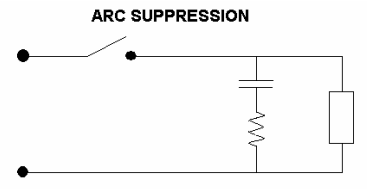
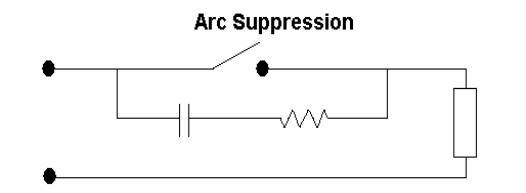
Spark suppression

Spark Suppression circuits are designed to reduce arcing and noise generation produced in switches and relays.

Arc suppression

When a switch/relay is opened an arc can develop across the contacts which over time can erode away the contacts over time. To prevent the contacts from being eroded a RC network is placed across the contacts.
When the contacts open the applied voltage is placed across the capacitor and not the contacts. The capacitor is to charge up at a rate faster than the contacts open thus preventing an arc from forming across the contacts.
When the contacts close the inrush current from the charged capacitor and source can be substantially higher than the contacts can safely conduct causing the contacts to deteriorate. This is why it is important to have a resistor in series with the capacitor. The resistor acts as a current limiter which reduces the inrush current by a significant amount that the arc caused at contact closure is greatly reduced extending the life of the contacts.





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The values of capacitance and resistance needed can be approximated from the following formulas developed by C.C. Bates

$$C=\frac{I^2}{10} \quad \text{and} \quad Rc= Vo /[10I(1+(50/Vo))]$$

The induced voltage at contact opening is

$$V=I*Rc=\frac{Rc}{RL}*Vo$$

Where Vo= Source voltage
I= Load current at contact opening
Rc= Resistance of RC network
C= capacitance of RC network
RL= Load resistance