

Applications Note: Building a Power Supply for Your CTI Network

Overview:

This Applications Note describes the circuitry needed to convert a conventional toy train transformer into a power supply capable of powering several CTI modules.

Circuit Description:

We probably all have that shoe box full of toy transformers lying around from those starter sets we bought years ago, and it's a shame to let them collect dust. Why not haul one out of mothballs and give it a second life as a Train Brain power supply. For just a few dollars, even the cheapest toy transformer can be turned into a computer grade supply that will power multiple boards in your CTI network.

The circuit shown below is all you'll need. It will accept the AC or DC output of any train transformer and produce the steady, precisely regulated voltage your CTI boards require. The circuit provides built-in short circuit and thermal protection, so it's virtually indestructible.

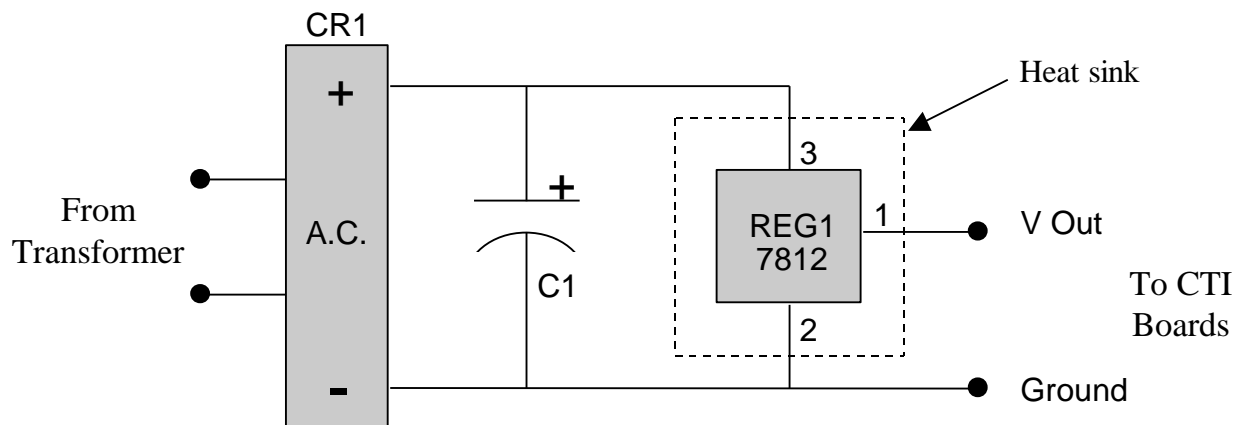


Figure 1. Circuit Schematic Diagram

Parts List:

	DigiKey	Mouser Electronics
CR1: 4 Amp Bridge Rectifier	RS401LDI	583-RS401L
C1: 2200 uF Capacitor (35V)	P5170	647-UVR1V222MHA
REG1: +12V Regulator	LM340T-12	511-I78S12CV

When wiring the circuit, be careful to check the polarity on the connections to capacitor C1 and be sure to observe the pinout on the voltage regulator.

Voltage regulator REG1 must be screw mounted to an adequate heat sink to keep it from overheating. You can use a commercial heat sink designed specifically for this purpose, or you can use any piece of metal adequately sized to keep the regulator cool. Check the temperature of the regulator during the first several minutes of normal operation. If it's uncomfortable to the touch, you probably need to change to a larger heat sink or adjust the voltage out of the transformer as described in the following section.

Adjusting the Power Supply:

The output voltage of the train transformer must be sufficiently high to allow the voltage regulator to do its job. But we don't want it to be too high, because the excess voltage will get converted to heat by the regulator. First of all, that's a waste, and secondly, excessive heating will shorten the life of the regulator.

To determine the optimum setting of your transformer's output, measure the DC voltage between the + and - terminals of the full-wave rectifier bridge, CR1. Adjust the transformer's output until this voltage is about 15 Volts (i.e. 3 Volts higher than the rated output of the voltage regulator).

How Many CTI Boards Will My Supply Handle?

That's a very tough question to answer since it depends on the types of CTI modules in your network, the number of controllers simultaneously energized, the number of signals illuminated, the voltage supplied by the train transformer, etc.

The voltage regulator is designed to provide up to about 1.5 Amps if attached to an adequate heat sink. In general, each supply should be able to handle anywhere from 5 to 8 CTI boards under typical conditions. The best advice is simply to monitor the temperature of the regulator and its output voltage. If it's outputting the specified 12 volts and isn't getting excessively warm, then everything should be fine.

Each time you add a new board to the network, recheck the output voltage and the regulator temperature. Stop when the regulator begins to feel unreasonably warm to the touch, and then back off one module or so.

Also keep an eye on your train transformer to make sure you're not exceeding its rated output as well.

When you reach the rated limits of the power supply circuit, you can simply build up another copy of the circuit and hook it to a second train transformer, splitting the CTI boards in your network between the two power supplies. You'll need to connect the Ground outputs of the two

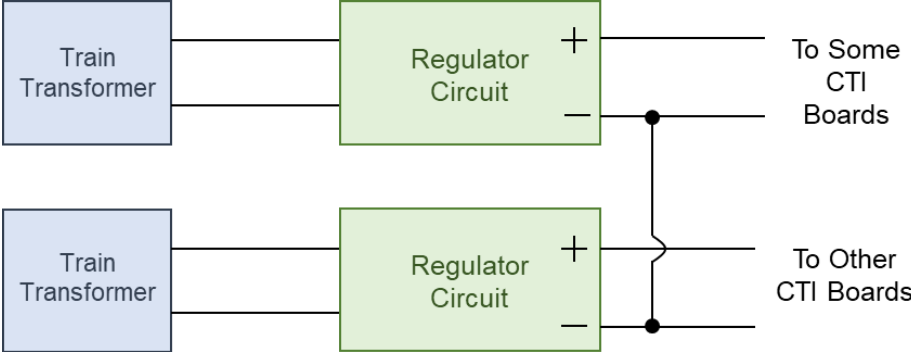


Figure 2. Combining Multiple Regulator Circuit Outputs