

## Application Note 025 Zero-Volt Switching Characteristics

### Introduction:

Solid State Optronics, Inc. AC relays have been designed with a driver circuit that controls the operation of two back-to-back silicon controlled rectifiers (SCRs), each responsible for switching one half of the AC cycle. If an AC signal is examined, the turn on, turn off, and zero-volt switching characteristics can be shown.

### Zero-Volt Switching

Figure 1 shows a typical 60Hz, 120Vac signal with a corresponding relay input signal and the sequence of zero-volt switching operation. At Stage 1, an input signal is applied to the relay. The relay will not turn on until the Threshold Voltage of 5V is reached. Once this point (Stage 2) is reached, SCR #1 (Designated as the SCR which controls positive AC voltage) turns on. However, SCR #1 only stays on

for an instant, as the cycle quickly crosses zero. At this point (Stage 3), SCR #1 will turn off and SCR #2 (negative AC voltage) will turn on. Likewise, at the next zero cross (Stage 4), SCR #2 will turn off and SCR #1 will turn back on. Even though the input signal is terminated at Stage 5, the relay will still continue to conduct (typical SCR behavior) until Stage 6, when SCR #1 crosses zero and turns off. Please note that Turn On can likewise begin on the negative phase of the AC cycle with a  $-5V$  threshold as well, even though only the positive phase is shown here.

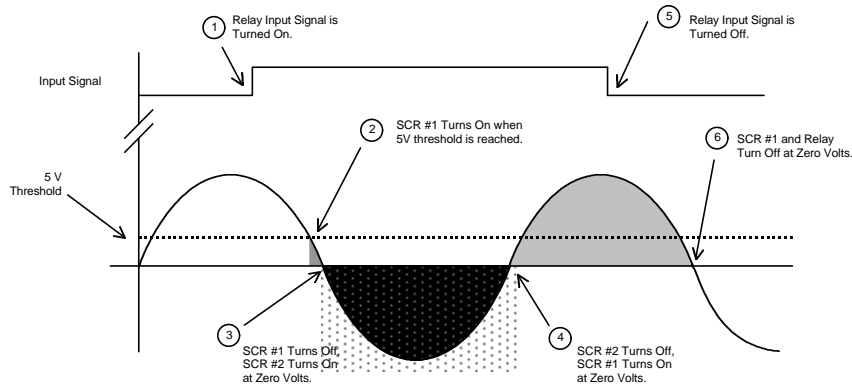


Figure 1: Zero-Volt Switching