YAMAHA

SERVICE MANUAL

EF3000iSE

7WL-28197-E0
310140

FOREWORD

This manual was written by the Yamaha Motor Company primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to put an entire mechanic's education into one manual, so it is assumed that persons using this book to perform maintenance and repairs on Yamaha generators have a basic understanding of the mechanical precepts and procedures inherent to generator repair technology. Without such knowledge, attempted repairs or service to this model may render it unfit for use and/or unsafe.

Yamaha Motor Company Ltd. is continually striving to further improve all models manufactured by Yamaha. Modifications and significant changes in specifications or procedures will be forwarded to all Authorized Yamaha dealers and will, where applicable, appear in future editions of this manual.

NOTE:
This Service Manual contains information regarding periodic maintenance to the emission control system. Please read this material carefully.

EF3000iSE
SERVICE MANUAL

Printed in Japan

HOW TO USE THIS MANUAL

PARTICULARLY IMPORTANT INFORMATION

This material is distinguished by the following notation.

⚠
The Safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

⚠ WARNING
Failure to follow WARNING instructions could result in severe injury or death to the machine operator, a bystander, or a person inspecting or repairing the machine.

CAUTION:
A CAUTION indicates special precautions that must be taken to avoid damage to the machine.

NOTE:
A NOTE provides key information to make procedures easier or clearer.

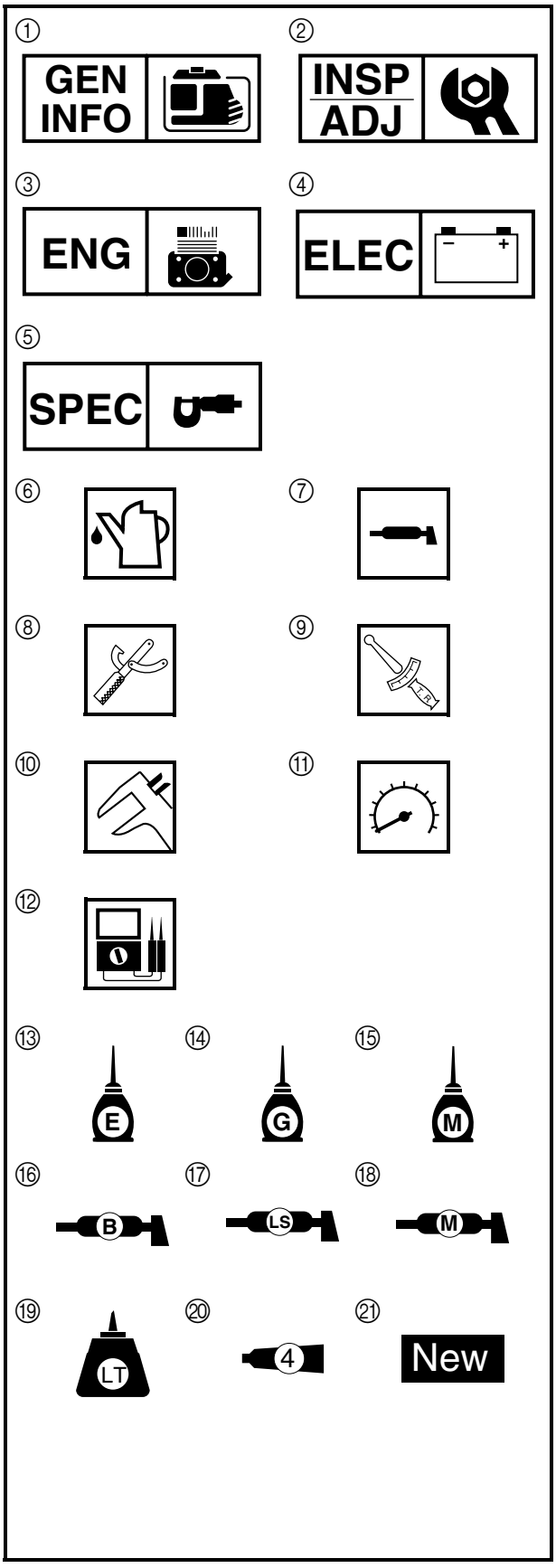
MANUAL FORMAT

The procedures in this manual are organized in a sequential, step-by-step format. The information has been compiled to provide the mechanic with an easy to read, handy reference that contains comprehensive explanations of all disassembly, repair, assembly, and inspection operations.
In this revised format, the condition of a faulty component will precede an arrow symbol and the course of action required will follow the symbol, e.g.,

- Bearings
  Pitting/damage → Replace.

EXPLODED DIAGRAM

Each chapter provides exploded diagrams before each disassembly section for ease in identifying the correct disassembly and assembly procedures.



ILLUSTRATED SYMBOLS (Refer to the illustration)

Illustrated symbols ① through ⑤ are designed as thumb tabs to indicate the chapter's number and content.

① General information
② Periodic inspections and adjustments
③ Engine
④ Electrical
⑤ Specifications

Illustrated symbols ⑥ through ⑫ are used to identify the specific tools and test equipment.

⑥ Filling fluid
⑦ Lubricant
⑧ Special tool
⑨ Tightening
⑩ Wear limit, clearance
⑪ Engine speed
⑫ Ω, V, A

Illustrated symbols ⑬ through ㉑ in the exploded diagram indicate the grades of lubricant and the locations of the lubrication points.

⑬ Apply engine oil
⑭ Apply gear oil
⑮ Apply molybdenum disulfide oil
⑯ Apply wheel bearing grease
⑰ Apply lightweight lithium-soap base grease
⑱ Apply molybdenum disulfide grease
⑲ Apply a locking agent (LOCTITE®)
⑳ Apply Yamaha bond
㉑ Use a new one

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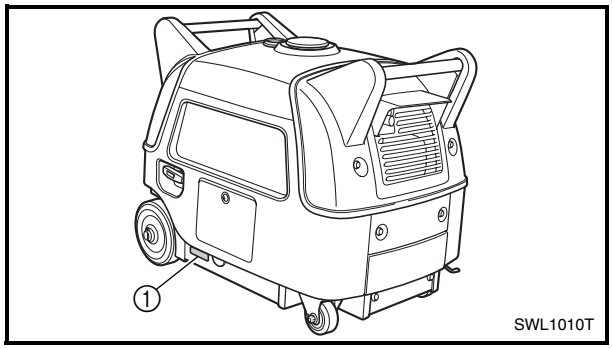
CHAPTER 1. GENERAL INFORMATION

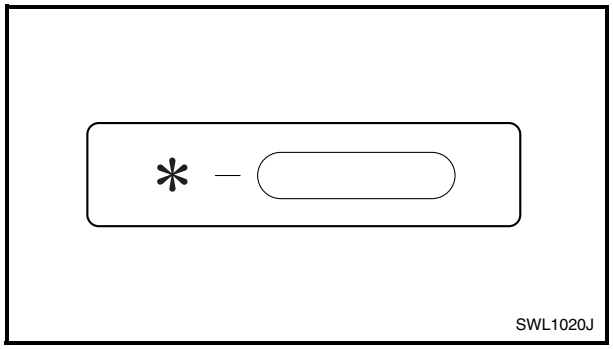
CHAPTER 2. PERIODIC INSPECTIONS AND ADJUSTMENTS

CHAPTER 3. ENGINE

CHAPTER 4. ELECTRICAL

CHAPTER 5. SPECIFICATIONS





GENERAL INFORMATION

MACHINE IDENTIFICATION

SERIAL NUMBER

The serial number is printed on a label ① which is affixed to the generator as shown.

NOTE:

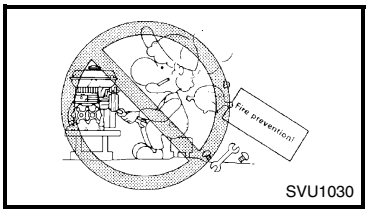
The first three characters of this number are for model identification, the remaining digits are the unit production number.

STARTING SERIAL NUMBER

Model	Code	Starting serial number
120 V-60 Hz	7WL2	7WL-220101~
220 V-50 Hz	7WL3	7WL-330101~
230 V-50 Hz	7WL3	7WL-300101~
230 V-50 Hz	7WL3	7WL-350101~

NOTE:

Designs and specifications are subject to change without notice.



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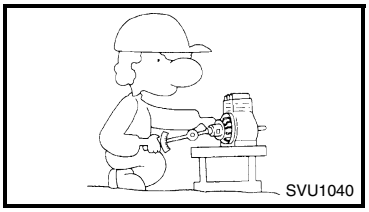
IMPORTANT INFORMATION

PREPARATION FOR REMOVAL AND DISASSEMBLY

CAUTION ON SERVICE

1. Fire prevention
   When servicing the engine, always keep the engine and yourself away from fire.

NOTES ON SERVICE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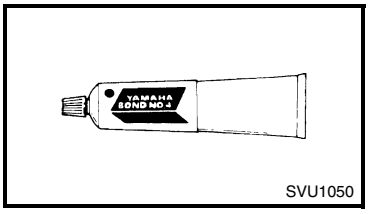
1. Correct tools
   Be sure to use the correct special tool for the job to guard against damage.



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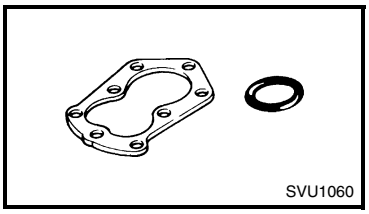
2. Oil, grease and seals
   Be sure to use genuine Yamaha oils, grease and sealers, or the equivalents.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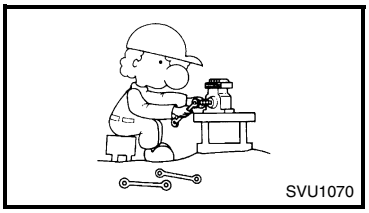
3. Expendable parts
   Always replace the gaskets, O-rings, cotter pins and circlips with new parts when servicing engine.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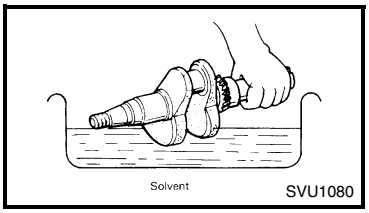
4. Tightening torque
   Be sure to follow torque specifications. When tightening bolts, nuts or screws, start with the largest-diameter fastener and work from an inner position to an outer position in a crisscross pattern.



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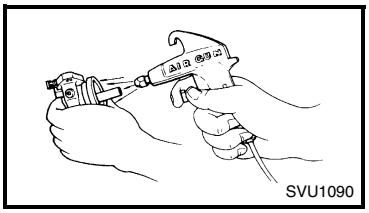
5. Notes on disassembly and assembly

a. Parts should be cleaned in solvent and blown dry with compressed air after disassembly.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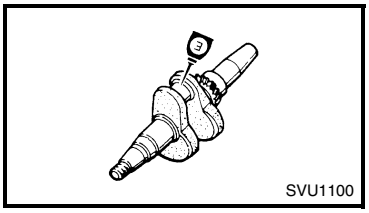
b. Contact surfaces of moving parts should be oiled when reassembled.


SVU1100

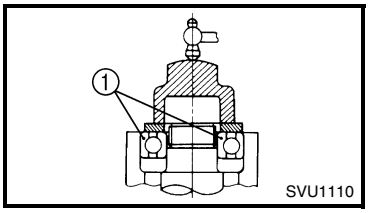
c. Make sure that the parts move smoothly after each section of the machine is assembled.

ALL REPLACEMENT PARTS

We recommend the use of genuine Yamaha parts for all replacements. Use oil and/or grease, recommended by Yamaha, for assembly and adjustment.

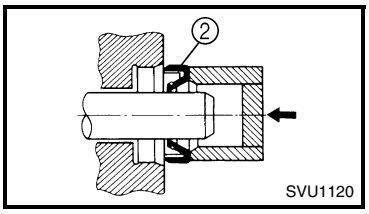
GASKETS, OIL SEALS, AND O-RINGS

1. All gaskets, seals, and O-rings should be replaced when an engine is overhauled. All gaskets surfaces, oil seal lips, and O-rings must be cleaned.
2. Properly oil all mating parts and bearings during reassembly. Apply grease to the oil seal lips.



BEARINGS AND OIL SEALS

Install the bearing(s) ① and oil seal(s) ② with their manufacture's marks or numbers facing outward. (In other words, the stamped letters must be on the side exposed to view.) When installing oil seal(s), apply a light coating of light-weight lithium base grease to the seal lip(s). Oil the bearings liberally when installing.



CAUTION:

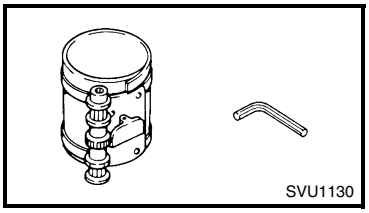
Do not use compressed air to spin the bearings dry. This causes damage to the bearing surfaces.

SPECIAL TOOLS AND TESTERS

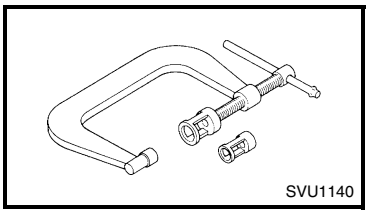
The proper special tools are necessary for complete and accurate tune-up and assembly. Using the correct special tool will help prevent damage caused by the use of improper tools or improvised techniques. The shape and part number used for the special tool differ by country, so two types are provided. Refer to the list provided to avoid errors when placing an order.

NOTE:

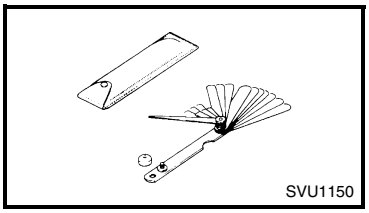
- For USA and Canada, use part number starting with “YM-”, “YU-” or “YS-”.
- For others, use part number starting with “90890-”.



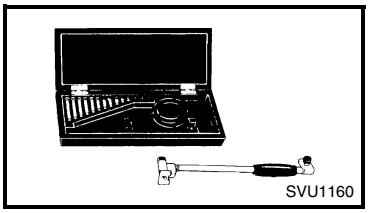
1. Piston ring compressor
   P/N. YU-33294, 90890-05158
   This tool is used to compress the piston rings when installing the piston.



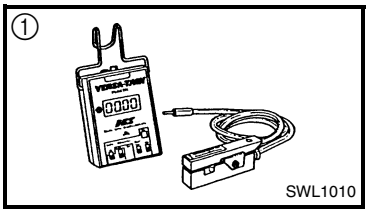
2. Valve spring compressor
   P/N. YM-01253, 90890-01253
   This tool is used to remove the valve springs.

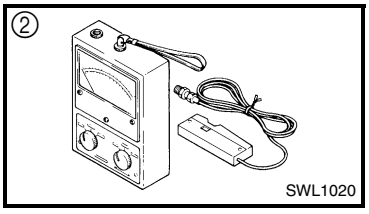


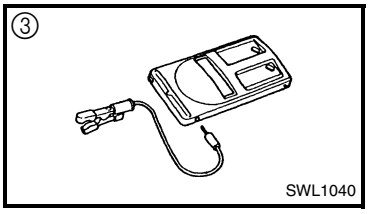
3. Thickness gauge
   P/N. YU-26900-9, 90890-03079
   This gauge is used to adjust valve clearance, piston clearance and piston ring end gap.

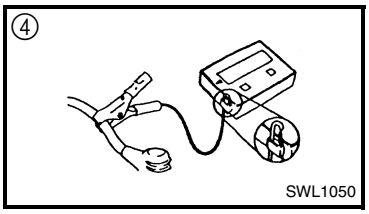


4. Cylinder gauge
   Commercially available
   This instrument is used for checking cylinder bore size and condition.

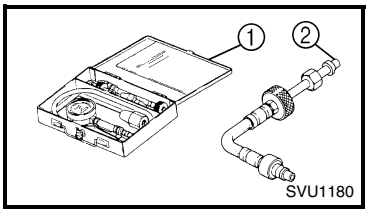




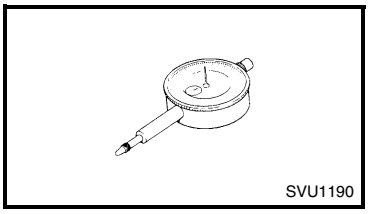




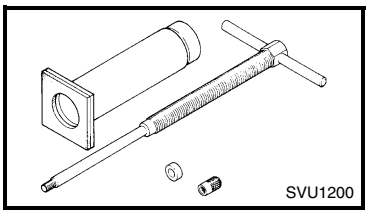
5. Inductive self-powered tachometer
   ① P/N. YU-8036-B
   Engine tachometer
   ② P/N. 90890-03113
   ③ P/N. 90793-80009
   ④ P/N. 90793-80032
   This instrument is used for reading engine r/min.



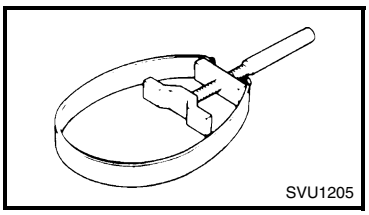
6. Compression gauge ①
   P/N. YU-33223, 90890-03081
   Adapter ②
   P/N. YU-33223-3, 90890-04082
   This gauge is used for checking engine compression.



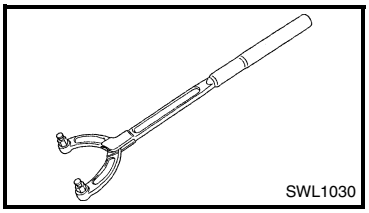
7. Dial gauge
   P/N. YU-03097, 90890-03097
   This instrument is used for checking crankshaft side clearance.



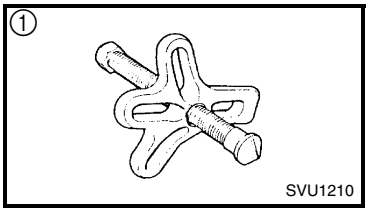
8. Piston pin puller
   P/N. YU-01304, 90890-01304
   This tool is used to remove the piston pin.



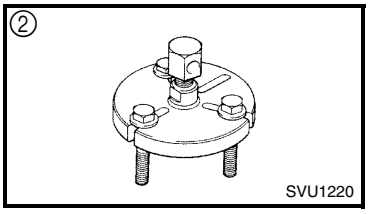
9. Sheave holder
   P/N. YS-01880-A, 90890-01701
   This tool is necessary for holding the flywheel or rotor.

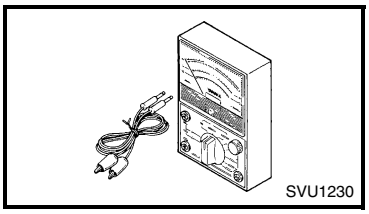


10.Rotor assembly holder
Commercially available
This tool is necessary for holding the rotor.

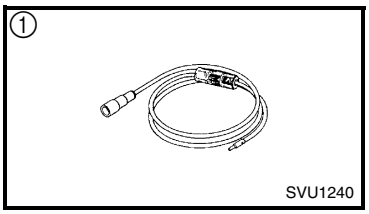


11.Rotor puller
① P/N. YU-33270-B
② P/N. 90890-01362
This tool is necessary for removing the flywheel.

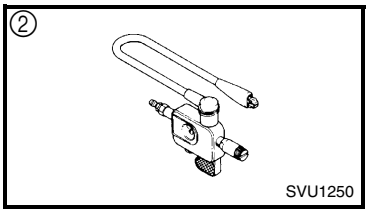


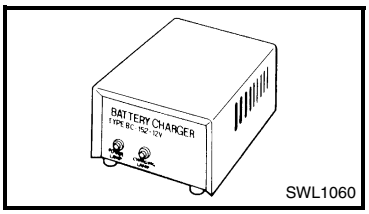


12.Pocket tester
P/N. YU-03112-C, 90890-03112
This instrument is necessary for checking the electrical system.



13.Dynamic spark tester ①
P/N. YM-34487
Ignition checker ②
P/N. 90890-06754
This instrument is necessary for checking the ignition system components.





14.MF Battery charging
Commercially available
This instrument is necessary for charging the electrical system.

PERIODIC INSPECTIONS AND ADJUSTMENTS

INTRODUCTION

This chapter includes all information necessary to perform recommended inspections and adjustments. These preventive maintenance procedures, if followed, will ensure more reliable machine operation and a longer service life. The need for costly overhaul work will be greatly reduced. This information applies to machines already in service as well as new machines that are being prepared for sale. All service technicians should be familiar with this entire chapter.

MAINTENANCE INTERVALS CHART (For Canada)

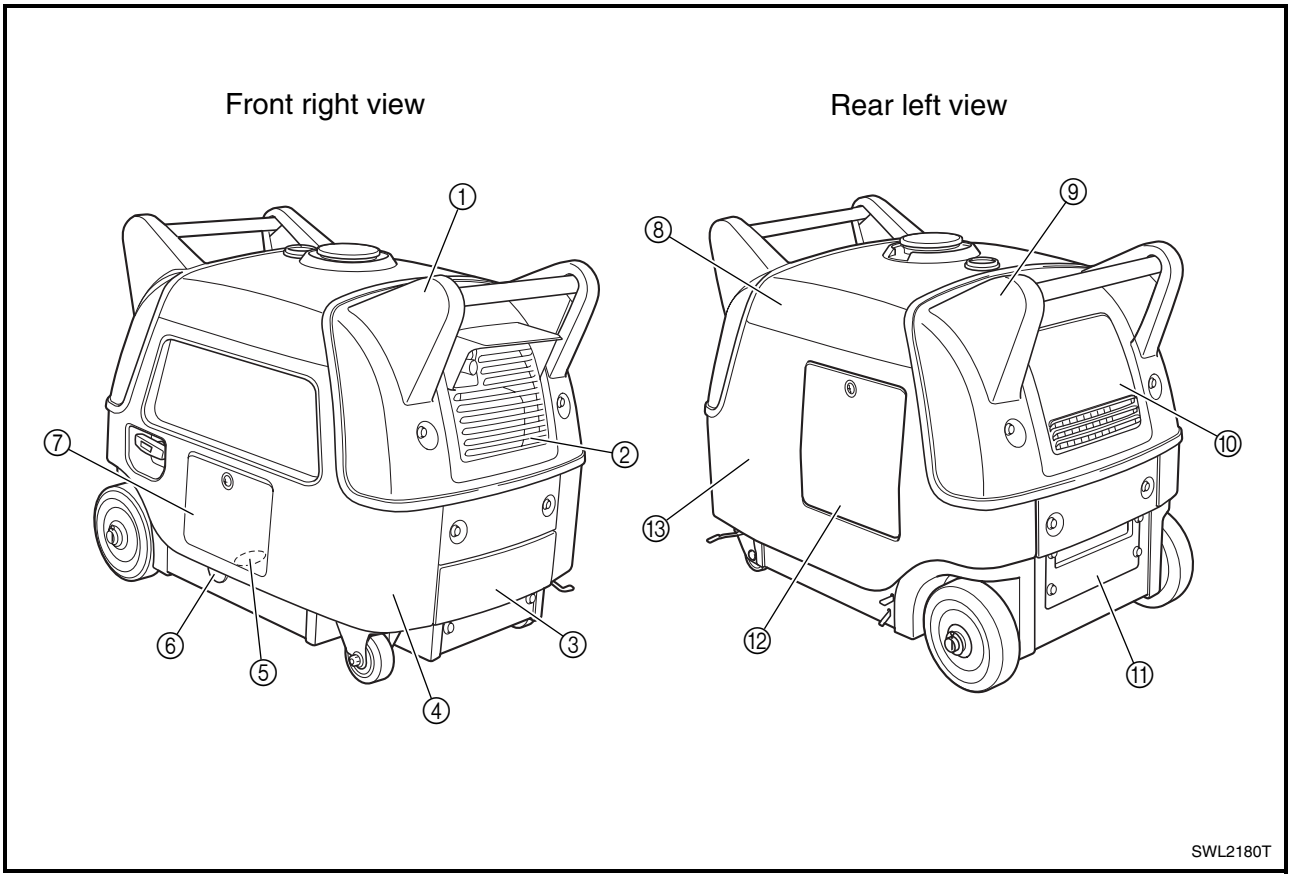
Proper periodic maintenance is important. Especially important are the maintenance services related to emissions control. These controls not only function to ensure cleaner air but are also vital to proper engine operation and maximum performance. In the following maintenance tables, the services related to emissions control are indicated as "*" in the chart.

PERIODIC MAINTENANCE/LUBRICATION INTERVALS

A Item	B Remarks	C Pre-Operation check (daily)	D Initial 1 month or 20 Hr	E Every 3 months or 50 Hr	F Every 6 months or 100 Hr	G Every 12 months or 300 Hr
H *Spark Plug	Check condition. Adjust gap and clean. Replace if necessary.			●		
I *Valve Clearance	Check and adjust when engine is cold.					●
J *Crankcase breather system	Check breather hose for cracks or damage. Replace if necessary.					●
K *Idle speed	Check and adjust engine idle speed.					●
L *Exhaust System	M Check for leakage. Retighten or replace gasket if necessary.	●				
	N Check muffler screen and spark arrester. Clean/replace if necessary.					●
O Engine Oil	P Check oil level.	●				
	Q Replace.		●		●	
R *Air Filter	Clean. Replace if necessary.			●		
S Fuel Filter	Clean fuel tank filter. Replace if necessary.				●	
T Fuel Line	Check fuel hose for crack or damage. Replace if necessary.	●				
U *Choke knob	Check choke operation.	●				
V Cooling System	Check for fan damage.					●
W Starting System	X Check recoil starter operation.	●				
	Y Check electric starter operation.	●				
Z *Decarbonization	More frequently if necessary.					●
a Generation	Check the pilot light comes on.	●				
b Fittings/Fasteners	Check all fittings and fasteners. Correct if necessary.				●	

*: Related to emission control system.

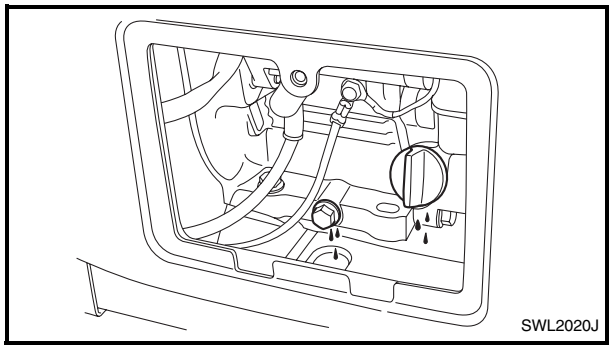
COVERS, PANELS, AND CAPS



① Cover 1	7.0 Nm (0.7 m · kg, 5.1 ft · lb)
② Panel 1	7.0 Nm (0.7 m · kg, 5.1 ft · lb)
③ Cover 2	7.0 Nm (0.7 m · kg, 5.1 ft · lb)
④ Cover 3	7.0 Nm (0.7 m · kg, 5.1 ft · lb)
⑤ Cap 1	
⑥ Cap 2	
⑦ Panel 2	
⑧ Cover 4	7.0 Nm (0.7 m · kg, 5.1 ft · lb)
⑨ Cover 5	7.0 Nm (0.7 m · kg, 5.1 ft · lb)
⑩ Panel 3	7.0 Nm (0.7 m · kg, 5.1 ft · lb)
⑪ Battery bracket	7.0 Nm (0.7 m · kg, 5.1 ft · lb)
⑫ Panel 4	
⑬ Cover 6	7.0 Nm (0.7 m · kg, 5.1 ft · lb)

NOTE:

- The EF3000iSE are equipped with soundproof covers and panels that cover the engine and frame.
- To make periodic maintenance checks easy, remove the applicable cover or panel.
- For cover or panel removal and installation, refer to “PANELS AND COVERS” in CHAPTER 3.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ENGINE

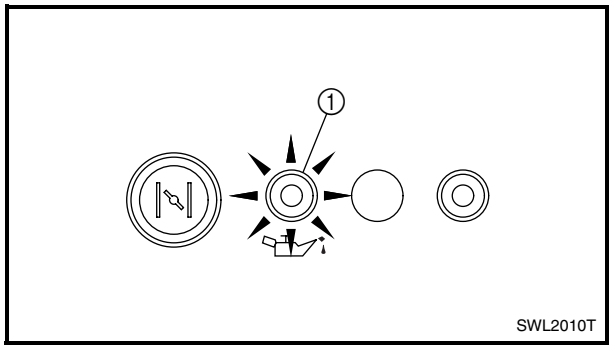
ENGINE OIL LEAKAGE CHECKING

1. Remove:
   - Panel 2
   - Panel 4

   Refer to “COVERS, PANELS, AND CAPS”.
2. Check the areas outside of the engine for oil leakage.

   Oil leakage → Replace the gasket, oil seal, or O-ring.
3. Install:
   - Panel 4
   - Panel 2

   Refer to “COVERS, PANELS, AND CAPS”.



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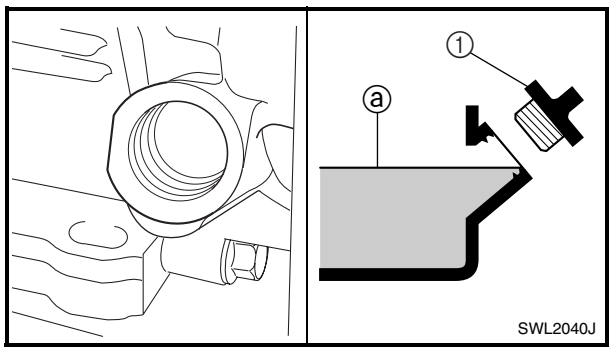

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OIL LEVEL CHECKING

1. Check:
   - Oil level with oil level warning light ①
   - Set the main switch to “START” “ ” or set it to “ON” “ ” and pull the recoil starter to check that the oil level warning light ① flashes.

   Oil level warning light flashes → Add oil.

   Oil level warning light does not flash → OK
2. Remove:
   - Panel 2

   Refer to “COVERS, PANELS, AND CAPS”.
   - Oil filler cap ①
3. Check:
   - Check that the engine oil is at the specified level ⓐ.

Oil level checking steps:

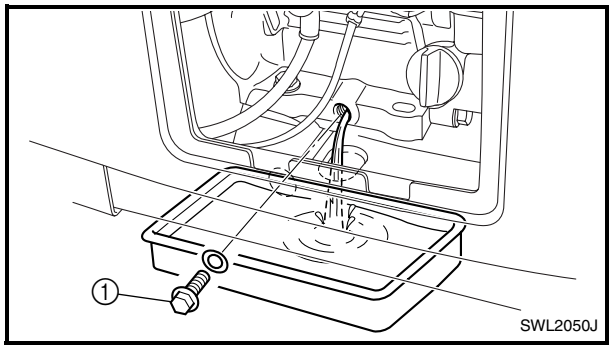
- Place the generator on a level surface.
- Warm up the engine for several minutes.
- Stop the engine.
- Check that the engine oil is at the specified level ⓐ. Add oil if necessary.

4. Install:
   - Oil filler cap
   - Panel 2
   Refer to “COVERS, PANELS, AND CAPS”.

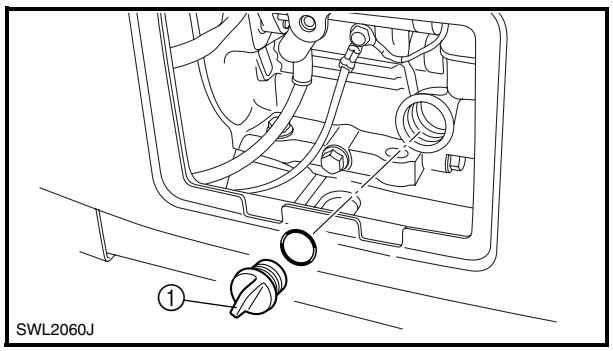
NOTE:
Tighten the oil filler cap securely by hand.

OIL REPLACEMENT

1. Warm up the engine for several minutes.
2. Stop the engine.
3. Remove:
   - Panel 2
   - Cap 2
   - Cap 1
   Refer to “COVERS, PANELS, AND CAPS”.
4. Place a receptacle under the engine.
5. Remove:
   - Oil drain bolt ①
6. Tilt the engine to drain the oil completely.
7. Tighten:
   - Oil drain bolt

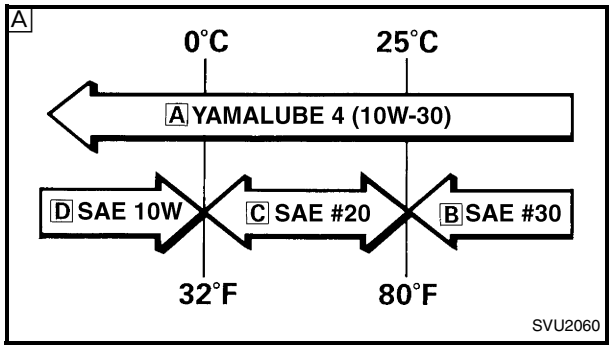


	Oil drain bolt: **17 Nm (1.7 m · kg, 12 ft · lb)**

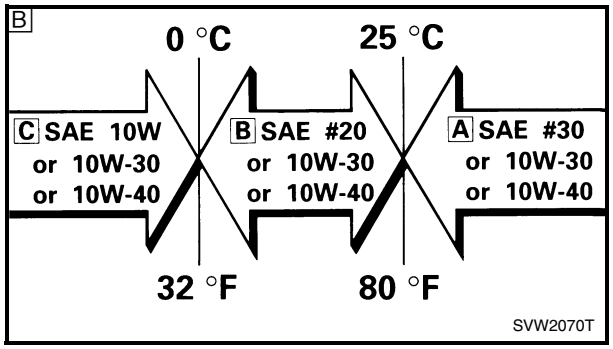


8. Remove:
   - Oil filler cap ①
9. Fill:

	Recommended oil: **A YAMALUBE 4 (10W-30) or SAE 10W-30 type SE** **B SAE #30** **C SAE #20** **D SAE 10W** **Engine oil quantity:** **0.6 L (0.53 Imp qt, 0.63 US qt)**



NOTE:
Recommended engine oil classification:
API Service “SE” or “SF”, if not available, “SD”.



Recommended oil:
A SAE #30 or 10W-30
or 10W-40
B SAE #20 or 10W-30
or 10W-40
C SAE 10W or 10W-30
or 10W-40
SAE #40: Above 35 °C (95 °F)
Engine oil quantity:
0.6 L (0.53 Imp qt, 0.63 US qt)

NOTE:
Recommended engine oil classification:
API Service "SE" or "SF", if not available, "SD".

A For Canada
B Except for Canada

10. Install:
    - Oil filler cap

NOTE:
Tighten the oil filler cap securely by hand.

11. Install:
    - Cap 1
    - Cap 2
    - Panel 2

    Refer to "COVERS, PANELS, AND CAPS".

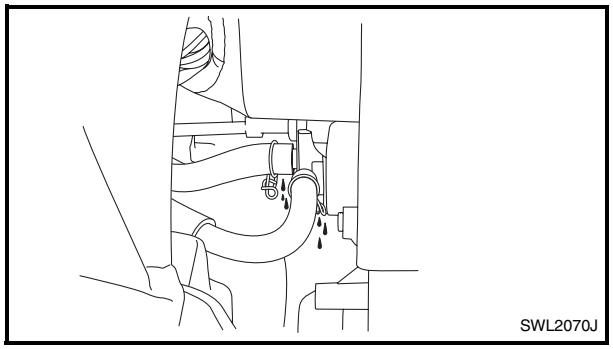
FUEL LEAKAGE

1. Remove:
   - Cover 1
   - Cover 5
   - Cover 4

   Refer to "COVERS, PANELS, AND CAPS".
2. Remove:
   - Fuel tank bolts

   Refer to "FUEL TANK AND CONTROL BOX" in CHAPTER 3.
3. Slide the fuel tank to check for leakage.

CAUTION:
When sliding the fuel tank, be sure not to extremely bend, twist, or pull the fuel hoses.


SWL2070J

4. Check:
   - Leakage
     Check at fuel tank, fuel cock, fuel hoses, and carburetor.

CAUTION:

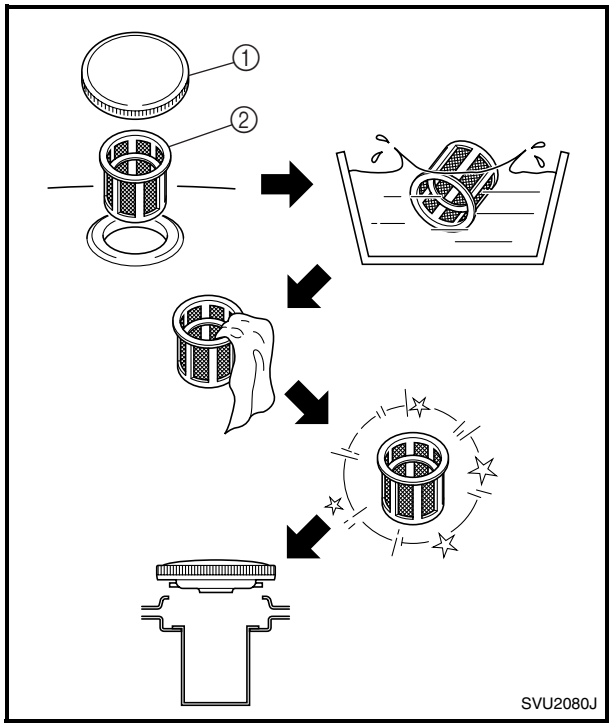
Replace the fuel hoses every four years.

5. Install:
   - Fuel tank
     Refer to “FUEL TANK AND CONTROL BOX” in CHAPTER 3.
6. Install:
   - Cover 4
   - Cover 5
   - Cover 1
     Refer to “COVERS, PANELS, AND CAPS”.

FUEL TANK FILTER

⚠ WARNING

Do not smoke, and keep away from open flames, sparks, or any other source of fire when handling or in the vicinity of fuel.



SVU2080J

1. Remove:
   - Fuel tank cap ①
   - Fuel tank filter ②
2. Inspect:
   - Fuel tank filter
     Damage → Replace.
3. Clean:
   - Fuel tank filter

NOTE:

Clean the fuel tank filter with solvent, and then dry it thoroughly.

4. Install:
   - Fuel tank filter
   - Fuel tank cap

⚠ WARNING

Be sure the tank cap is tightened securely.

FUEL PIPE STRAINER

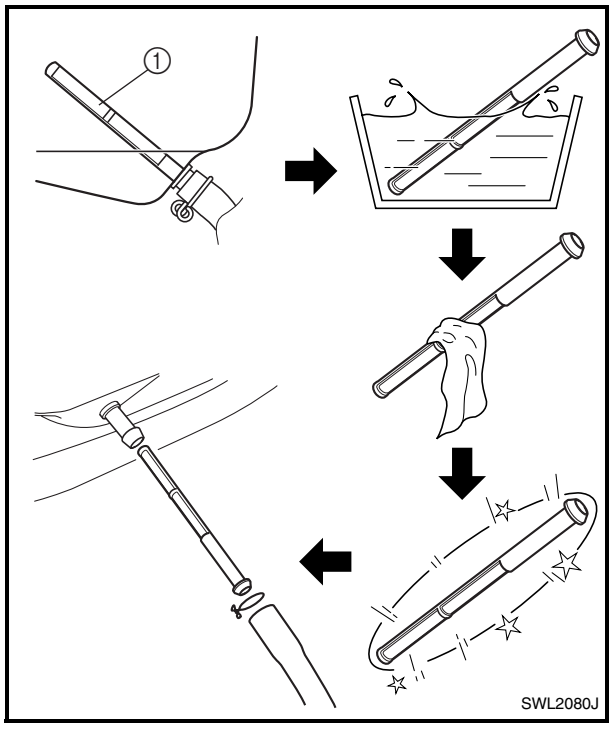
⚠ WARNING

Do not smoke, and keep away from open flames, sparks, or any other source of fire when handling or in the vicinity of fuel.

1. Drain the fuel.
2. Remove:
   - Cover 1
   - Cover 5
   - Cover 4

   Refer to “COVERS, PANELS, AND CAPS”.
3. Remove:
   - Fuel hose (fuel cock end)
   - Fuel tank

   Refer to “FUEL TANK AND CONTROL BOX” in CHAPTER 3.



4. Remove:
   - Fuel hose (fuel tank end)
   - Fuel pipe strainer ①
5. Inspect:
   - Fuel pipe strainer

   Damage → Replace.
6. Clean:
   - Fuel pipe strainer

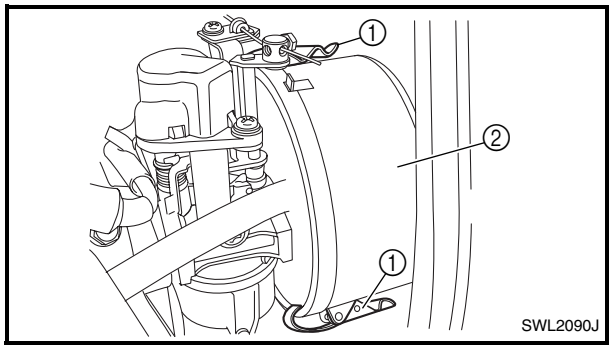
NOTE:

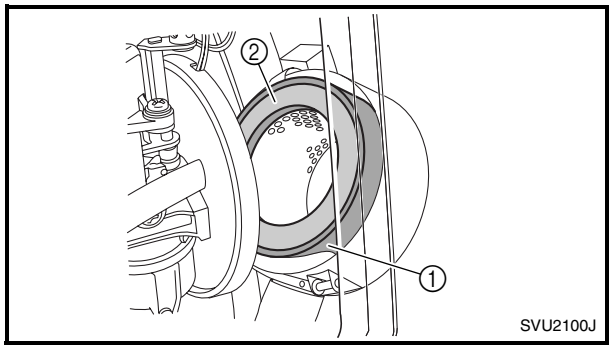
Clean the fuel pipe strainer with solvent, and then dry it thoroughly.

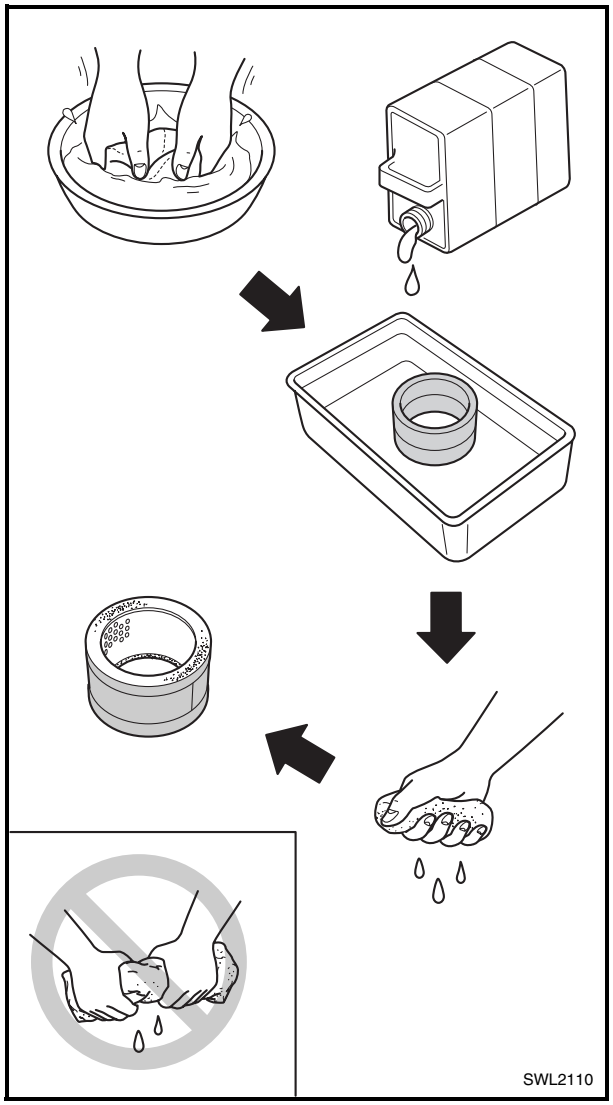
7. Install:
   - Fuel pipe strainer
   - Fuel hose (fuel tank end)
8. Install:
   - Fuel tank
   - Fuel hose (fuel cock end)

   Refer to “FUEL TANK AND CONTROL BOX” in CHAPTER 3.
9. Install:
   - Cover 4
   - Cover 5
   - Cover 1

   Refer to “COVERS, PANELS, AND CAPS”.







AIR FILTER ELEMENT

1. Remove:
   - Panel 4
   - Cover 5

   Refer to "COVERS, PANELS, AND CAPS".
2. Remove:
   - Hooks ①
   - Air filter element case ②
3. Remove:
   - Air filter element 1 ①
   - Air filter element 2 ②

NOTE:

Remove air filter element 1 and air filter element 2 as a set.

4. Inspect:
   - Air filter elements

   Damage → Replace.
5. Clean:
   - Air filter element 1

   Wash the air filter elements in kerosene.

NOTE:

Be sure to squeeze the excess kerosene out of the air filter element 1.

6. Lubricate:
   - Air filter element 1

   Soak the air filter element 1 in a 2–4:1 mixture of kerosene and engine oil.

NOTE:

Be sure to squeeze the excess kerosene and engine oil out of the air filter element 1.

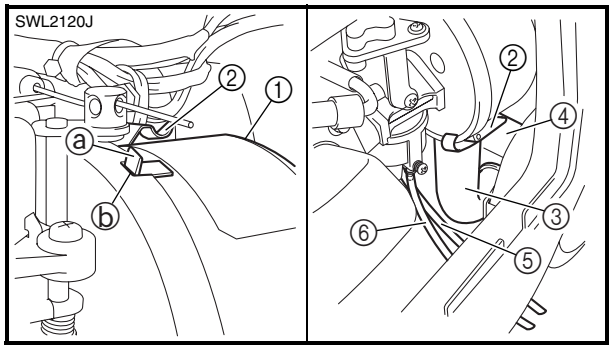
CAUTION:

- **Do not twist the air filter elements, otherwise they can tear.**
- **Do not wash the air filter elements in gasoline or in acid, alkaline, or organic solvents.**

7. Install:
   - Air filter element 1
   - Air filter element 2

NOTE:

Insert air filter element 1 into air filter element 2, and then install them into the air filter case.



8. Install:
   - Air filter element case ①
   - Hooks ②

NOTE:

- Align the projection ⓐ of the air filter case ① with the slot ⓑ in the air filter element bracket, and then install the air filter case.
- Make sure that the air intake duct ③ is securely installed onto the frame ④.
- Make sure that the air vent hose ⑤ and drain hose ⑥ are securely installed onto the frame ④.

9. Install:
   - Cover 5
   - Panel 4

   Refer to "COVERS, PANELS, AND CAPS".

CAUTION:

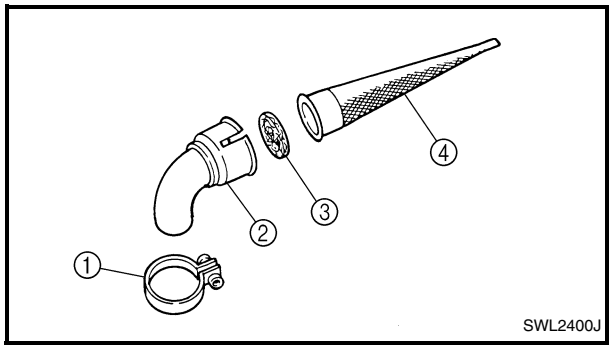
The engine should never run without the air filter element installed, otherwise excessive piston and/or cylinder wear may result.

MUFFLER

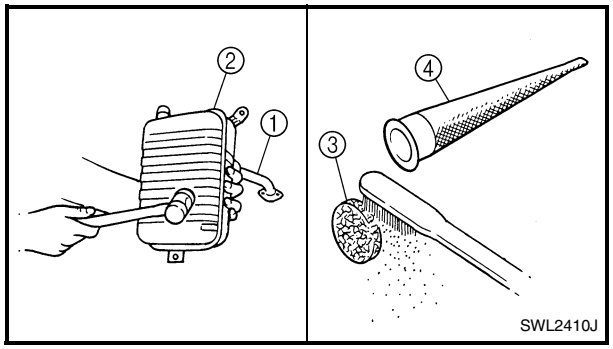
1. Remove:
   - Engine assembly

   Refer to "ENGINE ASSEMBLY" in CHAPTER 3.
2. Remove:
   - Muffler

   Refer to "MUFFLER" in CHAPTER 3.



3. Remove:
   - Muffler band ①
   - Muffler cap ②
   - Muffler screen ③
   - Spark arrester ④



4. Decarbonize:
   - Exhaust pipe ①
   - Muffler ②
   - Muffler screen ③
   - Spark arrester ④

   Tap on the muffler in the area shown in the illustration to loosen carbon buildup, and then shake it out of the end of the muffler.

CAUTION:

Do not use a wire to clean the muffler, otherwise the noise damping material may come out, and the damping effect may be reduced.

5. Install:
   - Spark arrester
   - Muffler screen
   - Muffler cap
   - Muffler band
   - Muffler

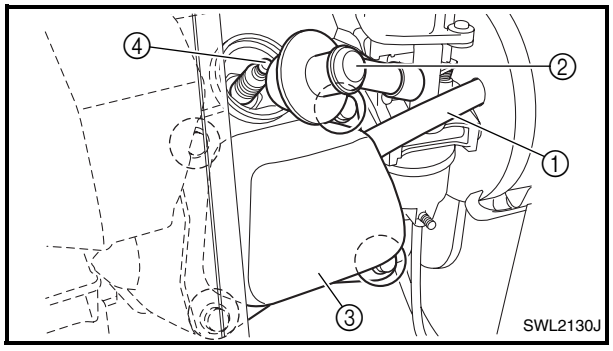
   Refer to “MUFFLER” in CHAPTER 3.
6. Install:
   - Engine assembly

   Refer to “ENGINE ASSEMBLY” in CHAPTER 3.

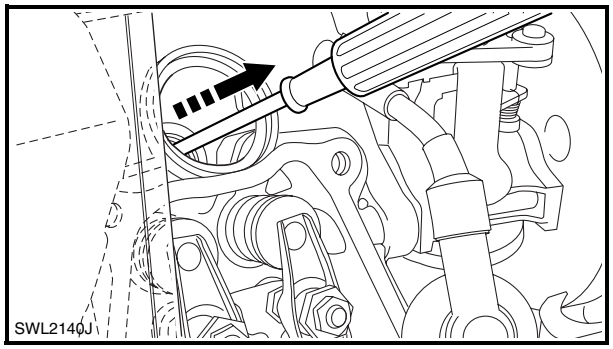
VALVE CLEARANCE ADJUSTMENT

1. Remove:
   - Panel 4

   Refer to “COVERS, PANELS, AND CAPS”.



2. Remove:
   - Breather hose ①
   - Spark plug cap ②
   - Cylinder head cover ③
   - Spark plug ④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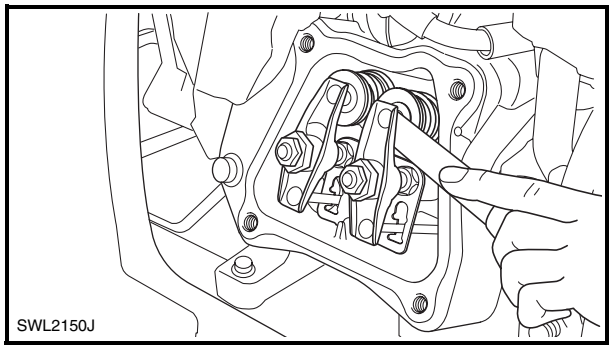
3. Gently pull the recoil starter to bring the piston to top dead center of its compression stroke (when the screwdriver inserted into the spark plug hole reaches the highest position).

NOTE:
If the piston is at top dead center of the exhaust stroke, turn the crankshaft one full turn (360°) to set the piston at top dead center of the compression stroke.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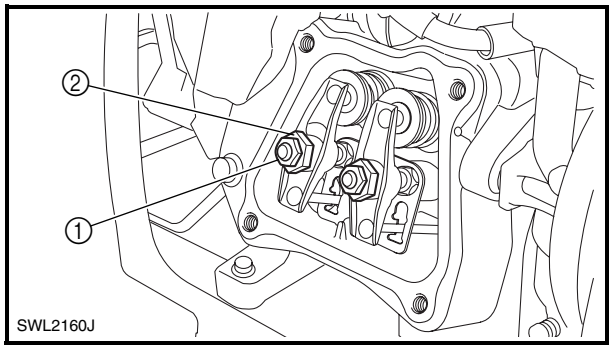
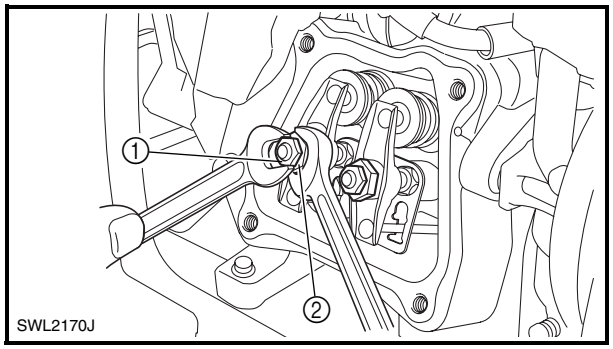
4. Measure:
   - Valve clearance
     Out of specification → Adjust.

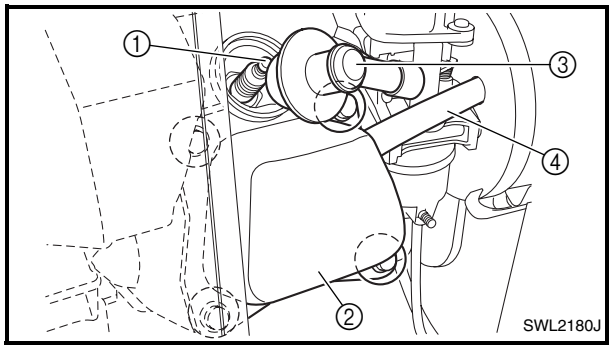
NOTE:
Valve clearance must be measured when the engine is cool to the touch.

Intake valve (cold):
0.18 ~ 0.22 mm (0.007 ~ 0.009 in)
Exhaust valve (cold):
0.18 ~ 0.22 mm (0.007 ~ 0.009 in)

Thickness gauge:
YU-26900-9, 90890-03079







5. Adjust:
   - Valve clearance

Adjustment steps:
- Loosen the locknut ①.
- Turn the adjuster ② in or out to obtain the proper clearance.

Adjuster	Valve clearance
Turn in	Decrease
Turn out	Increase

- Tighten the locknut ①.

Locknut:
10 Nm (1.0 m · kg, 7.2 ft · lb)

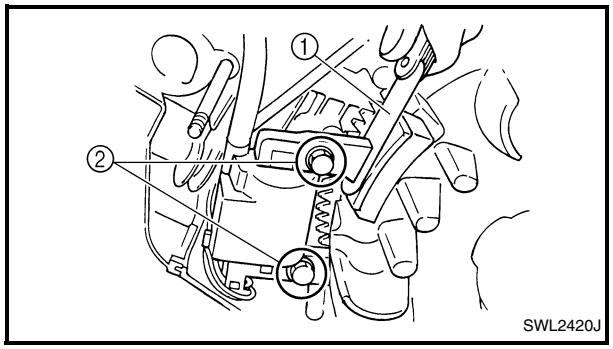
6. Install:
   - Spark plug ①
   - Cylinder head cover ②
   - Spark plug cap ③
   - Breather hose ④

Cylinder head cover bolt:
10 Nm (1.0 m · kg, 7.2 ft · lb)
Spark plug:
18 Nm (1.8 m · kg, 13 ft · lb)

7. Install:
   - Panel 4
     Refer to “COVERS, PANELS, AND CAPS”.

AIR GAP BETWEEN TCI UNIT AND FLYWHEEL MAGNETO

1. Remove:
   - Fuel tank
     Refer to “FUEL TANK AND CONTROL BOX” in CHAPTER 3.
   - Air filter element assembly
     Refer to “AIR FILTER ASSEMBLY AND CONTROL UNIT” and “AIR FILTER ASSEMBLY, CONTROL UNIT AND NOISE FILTER” in CHAPTER 3.
   - Carburetor
     Refer to “CARBURETOR” in CHAPTER 3.
   - Recoil starter
   - Flywheel magneto cover
     Refer to “RECOIL STARTER AND FLYWHEEL MAGNETO” in CHAPTER 3.



2. Measure:
   - Air gap between TCI unit and flywheel magneto
     Use a thickness gauge ①.
     Out of specification → Adjust.

	**Thickness gauge:** **YU-26900-9, 90890-03079**

3. Adjust:
   - Air gap between TCI unit and flywheel magneto

Adjustment steps:

- Loosen the bolts ②.
- Adjust the air gap between the TCI unit and flywheel magneto by moving the TCI unit up or down.
- Tighten the bolts ②.

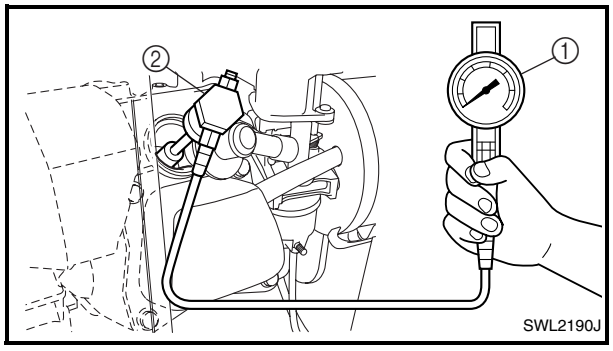
	**Air gap between TCI unit and flywheel magneto:** **0.5 ± 0.1 mm (0.020 ± 0.004 in)**
	**TCI unit bolt:** **10 Nm (1.0 m · kg, 7.2 ft · lb)**

4. Install:
   - Flywheel magneto cover
   - Recoil starter
     Refer to “RECOIL STARTER AND FLYWHEEL MAGNETO” in CHAPTER 3.
   - Carburetor
     Refer to “CARBURETOR” in CHAPTER 3.
   - Air filter element assembly
     Refer to “AIR FILTER ASSEMBLY AND CONTROL UNIT” and “AIR FILTER ASSEMBLY, CONTROL UNIT AND NOISE FILTER” in CHAPTER 3.
   - Fuel tank
     Refer to “FUEL TANK AND CONTROL BOX” in CHAPTER 3.

COMPRESSION PRESSURE

NOTE:
Measure the compression after checking and adjusting the valve clearance.

1. Warm up the engine for several minutes.
2. Remove:
   - Panel 4
     Refer to “COVERS, PANELS, AND CAPS”.
3. Remove:
   - Spark plug cap
   - Spark plug



4. Connect:
   - Compression gauge ①
   - Adapter ②

Compression gauge:
YU-33223, 90890-03081
Adapter:
YU-33223-3, 90890-04082

5. Measure:
   • Compression
   To measure the compression, set the main switch to "START" " " or set it to "ON" " " and pull the recoil starter until the needle stops rising on the compression gauge.

Standard compression pressure:
400 ~ 600 kPa
(4 ~ 6 kg/cm², 57 ~ 85 psi)

⚠ WARNING

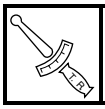
To prevent sparking when cranking the engine, ground the spark plug lead.

Testing steps (below minimum level):
- Squirt a few drops of oil into the cylinder.
- Measure the compression pressure again.

Reading	Diagnosis
If higher than without oil	• Worn cylinder, piston, and piston ring
If the same as without oil	• Defective piston, ring(s), valve(s), and cylinder head gasket • Improper valve timing and valve clearance

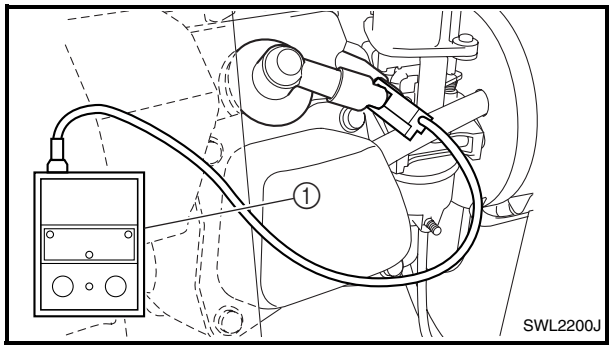
Testing steps (above maximum level):
- Check the cylinder head, valve surfaces, and piston crown for carbon deposits.

6. Install:
   • Spark plug
   • Spark plug cap



Spark plug:
18 Nm (1.8 m · kg, 13 ft · lb)

7. Install:
   • Panel 4
   Refer to "COVERS, PANELS, AND CAPS".

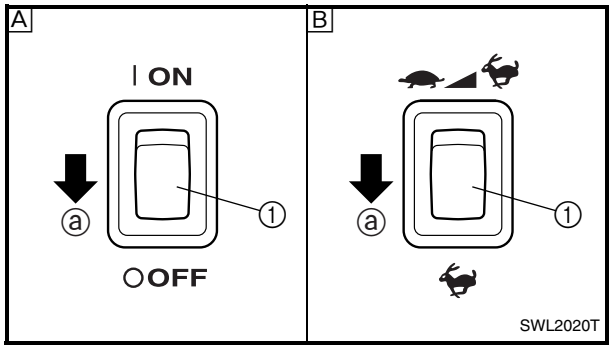


ENGINE SPEED (NO LOAD)

1. Remove:
   - Panel 4
     Refer to "COVERS, PANELS, AND CAPS".
2. Connect:
   - Inductive self-powered tachometer or engine tachometer ①

Inductive self-powered tachometer:
YU-8036-B
Engine tachometer:
90890-03113
(90793-80009, 90793-80032)

3. Inspect:
   - Engine speed (no load)
     Specified engine speed → OK
     Out of specification → Refer to "TROUBLESHOOTING" in CHAPTER 3.



Inspection steps:
- Operate the engine (no load).
- Turn the economy switch ① to "OFF" " " ⓐ.
- Measure the engine speed (no load).

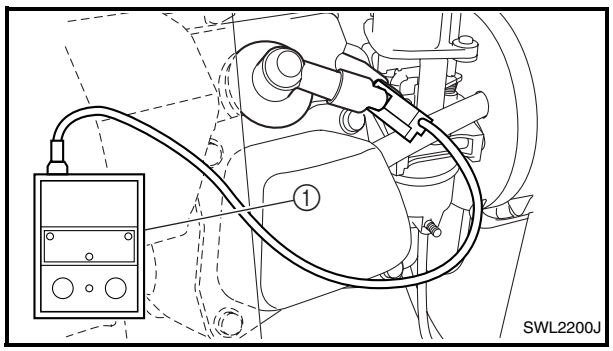
Engine speed (no load):
3,550 r/min

A 120 V-60 Hz, 220 V-50 Hz
B 230 V-50 Hz

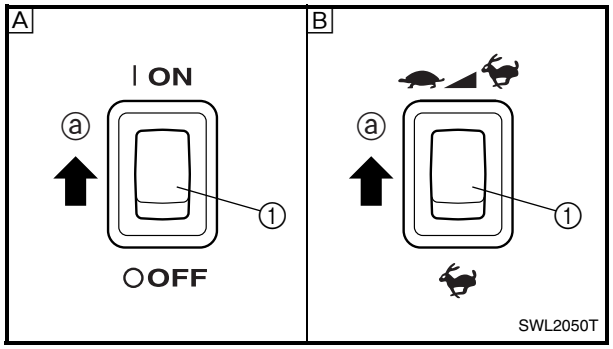
4. Install:
   - Panel 4
     Refer to "COVERS, PANELS, AND CAPS".

ECONOMY ENGINE SPEED

1. Remove:
   - Panel 4
     Refer to "COVERS, PANELS, AND CAPS".
2. Connect:
   - Inductive self-powered tachometer or engine tachometer ①



Inductive self-powered tachometer:
YU-8036-B
Engine tachometer:
90890-03113
(90793-80009, 90793-80032)



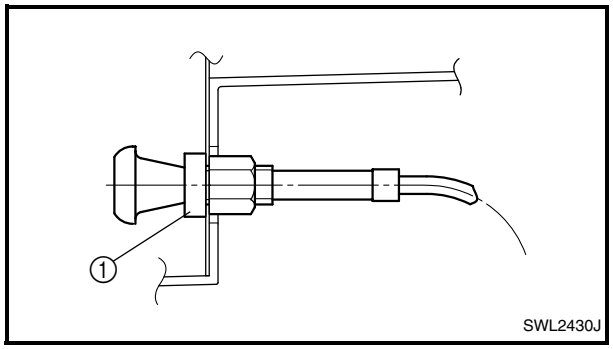
3. Inspect:
   - Economy engine speed
     Specified engine speed → OK
     Out of specification → Refer to "TROUBLE SHOOTING" in CHAPTER 3.

Inspection steps:
- Turn the economy switch ① to "ON" " " ⓐ.
- Operate the engine (no load).
- Measure the economy engine speed.

Economy engine speed (no load):
2,800 ± 50 r/min

A 120 V-60 Hz, 220 V-50 Hz
B 230 V-50 Hz

4. Install:
   - Panel 4
     Refer to "COVERS, PANELS, AND CAPS".



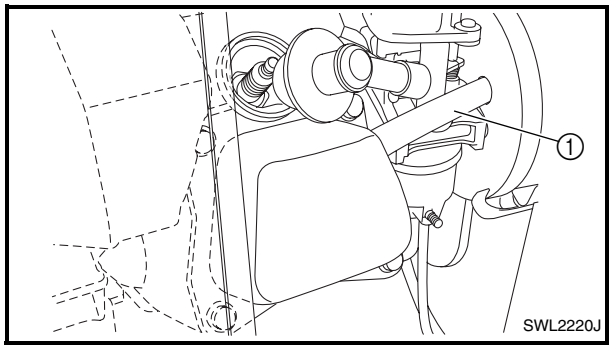
CHOKE CABLE

1. Inspect:
   - Choke knob
     (pull the choke knob all the way out)
     Choke knob automatically returns → Adjust.

Adjustment steps:
- Turn in the adjusting nut ① until the choke knob does not automatically return.

BREATHER HOSE

1. Remove:
   - Panel 4
     Refer to "COVERS, PANELS, AND CAPS".
2. Inspect:
   - Breather hose ①
     Cracks/damage → Replace.
     Poor connection → Correct.
3. Install:
   - Panel 4
     Refer to "COVERS, PANELS, AND CAPS".



ELECTRICAL

SPARK PLUG

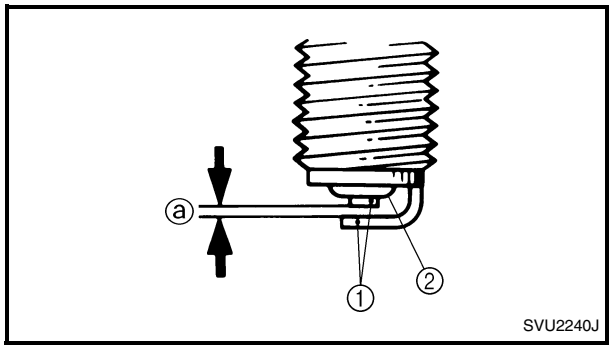
⚠ WARNING

Inspect and adjust the areas around the cylinder head after the engine has cooled down completely.

CAUTION:

Before removing the spark plug, use compressed air to clean the cylinder head cover to prevent dirt from falling into the engine.

1. Remove:
   - Panel 4
     Refer to "COVERS, PANELS, AND CAPS".
2. Remove:
   - Spark plug cap
   - Spark plug
3. Inspect:
   - Electrode ①
     Wear/damage → Replace.
   - Insulator color ②
4. Measure:
   - Spark plug gap ⓐ
     Use a wire gauge or thickness gauge.
     Out of specification → Regap.



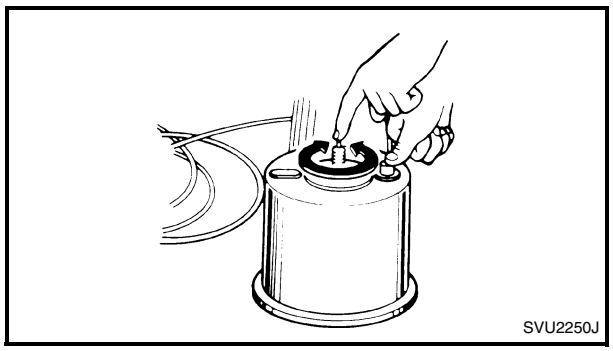
SVU2240J

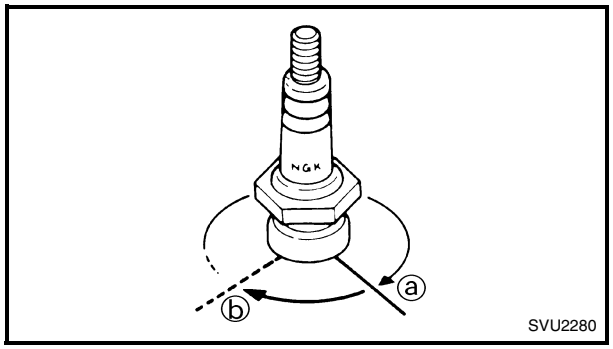
Spark plug gap:
0.7 ~ 0.8 mm (0.028 ~ 0.031 in)

If necessary, clean the spark plug with a spark plug cleaner.

Standard spark plug (with resistor):
BPR4ES (NGK)

Before installing the spark plug, clean the gasket surface and plug surface.


SVU2250J



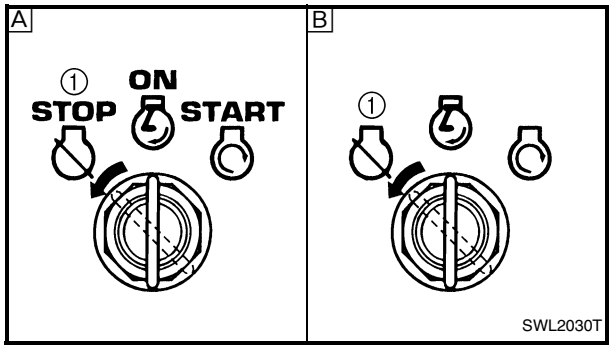
5. Tighten:
   - Spark plug

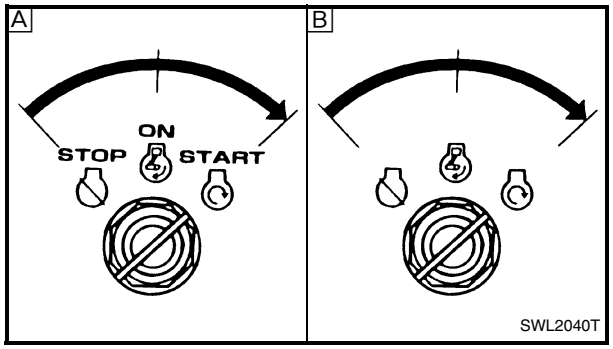
	Spark plug: **18 Nm (1.8 m · kg, 13 ft · lb)**

NOTE:

To prevent thread damage, finger tighten ⓐ the spark plug before tightening it to the specified torque ⓑ.

6. Install:
   - Spark plug cap
7. Install:
   - Panel 4
     Refer to "COVERS, PANELS, AND CAPS".





MAIN SWITCH

1. Check:
   - Main switch

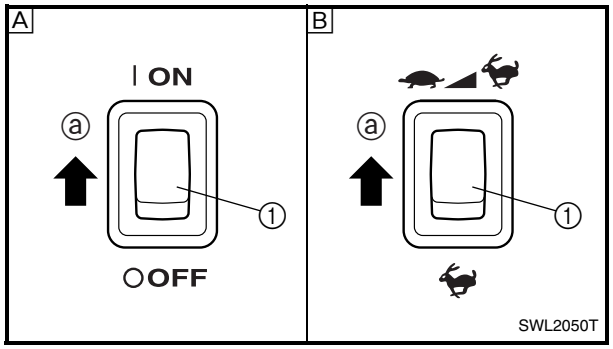
Checking steps:

- Set the main switch to "ON" " ⏻ " and pull the recoil starter to start the engine.
- Check that the engine stops when the main switch is set to "STOP" " ⏻ " ①.
  Engine does not stop → Refer to "IGNITION SYSTEM" in CHAPTER 4.

A 120 V-60 Hz, 220 V-50 Hz
B 230 V-50 Hz

- Check that the engine starts when the main switch is set to "START" " ⏻ ".
  Engine does not start → Refer to "ELECTRIC STARTING SYSTEM" in CHAPTER 4.

A 120 V-60 Hz, 220 V-50 Hz
B 230 V-50 Hz



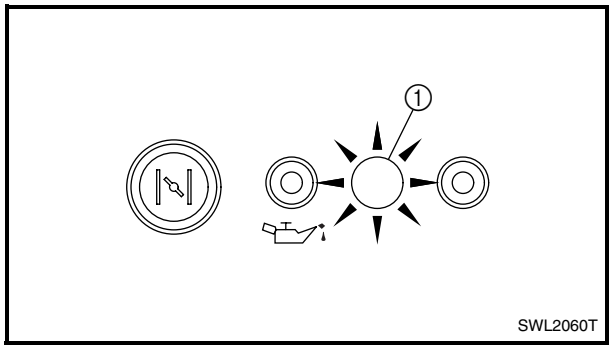
ECONOMY SWITCH

1. Check:
   - Economy switch ①

A 120 V-60 Hz, 220 V-50 Hz
B 230 V-50 Hz

Checking steps:

- Set the economy switch ① to "ON" " " ⓐ.
- Start the engine.
- Turn the switch of the electric device connected to the AC outlet "ON" " " and "OFF" " " to check whether the engine speed increases and decreases.
  Does not change → Refer to "TROUBLESHOOTING" in CHAPTER 3 and "GENERATOR SYSTEM" in CHAPTER 4.

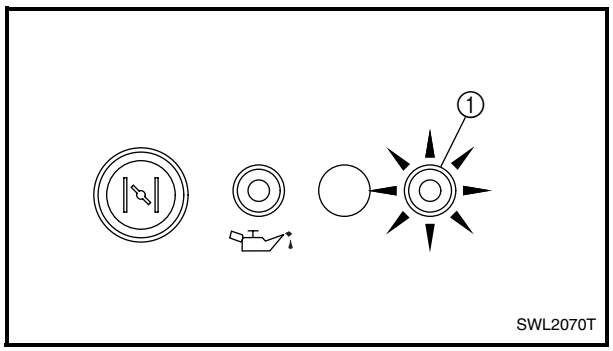


PILOT LIGHT

1. Check:
   - Pilot light ①

Checking steps:

- Start the engine.
- Check that the pilot light ① turns on.
  Refer to "GENERATOR SYSTEM" in CHAPTER 4.



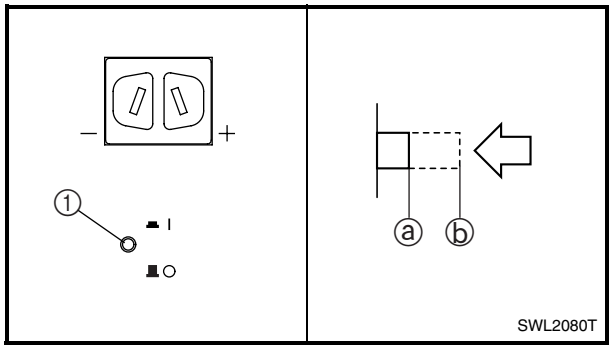
OVERLOAD WARNING LIGHT

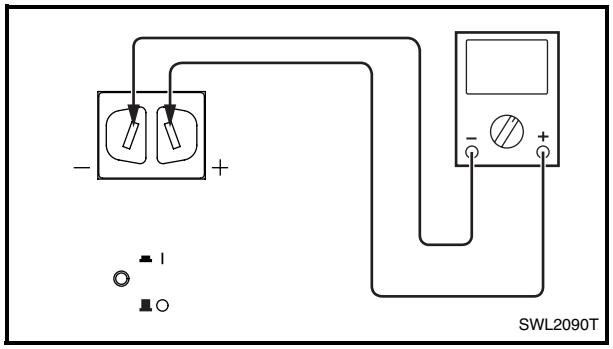
1. Check:
   - Overload warning light ①
2. Remove:
   - Control panel
   - Overload warning light connector
     Refer to "CONTROL PANEL" in CHAPTER 3.

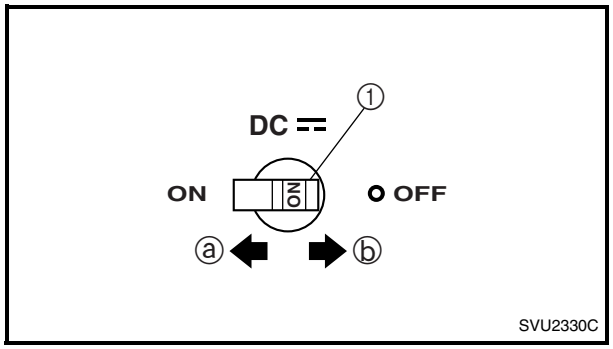
Checking steps:

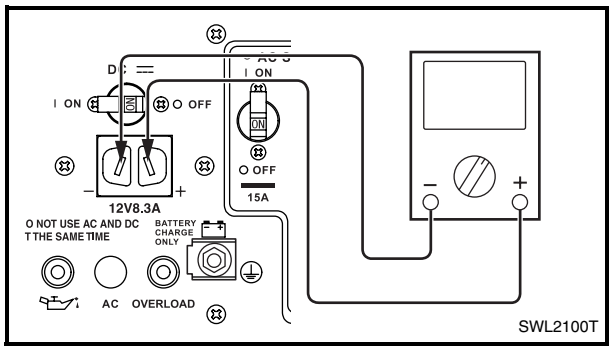
- Connect three dry cell batteries (1.5 V) to the overload warning light lead.
- Check that the overload warning light ① turns on.
  Does not turn on → Replace.

3. Install:
   - Overload warning light connector
   - Control panel
     Refer to "CONTROL PANEL" in CHAPTER 3.









DC CIRCUIT BREAKER

1. Check:
   - DC circuit breaker

Checking steps:

- Check if the DC circuit breaker knob ① is set to "RESET" " " ⓐ.
- If the knob ① is set to "OFF" " " ⓑ, direct current cannot be supplied.
- Start the engine.
- Connect a pocket tester (DC 20 V) to the DC receptacle and check if direct current is supplied.

Pocket tester:
YU-03112-C, 90890-03112

Direct current not supplied → Replace or refer to "GENERATOR SYSTEM" in CHAPTER 4.

DC CIRCUIT BREAKER (120 V-60 Hz)

1. Check:
   - DC circuit breaker

Checking steps:

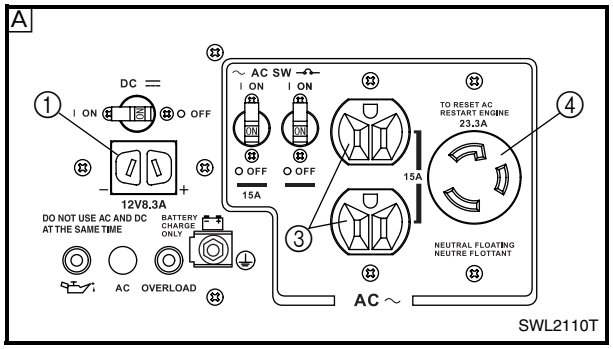
- Set the DC circuit breaker ① to the position of "ON" ⓐ.
- Connect the pocket tester (DC 20 V).

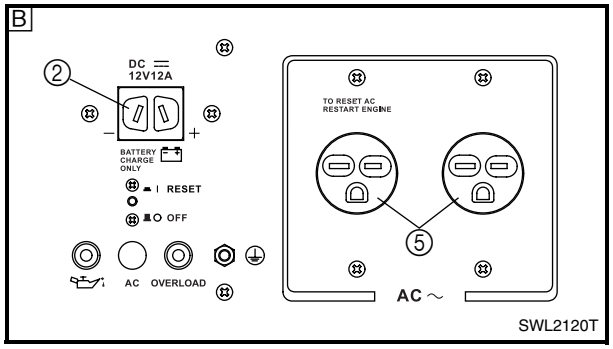
Pocket tester:
YU-03112-C, 90890-03112

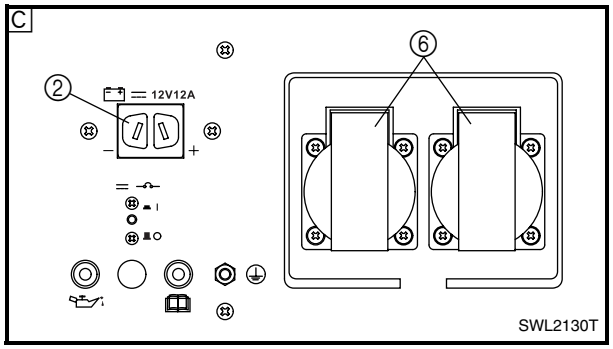
- Start the engine.
- Set the economy switch to "OFF".
- Measure the DC voltage.

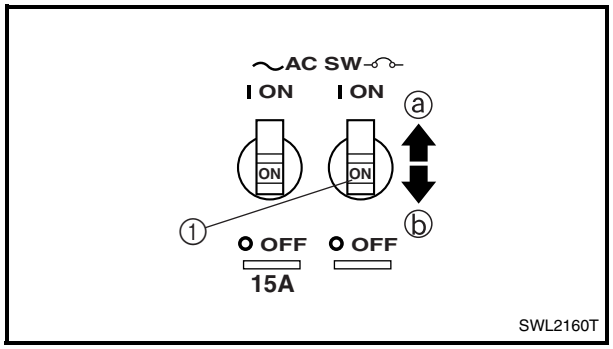
DC voltage:
More than 12 V at 3,550 r/min (no load at AC output current)

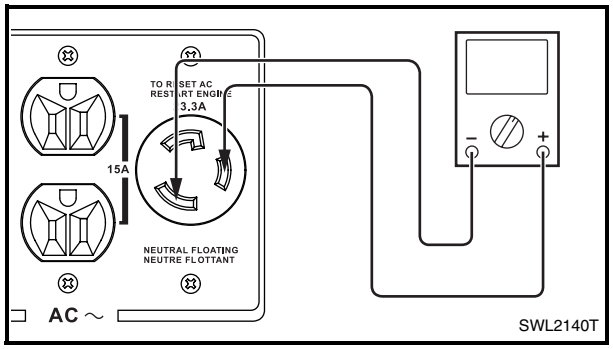
- Set the DC circuit breaker ① to "OFF" ⓑ. Voltage is zero → OK











RECEPTACLE

1. Check:
   - DC receptacle (12 V, 8.3 A) ①
   - DC receptacle (12 V, 12 A) ②
   - AC receptacles (15 A) ③
   - AC receptacle (23.3 A) ④
   - AC receptacles (15 A) ⑤
   - AC receptacles (16 A) ⑥

   Cracks/damage → Replace.
   Poor connection → Correct.

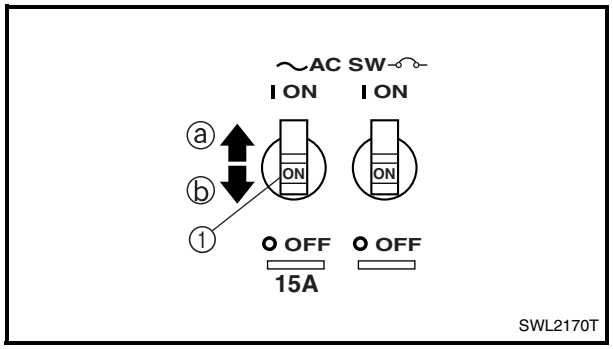
A 120 V-60 Hz
B 220 V-50 Hz
C 230 V-50 Hz

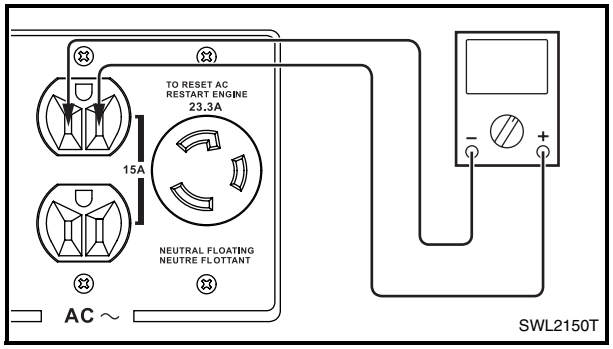
AC SWITCH (NFB) (120 V-60 Hz/23.5 A)

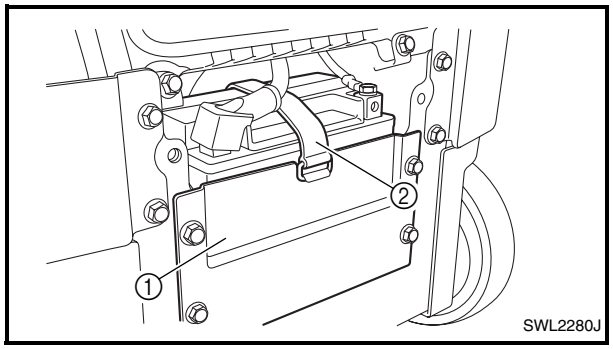
1. Set the AC switch (NFB) ① to the "ON" ⓐ position.
2. Connect the pocket tester (AC 120 V) to the AC receptacle (23.3 A) and check the AC switch (NFB) for continuity.
   No continuity → Replace the AC switch (NFB).

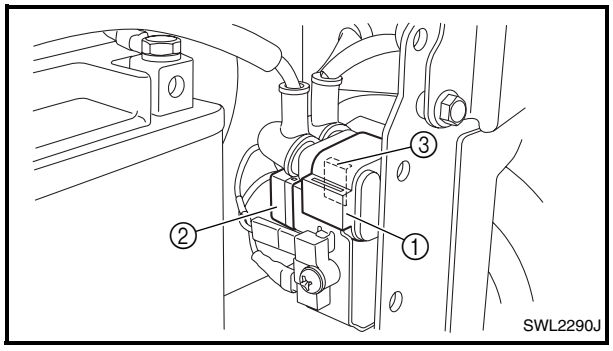
	Pocket tester: **YU-03112-C, 90890-03112**

3. Set the AC switch (NFB) ① to the "OFF" ⓑ position.
4. Connect the pocket tester (AC 120 V) to the AC receptacle (23.3 A) and check the AC switch (NFB) for continuity.
   Continuity → Replace the AC switch (NFB).









AC SWITCH (NFB) (120 V-60 Hz/15 A)

1. Set the AC switch (NFB) ① to the "ON" ⓐ position.
2. Connect the pocket tester (AC 120 V) to the AC receptacle (15 A) and check the AC switch (NFB) for continuity.
   No continuity → Replace the AC switch (NFB).

	Pocket tester: **YU-03112-C, 90890-03112**

3. Set the AC switch (NFB) ① to the "OFF" ⓑ position.
4. Connect the pocket tester (AC 120 V) to the AC receptacle (15 A) and check the AC switch (NFB) for continuity.
   Continuity → Replace the AC switch (NFB).

FUSES

CAUTION:

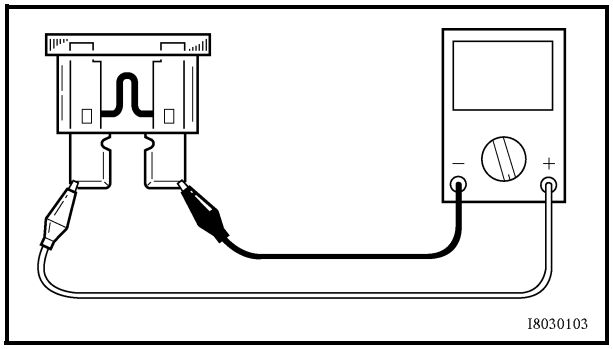
To avoid a short circuit, always set the main switch to "STOP" " ⏻ " when checking or replacing a fuse.

1. Remove:
   - Cover 5
     Refer to "COVERS, PANELS, AND CAPS".
2. Remove:
   - Battery bracket ①
   - Battery band ②
   - Battery

NOTE:

To check the fuses, slide the battery out with the positive battery lead and negative battery lead connected to the battery.

3. Remove:
   - Starter relay ①
   - Fuse ②
   - Fuse (spare) ③



4. Check:
   • Fuses

Checking steps:
• Connect the pocket tester (Ω × 1) to a fuse and check the continuity.

NOTE:
Set the pocket tester selector to "Ω × 1"

Pocket tester:
YU-03112-C, 90890-03112

• If the pocket tester indicates "∞", replace the fuse.
5. Replace:
   • Blown fuse

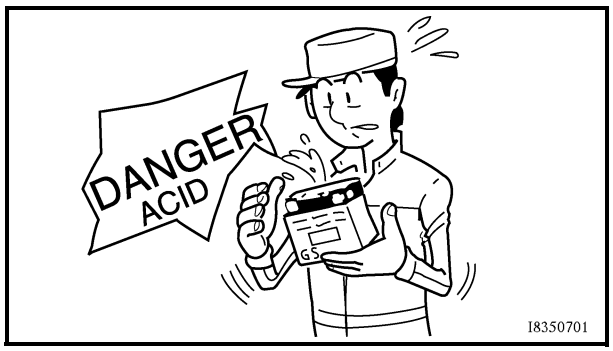
Replacing steps:
• Set the main switch to "STOP" " ".
• Install a new fuse of the correct amperage.
• Set the main switch to "ON" " " and verify if the electrical circuit is operational.
• If the fuse immediately blows again, check the electrical circuit.

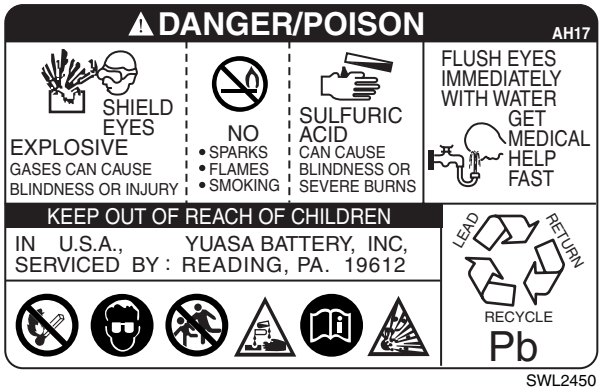
Fuse amperage:
10 A

⚠ WARNING

Never use a fuse with an amperage other than that specified. Improvising or using a fuse with the wrong amperage rating may cause extensive damage to the electrical system and could possibly cause a fire.

6. Install:
   • Fuse (spare)
   • Fuse
   • Starter relay
7. Install:
   • Battery
   • Battery band
   • Battery bracket
8. Install:
   • Cover 5
   Refer to "COVERS, PANELS, AND CAPS".

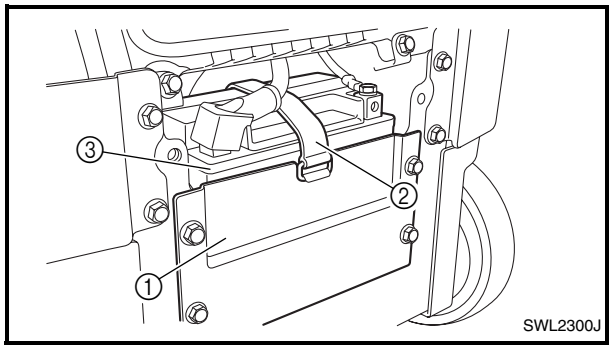


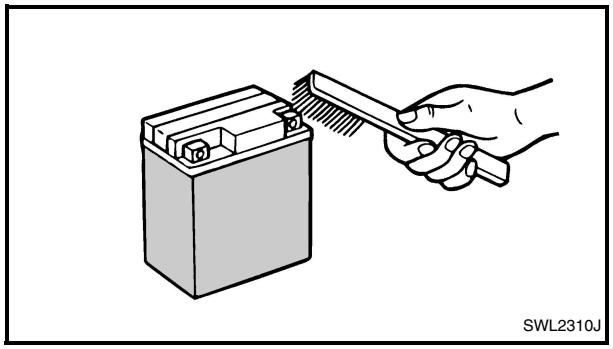


BATTERY

⚠ WARNING

Battery fluid is poisonous and dangerous, causes severe burns, etc. Contains sulfuric acid.
Avoid contact with skin, eyes or clothing.
Antidote:
EXTERNAL – Flush with water.
INTERNAL – Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call a physician immediately.
Eyes: Flush with water for 15 minutes and get prompt medical attention.
Batteries produce explosive gases. Keep sparks, flames, cigarettes, etc. away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries.
KEEP OUT OF REACH OF CHILDREN.





BATTERY TERMINAL

1. Remove:
   - Cover 5
     Refer to “COVERS, PANELS, AND CAPS”.
2. Remove:
   - Battery bracket ①
   - Battery band ②
   - Battery ③

CAUTION:

When removing the battery, disconnect the negative lead first.

3. Check:
   - Battery terminal
     Dirty terminal → Clean with a wire brush.
     Poor connection → Correct.

NOTE:

After cleaning the terminals, apply grease lightly to the terminals.

4. Install:
   - Battery
   - Battery band
   - Battery bracket

CAUTION:

Connect the positive lead to the battery terminal first.

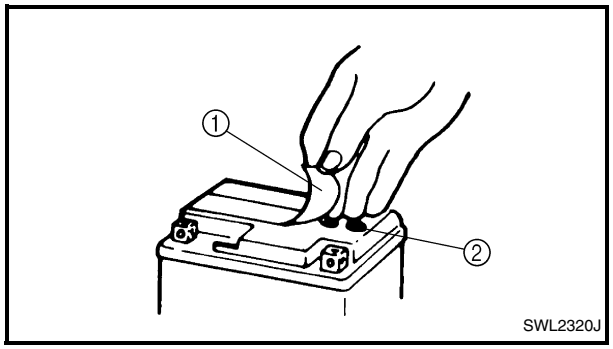
5. Install:
   - Cover 5
     Refer to “COVERS, PANELS, AND CAPS”.

BATTERY ELECTROLYTE

1. Fill:

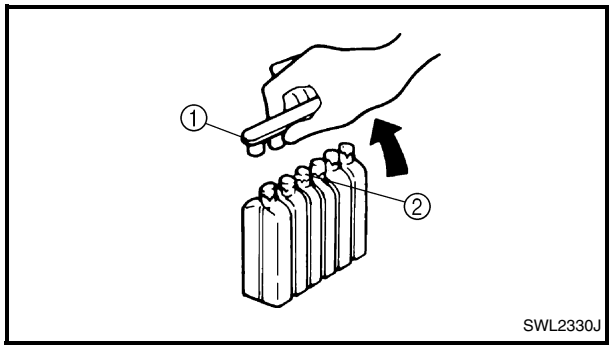
CAUTION:

- **Never remove the sealing sheet (aluminium seal) from the battery until the battery is filled with electrolyte.**
  If battery plates are exposed to air, they will oxidize. As a result, power will not be generated as specified.
- **Add electrolyte so that its level is correct as specified.**
  An incorrect electrolyte level has an adverse effect on battery performance.
  The quantity of electrolyte varies with the type of the electrolyte container. Use only the amount of electrolyte in the container which comes with the battery.
- **Avoid using any electrolyte other than specified.**
  The specific gravity of the MF battery electrolyte is 1.320 (20 °C). (The specific gravity of the general type battery electrolyte is 1.280.)
  If the electrolyte whose specific gravity is less than 1.320, the sulfuric acid will decrease and thus low battery performance will result.
  Should any electrolyte, whose specific gravity is 1.320 or more, be used, the battery plates will corrode and battery life will shorten.



a. Place the battery on a level surface.
b. Remove the sealing sheet ①.

② Filler port



c. Take the electrolyte container out of the vinyl bag.
d. Detach the strip of caps (used as battery plugs) ①.

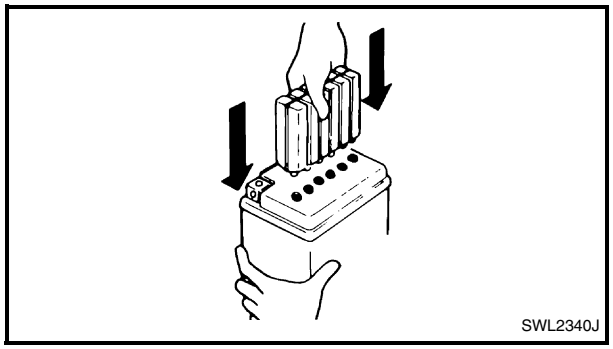
② Six sealed areas of container

NOTE:

Do not lose the strip of caps because it will be used as battery plugs.

CAUTION:

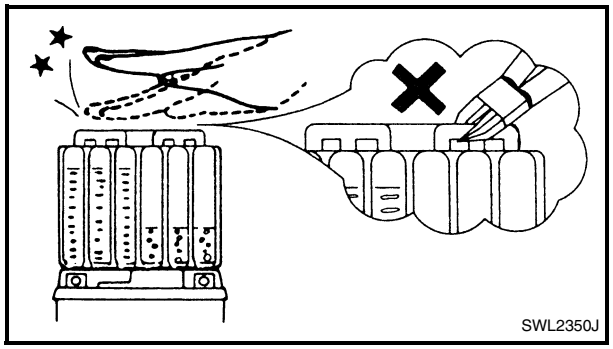
Do not peel or pierce the sealed areas.

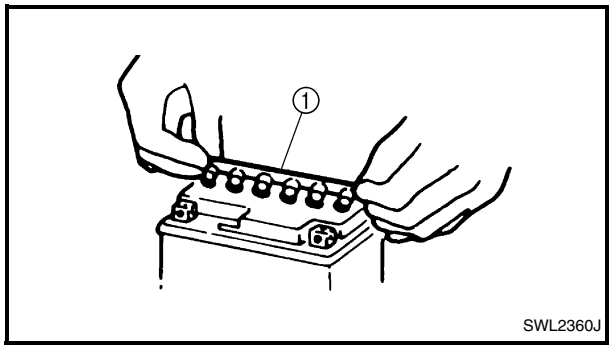


e. Turn the electrolyte container upside down with the six sealed areas in line with the six filler ports of the battery.
f. Push the container down strongly enough to break the seals. The electrolyte will start to flow into the battery.

CAUTION:

- **Do not tilt the container as the electrolyte may stop flowing.**
- **Never remove the container from the battery until all electrolyte has drained from the container.**


SWL2350J



SWL2360J

g. Leave the container in this position for 20 minutes or longer to allow proper chemical reaction.

NOTE:
- Make sure air bubbles are rising from all six filler ports.
- If air bubbles are not rising from a filler port, tap the top of the container a few times.
- Do not cut the connected parts.

h. Be certain that all the electrolyte has been drained from the container.
i. Fit the strip of caps (battery plugs) securely into the filler ports. Make sure the top of the strip is at the same level as the top of the battery.

① Press down horizontally with both hands.

CAUTION:

Never remove the strip of caps, nor add any water or electrolyte.

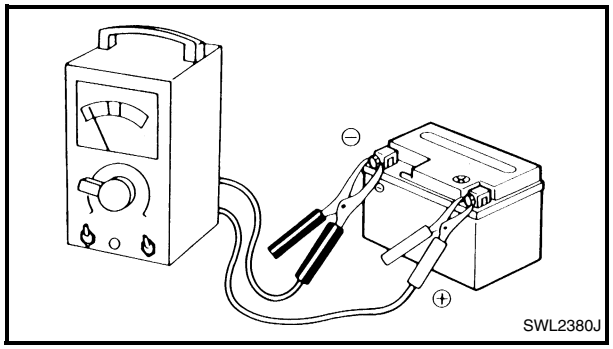
⚠ WARNING

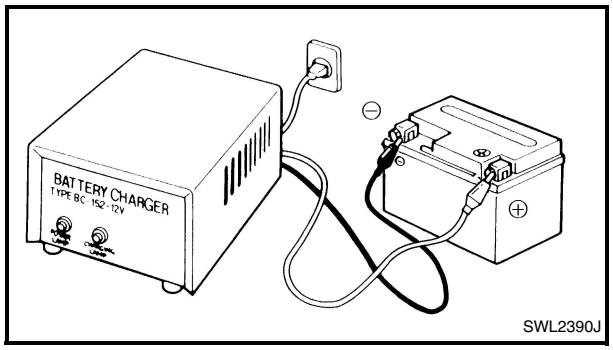
- **Do not attempt boost charging under any circumstances.**
- **Battery electrolyte is poisonous and dangerous, causing severe burns, etc. Contains sulfuric acid. Avoid contact with skin, eyes or clothing.**
  Antidote: External — Flush with water. Internal — Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.
  Eyes: Flush with water for 15 minutes and get prompt medical attention. Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc., away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries.
  KEEP OUT OF REACH OF CHILDREN.

2. Check:
   • Using a digital voltmeter, the state of a discharged MF battery can be checked by measuring open-circuit voltage (the voltage measured with the positive and negative terminals being disconnected).

CAUTION:

The battery must be charged after it is filled with electrolyte. If this is not done, the life of the battery will be shortened drastically.





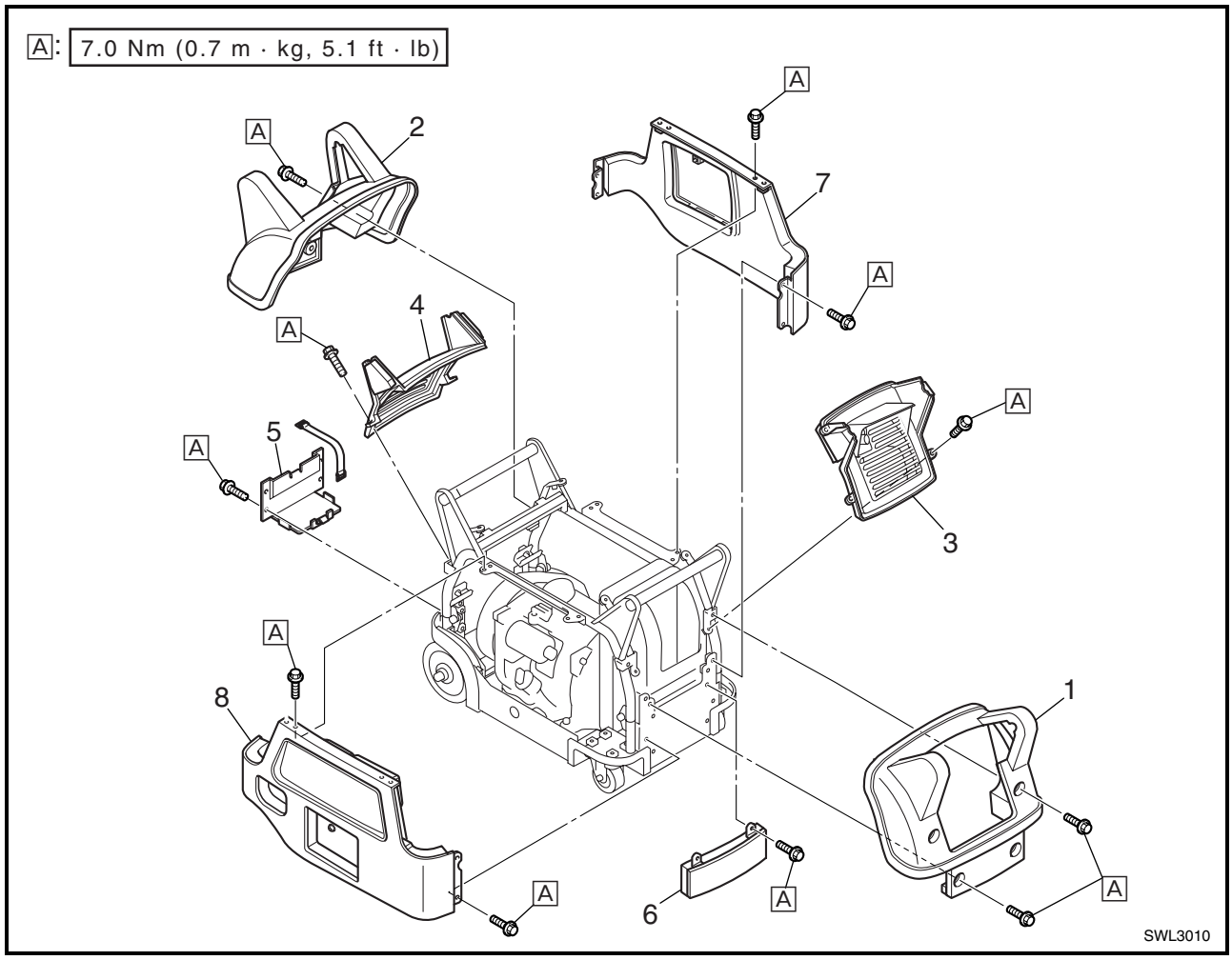
BATTERY CHARGING

1. Check:
   • Battery voltage
   Check the battery voltage using an MF battery tester (commercially available).
   Within green range → Correct
   Within yellow or red range → Charge the battery.
2. Recharge the battery using an MF battery charger (commercially available).
   • Charge the battery to the specified electric current and to the specified voltage.

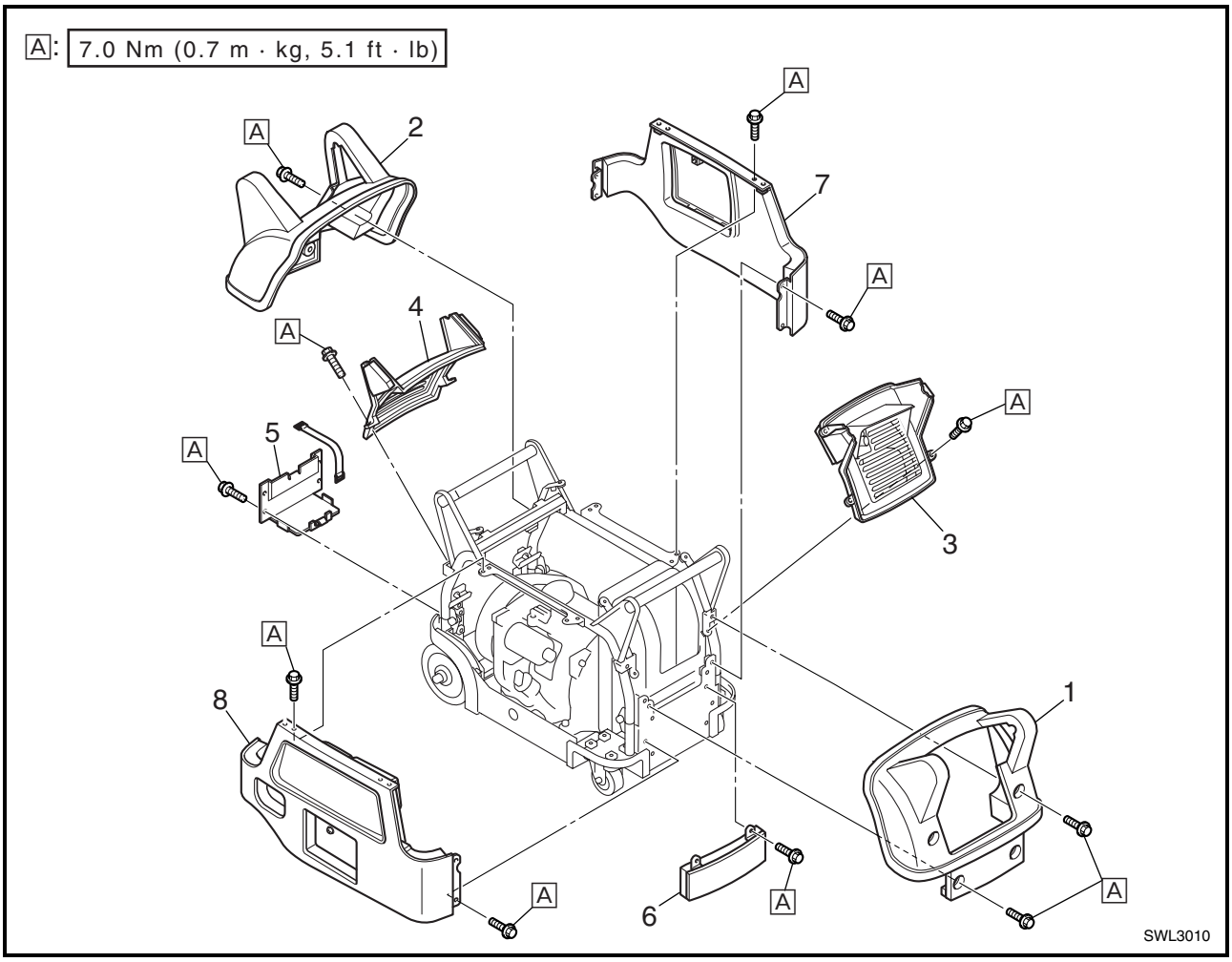
Charging amperage and charging time:
1.2 A × 5 ~ 10 hr
Charging voltage:
12.8 V or more

ENGINE

PANELS AND COVERS

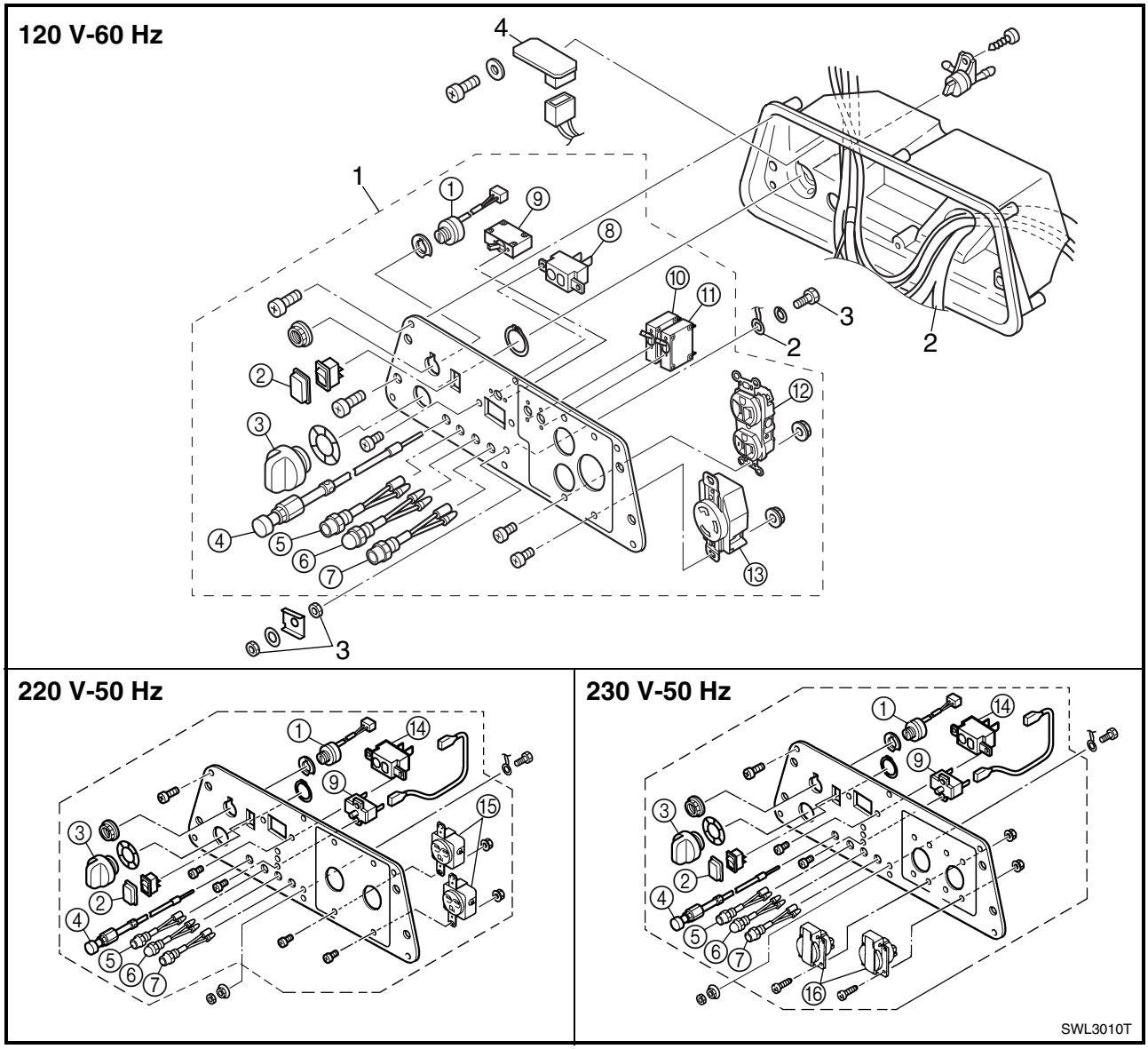


Order	Job name/Part name	Q'ty	Remarks
	Panels and covers removal		Remove the parts in the order listed below.
	Fuel tank/fuel hose		Refer to "FUEL TANK AND CONTROL BOX".
	Starter handle		Refer to "RECOIL STARTER AND FLYWHEEL MAGNETO".
1	Cover 1	1	
2	Cover 5	1	
3	Panel 1	1	
4	Panel 3	1	
5	Battery bracket	1	
6	Cover 2	1	



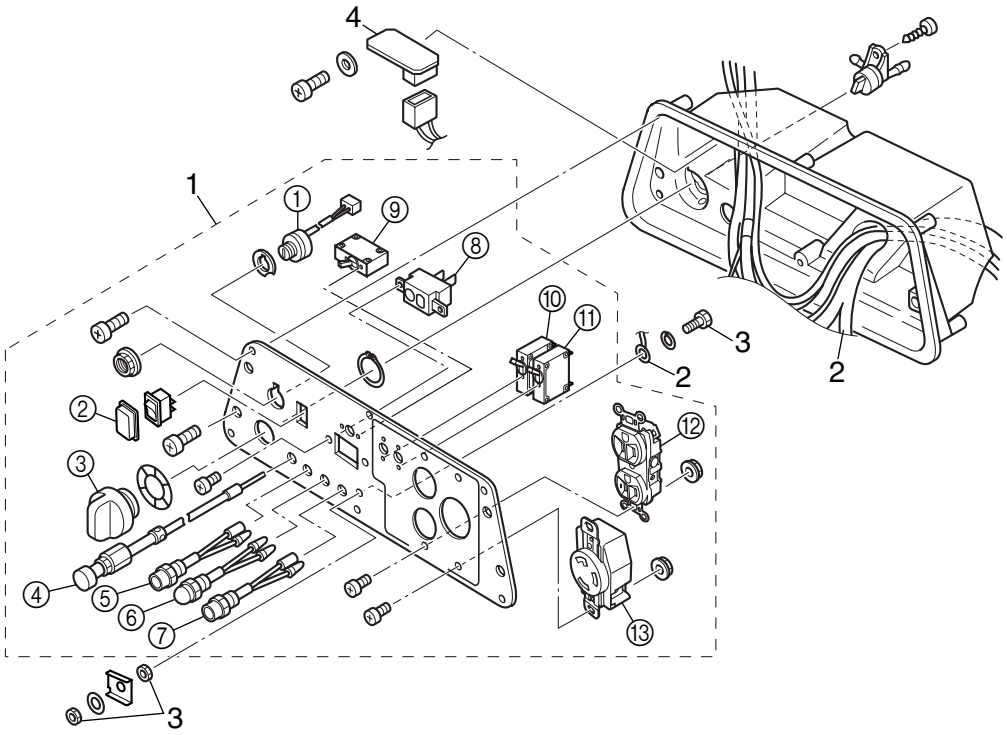
Order	Job name/Part name	Q'ty	Remarks
7	Cover 6	1	
8	Cover 3	1	**NOTE:** To remove the control box, disconnect the necessary couplers and leads. It is not necessary to remove the cover 3 from the control box.
			For installation, reverse the removal procedure.

CONTROL PANEL

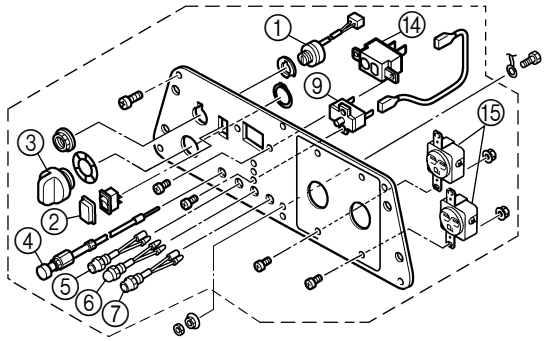


Order	Job name/Part name	Q'ty	Remarks
	Control panel removal		Remove the parts in the order listed below.
	Choke cable (carburetor end)		Refer to "CARBURETOR".
1	Control panel assembly	1	
2	Wire harness	1	**NOTE:** Disconnect all couplers and leads.
3	Ground terminal	1	
4	Engine speed limiter/oil level warning unit	1	**NOTE:** After installing all parts, refer to "WIRE ROUTING DIAGRAM" in CHAPTER 5 to check the cable, lead, and hose routings.
			For installation, reverse the removal procedure.

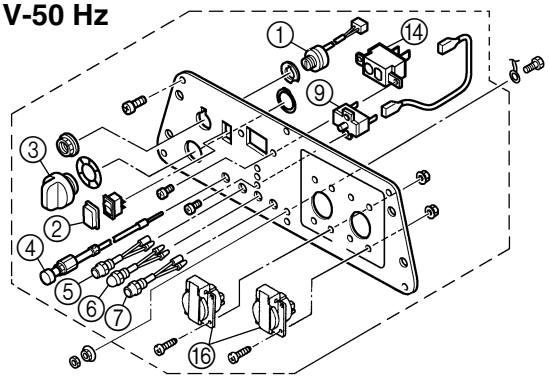
120 V-60 Hz



220 V-50 Hz



230 V-50 Hz



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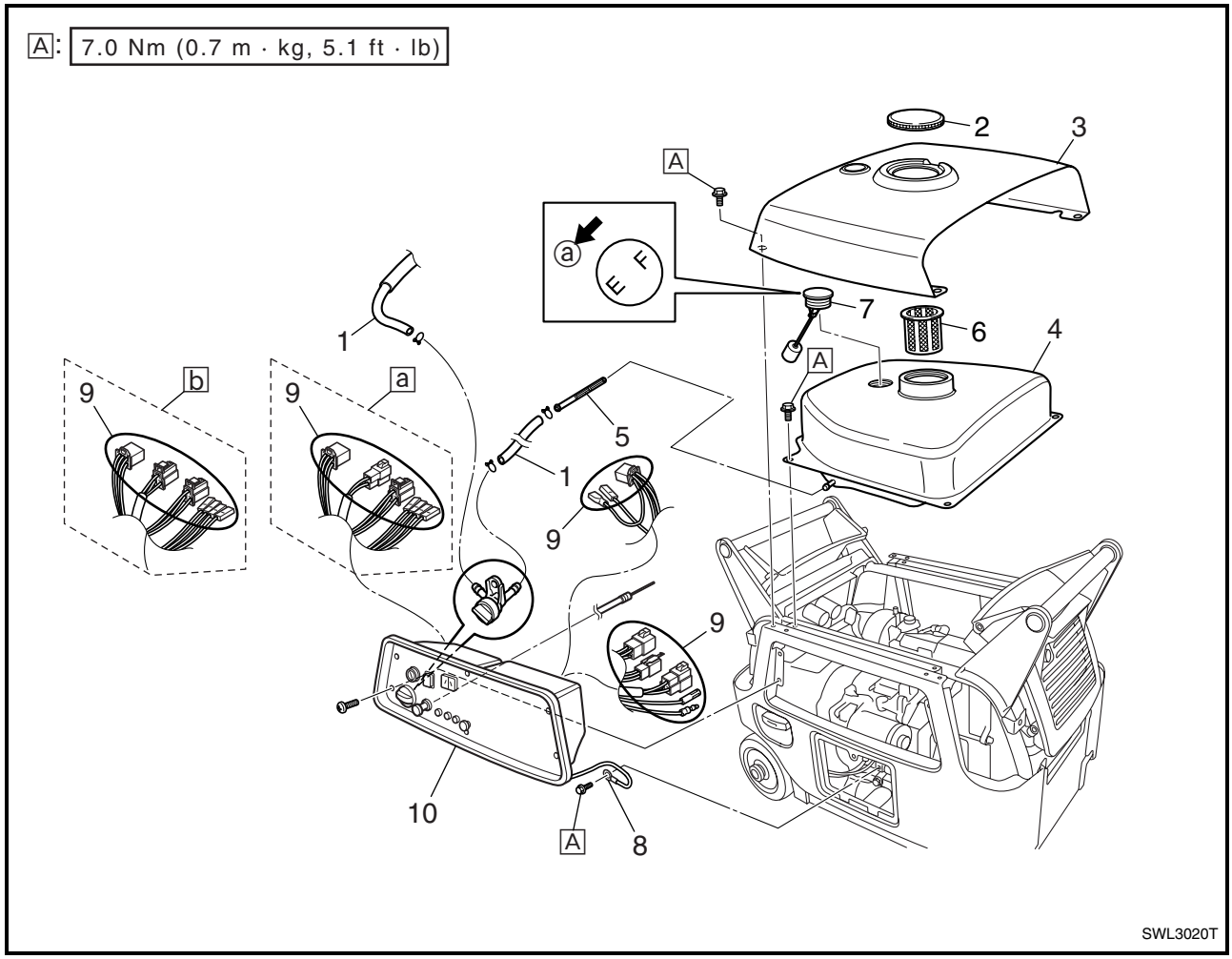
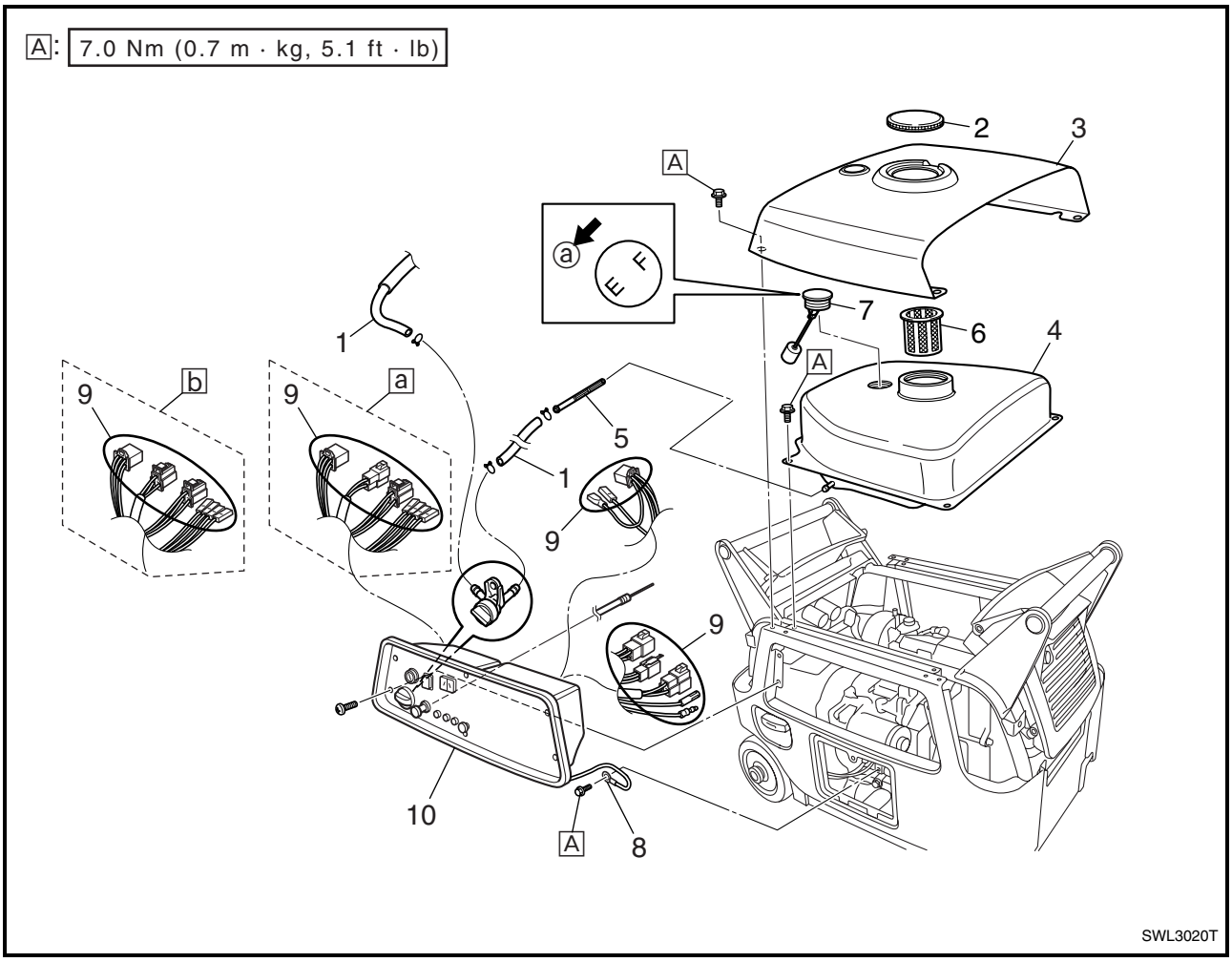
Order	Job name/Part name	Q'ty	Remarks
	Control panel disassembly		Remove the parts in the order listed below.
①	Main switch	1	**NOTE:**
②	Economy switch	1	After installing the fuel cock knob, check it
③	Fuel cock knob	1	for proper operation.
④	Choke knob	1	
⑤	Oil level warning light	1	
⑥	Pilot light	1	
⑦	Overload warning light	1	
⑧	DC receptacle (12 V, 8.3 A)	1	
⑨	DC circuit breaker	1	
⑩	AC switch (NFB) (15 A)	1	
⑪	AC switch (NFB) (23.5 A)	1	
⑫	AC receptacle (15 A × 2)	1	
⑬	AC receptacle (23.3 A)	1	
⑭	DC receptacle (12 V, 12 A)	1	
⑮	AC receptacle (15 A × 2)	1	For assembly, reverse the disassembly
⑯	AC receptacle (16 A × 2)	1	procedure.

FUEL TANK AND CONTROL BOX



a 120 V-60 Hz, 220 V-50 Hz b 230 V-50 Hz

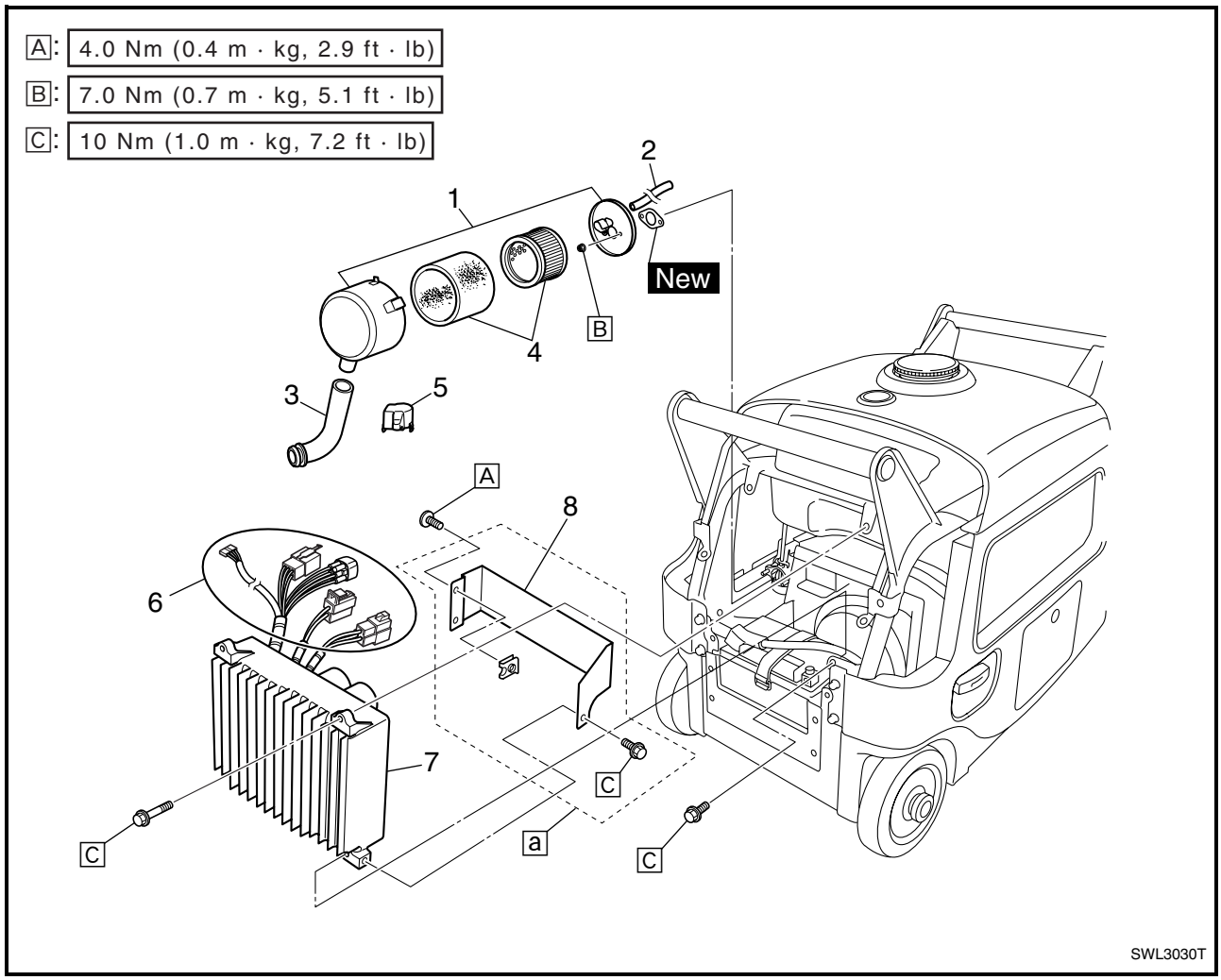
Order	Job name/Part name	Q'ty	Remarks
	Fuel tank and control box removal		Remove the parts in the order listed below.
	Cover 1/cover 5/panel 4/panel 2		Refer to "COVERS, PANELS, AND CAPS" in CHAPTER 2.
	Fuel		Drain.
	Choke cable (carburetor end)		Refer to "CARBURETOR".
1	Fuel hose	2	**NOTE:** When removing the fuel tank, disconnect only the fuel cock end of the fuel hose.
2	Fuel tank cap	1	
3	Cover 4	1	
4	Fuel tank	1	
5	Fuel pipe strainer	1	
6	Fuel tank filter	1	



Order	Job name/Part name	Q'ty	Remarks
7	Fuel level gauge	1	**NOTE:** To install the fuel level gauge, face the "E" mark toward the control panel ⓐ.
8	Ground lead	1	
9	Wire harness	1	**NOTE:** Disconnect all couplers, leads, and connectors.
10	Control box	1	**NOTE:** After installing all parts, refer to "WIRE ROUTING DIAGRAM" in CHAPTER 5 to check the cable, lead, and hose routings.
			For installation, reverse the removal procedure.

AIR FILTER ASSEMBLY AND CONTROL UNIT

120 V-60 Hz, 220 V-50 Hz

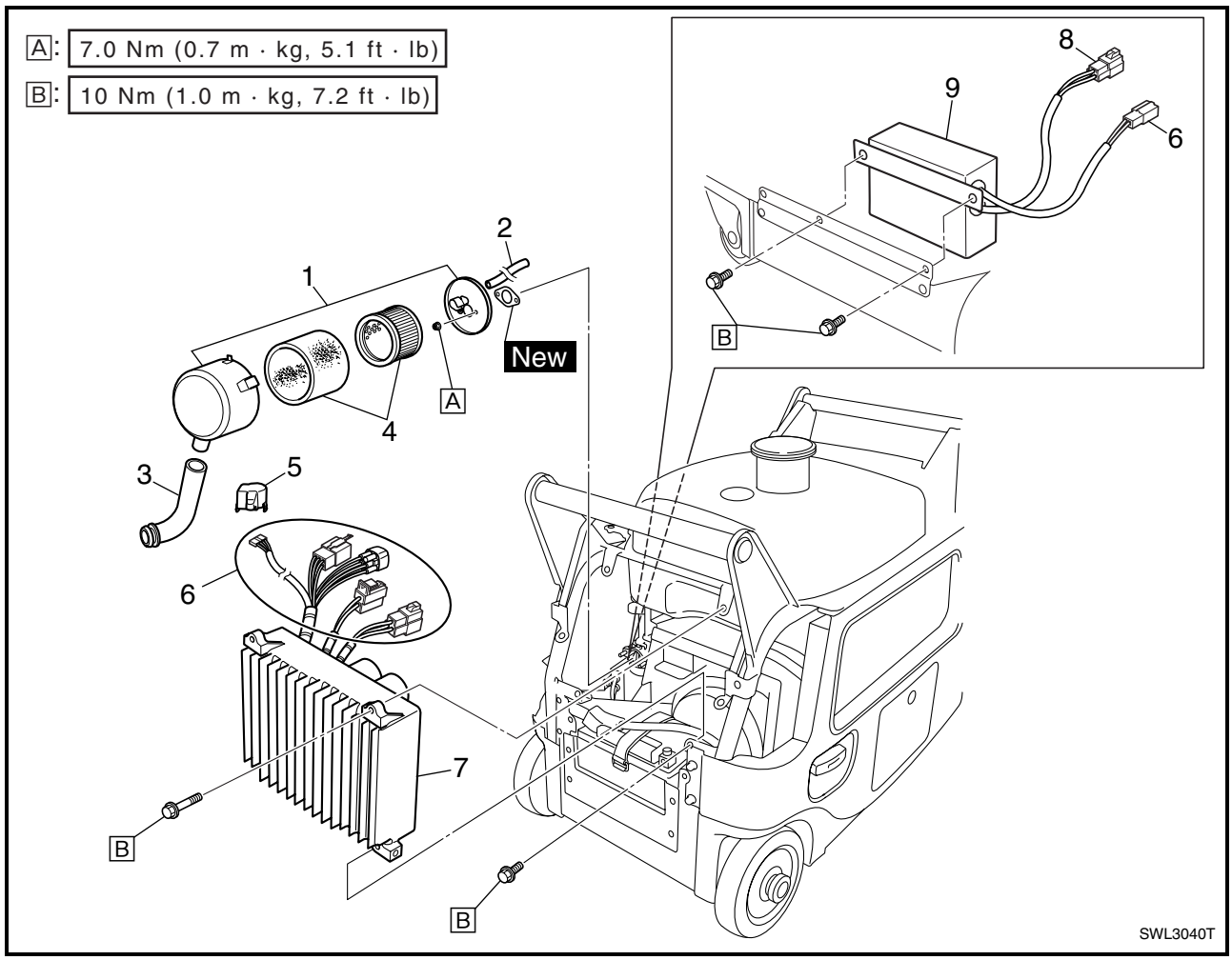


a 120 V-60 Hz

Order	Job name/Part name	Q'ty	Remarks
	Air filter assembly and control unit removal		Remove the parts in the order listed below.
	Cover 5/panel 3/panel 4		Refer to "COVERS, PANELS, AND CAPS" in CHAPTER 2.
1	Air filter assembly	1	
2	Breather hose	1	
3	Air intake duct	1	
4	Air filter element	2	**NOTE:** Remove air filter element 1 and air filter element 2 as a set.
5	Throttle control motor cover	1	
6	Coupler/connector	3/1	Disconnect.
7	Control unit	1	
8	Control unit cover	1	
			For installation, reverse the removal procedure.

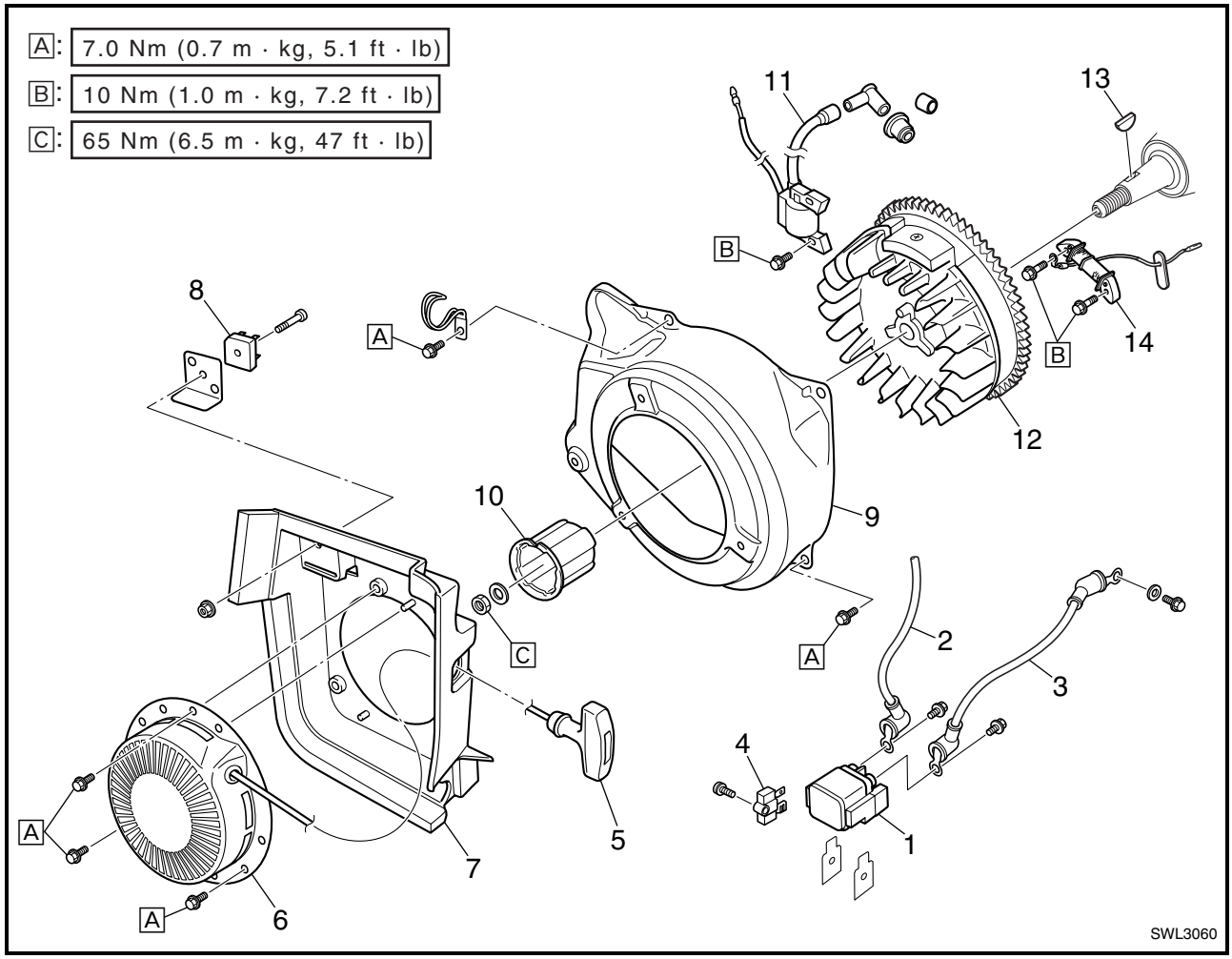
AIR FILTER ASSEMBLY, CONTROL UNIT AND NOISE FILTER

230 V-50 Hz

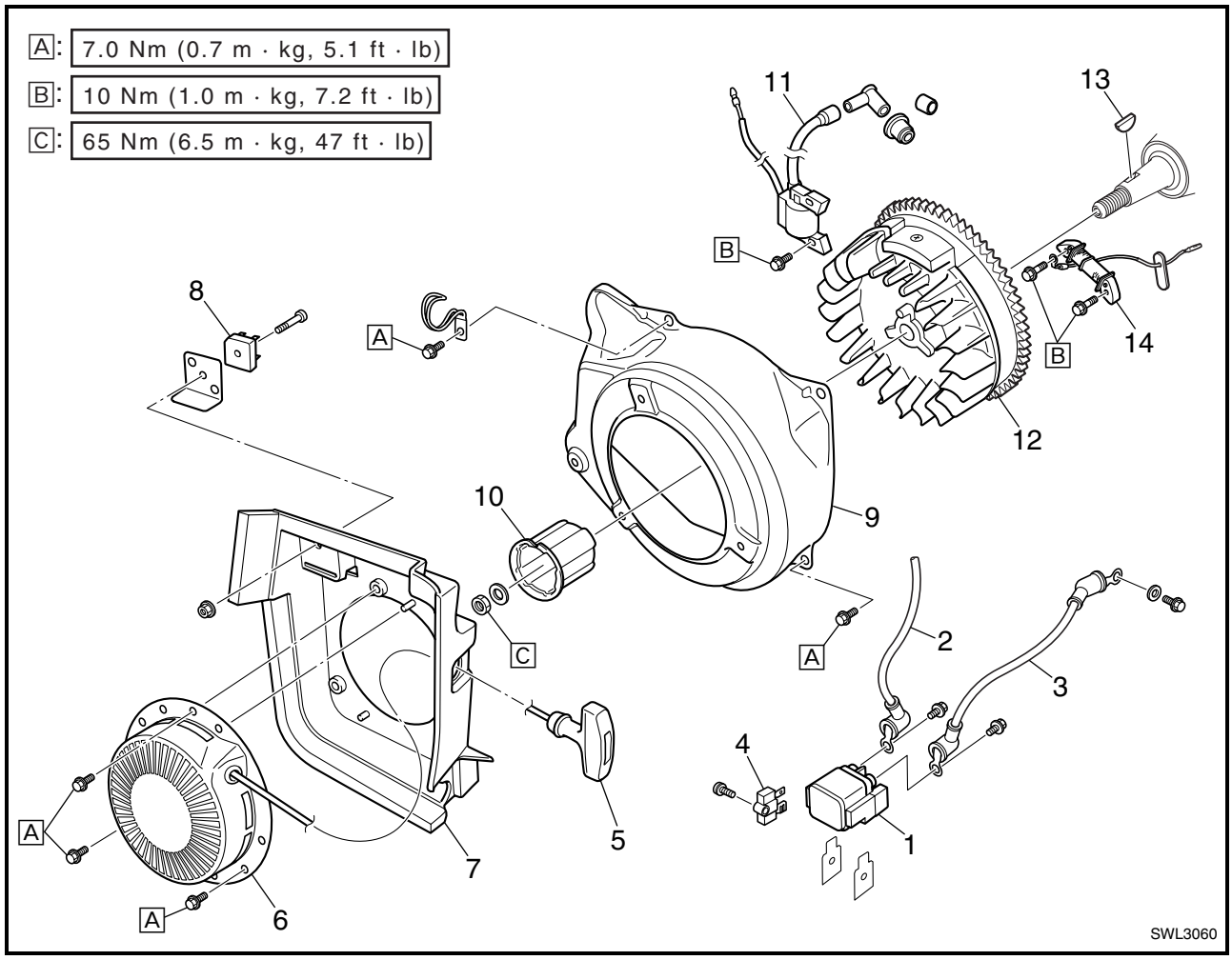


Order	Job name/Part name	Q'ty	Remarks
	Air filter assembly, control unit, and noise filter removal		Remove the parts in the order listed below.
	Cover 1/cover 5/cover 4/cover 2/ cover 6/panel 3		Refer to "COVERS, PANELS, AND CAPS" in CHAPTER 2.
1	Air filter assembly	1	
2	Breather hose	1	
3	Air intake duct	1	
4	Air filter element	2	**NOTE:** Remove air filter element 1 and air filter element 2 as a set.
5	Throttle control motor cover	1	
6	Coupler/connector	3/1	Disconnect.
7	Control unit	1	
8	Coupler	1	Disconnect.
9	Noise filter	1	
			For installation, reverse the removal procedure.

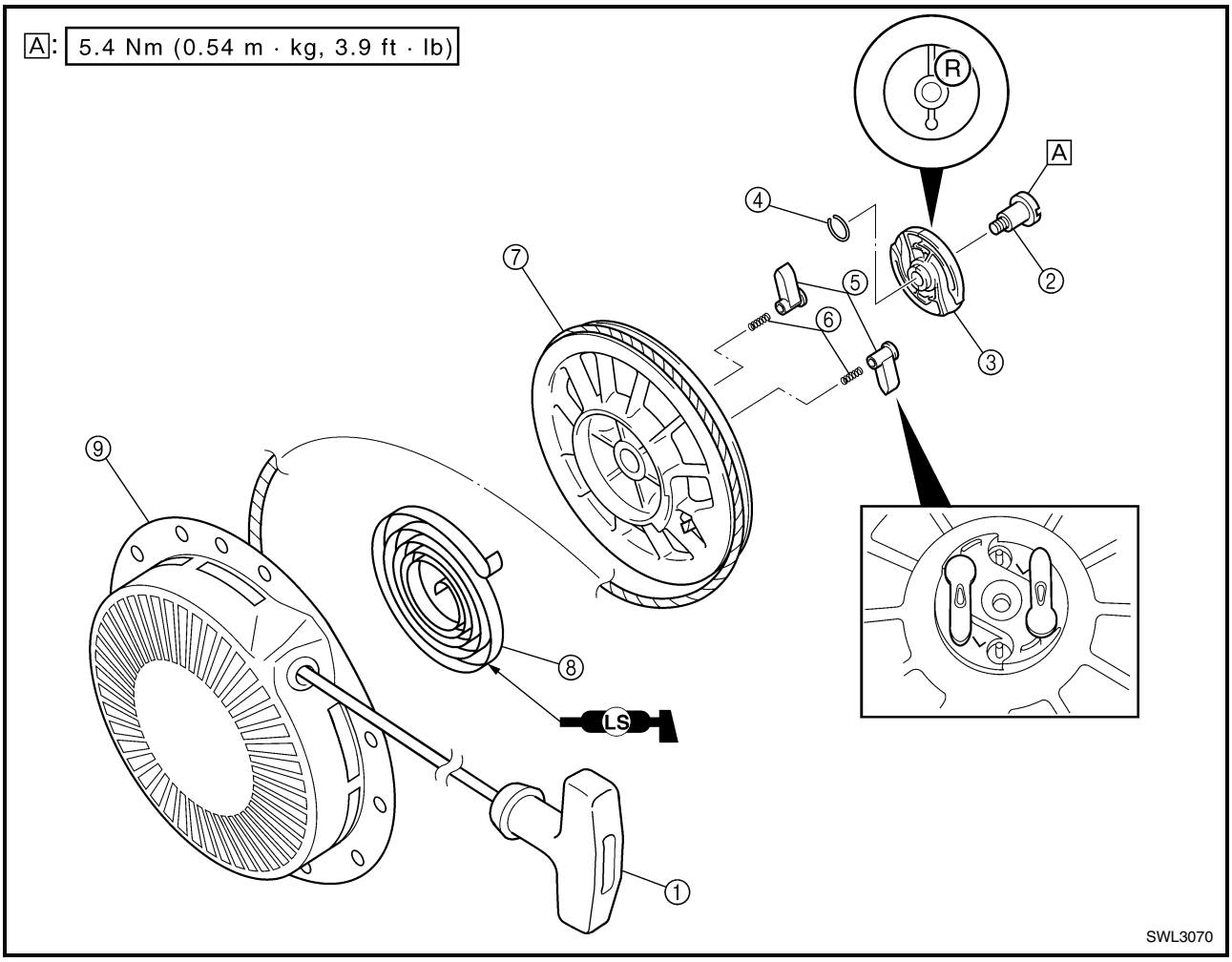
RECOIL STARTER AND FLYWHEEL MAGNETO



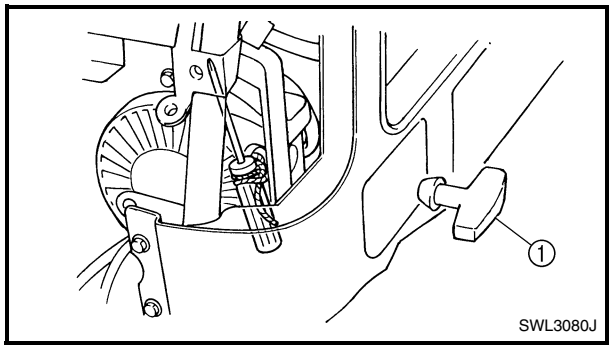
Order	Job name/Part name	Q'ty	Remarks
	Recoil starter and flywheel magneto removal		Remove the parts in the order listed below.
	Fuel tank		Refer to "FUEL TANK AND CONTROL BOX".
	Cover 3		Refer to "PANELS AND COVERS".
	Air filter assembly/control unit		Refer to "AIR FILTER ASSEMBLY AND CONTROL UNIT" and "AIR FILTER ASSEMBLY, CONTROL UNIT AND NOISE FILTER".
	Carburetor		Refer to "CARBURETOR".
	Battery		
1	Starter relay	1	
2	Positive battery lead	1	**⚠ WARNING** **Remove the battery before disconnecting the positive battery lead and the starter motor lead.**
3	Starter motor lead	1	
4	Rectifier	1	
5	Starter handle	1	



Order	Job name/Part name	Q'ty	Remarks
6	Recoil starter assembly	1	
7	Recoil starter cover	1	
8	DC rectifier	1	
9	Flywheel magneto cover	1	
10	Starter pulley	1	
11	TCI unit	1	
12	Flywheel magneto	1	
13	Woodruff key	1	
14	Charging coil	1	**NOTE:** After installing all parts, refer to "WIRE ROUTING DIAGRAM" in CHAPTER 5 to check the cable, lead, and hose routings. For installation, reverse the removal procedure.



Order	Job name/Part name	Q'ty	Remarks
	Recoil starter disassembly		Remove the parts in the order listed below.
①	Starter handle	1	
②	Bolt	1	
③	Drive plate	1	
④	Clip	1	
⑤	Drive pawl	2	
⑥	Spring	2	
⑦	Sheave drum	1	
⑧	Starter spring	1	
⑨	Starter case	1	
			For assembly, reverse the disassembly procedure.

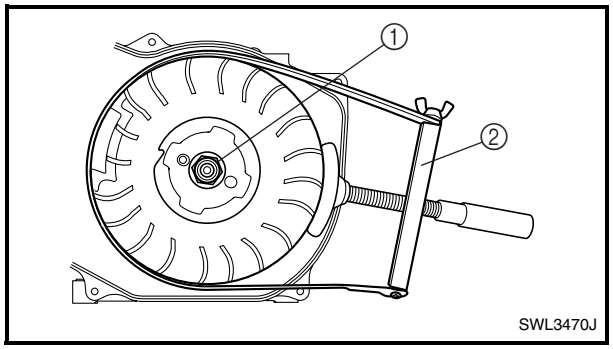


RECOIL STARTER REMOVAL

1. Remove:
   - Starter handle ①

NOTE:

When removing the starter handle from the starter rope, be sure to wrap the starter rope around a screwdriver, etc., to prevent the rope from retracting into the starter case.



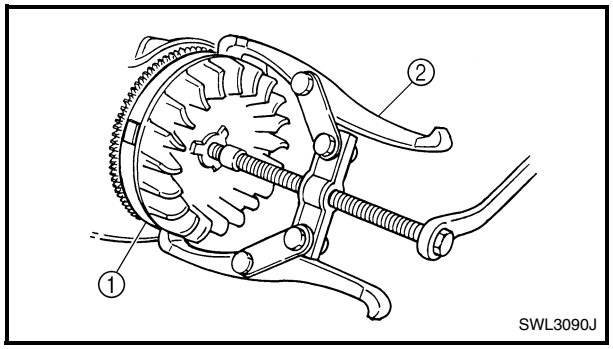
FLYWHEEL MAGNETO REMOVAL

1. Remove:
   - Flywheel magneto nut ①
   - Washer
   - Starter pulley

NOTE:

Attach the sheave holder ② to hold the flywheel magneto.

Sheave holder:
YS-01880-A, 90890-01701
Rotor assembly holder:
(commercially available)



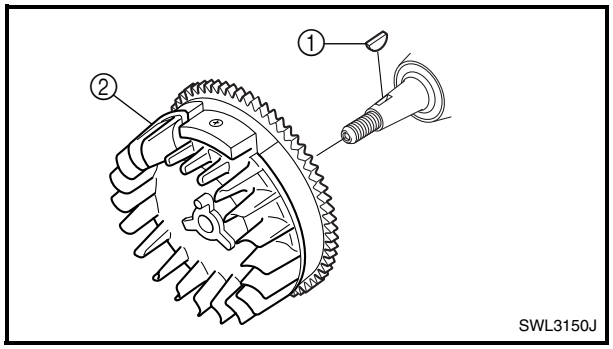
2. Remove:
   - Flywheel magneto ①

NOTE:

- Remove the flywheel magneto using a bearing puller (commercially available) ②.
- When removing the flywheel magneto, be sure to hold it so that it does not turn.

CAUTION:

Do not hold the flywheel magneto by its fins, otherwise the fins can be damaged.



FLYWHEEL MAGNETO INSTALLATION

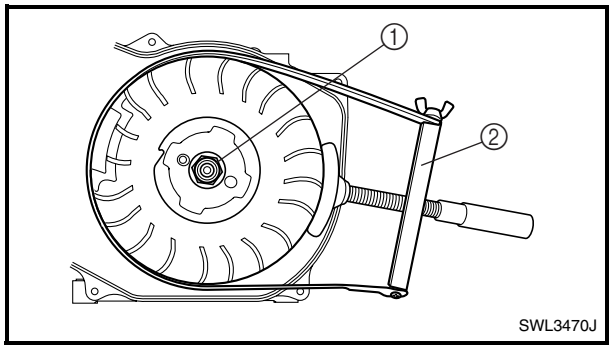
1. Install:
   - Woodruff key ①
   - Flywheel magneto ②

CAUTION:

Be sure to remove any oil or grease from the tapered portion of the crankshaft using a cloth dampened with thinner.

NOTE:

Insert the woodruff key ① into the groove in the flywheel magneto ②.



2. Install:
   - Starter pulley
   - Washer
   - Flywheel magneto nut ①

Flywheel magneto nut:
65 Nm (6.5 m · kg, 47 ft · lb)

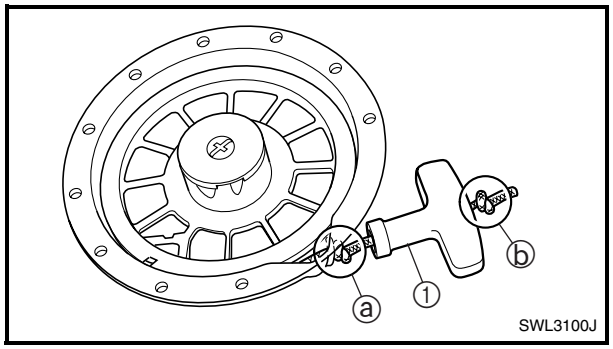
NOTE:

Tighten the flywheel magneto nut ① using the sheave holder ② to hold the flywheel magneto.

Sheave holder:
YS-01880-A, 90890-01701
Rotor assembly holder:
(commercially available)

3. Measure:
   - Air gap between TCI unit and flywheel magneto
     Refer to "AIR GAP BETWEEN TCI UNIT AND FLYWHEEL MAGNETO" in CHAPTER 2.

Air gap between TCI unit and flywheel magneto:
0.5 ± 0.1 mm (0.020 ± 0.004 in)

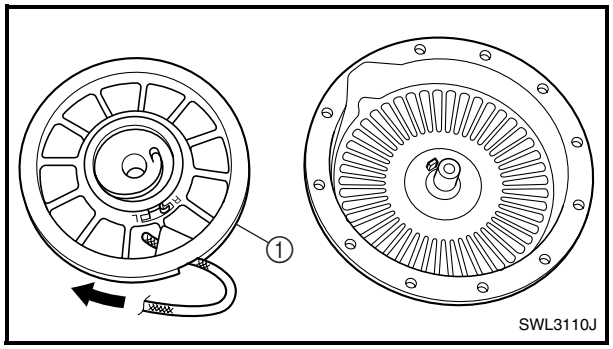


RECOIL STARTER DISASSEMBLY

1. Remove:
   - Starter handle ①

NOTE:

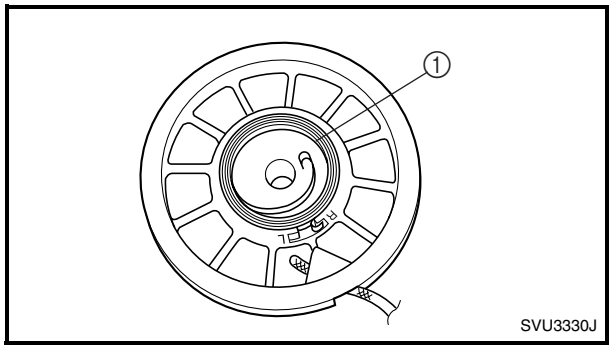
Make a knot ⓐ at the end of the starter rope to prevent the rope from being retracted into the starter case. Then, undo the knot ⓑ at the starter handle to the remove the starter handle ①.



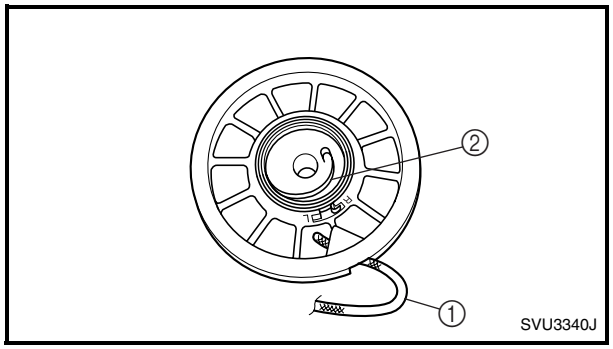
2. Remove:
   - Drum sheave ①

CAUTION:

Be sure to press down on the drum sheave, because the spring will spring out suddenly when it is removed from the sheave drum.

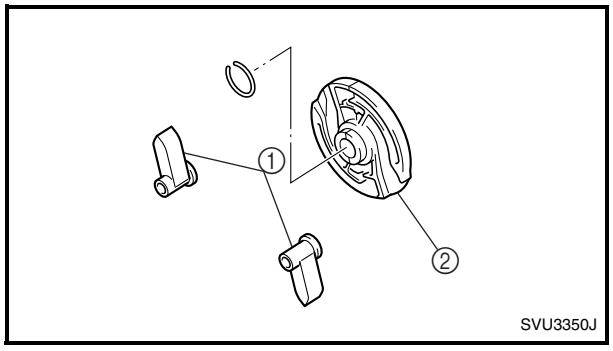


3. Remove:
   - Starter spring ①

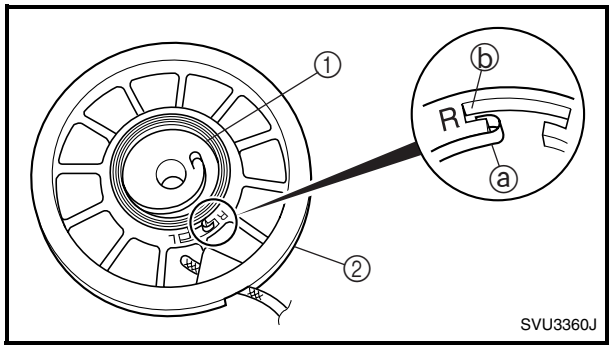


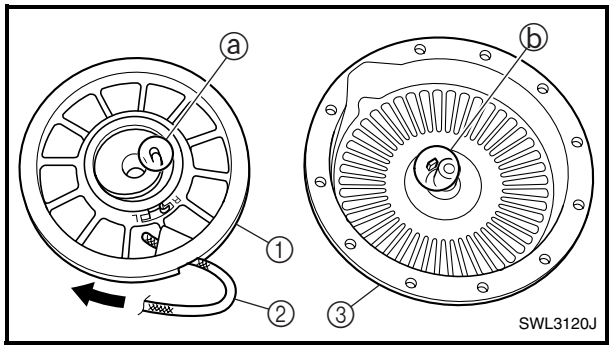
RECOIL STARTER INSPECTION

1. Inspect:
   - Starter rope ①
2. Inspect:
   - Starter spring ②
     Damage/deterioration → Replace.



3. Inspect:
   - Drive pawl ①
   - Drive plate ②
     Wear/damage → Replace.





RECOIL STARTER ASSEMBLY

1. Install:
   - Starter spring ①
   - Sheave drum ②

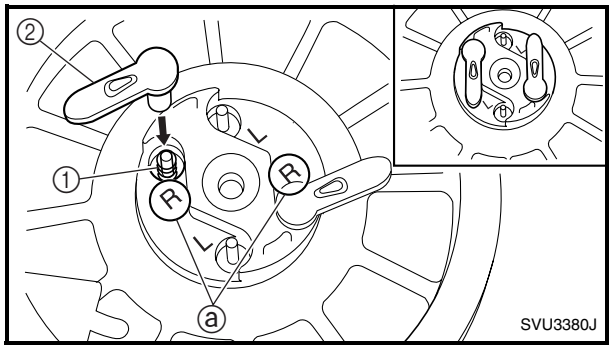
NOTE:

Engage the starter spring outer hook ⓐ with the groove ⓑ marked "R" on the sheave drum ②. Carefully wind the spring counterclockwise and place it on the sheave drum ②.

2. Install:
   - Sheave drum ①
   - Starter rope ②
   - Starter case ③

NOTE:

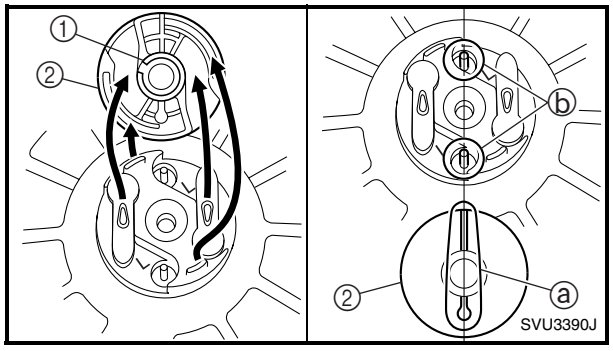
- Wind the starter rope ② clockwise two turns on the sheave drum ①.
- Engage the starter spring inner hook ⓐ with the strut ⓑ of the starter case ③, and then install the parts.



3. Install:
   - Springs ①
   - Drive pawls ②

NOTE:

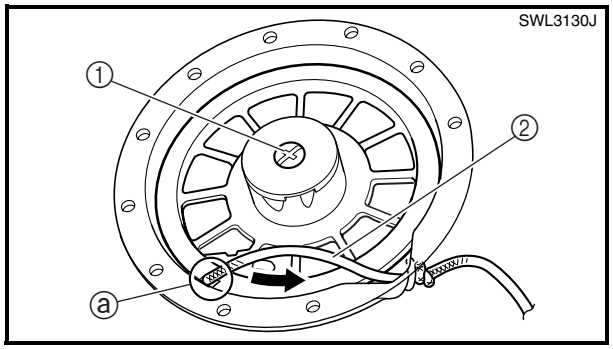
Install the springs ① and drive pawls ② at the "R" marks ⓐ.

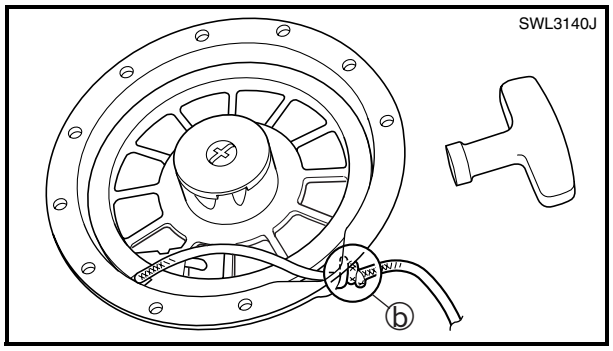


4. Install:
   - Clip ①
   - Drive plate ②

NOTE:

Align the groove ⓐ of the drive plate ② with the sheave drum strut ⓑ, and then install the parts.





5. Install:
   - Bolt ①

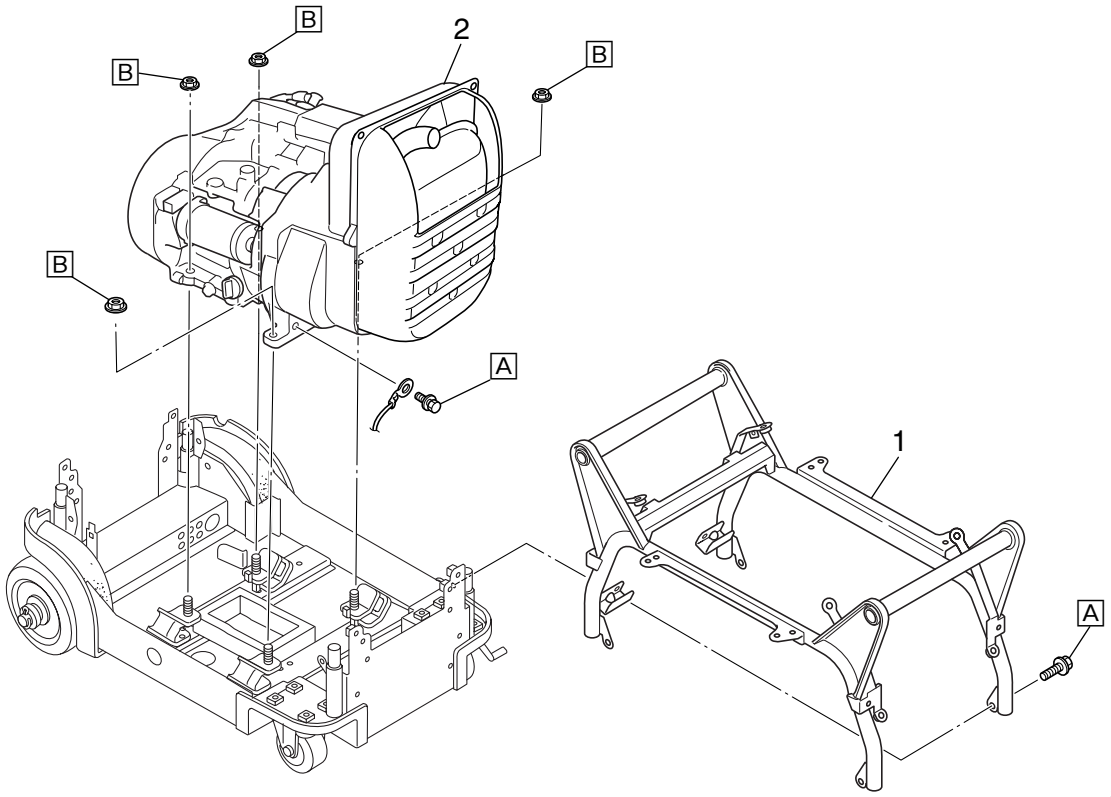
     After tightening the bolt, place the starter rope ② in the cutout ⓐ in the sheave drum, and wind it counterclockwise four turns.

NOTE:

Make a knot ⓑ at the end of the starter rope to prevent the rope from being retracted into the starter case.

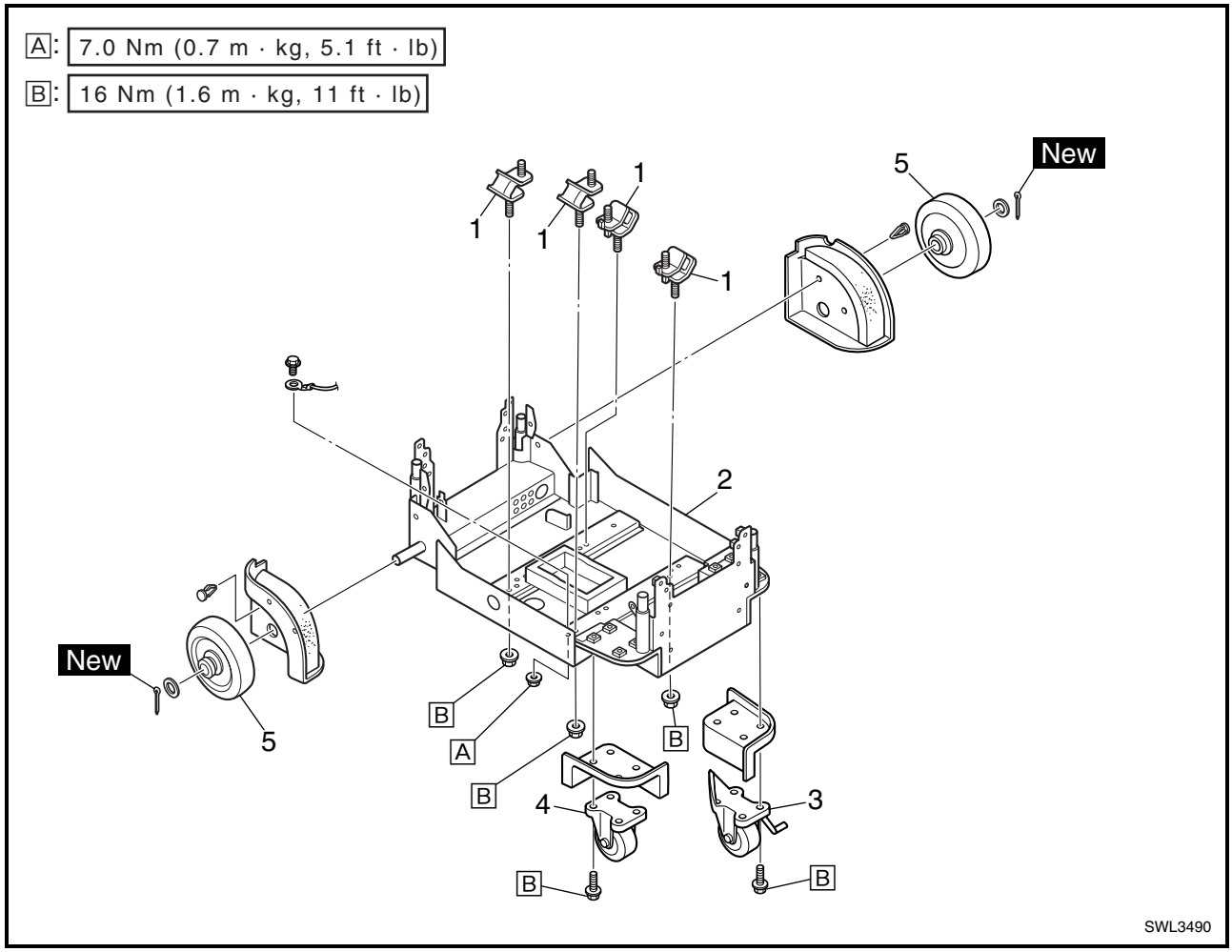
ENGINE ASSEMBLY

A: 7.0 Nm (0.7 m · kg, 5.1 ft · lb)
B: 16 Nm (1.6 m · kg, 11 ft · lb)



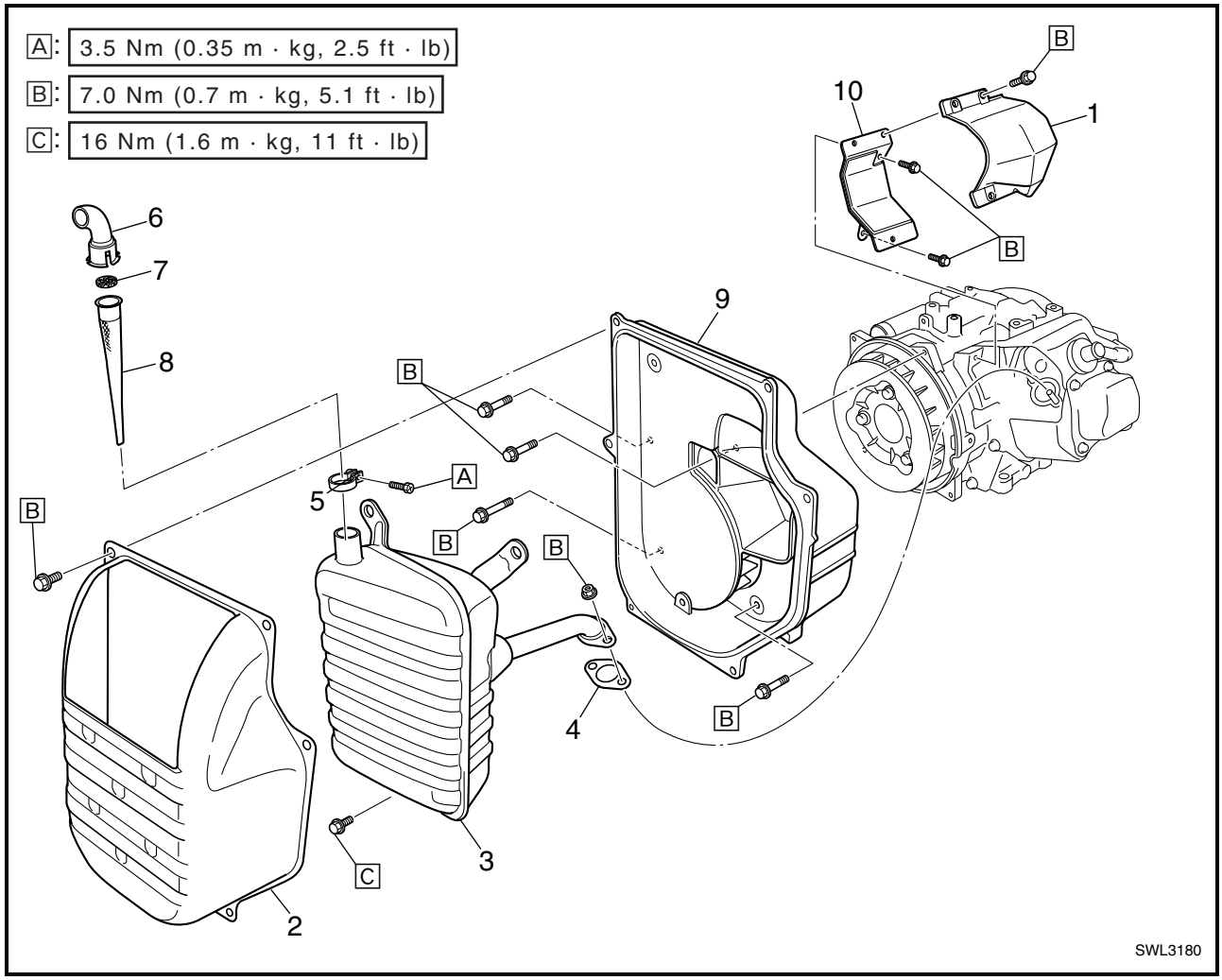
Order	Job name/Part name	Q'ty	Remarks
	Engine removal		Remove the parts in the order listed below.
	Engine oil		Drain.
	Fuel tank		Refer to "FUEL TANK AND CONTROL BOX".
	Cover 6/panel 1/battery bracket		Refer to "COVERS, PANELS, AND CAPS" in CHAPTER 2.
	Air filter assembly/control unit		Refer to "AIR FILTER ASSEMBLY AND CONTROL UNIT" and "AIR FILTER ASSEMBLY, CONTROL UNIT AND NOISE FILTER".
	Cover 3		Refer to "PANELS AND COVERS".
			NOTE: Remove the cover 3 with the control box installed.
	Recoil starter/recoil starter cover		Refer to "RECOIL STARTER AND FLYWHEEL MAGNETO".
1	Pipe frame	1	
2	Engine assembly	1	
			For installation, reverse the removal procedure.

CHASSIS AND CASTERS

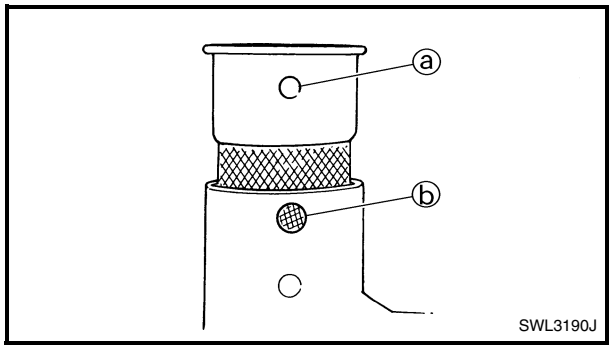


Order	Job name/Part name	Q'ty	Remarks
	Chassis and caster removal		Remove the parts in the order listed below.
	Engine assembly		Refer to "ENGINE ASSEMBLY".
1	Engine mount	4	
2	Frame	1	
3	Caster 1	1	
4	Caster 2	1	
5	Caster 3	2	
			For installation, reverse the removal procedure.

MUFFLER



Order	Job name/Part name	Q'ty	Remarks
	Muffler removal		Remove the parts in the order listed below.
	Engine assembly		Refer to "ENGINE ASSEMBLY".
1	Exhaust pipe air shroud 1	1	
2	Muffler protector	1	
3	Muffler	1	**NOTE:** Remove the muffler nut, then the muffler bolt.
4	Gasket	1	
5	Muffler band	1	
6	Muffler cap	1	
7	Muffler screen	1	
8	Spark arrester	1	
9	Generator cover	1	
10	Exhaust pipe air shroud 2	1	
			For installation, reverse the removal procedure.

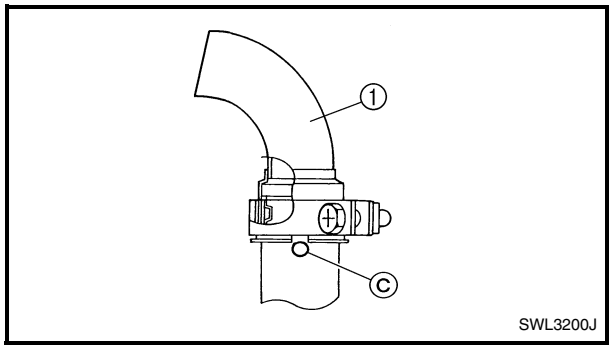


MUFFLER INSTALLATION

1. Install:
   - Spark arrester

NOTE:

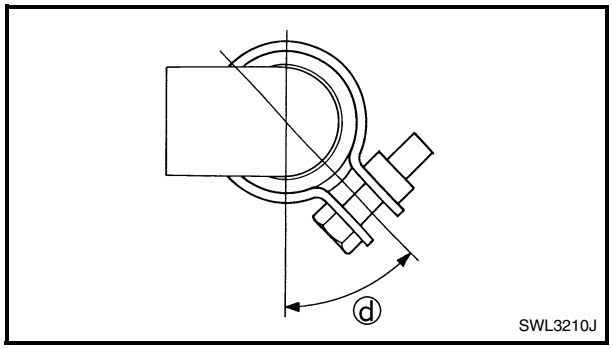
To install the spark arrester, align the projection ⓐ on the spark arrester with the hole ⓑ in the muffler.



2. Install:
   - Muffler cap ①

NOTE:

To install the muffler cap, align the slit in the muffler cap with the projection ⓒ on the muffler as shown in the illustration.



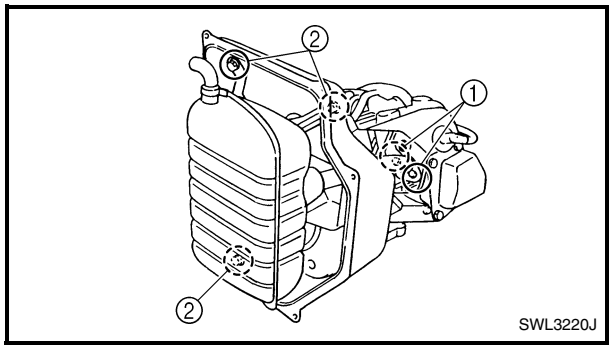
3. Install:
   - Muffler band

NOTE:

Tighten the muffler band at the angle ⓓ shown in the illustration. Make sure that the muffler band opening and muffler cap slit are not covering the hole ⓑ and that the muffler cap has not come out.

ⓓ 30 ~ 60°

Muffler band:
3.5 Nm (0.35 m · kg, 2.5 ft · lb)



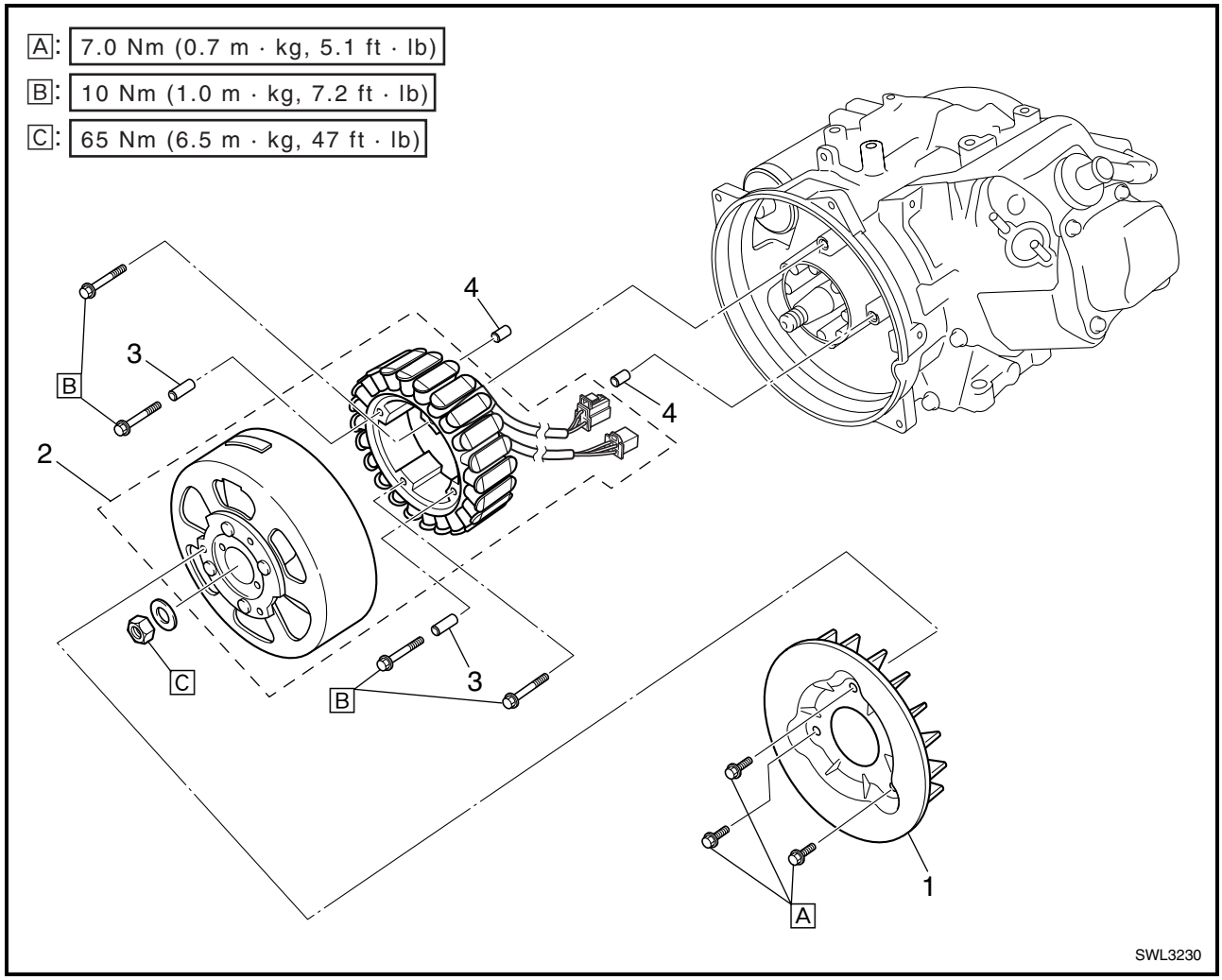
4. Install:
   - Muffler

NOTE:

Finger tighten the muffler nut ① and muffler bolt ②, and then tighten them to the specified torques, respectively.

Muffler nut:
7.0 Nm (0.7 m · kg, 5.1 ft · lb)
Muffler bolt:
16 Nm (1.6 m · kg, 11 ft · lb)

GENERATOR



Order	Job name/Part name	Q'ty	Remarks
	Generator removal		Remove the parts in the order listed below.
	Engine assembly		Refer to "ENGINE ASSEMBLY".
	Muffler		Refer to "MUFFLER".
1	Fan	1	
2	Generator	1	**CAUTION:** **The magnetic force of the magneto rotor is very strong. Therefore, be sure to remove the magneto rotor and stator coil assembly together as a set, otherwise they may be damaged.**
3	Tube	2	
4	Dowel pin	2	
			For installation, reverse the removal procedure.

GENERATOR ASSEMBLY REMOVAL

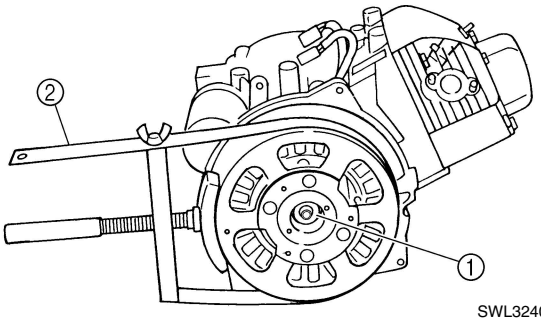
CAUTION:

The magnetic force of the magneto rotor is very strong. Therefore, be sure to remove the magneto rotor and stator coil assembly together as a set, otherwise they may be damaged.

1. Remove:
   - Magneto rotor nut ①

NOTE:

Attach the sheave holder ② to hold the magneto rotor.



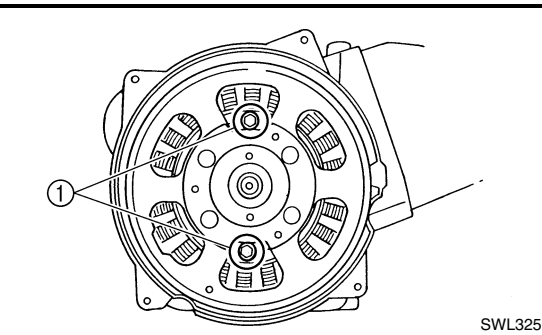
SWL3240J

Sheave holder:
YS-01880-A, 90890-01701
Rotor assembly holder:
(commercially available)

2. Remove:
   - Stator coil assembly bolts ①

NOTE:

Turn the magneto rotor until the stator coil assembly bolts are visible through the holes in the rotor, and then remove the bolts.

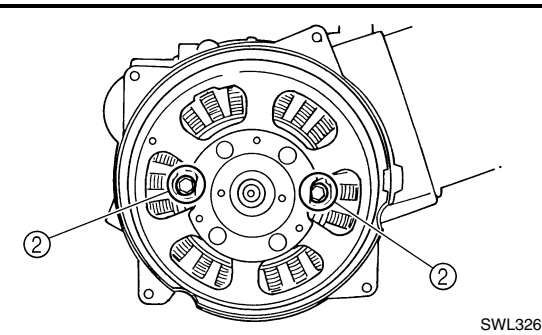


SWL3250J

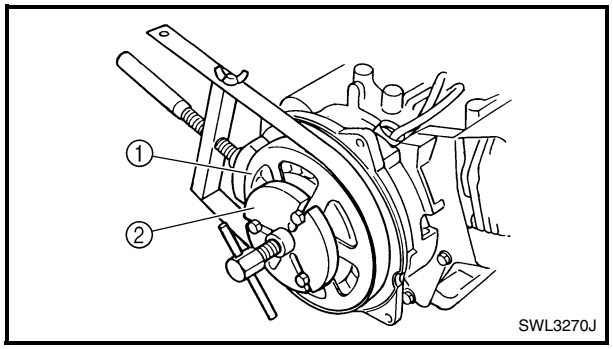
3. Remove:
   - Stator coil assembly bolts ②
   - Tubes

NOTE:

Turn the magneto rotor until the stator coil assembly bolts are visible through the holes in the rotor, and then remove the bolts.



SWL3260J



4. Remove:
   • Generator assembly ①

NOTE:

- Remove the magneto rotor together with the stator coil assembly using the rotor puller ②.
- Fully tighten the tool holding bolts, making sure that the tool body is parallel with the magneto rotor.

CAUTION:

The magnetic force of the magneto rotor is very strong. Therefore, do not change the position of the magneto rotor and stator coil assembly during or after removal, otherwise they may be damaged.

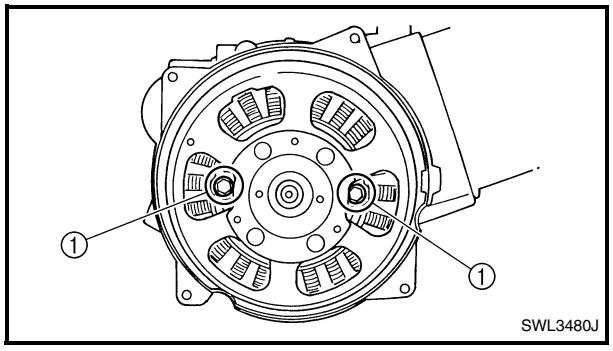
	Rotor puller: **YU-33270-B, 90890-01362**

GENERATOR ASSEMBLY INSTALLATION

CAUTION:

Be sure to remove any oil or grease from the tapered portion of the magneto rotor using a cloth dampened with thinner.

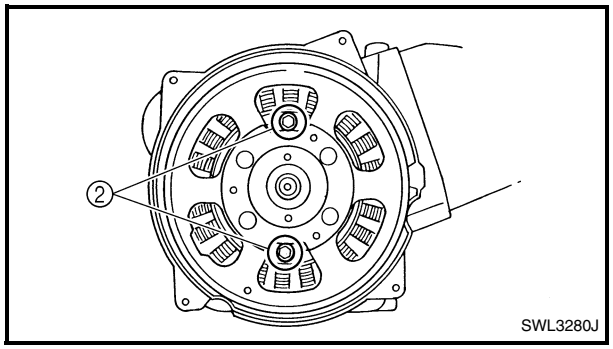
1. Install:
   • Generator assembly
2. Install:
   • Stator coil assembly bolts ①
   • Tubes



	Stator coil assembly bolts: **10 Nm (1.0 m · kg, 7.2 ft · lb)**

NOTE:

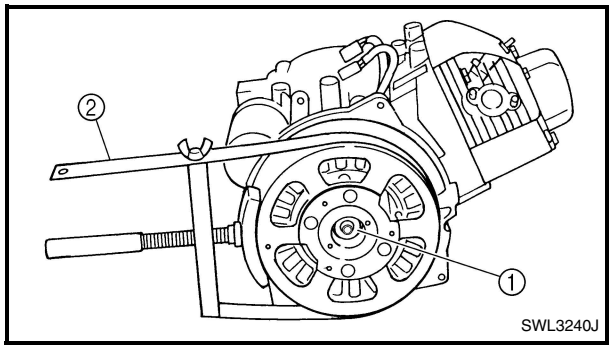
Turn the magneto rotor until the stator coil assembly bolts are visible though the holes in the rotor, and then install the bolts ①.



3. Install:
   • Stator coil assembly bolts ②

	Stator coil assembly bolts: **10 Nm (1.0 m · kg, 7.2 ft · lb)**

NOTE:
Turn the magneto rotor until the stator coil assembly bolts are visible though the holes in the rotor, and then install the bolts ②.



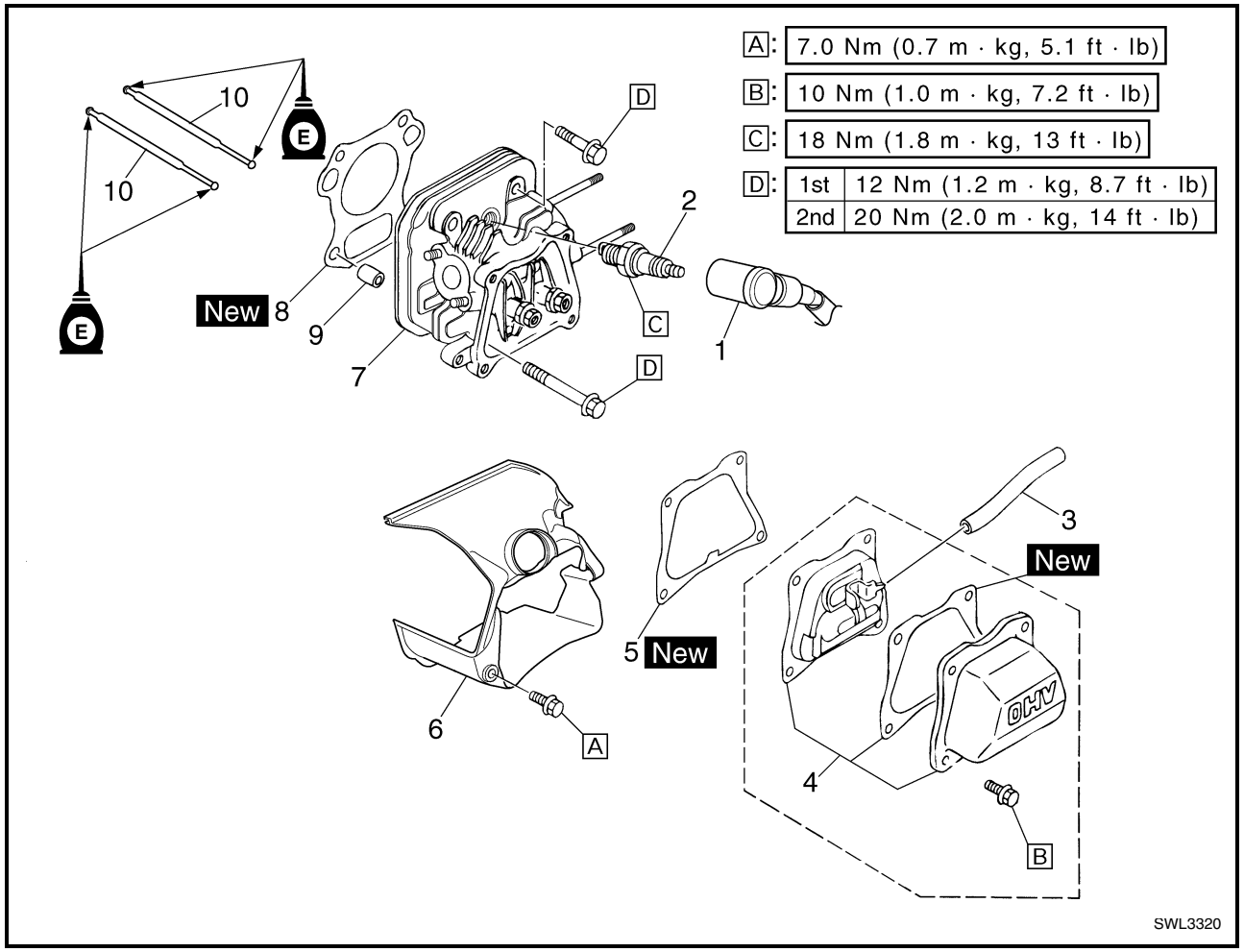
4. Tighten:
   • Washer
   • Magneto rotor nut ①

	Magneto rotor nut: **65 Nm (6.5 m · kg, 47 ft · lb)**

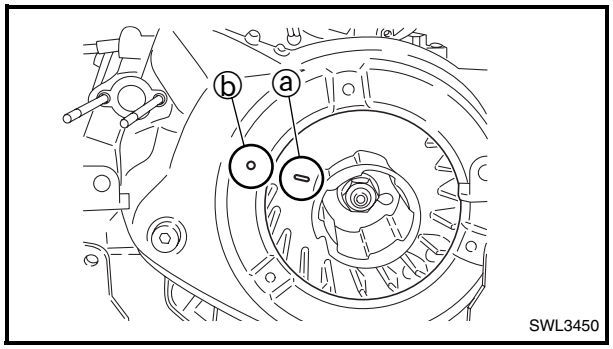
NOTE:
Tighten the magneto rotor nut ① using the sheave holder ②.

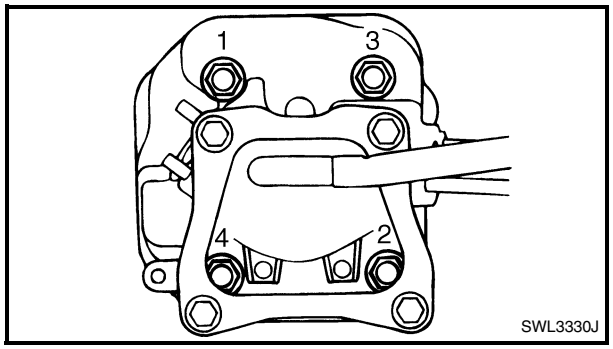
	Sheave holder: **YS-01880-A, 90890-01701** **Rotor assembly holder:** **(commercially available)**

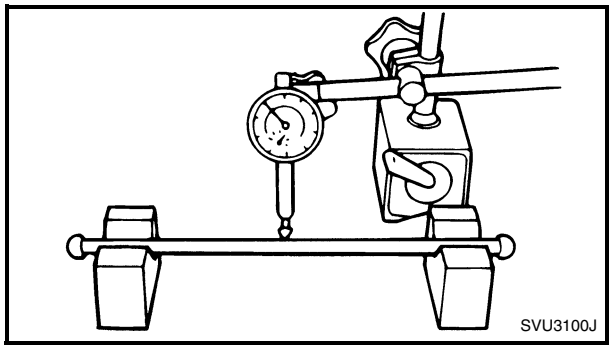
CYLINDER HEAD COVER AND CYLINDER HEAD

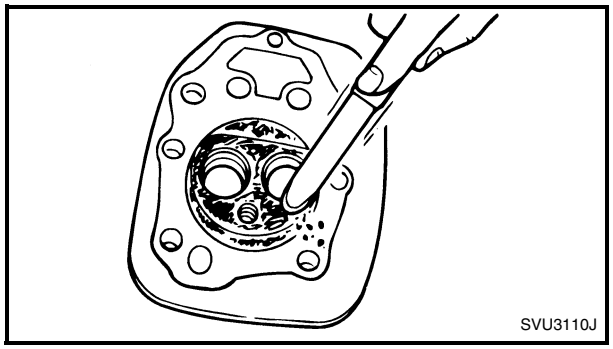


Order	Job name/Part name	Q'ty	Remarks
	Cylinder head cover and cylinder head removal		Remove the parts in the order listed below.
	Engine assembly		Refer to "ENGINE ASSEMBLY".
	Muffler		Refer to "MUFFLER".
	Flywheel magneto		Refer to "RECOIL STARTER AND FLYWHEEL MAGNETO".
1	Spark plug cap	1	
2	Spark plug	1	
3	Breather hose	1	
4	Cylinder head cover	1	
5	Gasket	1	
6	Air shroud	1	
7	Cylinder head assembly	1	
8	Cylinder head gasket	1	
9	Dowel pin	2	
10	Push rod	2	
			For installation, reverse the removal procedure.









CYLINDER HEAD REMOVAL

1. Remove:
   - Cylinder head

NOTE:

- Rotate the crankshaft clockwise until the mark ⓐ on the flywheel magneto is parallel with the punch mark ⓑ. This is the condition in which the piston is at top dead center of the compression stroke.
- If the piston is at top dead center of the exhaust stroke, turn the crankshaft one full turn (360°) to set the piston at top dead center of the compression stroke.
- Loosen the nuts in the proper sequence.

PUSH ROD INSPECTION

1. Measure:
   - Push rod runout

Runout limit:
0.5 mm (0.02 in)

Out of specification → Replace.

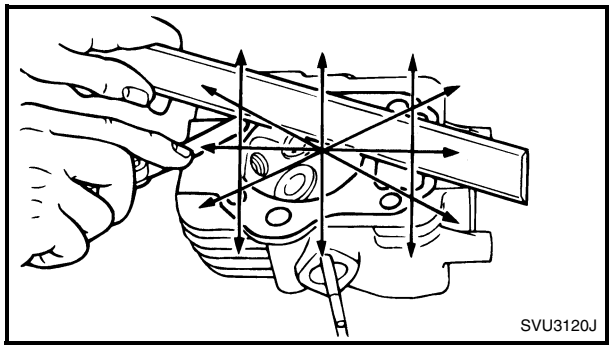
CYLINDER HEAD INSPECTION

1. Inspect:
   - Cylinder head combustion chamber
     Check the combustion chamber for carbon deposits
     Carbon deposits → Remove.

NOTE:

Be sure not to damage the contact surface of the cylinder.

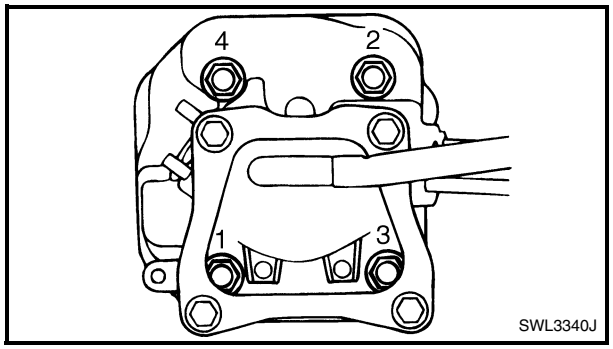
2. Inspect:
   - Cylinder head
     Cracks or damage around the spark plug hole → Replace.



3. Measure:
   • Cylinder head warpage
   Measure the warpage on the contact surface of the cylinder head at six points using a straightedge and thickness gauge.

Warpage limit:
0.05 mm (0.0020 in)

Out of specification → Resurface or replace.



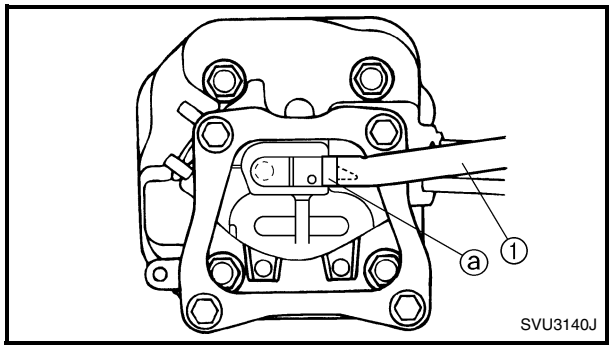
CYLINDER HEAD ASSEMBLY

1. Install:
   • Cylinder head bolts 1 to 4.

NOTE:

Tighten the bolts to the specified torques in two steps and in order from 1 to 4.

Cylinder head bolts:
1st: 12 Nm (1.2 m · kg, 8.7 ft · lb)
2nd: 20 Nm (2.0 m · kg, 14 ft · lb)



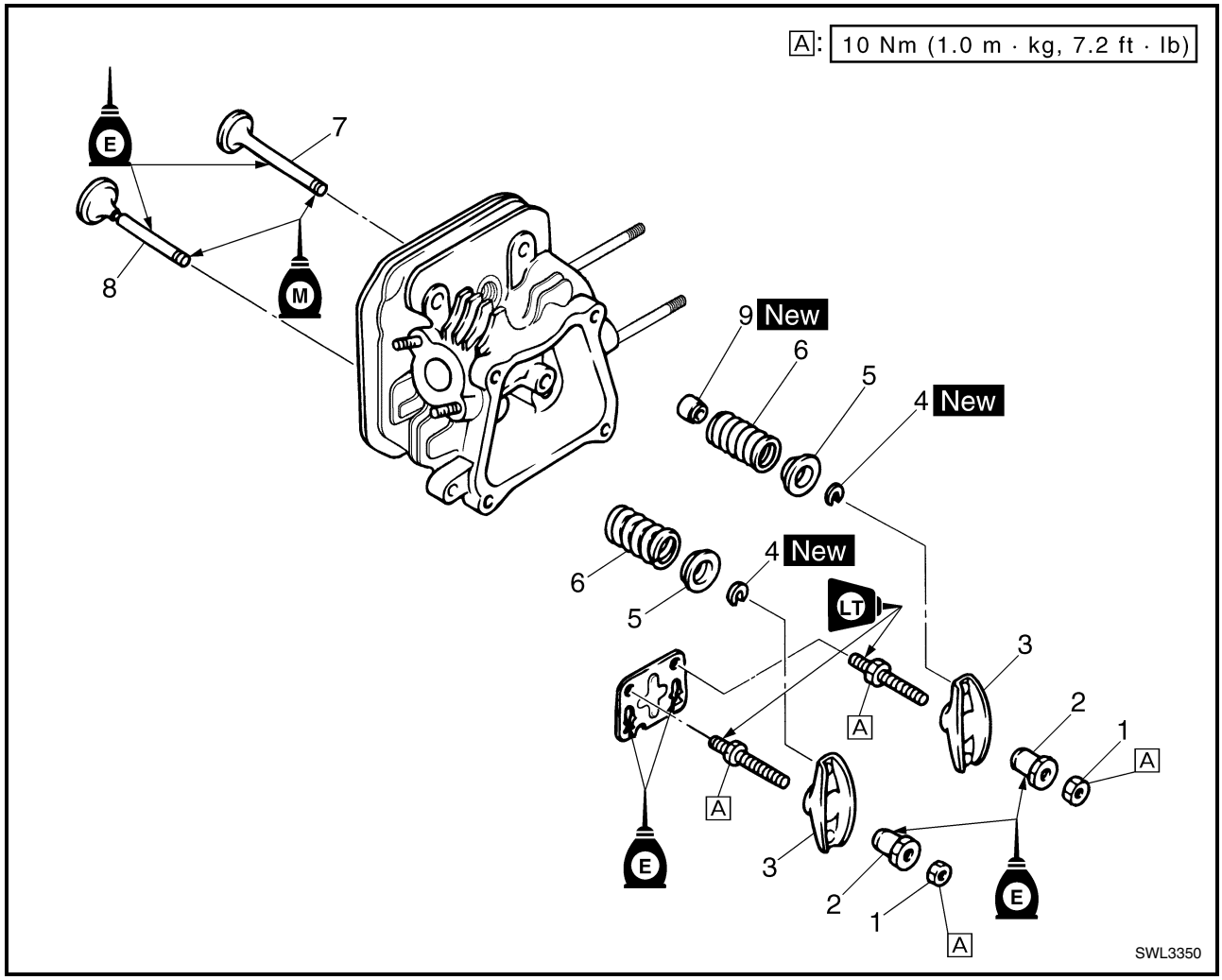
BREATHER HOSE

1. Inspect:
   • Breather hose ①

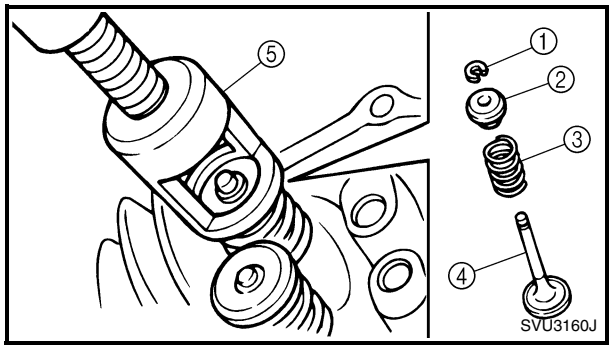
NOTE:

Contact the end of the breather hose to the reed valve stopper ⓐ.

VALVE



Order	Job name/Part name	Q'ty	Remarks
	Valve removal		Remove the parts in the order listed below.
	Cylinder head assembly		Refer to "CYLINDER HEAD COVER AND CYLINDER HEAD".
1	Locknut	2	
2	Adjuster	2	
3	Locker arm	2	
4	Valve cotter	2	
5	Valve spring retainer	2	
6	Valve spring	2	
7	Valve (intake)	1	
8	Valve (exhaust)	1	
9	Valve stem seal	1	
			For installation, reverse the removal procedure.



VALVE AND VALVE SPRING REMOVAL

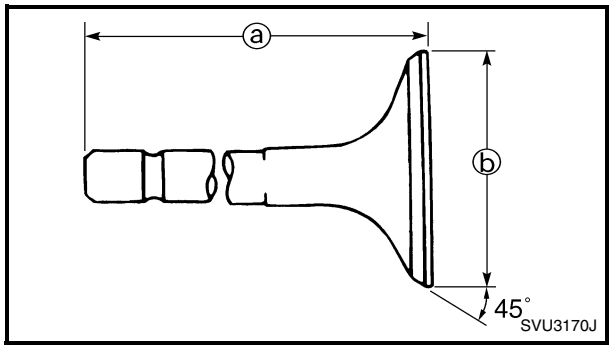
1. Remove:
   - Valve cotter ①
   - Valve spring retainer ②
   - Valve spring ③
   - Valve ④

   Remove the parts using the valve spring compressor ⑤.

CAUTION:

Do not compress the valve spring more than necessary.

Valve spring compressor:
YM-01253, 90890-01253



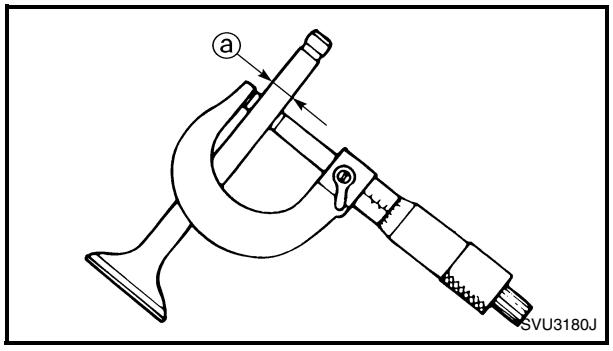
VALVE AND VALVE SPRING INSPECTION

1. Measure:
   - Valve stem length ⓐ
   - Valve face diameter ⓑ

Valve stem length:
Intake: 65.9 mm (2.59 in)
Exhaust: 66.2 mm (2.61 in)
Valve face diameter:
Intake: 23.9 ~ 24.1 mm (0.9409 ~ 0.9488 in)
Exhaust: 21.9 ~ 22.1 mm (0.8622 ~ 0.8701 in)

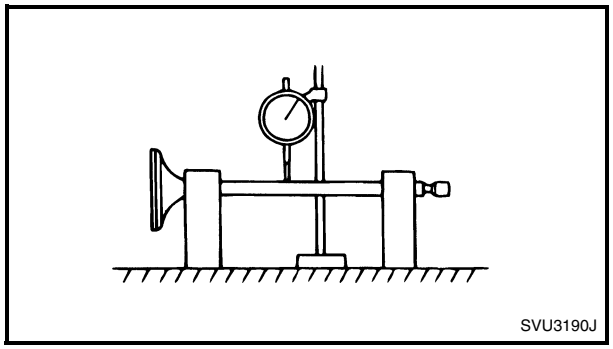
Out of specification → Replace.

2. Measure:
   - Valve stem diameter ⓐ



Valve stem diameter:
Intake: 5.448 ~ 5.463 mm (0.2145 ~ 0.2151 in)
Exhaust: 5.440 ~ 5.445 mm (0.2142 ~ 0.2144 in)
Wear limit:
Intake: 5.418 mm (0.2133 in)
Exhaust: 5.410 mm (0.2130 in)

Out of specification → Replace.

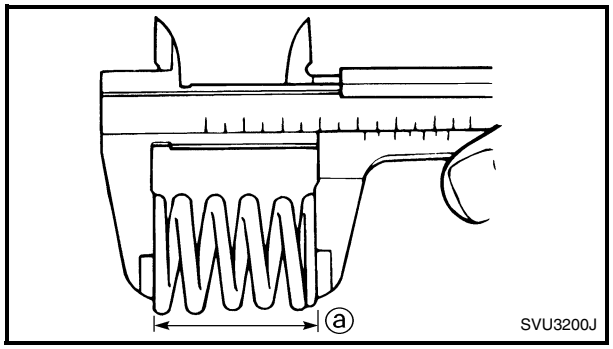

SVU3190J

3. Measure:
   • Valve stem runout

Runout limit:
0.01 mm (0.0004 in)

Out of specification → Replace.

NOTE:
The value is half of that indicated on the dial gauge.

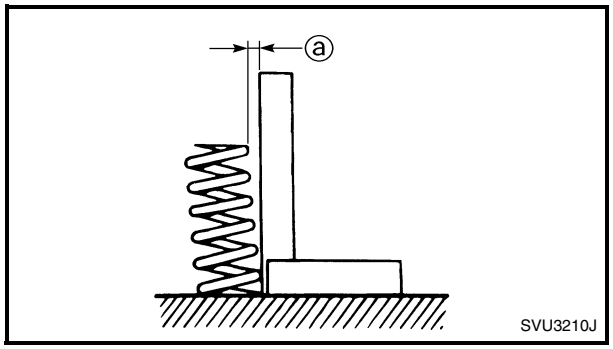


SVU3200J

4. Measure:
   • Valve spring free length ⓐ

Valve spring free length:
Intake and exhaust:
26.5 mm (1.04 in)
Limit: 25.2 mm (0.99 in)

Out of specification → Replace.

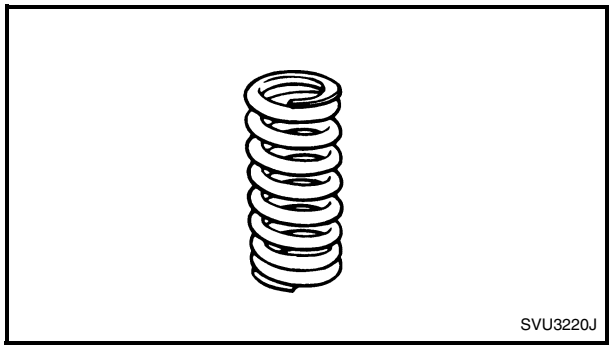


SVU3210J

5. Measure:
   • Valve spring tilt ⓐ

Tilt limit:
2.5°/1.6 mm (0.06 in)

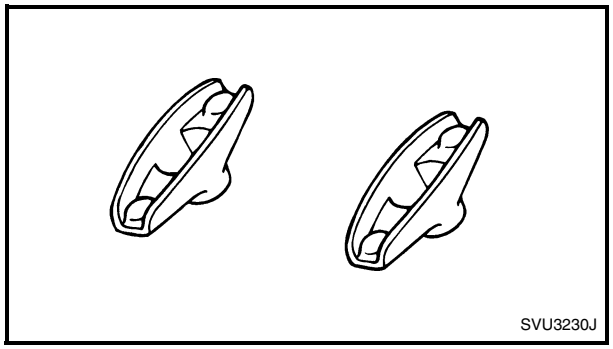
Out of specification → Replace.


SVU3220J

6. Inspect:
   • Valve spring contact surface
   More than 2/3 of the contact surface does not contact → Replace.

LOCKER ARM INSPECTION

1. Inspect:
   • Locker arm
   Wear/damage/cracks → Replace.

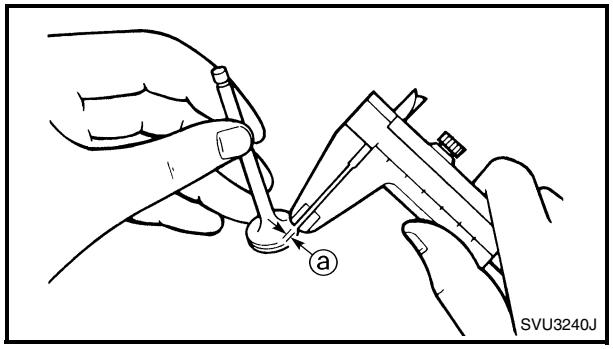

SVU3230J

VALVE SEAT INSPECTION

1. Remove carbon deposits from the valve face and valve seat.
2. Apply a small amount of coarse Mechanic's blueing dye (Dykem) to the valve face.
3. Insert the valve into the valve guide and use a valve lapper to contact the valve face with the valve seat.

NOTE:

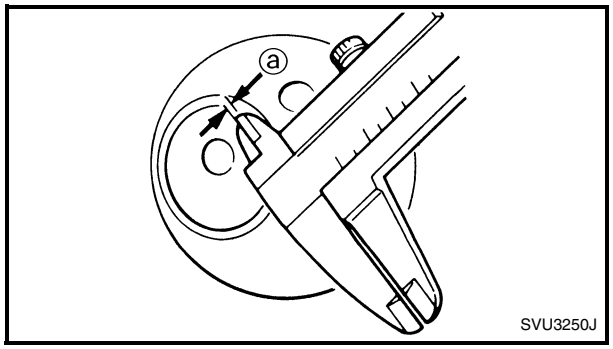
Do not rotate the valve while the valve face is contacting the valve seat.



4. Measure:
   - Valve face contact width ⓐ
     Make sure that the contact width along the entire valve face is within specifications.

Valve face contact width (intake and exhaust):
0.9 ~ 1.1 mm (0.0354 ~ 0.0433 in)
Limit: 1.6 mm (0.0630 in)

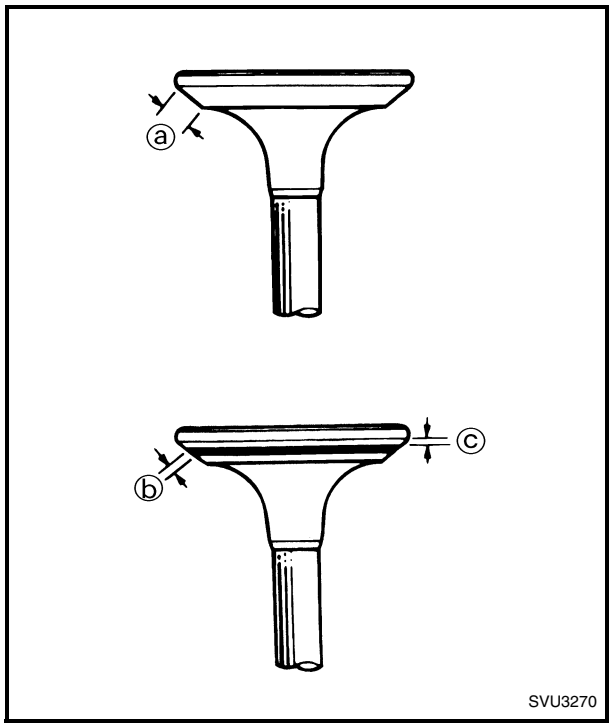
Out of specification/rough/eccentric wear → Replace.

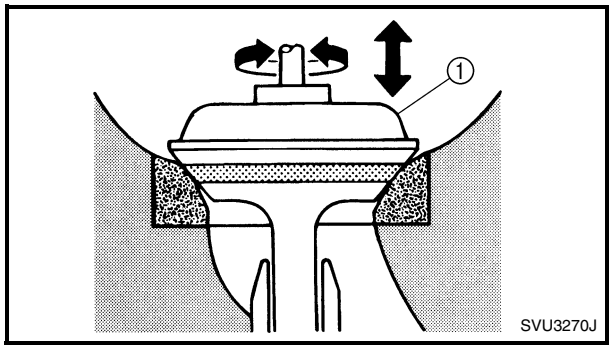


5. Measure:
   - Valve seat contact width ⓐ
     Make sure that the contact width along the entire valve seat is within specifications.

Valve seat contact width (intake and exhaust):
0.9 ~ 1.1 mm (0.0354 ~ 0.0433 in)
Limit: 1.6 mm (0.0630 in)

Out of specification/rough/eccentric wear → Replace.





6. Remove the carbon deposits on the valve face ⓐ and valve seat.
   - Valve face contact seat width ⓑ
   - Valve margin thickness ⓒ
     Apply a small amount of coarse Mechanic's blueing dye (Dykem) to the valve seat.
     Press the valve through the valve guide and onto the valve seat to make a clear impression.
   - Valve margin thickness
     Out of specification → Replace.
   - Valve face contact width
     Out of specification → Replace.

Valve seat width:
0.9 ~ 1.1 mm (0.0354 ~ 0.0433 in)
Valve margin thickness:
0.3 mm (0.012 in)

VALVE LAPPING

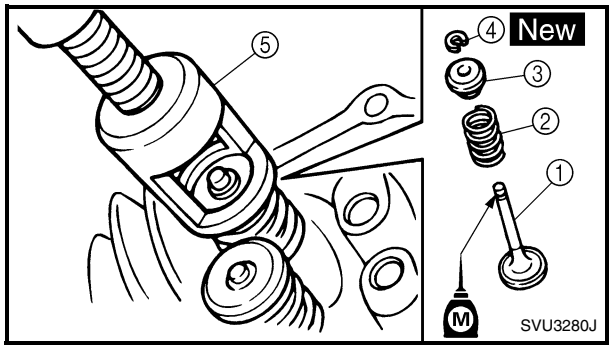
1. Apply a coarse lapping compound evenly on the valve face. Lap the valve by tapping and rotating the valve lapper ① clockwise and counterclockwise.
2. Clean off all of the lapping compound from the valve face and valve seat. Apply fine lapping compound on the valve face and lap the valve as in step 1.
3. If the contact width on the valve face shines white along the entire face, apply Mechanic's blueing dye (Dykem) to make sure that there are traces of even contact in the center of the valve face.

CAUTION:

Do not let the lapping compound enter the gap between the valve stem and the valve guide.

NOTE:

After every lapping procedure, clean off the compound from the valve face and valve seat.



VALVE AND VALVE SPRING ASSEMBLY

1. Install:
   - Valve ①
   - Valve spring ②
   - Valve spring retainer ③
   - Valve cotter ④ New

     Apply a small amount of molybdenum disulfide oil to the valve stem and use the valve spring compressor ⑤ to install the parts.

	Valve spring compressor: YM-01253, 90890-01253

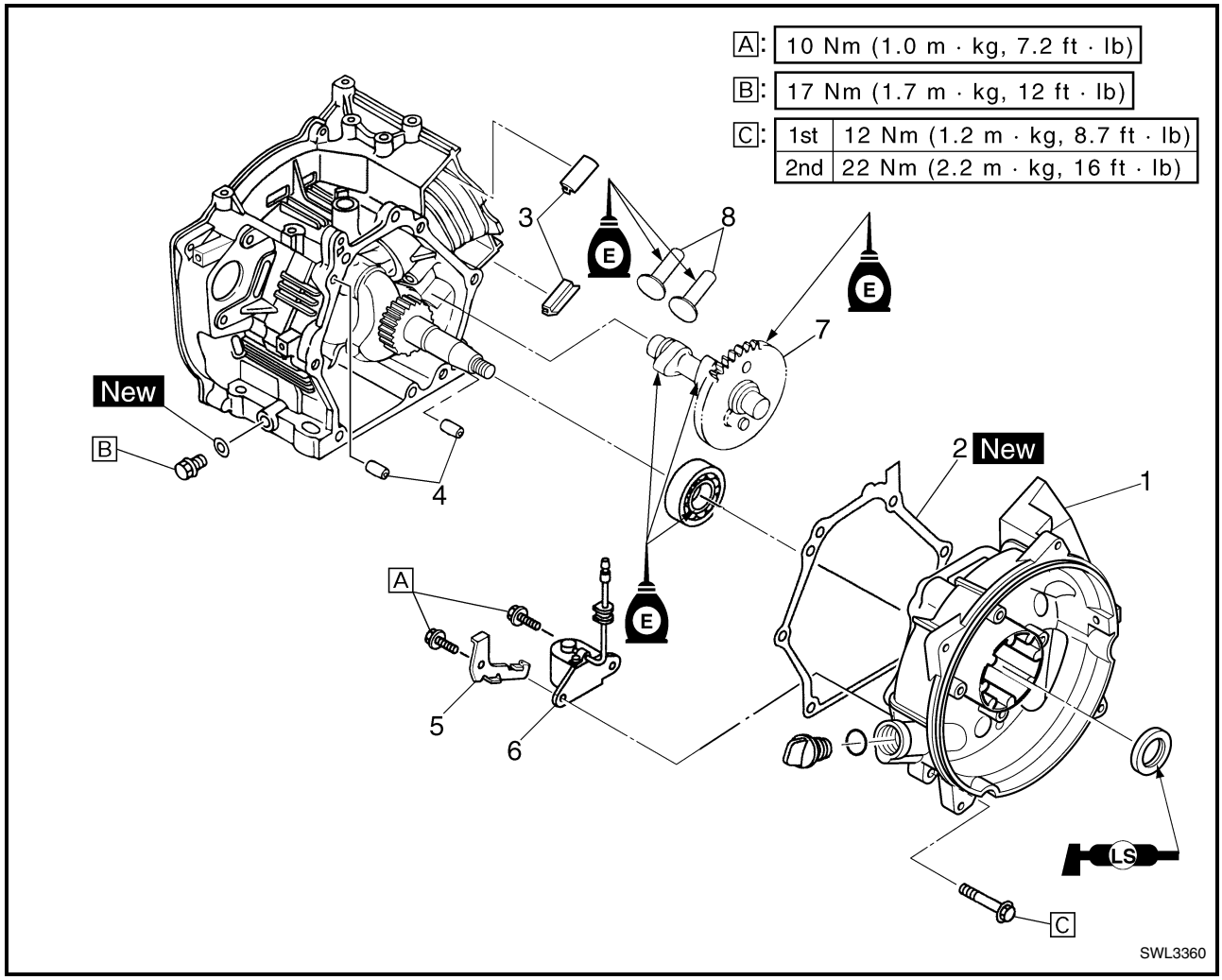
NOTE:

Install the chamfered side of the valve cotter facing down.

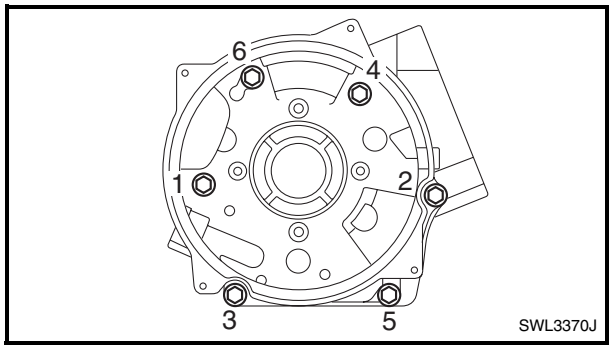
CAUTION:

Do not compress the valve spring more than necessary.

CRANKCASE COVER AND CAMSHAFT



Order	Job name/Part name	Q'ty	Remarks
	Crankcase cover and camshaft removal		Remove the parts in the order listed below.
	Engine assembly		Refer to "ENGINE ASSEMBLY".
	Cylinder head assembly		Refer to "CYLINDER HEAD COVER AND CYLINDER HEAD".
	Flywheel magneto		Refer to "RECOIL STARTER AND FLYWHEEL MAGNETO".
	Generator assembly		Refer to "GENERATOR".
1	Crankcase cover	1	
2	Gasket	1	
3	Rubber seal	2	
4	Dowel pin	2	
5	Bracket	1	
6	Oil level switch	1	
7	Camshaft	1	
8	Valve lifter	2	
			For installation, reverse the removal procedure.

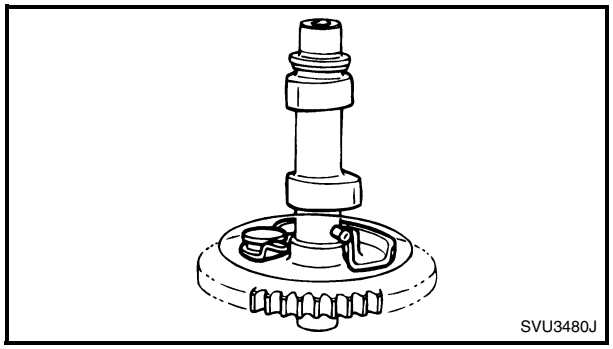


CRANKCASE COVER REMOVAL

1. Remove:
   - Crankcase cover

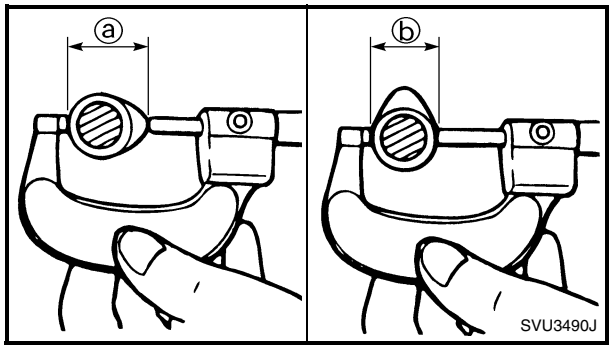
NOTE:

Loosen the bolts in the proper sequence.



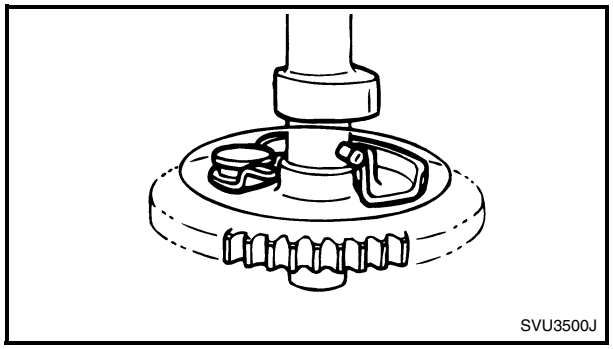
CAMSHAFT INSPECTION

1. Inspect:
   - Camshaft
     Damage → Replace.

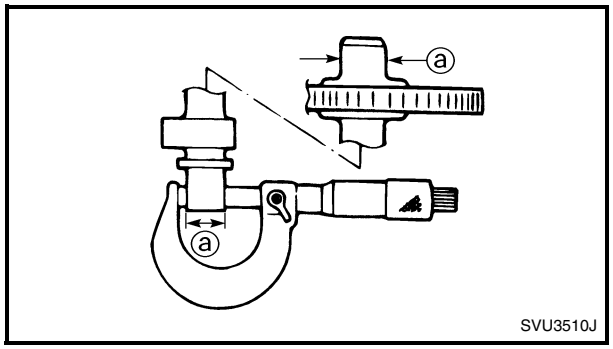


2. Measure:
   - Cam lobes length ⓐ and ⓑ
     Out of specifications → Replace.

Cam lobes length:
Intake ⓐ: 26.9 ± 0.05 mm (1.059 ± 0.002 in)
ⓑ: 22.0 ± 0.05 mm (0.866 ± 0.002 in)
Exhaust ⓐ: 26.68 ± 0.05 mm (1.050 ± 0.002 in)
ⓑ: 22.025 ± 0.05 mm (0.867 ± 0.002 in)

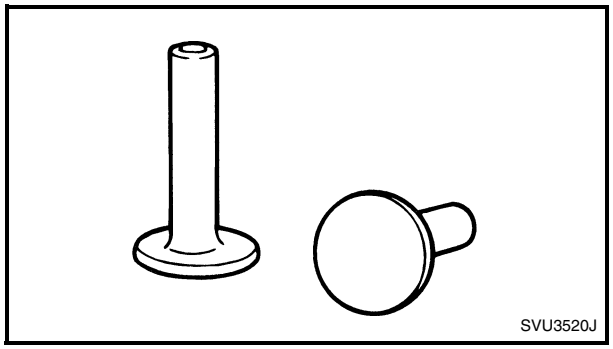


3. Inspect:
   - Surface of camshaft gear teeth
   - Decompressor
     Wear/damage → Replace.



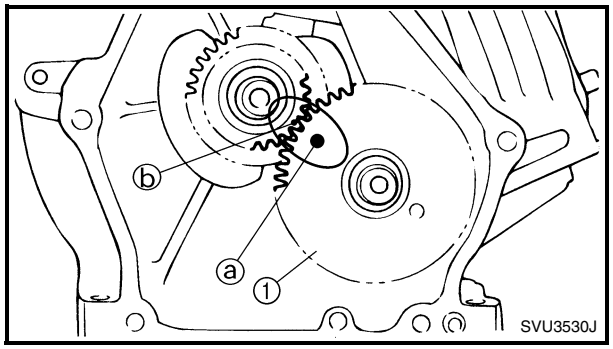
4. Measure:
   - Camshaft diameter ⓐ
     Out of specification → Replace.

Camshaft diameter:
14.965 ~ 14.990 mm (0.5892 ~ 0.5902 in)
Wear limit:
14.950 mm (0.5886 in)



VALVE LIFTER INSPECTION

1. Inspect:
   - Valve lifter
     Damage → Replace.

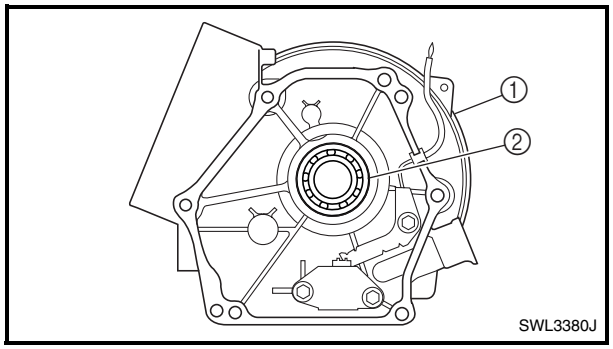


CAMSHAFT ASSEMBLY

1. Install:
   - Camshaft ①

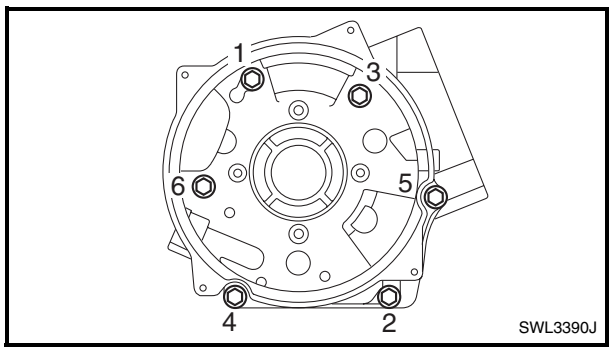
CAUTION:

Be sure to align the hole ⓐ in the camshaft gear with the crankshaft gear mark ⓑ.



CRANKCASE COVER INSPECTION

1. Inspect:
   - Crankcase cover ①
     Damage → Replace.
   - Bearing ②
     Noise/wear/rotational failure → Replace.

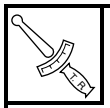


CRANKCASE COVER INSTALLATION

1. Install:
   - Crankcase cover bolts 1 to 6

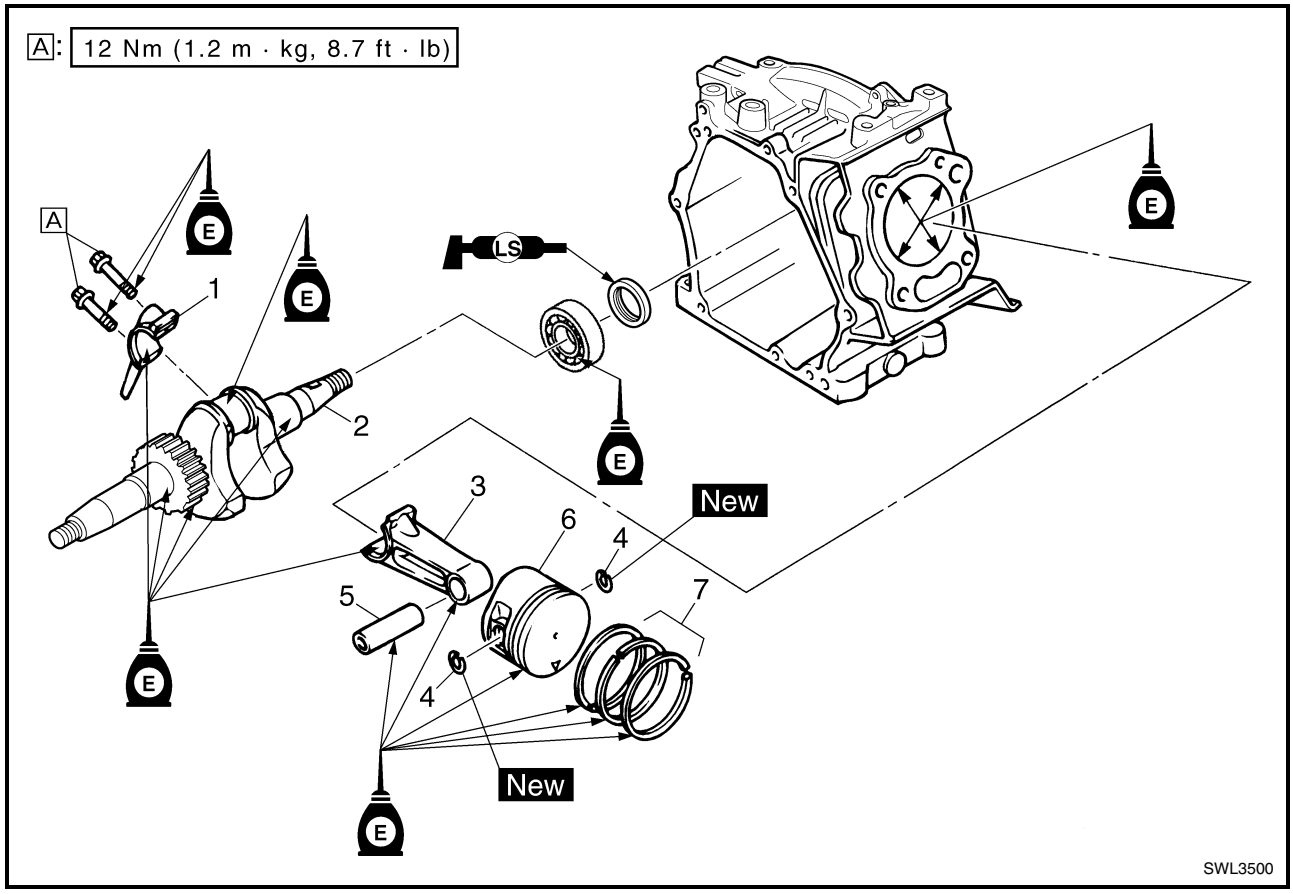
NOTE:

Tighten the bolts to the specified torques in two steps and in order from 1 to 6.

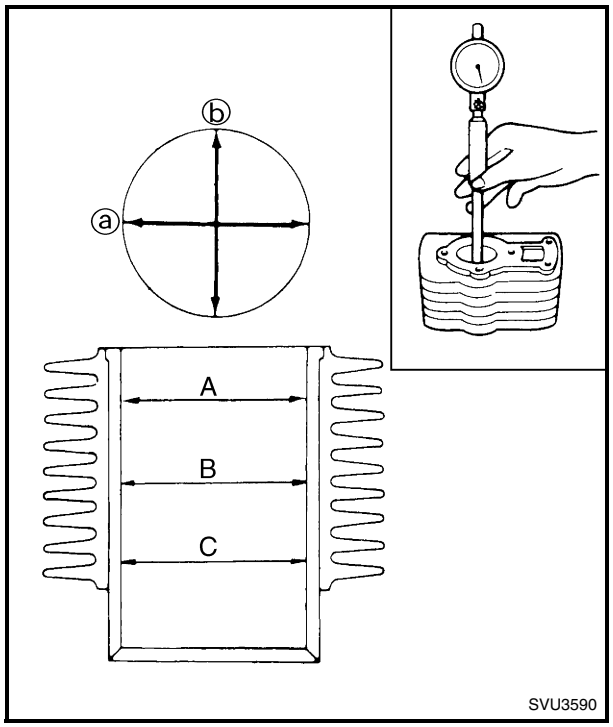


Crankcase cover bolts:
1st: 12 Nm (1.2 m · kg, 8.7 ft · lb)
2nd: 22 Nm (2.2 m · kg, 16 ft · lb)

PISTON, CONNECTING ROD, CRANKSHAFT AND CRANKCASE



Order	Job name/Part name	Q'ty	Remarks
	Piston, connecting rod, crankshaft and crankcase removal		Remove the parts in the order listed below.
	Engine assembly		Refer to "ENGINE ASSEMBLY".
	Cylinder head assembly		Refer to "CYLINDER HEAD COVER AND CYLINDER HEAD".
	Flywheel magneto		Refer to "RECOIL STARTER AND FLYWHEEL MAGNETO".
	Generator assembly		Refer to "GENERATOR".
	Crankcase cover/camshaft		Refer to "CRANKCASE COVER AND CAMSHAFT".
1	Connecting rod cap	1	
2	Crankshaft	1	
3	Connecting rod	1	
4	Piston pin circlip	2	
5	Piston pin	1	
6	Piston	1	
7	Piston ring	3	
			For installation, reverse the removal procedure.



CRANKCASE (CYLINDER) INSPECTION

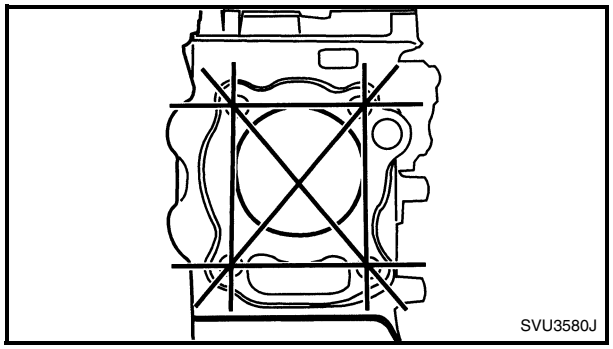
1. Measure:
   - Cylinder inside diameter

NOTE:

Take side to side ⓐ and front to back ⓑ measurements at each of the three locations A, B, and C (total of six measurements), and then find the average of the measurements.

Maximum wear = Maximum A, B, C
Cylinder taper = Maximum A – Minimum C
Out of specification → Replace.

Cylinder inside diameter:
66.005 ~ 66.015 mm
(2.5986 ~ 2.5990 in)
Cylinder inside diameter wear limit:
66.020 mm (2.5992 in)
Cylinder taper limit:
0.05 mm (0.0020 in)



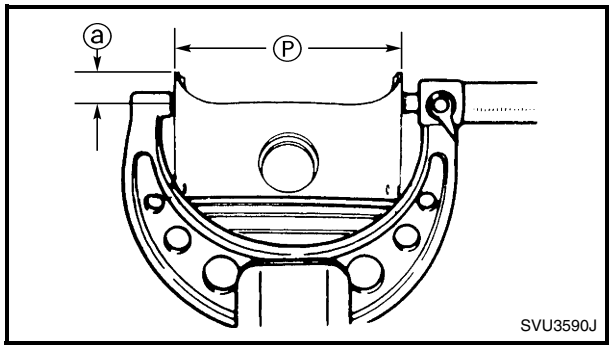
2. Measure:
   - Cylinder warpage

NOTE:

Measure the warpage on the contact surface of the cylinder head at six points using a straightedge and thickness gauge.

Out of specification → Resurface or replace.

Warpage limit:
0.05 mm (0.0020 in)



PISTON AND PISTON PIN INSPECTION

1. Measure:
   - Piston skirt diameter Ⓟ

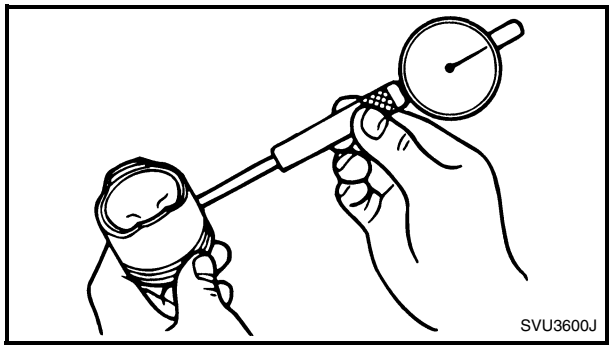
ⓐ = 10 mm (0.4 in) from the piston bottom edge
Out of specification → Replace.

Piston skirt diameter:
65.975 ~ 65.990 mm
(2.5974 ~ 2.5980 in)
Wear limit:
65.9 mm (2.5945 in)

2. Measure:
   • Piston clearance
   Out of specification → Rebore or replace cylinder and replace piston and piston rings.

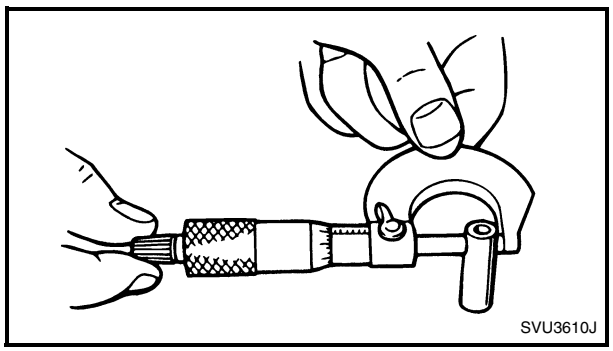
Piston clearance:
0.015 ~ 0.040 mm
(0.00059 ~ 0.00157 in)
Wear limit:
0.15 mm (0.00591 in)

Piston clearance =
Cylinder inside diameter –
Piston skirt diameter


SVU3600J

3. Measure:
   • Piston pin hole inside diameter
   Out of specification → Replace.

Piston pin hole inside diameter:
16.002 ~ 16.013 mm
(0.6300 ~ 0.6304 in)
Wear limit:
16.043 mm (0.6316 in)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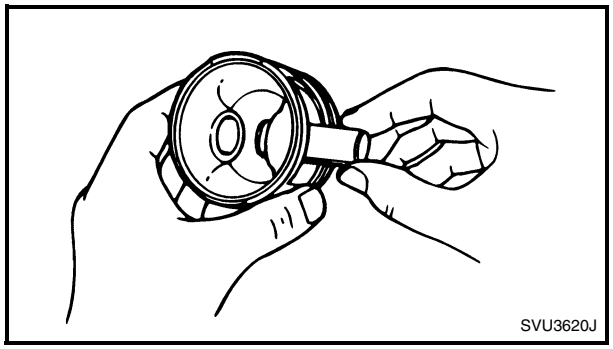
4. Measure:
   • Piston pin diameter
   Out of specification → Replace.

Piston pin diameter:
15.995 ~ 16.000 mm
(0.6297 ~ 0.6299 in)
Wear limit:
16.043 mm (0.6316 in)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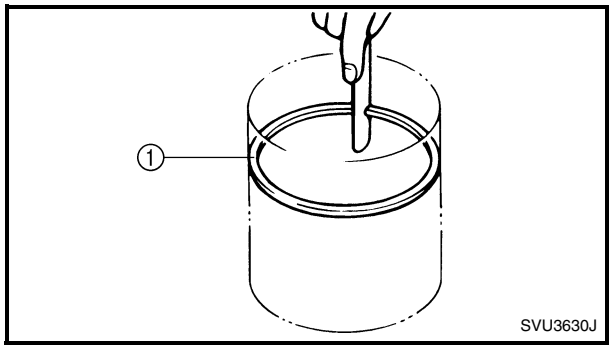
5. Inspect:
   • Check that the piston pin enters smoothly into the piston pin hole.
   If the piston pin fits tightly into the piston, check the piston pin hole. If there is any protrusion, use a knife or scraper to gently remove it so that the piston pin can be pushed in gently with your fingers.



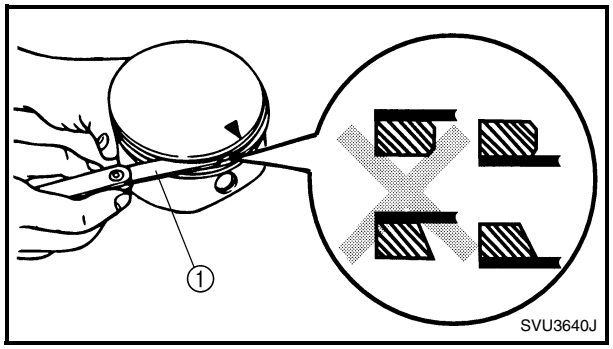
PISTON RING INSPECTION

1. Measure:
   - Piston ring end gap
     Out of specification → Replace.

NOTE:

Insert the piston ring ① into the cylinder, and push it approximately 5 mm (0.2 in) into the cylinder. Push in the ring with the piston crown so that the ring is at right angles to the cylinder bore.

	Ring end gap	Wear limit
Top ring	0.20 ~ 0.40 mm (0.0079 ~ 0.0157 in)	0.65 mm (0.0256 in)
2nd ring	0.20 ~ 0.40 mm (0.0079 ~ 0.0157 in)	0.75 mm (0.0295 in)
Oil ring	0.20 ~ 0.70 mm (0.0079 ~ 0.0276 in)	0.9 mm (0.0354 in)

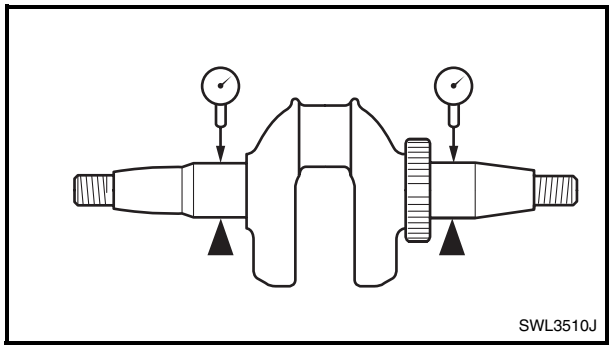


2. Measure:
   - Piston ring side clearance
     Out of specification → Replace.
     Use a thickness gauge ①.

	Piston ring side clearance	Wear limit
Top ring	0.04 ~ 0.08 mm (0.0016 ~ 0.0031 in)	0.13 mm (0.0051 in)
2nd ring	0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in)	0.12 mm (0.0047 in)

NOTE:

- Clean carbon deposits from the piston ring grooves and rings before measuring the side clearance.
- Measure the side clearance at several portions.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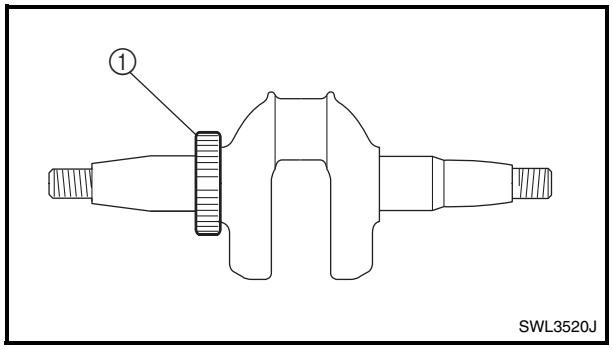

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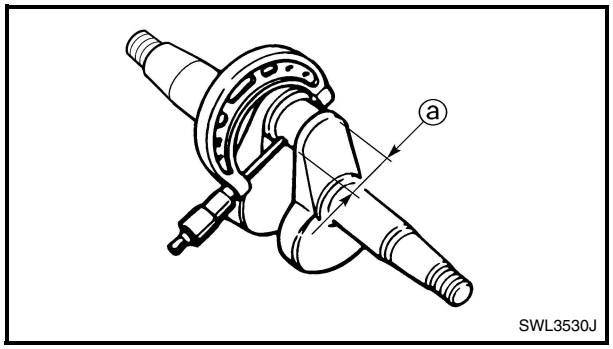

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CRANKSHAFT INSPECTION

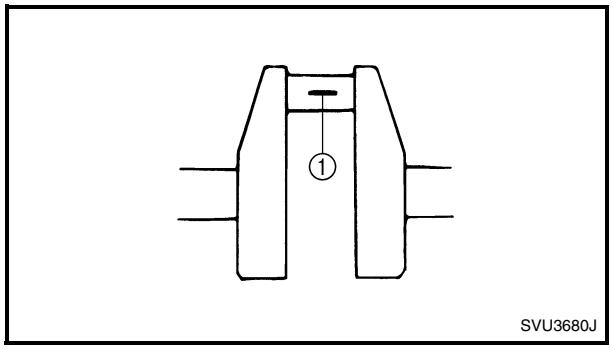
1. Measure:
   - Crankshaft runout limit
     Use a dial gauge.
     Out of specification → Replace.

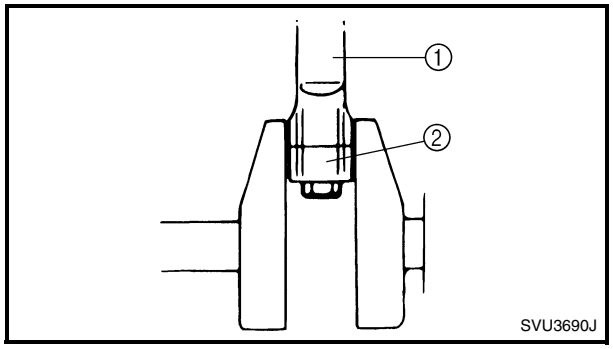
Runout limit:
0.02 mm (0.0008 in)

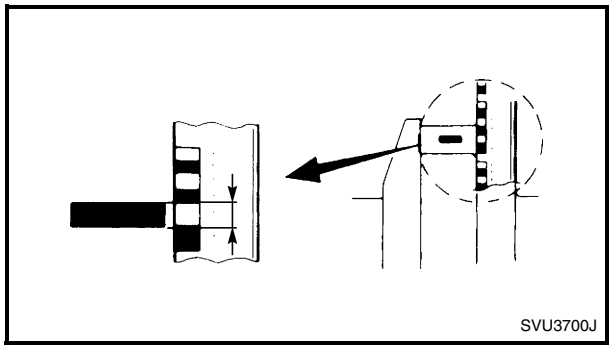
2. Inspect:
   - Crankshaft gear ①
     Wear/damage → Replace.

3. Measure:
   - Crankshaft pin outside diameter ⓐ
     Wear/damage → Replace.
     Use a micrometer.
     Out of specification → Replace.

Crankshaft pin outside diameter:
27.969 ~ 27.984 mm
(1.1011 ~ 1.1017 in)
Wear limit:
27.9 mm (1.0984 in)







CONNECTING ROD OIL CLEARANCE INSPECTION

NOTE:

Measure the oil clearance if replacing the crankshaft or connecting rod.

1. Place a piece of Plastigauge ① on the crankshaft pin horizontally.

NOTE:

Clean off oil from all parts thoroughly.

2. Install:
   - Connecting rod ①
   - Connecting rod cap ②

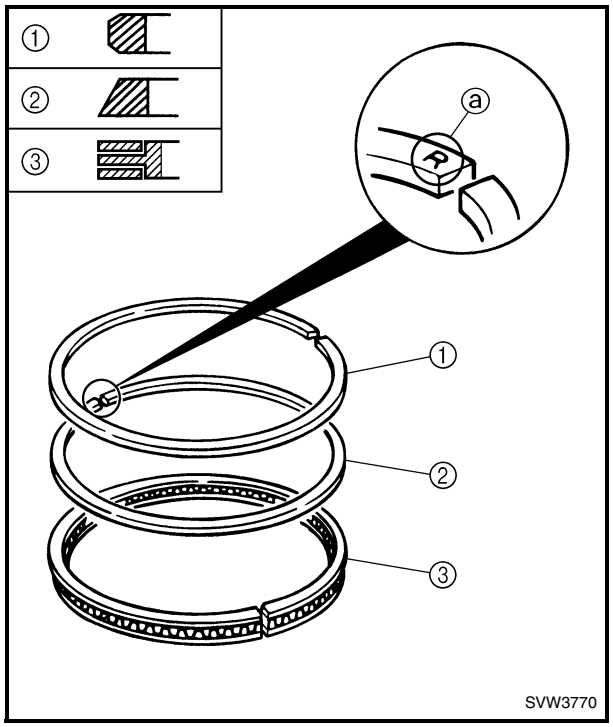
NOTE:

Tighten the cap bolts so that the crankshaft does not move while the oil clearance is being measured.

Connecting rod cap bolt:
12 Nm (1.2 m · kg, 8.7 ft · lb)

3. Remove:
   - Connecting rod cap
   - Connecting rod
4. Measure:
   - Widest portion of the pressed Plastigauge
     Out of specification → Replace crankshaft or connecting rod, and then measure the clearance again.

Connecting rod big end oil clearance:
0.015 ~ 0.040 mm
(0.0006 ~ 0.0016 in)
Wear limit:
0.1 mm (0.0039 in)



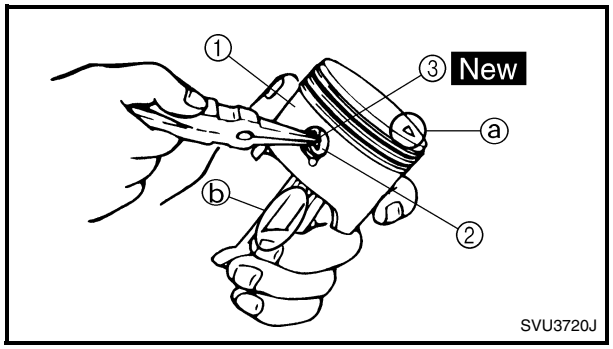
PISTON RING AND PISTON ASSEMBLY

1. Install:
   - Top ring ①
   - 2nd ring ②
   - Oil ring ③

NOTE:

- Be sure to install the second ring so that the manufactures mark ⓐ faces towards the piston head.
- Make sure that the piston rings move smoothly.

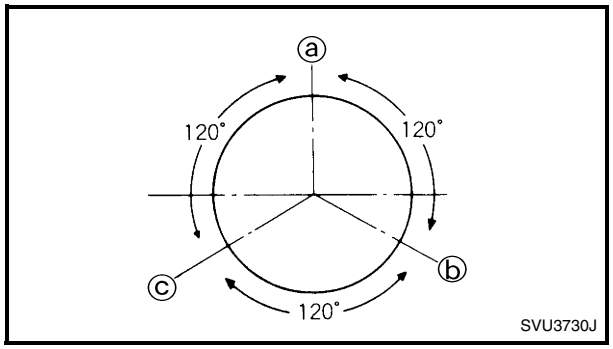
2. Apply 4-stroke engine oil to the inside of the connecting rod small end.

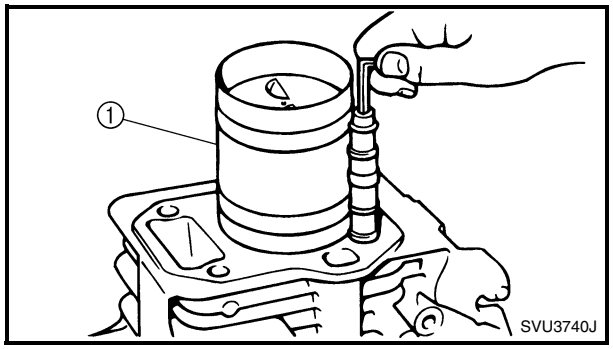


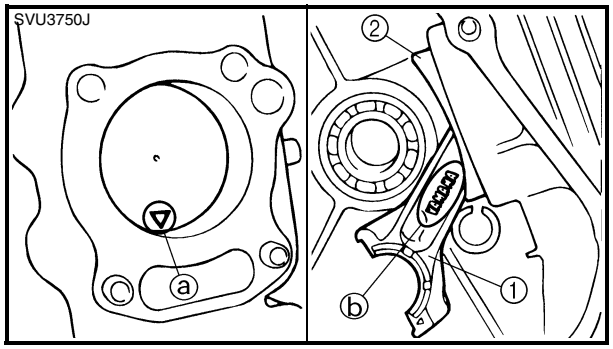
3. Install:
   - Piston ①
   - Piston pin ②
   - Piston pin circlip ③ New

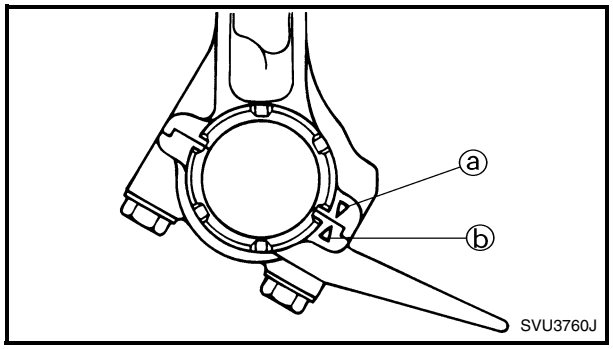
NOTE:

- Make sure that the "YAMAHA" mark ⓐ on the connecting rod faces toward the crankcase cover.
- Make sure that the " ▽ " mark ⓑ on the piston head faces toward the push rod.



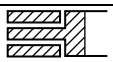






CRANKSHAFT ASSEMBLY

1. Make sure that the end gap of each piston ring is positioned, as shown in the illustration.

Top ring	ⓐ	
2nd ring	ⓑ	
Oil ring	ⓒ	

2. Install:
   - Piston ring compressor ①

Piston ring compressor:
YU-33294, 90890-05158

3. Install:
   - Connecting rod ①
   - Piston ②

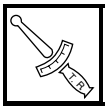
NOTE:

- Make sure that the " ▽ " mark ⓐ on the piston head faces toward the push rod.
- Make sure that the "YAMAHA" mark ⓑ on the connecting rod faces toward the crankcase cover.

4. Install:
   - Crankshaft
   - Connecting rod cap

NOTE:

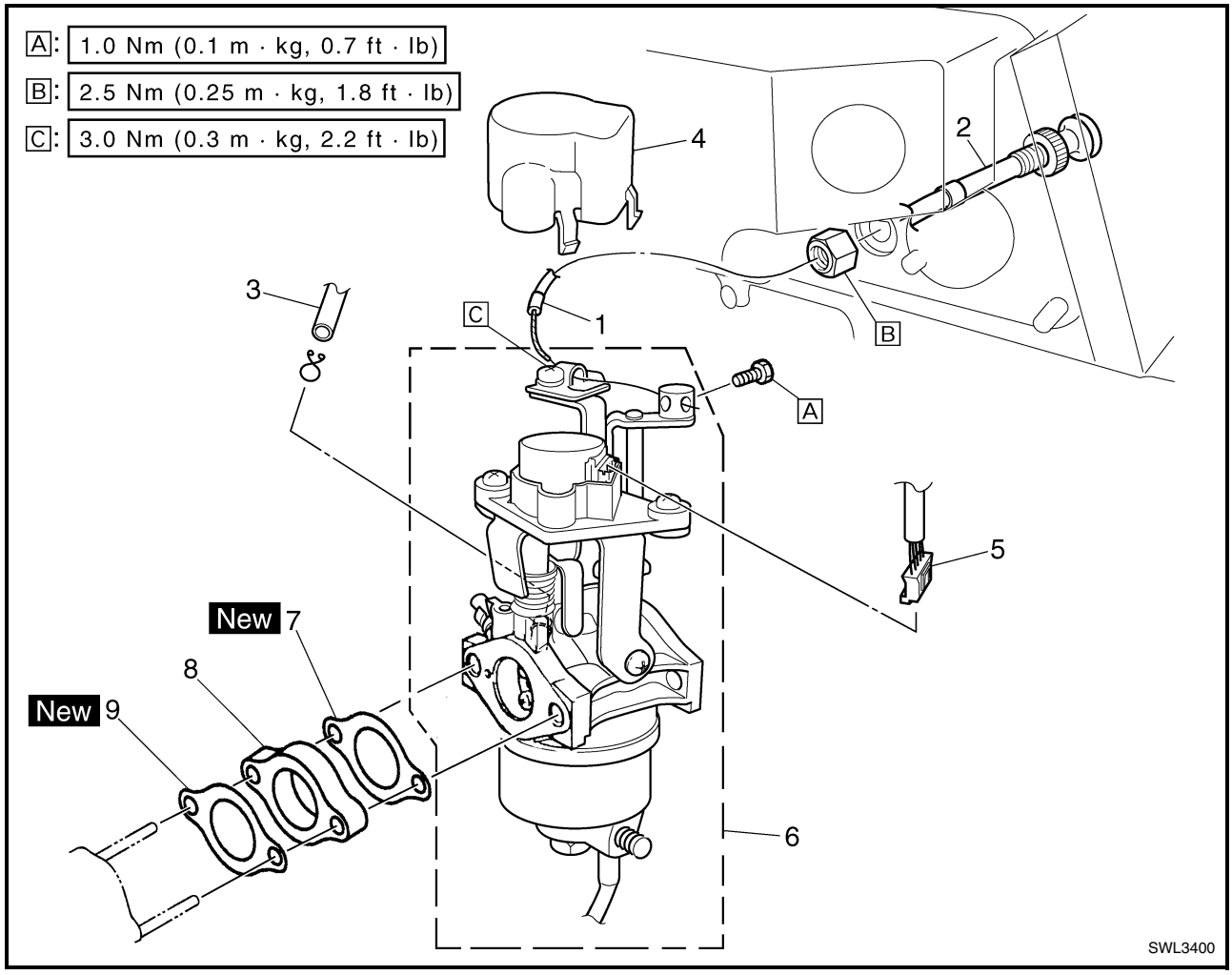
Make sure that the " ▽ " mark ⓐ on the connecting rod is aligned with the " ▽ " mark ⓑ on the rod cap.



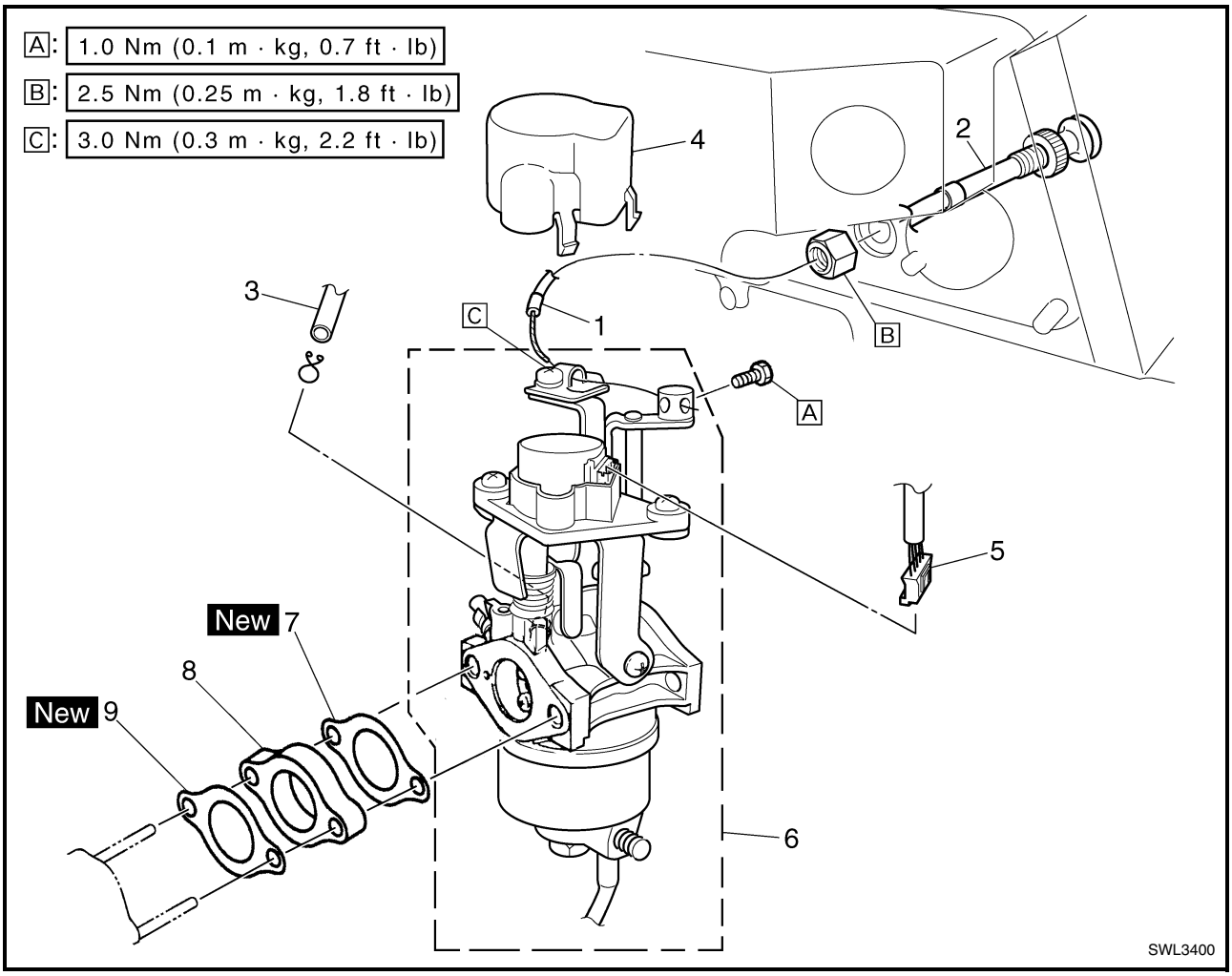
Connecting rod cap bolt:
12 Nm (1.2 m · kg, 8.7 ft · lb)

5. Install:
   - Camshaft
   - Crankcase cover
     Refer to "CRANKCASE COVER AND CAMSHAFT".

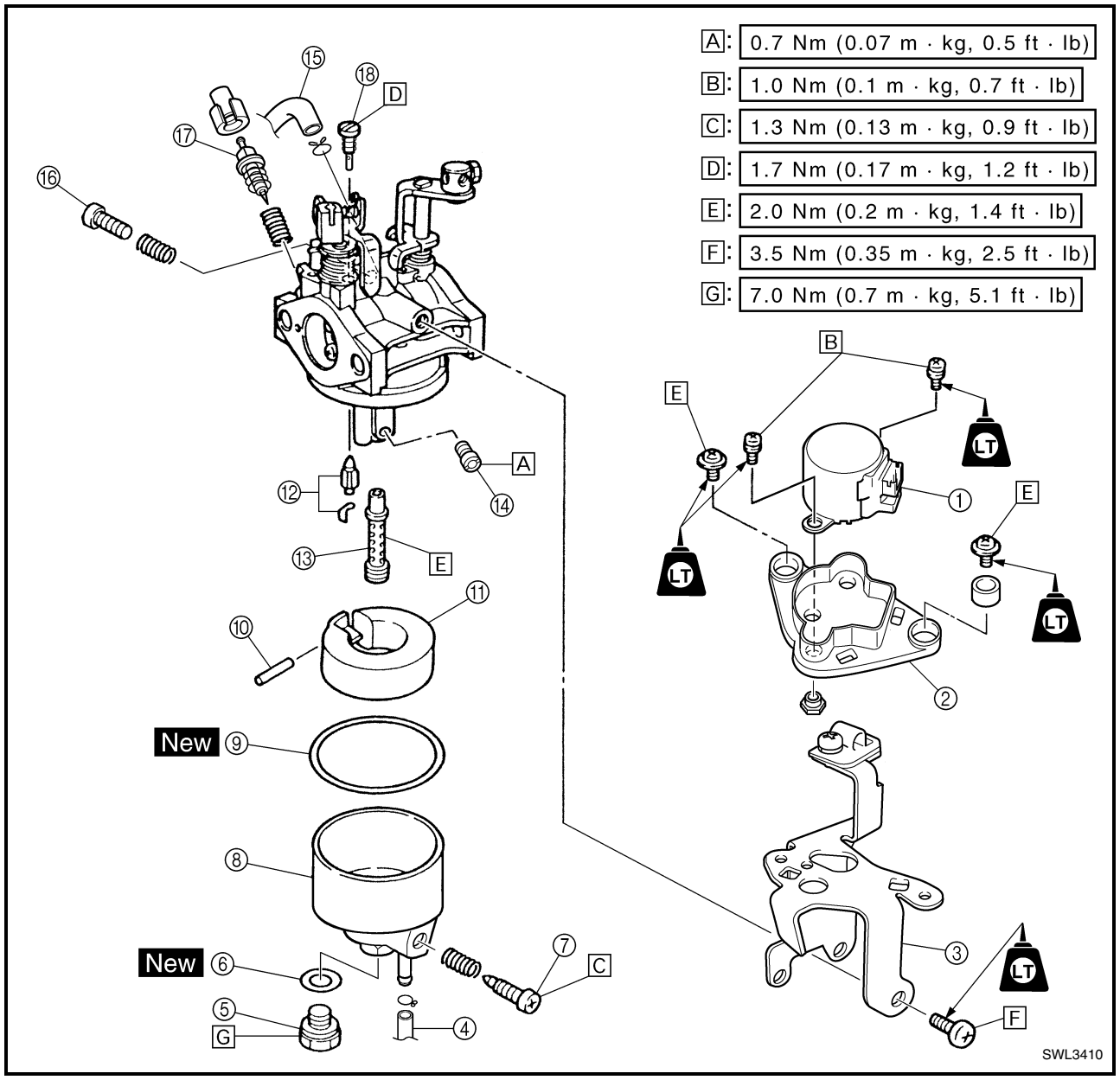
CARBURETOR



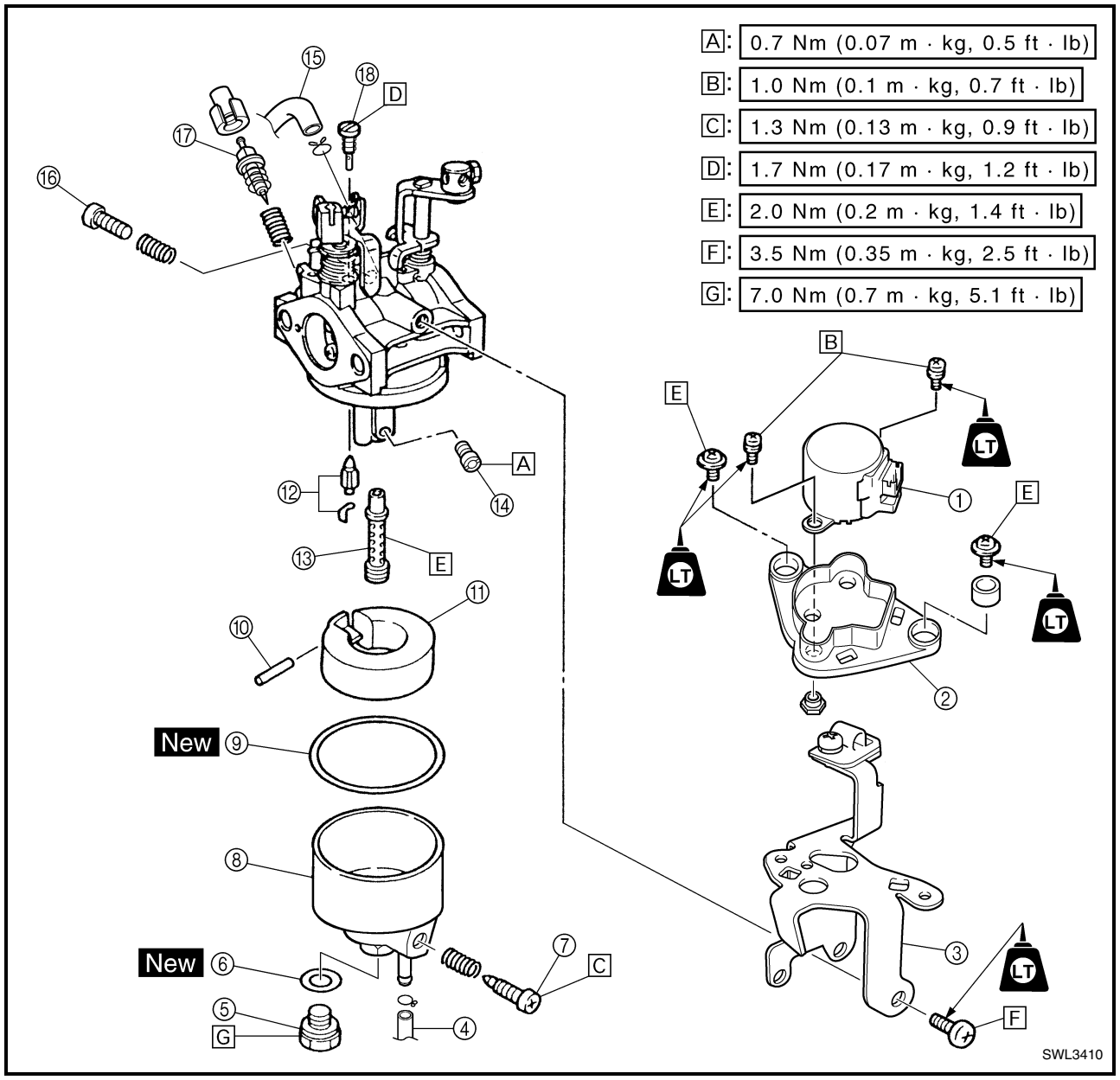
Order	Job name/Part name	Q'ty	Remarks
	Carburetor removal		Remove the parts in the order listed below.
	Panel 4/cover 5		Refer to "COVERS, PANELS, AND CAPS" in CHAPTER 2.
	Slide the fuel tank		Refer to "FUEL TANK AND CONTROL BOX".
	Air filter assembly		Refer to "AIR FILTER ASSEMBLY AND CONTROL UNIT" and "AIR FILTER ASSEMBLY, CONTROL UNIT AND NOISE FILTER".
1	Choke cable	1	
2	Choke knob	1	
3	Fuel hose	1	
4	Throttle control motor cover	1	
5	Throttle control motor coupler	1	
6	Carburetor	1	
7	Gasket	1	



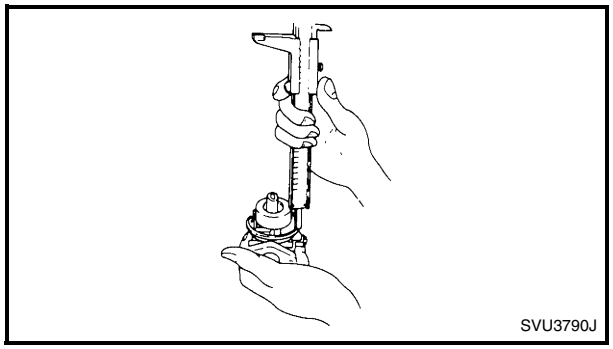
Order	Job name/Part name	Q'ty	Remarks
8	Carburetor joint	1	
9	Gasket	1	
			For installation, reverse the removal procedure.



Order	Job name/Part name	Q'ty	Remarks
	Carburetor disassembly		Remove the parts in the order listed below.
①	Throttle control motor assembly	1	
②	Throttle controller bracket	1	
③	Bracket	1	
④	Drain hose	1	
⑤	Bolt	1	
⑥	Gasket	1	
⑦	Drain screw	1	
⑧	Float chamber	1	
⑨	Gasket	1	



Order	Job name/Part name	Q'ty	Remarks
⑩	Float pin	1	
⑪	Float	1	
⑫	Needle valve	1	
⑬	Main nozzle	1	
⑭	Main jet	1	
⑮	Air vent hose	1	
⑯	Throttle stop screw	1	
⑰	Pilot screw	1	
⑱	Pilot jet	1	
			For assembly, reverse the disassembly procedure.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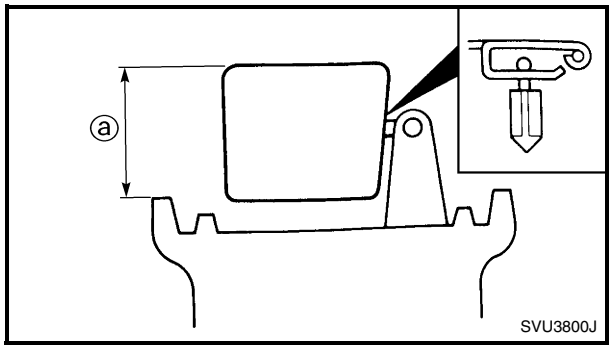

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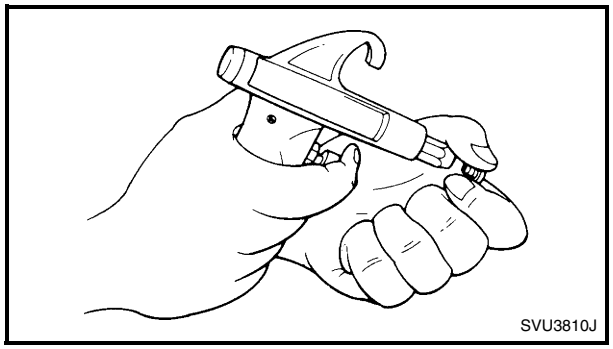
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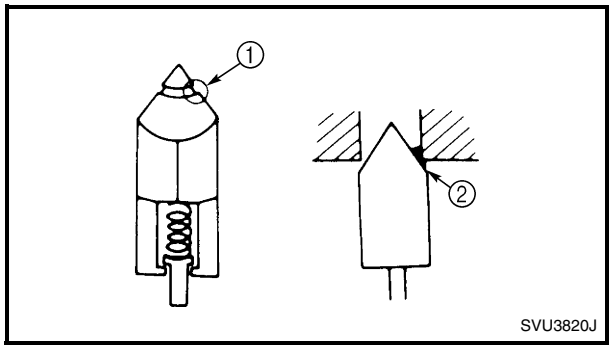


SVU3820J

FLOAT HEIGHT INSPECTION

1. Measure:
   - Float height
     Out of specification → Replace.

NOTE:

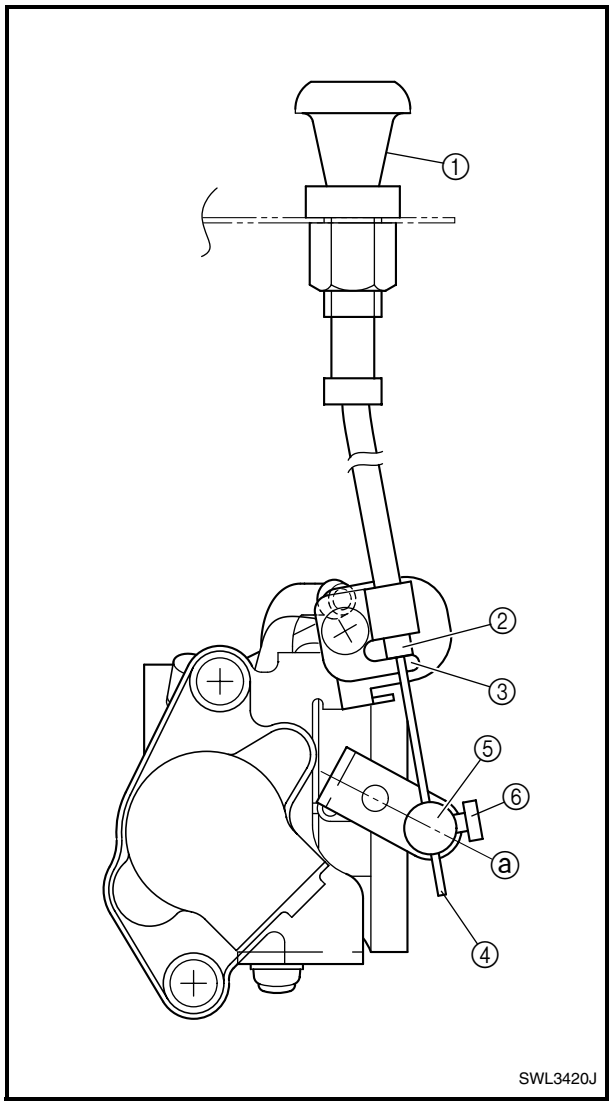
Lift up the float height so that the tip of the needle valve lightly contacts the float arm, and then measure the float height ⓐ. (This measurement should be made with the gasket removed.)

Float height:
16.0 mm (0.63 in)

2. Clean:
   - Carburetor body
     Blow out all passages, jets, and carburetor body with compressed air.

3. Inspect:
   - Valve seat
     Wear/damage → Replace.
     Dirt → Clean.

① Wear at groove
② Dirt



CHOKE CABLE INSTALLATION

1. Inspect:
   - Choke knob ①

NOTE:

Push the choke knob ① entirely in before installing it to the frame.

2. Install:
   - Casing cap (choke cable) ②

NOTE:

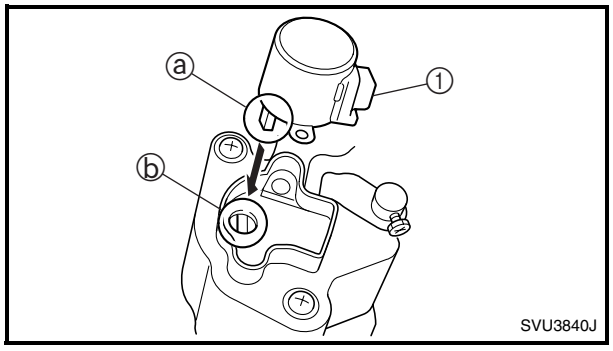
Place the choke knob casing cap against the stay ③.

3. Install:
   - Inner cable ④

NOTE:

Place the carburetor choke valve in its fully open position ⓐ, insert the tip of the inner cable into the drum hole ⑤, and then secure it in place with the screw ⑥.

	Screw: **1.0 Nm (0.1 m · kg, 0.7 ft · lb)**



THROTTLE CONTROL MOTOR

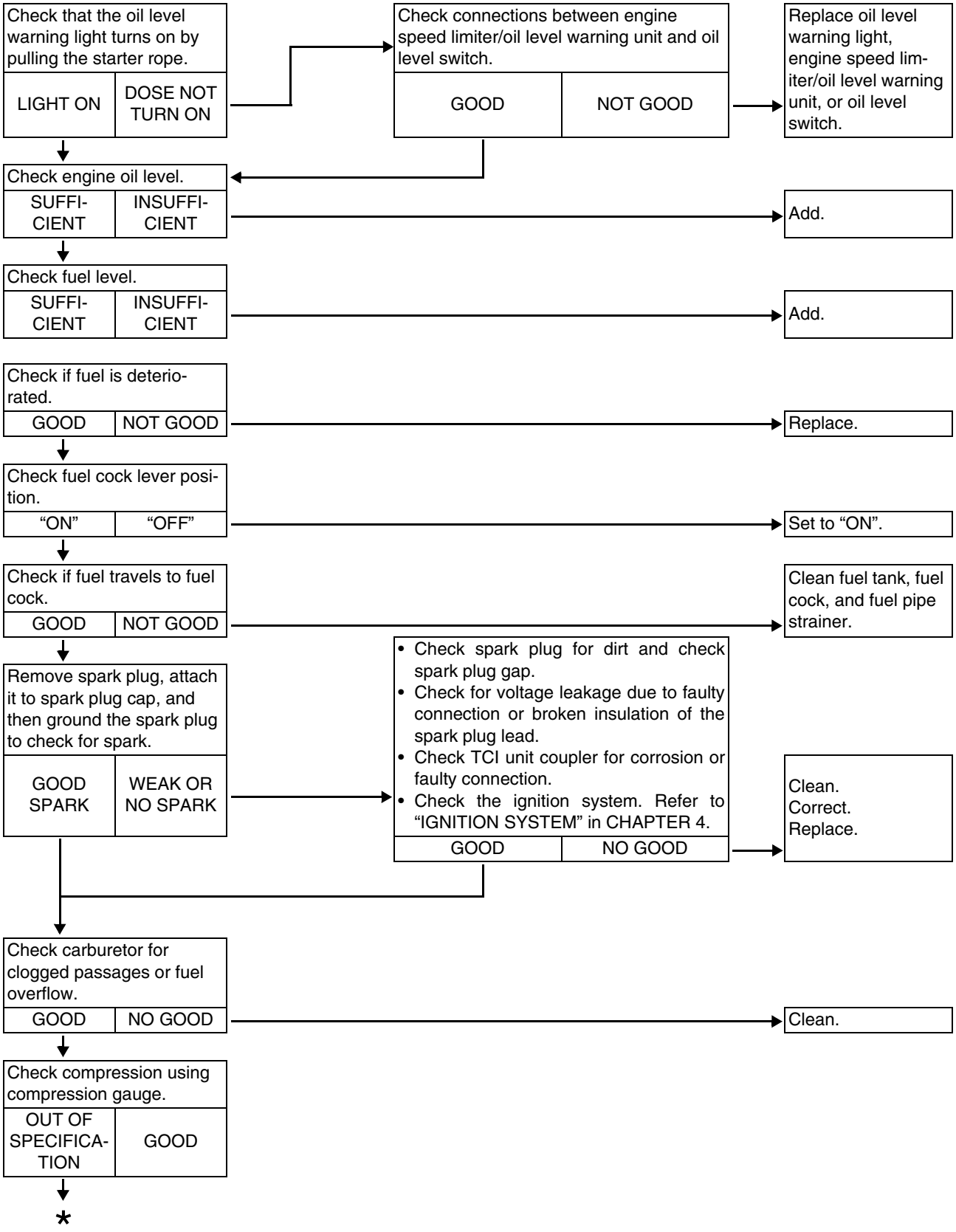
1. Inspect:
   - Throttle control motor ①

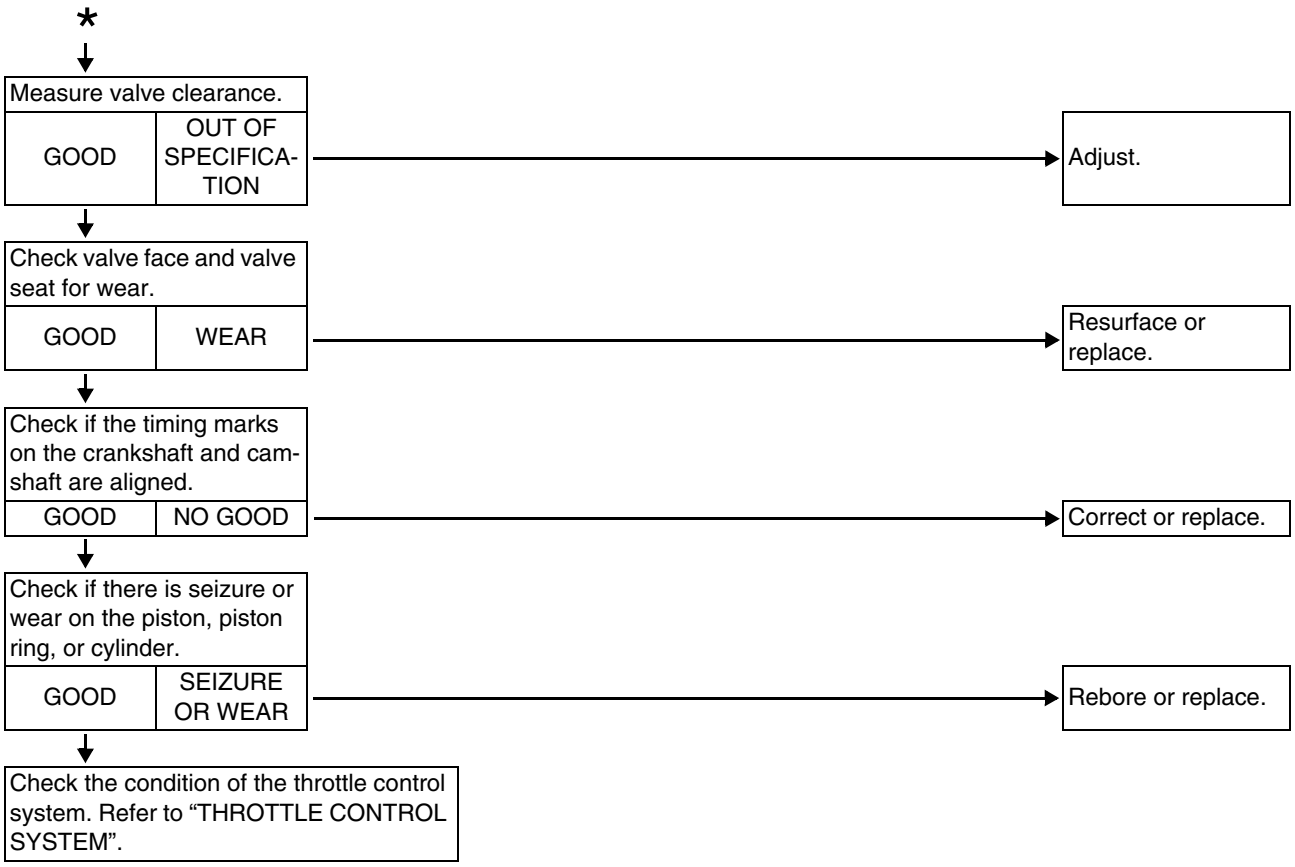
NOTE:

- Install the shaft ⓐ of the throttle control motor by aligning it with the groove ⓑ of the throttle shaft.
- Install the throttle valve, and then make sure that is moves smoothly.
- When installing the engine, fully open the throttle valve.

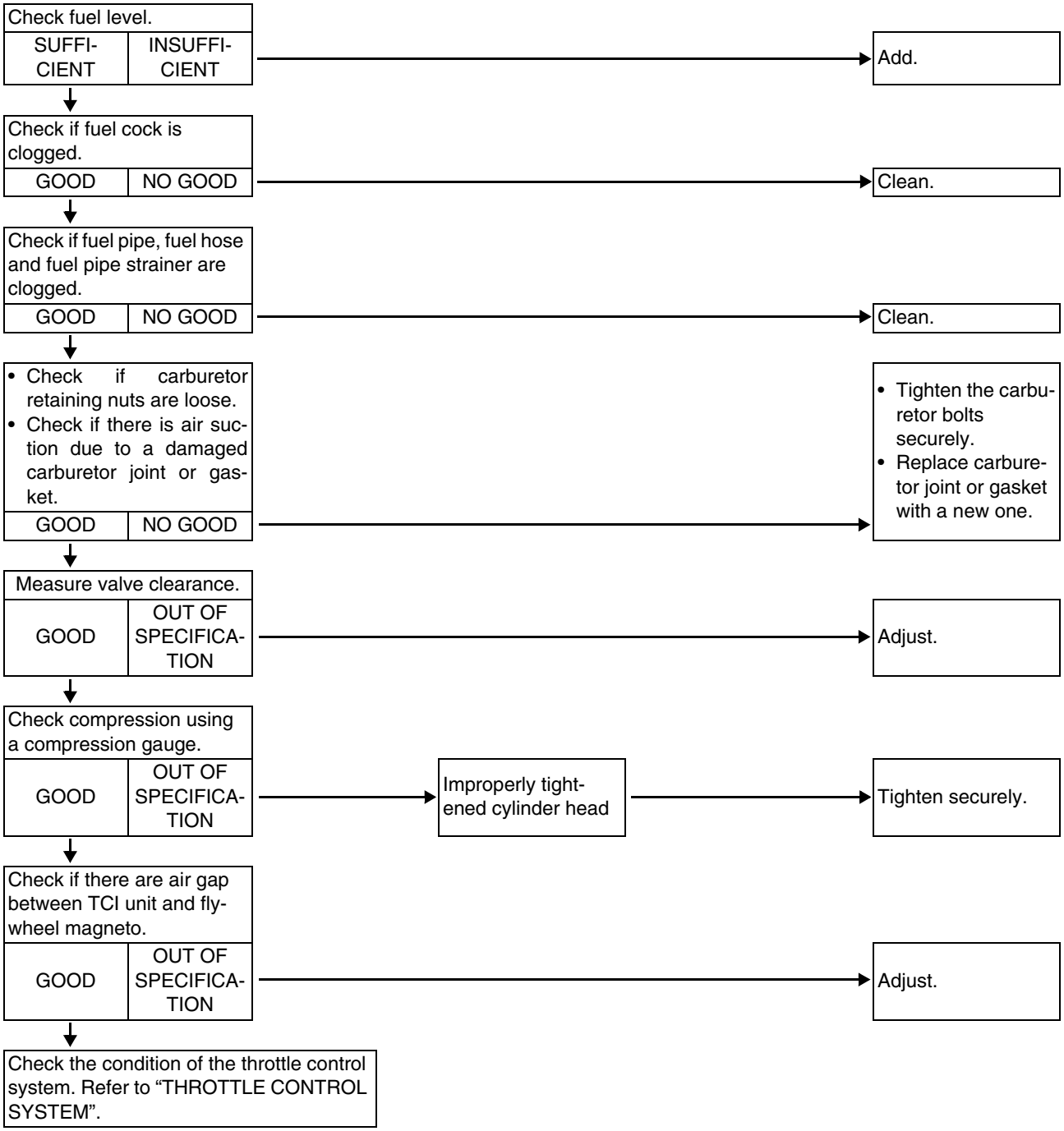
TROUBLESHOOTING

ENGINE DOES NOT START

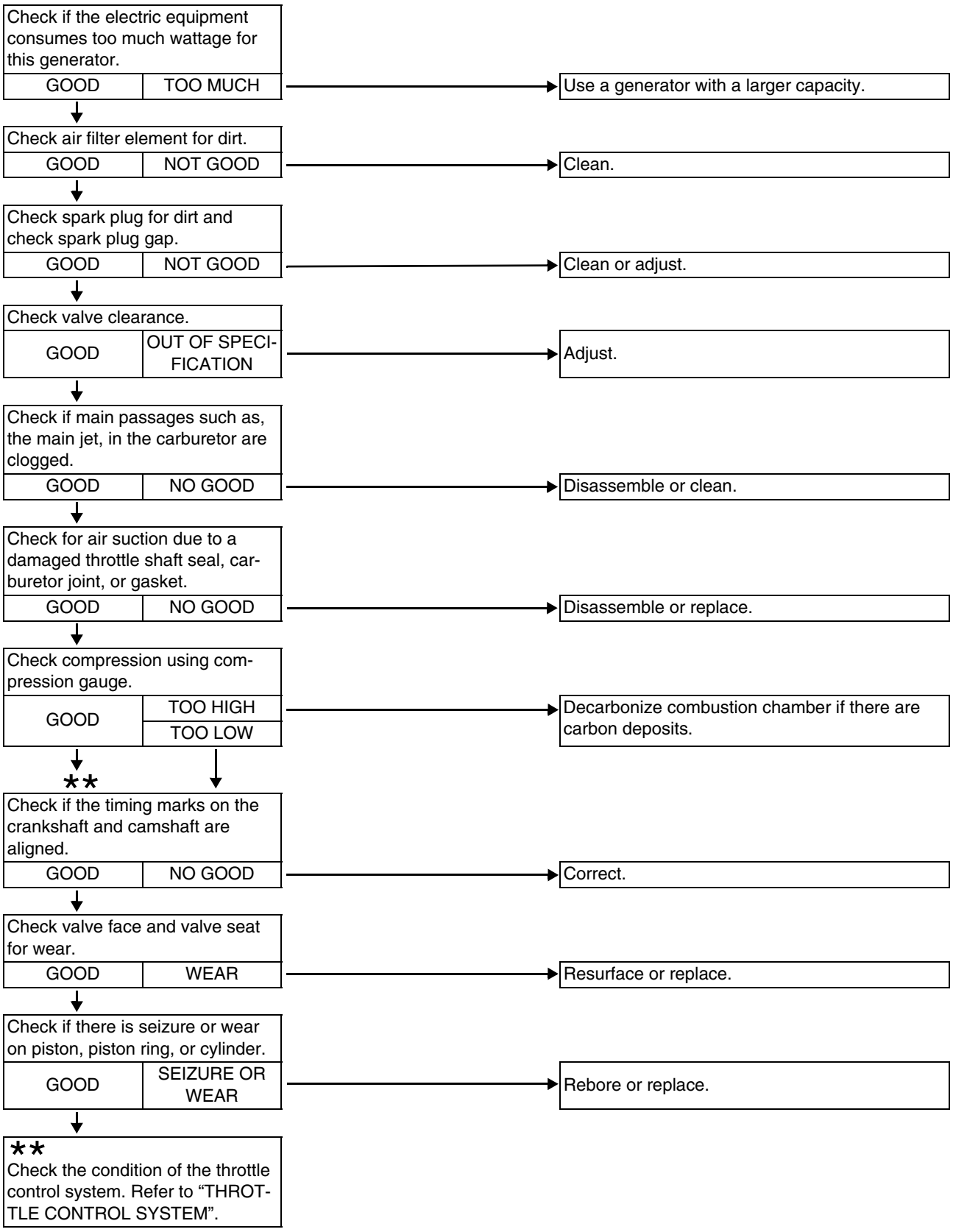



*
Measure valve clearance.
GOOD
OUT OF SPECIFICATION
Adjust.
Check valve face and valve seat for wear.
GOOD
WEAR
Resurface or replace.
Check if the timing marks on the crankshaft and camshaft are aligned.
GOOD
NO GOOD
Correct or replace.
Check if there is seizure or wear on the piston, piston ring, or cylinder.
GOOD
SEIZURE OR WEAR
Rebore or replace.
Check the condition of the throttle control system. Refer to “THROTTLE CONTROL SYSTEM”.

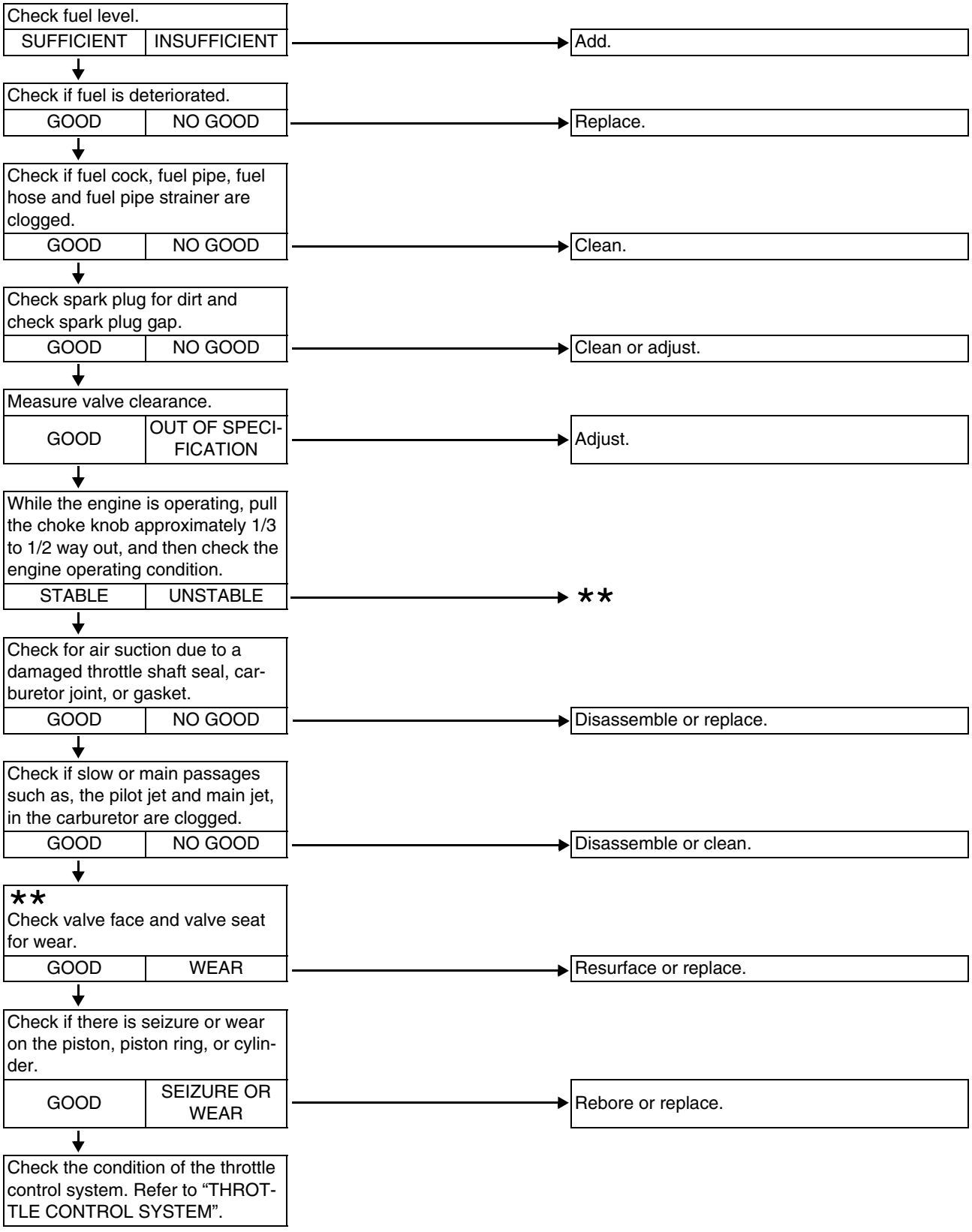
ENGINE STARTS BUT STALLS



ENGINE SPEED DOES NOT INCREASE



ENGINE SPEED IS UNEVEN



THROTTLE CONTROL SYSTEM

ENGINE DOES NOT START, ENGINE STARTS BUT STALLS, ENGINE SPEED DOES NOT INCREASE, OR ENGINE SPEED IS UNEVEN.

Check AC output.

GOOD	NO GOOD

→ NO GOOD: Refer to “GENERATOR SYSTEM” in CHAPTER 4.

↓ GOOD

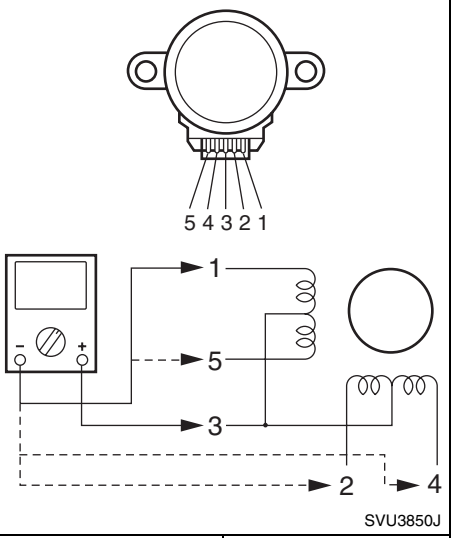
Rotate the shaft of the throttle control motor to check if it turns smoothly with slight resistance.

GOOD	NO GOOD

→ NO GOOD: Replace the throttle control motor.

↓ GOOD

Measure the coil resistance between 3-1, 3-2, 3-4, and 3-5 of the throttle control motor. (Tester range: Ω × 100)
250 Ω ± 7% /25 °C (77 °F)



GOOD	OUT OF SPECIFICATION

→ OUT OF SPECIFICATION: Replace the throttle control motor.

↓ GOOD

Check the connections of the wire harness connectors and couplers, and the wires for an open circuit or short circuit.

GOOD	NO GOOD

→ NO GOOD: Correct or replace.

↓ GOOD

Defective control unit.
Replace the control unit.

WITH NO LOAD, ENGINE SPEED DOES NOT INCREASE WHEN ECONOMY CONTROL SWITCH IS SET TO "OFF" " ".
WITH NO LOAD, ENGINE SPEED DOES NOT DECREASE WHEN ECONOMY CONTROL SWITCH IS SET TO "ON" " ".
WITH LOAD, ENGINE SPEED DOES NOT INCREASE WHEN ECONOMY CONTROL SWITCH IS SET TO "ON" " ".

Check AC output.
GOOD | NO GOOD → Refer to "GENERATOR SYSTEM" in CHAPTER 4.

↓

Check condition of the throttle control motor.
GOOD | NO GOOD → Replace throttle control motor.

↓

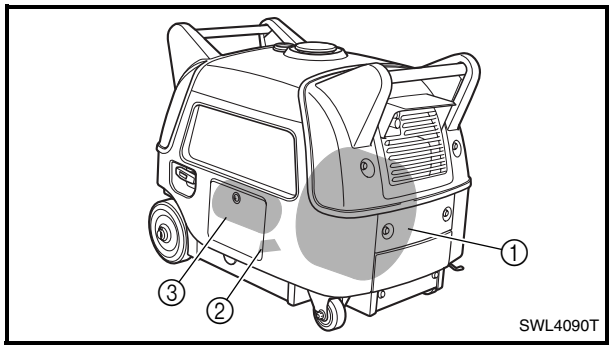
Check economy switch.
GOOD | NO GOOD → Replace economy switch.

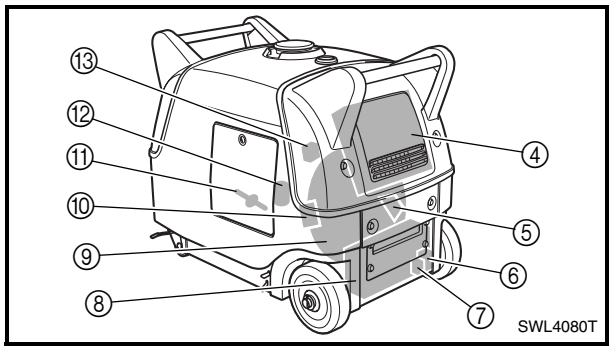
↓

Check the connections of the wire harness connectors and couplers, and the wires for an open circuit or short circuit.
GOOD | NO GOOD → Correct or replace.

↓

Defective control unit.
Replace the control unit.



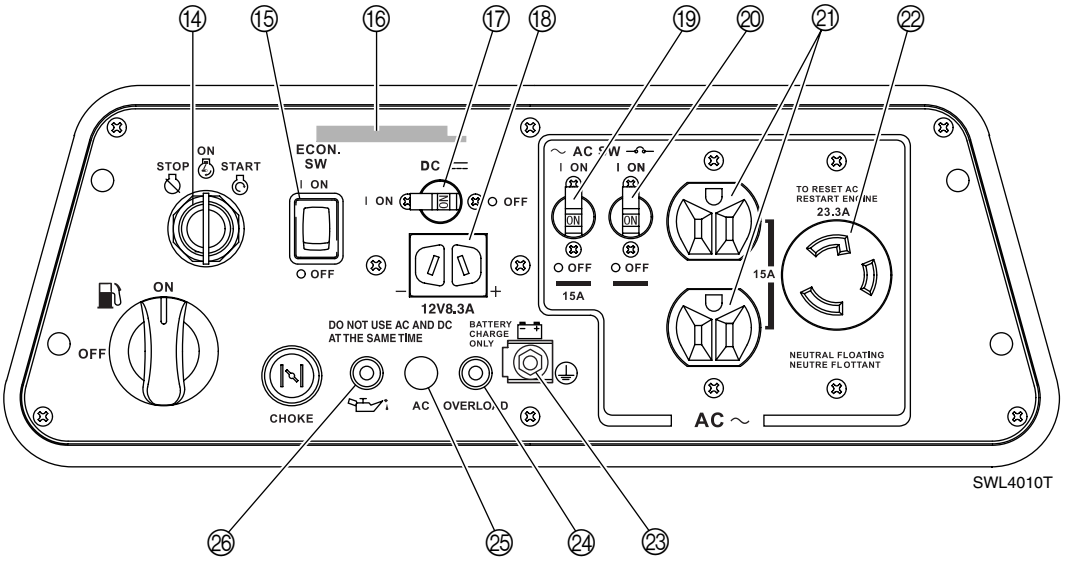


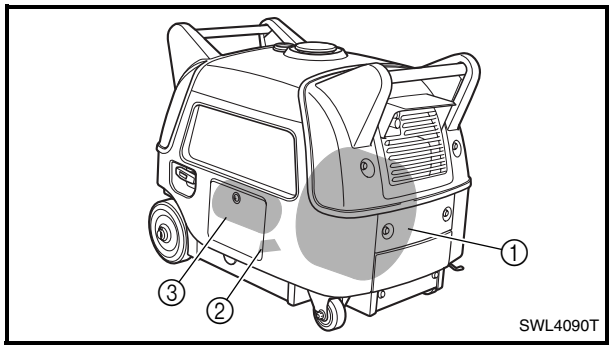
ELECTRICAL

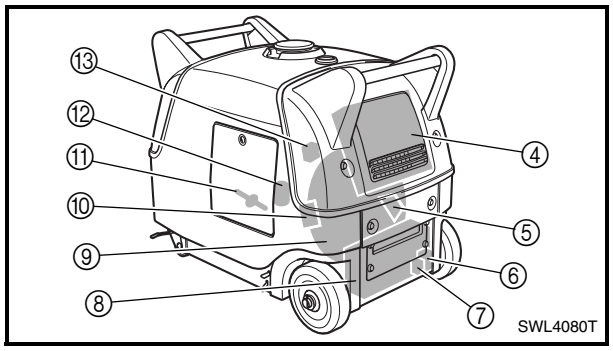
ELECTRICAL COMPONENTS

120 V-60 Hz

① Generator assembly
② Oil level switch
③ Starter motor
④ Control unit
⑤ Charging coil
⑥ Starter relay
⑦ Rectifier
⑧ Battery
⑨ Flywheel magneto
⑩ TCI unit
⑪ Spark plug
⑫ Throttle control motor
⑬ DC rectifier
⑭ Main switch
⑮ Economy switch
⑯ Engine speed limiter/oil level warning unit
⑰ DC circuit breaker
⑱ DC receptacle (12 V, 8.3 A)
⑲ AC switch (NFB) (15 A)
⑳ AC switch (NFB) (23.5 A)
㉑ AC receptacle (15 A × 2)
㉒ AC receptacle (23.3 A)
㉓ Ground terminal
㉔ Overload warning light (Red)
㉕ Pilot light (Green)
㉖ Oil level warning light (Red)

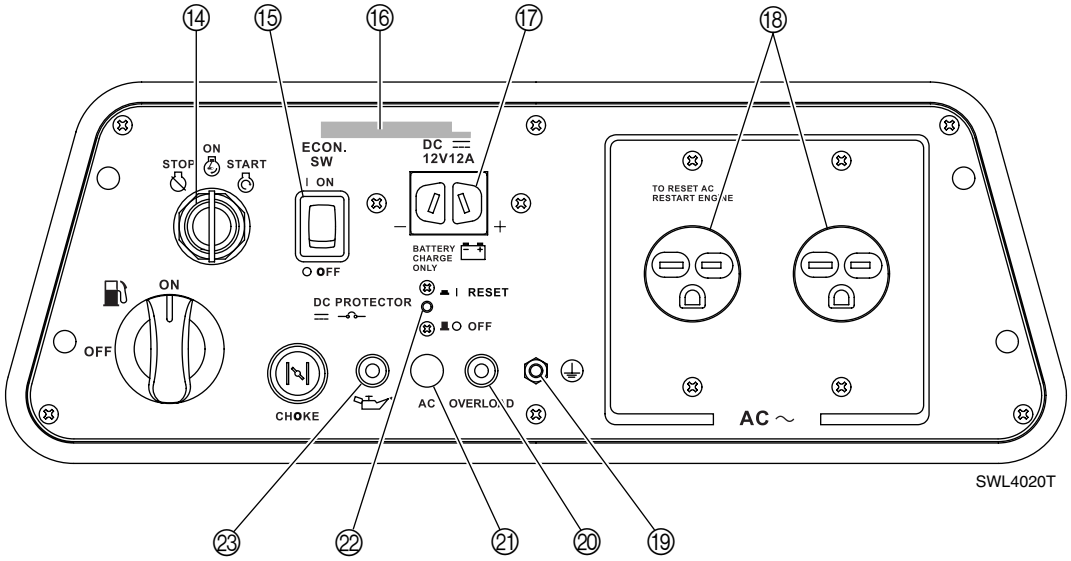


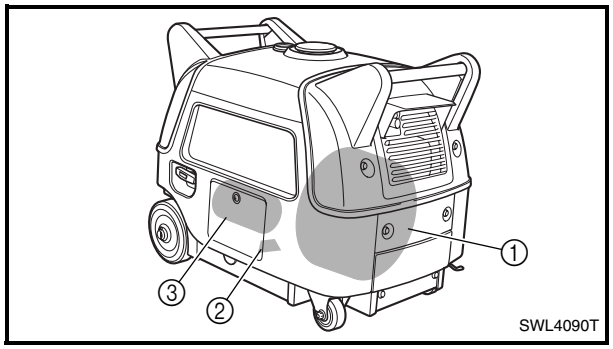


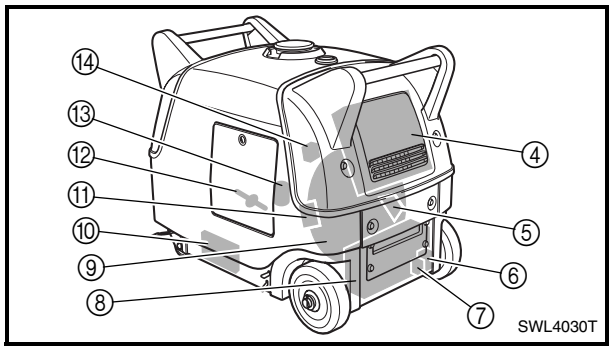


220 V-50 Hz

① Generator assembly
② Oil level switch
③ Starter motor
④ Control unit
⑤ Charging coil
⑥ Starter relay
⑦ Rectifier
⑧ Battery
⑨ Flywheel magneto
⑩ TCI unit
⑪ Spark plug
⑫ Throttle control motor
⑬ DC rectifier
⑭ Main switch
⑮ Economy switch
⑯ Engine speed limiter/oil level warning unit
⑰ DC receptacle (12 V, 12 A)
⑱ AC receptacle (15 A × 2)
⑲ Ground terminal
⑳ Overload warning light (Red)
㉑ Pilot light (Green)
㉒ DC circuit breaker
㉓ Oil level warning light (Red)

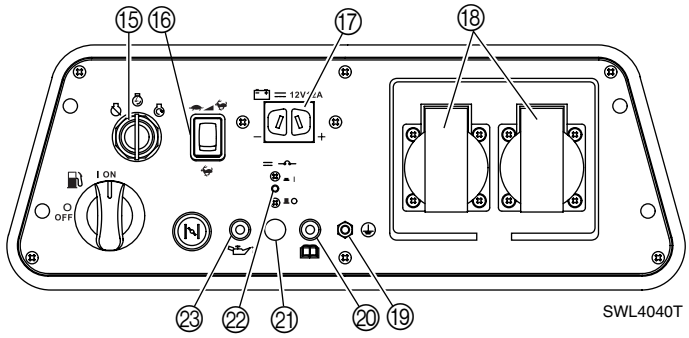


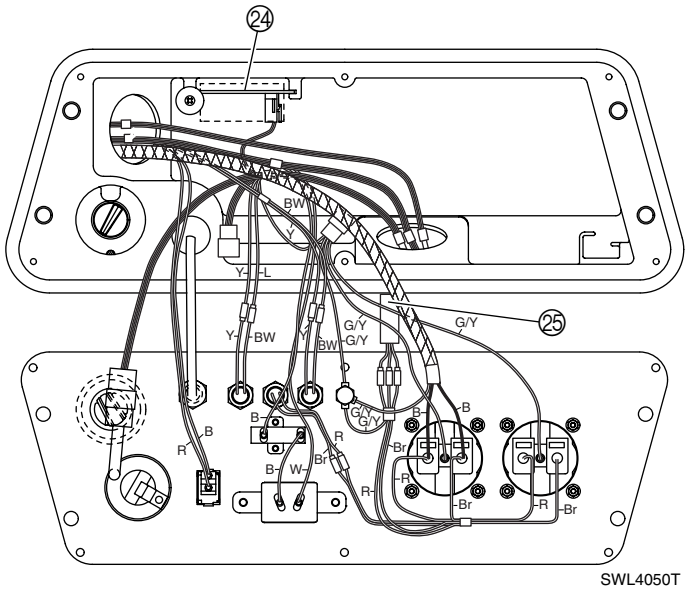


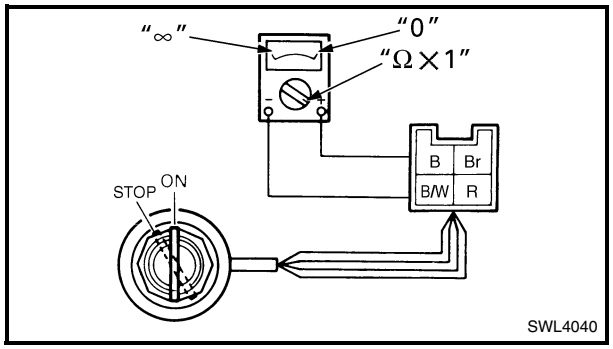


230 V-50 Hz

① Generator assembly
② Oil level switch
③ Starter motor
④ Control unit
⑤ Charging coil
⑥ Starter relay
⑦ Rectifier
⑧ Battery
⑨ Flywheel magneto
⑩ Noise filter 1
⑪ TCI unit
⑫ Spark plug
⑬ Throttle control motor
⑭ DC rectifier
⑮ Main switch
⑯ Economy switch
⑰ DC receptacle (12 V, 12 A)
⑱ AC receptacle (16 A × 2)
⑲ Ground terminal
⑳ Overload warning light (Red)
㉑ Pilot light (Green)
㉒ DC circuit breaker
㉓ Oil level warning light (Red)
㉔ Engine speed limiter/oil level warning unit
㉕ Noise filter 2







SWITCHES

CHECKING SWITCH CONTINUITY

Use a tester to check the terminals for continuity. If the continuity is faulty at any point, replace the switch.

Pocket tester:
YU-03112-C, 90890-03112

NOTE:

- Set the pocket tester to "0" before starting a test.
- When testing the switch for continuity the pocket tester should be set to the "Ω × 1" range.
- When checking a switch turn it on and off a few times.

IGNITION SYSTEM

TROUBLESHOOTING CHART

NO SPARK OR WEAK SPARK

Inspection steps:

1. Oil level
2. Spark plug
3. Ignition spark gap
4. Spark plug cap
5. TCI unit coil resistance
6. Main switch
7. Oil level switch
8. Air gap between TCI unit and flywheel magneto
9. Wire harness (ignition system)

NOTE:

- Remove the following part(s) before troubleshooting.
  1) Panel 4
  2) Fuel tank
  3) Control panel
  4) Flywheel magneto
  5) Crankcase cover
- Use the following special tool(s) for troubleshooting.

Pocket tester:
YU-03112-C, 90890-03112

Dynamic spark tester:
YM-34487
Ignition checker:
90890-06754

1. Oil level
- Check the oil level.
  Refer to "OIL LEVEL CHECKING" in CHAPTER 2.

OUT OF SPECIFICATION → Add oil.

MEETS SPECIFICATION ↓

2. Spark plug
- Check the spark plug condition.
  Refer to "SPARK PLUG" in CHAPTER 2.

NO GOOD → Repair or replace the spark plug.

GOOD ↓

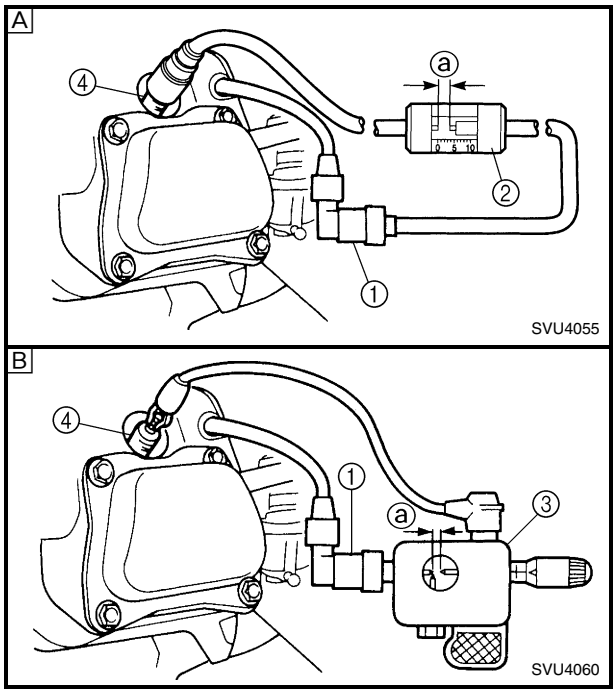
*

*

3. Ignition spark gap
- Disconnect the spark plug cap ① from the spark plug.
- Connect the dynamic spark tester ② or ignition checker ③ as shown.

Spark plug cap ① → Dynamic spark tester or ignition checker
Dynamic tester lead or ignition checker lead → Spark plug ④

A For USA and Canada
B Except for USA and Canada



- Crank the engine and measure the ignition spark gap ⓐ.

Minimum spark gap:
7 mm (0.28 in) or more

MEETS SPECIFICATION

OUT OF SPECIFICATION OR NO SPARK

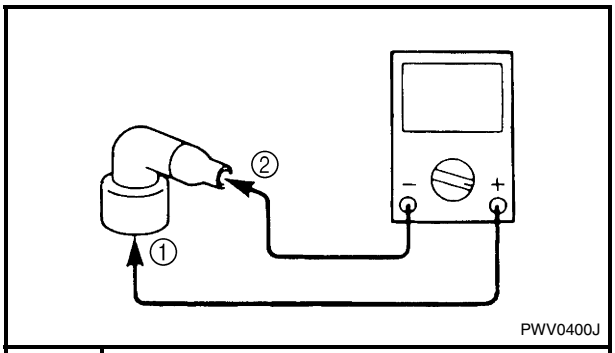
*

The ignition system is good.

*

4. Spark plug cap
- Remove the spark plug cap.
- Connect the pocket tester (Ω × 1k) to the spark plug.

Tester positive lead →
Spark plug end ①
Tester negative lead →
Spark plug lead end ②



Spark plug cap resistance:
3.8 ~ 6.3 kΩ at 20 °C (68 °F)

OUT OF SPECIFICATION

Replace the spark plug cap.

MEETS SPECIFICATION

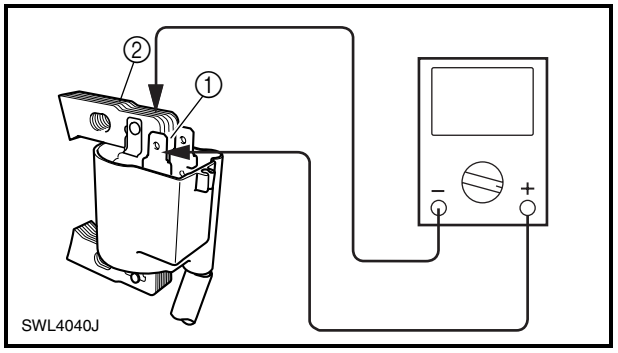
NOTE:
- Do not pull out the plug cap from the spark plug lead.
- Remove → Turn the plug cap counterclockwise.
- Install → Turn the plug cap clockwise.
- Inspect the spark plug lead for cracks or deterioration when installing the pug cap.
- Cut 5 mm off the end of the spark plug lead, and then connect it to the plug cap.

5. TCI unit coil resistance
- Remove the TCI unit.

1) Primary coil resistance
- Connect the pocket tester (Ω × 1) to the primary terminal.

Tester positive lead →
Black/White terminal ①
Tester negative lead → Core ②

Primary coil resistance:
0.5 Ω ± 20% at 20 °C (68 °F)



OUT OF SPECIFICATION

Replace the TCI unit.

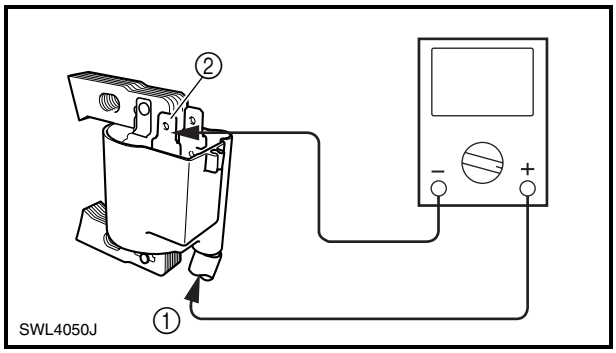
MEETS SPECIFICATION

*

*

2) Secondary coil resistance
- Connect the pocket tester (Ω × 1k) to the secondary terminal.

Tester negative lead →
Spark plug lead ①
Tester negative lead →
Black/White terminal ②



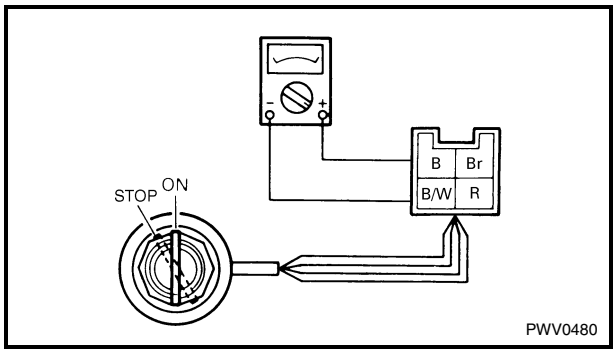
Secondary coil resistance:
11.5 kΩ ± 20% at 20 °C (68 °F)

OUT OF SPECIFICATION

MEETS SPECIFICATION

Replace the TCI unit.

6. Main switch
- Disconnect the main switch coupler.
- Connect the pocket tester (Ω × 1) to the main switch.



CONTINUITY

- Turn the main switch "ON" " " and check the main switch black and black/white for continuity.

NO CONTINUITY

- Turn the main switch "STOP" " " and check the main switch black and black/white for continuity.

NO CONTINUITY

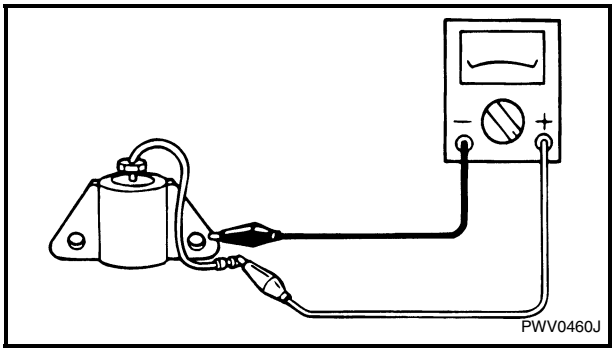
CONTINUITY

*

Replace the main switch.

*

7. Oil level switch
- Remove the oil level switch from the bottom of the crankcase.
  Refer to "CRANKCASE COVER AND CAMSHAFT" in CHAPTER 3.
- Connect the pocket tester ($\Omega \times 1$) to the oil level switch for continuity.



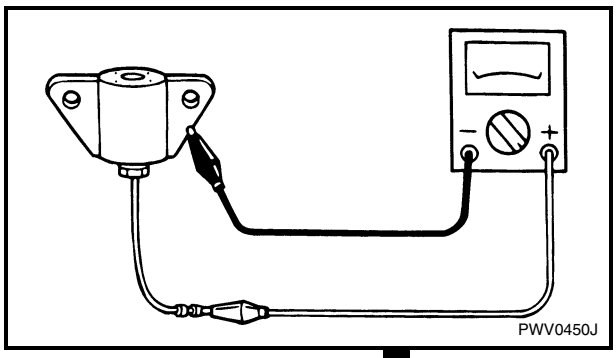
CONTINUITY

8. Air gap between TCI unit and flywheel magneto
- Measure the air gap between the magnet portion of the TCI unit and flywheel magneto.
  Refer to "AIR GAP BETWEEN TCI UNIT AND FLYWHEEL MAGNETO" in CHAPTER 2.

Air gap between TCI unit and flywheel magneto:
0.5 ± 0.1 mm (0.020 ± 0.004 in)

GOOD

*



NO CONTINUITY

CONTINUITY

Replace the oil level switch.

OUT OF SPECIFICATION

Adjust the air gap between the TCI unit and flywheel magneto.

*

9. Wire harness (ignition system)
- Check the terminal of the connector for contamination or rust, and the connector for proper connection.

DISCONNECTED

Correct or replace the connector.

GOOD

Replace the flywheel magneto.

GOOD

Replace the TCI unit.

GOOD

Replace the engine speed limiter/oil level warning unit.

ELECTRIC STARTING SYSTEM

TROUBLESHOOTING CHART

THE STARTER MOTOR DOES NOT OPERATE

Inspection steps:

1. Fuse
2. Battery voltage
3. Starter motor
4. Starter relay
5. Main switch
6. Wire harness (electric starting system)

NOTE:

- Remove the following part(s) before troubleshooting.
  1) Battery bracket
  2) Control panel
  3) Fuel tank
- Use the following special tool(s) for troubleshooting.

Pocket tester:
YU-03112-C, 90890-03112

Inductive self-powered tachometer:
YU-8036-B
Engine tachometer:
90890-03113
(90793-80009, 90793-80032)

1. Fuse
- Remove the fuse.
- Connect the pocket tester ($\Omega \times 1$) to the fuse.
- Check the fuse for continuity.

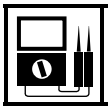
NO CONTINUITY →

Replace the fuse.

CONTINUITY ↓

2. Battery voltage
- Connect the pocket tester (DC 20 V) to the battery terminals.
- Measure battery voltage.

Tester positive lead → positive terminal
Tester negative lead → negative terminal



Battery voltage:
12.8 V or more

OUT OF SPECIFICATION →

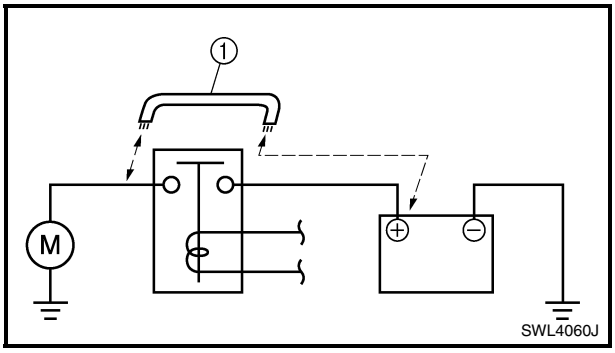
- Clean the battery terminals.
- Recharge or replace the battery.

GOOD ↓

*

*

3. Starter motor
- Connect the jumper lead ① to the starter relay terminals on the battery end and the starter motor end.



- Check the starter motor operation.

MOVES

4. Starter relay
- Disconnect the starter relay from the coupler.
- Connect the jumper lead to the starter relay and the battery terminals.

Battery positive terminal → pink ①
Battery negative terminal → green ②

Battery positive terminal → red/white ③
Battery negative terminal → green/yellow ④

A 120 V-60 Hz
B 220 V-50 Hz, 230 V-50 Hz

- Connect the pocket tester (Ω × 1) to check the starter relay terminals for continuity.

Tester positive probe → red ⑤
Tester negative probe → red ⑥

CONTINUITY

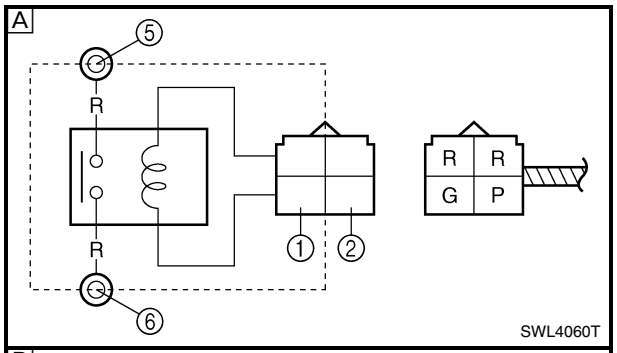
*

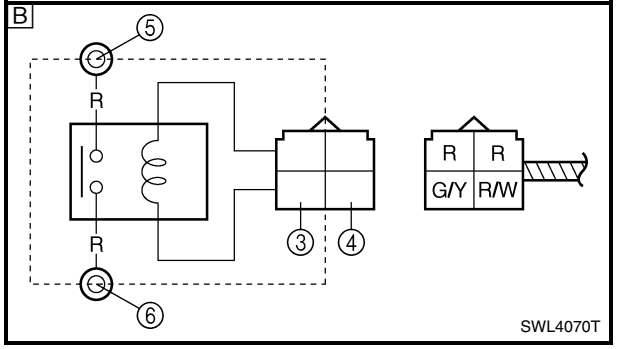
DOES NOT MOVE

Repair and/or replace the starter motor.

⚠ WARNING

- **A wire that is used as a jumper lead must have the equivalent capacity or more as that of the battery lead, otherwise the jumper lead may burn.**
- **This check is likely to produce sparks, so be sure that no flammable gas or fluid is in the vicinity.**





NO CONTINUITY

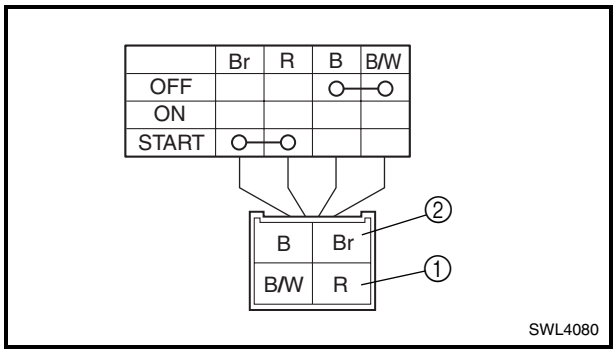
Replace the starter relay.

*

5. Main switch
- Disconnect the main switch coupler.
- Connect the pocket tester (Ω × 1) to the main switch.

Tester positive probe → red ①
Tester negative probe → brown ②

- Turn the main switch to "START" " " and check the main switch for continuity.



NO CONTINUITY

Replace the main switch.

CONTINUITY

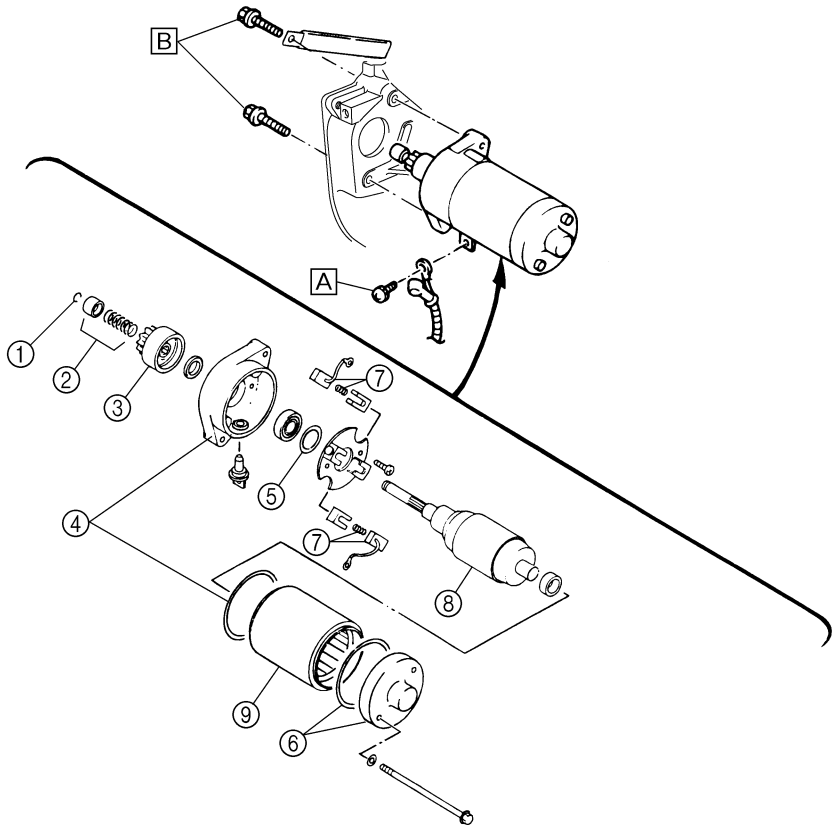
6. Wire harness (electric starting system)
- Check the terminal of the connector for contamination or rust, and the connector for proper connection.

DISCONNECTED

Correct or replace the connector.

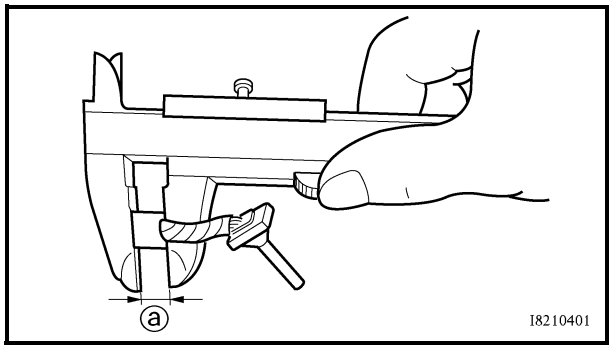
STARTER MOTOR

A: 4.0 Nm (0.4 m · kg, 2.9 ft · lb)
B: 10 Nm (1.0 m · kg, 7.2 ft · lb)



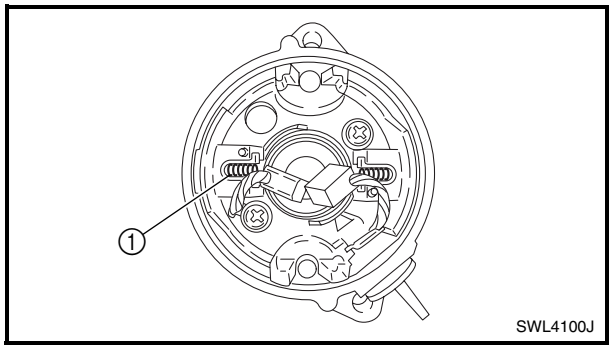
SWL4090

Order	Job name/Part name	Q'ty	Remarks
	Starter motor disassembly		Remove the parts in the order listed below.
	Flywheel magneto		Refer to "RECOIL STARTER AND FLYWHEEL MAGNETO" in CHAPTER 3.
①	Stop ring	1	
②	Spring holder/spring	1/1	
③	Overrun clutch	1	
④	Front bracket/gasket	1/1	
⑤	Washer	1	
⑥	Rear bracket/gasket	1/1	
⑦	Brush/brush spring	2/2	
⑧	Armature coil	1	
⑨	Yoke	1	
			For assembly, reverse the disassembly procedure.



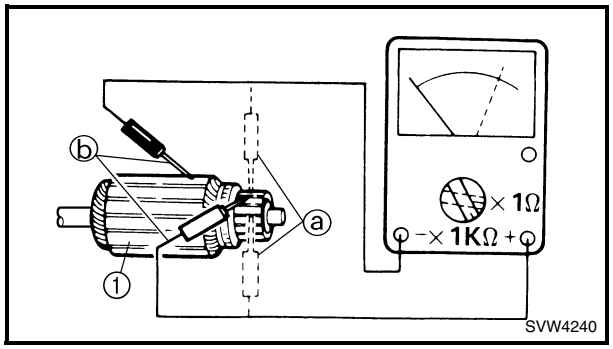
1. Measure:
   • Brush length ⓐ
   Out of specification → Replace the brushes as a set.

Brush length:
10 mm (0.39 in)
Wear limit:
3.5 mm (0.14 in)



2. Measure:
   • Brush spring force ①
   Out of specification → Replace the brush springs as a set.

Brush spring force:
5.5 ~ 8.3 N
(550 ~ 830 gf, 12.1 ~ 18.3 lb)

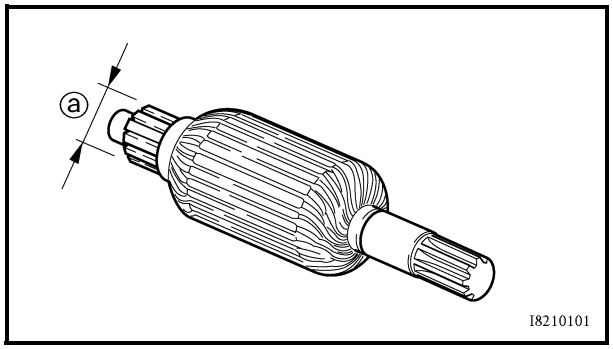


3. Measure:
   • Armature coil (insulation/continuity)
   Defects → Replace the starter motor.

Insulation resistance:
More than 1 MΩ at 20 °C (68 °F)

ⓐ Continuity check
ⓑ Insulation check
① Armature coil

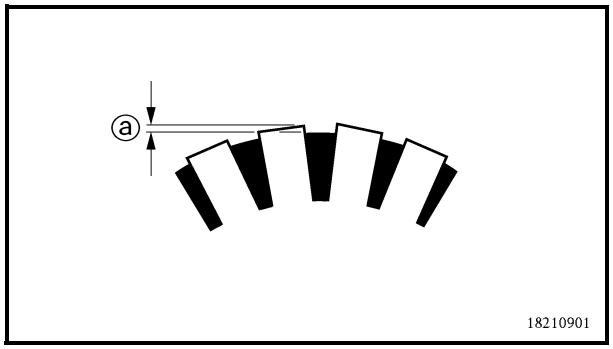
4. Inspect:
   • Commutator
   Dirt → Clean it with #600 grit sandpaper.



5. Measure:
   • Commutator diameter ⓐ

Commutator diameter:
22 mm (0.87 in)
Wear limit:
21 mm (0.83 in)

Out of specification → Replace the starter motor.



6. Measure:
   - Mica undercut ⓐ
     Out of specification → Scrape the mica to the proper measurement with a hack-saw blade that has been grounded to fit the commutator.

Mica undercut:
1.5 mm (0.06 in)

NOTE:
The mica of the commutator must be undercut to ensure proper operation of the commutator.

CHARGING SYSTEM

TROUBLESHOOTING CHART

THE BATTERY IS NOT CHARGED

Inspection steps:

1. Fuse
2. Battery voltage
3. Charging voltage
4. Charging coil resistance
5. Rectifier
6. Wire harness (charging system circuit)

NOTE:

- Remove the following part(s) before troubleshooting.
  1) Battery bracket
  2) Fuel tank
- Use the following special tool(s) for troubleshooting.

Pocket tester:
YU-03112-C, 90890-03112

Inductive self-powered tachometer:
YU-8036-B
Engine tachometer:
90890-03113
(90793-80009, 90793-80032)

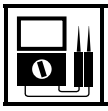
1. Fuse
- Remove the fuse.
- Connect the pocket tester ($\Omega \times 1$) to the fuse.
- Check the fuse for continuity.

NO CONTINUITY → Replace the fuse.

CONTINUITY ↓

2. Battery voltage
- Connect the pocket tester (DC 20 V) to the battery terminals.
- Measure battery voltage.

Tester positive lead → positive terminal
Tester negative lead → negative terminal



Battery voltage:
12.8 V or more

OUT OF SPECIFICATION →
- Clean the battery terminals.
- Recharge or replace the battery.

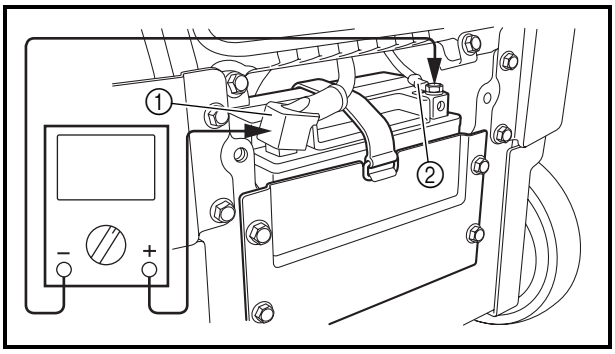
GOOD ↓

*

*

3. Charging voltage
- Start the engine.
- 3,800 r/min (no load)
- Measure the charging voltage.

Tester positive lead →
positive terminal ①
Tester negative lead →
negative terminal ②



Charging voltage:
12 ~ 16 V

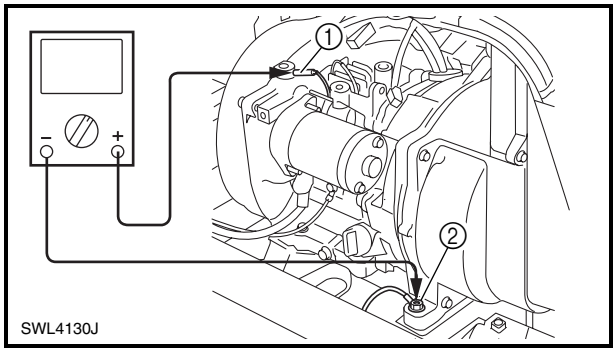
MEETS SPECIFICATION

OUT OF SPECIFICATION

Properly connect the charging system.

4. Charging coil resistance
- Disconnect the charging coil connector.
- Connect the pocket tester (Ω × 1) to the charging coil.

Tester positive lead → White terminal ①
Tester negative lead → Ground ②



Charging coil resistance:
White-Ground:
0.35 Ω ± 20% at 20 °C (68 °F)

OUT OF SPECIFICATION

GOOD

Replace the charging coil.

*

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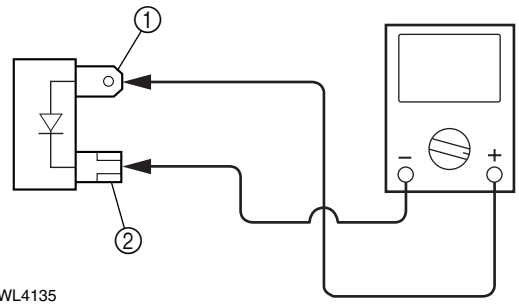
5. Rectifier
- Disconnect the rectifier connector.
- Connect the pocket tester (Ω × 1) to the rectifier.
- Check the rectifier for continuity.

Normal

Tester positive lead → White ① Tester negative lead → Red ②	**Continuity**
Tester positive lead → Red ② Tester negative lead → White ①	**No Continuity**



NO CONTINUITY

Replace the rectifier.

CONTINUITY

6. Wire harness (charging system)
Check the terminal of the connector for contamination or rust, and the connector for proper connection.

DISCONNECTED

Correct or replace the connector.

GENERATOR SYSTEM

TROUBLESHOOTING CHART

WEAK OR NO AC CURRENT

Start the engine.
Check the overload warning light.

DOES NOT TURN ON	TURNS ON

→ Disconnect the overloaded electric device.

TURNS ON	DOES NOT TURN ON

Start the engine.
Check the AC output indicator.

TURNS ON	DOES NOT TURN ON

→ Replace the AC output indicator.

Rated engine speed inspection

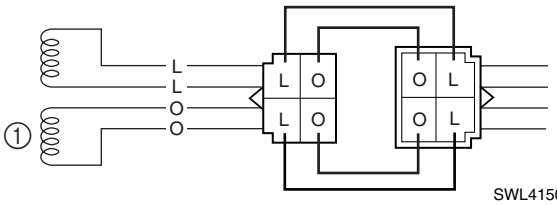
Operate the engine with no load.
Set the economy switch to "OFF" " ".
3,550 r/min

GOOD	OUT OF SPECIFICATION

→ Check the throttle control system.
Refer to "THROTTLE CONTROL SYSTEM" in CHAPTER 3.

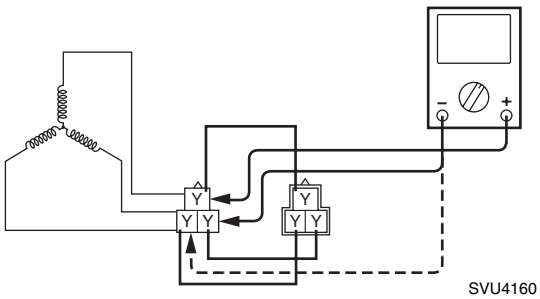
Main coil AC voltage inspection

Disconnect the subcoil coupler ①.
Connect the Blue leads, and then connect the Orange leads.



SWL4150

Disconnect the main coil coupler.
Start the engine.
Connect the tip of the probe of pocket tester to the Yellow leads.
Measure the voltage. (Tester range: AC 300 V)



SVU4160

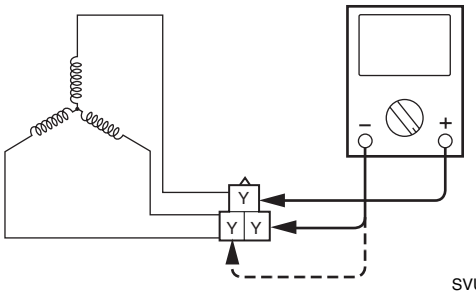
Main coil AC voltage:
200 ~ 250 V (120 V-60 Hz)
380 ~ 470 V
(220 V-50 Hz, 230 V-50 Hz)

GOOD	TOO LOW
	DOES NOT GENERATE

→ Magnetic force is weak.
→ Replace the generator assembly.

Main coil resistance measurement

Stop the engine.
Measure the resistance between the Yellow leads.
(Tester range: Ω × 1)



SVU4170

Main coil resistance:
0.79 Ω ± 20% at 20 °C (68 °F)
(120 V-60 Hz)
2.46 ± 20% at 20 °C (68 °F)
(220 V-50 Hz, 230 V-50 Hz)

GOOD	DISCONNECTED/ SHORT CIRCUIT

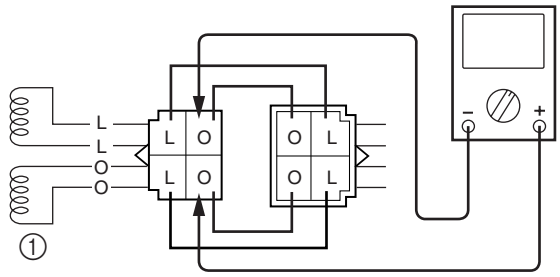
→ Replace the generator assembly.

*

*

Subcoil AC voltage inspection

Start the engine.
Measure the voltage between the Orange leads of the subcoil ①.



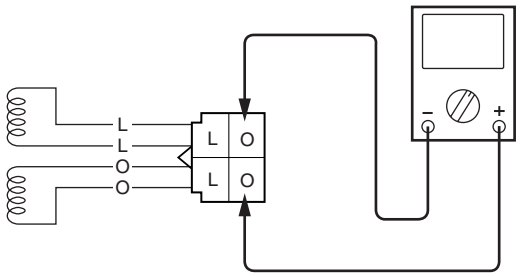
Subcoil AC voltage:
13.5 ~ 23.0 V

GOOD	TOO LOW
	DOES NOT GENERATE

TOO LOW → Magnetic force is weak.
→ Replace the generator assembly.

DOES NOT GENERATE → **Subcoil resistance inspection**

Stop the engine.
Measure the resistance between the Orange to Orange lead. (Tester range: Ω × 1)



Subcoil resistance:
0.17 Ω ± 20% at 20 °C (68 °F)

GOOD	DISCONNECTED/ SHORT CIRCUIT

→ Replace the generator assembly.

GOOD → **Economy switch continuity inspection**

Switch "ON" " " → Continuity
Switch "OFF" " " → No Continuity

GOOD	DISCONNECTED

→ Replace the economy switch.

GOOD → **Wire harness inspection**

Check the terminal of the connector for contamination or rust, and the connector for proper connection.

GOOD	DISCONNECTED

→ Connect or replace the connector.

GOOD → Replace the control unit.

WEAK OR NO DC CURRENT

DC circuit breaker inspection

Check the DC circuit breaker for continuity with the DC circuit breaker set to "RESET" " ".

CONTINUITY	NO CONTINUITY

→ Replace the DC circuit breaker.

↓

Start the engine.
Check the AC output indicator.

TURNS ON	DOES NOT TURN ON

→ Replace the AC output indicator.

↓

Rated engine speed inspection

Operate the engine with no load.
Set the economy switch to "OFF" " ".
3,550 r/min

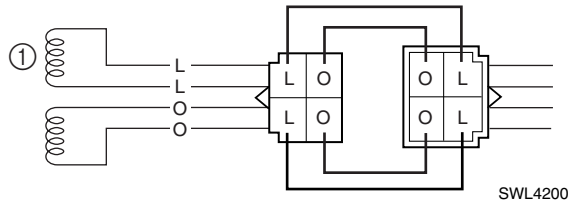
GOOD	OUT OF SPECIFICATION

→ Check the throttle control system.
Refer to "THROTTLE CONTROL SYSTEM" in CHAPTER 3.

↓

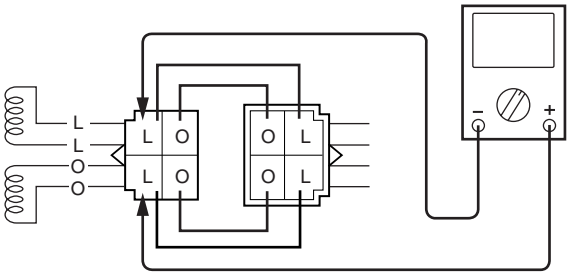
Subcoil AC voltage inspection

Disconnect the subcoil coupler ①.
Connect the Blue leads, and then connect the Orange leads.



SWL4200

Start the engine.
Connect the tip of the probe of pocket tester to the Blue leads.
Measure the voltage. (Tester range: AC 120 V)



SWL4210

Subcoil AC voltage:
13.5 ~ 23.0 V

GOOD	TOO LOW
	DOES NOT GENERATE

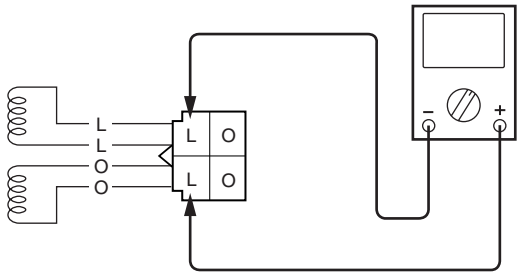
→ Magnetic force is weak.

↓

Replace the generator assembly.

Subcoil resistance measurement

Stop the engine.
Measure the resistance between the Blue leads.
(Tester range: Ω × 1)



SWL4220

Subcoil resistance:
0.07 Ω ± 20% at 20 °C (68 °F)

GOOD	DISCONNECTED/ SHORT CIRCUIT

↓

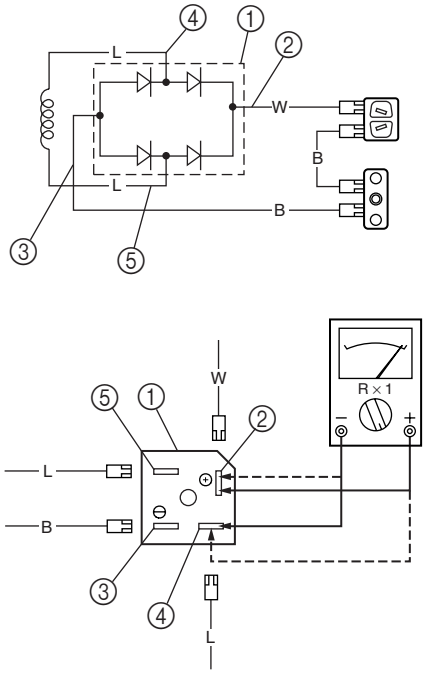
Replace the generator assembly.

↓

*

*

DC rectifier continuity inspection		
Disconnect the rectifier ① leads. Connect the pocket tester (Ω × 1).		
Check for continuity at the following points:		
Pocket tester connecting point		Tester needle moves
(+) Red	(–) Black	
White terminal ②	Blue terminal ④	YES
Blue terminal ④	White terminal ②	NO
White terminal ②	Blue terminal ⑤	YES
Blue terminal ⑤	White terminal ②	NO
Black terminal ③	Blue terminal ④	NO
Blue terminal ④	Black terminal ③	YES
Black terminal ③	Blue terminal ⑤	NO
Blue terminal ⑤	Black terminal ③	YES



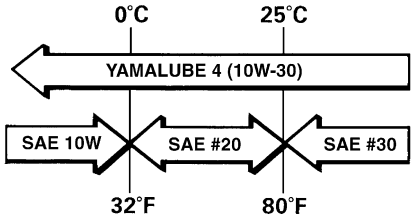
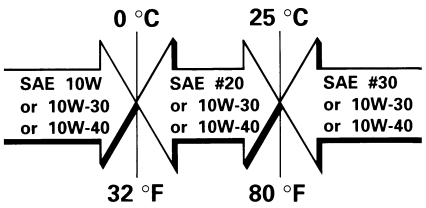
SWL4420

CONTINUITY	NO CONTINUITY	→ Replace the DC rectifier.

Wire harness inspection
Check the terminal of the connector for contamination or rust, and the connector for proper connection.

SPECIFICATIONS

GENERAL SPECIFICATIONS

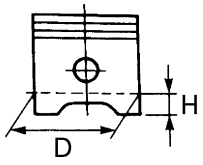
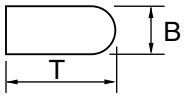
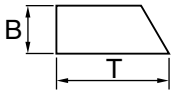
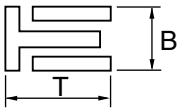
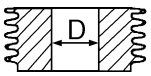
Unit		EF3000iSE
Model code number		7WL2/7WL3
Dimensions:		
Overall length	mm (in)	680 (26.8)
Overall width	mm (in)	445 (17.5)
Overall height	mm (in)	555 (21.9)
Dry weight	kg (lb)	67 (147.7) (120 V-60 Hz, 220 V-50 Hz) 68 (149.9) (230 V-50 Hz)
Engine:		
Engine type		4-stroke, OHV, forced air cooled
Cylinder arrangement		1
Displacement	L (cm^3)	0.171 (171)
Bore × Stroke	mm (in)	66.0 × 50.0 (2.60 × 1.97)
Compression ratio		8.5:1
Standard compression pressure	kPa (kg/cm^2, psi)	400 ~ 600 (4 ~ 6, 57 ~ 85)
Rated output	50 Hz · kW (PS)/3,800 r/min	3.5 (4.7)
	60 Hz · kW (PS)/3,800 r/min	3.5 (4.7)
Operating hours	50 Hz · Hrs	
1/4 load (economy switch is on)		20.5
Rated load (economy switch is on)		8.0
	60 Hz · Hrs	
1/4 load (economy switch is on)		20.5
Rated load (economy switch is on)		8.0
Fuel		Unleaded regular gasoline
Fuel tank capacity	L (Imp gal, US gal)	13.0 (2.86, 3.43)
Engine oil quantity	L (Imp qt, US qt)	0.6 (0.53, 0.63)
Engine oil grade		4-stroke engine oil API service classification SE or SF, if not available, SD (For Canada)  (Except for Canada) 

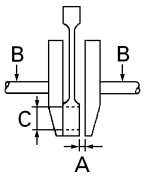
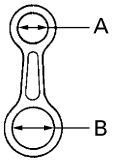
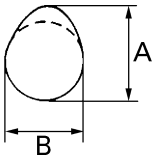
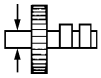
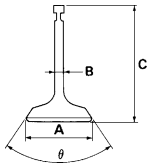
Unit		EF3000iSE
Electrical:		
Ignition system		TCI
Spark plug type		BPR4ES (NGK)
Gap	mm (in)	0.7 ~ 0.8 (0.028 ~ 0.031)
Generator:		
Type		Multi pole rotating field magnet
Initial excitation		Permanent magnet
Driving method		Direct connection
Rated power factor		1.0
Frequency variation		
Instantaneous		Less than 1%
Settling		Less than 0.1%
Settling time		Less than 1 sec
Voltage fluctuation		
Instantaneous		Less than 20%
Settling		Less than 3%
Settling time		Less than 2 sec
AC output		
Rated voltage	V	120 (120 V-60 Hz) 220 (220 V-50 Hz) 230 (230 V-50 Hz)
Frequency	Hz	50 (220 V-50 Hz, 230 V-50 Hz) 60 (120 V-60 Hz)
Rated output	kVA	2.8
Rated current	A	23.3 (120 V-60 Hz) 12.7 (220 V-50 Hz) 12.2 (230 V-50 Hz)
DC output		
Rated voltage	V	12
Rated current	A	8.3 (120 V-60 Hz) 12 (220 V-50 Hz, 230 V-50 Hz)
Safety device type	AC	Electronic no fuse breaker
	DC	Circuit breaker (No fuse breaker)
Engine speed (no load)	r/min	3,550
Rated engine speed	r/min	3,800
Economy engine speed (no load)	r/min	2,800 ± 50
Voltage regulation		Voltage feed back system
Voltage stability		Within ± 4%
Frequency stability	Hz	Within ± 1.0
Rotating speed control		Throttle motor control type
Wave distortion ratio		Less than 2.5%

Unit		EF3000iSE
Number of phase		
AC output (main coil)		Three phase
DC output (subcoil)		Single phase
Insulation resistance	MΩ	Over 10
Insulation type		B type
Receptacle	AC	15 A (Duples) × 1, 23.3 A × 1 (120 V-60 Hz) 15 A × 2 (220 V-50 Hz) 16 A × 2 (230 V-50 Hz)
	DC	12 A × 1 (220 V-50 Hz, 230 V-50 Hz) 8.3 A × 1 (120 V-60 Hz)

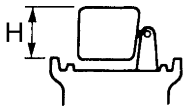
MAINTENANCE SPECIFICATIONS

ENGINE

Unit	EF3000iSE
Piston: mm (in)	
Piston clearance 	0.015 ~ 0.040 (0.00059 ~ 0.00157)
<Limit>	0.15 (0.00591)
Piston skirt "D"	65.975 ~ 65.990 (2.5974 ~ 2.5980)
<Limit>	65.9 (2.5945)
Measuring point "H"	10.0 (0.4)
Oversize 1st	66.225 ~ 66.240 (2.6072 ~ 2.6079)
2nd	66.475 ~ 66.490 (2.6171 ~ 2.6177)
Piston pin hole inside diameter	16.002 ~ 16.013 (0.6300 ~ 0.6304)
<Limit>	16.043 (0.6316)
Piston pin: mm (in)	
Piston pin diameter	15.995 ~ 16.000 (0.6297 ~ 0.6299)
<Limit>	16.043 (0.6316)
Piston ring: mm (in)	
Top ring 	
Type	Barrel face
Dimensions "B × T"	1.5 × 2.7 (0.0591 × 0.1063)
End gap	0.20 ~ 0.40 (0.0079 ~ 0.0157)
<Limit>	0.65 (0.0256)
Side clearance	0.04 ~ 0.08 (0.0016 ~ 0.0031)
<Limit>	0.13 (0.0051)
2nd ring 	
Type	Taper
Dimensions "B × T"	1.5 × 2.7 (0.0591 × 0.1063)
End gap	0.20 ~ 0.40 (0.0079 ~ 0.0157)
<Limit>	0.75 (0.0295)
Side clearance	0.02 ~ 0.06 (0.0008 ~ 0.0024)
<Limit>	0.12 (0.0047)
Oil ring 	
Type	Solid
Dimensions "B × T"	2.5 × 2.8 (0.0984 × 0.1102)
End gap	0.20 ~ 0.70 (0.0079 ~ 0.0276)
<Limit>	0.9 (0.0354)
Cylinder head: mm (in)	
Warpage limit	0.05 (0.0020)
Cylinder: mm (in)	
Inside diameter "D" 	66.005 ~ 66.015 (2.5986 ~ 2.5990)
<Limit>	66.020 (2.5992)
Taper limit	0.05 (0.0020)

Unit		EF3000iSE
Crankshaft:	mm (in)	
Big end side clearance "A"		0.2 ~ 0.6 (0.0079 ~ 0.0236)
<Limit>		0.8 (0.0315)
Runout "B"		
<Limit>		0.02 (0.0008)
Crankshaft pin diameter "C"		27.969 ~ 27.984 (1.1011 ~ 1.1017)
<Limit>		27.9 (1.0984)
Connecting rod:	mm (in)	
Small end diameter "A"		16.006 ~ 16.020 (0.6302 ~ 0.6307)
Oil clearance		0.007 ~ 0.018 (0.0003 ~ 0.0007)
Big end diameter "B"		28.000 ~ 28.015 (1.1024 ~ 1.1030)
Oil clearance		0.015 ~ 0.040 (0.0006 ~ 0.0016)
<Limit>		0.1 (0.0039)
Camshaft:	mm (in)	
Camshaft outside diameter		
Cam dimension		IN: 26.9 ± 0.05 (1.059 ± 0.002) / EX: 26.68 ± 0.05 (1.050 ± 0.002)
"A"		
"B"		IN: 22.0 ±0.05 (0.866 ± 0.002) / EX: 22.025 ± 0.05 (0.867 ± 0.002)
Camshaft journal		14.965 ~ 14.990 (0.5892 ~ 0.5902)
<Limit>		14.950 (0.5886)
Valve:	mm (in)	
Valve		
Face diameter "A"	IN 	23.9 ~ 24.1 (0.9409 ~ 0.9488)
	EX	21.9 ~ 22.1 (0.8622 ~ 0.8701)
Stem diameter "B"	IN	5.448 ~ 5.463 (0.2145 ~ 0.2151)
	EX	5.440 ~ 5.445 (0.2142 ~ 0.2144)
<Limit>	IN	5.418 (0.2133)
	EX	5.410 (0.2130)
Stem length "C"	IN	65.9 (2.59)
	EX	66.2 (2.61)
Valve face contact width "D"	IN 	0.9 ~ 1.1 (0.0354 ~ 0.0433)
	EX	0.9 ~ 1.1 (0.0354 ~ 0.0433)
<Limit>		1.6 (0.0630)
Valve stem runout limit		0.01 (0.0004)
"θ"		90°

Unit			EF3000iSE
Valve guide			
Guide inside diameter	IN		5.5 (0.22)
	EX		5.5 (0.22)
<Limit>	IN		5.4 (0.21)
	EX		5.4 (0.21)
Stem to guide clearance	IN		0.04 ~ 0.06 (0.0016 ~ 0.0024)
	EX		0.06 ~ 0.08 (0.0024 ~ 0.0031)
Valve clearance (cold)	IN		0.18 ~ 0.22 (0.007 ~ 0.009)
	EX		0.18 ~ 0.22 (0.007 ~ 0.009)
Push rod:		mm (in)	
Runout limit			0.5 (0.02)
Valve spring:		mm (in)	
Free length	IN		26.5 (1.04)
	EX		26.5 (1.04)
<Limit>	IN		25.2 (0.99)
	EX		25.2 (0.99)
Set length	IN		21.6 (0.85)
	EX		21.6 (0.85)
Set force	IN	N (kg, lb)	41.9 ~ 46.3 (4.2 ~ 4.6, 92.4 ~ 102.1)
	EX	N (kg, lb)	41.9 ~ 46.3 (4.2 ~ 4.6, 92.4 ~ 102.1)
Tilt limit		Degree/mm (in)	2.5/1.6 (0.06)
Carburetor:		mm (in)	
Type/manufacturer			BV20-15/MIKUNI
I.D. mark			7WL 00
Bore size			ø15
Main jet			#101.3
Min air jet			ø1.8
Pilot air jet			ø1.1
Pilot outlet			ø0.9
Valve seat size			ø1.8
Main nozzle			31B
Pilot jet			#37.5
Throttle valve			#150
Float height “H”			16.0 (0.63)
Throttle control motor resistance		Ω ± 7%	250



GENERATOR AND ELECTRICAL

Unit		EF3000iSE
Generator:		
Type/manufacturer		GP9823/KOKUSAN DENKI (120 V-60 Hz) GP9824/KOKUSAN DENKI (220 V-50 Hz, 230 V-50 Hz)
Main coil AC voltage (3 phase)	V	200 ~ 250 (120 V-60 Hz) 380 ~ 470 V (220 V-50 Hz, 230 V-50 Hz)
Subcoil AC voltage (single phase)	V	13.5 ~ 23.0
Coil resistance		
Main coil	Ω ± 20%	0.79 (Yellow-Yellow) (120 V-60 Hz) 2.46 (Yellow-Yellow) (220 V-50 Hz, 230 V-50 Hz)
Subcoil	Ω ± 20%	0.17 (Orange-Orange)
Subcoil	Ω ± 20%	0.07 (Blue-Blue)
Electrical:		
Ignition timing at 3,600 r/min		BTDC 23 ± 3°
TCI unit		
Primary coil resistance	Ω ± 20%	0.5
Secondary coil resistance	Ω ± 20%	11.5
Air gap between TCI unit and flywheel magneto	mm (in)	0.5 ± 0.1 (0.020 ± 0.004)
Charge coil resistance	Ω ± 20%	0.35 (white-ground)
Spark plug cap resistance	kΩ	3.8 ~ 6.3
Minimum spark gap	mm (in)	7 (0.28) or more
Battery		
Type/manufacturer		YTX12-BS/YUASA
Charging amperage and charging time	A × hr	1.2 × 5 ~ 10
Charging voltage	V	12.8 or more
Starter motor		
Brush length	mm (in)	10 (0.39)
<Limit>		3.5 (0.14)
Brush spring force	N (g, lb)	5.5 ~ 8.3 (550 ~ 830, 12.1 ~ 18.3)
Commutator diameter	mm (in)	22 (0.87)
<Limit>		21 (0.83)
Mica undercut	mm (in)	1.5 (0.06)
Fuse		
Main	A	10 × 1

LUBRICATION POINTS AND LUBRICANT TYPES

A Lubrication potions	B Lubricant type
Oil seal lips	LS
Connecting rod big end	E
Crankshaft pin	E
Crankshaft journals	E
Connecting rod bolts	E
Piston pin	E
Piston surface	E
Valve stems (intake and exhaust)	E
Valve stem ends (intake and exhaust)	M
Rocker arm shaft	E
Valve push rod ends	E
Valve push rod guides	E
Valve lifters	E
Camshaft lobes	E
Camshaft gear teeth	E
Decompressor pin	E
Camshaft journals	E
Crankcase ball bearing	E
Crankcase cover ball bearing	E

TIGHTENING TORQUE

Ⓐ Item	Ⓑ Tread size	Ⓒ Tightening torque Nm (m·kg, ft·lb)
Spark plug	M14 × 1.25	18 (1.8, 13)
Cylinder head cover	M6 × 1.0	10 (1.0, 7.2)
Cylinder head 1st 2nd	M8 × 1.25 M8 × 1.25	12 (1.2, 8.7) 20 (2.0, 14)
Valve adjuster locknut	M6 × 0.5	10 (1.0, 7.2)
Bolt (rocker arm)	M6 × 1.0	10 (1.0, 7.2)
Drain bolt	M10 × 1.25	17 (1.7, 12)
Engine	M8 × 1.25	16 (1.6, 11)
Engine mount	M8 × 1.25	16 (1.6, 11)
Ground wire lead (engine)	M6 × 1.0	7.0 (0.7, 5.1)
Ground wire lead (frame)	M6 × 1.0	7.0 (0.7, 5.1)
Crankcase cover 1st 2nd	M8 × 1.25 M8 × 1.25	12 (1.2, 8.7) 22 (2.2, 16)
Connecting rod cap	M7 × 1.0	12 (1.2, 8.7)
Muffler (nut) (bolt)	M6 × 1.0 M8 × 1.25	7.0 (0.7, 5.1) 16 (1.6, 11)
Muffler protector	M6 × 1.0	7.0 (0.7, 5.1)
Muffler band	M5 × 0.8	3.5 (0.35, 2.5)
Exhaust pipe air shroud 1	M6 × 1.0	7.0 (0.7, 5.1)
Exhaust pipe air shroud 2	M6 × 1.0	7.0 (0.7, 5.1)
Recoil starter	M6 × 1.0	7.0 (0.7, 5.1)
Drive plate	M6 × 1.0	5.4 (0.54, 3.9)
Flywheel magneto cover	M6 × 1.0	7.0 (0.7, 5.1)
Flywheel magneto nut	M14 × 1.5	65 (6.5, 47)
Generator cover	M6 × 1.0	7.0 (0.7, 5.1)
TCI unit	M6 × 1.0	10 (1.0, 7.2)
Fan	M6 × 1.0	7.0 (0.7, 5.1)
Magneto rotor	M14 × 1.5	65 (6.5, 47)
Stator coil	M6 × 1.0	10 (1.0, 7.2)
Control unit	M6 × 1.0	10 (1.0, 7.2)
Noise filter	M6 × 1.0	10 (1.0, 7.2)
Control unit cover	M6 × 1.0	10 (1.0, 7.2)
Air shroud	M6 × 1.0	10 (1.0, 7.2)
Oil level switch	M6 × 1.0	10 (1.0, 7.2)
Bracket (oil level switch)	M6 × 1.0	10 (1.0, 7.2)
Charging coil	M6 × 1.0	10 (1.0, 7.2)
Starter motor	M6 × 1.0	10 (1.0, 7.2)
Starter motor lead	M5 × 0.8	4.0 (0.4, 2.9)
Carburetor	M6 × 1.0	7.0 (0.7, 5.1)

A Item	B Tread size	C Tightening torque Nm (m·kg, ft·lb)
Choke inner cable	M4	1.0 (0.1, 0.7)
Choke outer cable	M5	3.0 (0.3, 2.2)
Choke cable	M10	2.5 (0.25, 1.8)
Throttle control motor	M3	1.0 (0.1, 0.7)
Throttle control motor bracket	M4	2.0 (0.2, 1.4)
Drain screw	M4	1.3 (0.13, 0.9)
Main nozzle	M6	2.0 (0.2, 1.4)
Main jet	M4	0.7 (0.07, 0.5)
Bracket	M5	3.5 (0.35, 2.5)
Bolt	M7	7.0 (0.7, 5.1)
Pilot jet	M6	1.7 (0.17, 1.2)
Pipe frame	M6 × 1.0	7.0 (0.7, 5.1)
Caster	M8 × 1.25	16 (1.6, 11)
Cover 1	M6 × 1.0	7.0 (0.7, 5.1)
Cover 2	M6 × 1.0	7.0 (0.7, 5.1)
Cover 3	M6 × 1.0	7.0 (0.7, 5.1)
Cover 4	M6 × 1.0	7.0 (0.7, 5.1)
Cover 5	M6 × 1.0	7.0 (0.7, 5.1)
Cover 6	M6 × 1.0	7.0 (0.7, 5.1)
Fuel tank	M6 × 1.0	7.0 (0.7, 5.1)
Panel 1	M6 × 1.0	7.0 (0.7, 5.1)
Panel 3	M6 × 1.0	7.0 (0.7, 5.1)
Battery bracket	M6 × 1.0	7.0 (0.7, 5.1)

GENERAL TORQUE SPECIFICATIONS

This chart specifies torque for standard fasteners with standard I.S.O. pitch treads. Torque specifications for special components or assemblies are included in the applicable sections of this book. To avoid warpage, tighten multi-fastener assemblies in a crisscross fashion, in progressive stages, until full torque is reached. Unless otherwise specifications call for clean, dry treads. Components should be at room temperature.

Tread size	Tightening torque		
	Nm	m·kg	ft·lb
M4	2	0.2	1.4
M5	3	0.3	2.2
M6	7	0.7	5.1
M7	10	1.0	7.2
M8	15	1.5	11
M10	30	3.0	22
M12	60	6.0	43

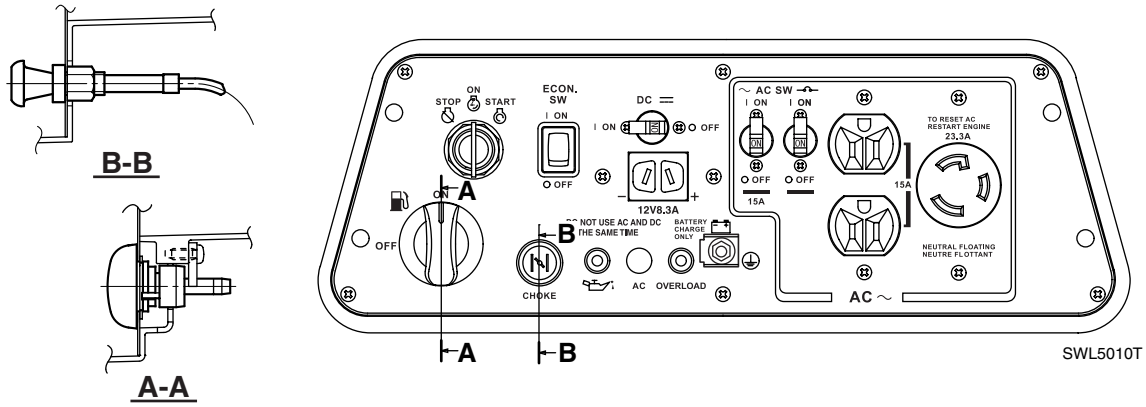
DEFINITION OF UNITS

Unit	Read	Definition	Measure
mm	Millimeter	10^{-3} meter	Length
cm	Centimeter	10^{-2} meter	Length
kg	Kilogram	10^{3} gram	Weight
N	Newton	1 kg × m/sec^2	Force
Nm	Newton meter	N × m	Torque
m·kg	Meter kilogram	m × kg	Torque
Pa	Pascal	N/m^2	Pressure
N/mm	Newton per millimeter	N/mm	Spring rate
L	Liter	—	Volume or capacity
cm^3	Cubic centimeter		
r/min	Revolutions per minute	—	Engine speed

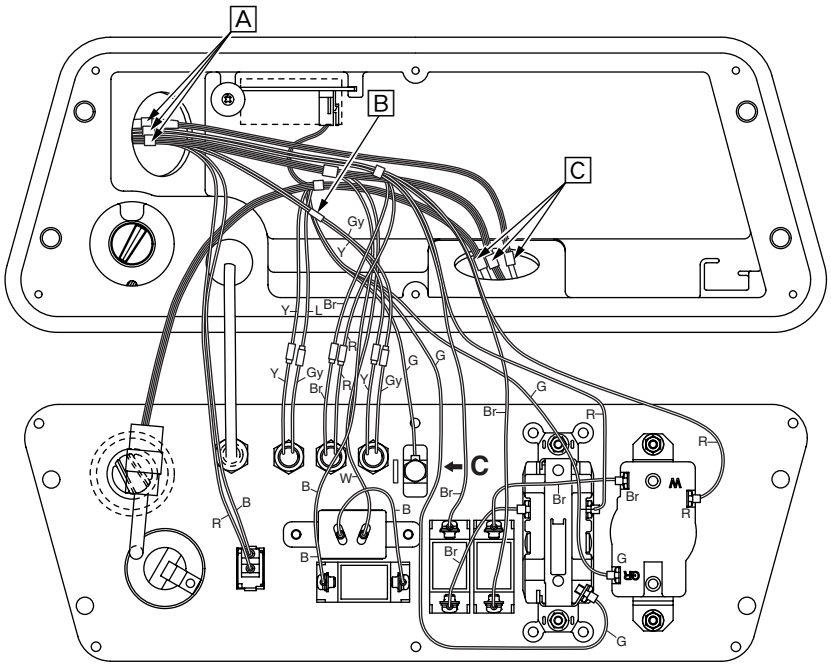
WIRE ROUTING DIAGRAM

120 V-60 Hz

CONTROL PANEL



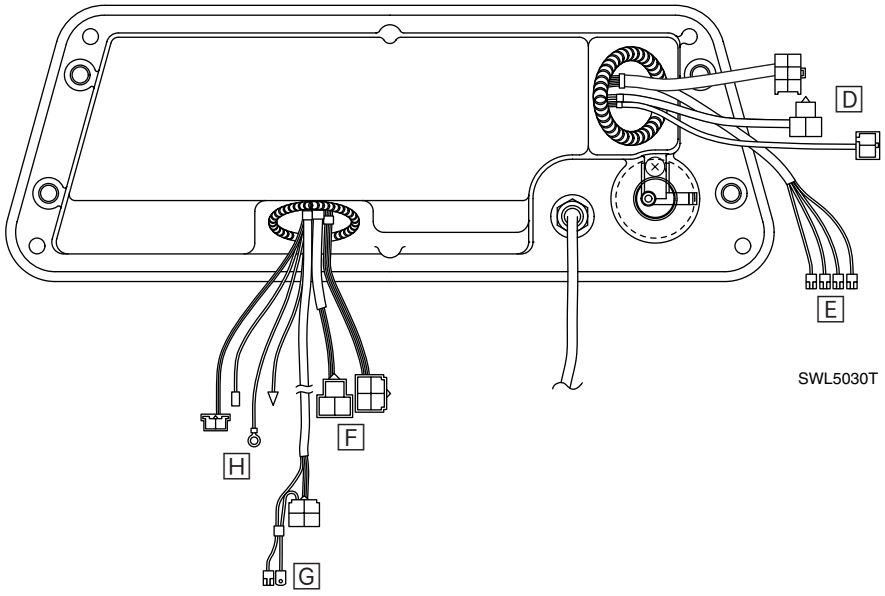
BEHIND CONTROL PANEL AND CONTROL BOX INTERIOR



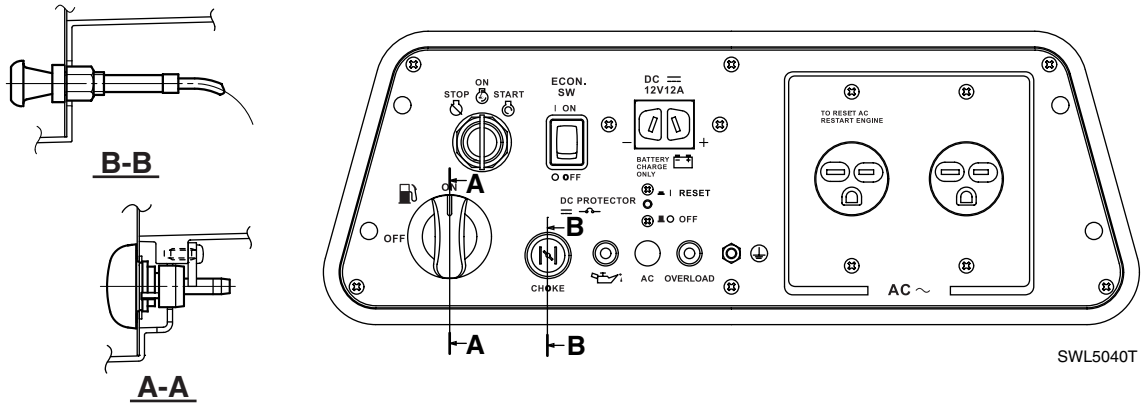
A White tape for identifying position
B Red tape for distinguishing leads
C Yellow tape for identifying position
D To control box
E To DC rectifier
F To generator
G To starter relay and rectifier
H To engine

COLOR CODE
B..... Black
Br..... Brown
L ..... Blue
G ..... Green
Gy..... Gray
R..... Red
W..... White
Y..... Yellow
B/W ..... Black/White

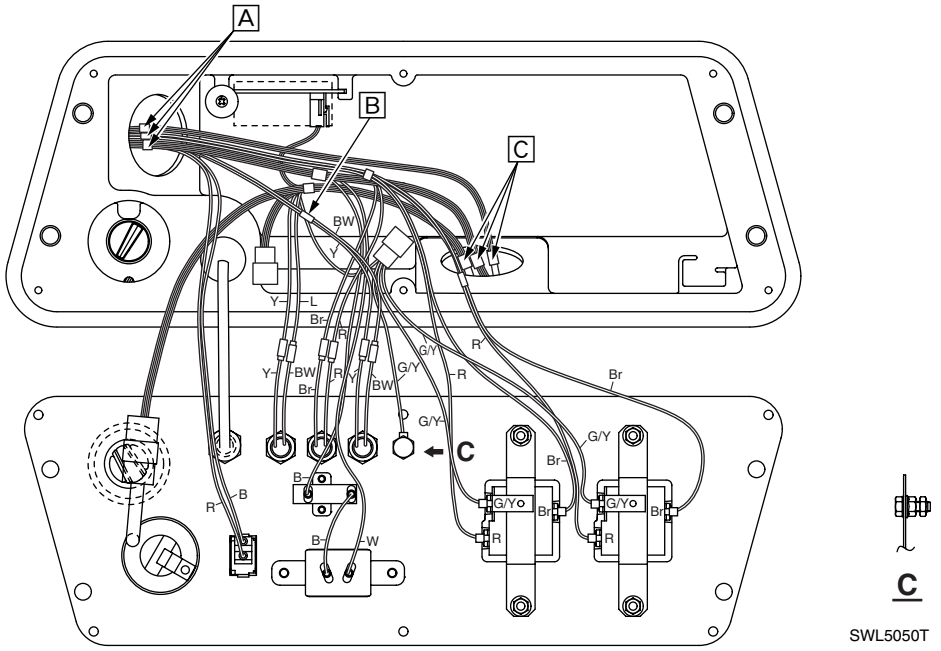
BEHIND CONTROL BOX



220 V-50 Hz
CONTROL PANEL



BEHIND CONTROL PANEL AND CONTROL BOX INTERIOR

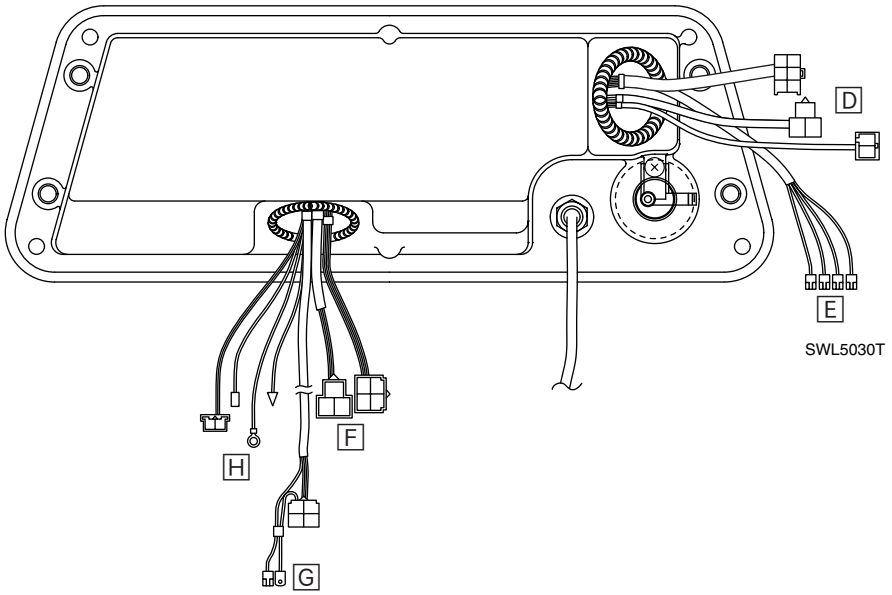


SWL5050T

A White tape for identifying position
B Red tape for distinguishing leads
C Yellow tape for identifying position
D To control box
E To DC rectifier
F To generator
G To starter relay and rectifier
H To engine

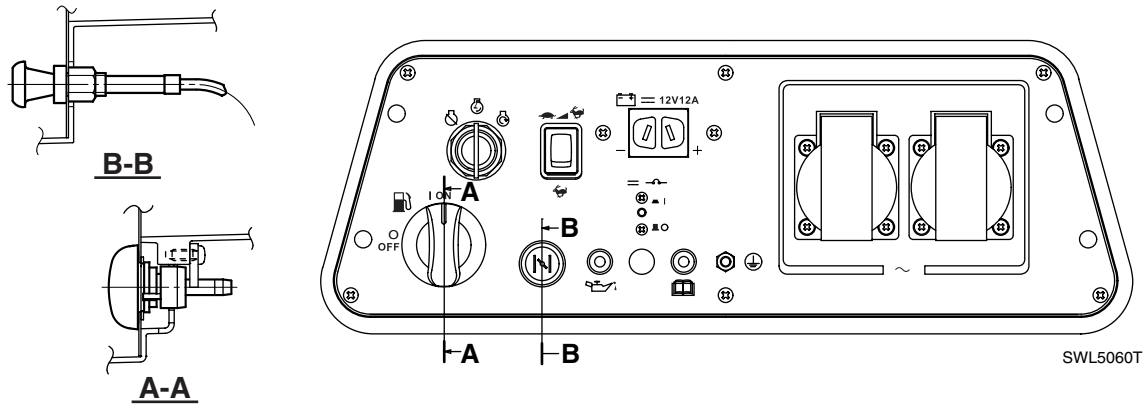
COLOR CODE
B .....Black
Br .....Brown
L.....Blue
R .....Red
W .....White
Y .....Yellow
B/W.....Black/White
G/Y .....Green/Yellow

BEHIND CONTROL BOX

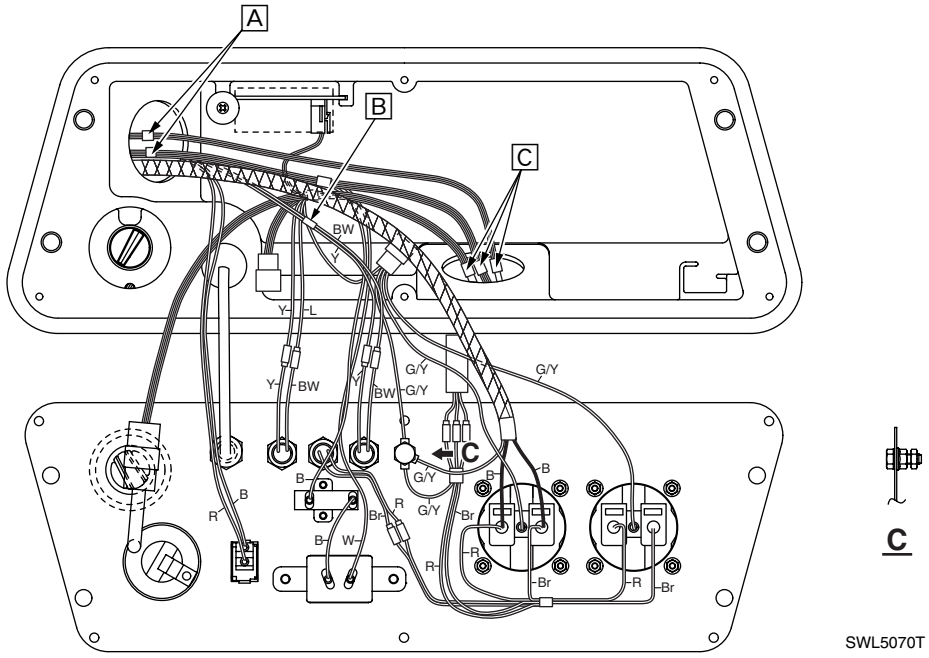


SWL5030T

230 V-50 Hz
CONTROL PANEL



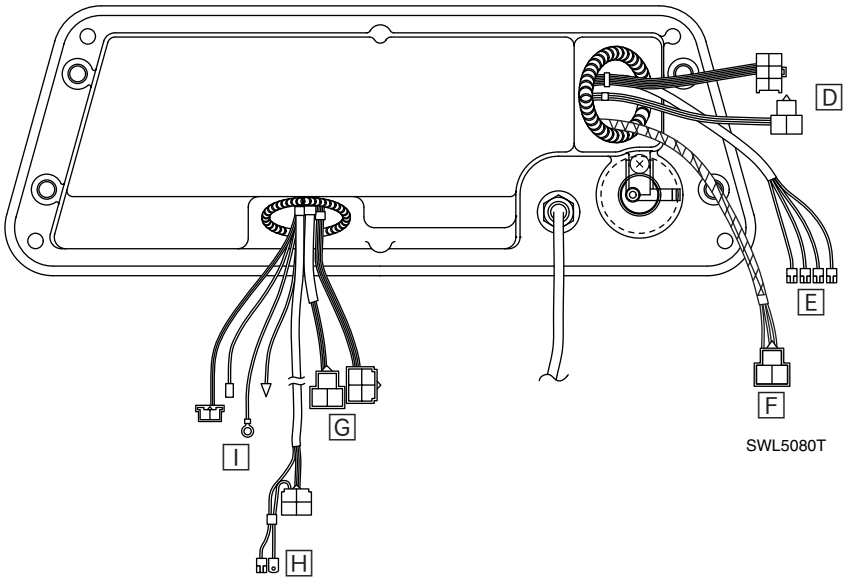
BEHIND CONTROL PANEL AND CONTROL BOX INTERIOR



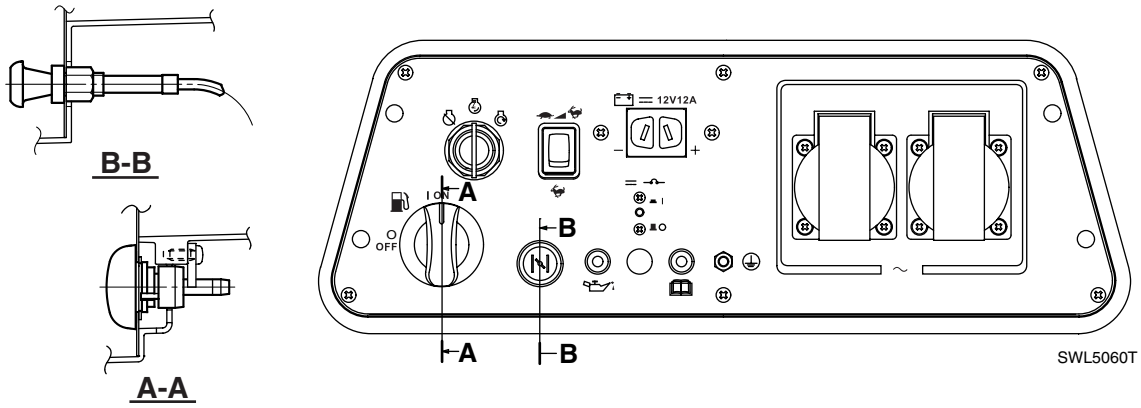
A White tape for identifying position
B Red tape for distinguishing leads
C Yellow tape for identifying position
D To control box
E To DC rectifier
F To noise filter
G To generator
H To starter relay and rectifier
I To engine

COLOR CODE
B .....Black
Br .....Brown
L.....Blue
R .....Red
W .....White
Y .....Yellow
B/W.....Black/White
G/Y .....Green/Yellow

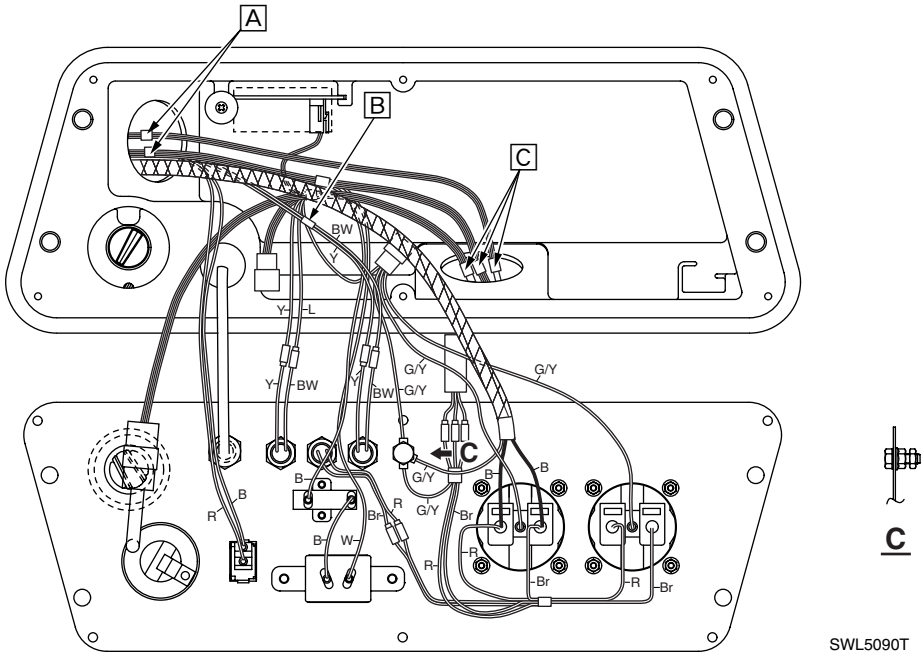
BEHIND CONTROL BOX



230 V-50 Hz
CONTROL PANEL



BEHIND CONTROL PANEL AND CONTROL BOX INTERIOR



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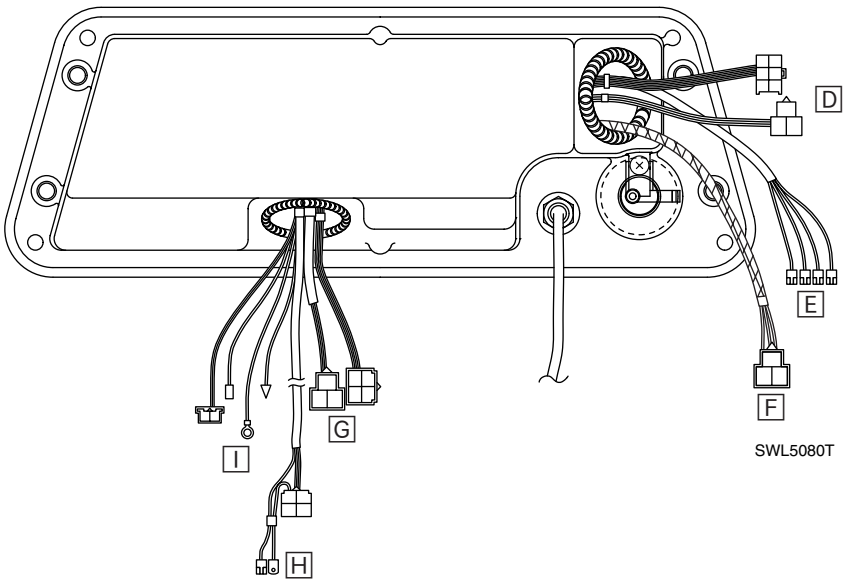
F To noise filter
G To generator
H To starter relay and rectifier
I To engine

COLOR CODE
B .....Black
Br .....Brown
L.....Blue
R .....Red
W .....White
Y .....Yellow
B/W.....Black/White
G/Y .....Green/Yellow

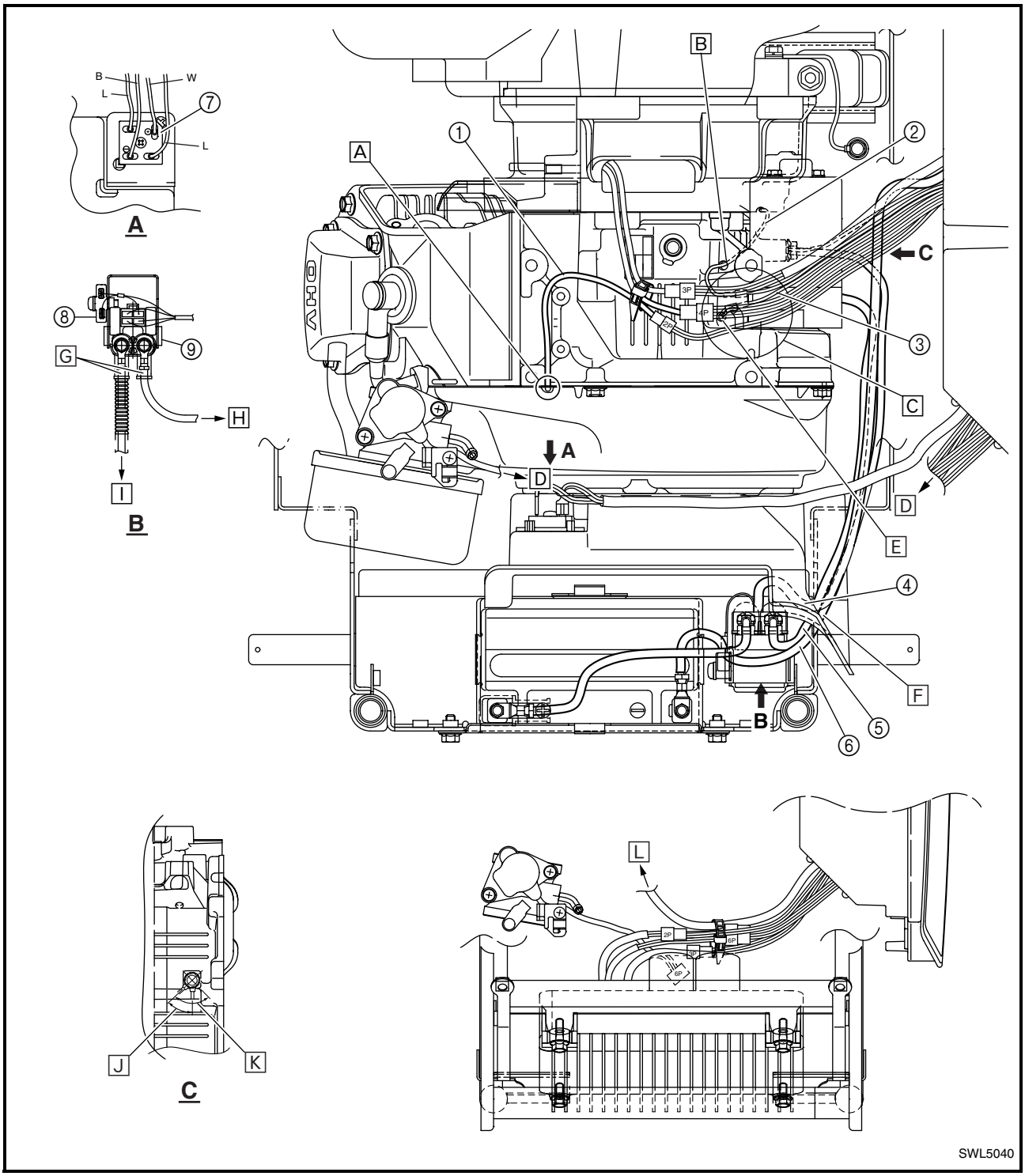
BEHIND CONTROL BOX



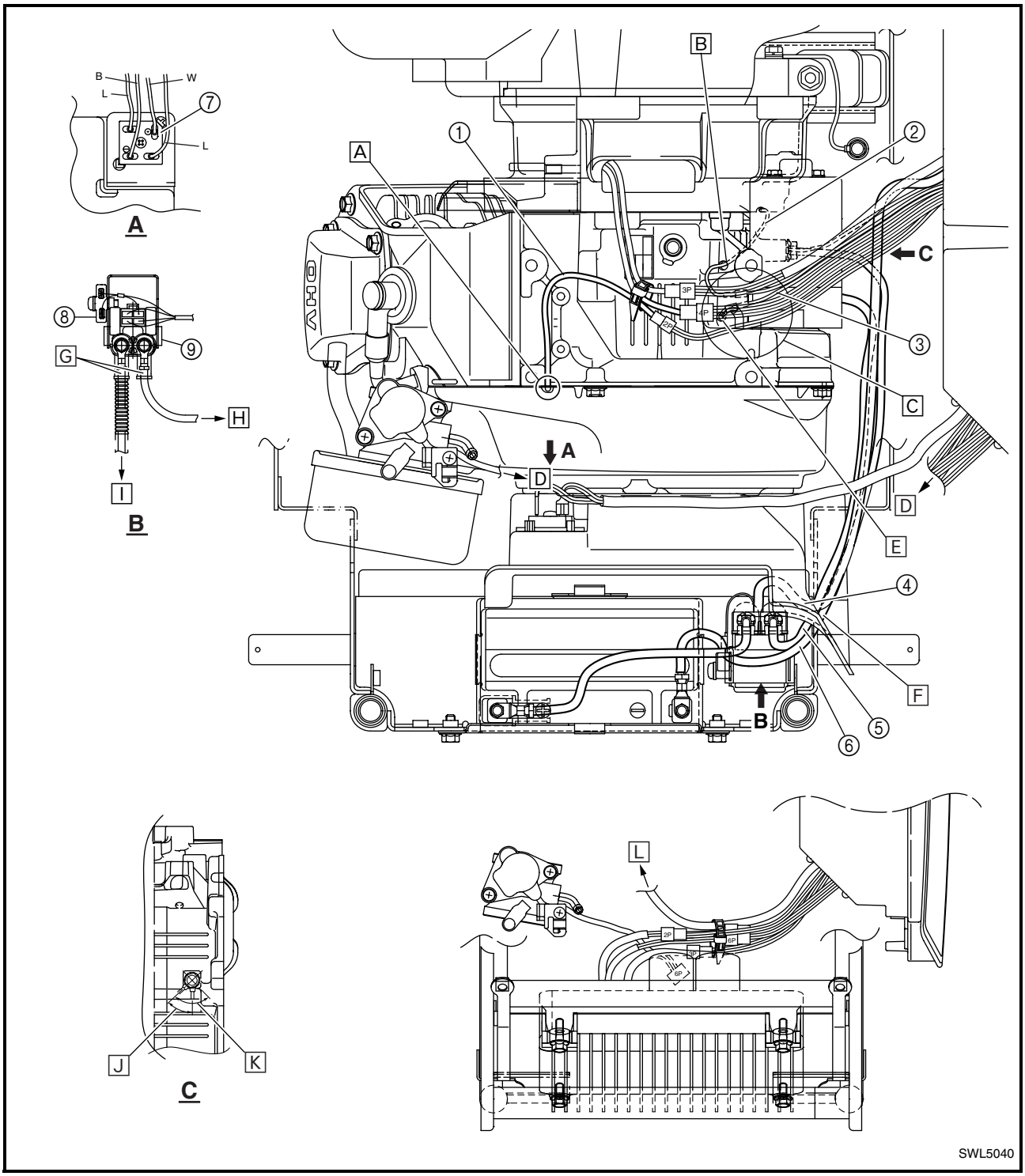
120 V-60 Hz, 220 V-50 Hz
ENGINE AND GENERATOR

① TCI unit lead
② Oil level switch lead
③ Charging coil lead
④ Starter relay and rectifier lead
⑤ Starter motor lead
⑥ Negative battery lead
⑦ DC rectifier
⑧ Rectifier
⑨ Starter relay

A Route the TCI unit lead through the notch in the fan case.
B Route the oil level switch lead through the hole in the crankcase.
C Route the wire harnesses as shown in the illustration.



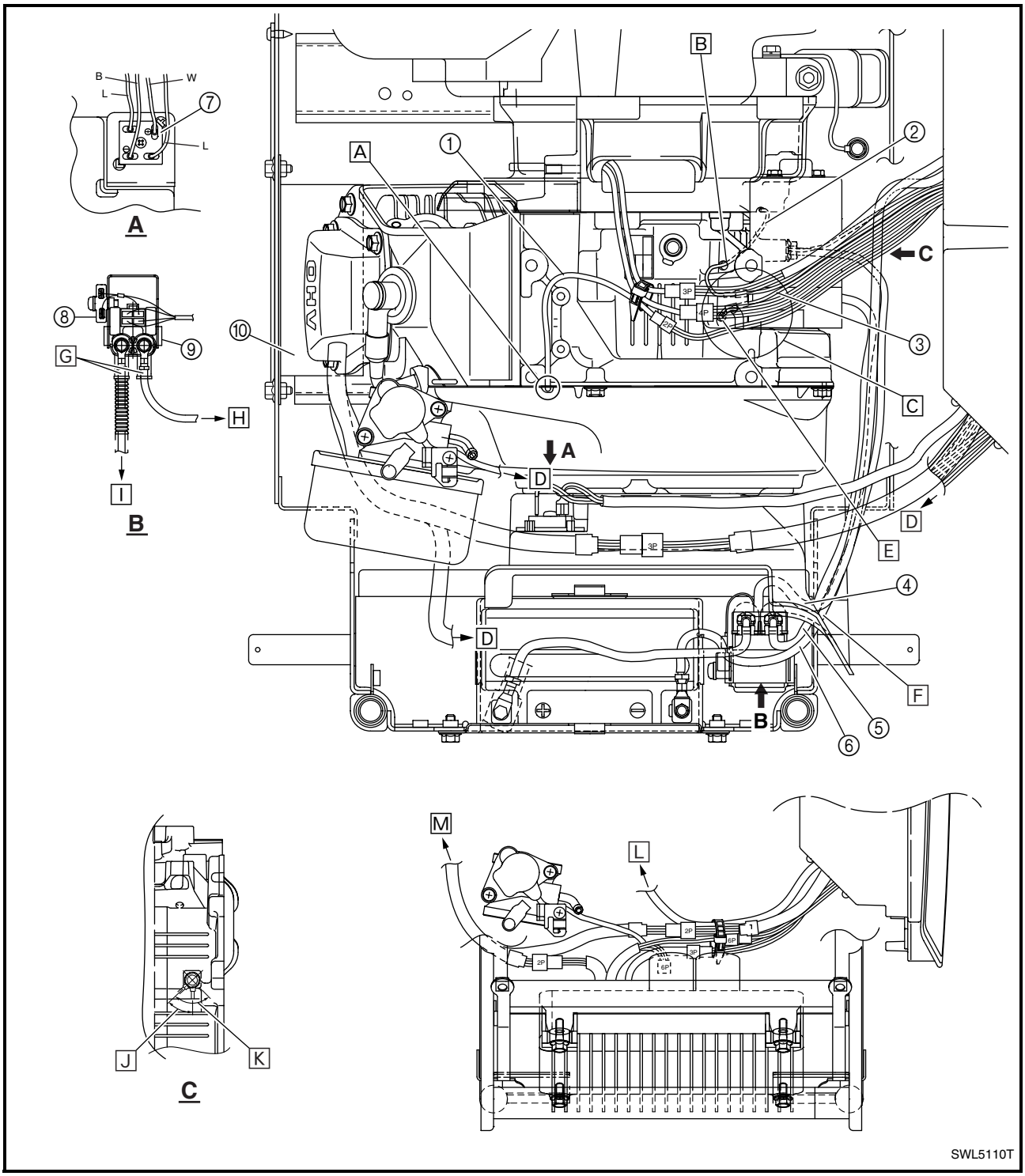
[D] To control unit
[E] Route the charging coil lead through the hole in the crankcase.
[F] Route the starter motor lead, negative battery lead, and starter relay/rectifier lead through the hole in the recoil starter cover.
[G] Install vertically.
[H] To starter motor
[I] To battery
[J] Connect the ground lead (green/yellow) within the range indicated in the illustration.
[K] Connect the negative battery lead within the range indicated in the illustration.
[L] To DC rectifier



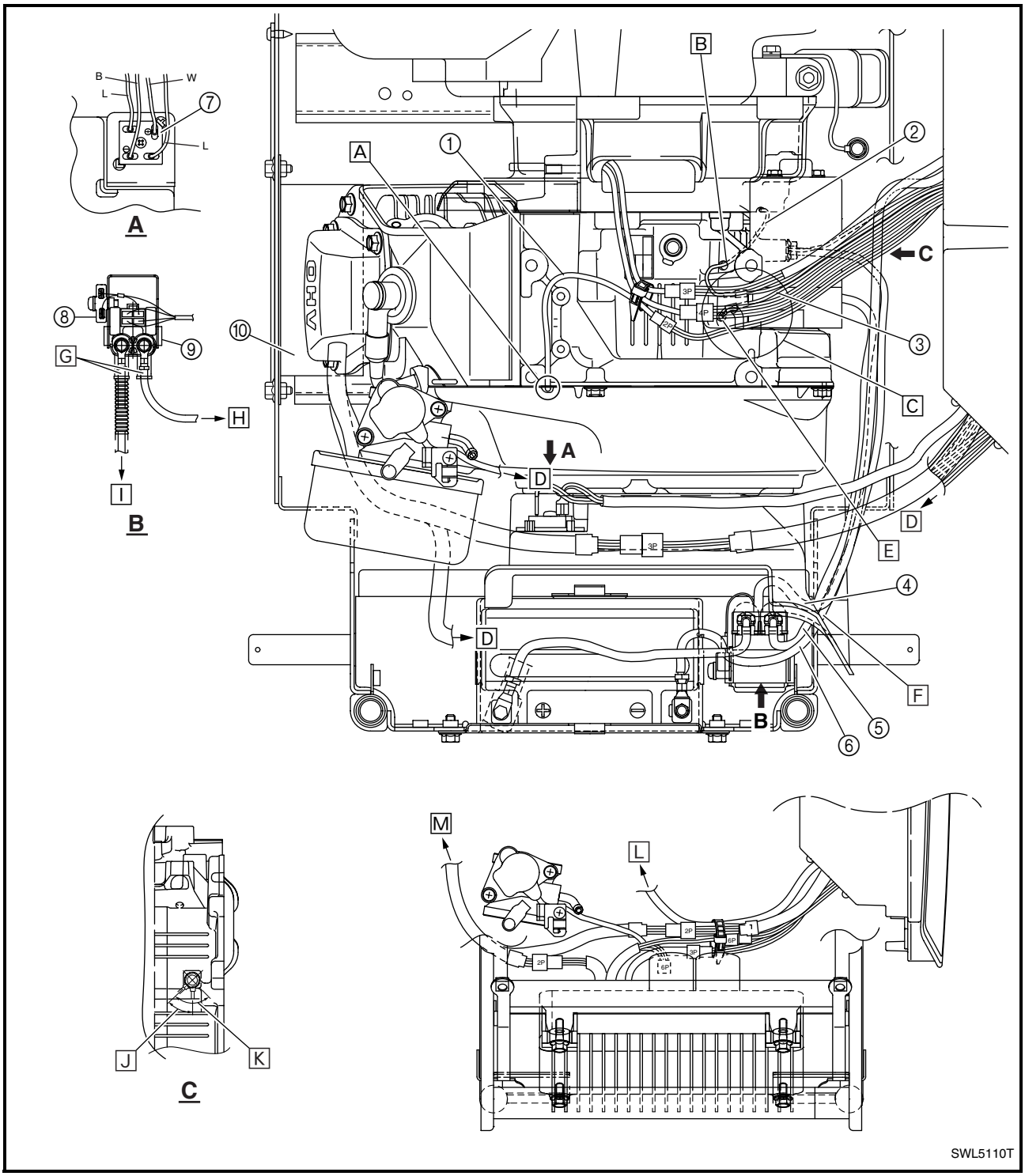
230 V-50 Hz
ENGINE AND GENERATOR

① TCI unit lead
② Oil level switch lead
③ Charging coil lead
④ Starter relay and rectifier lead
⑤ Starter motor lead
⑥ Negative battery lead
⑦ DC rectifier
⑧ Rectifier
⑨ Starter relay
⑩ Noise filter

A Route the TCI unit lead through the notch in the fan case.
B Route the oil level switch lead through the hole in the crankcase.
C Route the wire harnesses as shown in the illustration.

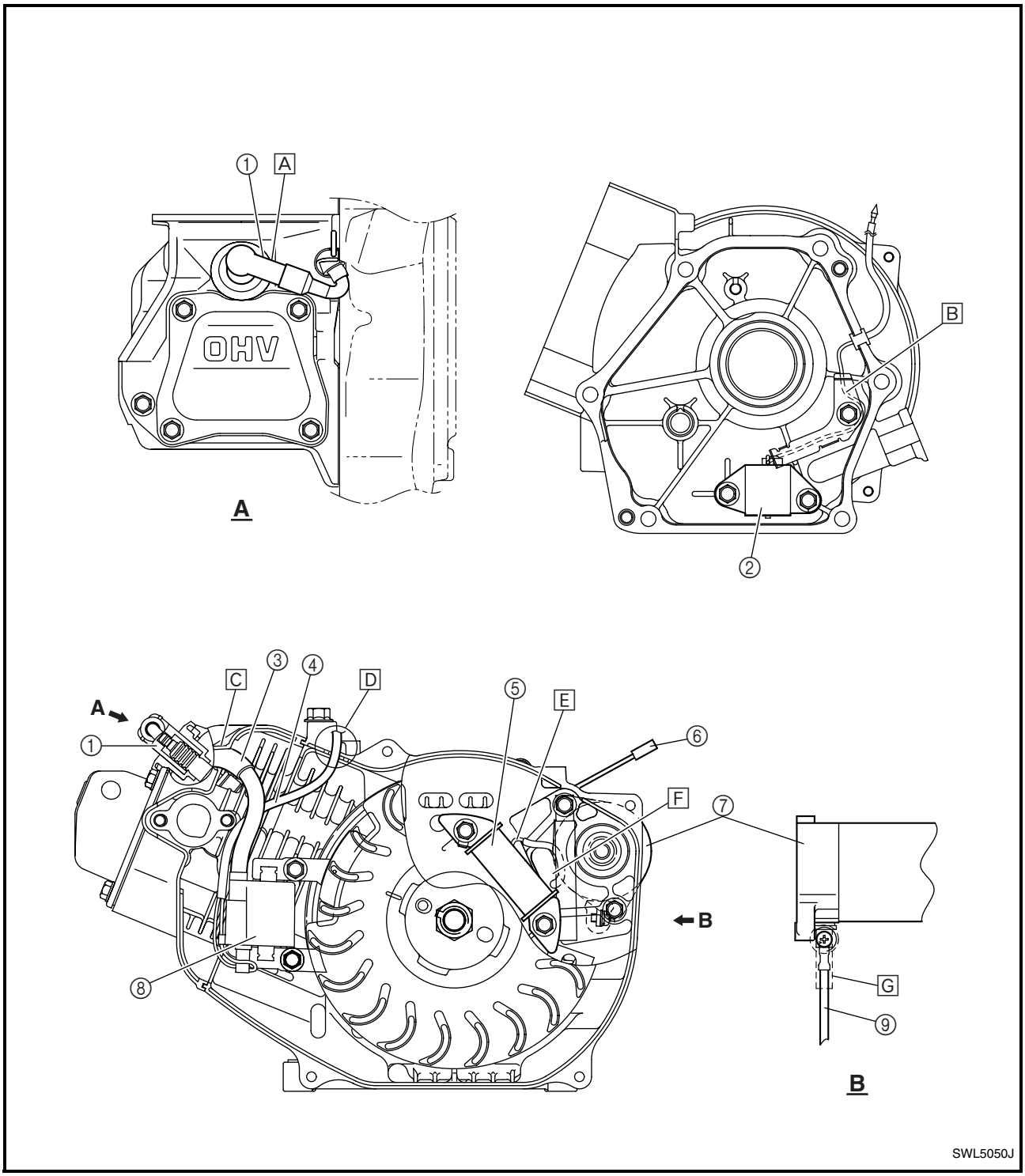


D To control unit
E Route the charging coil lead through the hole in the crankcase.
F Route the starter motor lead, negative battery lead, and starter relay/rectifier lead through the hole in the recoil starter cover.
G Install vertically.
H To starter motor
I To battery
J Connect the ground lead (green/yellow) within the range indicated in the illustration.
K Connect the negative battery lead within the range indicated in the illustration.
L To DC rectifier
M To noise filter

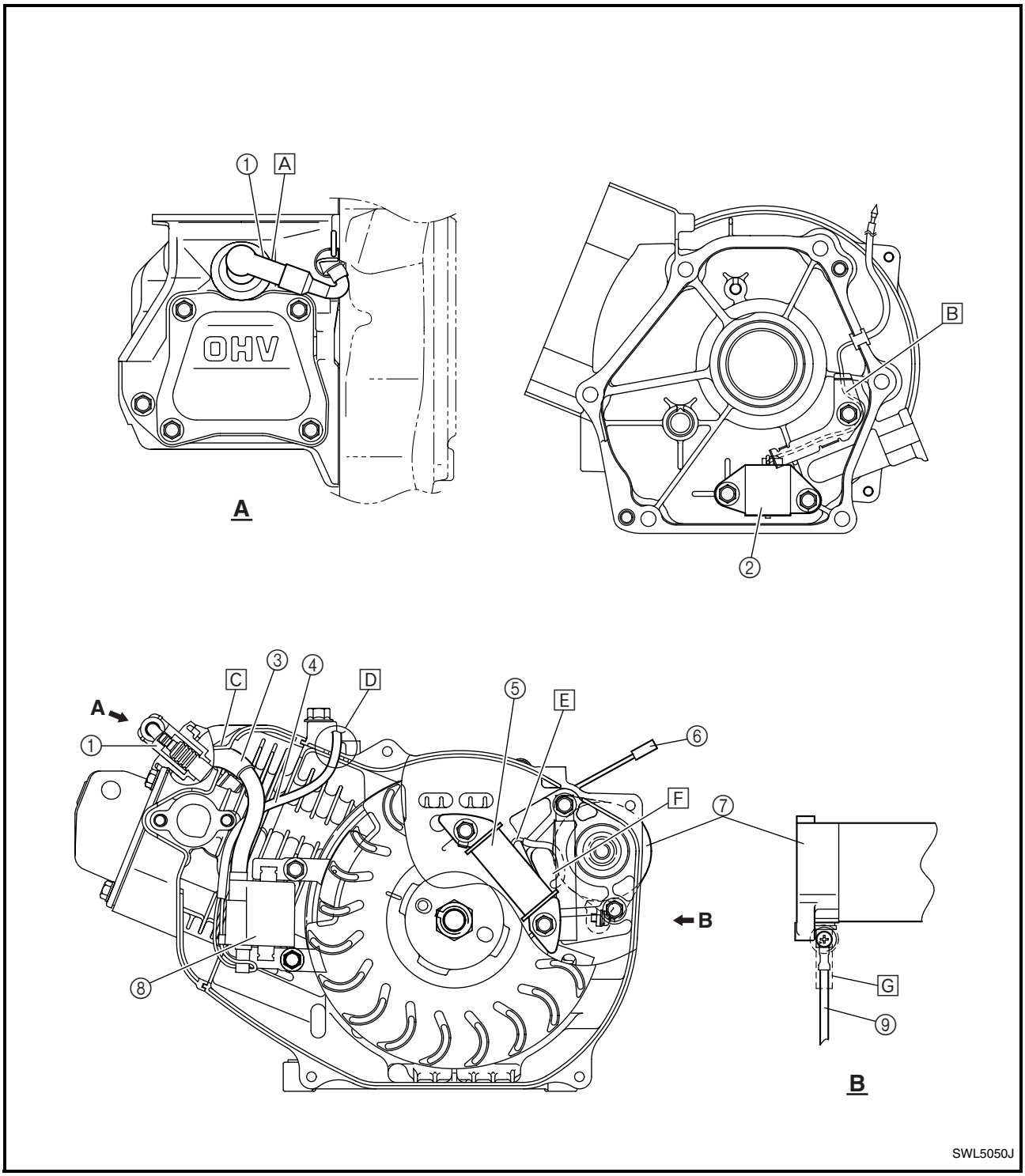


① Spark plug cap
② Oil level switch
③ Spark plug lead
④ TCI unit lead
⑤ Charging coil
⑥ Charging coil lead
⑦ Starter motor
⑧ TCI unit
⑨ Starter motor lead

A Install the spark plug cap as shown in the illustration.
B Route the oil level switch as shown in the illustration.
C Route the spark plug lead so that it is aligned with the air shroud.
D Route the TCI unit lead through the notch in the flywheel magneto cover.

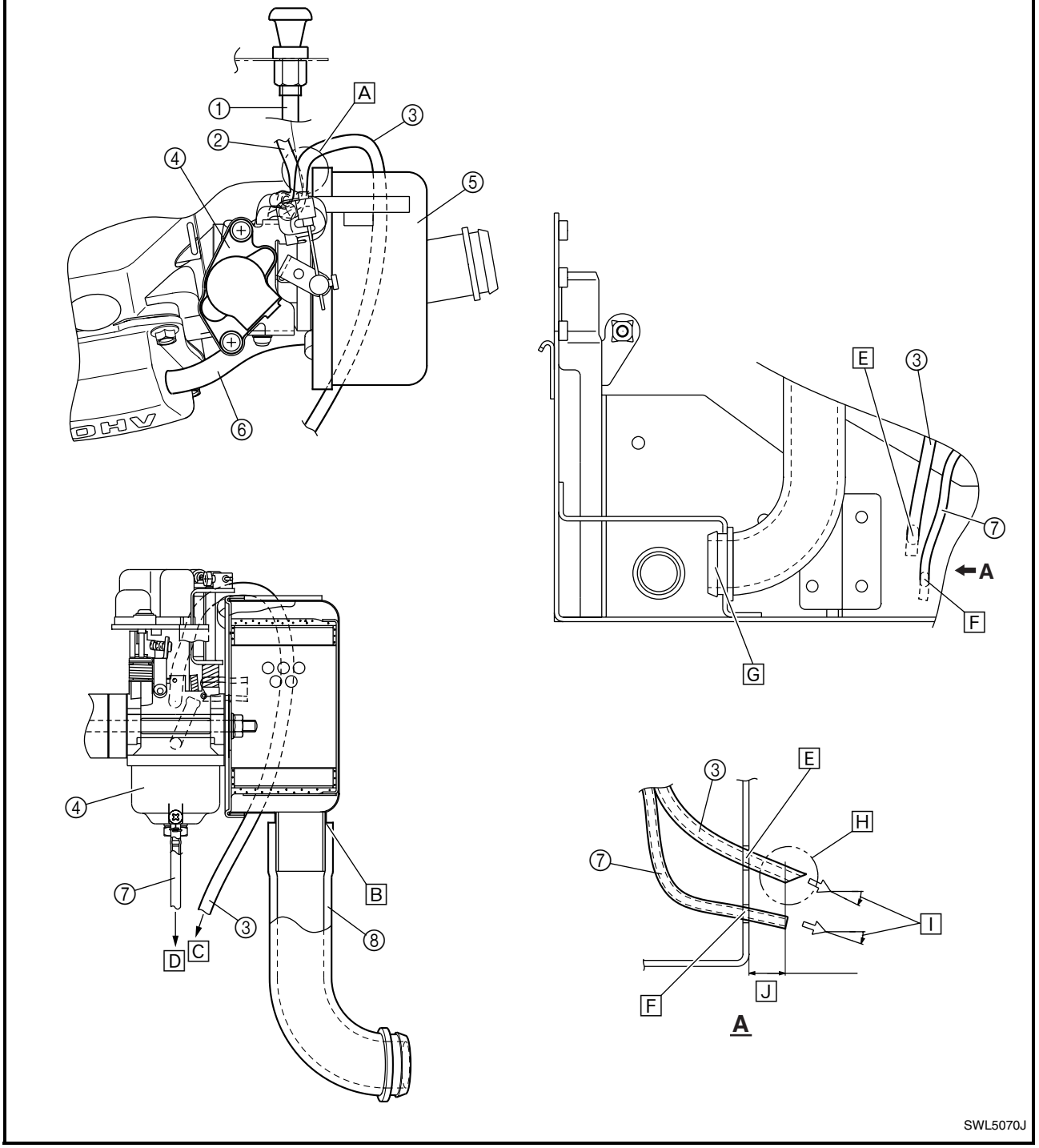


D Route the charging coil lead as shown.
F Securely install the charging coil grommet into the hole in the crankcase.
G Connect the starter motor lead, and then cover the terminal with the cover.

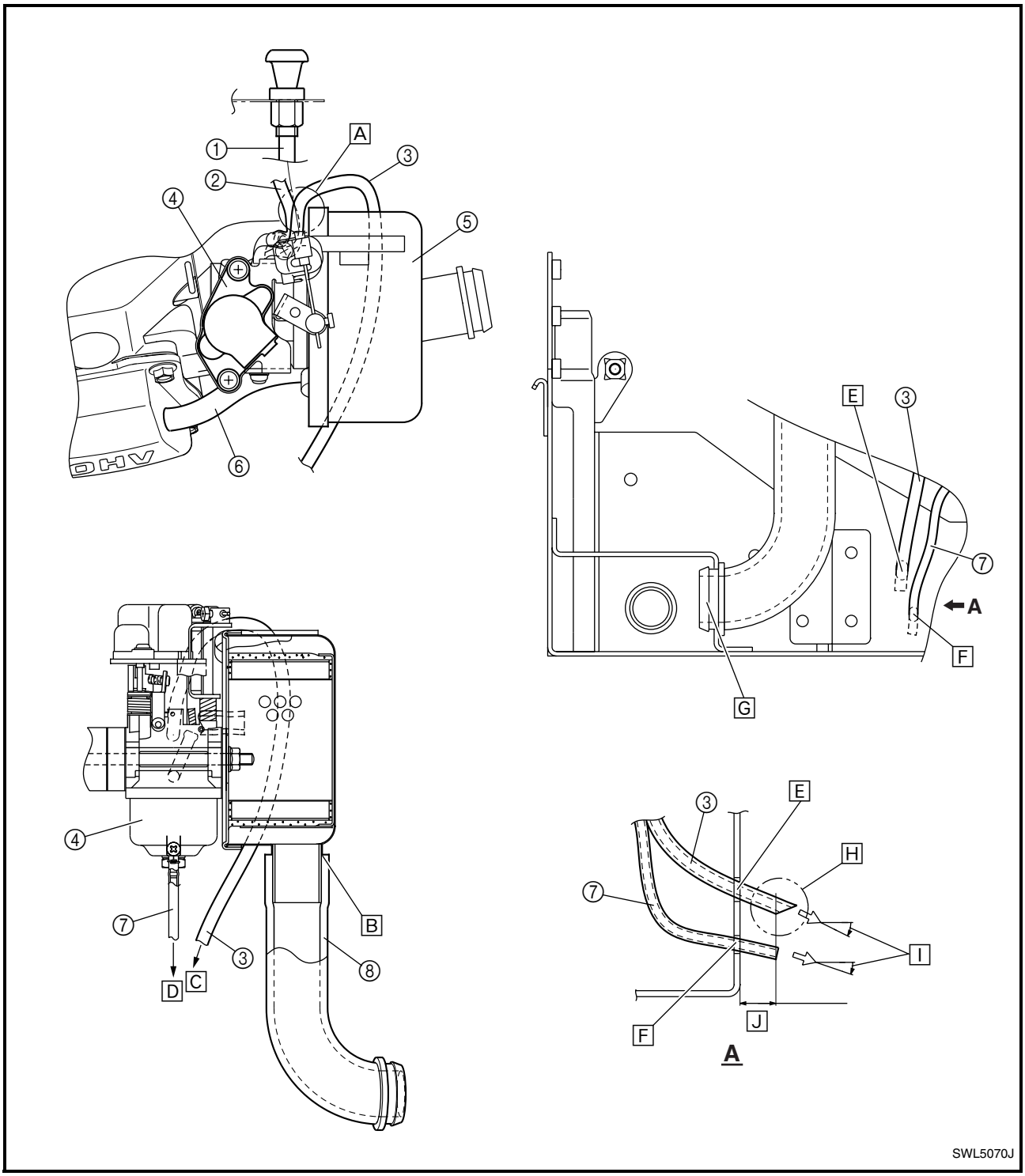


① Choke cable
② Fuel hose (fuel cook to carburetor)
③ Air vent hose
④ Carburetor
⑤ Air filter assembly
⑥ Cylinder head breather hose
⑦ Drain hose
⑧ Air intake duct

A Route the air vent hose over the fuel hose (fuel cock to carburetor).
B Securely install the air intake duct so that it contacts the bottom of the air filter assembly case.
C To hole a in the frame
D To hole b in the frame
E To hole a in the frame
F To hole b in the frame

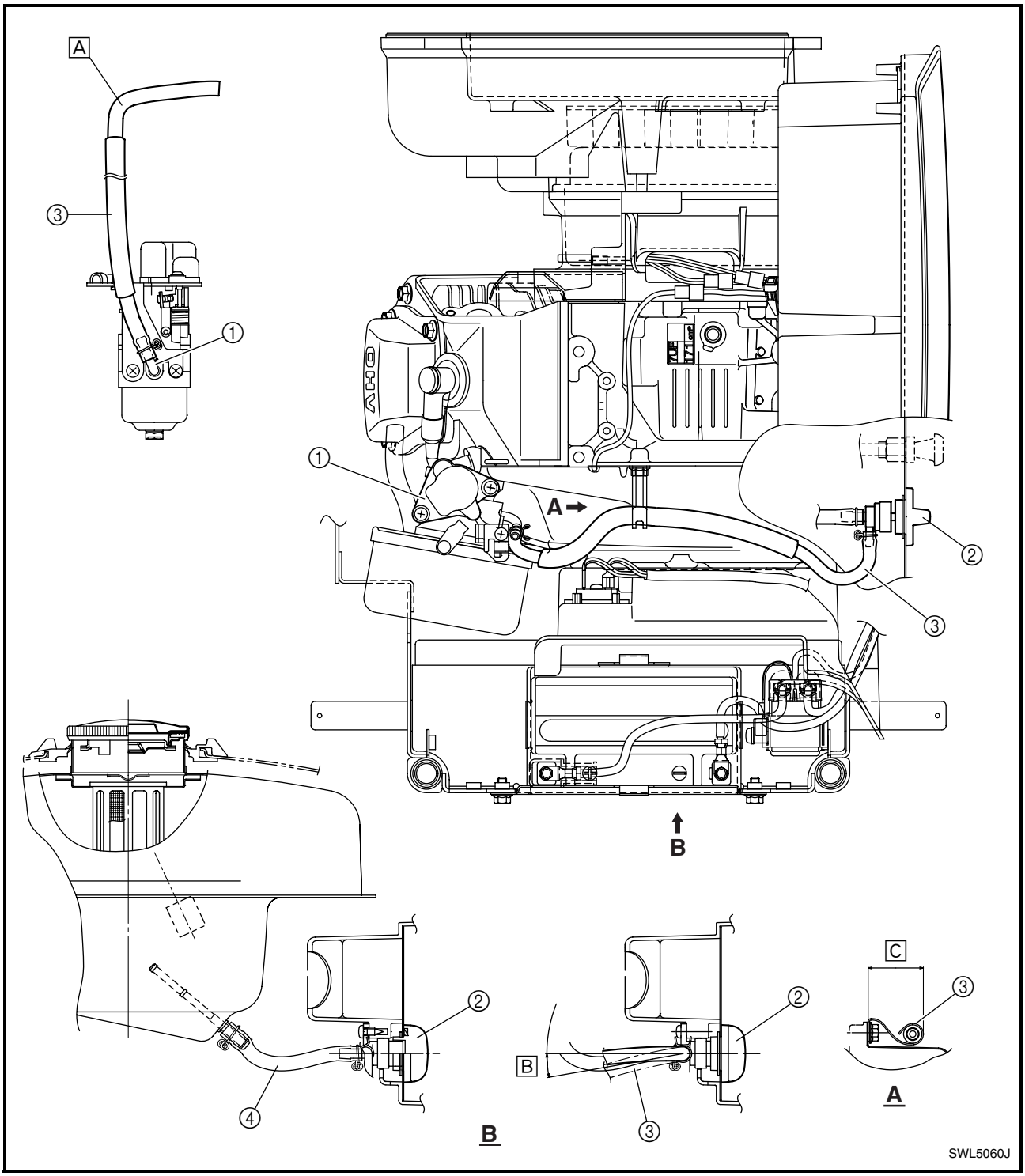


G Insert the air intake duct until its flange end contacts the installation hole of the frame, and then rotate the air intake duct (frame installation end) to attach the flange to the frame.
H Face the cut end of the air vent hose downward.
I Position the air vent hose end and cylinder head breather hose end below horizontal.
J 15 ~ 20 mm (0.6 ~ 0.8 in)



① Carburetor
② Fuel cock
③ Fuel hose (fuel cock to carburetor)
④ Fuel hose (fuel tank to fuel cock)

A Install the fuel hose (fuel cock to carburetor) with the hose (carburetor end) bent to the angle shown in the illustration.
B 10°
C 35 ± 5 mm (1.4 ± 0.2 in)



CIRCUIT DIAGRAM

120 V-60 Hz

① Main coil
② Subcoil (for battery)
③ Subcoil (for control power source)
④ DC rectifier
⑤ Generator assembly
⑥ Control unit
⑦ Pilot light
⑧ AC switch (NFB) (15 A)
⑨ AC switch (NFB) (23.5 A)
⑩ AC receptacle (15 A × 2)
⑪ AC receptacle (23.3 A)
⑫ Economy switch
⑬ Overload warning light
⑭ DC receptacle (12 V, 8.3 A)
⑮ DC circuit breaker
⑯ Ground terminal
⑰ Main switch
⑱ Oil level warning light
⑲ Engine speed limiter/oil level warning unit
⑳ Oil level switch
㉑ Fuse (10 A)
㉒ Starter relay
㉓ Starter motor
㉔ Battery
㉕ Rectifier
㉖ Charging coil
㉗ TCI unit
㉘ Spark plug
㉙ Throttle control motor

COLOR CODE

B..... Black
Br ..... Brown
G ..... Green
Gy ..... Gray
L ..... Blue
R ..... Red
W..... White
Y..... Yellow
O ..... Orange
B/W ..... Black/White
G/Y..... Green/Yellow
R/W ..... Red/White

CIRCUIT DIAGRAM

220 V-50 Hz

① Main coil
② Subcoil (for battery)
③ Subcoil (for control power source)
④ DC rectifier
⑤ Generator assembly
⑥ Control unit
⑦ Pilot light
⑧ AC receptacle (15 A × 2)
⑨ Economy switch
⑩ Overload warning light
⑪ DC receptacle (12 V, 12 A)
⑫ DC circuit breaker
⑬ Ground terminal
⑭ Main switch
⑮ Oil level warning light
⑯ Engine speed limiter/oil level warning unit
⑰ Oil level switch
⑱ Fuse (10 A)
⑲ Starter relay
⑳ Starter motor
㉑ Battery
㉒ Rectifier
㉓ Charging coil
㉔ TCI unit
㉕ Spark plug
㉖ Throttle control motor

COLOR CODE

B..... Black
Br ..... Brown
G ..... Green
Gy ..... Gray
L ..... Blue
R ..... Red
W..... White
Y..... Yellow
O ..... Orange
B/W ..... Black/White
G/Y..... Green/Yellow
R/W ..... Red/White

CIRCUIT DIAGRAM

230 V-50 Hz

① Main coil
② Subcoil (for battery)
③ Subcoil (for control power source)
④ DC rectifier
⑤ Generator assembly
⑥ Control unit
⑦ Noise filter 1
⑧ AC receptacle (16 A × 2)
⑨ Pilot light
⑩ Noise filter 2
⑪ Economy switch
⑫ Overload warning light
⑬ DC receptacle (12 V, 12 A)
⑭ DC circuit breaker
⑮ Ground terminal
⑯ Main switch
⑰ Oil level warning light
⑱ Engine speed limiter/oil level warning unit
⑲ Oil level switch
⑳ Fuse (10 A)
㉑ Starter relay
㉒ Starter motor
㉓ Battery
㉔ Rectifier
㉕ Charging coil
㉖ TCI unit
㉗ Spark plug
㉘ Throttle control motor

COLOR CODE

B..... Black
Br ..... Brown
G ..... Green
Gy ..... Gray
L ..... Blue
R ..... Red
W..... White
Y..... Yellow
O ..... Orange
B/W ..... Black/White
G/Y ..... Green/Yellow
R/W ..... Red/White

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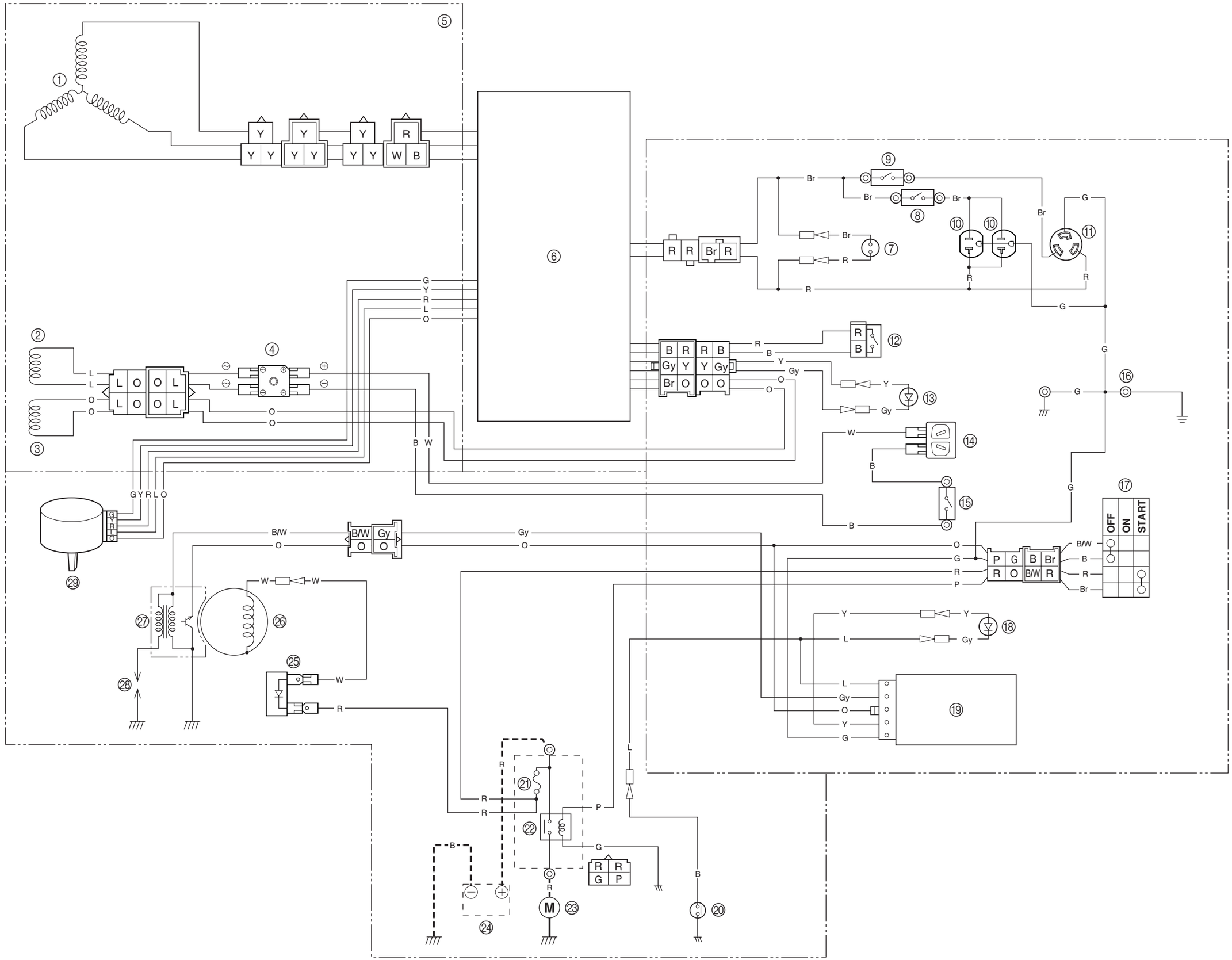
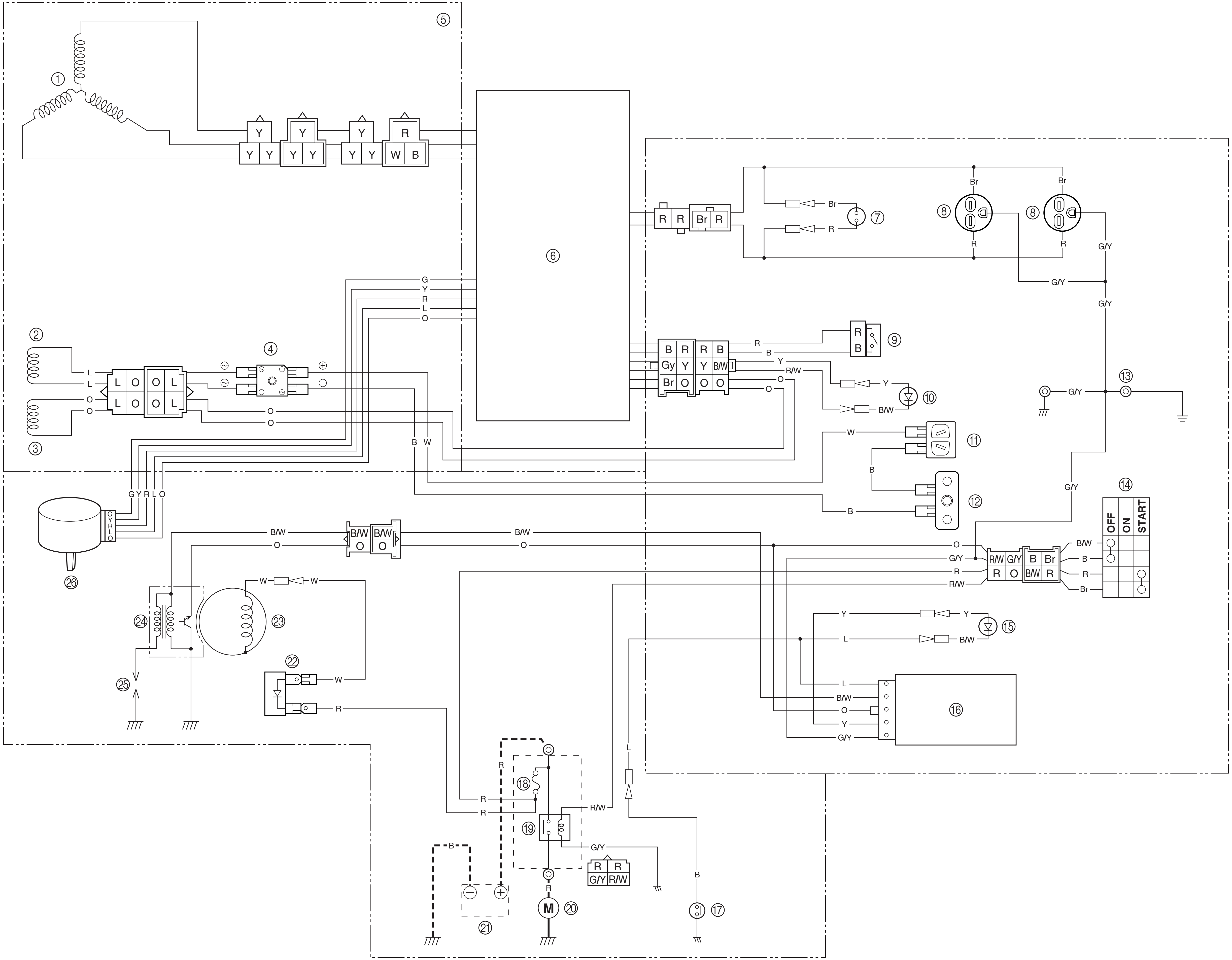
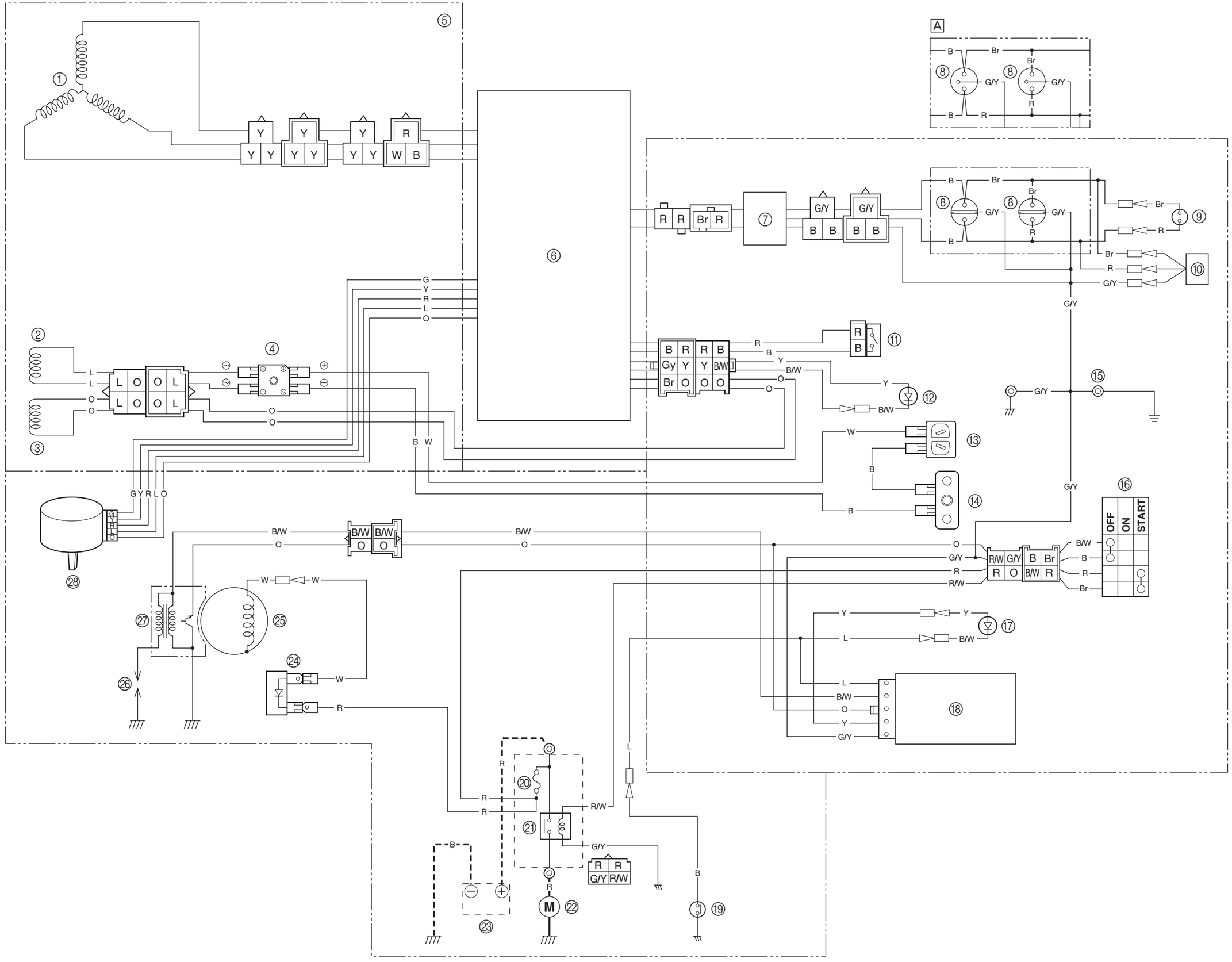
120 V-60 Hz



220 V-50 Hz



230 V-50 Hz


A
B Br
Br
⑧ G/Y ⑧ G/Y
R
B R
⑤
①
Y Y Y Y Y Y R W B
⑥
R R Br R ⑦ G/Y G/Y B B B B
Br
R ⑨
Br
R
G/Y ⑩
G/Y
②
③
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L O O L
G Y R L O
B W
B R R B
Gy Y Y B/W
Br O O O
R B ⑪
Y B/W O O
Y ⑫
B/W
W ⑬
B
⑭
G/Y
⑮
G/Y
⑯
OFF ON START
B/W B O G/Y R R/W
R/W G/Y B Br
R O B/W R
B/W O
B/W O
B/W O
B/W O
Y Y ⑰
L B/W
L B/W O Y G/Y ⑱
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