Experiment No. 4: Reed Relay and Solid State Relay

1. Objective

The objective of this experiment is to,

a. Understand the construction of Reed Relay and Solid State Relay

b. Operate Reed Relay and Solid State Relay

2. Apparatus

- Magnetic Bar
- IT-100 and IT-100A Trainer
- 12V AC Lamp
- 2mm Patch Cords
- Digital Multi-meter

3. Theory

A relay is a switching device as it works to isolate or change the state of an electric circuit from one state to another. These are found in all sorts of devices. Relays allow one circuit to switch over to a second circuit that can be completely separated from the first. There is no electrical connection inside the relay between the two circuits – the link is magnetic, optical and mechanical only.

3.1. Reed Relay

A reed relay is a type of relay that uses an electromagnet to control one or more reed switches. The contacts are of magnetic material and the electromagnet acts directly on them without requiring an armature to move them. They are comprised of at least two overlapping blades, or reeds, which are sealed within a gas-filled capsule as shown in the Figure 4.1. When the metal coil surrounding the reeds is energized, the reed contacts are drawn together and the switch closes. When the coil is de-energized, the spring force in the reeds pulls them apart and opens the switch.

A reed relay's contacts are much smaller and lighter than those of a typical electromechanical relay, resulting in a lightweight product capable of fast switching. However, the small sizes of reed relay contacts make them especially susceptible to contact damage due to arcing. Arcing often melts a small section of one contact to the other contact, resulting in a bond that is too strong for the reed's spring action to reverse.

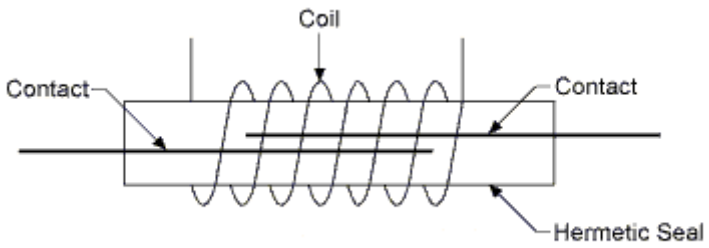

Figure 4.1: Construction of Reed Relay

3.2. Solid State Relay

A solid-state relay (SSR) is an electronic switching device that switches on or off when a small external voltage is applied across its control terminals. SSRs consist of a sensor which responds to an appropriate input (control signal), a solid-state electronic switching device which switches power to the load circuitry, and a optical coupling mechanism to enable the control signal to activate this switch without mechanical parts as shown in the Figure 4.2. The relay may be designed to switch either AC or DC to the load. It serves the same function as an electromechanical relay, but has no moving parts.

Packaged solid-state relays use power semiconductor devices such as triac, thyristors and transistors, to switch currents up to around a hundred amperes. Solid-state relays have fast switching speeds compared with electromechanical relays, and have no physical contacts to wear out. Application of solid-state relays must consider their lower ability to withstand momentary overload, compared with electromechanical contacts, and their higher "on" state resistance. Unlike an electromechanical relay, a solid-state relay provides only limited switching arrangements (SPST switching).

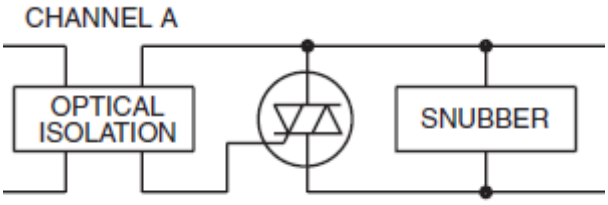

Figure 4.2: Circuit Diagram of SSR

4. Procedure

1. Locate the Reed relay block on IT-100A trainer.
2. Construct the circuit as shown in the Figure 4.3.
3. Apply the +5V to coil terminals (TP_{18} and TP_{19}) through the switch SPDT as shown the Figure 4.3.

4. Switch ON the power and observe the status of Lamp.
5. Measure the resistance of the switch as shown in the Figure 4.4 and record in the Table 4.1.
6. Switch OFF the power and measure the resistance of the switch and record in the Table 4.1.
7. Locate the SSR block on IT-100A trainer.
8. Construct the circuit as shown in the Figure 4.5.
9. Connect the variable power supply to the terminals (TP_{22} and TP_{23}) as shown in the Figure 4.5.
10. Slowly increase the power supply voltage until SSR and lamp are turned ON.
11. Measure the power supply voltage and record in the Table 4.1.

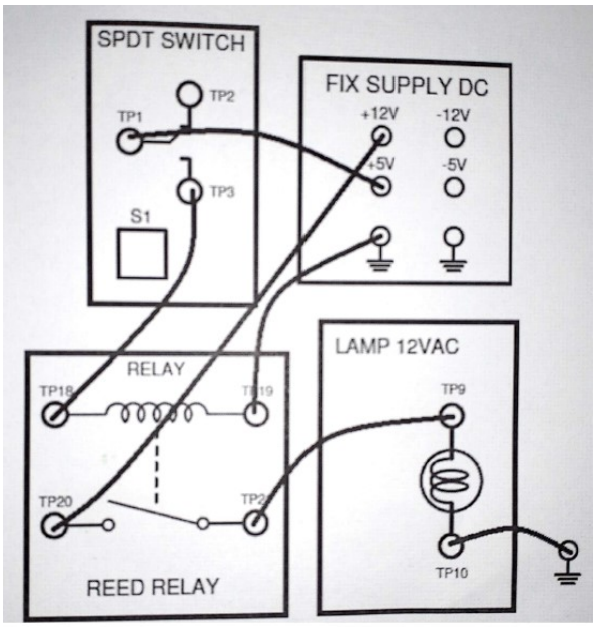

Figure 4.3: Connection Diagram of Reed Relay

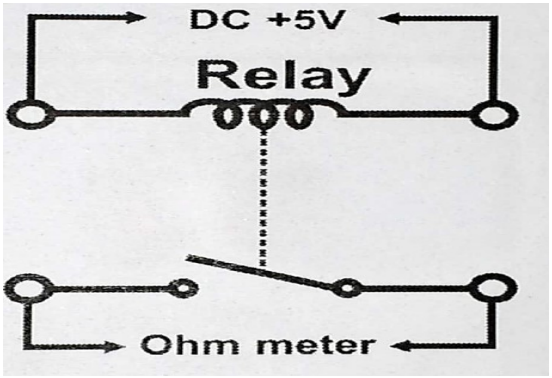

Figure 4.4: Measuring Resistance of Reed Switch

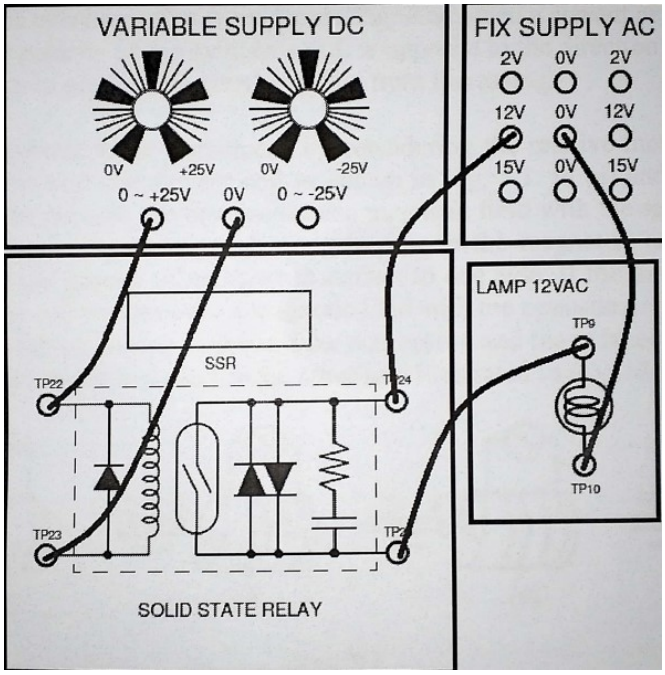

Figure 4.5: Connection Diagram of Solid State relay

Table 4.1

Reed Relay		**Solid State Relay**
Switch Status	Resistance of Switch (Ω)	Power Supply Voltage= _____V
ON		
OFF		

6. Lab Tasks:

1. Locate the Reed switch block on IT-100A trainer and connect the Lamp and 12V AC with the Reed switch. Operate the Reed switch with the help of magnet and conclude your observations.

7. Conclusions