Using the Lyen Hall/Phase/Throttle eBike Tester

description by Lyen et al, photo by Kiwi

Quick Start - The Four Tester Sections



Left Side LEDs

- 1. The top row of three LEDs are for the motor phase wire (marked as A, B, C)
- 2. The middle row of three LEDs are for the motor hall sensor (marked as A, B, C)
- 3. The first LED on third row is for the hall angle. Lights on = 60 degree, off = 120 degree
- 4. The second LED on third row is the power on. It is not necessary to turn the power on when testing the motor or controller phase wires.
- 5. The third LED on third row is for throttle. The color should sequence *Green, Off, Red* as the throttle is turned to WOT.

Right Side LEDs

1. The seven LEDs are used for the controller phase rotation testing. The middle LED labeled "5V" indicates the controller is supplying 5v to the motor hall sensors. It should light up when the controller hall sensor connector is plugged in to the tester.

Connection Description

- 1. First group from left connects to the throttle (red = +5v, blue = signal, black = ground/negative).
- 2. Second group from left connects to the phase wires of the motor (yellow, green, blue).
- 3. Third group from left with five wires connects to the hall sensor connector of the motor (red = +5v, yellow, green, blue = signal, black = ground/negative).
- 4. Fourth group from left connects to the controller phase output (yellow, green, blue).
- 5. Fifth group from left with five wires connects to the hall sensor connector of the controller (red = +5v, yellow, green, blue = signal, black = ground/negative).

Procedure to Test the Motor Phase Wires

- 1. With the tester OFF, connect only the 3 phase wires from the motor to the tester.
- 2. Rotate the motor in forward direction. (Note: Rotate the wheel backwards if the (geared) motor has a freewheel clutch.)
- 3. Verify that all three LED lights blink on and off.
- 4. If all three LEDs blink, then verify that they blink in sequence. The sequence should be from left to right for forward motion/rotation.

Procedure to Test the Motor Hall Sensors and Wires

- 1. Connect only the hall sensor connector from the motor to the tester. You may need to remove the white plastic connectors in order to test some brushless motors. To do so, pinch the pins from the holes to remove them.
- 2. With the tester ON, rotate the motor in the forward direction.
- 3. Verify that all three LED lights blink on and off.
- 4. If all three LEDs blink, then verify that they blink in sequence. The sequence should be from left to right for forward motion/rotation.

Procedure to Test the Controller

- 1. Connect throttle to the controller.
- 2. Connect the phase and hall wires from the controller to the tester.
- 3. Connect the battery pack to the controller.
- 4. Turn the tester ON.
- 5. Verify the 5V led light is on in the centre of the circle of rotation LEDs. If the 5V LED is off then the controller is NOT supplying 5V to the motor hall sensors.
- 6. Slowly turn the throttle.
- 7. Verify the opposite pairs in the circle of LEDs on the right are on and rotate.

Procedure to Test the Throttle

1. Connect throttle to the tester.

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- 2. With the tester ON, verify the throttle LED is green. If the LED is not green or does not light then the throttle wires or hall sensor may be open or short circuit.
- 3. Slowly turn the throttle to the wide open position.
- 4. Verify the throttle green LED turns off at about 1/2 throttle and lights up red at WOT. If the LED does not change color then the throttle is faulty.

FAQs

- 1. *What do you see when a hall sensor is dead?* The corresponding LED will not light up when the hall sensor is dead or the hall sensor wire is cut.
- 2. What does it mean when the '5v' LED in the middle of the circle on the right does not light? If this LED does not light, then either the controller 5v supply is defective or more likely, the red or black hall sensor wire is cut.
- 3. *What do you see with a broken or shorted phase wire?* When the motor is turned by hand the corresponding LED will not light up when a motor phase wire is cut.
- 4. Both my Crystalyte motors (408 and 5X) show reverse rotation (LEDs go right to left) when phases are connected color for color. Is this common with Crystalyte motors? To get the proper sequencing it is necessary to use the same phase and hall color wiring that is used for connecting a Lyen controller to your brand of motor. For Crystalyte this is:

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HALL		PHASE	PHASE	
Tester –	Motor	Tester –	Motor	
Yellow	Yellow	Yellow	Blue	
Green	Blue	Green	Green	
Blue	Green	Blue	Yellow	

Note: In general to diagnose a failed component or wire (differing from improper phase/hall wire color matches) the exact sequence is not important as long as all LEDs light in any repeating sequence when the connections are matched color for color. This is true for phase or hall LEDs.

- 5. *Why do all the phase LEDs seem to light at once when I turn the wheel of my MAC?* Because of the gearing, turning the wheel makes the inner motor of gear motors spin very rapidly and the LEDs flash too fast to see. Don't be concerned with the sequence which is impossible to distinguish, just check that all LEDs are lit. When testing the hall sensors, the LED sequencing can be seen by turning the wheel very slowly.
- What do you see with broken throttle? A throttle or the wiring is defective if the LED does not sequence *Green*, *Off, Red* from closed to WOT.