



Basic system check for New Generation controllers

Summary

This document describes a step by step procedure to make sure that the basic components of a system are functional. It applies to the HBL1650/VBL1650 HBL2350/VBL2350

Needed equipment

- Personal computer with a RS232 port or a USB to RS232 converter.
- Roboteq controller and black COMM cable (supplied with the controller).
- Motor or motors.
- Voltmeter/Ammeter

Check the motors in stand alone configuration

*This test consists of running the motors. Exercise common sense and care.
Skip it for brushless motors; they do not turn if directly connected to a battery as they do need a controller to operate correctly.*

First thing to do is to test the motors and the battery.

Disconnect the controller completely and connect the motors directly to the battery. Turn on the main switch. The motors must run at the speed corresponding to full power.

If they don't, then there is a problem either with the battery or the motors.

Note: this step is important if using a power supply or a half charged battery. You need to make sure that while the power source is driving the motors, the voltage power source is stable and does not collapse to a low value (less than nine volts). If it does then recharge the battery or use a more powerful power supply.

Check "logic" current

Connect the controller to power with the motor disconnected via the PWR-CTL connection (the thin yellow wire for encased controllers). Measure the current through the PWR-CTL wire; it should not exceed 200 mill- Amp .

Repeat by powering the controller through the thick red power cable.

Additionally observe the status LED on the front of the controller; when power the controller it has to blink fast for about one second.

Step 1 - Install Roborun+

As a first step install the software utility ROBORUN+ in the computer.

Note: the older utility ROBORUN will not work with these controllers.

Find Roborun+ install file at: <http://www.roboteq.com/tech-support/manuals-and-software.html>

Connect the controller to the PC; although the controller can accept both USB or RS232 connections, note that the COM connection is much more stable than the USB and should be preferred in debugging. Be aware that the quality of USB-RS232 converter changes significantly from one vendor to the other and only good quality converters should be used.

Power the controller.

Launch Roborun; first it must recognize the COM port showing the port is active.

Some USB-RS232 converters do not work as advertised. Use Hyper Terminal 1 (a Windows) application available in every PC) to test them.

If Roborun+says "COM Open" then COMM port is recognized and useable.

Roborun+ will report in the top right corner the controller model ID. Make sure the ID corresponds to the controller you are testing.



Go into the Roborun+ "console" screen; turning off and back on the controller will originate a series of messages on the screen originated by the controller. If the messages are readable then the connection is correct; if they are garbage characters, there is a problem with the settings of the COM channel in the PC or the USB-RS232 adapter if one is used.

Make sure you are using the latest firmware and Roborun+ release; previous releases may not be able to identify correctly the latest controller models. Check web site for the latest release.

The firmware release is reported at the bottom right corner of Roborun+

Step 2 - Bring the controller to a known state and check logic status

Connect the controller to power using the thick red and black power cables.

At the Roborun+ page "Configuration" locate the pushbutton marked "RESET DEFAULTS". Press it and restore the default configuration of the controller.

Turn to the Roborun+ page marked "RUN". Check the LEDs; all fault LEDs should be all dark.

Should any of the fault LEDs be red, it would indicate a problem with the controller.

NOTE: if the controller is powered only through the PWR CTL terminal (yellow wire in cased controllers) and the Vmot terminal (red power cable in cased controllers) the "Undervolt" LED will be red. This is normal and can be resolved by connecting Vmot to power as well which will turn off the LED.

Step 3 - Check basic voltages

On the page RUN of Roborun+ select the following parameters:

- **Battery Volt.** The min max should correspond to the voltage of the battery.
- **Controller Volt.** This is the internal logic power; should be 13 to 14 volt.
- **5 Volt output.** (This is the 5V going to the Hall sensors or encoders).

Enable the graph for these parameters to make sure there are no gross fluctuations.

Step 4 - Check the Hall sensors connection (for brushless controllers only)

Connect the Hall sensors to the controller; do not connect the phases.

Turn the rotor of the motor by hand. The corresponding counter should increment or decrement.

Please note: single channel controllers will show the count activity on "counter".

Dual channel controllers will show the activity on the counter corresponding to the channel to which the motor sensors are connected, either counter1 or counter2.

Note: When connecting the phases, make sure the motor on channel 1 has Hall sensors AND phases going to channel 1; check that turning the rotor by hand counter1 is the one active. Similarly for the motor on channel 2. In other words do not cross the connections (like phases connected to channel 1 and sensors active on counter2 or vice versa).

Step 4 – Run the motors

This test consists of running the motors. Exercise common sense and care. Disconnect the motors from their mechanical load; this test is to be performed with freestanding rotors.

Using the slider at the "RUN" page drive the motors and check they turn.

Step 4-A (brushless controllers only).

In order for the motors to run, both phases and Hall Effect sensors must be connected. The controller needs to be powered via the Vmot terminal, not the PWR-CTL terminal (yellow wire).

Most of the times it is necessary to find out by trial and error the right combination of Hall sensors ABC and phases UVW.

This process can be made difficult by the fact that if the connection is incorrect, the motor may not turn and the Stall Protection will come into play.



To avoid that, put a power resistor in series to the motor, like a 25-Watt resistor of value equal to one third of the battery voltage so it will limit the battery current to three Amp. In this way the Stall Protection will not come into play.

It may be a good idea to disable the Watch Dog timer; although not strictly necessary, it will activate if you exit the Roborun+ page "RUN" and cut off the voltage to the outputs, therefore if you want to measure the voltage at the outputs UVW while not being in the "RUN" page (example: you are using the console page), disable the watchdog (configuration=>commands=>command safety=>RS232 safety=>watchdog = 0).

Using the slider at the "RUN" page drive lightly the motor (the series resistor will prevent working at high speed). Change the combination "Phase" on UVW power terminals (or the combination "sensors" on the ABC inputs) connection until the motor spins both ways.

Note that in the wrong combination the motor is stalled so moving the slider it will present a short circuit to the battery. All battery voltage will drop on the resistor and as soon as the slider is moved a little the battery voltage at the controller will be gone and Roborun+ will show the message "Controller Lost".

As soon as the correct combination is hit, the motor will start rotating so developing a CEMF that will limit the battery current needed and it will be possible to move the slider more. Bear in mind that pushing the slider to a sufficient high speed will eventually cause the motor to draw enough current to drop its battery voltage down to the point of loading the controller, but before reaching that point it should be possible to rotate the motors at reasonable speed both in Forward and Reverse direction.

If the motor does not spin, check that the Hall effect sensors go to the right channel by spinning the rotor by hand and checking which counter shows activity ((counter1 or counter2).

Make sure that the correct truth table is generated as indicated in the datasheet (Truth Table Sequence).

Do this by measuring voltages between the Hall sensors and ground (High=5V / Low=GND) and the voltages at the phases (plus = Battery Voltage, minus = GND, blank = floating). Note that the truth table detail only six of the eight possible combinations. The missing combinations are "all inputs High and all inputs Low) that are not in the normal truth table of the motor and indicate the Hall inputs of the controller are not driven (example: Hall inputs connected to channel one and phases connected to channel two).

The above procedure will ensure basic functionality that is:

- **The battery works.**
- **The motors work.**
- **The controller logic works.**
- **The controller is able to turn all motors in all directions.**

Using a radio

If the controller is set for radio make sure the radio receiver is connected to both channels.

If it is connected to one channel only, then the other channel input must be set to "No Action" otherwise being active and not connected to a radio will trigger the watchdog that will cut power current to the motors after one second.

Still failing to perform satisfactorily ? Email Roboteq technical support.