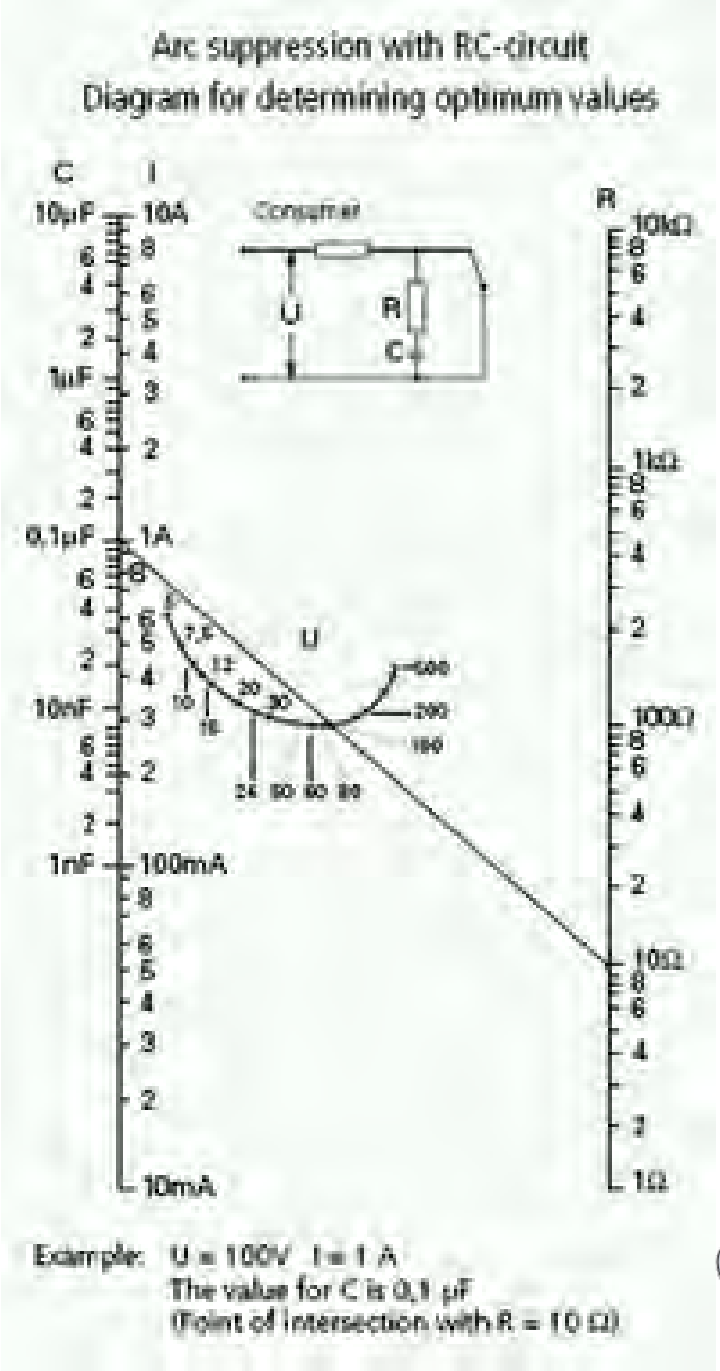
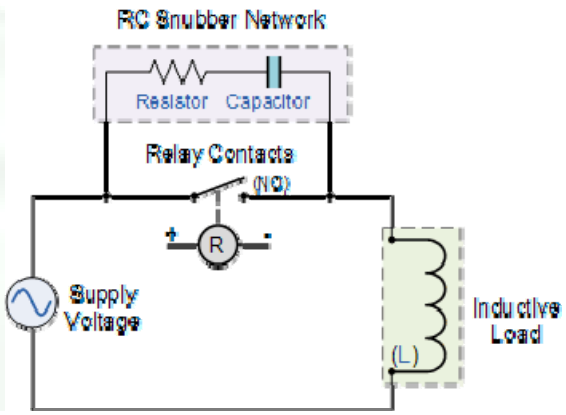
Arc suppression of relay contacts

(12/24/2016)

Arc suppression of relay contacts what does one need to know to allow the relay to last a long time? The following nomograph is using an RC circuit in parallel with the relay contacts.

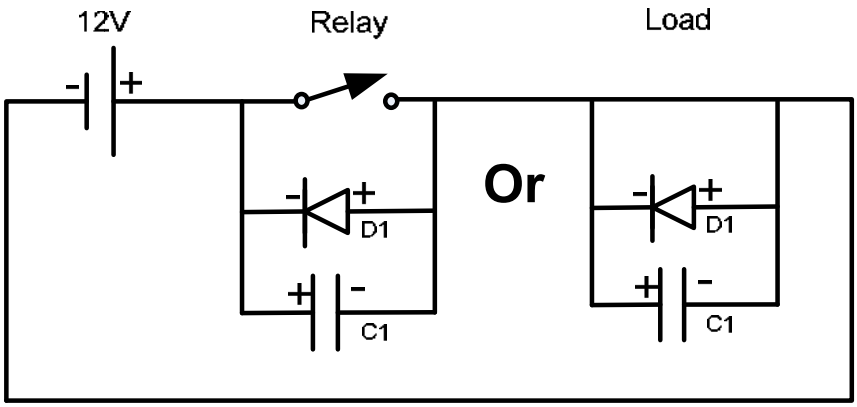




When using a relay to control dc 12 volt pumps, arc suppression of the relay contacts was found to be useful. The circuit above indicates the theory. The nomograph on the left is way off chart when working with 12 volts and currents above 10 amps. I found it necessary to use the experimental approach. After doing so, I recommend the

experimental as the best approach one should use any time and especially after the pole shift.

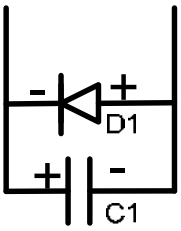
In working with 12 volts the resistor was found to be not needed. A diode in parallel is useful to short out any over swings so an electrolytic capacitor can be used instead of the more expensive non-polar caps. The resulting circuit can be put across the load or the relay contacts, but not both, and will do the same job of suppressing or snubbing the arc when the contacts open and close.

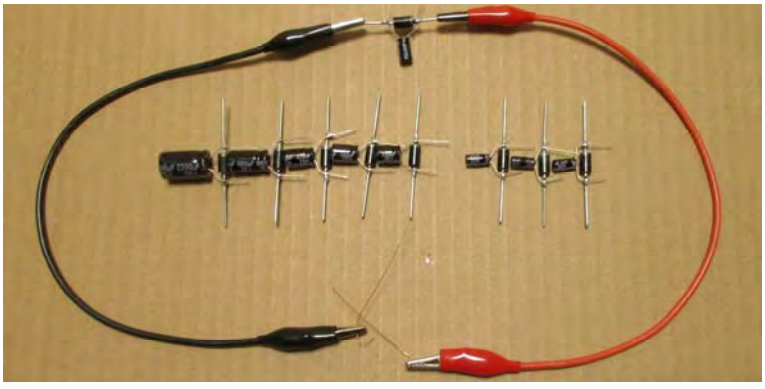


C1 is found experimentally and should be of a voltage 4-5 times the supply or 12 volts. The diode can be a current rating of less than the flow in the circuit. For it only conducts the back swing from the normal flow of current. And this is done in a small fraction of a second.

Arc Snubber

I found it useful to make a kit using the following circuit with different values of C. This can then be used at any time in the future as needed.





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The above was made for relay testing at low 12v voltages. A wide range of capacitance between 2200uf and 4.7uf was pre-soldered for easy testing. The diode used in this case was a 5 amp 1000v. I suspect this will work fine up to about 15-20 amps for it only gets a quick impulse that is not long enough to heat it. I can predict after the pole shift use of 12 volt relays will go up and a test kit like this would come in handy, especially if not needing to be made at the last minute.

This preassembled capacitor diode combination was more accurate than hooking all up with jumper leads. For example I found the minimum spark with jumper cables to be when using a 220uf capacitor, yet when soldering them, then testing, I found 100uf-diode combo to work best.

Put the test circuit across the load or the relay and if you can not see the contacts then simulate the closing by stroking or rubbing two very thin copper wires against each other in a darkened environment. I used number 28 gauge solid bare copper wire. Look for the length of the sparks and the amount of welding so then the wire jumps to a new spot. As one rubs them together one should see a uniform blue small blue spark without many breaks between them. Breaks indicate welding and snap back of the thin wire. Look to minimize the length of each spark.

For a 12 Volts pump (induction load) that uses 5.3- 6.3 amp when running that a arc suppresser made from a 5 amp diode 1000v and a 100uf 50-100v worked the best. This was Independent of paralleling the load or the switch. It was found to work best with no resistor. Polarized electrolytic seemed to work just fine. The diode is oriented to short any reverse polarity pulses that hit the electrolytic capacitor.

References

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http://www.austech.info/showthread.php/31533-How-to-overcome-relay-contact-burn-out

https://teknogenius.blogspot.com/2014/11/lr-series-circuit.html