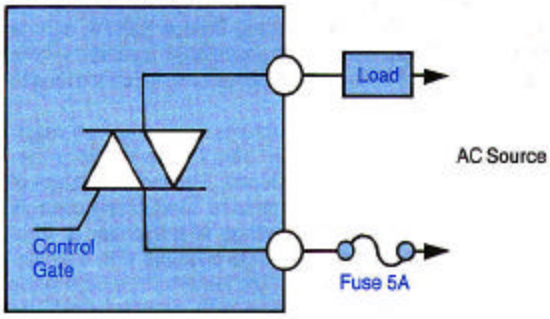
Components of a Photoelectric System

Solid State Relay (Triac)



Equivalent Circuit

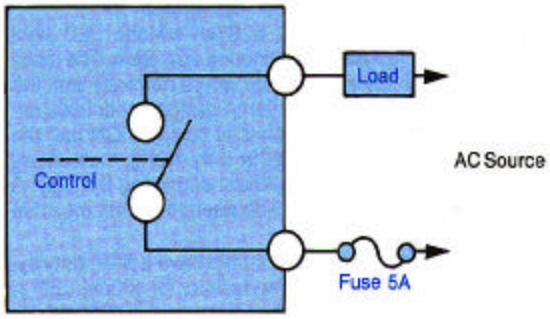


FIG. 11

the circuit would be either closed or open. An SPDT relay would have a single moving contact which could make connection with either of two stationary contacts. A DPDT relay will have two moving contacts, each of which can connect with either of two stationary contacts.

The moving contact of a Double Throw relay will be labelled "COM" or "Common". When the relay is de-energized the moving contact is held against the "NC" or "Normally Closed" stationary contact by the spring. When the relay is energized the armature moves to connect C with the "NO" or "Normally Open" contact.

Relays are rated by the amount of current they can handle at a stated voltage. For example, many relays will be rated for 5 Amps at 115 VAC, but only 3 Amps at 230 VAC or 28 VDC. It might be expected that a relay would handle less current at the higher AC voltage, but why only 3 Amps at the much lower DC voltage? The main problem is that DC current flows only in one direction. When the metal contacts are close but not touching, sparks arc across the gap and vaporize some of the metal. When the relay is switching AC current, the metal surfaces wear symmetrically. When DC current is switched, one contact becomes pitted while the other accumulates a metal deposit. This situation quickly degrades the quality of the electrical connection and shortens the useful life of the relay if it switches high DC currents.

Features

- Handles AC or DC
- Switches high power
- Familiar to personnel
- Isolation between amplifier and load circuit

Limitations

- Physically large — slow to switch — creates electromagnetic noise.
- Mechanical parts are subject to wear — contacts are eroded by arcing — limited life

Solid-State Relay Solid-state relays, sometimes called triacs, use semiconductor devices to control AC power. A complete solid-state relay would include the actual triac, an optoisolator, a zero voltage trigger circuit, and an RC network to suppress switching noise.

The solid-state relay output, then, performs the same function as a Single Pole Single Throw switch for AC only (see Fig. 11). When the Schmitt trigger amplifier turns ON, its output current turns ON the optoisolator, which in turn, drives enough current into the trigger circuit of the triac to make it conduct. Because solid-state relays switch when the line voltage crosses zero, response time may be as long as 9 milliseconds.