

Mains Power Protection.

By G8MNY

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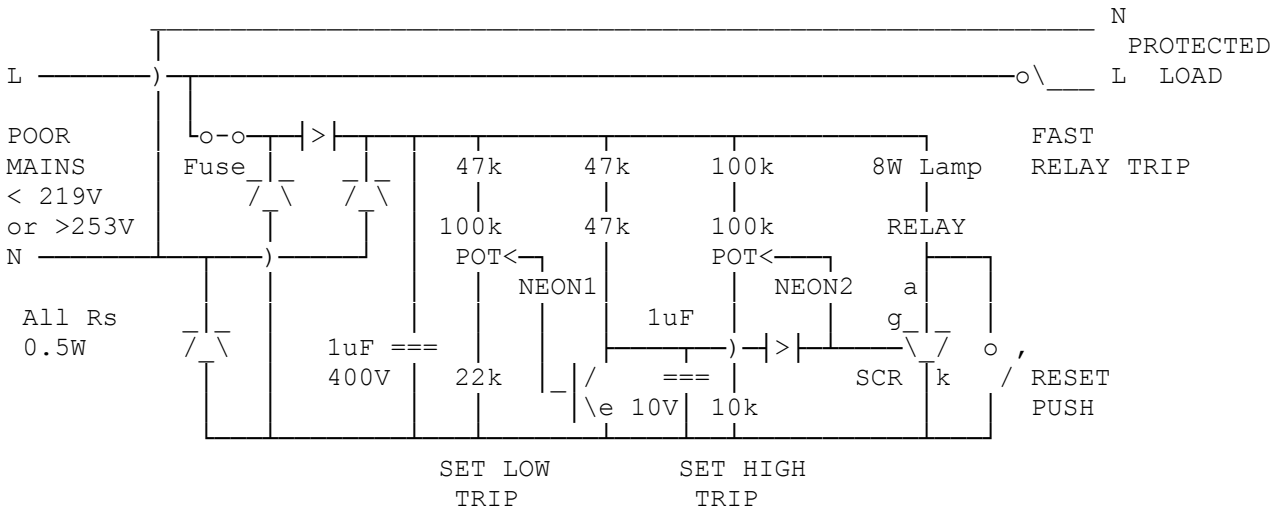
(8 Bit ASCII Graphics use code page 437 or 850)

After a topic raised by Lodewijk PA3BNX, here is my proposed design for a protector. Although spike suppressor plugs etc act fast & do protect to a certain point by blowing fuses, they don't act until the voltage is over 400V.

The problems about high mains are often due to the neutral having high resistance at the substation, so if the 3 phase street loads are balanced, there is little current so nothing gets hot. But when there is abnormal loads on the other phases you can get 300V mains quite easily! This certainly may happen if a neighbour blows a 30A fuse, and you get a large pulse on the other 2 phases. This may be enough to blow up a SMPSU etc.

Such a protector is also jolly useful on dodgy generator supplies!

Unlike mains spike protectors that attempt to snub voltages above 450v this protector works like an ELCB/RCB (e.g. an old one could be used as a starting point) & shuts power off to the load, if the voltage is too high or too low.



For 230V ±10% the RMS max is 253V which is 358V peak. So using a bridge rectifier & small capacitor, the peak voltage is determined. This can be on the mains direct with dangerous voltages as here, or using a transformer which is rated for 260V (before saturation!) to a lower voltage circuit.

The release relay here is a ZAP system, e.g. a sensitive SCR puts 350V DC into a 110V relay via a Resistor (small) lamp from the 358V DC. This gives very fast mains break times & the lamp reduces the hold current to a nominal level suitable for the relay.

OVER VOLTAGE

To trigger the SCR you just need a resistor chain with a pot across the 358V DC with a small 80V neon lamp NEON2 (or zener) from slider to the gate. The neon will tell you if the mains is still over voltage & the Lamp that the relay is operated disconnecting the load.

## UNDER VOLTAGE

For under voltage consider a voltage below  $230 - 10\% = 207V$  peak where equipment may not work properly & it is better to disconnect it (e.g. some PCs). The same idea with pot & a NEON1 to an inverting low voltage NPN transistor then via a diode to the same SCR gate as before. The trouble with this is that very low voltages will let the relay release & apply low mains to the kit. If this is a concern then a release relay system could be used but these are slower!

A push switch lets you release the triggered SCR reset, as well as a lamp test.

## 2 WIRE MAINS

Another power problem affecting hams is the use of 2 wire mains system, where no earth is used, they call the neutral the earth!! This is OK with plastic water & gas pipes, but very dangerous if you have a real earth. Houses have been burnt down due to that, as the 30/60A earth wire used for bonding to earths, can't take the whole 200A street neutral imbalance current!

Why Don't U send an interesting bul?

73 de John G8MNY @ GB7CIP