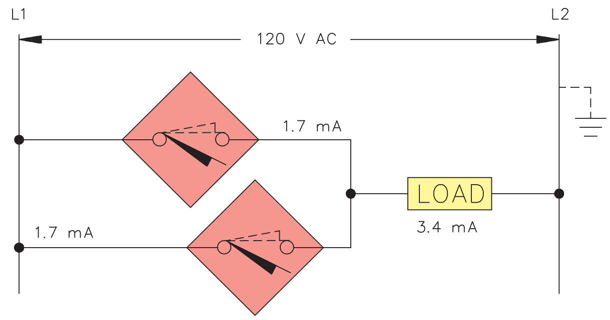
Parallel Connection

Figure 7

Parallel Connection: (Figure 7)

N.O. sensors: OR Function
(target present, any sensor: load "on")

N.C. sensors: NAND Function
(target present, all sensors: load "off")



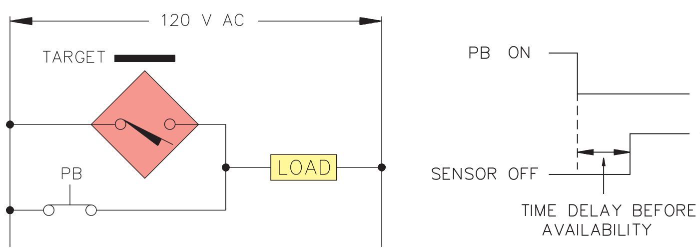
Wiring AC proximity sensors in parallel can result in inconsistent operation and should generally be avoided.

On-state voltage drop: With any sensor ON, the voltage across all other sensors is typically 7 Vrms. Since the minimum rated voltage for AC sensors is 20 Vrms, no other sensor with a target present can turn ON until the first sensor turns OFF. This transition is not instantaneous due to the time delay before availability, during which the load may drop out.

Leakage current through the load: This is equal to the total leakage of all sensors wired in parallel. Too much leakage into a solid state load can cause the input to turn ON and not turn OFF. Small relays may not drop out if the leakage current exceeds the relay's holding current.

Mechanical Switches in Parallel

Figure 8

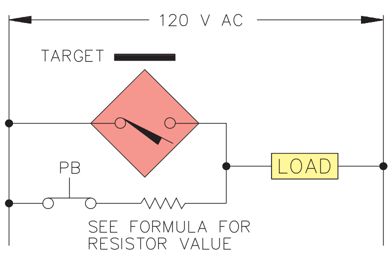


Problem:

As previously discussed, proximity sensors should be powered continuously to avoid the time delay before availability during power-up.

With mechanical switches in parallel, the sensor is shorted out every time the contact is closed, leaving it without power. If the target is present when the mechanical contact is opened, a small delay will be experienced during which the load may drop out.

Figure 9



Solution:

This delay can be avoided by adding a resistor in series with the mechanical contact. The voltage drop developed across the resistor with the contact closed will be enough to keep the sensor active. Use the formula below to determine the value and wattage.

Formula:

$$R = \frac{\text{minimum operating voltage of proximity sensor}}{\text{load current at operating voltage}}$$

Example:

$$R = \frac{20\ \text{V}}{180\ \text{mA}}$$

$$R = 110\ \text{W}$$

Minimum resistor wattage rating: E x I

Example: 20 V x 180 mA = 3.6 W ≈ 5 watts recommended