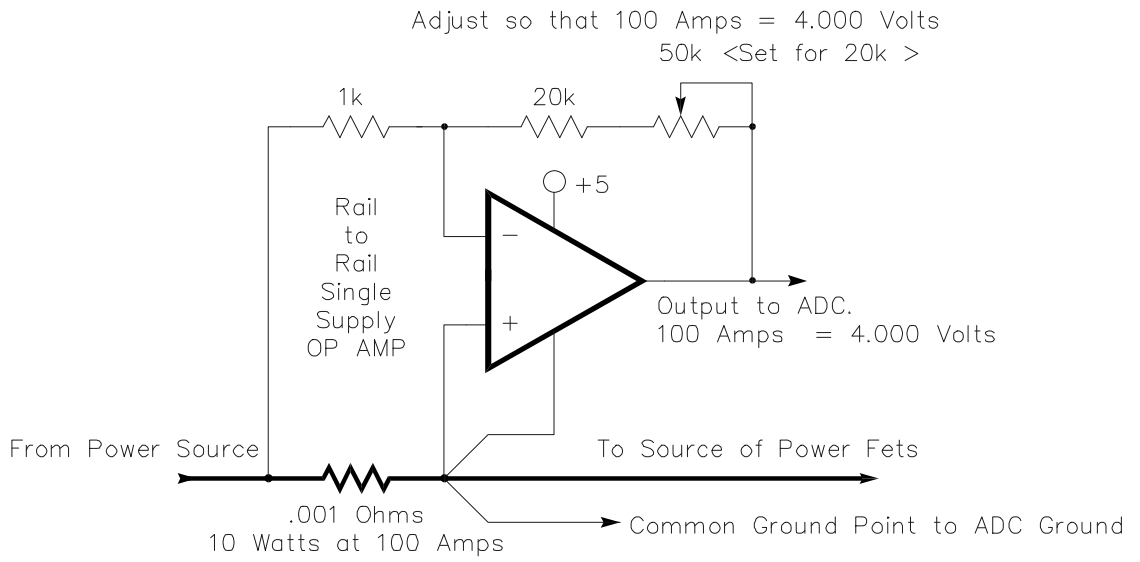
# 100 Amp to 4.000 Volt Converter




The drawing above shows the proposed 100 Amp to 4.000 Volt Converter. The power source for the OpAmp needs to be clean and free of noise. Ideally, it should be powered by the same power source that is connected to the ADC. In any case, there should be a parallel combination of a .1 ufd and a 10 ufd capacitor connected directly across the power pins of the OpAmp. Their purpose is to keep noise out of the OpAmp. The .1 ufd is for responding to high frequency noise. The 10 ufd is for responding to medium frequency noise. These capacitors are not shown in the drawing. but they must be included.

## Theory of Operation

When current flows through the .001 Ohm resistor, a voltage will be dropped across it. At 100 Amps it will drop .1 volts. The left side of the sensor resistor will be more negative than the right side of the resistor. We can make use of this fact to allow us to get by with just a single supply OpAmp. It must be a Rail-to-Rail type OpAmp.

Since we are using a single supply type OpAmp the output can only swing positive. But that is just fine, since the left side of the sensor resistor will only go negative. The circuit will adjust the output voltage such that the Inverting Input of the OpAmp is maintained at 0.000 volts.

The OpAmp is connected as a simple Inverting Amplifier. The 50k pot is initially adjusted to 20k, so that the total feedback resistance is 40k. This will give the circuit a gain of negative 40. This means that -.1000 volts across the sensor resistor will be amplified to +4.000 volts.

Notice that the OpAmp's Non-Inverting input and the OpAmp's Vminus and the ADC ground must ALL connect to a single POINT which becomes the Common Ground. This is very important! Failure to observe this single-point Common Ground will result in errors that will degrade the resolution of the circuit.

If the 10 Watt power dissipation of the .001 Ohm sensor is more power dissipation than you want, then try using a .0001 Ohm sensor resistor. Leave the 1k resistor unchanged, but use a 200k resistor in place of the 20k resistor, and use a 500k pot instead of a 50k pot. This will reduce the power dissipation of the sensor resistor to 1 Watt, but the circuit may be a little bit more susceptible to noise.

The suggested resistor and pot values allow 100 Amps to be scaled to an output from 2.000 volts to 7.000 volts. The pot is usually adjusted for 4.000 volts at 100 Amps.

Calibration can be done with a 10 Amp meter. A voltmeter connected between the precision Common Ground and the output of the OpAmp should read .400 volts at 10 Amps. Make sure that the meter is connected to the precision Common Ground or you will introduce errors into the reading.

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