

# **STYLE “OR-10” AND “OR-11”**

## **OVERLOAD RELAYS**

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## SERVICE MANUAL 3287

### STYLE "OR-10" AND "OR-11" OVERLOAD RELAYS

#### GENERAL

The OR-10 or OR-11 relay is used to provide overload protection for d-c. switch machines with an inverse time element with respect to the magnitude of the overload current. The relay is placed in the motor operating circuit and picks up when the current is excessive to deenergize another relay (or relays) controlling the supply of energy to operate the motor.

Either the overload relay or one of the relays controlled by it must be a "stick" relay to hold the motor circuit open until the switch machine controls are reversed when an overload occurs. Where the controlled relay is of the "stick" type, the overload relay has a single winding and is designated OR-10. Where the overload relay includes the "stick" feature, a second winding is provided for that function and the relay is designated OR-11.

The OR-10 relay is prevented from operating on the surge currents by means of a number of copper washers on the core. In the OR-11 relay, the "stick" winding is normally short-circuited by a back contact, thus providing surge protection.

The inverse time element is obtained by means of a resistor that has a large increase in resistance with increased temperature shunted across the operating winding. The larger the current becomes the more rapid will be the heating of the resistor and, consequently, its increase in resistance, until the voltage drop across the unit is increased sufficiently to pick up the relay. This resistor is included as a part of the relay assembly.

See U. D. 182 for a complete description of these relays.

#### ADJUSTMENTS

For detail adjustments refer to Service Spec. 3701

\*Adjustments for relays with 1/2 inch pole face made prior to May of 1946 are shown in parenthesis.

#### ARMATURE

On new relays, the armature stop has been fitted so that the armature moves freely with 0.004 inch to 0.009 inch end play in the axis of the hinge. With the armature in the deenergized position, it should have vertical play of 0.002 inch to 0.009 inch at right angles to the hinge and a horizontal clearance of 0.003 inch to 0.005 inch between it and the backstop.

The armature stroke should be 0.128 inch plus or minus 0.003 inch (\*0.103 in. -0.107 in.), measured at the end of the insulation strip. The armature stop pins should be 0.010 inch in length. The air gap should be practically parallel with the armature in the energized position. The armature stroke and parallel air gap are obtained by bending the armature.

### CONTACTS

The tension of the contact springs should be measured by means of a gram gauge (can be purchased from U. S. & S. as C.N. 62103).

#### 1. Continuity Contact.

(a) Adjust the front contact (lower) spring to exert a pressure of 10 to 15 grams (\*5 to 10 grams) on the armature with the armature in the deenergized position.

(b) Adjust the opening between the front contact and heel (upper) spring with the armature in the deenergized position, to be 0.065 inch to 0.070 inch (\*0.040 in.) by bending the lower stop. At the same time keep the back contact button just touching the lower stop by also adjusting the heel spring pressure. The upper stop should be adjusted to just touch the heel spring in the energized position. The heel spring pressure must not be more than sufficient to compress the back contact.

(c) With the armature in the energized position, adjust the back contact opening to be 0.030 inch to 0.035 inch (\*0.035 in.) by bending the loop at the end of the contact spring.

(d) Adjust the back contact spring so that it exerts an upward force of 5 to 10 grams against the lower stop with the armature in the energized position. Recheck the heel spring pressure.

(e) With the armature in the energized position and all adjustments completed, the opening between the back contact button and the lower stop is an approximate measure of the overlap of the contacts.

#### 2. Back Contacts for OR-11 Relay

(a) The back contact opening in the energized position shall be approximately 0.070 inch (\*0.060 in.). It must be adjusted to open before the front contact of the continuity stack closes. The back contact spring should have a trapped pressure of 10 to 15 grams (\*5 to 10 grams) and the heel spring should exert a pressure of 10 to 15 grams on the armature.

#### 3. Load Springs for OR-10 Relay

(a) The load spring should be adjusted to exert a pressure of approximately 10 grams on the armature in the deenergized position.

4. All contact tips shall be so adjusted that they make contact squarely and all similar contacts open or close approximately simultaneously.

The above adjustments are selected to operate the armature to core pin on Direct Pick-Up. The heel spring in the continuity stack must not have more pressure than is required to hold back contact buttons against the lower stop after the back contact pressure has been adjusted.

TESTRELAY CALIBRATION

The resistance of the operating winding should be within 5% of 5 ohms at 68° F. The resistance of the "stick" winding on the OR-11 relay should be within 10% of 65 ohms.

The relay unit should be calibrated by itself (without the shunt resistor) when any change may have been made to the assembly. It should pick up on not more than 0.90 volt nor less than 0.85 volt and release on not less than 0.15 volt. It is permissible to vary the contact pressures slightly to meet the pick-up value.

For checking the "stick" winding, the working voltage should be 5 volts (directly on the winding). A series resistor usually mounted on the top plate, is used with the "stick" winding to compensate for the higher switch control voltage.

OPERATING TESTS

The value of the shunt resistor used with the OR-10 or OR-11 relay is determined by the normal and clutch setting values of current for the switch machine. The relay, complete with the resistor, should be connected as shown in Fig. 1, and the current set for the proper value with the relay short-circuited. With the short removed the relay should pick up within 10% of the time given in Table I, for the piece number under test. The relay should be checked for both values of current, allowing ample time for the shunt resistor to cool between tests.

When the overload relay picks up, the switch must be opened at once; otherwise, the resistor may be burned out.

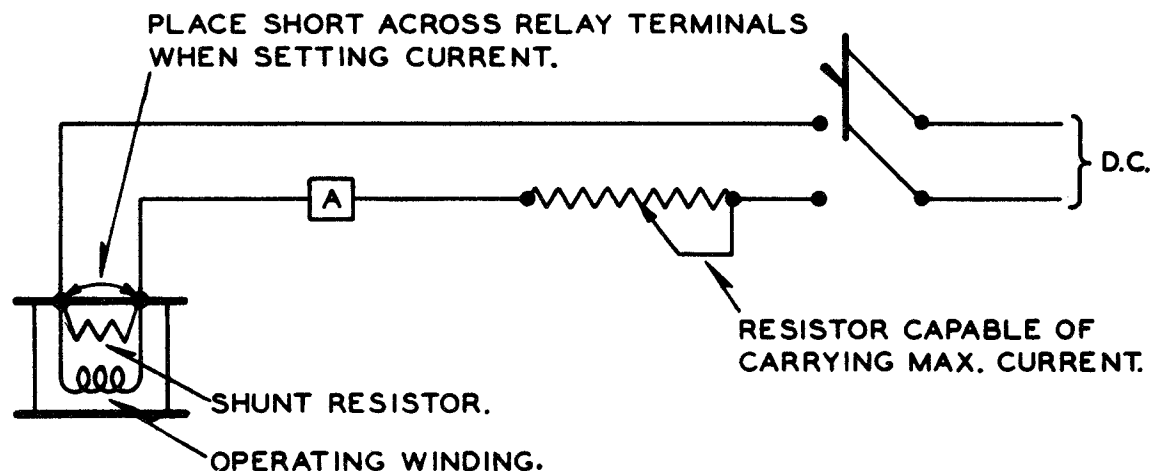


FIG. 1-TEST CIRCUIT

If the coil connections of the OR-11 relay are disturbed for any reason, such as replacing the coil, the relay should be checked to be sure the coils have the correct relative polarities. This may be done by disconnecting the thermal resistor, connecting the coils in series, and checking the pick-up. The coils will be in series and adding if a jumper is taken from the minus (-) operating coil terminal to 1F. Battery is then applied from the plus (+) coil terminal to 2B using a variable series resistor. If the pick-up is lower than for the high resistance winding alone, the relative polarities are correct. If the pick-up is higher, one of the windings must be reversed.

TABLE #I

| <u>Pc. No.</u> | <u>Style</u> | <u>Not less than</u>                  |             | <u>Not more than</u> |             |
|----------------|--------------|---------------------------------------|-------------|----------------------|-------------|
|                |              | <u>Sec.</u>                           | <u>Amp.</u> | <u>Sec.</u>          | <u>Amp.</u> |
| 192910         | OR-11        | 4.0                                   | 12.0        | 25.0                 | 8.0         |
| 195969         | OR-10        | (Superseded by Pc. 295421 and 295754) |             |                      |             |
| 295421         | OR-11        | 8.0                                   | 12.0        | 40.0                 | 8.0         |
| 295754         | OR-10        |                                       |             |                      |             |
| 213453         | OR-10        | 2.5                                   | 20.0        | 10.0                 | 15.0        |
| 213454         | OR-11        | (Superseded by Pc. 298193 and 295420) |             |                      |             |
| 298193         | OR-10        | 6.0                                   | 20.0        | 25.0                 | 15.0        |
| 295420         | OR-11        |                                       |             |                      |             |
| 207568         | OR-10        |                                       |             |                      |             |
| 211310         | OR-11        | 4.0                                   | 5.5         | 17.0                 | 4.0         |
| 256998         | OR-11        |                                       |             |                      |             |
| 271385*        | OR-11        |                                       |             |                      |             |
| 242976         | OR-11        | 4.0                                   | 9.0         | 8.0                  | 7.5         |
| 248583         | OR-11        | 4.0                                   | 15.0        | 17.0                 | 11.5        |

\*For test add temporary jumper from 1H to 2F on the relay.

Overload relays Pc. 192910, 195969, 213453, and 213454 used with Style M-2 or M-22A and B switch machines can be converted to a new piece number as indicated above to operate with either the M-2, M-22A and B machines or the M-3, M-23A and B machines by replacing the internal thermal resistor and applying a new name plate stamped for the proper current value and piece number. The new name plate is required for proper identification.