

## Soft-start circuit

The initial current to a filter capacitor chain is quite high since the rectifier diode(s) output sees an initial near-short-circuit until the caps are partly charged. There should be a way to limit the output current until the capacitors are at least partially charged.

There are two easy ways to limit this current: (1) Install a Varistor in the transformer's primary AC line, and (2) To use what is called a "soft start" circuit in the transformer's primary AC line.

Other ways can also be used such as putting a 50 ohm resistor of sufficient wattage in the diode output line, but for a high voltage KW transmitter supply, one of the above methods is probably preferable.

If the diodes and transformer are highly robust with respect to the normal output voltage and current, then method (1) is easiest. If these are not over- built, then (2) is probably better.

Microwave ovens contain a soft-start control relay with a current rating of 16 amperes at 250 VAC. The microwave oven circuit board containing the relay also has a small transformer, diodes, and cap that supplied a bit of power to activate the relay coil. Remove the excess circuitry including the discrete transistors controlling the relay, bypass the relay's transistor control connection and test the board.

Using a variac, I determined that the relay closed when about 60 volts was supplied to the board. That could be extended upwards by adding a resistor in series with the relay board's AC input. The little circuit board was perfect for soft start of the power supply. I used a 25 watt 25 ohm and a 15 watt 12 ohm resistor in series to limit the turn-on surge.

The relay closes to bypass these power resistors after the transformer primaries climb above 60 volts or other selected point. The soft-start worked perfectly and will extend the life of the HV transformer and diodes and may prevent blowing the circuit breaker or the supply's fuse upon turn-on.

In one HV supply that uses two 1200 watt microwave oven transformers with the primaries wired in series so that the output of the secondaries is approximately 1000 – 0 1000 volts, a simple varistor was used in the primary AC line since these transformers have robust primaries when two are wired in series.