SUZUKI OUTBOARD MOTOR

DF9.9
DF15

FOUR STROKE

SERVICE MANUAL

For 2003 model～

99500-93E10-01E

FOREWORD

This manual contains an introductory description on SUZUKI Outboard motor DF9.9/15 and procedures for the inspection, service and overhaul of its main components.
General knowledge information is not included.

Please read the GENERAL INFORMATION section to familiarize yourself with basic information concerning this motor. Read and refer to the other sections in this manual for information regarding proper inspection and service procedures.

This manual will help you better understand this outboard motor so that you may provide your customers with optimum and quick service.

- *This manual has been prepared using the latest information available at the time of publication.*
  If a modification has been made since then, differences may exist between the content of this manual and the actual outboard motor.
- *Illustrations in this manual are used to show the basic principles of operation and work procedures and may not represent the actual outboard motor in exact detail.*
- *This manual is intended for use by technicians who already possess the basic knowledge and skills to service SUZUKI outboard motors.*
  Persons without such knowledge and skills should not attempt to service an outboard engine by relying on this manual only.
  Instead, please contact your nearby authorized SUZUKI outboard motor dealer.

⚠ WARNING

Apprentice mechanics or do-it-yourself mechanics that don't have the proper tools and equipment may not be able to properly perform the services described in this manual. Improper repair may result in injury to the mechanic and may render the engine unsafe for the boat operator and passengers.

NOTE:
This manual is compiled based on 2003 (K3) model.

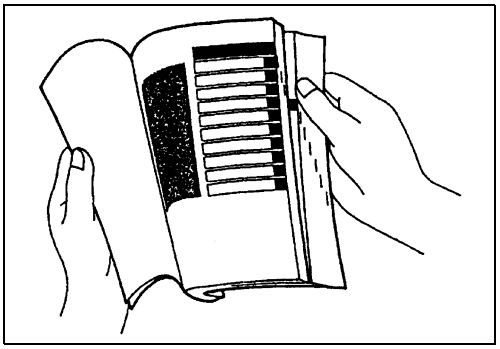
GROUP INDEX

GENERAL INFORMATION	1
PERIODIC MAINTENANCE	2
IGNITION AND ELECTRICAL	3
FUEL SYSTEM	4
RECOIL STARTER	5
POWER UNIT	6
MID UNIT	7
LOWER UNIT	8
ROUTING AND DIAGRAM	9

HOW TO USE THIS MANUAL

TO LOCATE WHAT YOU ARE LOOKING FOR:

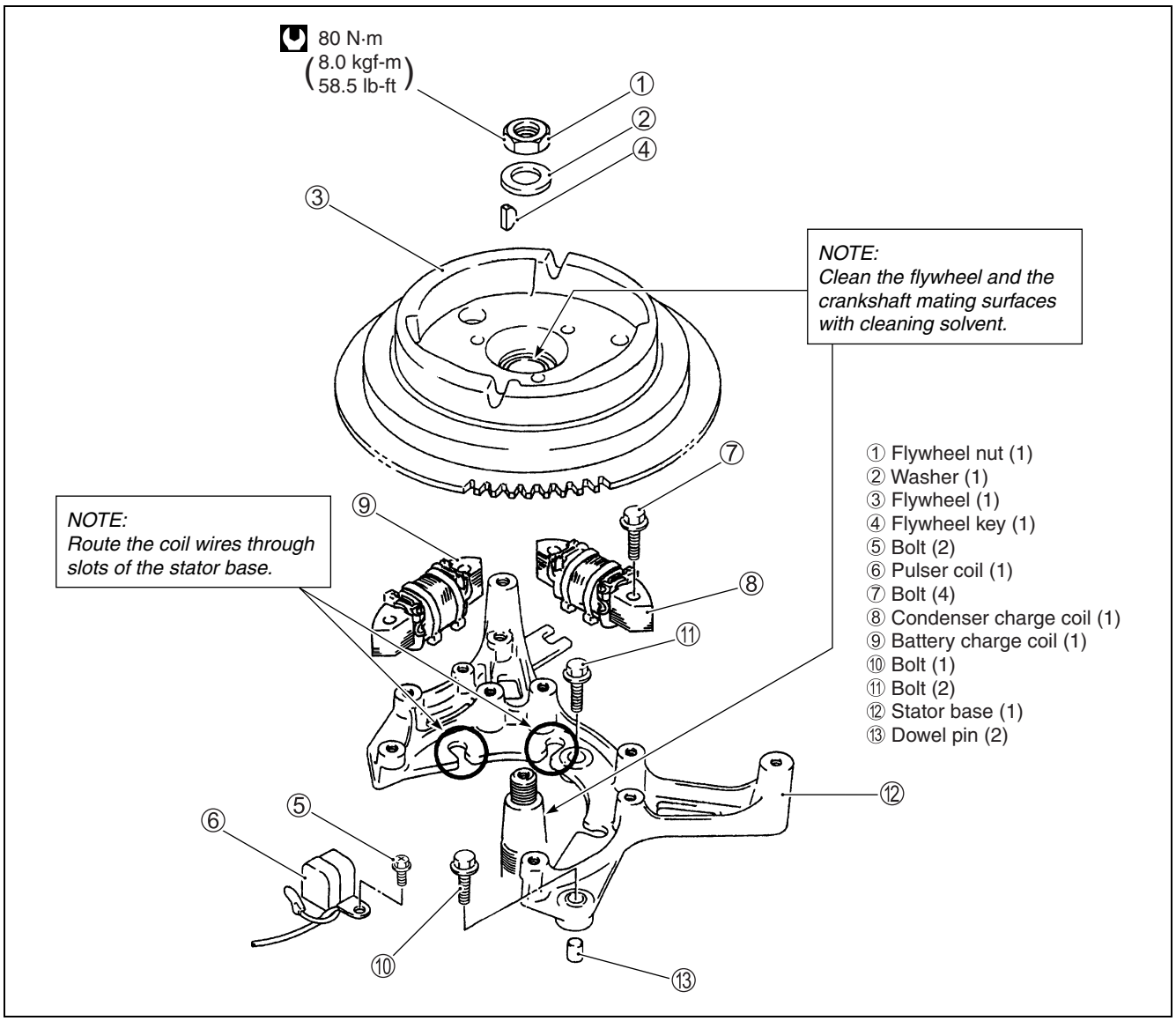
1. The text of this manual is divided into sections.
2. The section titles are listed on the previous page in a GROUP INDEX. Select the section needed for reference.
3. Holding the manual as shown at the right will allow you to find the first page of the section easily.
4. The first page of each section lists a table of contents to easily locate the item and page you need.



COMPONENT PARTS AND IMPORTANT ITEM ILLUSTRATIONS

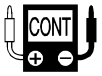
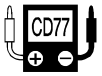
Under the name of each system or unit, an exploded view is provided with work instructions and other service information such as the tightening torque, lubrication and locking agent points.

Example:



SYMBOL

Listed in the table below are the symbols indicating instructions and other important information necessary for proper servicing. Please note the definition for each symbol. You will find these symbols used throughout this manual. Refer back to this table if you are not sure of any symbol(s) meanings.

SYMBOL	DEFINITION	SYMBOL	DEFINITION
	Torque control required. Data beside it indicates specified torque.		Apply the THREAD LOCK “1342”.
	Apply the oil. Use the engine oil unless otherwise specified.		Apply the THREAD LOCK SUPER “1333B”.
	Apply the SUZUKI OUTBOARD MOTOR GEAR OIL.		Measure in resistance range.
	Apply the SUZUKI SUPER GREASE “A”.		Measure in continuity test range.
	Apply the SUZUKI WATER RESISTANT GREASE.		Use peak voltmeter “Stevens CD-77”.
	Apply the SUZUKI BOND “1207B”.		Use special tool.
	Apply the SUZUKI SILICONE SEAL.		

GENERAL INFORMATION

1

CONTENTS

WARNING/CAUTION/NOTE 1- 2
GENERAL PRECAUTIONS 1- 2
IDENTIFICATION NUMBER LOCATION 1- 4
FUEL AND OIL 1- 5
GASOLINE RECOMMENDATION 1- 5
ENGINE OIL 1- 5
ENGINE BREAK-IN 1- 6
WARM-UP RECOMMENDATION 1- 6
THROTTLE RECOMMENDATION 1- 6
PROPELLERS 1- 7
SPECIFICATIONS 1- 8
SERVICE DATA 1-10
TIGHTENING TORQUE 1-17
SPECIAL TOOLS 1-19
MATERIALS REQUIRED 1-22

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the symbol and the words WARNING, CAUTION and NOTE have special meanings. Pay special attention to the messages highlighted by these signal words.

⚠ WARNING

Indicates a potential hazard that could result in death or injury.

CAUTION

Indicates a potential hazard that could result in motor damage.

NOTE:
Indicates special information to make maintenance easier or instructions clearer.

Please note, however, that the warnings and cautions contained in this manual cannot possibly cover all potential hazards relating to the servicing, or lack of servicing, of the outboard motor. In addition to the WARNING and CAUTION stated, you must also use good judgement and observe basic mechanical safety principles.

GENERAL PRECAUTIONS

⚠ WARNING

- **Proper service and repair procedures are important for the safety of the service mechanic and the safety and reliability of the outboard motor.**
- **To avoid eye injury, always wear protective goggles when filing metals, working on a grinder, or doing other work, which could cause flying material particles.**
- **When 2 or more persons work together, pay attention to the safety of each other.**
- **When it is necessary to run the outboard motor indoors, make sure that exhaust gas is vented outdoors.**
- **When testing an outboard motor in the water and on a boat, ensure that the necessary safety equipment is on board. Such equipment includes: flotation aids for each person, fire extinguisher, distress signals, anchor, paddles, bilge pump, first-aid kit, emergency starter rope, etc.**
- **When working with toxic or flammable materials, make sure that the area you work in is well-ventilated and that you follow all of the material manufacturer's instructions.**
- **Never use gasoline as a cleaning solvent.**
- **To avoid getting burned, do not touch the engine, engine oil or exhaust system during or shortly after engine operation.**
- **Oil can be hazardous. Children and pets may be harmed from contact with oil. Keep new and used oil away from children and pets. To minimize your exposure to oil, wear a long sleeve shirt and moisture-proof gloves (such as dishwashing gloves) when changing oil. If oil contacts your skin, wash thoroughly with soap and water. Launder any clothing or rags if wet with oil. Recycle or properly dispose of used oil.**
- **After servicing fuel, oil/engine cooling system and exhaust system, check all lines and fittings related to the system for leaks.**
- **Carefully adhere to the battery handling instructions laid out by the battery supplier.**

CAUTION

*** If parts replacement is necessary, replace the parts with Suzuki Genuine Parts or their equivalent.**
*** When removing parts that are to be reused, keep them arranged in an orderly manner so that they may be reinstalled in the proper order and orientation.**
*** Be sure to use special tools when instructed.**
*** Make sure that all parts used in assembly are clean and also lubricated when specified.**
*** When use of a certain type of lubricant, bond or sealant is specified, be sure to use the specified type.**
*** When removing the battery, disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable.**
*** When performing service to electrical parts, if the service procedures do not require using battery power, disconnect the negative cable at the battery.**
*** Tighten cylinder head and case bolts and nuts, beginning with larger diameter and ending with smaller diameter. Always tighten from inside to outside diagonally to the specified tightening torque.**
*** Whenever you remove oil seals, gaskets, packing, O-rings, locking washers, locking nuts, cotter pins, circlips and certain other parts as specified, always replace them with new. Also, before installing these new parts, be sure to remove any left over material from the mating surfaces.**
*** Never reuse a circlip. When installing a new circlip, take care not to expand the end gap larger than required to slip the circlip over the shaft. After installing a circlip, always ensure that it is completely seated in its groove and securely fitted.**
*** Use a torque wrench to tighten fasteners to the torque values when specified.**
Remove grease or oil from screw/bolt threads unless a lubricant is specified.
*** After assembly, check parts for tightness and operation.**

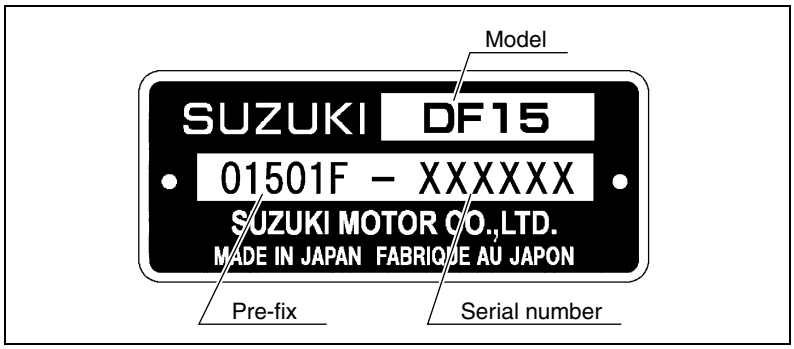
*** To protect the environment, do not unlawfully dispose of used motor oil, other fluids and batteries.**
*** To protect the Earth's natural resources, properly dispose of used motor parts.**

IDENTIFICATION NUMBER LOCATION

MODEL, PRE-FIX, SERIAL NUMBER

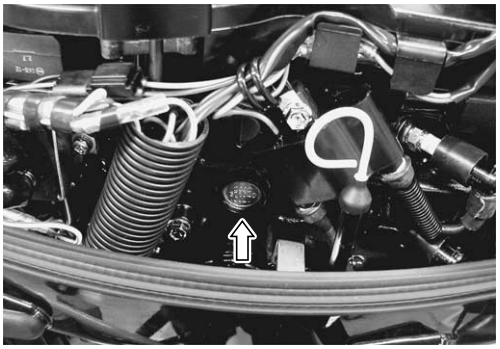
The MODEL, PRE-FIX and SERIAL NUMBER of the motor are stamped on a plate attached to the clamp bracket.

Example



ENGINE SERIAL NUMBER

A second engine serial number plate is pressed into a boss on the cylinder block.



FUEL AND OIL

GASOLINE RECOMMENDATION

Suzuki highly recommends that you use alcohol-free unleaded gasoline with a minimum pump octane rating of 87 (R+M /2 method) or 91 (Research method). However, blends of unleaded gasoline and alcohol with equivalent octane content may be used.

Allowable maximum blend of a single additive (not combination):

5% Methanol, 10% Ethanol, 15% MTBE

CAUTION

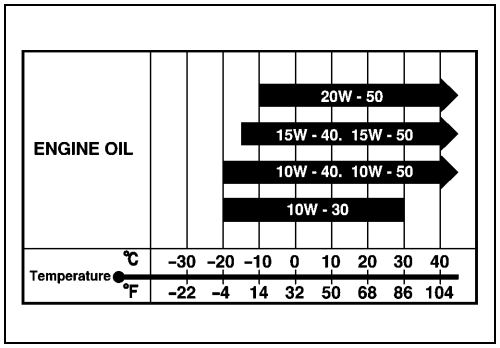
If leaded gasoline is used, engine damage may result. Use only unleaded gasoline.

ENGINE OIL

Use only oils that are rated SE, SF, SG, SH or SJ under the API (American Petroleum Institute) classification system.

The viscosity rating should be SAE 10W-40.

If an SAE 10W-40 motor oil is not available, select an alternative according to the chart at right.



ENGINE BREAK-IN

The first 10 hours are critically important to ensure correct running of either a brand new motor or a motor that has been reconditioned or rebuilt. How the motor is operated during this time will have direct bearing on its life span and long-term durability.

Break-in period: 10 hours

WARM-UP RECOMMENDATION

Allow sufficient idling time (more than 5 minutes) for the engine to warm up after cold engine starting.

THROTTLE RECOMMENDATION

NOTE:
Avoid maintaining a constant engine speed for an extended period at any time during the engine break-in by varying the throttle position occasionally.

1. FIRST 2 HOURS
   For first 15 minutes, operate the engine in-gear at idling speed.
   During the remaining 1 hour and 45 minutes, operate the engine in-gear at less than 1/2 (half) throttle (3 000 r/min).

NOTE:
The throttle may be briefly opened beyond the recommended setting to plane the boat, but must be reduced to the recommended setting immediately after planing.

2. NEXT 1 HOUR
   Operate the engine in-gear at less than 3/4 (three-quarter) throttle (4 000 r/min).

3. LAST 7 HOURS
   Operate the engine in-gear at desired engine speed.
   However, do not operate continuously at full throttle for more than 5 minutes.

PROPELLERS

An outboard motor is designed to develop its rated power within a specified engine speed range. The maximum rated power delivered by the DF9.9/15 models are shown below.

Recommended full throttle speed range	**DF9.9**	**4 500 – 5 500 r/min**
	DF15	**5 400 – 6 000 r/min**

If the standard propeller fails to meet the above requirement, use another pitch propeller to hold the engine speed within the range specified above.

Propeller selection chart

Blade × Diam. (in) × Pitch (in)
3 × 9¼ × 7
3 × 9¼ × 8
3 × 9¼ × 9
3 × 9¼ × 10
3 × 9¼ × 11

CAUTION

Installing a propeller with pitch either too high or too low will cause incorrect maximum engine speed, which may result in severe damage to the motor.

SPECIFICATIONS

Item		Unit	Date					
			DF9.9/9.9A	DF9.9E/9.9AE	DF9.9R/9.9AR	DF15/15A	DF15E/15AE	DF15R/15AR
DIMENSIONS & WEIGHT								
Overall length (front to back)		mm (in)	1 005 (39.6)					
Overall width (side to side)		mm (in)	320 (12.6)					
Overall heigth	S	mm (in)	1 095 (43.1)					
	L	mm (in)	1 220 (48.0)					
Weight	S	kg (lbs)	44.0 (97.0)	47.5 (104.7)	46.5 (102.5)	44.0 (97.0)	47.5 (104.7)	46.5 (102.5)
	L	kg (lbs)	45.0 (99.2)	48.5 (106.9)	47.5 (104.7)	45.0 (99.2)	48.5 (106.9)	47.5 (104.7)
Transom height [Trim position: 3]	S	mm (in. type)	427 (15)					
	L	mm (in. type)	554 (20)					
PERFORMANCE								
Maximum output		kW (PS)	7.3 (9.9)			11.0 (15)		
Recommended operating range		r/min	4 500 – 5 500			5 400 – 6 000		
Idle speed		r/min	1 100 ± 50					
In-gear idle speed		r/min	Approx. 1 000					
POWER HEAD								
Engine type			4-stroke SOHC					
Number of cylinders			2					
Bore		mm (in)	58.0 (2.28)					
Stroke		mm (in)	57.0 (2.24)					
Total displacement		cm^3 (cu. in)	302 (18.4)					
Compression ratio			9.0					
Spark plug		NGK	DCPR6E					
Intake system			Carburetor					
Exhaust system			Through prop exhaust					
Cooling system			Water cooled					
Lubrication system			Wet sump by trochoid pump					
Starting system			Manual	Electric		Manual	Electric	
Choke system			Manual		Electric	Manual		Electric
Throttle control			Twist grip		Remote control	Twist grip		Remote control
Ignition system			SUZUKI PEI (Digital CDI)					

Item	Unit	Date					
		DF9.9/9.9A	DF9.9E/9.9AE	DF9.9R/9.9AR	DF15/15A	DF15E/15AE	DF15R/15AR

FUEL & OIL

Fuel		Suzuki highly recommends that you use alcohol-free unleaded gasoline with a minimum pump octane rating of 87 (R+M /2 method) or 91 (Research method). However, blends of unleaded gasoline and alcohol with equivalent octane content may be used.
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating SAE 10W-40
Engine oil amounts	L (US/Imp. qt)	1.0 (1.1/0.9): Oil change only 1.1 (1.2/1.0): Oil filter change
Gear oil		SUZUKI Outboard Motor Gear Oil (SAE #90 hypoid gear oil)
Gearcase oil amounts	ml (US/Imp. qt)	170 (5.7/6.0)

BRACKET

Trim angle	Degrees	4 – 20
Number of trim position		5
Maximum tilt angle	Degrees	74

LOWER UNIT

Reversing system	Gear
Transmission	Forward-Neutral-Reverse
Reduction system	Bevel gear
Gear ratio	12 : 23 (1.917)
Drive line impact protection	Spline drive rubber hub
Propeller	Blade × Diam. (in) × Pitch (in)
	3 × 9¼ × 7 3 × 9¼ × 8 3 × 9¼ × 9 3 × 9¼ × 10 3 × 9¼ × 11

These specifications are subject to change without notice.

SERVICE DATA

Item	Unit	Date			
		DF9.9 (E)/9.9R	DF9.9A (E)/9.9AR	DF15 (E)/15R	DF15A (E)/15AR

POWERHEAD

Recommended operation range	r/min	4 500 – 5 500		5 400 – 6 000
Idle speed	r/min	1 100 ± 50 (in-gear: approx. 1 000)		
Cylinder compression* (with decompression system)	kPa (kg/cm², psi)	Approx. 400 (4.0, 57) with recoil starting		
Oil pressure* [Oil temp. at 60 °C (140 °F)]	kPa (kg/cm², psi)	Min. 200 (2.0, 28) Max. 500 (5.0, 71) at 3 000 r/min		
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating SAE 10W-40		
Engine oil amount	L (US/lpm. qt))	1.0 (1.1/0.9): Oil change only 1.1 (1.2/1.0): Oil filter change		
Thermostat operating temperature	°C (°F)	58 – 62 (136 – 144)		

* Figures shown are guidelines only, not absolute service limit.

CYLINDER HEAD/CAMSHAFT

Cylinder head distortion		Limit	mm (in)	0.05 (0.002)	
Cam height	IN	STD	mm (in)	22.259 – 22.319 (0.8763 – 0.8787)	23.471 – 23.531 (0.9241 – 0.9264)
		Limit	mm (in)	22.100 (0.8701)	23.320 (0.9181)
	EX	STD	mm (in)	22.257 – 22.317 (0.8763 – 0.8786)	23.471 – 23.531 (0.9241 – 0.9264)
		Limit	mm (in)	22.100 (0.8701)	23.230 (0.9181)
Camshaft journal oil clearance		STD	mm (in)	0.020 – 0.062 (0.0008 – 0.0024)	
		Limit	mm (in)	0.100 (0.0039)	
Camshaft holder inside diameter	Upper	STD	mm (in)	25.000 – 25.021 (0.9843 – 0.9851)	
	Lower	STD	mm (in)	23.000 – 23.021 (0.9055 – 0.9063)	
Camshaft journal outside diameter	Upper	STD	mm (in)	24.959 – 24.980 (0.9826 – 0.9835)	
	Lower	STD	mm (in)	22.959 – 22.980 (0.9039 – 0.9047)	
Rocker arm shaft to rocker arm clearance		STD	mm (in)	0.016 – 0.045 (0.0006 – 0.0018)	
		Limit	mm (in)	0.060 (0.0024)	
Rocker arm inside diameter		STD	mm (in)	13.000 – 13.018 (0.5118 – 0.5125)	
Rocker arm shaft outside diameter		STD	mm (in)	12.973 – 12.984 (0.5107 – 0.5112)	

Item			Unit	Date			
				DF9.9 (E)/9.9R	DF9.9A (E)/9.9AR	DF15 (E)/15R	DF15A (E)/15AR

VALVE/VALVE GUIDE

Valve diameter	IN	STD	mm (in)	26 (1.0)
	EX	STD	mm (in)	22 (0.9)
Valve clearance (when cold)	IN	STD	mm (in)	0.08 – 0.12 (0.003 – 0.005)
	EX	STD	mm (in)	0.13 – 0.17 (0.005 – 0.007)
Valve guide to valve stem clearance	IN	STD	mm (in)	0.010 – 0.037 (0.0004 – 0.0015)
		Limit	mm (in)	0.070 (0.0028)
	EX	STD	mm (in)	0.035 – 0.062 (0.0014 – 0.0024)
		Limit	mm (in)	0.090 (0.0035)
Valve guide inside diameter	IN	STD	mm (in)	5.500 – 5.512 (0.2165 – 0.2170)
	EX	STD	mm (in)	5.500 – 5.512 (0.2165 – 0.2170)
Valve guide outside diameter	IN	STD	mm (in)	5.475 – 5.490 (0.2156 – 0.2161)
	EX	STD	mm (in)	5.450 – 5.465 (0.2146 – 0.2152)
Valve stem end length	IN	Limit	mm (in)	2.2 (0.09)
	EX	Limit	mm (in)	2.2 (0.09)
Valve stem deflection	IN	Limit	mm (in)	0.16 (0.006)
	EX	Limit	mm (in)	0.16 (0.006)
Valve stem runout	IN	Limit	mm (in)	0.05 (0.02)
	EX	Limit	mm (in)	0.05 (0.02)
Valve head radial runout	IN	Limit	mm (in)	0.03 (0.001)
	EX	Limit	mm (in)	0.03 (0.001)
Valve head thickness	IN	Limit	mm (in)	0.5 (0.02)
	EX	Limit	mm (in)	0.5 (0.02)
Valve seat width	IN	STD	mm (in)	0.9 – 1.1 (0.035 – 0.043)
	EX	STD	mm (in)	0.9 – 1.1 (0.035 – 0.043)
Valve spring free length		STD	mm (in)	32.52 (1.280)
		Limit	mm (in)	32.40 (1.276)
Valve spring tension		STD	N (kg, lbs)	90 (9.0, 19.8) for 28.5 mm (1.12 in)
		Limit	N (kg, lbs)	76 (7.6, 16.8) for 28.5 mm (1.12 in)

Item			Unit	Date			
				DF9.9 (E)/9.9R	DF9.9A (E)/9.9AR	DF15 (E)/15R	DF15A (E)/15AR

CYLINDER/PISTON/PISTON RING

Cylinder distortion		Limit	mm (in)	0.05 (0.002)
Piston to cylinder clearance		STD	mm (in)	0.0276 – 0.0425 (0.0011 – 0.0017)
		Limit	mm (in)	0.100 (0.0039)
Cylinder bore		STD	mm (in)	58.000 – 58.015 (2.2835 – 2.2841)
Cylinder measuring position			mm (in)	50 (2.0) from cylinder top surface
Piston skirt diameter		STD	mm (in)	57.965 – 57.980 (2.2821 – 2.2827)
Piston measuring position			mm (in)	15 (0.6) from piston skirt end
Wear on cylinder bore		Limit	mm (in)	0.055 (0.0022)
Piston ring end gap	1st	STD	mm (in)	0.10 – 0.25 (0.004 – 0.010)
		Limit	mm (in)	0.50 (0.020)
	2nd	STD	mm (in)	0.10 – 0.25 (0.004 – 0.010)
		Limit	mm (in)	0.50 (0.020)
Piston ring free end gap	1st	STD	mm (in)	Approx. 5.8 (0.23)
		Limit	mm (in)	4.6 (0.18)
	2nd	STD	mm (in)	Approx. 7.4 (0.29)
		Limit	mm (in)	5.9 (0.23)
Piston ring to groove clearance	1st	STD	mm (in)	0.02 – 0.06 (0.001 – 0.002)
		Limit	mm (in)	0.10 (0.004)
	2nd	STD	mm (in)	0.02 – 0.06 (0.001 – 0.002)
		Limit	mm (in)	0.10 (0.004)
Piston ring to groove width	1st		mm (in)	1.21 – 1.23 (0.0476 – 0.0484)
	2nd		mm (in)	1.21 – 1.23 (0.0476 – 0.0484)
	Oil		mm (in)	2.51 – 2.53 (0.0988 – 0.0996)
Piston ring thickness	1st	STD	mm (in)	1.17 – 1.19 (0.0461 – 0.469)
	2nd	STD	mm (in)	1.17 – 1.19 (0.0461 – 0.469)
Piston pin oil clearance		STD	mm (in)	0.002 – 0.013 (0.0001 – 0.0005)
		Limit	mm (in)	0.040 (0.0016)
Piston pin outside diameter		STD	mm (in)	13.995 – 14.000 (0.5510 – 0.5512)
		Limit	mm (in)	13.980 (0.5504)
Piston pin hole diameter		STD	mm (in)	14.002 – 14.008 (0.5513 – 0.5515)
		Limit	mm (in)	14.030 (0.5524)

Item		Unit	Date			
			DF9.9 (E)/9.9R	DF9.9A (E)/9.9AR	DF15 (E)/15R	DF15A (E)/15AR

CRANKSHAFT/CONROD

Conrod small end inside diameter	STD	mm (in)	14.006 – 14.014 (0.5514 – 0.5517)
	Limit	mm (in)	14.040 (0.5528)
Conrod big end oil clearance	STD	mm (in)	0.025 – 0.043 (0.0010 – 0.0017)
	Limit	mm (in)	0.063 (0.0025)
Conrod big end inside diameter	STD	mm (in)	29.016 – 29.034 (1.1424 – 1.1431)
Crank pin outside diameter	STD	mm (in)	28.982 – 29.000 (1.1410 – 1.1417)
Crank pin outside diameter difference	Limit	mm (in)	0.010 (0.0004)
Conrod big end side clearance	STD	mm (in)	0.10 – 0.20 (0.004 – 0.008)
	Limit	mm (in)	0.60 (0.024)
Conrod big end width	STD	mm (in)	19.95 – 20.00 (0.785 – 0.787)
Crank pin width	STD	mm (in)	20.10 – 20.15 (0.791 – 0.793)
Crankshaft thrust clearance	Limit	mm (in)	0.60 (0.024)
Crankshaft length	STD	mm (in)	126.8 – 126.9 (4.992 – 4.996)
Crankcase length	STD	mm (in)	127.0 – 127.1 (5.000 – 5.004)
Crankshaft bearing oil clearance	STD	mm (in)	0.020 – 0.044 (0.0008 – 0.0017)
	Limit	mm (in)	0.060 (0.0024)
Crankshaft bearing holder inside diameter	STD	mm (in)	35.000 – 35.016 (1.3780 – 0.3986)
Crankshaft journal outside diameter	STD	mm (in)	31.984 – 32.000 (1.2592 – 1.2598)
Crankshaft journal outside diameter difference	Limit	mm (in)	0.010 (0.0004)
Bearing thickness	STD	mm (in)	1.486 – 1.498 (0.0585 – 0.0590)

Item	Unit	Date			
		DF9.9 (E)/9.9R	DF9.9A (E)/9.9AR	DF15 (E)/15R	DF15A (E)/15AR

LOWER UNIT

Gearcase oil amount	ml (US/Imp.oz)	170 (5.7/6.0)
Gear ratio		1.917 (23/12)

Preliminary gear shim & thrust washer

Pinion back up shim	mm (in)	1.0 (0.039)
Forward back up shim	mm (in)	1.0 (0.039)
Reverse back up shim	mm (in)	1.0 (0.039)
Forward thrust washer	mm (in)	1.5 (0.06)
Reverse thrust washer	mm (in)	1.5 (0.06)

Initial selection-shim adjustment may be required.

CARBURETOR

Type	MIKUNI	B22TI-15		B26TI-20	
I.D. mark		93E40	93E21	93E50	93E31
Main jet	#	92.5	86.3	123.8	118.8
Pilot jet	#	60	52.5	47.5	42.5
Pilot screw	Turns open	PRE-SET	PRE-SET	PRE-SET	PRE-SET
Float height	mm	17.6 ± 1	17.6 ± 1	17.6 ± 1	17.6 ± 1

NOTE:
Hold carburetor vertical (bore up) and slowly rotate to an inverted horizontal position until float adjustment tab contacts inlet needle valve. Holding carburetor in this position, measure with vernier caliper from the float to the mating surface of the carburetor body, gasket removed, at 180° from the needle valve.

Item		Unit	Date			
			DF9.9 (E)/9.9R	DF9.9A (E)/9.9AR	DF15 (E)/15R	DF15A (E)/15AR

ELECTRICAL

Ignition timing		Degree at r/min	BTDC 5° at 1 300 BTDC 35° at 3 500	BTDC 5° at 1 300 BTDC 30° at 3 500
Over revolution limiter		r/min	Approx. 6 500	
Condenser charge coil resistance		Ω at 20°	244 – 364 (G – B/R)	
Pulser coil resistance		Ω at 20°	155 – 233 (R/B – B)	
Ignition coil resistance (without spark plug cap)	Primary	Ω at 20°	0.2 – 0.4 (O – B)	
	Secondary	kΩ at 20°	6.4 – 9.6 (H.T. cord – H.T. cord)	
Spark plug cap resistance		kΩ at 20°	8 – 12	
Battery charge coil resistance		Ω at 20°	0.2 – 0.4 (R – Y)	
Battery charge coil output (12V)		Watt	80 (120.....with option coil)	
Standard spark plug	Type	NGK	DCPR6E	
	Gap	mm (in)	0.8 – 0.9 (0.031 – 0.035)	
Fuse amp rating		A	25: Electric start model	
Recommended battery capacity (12V)		Ah (kC)	35 (126) or over: Electric start model	
Chock solenoid coil resistance		Ω at 20 °C	2.8 – 4.2 (O – B): Remote control model	
Starter motor relay coil resistance		Ω at 20 °C	3.5 – 5.1 (Y/G – B): Remote control model	

STARTER MOTOR (only for Electric start model)

Max. continuous time of use		Sec.	30
Motor output		kW	0.6
Brush length	STD	mm (in)	12.5 (0.49)
	Limit	mm (in)	9.0 (0.35)
Commutator undercut	STD	mm (in)	0.5 – 0.8 (0.02 – 0.03)
	Limit	mm (in)	0.2 (0.01)
Commutator outside diameter	STD	mm (in)	30 (1.2)
	Limit	mm (in)	29 (1.1)
Difference between max/min diameter of commutator	STD	mm (in)	0.05 (0.002)
	Limit	mm (in)	0.40 (0.016)
Pinion/ring gear gap		mm (in)	3.0 – 5.0 (0.12 – 0.20)

PEAK VOLTAGE

Requirements for peak voltage measurement

- Remove all spark plugs to eliminate the variables at cranking speed.
- Crank with recoil starter.
- Use a STEVENS peak voltage tester, Model CD-77.

Testing sequence	Tester probe connection		Peak voltage	Tester range	Remarks
	⊕ (Red)	⊖ (Black)			
CDI output	Orange	Black	144 V or over	NEG 500	With ignition coil connected
Condenser charge coil output	Green	Black/Red	144 V or over	POS 500	With CDI unit disconnected
Pluser coil output	Red/Black	Black (Ground)	2.2 V or over	SEN 5	
Battery charge coil output	Red	Yellow	3.5 V or over	POS 50	With rectifier disconnected

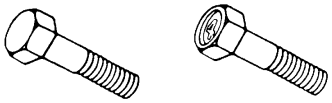
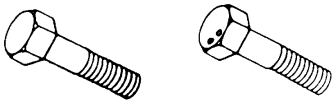
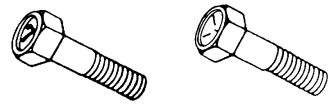
TIGHTENING TORQUE

Tightening torque – Important fasteners

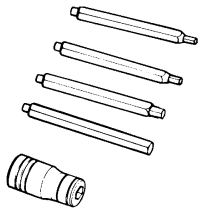
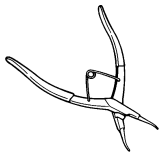
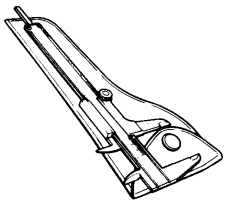
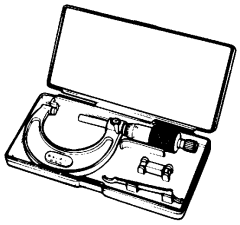
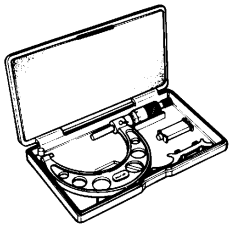
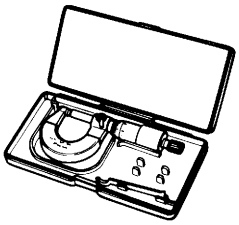
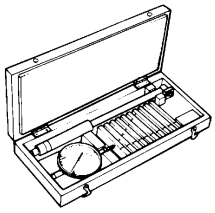
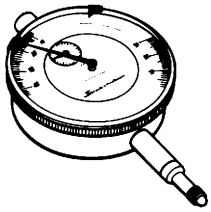
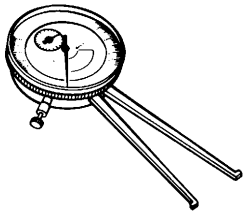
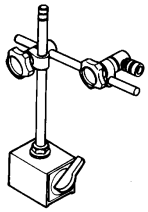
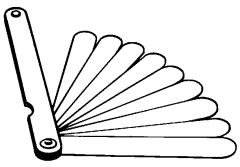
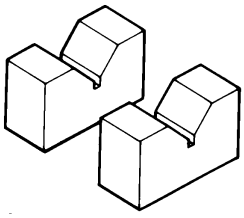
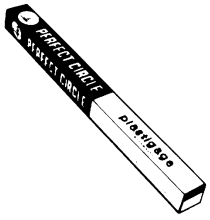
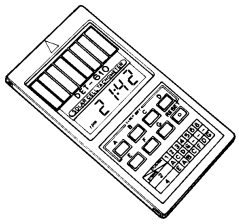
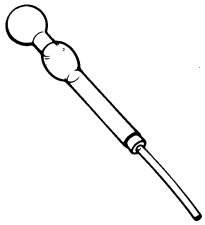
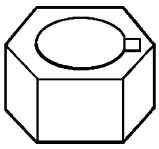
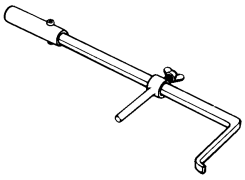
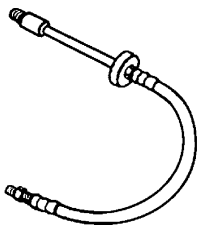
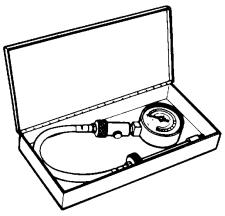
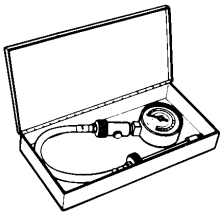
ITEM	THREAD DIAM.	TIGHTENING TORQUE		
		N·m	kgf-m	lb-ft
Cylinder head cover bolt	6 mm	10	1.0	7.0
Cylinder head bolt	8 mm	28	2.8	20.0
Crankcase bolt	6 mm	14	1.4	10.0
	8 mm	25	2.5	18.0
Conrod cap bolt	7 mm	12	1.2	8.5
Oil pump bolt	6 mm	14	1.4	10.0
Oil pump gallery bolt	6 mm	14	1.4	10.0
Intake manifold bolt	8 mm	23	2.3	16.5
Carburetor mounting bolt	6 mm	10	1.0	7.0
Fuel pump bolt	6 mm	10	1.0	7.0
Thermostat cover bolt	6 mm	10	1.0	7.0
Valve adjusting lock nut	5 mm	10	1.0	7.0
Timing pulley nut	26 mm	50	5.0	36.0
Flywheel nut	14 mm	80	8.0	58.5
Spark plug	—	17	1.7	12.5
Power unit mounting bolt and nut	8 mm	23	2.3	16.5
Driveshaft housing bolt	8 mm	23	2.3	16.5
Oil pressure switch	—	13	1.3	9.5
Oil regulator	14 mm	27	2.7	19.5
Camshaft pulley bolt	6 mm	10	1.0	7.0
Engine oil drain plug	12 mm	13	1.3	9.5
Upper mount bolt	8 mm	23	2.3	16.5
Upper mount bracket bolt	8 mm	23	2.3	16.5
Lower mount cover bolt	8 mm	23	2.3	16.5
Lower mount bolt	8 mm	23	2.3	16.5
Clamp bracket shaft nut	22 mm	43	4.3	31.0
Tilt lock arm bolt	10 mm	25	2.5	18.0
Handle pivot bolt	10 mm	6	0.6	4.5
Handle pivot nut	10 mm	23	2.3	16.5
Water pump case bolt	8 mm	8	0.8	6.0
Gearcase bolt	8 mm	23	2.3	16.5
Propeller nut	12 mm	18	1.8	13.0
Propeller shaft bearing housing bolt	6 mm	8	0.8	6.0

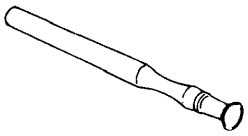
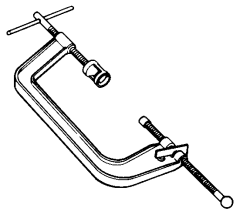
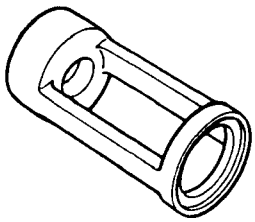
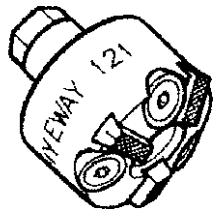
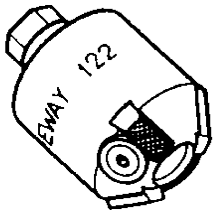
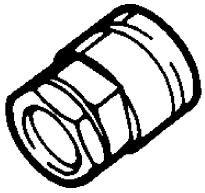
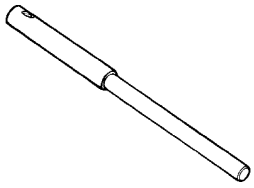
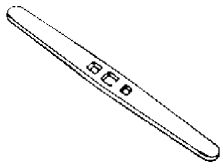
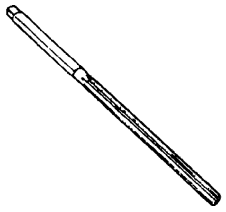
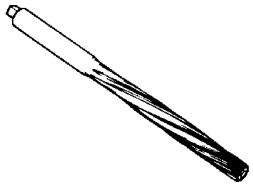
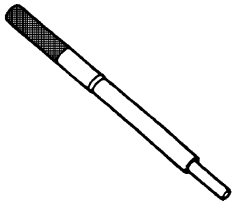
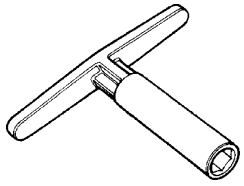
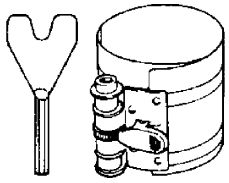
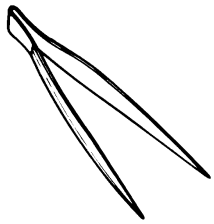
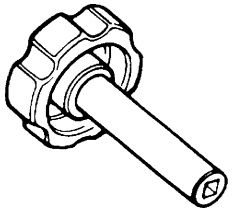
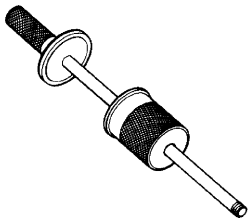
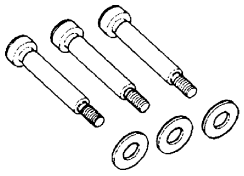
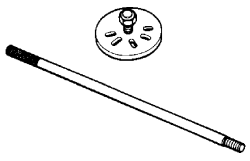
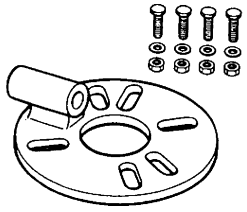
Tightening torque – General bolt

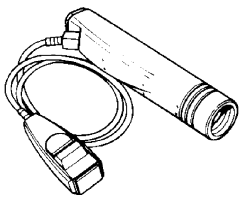
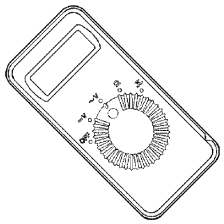
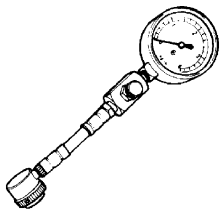
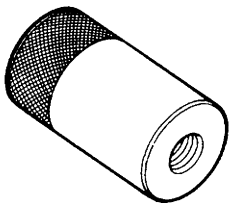
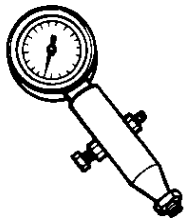
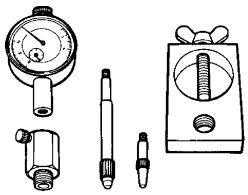
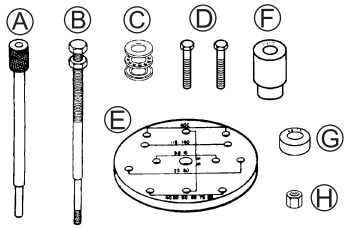
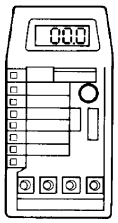
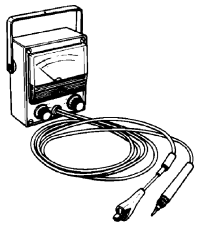
NOTE:
These value are only applicable when torque for a general bolt is not listed in the "Important Fasteners" table.

TYPE OF BOLT	THREAD DIAMETER	TIGHTENING TORQUE		
		N·m	kgf-m	lb-ft
 (Conventional or "4" marked bolt)	5 mm	2 – 4	0.2 – 0.4	1.5 – 3.0
	6 mm	4 – 7	0.4 – 0.7	3.0 – 5.0
	8 mm	10 – 16	1.0 – 1.6	7.0 – 11.5
	10 mm	22 – 35	2.2 – 3.5	16.0 – 25.5
 (Stainless steel bolt)	5 mm	2 – 4	0.2 – 0.4	1.5 – 3.0
	6 mm	6 – 10	0.6 – 1.0	4.5 – 7.0
	8 mm	15 – 20	1.5 – 2.0	11.0 – 14.5
	10 mm	34 – 41	3.4 – 4.1	24.5 – 29.5
 (7 marked or ⅄ marked bolt)	5 mm	3 – 6	0.3 – 0.6	2.0 – 4.5
	6 mm	8 – 12	0.8 – 1.2	6.0 – 8.5
	8 mm	18 – 28	1.8 – 2.8	13.0 – 20.0
	10 mm	40 – 60	4.0 – 6.0	29.0 – 43.5

SPECIAL TOOLS

1.  09900-00410 Hexagon wrench set	2.  09900-06108 Snap ring pliers	3.  09900-20101 (150 mm) 09900-20102 (200 mm) Vernier calipers	4.  09900-20202 Micrometer (25 – 50 mm)	5.  09900-20203 Micrometer (50 – 75 mm)
6.  09900-20205 Micrometer (0 – 25 mm)	7.  09900-20508 Cylinder gauge set (40 – 80 mm)	8.  09900-20602 Dial gauge	9.  09900-20605 Dial calipers (10 – 34 mm)	10.  09900-20701 Magnetic stand
11.  09900-20803 Thickness gauge	12.  09900-21304 Steel “V” block set	13.  09900-22301 Plastigauge (0.025 – 0.076 mm)	14.  09900-26006 Engine tachometer	15.  09900-28403 Hydrometer
16.  09911-49310 Crankshaft holder	17.  09913-50121 Oil seal remover	18.  09915-63210 Compression gauge adapter	19.  09915-64512 Compression gauge	20.  09915-77311 Oil pressure gauge

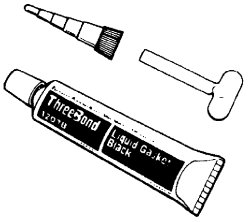
21.  **09915-78211** **Oil pressure gauge adapter**	**22.**  **09916-10911** **Valve lapper**	**23.**  **09916-14510** **Valve lifter**	**24.**  **09916-14521** **Valve lifter attachment**	**25.**  **09916-20610** **Valve seat cutter (15°) (N-121)**
26.  **09916-20620** **Valve seat cutter (45°) (N-122)**	**27.**  **09916-24440** **Handle adapter (N-503-1)**	**28.**  **09916-24450** **Solid pilot (N-100-5.52)**	**29.**  **09916-34542** **Valve guide reamer handle**	**30.**  **09916-34550** **Valve guide reamer (ϕ 5.5 mm)**
31.  **09916-38210** **Valve guide reamer (ϕ 11 mm)**	**32.**  **09916-44910** **Valve guide remover/installer**	**33.**  **09916-54910** **Handle (N-505)**	**34.**  **09916-77310** **Piston ring compressor**	**35.**  **09916-84511** **Tweezers**
36.  **09917-14910** **Valve adjuster driver**	**37.**  **09930-30104** **Sliding hammer**	**38.**  **09930-39210** **Flywheel remover attachment bolt**	**39.**  **09930-39411** **Flywheel remover**	**40.**  **09930-39520** **Flywheel holder**

41.  **09930-76420** **Timing light**	**42.**  **09930-99320** **Digital tester**	**43.**  **09940-44121** **Air pressure gauge**	**44.**  **09950-59320** **Propeller shaft remover**	**45.**  **09950-69512** **Gearcase oil leakage tester**
46.  **09951-09511** **Gear adjusting gauge**	**47.**  **Pinion bearing installer and remover** **09951-59910 Pinion bearing installer shaft Ⓐ** **09951-49910 Pinion bearing remover shaft Ⓑ** **09951-69910 Bearing Ⓒ** **01500-08403 Bolt Ⓓ** **09951-39914 Pinion bearing plate Ⓔ** **09951-19311 Attachment Ⓕ** **09951-79311 Spacer Ⓖ** **09951-29910 Nut Ⓗ**		**48.**  **99954-53008-820*** **Digital voltmeter**	**49.**  **99954-53873*** **Stevens CD-77 Peak reading voltmeter**
50.  **99954-53883*** **Gear oil filler**				

NOTE:

** Marked part No. is in U.S. market only.*

MATERIALS REQUIRED

SUZUKI OUTBOARD MOTOR GEAR OIL  **99000-22540 (400 ml × 24 pcs.)**	**SUZUKI SUPER GREASE "A"**  **99000-25030* 99000-25010 (500 g)**	**WATER RESISTANT GREASE**  **99000-25160 (250 g)**	**SUZUKI SILICONE SEAL**  **99000-31120 (50 g)**	**SUZUKI BOND "1207B"**  **99104-33140* 99000-31140 (100 g)**
THREAD LOCK "1342"  **99000-32050 (50 g)**	**THREAD LOCK SUPER "1333B"**  **99000-32020 (50 g)**	**4-Stroke Motor Oil** **API: SE, SF, SG, SH, SJ SAE: 10W-40**		

NOTE:
** Marked part No. is in U.S. market only.*

PERIODIC MAINTENANCE

CONTENTS

PERIODIC MAINTENANCE SCHEDULE 2- 2
PERIODIC MAINTENANCE CHART 2- 2
MAINTENANCE AND TUNE-UP PROCEDURES 2- 3
ENGINE OIL 2- 3
ENGINE OIL FILTER 2- 4
GEAR OIL 2- 5
LUBRICATION 2- 6
SPARK PLUG 2- 7
VALVE CLEARANCE 2- 8
TIMING BELT 2-10
IDLE SPEED 2-13
CARBURETOR 2-13
IGNITION TIMING 2-14
BREATHER AND FUEL LINE 2-14
FUEL FILTER 2-14
WATER PUMP/WATER PUMP IMPELLER 2-15
PROPELLER NUT AND PIN 2-15
ANODES AND BONDING WIRES 2-15
BATTERY 2-17
BOLTS AND NUTS 2-18

PERIODIC MAINTENANCE SCHEDULE

The chart below lists the recommended intervals for all the required periodic service work necessary to keep the motor operating at peak performance and economy.
Maintenance intervals should be judged by number of hours or months, whichever comes first.

NOTE:
More frequent servicing should be performed on outboard motors that are used under severe conditions.

PERIODIC MAINTENANCE CHART

Interval / Item to be serviced	Initial 20 hrs. or 1 month	Every 200 hrs. or 12 months	Every 100 hrs. or 6 months	Every 50 hrs. or 3 months	Refer to page
Spark plug	—	—	I	R	2-7
Breather and fuel line	I	I	I	I	2-14
	Replace every 2 years.				
Engine oil	R	—	R	R	2-3
Gear oil	R	—	R	R	2-5
Lubrication	—	I	I	I	2-6
Anodes and bounding wire	—	I	I	I	2-15
Battery	—	I	I	I	2-17
Bolts and nuts	T	—	T	T	2-18
Engine oil filter	R	—	—	R	2-4
Fuel filter	—	I	I	I	2-14
	Replace every 400 hours or 2 years.				
Valve clearance	I	—	—	I	2-8
Timing belt	—	—	—	I	2-10
	Replace every 4 years.				
Carburetor	I	—	I	I	2-13
Propeller nut and pin	I	—	I	I	2-15
Water pump	—	—	—	I	2-15
Water pump impeller	—	—	—	R	2-15
Idle speed	I	—	—	I	2-13
Ignition timing	—	—	—	I	2-14

I: Inspect and clean, adjust, lubricate or replace, if necessary **T:** Tighten **R:** Replace

MAINTENANCE AND TUNE-UP PROCEDURES

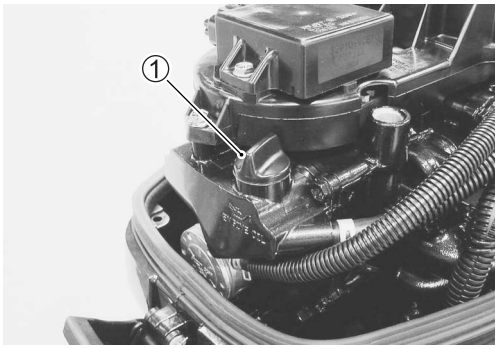
This section describes the servicing procedures for each of the periodic maintenance requirements.

ENGINE OIL

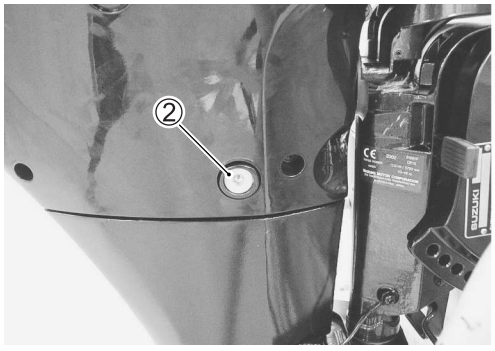
Change initially after 20 hours (1 month) and every 100 hours (6 months) thereafter.

NOTE:
Engine oil should be changed while the engine is warm.

1. Place the outboard motor upright on a level surface.
2. Remove the motor cover.
3. Remove the oil filler cap ①.



4. Place an oil pan, then drain oil by removing the oil drain plug ② and the gasket.



5. Install the gasket and the oil drain plug.
   Tighten the engine oil drain plug.

Engine oil drain plug: 13 N·m (1.3 kgf-m, 9.5 lb-ft)

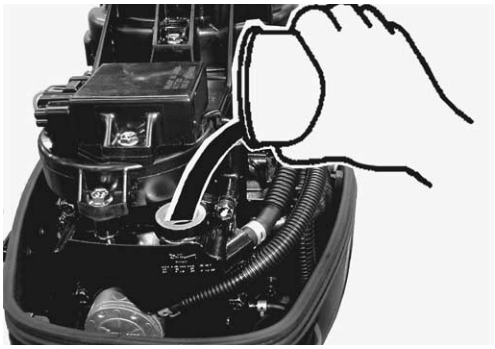
CAUTION

Do not re-use the gasket once removed. Always use a new gasket.

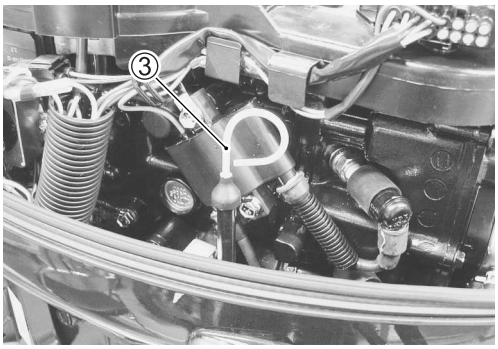
6. Pour the recommended engine oil, then install the oil filler cap.

   Necessary amount of engine oil:
   Oil change only: 1.0 L (1.1/0.9 US/Imp. qt)
   Oil filter change: 1.1 L (1.2/1.0 US/Imp. qt)

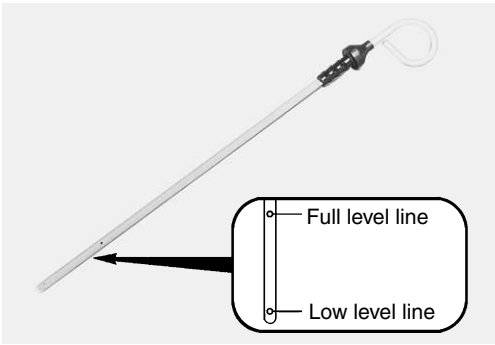
   Recommended oil:
   *** 4 stroke motor oil**
   *** API classification SE, SF, SG, SH, SJ**
   *** Viscosity rating SAE 10W-40**



7. Start the engine and allow it to run for several minutes at the idle speed.
   Turn off the engine and wait for approx. two minutes.
8. Remove the oil level dipstick ③ and wipe it clean.
9. Insert the dipstick fully into the dipstick hole, then pull it out.



10. Oil level should be between the full level hole (Max.) and the low level hole (Min.)
    If the level is low, add the recommended oil to the full level hole.



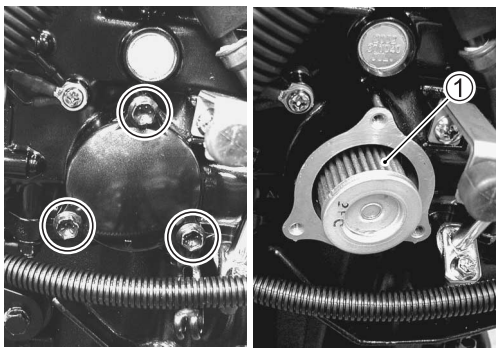
ENGINE OIL FILTER

Replace initially after 20 hours (1 month) and every 200 hours (12 months) thereafter.

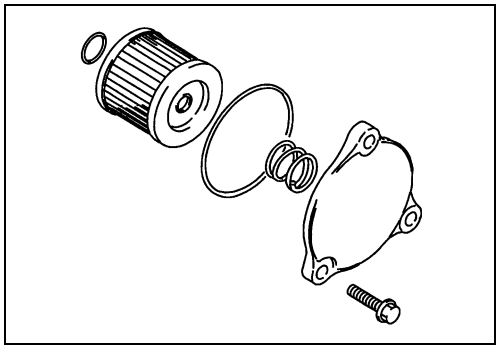
NOTE:
When replacing the engine oil filter, change the engine oil at the same time. (For oil change, see pages 2-3 and 2-4.)

Necessary amount of engine oil:
Oil filter change: 1.1 L (1.2/1.0 US/Imp. qt)

1. Remove the motor cover.
2. Remove the side covers.
3. Remove the three bolts securing the oil filter cap.
4. Remove the oil filter ①.



5. Assembly is reverse order of disassembly.



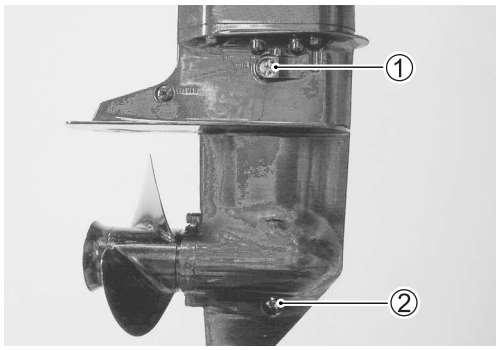
CAUTION

Do not re-use the O-rings removed. Always use a new O-ring.

GEAR OIL

Change initially after 20 hours (1 month) and every 100 hours (6 months) thereafter.

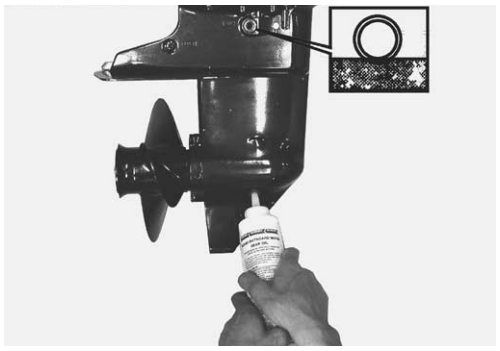
1. Place the outboard motor upright on a level surface.
2. Place a container under the lower unit.
3. Remove the gear oil drain plug ② before the gear oil level plug ① and drain the gear oil.



4. Fill with the recommended gear oil through the oil drain hole until the oil just starts to flow out from the oil level hole.

   Gear oil amount: 170 ml (5.7/6.0 US/Imp. oz)

   Recommended oil:
   SUZUKI OUTBOARD MOTOR GEAR OIL or
   SAE #90 HYPOID GEAR OIL



5. Install the oil level plug before removing the oil filler tube from the drain hole.
6. Install the oil drain plug.

CAUTION

Do not re-use the gasket once removed. Always use a new gasket.

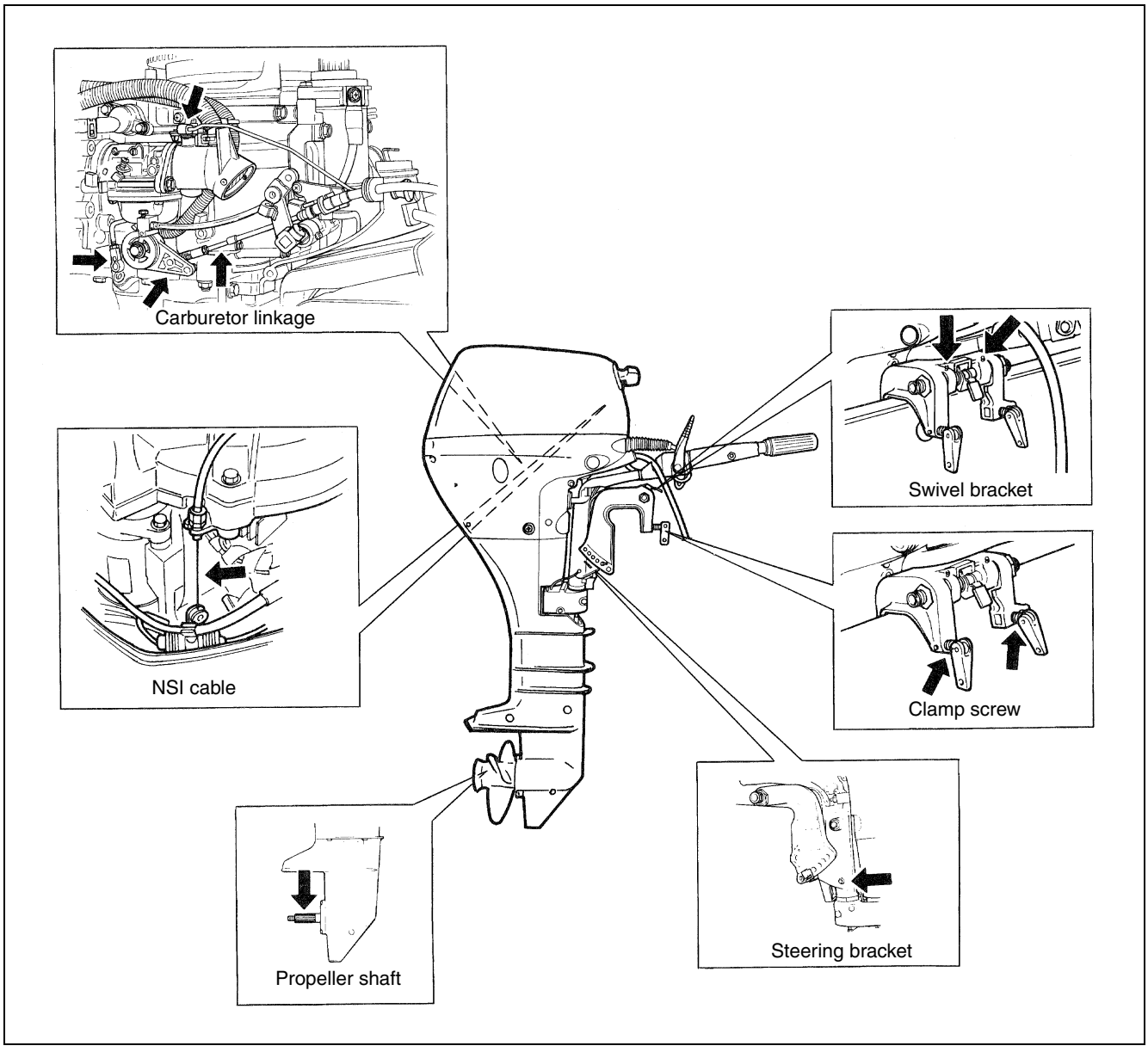
NOTE:
To avoid insufficient injection of the gear oil, check the gear oil level 10 minutes after doing the procedure in the step 6. If the oil level is low, slowly inject the gear oil up to the correct level.

LUBRICATION

Inspect every 50 hours (3 months).

Apply the water resistant grease to the following points.

W/R G's 99000-25160: SUZUKI WATER RESESTANT GREASE



SPARK PLUG

*** Inspect every 100 hours (6 months).**
*** Replace every 200 hours (12 months).**

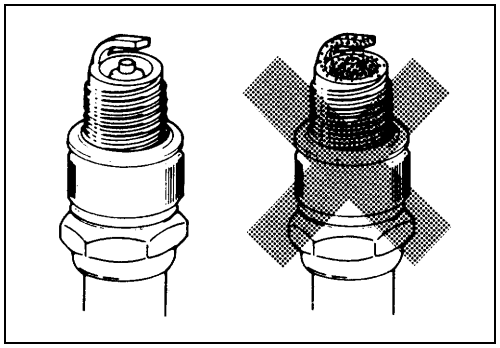
Standard spark plug: NGK DCPR6E

CAUTION

Only resistor (R) type spark plugs must be used with this engine. Using a non-resistor spark plug will cause ignition system malfunctions.

CARBON DEPOSIT

Inspect for a carbon deposit on the spark plug bases.
If carbon is present, remove carbon with a spark plug cleaning machine or by carefully using a pointed tool.

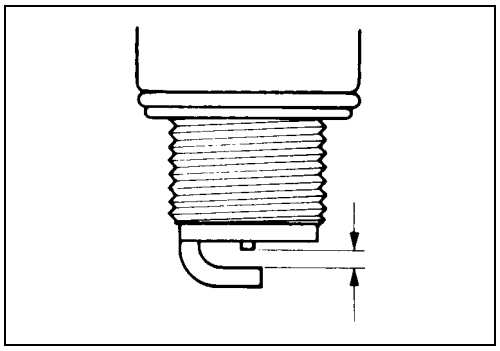


SPARK PLUG GAP

Measure for the spark plug gap using the thickness gauge.
Adjust to within the specified range if the gap is out of the specification.

Spark plug gap: 0.8 – 0.9 mm (0.031 – 0.035 in)

09900-20803: Thickness gauge

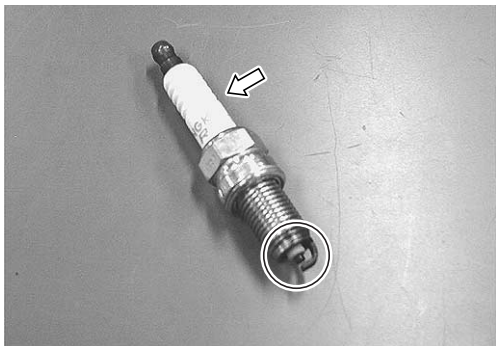


CONDITION OF ELECTRODE/INSULATOR

Check the electrode and insulator condition.
If the electrode is extremely worn or burnt, replace the spark plug.
If the spark plug has a broken insulator, damaged threads, etc., replace the spark plug.

CAUTION

Confirm the thread size and reach when replacing the plug. If the reach is too short, carbon will be deposited on the threaded portion of the plug hole resulting in possible engine damage.

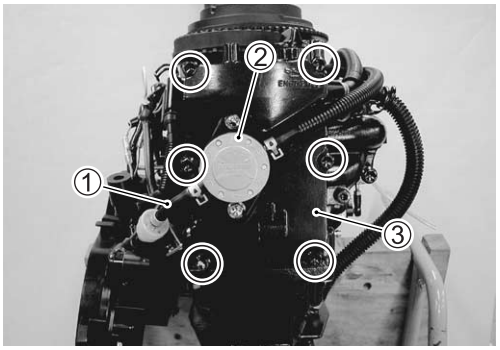


Spark plug: 17 N·m (1.7 kgf-m, 12.5 lb-ft)

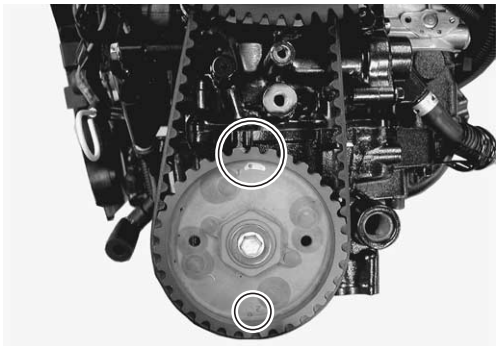
VALVE CLEARANCE

Inspect initially after 20 hours (1 month) and every 200 hours (12 months) thereafter.

1. Remove the following parts:
   * Motor cover
   * Side covers
   * Recoil starter
   * Spark plugs
2. Disconnect the fuel hoses ① from the fuel pump ②.
3. Remove the six bolts and the cylinder head cover ③.



4. Rotate the flywheel clockwise to bring each piston to the Top Dead Center (TDC) on a compression stroke. Align each PUNCH mark on the cam pulley with the INDEX mark on the cylinder head block.



PUNCH mark	TDC cylinder number
1	No. 1 cylinder
2	No. 2 cylinder

CAUTION

Rotate the crankshaft in the normal running direction only (clockwise) to prevent water pump impeller damage.

NOTE:

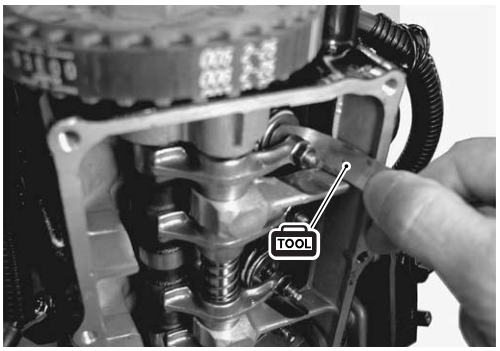
* *The piston must be at its TDC position on a compression stroke to check or adjust the valve clearance.*
* *The valve clearance specification is for COLD engine condition.*
* *The valve clearance specification is different for the intake (IN) valves and the exhaust (EX) valves.*

5. Insert the thickness gauge between the valve stem end and the valve adjusting screw on the rocker arm.

TOOL 09900-20803: Thickness gauge

Valve clearance (when cold):
IN. 0.08 – 0.12 mm (0.003 – 0.005 in)
EX. 0.13 – 0.17 mm (0.005 – 0.007 in)

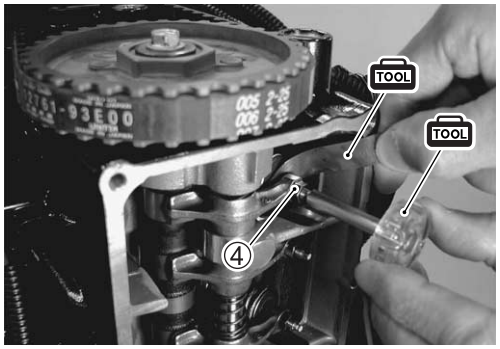
If the measurement is out of the specification, adjust the valve clearance.



ADJUSTMENT

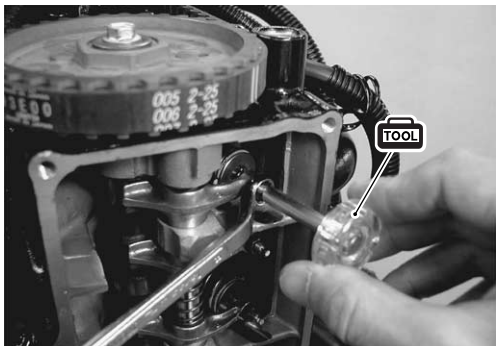
6. Loosen the valve adjusting lock nut ④.
7. Turn the valve adjusting screw using the valve adjuster driver to bring the valve clearance to within the specification.

09900-20803: Thickness gauge
09917-14910: Valve adjustment driver



8. Tighten the valve adjusting lock nut while holding the valve adjusting screw.

Valve adjusting lock nut: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

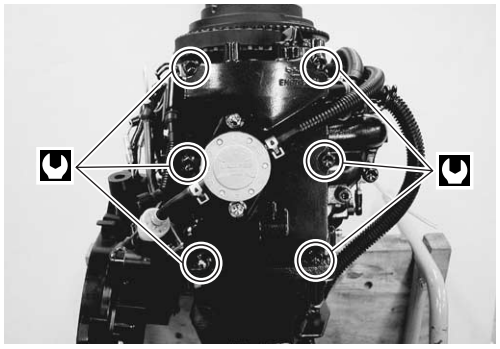


9. Recheck the valve clearance.
10. Tighten the cylinder head cover bolts to the specified torque.

Cylinder head cover bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

CAUTION

Do not re-use the gasket once removed. Always use a new gasket.

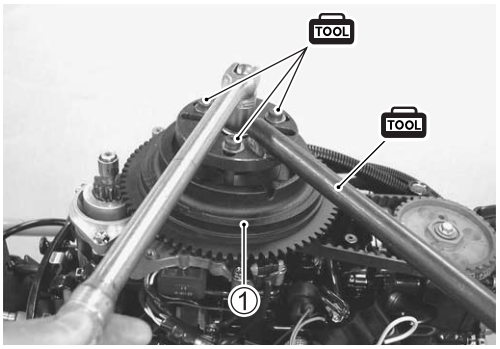


TIMING BELT

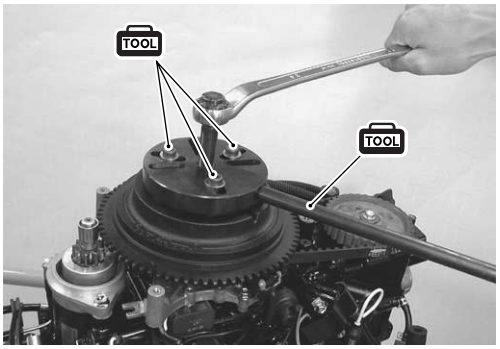
*** Inspect every 200 hours (12 months).**
*** Replace every 4 years.**

If wear, crack or other damage is found, replace the timing belt.

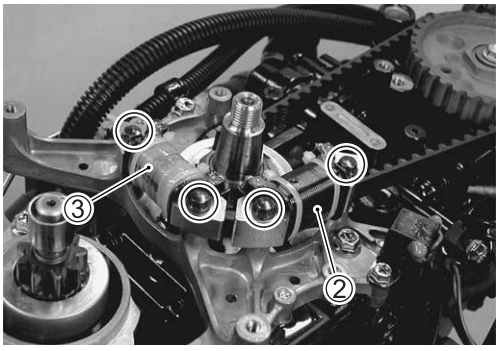
1. Remove the motor cover.
2. Remove the recoil starter.
3. Remove the side covers.
4. Remove the spark plugs.
5. Remove the flywheel ①. (See page 3-9.)



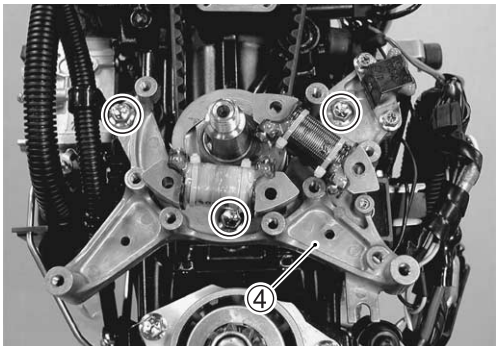
TOOL **09930-39520: Flywheel holder**
09930-39411: Flywheel remover
09930-39210: Flywheel remover attachment bolt



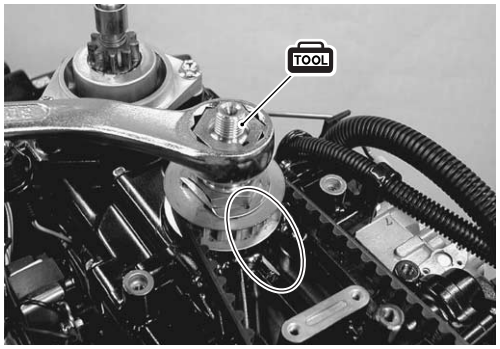
6. Remove the battery charge coil ② and condenser charge coil ③.



7. Remove the startor ④.



8. Rotate the crankshaft to align the HOLLOW mark on the washer with the INDEX mark on the cylinder block.



TOOL **09911-49310: Crankshaft holder**

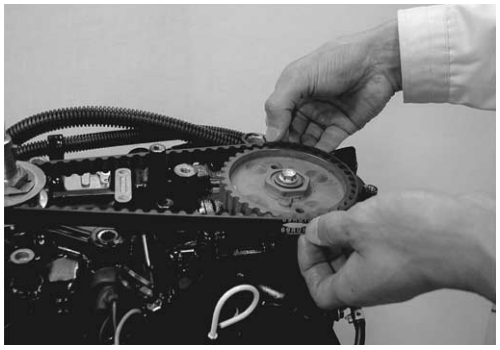
CAUTION

Rotate the crankshaft in the normal running direction (clockwise) to prevent water pump impeller damage.

CAUTION

Do not rotate the cam pulley with timing belt installed.

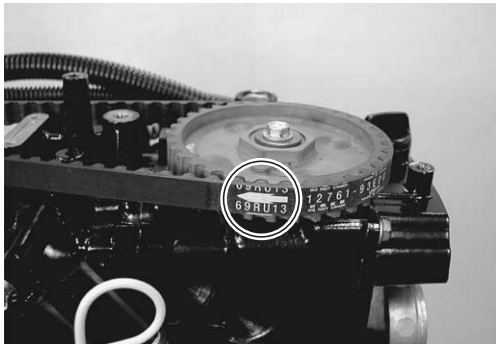
9. Remove the timing belt from the cam pulley first, then from the timing pulley.



CAUTION

Do not rotate the crankshaft or the cam pulley before installing the belt; the following must be checked:
*** The PUNCH mark on the timing pulley aligns with the INDEX mark on the cylinder block.**
*** The PUNCH mark "1" on the cam pulley aligns with the INDEX mark on the cylinder head block.**
If the timing pulley or the cam pulley is rotated with the timing belt removed or installed but misaligned, this may cause the valves to become bent.
If the alignment marks are not correctly matched, loosen the valve adjusting lock nuts and the valve adjusting screws fully to prevent valve damage.
Then align the marks correctly by rotating the cam pulley clockwise.

10. Install the timing belt on the timing pulley first, then the cam pulley.



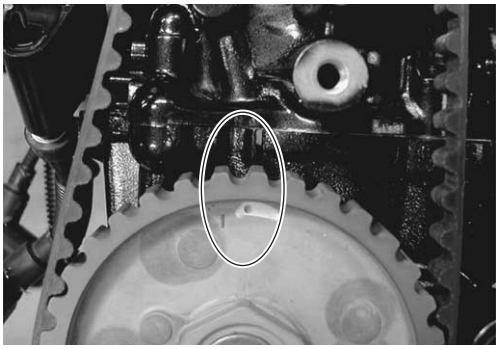
CAUTION

Always keep the timing belt away from any grease and oil.

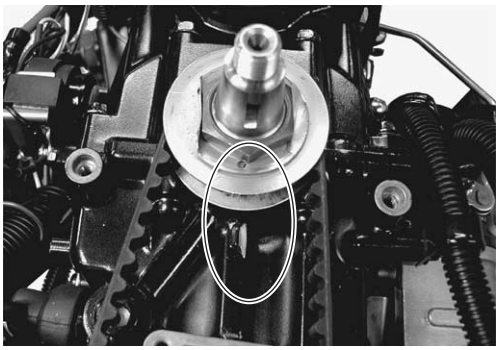
CAUTION

If the timing belt must be installed with the arrow mark on the timing belt toward the direction of rotation.

11. Make sure that either of the PUNCH mark “1” on the cam pulley aligns with the INDEX mark on the cylinder head block when the HOLLOW mark on the washer aligns with the INDEX mark on the cylinder clock.



12. Install the following parts.
    * Condenser charge coil (See page 3-10.)
    * Battery charge coil (See page 3-10.)
    * Flywheel (See page 3-10.)
    * Spark plugs
    * Recoil starter
    * Motor cover



IDLE SPEED

Inspect initially after 20 hours (1 month) and every 200 hours (12 months) thereafter.

Checking

1. Check the link mechanism and the carburetor throttle valves for smooth operation.
2. Attach the tachometer cord to the spark plug high-tension cord.

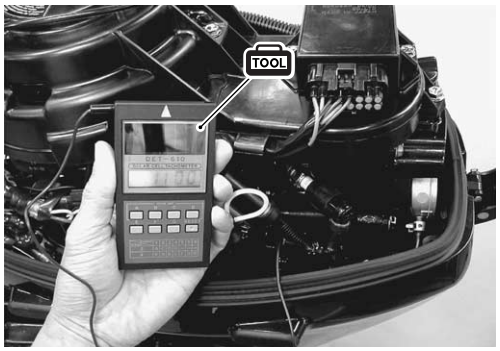
09900-26006: Engine tachometer

3. Start and warm up the engine.

NOTE:
Check and/or adjust the idle speed after the engine speed has stabilized.

4. Check the idle speed.

Idle speed (in neutral gear): 1 050 – 1 150 r/min



Adjustment

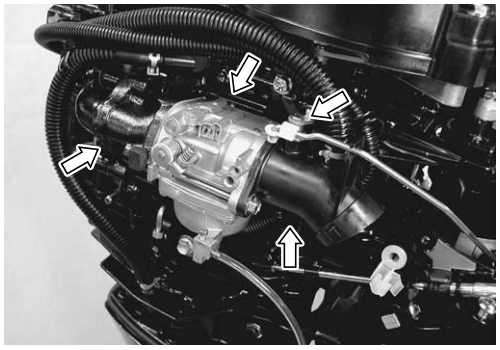
If the idle speed is out of the specification, adjust the speed as follows:

Turn the throttle stop screw.
* Turning clockwise: The engine speed becomes higher.
* Turning counterclockwise: The engine speed becomes lower.

CARBURETOR

Inspect initially after 20 hours (1 month) and every 100 hours (6 months) thereafter.

If crack or other damage is found on carburetor body, lever, rod connector, inlet manifold or silencer, replace.



IGNITION TIMING

Inspect every 200 hours (12 months).

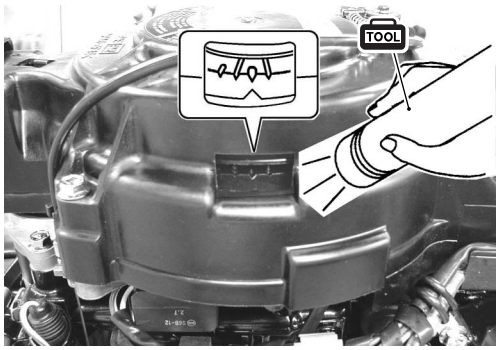
NOTE:
Before checking the ignition timing, make sure that the idle speed is adjusted within the specification.

1. Start and warm up the engine.
2. Attach the timing light to the No. 1 spark plug high-tension cord.

09930-76420: Timing light
09900-26006: Engine tachometer

3. Check the ignition timing while operating the engine at idling speed.

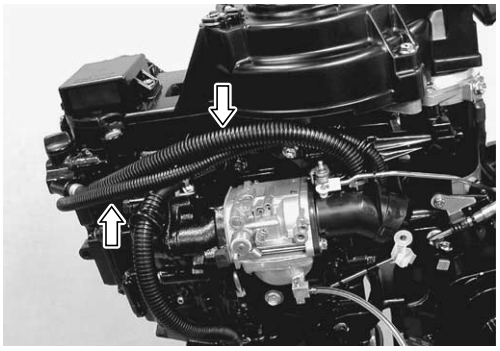
Ignition timing: Approx. BTDC 5° at 1 100 r/min

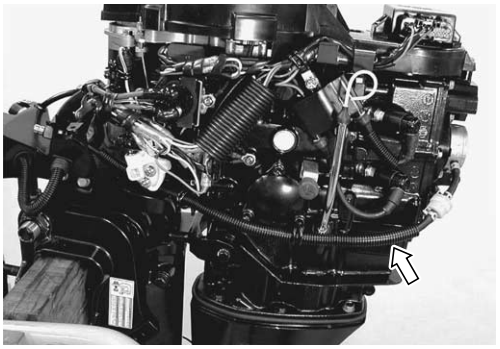


BREATHER AND FUEL LINE

*** Inspect initially after 20 hours (1 month) and every 50 hours (3 months) thereafter.**
*** Replace every 2 years.**

If leakage, cracks, swelling or other damage is found, replace the breather line and/or the fuel line.

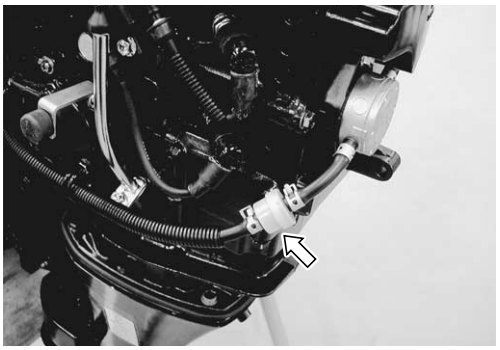




FUEL FILTER

*** Inspect every 50 hours (3 months).**
*** Replace every 400 hours or 2 years.**

If water accumulation, sediment, leakage, crack or other damage is found, replace the fuel filter.



WATER PUMP/WATER PUMP IMPELLER

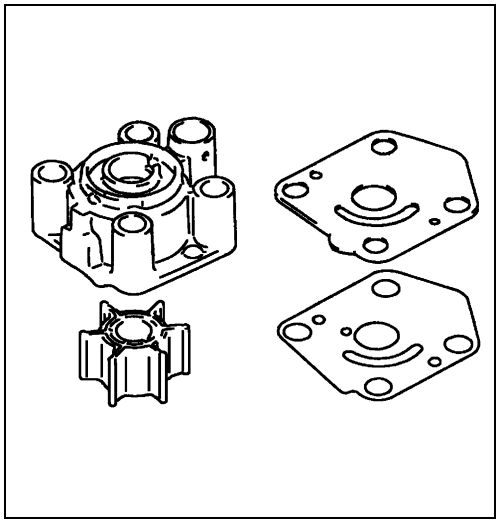
WATER PUMP
Inspect every 200 hours (12 months).

WATER PUMP IMPELLER
Replace every 200 hours (12 months).

If excessive wear, crack, distortion or corrosion is found on the pump case or the under panel, replace.

CAUTION

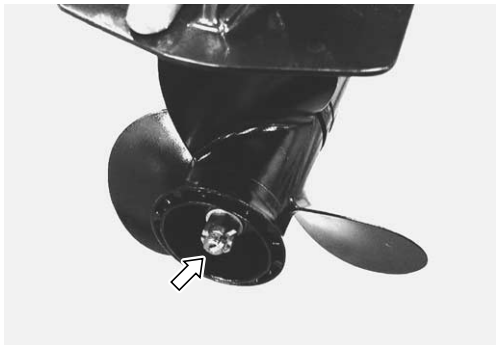
Do not re-use the gasket once removed. Always use a new gasket.



PROPELLER NUT AND PIN

Inspect initially after 20 hours (1 month) and every 100 hours (6 months) thereafter.

Make sure that the propeller nut and the pin are installed securely.
If excessive wear, breakage or other damage is found on the propeller, the propeller bush or the propeller shaft, replace.



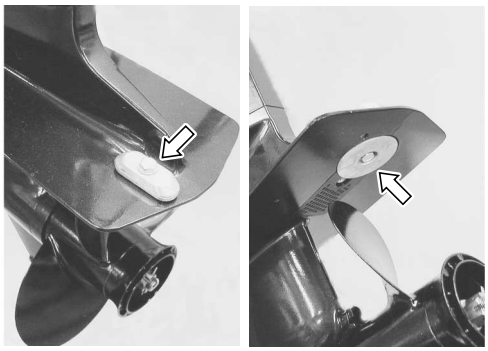
ANODES AND BONDING WIRES

Inspect every 50 hours (3 months).

ANODES
If 2/3 of the anode has corroded away, replace the anode.

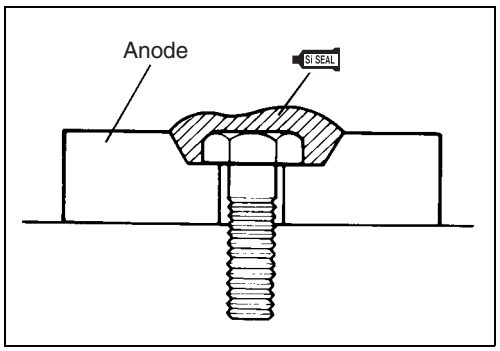
CAUTION

Never paint the anode.



NOTE:
The anode securing bolt should be covered with the SUZUKI SILICONE SEAL.

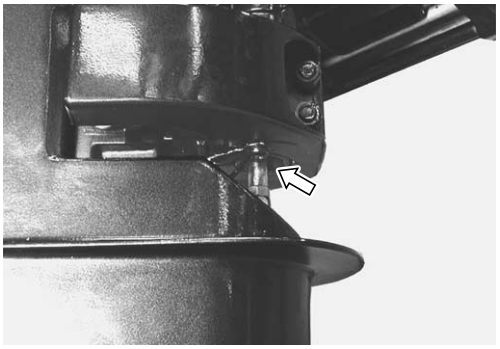
SI SEAL 99000-31120: SUZUKI SILICONE SEAL



BONDING WIRES

If breakage or other damage is found, replace the wire.

If rust or corrosion is found on the wire terminal, clean it with solvent.



BATTERY

Inspect every 50 hours (3 months).

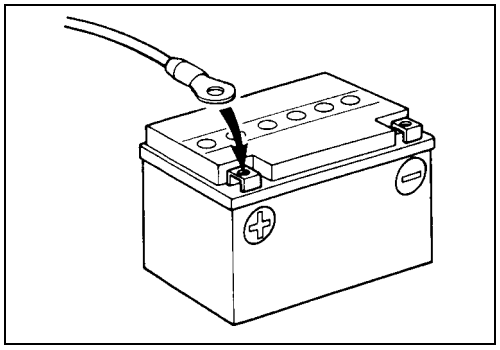
⚠ WARNING

*** Never expose battery to open flame or electric spark as batteries generate gas which is flammable and explosive.**
*** Battery acid is poisonous and corrosive. Avoid contact with eyes, skin, clothing and painted surfaces.**
If battery acid comes in contact with any of these, flush immediately with large amounts of water.
If acid contacts the eyes or skin, get immediate medical attention.
*** Batteries should always be kept out of reach of children.**
*** When checking or servicing battery, disconnect the negative (black) cable. Be careful not to cause a short circuit by allowing metal objects to contact battery posts and motor at the same time.**
*** Wear approved eye protection.**

Recommended battery:
12 V 35 AH (126 kC) or larger battery

CONNECTING BATTERY

Upon completion of the connection, lightly apply grease to the battery terminals.

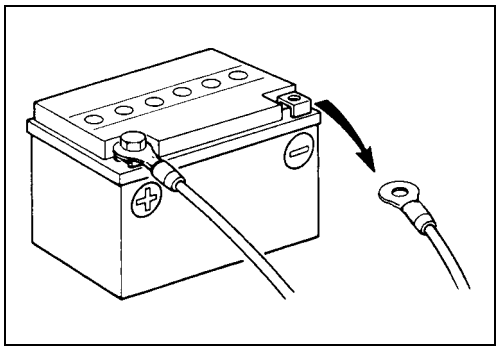


How to connect:
1. Connect the positive (+) terminal first.
2. Connect the negative (–) terminal second.

How to disconnect:
1. Disconnect the negative (–) terminal first.
2. Disconnect the positive (+) terminal second.

CAUTION

If the battery leads are incorrectly connected, the electrical system could be damage.



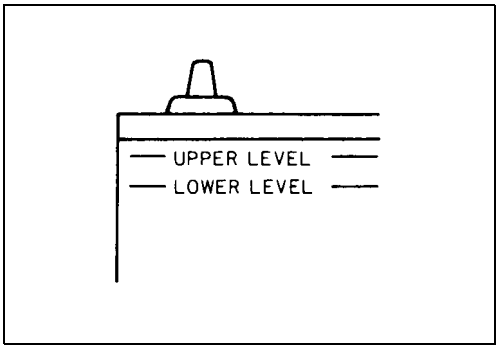
BATTERY SOLUTION LEVEL CHECK

The battery solution level should be between the UPPER and LOWER level.

If the level is low, add distilled water only.

CAUTION

Once the battery has been initially serviced, NEVER add diluted sulfuric acid, or you will damage the battery. Follow the battery manufacture's instructions for specific maintenance procedures.

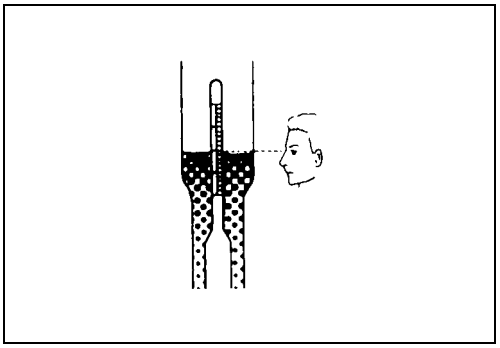


BATTERY SOLUTION SPECIFIC GRAVITY CHECK

Measure the gravity of the battery solution by using the hydrometer.

TOOL 09900-28403: Hydrometer

Battery solution specific gravity: 1.28 at 20 °C



BOLTS AND NUTS

Tighten initially after 20 hours (1 month) and every 100 hours (6 months) thereafter.

Check that all bolts and nuts listed below are tightened to their specified torque.

ITEM	THREAD DIAMETER	TIGHTENING TORQUE		
		N·m	kgf-m	lb-ft
Cylinder head cover bolt	6 mm	10	1.0	7.0
Cylinder head bolt	8 mm	28	2.8	20.0
Intake manifold bolt	8 mm	23	2.3	16.5
Carburetor mounting bolt	6 mm	10	1.0	7.0
Flywheel nut	14 mm	80	8.0	58.5
Power unit mounting bolt/nut	8 mm	23	2.3	16.5
Clamp bracket shaft nut	22 mm	43	4.3	31.0
Gearcase bolt	8 mm	23	2.3	16.5
Propeller nut	12 mm	18	1.8	13.0

IGNITION AND ELECTRICAL

CONTENTS

IGNITION SYSTEM 3- 2
- PRINCIPLES OF OPERATION 3- 2
- TROUBLESHOOTING 3- 3
- INSPECTION 3- 4
- REMOVAL/INSTALLATION 3- 8

CAUTION SYSTEM 3-11
- OVER-REVOLUTION CAUTION SYSTEM 3-11
- LOW OIL PRESSURE CAUTION SYSTEM 3-12
- INSPECTION 3-13
- REMOVAL AND INSTALLATION 3-14

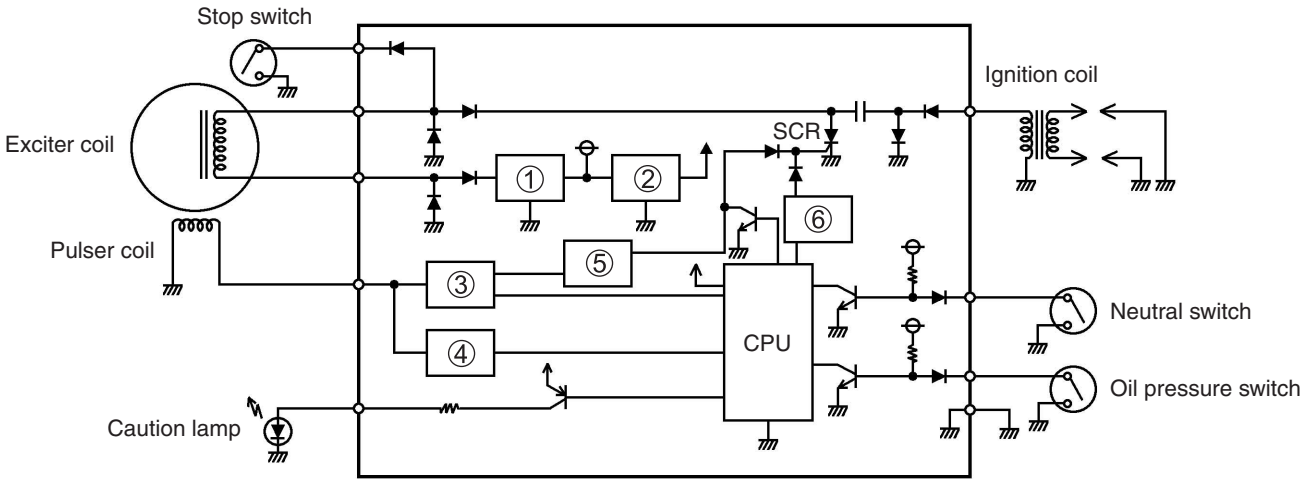
BATTERY CHARGING SYSTEM 3-15
- OUTLINE 3-15
- INSPECTION 3-16

ELECTRIC STARTER SYSTEM 3-18
- OUTLINE 3-18
- TROUBLESHOOTING 3-19
- INSPECTION 3-21
- STARTER MOTOR 3-23

IGNITION SYSTEM
PRINCIPLES OF OPERATION
A digital CDI (condenser discharge ignition) system is employed on the DF9.9/DF15.
The condenser built in the CDI unit stores the electrical energy generated by the exciter coil.
The electrical energy stored in the condenser is released to the ignition coil primary windings by the ignition timing signal calculated by the CDI microcomputer from the pulse coil signals.

SPECIFICATION

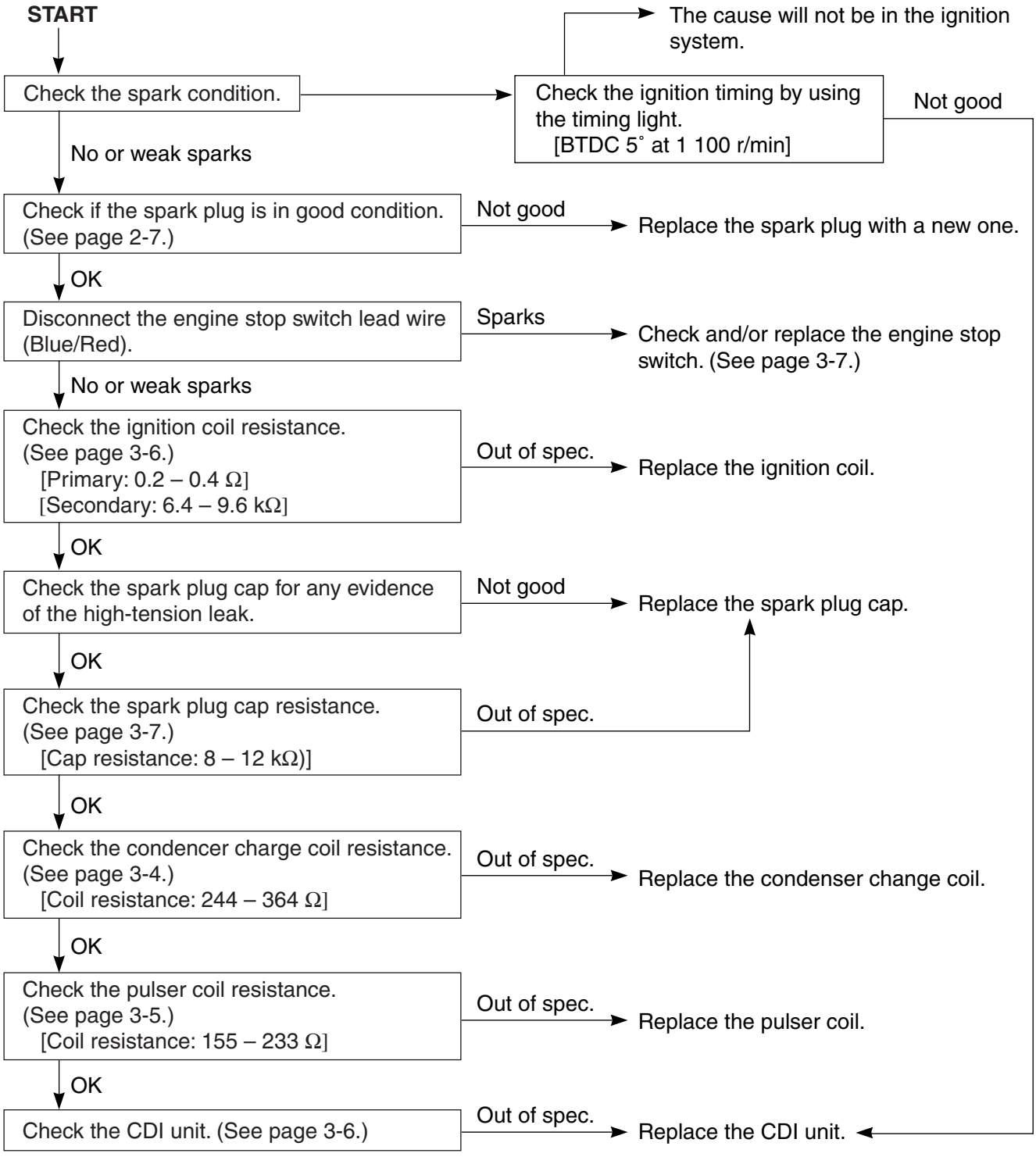
Ignition type	CDI
Advance	Electronic microcomputer control
Ignition timing	BTDC 5° – 35°: DF9.9 BTDC 5° – 30°: DF9.9A/DF15/DF15A



① Power source circuit 1
② Power source circuit 2
③ Base signal circuit 1
④ Base signal circuit 2
⑤ Hardware ignition signal circuit
⑥ Software ignition signal circuit

TROUBLESHOOTING

Perform the following ignition system tests when the engine is hard to start in order to determine if the cause is in the ignition or another system.



INSPECTION

⚠ WARNING

Always disconnect the battery before commencing resistance test.

CONDENSER CHARGE COIL OUTPUT

Peak Voltmeter Stevens CD-77
Tester selector: POS 500

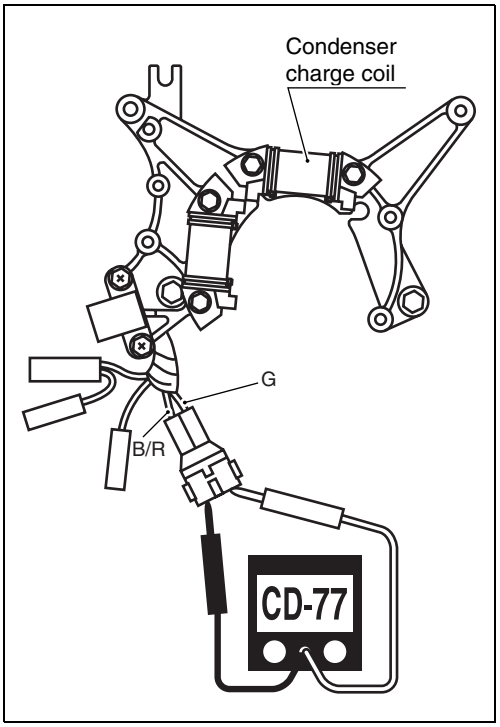
1. Disconnect the condenser charge coil lead wire connector.
2. Connect the test probe to the coil lead wires as shown.

Tester probe connection	
⊕ (Red)	⊖ (Black)
Green	Black/Red

3. Remove the all spark plugs.
4. Crank with the recoil starter, then measure voltage.

Condenser charge coil output: 144 V or over

If the measurement is out of the specification, replace the condenser charge coil.



CONDENSER CHARGE COIL RESISTANCE

09930-99320: Digital tester

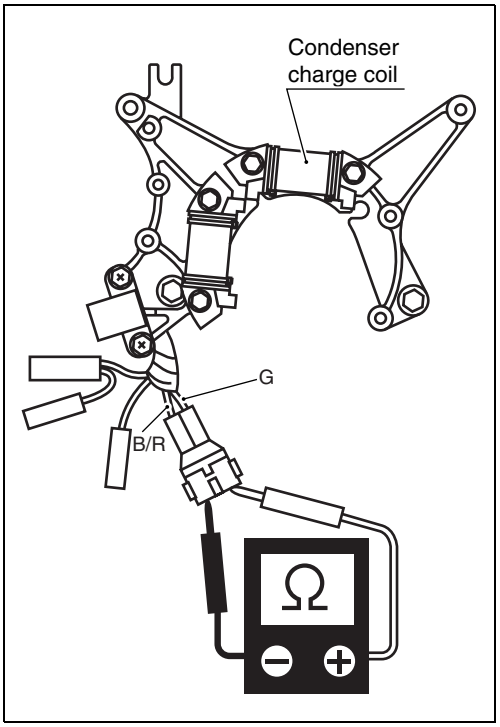
Tester selector: Ω

1. Disconnect the condenser charge coil lead wire connector.
2. Connect the test probe to the coil lead wires as shown.

Tester probe connection	
Probe	Other probe
Green	Black/Red

Condenser charge coil resistance: 244 – 364 Ω

If the measurement is out of the specification, replace the condenser charge coil.



PULSER COIL OUTPUT

Peak Voltmeter Stevens CD-77
Tester selector: SEN 5

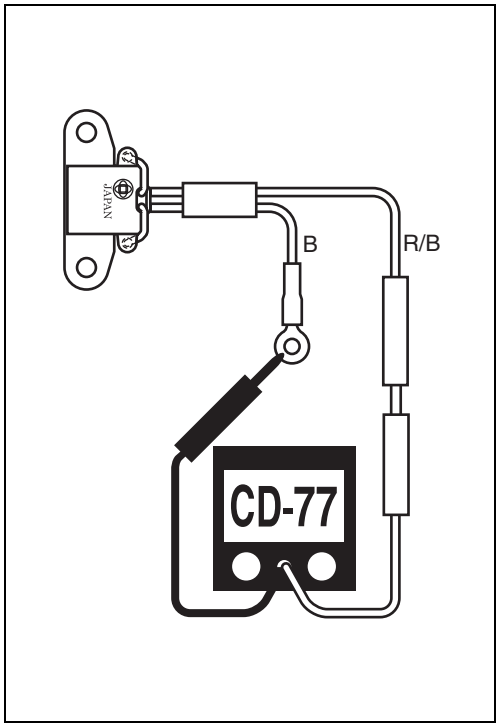
1. Disconnect the pulser coil lead wires.
2. Connect the test probe to the coil lead wires as shown.

Tester probe connection	
⊕ (Red)	⊖ (Black)
Red/Black	Black (Ground)

3. Remove all spark plugs.
4. Crank with the recoil starter, then measure voltage.

Pulser coil output: 2.2 V or over

If the measurement is out of the specification, replace the pulser coil.



PULSER COIL RESISTANCE

09930-99320: Digital tester

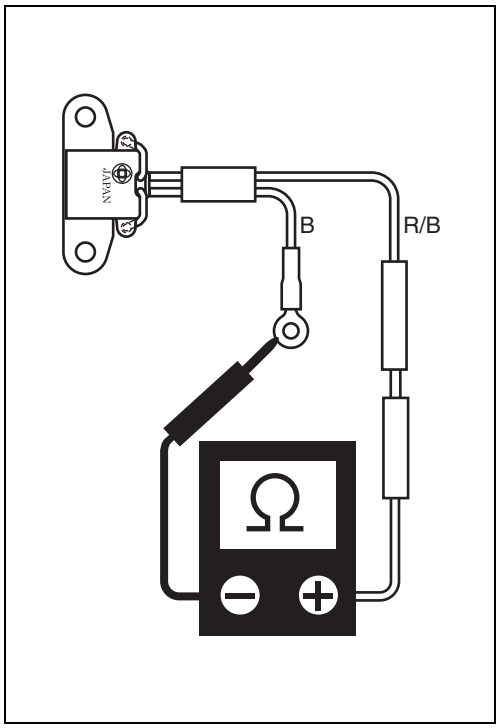
Tester selector: Ω

1. Disconnect the pulser coil lead wires.
2. Connect the test probe to the coil lead wires as shown.

Tester probe connection	
Probe	Other probe
Red/Black	Black (Ground)

Pulser coil resistance: 155 – 233 Ω

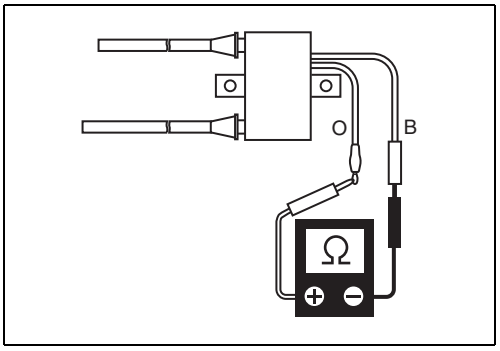
If the measurement is out of the specification, replace the pulser coil.



IGNITION COIL RESISTANCE

09930-99320: Digital tester

Tester selector: Ω



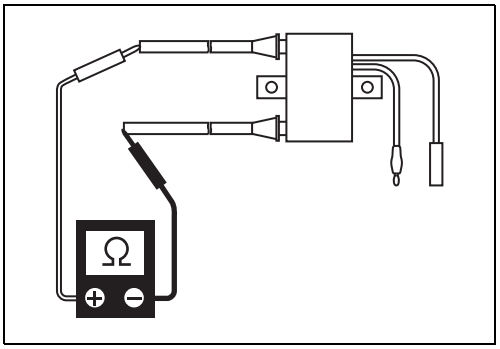
Primary side

1. Disconnect the ignition coil lead wires.
2. Connect the test probe to the coil lead wires as shown.

Tester probe connection	
Probe	Other probe
Orange	Black

Primary coil resistance: 0.2 – 0.4 Ω

If the measurement is out of the specification, replace the ignition coil.



Secondary side

1. Remove the spark plug cap from the high-tension cord.
2. Connect the test probe to the high-tension cords as shown.

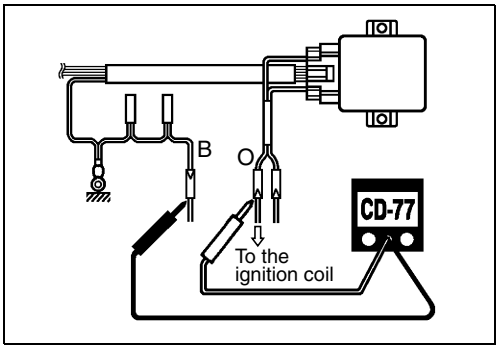
Tester probe connection	
Probe	Other probe
High-tension cord	Other High-tension cord

Secondary coil resistance: 6.4 – 9.6 6kΩ

If the measurement is out of the specification, replace the ignition coil.

CDI UNIT OUTPUT

Peak Voltmeter Stevens CD-77
Tester selector: NEG 500



1. Disconnect the CDI unit lead wires.

NOTE:
With the ignition coil connected.

2. Connect the test probe to the CDI unit lead wires as shown.

Tester probe connection	
⊕ (Red)	⊖ (Black)
Orange	Black

3. Remove all spark plugs.
4. Crank with the recoil starter, then measure voltage.

CDI unit output: 144 V or over

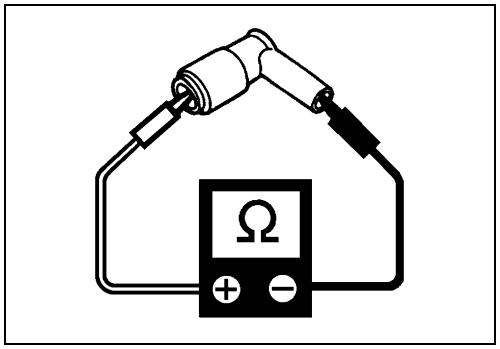
If the measurement is out of the specification, replace the CDI unit.

SPARK PLUG CAP

09930-99320: Digital tester

Tester range: Ω (Resistance)

Measure the spark plug cap resistance.



Tester probe connection	
Probe	Other probe
Cap end	Other cap end

Spark plug cap resistance: 8 – 12 kΩ

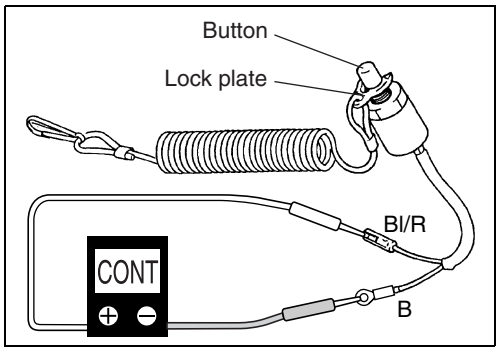
If the measurement is out of the specification, replace the spark plug cap.

ENGINE STOP SWITCH CONTINUITY

09930-99320: Digital tester

Tester range: (Continuity)

Inspect the continuity of the engine stop switch.



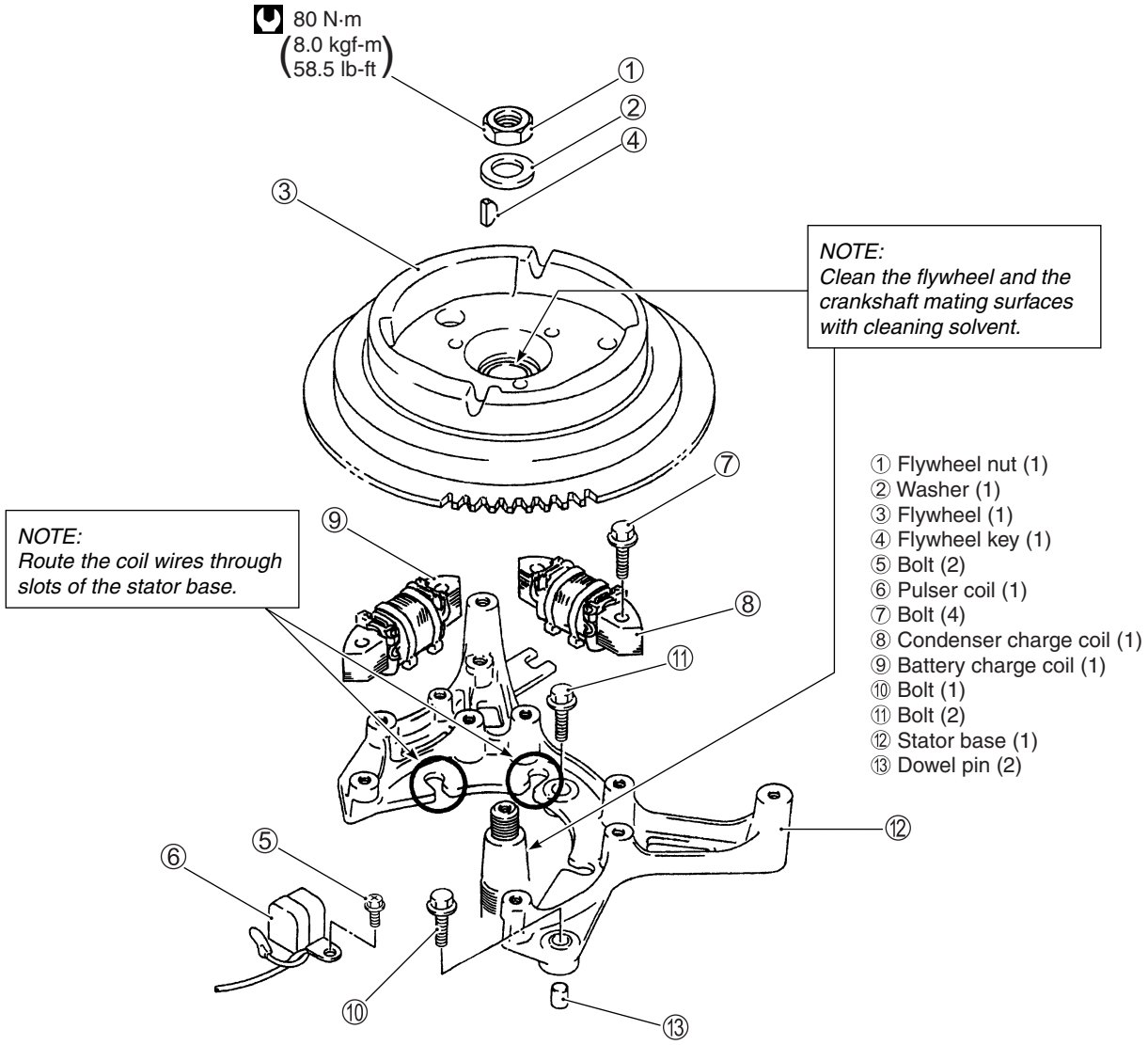
Tester probe connection	
Probe	Other probe
Blue/Red	Black

Spark plug cap resistance

Switch condition	Continuity
Lock plate IN	No
Lock plate OUT	Yes
Lock plate IN & button depressed	Yes

If the result is out of the specification, replace the engine stop switch.

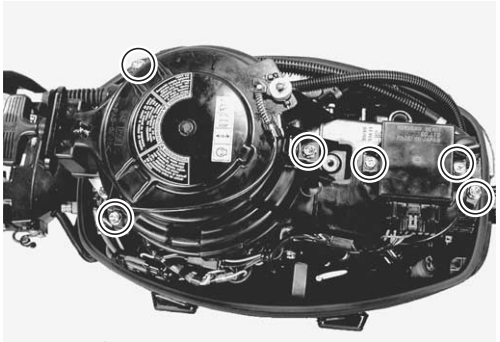
REMOVAL/INSTALLATION



REMOVAL

Before removing electrical parts:
*** Disconnect the battery cables from the battery.**

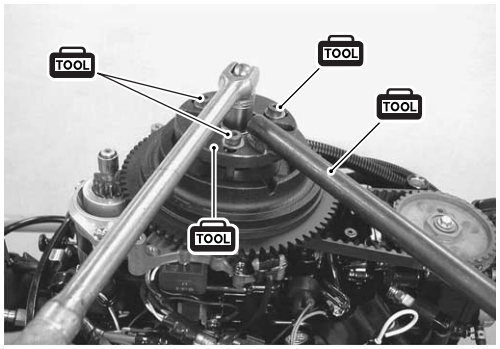
1. Remove the motor cover.
2. Remove the CDI unit and the recoil starter.
3. Remove the side cover. (See page 7-2.)



4. Remove the flywheel nut using the special tool.

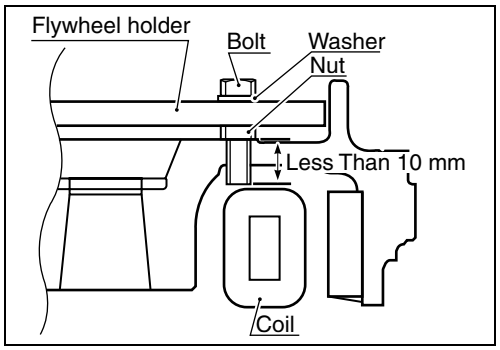
09930-39520: Flywheel holder
09930-39411: Flywheel remover
09930-39210: Flywheel remover attachment bolt

NOTE:
Use the flywheel holder and shaft of flywheel remover.



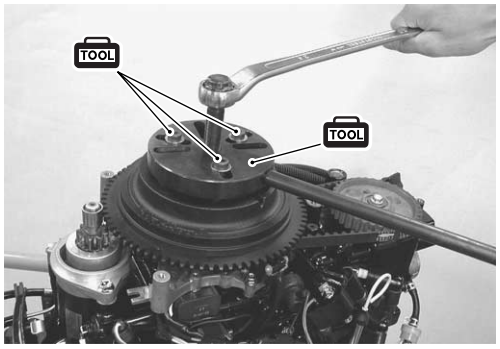
CAUTION

When installing a special tool for mounting or demounting the flywheel, do not thrust in the bolt for fixing the flywheel more than 10 mm into the flywheel. If may cause the bolt to come into contact with the coil (condenser charge coil, battery charge coil) to damage the coil.

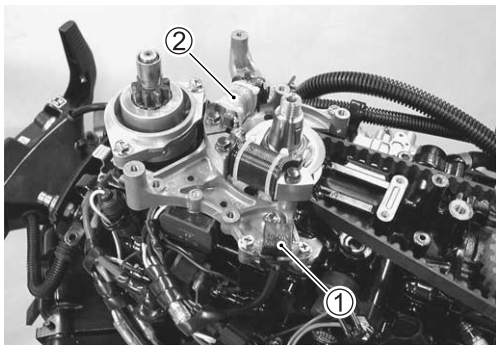


5. Remove the flywheel using the special tool.

09930-39411: Flywheel remover
09930-39210: Flywheel remover attachment bolt



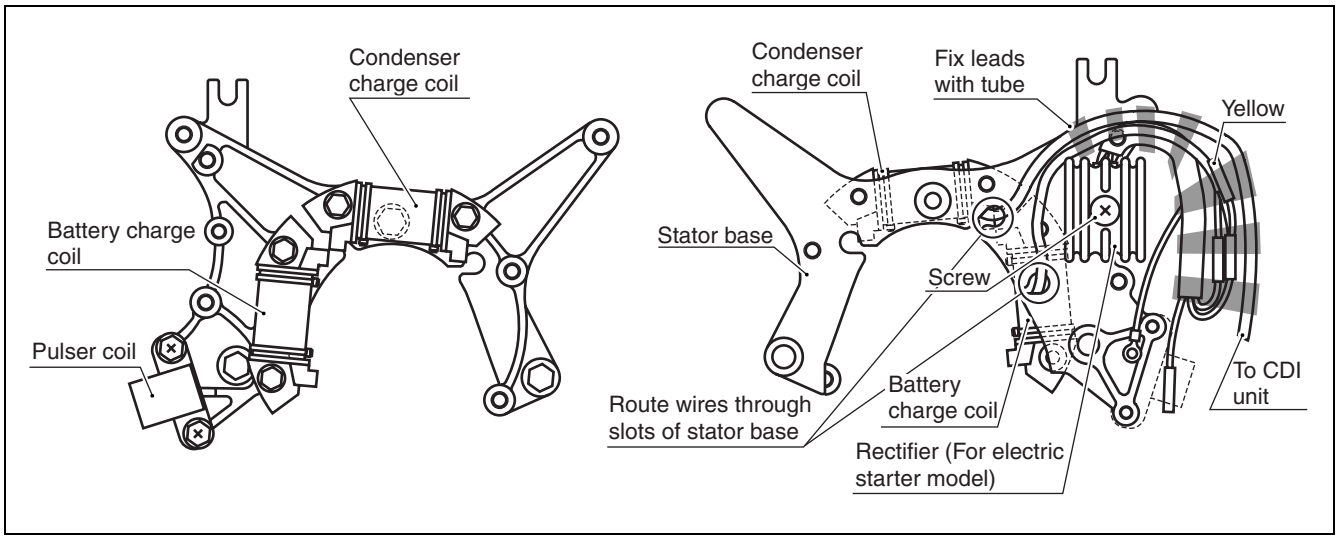
6. Remove the pulser coil ①.
7. Remove the condenser charge coil ②.



INSTALLATION

Installation is reverse order of removal with the special attention to the following steps.

Wire routing

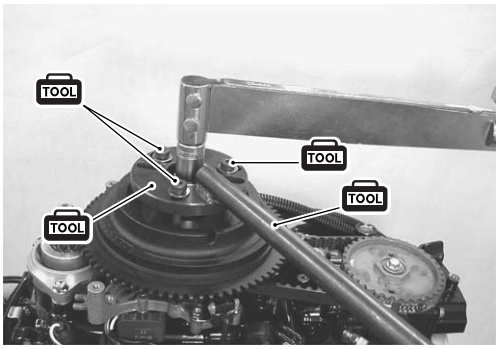


Flywheel

- Clean the flywheel and crankshaft mating surfaces with cleaning solvent.
- Tighten the flywheel nut to the specified torque.

09930-39520: Flywheel holder
09930-39411: Flywheel remover
09930-39210: Flywheel remover attachment bolt

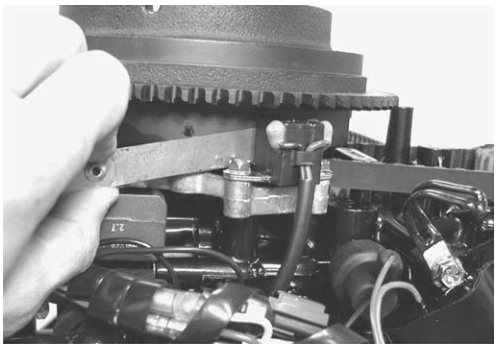
Flywheel nut: 80 N·m (8.0 kgf-m, 58.5 lb-ft)



Pulser

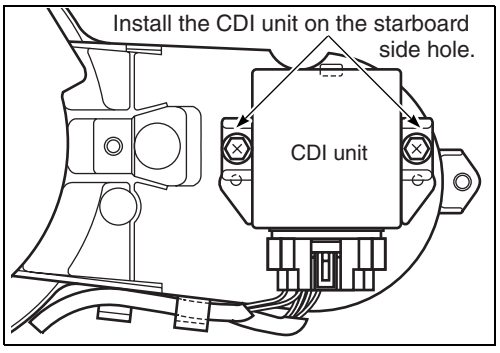
- Install the pulser coil with a gap of 0.8 mm (0.03 in) between the pulser coil and flywheel.

09930-20803: Thickness gauge

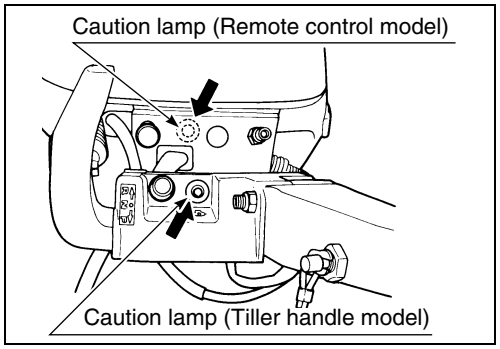


CDI unit

- Install the CDI unit as shown.



CAUTION SYSTEM



LAMP CHECK/BUZZER CHECK

Two (2) seconds after starting engine:

- The caution lamp turns on.
- The caution buzzer sounds. (Remote control models)

The following two caution systems alert the operator when an abnormality occurs on the engine.

- **OVER-REVOLUTION CAUTION**
- **LOW OIL PRESSURE CAUTION**

CAUTION TYPE	CAUTION LAMP	CAUTION BUZZER (*)	OVER-REV LIMITER
Over-revolution	No	No	Yes
Low oil pressure	Yes	Yes	Yes

*: Remote control model only

OVER-REVOLUTION CAUTION SYSTEM

CONDITION:

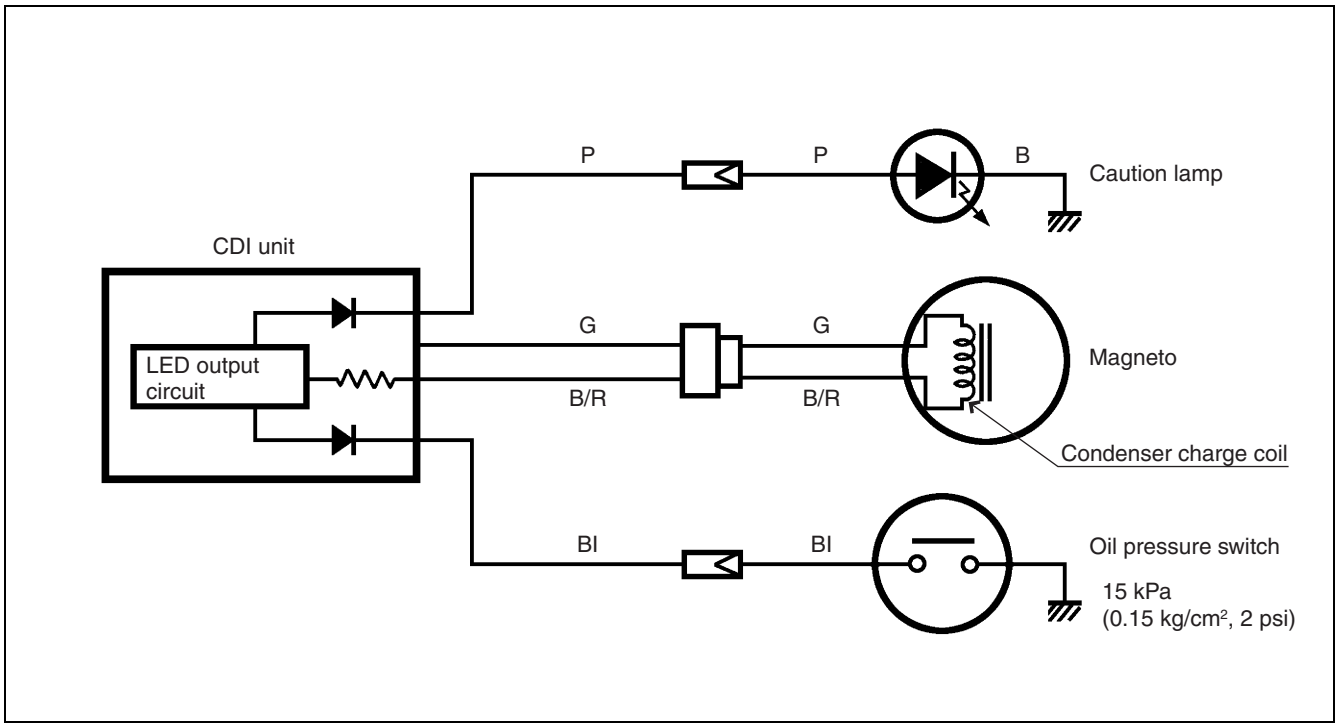
When the engine speed exceeds 6 500 r/min, the CDI initiates intermittent ignition signals to provide a maximum engine speed of 6 500 r/min (Over-revolution limiter).

ACTION:

- If the operator decreases engine speed to less than approximately 6 200 r/min within 10 seconds, the over-revolution caution control will be cancelled.
- If the engine is operated at a speed above 6 500 r/min for more than 10 seconds, the engine speed will be automatically controlled by ignition interruption and lowered to approximately 3 000 r/min.

To cancel the over-revolution caution control, close the throttle to reduce the engine speed below approximately 2 500 r/min for one second.

LOW OIL PRESSURE CAUTION SYSTEM



CONDITION:
Immediate activation of the system when the oil pressure switch turns “ON” due to an engine oil pressure drop below 15 kPa (0.15 kg/cm², 2 psi).

ACTION:
- The caution lamp is on.
- The caution buzzer sounds. (For remote control model only.)
- The engine speed automatically reduced to approx. 2 000 r/min by intermittent fuel injection and ignition signals if the system is activated at 2 000 r/min or higher.

RESET:
- Stop the engine and check the engine oil level. Refill the engine oil to the correct level.
- The low oil pressure caution system is reset when the oil pressure is restored to over 15 kPa (0.15 kg/cm², 2 psi) with approx. 1 500 r/min for 1.5 seconds.

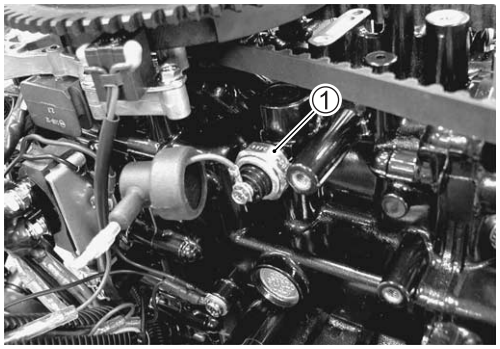
If the engine oil level is correct, the following causes may be considered:
- Improper oil viscosity
- Malfunctioning oil pressure switch
- Clogged oil filter
- Worn oil pump relief valve
- Oil leakage from oil passage
- Excessive wear/damage of oil pump

INSPECTION

Oil pressure switch

09940-44121: Air pressure gauge
09930-99320: Digital tester
: Air pump

Tester range: (Continuity)

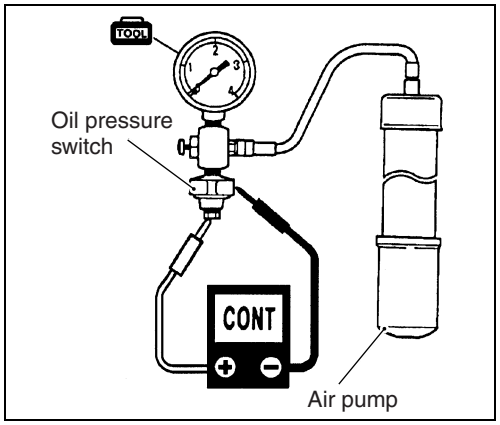


1. Remove the oil pressure switch ①. (See page 3-14.)
2. Connect the gauge and an air pump as shown.
3. While applying pressure to the oil pressure switch, inspect continuity.

Oil pressure switch function:

Pressure kPa (kg/cm², psi)	Continuity
Less than approx. 15 (0.15, 2)	Yes
Approx. 15 (0.15, 2) or over	No

If the measurement is out of the specification, replace the oil pressure switch.



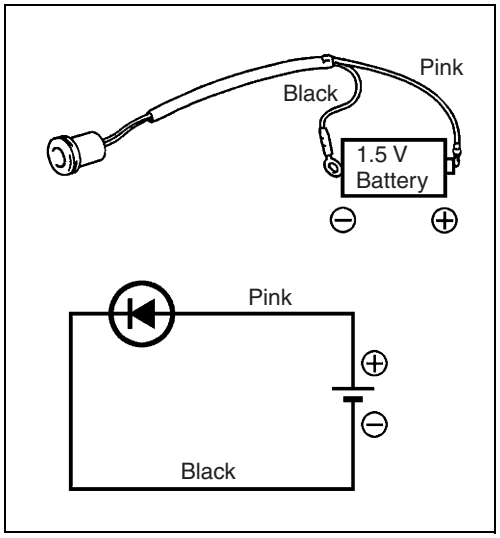
Caution lamp

Check for illumination of the caution lamp.

1. Disconnect the lamp lead wires from the engine harness.
2. Connect the test cord as shown.
3. For the tests using 1.5 V power source (or battery), connect the lamp lead wire to the 1.5 V power source (or battery) as shown below.

CAUTION

Do not use the battery larger than 2 V.



Pink lead wire → Battery (+)
Black lead wire → Battery (–)

When 1.5 V applied → Lamp ON

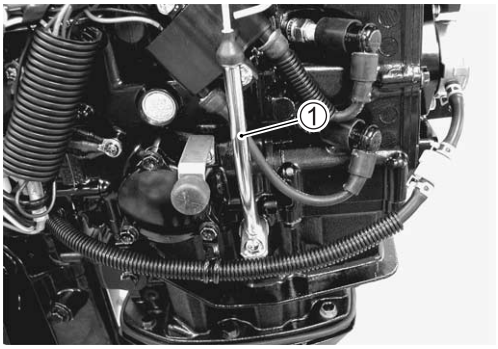
If the measurement is out of the specification, replace the caution lamp.

REMOVAL AND INSTALLATION

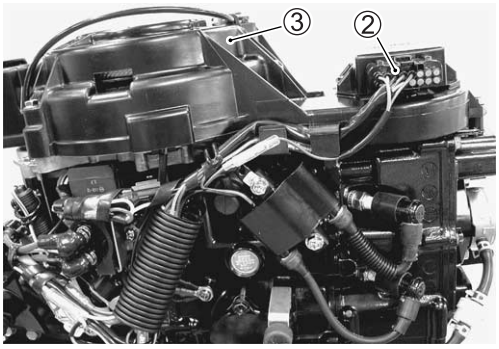
OIL PRESSURE SWITCH

Removal

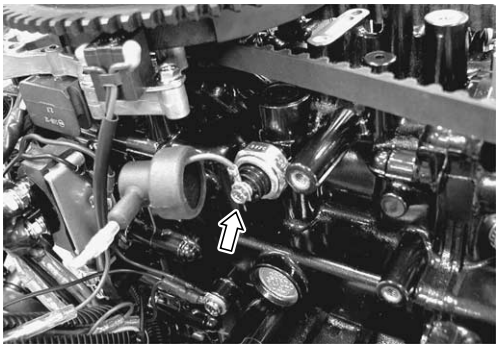
1. Remove the side cover. (See page 7-2.)
2. Remove the oil level gauge guide ①.



3. Remove the CDI unit ② and the recoil starter asssembly ③.



4. Loosen the bolt and disconnect the switch wire (Blue).
5. Remove the oil pressure switch from the cylinder block.



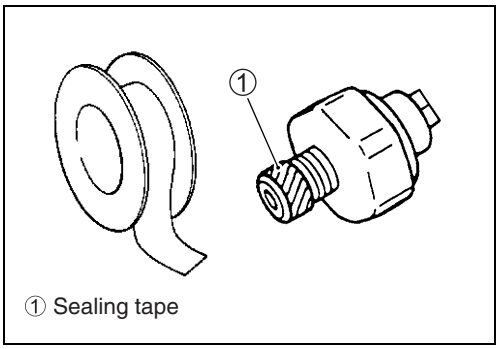
Installation

Installation is reverse order of removal with special attention to the following steps.

Oil pressure switch: 13 N·m (1.3 kgf-m, 9.5 lb-ft)

NOTE:

Prior to installation, wrap the oil pressure switch thread with sealing tape. If the sealing tape edge is bulged out from the thread, cut off the excess.



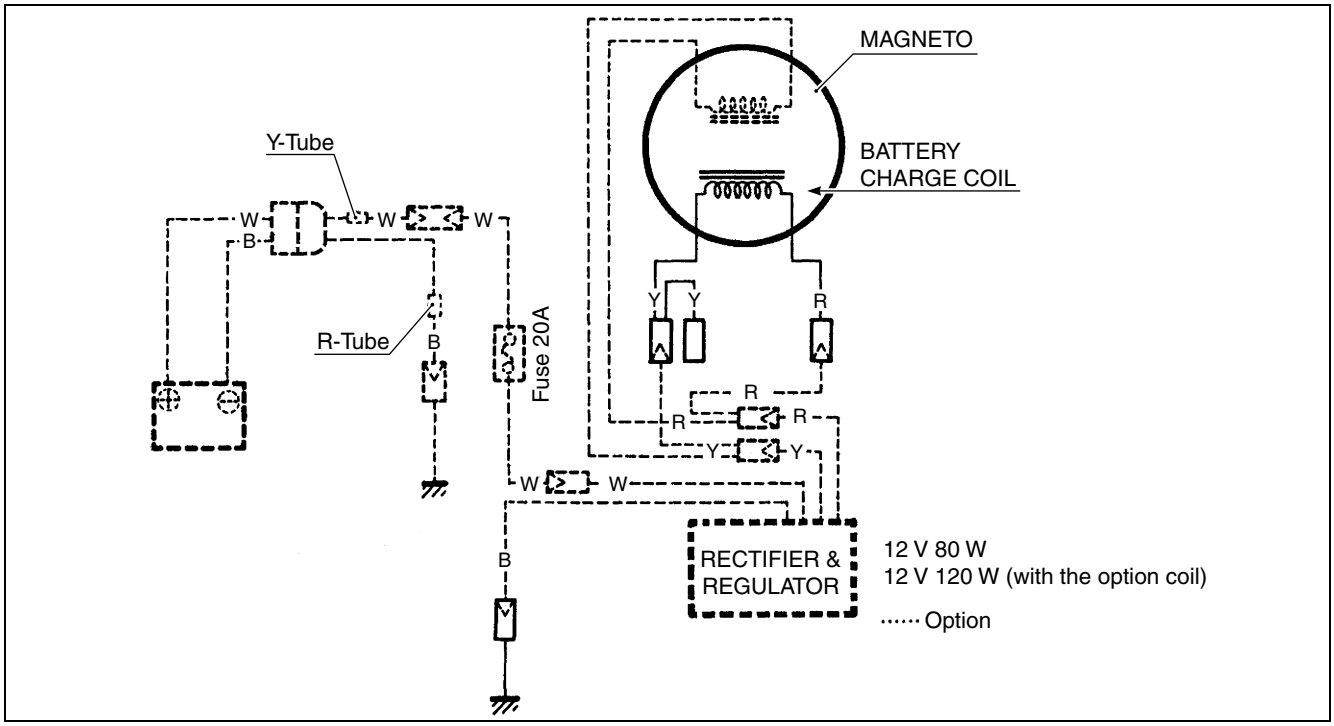
① Sealing tape

BATTERY CHARGING SYSTEM

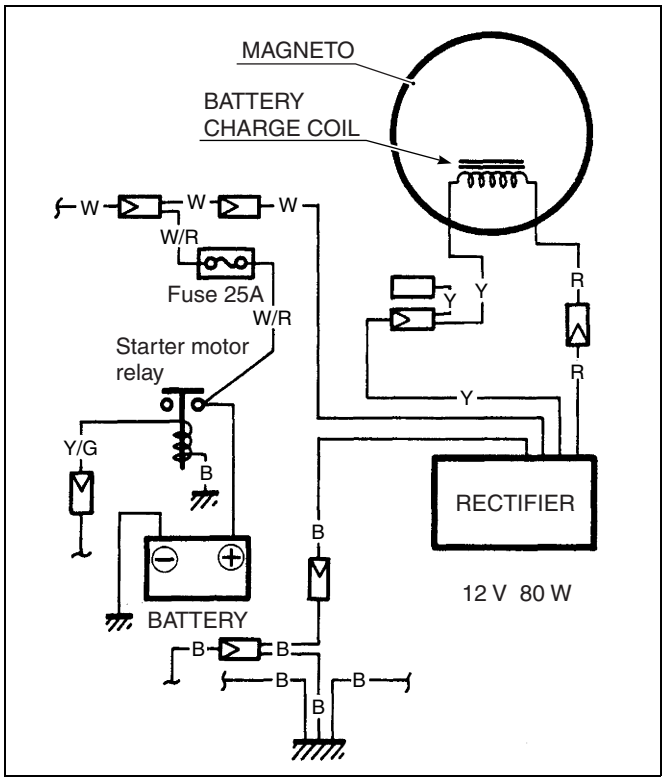
OUTLINE

The battery charging system circuit is illustrated below.
It is composed of the battery charge coil, the rectifier & regulator and the battery.
The AC current generated form the battery charge coil is converted by the rectifier into regulated DC current which is used to charge the battery.

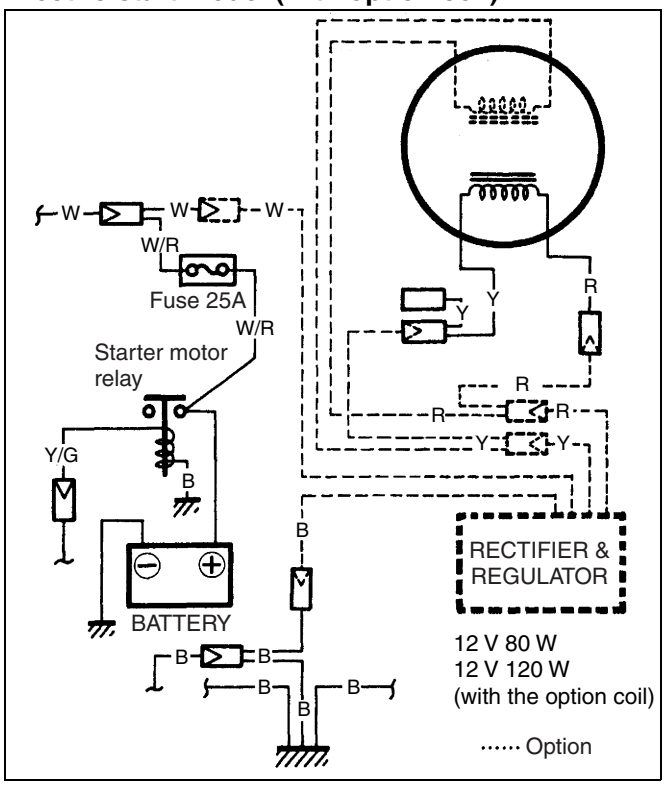
Manual start model



Electric start model



Electric start model (with option coil)



INSPECTION

BATTERY CHARGE COIL OUTPUT

Peak Voltmeter Stevens CD-77
Tester selector: POS 50

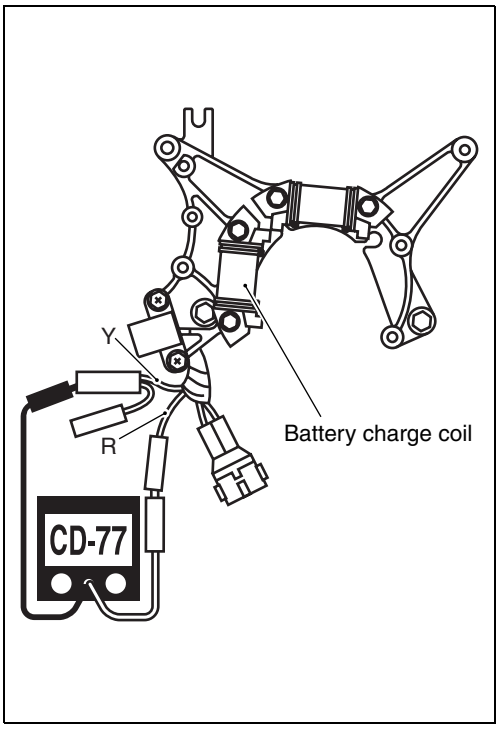
1. Disconnect the rectifier.
2. Remove all spark plugs.

Tester probe connection	
⊕ (Red)	⊖ (Black)
Red	Yellow

3. Crank with the recoil starter.

Coil output: Red – Yellow 3.5 V or over

If the measurement is out of the specification, replace the battery charge coil.



BATTERY CHARGE COIL RESISTANCE

09930-99320: Digital tester

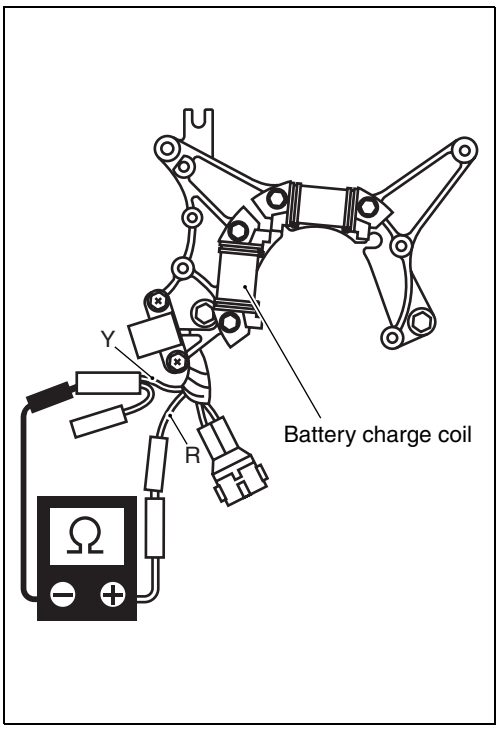
Tester selector: Ω

1. Disconnect the battery charge coil wires from the rectifier.

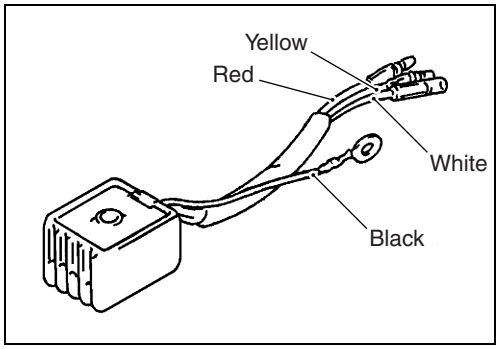
Tester probe connection	
Probe	Other probe
Red	Yellow

Coil resistance: Red – Yellow 0.2 – 0.4 Ω

If the measurement is out of the specification, replace the battery charge coil.



RECTIFIER



09930-99320: Digital tester

Tester selector: Ω

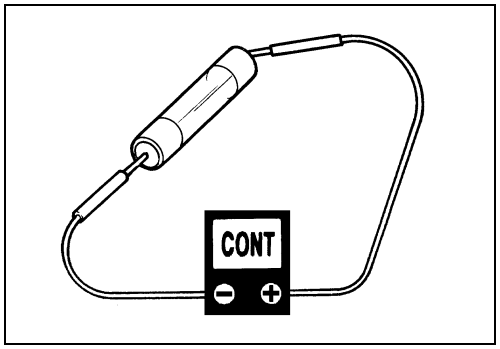
1. Disconnect all wires of the rectifier.
2. Measure resistance between the terminals for all combinations.

NOTE:
The values given below are for the SUZUKI digital tester.
As thyristors, diodes, etc. are used inside this rectifier, the resistance values will differ when an ohmmeter other than the SUZUKI digital tester is used.

Rectifier resistance:

		Tester probe ⊕ (Red)			
		Black	White	Yellow	Red
Tester probe ⊖ (Black)	Black		∞	∞	∞
	White	∞		4 – 7 MΩ	3 – 6 MΩ
	Yellow	4 – 7 MΩ	∞		∞
	Red	4 – 7 MΩ	∞	∞	

FUSE CASE/FUSE

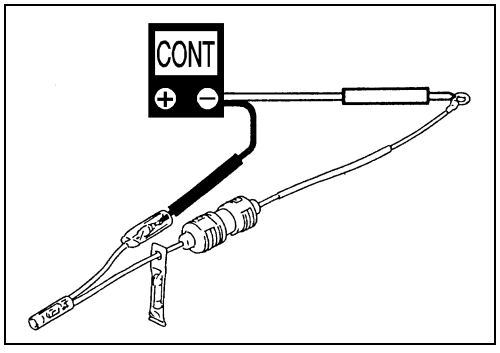


09930-99320: Digital tester

Tester range: (Continuity)

Fuse

1. Remove the fuse from the fuse case.
2. Inspect the fuse and replace with a new 25-amp fuse if needed.



Fuse case

1. Disconnect all wires of the fuse case.
2. Check continuity between White/Red lead wire with the plate terminal and the other two lead wires.

Tester range: (Continuity)

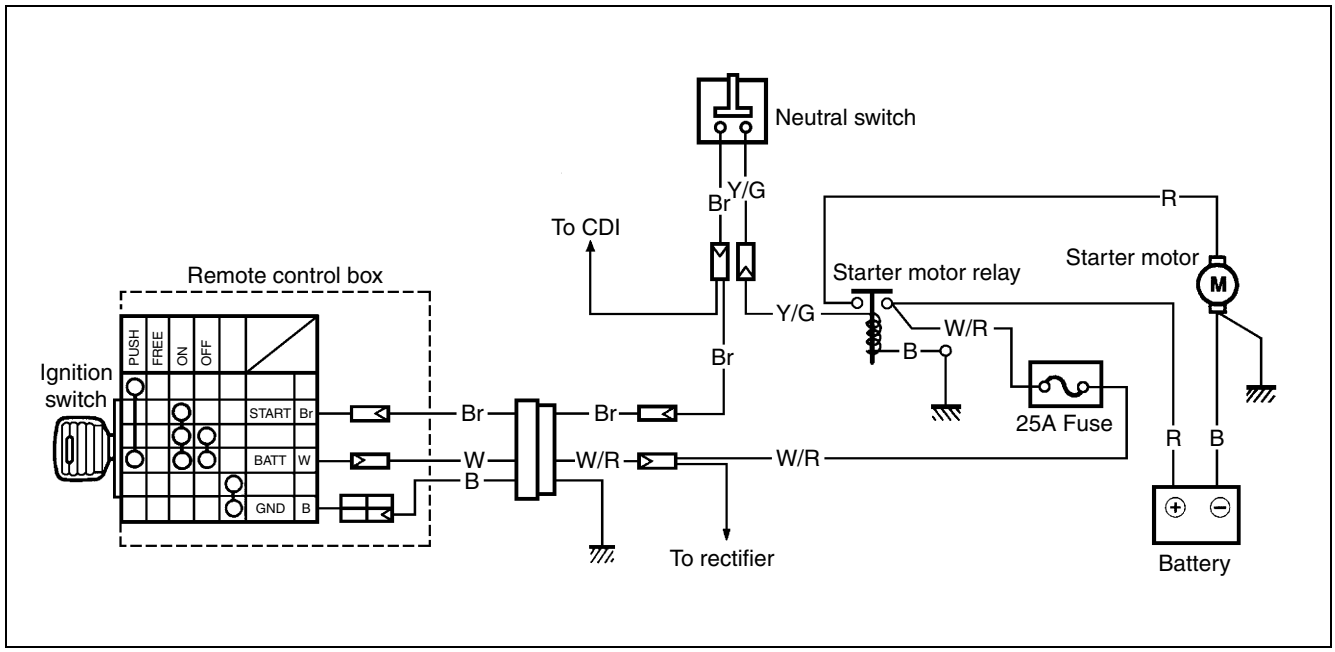
If no continuity is indicated, replace fuse case.

ELECTRIC STARTER SYSTEM

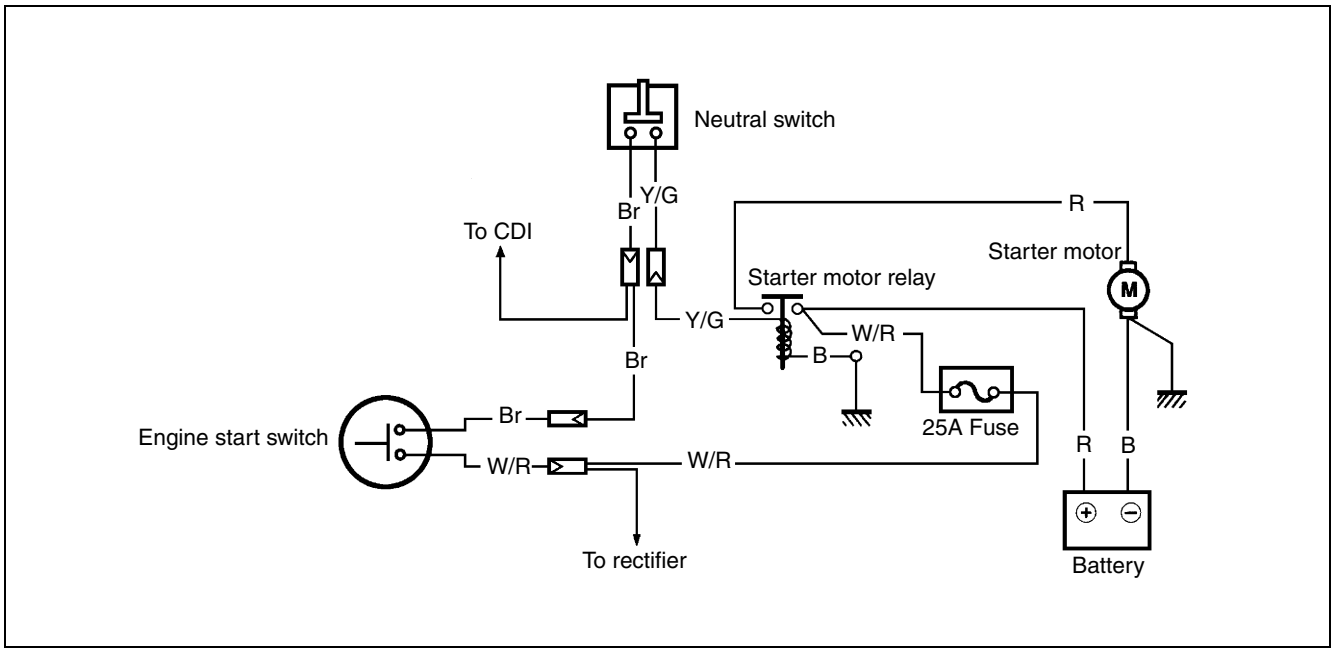
OUTLINE

The electric starter system circuit is illustrated below. It is mainly composed of the battery, starter motor, relay, neutral switches and ignition switch.

For Remote control model



For Electric start model



TROUBLESHOOTING

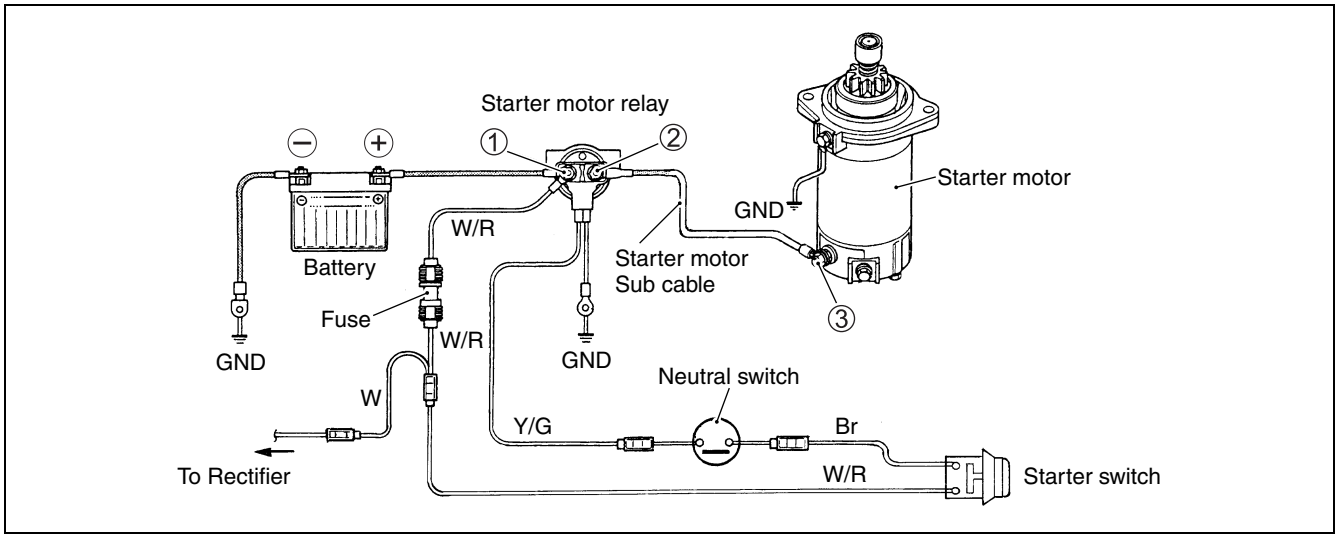
NOTE:

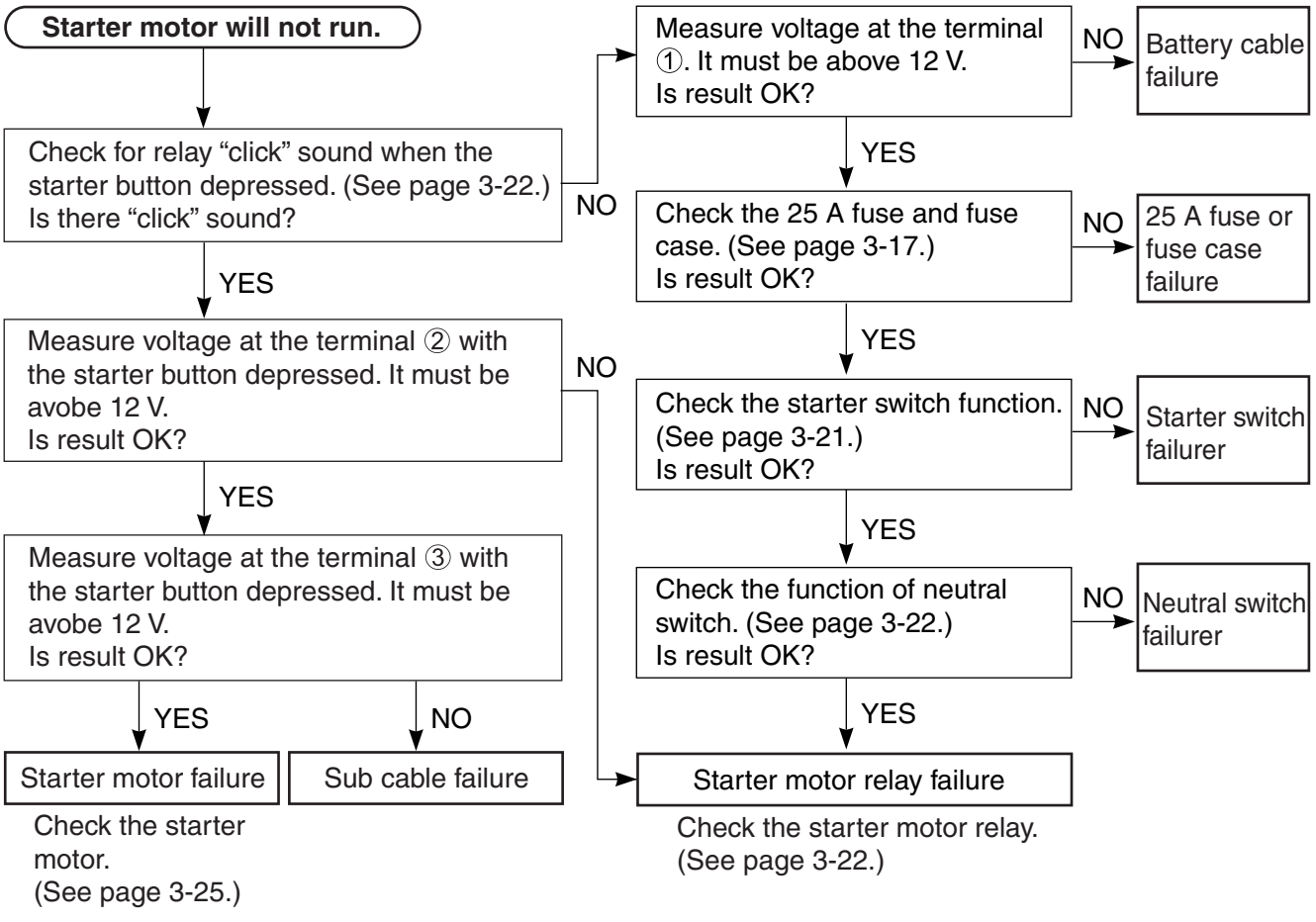
Before troubleshooting for the electric starter system, make sure of the following:

- *Battery is fully charged.*
- *All cables/wires are securely connected.*
- *Shift is in "NEUTRAL" position.*

ELECTRIC START MODEL

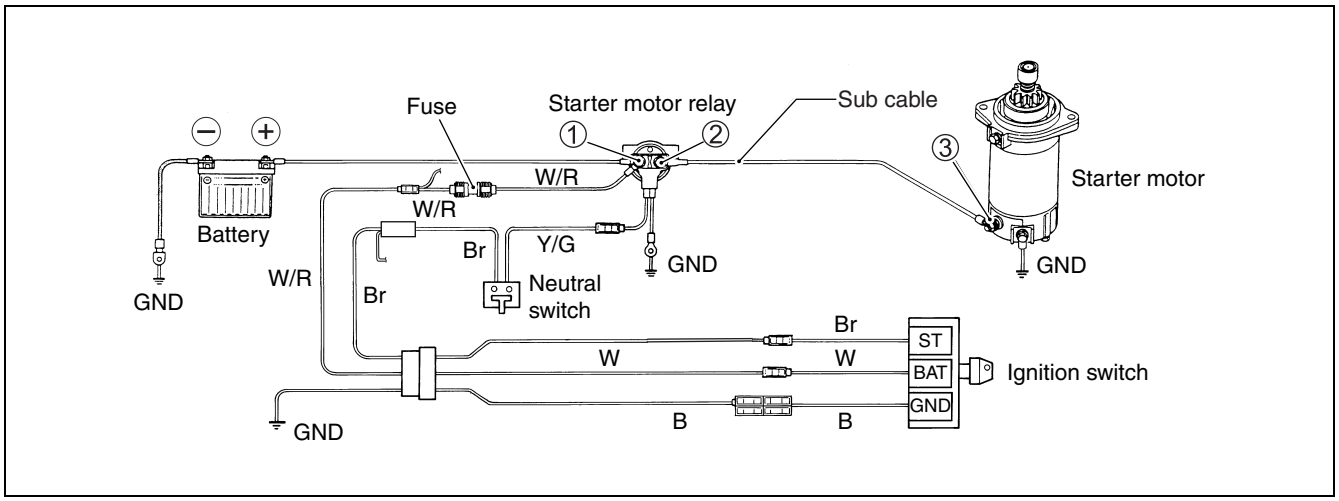
Circuit check schematic

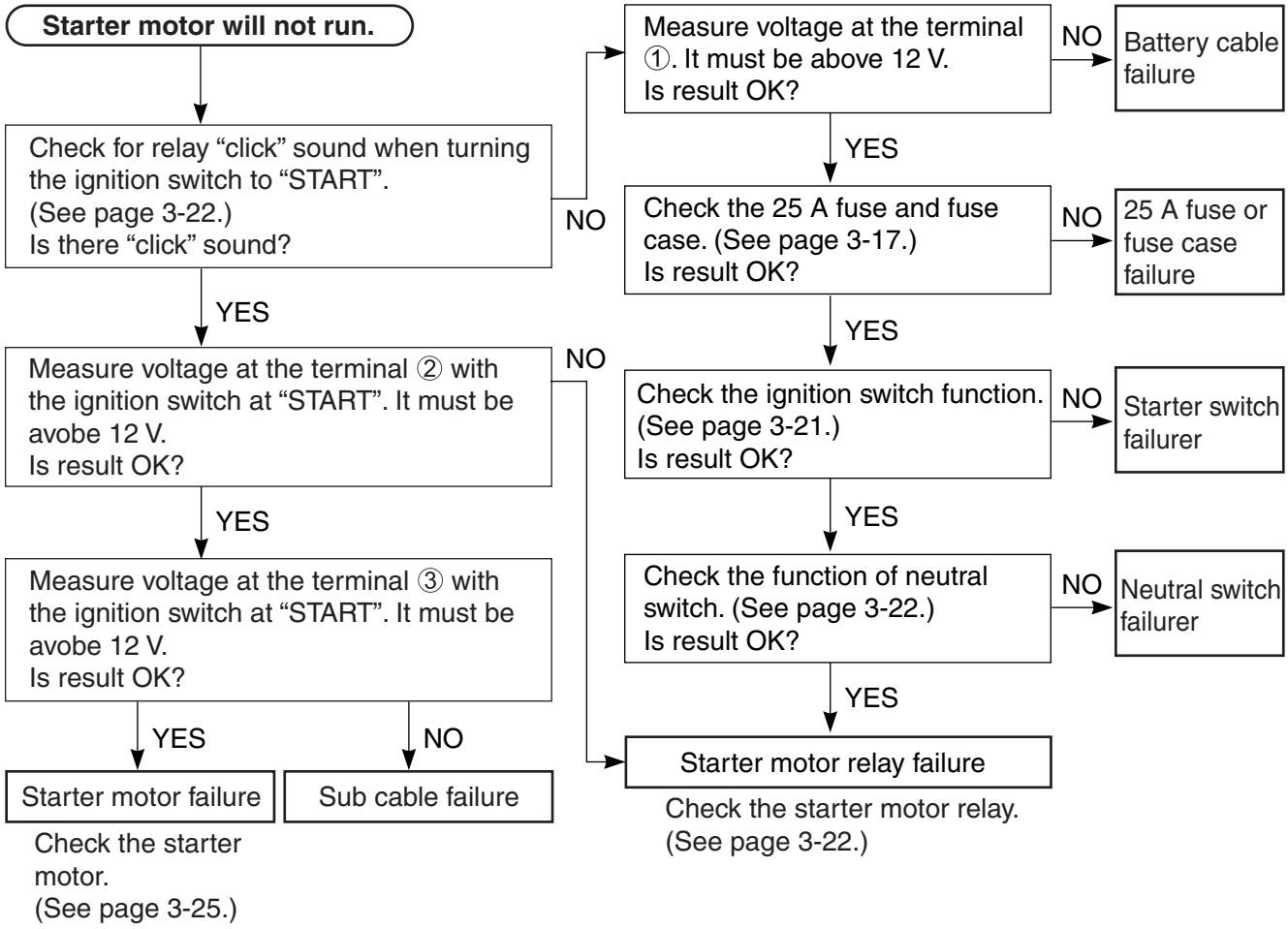




REMOTE CONTROL MODEL

Circuit check schematic





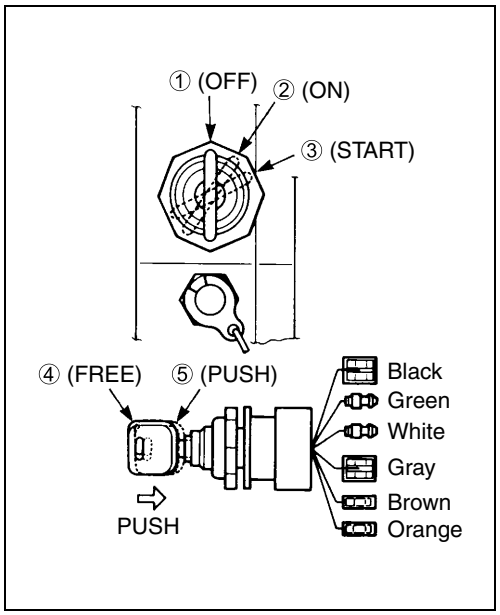
INSPECTION

IGNITION SWITCH (Remote control model)

09930-99320: Digital tester

Tester range: (Continuity)

1. Disconnect the ignition switch from the remo-con box wiring harness.
2. Check continuity between the wiring leads at the key positions shown in the chart.



Key Position	Switch Lead Wires					
	Black	Green	White	Gray	Brown	Orange
① OFF	○	○				
② ON			○	○		
③ START			○	○	○	
④ FREE						
⑤ PUSH			○			○

○——○ : Continuity

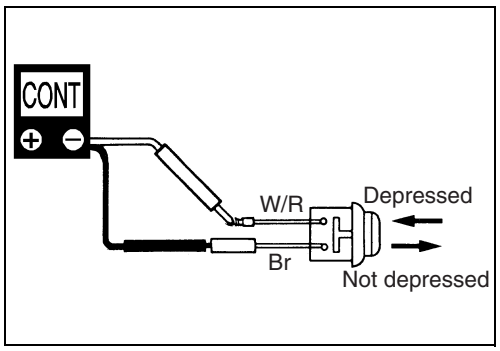
If out of the specification, replace the ignition switch.

STARTER SWITCH (Electric start model)

09930-99320: Digital tester

Tester range: (Continuity)

1. Disconnect the starter switch lead wire.
2. Check continuity between the wiring leads under the condition shown below.



	Tester probe connection		Continuity
	Probe	Other probe	
Starter button not depressed	White/Red	Brown	No
Starter button depressed			Yes

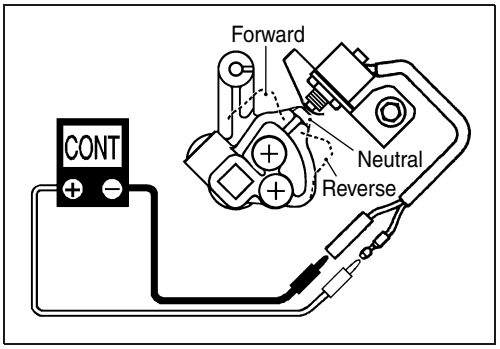
If out of the specification, replace the starter switch.

NEUTRAL SWITCH

09930-99320: Digital tester

Tester range: (Continuity)

1. Disconnect the neutral switch wire.
2. Inspect continuity between the Yellow/Green wire and the Brown wire while operating the shift lever or the remo-con handle.



Neutral switch function:

Shift position	Continuity
Neutral	Yes
Forward	No
Reverse	No

If the result is out of the specification, replace the neutral switch.

STARTER MOTOR RELAY

09930-99320: Digital tester

Disconnect all cables/wires from the starter motor relay.

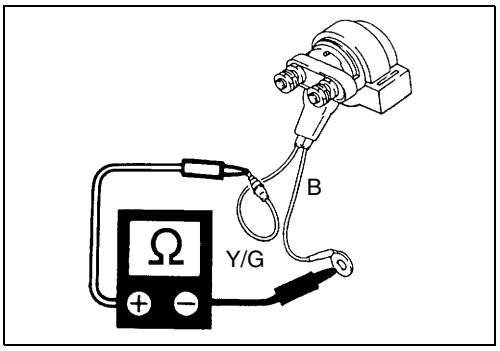
Resistance check

Tester selector: Ω (Resistance)

Measure resistance between the Yellow/Green wire and the Black wire.

Starter motor relay resistance: 3.5 – 5.1 Ω

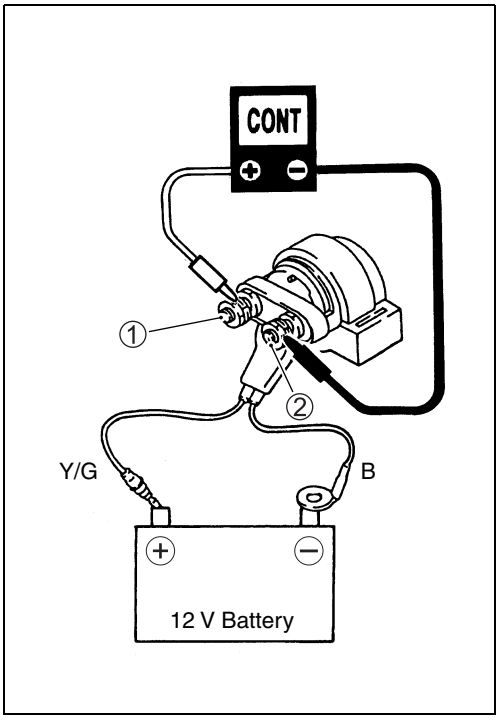
If the resistance is out of the specification, replace the starter motor relay.



Function check

Tester range: (Continuity)

Inspect continuity between the terminal ① and ② with momently applying 12 V power. Connect the Yellow/Green wire to the positive ⊕ terminal, and the Black wire to the negative ⊖ terminal of the battery.



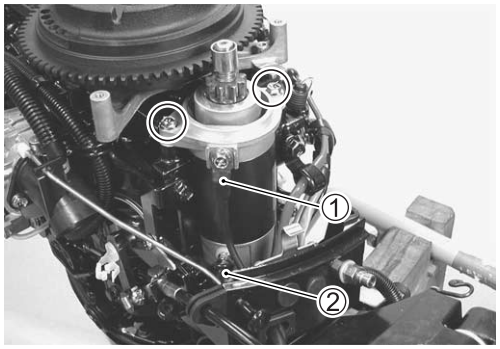
Starter motor relay function:

12 V power	Continuity
Applied	Yes
Not applied	No

If the result is out of the specification, replace the starter motor relay.

STARTER MOTOR

REMOVAL



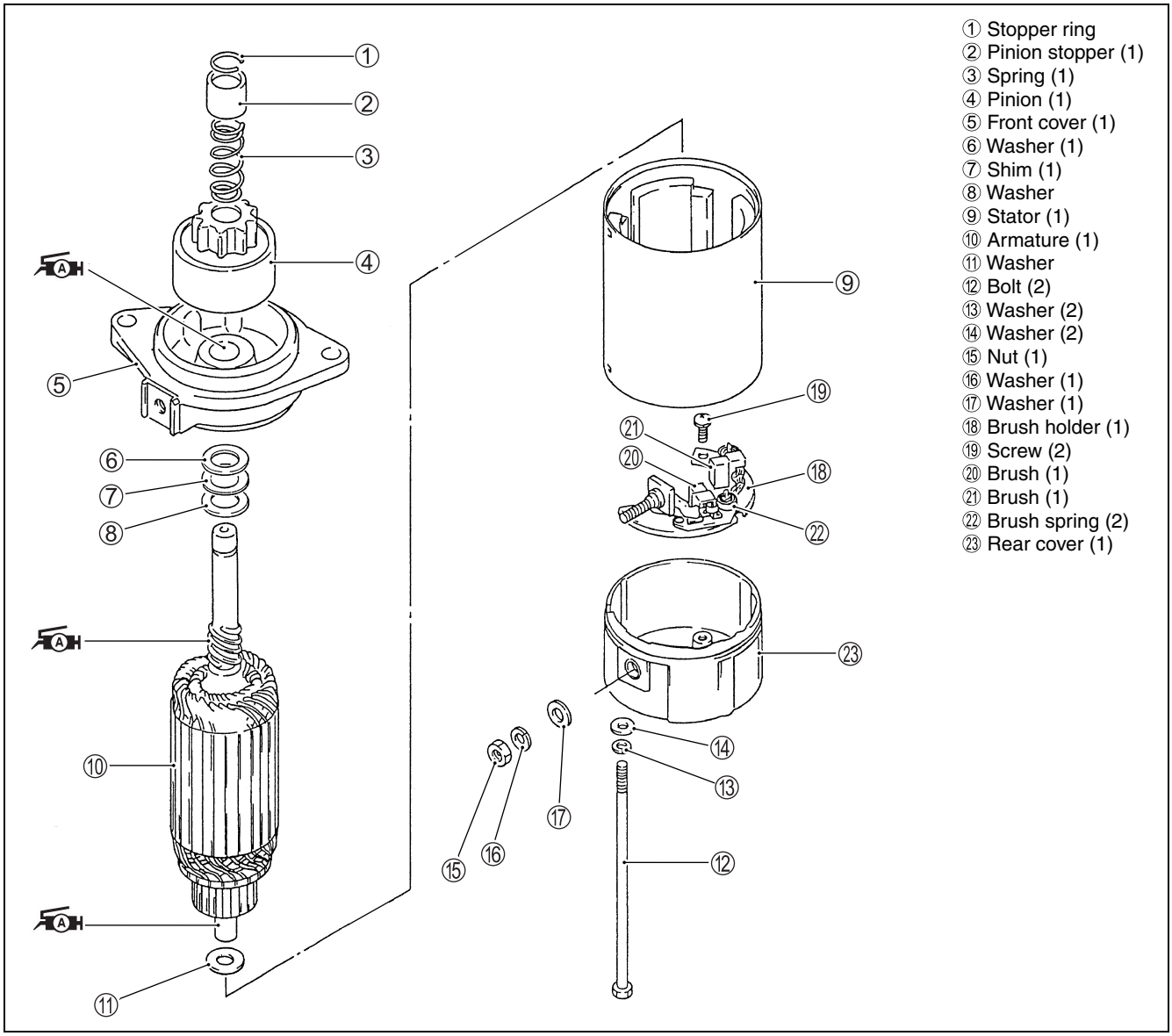
Before removing electrical motor:
*** Disconnect the battery cables from the battery.**

1. Remove the motor cover.
2. Remove the side covers. (See page 7-2.)
3. Remove the recoil starter.
4. Disconnect the starter cable ①.
5. Disconnect the starter sub cable ②.
6. Remove two bolts and the starter motor assy.

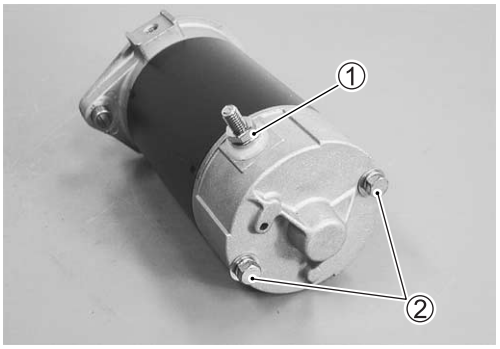
INSTALLATION

Installation is reverse order of removal with special attention to the following steps.

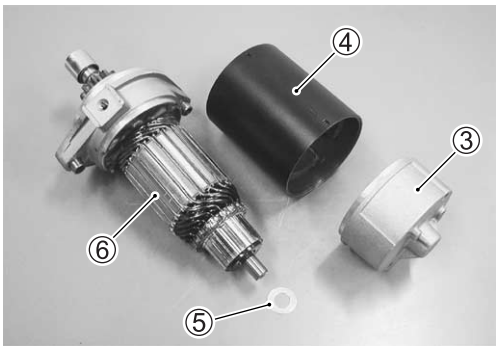
DISASSEMBLY



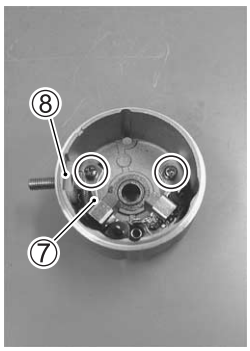
1. Remove the nut ① on the ⊕ terminal.
2. Remove two bolts ②.

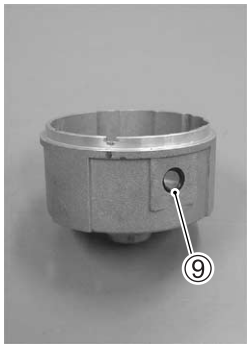


3. Remove the rear cover ③, the stator ④, the washer ⑤ and the armature ⑥ (with the front cover).



4. Remove brush holder assembly ⑦, bush ⑧ and the O-ring ⑨ from the rear cover.



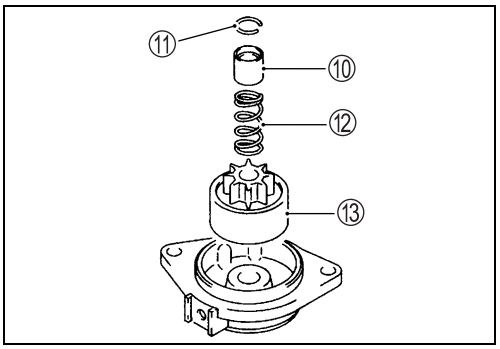


5. Push down the pinion stopper ⑩, remove the stopper ring ⑪.
6. Remove the pinion stopper ⑩, spring ⑫ and pinion ⑬.

⚠ WARNING

Wear the safety glasses when disassembling and assembling the stopper ring.

NOTE:
Using a screw-driver, pry off the stopper ring.

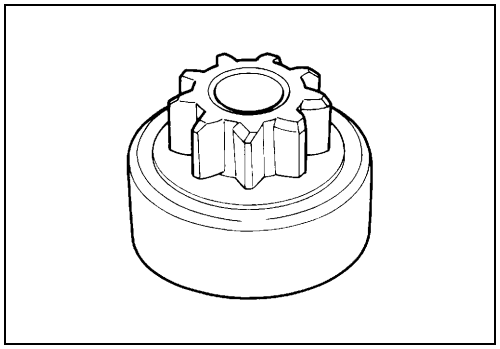


INSPECTION & SERVICING

Pinion

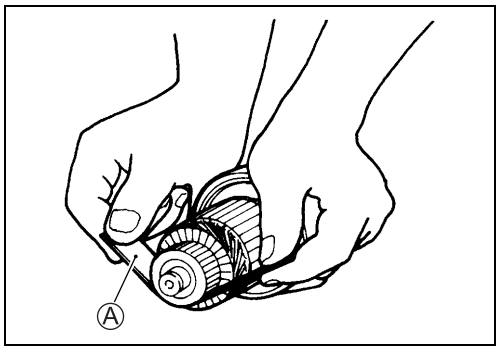
Inspect the pinion.

If excessive wear or other damage is found, replace the pinion.



Armature and Commutator

1. Inspect the commutator surface.
   If the surface is gummy or dirty, clean with 400 grade emery paper Ⓐ.

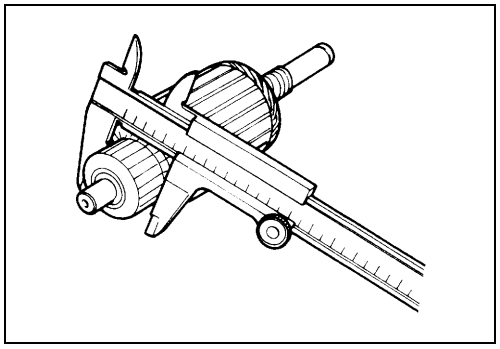


2. Measure the commutator outside diameter.

TOOL 09900-20101: Venier calipers

Commutator outside diameter:
Standard : 30.0 mm (1.18 in)
Service limit : 29.0 mm (1.14 in)

If the measurement exceeds the service limit, replace the armature.



3. Check that the mica (insulator) ① between the segments ② is undercut ③ to the specified depth.

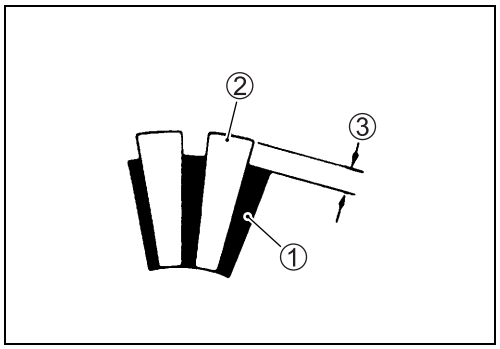
Commutator undercut:
Standard : 0.5 – 0.8 mm (0.02 – 0.03 in)
Service limit : 0.2 mm (0.01 in)

If the measurement exceeds the service limit, cut to the specified depth.

NOTE:
Remove all particles of mica and metal using compressed air.

⚠ WARNING

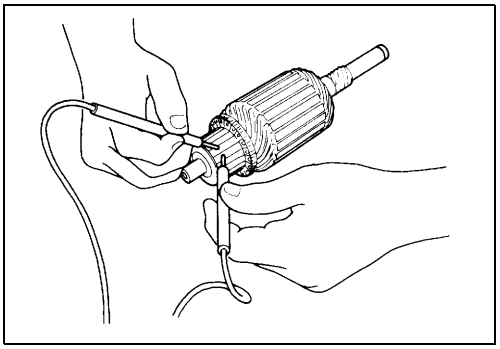
Wear the safety glasses when using compressed air.



4. Inspect continuity of the armature coil.

09930-99320: Digital tester

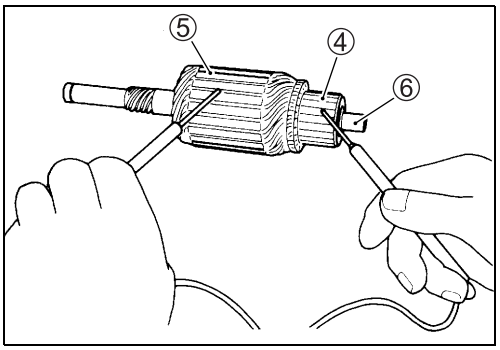
Tester range: (Continuity)



Armature coil continuity:

Tester probe connection	Continuity
Between commutator segments	Yes
Commutator ④ to Armature core ⑤	No
Commutator ④ to Shaft ⑥	No

If the result is out of the specification, replace the armature.



Brushes

Measure length of each brush.

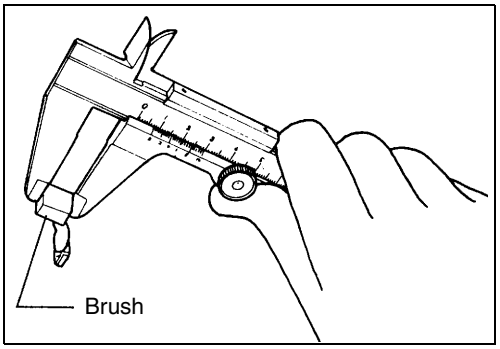
09900-20101: Venier calipers

Brush length:

Standard : 12.5 mm (0.49 in)

Service limit : 9.0 mm (0.35 in)

If the measurement exceeds the service limit, replace the brush.



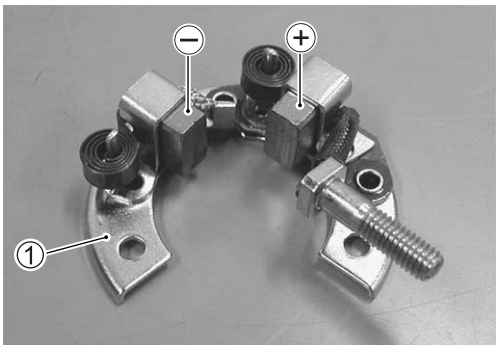
Brush Holder

Inspect continuity of the brush holder.

09930-99320: Digital tester

Tester range: (Continuity)

Brush holder continuity:



Tester probe connection	Continuity
Brush holder positive ⊕ to Brush holder negative ⊖	No
Brush holder positive ⊕ to Base plate ① (ground)	No

If the result is out of the specification, replace the brush holder.

ASSEMBLY

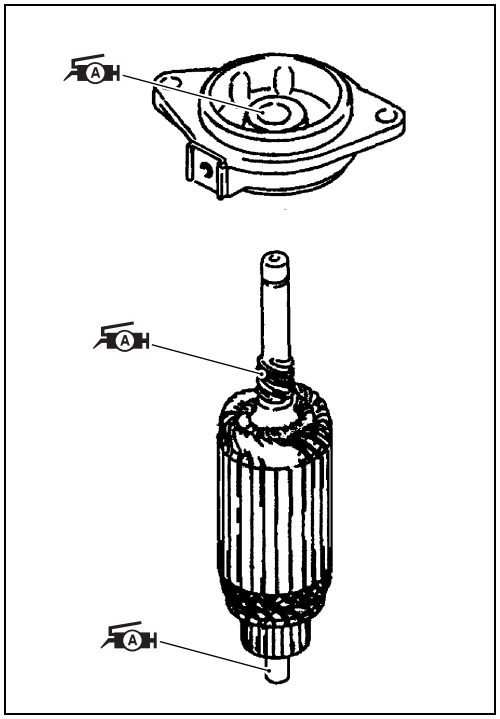
Assembly is reverse of disassembly with special attention to the following steps.

CAUTION

When installing armature, exercise care to avoid breaking brushes.

- Apply the grease to the armature shaft and shaft holes.

99000-25010: SUZUKI SUPER GREASE "A"



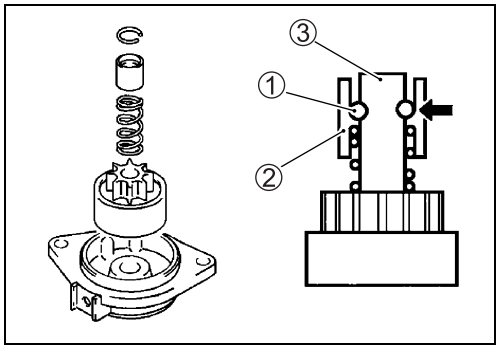
⚠ WARNING

Wear the safety glasses when disassembling and reassembling the stopper ring.

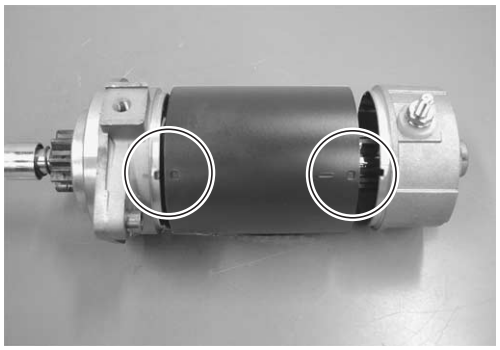
- Install the pinion, spring, pinion stopper and stopper rings.

NOTE:

Make sure that the stopper rings ① tightly fit in the pinion stopper ② and armature shaft ③.

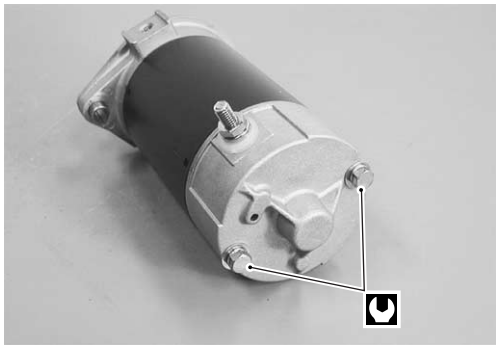


- Align the notch in the cover (Front & Rear) with the tab on the stator when assembling.



- Tighten the through bolts.

Through bolt: 4.0 N·m (0.4 kgf-m, 2.9 lb-ft)



FUEL SYSTEM

CONTENTS

PRECAUTION ON FUEL SYSTEM SERVICE 4- 2
GENERAL PRECAUTION 4- 2
FUEL LINE 4- 2
REMOVAL/INSTALLATION 4- 2
FUEL LEAKAGE CHECK PROCEDURE 4- 2
FUEL HOSE CONNECTION 4- 3
CARBURETOR 4- 4
REMOVAL 4- 4
INSTALLATION 4- 5
DISASSEMBLY 4- 6
CLEANING & INSPECTION 4- 7
OPERATION 4-10
ACCELERATOR PUMP SYSTEM 4-11
THROTTLE CONTROL 4-12
FUEL PUMP 4-14
REMOVAL/INSTALLATION 4-14
DISASSEMBLY/REASSEMBLY 4-15
INSPECTION 4-16
FUEL TANK 4-17
DISASSEMBLY/REASSEMBLY 4-17
INSPECTION 4-18

PRECAUTION ON FUEL SYSTEM SERVICE
GENERAL PRECAUTION

⚠ WARNING

Gasoline is extremely flammable and toxic. Always observe the following precautions when working around gasoline or servicing the fuel system.
*** Disconnect battery cables except using battery power for servicing/inspection.**
*** Keep the working area well ventilated, away from open flame (such as gas heater) or sparks.**
*** Do not smoke or allow anyone else to smoke near the working areas. Post a "NO SMOKING" sign.**
*** Have a CO2 fire extinguisher to be ready for use.**
*** Always use appropriate safety equipment and wear the safety glasses when working around pressurized fuel systems.**
*** To avoid potential fire hazards, do not allow fuel to spill on hot engine parts or on operating electrical components.**
*** Wipe up fuel spills immediately.**

⚠ WARNING

The components after the high pressure fuel pump remain pressurized at all times.
To protect against fuel spray, relieve fuel line pressure before disconnecting or removing components.

FUEL LINE
REMOVAL/INSTALLATION

Remove or install the fuel hoses with special attention to the following steps.

CAUTION

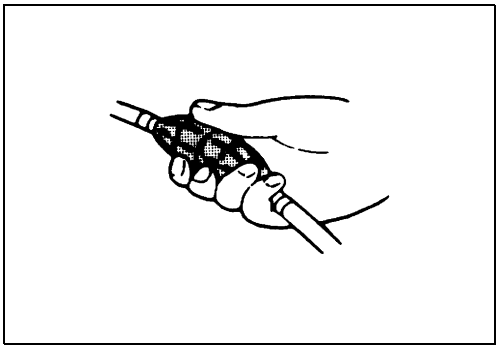
*** Do not over-bend (kink) or twist hoses when installing.**
*** When installing hose clips, position tabs to avoid contact with other parts.**
*** Be sure that hoses do not contact rods, levers or other components with engine either operating or at rest.**
*** Extreme care should be taken not to cut, abrade or cause any other damage to hoses.**
*** Use care not to excessively compress hoses when tightening clamps.**

NOTE:
** Check the fuel hose routing. (See page 9-11.)*
** Check for fuel leakage.*

FUEL LEAKAGE CHECK PROCEDURE

After performing any fuel system service, always be sure that there is no fuel leakage by checking as follows.

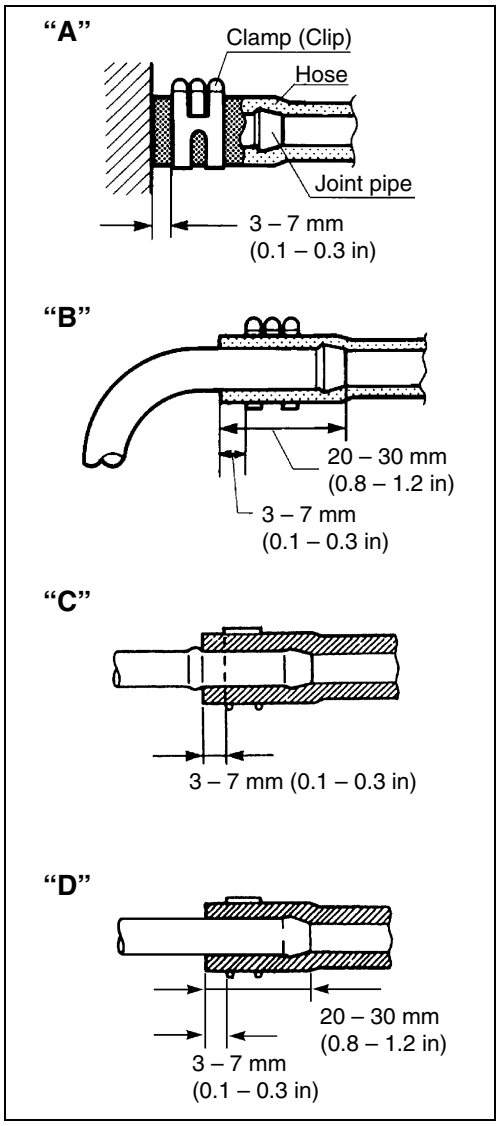
1. Squeeze the fuel primer bulb until you feel resistance.
2. Once pressurized, check all connections and components for any signs of leakage.



FUEL HOSE CONNECTION

Note that the fuel hose connection varies with each type of the pipe. Be sure to connect and clamp each hose correctly by referring to the following figure.

- For the type “A” (short barbed end) pipe, hose should completely cover the pipe.
- For the type “B” (bent end) pipe, hose should cover straight part of the pipe by 20 – 30 mm (0.8 – 1.2 in).
- For the type “C” pipe, hose should fit up against flanged part of the pipe.
- For the type “D” pipe, hose should cover the pipe by 20 – 30 mm (0.8 – 1.2 in).



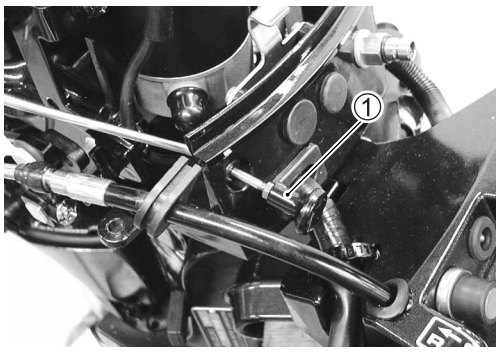
CARBURETOR

⚠ WARNING

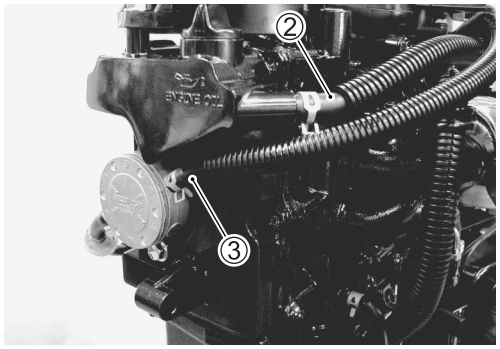
Before servicing for the fuel system, read and understand "PRECAUTION ON FUEL SYSTEM SERVICE" in the previous section.

REMOVAL

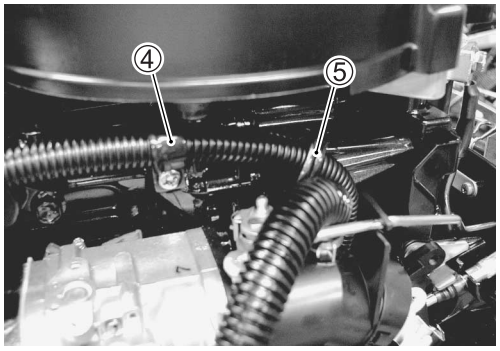
1. Remove the motor cover.
2. Remove the side covers. (See page 7-2.)
3. Remove the choke knob ①.



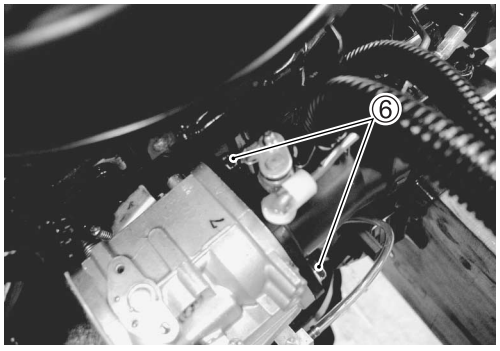
4. Disconnect the breather hose ② from the cylinder head cover.
5. Disconnect the fuel hose ③ from the fuel pump.



6. Remove the clamp ④.
7. Remove the fuel hose from the clamp ⑤.



8. Remove the two bolts ⑥.
   Remove the silencer and the carburetor.



INSTALLATION

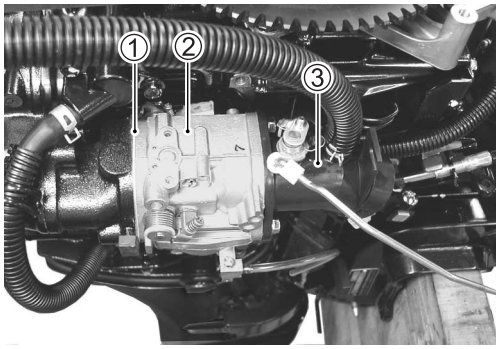
Installation is the reverse order of removal with special attention to the following steps.

CAUTION

Do not re-use the gaskets, as sealing abilities will be insufficient. Air leakage will induce a lean air/fuel mix which will result in severe engine damage.

- Install the carburetor gasket ①, the carburetor ② and the silencer ③, then tighten the carburetor mounting bolts to the specified torque.

Carburetor mounting bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

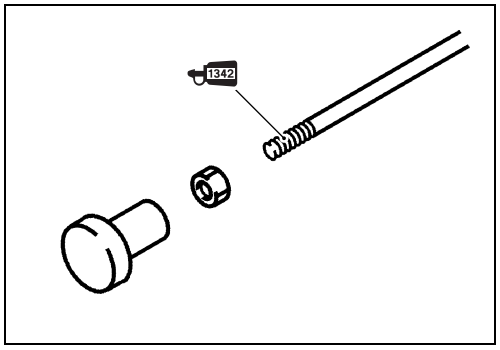


FINAL ASSEMBLY CHECK

Perform the following checks to ensure proper and safe operation.

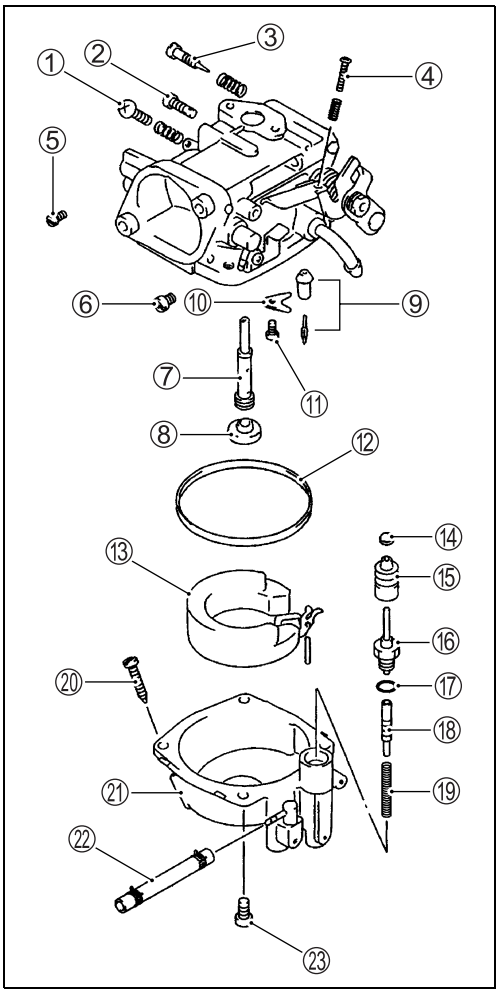
- All parts removed have been returned to their original positions.
- No fuel leakage is evident when fuel system is pressurized. (See page 4-2.)
- Apply the THREAD LOCK to the choke lever and install the choke knob.

1342 99000-32050: THREAD LOCK "1342"



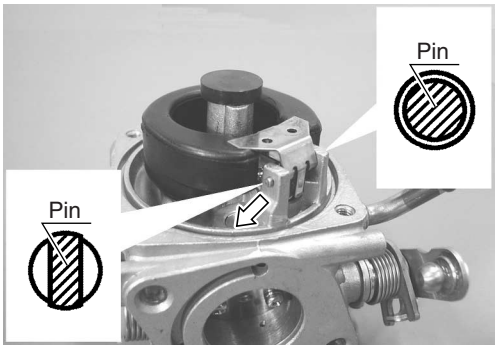
DISASSEMBLY

When disassembling the carburetor, refer to the construction diagram.



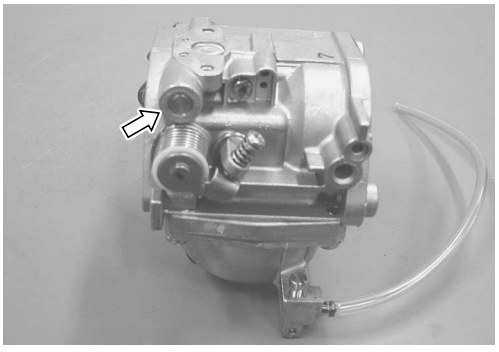
① Screw
② Pilot jet
③ Adjuster
④ Screw
⑤ Main air jet
⑥ Main jet
⑦ Main nozzle
⑧ Main nozzle cap
⑨ Needle valve assy
⑩ Plate
⑪ Screw
⑫ Float chamber gasket
⑬ Float
⑭ Cap
⑮ Cap
⑯ Holder guide
⑰ O-ring
⑱ Plunger
⑲ Spring
⑳ Adjuster
㉑ Float chamber
㉒ Hose
㉓ Screw

Remove the float pin from the right side to the left side. (See the figure.)



NOTE:

** Only for the pilot screw covered type carburetor:*
Do not remove the cover and the pilot screw.



CLEANING & INSPECTION

Clean thoroughly with cleaning solvent and compressed air before inspection.

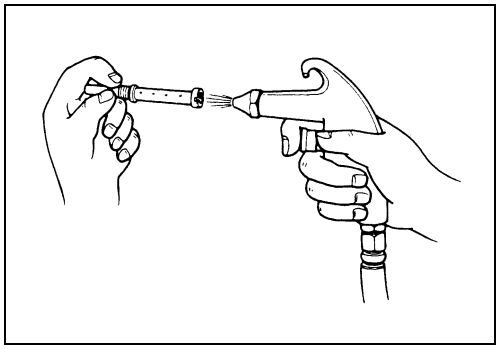
⚠ WARNING

Wear the safety glasses when using compressed air to expel solvent, carburetor cleaner, etc.

CAUTION

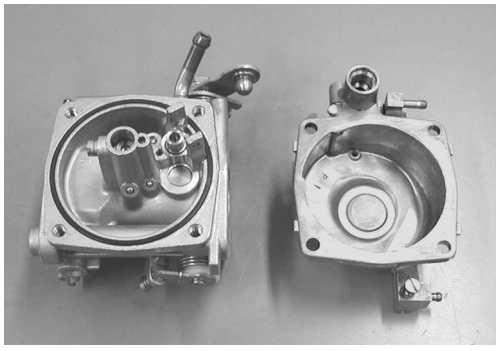
Do not place any rubber, plastic and non-metallic parts in cleaning solvent, as severe damage or deterioration will result.

NOTE:
Wire or small drill bits must not be used to clean carburetor orifices and jet.



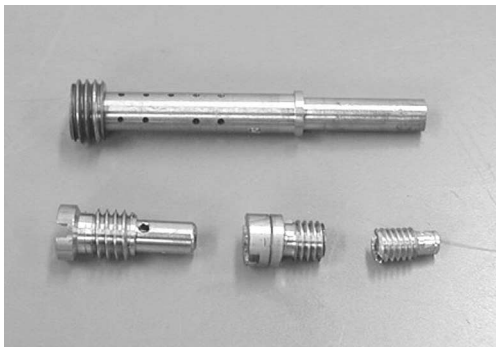
CARBURETOR BODY

Inspect the carburetor body. If cracks or other damage are found on any component, replace it.
Clean the carburetor body so that there is no obstruction.



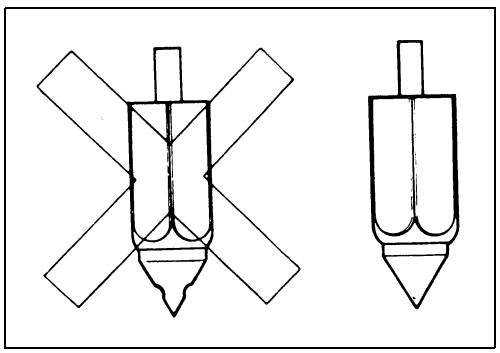
JET, NOZZLE

Inspect the jet and nozzle. If cracks or other damage are found on the jet and nozzle, replace them.
Clean the jet and nozzle thoroughly so that there is no obstruction.



NEEDLE VALVE ASSEMBLY

Inspect the needle valve assembly.
If broken tips or wear are found on the needle valve assembly, replace it.



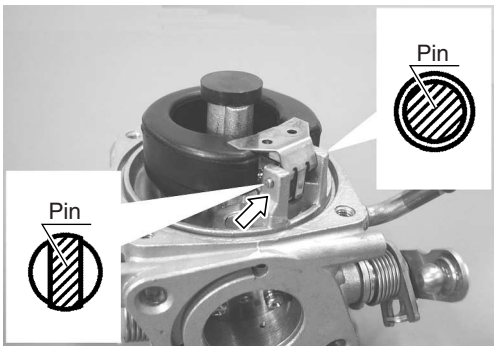
FLOAT
Inspect the float.
If cracks or other damage are found on the float, replace it.

REASSEMBLY
Reassembly is reverse order of disassembly with special attention to the following steps.

FLOAT
Install the float and the float pin.

CAUTION

Install the float pin from the left side to the right side. (See the figure.)

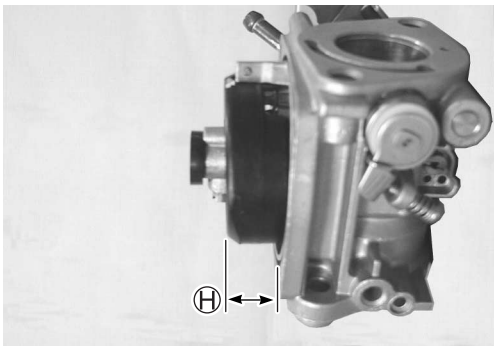


NOTE:
After installing float, inspect for smooth movement of the float.

CHECKING FLOAT HEIGHT
Remove the float chamber gasket and measure the float height.

NOTE:
Make sure that the float weight is not applied to the needle valve.

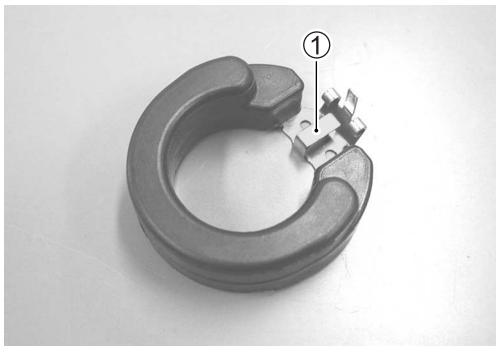
TOOL 09900-20101: Vernier calipers
Float height Ⓗ: 17.6 ± 1 mm



SETTING FLOAT HEIGHT
To correct specification, bend only the adjustment tab ①.

CAUTION

When adjusting tab, do not bend to the point that it applies pressure to the needle and the seat.



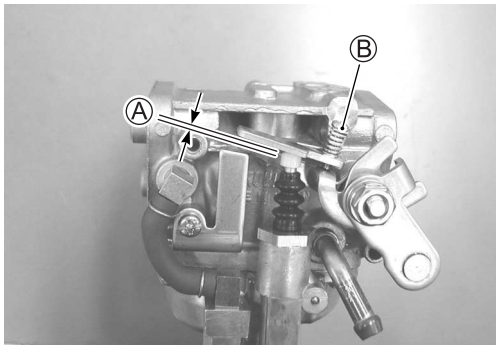
ADJUSTING ACCELERATION PUMP LEVER GAP

Adjust gap Ⓐ between the acceleration pump lever and the pump plunger rod by turning the adjust screw Ⓑ.

Gap Ⓐ (at the throttle valve fully closed)	0 – 0.5 mm

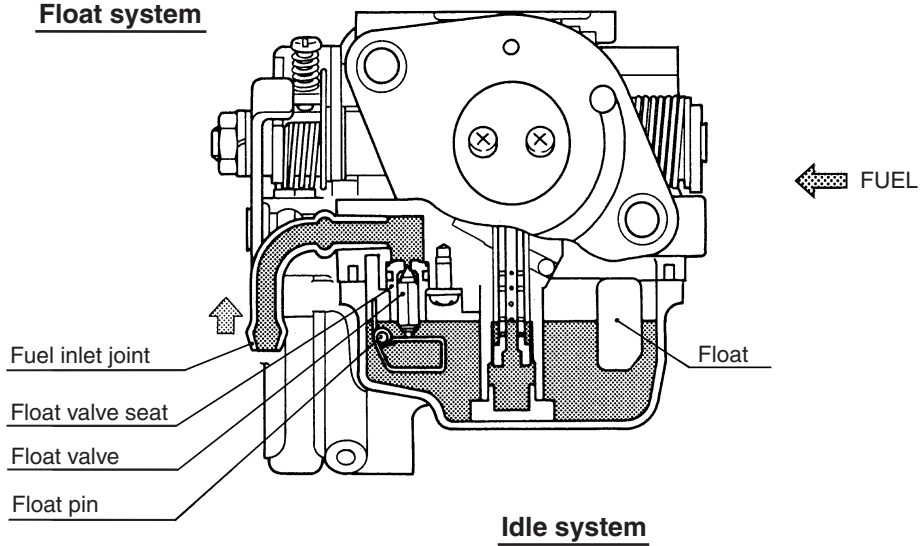
NOTE:

In normal use, adjustment of the acceleration pump lever is unnecessary as it has been adjusted at factory.

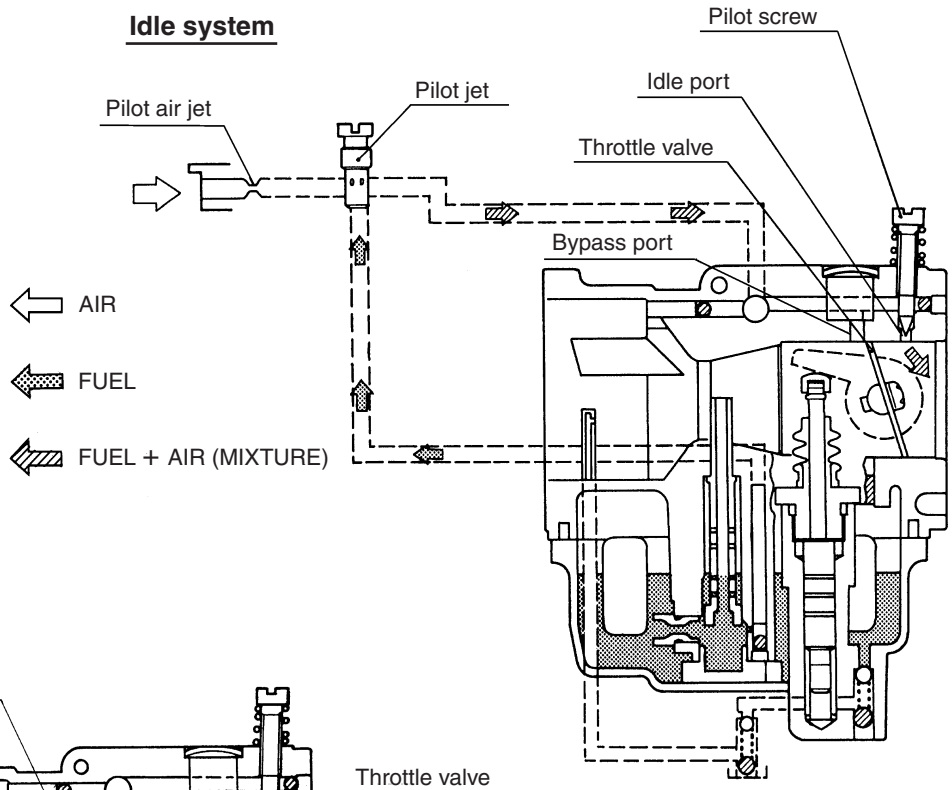


OPERATION

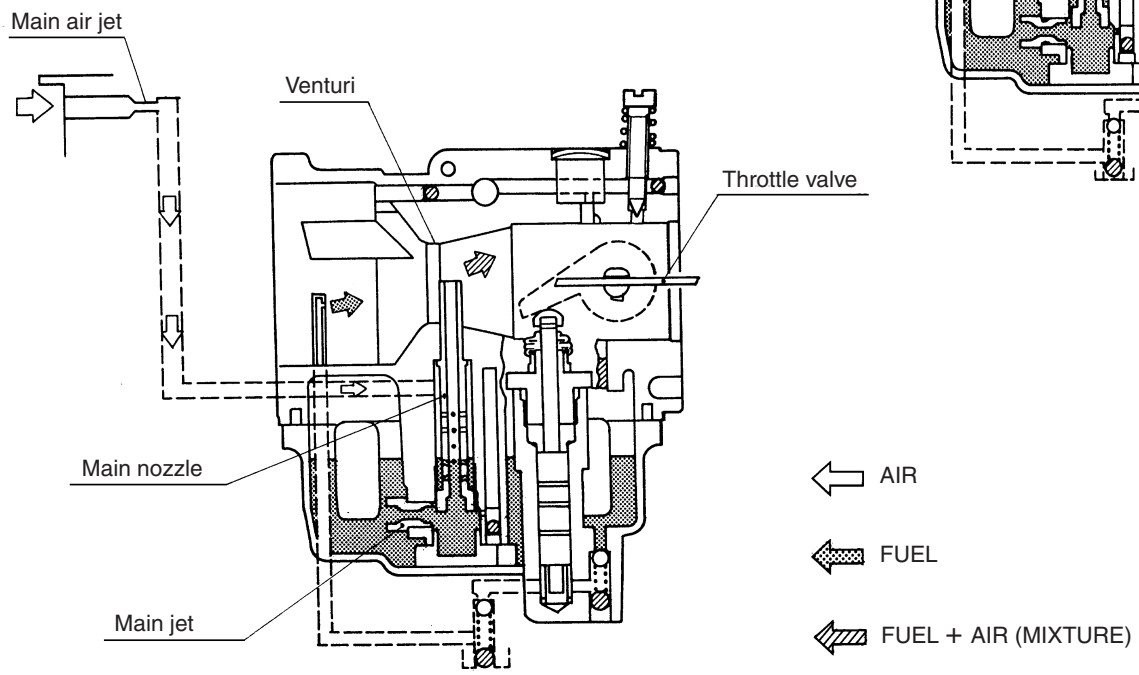
Float system



Idle system



Main Metering system



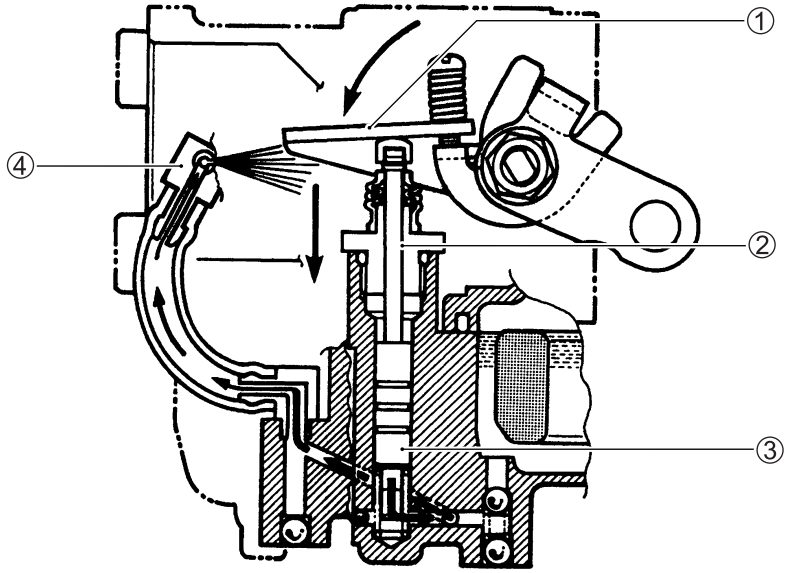
ACCELERATOR PUMP SYSTEM

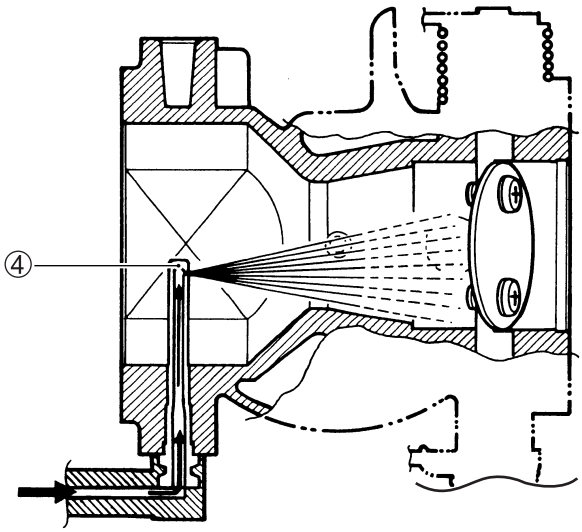
The DF9.9/15 models are equipped with an accelerator pump system. This system is composed of an accelerator pump on each carburetor with brass tubes connecting the pump to the fuel output nozzles on each carburetor.

A normal engine characteristic during hard acceleration is hesitation caused by an imbalance in the fuel/air ratio. This is due to the rapid rate of increase in intake air volume when the throttle is opened quickly with the air velocity and fuel flow rate following at a slower rate of increase. The accelerator pump system overcomes this characteristic.

Accelerator pump operation

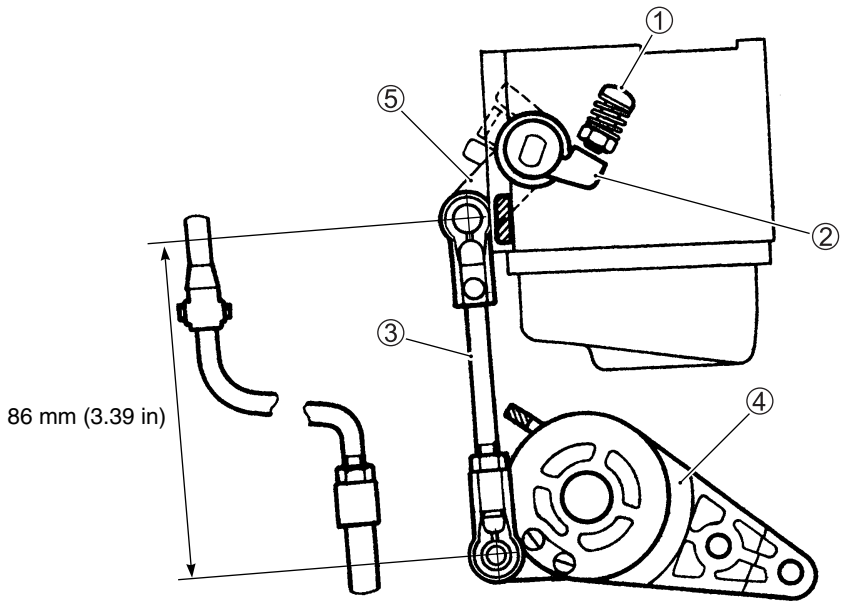
The accelerator pump system's function is to provide a balanced fuel/air ratio during acceleration only by adding a specific volume of fuel to richen the mixture. When the throttle is opened, the accelerator pump lever ① pushes down on the pump rod ② and plunger ③. As the plunger pushes against the fuel, the inlet passage check ball closes and fuel is pushed out of the pump body, through the brass tube and outlet nozzle ④, spraying into carburetor bore.



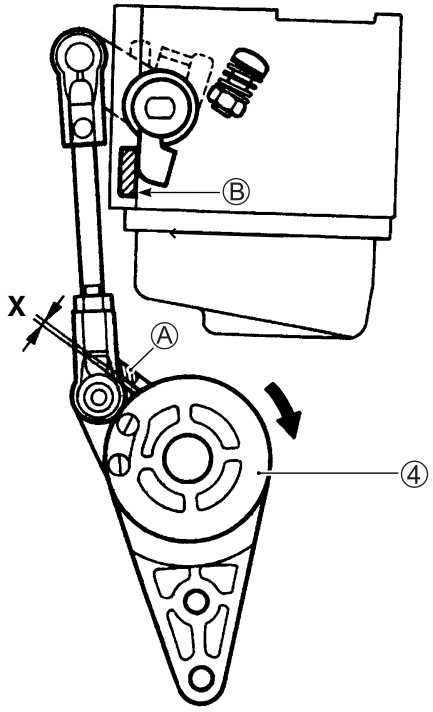


THROTTLE CONTROL

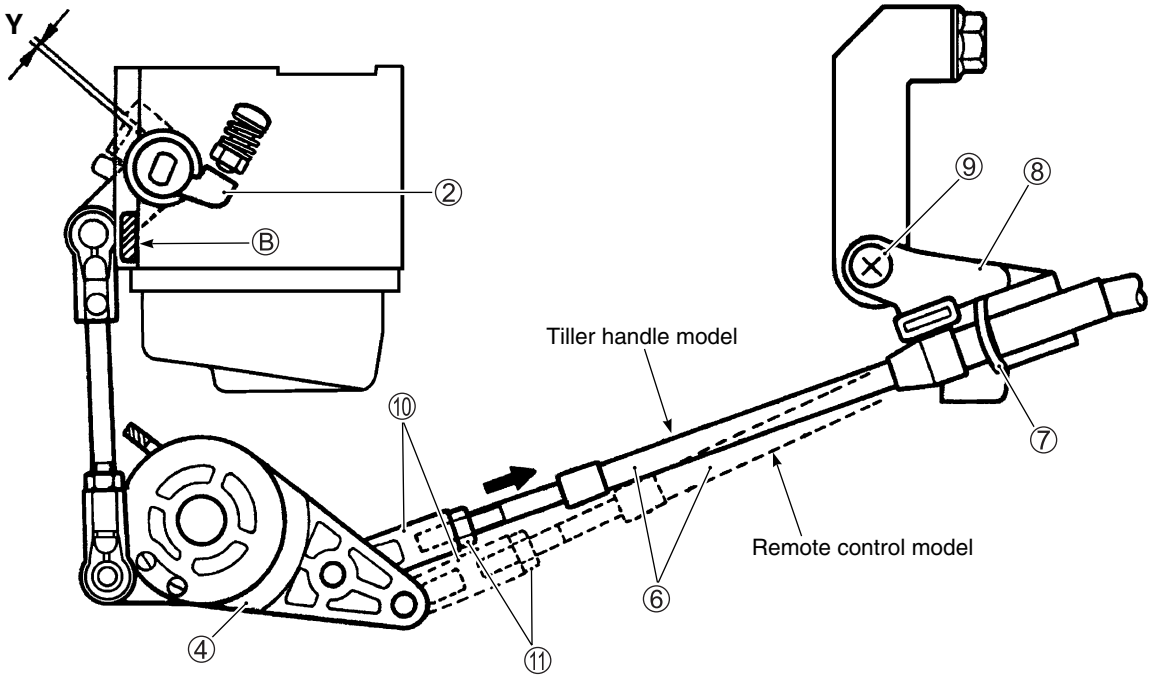
1. Turn the throttle stop screw ① counterclockwise until no longer contacts the throttle lever ②.
2. Adjust the throttle rod ③ length to 86 mm (3.39 in) measuring between the centers of the two connector holes.
3. Press fit the rod ③ onto the ball pivot on the throttle drum ④ and the throttle arm ⑤.



4. Turn the drum ④ clockwise, then check if the clearance "X" (between the drum and the stopper Ⓐ) is 0 – 1 mm when the lever ② just contacts with the stopper Ⓑ.
   If not, adjust the rod ③ setting.



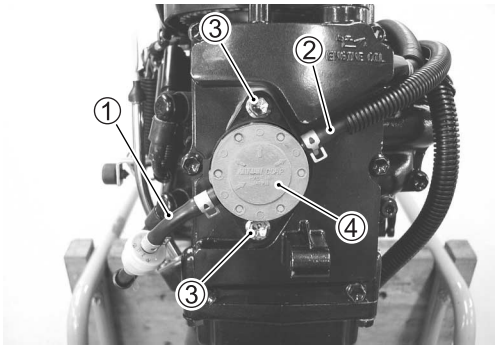
5. Fully close the throttle control grip (for tiller handle model).
   Position the control handle into “Neutral” (for remote control model).
6. Secure the throttle cable ⑥ in the holder ⑦ by fitting groove on the cable into a slot on the holder, then install the bracket ⑧ to fix the cable by the screw ⑨ as shown.
7. Thread the connector ⑩ onto the cable ⑥.
8. Turn the drum ④ counterclockwise until the clearance “Y” exists.
9. While pushing cable end as shown by arrow Ⓒ, adjust the connector ⑩ until the center of connector aligns with the center of ball pivot on the drum ④.
10. When aligned, press fit the connector onto the ball pivot and tighten the lock nut ⑪.
11. Make sure the lever ② contacts the stopper Ⓑ with the throttle control fully opened.
    Also make sure the clearance “Y” exists with the throttle control fully closed. If not, adjust the connector ⑩ again.



FUEL PUMP
REMOVAL/INSTALLATION

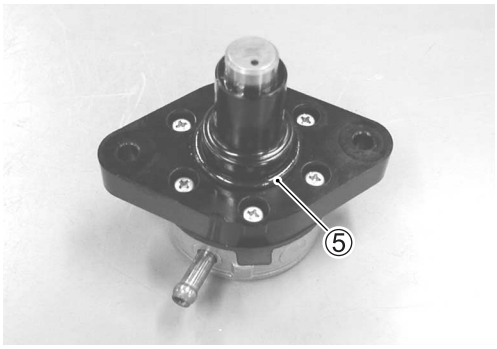
⚠ WARNING

Before servicing for the fuel system, read and understand "PRECAUTION ON FUEL SYSTEM SERVICE" in the previous section.



REMOVAL

1. Disconnect the inlet hose ① and the outlet hose ② from the fuel pump.
2. Remove the two bolts ③.
3. Remove the fuel pump ④ and the O-ring ⑤.

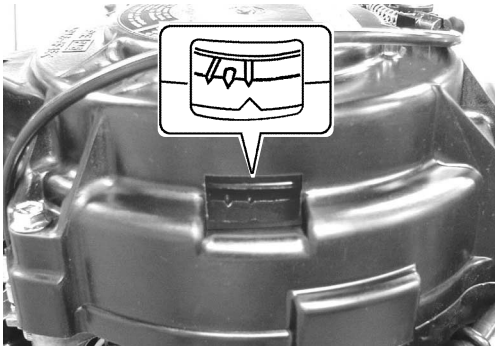


INSTALLATION

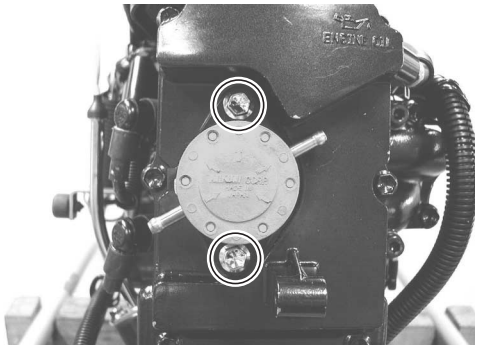
Installation is reverse order of removal with special attention to the following steps.

CAUTION

*** Before installing the fuel pump, rotate the crankshaft to bring the No. 1 (top cylinder) piston to Top Dead Center on a compression stroke.**
*** Do not re-use the O-ring once removed. Always use a new O-ring.**



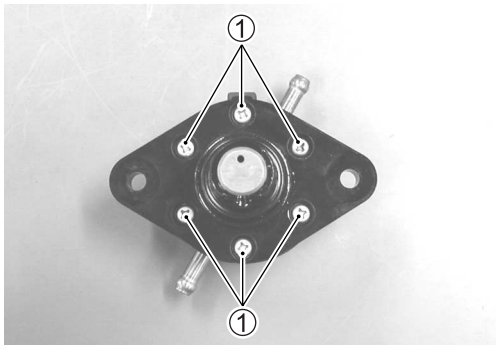
Fuel pump bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

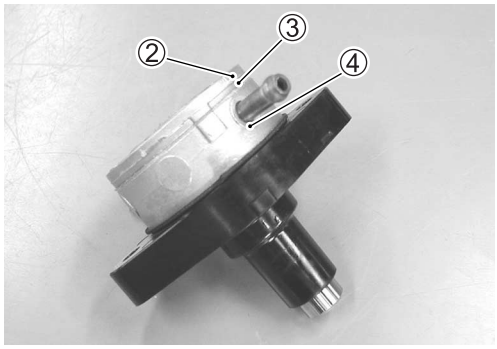


DISASSEMBLY/REASSEMBLY

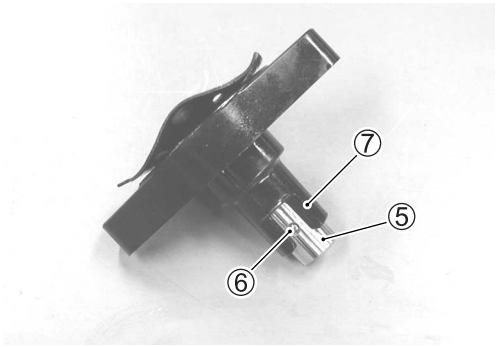
DISASSEMBLY

Remove the six screws ① and remove in sequence the outer plate ②, the gasket ③ and the valve body ④.





Turn the piston ⑤ until the pin ⑥ comes out through cutaway of the pump body ⑦.

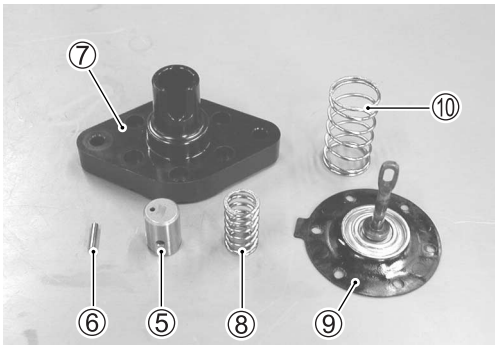


Remove the following parts:

- Piston ⑤
- Pin ⑥
- Pump body ⑦
- Spring ⑧
- Diaphragm ⑨
- Spring ⑩

CAUTION

Do not re-use the diaphragm set once removed. Always use a new diaphragm set.

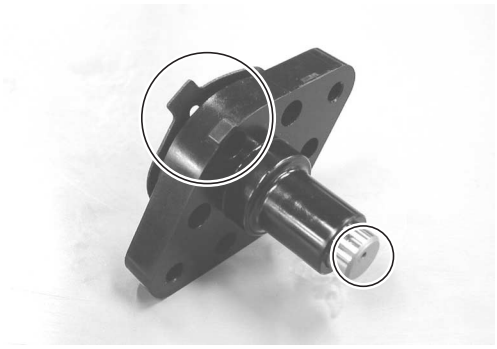


ASSEMBLY

Assembly is reverse order of disassembly with special attention to the following steps.

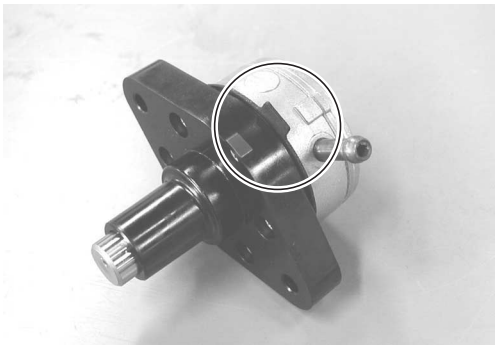
CAUTION

Do not re-use the diaphragm set once removed. Always use a new diaphragm set.



When connecting the diaphragm set to the piston with the pin, align the punch mark on the piston and the convex of the diaphragm.

Align the convex marks on the pump body, the diaphragm, the valve body, the gasket and the outer plate when assembling.



INSPECTION

Check-valves

Inspect the fuel pump check valves. If tears, distortion or damage is found, replace the fuel pump.

Pump body

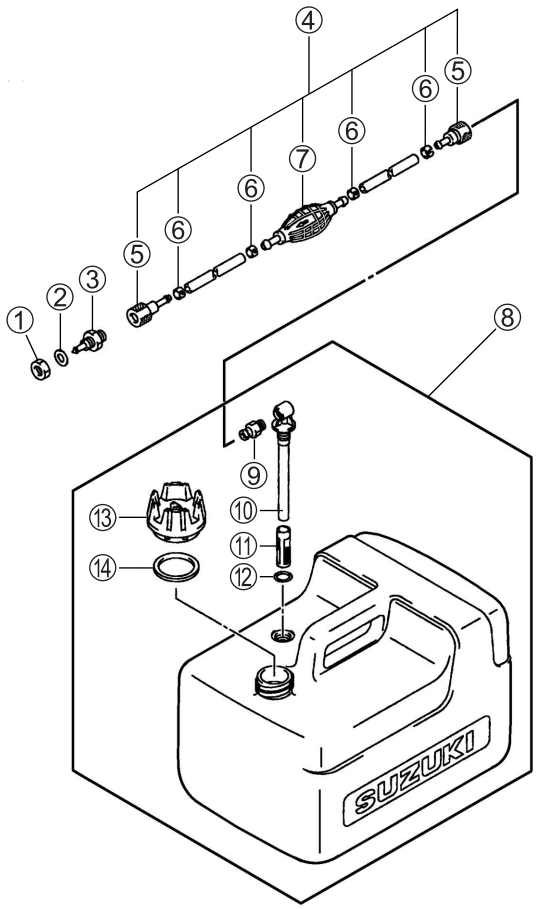
Inspect the fuel pump body and the outer plate.

If cracks, nicks, distortion or damage is found, replace the fuel pump.

FUEL TANK
DISASSEMBLY/REASSEMBLY

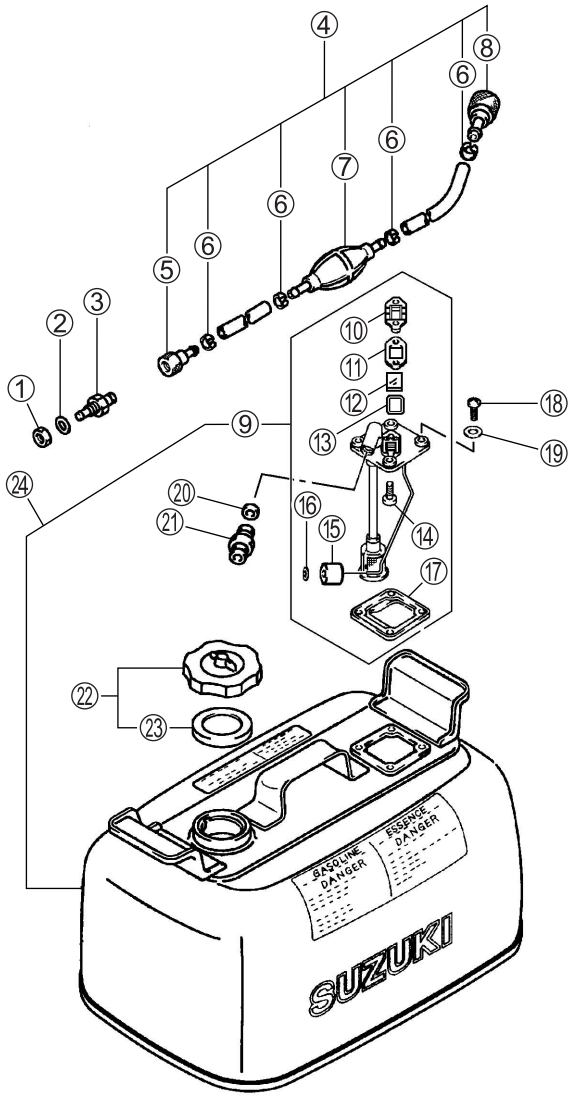
When disassembling or reassembling the fuel tank, refer to the construction diagram below.

Steel tank



① Nut (1)
② Washer (1)
③ Fuel plug (1)
④ Fuel hose assy (1)
⑤ Socket (2)
⑥ Clip (4)
⑦ Squeeze pump (1)
⑧ Fuel tank assy (1)
⑨ Fuel connector plug (1)
⑩ Outlet (1)
⑪ Outlet filter (1)
⑫ O-ring (1)
⑬ Fuel tank cap
⑭ Fuel tank cap gasket

Plastic tank

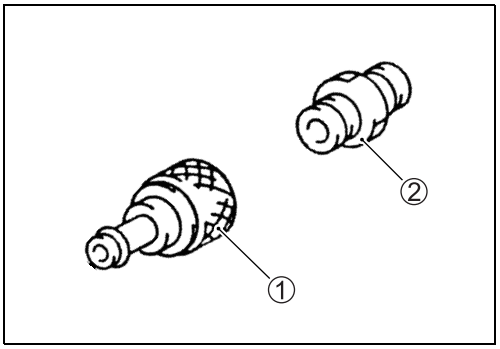


① Nut (1)
② Washer (1)
③ Fuel plug (1)
④ Fuel hose assy (1)
⑤ Fuel connector (1)
⑥ Clip (4)
⑦ Squeeze pump (1)
⑧ Fuel connector (1)
⑨ Fuel gauge assy (1)
⑩ Gauge cover (1)
⑪ Gasket (1)
⑫ Lens (1)
⑬ Lens gasket (1)
⑭ Screw (4)
⑮ Float (1)
⑯ Push nut (1)
⑰ Gasket
⑱ Screw (4)
⑲ Washer (4)
⑳ Connector gasket (1)
㉑ Fuel connector (1)
㉒ Tank cap assy (1)
㉓ Tank cap gasket (1)
㉔ Fuel tank set

INSPECTION

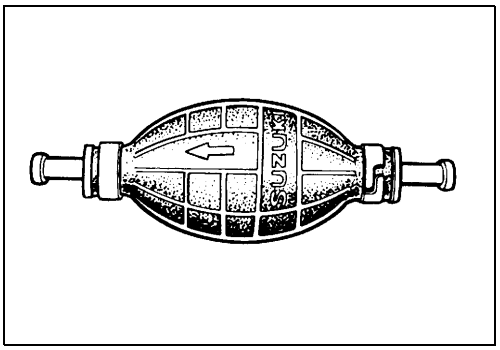
Fuel connector

Inspect the fuel connector ① and the connector plug ②. If leakage, deterioration or other damage is found, replace the connector and/or the plug.



Fuel primer bulb

Inspect the fuel primer bulb. If crack, leakage or deterioration is found, replace the bulb.
If the check valve function is defective, replace the bulb.

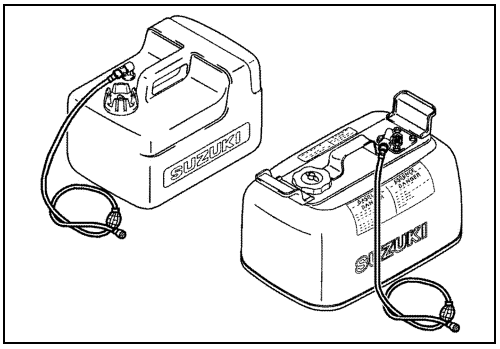


Fuel hose

Inspect the fuel hoses. If cut, crack, leakage, abrasion, tear or deterioration is found, replace the hoses.

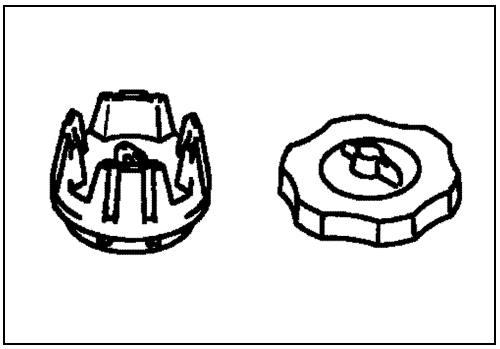
Fuel tank

Inspect the fuel tank. If crack, leakage or deterioration is found, replace the tank.
If water or other contamination is found, drain and clean the tank.



Tank cap

Check that the fuel tank vent opens and relieves internal tank pressure properly.
If vent is suspect, replace the tank cap.



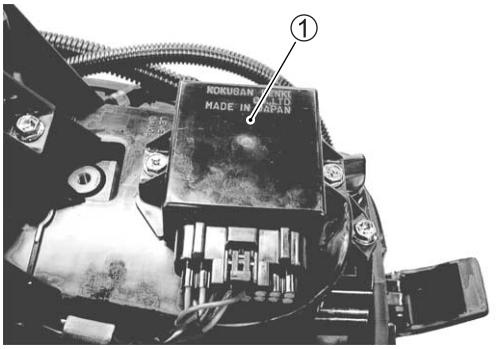
RECOIL STARTER

CONTENTS

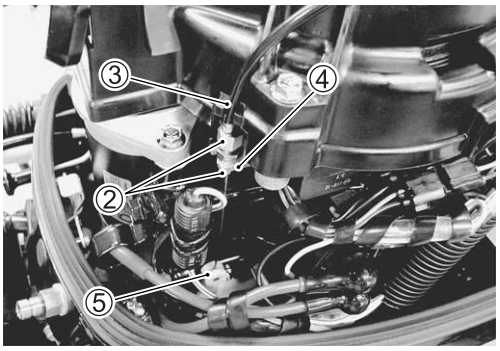
REMOVAL 5- 2
DISASSEMBLY 5- 3
INSPECTION 5- 5
REASSEMBLY 5- 6
INSTALLATION 5- 8
NEUTRAL START INTERLOCK (NSI) 5- 9
INSTALLATION/ADJUSTMENT 5- 9

REMOVAL

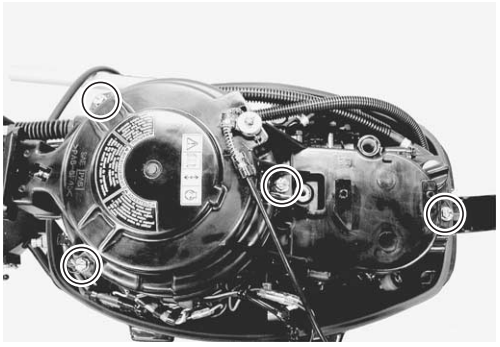
1. Remove the CDI unit ①.



2. Loosen the lock nuts ② and remove the NSI cable ③ from the cable bracket ④.
3. Remove the NSI cable from the clutch notch lever ⑤.



4. Loosen and remove the four (4) bolts securing the recoil starter.
5. Remove the recoil starter assembly.

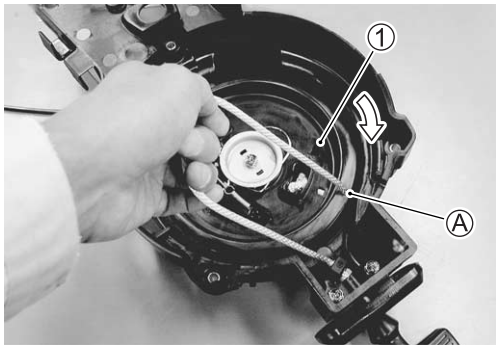


DISASSEMBLY

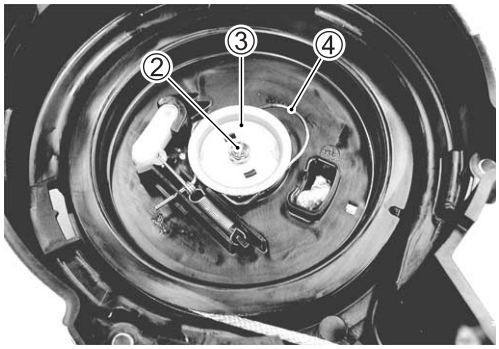
CAUTION

Because of the coiled tension in the recoil spring, wear the safety glasses and hand protection when winding or unwinding this component.

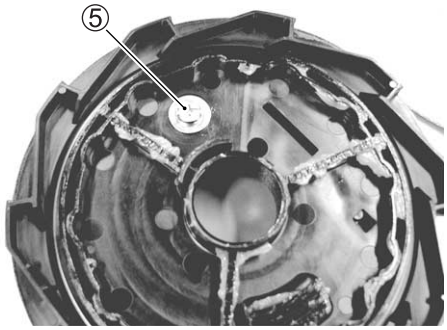
1. Guide the rope into notch Ⓐ in the reel and turn the reel ① clockwise to release the coiled tension in the recoil spring.

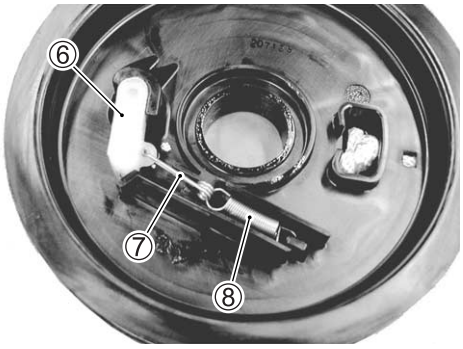


2. Remove the bolt ②, then remove the friction plate ③ with the friction spring ④.
3. Remove the reel.



4. Remove the screw ⑤ first, and then take off the ratchet (pawl) ⑥, the ratchet guide ⑦ and the return spring ⑧.



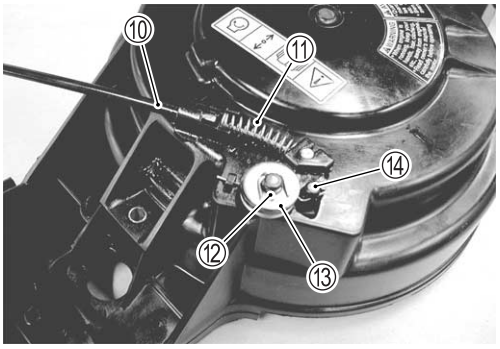


5. Remove the rope.

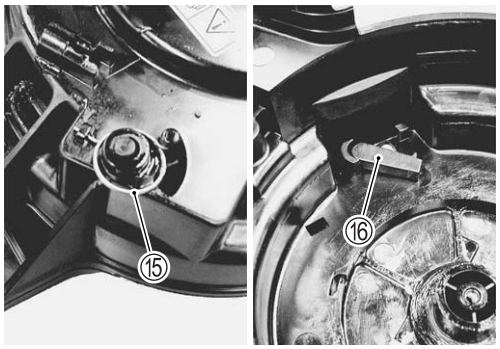
6. Remove the recoil spring ⑨.

NOTE:
Do not remove the recoil spring unless replacement is necessary. It should be visually inspected in its assembled position.

7. Remove the NSI cable ⑩ and the spring ⑪.
   Remove the cotter pin ⑫, the washer ⑬ and the stopper arm ⑭.



8. Remove the reel stopper spring ⑮ and the reel stopper ⑯.



INSPECTION

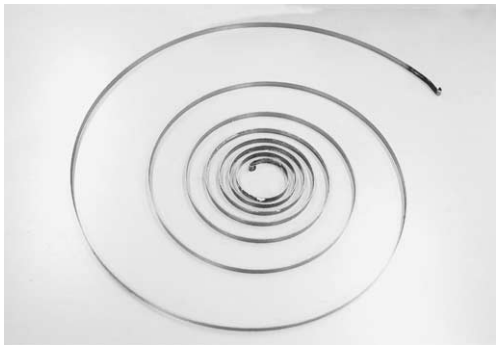
NOTE:
If any parts is worn excessively, cracked, defective or damaged in any way, it must be replaced.

- Inspect the ratchet (pawl), the stopper arm and all springs.
  If there is any defect such as excessive wear or damage, replace it.

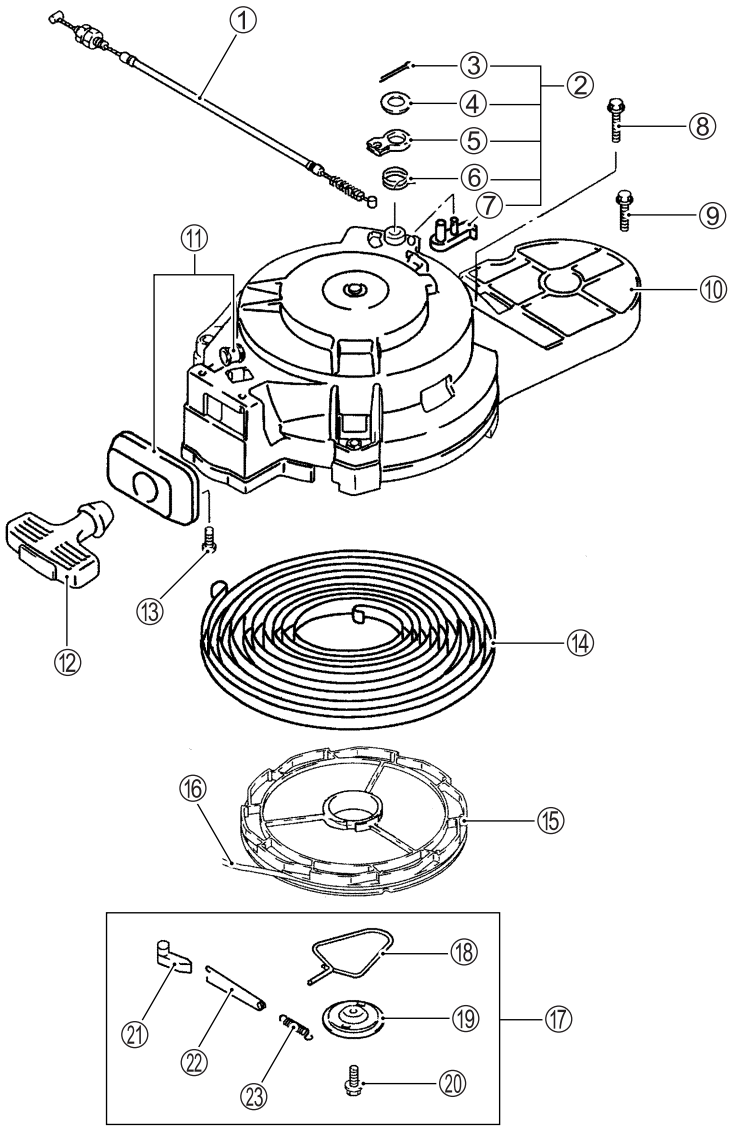
- Inspect the reel and the recoil case.
  If any cracks or damage is found on them, replace it.

- Inspect the recoil rope.
  If the recoil rope is worn or damaged, replace it.

- Inspect the recoil spring.
  If there is any cracks, deformation or excessive curve on the recoil spring, replace it.



REASSEMBLY



① NSI cable (1)
② NSI set
③ Cotter pin (1)
④ Washer (1)
⑤ Stopper arm (1)
⑥ Spring (1)
⑦ Reel stopper (1)
⑧ Bolt (1)
⑨ Bolt (3)
⑩ Recoil case (1)
⑪ Rope guide (1)
⑫ Grip (1)
⑬ Screw (1)
⑭ Recoil spring (1)
⑮ Reel (1)
⑯ Rope (1)
⑰ Ratchet set
⑱ Friction spring (1)
⑲ Friction plate (1)
⑳ Bolt (1)
㉑ Ratchet (1)
㉒ Ratchet guide (1)
㉓ Return spring (1)

Reassembly is in the reverse order of disassembly with special attention to the following reassembling steps.

- Install the stopper spring as shown figure.

- Install the NSI set and the NSI cable.
  Apply the grease to the NSI cable.

W/R G's **99000-25160: SUZUKI WATER RESISTANT GREASE**

- Secure the outer end of the recoil spring on the groove in the recoil case and wind spring inward towards the center of the case in a counterclockwise direction.

CAUTION

Because of the coiled tension in the recoil spring, wear the safety glasses and hand protection when winding or unwinding this components.

- Install the ratchet set.

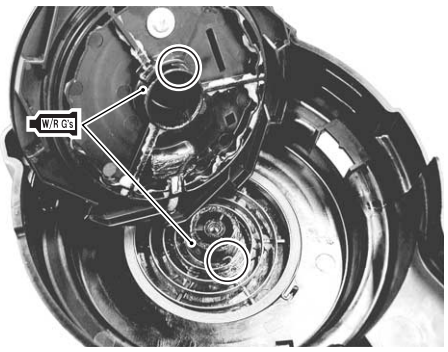
- Install the reel on the recoil case.

NOTE:

** Apply the grease to the reel as shown figure.*

W/R G's **99000-25160: SUZUKI WATER RESISTANT GREASE**

** Align groove in the reel with bent end of the spring.*

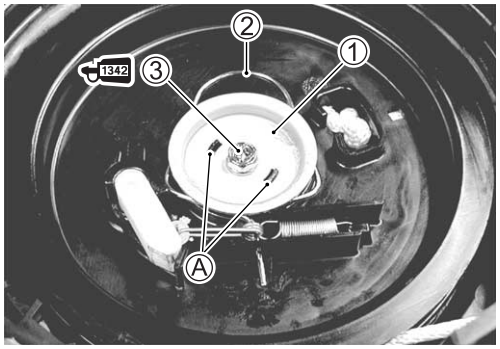


- Install the friction plate ① (with the friction spring ②) and secure it with the bolt ③.
  Apply the THREAD LOCK to the thread of the bolt.

1342 **99000-32050: THREAD LOCK "1342"**

NOTE:

Twist friction plate slightly to align holes in the plate with the square lugs Ⓐ on the center boss.



- After assembling, guide the rope into notch in the reel and rotate the reel approximately 5 turns counterclockwise until the spring is tensioned.

INSTALLATION

Installation is in the reverse order of removal with special attention to the following.

- Check to ensure that all removed parts are back in place.
- Check the neutral start interlock function.

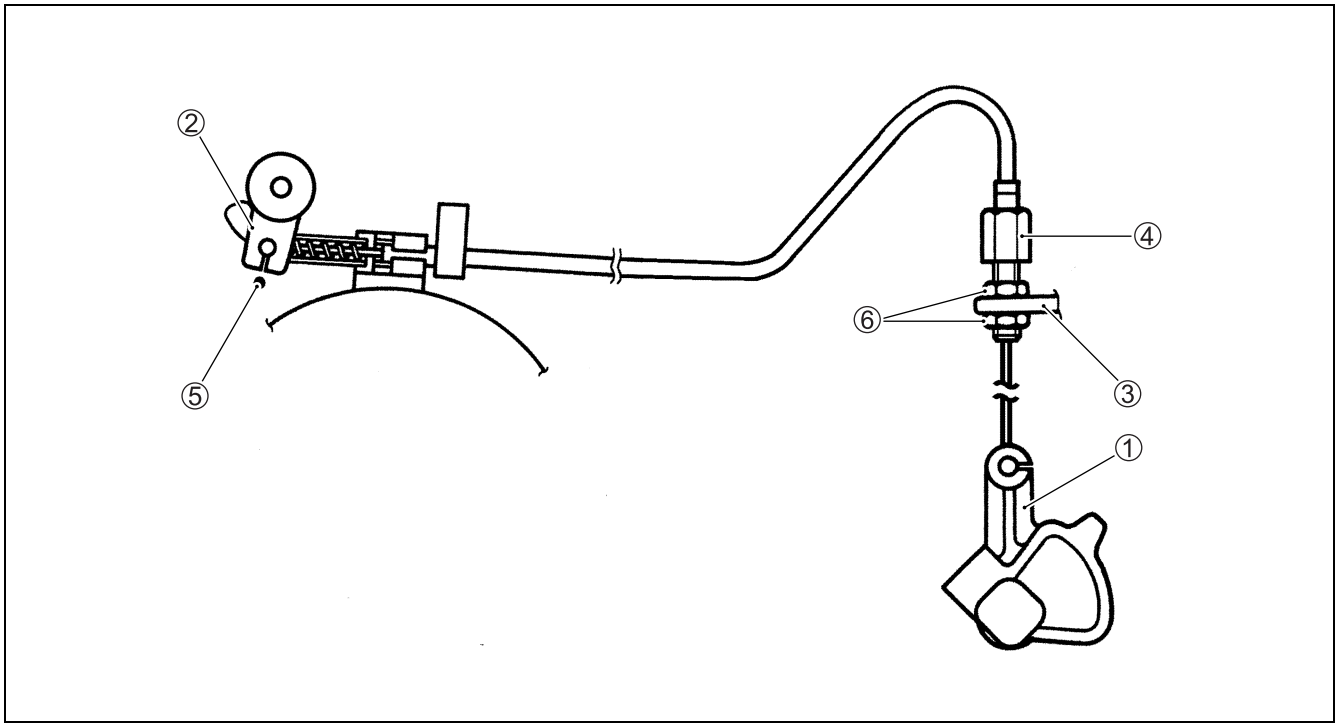
NEUTRAL START INTERLOCK (NSI)
INSTALLATION/ADJUSTMENT

1. Shift into “NEUTRAL” position.
2. Install the NSI cable in the recoil starter, the clutch notch lever ①, the stopper arm ② and the cable bracket ③.
3. Turn the adjustment nut ④ to align the slot on the stopper arm ② with the punch mark ⑤ on the recoil starter case.
4. Pull the recoil starter and make sure that the starter does not work when the shift lever is in “FORWARD” and “REVERSE” position.
5. Tighten the lock nuts ⑥.
6. Apply SUZUKI WATER RESISTANT GREASE to the inner cable, the cable end and the cam.

W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE

CAUTION

If the NSI cable is removed or left without correct adjustment, there is a high risk of losing one's balance and/or being thrown overboard if the motor starts in gear.



POWER UNIT

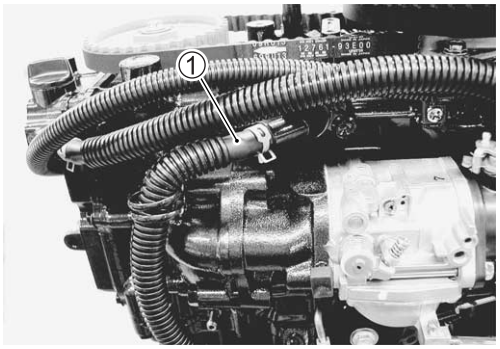
CONTENTS

POWER UNIT 6- 2
REMOVAL 6- 2
INSTALLATION.....6- 4
CYLINDER HEAD ASSY 6- 6
REMOVAL AND DISASSEMBLY 6- 6
INSPECTION/SERVICING 6- 9
REASSEMBLY AND INSTALLATION.....6-18
CYLINDER/CRANKSHAFT/PISTON.....6-23
DISASSEMBLY 6-23
INSPECTION/SEVICING.....6-27
CONROD SELECTION 6-34
REASSEMBLY 6-38
OPERATION 6-44
WATER COOLING SYSTEM 6-44
ENGINE LUBRICATION SYSTEM.....6-45
CRANKCASE VENTILATION SYSTEM 6-47
EXHAUST SYSTEM 6-48

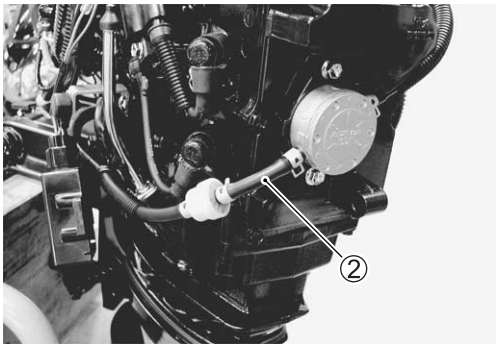
POWER UNIT
REMOVAL

Before removing the power unit:
*** Disconnect the battery cable from the battery.**
*** Drain the engine oil.**

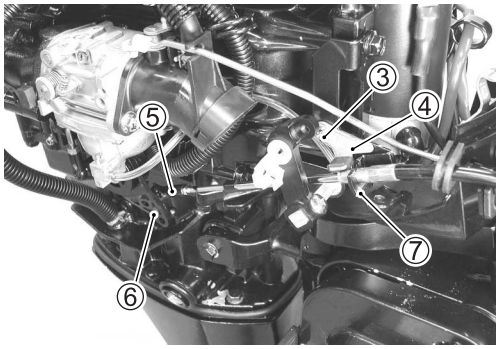
1. Remove the motor cover.
2. Remove the side covers. (See page 7-2.)
3. Remove the recoil starter. (See page 5-2.)
4. Disconnect the water hose ① from the thermostat cover.



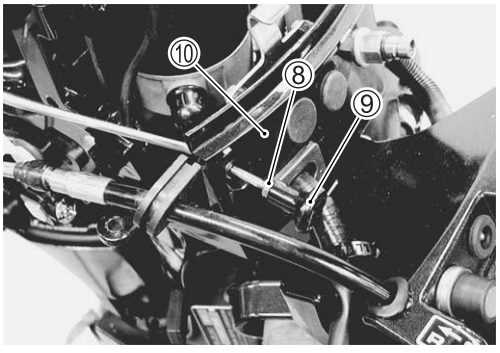
5. Disconnect the fuel hose ② from the fuel pump.



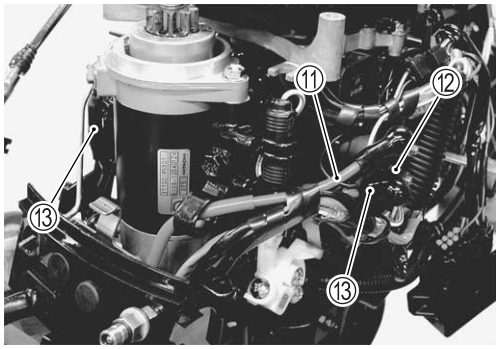
6. Remove the screw ③ and the throttle cable holder plate ④.
7. Unthread the connector ⑤ from the throttle drum ⑥.
   Detach the throttle cable from the throttle cable holder ⑦.



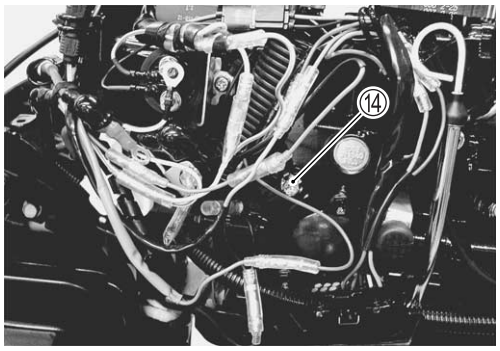
8. Loosen the nut ⑧ and remove the choke knob ⑨.
   Remove the choke lever from the instrument panel ⑩.



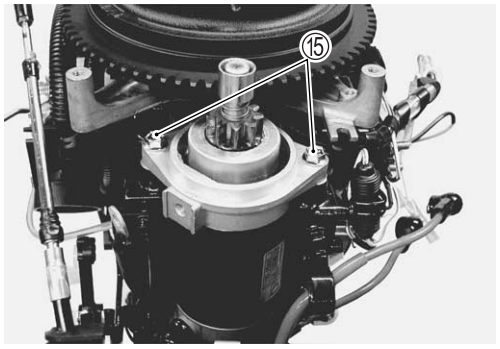
9. Remove the starter motor sub cable ⑪ from the starter motor relay ⑫.
10. Remove the battery cables ⑬ from the starter motor and the starter motor relay ⑫.



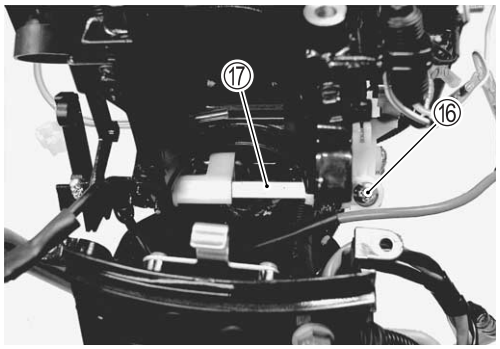
11. Disconnect the lead wires (White/Red, Brown, Blue/Red, Black, Pink).
12. Remove the bolt ⑭ and the ground lead wires.



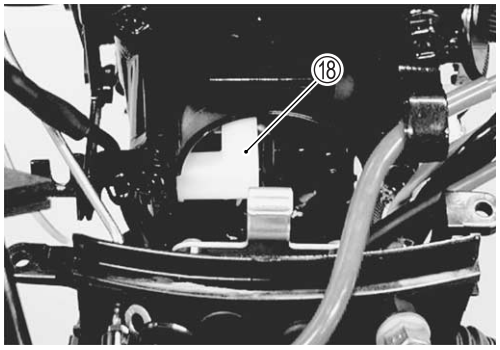
13. Remove the two bolts ⑮ and the starter motor. (Push the starter motor toward the up side.)



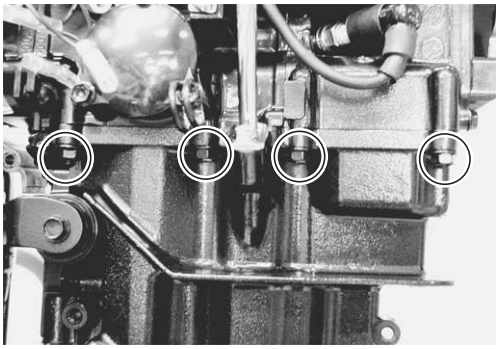
14. Remove the screw ⑯ and the clutch lever shaft ⑰.

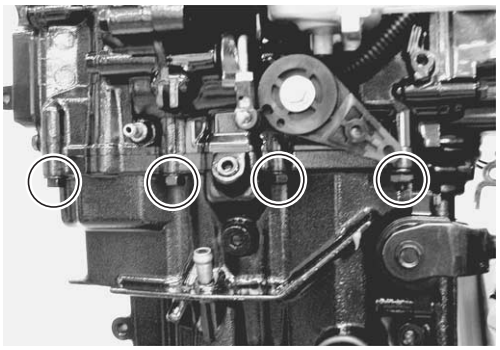


15. Disconnect the clutch rod arm ⑱.

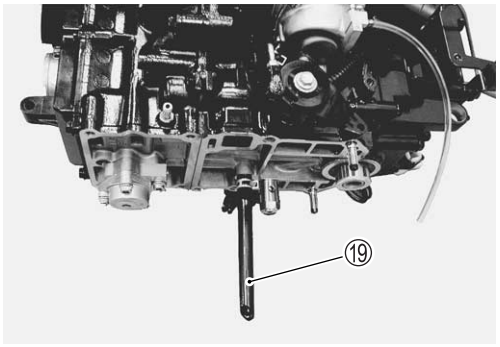


16. Remove the six bolts and the two nuts.
17. Remove the power unit.





18. Remove the oil hose ⑲.



INSTALLATION

Installation is reverse order of removal with the special attention to the following steps.

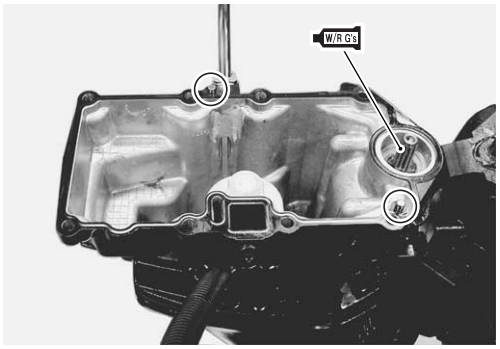
CAUTION

Do not re-use the gasket once removed. Always use a new gasket.

POWER UNIT

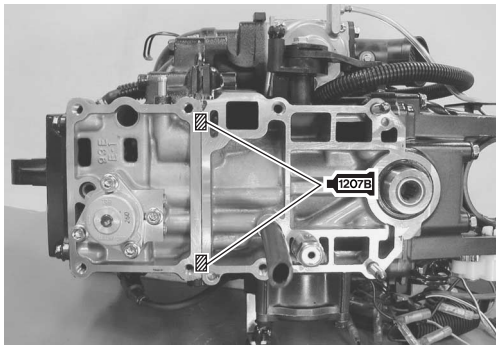
1. Set the two dowel pins and the gasket.
2. Apply the grease to the drive shaft splines.

W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE



3. Apply the bond to the cylinder block and the cylinder head as shown.

1207B **99000-31140: SUZUKI BOND "1207B"**



4. Install the power unit.

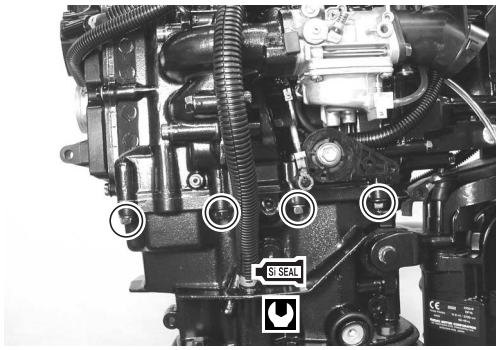
NOTE:
Rotate the crankshaft to aid alignment of the drive shaft and the crankshaft splines.

5. Apply the seal to the bolts and the nuts.

Si SEAL **99000-31120: SUZUKI SILICONE SEAL**

6. Tighten the six bolts and the two nuts.

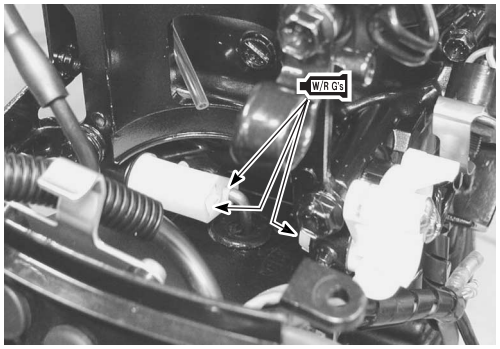
Power unit mounting bolt and nut:
23 N·m (2.3 kgf-m, 16.5 lb-ft)



CLUTCH LEVER SHAFT

- Apply the grease to the clutch rod arm, the clutch notch plate and the clutch rod.

W/R G's **99000-25160: SUZUKI WATER RESISTANT GREASE**



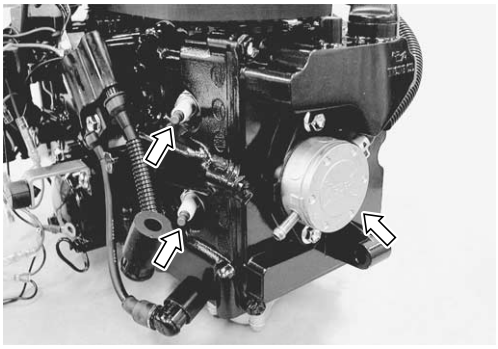
FINAL ASSEMBLY CHECK

Perform the following checks in order to ensure proper and safe operation of the repaired unit.

- All parts removed have been returned to the original positions.
- Lower unit gear engagement is properly adjusted.
- Fuel hose routing matches the service manual illustration. (See page 9-11.)
- Wire routing matches the service manual illustration. (See page 9-2 to 9-4.)
- No fuel leakage is evident.
- No water leakage is evident during final test running.

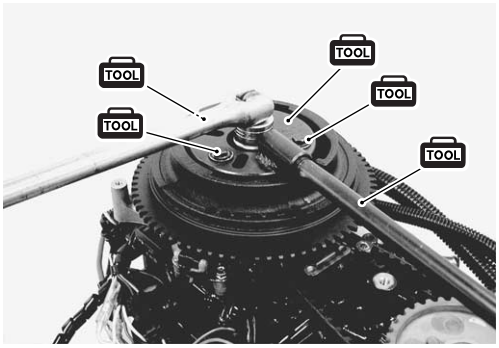
CYLINDER HEAD ASSY
REMOVAL AND DISASSEMBLY

1. Remove the power unit. (See page 6-2 to 6-4.)
2. Remove the spark plugs and the fuel pump.



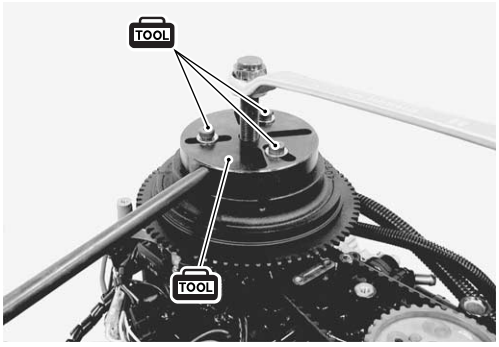
3. Remove the flywheel nut.

TOOL **09930-39520: Flywheel holder**
09930-39411: Flywheel rotor remover
09930-39210: Flywheel remover attachment bolt

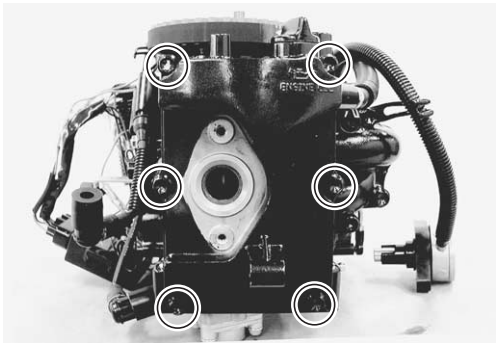


4. Remove the flywheel.

TOOL **09930-39411: Flywheel rotor remover**
09930-39210: Flywheel remover attachment bolt



5. Remove the cylinder head cover.

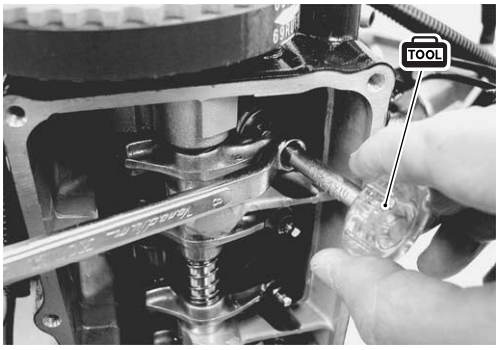


6. Loosen all valves adjusting the lock nuts.
   Loosen all valves adjusting the screws fully.

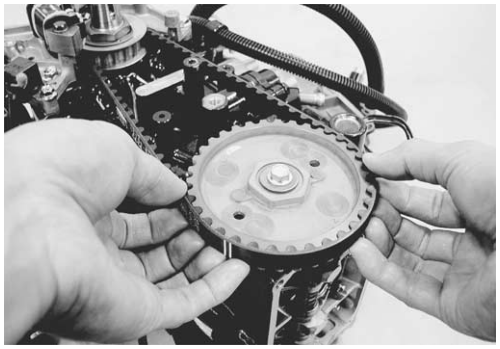
TOOL **09917-14910: Valve adjuster driver**

CAUTION

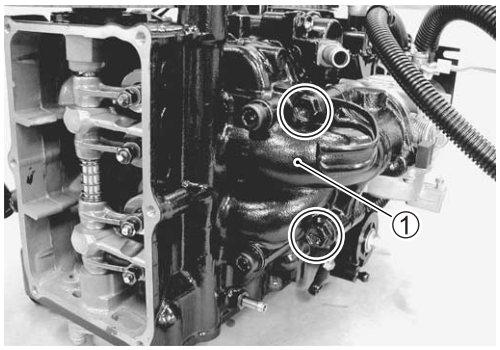
To prevent valve damage, loosen the valve adjusting lock nuts and the valve adjusting screws fully before removing the timing belt.



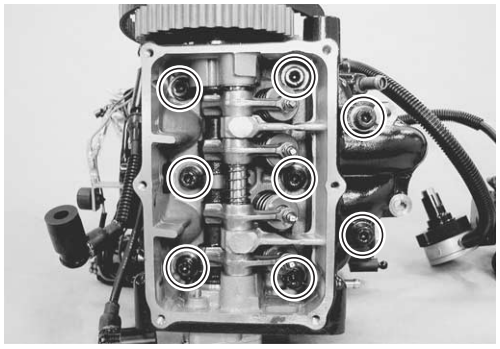
7. Remove the timing belt.



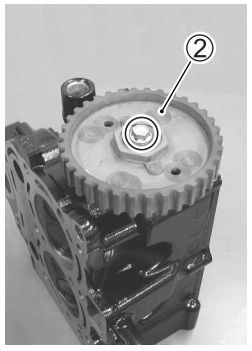
8. Remove the two bolts and the intake manifold ① with the carburetor assembly.

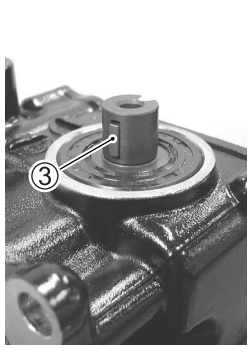


9. Remove the eight bolts.
   Remove the cylinder head assy and the gasket.

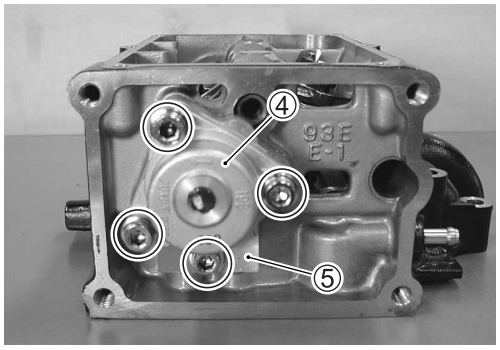


10. Remove the bolt and the cam pulley ②.
    Remove the key ③ from the camshaft.



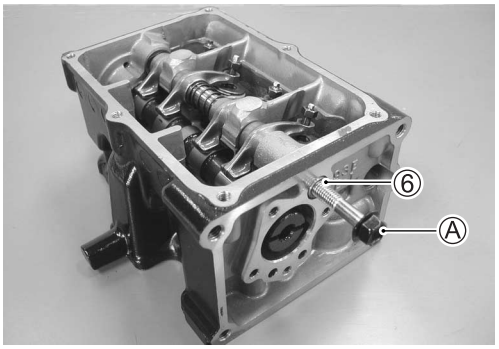


11. Remove the four bolts.
    Remove the oil pump ④ and the oil gallery block ⑤.



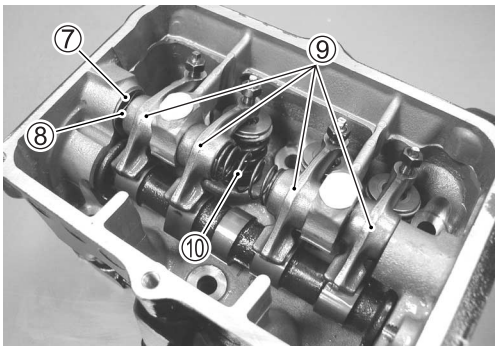
12. Remove the rocker arm shaft ⑥.

NOTE:
Install the 8 mm bolt Ⓐ into the lower end of the rocker arm shaft and pull out the rocker arm shaft.

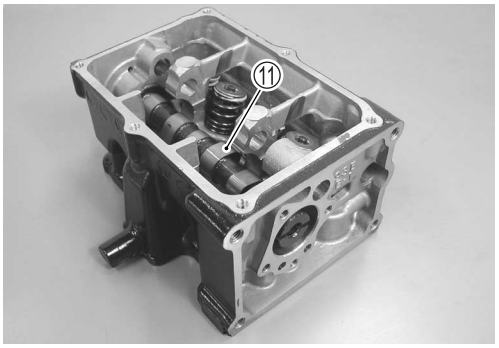


13. Remove the washer ⑦, the wave washer ⑧, the rocker arms ⑨ and the spring ⑩.

NOTE:
Reassemble each rocker arm to the original position.



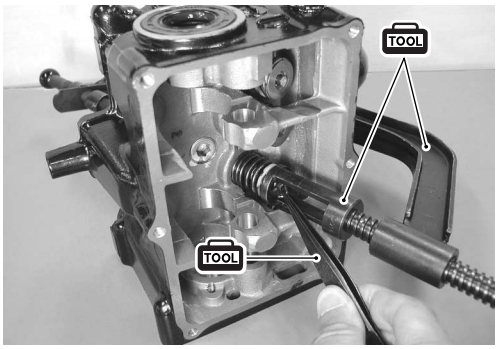
14. Remove the camshaft ⑪.

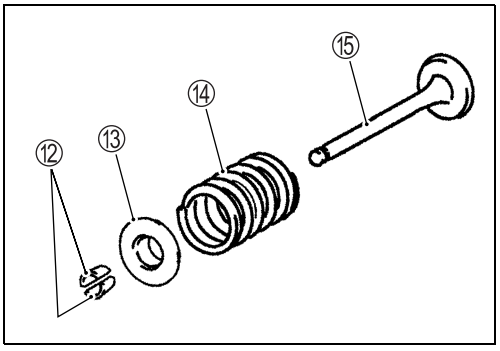


15. Remove the valve cotters ⑫ while compressing the valve spring.
16. Remove the valve spring retainer ⑬, the valve spring ⑭ and the valve ⑮.

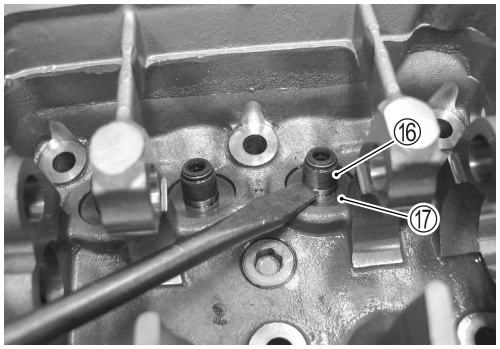
TOOL 09916-14510: Valve lifter
09916-14521: Attachment
09916-84511: Tweezers

NOTE:
Reassemble each valve and the valve spring to their original positions.



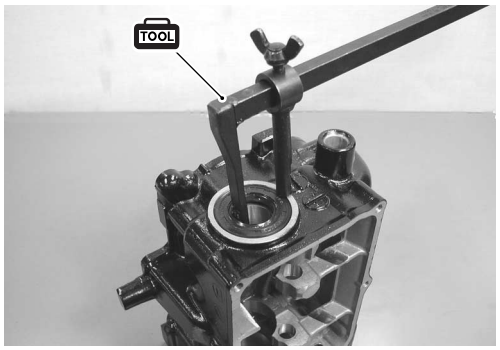


17. Remove the valve stem seal ⑯ and the valve spring seat.

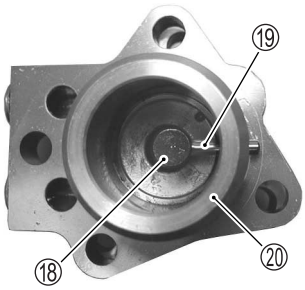


18. Remove the oil seal using the special tool.

TOOL **09913-50121: Oil seal remover**



19. Turn the shaft ⑱ until the pin ⑲ comes out through hole of the oil galley block ⑳.



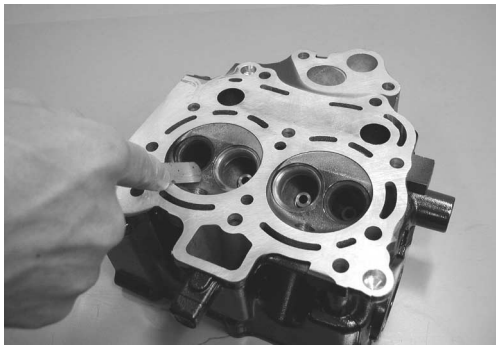
INSPECTION/SERVICING

NOTE:
If crack, excessive wear or other damage is found on any component, replace.

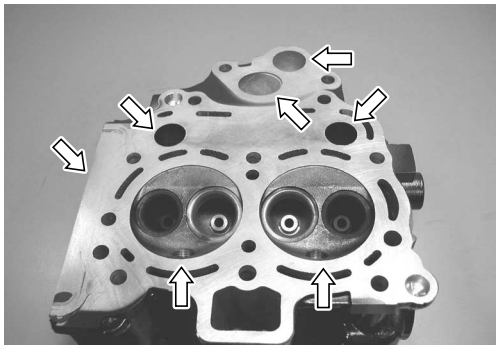
CYLINDER HEAD

1. Remove all carbon from the combustion chamber.

NOTE:
* *Do not use any sharp edged tool to scrape carbon off the cylinder head or the head components.*
* *Be careful not to scuff or nick the metal surfaces when decarboning.*



2. Inspect the intake ports, the exhaust ports, the combustion chambers and the head surface.
   If crack or other damage is found, replace the cylinder head.



Valve seat

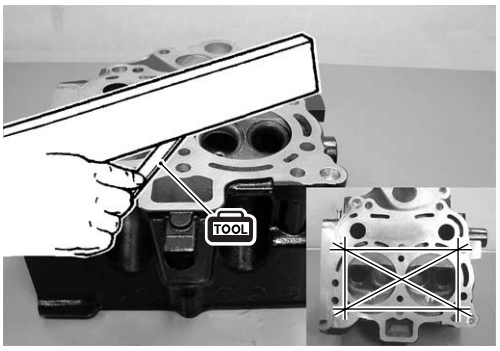
Check the valve seat.
If crack or other damage is found, replace the cylinder head.

Cylinder head distortion

Measure the cylinder head distortion (gasketed surface) at a total of 6 locations as shown.

TOOL 09900-20803: Thickness gauge
Straight gauge

Service limit: 0.05 mm (0.002 in)

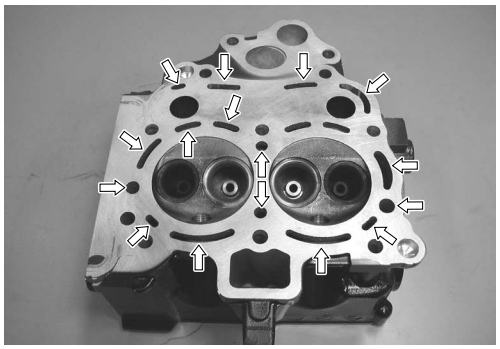


If the measurement exceeds the service limit, resurface or replace the cylinder head.

NOTE:
The cylinder head can be resurfaced, using a surface plate and #400 grit wet sandpaper. Move the cylinder head in a figure eight pattern when sanding.

Water jackets

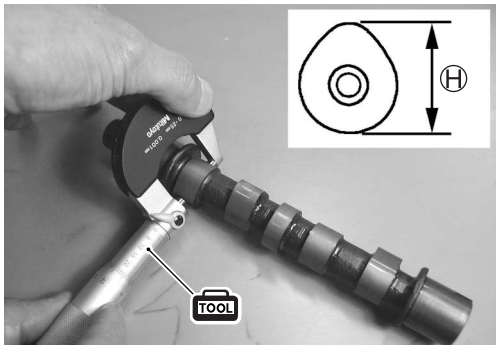
Inspect the water jackets.
If clog or obstruction is found, clean the water jacket.



CAMSHAFT

Cam height

Measure the cam height Ⓗ.



TOOL **09900-20202: Micrometer**

Standard:

DF9.9 IN 22.259 – 22.319 mm (0.8763 – 0.8787 in)
EX 22.257 – 22.317 mm (0.8763 – 0.8786 in)
DF15 IN & EX
23.471 – 23.531 mm (0.9241 – 0.9264 in)

Service limit:

DF9.9 IN & EX 22.100 mm (0.8701 in)
DF15 IN & EX 23.320 mm (0.9181 in)

If the measurement exceeds the service limit, replace the camshaft.

Camshaft identification

DF9.9 : 00 – Electric start model
DF9.9 : 40 – Manual start model
DF15 : 10 – Electric start model
DF15 : 50 – Manual start model

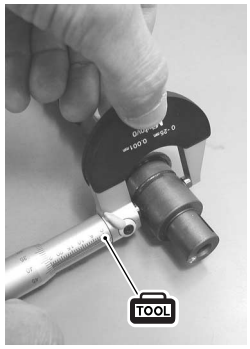
Camshaft journal oil clearance

Standard: 0.020 – 0.062 mm (0.0008 – 0.0024 in)
Service limit: 0.100 mm (0.0039 in)

If the measurement exceeds the service limit, replace the camshaft and/or cylinder head.

To check the clearance, measure the following items:

- Camshaft journal outside diameter (2 locations)
- Camshaft holder inside diameter (2 locations)



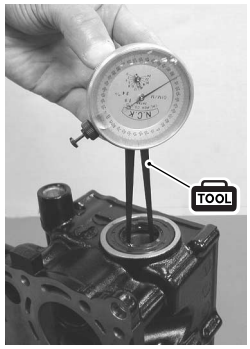
TOOL **09900-20202: Micrometer**
09900-20605: Dial calipers

Camshaft journal outside diameter

Standard:
Upper side 24.959 – 24.980 mm (0.9826 – 0.9835 in)
Lower side 22.959 – 22.980 mm (0.9039 – 0.9047 in)

Camshaft holder inside diameter

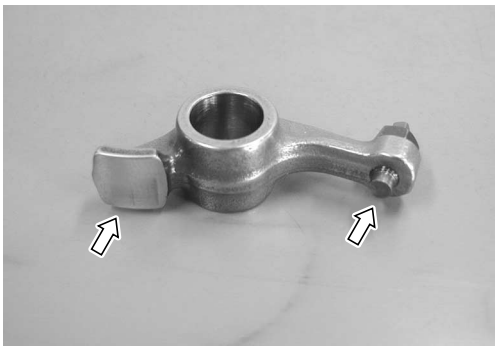
Standard:
Upper side 25.000 – 25.021 mm (0.9843 – 0.9851 in)
Lower side 23.000 – 23.021 mm (0.9055 – 0.9063 in)



Decompression parts (For manual starter model)
Inspect the decompression parts in the camshaft.
If abnormal movement is found, replace the camshaft.

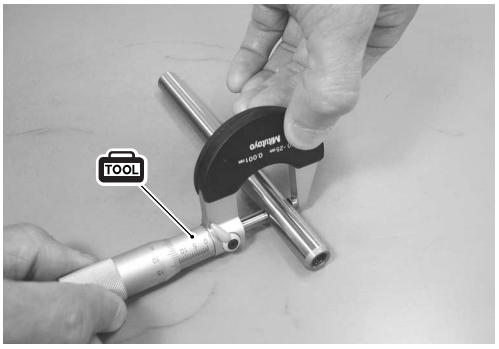
ROCKER ARM/SHAFT

Rocker arm wear
Inspect the arm-riding face and tip of the adjusting screw.
If excessive wear is found, replace the rocker arm and/or adjusting screw.



Rocker arm shaft to rocker arm clearance
Standard: 0.006 – 0.035 mm (0.0002 – 0.0014 in)
Service limit: 0.060 mm (0.0024 in)

If the measurement exceeds the service limit, replace the rocker arm and/or rocker arm shaft.

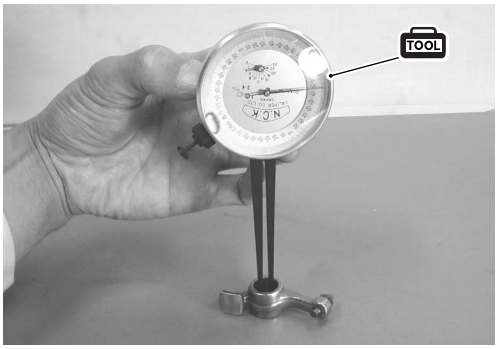


To check the clearance, measure the following items:
- Rocker arm shaft outside diameter
- Rocker arm inside diameter

TOOL 09900-20205: Micrometer
09900-20605: Dial calipers

Rocker arm shaft outside diameter
Standard: 12.973 – 12.984 mm (0.5107 – 0.5112 in)

Rocker arm inside diameter
Standard: 13.000 – 13.018 mm (0.5118 – 0.5125 in)



VALVE/VALVE GUIDE

Valve guide to valve stem clearance

Standard: IN 0.010 – 0.037 mm (0.0004 – 0.0015 in)
EX 0.035 – 0.062 mm (0.0014 – 0.0024 in)
Service limit: IN 0.070 mm (0.0028 in)
EX 0.090 mm (0.0035 in)

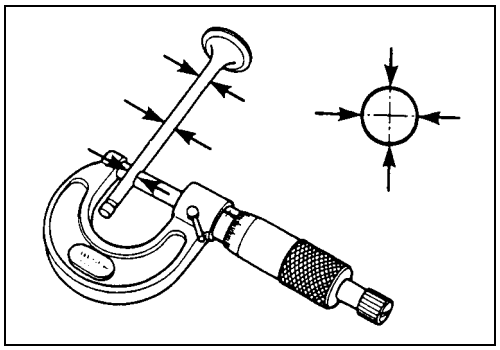
If the measurement exceeds the service limit, replace the valve and/or valve guide.

To check the clearance, measure the following items:
- Valve stem outside diameter
- Valve guide inside diameter

TOOL 09900-20205: Micrometer
Small bore gauge or dial calipers

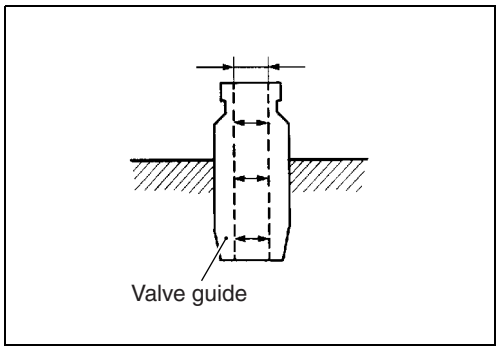
Valve stem outside diameter

Standard: IN 5.475 – 5.490 mm (0.2156 – 0.2161 in)
EX 5.450 – 5.465 mm (0.2146 – 0.2152 in)



Valve guide inside diameter

Standard: IN & EX 5.500 – 5.512 mm (0.2165 – 0.2170 in)



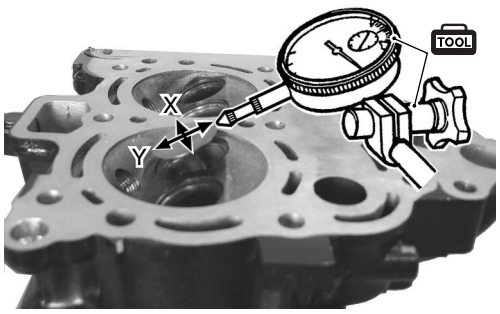
If you are unable to measure the valve guide inside diameter, measure the "Valve stem deflection".

Valve stem deflection

Measure the valve stem deflection as follows:
1. Install the valve into the valve guide.
2. Position the valve head at approx. 10 mm away from the valve seat.
3. Move the stem in the direction "X – Y", and measure the deflection.

TOOL 09900-20602: Dial gauge
09900-20701: Magnetic stand

Service limit: IN & EX 0.16 mm (0.006 in)



If the measurement exceeds the service limit, replace the valve. If the measurement still exceeds the service limit with a new valve, replace the valve guide.

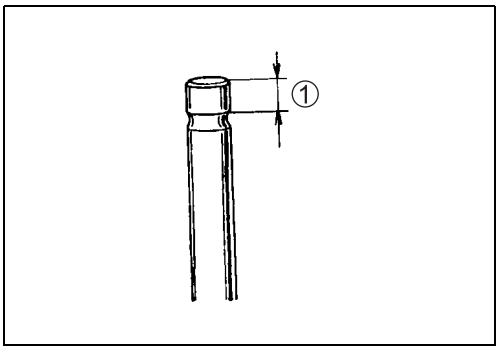
NOTE:
For the valve guide replacement, see the "VALVE GUIDE REPLACEMENT" section on page 6-15.

Valve stem end length
Measure the valve stem end length ①.

09900-20102: Vernier calipers

Service limit: IN & EX 2.2 mm (0.09 in)

If the measurement exceeds the service limit, replace the valve.

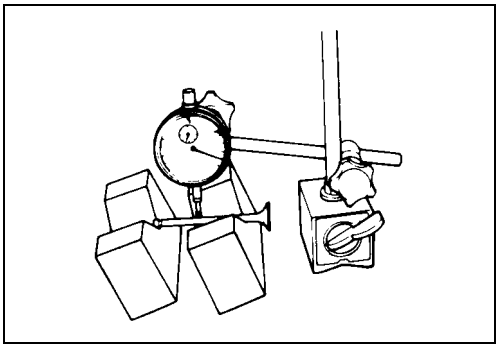


Valve stem runout
Measure the valve stem runout.

09900-20602: Dial gauge
09900-20701: Magnetic stand
09900-21304: Steel "V" block set

Service limit: IN & EX 0.05 mm (0.002 in)

If the measurement exceeds the service limit, replace the valve.

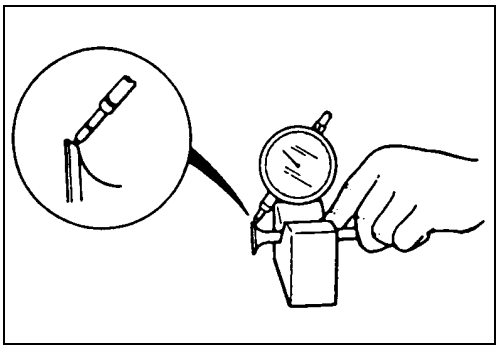


Valve head radial runout
Measure the valve head radial runout.

09900-20602: Dial gauge
09900-20701: Magnetic stand
09900-21304: Steel "V" block set

Service limit: IN & EX 0.03 mm (0.0012 in)

If the measurement exceeds the service limit, replace the valve.

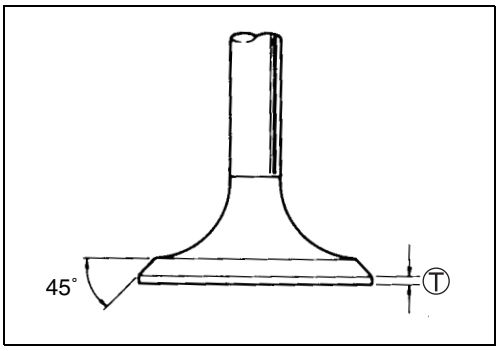


Valve head thickness
Measure the valve head thickness Ⓣ.

09900-20102: Vernier Calipers

Service limit: IN & EX 0.5 mm (0.02 in)

If the measurement exceeds the service limit, replace the valve.



Valve seating contact width

Measure the valve seating contact width Ⓐ as follows:

1. Coat the valve seat evenly with Prussian blue (or equivalent).
2. Install the valve into the valve guide.
3. Put the valve lapper on the valve.

TOOL 09916-10911: Valve lapper

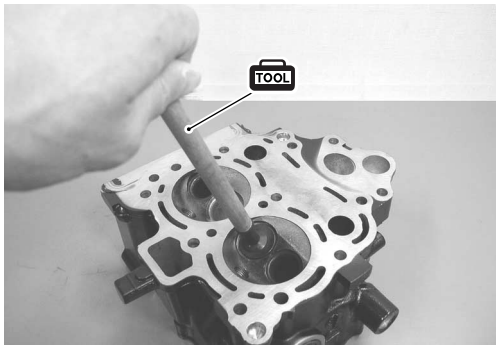
4. Rotate the valve while gently tapping the valve contact area against the seat.
5. Continuously pattern on the valve seating face with Prussian blue.
6. Measure the valve seating contact width Ⓐ.

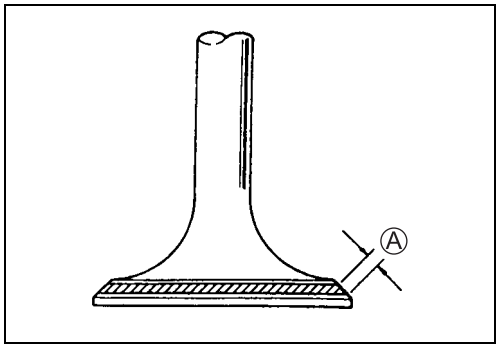
TOOL 09900-20102: Vernier calipers

Standard: IN & EX 0.9 – 1.1 mm (0.035 – 0.043 in)

If the measurement is out of the specification, service the valve seat.

NOTE:
For the valve seat servicing, see the "VALVE SEAT SERVICING" section on page 6-16.





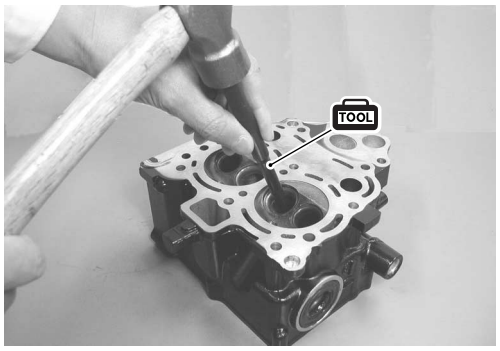
VALVE GUIDE REPLACEMENT

CAUTION

Be careful not to damage the cylinder head when replacing the valve guide.

1. Drive the valve guide out toward the valve spring side.

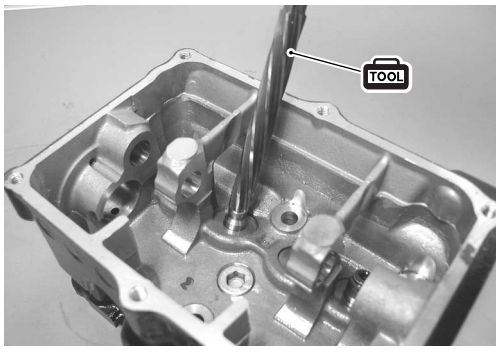
TOOL 09916-44910: Valve guide remover/installer



2. Refinish the valve guide hole.

TOOL 09916-38210: Valve guide reamer (ϕ 11 mm)
09916-34542: Valve guide reamer handle

NOTE:
Turn the reamer clockwise, never counterclockwise.



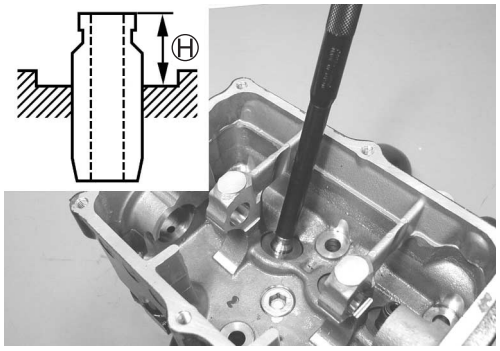
3. Drive the valve guide in from the valve spring side to the specified height.

TOOL 09916-44910: Valve guide/Remover installer

4. Measure the valve guide protrusion Ⓗ.

TOOL 09900-20102: Vernier calipers

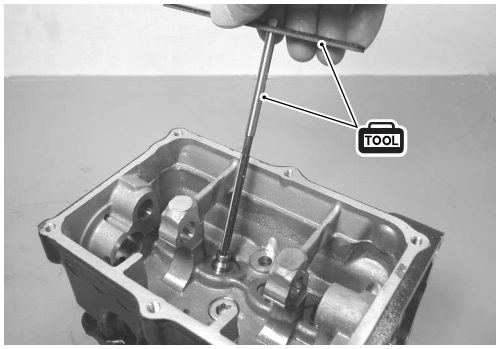
Valve guide protrusion:
Standard: IN & EX 10.0 ± 0.5 mm (0.39 ± 0.02 in)



5. Refinish the valve guide bore.

TOOL 09916-34550: Valve guide reamer (ϕ 5.5 mm)
09916-34542: Valve guide reamer handle

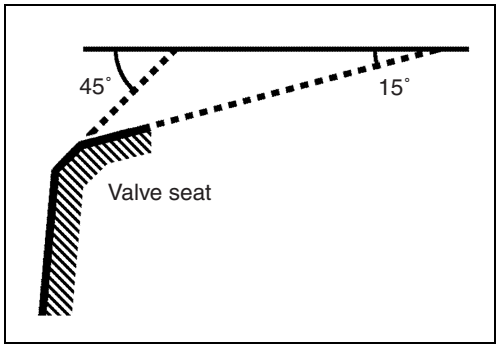
NOTE:
Clean and oil the valve guide bore after reaming.



VALVE SEAT SERVICING

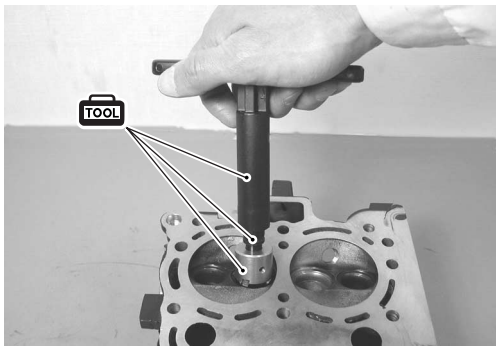
If the valve seating contact width is out of the specification, reface the valve seat as follows:

TOOL 09916-20610: Valve seat cutter 15° (N-121)
09916-20620: Valve seat cutter 45° (N-122)
09916-24440: Handle adapter (N-503-1)
09916-24450: Solid pilot (N-100-5.52)
09916-54910: Handle (N-505)

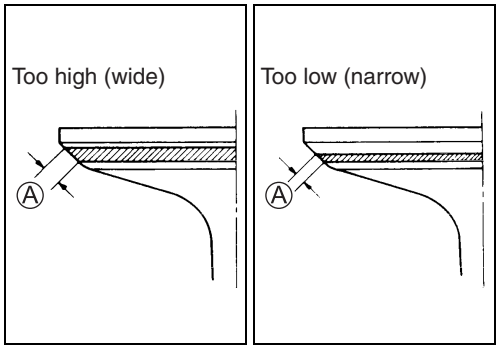


NOTE:
Turn the cutter clockwise, never counterclockwise.

1. Insert the 45° cutter and reface the valve seat.



2. Measure the valve seating contact width Ⓐ. See the "Valve seating contact width" section on page 6-15.
3. If the width Ⓐ is too high (or wide), reface the valve seat using the 15° cutter.
   If the width Ⓐ is too low (or narrow), reface the valve seat using the 45° cutter.
4. Clean up any burrs using the 45° cutter very lightly.



CAUTION

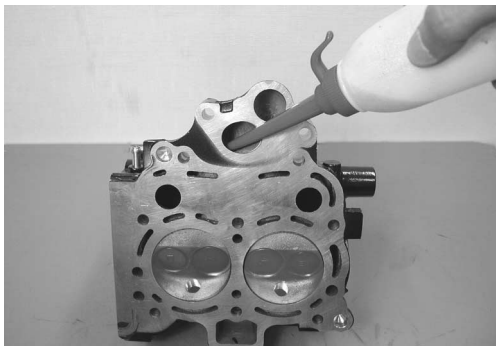
Grind the seat areas minimally only.
Do not grind more than necessary.

5. Recheck the valve seat contact width Ⓐ.

CAUTION

Do not use lapping compound after the final cut is made. The finished valve seat should have a velvety smooth finish and not a highly polished or shiny finish. This will provide a soft surface for the final seating of the valve which will occur during the first few seconds of engine operation.

NOTE:
Clean and assemble the cylinder head and valve components. Fill the intake and exhaust ports with solvent to check for leaks between the valve seat and valve. If any leaks occur, inspect the valve seat and the face for burrs or other things that could prevent the valve from sealing.



VALVE SPRING

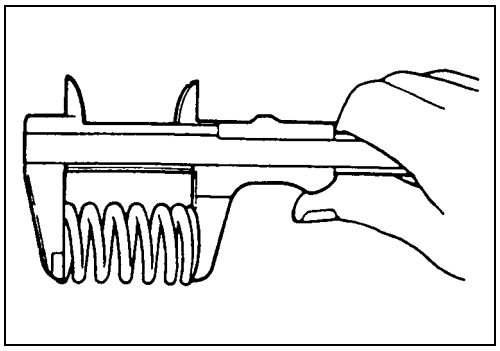
Valve spring free length

Measure the spring free length.

TOOL 09900-20102: Vernier calipers

Standard: 32.52 mm (1.280 in)
Service limit: 32.40 mm (1.276 in)

If the measurement is lower than the service limit, replace the valve spring.



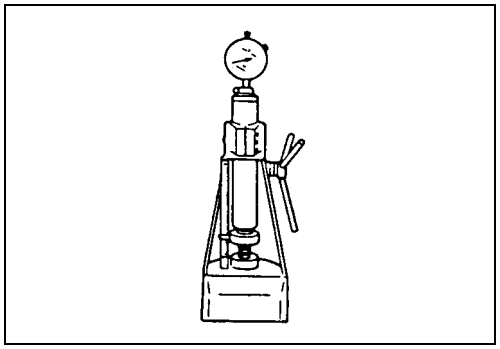
Valve spring tension

Measure the valve spring tension.

TOOL 09900-20102: Vernier caliper

Standard: 9 kg (19.8 lbs) for 28.5 mm (1.12 in)
Service limit: 7.6 kg (16.8 lbs) for 28.5 mm (1.12 in)

If the measurement is lower than the service limit, replace the valve spring.



OIL SEAL
Inspect condition.
If cracked, cut or damaged, replace oil seal.

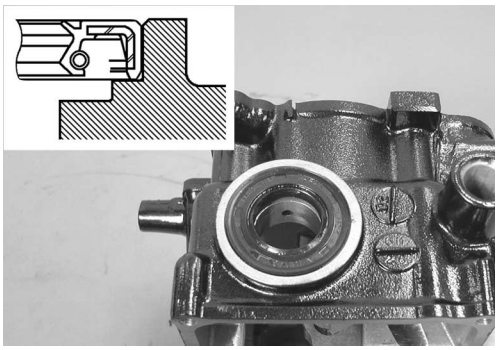
REASSEMBLY AND INSTALLATION

Reassembly is reverse order of disassembly with the special attention to the following steps:

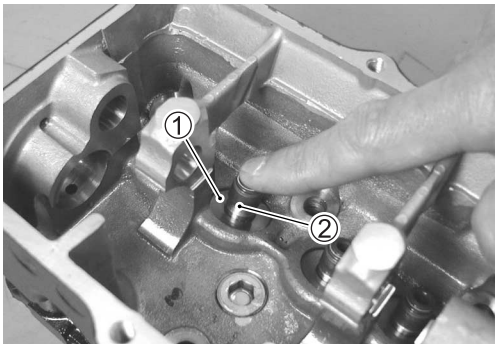
OIL SEAL
Press the oil seal with the spring/lipped side facing inward.

CAUTION

Do not re-use the seal once removed. Always install a new oil seal.



VALVE
1. Install the valve spring seat ①.
2. Apply the engine oil to the valve stem seal ②.
3. Install the valve stem seal onto the valve guide by pushing with the finger tip.

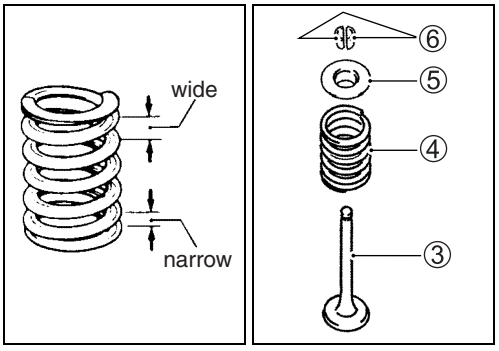


CAUTION

Do not re-use the valve stem seal once removed. Always use a new valve stem seal.

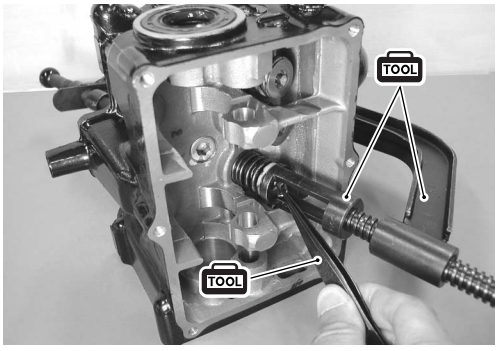
4. Apply the engine oil to the stem seal, the valve guide bore and the valve stem.
5. Install the valve ③, the valve spring ④ and the valve retainer ⑤.

NOTE:
* *Reassemble each valve and valve spring to their original position.*
* *Set the valve spring in place with the narrow spiral area facing the valve spring seat.*

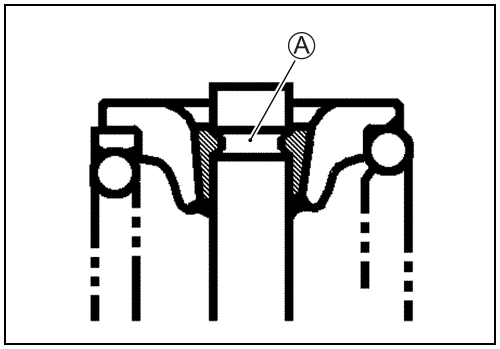


6. Install the valve cotters ⑥ while compressing the valve spring by the tool.

TOOL 09916-14510: Valve lifter
09916-14521: Attachment
09916-84511: Tweezers

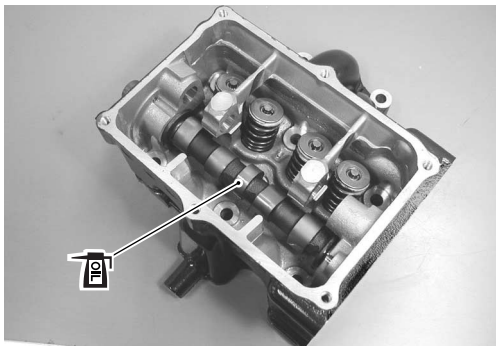


7. Make sure the valve cotters seat in the groove Ⓐ properly.



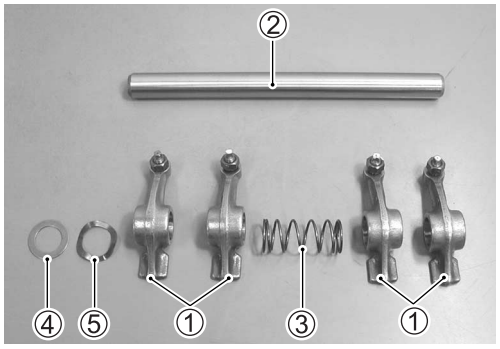
CAMSHAFT

1. Apply the engine oil to the camshaft and all holder journals.
2. Install the camshaft.



ROCKER ARM/SHAFT

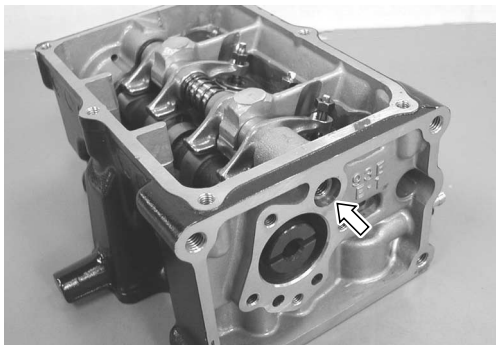
1. Apply the engine oil to the rocker arms ① and the rocker arm shafts ②.
2. Install the rocker arms, the rocker arm springs ③, the washer ④, the wave washer ⑤ and the rocker arm shaft ②.



NOTE:

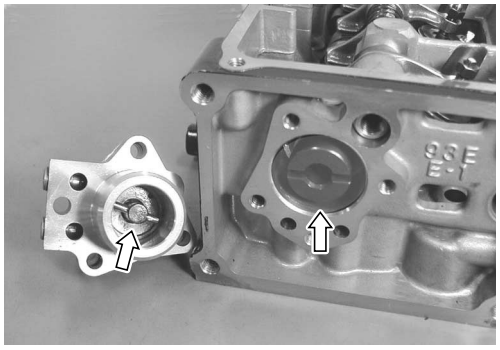
** Reassemble each rocker arm to its original position.*

** Install the rocker arm shaft with its threaded end down.*



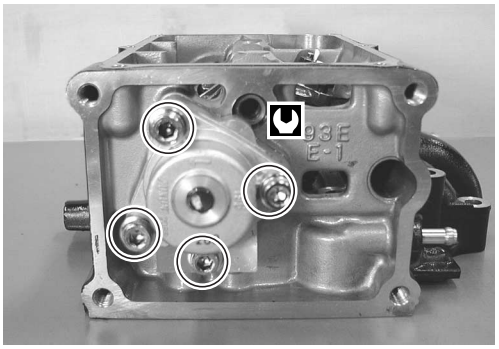
OIL PUMP

1. Align the pin on the oil pump shaft with the recess in the camshaft.



2. Install the oil pump gallery block and the oil pump.

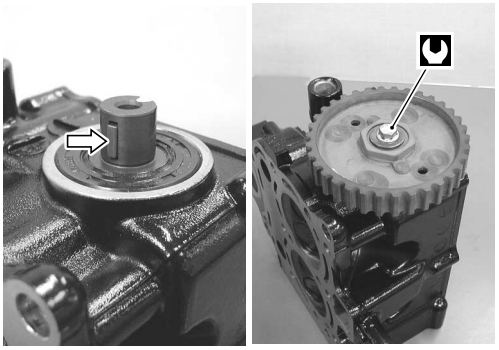
Oil pump bolt: 14 N·m (1.4 kgf-m, 10.0 lb-ft)



CAMSHAFT PULLEY

1. Install the key and the camshaft pulley.

Camshaft pulley bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)



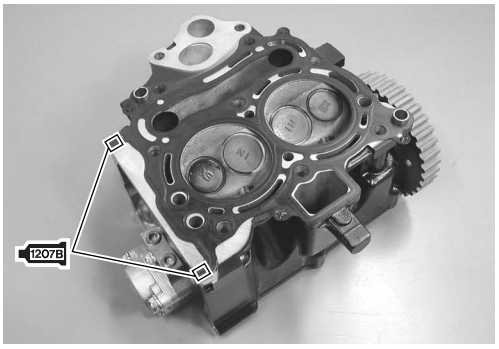
CYLINDER HEAD ASSY

CAUTION

Do not re-use the gasket once removed. Always use a new gasket.

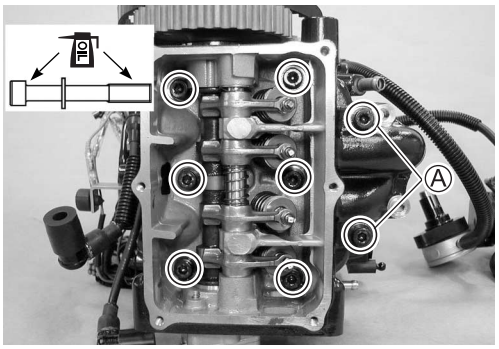
1. Apply the bond to the cylinder head block as shown.

1207B 99000-31140: SUZUKI BOND "1207B"



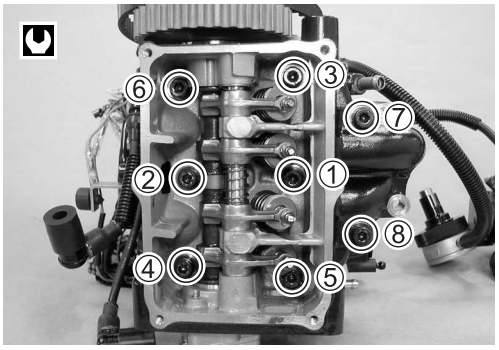
2. Install the gasket and the two dowel pins.
3. Install the cylinder head to the cylinder block.
4. Apply the engine oil lightly to six cylinder head bolts.

NOTE:
Do not apply the engine oil to the two cylinder head bolts Ⓐ.



5. Tighten the bolts to the specified torque according to the numerical order in the figure.

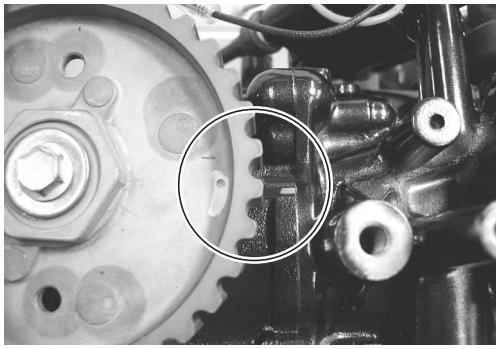
Cylinder head bolt: 28 N·m (2.8 kgf-m, 20.0 lb-ft)



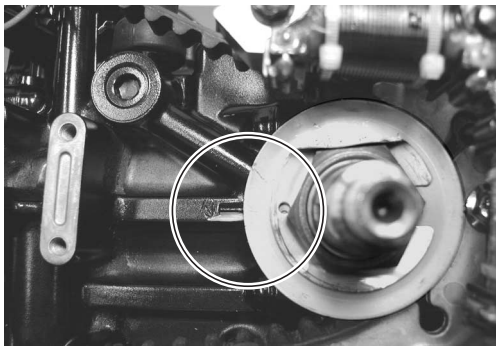
TIMING BELT AND VALVE CLEARANCE

Timing belt

1. Rotate the camshaft clockwise to align the PUNCH mark “1” on the cam pulley with the INDEX mark on the cylinder head block.



2. Rotate the crankshaft to align the HOLLOW mark on the lock washer with the INDEX mark on the cylinder block.

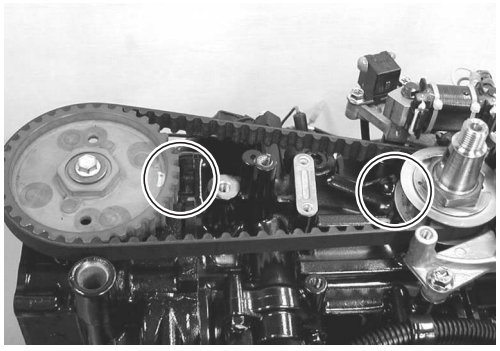


3. Install the timing belt.

CAUTION

*** Always keep the timing belt away from any grease and oil.**
*** If the timing belt must be installed with the arrow mark on the timing belt toward the direction of rotation.**

4. Make sure that either of the PUNCH mark “1” on the cam pulley aligns with the INDEX mark on the cylinder head block when the HOLLOW mark on the lock washer aligns with the INDEX mark on the cylinder block.



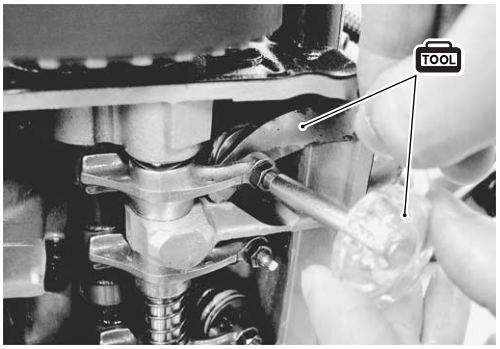
Valve clearance

IN: 0.08 – 0.12 mm (0.003 – 0.005 in)
EX: 0.13 – 0.17 mm (0.005 – 0.007 in)

TOOL 09900-20803: Thickness gauge
09917-14910: Valve adjuster driver

Valve adjusting lock nut: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

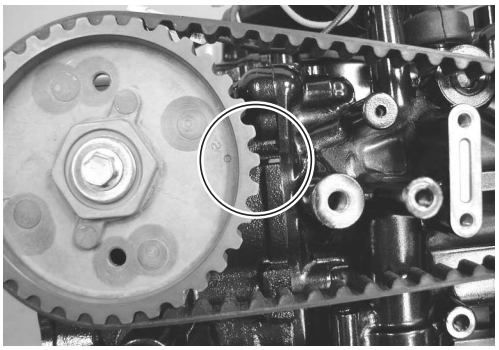
5. Adjust the valve clearance on the No. 1 (Top) cylinder.



6. Rotate the crankshaft clockwise to align the PUNCH mark "2" on the cam pulley with the INDEX mark on the cylinder head block.

CAUTION

Rotate the crankshaft in the normal running direction (clockwise) to prevent water pump impeller damage.

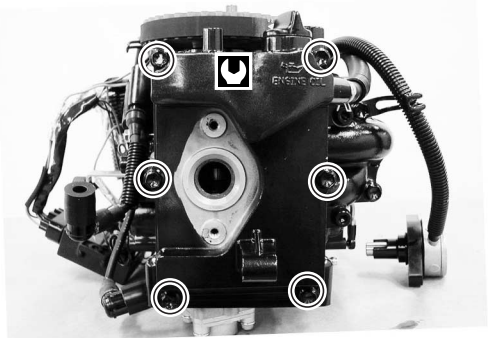


7. Adjust the valve clearance on the No. 2 (Bottom) cylinder.

CYLINDER HEAD COVER

- Install the cylinder head cover.

Cylinder head cover bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

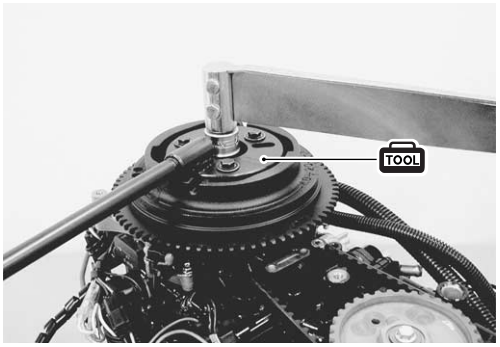


FLYWHEEL

- Install the flywheel. (See page 3-10.)

Flywheel bolt: 80 N·m (8.0 kgf-m, 58.5 lb-ft)

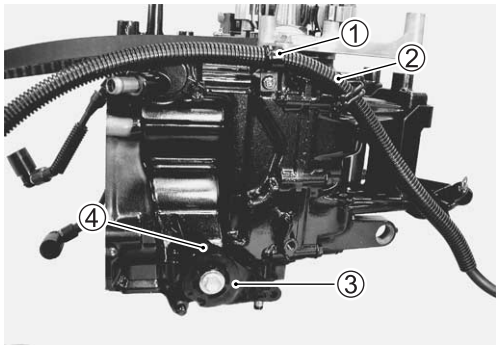
09930-39520: Flywheel holder



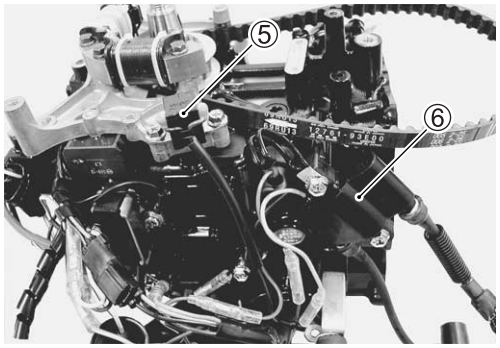
CYLINDER/CRANKSHAFT/PISTON
DISASSEMBLY

Before disassembling:
*** Remove the power unit. (See page 6-2 to 6-4.)**
*** Remove the cylinder head assy. (See page 6-6.)**

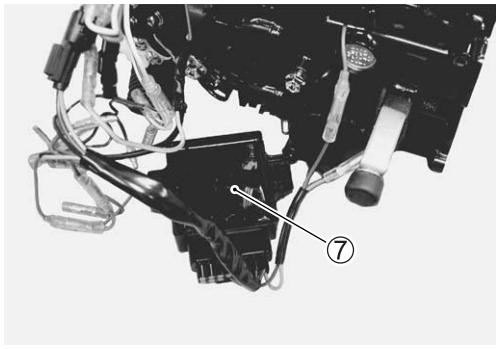
1. Remove the clamp ① and fuel hose ②.
   Remove the throttle drum ③ and the throttle control lever ④.



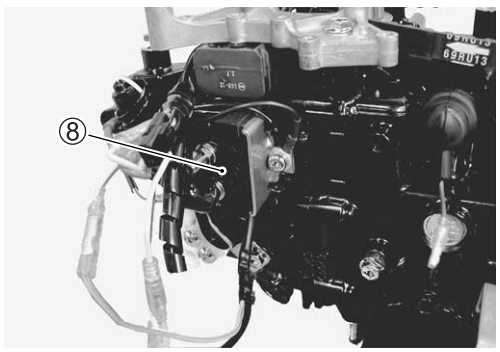
2. Remove the pulser coil ⑤ and the ignition coil ⑥.



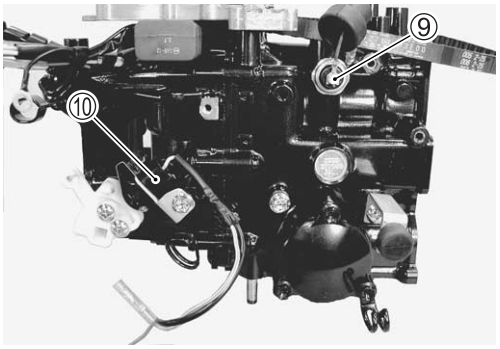
3. Remove the CDI unit ⑦.



4. Remove the starter relay ⑧.

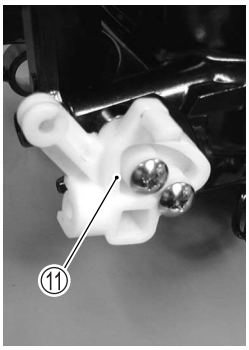


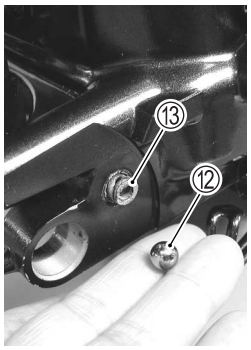
5. Remove the oil pressure switch ⑨ and the neutral switch ⑩.



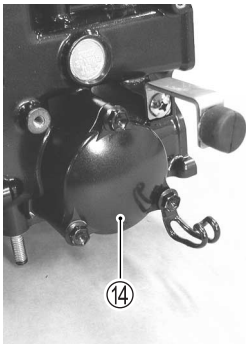
6. Remove the clutch notch lever ⑪ (with the clutch notch plate), the ball ⑫ and the spring ⑬.

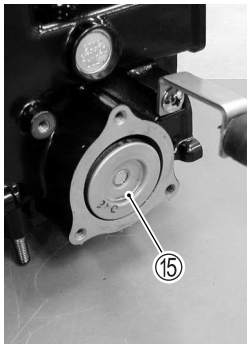
NOTE:
Note the clutch notch ball ⑫.



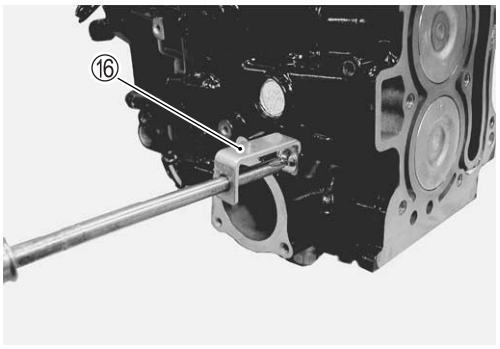


7. Remove the oil filter cap ⑭ and the oil filter ⑮.

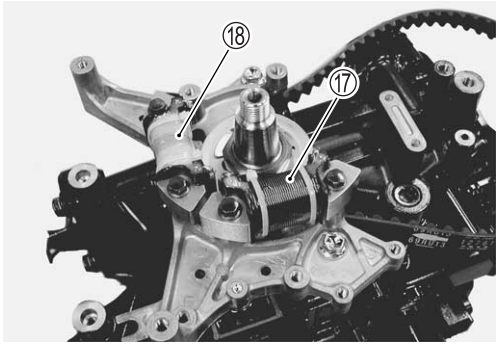




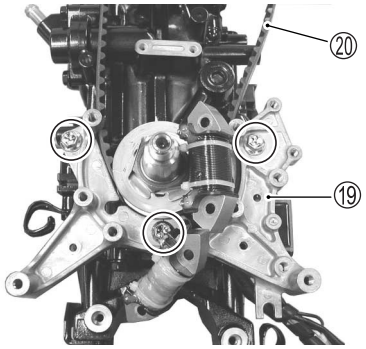
8. Remove the side cover cushion, the screw and the side cover holder ⑯.



9. Remove the battery charge coil ⑰ and the condenser charge coil ⑱.



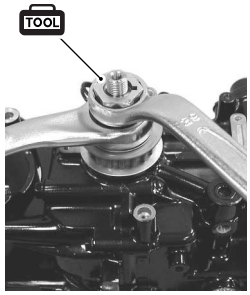
10. Remove the stator base ⑲.
    Remove the timing belt ⑳.

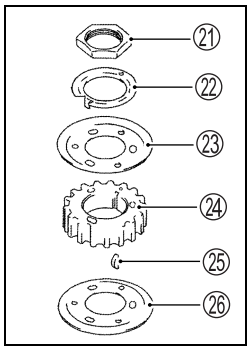


11. Remove the timing pulley nut ㉑.

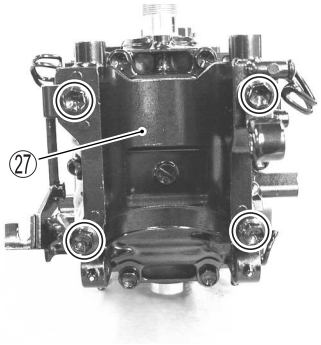
TOOL 09911-49310: Crankshaft holder

Remove the lock washer ㉒, the upper guide ㉓, the timing pulley ㉔, the key ㉕ and the lower guide ㉖.

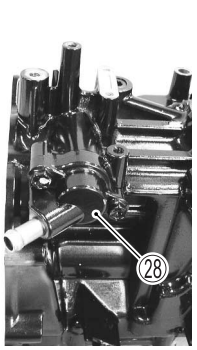


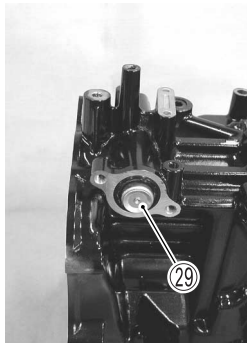


12. Remove the starter motor bracket ㉗.

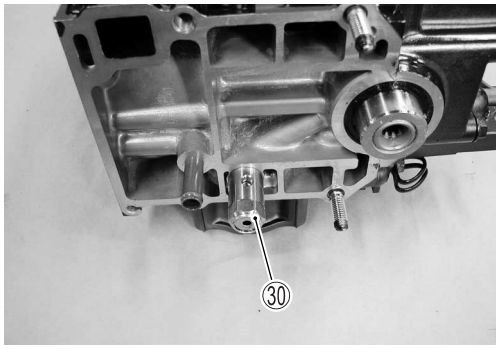


13. Remove the thermostat cover ㉘ and the thermostat ㉙.

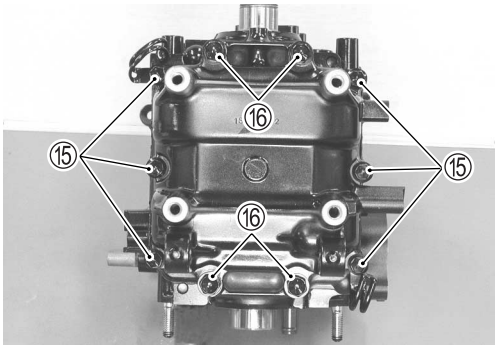




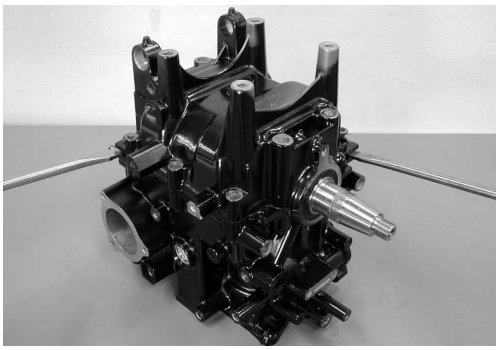
14. Remove the oil pressure regulator ㉚.



15. Remove the six M6-bolts ⑮.
16. Remove the four M8-bolts ⑯.

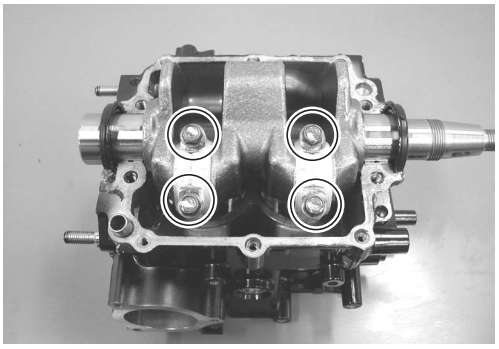


17. Remove the crankcase from the cylinder block.

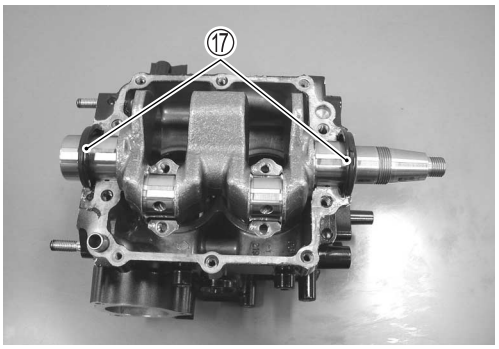


18. Remove the conrod cap bolts and the conrod caps.

NOTE:
For proper assembly, mark the cylinder number on all conrod caps using quick dry paint.

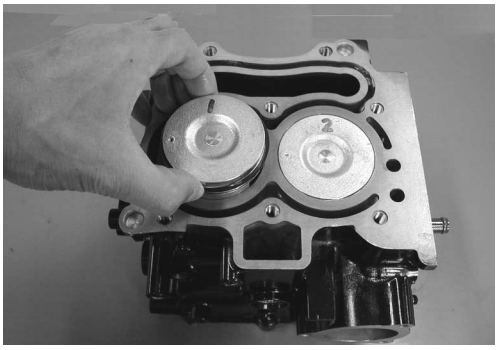


19. Remove the crankshaft.
20. Remove the oil seals ⑰ from the crankshaft.



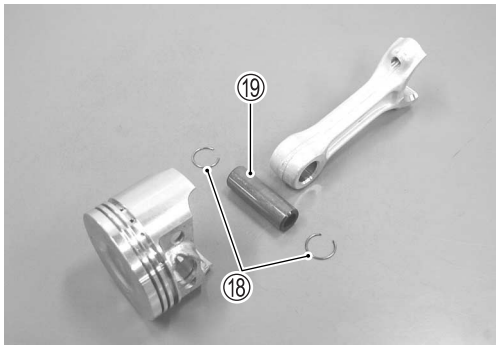
21. Remove the pistons with the conrod.

NOTE:
* *For proper assembly, mark cylinder number on all conrods and pistons using quick dry paint.*
* *To prevent damage to the piston rings, decarbon from the cylinder bore wall before removing the piston.*



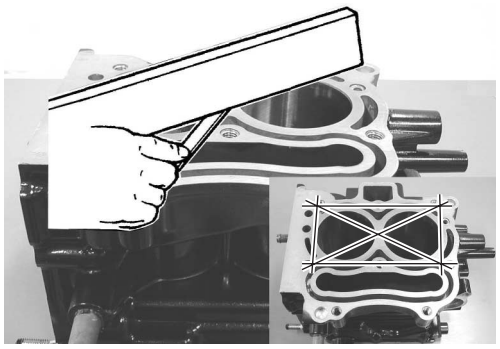
22. Remove the circlips ⑱.
23. Remove the piston pin ⑲, the piston and the conrod.
24. Remove all piston rings.

NOTE:
Install the 1st ring to the piston with its original direction. There is no I.D. mark on the standard size 1st ring.



INSPECTION/SEVICING

NOTE:
If excessive wear, cracks, defective or other damage is found on any component, replace component.



CYLINDER/PISTON
Cylinder distortion
Measure the cylinder distortion (gasketed surface) at a total of 6 locations as shown.

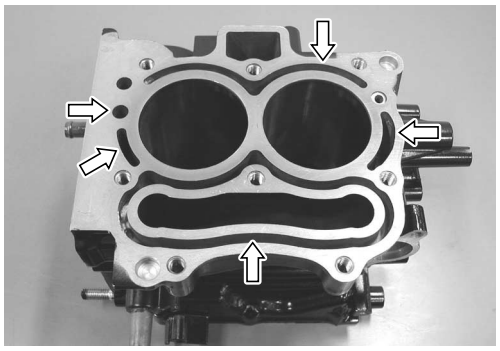
TOOL 09900-20803: Thickness gauge
Straight gauge

Service limit: 0.05 mm (0.002 in)

If the measurement exceeds the service limit, resurface or replace the cylinder.

NOTE:
The cylinder can be resurfaced, using a surface plate and #400 grit wet sandpaper. Move the cylinder in a figure eight pattern when sanding.

Water jacket
Check the water jackets.
If clog or obstruction is found, clean the water jacket.

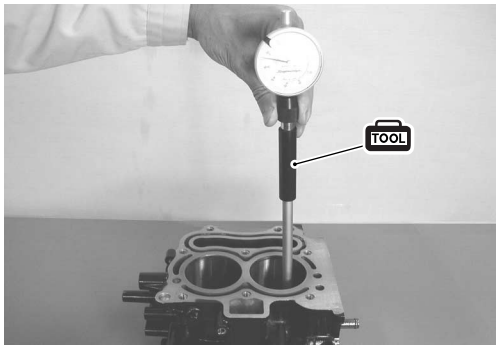


Cylinder bore wear (difference)

Measure the cylinder bore in the thrust and axial directions at the three positions Ⓐ, Ⓑ and Ⓒ as shown.

Check for the followings:

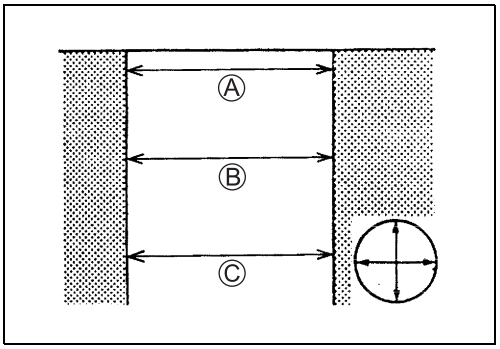
- Difference of the measurements at two positions (Taper)
- Difference between the thrust and axial measurement (Out-of-round)



TOOL 09900-20508: Cylinder gauge set

Service limit: 0.055 mm (0.0022 in)

If the measurement exceeds the service limit, rebore or replace the cylinder.



Piston to cylinder clearance

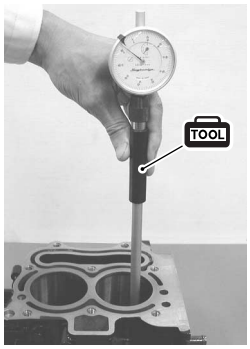
Standard: 0.0276 – 0.0425 mm (0.0008 – 0.0016 in)

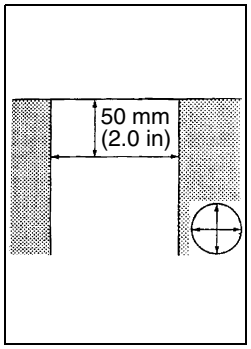
Service limit: 0.100 mm (0.0039 in)

If the measurement exceeds the service limit, replace the piston and/or the cylinder or rebore the cylinder.

To check the clearance, measure the following items:

- Cylinder bore at 50 mm elevation from the gasketed surface
- Piston skirt diameter at 15 mm elevation from the skirt end





TOOL 09900-20508: Cylinder gauge set

09900-20203: Micrometer

Cylinder bore

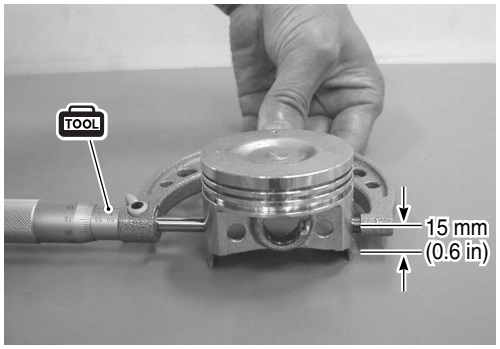
Standard: 58.000 – 58.015 mm (2.2835 – 2.2841 in)

Piston skirt diameter

Standard: 57.965 – 57.980 mm (2.2821 – 2.2827 in)

NOTE:

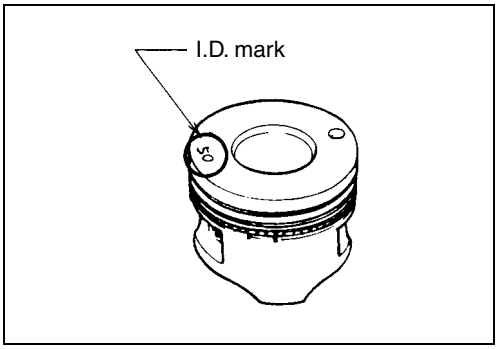
For this check, measure the cylinder bore and the piston skirt diameter in the direction that makes a right angle with the crankshaft (piston pin).



Identification of oversize piston/piston ring

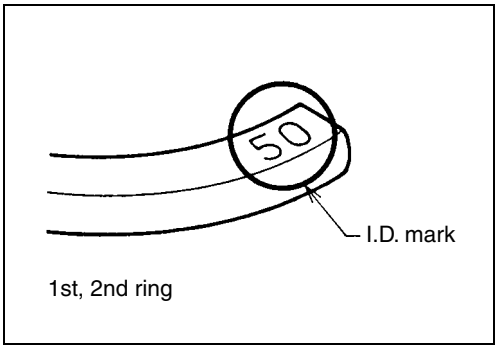
Piston

Oversize	I.D. mark
0.50 mm (0.020 in)	0.50



1st & 2nd ring

Oversize	I.D. mark
0.50 mm (0.020 in)	50

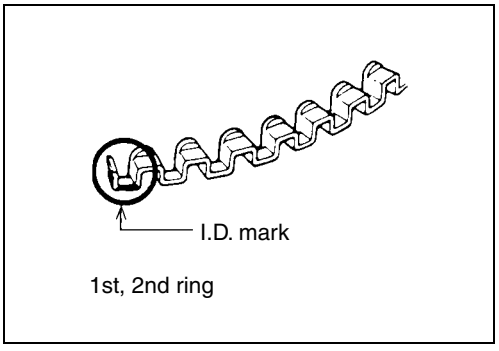


1st, 2nd ring

Oil ring

Oversize	I.D. mark
0.50 mm (0.020 in)	Red paint

NOTE:
For the oil ring side rail, measure the outer diameter of the rail to distinguish because there is no I.D. mark.



1st, 2nd ring

Piston ring to groove clearance

Measure the clearance after decarboning.

TOOL 09900-20803: Thickness gauge

Standard: 1st & 2nd 0.02 – 0.06 mm (0.0008 – 0.0024 in)
Service limit: 1st & 2nd 0.10 mm (0.004 in)

If the measurement exceeds the service limit, replace the piston and/or piston ring.

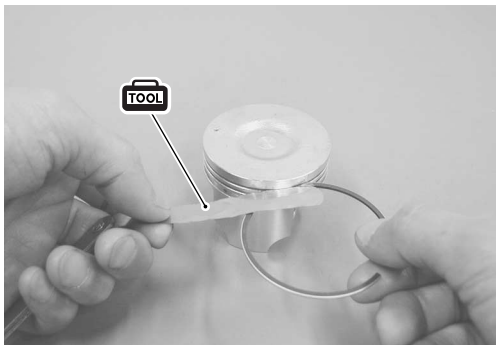
TOOL 09900-20102: Vernier calipers
09900-20205: Micrometer

Piston ring groove width

Standard:
1st & 2nd 1.21 – 1.23 mm (0.0476 – 0.0484 in)
Oil 2.51 – 2.53 mm (0.0988 – 0.0996 in)

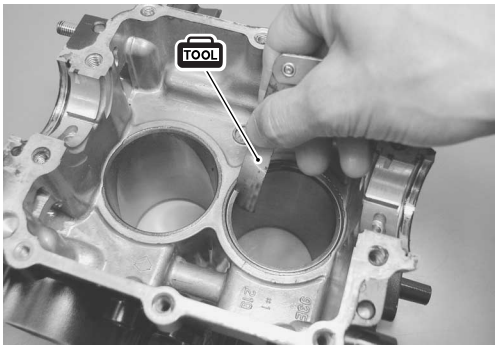
Piston ring thickness

Standard: 1st & 2nd 1.17 – 1.19 mm (0.0461 – 0.0469 in)



Piston ring end gap

Measure the piston ring end gap with the piston ring in the lowest position of the cylinder bore.



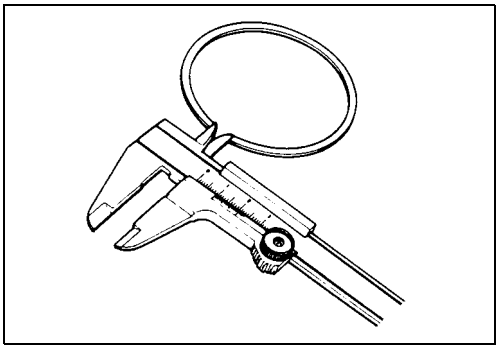
TOOL 09900-20803: Thickness gauge

Standard: 1st & 2nd 0.10 – 0.25 mm (0.004 – 0.010 in)
Service limit: 1st & 2nd 0.50 mm (0.020 in)

If the measurement exceeds the service limit, replace the piston ring.

Piston ring free end gap

Measure the piston ring free end gap.



TOOL 09900-20102: Vernier calipers

Standard: 1st Approx. 5.8 mm (0.23 in)
2nd Approx. 7.4 mm (0.29 in)
Service limit: 1st 4.6 mm (0.18 in)
2nd 5.9 mm (0.23 in)

If the measurement is lower than the service limit, replace the piston ring.

Piston pin oil clearance

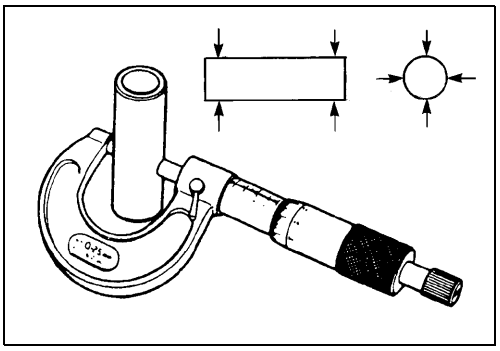
Check for the followings:

- The piston pin and the piston pin hole are free from excessive wear and damage.
- The piston pin can move smoothly in the piston pin hole with oil.

If the result is not the above conditions, replace the piston pin and/or piston.

Standard: 0.002 – 0.013 mm (0.00008 – 0.00051 in)
Service limit: 0.040 mm (0.0016 in)

If the measurement exceeds the service limit, replace the piston pin and/or piston.



To check the clearance, measure the following items:

- Piston pin outside diameter in the thrust and axial directions
- Piston pin hole diameter in the thrust and axial directions

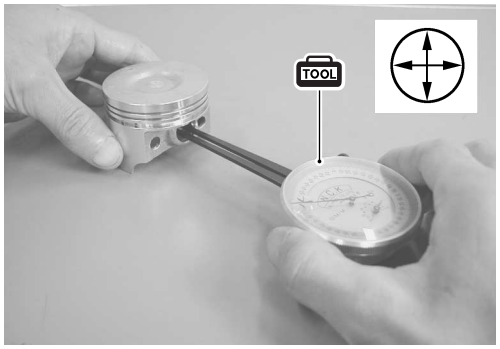
TOOL 09900-20205: Micrometer
09900-20605: Dial calipers

Piston pin outside diameter

Standard: 13.995 – 14.000 mm (0.5510 – 0.5512 in)
Service limit: 13.980 mm (0.5504 in)

Piston pin hole diameter

Standard: 14.002 – 14.008 mm (0.5513 – 0.5515 in)
Service limit: 14.030 mm (0.5524 in)



Conrod small end inside diameter

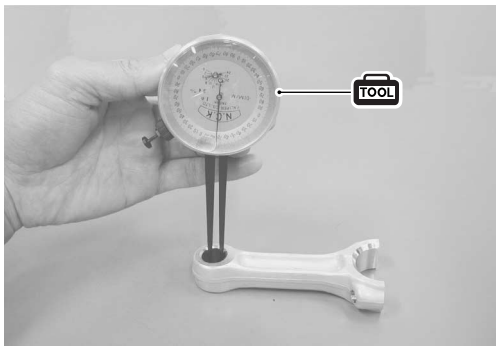
Measure the conrod small end inside diameter.

09900-20605: Dial calipers

Standard: 14.006 – 14.014 mm (0.5514 – 0.5517 in)
Service limit: 14.040 mm (0.5528 in)

If the measurement is out of the specification, replace the conrod.

NOTE:
The piston pin is press-fitted into the conrod small end hole. There must be a negative clearance between two items.



CONROD/CRANKSHAFT/CRANKCASE

Conrod big end side clearance

Measure the conrod big end side clearance with the conrod installed on the crank pin as shown.

09900-20803: Thickness gauge

Standard: 0.10 – 0.20 mm (0.004 – 0.008 in)
Service limit: 0.60 mm (0.024 in)

If the measurement exceeds the service limit, replace the conrod and/or crankshaft.

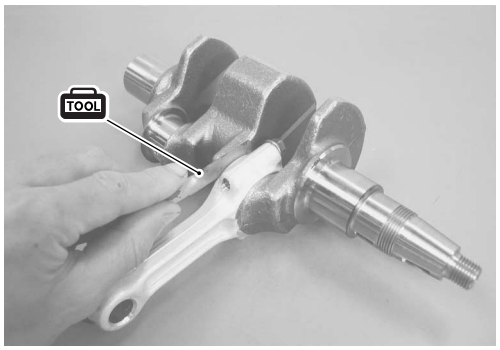
09900-20205: Micrometer
09900-20605: Dial calipers

Conrod big end width

Standard: 19.95 – 20.00 mm (0.785 – 0.787 in)

Crank pin width

Standard: 20.10 – 20.15 mm (0.791 – 0.793 in)

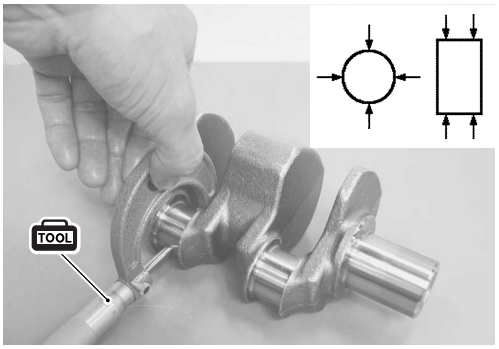


Crank pin outside diameter/difference

Measure the crank pin outside diameter in the thrust and axial directions at two positions as shown.

Check for the followings:

- Difference of the measurements at two positions (Taper)
- Difference between the thrust and axial measurement (Out-of-round)



TOOL 09900-20202: Micrometer

Service limit: 0.010 mm (0.0004 in)

If the measurement exceeds the service limit, replace the crankshaft.

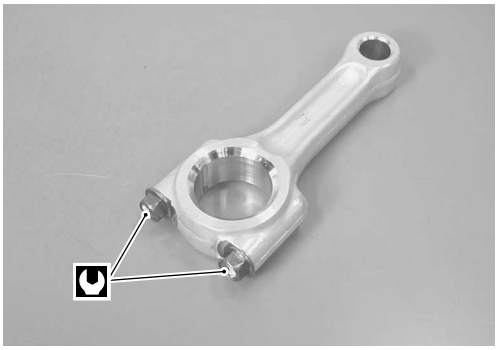
Crank pin outside diameter:

Standard: 28.982 – 29.000 mm (1.1410 – 1.1417 in)

Conrod big end inside diameter

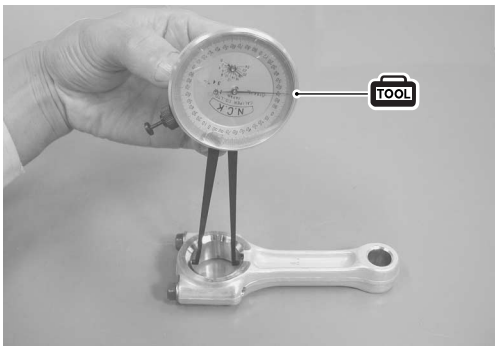
Measure the conrod big end inside diameter as follows.

1. Clean the surface of the conrod and the conrod cap.
2. Install the conrod cap to the conrod.
3. Apply the engine oil to the conrod bolts and tighten the bolts to the specified torque.



Conrod cap bolt: 12 N·m (1.2 kgf-m, 8.5 lb-ft)

4. Measure the conrod big end inside diameter.



TOOL 09900-20605: Dial calipers

Conrod big end inside diameter

Standard: 29.016 – 29.034 mm (1.1424 – 1.1431 in)

Conrod big end oil clearance

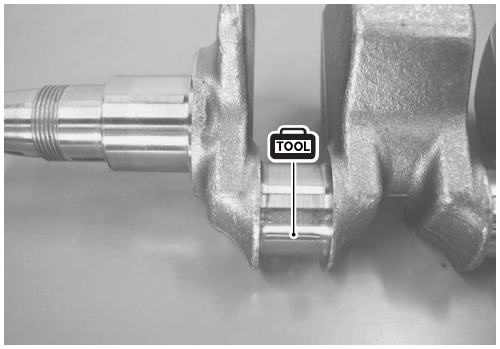
Standard: 0.025 – 0.043 mm (0.0010 – 0.0017 in)

Service limit: 0.063 mm (0.0025 in)

If the measurement exceeds the service limit, replace the conrod assembly and/or crankshaft.

Measure the conrod big end oil clearance as follows:
1. Clean the surface of the conrod, the conrod cap and the crank pin.
2. Place a piece of the plastigauge on the crank pin with parallel to the crankshaft, avoiding the oil hole.

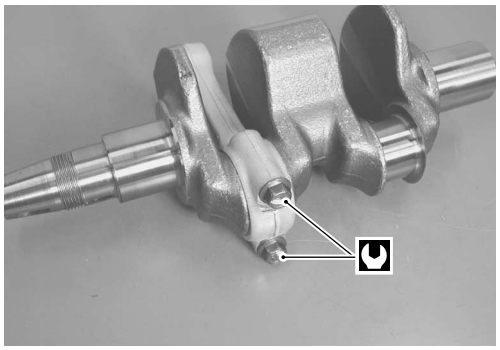
TOOL 09900-22301: Plastigauge



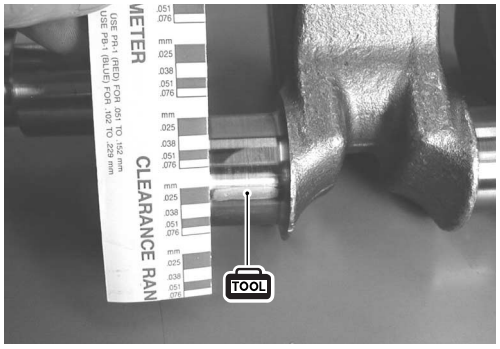
3. Install the conrod cap.
4. Apply the engine oil to the conrod bolts and tighten the bolts to the specified torque.

Conrod cap bolt: 12 N·m (1.2 kgf-m, 8.5 lb-ft)

NOTE:
Do not rotate the conrod with the plastigauge in place.



5. Remove the conrod and conrod cap from the crank pin.
6. Measure the compressed plastigauge width at its widest point.



Crankshaft and conrod combination

CONROD BIG END INSIDE DIAMETER CODE
The code is stamped on the conrod as shown.

Standard:

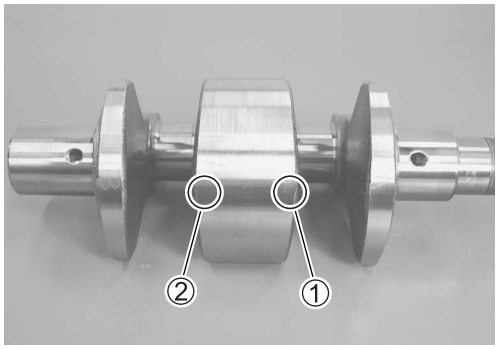
Code	Conrod big end inside diameter
1	29.025 – 29.034 mm (1.1427 – 1.1430 in)
2	29.016 – 29.025 mm (1.1424 – 1.1427 in)

CRANK PIN OUTSIDE DIAMETER CODE
The codes are stamped on the bottom of the crankshaft middle web.

Standard:

Code	Crank pin outside diameter
1	28.991 – 29.000 mm (1.1414 – 1.1417 in)
2	28.982 – 28.991 mm (1.1389 – 1.1414 in)

① Top crank pin O.D. code ② 2nd crank pin O.D. code



CONROD SELECTION

Select the conrod referring the below table.

Conrod selection table

Item		Conrod big end inside diam.	
	Code	1	2
Crank pin outside diam.	1	OK	NG
	2	NG	OK

NOTE:
Assemble the crankshaft and the conrod of the same code.

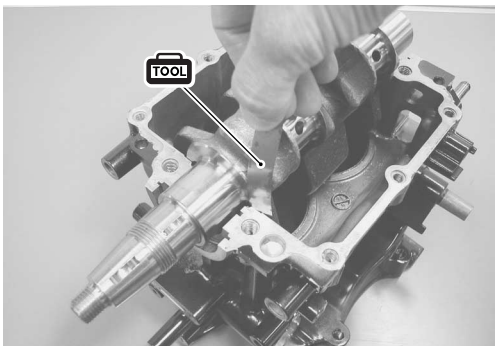
CRANKSHAFT THRUST CLEARANCE

Measure the crankshaft thrust clearance.

TOOL 09900-20803: Thickness gauge

Crankshaft thrust clearance
Service limit: 0.6 mm (0.024 in)

If the measurement exceeds the service limit, replace crankshaft and/or crankcase.



Crankshaft journal outside diameter/difference

Measure the crankshaft journal outside diameter in the thrust and axial directions at two positions as shown.
Check for the followings:

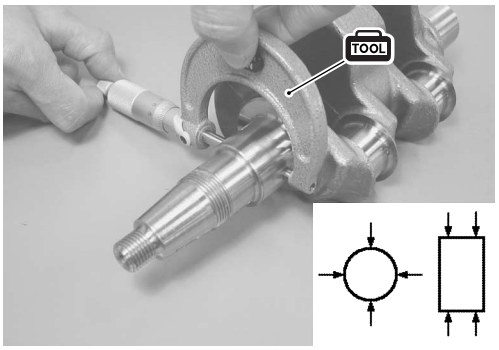
- Difference of the measurements at two positions (Taper)
- Difference between the thrust and axial measurement (Out-of-round)

TOOL 09900-20202: Micrometer

Service limit: 0.010 mm (0.0004 in)

If the measurement exceeds the service limit, replace the crankshaft.

Crankshaft journal outside diameter:
Standard: 31.984 – 32.000 mm (1.2592 – 1.2598 in)

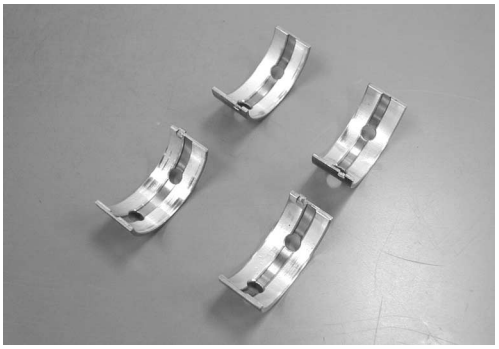


Crankshaft bearing condition

If pitting, flaking, burn or excessive wear is found, replace the bearing.

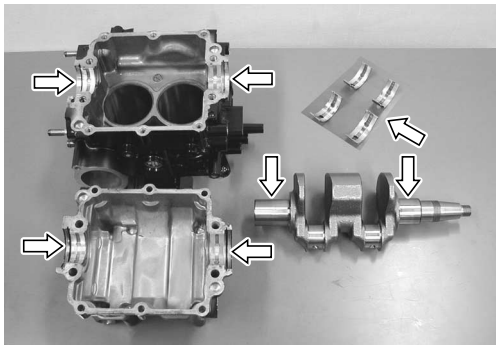
Crankshaft bearing oil clearance
Standard: 0.020 – 0.044 mm (0.0008 – 0.0017 in)
Service limit: 0.060 mm (0.0024 in)

If the measurement exceeds the service limit, replace the crankshaft bearing.



Measure the crankshaft bearing oil clearance as follows:

1. Clean the surface of the bearing holder (the crankcase and the cylinder), the bearing and the crankshaft bearing journal.



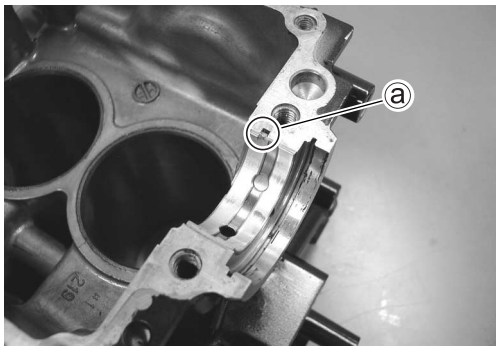
2. Install the crankshaft bearing to the cylinder and the crankcase.

NOTE:

** Reassemble each bearing to its original position.*

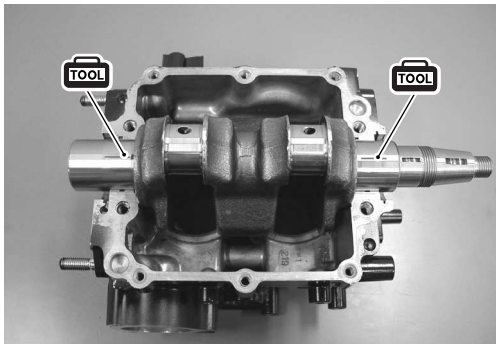
** Align the tab ⓐ of the bearing with the notch in the cylinder and the crankcase.*

** Do not apply the oil to the bearing.*



3. Install the crankshaft to the cylinder.
4. Place a piece of the plastigauge on the journal with parallel to the crankshaft, avoiding the oil hole.

TOOL 09900-22301: Plastigauge

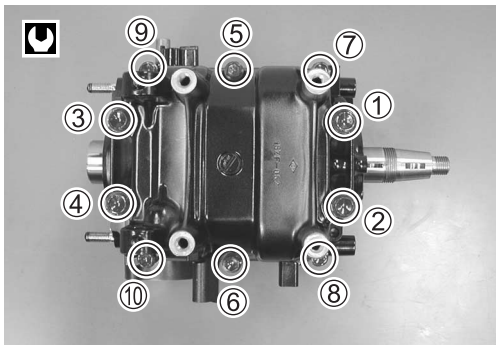


5. Install the crankcase (with the bearing) to the cylinder.
6. Apply the engine oil to the crankcase bolts and tighten the bolts to the specified torque in the indicated order.

Crankcase bolt:

6 mm 14 N·m (1.4 kgf-m, 10.0 lb-ft)

8 mm 25 N·m (2.5 kgf-m, 18.0 lb-ft)



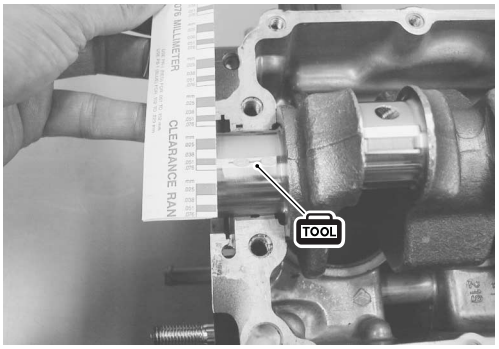
NOTE:

** The crankcase should be torqued to the specification in order to assure proper compression of the plastigauge and accurate reading of the clearance.*

** Do not rotate the crankshaft with the plastigauge in place.*

7. Remove the crankcase from the cylinder.
8. Measure the compressed plastigauge width at its widest point.

NOTE:
For bearing replacement, see the "CRANKSHAFT/CRANKCASE COMBINATION" section.



CRANKSHAFT/CRANKCASE COMBINATION

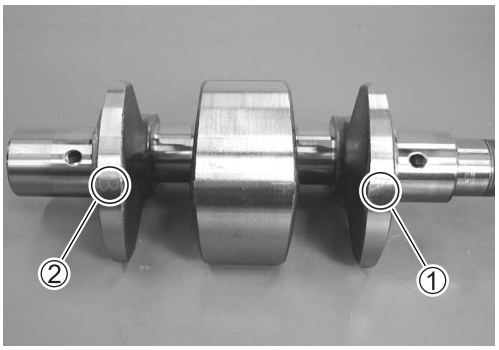
Crankshaft journal outside diameter code

The codes are stamped on the upper (flywheel side) and lower web of the crankshaft as shown.

Standard:

Code	Crankshaft journal outside diameter
A	31.992 – 32.000 mm (1.2595 – 1.2598 in)
B	31.984 – 31.992 mm (1.2592 – 1.2595 in)

① Top side O.D. code ② Lower side O.D. code



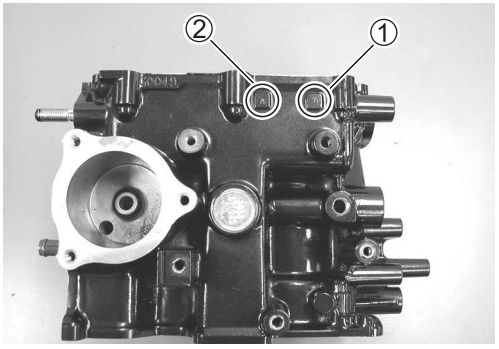
Crankcase bearing holder inside diameter code

The codes are stamped on the port side of the cylinder block as shown.

Standard:

Code	Crankcase bearing holder inside diameter
A	35.008 – 35.016 mm (1.3783 – 1.3786 in)
B	35.000 – 35.008 mm (1.3780 – 1.3783 in)

① Top side I.D. code ② Lower side I.D. code



Crankshaft bearing thickness code

The codes are painted on the side of the bearing as shown.

Standard:

Code	Crankshaft bearing thickness
Green	1.486 – 1.490 mm (0.0585 – 0.0587 in)
Black	1.490 – 1.494 mm (0.0587 – 0.0588 in)
Brown	1.494 – 1.498 mm (0.0588 – 0.0590 in)
Yellow	1.498 – 1.502 mm (0.0590 – 0.0591 in)

Crankshaft bearing selection

Select the crankshaft bearing referring the below table.

Bearing selection table

Item		Crankshaft journal outside diameter	
	Code	A	B
Crankcase bearing holder inside diameter	A	Black	Brown
	B	Green	Black

NOTE:

Remeasure the crankshaft bearing oil clearance using the new bearings selected. (See page 6-34.)

OIL SEAL

If crack, cut or other damage is found, replace.

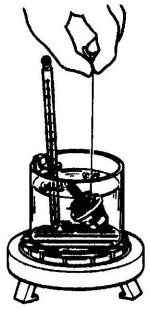
THERMOSTAT

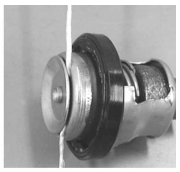
If deposited salt, corrosion, wear or other damage is found, clean or replace.

Thermostat operation

Check the thermostat opening temperature as follows:

1. Insert a length of thread between the thermostat valve/body and suspend the thermostat in a container filled with water.
2. Place the thermometer in the container and heat water. Observe water temperature when the thermostat valve opens and releases the thread.





Thermostat operating temperature:

Standard: 58 – 62 °C (136 – 144 °F)

REASSEMBLY

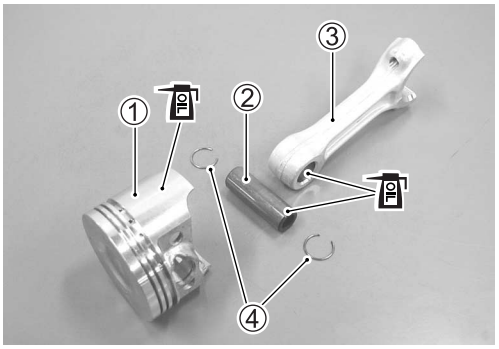
Reassembly is reverse order of disassembly with the special attention to the following steps:

CAUTION

*** If the original components are not replaced, each piston, piston pin and conrod is to be assembled and installed in the original order and position.**
*** Do not re-use the gasket, oil seal, O-ring and circlip once removed. Always use new parts.**

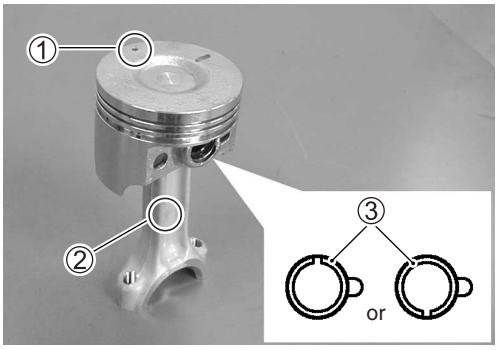
PISTON TO CONROD

1. Apply the engine oil to the piston pin ②, piston pin bore and the conrod ③.
2. Fit the conrod to the piston ① as shown in the figure and insert the piston pin through the piston and the conrod.
3. Install the piston pin circlips ④.



NOTE:

** Make sure that the conrod is installed in the direction shown in the figure.*
① Up mark
② I.D. mark
③ Circlip
** Install the circlips with a gap facing either up or down as shown in the figure.*



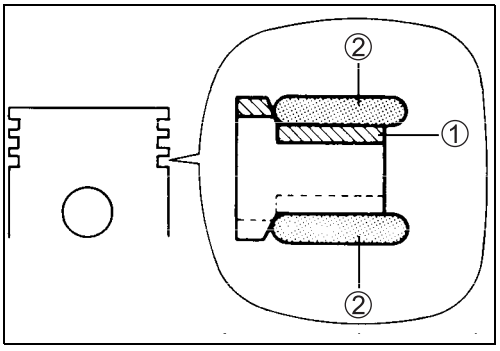
PISTON RING TO PISTON

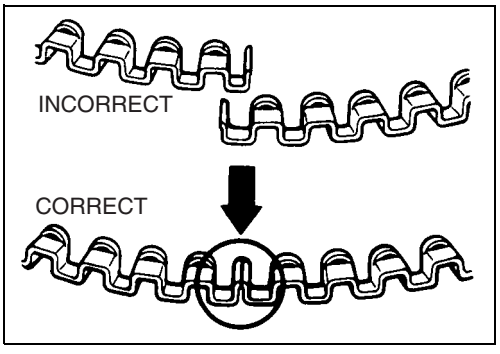
Oil ring

1. Apply the engine oil to the piston rings.
2. Install the spacer ① first, then the side rails ② to the piston.

CAUTION

When installing the spacer, do not allow its two ends to overlap in the groove.



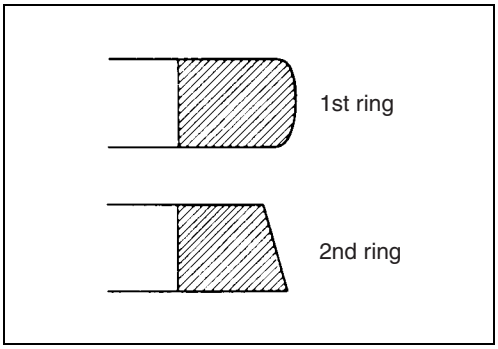


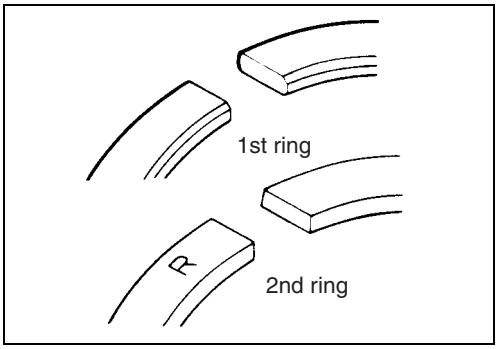
1st ring and 2nd ring

1. Apply the engine oil to the piston rings.
2. Install the 2nd ring and the 1st ring to the piston.

CAUTION

*** Install the 2nd ring to the piston with the "R" mark toward the piston head side.**
*** Install the 1st ring to the piston with its original direction.**
There is no I.D. mark on the standard size 1st ring.

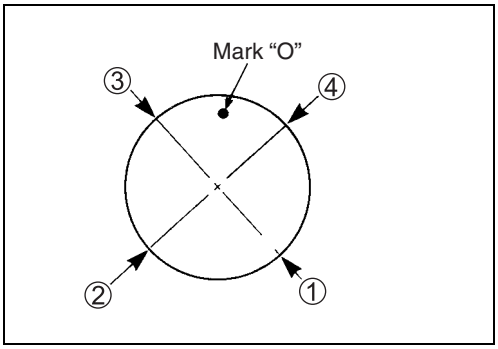




Ring gap direction

Position the rings so that their gaps are stagged at approximately 90 degree angles as shown.

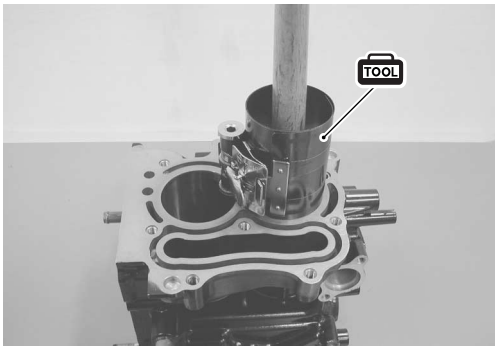
① 1st ring
② Oil ring lower side rail
③ 2nd ring
④ Oil ring upper side rail



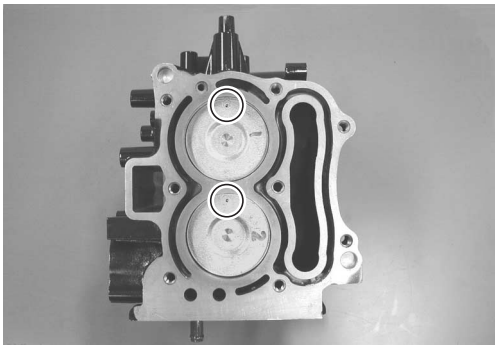
PISTON TO CYLINDER

1. Apply the engine oil to the piston and the cylinder bore wall.
2. Insert the piston (with conrod) to the cylinder from the head side using the special tool.

TOOL 09916-77310: Piston ring compressor

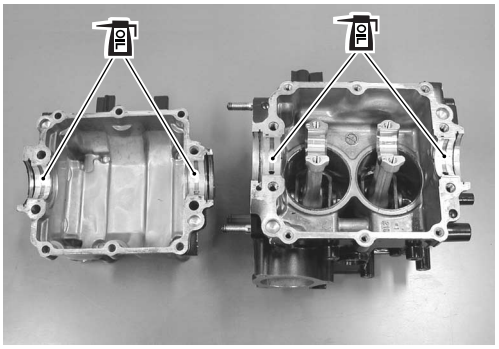


NOTE:
Position the CIRCLE mark on the piston head to the flywheel side.



CRANKSHAFT TO CYLINDER

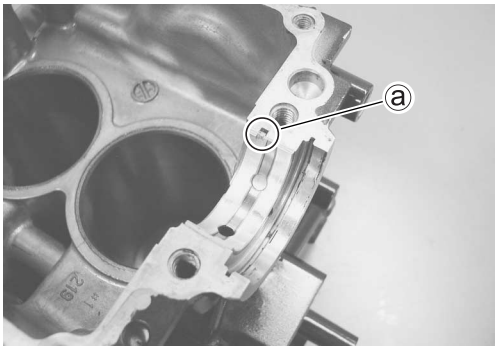
1. Install the crankshaft bearings to the cylinder and the crankcase.
2. Apply the engine oil to the bearings.



CAUTION

*** Reassemble each bearing to its original position.**
*** Do not apply the oil to the back of the bearing.**

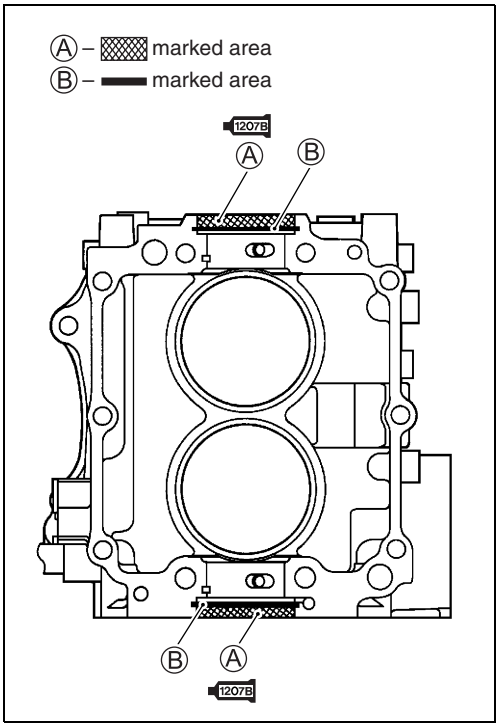
NOTE:
Align the tab ⓐ of the bearing with the notch in the cylinder and crankcase.



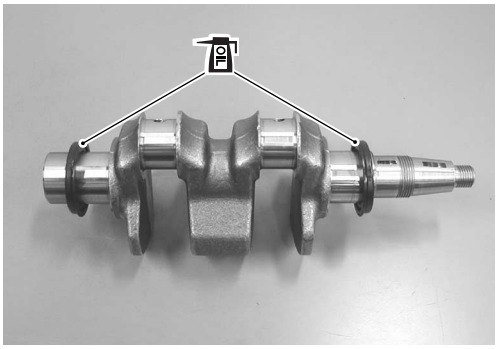
3. Clean the oil seal fitting surface of the cylinder.
   Apply the bond to the oil seal fitting surface of the cylinder as shown.

1207B 99000-31140: SUZUKI BOND "1207B"

Ⓐ – Oil seal fitting surface (Apply the bond.)
Ⓑ – Groove for the oil seal rib (Do not apply the bond.)



4. Apply the engine oil to the lip area of the oil seals.
5. Install the oil seals to the crankshaft.



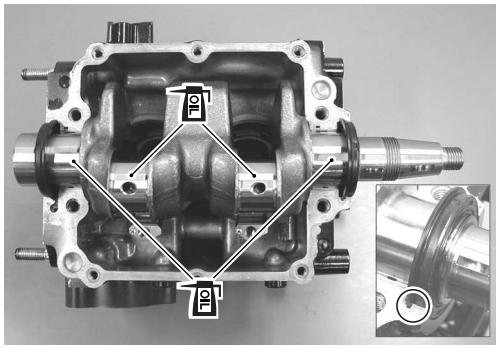
CAUTION

Do not re-use the seal once removed. Always use a new seal.

NOTE:
Install the oil seals with its spring/lipped side facing inward.

6. Apply the engine oil to the crank journal, the crank pin and the conrod.
7. Install the crankshaft to the cylinder.

NOTE:
When installing the crankshaft to the cylinder, be sure to fit the oil seal tabs in the grooves of the cylinder.



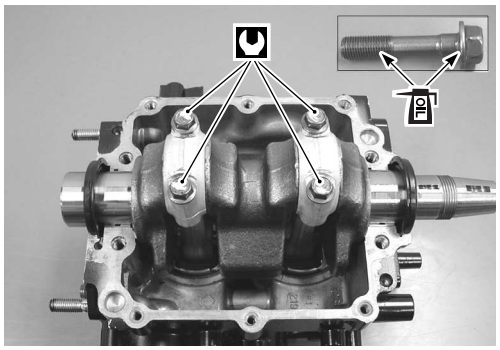
8. Apply the engine oil to the conrod cap.
9. Install the conrod cap to the cylinder.

CAUTION

Reassemble each conrod cap to its original position.

10. Apply the engine oil to the conrod cap bolts.
11. Tighten the bolts to the specified torque.

Conrod cap bolt: 12 N·m (1.2 kgf-m, 8.5 lb-ft)



CRANKCASE TO CYLINDER

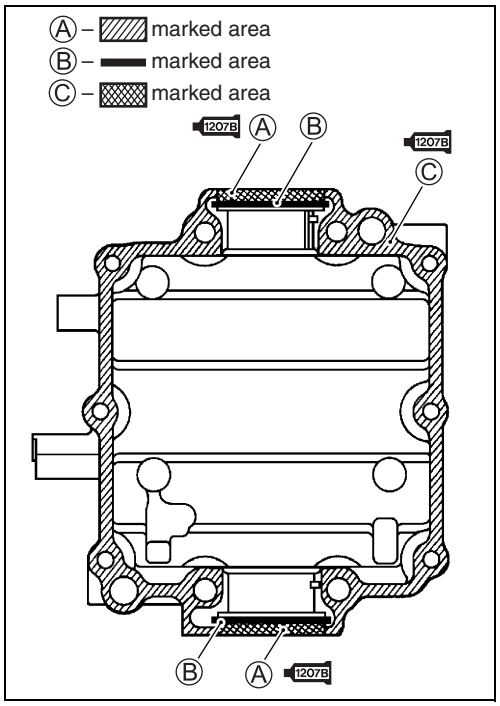
1. Clean the mating surface of the cylinder and the crankcase.
2. Apply the bond to the mating surface of the crankcase as shown.

1207B 99000-31140: SUZUKI BOND "1207B"

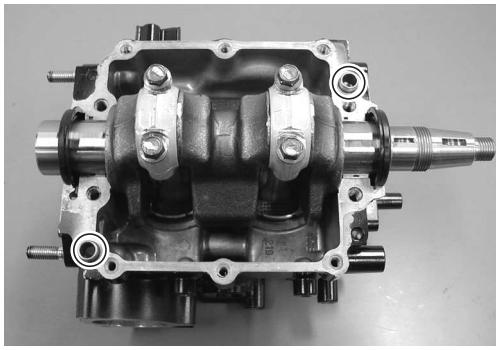
CAUTION

Apply the bond to the mating surface avoiding the bearing with bond.

Ⓐ – Fitting surface of the oil seal (Apply the bond.)
Ⓑ – Groove for the oil seal rib (Do not apply the bond.)
Ⓒ – Mating surface of the crankshaft (Apply the bond.)

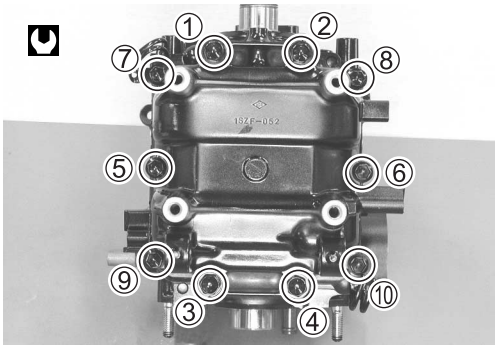


3. Install the two dowel pins.



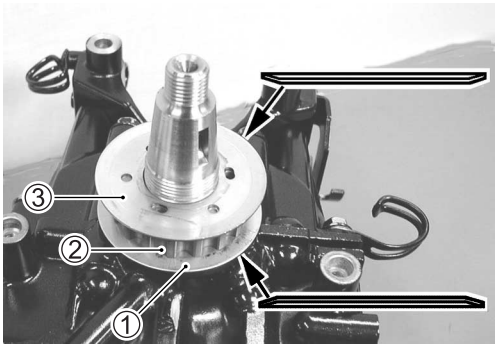
4. Install the crankcase (with the bearing) to the cylinder.
5. Apply the engine oil lightly to the crankcase bolts.
6. Tighten the ten bolts of the specified torque according to the numerical order as shown.

Crankcase bolt:
6 mm 14 N·m (1.4 kgf-m, 10.0 lb-ft)
8 mm 25 N·m (2.5 kgf-m, 18.0 lb-ft)

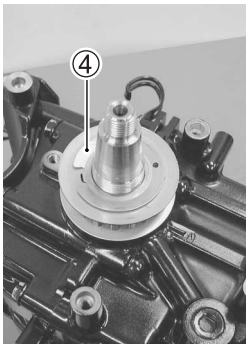


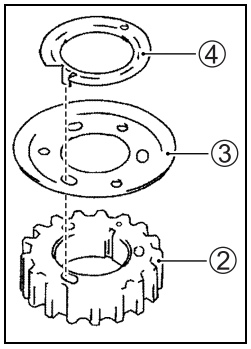
TIMING PULLEY

1. Install the lower guide ①.
2. Install the key.
3. Install the timing pulley ② and the upper guide ③ with the direction as shown.



4. Install the lock washer ④ with the direction as shown.





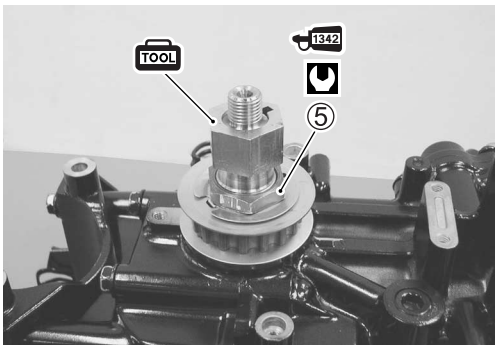
5. Apply the THREAD LOCK to the timing pulley nut ⑤.

1342 99000-32050: THREAD LOCK "1342"

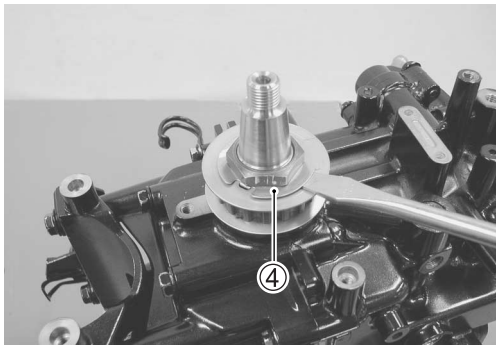
6. Install the timing pulley nut ⑤.
   Tighten the timing pulley nut ⑤ to the specified torque using the special tool.

TOOL 09911-49310: Crankshaft holder

Timing pulley nut: 50 N·m (5.0 kgf-m, 36.0 lb-ft)

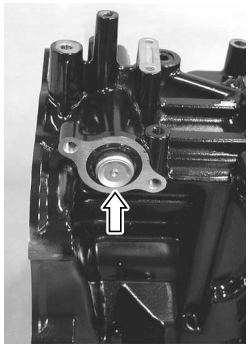


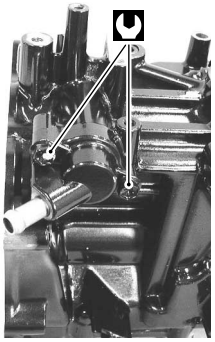
7. Bend the lock washer ④.



THERMOSTAT
Install the thermostat and the cover by three bolts.

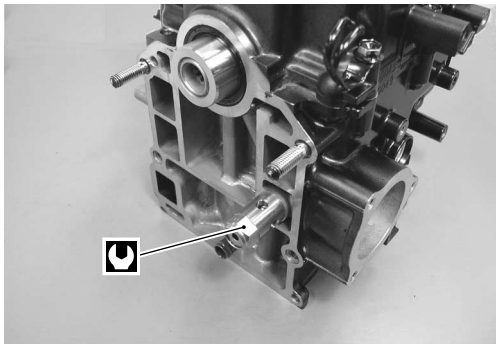
Thermostat cover bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)





OIL PRESSURE REGULATOR
Install the oil pressure regulator to the specified torque.

Oil pressure regulator: 27 N·m (2.7 kgf-m, 19.5 lb-ft)



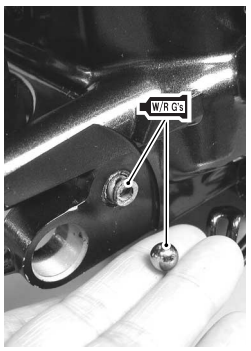
ENGINE OIL FILTER
Install the engine oil filter. (Refer to page 2-4.)

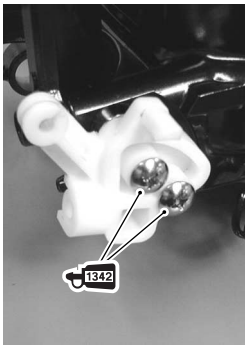
CLUTCH NOTCH LEVER
Apply the grease to the clutch notch spring and the ball.

W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE

Apply the THREAD LOCK to the clutch notch plate screw.

1342 99000-32050: THREAD LOCK "1342"



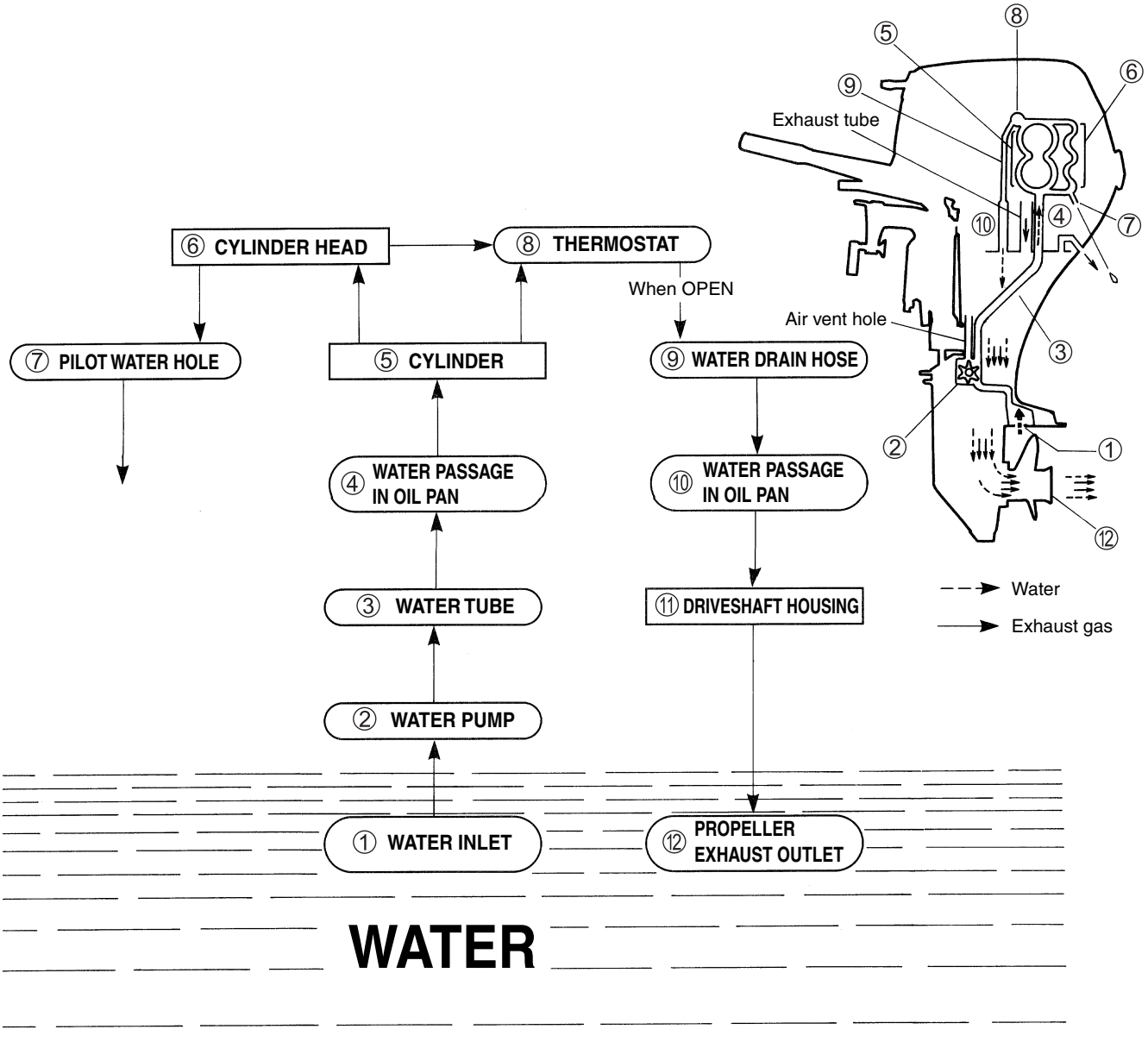


OIL PRESSURE SWITCH
Install the oil pressure switch. (Refer to page 3-14.)

OPERATION
WATER COOLING SYSTEM
The water cooling system consists of the water pump (in the lower unit), the water tube (between the lower unit and the power unit) and the thermostat (in the cylinder). This system cools both the power unit and the exhaust and is shown in schematic form below.
If overheating occurs, the components of the cooling system must be inspected for blockage, corrosion build-up or damage.

Component inspection	Refer to page
Water pump/Impeller	8-10
Water tube	7-9
Thermostat	6-37
Cylinder head	6-10
Cylinder block	6-27

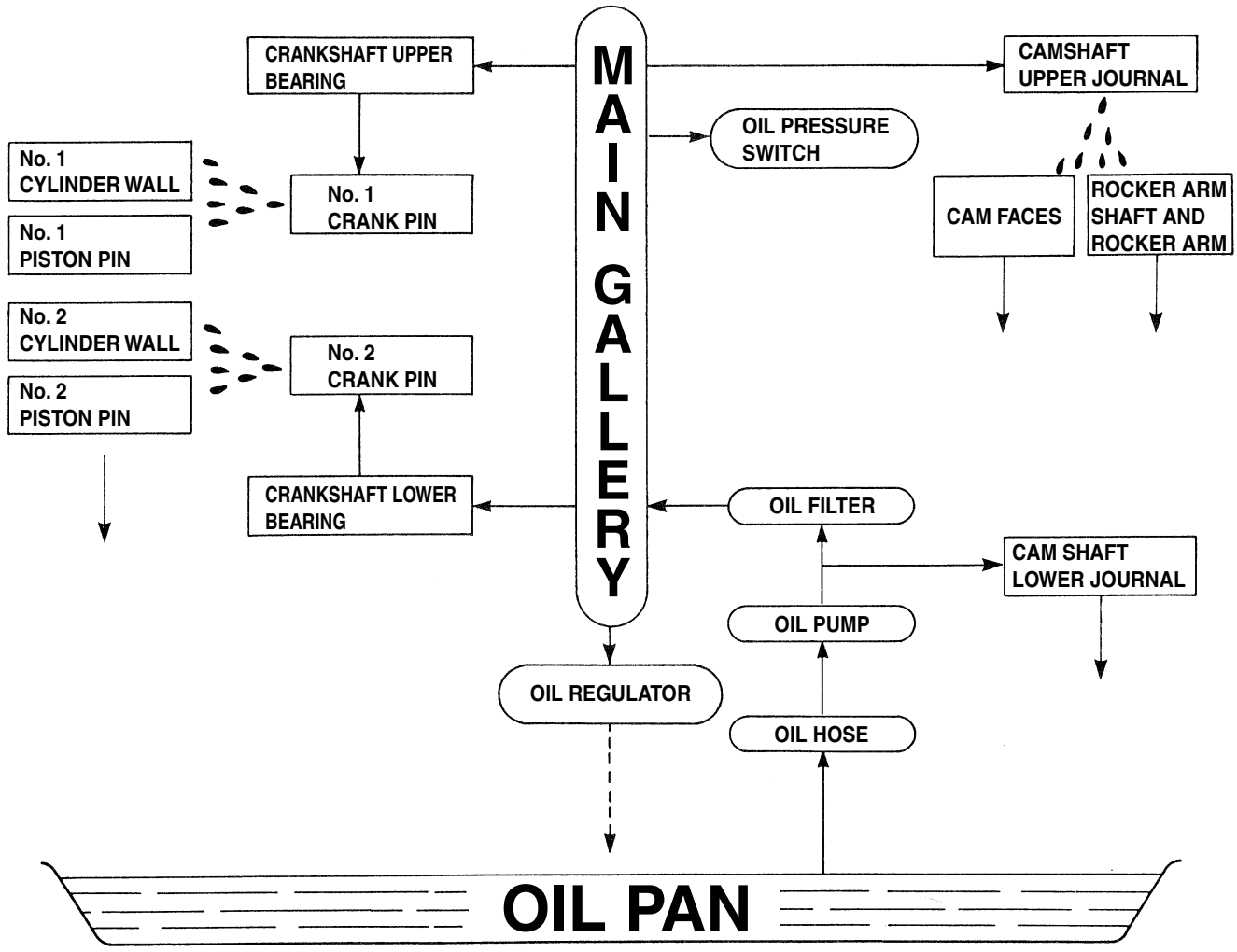
COOLING SYSTEM SCHEMATIC



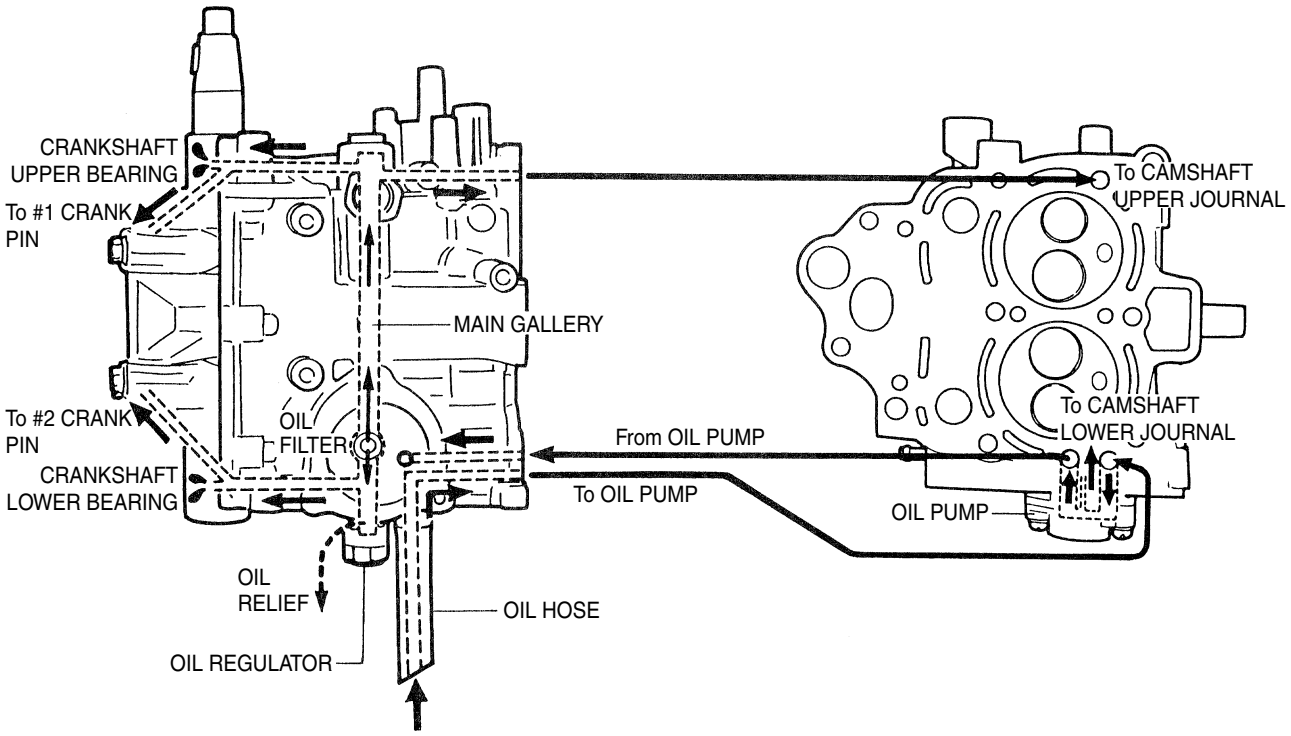
ENGINE LUBRICATION SYSTEM

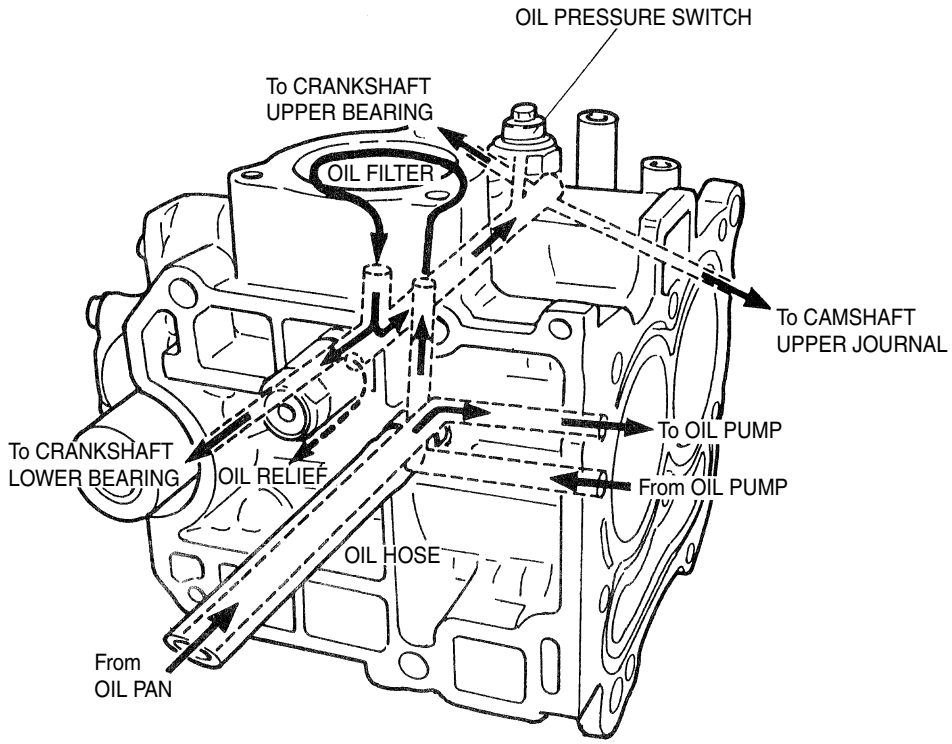
Engine oil stored in the oil pan is pumped up by the trochoid type pump.

ENGINE OIL LUBRICATION CHART



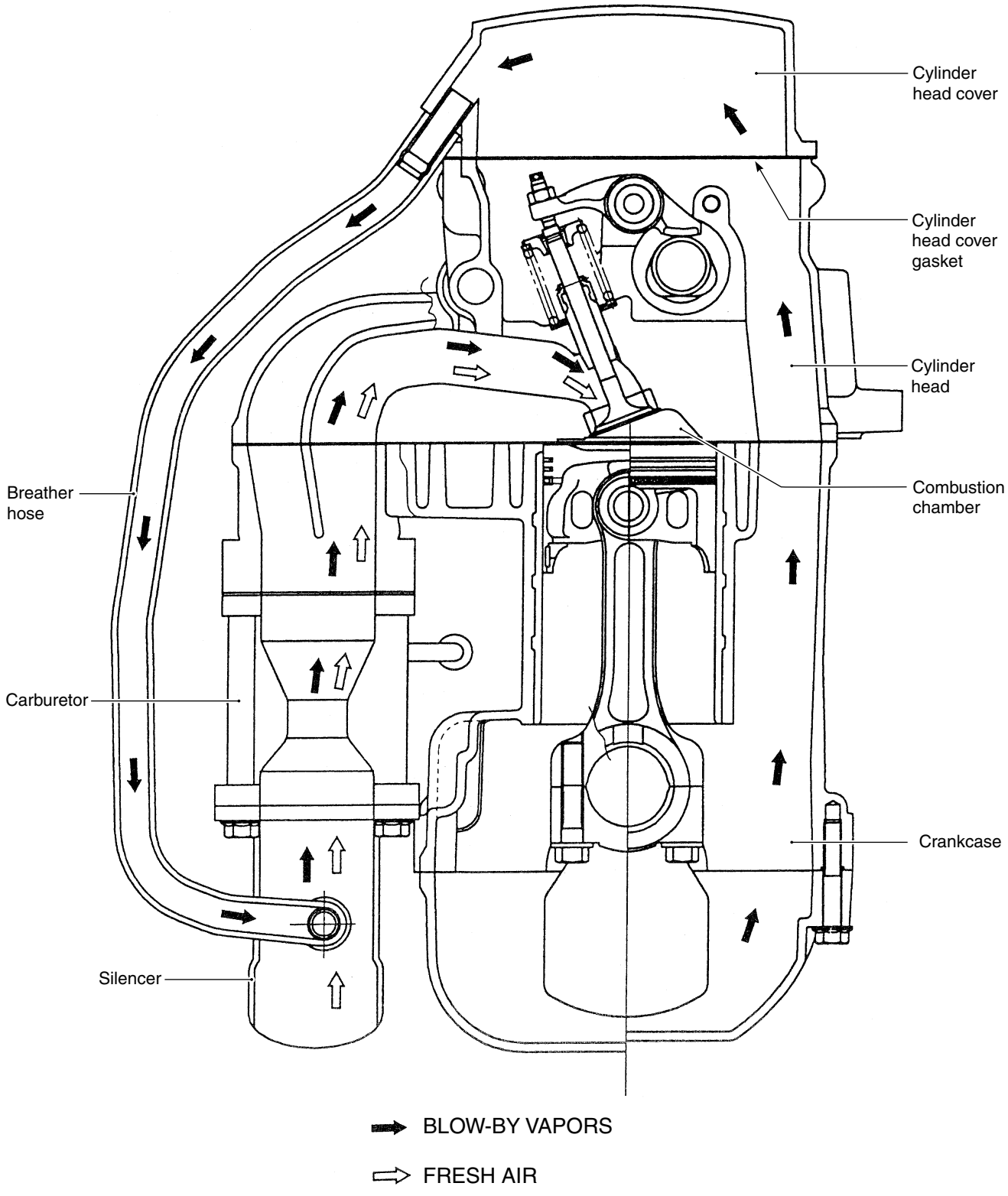
OIL PASSAGE LOCATION





CRANKCASE VENTILATION SYSTEM

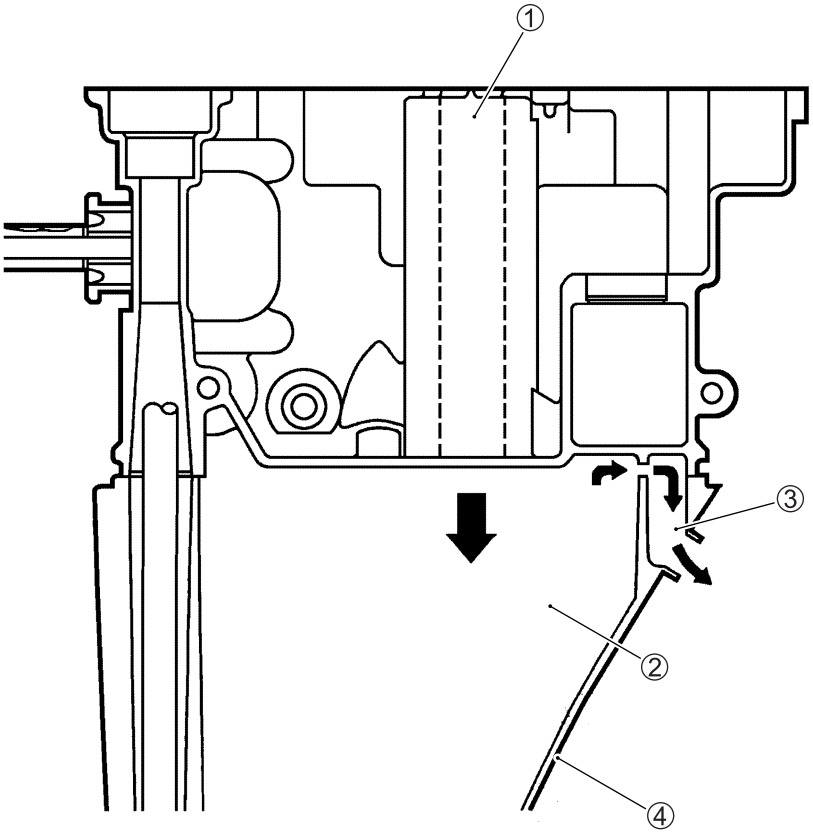
The blow-by vapors which is generated inside the crankcase is separated into the liquid and vapors components inside the space which is bounded by the head cover and the head cover gasket. Only the resulting vapors component is sent via the breather hose to the silencer. After this, it is mixed with fresh air, and the resulting mixture is drawn into the combustion chamber to improve combustion efficiency.



EXHAUST SYSTEM

A prop-hub exhaust system has been adopted. This is basically the same as the exhaust system which is employed in the two-stroke engines. A three-stage baffle chamber is located in the exhaust release circuit to reduce noise while trolling.

① Main exhaust passage
② 1st baffle chamber
③ 2nd baffle chamber
④ Driveshaft housing



MID UNIT

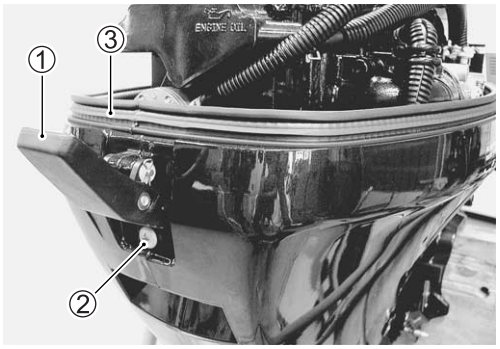
CONTENTS

ENGINE SIDE COVER 7- 2
REMOVAL 7- 2
INSTALLATION.....7- 3
TILLER HANDLE.....7- 4
REMOVAL/DISASSEMBLY 7- 4
REASSEMBLY/INSTALLATION.....7- 5
DRIVESHAFT HOUSING AND OIL PAN 7- 7
REMOVAL 7- 7
INSPECTION 7- 9
REASSEMBLY 7-10
SWIVEL BRACKET, STEERING BRACKET AND CLAMP BRACKET 7-13
REMOVAL/DISASSEMBLY 7-13
INSPECTION 7-15
REASSEMBLY 7-16

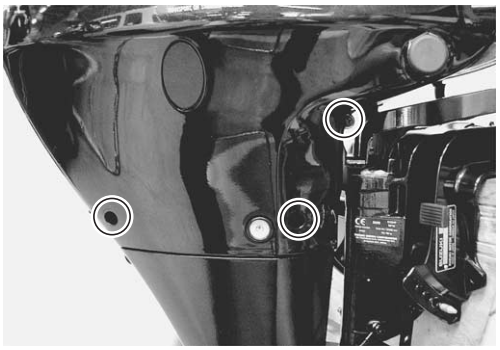
ENGINE SIDE COVER

REMOVAL

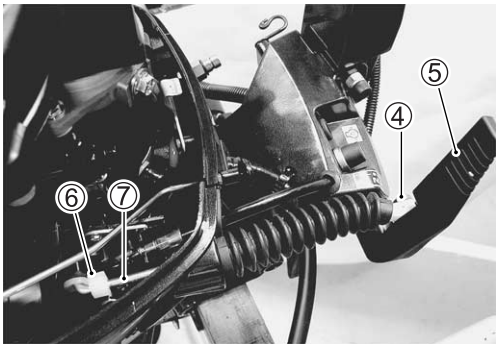
1. Remove the snap pin, the washer, the pin and the fastener ①.
   Remove the screw ②.
2. Remove the side cover rubber ③.



3. Remove the three side cover bolts.

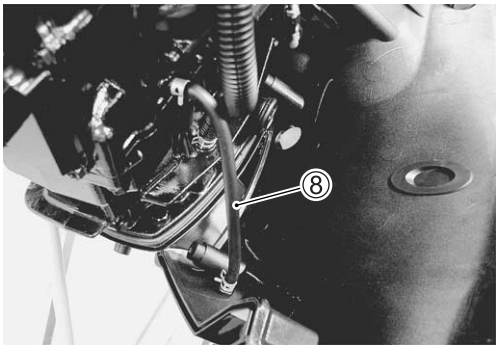


4. Remove the bolt ④ from the clutch lever ⑤.
5. Remove the connector ⑥ and the clutch lever link ⑦.



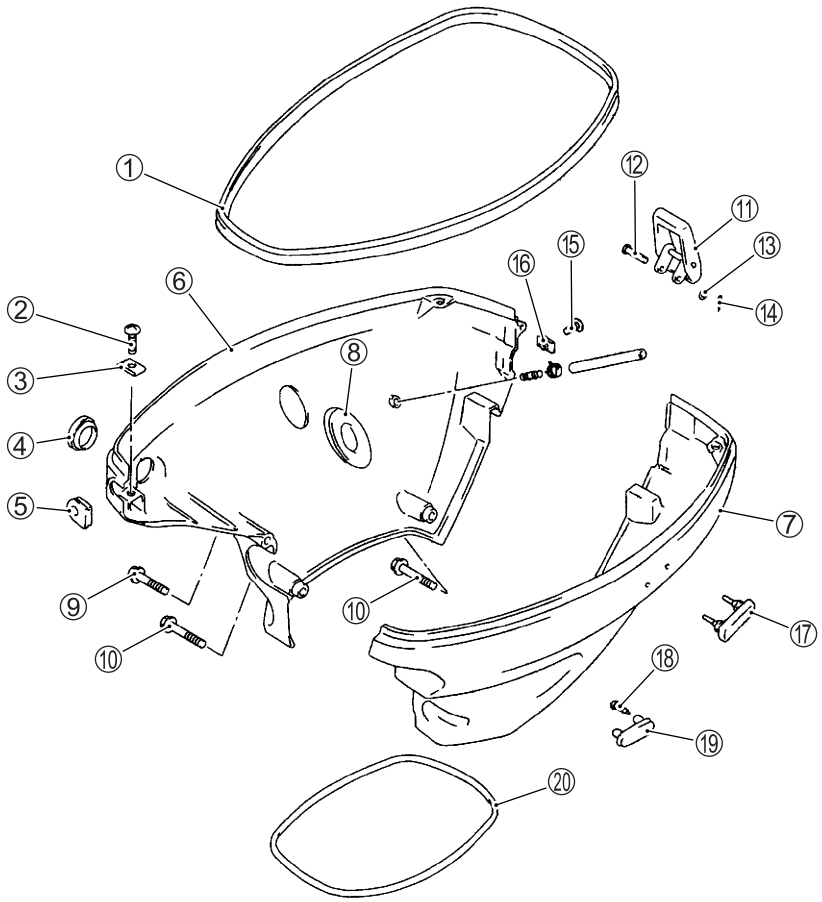
6. Remove the two screws and the engine side cover.

7. Disconnect the water hose ⑧.



INSTALLATION

Installation is revers order of removal.



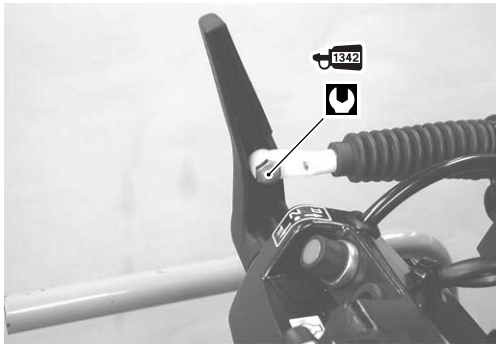
① Side cover rubber (1)
② Screw (2)
③ Nut (2)
④ Plug (1)
⑤ Remocon cable grommet (1)
⑥ Side cover (Starboard) (1)
⑦ Side cover (Port) (1)
⑧ Side cover plug (1)
⑨ Bolt (1)
⑩ Bolt (2)
⑪ Fastener (1)
⑫ Pin (1)
⑬ Washer (1)
⑭ Snap pin (1)
⑮ Screw (1)
⑯ Nut (1)
⑰ Protector (2)
⑱ Screw (4)
⑲ Protector (2)
⑳ Side cover seal (1)

Apply the THREAD LOCK to the clutch lever bolt.

1342 99000-32050: THREAD LOCK "1342"

Tighten the clutch lever bolt to the specified torque.

Clutch lever bolt: 8 N·m (0.8 kgf-m, 6.0 lb-ft)

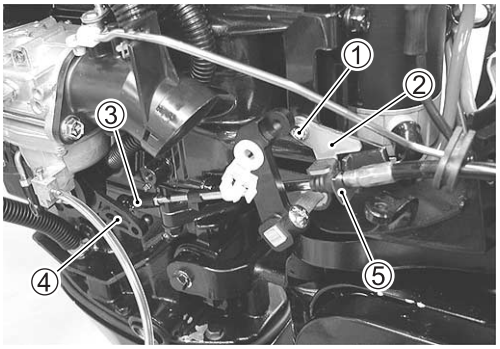


TILLER HANDLE

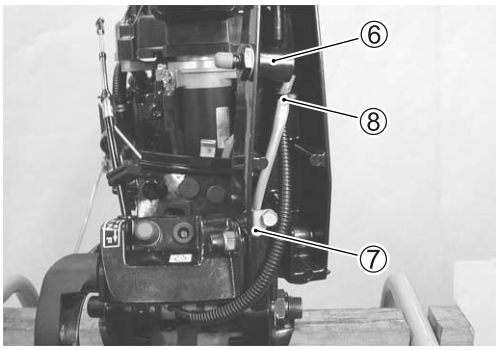
REMOVAL/DISASSEMBLY

REMOVAL

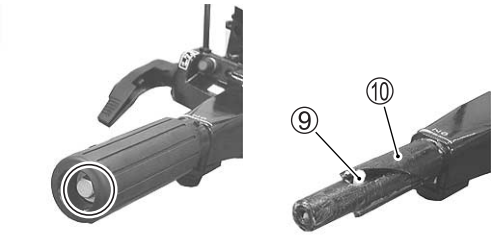
1. Remove the side cover.
2. Remove the screw ① and the throttle cable holder plate ②.
3. Unthread the connector ③ from the throttle drum ④.
   Detach the throttle cable from the throttle cable holder ⑤.



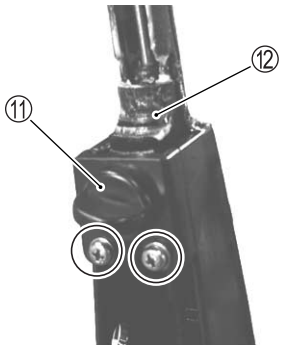
4. Remove the emergency/stop switch ⑥, the tiller handle stopper ⑦ and the clamp ⑧.



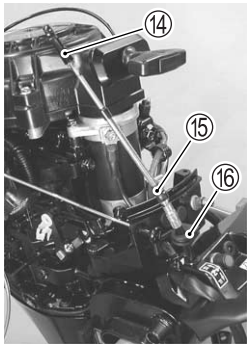
5. Remove the handle grip.
6. Pull out the pin ⑨ and remove the inner grip ⑩.



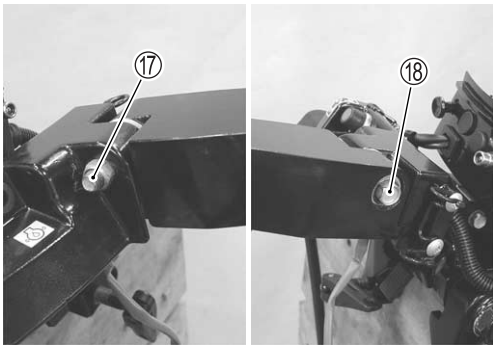
7. Remove the handle grip adjuster ⑪ and the slider ⑫.



8. Detach the throttle cable ⑬ from the tiller handle.
9. Remove the connector ⑭, the boot ⑮ and the grommet ⑯.
   Remove the throttle cable.



10. Remove the tiller handle nut ⑰.
11. Remove the tiller handle bolt ⑱ and the tiller handle.

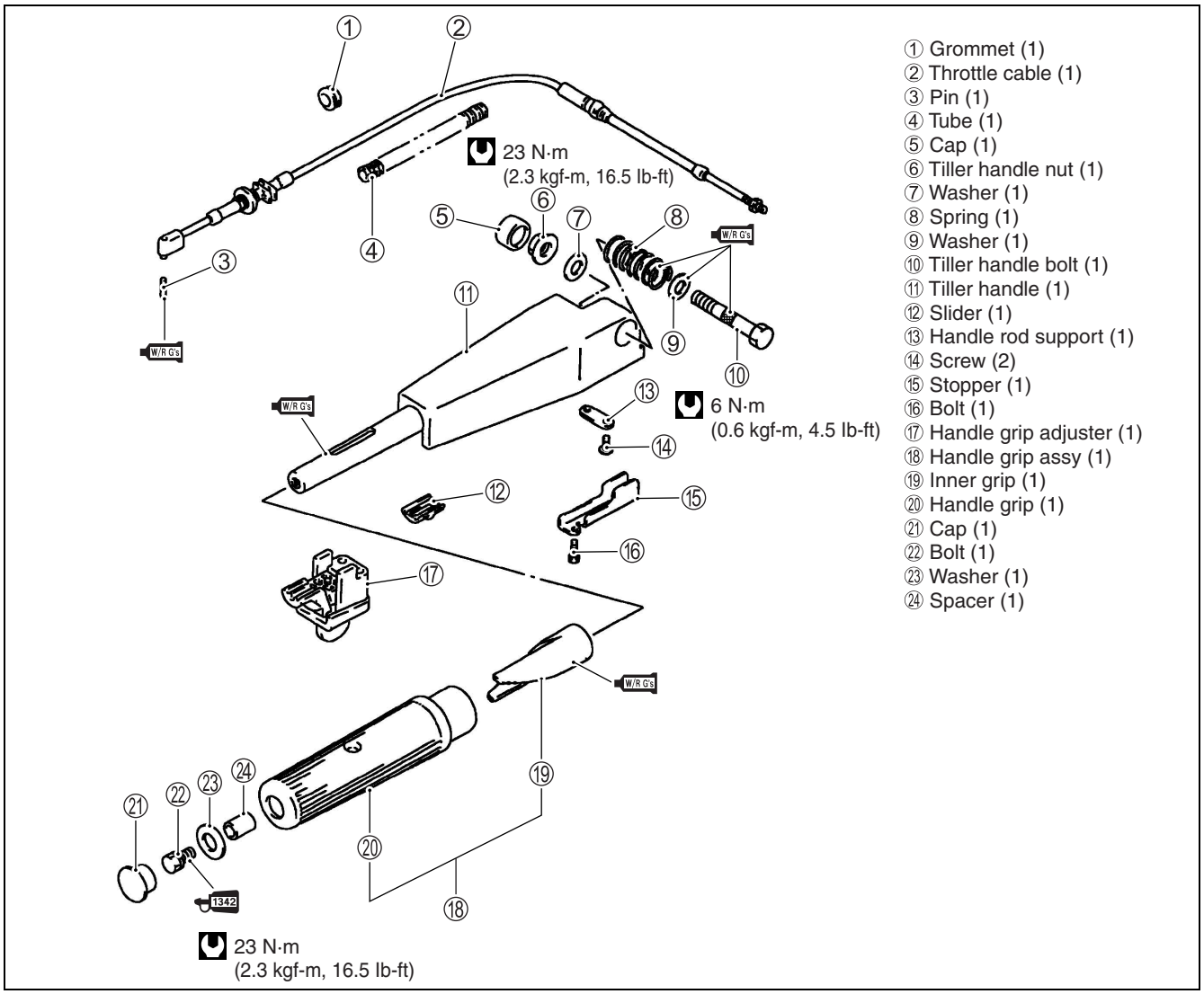


REASSEMBLY/INSTALLATION

REASSEMBLY

Assembly is revers order of disassembly.

When reassembling the tiller handle, refer to the construction diagram below.



① Grommet (1)
② Throttle cable (1)
③ Pin (1)
④ Tube (1)
⑤ Cap (1)
⑥ Tiller handle nut (1)
⑦ Washer (1)
⑧ Spring (1)
⑨ Washer (1)
⑩ Tiller handle bolt (1)
⑪ Tiller handle (1)
⑫ Slider (1)
⑬ Handle rod support (1)
⑭ Screw (2)
⑮ Stopper (1)
⑯ Bolt (1)
⑰ Handle grip adjuster (1)
⑱ Handle grip assy (1)
⑲ Inner grip (1)
⑳ Handle grip (1)
㉑ Cap (1)
㉒ Bolt (1)
㉓ Washer (1)
㉔ Spacer (1)

INSTALLATION

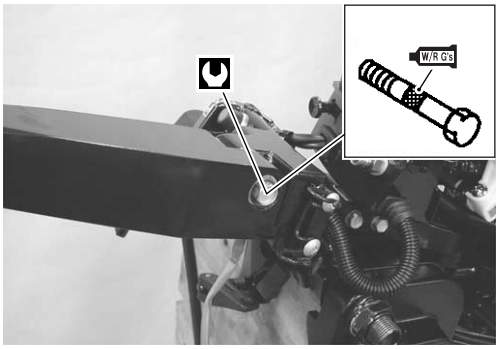
Installation is reverse order of removal with the special attention to the following steps.

Tiller handle assembly

- Apply the grease to the tiller handle bolt and tighten the bolt to the specified torque.

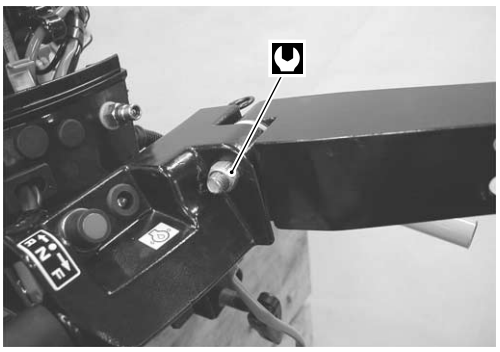
W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE

Handle pivot bolt: 6 N·m (0.6 kgf-m, 4.5 lb-ft)

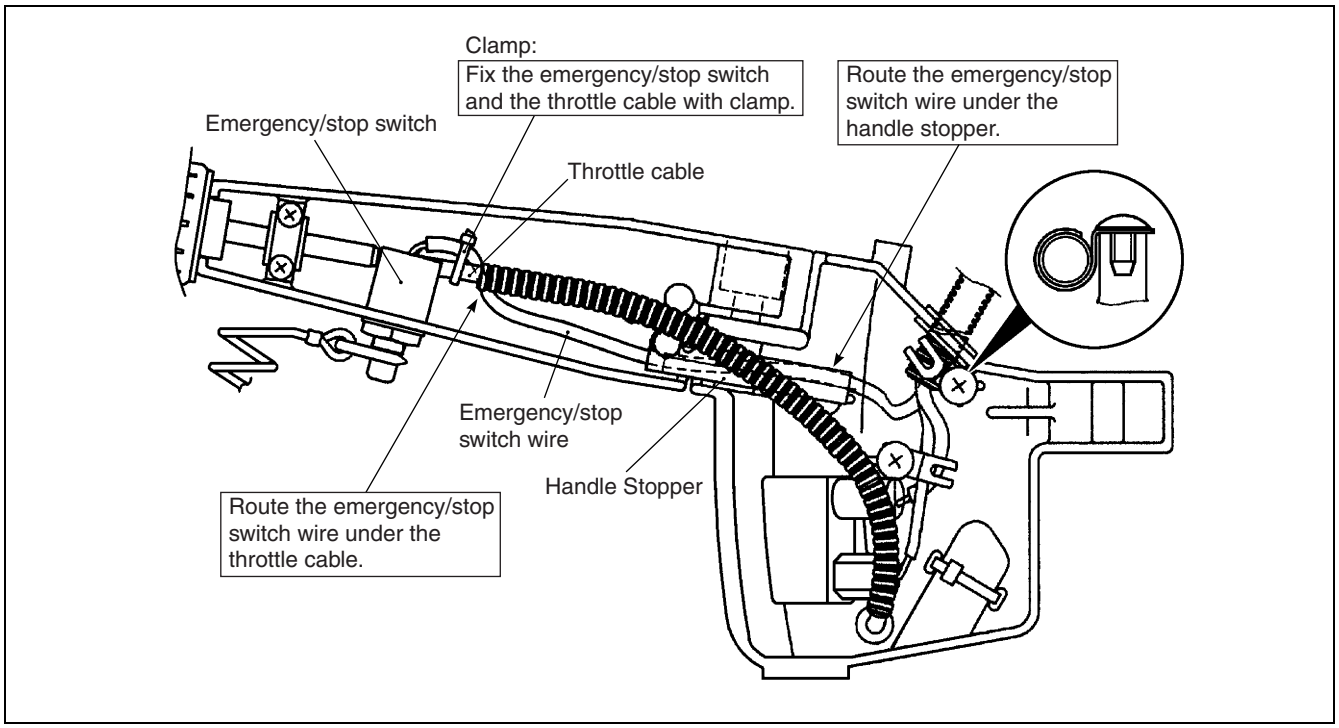


- Tighten the tiller handle nut to the specified torque.

Handle pivot nut: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



EMERGENCY/STOP SWITCH WIRE ROUTING



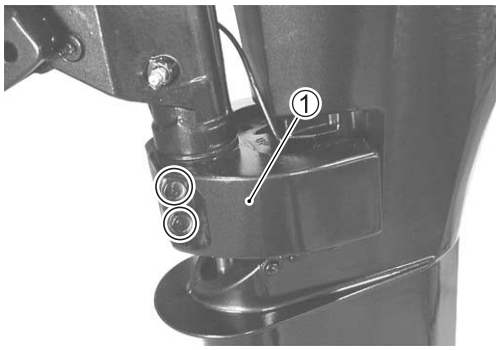
- Adjust the throttle control. (See page 4-11 and 4-12.)

DRIVESHAFT HOUSING AND OIL PAN

REMOVAL

1. Remove the power unit. (See page 6-2 to 6-4.)
2. Remove the lower unit. (See page 8-2.)
3. Remove the screw and the bonding wire from the swivel bracket.

4. Remove the two bolts and the lower mount cover ①. (Both sides)

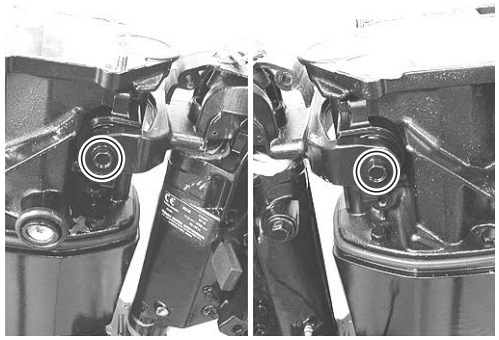


5. Remove the screw and the bonding wire from the lower mount cover. (STBD side)

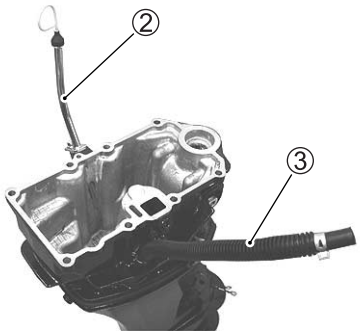
6. Remove two bolts and the driveshaft housing (with the oil pan).

⚠ WARNING

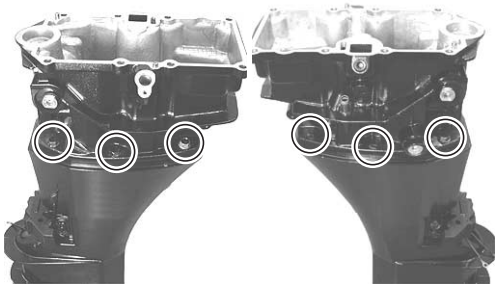
During the removing the upper mount bolts, the driveshaft housing must be firmly secured.



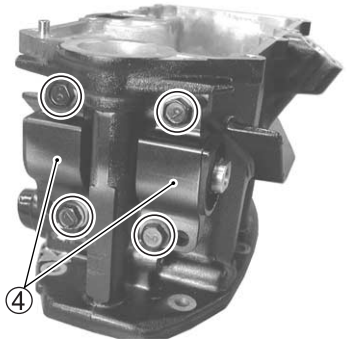
7. Remove the oil level gauge guide ② and the water hose ③.



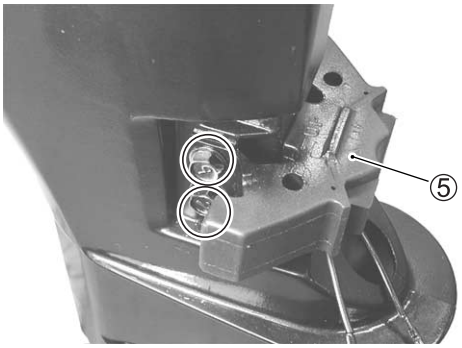
8. Remove the six bolts and the oil pan from the driveshaft housing.



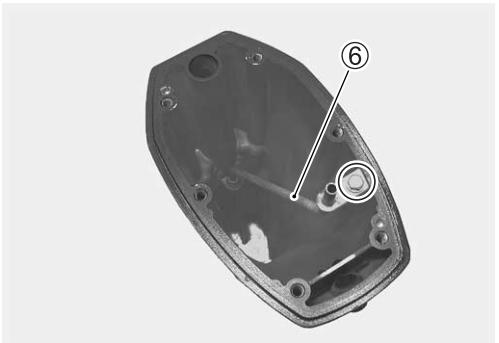
9. Remove the four bolts and the upper mounts ④.



10. Remove the four bolts and the lower mount ⑤.



11. Remove the water tube ⑥.



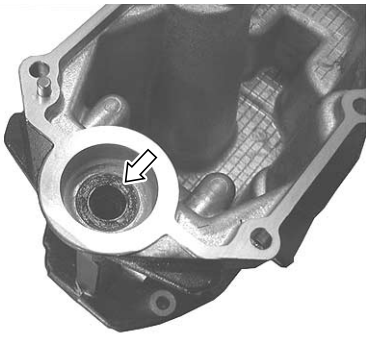
INSPECTION

NOTE:
If excessive wear, cracks, defective or other damage is found on any component, replace component.

OIL PAN AND DRIVESHAFT HOUSING
Inspect the oil pan and the driveshaft housing.
If crack, defective or other damage is found, replace.

MOUNT
Inspect the upper mount and the lower mount.
If excessively wear, corrosion or other damage is found, replace.

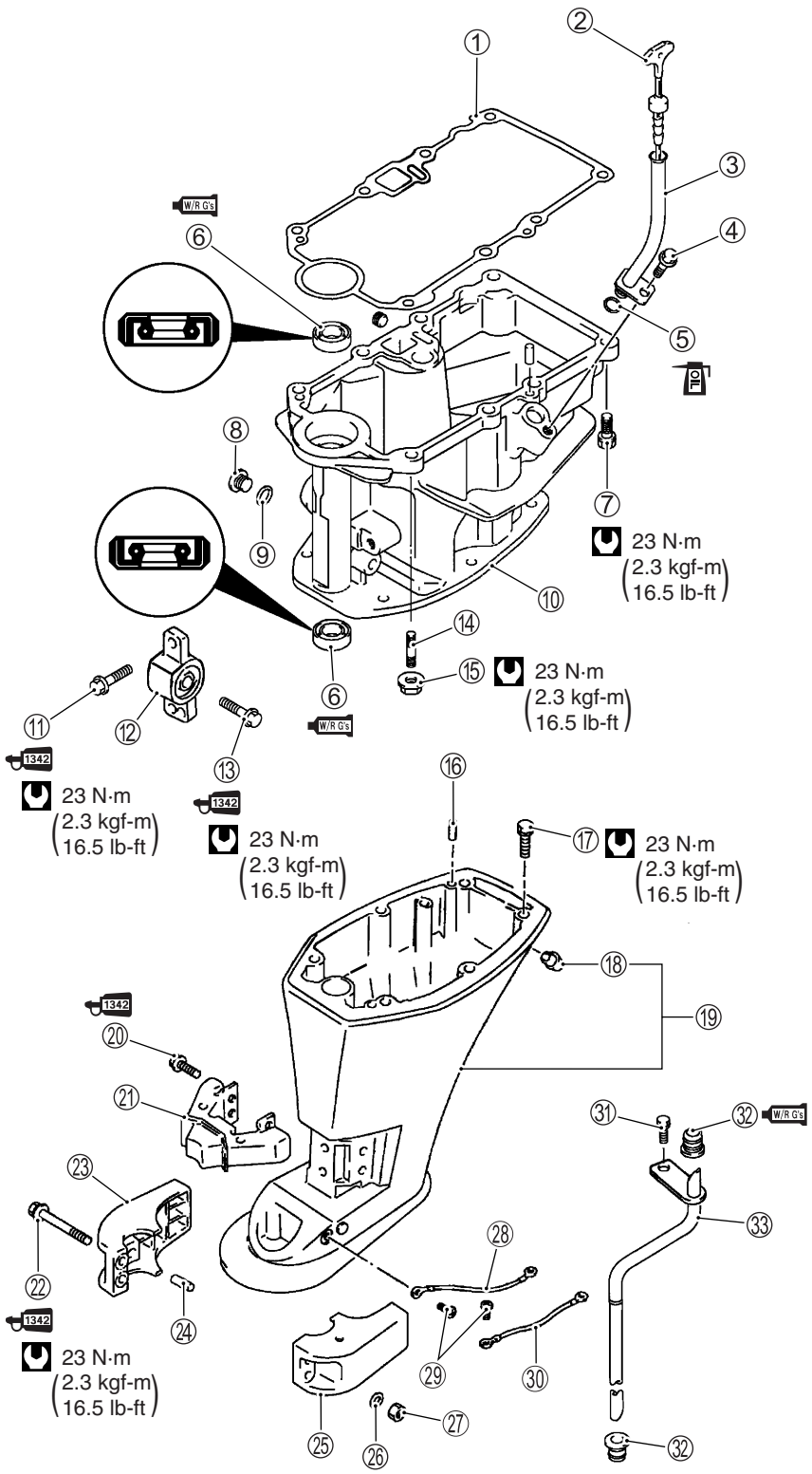
OIL SEAL
Inspect the oil seal.
If crack, cut or other damage is found, replace.



WATER TUBE
Inspect the water tube.
If clog is found, clean.
If crack, corrosion or other damage is found, replace.

REASSEMBLY

Reassembly is reverse order of removal with the special attention to the following steps.

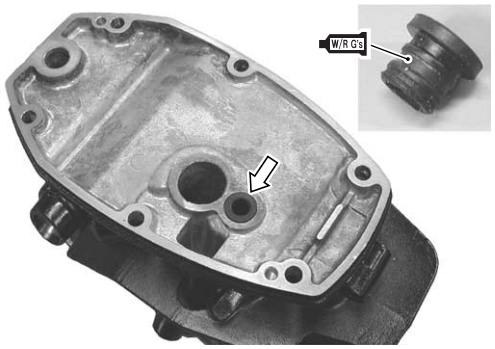


① Gasket (1)
② Oil level gauge (1)
③ Oil level gauge guide (1)
④ Bolt (1)
⑤ O-ring (1)
⑥ Oil seal (2)
⑦ Bolt (6)
⑧ Plug (2)
⑨ Gasket (2)
⑩ Oil pan assy (1)
⑪ Bolt (4)
⑫ Upper mount (2)
⑬ Bolt (2)
⑭ Stud bolt (2)
⑮ Nut (2)
⑯ Knock pin (2)
⑰ Bolt (6)
⑱ Pipe (1)
⑲ Driveshaft housing (1)
⑳ Bolt (4)
㉑ Lower mount (1)
㉒ Bolt (2)
㉓ Lower mount cover (STBD) (1)
㉔ Pin (2)
㉕ Lower mount cover (Port) (1)
㉖ Washer (2)
㉗ Nut (2)
㉘ Bonding wire (1)
㉙ Screw (2)
㉚ Bonding wire (1)
㉛ Bolt (1)
㉜ Grommet (2)
㉝ Water tube (1)

WATER TUBE UPPER GROMMET

- Apply the grease to the outer surface of the water tube upper grommet ①.

W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE



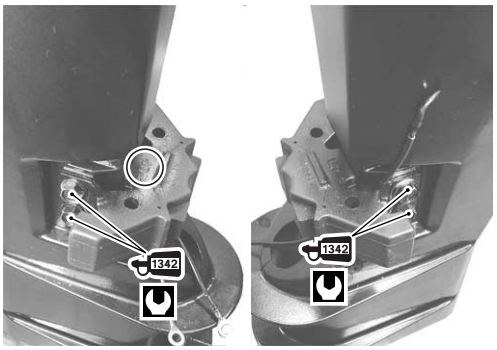
LOWER MOUNT

1. Install the lower mount with the lettered mark "UP" facing upward.
2. Apply the THREAD LOCK to the lower mount bolts.

1342 99000-32050: THREAD LOCK "1342"

3. Tighten the lower mount bolts to the specified torque.

Lower mount bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



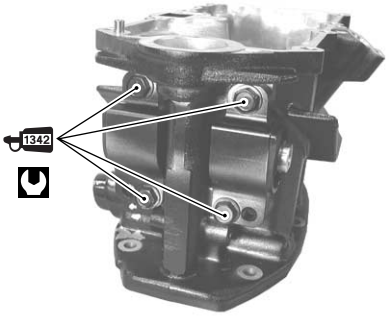
UPPER MOUNT

1. Apply the THREAD LOCK to the upper mount bolts.

1342 99000-32050: THREAD LOCK "1342"

2. Tighten the upper mount bolts to the specified torque.

Upper mount bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



OIL PAN AND DRIVESHAFT HOUSING

1. Install the two dowel pins to the driveshaft housing.

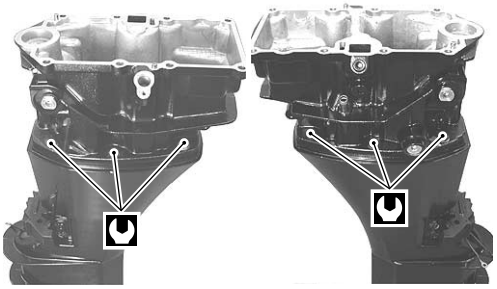
CAUTION

Do not re-use the gasket once removed. Always use a new gasket.

2. Install the oil pan to the driveshaft housing.

3. Tighten the driveshaft housing bolts to the specified torque.

Driveshaft housing bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



OIL LEVEL GAUGE GUIDE

- Install the O-ring ① to the oil level gauge guide and apply the engine oil to the O-ring ①.

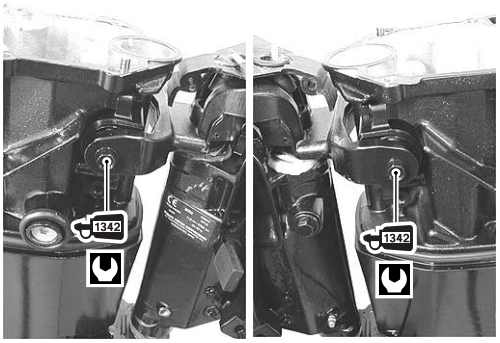
UPPER MOUNT BRACKET

1. Apply the THREAD LOCK to the upper mount bracket bolts.

1342 99000-32050: THREAD LOCK "1342"

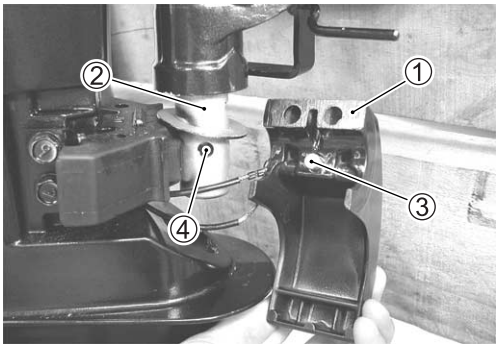
2. Tighten the upper mount bracket bolts to the specified torque.

Upper mount bracket bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



LOWER MOUNT COVER

When attaching the lower mount cover ① to the steering shaft ②, ensure that the pin ③ into the hole ④ of the steering shaft.

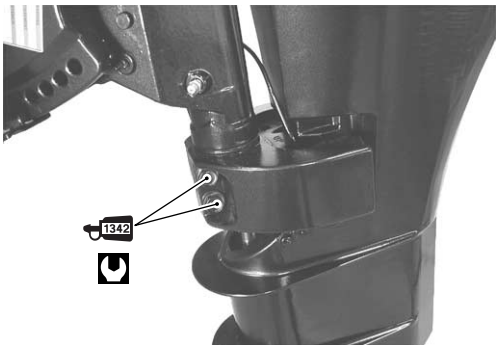


1. Apply the THREAD LOCK to the lower mount cover bolts.

1342 99000-32050: THREAD LOCK "1342"

2. Tighten the lower mount cover bolt to the specified torque.

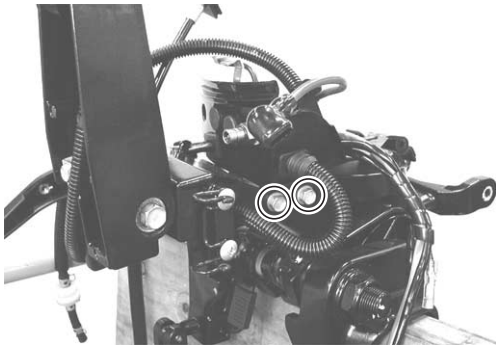
Lower mount cover bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



SWIVEL BRACKET, STEERING BRACKET AND CLAMP BRACKET

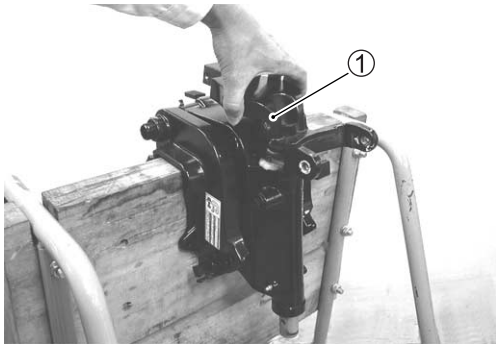
REMOVAL/DISASSEMBLY

1. Remove the driveshaft housing/oil pan. (See page 7-7.)
2. Remove two bolts.
   Remove the handle bracket (with the handle) and the instrument panel assy.

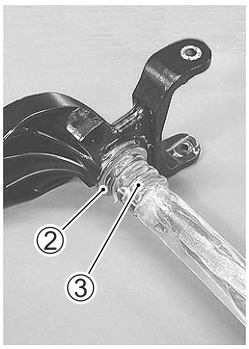


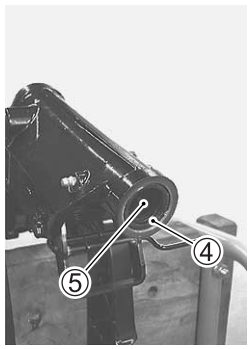
3. Loosen the steering adjuster bolt.

4. Lift the steering bracket ① upward to remove from the swivel bracket.

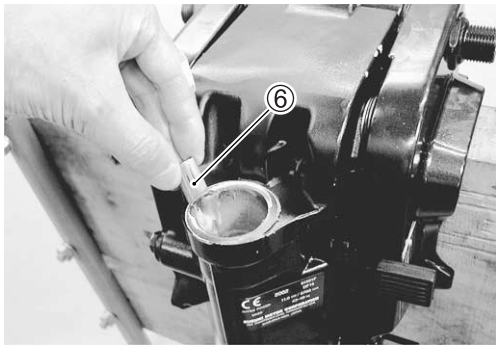


5. Remove the washer ② and the upper bushing ③.
6. Remove the O-ring ④ and the lower bushing ⑤.

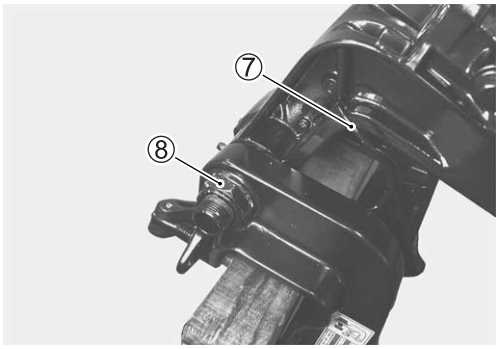




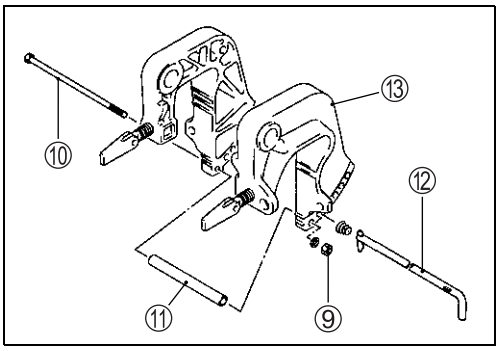
7. Detach the steering adjuster ⑥.



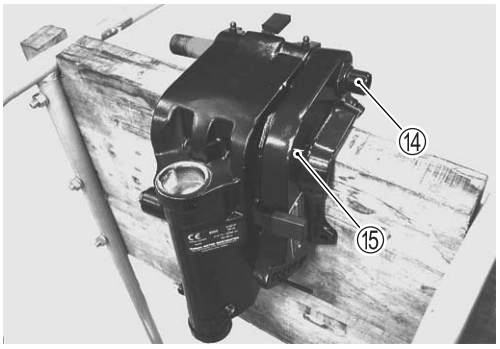
8. Remove the bonding wire ⑦.
9. Remove the nut ⑧.



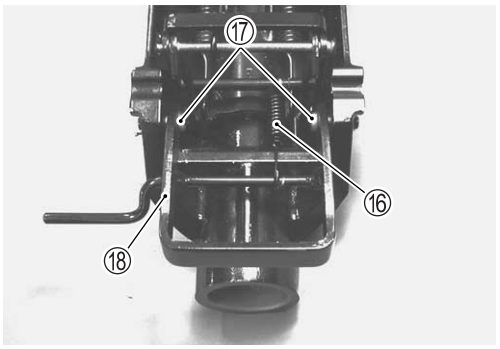
10. Remove the nut ⑨ and the bolt ⑩.
    Remove the spacer ⑪.
11. Remove the tilt lock pin ⑫.
12. Remove the port clamp bracket ⑬.



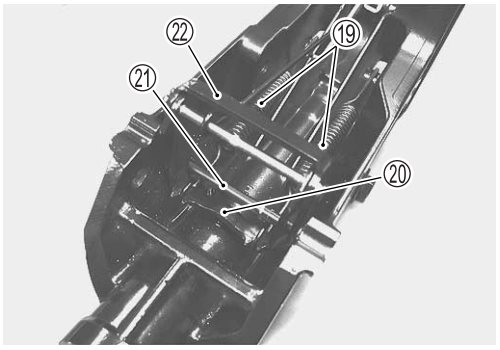
13. Remove the clamp bracket shaft ⑭ and the STBD clamp bracket ⑮.



14. Remove the shallow drive arm spring ⑯.
    Remove the shallow drive arm pins ⑰ and the shallow drive arm ⑱.



15. Remove the springs ⑲ from the reverse lock arm ⑳.
    Remove the reverse lock arm pin ㉑, the reverse lock arm link ㉒ and the reverse lock arm ⑳.



INSPECTION

NOTE:
If excessive wear, cracks, defective or damage is found on any component, replace component.

BUSHINGS
Inspect all bushings for excessive wear or other damage.
Replace if necessary.
If bushing fit is loose when installing, replace the bushing.

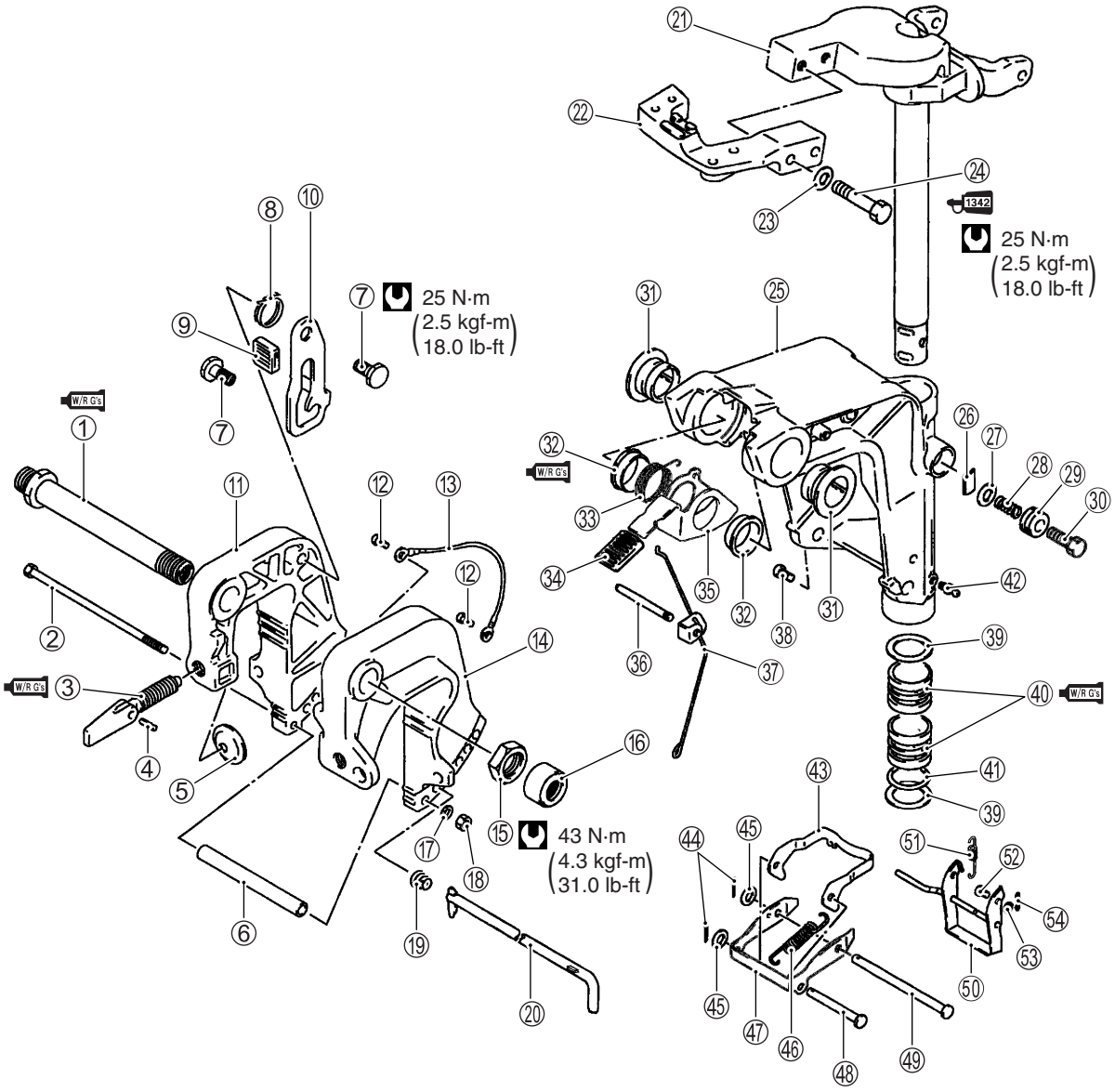
O-RING
Inspect swivel bracket O-ring for cuts, nicks, excessive wear or other damage.

CLAMP BRACKET SHAFT
Inspect the clamp bracket shaft for bend, twist or other damage.
Replace if necessary.

BRACKET
Inspect the clamp brackets, the steering bracket and the swivel bracket for excessive wear, cracks or other damage.
Replace if necessary.

REASSEMBLY

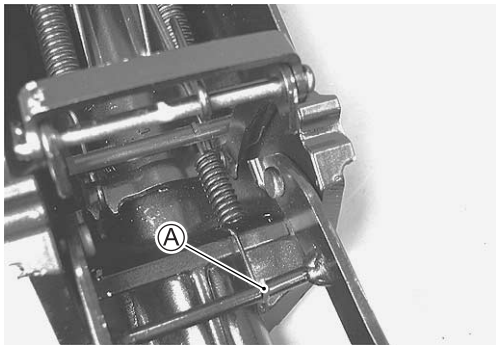
Reassembly is reverse order of removal with the special attention to the following steps.



① Clamp bracket shaft (1)
② Bolt (1)
③ Clamp screw (2)
④ Pin (2)
⑤ Clamp plate (2)
⑥ Spacer (1)
⑦ Bolt (2)
⑧ Spring (1)
⑨ Rubber (1)
⑩ Tilt lock arm (1)
⑪ Clamp bracket (STBD) (1)
⑫ Screw (2)
⑬ Bonding wire (1)
⑭ Clamp bracket (Port) (1)
⑮ Nut (1)
⑯ Seal (1)
⑰ Washer (1)
⑱ Nut (1)
⑲ Spring (1)
⑳ Tilt lock pin (1)
㉑ Steering bracket (1)
㉒ Steering bracket attachment (1)
㉓ Washer (2)
㉔ Bolt (2)
㉕ Swivel bracket (1)
㉕ Steering adjuster (1)
㉗ Washer (1)
㉘ Spring (1)
㉙ Cover (1)
㉚ Bolt (1)
㉛ Bushing
㉜ Bushing
㉝ Spring (1)
㉞ Rubber (1)
㉟ Release lever (1)
㊱ Release arm pin (1)
㊲ Release link (1)
㊳ Screw (1)
㊴ Washer (2)
㊵ Bushing (2)
㊶ O-ring (1)
㊷ Nipple (3)
㊸ Release lock arm (1)
㊹ Cotter pin (2)
㊺ Washer (2)
㊻ Spring (2)
㊼ Reverse lock arm link (1)
㊽ Pin (1)
㊾ Pin (1)
㊿ Shallow drive (1)
(51) Spring (1)
(52) Pin (2)
(53) Washer (2)
(54) Cotter pin (2)

SHALLOW DRIVE ARM SPRING

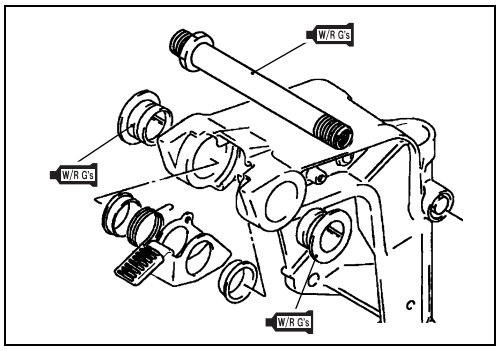
- Install the shallow drive arm spring as shown in the figure.
  Ⓐ Groove



CLAMP BRACKET AND SWIVEL BRACKET

Apply the grease to the clamp bracket shaft and the bushings.

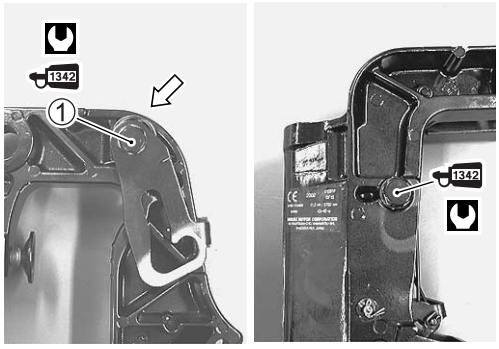
W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE



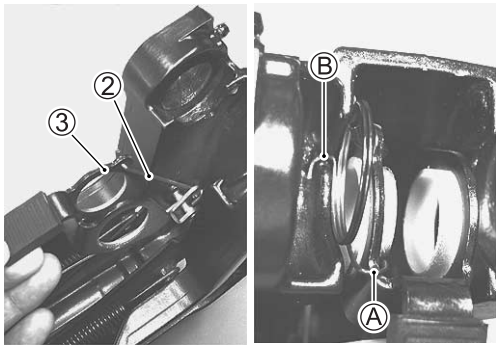
1. Install the tilt lock arm spring as shown in the figure.
   Apply the THREAD LOCK to the tilt lock arm bolt ① to the specified torque.

1342 99000-32050: THREAD LOCK "1342"

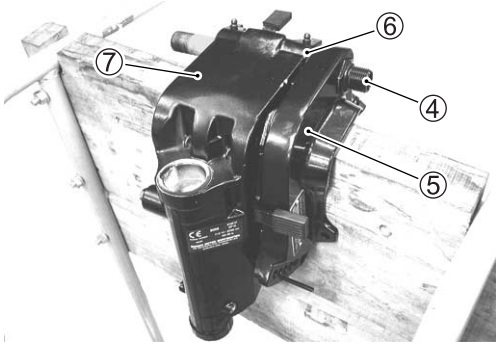
Tilt lock arm bolt: 25 N·m (2.5 kgf-m, 18.0 lb-ft)



2. Install the release link ② to the release lever ③.
   Hang the spring end Ⓐ on the release lever ③ and other spring end Ⓑ on groove of the swivel bracket.

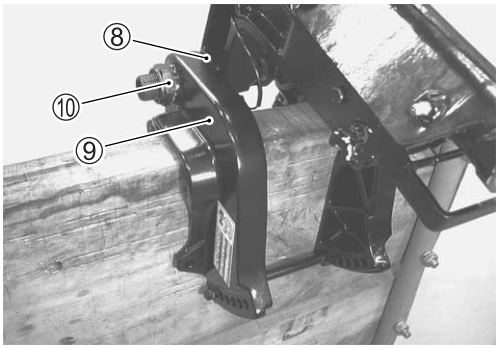


3. Assemble the clamp bracket shaft ④, the STBD clamp bracket ⑤, the bush ⑥ and the swivel bracket ⑦.

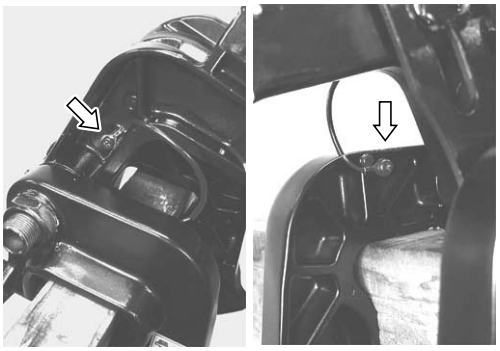


4. Install the bush ⑧, the port clamp bracket ⑨ and the clamp bracket shaft nut ⑩, then the nut to the specified torque.

Clamp bracket shaft nut: 43 N·m (4.3 kgf-m, 31.0 lb-ft)

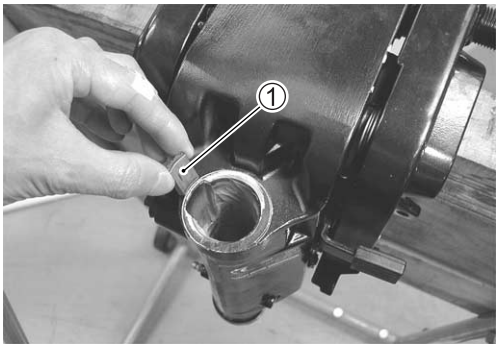


5. Reattach the bonding wires, then tighten the screw securely.



STEERING BRACKET

1. Install the steering adjuster ① to the swivel bracket.



2. Apply the grease to the bushing.

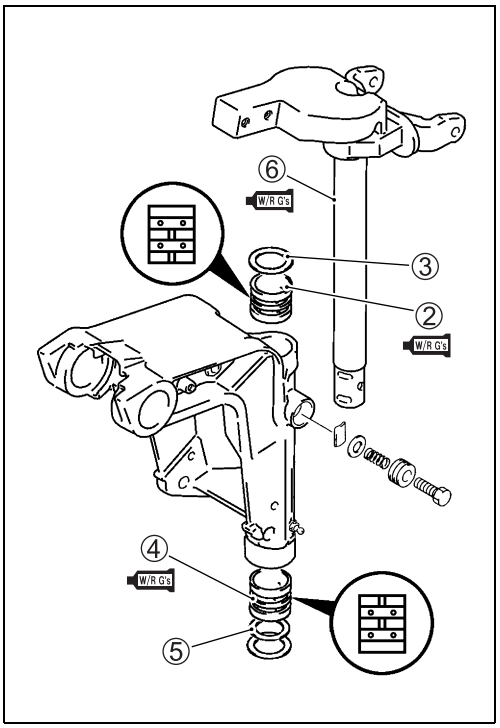
W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE

3. Install the upper bushing ② and the washer ③ to the swivel bracket.
4. Install the lower bushing ④ and the O-ring ⑤ to the swivel bracket.
5. Apply the grease to the steering bracket shaft.

W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE

NOTE:
Apply grease to the bushings, the O-ring and the pilot shaft portion of the steering bracket.

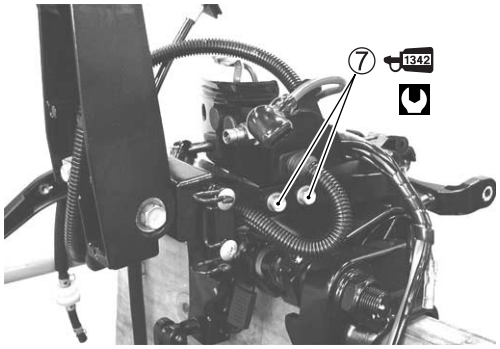
6. Install the steering bracket ⑥ to the swivel bracket.



7. Apply the THREAD LOCK to the steering bracket attachment bolts ⑦ to the specified torque.

1342 99000-32050: THREAD LOCK "1342"

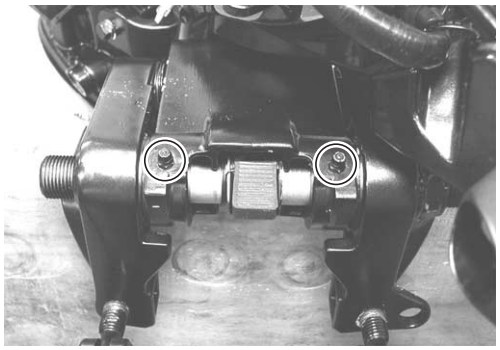
Steering bracket attachment bolt:
23 N·m (2.3 kgf-m, 16.5 lb-ft)



LUBRICATION

After completing reassembly of the mid unit, apply Water Resistant Grease through each grease nipple.

W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE



LOWER UNIT

CONTENTS

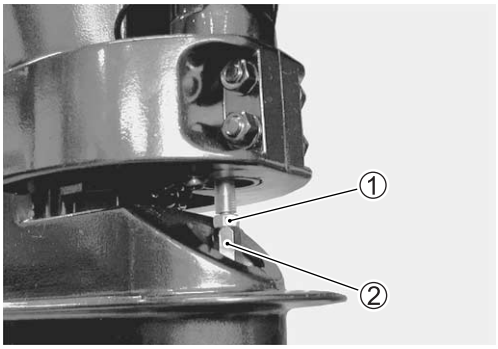
REMOVAL & DISASSEMBLY 8- 2
PINION BEARING 8- 6
INSPECTION 8- 8
PROPELLER 8- 8
GEARCASE 8- 8
GEARS 8- 8
PROPELLER SHAFT COMPONENTS 8- 9
PROPELLER SHAFT BEARING HOUSING 8- 9
SHIFT ROD GUIDE HOUSING COMPONENTS 8-10
WATER PUMP AND RELATED ITEMS 8-10
WATER INLET HOUSING 8-10
DRIVESHAFT 8-11
ASSEMBLY & INSTALLATION 8-12
LOWER UNIT GEARS- SHIMMING AND ADJUSTMENT 8-21
FOREWARD GEAR/PINION GEAR 8-21
PINION GEAR/REVERSE GEAR 8-23
CHECKING PROPELLER SHAFT THRUST PLAY 8-24

REMOVAL & DISASSEMBLY

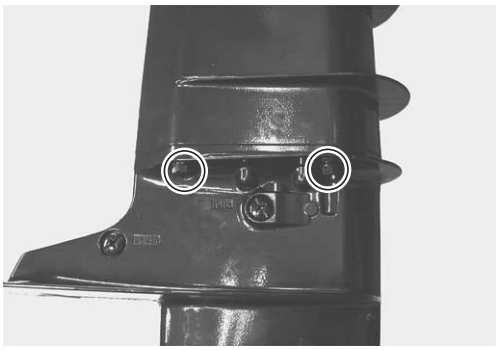
⚠ WARNING

Before removing the lower unit, disconnect the battery cable.

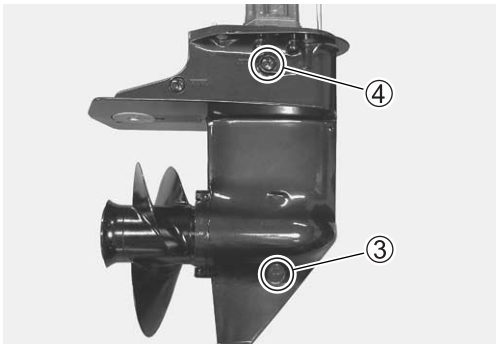
1. Loosen the clutch rod lock nut ①.
   To separate the clutch rod from the shift rod, unscrew the turnbuckle ②.



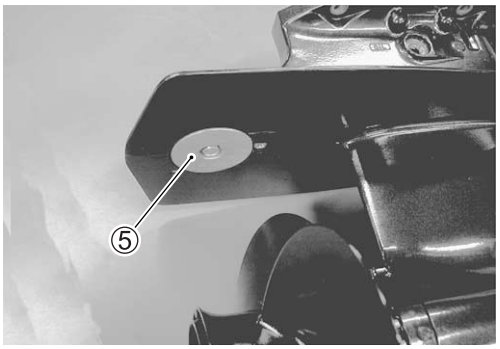
2. Remove the four bolts and separate the gearcase from the driveshaft housing.



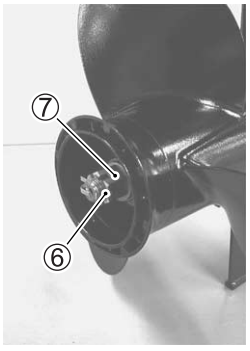
3. Place a drain pan under the oil drain plug.
   Remove the oil drain plug ③ first, then the oil level plug ④, and allow gear oil to drain.

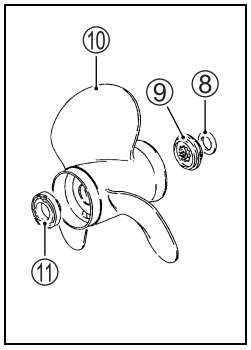


4. Remove the bolt and the zinc ⑤ (if necessary).



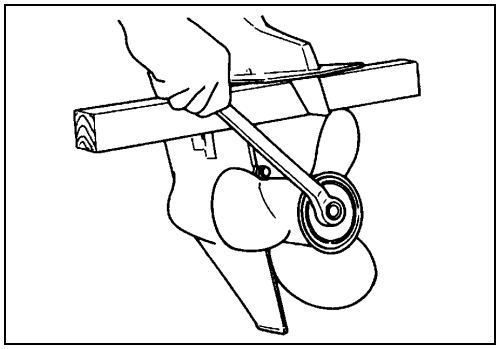
5. Remove the cotter pin ⑥ from the propeller shaft and remove the propeller nut ⑦.
6. Remove the washer ⑧, the spacer ⑨, the propeller ⑩ and the stopper ⑪ from the propeller shaft.



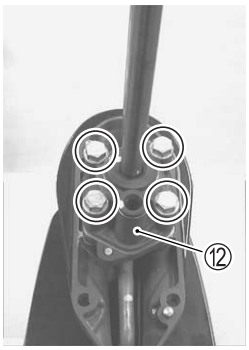


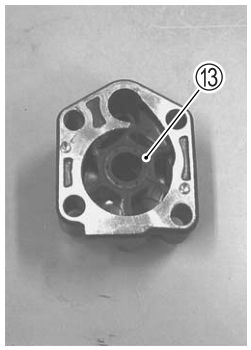
⚠ WARNING

To prevent injury from the propeller blades, wear gloves and place a block of wood between the anti-cavitation plate and the propeller blade tips to lock the propeller in place.

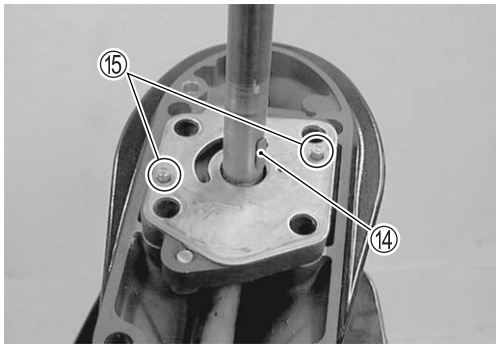


7. Remove the four bolts then remove the water pump case ⑫ and the impeller ⑬.

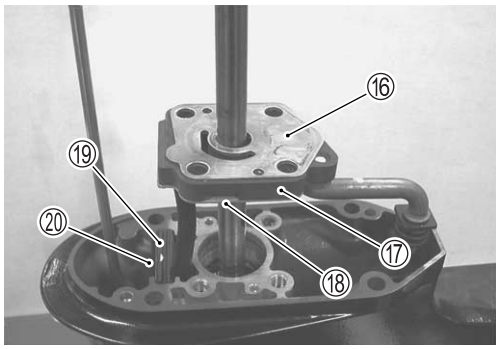




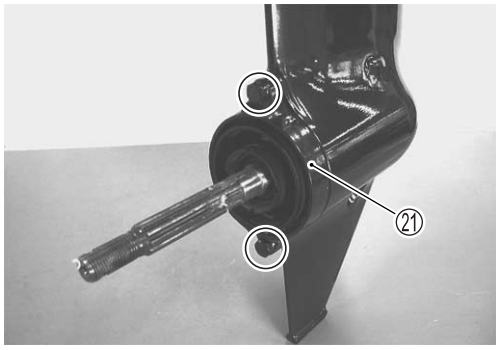
8. Remove the key ⑭ and the dowel pins ⑮.



9. Remove the under panel ⑯, under the panel gasket, the water inlet housing ⑰, the gasket ⑱, the exhaust seal rubber ⑲ and the exhaust seal core ⑳.

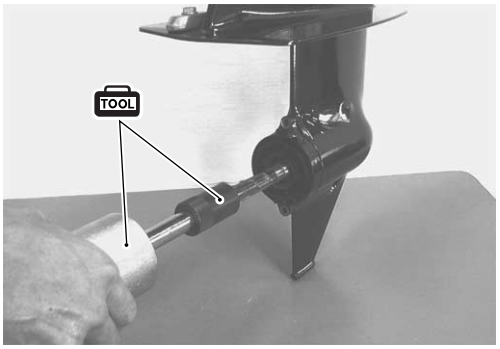


10. Remove the two bolts securing the propeller shaft bearing housing ㉑ to the gearcase.

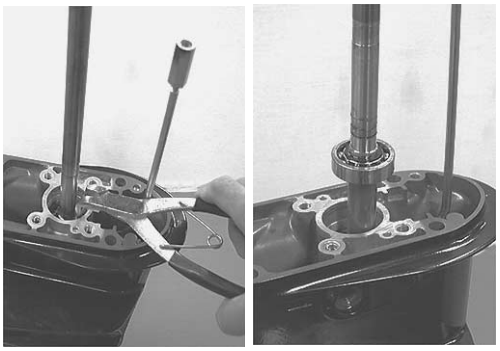


11. Using the special tools, draw out propeller shaft and the bearing housing assembly.

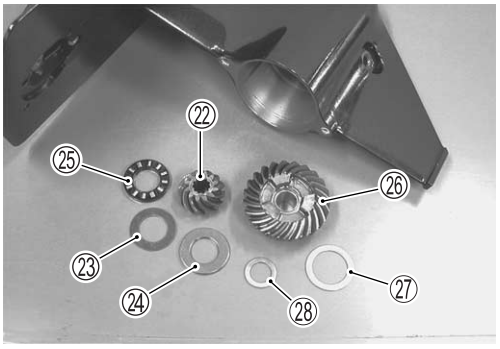
TOOL 09930-30104: Sliding hammer
09950-59320: Propeller shaft remover



12. Remove the circlip from the driveshaft.
Lift out the driveshaft assy.



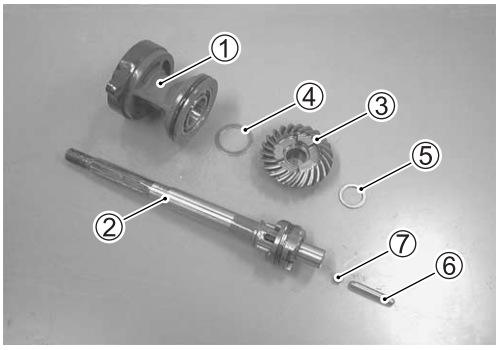
13. Remove the pinion gear ㉒, the pinion gear back up shim ㉓, the washer ㉔, and the thrust bearing ㉕.
14. Remove the forward gear ㉖, the thrust washer ㉗ and the forward gear back-up shim ㉘.



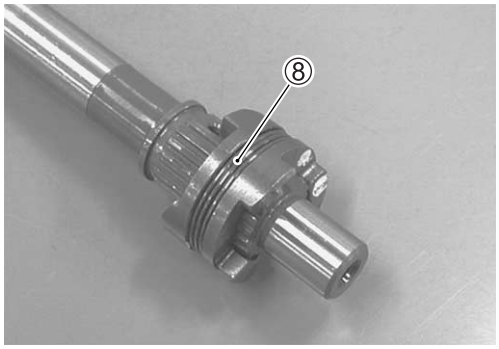
15. Remove the nut and the shaft rod assembly.

Disassembly of propeller shaft component

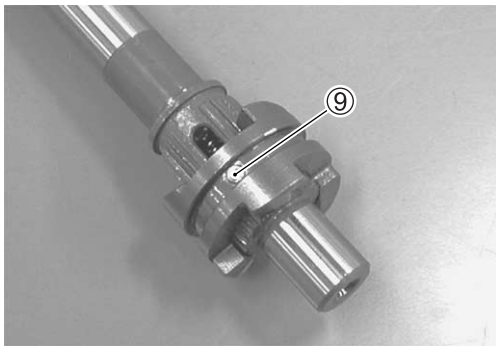
1. Separate the propeller shaft bearing housing ①, the propeller shaft ② (with the clutch dog shifter), the reverse gear ③, the reverse gear back up shim ④, the thrust washer ⑤, the push rod ⑥ and the push pin ⑦.



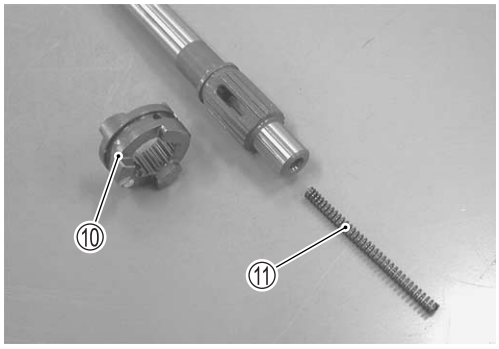
2. Remove the spring ⑧ from the clutch dog shifter.



3. Remove the dog pin ⑨.

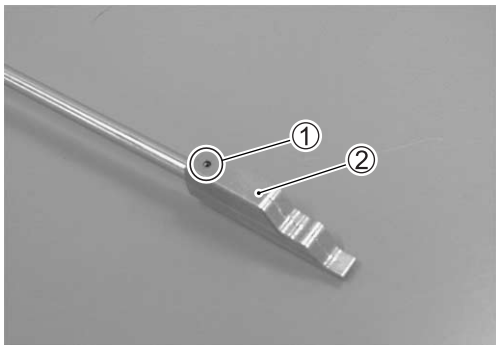


4. Remove the clutch dog shifter ⑩, and the spring ⑪.

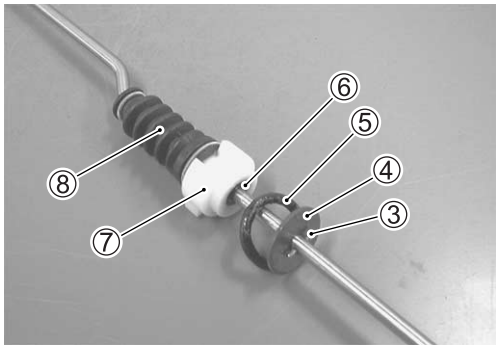


Disassembly of shift rod components

1. Push the pin ① and remove the clutch cam ②.

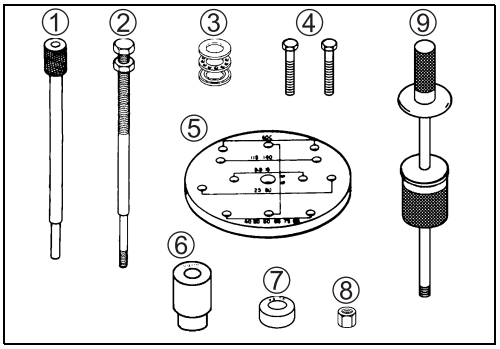


2. Remove the pin ③, the washer ④, the O-ring ⑤, the O-ring ⑥, the shift rod guide ⑦ and the boot ⑧.



PINION BEARING

Removal/installation is in the following procedure.



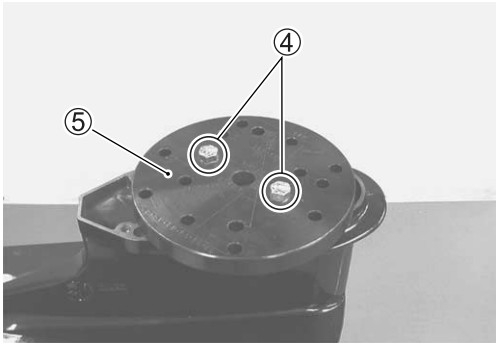
Removal & Installation tools

09951-59910: Shaft (Installation) ①
09551-49910: Shaft (Removal) ②
09951-69910: Bearing ③
01500-08403: Bolt ④
09951-39914: Plate ⑤
09951-19311: Attachment ⑥
09951-79311: Spacer (Attachment) ⑦
09951-29910: Nut ⑧
09930-30104: Sliding hammer ⑨

REMOVAL

1. Set the plate ⑤ on the gearcase with the two bolts ④.

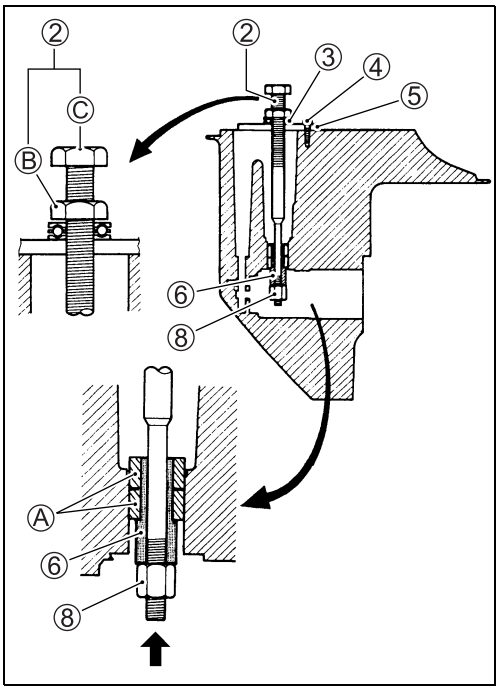
NOTE:
Using the two water pump bolt holes.



2. Set the shaft (removal) ②, the bearing ③, the attachment ⑥ and the nut ⑧ as shown.
3. To push the pinion bearings Ⓐ out of the gearcase, turn the lower nut Ⓑ clockwise while holding the bolt Ⓒ tightly.

CAUTION

Do not re-use the pinion bearing once removed.
Always use a new pinion bearing.

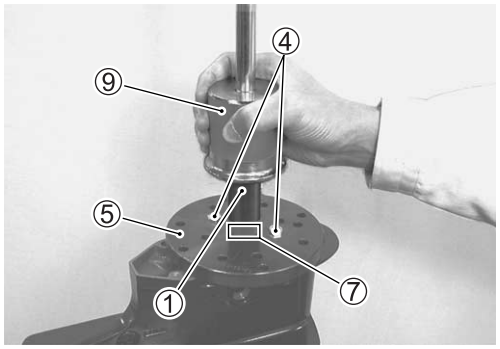


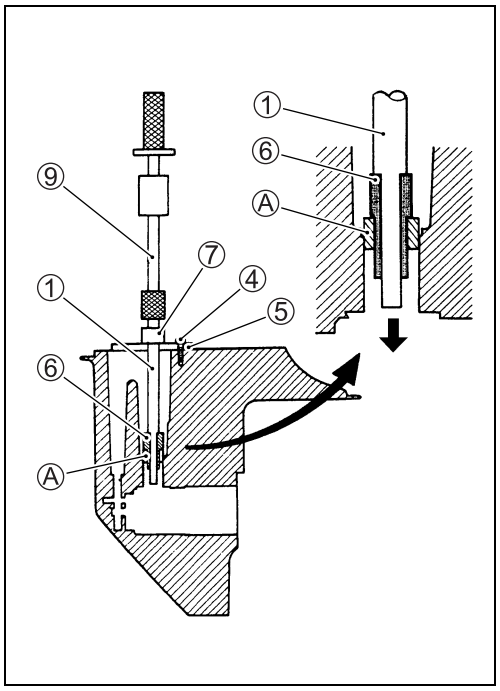
INSTALLATION

CAUTION

*** Before installing the bearing, ensure that the inside of the gearcase is clean and free of debris.**
*** Ensure that the bearing stamped mark faces upward.**

1. Set the shaft installation ①, the plate ⑤, the spacer ⑦, the attachment ⑥ and the pinion bearing Ⓐ as shown in the figure.
2. Place the shaft ① (with the pinion bearing Ⓐ on the end of the shaft) into the gearcase.
3. Secure the plate ⑤ by tightening the bolts ④.
4. Thread the sliding hammer ⑨ into the top of the shaft ①.
5. Drive the pinion bearing Ⓐ down into position by gently striking the shaft ① until the coupler touches the plate ⑤.
6. Repeat Nos. 4 – 8 to install the second bearing.





INSPECTION

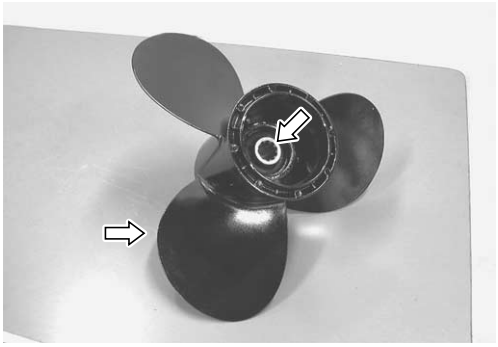
NOTE:
Thoroughly wash all metal components with cleaning solvent and dry with compressed air.

⚠ WARNING

Wear the safety grasses when using compressed air.

PROPELLER

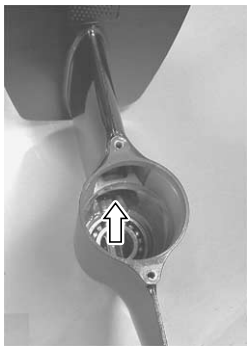
- Inspect the propeller for bent, chipped or broken blades. Replace or repair if necessary.
- Inspect the propeller bushing splines for wear or other damage. Replace if necessary.
- Inspect the propeller bushing for deterioration or slipping. Replace if necessary.



GEARCASE

- Inspect the gearcase for cracks or other damage. Replace if necessary.
- Inspect the pinion bearing for pitting, rough or other damage. Replace if necessary.

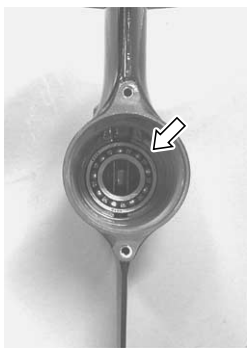
NOTE:
If removal and replacement are required, see the "PINION BEARING" section on page 8-6.



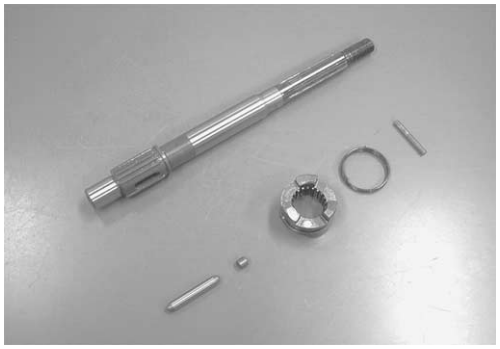
GEARS

- Inspect the forward gear, the reverse gear and the pinion gear teeth and engaging dogs for excessive wear or other damage. Replace if necessary.

- Inspect the thrust bearing and the forward gear bearing for pitting, rough or other damage. Replace if necessary.



PROPELLER SHAFT COMPONENTS

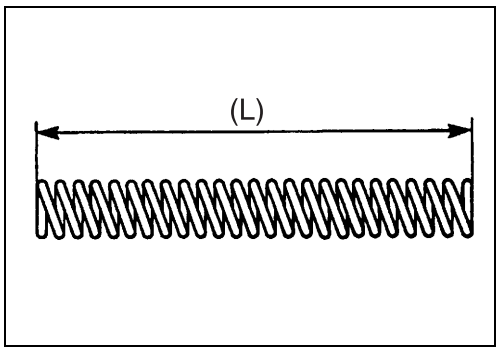


- Inspect the push rod and push rod pin for excessive wear or other damage. Replace if necessary.
- Inspect the clutch dog shifter for excessive wear, chip or other damage. Replace if necessary.
- Inspect the dog pin for bent or other damage. Replace if necessary.
- Inspect the propeller shaft/splines for wear, twist or other damage. Replace if necessary.

- Measure the clutch return spring free length.

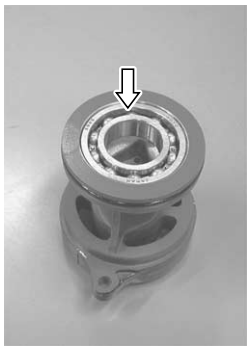
09900-20101: Vernier calipers

Clutch return spring free length (L)
Standard: 67 mm (2.6 in)
Service limit: 64 mm (2.5 in)



If the measurement exceeds the service limit, replace the clutch return spring.

PROPELLER SHAFT BEARING HOUSING

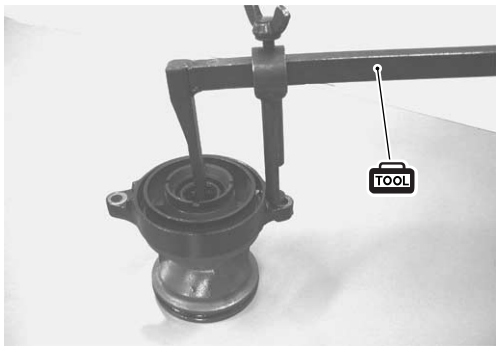


- Inspect the housing for cracks or other damage. Replace if necessary.
- Inspect the propeller shaft bearings and the reverse gear bearing for pitting, rough or other damage. Replace if necessary.
- Inspect the oil seals and the O-ring for cuts, nicks or tears.

Replacing propeller shaft oil seal

1. Extract the oil seals ③ using the oil seal remover.

09913-50121: Oil seal remover

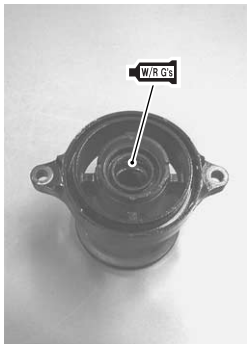


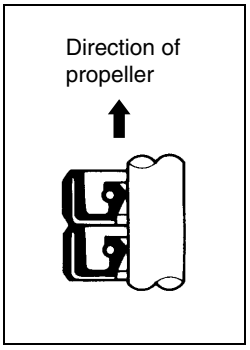
CAUTION

Do not re-use the oil seal once removed.
Always use a new oil seal.

2. Apply the grease to the inner circumference of the housing.
3. Using an oil seal installer, drive two oil seals (one at a time) into the housing.
   The lipped portion of the seal should face toward the propeller.
   Apply the grease to the seal lips.

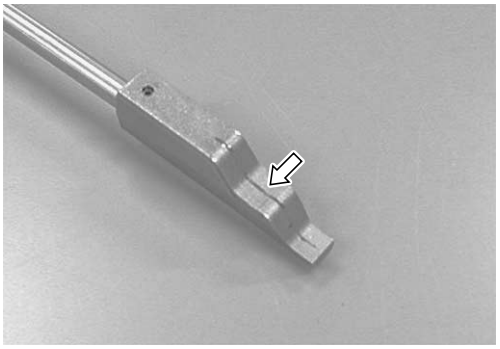
99000-25160: SUZUKI WATER RESISTANT GREASE





SHIFT ROD GUIDE HOUSING COMPONENTS

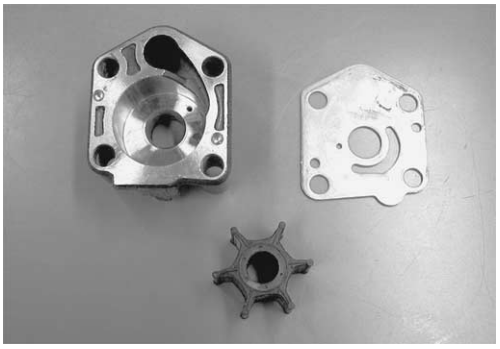
- Inspect the “stepped” surfaces of the shift cam for excessive wear, chip or other damage. Replace if necessary.



- Inspect the shift rod guide for excessive wear, pit, corrosion or stiff. Replace if necessary.
- Inspect the O-ring for wear, cuts, nicks or tears.
- Inspect the boot for cracked or other damage

WATER PUMP AND RELATED ITEMS

- Inspect the impeller vanes for cuts, cracks, tears or excessive wear. Replace if necessary.
- Inspect the pump case and the under panel for cracks, distortion or corrosion. Replace if necessary.



WATER INLET HOUSING

- Inspect the housing for cracks or other damage. Replace of necessary.
- Inspect the oil seal for wear, cuts, nicks of tears.

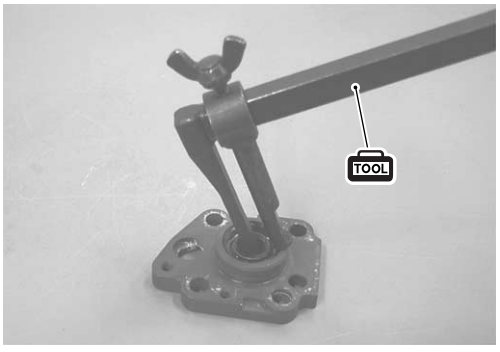
Replacing oil seal

1. Extract the oil seal using the oil seal remover.

TOOL 09913-50121: Oil seal remover

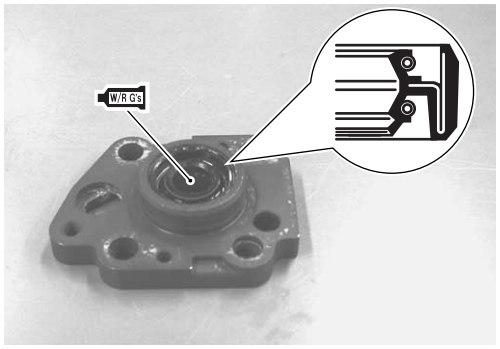
2. Apply the water resistant grease to the inner circumference of the housing.

W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE



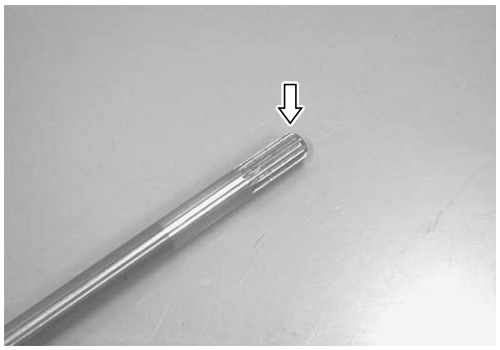
3. Using an oil seal installer, drive the oil seal into the housing.
   The lipped portion of the seal should face toward the water pump case.
   Apply the grease to the seal lips.

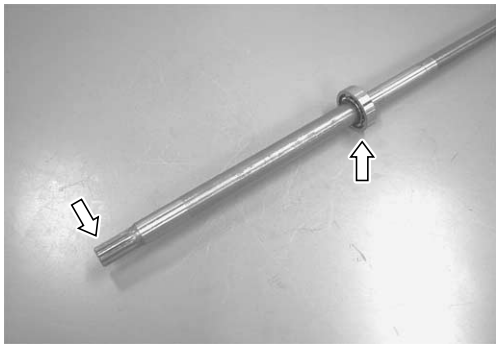
W/R G's **99000-25160: SUZUKI WATER RESISTANT GREASE**



DRIVESHAFT

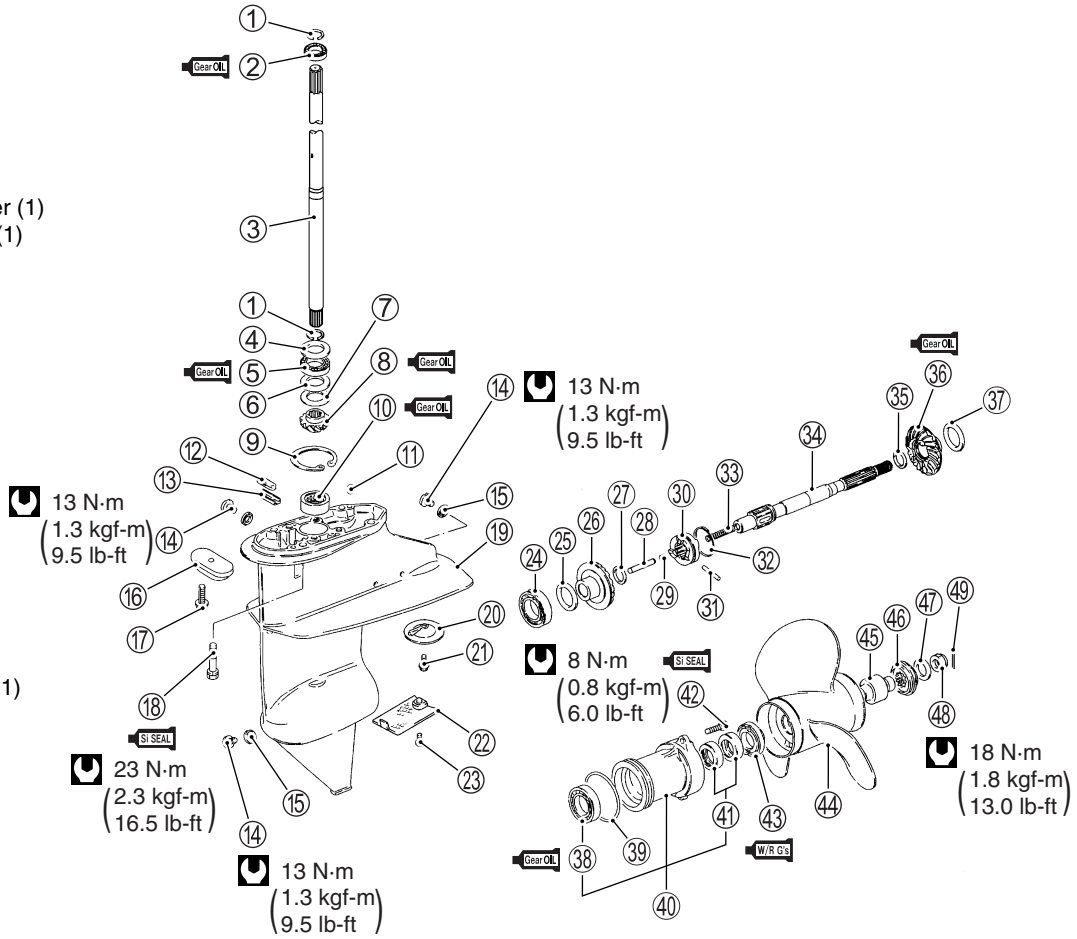
- Inspect the driveshaft/splines for wear, twist or other damage. Replace if necessary.
- Inspect the driveshaft bearing for pitting, rough or other damage. Replace if necessary.





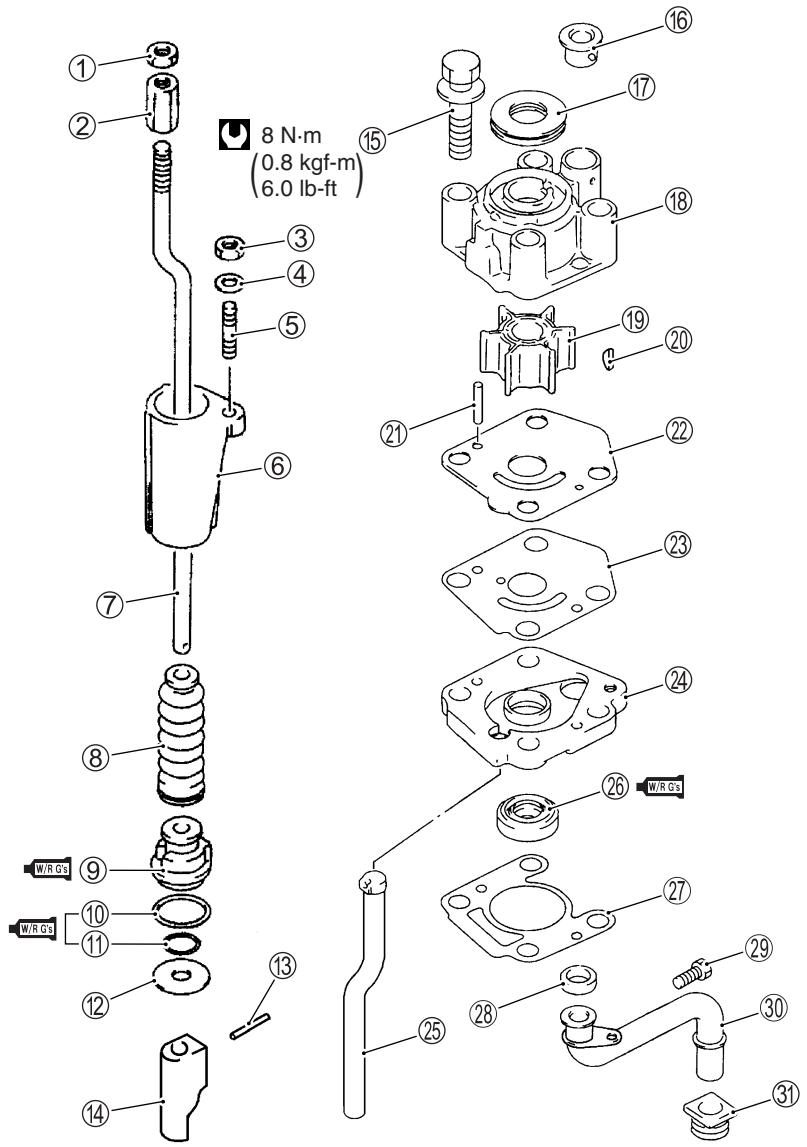
ASSEMBLY & INSTALLATION

Assembly & installation are reverse order of removal & disassembly with the special attention to the following steps.



① Circlip (2)
② Bearing (1)
③ Drive shaft (1)
④ Washer (1)
⑤ Bearing (1)
⑥ Washer (1)
⑦ Shim (1)
⑧ Pinion gear (1)
⑨ Circlip (1)
⑩ Pinion bearing (2)
⑪ Knock pin (2)
⑫ Exhaust seal rubber (1)
⑬ Exhaust seal core (1)
⑭ Plug (3)
⑮ Gascket (3)
⑯ Zinc (1)
⑰ Bolt (1)
⑱ Bolt (4)
⑲ Gearcase (1)
⑳ Zinc (1)
㉑ Bolt (1)
㉒ Water filter (1)
㉓ Screw (1)
㉔ Bearing (1)
㉕ Shim (1)
㉖ Forward gear (1)
㉗ Thrust washer (1)
㉘ Push rod (1)
㉙ Push pin (1)
㉚ Clutch dog shifter (1)
㉛ Dog pin (1)
㉜ Dog spring (1)
㉝ Return spring (1)
㉞ Propeller shaft (1)
㉟ Washer (1)
㊱ Reverse gear (1)
㊲ Shim (1)
㊳ Bearing (1)
㊴ O-ring (1)
㊵ Propeller shaft bearing housing (1)
㊶ Oil seal (2)
㊷ Bolt (2)
㊸ Propeller bush stopper (1)
㊹ Propeller (1)
㊺ Propeller bush (1)
㊻ Spacer (1)
㊼ Washer (1)
㊽ Nut (1)
㊾ Cotter pin (1)

① Nut (1)
② Turnbuckle (1)
③ Nut (1)
④ Washer (1)
⑤ Stud bolt (1)
⑥ Coller (1)
⑦ Shift rod (1)
⑧ Boot (1)
⑨ Shift rod guide (1)
⑩ O-ring (1)
⑪ O-ring (1)
⑫ Washer (1)
⑬ Spring pin (2)
⑭ Shift cam (1)
⑮ Bolt (4)
⑯ Bush (1)
⑰ Grommet (1)
⑱ Water pump case (1)
⑲ Impeller (1)
⑳ Key (1)
㉑ Dowel pin (2)
㉒ Under panel (1)
㉓ Gasket (1)
㉔ Water inlet housing (1)
㉕ Water inlet drain (1)
㉖ Oil seal (1)
㉗ Gasket (1)
㉘ Grommet
㉙ Bolt (1)
㉚ Water inlet tube (1)
㉛ Grommet (1)



CAUTION

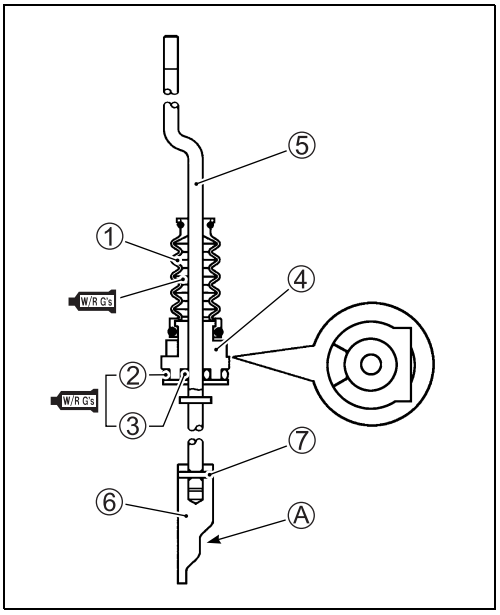
*** Make sure that all parts used in assembly are clean and lubricated.**
*** After assembly, check parts for tightness and smoothness of operation.**
*** Before final assembly, be absolutely certain that all gear contact, shim adjustments and tolerances are correct.**
Failure to correctly adjust these areas will result in lower unit damage. (See the "GEARS SHIMMING AND ADJUSTMENT" section on page 8-21.)

SHIFT ROD/SHIFT CAM ASSEMBLY

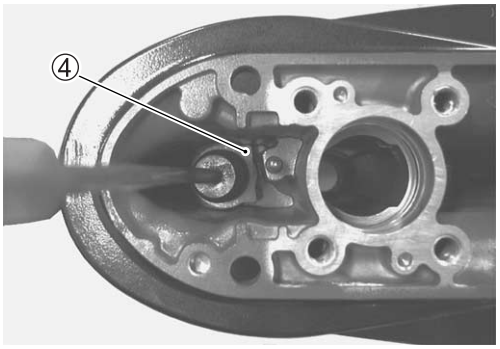
- Apply the grease to the inside of the boot ①, the O-ring ② and the O-ring ③.

W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE

- Install the shift rod guide ④ to the shift rod ⑤ as shown in the figure.
- Fit the shift cam ⑥ to the shift rod as shown in the figure and insert the spring pin ⑦.
- Install the shift rod/shift cam assembly to gearcase with the face Ⓐ of the cam facing toward the propeller side.



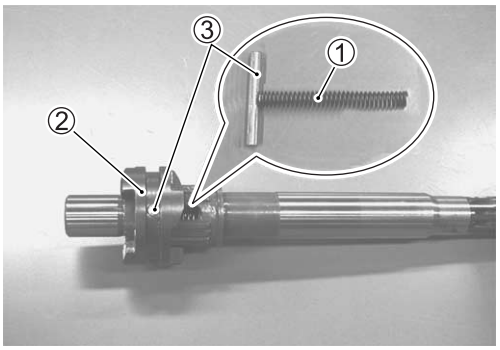
- Fit the shift rod guide ④ to gearcase as shown in the figure.



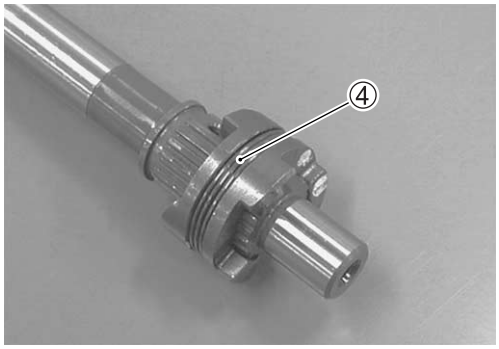
PROPELLER SHAFT/CLUTCH DOG ASSEMBLY

- Install the clutch dog shifter with “F” mark toward the forward gear side.

- Fit the return spring ① snugly in to the groove on the dog shifter ② so that the dog pin ③ does not come out.



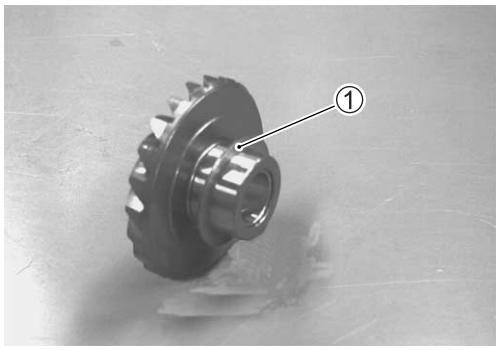
• Install the dog spring ④, ensuring that it fits snugly into the groove on the clutch dog shifter.



FORWARD GEAR

Apply the gear oil to the forward gear and place the back-up shim ① in position, then install the forward gear.

Gear OIL **99000-22540: SUZUKI OUTBOARD MOTOR GEAR OIL**

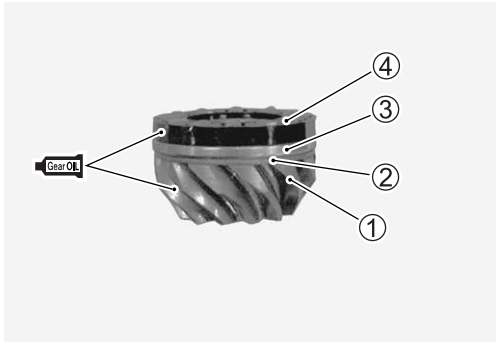


PINION GEAR AND DRIVE SHAFT

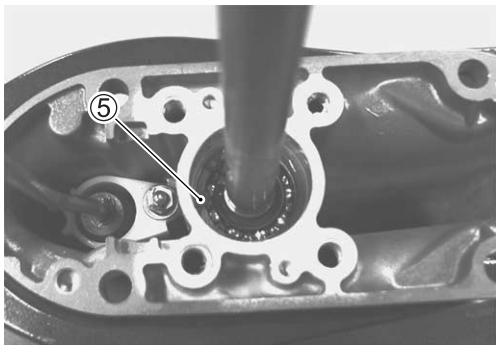
1. Apply the gear oil to the thrust bearing ④ and pinion gear ①.

Gear OIL **99000-22540: SUZUKI OUTBOARD MOTOR GEAR OIL**

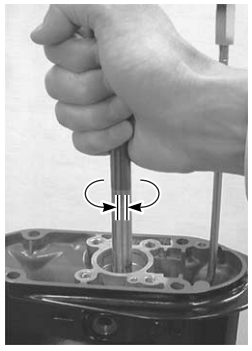
2. Place the pinion gear ①, the back-up shim ②, the washer ③ and the thrust bearing ④ in the gearcase.
3. Slide the driveshaft assembly down into the gearcase and install the pinion gear on splines.

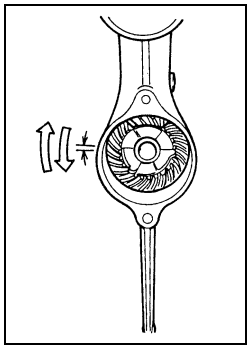


4. Install the circlip ⑤.



5. Check the backlash exists between the pinion gear and the forward gear. (See the “FORWARD GEAR/PINION GEAR” section on page 8-21 to 8-23.)





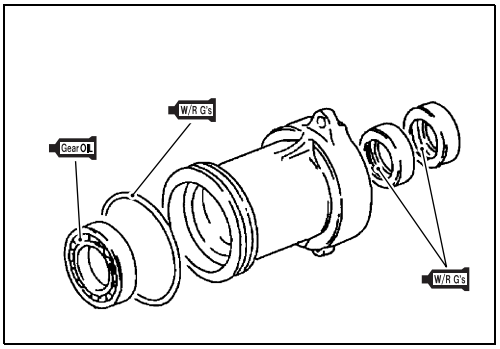
PROPELLER SHAFT BEARING HOUSING

- Apply the grease to the oil seals and O-ring.

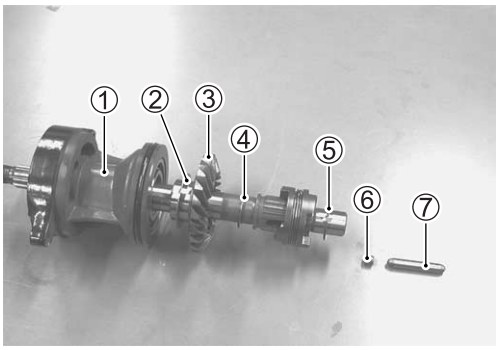
W/R G's **99000-25160: SUZUKI WATER RESISTANT GREASE**

- Apply gear oil to the bearings.

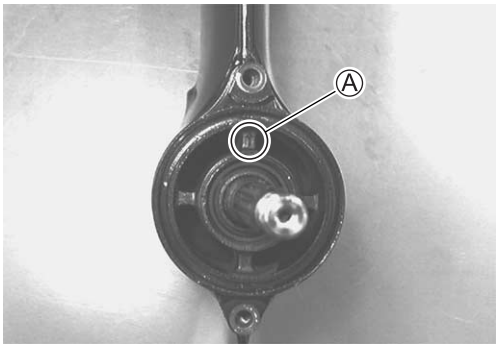
Gear OIL **99000-22540: SUZUKI OUTBOARD MOTOR GEAR OIL**



- Assemble the propeller shaft in the following sequence.
  * Propeller shaft housing ①
  * Reverse gear back-up shim ②
  * Reverse gear ③
  * Reverse gear thrust washer ④
  * Forward gear thrust washer ⑤
  * Push pin ⑥
  * Push rod ⑦

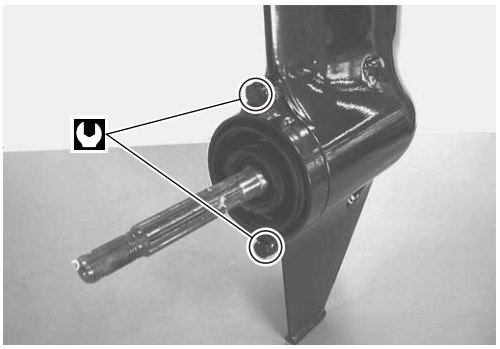


- Install the propeller shaft bearing housing assembly to gear-case with the arrow mark Ⓐ of the housing toward the upside.

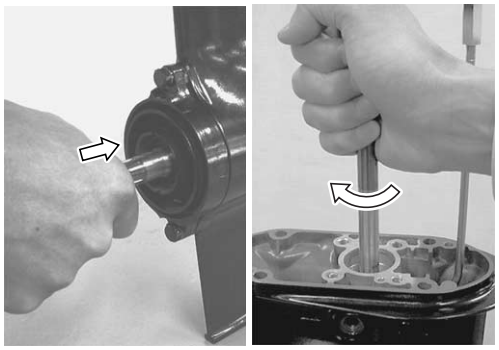


- When the housing is fully seated, tighten two bolts to the specified torque.

Bearing housing bolt: 8 N·m (0.8 kgf-m, 6.0 lb-ft)



- Check and adjust the shimming of the gears.
  (See page 8-23.)

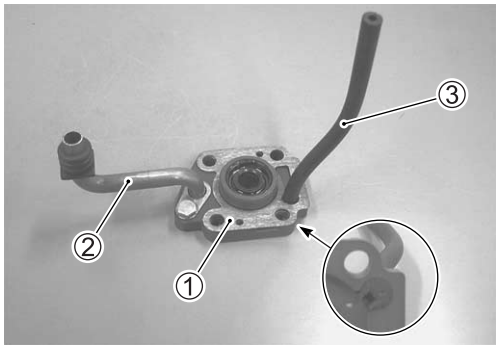


WARTER INLET HOUSING

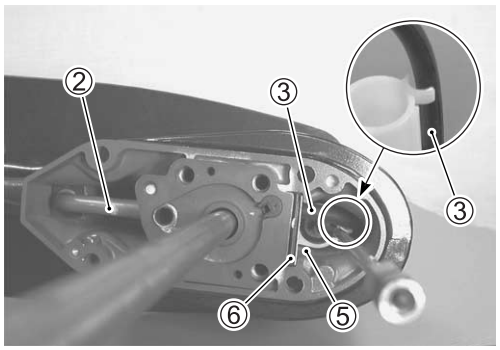
1. Apply the grease to the oil seal.

W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE

2. Install the gasket ①, the water inlet tube ② and the water inlet drain ③ to the water inlet housing.

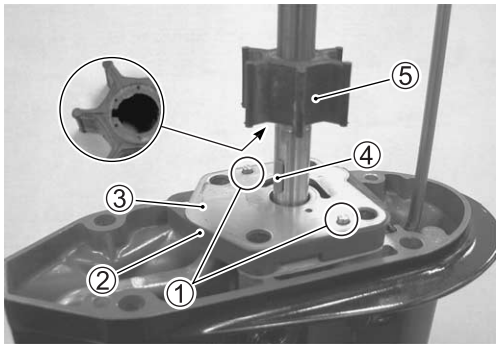


3. Install the exhaust seal core ⑤ and the rubber ⑥.
4. Install the water inlet housing assembly to the gearcase. Place the water inlet tube ② and drain ③ into position.



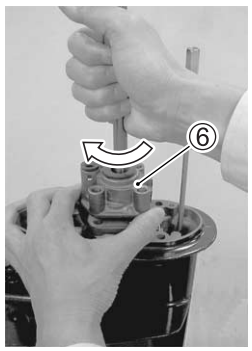
WATER PUMP

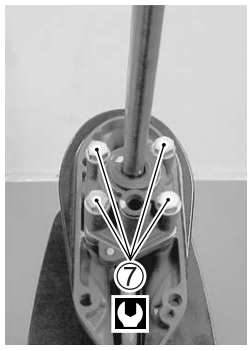
1. Place the dowel pins ①, the under panel gasket ② and the under panel ③ into the position.
2. Insert the key ④ in the driveshaft and slide the impeller ⑤ onto the driveshaft, ensuring that the key and keyway are aligned.



3. Install the pump case ⑥ while rotating the driveshaft clockwise to flex the impeller vanes in correct direction.
4. Tighten the four pump case bolts ⑦ to the specified torque.

Pump case bolt: 8 N·m (0.8 kgf-m, 6.0 lb-ft)





LEAKAGE CHECK

Check for leakage of the oil seal and the O-ring when applying air pressure inside of the gearcase.

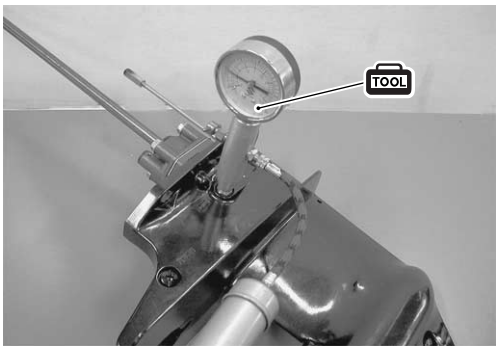
TOOL 09950-69512 : Oil leakage tester
: Hand air pump

Procedure

1. Install the oil leakage tester into the oil level hole.
2. Connect a hand air pump to the oil leakage tester.
3. While rotate the driveshaft and propeller shaft clockwise several times, apply specified pressure for leakage test.

NOTE:
Apply low initial pressure of 20 – 40 kPa, (0.2 – 0.4 kg/cm², 2.8 – 5.7 psi) first, then apply specified pressure.

Leakage test pressure: 100 kPa (1.0 kgf/cm², 14.2 psi)



CAUTION

Do not exceed pressure of 110 kPa (1.1kg/cm², 15.6 psi) or damage to oil seals will result.

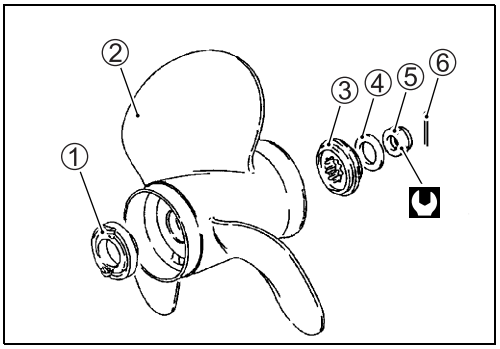
4. Once stabilized, pressure should remain steady for at least 5 min.
   If pressure does not fall, sealing performance is correct.

PROPELLER INSTALATION

1. Install the propeller stopper ① onto the propeller shaft, then slide on the propeller ②.
2. Fit the spacer ③, the washer ④ and the nut ⑤, then tighten the nut to the specified torque.

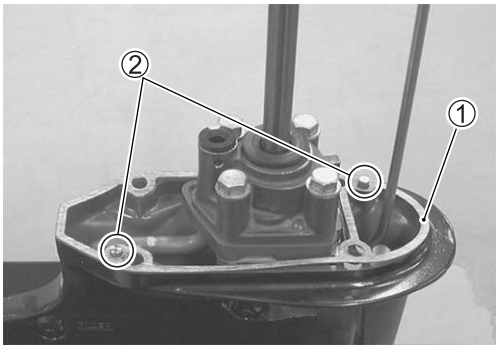
Propeller nut: 18 N·m (1.8 kgf-m, 13.0 lb-ft)

3. Push the cotter pin ⑥ through the nut and the shaft, then bend to secure.



LOWER UNIT INSTALLATION

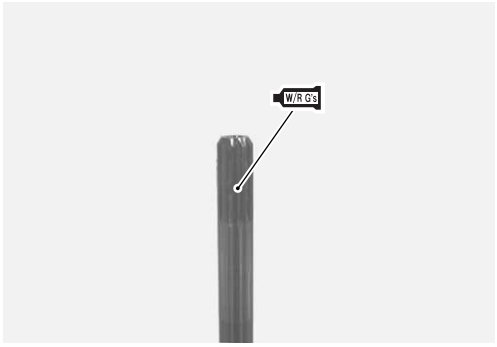
1. Install the gasket ① and the two dowel pins ②.



2. Apply the grease to the driveshaft splines.

W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE

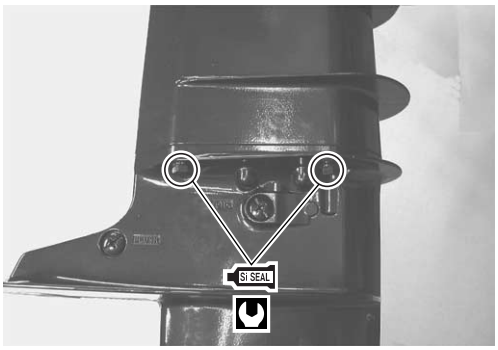
3. Slide the gearcase into place, making sure that the top of the driveshaft engages properly with the crankshaft and the water tube locates in the water pump case outlet.



4. Apply the seal to the four gearcase bolts and tighten them to the specified torque.

SI SEAL 99000-31120: SUZUKI SILICONE SEAL

Gearcase bolt: 23 N·m (2.3 kg-m, 16.5 lb-ft)

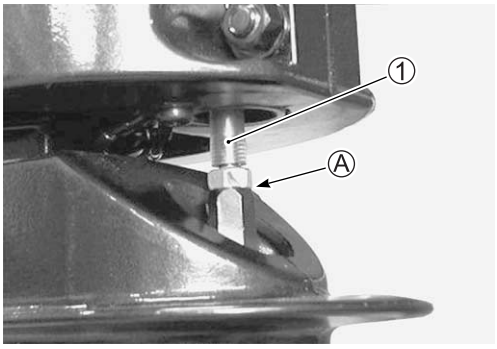


CLUTCH ADJUSTMENT

1. Install the hose ① on the clutch rod.
2. Connect the clutch rod to the shift rod as shown.

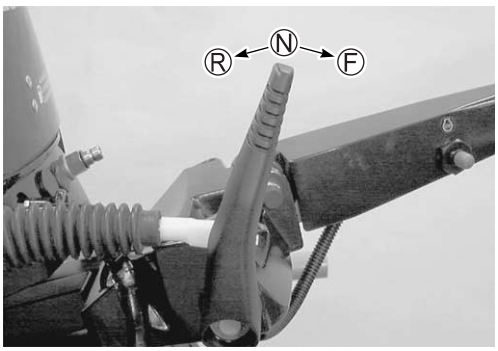
CAUTION

Make sure that chambered edge Ⓐ of the turnbuckle faces upward to seat against the upper nut when tightened.

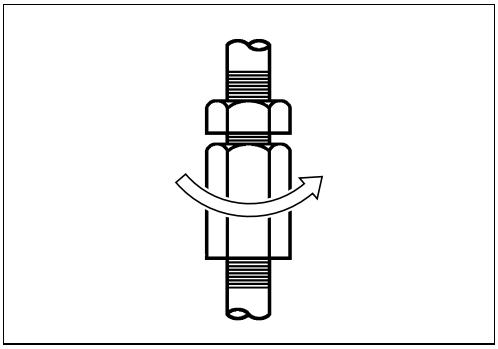


Adjustment step:

1. Shift the clutch lever from Neutral Ⓝ through Forward Ⓕ and Reverse Ⓡ to check that proper engagement of both gears is at an equal angle from Neutral.

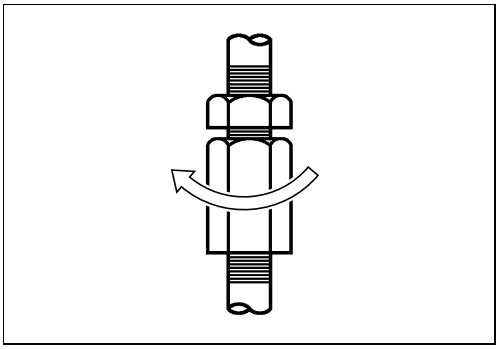


- If Forward gear engages earlier (at a smaller angle) than Reverse, the turnbuckle should be rotated counterclockwise until both gears engage with the same amount of clutch lever travel.



- If Reverse gear engages earlier than Forward, the turnbuckle should be rotated clockwise.

2. Lock the upper nut securely against the turnbuckle when clutch lever adjustment is correct.



GEAR OIL

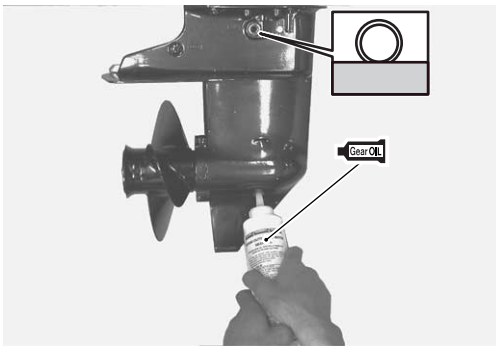
Fill the gearcase with the specified gear oil.

See the “PERUIODIC MAINTENANCE/GEAR OIL” section on page 2-5.

Necessary amount of gear oil:

170 ml (5.7/6.0 US/Imp.oz)

Gear OIL 99000-22540: SUZUKI OUTBOARD MOTOR GEAR OIL

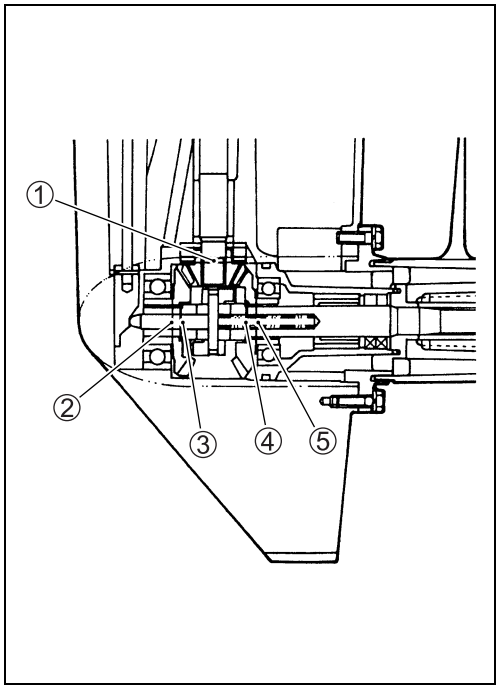


LOWER UNIT GEARS- SHIMMING AND ADJUSTMENT

If the lower unit has been rebuilt or has had components replaced, shimming for correct gear contact and backlash will have to be adjusted to ensure smooth, reliable operation of gears.

Shim/Washer & Mounting position

	Numerical index/item	Available thickness (mm)	Design specification thickness (mm)
①	Pinion gear back up shim	0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3	1.0
②	Forward gear back up shim	0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3	1.0
③	Forward gear thrust washer	1.5	1.5
④	Reverse gear thrust washer	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9	1.5
⑤	Reverse gear back up shim	0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3	1.0



FOREWARD GEAR/PINION GEAR

Step to prior to adjustment

Correctly assemble the forward gear, the pinion gear, the driveshaft and related components. (See page 8-15 to 8-16.)

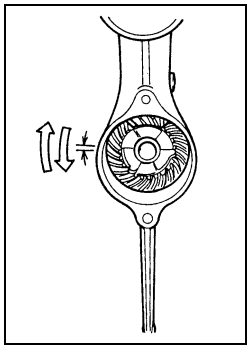
NOTE:

When installing the forward gear back-up shim, choose shim thinner than design specification for calculating adjustment.

Adjusting gear backlash

Check a slight amount of backlash exists between the pinion gear and the forward gear by slightly rotating the driveshaft or the forward gear by hand.

- If backlash is larger than the specified, thickness of the forward gear back-up shim must be increased.
- If backlash is smaller, the forward gear back-up shim thickness must be decreased.

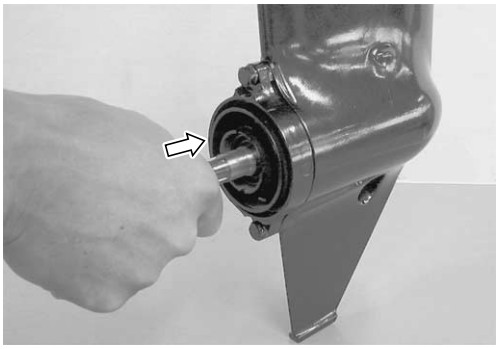


Checking and adjusting tooth contact pattern (Pinion and forward gear)

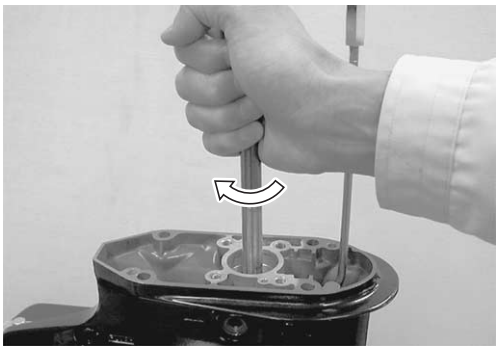
1. To assess the tooth contact, apply a light coat of Prussian Blue on the convex surface of the forward gear.
2. Install the propeller shaft and the housing assembly (minus the reverse gear and the internal components).

Propeller shaft bearing housing bolt:
8 N·m (0.8 kgf-m, 6.0 lb-ft)

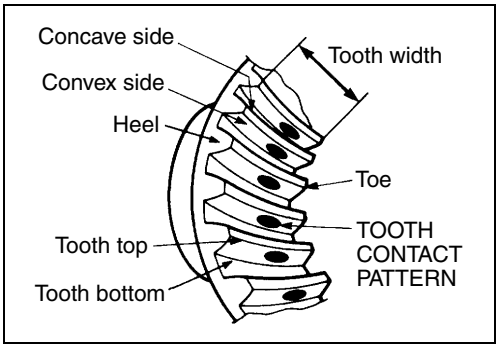
3. Push the propeller shaft inward and hold in the position.



4. Rotate the driveshaft clockwise 5 – 6 times by hand.



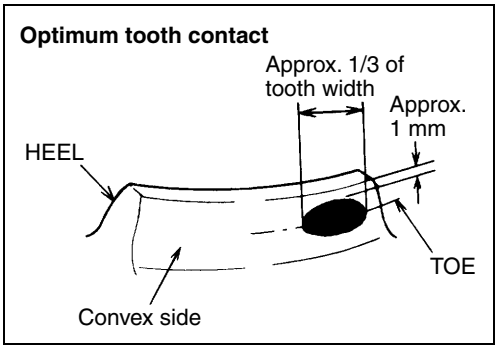
5. Carefully pull out the propeller shaft and the housing to check the tooth contact pattern.



Optimum tooth contact
The optimum tooth contact is shown in the figure.
A shim adjustment may be necessary to obtain the optimum tooth contact pattern.

CAUTION

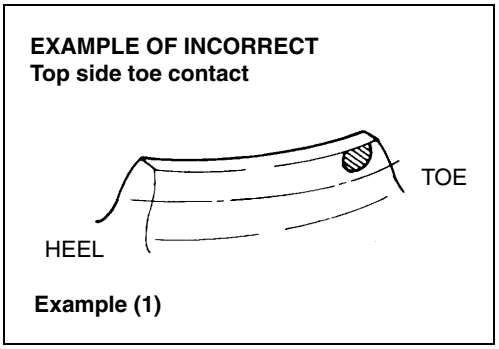
The backlash of the gear should be checked when increasing or decreasing the thickness of the shim to adjust tooth contact.



Example (1)
Incorrect topside toe contact:
Correction measures:
- Decrease the thickness of the forward gear back-up shim.
- Slightly increase the pinion gear back-up shim thickness.

CAUTION

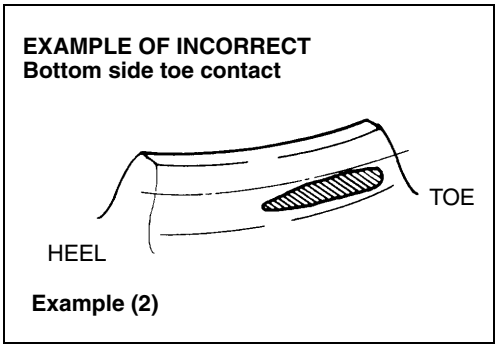
Do not set tooth contact in the top side toe contact position. Damage and chipping of the forward and pinion gear back-up may result.



Example (2)
Incorrect bottom side toe contact:
Correction measures:
- Increase the thickness of the forward gear back-up shim.
- Slightly decrease the pinion gear back-up shim thickness.

CAUTION

Do not set tooth contact in the bottom side toe contact position. Chipping of the pinion gear may result.

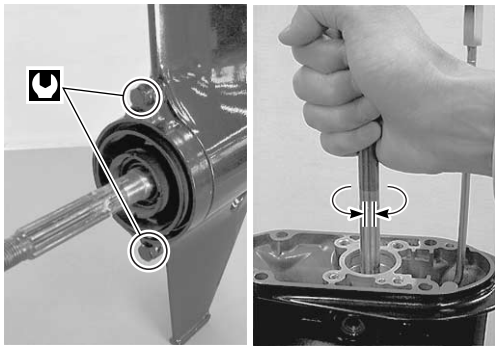


PINION GEAR/REVERSE GEAR

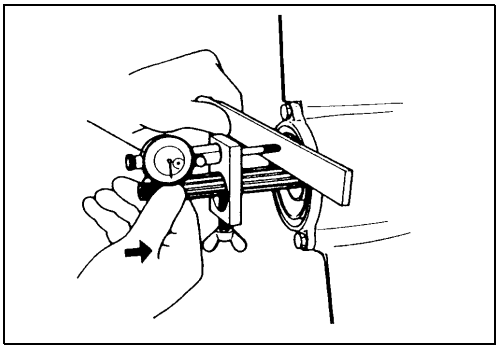
1. Check the amount of backlash between the pinion gear and forward gear. (See page 8-21.)
2. Install the propeller shaft/bearing housing assembly to the gearcase.

Propeller shaft bearing housing bolt:
8 N·m (0.8 kgf-m, 6.0 lb-ft)

3. Check the amount of backlash by slightly rotating the driveshaft by hand.
4. Backlash should not be less than when checked step (1).
   If backlash is less, reduce the reverse gear back-up shim thickness.



CHECKING PROPELLER SHAFT THRUST PLAY



After adjusting all gear positions, measure the propeller shaft thrust play. If the measurement is not within the following specification, a shim adjustment is required.

Propeller shaft thrust play: 0.2 – 0.4 mm (0.01 – 0.02 in)

NOTE:
Maintain the forward gear thrust washer at the standard thickness (1.5 mm) and adjust only reverse gear thrust washer with the shim.

1. Affix the gear adjusting gauge to the propeller shaft.

TOOL 09951-09511: Gear adjusting gauge

2. Slowly push the propeller shaft inward.
3. Hold the shaft in and set the dial gauge pointer to zero.
4. Slowly pull the propeller shaft outward and read the maximum thrust play.

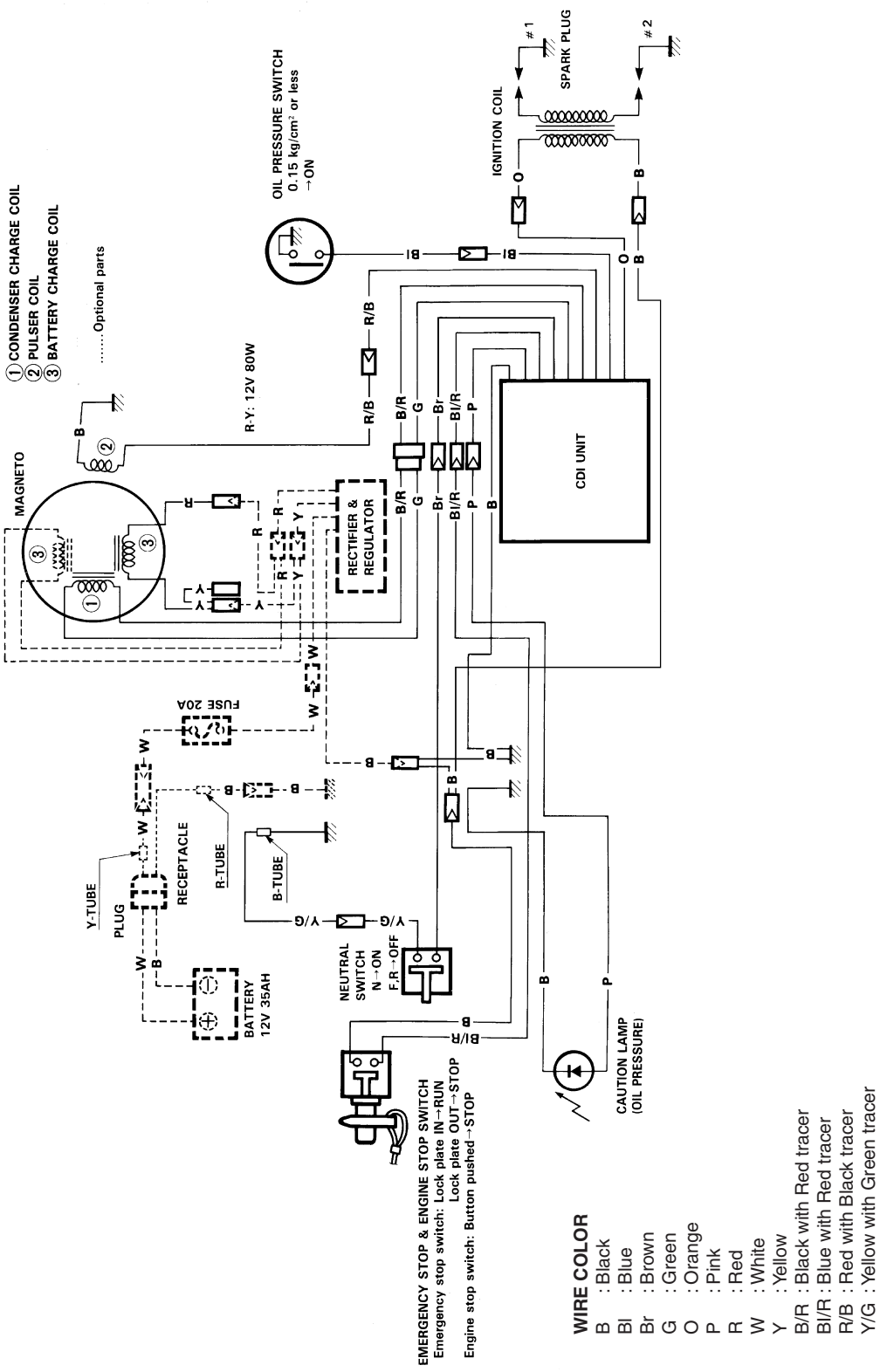
If the measurement is more than the specification, increase the reverse gear thrust washer thickness.
If the measurement is less than the specification, reduce the reverse gear thrust washer thickness.

ROUTING AND DIAGRAM

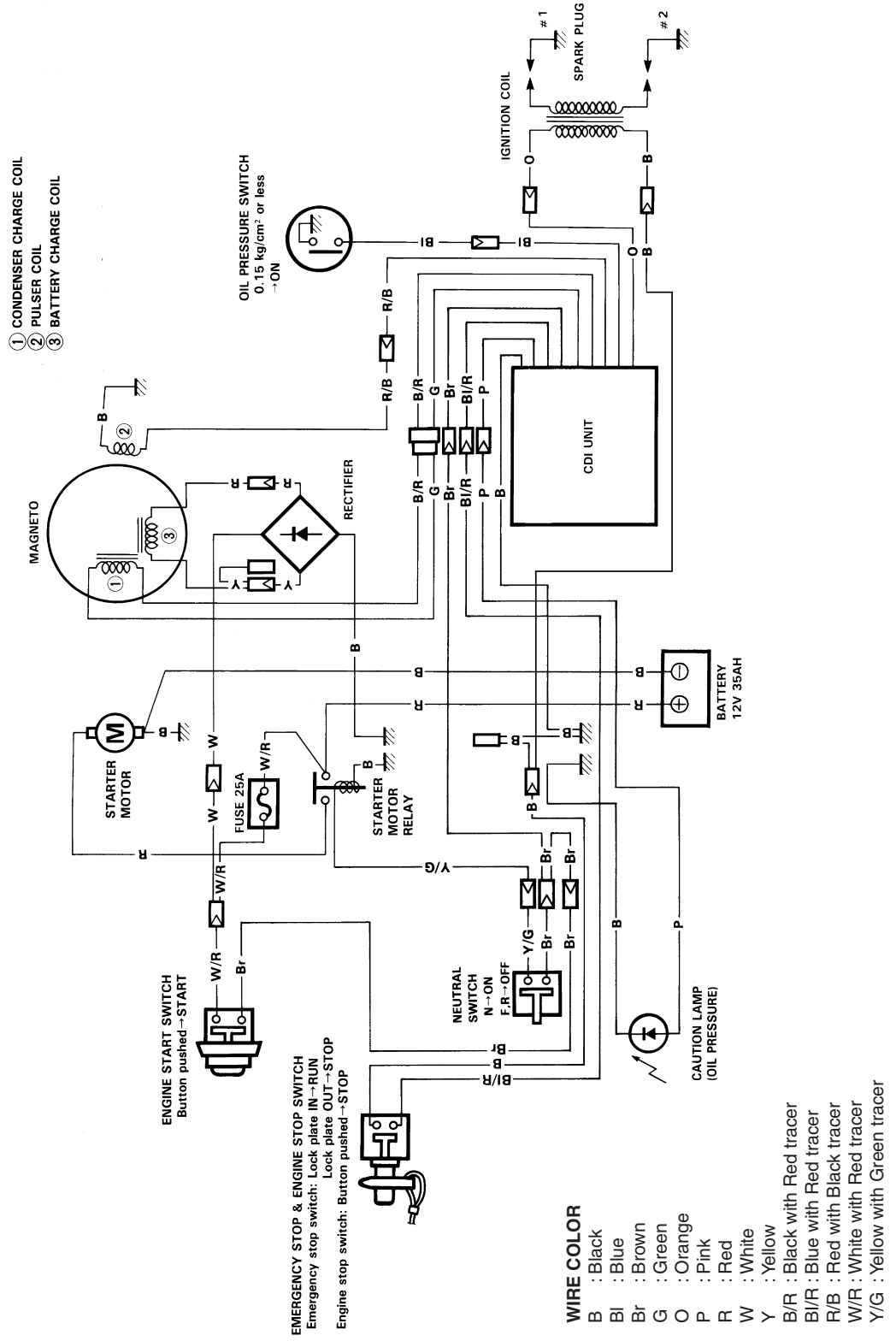
CONTENTS

WIRING DIAGRAM 9- 2
DF9.9/DF9.9A/DF15/DF15A (MANUAL STARTER MODEL) 9- 2
DF9.9E/DF9.9AE/DF15E/DF15AE (ELECTRIC STARTER MODEL) 9- 3
DF9.9R/DF9.9AR/DF15R/DF15AR (REMORT CONTROL MODEL) 9- 4
WIRE ROUTING 9- 5
EXCEPT FOR REMOTE CONTROL MODEL 9- 6
FOR REMOTE CONTROL MODEL 9- 6
TILLER HANDLE MODEL 9-10
HOSE ROUTING 9-11

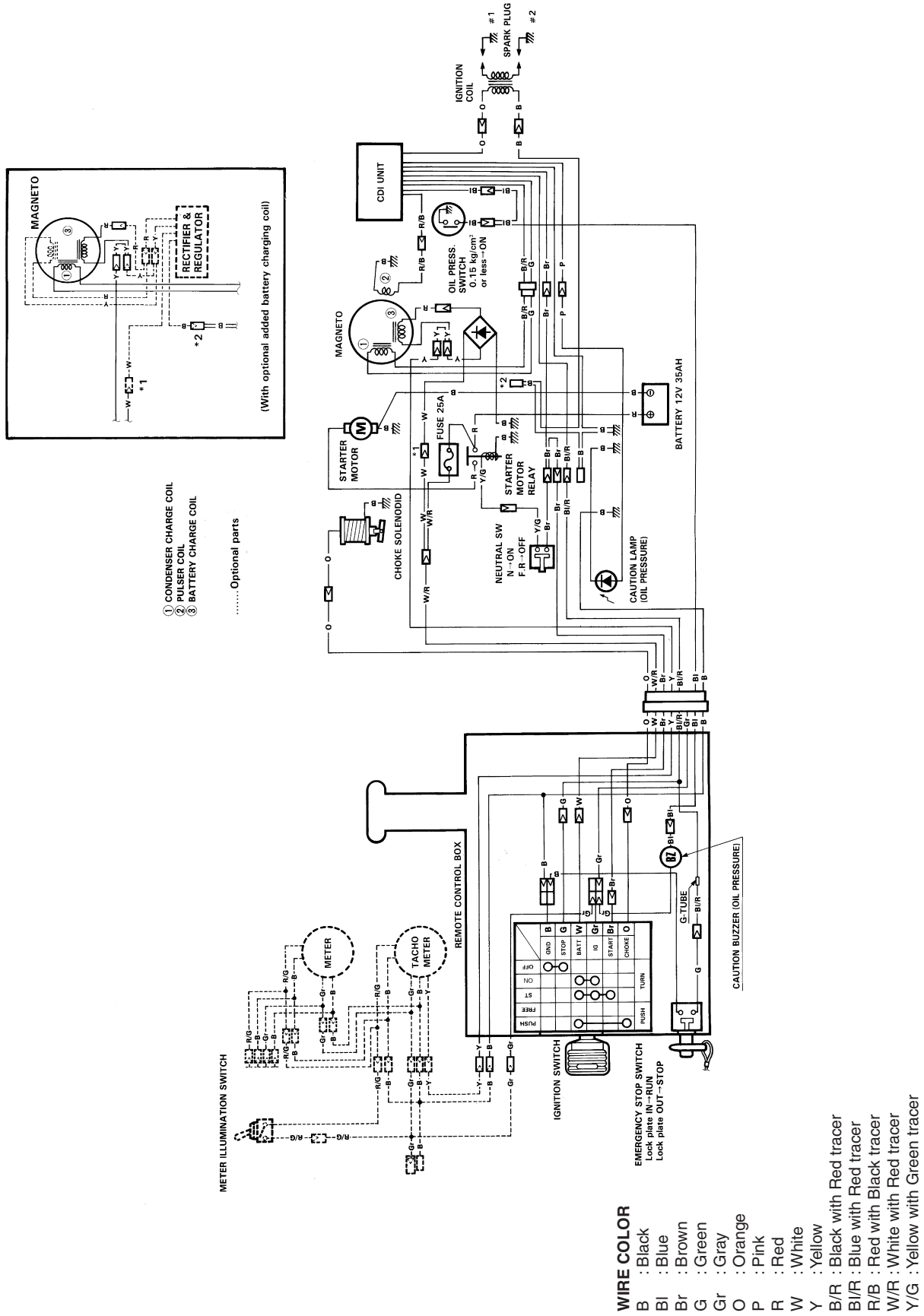
WIRING DIAGRAM
DF9.9/DF9.9A/DF15/DF15A (MANUAL STARTER MODEL)



DF9.9E/DF9.9AE/DF15E/DF15AE (ELECTRIC STARTER MODEL)



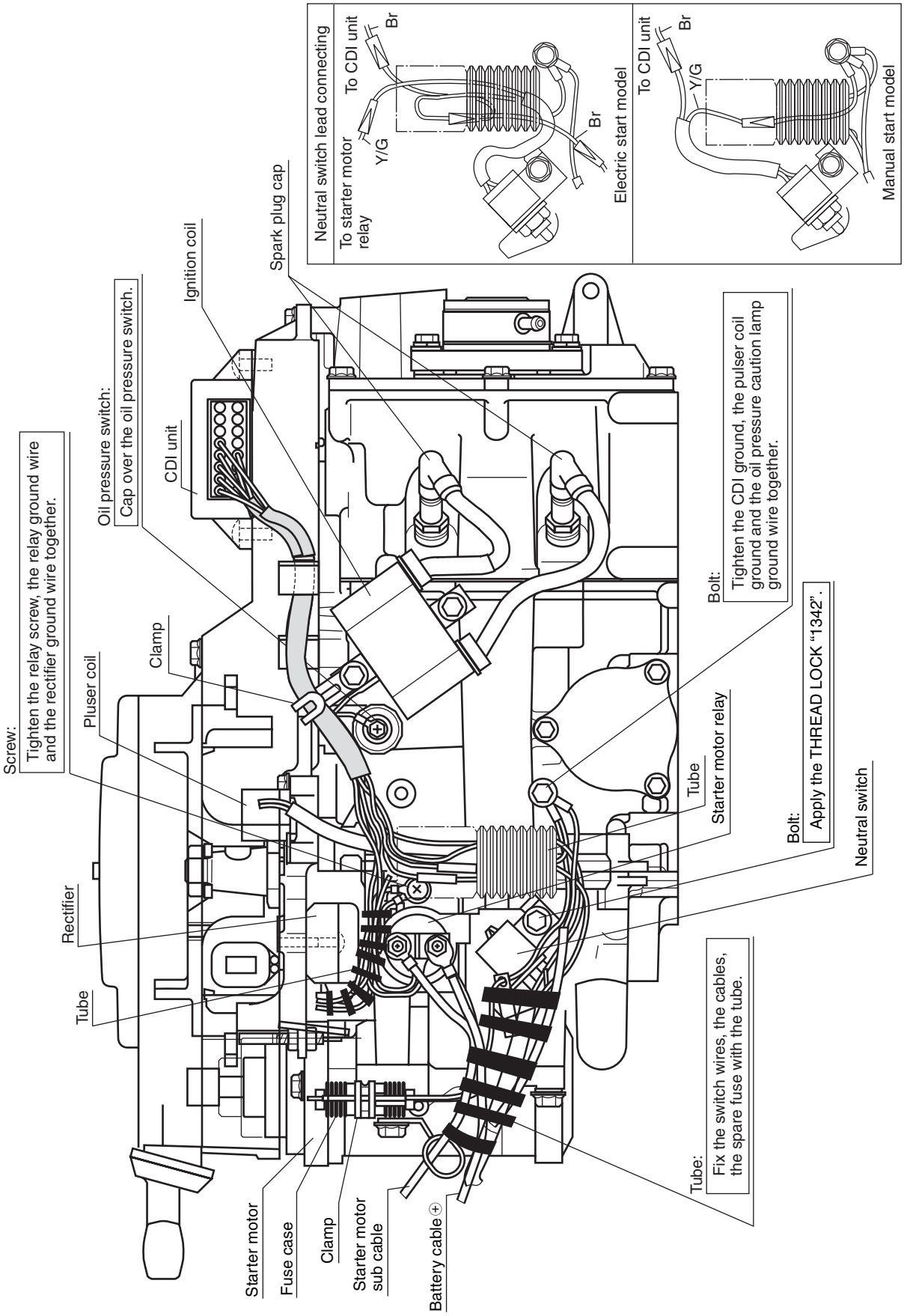
DF9.9R/DF9.9AR/DF15R/DF15AR (REMORT CONTROL MODEL)



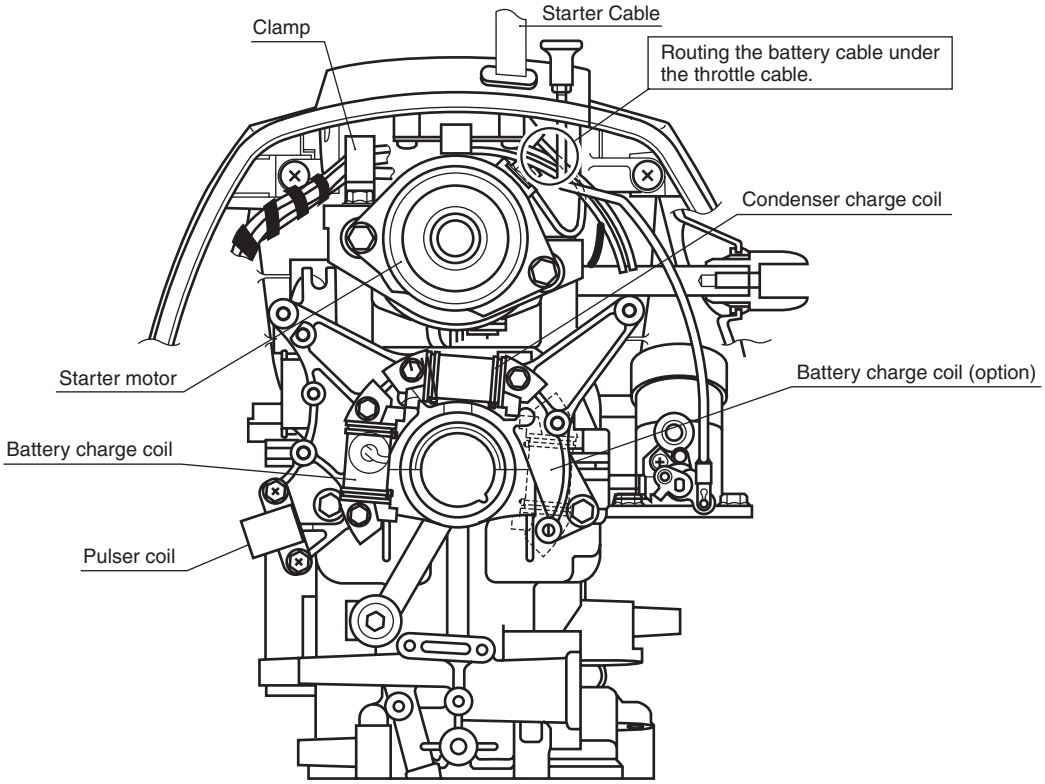
WIRE COLOR

B	: Black
Bl	: Blue
Br	: Brown
G	: Green
Gr	: Gray
O	: Orange
P	: Pink
R	: Red
W	: White
Y	: Yellow
B/R	: Black with Red tracer
Bl/R	: Blue with Red tracer
R/B	: Red with Black tracer
W/R	: White with Red tracer
Y/G	: Yellow with Green tracer

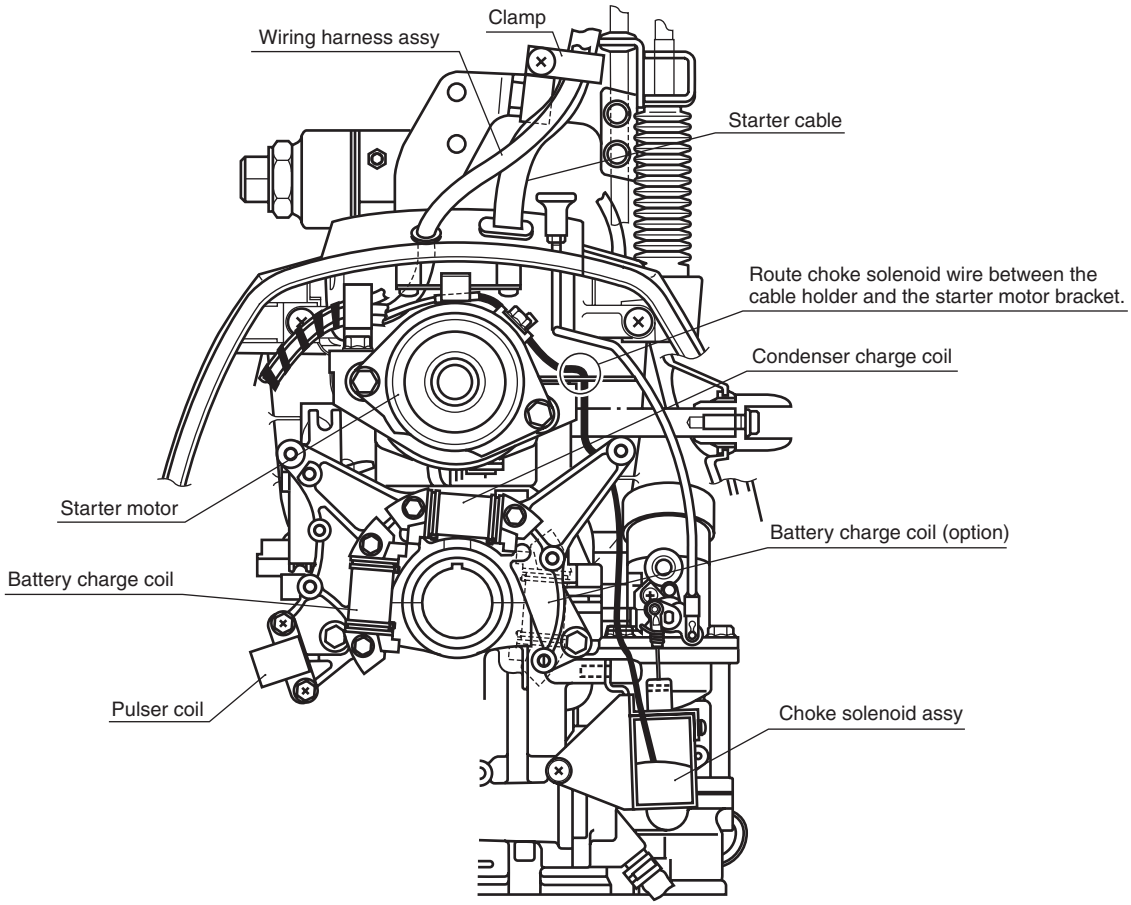
WIRE ROUTING

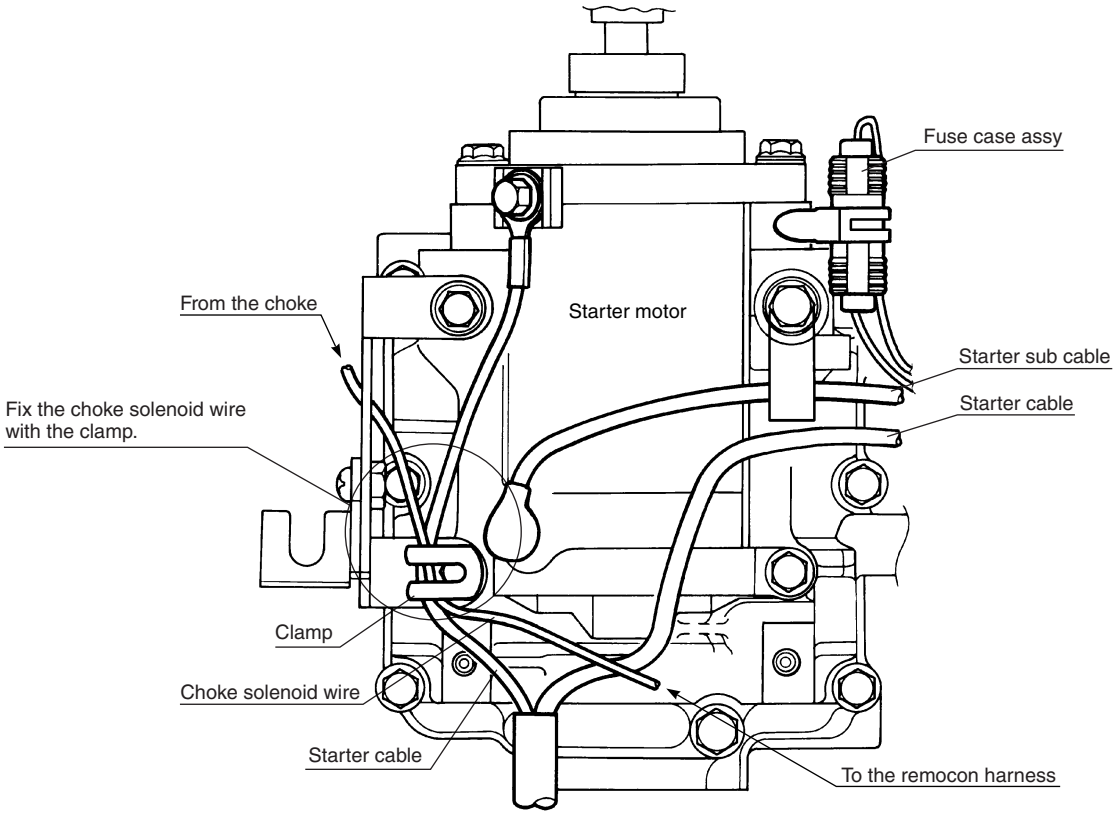


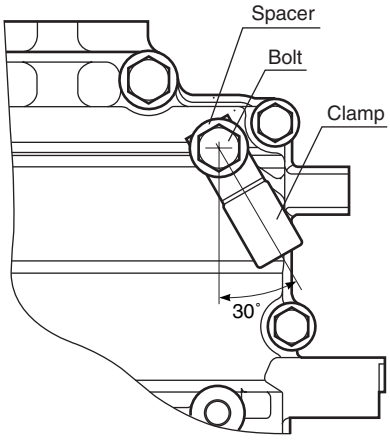
EXCEPT FOR REMOTE CONTROL MODEL



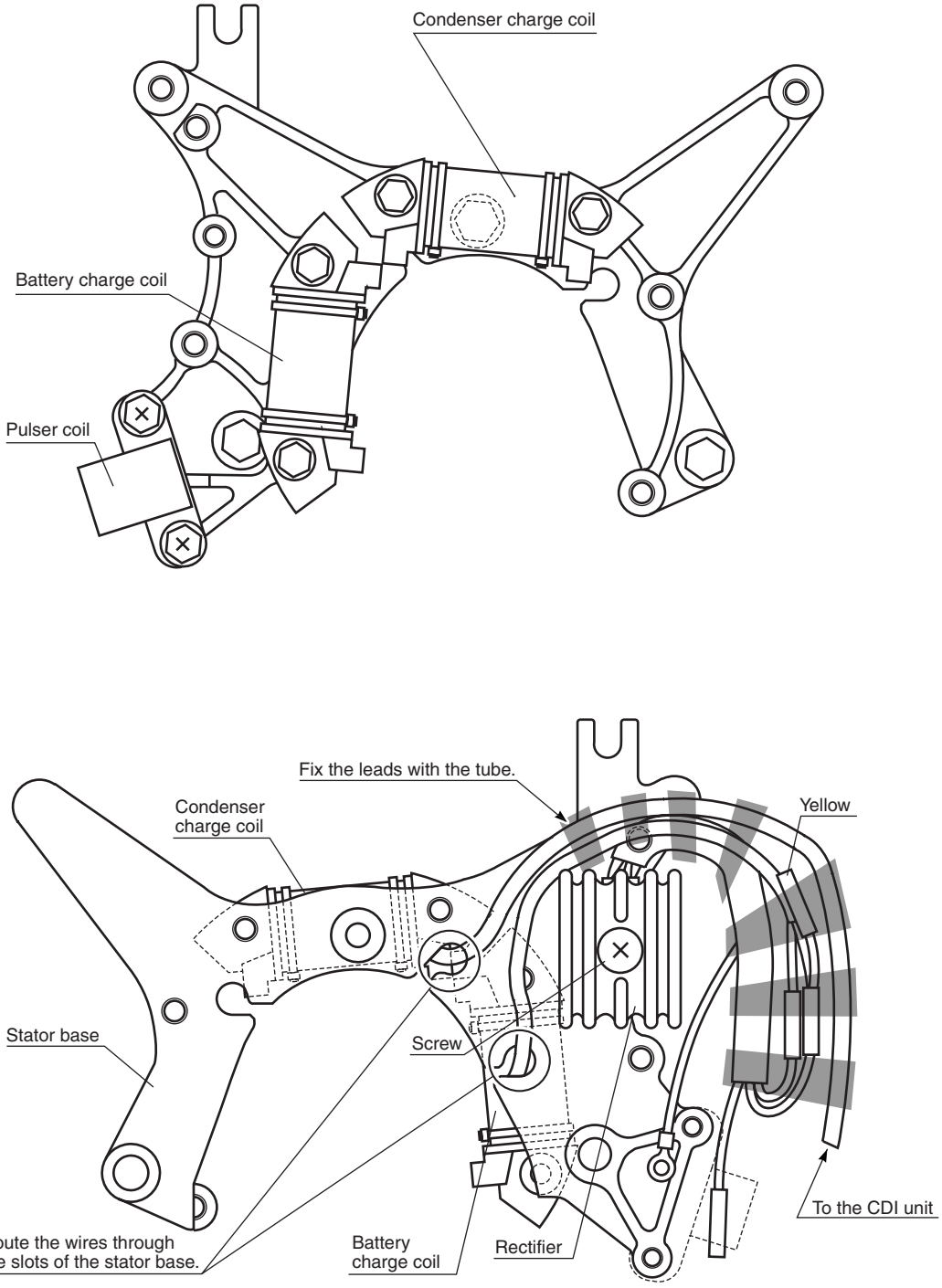
FOR REMOTE CONTROL MODEL





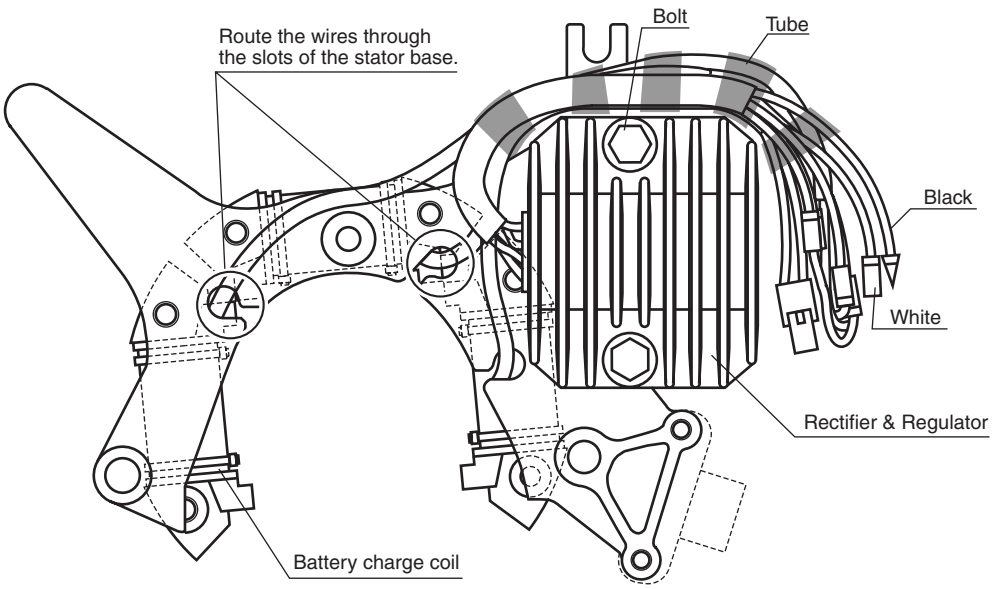


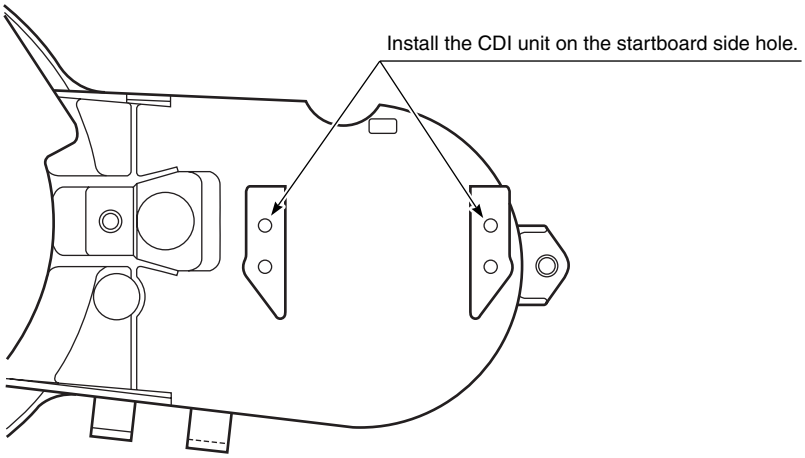
Manual starter model

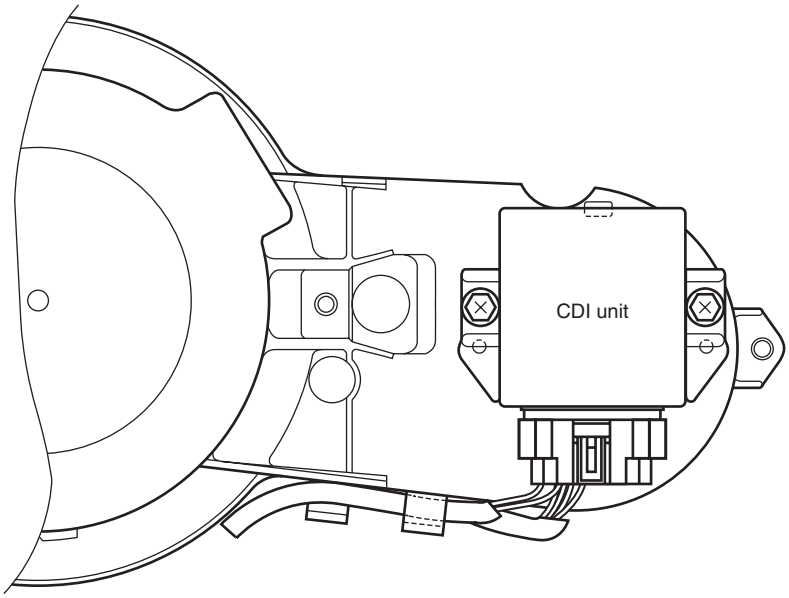


Electric starter model

Manual/Electric start model with options

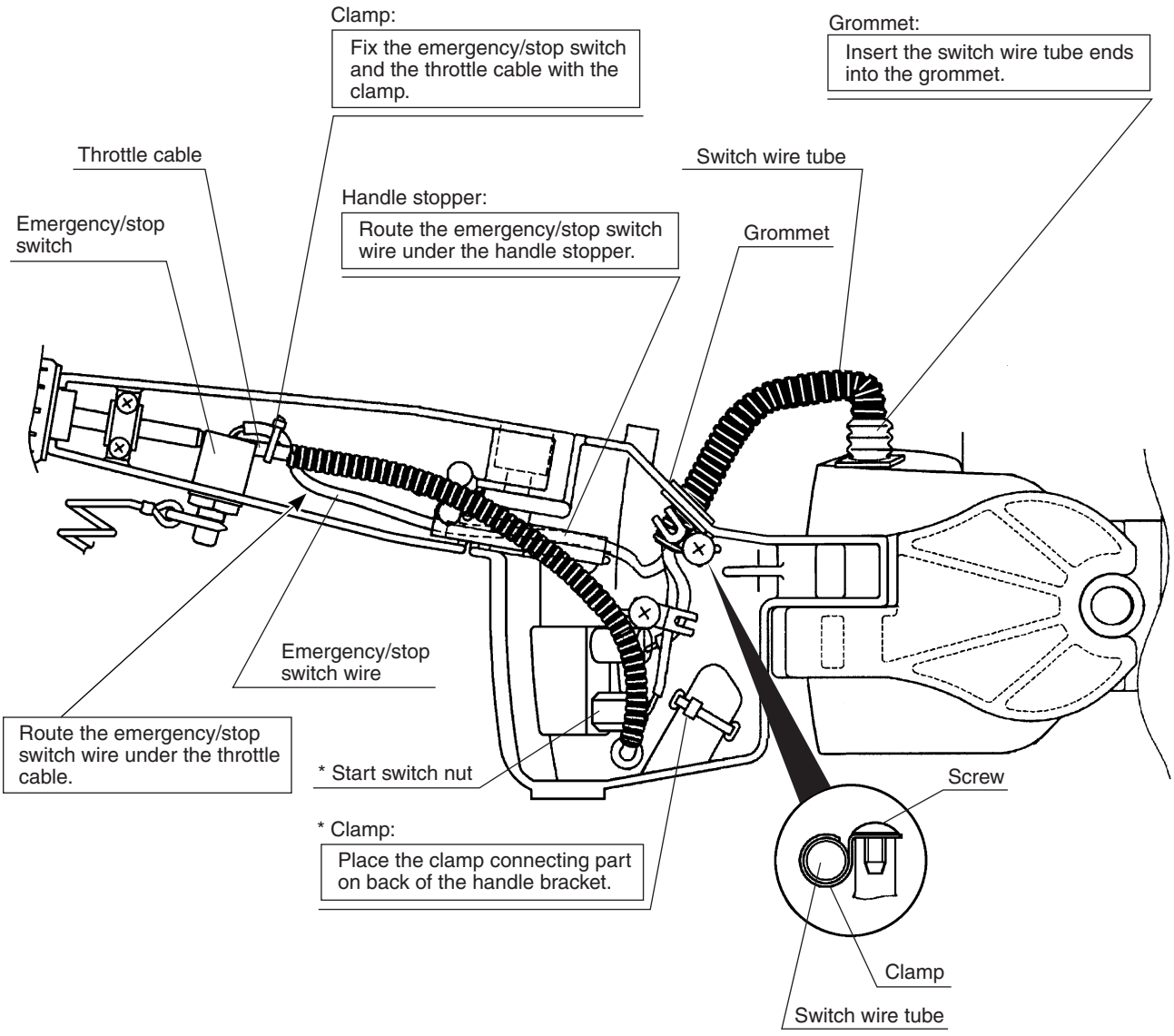




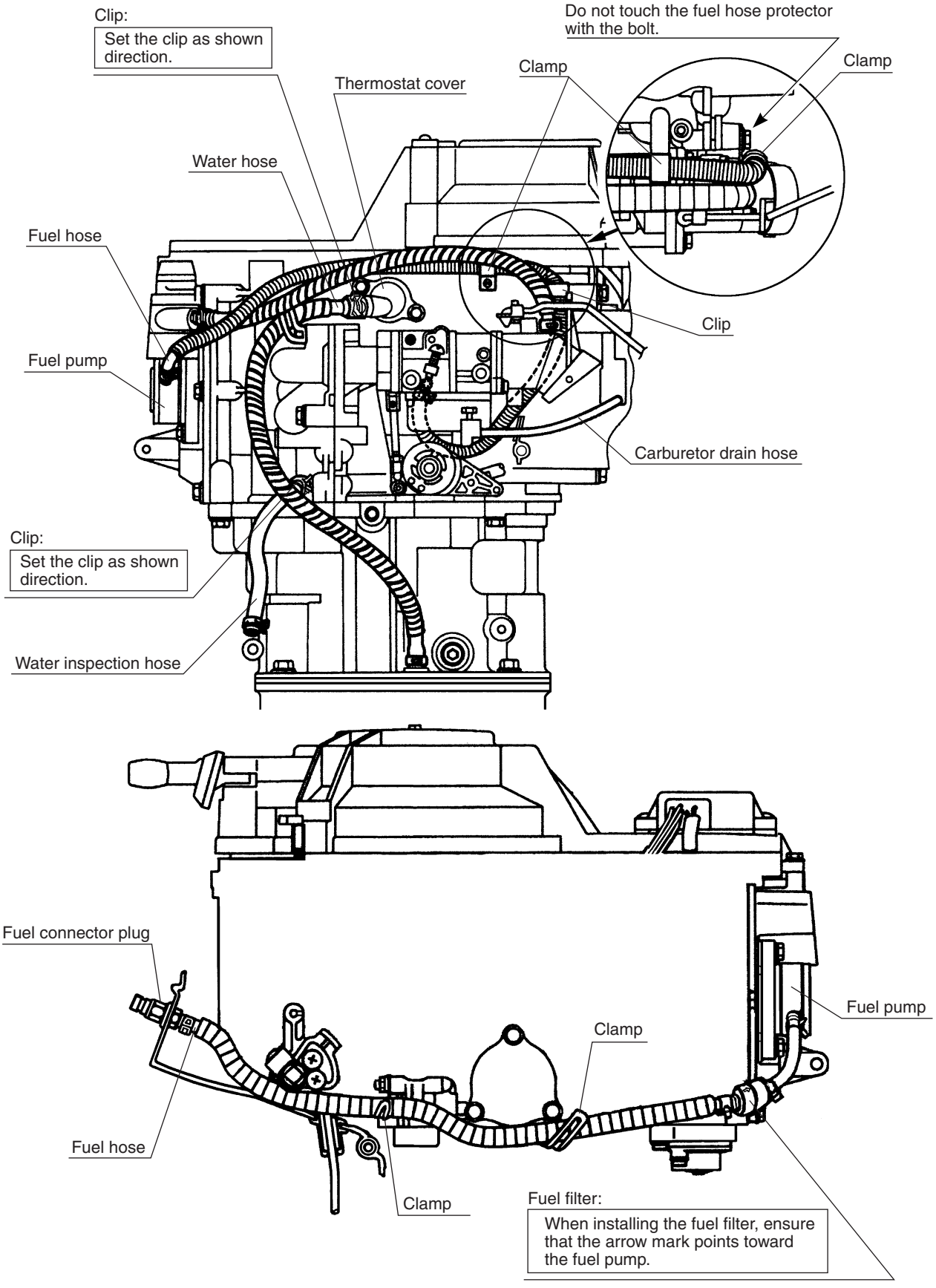


TILLER HANDLE MODEL

* marked item: For electoric start model only.



HOSE ROUTING



Prepared by

SUZUKI MOTOR CORPORATION

Marine & Power Products Division

February, 2003
Manual No.99500-93E10-01E
Printed in Japan

SUZUKI MOTOR CORPORATION

Printed in Japan (TK)
K3