

Troubleshooting the PowerGrip

Required: Simple Voltmeter with continuity test option, or separate continuity tester. (Continuity means there is a complete circuit which is usually indicated by a light or buzzing sound.)

PowerGrip Control Wire

First try replacing the 6 foot (1.5 m) PowerGrip Control Wire with 1/8" (3.5 mm) male plugs at both ends that runs from the PowerGrip controller, along the wearer's arm, to the PowerGrip actuator. More often than not this wire has been pinched or otherwise damaged and can result in erratic behavior. For your convenience, a 3-pack of replacements among other replacement parts are available on the Broadened Horizons website PowerGrip Components page for \$35 or they are available from most electronics stores such as RadioShack (part #42-2420) or Wal-Mart for a few dollars.



http://www.gimpgear.US/powergrip_components.htm

<http://www.radioshack.com/product/index.jsp?productId=2102950&cp>

Sometimes the wire may be referred to as an "Audio Dubbing Cable". Mono is preferred and slightly less expensive but stereo will work fine. Remember to keep a spare on hand. If this does not resolve the problem, continue to the next section, *Test Power Input*.

If you'd like to test the wire, set the voltmeter for continuity or use the continuity tester. Touch your probes together to be sure it's working. Wiggle the wire for each of the following steps near the plugs at each end and on either side of any points in the wire that are suspect to suspicion on visual inspection. However, intermittent problems can be difficult to detect at times, in which case just replace the wire. (The tip and base of each plug is separated by a black band.)

1. Touch each probe to the tip of each plug at either end of the wire. You should have continuity.
2. Touch each probe to the base of each plug at either end of the wire. You should have continuity.
3. Touch a probe to the tip of one of the plugs, and touch the other probe to the base of the plug at the other end of the wire. You should not have continuity.
4. Reverse step #3 by moving the probe that was on the tip of the first plug to that plug's base, and the probe that was on the base of the second plug to that second plug's tip.

Broadened Horizons recommends attaching the PowerGrip controller under the wheelchair seat with the supplied Velcro. Then route the PowerGrip Control Wire between the seat cushion and bottom of the back rest, entering under the wearer's shirt at the hip, up inside shirt to the armpits and then down inside the sleeve of the wearer's shirt to where it plugs into the PowerGrip actuator. Avoid any locations where the wire might be pinched and secure it in place with wire ties as necessary. When the PowerGrip is removed at night, simply wrap the control wire around the wheelchair headrest or push handle so it does not fall and get caught in the wheelchair wheels when it is being moved or prepared for charging by an assistant. If the PowerGrip is not being worn while the user is in the wheelchair during the day, either unplug the PowerGrip Control Wire from the controller and store it in a bag on the wheelchair, or be sure it is coiled up and secured to the wheelchair with a twist tie which can be opened and closed repeatedly where it will not get caught or pinched.

Test Power Input

1. Set the voltmeter to 20 VDC (or closest setting above 12 VDC)
2. Place the red or positive probe into the center of the power plug (either the wire coming from the lithium-ion battery or from the Wheelchair Battery Power Adapter)

3. Touch your black or negative probe to the outside of the power plug. It should read somewhere between 9 V and 13 V. If you read a negative voltage see part c.
 - a. *Lithium-Ion Battery Pack:* The splint and controller will likely operate down to 6 V but with degraded performance. If you are detecting less than 9 V try plugging the battery charging AC adapter into the PowerGrip controller to continue testing and recharge the battery. If the battery will not achieve a charge of between 12 V and 13 V, test the output from the battery charger to confirm it is between 12 V and 13 V.
 - b. *Wheelchair Battery Power Adapter:* Check if the input power red LED indicator is lit. If it is not lit, check for proper connections, a blown fuse, and damage to the wires leading to the adapter. If the red LED indicator is lit, and an output voltage is detected but is less than 0.5 V, the Wheelchair Battery Power Adapter may need to be replaced.
 - c. *Negative Voltage:* If this is indicated with the Wheelchair Battery Power Adapter, the plug on the end of the universal 2 prong output wire might be reversed. Try flipping it and check with your voltmeter again. The inside of the plug should be positive and the outside negative otherwise the PowerGrip controller will do nothing.

Test the Control Switches

1. Inspect the switches for sticking and carefully follow both lengths of wire inspecting for any points where it may have been pinched or frayed.
2. Set a voltmeter to its continuity test setting or use a continuity tester. Touch the probes together to be sure it's working.
3. Choose one of the switch male plugs. Touch one probe to base of plug, touch the other probe to the tip of the plug (a black band separates the base from the tip of the plug)
4. Press both buttons. You should not have continuity until the button corresponding to the plug your testing is pressed down. Try wiggling the wire at a few different locations while holding the button down to ensure there are no breaks in the wire. If continuity stops while you are wiggling the wire and the button is held down this would indicate a damaged wire.
5. Repeat with the other switch's male plug.

Test Output from PowerGrip Controller to Power Actuator

1. Set the voltmeter to 20 VDC (or closest setting above 12 VDC)
2. Be sure Power and control switches are properly connected to the PowerGrip Controller.
3. Unplug the PowerGrip Control Wire from the PowerGrip Actuator female jack.
4. Touch the red or positive probe to the tip of the plug and touch the black or negative probe to the base of the plug. (if the probes are reversed it does not matter, as long as one is touching the plug tip and one is touching the plug base)
5. Operate the control switches. When you operate one switch you should see +12 V, and when you operate the other you should see -12 V. (Actually the voltage will be equal to the voltage detected when testing the power input, but should be between ± 9 V and ± 13 V)

PowerGrip Actuator

If the results of step #5 from *Testing the Output from the PowerGrip Controller* are successful as described, yet the PowerGrip still operates erratically, the short wire running from the PowerGrip Actuator female jack to the actuator housing may be damaged. This can be tested by operating the PowerGrip while slowly wiggling the wire close to the jack, close to the actuator housing, and any points in between where the wire has been bent or flexed repeatedly. Depending where the damage is, it might be possible to repair it by cutting the wire at the break and replacing the PowerGrip Actuator female jack or the actuator, wire, and jack assembly can be replaced in entirety.