 3-10.

BREAKERS WITH A SIDE BRACKET

1. Drill a hole¾" diameter, into the mounting base (Fig. 3-3). This will provide the necessary clearance for the bracket. The hole locations are given in Fig. 3-5.
2. Remove the side bracket from the frame and drill holes as shown in Fig. 3-4. Return the side bracket to its original location upon completion of this step.
3. Install the new flux shifter device. The bottom screw must be inserted in the reverse direction, i.e., the screw must be fed from the inside of the frame to the outside. Use tape to hold the nut on the wrench



1. Actuator
2. Actuator arm
3. Trip rod
4. Trip rod adjuster end
5. Reset linkage
6. Actuator bracket
7. Mounting base
8. Position switch

Fig. 3-3. Flux Shifter

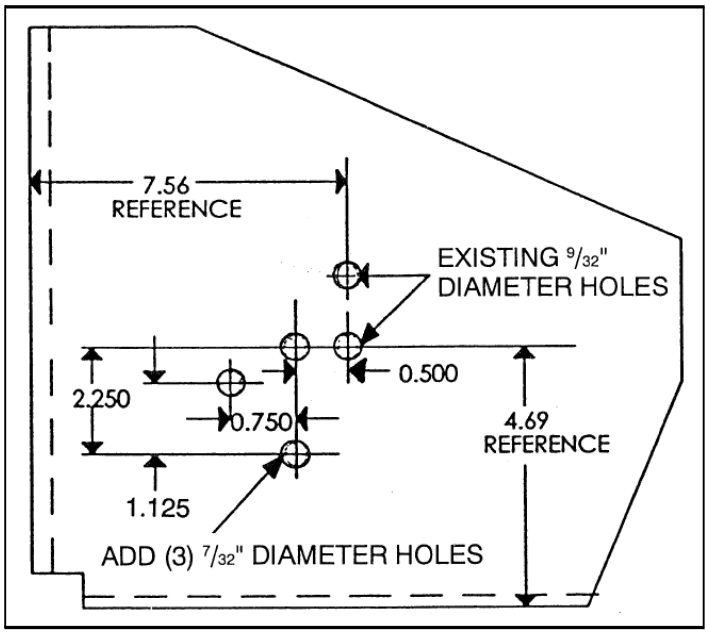


Fig. 3-4. Mounting Hole Pattern

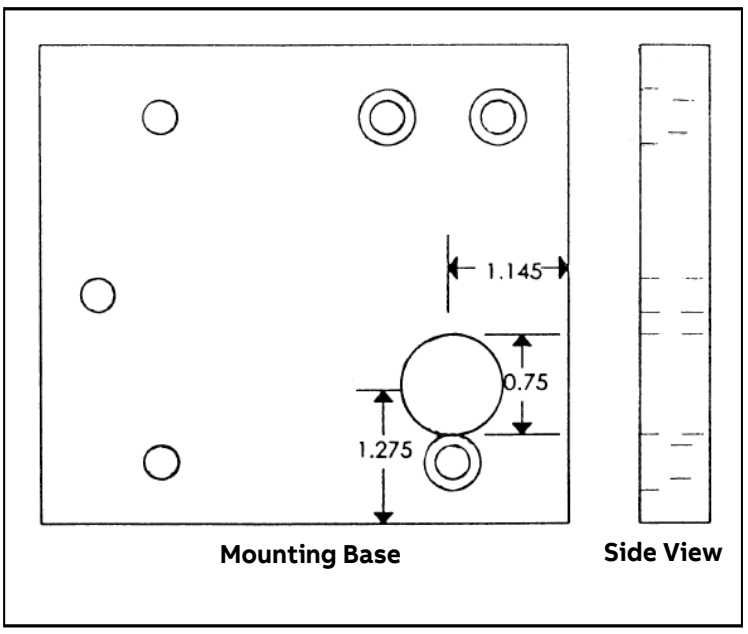


Fig. 3-5. Mounting Base Adjustement

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Flux Shifter (Cont'd)

AKU-50 BREAKERS ONLY

1. For easier installation of AKU-50 breakers, the Open Fuse Lock Out (OFLO) device may be separated from the breaker to allow insertion of the flux shifter. To do this, remove the three bolts attaching it to the base.

2. The terminal block must be remounted on the upper left hand side of the breaker. Certain parts, (not provided with the conversion kit), and tools are required to complete this task:
   - Six strips of 14 AWG wire
   - Wire splice
   - 12 butt splices
   - Wire labels
   - Drill and size "F" drill bit
   - 5/16 - 18 tap
   - Flathead screwdriver
   - Two 5/16 - 18 bolts and lock washers

To remount the terminal block:

Step 1.
Drill and tap two (2) holes for the 5/16 - 18 nuts. See Fig. 3-6 for hole locations.

Step 2.
Separate the Open Fuse Lock Out (OFLO) device by removing the three bolts shown in Fig. 3-7.

Step 3.
Remove the wires that connect the (OFLO) device to the terminal block.

Step 4.
Cut the wires that connect to the coils where they join and label the wires. Attach butt splices to all twelve open ends (Fig. 3-8).

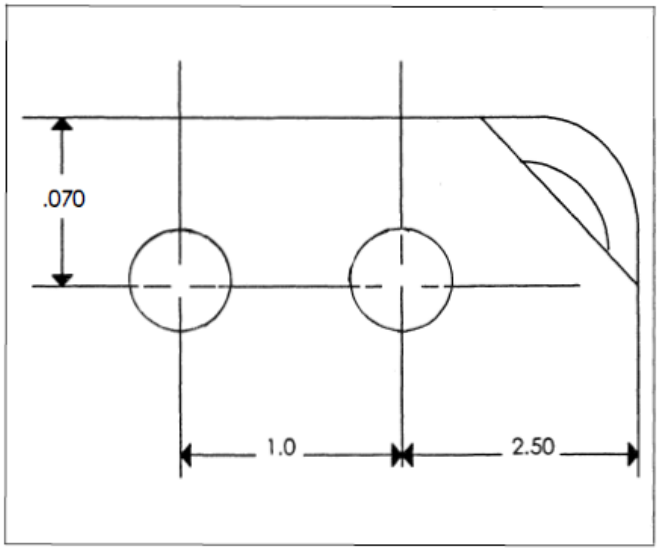


Fig. 3-6. Temrinal Block Mounting Hole Pattern

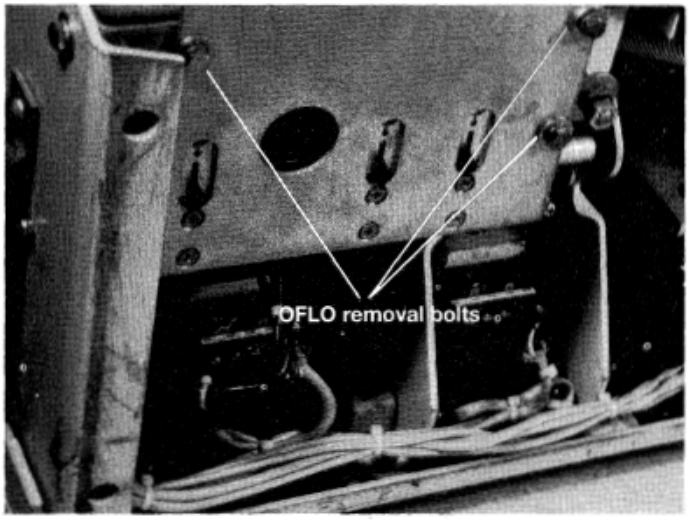


Fig. 3-7. OFLO Removal Bolts

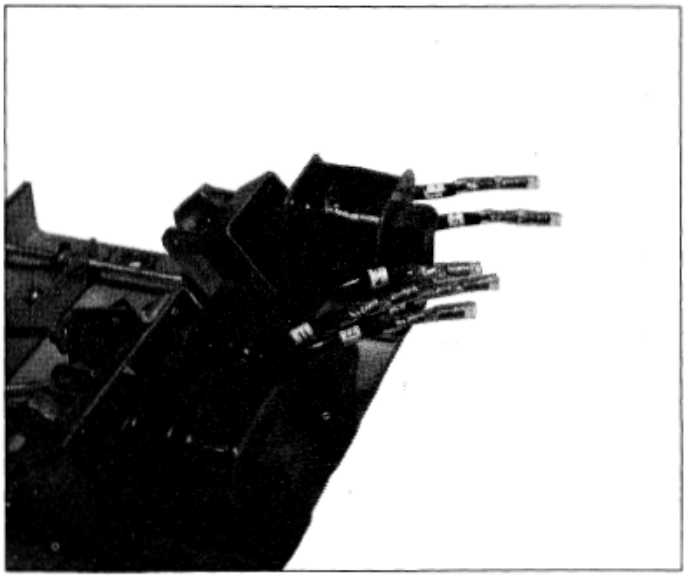


Fig. 3-8. Wire Connectors with Butt Splices

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Flux Shifter (Cont'd)

Step 5.
Connect the strands of wire to the (OFLO) (Fig. 3-9). Mount the terminal block to its new location. DO NOT complete the wire connections until the flux shifter is installed.

Step 6.
Install the new flux shifter, positioning the insulator and programmer connector bracket as shown in Fig. 3-10.

Step 7.
Connect cables attached to terminal block and tie together as shown in Fig. 3-11.

ECS OR SST TRIP SYSTEMS

Step 1.
Remove the ECS or SST Programmer.

Step 2.
Remove the existing flux shifter device and the programmer control harness.

Step 3.
Install the new flux shifter device, positioning the insulator and programmer connector bracket as shown in Fig. 3-10.

EC OR POWER SENSOR TRIP SYSTEMS

Step 1.
Drill the flux shifter mounting holes at the left side of the front frame. The drill pattern for the required three (3)½211 diameter holes is shown in Fig. 3-4.

Step 2.
Install the new flux shifter, positioning the insulator and programmer connector bracket as shown in Fig. 3-10.

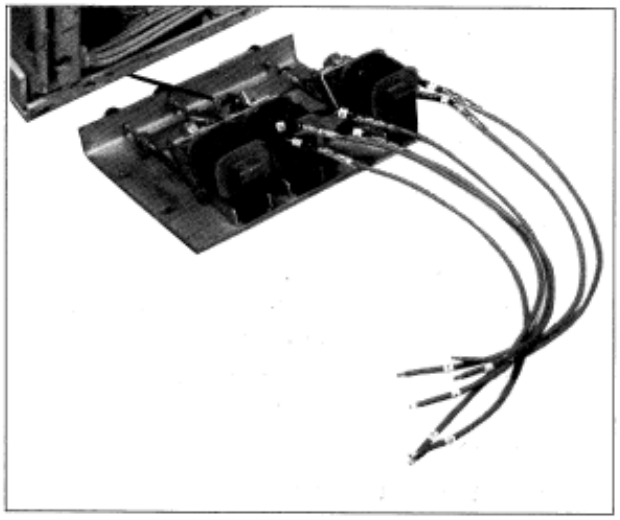


Figure 3-9. Wire Connected to (OFLO)

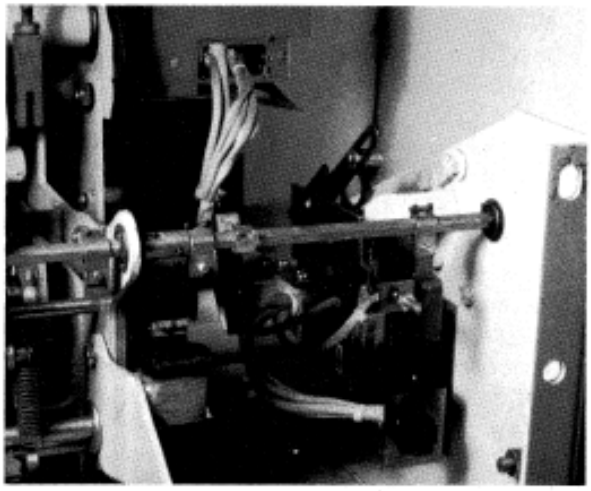


Figure 3-10. Flux Shifter Installed

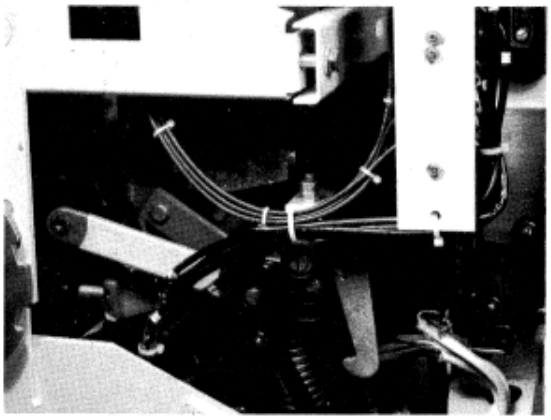


Figure 3-11. Relocated Terminal Block and Wire Harness

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Flux Shifter (Cont'd)

INSTALLING THE FLUX SHIFTER TRIP PADDLE

1. For breakers equipped with an ECS or SST system, the existing flux shifter trip paddle will be used with the new flux shifter. For all other breakers, the flux shifter trip 'paddle must be assembled to the trip shaft as shown in Fig. 3-12.

FLUX SHIFTER ADJUSTMENTS

Once the flux shifter and trip paddle are installed and the breaker frames are reassembled, the following adjustments must be made:

1. With the breaker in the OPEN position and the mechanism charged, set the gap between the trip paddle and the end of the flux shifter rod at 0.100 inches. Use a 0.100-inch diameter rod, not supplied, as shown in Fig. 3-12. Set the adjuster end of the trip rod and lock it in place with the jam nut. Note that removal of the buffer stud will make the trip paddle easier to install and adjust.
2. As the crossbar travels between the breaker CLOSED and the breaker OPEN positions, the tang of the actuator bracket must clear the buffer stud. If insufficient clearance exists, loosen the two mounting screws and rotate the bracket clockwise to take up mounting hole slack. Retighten screws.
3. OPTIONAL TEST: The flux shifter assembly may be tested by closing the breaker and apply-ing a 9 V dc power source to the flux shifter leads. The red wire is the positive lead. The breaker should trip.

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Programmer Mounting Bracket

MicroVersaTrip Plus and PM programmers mount to the left side of the front channel. A mounting bracket is shock mounted to a-plate that is assembled to the front channel as shown in Fig. 3-14. Use Loctite* or an equivalent retaining material on the mounting screws for the plate assembled to the front channel.

ECS OR SST TRIP SYSTEM

Replace the existing plate and mounting bracket with the new ones provided. Assemble the mounting bracket to the plate using the holes closest to the front of the breaker (See Fig. 3-14).

If the manual indicator assembly busing on AK-50 manual breakers interferes with the mounting bracket installation (Fig. 3-14), then the bracket will have to be modified. This is accomplished by cutting off a ¾" x 1 ½" section off the right front of the plate as shown in Fig. 3-15.

EC OR POWER SENSOR TRIP SYSTEMS

The holes for the new plate may have to be added to the front channel. The drill pattern for these holes is given in Fig. 3-16. Once the plate is installed, assemble the mounting bracket to the plate using the holes closest to the front of the breaker (See Fig. 3-14).

*** Trademark of the Loctite Corp**

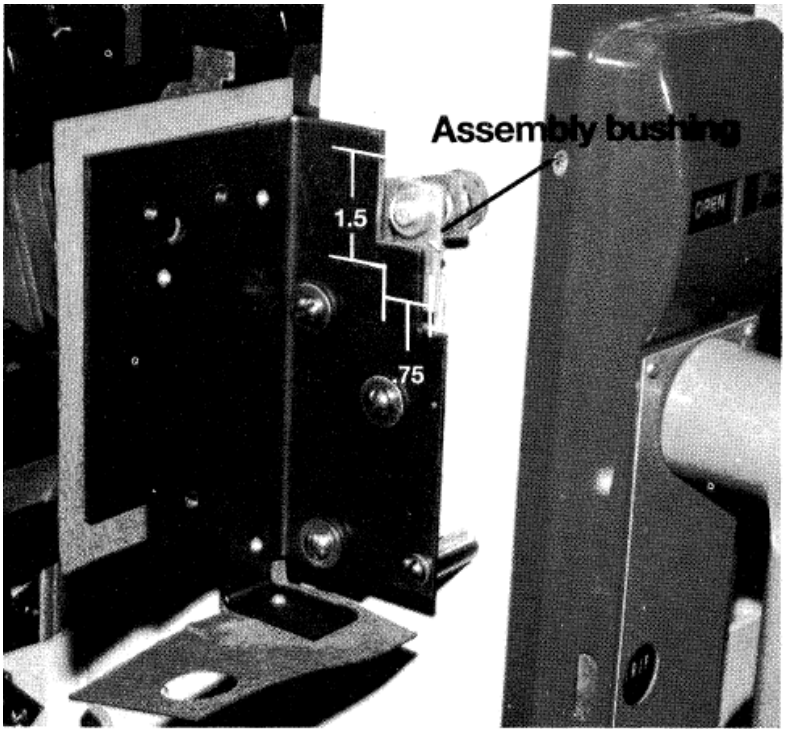


Fig. 3-15. Programmer Mounting Bracket and Plate on a Type AK-50 Breaker

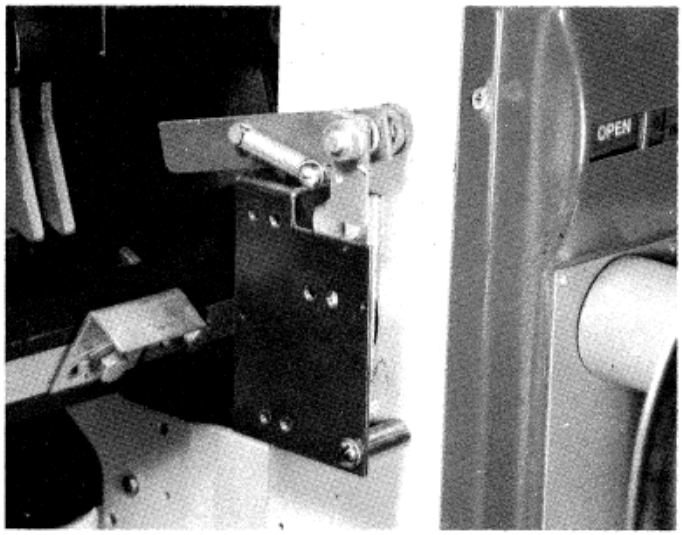


Fig. 3-14. Plate Assembled to Channel

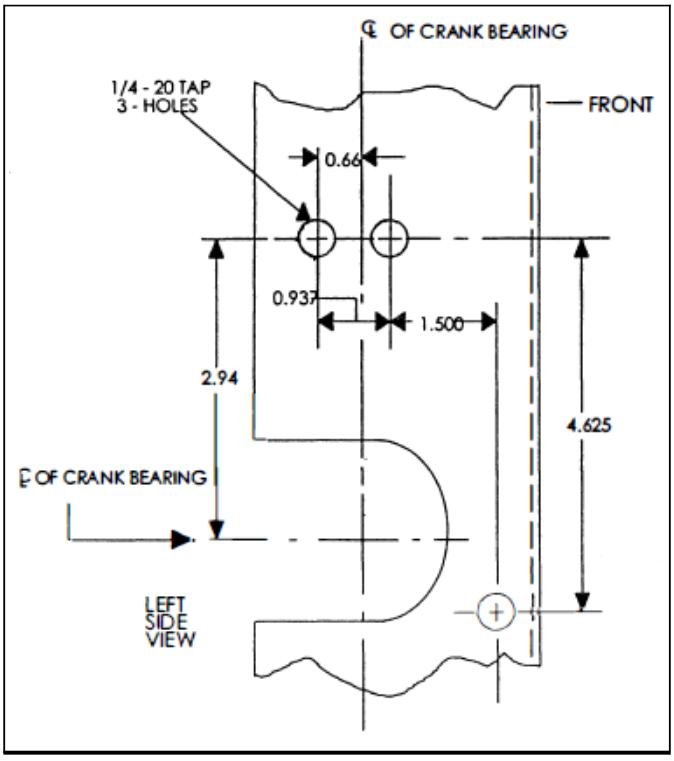


Fig. 3-16. Mounting Plate Hole Pattern

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Programmer Harness

The programmer harness consists of the mating 36-pin programmer connector and the 16-pin front frame half of the front/back frame connector. Refer to Fig. 3-18. Assemble the adapter bracket to the 36-pin programmer connector (with bevels to right side) by pushing bracket over notches in ends of plug body (Step 1). Follow Steps 2-5 of Fig. 3-18 to complete assembly of programmer harness to programmer bracket.

The 15-pin connector is inserted into the programmer connector bracket which is part of the flux shifter assembly. See Fig. 3-10. Insert the connector so that the Number 1 pin is toward the breakers' top, right-hand side.

Route the harness under the flux shifter base. Attach the harness to this base using the wire keepers provided.

Install the programmer harness as shown in Fig. 3-10. Include the flux shifter leads with this harness. Join the 4-pin connector on the programmer harness to the 4-pin connector on the flux shifter.

Assemble the programmer bracket to the mounting bracket as shown in Fig. 3-17.

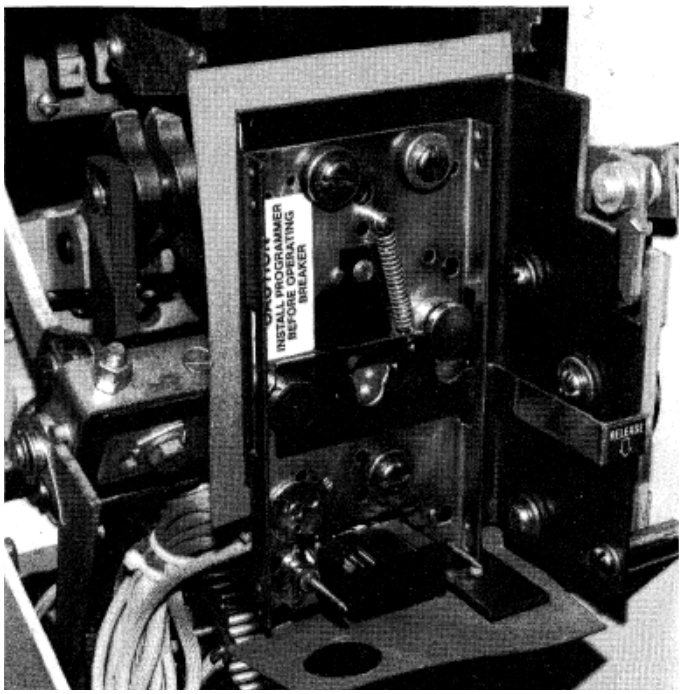


Fig. 3-17. Programmer Plate Installation

CAUTION: Adapter bracket must be installed onto harness plug as shown in Fig. 3-17. Failure to do so will result in harness plug failure and the programmer will not provide protection.

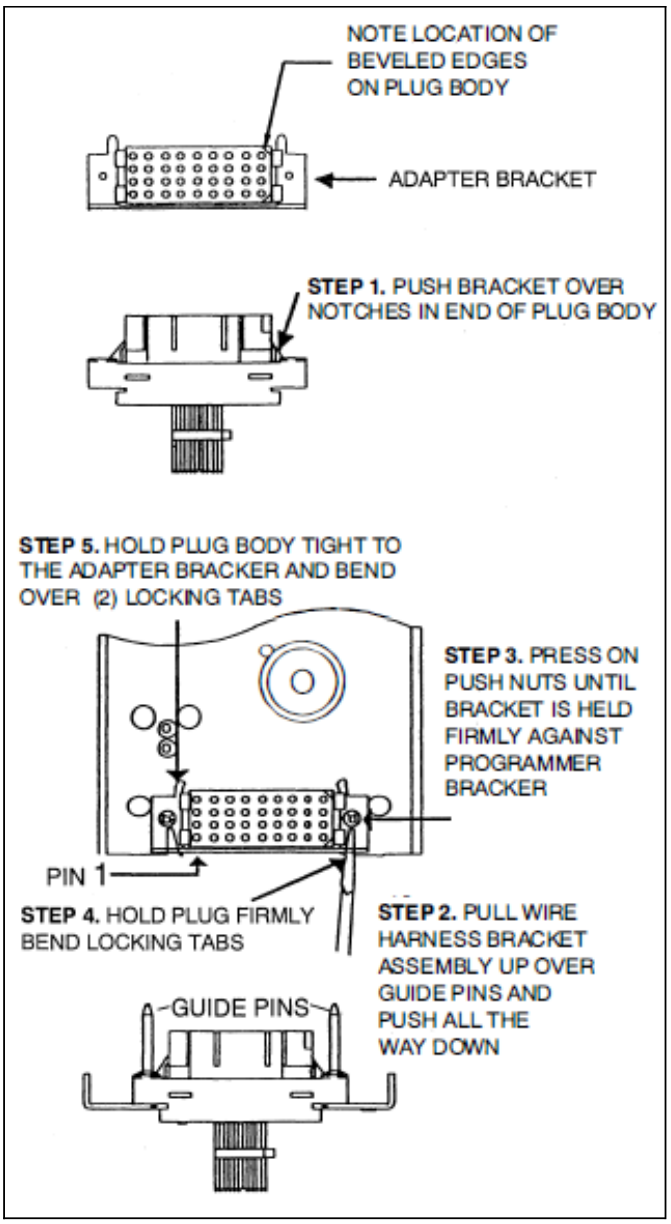


Fig. 3-18. Harness Connector

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Communications Harness (When Required)

The communications harness may be installed on either side of the breaker, depending on which direction the compartment door swings open. It is recommended to install the harness on the door's hinge side, away from any moving parts. The caution label should be stuck on front of the breaker where it can be seen as a reminder.

For AKU-50 breakers, the harness must be connected on the right side of the breaker as there is no room for it on the left side, see Fig. 3-19. Drill two (2) 0.228 diameter holes, using a #1 drill to install the harness on all type breakers. Figures 3-20 through 3-21 are representative examples of harness connections and routing directions. They are not meant to be all-inclusive.

A caution label, Fig. 3-22, should be mounted on both the breaker door, and the compartment door as a warning to prevent unnecessary damage.

Note: Hole locations for bracket mounting as shown for reference only. The positioning of the communication disconnect plug is dependent on the configuration of the breaker installation. The plug may be located by a field engineer during job assessment or installation.

Fig. 3-19. Communications Harness Installation on a Type AKU-50 Breaker

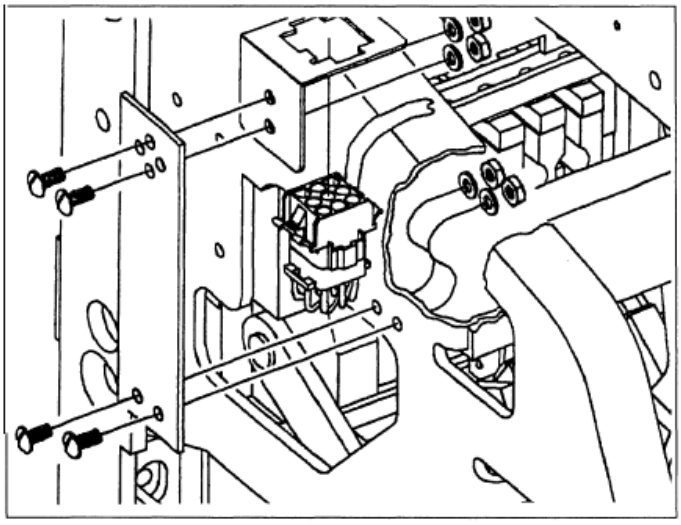


Fig. 3-20. Mounting Pattern for Types AK-50, AK-100 Breakers

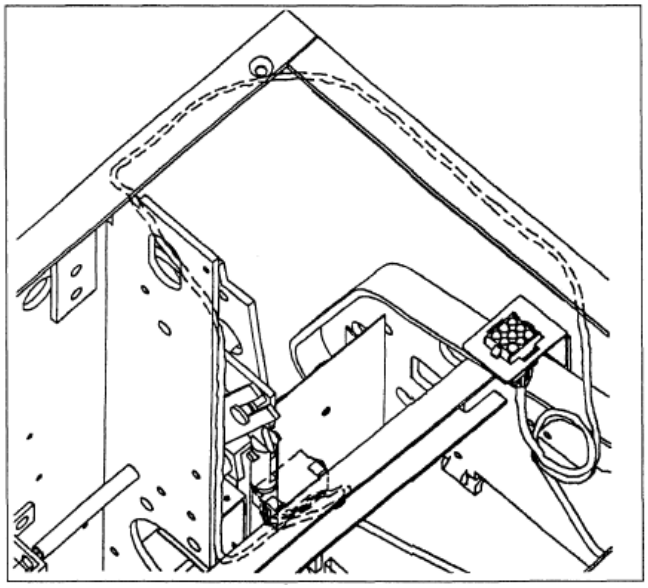


Fig. 3-21. Wire Routing Pattern

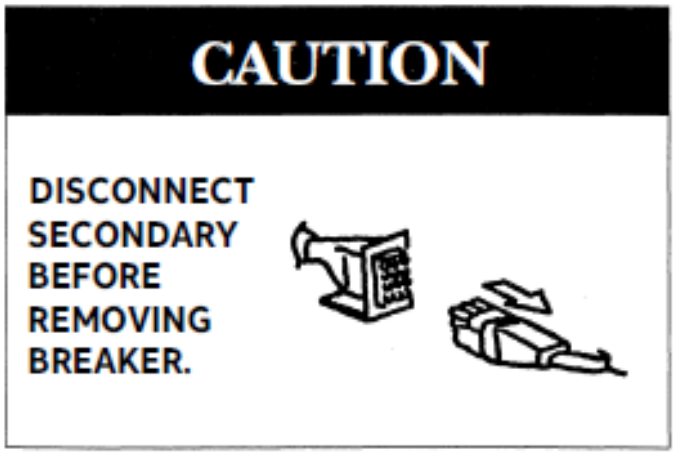


Fig. 3-22. Caution Label

SECTION 4 BACK FRAME CONVERSION

The back frame conversion consists of the following:

1. Modification of the crossbar assembly for the flux shifter installation.
2. Installing of the phase sensors.
3. Installing of the back frame harness.

Crossbar Modification

The Flux shifters reset linkage is driven by the actuator bracket. See Fig. 3-3. The actuator bracket must be assembled to the left side link of the left pole, as shown in Fig. 4-1.

If the actuator bracket mounting holes are not in the left side link, the holes must be added. Drill and tap two 5/16"-18 holes using the hole pattern given in Fig. 4-2.

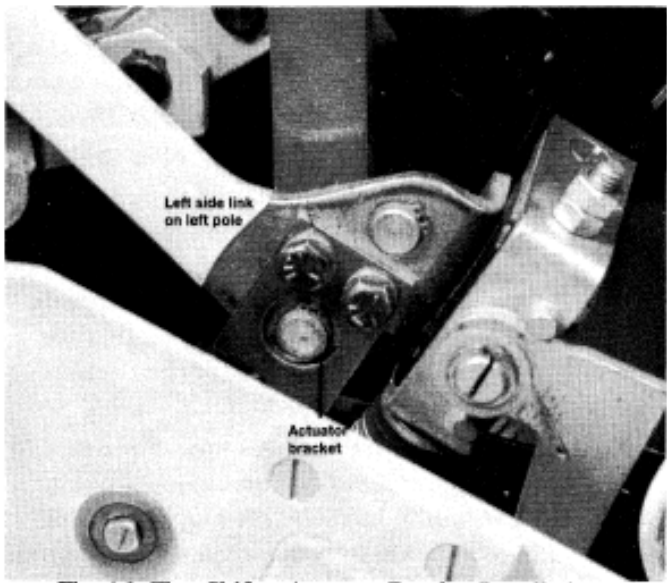


Fig. 4-1. Flux Shifter Actuator Bracket Installation

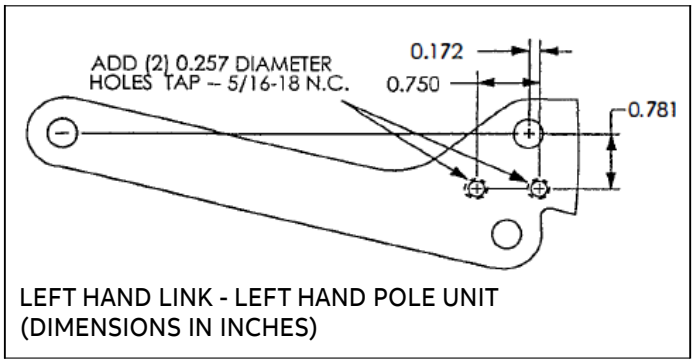


Fig. 4-2. Actuator Bracket Mounting Holes

SECTION 4 BACK FRAME CONVERSION

Phase Sensors

AK-50, AKS-50 BREAKERS WITH EC OR POWER SENSOR TRIP SYSTEMS

Step 1.
Remove the existing trip devices and harnesses.

Step 2.
Install the lower adapter connector, as shown in Fig.4-3.

Step 3.
Install the MicroVersaTrip phase sensor provided. Secure the sensor to the lower adapter with RTV or equivalent adhesive. Install the upper adapter connector (See Fig. 4-4).

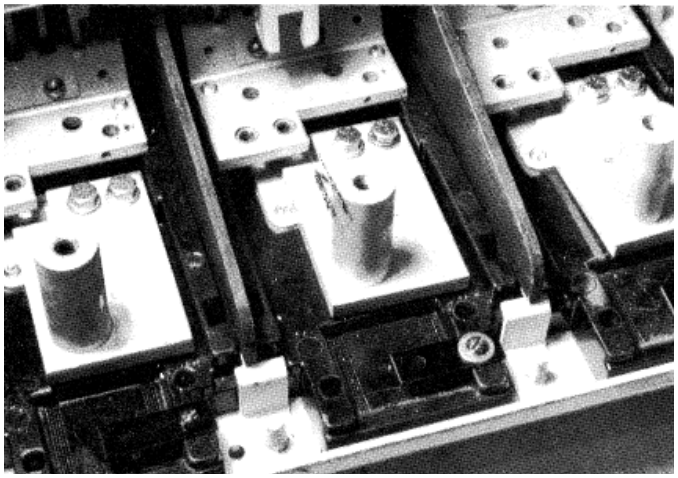


Fig. 4-3. Lower Adapter Connector

AK-50, AKS-50 BREAKERS WITH SST TRIP SYSTEMS

Step 1.
Replace the existing SST phase sensor with the new MicroVersaTrip phase sensor provided.

Step 2.
Install as shown in Fig. 4-4.

NOTE: Occasionally, during current sensor manufacturing, a slight separation may occur between the epoxy and plastic shell. This may amount to as much as 0.030" and has no effect on performance. Additionally, slight surface imperfections are part of the epoxy curing process and have no effect on performance.

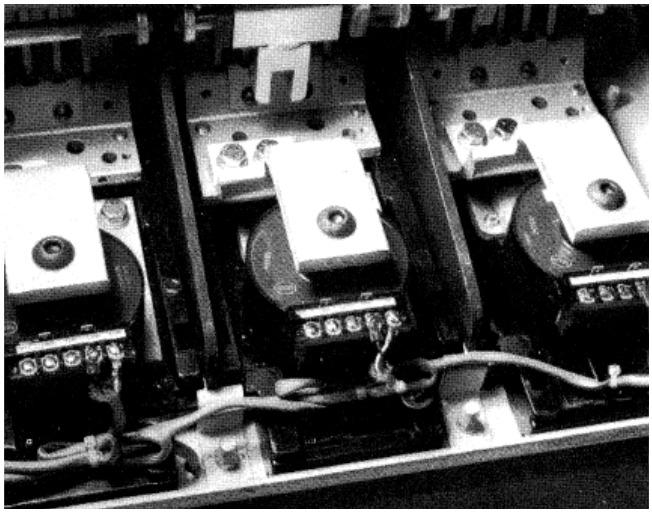


Fig. 4-4. Phase Sensors and Harness Installed

SECTION 4 BACK FRAME CONVERSION

Phase Sensors(Cont'd)

AK-75, AKS-100 BREAKERS WITH EC OR POWER SENSOR TRIP SYSTEMS

Step 1.

Remove the existing trip devices and harnesses.

Step 2.

The MicroVersaTrip® RMS-9 sensors mount on the upper breaker studs. The sensors are held on the stud with the locking rings, as shown in Fig 4-5. Leave enough of the stud exposed for the primary fingers to engage. Engage the sensor's anti-turn lugs with the notch in the locking ring. Before tightening the locking rings, position each sensor so that its leads will exit between the pole bases, as shown in Fig. 4-6.

Step 3.

Mount the three sensor terminal boards to the rear of the back frame using the hardware provided.

Step 4.

Form each sensor's leads downward between the pole bases.

AK-75, AKS-100 BREAKERS WITH SST TRIP SYSTEMS

MicroVersaTrip phase sensors are visually identical to the SST sensor. Follow the basic procedure given above and replace the SST with MicroVersaTrip phase sensor provided.

Note: Longer leads are to air core connections. CT's without air core are shown.

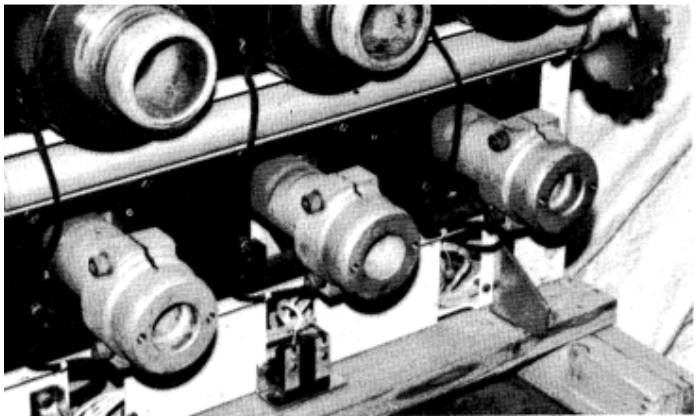


Fig. 4-6. Phase Sensor Wiring Installation

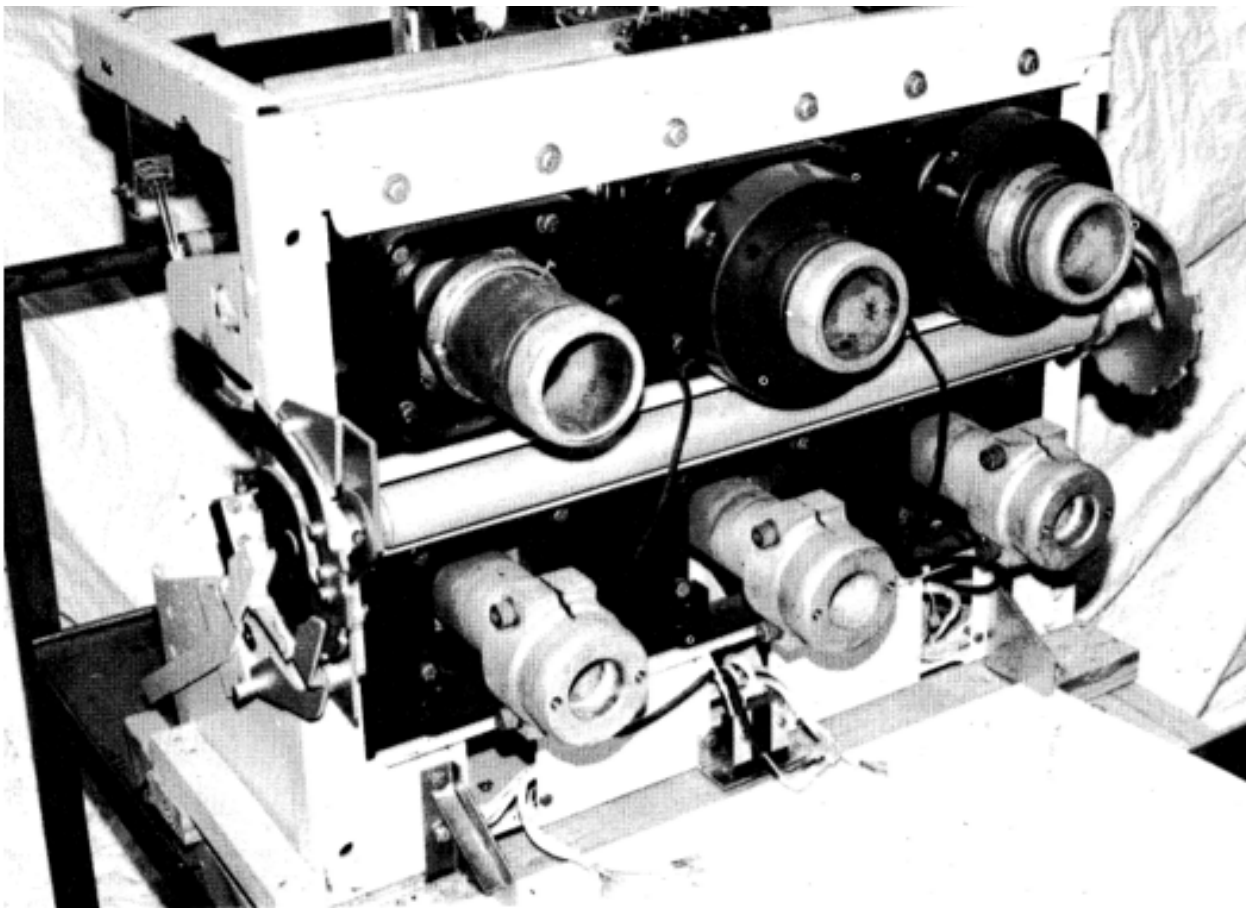


Fig. 4-5. Phase Sensor Installation for AK-75, AK-100 Breakers

SECTION 5 FOUR-WIRE GROUP FAULT OPTION

The MicroVersaTrip Plus or PM Ground Fault option requires an additional neutral sensor when used on a four-wire system with the neutral grounded at the transformer. The phase sensors are mounted on the breaker. However, the neutral sensor is inserted in the neutral, which is part of the equipment. The neutral sensor is connected to the breaker through the 4th-wire neutral disconnect.

Stationary Breaker Conversion

TYPES AK-50, AKS-50 STATIONARY BREAKERS

The 4th wire disconnect for stationery breakers consists of terminal board mounted to the lower front channel as shown in Fig. 5-1

Step 1.

If the terminal board already exists, just replace the control Harness. Maintain the following color code: White - Common, Black - Tap.

Step 2.

If the terminal board assembly is being added, mount as shown in Fig. 5-1. The mounting holes may have to be added to the front channel. See Fig. 5-1.

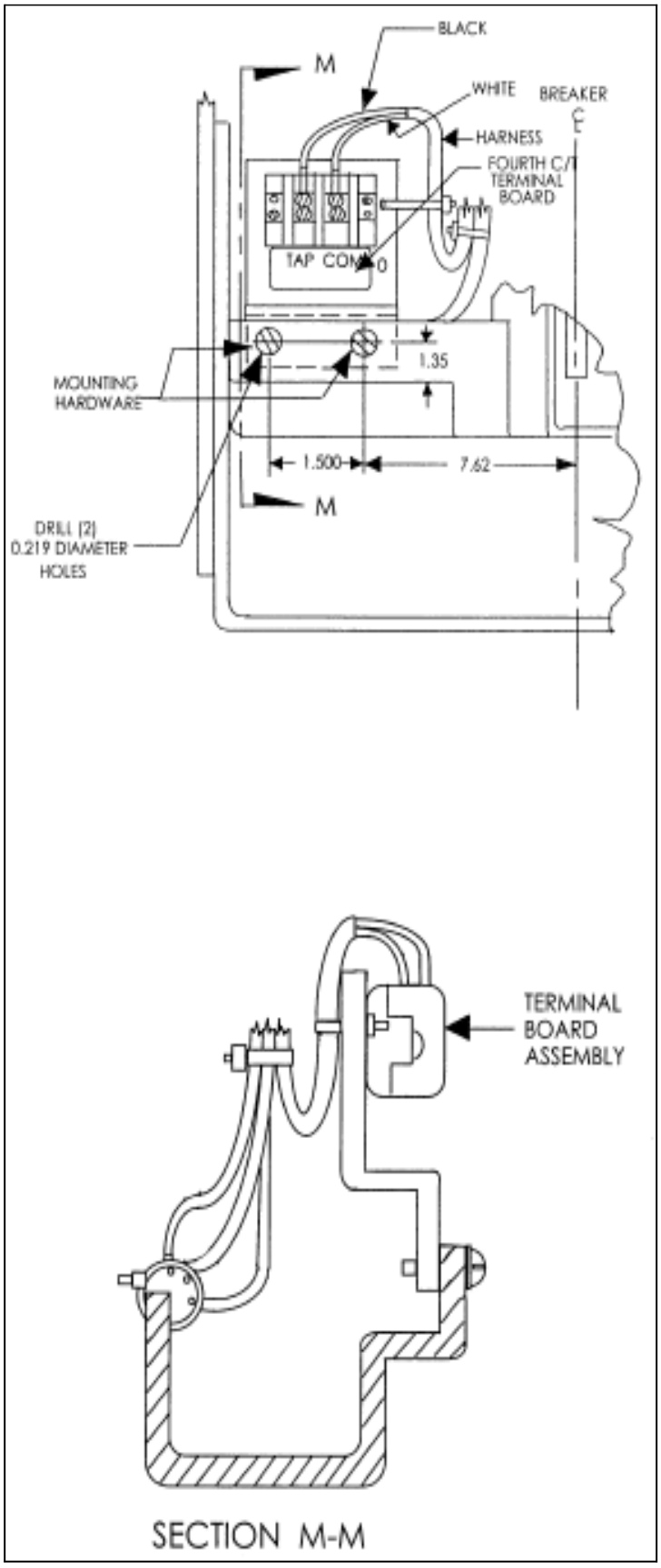


Fig. 5-1. 4th Wire Terminal Board Installed Types AK-50, AKS-50 Stationary

SECTION 5 FOUR-WIRE GROUP FAULT OPTION

Draw Out Breaker Conversion

AK-50, AKS-50 DRAW OUT

The 4th-wire disconnect for AK-50, AKS-50 draw out breakers mounts to the lower-back frame as shown in Fig. 5-2.

If the disconnect is existing,just replace the control harness. Maintain the following color code: White - common. Black - tap.

If the disconnect is being added, mount the disconnect assembly as shown in Fig. 5-2.

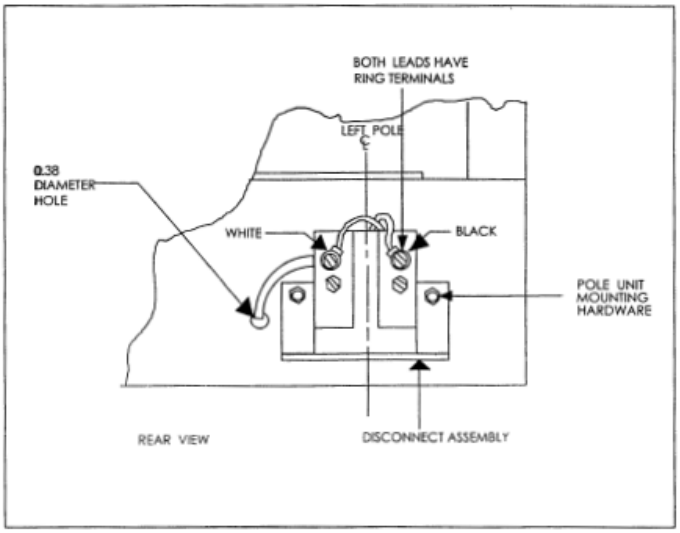


Fig. 5-2. 4th Wire Disconnect Installed Types AK-50, AKS-50 Draw Out Breakers

AK-75, AK-100 DRAW OUT

There are two 4th-wire disconnect designs used with these breakers. One design is used on breakers for GE type AKD Switchgear equipment. The other design is used on breakers for GE types AKD-5 and AKD-6 equipment. The only difference is the bracket used for mounting the disconnect to the breaker. Figures 5-3, 5-4 depict the two designs.

The Conversion Kit contains an assembled, ready to install, mounting block and bracket for AKD-5 or AKD-6 installation, plus a bracket only for type AKD equipment installations. For type AKD equipment, remove the bracket from the assembled bracket and mounting block furnished with the conversion kit and replace it with the type AKD bracket.

The 4th-wire disconnect for the AK-75, AK-100 draw out breakers mount to the lower back frame as shown in Fig. 5-5.

1. If the disconnect is existing, just replace the control harness. Maintain the following color code: White - Common, Black - Tap.
2. If the disconnect is being added, mount the disconnect assembly as shown in Fig. 5-5.

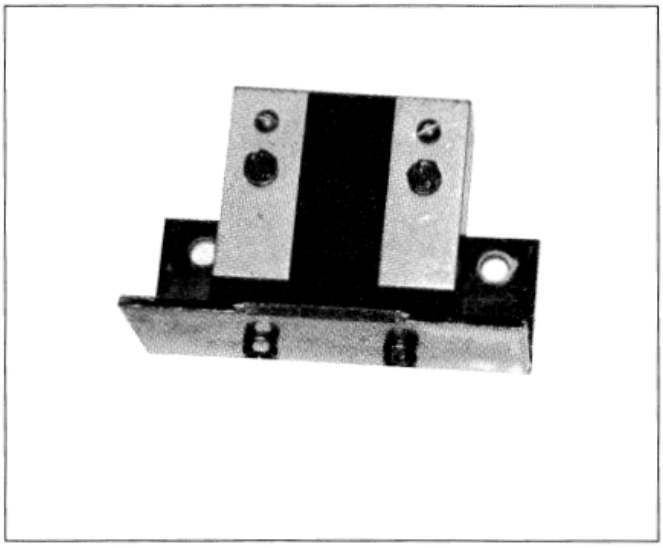


Fig. 5-3. 4th Wire Disconnect Type, AKD-5 or AKD-6

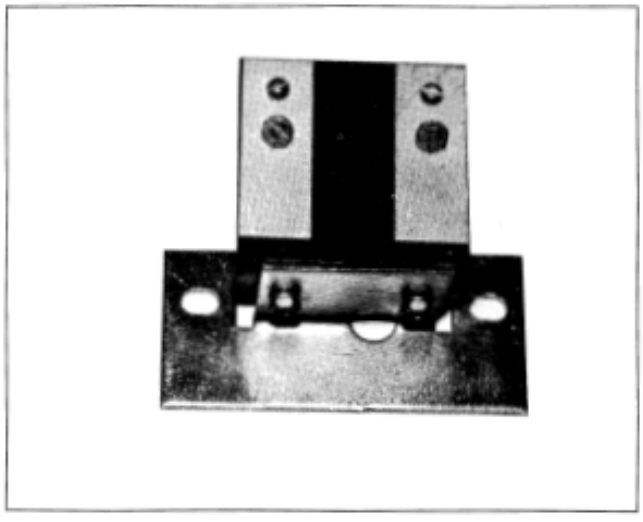
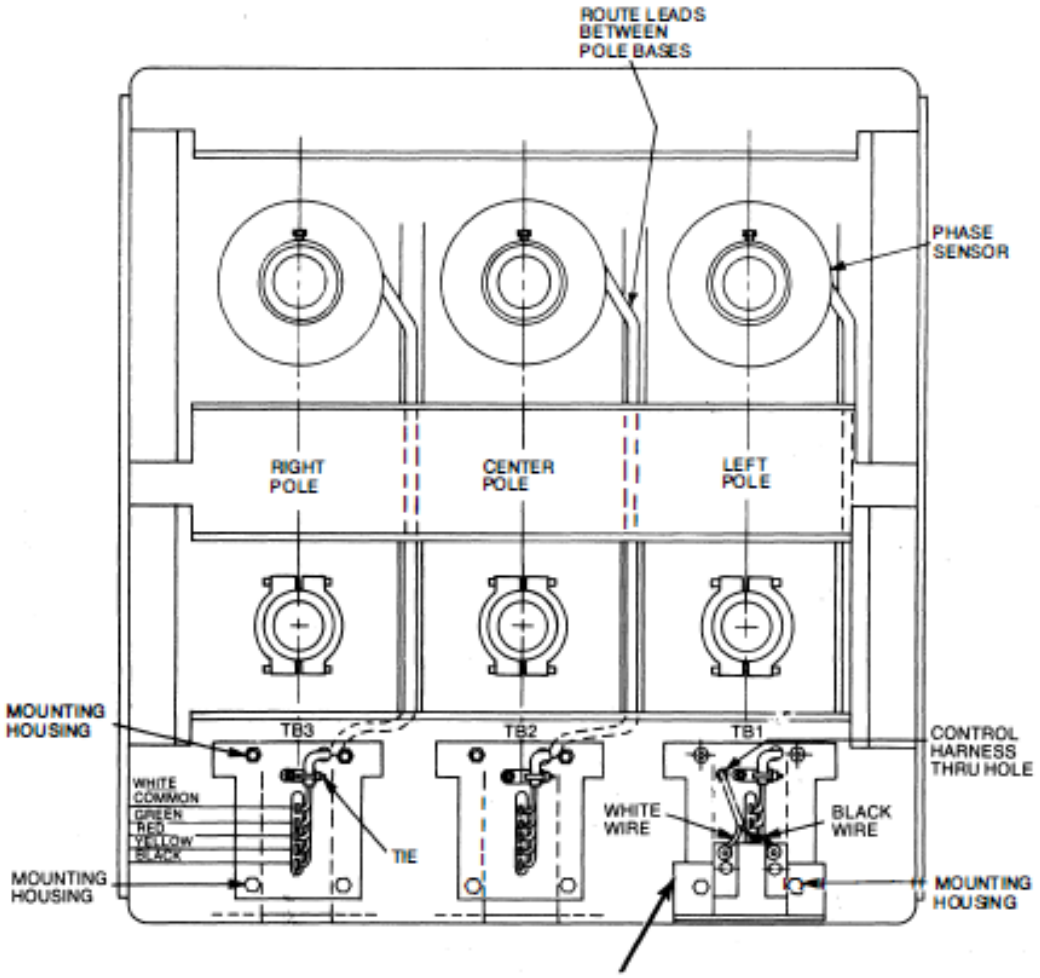


Fig. 5-4. 4th Wire Disconnect Type AKD

SECTION 5 FOUR-WIRE GROUP FAULT OPTION

AK-75, AK-100 DRAW OUT (CONT'D)



WHEN USED, THE 4TH-WIRE NEUTRAL SENSOR DISCONNECT BLOCK MOUNTS ON TOP OF TAP TERMINAL BOARD VIA ITS 2 LOWER MOUNTING SCREWS. THE AKD-5 TYPE MOUNTING IS ILLUSTRATED. THE ARRANGEMENT FOR AKD TYPES IS IDENTICAL EXCEPT FOR USE OF A DIFFERENT MOUNTING BRACKET.

Fig. 5-5. AK-75, AK-100 Back Frame Conversion

SECTION 5 FOUR-WIRE GROUP FAULT OPTION

INSTALLING NEUTRAL SENSORS

The neutral sensor is an electrical duplicate of the phase sensor, including the taps. Therefore, when taps (if provided) are changed on the phase sensors, the taps on the neutral sensor must be correspondingly positioned. For kits with fixed phase sensors, be sure to use the corresponding tap on the neutral sensor.

Mount the neutral sensor in the outgoing neutral lead, normally in the equipment's bus or cable compartment, see Fig. 5-6 and 5-7.

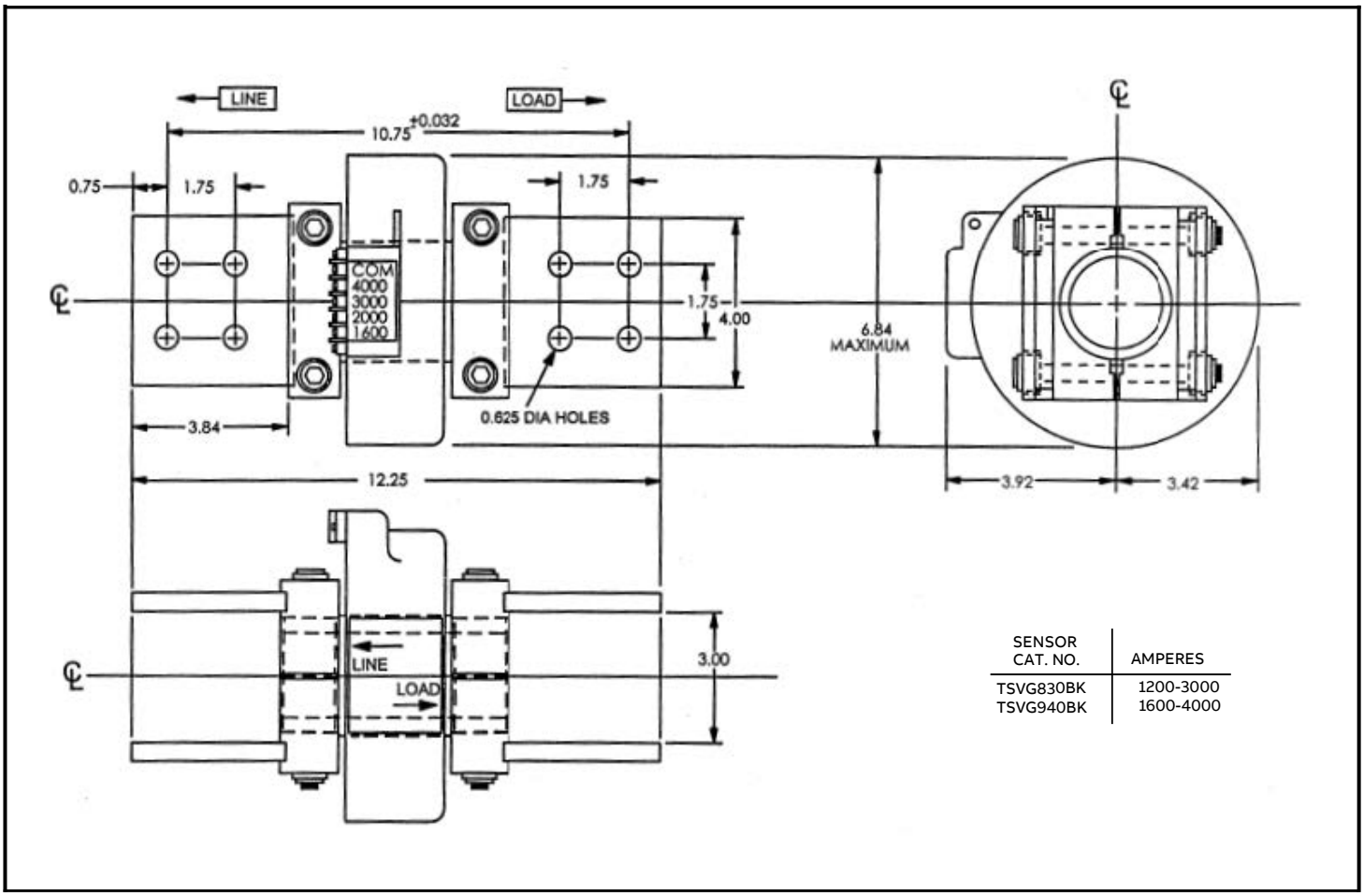


Fig. 5-6. Outline of the AK-75, AK-100 Neutral Sensor

SECTION 5 FOUR-WIRE GROUP FAULT OPTION

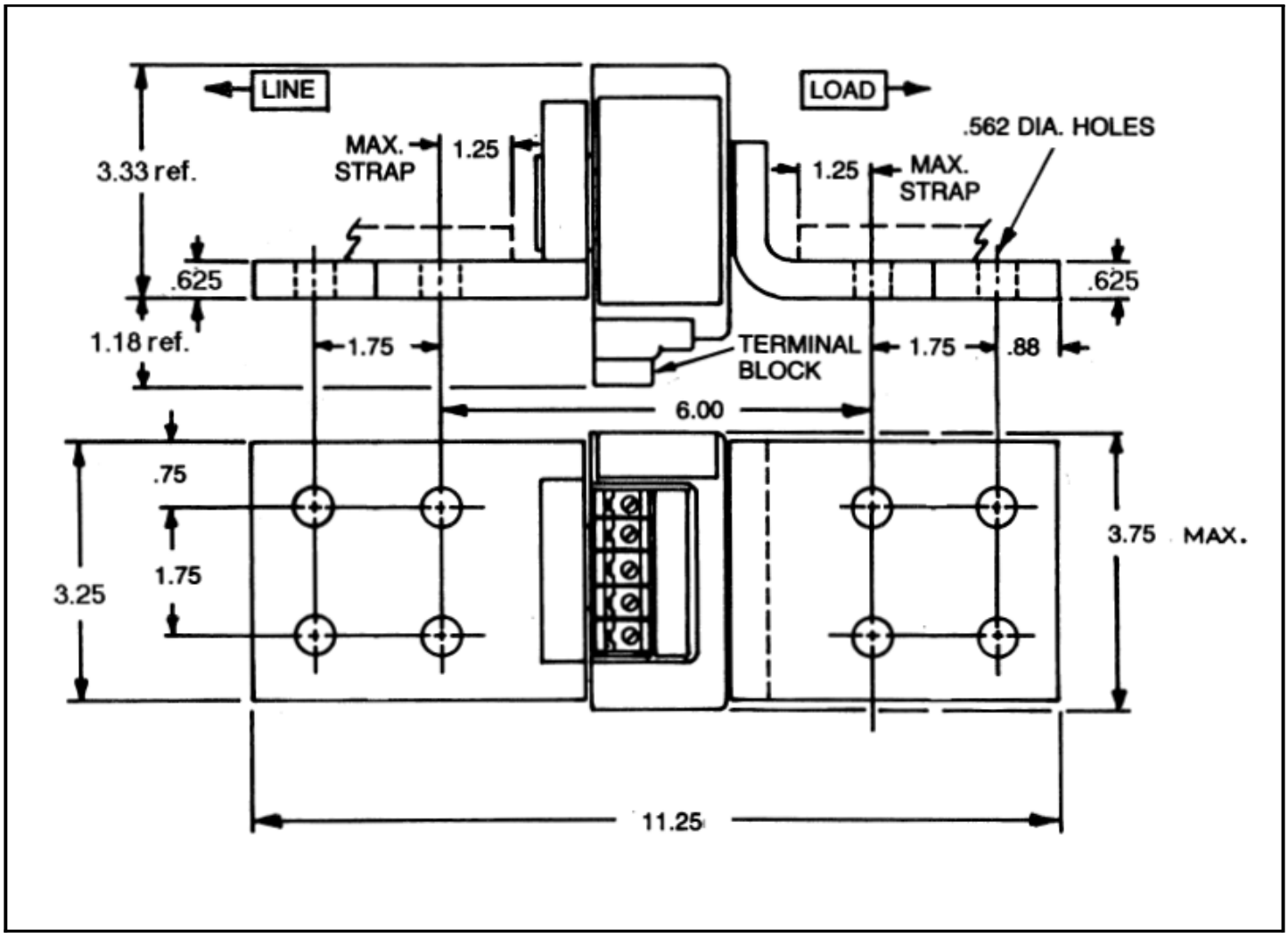


Fig. 5-7. Neutral Sensor Outline for AK-50

SECTION 6 EQUIPMENT CONVERSION

Installing Mounting Brackets

The equipment compartment contains the mating portions of the 4-wire disconnect, and the neutral sensor outlined in Section 5, pages 15-18. The same disconnect assembly is used for types AKD, AKD-5 and AKD-6 switchgear. Mounting brackets for AKD, AKD-5 and AKD-6, and AKD-8 switchgear applications are supplied in the conversion kit. See Figs. 6- 1 through 6-5 for mounting diagrams.

225	Breaker portion of 4th-wire disconnect
226	Equipment portion of 4th-wire disconnect
229	Mounting bracketAK-100 for AKD type compartments.
230	10-32 x 1.375-inch mounting screws
231	Insualation
232	10# lock washer
233	10# flat washer
235	1/8 - 20 flat washer
236	1/8 - 20 lock washer
237	1/4 - 20 nut
238	1/4 - 20 x 1.25 - inch mounting screws
239	Bracket

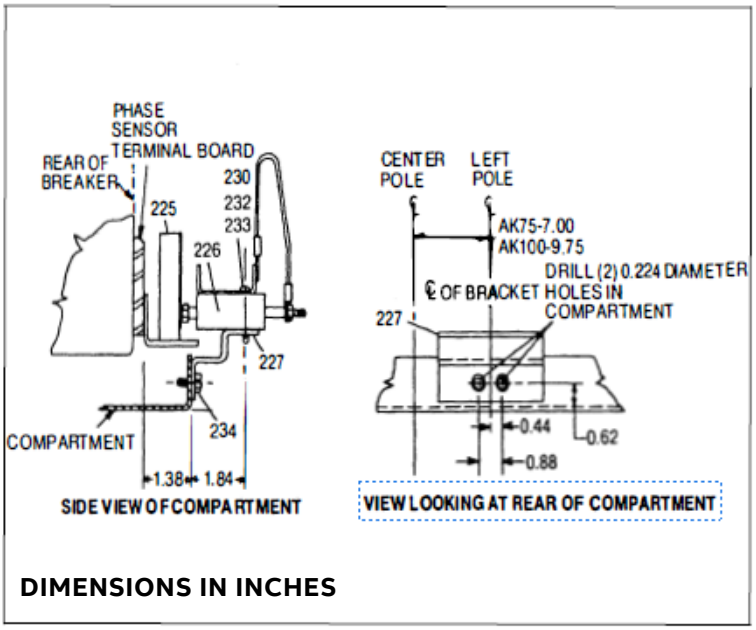


Fig. 6-1. AK-50, AKS-50 4th Wire Disconnect Type AKO

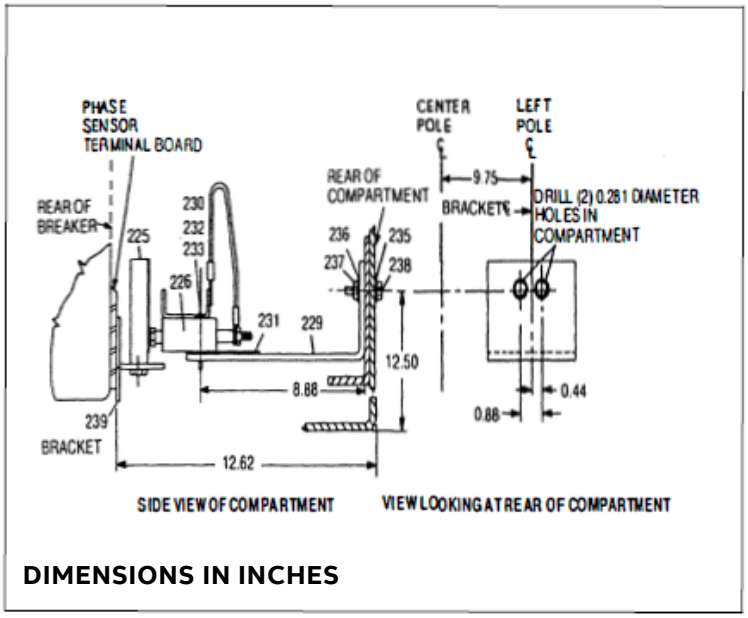


Fig. 6-2. AK-75, AKS-100 4th Wire Disconnect Type AKD-5, AKD-6

SECTION 6 EQUIPMENT CONVERSION

INSTALLING MOUNTING BRACKETS (CONT'D)

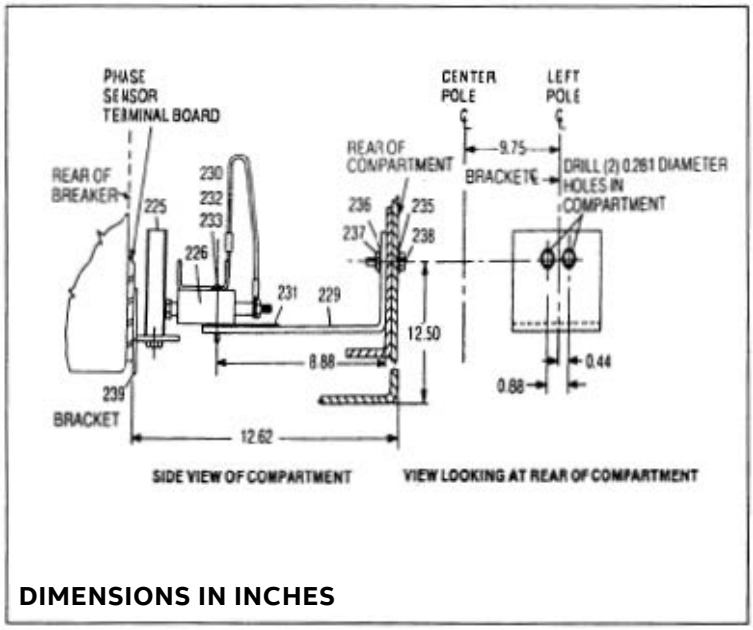


Fig. 6-3. AK-100 4th Wire Disconnect Type AKO

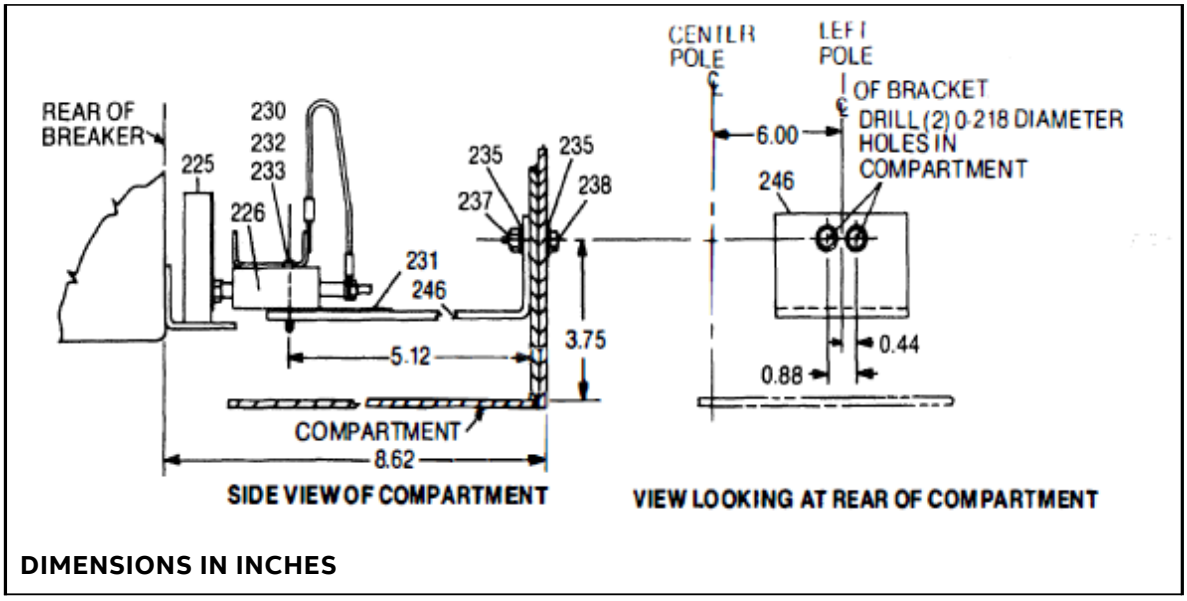


Fig. 6-4. AK-50, AKS-50 4th Wire Disconnect Type AKO

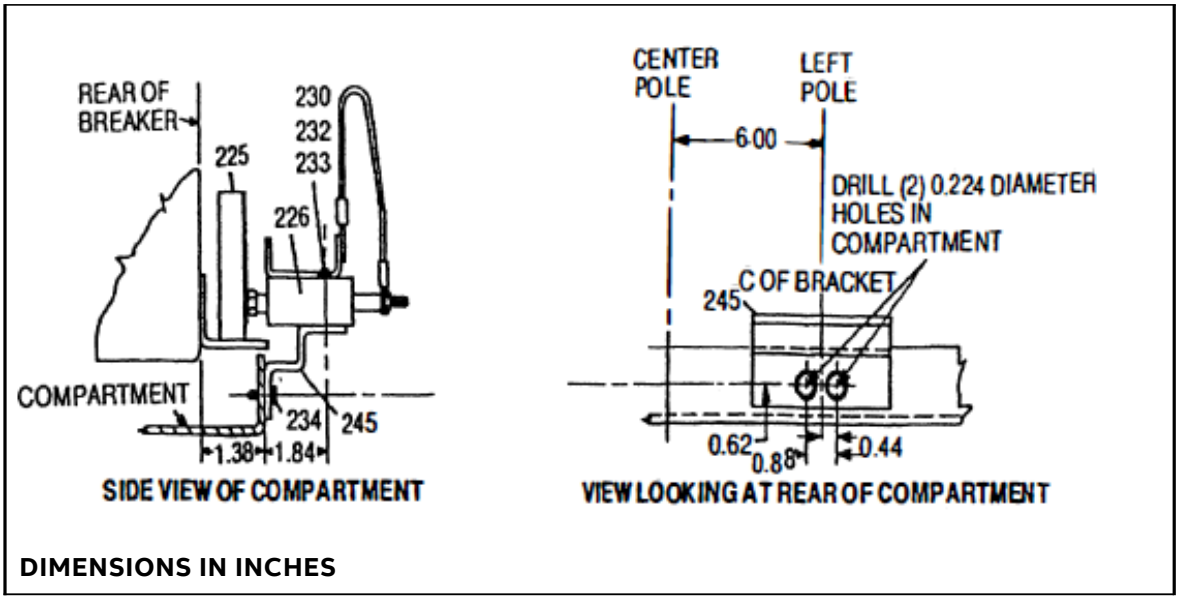


Fig. 6-5. 4th Wire Disconnect Installation Types AKD-5, AKD-6

SECTION 7 INSTALLING THE PROGRAMMER

The programmer is attached to the bracket mounted to the left side of the breaker's center channel. The guide pins on this bracket mate with the holes on either side of the programmer box. The guide pins provide the necessary alignment for the connector engagement. The locking lever en-gages with the pin, which is assembled to the programmer frame, and secures the programmer to the mounting bracket.

TYPE AK-50, AKS-50 BREAKERS

The AKS-50 mounting bracket is shown in Fig. 7 1. To install:

Step 1.

Insert the guide pins into the hole and push on the programmer. This will engage the connectors and release the locking lever which will move upwards.

Step 2.

Verify that the locking lever actually engaged the programmer pin.

To remove the programmer, move locking lever to horizontal position, thus releasing the programmer pin. Then, remove the programmer.

TYPE AK-75, AK-100 BREAKERS

The AK-75, AK-100 mounting bracket is shown in Fig. 7-2. To install:

Step 1.

Insert the guide pins into the holes and push the programmer, engaging the connectors.

Step 2.

Release the locking lever, securing the programmer.

Step 3.

Verify that the locking lever actually engaged the programmer pin.

To remove the programmer, pull out the locking lever, which will release the programmer pin. Then remove.

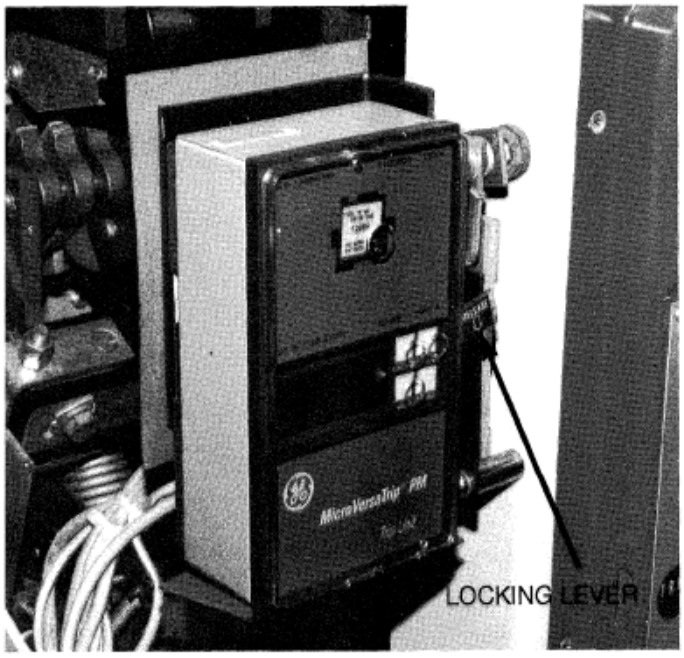


Fig. 7-1. Programmer Installed

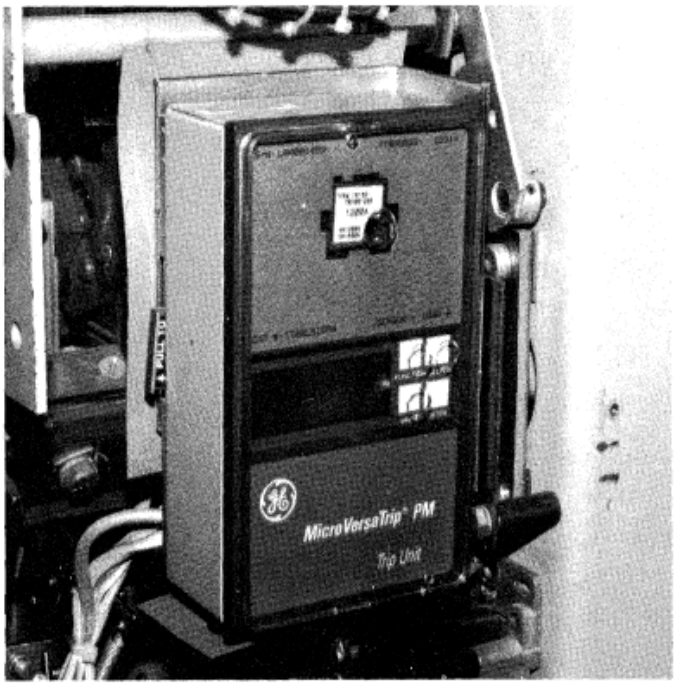


Fig. 7-2. Programmer Installed

SECTION 8 TESTING AND TROUBLESHOOTING

Once the breaker has been converted, but before it is energized, it must be tested. See below for troubleshooting details.

TESTING

Before installing a converted breaker back into service, perform the following steps:

Step 1.

Verify that the programmer is securely installed. The phase sensors must not be energized if they are open-circuited.

Step 2.

Megger the breaker primary circuit using a 1,000-Volt Megger.

Step 3.

Measure the res1stance across the line and load terminals for each phase using a Micro-Ohmeter or Milli-Volt tester. Also, measure the resistance across the CT assembly. If the resistance differs considerably from phase to phase, the electrical points may· not be properly tightened. Also, it may indicate improper contact wipe.

Step 4.

To verify that the breaker has been properly retro-fitted, a primary injection test should be performed on each phase. This test will check the CTs, bus, wiring harness, flux shifter,and trip unit as a complete system. A high current, low voltage power supply should be connected across each line and load terminal to simulate an over current fault. The programmer long-time may be set at 0.5 to minimize the breaker stress. When ground fault is installed, the test can be performed by wiring two adjacent poles in series. This will prevent the breaker from tripping due to an unbalance current flow. **Do not attempt to use test kit Cat. No. TVTSI or TVRMS on this programmer.**

TROUBLESHOOTING

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

1. Breaker not tripping in proper response to over currents or incipient ground faults.
2. Breaker remaining in a trip-free state due to mechanical interference along its trip shaft.
3. Inadvertent shunt trip activations.

WARNING: Do not change taps on the current sensors or adjust the programmer unit set knobs while the breaker is carrying current.

False Tripping Breakers Equipped with Ground Fault

When nuisance tripping occurs on breakers equipped with the ground fault trip element, a probable cause is the existence of a false "ground" signal. Each phase sensor is connected to summing circuitry in the programmer. Under no-fault conditions on 3-wire load circuits, the currents add to zero, and no ground signal is developed. This cur- rent sum will be zero only if all three sensors have the same electrical characteristics. If one sensor differs from the others (i.e., different rating or wrong tap setting), the circuitry can produce output sufficient to trip the breaker. Similarly, discontinuity be- tween any sensor and the programmer 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 PM components have previously demonstrated satisfactory performance. After disconnecting the breaker from all power sources, perform the following steps:

Step 1.

Check that all phase sensors are the same type (ampere range).

Step 2.

Make sure that the tap settings on all three-phase sensors are identical.

Step 3.

Verify that the harness connections to the sensors meet the polarity constraints indicated by the cabling diagram.

SECTION 8 TESTING AND TROUBLESHOOTING

FALSE TRIPPING BREAKERS EQUIPPED WITH GROUND FAULT (CONT'D)

Step 4.

On ground fault breakers serving four-wire loads, check that the neutral sensor is properly connected. See cabling diagram Fig. 8-1. In particular, the following:

A. Verify that the neutral sensor has the same rating and tap setting as the phase sensors.

B. Check 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 female harness connector.

C. If the breaker's lower studs connect to the supply source, then the neutral sensor must have its load end connected to the source. See Fig. 8-1.

D. Make sure that the neutral conductor is carrying only that neutral current associated with the breaker's load current (neutral not shared with other loads.)

Step 5.

If the preceding steps fail to identify the problem, then measure the sensor resistances. Since the phase and neutral sensors are electrically identical, their resistance should closely agree.

Table 8-1. Resistance Values

Breaker Frame Size	Ampere Tap	Resistance in Ohms between Common and Tap Terminals
AK-50 AKS-50	300	20-24
	400	27-32
	600	42-50
	800	58-68
	600	42-50
	800	58-68
	1200	93-109
	1600	130-154
AK-75	1200	20-24
	1600	28-34
	2000	37-44
	3000	61-72
AK-100	1600	36-43
	2000	47-55
	3000	75-88
	4000	108-127

SECTION 8 TESTING AND TROUBLESHOOTING

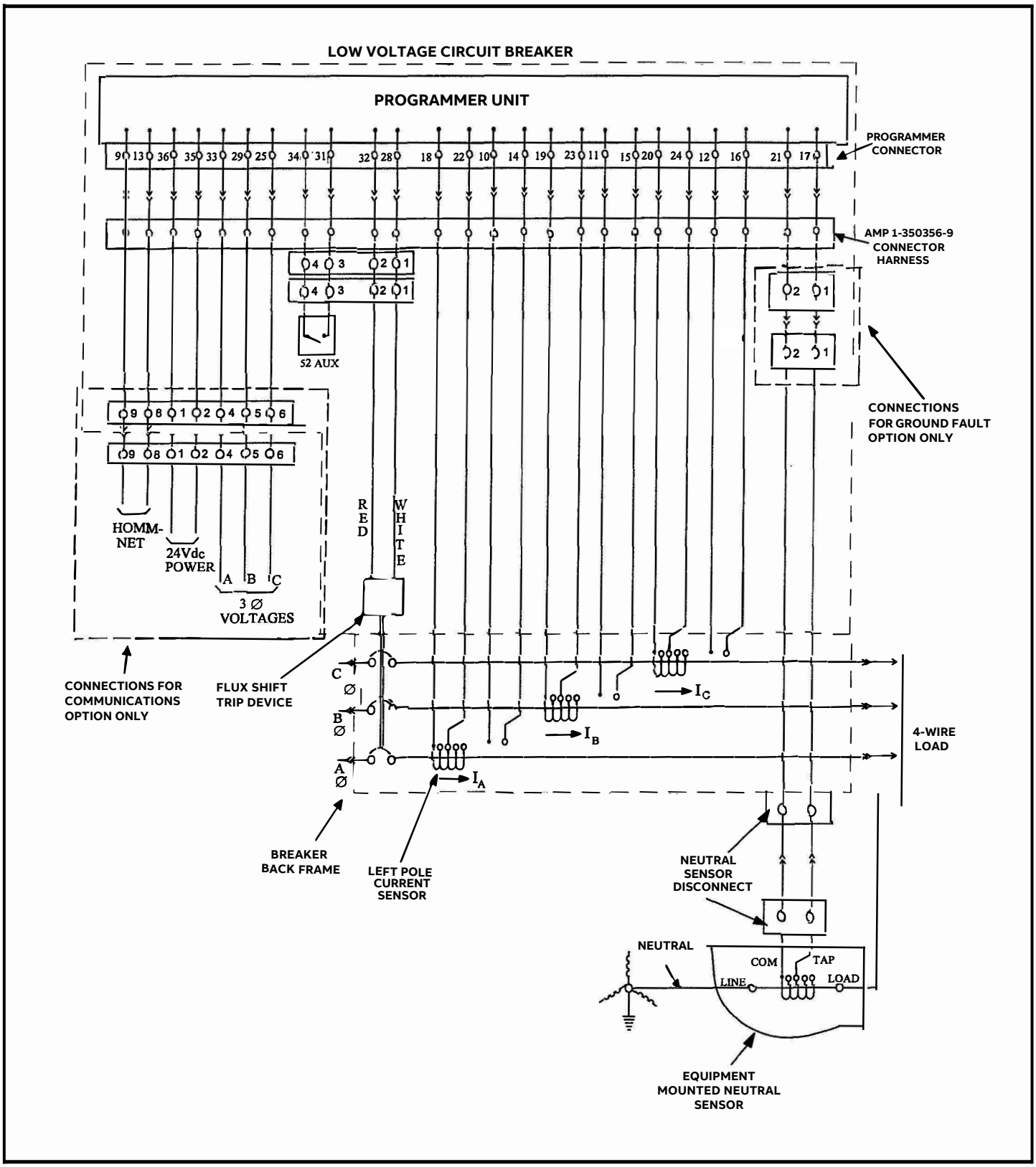


Figure 8-1. Cabling Diagram MicroVersaTrip Plus and PM With Ground Fault On 4-Wire Load

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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