

A quick guide to the EZServo® starter kit

Revision C1

This guide applies when using the RS232-to-RS485 Converter, or the USB-to-RS485 Converter after USB driver is installed.

For these products

- EZSV17
- EZSV23

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 EZServo® Controller/Driver, servo motor, and encoder. A motor 2" (SV17) or 3" (SV23) or smaller rated at about 1/2 of supply voltage is best. Also see Encoder Note.
- ▶ RS232 to RS485 Converter or USB to RS485 Converter, with cables supplied
- ▶ PC with port to match cable supplied, with USB driver installed if USB to RS485 Converter is being used.
- ▶ Power supply, 12 to 40V. For first-time EZServo users we recommend a current-limited power supply set to 20V, 1A to protect against miswiring.
- ▶ HyperTerminal application (For Windows 98, download HyperTerminal Private Edition 4.0+ from www.hilgraeve.com. This corrects echo problem in Windows 98 version.)
- ▶ Crimp tool (recommended): Digikey part H9924-ND. Otherwise, soldering equipment.
- ▶ Small Philips screwdriver for operating address switch
- ▶ If troubleshooting is required: ohmmeter, oscilloscope

Precautions

- ▶ Observe all electrostatic discharge precautions to avoid damaging circuit boards.
- ▶ Allow at least 0.1" air gap when bolting EZServo to motor, for cooling (larger version of the board).
- ▶ Use 4-40 round standoffs to bolt EZServo to motor, 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 RS485 Converter on metal surface when powered (to prevent shorts).
- ▶ DO NOT run Palm Pilot Hotsync on the computer. It will take over the comm port.
- ▶ 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.

1. Connect power supply to RS485 Converter.
 - ▶ Important! On SV23 model, install J3 if power is less than 15V.
 - ▶ Turn power ON. Confirm current is less than 100mA. Turn power OFF.

2. Connect EZServo to RS485 converter.
 - ▶ If using EZ Start kit, use cable provided. If not using kit, wire mating 4-pin connectors pin-to-pin per the markings on the connector. (See Wiring Note below.)
 - ▶ Turn power ON. Ensure current is less than 0.25A, and green Life LED blinks. *If not, look for bad power connection.* Turn power OFF.

3. Set address switch firmly to number 1 with Philips screwdriver. Turn power ON.

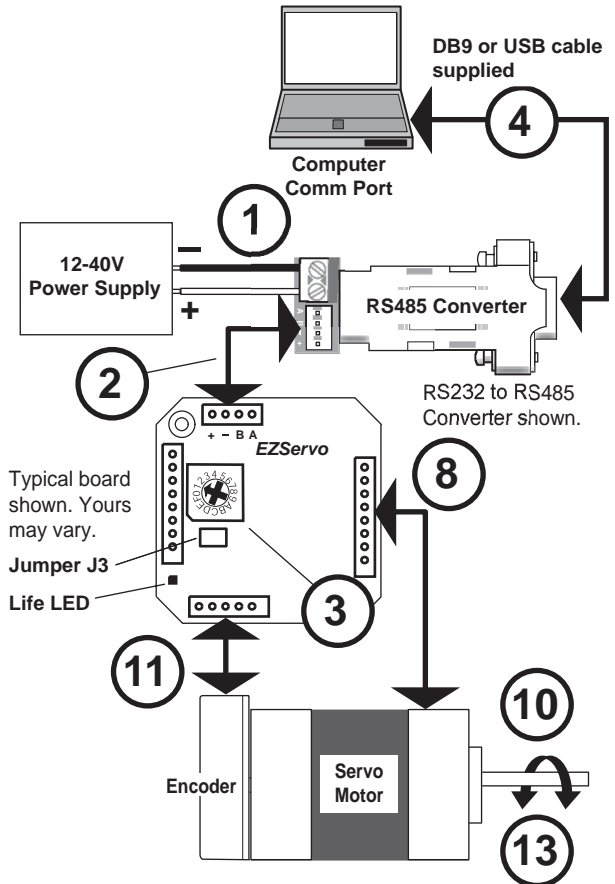
4. Connect RS485 Converter to the pc.

5. Start HyperTerminal or the EZCommander™ application (see last page for HyperTerminal setup).

6. Issue the command /1P1000R <CR> and observe result. This command tells motor to turn 1000 encoder counts and stop.

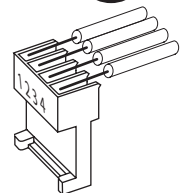
7. Turn power OFF.

Procedure continued next page.



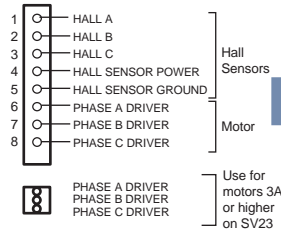
Wiring Note

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.)



8. Connect EZServo 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.) On SV23 models, use 3-pin screw terminal for high-current motors.



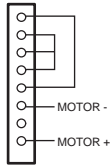
NOTE
On SV17, Hall Sensor power is +15V. If +5V is needed, obtain from encoder connector pin 4.

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

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



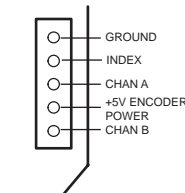
9. Ensure power is ON.

10. Test velocity function:

- ▶ Issue command /1N0R to tell the board there is no encoder.
- ▶ Issue command /1P0R or /1D0R endless move; then confirm response.
- ▶ Issue command such as /1V10R to change speed; then confirm response. (Hall sensors provide feedback for velocity control.)

11. If only velocity control is required, skip this step. If position control is required, turn power OFF.

Then connect encoder to 5-pin connector as shown in diagram:
(See Wiring Note on preceding page.)



12. Turn power ON.

13. Issue command /1P1000. The motor will move 1000 steps in the positive direction.

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. Set the current limit low by issuing command /1m30R.
3. 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 /1A1000R. The motor should spin smoothly in one direction for about 5 seconds and stop.

- ▶ 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.)

Starting HyperTerminal

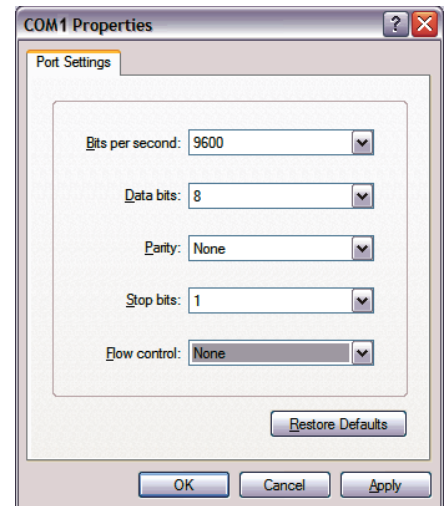
- 1 Make sure no other programs are using the comm port you will be connecting to with HyperTerminal.
- 2 Open HyperTerminal by following this (typical) path:
Start/All Programs/Accessories/ Communications/ HyperTerminal/ HyperTerminal
The path shown is for Windows XP.



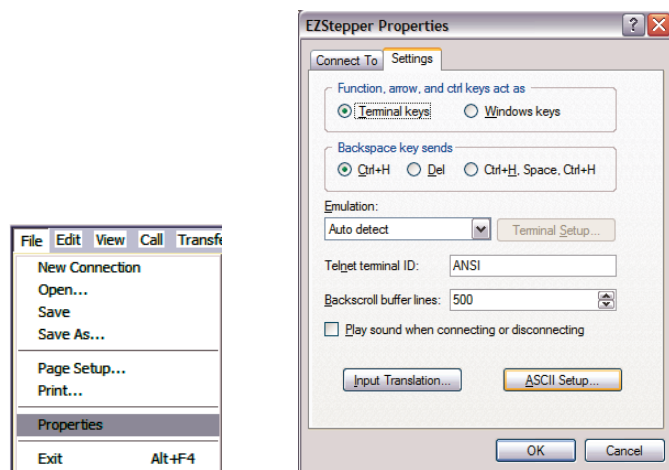
- 3 Name the new connection and select an icon. Click **OK**.



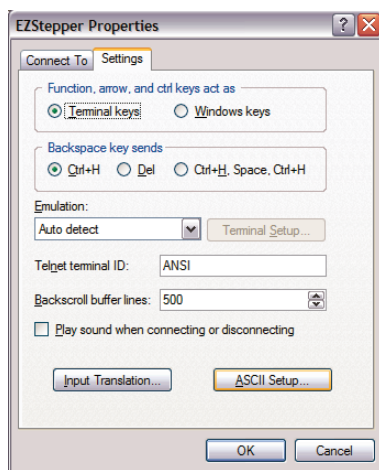
- 4 Select connection. Click **OK**. Note that USB uses higher port number.



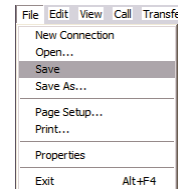
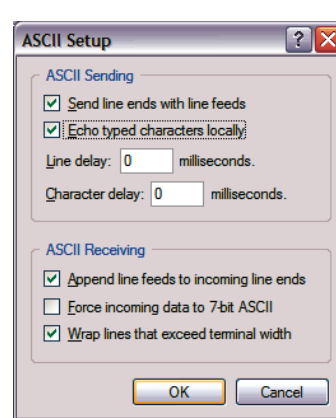
- 5 Make the port settings shown above. Click **Apply**, then click **OK**.



- 6 In HyperTerminal, choose **File/Properties**.



- 7 Click the **ASCII Setup** button on the **Settings** tab.



- 9 Click **File/Save** to store this connection. Now you're ready to send commands.

You can open this connection later by choosing **File/Open** from the HyperTerminal menu.

To change connection properties later, first click the **Call/Disconnect** icon to terminate the connection.

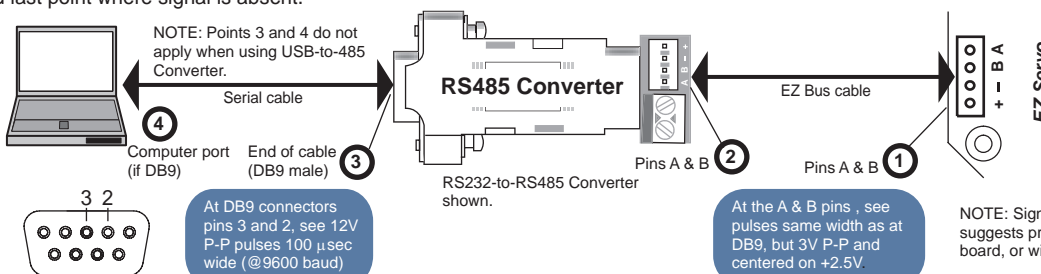
- 8 Make selections shown above. Click **OK**, then click **OK** again. Commands and responses will be displayed as separate pairs.

You can also use the EZCommander™ Windows application to control your servomotor. To obtain the application, visit the part of our website for your product.

Troubleshooting

If motor does not respond to commands:

- ▶ Make sure address switch is detented exactly on position number 1. (After resetting, power must be cycled to establish new address).
- ▶ Turn off Palm Pilot Hotsync or other applications that use the comm port.
- ▶ Re-check that correct com port is selected.
- ▶ Issue "reconnect" command from HyperTerminal.
- ▶ Confirm good ground between PC and power supply. First measure resistance with power off; then check for voltage drop with power on. Repair poor ground connections.
- ▶ Issue command /1<CR> and verify that the response "/0b" is received. If ok, motor connection may be miswired or loose. If not, continue to next item.
- ▶ Check continuity of communication data to EZServo board at point 1 in diagram below. If not present, check at other points shown. Suspect failed component or faulty wiring/connector between point where signal is present and last point where signal is absent.



If motor gives up partway through a move:

Query by issuing command /1Q. Overload error will be returned (upper or lower-case i). 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.