

## A quick guide to the EZQUAD Servo®

This guide applies using USB or the RS232-to-RS485 Converter.

### For these products

- EZQUAD Servo

#### Encoder Note

An encoder of 400-1000 lines/channel, giving 1600-4000 quadrature encoder counts per revolution, is recommended. (Other line counts could require changing PID coefficients.)

### You will need:

- ▶ Your EZQUAD Servo® Controller/Driver, servo motor, and encoder. A motor 2" or 3" or smaller rated at about 1/2 of supply voltage is best. Also see Encoder Note.
- ▶ Serial Converter: USB cable supplied, or USB to RS485 converter, or RS232 to RS 485 converter.
- ▶ PC with port to match Serial Converter being used (USB or RS232).
- ▶ Power supply, 7 to 40V. For first-time EZQUAD Servo users we recommend a current-limited power supply set to 12V, 1A to protect against miswiring.
- ▶ Crimp tool (recommended): Digikey part A9982-ND or (better) Digikey A2031-ND + A1998-ND. Otherwise, soldering equipment.
- ▶ Small Phillips screwdriver for operating address switch
- ▶ If troubleshooting is required: ohmmeter, oscilloscope

### Precautions

- ▶ Observe all electrostatic discharge precautions to avoid damaging circuit boards.
- ▶ Use 4-40 round standoffs to bolt EZQUAD Servo, NOT hex (Hex standoffs will touch components).
- ▶ DO NOT disconnect motor wires while power is on, to avoid damage to circuit board.
- ▶ DO NOT place EZServo board or RS232 Converter on metal surface when powered (to prevent shorts).
- ▶ Avoid bundling encoder or IO wires with motor power wires, as this may cause noise pickup from motor wires. If bundling is necessary, put motor wires in a separate shielded twisted-pair cable.
  - For 10' or longer, shield each IO line individually.
  - If using ribbon cable, add grounds between signal wires and motor wires.

### Starting up

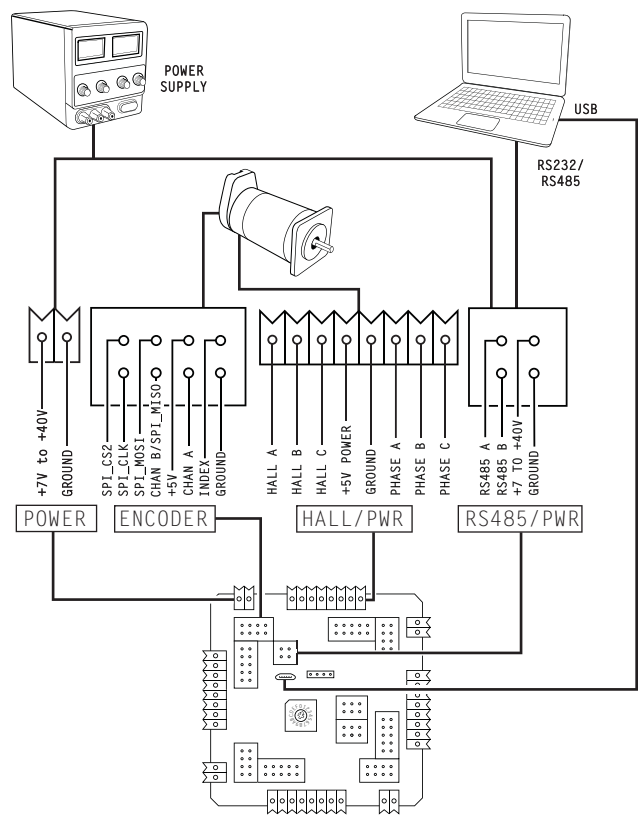
Start with power supply OFF.

NOTE: If using USB, disregard instructions for RS232 Converter.

1. Get the Starter Kit - it's free to first time buyers.
2. Download and install the EZCommander™ application from [www.allmotion.com/support](http://www.allmotion.com/support).
3. Download and install appropriate USB driver from [www.allmotion.com/support](http://www.allmotion.com/support).
4. Ensure power is OFF. Connect power supply to EZQUAD and RS232 Converter.
5. Connect EZQUAD Servo to RS232 Converter.
  - ▶ Turn power ON. Confirm that green Life LED slowly blinks. *If not, look for bad power connection.*
6. Set address switch firmly to number 1 with Phillips screwdriver.
7. Cycle power OFF/ON if address switch was moved in preceding step.
8. *With USB cable from Converter to PC unplugged:* Start the EZCommander application (see other side of sheet for instructions if needed). Click Settings, then Re-scan Ports. Note available ports, then click OK.
9. Connect PC USB port to EZQUAD USB port.
10. In EZCommander, click Settings, then Re-Scan Ports. Select the new port that becomes available, and click OK. (For RS232 converter, the new port will be com1.) *If no new port appears, a problem with the USB driver is indicated. Re-install the driver for your system.*
11. In EZCommander, click Send String 0 to issue the command /1&. Confirm return message showing product name and firmware version. *If return message says "No EZStepper (or EZServo) Found", troubleshoot communications (page 3) before connecting motor.*
12. Turn power OFF.

Procedure continued next page.

### BLDC Motor Connection Detail

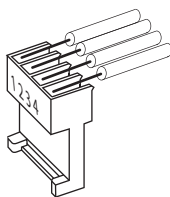


## Starting up

(continued)

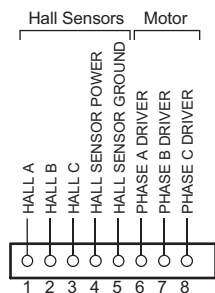
## Wiring Note

Always wire to the mating connectors supplied on circuit board. Use crimp tool if you have it, or else solder. (DO NOT solder to circuit board; damage is likely. Also, DO NOT press in with a screwdriver, because this makes unreliable connections.)



13. With power OFF, connect EZQUAD Servo to motor.

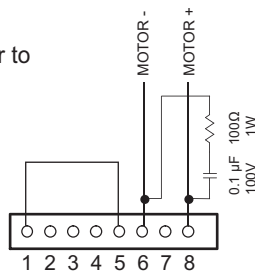
- ▶ BLDC motors: Connect servo motor and Hall sensors to the eight pins of the motor connector as shown in diagram: (See Wiring Note on preceding page and Hall sensor phasing instructions on this page.)

**CAUTION!**

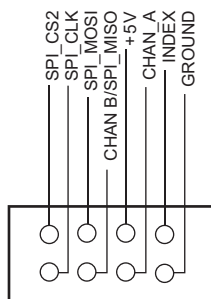
Always turn off power before connecting or disconnecting motor to avoid damaging circuit board.

NOTE: If you send your motor to us, we will be happy to work out the correct Hall sensor phasing for you.

- ▶ Brush motors: Connect brush servo motor to the eight pins of the motor connector as shown in diagram: (See Wiring Note on preceding page.)



14. With power OFF, connect encoder to 8-pin connector as shown in diagram:  
(Also see Wiring Note on preceding page.)



15. Turn power ON.

16. In EZ Commander, click Send String 2 to issue the command /1A1000A0R. Confirm that motor goes back and forth.
- ▶ If motor spins without stopping, reverse the CHA and CHB connections.

**You're on your way!** For other commands and hookups, see the full command set and wiring diagram on our website.

**Hall Sensor Phasing (BLDC motors)**

This is a trial-and-error method for finding the correct hookup for your Hall sensor. (The correct hookup for many Hall sensors can be found in the EZSV17 or EZSV23 wiring diagram on our Web site.)

NOTE: For Hall sensor phasing by trial and error, you MUST use a current-limited lab supply set to the lesser value of 1/2A or 1/4 of the maximum current rating of the motor.

1. With power OFF and the encoder disconnected, wire Hall sensors to pins 1, 2, and 3 in any order.
2. Do the following as you try each of the 6 possible wiring combinations (123,132, 213, 231, 312, 321): ALWAYS DISCONNECT POWER BEFORE CHANGING WIRES

- ▶ Issue command /1h5R. The motor should spin smoothly in one direction.
- ▶ While the motor spins, hold its shaft lightly and observe any "dead spots" that you feel. DO THIS ONLY IF YOU CAN DO IT SAFELY!
- ▶ Four combinations will produce dead spots or positions at which the rotor locks.
- ▶ One combination will produce dead spots or positions at which the rotor locks that are less obvious.
- ▶ One combination will produce very smooth motion with no dead spots or rotor locking points. This is the correct wiring combination for your Hall sensors.

NOTE: Don't switch power wires to the motor; only switch Hall sensor wires.

**Motor Tuning (BLDC motors)**

If motor behavior is oscillatory:

- ▶ Increase the value of the differential gain constant, for example /1y3000R.
- ▶ If oscillatory behavior continues, motor is noisy, and encoder ticks can be heard, reduce both the proportional and the differential constants until satisfactory performance is obtained. For example, /1w250y500R works well, especially with high (4000) line-count encoders.  
(The larger the line count, the smaller the w, x, and y values.)

**Troubleshooting:** See page 3. →

**Using EZCommander™**

Start with USB cable unplugged.

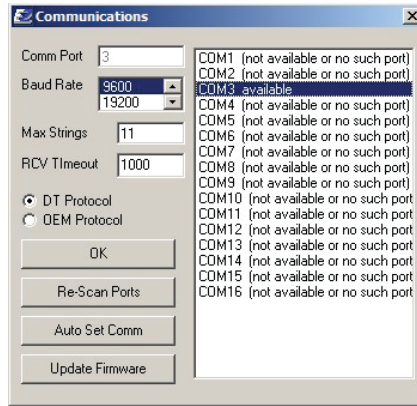
NOTE: If using USB, disregard instructions for RS232 Converter.

**1** Open EZCommander.



**2** Click the **Settings** button to open the Communications window.

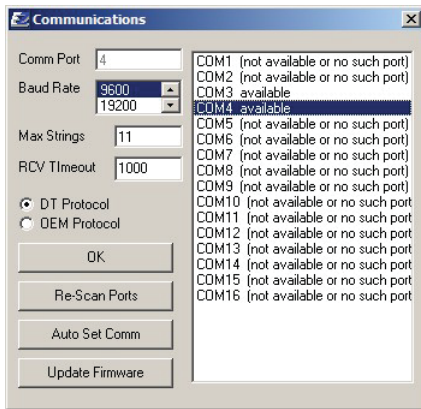
- Click Re-Scan Ports; note available ports; then click OK to close.



NOTE: USB cable is disconnected for this step.

**3** Plug USB cable into the PC.

- Click Settings button, then Re-scan Ports. A new comm port will become available (will be com1 if using RS232 Converter).
- Select the newly available comm port and click OK to close the Communications Window.



**4** Issue commands :

- Enter string in a left-hand field.
- Press adjacent **Send String** button to issue command.
- See return message in field to right.



**Troubleshooting**

**If motor does not respond to commands:**

NOTE: If using USB, disregard instructions for RS232 Converter.

- ▶ Make sure address switch is detented exactly on position number 1. (After resetting, power must be cycled to establish new address.)
- ▶ Brush motors: confirm that jumper is installed between pins 1 and 5 on motor connector.
- ▶ Re-check that correct comm port is selected.
- ▶ Confirm good ground between PC and negative terminal of power supply. First measure resistance with power off; then check for voltage drop with power on. Repair poor ground connections.
- ▶ Issue command /1& and verify that a response identifying the product and firmware version is received. If ok, motor connection may be miswired or loose. If not ok, re-install USB driver. Continue to next item if not resolved.
- ▶ Check continuity of communication data to AllMotion circuit board at point 1 in diagram below. If not present, check at other points

indicated. Suspect failed component or faulty wiring/connector between point where signal is absent and last point where signal is present.

**If motor gives up partway through a move:**

Query by issuing command /1Q. Overload error will be returned (Error 9 in EZCommander). Motor cannot keep up with the trajectory specified in the command. Try the following:

- ▶ Increase maximum move current with the "m" command to allow the motor to move faster. For example /1m100R allows 100% current.
- ▶ Reduce the velocity (V) and/or acceleration (L).

**If motor cannot reach specified speed:**

- ▶ Increase supply voltage.
- ▶ Increase maximum move current with the "m" command to allow the motor to move faster. For example /1m100R allows 100% current.

