Stepper Motor Driver Power Supply Design

If you are considering making your own power supply then three components are needed:

- Transformer
- Bridge rectifier
- Smoothing capacitor.

The transformer's current rating a least 2/3rd 's of the stepper drive boards capability, so for example: The RoutOut CNC stepper drivers have a 2.5A limit therefore (2.5 / 3) X 2 = 1.66A

If you had for example 3 boards (X,Y,Z) then this would be 1.66 X 3 = 4.98 A Total Current.

The DC output voltage of the supply will be 1.4 times the transformer's ac voltage when rectified. For example: An 18 VAC secondary will provide about 25 VDC at the output of the smoothed supply. The bridge rectifier's voltage and current ratings must exceed what the supply will deliver.

Finally the minimum filter capacitor size must be calculated. Use the following equation to do this:

C = (80,000 X Amps) / Volts

The results will be in microfarads for the capacitor. When choosing the capacitor, any value equal or greater will be fine. Be sure to use a capacitor with a voltage rating at least 20 percent higher than the output voltage of the power supply.

Example: Using an 18v Toroidal Transformer to drive three RoutOut CNC Stepper drives at 2.5A.

18V X 1.4 = 25.2 Volts Smoothed

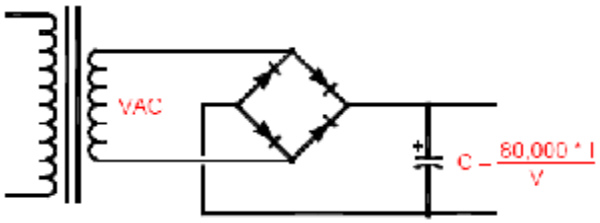
One board = (2.5 / 3) X 2 = 1.66A

1.66A X 3 boards = 4.98 Amps Total current drawn.

Capacitor needed for smoothing = (80,000 X 4.98) / 25.2 = 15,809uF

The Nearest preferred capacitor value = 22,000uF

Unregulated power supply



There are special considerations if the power supply voltage will be at or near the maximum voltage rating of the drive (30 V DC). If the motor will be rapidly decelerating a large inertial load from a high speed, care has to be taken to absorb the returned energy. The energy stored in the momentum of the load must be removed during deceleration and be safely dissipated. Because of the drive efficiency, the drive has no means of dissipating this energy so it returns it to the power supply and in effect, instead of drawing current from the power supply, the drive becomes the source of the current. This current then may charge the power supply capacitor to destructive voltage levels.

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