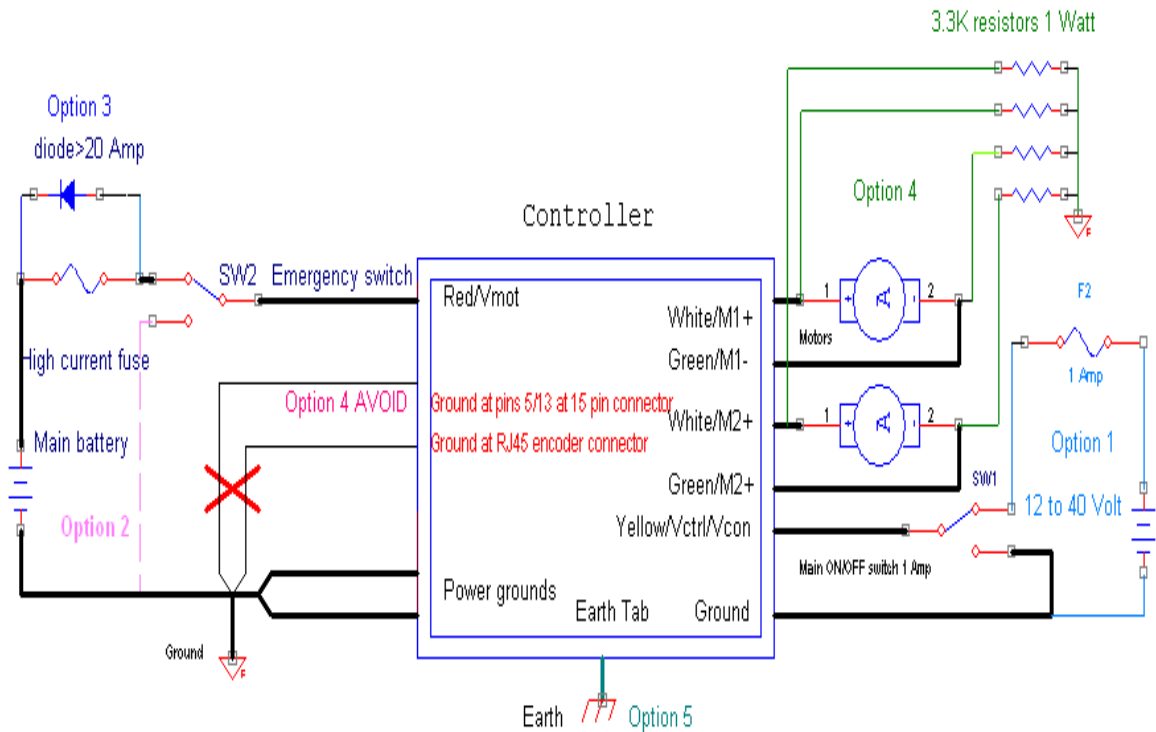


READ FIRST

Roboteq controllers operate in an environment where high currents may circulate in unexpected manners under certain condition. Please follow these instructions. Roboteq reserves the right to void product warranty if analysis determines that damage is due to improper controller power connection. See the Users manual for more details.



Mandatory Connections

It is imperative that the controller is connected as show in the above diagram in order to ensure a safe and trouble-free operation. All connections shown as thick black lines line are mandatory. The controller must be powered On/Off using switch SW1 on the Yellow wire / Power Control terminal. Grounding this line powers off the controller. Floating or pulling this line to a voltage will power on the controller. Use a suitable fuse as a safety measure to prevent fire or run-away vehicles in case of malfunction.

The battery must be connected in permanence to the controller's Red wires / Vmot Terminals via a high-power emergency switch SW2 as additional safety measure.

- **WARNING:** Partially discharged batteries may not blow the fuse, while still having enough power left to cause a fire.
- Leave the switch SW2 closed at all times and open only in case of an emergency. Use the main On/Off switch SW1 for normal operation. This will prolong the life of SW2, which is subject to arcing when opening under high current with consequent danger of contact welding. If installing in an electric vehicle equipped with a Key Switch where SW2 is a contactor, and the key switch energizes the SW2 coil, then implement SW1 as a relay. Connect the Key Switch to both coils of SW1 and SW2 so cutting off the power to the vehicle by the key switch and SW2 will set the main switch SW1 in the OFF position as well.
- SW2: Digikey P/N: 360-2095-ND or 360-2096-ND (wire in parallel for higher current).
- Fuse: Littlefuse MAXI 999 or ATO 257. Digikey P/N 09990AAZXN-ND or F1220-ND
- SW1: any common switch SPDT rated 1 Amp or more.

Connection for Safe Operation with Discharged Batteries (option 1)

The controller will stop functioning when the main battery voltage drops below 10.5V. To ensure motor operation with weak or discharged batteries, connect an auxiliary battery to the Power Control wire/terminal via the SW1 switch. This battery will power only the controller's logic (max 200 milliAmp), not the motor. It can be any voltage from 12 Volt up to controller max voltage rating, size as small as 5 Ampere x hour.



Protection against Damage due to Regeneration (option 2 and 3)

Voltage generated by motors rotating while not powered by the controller can cause serious damage even if the controller is Off or disconnected. This protection is highly recommended in any application where high motion inertia exists or when motors can be made to rotate by towing or pushing (vehicle parking).

- Use the main SW1 switch on the Power Control wire/terminal to turn Off and keep Off the controller.
- Insert a diode (Digikey P/N 10A01CT-ND) to ensure a return path to the battery in case the fuse is blown. Smaller diodes are acceptable as long as their single pulse current rating is > 20 Amp
- Use a Single Pole, Dual Throw switch for SW2 to ground the controller power input when OFF.

If a DT switch cannot be used, then consider extending the diode across the fuse and the switch SW2

Ground loops if connecting accessories (RS232, encoders...)(option 4 AVOID)

The ground power connection must never be broken or high motor current may flow through the signal ground, causing harm to the signal ground wires. Do not use connectors on power ground. Wire in parallel two grounds at the controller to avoid occasional ground disconnect at the controller. Do not connect externally the signal ground to power ground. Wiring as shown in option 4 creates a spurious ground loop and must be avoided. Signal ground refers to ground pins in the 15 pin connector and the RJ45 connector.

Avoiding instabilities (option 4)

Sudden current demand from the motor(s) may cause an instantaneous voltage drop at the battery internal impedance and wiring, reducing the voltage at the controller; in certain condition, this can cause potentially damaging low frequency oscillations. For safer operation, connect four 3.3 k-Ohm 1W resistors between each M terminal (M1+, M1-, M2+, M2-) and ground. Resistors are factory installed on all recent models (AX2550/AX3500). Check first resistance between output and ground before installing.

Connect Case to Earth if connecting AC equipment (option 5)

If building a robot, which uses rechargeable batteries, it must be assumed that periodically a user will connect an AC battery charger the robot. Being connected to the AC main, the charger may accidentally bring AC high voltage to the robot chassis and to the controller's enclosure. Encased Roboteq controllers are supplied with an Earth tab, which permits earthing the metal case. Connect this tab to a wire connected to the Earth while the charger is plugged in the AC main, or if the controller is powered by an AC power supply or is being repaired using any other AC equipment (PC, Voltmeter etc.)

Max current rating of the controller

The controller max current is rated for the current flowing through the motor, which can be higher than the battery current. Read the section "battery versus motor current" in the user manual. Connect only motors with maximum operating Amps lower or equal to the maximum Amps rating of the controller. Motor max operating Amps = motor current at max speed/load combination. Setting the current limit lower than the max current of the motor will not allow connecting motors rated higher than the controller current rating.

Connecting to the controller internal +5 Volt supply

The maximum load that can be connected to internal +5Volt supply is 300 milliamp, sufficient for joysticks, potentiometers, most digital encoders etc. Make sure not to exceed the limit. Do not connect servomotors power wires or other loads requiring substantial more power. Damage to the controller may occur.

Using a radio controller

Before connecting a radio receiver, check if it has an internal battery. If it does, consult the manual on how to avoid damage to the controller by modifying the supplied RC cable.