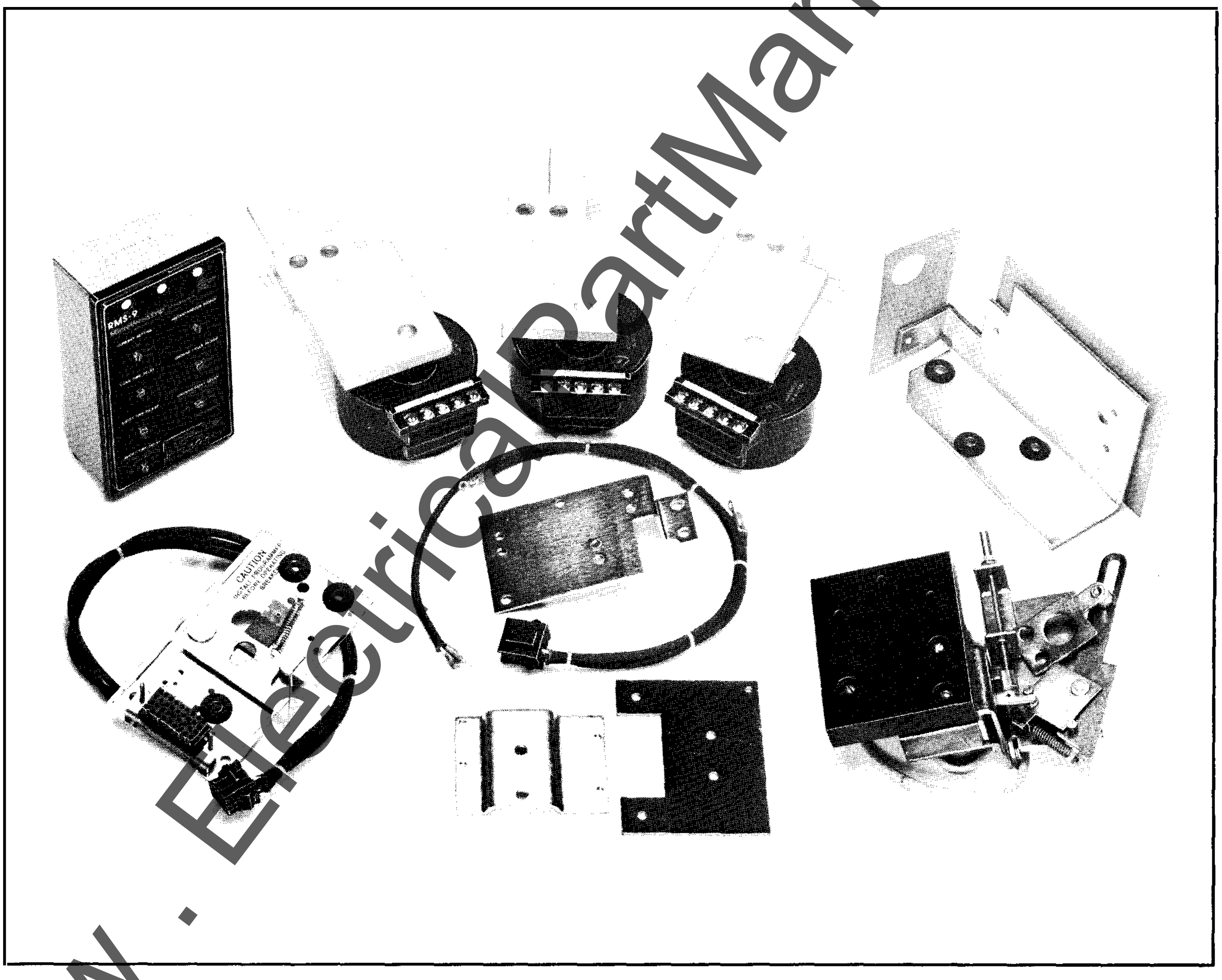
Instructions for Converting Existing ECS and SST Trip Systems to MicroVersaTrip® RMS-9

GEK-97729A

MicroVersaTrip® RMS-9 Conversion Kits

Types AKR 30/50 and AKRT-50



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SECTION 1 Introduction

These instructions cover the installation of MicroVersaTrip® RMS-9 solid-state trip device conversion kits on AKR 30/50 breakers listed in Table 1-1. Each kit contains the necessary material to convert from existing ECS or SST trip device systems.

Kit installation is straightforward. However, careful workmanship and attention to these instructions should be maintained. Familiarity with the breaker will prove helpful. The general approach is to first strip the breaker of its existing trip devices and then install the MicroVersaTrip® RMS-9 components. Following this, the converted breaker is performance-tested prior to being restored to service.

Prior to starting the conversion, the installer should verify that the correct kit, current sensors and programmer unit have been furnished—see Tables 1-1 through 1-4. Whenever the ground fault trip element is furnished for breakers applied on 4-wire systems, note that, in addition to installing the kit on the breaker, an associated neutral sensor (CT) is required for separate mounting in the equipment. Insure also that retrofitted breakers are applied within their short circuit ratings. For example, as part of a conversion where the breaker's trip elements are to be changed from LI to LS, the short-time rating would govern the application.

As a service-related consideration, the installation of the MicroVersaTrip® RMS-9 kit provides an excellent opportunity to perform normal maintenance on the breaker. Such procedures are described in maintenance manual GEK-64459. Also, any renewal parts required are listed in Renewal Parts publication GEF-4527. If required, copies of these publications are available from the factory.

Table 1-1 MicroVersaTrip® RMS-9 Conversion Kit Model Selection For Fixed Sensors With Interchangeable Rating Plug

Frame Size		Stationary or Draw-out		3- or 4-Wire		Fixed Sensor		Sensor Rating		Programmer Functions
AKR-30/30H = TKR30 AKRU-30	+	S OR D	+	3 OR 4*	+	F	+	AKR-30/30H 150A = 01 AKRU-30 400A = 04 800A = 08	+	L1 = 01 LIT1 = 02 LIGT2 = 03 LSIT1 = 04 LSIGT2 = 05 LSTI = 06 LSGT2-07 LSIGT2X = 08
AKR-50/50H = TKR50** AKRU-50 AKRT-50/50H								AKR-50/50H 800A = 08 AKRU-50 1600A = 16 AKRT-50/50H 2000A = 20		

*Only applicable to programmer functions with ground fault.
**Not suitable for converting Power Sensor-equipped breakers.

EXAMPLE:

- AKR-50, Draw-out construction, 3-wire system, 1600 Amp fixed sensor, LSIGT2 programmer, 1200 Amp rating plug
- MicroVersaTrip® RMS-9 conversion kit model number: TKR50D3F1605
- Interchangeable rating plug, 1200 Amp, model number: TR16S1200

Table 1-2—Current Sensors

Breaker Type	Sensor Ampere Rating	Cat. No.
AKR/AKRU-30, AKR-30H	150 400 800	139C4970G25 139C4970G28 139C4970G30
AKR50/50H, AKRU-50	800 1600	139C4970G30 139C4970G32
AKRT-50/50H	2000	139C4970G33

Table 1-3—Neutral Current Sensors①

Breaker Frame Size	Circuit Breaker Sensor Rating (Amps)	Neutral Sensor Rating or Tap Settings (Amps)	Cat. No.
800	150 400,800	100-300 300-800	TSVG303B TSVG508B
1600	800 1600	300-800 600-1600	TSVG508B TSVG516B
2000	2000	800-2000	TSVG620B

①Provided when 4-wire system with ground fault is specified

Table 1–4—Available Programmer Functions For MicroVersaTrip® RMS-9 Conversion Kits

Function	Model Code	Programmer Function Definition
L1	01	Long-Time, Instantaneous
LIT1	02	Long-Time, Instantaneous, Overload—Short Circuit Trip Indicators
LIGT2	03	Long-Time, Instantaneous, Ground Fault, Overload—Short Circuit—Ground Fault Trip Indicators
LSIT1	04	Long-Time, Short-Time, Instantaneous, Overload—Short Circuit Trip Indicators
LSITGT2	05	Long-Time, Short-Time, Instantaneous, Ground Fault, Overload—Short Circuit—Ground Fault Trip Indicators
LST1	06	Long-Time, Short-Time, Overload—Short Circuit Trip Indicators
LSGT2	07	Long-Time, Short-Time, Ground Fault, Overload—Short Circuit—Ground Fault Trip Indicators
LSIGT2X	08	Long-Time, Short-Time, Switchable Instantaneous Pickup (Off Position), Switchable Ground Fault Pickup (Off Position), Overload—Short Circuit—Ground Fault Trip Indicators

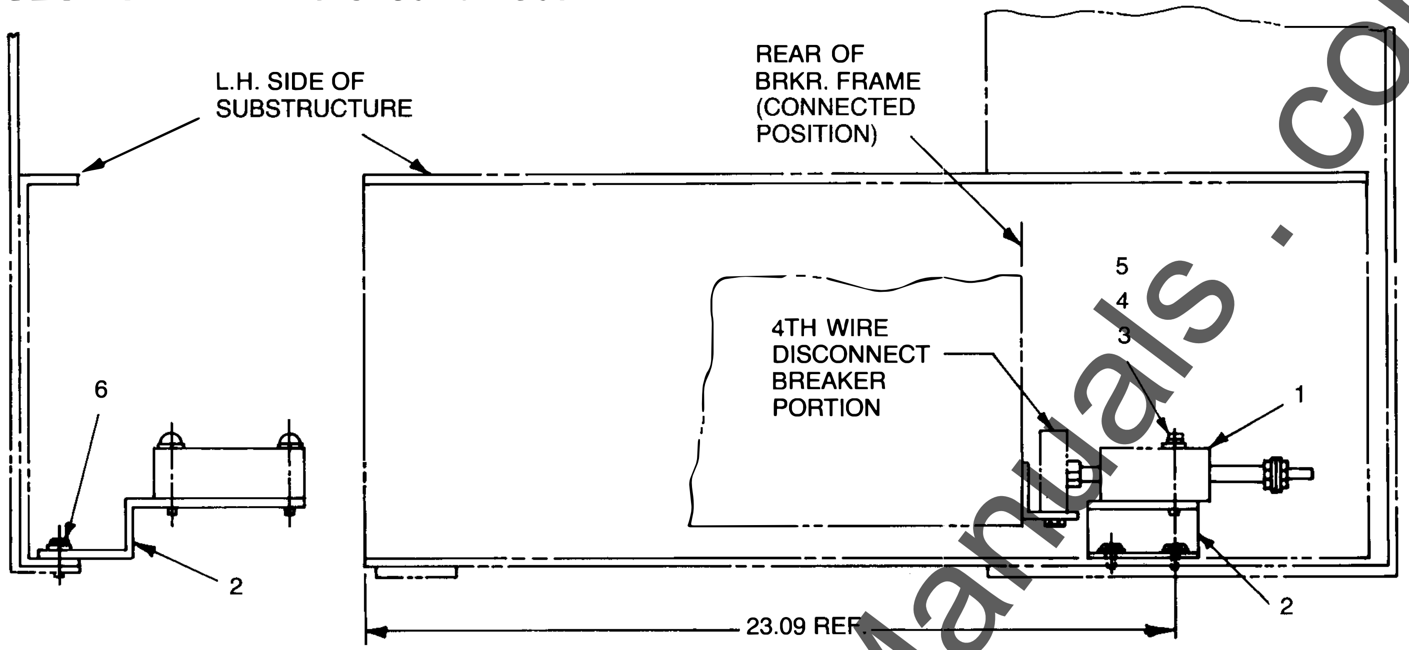
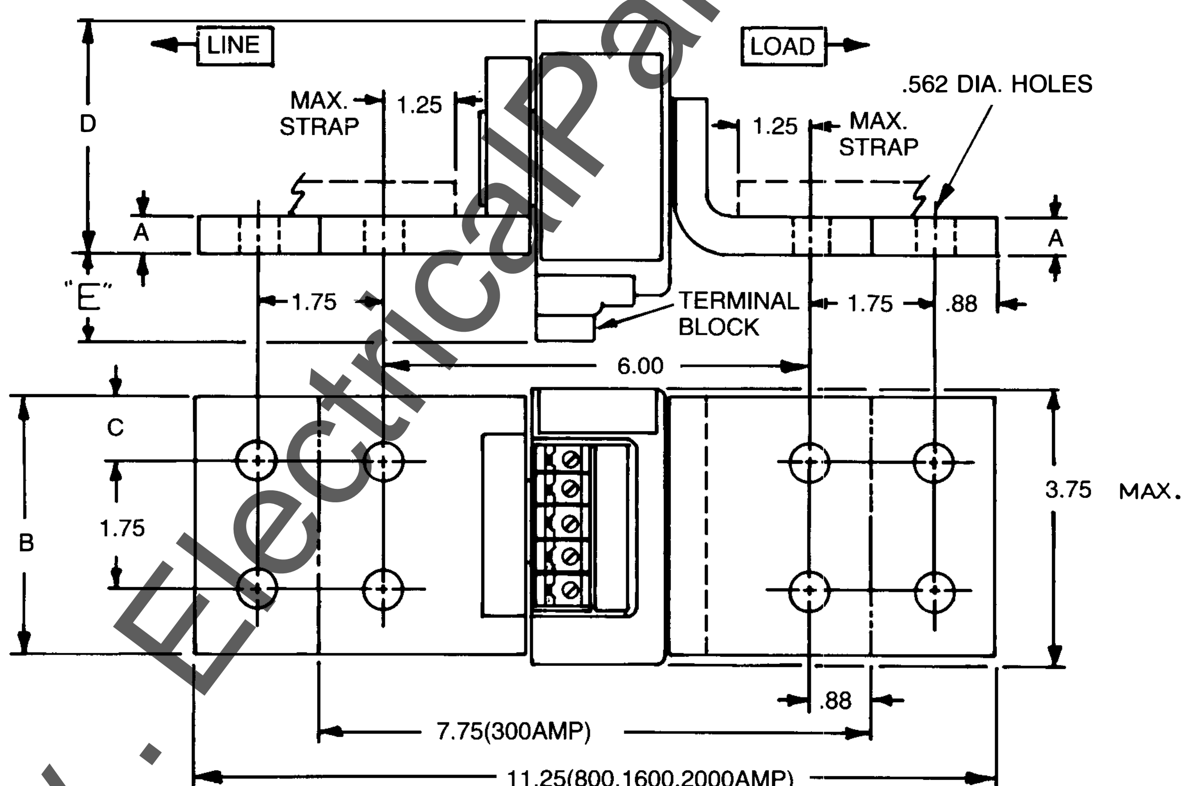


Figure 4-4 4th Wire Disconnect Installation—Substructure



SENSOR CAT. NO.	AMPERE RANGE	A	B	C	D	E
TSVG303BK	100-300	.250	3.25	.75	3.20	1.30
TSVG508BK	300-800	.250	3.25	.75	3.20	1.30
TSVG516BK	800-1600	.500	3.62	.94	3.20	1.30
TSVG620BK	800-2000	.625	3.25	.75	3.33	1.18

Figure 4-5 Neutral Sensor Outline

SECTION 4 4-Wire Ground Fault

4.5 INSTALLATION NOTES

- Observe LINE and LOAD markings when making bus or cable connections.
- Bond sensor on LINE side only.
- Maintain polarity of sensor secondary leads when connecting to breaker, i.e., TAP to TAP, COM to COM.

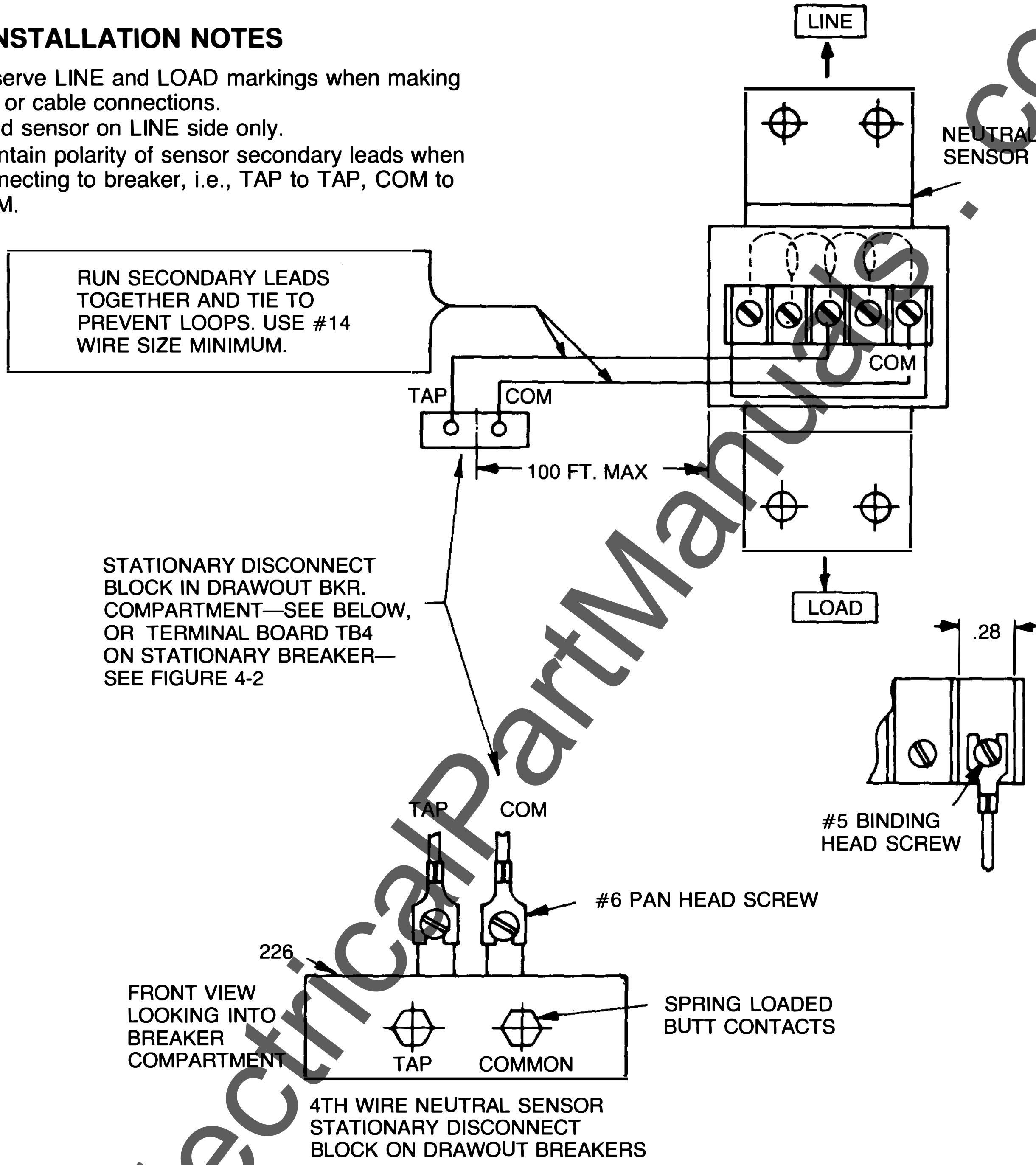


Figure 4-6 Connecting the 4th-wire neutral sensor.

SECTION 5 Programmer Installation

Prior to installing the MicroVersaTrip® RMS-9 programmer, an adapter bracket (205) must be first assembled to the 36-pin programmer connector—see Figure 5-1.

1. Assemble adapter bracket (205) to 36-pin programmer connector (with bevels to right side) by pushing bracket over notches in ends of plug body (step ①). Follow steps ② through ⑤ of Figure 5-1 to complete assembly of programmer harness to programmer bracket.

2. Install the programmer as follows:

a. Insert the guide pins into the holes, and push on the programmer. This will engage the connector and release the locking level which will then move upwards.

b. Verify that the locking lever did engage the programmer pin.

3. Remove the programmer as follows:

a. Move the locking lever to a horizontal position, releasing the programmer pin.

b. Remove the programmer.

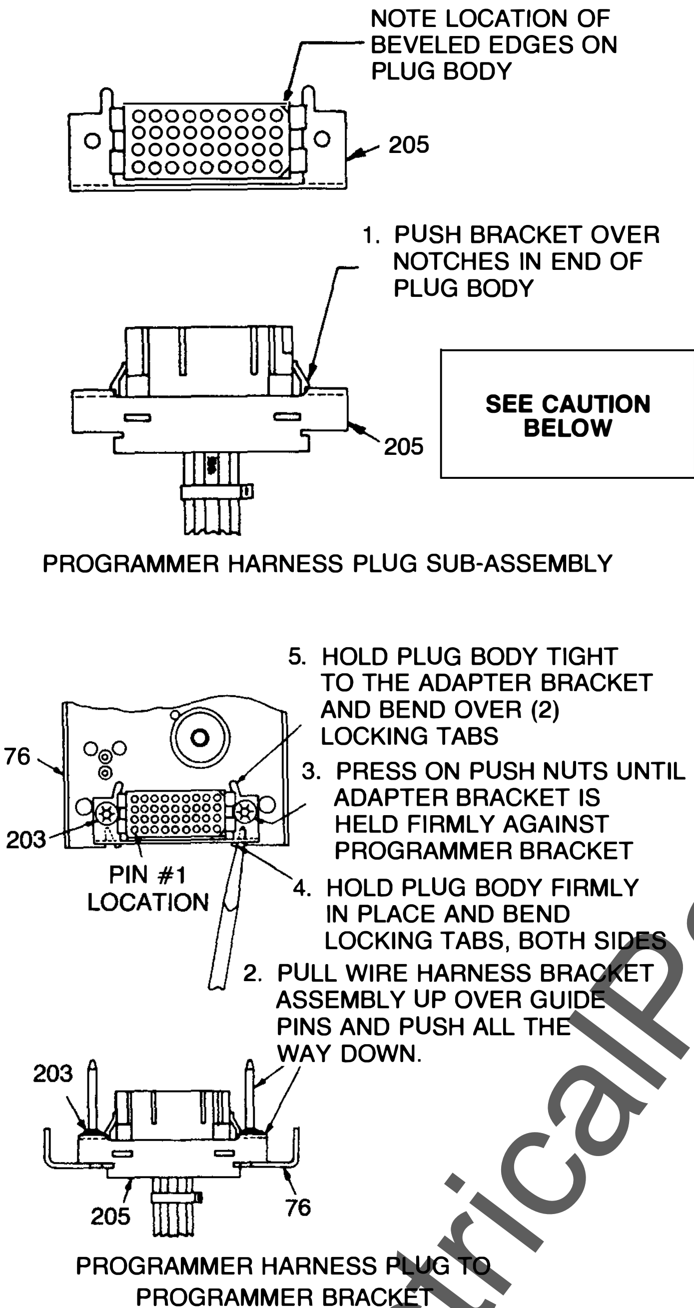


Figure 5-1 Harness Connector

CAUTION—ADAPTER BRACKET (205) MUST BE INSTALLED ONTO HARNESS PLUG AS SHOWN IN FIGURE 5-1 ABOVE. FAILURE TO DO SO WILL RESULT IN HARNESS PLUG FAILURE AND PROGRAMMER WILL NOT PROVIDE ANY PROTECTION.

SECTION 6 Testing and Troubleshooting

Once the breaker has been converted, and before it is energized, it must be tested as described in Section 6.1. If any problems develop with the trip device system, refer to Section 6.2 and 6.3 for troubleshooting details.

6.1 Testing

Before returning a converted breaker to service, perform the following steps:

a. Verify that the programmer is securely installed. The phase sensors **MUST NOT** be energized if they are open-circuited.

b. Megger breaker primary circuit using a 1000 volt megger.

c. Check the trip device system by either of two methods:

1. Conduct high-current, single phase tests on the breaker using a high-current, low-voltage test set.

NOTE: For these single-phase tests, special connections must be employed for MicroVersaTrip RMS-9 breakers equipped with ground fault. Any single-phase input to the programmer circuit will generate an unwanted "ground fault" output signal which will trip the breaker. This trip signal can be nullified by testing two poles of the breaker in series, or Test Set TVRMS can be used, in conjunction with high-current testing, to temporarily defeat the ground fault function. MicroVersaTrip® ground fault defeat cable Cat. No. TVTGD9 **CANNOT** and **MUST NOT** be used with MicroVersaTrip® RMS-9 programmers. Programmer damage may result. Likewise, do not attempt to use test kit Cat. No. TVTS1 on this programmer.

2. Test the components of the MicroVersaTrip RMS-9 system using portable test set Cat. No. TVRMS. The applicable test procedures are detailed in instruction book GEK-97367.

6.2 Troubleshooting

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

a. Breaker tripping in proper response to overcurrents or incipient ground faults.

b. Breaker remaining in a trip-free state due to mechanical interference along its trip shaft.

c. 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.

Once it has been established that the circuit breaker can be opened and closed normally from the test position, attention can be directed to the trip device proper. Testing is performed as described in Section 6.1.

6.2.1 Resistance Values

For use in troubleshooting the MicroVersaTrip® RMS-9 phase sensors, the resistance of the windings is given in Table 6-1.

Table 6-1—Fixed Sensor Resistance Values

Ampere Rating	Resistance in Ohms Between Terminals
150	10-12
400	27-32
800	58-68
1600	129-151
2000	207-243

The coil resistance of the MicroVersaTrip flux shifter device is approximately 7 ohms.

6.3 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. As indicated by the cabling diagram of Figure 6-2, each phase sensor is connected to summing circuitry in the programmer. Under no-fault conditions on 3-wire load circuits, the currents in this circuitry 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 programmer unit can cause a false trip signal.

If nuisance tripping is encountered on any breaker whose MicroVersaTrip® RMS-9 components have previously demonstrated satisfactory performance via the TVRMS test set, the sensors and their connections should be closely scrutinized. After disconnecting the breaker from all power sources:

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

2. Insure that the tap settings on all 3-phase sensors are identical.

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

4. On ground fault breakers serving 4-wire loads, check that the neutral sensor is properly connected (see cabling diagram Figure 6-3). In particular,

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. Verify that on breakers where the lower studs connect to the supply source, the neutral sensor has its LOAD end connected to the source. See Figure 6.4.

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

5. If the preceding steps fail to identify the problem, measure the sensor resistances. Since the phase and neutral sensors are electrically identical, their tap-to-tap resistances should closely agree. See Table 6-1.

6.4 MicroVersaTrip Cabling Diagrams

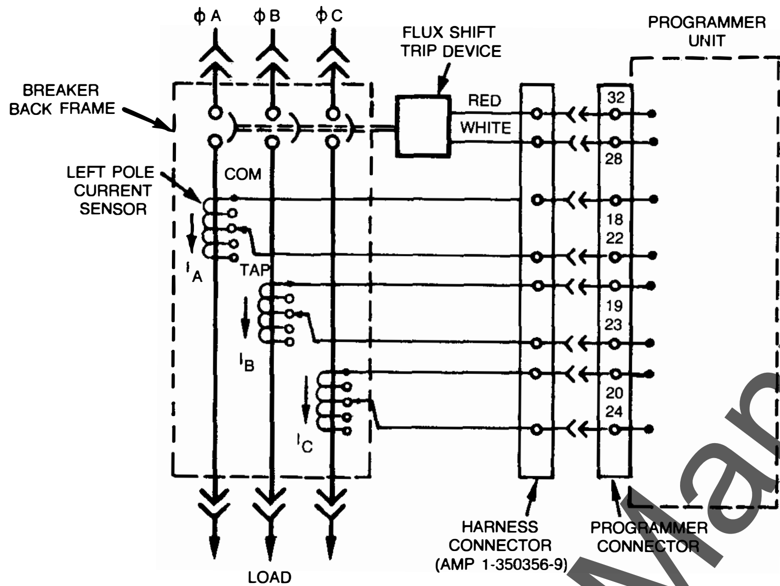


Figure 6-1 Cabling Diagram—MicroVersaTrip® RMS-9 Without Ground Fault

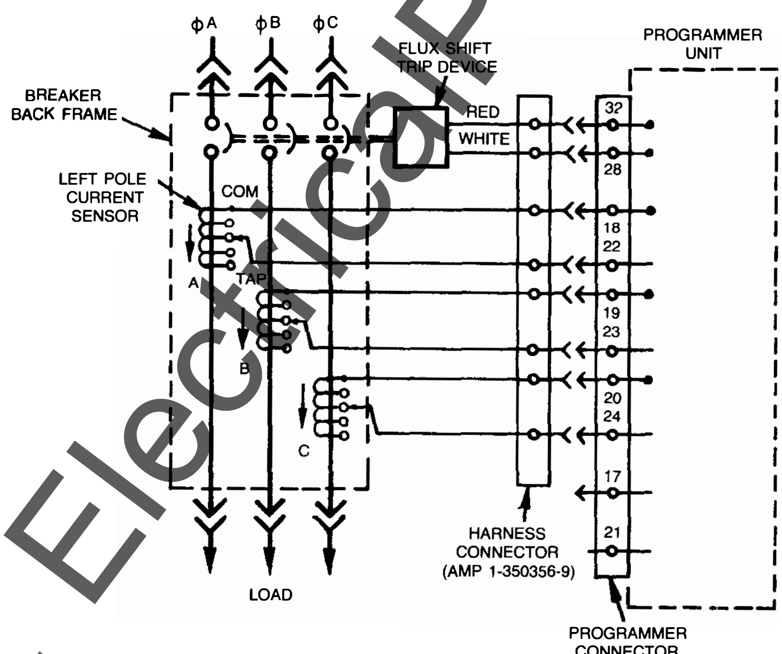


Figure 6-2 Cabling Diagram—MicroVersaTrip® RMS-9 With Ground Fault On 3-Wire Load

6.4 MicroVersaTrip Cabling Diagrams

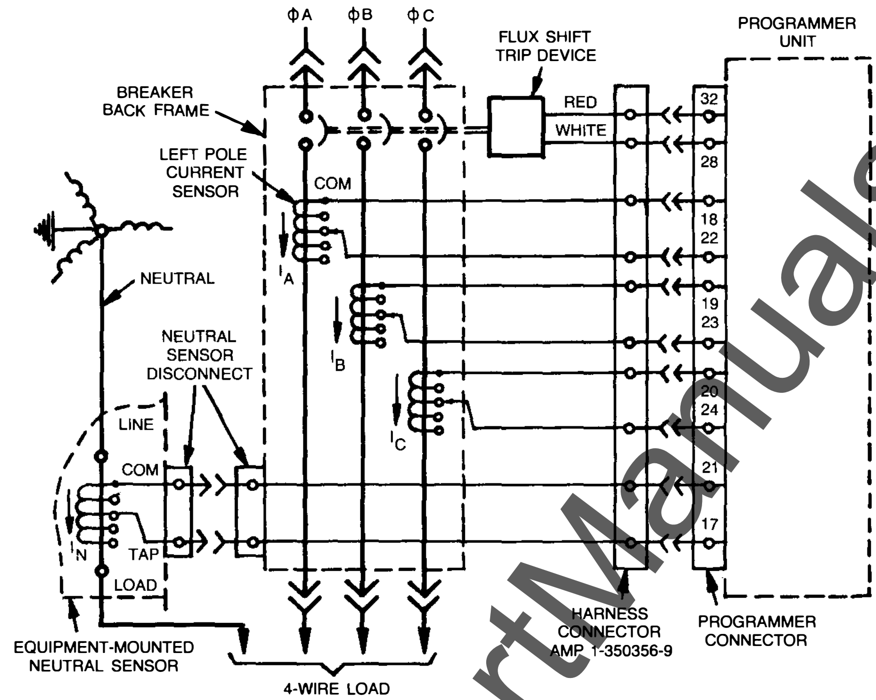


Figure 6-3 Cabling Diagram—MicroVersaTrip With Ground Fault On 4-Wire Load

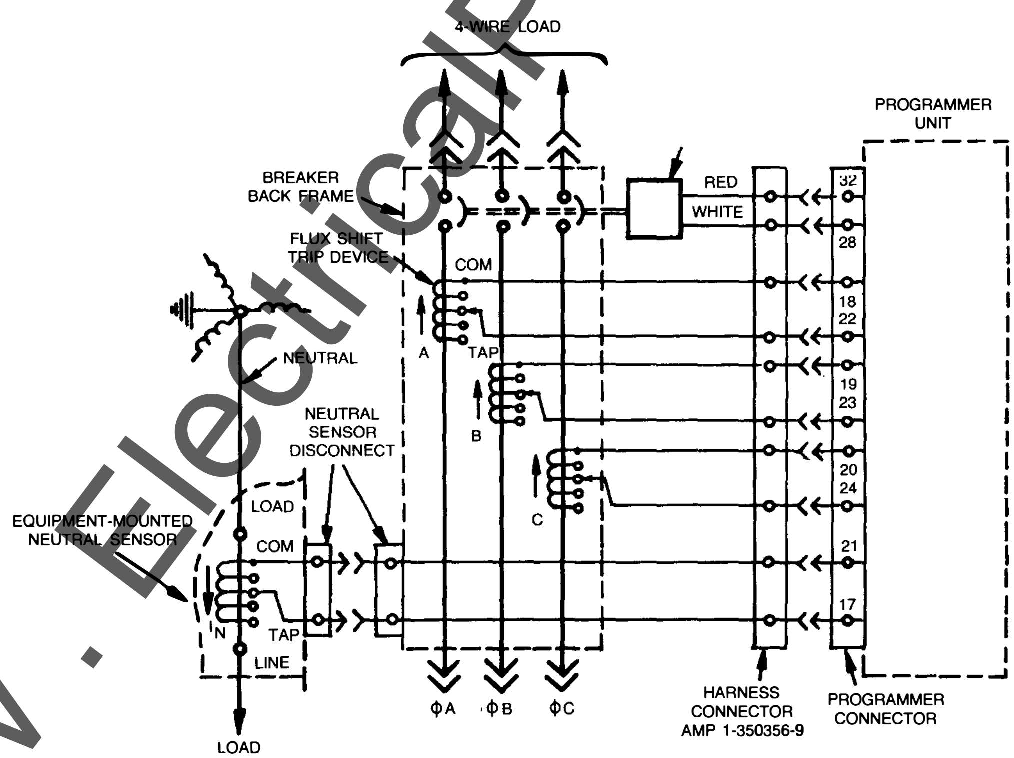


Figure 6-4 Cabling Diagram—MicroVersaTrip With Ground Fault on 4-Wire Load —Breaker Reverse Fed

6.4 MicroVersaTrip Cabling Diagrams

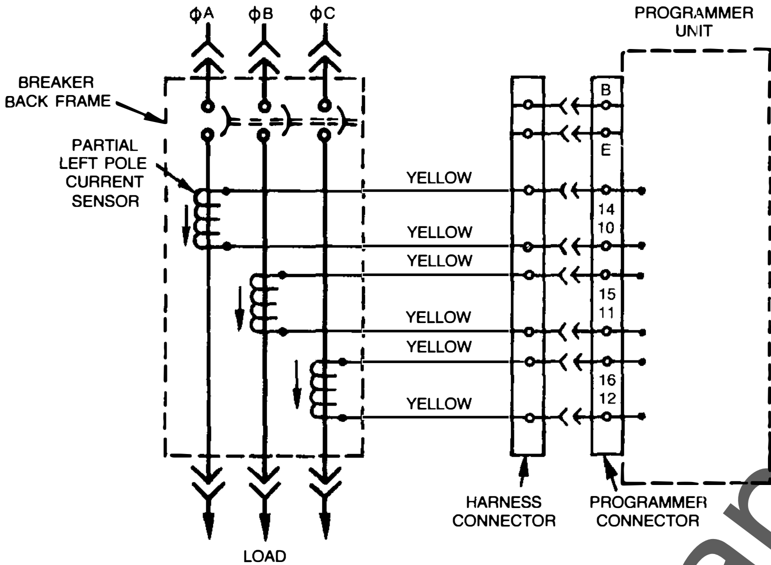


Figure 6-5 Partial Cabling Diagram: 'H'-Option Winding Connections

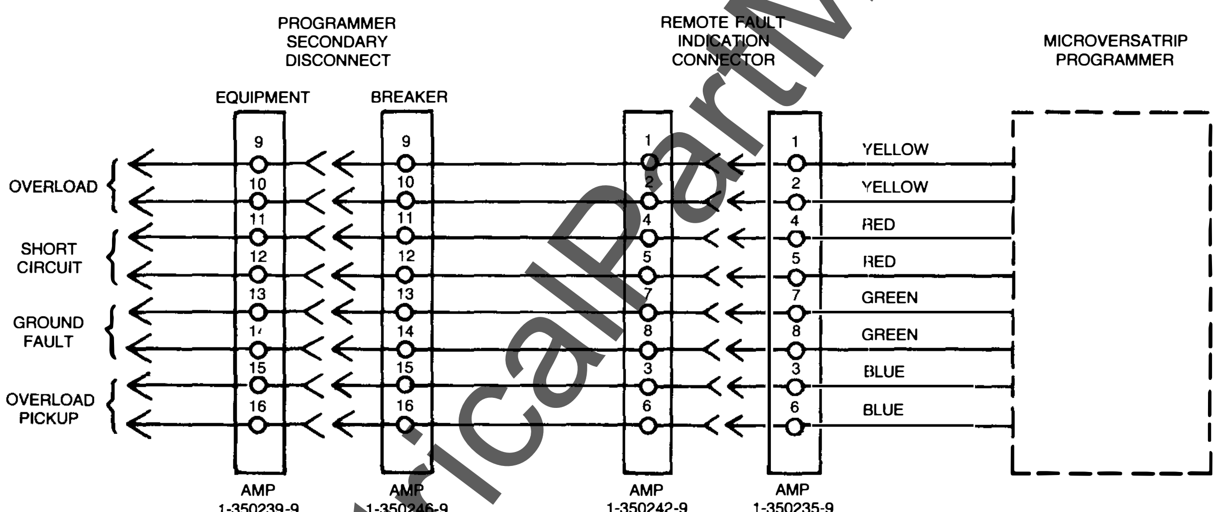


Figure 6-6 Cabling Diagram—Remote Fault Indication

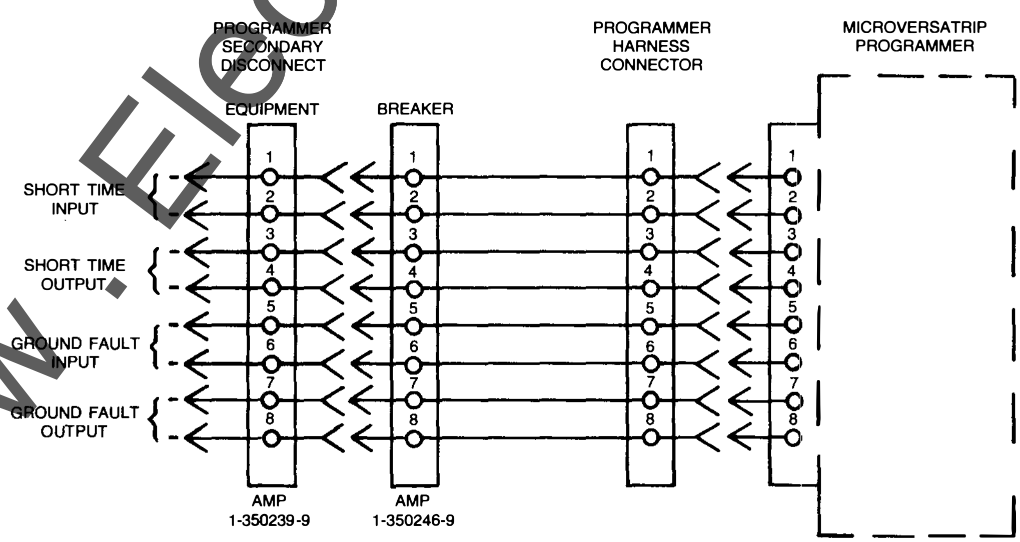
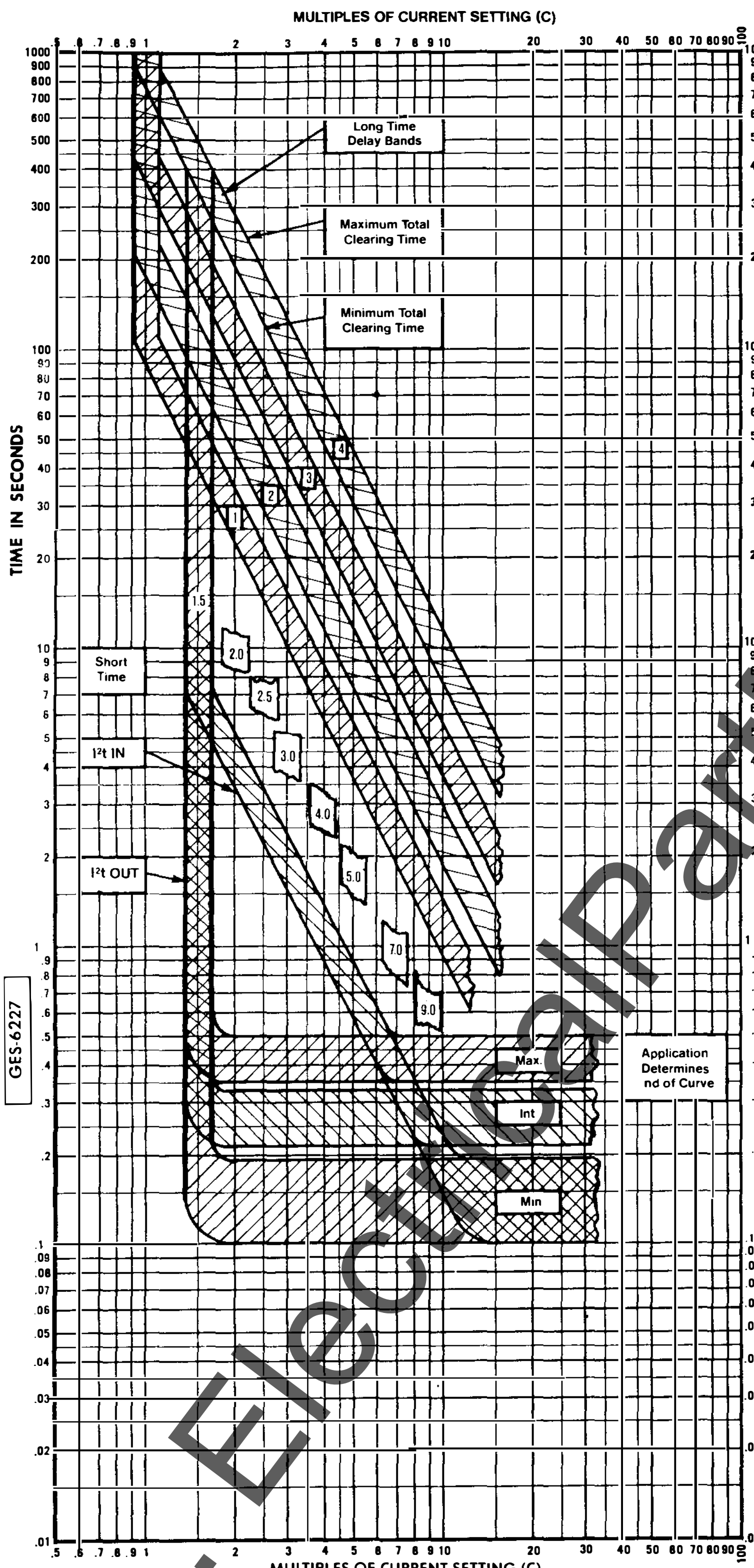
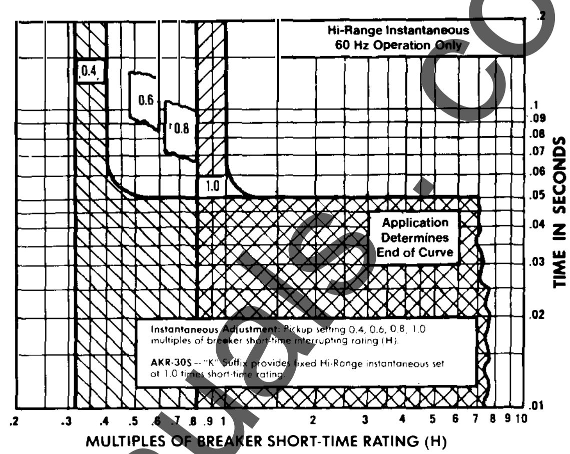


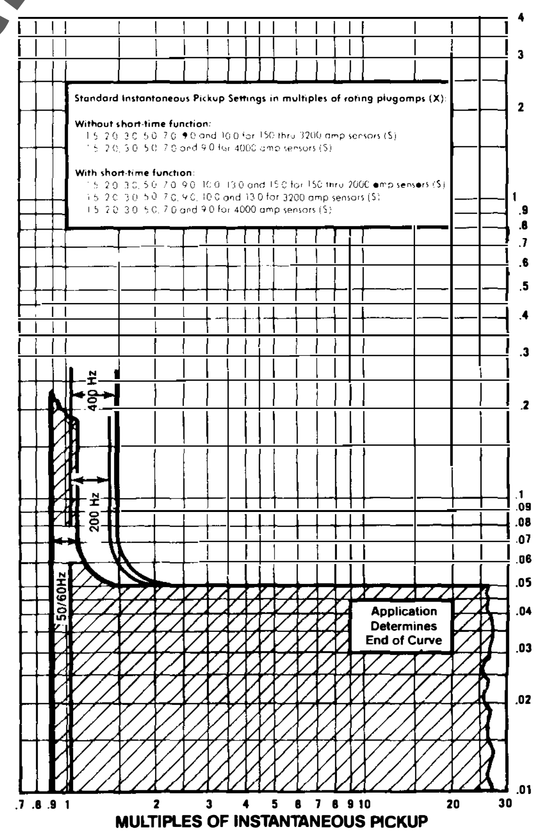
Figure 6-7 Cabling Diagram—Zone Selective Interlock

6.5 Time Overcurrent Curves

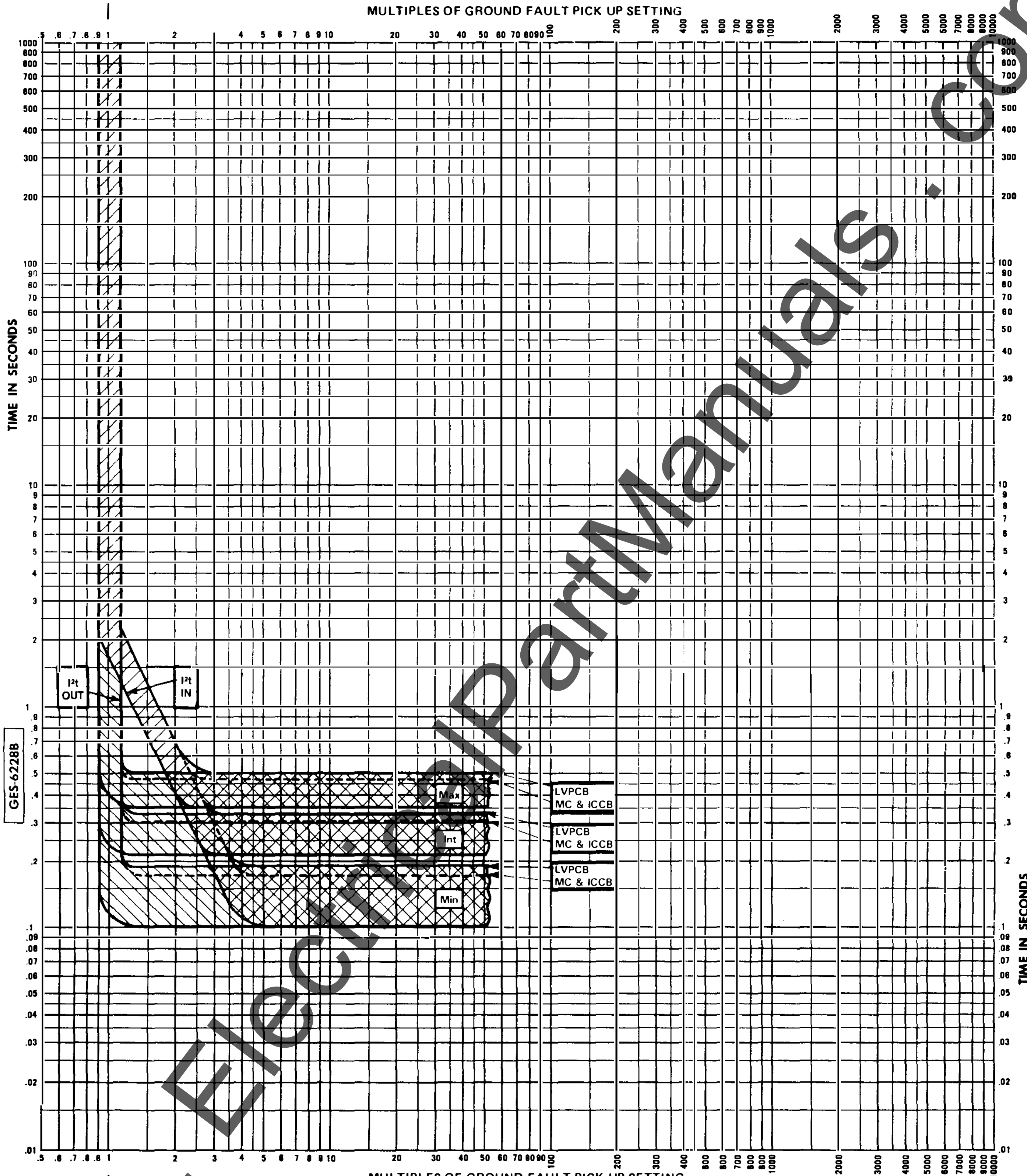




Breaker Type	Short-time Rating (H) (Amps, rms symmetrical)		
	240Vac	480Vac	600Vac
AKR-30S	22000	22000	22000
AKR-30	30000	30000	30000
AKR-30H	42000	42000	42000
AKR-50	50000	50000	42000
AKR-50H/AKRT-50H	65000	65000	65000
AKR-75	65000	65000	65000
AKR-100	85000	85000	85000



6.5 Time Overcurrent Curves



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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 General Electric Company.

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