Instructions for Retrofit Kit DB-25

Retrofit Kit Styles 8184A50G84
8184A50G85
8184A50G86
8184A50G87

I.L. 33-852-2A

NOTICES FOR COMMERCIAL GRADE COMPONENTS

The descriptions and specifications for the products described herein are provided for general commercial use and are not applicable for use in a nuclear power plant. Additional certification may be available upon specific request to qualify these products for use in safety-related applications in a nuclear facility.

GENERAL INFORMATION

The retrofit kit which you have received contains all the necessary parts to convert your DB breaker from a device using an electro-mechanical tripping system to one which will have solid state tripping. To understand the transition, one should be acquainted with the basic components and their functions.

The circuit breaker is tripped on fault conditions by combined operation of three components:

(a) Sensors – Quantity of Three
(b) RK – Solid-State trip unit – Quantity of One
(c) Actuator – Quantity of One

Schematically this can be shown in Figs. 1 and 2. This makes a very flexible system covering a wide range of tripping characteristics, due to the adjustable RK unit and the range of sensors available. All necessary tripping energy is derived from the load current flowing through the sensors, no separate power source is required. The tripping characteristics for a specific breaker rating, as established by the sensor rating, are determined by the continuously variable settings of the RK static trip unit. This unit supplies a pulse of tripping current to the actuator which trips the breaker.

SENSORS

The sensors produce an output proportional to the load current, so the breaker continuous current rating within the frame size can be changed simply by changing the tap setting or the sensors. Proper polarities must be maintained.

It is the sensor rating (or tap) that determines the actual current for one (1) per unit current on the RK.

All sensors are mounted on the rear lower studs on the back of the breaker base, Fig. 10.

ACTUATOR

When the actuator receives a tripping current from the RK, it releases a mechanical force to trip the breaker. The actuator is made up of a permanent magnet and a spring (see Fig. 2). When the breaker is open, the cross bar pushes the reset lever. The reset lever moves the plunger out, and the plunger then compresses the spring and pulls the keeper until it contacts the pole pieces of the magnet. Although the magnet cannot pull and reset the keeper against the force of the spring acting on the plunger, it can hold the spring force when the keeper is in contact with the magnet. A tripping current from the RK unit counteracts the effects of the permanent magnet allowing the spring to separate the keeper from the magnet and move the plunger to actuate the trip lever.

WARNING

High voltages are present in a circuit breaker and associated accessories. Before working on a circuit breaker or accessories installed in an electrical system, make sure the circuit breaker is OPEN and there is no voltage present where work is to be performed. The voltages in energized equipment can cause serious injury or death.

Before closing a circuit breaker, make sure that no work is being carried out by personnel on equipment serviced by the circuit breaker. The voltages from energized circuit breakers can cause serious injury or death.

RK UNIT

The Westinghouse RK unit is a solid-state device that provides adjustable overcurrent tripping for the retrofitting of DB breakers.

Only one unit is required per breaker; it receives all of its energy from a set of sensors – one mounted on each pole of the breaker. It develops an output for its associated trip actuator when preselected conditions of current magnitude and duration are exceeded.

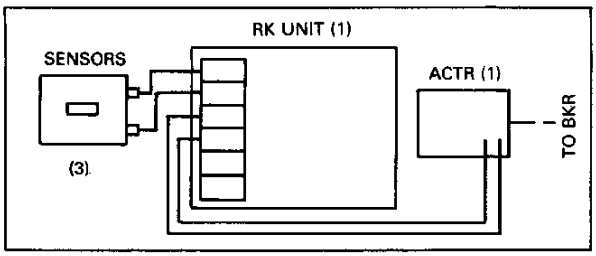

Fig. 1 *Schematic of Solid State Tripping*

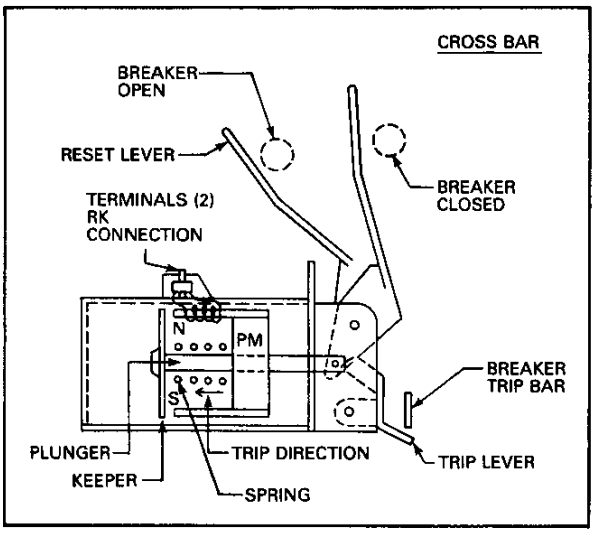

Fig. 2 *Actuator Diagram*

The RK is supplied in two (2) models of a combination of three (3) independent continuously adjustable overcurrent tripping functions: Long delay (L), Short delay (S) and Instantaneous. The combination of RK unit are:

LS – Long Delay and Short Delay
LSI – Long Delay, Short Delay and Instantaneous

Adjustments:

There are a maximum of eight (8) adjustable controls on the RK with LSI and seven (7) on the LS, all adjustable with a screwdriver after removal of the protective cover.

(1) Continuous Current Setting (Cont. Adj.) 0.5x to 1.0x External Sensor Rating.
(2) Long Delay Current Pickup (Cont. Adj.) 0.5x to 1.0x Cont. Current Rating.
(3) Long Delay Time (Discreet Adj.) 2.5, 5.0 12.5 and 27.0 Sec. @ 6x
(4) High Current Alarm Pickup (Relay Contact) (Closure of Form C Contacts Min. of 40% Sensor Rated Current Required)
(5) High Current Alarm Time (30-90 Sec. Delay)
(6) Short Delay Current Pickup (Cont. Adj.) 2x to 10x
(7) Short Delay Time (Cont. Adj.) 0.18 Sec. to 0.5 Sec. @ 6x
(8) Instantaneous Current Pickup (Cont. Adj.) 2x to 12x

In addition to the standard LSI and LS settings the RK unit has several other added features.

(A) High Load Alarm Contact, which closes after a selected delay time (30-90 Sec.) when the High Current Alarm pickup current reaches a predetermined value and resets when the current recedes below the setpoint. Adjustable from 0.75 to 1.1 of the long delay pickup, it provides an early warning of a possible trip out.

(B) I^2t Switch provides options in I^2t slope in fixed short-time delay or short-time delay, 0.085 sec. @ 6x.

(C) LED Indicators for overload and short circuit fault trip indication, lithium battery operated.

(D) Reset Button for LED indicator and battery check.

MAKING CURRENT RELEASE (DISCRIMINATOR)

All RK trip units which do not have an instantaneous trip function (LS version) are provided with a "making current release" which is referred to as a "Discriminator". This is a circuit in the trip unit which determines at the time of a fault whether or not there has been any current flow in the primary circuit previous to the fault. If there has been no measurable current flow previous to the fault, indicating that the circuit breaker is just being closed (or possibly that a switching device ahead of the breaker has just been closed) and if the primary current flow exceeds approximately twelve times the sensor rating, the trip unit will function instantaneously. If the "Discriminator" circuit determines that there has been a measurable current flow prior to the fault, the instantaneous operation will not occur and the normal short time delay element will take over to delay tripping. The purpose of this unique tripping concept is that selectivity and continuity of service in un-faulted sections of the system can be maintained if there is any need, but if there is no previously operating load on the circuit, the instantaneous function takes over to limit extensive damage which might occur due to a delayed tripping operation.

SERVICING OF THE RK

The RK unit is the intelligence of the overcurrent protection provided by the breaker. It is made up of many solid state components: the only moving parts are for setpoint adjustments. All internal components, including the printed circuit board are coated to give effective environmental protection.

Each RK unit includes two (2) test pin terminals for field checking of operation and calibration. A specially designed portable test device with a plug to match the receptacle on the front of the unit is available and recommended for verifying the functional operation of the RK unit. The tester can be plugged into any 120V, 60 HZ outlet and can provide enough current to check any pickup and time calibration.

If there is any reason to suspect that the RK unit is not operating correctly, it should not be tampered with: tampering can result in loss of vital overcurrent protection. If the unit is questionable it should be substituted with a new unit and returned to the factory for service. **NOTE: RK UNITS ARE NOT FIELD REPAIRABLE.**

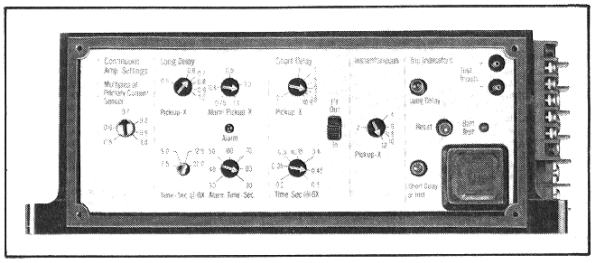

Fig. 3 *RK Unit*

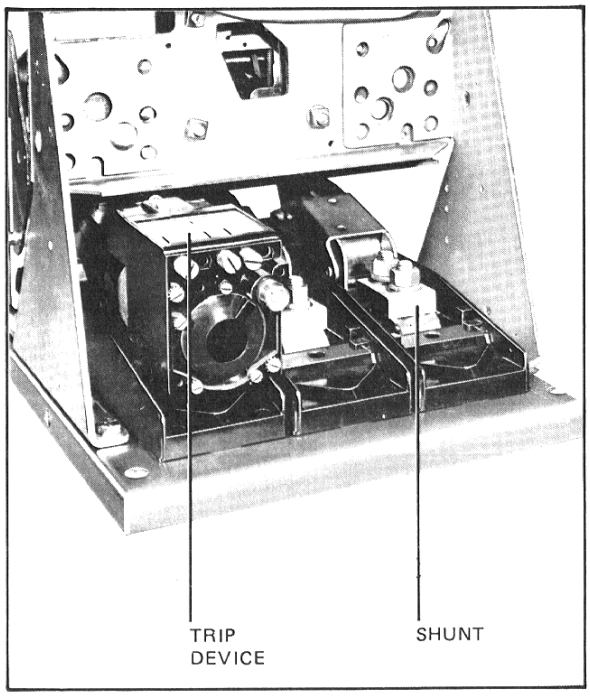

Fig. 4 *Removal of Electro-Mechanical Trip Devices*

REQUIREMENTS

Before proceeding with the conversion the following should be noted.

1. Items on hand:
   Ratchet (⅜") socket set with ¾", 9/16", ½", 7/16" sockets straight edge, scriber, center punch, file, screwdriver, hammer.
   Electric drill, ⅛", 7/32", 11/32" #20 and #1 twist drills, ¼-20 taps, 10-32 taps, tap holder, pliers.
   28 Vdc source.
   Test apparatus, such as RK unit Tester S#1232C08G01.

2. Check items received against bill of material as listed for each type of breaker and for proper style numbered kit.

3. Operate the actuator a few times. Alternately pull back on the reset lever (see Fig. 2) and then trip by applying 28 Vdc (be sure to use correct polarity) to the terminals.

   NOTE: Arm must be manually reset after each operation.

4. Review the procedure for each type of breaker involved and the sensor tap connections for the various current ratings.

5. Review the photographs to acquaint yourself with the items and location. Especially the right side view of the breaker Fig. 8.

6. Arc chutes need not be removed and breaker should be worked on in the upright position.

RETROFIT KIT

All retrofit kits are style numbered and contain the parts necessary to fulfill your requirements, therefore check to see that you have received the styles as ordered. Remove items from box and check against bill of material for appropriate parts.

DB-25 Retrofit Kit Bill of Material

Quantity per Breaker	Description	Style Number
1	LSI RK Unit	1375D25G02
or 1	LS RK Unit	1375D25G01
1	Actuator	692C704G03
3	Sensors 100 Amperes	8184A41H01
or 3	Sensors Multi-current (200-600 Amperes)	8184A39H01
1 Set	RK Mounting Hardware Consisting of Left and Right Hand "T" Brackets	8271A10G02
1	Cross Bracket	8187A05H01
1	Wiring Harness	6502C15G02
3	Copper Jumpers	1491 435
*1	Hardware Kit	6478C40G01

*Note: Kits contain more hardware than required due to multi-purpose use, check right side view Fig. 8 for number and size of hardware.

PROCEDURE

After you have read the requirement and you are familiar with all details, proceed in the following manner.

Remove the three electro-mechanical trip units and replace with three copper jumpers using .5-13 x 3.0 bolts. See Figs. 4 and 8.

PLACEMENT OF ACTUATOR

1. Using the existing .25-20 tapped hole in the breaker platform and .25-20 x .5 sems screw secure the actuator to the breaker with the right edge of the actuator base parallel to the side of the breaker platform. See Figs. 5 and 6.

2. Using a 28 Vdc source and after having closed the breaker manually, check tripping and reset functions of actuator, repeat numerous times to verify proper functioning. It may be necessary to bend reset arm for positive resetting of actuator, Fig. 2.

3. Using the actuator as a template, drill and tap a .190-32 hole in breaker platform and secure actuator to platform with "L" bracket in place using .190-32 x .75 screw, nut and washers. Fig. 7. DO NOT TIGHTEN.

4. Remove the Tru-arc retaining ring from the right end of the main contact cross bar. Slide 1 (one) cross bar spacer over the bar against the insulator and replace the Tru-arc ring. See Figs. 6 and 8.

CAUTION

When retrofitting DBL-25, make sure there is no interference between actuator tripping linkage and breaker limiter tripping screw.

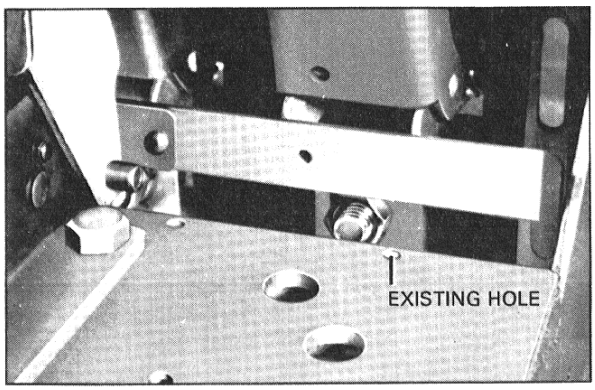

Fig. 5 *Location of Existing Hole for Actuator*

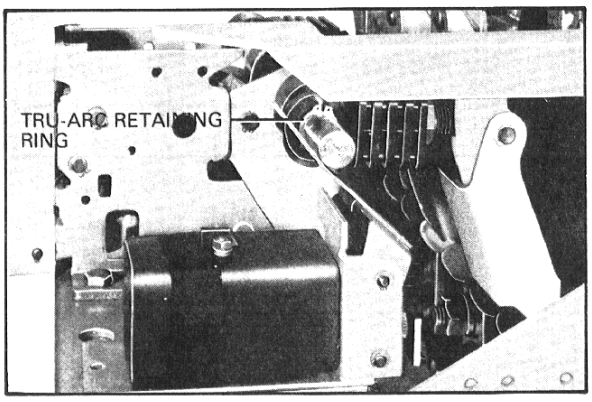

Fig. 6 *Positioning of Actuator*

PLACEMENT OF RK

1. The RK mounting details consist of two (2) 'T' shaped brackets. One (1) right and one (1) left hand and one (1) cross bracket. Remove the existing bolts at the top of the rear frame, place bracket over lift bracket and secure with .5-13 x 1.25 bolt, using the existing hole secure the bottom end of bracket with .38-16 x 1.5 bolt, Fig. 8. Place cross bracket between the brackets and secure using .25-20 x .5 fil. hd. screw, washers and the .25-20 threaded hole in bracket, Fig. 8.

2. The RK is now mounted on the cross bracket using .190-32 x .75 fil. hd. screw, washers, lockwashers and nuts, Fig. 8.

WIRING HARNESS AND SENSORS

1. Acquaint yourself with the wiring scheme. See schematic Fig. 9.

2. Check each lug on the harness to ensure they are properly secured to the wires.

3. Connect colored wires to the RK unit per wiring diagram.

4. Connect the black wires to the actuator using .138 nut lock and flat washers. See Fig. 7 being careful to observe polarity mark on one wire. Connect green wire to "L" bracket on actuator. Fig. 7. This now grounds the sensor star point.

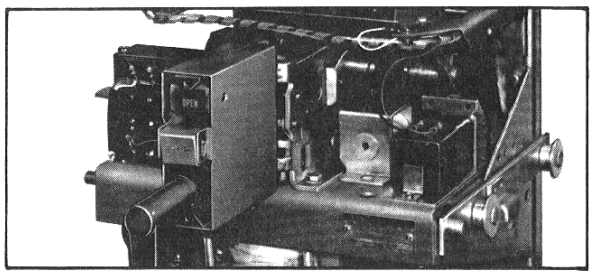

Fig. 7 *Actuator Mounted and Wired on a DB-25 ACB*

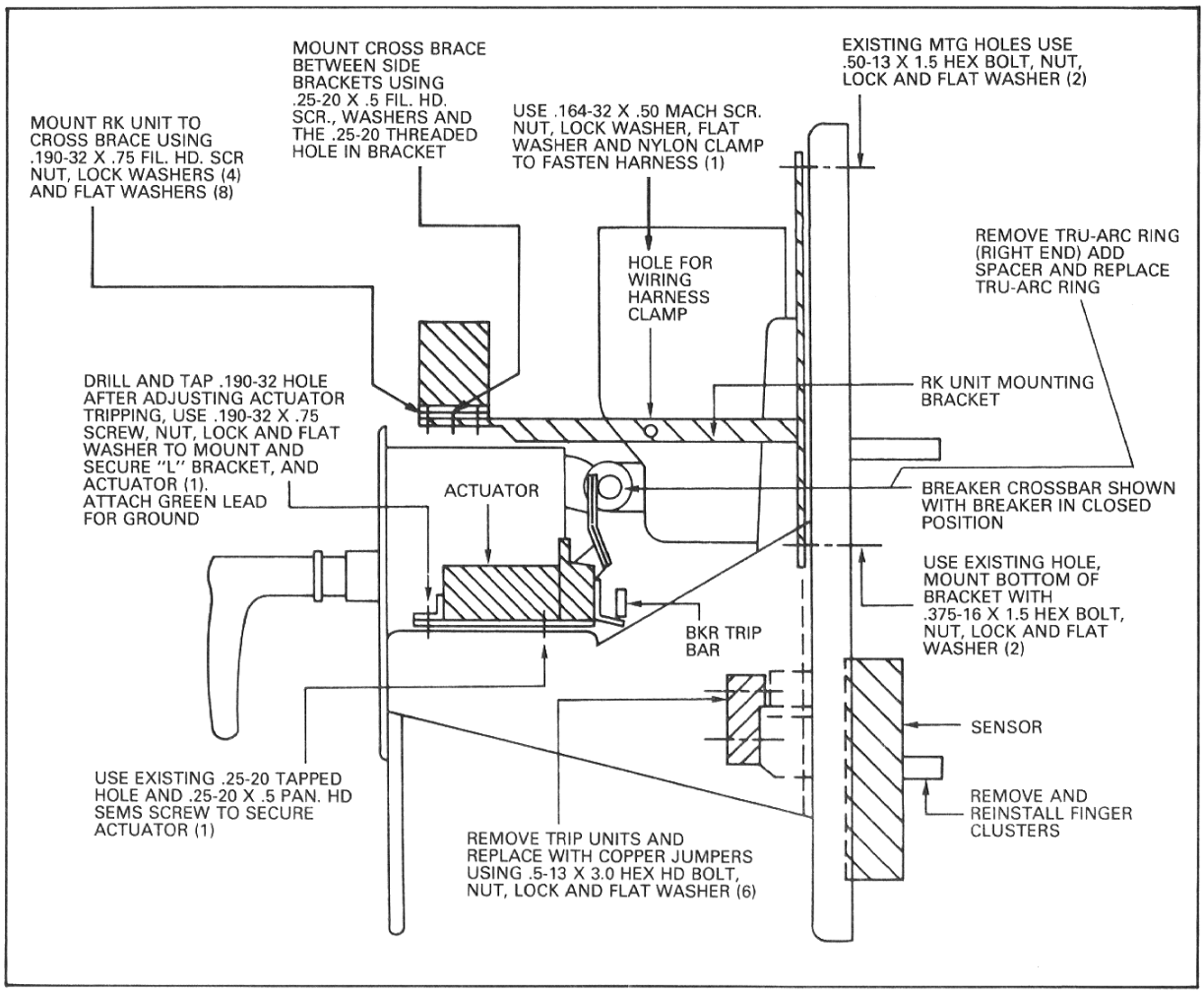

Fig. 8 *Right Side View of DB-25*

5. Install grommet in lower slot on right side of breaker rear frame. **Note: Remove approximately 18" of the harness cover to get the sensor end of harness through grommet.** Thread the sensor end of the harness through this grommet, Fig. 11.

6. Remove the finger clusters from the lower studs, wire the harness leads to the sensors, (Figs. 10-11). Attaching the wires can be accomplished easily by having the terminals of the sensor facing upwards. Once the leads are secured the sensors can be flipped 180° and placed on the lower studs, (Fig. 10), now reinstall the finger clusters. Secure the wiring harness to the right hand mounting bracket using nylon clamp and .164 hardware. Fig. 8

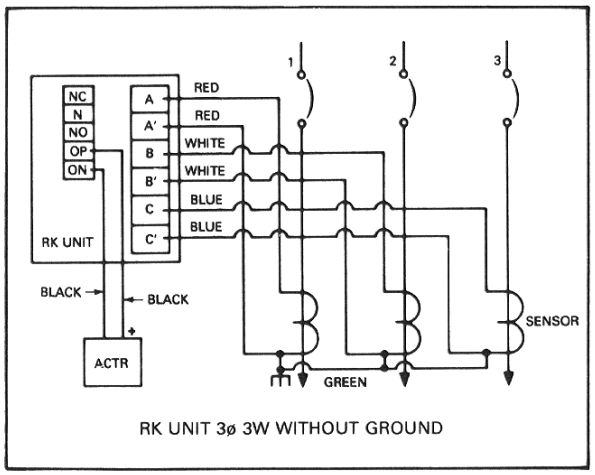

Fig. 9 *Wiring Diagram*

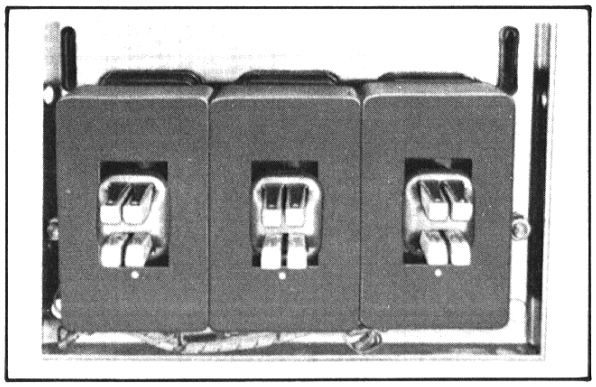

Fig. 10 *Sensors in Place DB-25, Bottom Studs, Rear View*

TEST

NOTE: The amptector test sets identified by style 140D481G02 or 140D481G03 should not be used to check calibration of the RK trip units. These test units are not regulated well enough to provide an undistorted wave form to the trip unit. All timing values will not be consistent with the time/current curve.

Using the RK test kit S#1232C08G01.

1. Check operation of the RK actuator system sufficient number of times to insure proper operation.

2. Set the RK dials to the required settings, and verify that the RK is in calibration.

3. Record the settings to the side of the RK for a permanent record.

WARNING

Circuit breakers applied in systems with available fault currents in excess of their interrupting/withstand capabilities can cause severe personal injury or death. To avoid misapplication, the interrupting/withstand rating of the breaker together with the maximum possible settings of the trip unit used, must equal or exceed the maximum fault current available in the applied system.

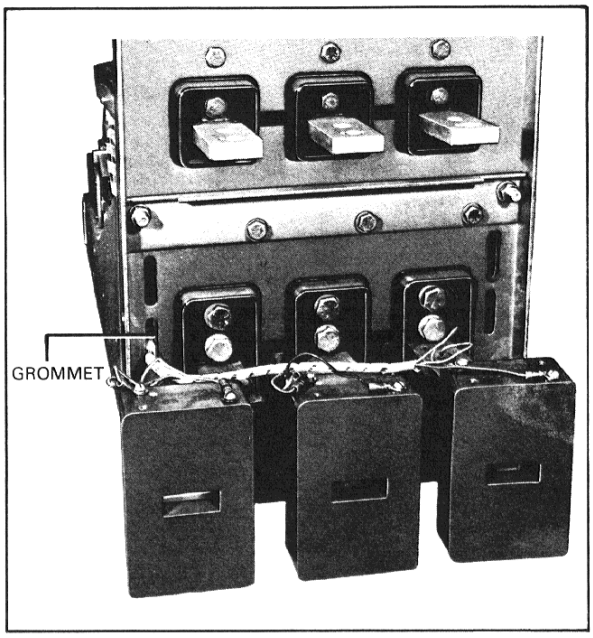

Fig. 11 *Attaching Wiring Harness to Sensors DB-25*

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