EMD MAINTENANCE INSTRUCTION

TRANSITION RELAY - TYPE 277

DESCRIPTION

The seven type 277 relays covered by this bulletin are tabulated in Table I of this bulletin. They have all been employed on EMD locomotives as a transition relay and all are similar in design and appearance to the one illustrated in Fig. 1. The only differences between these various relays is the number and arrangement of contacts, and dropout value.

The base of the relay is fitted with a removable cover which, when in place, encloses all the moving parts of the relay in a dust-proof compartment. All internal electrical connections are soldered and the external connections are made on No. 10-32 terminal studs.

The type 277 transition relay is a voltage sensitive, torque operated device with an "S" shaped armature, Fig. 2. The armature is pivoted at its center and rotates on a Monel metal shaft. The ends of this shaft are inserted in sintered graphite-bronze bearings, one in the relay base and the other in the support bar. No lubrication is required on these bearings.

A tension spring is attached between a pin on each leg of the "S" shaped armature and an extension arm mounted on the support bar. These springs act to return the armature to its normal, de-energized position immediately when the dropout voltage value of the relay is reached. Prompt and positive contact action is essential in any transition control device.

Both normally open and normally closed contacts are of the silver insert

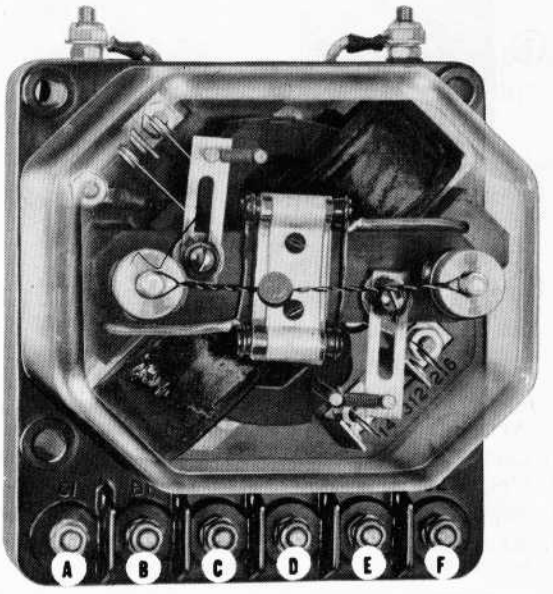


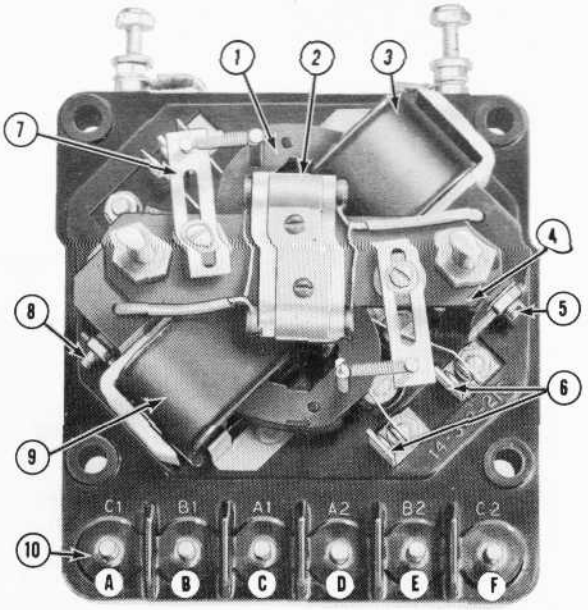
Fig. 1 - Type 277 Relay

type. The movable contacts are mounted on flexible spring arms which in turn are mounted on the "S" shaped armature. The stationary contacts are mounted on angle supports screwed to the relay base. The contacts on all seven of these relays have a 2 ampere rating. The coil circuit includes a temperature compensating resistance unit which is mounted atop the support bar and is designed to maintain terminal resistance within ± 2% over an ambient temperature range of 0-75° C. This feature is not adjustable.

OPERATION

The type 277 relay is inserted in locomotive high voltage circuits in order to be sensitive to actual main generator output voltage values. It is normally connected in series with two 10,000 ohm resistors (one fixed, one adjustable)

* THIS BULLETIN SUPERSEDES ALL ISSUES OF M.I. 2035.



1. Armature
2. Compensating Unit
3. Coil
4. Support Bar
5. Armature Return Stop Stud
6. Stationary Contacts
7. Spring Extension Bars
8. Air Gap Adjusting Stud
9. Coil
10. Relay Terminals

Fig. 2 - Type 277 Relay Cover Removed

directly across the main generator, Fig. 3. The adjustable resistor may have one or more slide bands used to set separate pickup and dropout values required in individual automatic transition circuit designs. Refer to the locomotive wiring diagram of the unit or units to which this relay is applied to determine the exact circuit arrangement.

When locomotive main generator voltage reaches a pre-determined value, the relay picks up or drops out and its interlocks change position, causing other relays and contactors to be energized or de-energized according to circuit design. The net result is a change in traction motor connections in order that the highest possible main generator power can be *developed within its current and voltage limits.*

The pickup slide band on the adjustable 10,000 ohm resistor is adjusted so that the desired main generator voltage output will cause current of sufficient strength to flow through the two relay coils in series, Fig. 4. This current establishes a magnetic field of sufficient strength to attract the "S" type armature and cause it to rotate, overcoming the influence of the two tension springs. As the armature rotates, the normally open

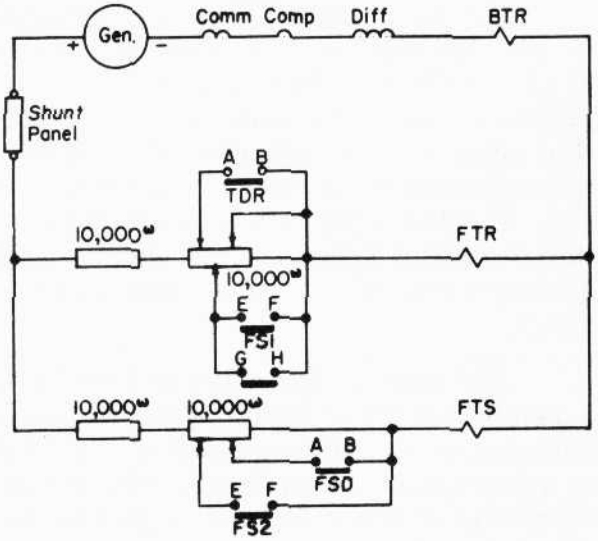


Fig. 3 - Typical Locomotive High Voltage Schematic

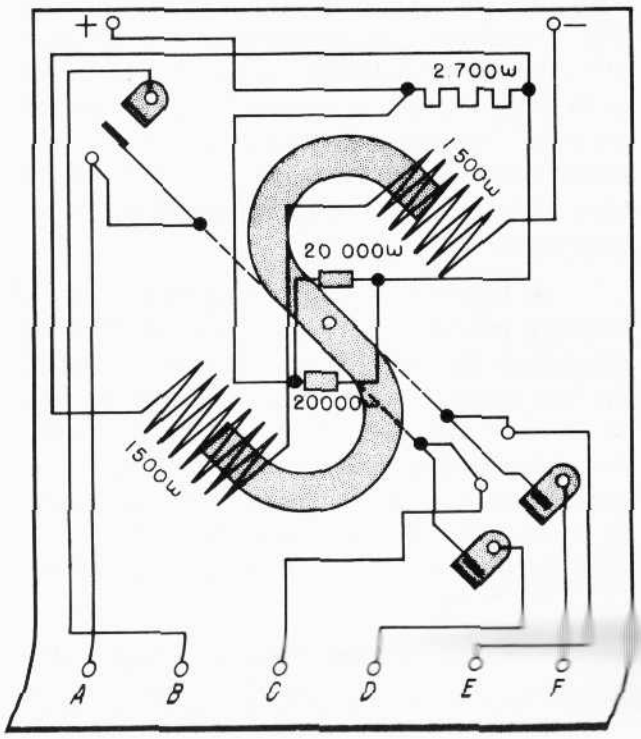


Fig. 4 - Wiring Diagram Type 277 Relay

contacts close and the normally closed contacts open.

Each of the seven relays covered in this bulletin are designed to pick up at .041-.044 amperes. The inherent dropout of each is different to meet specific circuit designs, see Table I.

Either the inherent dropout value of the relays or a dropout value set by one or more slide bands on the adjustable resistor can be used to obtain the desired relay function for automatic transition, Fig. 3. Upon de-energization, the tension springs return the "S" type armature to its normal position which in turn causes the relay contacts to resume their normal arrangement.

MAINTENANCE

INSPECTION

At intervals as specified in the Scheduled Maintenance Program, Maintenance Instruction 1704, remove the cover from the relay and check the following items:

1. Check for contact burns and discoloration of the contact arms. The contact surfaces should not be disturbed unless there is evidence of severe pitting. If the contacts must be redressed, a small, flat, clean, fine, mill file should be used.

2. Check all screws and locknuts for tightness. Make sure that the bottom locknuts to the top terminal posts of the relay are tight.

3. Check wiring connections for electrical continuity.

4. Check coils and resistors for burns and discoloration.

LUBRICATION

No lubrication is necessary for the sintered graphite-bronze bearings.

CONTACT ADJUSTMENT

1. Clean the Glyptol from air gap adjusting screws and locknut.

2. Loosen the air gap adjusting screws, Fig. 2, until armature bottoms in both coil support blocks. Work armature by hand to check for bottoming. Tighten screws after adjustment.

3. Move the armature by hand until the contacts just close. Scribe a line on the armature at coil and continue to move the armature until it is finally closed against its poles. Scribe another line on the armature at the coil.

4. With the contacts just closed, there should be enough gap between the armature and the poles to permit the movable contact fingers to be deflected (carry-through of contacts) 1/16" + 0 - 1/32" when the armature is closed against its poles. The 1/16" + 0 - 1/32" value can be measured by scaling the gap between the two scribed lines in Step 3.

5. The adjustments in Step 4 are obtained by loosening the locknut and moving each stationary contact against its movable contact. Strive to adjust the carry-through of the contacts (contact wipe) to the nominal 1/16" dimension. Tighten the locknut after each adjustment.

6. With the relay de-energized, the contact gap with the contacts open should have a minimum gap of 1/16".

ADJUSTMENT OF RELAY PICKUP AND INHERENT DROPOUT (DIFFERENTIAL)

The relay pickup and the dropout settings should be checked at periods specified in Maintenance Instruction 1704. Proceed as follows:

Connect the high voltage leads from the motor-generator set or from another source of DC energy with a wide range

of voltage (125-260 volts) to the relay terminals. The negative lead from DC source of energy goes to right terminal (front view) of the relay, Fig. 4. Connect a milliammeter in series with the relay coils.

Increase the M-G set voltage gradually and observe the pickup current of relay, .041 - .044 amperes. Hold the pickup current for about five minutes to charge the relay. Make a second observation of relay pickup before checking the dropout.

Lower the applied voltage gradually and observe the dropout current, see Maintenance Data.

If the differential is too wide, close (screw in) the air gap adjusting screw, Fig. 2, until the required differential is reached. Check the pickup and dropout current values after each air gap change.

NOTE: The differential is the difference between the pickup and dropout current values as noted in the Maintenance Data. This pickup to dropout differential is controlled by setting the carry-through of the contacts (contact wipe), air gap and/or tension springs.

If the differential is too narrow, reduce the carry-through of the contacts (contact wipe) toward the minimum dimension. The final adjustment is then made by closing (screwing in) the air gap adjusting screw.

NOTE: There should be a minimum contact opening of 1/16" when the relay is de-energized and a carry-through of the contacts (contact wipe) of not less than 1/32" after the initial contact is made. Also, be sure all contacts close simultaneously. The contacts should be set to operate with a maximum variation of 0.005".

If the differential is still too narrow, reduce the dimension equally on the two tension spring extension bars. Loosen the two hex head locknuts on the armature return stop stud, Fig. 2, and open (back out) the return stop stud until required pickup value is reached. Then make the final adjustment for differential by closing (screwing in) the air gap adjusting screw.

All locknuts must be retightened when differential is reached. The pickup and dropout values must be rechecked to make certain they have not changed.

Do not Glyptol the screws and the locknuts disturbed in setting the differential. Apply the cover and wire seal to the relay to discourage any unauthorized personnel from disturbing the adjustments of the relay.

MAINTENANCE DATA

TABLE I

EMD Part Number	Contact Arrangement	Resistance (Each Coil)	Resistance (Total Coil Circuit)	Inherent Dropout
8131265	3 N.O.	1611 Ohms ± 10% @ 68° F.	5300 Ohms ± 10% @ 68° F.	67.7 - 71.3% of Pickup
8147352	2 N.O.	1500 Ohms ± 10% @ 68° F.	5125 Ohms ± 10% @ 68° F.	65.0 - 69.0% of Pickup
8172894	2 N.O.	1500 Ohms ± 10% @ 68° F.	5125 Ohms ± 10% @ 68° F.	74.0 - 78.0% of Pickup
8188467	1 N.O. 1 N.C.	1500 Ohms ± 10% @ 68° F.	5125 Ohms ± 10% @ 68° F.	65.0 - 69.0% of Pickup
8198402	2 N.O.	1580 Ohms ± 10% @ 68° F.	5300 Ohms ± 10% @ 68° F.	68.0 - 72.0% of Pickup
8208853	1 N.O. 1 N.C.	1500 Ohms ± 10% @ 68° F.	5125 Ohms ± 10% @ 68° F.	74.0 - 78.0% of Pickup
8211227	2 N.O. 1 N.C.	1500 Ohms ± 10% @ 68° F.	5125 Ohms ± 10% @ 68° F.	74.0 - 78.0% of Pickup

Contacts (All Relays)

Rating	2.0 Amperes
Air Gap	1/16" Minimum
Overtravel	1/16" ± 1/32"

Pickup (All Relays) . . . . . .041 - .044 Amperes

Hi-Pot Test (All Relays) . . . . . 1 Minute Duration

Coil To Ground	2400 Volts AC RMS - 60 Cycles
Coil To Contacts	2400 Volts AC RMS - 60 Cycles
Contacts To Ground	600 Volts AC RMS - 60 Cycles