SCOOTER

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Pride Mobility Products Corp.

IPC Controllers

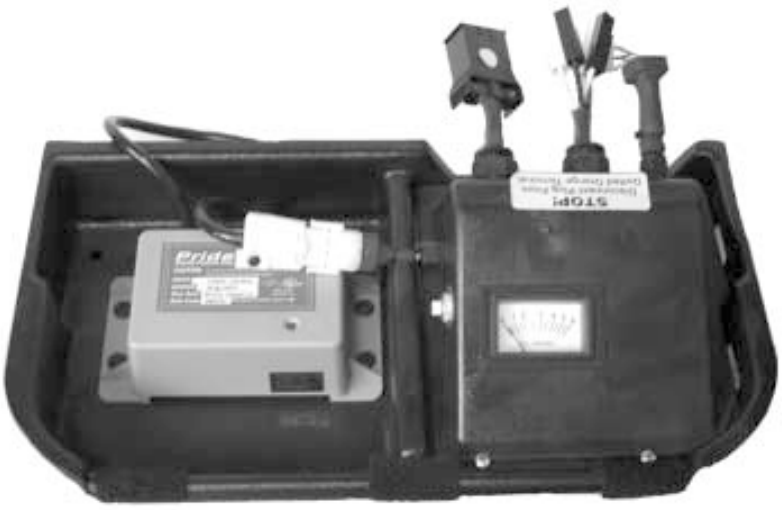
This guide was written for scooters manufactured prior to 2000 that use the 70 Amp IPC controller. Other than differences in appearance and component location, most Pride scooters function in the same way. Two 12-Volt batteries are connected in a series. Voltage is applied to the rear main controller. The voltage is sent up to the key switch located at the console. It then travels to the meter, horn, and back down to the controller. When the throttle lever is depressed in either direction, the controller sends approximately 24 volts to the brake assembly, releasing it and the scooter will move in the desired direction at the desired speed.

In this guide, we will follow the troubleshooting process of an IPC Controller and introduce the procedures of the IPC Controller Card Setup.

To prevent overlooking the obvious when troubleshooting, answer the following questions before beginning:
1) Are the batteries fully charged?
2) Are the batteries securely connected to the unit?
3) Is the key inserted?
4) Are all harnesses connected to the controller?
5) Is the unit in freewheel mode?

In this guide, we will address the troubleshooting process in several different scenarios as well as each individual fault code. Within the diagnostic testing material, a toolbox icon will appear after each test. The text included with the toolbox will prompt the correct action to be taken in lieu of the outcome of the test. The light bulb icon, will offer additional hints and tips.

If at any time you need further assistance please contact Pride Power Chair Technical Service at 1-877-800-1248.



Component 1 The Batteries

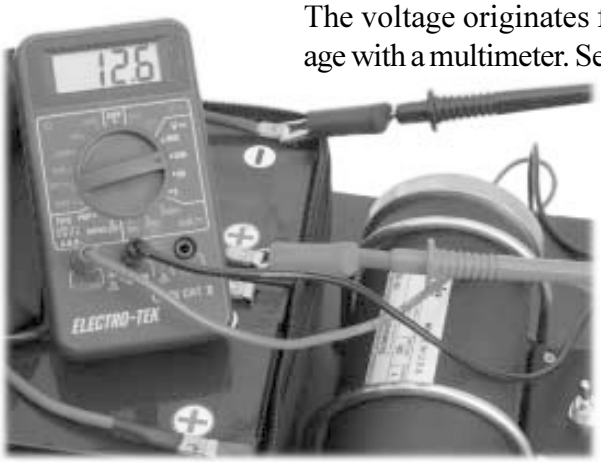


Figure 3.1. Battery Test

The voltage originates from the batteries. Take a reading at each individual battery for voltage with a multimeter. See figure 3.1.

The reading should not be less then 12.4 volts on either battery. If not, then recharge the batteries, and load test. Refer to the "Battery Diagnostics" section of this manual for load testing instructions.

The left battery reads_____volts DC.

The right battery reads_____volts DC.

If the reading is outside tolerance, replace the battery or batteries. Pride recommends replacing BOTH batteries.

Component 2 Battery Terminal Input Harness

The voltage travels from the batteries through the harnesses. Using a multimeter, take a reading on each of the batteries at the terminals. Then, disconnecting the harnesses, take a reading at the black and white connectors.

The readings off both battery terminals should be the same as the readings off the black and white connectors. See figure 3.2. Reconnect the batteries.

The left battery reads_____volts DC.

The right battery reads_____volts DC.

Figure 3.2. Battery Harness

If these readings are not the same as the readings taken on the individual battery terminals, replace the battery terminal input harness or harnesses.

Component 3 The Circuit Breaker

Voltage leaves the batteries and travels through the circuit breaker. If the circuit breaker is open, voltage can not pass through to the console. Using the multimeter to test the circuit breaker, take a voltage reading from each side of the circuit breaker to the most negative battery terminal.

Figure 3.3. Circuit Breaker

To determine the most negative battery terminal, place the red lead of the multimeter on the positive terminal of one battery, and the black lead on the negative terminal of the opposite battery. Read the total battery voltage.

It is possible to get an initial reading of zero volts. If this reading appears, move to the other positive and negative and you should get a total battery voltage of approximately 24 volts.

With the most negative battery terminal found, take a reading from the metal tabs of the circuit breaker to the most negative battery terminal. See figure 3.3. Both readings should be no less then the total battery voltage. Reconnect the batteries.

The 1st tab reads_____volts DC. **The 2nd tab reads_____volts DC.**

If the reading is incorrect, take a resistance reading across the circuit breaker. If an "open" or more than 3 ohms are detected, replace the circuit breaker.

Notes:

Component 4 The Charger

If the previous test did not yield at least 25 volts DC, there may be a problem with the battery charging system. To test the charger system, unplug the white 3-pin connector between the charger, and controller housing. Take 2 separate readings with the batteries connected to the unit and the power harness cord plugged in from the back of the scooter to a standard wall outlet.

Figure 3.4. Charger Output Harness

Step 1:
Take a reading across the two outside pins of the charger output harness. The reading should read be approximately 25 volts to a maximum of 30 volts DC. See figure 3.4.

When taking the output voltage from the charger, allow the reading to normalize before documenting the reading. This could take a few minutes.

The meter reads_____volts DC.

If this reading is outside tolerance, replace the battery charger.

Step 2:
Take a reading on the two outside pins of the controller charging harness. See figure 3.5. Read the total battery voltage. This is the battery voltage feeding back through the controller to the charger. Reconnect the battery charger harness.

Figure 3.5. Controller Charging Harness

The meter reads_____volts DC.

If this reading is outside tolerance, replace the charger harness.

Component 5 The IPC Controller Interface Harness

The voltage runs through the circuit breaker to the B+ terminal on the IPC controller. From this B+ terminal, the voltage travels to pin #6 (bottom row, center pin) of the 9-pin front-to-rear harness. The B- voltage will be on pin #1 (top row, left "D" shaped pin).

Unplug the front-to-rear harness. The harness contains 3 rows of 3 pins. Because the connector can be turned in any direction, determine which of the pins is the bottom row center pin #6 that the voltage travels through. See figure 3.6.

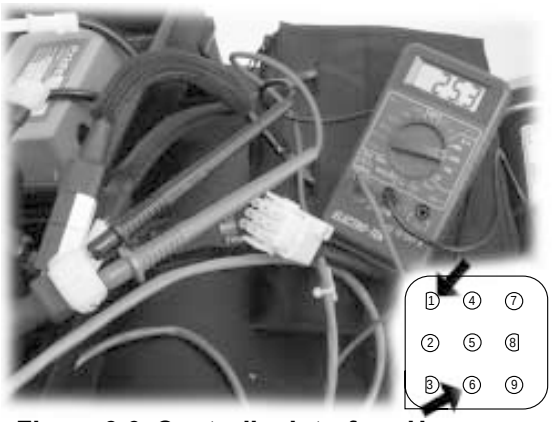


Figure 3.6. Controller Interface Harness

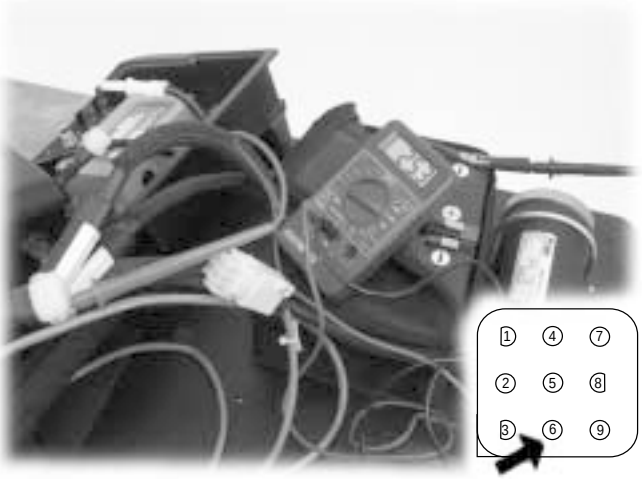


Figure 3.7. Controller Interface Harness

To determine the bottom row, hold the controller side of the 9-pin harness with the two "D" shaped pins on the left side. The bottom center pin #6 is to the right of the lower "D" shaped pin. With the pin identified, take a reading from the bottom row center pin #6 to the most negative battery terminal. See figure 3.7. The reading may also be taken across pin #1 (the B- voltage) and pin #6. See figure 3.6. A reading no less than the total battery voltage of approximately 24 volts should appear.

The meter reads_____volts DC.

If this reading is outside tolerance, replace the controller interface harness.

Component 6 The Front-to-Rear Cable

Taking a reading from brown wire #1 to black wire #8 should yield a reading equal to the total battery voltage.

The battery voltage travels up to the console of the scooter on a black wire in the front-to-rear harness.

Open the console assembly in the front of the scooter and locate the red 8-pin connector, which should be plugged into the console board. Identify the black wire on the red connector. This is the same wire we previously tested on the controller harness in the rear of the scooter. Take a reading from the black wire of the red 8-pin connector to the most negative battery terminal. See figure 3.8. The reading should indicate no less then the total battery voltage.

The meter reads_____volts DC.

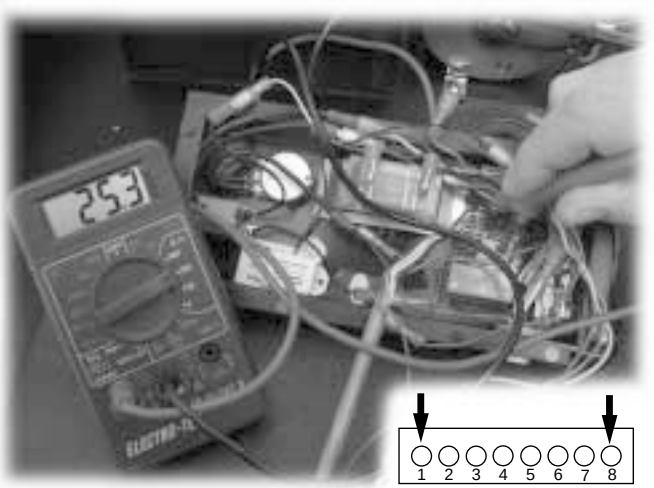


Figure 3.8. Front-to-Rear Harness

If this reading is outside tolerance, replace the front-to-rear harness.

Notes:

Component 7 The Console

The main function of the console is to power the unit up, control forward and reverse motion, and to monitor battery voltage. The function of the key switch is to complete the path of the battery voltage back to the IPC controller. When the key is inserted, battery voltage is sent back to the controller allowing it to power up. The voltage is sent to the front through the front-to-rear harness on the black wire (just tested), and returned to the IPC controller on the red pin of the red 8-pin connector.

If the console is working properly with the key inserted, take a reading from the red pin of the red 8-pin connector to the most negative battery terminal. See figure 3.9. The reading should indicate no less than the total battery voltage.

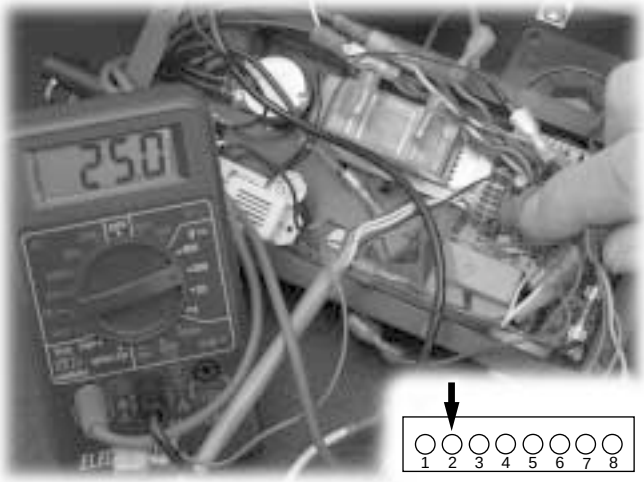


Figure 3.9. Console

The meter reads_____volts DC.

If this reading is outside tolerance, replace the console assembly.

Component 8 The IPC Controller Harness

The battery voltage is then sent back down through the front-to-rear harness and into the IPC controller housing via the top row center pin #4 of the front-to-rear harness. Inside the controller housing, the battery voltage is sent to the "SW" (switched voltage) terminal located on the controller card. At this point, the IPC controller is "powered up." Take a reading from the SW terminal on the controller card (without removing the wire), to the most negative battery terminal. See figure 3.10. The reading should be equal to the total battery voltage.

Figure 3.10. IPC Harness

The meter reads_____volts DC.

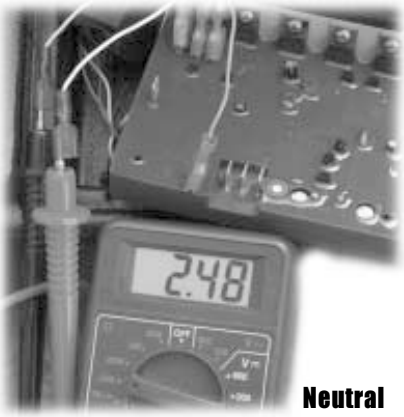
If this reading is outside tolerance, replace the IPC harness.

Notes:

Component 9 The Throttle Potentiometer (pot)

At this point, the IPC controller monitors the dropping of voltage across the throttle pot.

This is how the controller determines how fast and in what direction the scooter should move. Check the reading across the throttle pot from the IPC controller card in the back of the scooter. First, unplug the batteries. Now unplug the three throttle pot wires connected to the controller card. These terminals are labeled "PH" (pot high, yellow wire), "PW" (pot wiper, white wire), and "PL" (pot low, blue wire).



Neutral

Forward

Reverse

Figure 3.11. Throttle Pot

Set the multimeter to a 20K resistance (ohms) setting and with the speed pot (Turtle/Rabbit knob) set to the fastest setting (Rabbit), take the following readings:

From PH (yellow wire) to PW (white wire) the reading should read 2500 ohms or 2.5K.

By pushing the throttle in either forward or reverse we should notice a resistance change of about 300 ohms or .300K. See figure 3.11.

Without depressing the throttle bar, the meter reads_____ohms.

Depressing the throttle bar forward, the meter reads_____ohms.

Depressing the throttle bar reverse, the meter reads_____ohms.

Forward

Neutral

Reverse

Figure 3.12. Throttle Pot

Check resistance across the throttle pot. Take these readings from the PW (white) to the PL (blue) wire. Once again the reading should be 2500 ohms or 2.5K and pushing the throttle forward or reverse should show a change in resistance of about 300 ohms or .300K. See figure 3.12.

Without depressing the throttle bar, the meter reads_____ohms.

Depressing the throttle bar forward, the meter reads_____ohms.

Depressing the throttle bar reverse, the meter reads _____ ohms.

Check for resistance across the whole throttle pot. Without depressing the throttle bar, take a reading of resistance from the PH (yellow) wire to the PL (blue) wire. See figure 3.13. A reading of 5000 or 5K should appear.

Reconnect the batteries.

The meter reads_____ohms.

Figure 3.13. Throttle Resistance

If these readings do not appear to be within tolerance, there is most likely a break in one of the wires. Follow the wires back to the throttle pot to determine where (if) a break has occurred and replace the necessary harness. If the readings are traced back to the throttle pot and are still outside tolerance, replace the throttle pot.

Component 10 Motor Voltage

The IPC controller manages the rest of the primary functions until it distributes the output voltage to the motor/brake assembly, causing the scooter to move.

Remove the M+ (motor positive, red wire) and M- (motor negative, black wire) wires from the IPC controller card. With the batteries reconnected, the key inserted, the speed set to rabbit, and the multimeter set to DC (volt scale), take a volt reading. Place the red lead of the multimeter to the M+ terminal and the black lead to the M- terminal. Press the throttle to the forward position.

If the IPC controller board is functioning properly, a reading of approximately 1 volt less then the total battery voltage should appear. See figure 3.14.

The meter reads_____volts DC.

Figure 3.14. Forward Motor Voltage

Depress the throttle in reverse. With the throttle pressed to reverse, a negative reading of approximately 60% of the total battery voltage should appear. See figure 3.15.

Reconnect the M+ and M- harnesses.

The meter reads_____volts DC.

Figure 3.15. Reverse Motor Voltage

If these readings are outside tolerance, refer to the "IPC Controller Setup" in Scooter Diagnostics.

Component 11 Motor Output Voltage

The motor harness is the 6-pin connector located on the outside of the controller housing.

In order to read the harness output, we must make the IPC controller think that the micro-switch on the brake assembly is closed. When the switch is open, the M- output wire from the IPC control board is open and there is no voltage to the motor.

To take an output reading, short together the two brown pins of the connector, making the controller think the switch is closed. This can be done with a jumper wire, paper clip, or anything that is conductive.

With the brown connectors shorted, you should hear a faint "click" sound from the controller housing. If a click is not heard, check to ensure that the two brown connectors are securely shorted together.

Once shorted, place the red lead of the meter on the red pin, and the black lead to the black pin, and push forward on the throttle bar.

A correct reading will be 1 volt less than the total battery voltage. See figure 3.16.

The meter reads_____volts DC.

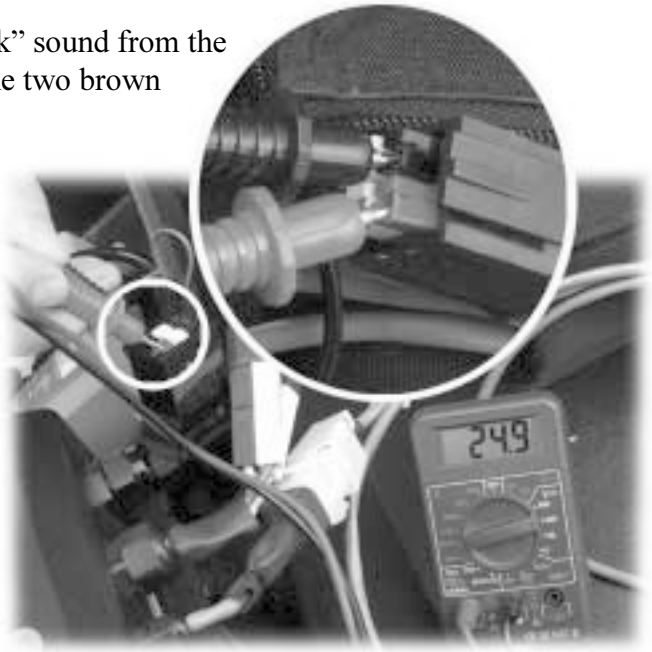


Figure 3.16. Forward Output Voltage

Figure 3.17. Reverse Output Voltage

Push the throttle bar in reverse and the meter should read 60% of the total battery voltage. See figure 3.17.

The meter reads_____volts DC.

If these readings are outside tolerance, replace the motor harness.

Notes:

Component 12 The Motor

If the previous readings are within tolerance, proceed to the motor side of the 6-pin connector. Turn the meter to resistance (ohms) scale and check the resistance across the motor. Place the red lead on the red connector, and the black lead on the black connector. See figure 3.18.

A good reading is between .5 ohms to 3 ohms.

The meter reads_____ohms.

If the reading is higher than 3 ohms, try cleaning or replacing the motor brushes. If the problem continues, replace the motor assembly.

Figure 3.18. Motor Harness

Figure 3.19. Brake Resistance

Check for a resistance reading within the brake assembly.

Place the red lead of the meter on one of the white connectors, and the black lead on the other white connector. A reading of approximately 30 - 100 ohms should appear. See figure 3.19. The reading will depend on the age of the scooter. Older models will read about 45 ohms, newer models can read about 30, 65, or 100 ohms.

The meter reads_____ohms.

If a proper reading does not occur, replace the brake assembly.

Check the micro-switch assembly.

Place the red lead of the meter on one of the brown connectors, and the black lead on the other brown connector. With the unit in the drive mode (freewheel lever locked down), the meter should read a direct short (less then 2 ohms of resistance). See figure 3.20.

The meter reads_____ohms.

Figure 3.20. Drive Mode

Figure 3.21. Freewheel Mode

Put the unit in freewheel mode, by pulling up on the freewheel lever. See figure 3.21. The meter should read infinite, or "O.L" for overload.

The meter reads_____ohms.

If the readings are outside tolerance, replace the micro-switch assembly.

The IPC Controller Setup

The IPC controller setup is a procedure to ensure that the scooter functions properly. Setting up the IPC controller will help eliminate a few problems. For instance, if the center of the throttle pot and the center of the IPC controller are offset enough, the scooter brake may disengage when the key is inserted. Also, if the forward speed is set too high, the scooter will shut itself down when attempting to run at full speed.

There are 3 objectives in the controller card setup:
1) Finding the center
2) Setting the forward speed (gain)
3) Setting the reverse speed

Finding the Center

First, ensure that the speed pot (Turtle/Rabbit) is set to top speed (Rabbit). Remove the PW (white wire) from the board. Insert the key into the unit.

With the multimeter set to DC millivolts, place the red lead of the meter into the white wire that you just removed, and the black lead of the meter onto the terminal on the board that accepts the white wire.

The reading on the multimeter should be +10 millivolts to -10 millivolts. Zero being perfect.

If the reading is not within this range, you must adjust the center using a 2.5-MM screwdriver. The center pot is blue in color and located next to the blue (PL) wire. A clockwise turn will decrease the voltage. A counterclockwise turn will increase the voltage. See figure 3.22.

Once the board is centered, reconnect the white wire to the PW terminal.

Figure 3.22. Finding Center

Once you have obtained a within tolerance center voltage, ensure that the scooter has not timed out before proceeding to the next step.

Setting the Forward Speed (Gain)

Reset the unit by pulling the key out of the console, and reinserting it. This will ensure that the unit has not "timed out" (shut itself down). If the scooter has timed out, remove and reinsert the key.

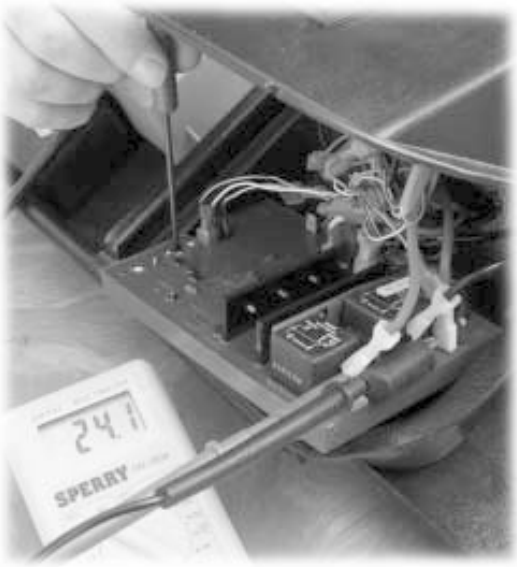


Figure 3.23. Setting Gain

Ensure the speed pot is set to the top speed (Rabbit). Disconnect the red (M+) and black (M-) wires from the controller board.

With the multimeter set to a range above 30 volts DC, place the red lead of the meter to the terminal on the board that accepts the red wire, and the black lead to the terminal that accepts the black wire. When you get a solid connection, depress the throttle to the forward position.

The meter should read approximately 23.5 to 25.5 volts (1 volt below the total battery voltage).

If not, the forward speed must be adjusted. The gain pot is white in color and located next to the center pot. A clockwise turn will decrease the voltage, while a counter clockwise turn will increase the voltage. See figure 3.23.

Setting the Reverse Speed

Reset the unit as in "Setting the Forward Speed (Gain)."

Place the red lead of the meter on the terminal that accepts the black wire, and the black lead to the terminal that accepts the red wire. When you get a solid connection, depress the throttle in the reverse position.

The meter should show a reading of approximately 15.5 to 17.5 volts.

If not, you must adjust the reverse speed. The reverse pot is located near the edge of the board. A clockwise turn will decrease the voltage, while a counter clockwise turn will increase the voltage. See figure 3.24.

Reconnect the motor leads to the M+ and M- terminals and test the operation of the scooter.

Figure 3.24. Setting Reverse

Pots are very sensitive. Be careful!

If you are unable to find the center, set the forward and/or reverse speeds. Replace the IPC Controller Card.

Notes:

Analog Curtis Controllers

This troubleshooting guide was written for Scooters that use the analog Curtis controller.

In this guide, we will address the troubleshooting process in several different scenarios as well as each individual fault code. Within the diagnostic testing material, a toolbox icon will appear after each test. The text included with the toolbox will prompt the correct action to be taken in lieu of the outcome of the test. The light bulb icon, will offer additional hints and tips.

While they may appear simple, the following are often overlooked in troubleshooting:
1) Are the batteries fully charged?
2) Are the batteries securely connected to the unit?
3) Is the key inserted?
4) Are all harnesses connected to the controller?
5) Is the unit in freewheel mode?

If at any time you need further assistance please contact Pride Power Chair Technical Service at 1-877-800-1248.

Component 1 The Batteries

The voltage originates from the batteries. Take a reading at each individual battery for voltage with a multimeter. See figure 3.25.

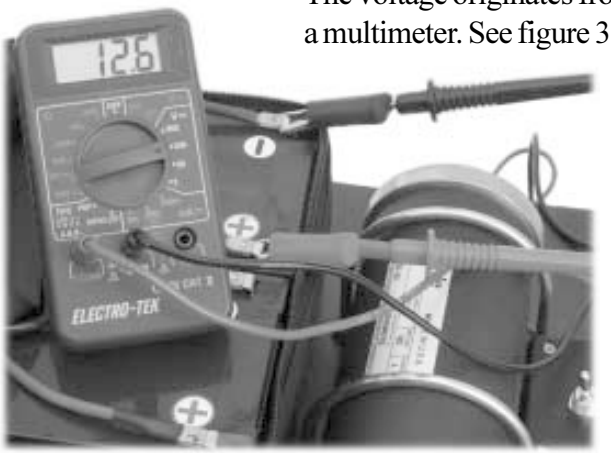


Figure 3.25. Battery Test

The reading should indicate no less then 12.4 volts on either battery. If it is not, then recharge the batteries and load test. Refer to the Battery Diagnostics section of this manual for load testing instructions.

The left battery reads_____volts DC.

The right battery reads_____volts DC.

If the reading is outside tolerance, replace the battery or batteries. Pride recommends replacing BOTH batteries in this case.

Component 2 Battery Terminal Input Harness

The voltage travels from the batteries through the harnesses. Using a multimeter, take a reading at the two white connectors on the end of each battery terminal harness.

The left battery reads_____volts DC.

The right battery reads_____volts DC.

If these readings are not the same as the readings taken on the individual battery terminals, replace the battery terminal input harness or harnesses.

Notes:

Component 3 The Circuit Breaker

Voltage leaves the batteries and travels through the circuit breaker. If the circuit breaker is open, voltage can not pass through to the console. Using the multimeter to test the circuit breaker, take a voltage reading from each side of the circuit breaker to the most negative battery terminal.

Figure 3.26. Circuit Breaker

To determine the most negative battery terminal, place the red lead of the multimeter on the positive terminal of one battery, and the black lead on the negative terminal of the opposite battery. Read the total battery voltage.

It is possible to get an initial reading of zero volts. If this reading appears, move to the other positive and negative and the reading should be approximately 24 volts.

With the most negative battery terminal found, take a reading from the metal tabs of the circuit breaker to the most negative battery terminal. See figure 3.26. Both readings should be no less then the total battery voltage. Reconnect the batteries.

The 1st tab reads_____volts DC. **The 2nd tab reads_____volts DC.**

If the reading is incorrect, take a resistance reading across the circuit breaker. If an "open" or more than 3 ohms are detected, replace the circuit breaker.

Notes:

Component 4 The Charger

If the previous test did not yield at least 12.4 volts DC per battery, there may be a problem with the battery charging system.

In order to identify the problem, follow the two steps below:

Step 1:
With certain battery chargers, it is not possible to check output voltage of the charger if the circuit is not complete (batteries not connected). Take a reading of the total battery voltage at the batteries.

Plug the charger into a standard 120V AC source. There should be an increase of at least 1 volt.

The meter reads_____volts DC.

If this reading is within tolerance, the charger is working properly. If not, proceed to Step 2.

Step 2:
Unplug the white 3-pin connector between the charger and controller housing. Take a reading on the two outside pins of the harness coming from the controller housing side. See figure 3.27. The reading should be equal to the total battery voltage.

Figure 3.27. Charger Harness

The meter reads_____volts DC.

If this reading is outside tolerance, replace the battery charger harness. If the reading is within tolerance, replace the charger.

Component 5 The Controller Interface Harness

Voltage runs through the circuit breaker to the B+ terminal on the controller board. It travels toward the front of the scooter through the bottom left pin (#1) of the front-to-rear harness.

Unplug the front-to-rear harness. The harness contains 3 rows of 3 pins. Because the connector can be turned in any direction, you must determine which of the pins is the bottom row left pin (#1). See figure 3.28.

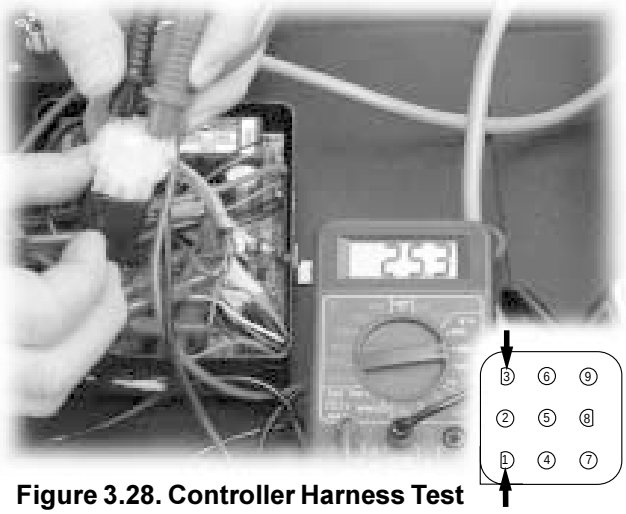


Figure 3.28. Controller Harness Test

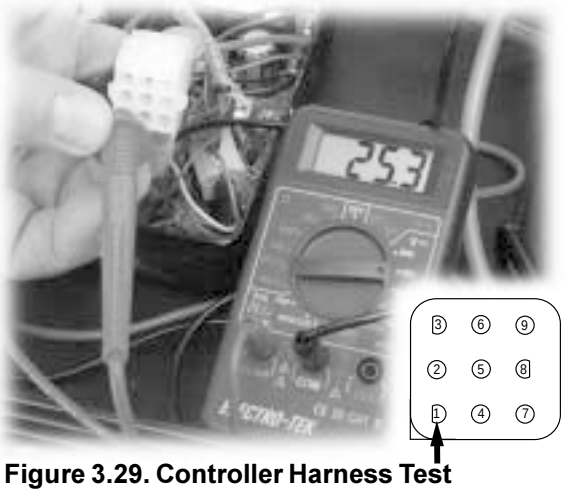


Figure 3.29. Controller Harness Test

To determine the bottom row, hold the controller side interface harness with the two "D" shaped pins on the left side. Pin #1 is now the bottom left pin. With the pin now identified, take a reading from the bottom left pin (#1) coming from the controller to the most negative battery terminal. See figure 3.39. The reading should be equal to the total battery voltage. Reconnect the front-to-rear harness. This reading can also be taken across pin #1 (+) and pin #3 (-) as shown on previous page. See figure 3.29.

The meter reads_____volts DC.

If this reading is outside tolerance, replace the controller harness.

Component 6 The Front-to-Rear Harness

The battery voltage travels up to the console of the scooter on a red wire in the front-to-rear harness.

Open the console assembly in the front of the scooter and locate the white 8-pin connector, which should be plugged into the console board. Identify the red wire on the white connector. This is the same wire previously tested on the controller harness in the rear of the scooter. Take a reading from the red wire (pin #1) of the white 8-pin connector to the black wire (pin #7). The reading should be no less than the total battery voltage. See figure 3.30. This reading can also be taken from pin #1 (+) to the most negative battery terminal.

The meter reads_____volts DC.

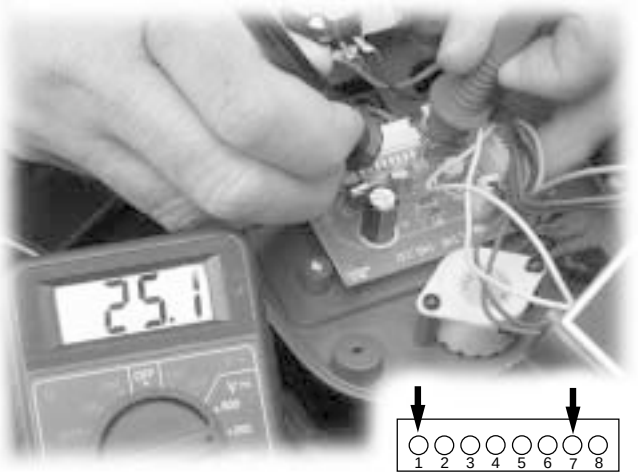


Figure 3.30. Front-to-Rear Harness

If this reading is outside tolerance, replace the front-to-rear harness.

Notes:

Component 7 The Console

The function of the console is to power up the unit, control forward and reverse motion, and monitor battery voltage. The function of the key switch is to complete the path of the battery voltage to send back to the PCB Controller. When the key is inserted, battery voltage is sent back to the controller allowing it to power up. The voltage is sent to the front through the front-to-rear harness on the red wire (just tested), and returned to the controller on the brown wire of the 8-pin connector.

If the console is working properly, with the key inserted, take a reading from the brown pin (#2) of the white 8-pin connector to the most negative battery terminal (or pin #7). The reading should be no less then the total battery voltage. See figure 3.31.

The meter reads_____volts DC.

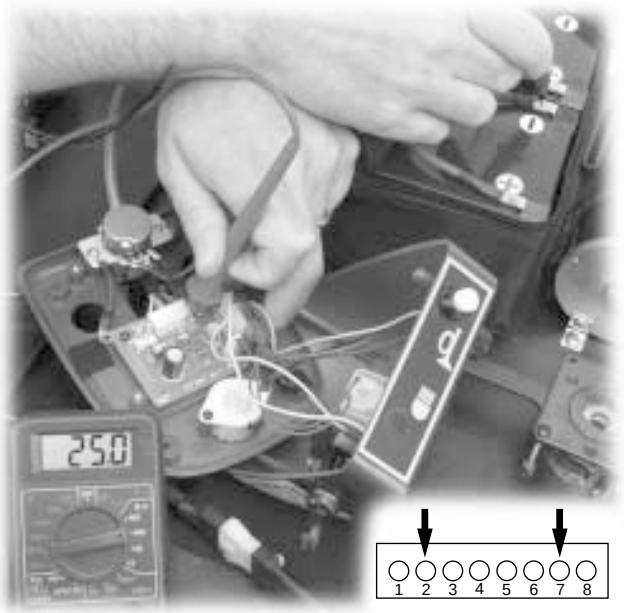


Figure 3.31. Console

If this reading is outside tolerance, replace the console assembly.

Component 8 The Front-to-Rear Harness

The battery voltage will leave the console and travel into the controller through the center row left pin #2 of the front-to-rear harness. At that time, the battery voltage is sent to the brown wire (#3) of the 7-pin connector.

Take a reading from the brown wire from the 7-pin connector to the most negative battery terminal. See figure 3.32. The reading should be no less than the total battery voltage.

The meter reads_____volts DC.

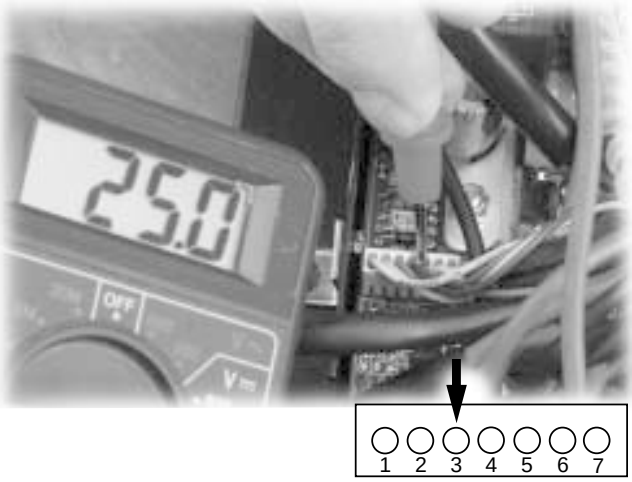


Figure 3.32. Front-to-Rear Harness

If this reading is outside tolerance, replace the front-to-rear harness.

Notes:

Component 9 The Throttle Potentiometer (pot)

The PCB controller monitors the dropping of voltage across the throttle pot. This is how the controller determines how fast and in which direction the scooter should move. Check the reading across the throttle pot from the white 7-pin connector in the controller.

Unplug the batteries, and then unplug the white 7-pin connector from the control board. Set the multimeter to 20K resistance (ohms). With the speed pot (Turtle/Rabbit) set to the fastest setting (Rabbit), take the following readings:

From the blue pin to the green pin, the reading should read approximately 2500 ohms, or 2.5K. By pushing the throttle in either forward or reverse, a noticeable resistance change of ±2500 ohms, or 2.5K should be recorded See figure 3.33.

Neutral

Forward

Reverse

Figure 3.33. Throttle Pot

Without depressing the throttle, the meter reads_____ohms.

Depressing the throttle forward, the meter reads_____ohms.

Depressing the throttle reverse, the meter reads_____ohms.

Perform the same test from the yellow to green wires. Pushing the throttle in either forward or reverse should yield a resistance change of ±2500 ohms, or 2.5K See figure 3.34.

Neutral

Forward

Reverse

Figure 3.34. Throttle Pot

Without depressing the throttle, the meter reads_____ohms.

Depressing the throttle forward, the meter reads_____ohms.

Depressing the throttle reverse, the meter reads _____ ohms.

Figure 3.35. Throttle Resistance

Check for resistance across the whole throttle pot. Without depressing the throttle bar, take a reading of resistance from the yellow wire to the blue wire. See figure 3.35. A reading of approximately 5000 ohms or 5K should appear.

Reconnect the batteries and 7-pin connector.

The meter reads_____ohms.

If these readings do not appear to be within tolerance, there is most likely a break in one of the wires. Follow the wires back to the potentiometer to determine where (if) a break has occurred and replace the necessary harness. If the readings are traced back to the throttle pot and are still outside tolerance, proceed to the next step.

Check the throttle potentiometer by taking readings from the console.

Locate and disconnect the 3-pin harness from the throttle pot to the console. With the meter, take a resistance reading from the red wire to the blue wire. See figure 3.36.

Pushing the throttle in either forward or reverse should yield a resistance change of plus or minus 2500 ohms or 2.5K.

Neutral

Forward

Reverse

Figure 3.36. Throttle Pot

Without depressing the throttle, the meter reads_____ohms.

Depressing the throttle forward, the meter reads_____ohms.

Depressing the throttle reverse, the meter reads_____ohms.

Neutral

Forward

Figure 3.37. Throttle Pot

Check the reading from the blue to the black wire, once again the meter should read 2500 ohms, or 2.5K. Pushing the throttle forward should yield a resistance change of 2500 ohms, or 2.5K. See figure 3.37.

Without depressing the throttle, the meter reads_____ohms.

Depressing the throttle forward, the meter reads_____ohms.

Depressing the throttle reverse, the meter reads_____ohms.

Check for a resistance reading across the whole pot by taking a reading from the black wire to the red wire. See figure 3.38. The meter should read approximately 5000 ohms, or 5K.

Reconnect the 3-pin throttle pot harness.

The meter reads_____ohms.

Reconnect the throttle pot, the 7-pin connector in the controller, and the batteries.

If these readings are outside tolerance, replace the throttle pot.

Figure 3.38. Throttle Pot

Component 10 Controller

The control board regulates the rest of the primary functions. When the throttle pot is depressed, the controller sends the proper output voltage to the motor and brake assemblies, causing the scooter to move. Take a reading from the output terminals on the control board.

Figure 3.39. Controller Forward

Unplug the T3 (motor-) and T4 (motor +) wires from the control board. Set the meter to read a DC volt scale, and ensure that the speed potentiometer is set to the fastest setting (rabbit). Place the red lead of the meter to the T4 terminal (motor +) and the black lead to the T3 terminal (motor-). If the controller board is functioning properly with a good connection and the throttle bar is pressed forward, the meter should read the total battery voltage. See figure 3.39.

The meter reads_____volts.

When the throttle is pressed in reverse, the reading should be a negative reading of approximately 60% of the total battery voltage. See figure 3.40.

The meter reads_____volts.

Reconnect the red and black wires to T3 and T4 terminals.

Figure 3.40. Controller Reverse

If these readings are outside tolerance, replace the Curtis controller.

Component 11 The Brake

Test to ensure that the brake output voltage is correct. When the key is inserted and the unit is powered up, depressing the throttle in either forward or reverse causes the motors to engage and the brake to release. A clicking sound from the rear of the scooter will verify this. The brake assembly is always locked until voltage is applied to it. When voltage is applied to the brake coil, a magnetic field is generated. This field pulls away the plate that locks the brake into place and allows the pad to spin freely, allowing the scooter to move.

Figure 3.41. Brake Voltage

Unplug the 2-pin connector with the two thin white wires going from the controller to the brake assembly. Place the meter leads in the connector coming from the controller. By pressing forward or reverse on the throttle lever, the meter should read the total battery voltage. See figure 3.41.

Depressing the throttle forward, the meter reads_____volts.

Depressing the throttle reverse, the meter reads_____volts.

If the readings are outside tolerance, replace the controller assembly.

Notes:

Component 12 The Motor Harness

Disconnect the red and black wires coming from the controller to the motor assembly at the single pin connectors. With the meter, place the red lead into the red wire connector going to the controller and the black lead into the black connector. By pushing forward on the throttle the meter should read the total battery voltage. See figure 3.42.

Figure 3.42. Motor Forward

The meter reads_____volts.

Figure 3.43. Motor Reverse

In reverse the meter should read approximately a negative 60% of the total battery voltage. See figure 3.43.

The meter reads_____volts.

If either of these readings are outside tolerance, replace the motor harness.

Notes:

Component 13 The Motor/Brake

If the previous readings were within tolerance, check the motor side of the two single pin connectors. These accept the motor wires. Set the multimeter to its lowest resistance (ohms) scale and measure resistance across the motor. Place the red meter lead onto the red connector and the black meter lead onto the black connector. See figure 3.44.

The reading should be approximately between .5 and 3 ohms.

The meter reads_____ohms.

Figure 3.44. Motor Resistance

If the reading is outside tolerance, clean and/or replace the motor brushes. If the problem continues, replace the motor assembly.

Figure 3.45. Brake Resistance

Check the resistance within the brake assembly.

Disconnect the 2-pin connector for the brake wires and place the meter leads on each of the pins going to the brake assembly. See figure 3.45. A reading of approximately 30 - 100 ohms should appear. The reading will depend on the age of the scooter. Older models will read about 45 ohms, newer models will read about 30, 65, or 100 ohms.

The meter reads_____ohms.

If the reading is outside tolerance, replace the brake assembly.

Notes:

Digital Curtis Controllers

The following guide was written for scooters that use the 24 volt/70amp pre-programmed digital Curtis controller. The system has a built in diagnostic system that allows the electronics to detect what the system defines as a "critical fault." The faults are interpreted and displayed on the console as a series of flashes of the status LED. This guide will follow the troubleshooting process of a Digital Curtis Controller, examine the various fault codes, and how to troubleshoot them.

In this guide, we will address the troubleshooting process in several different scenarios as well as each individual fault code. Within the diagnostic testing material, a toolbox icon will appear after each test. The text included with the toolbox will prompt the correct action to be taken in lieu of the outcome of the test. The light bulb icon, will offer additional hints and tips.

While they may appear simple, the following are often overlooked in troubleshooting:
1) Are the batteries fully charged?
2) Are the batteries securely connected to the unit?
3) Is the key inserted?
4) Are all harnesses connected to the controller?
5) Is the unit in freewheel mode?

If at any time you need further assistance please contact Pride Power Chair Technical Service at 1-877-800-1248.

Component 1 The Batteries

Figure 3.46. Battery Test

The voltage originates from the batteries. Take a reading at each individual battery for voltage with a multimeter. See figure 3.46.

The reading should indicate no less then 12.4 volts on either battery. If this is not the case, recharge the batteries and load test. Follow the instructions for load testing in the "Battery Diagnostics" section of this manual.

The left battery reads_____volts DC.

The right battery reads_____volts DC.

If the reading is outside tolerance, replace the battery or batteries. Pride recommends replacing BOTH batteries.

Component 2 Battery Terminal Input Harness

Voltage travels from the batteries through the harnesses. With a multimeter, take a reading of the voltage from each battery. Then take a reading from the battery harnesses. See figure 3.47. The two readings should be the same.

The left battery reads_____volts DC.

The right battery reads_____volts DC.

Figure 3.47. Battery Harness

If these readings are not the same as the readings taken on the individual battery terminals, replace the battery terminal input harness or harnesses.

Component 3 The Circuit Breaker

When the batteries and charger are working properly, the input voltage travels through the circuit breaker. The main purpose of the circuit breaker is to function as a protection device to the electronic system of the scooter. In the occurrence of a severe draw, or short across the batteries, the circuit breaker will trip, effectively disconnecting the batteries from the scooter.

With the meter set to an appropriate DC voltage scale, place the black lead on the most negative battery terminal and the red lead on each terminal of the circuit breaker.

The reading should be equal to a single battery voltage (12.4VDC) and the same on both terminals.

The 1st terminal reads_____volts DC.

The 2nd terminal reads_____volts DC.

If the reading is incorrect, take a resistance reading across the circuit breaker. If an "open" or more than 3 ohms are detected, replace the circuit breaker.

Notes:

Component 4 The Charger

Figure 3.48. Charger Output Harness

If the previous test did not yield at least 24 volts, there may be a problem with the scooter's charging system. To determine where the problem lies, follow these two steps:

Step 1
Unplug the large white 3-pin connector from the charger. Plug the power cord from the back of the scooter into a 120 volt AC source.

With the multimeter still set for DC, measure across the two outside pins of the large white 3-pin connector. See figure 3.48.

The reading should indicate approximately 25-30 volts DC.

When taking the output voltage from the charger, allow the reading to normalize before documenting the reading. This could take a few minutes.

The meter reads_____volts DC.

If this reading is outside tolerance, replace the battery charger.

Step 2
Take a reading on the two outside pins of the charger harness coming from the controller. See figure 3.49. The reading should indicate the total battery voltage (approximately 24 volts).

Figure 3.49. Controller Charger Harness

The meter reads_____volts DC.

If this reading is outside tolerance, replace the controller charger harness.

Notes:

Component 5 The Controller

The voltage leaves the circuit breaker, travels through the controller, and up to the console through the front-to-rear controller interface harness.

Disconnect the front-to-rear interface harness from the controller. While holding the controller side of the harness horizontally (3 rows of 5 pins), with a single "D" shaped pin on the left and two (2) "D" shaped pins on the right, take a reading from the bottom row second pin from the left (#10) to the most negative battery terminal (see figure 3.50) or, from pin #10 (+) to pin #1 (-).

The reading should be the total battery voltage (approximately 24 volts DC).

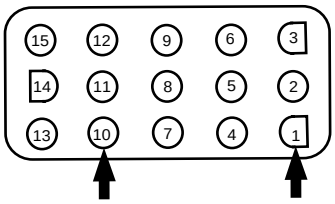


Figure 3.50. 15-pin Front-to-Rear Harness

The meter reads_____volts DC.

If this reading is outside tolerance, replace the controller.

Component 6 The Controller Interface Harness

The voltage continues from the controller through the controller interface harness to the front-to-rear cable. Depending on the model of scooter, the voltage may travel through a controller interface harness before reaching the front-to-rear harness. The Legend and Celebrity use a 15 to 28-pin controller interface harness. The Sundancer uses a 15 to 15-pin controller interface harness.

Legend and Celebrity:
Unplug the front-to-rear harness from the rear pod (28-pin connector). Take a voltage reading from pin #1 on the pod (female) side of the 28-pin connector (top row most right pin), to the most negative battery terminal. See figure 3.51. The reading should be equal to the total battery voltage.

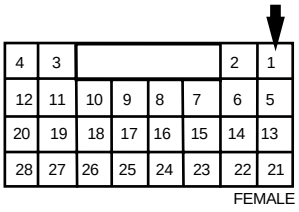


Figure 3.51. 28-pin Controller Interface Harness

The meter reads_____volts DC.

Sundancer:
Unplug the front-to-rear harness from the rear pod (15-pin connector). Holding the pod side of the harness so that the two "D-shaped" pins run across the top row, take a voltage reading from the top right pin (#3) of the 15-pin connector to the most negative battery terminal. See figure 3.52. The reading should be equal to the total battery voltage.

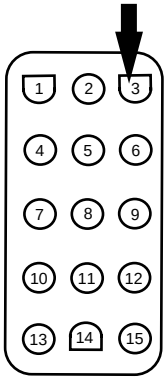


Figure 3.52. 15-pin Front-to-Rear Harness

The meter reads_____volts DC.

If this reading is outside tolerance, replace the controller interface harness.

Component 7 The Front-to-Rear Harness

The front-to-rear harness carries voltage from the rear of the scooter to the console. The front end of the front-to-rear harness may be one of three configurations depending on scooter model. The Legend 2000 and Celebrity 2000 have a male 20-pin connector, the Revo and Sonic use an in-line 8-pin connector, and the Sundancer uses an in-line 12-pin connector.

Legend 2000 and Celebrity 2000

Unplug the 20-pin front-to-rear harness (Celebrity - plugs into a console interface harness, which plugs into the console; Legend - plugs into an octopus harness) and hold the harness so that the beveled corners are on the bottom. Take a voltage reading from pin #1 (top right pin) to the most negative battery terminal. See figure 3.53. The reading should be equal to the total battery voltage.

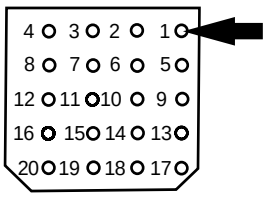


Figure 3.53. 20-pin Front-to-Rear Harness

Revo and Sonic

Unplug the 8-pin front-to-rear harness that plugs into the console board. Take a voltage reading from pin #1 (red wire) to the most negative battery terminal. See figure 3.54. The reading should be equal to the total battery voltage.

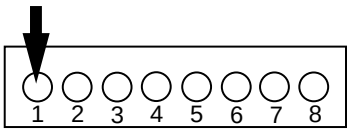


Figure 3.54. 8-pin Front-to-Rear Harness

Sundancer

Unplug the 12-pin front-to-rear harness that plugs into the console board. Take a voltage reading from pin #1 (red wire) to the most negative battery terminal. See figure 3.55. The reading should be equal to the total battery voltage.

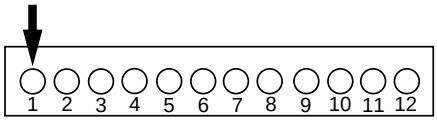


Figure 3.55. 12-pin Front-to-Rear Harness

The meter reads_____volts DC.

If this reading is outside tolerance, replace the front-to-rear harness.

Component 8 Console Interface Harness

The voltage travels from the front-to-rear cable to the key switch. This happens in a couple of different ways depending on scooter model. Legend and Celebrity scooters use a console interface harness that connects to the key switch. On the Sonic, Revo, and Sundancer scooters, the front-to-rear harness connects to the console board and through the board to the key switch. Celebrity scooters use a console interface harness to connect to the console board, and through the board to the key switch.

Legend 2000 and Celebrity 2000

Unplug the key switch from the console interface harness. The 2-pin connector contains a red and brown wire. On the console interface harness side of the 2-pin connector, take a voltage reading from the red wire to the most negative battery terminal. The reading should be equal to the total battery voltage.

Revo, Sonic, and Sundancer

Unplug the key switch from the console board. The key switch has a 2-pin connector containing a red wire and a brown wire. Take a voltage reading from the pin on the console board that accepts the red wire to the most negative battery terminal. The reading should be equal to the total battery voltage.

The meter reads_____volts DC.

If all harnesses pass continuity check, replace the controller interface harness.

Component 9 Key Switch

Check to ensure that the key has continuity. Make sure that the key is turned to the on position and set the multimeter to measure resistance (ohms).

Take a reading across the two pins of the key switch. See figure 3.56. The reading should indicate less than one ohm.

The meter reads_____ohms.

Figure 3.56. Key Switch

If this reading is outside tolerance, replace the key switch.

Component 10 Console Continuity

If the unit still shows no power, check all the connections for broken or bent pins. Also, check the connectors for possible corrosion. It is also possible that when the key is turned on, the wire that returns the voltage to the controller may be broken. Check this by performing a continuity test on the console interface, the front-to-rear, and the controller interface harnesses. If all these test well, replace the controller.

Describing Faults

If the scooter is set up for self-diagnostics, you can identify potential faults on the console as a series of flashes of the status light, or with an audible beep (from the rear of the scooter). These beeps are separated by short and long pauses. A long pause indicates the end of the fault code. For a list of all scooter fault codes, see Appendix K.

Notes:

Egis Controllers

This guide was written for Scooters that utilize the Penny & Giles Egis Controller.

In this guide, we will address the troubleshooting process in several different scenarios as well as each individual fault code. Within the diagnostic testing material, a toolbox icon will appear after each test. The text included with the toolbox will prompt the correct action to be taken in lieu of the outcome of the test. The light bulb icon, will offer additional hints and tips.

While they may appear simple, the following are often overlooked in troubleshooting:
1) Are the batteries fully charged?
2) Are the batteries securely connected to the unit?
3) Is the key inserted?
4) Are all harnesses connected to the controller?
5) Is the unit in freewheel mode?

If at any time you need further assistance please contact Pride Power Chair Technical Service at 1-877-800-1248.

Component 1 The Batteries

Figure 3.57. Battery Test

The voltage originates from the batteries. Take a reading at each individual battery for voltage with a multimeter. See figure 3.57.

The reading should indicate no less then 12.4 volts on either battery. If so, then recharge the batteries, and load test them again. Refer to the "Battery Section" of this manual for instructions on load testing.

The left battery reads_____volts DC.

The right battery reads_____volts DC.

If the reading is outside tolerance, replace the battery or batteries. Pride recommends replacing BOTH batteries.

Component 2 Battery Terminal Input Harness

Voltage travels from the batteries through the harness. With a multimeter, take a voltage reading from each battery. Then take a reading from the battery harnesses. See figure 3.58. The readings should be the same. Reconnect the batteries.

Figure 3.58. Battery Harness

The left battery reads:_____volts DC.

The right battery reads:_____volts DC.

If these readings are not the same as the readings taken on the individual battery terminals, replace the battery terminal input harness or harnesses.

Component 3 The Circuit Breaker

When the batteries and charger are working properly, the input voltage travels through the circuit breaker.

The main purpose of the circuit breaker is to function as a protection device to the electronic system of the scooter. In the occurrence of a severe draw, or short across the batteries, the circuit breaker will trip, effectively disconnecting the batteries from the scooter.

To check the circuit breaker, use the most negative battery terminal as a ground, and check the voltage from both sides of the circuit breaker.

The reading should indicate approximately 12.4 volts on both sides.

The 1st tab reads_____volts DC. **The 2nd tab reads_____volts DC.**

If the reading is outside tolerance, take a resistance reading across the circuit breaker. If an "open" or more than 3 ohms are detected, replace the circuit breaker.

Component 4 The Charger

Figure 3.59. Charger Output Harness

If the previous test did not yield at least 24 volts, there may be a problem with the charging system.

Unplug the large white 3-pin connector from the charger. Plug in the power harness cord from the back of the scooter to a 120 volt outlet.

With the multimeter, test the two outside pins of the cord coming from the charger. See figure 3.59.

The reading should indicate approximately 25-30 volts DC.

The meter reads_____volts DC.

If this reading is outside tolerance, replace the battery charger.

If voltage is present, take a reading from pin #1 (-) to pin #2 (+) of the charger/ programming port located on the controller. See figure 3.70.

The reading should be equal to the total battery voltage.

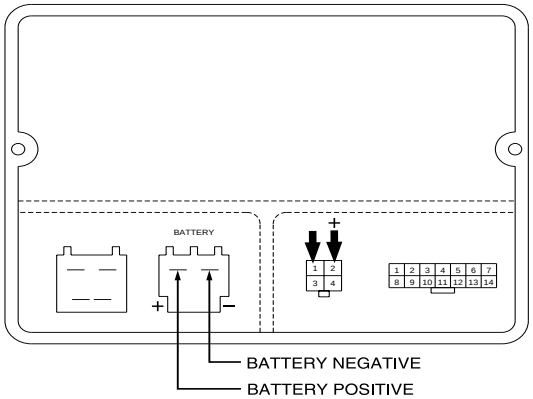


Figure 3.60. Charger/Programmer Port

The meter reads_____volts DC.

If the reading is outside tolerance, verify that the battery harness is plugged into the Egis controller. If the reading is within tolerance, check 15 amp fuse in the charger interface harness. See Appendix T. If the fuse checks good, replace the charger interface harness.

Component 5 The Front-to-Rear Harness

The voltage travels from the controller through the controller interface harness to the front-to-rear harness. Unplug the front-to-rear harness from the pod. Looking at the pod side of the harness, check for voltage from pin #10 to pin #1. See figure 3.61. The reading should indicate the total battery voltage.

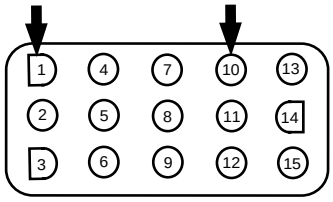


Figure 3.61. Controller Interface Harness

If this reading is outside tolerance, take a voltage reading from pin #1 of the 14-pin connector located on the Egis controller to the most negative battery terminal. See figure 3.62. This reading can also be taken across pin #1 and pin #10. The reading should be equal to the total battery voltage.

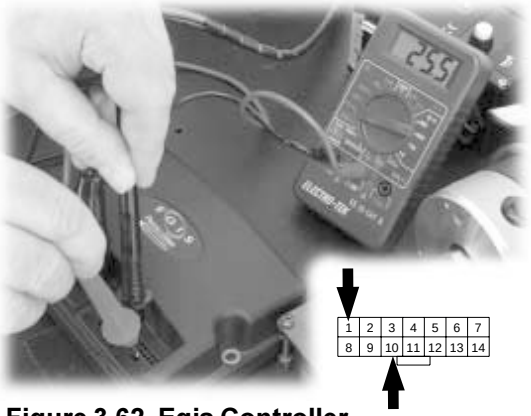


Figure 3.62. Egis Controller

The meter reads_____volts DC.

If this reading is within tolerance, replace the controller interface harness. If the reading is outside tolerance, replace the Egis controller.

Component 6 The Console Interface Harness

The voltage travels up to the console on the front-to-rear harness. The front-to-rear harness attaches to the console board via a 10-pin connector on the Victory XL4 and a 13-pin connector on the Legend 2002. In either case, take a reading from the red wire of the harness to the most negative battery terminal. The reading should be equal to the total battery voltage.

The meter reads_____volts DC.

If this reading is outside tolerance, replace the front-to-rear harness.

Component 7 The Console and Turn Signal Board

Voltage travels to the console board and then to the keyswitch connector (CN 16 on Victory XL 4 and CN 2 on Legend 2002).

Unplug the keyswitch and measure the voltage from the most negative battery terminal to the pin on the console board where the red wire was connected. See figures 3.63 and 3.64. The reading should be equal to the total battery voltage.

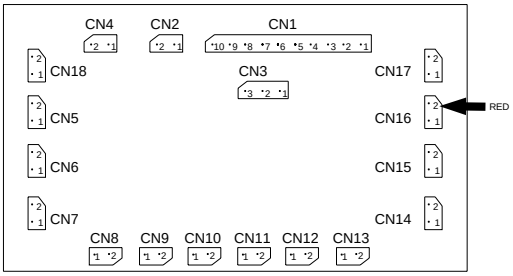


Figure 3.63. Victory XL 4 Console Board

The meter reads_____volts DC.

CN1 Front-to-Rear
CN2 Fuse
CN3 Key Switch
CN4 Throttle Pot
CN5 Speed Pot
CN6 Hazard
CN7 Left Turn Signal Switch
CN8 Left Turn Signal Bulb
CN9 Left Turn Signal LED
CN10 Right Turn Signal LED
CN11 Right Turn Signal Bulb
CN12 Right Turn Signal Switch
CN13 Left Horn Switch
CN14 Right Horn Switch
CN15 Horn Buzzers
CN16 Upper Head Light Bulb
CN17 Upper Head Light Switch
CN18 Mode (not used)
CN19 Voltmeter/Lower Head Light Bulb and Switch
CN20 Status LED
CN21 Power Seat (Not used)

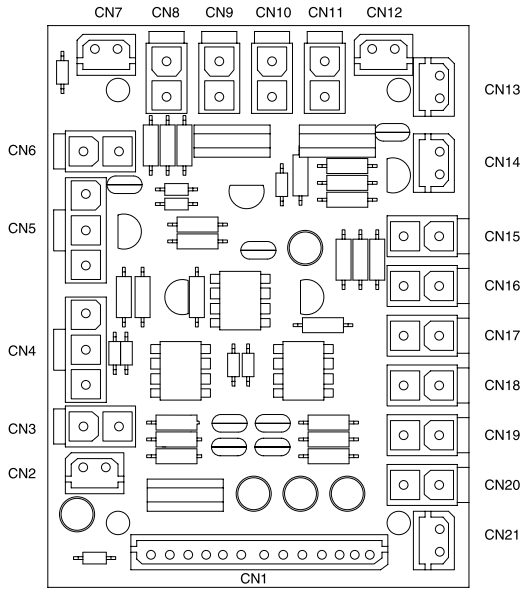


Figure 3.64. Legend 2002 Console Board

If this reading is outside tolerance, check the 5-amp ato fuse located on the tiller. See Appendix T. If the fuse is good, replace the console and turn signal board.

Component 8 Console Resistance

With the keyswitch still unplugged, measure the resistance across the 2-pin connector with the key in the "on" position. The reading should indicate less than one ohm of resistance, if not replace the key switch.

With the key switch plugged back in, check for voltage from the most negative battery terminal to the tan colored wire of the CN1 connector on the console turn signal board. The reading should be equal to the total battery voltage.

The meter reads_____volts DC.

If this reading is outside tolerance, replace the console and turn signal board.

Component 9 Console Continuity

Voltage travels back to the Egis controller on the tan wire to pin #8 of the 14-pin connector located on the Egis controller.

With the key in the "on" position the controller powers on and waits for a command from the throttle pot. If after depressing the throttle control lever in either direction you have no response, unplug the 14-pin connector from the Egis and measure the resistance from pin #8 of the harness to the tan wire of the CN1 connector on the console board. See figure 3.65. The reading should indicate less than one ohm resistance.

The meter reads_____ohms.

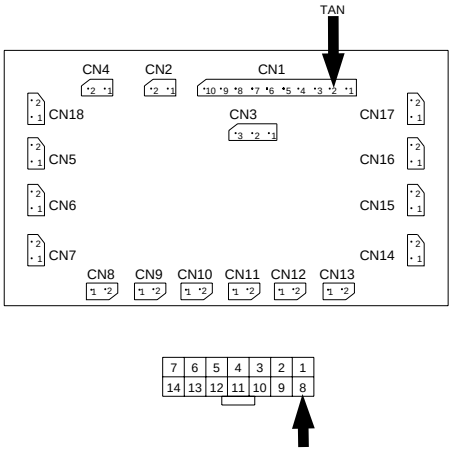


Figure 3.65. Continuity Test

If the reading is outside tolerance, replace the front-to-rear harness. If the reading is within tolerance, proceed to the next step.

Component 10 The Throttle Potentiometer (pot)

The Egis controller will continue to monitor the dropping of voltage across the throttle pot. This is how the controller determines how fast and in which direction the scooter should move. Get a reading across the throttle pot from the black 14-pin connector at the controller.

Unplug the batteries and unplug the 14-pin connector from the Egis controller. Set the multimeter to measure 20K resistance (ohms). With the speed pot (Turtle/Rabbit) turned to the fastest setting (Rabbit), take the following readings:

From the #5 pin to the #7 pin, the reading should be approximately 2500 ohms (2.5K). See figure 3.66. Pressing the throttle control lever in either direction should yield a noticeable resistance change (±2500 ohms).

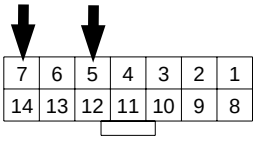


Figure 3.66. 14-pin Interface Harness

Without depressing the throttle, the meter reads_____ohms.

Depressing the throttle forward, the meter reads_____ohms.

Depressing the throttle reverse, the meter reads_____ohms.

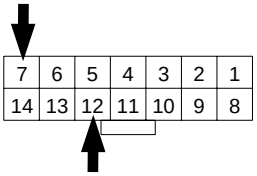


Figure 3.67. 14-pin Interface Harness

Perform the same test from pin #12 to pin #7. See figure 3.67. Pressing the throttle control lever in either direction should yield a resistance change of ±2500 ohms (2.5K).

Without depressing the throttle, the meter reads_____ohms.

Depressing the throttle forward, the meter reads_____ohms.

Depressing the throttle reverse, the meter reads_____ohms.

Check for resistance across the whole throttle pot. Without depressing the throttle bar, take a reading of resistance from pin #12 to pin #5. See figure 3.68. A reading of approximately 5000K (5K) should appear.

The meter reads_____ohms.

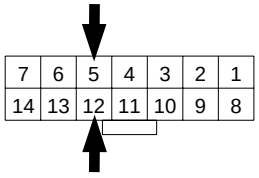


Figure 3.68. 14-pin Interface Harness

If these readings do not appear to be within tolerance, there is most likely a break in one of the wires. Follow the necessary wires back to the throttle pot to determine where (if) a break has occurred and replace the necessary harness. If the readings are traced back to the throttle pot and are still outside tolerance, proceed to the next step.

Notes:

Check the throttle pot by taking the following readings at the console:

Locate and disconnect the 3-pin harness from the throttle pot to the console board. With a multimeter, take a resistance reading from the red wire to the blue wire. Pressing the throttle control lever in either direction should yield a resistance change of ±2500 ohms (2.5K). See figure 3.69.

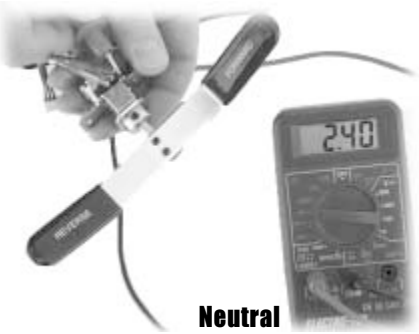
Without depressing the throttle, the meter reads_____ohms.

Depressing the throttle forward, the meter reads_____ohms.

Depressing the throttle reverse, the meter reads_____ohms.

Figure 3.69. Throttle Pot

Take a reading from the blue to the black wire. The meter should read 2500 ohms (2.5K). Pushing the throttle control lever in either direction should yield a resistance change of ±2500 ohms (2.5K). See figure 3.70.

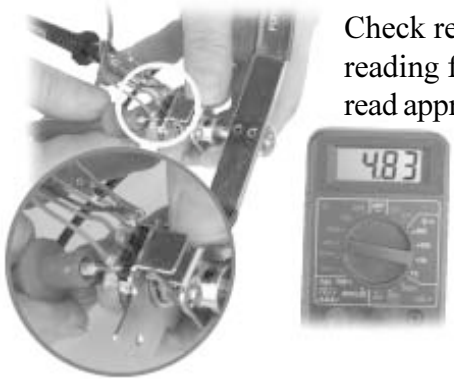


Without depressing the throttle, the meter reads_____ohms.

Depressing the throttle forward, the meter reads_____ohms.

Depressing the throttle reverse, the meter reads_____ohms.

Figure 3.70. Throttle Pot



Check resistance across the whole potentiometer by taking a reading from the black wire to the red wire. The meter should read approximately 5000 ohms (5K). See figure 3.71.

The meter reads_____ohms.

Figure 3.71. Throttle Pot

If these readings are outside tolerance, replace the throttle pot.

Component 11 The Motor/Brake

Unplug the 4-pin connector from the left side of the Egis controller. With the meter set to resistance measure across the two larger pins of the harness. See figure 3.72.

The reading should indicate approximately 30 to 100 ohms.

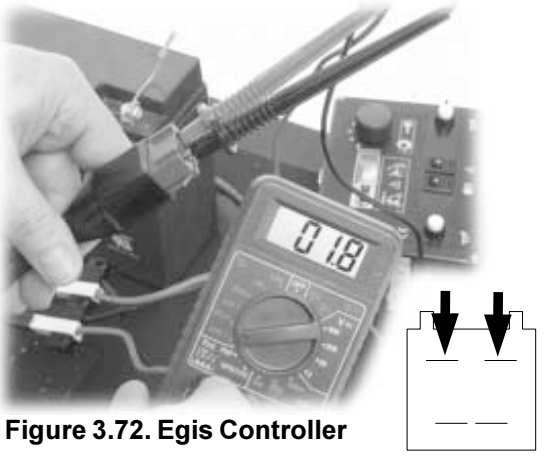


Figure 3.72. Egis Controller

The meter reads_____ohms.

If the reading is outside tolerance (open or more than 3 ohms), check the brushes. If the brushes are good, replace the motor assembly.

Measure across the two smaller pins of the harness. This will be the resistance reading of the brake. See figure 3.73. The reading should indicate approximately 45-65 ohms.

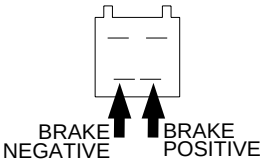


Figure 3.73. Egis Motor Connection

The meter reads_____ohms.

If the reading is outside tolerance, replace the brake assembly.

If the Egis does not see the motor and brake resistance, it will not allow the scooter to operate in any direction.

Describing Faults

If the scooter is set up for self-diagnostics, you can identify potential faults on the console as a series of flashes of the status light, or with an audible beep (from the rear of the scooter). These beeps are separated by short and long pauses. A long pause indicates the end of the fault code. For a complete list of scooter fault codes, see Appendix L.

Notes: