

A Few Words About Safety

Service Information

The service and repair information contained in this manual is intended for use by qualified, professional technicians. Attempting service or repairs without the proper training, tools, and equipment could cause injury to you and/or others. It could also damage this Honda product or create an unsafe condition.

This manual describes the proper methods and procedures for performing service, maintenance, and repairs. Some procedures require the use special tools. Any person who intends to use a replacement part, service procedure, or a tool that is not recommended by Honda must determine the risks to their personal safety and the safe operation of this product.

If you need to replace a part, use Honda Genuine parts with the correct part number or an equivalent part. We strongly recommend that you do not use replacement parts of inferior quality.

For Your Customer's Safety

Proper service and maintenance are essential to the customer's safety and the reliability of this product. Any error or oversight while servicing this product can result in faulty operation, damage to the product, or injury to others.

⚠ WARNING

Improper service or repairs can create an unsafe condition that can cause your customer or others to be seriously hurt or killed.

Follow the procedures and precautions in this manual and other service materials carefully.

For Your Safety

Because this manual is intended for the professional service technician, we do not provide warnings about many basic shop safety practices (e.g., Hot parts-wear gloves). If you have not received shop safety training or do not feel confident about your knowledge of safe servicing practices, we recommend that you do not attempt to perform the procedures described in this manual.

Some of the most important general service safety precautions are given below. However, we cannot warn you of every conceivable hazard that can arise in performing service and repair procedures. Only you can decide whether or not you should perform a given task.

⚠ WARNING

Failure to properly follow instructions and precautions can cause you to be seriously hurt or killed.

Follow the procedures and precautions in this manual carefully.

Important Safety Precautions

Make sure you have a clear understanding of all basic shop safety practices and that you are wearing appropriate clothing and using safety equipment. When performing any service task, be especially careful of the following:

- Read all of the instructions before you begin, and make sure you have the tools, the replacement or repair parts, and the skills required to perform the tasks safely and completely.
- Protect your eyes by using proper safety glasses, goggles, or face shields anytime you hammer, drill, grind, or work around pressurized air, pressurized liquids, springs or other stored-energy components. If there is any doubt, put on eye protection.
- Use other protective wear when necessary, for example gloves or safety shoes. Handling hot or sharp parts can cause severe burns or cuts. Before you grab something that looks like it can hurt you, stop and put on gloves.
- Protect yourself and others whenever you have the product up in the air. Anytime you lift this product with a hoist, make sure that the hoist hook is securely attached to the product.

Make sure the motor is off and the battery pack is removed before you begin any servicing procedures, unless the instruction tells you to do otherwise. This will help eliminate several potential hazards:

- Injury from moving parts. If the instruction tells you to run the motor, be sure your hands, fingers, and clothing are out of the way.
- Do not tilt this product when starting the motor. Start the motor and run it on a flat surface that is free of obstacles.

Moisture and electricity are not compatible.

- Always handle and connect battery pack in dry conditions.
- Never allow battery pack to contact wet areas.

Keep all cigarettes, sparks, and flames away from the battery pack and its related equipment.

How to use this manual

REVISION HISTORY

No.	Date of revision	Contents of revision
1	February, 2021	Newly published
2	September, 2021	New types added (Without Control Box; S4, S5, Q5, Q6/With Control Box; S2, S3, Q3, Q4) (page 1-2)
		New types added (Variable-speed type; S3, S5, Q4, Q6) (page 1-3)
		New type added (With Control Box) (page 1-5)
		Torque values added (page 2-2)
		Caption added to 20P (Gray) connector (page 2-4)
		Caption added to control wire harness (page 2-5)
		New type added (With Control Box) (page 2-6)
		Maintenance schedule revised (page 3-2)
		Motor set speed check procedure revised (page 3-4)
		Battery indicator indication pattern table revised (page 4-3)
		Note (*) on indicator indication pattern added (page 4-3)
		Figure of indicator changed (page 4-4)
		Power unit indicator indication pattern table revised (page 4-4)
		Note (***) on indicator indication pattern added (page 4-4)
		Charger indicator indication pattern table revised (page 4-5)
		DTC of power unit added (3A121, 3A122) (page 4-14)
		Before removing procedure revised and silent sheet added (page 5-2)
		Procedure of silent sheet replacement added and clip band Q'ty revised (page 5-3)
		Control Box Removal/Installation added (page 6-2)
		Control Box Disassembly/Assembly added (page 6-3)
		Start/stop switch continuity table and terminal number corrected (page 6-8)
		Speed volume switch inspection added (page 6-9)
		Cooling fan nut removal/installation description added (figure in previous page deleted) (page 7-7)
		Wiring diagrams revised (page 8-2)

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How to use this manual

INTRODUCTION

This manual covers the service and repair procedures for Honda product.

All information contained in this manual is based on the latest product information available at the time of printing. We reserve the right to make changes at anytime without notice.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of the publisher. This includes text, figures, and tables.

As you read this manual, you will find information that is preceded by a **NOTICE** symbol. The purpose of this message is to help prevent damage to this Honda product, other property, or the environment.

SAFETY MESSAGES

Your safety, and the safety of others, is very important. To help you make informed decisions, we have provided safety messages and other safety information throughout this manual. Of course, it is not practical or possible to warn you about all the hazards associated with servicing these products. You must use your own good judgment.

You will find important safety information in a variety of forms, including:

- Safety Labels – on the product.
- Safety Messages – preceded by a safety alert symbol  and one of three signal words, DANGER, WARNING, or CAUTION. These signal words mean:

 DANGER You WILL be KILLED or SERIOUSLY HURT if you don't follow instructions.

 WARNING You CAN be KILLED or SERIOUSLY HURT if you don't follow instructions.

 CAUTION You CAN be HURT if you don't follow instructions.

- Instructions – how to service these products correctly and safely.

ALL INFORMATION, ILLUSTRATIONS, DIRECTIONS AND SPECIFICATIONS INCLUDED IN THIS PUBLICATION ARE BASED ON THE LATEST PRODUCT INFORMATION AVAILABLE AT THE TIME OF APPROVAL FOR PRINTING. Honda Motor Co., Ltd. RESERVES THE RIGHT TO MAKE CHANGES AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING ANY OBLIGATION WHATSOEVER. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT WRITTEN PERMISSION. THIS MANUAL IS WRITTEN FOR PERSONS WHO HAVE ACQUIRED BASIC KNOWLEDGE OF MAINTENANCE ON Honda PRODUCTS.

SERVICE RULES

- Use Honda Genuine or Honda-recommended parts and lubricants or their equivalents. Parts that do not meet Honda's design specifications may damage the unit.
- Use the special tools designed for the product.
- Install new gaskets, O-rings, etc. when reassembling.
- When torquing bolts or nuts, begin with larger-diameter or inner bolts first and tighten to the specified torque diagonally, unless a particular sequence is specified.
- Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before assembly.
- After assembly, check all parts for proper installation and operation.
- Many screws used in this machine are self-tapping. Be aware that cross-threading or overtightening these screws will strip the threads and ruin the hole.

Metric bolts, nuts and screws may be not interchangeable with non-metric fasteners. The use of incorrect tools and fasteners will damage the unit.

SYMBOLS

The symbols used throughout this manual show specific service procedures. If supplementary information is required pertaining to these symbols, it will be explained specifically in the text without the use of the symbols.

NEW	Replace the part(s) with new one(s) before assembly.
OIL	Use the recommend engine oil, unless otherwise specified.
Mo OIL	Use molybdenum oil solution (mixture of the engine oil and molybdenum grease in a ratio of 1:1).
GREASE	Use multi-purpose grease (lithium based multi-purpose grease NLGI #2 or equivalent).
MR GREASE	Use marine grease (water resistant urea based grease).
LOCK	Apply a locking agent. Use a medium strength locking agent unless otherwise specified.
SEAL	Apply sealant.
ATF	Use automatic transmission fluid.
(O x O) (O)	Indicates the diameter, length, and quantity of bolts used.
page 1-1	Indicates the reference page.

How to use this manual

ABBREVIATIONS

Throughout this manual, the following abbreviations are used to identify the respective parts or systems.

Abbreviated term	Full term
ACG	Alternator
A/F	Air Fuel Ratio
AFE	Analog Front End
API	American Petroleum Institute
Approx.	Approximately
Assy.	Assembly
ATDC	After Top Dead Center
ATF	Automatic Transmission Fluid
ATT	Attachment
BAT	Battery
BBDC	Before Bottom Dead Center
BDC	Bottom Dead Center
BTDC	Before Top Dead Center
BARO	Barometric Pressure
CKP	Crankshaft Position
Comp.	Complete
CMP	Camshaft Position
CYL	Cylinder
DBW	Drive By Wire
DLC	Data Link Connector
DTC	Diagnostic Trouble Code
EACV	Electric Air Control Valve
EBT	Engine Block Temperature
ECT	Engine Coolant Temperature
ECM	Engine Control Module
EMT	Exhaust Manifold Temperature
EOP	Engine Oil Pressure
EX	Exhaust
F	Front or Forward
FI	Fuel Injection
GND	Ground
HI	High
HST	Hydrostatic Transmission
HO2S	Heated Oxygen sensor
IAB	Intake Air Bypass
IAC	Idle Air Control
IAT	Intake Air Temperature
I.D.	Inside diameter
IG or IGN	Ignition
IN	Intake
INJ	Injection
ISO	International Organization for Standardization
L.	Left
LAF	Linear Air-Fuel Ratio
LO	Low
MAP	Manifold Absolute Pressure
MIL	Malfunction Indicator Lamp
O.D.	Outside Diameter
OP	Optional Part
PDU	Power Drive Unit
PGM-FI	Programmed-Fuel Injection
PTC	Plug Top Coil
P/N	Part Number
Qty	Quantity
R.	Right
SAE	Society of Automotive Engineers
SBW	Shift By Wire
SCS	Service Check Signal

Abbreviated term	Full term
SOC	State of Charge
STD	Standard
SW	Switch
TBW	Throttle By Wire
TDC	Top Dead Center
TP	Throttle Position
VST	Variable Speed Transmission
VTEC	Variable Valve Timing & Valve Lift Electronic Control

MEMO

1. SPECIFICATIONS

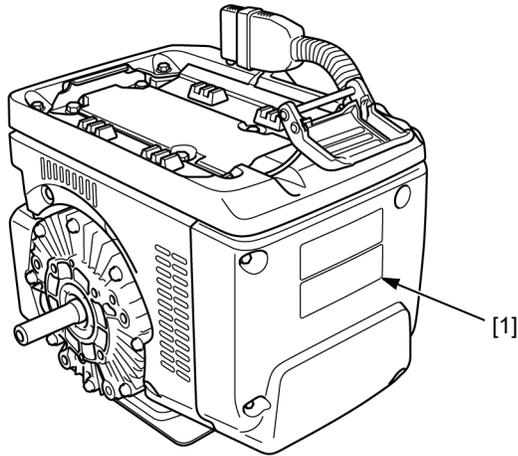
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SPECIFICATIONS

SERIAL NUMBER LOCATION

The serial number [1] is located on the PDU cover.

Refer to it when ordering parts or making technical inquiries.



SPECIFICATIONS

DIMENSIONS AND WEIGHTS

DC POWER UNIT

Without Control Box

Model	GXE2.0H						
Type	S1	S4	S5	Q1	Q2	Q5	Q6
Overall length	294 mm (11.6 in)			303 mm (11.9 in)			
Overall width	353 mm (13.9 in)						
Overall height	296 mm (11.7 in) ^{*1} / 420 mm (16.5 in) ^{*2}						
Mass [weight]	18.5 kg (40.8 lbs) ^{*1} / 25.0 kg (55.1 lbs) ^{*2}						

With Control Box

Model	GXE2.0H			
Type	S2	S3	Q3	Q4
Overall length	294 mm (11.6 in)		303 mm (11.9 in)	
Overall width	418 mm (16.5 in)			
Overall height	296 mm (11.7 in) ^{*1} / 420 mm (16.5 in) ^{*2}			
Mass [weight]	19.7 kg (43.4 lbs) ^{*1} / 26.2 kg (57.8 lbs) ^{*2}			

*1: Without battery pack

*2: With battery pack

BATTERY CHARGER

Model	CV7285Z				
Type	JM	AM	EM	BM	SWM
Overall length	266 mm (10.5 in)				
Overall width	352 mm (13.9 in)				
Overall height	247 mm (9.7 in)				
Mass [weight]	11.0 kg (24.3 lbs)				

DC POWER UNIT

Model		GXE2.0H											
Description code		GMABK											
Type		S1	S2	S4	Q1	Q2	Q3	Q5	S3	S5	Q4	Q6	
P.T.O.		S type			Q type			S type		Q type			
Motor	Type	Permanent magnet 3-phase DC brushless											
	Continuous rated power	1.6 kW (2.1 HP)/3,600 min ⁻¹ (rpm)											
	Continuous rated torque	4.3 N·m (0.44 kgf·m, 3.2 lbf·ft)/3,600 min ⁻¹ (rpm)											
	Control current/voltage	27 A/72 V											
	Maximum power	1.8 kW (2.4 HP)/3,600 min ⁻¹ (rpm)											
	Maximum torque	4.8 N·m (0.49 kgf·m, 3.5 lbf·ft)/3,600 min ⁻¹ (rpm)											
	Set speed	3,600 min ⁻¹ (rpm)							1,800 – 3,600 min ⁻¹ (rpm)				
	Rotating direction	Counterclockwise (viewed from P.T.O. shaft end)											
	Cooling system	Forced air											
	Breather system	Air open type											
	Stopping system	Regenerative brake (resistant consumption)											
Rotor sensor		Hall IC rotation sensor (thermistor temperature sensor built-in)											
PDU	Type	3-phase square-wave drive											
	Control system	PWM (Pulse Width Modulation)											
	Maximum 3-phase output current	80 A											
	Cooling system	Air cooled											
Battery pack	Type	DP72104Z (Li-ion)											
	Power capacity	72 V-720 Wh											
Operating temperature range		-15 – 40°C (-5 – 104°F)											

BATTERY CHARGER

Model		CV7285Z				
Description code		UAAC				
Type		JM	AM	EM	BM	SWM
Charging control system		Constant current/constant voltage type				
Cooling system		Forced air				
Power source input	Voltage (AC)	100 – 240 V				
	Current	7.8 A (100 V) / 3.4 A (230 V)				
	Frequency	50/60 Hz				
Charging output	Voltage (DC)	82.8 V				
	Current	8.5 A				

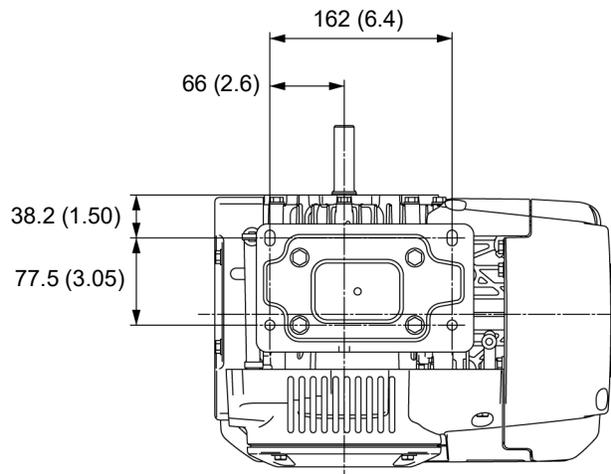
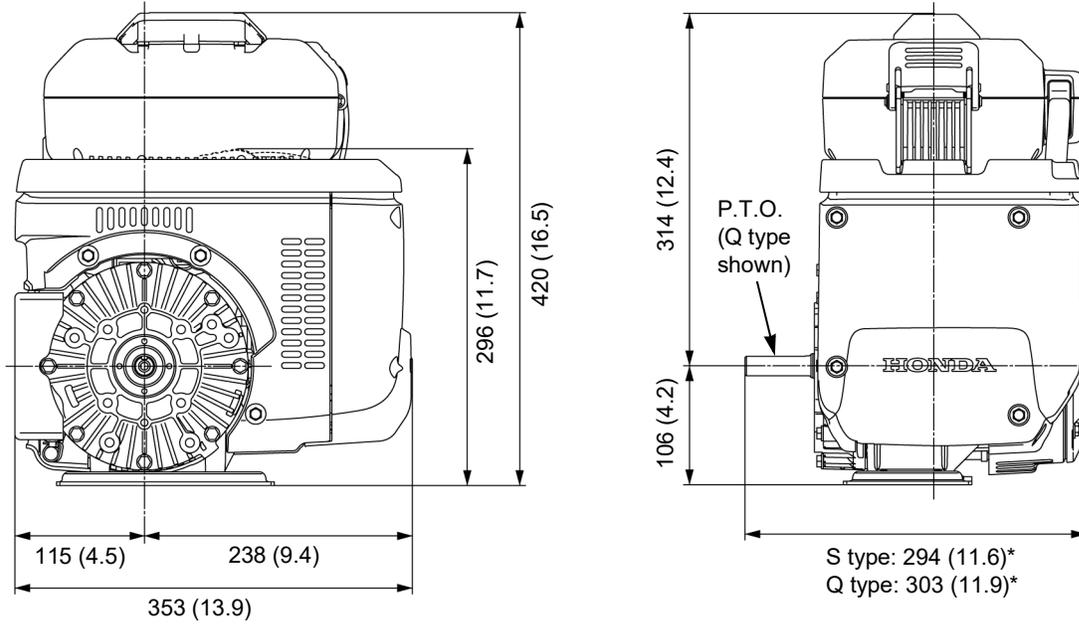
SPECIFICATIONS

DIMENSIONAL DRAWINGS

*: P.T.O. type (page 1-3)

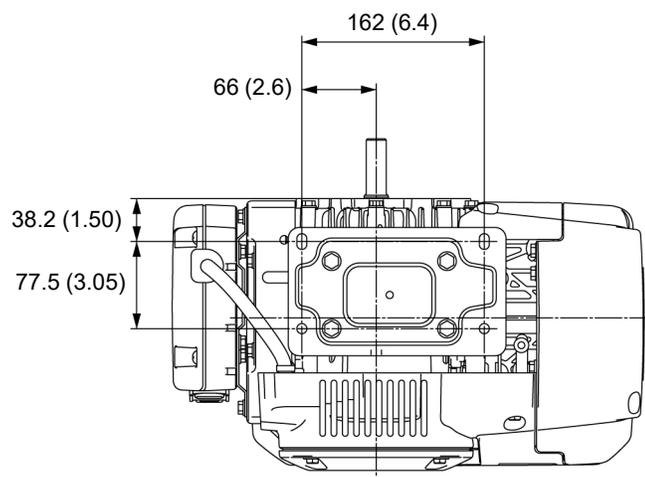
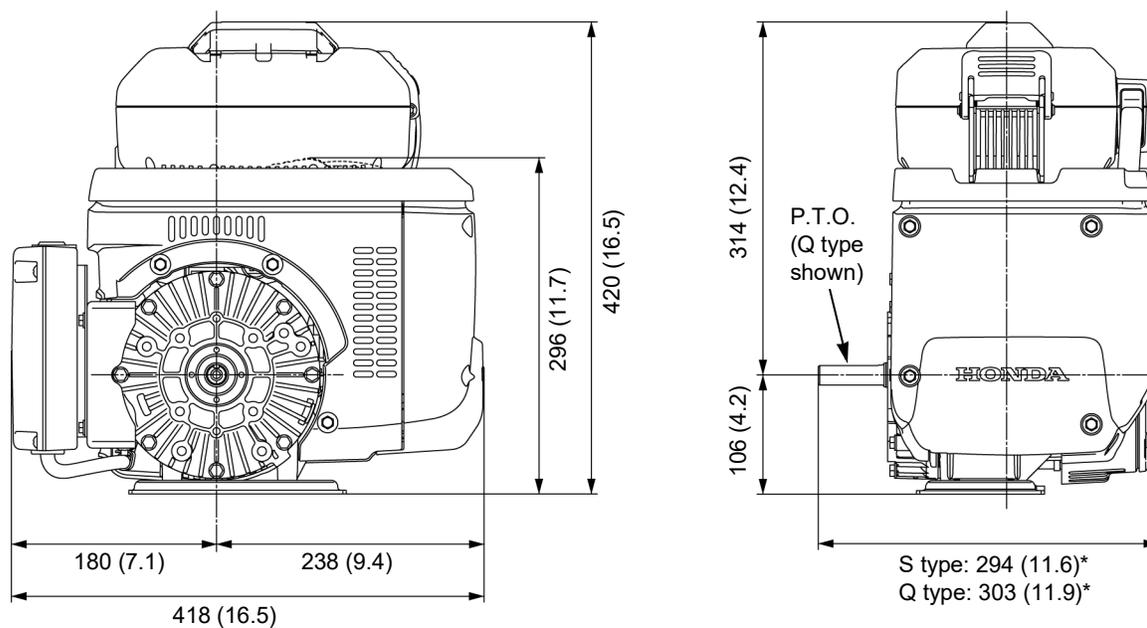
Without Control Box

Unit: mm (in)



With Control Box

Unit: mm (in)

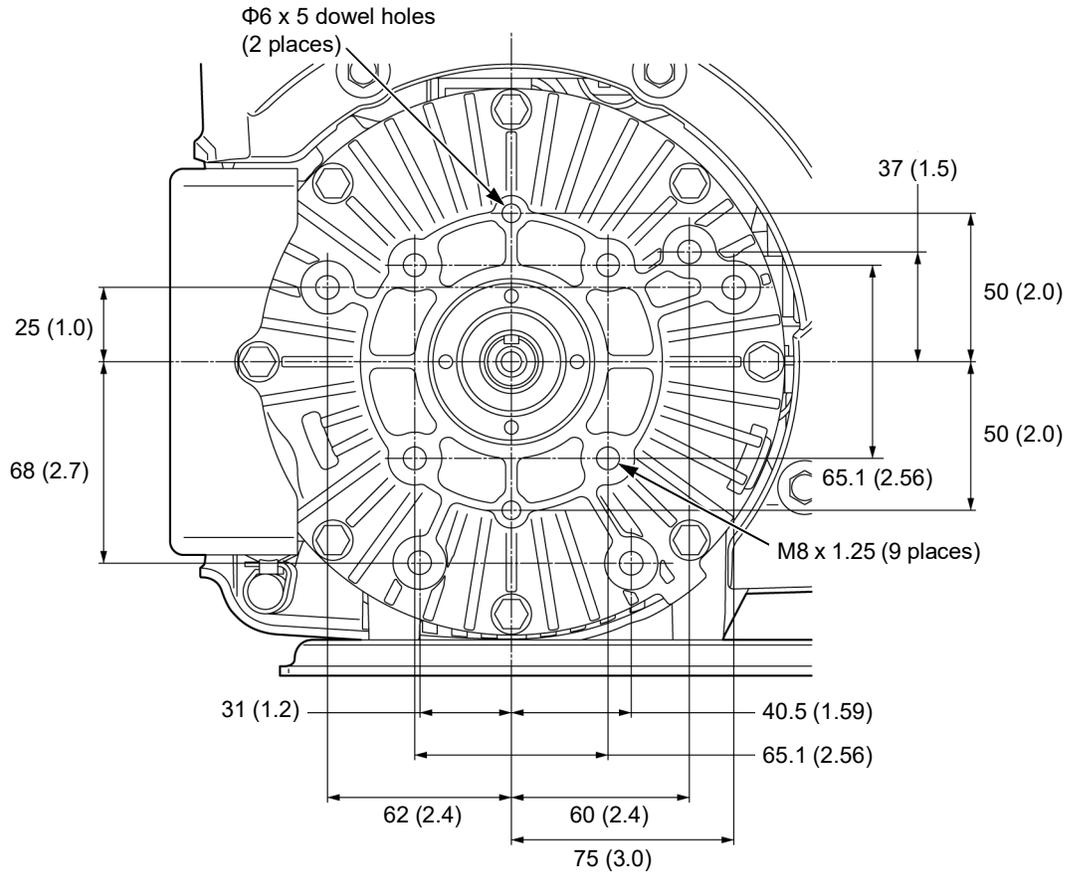


SPECIFICATIONS

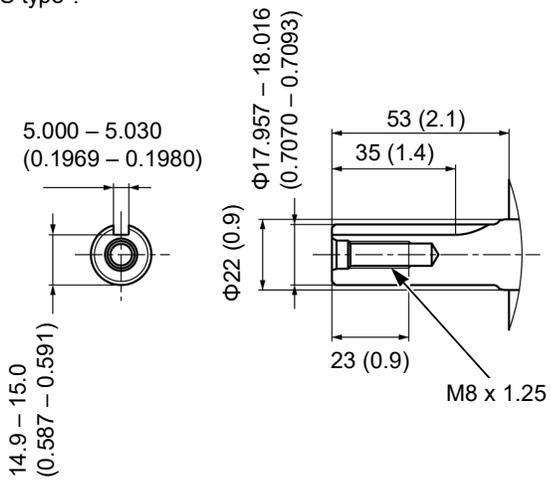
P.T.O. DIMENSIONAL DRAWINGS

*: P.T.O. type (page 1-3)

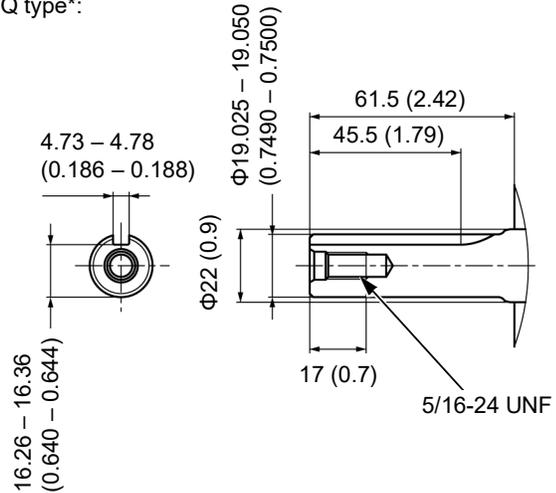
Unit: mm (in)



S type*:



Q type*:



2. SERVICE INFORMATION

MAINTENANCE STANDARDS 2-2 TOOLS 2-3
TORQUE VALUES 2-2 HARNESS ROUTING 2-4
LUBRICATION & SEAL POINT 2-2

SERVICE INFORMATION

MAINTENANCE STANDARDS

Part	Item	Standard	Service Limit
Motor	Stator coil resistance (at 20°C/68°F)	65.5 – 72.5 mΩ	–

TORQUE VALUES

Item	Thread Dia. and pitch	Torque Values			Remarks
		N·m	kgf·m	lbf·ft	
Rotor fan bolt	M5 x 0.8	5.9	0.6	4.4	
Stator bolt	M6 x 1.0	10	1.0	7	
Motor harness stay bolt	M6 x 1.0	10	1.0	7	
Cooling fan nut	M12 x 1.25	59	6.0	44	
Air duct bolt	M5 x 0.8	5.9	0.6	4.4	
Fastener lever wire bolt	M6 x 1.0	10	1.0	7	
Harness clip bracket bolt	M6 x 1.0	10	1.0	7	
Battery connector stay bolt	M5 x 0.8	5.9	0.6	4.4	
Special collar (at PDU stay C)	M8 x 1.25	27	2.8	20	
Top cover bolt	M6 x 1.0	8	0.8	5.9	
Control cover screw (With control box)	M5 x 1.8	1.7	0.2	1.3	
Speed volume switch nut (Variable-speed type)	M10 x 0.75	1.1	0.1	0.8	
Speed volume switch bracket screw (Variable-speed type with control box)	M5 x 1.8	1.7	0.2	1.3	

STANDARD TORQUE VALUES

Item	Thread Dia.	Torque Values		
		N·m	kgf·m	lbf·ft
Screw	3 mm	1.0	0.1	0.7
	4 mm	2.0	0.2	1.5
	5 mm	4.2	0.4	3.1
	6 mm	9	0.9	6.6
Bolt and nut	5 mm	5.2	0.5	3.8
	6 mm*1	10	1.0	7
	8 mm	22	2.2	16
	10 mm	34	3.5	25
	12 mm	54	5.5	40
Flange bolt and nut	6 mm*2	12	1.2	9
	8 mm	27	2.8	20
	10 mm	39	4.0	29

*1: Including SH flange bolt (8 mm head, small flange)

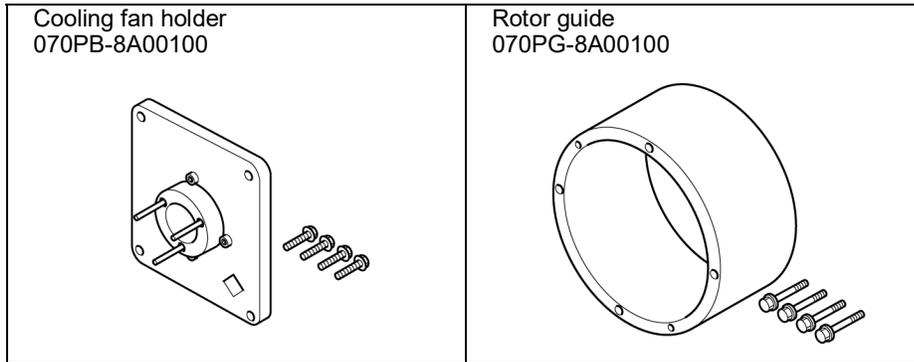
*2: Including NSHF flange bolt (8 mm head, large flange)

LUBRICATION & SEAL POINT

Material	Location	Remarks
Multi-purpose grease	Rotor shaft bearing part	

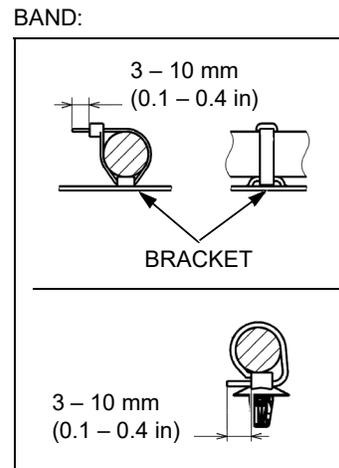
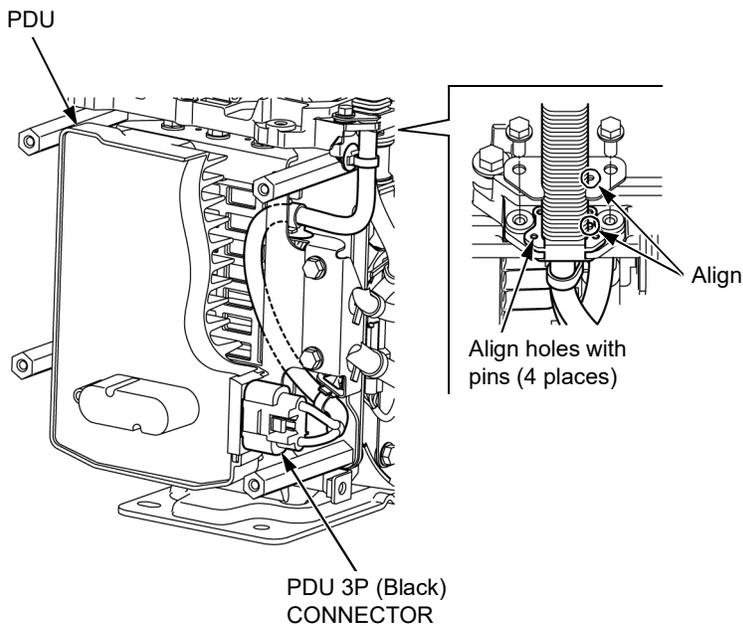
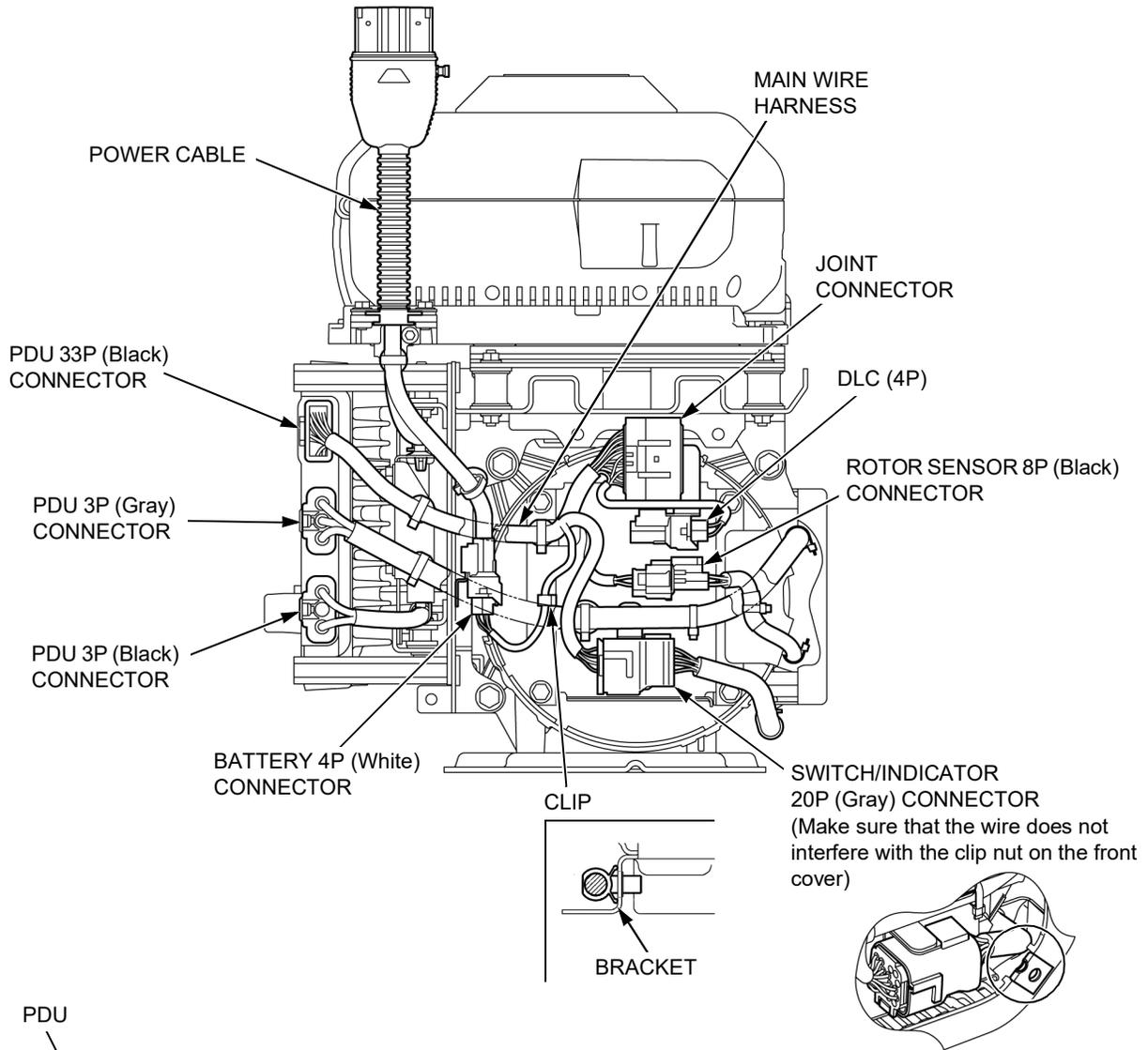
TOOLS

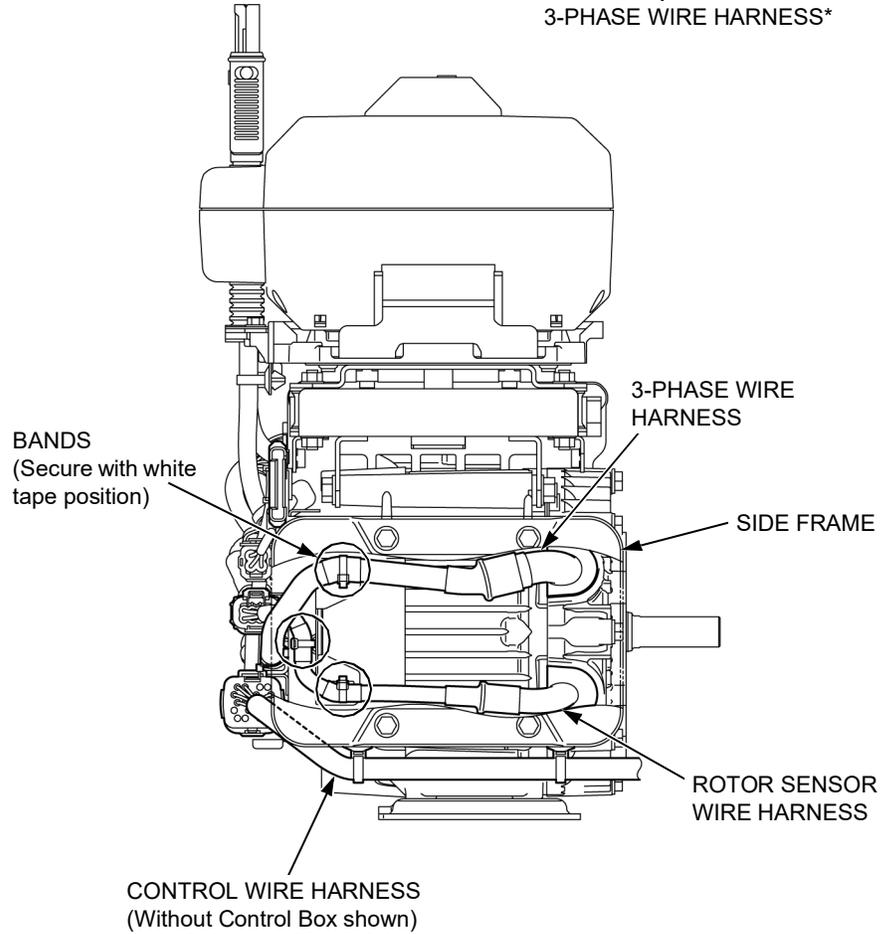
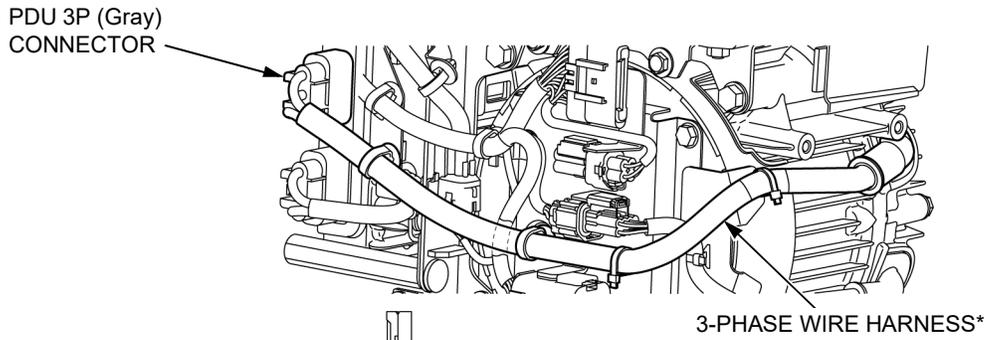
Special tools used in this manual can be ordered using normal Honda parts ordering procedures.



SERVICE INFORMATION

HARNESS ROUTING

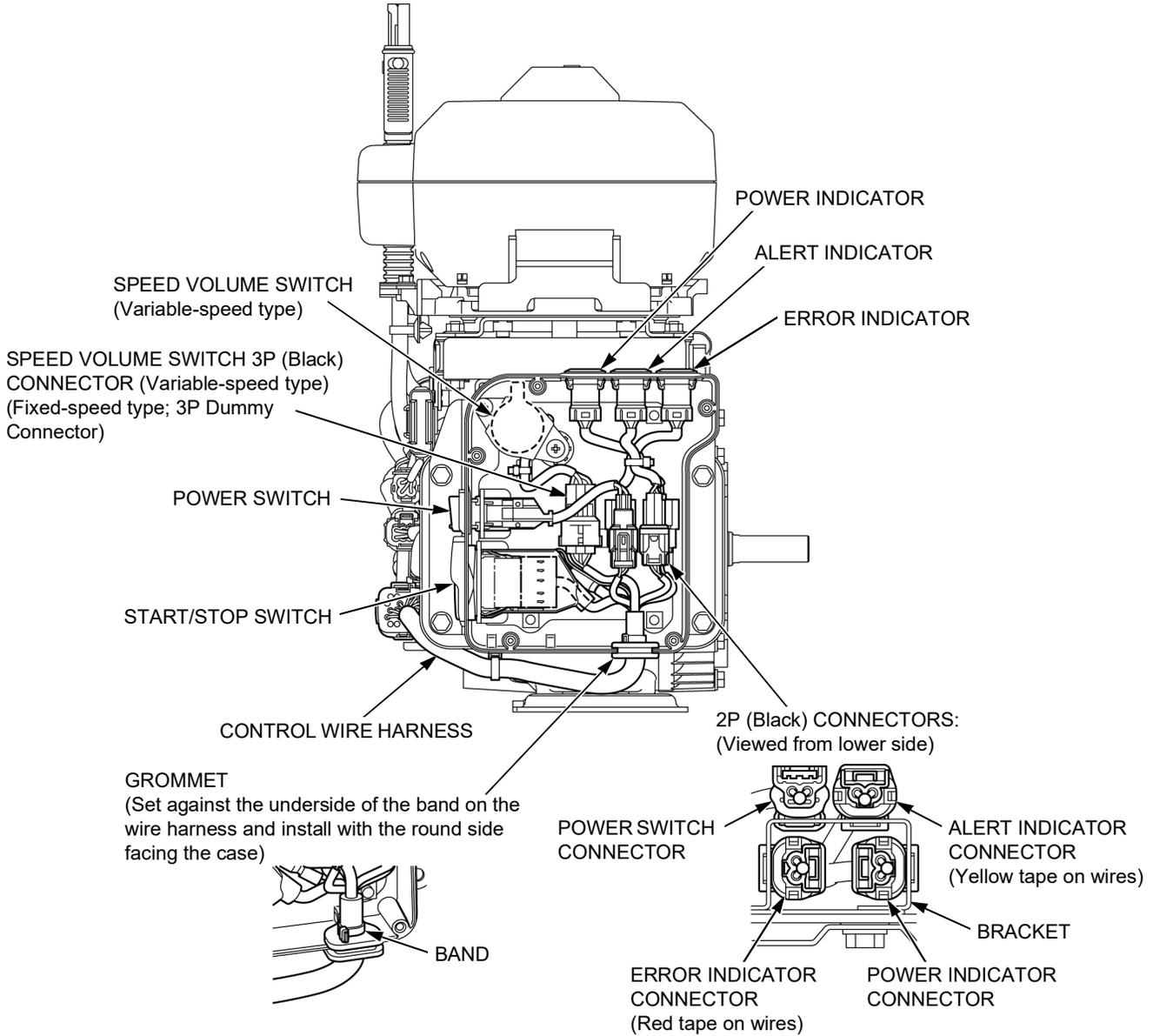




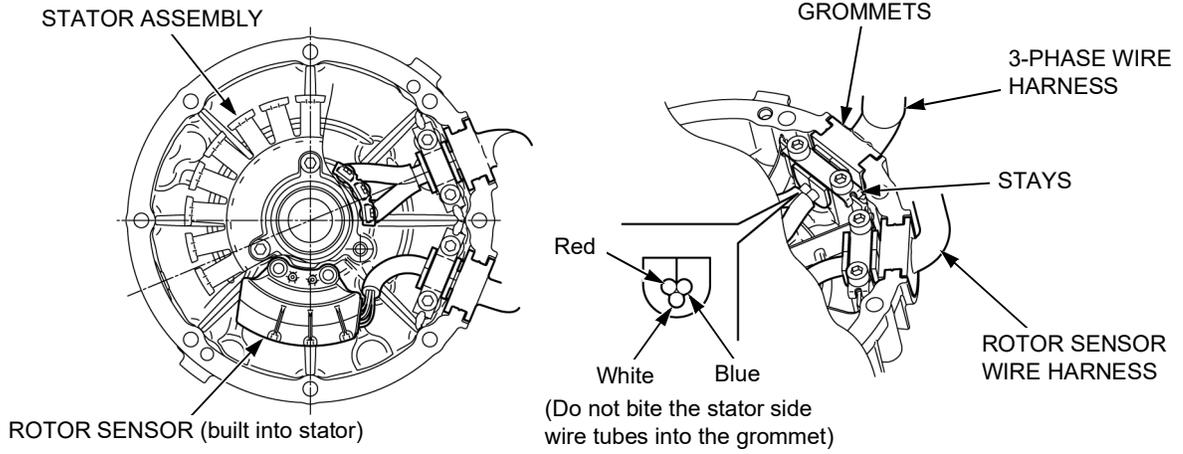
*: Installation (page 7-3)

SERVICE INFORMATION

With Control Box:



Inside of motor housing (P.T.O. side):



MEMO

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MAINTENANCE

MAINTENANCE SCHEDULE

Item		REGULAR SERVICE PERIOD (1)		Refer to page
		Each use	Every 5 years or 500 hrs.	
Exterior cover	Check	○		3-3
Switch, Speed control lever (applicable type)	Check	○		3-3
LED (applicable type)	Check	○		3-3
Power cable	Check	○		3-3
Set of wire harnesses	Check		○ (2) (4)	3-3
Battery fastener	Check	○		3-3
	Replace		○ (2)	5-4
Battery mount rubber	Check	○		3-3
	Replace		○ (2)	5-4
Battery hook	Check	○		3-3
	Replace		○ (2)	5-4
Mount rubber	Replace		○ (2)	5-4
				6-6
Stopper bolt	Replace		○ (2)	6-6
Stopper rubber	Replace		○ (2)	5-4
Drain hole	Clean		○ (2)	3-4
Set speed	Check	When required (3)		3-4

- (1) Perform at every indicated time or operating hours interval, whichever comes first.
- (2) These items should be serviced by your servicing dealer, unless you have the proper tools and are mechanically proficient. Consult an authorized Honda dealer.
- (3) If the DC Power Unit makes an unusual sound, have it inspected by your servicing dealer.
- (4) Replace if necessary.

BEFORE OPERATION CHECK

NOTE: Before beginning the checks, be sure the DC power unit is on a level surface and stopped. Also, perform a test run during the checks.

BEFORE ATTACHING THE BATTERY PACK

Check the following:

- Exterior covers [1] for damage
- Power cable [2] for damage or any foreign material in battery connector
- Battery fastener [3] for deflection or damage
- Battery mount rubbers [4] (4 places) for wear or damage
- Battery hook [5] for deformation or damage

NOTE: Replace each part in accordance with the maintenance schedule.

WHEN ATTACHING THE BATTERY PACK

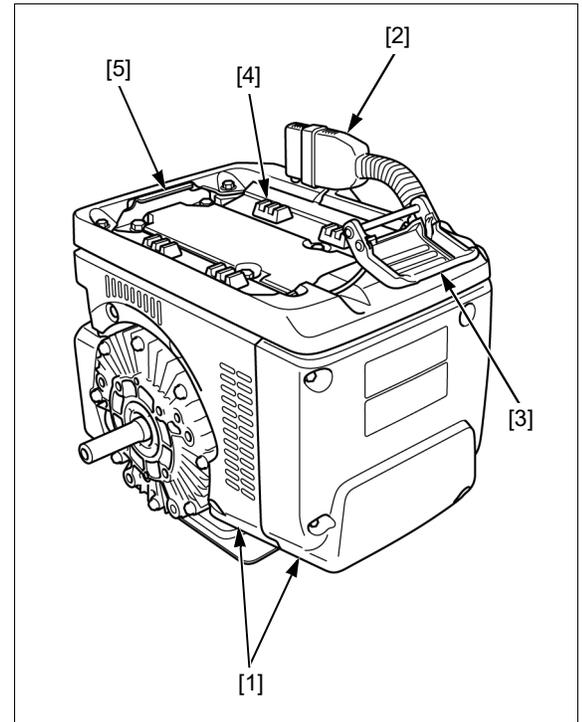
NOTICE: Ensure the battery pack is securely installed so it does not come loose during operation or become damaged.

Check the setting condition of the battery pack and If it feels loose, the fastening components must be checked (page 5-6).

DURING THE TEST RUN

Check that the following (applicable type):

- All indicators light (when the power unit is turned on)
- All switches work properly



VIBRATION DAMPING STRUCTURE COMPONENTS

⚠ WARNING

Defective of the damping mount related part will cause severe damage of the battery pack or the wire harness that is possible to ignite and fume the power unit.

NOTE: Replace the parts related to the vibration damping mount (i.e. mount rubbers, stopper pin bolts, stopper rubber) in accordance with the maintenance schedule.

Refer to the following sections for inspection.

- Cover (battery frame) (page 5-6)
- Control Unit (PDU) (page 6-8)

WIRE HARNESS CHECK

Remove the covers (page 5-2).

Check each connecting part of the wire harnesses for looseness or damage.

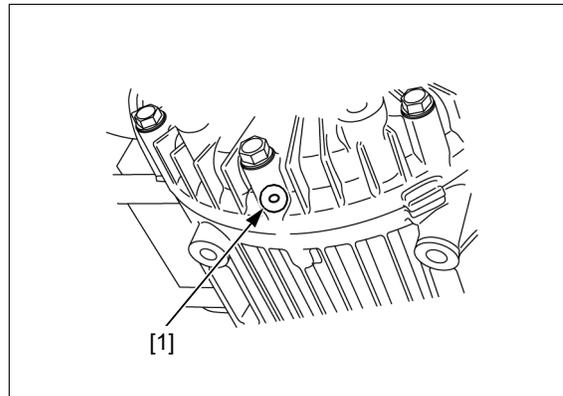
Replace the wire harness or the related part if necessary.

MAINTENANCE

DRAIN HOLE CLEANING

Remove the motor base (page 7-5).

Clean around the drain hole [1] to remove dirt, debris, or foreign objects.



MOTOR SET SPEED CHECK

Check that there is no malfunction or unusual sound by rotating and stopping the motor. The rotational speed of the motor is set at a constant speed for the fixed-speed type.

For the variable-speed type, check the rotational speed is adjustable with the speed control lever and that the speed varies smoothly.

If any abnormality is found, follow the troubleshooting (page 4-2).

4. TROUBLESHOOTING

TRUBLESHOOTING INFORMATION 4-2 DTC TROUBLESHOOTING 4-6

TROUBLESHOOTING

TROUBLESHOOTING INFORMATION

SYSTEM DESCRIPTION

SELF-DIAGNOSIS AND FAIL-SAFE FUNCTION

The power drive unit (PDU) in the DC power unit is equipped with a self-diagnostic function. When an abnormality occurs, the PDU turns on the appropriate indicators related to the failure (page 4-3) and stores a diagnostic trouble code (DTC) in its memory, and the fail-safe function stops the system (except for "Warning" items). It is necessary to retrieve the DTC and other system conditions with Dr. H for diagnosis.

Dr. H INFORMATION

Refer to the Instruction Manual for the Dr. H for the connection method to a personal computer and for the step-up method.

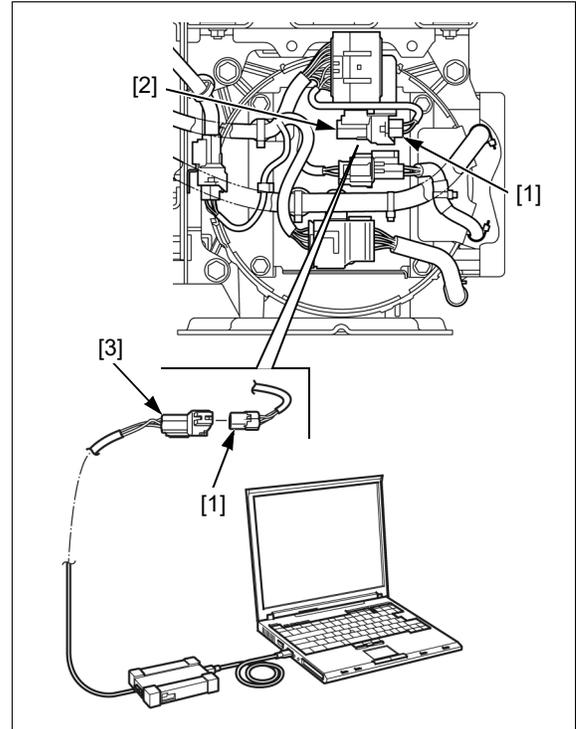
How to connect Dr. H to power unit

Stop the power unit system (all the indicators are turn-off state).

Remove the front cover (page 5-2).

Release the DLC [1] from the stay and remove its dummy connector [2].

Connect the 4P connector [3] of the Dr. H to the DLC.



INDICATOR DESCRIPTION

Each component of the battery pack, power unit and battery charger is equipped with several indicators that identify the operation and failure status. The indication patterns are described later, and if the indicator(s) related the failure lights or flashes, perform the DTC troubleshooting (page 4-6).

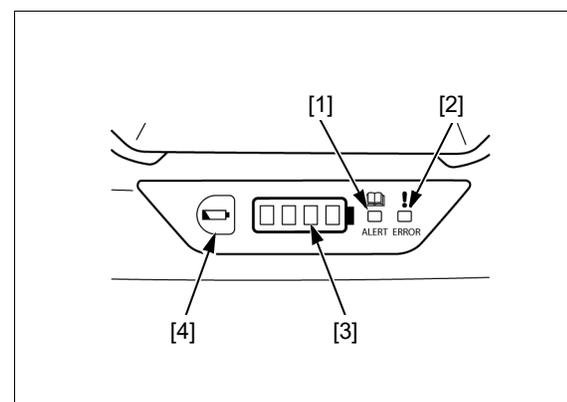
INDICATOR INDICATION PATTERN

BATTERY INDICATOR

The battery pack has the indicators for ALERT (Orange) [1] and ERROR (Red) [2] along with the charge level (residue) indicators (Green) [3].

To check the battery status by the indicator, press the check button [4] while the battery pack is not activated (as a single part).

While the battery pack is operating, the charge level indicator lights or flashes to indicate the residual capacity.



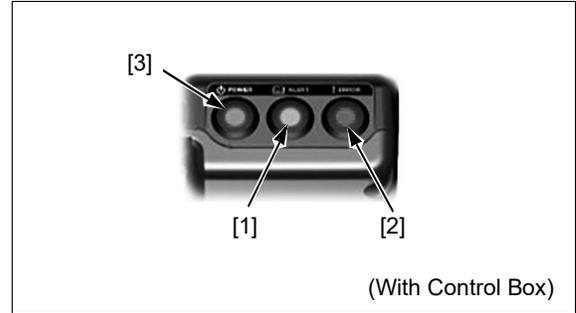
Classification	Protection Function	Indicator			Indication Condition	Indicator Reset
		Charge Level (Green)	ALERT (Orange)	ERROR (Red)		
Error (Level 0)	Cell high temperature protection (at discharging)	–	Flash	–	When detects protection function item or Protection state continued	10 seconds have elapsed from protection detection or 5 seconds have elapsed from pressing check button or Cancels protection function*
	Cell low temperature protection (at discharging)	–	Flash	–		
	Cell high temperature protection (at charging)	–	Flash	–		
	Cell low temperature protection (at charging)	–	Flash	–		
Error (Level 1)	C-FET high temperature protection	–	Flash	–		
	D-FET high temperature protection	–	Flash	–		
	Overvoltage protection	Flash (4 segments)	Flash	–		
	Undervoltage protection	Flash (1 segment)	Flash	–		
	Charge overcurrent protection	–	–	Stay on		
	Pre-charge overcurrent protection	–	–	Stay on		
	Discharge overcurrent protection	–	–	Stay on		
	Short-circuit protection	–	–	Stay on		
	CAN no communication protection	–	Flash	–		
Malfunction (Level 2)	Overcharging failure	–	–	Flash	10 seconds have elapsed from protection detection or 5 seconds have elapsed from pressing check button	
	Overdischarging failure	–	–	Flash		
	Cell voltage balance failure	–	–	Flash		
	Pre-charge time out	–	–	Flash		
	C-FET failure	–	–	Flash		
	D-FET failure	–	–	Flash		
	AFE failure	–	–	Flash		
	Cell thermistor shorted	–	–	Flash		
	Cell thermistor opened	–	–	Flash		
	FET thermistor shorted	–	–	Flash		
FET thermistor opened	–	–	Flash			

* The protection function cancels automatically when the failure or abnormality is resolved.

TROUBLESHOOTING

POWER UNIT INDICATOR

The power unit has the indicators for ALERT (Orange) [1] and ERROR (Red) [2] along with the POWER indicator (Green) [3].



Classification	Protection Function	Unit Operation	Indicator			Indication Condition	Indicator Reset
			ERROR (Red)	ALERT (Orange)	POWER (Green)		
Malfunction	Regenerative resistance circuit failure	Stop	Flash	–	–	When detects protection function item, then lights immediately	Turn off power unit with POWER button or After lighting for 1 minute, power unit turns off
	START/STOP switch failure	Stop	Flash	–	–		
	CAN communication interruption	Stop	Flash	–	–		
	Rotor sensor failure	Stop	Flash	–	–		
	Output pulse abnormality	Stop	Flash	–	–		
	Pre-charge circuit failure	Stop	Flash	–	–		
	FET thermistor shorted/opened	Stop	Flash	–	–		
	Motor thermistor shorted/opened	Stop	Flash	–	–		
Error	FET overtemperature abnormality	Stop	–	Flash	–		
	Motor overtemperature abnormality	Stop	–	Flash	–		
	Motor lock failure	Stop	–	Flash	–		
	Motor overspeed (Except S1, Q1, Q2 type)	Stop	–	Flash	–		
	Motor reverse rotation (Except S1, Q1, Q2 types)	Stop	–	Flash	–		
	Overcurrent abnormality (overload)	Stop	–	Flash	–		
	Undervoltage abnormality	Stop	–	Flash	–		
	Overvoltage abnormality	Stop	–	Flash	–		
Warning	Electrostatic malfunction	Stop	–	Flash	–		
	FET overtemperature warning	Continuing operation*	–	Flash	Stay on	Cancels protection function*** or Turn off power unit with POWER button or After lighting for 1 minute, power unit turns off	
Motor overtemperature warning	Continuing operation*	–	Flash	Stay on			
Misoperation	Starting interlock**	Stop	–	Flash	–	Turn off power unit with POWER button or After lighting for 1 minute, power unit turns off	

* Stop using the power unit and wait for it to cool down.

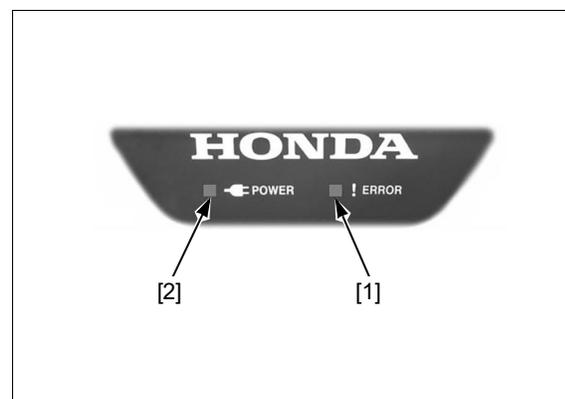
** The POWER button is pressed with the START/STOP switch in the START position when starting the power unit.

*** The protection function cancels automatically when the failure or abnormality is resolved.

CHARGER INDICATOR

The battery charger has the ERROR (Red) [1] and POWER (Green) [2] indicators.

If it detects an abnormality, the ERROR indicator lights and the charging stops.



Classification	Status	Indicator		Indication Condition	Indicator Reset
		POWER (Green)	ERROR (Red)		
Normal	Standby before charging	Stay on	–	AC plug connection (Power on)	AC plug disconnection (Power off)
	Charging	Stay on	–		
	Charging completed	Stay on	–		
Error	Charger output overvoltage	–	Stay on	When detects protection function item or Protection state continued	AC plug disconnection (Power off)
	Charger output current abnormality	–	Stay on		
	Charger output low voltage abnormality	–	Stay on		
	Charger temperature abnormality	–	Stay on		
	Charger voltage abnormality	–	Stay on		
	Charger shorted	–	Stay on		
	CAN communication error	–	Stay on		
Internal voltage abnormality	–	Stay on			

TROUBLESHOOTING

DTC TROUBLESHOOTING

BATTERY PACK

DTC	Detecting Item	Failure Condition/ Possible Cause	Verification Item (Check in numerical order)	
			Applicable Part	Check for (abnormal symptom)
3A400	Overcharging (permanent failure)	Power unit is unable to power on	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
		No internal power in battery pack	2. Battery pack (connected with Dr. H)	Communication cannot be performed with Dr. H
No DTC displayed (blown battery internal fuse)		No internal power in battery pack	3. Battery indicator (single part)	Indicators of battery pack do not come on, pressing check button
		Damaged battery	4. Battery pack	Replace battery pack
3A401	Overdischarging (permanent failure)	Battery cannot supply power	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery cell voltage (connected with Dr. H)	Cell voltage is 1.6 V or less
			3. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			4. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
		Damaged battery	5. Battery pack	Replace battery pack
3A404	Cell voltage balance abnormality (permanent failure)	Battery cannot supply power	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery cell voltage (connected with Dr. H)	Excessive voltage difference between respective cells
			3. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			4. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
		Damaged battery	5. Battery pack	Replace battery pack
3A405	Pre-charge time out (permanent failure)	Battery cannot be charged due to C-FET malfunction	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery cell voltage (connected with Dr. H)	Cell voltage is 2.5 V or less
			3. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			4. Battery charger (battery pack installed)	Charger does not start charging
		Damaged battery	5. Battery pack	Replace battery pack
3A406	Charging FET abnormality (permanent failure)	Battery cannot be charged due to C-FET damaged	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			3. Battery charger (battery pack installed)	Charger does not start charging
		Damaged battery	4. Battery pack	Replace battery pack

DTC	Detecting Item	Failure Condition/ Possible Cause	Verification Item (Check in numerical order)	
			Applicable Part	Check for (abnormal symptom)
3A407	Discharging FET abnormality (permanent failure)	Battery cannot be discharged due to D-FET damaged	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			3. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
		Damaged battery	4. Battery pack	Replace battery pack
3A410	Internal circuit communication error (permanent failure)	Communication failure with MCU due to AFE damaged, resulting in battery not being charged and discharged	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			3. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
			4. Battery charger (battery pack installed)	Charger does not start charging
		Damaged battery	5. Battery pack	Replace battery pack
3A411	Battery thermistor shorted (permanent failure)	Line short-circuit failure due to thermistor damaged, resulting in battery not being charged and discharged	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery cell temperature (connected with Dr. H)	Cell temperature is 130°C (266°F) or more
			3. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			4. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
		Damaged battery	5. Battery pack	Replace battery pack
3A412	Battery thermistor opened (permanent failure)	Line open-circuit failure due to thermistor damaged, resulting in battery not being charged and discharged	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery cell temperature (connected with Dr. H)	Cell temperature is -35°C (-31°F) or less
			3. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			4. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
		Damaged battery	5. Battery pack	Replace battery pack
3A413	Battery temperature abnormality (permanent failure)	Damaged battery thermistor or AFE, resulting in battery not being charged and discharged	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery cell temperature (connected with Dr. H)	Temperature difference between respective cells is 30°C (86°F) or more
			3. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			4. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
		Damaged battery	5. Battery pack	Replace battery pack

TROUBLESHOOTING

DTC	Detecting Item	Failure Condition/ Possible Cause	Verification Item (Check in numerical order)	
			Applicable Part	Check for (abnormal symptom)
3A414	FET thermistor shorted (permanent failure)	Line short-circuit failure due to thermistor damaged, resulting in battery not being charged and discharged	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery cell temperature (connected with Dr. H)	Cell temperature is 130°C (266°F) or more
			3. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			4. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
		Damaged battery	5. Battery pack	Replace battery pack
3A415	FET thermistor opened (permanent failure)	Line open-circuit failure due to thermistor damaged, resulting in battery not being charged and discharged	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery cell temperature (connected with Dr. H)	Cell temperature is -35°C (-31°F) or less
			3. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			4. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
		Damaged battery	5. Battery pack	Replace battery pack
3A420	Overvoltage protection	Abnormal battery cell voltage, so that does not activate battery pack by itself	1. Battery cell voltage (connected with Dr. H)	Cell voltage is 4.2 V or more
			2. Battery indicator (single part)	ALERT (Orange) indicator of battery pack flashes, pressing check button
		Abnormal battery cell voltage due to PDU malfunction	3. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
			4. PDU (power unit indicator) (battery pack installed on power unit)	ERROR (Red) or ALERT (Orange) indicator of power unit flashes
		Abnormal battery cell voltage due to battery charger malfunction	5. Battery charger (battery pack installed)	Charger does not start charging
			6. Charger indicator (battery pack installed)	ERROR (Red) indicator of charger stays on during charging
		Damaged battery	7. Battery pack	Replace battery pack
3A421	Undervoltage protection	Abnormal battery cell voltage, so that does not activate battery pack by itself	1. Battery cell voltage (connected with Dr. H)	Cell voltage is 2.8 V or less
			2. Battery indicator (single part)	ALERT (Orange) indicator of battery pack flashes, pressing check button
		Abnormal battery cell voltage due to PDU malfunction	3. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
			4. PDU (power unit indicator) (battery pack installed on power unit)	ERROR (Red) or ALERT (Orange) indicator of power unit flashes
		Abnormal battery cell voltage due to battery charger malfunction	5. Battery charger (battery pack installed)	Charger does not start charging
			6. Charger indicator (battery pack installed)	ERROR (Red) indicator of charger stays on during charging
		Cell voltage lowers due to excessive load	7. Driven mechanism	Mechanical lock or excessive overload
		Damaged battery	8. Battery pack	Replace battery pack

DTC	Detecting Item	Failure Condition/ Possible Cause	Verification Item (Check in numerical order)	
			Applicable Part	Check for (abnormal symptom)
3A422	Charge overcurrent protection	Excessive current flows in battery, so that does not activate battery pack by itself	1. Battery indicator (single part)	ERROR (Red) indicator of battery pack stays on, pressing check button
			2. Battery connector terminals	Any foreign material in connector (+)/(-)
		Excessive current flows in battery due to battery charger shorted or malfunction resulting in battery not being charged	3. Charger connector terminals	Any foreign material in connector (+)/(-)
			4. Battery charger (battery pack installed)	Charger does not start charging
			5. Battery indicator (battery pack installed on charger)	ERROR (Red) indicator of battery pack stays on during charging
			6. Charger indicator	ERROR (Red) indicator of charger stays on during charging
		Damaged battery	7. Battery pack	Replace battery pack
3A423	Pre-charge overcurrent protection	Excessive current flows in battery, so that does not activate battery pack by itself	1. Battery indicator (single part)	ERROR (Red) indicator of battery pack stays on, pressing check button
			2. Battery charger (battery pack installed)	Charger does not start charging
		Excessive current flows in battery due to battery charger shorted or malfunction resulting in battery not being charged	3. Battery indicator (battery pack installed on charger)	ERROR (Red) indicator of battery pack stays on during charging
			4. Charger indicator (battery pack installed)	ERROR (Red) indicator of charger stays on during charging
		Damaged battery	5. Battery pack	Replace battery pack
3A424	Discharge overcurrent protection	Excessive current flows in battery, so that does not activate battery pack by itself	1. Battery current (connected with Dr. H)	Battery current is 60 A or more
			2. Battery indicator (single part)	ERROR (Red) indicator of battery pack stays on, pressing check button
			3. Battery connector terminals	Any foreign material in connector (+)/(-)
		Excessive current flows in battery due to PDU or related wire shorted resulting in battery not being discharged	4. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
			5. PDU (power unit indicator) (battery pack installed on power unit)	ERROR (Red) or ALERT (Orange) indicator of power unit flashes
			6. Battery indicator (battery pack installed on power unit)	ERROR (Red) indicator of battery pack stays on during running
			7. Power lines of PDU	Any foreign material in 3P (Black) connector (+)/(-) or line short-circuit
		Battery cannot be discharged due to excessive load	8. Driven mechanism	Mechanical lock or excessive overload
		Damaged battery	9. Battery pack	Replace battery pack

TROUBLESHOOTING

DTC	Detecting Item	Failure Condition/ Possible Cause	Verification Item (Check in numerical order)	
			Applicable Part	Check for (abnormal symptom)
3A425	Short-circuit protection	Excessive current flows in battery, so that does not activate battery pack by itself	1. Battery current (connected with Dr. H)	Battery current is 80 A or more
			2. Battery indicator (single part)	ERROR (Red) indicator of battery pack stays on, pressing check button
			3. Battery connector terminals	Any foreign material in connector (+)/(-)
		Excessive current flows in battery due to PDU or related wire shorted resulting in battery not being discharged	4. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
			5. PDU (power unit indicator) (battery pack installed on power unit)	ERROR (Red) or ALERT (Orange) indicator of power unit flashes
			6. Battery indicator (battery pack installed on power unit)	ERROR (Red) indicator of battery pack stays on during running
			7. Power lines of PDU	Any foreign material in 3P (Black) connector (+)/(-) or line short-circuit
		Battery cannot be discharged due to excessive load	8. Driven mechanism	Mechanical lock or excessive overload
		Damaged battery	9. Battery pack	Replace battery pack
3A426	Charging FET temperature protection	Battery charging FET overheats resulting in battery not being activated by itself	1. Battery cell temperature (connected with Dr. H)	Cell temperature is 100°C (212°F) or more
			2. Battery indicator (single part)	ALERT (Orange) indicator of battery pack flashes, pressing check button
		Excessive current flows from charger resulting in battery not being charged (Charger side is abnormal or not)	3. Battery charger (battery pack installed)	Charger does not start charging
			4. Charger indicator (battery pack installed)	ERROR (Red) indicator of charger stays on during charging
		FET heats due to high temperature around battery	5. Battery peripheral area (installed on charger)	Peripheral temperature is more than 50°C (122°F)
		Charger cooling fan stops due to foreign object interference or fan motor connector disconnected	6. Charger cooling fan (battery pack installed) and connector	Cooling fan does not operate during charging
Damaged battery	7. Battery pack	Replace battery pack		
3A427	Discharging FET temperature protection	Battery discharging FET overheats resulting in battery not being activated by itself	1. Battery cell temperature (connected with Dr. H)	Cell temperature is 100°C (212°F) or more
			2. Battery indicator (single part)	ALERT (Orange) indicator of battery pack flashes, pressing check button
		Excessive current flows and FET heats resulting in battery not being discharged (PDU side is abnormal or not)	3. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
			4. PDU (power unit indicator) (battery pack installed on power unit)	ALERT (Orange) indicator of power unit flashes during discharging (POWER button pressed to ON)
		FET heats due to high temperature around battery	5. Battery peripheral area (installed on power unit)	Peripheral temperature is more than 50°C (122°F)
		Battery cannot be discharged due to excessive load	6. Driven mechanism	Mechanical lock or excessive overload
Damaged battery	7. Battery pack	Replace battery pack		

DTC	Detecting Item	Failure Condition/ Possible Cause	Verification Item (Check in numerical order)	
			Applicable Part	Check for (abnormal symptom)
3A430	CAN communication error	Short circuit between DLC terminals	1. DLC (4P)	Short circuit
		Open circuit in CAN communication line	2. CAN wires between PDU and battery pack (CAN L/ CAN H)	Open circuit
3A431	Battery cell voltage balance protection	Battery cannot be supplied power	1. Battery connectors (at battery pack and power cable)	Any foreign material, short-circuit failure, or other problem in connector
			2. Battery cell voltage (connected with Dr. H)	Cell voltage is 0.3 V or less
			3. Battery indicator (single part)	ERROR (Red) indicator of battery pack flashes, pressing check button
			4. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
		Damaged battery	5. Battery pack	Replace battery pack
3A440	Battery cell high temperature protection (at discharging)	Battery cell overheats resulting in battery not being activated by itself	1. Battery cell temperature (connected with Dr. H)	Cell temperature is 80°C (176°F) or more
			2. Battery indicator (single part)	ALERT (Orange) indicator of battery pack flashes, pressing check button
		Excessive current flows resulting in battery not being discharged (PDU side is abnormal or not)	3. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
			4. PDU (power unit indicator) (battery pack installed on power unit)	ALERT (Orange) indicator of power unit flashes during discharging (POWER button pressed to ON)
		Battery cannot be discharged due to high ambient temperature	5. Battery peripheral area (installed on power unit)	Peripheral temperature is more than 50°C (122°F)
		Battery cannot be discharged due to excessive load	6. Driven mechanism	Mechanical lock or excessive overload
		Damaged battery	7. Battery pack	Replace battery pack
3A441	Battery cell high temperature protection (at charging)	Battery cell overheats resulting in battery not being activated by itself	1. Battery cell temperature (connected with Dr. H)	Cell temperature is 60°C (140°F) or more
			2. Battery indicator (single part)	ALERT (Orange) indicator of battery pack flashes, pressing check button
		Excessive current flows resulting in battery not being charged (Charger side is abnormal or not)	3. Battery charger (battery pack installed)	Charger does not start charging
			4. Charger indicator (battery pack installed)	ERROR (Red) indicator of charger stays on during charging
		Battery cannot be charged due to high ambient temperature	5. Battery peripheral area (installed on charger)	Peripheral temperature is more than 50°C (122°F)
		Charger cooling fan stops due to foreign object interference or fan motor connector disconnected	6. Charger cooling fan (battery pack installed)	Cooling fan does not operate during charging
		Damaged battery	7. Battery pack	Replace battery pack

TROUBLESHOOTING

DTC	Detecting Item	Failure Condition/ Possible Cause	Verification Item (Check in numerical order)	
			Applicable Part	Check for (abnormal symptom)
3A442	Battery cell low temperature protection (at charging)	Battery cell overcools resulting in battery not being activated by itself	1. Battery cell temperature (connected with Dr. H)	Cell temperature is 0°C (32°F) or less
			2. Battery indicator (single unit)	ALERT (Orange) indicator of battery pack flashes, pressing check button
		Battery cannot be charged due to charger left at low temperature for long time etc. (Charger side is abnormal or not)	3. Battery charger (battery pack installed)	Charger does not start charging
			4. Charger indicator (battery pack installed)	ERROR (Red) indicator of charger stays on during charging
		Low ambient temperature of 0°C (32°F) or less	5. Battery peripheral area (installed on charger)	Peripheral temperature is 0°C (32°F) or less
Damaged battery	6. Battery pack	Replace battery pack		
3A443	Battery cell low temperature protection (at discharging)	Battery cell overcools resulting in battery not being activated by itself	1. Battery cell temperature (connected with Dr. H)	Cell temperature is -20°C (-4°F) or less
			2. Battery indicator (single part)	ALERT (Orange) indicator of battery pack flashes, pressing check button
		PDU malfunction	3. PDU (battery pack installed on power unit)	Motor operation by performing the starting procedure
			4. PDU (power unit indicator) (battery pack installed on power unit)	ALERT (Orange) indicator of power unit flashes during discharging (POWER button pressed to ON)
		Low ambient temperature of -20°C (-4°F) or less	5. Battery peripheral area (installed on power unit)	Peripheral temperature is -20°C (-4°F) or less
Damaged battery	6. Battery pack	Replace battery pack		

POWER UNIT

DTC	Detecting Item	Failure Condition/ Possible Cause	Verification Item (Check in numerical order)	
			Applicable Part	Check for (abnormal symptom)
3A102	CAN received message	Short circuit between DLC terminals	1. DLC (4P)	Short circuit
		Open circuit in CAN communication line	2. CAN wires between PDU and battery pack (CAN L/ CAN H)	Open circuit
3A103	Rotor sensor malfunction	Loosely connected connector	1. Motor 8P connector	Loose or poor connection
		Loosely connected connector terminal	2. Motor 8P connector terminal	Loose or poor contact
		Open circuit in sensor wire	3. Rotor sensor wires between motor and PDU	Open circuit
		Damaged PDU	4. PDU	Replace PDU
		Damaged motor	5. Motor	Replace motor
3A104	Output pulse abnormality	Loosely connected connector	1. Motor 8P connector	Loose or poor connection
		Loosely connected connector terminal	2. Motor 8P connector terminal	Loose or poor contact
		Open circuit in sensor wire	3. Rotor sensor wires between motor and PDU	Open circuit
		Damaged PDU	4. PDU	Replace PDU
		Damaged motor	5. Motor	Replace motor
3A105	START/STOP switch malfunction	Loosely connected connector	1. START/STOP switch connector	Loose or poor connection
		Loosely connected connector terminals	2. START/STOP switch connector terminal	Loose or poor contact
		Open circuit in switch wire	3. Switch wires between switch and PDU	Open circuit
		Damaged PDU	4. PDU	Replace PDU
3A106	Regenerative resistance circuit malfunction	Damaged PDU	1. PDU	Replace PDU
3A107	Pre-charge circuit malfunction	Damaged PDU	1. PDU	Replace PDU
3A110	FET thermistor shorted/opened	Damaged PDU	1. PDU	Replace PDU
3A111	Motor thermistor opened	Loosely connected connector	1. Motor 8P connector	Loose or poor connection
		Loosely connected connector terminal	2. Motor 8P connector terminal	Loose or poor contact
		Open circuit in sensor wire	3. Rotor sensor wires between motor and PDU	Open circuit
		Damaged PDU	4. PDU	Replace PDU
		Damaged motor	5. Motor	Replace motor
3A112	Electrostatic malfunction*	Abnormal charge of static electricity	1. Running on insulator	<ul style="list-style-type: none"> • Operating location • Ground line setting between product and ground
			2. Static electrification on frame while running	
		Damaged PDU	3. PDU	Replace PDU

* The strong electrostatic charging may be stopped the motor. If this DTC is indicated, review the installation condition of the motor and/or the operating condition of the product.

TROUBLESHOOTING

DTC	Detecting Item	Failure Condition/ Possible Cause	Verification Item (Check in numerical order)	
			Applicable Part	Check for (abnormal symptom)
3A120	Lock error	Overload operation	1. PDU (connected with Dr. H)	Current value is 35 A or more in motor running status (abnormal)
		Lock or overload by driven system	2. Driven mechanism	Mechanical lock or excessive overload
		Loosely connected connector	3. PDU 3P (Gray) connector	Loose or poor connection
		Loosely connected connector terminal	4. PDU 3P (Gray) connector terminal	Loose or poor contact
		Damaged stator coil	5. Stator coil	Coil resistance value measurement (page 7-8)
		Damaged PDU	6. PDU	Replace PDU
3A121	Motor overspeed	Excessive overload driving on downward slope	1. Driving situation of completed machine	<ul style="list-style-type: none"> Load weight Slope of working condition
		Traction driving by external force	2. Driving situation of completed machine	Traction operation
		Damaged stator coil	3. Stator coil	Coil resistance value measurement (page 7-8)
3A122	Motor reverse rotation	Excessive overload driving on upward slope	1. PDU (connected with Dr. H)	Rotating direction
			2. Motor P.T.O. shaft	Rotating direction
		3-phase wire misconnection	3. PDU 3P (Gray) connector	Wire connection (poor connection of terminal or connector)
		Rotor sensor wire misconnection	4. Rotor sensor 8P (Black) connector	Wire connection (poor connection of terminal or connector)
3A130	FET overcurrent (OC2)	Overload operation	1. PDU (connected with Dr. H)	Current value is 35 A or more in motor running status (abnormal)
		High ambient temperature around product	2. PDU mounting area	Peripheral temperature
		Lock or overload by driven system	3. Driven mechanism	Mechanical lock or excessive overload
		Improper installation of PDU on frame	4. PDU	PDU mounting condition
		Damaged PDU	5. PDU	Replace PDU
3A131	FET excessively overheating (OT2)	Overload operation	1. PDU (connected with Dr. H)	Current value is 35 A or more in motor running status (abnormal)
		High ambient temperature around product	2. PDU mounting area	Peripheral temperature
		Lock or overload by driven system	3. Driven mechanism	Mechanical lock or excessive overload
		Improper installation of PDU on frame	4. PDU	PDU mounting condition
		Damaged PDU	5. PDU	Replace PDU
3A132	Motor excessively overheating (OT2)	Overload operation	1. PDU (connected with Dr. H)	Current value is 35 A or more in motor running status (abnormal)
		High ambient temperature around product	2. Motor peripheral area	Peripheral temperature
		Lock or overload by driven system	3. Driven mechanism	Mechanical lock or excessive overload
		Improper installation of PDU on frame	4. PDU	PDU mounting condition
		Damaged PDU	5. PDU	Replace PDU

DTC	Detecting Item	Failure Condition/ Possible Cause	Verification Item (Check in numerical order)	
			Applicable Part	Check for (abnormal symptom)
3A133	Driver input overvoltage (OV2)	Voltage rise caused by regeneration current	1. PDU (connected with Dr. H)	DC voltage value rises suddenly in motor running and stop status (abnormal)
		Damaged regenerative resistance circuit	2. PDU (connected with Dr. H)	Failure state of regenerative resistance circuit DTC 3A106 (page 4-13)
		Failure in related battery	3. Battery pack	Failure state of battery DTC (page 4-6)
		Damaged PDU	4. PDU	Replace PDU
3A134	Driver input undervoltage (UV2)	Overload operation	1. PDU (connected with Dr. H)	Current value is 35 A or more in motor running status (abnormal)
		Lock or overload by driven system	2. Driven mechanism	Mechanical lock or excessive overload
		Failure in related battery	3. Battery pack	Failure state of battery DTC (page 4-6)
		Damaged PDU	4. PDU	Replace PDU
3A141	FET overheating (OT1)	Overload operation	1. PDU (connected with Dr. H)	Current value is 35 A or more in motor running status (abnormal)
		High ambient temperature around product	2. Motor peripheral area	Peripheral temperature
		Lock or overload by driven system	3. Driven mechanism	Mechanical lock or excessive overload
		Improper installation of PDU on frame	4. PDU	PDU mounting condition
		Damaged PDU	5. PDU	Replace PDU
3A142	Motor overheating (OT1)	Overload operation	1. PDU (connected with Dr. H)	Current value is 35 A or more in motor running status (abnormal)
		High ambient temperature around product	2. Motor peripheral area	Peripheral temperature
		Lock or overload by driven system	3. Driven mechanism	Mechanical lock or excessive overload
		Improper installation of PDU on frame	4. PDU	PDU mounting condition
		Damaged PDU	5. PDU	Replace PDU
3A172	Power-on to running inhibition	POWER button is pressed ON with START/STOP switch in START position	1. START/STOP switch	Switch position (START)
		Melt sticking or short circuit of START/STOP switch	2. START/STOP switch	Continuity between terminals in START/STOP switch (page 6-8)
		Damaged PDU	3. PDU	Replace PDU

MEMO

COVER REMOVAL/INSTALLATION 5-2

FRAME MOUNT RUBBER CHECK 5-6

BATTERY TRAY
REMOVAL/INSTALLATION 5-4

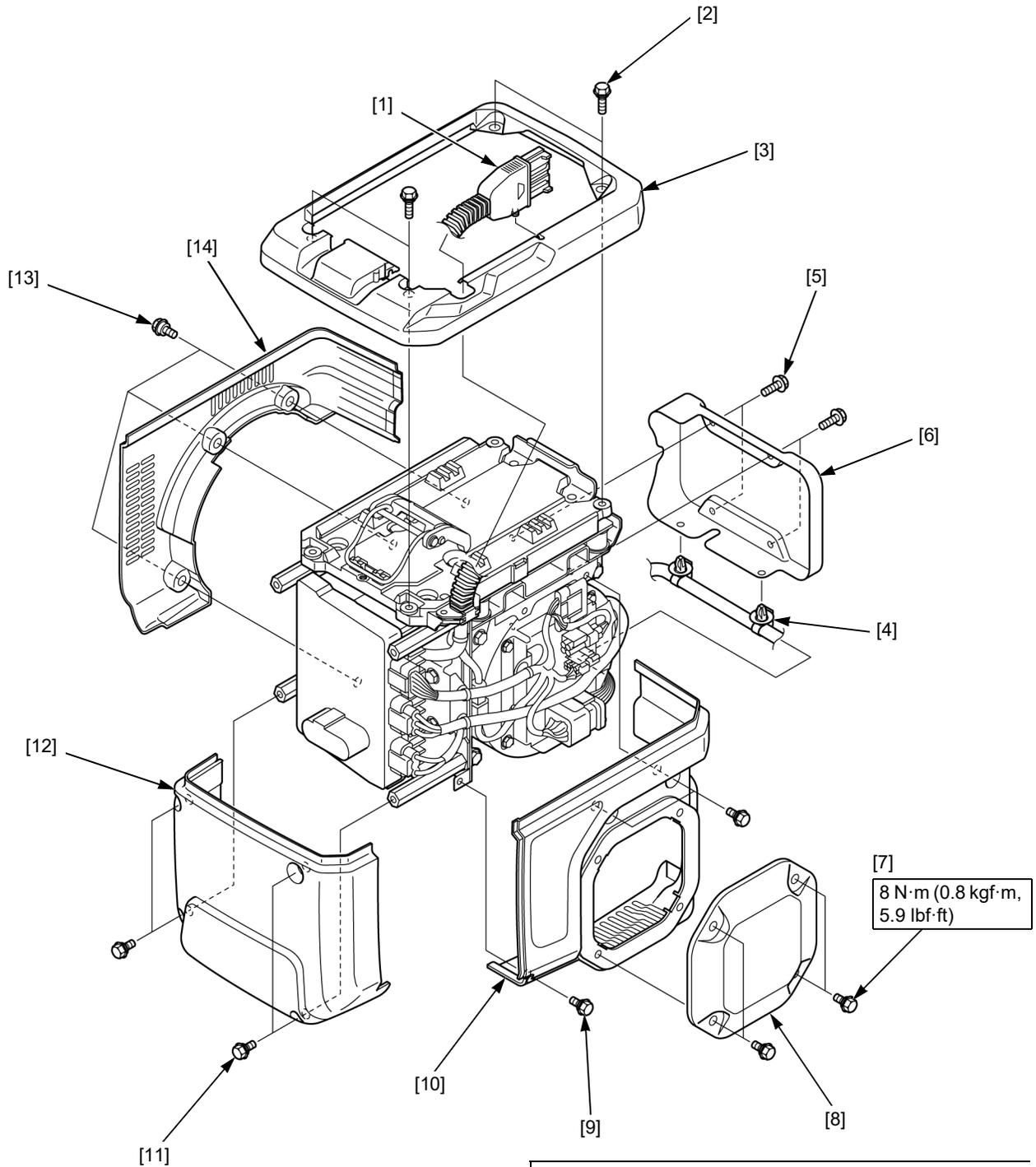
BATTERY FASTENING COMPONENT
CHECK 5-6

COVER

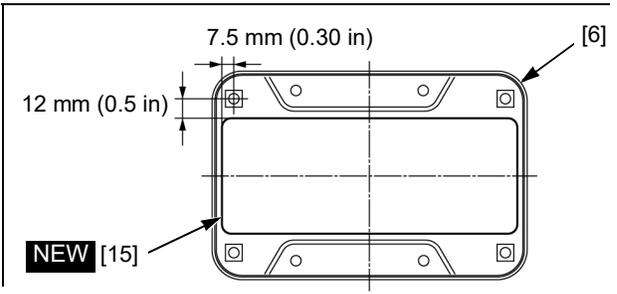
COVER REMOVAL/INSTALLATION

Remove the battery pack (for the battery tray cover) (page 7-2).

Remove the control box assembly (applicable type) (for the side frame and the rear cover) (page 6-2).



[7]
8 N·m (0.8 kgf·m,
5.9 lbf·ft)



Parts	Remarks
[1] BATTERY CONNECTOR	INSTALLATION: Install its setting boss into the cover groove if the battery pack is not connected.
[2] SPECIAL BOLT (6 x 16 mm) (4)	
[3] BATTERY TRAY COVER	
[4] CLIP BAND	(Without Control Box: Q'ty; 2/With Control Box: Q'ty; 1)
[5] BOLT (6 x 16 mm) (4)	
[6] SIDE FRAME	
[7] SPECIAL BOLT (6 x 12 mm) (4)	
[8] TOP COVER	
[9] SPECIAL BOLT (6 x 12 mm) (3)	
[10] FRONT COVER	
[11] SPECIAL BOLT (6 x 12 mm) (4)	
[12] PDU COVER	
[13] SPECIAL BOLT (6 x 12 mm) (3)	
[14] REAR COVER	
[15] SILENT SHEET (Except S1, Q1, Q2 types)	REPLACEMENT: Strip the sheet and remove any adhesive from the side frame thoroughly to clean it. Peel off the adhesive protective film of a new sheet and attach it in position as shown.

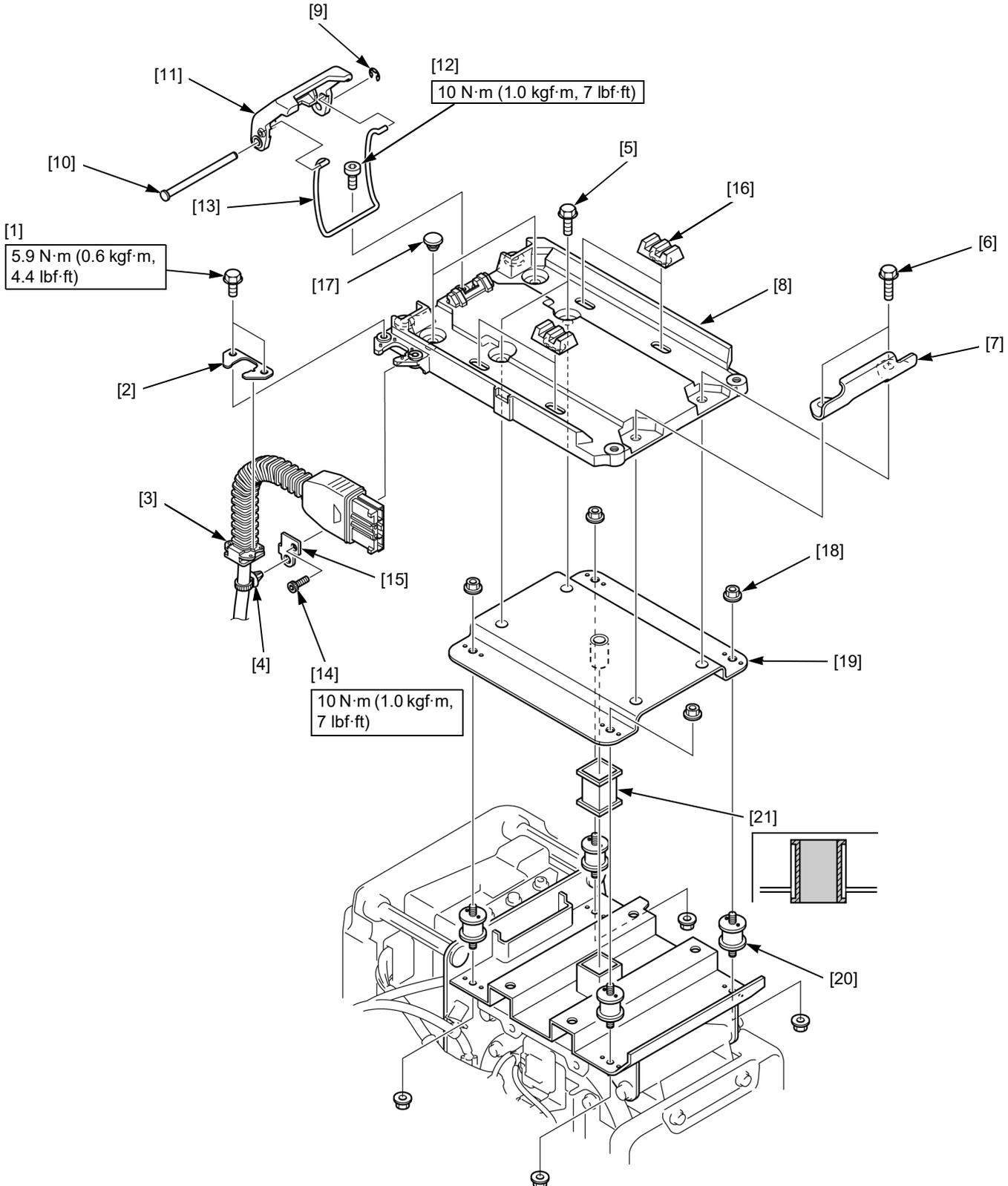
COVER

BATTERY TRAY REMOVAL/INSTALLATION

Remove the following covers (page 5-2).

- Battery tray cover
- Front cover
- Rear cover

NOTE: Before removal, check whether the components of the vibration damping structure are normal (page 5-6).



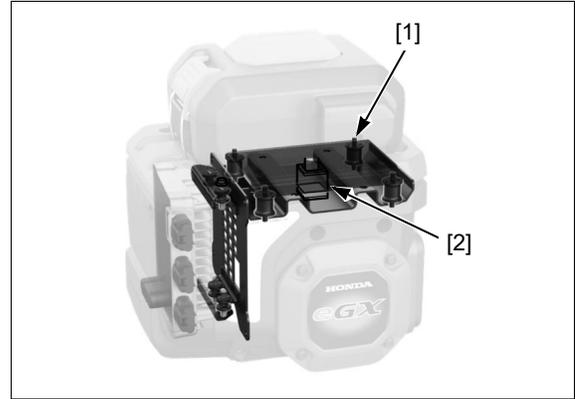
Parts	Remarks
[1] BOLT (5 x 12 mm) (2)	
[2] CONNECTOR STAY	INSTALLATION: Align the groove with the lug (page 2-4).
[3] POWER CABLE	INSTALLATION: Align the four holes with the pins of the tray (page 2-4).
[4] CLIP BAND	
[5] BOLT (8 x 16 mm) (2)	
[6] BOLT (8 x 20 mm) (2)	
[7] BATTERY HOOK	INSPECTION: page 5-6
[8] BATTERY TRAY	
[9] E-RING	
[10] LOCK LEVER PIN	
[11] FASTENER LEVER	
[12] SOCKET BOLT (6 x 12 mm)	
[13] FASTENER WIRE	INSPECTION: page 5-6
[14] SOCKET BOLT (6 x 12 mm)	
[15] HARNESS CLIP BRACKET	
[16] BATTERY MOUNT RUBBER (4)	INSPECTION: page 5-6
[17] HOLE CAP (2)	
[18] NUT (6 mm) (8)	
[19] BATTERY FRAME	
[20] FRAME MOUNT RUBBER (4)	INSPECTION: Check for cracks or other damage. INSTALLATION: Align each two locating pins with the holes in the frames.
[21] STOPPER RUBBER	INSPECTION: Check for wear or deterioration. INSTALLATION: Fit the rubber flanges over the sleeve edge of the frame securely.

COVER

FRAME MOUNT RUBBER CHECK

Check the mount rubbers [1] for looseness by lifting the battery tray lightly at points of the four corners. The tray should have very little movement if the mount rubbers are not damaged.

If any looseness is noted, they may be damaged, and replace the mount rubbers and stopper rubber [2] as a set.



BATTERY FASTENING COMPONENT CHECK

[1] BATTERY MOUNT RUBBERS

Check each rubber for damage and measure the rubber height.

If the rubber is severely damaged or the height is excessively lower than the standard value, replace them as a set.

[2] BATTERY HOOK

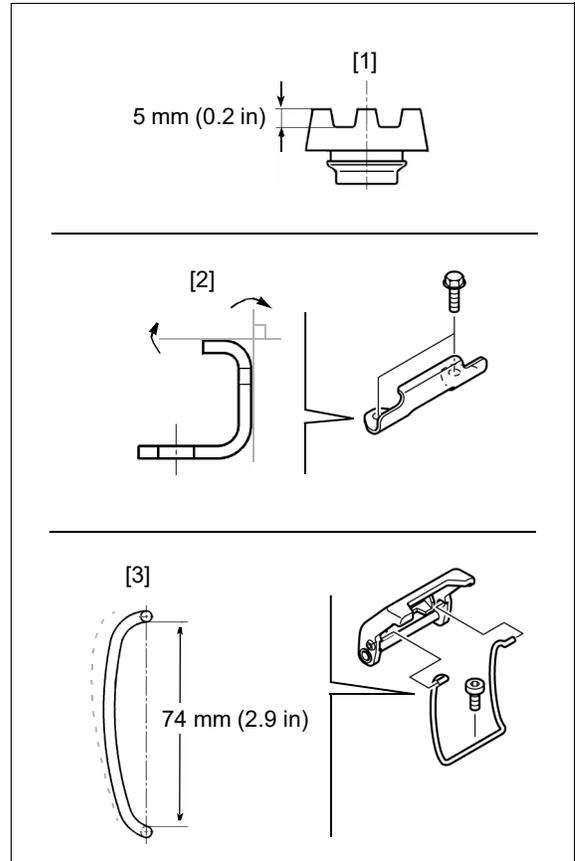
Looking at the fastener wire from the side (as shown), check to see whether the hook shape is bent in the direction of the arrows.

If there is any distortion, repair or replace it.

[3] FASTENER WIRE

Looking at the fastener wire from the side (as shown), check to see if the wire is correctly bent into a curve with the indicated measurements.

If the length is longer, the wire has straightened out and requires replacing.



**CONTROL BOX
REMOVAL/INSTALLATION
(Applicable type)..... 6-2**

**CONTROL BOX
DISASSEMBLY/ASSEMBLY
(Applicable type)..... 6-3**

PDU REMOVAL/INSTALLATION..... 6-5

PDU MOUNT RUBBER CHECK 6-8

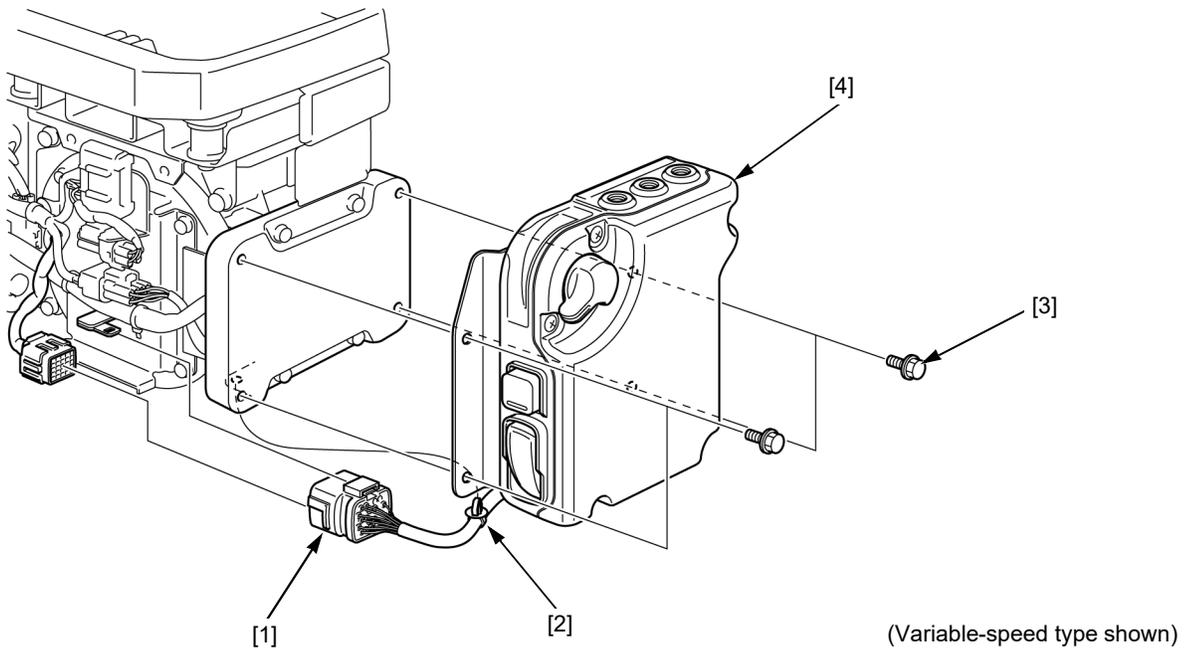
SWITCH INSPECTION..... 6-8

CONTROL UNIT

CONTROL BOX REMOVAL/INSTALLATION (Applicable type)

Remove the front cover (page 5-2).

NOTE: Route the wire harness properly (page 2-4).



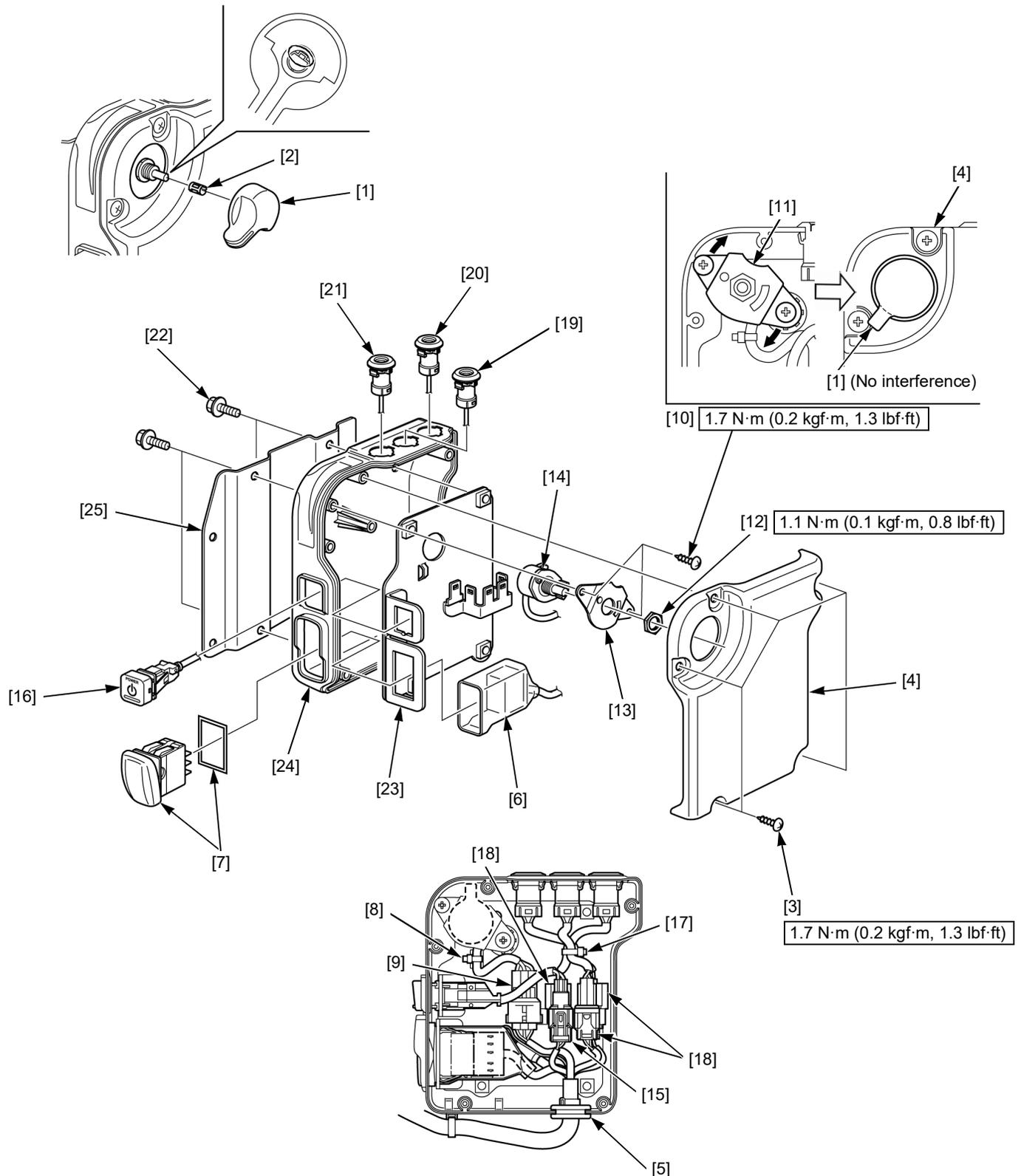
Parts	Remarks
[1] 20P (Gray) CONNECTOR	
[2] CLIP BAND	
[3] BOLT (6 x 10 mm) (4)	
[4] CONTROL BOX ASSEMBLY	

CONTROL BOX DISASSEMBLY/ASSEMBLY (Applicable type)

Remove the control box assembly (page 6-2).

NOTE:

- The electrical parts in the control box can be serviced with the control case installed on the power unit.
- Route the wires properly (page 2-6).



CONTROL UNIT

Parts	Remarks
[1] SPEED CONTROL LEVER	Variable-speed type REMOVAL: Raise the lever around it evenly to remove it. INSTALLATION: Align the flat surfaces.
[2] RETAINER	Variable-speed type
[3] TAPPING SCREW (5 mm) (5)	
[4] CONTROL COVER	
[5] GROMMET	
[6] 10P (Black) CONNECTOR	
[7] START/STOP SWITCH	INSPECTION: page 6-8
[8] BAND	INSTALLATION: Secure the switch wire to the box bracket.
[9] 3P (Black) CONNECTOR	[9] – [14]; Variable-speed type
[10] TAPPING SCREW (5 mm) (2)	INSTALLATION: Temporarily tighten and then tighten securely with the switch bracket turned clockwise. After installing the control lever, make sure the lever is not interfered with the control cover.
[11] VOLUME SWITCH ASSEMBLY	
[12] NUT (10 mm)	
[13] SWITCH BRACKET	
[14] SPEED VOLUME SWITCH	INSPECTION: page 6-9
[15] 2P (Black) CONNECTOR	
[16] POWER SWITCH	INSPECTION: page 6-8
[17] BAND	INSTALLATION: Secure the three indicator wires.
[18] 2P (Black) CONNECTOR (3)	INSTALLATION: Connect with the same colors on the wire tape.
[19] ALERT INDICATOR	Yellow tape
[20] ERROR INDICATOR	Red tape
[21] POWER INDICATOR	(No tape)
[22] BOLT (6 x 14 mm) (4)	
[23] BOX BRACKET	
[24] CONTROL CASE	
[25] CASE MOUNT BRACKET	

PDU REMOVAL/INSTALLATION

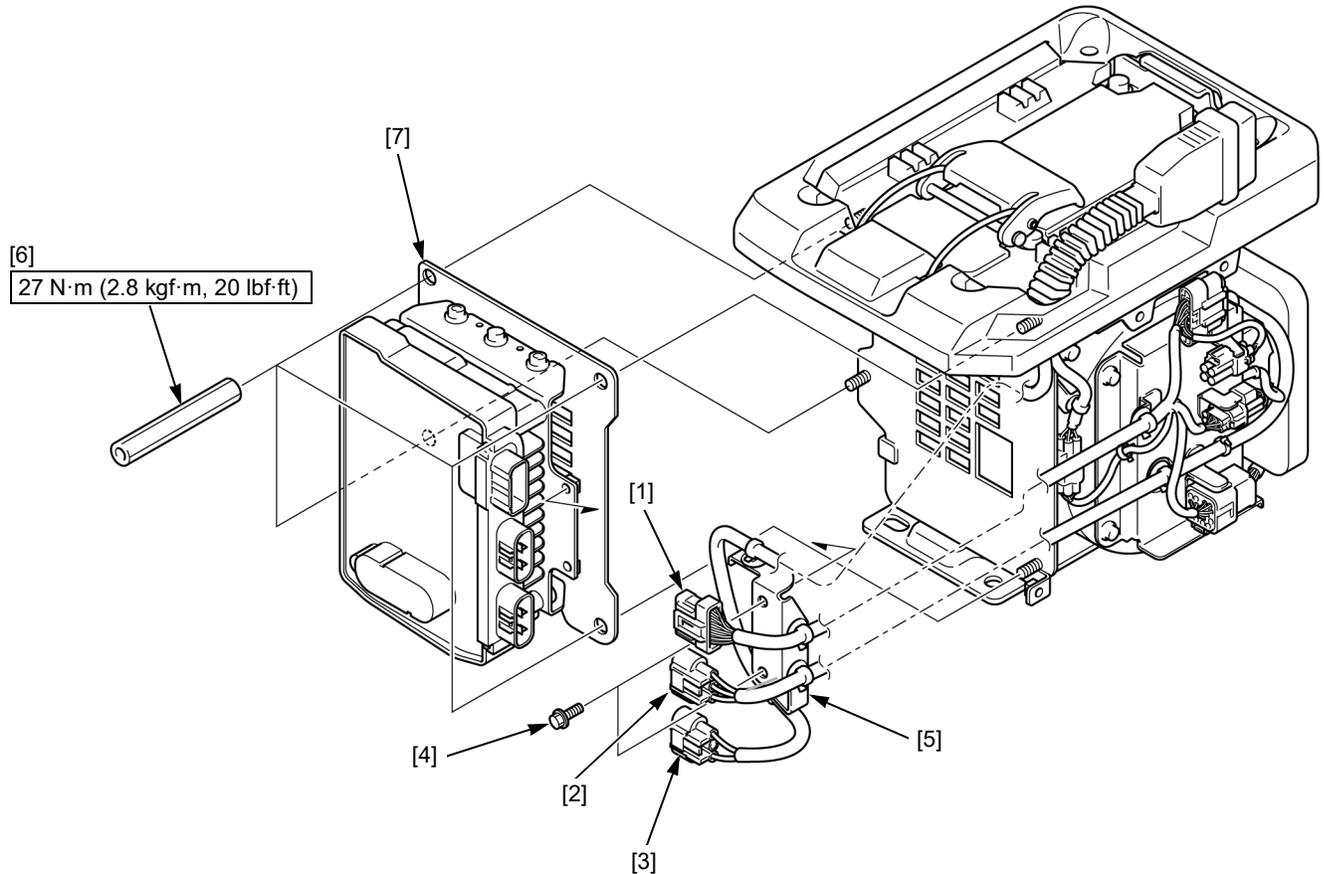
Remove the following covers (page 5-2).

- PDU cover
- Front cover
- Rear cover

NOTE: Before removing the PDU from the stay, check whether the components of the vibration damping structure are normal (page 6-8).

NOTICE: Do not apply excessive force to the mount rubbers supported PDU during servicing.

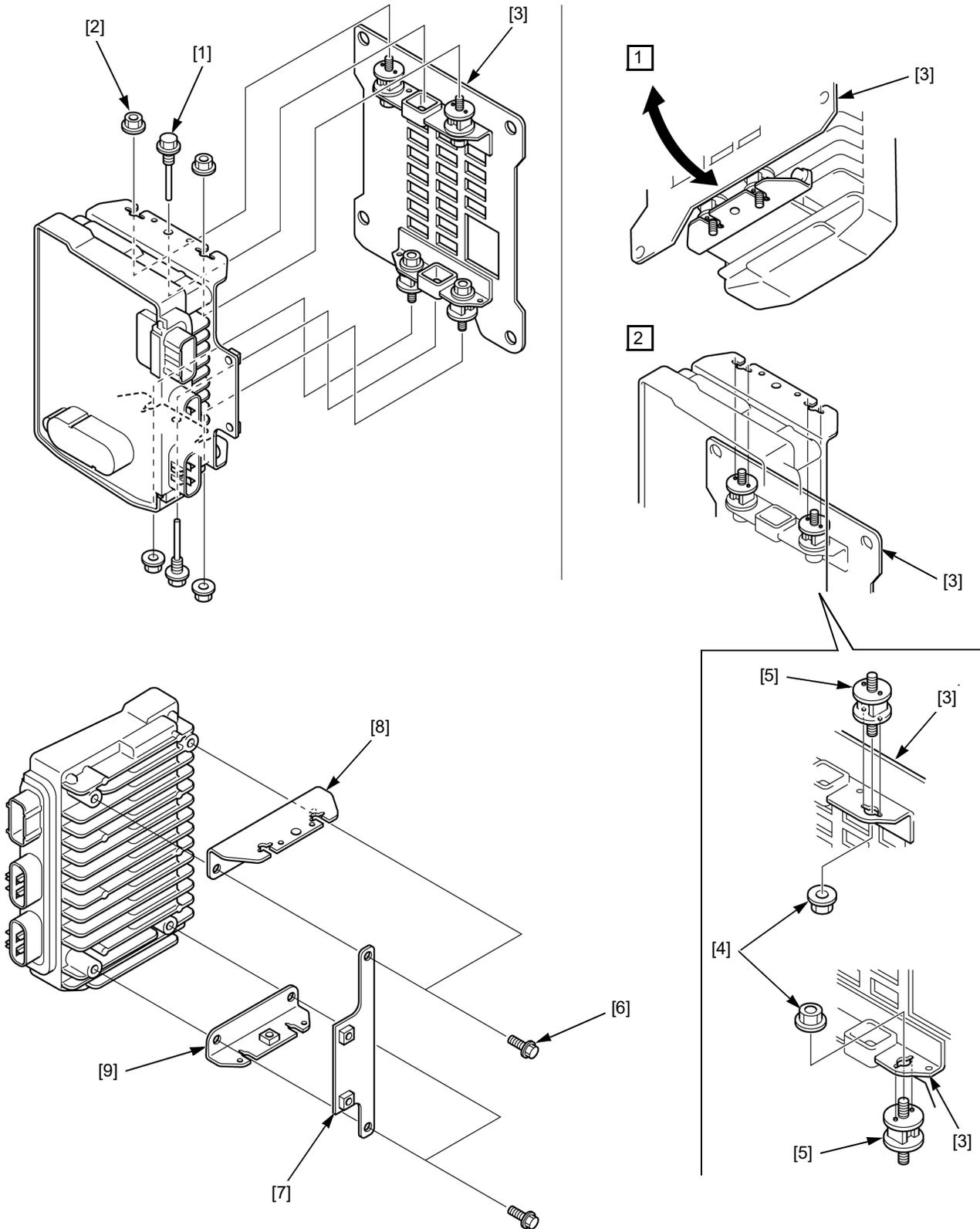
PDU/STAY ASSEMBLY



Parts	Remarks
[1] 33P (Black) CONNECTOR	
[2] 3P (Gray) CONNECTOR	
[3] 3P (Black) CONNECTOR	
[4] BOLT (6 x 10 mm) (2)	
[5] HARNESS BRACKET B	
[6] SPECIAL COLLAR (4)	
[7] PDU/STAY ASSEMBLY	REMOVAL: Pull on the stay part gradually by prying the stay at each stud bolt part evenly. Do not hold the PDU. INSTALLATION: Check the stay clearance (page 6-7).

CONTROL UNIT

STAYS/MOUNT RUBBERS



Parts	Remarks
[1] STOPPER PIN BOLT (2)	INSPECTION: Check for wear or other damage.
[2] NUT (6 mm) (4)	
[3] PDU STAY C	REMOVAL/INSTALLATION: Release the lower side by sliding it and then the upper side in sequence as shown to avoid damaging the mount rubbers (Installation is in the reverse order).
[4] NUT (6 mm) (4)	
[5] MOUNT RUBBER (4)	INSPECTION: Check for cracks or other damage. INSTALLATION: Align the two locating pins with the slot in the PDU stay C.
[6] BOLT (6 x 16 mm) (4)	
[7] BRACKET STAY	INSTALLATION: Face the weld nuts to the opposite side of the PDU.
[8] PDU STAY A	
[9] PDU STAY B	

MOUNT STAY CLEARANCE CHECK

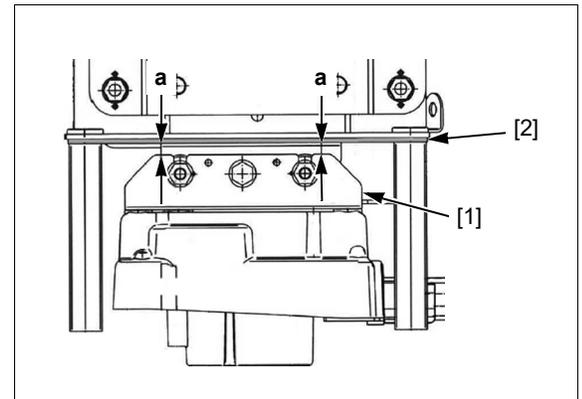
Remove the battery tray (page 5-4).

Measure the clearance between the PDU stay A [1] and C [2] at the points "a" without force.

It should be within 4.6 – 8.0 mm (0.18 – 0.31 in).

The clearance cannot be adjusted.

If it is not within specification, check each installation part for deformation, looseness, or damage.



CONTROL UNIT

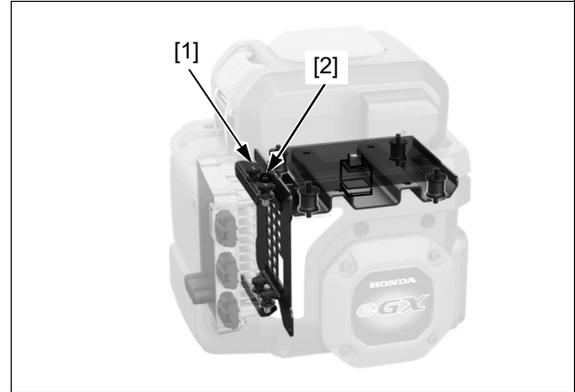
PDU MOUNT RUBBER CHECK

Check the mount rubbers [1] supported the PDU for cracks or tears by pulling the PDU lightly. Also, check the stopper pin bolts [2] in between the mount rubbers for excessive wear or breakage.

Do not apply more load to the mount rubbers than necessary.

If any abnormality is found, replace the rubbers and pin bolts as a set.

Check the stay clearance (page 6-7).

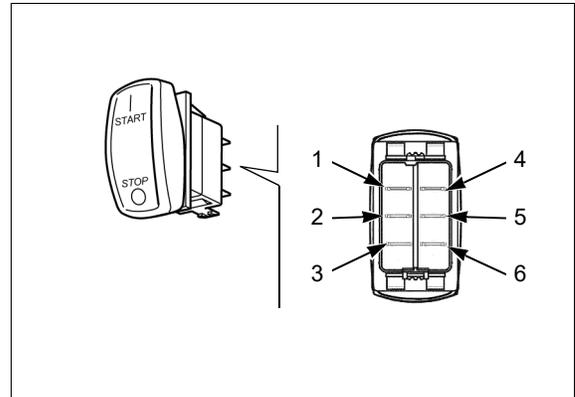


SWITCH INSPECTION

START/STOP SWITCH (Applicable type)

Check for continuity between the terminals of the START/STOP switch in each switch position shown in the table below.

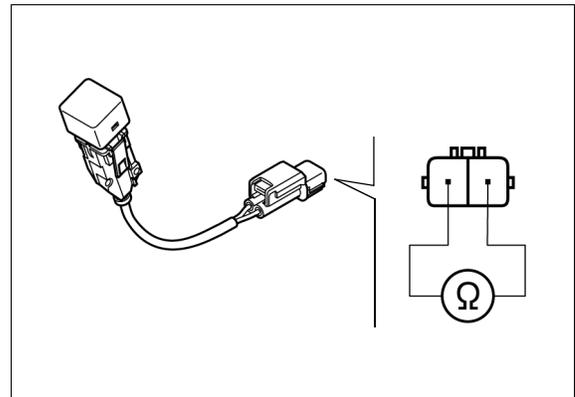
Terminal	1	2	3	4	5	6
Position						
START		○—○			○—○	
STOP	○—○			○—○		



POWER SWITCH (Applicable type)

Check for continuity between the terminals of the 2P connector.

There should be continuity with the switch pressed and should be no continuity with the switch released.



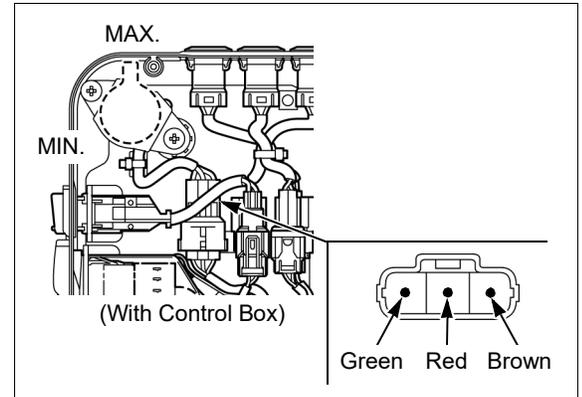
SPEED VOLUME SWITCH (Applicable type)

Measure the resistance between the Brown and Green wire terminals of the switch side 3P connector.

Standard: 4.0 – 6.0 k Ω

Check that the resistance between the Red and Green wire terminals varies in accordance with the switch position by operating the speed control lever.

- Turn to right (from MIN. to MAX.): Resistance increase
- Turn to left (from MAX. to MIN.): Resistance decrease



MEMO

BATTERY PACK
REMOVAL/INSTALLATION 7-2

FAN COVER/WIRE HARNESS
REMOVAL/INSTALLATION 7-3

MOTOR REMOVAL/INSTALLATION 7-5

MOTOR DISASSEMBLY/ASSEMBLY 7-6

STATOR INSPECTION 7-8

POWER UNIT

BATTERY PACK REMOVAL/ INSTALLATION

NOTICE: Do not handle the battery with wet hands or in wet or rainy conditions.

NOTE: Always clean the battery attaching area and battery connector, and be sure that there is no foreign material on the contacts or in the connector.

REMOVAL

Disconnect the battery connector [1] of the power cable from the battery pack [2].

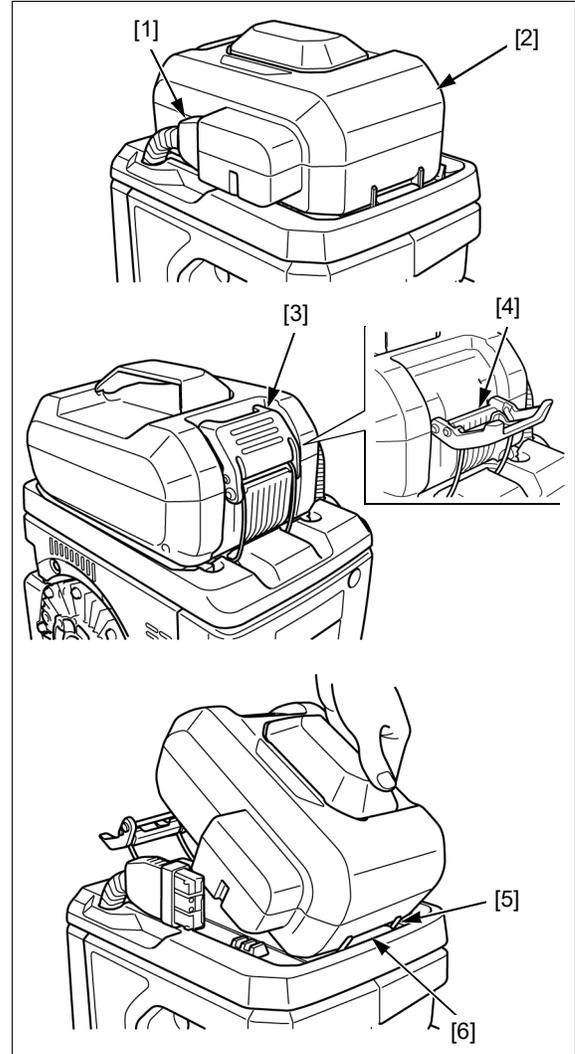
Pull the fastener lever [3] toward you to release the lever pin [4] and then remove the battery pack.

INSTALLATION

Insert the claw [5] of the battery pack into the battery hook [6] securely and set it onto the tray.

Hook the lever pin and turn the fastener lever over the battery pack to secure it. Connect the battery connector.

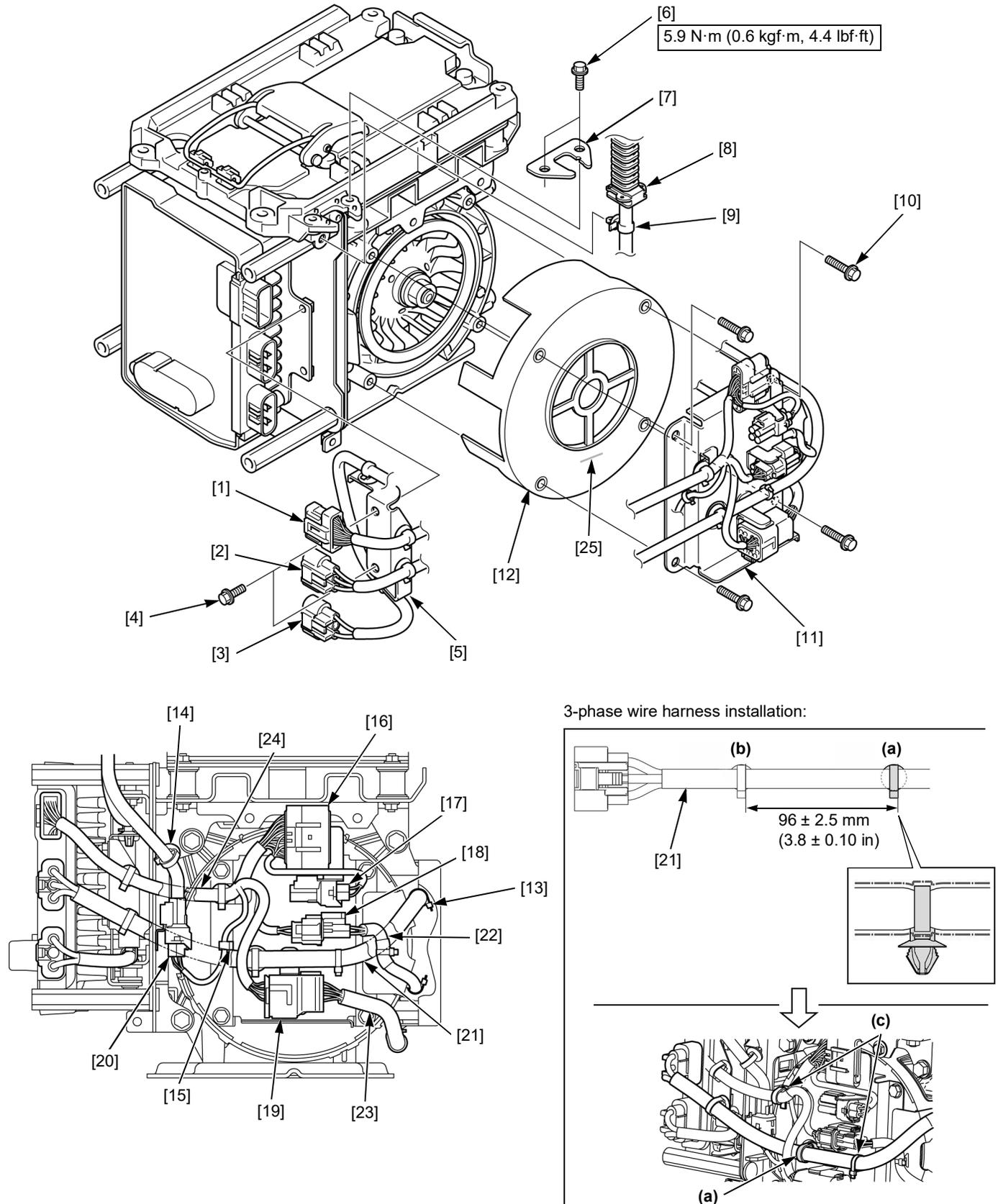
After installation, make sure the battery pack is securely attached on the tray.



FAN COVER/WIRE HARNESS REMOVAL/INSTALLATION

Remove all the covers (page 5-2).

NOTE: Route the wire harnesses properly (page 2-4).

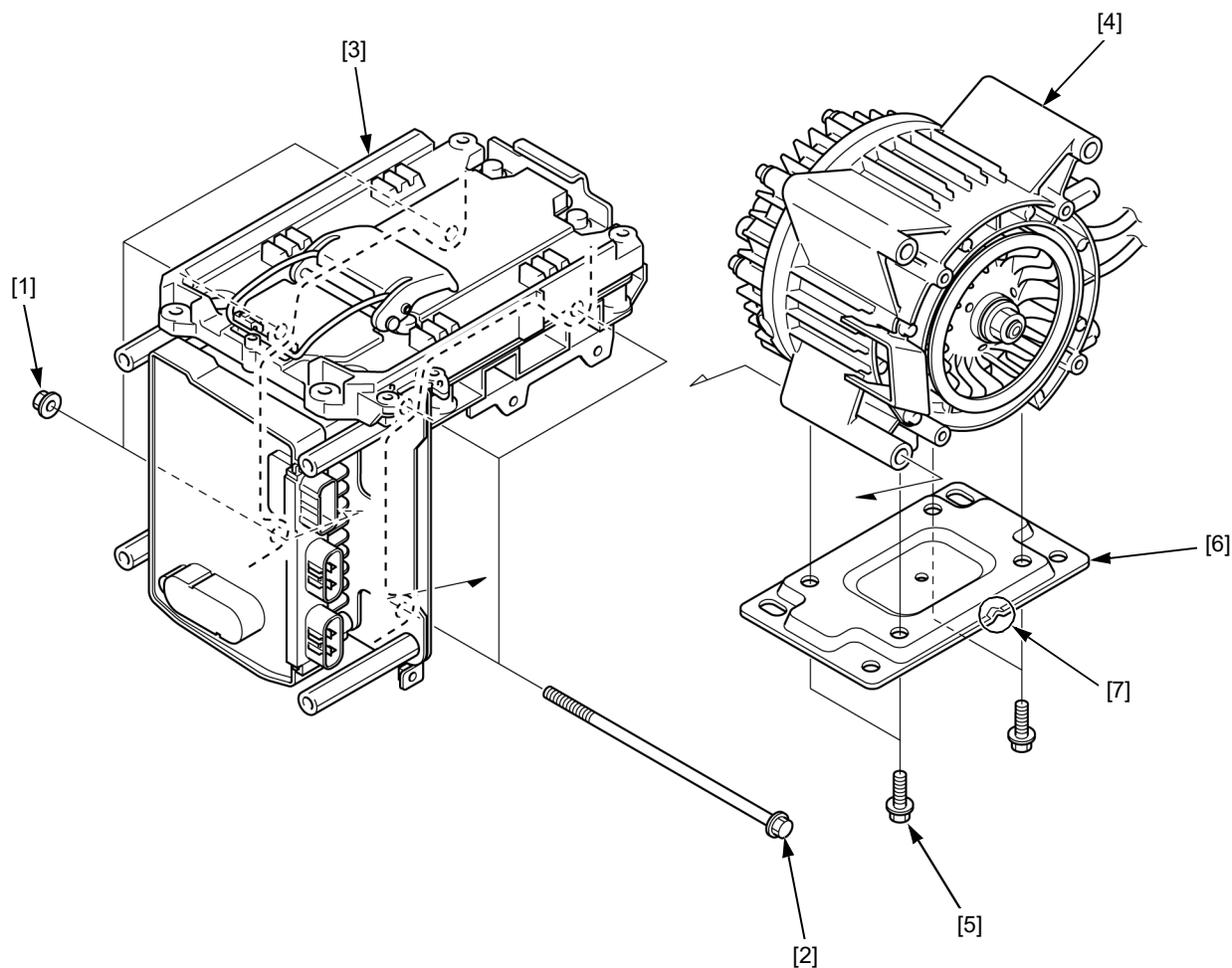


POWER UNIT

Parts	Remarks
[1] 33P (Black) CONNECTOR	
[2] 3P (Gray) CONNECTOR	
[3] 3P (Black) CONNECTOR	
[4] BOLT (6 x 10 mm) (2)	
[5] HARNESS BRACKET B	
[6] BOLT (5 x 12 mm) (2)	
[7] CONNECTOR STAY	INSTALLATION: Align the groove with the lug (page 2-4).
[8] POWER CABLE	INSTALLATION: Align the four holes with the pins of the tray (page 2-4).
[9] CLIP BAND	
[10] BOLT (6 x 20 mm) (4)	
[11] HARNESS BRACKET A	
[12] FAN COVER	INSTALLATION: Install with HONDA mark [25] facing down.
[13] BAND (4)	
[14] CLIP BAND (8)	
[15] WIRE CLIP	
[16] JOINT CONNECTOR	
[17] DLC	
[18] 8P (Black) CONNECTOR	
[19] 20P (Gray) CONNECTOR	
[20] 4P (White) CONNECTOR	
[21] 3-PHASE WIRE HARNESS (including stator)	INSTALLATION: Determine the band (a) installation position based on the assembled band (b) in the state of a single item kept straight. Install the band (a) at the position of 96 mm (3.8 in), and secure it tightly as shown and make sure it does not move. When installing to the bracket A on the power unit, install the band (a) first to make a positioning and then the bands (c) and secure them (c).
[22] ROTOR SENSOR WIRE HARNESS (including stator)	
[23] CONTROL WIRE HARNESS	
[24] MAIN WIRE HARNESS	

MOTOR REMOVAL/INSTALLATION

Remove the fan cover and the wire harnesses related to the motor (page 7-3).

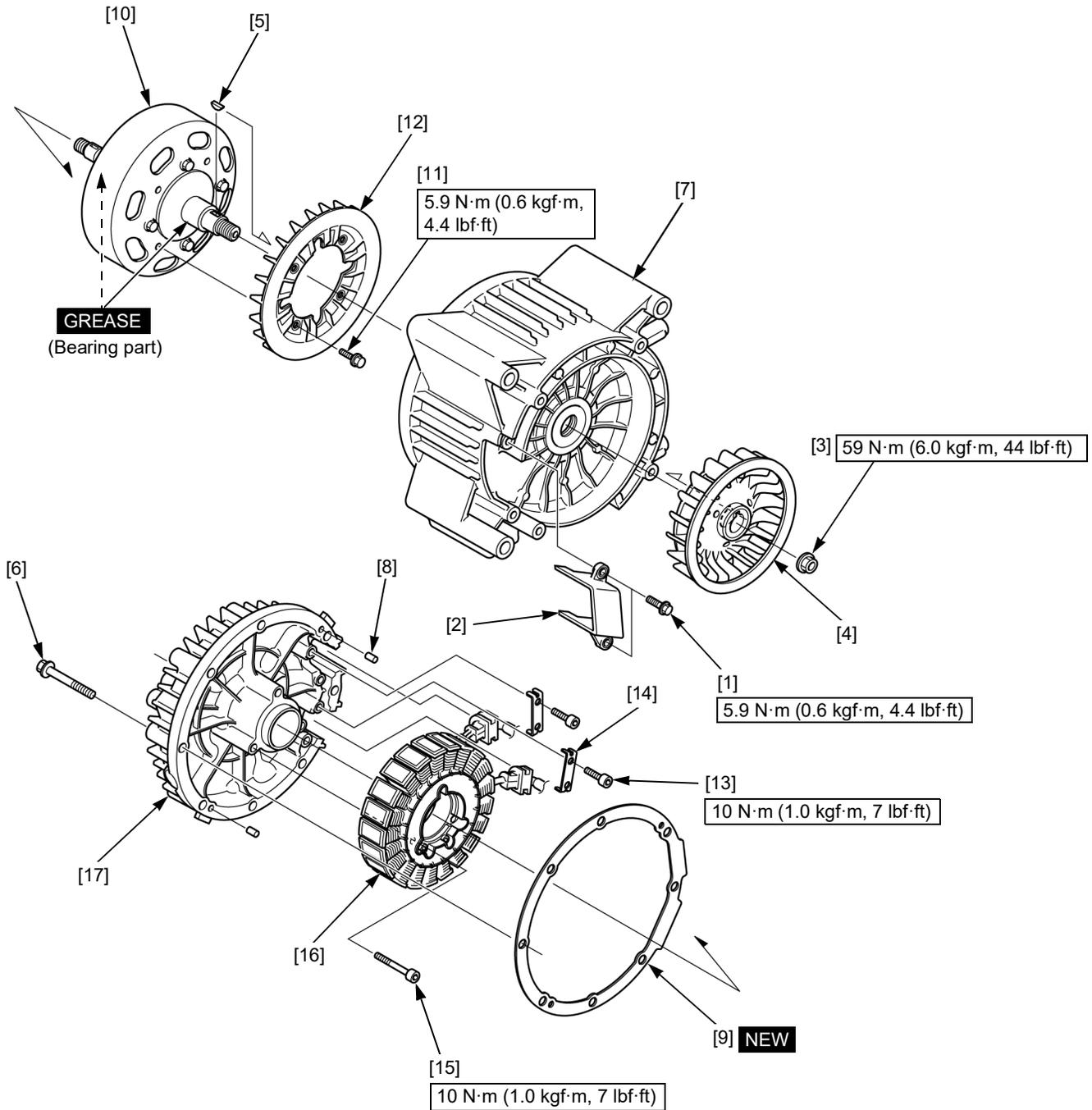


Parts	Remarks
[1] NUT (8 mm) (3)	
[2] BOLT (8 x 125 mm) (3)	
[3] FRAME ASSEMBLY	
[4] MOTOR	
[5] BOLT (8 x 20 mm) (4)	
[6] MOTOR BASE	INSTALLATION: Face the concavity [7] to the cooling fan side.

POWER UNIT

MOTOR DISASSEMBLY/ASSEMBLY

Remove the motor (page 7-5).



Parts	Remarks
[1] BOLT (5 x 16 mm) (2)	
[2] AIR DUCT	
[3] NUT (12 mm)	TOOL: COOLING FAN HOLDER (070PB-8A00100) (page 7-7)
[4] COOLING FAN	
[5] WOODRUFF KEY (13 x 12 mm)	
[6] BOLT (6 x 50 mm) (8)	
[7] MOTOR HOUSING (FAN SIDE)	INSPECTION: Check the dust seal and bearing in the housing for wear or damage.
[8] DOWEL PIN (2)	
[9] HOUSING PACKING	
[10] ROTOR/SHAFT	TOOL: ROTOR GUIDE (070PG-8A00100) (page 7-8)
[11] BOLT (5 x 12 mm) (4)	
[12] ROTOR FAN	
[13] SOCKET BOLT (6 x 16 mm) (4)	
[14] MOTOR HARNESS STAY (2)	
[15] SOCKET BOLT (6 x 40 mm) (3)	
[16] STATOR ASSEMBLY	INSPECTION: Check for damage in the stator coils (page 2-7). INSTALLATION: Set the wires in the grommets properly and install them into the housing grooves tightly (page 2-7).
[17] MOTOR HOUSING (P.T.O. SIDE)	INSPECTION: Check the dust seal and bearing in the housing for wear or damage.

COOLING FAN REMOVAL/INSTALLATION

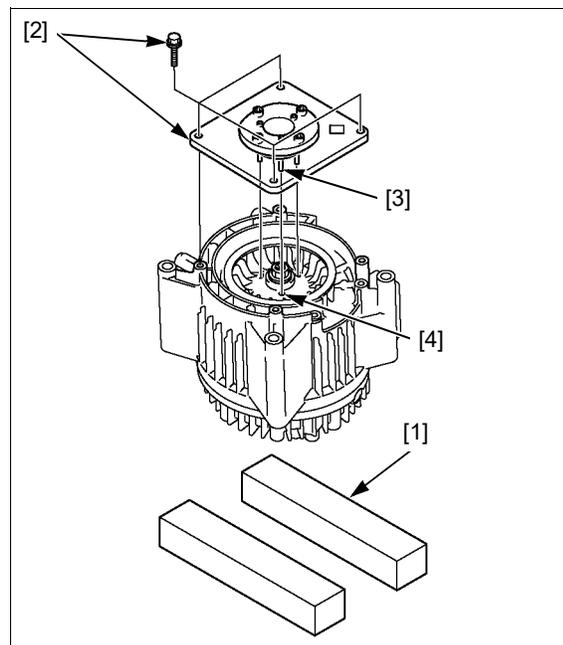
TOOL FITTING

Place the motor assembly on wooden blocks [1] and install the special tool.

– [2] Tool: Cooling fan holder (070PB-8A00100)

NOTE: There are three pins [3] on the special tool that allows gaps between the pins and the holes [4] in the fan so that they contact evenly.

The four 6 mm bolts of the special tool are tightened to 12 N·m (1.2 kgf·m, 9 lbf·ft).

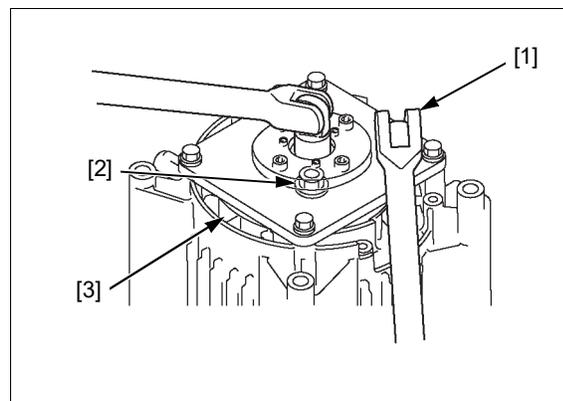


REMOVAL/INSTALLATION

Holding the special tool with a breaker bar [1], loosen the 12 mm nut [2], and then remove the cooling fan [3].

Installation is in the reverse order of removal.

TORQUE: 12 mm nut: 59 N·m (6.0 kgf·m, 44 lbf·ft)



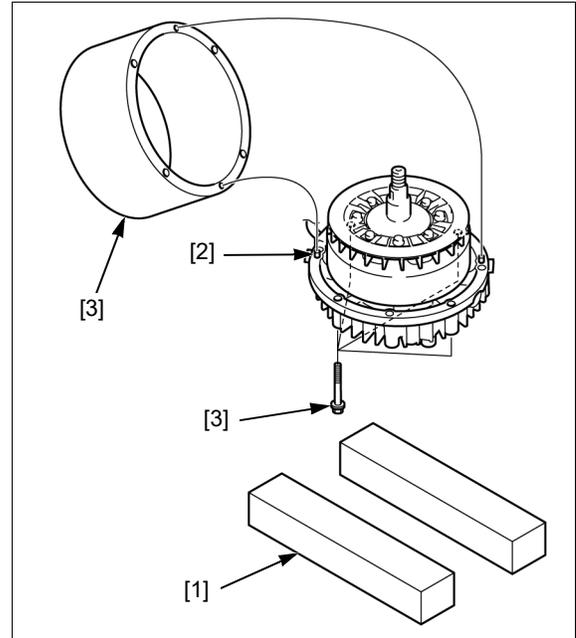
POWER UNIT

ROTOR SHAFT REMOVAL/INSTALLATION

TOOL FITTING

Install the following and place the assembly on wooden blocks [1].

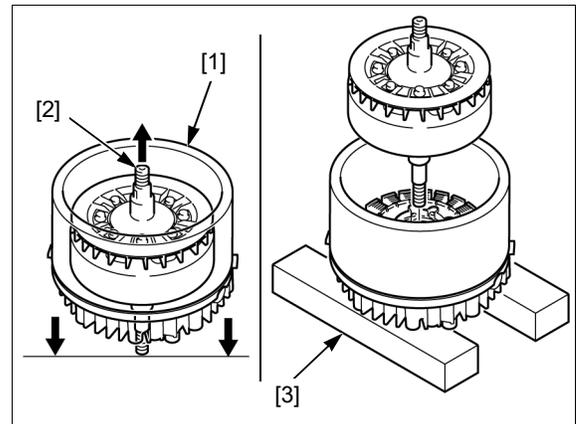
- [2] Dowel pin (2)
- [3] Tool: Rotor guide (070PG-8A00100)



REMOVAL/INSTALLATION

Push the rotor guide [1] down without wooden blocks to release the rotor shaft [2].

To install, insert the rotor shaft into the rotor guide while holding it securely set with wooden blocks [3].



STATOR INSPECTION

Remove the PDU cover (page 5-2).

Disconnect the PDU 3P (Gray) connector [1].

Check for connector for loose contacts or corroded terminals.

Measure the coil resistance between the terminals of the stator side 3P (Gray) connector.

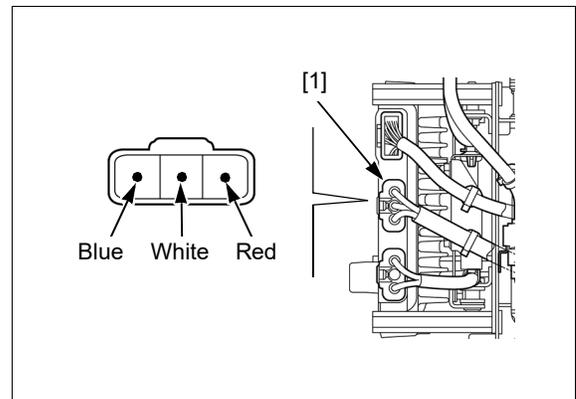
CONNECTION: Red – White
Blue – Red
White – Blue

STANDARD: 65.5 – 72.5 m Ω (20°C/68°F)

Measure the insulation resistance between each connector terminal and the motor housing and rotor shaft (with 1,000 VDC range in a insulation resistance tester).

RESISTANCE: 10 M Ω or more

Replace the stator assembly if the coil resistance is out of specification, or if the insulation resistance is abnormal.



8. WIRING DIAGRAMS

WIRING DIAGRAMS 8-2

MEMO

INDEX

BATTERY FASTENING COMPONENT CHECK	5-6	MAINTENANCE STANDARDS	2-2
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