

SERVICE MANUAL

e-Bike SYSTEMS Battery Pack

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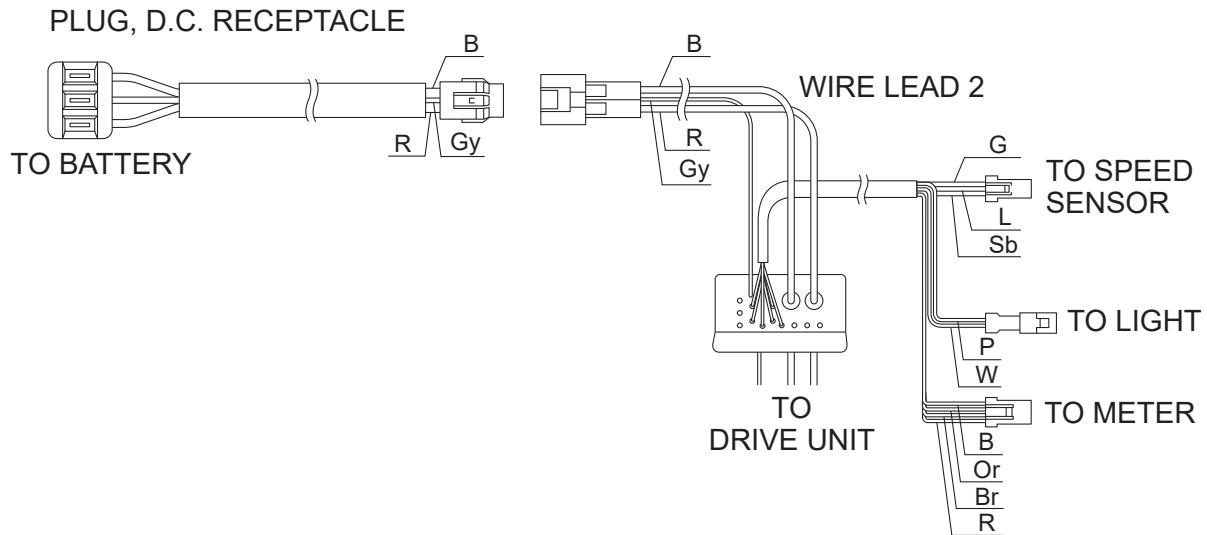
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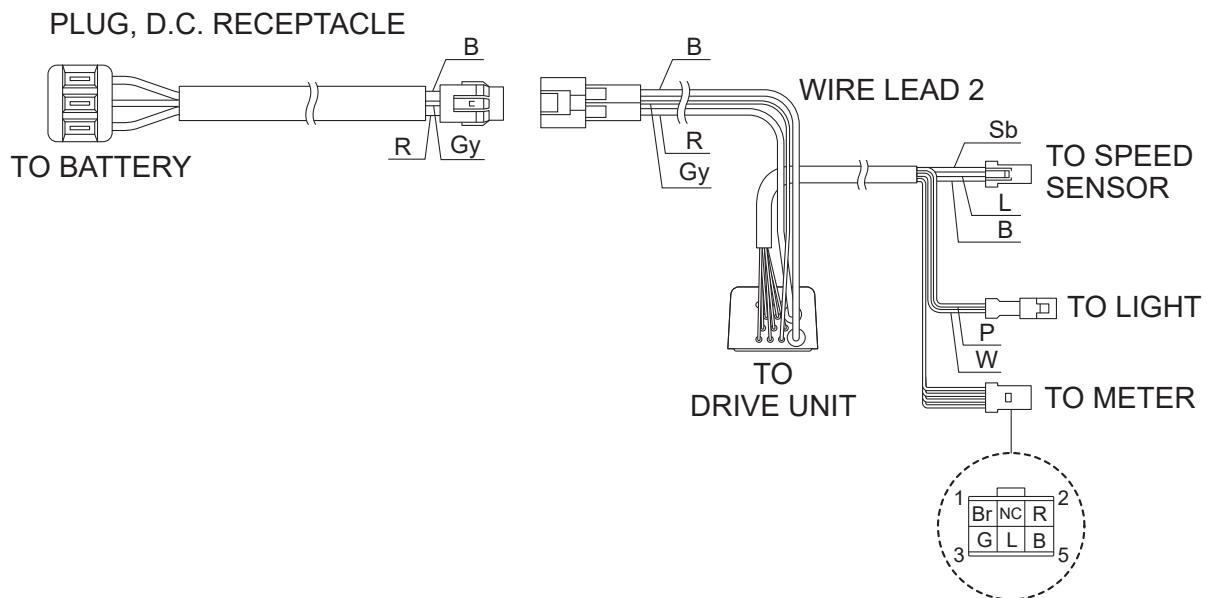
Installation

Electrical component wiring diagram

For PWseries, PWseries 45

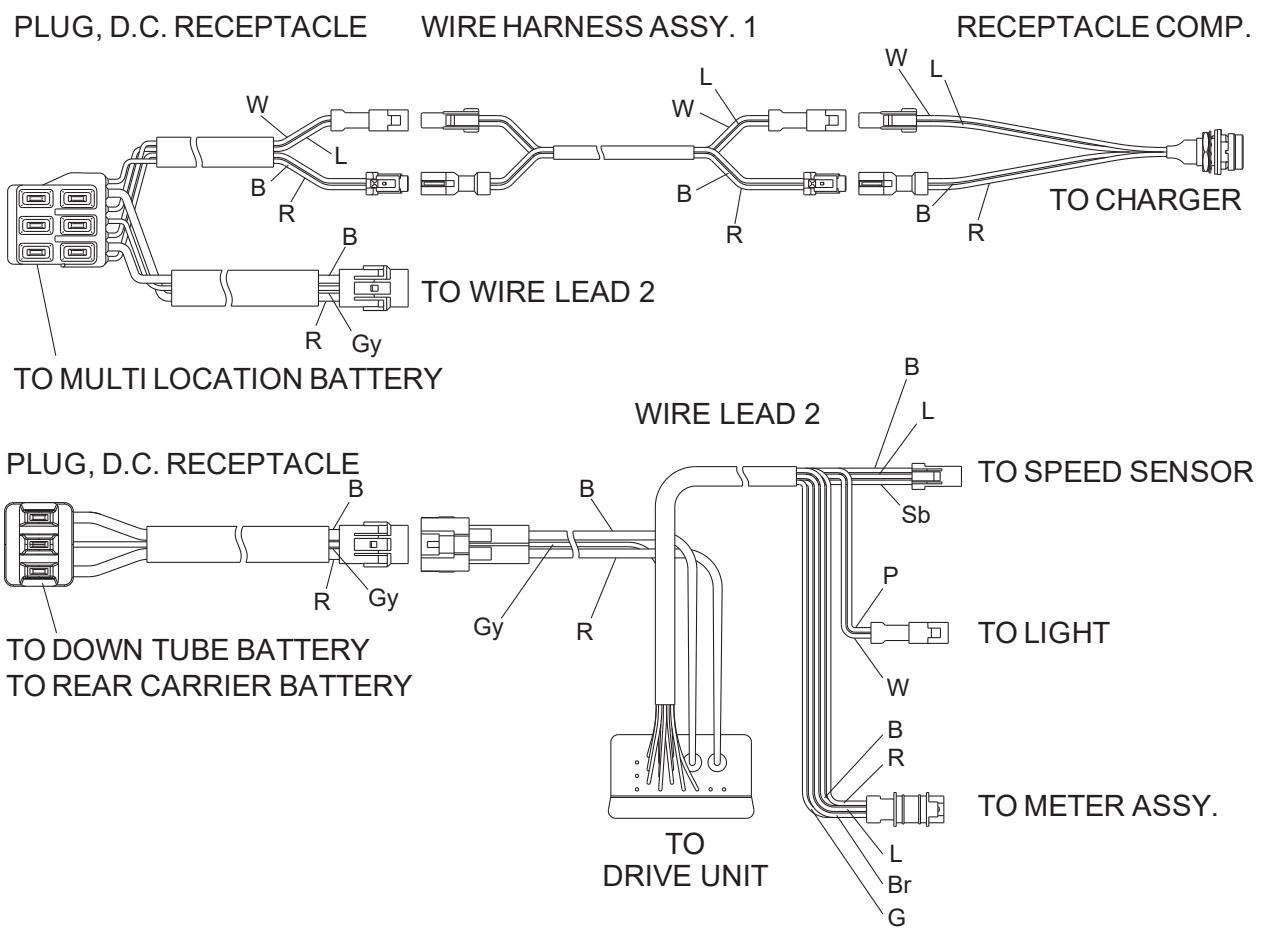


For MY2018 Drive Unit (PWseries SE, PW-X)



B = Black	P = Pink
Br = Brown	R = Red
G = Green	Sb = Sky blue
Gy = Gray	W = White
L = Blue	Y = Yellow
Or = Orange	

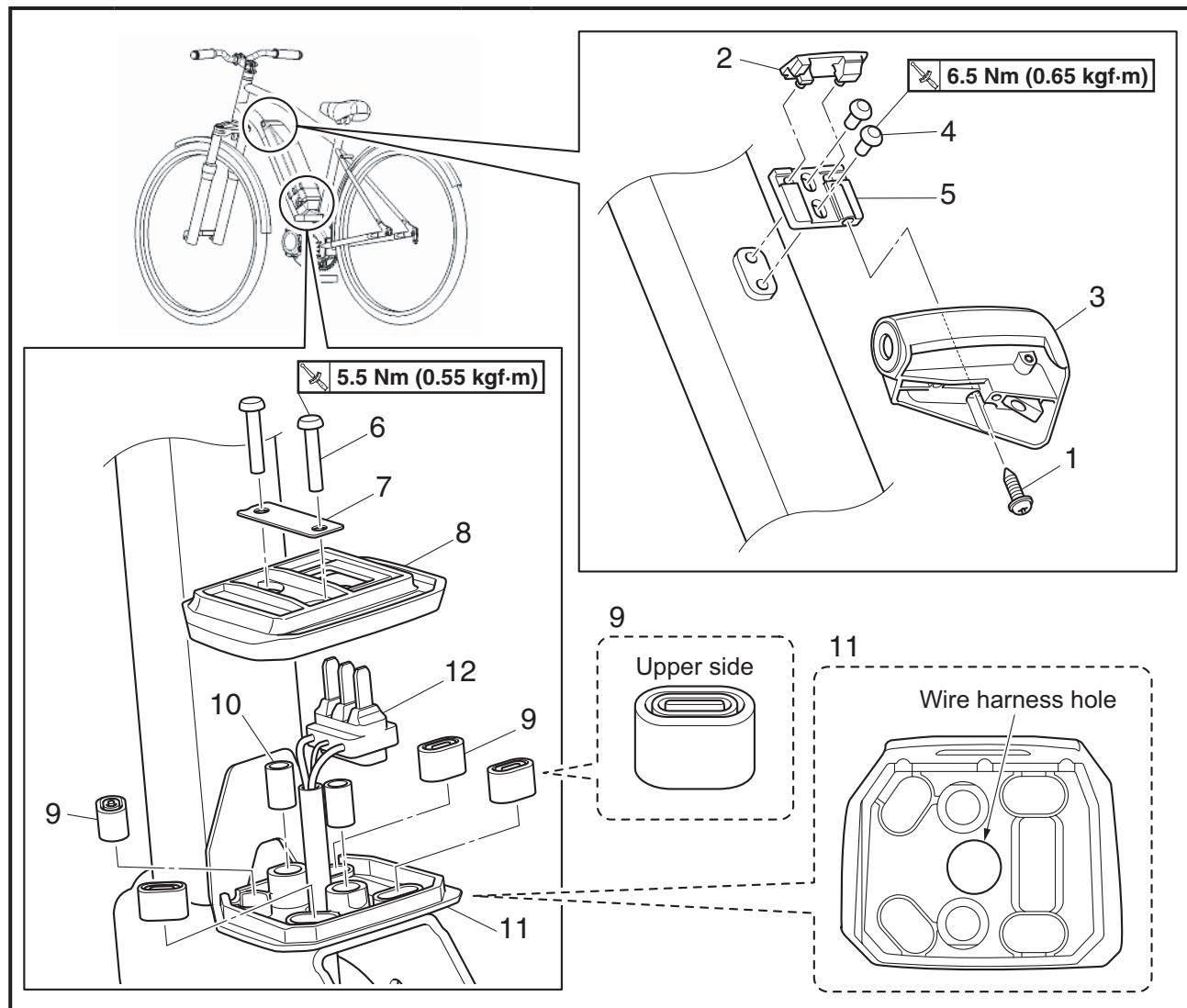
For MY2019 Drive Unit (PWseries SE/TE, PW-X)



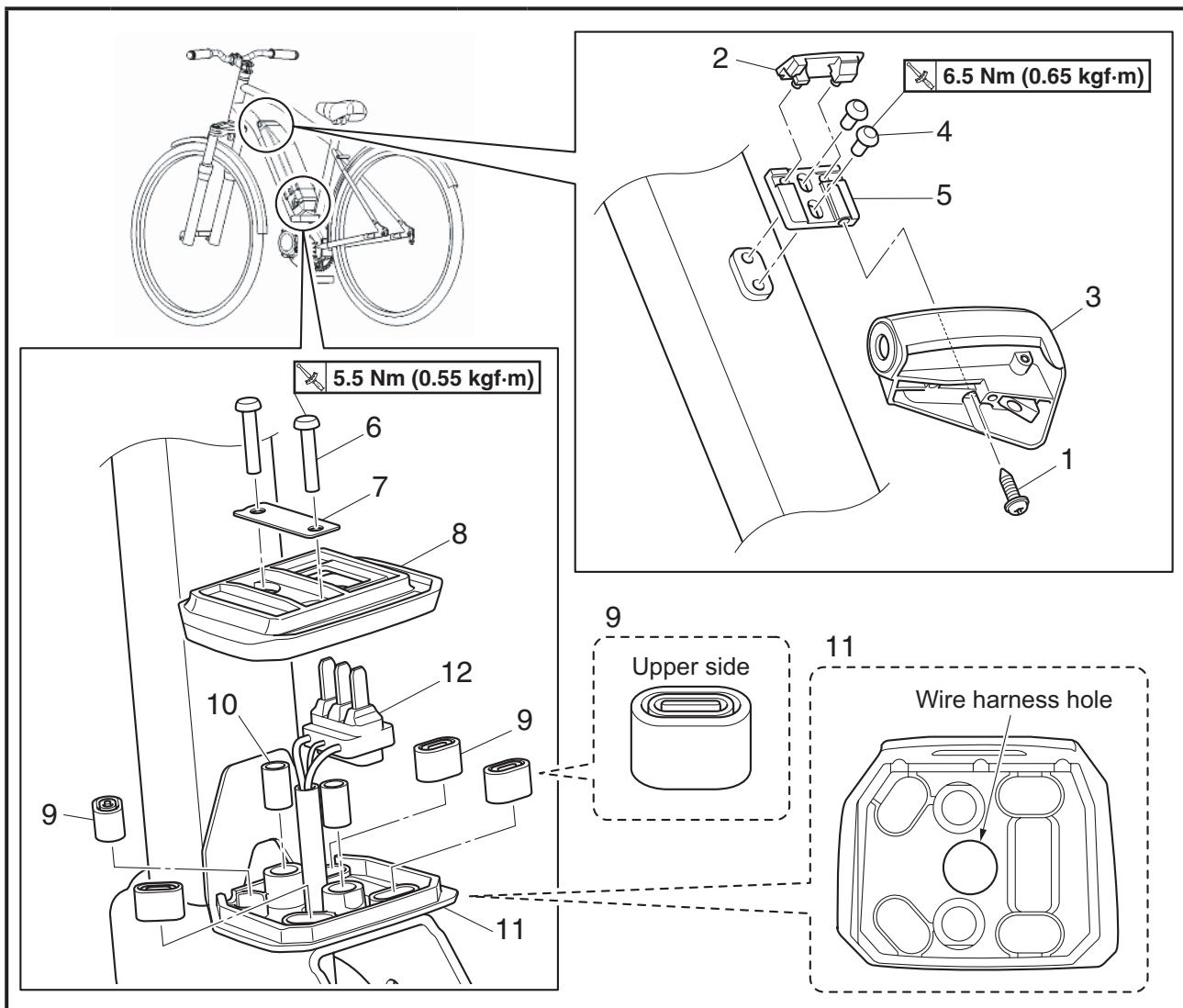
B = Black	P = Pink
Br = Brown	R = Red
G = Green	Sb = Sky blue
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L = Blue	Y = Yellow
Or = Orange	

Battery fixtures

Down tube battery

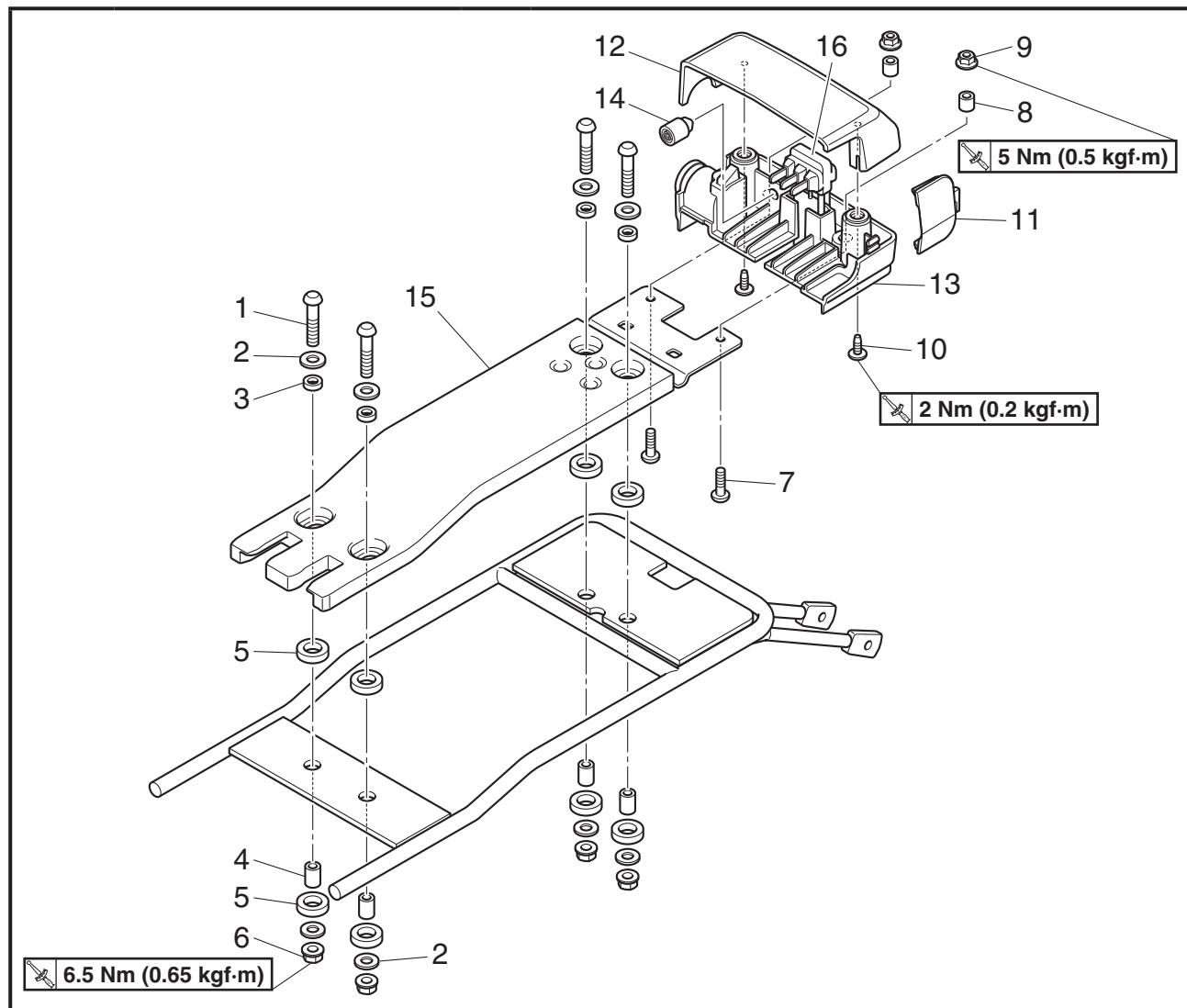


Order	Job/Part	Q'ty	Remarks
	Removal of the battery base from the bicycle frame.		Follow the work procedures for removal.
1	Screw	1	
2	Cap cover	1	
3	Lock assy.	1	
4	Button head bolt	2	
5	Bracket	1	
6	Hex. Socket button bolt	2	
7	Plate, 1	1	
8	Case, 2	1	
9	Damper	4	
10	Collar	2	

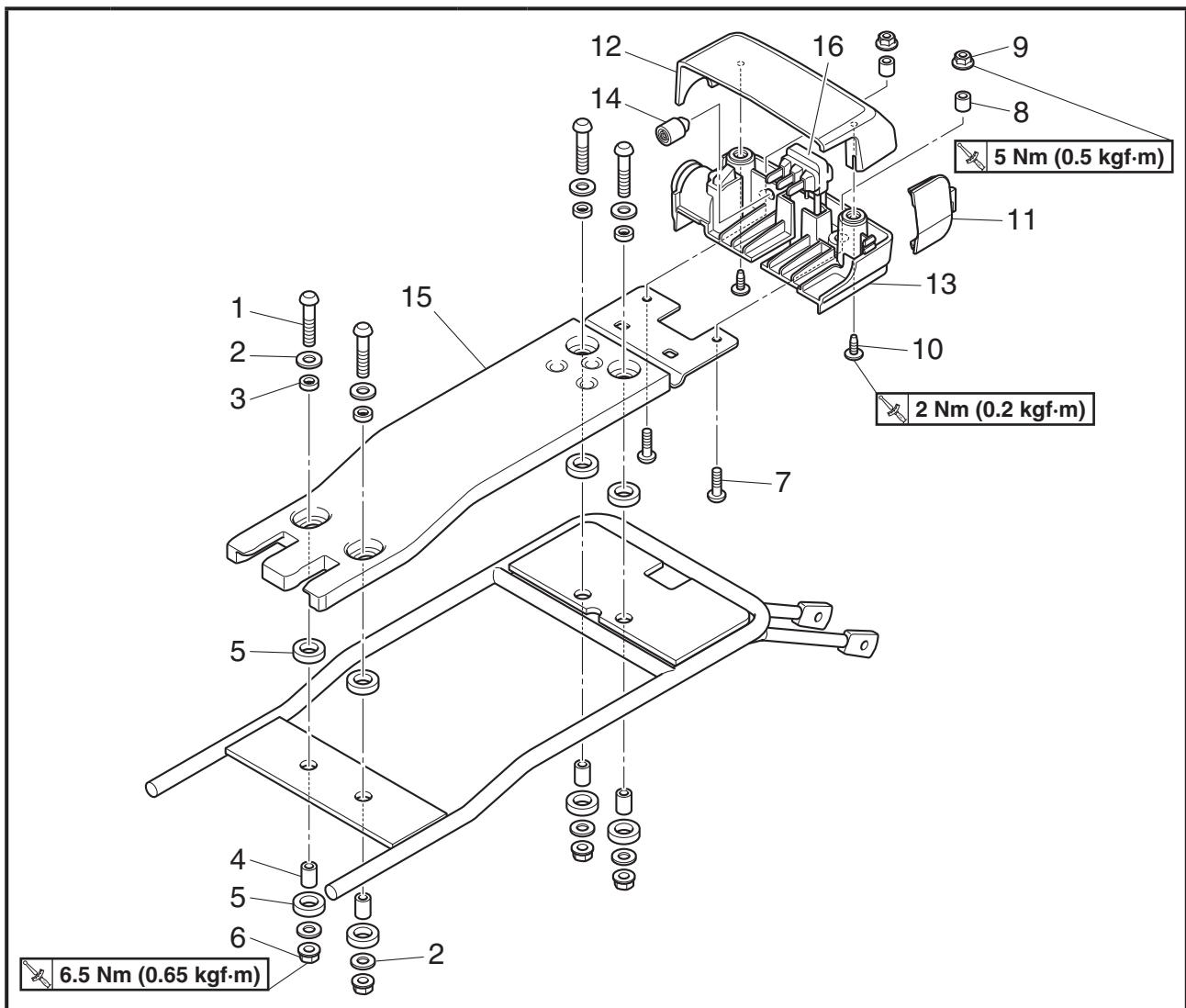


Order	Job/Part	Q'ty	Remarks
11	Case	1	
12	Plug, D.C. receptacle	1	<p>Reverse the removal process for installation.</p> <p>After installation, make sure that the battery can be installed smoothly and there is no looseness in the battery after it is installed.</p>

Rear carrier battery (Rubber mount type)

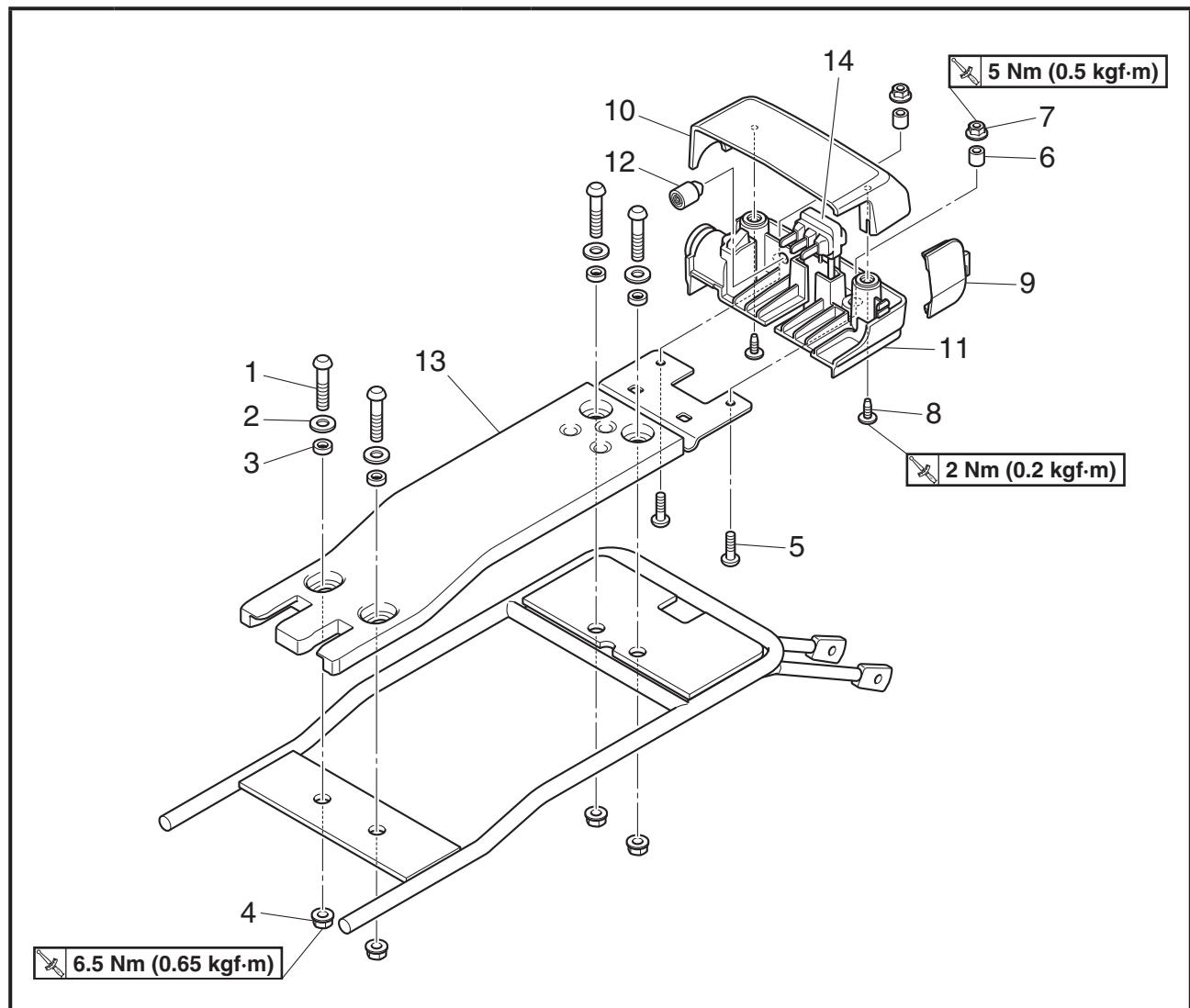


Order	Job/Part	Q'ty	Remarks
	Removal of the battery base from the bicycle frame.		Follow the work procedures for removal.
1	Button head bolt	4	
2	Washer	8	
3	Collar	4	
4	Collar	4	
5	Damper	8	
6	Flange nut	4	
7	Button head bolt	2	
8	Collar	2	
9	Flange nut	2	
10	Tapping screw	2	
11	Lid, 1	1	
12	Cover, 2	1	

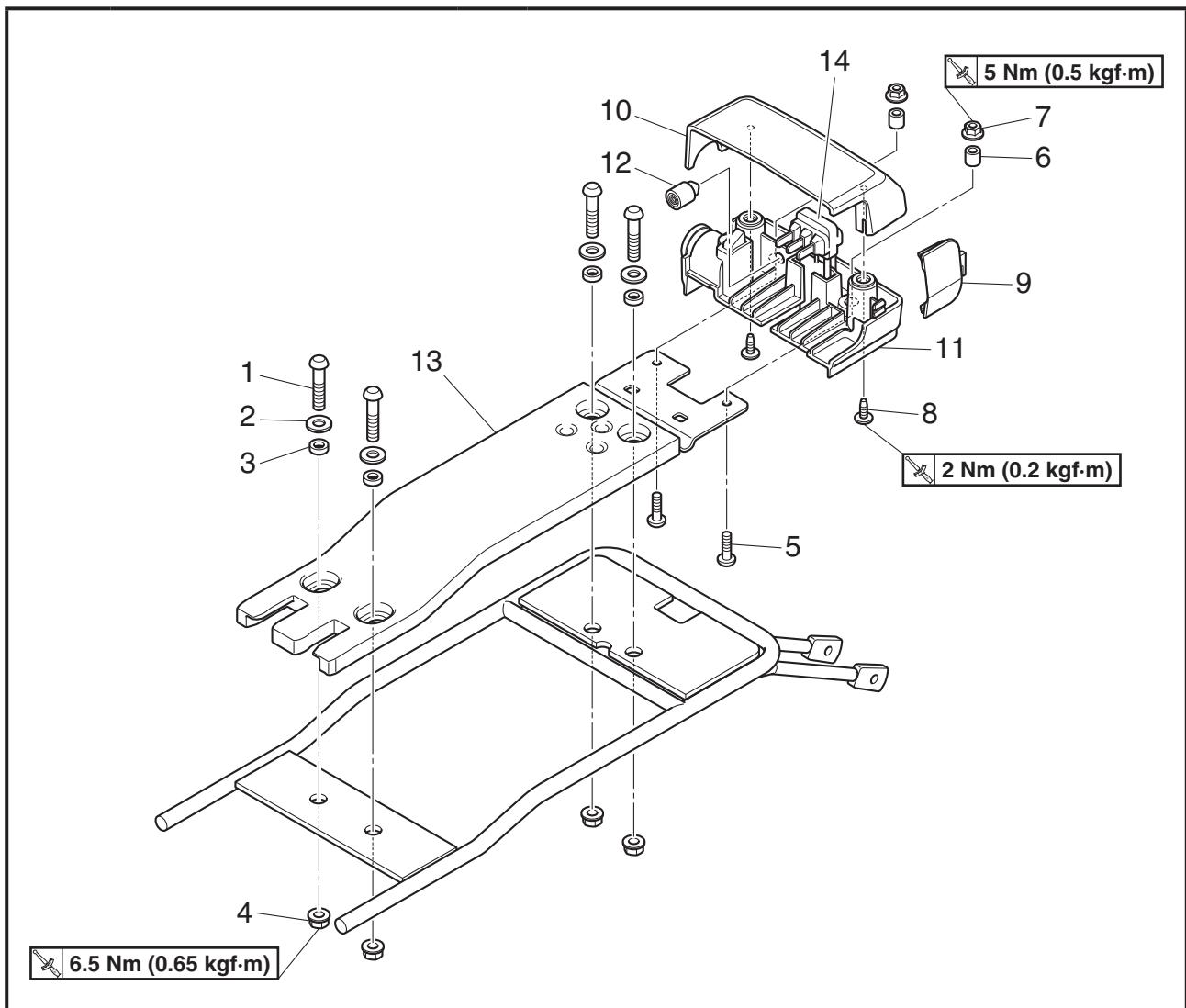


Order	Job/Part	Q'ty	Remarks
13	Lock assy.	1	
14	Damper	1	
15	Slide plate	1	
16	Plug, D.C. receptacle	1	<p>Reverse the removal process for installation.</p> <p>After installation, make sure that the battery can be installed smoothly and there is no looseness in the battery after it is installed.</p>

Rear carrier battery (Rigid mount type)

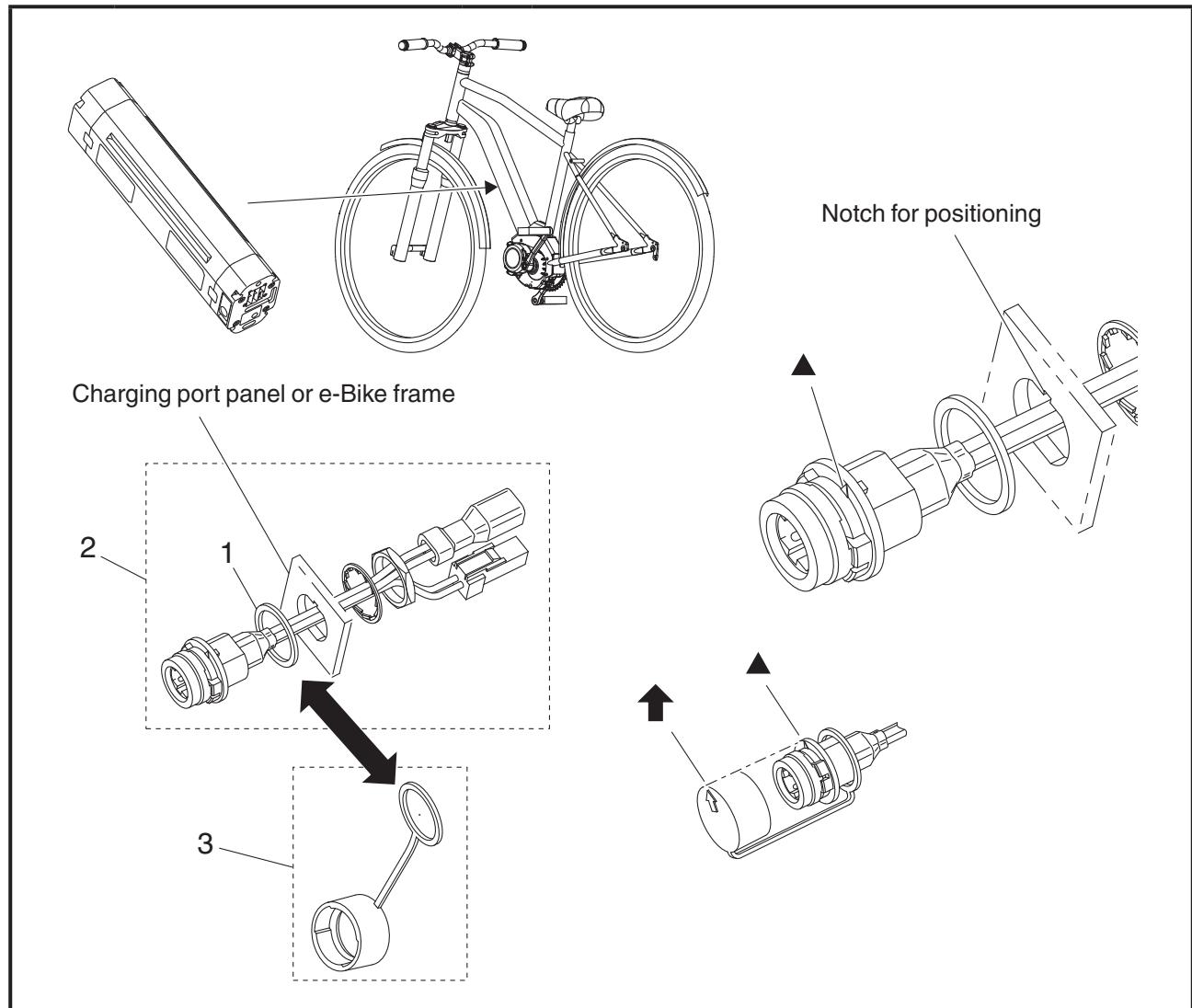


Order	Job/Part	Q'ty	Remarks
	Removal of the battery base from the bicycle frame.		Follow the work procedures for removal.
1	Button head bolt	4	
2	Washer	4	
3	Collar	4	
4	Flange nut	4	
5	Button head bolt	2	
6	Collar	2	
7	Flange nut	2	
8	Tapping screw	2	
9	Lid, 1	1	
10	Cover, 2	1	
11	Lock assy.	1	



Order	Job/Part	Q'ty	Remarks
12	Damper	1	
13	Slide plate	1	
14	Plug, D.C. receptacle	1	<p>Reverse the removal process for installation.</p> <p>After installation, make sure that the battery can be installed smoothly and there is no looseness in the battery after it is installed.</p>

Multi-location battery (600Wh)



Order	Job/Part	Q'ty	Remarks
1	Gasket	1	
2	RECEPTACLE COMP.	1	
3	CAP	1	<p>If the e-Bike is not equipped with a waterproof cap for Charging port, replace the Gasket with CAP for covering the Charging port.</p> <p>Reverse the removal process for installation.</p> <p>After installation, make sure that the battery can be installed smoothly and there is no looseness in the battery after it is installed.</p>

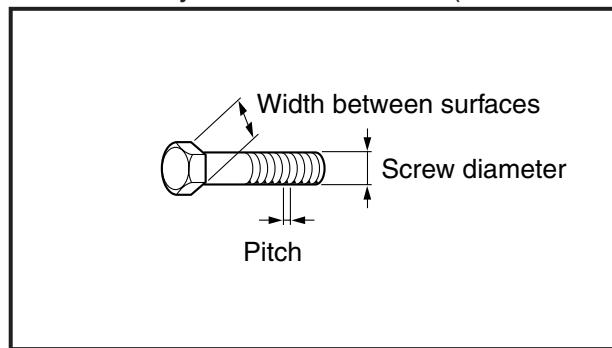
Tightening torque

Unit: Nm kgf·m (in)

Tightening locations	Screw diameter	Q'ty	Tightening torque	Notes
(Down tube battery) Lock assembly bracket installation	–	2	6.5 (0.65)	Because the parts are provided by the bicycle manufacturer, the tightening torque is for reference only.
(Down tube battery) Case assembly installation	M5	2	5.5 (0.55)	
(Rear carrier battery) Slide plate installation	M6	4	6.5 (0.65)	Because the parts are provided by the bicycle manufacturer, the tightening torque is for reference only.
(Rear carrier battery) Cover assembly installation	M4	2	2 (0.2)	Tapping screw Because the parts are provided by the bicycle manufacturer, the tightening torque is for reference only.
(Rear carrier battery) Lock assy. installation	M5	2	5 (0.5)	Because the parts are provided by the bicycle manufacturer, the tightening torque is for reference only.

Other, general tightening torques

The tightening torques of bolts and nuts other than those with tightening force for specified locations is determined by the screw diameter (width between two surfaces) and the pitch.



Screw diameter (width between two surfaces) x pitch	Tightening torque
M4 (7 mm) x P0.7	1.5 to 2.5 Nm (0.15 to 0.25 kgf·m)
M5 (8 mm) x P0.8	3 to 4.5 Nm (0.3 to 0.45 kgf·m)
M6 (10 mm) x P1.0	5 to 8 Nm (0.5 to 0.8 kgf·m)
M8 (12 mm) x P1.25	12 to 19 Nm (1.2 to 1.9 kgf·m)

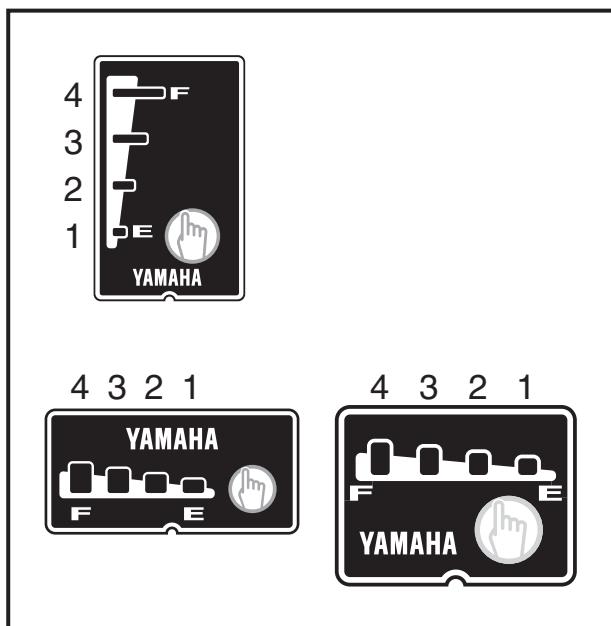
Display function

Battery pack

Battery pack display function

By holding down the battery capacity indicator button “” on the battery pack, the following items can be checked.

Length of time that the button is pushed	Display item	Display time	Details
When pushed	Normal state: Residual battery capacity	5 seconds	See the owner's manual.
	Error detected: Error display	5 seconds	See "Error display".
20 seconds	Total number of battery charging cycle	5 seconds	See "How to check the total number of battery charging cycles".
30 seconds	Full charge capacity	5 seconds	See "How to check the full charge capacity".



Type of battery capacity indicator

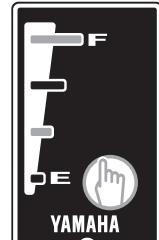
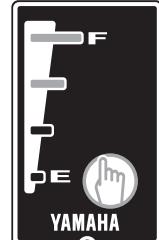
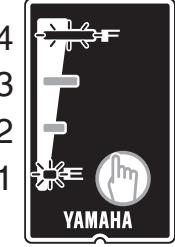
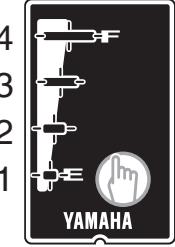
Depending on the model, the battery capacity indicators are arranged horizontally or vertically as shown.

In the explanations in this manual, the numbers used for the battery capacity indicator lamps are [4], [3], [2], and [1] from left to right or from top to bottom.

Although the illustrations in this manual show only the vertical-type battery capacity indicator, the operation of the lamps is the same for both types of battery capacity indicators.

Error display

When the system detects a malfunction, following errors are displayed when the battery capacity indicator button “” is pushed and connect the battery charger.

Battery capacity indicator lamps		Types of error	Details
1/3 and 2/4 turn on alternately	 	Recoverable errors of battery pack	See “Recoverable errors of battery pack or battery charger”
1/2 and 3/4 turn on alternately	 	Recoverable errors of battery pack or battery charger	See “Recoverable errors of battery pack or battery charger”
1 and 4 flash rapidly		Non-recoverable errors of battery pack	See “Non-recoverable errors of battery pack”
All 4 lamps flash slowly at the same time		Temperature protection function	<p>When connect the battery charger: “Display on battery capacity indicator lamps while charging”</p> <p>When the battery capacity indicator button is pushed: See “Temperature protection function”</p>

■ Off

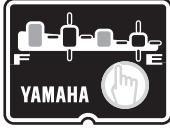
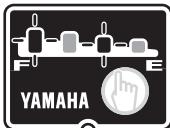
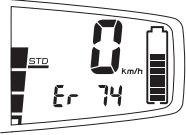
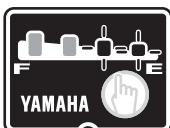
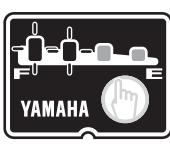
■ On

-  - Slow flashing

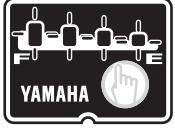
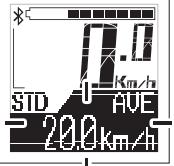
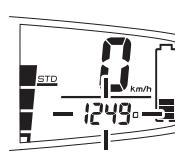
-  - Fast flashing

Error display (Multi-location battery)

The Multi-location battery can be confirmed some battery error indication via the MY2019 meter.

Indicator lamps	Error types	MY19 Display X	MY19 Display A	MY19 Display C	
1/3 and 2/4 turn on alternately  ↓ 	Recoverable errors of battery pack	 ↓ 	 ↓ 		
1/2 and 3/4 turn on alternately  ↓ 	Recoverable errors of battery charger				
1 and 4 flash rapidly 	Non-recoverable errors of battery pack	Power assist will stop after determine the error. Error code will record.			

Display function

Indicator lamps	Error types	MY19 Display X	MY19 Display A	MY19 Display C
All 4 lamps flash slowly at the same time 	Temperature protection function	Power assist will stop during determine the error. Error code does not record.		

■ Off

■ On

— ■ — Slow flashing

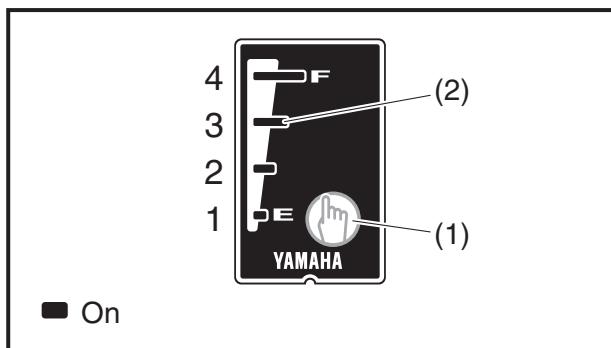
— ■ — Fast flashing

TIP

Because the indicator lamps are not visible on the Multi Location battery, errors are displayed on the display when the battery is connected to the MY2019 Drive Unit. However, errors will not be displayed on the display if the Multi Location battery is connected to a Drive Unit for MY2018 or earlier.

Please see Wire Lead 2 in pages 1-1 to 1-2 for the difference between MY2018 Drive Unit and MY2019 Drive Unit.

Display function



How to check the total number of battery charging cycles

Check the total number of battery charging cycles as follows:

1. Hold down the battery capacity indicator button “” (1) for 20 seconds.
2. The total number of battery charging cycles is indicated by the four battery capacity indicator lamps (2) on the battery pack.

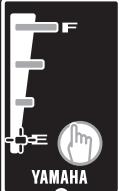
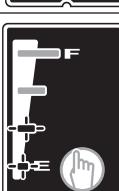
TIP

While holding down the battery capacity indicator button “” for 20 seconds, the lamps will display the currently applicable condition (residual battery capacity, * error diagnosis), for 5 seconds for each condition.

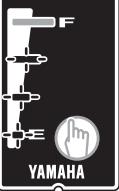
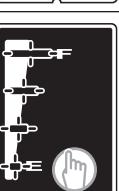
* The error diagnosis are displayed only for a malfunction, and is not displayed in normal state.

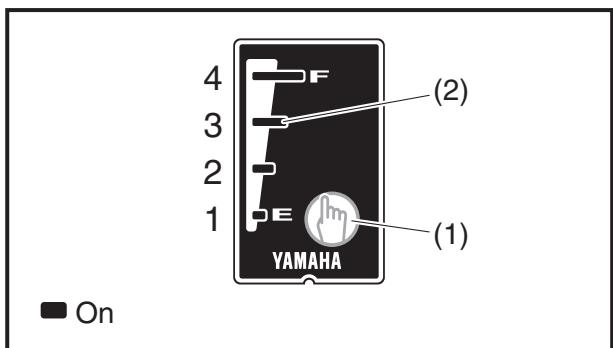
The table below indicates the relationship between the total number of battery charging cycles and the battery capacity indicator lamps.

Display of the total number of battery charging cycles

battery capacity indicator lamps	The total number of battery charging cycles
	0 to 100 times
	101 to 200 times
	201 to 300 times
	301 to 400 times

■ Off ■ On - - - Slow flashing

battery capacity indicator lamps	The total number of battery charging cycles
	401 to 500 times
	501 to 600 times
	601 to 700 times
	701 times or more



How to check the full charge capacity

Check the ^{*1} full charge capacity as follows:

1. Hold down the battery capacity indicator button “” (1) for 30 seconds.
2. The ^{*1} full charge capacity is indicated by the four battery capacity indicator lamps (2) on the battery pack.

TIP

While holding down the battery capacity indicator button “” for 30 seconds, the lamps will display the currently applicable conditions (residual battery capacity, ^{*2} error diagnosis, Total number of battery charging cycles), for 5 seconds for each condition.

^{*1} Full charge capacity:

Full charge capacity is not the relative specified electric power capacity that the battery pack has at any given point, but the actual electric capacity that the battery pack itself can store. The capacity at the time of shipment is considered 100%.

^{*2} The error diagnosis are displayed only during a malfunction, and is not displayed in normal state.

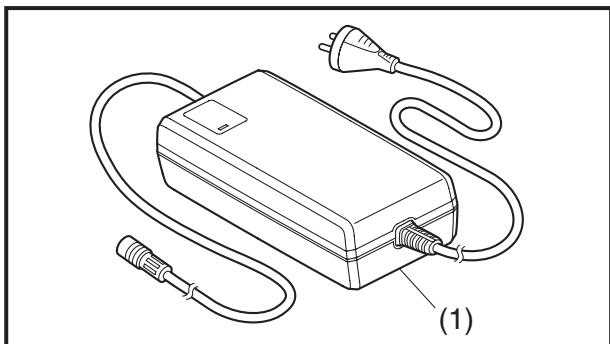
The table below indicates the relationship between the full charge capacity and the battery capacity indicator lamps.

Display of the full charge capacity

Battery capacity indicator lamps	Full charge capacity (%)
	0 to 24%
	25 to 49%

■ Off ■ On

Battery capacity indicator lamps	Full charge capacity (%)
	50 to 74%
	75 to 100%



Charger

e-Bike system dedicated battery charger

This battery charger (1) is a dedicated battery charger for the e-Bike system's battery pack.

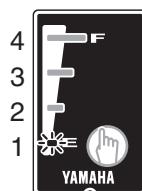
Example of display on battery capacity indicator lamps while charging

- Preliminary charging
- When starting charge from a discharged state
-
-
-

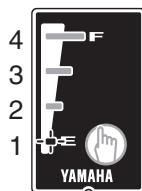
Charging time



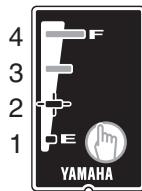
Charging complete
(Fully-charged state)



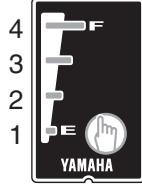
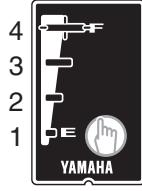
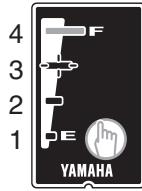
Fast flashing



Slow flashing



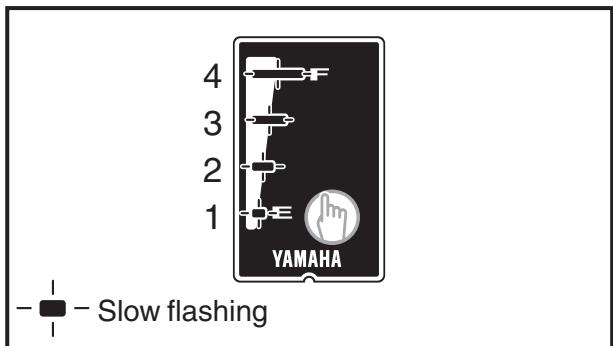
The lamp above the currently illuminating lamp flashes, indicating that it is charging.



Turn off

- On
- Fast flashing
- Slow flashing
- Off

Display function



Display on battery capacity indicator lamps while charging

Some phenomena such as the following may occur while charging the battery pack, depending on the battery pack's state; however, these are not malfunctions.

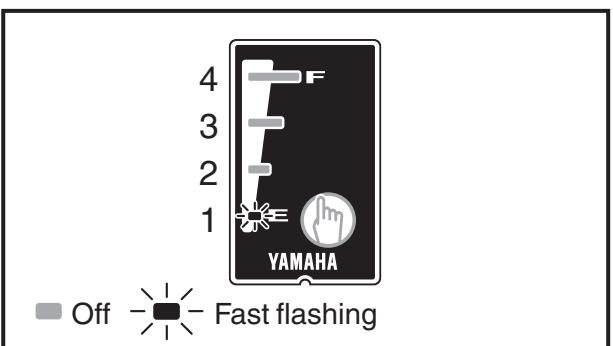
1. Charging on stand-by

Display on the battery capacity indicator lamps: [All four lamps flashing slowly at the same time].

When the battery pack's internal temperature goes out of operating range, the battery pack changes to the "Charging on stand-by" state automatically.

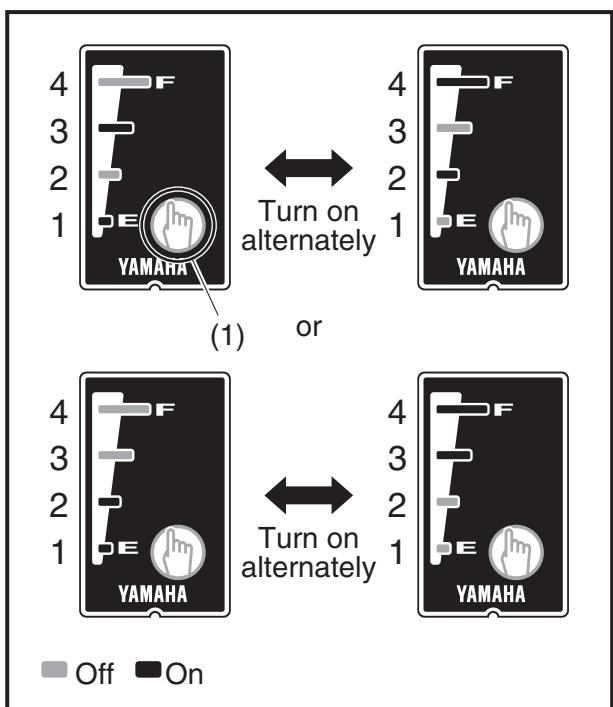
TIP

- Once the temperature inside the battery pack becomes suitable for charging, the charging starts automatically.
(In such case, the charging time becomes longer by the time during which all four battery capacity indicator lamps on the battery pack were flashing simultaneously.)
As much as possible, charge at an optimal room temperature, approximately 15 to 25°C.
- Even if you start charging properly, if the battery pack exceeds the specified temperature range while charging, the charging process is aborted to protect the battery pack. This may result in insufficient charging.
In such case, when checking the residual battery capacity, not all of the four battery capacity indicator lamps may not turn on.
Cool down the battery pack for a while, and charge again, preferably in a cool place.
- Even if the room temperature is within the 0 to 45°C range, if attempting to charge the battery pack immediately after driving, or if the battery pack had been left in the sun during summer, the battery pack's internal temperature may be outside the allowable temperature range for charging.
If the room temperature is 30°C, it may take approximately 4 hours until the battery pack's internal temperature is within the allowable temperature range for charging.



2. During pre-charging

Display on the battery capacity indicator lamps: [Battery capacity indicator lamps [1] flash rapidly].



Diagnosis function

Recoverable errors of battery pack or battery charger

If the battery pack or battery charger has the errors, the following procedure can be used to access the error diagnosis mode and confirm the details regarding the error of the battery pack or battery charger.

1. If there is an error when the battery capacity indicator button “(1)” (1) on the battery pack is pushed or connect the battery charger, the battery capacity indicator lamps [1]/[3] and [2]/[4] turn on alternately, or the lamps [1]/[2] and [3]/[4] turn on alternately. When the battery capacity indicator lamps turn on alternately, the residual battery capacity is not displayed.
2. Hold down the battery capacity indicator button “(1)” (1) for 10 seconds.
3. The lighting display of the battery capacity indicator lamps indicates the error of the battery pack or battery charger.

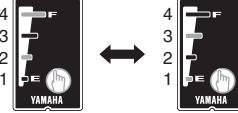
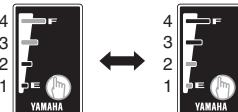
TIP

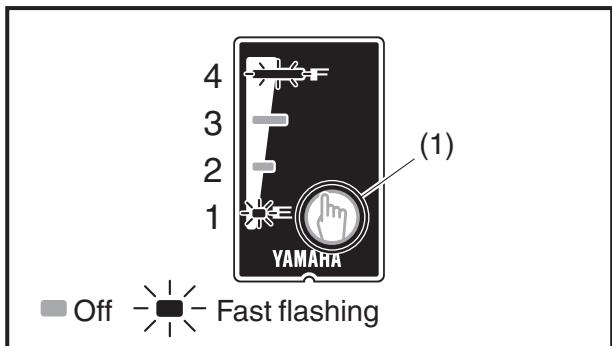
- If the battery pack or battery charger is operating normally, the battery capacity indicator lamps indicate the residual battery capacity.
- If there are multiple errors, only the latest error will be displayed.
- The error diagnosis mode can be accessed whether the battery charger is connected or disconnected.

Diagnosis function

List of battery pack/battery charger diagnosis items (Recoverable)

■ Off ■ On

Battery capacity indicator lamps		Battery capacity indicator lamps	Fault device	Failure	Action
1/3 and 2/4 turn on alternately 	Hold down the battery capacity indicator button “  ” for 10 seconds		Battery pack failure	Overcharging during discharging	1. Connect the battery pack to the dedicated battery charger for the e-Bike system and charge it for a while. 2. The battery pack returns to the normal state after the step 1, install the battery pack to the bicycle and ride it for a while. 3. If the battery pack error occurs again, perform the following: <ul style="list-style-type: none">• Check the Drive Unit failure.• Replace the battery pack.
				Charging over current during discharging	
				Discharging over current	
				Short circuit	
				FET temperature fault	
1/2 and 3/4 turn on alternately 	Hold down the battery capacity indicator button “  ” for 10 seconds		Battery charger failure	Overcharging during charging	Replace the battery charger. The battery pack will return to the normal state, after the battery pack is installed to the bicycle and the bicycle is ridden for a while.
				Charging over current during charging	
				AFE fault (recoverable)	
				Zero charging current	1. Disconnect the charging plug. 2. Clean the charging connector and charging plug, and dry them. 3. Connect the charging plug to the charging connector. 4. If the battery pack error occurs again, replace the battery charger.



Non-recoverable errors of battery pack

If the battery pack has the errors, the following procedure can be used to access the error diagnosis mode and confirm the details regarding the error of the battery pack.

1. If there is a non-recoverable errors when the battery capacity indicator button “

3-3

List of battery pack/battery charger diagnosis items (Non-recoverable)

■ Off ■ On  Fast flashing

Battery capacity display lamp		Battery capacity display lamp	Fault device	Failure	Action
				FET failure	Replace the battery pack.
1 and 4 flash rapidly	Hold down the residual battery capacity indicator button "Ⓐ" for 10 seconds			AFE fault (non-recoverable)	
				High-temperature exposure	
			Battery pack failure	FET temperature fault	
				Cells unbalanced	
				Thermistor fault	
				Over charging	

Communication error between the Drive Unit and the battery

Down tube battery and Rear career battery

The power will turn off automatically after 4 seconds even when the power of the display unit turn ON, in the communication error occurs between the Drive Unit and the battery.

Action: Check the battery pack signal lead wire (gray) for a wire break or disconnection.

-> Replace the DC plug, then power lead wire.

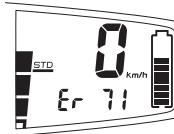
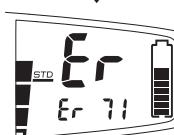
Multi-location battery

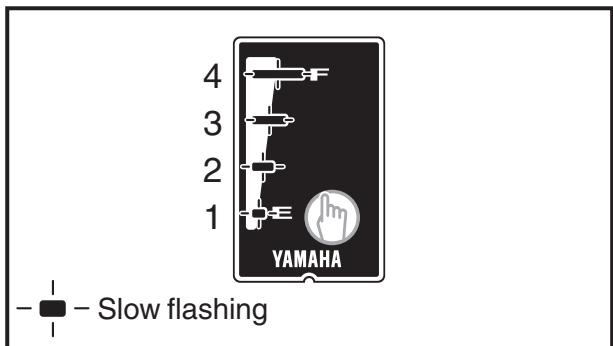
If there is a communication error between the Drive Unit and the battery, the power will not turn off automatically and error code 71 will be displayed on the display.

Action: Check the battery pack signal lead wire (gray) for a wire break or disconnection.

-> Replace the DC plug, then power lead wire.

For the Multi Location battery, the display flashes as shown in the illustration to the left.

MY19 Display X	MY19 Display A	MY19 Display C
 <p>Alternately displays</p> 	 <p>Alternately displays</p> 	



Temperature protection function

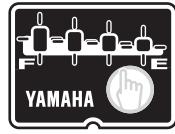
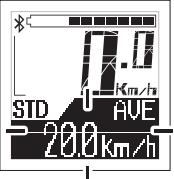
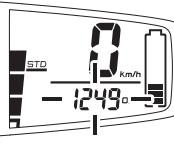
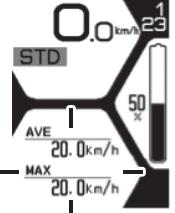
If the battery pack's internal temperature is -20°C or less or 80°C or higher while the battery pack is discharging (during the power assist), the temperature protection function of the battery pack operates and the battery pack stops discharging. If the battery capacity indicator button “” is pushed at this time, the battery capacity indicator lamps [1], [2], [3], and [4] flash slowly at the same time.

TIP

The battery pack automatically recovers when the battery pack's internal temperature returns to the allowable temperature range for charging.

For the Multi Location battery, the display flashes as shown in the illustration to the left.

 Slow flashing

Indicator lamps	Error types	MY19 Display X	MY19 Display A	MY19 Display C	
All 4 lamps flash slowly at the same time 	Temperature protection function	Power assist will stop during determine the error. Error code does not record.			

Over-discharge protection

function

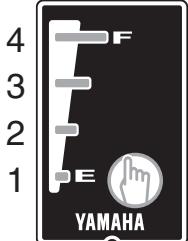
If the battery pack becomes over-discharged, the over-discharge protection function of the battery pack operates.

If the battery capacity indicator button “” is pushed at this time, the battery capacity indicator lamps do not turn on.

The following procedure can be used to access the over-discharge protection function diagnostic mode and confirm the details regarding the malfunction of the battery pack.

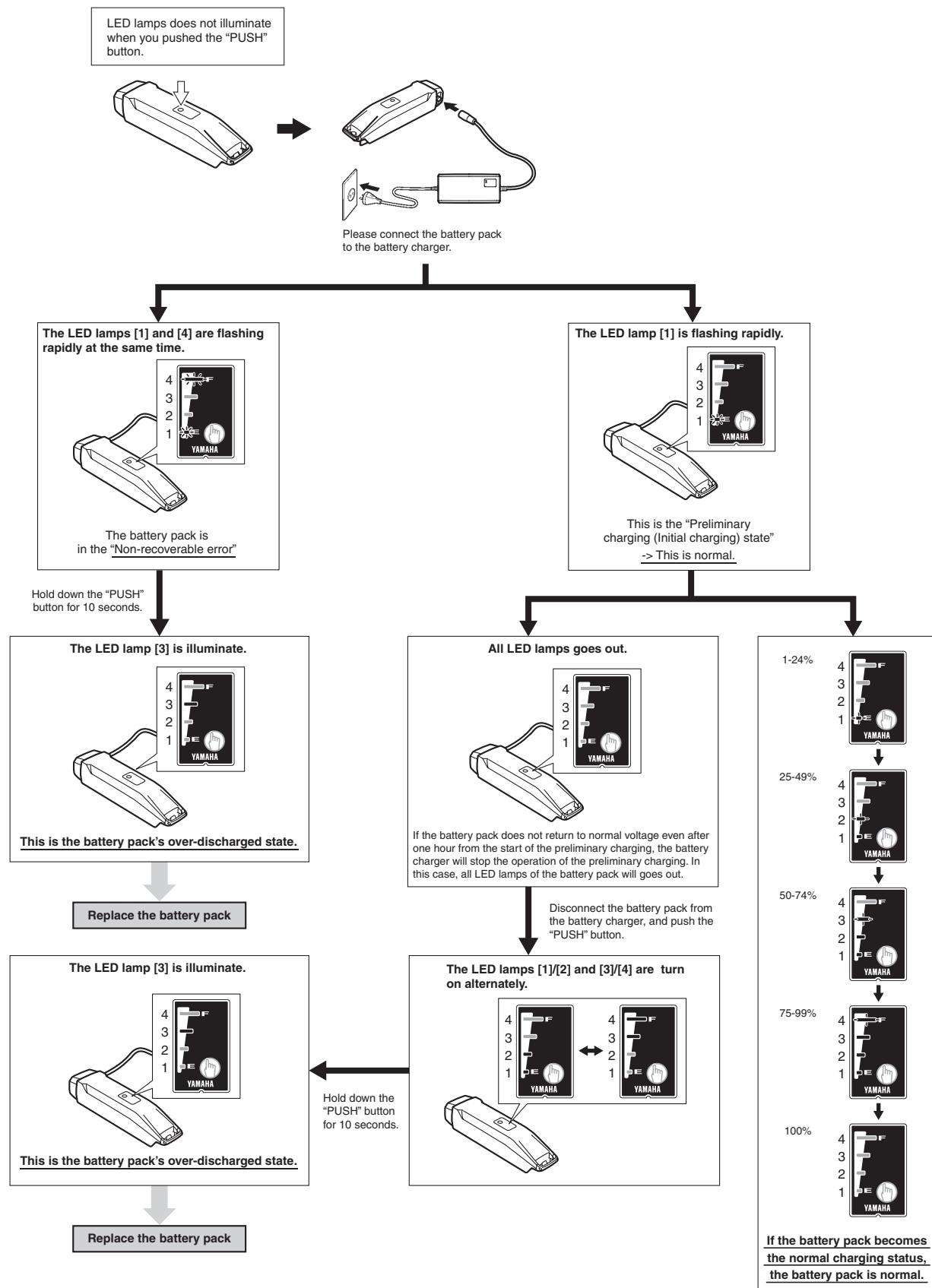
*First connect the battery charger to the battery.

*Because the battery voltage is insufficient when the battery pack is over-discharged, the battery capacity indicator lamps will not turn on or flash if the battery pack is not connected to the battery charger.



Off

Over-discharging of the battery pack



Battery Pack Service Manual
BT-02

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