

E-Drive PLUS Service Manual





Foreword

This Service Manual describes the procedures for inspecting, adjusting, and assembling 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.
N	IOTICE	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)
- Assistant controller (optional)

1.2. Variations

(1) Power Unit for Wheelchairs

Model		E-Drive PLUS		
Tire size		20", 22" and 24"	16"	
Controllor	Left	0	0	
Controller	Right	0	0	
Controllor mounting	Standard	0	0	
	Swing out	0	0	
Speed	4.5 km/h type	0	0	
Speed	6.0 km/h type	0	0	
	Cramp bracket	0	_	
Mounting brackets	Bracket A	_	0	
	Bracket B	_	0	
Rattory coat	Integrated	0	0	
Dallery Seal	Separate	_	0	
Battery location (when	No offset	0	0	
battery seat)	Offset (28.5 mm)	0	0	
Battery types	Nickel metal hydride battery	0	0	
	Lithium ion battery	0	0	
Assistant controller (optional, right-hand operation only)	Assistant controller included	0	0	

2. Wheelchair Frame Conditions for Installing E-Drive PLUS

- Do not install E-Drive PLUS on a wheelchair frame that has insufficient strength.
- Do not install 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 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 E-Drive PLUS 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]



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2.3. Functional Conditions

The wheelchair on which 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 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 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 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
Ø	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
10	Plate assembly		1
1	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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	C.				
a.	dim dim		Product Name	Remarks	Quantity
	d. සිතිහි සිතිහි	a.	Battery box		1
	0 0 0 0 0 0 0 0 0 0 0 0 0	b.	Bottom lid		1
		C.	Screw for bottom lid		4
	f	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



\searrow	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



\searrow	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 E-Drive PLUS can be moved and installed 53.5 mm 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 ø1 7	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

- 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.)
- 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

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

- S 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.
- @ 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.
 - 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

- (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.
 - Fully tighten the nut that was temporarily tightened to the frame axle hole.
 Tightening torque: 40 to 50 Nm
 - If 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

Under Holder Assembly Installation Install the under holder onto the wheelchair frame.

- In 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 InstallationInstall 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 Hand rest plate Tightening torque: 6 to 8 Nm Brackets Upper holder assembly Tightening torque: 6 to 8 Nm



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.



🛕 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 handtightened screw.

- (3) Swing Out Bracket
 - Tit 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.



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.



^② Remove the cover under the battery seat.

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





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 " \times " 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.



- 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)
 - 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.
 - S 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.
 - 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.





- d. To the right motor control
- ④ Coil the excess lead wires and left unit wire harness, and bind them with a clamp.



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

The anti-tip bars must be adjusted so that they meet the requirements below.

- (1) When the casters and rear wheels are in contact with the ground, the safety wheels on the ends of the anti-tip bars must be 35–50 mm (1.4–2.0 inches) above the ground.
- (2) The distance between the center of the wheelchair back tube (where the axles of the rear wheels are installed) and the center of the safety wheels on the ends of the anti-tip bars is 245 mm (9.7 inches) or more.



3.5.1. Adjusting the Angle (E-Drive PLUS 16")

Required tools: Hexagonal wrenches (Allen keys), 10 mm socket, socket wrench, torque wrench

- (1) Anti-tip bar Angle Adjustment (Adjustable to 3 Angles)
 - 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 bar.

The anti-tip bar angle can be adjusted in 5° increments.

④ After inserting the bolts in the holes, tighten the bolts and nuts while pushing the anti-tip bar upward.

Bolts and Nuts

Tightening torque: 6 to 8 Nm



3

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. Func- tional 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)





	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.









- Brake Cable Connection
 - 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.


4.2.1. Option Knob

Joystick knob shape						
а			b			
Narrow type (60 mm)	Round type	Long type (135 mm)	T-shaped	U-shaped		
	\bigcirc					

4.2.2. Joystick Knob Replacement

- (1) Joystick Knob Replacement Method (a)
 - 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.
 - ④ Tighten the set screw with a wrench.Tightening torque: 0.1 to 0.3 Nm
- (2) Joystick Knob Replacement Method (b)
 - 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.
 - ④ Tighten the set screw with a wrench.☐ Tightening torque: 0.1 to 0.3 Nm
 - S As shown in the figure, hold firmly the bar on the tip of the Joystick knob and tighten the adjustment screw.





4.2.3. Inspection Method after Installation (Required)

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

- 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.
- 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.

- 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.

4.2.4. 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





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.

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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.
- S 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.
- C Loosen the nut with an open-end wrench, remove it, and then remove the toggle switch from the case.
- 8 Repeat steps S-Ø to remove the other toggle switch.







4.3.2. Switch Extension Harness Installation

 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

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 "Pushtype 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.

4.3.3. Push-Button Switch Installation

NOTICE

- When installing the push-button switches, be sure to use the included nuts and washers. Because a thick nut is included for the speed switch (push-button switch) and a thin nut is included for the power switch (push-button switch), be careful not to mix up the nuts.
- If you use the nuts and washers from the toggle switches for the push-button switches or if you mix up the thick and thin nuts, the push-button switches could be damaged.
- Remove the toggle switches according to the procedure in 4.3.1.
- ② Disconnect the connector on the printed circuit board.
- ③ Lift up the lock and pull out the LCD cord.
- ④ Remove the 4 screws, and then remove the printed circuit board.



- Insert a push-button switch into the 2-hole washer, and then insert the switch into the switch case by aligning the switch with the D-shaped hole in the case.
- Install the washer from the inside of the switch case, and then tighten the nut using a box-end wrench.

Tightening torque: 1.4 to 1.6 Nm

 $\oslash\,$ Repeat steps $\circledcirc\,$ and $\circledcirc\,$ to install the other pushbutton switch.

When installing a push-button switch for only the power switch, install the toggle switch for the speed switch. In this case, the washer included with the toggle switch is not necessary.

Install the printed circuit board (4 screws).

Tightening torque: 0.4 to 0.6 Nm

- Onnect the connector to the printed circuit board.
- Insert the LCD cord, and then lower the lock to secure the cord.



- Connect the 2 connectors for the push-button switches.
- Connect the 3 connectors for the under cover of the switch case.
- Install the under cover (6 screws).

Tightening torque: 1.1 to 1.4 Nm

Affix the power label.

M



If the speed switch was changed to a push-button switch, be sure to use JW Smart Tune to set the speed switch type to "Push switch". For instructions, refer to the JW Smart Tune Operation Manual.

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

- 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
 - Unfold the wheelchair, place it on a level surface, and engage the parking brake.
 - 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.
 - Insert the other screwdriver further into the widened gap.





S 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
 - 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. Installation, Removal, Disassembly, Assembly, and Adjustment Procedures of Each Part

5.1. Wheel Assembly Removal and Installation

(1) Detachment

① Remove the dust cover.



② Fix the tire in position. Move the clutch lever to [Manual] and apply the parking brake, and then fix the tire in place with the tire fixing tool to prevent the wheel from moving.

Attach the bracket to the rim of the wheel in the direction of the arrow while referring to the illustration below to fix the wheel in place.



16" Model

Set the tire fixing tool in place from the outside of the wheel.



^③ Loosen the wheel nut. Loosen the wheel nut with the socket wrench with the tire fixing tool fixed in place.





④ Remove the clip.

20", 22", and 24" Models: If the clip is difficult to remove, use a slot-ted 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.



S Remove the wheel.

(2) Attachment

 Set the wheel in place.
 Refer to the illustration on the right and confirm that the base of the hub and the front edge of the gear are separated by at least 8 mm.



^② Tighten the wheel nut.

The former specifications self-locking nut, clip and washer cannot be reused. If you disassemble them, replace them with a new flange nut.

Move the clutch lever to [Manual] and apply the parking brake, and then fix the tire in place with the tire fixing tool to prevent the wheel from moving and tighten the nut with the torque wrench (100 N \cdot m).

Wheel Nut Tightening Torque 100 N·m

③ Install the dust cover.



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

- (1) Removal
 - If necessary, remove the wheel assembly according to the instructions in section (1) in 5.1.
 - 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.





S 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

The motor control unit (printed circuit board) is available with new specifications and old specifications.

The specifications in effect can be confirmed as either new or old with the production serial number.

The method of installing the printed circuit boards differs between new and old specifications, and both the left-hand and right-hand circuit boards must share the same specifications. An error will be triggered if the specifications of the left-hand and right-hand circuit boards do not match up.

Check the production serial number without fail when replacing the circuit boards.

<Old circuit board (X0Fo-0oooo) >

- (1) Removal
 - 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.)
 - 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.

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







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



(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.

 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.
- 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

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





<New circuit board (X0Fo-20000) >

- (1) Removal
 - 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.)
 - 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. 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.





S Loosen the 5 screws, and remove the motor control unit.

<u>- Installing a new motor control unit</u> A gasket is attached to the rear of the motor control unit (see Fig. A).

If a gasket is attached to the drive unit, remove it.

- Reusing the same motor control unit Check to make sure that the gasket attached to the rear of the motor control unit or the gasket attached to the drive unit are not broken. If they are broken, replace them with new gaskets.



(2) Installation

Install using the reverse order of the removal procedure. Before installation, check that the heat dissipation sheet is neatly applied on the motor control unit.

 Install the motor control unit to the drive unit, and tighten the 5 screws evenly to the specified tightening torque.

Tightening torque: 0.4 to 0.6 Nm

- ⁽²⁾ Connect the connectors in their original locations.
- ③ Set the O ring in place and install the plastic transmission cover while making sure that the O ring and lead wires do not get pinched.

Tightening torque: 1.5 to 2.5 Nm

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





5.4. Wire Harness and Lead Wire Removal and Installation

- (1) Removal
 - Remove the motor control unit according to the instructions in section (1) in 5.3.
 - $^{\odot}$ 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
 - Install using the reverse order of the removal procedure.

Wire guide mounting bolt tightening torque: 0.4 to 0.6 Nm

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

- 5
- (1) Removal
 - 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.



 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

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

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".





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5.6. Adjusting the Free Play on the Clutch Lever (16" Model)

- Remove the wheel assembly according to the instructions in 5.1. Wheel Assembly Removal and Installation.
- ② Move the clutch lever to the [Motor] position, and then lean the wheelchair against a worktop or similar item where it is easy to carry out the work.



- ③ Adjust the free play on the clutch lever. It is necessary to adjust the free play on the clutch lever if it is excessive. If a level of free play exceeding 1 mm exists, adjust the free play in accordance with the following procedure.
- Adjust the clutch lever. First of all, loosen the nut where the clutch wire is connected.
 Required Tool: 10 mm spanner wrench





⑤ Pull gently on the clutch wire while turning the adjustment nut counterclockwise until the level of free play on the lever is reduced. If the free play has disappeared but the wire has been pulled too far, turn the adjustment nut in the opposite direction to adjust it.

Required Tool: 8 mm spanner

Pull on the wire to check the level of clutch lever free play.



Take care to avoid the clutch wire becoming detached if this is turned too far.



⑥ Once the level of lever free play has reached approximately 1 mm, hold it in place to prevent the adjustment nut from rotating, and then tighten the nut where the clutch wire is connected.

Required Tools: 8 mm spanner, 10 mm spanner



 Once the nut has been tightened, check the level of clutch lever free play once again.

If the level of free play is approximately 1 mm, the procedure is complete.



 Check that the switch between Motor and Manual is operating normally while con- firming this on the automatic operation remote controller.

If the display on the automatic operation remote controller shows [Remaining Battery] when the power is switched on and the clutch lever set in the [Motor] position, and [C1] when set in the [Manual] position, the procedure is complete.

If [C1] is not displayed when the clutch lever is set in the [Manual] position, adjust the free play a little more and then recheck the switch display.

Ince normal operations have been confirmed, install the wheel assembly according to the instructions in 5.1. Wheel Assembly Removal and Installation.



5.7. 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	

5.8. Controller Removal, Installation, and Position Adjustment

5.8.1. Standard

- (1) Removal
 - ① Remove the bolts (a).
 - ^② Remove the controller.



(2) Installation

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

Bolts (a)

Tightening torque: 6 to 8 Nm

- (3) Position Adjustment
 - Loosen the bolts (a) that are securing the controller (see the diagram above) and the height-adjusting bolt (b).
 - ② Set the controller in the appropriate position, and tighten the bolts.

Bolts (a)

Tightening torque: 6 to 8 Nm

Height-adjusting bolt (b)

Tightening torque: 14 to 16 Nm



5.8.2. Swing Out Bracket

- (1) Removal
 - ① Remove the bolts (a).
 - ^② Remove the controller.



- (2) Installation
 - ① Set the controller onto the arm.
 - ^② Tighten the bolts (a).



Tightening torque: 6 to 8 Nm

- (3) Position Adjustment
 - ① Loosen the bolts (a) and (b).
 - ⁽²⁾ Set the controller in the appropriate position.
 - ③ Tighten the bolts (a) and (b).

Bolts (a) and (b)

Tightening torque: 6 to 8 Nm



5.8.3. Slide Bracket

- (1) Removal
 - ① Remove the bolts (a).
 - ^② Remove the controller.



- (2) Installation
 - ① Set the controller onto the bracket.
 - ^② Install and tighten the bolts (a).

Bolts (a)

Tightening torque: 6 to 8 Nm



- (3) Position Adjustment
 - ① Loosen the bolts (a) and (b).
 - ② Set the controller in the appropriate position.
 - ^③ Tighten the bolts (a) and (b).

Bolts (a)

Tightening torque: 6 to 8 Nm

Bolts (b)

Tightening torque: 6 to 8 Nm



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5.9. Switching the Controller Left/Right Side Position

5.9.1. Standard

- (1) Removal
 - 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.
- From the under holder, remove the controller with the upper holder.
- S 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.



- 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

5.9.2. Swing Out Bracket

- 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.









S 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.



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



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.
- 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





5.10. 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.



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 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





Procedure after Printed Circuit Board Replacement (Required)
 Adjust the joystick range of motion according to the instructions in "4.2.4. Joystick Range of Motion Adjustment (Required)".

5.11. Assistant Controller (Option) Disassembly and Assembly

- (1) Removal and Disassembly
 - 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.
- To replace the print board: Remove the 3 screws, and pull out the print board from the case.



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(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

5.12. Adjusting the slide bracket free play

Required tools: Philips-head screwdriver, 10 mm wrench

- (1) Remove the controller from the slide bracket. (Refer to "3.4. Controller Installation".)
- (2) Turn the slide bracket outward to access the screws as shown in the illustration.

(3) Loosen the screws.





(4) Slightly turn the cam so that the boss moves backward to increase the tension of the inner belt. Check that the bracket free play is approximately 1 mm as shown in the illustration.



Make sure that the belt is not too taut. Otherwise, it will be difficult to move the slide bracket.

- Boss 1 mm
- Screw Contraction of the second secon
- (5) Tighten the screw of the cam while holding the cam using the wrench.

Screw

Tightening torque: 1.1 to 1.4 Nm

(6) Tighten the other screw.

Screw

Tightening torque: 1.1 to 1.4 Nm

(7) Recheck that the bracket free play is approximately 1 mm as shown in the illustration.If the free play is more than 1 mm, repeat the procedure starting from step (2).

(8) Move the slide bracket to the left and right and check that it moves smoothly.

Also, check that the slide bracket can be locked in 3 positions.

If it is difficult to move the slide bracket because the belt is too taut, repeat the procedure starting from step (2).

(9) Install the controller to the slide bracket. (Refer to "3.4. Controller Installation".)







6. Settings the Parameters

The settings of the features and characteristics of 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 preconfigured at the time of shipping from the factory.



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

6





(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.

Propot Solootion	Setting in Preset Mode			
Freset Selection	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)		
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	Operat	ion 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 param- eters.	Horn switch For switch	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 <u>lit</u>



6.3. Driving Parameters ~Free Mode~ Setting Method

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

Itom	Description	Meaning of Speed Level Indication Position				
nem	Description	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 Stan- dard)	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.

	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 param- eters.	Horn switch For switch Speed switch	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

-X-: Flashing















6.4. Function Parameters Setting Method

Itom	Description	Meaning of Speed Level Indication Position			
nem	Description	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	Opera	tion 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 param- eters.	Horn switch	Turn on the power switch while push- ing 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.	
[3]	[Auto Power Off Time Set- ting] Set how many minutes lapse after the last operation until the power automatically turns off.	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 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) 10 minutes (default setting) 60 minutes 10 minutes None







6.5. Method for Restoring Factory Settings

	Purpose of Operation	Operat	tion 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.	Horn switch For switch Speed switch	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.	All lit
[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.		While tilting the joystick forward, turn on the power.	
		Power 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]	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 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.

(n)

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	Operat	ion 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	 Turn on the power switch. Lower the speed switch to select the slowest speed, and then release your hand from the switch. 	. 80 %
[3]	[Anti-tampering Function Setting]	Horn switch Speed switch	 Hold down the speed switch. Once the buzzer beeps, release your hand from the switch. Immediately push the horn switch long.* 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



* 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 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 accord-ing to the information in the following table.

ON O	OFF	Blinking	Controller	display ● 藤豊素売 淡 伝	Assistant controller d	isplay
Warnir (≜ b	ng Display linking)	Buzzer	Item	Details	Unit Operation	Recovery
				One or both clutches become disengaged while driving.	Does not move.	When the clutch engages at the gear side.
•		Beeps 4 times (2 short beeps each time)	Clutch disengage- ment	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.
	[2]	Beeps for 2.5	Dash out preven-	The user has moved the control lever before turning on the power.	Does not move.	Turn on the power without moving the control lever.
0	<u>, ot</u>	seconds	tion	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.
•	L ₩	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 tempera- ture 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	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.
× III ×	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 communi- cation)	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 communi- cation	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.
I 10 ⁵⁵ *	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 C	FF Blinking	9	Co	ntı	rolle	er	dis	pla	y	() <u>Ř</u>	また];0:	{	Ass	sist	an	t co	ont	roller dis	splay
Malfunction Item	Malfunction Detail Indication	Beeping Pattern	Meaning of Display		R	epla	acer	nent	t (C):Mo	st S	usp	ect,	۸:۸	Vext	Sus	spec	t)		Failur	e Judgment Condition
Indication	Indication			A tor ma	u- no- ous	A si ta	s- s- nt		Rig	ght L	Jnit			Le	eft U	nit		Relay	Battery	CNT DRV	:Controller board :Driver board
pattern at time of mal- function	speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness	Board		ENC EMB Harness relay boar	:Encoder :Electromagnetic brake :Wire harness between d and each unit
[Power Related]																				
<i>E /</i>		_	5V power fluctuation (CNT)	0		0														The powe processor specified v	er to the controller micro has fluctuated beyond th value.
	<u>Z</u> ×	Beeps for 2.5 seconds	Battery overvolt- age																Δ	BMC has voltage ha value (this tion with a long down	detected that the batter as exceeded the specifie s can happen by regenera fully charged battery on a slope.)
[CPU Self Ch	eck]																				
<i>E </i> 0 0		Beeps for 2.5 seconds	Speed command calculation malfunc- tion	0		0															
	<u>×</u>	Beeps for 2.5 seconds	EEPROM malfunc- tion	0		0															
		Beeps for 2.5 seconds	AD buffer malfunc- tion	0		0															
		Beeps for 2.5 seconds	Command value mal- function (CNT)	0		0															

Malfunction Item	Malfunction Detail Indication	Beeping Pattern	Meaning of Display Replacement (O:Most Suspect, ∆:Next Suspect)									pec	t)		Failure Judgment Condition					
Indication	Indication			A toi	u- no-	Asi	S- IS-		Rię	ght l	Jnit			Le	eft U	nit		Relay	Batte	CNT :Controller board
pattern at time of mal- function	pattern when speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness	Board	Ţ	ENC :Encoder EMB :Electromagnetic brake Harness :Wire harness between relay board and each unit
[Status Transiti	on Related]		r T	1	1		·		·	1				·	1	 1	I		1	1
<i>E </i>	×	Beeps for 2.5 seconds	CAN bus- off (CNT)	0	Δ	0	Δ	Δ					Δ					0		
	∦] ∞ ∭ ∎0	Beeps for 2.5 seconds	CAN timed out (CNT)	Δ	0	Δ	0	Δ				0	Δ				0	0		
	<i>₿</i> ≈∎∎o	Beeps for 2.5 seconds	Start failure (CNT)	Δ	0	Δ	0	0				0	0				0	0		When starting, no "standby" signal is received from the driver.
	?] ¤∭©	Beeps for 2.5 seconds	Position inconsis- tency of left and right DIP rotary switches					0				Δ	0				Δ			The left and right driver board (mo- tor controllers) specifications are different.
[Output Related	[[1	1	1		1	1	1	1	1	1		1	1	1	T	1			
<i>E </i> 011110		Beeps for 2.5 seconds	Direction error					0	0	Δ	Δ		0	0	Δ	Δ				The difference between the direc- tion 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)
		Beeps for 2.5 seconds	Overspeed					0	0	Δ			0	0	Δ					[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 regard- less of the command value.
[Input Related	[[1	1	1	1	1	1		1	1	1	1	1	1	1	1	1		1	
<i>E </i>		Beeps for 2.5 seconds	Speed volume malfunc- tion (lower limit)			0														The speed adjustment volume volt- age of the assistant controller is over the specified value.
		Beeps for 2.5 seconds	Speed volume malfunc- tion (upper limit)			0														The speed adjustment volume volt- age of the assistant controller is less than the specified value.
	× · · · · · · · · · · · · · · · · · · ·	Beeps for 2.5 seconds	Reverse switch mal- function			0														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 mal- function			0														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	0																The forward-reverse direction volt- age of the joystick does not have the specified value.
	30	Beeps for 2.5 seconds	Joystick left-right direction malfunction	0																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 (O:Most Suspect, ∆:Next Suspect) Failure Judgment Condition																		
Indication	Indication			A tor ma	u- 10- Dus	A si ta	s- s- nt		Rig	ght L	Jnit			Le	ft U	nit		Relay	Batter		Controller board
pattern at time of mal- function	pattern when speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness	Board	Y	ENC EMB Harness relay board	Encoder Electromagnetic brake Wire harness between I and each unit
[Left Driver Rel	ated]																				
<i>[]</i>	×	Beeps for 2.5 seconds	Setting switch mal- function										0							The settin board is ma	g switch on the driver alfunctioning.
	5	Beeps for 2.5 seconds	CAN bus- off (DRV)										Δ				0				
	<i>15</i>	Beeps for 2.5 seconds	CAN timed out (DRV)	0		0							Δ								
	17 	Beeps for 2.5 seconds	Start fail- ure (DRV)	0		0							Δ				Δ			No "standb the control	y" signal is returned from er.
		Beeps for 2.5 seconds	Brake mal- function										Δ			0				The moto should be s	r has moved when it stopped.
	іс 	Beeps for 2.5 seconds	Relay contacts melted										0							The relay function.	on the driver board mal-
		Beeps for 2.5 seconds	Thermistor malfunc- tion										0							The therm malfunction	istor on the driver board n.
	2 / ¤ 11 0	Beeps for 2.5 seconds	Speed pulse error										Δ		0					The encod	er malfunction.
		Beeps for 2.5 seconds	Motor wire open circuit malfunction											0			Δ				
	<u>23</u> ×	Beeps for 2.5 seconds	Magnetic pole detection malfunction										Δ		0					The encod	er malfunction.
		Beeps for 2.5 seconds	Amperage offset										0							The motor functioning	current sensor is mal-
	×	Beeps for 2.5 seconds	Motor overamp- erage										0	Δ						The motor specified v	current has exceeded the alue.

Malfunction Item	Malfunction Detail Indication	Beeping Pattern	Meaning of Display	Aleaning of Display Replacement (O:Most Suspect, ∆:Next Suspec								t)		Failure Judgment Condition						
Indication	Indication			A toi	u- no-	A si ta	S- S- int		Rię	ght l	Jnit			Le	eft U	nit		Relay	Battei	CNT :Controller board
pattern at time of mal- function	pattern when speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness	Board	Y	ENC :Encoder EMB :Electromagnetic brake Harness :Wire harness between relay board and each unit
[Left Driver Rel	ated]	1	1	1	1		ı	ı	1				1	, ,	1	1	1	1		1
EC 011110		Beeps for 2.5 seconds	Arm shorted										0							The current of the motor drive circuit has exceeded the specified value.
		Beeps for 2.5 seconds	12V power fluctuation	Δ		Δ							0				Δ		0	The 12V control power malfunction.
		Beeps for 2.5 seconds	Vehicle overvolt- age	Δ		Δ		Δ					Δ							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	Accelera- tion command over	0		0							Δ							
		Beeps for 2.5 seconds	Power line open circuit														0	0		The voltage is not the specified value.
		Beeps for 2.5 seconds	Speed command over	0		0							Δ							
		Beeps for 2.5 seconds	5V power fluctuation (DRV)										0							The power for the microprocessor is not the specified value.
[Right Driver R	elated]					1	1						1	1	1			1		
[] []	/-/ ¤ <u>:</u>	Beeps for 2.5 seconds	Setting switch mal- function					0												The setting switch on the driver board is malfunctioning.
	<i>¥</i> 5 ∞∰∎©	Beeps for 2.5 seconds	CAN bus- off (DRV)					Δ				0								
	₩ 	Beeps for 2.5 seconds	CAN timed out (DRV)	0		0		Δ												
	/7	Beeps for 2.5 seconds	Start fail- ure (DRV)	0		0		Δ												No "standby" signal is returned from the controller.
		Beeps for 2.5 seconds	Brake mal- function					Δ			0									The motor has moved when it should be stopped.

Malfunction Item	Malfunction Detail Indication	Beeping Pattern	Meaning of Display	of Replacement (O:Most Suspect, ∆:Next Suspect)								Failure Judgment Condition								
Indiaction	Indication			A tor	u- 10-	A si	S- S-		Riç	ght l	Jnit			Le	eft U	nit		Relay	Batte	CNT :Controller board
pattern at time of mal- function	pattern when speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness	/ Board	Ŋ	ENC :Encoder EMB :Electromagnetic brake Harness :Wire harness between relay board and each unit
[Right Driver R	elated]																			
<i>E3</i>	<u>ка</u> При о	Beeps for 2.5 seconds	Relay contacts melted					0												The relay on the driver board mal- function.
		Beeps for 2.5 seconds	Thermistor malfunc- tion					0												The thermistor on the driver board malfunction.
	₽ ₩ ₩	Beeps for 2.5 seconds	Speed detection malfunction					Δ		0										The encoder malfunction.
	<u>ZZ</u> ×	Beeps for 2.5 seconds	Motor wire open circuit malfunction						0			Δ								
		Beeps for 2.5 seconds	Magnetic pole detection malfunction					Δ		0										The encoder malfunction.
		Beeps for 2.5 seconds	Amperage offset					0												The motor current sensor is mal- functioning.
	× E E E E E	Beeps for 2.5 seconds	Motor overamp- erage					0	Δ											The motor current has exceeded the specified value.
		Beeps for 2.5 seconds	Arm shorted					0												The current of the motor drive circuit has exceeded the specified value.
		Beeps for 2.5 seconds	12V power fluctuation	Δ		Δ		0											0	The 12V control power malfunction.
		Beeps for 2.5 seconds	Vehicle overvolt- age	Δ		Δ		Δ					Δ							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.)
	29 ¤įo	Beeps for 2.5 seconds	Accel- eration command over	0		0		Δ												
		Beeps for 2.5 seconds	Power line open circuit									0						0		The voltage is not the specified value.

Malfunction Item	Malfunction Detail Indication	Beeping Pattern	Meaning of Display		F	Repla	acer	nen	t (C):Mc	st S	Susp	ect,	∆:№	lext	Sus	pec	t)		Failur	e Judgment Condition
Indication	Indication			A tor mc	u- 10- bus	A si ta	s- s- int		Rig	ght L	Jnit			Le	eft U	nit		Relay E	Battery	CNT DRV	:Controller board :Driver board
pattern at time of mal- function	speed switch is pushed up or down			CNT	Harness	CNT	Harness	DRV	Motor	ENC	EMB	Harness	DRV	Motor	ENC	EMB	Harness	Board		ENC EMB Harness relay boar	:Encoder :Electromagnetic brake :Wire harness between rd and each unit
[Right Driver Re	elated]																				
<i>[</i>] omo		Beeps for 2.5 seconds	Speed command over	0		0		Δ													
		Beeps for 2.5 seconds	5V power fluctuation (DRV)					0												The powe not the sp	er for the microprocessor is becified value.

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.)



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".



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 dam- age No twisting or looseness No looseness or significant wobble
	Damage, deformation, and looseness	No damage, deformation, or looseness of retaining screws
Controllor	Main switch and speed switch operation	Turns ON and OFF securely and speed can be adjusted
Controller	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
	Damage, deformation, and looseness	No damage, deformation, or looseness of screws
Assistant	Main switch and speed adjustment dial operation Forward and reverse switch operation ease	Turns ON and OFF securely, speed can be ad- justed, and moves smoothly and can be controlled
Controller	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
	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
Unit	Axle tightening	Axle tightened at 40 to 50 Nm
	Anti-tip device looseness, deformation, and dam- age	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	
Dimensi	ons (length × width	× height)		-	-	-
Seat stru (seat wic	ucture and dimension of the seat depthes b	ons ack support he	eight)*1	_	_	_
	With bottony	Nickel metal	hydride battery	18.0 kg	18.2 kg	18.4 kg
Weight	with battery	Lithium ion b	pattery	18.7 kg	18.9 kg	19.1 kg
	Without battery			15.1 kg	15.3 kg	15.5 kg
	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)
Tires			Air pressure	420 kPa (4.2 kg/cm², 60 PSI)	450 (4.5 kg/cr) kPa n², 65 PSI)
	Front wheels			_	_	-
Batterv		Nickel metal	hydride battery	JWB	2 (24 V 6.7 Ah) × 1 (5-hou	r rate)
(built-in	microprocessor)	Lithium ion b	pattery	ESB	1 (25 V 11.2 Ah) × 1 (5-hou	r rate)
Ohannan		For nickel m	etal hydride battery	JWC-2 <rat Automatic ch</rat 	ed output 29 V·2.6 A (durin harging controlled by the m	g charging)> icroprocessor
Charger		For lithium io	on battery	ESC1 or ESC2 < Automatic ch	rated output 29.2 V·3.0 A (arging controlled by the m	during charging)> icroprocessor
Drive mo	otor (AC servo moto	r)		24 V 1	20 W × 2 (30-minute rated	output)
Drive sys	stem				Rear wheel direct drive	
Brake sy	vstem			Motor regen	erative braking + electrom	agnetic brake
Steering	system				Joystick steering	
Control s	system				Microprocessor control	
Hill climb	bing ability			6	δ° (slope approximately 109	%)
	Continuous travel	With nickel r	netal hydride battery		15 km	
Travel	range*2	With lithium	ion battery		29 km	
range	Continuous travel	With nickel r	netal hydride battery		15 km	
	range*3	With lithium	ion battery		30 km	
Minimum	n turning radius			Varies depending c	on the wheelchair on which	the unit is installed.
Maximur	n height of bumps t	hat can be gor	ne over	Varies depending c	on the wheelchair on which	the unit is installed.
Maximur	n width of ditches th	nat can be gon	e over	Varies depending c	on the wheelchair on which	the unit is installed.
			First speed		1.7 km/h	
			Second speed		2.4 km/h	
		Forward	Third speed		3.1 km/h	
			Fourth speed		3.8 km/h	
	Controllor		Fifth speed		4.5 km/h	
Maxi-	Controller		First speed		0.9 km/h	
speed			Second speed		1.2 km/h	
		Backward	Third speed		1.6 km/h	
			Fourth speed		1.9 km/h	
			Fifth speed		2.3 km/h	
	Assistant	Forward			1.0-4.9 km/h	
	controller	Backward			0.4–1.9 km/h	
Maximur	n weight of user (in	cluding any ca	rried items)	Varies depending o	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. Specified dimensions according to JIS T9203 (2010) *2 Measured according to JIS T9203 (2010) Yamaha pattern travel: Continuous travel in a straight line on a flat surface, 24-inch wheels, new, fully charged battery, and ambient tempera-ture of 15–25°C *1 *3

(Model: X0F2) 6.0 km/h type

		Model		Electric w powe	rheelchair ar unit
		Nickel meta	l hydride battery	18.2 kg	18.4 kg
Weight	with battery	Lithium ion I	battery	18.9 kg	19.1 kg
	Without battery			15.3 kg	15.5 kg
	Rear wheels			22 inch	24 inch
Tinga			Tire size	37-501 (22 × 1 ³ / ₈)	37-540 (24 × 1 ³ / ₈)
lires			Air pressure	450 kPa (4.5 k	g/cm², 65 PSI)
	Front wheels			_	_
Battery		Nickel meta	l hydride battery	JWB2 (24 V 6.7 At	n) × 1 (5-hour rate)
(built-in	microprocessor)	Lithium ion	battery	ESB1 (25 V 11.2 Ah 28	0 Wh) × 1 (5-hour rate)
Charger		For nickel m	etal hydride battery	JWC-2 <rated 29="" \<br="" output="">Automatic charging contro</rated>	/·2.6 A (during charging)> lled by the microprocessor
Charger		For lithium i	on battery	ESC1 or ESC2 <rated 2<br="" output="">Automatic charging contro</rated>	29.2 V·3.0 A (during charging)> lled by the microprocessor
Drive mo	otor (AC servo moto	r)		24 V 120 W × 2 (30-	minute rated output)
Drive sy	stem			Rear wheel	direct drive
Brake sy	/stem			Motor regenerative brakin	g + electromagnetic brake
Steering	j system			Joystick	steering
Control	system			Microproce	ssor control
Hill clim	climbing ability			6° (slope appro	oximately 10%)
	Continuous travel	With nickel	metal hydride battery	15	km
Travel	range*1	With lithium	ion battery	29	km
range	Continuous travel	With nickel	metal hydride battery	16	km
	range*2	With lithium	ion battery	32	km
Minimun	n turning radius			Varies depending on the wheelch	nair on which the unit is installed.
Maximu	m height of bumps t	hat can be go	ne over	Varies depending on the wheelch	nair on which the unit is installed.
Maximu	m width of ditches th	nat can be gor	ne over	Varies depending on the wheelch	nair on which the unit is installed.
			First speed	1.7 -	<m h<="" td=""></m>
			Second speed	2.6 km/h	2.7 km/h
		Forward	Third speed	3.6 km/h	3.7 km/h
			Fourth speed	4.5 km/h	4.7 km/h
	Controllor		Fifth speed	5.5 km/h	5.7 km/h
Maxi-	Controller		First speed	0.91	km/h
speed			Second speed	1.4	km/h
		Backward	Third speed	1.8	xm/h
			Fourth speed	2.3	km/h
			Fifth speed	2.81	km/h
	Assistant	Forward		1.0-4.	9 km/h
	controller	Backward		0.4–1.	9 km/h
Maximu	m weight of user (in	cluding any ca	arried items)	Varies depending on the wheelch	nair on which the unit is installed.

• *1 *2

Please note that the specifications, appearance, and any of the above data are subject to change without notice for the purposes of improvement. Measured according to JIS T9203 (2010) Yamaha pattern travel: Continuous travel in a straight line on a flat surface, 24-inch wheels, new, fully charged battery, and ambient tempera-ture of 15–25°C

(Model: X0F5) 4.5 km/h type

		Model			Electric wheelchair power unit
	With battory	Nickel metal	hydride battery		17.6 kg
Weight	with battery	Lithium ion b	pattery		18.3 kg
	Without battery				14.7 kg
Dimensi	ons (length × width	× height)			-
Front tir	es				_
		Tire size			_
					16 inch
Rear tire	es	Tire size			47-305 (16 × 1.75)
		Air pressure			345 kPa (3.5 kg/cm², 50 PSI)
Battery		Nickel metal	hydride battery	J	WB2 (24 V 6.7 Ah) × 1 (5-hour rate)
(built-in	microprocessor)	Lithium ion b	pattery	ESB1	(25 V 11.2 Ah 280 Wh) × 1 (5-hour rate)
Charger		For nickel m	etal 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 i	on 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 m	otor (AC servo moto	r)		24	V 120 W × 2 (30-minute rated output)
Drive sy	stem				Rear wheel direct drive
Brake sy	/stem			Motor reg	generative braking + electromagnetic brake
Steering	system				Joystick steering
Control	system				Microprocessor control
Seat str Seat wid	ucture and dimensio Ith (W ₁) × seat depth	ns ı (L₂) × back s	upport height (H ₄)		-
Minimun	n turning radius				-
Maximu	m height of bumps th	nat can be gor	ne over		-
Maximu	m width of ditches th	nat can be gor	ie over		-
operat-	Use environment				Inside and outside
condi- tions	Hill climbing ability	/			6° (slope approximately 10%)
Travel	Continuous travel	With nickel r	metal hydride battery		16 km
range	to JIS T9203 (2010)	With lithium	ion battery		27 km
			First speed		1.6 km/h
			Second speed		2.4 km/h
		Forward	Third speed		3.1 km/h
			Fourth speed		3.9 km/h
	Controllor		Fifth speed		4.6 km/h
Travel	Controller		First speed		0.9 km/h
speed			Second speed		1.2 km/h
		Backward	Third speed		1.6 km/h
			Fourth speed		1.9 km/h
			Fifth speed		2.3 km/h
	Assistant	Forward			1.0-4.9 km/h
	controller	Backward			0.4–1.9 km/h
Maximu	m weight of user (ind	cluding any ca	rried items)	Varies dependir	ng 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.

(Model: X0F6) 6.0 km/h type

		Model			Electric wheelchair power unit
	With bottony	Nickel metal	hydride battery		17.6 kg
Weight	with battery	Lithium ion b	pattery		18.3 kg
	Without battery				14.7 kg
Dimensi	ons (length × width	× height)			-
Front tir	0.5				-
	63	Tire size			-
					16 inch
Rear tire	es	Tire size			47-305 (16 × 1.75)
		Air pressure			345 kPa (3.5 kg/cm², 50 PSI)
Battery		Nickel metal	hydride battery	J	WB2 (24 V 6.7 Ah) × 1 (5-hour rate)
(built-in	microprocessor)	Lithium ion b	pattery	ESB1	(25 V 11.2 Ah 280 Wh) × 1 (5-hour rate)
Charger		For nickel m	etal 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 i	on 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 mo	otor (AC servo moto	r)		24	V 120 W × 2 (30-minute rated output)
Drive sy	/e system ke system				Rear wheel direct drive
Brake sy	ke system ering system			Motor re	generative braking + electromagnetic brake
Steering	ering system				Joystick steering
Control	system				Microprocessor control
Seat str Seat wic	ucture and dimensic dth (W1) × seat depth	ons ı (L₂) × back s	upport height (H ₄)		-
Minimun	n turning radius				_
Maximu	m height of bumps tl	hat can be gor	ne over		
Maximu	m width of ditches th	nat can be gor	ie over		-
ing	Use environment				Inside and outside
condi- tions	Hill climbing ability	y			6° (slope approximately 10%)
Travel	Continuous travel	With nickel r	metal hydride battery		16 km
range	to JIS T9203 (2010)	With lithium	ion battery		27 km
			First speed		1.7 km/h
			Second speed		2.7 km/h
		Forward	Third speed		3.7 km/h
			Fourth speed		4.7 km/h
	Controllor		Fifth speed		5.7 km/h
Travel	Controller		First speed		0.9 km/h
speed			Second speed		1.4 km/h
	Backward Third spec				1.8 km/h
	Fourth speed				2.3 km/h
			Fifth speed		2.8 km/h
	Assistant	Forward			1.0–4.9 km/h
	controller	Backward			0.4–1.9 km/h
Maximu	m weight of user (ind	cluding any ca	rried items)	Varies dependir	ng 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.

11.2. Wiring Diagram


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