



M AINTENANCE I NSTRUCTION

DYNAMIC BRAKE WARNING RELAYS 8160545, 8175070 AND 8187957

DESCRIPTION

Voltage sensitive relays of the type shown in Fig. 1 are used as a protective device on locomotives equipped with dynamic brakes. They are connected across the circuit to the braking resistor grids and function to detect current flow in excess of the locomotive dynamic brake rating. When picked up, the relay establishes a circuit to light the warning light in the cab of the locomotive, thus alerting the engineman to reduce dynamic braking strength to a safe level.

The three Type 277 relays covered by this bulletin have identical functions and are similar in appearance. They differ however, in such respects as contact opening and settings for pickup and dropout. Since they are basically the same, the information in this bulletin will apply to all three relays unless otherwise specifically identified.

Referring to Fig. 2, it will be seen that the brake warning relay is equipped with an "S" shaped armature and is a torque operated device. The center pivoted armature rotates on a Monel metal shaft supported at the ends in sintered graphite-bronze bearings. One bearing is in the relay base and the other is in the support bar. No lubrication is required for these bearings.

The silver alloy insert type contacts are rated for 2 amperes. Movable contacts are mounted on flexible spring arms which in turn are mounted on the "S" shaped armature. Stationary contacts are mounted on angle supports screwed to the

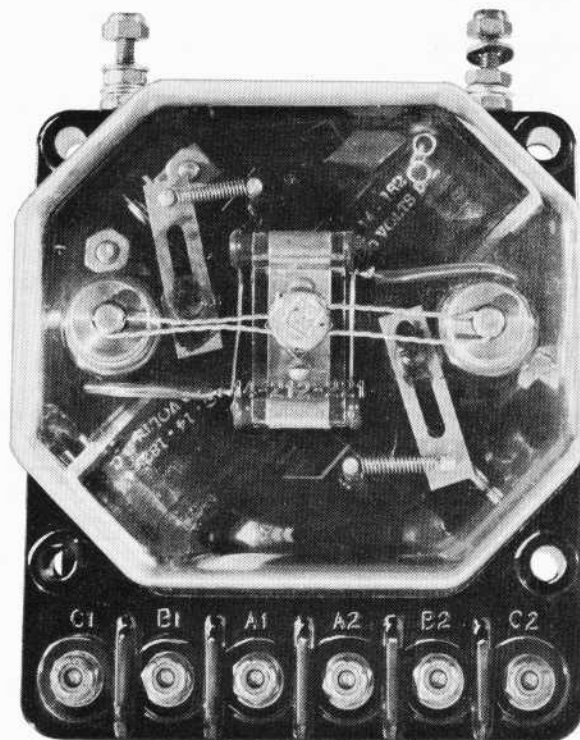


Fig. 1 - Brake Warning Relay

relay base. A tension spring is attached between a pin on each leg of the 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 dropout voltage value of the relay is reached. This insures prompt and positive contact action.

The relay operating coil circuit includes a temperature compensating unit which is mounted on top of the support bar. It is designed to maintain terminal resistance within $\pm 2\%$ over an ambient temperature range of 0 to 75° C. This feature is not adjustable.

*THIS BULLETIN IS COMPLETELY REVISED AND SUPERSEDES M. I. 2043.

MAINTENANCE

The brake warning relay is a very important device and should be kept in good working condition. Visual inspection of the relay and check for proper pickup and dropout settings should be made at intervals specified in the Scheduled Maintenance Program, Maintenance Instruction 1704.

INSPECTION

Remove cover and visually check relay as follows:

1. Check contacts for burns and discoloration of contact arms. Contact surfaces should not be disturbed unless there is evidence of severe pitting. If necessary, contacts may be dressed by careful use of a small, fine mill file.
2. Check coils and resistors for burns or discoloration.
3. Check wiring connections for electrical continuity.
4. Check all screws and lock nuts for tightness. Make sure the bottom lock

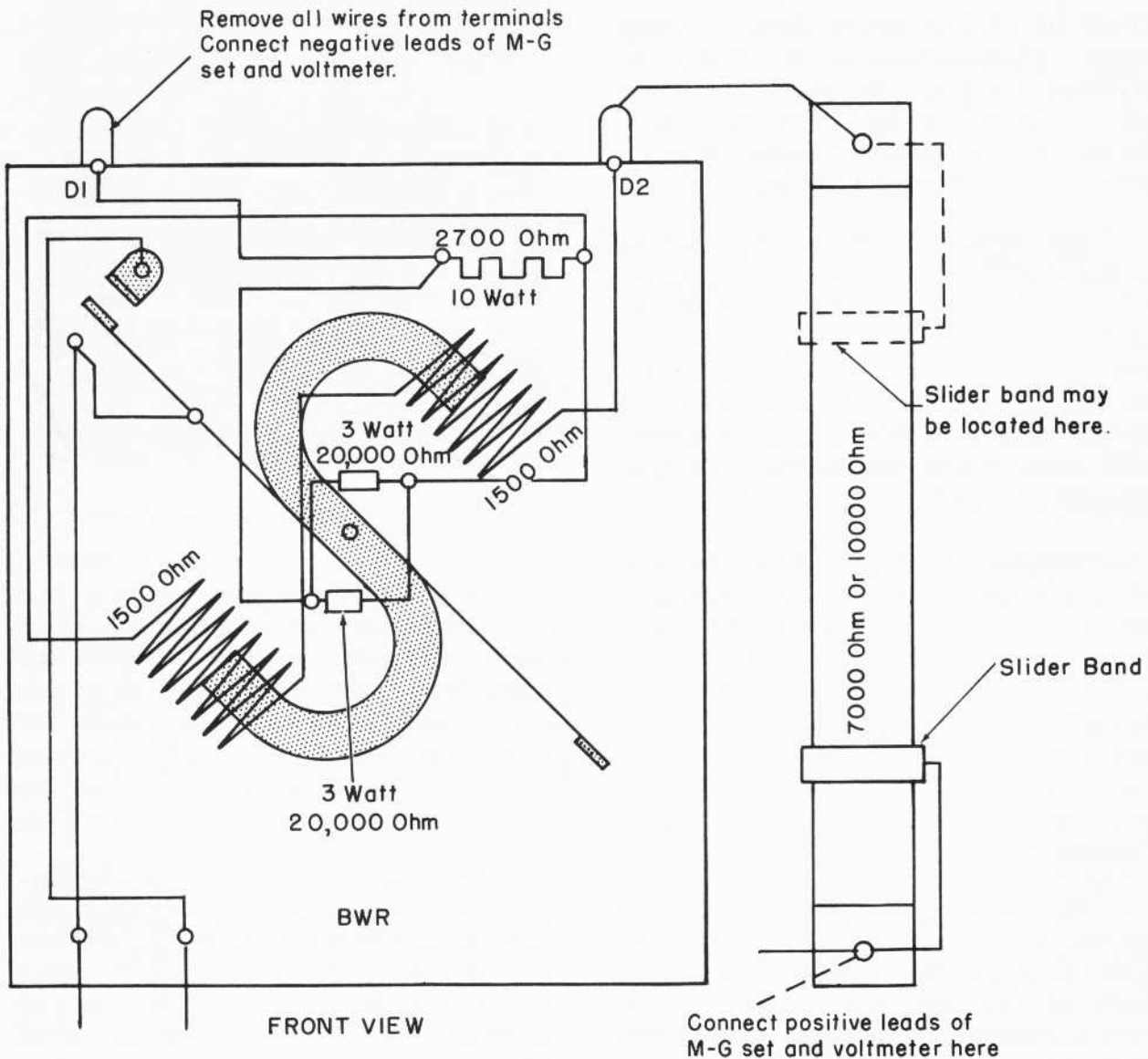


Fig. 2 - Connection For Testing Relay On Locomotive

nuts to the top terminal posts of the relay are tight.

5. Check armature for freedom of movement.

EXTERNAL ADJUSTMENTS (RELAY ON LOCOMOTIVE)

To check relay pickup and dropout, refer to Maintenance Instruction 6827 for proper settings and proceed as follows:

Connect the high voltage output leads of a motor generator set and leads of a suitable voltmeter as shown in Fig. 2. Connect the input leads of the motor generator set across a suitable low voltage DC source, such as the battery. Observe proper polarity. Then by increasing the motor generator output gradually, note the point at which the relay picks up. The relay should be cycled several times prior to taking final pickup and dropout readings.

Pickup voltage of the relay may be readily adjusted if necessary by means of the slider band on the external resistor. This band may be moved to obtain the desired pickup value.

Dropout voltage of the relay is inherent and cannot be readily adjusted with the relay mounted in the locomotive. If the pickup voltage cannot be set as outlined above or if the dropout voltage is not satisfactory, the trouble may be due to internal setting of the relay. In such instances, the relay should be removed from the locomotive for internal adjustment.

INTERNAL ADJUSTMENTS (RELAY REMOVED FROM LOCOMOTIVE)

With the relay removed from the locomotive, recalibration of the internal adjustments may be made as follows:

1. Check relay internal resistance with resistance bridge as per "Maintenance Data."

2. Set approximate armature travel with the right hand magnetic gap adjusting screw, Fig. 5, so that it protrudes three turns beyond the coil support block, Fig. 3. Hold the armature against the gap adjusting screw and set the stop stud, Fig. 4, against the armature and lock in position. Then back off the right hand magnetic gap adjusting screw approximately two and one-half turns.

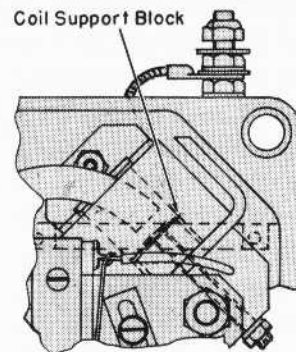


Fig. 3 - Location Of
Coil Support Block

3. Set contact gap and wipe. Loosen nut holding stationary contacts and adjust contact gap as per "Maintenance Data." Relays having two sets of contacts should be set so that both close simultaneously. This can be accomplished by adjusting the contacts in their open position using a 0.052" feeler gauge. The maximum permissible variation between the closing of one and the other is 0.005".
4. Set relay pickup value. Mount relay in vertical position. Connect a millimeter in series with the relay coils and connect the output leads of a motor generator set or some other

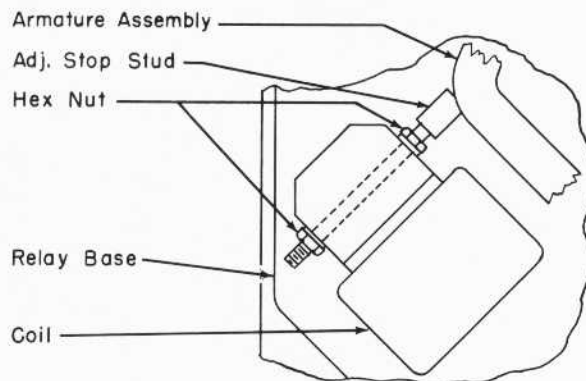


Fig. 4 - Armature Adjustable Stop Stud

source of DC energy with a wide range of voltage (125-290 volts) across the milliammeter and the relay. Observe proper polarity; the top right terminal (D2) when facing relay is positive. Adjust applied voltage gradually and observe pickup current of relay, see "Maintenance Data." Cycle relay several times.

5. Set relay dropout.

a. Relay 8160545

When adjusting or checking the dropout value of relay 8160545, decrease the applied voltage gradually until relay drops out. If the relay dropout is not within limits as given in the "Maintenance Data," adjust the right hand magnetic gap

adjusting screw, Fig. 5, to obtain the proper dropout.

After calibration, and with the armature in pickup position, reduce the coil current to approximately 1/4 milliampere above the dropout value and turn the left hand magnetic gap adjusting screw IN until it just contacts the armature. If correction is necessary, use the left hand magnetic gap adjusting screw to make adjustment.

b. Relay 8175070

When adjusting or checking the dropout value of relay 8175070, set up an adjustable 6000 ohm resistor in series with the coil circuit, terminals D1 and D2, and adjust the total series circuit resistance to

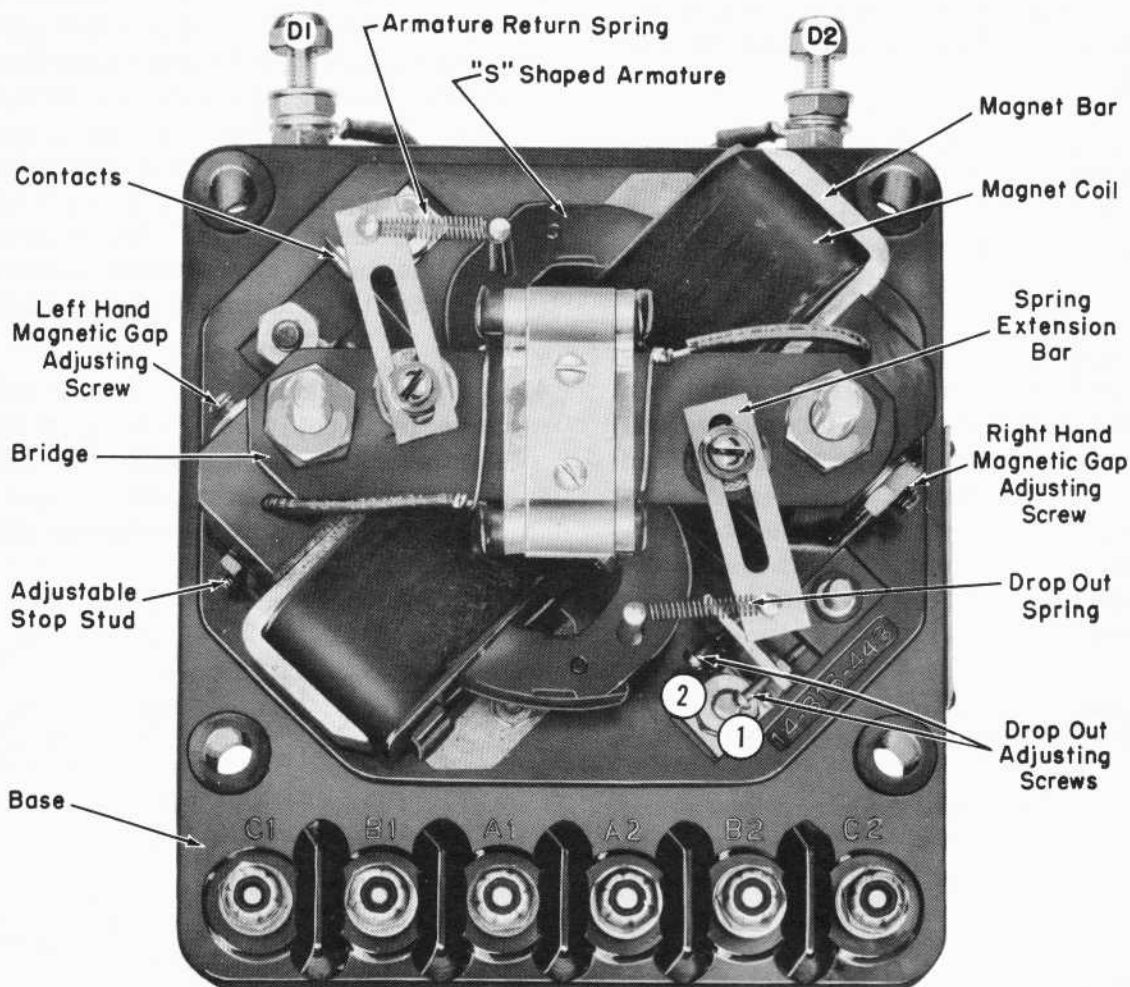


Fig. 5 - Relay 8187957

10,580 ohms \pm 25 ohms with the relay contacts open. Adjust the armature return spring for 42.5 \pm 0.2 milliampere pickup. Insert a thin sheet of paper (less than .005" thick) between the lower contacts. Then adjust the dropout to 36.0 \pm .2 milliamperes with the right hand magnetic gap adjusting screw.

After calibration, and with the armature in pickup position, reduce the coil current to approximately 1/4 milliampere above the dropout value. Turn the left hand magnetic gap adjusting screw IN until it just contacts the armature. Recheck calibration to see that it has not been disturbed. If correction is necessary, use the left hand magnetic gap adjusting screw.

Remove the paper from between lower contacts and slowly apply approximately 95% of pickup voltage. Open and close the relay by hand, noting the tendency of the relay to vibrate when the contacts first make. Adjust the lower stationary contact for minimum vibration, both opening and closing.

NOTE: If relay vibrates while closing and not while opening, move the lower stationary contacts away from the movable contact. If the opposite condition exists, make the opposite correction.

Check gap variation between both normally open contacts, see preceding Step 3. Recheck pickup and dropout values (paper removed from between lower contacts, dropout value is 95-97% of pickup value). Readjust dropout value if necessary by adjusting the right hand magnetic gap adjusting screw.

c. Relay 8187957

When adjusting the dropout value of relay 8187957, proceed as follows:

- (1) Decrease applied voltage slowly. (Relay when properly adjusted will drop out at 40.75 \pm 0.2 milliamperes.)
- (2) To obtain this dropout, back off the two dropout adjusting screws, Fig. 5, far enough so they do not touch the dropout spring, when the armature is in its closed position.

NOTE: For reference, the adjusting screw farthest away from the armature center is called #1, and the one nearest the armature center is #2.

- (3) Adjust the armature return springs for a 43.0 \pm 0.2 milliampere pickup by moving the spring extension bars.
- (4) With the armature in the attracted position, adjust the right hand magnetic gap adjusting screw so the relay drops out at 34.5 to 33.0 milliamperes.
- (5) After calibration on the armature is complete and with the armature in the picked up position, reduce the applied coil current to approximately 1/4 milliampere above the dropout value.
- (6) Turn the left hand magnetic gap adjusting screw IN until it just contacts the armature. (Recheck calibration on the armature to make certain it was not disturbed. If correction is necessary, use the left hand adjusting screw to make corrections.)
- (7) Set the clearance between the dropout spring and dropout adjusting screw #1 to .015" to .020" with the armature in its open position.

(8) Adjust screw #2 so the relay drops out at 40.75 ± 0.2 milli-amperes, making certain the armature completes its travel (closing and opening) without hesitation.

should be approached gradually and the armature must always complete its full travel.

The adjusting springs and arms should be evenly adjusted for minimum bearing side pressure.

NOTE: The movement of the armature in opening and closing contacts should be sudden. The operating value

6. Secure all screws and lock nuts disturbed in setting the relay with radio cement. Apply cover to the relay.

MAINTENANCE DATA

For tabulation of relay operating values (with external resistors) as applied on locomotives, refer to Maintenance Instruction 6827.

Relay Internal Resistance At 20° C.

Coil terminal resistance (contacts open and measured from terminals D1 and D2)	5,125 ohms $\pm 10\%$
Coil resistance (measured from D2 to 2700 ohm resistor).	3000 ohms $\pm 10\%$ - 1500 ohms $\pm 10\%$ each

Additional resistor on relay 8175070 which provides high percent dropout (measured from lower stationary contact, lower contact open, to D1 terminal). 20,000 ± 200 ohms

Contact Opening

Relay 8160545	1/16" min., 5/64" max.
Relay 8175070052" $\pm .005$ "
Relay 8187957052" $\pm .005$ "

Contact Wipe (Overtravel) 1/32" min.

Contact Pressure 25 grams

Contact Rating 2 amperes at 74 volts DC

Relay Magnet Coil Operating Values At 20° C.

Relay 8160545

Pickup041 to .044 amperes
Dropout0372 $\pm .0002$ amperes

Relay 8175070

Pickup	42.5 ± 0.2 milliamperes
Dropout	36.0 ± 0.2 milliamperes

Relay 8187957

Pickup	43.5 ± 0.2 milliamperes
Dropout	40.75 to 0.2 milliamperes

Hi-Pot (Bench Test - 1 Minute Duration)

Coil to ground	2400 V. RMS, 60 cycle
Coil to contacts	2400 V. RMS, 60 cycle
Contacts to ground	600 V. RMS, 60 cycle

