

DC Power Supply Protection W4NPN

AC Input: Use a slow-blow fuse rated to carry the load plus about 30% and round up. Thus, a 3 amp load would require $3 \times 1.30 = 3.9$ amp fuse. Use a 4 amp; 5 amp will do if no 4 amp can be found.

The fuse should be the **first device** in the AC line, not after the AC safety capacitors and not after the switch. Putting it after some circuitry such as the AC safety caps is a common design error. Should they short, the fuse won't blow and a fire or shock hazard will exist.

Consider using a Varistor or another "Slow-Start" circuit in the transformer primary lead, if solid state rectifiers are to be used – they switch on instantly, giving the transformer a real jolt, especially if they feed into a large filter capacitor bank (which looks like a short circuit at start-up).

The old style tube rectifiers don't begin to conduct until the filaments reach about 60% of their voltage so they have a built-in slow start feature.

A slow start circuit can be removed from a junked microwave oven – all the ovens with linear power supplies have them. Varistors are cheap.

Consider placing 30 to 50 ohm resistors in each leg of the secondary winding. Again, this slows the inrush to the rectifiers which translates to a jolt to the primary winding as well. This is an old-fashioned inrush technique but it works.

Immediately following the solid state rectifier(s), and before the filter capacitors, place a high voltage fuse. If this is a high voltage power supply, use one designed for use in Microwave ovens. They are cheaply available on Amazon or Ebay. Size it with enough headroom that it will blow with, say, a 50% overload. Use one that is housed in a plastic case. If it blows, you don't want glass shards flung throughout the power supply, waiting for your fingers.

NEVER use an ordinary 120/250 VAC fuse in the HV part of the power supply. These can arc over and cause real mischief.

After the HV fuse, place a "glitch resistor." This is normally about 50 ohms, of as many watts as you can find. For a 2500 volt power supply, a 50 watt resistor is optimal, but use what you have. A ten or 20 watt is probably OK. Its purpose is to soak up an instantaneous surge such as a brief flashover or arc and will protect the fuse in many cases.

Some designs use the filter capacitor equalizing resistors to discharge the caps upon shut-off, rather than installing a proper safety bleeder. Whichever way you choose, size them so that they will discharge the HV before the time it takes to open the supply's cabinet and stick your fingers in.

If you use a safety bleeder in an HV supply, don't use a single high value resistor – it might arc over. Use several resistors in series. Example: for a 10 ma bleed in a 2500 volt supply, 250,000 ohms are needed. Use 5 50K resistors in series. Four 60K would be close enough.

You DO unplug the unit and READ THE METER before opening the unit, don't you?