# Proper Reed Switch Circuit Design for Long Life Application

## Reed Switch Contact Protection

Switch Specification parameters for Switching Current, Maximum Switching Voltage, and power parameters such as Max VA or Max Switching Wattage should not be exceeded either during switching, or under transient conditions. To do so will damage the switch contacts. Contact life can also be decreased by the following conditions.

Inductive Loads — High Inrush Loads
Capacitive Loads — Capacitive Discharge Loads.

Below are a few examples of these damaging

## HIGH INRUSH LOADS

(1) Capacitors charged or discharged through the reed switch contacts without proper current limiting circuitry.

(2) The Switching of Incandescent lamp loads through the reed switch contact. Lamps typically have a cold filament inrush current that can be 10 times the lamps operating current.

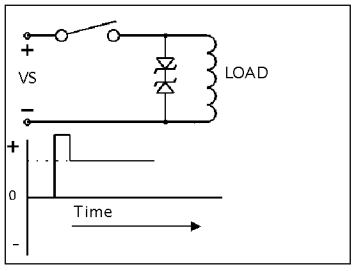
A Reed Switch operated under these conditions is switching it's largest load as soon as the contacts close, and during the contact bounce time of the switch. Results can range from vaporizing some contact material and shortening the life of the switch, to permanently welding the switch contacts

## INDUCTIVE LOADS

(1) Switching inductive loads such as relays, and motor starters can produce high transient voltage surges that can result in an arc across the switch contacts when the switch opens, unless some means of absorbing this transient energy is employed.

ARC SUPPRESSION circuit designs can be used to decrease these problems by reducing the Time and Amplitude of these Transient Spike Voltage Surges.

### Arc Suppression for DC Inductive Load Circuits

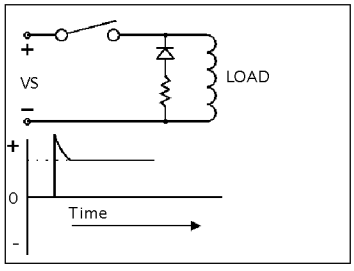



Back to Back Zener Diode Protection

The Zener Diodes should be sized for a Voltage Somewhat higher than the circuit source Voltage (VS).

The Transient Spike Voltage that occurs when the switch opens, is decreased to an amplitude equal to the back to back Zener Diode Voltage which decreases damaging effects to the reed switch contact.

The Voltage Waveform shown is observed across the Coil or Relay Contacts.

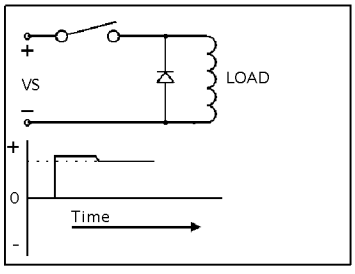



Diode / Resistor Protection

This Circuit also protects the switch from the Transient Spike voltage that occurs when the reed switch contacts open. The peak Transient Voltage is equal to the current when the switch opens times the resistance in the circuit.

Advantages of this circuit are:

The Transient time is shortened, and a good performance versus cost tradeoff.




Diode Suppression

This circuit is commonly used as a low cost alternate to the Diode/ Resistor circuit shown above.

It's overall performance is slightly lower than the circuit above, but has the advantage of "Clipping" the Peak Transient Voltage to a Very Low Value , ( the forward voltage drop value of the diode)

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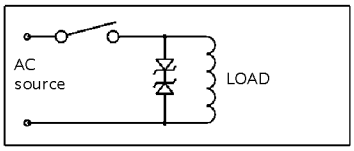
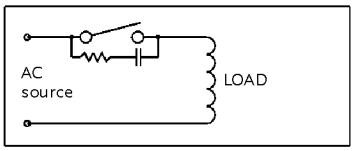
## Arc Suppression for AC Inductive Loads




### Back to Back Zener Diode Protection

The Zener Diodes should be sized for a Voltage Somewhat higher than the peak AC source Voltage.

The Transient Spike Voltage that occurs when the switch opens, is decreased to an amplitude equal to the back to back Zener Diode Voltage which decreases damaging effects to the reed switch contact.




### RC Suppression

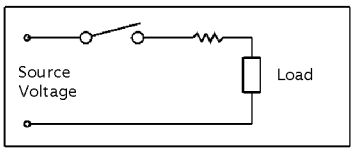
Here the Suppression network is shown connected across the reed switch, but may be also be connected across the load. The circuit absorbs inductive voltage spikes to help protect the reed switch contacts.

The following formula may be used for calculating Resistor and Capacitor values for the RC Suppression Circuit shown above where:

R is in Ohms, C is in Microfarads
I= Closed loop current in Amps
E= Open Circuit Voltage in Volts

$$C = \frac{I^2}{10} \qquad R = \frac{E}{10 * \left(I^{\left(1+\frac{50}{E}\right)}\right)}$$

## Inrush Current Protection AC/DC Loads



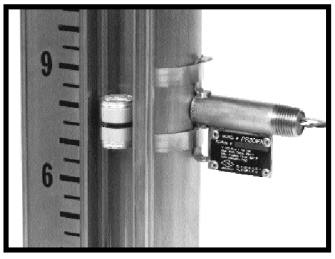

### Inrush Current Suppression

The series resistance circuit shown here protects the reed switch contacts by limiting the current flow through the load.

The Resistive load in this case is typically an incandescent lamp which has a high inrush current when first switched on.

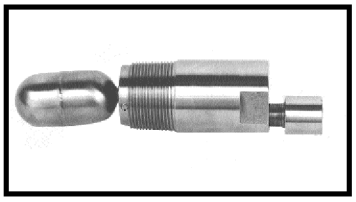
The resistor should be chosen to limit the maximum current to less than the contact switching rating for the reed switch.

* This circuit may also be used to protect the switch from capacitive loads only in DC Circuits.




**ES-30**
**Bulletin 1002**

**FS-31**
**Bulletin 1001**



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