SERVICE MANUAL

e-Bike SYSTEMS
Drive Unit and Display

DU-08

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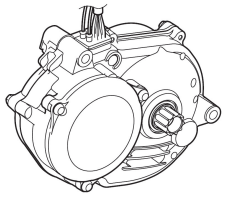
General Information

Description

1



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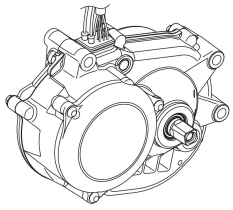

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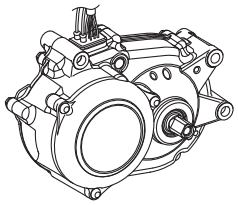

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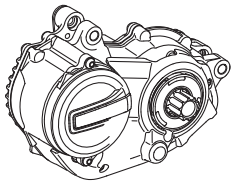

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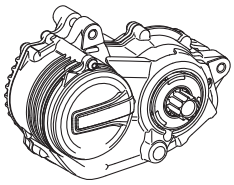

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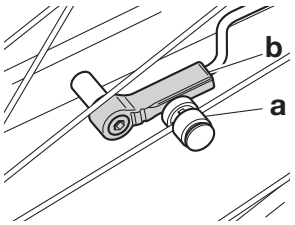

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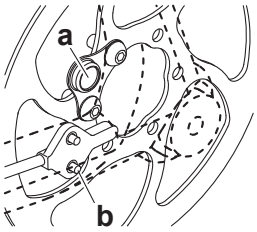

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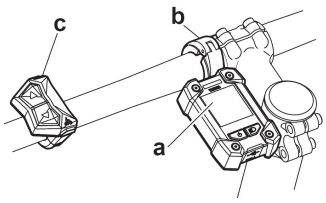

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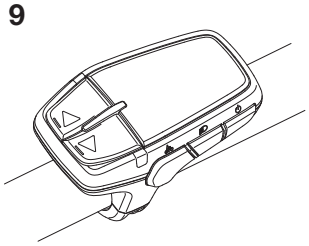

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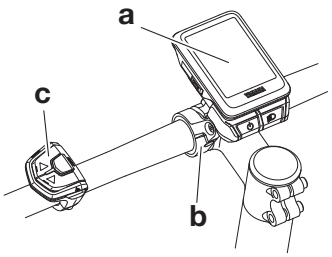

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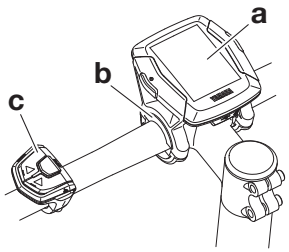

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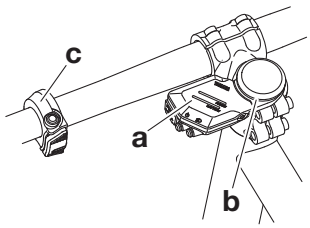

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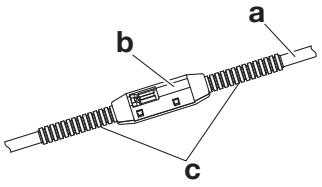
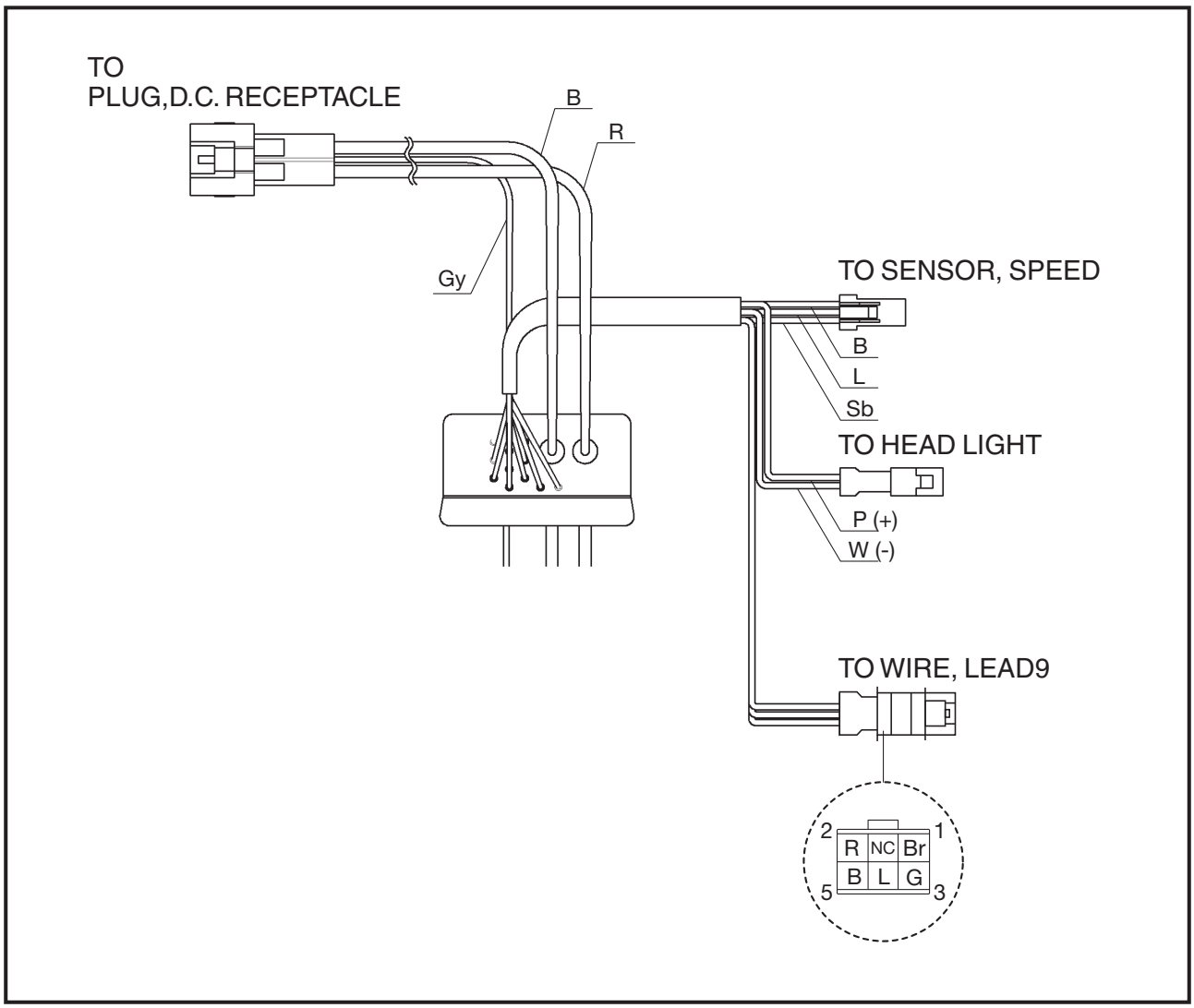


1. Drive Unit (PW-X2, PW-X2 45)
2. Drive Unit (PWseries TE / ST)
3. Drive Unit (PWseries CE)
4. Drive Unit (PW-X3)
5. Drive Unit (PWseries S2)
6. Speed Sensor Set (Spoke type)
   a) Spoke magnet
   b) Speed sensor (Spoke type)
7. Speed Sensor Set (Rotor type)
   a) Rotor magnet
   b) Speed sensor (Rotor type)
8. Display Unit (Display X)
   a) Display
   b) Clamp
   c) Switch
9. Display Unit (Display A)
10. Display Unit (Display B)
    a) Display (detachable)
    b) Display holder
    c) Remote switch
11. Display Unit (Display C)
    a) Display
    b) Clamp
    c) Switch
12. Display Unit (Interface X)
    a) Communication unit
    b) Mounting spacer
    c) Remote switch
13. Intermediate cable (Display Unit - Drive Unit)
    a) Wire lead 9
    b) Cover connector
    c) Tube

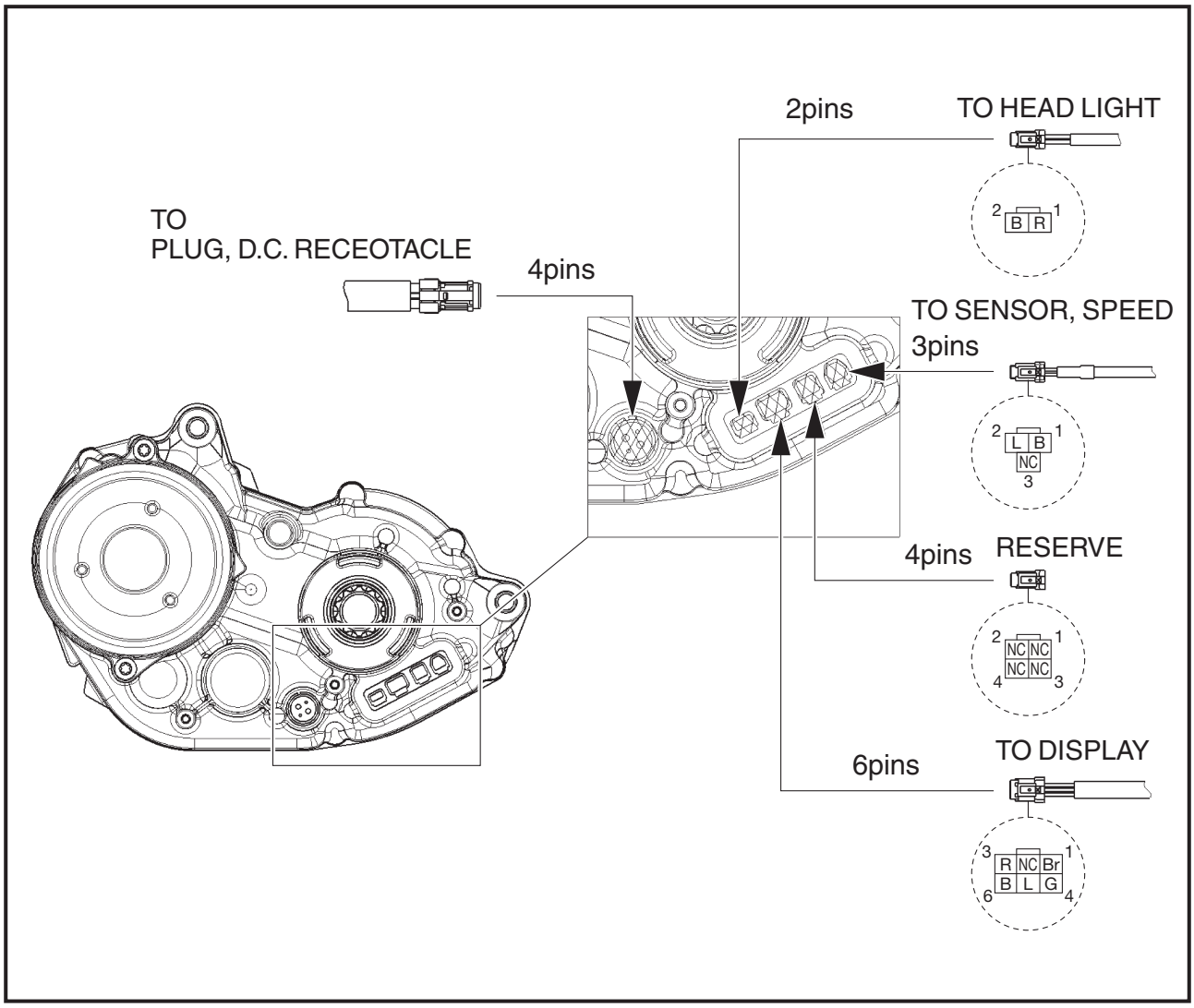
Installation

Electrical component wiring diagram



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

<PW-X3/PWseries S2> Electrical component wiring diagram



B	= Black	P	= Pink
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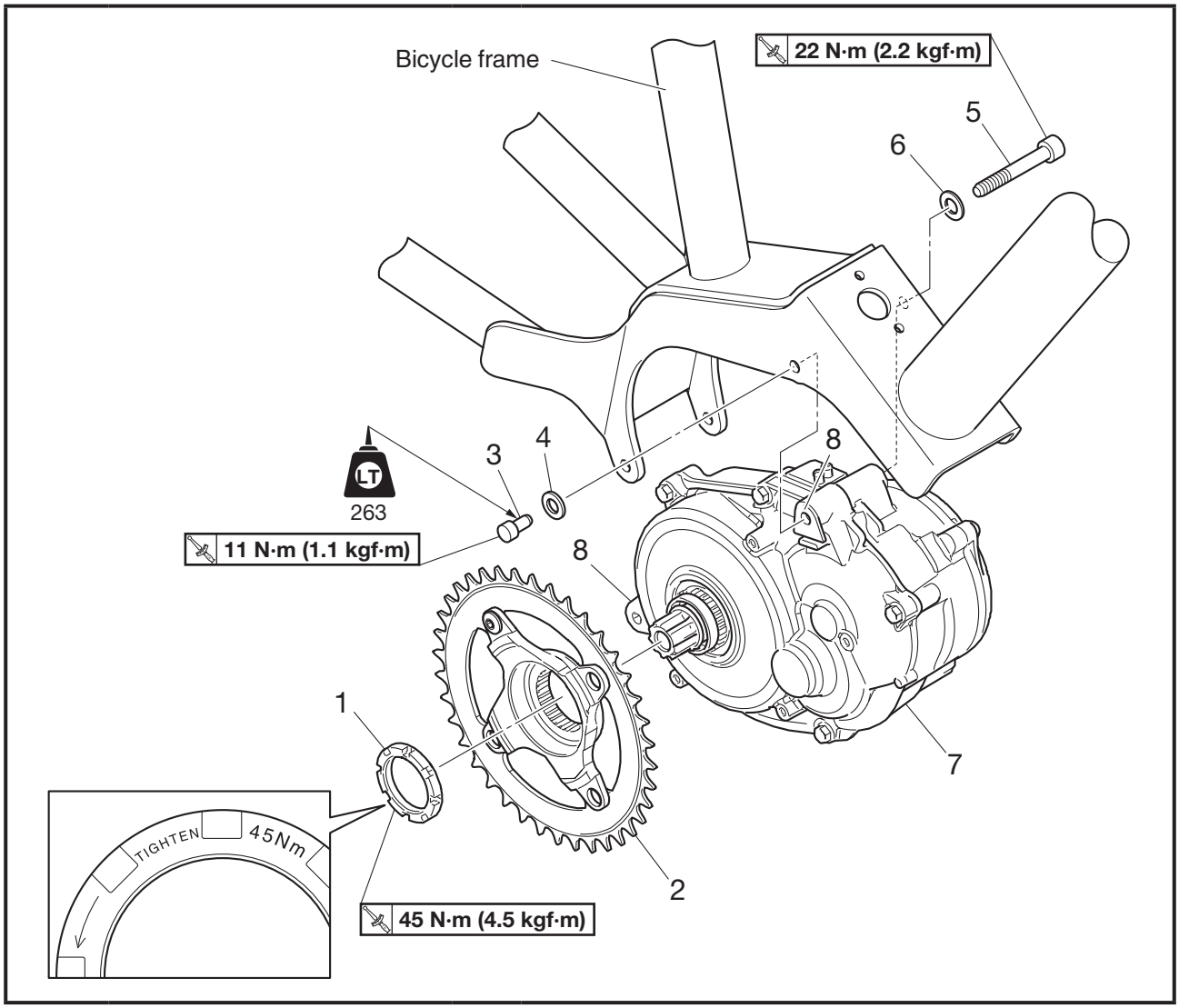
<PW-X2, PW-X2 45> Drive Unit assy.

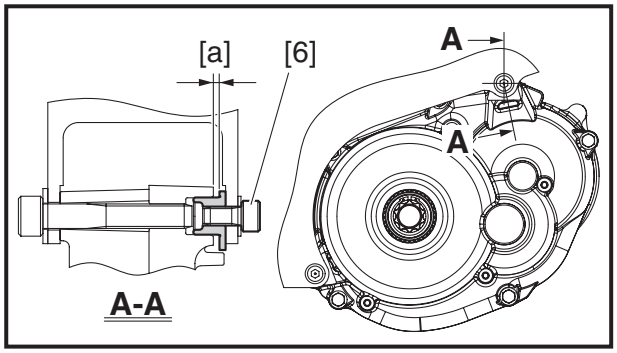


Order	Job/Part	Q'ty	Remarks
	Removal of the Drive Unit assy. from the bicycle frame.		Follow the work procedures for removal.
1	Lock nut	1	Left-hand screw
2	Spider & Chainring(s)	1	
3	Bolt (M6)	2	
4	Washer	2	
5	Bolt (M8)	2	
6	Washer	2	
7	Drive Unit assy.	1	
8	Drive Unit assy. plug	2	Basically it is not necessary to remove this parts, but it may be removed depending on tolerance. Reverse the removal process for installation.

Introduction

NOTICE

Because a Drive Unit assy. is a precision machinery, do not disassemble or exert any strong force on it (for example, do NOT hit this product with a hammer).
Especially the crank axle is directly connected to the inside of the Drive Unit assy., any large damages inflicted on the crank axle may lead to failures.

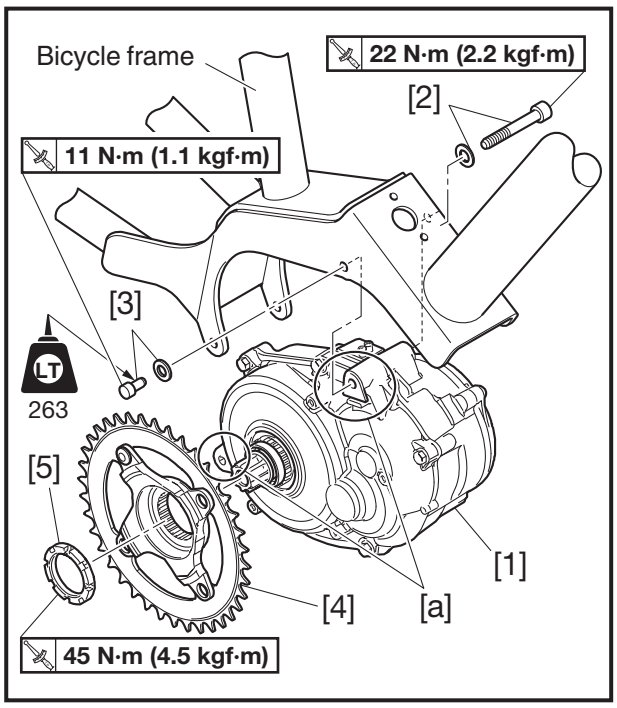


Removing the Drive Unit assy.

Remove the parts in the order listed in "Removal of the Drive Unit assy. from the bicycle frame".

TIP

To remove the Drive Unit assy. from the bicycle frame easily, loosen the bolt (M6) [6] 2–3 turns, and then lightly tap the bolt head with a plastic hammer to push in the protruding portion [a] of the Drive Unit assy. plug.



Installing the Drive Unit assy.

1. Install:
   - Drive Unit assy. [1]
   - Bolt (M8) and washer × 2 [2]
   - Bolt (M6) and washer × 2 [3]

TIP

- Before installing the Drive Unit assy. to the bicycle frame, removing old LOCTITE® from the bolt (M6) [3] and the Drive Unit assy. plug (ex. Using threading tap and thread cutting die). After that, lightly tap the protruding portion [a] of the Drive Unit assy. plug with a plastic hammer to push it in.
- Apply LOCTITE® 263 to the threaded portion of the bolt (M6) [3].
- Do not fully tighten the bolt and washer.

2. Tighten:
   - Bolt (M8) and washer [2] × 2

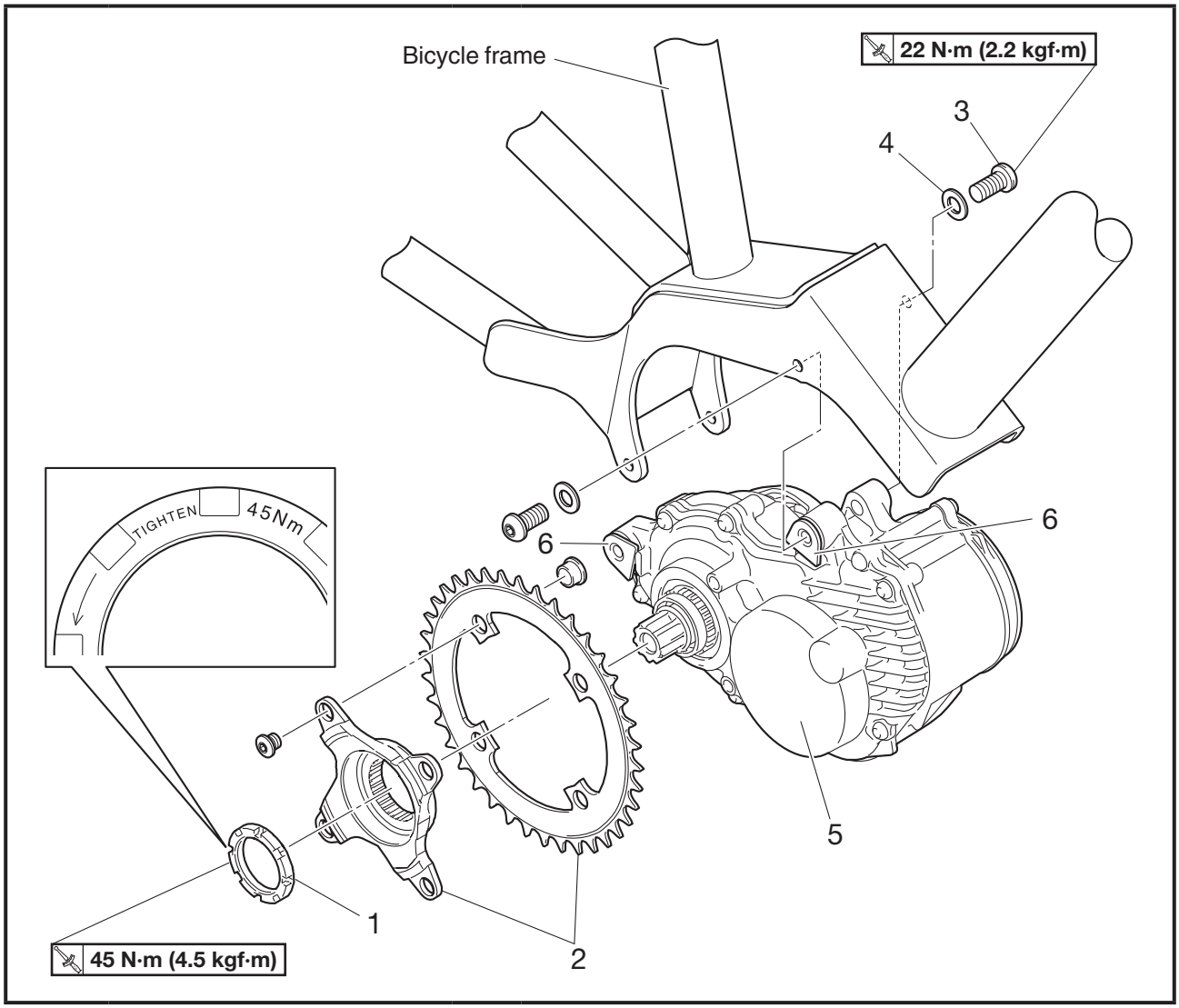
     22 N·m (2.2 kgf·m)
   - Bolt (M6) and washer [3] × 2

     11 N·m (1.1 kgf·m)

3. Install:
   Spider & Chainring(s) [4]
   Lock nut (Left-hand screw) [5]
4. Tighten:
   Lock nut (Left-hand screw) [5]

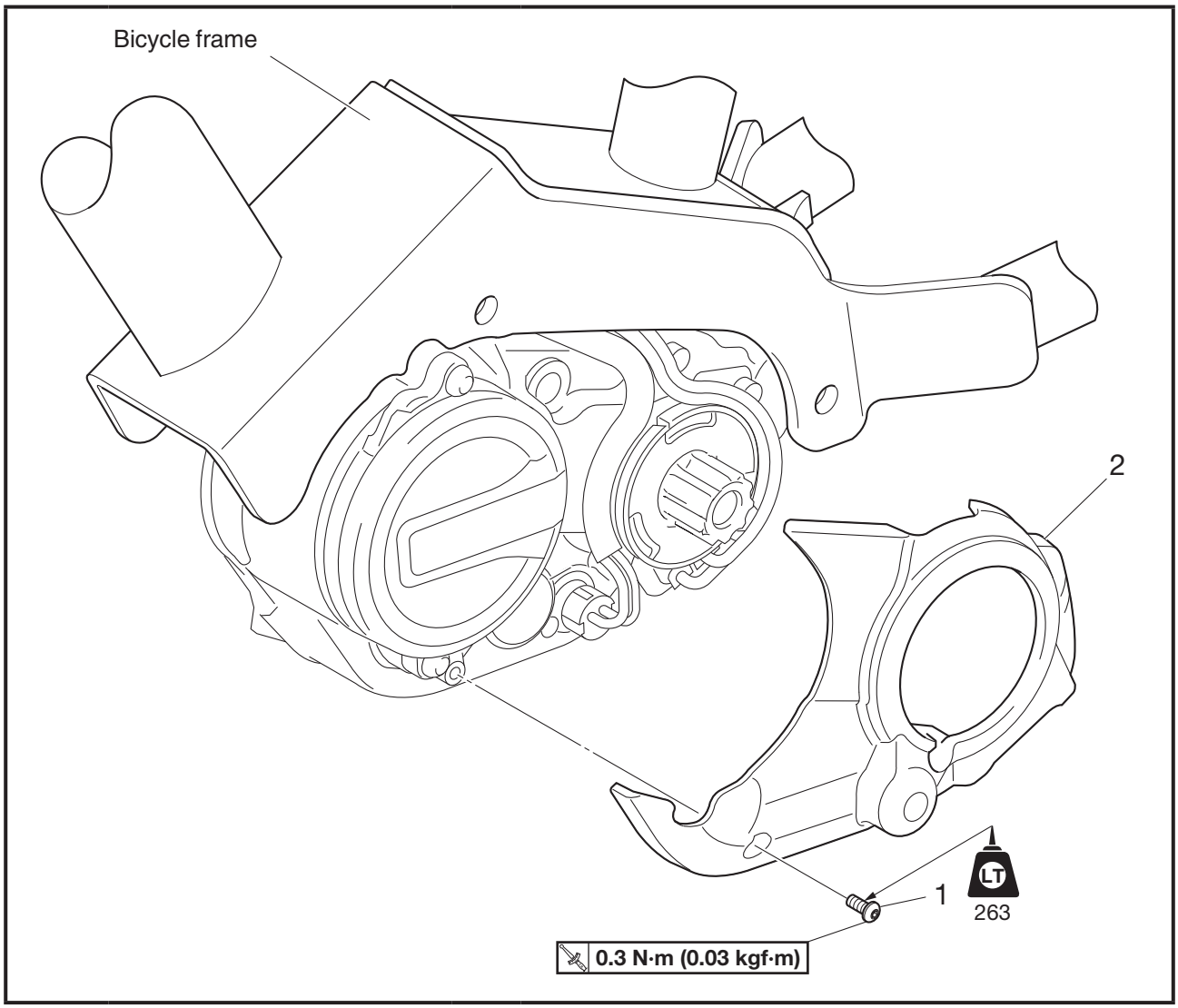
	45 N·m (4.5 kgf·m)

<PW-X3/PWseries S2> Drive Unit assy.

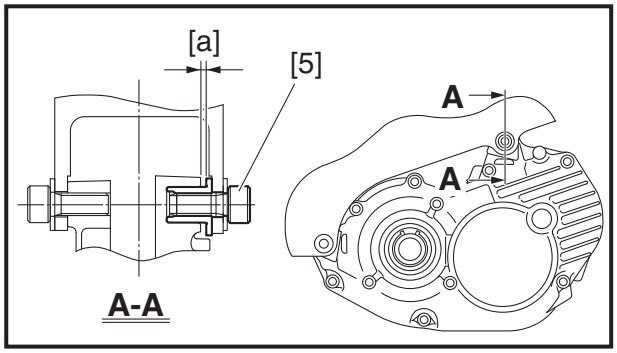


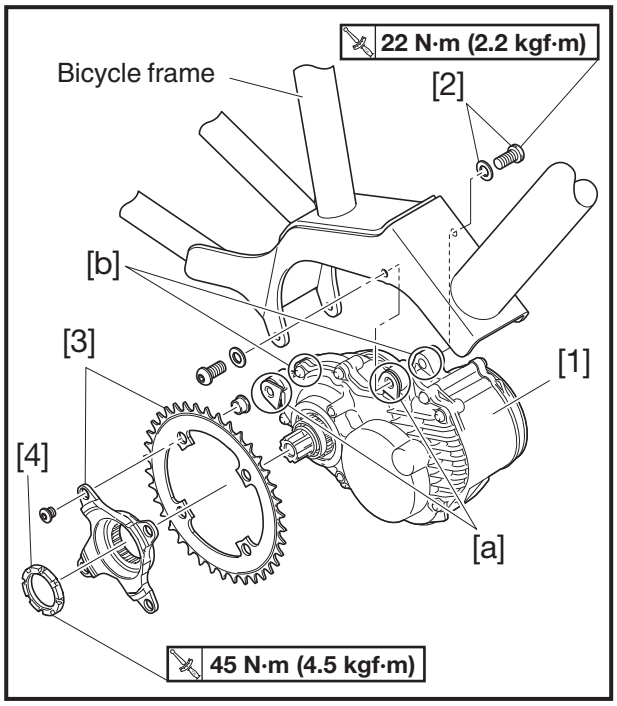
Order	Job/Part	Q'ty	Remarks
	Removal of the Drive Unit assy. from the bicycle frame.		Follow the work procedures for removal.
1	Lock nut	1	Left-hand screw
2	Spider & Chainring(s)	1	
3	Bolt (M8)	4	When installing, tighten the bolt on the side without the plug.
4	Washer	4	
5	Drive Unit assy.	1	
6	Drive Unit assy. plug	2	Basically it is not necessary to remove this parts, but it may be removed depending on tolerance. Reverse the removal process for installation.

<PW-X3/PWseries S2> Drive Unit assy.



Order	Job/Part	Q'ty	Remarks
1	Hexagon socket button bolt	3/4	PW-X3 : 3 bolts / PWseries S2 : 4 bolts
2	Side cover	1	





Introduction

NOTICE

Because a Drive Unit assy. is a precision machinery, do not disassemble or exert any strong force on it (for example, do NOT hit this product with a hammer).
Especially the crank axle is directly connected to the inside of the Drive Unit assy., any large damages inflicted on the crank axle may lead to failures.

Removing the Drive Unit assy.

Remove the parts in the order listed in "Removal of the Drive Unit assy. from the bicycle frame".

TIP

To remove the Drive Unit assy. from the bicycle frame easily, loosen the bolt (M8) [5] 2–3 turns, and then lightly tap the bolt head with a plastic hammer to push in the protruding portion [a] of the Drive Unit assy. plug.

Installing the Drive Unit assy.

1. Install:
   - Drive Unit assy. [1]
   - Bolt (M8) and washer × 4 [2]

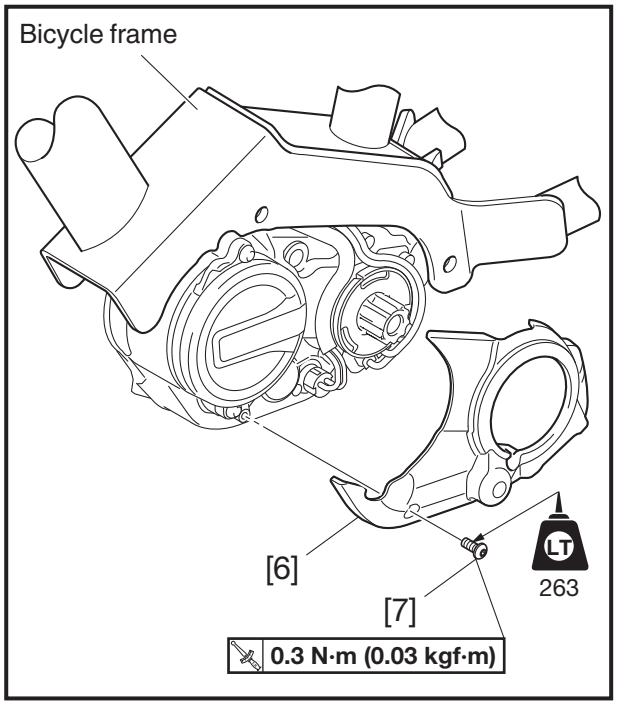
TIP

- Before installing the Drive Unit assy. to the bicycle frame, lightly tap the protruding portion [a] of the Drive Unit assy. plug with a plastic hammer to push it in.
- Before installing the Drive Unit assy. to the bicycle frame, make sure to route all wiring through the slits [b].
- Do not fully tighten the bolt and washer.
- When installing, tighten the bolt on the side without the plug.

2. Tighten:
   - Bolt (M8) and washer [2] × 4

   22 N·m (2.2 kgf·m)
3. Install:
   - Spider & Chainring(s) [3]
   - Lock nut (Left-hand screw) [4]
4. Tighten:
   - Lock nut (Left-hand screw) [4]

   45 N·m (4.5 kgf·m)



5. Install:
   - Side cover [6]
   - Hexagon socket button bolt [7] × 3

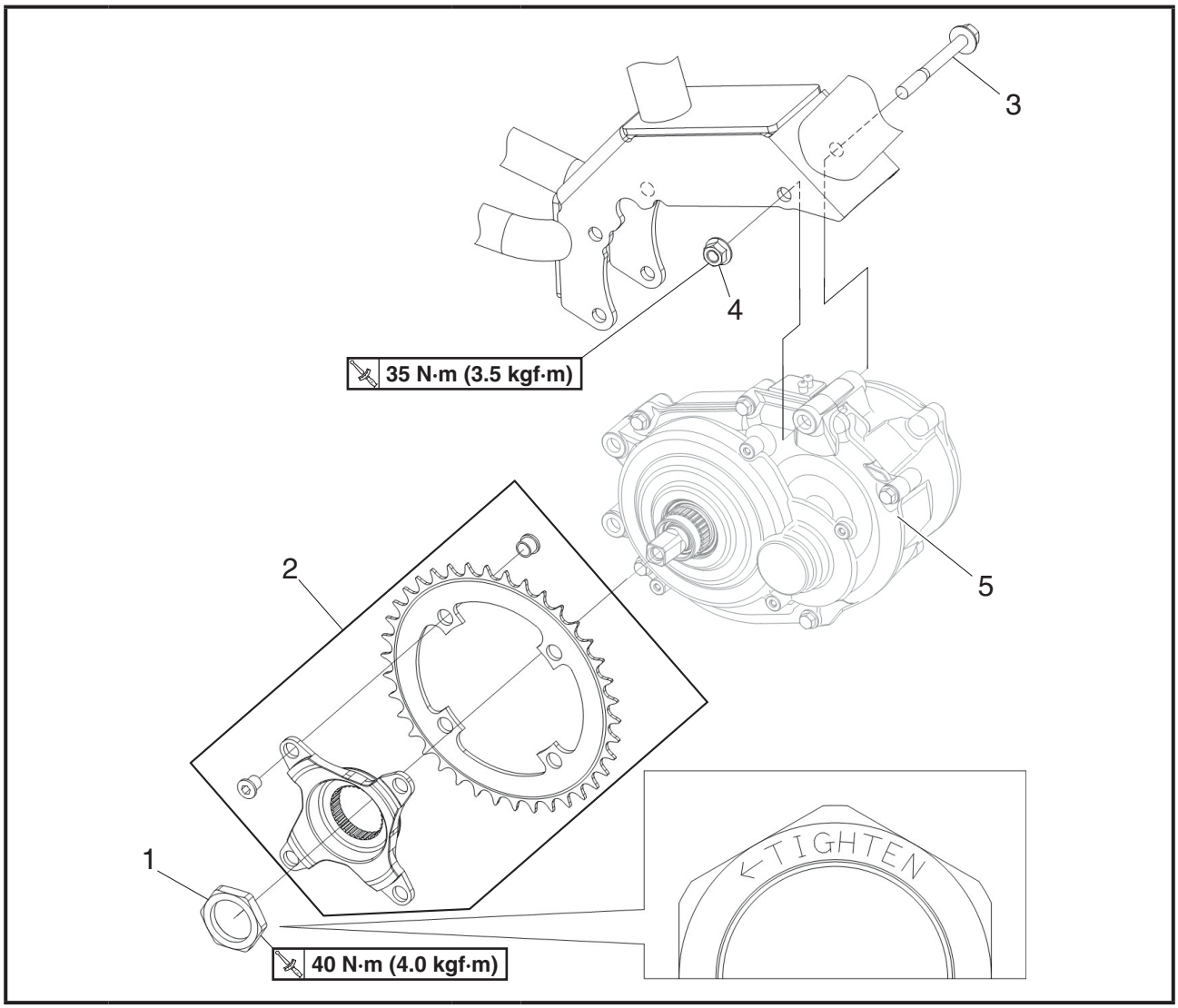
TIP

- Before installing the side cover to the Drive Unit assy., remove old LOCTITE® from the hexagon socket button bolt [7] and Drive Unit assy. hole (ex. Using threading tap and thread cutting die).
- Before installing the side cover to the Drive Unit assy., make sure to route the battery wiring forward, and the other wiring rearward of the drive axle.
- Apply LOCTITE® 263 to the threaded portion of the hexagon socket button bolt [7].
- Do not fully tighten the hexagon socket button bolt.

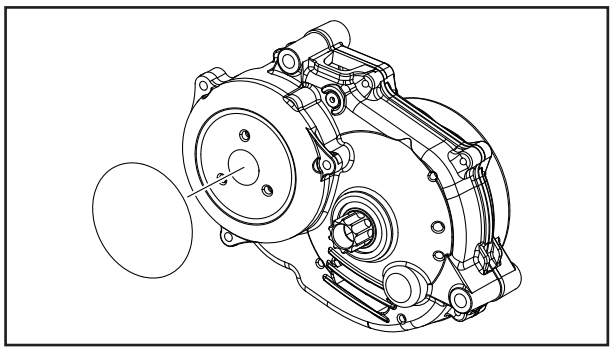
6. Tighten:
   - Hexagon socket button bolt [7] × 3
     (PW-X3 : 3 bolts / PWseries S2 : 4 bolts)

     0.3 N·m (0.03 kgf·m)

<PWseries TE / ST / CE> Drive Unit assy.

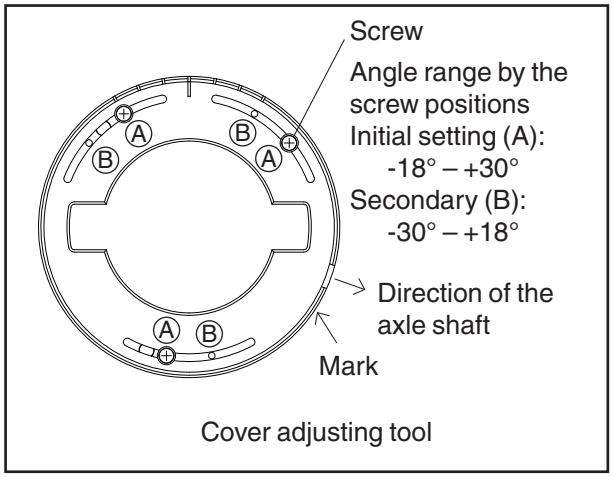


Order	Job/Part	Q'ty	Remarks
	Removal of the Drive Unit assy. from the bicycle frame.		Follow the work procedures for removal.
1	Lock nut	1	Left-hand screw
2	Spider & Chainring(s)	1	
3	Flange bolt (M8)	3	
4	Flange nut (M8)	3	
5	Drive Unit assy.	1	
			Reverse the removal process for installation.



Removing the Cover assy.

The Cover assy. is attached to the Drive Unit assy. with adhesive tape, so once removed it can not be reused. Please use the new Cover assy. when you put on the Cover assy. again.

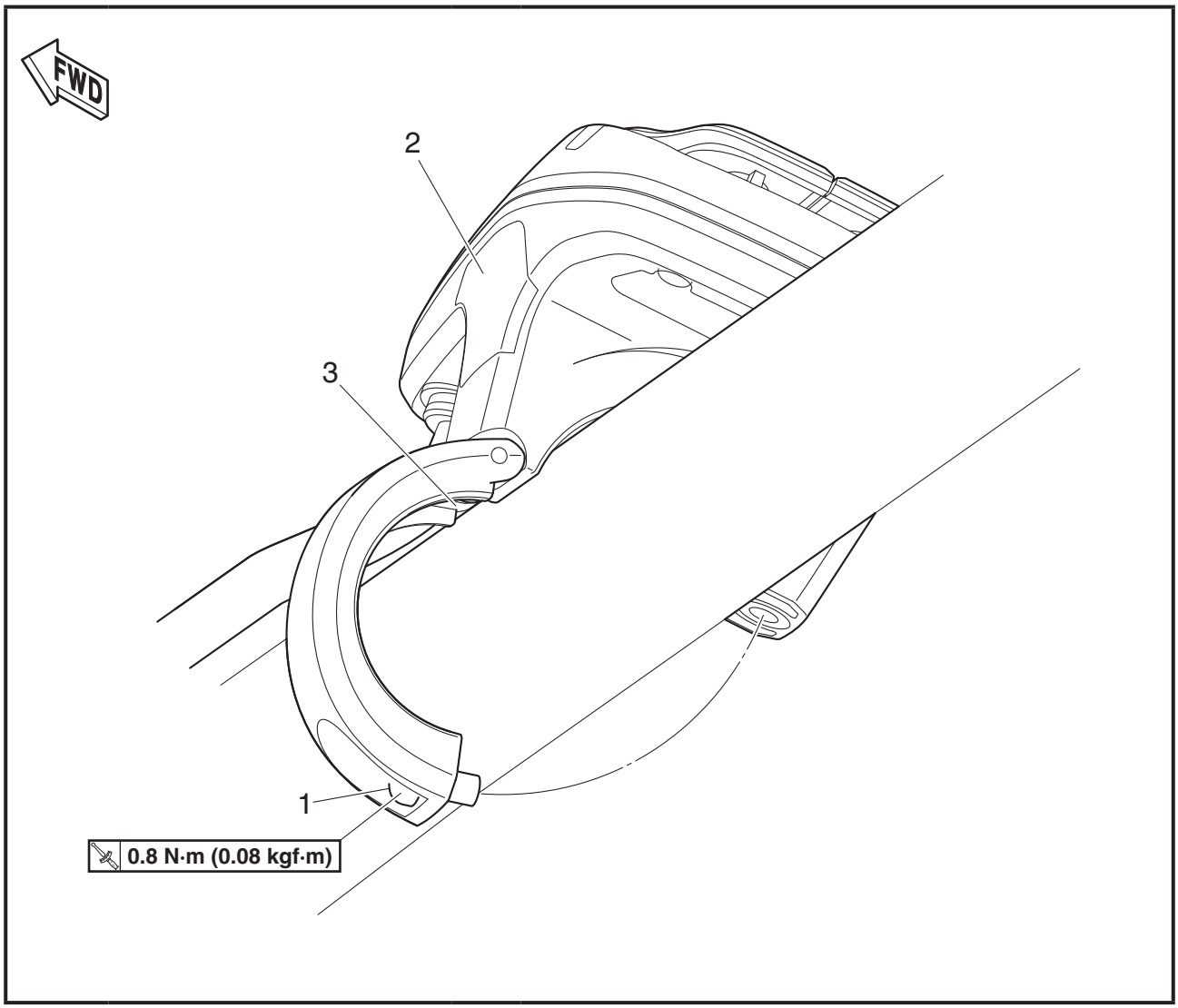


Cover adjusting tool

Installing the Cover assy.

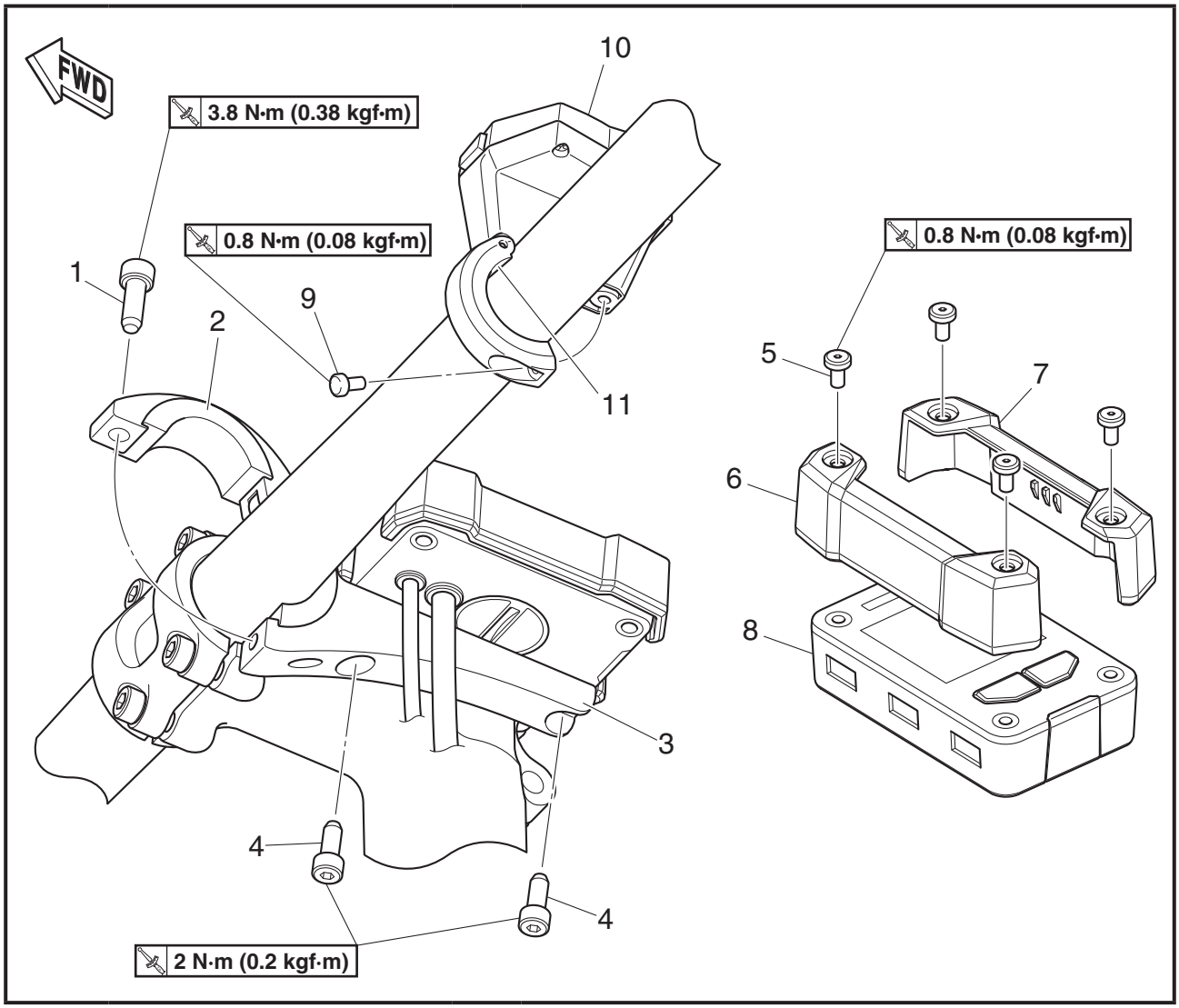
1. Clean:
   Clean up the surface of the Drive Unit assy. with degreaser.
2. Setting:
   Align three holes of the cover adjusting tool with the bolts on the Drive Unit assy., and set the cover adjusting tool on the drive unit.
3. Install:
   After fix logo angle with screws, peel off a film on the adhesive tape and push the center of the Cover assy. to sticks to the Drive Unit assy.
4. Remove:
   Remove the cover adjusting tool and pull the tabs in both directions.

<Display A> Display Unit



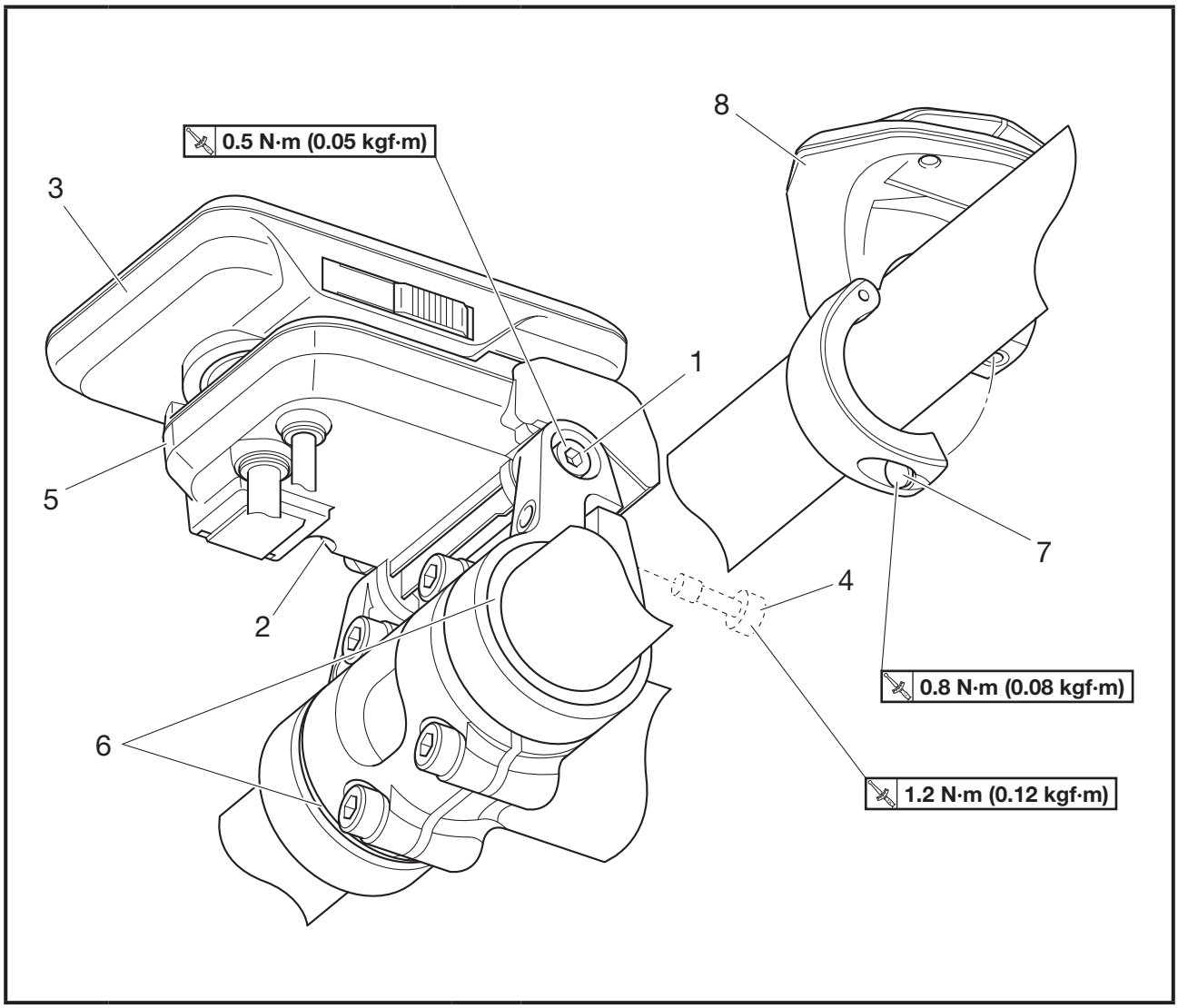
Order	Job/Part	Q'ty	Remarks
	Removal of the display unit from the bicycle handle.		Follow the work procedures for removal.
1	Bolt	1	
2	Display Unit	1	
3	Rubber sheet	2	It is provided as spare parts. The display unit originally has this parts. Reverse the removal process for installation.

<Display X> Display Unit



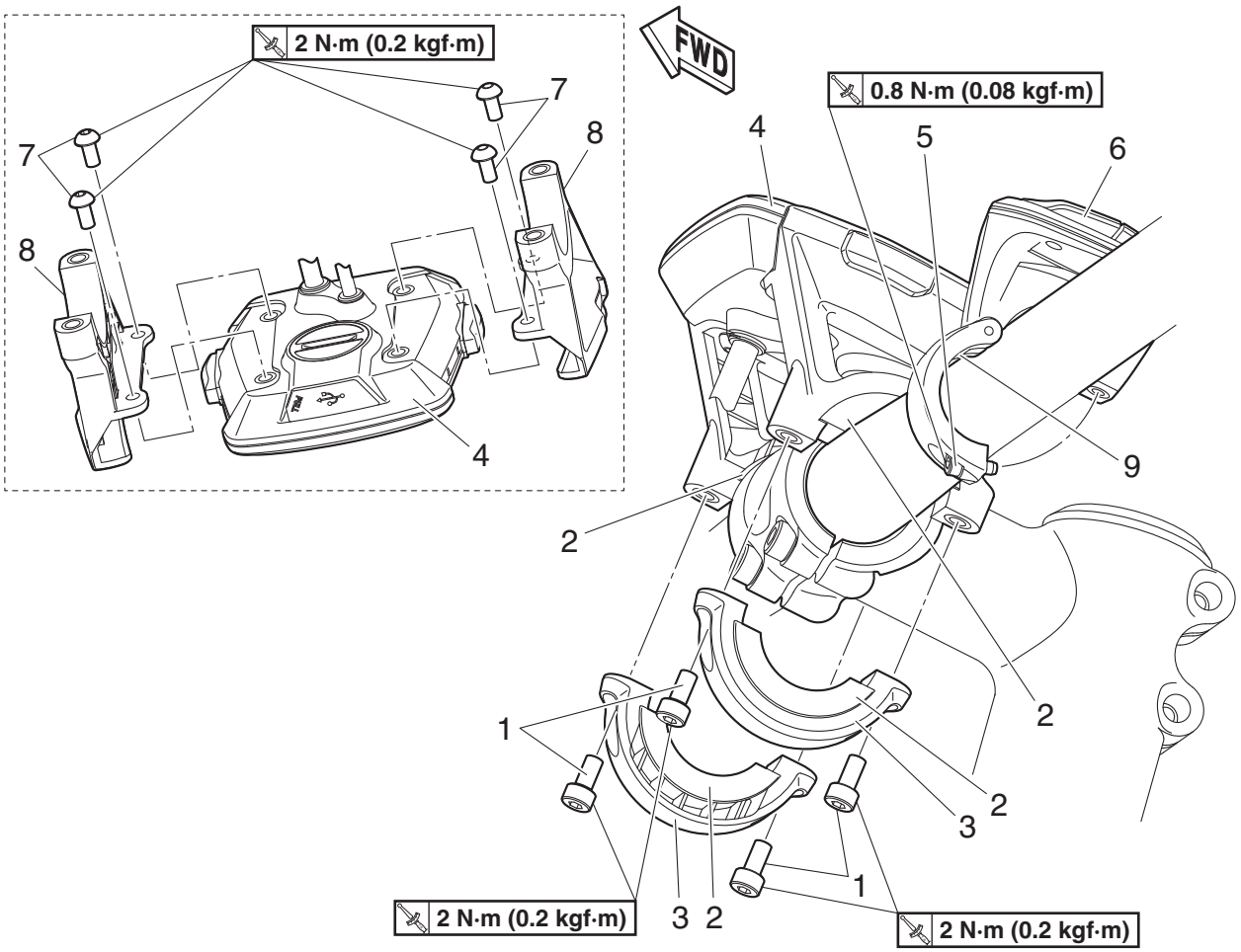
Order	Job/Part	Q'ty	Remarks
	Removal of the display and switch from the bicycle handle.		Follow the work procedures for removal.
1	Bolt	1	
2	Rubber adapter	2	
3	Clamp	1	
4	Bolt	2	
5	Bolt	4	
6	Display cover (L)	1	Printed as "L-01" on the back side.
7	Display cover (R)	1	Printed as "R-01" on the back side.
8	Display	1	
9	Screw	1	
10	Switch	1	
11	Rubber sheet	2	It is provided as spare parts. The switch originally has this parts. Reverse the removal process for installation.

<Display B> Display Unit



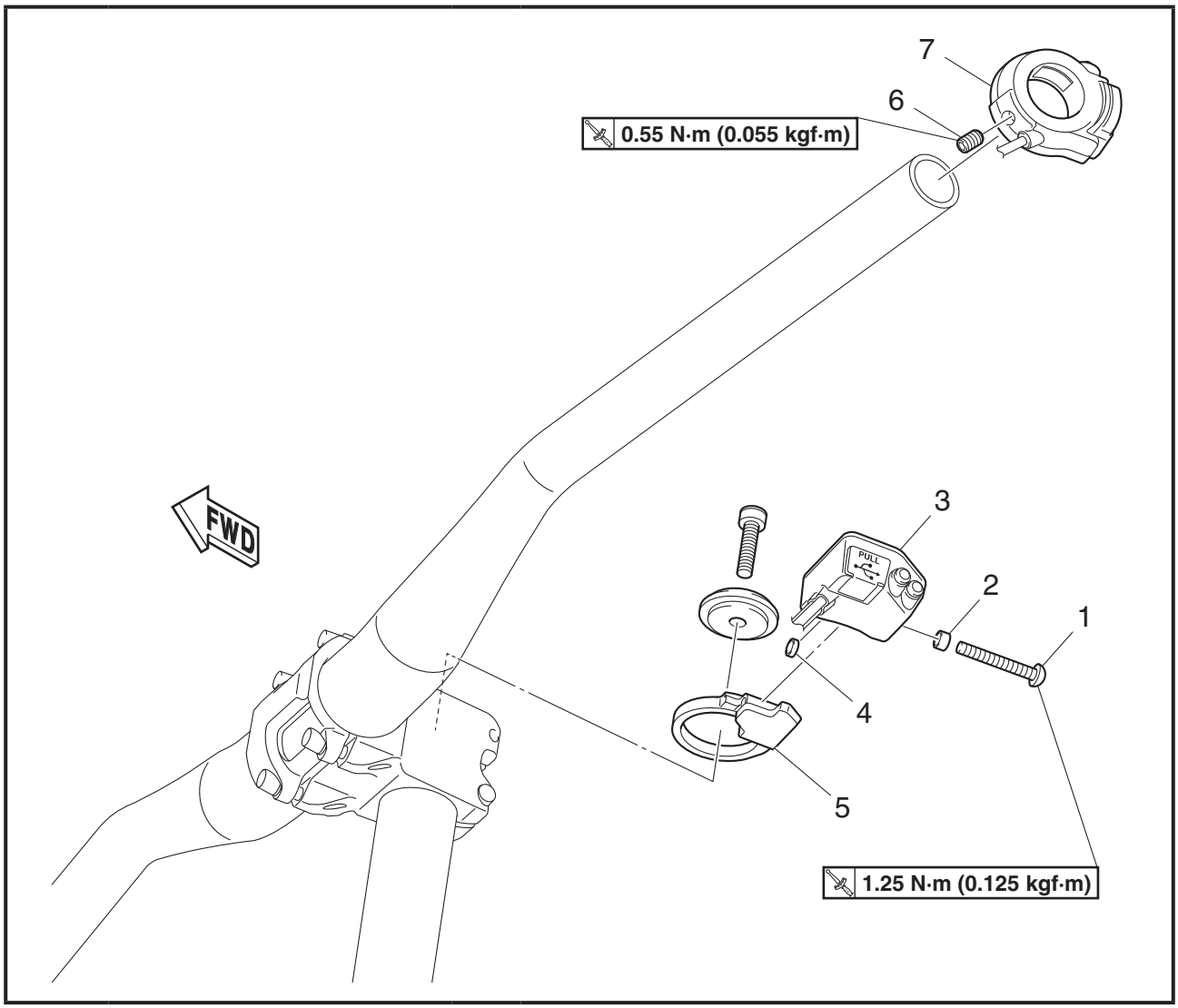
Order	Job/Part	Q'ty	Remarks
1	Bolt	1	
2	Bolt	1	Install this bolt if necessary.
3	Display	1	
4	Bolt	2	
5	Display holder	2	
6	Rubber adapter	2	
7	Screw	1	
8	Switch	1	

<Display C> Display Unit

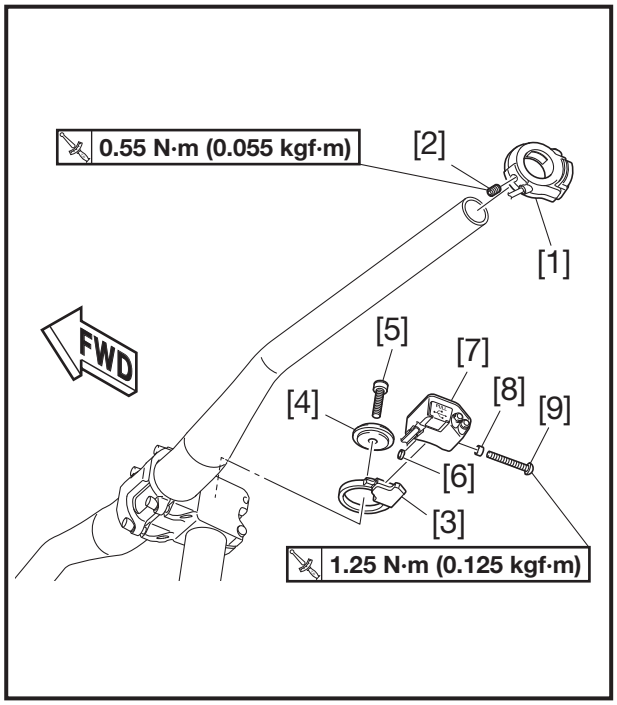


Order	Job/Part	Q'ty	Remarks
	Removal of the display and switch from the bicycle handle.		Follow the work procedures for removal.
1	Bolt	4	
2	Rubber adapter	4	
3	Clamp	2	
4	Display	1	
5	Bolt	1	
6	Switch	1	
7	Bolt	4	
8	Display holder	2	
9	Rubber sheet	2	It is provided as spare parts. The switch originally has this parts. Reverse the removal process for installation.

<Interface X> Display Unit



Order	Job/Part	Q'ty	Remarks
	Removal of the communication unit and switch from the bicycle handle.		Follow the work procedures for removal.
1	Communication unit fixed bolt	1	
2	Collar 1	1	
3	Communication unit	1	
4	Collar 2	1	
5	Mounting spacer	1	Mounting spacer can also be fixed under the stem.
6	Remote switch fixed screw	1	
7	Remote switch	1	
			Reverse the removal process for installation.



Installing the Display Unit (Interface X)

1. Install:
   - Remote switch [1]
   - Remote switch fixed screw [2]

TIP

Install the remote switch outward of the rear brake lever bracket.

2. Tighten:
   - Remote switch fixed screw [2]

   0.55 N·m (0.055 kgf·m)
3. Install:
   - Mounting spacer [3]

TIP

Install the mouting spacer over or under the stem, and secure it with the stem cap [4] and stem cap bolt [5].

4. Install:
   - Collar 2 [6]
   - Communication unit [7]
   - Collar 1 [8]
   - Communication unit fixed bolt [9]

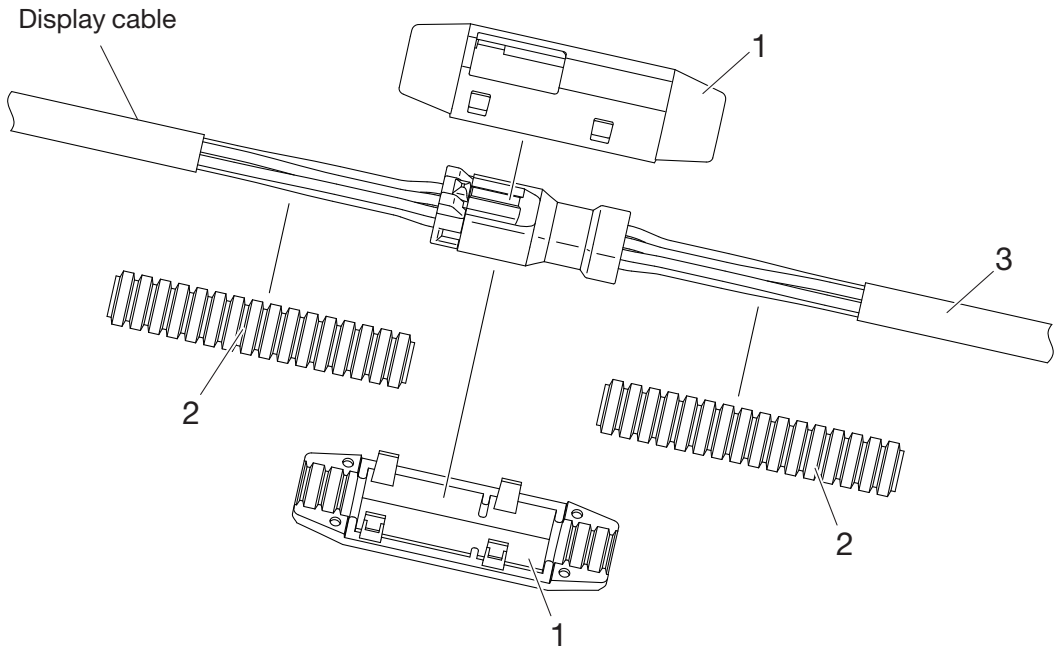
TIP

Insert the collar 2 and collar 1 into the hole on the communication unit, and then fix the communication unit to mounting spacer with the communication unit fixed bolt.

5. Tighten:
   - Communication unit fixed bolt [9]

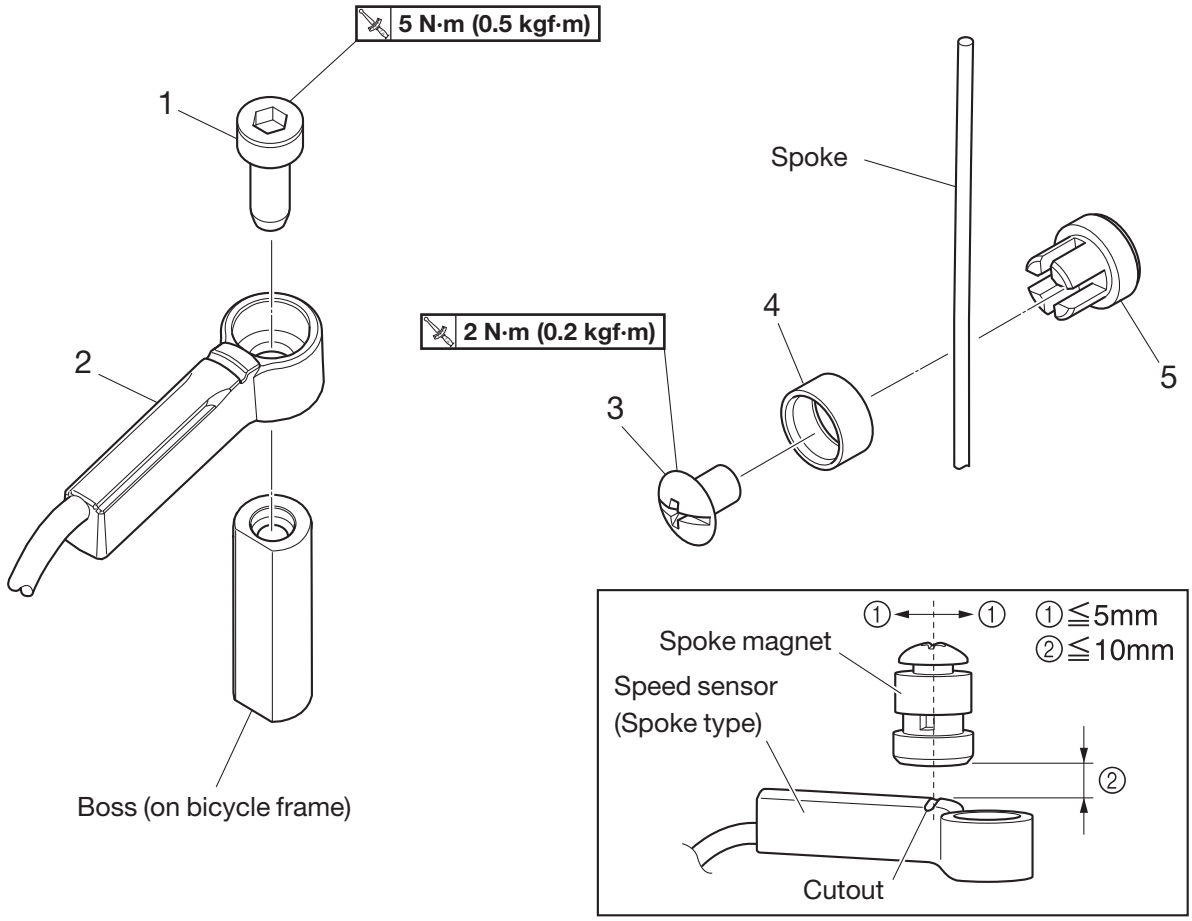
   1.25 N·m (0.125 kgf·m)

Intermediate cable



Order	Job/Part	Q'ty	Remarks
	Removal of the intermediate cable from the bicycle.		Follow the work procedures for removal.
1	Cover connector	1	The connector cover and tube shall be installed around the connector when the connector is installed outside the down tube.
2	Tube	2	
3	Wire lead 9	1	
			Reverse the removal process for installation.

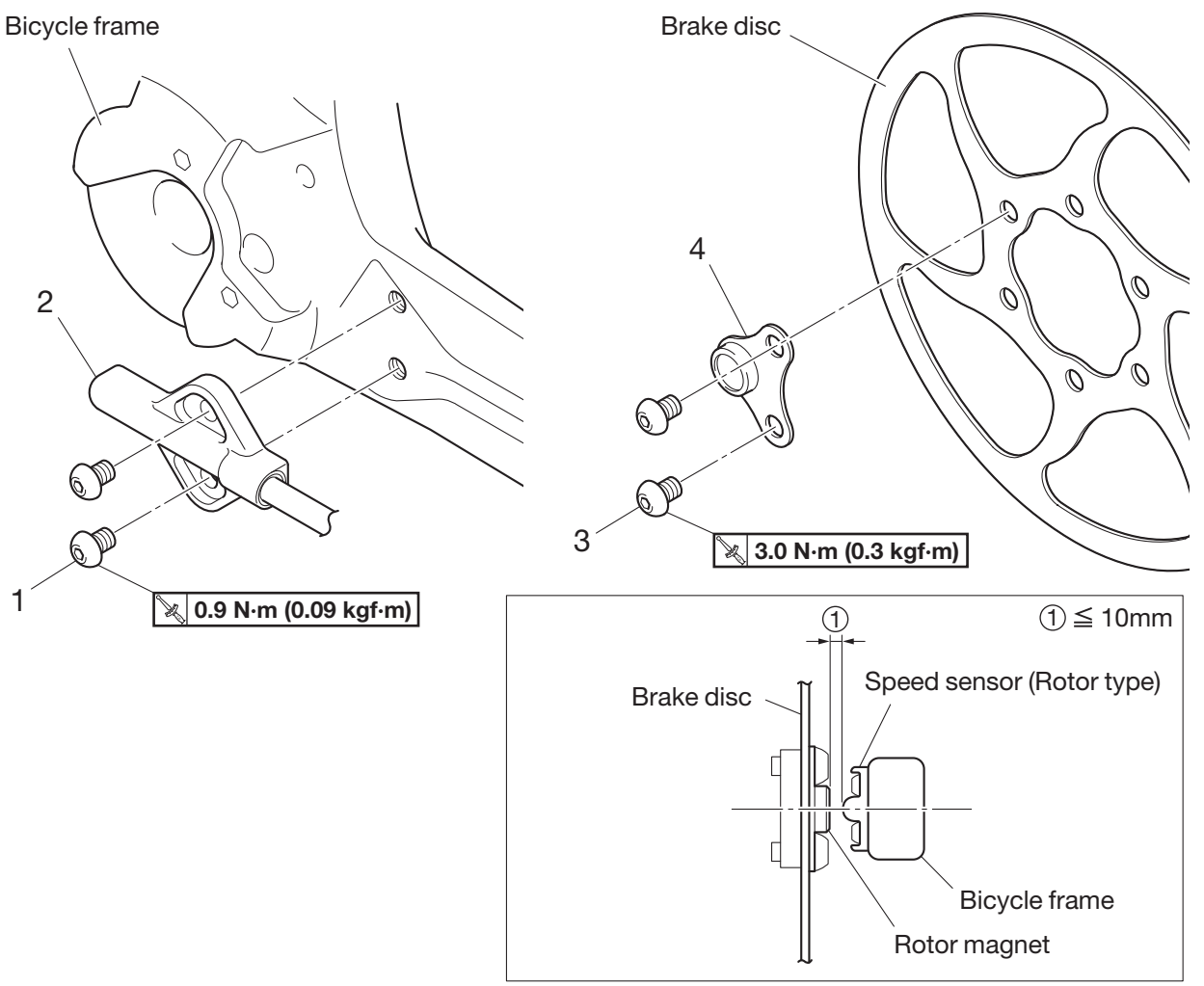
Speed Sensor Set (Spoke type)



Check the center location ① of spoke magnet,and the gap ② between spoke magnet and speed sensor (Spoke type).

Order	Job/Part	Q'ty	Remarks
	Removal of the speed sensor from the bicycle.		Follow the work procedures for removal.
1	Bolt	1	
2	Speed sensor (Spoke type)	1	
3	Bolt	1	
4	Hoop	1	
5	Spoke magnet	1	
			Reverse the removal process for installation.

Speed Sensor Set (Rotor type)



Check the gap ① between rotor magnet and speed sensor (Rotor type).

Order	Job/Part	Q'ty	Remarks
	Removal of the speed sensor from the bicycle.		Follow the work procedures for removal.
1	Screw	2	
2	Speed sensor (Rotor type)	1	
3	Bolt	2	
4	Rotor magnet	1	
			Reverse the removal process for installation.

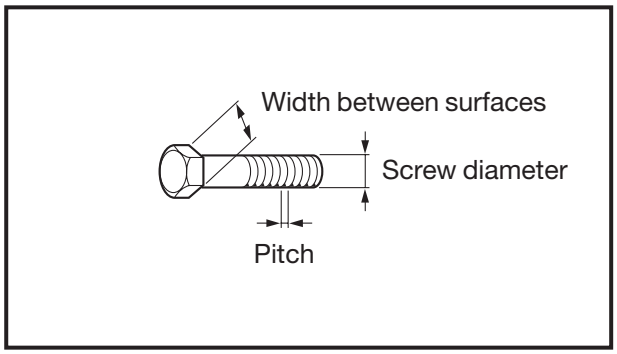
Tightening Torque

Unit: N·m kgf·m (in)

Tightening locations	Screw diameter	Q'ty	Tightening torque	Notes
(PWseries TE/ST/CE) Drive sprocket lock nut	M27	1	40 (4.0)	Left hand screw
(PWseries TE/ST/CE) Drive Unit fixed bolt & nut	M8	3	35 (3.5)	
(PW-X, PW-X2, PW-X2 45, PW-X3, PWseries S2) Drive sprocket lock nut	M32	1	45 (4.5)	Left hand screw The part can be removed and installed using a commercially available bottom bracket tool.
(PW-X, PW-X2, PW-X2 45, PW-X3, PWseries S2) Drive Unit fixed bolt	M8	2	22 (2.2)	
(PW-X2, PW-X2 45) Drive Unit fixed bolt	M6	2	11 (1.1)	
(Display X) Clamp fixed bolt	M5	1	3.75 (0.375)	
(Display X) Display fixed bolt	M4	2	2 (0.2)	
(Display X) Display cover fixed bolt	M3	4	0.8 (0.08)	
(Display X) Switch fixed screw	M3	1	0.8 (0.08)	
(Display A) Switch fixed screw	M3	1	0.8 (0.08)	
(Display B) Display angle adjust bolt	M4	1	0.5 (0.05)	
(Display B) Clamp fixed bolt	M4	2	1.2 (0.12)	
(Display B) Display fixed bolt	M3	1	0.5 (0.05)	
(Display B) Switch fixed screw	M3	1	0.8 (0.08)	
(Display C) Clamp fixed bolt	M4	4	2 (0.2)	
(Display C) Display fixed bolt	M4	4	2 (0.2)	
(Display C) Switch fixed screw	M3	1	0.8 (0.08)	
(Interface X) Communication unit fixed bolt	M4	1	1.25 (0.125)	
(Interface X) Remote switch fixed screw	M3	1	0.55 (0.055)	
Speed sensor (Spoke type)	M5	1	5 (0.5)	Because the parts are provided by the bicycle manufacturer, the tightening torque is for reference only.
Spoke magnet	–	1	2 (0.2)	
Speed sensor (Rotor type)	M3	2	0.9 (0.09)	
Rotor magnet	M3	2	3.0 (0.3)	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) × pitch	Tightening torque
M4 (7 mm) × P0.7	1.5 to 2.5 N·m (0.15 to 0.25 kgf·m)
M5 (8 mm) × P0.8	3 to 4.5 N·m (0.3 to 0.45 kgf·m)
M6 (10 mm) × P1.0	5 to 8 N·m (0.5 to 0.8 kgf·m)
M8 (12 mm) × P1.25	12 to 19 N·m (1.2 to 1.9 kgf·m)

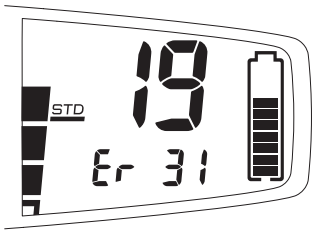
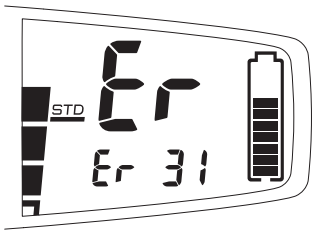
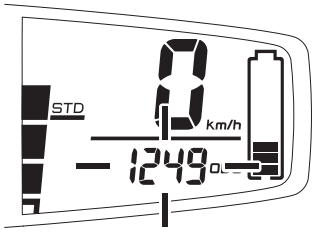
<Display A> Diagnosis function

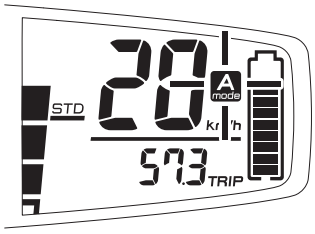
System malfunction

This model is equipped with a self-diagnosis function in order to ensure that the assist system is operating normally.
If this function detects a malfunction in the e-Bike Systems, it immediately operates the assist system under substitute characteristics and displays the error indication to alert the rider that a malfunction has occurred in the e-Bike Systems.
For details about error codes, see the error code tables.

In addition, the Yamaha e-kit diagnostic tool can be connected to this model for more detailed troubleshooting. For details, see "YAMAHA E-KIT DIAGNOSTIC TOOL".

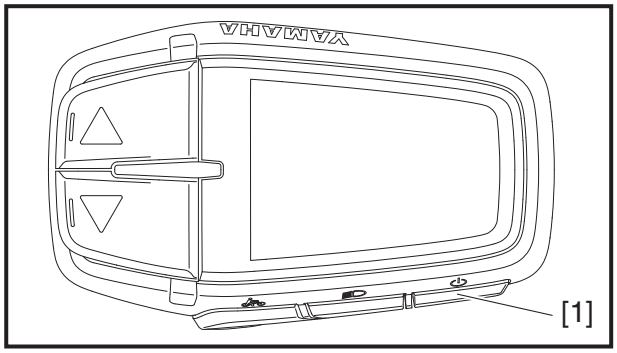
List of Error Codes Display

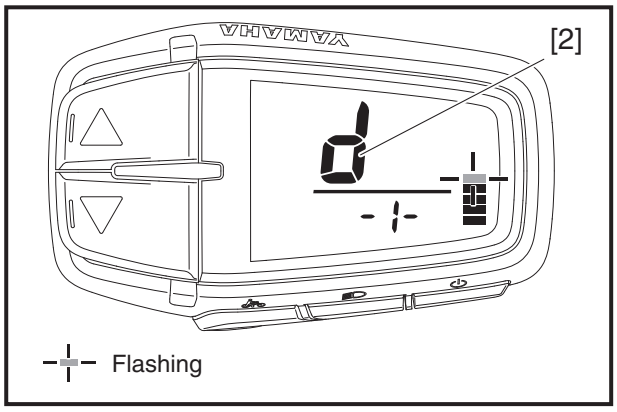
Display pattern	Error codes	Fault device	Power assist behavior and error code record
 Alternately displays 	12	Drive Unit – Display Unit communication	Power assist is normal. Error code does not record.
	13	Display Unit	
	31	Torque sensor	Power assist will stop after determine the error. Error code will record.
	32		
	33		
	34		
	35		
	36		
	37		
	38	Crank sensor	
	39		
	61	Controller	
	62	Motor	
	63	Controller	
	66		
	64		
	67	Motor	
	68	Encoder	
	71	Battery	
	73		
	74		
	79	DC/DC converter	
 The function display flashes	–	(Even if the wheel where the speed sensor is installed rotates, the value displayed on the speedometer section of the display unit does not change from "0".) ➡ Speed sensor	Power assist is limited. Error code does not record.
		(When the wheel where the speed sensor is installed rotates, the speed is displayed on the speedometer section of the display unit.) ➡ This is not a malfunction. It is in a state that the operation of the power assist system is normal. This state may occur depending on the pedaling strength and riding speed, but it returns to normal condition if it is confirmed that the e-Bike Systems are normal.	Power assist will stop during determine the error. Error code does not record.
		(When charging while the battery is installed to the bicycle) ➡ This state may occur during the battery internal temperature is -20°C or less or 80°C or higher, but it returns to normal condition if battery internal temperature returns to the normal temperature range.	

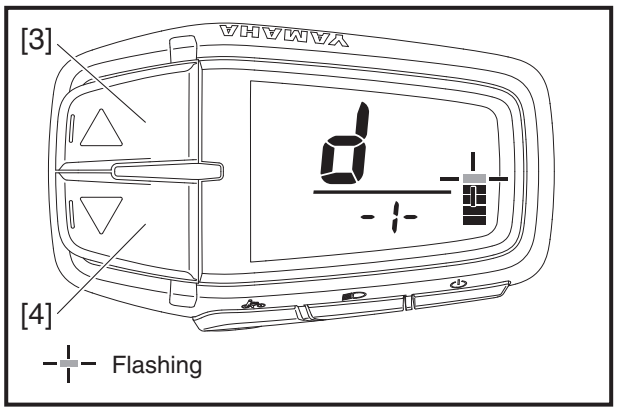
Display pattern	Error codes	Fault device	Power assist behavior and error code record
Even if the power switch is pressed to turn the power on, the power turns off automatically after 4 seconds.	–	Drive Unit - Battery	Power assist will stop after determine the error. Error code will record.
The Automatic mode indicator flashes 	–	Angle sensor To troubleshoot or check the status of malfunctions related to the angle sensor, use the Yamaha e-kit diagnostic tool that was provided separately by Yamaha. (See page 3-14.)	Drive unit can not recognize the angle of bicycle when the angle sensor has some malfunction. So, power assist will be strange only when starting pedaling. Error code does not record.

Self-diagnosis mode

This is the mode in which each type of diagnosis and the content of error codes, which are stored when there is an error, are displayed. You can switch between speed sensor diagnosis mode, Drive Unit diagnosis mode, error log check mode and firmware ver. check mode by the display unit operation.







Operating procedures to self-diagnosis mode

1. Make sure that the power is turned off to the display unit.
   Press the power switch [1] to turn on the power.
   When the power is turned on, all segments of the display unit will come on.
   After approximately 2 seconds, the segments will turn off, and then the display will return to normal.
2. Press the power switch [1] again, and continue pressing the switch until the “d” [2] is displayed (approximately 10 seconds).
   Confirm that the “d” [2] is displayed, and then release the power switch [1].

TIP

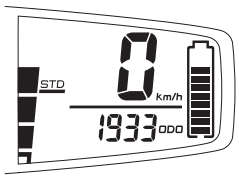
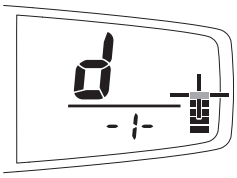
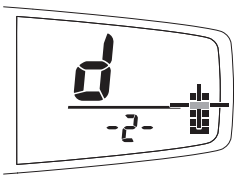
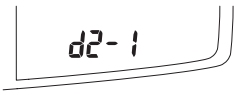
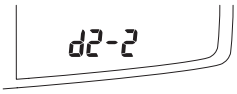
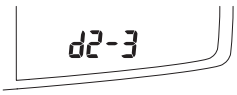
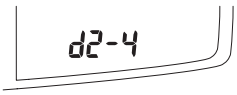
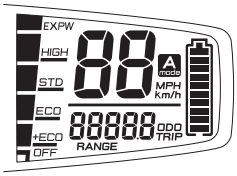
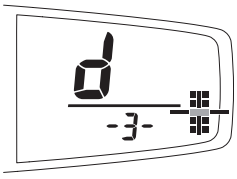
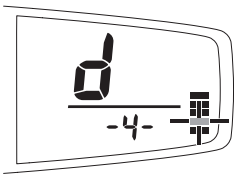
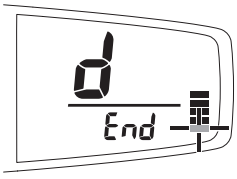
Step 2 must be performed within 30 seconds from performing step 1.

3. Press the assist mode switch [3] or [4] to change the diagnosis menu.
4. Hold down the assist mode down switch [4] for 2 seconds to enter the selected diagnosis mode.

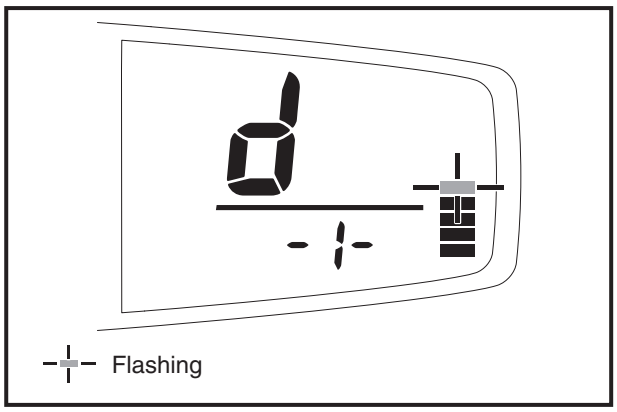
TIP

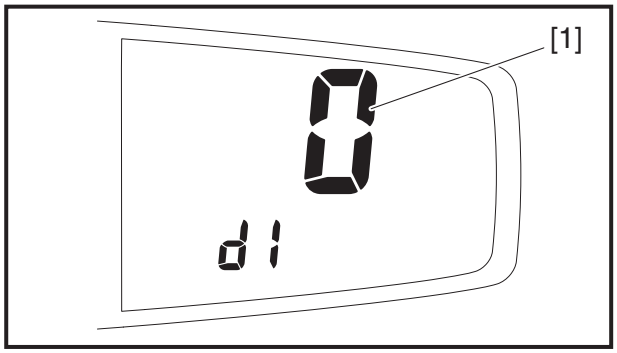
If you pressed the wrong switch, turn off the power and perform steps 1–4 again.

Self-diagnosis mode table

Layer 1	Layer 2	Layer 3	Layer 4	Description
 Normal display	 Speed sensor diagnosis mode	 Speed sensor rotation check		Checks the functionality of the speed sensor operation
	 Drive Unit diagnosis mode	 Torque sensor reference voltage		Displays the condition of the torque sensor reference voltage
		 Motor current		Checks the functionality of the motor current (%)
		 Error display		Displays the error from the motor and controller
		 Display Unit function check	 All segments Illuminate	Checks the functionality of the display unit operation
	 Error log check mode	 Error log results		Retrieves the fault records from the controller to display the list of error codes
	 Firmware ver. check mode	 Meter hardware		Imports the display hardware version
	 EXIT			EXIT

Flashing





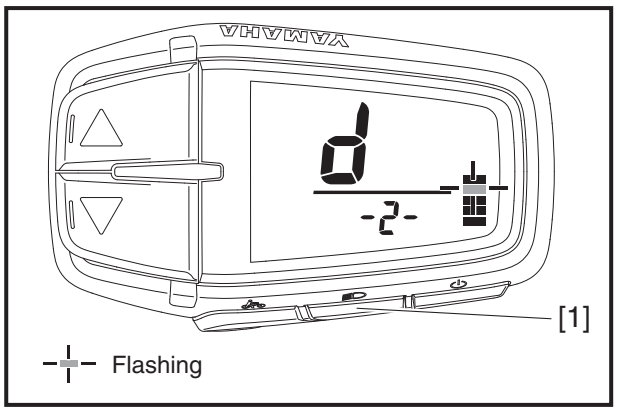
Speed sensor diagnosis mode display method

To determine if the controller is correctly recognizing the speed sensor signal, rotate the wheel to which the speed sensor is connected and make sure that the number of rotations of the wheel indicated matches the actual number of rotations.

1. Enter the speed sensor diagnosis mode.
   See “Operating procedures to self-diagnosis mode”.
   Confirm that the function display is displaying “d1”.
2. When you raise and rotate the wheel (with the speed sensor), the rotation number display [1] on the display unit will change.
   Before rotating the wheel (with the speed sensor), <0> will be displayed on the rotation number display [1] of the display unit.
   Each rotation of the wheel is counted. The rotation number display shows up to <99> and will return to <0> when the wheel is rotated 100 times.

TIP

- You should at least rotate the wheel (with the speed sensor) 3 times and make sure that <3> is displayed.
- If the speed sensor malfunctions, the number of rotations displayed on the display unit will increase before the wheel (with the speed sensor) is rotated even once, or the number will not increase even when the wheel (with the speed sensor) is rotated once (or there is a delay in the increase in the value).

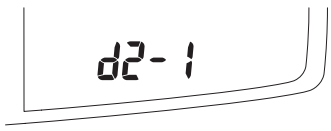
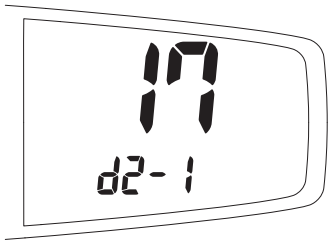
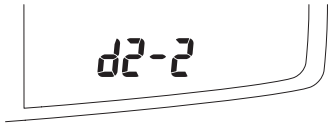
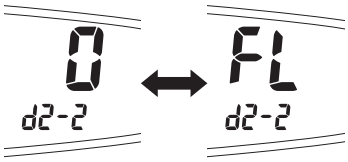
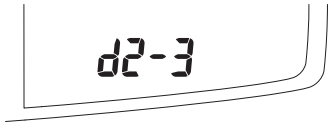
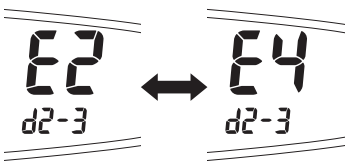
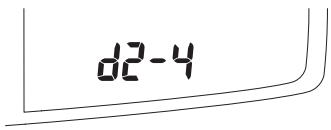
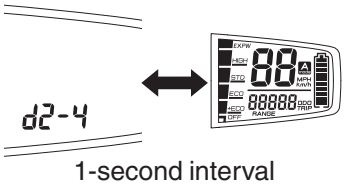


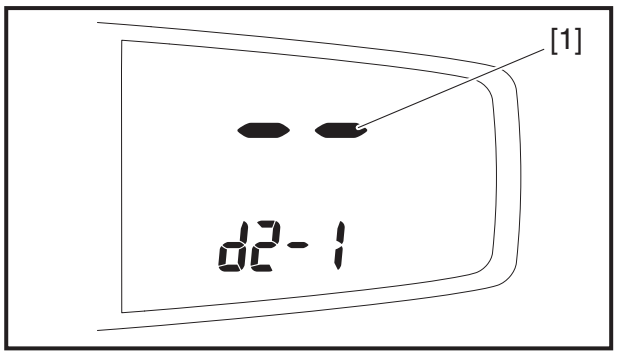
Drive Unit diagnosis mode display method

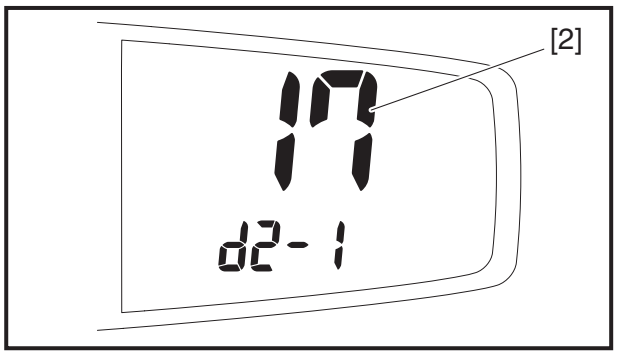
You can check the status of malfunctions in the Drive Unit.

1. Enter the Drive Unit diagnosis mode.
   See “Operating procedures to self-diagnosis mode”.
   Confirm that the function display is displaying “d2-1”.
   Press the light switch [1] to select the torque sensor reference voltage, motor current, error displays (<E2>, <E4>), and the display unit function check.

List of Drive Unit diagnosis mode display methods

Inspection items	Display		
1) Torque sensor reference voltage			Values are displayed from 0.0 to 9.9 (V). When the values are displayed on the display unit, the decimal points are omitted. Examples: 00 -> 0.0 V 05 -> 0.5 V 10 -> 1.0 V 11 -> 1.1 V
Press the light switch			
2) Motor current			Motor output current in “HIGH” mode is displayed as 0 (%) to FL (= Full)
Press the light switch			
3) Error display			When there is an error, either (E2) (motor) or (E4) (controller) is displayed. *There is no display when there are no errors.
Press the light switch			
4) Display Unit function check			The “d2-4” display and the all-segment display are shown alternately at 1-second intervals.
Press the light switch or Press the power switch			
Power turn off			





* Determining whether or not the torque sensor is good
0.2 to 1.1 V = normal
If the torque sensor is outside of this range
->Implement the torque sensor reference voltage adjustment function.
If the torque sensor remains outside of its normal range after torque sensor reference voltage adjustment
->Torque sensor malfunction (replace)

1) Torque sensor reference voltage

1. Torque sensor reference voltage display

a. <- -> is displayed in the diagnosis mode display [1] of the display unit for several seconds.

b. Values are displayed from 0.0 to 9.9 (V) in the diagnosis data display [2] of the display unit. When the values are displayed on the display unit, the decimal points are omitted.
Examples: 00 -> 0.0 V
05 -> 0.5 V
10 -> 1.0 V
11 -> 1.1 V

c. The torque sensor is normal if the display voltage is 0.2 to 1.1 V.
Perform a torque sensor reference voltage adjustment if values outside of this range are displayed.

d. Press the light switch "≡D" of the display unit.

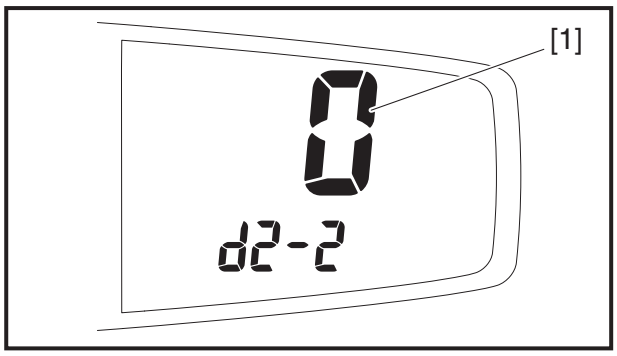
e. Proceed to 2) Motor current.

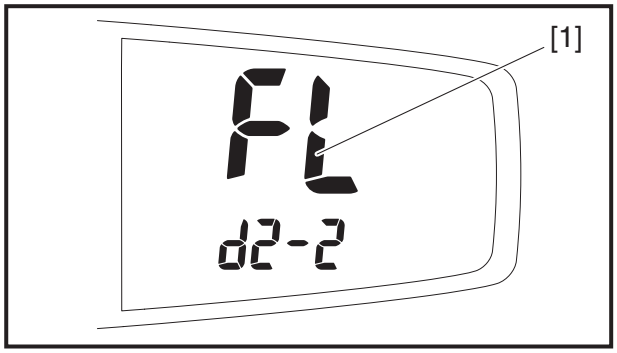
Torque sensor reference voltage adjustment function.

Turn the power on to the display unit and let it stand.
Guideline: Until the power to the display unit is turned off automatically (about 5 min.).

TIP

Do not place feet on the pedals while performing a torque sensor reference voltage adjustment.





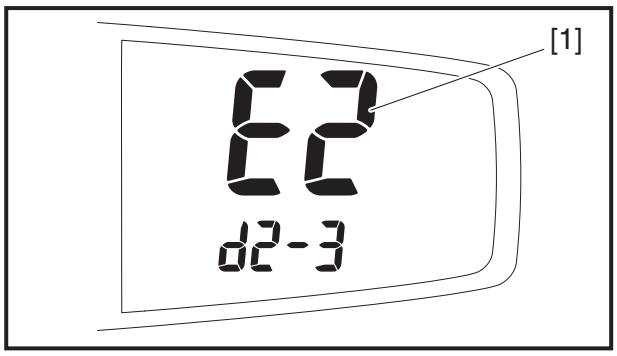
2) Motor current

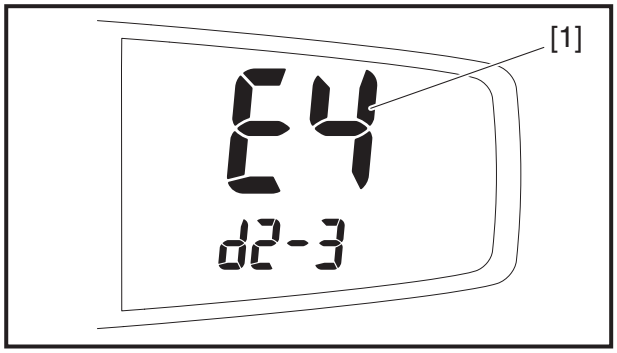
a. The diagnosis data display [1] of the display unit displays the motor output current (%).

b. Confirm that the diagnosis data display [1] of the display unit displays <FL> when applying the rear brake and strongly pressing on the pedals.
- <FL> is displayed: good
- <FL> is not displayed: If the bicycle was ridden immediately before checking the motor current, it is possible that the battery or the controller temperature control is working; therefore, wait until the bicycle cools down.
  If the bicycle was not ridden immediately before checking the motor current, recheck using a battery that is operating properly.
- <FL> is not displayed: The battery response is weak in winter (low temperatures), so use a battery that has been stored in a heated room.
- <FL> is not displayed: Replace the controller assembly (internal circuit board).

c. Press the light switch "≡D" of the display unit.

d. Proceed to 3) Error display.





3) Error display

a. When there is a malfunction, <E2> (motor) or <E4> (controller) will be displayed on the diagnosis data display [1] of the display unit.

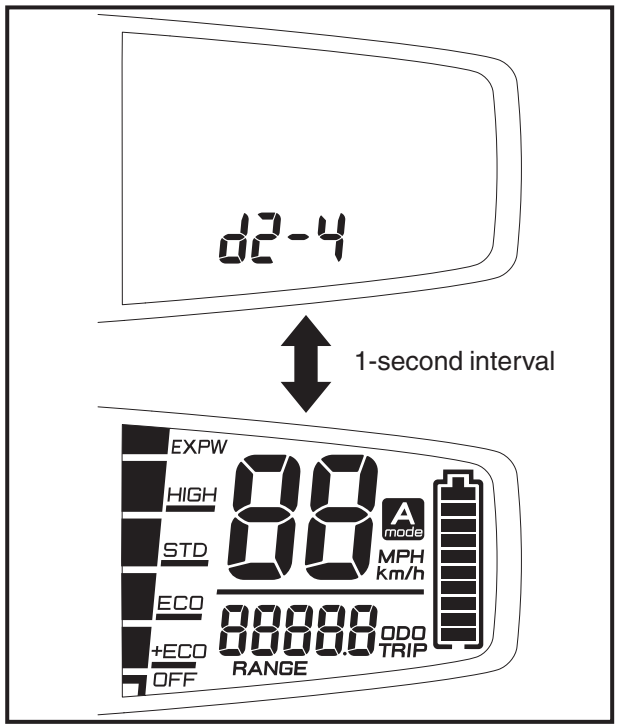
b. Press the light switch "≡D" of the display unit.

c. Proceed to 4) Display Unit function check.

TIP

Check the error code if <E2> or <E4> is displayed.

- When there is no malfunction, the next "d2-4" is displayed without the diagnosis mode "d2-3" being displayed.
- Perform a final check to make sure there is no error display in this mode when performing repairs or replacing parts.



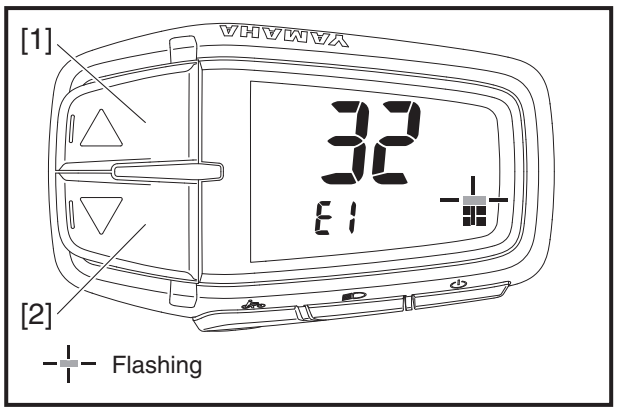
4) Display Unit function check

a. The "d2-4" display and the all-segment display are shown alternately at 1-second intervals.

b. Replace the display unit if there are segments which are not illuminated.

c. Press the power switch "⏻" of the display unit.

d. The power to the display unit is turned off.



Error log check mode display method

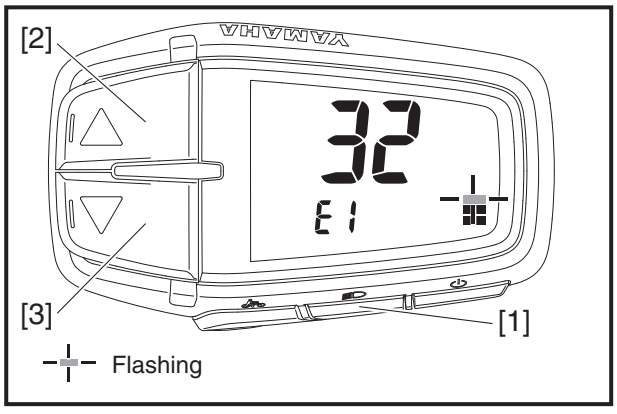
The three most recent types of error codes which are stored when there is an error are stored.

1. Enter the error log check mode.
   See “Operating procedures to self-diagnosis mode”.
   The display unit displays the three most recent error codes. To display the error codes, press the assist mode switch [1] or [2].
   “E0” will be displayed when there are no errors.
   Press the power switch to turn off the display unit.
   Press the assist mode switches [1] or [2] to switch the display.

List of error log check mode display methods

When there are no error codes	0 E0
When there are 1–3 error codes	32 E1 ⇄ ASSIST UP / ASSIST DOWN ⇄ 61 E2 ⇄ ASSIST UP / ASSIST DOWN ⇄ 33 E3

Flashing

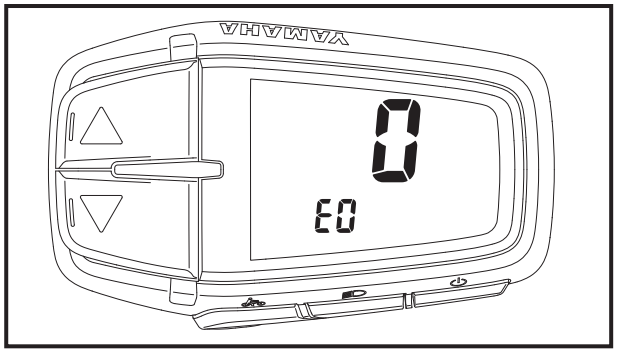


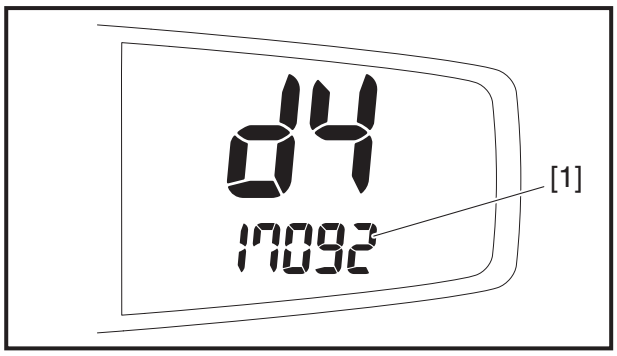
How to delete the malfunction history

1. While pressing the light switch [1] during the error code display, press the assist mode switches [2] or [3].
2. When the history is deleted, “E0” is displayed. Press the power switch to turn off the display unit.

TIP

Be sure to clear the diagnosis history after replacing the motor or other parts.





Firmware ver. check mode

You can confirm the version information for the firmware of the meter

1. Enter the firmware ver. check mode.
   See “Operating procedures to self-diagnosis mode”.
   Confirm that the speed meter area is displaying “d4”.
   The multifunction display [1] of the display unit displays the firmware version of the meter.

TIP

Detailed version information will be provided from Yamaha separately as needed.

List of error codes and corresponding assist operation

Error codes	Fault device	Fault details	Restoration condition	Action
12	Display Unit	Stopped the communications to the display unit	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal immediately.	1. Check the display unit connector. 2. Replace the display unit assembly. 3. Replace the wire lead 2. 4. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
13	Drive Unit - Display Unit	Communication data failure to display unit		Make sure that the combination of Drive Unit and display unit are correct.
31	Torque sensor	No communication signals	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the torque sensor assembly. 2. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Disconnected		
		Short-circuited		
		Wiring failure between the torque sensor and the controller		
32		Wiring failure between the coil and the circuit board (wire chattering: nearly disconnected)		
33		Abnormal no-load voltage	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled. (When the e-Bike Systems detect the same error several times, the e-Bike Systems cannot return to normal even if the power is cycled.)	1. Perform the torque sensor reference voltage adjustment. 2. Replace the torque sensor assembly. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
34		Abnormal voltage (detected during running / with high constant voltage)		
35				
36		Abnormal voltage (detected during running / others)		
37		Abnormal voltage (detected during running at low speeds)		
38	Crank sensor	Torque sensor or crank sensor failure	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the torque sensor assembly or controller assembly or drive axle assembly.
39		Short-circuited or crank sensor failure		Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
61	Controller	Abnormal voltage of the sensor for U phase current while the motor is not operating	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Abnormal voltage of the sensor for W phase current while the motor is not operating		
62	Motor	Over current is applied to the U phase of the motor	The e-Bike Systems cannot return to normal even if the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Over current is applied to the V phase of the motor		
		Over current is applied to the W phase of the motor		
		Abnormal current is applied to the U phase of the motor		
		Abnormal current is applied to the V phase of the motor		
		Abnormal current is applied to the W phase of the motor		

Error codes	Fault device	Fault details	Restoration condition	Action
63	Controller	Failure in data reading	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
66		External memory data error		
		EEPROM error		
64		Detected circuit board temperature is too low (–20°C)	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled. (When the e-Bike Systems detect the same error several times, the e-Bike Systems cannot return to normal even if the power is cycled.)	
		Detected circuit board temperature is too high (125°C) (including DC circuit)		
		Sensor on the board is nearly detached		
67	Motor	2 lead wires are disconnected	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 2. Replace the wire lead 3 or wire lead 4 or wire lead 5.
		Yellow lead wire is disconnected (U phase)		
		Blue lead wire is disconnected (V phase)		
		White lead wire is disconnected (W phase)		
68	Encoder	Disconnected or led wire is short-circuited	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Check the encoder connector. 2. Replace the encoder lead wire. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 4. Replace the motor assembly.
		Black wire is short-circuited		
71	Battery	Can't receive data from battery correctly	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Check the connection portion between the battery pack and bicycle, charging connector of power lead. 2. Replace the plug D.C. receptacle or wire lead 2. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 4. Replace the battery assembly.
73		Detected battery voltage is too high (45V)		1. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 2. Replace the battery assembly.
74		Internal system failure		Battery capacity indicator may flush abnormally, refer to the battery service manual.
79	DC/DC converter	Abnormal DC current	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the external DC/DC converter. 2. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
–	Speed sensor	Speed sensor disconnected	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal immediately.	1. Check the speed sensor lead connector. 2. Check the gap between the speed sensor and the magnet. 3. Replace the speed sensor set.
		Speed tuning detected	The e-Bike Systems will not return to normal even if the power is switched ON and OFF.	Check whether or not a speed tuning device is installed. If such a device is installed, remove it, and if it is not installed, contact bicycle manufacturer.

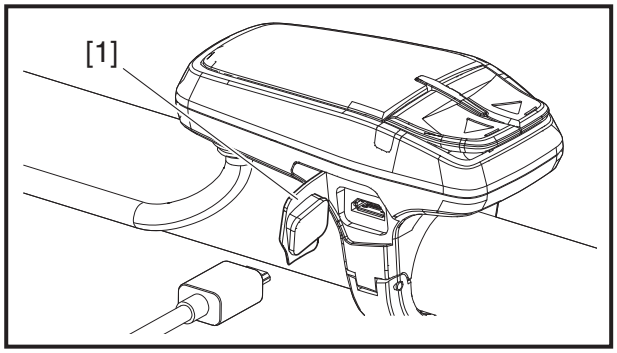
YAMAHA E-KIT DIAGNOSTIC TOOL

This model uses the Yamaha e-kit diagnostic tool to identify malfunctions.
For more information about using the Yamaha e-kit diagnostic tool, refer to the operation manual that is included with the tool.
There are two types of diagnostic tools.
Old : YAMAHA e-Bike diagnostic software
New : YAMAHA e-Bike Diagnostic Tool (YeDT)

Functions of the Yamaha e-kit diagnostic tool

Drive Unit malfunction diagnosis:
Drive Unit malfunction codes recorded on the controller are read, and the contents are displayed. The freeze frame data (FFD) is the operation data when a malfunction was detected. This data can be used to identify when the malfunction occurred and check the Drive Unit conditions and running conditions when it occurred.

Drive Unit system function test:	Check the operation and the output value of each sensor and actuator.
Battery information:	Displays the battery data.
Angle sensor reset:	Reset the Angle sensor setting. When a new or repaired Drive Unit which equipped with the angle sensor is installed, its initial horizontal level/angle programing is recommended.



Connecting the Yamaha e-kit diagnostic tool

1. Open the USB port cap [1] of the display.
2. Connect the USB cable to the switch and computer with the Yamaha e-kit diagnostic tool.

TIP

- After disconnecting the USB cable, be sure to close the USB port cap [1].
- For the USB cable, use a Type-A to Micro-B cable that is not an OTG cable.
- When the Yamaha e-kit diagnostic tool is connected to the vehicle, the operation of the multifunction meter and indicators will be different from the normal operation.

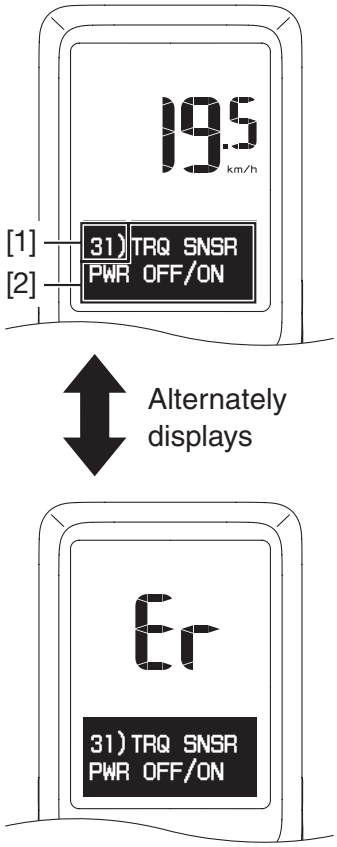
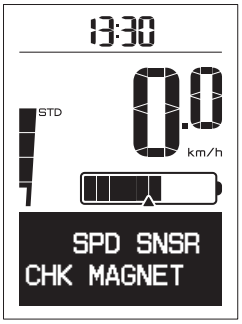
<Display B> Diagnosis function

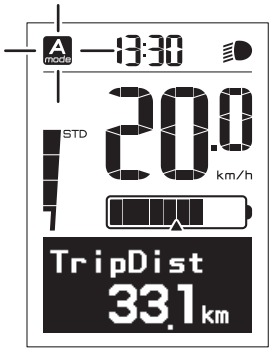
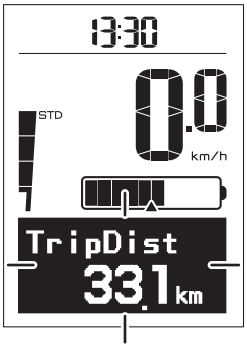
System malfunction

This model is equipped with a self-diagnosis function in order to ensure that the assist system is operating normally.
If this function detects a malfunction in the e-Bike Systems, it immediately operates the assist system under substitute characteristics and displays the error indication to alert the rider that a malfunction has occurred in the e-Bike Systems.
For details about error codes, see the error code tables.

In addition, the Yamaha e-kit diagnostic tool can be connected to this model for more detailed troubleshooting. For details, see "YAMAHA E-KIT DIAGNOSTIC TOOL".

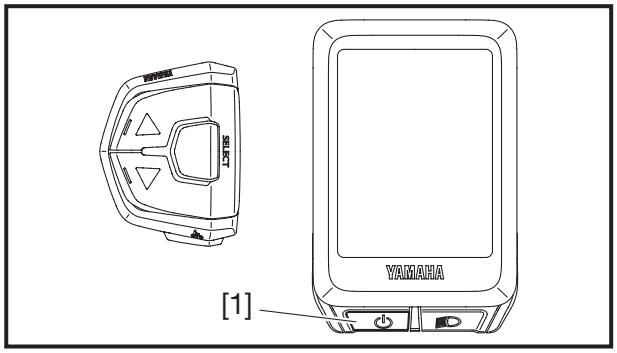
List of Error Codes Display

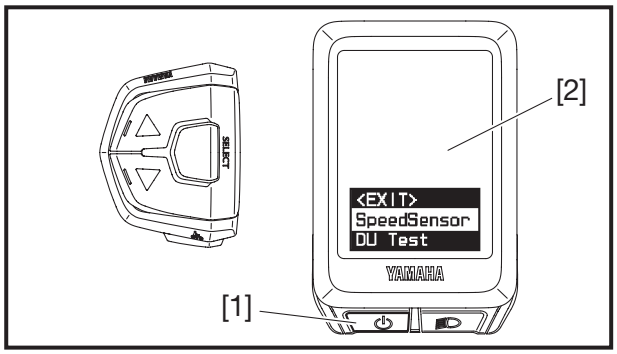
Display pattern	Error codes [1]	Error message [2]	Fault device	Power assist behavior and error code record
	12	METER CHK CONN	Drive Unit – Display Unit communication	Power assist is normal. Error code does not record.
	13	DU-METER INCOMPATIBLE	Display Unit	
	31 32 33 34 35 36 37	TRQ SNSR PWR OFF/ON	Torque sensor	Power assist will stop after determine the error. Error code will record.
	38 39	CRK SNSR PWR OFF/ON	Crank sensor	
	61	CONT PWR OFF/ON	Controller	
	62	MOTOR PWR OFF/ON	Motor	
	63 66 64	CONT PWR OFF/ON	Controller	
	67	MOTOR PWR OFF/ON	Motor	
	68	ENCODER PWR OFF/ON	Encoder	
	71 73 74	BATTERY PWR OFF/ON	Battery	
	79	DC/DC PWR OFF/ON	DC/DC converter	
	–	SPD SNSR CHK MAGNET	Speed sensor	Power assist is limited. Error code does not record.

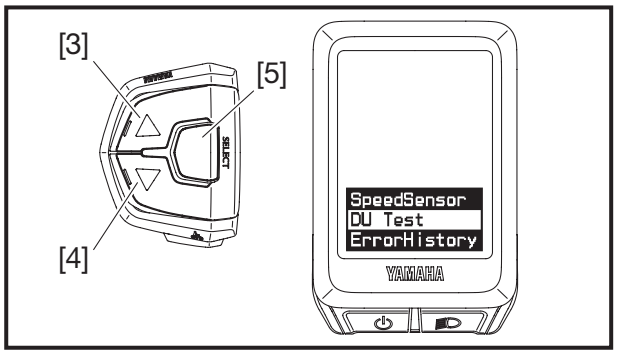
Display pattern	Error codes [1]	Error message [2]	Fault device	Power assist behavior and error code record
Even if the power switch is pressed to turn the power on, the power turns off automatically after 4 seconds.	–	–	Drive Unit - Battery	Power assist will stop after determine the error. Error code will record.
"A:####" and "####" on the assist mode indicator are alternately displayed.  * In the case of Standard mode	–	–	Angle sensor To troubleshoot or check the status of malfunctions related to the angle sensor, use the Yamaha e-kit diagnostic tool that was provided separately by Yamaha. (See page 4-14.)	Drive unit can not recognize the angle of bicycle when the angle sensor has some malfunction. So, power assist will be strange only when starting pedaling. Error code does not record.
The assist mode indicator and function display are flashing.  Flashing	–	–	This is not a malfunction. It is in a state that the operation of the power assist system is normal. This state may occur depending on the pedaling strength and riding speed, or it may occur while the battery internal temperature is -20°C or less or 81°C or higher, but it returns to normal condition if it is confirmed that the e-Bike Systems are normal or the battery internal temperature returns to the normal temperature range.	Power assist will stop during determine the error. Error code does not record.
			(When the wheel where the speed sensor is installed rotates, the speed is displayed on the speedometer section of the display unit.) ➡ This is not a malfunction. It is in a state that the operation of the power assist system is normal. This state may occur depending on the pedaling strength and riding speed, but it returns to normal condition if it is confirmed that the e-Bike Systems are normal.	
			(When charging while the battery is installed to the bicycle) ➡ This state may occur during the battery internal temperature is -20°C or less or 80°C or higher, but it returns to normal condition if battery internal temperature returns to the normal temperature range.	

Self-diagnosis mode

This is the mode in which each type of diagnosis and the content of error codes, which are stored when there is an error, are displayed. You can switch between speed sensor diagnosis mode, Drive Unit diagnosis mode, and error log check mode by the display unit operation.







Operating procedures to self-diagnosis mode

1. Make sure that the power is turned off to the display unit.
   Press the power switch [1] to turn on the power.
   When the power is turned on, the initial display sequence is shown, and then the display will return to normal.

2. Press the power switch [1] again, and continue pressing the switch until the DIAG MENU [2] is displayed (approximately 10 seconds).
   Confirm that the DIAG MENU is displayed, and then release the power switch [1].

TIP

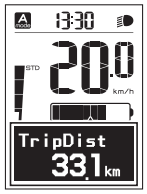
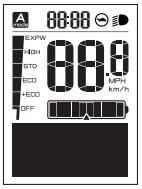
Step 2 must be performed within 30 seconds from performing step 1.

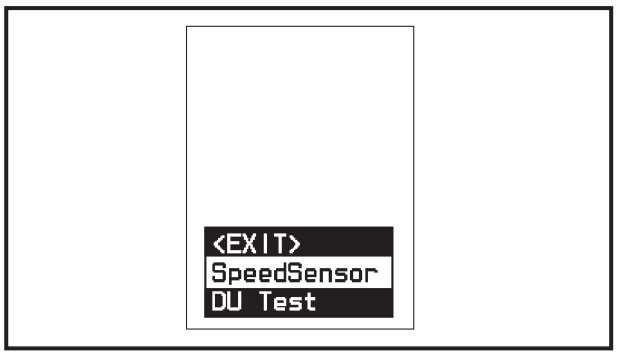
3. Press the assist mode switch [3] or [4] to change the DIAG MENU.
4. Press the function select switch [5] to enter the selected self-diagnosis mode.

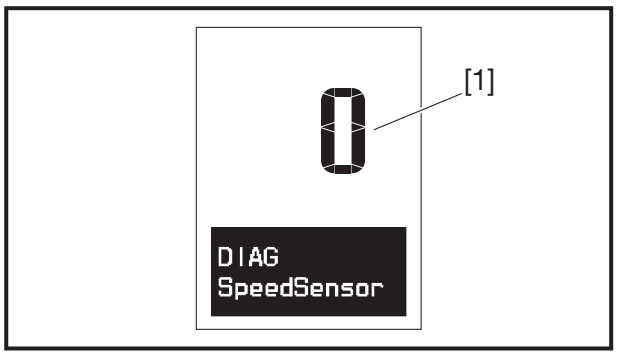
TIP

If you pressed the wrong switch, turn off the power and perform steps 1–4 again.

Self-diagnosis mode table

Layer 1	Layer 2	Layer 3	Layer 4	Description
 Normal display	<EXIT> SpeedSensor DU Test Speed sensor diagnosis mode	DIAG SpeedSensor Speed sensor rotation check		Checks the functionality of the speed sensor operation
		DIAG DU Torque V Torque sensor reference voltage		Displays the condition of the torque sensor reference voltage
	SpeedSensor DU Test ErrorHistory Drive Unit diagnosis mode	DIAG DU Current % Motor current		Checks the functionality of the motor current (%)
		DIAG DU ErrResult Error display		Displays the error from the motor and controller
		DIAG Display Display Unit function check	 All segments Illuminate	Checks the functionality of the display unit operation
	DU Test ErrorHistory Version Error log check mode	ErrHist (NO ERROR) Error log results		Retrieves the fault records from the controller to display the list of error codes
	ErrorHistory Version <EXIT> Firmware ver. check mode	Ver. Hard.M XXXXXXXXXXX Meter hardware		Imports the display hardware version
		Ver. Soft.M XXXXXXXXXXX Meter software		Imports the display firmware version
		Ver. Hard DU XXXXXXXXXXX Drive Unit hardware		Imports the Drive Unit hardware version
		Ver. Soft.DU XXXXXXXXXXX Drive Unit software		Imports the Drive Unit firmware version
	Version <EXIT> SpeedSensor EXIT			EXIT





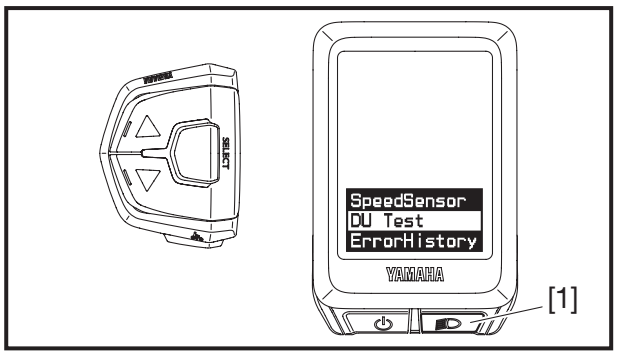
Speed sensor diagnosis mode display method

To determine if the controller is correctly recognizing the speed sensor signal, rotate the wheel to which the speed sensor is connected and make sure that the number of rotations of the wheel indicated matches the actual number of rotations.

1. Enter the speed sensor diagnosis mode.
   See “Operating procedures to self-diagnosis mode”.
2. When you raise and rotate the wheel (with the speed sensor), the rotation number display [1] on the display unit will change.
   Before rotating the wheel (with the speed sensor), <0> will be displayed on the rotation number display [1] of the display unit.
   Each rotation of the wheel is counted. The rotation number display shows up to <999> and will return to <1> when the wheel is rotated 1,000 times.

TIP

- You should at least rotate the wheel (with the speed sensor) 3 times and make sure that <3> is displayed.
- If the speed sensor malfunctions, the number of rotations displayed on the display unit will increase before the wheel (with the speed sensor) is rotated even once, or the number will not increase even when the wheel (with the speed sensor) is rotated once (or there is a delay in the increase in the value).



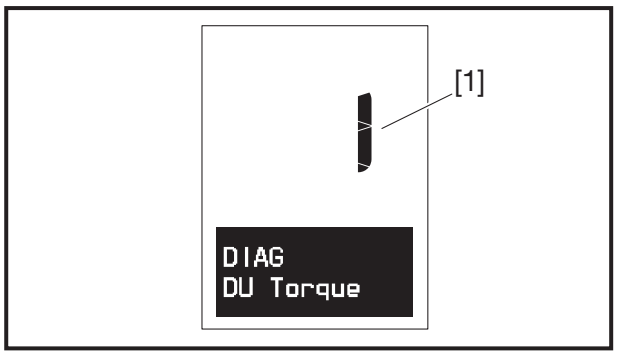
Drive Unit diagnosis mode display method

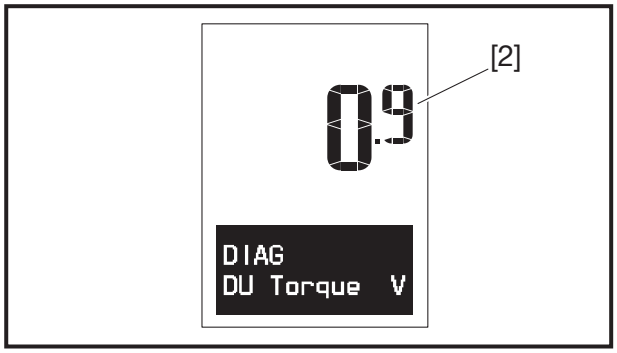
You can check the status of malfunctions in the Drive Unit.

1. Enter the Drive Unit diagnosis mode.
   See “Operating procedures to self-diagnosis mode”.
   Press the light switch [1] to select the torque sensor reference voltage, motor current, error displays (<E2>, <E4>), and the display unit function check.

List of Drive Unit diagnosis mode display methods

Inspection items	Display		
1) Torque sensor reference voltage	DIAG DU Torque V	0.9 DIAG DU Torque V	Values are displayed from 0.0 to 5.0 (V)
Press the light switch			
2) Motor current	DIAG DU Current %	0 ~ 100 DIAG DU Current %	Motor output current in “HIGH” mode is displayed as 0 to 100 (= % output)
Press the light switch			
3) Error display	DIAG DU ErrResult	E2 . E4 DIAG DU ErrResult	When there is an error, either (E2) (motor) or (E4) (controller) is displayed. *There is no display when there are no errors.
Press the light switch			
4) Display Unit function check	DIAG Display	88:88 888	If the Function select switch is pressed all segment will light up.
Press the light switch or Press the power switch			
Power turn off			





* Determining whether or not the torque sensor is good
0.2 to 1.1 V = normal
If the torque sensor is outside of this range
->Implement the torque sensor reference voltage adjustment function.
If the torque sensor remains outside of its normal range after torque sensor reference voltage adjustment
->Torque sensor malfunction (replace)

1) Torque sensor reference voltage

1. Torque sensor reference voltage display

a. <1> is displayed in the diagnosis mode display [1] of the display unit for several seconds.

b. Displayed in units of 0.1 V in the diagnosis data display [2] of the display unit.

c. The torque sensor is normal if the display voltage is 0.2 to 1.1 V.
Perform a torque sensor reference voltage adjustment if values outside of this range are displayed.

d. Press the light switch "  " of the display unit.

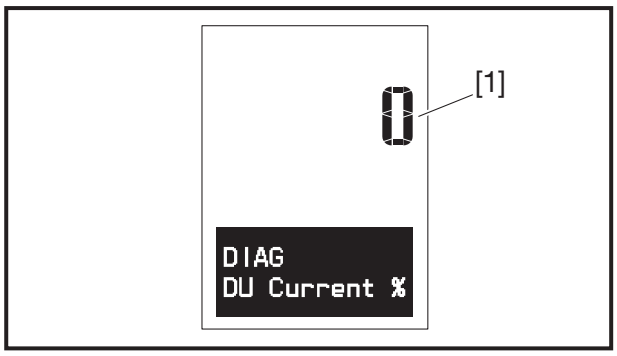
e. Proceed to 2) Motor current.

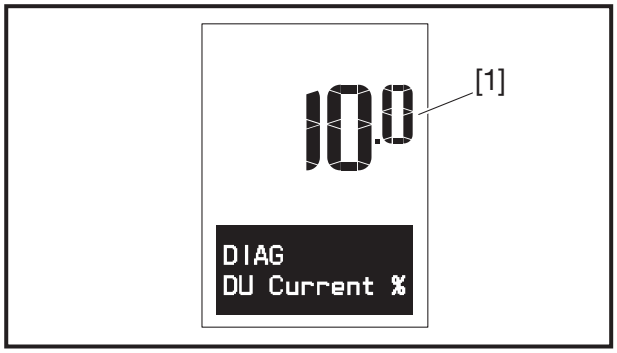
Torque sensor reference voltage adjustment function.

Turn the power on to the display unit and let it stand.
Guideline: Until the power to the display unit is turned off automatically (about 5 min.).

TIP

Do not place feet on the pedals while performing a torque sensor reference voltage adjustment.





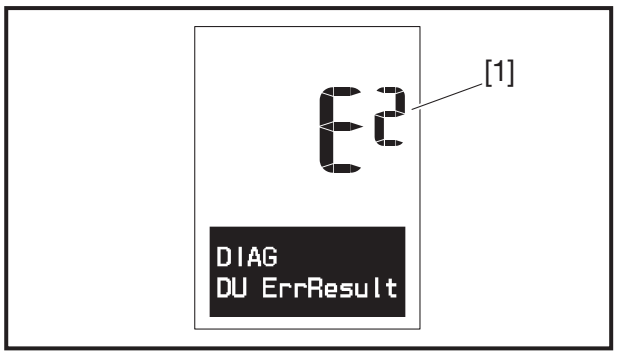
2) Motor current

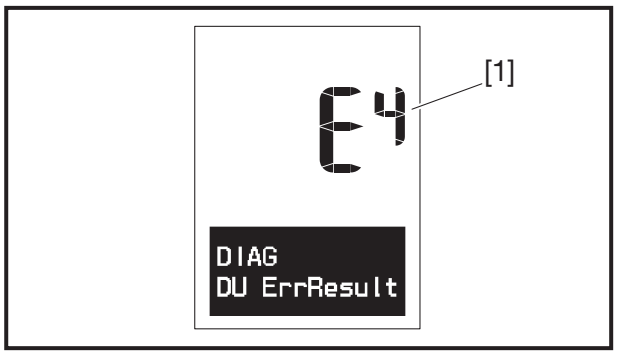
a. The diagnosis data display [1] of the display unit displays the motor output current (%).

b. Confirm that the diagnosis data display [1] of the display unit displays <100> when applying the rear brake and strongly pressing on the pedals.
- <100> is displayed: good
- <100> is not displayed: If the bicycle was ridden immediately before checking the motor current, it is possible that the battery or the controller temperature control is working; therefore, wait until the bicycle cools down.
  If the bicycle was not ridden immediately before checking the motor current, recheck using a battery that is operating properly.
- <100> is not displayed: The battery response is weak in winter (low temperatures), so use a battery that has been stored in a heated room.
- <100> is not displayed: Replace the controller assembly (internal circuit board).

c. Press the light switch "  " of the display unit.

d. Proceed to 3) Error display.





3) Error display

a. When there is a malfunction, <E2> (motor) or <E4> (controller) will be displayed on the diagnosis data display [1] of the display unit.

TIP

Check the error code if <E2> or <E4> is displayed.

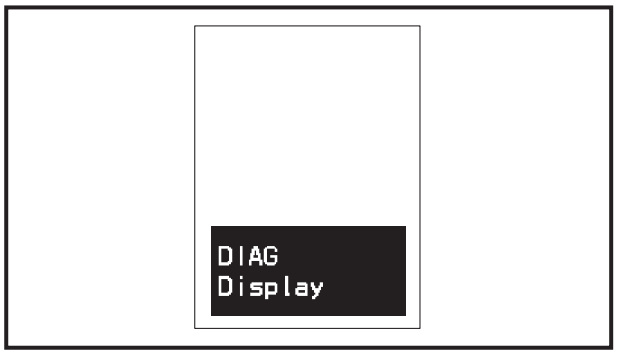
b. Press the light switch "  " of the display unit.

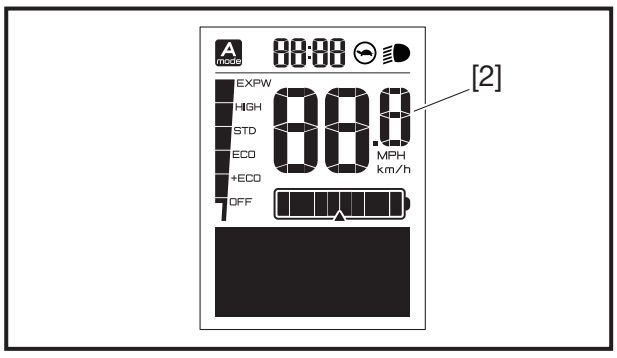
c. Proceed to 4) Display Unit function check.

TIP

Check the error code if <E2> or <E4> is displayed.

- When there is no malfunction, the next [DISPLAY] is displayed without the diagnosis mode [ERR] being displayed.
- Perform a final check to make sure there is no error display in this mode when performing repairs or replacing parts.





4) Display Unit function check

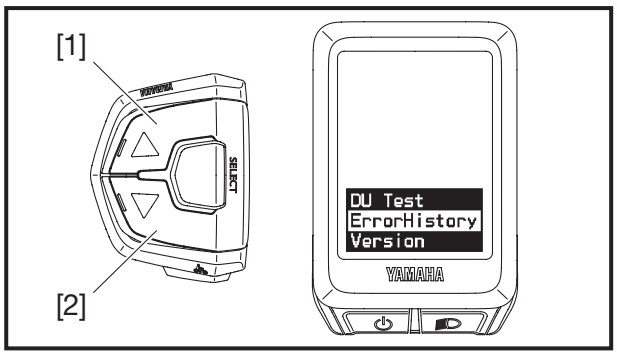
a. Press the function select switch of the remote switch.

b. All segments of the display unit [2] will illuminate.

c. Replace the display unit if there are segments which are not illuminated.

d. Press the power switch "  " of the display unit.

e. The power to the display unit is turned off.



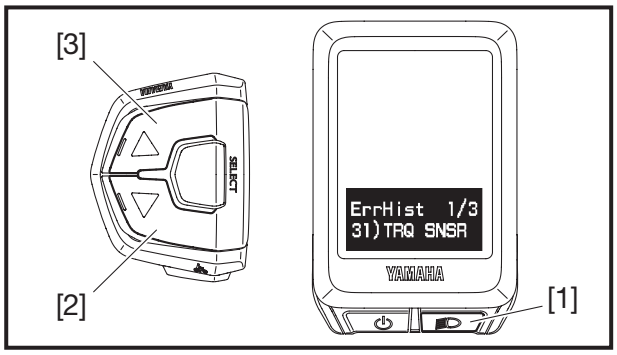
Error log check mode display method

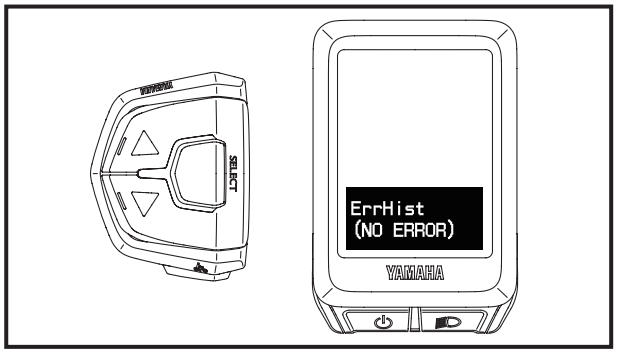
The three most recent types of error codes which are stored when there is an error are stored.

1. Enter the error log check mode.
   See “Operating procedures to self-diagnosis mode”.
   The display unit displays the three most recent error codes. To display the error codes, press the assist mode switch [1] or [2].
   “NO ERROR” will be displayed when there are no errors.
   Press the power switch to turn off the display unit.
   Press the assist mode switches [1] or [2] to switch the display.

List of error log check mode display methods

When there are no error codes	
When there are 1–3 error codes	



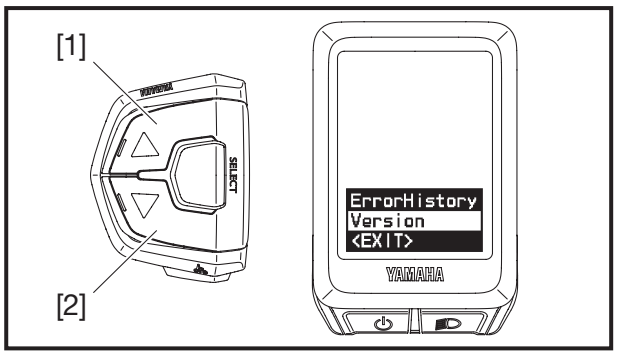


How to delete the malfunction history

1. While pressing the light switch [1] during the error code display, press the assist mode switches [2] or [3].
2. When the history is deleted, “NO ERROR” is displayed. Press the power switch to turn off the display unit.

TIP

Be sure to clear the diagnosis history after replacing the motor or other parts.



Firmware ver. check mode

You can confirm the version information for the hardware and firmware of the Drive Unit and meter.

1. Enter the firmware ver. check mode.
   See “Operating procedures to self-diagnosis mode”.
2. Press the assist mode switch [1] or [2] to display the version information for the meter hardware, meter firmware, Drive Unit hardware, and Drive Unit firmware.

TIP

Detailed version information will be provided from Yamaha separately as needed.

List of firmware ver. check mode display methods

Items	Display
1) Meter hardware version	Ver. Hard.M XXXXXXXXXXX
2) Meter firmware version	Ver. Soft.M XXXXXXXXXXX
3) Drive Unit hardware version	Ver. Hard.DU XXXXXXXXXXX
4) Drive Unit firmware version	Ver. Soft.DU XXXXXXXXXXX

List of error codes and corresponding assist operation

Error codes	Fault device	Fault details	Restoration condition	Action
12	Display Unit	Stopped the communications to the display unit	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal immediately.	1. Check the display unit connector. 2. Replace the display unit assembly. 3. Replace the wire lead 2. 4. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
13	Drive Unit - Display Unit	Communication data failure to display unit		Make sure that the combination of Drive Unit and display unit are correct.
31	Torque sensor	No communication signals	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the torque sensor assembly. 2. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Disconnected		
		Short-circuited		
		Wiring failure between the torque sensor and the controller		
32		Wiring failure between the coil and the circuit board (wire chattering: nearly disconnected)		
33		Abnormal no-load voltage	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled. (When the e-Bike Systems detect the same error several times, the e-Bike Systems cannot return to normal even if the power is cycled.)	1. Perform the torque sensor reference voltage adjustment. 2. Replace the torque sensor assembly. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
34		Abnormal voltage (detected during running / with high constant voltage)		
35				
36		Abnormal voltage (detected during running / others)		
37		Abnormal voltage (detected during running at low speeds)		
38	Crank sensor	Torque sensor or crank sensor failure	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the torque sensor assembly or controller assembly or drive axle assembly.
39		Short-circuited or crank sensor failure		Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
61	Controller	Abnormal voltage of the sensor for U phase current while the motor is not operating	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Abnormal voltage of the sensor for W phase current while the motor is not operating		
62	Motor	Over current is applied to the U phase of the motor	The e-Bike Systems cannot return to normal even if the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Over current is applied to the V phase of the motor		
		Over current is applied to the W phase of the motor		
		Abnormal current is applied to the U phase of the motor		
		Abnormal current is applied to the V phase of the motor		
		Abnormal current is applied to the W phase of the motor		

Error codes	Fault device	Fault details	Restoration condition	Action
63	Controller	Failure in data reading	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
66		External memory data error		
		EEPROM error		
64		Detected circuit board temperature is too low (–20°C)	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled. (When the e-Bike Systems detect the same error several times, the e-Bike Systems cannot return to normal even if the power is cycled.)	
		Detected circuit board temperature is too high (125°C) (including DC circuit)		
		Sensor on the board is nearly detached		
67	Motor	2 lead wires are disconnected	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 2. Replace the wire lead 3 or wire lead 4 or wire lead 5.
		Yellow lead wire is disconnected (U phase)		
		Blue lead wire is disconnected (V phase)		
		White lead wire is disconnected (W phase)		
68	Encoder	Disconnected or led wire is short-circuited	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Check the encoder connector. 2. Replace the encoder lead wire. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 4. Replace the motor assembly.
		Black wire is short-circuited		
71	Battery	Can't receive data from battery correctly	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Check the connection portion between the battery pack and bicycle, charging connector of power lead. 2. Replace the plug D.C. receptacle or wire lead 2. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 4. Replace the battery assembly.
73		Detected battery voltage is too high (45V)		1. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 2. Replace the battery assembly.
74		Internal system failure		Battery capacity indicator may flush abnormally, refer to the battery service manual.
79	DC/DC converter	Abnormal DC current	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the external DC/DC converter. 2. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
–	Speed sensor	Speed sensor disconnected	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal immediately.	1. Check the speed sensor lead connector. 2. Check the gap between the speed sensor and the magnet. 3. Replace the speed sensor set.
		Speed tuning detected	The e-Bike Systems will not return to normal even if the power is switched ON and OFF.	Check whether or not a speed tuning device is installed. If such a device is installed, remove it, and if it is not installed, contact bicycle manufacturer.

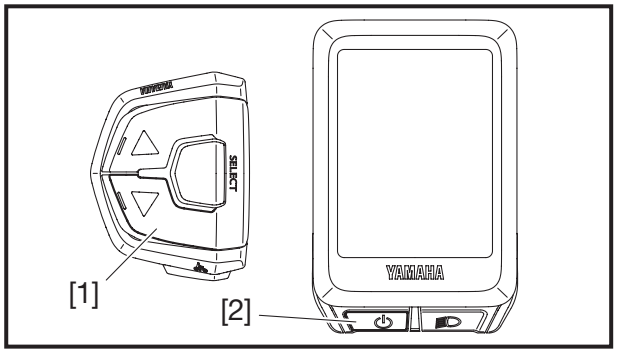
YAMAHA E-KIT DIAGNOSTIC TOOL

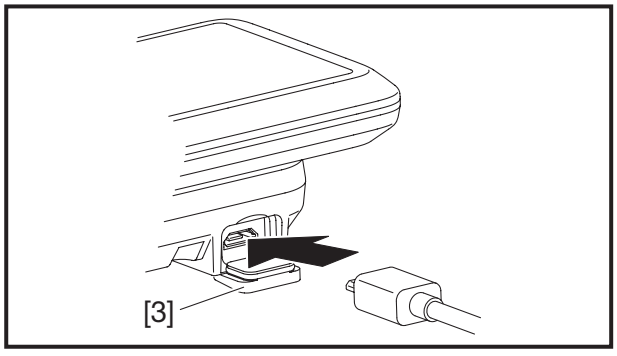
This model uses the Yamaha e-kit diagnostic tool to identify malfunctions.
For more information about using the Yamaha e-kit diagnostic tool, refer to the operation manual that is included with the tool.
There are two types of diagnostic tools.
Old : YAMAHA e-Bike diagnostic software
New : YAMAHA e-Bike Diagnostic Tool (YeDT)

Functions of the Yamaha e-kit diagnostic tool

Drive Unit malfunction diagnosis:
Drive Unit malfunction codes recorded on the controller are read, and the contents are displayed. The freeze frame data (FFD) is the operation data when a malfunction was detected. This data can be used to identify when the malfunction occurred and check the Drive Unit conditions and running conditions when it occurred.

Drive Unit system function test:	Check the operation and the output value of each sensor and actuator.
Battery information:	Displays the battery data.
Angle sensor reset:	Reset the Angle sensor setting. When a new or repaired Drive Unit which equipped with the angle sensor is installed, its initial horizontal level/angle programing is recommended.





Connecting the Yamaha e-kit diagnostic tool

1. Make sure that the power is turned off to the display unit.
2. Continue to press the assist mode switch (down) [1] and power switch [2] over 2 sec.
3. Confirm that the “Pc” is displayed, and then release the assist mode switch (down) [1] and power switch [2].
4. Open the USB port cap [3] of the display.
5. Connect the USB cable to the switch and computer with the Yamaha e-kit diagnostic tool.

TIP

- After disconnecting the USB cable, be sure to close the USB port cap [3].
- For the USB cable, use a Type-A to Micro-B cable that is not an OTG cable.
- When the Yamaha e-kit diagnostic tool is connected to the vehicle, the operation of the multifunction meter and indicators will be different from the normal operation.

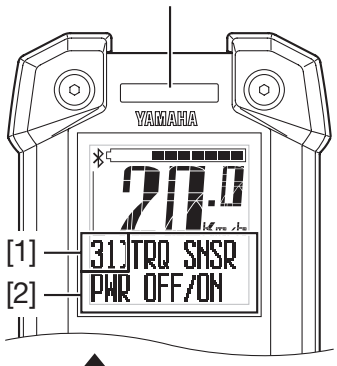
<Display X> Diagnosis function

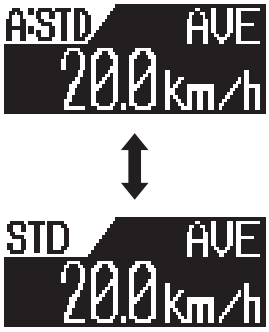
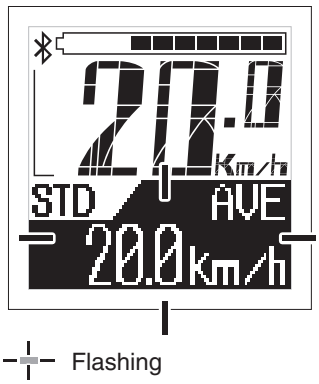
System malfunction

This model is equipped with a self-diagnosis function in order to ensure that the assist system is operating normally.
If this function detects a malfunction in the e-Bike Systems, it immediately operates the assist system under substitute characteristics and displays the error indication to alert the rider that a malfunction has occurred in the e-Bike Systems.
For details about error codes, see the error code tables.

In addition, the Yamaha e-kit diagnostic tool can be connected to this model for more detailed troubleshooting. For details, see “YAMAHA E-KIT DIAGNOSTIC TOOL”.

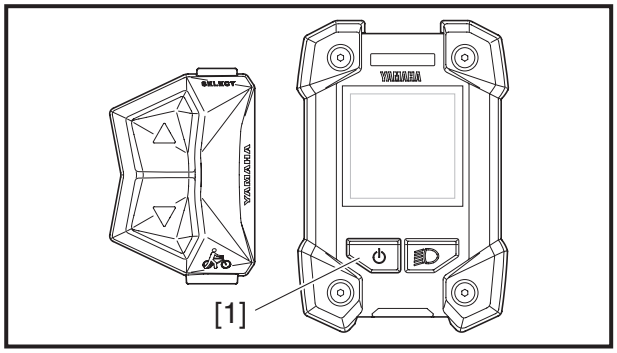
List of Error Codes Display

Display pattern	Error codes [1]	Error message [2]	Fault device	Power assist behavior and error code record
LED indicator: RED  Alternately displays LED indicator: RED  	12	METER CHK CONN	Drive Unit – Display Unit communication	Power assist is normal. Error code does not record.
	13	DU-METER INCOMPATIBLE	Display Unit	
	31	TRQ SNSR PWR OFF/ON	Torque sensor	Power assist will stop after determine the error. Error code will record.
	32			
	33			
	34			
	35			
	36			
	37			
	38	CRK SNSR PWR OFF/ON	Crank sensor	
	39			
	61	CONT PWR OFF/ON	Controller	
	62	MOTOR PWR OFF/ON	Motor	
	63	CONT PWR OFF/ON	Controller	
	66			
	64			
	67	MOTOR PWR OFF/ON	Motor	
	68	ENCODER PWR OFF/ON	Encoder	
	71	BATTERY PWR OFF/ON	Battery	
	73			
	74			
	79	DC/DC PWR OFF/ON	DC/DC converter	
 	–	SPD SNSR CHK MAGNET	Speed sensor	Power assist is limited. Error code does not record.

Display pattern	Error codes [1]	Error message [2]	Fault device	Power assist behavior and error code record
Even if the power switch is pressed to turn the power on, the power turns off automatically after 4 seconds.	–	–	Drive Unit - Battery	Power assist will stop after determine the error. Error code will record.
"A:####" and "####" on the assist mode indicator are alternately displayed.  * In the case of Standard mode	–	–	Angle sensor To troubleshoot or check the status of malfunctions related to the angle sensor, use the Yamaha e-kit diagnostic tool that was provided separately by Yamaha. (See page 5-14.)	Drive unit can not recognize the angle of bicycle when the angle sensor has some malfunction. So, power assist will be strange only when starting pedaling. Error code does not record.
The assist mode indicator and function display are flashing.  Flashing	–	–	This is not a malfunction. It is in a state that the operation of the power assist system is normal. This state may occur depending on the pedaling strength and riding speed, or it may occur while the battery internal temperature is -20°C or less or 81°C or higher, but it returns to normal condition if it is confirmed that the e-Bike Systems are normal or the battery internal temperature returns to the normal temperature range.	Power assist will stop during determine the error. Error code does not record.
			(When the wheel where the speed sensor is installed rotates, the speed is displayed on the speedometer section of the display unit.) ➡ This is not a malfunction. It is in a state that the operation of the power assist system is normal. This state may occur depending on the pedaling strength and riding speed, but it returns to normal condition if it is confirmed that the e-Bike Systems are normal.	
			(When charging while the battery is installed to the bicycle) ➡ This state may occur during the battery internal temperature is -20°C or less or 80°C or higher, but it returns to normal condition if battery internal temperature returns to the normal temperature range.	

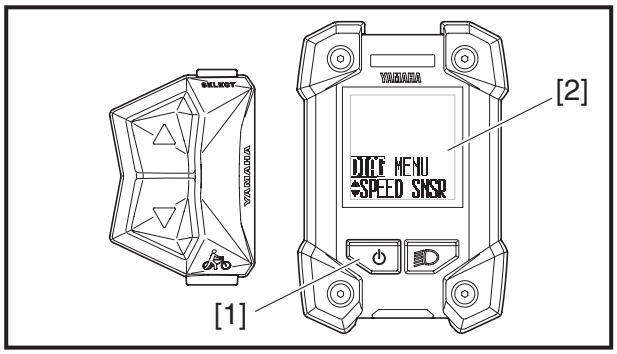
Self-diagnosis mode

This is the mode in which each type of diagnosis and the content of error codes, which are stored when there is an error, are displayed. You can switch between speed sensor diagnosis mode, Drive Unit diagnosis mode, and error log check mode by the display unit operation.



Operating procedures to self-diagnosis mode

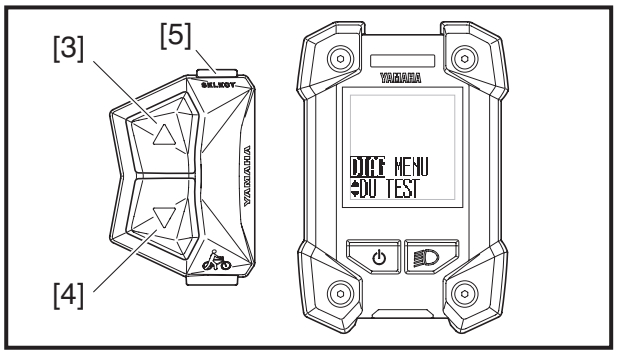
1. Make sure that the power is turned off to the display unit.
   Press the power switch [1] to turn on the power.
   When the power is turned on, the initial display sequence is shown, and then the display will return to normal.



2. Press the power switch [1] again, and continue pressing the switch until the DIAG MENU [2] is displayed (approximately 10 seconds).
   Confirm that the DIAG MENU is displayed, and then release the power switch [1].

TIP

Step 2 must be performed within 30 seconds from performing step 1.

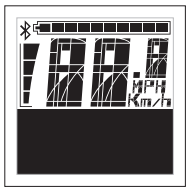
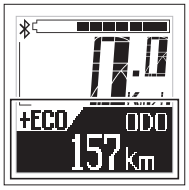


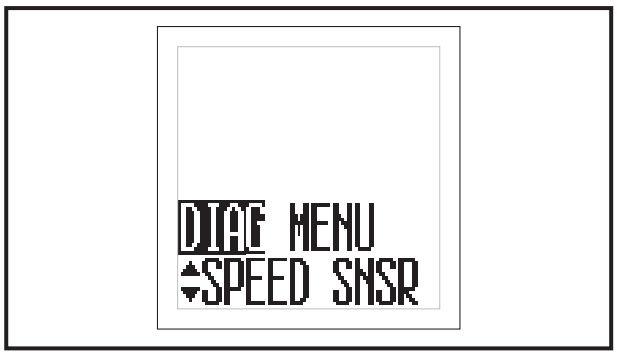
3. Press the assist mode switch [3] or [4] to change the DIAG MENU.
4. Press the function select switch [5] to enter the selected self-diagnosis mode.

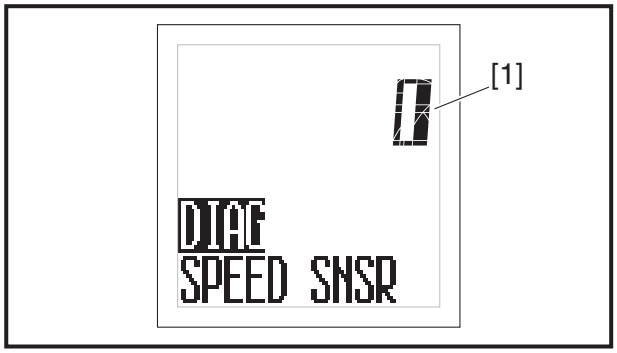
TIP

If you pressed the wrong switch, turn off the power and perform steps 1–4 again.

Self-diagnosis mode table

Layer 1	Layer 2	Layer 3	Layer 4	Description
	DIAG MENU SPEED SNSR Speed sensor diagnosis mode	DIAG SPEED SNSR Speed sensor rotation check		Checks the functionality of the speed sensor operation
	DIAG MENU DU TEST Drive Unit diagnosis mode	DIAG (V) DU TORQUE Torque sensor reference voltage		Displays the condition of the torque sensor reference voltage
		DIAG % DU CURRENT Motor current		Checks the functionality of the motor current (%)
		DIAG ERR DU RESULT Error display		Displays the error from the motor and controller
		DIAG DISPLAY Display Unit function check	 All segments Illuminate	Checks the functionality of the display unit operation
 Normal display	DIAG MENU ERROR INFO Error log check mode	DIAG HIST NO ERROR Error log results		Retrieves the fault records from the controller to display the list of error codes
	DIAG MENU VERSION Firmware ver. check mode	DIAG HARD. M ***-**-*** Meter hardware		Imports the display hardware version
		DIAG SOFT. M ******-** Meter software		Imports the display firmware version
		DIAG HARD. DU ***** Drive Unit hardware		Imports the Drive Unit hardware version
		DIAG SOFT. DU ********** Drive Unit software		Imports the Drive Unit firmware version
	DIAG MENU <EXIT> EXIT			EXIT





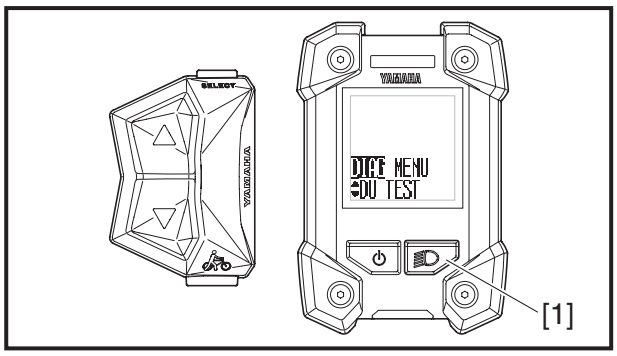
Speed sensor diagnosis mode display method

To determine if the controller is correctly recognizing the speed sensor signal, rotate the wheel to which the speed sensor is connected and make sure that the number of rotations of the wheel indicated matches the actual number of rotations.

1. Enter the speed sensor diagnosis mode.
   See “Operating procedures to self-diagnosis mode”.
2. When you raise and rotate the wheel (with the speed sensor), the rotation number display [1] on the display unit will change.
   Before rotating the wheel (with the speed sensor), <0> will be displayed on the rotation number display [1] of the display unit.
   Each rotation of the wheel is counted. The rotation number display shows up to <999> and will return to <1> when the wheel is rotated 1,000 times.

TIP

- You should at least rotate the wheel (with the speed sensor) 3 times and make sure that <3> is displayed.
- If the speed sensor malfunctions, the number of rotations displayed on the display unit will increase before the wheel (with the speed sensor) is rotated even once, or the number will not increase even when the wheel (with the speed sensor) is rotated once (or there is a delay in the increase in the value).



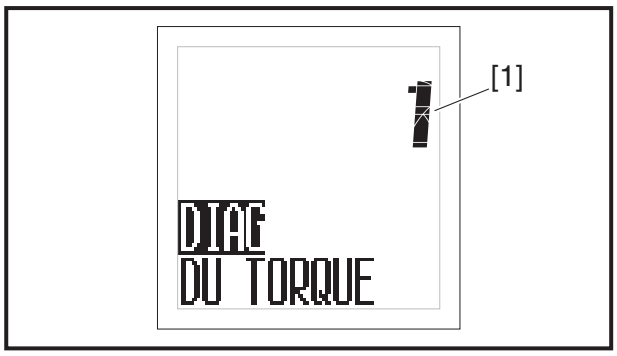
Drive Unit diagnosis mode display method

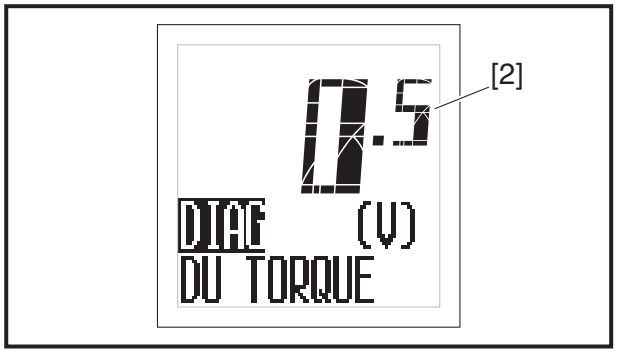
You can check the status of malfunctions in the Drive Unit.

1. Enter the Drive Unit diagnosis mode.
   See “Operating procedures to self-diagnosis mode”.
   Press the light switch [1] to select the torque sensor reference voltage, motor current, error displays (<E2>, <E4>), and the display unit function check.

List of Drive Unit diagnosis mode display methods

Inspection items	Display		
1) Torque sensor reference voltage	DIAG (V) DU TORQUE	0.5 DIAG (V) DU TORQUE	Values are displayed from 0.0 to 5.0 (V)
Press the light switch			
2) Motor current	DIAG % DU CURRENT	0 DIAG % DU CURRENT ~ 100 DIAG % DU CURRENT	Motor output current in “HIGH” mode is displayed as 0 to 100 (= % output)
Press the light switch			
3) Error display	DIAG ERR DU RESULT	E2 DIAG ERR DU RESULT · E4 DIAG ERR DU RESULT	When there is an error, either (E2) (motor) or (E4) (controller) is displayed. *There is no display when there are no errors.
Press the light switch			
4) Display Unit function check	DIAG DISPLAY	188.8 MPH Km/h	If the Function select switch is pressed all segment will light up.
Press the light switch or Press the power switch			
Power turn off			





* Determining whether or not the torque sensor is good
0.2 to 1.1 V = normal
If the torque sensor is outside of this range
->Implement the torque sensor reference voltage adjustment function.
If the torque sensor remains outside of its normal range after torque sensor reference voltage adjustment
->Torque sensor malfunction (replace)

1) Torque sensor reference voltage

1. Torque sensor reference voltage display

a. <1> is displayed in the diagnosis mode display [1] of the display unit for several seconds.

b. Displayed in units of 0.1 V in the diagnosis data display [2] of the display unit.

c. The torque sensor is normal if the display voltage is 0.2 to 1.1 V.
Perform a torque sensor reference voltage adjustment if values outside of this range are displayed.

d. Press the light switch "  " of the display unit.

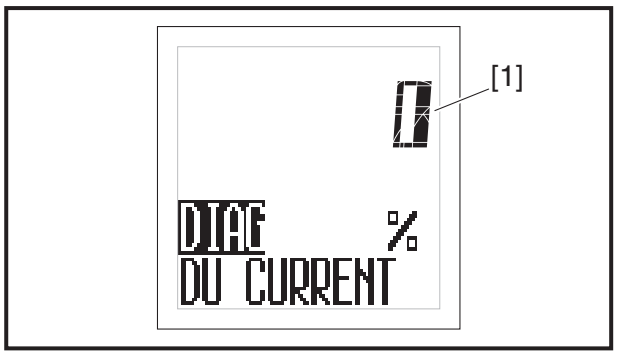
e. Proceed to 2) Motor current.

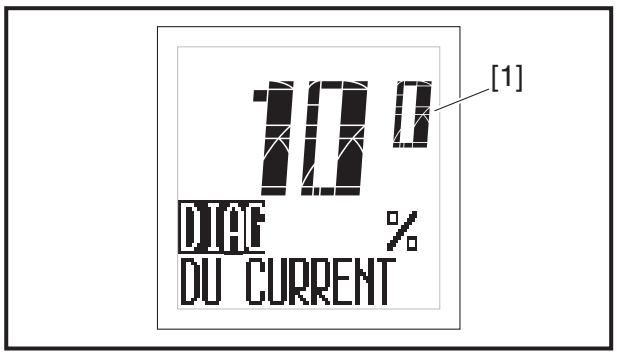
Torque sensor reference voltage adjustment function.

Turn the power on to the display unit and let it stand.
Guideline: Until the power to the display unit is turned off automatically (about 5 min.).

TIP

Do not place feet on the pedals while performing a torque sensor reference voltage adjustment.





2) Motor current

a. The diagnosis data display [1] of the display unit displays the motor output current (%).

b. Confirm that the diagnosis data display [1] of the display unit displays <100> when applying the rear brake and strongly pressing on the pedals.
- <100> is displayed: good
- <100> is not displayed: If the bicycle was ridden immediately before checking the motor current, it is possible that the battery or the controller temperature control is working; therefore, wait until the bicycle cools down.
  If the bicycle was not ridden immediately before checking the motor current, recheck using a battery that is operating properly.
- <100> is not displayed: The battery response is weak in winter (low temperatures), so use a battery that has been stored in a heated room.
- <100> is not displayed: Replace the controller assembly (internal circuit board).

c. Press the light switch "  " of the display unit.

d. Proceed to 3) Error display.

3) Error display

a. When there is a malfunction, <E2> (motor) or <E4> (controller) will be displayed on the diagnosis data display [1] of the display unit.

TIP

Check the error code if <E2> or <E4> is displayed.

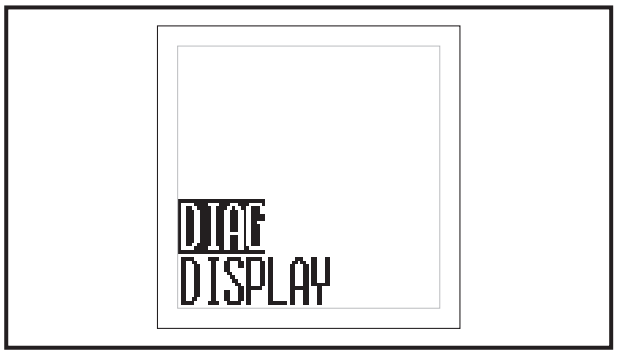
b. Press the light switch "  " of the display unit.

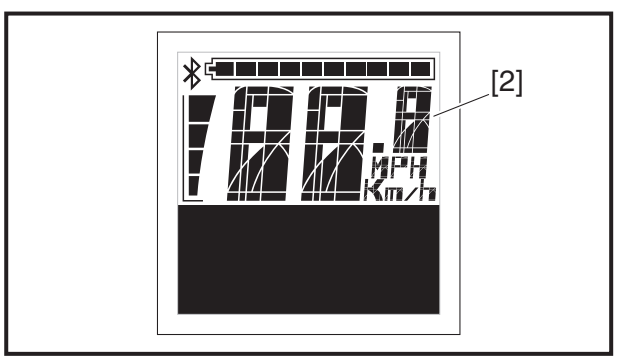
c. Proceed to 4) Display Unit function check.

TIP

Check the error code if <E2> or <E4> is displayed.

- When there is no malfunction, the next [DISPLAY] is displayed without the diagnosis mode [ERR] being displayed.
- Perform a final check to make sure there is no error display in this mode when performing repairs or replacing parts.





4) Display Unit function check

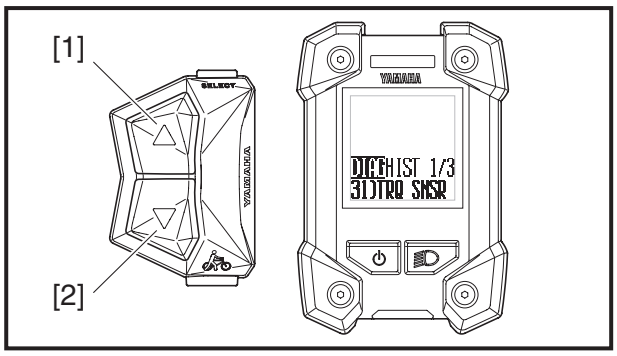
a. Press the function select switch of the remote switch.

b. All segments of the display unit [2] will illuminate.

c. Replace the display unit if there are segments which are not illuminated.

d. Press the power switch "  " of the display unit.

e. The power to the display unit is turned off.



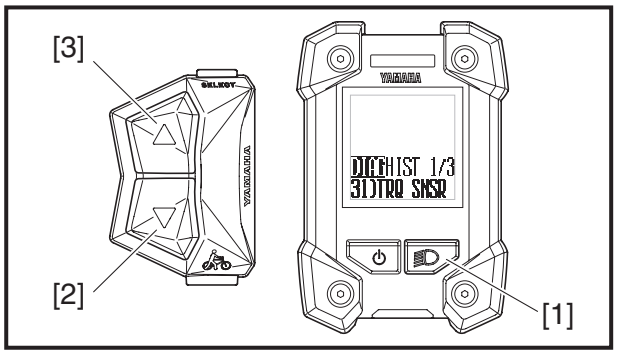
Error log check mode display method

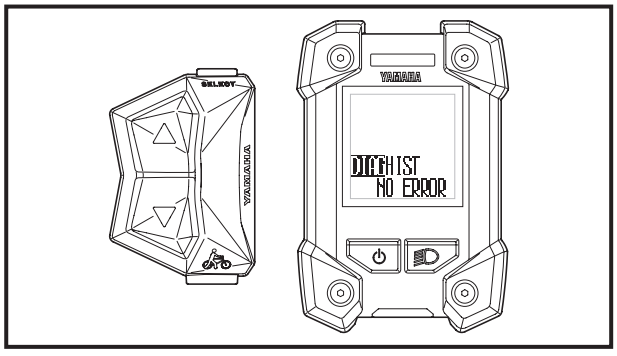
The three most recent types of error codes which are stored when there is an error are stored.

1. Enter the error log check mode.
   See “Operating procedures to self-diagnosis mode”.
   The display unit displays the three most recent error codes. To display the error codes, press the assist mode switch [1] or [2].
   “NO ERROR” will be displayed when there are no errors.
   Press the power switch to turn off the display unit.
   Press the assist mode switches [1] or [2] to switch the display.

List of error log check mode display methods

When there are no error codes	
When there are 1–3 error codes	



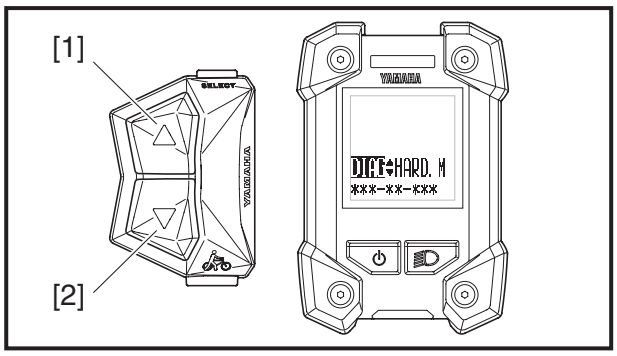


How to delete the malfunction history

1. While pressing the light switch [1] during the error code display, press the assist mode switches [2] or [3].
2. When the history is deleted, “NO ERROR” is displayed. Press the power switch to turn off the display unit.

TIP

Be sure to clear the diagnosis history after replacing the motor or other parts.



Firmware ver. check mode

You can confirm the version information for the hardware and firmware of the Drive Unit and meter.

1. Enter the firmware ver. check mode.
   See “Operating procedures to self-diagnosis mode”.
2. Press the assist mode switch [1] or [2] to display the version information for the meter hardware, meter firmware, Drive Unit hardware, and Drive Unit firmware.

TIP

Detailed version information will be provided from Yamaha separately as needed.

List of firmware ver. check mode display methods

Items	Display
1) Meter hardware version	DIAG HARD. M ***-**-***
2) Meter firmware version	DIAG SOFT. M ******-**
3) Drive Unit hardware version	DIAG HARD. DU *****
4) Drive Unit firmware version	DIAG SOFT. DU **********

List of error codes and corresponding assist operation

Error codes	Fault device	Fault details	Restoration condition	Action
12	Display Unit	Stopped the communications to the display unit	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal immediately.	1. Check the display unit connector. 2. Replace the display unit assembly. 3. Replace the wire lead 2. 4. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
13	Drive Unit - Display Unit	Communication data failure to display unit		Make sure that the combination of Drive Unit and display unit are correct.
31	Torque sensor	No communication signals	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the torque sensor assembly. 2. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Disconnected		
		Short-circuited		
		Wiring failure between the torque sensor and the controller		
32		Wiring failure between the coil and the circuit board (wire chattering: nearly disconnected)		
33		Abnormal no-load voltage	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled. (When the e-Bike Systems detect the same error several times, the e-Bike Systems cannot return to normal even if the power is cycled.)	1. Perform the torque sensor reference voltage adjustment. 2. Replace the torque sensor assembly. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
34		Abnormal voltage (detected during running / with high constant voltage)		
35				
36		Abnormal voltage (detected during running / others)		
37		Abnormal voltage (detected during running at low speeds)		
38	Crank sensor	Torque sensor or crank sensor failure	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the torque sensor assembly or controller assembly or drive axle assembly.
39		Short-circuited or crank sensor failure		Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
61	Controller	Abnormal voltage of the sensor for U phase current while the motor is not operating	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Abnormal voltage of the sensor for W phase current while the motor is not operating		
62	Motor	Over current is applied to the U phase of the motor	The e-Bike Systems cannot return to normal even if the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Over current is applied to the V phase of the motor		
		Over current is applied to the W phase of the motor		
		Abnormal current is applied to the U phase of the motor		
		Abnormal current is applied to the V phase of the motor		
		Abnormal current is applied to the W phase of the motor		

Error codes	Fault device	Fault details	Restoration condition	Action
63	Controller	Failure in data reading	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
66		External memory data error		
		EEPROM error		
64		Detected circuit board temperature is too low (–20°C)	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled. (When the e-Bike Systems detect the same error several times, the e-Bike Systems cannot return to normal even if the power is cycled.)	
		Detected circuit board temperature is too high (125°C) (including DC circuit)		
		Sensor on the board is nearly detached		
67	Motor	2 lead wires are disconnected	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 2. Replace the wire lead 3 or wire lead 4 or wire lead 5.
		Yellow lead wire is disconnected (U phase)		
		Blue lead wire is disconnected (V phase)		
		White lead wire is disconnected (W phase)		
68	Encoder	Disconnected or led wire is short-circuited	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Check the encoder connector. 2. Replace the encoder lead wire. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 4. Replace the motor assembly.
		Black wire is short-circuited		
71	Battery	Can't receive data from battery correctly	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Check the connection portion between the battery pack and bicycle, charging connector of power lead. 2. Replace the plug D.C. receptacle or wire lead 2. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 4. Replace the battery assembly.
73		Detected battery voltage is too high (45V)		1. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 2. Replace the battery assembly.
74		Internal system failure		Battery capacity indicator may flush abnormally, refer to the battery service manual.
79	DC/DC converter	Abnormal DC current	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the external DC/DC converter. 2. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
–	Speed sensor	Speed sensor disconnected	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal immediately.	1. Check the speed sensor lead connector. 2. Check the gap between the speed sensor and the magnet. 3. Replace the speed sensor set.
		Speed tuning detected	The e-Bike Systems will not return to normal even if the power is switched ON and OFF.	Check whether or not a speed tuning device is installed. If such a device is installed, remove it, and if it is not installed, contact bicycle manufacturer.

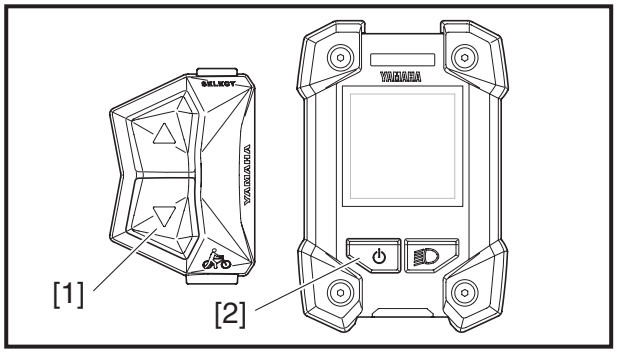
YAMAHA E-KIT DIAGNOSTIC TOOL

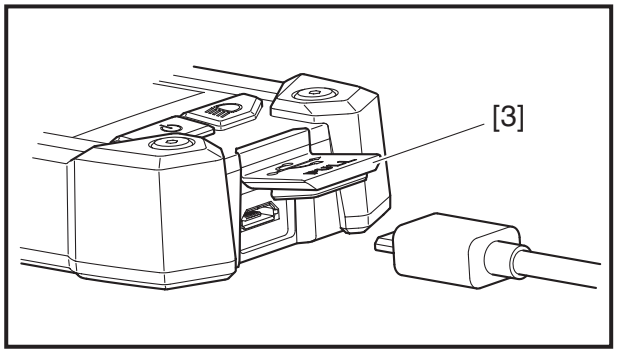
This model uses the Yamaha e-kit diagnostic tool to identify malfunctions.
For more information about using the Yamaha e-kit diagnostic tool, refer to the operation manual that is included with the tool.
There are two types of diagnostic tools.
Old : YAMAHA e-Bike diagnostic software
New : YAMAHA e-Bike Diagnostic Tool (YeDT)

Functions of the Yamaha e-kit diagnostic tool

Drive Unit malfunction diagnosis:
Drive Unit malfunction codes recorded on the controller are read, and the contents are displayed. The freeze frame data (FFD) is the operation data when a malfunction was detected. This data can be used to identify when the malfunction occurred and check the Drive Unit conditions and running conditions when it occurred.

Drive Unit system function test:	Check the operation and the output value of each sensor and actuator.
Battery information:	Displays the battery data.
Angle sensor reset:	Reset the Angle sensor setting. When a new or repaired Drive Unit which equipped with the angle sensor is installed, its initial horizontal level/angle programing is recommended.





Connecting the Yamaha e-kit diagnostic tool

1. Make sure that the power is turned off to the display unit.
2. Continue to press the assist mode switch (down) [1] and power switch [2] over 2 sec.
3. Confirm that the “Pc” is displayed, and then release the assist mode switch (down) [1] and power switch [2].
4. Open the USB port cap [3] of the display.
5. Connect the USB cable to the switch and computer with the Yamaha e-kit diagnostic tool.

TIP

- After disconnecting the USB cable, be sure to close the USB port cap [3].
- For the USB cable, use a Type-A to Micro-B cable that is not an OTG cable.
- When the Yamaha e-kit diagnostic tool is connected to the vehicle, the operation of the multifunction meter and indicators will be different from the normal operation.

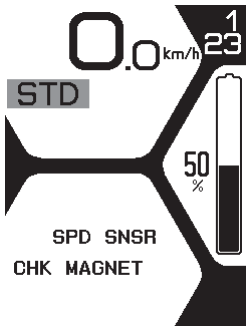
<Display C> Diagnosis function

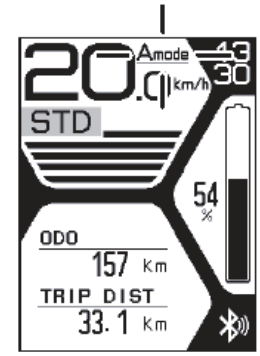
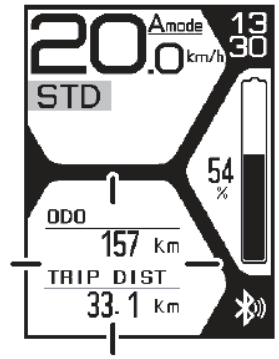
System malfunction

This model is equipped with a self-diagnosis function in order to ensure that the assist system is operating normally.
If this function detects a malfunction in the e-Bike Systems, it immediately operates the assist system under substitute characteristics and displays the error indication to alert the rider that a malfunction has occurred in the e-Bike Systems.
For details about error codes, see the error code tables.

In addition, the Yamaha e-kit diagnostic tool can be connected to this model for more detailed troubleshooting. For details, see “YAMAHA E-KIT DIAGNOSTIC TOOL”.

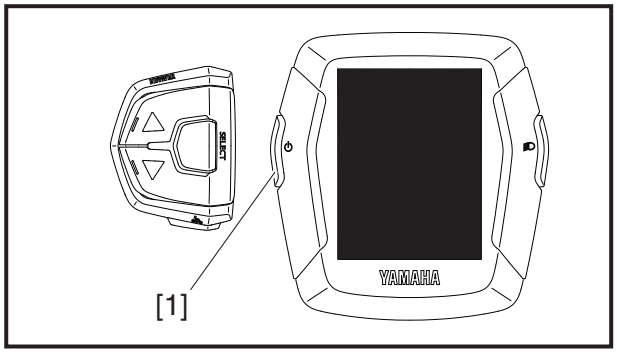
List of Error Codes Display

Display pattern	Error codes [1]	Error message [2]	Fault device	Power assist behavior and error code record
	12	METER CHK CONN	Drive Unit – Display Unit communication	Power assist is normal. Error code does not record.
	13	DU-METER INCOMPATIBLE	Display Unit	
	31	TRQ SNSR PWR OFF/ON	Torque sensor	Power assist will stop after determine the error. Error code will record.
	32			
	33			
	34			
	35			
	36			
	37			
	38	CRK SNSR PWR OFF/ON	Crank sensor	
	39			
	61	CONT PWR OFF/ON	Controller	
	62	MOTOR PWR OFF/ON	Motor	
	63	CONT PWR OFF/ON	Controller	
	66			
	64			
	67	MOTOR PWR OFF/ON	Motor	
	68	ENCODER PWR OFF/ON	Encoder	
	71	BATTERY PWR OFF/ON	Battery	
	73			
	74			
	79	DC/DC PWR OFF/ON	DC/DC converter	
	–	SPD SNSR CHK MAGNET	Speed sensor	Power assist is limited. Error code does not record.

Display pattern	Error codes [1]	Error message [2]	Fault device	Power assist behavior and error code record
Even if the power switch is pressed to turn the power on, the power turns off automatically after 4 seconds.	–	–	Drive Unit - Battery	Power assist will stop after determine the error. Error code will record.
The Automatic Support mode indicator is flashing.  Flashing	–	–	Angle sensor To troubleshoot or check the status of malfunctions related to the angle sensor, use the Yamaha e-kit diagnostic tool that was provided separately by Yamaha. (See page 6-14.)	Drive unit can not recognize the angle of bicycle when the angle sensor has some malfunction. So, power assist will be strange only when starting pedaling. Error code does not record.
The function display is flashing.  Flashing	–	–	This is not a malfunction. It is in a state that the operation of the power assist system is normal. This state may occur depending on the pedaling strength and riding speed, or it may occur while the battery internal temperature is -20°C or less or 81°C or higher, but it returns to normal condition if it is confirmed that the e-Bike Systems are normal or the battery internal temperature returns to the normal temperature range.	Power assist will stop during determine the error. Error code does not record.
			(When the wheel where the speed sensor is installed rotates, the speed is displayed on the speedometer section of the display unit.) ➡ This is not a malfunction. It is in a state that the operation of the power assist system is normal. This state may occur depending on the pedaling strength and riding speed, but it returns to normal condition if it is confirmed that the e-Bike Systems are normal.	
			(When charging while the battery is installed to the bicycle) ➡ This state may occur during the battery internal temperature is -20°C or less or 80°C or higher, but it returns to normal condition if battery internal temperature returns to the normal temperature range.	

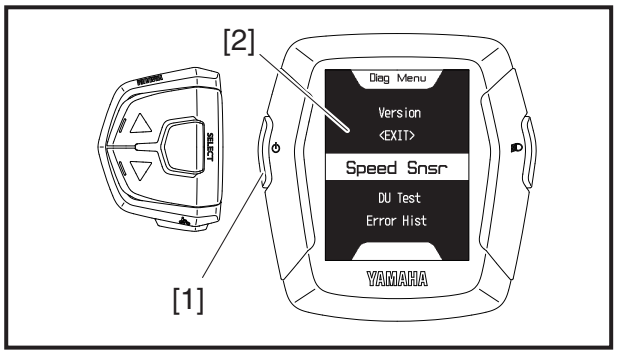
Self-diagnosis mode

This is the mode in which each type of diagnosis and the content of error codes, which are stored when there is an error, are displayed. You can switch between speed sensor diagnosis mode, Drive Unit diagnosis mode, and error log check mode by the display unit operation.



Operating procedures to self-diagnosis mode

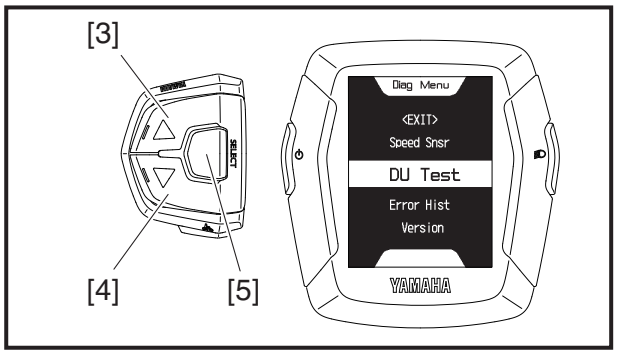
1. Make sure that the power is turned off to the display unit.
   Press the power switch [1] to turn on the power.
   When the power is turned on, the initial display sequence is shown, and then the display will return to normal.



2. Press the power switch [1] again, and continue pressing the switch until the DIAG MENU [2] is displayed (approximately 10 seconds).
   Confirm that the DIAG MENU is displayed, and then release the power switch [1].

TIP

Step 2 must be performed within 30 seconds from performing step 1.

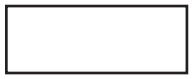


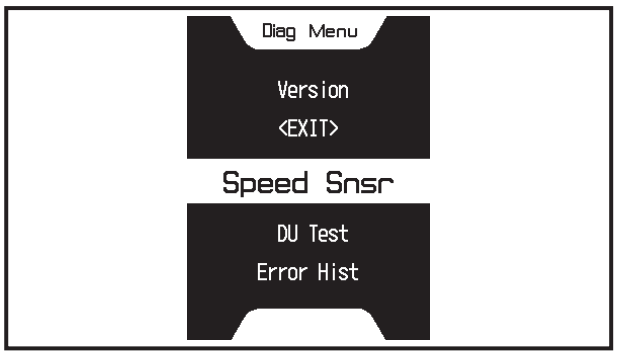
3. Press the assist mode switch [3] or [4] to change the DIAG MENU.
4. Press the function select switch [5] to enter the selected self-diagnosis mode.

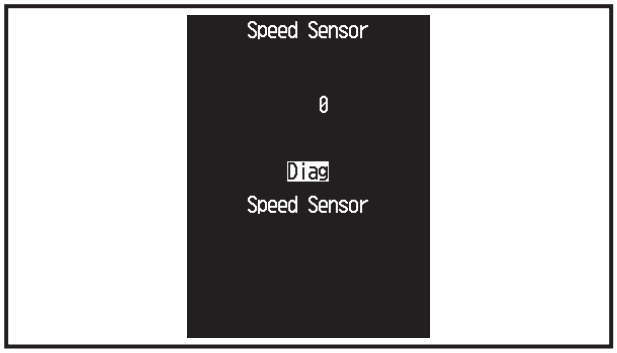
TIP

If you pressed the wrong switch, turn off the power and perform steps 1–4 again.

Self-diagnosis mode table

Layer 1	Layer 2	Layer 3	Layer 4	Description
 Normal display	 Speed Snsr Speed sensor diagnosis mode	 Speed sensor rotation check		Checks the functionality of the speed sensor operation
		 Torque sensor reference voltage		Displays the condition of the torque sensor reference voltage
	 DU Test Drive Unit diagnosis mode	 Motor current		Checks the functionality of the motor current (%)
		 Error display		Displays the error from the motor and controller
		 Display Unit function check	 All segments Illuminate	Checks the functionality of the display unit operation
	 Error Hist Error log check mode	 Error log results		Retrieves the fault records from the controller to display the list of error codes
		 Meter hardware		Imports the display hardware version
	 Version Firmware ver. check mode	 Meter software		Imports the display firmware version
		 Drive Unit hardware		Imports the Drive Unit hardware version
		 Drive Unit software		Imports the Drive Unit firmware version
	 EXIT			EXIT





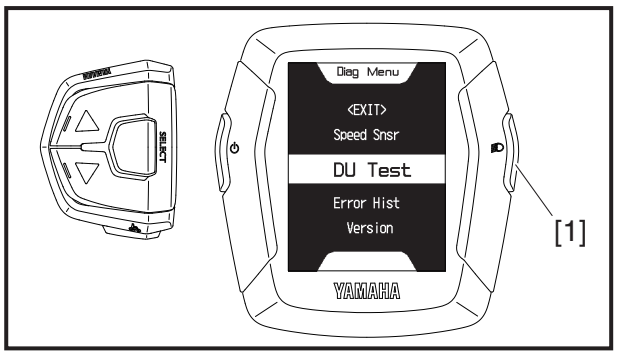
Speed sensor diagnosis mode display method

To determine if the controller is correctly recognizing the speed sensor signal, rotate the wheel to which the speed sensor is connected and make sure that the number of rotations of the wheel indicated matches the actual number of rotations.

1. Enter the speed sensor diagnosis mode.
   See “Operating procedures to self-diagnosis mode”.
2. When you raise and rotate the wheel (with the speed sensor), the rotation number display [1] on the display unit will change.
   Before rotating the wheel (with the speed sensor), <0> will be displayed on the rotation number display [1] of the display unit.
   Each rotation of the wheel is counted. The rotation number display shows up to <999> and will return to <1> when the wheel is rotated 1,000 times.

TIP

- You should at least rotate the wheel (with the speed sensor) 3 times and make sure that <3> is displayed.
- If the speed sensor malfunctions, the number of rotations displayed on the display unit will increase before the wheel (with the speed sensor) is rotated even once, or the number will not increase even when the wheel (with the speed sensor) is rotated once (or there is a delay in the increase in the value).



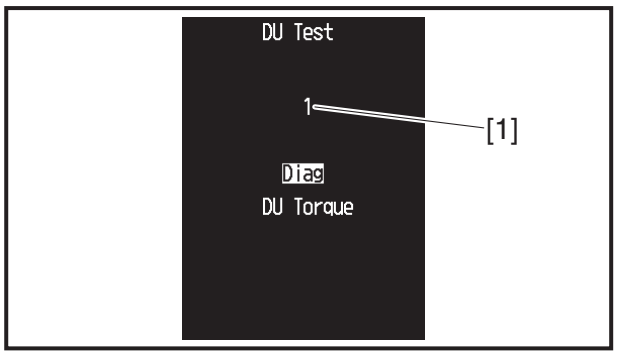
Drive Unit diagnosis mode display method

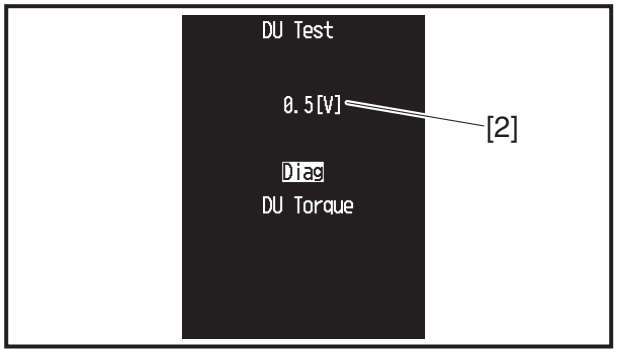
You can check the status of malfunctions in the Drive Unit.

1. Enter the Drive Unit diagnosis mode.
   See “Operating procedures to self-diagnosis mode”.
   Press the light switch [1] to select the torque sensor reference voltage, motor current, error displays (<E2>, <E4>), and the display unit function check.

List of Drive Unit diagnosis mode display methods

Inspection items	Display	
1) Torque sensor reference voltage	Diag DU Torque DU Test 0.5[V] Diag DU Torque	Values are displayed from 0.0 to 5.0 (V)
Press the light switch		
2) Motor current	Diag DU Current DU Test 10% Diag DU Current DU Test 100% Diag DU Current	Motor output current in “HIGH” mode is displayed as 0 to 100 (= % output)
Press the light switch		
3) Error display	Diag Err DU Result DU Test E2 Diag Err DU Result DU Test E4 Diag Err DU Result	When there is an error, either (E2) (motor) or (E4) (controller) is displayed. *There is no display when there are no errors.
Press the light switch		
4) Display Unit function check	Diag Display DU Test Diag Display	If the Function select switch is pressed all segment will light up.
Press the light switch or Press the power switch		
Power turn off		





* Determining whether or not the torque sensor is good
0.2 to 1.1 V = normal
If the torque sensor is outside of this range
->Implement the torque sensor reference voltage adjustment function.
If the torque sensor remains outside of its normal range after torque sensor reference voltage adjustment
->Torque sensor malfunction (replace)

1) Torque sensor reference voltage

1. Torque sensor reference voltage display

a. <1> is displayed in the diagnosis mode display [1] of the display unit for several seconds.

b. Displayed in units of 0.1 V in the diagnosis data display [2] of the display unit.

c. The torque sensor is normal if the display voltage is 0.2 to 1.1 V.
Perform a torque sensor reference voltage adjustment if values outside of this range are displayed.

d. Press the light switch "" of the display unit.

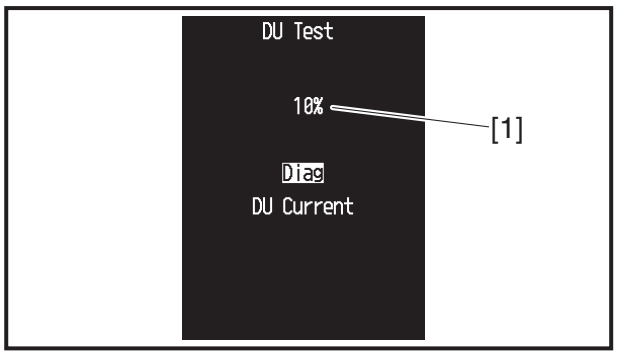
e. Proceed to 2) Motor current.

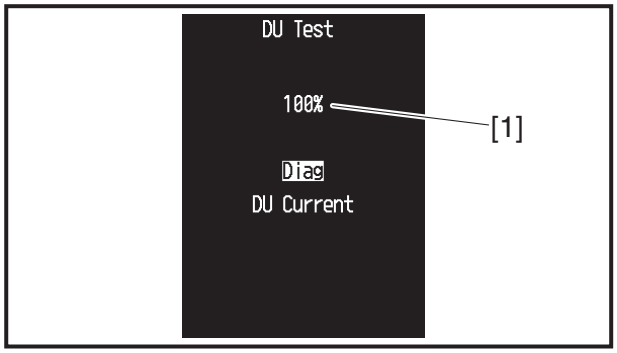
Torque sensor reference voltage adjustment function.

Turn the power on to the display unit and let it stand.
Guideline: Until the power to the display unit is turned off automatically (about 5 min.).

TIP

Do not place feet on the pedals while performing a torque sensor reference voltage adjustment.





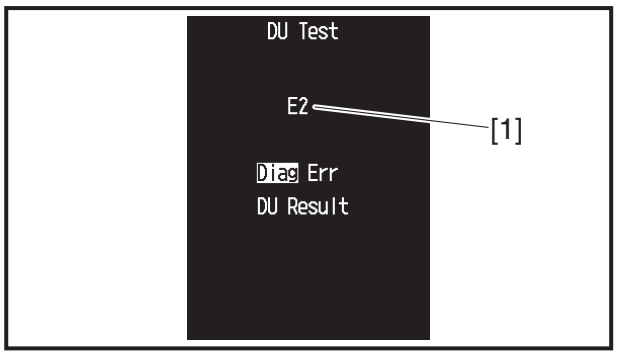
2) Motor current

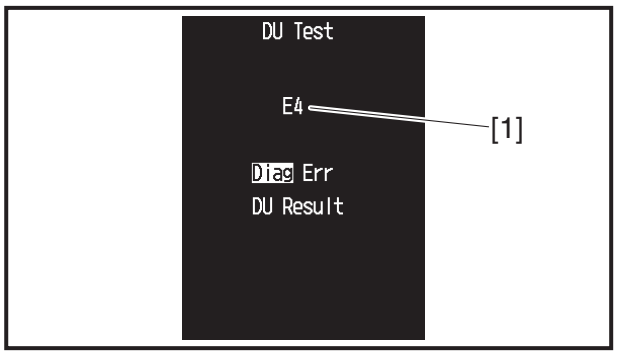
a. The diagnosis data display [1] of the display unit displays the motor output current (%).

b. Confirm that the diagnosis data display [1] of the display unit displays <100> when applying the rear brake and strongly pressing on the pedals.
- <100> is displayed: good
- <100> is not displayed: If the bicycle was ridden immediately before checking the motor current, it is possible that the battery or the controller temperature control is working; therefore, wait until the bicycle cools down.
  If the bicycle was not ridden immediately before checking the motor current, recheck using a battery that is operating properly.
- <100> is not displayed: The battery response is weak in winter (low temperatures), so use a battery that has been stored in a heated room.
- <100> is not displayed: Replace the controller assembly (internal circuit board).

c. Press the light switch "" of the display unit.

d. Proceed to 3) Error display.





3) Error display

a. When there is a malfunction, <E2> (motor) or <E4> (controller) will be displayed on the diagnosis data display [1] of the display unit.

TIP

Check the error code if <E2> or <E4> is displayed.

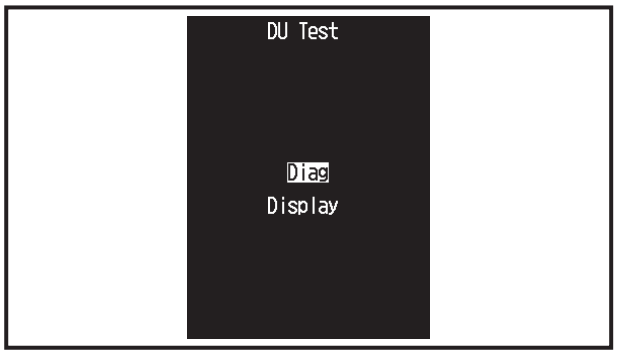
b. Press the light switch "" of the display unit.

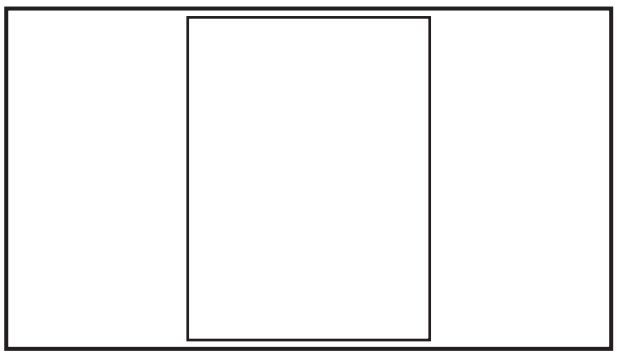
c. Proceed to 4) Display Unit function check.

TIP

Check the error code if <E2> or <E4> is displayed.

- When there is no malfunction, the next [DISPLAY] is displayed without the diagnosis mode [ERR] being displayed.
- Perform a final check to make sure there is no error display in this mode when performing repairs or replacing parts.





4) Display Unit function check

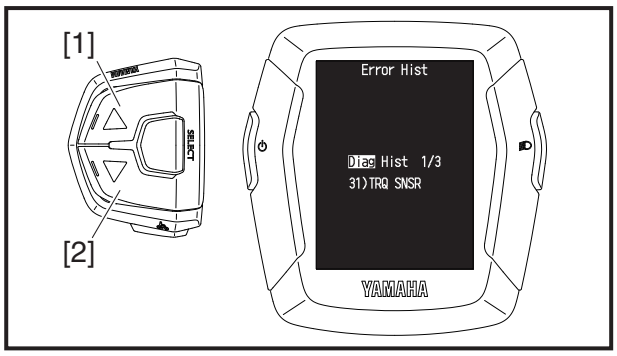
a. Press the function select switch of the remote switch.

b. All segments of the display unit [2] will illuminate.

c. Replace the display unit if there are segments which are not illuminated.

d. Press the power switch "" of the display unit.

e. The power to the display unit is turned off.

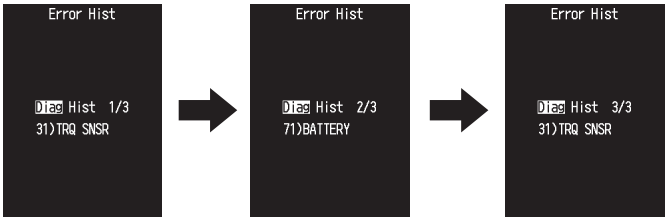


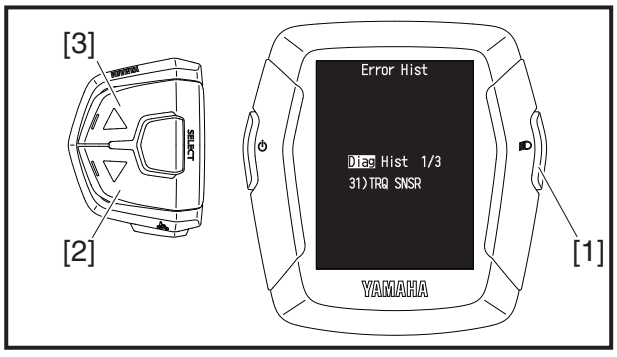
Error log check mode display method

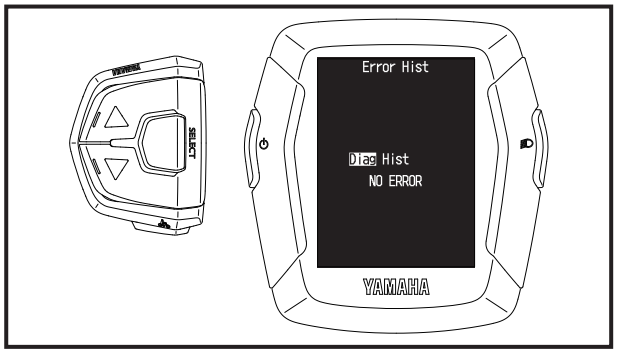
The three most recent types of error codes which are stored when there is an error are stored.

1. Enter the error log check mode.
   See “Operating procedures to self-diagnosis mode”.
   The display unit displays the three most recent error codes. To display the error codes, press the assist mode switch [1] or [2].
   “NO ERROR” will be displayed when there are no errors.
   Press the power switch to turn off the display unit.
   Press the assist mode switches [1] or [2] to switch the display.

List of error log check mode display methods

When there are no error codes	
When there are 1–3 error codes	



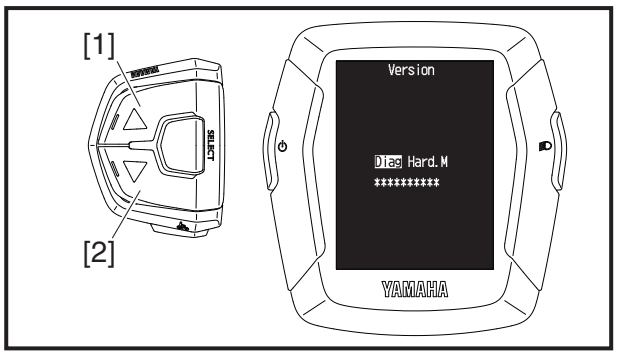


How to delete the malfunction history

1. While pressing the light switch [1] during the error code display, press the assist mode switches [2] or [3].
2. When the history is deleted, “NO ERROR” is displayed. Press the power switch to turn off the display unit.

TIP

Be sure to clear the diagnosis history after replacing the motor or other parts.



Firmware ver. check mode

You can confirm the version information for the hardware and firmware of the Drive Unit and meter.

1. Enter the firmware ver. check mode.
   See “Operating procedures to self-diagnosis mode”.
2. Press the assist mode switch [1] or [2] to display the version information for the meter hardware, meter firmware, Drive Unit hardware, and Drive Unit firmware.

TIP

Detailed version information will be provided from Yamaha separately as needed.

List of firmware ver. check mode display methods

Items	Display
1) Meter hardware version	
2) Meter firmware version	
3) Drive Unit hardware version	
4) Drive Unit firmware version	

List of error codes and corresponding assist operation

Error codes	Fault device	Fault details	Restoration condition	Action
12	Display Unit	Stopped the communications to the display unit	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal immediately.	1. Check the display unit connector. 2. Replace the display unit assembly. 3. Replace the wire lead 2. 4. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
13	Drive Unit - Display Unit	Communication data failure to display unit		Make sure that the combination of Drive Unit and display unit are correct.
31	Torque sensor	No communication signals	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the torque sensor assembly. 2. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Disconnected		
		Short-circuited		
		Wiring failure between the torque sensor and the controller		
32		Wiring failure between the coil and the circuit board (wire chattering: nearly disconnected)		
33		Abnormal no-load voltage	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled. (When the e-Bike Systems detect the same error several times, the e-Bike Systems cannot return to normal even if the power is cycled.)	1. Perform the torque sensor reference voltage adjustment. 2. Replace the torque sensor assembly. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
34		Abnormal voltage (detected during running / with high constant voltage)		
35				
36		Abnormal voltage (detected during running / others)		
37		Abnormal voltage (detected during running at low speeds)		
38	Crank sensor	Torque sensor or crank sensor failure	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the torque sensor assembly or controller assembly or drive axle assembly.
39		Short-circuited or crank sensor failure		Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
61	Controller	Abnormal voltage of the sensor for U phase current while the motor is not operating	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Abnormal voltage of the sensor for W phase current while the motor is not operating		
62	Motor	Over current is applied to the U phase of the motor	The e-Bike Systems cannot return to normal even if the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Over current is applied to the V phase of the motor		
		Over current is applied to the W phase of the motor		
		Abnormal current is applied to the U phase of the motor		
		Abnormal current is applied to the V phase of the motor		
		Abnormal current is applied to the W phase of the motor		

Error codes	Fault device	Fault details	Restoration condition	Action
63	Controller	Failure in data reading	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
66		External memory data error		
		EEPROM error		
64		Detected circuit board temperature is too low (–20°C)	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled. (When the e-Bike Systems detect the same error several times, the e-Bike Systems cannot return to normal even if the power is cycled.)	
		Detected circuit board temperature is too high (125°C) (including DC circuit)		
		Sensor on the board is nearly detached		
67	Motor	2 lead wires are disconnected	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 2. Replace the wire lead 3 or wire lead 4 or wire lead 5.
		Yellow lead wire is disconnected (U phase)		
		Blue lead wire is disconnected (V phase)		
		White lead wire is disconnected (W phase)		
68	Encoder	Disconnected or led wire is short-circuited	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Check the encoder connector. 2. Replace the encoder lead wire. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 4. Replace the motor assembly.
		Black wire is short-circuited		
71	Battery	Can't receive data from battery correctly	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Check the connection portion between the battery pack and bicycle, charging connector of power lead. 2. Replace the plug D.C. receptacle or wire lead 2. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 4. Replace the battery assembly.
73		Detected battery voltage is too high (45V)		1. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 2. Replace the battery assembly.
74		Internal system failure		Battery capacity indicator may flush abnormally, refer to the battery service manual.
79	DC/DC converter	Abnormal DC current	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the external DC/DC converter. 2. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
–	Speed sensor	Speed sensor disconnected	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal immediately.	1. Check the speed sensor lead connector. 2. Check the gap between the speed sensor and the magnet. 3. Replace the speed sensor set.
		Speed tuning detected	The e-Bike Systems will not return to normal even if the power is switched ON and OFF.	Check whether or not a speed tuning device is installed. If such a device is installed, remove it, and if it is not installed, contact bicycle manufacturer.

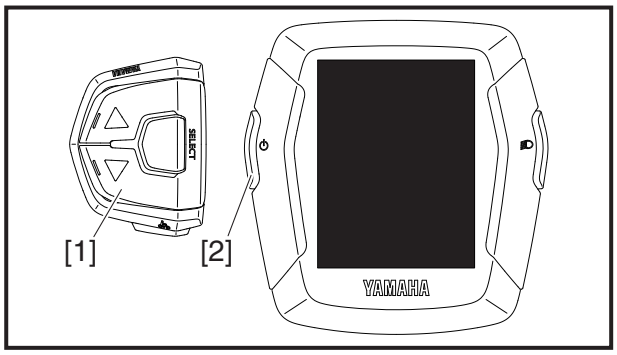
YAMAHA E-KIT DIAGNOSTIC TOOL

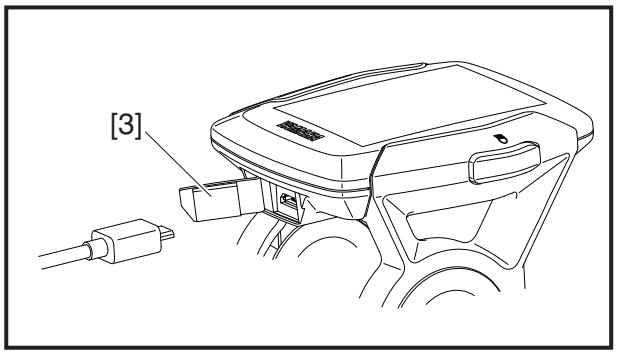
This model uses the Yamaha e-kit diagnostic tool to identify malfunctions.
For more information about using the Yamaha e-kit diagnostic tool, refer to the operation manual that is included with the tool.
There are two types of diagnostic tools.
Old : YAMAHA e-Bike diagnostic software
New : YAMAHA e-Bike Diagnostic Tool (YeDT)

Functions of the Yamaha e-kit diagnostic tool

Drive Unit malfunction diagnosis:
Drive Unit malfunction codes recorded on the controller are read, and the contents are displayed. The freeze frame data (FFD) is the operation data when a malfunction was detected. This data can be used to identify when the malfunction occurred and check the Drive Unit conditions and running conditions when it occurred.

Drive Unit system function test:	Check the operation and the output value of each sensor and actuator.
Battery information:	Displays the battery data.
Angle sensor reset:	Reset the Angle sensor setting. When a new or repaired Drive Unit which equipped with the angle sensor is installed, its initial horizontal level/angle programing is recommended.





Connecting the Yamaha e-kit diagnostic tool

1. Make sure that the power is turned off to the display unit.
2. Continue to press the assist mode switch (down) [1] and power switch [2] over 2 sec.
3. Confirm that the “Pc” is displayed, and then release the assist mode switch (down) [1] and power switch [2].
4. Open the USB port cap [3] of the display.
5. Connect the USB cable to the switch and computer with the Yamaha e-kit diagnostic tool.

TIP

- After disconnecting the USB cable, be sure to close the USB port cap [3].
- For the USB cable, use a Type-A to Micro-B cable that is not an OTG cable.
- When the Yamaha e-kit diagnostic tool is connected to the vehicle, the operation of the multifunction meter and indicators will be different from the normal operation.

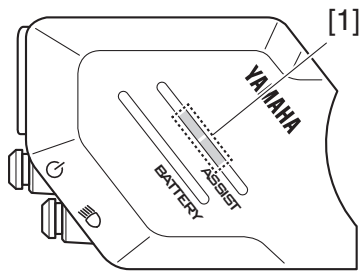
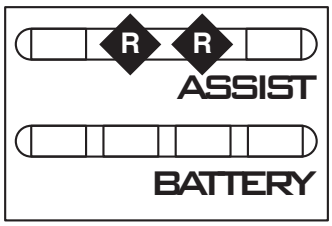
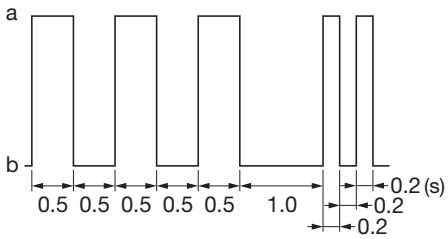
<Interface X> Diagnosis function

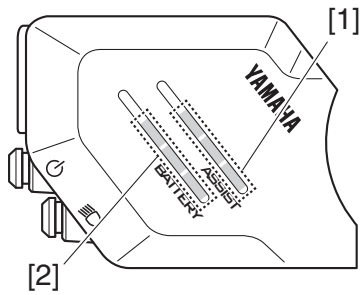
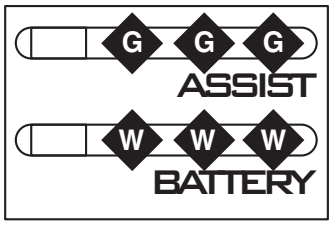
System malfunction

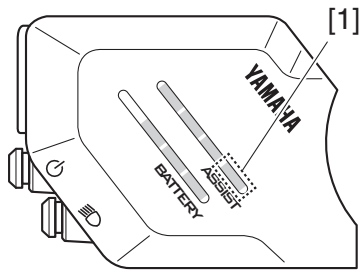
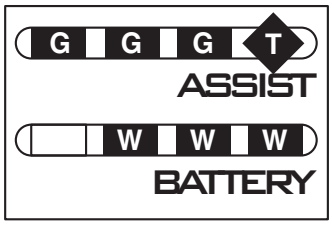
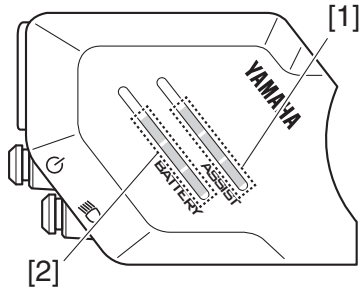
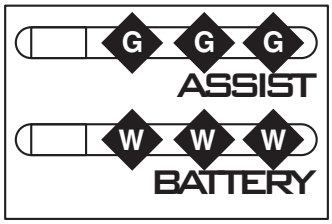
This model is equipped with a self-diagnosis function in order to ensure that the assist system is operating normally.
If this function detects a malfunction in the e-Bike Systems, it immediately operates the assist system under substitute characteristics and displays the error indication to alert the rider that a malfunction has occurred in the e-Bike Systems.
For details about error codes, see the error code tables.

In addition, the Yamaha e-kit diagnostic tool can be connected to this model for more detailed troubleshooting. For details, see “YAMAHA E-KIT DIAGNOSTIC TOOL”.

List of Error Codes Display

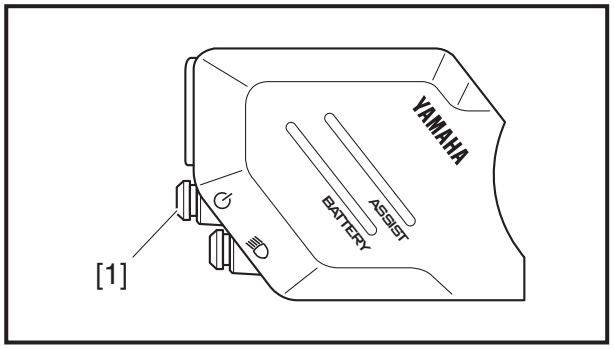
Display pattern	Error codes	Fault device	Power assist behavior and error code record
After all assist mode indicators light are lit in red, the middle two assist mode indicators [1] flash in red to indicate an error code. The number of flashes every 0.5 seconds indicate the tenth digit of the error code, and the number of flashes every 0.2 seconds indicates the first digit of the error code.   ···· No light R ···· Flashing red Example: Error code 32  a. Lit in red b. No light	12	Drive Unit – Display Unit communication	Power assist is normal. Error code does not record.
	13	Display Unit	
	31	Torque sensor	Power assist will stop after determine the error. Error code will record.
	32		
	33		
	34		
	35		
	36		
	37		
	38	Crank sensor	
	39		
	61	Controller	
	62	Motor	
	63	Controller	
	66		
	64		
	67	Motor	
	68	Encoder	
	71	Battery	
	73		
	74		
	79	DC/DC converter	

Display pattern	Error codes	Fault device	Power assist behavior and error code record
*All lit assist mode indicators [1] and battery indicator [2] flash.   *Example when the battery level is 51–75% in standard mode ···· No light G ···· Flashing green W ···· Flashing white	–	Speed sensor	Power assist is limited. Error code does not record.
Even if the power switch is pressed to turn the power on, the power turns off automatically after 4 seconds.	–	Drive Unit - Battery	Power assist will stop after determine the error. Error code will record.

Display pattern	Error codes	Fault device	Power assist behavior and error code record
*The assist mode indicator [1] on the right end flashes in turquoise.   *Example when the battery level is 51–75% in high mode G ···· Green T ···· Flashing turquoise W ···· White □ ···· No light	–	Angle sensor To troubleshoot or check the status of malfunctions related to the angle sensor, use the Yamaha e-kit diagnostic tool that was provided separately by Yamaha. (See page 7-16.)	Drive unit can not recognize the angle of bicycle when the angle sensor has some malfunction. So, power assist will be strange only when starting pedaling. Error code does not record.
*All lit assist mode indicators [1] and battery indicator [2] flash.   *Example when the battery level is 51–75% in standard mode □ ···· No light G ···· Flashing green W ···· Flashing white	–	This is not a malfunction. It is in a state that the operation of the power assist system is normal. This state may occur depending on the pedaling strength and riding speed, or it may occur while the battery internal temperature is -20°C or less or 81°C or higher, but it returns to normal condition if it is confirmed that the e-Bike Systems are normal or the battery internal temperature returns to the normal temperature range. (When the wheel where the speed sensor is installed rotates, the speed is displayed on the speedometer section of the display unit.) ➡ This is not a malfunction. It is in a state that the operation of the power assist system is normal. This state may occur depending on the pedaling strength and riding speed, but it returns to normal condition if it is confirmed that the e-Bike Systems are normal. (When charging while the battery is installed to the bicycle) ➡ This state may occur during the battery internal temperature is -20°C or less or 80°C or higher, but it returns to normal condition if battery internal temperature returns to the normal temperature range.	Power assist will stop during determine the error. Error code does not record.

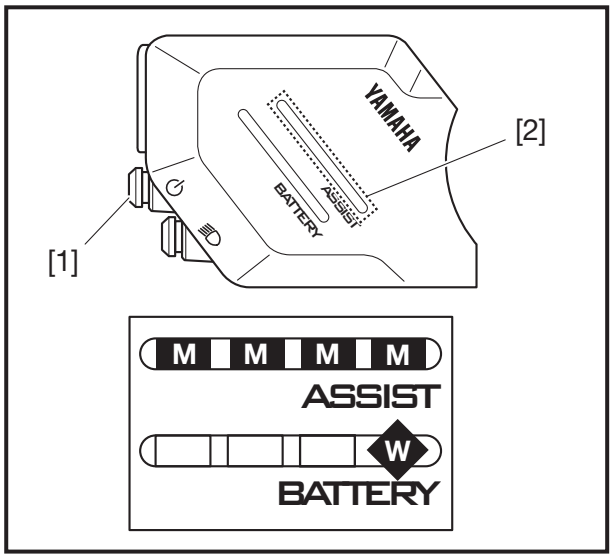
Self-diagnosis mode

This is the mode in which each type of diagnosis and the content of error codes, which are stored when there is an error, are displayed. You can switch between speed sensor diagnosis mode, Drive Unit diagnosis mode, and error log check mode by the display unit operation.



Operating procedures to self-diagnosis mode

1. Make sure that the power is turned off to the display unit.
   Press the power switch [1] to turn on the power.
   When the power is turned on, the initial display sequence is shown, and then the display will return to normal.



2. Press the power switch [1] again, and continue pressing the switch (approximately 10 seconds).
   Confirm that all assist mode indicators [2] light magenta, and then release the power switch [1].

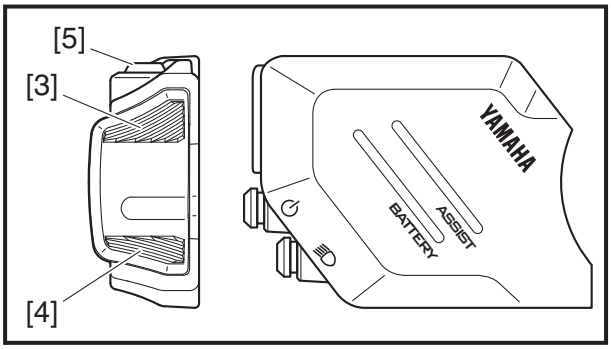
TIP

Step 2 must be performed within 30 seconds from performing step 1.

M ···· Magenta

□ ···· No light

W ···· Flashing white

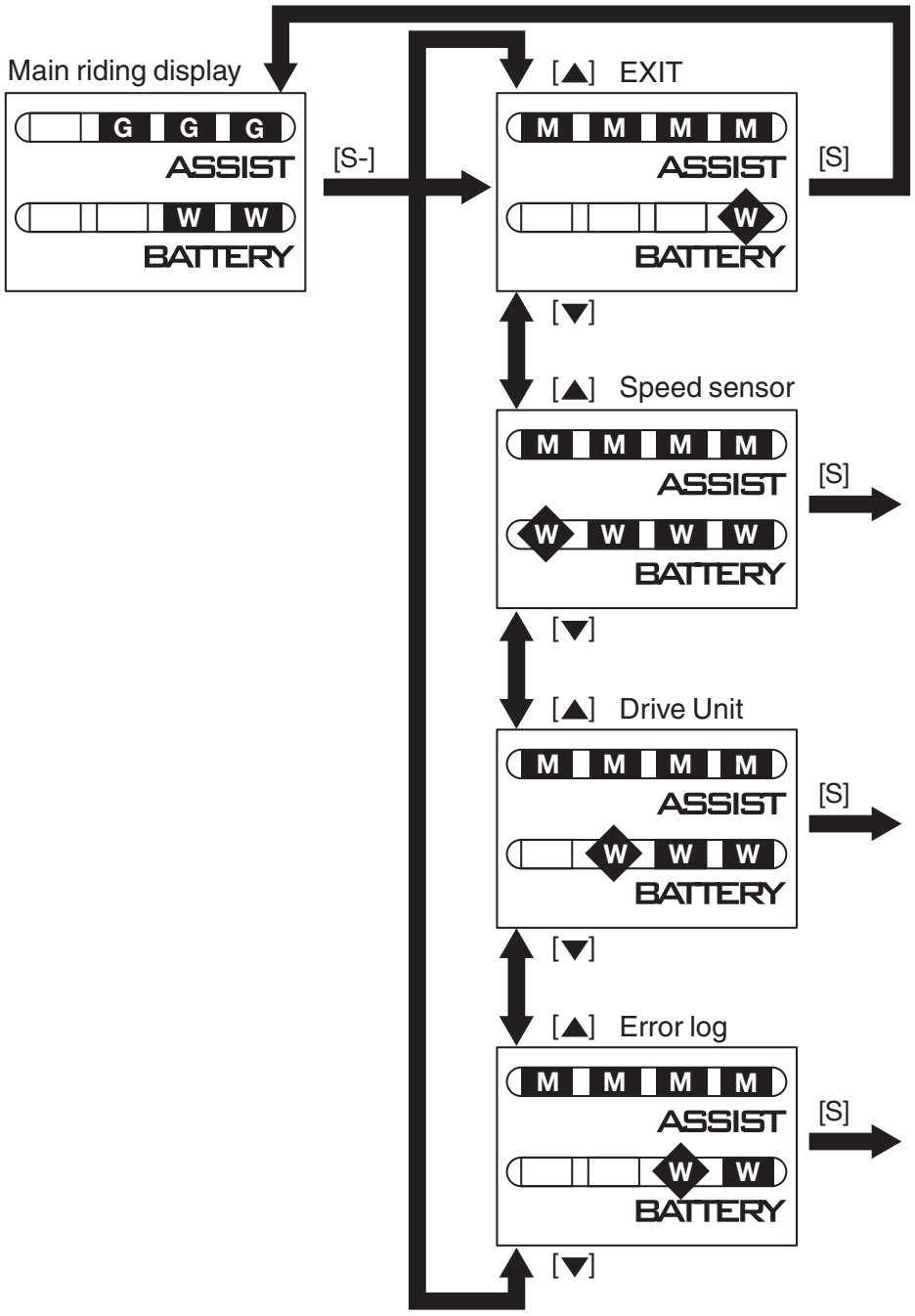


3. Press the assist mode switch [3] or [4] to change the diagnostic modes.
4. Press the function select button [5] to enter the selected self-diagnosis mode.

TIP

If you pressed the wrong switch, turn off the power and perform steps 1–4 again.

Self-diagnosis mode table

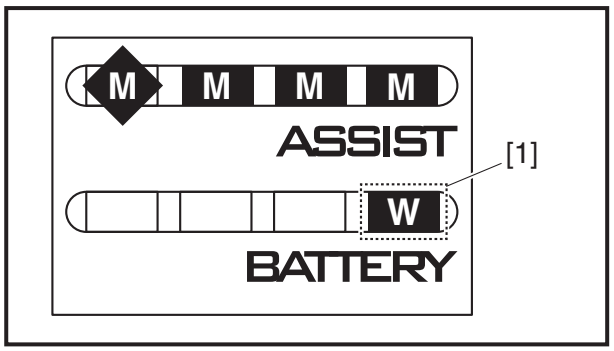


- Speed sensor diagnosis
Check the functionality of the speed sensor operation.
For details, see “Speed sensor diagnosis mode display method”.

- Drive Unit diagnosis
Check the functionality of the Drive Unit operation.
For details, see “Drive Unit diagnosis mode display method”.

- Error log check mode
Retrieves the fault records from the controller to display the list of error codes.
For details, see “Error log check mode display method”.

[S-]·····Press the select button for 10 seconds or longer
[S] ·····Press the select button
[▲]·····Press the assist mode switch (up)
[▼]·····Press the assist mode switch (down)
□ ····No light
G ····Green
M ····Magenta
W ····White
W ····Flashing white



M ···· Flashing magenta
M ···· Magenta
···· No light
W ···· White

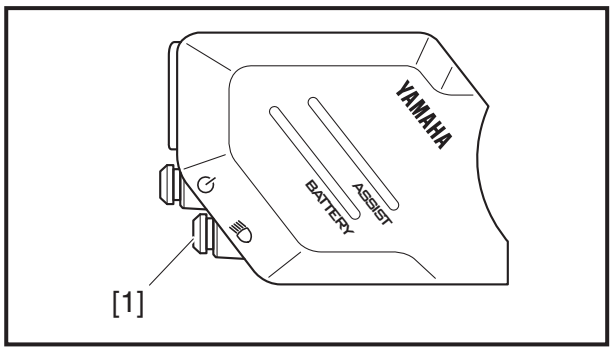
Speed sensor diagnosis mode display method

To determine if the controller is correctly recognizing the speed sensor signal, rotate the wheel to which the speed sensor is connected and make sure that the indicator display is linked to the rotation of the wheel.

1. Enter the speed sensor diagnosis mode.
   See "Self-diagnosis mode table".
2. When you raise and rotate the wheel (with the speed sensor), the battery indicator [1] that is lit in white, moves from right to left.
   Before rotating the wheel (with the speed sensor), the battery indicator [1] on the right end is lit in white.
   Each rotation of the wheel is counted. The battery indicator [1] that is lit in white, moves from right to left, and when it reaches the left end, it returns to the right end.

TIP

- You should at least rotate the wheel (with the speed sensor) 3 times and make sure that the battery indicator [1] that is lit in white, moves from right to left 3 times.
- If the speed sensor malfunctions, the battery indicator [1] that is lit in white, moves from right to left before the wheel (with the speed sensor) is rotated even once, or the battery indicator [1] that is lit in white, does not move even when the wheel (with the speed sensor) is rotated once (there is delay in the movement of the battery indicator [1], that is lit in white).

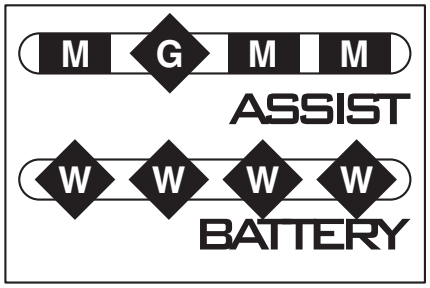


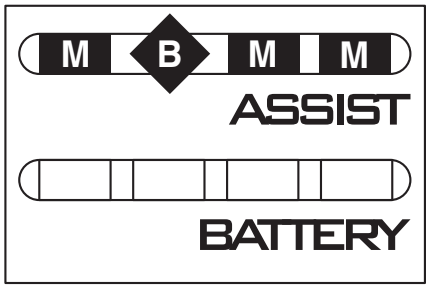
Drive Unit diagnosis mode display method

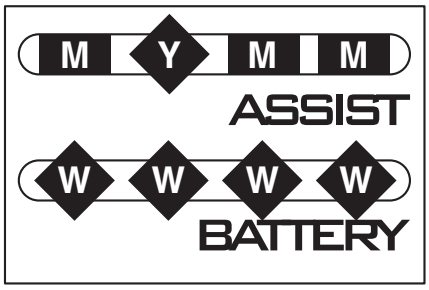
You can check the status of malfunctions in the Drive Unit.

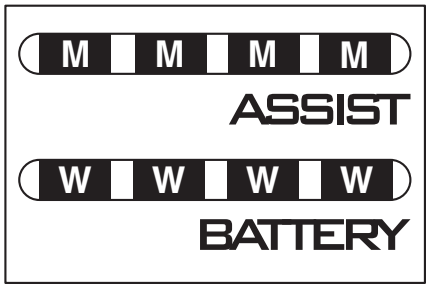
1. Enter the Drive Unit diagnosis mode.
   See "Operating procedures to self-diagnosis mode".
   Press the light switch [1] to select the torque sensor reference voltage, motor current, error displays (<E2>, <E4>), and the display unit function check.

List of Drive Unit diagnosis mode display methods

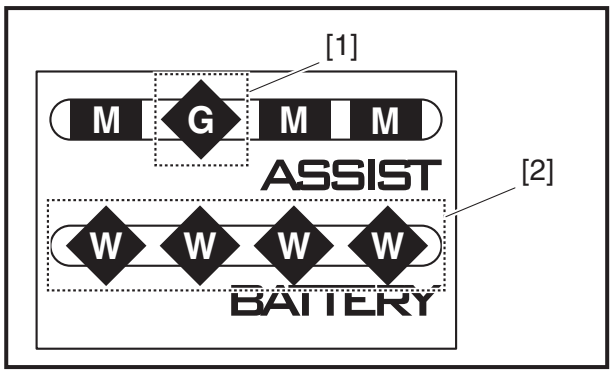
<table>
<tr><th>Inspection items</th><th colspan="2">Display</th></tr>
<tr><td>1) Torque sensor reference voltage</td><td> 

M ···· Magenta
G ···· Flashing green
W ···· Flashing white</td><td>Values are displayed from 0.0 to 5.0 (V).</td></tr>
<tr><td colspan="3">Press the light switch ⇩</td></tr>
<tr><td>2) Motor current</td><td> 

M ···· Magenta
B ···· Flashing blue
□ ···· No light</td><td>Motor output current in high mode is displayed.</td></tr>
<tr><td colspan="3">Press the light switch ⇩</td></tr>
<tr><td>3) Error display</td><td> 

M ···· Magenta
Y ···· Flashing yellow
W ···· Flashing white</td><td>When there is an error, either (E2) (motor) or (E4) (controller) is displayed.
* When there are no errors, the error display is skipped and we proceed to the display unit function check.</td></tr>
<tr><td colspan="3">Press the light switch ⇩</td></tr>
<tr><td>4) Display Unit function check</td><td> 

M ···· Magenta
W ···· White</td><td>If the Function select switch is pressed all segment will light up.</td></tr>
<tr><td colspan="3">Press the light switch or Press the power switch ⇩</td></tr>
<tr><td colspan="3">Power turn off</td></tr>
</table>



M ···· Magenta

G ···· Flashing green

W ···· Flashing white

* Determining whether or not the torque sensor is good

* 0.2 to 1.1 V = normal

If the torque sensor is outside of this range

->Implement the torque sensor reference voltage adjustment function.

If the torque sensor remains outside of its normal range after torque sensor reference voltage adjustment

->Torque sensor malfunction (replace)

1) Torque sensor reference voltage

a. The 2nd assist mode indicator [1] from the left is flashing green, and the other assist mode indicators are lit in magenta. At this time, you can hear the sound of the motor of the Drive Unit.

b. All battery indicators [2] flash white and the number of flashes indicates the torque sensor reference voltage. For example, if battery indicator [2] flashes 5 times in a row, the torque sensor reference voltage is 0.5 V.

c. The torque sensor is normal if the display voltage is 0.2 to 1.1 V.
Perform a torque sensor reference voltage adjustment if values outside of this range are displayed.

d. Press the light switch "≡D" of the display unit.

e. Proceed to 2) Motor current.

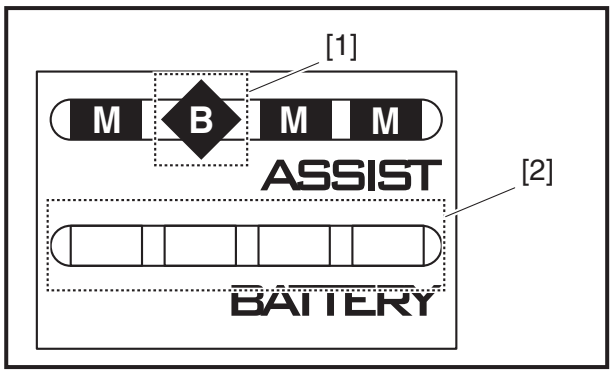
Torque sensor reference voltage adjustment function.

Turn the power on to the display unit and let it stand.

Guideline: Until the power to the display unit is turned off automatically (about 5 min.).

TIP

Do not place feet on the pedals while performing a torque sensor reference voltage adjustment.



M ···· Magenta

□ ···· No light

B ···· Flashing blue

Motor current (%)	Display
75-100	W W W W BATTERY
50-74	W W W BATTERY
25-49	W W BATTERY
1-24	W BATTERY
0	BATTERY

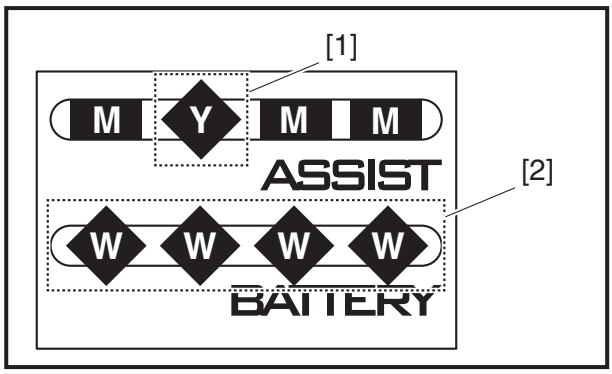
2) Motor current

a. The 2nd assist mode indicator [1] from the left is flashing blue, and the other assist mode indicators are lit in magenta.

b. Confirm that the battery indicators [2] are lit in white when applying the rear brake and strongly pressing on the pedals. The number of lit battery indicators (2) indicates the motor current (%).
- All battery indicators [2] are lit: good
- 0-3 segments of the battery indicator [2] are lit: If the bicycle was ridden immediately before checking the motor current, it is possible that the battery or the controller temperature control is working; therefore, wait until the bicycle cools down.
  If the bicycle was not ridden immediately before checking the motor current, recheck using a battery that is operating properly.
- 0-3 segments of the battery indicator [2] are lit: The battery response is weak in winter (low temperatures), so use a battery that has been stored in a heated room.
- 0-3 segments of the battery indicator [2] are lit: Replace the controller assembly (internal circuit board).

c. Press the light switch "≡D" of the display unit.

d. Proceed to 3) Error display.



M ···· Magenta

Y ···· Flashing yellow

W ···· Flashing white

3) Error display

a. When there is a malfunction, the 2nd assist mode indicator [1] from the left is flashing yellow, and the other assist mode indicators are lit in magenta. All battery indicators [2] flash two or four times consecutively. If the battery indicator [2] flashes twice consecutively, it indicates error code <E2> (motor), and if it flashes four times, it indicates error code <E4> (controller).

TIP

Check the error code if <E2> or <E4> is displayed.

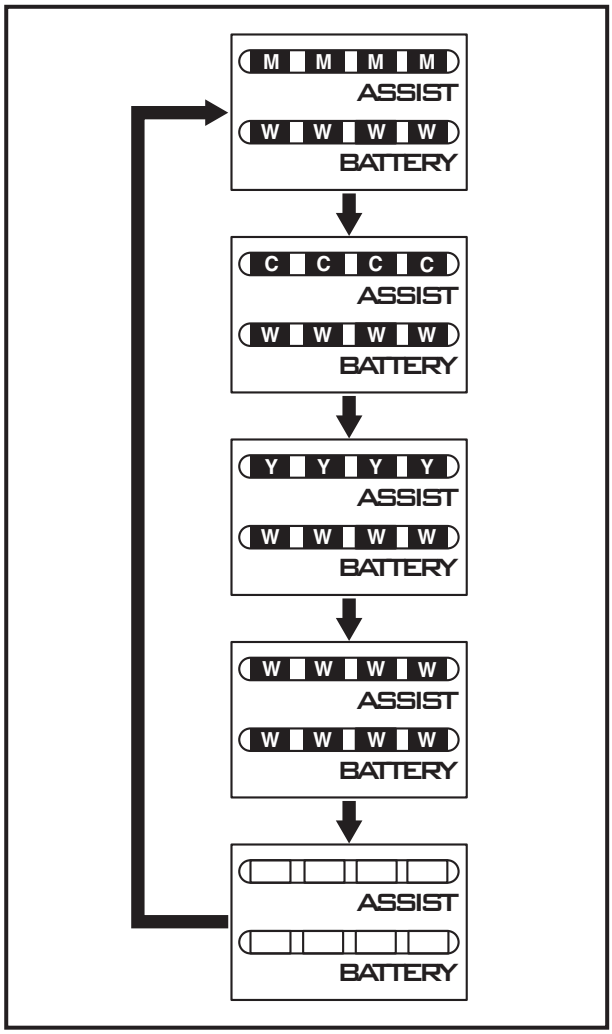
b. Press the light switch "≡D" of the display unit.

c. Proceed to 4) Display Unit function check.

TIP

Check the error code if <E2> or <E4> is displayed.

- When there is no malfunction, skip error display and proceed to display unit function check.
- Perform a final check to make sure there is no error display in this mode when performing repairs or replacing parts.



M ···· Magenta
W ···· White
C ···· Cyan
Y ···· Yellow
□ ···· No light

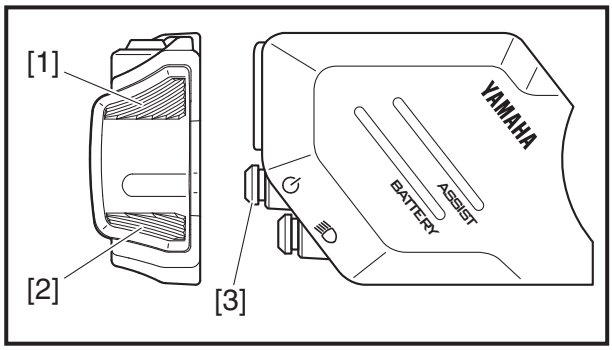
4) Display Unit function check

a. All segments of the display unit will illuminate in the order shown in the illustration on the left.

b. Replace the display unit if there are segments which are not illuminated, or illuminated in different color order.

c. Press the power switch "⏻" or light switch "≣D" of the display unit.

d. The power to the display unit is turned off.

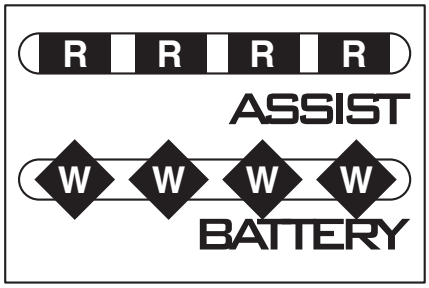
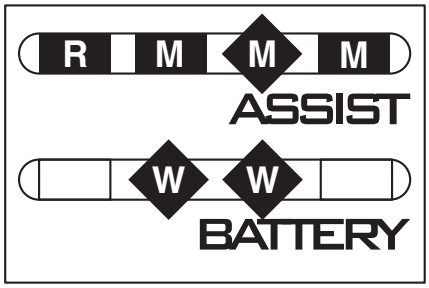
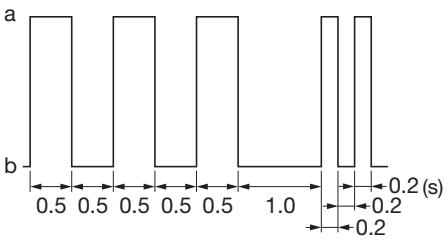


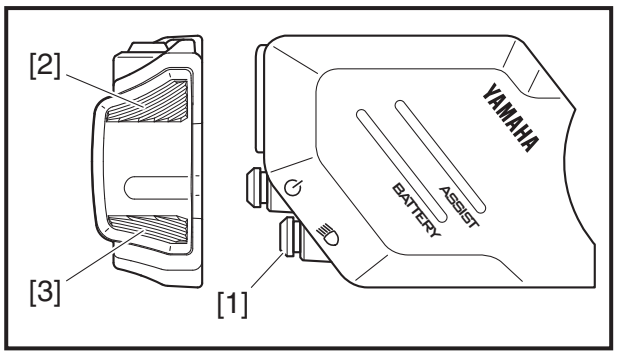
Error log check mode display method

The three most recent types of error codes which are stored when there is an error are stored.

1. Enter the error log check mode.
   See "Operating procedures to self-diagnosis mode".
   The display unit displays the three most recent error codes. To switch the error codes, press the assist mode switch [1] or [2].
   To turn off the display unit, press the power switch [3].

List of error log check mode display methods

	Display	Description
When there are no error codes	 R ···· Red W ···· Flashing white	All assist mode indicator light red. All battery indicator flash white.
When there are 1–3 error codes	 R ···· Red M ···· Magenta M ···· Flashing magenta ···· No light W ···· Flashing white Example: Error code 32  a. Lit in white b. No light	1–3 assist mode indicators from the right side are lit in magenta, and indicate the number of recorded error codes. Of the assist mode indicators lit in magenta, the number of flashing lights from the right, display the number of error code currently displayed. The two battery indicators in the middle flash white, and the number of flashes indicates the error code number. The number of flashes in the 0.5 second interval indicates the tenth digit of the error code, and the number of flashes in the 0.2 second interval indicates the first digit of the error code.



How to delete the malfunction history

1. While pressing the light switch [1] during the error code display, press the assist mode switches [2] or [3].
2. When the history is deleted, all assist mode indicator light red and all battery indicator flash white. Press the power switch to turn off the display unit.

TIP

Be sure to clear the diagnosis history after replacing the motor or other parts.

List of error codes and corresponding assist operation

Error codes	Fault device	Fault details	Restoration condition	Action
12	Display Unit	Stopped the communications to the display unit	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal immediately.	1. Check the display unit connector. 2. Replace the display unit assembly. 3. Replace the wire lead 2. 4. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
13	Drive Unit - Display Unit	Communication data failure to display unit		Make sure that the combination of Drive Unit and display unit are correct.
31	Torque sensor	No communication signals	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the torque sensor assembly. 1. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Disconnected		
		Short-circuited		
		Wiring failure between the torque sensor and the controller		
32		Wiring failure between the coil and the circuit board (wire chattering: nearly disconnected)		
33		Abnormal no-load voltage	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled. (When the e-Bike Systems detect the same error several times, the e-Bike Systems cannot return to normal even if the power is cycled.)	1. Perform the torque sensor reference voltage adjustment. 2. Replace the torque sensor assembly. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
34		Abnormal voltage (detected during running / with high constant voltage)		
35				
36		Abnormal voltage (detected during running / others)		
37		Abnormal voltage (detected during running at low speeds)		
38	Crank sensor	Torque sensor or crank sensor failure	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the torque sensor assembly or controller assembly or drive axle assembly.
39		Short-circuited or crank sensor failure		Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
61	Controller	Abnormal voltage of the sensor for U phase current while the motor is not operating	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Abnormal voltage of the sensor for W phase current while the motor is not operating		
62	Motor	Over current is applied to the U phase of the motor	The e-Bike Systems cannot return to normal even if the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
		Over current is applied to the V phase of the motor		
		Over current is applied to the W phase of the motor		
		Abnormal current is applied to the U phase of the motor		
		Abnormal current is applied to the V phase of the motor		
		Abnormal current is applied to the W phase of the motor		

Error codes	Fault device	Fault details	Restoration condition	Action
63	Controller	Failure in data reading	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
66		External memory data error		
		EEPROM error		
64		Detected circuit board temperature is too low (–20°C)	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled. (When the e-Bike Systems detect the same error several times, the e-Bike Systems cannot return to normal even if the power is cycled.)	
		Detected circuit board temperature is too high (125°C) (including DC circuit)		
		Sensor on the board is nearly detached		
67	Motor	2 lead wires are disconnected	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 2. Replace the wire lead 3 or wire lead 4 or wire lead 5.
		Yellow lead wire is disconnected (U phase)		
		Blue lead wire is disconnected (V phase)		
		White lead wire is disconnected (W phase)		
68	Encoder	Disconnected or led wire is short-circuited	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Check the encoder connector. 2. Replace the encoder lead wire. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 4. Replace the motor assembly.
		Black wire is short-circuited		
71	Battery	Can't receive data from battery correctly	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Check the connection portion between the battery pack and bicycle, charging connector of power lead. 2. Replace the plug D.C. receptacle or wire lead 2. 3. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 4. Replace the battery assembly.
73		Detected battery voltage is too high (45V)		1. Replace the controller assembly (internal circuit board) or the Drive Unit assembly. 2. Replace the battery assembly.
74		Internal system failure		Battery capacity indicator may flush abnormally, refer to the battery service manual.
79	DC/DC converter	Abnormal DC current	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal when the power is cycled.	1. Replace the external DC/DC converter. 2. Replace the controller assembly (internal circuit board) or the Drive Unit assembly.
–	Speed sensor	Speed sensor disconnected	If the e-Bike Systems do not detect any errors, the e-Bike Systems can return to normal immediately.	1. Check the speed sensor lead connector. 2. Check the gap between the speed sensor and the magnet. 3. Replace the speed sensor set.
		Speed tuning detected	The e-Bike Systems will not return to normal even if the power is switched ON and OFF.	Check whether or not a speed tuning device is installed. If such a device is installed, remove it, and if it is not installed, contact bicycle manufacturer.

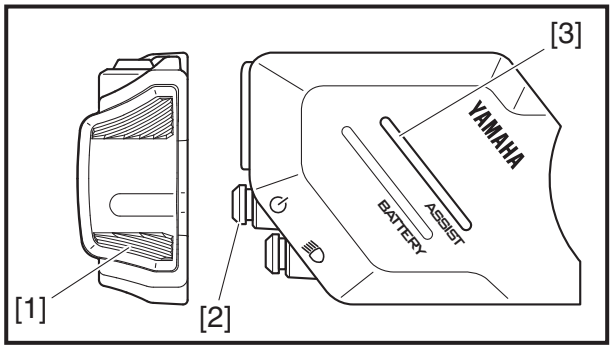
YAMAHA E-KIT DIAGNOSTIC TOOL

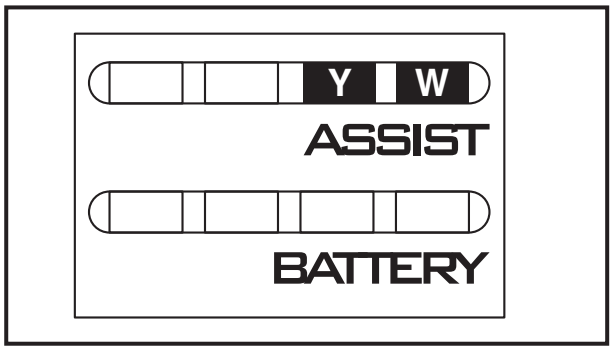
This model uses the Yamaha e-kit diagnostic tool to identify malfunctions.
For more information about using the Yamaha e-kit diagnostic tool, refer to the operation manual that is included with the tool.
There are two types of diagnostic tools.
Old : YAMAHA e-Bike diagnostic software
New : YAMAHA e-Bike Diagnostic Tool (YeDT)

Functions of the Yamaha e-kit diagnostic tool

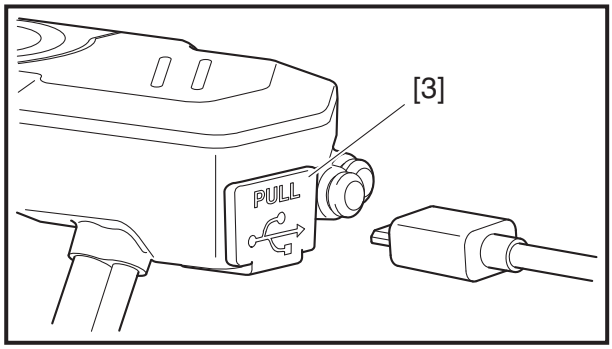
Drive Unit malfunction diagnosis:
Drive Unit malfunction codes recorded on the controller are read, and the contents are displayed. The freeze frame data (FFD) is the operation data when a malfunction was detected. This data can be used to identify when the malfunction occurred and check the Drive Unit conditions and running conditions when it occurred.

Drive Unit system function test:	Check the operation and the output value of each sensor and actuator.
Battery information:	Displays the battery data.
Angle sensor reset:	Reset the Angle sensor setting. When a new or repaired Drive Unit which equipped with the angle sensor is installed, its initial horizontal level/angle programing is recommended.





···· No light
Y ···· Yellow
W ···· White



Connecting the Yamaha e-kit diagnostic tool

1. Make sure that the power is turned off to the display unit.
2. Continue to press the assist mode switch (down) [1] and power switch [2] over 2 sec.
3. Confirm that the 3rd and 4th assist mode indicator [3] from the right is lit in yellow and white as shown in the illustration, and the yellow and white lights moves from right to left. And then release the assist mode switch (down) [1] and power switch [2].
4. Open the USB port cap [3] of the display unit.
5. Connect the USB cable to the display unit and computer with the Yamaha e-kit diagnostic tool.

TIP

- After disconnecting the USB cable, be sure to close the USB port cap [3].
- For the USB cable, use a Type-A to Micro-B cable that is not an OTG cable.
- When the Yamaha e-kit diagnostic tool is connected to the vehicle, the operation of the multifunction meter and indicators will be different from the normal operation.

Drive Unit and Display Service Manual
DU-08
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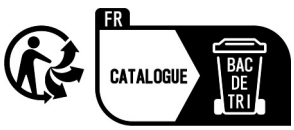
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