LM317T Voltage Regulator with Pass Transistor

The LM317T output current can be increased by using an additional power transistor to share a portion of the total current. The amount of current sharing is established with a resistor placed in series with the 317 input and a resistor placed in series with the emitter of the pass transistor. In the figure below, the pass transistor will start conducting when the LM317 current reaches about 1 amp, due to the voltage drop across the 0.7 ohm resistor. Current limiting occurs at about 2 amps for the LM317 which will drop about 1.4 volts across the 0.7 ohm resistor and produce a 700 millivolt drop across the 0.3 ohm emitter resistor. Thus the total current is limited to about 2+ (.7/.3) = 4.3 amps. The input voltage will need to be about 5.5 volts greater than the output at full load and heat dissipation at full load would be about 23 watts, so a fairly large heat sink may be needed for both the regulator and pass transistor. The filter capacitor size can be approximated from C=IT/E where I is the current, T is the half cycle time (8.33 mS at 60 Hertz), and E is the fall in voltage that will occur during one half cycle. To keep the ripple voltage below 1 volt at 4.3 amps, a 36,000 uF or greater filter capacitor is needed. The power transformer should be large enough so that the peak input voltage to the regulator remains 5.5 volts above the output at full load, or 17.5 volts for a 12 volt output. This allows for a 3 volt drop across the regulator, plus a 1.5 volt drop across the series resistor (0.7 ohm), and 1 volt of ripple produced by the filter capacitor. A larger filter capacitor will reduce the

input requirements, but not much.