

## **3. “BASIC PANEL COMPONENTS”**

### **DIODES**

The simplest type of solid state device is the **DIODE**. Most of us are familiar with the large diodes used on an SCR panel, but this is only one type. There are many different types and sizes of diodes in use today. The basic type which we will be discussing is called a **silicon rectifier diode**. Silicon being the major material semiconductors are made from and rectifier meaning a device which limits current flow to one direction: unidirectional. The diode is a two part, non-gated device represented by the symbol shown in Figure 1.

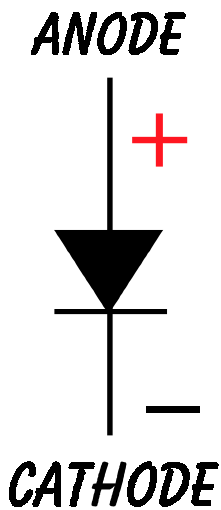


Figure 1

Typically on large diodes this symbol will be shown to specify the **ANODE** from the **CATHODE**. Large diodes may have the stud as the anode or the cathode. On smaller diodes, typically those used in circuit boards, the cathode will be marked with a band that circles one end of the device. As stated, the diode is a unidirectional device which allows current to flow in one direction only.

**F**orward-biased means that the diode is connected with the correct polarity, anode to positive and cathode to negative. In Figure 2 we can see that the

diode is forward-biased to allow current to flow through the lamp and the diode to complete a path from battery positive to battery negative. If we would measure the voltage across the diode in Figure 2, we would measure approximately .7 volts. This means that the voltage across the lamp would be 35.3 volts or 36 volts minus the .7 volts across the diode. It should be noted that in any series circuit, such as Figure 2, the voltage drop across each component must add up to the voltage being supplied, in this case 36 volts. The .7 volt drop across our diode is typical for any diode of any size. The larger the diode the higher the current rating but the voltage drop of .7 volt is always the same.

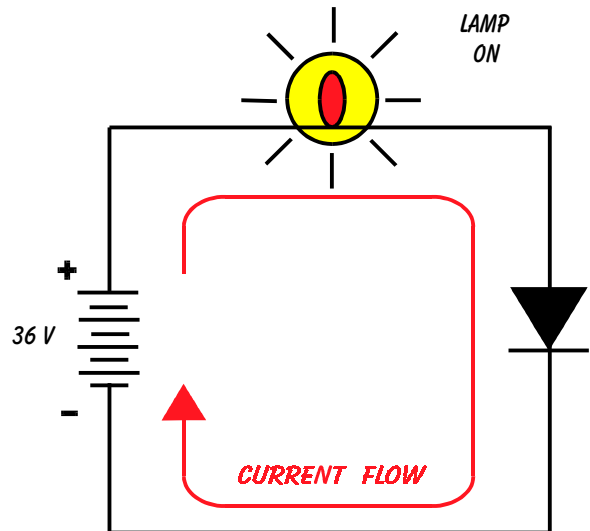


Figure 2

**I**n Figure 3, the diode is reverse biased, connected in a non-conducting state. The cathode or nega-

## 4. “DIRECTIONAL CIRCUITS”

Needless to say, any type of material handling equipment must have the capability to move in both forward and reverse directions. This is the job of the directional circuits, which are composed of a directional contactor set. The directional set consists of one forward and one reverse contactor, each contactor having a normally closed and a normally open set of power contacts. These power contacts carry the full load of the motor, so the contactor tips may have as much as a 350 ampere rating. Each contactor is controlled by a contactor coil, which when voltage is applied becomes an electro-magnet and energizes the contactor. Figure 1 shows an example of a typical single directional contactor.

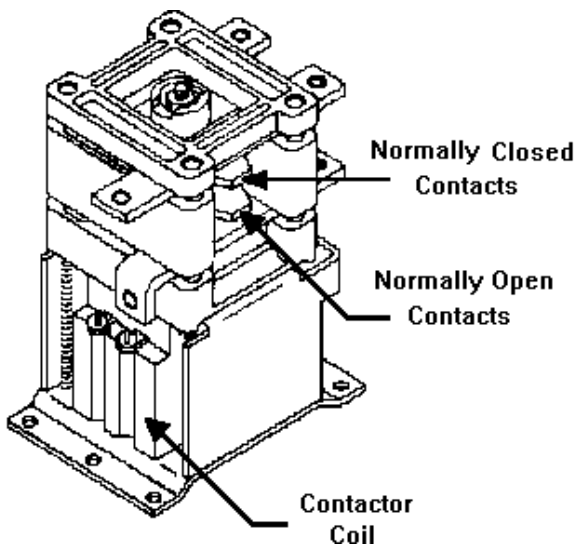


Figure 1

In order to change the rotation of any DC series wound motor, we must change the direction of current flowing through either the armature or the series field. In most cases the directional control changes the current through the series field, so we will use that as an example.

Figure 2 shows a simple directional circuit using a series wound motor. The “FWD” stands for forward and the “REV” represents reverse. Notice how there are two of each contactor, one normally open set of contacts and one set of normally closed contacts (shown with the line through the contactor).

**\* No Direction Selected \***

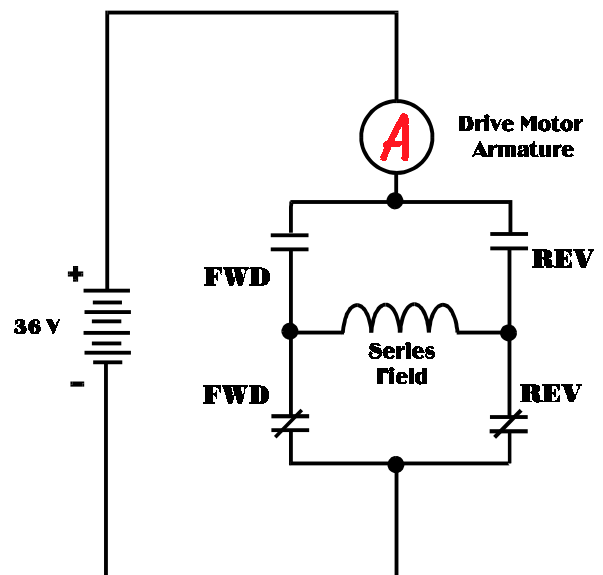


Figure 2