Signal Training Bulletin

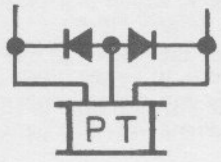
COMMITTEE G: Education & Training
Communication & Signal Division, AAR

C-13 Power Off or Power Transfer Relay

Approved October 1973

Definition: Power Off Relay or Power Transfer Relay: A relay so connected to the normal source of power that the failure of such source of power causes the load to be transferred to another source of power.

Symbol:



Description: Power off or power transfer relays are dc neutral relays with a half wave rectifier mounted externally and connected in parallel with each relay coil to provide dc current through the coils. The relay is available with two, four or six contacts. However, the most commonly used is the one with two contacts.

Figures 1(a) and 1(b) illustrate two types of power off relays.

Purpose and Application: Some signal installations have several lighting circuits, i.e., crossing protections. If commercial ac power is available it is the normal practice to light the lamp bulbs by ac to conserve on battery. Because commercial ac is subject to occasional outages it is necessary to ensure that during such outages that lamp circuits be transferred to an alternate source. The alternate or standby source is normally batteries.

The power transfer (PT) relay is the device employed to detect power outages and transfer the load to battery. The coils of the PT relay are connected to ac. The half-wave rectifiers mentioned in the description are mounted so that the current supplied to the coils is rectified ac. A description of the rectifying process is covered under Detailed Operation.

When the ac supply is intact the PT relay is energized. The lamp bulbs receive ac through the heel and front contacts of the PT relay. If the ac supply fails, the PT is de-energized. When the relay drops the heel makes with the backs. The back contacts are connected to the standby supply, ensuring energy for the lamps. A typical circuit for the above is included under Detailed Operation.

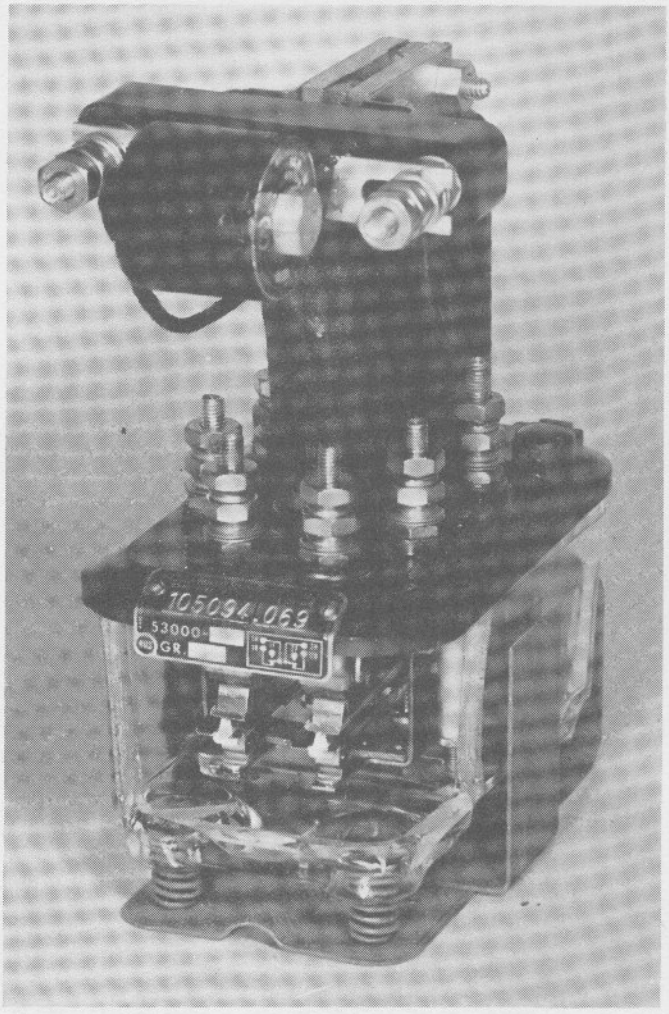


Figure 1 (a)

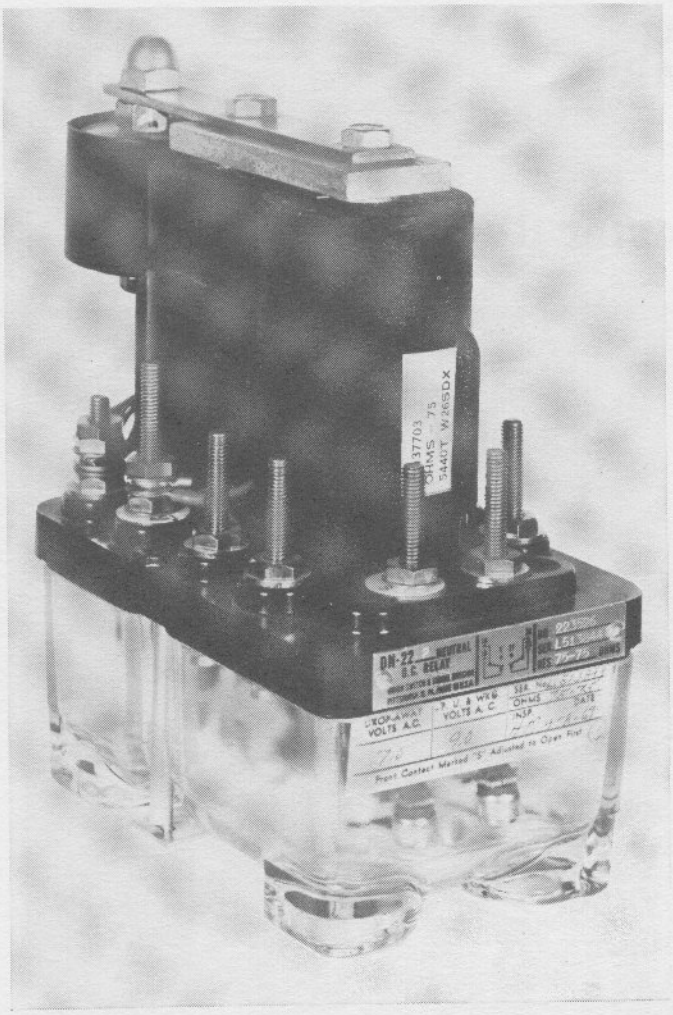


Figure 1 (b)

General Information: Some of the special features provided in power transfer relays are as follows:

Positive drop-away of the armature when the alternating current voltage has dropped to a predetermined value below the normal voltage. This provides protection against low voltage as well as loss of power.

A complete pick-up and drop-away, i.e., the relay will completely release to the de-energized position when the control voltage is reduced to the drop-away value. It will pick up to its full working position when the pick-up value of voltage is reached and will not assume a midway position on either pick-up or drop-away. This will prevent the armature from floating or hanging.

Detailed Information: Figures 2 and 3 illustrate a typical control circuit of a power-transfer relay. The coils of the power-transfer relay are connected to the transformer secondary, which is a source of alternating current.

In Figure 2 current flow through one coil of the relay during the first half cycle of ac is shown by the heavy dark line. Note that current flow is through one relay coil and that leg of the rectifier in parallel with the second relay coil.

Figure 3 illustrates by the dark line the current flow through the other coil of the relay during the second half cycle. Note that current flow during the second half of the ac cycle is through the second relay coil and the leg of the rectifier in parallel with the first relay coil.

In Figure 4(a) note that the power transfer relay coils are in parallel with the lighting circuit that is being energized from the secondary of the transformer via the front and heel contacts of the power transfer relay. If ac power is removed from the primary of the transformer, current will stop flowing in the secondary, thereby de-energizing the power transfer relay. Current flow to the light will then be from the standby battery via the back and heel contacts.

In Figure 4(b) note that the power transfer relay coils are on a secondary winding other than that used by the lighting circuit. This is normally done when there are

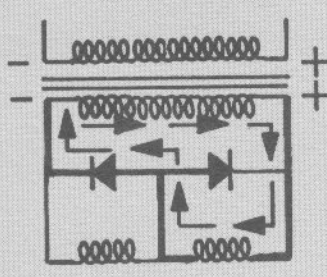


Figure 2

TRANSFORMER PRIMARY
TRANSFORMER SECONDARY
HALF-WAVE RECTIFIERS
PT RELAY COILS

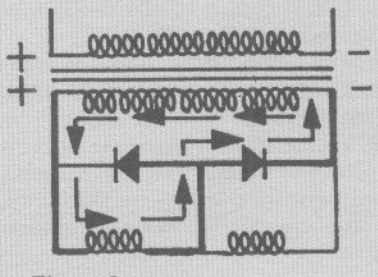


Figure 3

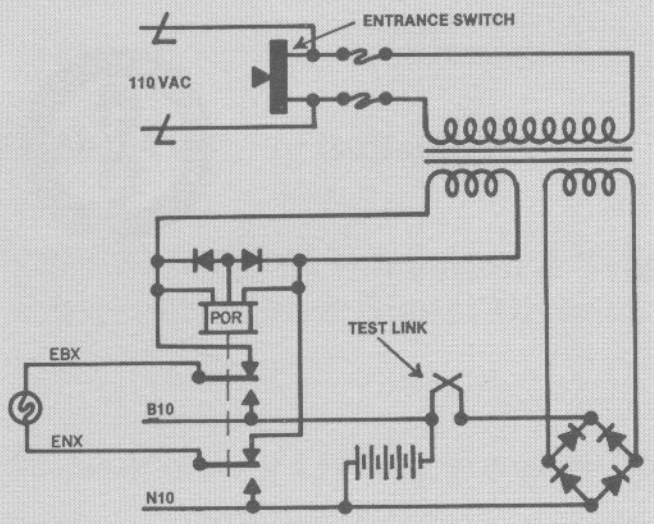


Figure 4 (a)

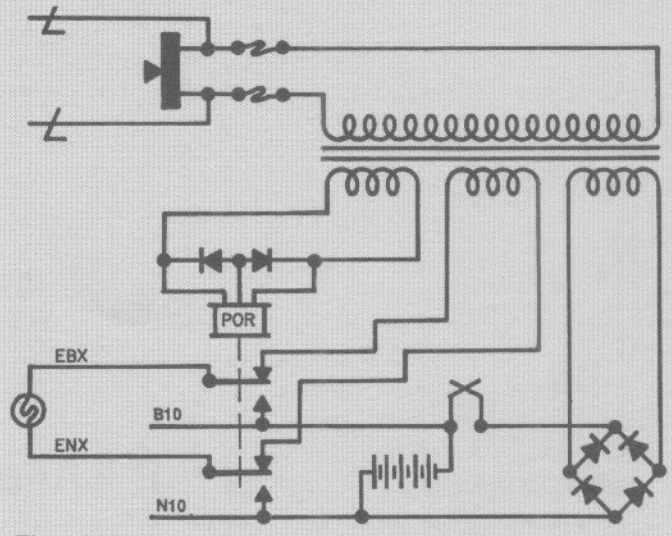


Figure 4 (b)

many lights or long cable runs which require the lighting secondary voltage to be set higher than the voltage allowable for use on the relay coils.

Figure 4(a) is a more desirable circuit because if the secondary winding should open, the relay will always be de-energized and the lights will be lit from the standby battery. Whereas, with scheme 4(b) there is a possibility of the lighting secondary opening up and the PT relay coils secondary remaining intact and the PT relay staying energized. With this situation the signals will not be lit, therefore the safety factor of the standby battery has been eliminated.

Notes