AUTOMATIC LIGHT SWITCHES

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AUTOMATIC LIGHT SWITCHES HAVE BE-come quite popular, not only in rural areas but in suburban areas as well. These switches use a very simple electronic circuit; a small relay which is controlled by a photocell. When the outside light is high enough, the relay is energized and the light goes off. Figure 1 is the schematic of a typical unit. This is one of the smaller types, for controlling lamps up to 300 watts. There are several different sizes, including types which can control high-intensity mercury lamps.

The ac current flows through a 5100-ohm resistor (refer to Fig. 1), through a cadmium-sulphide photo-

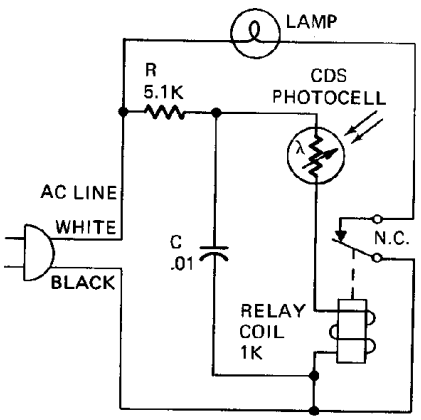

FIG. 1

cell (abbreviated CdS), then through the coil of the relay. The CdS cell here is used as a variable resistor. The arrows are the symbol for a light-actuated device.

When the cell is dark, it has a high resistance. More light falling on it decreases the resistance and more current flows. The relay contacts do the actual switching. They are normally closed ("NC") when the relay is *not* energized, and the light goes on. This gives us "fail-safe" operation. If anything goes wrong in the control circuitry, the light remains lit.

The control unit is usually mounted on top of the lamp reflector, under a small metal cover. This will have a little window in it; the photocell is mounted behind this. For best results, this window should be on the north side of the cover when installed. This keeps the direct rays of the sun from falling on it, and gives better control of the light.

To repair one of these, start with the lamp. If the lamp won't light, replace the bulb with a good one. Now, cover the window on the housing with your hand. You should hear the relay click. If this happens, but the light still refuses to go on, turn the power off and remove the cover. There are several hot wires exposed, so don't take any chances.

Check the relay contacts; they may be burned or pitted so badly that they do not make contact, even though the armature of the relay may pull in. In most of these units, the contacts are easily accessible. Pull a strip of fine sandpaper between them, holding the armature down with your finger (power OFF, remember!) Close the relay gently by hand and look at the contacts; you will be able to tell whether they're touching or not. Turn the power on, keeping clear, and recheck the unit to see if it's operating. You can cover the photocell with a piece of dark paper or cloth.

One common cause of damage to these units is a nearby lightning discharge. If this has happened, you will probably see burned parts, charred insulation or carbon "tracks" across insulators. If this is the case, take the unit off and repair it.

Disconnect both wires and remove the control unit and lamp socket. You'll need an ohmmeter to check it. Disconnect the capacitor across the relay coil and check it for shorts. If it has shorted, the 5100-ohm resistor will probably be well charred, too. Replace these, if they're bad. Before connecting them back, check the relay coil. If it too, has been damaged by the lightning, its coil will look very dark, or even charred. Normal resistance of a typical unit is about 1000 ohms.

If the capacitor took a direct hit, its case may have exploded, so that you can't read the markings. Fortunately, they aren't too critical; a .01-μF capacitor at 600 volts is a good size.

While the circuit is opened up, check the photocell. With the surface

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covered, this should read approximately 15,000 ohms or more. Now uncover the cell and let light hit it. The resistance should drop to somewhere around 1500 to 2000 ohms. The higher the intensity of the light, the lower the resistance. The relay should now close if power is applied to the unit. If it won't move, turn the power off and connect a jumper clip lead across the photocell. The armature should now close unless the coil has some shorted turns.

Figure 2 shows the schematic of a larger unit, used with the mercury-vapor lamps. Note the similarity. This one has a temperature-sensitive resistor mounted in shunt with the photocell and coil. Some units have a sensitivity control, so the lamp can be turned on at any desired level of outside light. (Some of these can be so sensitive that they turn on when the weather is fairly cloudy!)

The control unit in Fig. 1 is practically instantaneous. With the larger units in Fig. 2 and mercury-vapor lamps, there will be about one or two second delay. This isn't due to the control unit but rather the characteristics of a mercury-vapor lamp. These are actually "arc lamps," and it takes

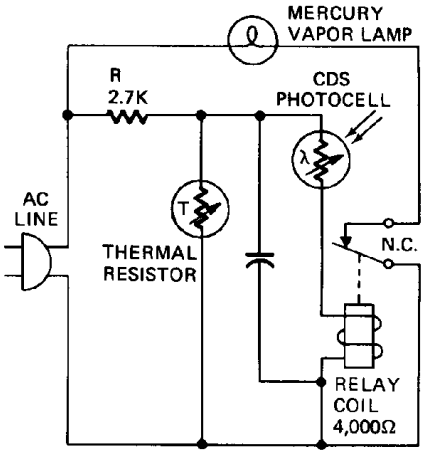

FIG. 2

a little time for the arc to form.

This delay will be almost impossible to notice during normal operation. However, during a violent thunderstorm with its associated bright flashes of lightning, you may notice the lamp going off. It may stay off for a moment, especially after a very bright flash. The photocells in this case are said to be temporarily "blocked". This is caused by very high-intensity light, just as human vision is temporarily blinded. This won't do any permanent damage, unless of course the unit takes a direct lightning hit. **R-E**