Servicemanual

E-Drive PLUS

Brukarmanual version: 1605

decon
Creating Freedom

Foreword

This Service Manual describes the procedures for inspecting, adjusting, and assembling the E-Drive PLUS, as well as how to handle errors.

Symbols Used in This Manual

Items concerning proper handling are indicated with the following symbols.

WARNING	Indicates that misuse may lead to fatal or severe injury, or disability.
NOTICE	Indicates that misuse may lead to material damage.
	Indicates correct methods and key points when operating the product.

Other Precautions

- For product improvement purposes, the descriptions and specifications in this manual are subject to change without notice.
- Due to changes in the specifications, some of the photos and descriptions may differ from the actual product.
- This manual is intended for use by persons possessing the basic technical knowledge and skills.
- Persons who do not possess the general service skills and knowledge should not rely solely on this service manual to perform inspection, adjustment, disassembly, or reassembly.
  Failure to observe this precaution can lead to maintenance problems or mechanical damage.

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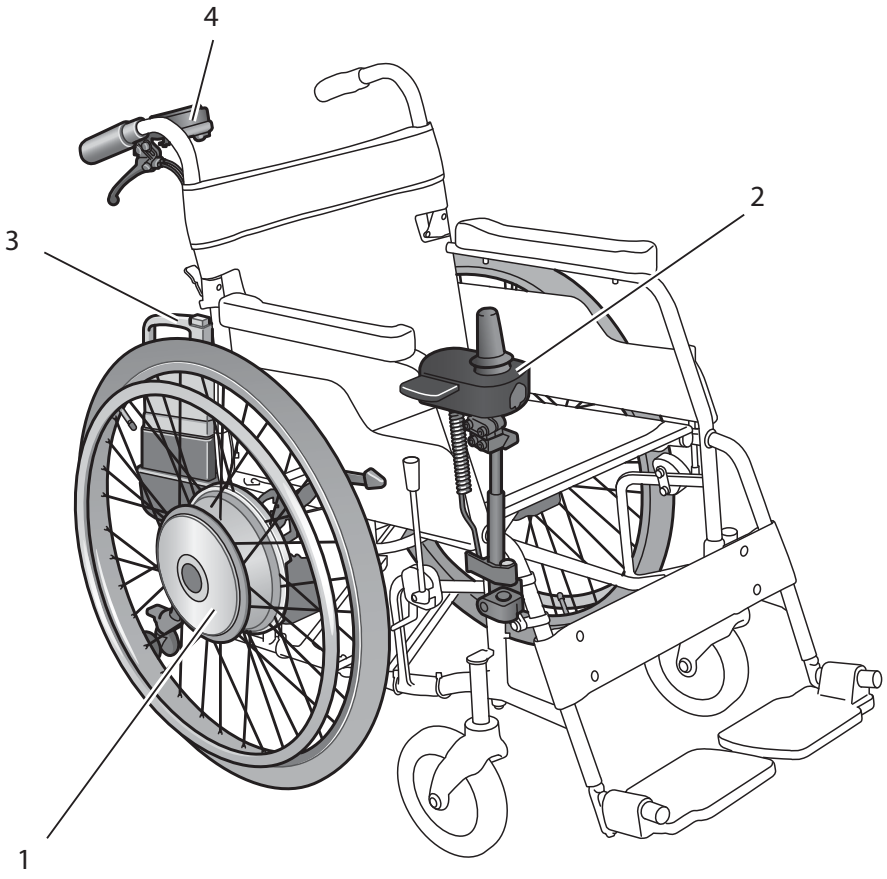
1. Product Overview

1.1. Product Features

Example of installed E-Drive PLUS



1 Drive unit with AC servo flat motor.
2 Joystick controller.
3 Dedicated battery with built-in microcomputer.
(Nickel metal hydride battery or lithium ion battery)
4 Assistant controller (optional)

1.2. Variations

(1) Power Unit for Wheelchairs

Model		E-Drive PLUS	
Tire size		20", 22" and 24"	16"
Controller	Left	○	○
	Right	○	○
Controller mounting	Standard	○	○
	Swing out	○	○
Speed	4.5 km/h type	○	○
	6.0 km/h type	○	○
Mounting brackets	Cramp bracket	○	–
	Bracket A	–	○
	Bracket B	–	○
Battery seat	Integrated	○	○
	Separate	–	○
Battery location (when using the integrated battery seat)	No offset	○	○
	Offset (28.5 mm)	○	○
Battery types	Nickel metal hydride battery	○	○
	Lithium ion battery	○	○
Assistant controller (optional, right-hand operation only)	Assistant controller included	○	○

2. Wheelchair Frame Conditions for Installing the E-Drive PLUS

⚠ WARNING

- Do not install the E-Drive PLUS on a wheelchair frame that has insufficient strength.
- Do not install the E-Drive PLUS on a wheelchair frame that does not meet the installation conditions. Even if it can be installed on the frame, it may malfunction during use if the conditions are not met, which could injure the user.

2.1. Strength Conditions

In order to ensure that the entire wheelchair has sufficient strength, the wheelchair frame on which the E-Drive PLUS is installed must meet the following conditions.

(1) It must have strength equivalent to that required by JIS standards (T9203).
(2) The axle sleeve bracket is securely installed and does not have any looseness.
(3) It must not have a camber angle.
(4) It must have sufficient strength. (There is the chance that wheelchair frames that have been used for a long time will lose some of their strength.)
(5) It must not have a camber angle.
(6) It must have sufficient strength.
(There is the chance that wheelchair frames that have been used for a long time will lose some of their strength.)

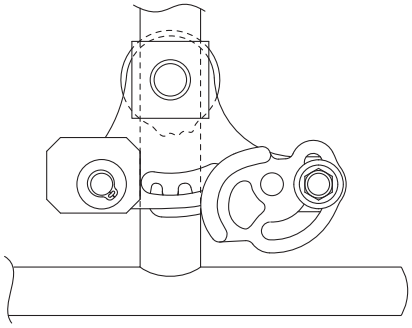
2.2. Structure Conditions

The wheelchair frame must have the following structure.

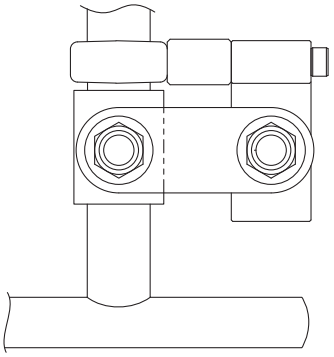
(1) The diameter of the axle hole is 12.5 to 13.5 mm. (Fixed type case)
(2) The location that the nuts are in contact with around the axle hole must be flat and have a sufficient surface area. (Fixed type case)
(3) The distance from the center of the axle hole to the base pipe must be at least 70 mm (16" model bracket A case) or 80 mm (20, 22, 24" model case)
(4) The back pipe diameter must be ø22, and the height of the square lock portion from the axle hole center must be 20 mm or shorter. (16" model bracket B case)
(5) When attached, the wheelchair frame and the E-Drive must not interfere with each other.
- If installing the adjustment washers in the shaft in order to prevent interference, use up to 3 per side.

16" Model

[Bracket A]



[Bracket B]



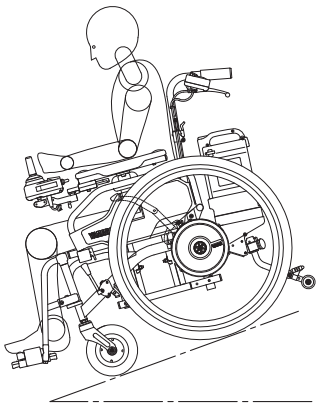
2.3. Functional Conditions

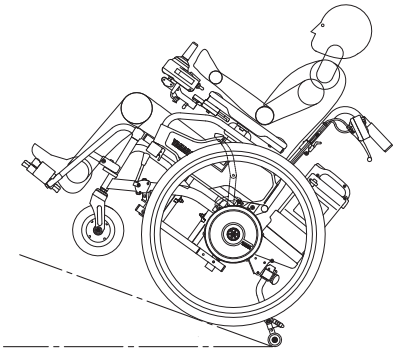
The wheelchair on which the E-Drive PLUS is installed must have the following functions in order to ensure an appropriate sitting position.

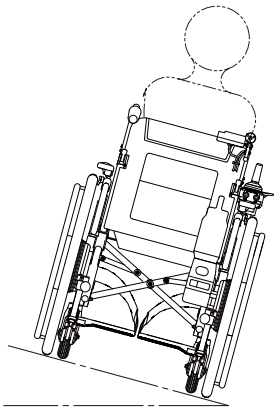
(1) The suitable size of the wheels must be 16, 20, 22 and 24 inches.

(2) Parking brakes must be installed and adjusted to the proper position for the tires. When the E-Drive PLUS is installed, it must be able to stop the wheelchair at a forward-reverse angle of 7 degrees when the parking brakes are applied.

(3) When the E-Drive PLUS is installed, a forward-backward tip angle of at least 20 degrees and a side tip angle of at least 15 degrees must be ensured. (See diagram below) A backward tip angle of at least 25 degrees is recommended.





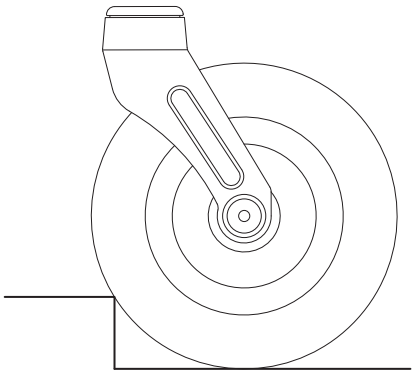


(4) Please ensure that the functions of the wheelchair frame are not impaired when the E-Drive PLUS is installed.

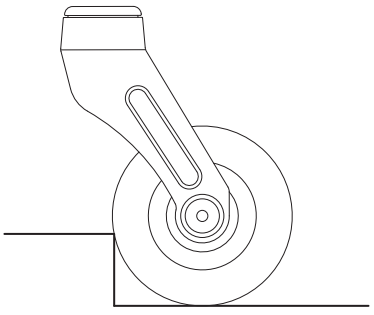
Examples) The movable arm supports can move, the folding feature, reclining feature, and parking brakes are functional, etc.

2.4. Other

Front casters at least 7 inches in diameter are recommended.
During power driving, operations like caster lifting are not possible. If the casters are small, it is difficult to get over large bumps. The impact is also greater if the casters are small.



Large diameter (easy to get over bumps)



Small diameter (difficult to get over bumps)

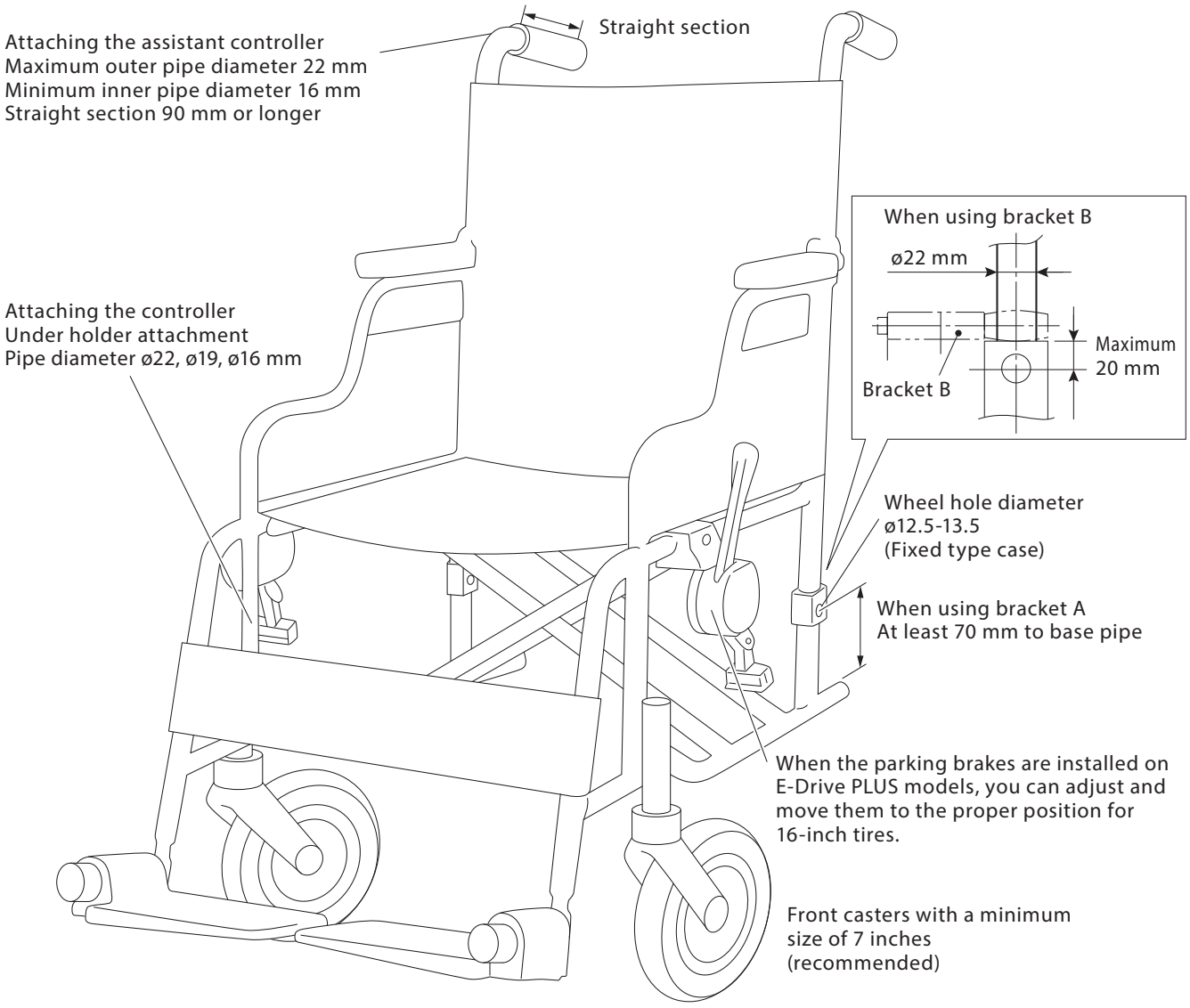
2.5. Assistant Controller

If installing the optional assistant controller:

(1) The push grip pipe must have a maximum outer diameter of 22 mm.

(2) The push grip pipe must have a minimum inner diameter of 16 mm.

(3) The straight section from the end of the push grip pipe must be 90 mm or longer.

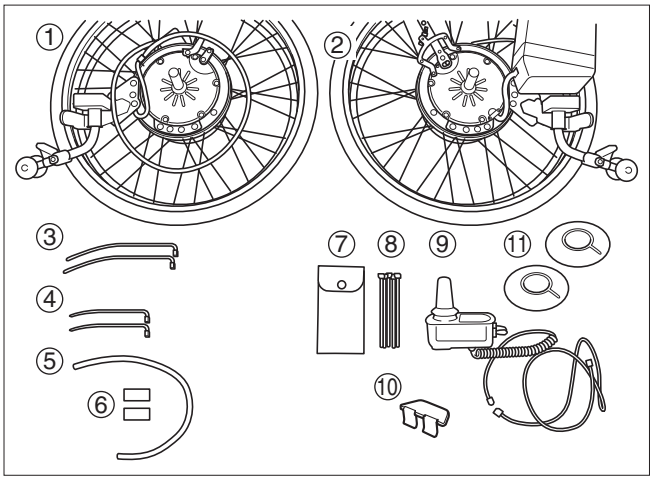


3. Installation Procedure

3.1. Supplied Parts Check

3.1.1. Supplied Parts Check for 20", 22" and 24" Models

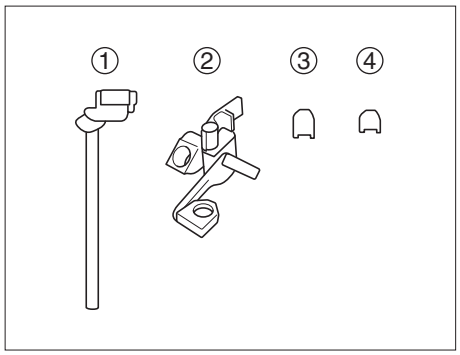
(1) Standard Supplied Parts



	Product Name	Remarks	Quantity
1	Left drive unit assembly		1
2	Right drive unit assembly		1
3	Large clamp	For securing the wire harness	2
4	Small clamp	For securing the wire harness	2
5	Spiral tube	For protecting the wire harness	1
6	Sticker	For affixing to the manual and power drive positions	3 each
7	Supplied tools	Two 8×10 mm open-end wrenches, and one 5 mm hexagon wrench	1
8	Clamp	For securing the wire harness	18
9	Controller assembly		1
:	Plate assembly		1
A	Wheel cap	Installed to the drive units	2

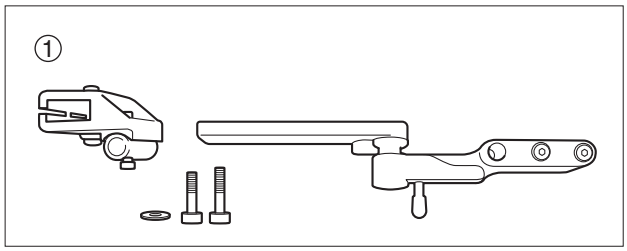
(2) Controller Installation

[Standard]



	Product Name	Remarks	Quantity
1	Upper holder assembly	For installing the controller	1
2	Under holder assembly	For installing the controller	1
3	Side plate for ø19–20	For installing the under holder	4
4	Side plate for ø16–17	For installing the under holder	4

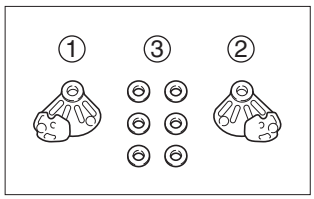
[Swing Out Bracket]



	Product Name	Remarks	Quantity
1	Swing out bracket	For installing the controller	1

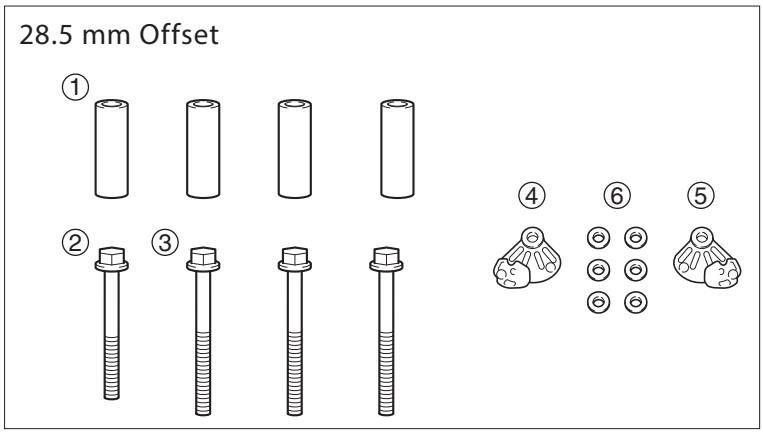
(3) Battery Location

[No Offset]



	Product Name	Remarks	Quantity
1	Left clamp bracket	For installing the drive unit	1
2	Right clamp bracket	For installing the drive unit	1
3	Plate washer	For adjusting the outward position of the drive unit	6

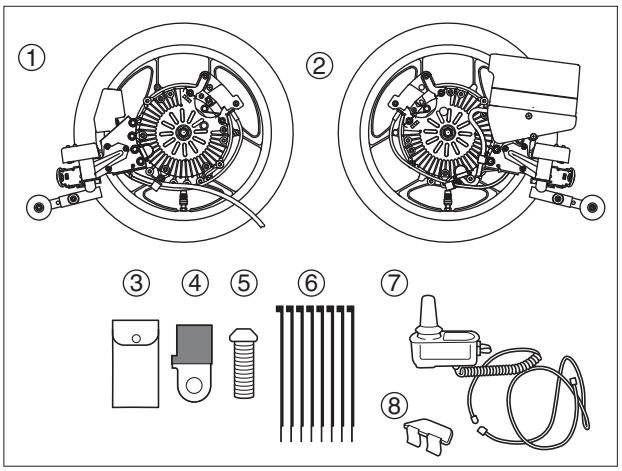
[Offset]
Battery Seat Offset Parts (Optional)



	Product Name	Remarks	Quantity
1	Spacer	28.5 mm	4
2	Flange bolt	40 mm	1
3	Flange bolt	45 mm	3
4	Left clamp bracket	For installing the drive unit	1
5	Right clamp bracket	For installing the drive unit	1
6	Plate washer	For adjusting the outward position of the drive unit	6

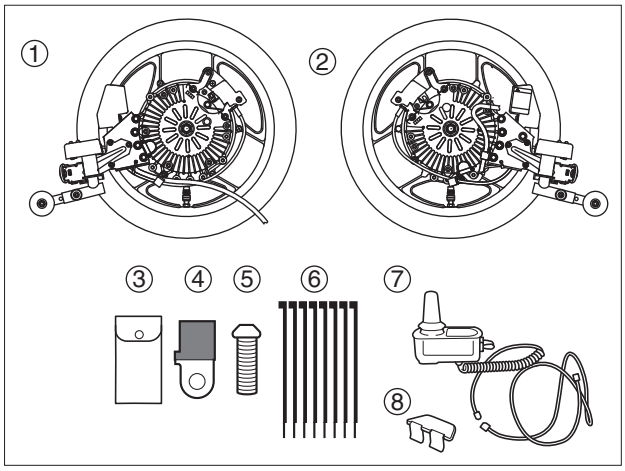
3.1.2. Supplied Parts Check for 16" Model

(1) Standard Supplied Parts ~Integrated Battery Seat~



	Product Name	Remarks	Quantity
1	Left drive unit assembly		1
2	Right drive unit assembly		1
3	Supplied tools	Two 8×10 mm open-end wrenches, and one 5 mm hexagon wrench	1
4	Clamp 1	For securing the wire harness to the unit (used when necessary)	1
5	Screw for clamp 1	Used when necessary	1
6	Clamp 2	For securing the wire harness to the wheelchair frame	8
7	Controller assembly		1
8	Plate assembly		1

(2) Standard Supplied Parts ~Separate Battery Seat~



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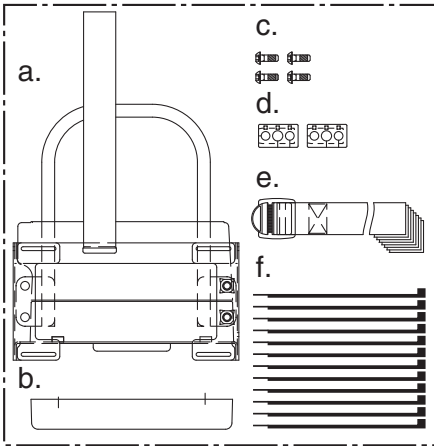
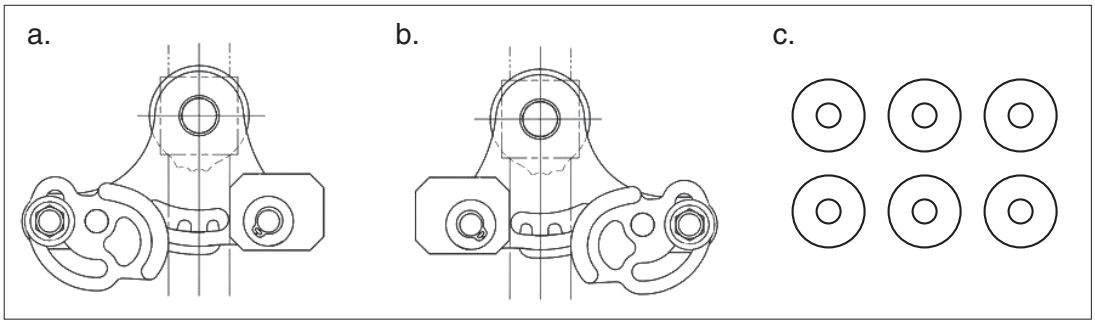


	Product Name	Remarks	Quantity
a.	Battery box		1
b.	Bottom lid		1
c.	Screw for bottom lid		4
d.	Grommet		2
e.	Band	For securing the battery box	8
f.	Clamp	For securing the wire harness	12

	Product Name	Remarks	Quantity
1	Left drive unit assembly		1
2	Right drive unit assembly		1
3	Supplied tools	Two 8×10 mm open-end wrenches, and one 5 mm hexagon wrench	1
4	Clamp 1	For securing the wire harness to the unit (used when necessary)	1
5	Screw for clamp 1	Used when necessary	1
6	Clamp 2	For securing the wire harness to the wheelchair frame	8
7	Controller assembly		1
8	Plate assembly		1
9	Battery box assembly	See the diagram above for the parts configuration.	1 set

(3) Installation Brackets

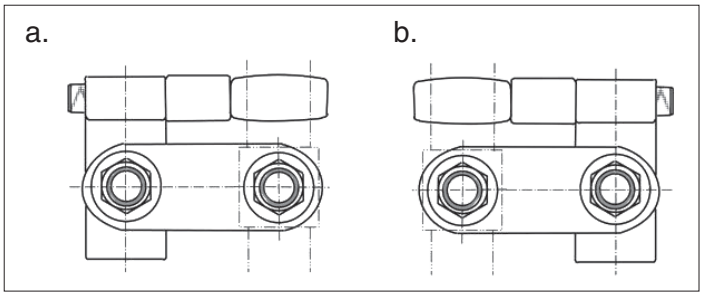
1 Bracket A



	Product Name	Remarks	Quantity
a.	Bracket A for left unit		1
b.	Bracket A for right unit		1
c.	Width adjustment washer	Used when necessary	6

* Please use a maximum of 3 washers per side.

2 Bracket B

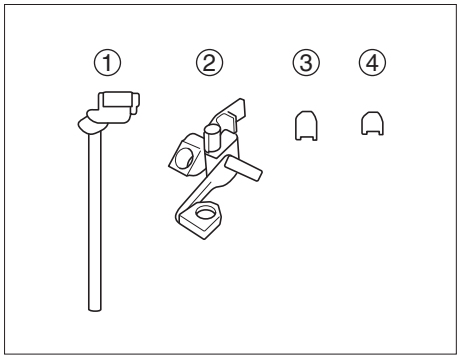


	Product Name	Remarks	Quantity
a.	Bracket B for left unit		1
b.	Bracket B for right unit		1

Use bracket B when the backward tip angle is small.
If bracket B is used, the axles of the E-Drive PLUS can be moved and installed 53.5mm back from the back pipe of the wheelchair frame.

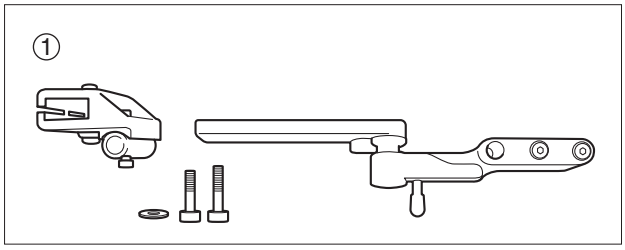
(4) Controller Installation

[Standard]



	Product Name	Remarks	Quantity
1	Upper holder assembly	For installing the controller	1
2	Under holder assembly	For installing the controller	1
3	Side plate for ø19–20	For installing the under holder	4
4	Side plate for ø16–17	For installing the under holder	4

[Swing Out Bracket]



	Product Name	Remarks	Quantity
1	Swing out bracket	For installing the controller	1

3.2. Power Unit Installation

3.2.1. Installation for E-Drive PLUS 20", 22", and 24" Fixed Axle Models

Required tools:	10 mm and 17 mm sockets, socket wrench, and torque wrench

(1) Right Drive Unit Installation

1 Install the clamp bracket for the right unit to the E-Drive PLUS unit. Fit the projections on the unit into the slots in the clamp bracket. (The standard slots are Nos. 6, 7, 8, and 9.)

2 While keeping the clamp bracket and right unit in this condition, install the unit to the wheelchair frame. Fit the back pipe of the wheelchair frame between the post and stopper of the clamp bracket.

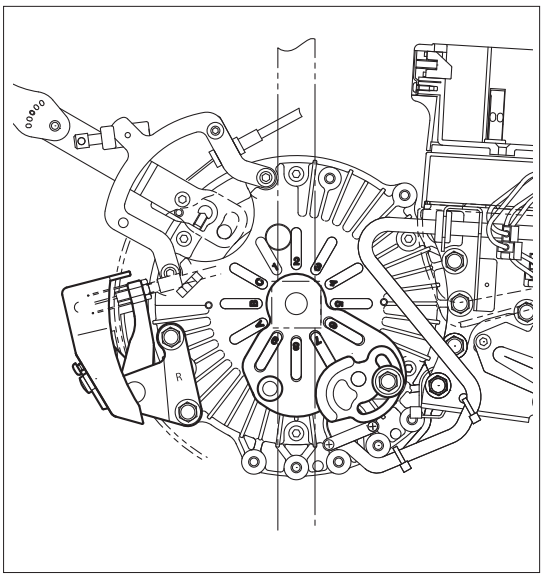
3 Temporarily tighten the axle using the nut (tightening torque: approximately 5 Nm) so that there is no looseness in the axle.

4 Move the stopper so that there are no gaps between the clamp bracket post, frame, and stopper, and then tighten the stopper bolt.

Tightening torque: 11 to 15 Nm

5 Tighten the axle mounting nut.

Tightening torque: 40 to 50 Nm



(2) Left Drive Unit Installation

Install the left unit in the same way as the right unit.

NOTICE

When the E-Drive PLUS unit is installed, the unit and the wheelchair frame must not interfere with each other. When installing the width adjustment washers to the shaft in order to prevent interference, use up to 3 washers per side.

(3) Angle Adjustment

To adjust the angle 30°, shift the clamp bracket slots by 1 projection on the unit.

3.2.2. Installation for E-Drive PLUS 16" Fixed Axle Model (When Using Bracket A)

Required tools:	10 mm and 17 mm sockets, socket wrench, and torque wrench

Note Remove the washers and O rings attached to the axle before installation.

(1) Right Drive Unit Installation

1 Install bracket A for the right unit to the E-Drive PLUS. Fit the projections on the unit into the slots in bracket A.

2 While keeping bracket A and the right unit in this condition, install the unit to the wheelchair frame. Fit the back pipe of the wheelchair frame between stopper 1 and stopper 2 of bracket A.

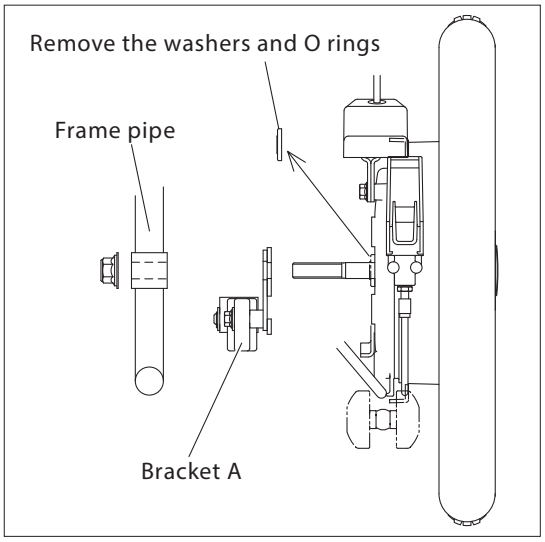
3 Temporarily tighten the axle using the nut (tightening torque: approximately 5 Nm) so that there is no looseness in the axle.

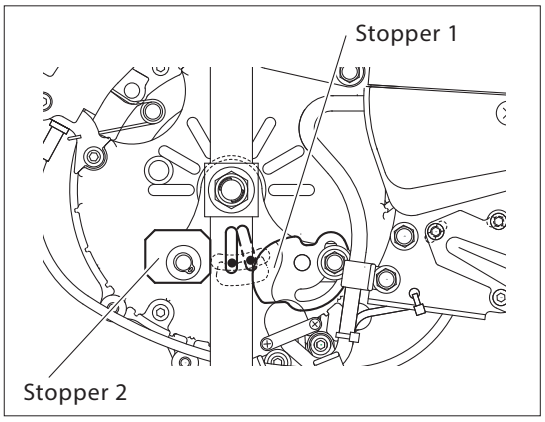
4 Move stopper 1 so that there are no gaps between the frame, stopper 1, and stopper 2, and then tighten the stopper bolt.

Tightening torque: 9 to 11 Nm

5 Tighten the axle mounting nut.

Tightening torque: 40 to 50 Nm





(2) Left Drive Unit Installation

1 Install bracket A for the left unit to the E-Drive PLUS. Fit the projections on the unit into the slots in bracket A.

2 While keeping bracket A and the left unit in this condition, install the unit to the wheelchair frame. Fit the back pipe of the wheelchair frame between stopper 1 and stopper 2 of bracket A.

3 Temporarily tighten the axle using the nut (tightening torque: approximately 5 Nm) so that there is no looseness in the axle.

4 Move stopper 1 so that there are no gaps between the frame, stopper 1, and stopper 2, and then tighten the stopper bolt.

Tightening torque: 9 to 11 Nm

5 Tighten the axle mounting nut.

Tightening torque: 40 to 50 Nm

(3) Angle Adjustment

1 To adjust the angle 5°, turn stopper 2 on bracket A to change the contact surface of stopper 2 and the frame.

2 To adjust the angle 15°, shift the bracket A slots by 1 projection on the unit.

NOTICE

When the E-Drive PLUS unit is installed, the unit and the wheelchair frame must not interfere with each other. When installing the width adjustment washers to the shaft in order to prevent interference, use up to 3 washers per side.

3.2.3. Installation for E-Drive PLUS 16" Fixed Axle Model (When Using Bracket B)

NOTICE

When using bracket B to install the power unit to the wheelchair frame, be sure to leave the O rings and washers attached to the axle. If the O rings and washers are removed, the power unit will be damaged.

Required tools: 17 mm socket, socket wrench, torque wrench, 17×19 mm open-end wrench, and 5 mm hexagon wrench

Note Leave the washers and O rings attached to the axle during installation.

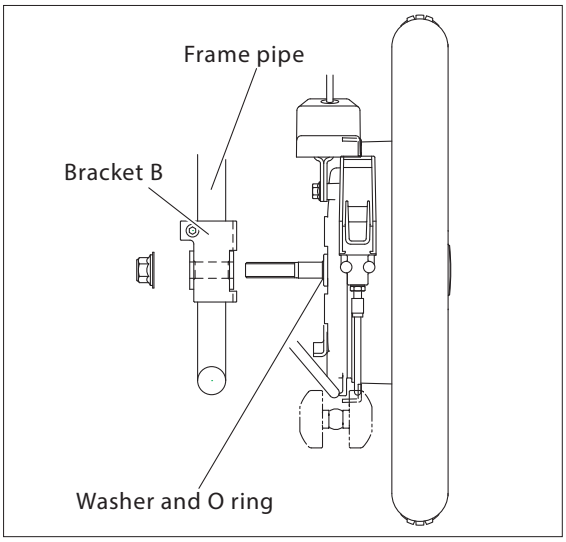
(1) Right Drive Unit Installation

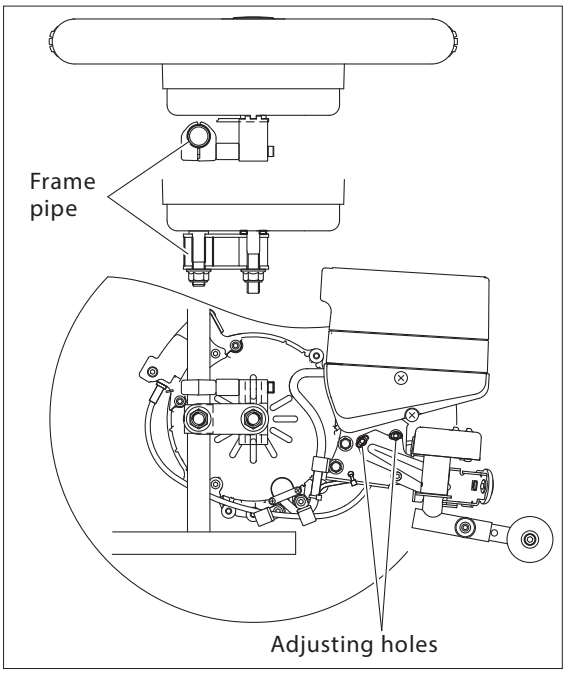
1. Temporarily tighten bracket B for the right unit to the back pipe using the frame axle hole. Align the holes in the plate and boss and tighten sufficiently to remove any looseness.
2. Temporarily tighten the drive unit using the mounting nut. The nut is temporarily tightened to prevent the drive unit from falling; therefore, do not tighten the nut forcefully.
3. Fully tighten the nut that was temporarily tightened to the frame axle hole.

   Tightening torque: 40 to 50 Nm
4. Fit the projections on the back of the drive unit into the slots in bracket B, and then fully tighten the axle.

   Tightening torque: 40 to 50 Nm
5. Fully tighten the bolt.

   Tightening torque: 14 to 16 Nm





(2) Left Drive Unit Installation

1 Temporarily tighten bracket B for the left unit to the back pipe using the frame axle hole. Align the holes in the plate and boss and tighten sufficiently to remove any looseness.

2 Temporarily tighten the drive unit using the mounting nut. The nut is temporarily tightened to prevent the drive unit from falling; therefore, do not tighten the nut forcefully.

3 Fully tighten the nut that was temporarily tightened to the frame axle hole.

Tightening torque: 40 to 50 Nm

4 Fit the projections on the back of the drive unit into the slots in bracket B, and then fully tighten the axle.

Tightening torque: 40 to 50 Nm

5 Fully tighten the bolt.

Tightening torque: 14 to 16 Nm

(3) Angle Adjustment

To adjust the angle 30°, shift the clamp bracket slots by 1 projection on the unit.

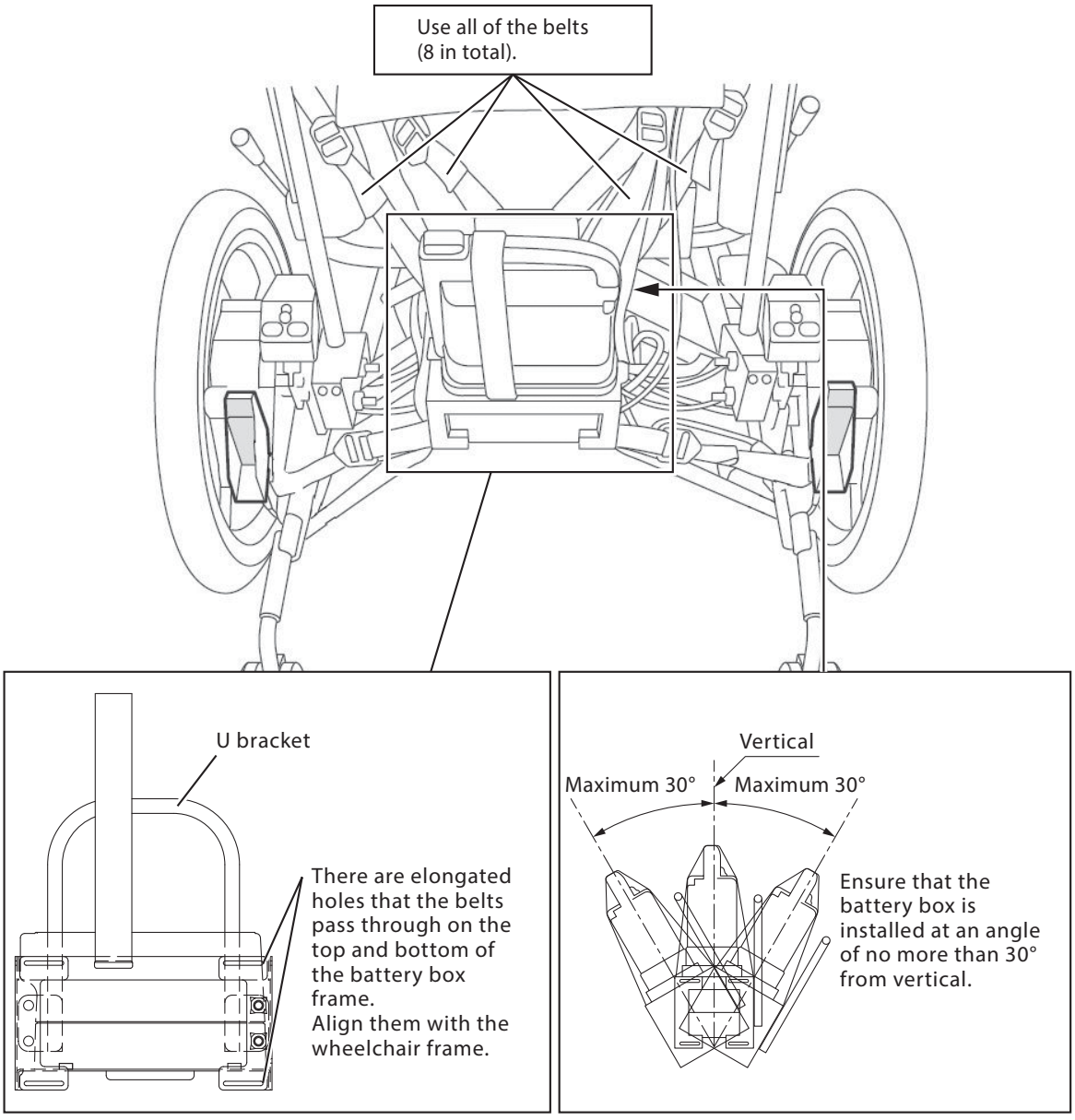
3.3. Separate Battery Seat Installation

If using the separate battery seat, secure the battery box to the wheelchair frame.

(1) Pass the belts through the elongated holes on the battery box.
(A total of 8 belts are used.)

(2) Secure the battery box to the wheelchair frame.
Please secure the battery box so that the U bracket goes backwards.
After the belts are passed through the elongated holes and U bracket of the battery box, pass them through parts of the frame, such as the seat and back pipe.
(A total of 8 belts are used.)
Position the battery box with the 4 belts on top, then add tension and secure it with the 4 on the bottom.

(3) After the battery is installed, ensure that it is firmly secured. If the ends of the belts hang down, ensure that they do not interfere with the turning and moving parts of the wheelchair frame.



3.4. Controller Installation

(1) Under Holder Assembly Installation

Install the under holder onto the wheelchair frame.

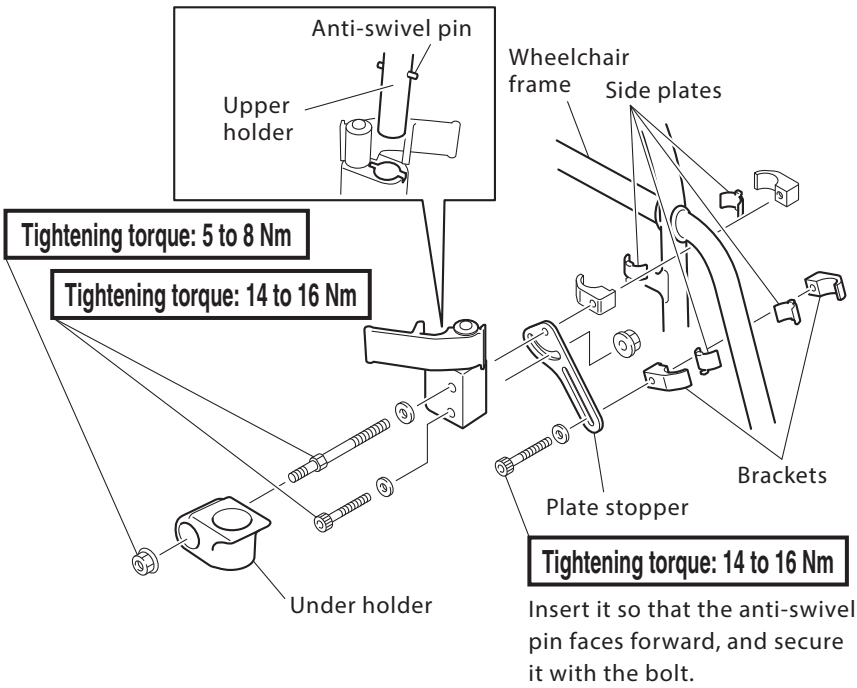
1 From the temporarily-assembled under holder assembly, remove the under holder piece.

2 Mount the assembly onto the wheelchair frame. If necessary, insert the side plates between the brackets and the wheelchair frame.

<Side plates (included)>

3 Attach the under holder piece.

Required tools:	10 mm socket, socket wrench, torque wrench 8×10 mm open-end wrench, 5 mm hexagon wrench



*The illustration above is for the right-hand drive model. For the left-hand drive model, the placement of the parts will be the opposite of the above illustration.

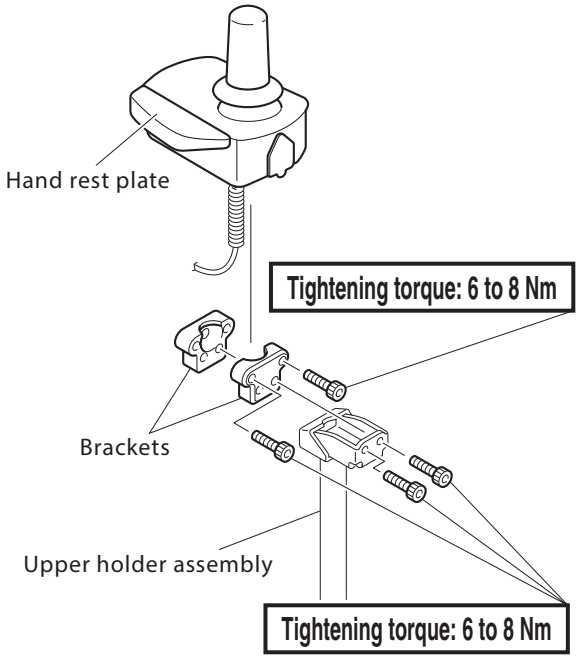
(2) Upper Holder Assembly and Controller Installation

Install the upper holder onto the controller and adjust the position.

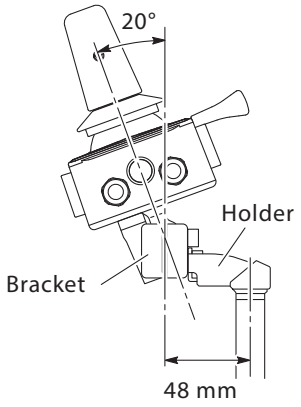
1 Remove the bracket from the upper holder and install it onto the controller.

2 Install the bracket onto the upper holder.

Required tools: 5 mm hexagon wrench, torque wrench



Adjusting the Installation Position of the Controller (Part 1)

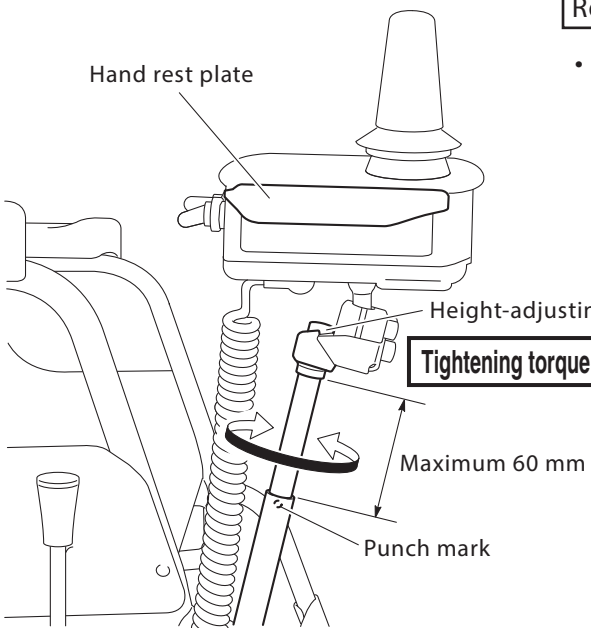


- The brackets can be installed on the outside of the holder.
- The angle of the controller can be changed within a 20-degree span.

3 Adjust the installation position.

Adjust the controller to a position that is easiest to operate by taking the height, angle, and its distance to the arm support into consideration.

Adjusting the Installation Position of the Controller (Part 2)



Required tools: 5 mm hexagon wrench

- Adjust the height so that the punch mark (adjustment limit punch mark) remains hidden.

Switching the hand rest plate to the left- or right-hand side

On the left-hand drive model, remove the hand rest plate by pulling it upward, change the rubber plate direction and relocate it to the left.

WARNING

Removal of the Controller

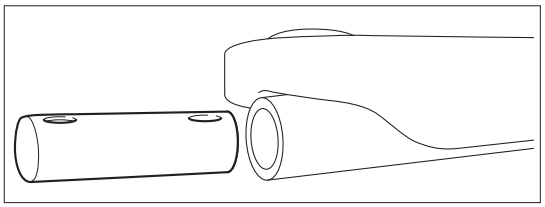
For example, when the customer wants to sit close to a table, the controller can be detached with moving the under holder locking lever.

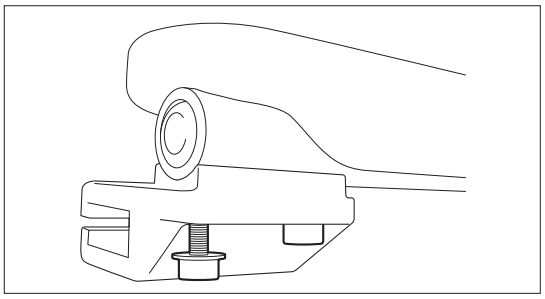
- Do not remove the controller from the under holder while the power is switched ON.
- Once you remove the controller from the under holder, do not switch the power ON. The control lever may tilt to cause the wheelchair to move unexpectedly, and you or other people around you may get injured. In addition, if you removed the retaining bolt, you can use the supplied hand-tightened screw.

(3) Swing Out Bracket

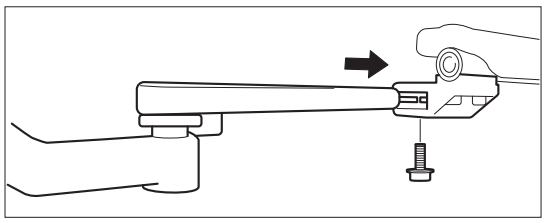
1 Fit bar 1 into the pipe. Make sure that bar 1 is installed in the correct direction.
Install the holder, and then tighten the bolt.

Front (25 mm) Tightening torque: 6 to 8 Nm Rear (40 mm or 45 mm) Tightening torque: 2 to 3 Nm

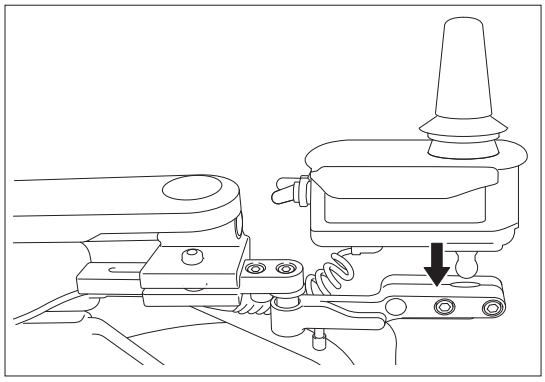




2 Install the upper holder assembly to the holder and temporarily tighten it.



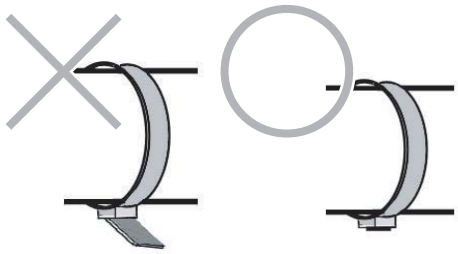
3 Install the upper holder assembly to the controller and temporarily tighten it.



(4) Wire Routing

Route the controller lead wire and the left unit harness, and connect to the power unit.

⚠ WARNING



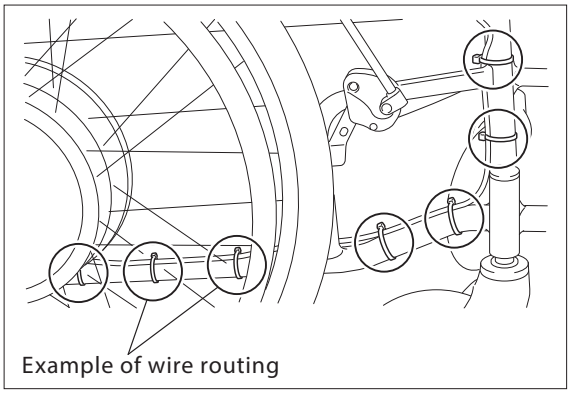
- Route and secure the wires correctly not to entwine or touch to the unit rotating parts, even the unit is detachable one and when the wire connectors are disconnected.
- When cutting off excess tie strap, do not cut diagonally, and cut as close to the knot as possible. If you leave the straps with sharp ends, the customer may get injured.

1 Route the lead wires for the controller/assistant controller and the left unit harness.

Required tools: Wire cutters

Route the wires in such a way to meet the following requirements.

- Run the wire along the top and inner sides of the pipe, secure it with tie straps.
- Fasten the tie straps in 5 to 10 cm intervals.
- Make sure the wire does not interfere with the rear tire.
- Make sure the wire does not interfere with or get caught between moving parts like the anti-tip bars of the wheelchair frame.
  * Pay special attention when tilting or reclining.
- When folding up the wheelchair, make sure the wire does not get caught by the crossbar.
- Fasten the tie straps loosely at the junction between the crossbar and the pipe, so that the lead wire does not get twisted.
- In case the unit is detachable one, make sure to secure the wires to make appropriate margin length for the connecting/disconnecting.
- Use single edged nippers to cut the ends of the tie straps.
- In case the separated battery seat type unit, make sure not to connect the left/right wires in reverse.

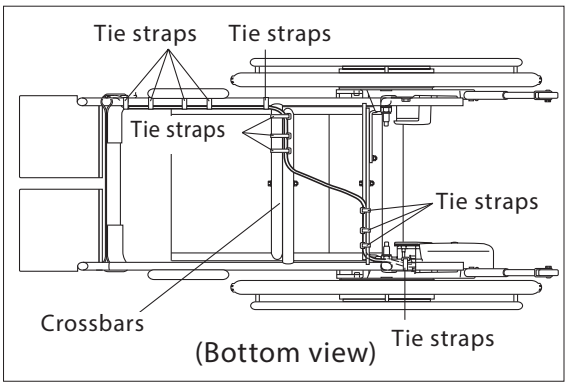


Example of wire routing

2 Remove the cover under the battery seat.

(5) Wire Routing for Left-Side Installation of Controller

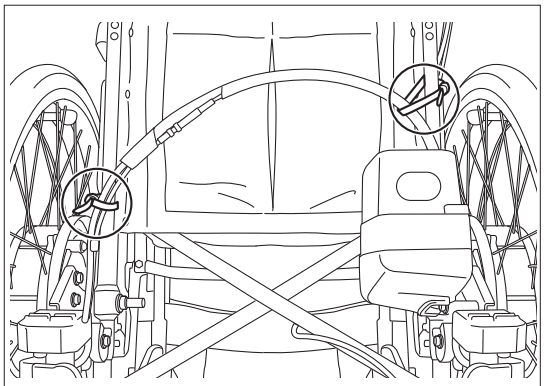
1 With the controller installed on the left side of the wheelchair, route the lead wires from below the under holder toward the battery seat. Route the lead wires along the frame and crossbars, securing the lead wires at 5 to 10 cm intervals. (See diagram at right.)
2 When routing the lead wires along the base pipe, route them on top of the pipe and secure them.
3 When routing the lead wires along the crossbars, route the leads so that they will not be pinched by the pipes, be pulled, or become twisted or slack when the wheelchair is folded.
4 Use wire cutters or a similar tool to cut off the excess ends of clamps so that the ends do not protrude.
5 Connect the control unit according to the instructions in "(8) Connecting the Control Unit and Lead Wires" in 3.4.



(Bottom view)

(6) Wire Harness Routing for the Left Drive Unit (20", 22", and 24" Models)

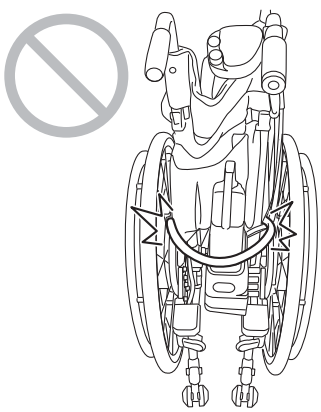
1 Route the wire harness so that it forms an upward arch and adjust the length of the harness so that it will not be pulled or become too slack. (If the wire harness is hanging down, it can easily become caught, causing a malfunction.)
2 Adjust the position of the arched portion of the wire harness so that any items will not rest on top of the wire harness. If necessary, use the 2 large clamps and 2 small clamps that are supplied to secure the wire harness.

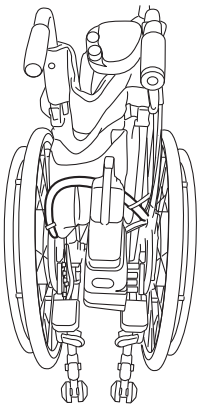

(Fixed Axle Model Sample)

Secure the wire harness if necessary.

If the wire harness behind the seat back is not secured, the battery may be positioned to the inside of the harness as shown in the "×" diagram (lower left) when the wheelchair is folded.
If the wheelchair is unfolded in this condition, an excessive force will be applied to the wire harness and the wire harness could be damaged.

When not secured	When secured

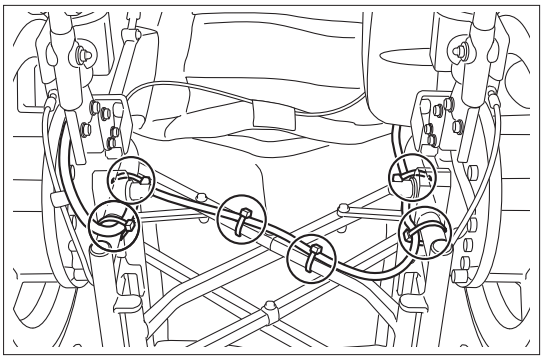




3 Connect the control unit according to the instructions in "(8) Connecting the Control Unit and Lead Wires" in 3.4.

(7) Wire Harness Routing for the Left Drive Unit (16" Model)

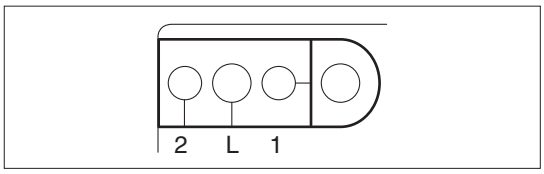
1 Route the wire harness along the frame and temporarily secure it using clamps.
2 Adjust the wire harness so that it will not be pulled or become too slack.
3 Check that the wire harness is not pulled when the frame is folded.
4 Use single edged nippers or a similar tool to cut off the excess ends of clamps so that the ends do not protrude.
5 Connect the control unit according to the instructions in "(8) Connecting the Control Unit and Lead Wires" in 3.4.



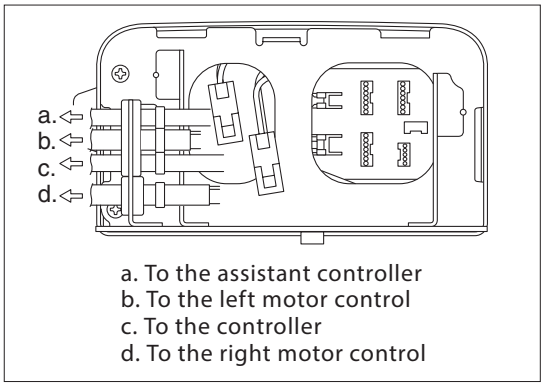
(8) Connecting the Control Unit and Lead Wires

1 Remove the cover under the battery seat.

2 Route the lead wires and wire harness through the grommet.
- Inner 1: Controller lead wire
- Center L: Left unit wire harness
- Outer 2: Assistant controller lead wire

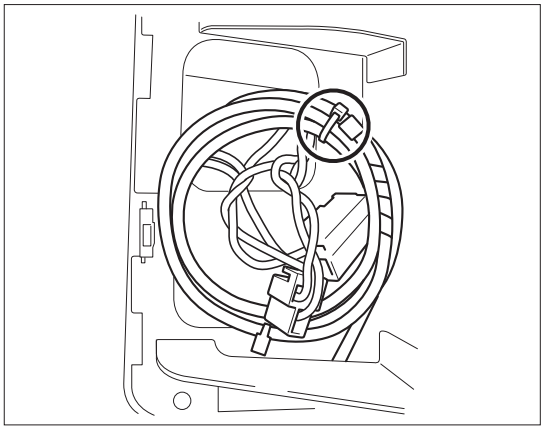


3 Connect the connectors to the control unit assembly. The connectors can be connected to any receptacle as long as the shapes match.



a. To the assistant controller
b. To the left motor control
c. To the controller
d. To the right motor control

4 Coil the excess lead wires and left unit wire harness, and bind them with a clamp.



5 Install the plate cover. Make sure not to pinch the lead wires and wire harness when installing the cover.

Tightening torque: 1.5 to 2.5 Nm

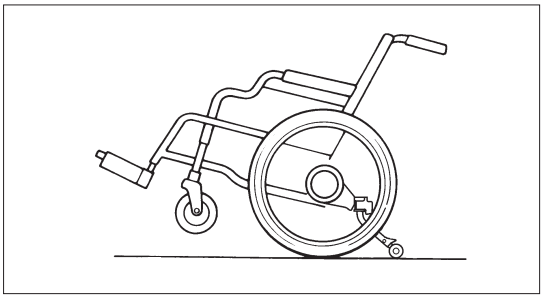
3.5. Anti-tip Device Adjustment

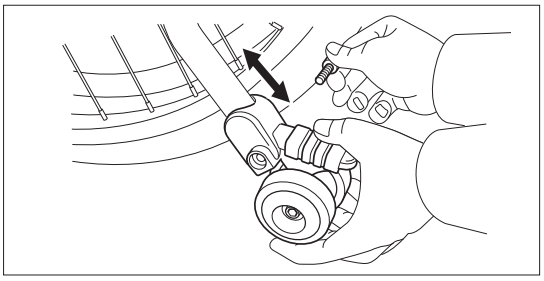
Adjust the anti-tip device so that the front casters are not more than 10 cm off the ground when the anti-tip device contacts the ground.

(1) Anti-tip Device Length Adjustment
The 16" model can be adjusted to 2 lengths and the 20", 22", and 24" models can be adjusted to 3 lengths.

1 Remove the bolt that secures the anti-tip device.
2 While checking the front caster height when the anti-tip device contacts the ground, select the appropriate mounting hole.
3 Install the bolt.

Tightening torque: 4 to 6 Nm



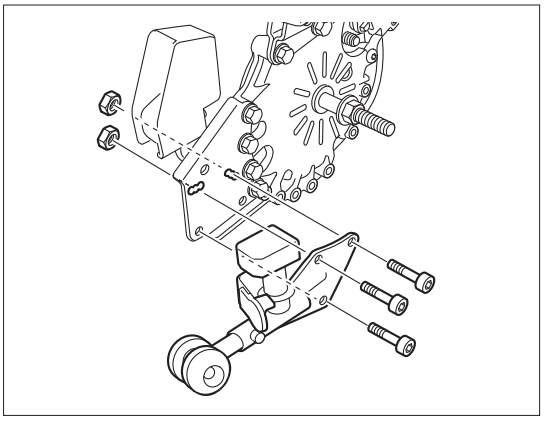


(2) Anti-tip Device Angle Adjustment (Adjustable to 3 Angles)
Anti-tip Device Installation Angle Adjustment

1 Remove the clamps that are securing the lead wire.
2 Remove the bolts and nuts.
3 Select the mounting holes for the bolts to adjust the angle of the anti-tip device. Make sure that the lead wire is not pulled.
4 After inserting the bolts in the holes, tighten the bolts and nuts while pushing the anti-tip device upward.

Tightening torque: 6 to 8 Nm

5 Secure the lead wire so that it will not contact the wheels or other parts.

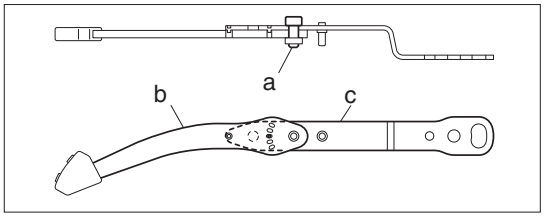


3.6. Clutch Lever Position Adjustment

On the 20", 22" and 24" models, if the clutch lever interferes with the operation of the parking brake lever or other parts, the length and angle of the clutch lever can be adjusted.

(1) Angle Adjustment

1 Remove nut “a” and loosen the bolt.
2 Fit the projection on lever “c” into an appropriate hole in lever “b” to adjust the position of lever “b”.
3 Tighten the bolt and nut.

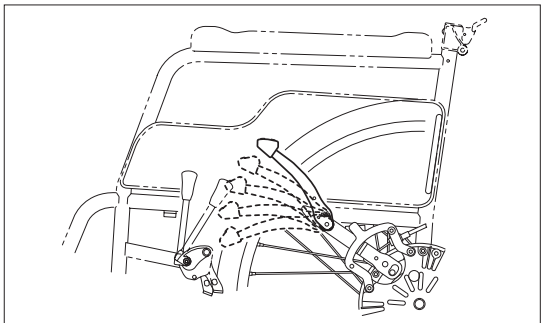


(2) Length Adjustment

The total length of the clutch lever can be adjusted to 2 lengths by installing the lever in either of the 2 mounting holes.

1 Remove nut “a” and the bolt.
2 Select the appropriate mounting hole and tighten the bolt and nut for adjusting the lever angle according to the instructions in section (1) in 3.6.

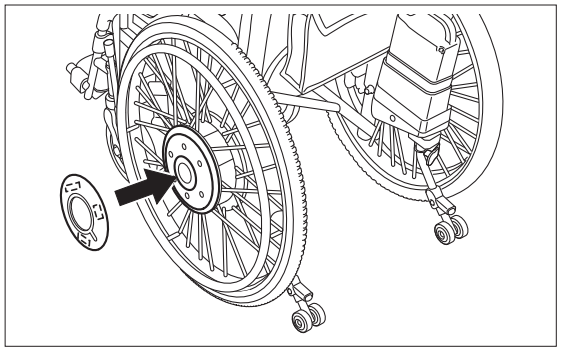
Bolt tightening torque: 10 to 12 Nm Nut tightening torque: 6 to 8 Nm



Example showing 5 adjustments

3.7. Wheel Cap Installation (20", 22" and 24" Models)

Peel off the film from the double-sided tape on the back of the wheel cap.
Position the wheel cap so that it will not cover ring 2 or the cap, and install it to the hub.
Push the wheel cap so that the double-sided tape is affixed securely.



3.8. Check Items after Power Unit Installation

	Item	Check
1	The forward and backward tip angles are at least 20°, and the side tip angle is at least 15°. (For details, refer to “2.3. Functional Conditions”.)	
2	There is no interference between the power unit and the frame.	
3	There are no gaps between the clamp bracket stopper and the frame back pipe. (Fixed Axle Models)	
4	All parts are tightened (re-check the installation).	
5	The wire harness and cables are routed properly. (The wire harness and cables are not slack or pulled. In addition, the wire harness and cables are not pinched when the wheelchair is folded and are not caught or pinched when the wheelchair is unfolded.)	
6	The tire air pressure is correct. 22" and 24" models: 450 kPa (65 PSI) 20" model: 420 kPa (60 PSI) 16" model: 345 kPa (50 PSI)	
7	The parking brakes operate properly. (For details, refer to “2.3. Functional Conditions”.)	
8	The assistant brakes operate properly and do not make any abnormal sounds.	
9	The clutch operates properly.	
10	The wheelchair operates properly with the controller and the assistant controller.	
11	There are no abnormal sounds or vibration.	
12	The wheel caps are installed.	
	Inspector’s name and date	

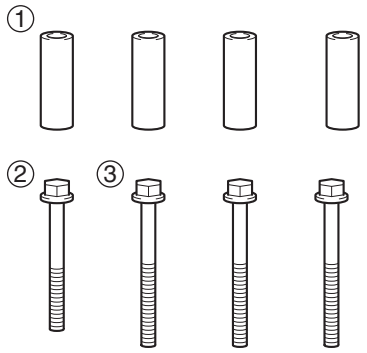
4. Optional Part Installation and Adjustment Procedures

4.1. Battery Seat Offset Parts

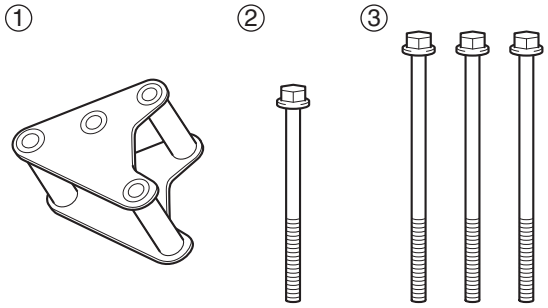
4.1.1. Supplied Parts Check

Battery Seat Offset Installation Parts (Optional)

28.5 mm Offset



53 mm Offset



	Part Number	Part Name	Quantity
1	90560-06183	Spacer 28.5 mm	4
2	95817-06040	Flange bolt 40 mm	1
3	95817-06045	Flange bolt 45 mm	3

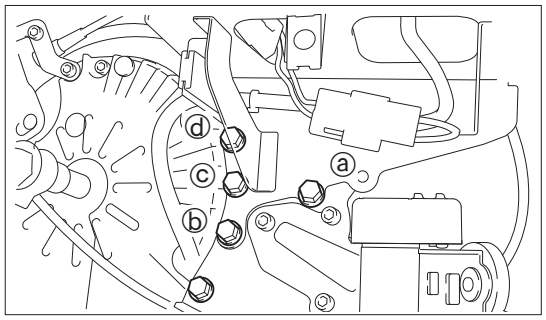
	Part Number	Part Name	Quantity
1	X0C-21394-00	Bracket	1
2	95817-06065	Flange bolt 65 mm	1
3	95187-06070	Flange bolt 70 mm	3

If the wheelchair has flip-up arm supports and the battery interferes with the arm supports, these parts may be used to change the position of the battery.

4.1.2. Installation

If the battery box interferes with the wheelchair frame or other parts when the reclining or tilting functions are used or the arm supports are flipped up, the position of the battery seat can be changed to prevent the interference.

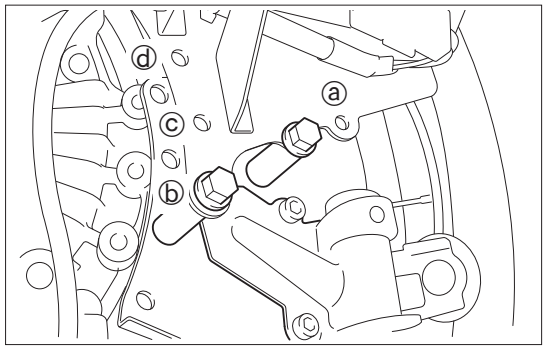
1 Remove bolts a, b, c, and d.
(Do not reuse the removed bolts.)



2 Using the spacers and bolts from the "Battery Seat Offset Installation Parts (Optional)", insert spacers between the battery seat and the anti-tip device mounting plate, and tighten the bolts to secure the battery seat.

Tightening torque: 9 to 11 Nm

For bolt a, use the 40 mm (65 mm) flange bolt.
For bolts b, c, and d, use the 45 mm (70 mm) flange bolts.

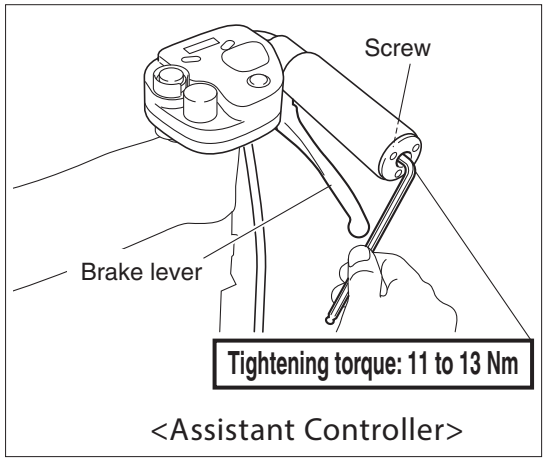


3 Place the controller fully over the hand grip pipe. Tighten the screw so that the brake lever faces straight down.

Required tools:	5 mm hexagon wrench and torque wrench

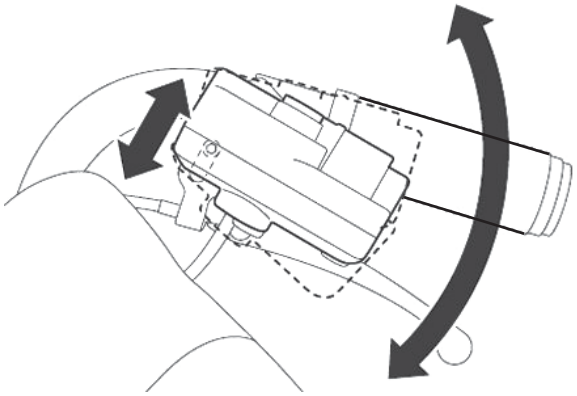
If the inner diameter of the pipe is small, replace the nut lock.

Ensure that at least 40 mm is inserted.
Also note that if it is inserted as far as it will go, it may come in contact with the shoulders and head of the individual sitting in the wheelchair.



<Assistant Controller>

Assistant Controller Installation Position Adjustment

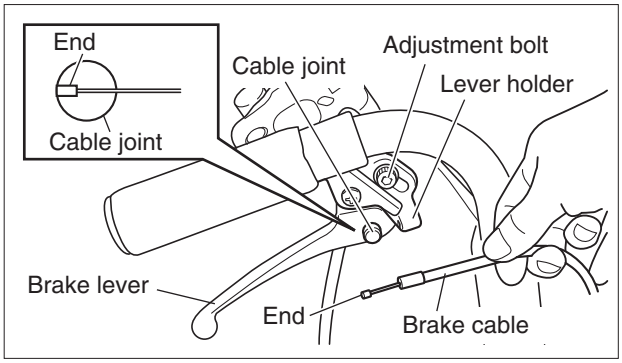


Required tools: 5 mm hexagon wrench

The height and angle of the controller can be changed by loosening the adjustment bolt (see diagram below).

4 Brake Cable Connection

1 Insert the cable joint into the brake lever hole.
2 Place the brake cable end in the cable joint hole.
3 Place the outer portion of the brake cable in the lever holder hole.



4.2. Joystick Knob and Return Spring Replacement

⚠ WARNING

- There are specified combinations for the joystick knobs and return springs. Select a correct combination as indicated in the combination table. If you use an incorrect combination, the joystick knob may not return fully to the neutral position, causing the user or those around the user to be injured.

4.2.1. Combination Table

Return spring		Joystick knob shape							
		a						b	
Type	Operation load*2	Compact type	Compact + urethane cylinder type	Compact + rubber bowl type	Narrow type (60 mm)	Round type	Long type (135 mm)	T-shaped	U-shaped
Strong SP (red)	5 Nm	○	○	○	○	○	○	○	○
Standard SP	2 Nm	○	○	○	○	○	○	○	○
Weak SP (blue)*1	0.9 Nm	○	○	○	○	○	×	×	×
Weakest SP (green)*1	0.5 Nm	○	○	×	×	×	×	×	×

○ : Usable

× : Do not use with this combination

*1 When using the weak SP (blue) or weakest SP (green) spring, contact the wheelchair manufacturer.

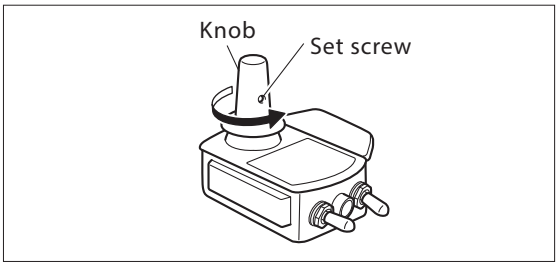
*2 The operation load is the load at the set screw when the joystick is operated.

4.2.2. Joystick Knob Replacement

(1) Joystick Knob Replacement Method (a)

1. Loosen the set screw with a wrench. (See diagram at right.)
2. Turn the joystick knob counterclockwise and remove it.
3. Turn the joystick knob clockwise until it stops and is securely screwed on.
4. Tighten the set screw with a wrench.

   Tightening torque: 0.1 to 0.3 Nm
5. When installing the compact + urethane cylinder type or compact + rubber bowl type, install the compact joystick knob, and then fit the urethane cylinder or rubber bowl onto the knob.

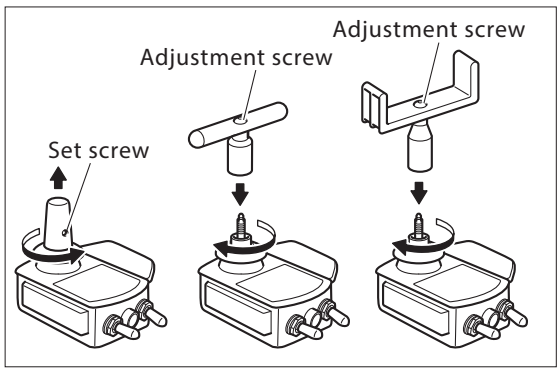


(2) Joystick Knob Replacement Method (b)

1 Loosen the set screw with a wrench. (See diagram at right.)
2 Turn the joystick knob counterclockwise and remove it.
3 Turn the joystick knob clockwise until it stops and is securely screwed on.
4 Tighten the set screw with a wrench.

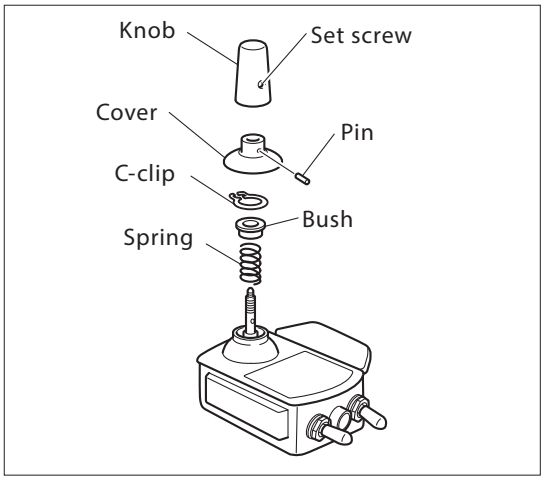
Tightening torque: 0.1 to 0.3 Nm

5 Position the joystick knob head in an easy-to-use location (rotation direction) and secure it with the adjustment screw.



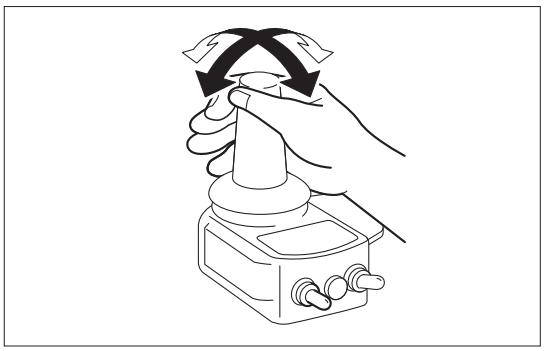
4.2.3. Return Spring Replacement

1 Loosen the set screw with a wrench.
2 Turn the joystick knob counterclockwise and remove it.
3 Remove the pin by pushing it out from the opposite side with a 1.5 mm hexagon wrench.
4 Remove the cover by sliding it upward.
5 Remove the C-clip with snap-ring pliers or a similar tool.
6 Remove the bushing by sliding it upward.
7 Replace the return spring. Before installing the new return spring, make sure that it is correct for the joystick knob that will be installed. If you use an incorrect combination, the joystick knob may not return fully to the neutral position.
8 Install using the reverse order of the removal procedure.
Do not reuse the C-clip. Be sure to replace it with the new C-clip that is supplied with the return spring.



4.2.4. Inspection Method after Installation (Required)

1 Set the driving parameter settings or the driving parameters in JW Smart Tune to the Free Mode, and then set the joystick dead zone to “Narrow”. For the setting procedure, refer to “6.3. Driving Parameters ~Free Mode~ Setting Method” in this service manual or to the JW Smart Tune Operation Manual.
2 Turn off the power switch.
3 With the controller positioned as when it is installed to the wheelchair, tilt the joystick knob fully forward, and then slowly return it to the center position and release it.
4 Then, turn on the power switch. Confirm that an error is not displayed.



5 Check the backward, left, and right directions using the same procedure.
If an error is displayed in any direction, do not use the joystick knob.
The combination of the joystick knob and spring may be incorrect, or there could be a malfunction. Contact a wheelchair manufacturer service representative.

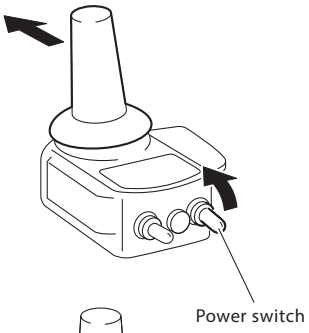
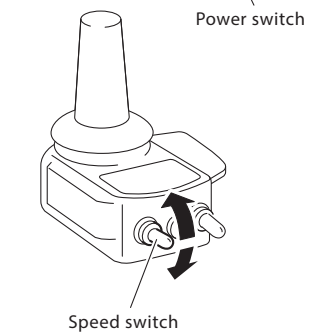
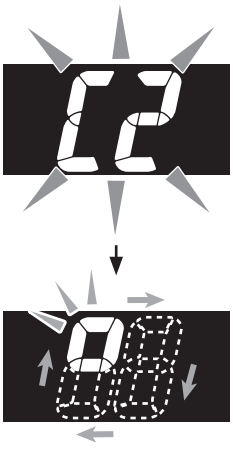
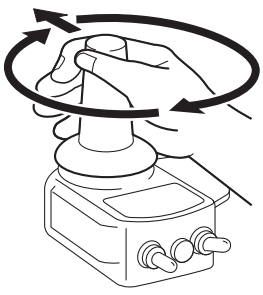
6 If the controller is installed to a flip-up type of arm support, flip up the arm support, and then tilt the joystick knob backward and slowly return it to the neutral position. Perform the same confirmation described above.

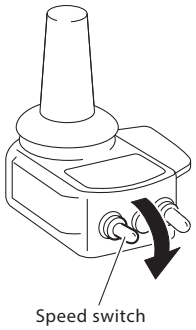
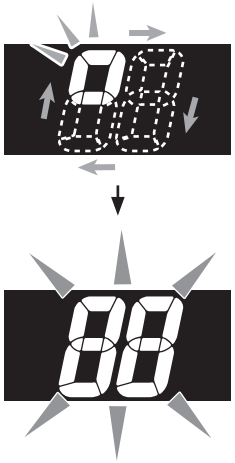
7 After completing the inspection, return the driving parameters to the original settings.

4.2.5. Joystick Range of Motion Adjustment (Required)

This procedure must be performed when the joystick knob or return spring is replaced.

[Setting Method]

	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[1]	[Preparation] Prepare to adjust the range of motion.	Stop the wheelchair in a stable state, engage the parking brake, and power OFF.	 Off
[2]	[Range of Motion] Enter the adjustment mode.	 Power switch While tilting the joystick forward, turn on the power.  Speed switch Error "C2" will be displayed, then, flip the speed switch up and down several times. Continue this operation until the range of motion input screen shown to the right is displayed.	 Range of motion input screen
[3]	[Range of Motion Input] Operate the joystick to input the range of motion.	 Tilt the joystick forward and slowly make 2 clockwise rotations within the possible operation range, and then release your hand from the joystick.	

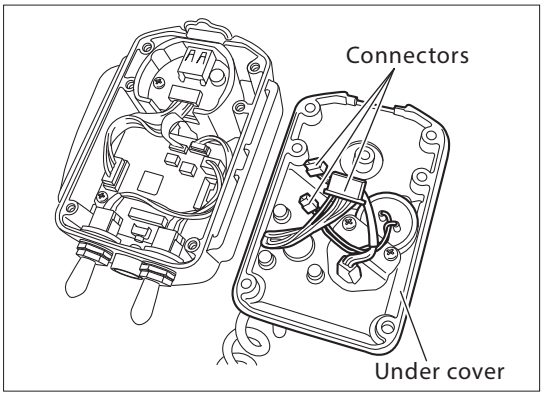
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[4]	[Saving the Range of Motion]	 Hold down the speed switch for 2 seconds (until the buzzer beeps). At this time, you will hear a long buzzer. Once the buzzer beeps, release your hand from the switch. The setting is saved. If you turn off the power without performing this operation, the setting will not be changed.	

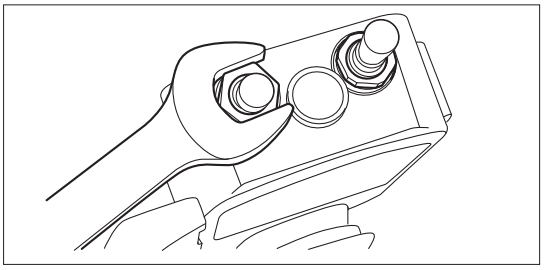
If the speed switch type is set to “Push-type switch” in JW Smart Tune, the range of motion for the joystick cannot be adjusted using the controller.
Use JW Smart Tune to adjust the range of motion for the joystick. For instructions, refer to the JW Smart Tune Operation Manual.

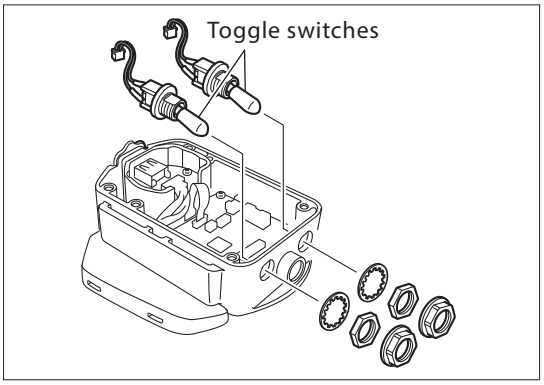
4.3. Power Switch and Speed Switch Replacement

4.3.1. Toggle Switch Removal

1 Remove the battery.
2 Turn on the power switch, and then turn it off again after approximately 1 second. (This discharges any residual electricity held in the capacitors, etc., on the printed circuit board.)
3 Remove the 6 screws from the under cover of the switch case.
4 Disconnect the 3 connectors on the printed circuit board that are connecting the lead wires from the under cover of the switch case.
5 Disconnect the connector on the printed circuit board that is connecting the lead wire from the toggle switch.
6 Loosen the cap with an open-end wrench and remove it.
7 Loosen the nut with an open-end wrench, remove it, and then remove the toggle switch from the case.
8 Repeat steps 5–7 to remove the other toggle switch.

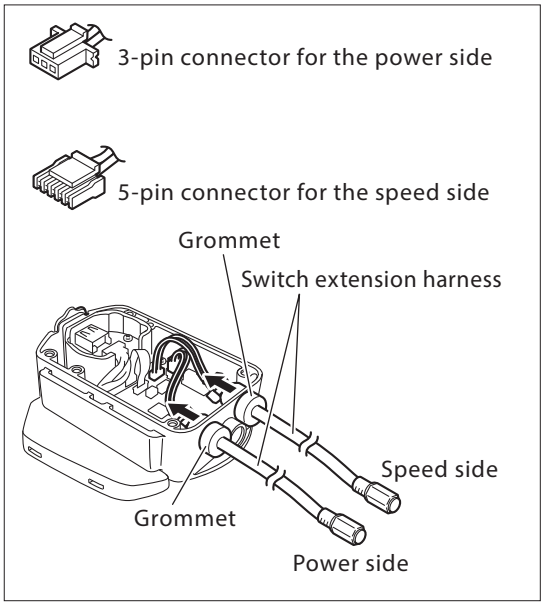






4.3.2. Switch Extension Harness Installation

1 Insert the switch extension harnesses into the switch case from outside the case. Fit the grommets securely into the case.
3-pin connector for the power side
5-pin connector for the speed side



2 Connect the 2 connectors on the switch extension harnesses to the printed circuit board.
3 Connect the 3 connectors on the under cover of the switch case.
4 Tighten the 6 screws on the under cover of the switch case.

Tightening torque: 1.1 to 1.4 Nm

4

NOTICE

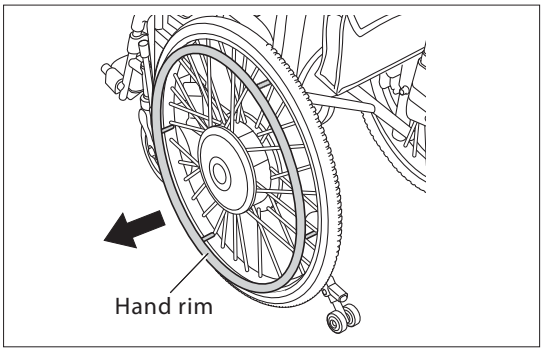
Note that the switch extension harnesses are not waterproof.

- When changing the speed switch to the switch extension harness, be sure to use JW Smart Tune and change the setting for the speed switch type to “Push-type switch”. For instructions, refer to the JW Smart Tune Operation Manual.
- Use an alternate switch for the power side and a momentary switch for the speed side.

4.4. Hand Rim Replacement (20", 22", and 24" Models)

4.4.1. Hand Rim Removal

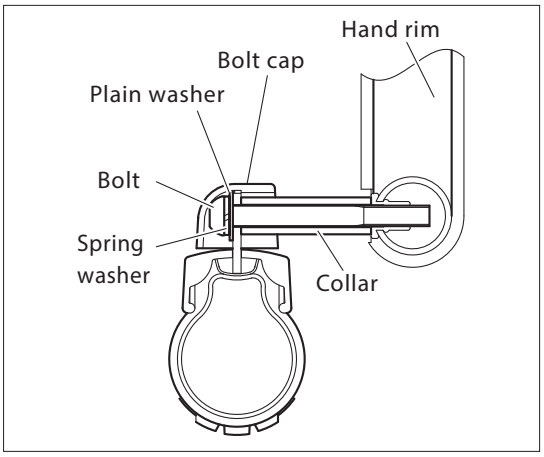
1 Remove the 6 bolt caps.
2 Loosen the bolts with a wrench and remove the hand rim.
Do not lose the collars, plain washers, and spring washers because they will be used for the installation.



4.4.2. Hand Rim Installation

1 Temporarily tighten at the 6 locations shown in the right diagram. Be sure to use the supplied bolts (with thread-locking agent applied).
2 Tighten the bolts.

Tightening torque: 4 to 5 Nm



4.5. Wheel Cap Replacement (20", 22", and 24" Models)

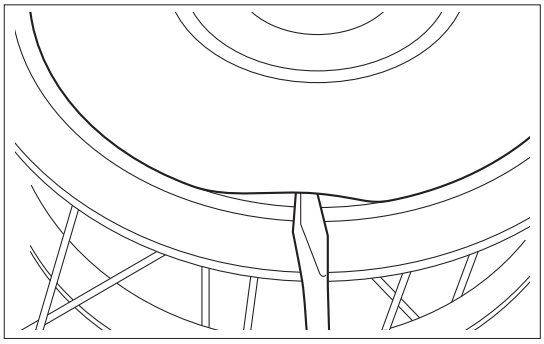
4.5.1. Removal

Required tools: Slotted screwdriver
(2 medium-sized screwdrivers)

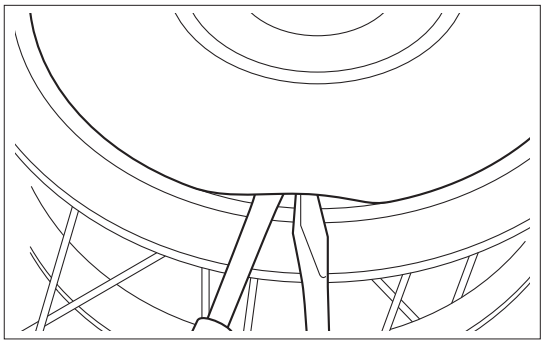
Read the entire replacement procedure and all of the notices, and then perform the replacement following the order in the instructions.

(1) Wheel Cap Removal

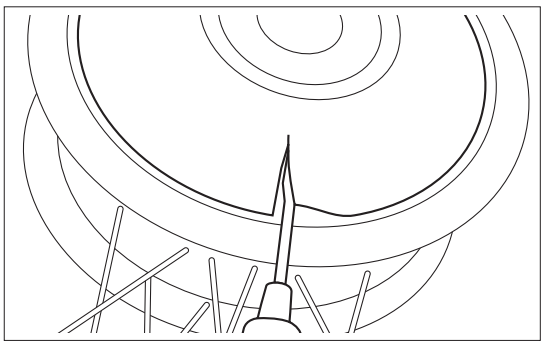
1 Unfold the wheelchair, place it on a level surface, and engage the parking brake.
2 Insert a slotted screwdriver slightly into the gap between the hub and the wheel cap.
3 Widen the gap of the wheel cap with the slotted screwdriver.

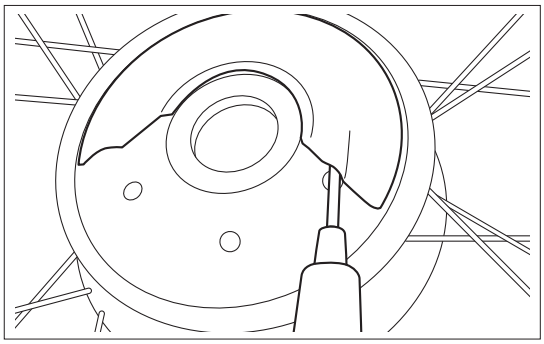


4 Insert the other screwdriver further into the widened gap.



5 Move the screwdrivers to remove the wheel cap.





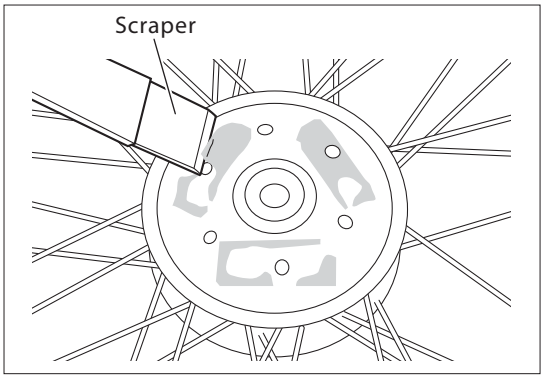
NOTICE

When inserting the screwdrivers, be careful not to scratch or damage the visible parts of the hub (aluminum portion). Lift up the handles of the screwdrivers so that the screwdrivers do not scratch the visible portions of the hub.
The standard wheel caps are affixed strongly. Perform the work with sufficient care to ensure that you do not scratch the visible portions or injure yourself.

(2) Cleaning of Affixing Surfaces

1 Remove the remaining double-sided tape with a scraper or similar tool.
Be careful that alcohol or tape does not enter the hub through the open holes in the hub.

2 Remove any grease from the affixing surface with alcohol or a similar substance.



NOTICE

When cleaning the wheelchair, do not use an organic solvent. Wipe the wheelchair using a towel that has been wrung out. If the dirt is difficult to remove, use neutral detergent and wipe the wheelchair. Because water could enter the power unit, do not clean the wheelchair by spraying or splashing water on it.

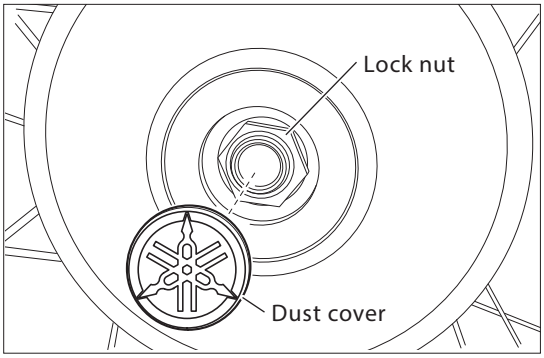
(3) Wheel Cap Affixing

Affix the wheel caps according to the instructions in “3.7. Wheel Cap Installation (20", 22" and 24" Models)”.

5.1. Wheel Assembly Removal and Installation

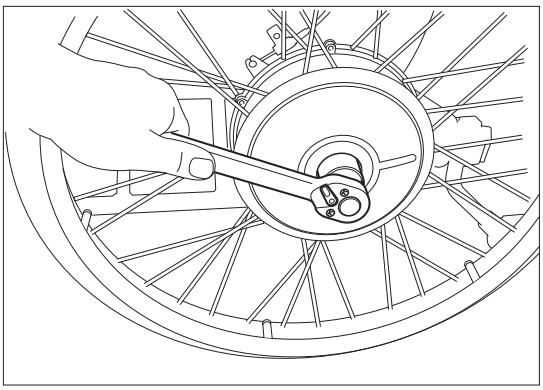
(1) Removal

1 Remove the dust cover.

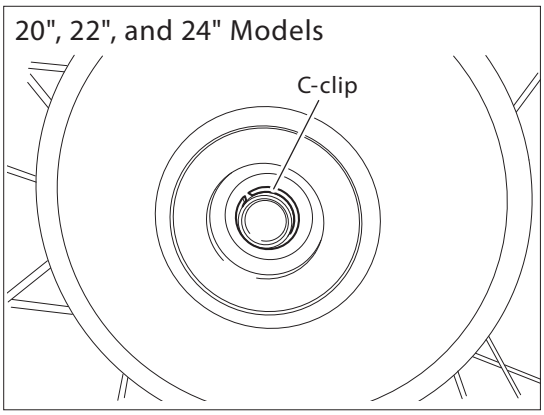


2 Loosen the lock nut.

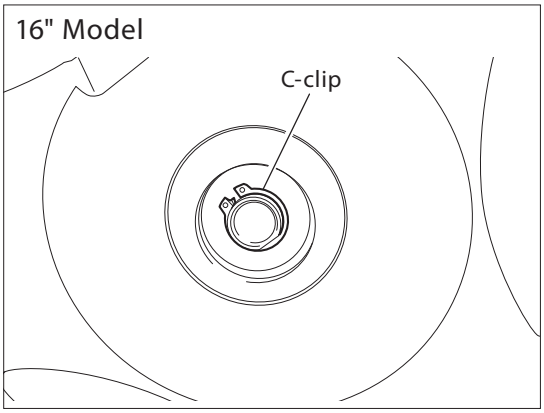
3 Remove the washer.



4 Remove the clip.
20", 22", and 24" Models
If the clip is difficult to remove, use a slotted screwdriver or similar tool and turn the clip counterclockwise along the screw thread.



16" Model
Remove the clip with snap-ring pliers or a similar tool.



5 Remove the wheel.

(2) Installation

1 Install the wheel.
2 Install the clip sufficiently onto the screw thread. If the clip is difficult to install, turn the clip along the screw thread.
3 Install the washer.
4 Tighten the lock nut to the specified tightening torque.

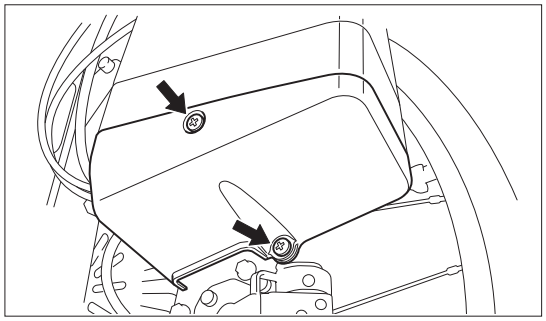
Lock nut tightening torque: 55 to 65 Nm

5 Install the dust cover.

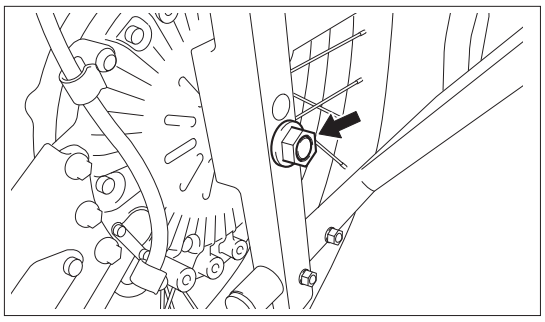
5.2. Drive Unit Removal and Installation (Fixed Axle Models)

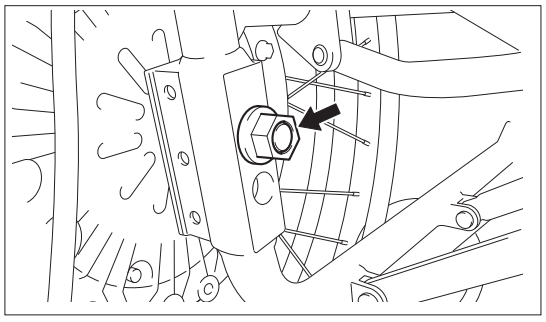
(1) Removal

1 If necessary, remove the wheel assembly according to the instructions in section (1) in 5.1.
2 Remove the plate cover on the battery seat, disconnect the wire connectors, and detach the right and left drive units, controller, and assistant controller (if installed).
3 Disconnect the assistant brake cable (if connected).

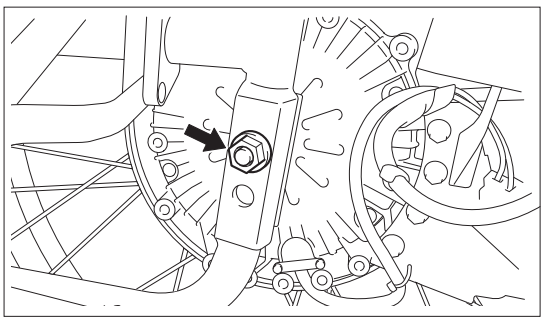


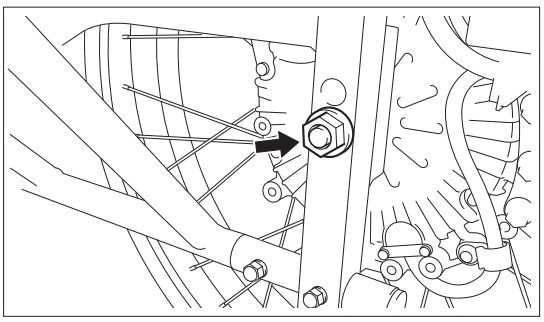
4 Remove the axle mounting nut that is securing the left unit, and remove the left drive unit assembly.





5 Remove the right drive unit assembly in the same way.





(2) Installation

Refer to “3.2. Power Unit Installation”.

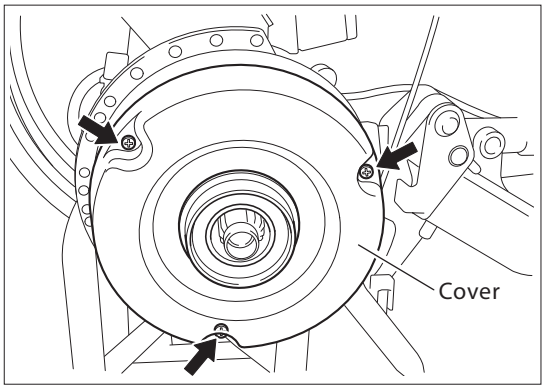
5.3. Motor Control Unit (Printed Circuit Board) Removal and Installation

(1) Removal

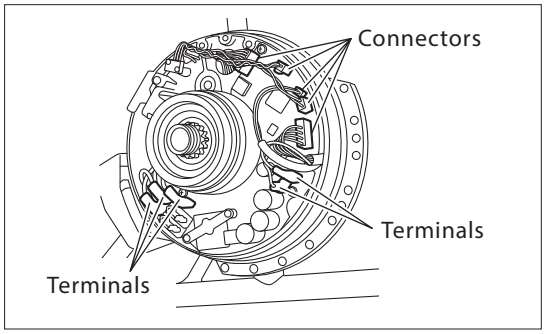
1 Remove the battery, turn on the power switch, and then turn it off again after approximately 1 second. (This discharges any residual electricity held in the capacitors, etc., on the printed circuit board.)

2 Remove the wheel assembly according to the instructions in section (1) in 5.1.

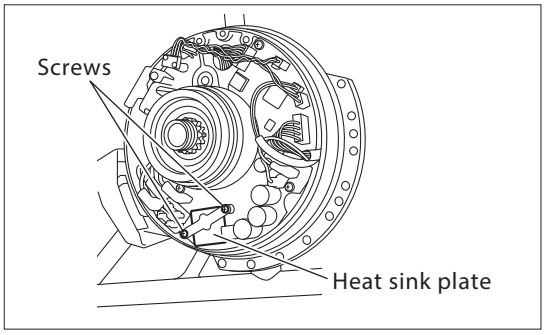
3 Remove the 3 screws and remove the plastic transmission cover and O ring.



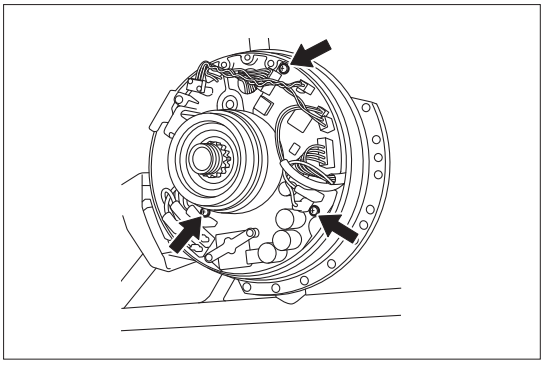
4 Disconnect all of the connectors that are connected to the motor control unit (printed circuit board).
To prevent breaking the terminals on the printed circuit board, slowly pull the connectors for the red, white, and black lead wires while moving the connectors in a direction that does not bend the circuit board terminals.



5 Loosen the 2 spring screws, and remove the heat sink plate.
Be careful not to lose the collar (white pipe).



6 Loosen the 3 screws, and remove the motor control unit.



5

(2) Installation

Install using the reverse order of the removal procedure. Before installation, check that the heat dissipation sheet (also acts as an insulator sheet) is neatly applied on the motor control unit.

1 Install the motor control unit (circuit board) to the drive unit, and tighten the 3 screws evenly to the specified tightening torque. Using the spring and spacers, secure the heat sink plate with the 2 screws.

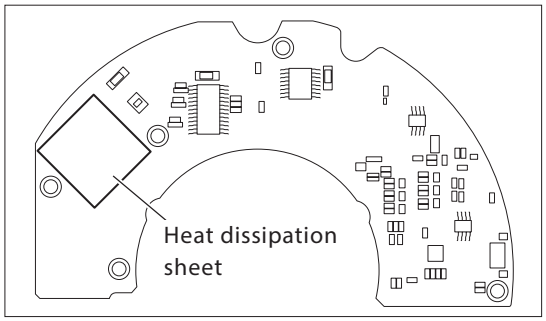
Tightening torque: 0.4 to 0.6 Nm

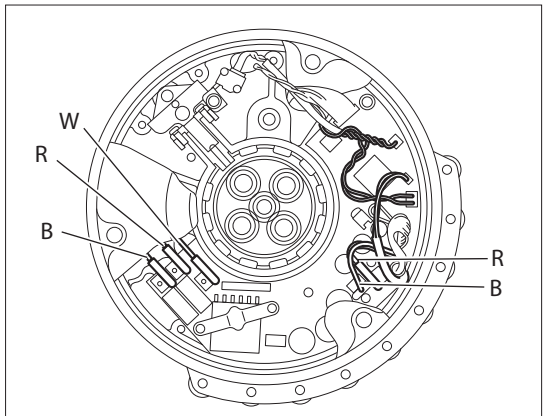
2 Connect the connectors in their original locations.

3 Install the O ring and plastic transmission cover, making sure that the lead wires do not get pinched.

Tightening torque: 1.5 to 2.5 Nm

4 Install the wheel assembly according to the instructions in section (2) in 5.1.





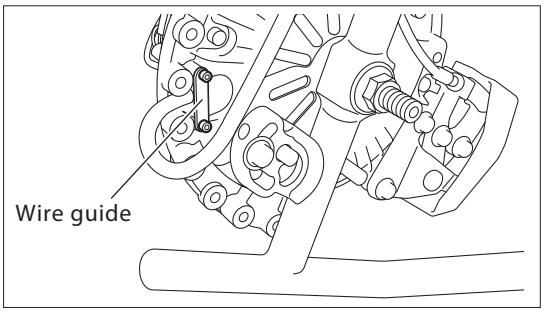
R : Red cable line
W: White cable line
B : Black cable line

5.4. Wire Harness and Lead Wire Removal and Installation

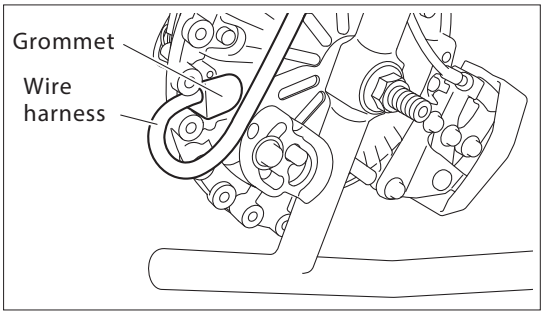
(1) Removal

1 Remove the motor control unit according to the instructions in section (1) in 5.3.

2 Remove the wire guide.



3 Remove the grommet from the case, and then pull out the wire harness and lead wire. Perform this operation carefully without damaging the wire harness connector or signal wires.



(2) Installation

1 Install using the reverse order of the removal procedure.

Wire guide mounting bolt tightening torque: 0.4 to 0.6 Nm

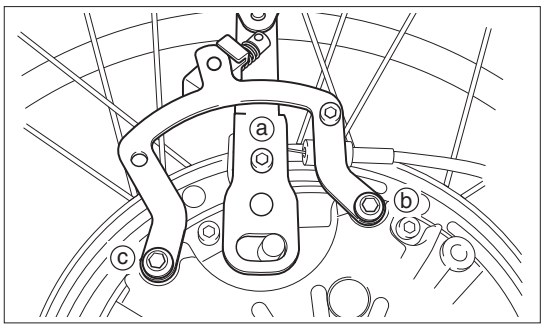
5

5.5. Clutch Lever Removal and Installation (20", 22" and 24" Models)

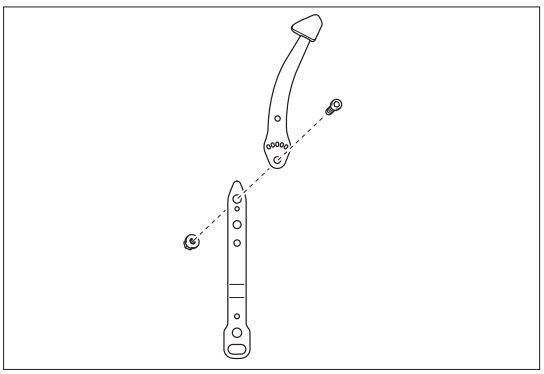
(1) Removal

1 Remove the drive unit from the wheelchair frame according to the instructions in section (1) in “5.2. Drive Unit Removal and Installation (Fixed Axle Models)”.

2 Remove bolts “a”, “b”, and “c”. Then, remove the clutch lever, clutch link, and shift plate 2.

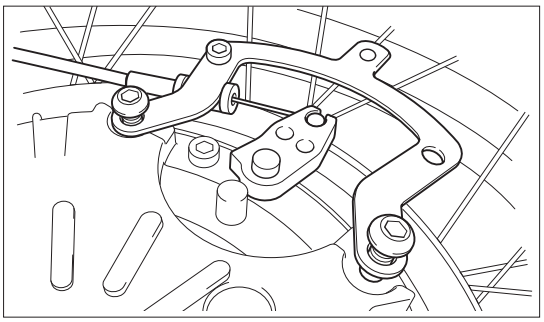


3 Disassemble clutch lever 1 and clutch lever 2 and reassemble them for use on the left side.
(Refer to “3.6. Clutch Lever Position Adjustment”.)



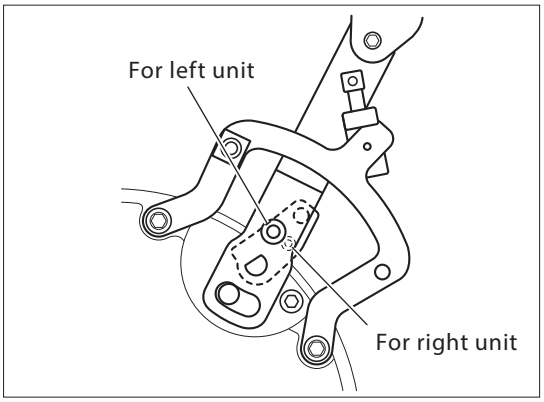
(2) Installation

1 Temporarily install shift plate 2



2 Install the clutch lever and clutch link to shift plate 2, and secure clutch lever 2 to the bolt hole. Be sure to use the correct bolt holes for the left clutch and right clutch. Secure shift plate 2, which was temporarily installed in step 1.

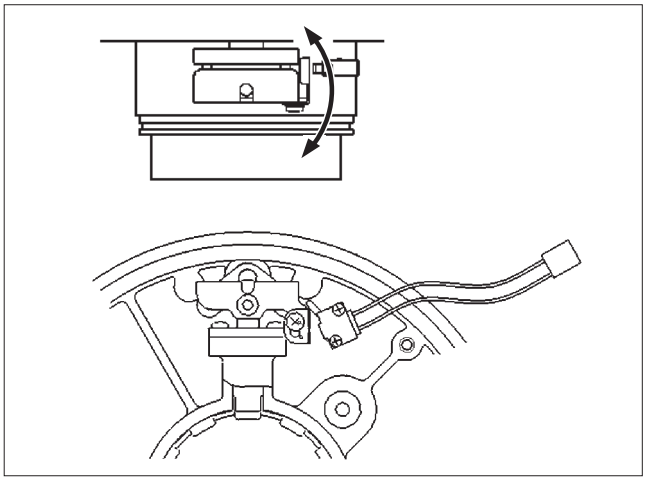
Tightening torque: 6 to 8 Nm



3 Install the left and right drive units to the wheelchair according to the instructions in sections (1) and (2) in “3.2. Power Unit Installation”.

5.6. Clutch Switch Adjustment

Be sure to perform the following adjustment after replacing the clutch switch or shift plate 1.
Disconnect the clutch switch coupler and connect it to a tester.
When dimension A (the distance between shift plate 1 and the seal plate) is changed, the continuity of the clutch switch should be as shown in the following table. Loosen the screw, adjust the position of the adjuster plate, and tighten the screw.
(As you check for continuity, no changes should occur when you shake shift plate 1 in the direction of the wobble shown to the right.)



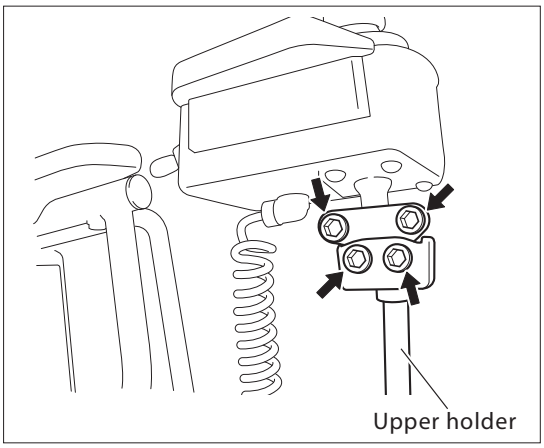
Dimension A	Clutch Switch Continuity
3.5 mm	Yes
4.5 mm	No

5.7. Controller Removal, Installation, and Position Adjustment

5.7.1. Standard

(1) Removal

1 Loosen the 4 bolts indicated by the arrows.
2 Remove the controller.



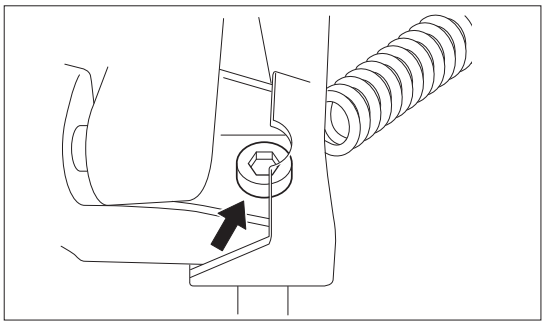
(2) Installation

1 Set the controller onto the upper holder.
2 Tighten the 4 bolts evenly.

Tightening torque: 6 to 8 Nm

(3) Position Adjustment

1 Loosen the 4 bolts that are securing the controller (see the diagram above) and the height-adjusting bolt (see the diagram at the right).



2 Set the controller in the appropriate position, and tighten the bolts.
Controller mounting bolt (4 bolts)

Tightening torque: 6 to 8 Nm

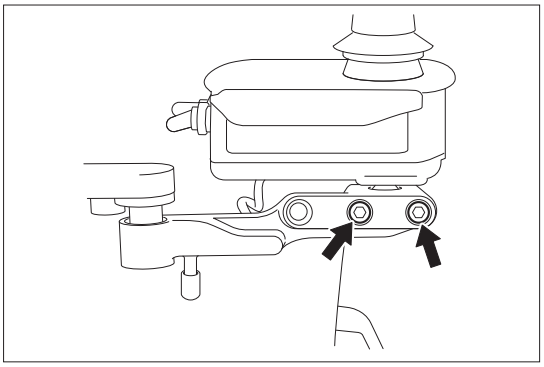
Height-adjusting bolt

Tightening torque: 14 to 16 Nm

5.7.2. Swing Out Bracket

(1) Removal

1 Loosen the 2 bolts indicated by the arrows.
2 Remove the controller.



(2) Installation

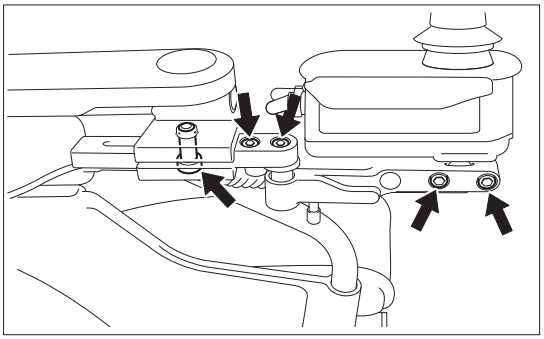
1 Set the controller onto the arm.
2 Tighten the 2 bolts.

Tightening torque: 6 to 8 Nm

(3) Position Adjustment

1 Loosen the 5 bolts shown in the diagram.
2 Set the controller in the appropriate position.
3 Tighten the 5 bolts.

Tightening torque: 6 to 8 Nm



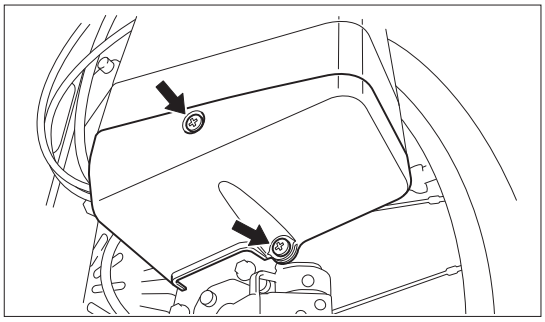
5.8. Switching the Controller Left/Right Side Position

5.8.1. Standard

(1) Removal

1 Remove the clamps that are securing the lead wires from the controller to the battery seat.

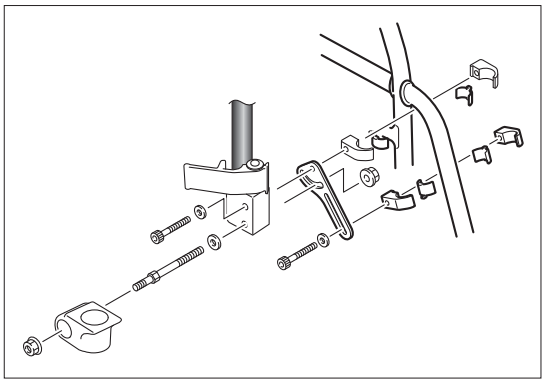
2 Remove the plate cover on the battery seat.



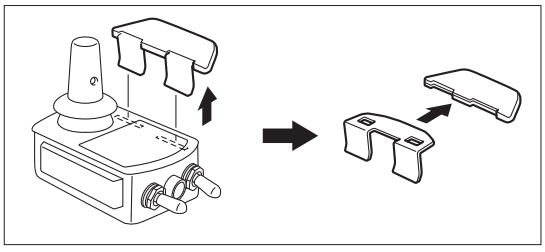
3 Pull out the lead wires stored in the battery box, remove the clamps, and disconnect the connectors from the circuit board.

4 From the under holder, remove the controller with the upper holder.

5 Remove the under holder from the frame, and attach it on the left side of the frame, so that the position of each component will be symmetrically opposite from when it was previously on the right side.

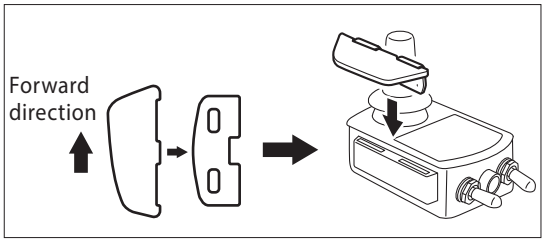


6 Remove the plate assembly from the remote controller assembly, pull out the metal plate, and change the direction of the rubber hand rest.



(2) Installation

1 Fit the metal plate into the remote controller assembly, and then install the assembly to the left side of the wheelchair.

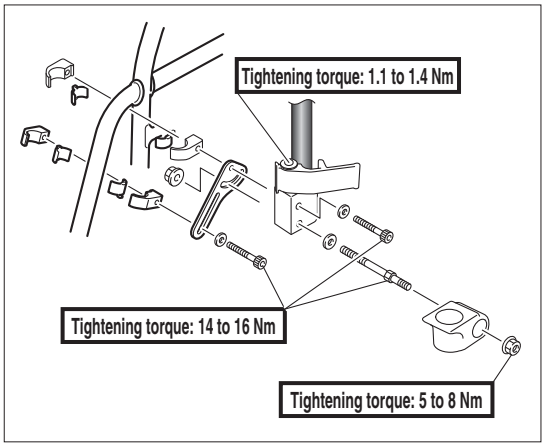


5

2 Route the lead wires and secure them with clamps. Route the lead wires with enough slack so that they will not be pulled when the frame is folded. (Refer to "(4) Wire Routing" in 3.4.)

3 Bundle the excess lead wires and store them in the battery box. Install the cover.

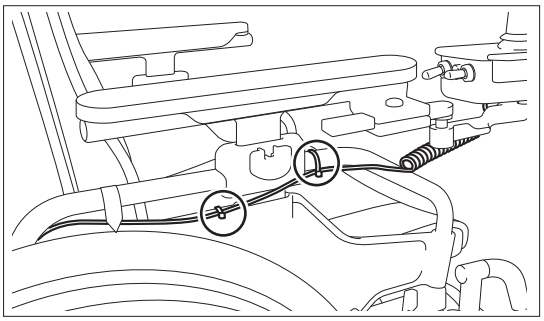
Plate cover bolt tightening torque: 1.5 to 2.5 Nm



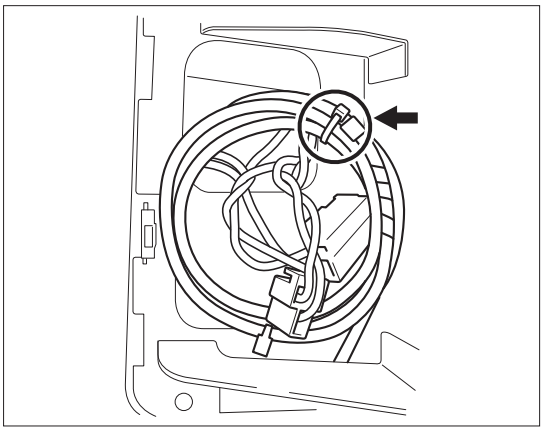
5.8.2. Swing Out Bracket

1 Remove the clamps that are securing the lead wires from the controller to the battery seat.

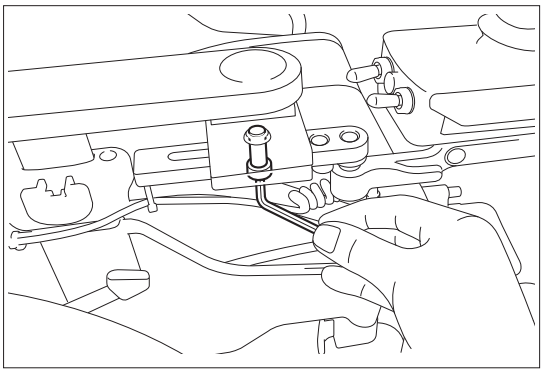
2 Remove the plate cover on the battery seat.



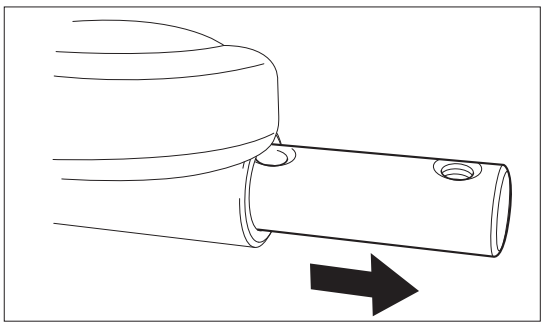
3 Pull out the lead wires stored in the battery box, cut the clamp, and disconnect the connector from the circuit board.



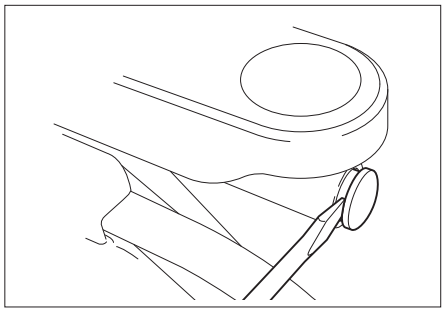
4 Remove the bolt securing the slider to the holder, and remove the slider with the controller.

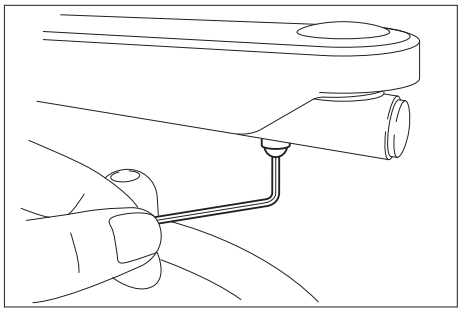


5 Remove the bolt securing the holder, and remove the bar from the arm support pipe.



6 Remove blind plug 1 from the arm support pipe where the controller will be installed, and remove the bolt.





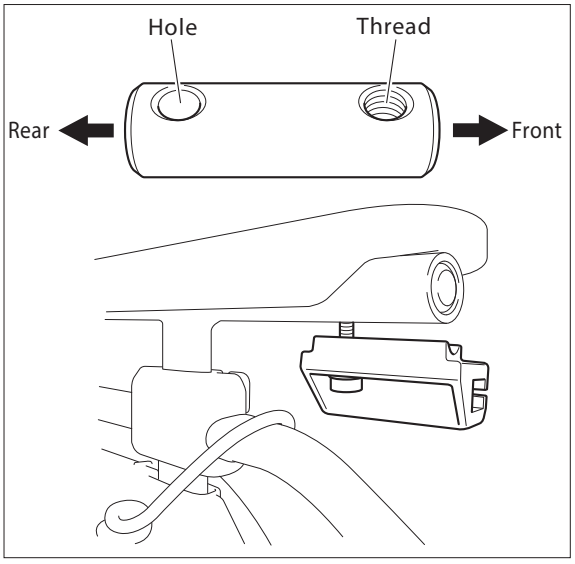
7 Install blind plug 1 and the bolt to the arm support on the opposite side of the wheelchair.

8 Fit bar 1 into the arm support pipe where the controller will be installed (make sure that bar 1 is installed in the correct direction), and secure the slider with the bolt.

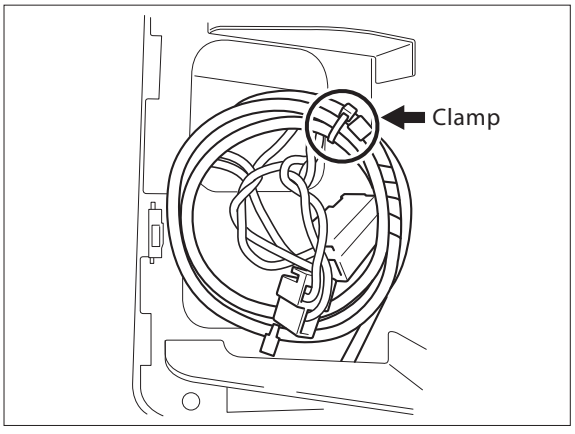
Front (25 mm) Bolt tightening torque: 6 to 8 Nm Rear (40 mm or 45 mm) Bolt tightening torque: 2 to 3 Nm

9 Install the slider with the controller to the holder.

Bolt tightening torque: 6 to 8 Nm



: Route the lead wires and secure them with clamps. Route the lead wires with enough slack so that they will not be pulled when the frame is folded or the arm support is flipped up, and they will not be pinched by the crossbars or other movable parts.



A Bundle the excess lead wires and store them in the battery box. Install the cover.

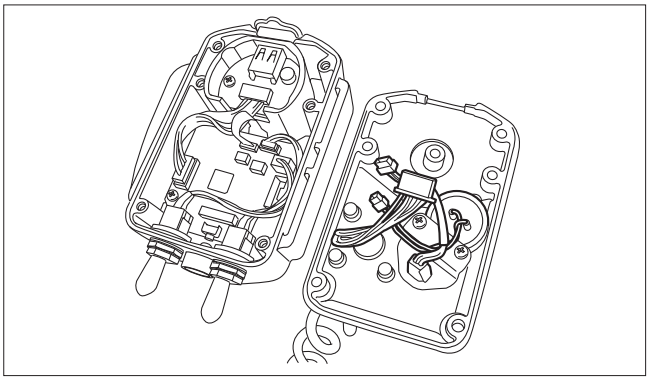
Plate cover bolt tightening torque: 1.5 to 2.5 Nm

5.9. Controller Disassembly, Assembly, and Parts Replacement

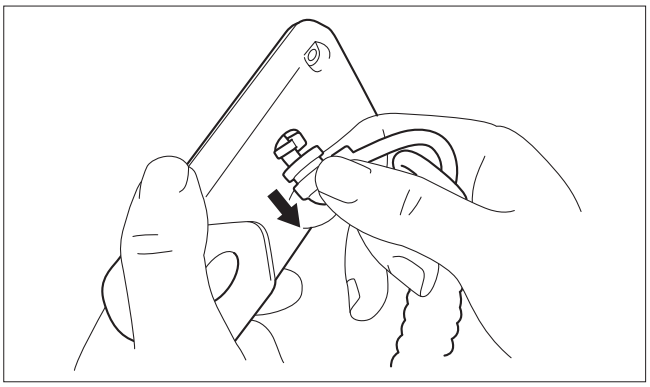
(1) Disassembly

1 Remove the 6 screws, and remove the under cover from the controller switch case.

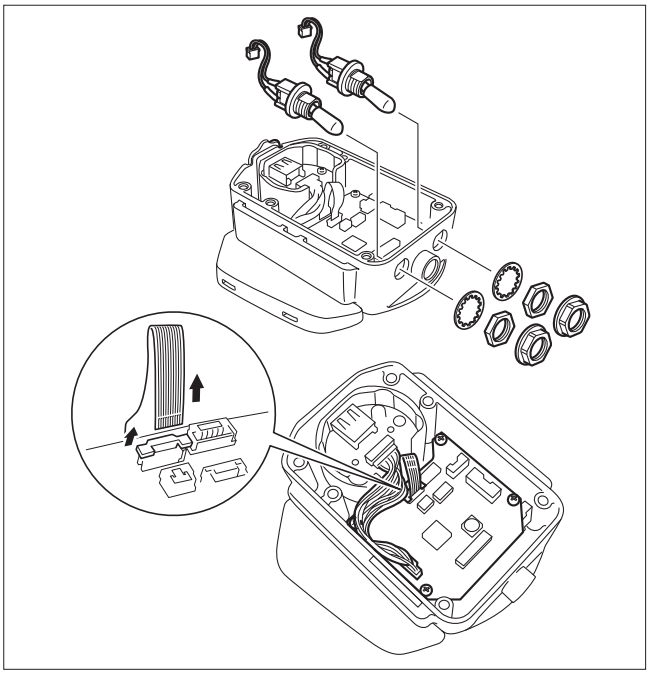
2 Disconnect the 3 connectors that are connecting the lead wires to the printed circuit board.



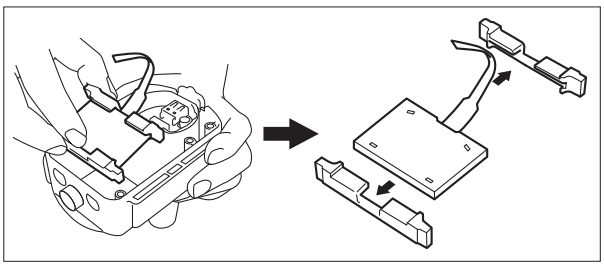
3 To replace the lead wire:
Remove the 2 screws for the wire guide, and remove the lead wire from the under cover of the switch case.



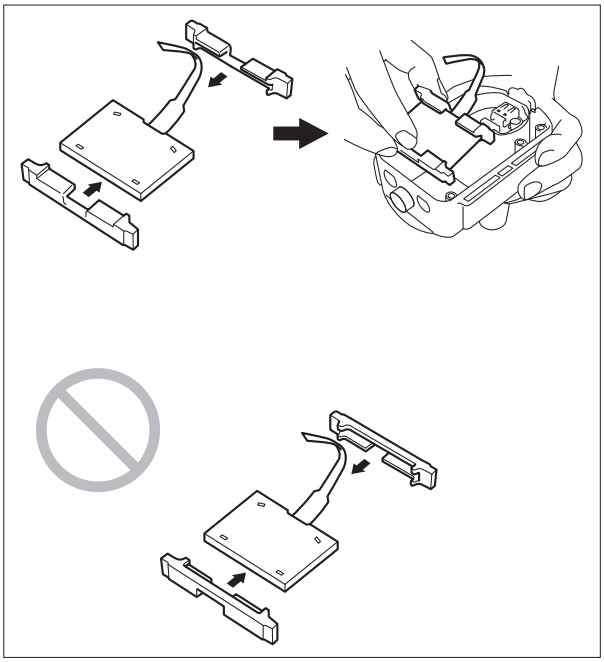
4 To replace the printed circuit board:
Disconnect the switch connector, remove the cap, nut, and washer, and then remove the switch. Repeat this step to remove the other switch.
Disconnect connector A.
Lift up the lock, and pull out the LCD ribbon cable.
Be careful not to bend or damage the LCD ribbon cable.
Remove the 4 screws, and pull out the printed circuit board.



5 To replace the LCD unit:
Remove the printed circuit board, and then pull out the LCD unit with the display holder.
Remove the display holder.



(2) Installation
Install using the reverse order of the removal procedure. When installing the LCD unit, make sure that the LCD unit and display holder are installed in the correct directions. (See diagram at right.)



Printed circuit board installation
(4 screws)

Tightening torque: 0.4 to 0.6 Nm

Switch installation (2 switches)

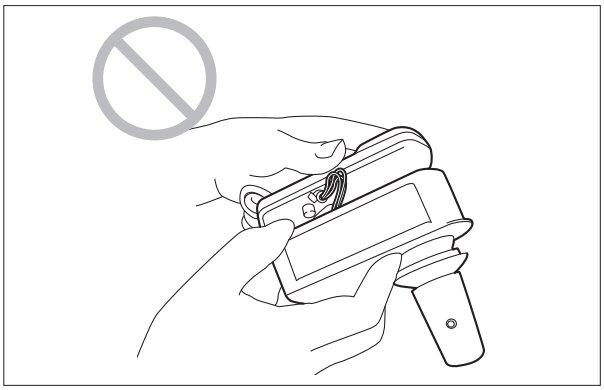
Tightening torque: 1.4 to 1.6 Nm

Switch cap installation (2 caps)

Tightening torque: 0.4 to 0.6 Nm

When installing the under cover to the upper cover of the switch case, be careful not to pinch the lead wires.
Switch case under cover (6 screws)

Tightening torque: 1.1 to 1.4 Nm

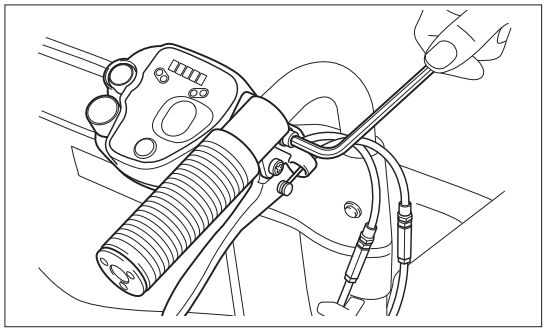


(3) Procedure after Printed Circuit Board Replacement (Required)
Adjust the joystick range of motion according to the instructions in “4.2.5. Joystick Range of Motion Adjustment (Required)”.

5.10. Assistant Controller (Option) Disassembly and Assembly

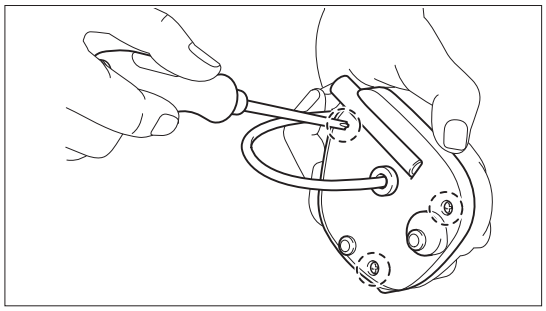
(1) Removal and Disassembly

1 Loosen the retaining bolt and remove the assistant controller.



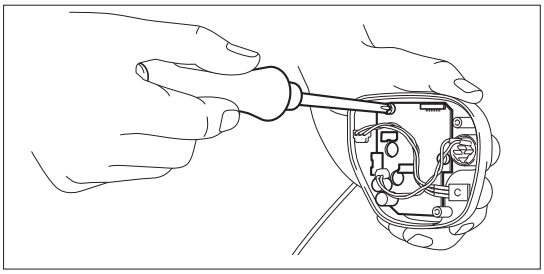
2 Loosen the 3 screws, and remove the under cover of the assistant controller.

3 Disconnect the connectors of the lead wire, etc. that are connected to the print board.



4 To replace the lead wire:
Use a slotted screwdriver to push out the rubber grommet that is securing the lead wire onto the under cover, and remove the lead wire.

5 To replace the print board:
Remove the 3 screws, and pull out the print board from the case.



(2) Assembly and Installation

Replace the components and assemble using reverse procedure.

Screws for securing the print board (× 3)

Tightening torque: 0.4 to 0.6 Nm

Screws for securing the under case (× 3)

Tightening torque: 0.6 to 0.8 Nm

Bolt for securing the controller (× 1)

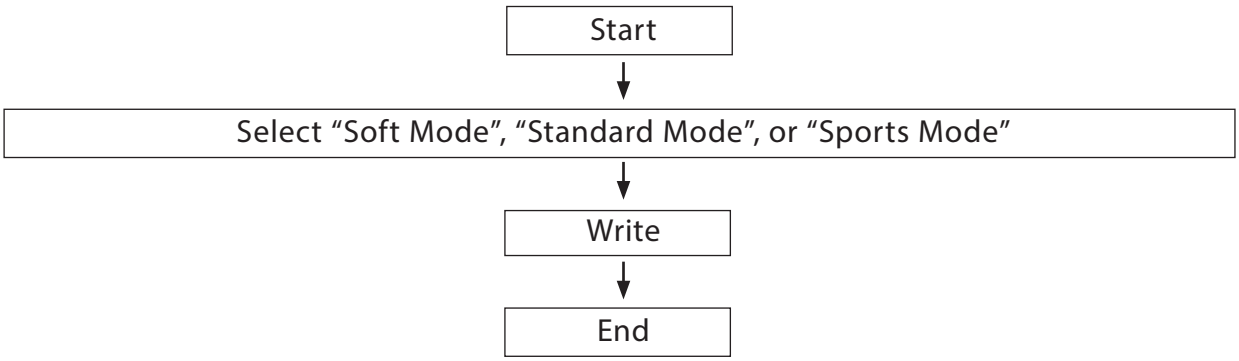
Tightening torque: 12 to 16 Nm

6. Settings the Parameters

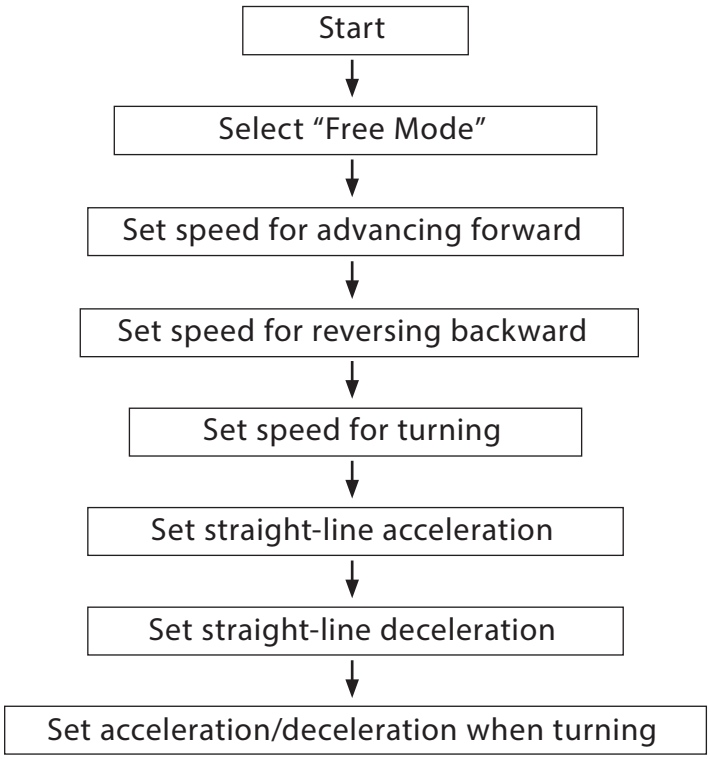
The settings of the features and characteristics of the E-Drive PLUS can be changed as follows to suit the usage.
You can modify two sets of parameters: “driving parameters” and “function parameters”.
The driving parameters allow you to set such settings as the maximum speed of the wheelchair, acceleration, and joystick sensitivity. You can configure each item in detail using the “Free Mode”, or select one of the preset modes: “Soft Mode”, “Standard Mode” and “Sports Mode”.
The function parameters allow you to set the time lapse for auto power off, the buzzer sound, the LCD brightness, and so on.

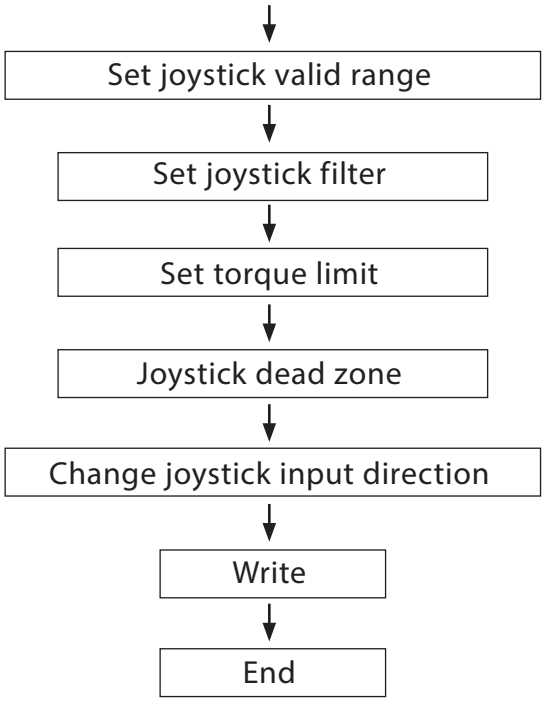
6.1. Operation Overview

(1) Driving Parameters ~Preset Mode~
You can select and use the “Soft Mode”, “Standard Mode”, or “Sports Mode” which are pre-configured at the time of shipping from the factory.



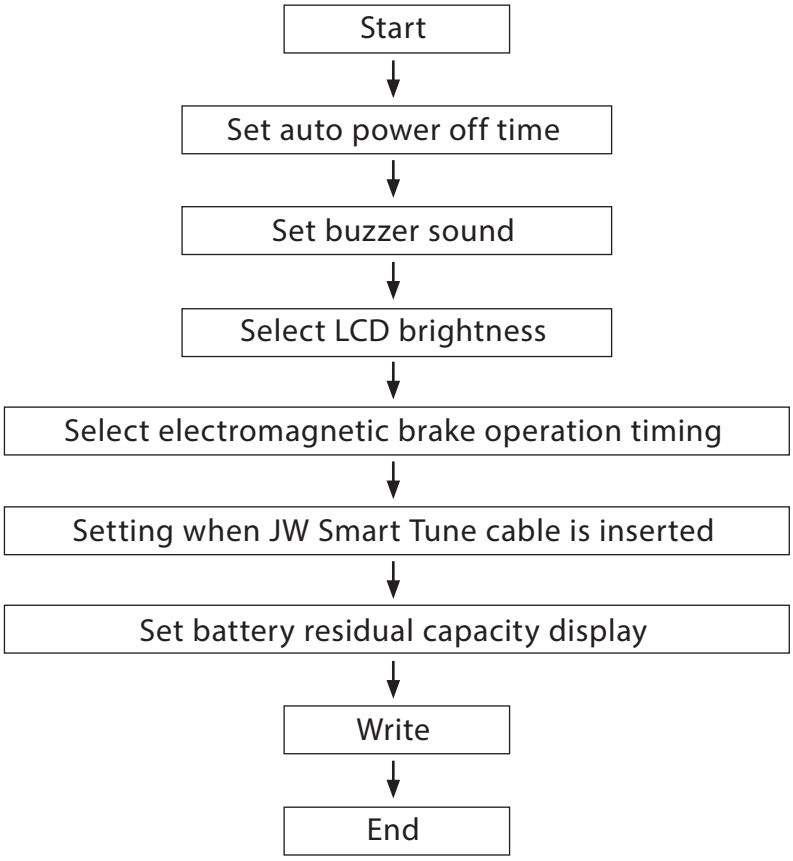
(2) Driving Parameters ~Free Mode~
You can fine-tune the speed, acceleration and joystick sensitivity.





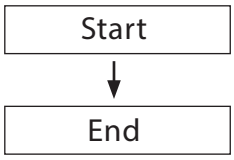
(3) Functional Parameters

You can set auto power off (amount of time that lapses after the last operation until the power automatically turns off), whether or not to sound the buzzer, the LCD brightness, and so on.



(4) Return to Factory Settings

Returns each of the driving and function parameters to its factory setting. This operation is performed at the time the power is turned on.

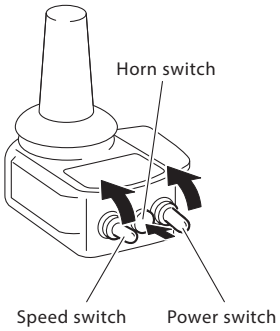
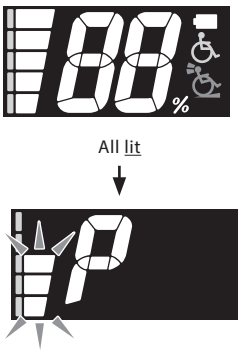


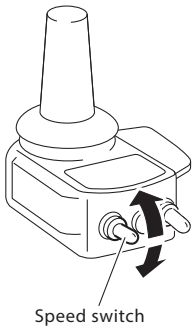
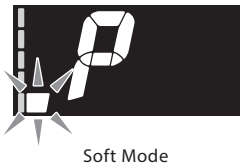
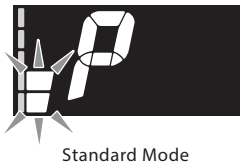
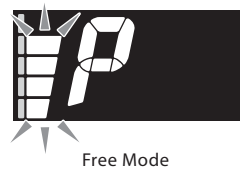
If the speed switch type is set to “Push-type switch” in JW Smart Tune, the parameters cannot be written using the controller.
In this case, use JW Smart Tune to set the parameters. For instructions, refer to the JW Smart Tune Operation Manual.

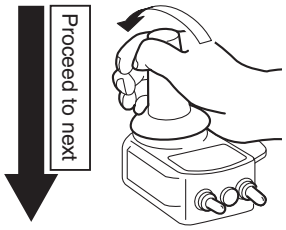
6.2. Driving Parameters ~Preset Mode~ Setting Method

Relationship between the Free Mode and Preset Modes
The preset modes are modes in which each of the parameters configurable in the Free Mode have been pre-configured, so that they can be easily switched.

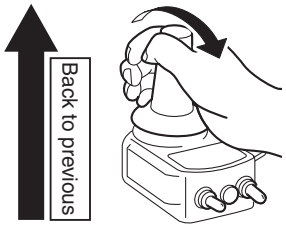
Preset Selection	Setting in Preset Mode		
	Soft Mode	Standard Mode	Sports Mode
Forward Speed	2 (Medium Speed)	4 (High Speed)	4 (High Speed)
Backward Speed	3 (High Speed)	3 (High Speed)	3 (High Speed)
Turning Speed	2 (Medium Speed)	2 (Medium Speed)	3 (High Speed)
Straight-line Acceleration	1 (Slow)	2 (Standard)	3 (Quick)
Straight-line Deceleration	3 (Quick)	2 (Standard 20", 22", 24" Models) 3 (Quick 16" Model)	3 (Quick)
Turning Acceleration/Deceleration	1 (Slow)	2 (Standard)	3 (Quick)
Joystick Valid Range	3 (Wide)	3 (Wide)	3 (Wide)
Joystick Filter	3 (Standard)	3 (Standard)	3 (Standard)
Torque Limit	3 (No Limit)	3 (No Limit)	3 (No Limit)
Joystick Dead Zone	2 (Standard)	2 (Standard)	2 (Standard)
Joystick Input Direction Selection	1 (Normal)	1 (Normal)	1 (Normal)

	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[1]	[Preparation] Prepare to set the parameters.	Stop the wheelchair in a stable state, engage the parking brake, and power OFF.	 Off
[2]	[Start Operation] Start setting the parameters.	 With the speed switch raised, turn on the power switch while pushing the horn switch. The entire LCD will light up for approximately 1 second, and you will hear a long buzzer. Once the buzzer beeps, release your hand from the switch.	 All lit Parameter that is currently being set blinks

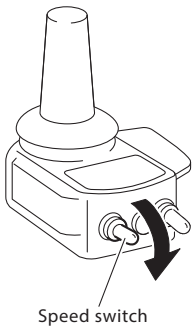
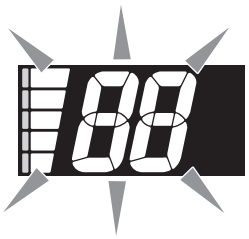
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[3]	[Preset Mode Pattern Selection] Select one from "Soft Mode", "Standard Mode", and "Sports Mode".	 Speed switch The currently selected mode blinks. Flip the speed switch up (or down) to select the "Soft Mode", "Standard Mode", or "Sports Mode".	 Soft Mode  Standard Mode  Sports Mode  Free Mode



Briefly tilt forward once.



Briefly tilt toward you once.

[4]	[Write] Write the selected settings to memory.	 Speed switch Hold down the speed switch for 2 seconds (until the buzzer beeps). At this time, you will hear a long buzzer. Once the buzzer beeps, release your hand from the switch. The settings are saved. If you turn off the power without performing this operation, the settings will not be changed.	 Writing timing indication  Writing complete
[5]	[Restart] Use the wheelchair with the saved settings.	Turn off the power, and then turn it back on. You will hear a short buzzer. This is the same as when the power is normally turned on. You can now use the wheelchair with the modified settings.	

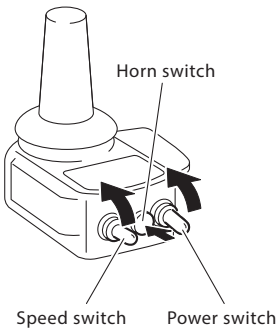
6.3. Driving Parameters ~Free Mode~ Setting Method

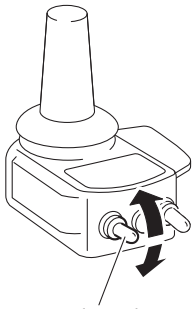
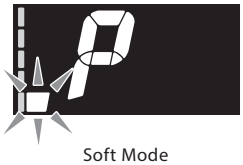
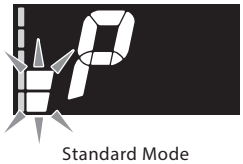
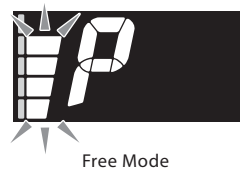
In the Free Mode, each of the following 9 parameters can be set individually.

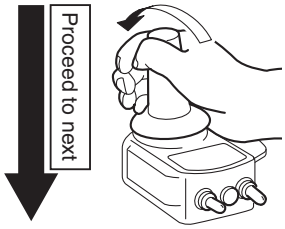
Item	Description	Meaning of Speed Level Indication Position				
		1	2	3	4	5
P1	Forward Speed	Low Speed (30%)	Medium Speed (60%)	Medium to High Speed (80%)	High Speed (100%)	–
P2	Backward Speed	Low Speed (30%)	Medium Speed (40%)	High Speed (50%)	–	–
P3	Turning Speed	Low Speed	Medium Speed	High Speed	–	–
P4	Straight-line Acceleration	Slow	Standard	Quick	–	–
P5	Straight-line Deceleration	Slow	Standard	Quick	–	–
P6	Turning Acceleration	Slow	Standard	Quick	–	–
P7	Joystick Valid Range (Sensitivity)	Narrow	Normal	Wide	–	–
P8	Joystick Filter	Insensitive	Slightly Insensitive	Standard	–	–
P9	Torque Limit	High Limit (45 kg)	Low Limit (90 kg)	No Limit (120 kg)	–	–
PA	Joystick Dead Zone	Narrow (50% of Standard)	Standard (100%)	Slightly Wide (150% of Standard)	Wide (200% of Standard)	Very Wide (300% of Standard)
Pb	Joystick Input Direction Selection	Standard	Front/Back Reversed	Left/Right Reversed	Both Reversed	–

Note: Bold characters indicate the default settings.

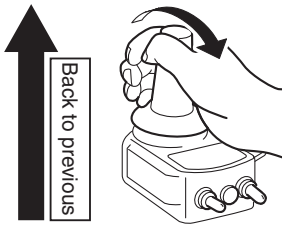
: Flashing

	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[1]	[Preparation] Prepare to set the parameters.	Stop the wheelchair in a stable state, engage the parking brake, and power OFF.	 Off
[2]	[Start Operation] Start setting the parameters.	 With the speed switch raised, turn on the power switch while pushing the horn switch. The entire LCD will light up for approximately 1 second, and you will hear a long buzzer. Once the buzzer beeps, release your hand from the switch.	 All lit  Parameter that is currently being set blinks

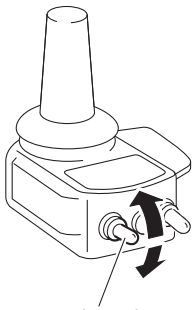
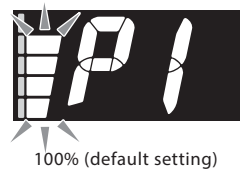
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[3]	[Basic Mode Selection] Select the “Free Mode”.	 Speed switch The currently selected mode blinks. Flip the speed switch up (or down) to select the “Free Mode”.	 Soft Mode  Standard Mode  Sports Mode  Free Mode



Briefly tilt forward once.

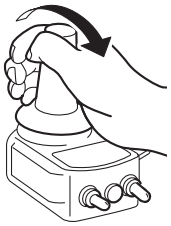


Briefly tilt toward you once.

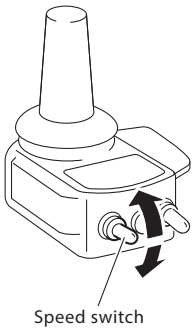
[4]	[Forward Speed Setting] Set the straight-line forward speed as a percentage of the maximum speed that the wheelchair is capable of reaching.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 30%  60%  80%  100% (default setting)

	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning

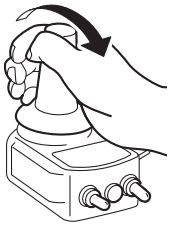
Briefly tilt forward once.



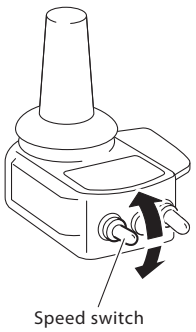
Briefly tilt toward you once.

[5]	[Backward Speed Setting] Set the straight-line backward speed as a percentage of the maximum forward speed that the wheelchair is capable of reaching.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 30%  40%  50% (default setting)

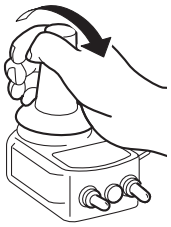
Briefly tilt forward once.



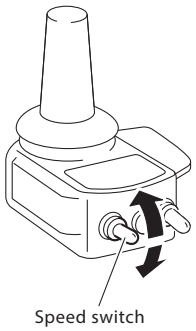
Briefly tilt toward you once.

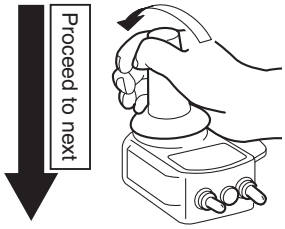
[6]	[Turning Speed Setting] Set the speed for turning.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Low speed  Medium speed (default setting)  High speed

Briefly tilt forward once.

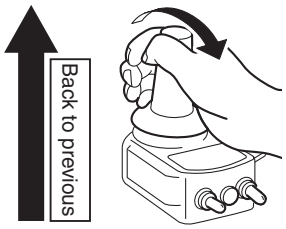


Briefly tilt toward you once.

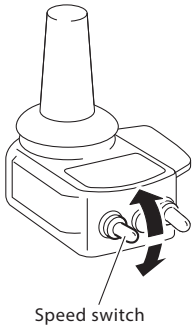
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[7]	[Straight-line Acceleration Setting] Set the straight-line (forward and backward) acceleration.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Slow  Standard (default setting)  Quick

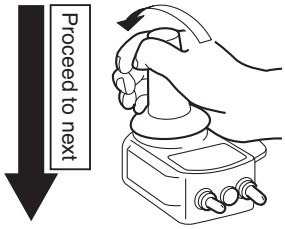


Briefly tilt forward once.

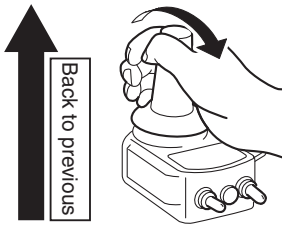


Briefly tilt toward you once.

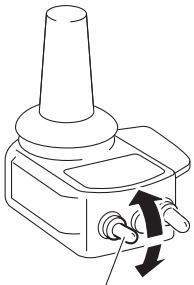
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[8]	[Straight-line Deceleration Setting] Set the straight-line (forward and backward) deceleration.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Slow  Standard (default setting)  Quick

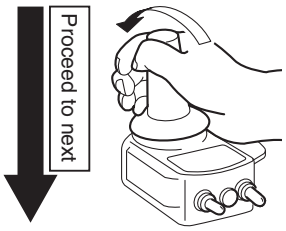


Briefly tilt forward once.

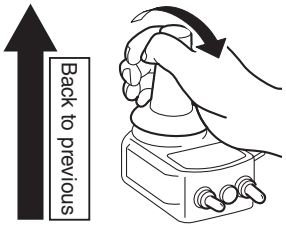


Briefly tilt toward you once.

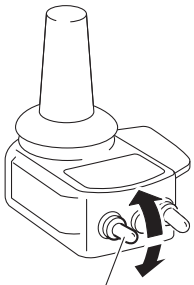
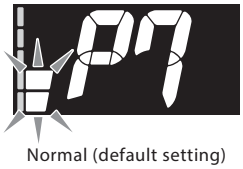
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[9]	[Turning Acceleration/ Deceleration Setting] Set the acceleration and deceleration when turning.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Slow  Standard (default setting)  Quick

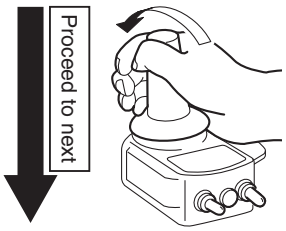


Briefly tilt forward once.

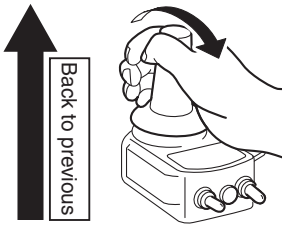


Briefly tilt toward you once.

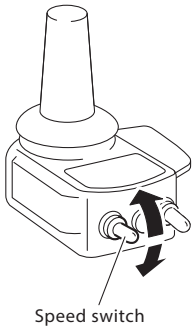
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[10]	[Joystick Valid Range Setting] Set how much the joystick should be tilted to reach the maximum speed. This function makes the operation easier for people who have the optional long joystick, or for people with limited hand mobility.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Narrow  Normal (default setting)  Wide

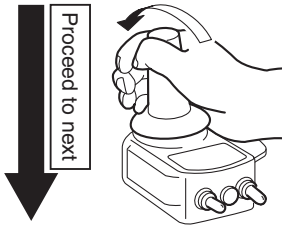


Briefly tilt forward once.

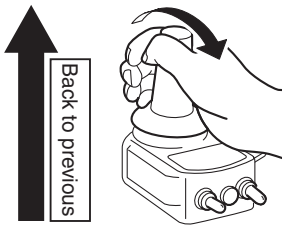


Briefly tilt toward you once.

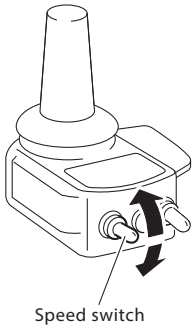
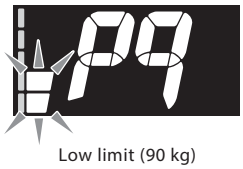
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[11]	[Joystick Filter Setting] Set the sensitivity of the wheelchair's response to the movement of the joystick. This function makes the operation easier for users who have trembling hands.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Insensitive  Slightly insensitive  Standard (default setting)

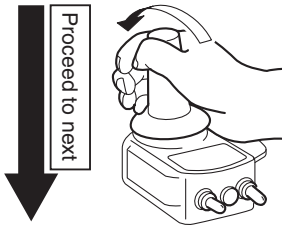


Briefly tilt forward once.

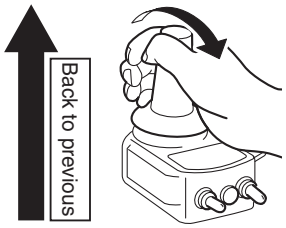


Briefly tilt toward you once.

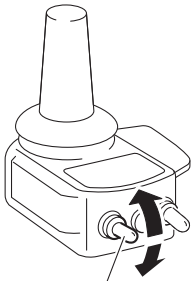
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[12]	[Torque Limit Setting] Set the motor torque as a percentage of the maximum value. This enables smooth movement for a lightweight passenger.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 High limit (45 kg)  Low limit (90 kg)  No limit (120 kg) (default setting)

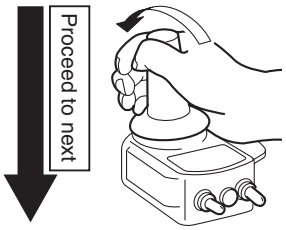


Briefly tilt forward once.

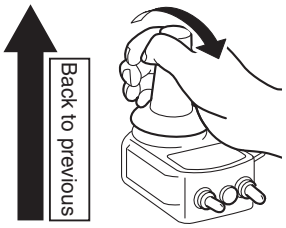


Briefly tilt toward you once.

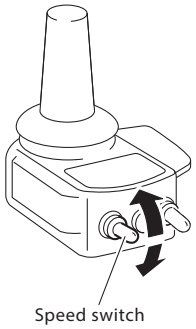
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[13]	[Joystick Dead Zone] Set the size of the dead zone for the joystick operation. The dead zone is "the range in which the wheelchair does not move" from when the user starts to tilt the joystick until the wheelchair begins to move.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Narrow (50% of standard)  Standard (default setting)  Slightly wide (150% of standard)  Wide (200% of standard)  Very wide (300% of standard)



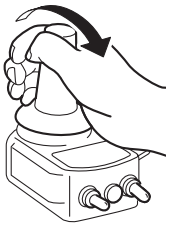
Briefly tilt forward once.



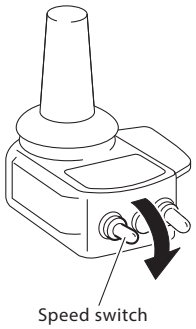
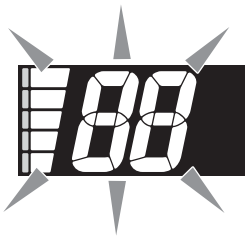
Briefly tilt toward you once.

	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[14]	[Joystick Input Direction Selection] Set whether the wheelchair moves in the same direction or the opposite direction of the joystick input direction. This setting is a special operation method for users who use a chin controller, and so on. Normally, do not use this setting.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Standard  Front/back reversed  Left/right reversed  Front/back and left/right reversed

Briefly tilt forward once.



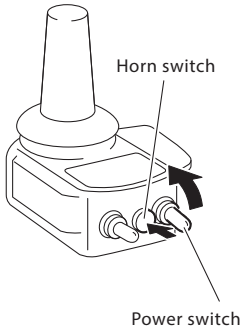
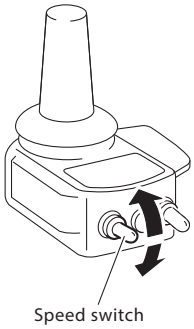
Briefly tilt toward you once.

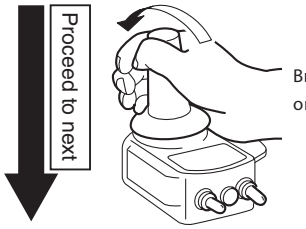
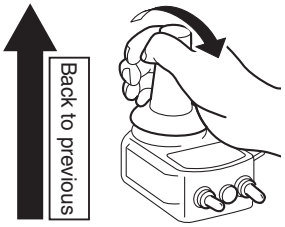
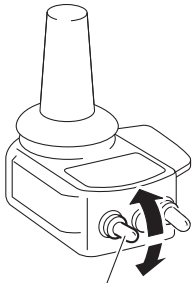
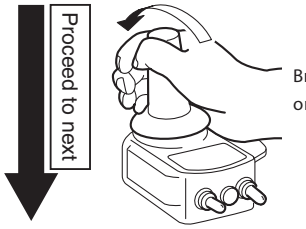
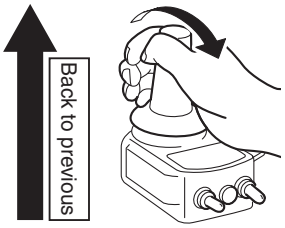
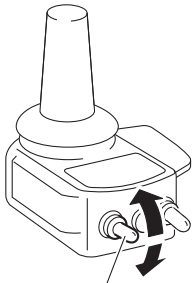
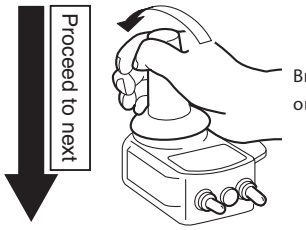
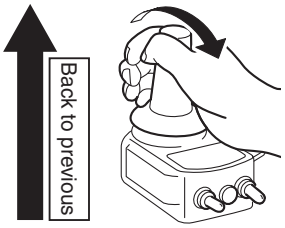
[15]	[Write] Write the selected settings to memory.	 Speed switch Hold down the speed switch for 2 seconds (until the buzzer beeps). At this time, you will hear a long buzzer. Once the buzzer beeps, release your hand from the switch. The settings are saved. If you turn off the power without performing this operation, the settings will not be changed.	 Writing timing indication  Writing complete
[16]	[Restart] Use the wheelchair with the saved settings.	Turn off the power, and then turn it back on. You will hear a short buzzer. This is the same as when the power is normally turned on. You can now use the wheelchair with the modified settings.	

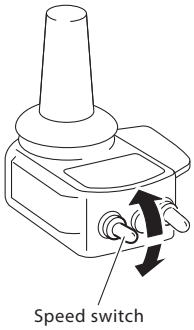
6.4. Function Parameters Setting Method

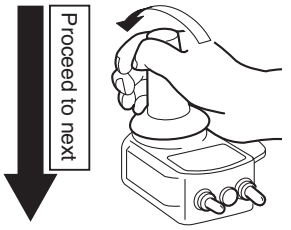
Item	Description	Meaning of Speed Level Indication Position		
		1	2	3
F1	Auto Power Off Time	10 Minutes	60 Minutes	None
F2	Buzzer Sound	Yes	None	–
F3	LCD Brightness	Normal	Slightly Dark	Dark
F4	Electromagnetic Brake Operation Timing	10 Seconds after Stopping	Immediately after Stopping	–
F5	JW Smart Tune Cable Insertion	Stop	Notification Only	–
F6	Battery Residual Capacity Display	Pattern 1	Pattern 2	–

Note: Bold characters indicate the default settings.

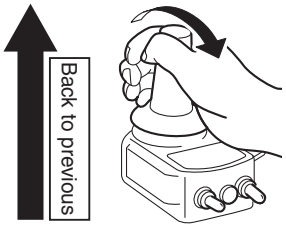
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[1]	[Preparation] Prepare to set the parameters	Stop the wheelchair in a stable state, engage the parking brake, and power OFF.	 Off
[2]	[Start Operation] Start setting the parameters.	 Turn on the power switch while pushing the horn switch. The entire LCD will light up for approximately 1 second, and you will hear a long buzzer. Once the buzzer beeps, release your hand from the switch.	 All lit ↓ 
[3]	[Auto Power Off Time Setting] Set how many minutes lapse after the last operation until the power automatically turns off.	 If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up or down while the parameter is blinking until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 10 minutes (default setting)  60 minutes  None

	Purpose of Operation	Operation Method		Parameter Status during Operation and Its Meaning
		 Briefly tilt forward once.	 Briefly tilt toward you once.	
[4]	[Buzzer Sound Setting] Set whether the buzzer sounds to confirm operations and indicate warnings, such as the clutch disengagement warning. Except for the clutch disengagement warning, the buzzer sound for warnings and errors cannot be turned off.		If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up (or down) once while the parameter is blinking until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Yes (default setting)  None
		 Briefly tilt forward once.	 Briefly tilt toward you once.	
[5]	[LCD Brightness] Set the brightness of the LCD.		If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up (or down) once while the parameter is blinking until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Normal (default setting)  Slightly dark  Dark
		 Briefly tilt forward once.	 Briefly tilt toward you once.	

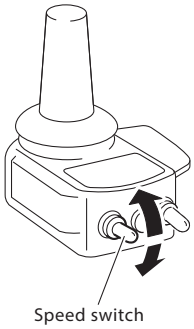
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[6]	[Electromagnetic Brake Operation Timing Selection] Select whether the electromagnetic brake is applied immediately after the wheelchair stops or 10 seconds after the wheelchair stops.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up (or down) once while the parameter is blinking until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 10 seconds after stopping (default setting)  Immediately after stopping

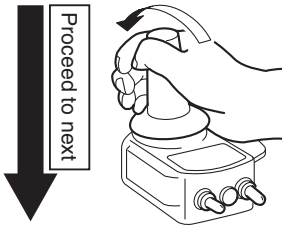


Briefly tilt forward once.

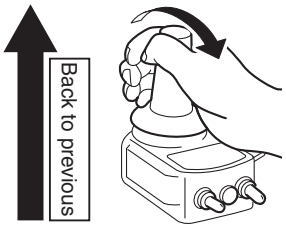


Briefly tilt toward you once.

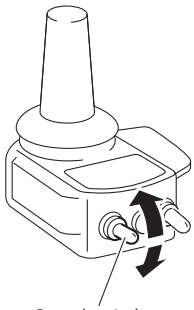
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[7]	[JW Smart Tune Cable Insertion] Select whether the wheelchair stops or a notification is displayed on the LCD when the JW Smart Tune cable is connected.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up (or down) once while the parameter is blinking until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Stop (default setting)  Notification only



Briefly tilt forward once.



Briefly tilt toward you once.

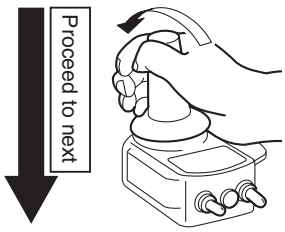
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[8]	[Battery Residual Capacity Display] Set the display method for the battery.	 Speed switch If the desired parameter is blinking, the following operation is not necessary. If a different parameter is blinking, briefly flip the speed switch up (or down) once while the parameter is blinking until the desired parameter is blinking. The buzzer sounds briefly only when a setting has been changed. You can redo this as many times as you wish.	 Pattern 1 (default setting)  Pattern 2

When using the black lithium ion battery:
Select one of the following display patterns.

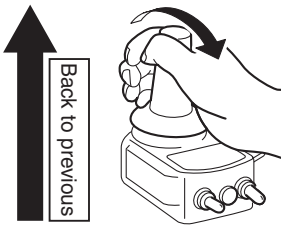
Pattern 1 Display

Pattern 2 Display

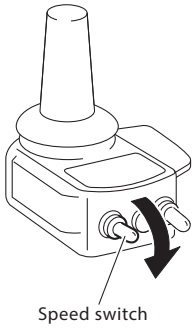
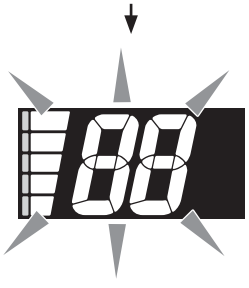
When using the nickel metal hydride battery or the gray lithium ion battery:
The display pattern cannot be selected. The following display pattern (20% increments) will be used even if you select pattern 1 or pattern 2.



Briefly tilt forward once.

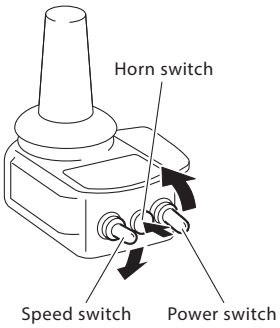
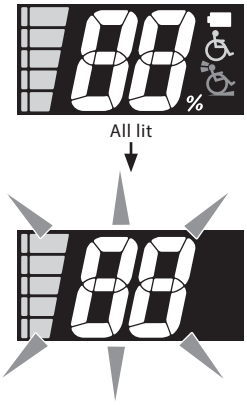


Briefly tilt toward you once.

[9]	[Write] Write the selected settings to memory.	 Speed switch In the writing screen, hold down the speed switch for 2 seconds (until the buzzer beeps). At this time, you will hear a long buzzer. Once the buzzer beeps, release your hand from the switch. The settings are saved. If you turn off the power without performing this operation, the settings will not be changed.	 Writing screen  Writing complete
[10]	[Restart] Use the wheelchair with the saved settings.	Turn off the power, and then turn it back on. You will hear a short buzzer. This is the same as when the power is normally turned on. You can now use the wheelchair with the modified settings.	

6

6.5. Method for Restoring Factory Settings

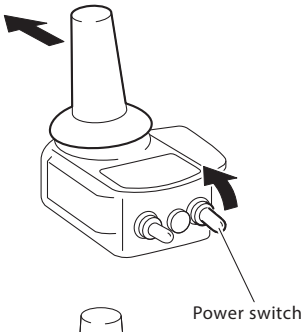
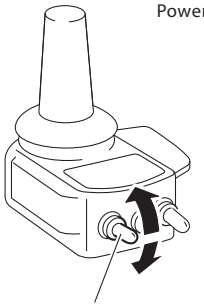
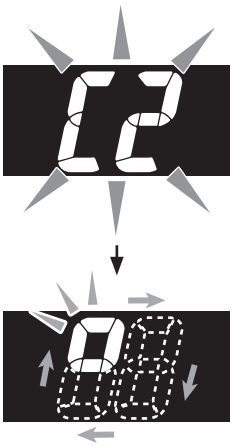
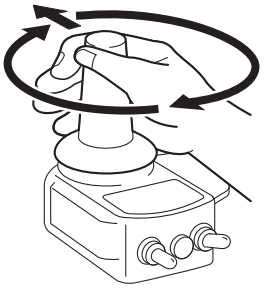
	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[1]	[Preparation] Prepare to restore the parameters to their factory settings.	Stop the wheelchair in a stable state, engage the parking brake, and power OFF.	 Off
[2]	[Setting Operation] This operation resets the driving and function parameters to their factory settings.	 With the speed switch lowered, turn on the power switch while pushing the horn switch. The entire LCD will light up for approximately 1 second, and you will hear a long buzzer. Once the buzzer beeps, release your hand from the switch. The driving and function parameters have now been restored to their factory settings.	
[3]	[Restart]	Turn off the power, and then turn it back on. You will hear a short buzzer. This is the same as when the power is normally turned on. The settings are now the same as the settings at the time of shipping from the factory.	

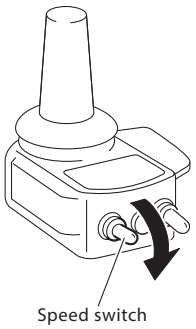
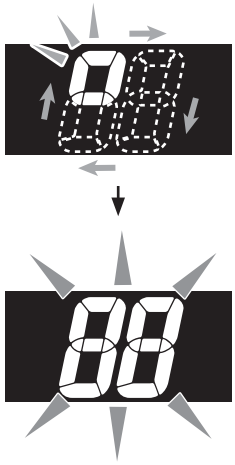
7. Other Settings

7.1. Joystick Range of Motion Adjustment

The range of motion can be adjusted.
By adjusting the range of motion, the maximum speed of the wheelchair can be reached even when the range of motion is set to the narrow setting.

(1) Setting Method

	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[1]	[Preparation] Prepare to adjust the range of motion.	Stop the wheelchair in a stable state, engage the parking brake, and power OFF.	 Off
[2]	[Range of Motion] Enter the adjustment mode.	 Power switch While tilting the joystick forward, turn on the power.  Speed switch Error "C2" will be displayed, then flip the speed switch up and down several times. Continue this operation until the range of motion input screen shown to the right is displayed.	 Range of motion input screen
[3]	[Range of Motion Input] Operate the joystick to input the range of motion.	 Within the possible operation range, tilt the joystick forward and slowly make 2 clockwise rotations, and then release your hand from the joystick.	

	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[4]	[Saving the Range of Motion]	 Hold down the speed switch for 2 seconds (until the buzzer beeps). At this time, you will hear a long buzzer. Once the buzzer beeps, release your hand from the switch. The setting is saved. If you turn off the power without performing this operation, the setting will not be changed.	

(2) Returning to the Normal Range of Motion

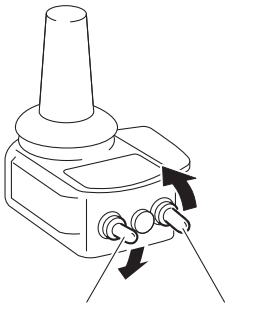
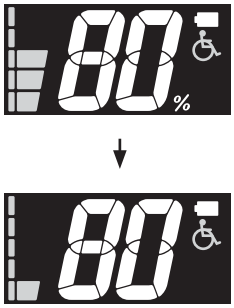
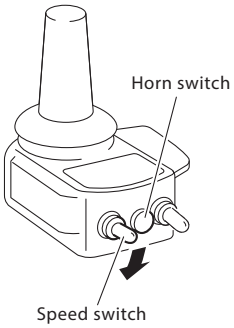
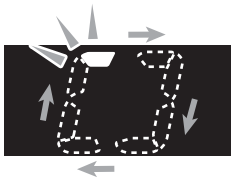
To reset the range of motion to the normal setting, perform the procedure in "(1) Setting Method" in 7.1. again, make 2 rotations of the joystick at the maximum circumference in "[3] [Range of Motion Input]", and save the setting.

If the speed switch type is set to "Push-type switch" in JW Smart Tune, the range of motion for the joystick cannot be adjusted using the controller.
Use JW Smart Tune to adjust the range of motion for the joystick. For instructions, refer to the JW Smart Tune Operation Manual.

7.2. Anti-tampering Function Setting

By setting the anti-tampering function, you can prevent operation of the wheelchair using the controller.

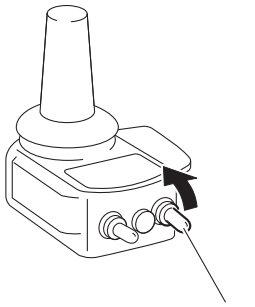
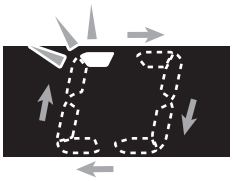
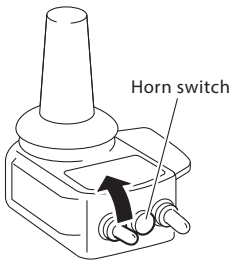
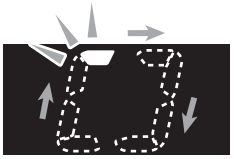
(1) Setting Method

	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[1]	[Preparation] Prepare to set the anti-tampering function.	Stop the wheelchair in a stable state, engage the parking brake, and power OFF.	 Off
[2]	[Start Operation]	 Speed switch Power switch 1 Turn on the power switch. 2 Lower the speed switch to select the slowest speed, and then release your hand from the switch.	
[3]	[Anti-tampering Function Setting]	 Horn switch Speed switch 1 Hold down the speed switch. 2 Once the buzzer beeps, release your hand from the switch. 3 Immediately push the horn switch long.* 4 Confirm that the anti-tampering function setting is complete on the LCD and release your finger.	 Anti-tampering function setting screen

* If the buzzer sounds when the horn switch is pushed, the operation was not completed successfully. Hold down the speed switch again and repeat the procedure.

Note that the anti-tampering function cannot be set if the speed switch type is set to “Push-type switch” in JW Smart Tune.

(2) Canceling Method

	Purpose of Operation	Operation Method	Parameter Status during Operation and Its Meaning
[1]	[Preparation] Prepare to cancel the setting for the anti-tampering function.	Stop the wheelchair in a stable state, engage the parking brake, and power OFF.	 Off
[2]	[Start Operation]	 Power switch 1 When the power switch is turned on, the screen shown to the right is displayed.	
[3]	[Canceling the Anti-tampering Function Setting]	 Horn switch 1 Hold the speed switch up. 2 Once the buzzer beeps, release your hand from the switch. 3 Immediately push the horn switch long.* 4 Confirm that the cancellation of the anti-tampering function setting is complete on the LCD and release your finger.	 Anti-tampering function setting screen  Normal screen

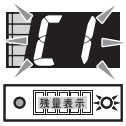
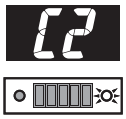
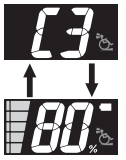
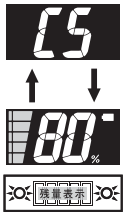
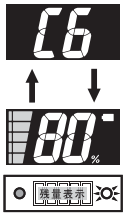
* If the buzzer sounds when the horn switch is pushed, the operation was not completed successfully. Hold down the speed switch again and repeat the procedure.

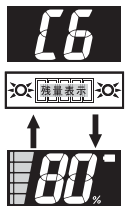
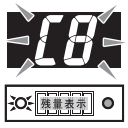
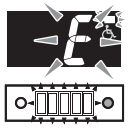
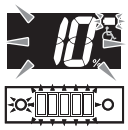
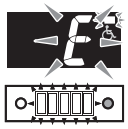
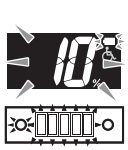
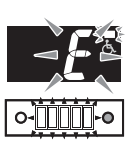
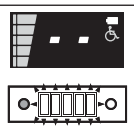
8. Warnings

8.1. List of Warnings

If the state of the E-Drive PLUS becomes undesirable during use or if an error occurs that can be recovered using a simple operation, the controller LCD or assistant controller LEDs, together with the buzzer sound, indicate the warning. If a warning is issued, resolve the problem according to the information in the following table.

ON ○ OFF ● Blinking ☼  Controller display  Assistant controller display

Warning Display (▲ blinking)	Buzzer	Item	Details	Unit Operation	Recovery
	Beeps 4 times (2 short beeps each time)	Clutch disengagement	One or both clutches become disengaged while driving.	Does not move.	When the clutch engages at the gear side.
			Improper clutch adjustment (clutch cable too tight)	Moves a little, then stops.	Properly adjust the clutch cable.
			Improper clutch switch adjustment	Moves a little, then stops.	Properly adjust the clutch switch.
	Beeps for 2.5 seconds	Dash out prevention	The user has moved the control lever before turning on the power.	Does not move.	Turn on the power without moving the control lever.
			With the speed switch raised (or lowered), the user has turned on the power.	Does not move.	Turn on the power without touching the speed switch.
	Beeps repeatedly (short beep and long beep)	Retracted anti-tip device (wheelchair can move)	The anti-tip device is retracted.	Able to continue moving.	Extend the anti-tip device.
	No	Power warning (power is already turned on)	With the power already turned on, the power switch for the controller or assistant controller was turned on.	Device with power turned on first: Able to continue moving. Device with power turned on later: Cannot move.	Turn off the power for the device that was turned on later.
	Beeps repeatedly (continuous short beeps)	Torque limit 1	The temperature of the motor or motor controller circuit board has exceeded the specified value.	Limits the current to the motor to one-half of the maximum amperage.	Turn on the power again after the temperature decreases.
	One-second beeping (long beep) repeatedly	Heavy loading alert	Excessive load is applied on the motor.	Able to continue moving.	Reduce the load on the motor.

Warning Display (▲ blinking)	Buzzer	Item	Details	Unit Operation	Recovery
	Beeps repeatedly (continuous short beeps)	Torque limit 2	The wheelchair is stuck against an object for more than 16 seconds, but less than 24 seconds.	Limits the current to the motor to one-half of the maximum amperage.	Free the wheelchair from being stuck or return the control lever.
	Beeps for 2.5 seconds	Overload protection 1	The temperature of the motor or motor controller circuit board has exceeded "specified value 2".	Stops slowly.	Turn on the power again, and then the temperature decreases.
	Beeps for 2.5 seconds	Overload protection 2	The wheelchair is stuck against an object for more than 24 seconds.	Stops slowly.	Return the joystick lever (this can be repeated up to 5 times).
	Beeps for 2.5 seconds	Overload protection 2	The wheelchair has repeatedly struck an object for 6 times or more.	Stops slowly.	Turn on the power again and return the control lever.
	Beeps 5 times (0.5-second beeps)	10 seconds before battery cutoff	There are 10 seconds remaining before the battery power is cut off.	Stops moving after 10 seconds.	Charge the battery, and then turn on the power again.
	Beeps repeatedly (continuous short beeps)	Battery current limit	The battery temperature is outside its normal range (1: below –5°C, 2: below –10°C, 3: above 60°C). Or, the BMC temperature has exceeded its normal range (4: above 100°C).	1: Limits the battery amperage to be below 16 A. 2: Limits the battery amperage to be below 8 A. 3: Limits the battery amperage to be below 10 A. 4: Limits the battery amperage to be below 10 A.	Return the temperature to within the normal range.
	Beeps 4 times (4 short beeps each time)	Battery residual capacity warning (communication normal)	Battery residual capacity is below 5 to 10%.	Able to continue moving.	Charge the battery, and then turn on the power.
	Beeps 5 times; then, 5 seconds later, beeps for 2.5 seconds	Battery level alert (communication normal)	Battery residual capacity is 0.	Stops slowly.	Charge the battery, and then turn on the power.
	Beeps 4 times (4 short beeps each time)	Battery residual capacity warning (no communication)	With the communication between the battery and the wheelchair disrupted, the battery voltage has dropped below "specified value 2".	Able to continue moving.	Charge the battery, and then turn on the power again. Then, the signal will come from the BMC.
	Beeps 5 times; then, 5 seconds later, beeps for 2.5 seconds	Battery level alert (no BMC communication)	With the communication between the battery and the wheelchair disrupted, the battery voltage has dropped below "specified value 1".	Stops slowly.	Charge the battery, and then turn on the power again. Then, the signal will come from the BMC.
	No	No BMC communication	No signals are coming from the battery (BMC).	Able to continue moving.	The signals start coming from the BMC.

Warning Display (▲ blinking)	Buzzer	Item	Details	Unit Operation	Recovery
	Beeps for 2.5 seconds	JW Smart Tune cable insertion (when set to stop)	The JW Smart Tune cable is inserted.	Does not move.	Disconnect the JW Smart Tune cable.
	No	JW Smart Tune cable insertion (when set to notification only)	The JW Smart Tune cable is inserted.	Able to continue moving. (During reading, writing, and other communication, cannot move.)	Disconnect the JW Smart Tune cable.

9. Self-Diagnosis

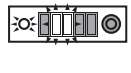
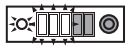
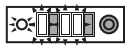
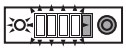
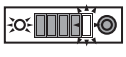
9.1. Self-Diagnosis Function

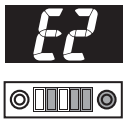
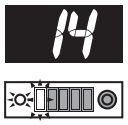
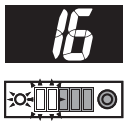
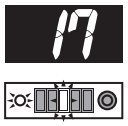
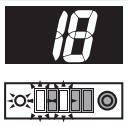
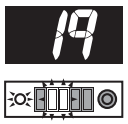
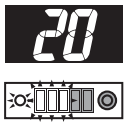
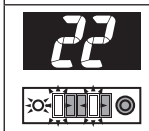
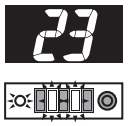
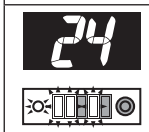
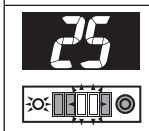
When a malfunction is detected, it sounds the buzzer, the battery indicator indicates the malfunction, and the unit will stop operating. In this state, the “malfunction detail indication” will appear if the user pushes the speed switch up or down on the controller or the forward or reverse switch on the assistant controller. Turning OFF the power will reset the indicator.

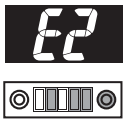
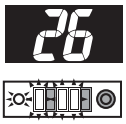
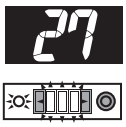
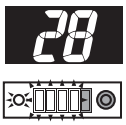
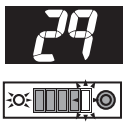
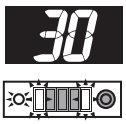
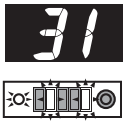
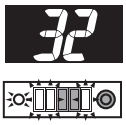
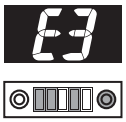
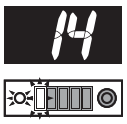
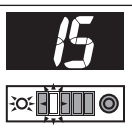
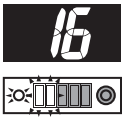
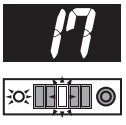
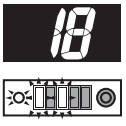
9.2. List of Detected Malfunctions

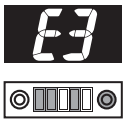
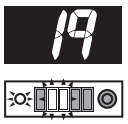
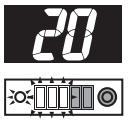
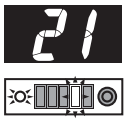
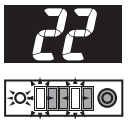
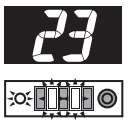
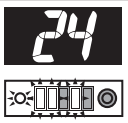
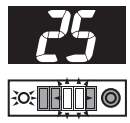
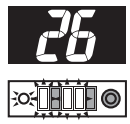
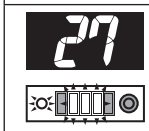
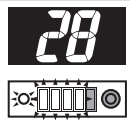
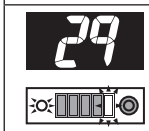
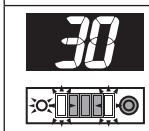
ON ○ OFF ● Blinking ☼  Controller display  Assistant controller display

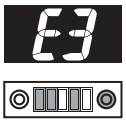
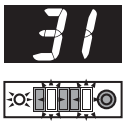
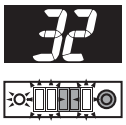
Malfunction Item	Malfunction Detail Indication	Beeping Pattern	Meaning of Display	Replacement (○:Most Suspect, △:Next Suspect)															Failure Judgment Condition
				Autonomous		Assistant		Right Unit					Left Unit					Relay Board	Battery	
Indication pattern at time of malfunction	Indication pattern when speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness			CNT :Controller board DRV :Driver board ENC :Encoder EMB :Electromagnetic brake Harness :Wire harness between relay board and each unit
[Power Related]																				
E1	32	—	5V power fluctuation (CNT)	○		○														The power to the controller microprocessor has fluctuated beyond the specified value.
	22	Beeps for 2.5 seconds	Battery overvoltage																△	BMC has detected that the battery voltage has exceeded the specified value (this can happen by regeneration with a fully charged battery on a long down slope.)
[CPU Self Check]																				
E1	14	Beeps for 2.5 seconds	Speed command calculation malfunction	○		○														
	15	Beeps for 2.5 seconds	EEPROM malfunction	○		○														
	19	Beeps for 2.5 seconds	AD buffer malfunction	○		○														
	31	Beeps for 2.5 seconds	Command value malfunction (CNT)	○		○														

Malfunction Item	Malfunction Detail Indication	Beeping Pattern	Meaning of Display	Replacement (○:Most Suspect, △:Next Suspect)																Failure Judgment Condition
				Autonomous		Assistant		Right Unit					Left Unit					Relay Board	Battery	
Indication pattern at time of malfunction	Indication pattern when speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness			CNT :Controller board DRV :Driver board ENC :Encoder EMB :Electromagnetic brake Harness :Wire harness between relay board and each unit
[Status Transition Related]																				
E1		Beeps for 2.5 seconds	CAN bus-off (CNT)	○	△	○	△	△					△					○		
17		Beeps for 2.5 seconds	CAN timed out (CNT)	△	○	△	○	△				○	△				○	○		
18		Beeps for 2.5 seconds	Start failure (CNT)	△	○	△	○	○				○	○				○	○		When starting, no "standby" signal is received from the driver.
23		Beeps for 2.5 seconds	Position inconsistency of left and right DIP rotary switches					○				△	○				△			The left and right driver board (motor controllers) specifications are different.
[Output Related]																				
E1	20	Beeps for 2.5 seconds	Direction error					○	○	△	△		○	○	△	△				The difference between the direction of travel that the rider intends by tilting the control lever and the actual direction of travel of the wheelchair exceeds the specified value. (Occurs during over limit traverse travel)
	21	Beeps for 2.5 seconds	Overspeed					○	○	△			○	○	△					[Joystick] The average speed of the left and right wheels exceeds the specified value of the command value. [Assistant] The speed of the right or left wheel exceeds the specified value regardless of the command value.
[Input Related]																				
E1		Beeps for 2.5 seconds	Speed volume malfunction (lower limit)			○														The speed adjustment volume voltage of the assistant controller is over the specified value.
		Beeps for 2.5 seconds	Speed volume malfunction (upper limit)			○														The speed adjustment volume voltage of the assistant controller is less than the specified value.
		Beeps for 2.5 seconds	Reverse switch malfunction			○														Only 1 contact point (of the 2 contact points) is engaged in the reverse switch of the assistant controller.
		Beeps for 2.5 seconds	Forward switch malfunction			○														Only 1 contact point (of the 2 contact points) is engaged in the forward switch of the assistant controller.
	29	Beeps for 2.5 seconds	Joystick forward-reverse direction malfunction	○																The forward-reverse direction voltage of the joystick does not have the specified value.
	30	Beeps for 2.5 seconds	Joystick left-right direction malfunction	○																The left-right direction voltage of the joystick does not have the specified value.

Malfunction Item	Malfunction Detail Indication	Beeping Pattern	Meaning of Display	Replacement (○:Most Suspect, △:Next Suspect)																Failure Judgment Condition
				Autonomous		Assistant		Right Unit					Left Unit					Relay Board	Battery	
Indication pattern at time of malfunction	Indication pattern when speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness			CNT :Controller board DRV :Driver board ENC :Encoder EMB :Electromagnetic brake Harness :Wire harness between relay board and each unit
[Right Driver Related]																				
		Beeps for 2.5 seconds	Setting switch malfunction					○												The setting switch on the driver board is malfunctioning.
		Beeps for 2.5 seconds	CAN bus-off (DRV)					△				○								
		Beeps for 2.5 seconds	CAN timed out (DRV)	○		○		△												
		Beeps for 2.5 seconds	Start failure (DRV)	○		○		△												No “standby” signal is returned from the controller.
		Beeps for 2.5 seconds	Brake malfunction					△			○									The motor has moved when it should be stopped.
		Beeps for 2.5 seconds	Relay contacts melted					○												The relay on the driver board malfunction.
		Beeps for 2.5 seconds	Thermistor malfunction					○												The thermistor on the driver board malfunction.
		Beeps for 2.5 seconds	Speed pulse error					△		○										The encoder malfunction.
		Beeps for 2.5 seconds	Motor wire open circuit malfunction									○								
		Beeps for 2.5 seconds	Magnetic pole detection malfunction					△		○										The encoder malfunction.
		Beeps for 2.5 seconds	Amperage offset					○												The motor current sensor is malfunctioning.
		Beeps for 2.5 seconds	Motor overamperage					○	△											The motor current has exceeded the specified value.

Malfunction Item	Malfunction Detail Indication	Beeping Pattern	Meaning of Display	Replacement (○:Most Suspect, △:Next Suspect)																Failure Judgment Condition
				Autonomous		Assistant		Right Unit					Left Unit					Relay Board	Battery	
Indication pattern at time of malfunction	Indication pattern when speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness			CNT :Controller board DRV :Driver board ENC :Encoder EMB :Electromagnetic brake Harness :Wire harness between relay board and each unit
[Right Driver Related]																				
		Beeps for 2.5 seconds	Arm shorted					○												The current of the motor drive circuit has exceeded the specified value.
		Beeps for 2.5 seconds	12V power fluctuation					○												The 12V control power malfunction.
		Beeps for 2.5 seconds	Vehicle overvoltage	△		△		△					△							The voltage of the power line has exceeded the specified value. (This may occur when the battery is disconnected while the wheelchair is descending a steep slope.)
		Beeps for 2.5 seconds	Acceleration command over	○		○		△												
		Beeps for 2.5 seconds	Power line open circuit									○						○		The voltage is not the specified value.
		Beeps for 2.5 seconds	Speed command over	○		○		△												
		Beeps for 2.5 seconds	5V power fluctuation (DRV)					○												The power for the microprocessor is not the specified value.
[Left Driver Related]																				
		Beeps for 2.5 seconds	Setting switch malfunction										○							The setting switch on the driver board is malfunctioning.
		Beeps for 2.5 seconds	CAN bus-off (DRV)										△				○			
		Beeps for 2.5 seconds	CAN timed out (DRV)	○		○							△							
		Beeps for 2.5 seconds	Start failure (DRV)	○		○						△	△							No “standby” signal is returned from the controller.
		Beeps for 2.5 seconds	Brake malfunction										△			○				The motor has moved when it should be stopped.

Malfunction Item	Malfunction Detail Indication	Beeping Pattern	Meaning of Display	Replacement (○:Most Suspect, △:Next Suspect)																Failure Judgment Condition
				Autonomous		Assistant		Right Unit					Left Unit						Relay Board	Battery	
Indication pattern at time of malfunction	Indication pattern when speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness				CNT :Controller board DRV :Driver board ENC :Encoder EMB :Electromagnetic brake Harness :Wire harness between relay board and each unit
[Left Driver Related]																					
		Beeps for 2.5 seconds	Relay contacts melted										○								The relay on the driver board malfunction.
		Beeps for 2.5 seconds	Thermistor malfunction										○								The thermistor on the driver board malfunction.
		Beeps for 2.5 seconds	Speed detection malfunction										△		○						The encoder malfunction.
		Beeps for 2.5 seconds	Motor wire open circuit malfunction									○									
		Beeps for 2.5 seconds	Magnetic pole detection malfunction										△		○						The encoder malfunction.
		Beeps for 2.5 seconds	Amperage offset										○								The motor current sensor is malfunctioning.
		Beeps for 2.5 seconds	Motor overamperage										○	△							The motor current has exceeded the specified value.
		Beeps for 2.5 seconds	Arm shorted										○								The current of the motor drive circuit has exceeded the specified value.
		Beeps for 2.5 seconds	12V power fluctuation										○				△				The 12V control power malfunction.
		Beeps for 2.5 seconds	Vehicle overvoltage	△		△		△					△								The voltage of the power line has exceeded the specified value. (This may occur when the battery is disconnected while the wheelchair is descending a steep slope.)
		Beeps for 2.5 seconds	Acceleration command over	○		○							△								
		Beeps for 2.5 seconds	Power line open circuit														○	○			The voltage is not the specified value.

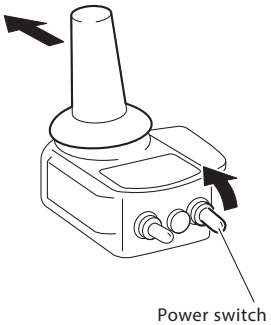
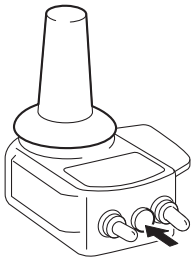
Malfunction Item	Malfunction Detail Indication	Beeping Pattern	Meaning of Display	Replacement (○:Most Suspect, △:Next Suspect)																Failure Judgment Condition
				Autonomous		Assistant		Right Unit					Left Unit					Relay Board	Battery	
Indication pattern at time of malfunction	Indication pattern when speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness			CNT :Controller board DRV :Driver board ENC :Encoder EMB :Electromagnetic brake Harness :Wire harness between relay board and each unit
[Left Driver Related]																				
		Beeps for 2.5 seconds	Speed command over	○		○							△							
		Beeps for 2.5 seconds	5V power fluctuation (DRV)										○							The power for the microprocessor is not the specified value.

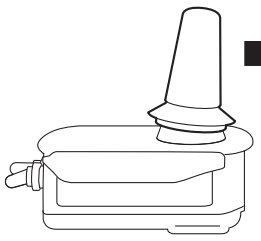
9

9.3. History Display of Detected Malfunctions Using the Self-Diagnosis

(1) History Display Method

The history of the 5 most recently detected malfunctions and some warning displays can be checked. (You can only use the controller to perform this operation.)

	Purpose of Operation	Operation Method	LCD Status during Operation and Its Meaning
[1]	[Preparation] Prepare to display the malfunction history.	Stop the wheelchair in a stable state, engage the parking brake, and power OFF.	 Off
[2]	[Controller Operation]	 Power switch While tilting the joystick forward, turn on the power.	
[3]	[Malfunction History Display]	 Press the horn switch 5 times within 2 seconds to display the malfunction history. The malfunction history will display the "malfunction device indication" and "malfunction detail indication" alternately.	 Malfunction device indication ↓ ↑  Malfunction detail indication



Briefly tilt the joystick forward once to switch to the next display.

When there is no history of previously detected malfunctions

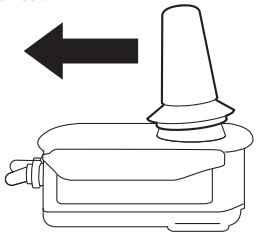
Most recently detected malfunction

2nd previously detected malfunction

3rd previously detected malfunction

4th previously detected malfunction

5th previously detected malfunction



Briefly tilt the joystick backward once to switch to the preceding display.

For information about the displayed contents, refer to "9.2. List of Detected Malfunctions".
Some warnings are also displayed. For a list of the displayed warnings, see the following page.

(2) Warning Displays

The following displays are shown only when you perform the procedure in “History Display of Detected Malfunctions Using the Self-Diagnosis”. When a warning is normally issued, refer to the information in “8.1. List of Warnings”.

Malfunction Device Indication	Malfunction Detail Indication	Item
[Controller Related]		
		Battery current limit
[Left Driver Related]		
		Overload protection 2
		Overload protection 1
		No BMC communication
[Right Driver Related]		
		Overload protection 2
		Overload protection 1
		No BMC communication

10. Inspection and Maintenance

10.1. Inspection Item

Perform inspections in accordance with the following inspection items.

Inspection Item	Inspection Location	Inspection Criteria
Caster	Air pressure (air type), wear, cracks, damage, twisted valve, cap looseness, fork mounted area looseness, wobble, and noise	Proper air pressure, and no wear, cracks, or damage No twisting or looseness No looseness or significant wobble
Controller	Damage, deformation, and looseness	No damage, deformation, or looseness of retaining screws
	Main switch and speed switch operation	Turns ON and OFF securely and speed can be adjusted
	Rubber cap damage Joystick operation ease	No damage Moves smoothly and can be controlled
	Lead wire routing and damage	No twisting or looseness, and does not get pinched when folded
Assistant Controller	Damage, deformation, and looseness	No damage, deformation, or looseness of screws
	Main switch and speed adjustment dial operation Forward and reverse switch operation ease	Turns ON and OFF securely, speed can be adjusted, and moves smoothly and can be controlled
	Brake lever free play and effectiveness	No pulling to one side and lever free play 15 to 20 mm
	Brake cable and lead wire routing and damage	No unraveling or damage of cable
Unit	No noise or abnormal vibration Tire air pressure*, wear, cracks, and looseness of valve	No noise or abnormal vibration while driving No wear, cracks, or damage
	Hand rim looseness and damage	No looseness or damage at installed area
	Wheel deformation	No deformation
	Axle tightening	Axle tightened at 40 to 50 Nm
	Anti-tip device looseness, deformation, and damage	No looseness, deformation, or damage
	Battery exterior screw looseness	No looseness or no detachment
	Clutch operation ease	Can be operated securely
	Wiring connection looseness and damage	Connected securely; No damage
Battery and Charger	Use conditions and deterioration level	Frequency of use and deterioration level (battery simple diagnosis check)

11. Specifications and Other Information

11.1. Table of Specifications

(Model: X0F1) 4.5 km/h type

Model				Electric wheelchair power unit		
Dimensions (length × width × height)				–	–	–
Seat structure and dimensions (seat width × seat depth × back support height)*1				–	–	–
Weight	With battery	Nickel metal hydride battery		18.0 kg	18.2 kg	18.4 kg
		Lithium ion battery		18.7 kg	18.9 kg	19.1 kg
	Without battery			15.1 kg	15.3 kg	15.5 kg
Tires	Rear wheels			20 inch	22 inch	24 inch
			Tire size	37-451 (20 × 1 3/8)	37-501 (22 × 1 3/8)	37-540 (24 × 1 3/8)
			Air pressure	420 kPa (4.2 kg/cm², 60 PSI)	450 kPa (4.5 kg/cm², 65 PSI)	
	Front wheels			–	–	–
Battery (built-in microprocessor)		Nickel metal hydride battery		JWB2 (24 V 6.7 Ah) × 1 (5-hour rate)		
		Lithium ion battery		ESB1 (25 V 11.2 Ah) × 1 (5-hour rate)		
Charger		For nickel metal hydride battery		JWC-2 <rated output 29 V·2.6 A (during charging)> Automatic charging controlled by the microprocessor		
		For lithium ion battery		ESC1 or ESC2 <rated output 29.2 V·3.0 A (during charging)> Automatic charging controlled by the microprocessor		
Drive motor (AC servo motor)				24 V 120 W × 2 (30-minute rated output)		
Drive system				Rear wheel direct drive		
Brake system				Motor regenerative braking + electromagnetic brake		
Steering system				Joystick steering		
Control system				Microprocessor control		
Hill climbing ability				6° (slope approximately 10%)		
Travel range	Continuous travel range*2	With nickel metal hydride battery		15 km		
		With lithium ion battery		29 km		
	Continuous travel range*3	With nickel metal hydride battery		15 km		
		With lithium ion battery		30 km		
Minimum turning radius				Varies depending on the wheelchair on which the unit is installed.		
Maximum height of bumps that can be gone over				Varies depending on the wheelchair on which the unit is installed.		
Maximum width of ditches that can be gone over				Varies depending on the wheelchair on which the unit is installed.		
Maximum speed	Controller	Forward	First speed	1.7 km/h		
			Second speed	2.4 km/h		
			Third speed	3.1 km/h		
			Fourth speed	3.8 km/h		
			Fifth speed	4.5 km/h		
		Backward	First speed	0.9 km/h		
			Second speed	1.2 km/h		
			Third speed	1.6 km/h		
			Fourth speed	1.9 km/h		
			Fifth speed	2.3 km/h		
	Assistant controller	Forward		1.0–4.9 km/h		
		Backward		0.4–1.9 km/h		
Load capacity				125 kg*4		
Maximum weight of user (including any carried items)				Varies depending on the wheelchair on which the unit is installed.		

 Please note that the specifications, appearance, and any of the above data are subject to change without notice for the purposes of improvement.

*1 Specified dimensions according to JIS T9203 (2010)

*2 Measured according to JIS T9203 (2010)

*3 Yamaha pattern travel: Continuous travel in a straight line on a flat surface, 24-inch wheels, new, fully charged battery, and ambient temperature of 15–25°C

*4 The E-Drive PLUS unit can withstand a load of 125 kg (including the rider, luggage, and frame weight). However, confirm the detailed specifications, including the frame strength, with the wheelchair manufacturer.

(Model: X0F2) 6.0 km/h type

<table>
<tr><th colspan="5">Model</th><th colspan="2">Electric wheelchair
power unit</th></tr>
<tr><td rowspan="3">Weight</td><td colspan="2" rowspan="2">With battery</td><td colspan="2">Nickel metal hydride battery</td><td>18.2 kg</td><td>18.4 kg</td></tr>
<tr><td colspan="2">Lithium ion battery</td><td>18.9 kg</td><td>19.1 kg</td></tr>
<tr><td colspan="3">Without battery</td><td>15.3 kg</td><td>15.5 kg</td></tr>
<tr><td rowspan="3">Tires</td><td colspan="3">Rear wheels</td><td>22 inch</td><td>24 inch</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>Tire size</td><td>37-501 (22 × 1 3/8)</td><td>37-540 (24 × 1 3/8)</td></tr>
<tr><td>Air pressure</td><td colspan="2">450 kPa (4.5 kg/cm^2, 65 PSI)</td></tr>
<tr><td colspan="3">Front wheels</td><td>–</td><td>–</td></tr>
<tr><td colspan="2" rowspan="2">Battery
(built-in microprocessor)</td><td colspan="2">Nickel metal hydride battery</td><td colspan="2">JWB2 (24 V 6.7 Ah) × 1 (5-hour rate)</td></tr>
<tr><td colspan="2">Lithium ion battery</td><td colspan="2">ESB1 (25 V 11.2 Ah 280 Wh) × 1 (5-hour rate)</td></tr>
<tr><td colspan="2" rowspan="2">Charger</td><td colspan="2">For nickel metal hydride battery</td><td colspan="2">JWC-2 <rated output 29 V·2.6 A (during charging)>
Automatic charging controlled by the microprocessor</td></tr>
<tr><td colspan="2">For lithium ion battery</td><td colspan="2">ESC1 or ESC2 <rated output 29.2 V·3.0 A (during charging)>
Automatic charging controlled by the microprocessor</td></tr>
<tr><td colspan="4">Drive motor (AC servo motor)</td><td colspan="2">24 V 120 W × 2 (30-minute rated output)</td></tr>
<tr><td colspan="4">Drive system</td><td colspan="2">Rear wheel direct drive</td></tr>
<tr><td colspan="4">Brake system</td><td colspan="2">Motor regenerative braking + electromagnetic brake</td></tr>
<tr><td colspan="4">Steering system</td><td colspan="2">Joystick steering</td></tr>
<tr><td colspan="4">Control system</td><td colspan="2">Microprocessor control</td></tr>
<tr><td colspan="4">Hill climbing ability</td><td colspan="2">6° (slope approximately 10%)</td></tr>
<tr><td rowspan="4">Travel range</td><td rowspan="2">Continuous travel range*1</td><td colspan="2">With nickel metal hydride battery</td><td colspan="2">15 km</td></tr>
<tr><td colspan="2">With lithium ion battery</td><td colspan="2">29 km</td></tr>
<tr><td rowspan="2">Continuous travel range*2</td><td colspan="2">With nickel metal hydride battery</td><td colspan="2">16 km</td></tr>
<tr><td colspan="2">With lithium ion battery</td><td colspan="2">32 km</td></tr>
<tr><td colspan="4">Minimum turning radius</td><td colspan="2">Varies depending on the wheelchair on which the unit is installed.</td></tr>
<tr><td colspan="4">Maximum height of bumps that can be gone over</td><td colspan="2">Varies depending on the wheelchair on which the unit is installed.</td></tr>
<tr><td colspan="4">Maximum width of ditches that can be gone over</td><td colspan="2">Varies depending on the wheelchair on which the unit is installed.</td></tr>
<tr><td rowspan="12">Maxi-mum speed</td><td rowspan="10">Controller</td><td rowspan="5">Forward</td><td>First speed</td><td colspan="2">1.7 km/h</td></tr>
<tr><td>Second speed</td><td>2.6 km/h</td><td>2.7 km/h</td></tr>
<tr><td>Third speed</td><td>3.6 km/h</td><td>3.7 km/h</td></tr>
<tr><td>Fourth speed</td><td>4.5 km/h</td><td>4.7 km/h</td></tr>
<tr><td>Fifth speed</td><td>5.5 km/h</td><td>5.7 km/h</td></tr>
<tr><td rowspan="5">Backward</td><td>First speed</td><td colspan="2">0.9 km/h</td></tr>
<tr><td>Second speed</td><td colspan="2">1.4 km/h</td></tr>
<tr><td>Third speed</td><td colspan="2">1.8 km/h</td></tr>
<tr><td>Fourth speed</td><td colspan="2">2.3 km/h</td></tr>
<tr><td>Fifth speed</td><td colspan="2">2.8 km/h</td></tr>
<tr><td rowspan="2">Assistant controller</td><td colspan="2">Forward</td><td colspan="2">1.0–4.9 km/h</td></tr>
<tr><td colspan="2">Backward</td><td colspan="2">0.4–1.9 km/h</td></tr>
<tr><td colspan="4">Load capacity</td><td colspan="2">125 kg*3</td></tr>
<tr><td colspan="4">Maximum weight of user (including any carried items)</td><td colspan="2">Varies depending on the wheelchair on which the unit is installed.</td></tr>
</table>

 Please note that the specifications, appearance, and any of the above data are subject to change without notice for the purposes of improvement.
*1 Measured according to JIS T9203 (2010)
*2 Yamaha pattern travel: Continuous travel in a straight line on a flat surface, 24-inch wheels, new, fully charged battery, and ambient temperature of 15–25°C
*3 The E-Drive PLUS unit can withstand a load of 125 kg (including the rider, luggage, and frame weight). However, confirm the detailed specifications, including the frame strength, with the wheelchair manufacturer.

(Model: X0F5) 4.5 km/h type

Model				Electric wheelchair power unit	
Weight	With battery	Nickel metal hydride battery		17.6 kg	
		Lithium ion battery		18.3 kg	
	Without battery			14.7 kg	
Dimensions (length × width × height)				–	
Front tires				–	
		Tire size		–	
Rear tires				16 inch	
		Tire size		47-305 (16 × 1.75)	
		Air pressure		345 kPa (3.5 kg/cm^2, 50 PSI)	
Battery (built-in microprocessor)		Nickel metal hydride battery		JWB2 (24 V 6.7 Ah) × 1 (5-hour rate)	
		Lithium ion battery		ESB1 (25 V 11.2 Ah 280 Wh) × 1 (5-hour rate)	
Charger		For nickel metal hydride battery		JWC-2	Power: AC 100–240 V, 50–60 Hz Rated output: 29 V·2.6 A (during charging) Automatic charging controlled by the microprocessor
		For lithium ion battery		ESC1	Power: AC 100–240 V, 50–60 Hz Rated output: 29.2 V·3.0 A (during charging) Automatic charging controlled by the microprocessor
Drive motor (AC servo motor)				24 V 120 W × 2 (30-minute rated output)	
Drive system				Rear wheel direct drive	
Brake system				Motor regenerative braking + electromagnetic brake	
Steering system				Joystick steering	
Control system				Microprocessor control	
Seat structure and dimensions Seat width (W_1) × seat depth (L_2) × back support height (H_4)				–	
Minimum turning radius				–	
Maximum height of bumps that can be gone over				–	
Maximum width of ditches that can be gone over				–	
Operating conditions	Use environment			Inside and outside	
	Hill climbing ability			6° (slope approximately 10%)	
Travel range	Continuous travel range Note: According to JIS T9203 (2010)	With nickel metal hydride battery		16 km	
		With lithium ion battery		27 km	
Travel speed	Controller	Forward	First speed	1.6 km/h	
			Second speed	2.4 km/h	
			Third speed	3.1 km/h	
			Fourth speed	3.9 km/h	
			Fifth speed	4.6 km/h	
		Backward	First speed	0.9 km/h	
			Second speed	1.2 km/h	
			Third speed	1.6 km/h	
			Fourth speed	1.9 km/h	
			Fifth speed	2.3 km/h	
	Assistant controller	Forward		1.0–4.9 km/h	
		Backward		0.4–1.9 km/h	
Load capacity				125 kg*	
Maximum weight of user (including any carried items)				Varies depending on the wheelchair on which the unit is installed.	

 Please note that the specifications, appearance, and any of the above data are subject to change without notice for the purposes of improvement.

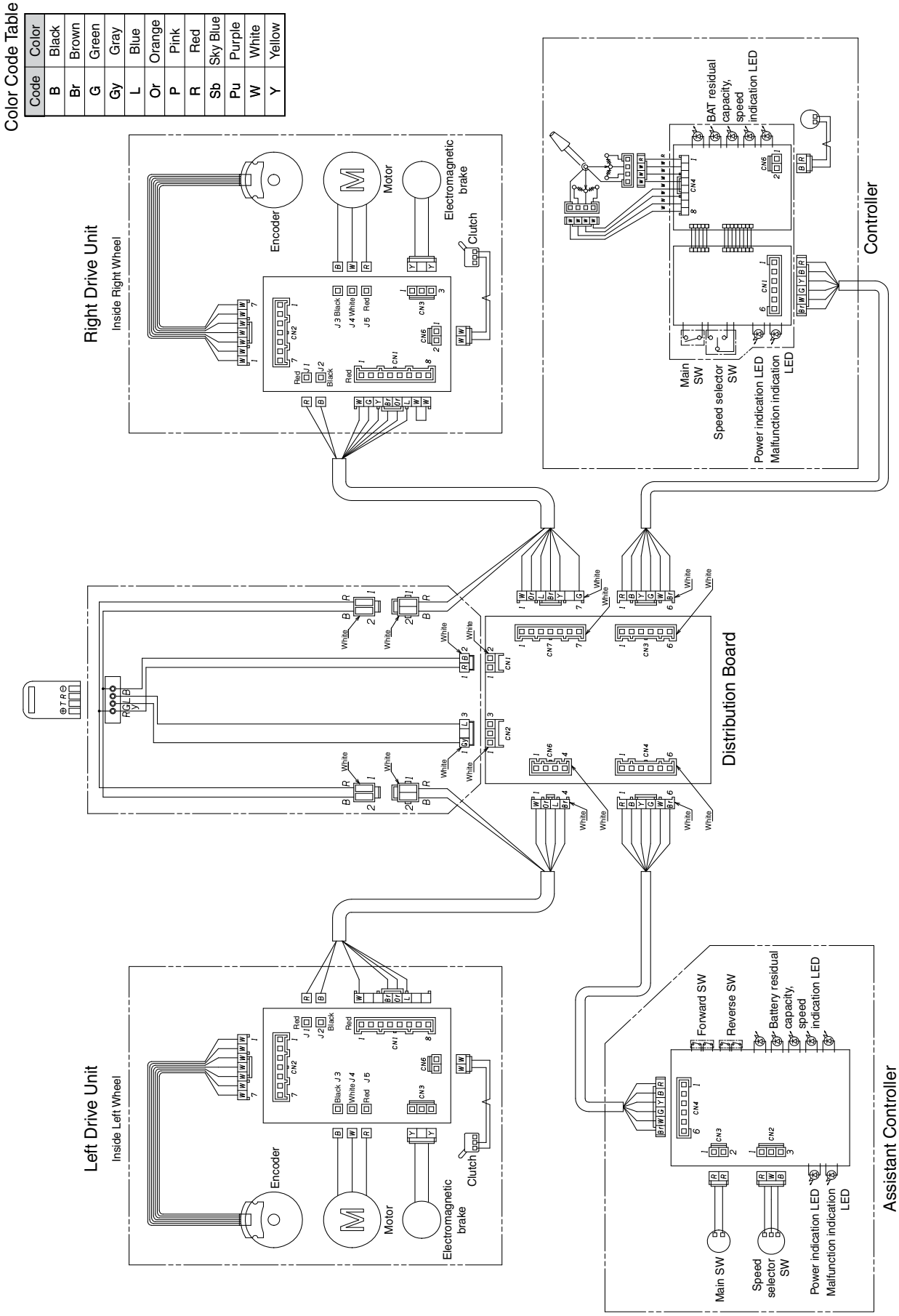
* The E-Drive PLUS can withstand a load of 125 kg (including the rider, luggage, and frame weight). However, the frame itself may have a lighter load capacity. Please confirm before use.

(Model: X0F6) 6.0 km/h type

Model				Electric wheelchair power unit	
Weight	With battery	Nickel metal hydride battery		17.6 kg	
		Lithium ion battery		18.3 kg	
	Without battery			14.7 kg	
Dimensions (length × width × height)				–	
Front tires				–	
		Tire size		–	
Rear tires				16 inch	
		Tire size		47-305 (16 × 1.75)	
		Air pressure		345 kPa (3.5 kg/cm^2, 50 PSI)	
Battery (built-in microprocessor)		Nickel metal hydride battery		JWB2 (24 V 6.7 Ah) × 1 (5-hour rate)	
		Lithium ion battery		ESB1 (25 V 11.2 Ah 280 Wh) × 1 (5-hour rate)	
Charger		For nickel metal hydride battery		JWC-2	Power: AC 100–240 V, 50–60 Hz Rated output: 29 V-2.6 A (during charging) Automatic charging controlled by the microprocessor
		For lithium ion battery		ESC1	Power: AC 100–240 V, 50–60 Hz Rated output: 29.2 V-3.0 A (during charging) Automatic charging controlled by the microprocessor
Drive motor (AC servo motor)				24 V 120 W × 2 (30-minute rated output)	
Drive system				Rear wheel direct drive	
Brake system				Motor regenerative braking + electromagnetic brake	
Steering system				Joystick steering	
Control system				Microprocessor control	
Seat structure and dimensions Seat width (W_1) × seat depth (L_2) × back support height (H_4)				–	
Minimum turning radius				–	
Maximum height of bumps that can be gone over				–	
Maximum width of ditches that can be gone over				–	
Operating conditions	Use environment			Inside and outside	
	Hill climbing ability			6° (slope approximately 10%)	
Travel range	Continuous travel range Note: According to JIS T9203 (2010)	With nickel metal hydride battery		16 km	
		With lithium ion battery		27 km	
Travel speed	Controller	Forward	First speed	1.7 km/h	
			Second speed	2.7 km/h	
			Third speed	3.7 km/h	
			Fourth speed	4.7 km/h	
			Fifth speed	5.7 km/h	
		Backward	First speed	0.9 km/h	
			Second speed	1.4 km/h	
			Third speed	1.8 km/h	
			Fourth speed	2.3 km/h	
			Fifth speed	2.8 km/h	
	Assistant controller	Forward		1.0–4.9 km/h	
		Backward		0.4–1.9 km/h	
Load capacity				125 kg*	
Maximum weight of user (including any carried items)				Varies depending on the wheelchair on which the unit is installed.	

- Please note that the specifications, appearance, and any of the above data are subject to change without notice for the purposes of improvement.
- * The E-Drive PLUS can withstand a load of 125 kg (including the rider, luggage, and frame weight). However, the frame itself may have a lighter load capacity. Please confirm before use.

11.2. Wiring Diagram



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