Signal Training Bulletin

COMMITTEE G: Education & Training
Communication & Signal Division, AAR

C-17 Overload Relay

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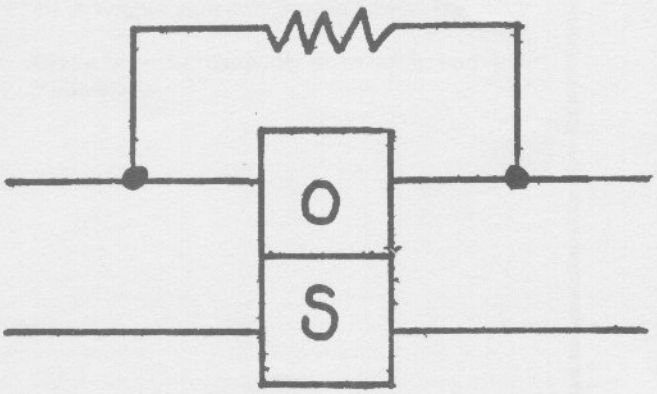
The Signalman's Journal

Definition: A relay which operates to open its contacts when the current through its coils exceeds a predetermined value.

Symbol:



Description: An overload relay consists of two coils which operate independently of each other. One is the overload or pickup coil, and the other is the holding or stick coil.

The overload relay, illustrated in Figure 1 (a), is commonly used in the control circuit of direct current switch machines. It employs a resistor consisting of a few turns of thermal resistance wire connected across the overload coil terminals inside the relay case to detect the overload. Another resistor mounted across the terminals of the relay is connected in series with the stick coil to reduce the stick current. The relay is equipped with one set of dependent contacts and one independent back contact.

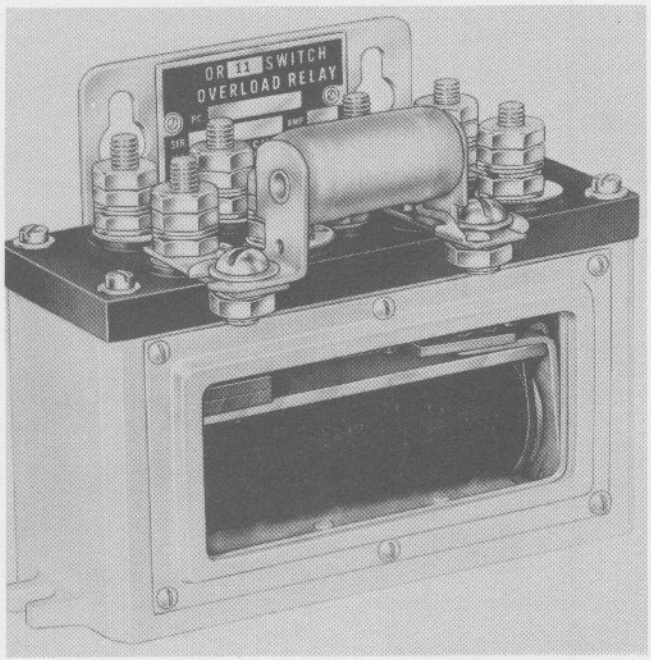


Figure 1(a) is a shelf-type overload relay.

The overload relay shown in Figure 1 (b) is the plug-in type which employs one low resistance coil and one high resistance coil. The plug-in overload relay employs one dependent back and front contacts and one independent back contact which opens the switch control circuit when an overload occurs.

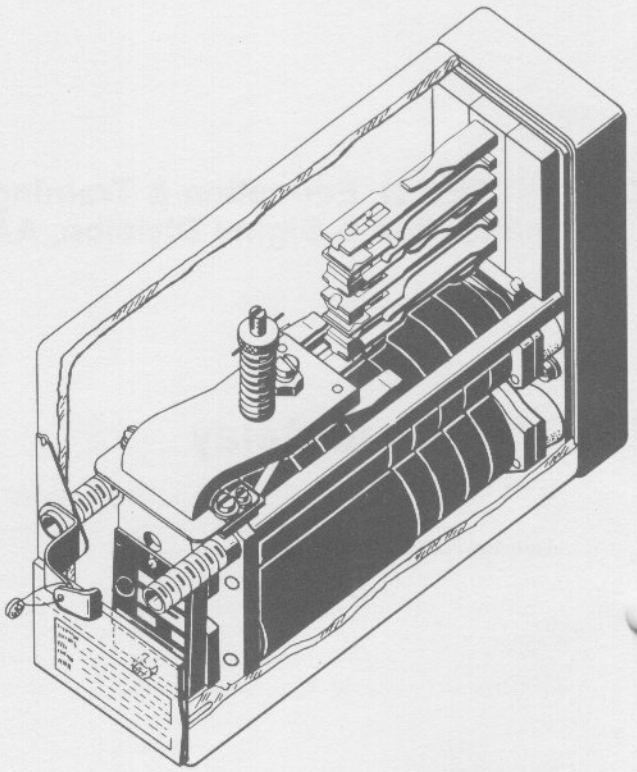


Figure 1(b) is the plug-in type overload relay.

Purpose and Application: The principal function of the overload relay is to protect switch machine motors, contacts and batteries if an overload should occur due to an obstruction in the switch or switch machine that would cause the switch machine motor to draw excessive current. If for any reason the switch machine should become stalled during a switch movement, it can readily be seen that without such overload protection the motor current would increase. Too much current would then flow through the motor armature and field, as well as the motor control contacts, possibly causing damage. A heavy current drain would also be placed on the operating battery.

Figure 2 (a) shows the switch control circuit using the overload relay illustrated in Figure 1 (a).

To understand the operation of the overload relay, refer to Figure 2 (a). To operate the switch machine to the reverse position, relay WR is pole-changed by its control circuit. The motor current then flows from B24 through neutral heavy duty contact 5F on WR, reverse polar contact 3R, thermal resistor and OR relay coil in parallel, then through the motor armature, polar contact 4R, contact 12 on switch circuit controller, motor field and hand crank contact to N24.

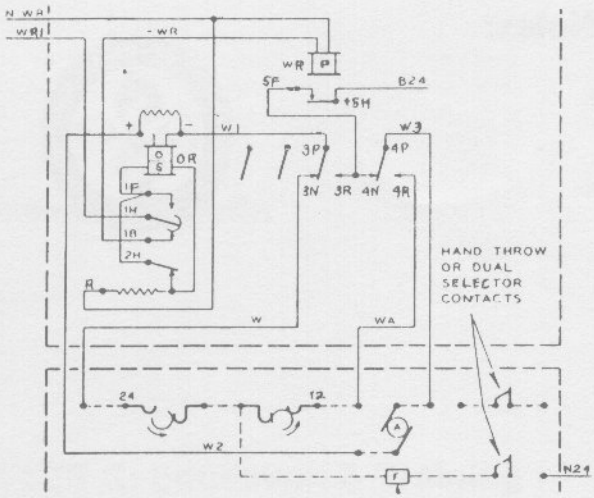


Figure 2(a) shows the switch control circuit using a shelf-type overload relay.

The thermal resistor in parallel with the OR operating coil carries most of the motor current, and since the relay is made slow pickup by short circuiting stick winding S through back contact 2, the relay will not pickup on the initial current surge of the motor. However, on a sustained overload, the increased current will result in the resistor heating, increasing its resistance. This increase in resistance will cause more current to flow through the operating coil picking up the relay. When the overload relay picks up, the control for switch control relay WR is opened at back contact 1, removing battery from the motor control circuit at neutral contact 5F on the WR. At the same time, the secondary winding (S) of the OR relay becomes energized through its front contact 1F. Relay OR will remain energized, and relay WR de-energized until the polarity of the switch control circuit is reversed, after which, the switch machine will return to its normal position.

Because of the quick cooling characteristics of the thermal resistor, it is possible to attempt to again reverse the switch. With the clutch of the switch machine adjusted to slip at the recommended current, the overload relay will operate in approximately five seconds after the overload occurs. With the clutch slipping at 75 percent of the recommended current, the relay will operate in approximately 20 to 25 seconds.

The clutch should be properly adjusted to the recommended current to save wear on the clutch and reduce drain on the operating battery.

Figure 2 (b) shows a typical switch control circuit using the overload relay pictured in Figure 1 (b).

The low resistance coil of the plug-in overload relay is inserted in the switch control circuit for both normal and reverse movement. An overload will cause excessive current to flow through the coil picking up the overload relay, de-energizing the switch control relays NWR and RWR. They, in turn, will open the switch control circuit, removing energy from the motor circuit. The overload relay will stick-up until energy to the control circuit is reversed by operating the control lever.

General Information: Most railroads have instructions outlining test procedures for checking overload protection. Generally, the test is made by placing a piece of wood in the switch point, causing the overload relay to become energized and removing energy from the motor circuit.

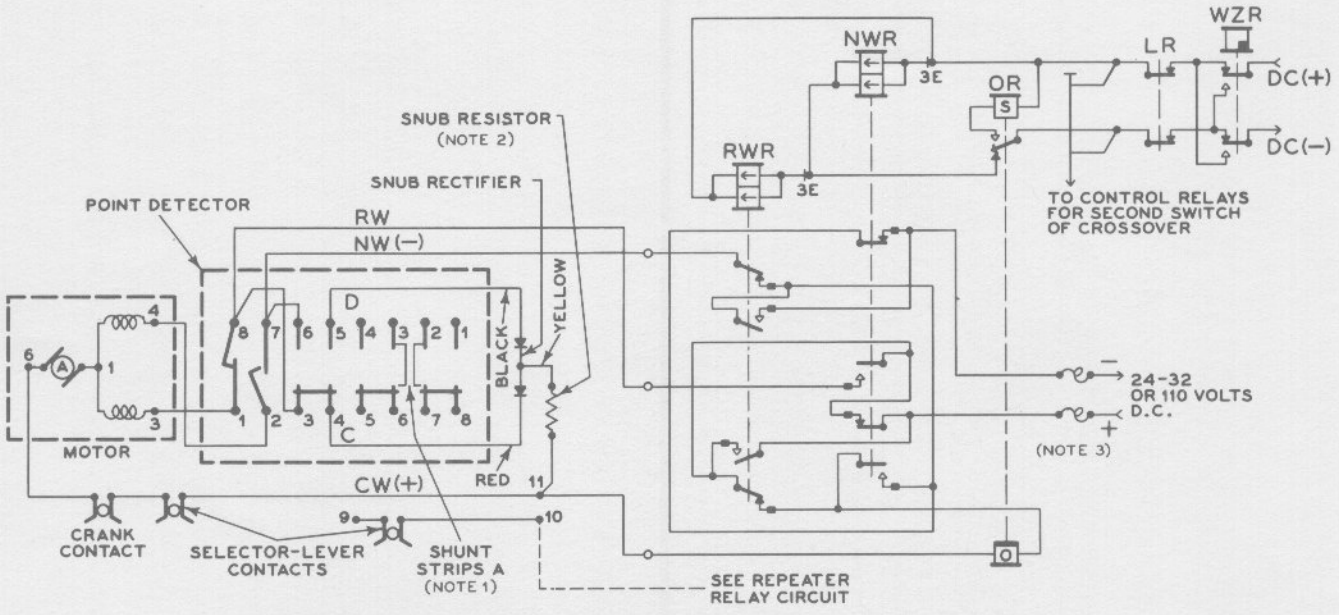


Figure 2(b) is a typical switch control circuit using a plug-in type overlay relay.

Note1—Shunt strips A are used for polarized switch repeater relay circuits only.

Note 2—Snub resistor is used in 110-volt machines only.

Note 3—8-amp Fusetrons are used with 110-volt machines.
10-amp Fusetrons are used with 24- to 32-volt machines.

Detailed Operation: Since overload relays are connected in series in the switch control circuit, they must be slow acting so that surges caused by the motor starting will not cause them to pickup. On the shelf mounted overload relay, the secondary coil is normally short circuited through its back contact making it slow pickup. Once the relay picks up and closes its front contact, the secondary coil is connected in the control circuit to stick-up the relay. The plug-in overload relay consists of one pickup coil and one holding coil. A copper slug and washers make the relay slow acting.

Overload relays may be used on both high and low voltage switch machines.

Note: This Bulletin is for general information only. For specific applications consult the rules, standards and instructions published by your railroad.

Notes: