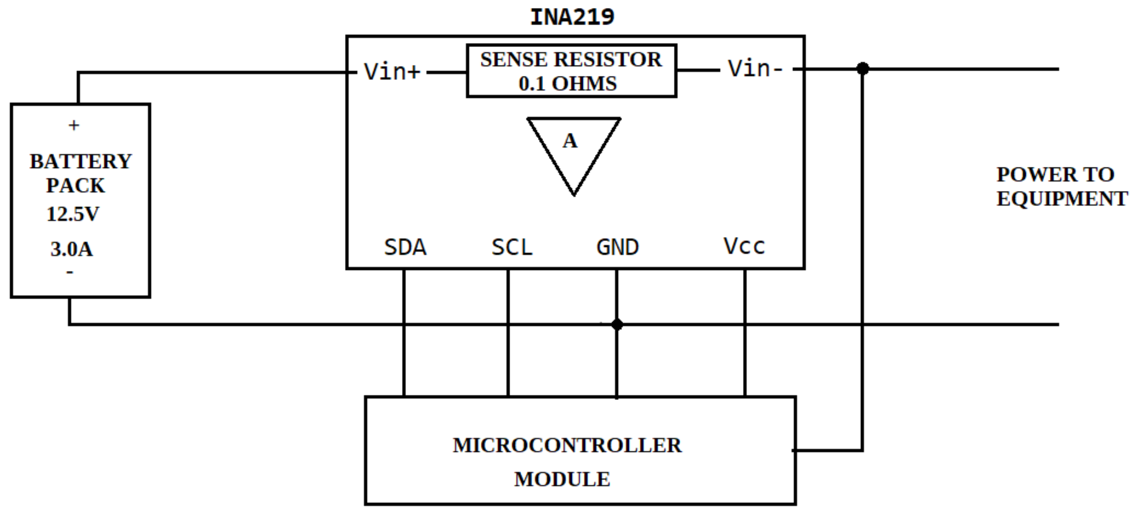
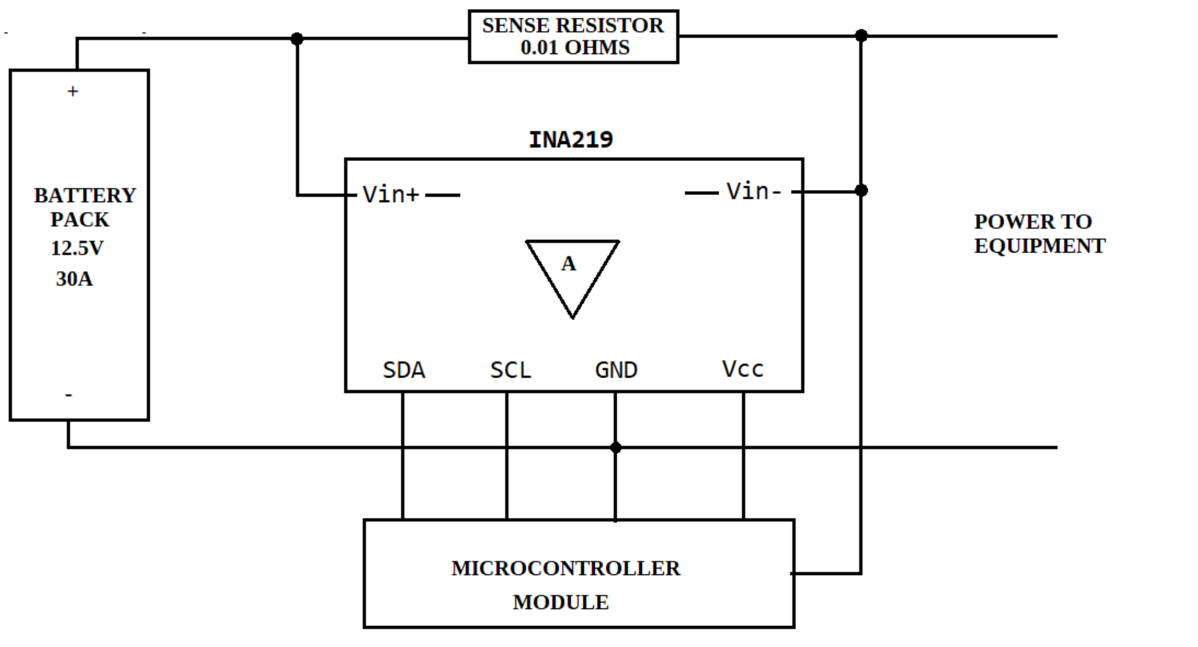
A common (Ground) connection is needed between the battery pack negative, the INA219 ground, and the controller ground. The INA219 also needs a 3.3V or 5.0V (Vcc) logic power supply. That can be an external supply or power from the microcontroller module. The SDA and SCL are used to communicate with the INA219, and can connect to several INA's as long as each one has a unique address. If multiple INA's connected to multiple battery packs are controlled by a single microcontroller they must have a common connection between all the grounds and negative battery pack connections.



CIRCUIT A - LOW CURRENT

Circuit A is suitable for monitoring voltage, current, and power for currents up to 3.2 amps.
The battery + connects to the Vin+ connection of the current sense resistor on the board, and the current out to the load connects to the V- connection. The voltage across the current sense resistor is proportional to the current flowing through it. For the 0.1 ohm resistor on the board that voltage (E = I x R) would be 1A x 0.1ohms = 0.1V per amp. The ADC on the INA219 chip measures that voltage to determine the load current.



CIRCUIT B - HIGH CURRENT

Circuit B is suitable for monitoring voltage, current, and power for currents up to 32 amps.
The battery + connects directly to the current sense resistor on the board, and the current out to the load connects directly to the other side of the resistor. A pair of small gage wire sends the voltage across the current sense resistor to the INA219 Vin+ and Vin- connections. As with the previous circuit the voltage is proportional to the current flowing through the sense resistor. For the 0.01 ohm resistor that voltage (E = I x R) would be 1A x 0.01ohms = 0.01V per amp. The software on the microcontroller would have to take that into account for calculating the current and power.