

Wiring a big electric motor using a solenoid (4WD and 6WD Wheelchair ATRs and Snowplows)

To power an electric motor, determine the power consumption at maximum rate. Then you can choose the correct wiring size. You can choose a wire size from the wire gauge table.

You also have to choose overcurrent protection. An auto reset circuit breaker (perfect for our sealed lead acid battery based robot platforms) removes the need for disposable barrel fuses, and also serves as a convenient mounting point for 24V or 12V systems.

You will need a solenoid switch that will take the same amps or higher than your load. Solenoids are a current-carrying coil of wire wrapped around an iron core. When energized, they create a magnetic field which produces high current and force. This makes solenoids very advantageous, because it allows for a low input while generating a larger output as in the case of a starter solenoid. This solenoid switch needs to be powered by a toggle switch. The toggle switch is the one in charge to turn on the solenoid switch.

The other component you will need is a motor driver. A motor driver is a little current amplifier; the function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor.

Example: Powering a big electric motor

Suppose you are using our wheelchair motors. They are 24V motors that will pull a maximum of about 70A (stall current). We'll start by choosing the wire size. From our wire gauge table, we know 12 AWG can only take 41A. If we double up the 12 AWG wire (use two wires per run), however, it can take 82A. Another option is to use 8 AWG gauge which can take 73A. You can use whatever combination of wire as long it will take more than 70A. We recommend oversizing the wire so know it won't burn up. So we are going to go with two 12 AWG wires. Because of the cable combination, we need overcurrent protection that trips between 70A and 82A. If we choose overcurrent protection higher than the cable can hold, the wires will burn, and the protection will never actuate. If we go lower, the motors may cut out prematurely. So we'll use two auto reset circuit breakers – 24V, 40A.

The toggle switch can be wired with a smaller wire, like 18AWG, with a 10A breaker. For the main switch we'll use a SPST 24V 100A solenoid switch. This switch holds 100A, which is more than enough, because it will support the 70A stall current of the motors.

Now, the only thing we need is a motor driver that can hold 24V-70A. The Sabertooth Dual 60A motor driver holds two 60A motors totaling 120A. The schematic below shows how everything is connected.

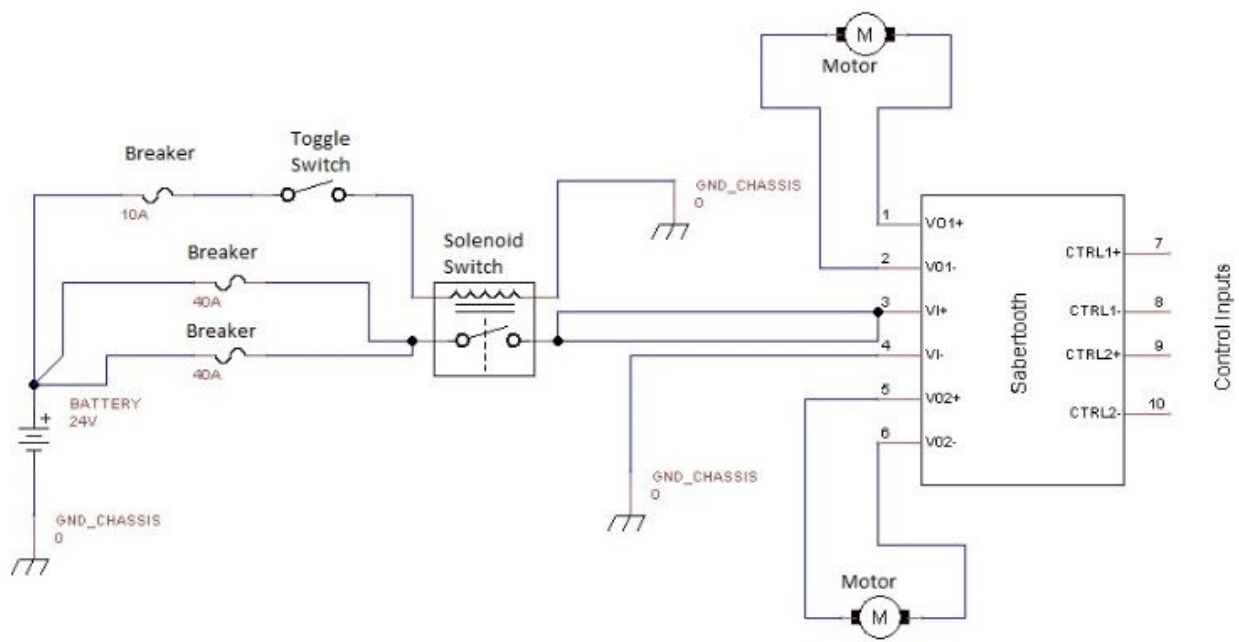


Figure 1: Solenoid Switch Wiring