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DEH-023 ***Installation Instructions***

MicroVersaTrip® Plus and MicroVersaTrip® PM Conversion Kits

For Westinghouse® Types DS-206, DSL-206, DS-416, DSL-416, DS-420, DS-632 Low Voltage Power Circuit Breakers

INTRODUCTION

GE Conversion Kits are designed to upgrade existing Westinghouse® Low Voltage Power Circuit Breakers, rather than replacing the entire breaker. The Conversion Kits contain enhanced solid-state MicroVersaTrip® Plus or MicroVersaTrip® PM Trip Units, representing the latest technological advancement in GE trip systems.

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

This publication covers the installation of MicroVersaTrip® Plus and MicroVersaTrip® PM Conversion Kits on Westinghouse® Types DS-206, DSL-206, DS-416, DSL-416, DS-420, and DS-632 Low Voltage Power Circuit Breakers. Each Conversion Kit contains all appropriate material to convert from an existing solid-state 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 itself is highly desirable. The general approach is to first strip the breaker of its existing trip devices, then install the MicroVersaTrip® Plus or MicroVersaTrip® 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 programmer unit have been furnished. Whenever 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 on 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-related consideration, the installation of the MicroVersaTrip® Plus or MicroVersaTrip® PM kits provides an excellent opportunity to perform normal maintenance on the breaker, particularly when the front and back frames are separated. Such procedures are described in the installation and maintenance manuals normally 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 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 with breaker and be sure the stored energy springs are discharged avoiding any 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 any 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 BREAKER PREPARATION

Preparing a Westinghouse® DS type breaker (Fig. 1) for conversion consists of the following steps:

1. Removing the existing Current Sensors, Wiring Harness, Trip Actuator and Trip Unit.
2. Disassembly of the Westinghouse® Trip Actuator.
3. Any cleaning, lubrication, or maintenance of the breaker contacts and mechanism that are required.

Following is a detailed description of the first two steps.

Trip Device Removal

Step 1.
Remove and retain the load side primary draw out fingers (Fig. 2). Disconnect the existing CT wire harness from the current sensors. Slide the CT's off the primary load stabs and discard. If a DS-206, or DSL-206 breaker is being retrofitted, be sure to save the existing molded CT spacers (Fig. 3).

Fig. 1. DS-416 Shown Prior to Conversion

Fig. 3. DS-206, DSL-206 Molded CT Spacers

Fig. 2. Removal of Draw Out Fingers, DS-206

SECTION 3 BREAKER PREPARATION (CONTINUED)

Step 2.
Separate the front escutcheon cover of the breaker by removing the charging handle knob, and four (4) screws from the front of the breaker (six (6) screws on DS-632 breakers). Remove the trip actuator from the breaker frame by carefully disconnecting the trip paddle spring (Fig. 4) and removing the three (3) hex head bolts from the bottom of the breaker. Save the trip paddle spring and hardware for reuse. Disconnect the trip actuator wiring at the programmer terminal block (Fig. 5). Retain the trip actuator for modification.

CAUTION: The trip paddle spring is located behind the existing trip actuator and is connected to both the trip actuator frame and to the existing trip paddle on the breaker's common trip shaft. Removal of the trip actuator without disconnecting the trip paddle spring may result in damage to the trip paddle spring.

Fig. 4. Removing the Trip Paddle Spring

Step 3.
Remove the two (2) screws that attach the programmer unit to the auxiliary switch panel of the breaker (Fig. 5). Remove any wire ties that may be holding the existing CT wire harness to the breaker frame. Discard the programmer unit and CT wire harness.

Fig. 5. Westinghouse® Programmer Unit and CT Wire Harness

SECTION 3 BREAKER PREPARATION (CONTINUED)

Trip Actuator Disassembly

The existing Westinghouse® trip actuator must be converted to the new MicroVersaTrip® flux shifter assembly. The following steps will detail how to disassemble the trip actuator and which components must be saved. The actual assembly of the new MicroVersaTrip® flux shifter is detailed later in this manual.

Step 1.
Separate the bottom cover of the Westinghouse® trip actuator by removing the tape wrapping at the joint of the two housings (Fig. 6). Discard the bottom housing cover.

Fig. 6. Westinghouseâ Actuator Bottom Cover

Step 2.
Remove the 7/16" self-locking hex nut from the bottom of the actuator shaft. Slide the actuator shaft out of the assembly (Fig. 7). Discard the actuator shaft and hardware.

Fig. 7. Westinghouseâ Actuator Shaft

Step 3.
Separate the upper housing assembly from the actuator frame by removing the two (2) hex nuts which are located on top of the actuator frame (Fig. 8). Discard the upper housing and hardware. Save, clean, and lubricate the actuator frame and reset mechanism.

Fig. 8. Westinghouseâ Actuator Coil & Housing

SECTION 4 INSTALLING THE CONVERSION KIT

Installing the Phase Sensors (CT's)

Step 1.
The CT's slide onto the breaker's primary load stabs in the place of the original CT's on the back of the breaker frame. The CT's should be mounted with the wiring taps toward the rear of the breaker (Figs. 9-11). When installing the CT's on DS-206 or DSL-206 breakers, re-install the molded CT spacers that were used with the original Westinghouse® CT's.

Fig. 10. CT Assembly for a DS-206H, DS-416, or DS-420

Fig. 9. CT Assembly for a DS-206 or DSL-206

Fig. 11. CT Assembly for a DS-632 Breaker

SECTION 4 INSTALLING THE CONVERSION KIT (CONTINUED)

Flux Shifter Assembly, Adjustment and Installation

The new MicroVersaTrip® flux shifter will be supplied from the factory with the actuator shaft and shoe assembled. Prior to installation, the actuator shaft and shoe components must be disassembled from the flux shifter and then reassembled into the Westinghouse® actuator frame along with the flux shifter device.

Fig. 12. Flux Shifter Assembly as Shipped from Factory

Step 1.
Remove and retain the two (2) jamb hex nuts used to attach the shoe to the actuator shaft of the flux shifter (Fig. 12 & 13). Slide the actuator shaft out of the flux shifter assembly. Save all hardware.

Step 2.
Install the flux shifter assembly onto the Westinghouse® actuator frame using the two (2) #10 hex nuts and lock washers provided (Fig. 14).

Fig. 13. Actuator Shaft and Shoe Removal

Fig. 14. Flux Shifter Mounting

SECTION 4 INSTALLING THE CONVERSION KIT (CONTINUED)

Flux Shifter Assembly, Adjustment and Installation (Continued)

Step 3.
Slide the actuator shaft into the flux shifter device. Be sure that the reset arm of the Westinghouse® actuator frame is below the button of the actuator shaft (Fig. 15a). Reinstall the first of the two (2) ¼" jamb hex nuts removed earlier onto the actuator shaft. With the flux shifter plunger in the discharged position (Fig. 15b), adjust the first jamb hex nut (with the shoe in place against the flux shifter plunger) so there is approximately .125 inch clearance between the reset arm and the top of the Westinghouse® actuator frame. Lock the assembly in place with the second jamb hex nut. Be sure to adjust the location of the microswitch on the flux shifter to ensure operation of the microswitch when the flux shifter is discharged.

Step 4.
Reinstall the converted trip actuator into the breaker frame in the reverse order of disassembly. Be sure to reattach the trip paddle spring to the Westinghouse® actuator frame and to the existing trip paddle.

Optional Test: The flux shifter assembly may be tested by closing the breaker and applying a 9V dc power source to the flux shifter leads. The red wire (pin #2) is the positive lead. The white wire (pin #1) is the negative lead. The breaker should open.

CAUTION: The 9V dc power source should only be applied momentarily. Prolonged application of this dc power source can damage the flux shifter device.

Fig. 15a. Flux Shifter Reset Arm

Fig. 15b. Flux Shifter Adjustment

SECTION 4 INSTALLING THE CONVERSION KIT (CONTINUED)

Wire Harness Connector Assembly and Installation

The wire harness includes a 36-pin programmer connector, which must be assembled and installed to the programmer bracket prior to the installation of the programmer unit.

WARNING: THE ADAPTER BRACKET MUST BE INSTALLED ONTO THE PROGRAMMER 36-PIN CONNECTOR AND PROGRAMMER BRACKET AS DETAILED BELOW. FAILURE TO DO SO WILL RESULT IN HARNESS PLUG FAILURE AND THE PROGRAMMER WILL NOT PROVIDE PROTECTION. IF THE CONVERTED BREAKER IS ENERGIZED OR PRIMARY INJECTED WITH THE ADAPTER BRACKET NOT INSTALLED OR INSTALLED IMPROPERLY, DAMAGE WILL RESULT TO THE PROGRAMMER UNIT, WIRE HARNESS, 36-PIN CONNECTOR, AND CT'S. FAILURE TO ADHERE TO THESE INSTRUCTIONS WILL VOID ALL WARRANTIES.

Step 1.
Slide the adapter bracket onto the 36-pin programmer connector (Figs. 16a & 16b). Be sure that the beveled corners of the programmer connector are facing toward the right side, the adapter bracket slides in place behind the notches on either side of the connector body, and that the connector's tabs align with the notches provided on the bottom of the adapter bracket.

Step 2.
Hold the adapter bracket tight to the programmer connector and bend the two (2) locking tabs provided on the adapter bracket over the connector body (Fig. 16c).

Fig. 16a. 36-Pin Programmer Connector

Fig. 16b. Adapter Bracket

Fig. 16c. Adapter Bracket Locking Tabs

SECTION 4 INSTALLING THE CONVERSION KIT (CONTINUED)

Wire Harness Connector Assembly and Installation (Continued)

Step 3.
Slide the adapter bracket and connector assembly over the guide pins of the programmer bracket. Press the two (2) steel push nuts provided onto the guide pins using a nut driver until the assembly is held firmly against the programmer bracket (Fig. 16d).

Step 4.
While holding the adapter bracket and connector assembly firmly in place against the programmer bracket, bend the two (2) locking tabs on the programmer bracket into the mating notches on the adapter bracket using a screwdriver (Fig. 16e).

Fig. 16d. Installing Push Nuts

Fig. 16e. Programmer Bracket Locking Tabs

SECTION 4 INSTALLING THE CONVERSION KIT (CONTINUED)

Programmer Bracket Installation

Step 1.
Install the programmer bracket to the auxiliary switch plate of the breaker using the two (2) ¼”-20 x ¾” screws provided (Fig. 17).

Wire Harness Installation

The wire harness installation consists of the programmer portion and the communication portion. The communication harness is supplied, pre-wired for all kits, but may not be required for MicroVersaTrip® Plus trip units. Separate and route the wire harness as follows:

Step 1.
The 4-pin wire lead plug should be routed through the notch in the front left-handed corner of the auxiliary switch mounting plate and along the left side frame of the breaker to its mating plug on the flux shifter. Tie the harness away from any moving parts or sharp edges of the breaker (Fig. 17).

Fig. 17. Installed Programmer Bracket & Wire Harness

Step 2.
Route the CT wire leads through the original wire channel along the left side frame of the breaker and along the left-rear frame of the breaker (Fig. 18). Pay special attention to polarity.

White - Tap - X2 Black - Common - X1

Step 3.
When the communications portion or the neutral CT portion of the wire harness is installed, it is recommended that these leads be tied to the frame of the breaker in such a manner where it is accessible with the breaker in the switchgear cubicle. The actual location is dependent on the configuration of the switchgear assembly and the location of the mating equipment within the switchgear. The installation and termination points of these components may be determined by a field engineer. If either the communications portion or the neutral CT portion of the wire harness is utilized, a caution label (Fig. 19 on page 13) should be mounted on the breaker and the compartment door as a warning to prevent unnecessary damage.

Fig. 18. Wire Harness Routing to CT’s

SECTION 4 INSTALLING THE CONVERSION KIT (CONTINUED)

Wire Harness Installation (Continued)

A mounting plate is supplied with each hardware kit for locating the communications portion of the wire harness. When the communications portion and/or the neutral CT portion of the wire harness are not to be used, it is recommended that they be coiled and tied next to the programmer bracket (Fig. 20).

Fig. 19. Caution Label

SECTION 5 INSTALLING THE PROGRAMMABLE TRIP UNIT

The programmer is attached to the programmer mounting bracket. The guide pins in the 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 engages with the pin, which is assembled to the programmer unit, and secures the programmer to the mounting bracket.

To Install the Programmer:

Step 1.
Insert the guide pins into the holes and push on the programmer. This will engage the connectors and release the locking lever which will move upwards (Fig. 21).

Step 2.
Verify that the locking lever actually engaged with the pin on the rear of the programmer.

To remove the programmer, pull the locking lever down, thus releasing the programmer pin. Then, remove the programmer.

WARNING: BE SURE TO PERFORM THE CONTINUITY TEST DETAILED IN STEP 1 OF TESTING ON PAGE 17 PRIOR TO ENERGIZING OR PRIMARY INJECTING THE CONVERTED BREAKER. FAILURE TO DO SO MAY RESULT IN DAMAGE TO THE PROGRAMMER UNIT, WIRE HARNESS, 36-PIN PROGRAMMER CONNECTOR AND CT'S. FAILURE TO ADHERE TO THESE INSTRUCTIONS WILL VOID ALL WARRANTIES.

Fig. 20. Communications and Neutral CT Wire Leads

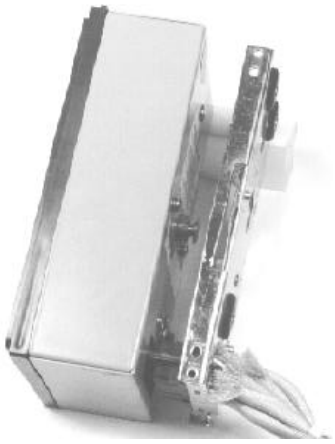

Fig. 21. Programmer Installation

SECTION 6 FOUR-WIRE GROUND FAULT OPTION

The ground fault option in all four-wire systems requires an additional neutral sensor. The neutral sensor is installed in the neutral bus in the equipment and is connected to the programmable trip unit through a wiring harness provided.

Step 1.
Mount the neutral sensor on the outgoing neutral lead, normally in the equipment's bus or cable compartment (Figs. 22-24).

Step 2.
Connect the neutral sensor wire harness to the correct taps on the sensor. The tap setting on the neutral sensor must match the phase sensors. Maintain the following color code:

White - Common Black - Tap

Step 3.
Route the wire through the equipment and connect to the 2-pin connector on the programmer harness. The wire should be tied to the breaker frame in an easily accessible location. It may be located with the communications harness (See Fig. 20 on page 13).

Fig. 22. Neutral Sensor Outline for DS-206 and DSL-206 Breakers

Fig. 23. Neutral Sensor Outline for DS-416, DSL-416 and DS-420 Breakers

Fig. 24. Neutral Sensor Outline for DS-632 Breaker

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

Testing

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

Step 1.

Verify that the programmable trip unit is securely installed by performing a continuity test on the CT wiring and programmer. Disconnect the black CT wires at each phase sensor. Then using a continuity tester or V.O.M., check for continuity from the white CT wire lead of the phase "A" CT to the white CT wire lead of the phase "B" CT. Repeat this continuity test for the white CT wire leads of phase "A" and phase "C". Next, measure the resistance across each phase sensor and compare the values measured to the values listed in table 7-1. Be sure to reconnect the black CT wire leads to all of the phase sensors prior to performance testing the breaker.

CAUTION: In addition to the continuity test described above and prior to performance testing 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, the programmer's screen should be activated by depressing the battery button on its face and check that the test current is displayed on the screen for each phase tested. This test along with the continuity test will confirm that no open circuits exists in the CT harness and that the trip unit is mounted properly. If the programmer fails to display the test current, the test should be stopped immediately and the programmer/wire harness installation should be verified prior to proceeding with any additional testing.

WARNING: IF THE CONVERTED BREAKER IS ENERGIZED OR PRIMARY INJECTED USING A SUFFICIENT LEVEL OF TEST CURRENT WITH A LOOSE OR OPEN CIRCUIT BETWEEN THE CT'S AND THE PROGRAMMER, DAMAGE WILL OCCUR TO THE PROGRAMMER UNIT, WIRE HARNESS, 36-PIN PROGRAMMER CONNECTOR AND CT'S. FAILURE TO ADHERE TO THESE INSTRUCTIONS WILL VOID ALL WARRANTIES.

Step 2.

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

Step 3.

Measure the resistance across the line and load terminals for each phase using a Micro-Ohmmeter or Milli-Volt tester. 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 retrofitted, a primary injection test should be performed on each phase. This test will check the CT's, 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 overcurrent fault. The 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 or by using the GE test kit Cat. No. TVRMS2. This will prevent the breaker from tripping due to an unbalanced current flow.

Do not attempt to use GE test kit Cat. No. TVTS1 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 tripping in proper response to overcurrents or incipient ground faults.
2. Breaker remaining in a trip-free state due to mechanical interference along its trip shaft.
3. Inadvertent shunt trip activation's.

WARNING: DO NOT CHANGE TAPS ON THE CURRENT SENSORS OR ADJUST THE PROGRAMMER TRIP UNIT SETTINGS OR REMOVE THE PROGRAMMER TRIP UNIT WHILE THE BREAKER IS CARRYING CURRENT. FAILURE TO ADHERE TO THESE INSTRUCTIONS WILL VOID ALL WARRANTIES.

SECTION 7 TESTING AND TROUBLESHOOTING (CONTINUED)

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 current 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 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 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 (Fig. 25).

Step 4.
On ground fault breakers serving four-wire loads, check that the neutral sensor is properly connected. See cabling diagram Fig. 25. In particular, check 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 connect block through 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. 25.

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 resistance's. Since the phase and neutral sensors are electrically identical, their resistance's should closely agree.

Table 7-1. CT Resistance Values

Breaker	Ampere CT Rating	Resistance in Ohms
DS-206	150A	4.7-5.8
DSL-206	225A	6.2-8.3
DS-206H	400A	10-14
	600A	14-20
	800A	20-25
DS-416	800A	20-25
DSL-416	1600A	40-50
DSL-416H	1600A	40-50
DS-420	2000A	84-103
DS-632	3200A	44-60*

* CT's have .4A output at rated input current.

Fig. 25. Cabling Diagram - MicroVersaTrip® Plus and MicroVersaTrip® PM with Ground Fault on 4-Wire Load

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

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