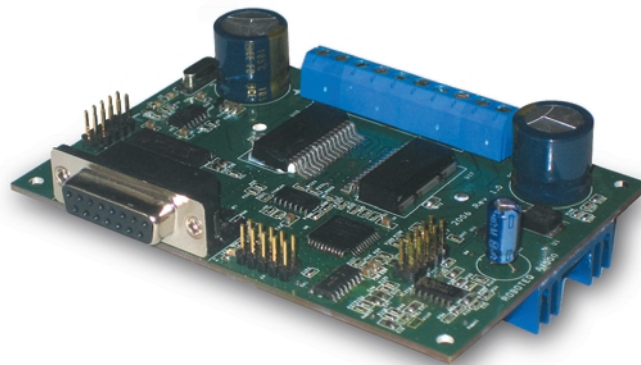


AX500

Dual Channel Digital Motor Controller

Quick Start Manual



v1.9b, June 1, 2007

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Important Safety Warnings

Read this Section First

The AX500 is a power electronics device. Serious damage, including fire, may occur to the unit, motors, wiring and batteries as a result of its misuse. Please review the User's Manual for added precautions prior to applying full battery or full load power.

This product is intended for use with rechargeable batteries

Unless special precautions are taken, damage to the controller and/or power supply may occur if operated with a power supply alone. See "Power Regeneration Considerations" on page 31 of the Users Manual. **Always keep the controller connected to the Battery.**

Avoid Shorts when Mounting Board against Chassis

Use precautions to avoid short circuits when mounting the board against a metallic chassis with the heat sink on or removed. See "Attaching the Controller Directly to a Chassis" on page 151.

Do not Connect to a RC Radio with a Battery Attached

Without proper protection, a battery attached to an RC Radio may inject its voltage directly inside the controller's sensitive electronics. See

Beware of Motor Runaway in Improperly Closed Loop

Wiring or polarity errors between the feedback device and motor in position or closed loop position mode may cause the controller to runaway with no possibility to stop it until power is turned off.

AX500

Quick Start

This section will give you the basic information needed to quickly install, setup and run your AX500 controller in a minimal configuration.

What you will need

For a minimal installation, gather the following components:

- One AX500 Controller and its provided cables
- 12V to 24V battery
- One or two brushed DC motors
- One R/C to DB15 connector (provided)
- Miscellaneous wires, connectors, fuses and switch

Locating the Connectors

Take a moment to familiarize yourself with the controller's connectors.

The front side contains the 15-pin connector to the R/C radio, joystick or microcomputer, as well as connections to optional switches and sensors.

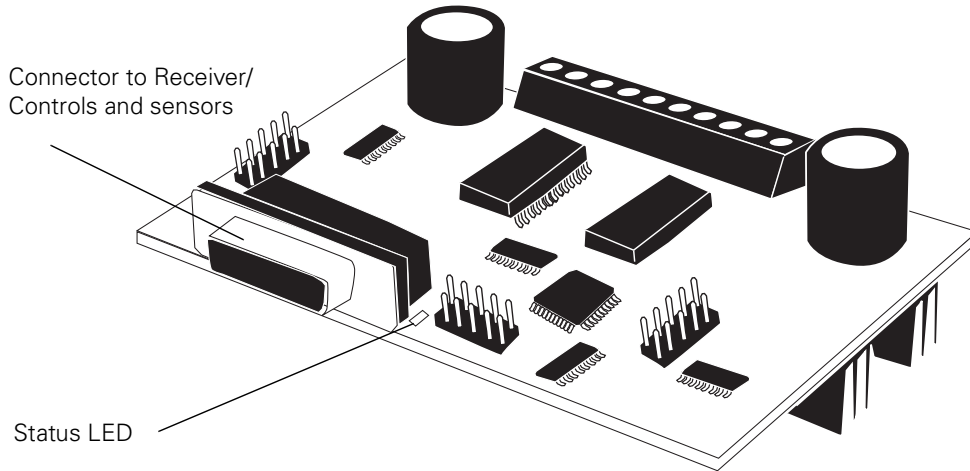


FIGURE 1. AX500 Controller Front View

At the back of the controller (shown in the figure below) are located all the that must be connected to the batteries and the motors.

Note:

Both VMot terminals are connected to each other in the board and must be wired to the same voltage.

Power Must be connected to VCon and VMot for the controller to operate

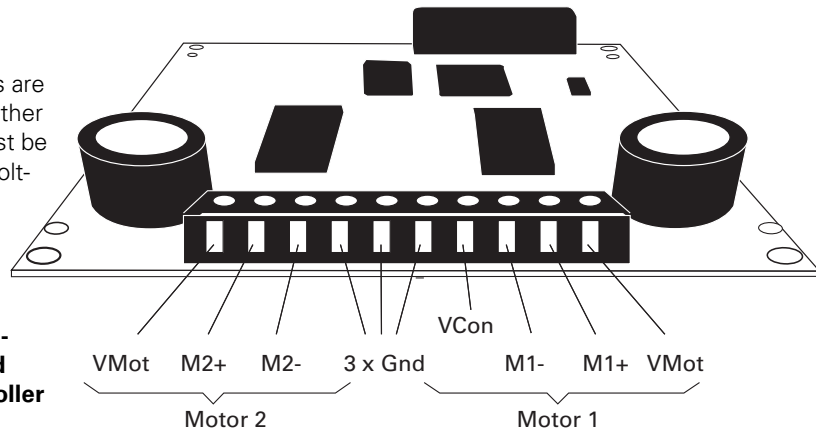
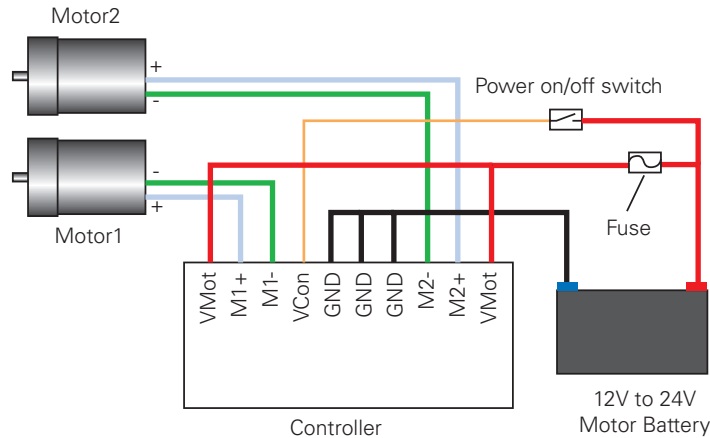


FIGURE 2. AX500 Controller Rear View

Connecting to the Batteries and Motors

Connection to the batteries and motors is shown in the figure below and is done by connecting wires to the controller's terminal strip.



Notes:

- The Battery Power connection are doubled in order to provide the maximum current to the controller. If only one motor is used, only one set of motor power cables needs to be connected.
- Typically, 1 or 2 x 12V batteries are connected in series to reach 12 or 24V respectively.

FIGURE 3. AX500 Electrical Power Wiring Diagram

1- Connect each motor to one of the two M+ and M- terminal pairs. Make sure to respect the polarity, otherwise the motor(s) may spin in the opposite direction than expected

two of the three Ground terminals
 2- Connect the VCon terminal (powering the controller's internal circuits) through a power switch to the main battery. Connect the VMot terminals (powering the output drivers) directly and permanently to the positive battery terminal. VCon may be connected to a separate battery to ensure that the controller stays alive even as the battery powering the Motors discharges. **Motors will turn only if voltage is present on both VCon and VMot.** Refer to the chapter "Connecting Power and Motors to the Controller" on page 25 for more information about batteries and other connection options.

The two are connected to each other inside the controller. The same is true for the. You should wire each pair together as shown in the diagram above.

Important Warning

Do not rely on cutting power to the controller for it to turn off if the Power Control is left floating. If motors are spinning because the robot is pushed or because of inertia, they will act as generators and will turn the controller, possibly in an unsafe state. Always use the switch on the VCon terminal to power the controller On or Off.

Important Warning

The controller includes large capacitors. When connecting the Motor Power Cables, a spark will be generated at the connection point. This is a normal occurrence and should be expected.

Connecting to the 15-pin Connector

The controller's I/O are located on its standard 15-pin D-Sub Connector. The functions of some pins varies depending on controller model and operating mode. Pin assignment is found in the table below.

Pin	Signal		
	RC Mode	RS232 Mode	Analog Mode
1	100mA Digital Output C (same as pin 9)		
2	TxData		
3	RC Ch1	RxData	Unused
4	RC Ch 2	Digital Input F	
5	Ground Out		
6	Unused		
7	Unused		
8	Digital Input E and Analog Input 4		
9	100mA Digital Output C (same as pin 1)		
10	Analog Input 2		
11	Analog Input 1		
12	Analog Input 3		
13	Ground Out		
14	+5V Out (100mA max.)		
15	Emergency Stop or Invert Switch input		

Connecting the R/C Radio

Connect the R/C adapter cables to the controller on one side and to two or three channels on the R/C receiver on the other side. If present, the third channel is for activating the accessory outputs and is optional.

When operating the controller in "Separate" mode, the wire labelled Ch1 controls Motor1, and the wire labelled Ch2 controls Motor2.

When operating the controller in "Mixed" mode, Ch1 is used to set the robot's speed and direction, while Ch2 is used for steering.

See "R/C Operation" on page 81 of the User's Manual for a more complete discussion on R/C commands, calibration and other options.

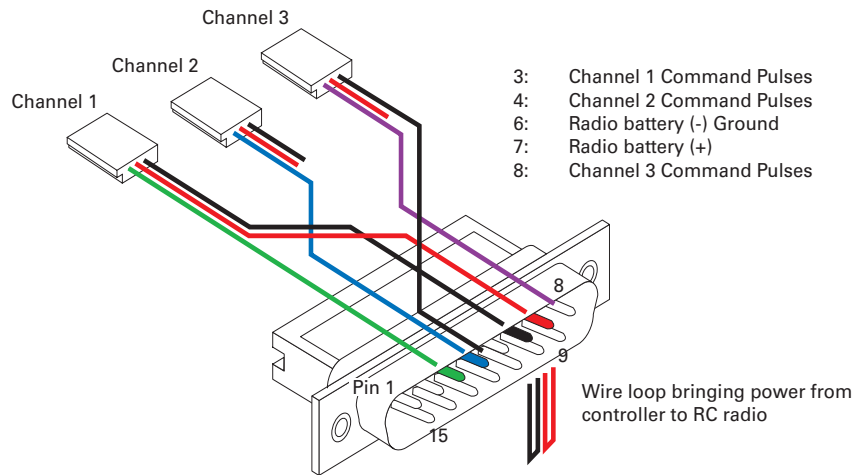


FIGURE 4. R/C connector wiring for 3 channels and battery elimination (BEC)

This wiring - with the wire loop uncut - assumes that the R/C radio will be powered by the AX500 controller. Other wiring options are described in "R/C Operation" on page 81 of the User's Manual.

Important Warning

Do not connect a battery to the radio when the wire loop is uncut. The RC battery voltage will flow directly into the controller and cause permanent damage if its voltage is higher than 5.5V.

Connecting the optional channel 3 will enable you to turn on and off the accessory output. See "Connecting Sensors and Actuators to Input/Outputs" on page 47 and "Data Logging in R/C Mode" on page 91 of the User's Manual.

Powering On the Controller

Important reminder: There is no On-Off switch on the controller. You must insert a switch on the controller's power terminal as described in section "Connecting to the Batteries and Motors" on page 15.

To power the controller, center the joystick and trims on the R/C transmitter. In Analog mode, center the command potentiometer or joystick. Then turn on the switch that you have placed on the on the VCon wire.

The status LED will start flashing a pattern to indicate the mode in which the controller is in:

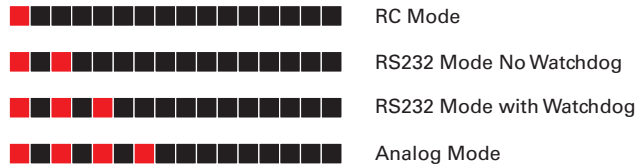


FIGURE 5. Status LED Flashing pattern during normal operation

Default Controller Configuration

Version 1.9b of the AX500 software is configured with the factory defaults shown in the table below. Although Roboteq strives to keep the same parameters and values from one version to the next, changes may occur from one revision to the next. Make sure that you have the matching manual and software versions. These may be retrieved from the Roboteq web site.

TABLE 1. AX500 Default Settings

Parameter	Default Values	Letter
Input Command mode:	(0) = R/C Radio mode	I
Motor Control mode	(0) = Separate A, B, speed control, open loop	C
Amp limit	(5) = 13.125A	A
Acceleration	(2) = medium-slow	S
Input switch function	(3) = no action	U
Joystick Deadband	(2) = 16%	d
Exponentiation on channel 1	(0) = Linear (no exponentiation)	E
Exponentiation on channel 2	(0) = Linear (no exponentiation)	F
Left / Right Adjust	(7) = no adjustment	L

Any one of the parameters listed in Table 1, and others not listed, can easily be changed either using the PC with the Roboteq Configuration Utility. See "Using the Roborun Configuration Utility" on page 131.

Connecting the controller to your PC using Roborun

Connecting the controller to your PC is not necessary for basic R/C operation. However, it is a very simple procedure that is useful for the following purposes:

- to Read and Set the programmable parameters with a user-friendly graphical interface
- to obtain the controller's software revision and date
- to send precise commands to the motors
- to read and plot real-time current consumption value
- Save captured parameters onto disk for later analysis

- to update the controller's software

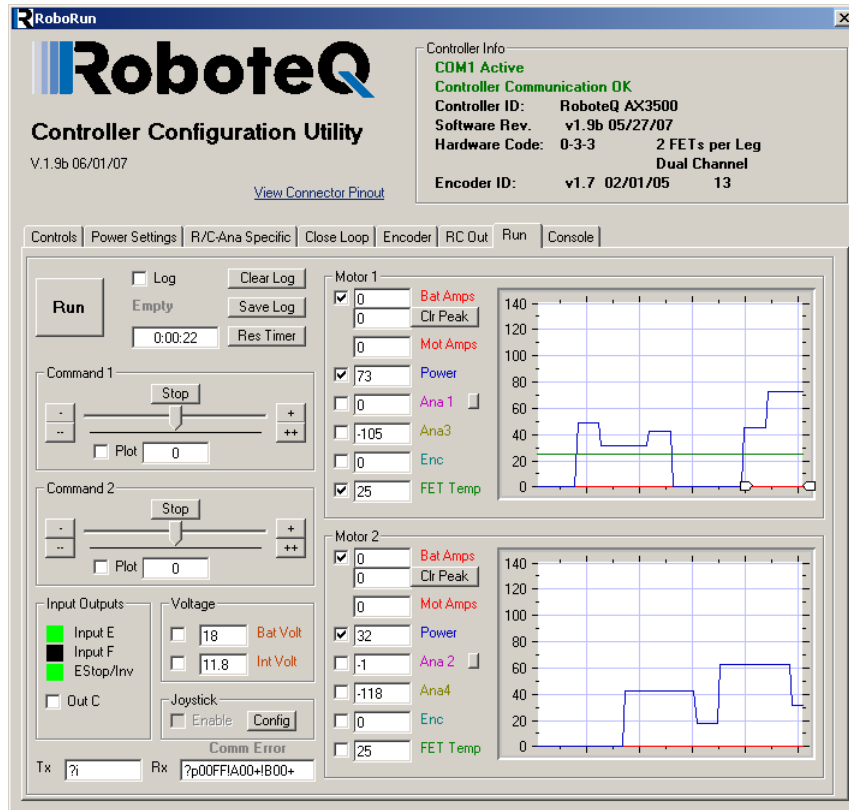


FIGURE 6. Roborun Utility screen layout

To connect the controller to your PC, use the provided cable. Connect the 15-pin connector to the controller. Connect the 9-pin connector to your PC's available port (typically COM1) - use a USB to serial adapter if needed. Apply power to the controller to turn it on.

Load your CD or download the latest revision of Roborun software from www.Roboteq.com, install it on your PC and launch the program. The software will automatically establish communication with the controller, retrieve the software revision number and present a series of buttons and tabs to enable its various possibilities.

The intuitive Graphical User Interface will let you view and change any of the controller's parameters. The "Run" tab will present a number of buttons, dials and charts that are used for operating and monitoring the motors.

Obtaining the Controller's Software Revision Number

One of the unique features of the AX500 is the ability to easily update the controller's operating software with new revisions downloaded from Roboteq's web site at www.roboteq.com. This is useful for adding features and/or improving existing ones.

Each software version is identified with a unique number. Obtaining this number can be done using the PC connection discussed previously.

Now that you know your controller's software version number, you will be able to see if a new version is available for download and installation from Roboteq's web site and which features have been added or improved.

Installing new software is a simple and secure procedure, fully described in "Updating the Controller's Software" on page 146 of the User's Manual.

Exploring further

By following this quick-start section, you should have managed to get your controller to operate in its basic modes within minutes of unpacking.

Each of the features mentioned thus far has numerous options which are discussed further in the complete User's Manual, including:

- Self test mode
- Emergency stop condition
- Using Inputs/Outputs
- Current limiting
- Closed Loop Operation
- Software updating
- and much more