



Model A / M

Manual

For Device Maintenance

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1 Device Maintenance at a Glance

WHILL Maintenance Overview

Materials and Tools

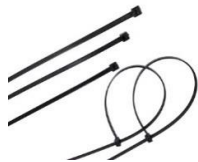
The following tools are needed to properly configure WHILL device components:



Metric Allen key set. Most of the configurations on the device require the loosening of hex screws. In particular, the #2.5 #3, #4, #5, and #6 Allen keys are absolutely necessary. *Note: For metric tools, there are numbers associated with different sizes that all refer to their diameter (e.g., a hex wrench that reads “3” is a 3mm diameter hex wrench).*

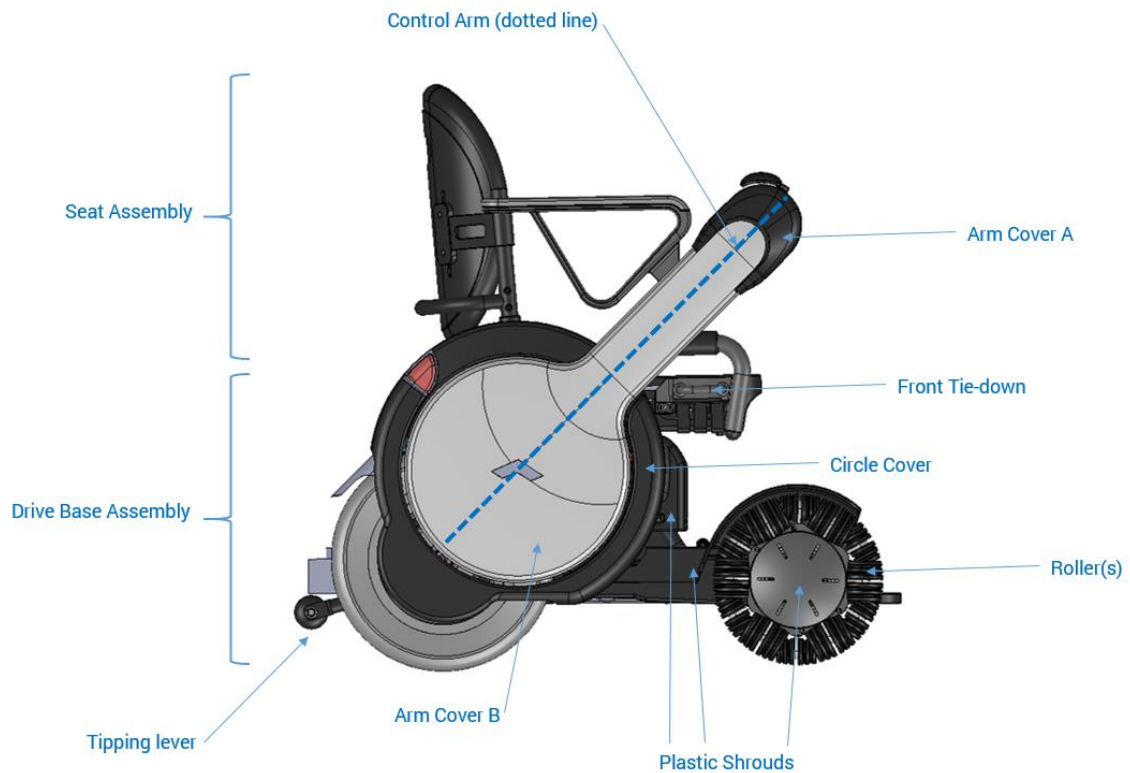
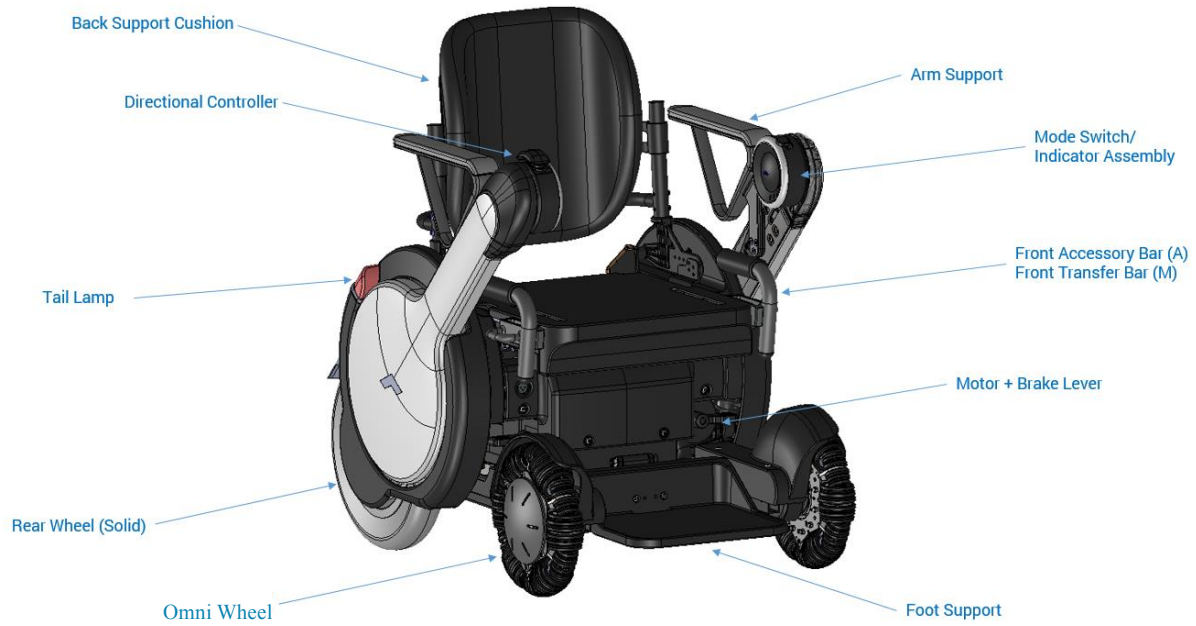


Socket ratchet, metric socket set, and extensions. For these tools, it is important to have multiple extension lengths to reach difficult locations on the device. The only socket size required is #12 (12 mm). If possible, use an adjustable torque wrench to properly fasten the bolts at a given “optimal” torque setting (to be given later in this document).



Clippers and zip ties. There are components on the WHILL device that are connected to each other via electrical wiring. These zip ties prevent loose hanging wires and also provide some measure of strain relief. When configuring or exchanging components, be sure to note the location of existing zip ties before removing them, and replace them after the configuration is complete. It helps to work on one side at a time to maintain a reference.

WHILL Model-A/M Naming Convention



2 Servicing the WHILL Device

Arm Cover A

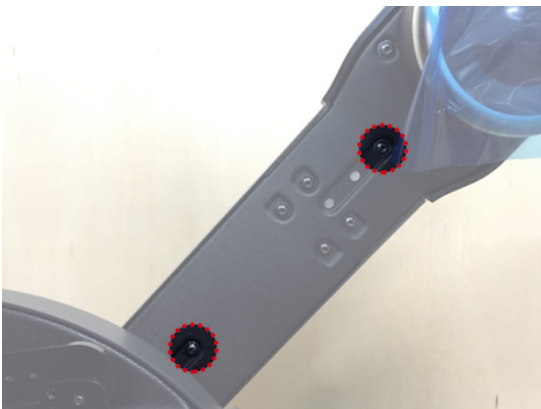


Materials Needed

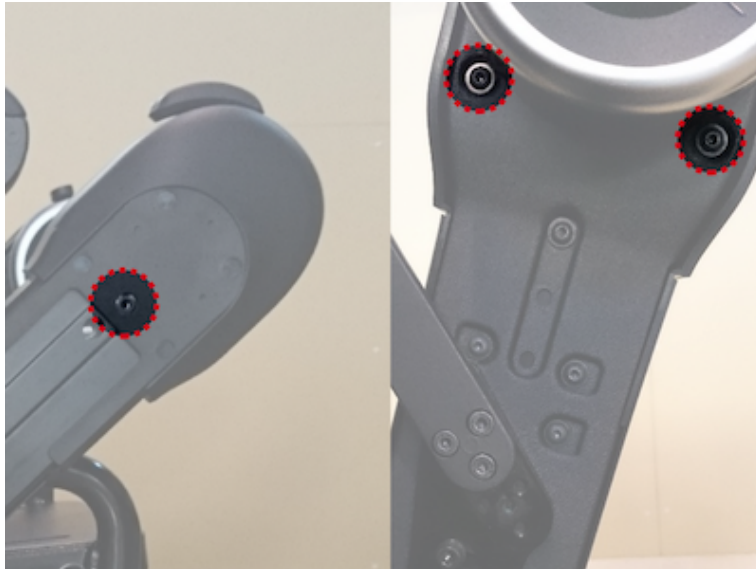
#3 Allen wrench

Procedure

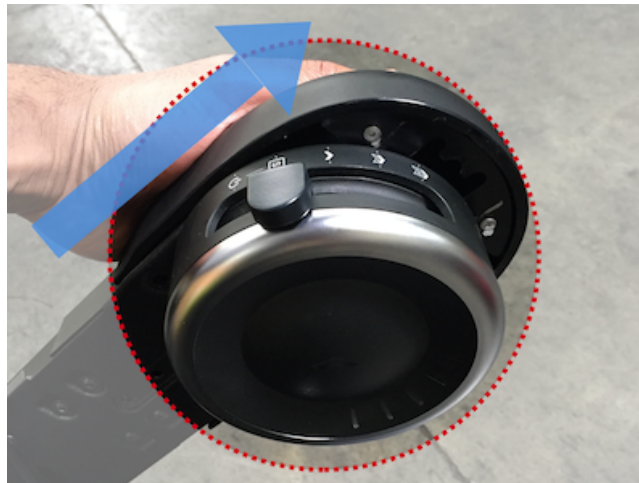
Remove arm cover B. Remove the two centerline screws on the inside of the arm. Then pull arm cover B straight out. *Note: first image below does not show Model M's arm supports.*



Unscrew arm cover A. Unscrew arm cover A by first unscrewing the two inner bolts followed by the single outer bolt.



Remove arm cover A. Pull the cover straight up (you might have to wiggle it a little). *Note: be careful not to snag the wiring underneath.*



Replace arm cover A. Replace the cover by following these steps in reverse. *Note: be careful to not damage the wiring or board when sliding the cover back on.*

Replace arm cover B. Line the two shafts on the inside of the arm cover up with the holes on the arm, and then slide it into place. Pat the circular portion to attach the velcro.

Fasten arm cover B. Fasten the main arm cover using the two screw holes on the centerline of the inside of the arm. It is recommended to start by hand to prevent cross threading.

Arm Cover B

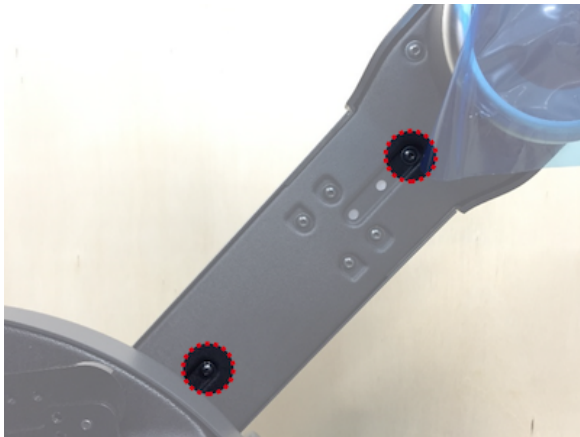
Materials Needed

#3 Allen wrench

Procedure (Model A/M)

Remove arm cover B. Remove the two centerline screws on the inside of the arm. Then pull arm cover B straight out.

Note: first image below does not show Model M's arm supports.



Replace arm cover B. Line the two shafts on the inside of the arm cover up with the holes on the arm, and then slide it into place. Pat the circular portion to attach the velcro.

Fasten arm cover B. Fasten the main arm cover using the two screw holes on the centerline of the inside of the arm. It is recommended to start by hand to prevent cross threading.

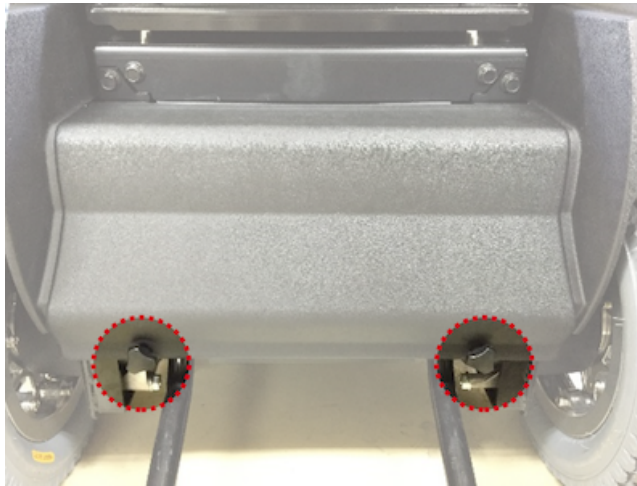
Arm Root

Materials Needed

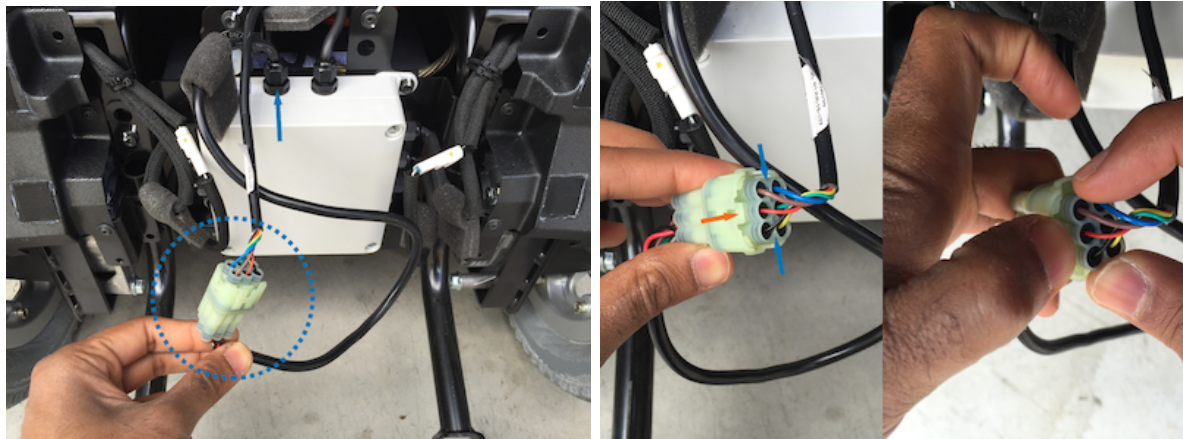
#3 Allen wrench
#4 Allen wrench
#12 socket
zip ties + clippers
Ratchet with extension

Procedure (Model A/M)

Remove the rear cover. Make sure the device is powered down, then unscrew the two grip bolts, and pull the cover off.



Unplug the seat actuator. Pull the seat actuator cable out from under the device (top left cable). Cut the zip tie and unplug the cable by pulling up the small tab (orange arrow) on the outer plug and pinching the rear plastic plug inner plug (blue arrows). *Note: make sure to pull on the plug itself and not on the wires.*



Thread the cable. Thread the portion of the seat actuator cable connected to the device through the top cover to ensure the cable is free when you remove the seat.



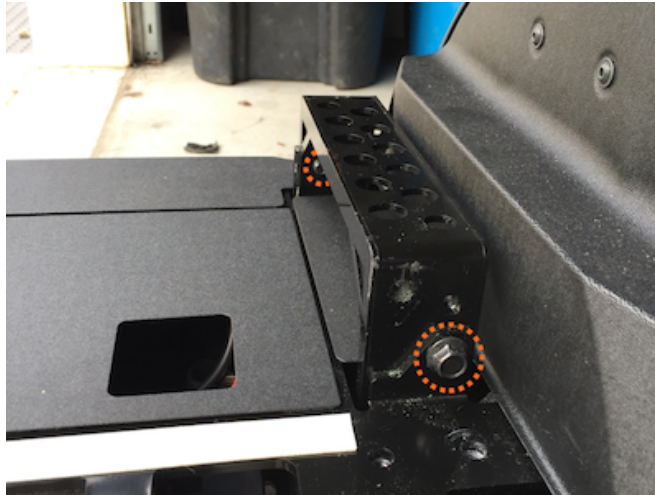
Unscrew the seat assembly. To remove the seat, first unscrews the top two bolts that attach the seat assembly to the seat height bracket. Next, unscrew the two bolts, in the same location, on the front of the seat assembly.



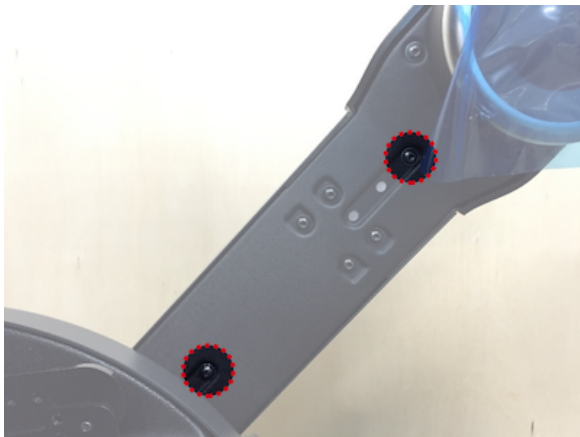
Remove the seat assembly. Place both arms to the upright position. While making sure the actuator cable doesn't snag, lift the seat assembly straight up and off the device. When placing the seat assembly down, make sure to place the seat on a flat surface, with the rear propped to prevent the actuator cable from getting pinched.



Remove the seat height bracket. Unscrew the 2 bolts on each of the seat bracket with a #12 socket (only the rear bolt circled in picture).



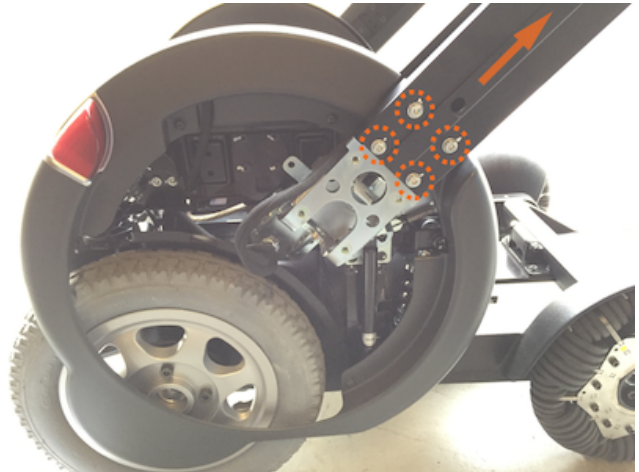
Remove arm cover B. Remove the two centerline screws on the inside of the arm. Then pull arm cover B straight out. *Note: first image below does not show Model M's arm supports.*



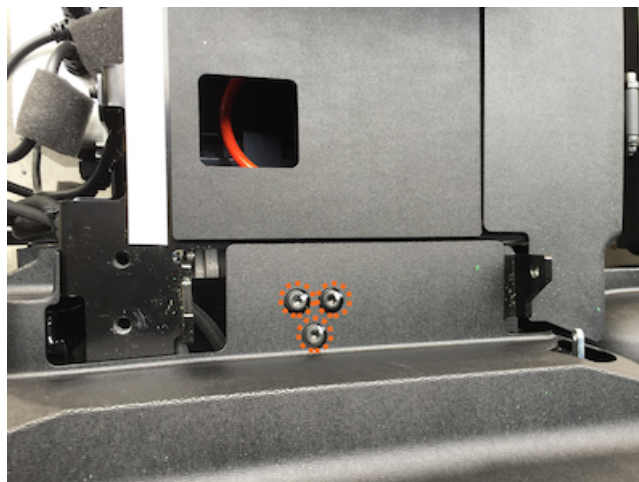
Remove the circle frame. Cut the two zip ties, marked with an x, and remove the four bolts, circled, with a #4 allen.



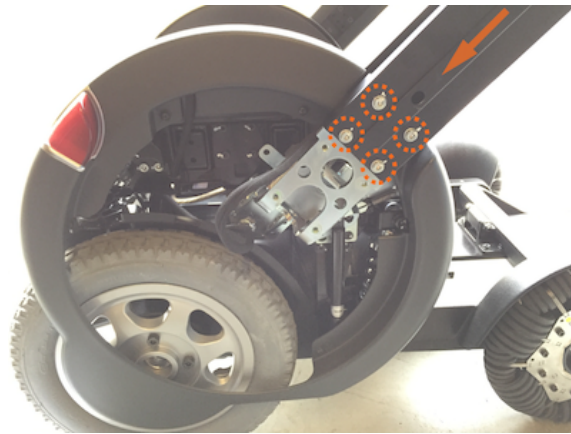
Remove arm frame. Remove the 3 zip ties, marked with an x (2 in one spot). Then unscrew the four bolts with a #4 allen, circled in second picture, and pull the arm frame off the arm root. Carefully rest the arm down on something soft.



Replace the arm root. Unscrew the 3 circled screws with a #5 Allen while holding onto the arm root. Replace it with the new one. Tighten the screws just enough that it holds into place.



Adjust the arm lock. Replace the arm framed removed previously by replacing the 4 circled bolts with a #4 allen. Next, check the arm lock sensitivity by locking and unlocking the arm at its lowest position. If it feels loose or tight, loosen the 3 arm root screws, reposition the arm root, and then retighten the screws. Once it's adjusted properly (you can test against the opposite arm) tighten the arm root screws completely.



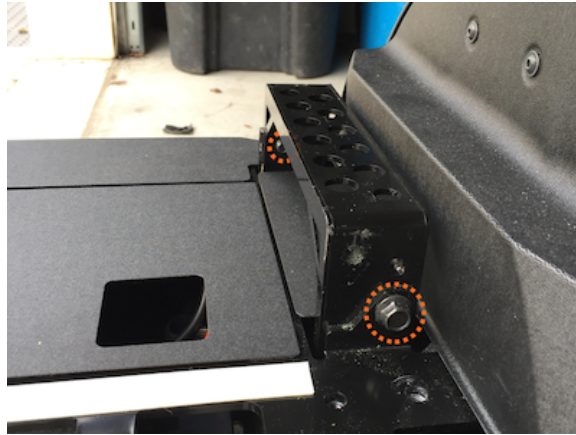
Replace the arm root zip ties. Replace all 3 zip ties removed, each marked with an x, with two in one spot.



Replace the circle frame. Replace the four circled bolts with a #4 allen and secure the cable by replacing two zip ties, each marked with an x.



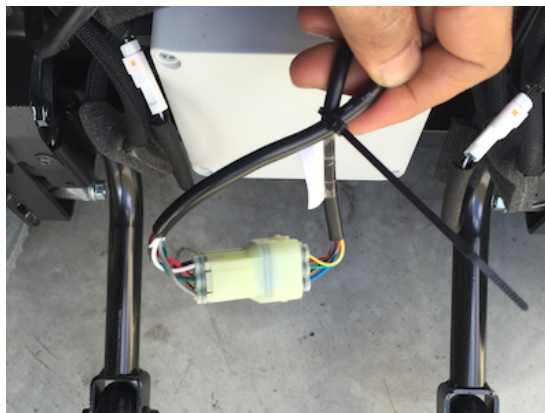
Replace the seat height bracket. Replace the bolts on the front and rear of the seat bracket at the correct height setting. Do not completely tighten.



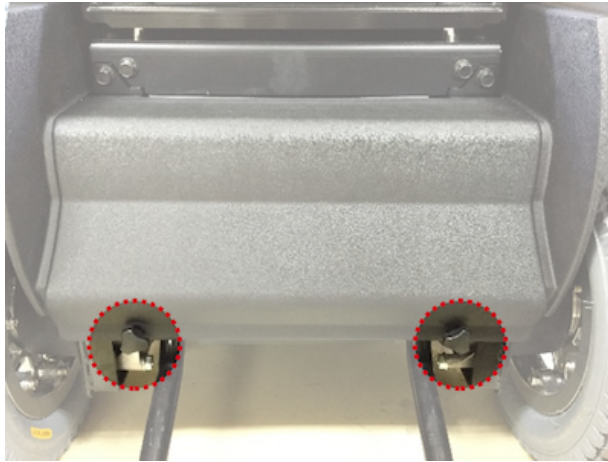
Replace the seat assembly. While holding the actuator cable, lift up the seat assembly and carefully replace it onto the seat height brackets. Angle the back up, and thread the cable through the top cover. Replace all the top four seat assembly bolts (two in the back and two in the front). Then tighten all the seat height bracket screws from the previous step.



Replug the seat actuator. Replug the seat actuator cable and zip tie the two cables for wire strain relief. Cut the excess zip-tie.



Replace the rear cover. Line up the holes on the bottom of the rear cover and main frame and guide the top of the cover into place. Re-insert and tighten the two grip bolts.



Arm Support (Model M Only)

Materials Needed

#4 Allen wrench

#5 Allen wrench

8x M6 18mm flanged bolts

6x M6 8mm cheese head bolts

Spare arm support

Procedure

Slide the seat and raise arm. Using the seat slide, move the seat all the way forward and raise up the right arm.



Install the angle adjustment bracket. On the inside of the arm, install an angle adjuster bracket in the correct orientation on the inner arm bracket circled above using 4 flanged M6 bolts. To determine a level starting position, use your WHILL's seat and arm angle with the chart below.



		Arm Angle			
		45	48	51	54
Seat Angle	1				
	4				
	7				
	10				

Install the arm support. Install the right arm support (recessed holes face towards user) using 3 of the smaller M6 bolts at the desired height. *Note: the bolts should sit flush in the arm support.*



Repeat on the left side. Repeat the steps above on the other side, matching the angle and height settings on the right side.

Battery

Materials Needed

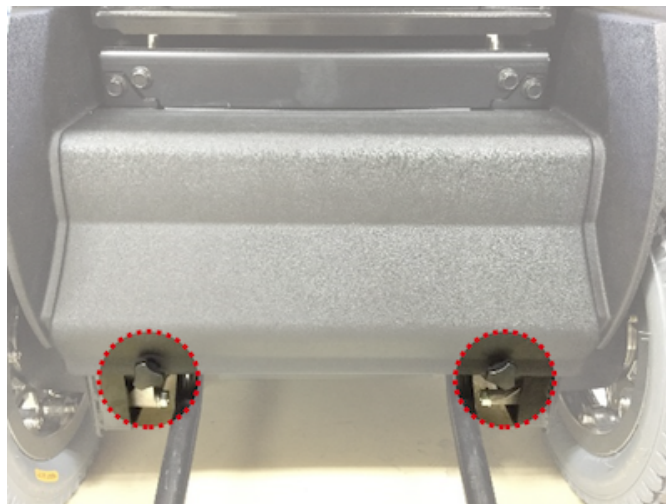
#4 allen wrench

#10mm socket wrench (or Philips head screw driver)

2 x 12 V DC sealed lead acid batteries (MK- ES50-12)

Procedure (Model A/M)

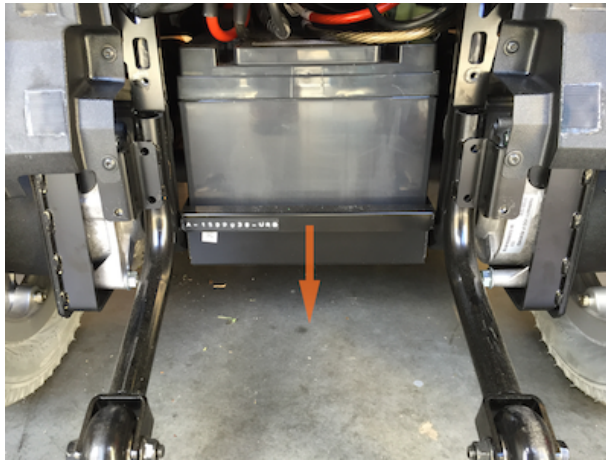
Remove the rear cover. Make sure the device is powered down, then unscrew the two **grip bolts**, and pull the cover off.



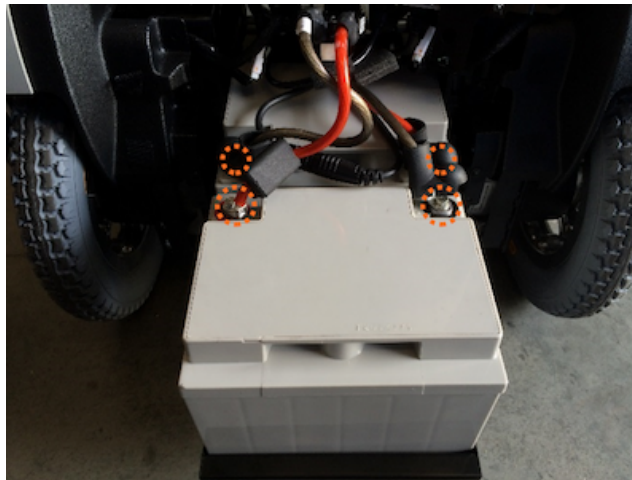
Remove the electrical board box. Use the #4 allen wrench to remove the four screws pictured below. Carefully pull the box out, then up, making sure not to damage the circuit breaker or any wires.



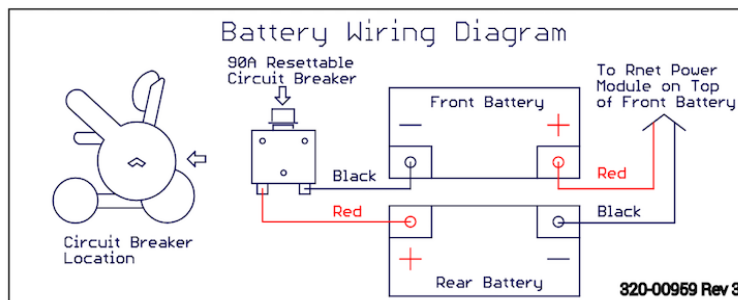
Expose the batteries. Carefully pull out the battery tray and expose the leads on the two batteries. Be mindful of the wires as you are pulling out the tray.



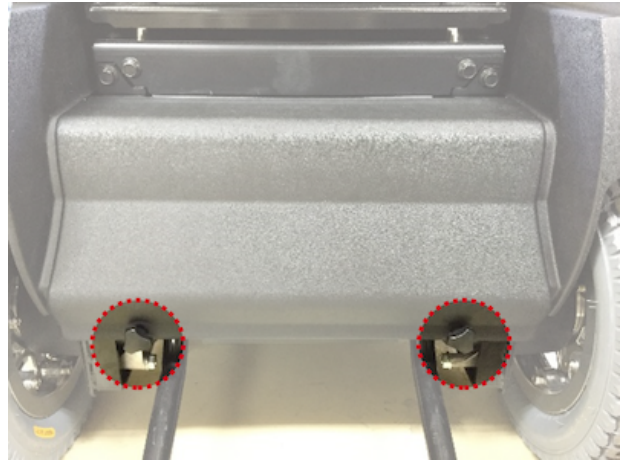
Disconnect the batteries. Slide up the rubber boots and use a **10mm socket wrench** (or Phillips head screwdriver) to disconnect the battery terminals.



Replace the batteries. Replace the batteries connecting the new ones in the same way (wiring diagram is also available on the inside of the rear cover). Once complete, ensure the rubber boots are covering all of the leads, then carefully slide the tray back in.



Replace the board box and rear cover. Reconnect the electrical board box via the 4 bolts and a #4 allen. Then replace the rear cover using the 2 grip bolts.



Back Support

Materials Needed

Socket wrench

12mm socket

hex bit screwdriver

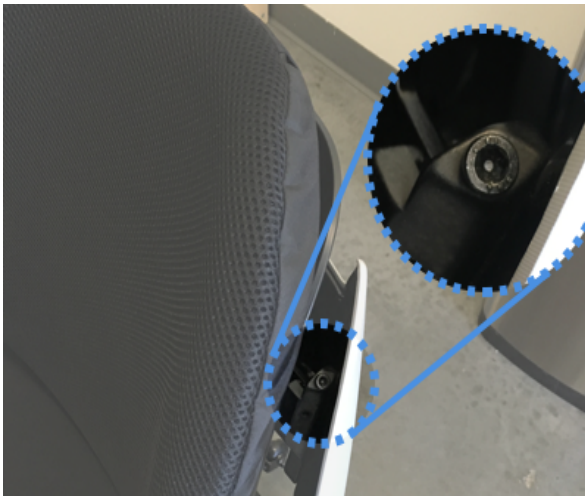
#4 hex bit

#3 hex bit

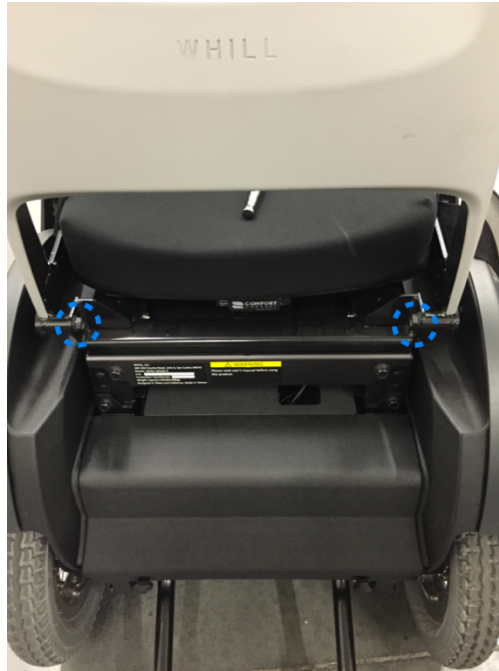
Procedure (Model A/M)

Remove back pad set screws. Using the #3 hex bit, remove the two set screws holding the back pad in place.

Remove back pad. By hand, remove the back pad by sliding it upward and out of its brackets (shown below).



Remove rear screws. Locate the two back assembly screws located on the rear of the unit. Remove both using the 12mm socket and socket wrench.



Remove side screws. Locate the four side screws supporting the back assembly. There will be two on each side of the unit. Remove these using the #4 hex bit in the hex bit screwdriver.



Back Support Cover

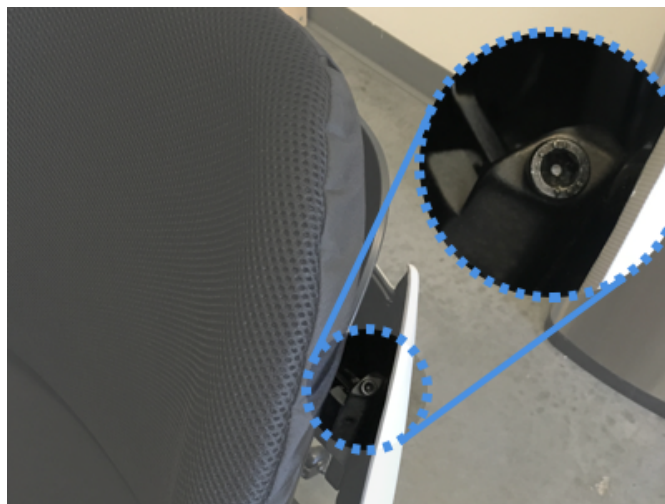
Materials Needed

#4 Allen wrench

#3 Allen wrench

Procedure (Model A)

Remove the Back support. Locate the 2 back support locking screws, as shown in the image below: Using a #4 allen wrench, loosen (or remove) these screws to free the back support from the back support frame. Lift the back support vertically to remove it from the device.



Remove the plastic back support cover. There are 7 total screws to remove in order to detach the back support cover from the back support frame. Move the seat all the way forward to access the screws shown in the image below. Using a #3 allen wrench, remove these two screws. There are two additional screws in the same location on the opposite side, remove these as well.



There are three screws remaining on the top portion of the back support frame, as shown in the image below. Remove these three screws, then the plastic back support cover should easily be removed from the back support chassis.



Reassembly. To reassemble the back support cover, follow these directions for removal in reverse: start with the three screws at the top and finish with the two pairs of two screws (four total) on the bottom. Then reattach the back support and lock it in place by tightening the two mounting screws that were loosened (or removed) in step 1.

Circle Cover



Materials Needed

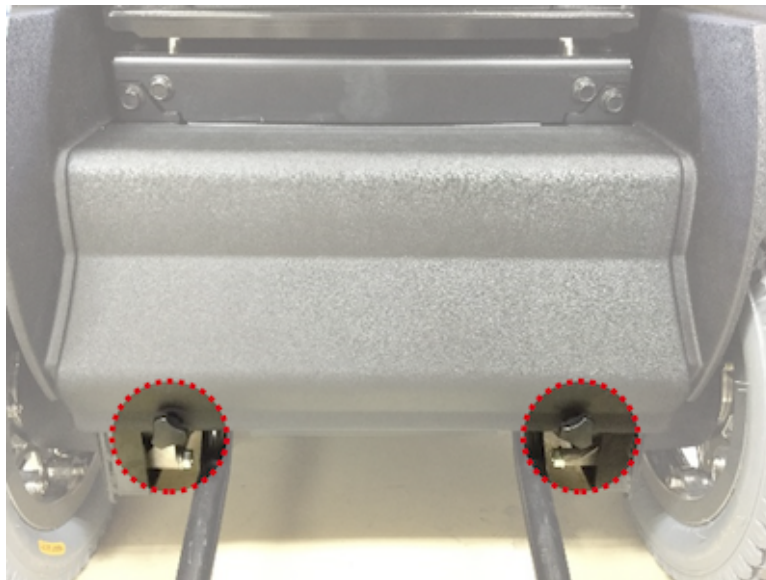
#5 Allen wrench

#10 socket head + ratchet

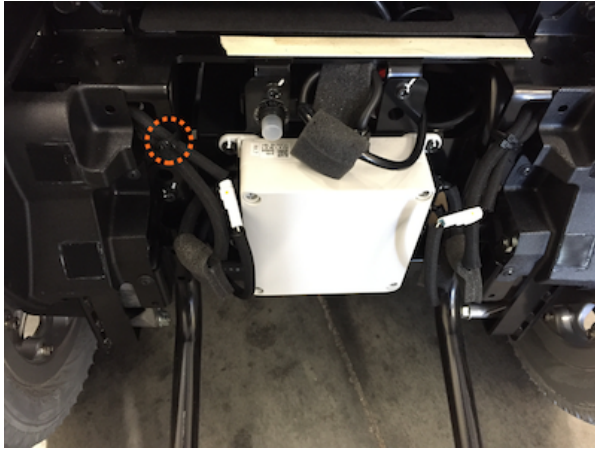
Protractor

Procedure

Remove the rear cover. Move the seat all the way forward then power down the device. Unscrew the two grip bolts, and pull the cover off.



Unplug the taillight LED cables. Cut the zip tie and unplug the taillight LED cables by pushing on the small tab and pulling the plug apart. Make sure to pull on the plastic plug ends and not on the wires.



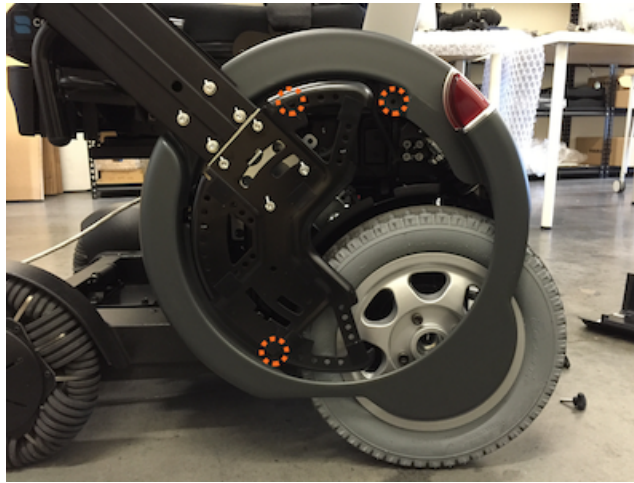
Remove arm cover B. Remove the two centerline screws on the inside of the arm. Then pull arm cover B straight out. *Note: first image below does not show Model M's arm supports.*



Free the LED wires. Remove the zip ties from the inside of circle cover (image below) and then guide the wire out through the frame.



Unfasten the circle cover. Remove the three screws that secure the circle cover.



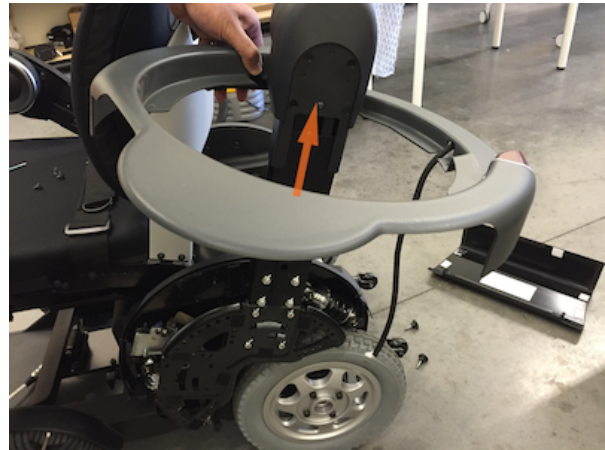
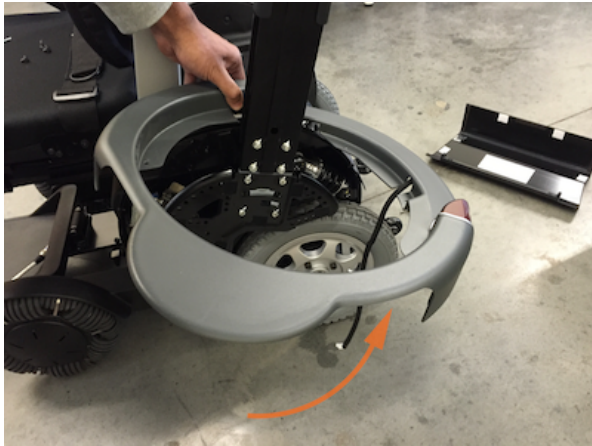
Remove the circle cover. With the arm in the down, locked position, lift out the two tabs (indicated with arrows) and pull off the cover. *Note: the seat should be all the way forward for this step*



Then, lift up the arm and rotate the cover to the point shown below.



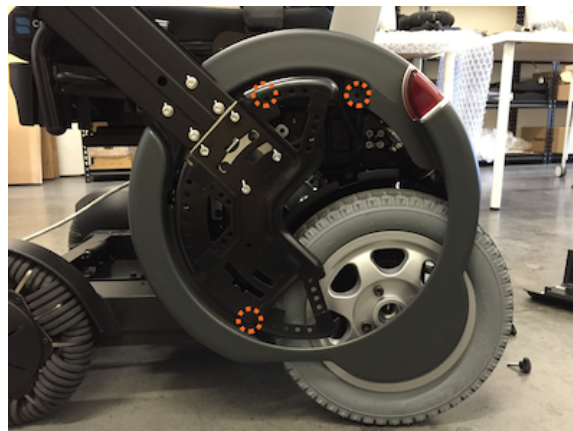
Flip up the bottom of the cover as shown below. Lift the cover up and out.



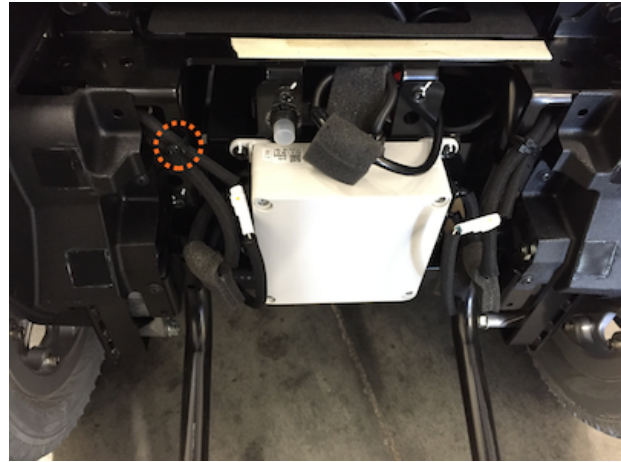
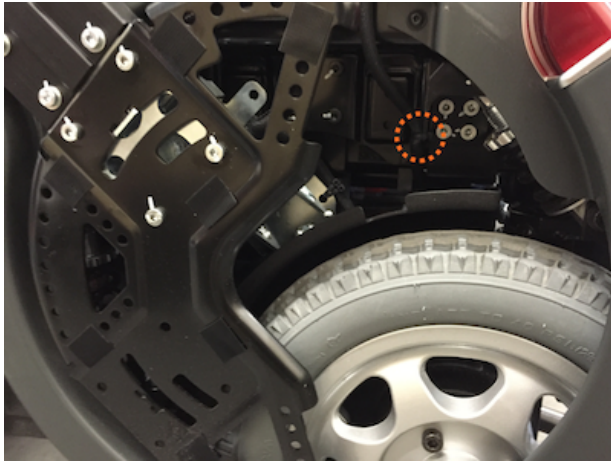
Insert new circle cover. Lower the new circle cover over the arm lining up the cover's lip as shown below. Just as the old one was removed, tilt the cover down and then rotate it towards the front of the device. Insert the two tabs.



Fasten the circle cover. Replace the three screws to fasten the circle cover (hand tighten first to prevent cross threading). Then thread the wire towards the hub box in the rear and reconnect the cable.



Replace the zip ties. Replace the 3 zip-ties cut earlier (1 inside of the circle cover and 2 through the same hole in the rear). Remove the excess.



Replace all other covers. Reinstall arm cover B and the rear cover opposite of how they were removed.

Directional Controller / Indicator Assembly

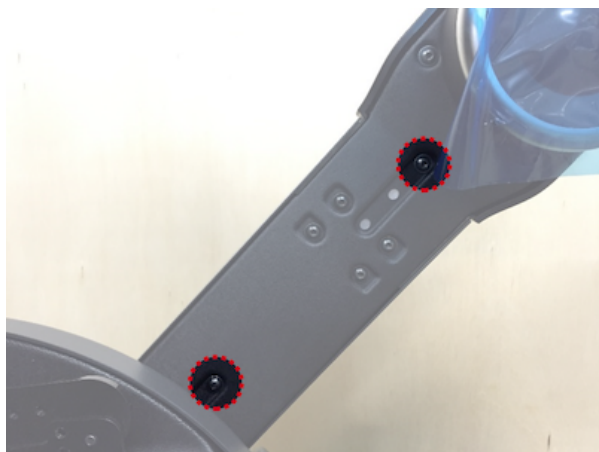
Materials Needed

#4 Allen wrench

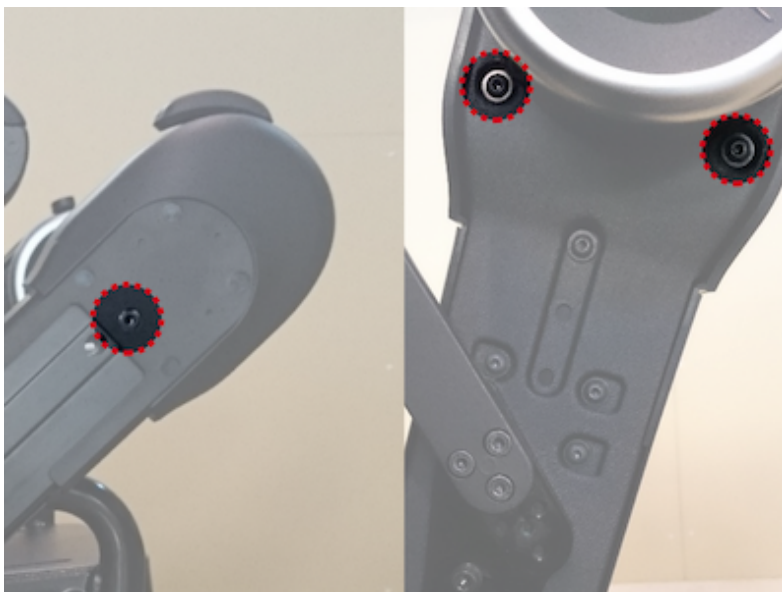
Zip ties + clippers

Procedure (Model A/M)

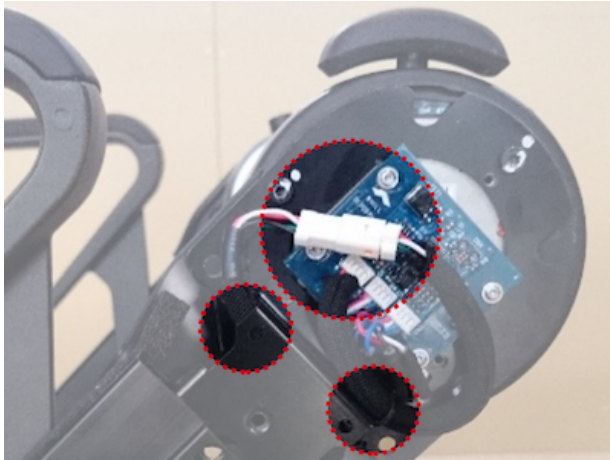
Remove arm cover B. Remove the two centerline screws on the inside of the arm. Then pull arm cover B straight out. *Note: first image below does not show Model M's arm supports.*



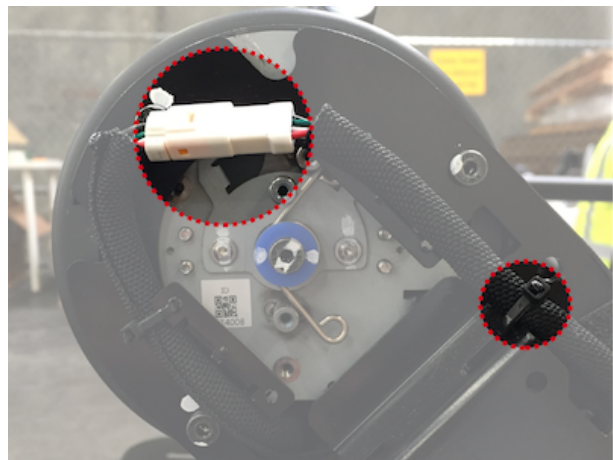
Remove Arm Cover A. Remove Arm Cover A by first unscrewing the two inner bolts followed by the single outer bolt. Pull the cover straight up (you might have to wiggle it a little).



Unplug the directional controller or indicator assembly. Cut the zip-tie(s) and unplug the controller (or indicator) assembly by depressing the small pin on the connector (Note: please pull on the plastic plug and not on the wires.)



Directional Controller



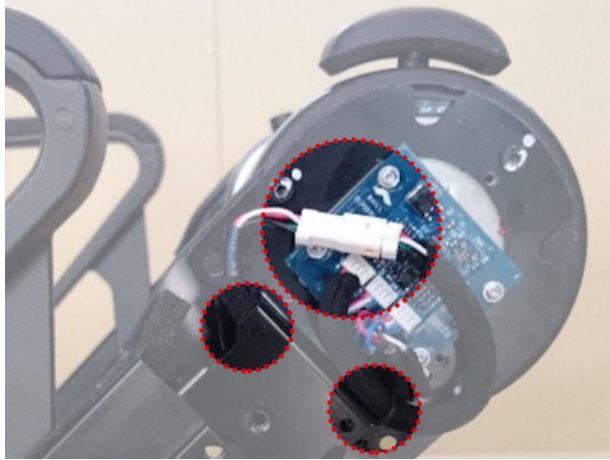
Indicator

Remove the directional controller or indicator assembly. Remove the four screws on the inside of the arm that hold the controller (or indicator) frame. Be careful to hold the directional controller (or indicator) assembly when you remove the last one. Then slide the assembly and frame straight out.

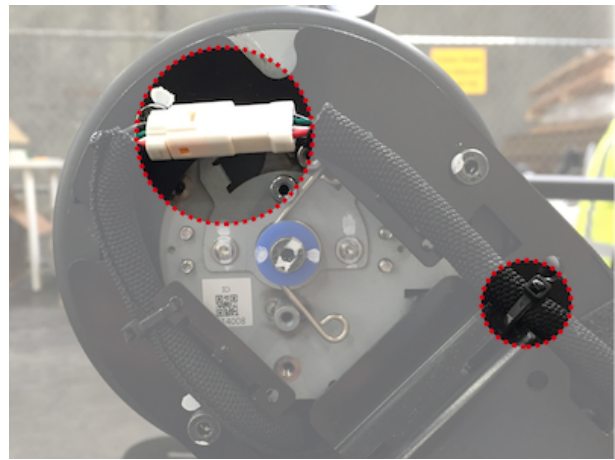


Replace the directional controller or indicator assembly. Replace the directional controller (or indicator) assembly and the four screws that hold the frame on the inside of the arm. Make sure to align it to the same position as the other arm.

Replug the directional controller or indicator assembly. Replug the directional controller (or indicator) assembly and zip-tie the cable at the original location.

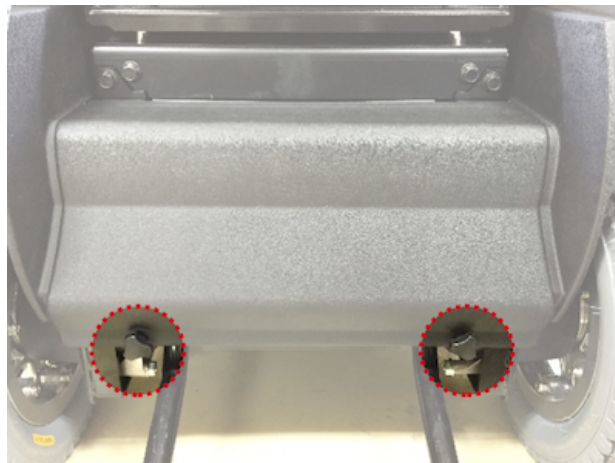


Directional

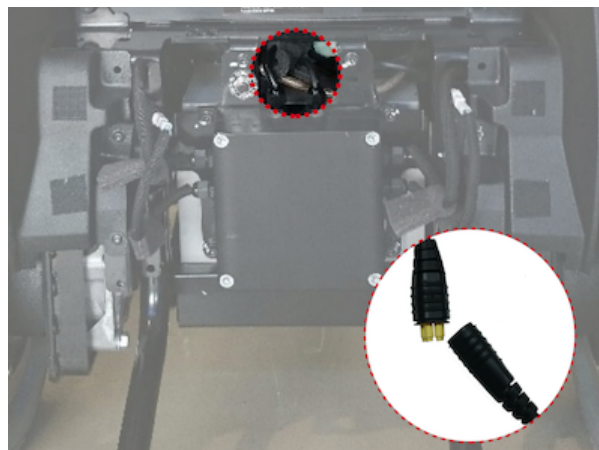


Indicator

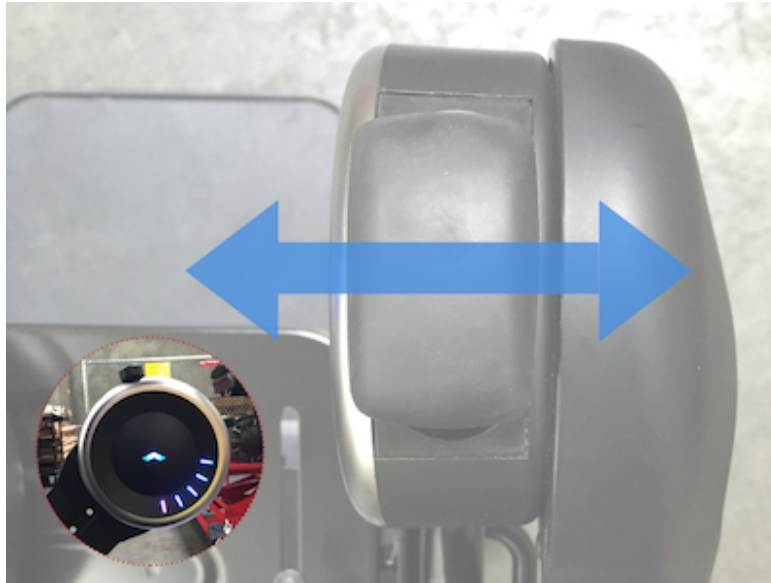
Remove the rear cover. Make sure the device is powered down, then unscrew the two grip bolts, and pull the cover off.



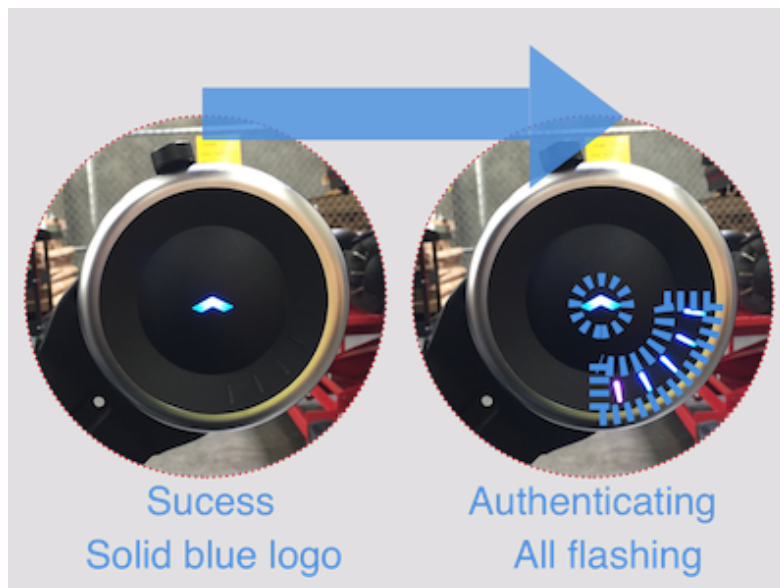
Reconnect the R-NET cable. Disconnect and reconnect the R-NET cable.



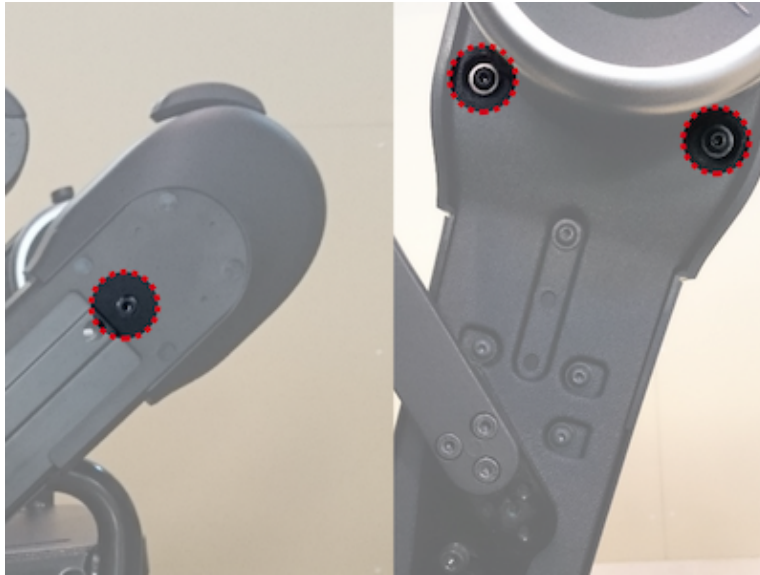
Input calibration command into directional controller. After reconnecting the cable, the device will enter calibration mode. The indicator LEDs and logo LED will turn solid blue while in calibration mode. While these lights are on, move the joystick handle all the way in the following directions and order: right, left, right, left, right. If the device is successfully calibrated, the indicator LEDs will turn off and only logo LED will stay lit.



Authenticate the device. Turn on the device again and the authentication process will begin. If the device is properly calibrated, all the LEDs will rapidly flash for a few seconds. If not, repeat the previous step.



Replace Arm Cover A. Replace Arm Cover A by sliding it in and tapping it into place. Then re-fasten by replacing the single screw on the outside, and the two on the inside.



Replace arm cover B. Line the two shafts on the inside of the arm cover up with the holes on the arm, and then slide it into place. Pat the circular portion to attach the velcro.

Fasten the arm cover B. Fasten the main arm cover using the two screw holes on the centerline of the inside of the arm. It is recommended to start by hand to prevent cross threading.

Directional Controllers (Mouse/ Joystick)

Materials Needed

#3 Allen wrench

#2 allen wrench or Philips head (depends on batch)

Procedure (Model A/M)

Replacing outer covers.

Mouse: Slide off the cover by peeling off from the edge. Reinstall a new outer cover by stretching it on.



Joystick (Easy Grip) : Pull the joystick cover straight up and off. Reinstall a new knob by press fitting it on.



Switching from mouse to joystick (Easy Grip). Remove the outer mouse cover and the two outer screws on the plastic base. Replace the center screw with the long joystick screw and slide on the joystick knob by press fitting it on.



1



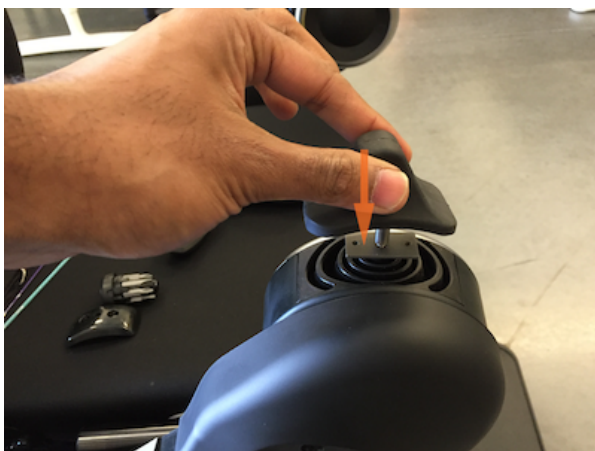
2



3



4



5

Front Wheel

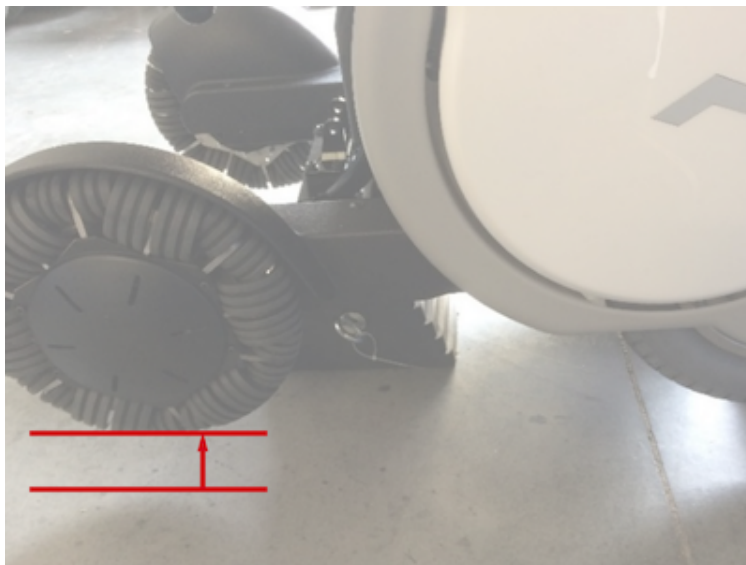
Materials Needed

#2.5 or #3 allen wrench (depends on batch)

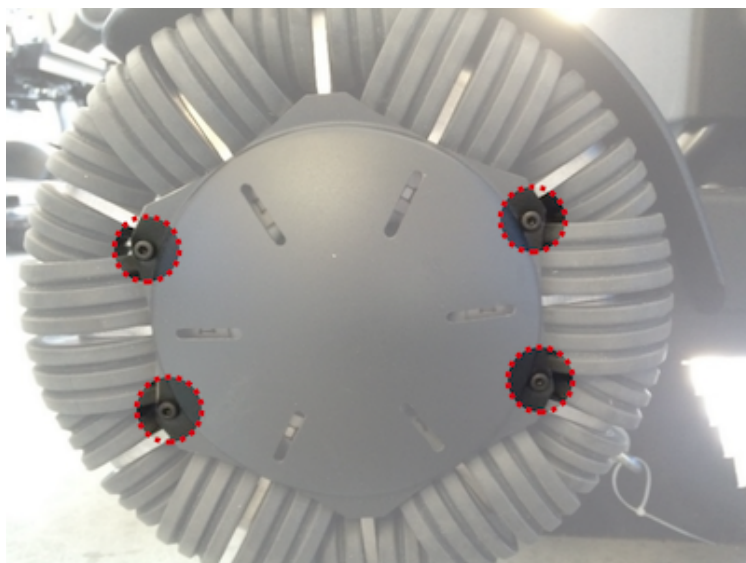
#6 allen wrench

Procedure

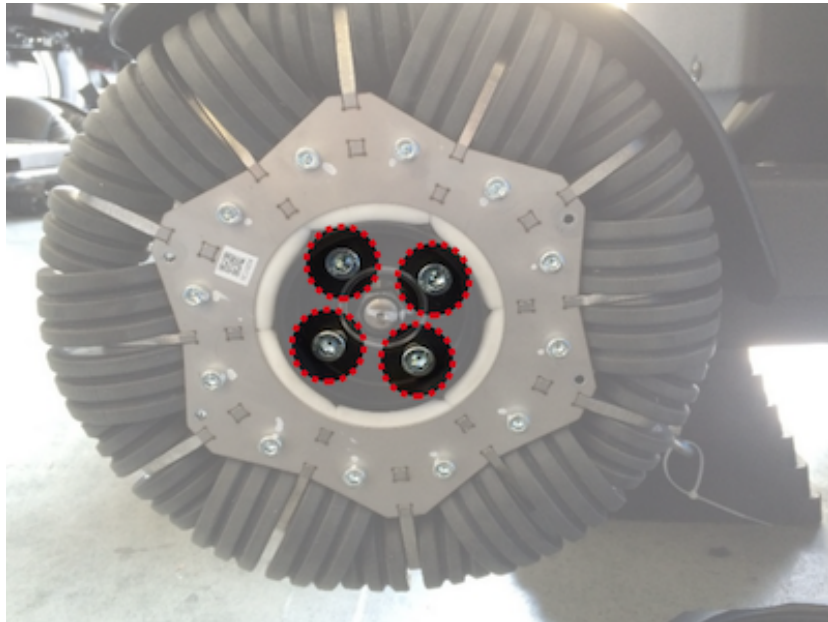
Lift up device. Elevate the entire device on a platform or chocks, so that the wheels readily rotate in the air.



Remove the Omni wheel cover. Remove tire cover using a #2.5 or #3 allen wrench to loosen the screws circled below.



Remove the front wheel. Use the #6 Allen wrench to loosen the tire lug nuts (pictured below). If tires slip while trying to loosen lug nuts, use a contoured chock or wood block to prevent tire rotation.



Install new front wheel. Install the new wheel by replacing the four screws removed earlier. Recommended screw torque is 25 Nm.

Repeat procedure. For the other side of the device.

Rear Wheel

Materials Needed

#3 allen wrench

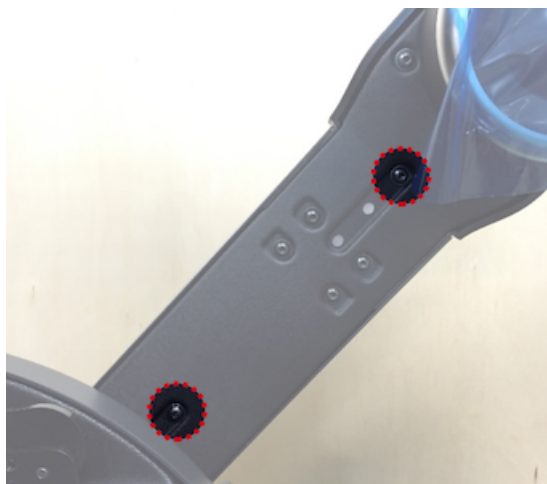
#6 allen wrench

Procedure

Lift up device. Elevate the entire device on a platform or chocks, so that the wheels readily rotate in the air.



Remove arm cover B. Remove the two centerline screws on the inside of the arm. Then pull arm cover B straight out. *Note: first image below does not show Model M's arm supports.*



Unscrew the rear wheel. Use the #6 Allen wrench to loosen the tire lug nuts (pictured below).

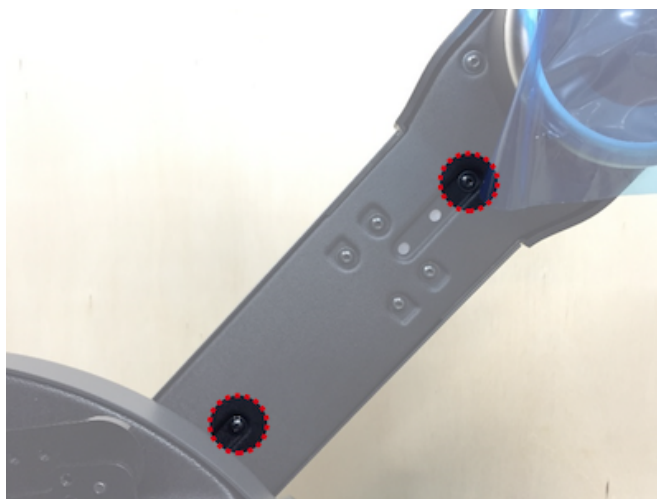
Unlock the motor brake and rotate tire as necessary so that hidden screws become accessible.



Remove the rear wheel. Remove the rear wheel by moving the arm upright and pushing away the circle cover.

Replace the new rear wheel. Install the new wheel by replacing the four screws removed earlier. Recommended screw torque is 25 Nm.

Replace and fasten arm cover B. Line the two shafts on the inside of the arm cover up with the holes on the arm, and then slide it into place. Pat the circular portion to attach the velcro. Fasten the main arm cover using the two screw holes on the centerline of the inside of the arm. It is recommended to start by hand to prevent cross threading.



Repeat procedure. For the other side of the device.

Tie Down Securement

Materials Needed

#6 allen wrench

Torque wrench (need 25Nm)

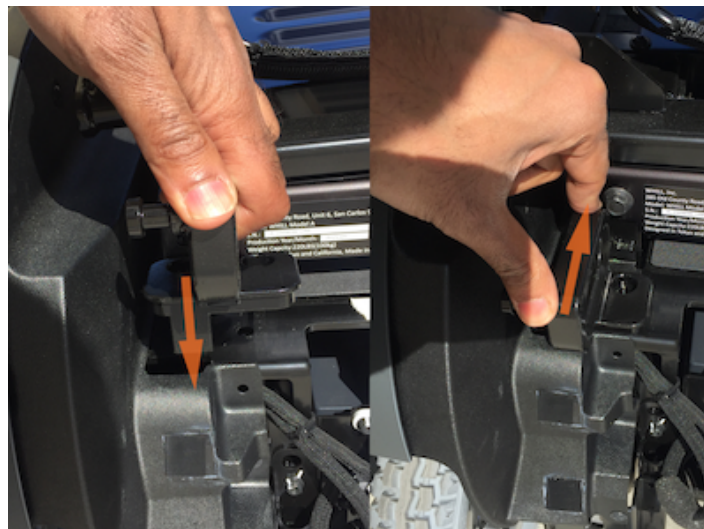
Procedure- Rear Tie Down

Note: complete install after seat assembly is adjusted as installing tie-downs blocks the required bolts.

Remove the rear tie down covers. If rear tie downs were not originally present, there might be rear tie down covers. Using the #6 allen, remove the covers by simply removing the indicated screw on each.



Install the new rear tie downs. Install the new tie down by sliding the tie downs downward then in. Insert 2 bolts on each tie down in the indicated locations. Tighten the bolts to 25N/m.





Front Tie Down Procedure

Remove the seat covers. Remove the seat cover by pulling it up and off from its front edge.



Remove the front tie downs. Using the #6 allen, remove the 3 bolts on each of the front tie downs.



Install the new front tie downs. Install the new front tie downs by attaching the corresponding tie down with 3 bolts each (refer to the images in the previous step). Tighten the bolts to 25N/m.

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Additional Support

If you have any additional questions or concerns, please don't hesitate to call a WHILL representative at our toll-free phone number:

[+1-844-MY-WHILL](tel:+1844MYWHILL)

[+1-844-699-4455](tel:+18446994455)

Or shoot us a message via email: support@whill.us

For general information on the company or our products, visit our website: www.whill.us