Relay Types

Publish Date: Feb 25, 2010 | 158 Ratings | **3.58** out of 5

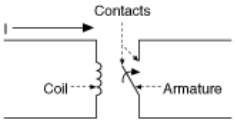
Overview

NI uses the following types of relays for SCXI and PXI switch modules. Refer to the specifications guide of the module for the relay type(s) used in the switch module.

Table of Contents

1. Electromechanical Armature Relays

Armature relays are made of coils and contacts. When the coil is energized, the induced magnetic field moves the armature, which opens or closes the contacts. If your switch module uses electromechanical relays, consider the factors that affect relay life.

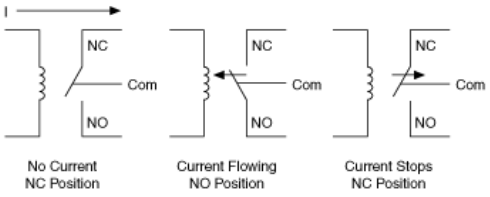


There are 2 types of electromechanical relays: latching and non-latching.

Non-Latching

A non-latching relay has an initial position of normally closed (NC) maintained by the force of a spring or permanent magnet while no current flows. The normally open (NO) contact is maintained by the force of a magnetic field while current flows through the coil. When the current stops, the relay reverts back to its initial NC position.

Non-latching electromechanical relays are useful in control applications when the switch must return to a known state if power is lost.



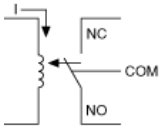
Latching

A latching relay can have 1 or 2 coils. Latching relays have no default position and remain in their last position when the drive current stops flowing. While the relays themselves may be latching, their reset position in a module is based on the control circuitry and software (NI-SWITCH resets all relays on all modules during initialize and reset). Latching relays are useful in applications where power consumption and dissipation must be limited because, once actuated, they require no current flow to maintain their position.

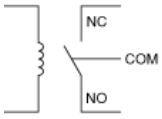
In one–coil latching, the direction of current flow determines the position of the relay. In 2–coil latching, the coil in which the current flows determines the position of the armature.

1-Coil Latching Relay

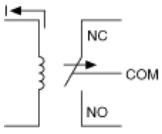
1. Current Flows (NO Position)



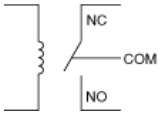
2. Current Stops and Relay Stays In Position



3. Current Flows In Opposite Direction (NC Position)

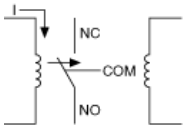


4. Current Stops and Relay Stays In Position

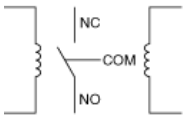


2-Coil Latching Relay

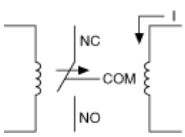
1. Current Flows In One Coil (NO Position)



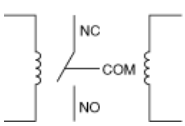
2. Current Stops and Relay Stays In Position



3. Current Flows In the Other Coil (NC Position)

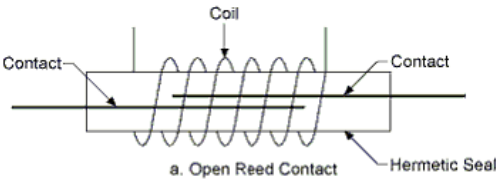


4. Current Stops and Relay Stays In Position

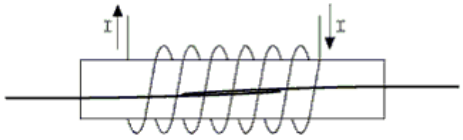


2. Reed Relays

Reed relays are made up of coils wrapped around reed switches. The reed switch is composed of two overlapping ferromagnetic blades hermetically sealed within a glass capsule that is filled with an inert gas. National Instruments uses a dry reed relay and the inert gas inside the capsule is typically nitrogen. When the coil is energized, the two reeds physically contact one another to complete a path through the relay. When the coil is de-energized, the spring force in the reeds pulls the reeds apart.



a. Open Reed Contact



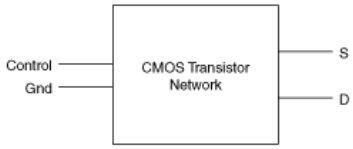
b. Closed Reed Contact

The reeds are generally smaller and therefore can actuate much faster than the armatures in electromechanical relays. However, reeds are also more susceptible to damage from arcing than are armatures in electromechanical relays. When a spark jumps across the contacts, it can melt a small section of the reed. If the contacts are still closed when the molten section re-solidifies, the contacts may weld together. The spring force in the reeds is often insufficient to mechanically break the weld.

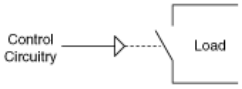
See Also:
Reed Relay Protection

3. FET Switches

FET switches are made of several CMOS transistors. A voltage is applied to control circuitry, which connects the source and drain of a transistor network (load circuit).



There is no additional isolation between the control circuitry and the signal path, which restricts operation to low voltage, but allows very fast switching speeds.



4. Solid State/Solenoid/Proximity and Limit/Process Switches

DeveloperZone documents have been created that go into further detail on each of these topics. Please refer to the links below.

See Also:
Solid State Relays
Solenoids
Proximity / Limit Switches
Process Switches