SUZUKI OUTBOARD MOTOR

DF4/5

FOUR STROKE

SERVICE MANUAL

99500-91J00-01E

FOREWORD

This manual contains an introductory description on SUZUKI Outboard motor DF4/5 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 2002 (K2) model.

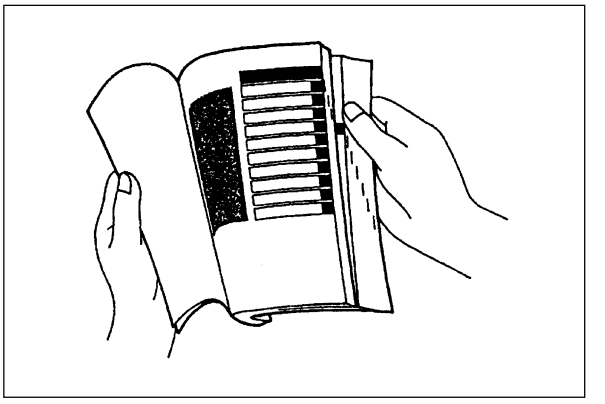
Marine & Power Products Division

GROUP INDEX

HOW TO USE THIS MANUAL

TO LOCATE WHAT YOU ARE LOOKING FOR:

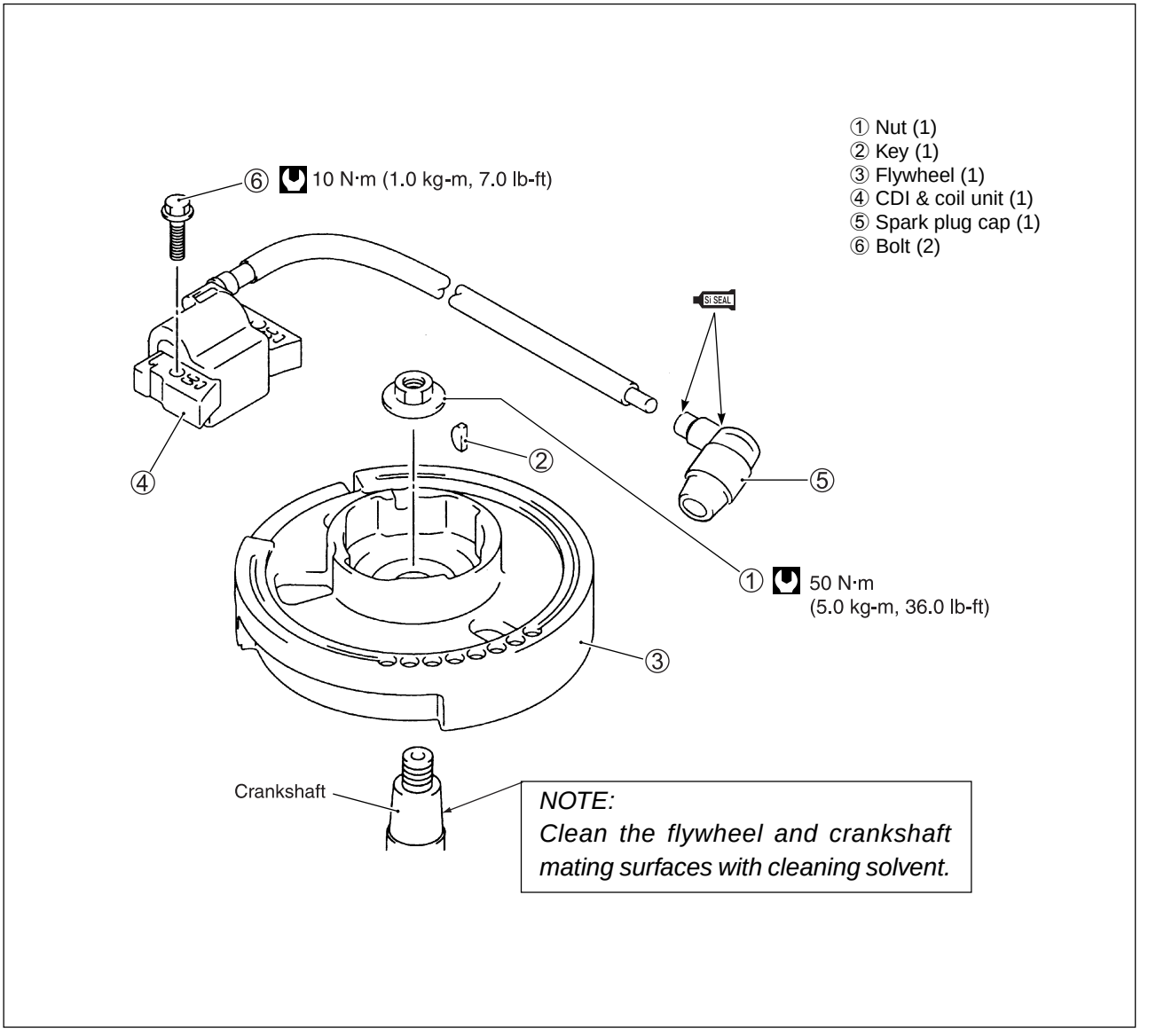
1. The text of this manual is divided into sections.
2. The section titles are listed on the previous page in a GROUP INDEX. Select the section needed for reference.
3. Holding the manual as shown at the right will allow you to find the first page of the section easily.
4. The first page of each section 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 THREAD LOCK “1342”.
	Apply oil. Use engine oil unless otherwise specified.		Apply THREAD LOCK SUPER “1333B”.
	Apply SUZUKI OUTBOARD MOTOR GEAR OIL.		Measure in DC voltage range.
	Apply SUZUKI SUPER GREASE “A”.		Measure in resistance range.
	Apply SUZUKI WATER RESISTANT GREASE.		Measure in continuity test range.
	Apply SUZUKI BOND “1104”.		Use peak voltmeter “Stevens CD-77”.
	Apply SUZUKI BOND “1207B”.		Use special tool.
	Apply SUZUKI SILICONE SEAL.		

GENERAL INFORMATION

1

CONTENTS

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

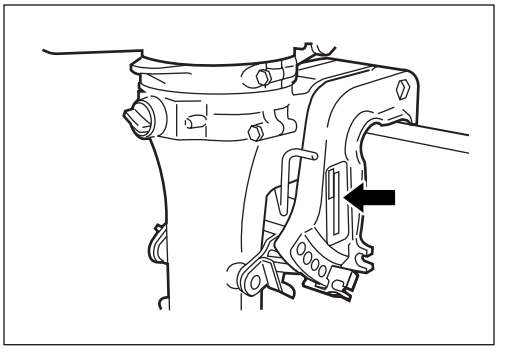
- **If parts replacement is necessary, replace the parts with Suzuki Genuine Parts or their equivalent.**
- **When removing parts that are to be reused, keep them arranged in an orderly manner so that they may be reinstalled in the proper order and orientation.**
- **Be sure to use special tools when 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.**

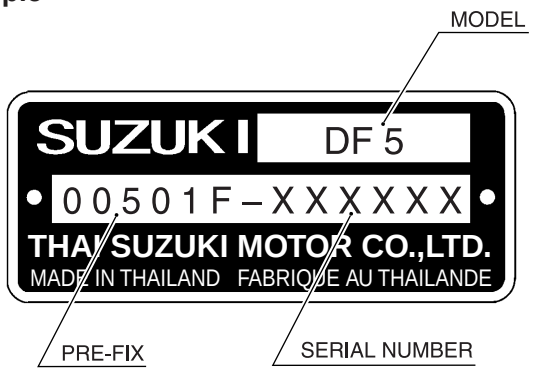
IDENTIFICATION NUMBER LOCATION

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.

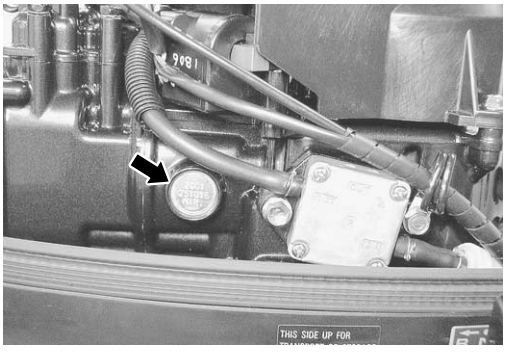


Example



ENGINE SERIAL NUMBER

A second engine serial number plate is pressed into a boss on the sylinder 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

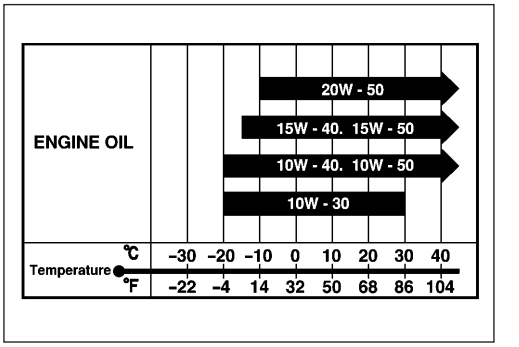
If leaded gasoline is used, engine damage may result. Use only unleaded gasoline.

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 (3000 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 (4000 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 DF4/5 models are shown below.

Recommended full throttle speed range	**DF4**	**4000 – 5000 r/min**
	DF5	**4500 – 5500 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	×	7 - ½	×	6	(C 600)
3	×	7 - ½	×	6 - ½	(C 610)
3	×	7 - ½	×	7	(C 700)

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

*These specifications are subject to change without notice.

Item	Unit	Data	
		DF4	DF5
PRE-FIX		00401F	00501F

DIMENSIONS & WEIGHT

Overall length (front to back)		mm (in)	554 (21.8) : with tiller handle raised
Overall width (side to side)		mm (in)	309 (12.2)
Overall height	S	mm (in)	1064 (41.9)
	L	mm (in)	1191 (46.9)
Weight (without engine oil)	S	kg (lb)	26 (55.1)
	L	kg (lb)	27 (57.3)
Transom height	S	mm (inch type)	442 (15)
	L	mm (inch type)	569 (20)

PERFORMANCE

Maximum output	kW (PS)	2.9 (4)	3.7(5)
Recommended operating range	r/min	4000 – 5000	4500 – 5500
Idle speed	r/min	1300 ± 50 (in-gear : approx : 1150)	

POWERHEAD

Engine type		4-stroke. OHV
Number of cylinders		1
Bore	mm (in)	62.0 (2.44)
Stroke	mm (in)	46.0 (1.81)
Total displacement	cm^3 (cu in.)	138 (8.4)
Compression ratio	:1	9.2
Spark plug	NGK	BPR6ES
Ignition system		SUZUKI PEI (Digital CDI)
Fuel supply system		Carburetor
Exhaust system		Above prop exhaust
Cooling system		Water cooled
Lubrication system		Wet sump by trochoid pump
Starting system		Manual
Choke system		Manual
Throttle control		Twist grip

Item	Unit	Data	
		DF4	DF5

FUEL & OIL

Fuel		Suzuki highly recommends that you use alcohol-free unleaded gasoline with a minimum pump octane rating of 87 ($\frac{R+M}{2}$ method) or 91 (Research method). However, blends of unleaded gasoline and alcohol with equivalent octane content may be used.
Fuel tank capacity (Built-in tank)	L (US/Imp. gal)	1.5 (0.4/0.3)
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating 10W-40
Engine oil amounts	L (US/Imp. qt)	0.7 (0.74/0.62)
Gear oil		SUZUKI Outboard Motor Gear Oil (SAE #90 hypoid gear oil)
Gearcase oil amounts	ml (US/Imp. oz)	190 (6.4/6.7)

BRACKET

Trim angle		4° – 20° (Shallow drive angle: 32°,45°)
Number of tilt pin position	Adjustable	5
Maximum tilt angle	degree	71° (from lowest tilt pin position)

LOWER UNIT

Reversing system	Gear
Transmission	Forward-Neutral-Reverse
Reduction system	Bevel gear
Gear ratio	12 : 23 (1.92)
Drive line impact protection	Shear pin and cogged rubber bushing
Propeller	Blade × Diam. (in) × Pitch (in)
	3 × 7 ½ × 6 (C 600) 3 × 7 ½ × 6 ½ (C 610) 3 × 7 ½ × 7 (C 700)

*SERVICE DATA

*These service data are subject to change without notice.

Item	Unit	Data	
		DF4	DF5

POWERHEAD

Recommended operating range	r/min	4000 – 5000	4500 – 5500
Idle speed	r/min	1300 ± 50 (in-gear: approx. 1150)	
*Cylinder compression (with decompression system)	kPa (kg/cm^2. psi)	550 – 650 (5.5 – 6.5, 78 – 92)	
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating SAE 10W-40	
Engine oil amounts	L (US/Imp. qt)	0.7 (0.74/0.62)	
Thermostat operating temperature	°C (°F)	48 – 52 (118 – 126)	

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

CARBURETOR

Item	Unit	Data	
		DF4	DF5

Type	MIKUNI	BV22-14-1	BV22-14-2
I.D mark		91J00	91J10
Main jet	#	77.5	
Pilot jet	#	35	
Pilot screw	Turns open	2 ½ ± ¼	
Float height	mm	14 ± 1	

Item			Unit	Data	
				DF4	DF5

CYLINDER HEAD / CAMSHAFT

Cylinder head distortion		Limit	mm (in)	0.05 (0.002)
Cam height	IN	STD	mm (in)	32.460 – 32.520 (1.2780 – 1.2803)
		Limit	mm (in)	32.160 (1.2661)
	EX	STD	mm (in)	32.538 – 32.598 (1.2810 – 1.2834)
		Limit	mm (in)	32.238 (1.2692)
Camshaft journal oil clearance	Upper	STD	mm (in)	0.016 – 0.062 (0.0006 – 0.0024)
		Limit	mm (in)	0.150 (0.0059)
	Lower	STD	mm (in)	0.016 – 0.052 (0.0006 – 0.0020)
		Limit	mm (in)	0.150 (0.0059)
Camshaft holder inside diameter	Upper	STD	mm (in)	15.000 – 15.028 (0.5906 – 0.5917)
	Lower	STD	mm (in)	16.000 – 16.018 (0.6299 – 0.6306)
Camshaft journal outside diameter	Upper	STD	mm (in)	14.966 – 14.984 (0.5892 – 0.5899)
	Lower	STD	mm (in)	15.966 – 15.984 (0.6286 – 0.6293)

Item			Unit	Data	
				DF4	DF5
VALVE / VALVE GUIDE					
Valve diameter		IN	mm (in)	24.0 (0.94)	
		EX	mm (in)	22.0 (0.87)	
Valve clearance (Cold engine condition)	IN	STD	mm (in)	0.03 – 0.07 (0.001 – 0.003)	
	EX	STD	mm (in)	0.03 – 0.07 (0.001 – 0.003)	
Valve seat angle		IN	——	15°, 45°	
		EX	——	15°, 45°	
Valve guide to valve stem clearance	IN	STD	mm (in)	0.025 – 0.052 (0.0010 – 0.0020)	
		Limit	mm (in)	0.075 (0.0030)	
	EX	STD	mm (in)	0.045 – 0.072 (0.0018 – 0.0028)	
		Limit	mm (in)	0.090 (0.0035)	
Valve guide inside diameter	IN,EX	STD	mm (in)	5.500 – 5.512 (0.2165 – 0.2170)	
Valve guide protrusion	IN,EX	STD	mm (in)	11.0 (0.43)	
Valve stem outside diameter	IN	STD	mm (in)	5.460 – 5.475 (0.2150 – 0.2156)	
	EX	STD	mm (in)	5.440 – 5.455 (0.2142 – 0.2148)	
Valve stem deflection	IN,EX	Limit	mm (in)	0.35 (0.014)	
Valve stem runout	IN,EX	Limit	mm (in)	0.05 (0.002)	
Valve head radial runout	IN,EX	Limit	mm (in)	0.08 (0.003)	
Valve head thickness	IN,EX	STD	mm (in)	1.0 (0.04)	
		Limit	mm (in)	0.5 (0.02)	
Valve seat contact width	IN	STD	mm (in)	0.8 – 1.0 (0.03 – 0.04)	
	EX	STD	mm (in)	1.0 – 1.2 (0.04 – 0.05)	
Valve spring free length		STD	mm (in)	29.5 (1.16)	
		Limit	mm (in)	28.3 (1.11)	
Valve spring tension		STD	N (kg, lbs)	139 – 159 (13.9 – 15.9, 30.6 – 35.1) for 19.3 mm (0.76 in)	
		Limit	N (kg, lbs)	127 (12.7, 28.0) for 19.3 mm (0.76 in)	

Item		Unit	Data	
			DF4	DF5

CYLINDER / PISTON / PISTON RING

Cylinder distortion		Limit	mm (in)	0.05 (0.002)
Piston to cylinder clearance		STD	mm (in)	0.010 – 0.040 (0.0004 – 0.0016)
		Limit	mm (in)	0.100 (0.0039)
Cylinder bore		STD	mm (in)	62.000 – 62.015 (2.4409 – 2.4415)
Cylinder measuring position			mm (in)	35 (1.4) from cylinder top surface
Piston skirt diameter		STD	mm (in)	61.975 – 61.990 (2.4400 – 2.4406)
Piston measuring position			mm (in)	14 (0.6) from piston skirt end.
Cylinder bore wear		Limit	mm (in)	0.100 (0.0039)
Piston ring end gap	1st	STD	mm (in)	0.20 – 0.35 (0.008 – 0.014)
		Limit	mm (in)	0.70 (0.028)
	2nd	STD	mm (in)	0.35 – 0.50 (0.014 – 0.020)
		Limit	mm (in)	1.00 (0.039)
Piston ring free end gap	1st, 2nd	STD	mm (in)	Approx. 8.5 (0.33)
		Limit	mm (in)	6.8 (0.27)
Piston ring to groove clearance	1st, 2nd	STD	mm (in)	0.03 – 0.07 (0.001 – 0.003)
		Limit	mm (in)	0.12 (0.005)
Piston ring groove width	1st, 2nd	STD	mm (in)	1.22 – 1.24 (0.048 – 0.049)
	Oil	STD	mm (in)	2.51 – 2.53 (0.099 – 0.100)
Piston ring thickness	1st, 2nd	STD	mm (in)	1.17 – 1.19 (0.046 – 0.047)
Pin clearance in piston pin hole		STD	mm (in)	0.006 – 0.019 (0.0002 – 0.0007)
		Limit	mm (in)	0.040 (0.0016)
Piston pin outside diameter		STD	mm (in)	17.995 – 18.000 (0.7085 – 0.7087)
		Limit	mm (in)	17.980 (0.7079)
Piston pin hole diameter		STD	mm (in)	18.006 – 18.014 (0.7089 – 0.7092)
		Limit	mm (in)	18.030 (0.7098)
Pin clearance in conrod small end		STD	mm (in)	0.006 – 0.019 (0.0002 – 0.0007)
		Limit	mm (in)	0.050 (0.0020)

Item		Unit	Data	
			DF4	DF5

CRANKSHAFT / CONROD

Conrod small end inside diameter	STD	mm (in)	18.006 – 18.014 (0.7089 – 0.7092)	
	Limit	mm (in)	18.040 (0.7102)	
Conrod big end oil clearance	STD	mm (in)	0.015 – 0.035 (0.0006 – 0.0014)	
	Limit	mm (in)	0.080 (0.0031)	
Conrod big end inside diameter	STD	mm (in)	28.015 – 28.025 (1.1030 – 1.1033)	
Crank pin outside diameter	STD	mm (in)	27.990 – 28.000 (1.1020 – 1.1024)	
Crank pin outside diameter difference (out-of-round and taper)	Limit	mm (in)	0.010 (0.0004)	
Conrod big end side clearance	STD	mm (in)	0.20 – 0.90 (0.008 – 0.0035)	
	Limit	mm (in)	1.20 (0.047)	
Conrod big end width	STD	mm (in)	23.30 – 23.80 (0.917 – 0.937)	
Crank pin width	STD	mm (in)	24.00 – 24.20 (0.945 – 0.953)	
Crankshaft runout	Limit	mm (in)	0.05 (0.002)	
Crankshaft lower journal oil clearance	STD	mm (in)	0.020 – 0.062 (0.0008 – 0.0024)	
	Limit	mm (in)	0.100 (0.0039)	
Crankcase lower holder inside diameter	STD	mm (in)	25.000 – 25.021 (0.9843 – 0.9851)	
Crankshaft lower journal outside diameter	STD	mm (in)	24.959 – 24.980 (0.9826 – 0.9835)	

Item	Unit	Data	
		DF4	DF5

ELECTRICAL

Ignition timing		Degrees at r/min	BTDC 6° – 26.5°
Over revolution limiter		r/min	6000
Ignition coil resistance	Secondary	kΩ at 20°C	8.4 – 12.4 [H.T.cord – pulser core]
Spark plug cap resistance		kΩ at 20°C	7.5 – 12.5
Battery charge coil resistance (Optional part)		Ω at 20°C	0.6 – 1.0 [R – Y]
Battery charge coil output (12V) (Optional part)		Watt	80
Standard spark plug	Type	NGK	BPR6ES
	Gap	mm (in)	0.7 – 0.8 (0.028 – 0.031)

LOWER UNIT

Desige specification thickness for shim & washer

Pinion gear backup shim	mm (in)	2.0 (0.08)
Forward gear backup shim	mm (in)	1.2 (0.05)
Forward gear thrust washer	mm (in)	1.0 (0.04)
Reverse gear thrust washer	mm (in)	1.0 (0.04)
Reverse gear backup shim	mm (in)	0.8 (0.03)

Initial selection-shim adjustment may be required.

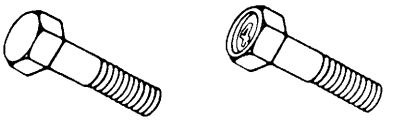
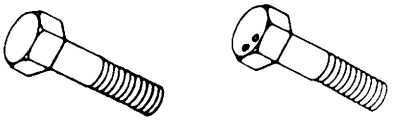
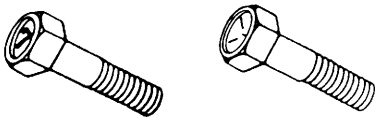
TIGHTENING TORQUE

Tightening Torque – Important Fasteners

ITEM		THREAD DIAMETER	TIGHTENING TORQUE		
			N · m	kg-m	lb-ft
Cylinder head cover bolt		6 mm	8	0.8	6.0
Cylinder head bolt		8 mm	28	2.8	20.5
Crankcase bolt		6 mm	10	1.0	7.0
Conrod cap bolt		8 mm	21	2.1	15.0
Rocker arm pivot bolt		6 mm	10	1.0	7.0
Valve adjusting lock nut		6 mm	11	1.1	8.0
Intake manifold bolt		6 mm	10	1.0	7.0
CDI & coil unit mounting bolt		6 mm	10	1.0	7.0
Carburetor mounting bolt		6 mm	10	1.0	7.0
Fuel pump mounting bolt		6 mm	8	0.8	6.0
Fuel tank mounting bolt		6 mm	10	1.0	7.0
Flywheel nut		12 mm	50	5.0	36.0
Engine oil drain plug		10 mm	10	1.0	7.0
Power unit mounting bolt		6 mm	10	1.0	7.0
Tiller handle pivot	Bolt	8 mm	12	1.2	8.5
	Nut	8 mm	17	1.7	12.5
Steering bracket cover bolt		6 mm	10	1.0	7.0
Swivel bracket cover bolt		6 mm	10	1.0	7.0
Gearcase nut / bolt		8 mm	17	1.7	12.5
Water pump case nut		6 mm	8	0.8	6.0
Shift rod guide plate bolt		6 mm	8	0.8	6.0
Rod connecting plate bolt		6 mm	11	1.1	8.0
Propeller shaft bearing housing bolt		6 mm	8	0.8	6.0
Clamp bracket shaft nut		10 mm	25	2.5	18.0

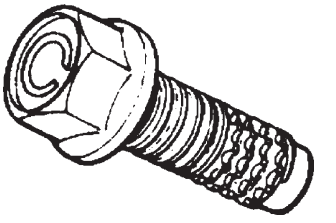
Tightening torque – general bolt

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

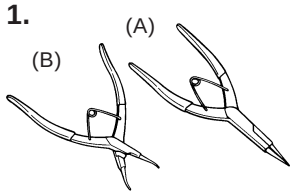
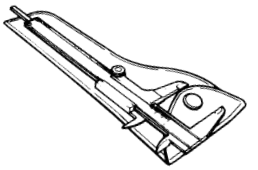
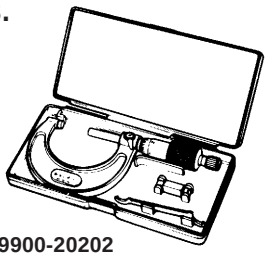
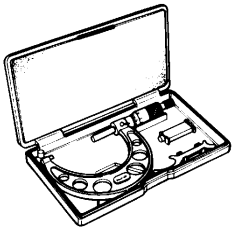
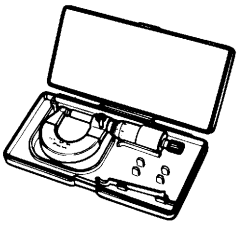
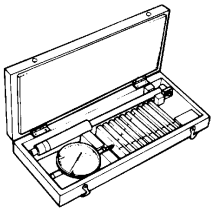
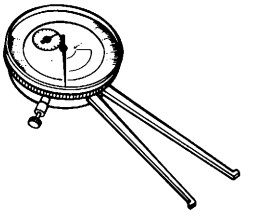
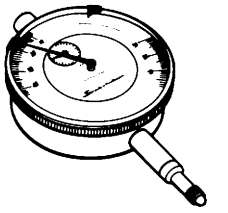
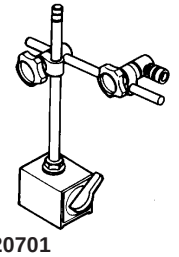
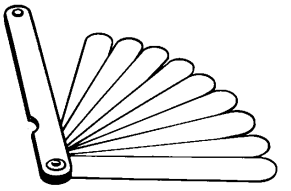
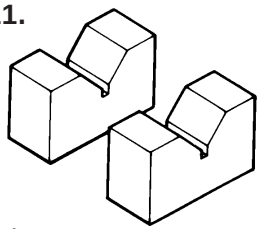
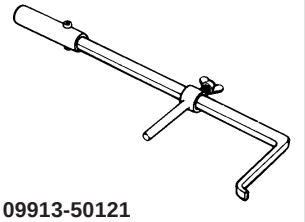
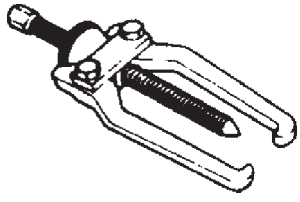
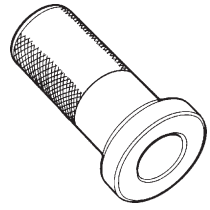
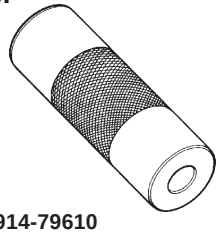
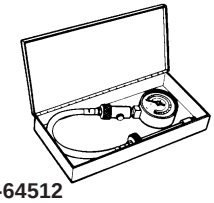
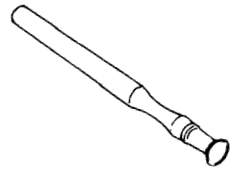
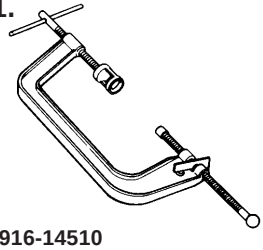
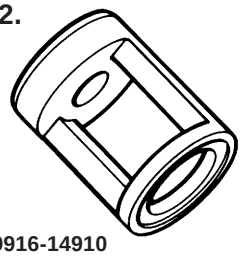
TYPE OF BOLT	THREAD DIAMETER	TIGHTENING TORQUE		
		N · m	kg-m	lb-ft
 (Conventional or "4" marked bolt)	5 mm	2 – 4	0.2 – 0.4	1.5 – 3.0
	6 mm	4 – 7	0.4 – 0.7	3.0 – 5.0
	8 mm	10 – 16	1.0 – 1.6	7.0 – 11.5
	10 mm	22 – 35	2.3 – 3.5	16.0 – 25.5
 (Stainless steel bolt)	5 mm	2 – 4	0.2 – 0.4	1.5 – 3.0
	6 mm	6 – 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 Y 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

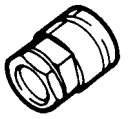
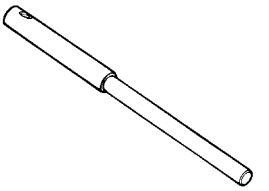
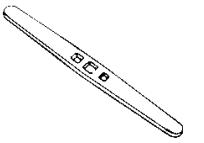
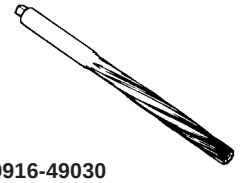
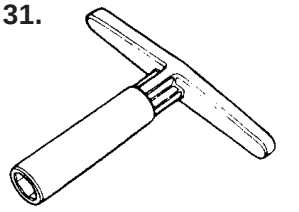
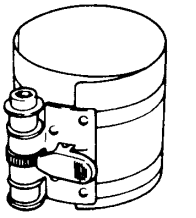
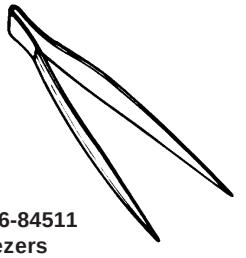
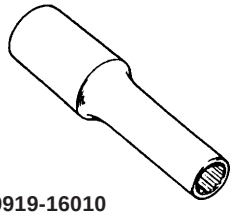
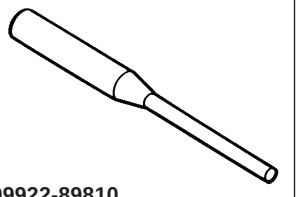
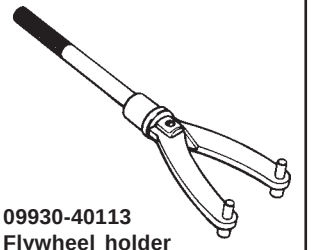
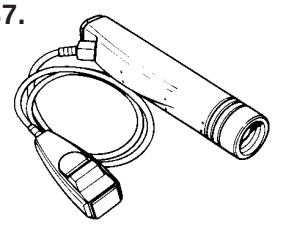
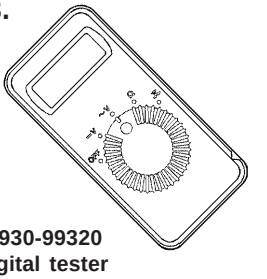
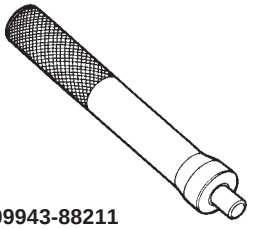
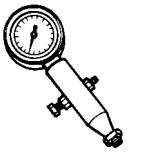
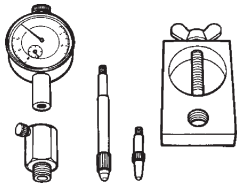
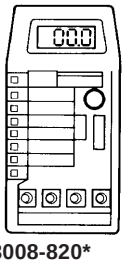
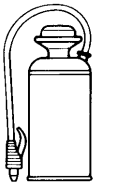
NOTE:
"C" marked self-tapping bolt will tap a thread to an aluminum alloy part which is replaced by servicing. When installing the self-tapping bolt to a new part, follow the procedure below.

- *Thighten the bolt until the bolt head is seated on the secured part first.*
- *Completely loosen the bolt.*
- *Retighten the bolt to the specified torque finally.*



SPECIAL TOOLS

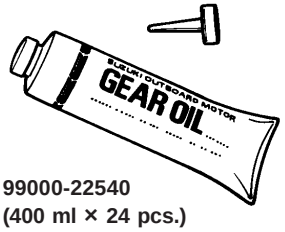
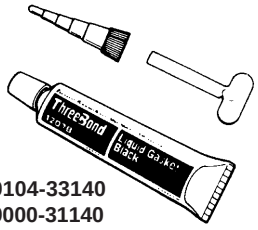
1.  **(A) 09900-06107** **(B) 09900-06108** **Snap ring pliers**	**2.**  **09900-20101 (150 mm)** **09900-20102 (200 mm)** **Vernier calipers**	**3.**  **09900-20202** **Micrometer (25 – 50 mm)**	**4.**  **09900-20203** **Micrometer (50 – 75 mm)**
5.  **09900-20205** **Micrometer (0 – 25 mm)**	**6.**  **09900-20508** **Cylinder gauge set** **(40 – 80 mm)**	**7.**  **09900-20605** **Dial calipers (10 – 34 mm)**	**8.**  **09900-20602** **Dial gauge**
9.  **09900-20701** **Magnetic stand**	**10.**  **09900-20803** **Thickness gauge**	**11.**  **09900-21304** **Steel "V" block set**	**12.**  **09900-22301** **(0.025 – 0.076 mm)** **Plastigauge**
13.  **09900-26006** **Engine tachometer**	**14.**  **09913-50121** **Oil seal remover**	**15.**  **09913-65135** **Flywheel remover**	**16.**  **09913-75810** **Remover & installer**
17.  **09913-75821** **Remover & installer**	**18.**  **09914-79610** **Remover & installer**	**19.**  **09915-64512** **Compression gauge** **09915-63210** **Adaptor**	**20.**  **09916-10911** **Valve lapper**
21.  **09916-14510** **Valve lifter**	**22.**  **09916-14910** **Valve lifter attachment**	**23.**  **09916-20610** **Valve seat cutter** **(Neway 121)**	**24.**  **09916-20620** **Valve seat cutter** **(Neway 122)**

25.  **09916-24440** **Handle adaptor (N-503-1)**	**26.**  **09916-24450** **Solid pilot (N-100-5.52)**	**27.**  **09916-34542** **Valve guide reamer handle**	**28.**  **09916-34550** **Valve guide reamer (ϕ 5.5 mm)**
29.  **09916-44310** **Valve guide remover / installer**	**30.**  **09916-49030** **Valve guide reamer (ϕ 9.3 mm)**	**31.**  **09916-54910** **Handle (N-505)**	**32.**  **09916-77310** **Piston ring compressor**
33.  **09916-84511** **Tweezers**	**34.**  **09919-16010** **Deep socket wrench**	**35.**  **09922-89810** **Shift lock pin remover**	**36.**  **09930-40113** **Flywheel holder**
37.  **09930-76420** **Timing light**	**38.**  **09930-99320** **Digital tester**	**39.**  **09943-88211** **Remover & installer**	**40.**  **09950-69512** **Gearcase oil leakage tester**
41.  **09951-09511** **Gear adjusting gauge**	**42.**  **99954-53008-820*** **Digital voltmeter**	**43.**  **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)**	**SUZUKI 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)**	**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

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 50 hrs. or 3 months	Every 100 hrs. or 6 months	Every 200 hrs. or 12 months
Spark plug	—	—	I	R
Breather hose & Fuel line	I	I	I	I
	Replace every 2 years			
Engine oil	R	—	R	R
Gear oil	R	—	R	R
Lubrication	—	I	I	I
Anodes	—	I	I	I
Engine oil filter	—	—	—	I
Fuel filter	Replace every 400 hours or 2 years.			
Ignition timing	—	—	—	I
Carburetor	I	—	I	I
Idle speed	I	—	—	I
Valve clearance	I	—	—	I
Water pump	—	—	—	I
Water pump impeller	—	—	—	R
Propeller nut & pin	I	—	I	I
Bolts & Nuts	T	—	T	T

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

MAINTENANCE AND TUNE-UP PROCEDURES

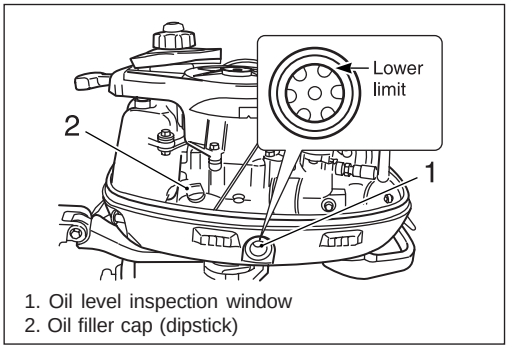
This section describes the servicing procedures for each of the periodic maintenance requirements.

ENGINE OIL / ENGINE OIL FILTER

ENGINE OIL LEVEL CHECK

Inspect the oil level before every use.

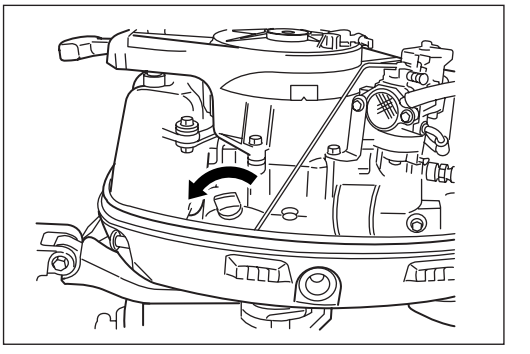
1. Place the outboard motor upright on a level surface.
2. Check the oil level through the oil level inspection window. The oil should be seen in the whole of the window.



1. Oil level inspection window
2. Oil filler cap (dipstick)

If the level is low, add the recommended oil to the upper limit.

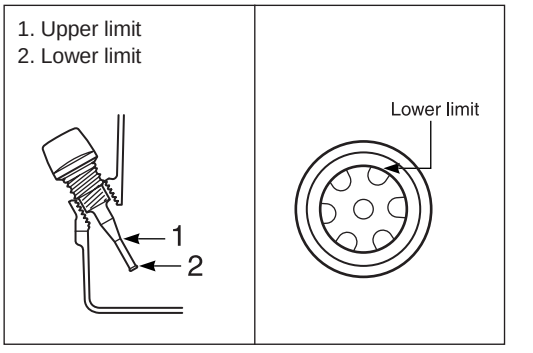
Recommended oil :
- **4 stroke motor oil**
- **API classification SE, SF, SG, SH, SJ.**
- **Viscosity rating SAE 10 W-40.**



Perform the following steps in order to add the oil to the upper limit:

3. Remove the motor cover.
4. Remove the oil filler cap (dipstick) and wipe the dipstick clean.
5. Fill the engine oil to the upper limit.
6. Touch the filler cap threads onto the filler hole edge in order to check the oil level. Do not screw the filler cap.
7. Tighten the oil filler cap securely.

1. Upper limit
2. Lower limit

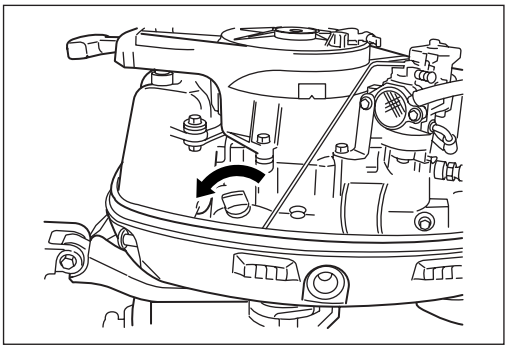


ENGINE OIL CHANGE

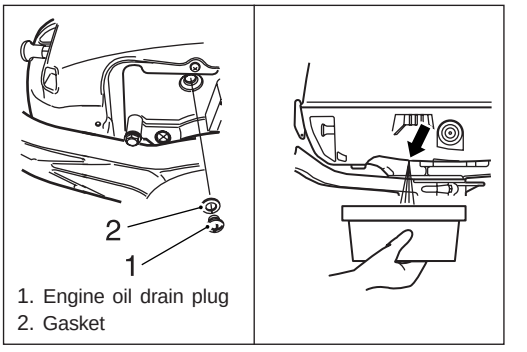
Change initially after 20 hours (1 month) and every 100 hours (6 months) thereafter.

NOTE:
Change the engine oil while the engine is warm.

1. Place the outboard motor upright on a level surface.
2. Remove the oil filler cap.
3. Place a container under the engine oil drain plug.



4. Remove the engine oil drain plug and the gasket in order to drain the engine oil.



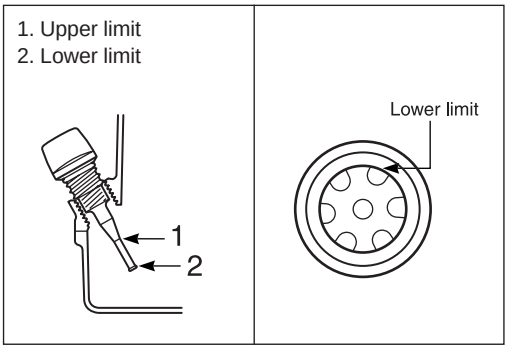
1. Engine oil drain plug
2. Gasket

5. Install the gasket and the engine oil drain plug. Tighten the plug to the specified torque.

Engine oil drain plug : 10 N·m (1.0 kg-m, 7.0 lb-ft)

CAUTION

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



6. Pour the recommended engine oil to the upper limit.
7. Tighten the oil filler cap securely.

Engine oil amounts: 0.7 L (0.74 / 0.62 US/Imp. qt)

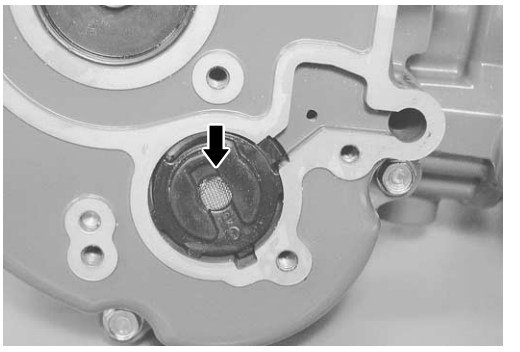
8. Start the engine. Allow the engine to run for several minutes at the idle speed. Check for oil leakage.
9. Turn off the engine and wait for approx. two minutes. Recheck the engine oil level. (See the page 2-3)

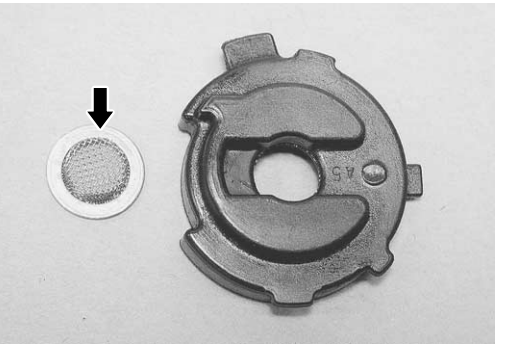
ENGINE OIL FILTER INSPECTION

Inspect every 200 hours (12 months).

To inspect the engine oil filter :

1. Remove the power unit from the engine lower cover. (See the page 6-2 to 6-4)
2. Detach the engine oil filter with the holder from the crankcase.
3. Inspect the engine oil filter for dirt, clog or other damage. Clean or replace the filter if necessary.



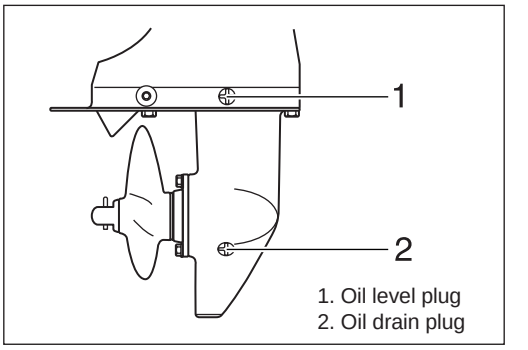


GEAR OIL

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

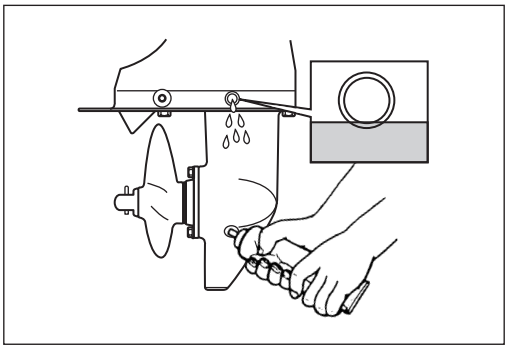
1. Place the outboard motor upright on a level surface.
2. Place a container under the lower unit.

3. Remove the gear oil drain plug before the gear oil level plug and drain the gear oil.



1. Oil level plug
2. Oil drain plug

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 amounts : 190 ml (6.4 / 6.7 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.

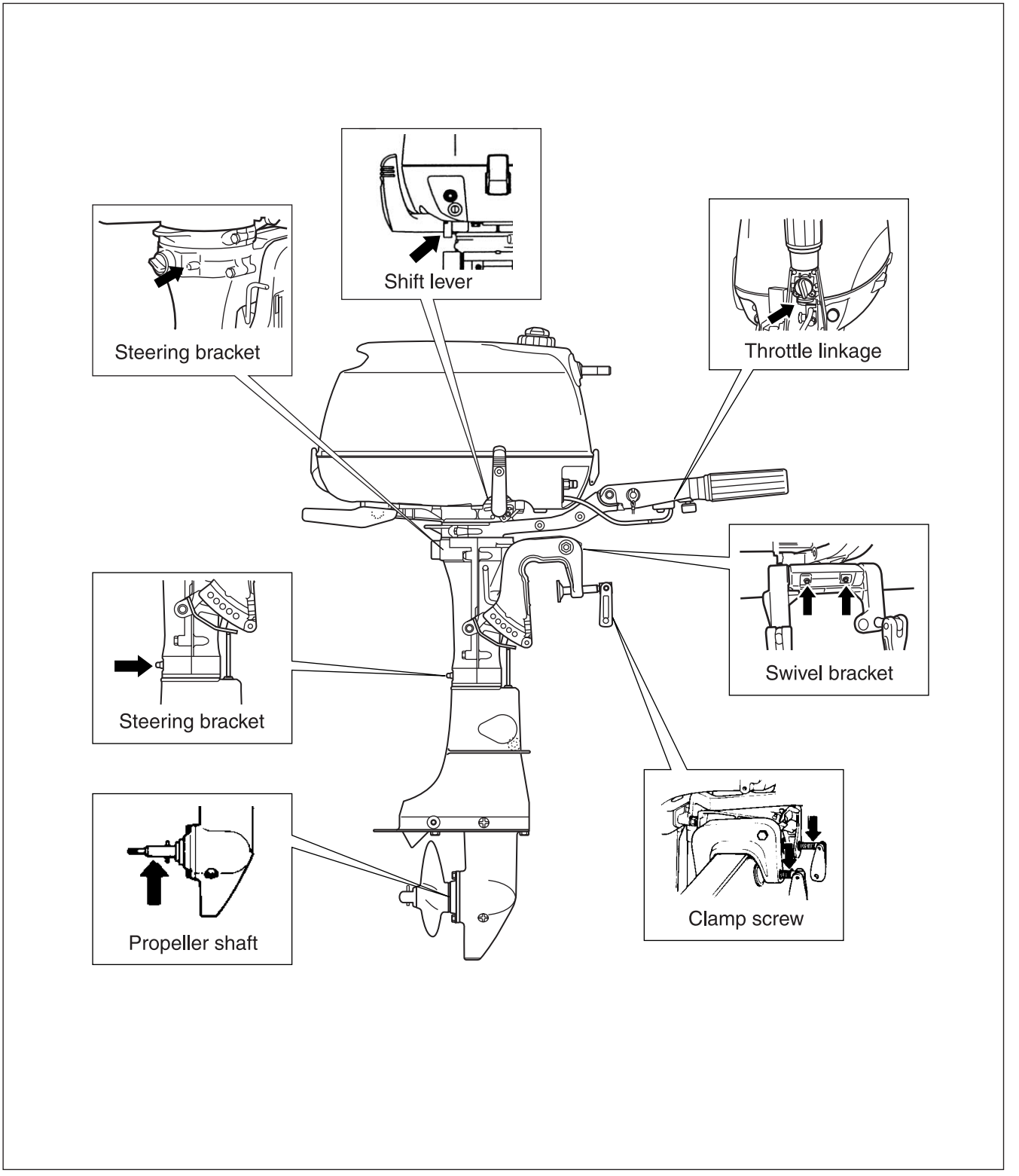
NOTE:
To avoid insufficient injection of the gear oil, check the gear oil level 10 minutes after doing the procedure in the step 6. If the oil level is low, slowly inject the gear oil up to the correct level.

LUBRICATION

Inspect every 50 hours (3 months).

Apply the Water Resistant Grease to the following points.

99000-25160 : Suzuki Water Resistant Grease



SPARK PLUG

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

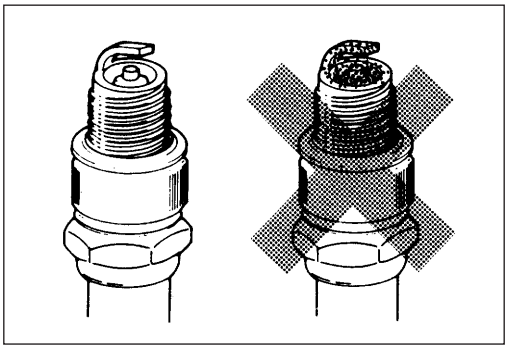
Standard spark plug : NGK BPR6ES

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.

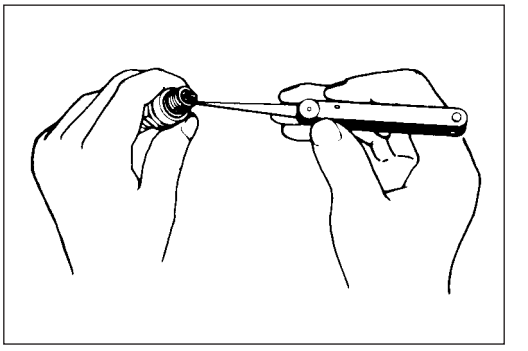


SPARK PLUG GAP

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

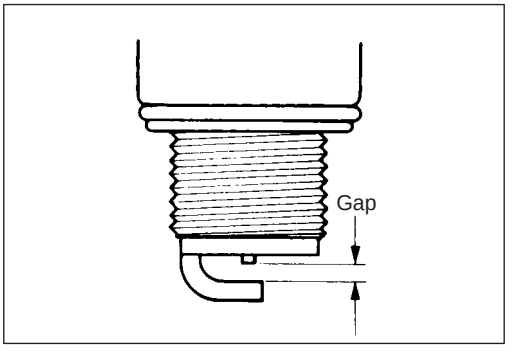
Spark plug gap : 0.7 – 0.8 mm (0.028 – 0.031 in)

09900-20803 : Thickness gauge



CONDITION OF ELECTRODE / INSULATOR

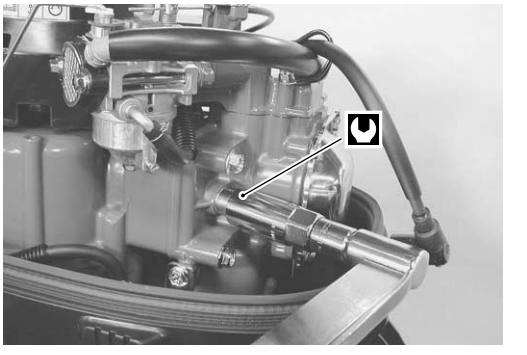
Check the electrode and insulator condition.
If the electrode is extremely worn or burnt, replace the spark plug.
If the spark plug has a broken insulator, damaged threads, etc., replace the spark plug.



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 : 28 N·m (2.8 kg-m, 20.0 lb-ft)



VALVE CLEARANCE

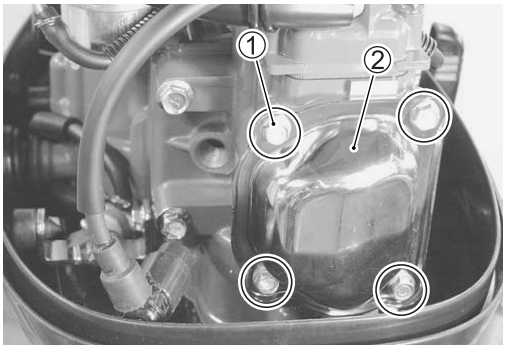
Inspect initially after 20 hours (1 month) and every 200 hours (12 months) thereafter.

CHECKING AND ADJUSTING VALVE CLEARANCE

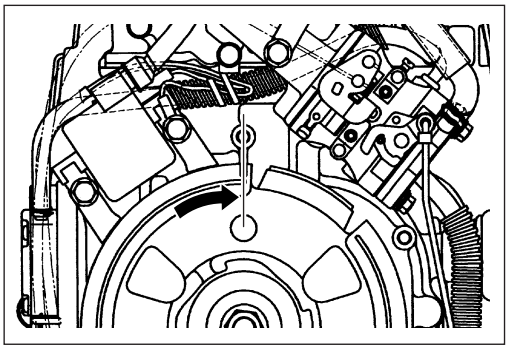
Checking

1. Remove the following parts :
   - Engine cover
   - Recoil starter
   - Spark plug
   - Engine cover seal

2. Remove the four bolts ① and the cylinder head cover ②.



3. Rotate the flywheel clockwise to bring the piston to the Top Dead Center (TDC) on a compression stroke.



CAUTION

Rotate the crankshaft clockwise to prevent water pump impeller damage.

NOTE :

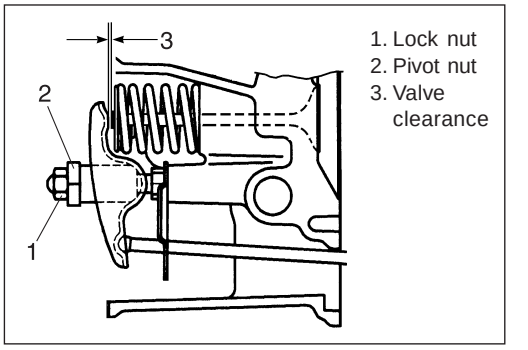
- *To confirm whether the piston is at the TDC position on a compression stroke or on a exhaust stroke, rotate the flywheel within ±15° beyond the TDC position.*
- *If both rocker arms do not move at all, the piston is at the position on a compression stroke.*
- *If any rocker arm moves, the piston is at the TDC on a exhaust stroke. Rotate the flywheel one more turn.*
- *The valve clearance specification is for COLD engine condition.*

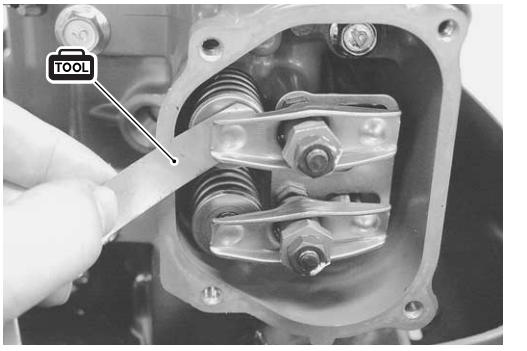
4. Measure the valve clearance by inserting thickness gauge between the valve stem end and the rocker arm.

TOOL 09900-20803 : Thickness gauge

Valve clearance (cold engine condition) :
IN 0.03 – 0.07 mm (0.001 – 0.003 in)
EX 0.03 – 0.07 mm (0.001 – 0.003 in)

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

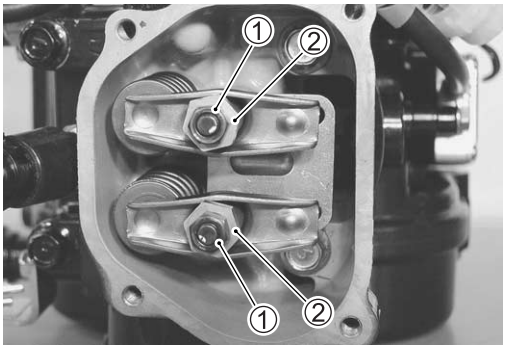




Adjustment

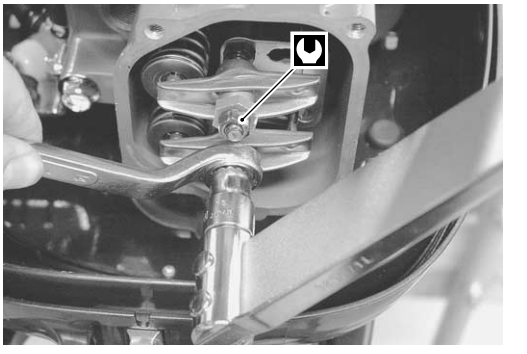
5. Loosen the valve adjusting lock nut ① while holding the pivot nut ②.
6. Turn the pivot nut ② to bring the valve clearance to within the specification.

TOOL 09900-20803 : Thickness gauge



7. Tighten the lock nut ① to the specified torque while holding the pivot nut ②.

Valve adjusting lock nut : 11 N·m (1.1 kg-m, 8.0 lb-ft)



8. Recheck the valve clearance.

Installation

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

- Tighten the four cylinder head cover bolts diagonally to the specified torque.

Cylinder head cover bolt : 8 N·m (0.8 kg-m, 6.0 lb-ft)

CAUTION

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

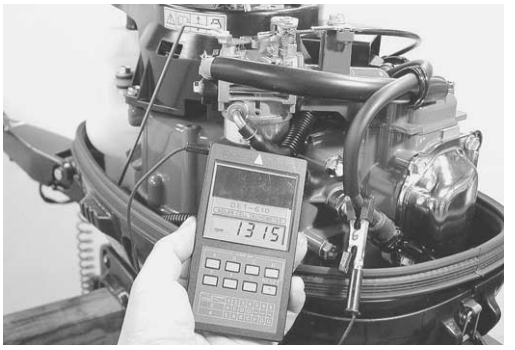
- Make sure that the cylinder head cover gasket is installed correctly. (See the page 6-39)

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.



TOOL **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.

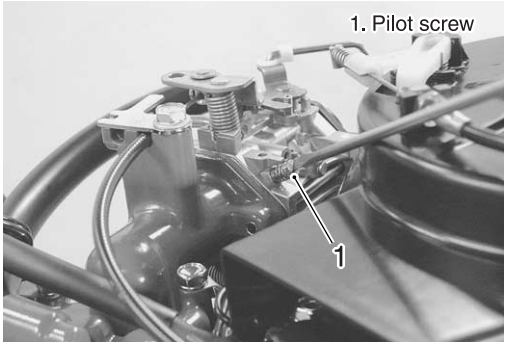
4. Check the idle speed.

Idle speed (in neutral gear) : 1250 – 1350 r/min.

Adjustment

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

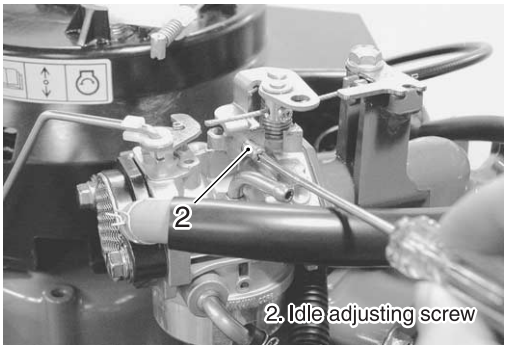
1. Turn the pilot screw to the standard specification.



Pilot screw initial setting
DF4 2-½ turns open
DF5 2-½ turns open

NOTE :
When turning the pilot screw fully in, lightly seat the screw only. Do not over tighten in order to avoid damaging the needle valve and the seat.

2. Turn the idle adjusting screw.

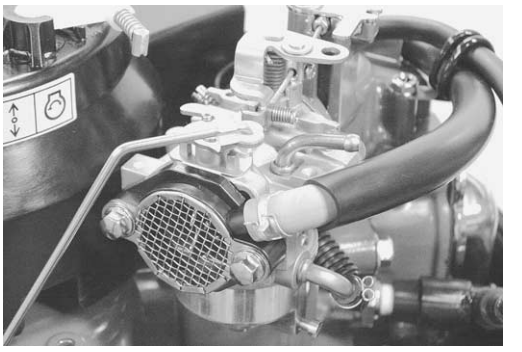


- Turning clockwise :
  The engine speed becomes higher.
- Turning counterclockwise :
  The engine speed becomes lower.

3. Adjust the pilot screw in small increments until a stable engine speed is achieved.
   Change the pilot screw setting within ±1/4 turn to the standard specification.

- Turning clockwise :
  The fuel / air mixture becomes leaner.
- Turning counterclockwise :
  The fuel / air mixture becomes richer.

CARBURETOR



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

Inspect the body, the float chamber, the lever, the linkage, the connector and the fuel inlet.
If crack or other damage is found, replace.

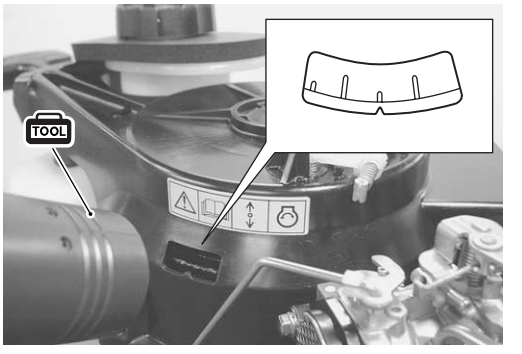
IGNITION TIMING

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 cord to the spark plug high-tension cord.



TOOL **09930-76420 : Timing light**

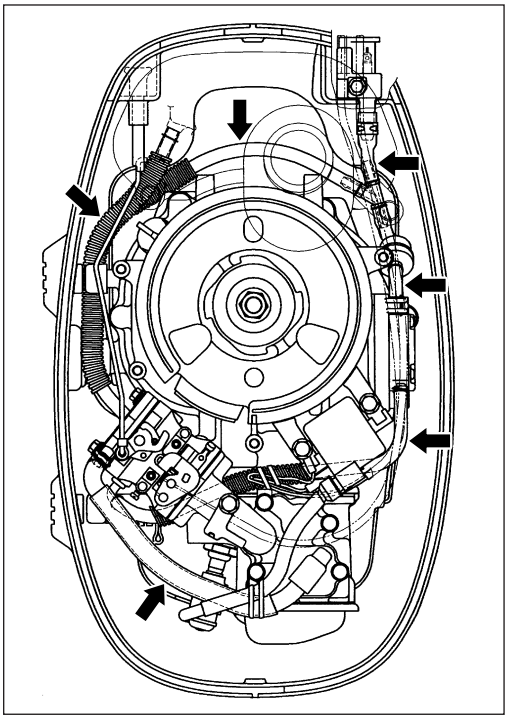
3. Check the ignition timing while operating the engine at the idling speed.

   Ignition timing : Approx. BTDC 6° at 1300 r/min.

BREATHER HOSE AND FUEL LINE

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

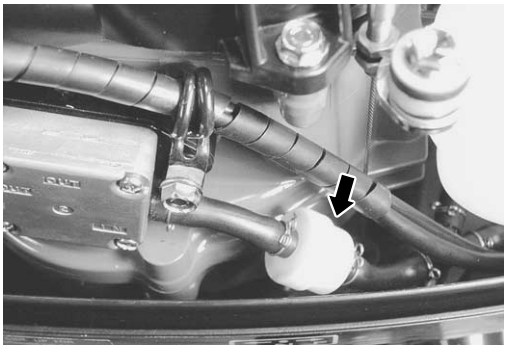
If leakage, crack, swelling or other damage is found, replace the breather hose and/or the fuel line.



FUEL FILTER

- **Inspect before every use.**
- **Replace every 400 hours or 2 years.**

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



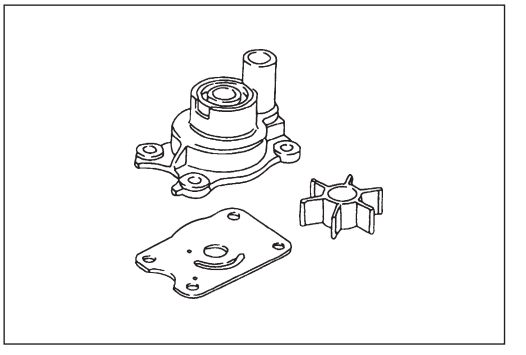
WATER PUMP / WATER PUMP IMPELLER

WATER PUMP
Inspect every 200 hours (12 months).

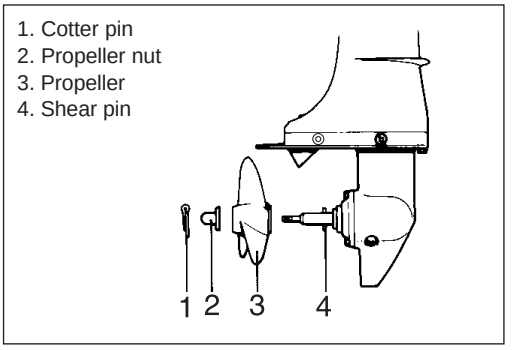
Inspect the pump case and the under panel.
If wear, crack, distortion or corrosion is found, replace.

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

If cut, tear, or excessive wear is found, replace the impeller.



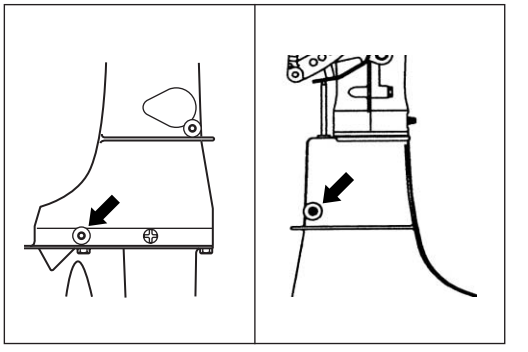
PROPELLER / NUT / COTTER PIN



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

- Inspect the propeller for bent, chipped or broken blades. If damage noticeably affects operation, replace.
- Make sure that the propeller nut is tightened.
- Make sure that the cotter pin is installed securely.

ANODES



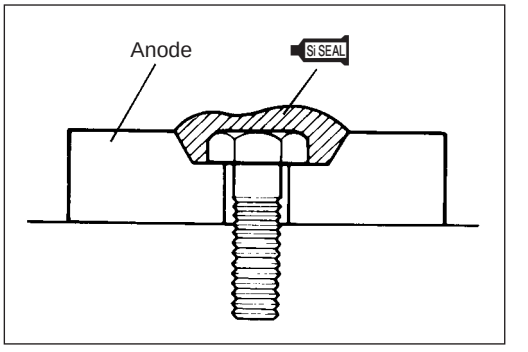
Inspect every 50 hours (3 months).

ANODES

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

CAUTION

Do not paint the anode.



NOTE:

Apply the Silicone Seal to the anode securing bolts.

Si SEAL **99000-31120 : Suzuki Silicone Seal**

BOLTS AND NUTS

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

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

ITEM	THREAD DIAMETER	TIGHTEN TORQUE		
		N·m	kg-m	lb-ft
Cylinder head cover bolt	6 mm	8	0.8	6.0
Cylinder head bolt	8 mm	28	2.8	20.5
Flywheel nut	12 mm	50	5.0	36.0
Power unit mounting bolt	6 mm	10	1.0	7.0
Clamp bracket shaft nut	10 mm	25	2.5	18.0
Gearcase bolt / nut	8 mm	17	1.7	12.5

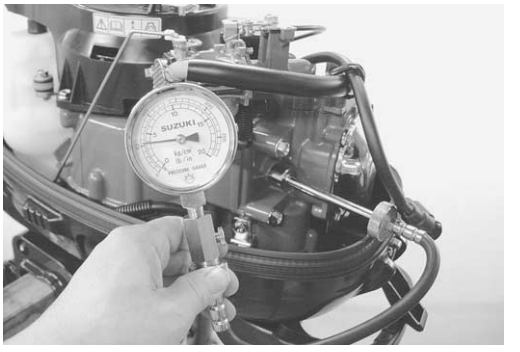
CYLINDER COMPRESSION

NOTE:
Figures shown are guidelines only, not absolute service limits.

Cylinder compression
(with decompression system):
550 – 650 kPa (5.5 – 6.5 kg/cm², 78 – 92 psi)

Low compression pressure can indicate one or more of the following :
- Excessively worn cylinder wall
- Worn piston or piston rings
- Stuck piston rings
- Poor seating of valves
- Ruptured or otherwise damaged cylinder head gasket

Test procedure
1. Start and warm up the engine, then shut the engine off.
2. Remove the spark plug.
3. Install the compression gauge into the plug hole.



TOOL **09915-64512 : Compression gauge**
09915-63210 : Compression gauge adaptor

4. Disconnect the safety lanyard from the emergency stop switch.

⚠ WARNING

Disconnect the safety lanyard from the emergency stop switch prior to cranking the engine.
This will prevent any residual fuel discharged from the cylinders from being ignited by a spark discharged from the spark plug cap.

5. Move and hold the throttle control grip in the full-open position.
6. While cranking the engine with the recoil starter, note the maximum compression pressure reading on the gauge.

IGNITION AND ELECTRICAL

CONTENTS

IGNITION SYSTEM

OUTLINE

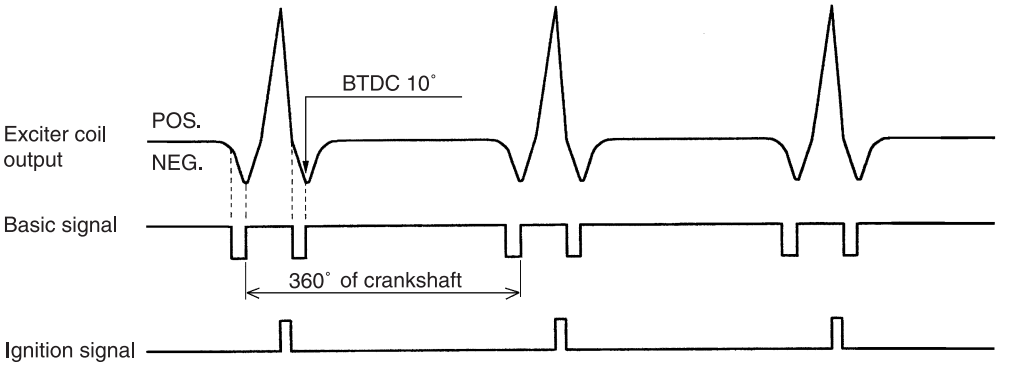
A digital CDI (condenser discharge ignition) system is employed on the DF4/DF5.
The CDI & coil unit incorporates an ignition coil and pulser core. If the magnetic reluctor bar on the flywheel passes through the pulser core, the exciter coil in the unit generates the electrical energy as shown in the chart below.
The condenser stores the positive side electrical energy, while the CPU utilizes the negative side electrical energy as basic signals in order to calcurate the engine speed and to control the ignition timing.
The electrical energy stored in the condenser is released to the ignition coil primary windings, then a high surge voltage occurs in the ignition coil secondary windings and spark is generated.

The CDI & coil unit incorporates an over-revolution limiter which limits maximum engine speed to approximately 6000 r/min. If the over-revolution limiter activates, the motor will exhibit a rough running condition.

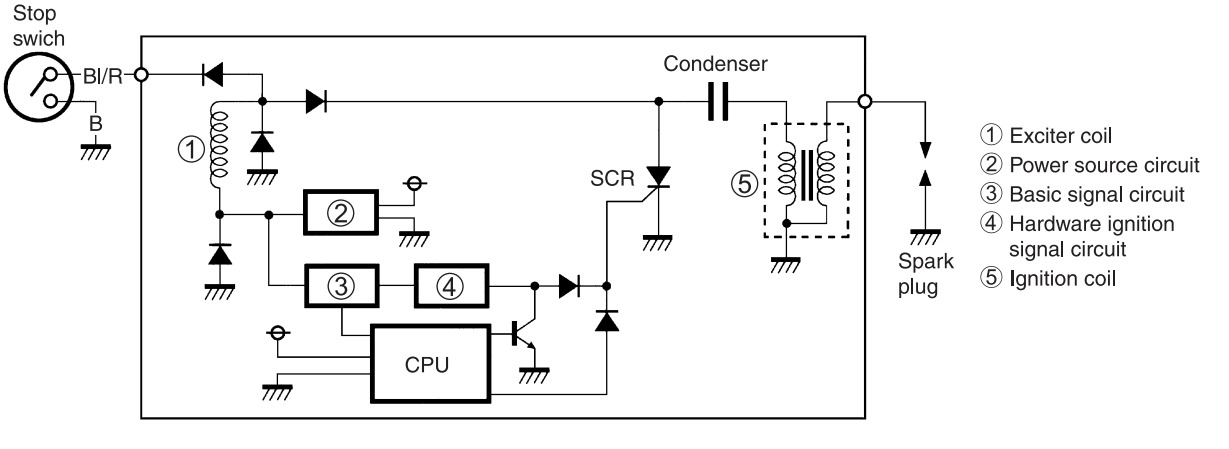
SPECIFICATION

Ignition type	CDI
Advance	Electronic microcomputer control
Ignition timing	BTDC 6° – 26.5°

IGNITION SIGNAL CHART

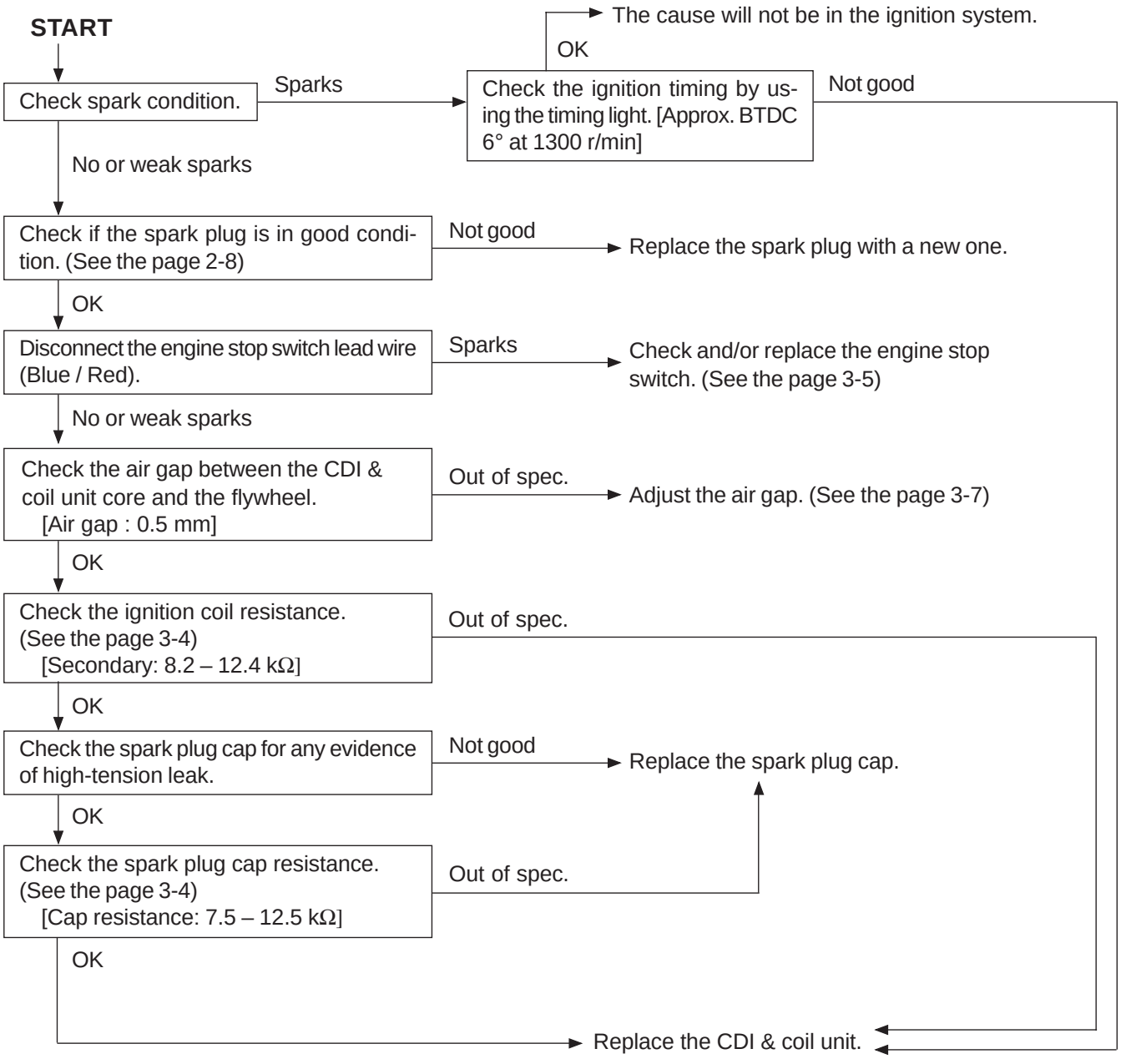


UNIT INTERNAL STRUCTURE



IGNITION TROUBLESHOOTING

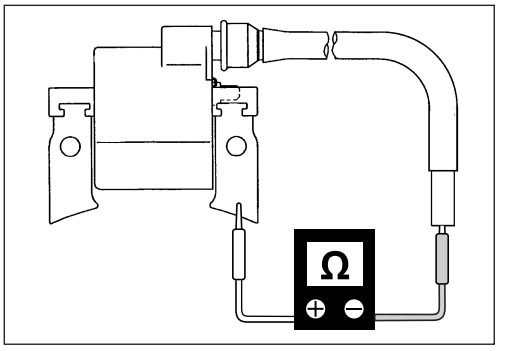
Perform the following ignition system tests when the engine is hard to start in order to determine if the cause is in the ignition or another system.



INSPECTION

IGNITION SECONDARY COIL RESISTANCE

Measure the secondary coil resistance in the CDI & coil unit.



09930-99320 : Digital tester

Tester range : Ω (Resistance)

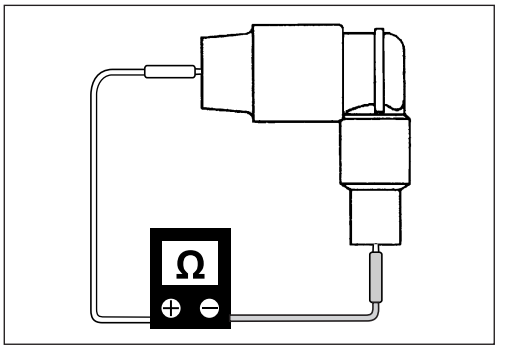
1. Remove the spark plug cap from the high-tension cord.
2. Measure the secondary coil resistance.

Tester probe connection	
Probe	Other probe
High-tension cord	Core

Ignition secondary coil resistance : 8.2 – 12.4 kΩ

If the measurement is out of the specification, replace the CDI & coil 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 : 7.5 – 12.5 kΩ

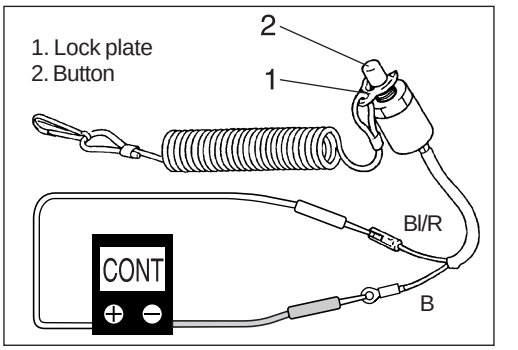
If the measurement is out of the specification, replace the spark plug cap.

ENGINE STOP SWITCH

09930-99320 : Digital tester

Tester range : (Continuity)

Inspect the continuity of the engine stop switch.



Tester probe connection	
Probe	Other probe
Blue/Red	Black

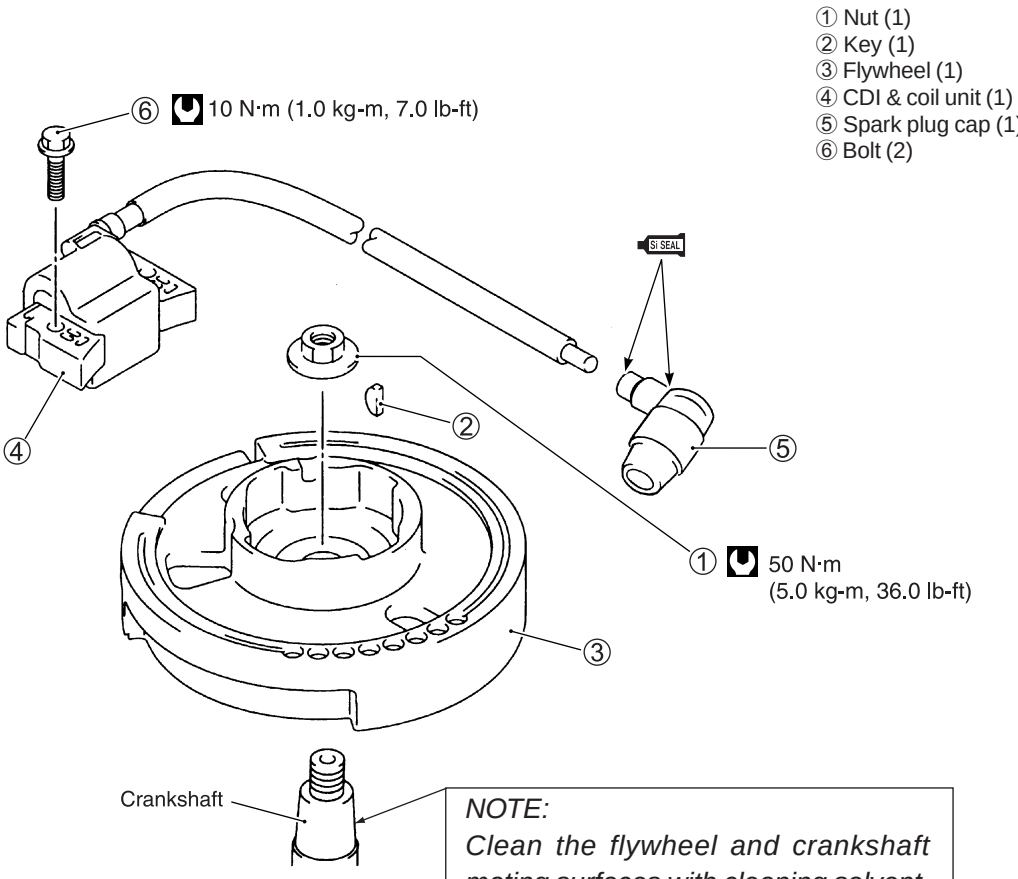
Stop switch continuity :

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

System construction

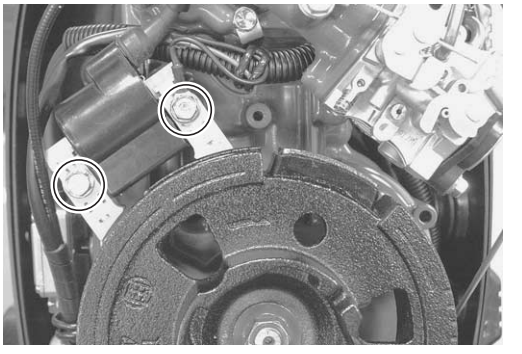


NOTE:
Clean the flywheel and crankshaft mating surfaces with cleaning solvent.

REMOVAL

Prior to removing the electrical parts, disconnect the spark plug cap from the spark plug.

1. Remove the recoil starter. (See the page 5-2)
2. Remove the two bolts securing the CDI & coil unit.
3. Disconnect the Blue/Red lead wire from the unit.



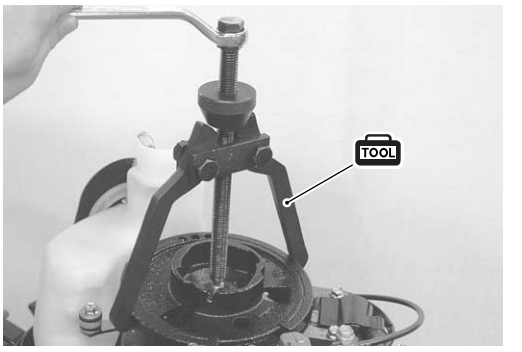
4. Remove the flywheel nut using the special tool.

TOOL **09930-40113 : Flywheel holder**

5. Remove the flywheel from the crankshaft using the special tool.

09913-65135 : Flywheel remover

6. Remove the key from the crankshaft.



INSTALLATION

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

Flywheel

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

09930-40113 : Flywheel holder

Flywheel nut : 50 N·m (5.0 kg-m, 36.0 lb-ft)

CDI & coil unit

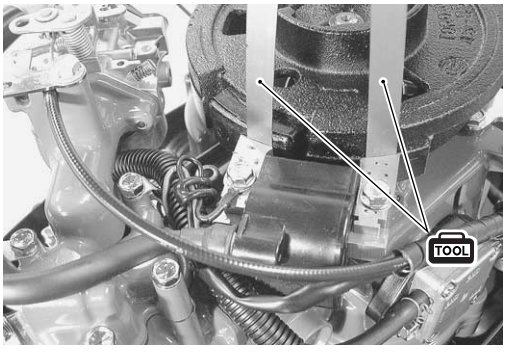
- Install the unit with an air gap of 0.5mm between the both core ends and the flywheel. Check the gaps at the machining part of the flywheel as shown in the figure.

09900-20803 : Thickness gauge

Air gap : 0.5 mm (0.02 in)

- Tighten the mounting bolts to the specified torque.

CDI & coil unit mounting bolt :
10 N·m (1.0 kg-m, 7.0 lb-ft)



Wire routing

Check the wire routing. (See the page 9-2 and 9-3)

FUEL SYSTEM

CONTENTS

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.

- **Keep the working area well ventilated and 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.
- **Keep a fully charged CO_2 fire extinguisher and readily available for use.**
- **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.**

FUEL LINE

REMOVAL / INSTALLATION

Pay special attention to the following steps when removing or installing the fuel hoses.

CAUTION

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

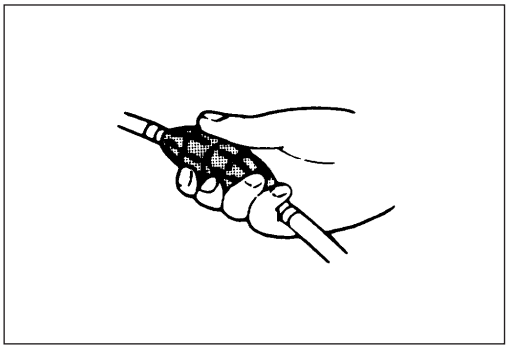
NOTE:

- *Check the fuel hose routing. (See the page 9-2 and 9-3)*
- *Check for fuel leakage.*

FUEL LEAKAGE CHECK PROCEDURE

After performing any fuel system service, always be sure that there is not fuel leakage by checking as follows.

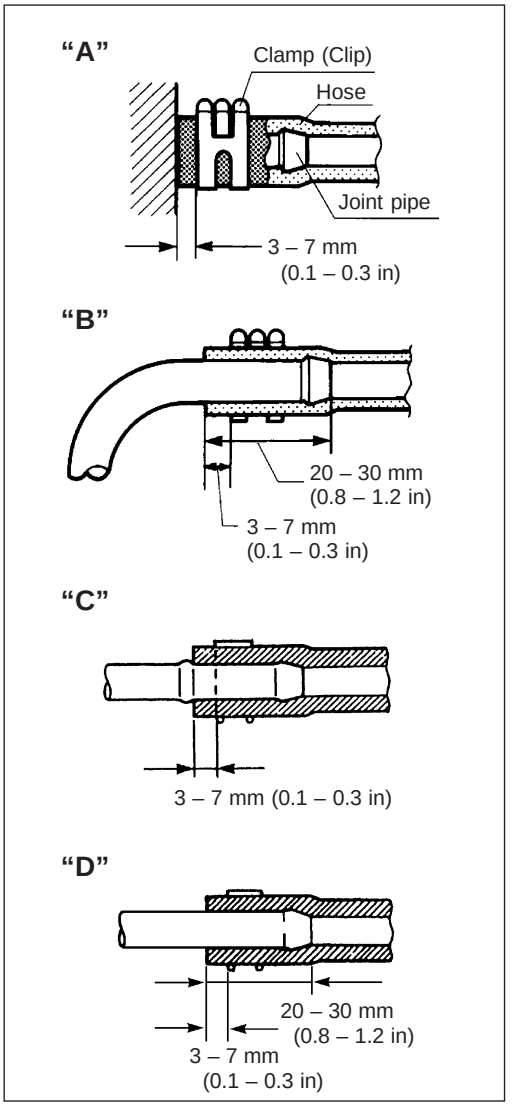
1. Squeeze the fuel primer bulb until you feel resistance.
2. Once pressurized, check all connections and components for any signs of leakage.



FUEL HOSE CONNECTION

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

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



CARBURETORS

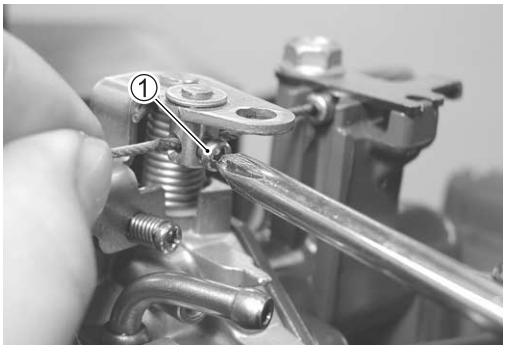
⚠ WARNING

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

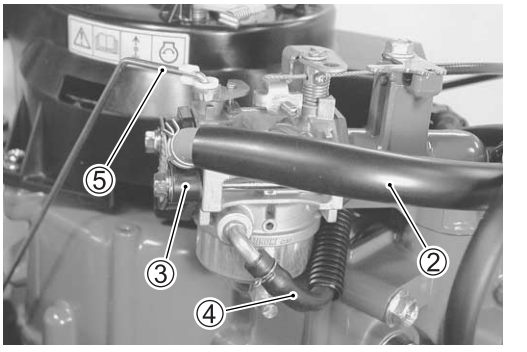
REMOVAL / INSTALLATION

REMOVAL

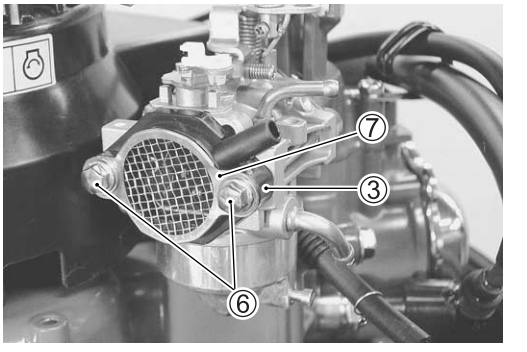
1. Loosen the screw ① securing the throttle control inner cable.



2. Remove the breather hose / protecter ② from the flame arrester holder ③.
3. Remove the fuel inlet hose ④ from the carburetor.
4. Detach the choke rod ⑤ from the linkage.



5. Remove the two bolts ⑥, the flame arrester holder ③, the flame arrester ⑦, the carburetor and the gasket from the intake manifold.



INSTALLATION

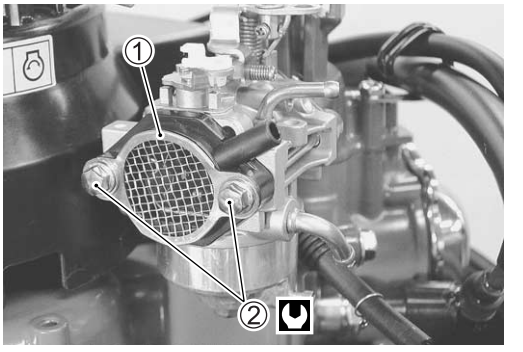
Installation is reverse order of removal with the special attention to the following steps.

CAUTION

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

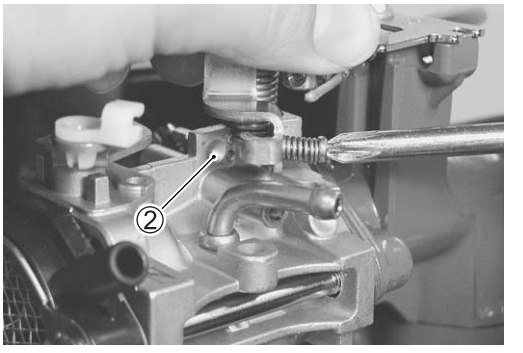
- Install the flame arrester ① with the smooth surface side outward.
- Tighten the carburetor mounting bolts ② to the specified torque.

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



Throttle control cable installation and adjustment

1. Fully close the throttle control grip.
2. Turn the idle adjusting screw ① counterclockwise until the screw do not touch the stopper plate ②.



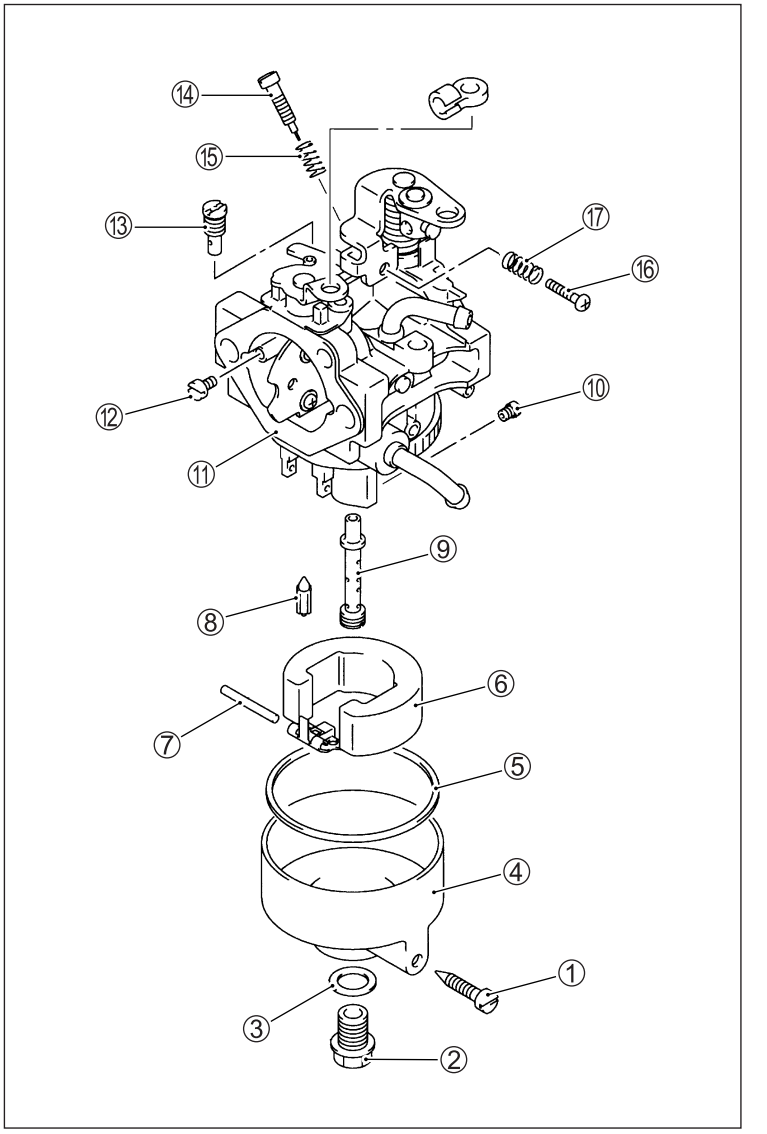
3. Insert the throttle control inner cable ③ into the linkage hole.
4. While pulling the cable ③, tighten the screw ④ in order to secure the cable.
5. Adjust the idle speed. (See the page 2-11)

DISASSEMBLY

When disassembling the carburetor, refer to the construction diagram.

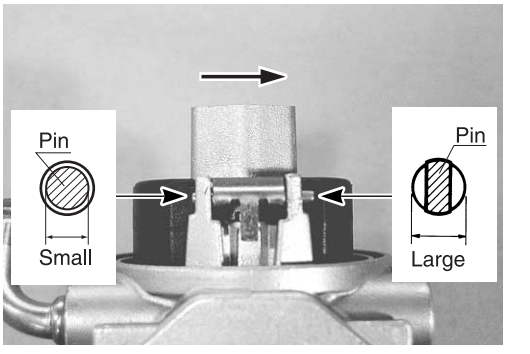
Remove the following parts:

- Drain screw ①
- Bolt ②
- Gasket ③
- Float chamber ④
- Float chamber gasket ⑤
- Float ⑥
- Float pin ⑦
- Needle valve ⑧
- Main nozzle ⑨
- Main jet ⑩
- Carburetor body ⑪
- Pilot air jet ⑫
- Pilot jet ⑬
- Pilot screw ⑭
- Spring ⑮
- Idle adjusting screw ⑯
- Spring ⑰



CAUTION

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



CLEANING & INSPECTION

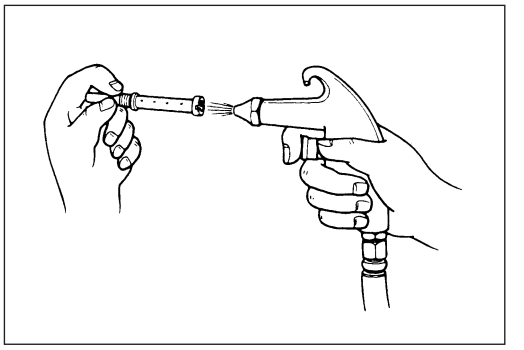
Clean thoroughly with cleaning solvent and compressed air before inspection.

⚠ WARNING

Wear 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.



CAUTION

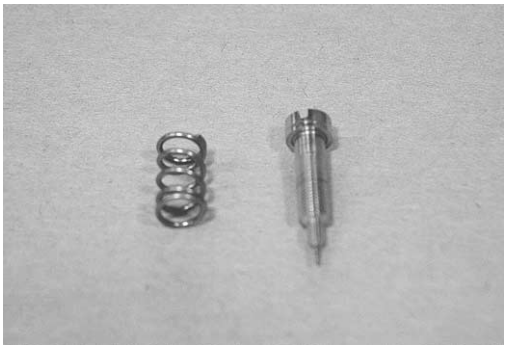
Do not use a wire or a small drill bit in order to clean the orifices and jets of the carburetor.

CARBURETOR BODY / FLOAT CHAMBER

Inspect the carburetor body and the float chamber. If crack or other damage is found, replace the body and/or the chamber. Clean the carburetor body and the float the chamber in order to remove obstructions.

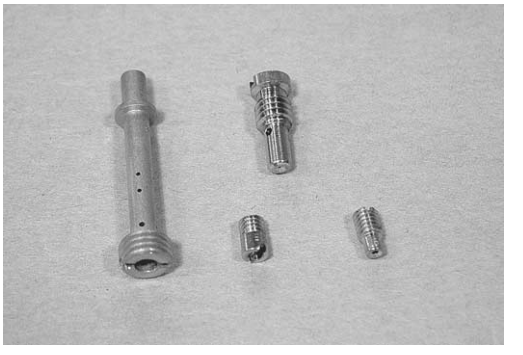
PILOT SCREW

Inspect pilot screw. If wear, damaged threads, broken tip is found, replace the screw.

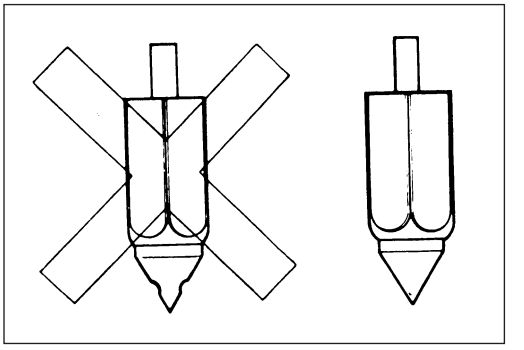


JET / NOZZLE

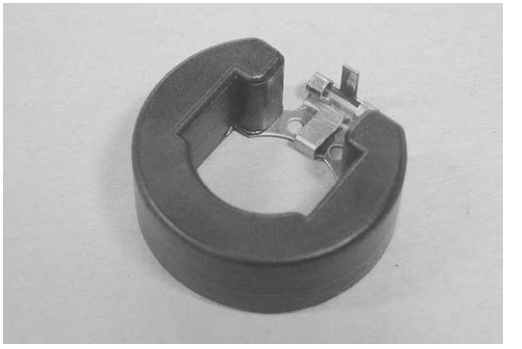
Inspect the jets and the nozzle. If crack or other damage is found, replace the jet and/or the nozzle.
Clean the jets and the nozzle in order to remove obstructions.



NEEDLEVALVE
Inspect the needle valve.
If broken tip or wear is found, replace the valve.



FLOAT
Inspect the float.
If crack or other damage is found, replace the float.



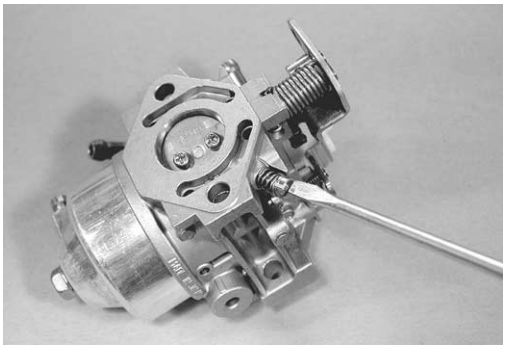
REASSEMBLY

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

JET / NOZZLE
Install the main nozzle to the carburetor body before installing the main jet.

PILOT SCREW
Install the pilot screw and the spring in the carburetor.
Turn the screw clockwise until lightly seated, then turn the screw counterclockwise to the specified value for the initial setting.

Pilot screw initial setting :
DF4 2-½ turns open
DF5 2-½ turns open



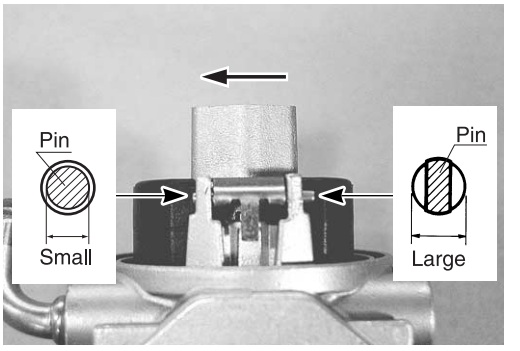
NOTE:
When turning the pilot screw fully in, lightly seat the screw only. Do not over tighten in order to avoid damaging the needle valve and the seat.

FLOAT

Install the float and the float pin.

CAUTION

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



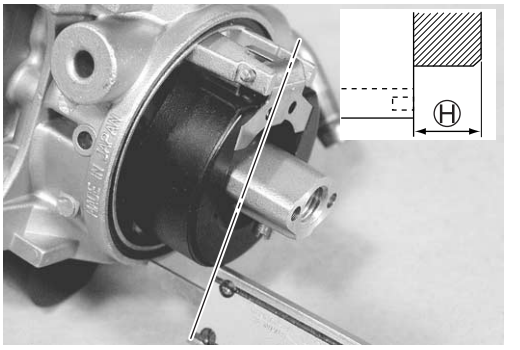
NOTE:
After installing float, inspect for smooth movement of float.

CHECKING AND ADJUSTING FLOAT HEIGHT

Measure the float height.

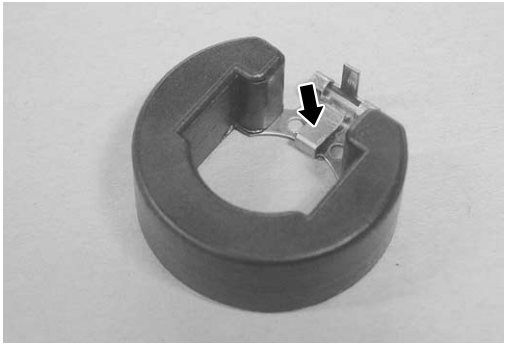
NOTE:
Make sure that float weight is not applied to needle valve.

TOOL 09900-20101 : Vernier calipers



Float height Ⓗ : 14 ± 1 mm

If the measurement is out of the specification, bent the adjustment tab only.



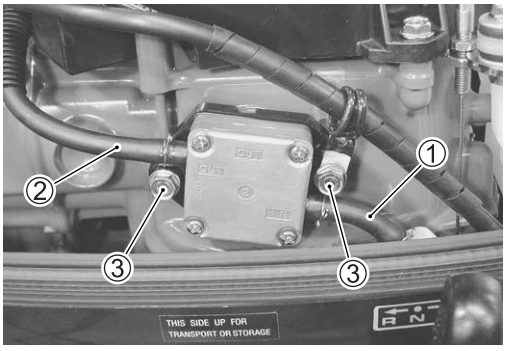
CAUTION

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

FUEL PUMP
REMOVAL / INSTALLATION

⚠ WARNING

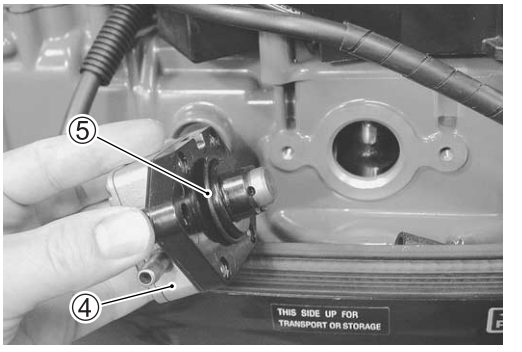
Before servicing the fuel system, read and understand "PRECAUTION ON FUEL SYSTEM SERVICE" in the previous section.



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.

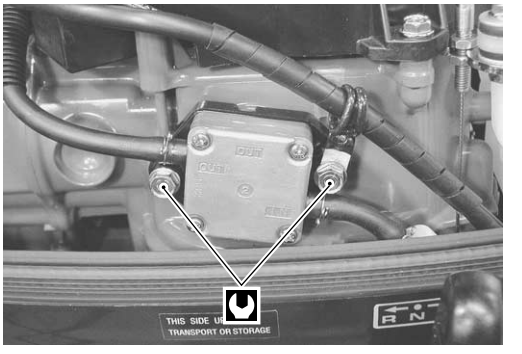


INSTALLATION

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

CAUTION

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



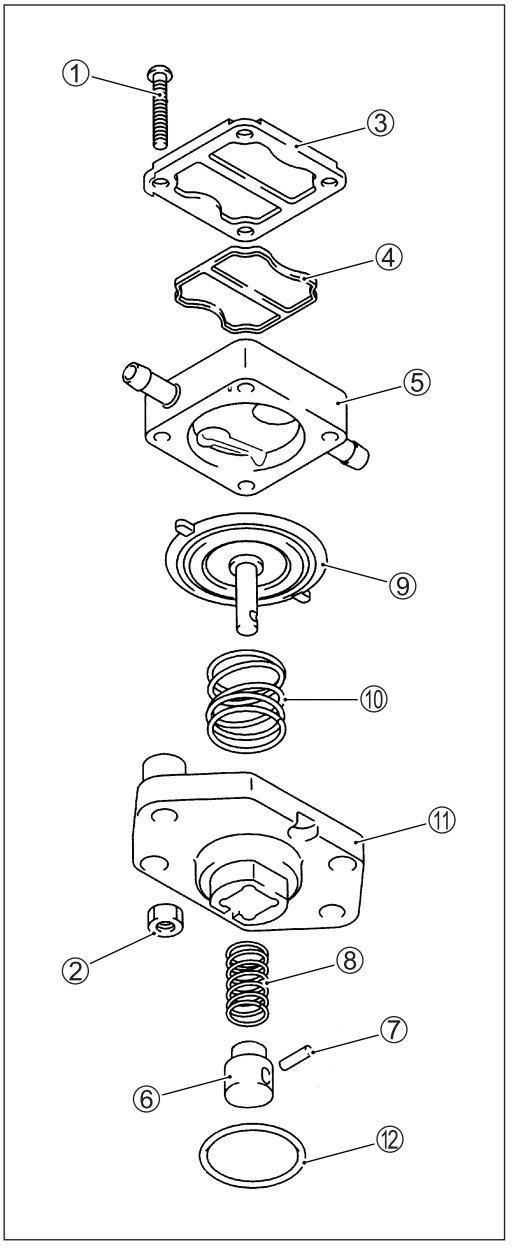
- Tighten the fuel pump mounting bolts to the specified torque.

Fuel pump mounting bolt : 8 N·m (0.8 kg-m, 6.0 lb-ft)

- Make sure that the fuel filter is installed with the arrow mark on the filter toward the fuel pump.

DISASSEMBLY / REASSEMBLY

DISASSEMBLY



1. Remove the following parts.
   - Screws ①
   - Nuts ②
   - Outer plate ③
   - Diaphragm ④
   - Valve body ⑤

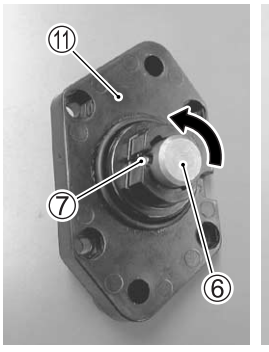
2. Turn the piston ⑥ until the pin ⑦ comes out through a cutaway of the pump body ⑪.

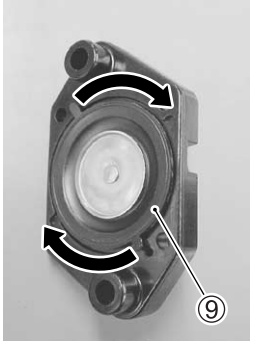
3. Separate the following parts.
   - Piston ⑥
   - Pin ⑦
   - Spring ⑧
   - Diaphragm ⑨
   - Spring ⑩
   - Pump body ⑪
   - O-ring ⑫

ASSEMBLY

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

NOTE:
After connecting the diaphragm rod to the piston ⑥ with the pin ⑦, align the two diaphragm projections to the pump body hollows by turning the piston ⑥ and the diaphragm ⑨ together in order to prevent the pin from coming out through the cutaway of the pump body ⑪.





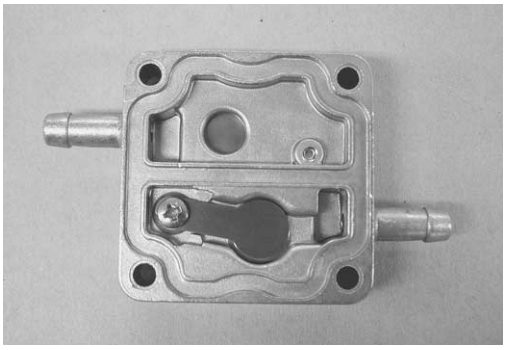
INSPECTION

Diaphragm

Inspect all diaphragms. If distortion, tear or other damage is found, replace the diaphragms.

Check-valves

Inspect the check valves in the valve body. If tear, distortion or other damage is found, replace the fuel pump assembly.



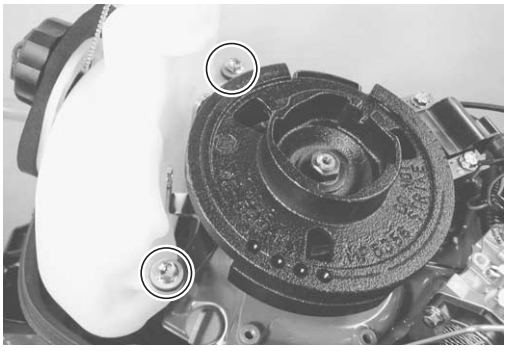
Pump body

Inspect the pump body.
If crack, nick, distortion or other damage is found, replace the fuel pump assembly.

FUEL TANK AND FUEL COCK
REMOVAL / INSTALLATION

REMOVAL

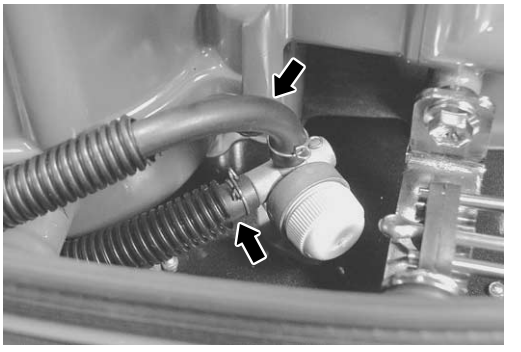
1. Remove the recoil starter. (See the page 5-2)
2. Remove the two bolts securing the fuel tank.



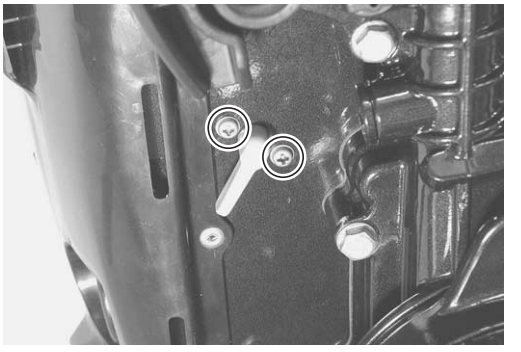
3. Remove the fuel hoses from the fuel cock and immediately plug the fuel tank hose in order to avoid fuel flow from the tank.

⚠ WARNING

Wipe up fuel spills immediately.



4. Remove the two screws and the fuel cock from the lower cover.

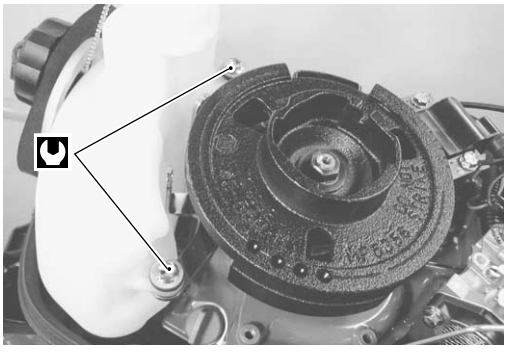


INSTALLATION

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

- Before installing the fuel tank, drain all fuel from the tank.
- Tighten the fuel tank mounting bolts to the specified torque.

Fuel tank mounting bolt : 10 N·m (1.0 kg-m, 7.0 lb-ft)

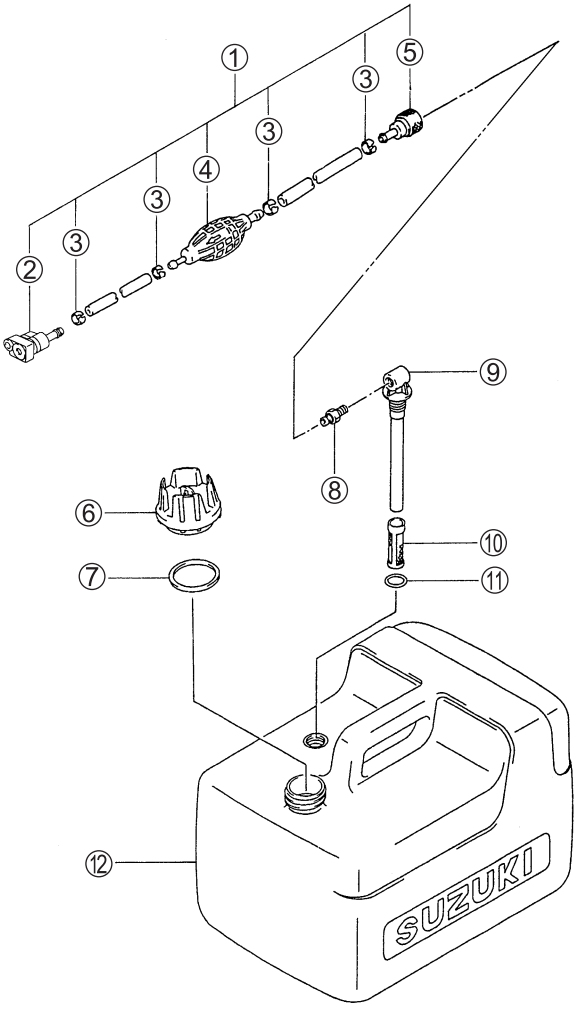


- Check the fuel hose routing. (See the page 9-2 and 9-3)
- Check for fuel leakage.

DISASSEMBLY / REASSEMBLY

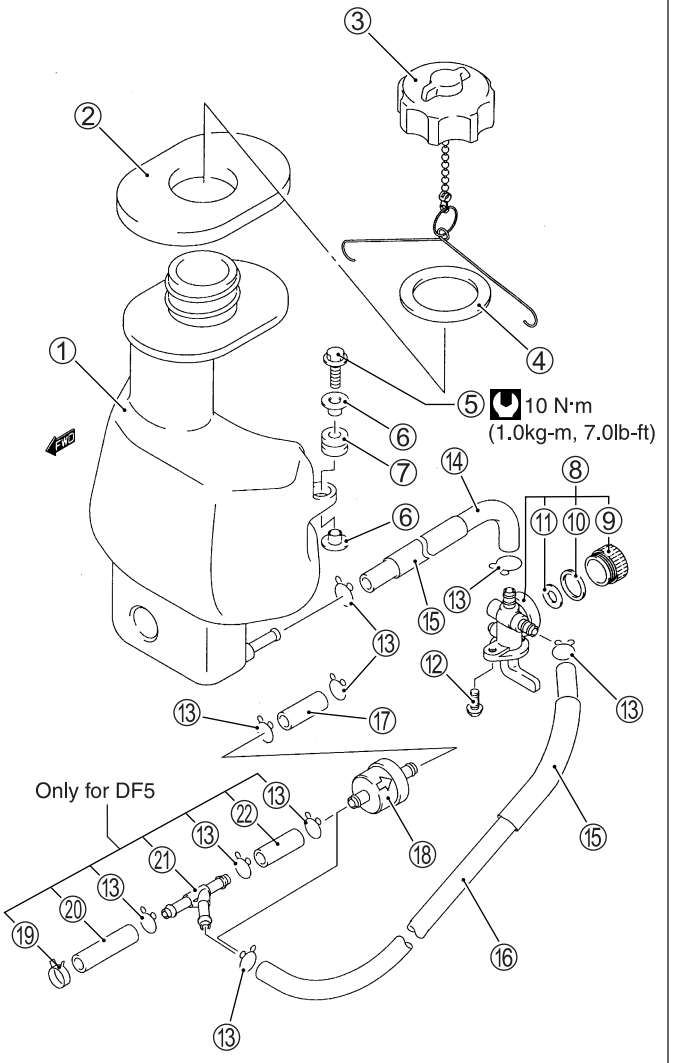
When disassembling or reassembling the fuel tank and the related parts, refer to the construction diagram below.

Separate fuel tank (Optional part)



① Fuel hose assy (1)
[② Connector]
[③ Clip (4)]
[④ Primer bulb (1)]
[⑤ Connector (1)]
⑥ Tank cap (1)
⑦ Gasket (1)
⑧ Connector plug (1)
⑨ Outlet (1)
⑩ Filter (1)
⑪ O-ring (1)
⑫ Fuel tank (1)

Built-in fuel tank

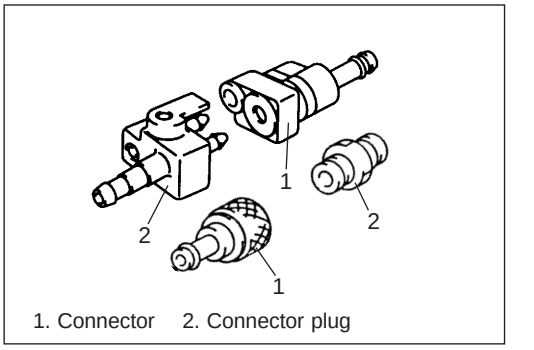


① Fuel tank (1)
② Cushion (1)
③ Tank cap assy (1)
④ Gasket (1)
⑤ Bolt (2)
⑥ Washer (2)
⑦ Cushion (2)
⑧ Fuel cock assy (1)
[⑨ Cock cap (1)]
[⑩ O-ring (1)]
[⑪ Gasket (1)]
⑫ Screw (2)
⑬ Clip (6) for DF4
Clip (9) for DF5
⑭ Hose (1)
⑮ Protector (2)
⑯ Hose (1)
⑰ Hose (1)
⑱ Fuel filter
⑲ Clip (1)
⑳ Hose (1)
㉑ 3-way joint (1)
㉒ Hose (1)

INSPECTION

Fuel connector

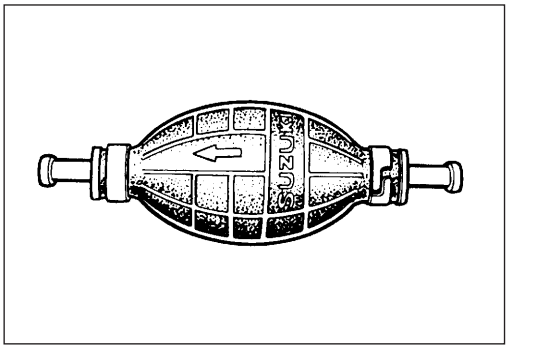
Inspect the fuel connector and the connector plug. If leakage, deterioration or other damage is found, replace the connector and/or the plug.



1. Connector 2. Connector 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.

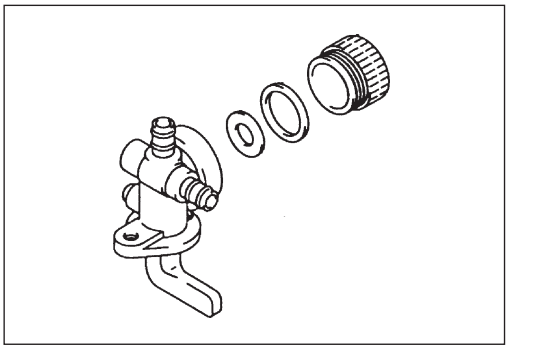


Fuel hose

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

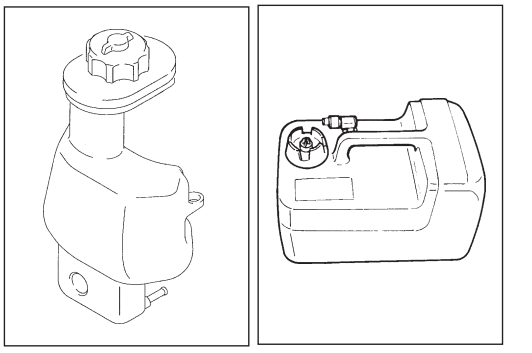
Fuel cock

Inspect the fuel cock. If leakage, deterioration or other damage is found, replace the cock.



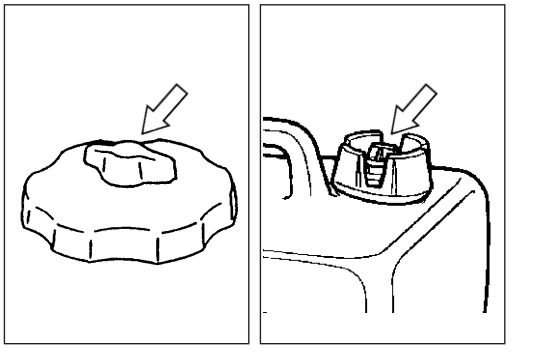
Fuel tank

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.



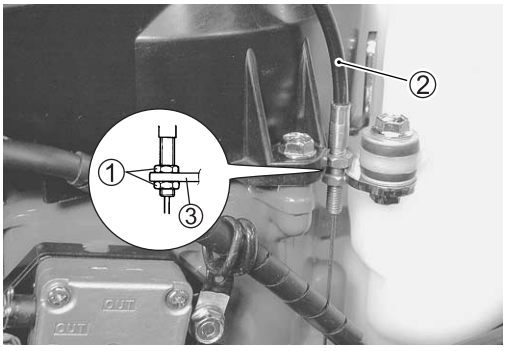
RECOIL STARTER

CONTENTS

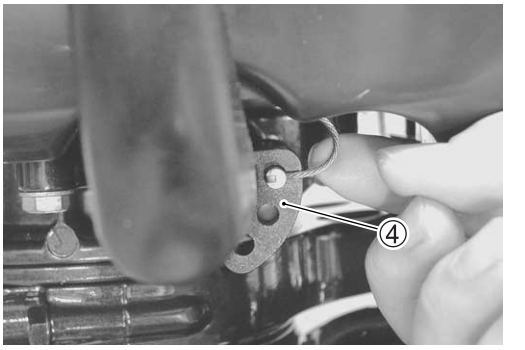
5

REMOVAL

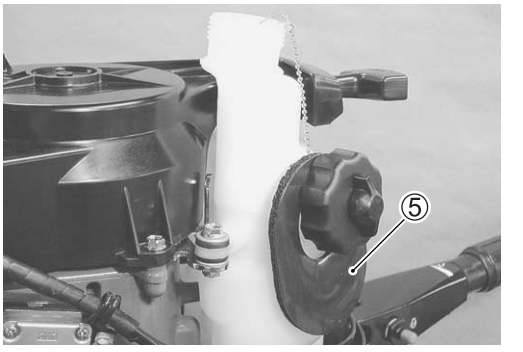
1. Loosen the lock nuts ① and remove the NSI cable ② from the bracket ③.



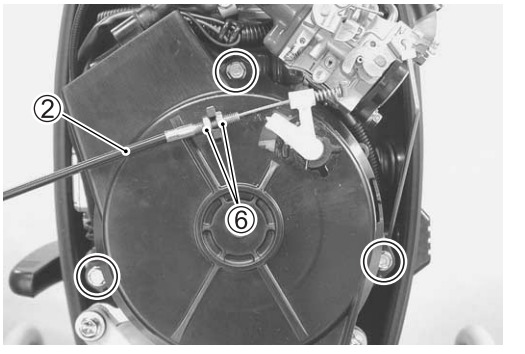
2. Remove the NSI cable from the clutch notch plate ④.



3. Remove the fuel tank cap.
4. Detach the cushion plate ⑤ of the fuel tank.



5. Loosen the lock nuts ⑥ and remove the NSI cable ② from the recoil starter.
6. Remove the three bolts and the recoil starter.

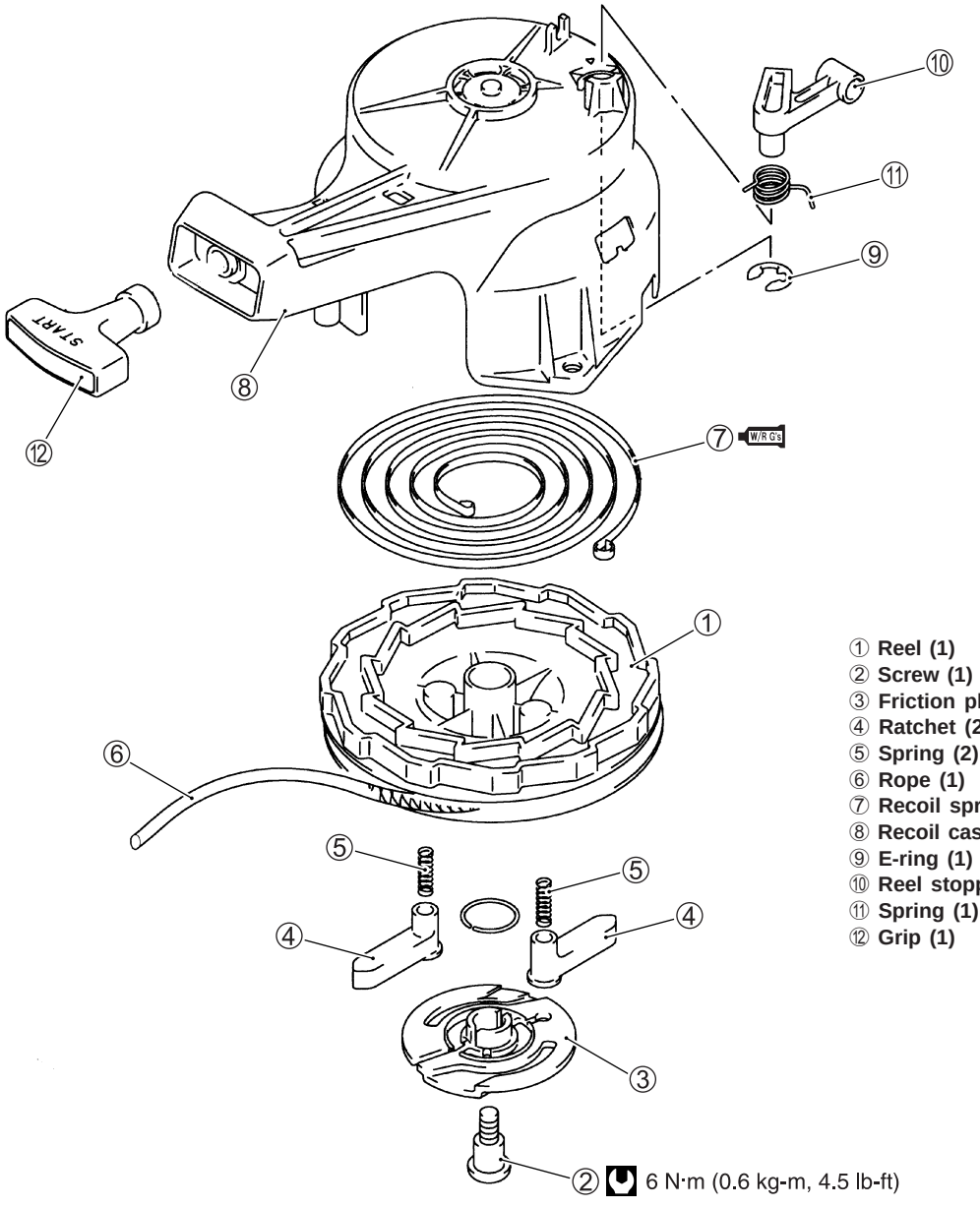


DISASSEMBLY

CAUTION

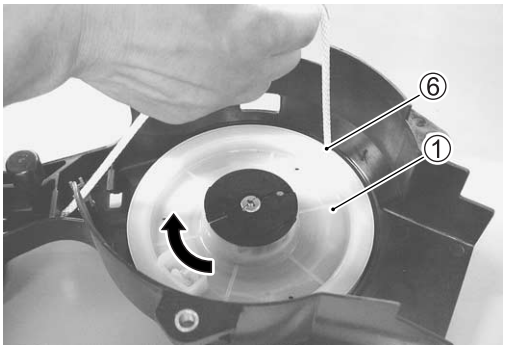
Because of the coiled tension in the recoil spring, wear safety glasses and hand protection when winding or unwinding the component.

System construction

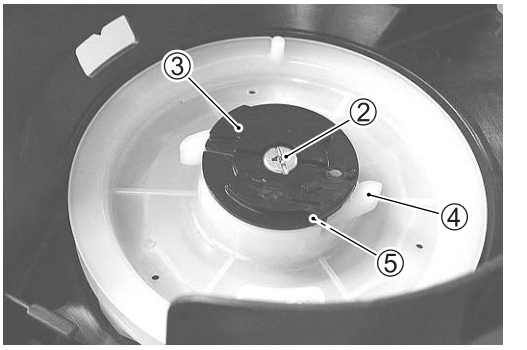


① Reel (1)
② Screw (1)
③ Friction plate (1)
④ Ratchet (2)
⑤ Spring (2)
⑥ Rope (1)
⑦ Recoil spring (1)
⑧ Recoil case (1)
⑨ E-ring (1)
⑩ Reel stopper (1)
⑪ Spring (1)
⑫ Grip (1)

1. Hitch the rope ⑥ into the notch on the reel ① and turn the reel clockwise in order to release the coiled tension in the recoil spring.

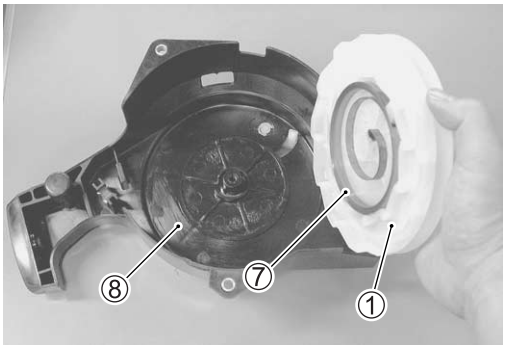


2. Remove the screw ②.
3. Remove the friction plate ③, the ratchets ④ and the springs ⑤.
4. Remove the rope ⑥ from the reel ①.

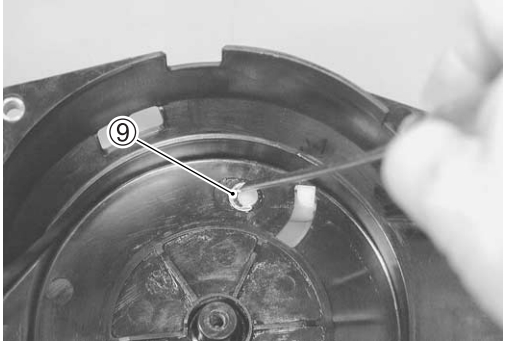


5. Slowly remove the reel ① with the recoil spring ⑦ from the recoil case ⑧.

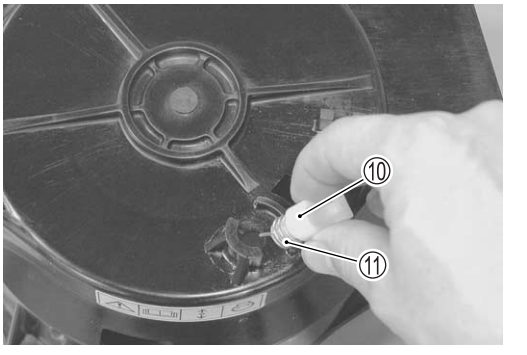
NOTE:
Do not remove the recoil spring unless replacement is necessary. Inspect the spring in the assembled position.



6. Remove the E-ring ⑨.



7. Remove the reel stopper ⑩ and the spring ⑪.



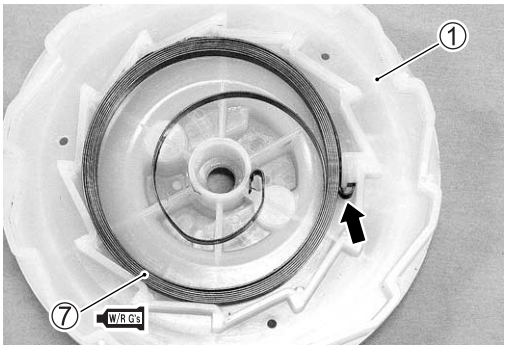
REASSEMBLY

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

CAUTION

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

- Secure the outer end of the recoil spring ⑦ on the boss in the reel ① and wind the spring toward the center of the reel in a counterclockwise direction.



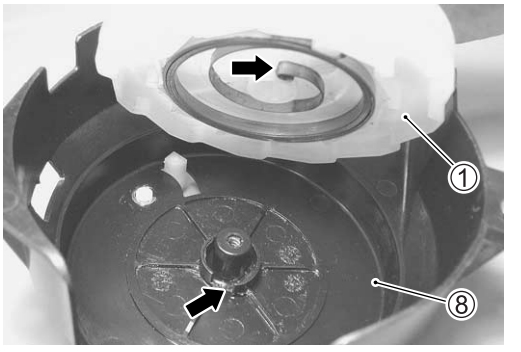
CAUTION

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

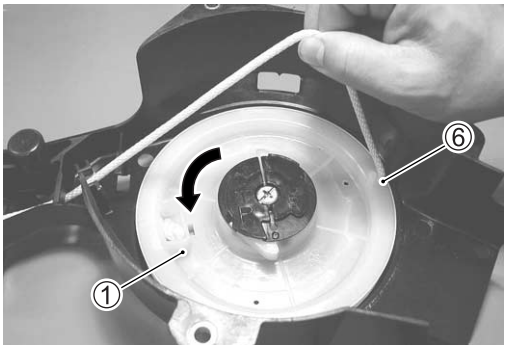
- Apply the Water Resistant Grease to the recoil spring.

W/R G's **99000-25160 : Suzuki Water Resistant Grease**

- Install the reel ① and the recoil spring to the recoil case aligning the inner end of the spring with the boss cutaway on the case ⑧.



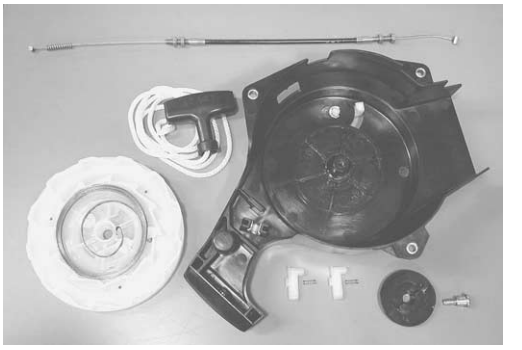
- Hitch the rope ⑥ into the notch on the reel ①. Rotate the reel approximately 5 turns counterclockwise until the recoil spring is tensioned.



NOTE:
To rotate the reel, adjust the position of the reel stopper by hand.

INSPECTION

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



- Inspect the ratchet and the all springs.
  If excessive wear or other damage is found, replace.

- Inspect the reel and the recoil case.
  If crack or other damage is found, replace.

- Inspect the recoil rope.
  If wear or fraying is found, replace.

- Inspect the recoil spring.
  If crack, deformation or excessive curve is found, replace.

INSTALLATION

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

- Check to ensure that all removed parts are back in plate.
- Check the neutral start interlock (NSI) function.
  (See the page 5-7)

NEUTRAL START INTERLOCK (NSI)

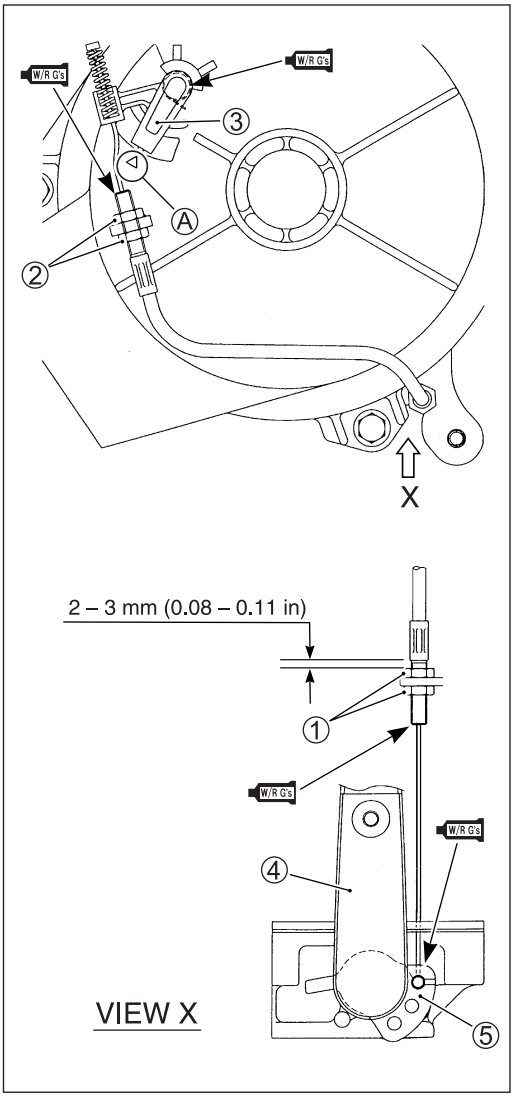
ADJUSTMENT

1. Shift into “NEUTRAL” position.
2. Adjust and tighten the lock nuts ① as shown position.
3. Loosen the adjustment nuts ②.
4. Adjust the nuts ② until the center of the reel stopper ③ aligns with the arrow mark Ⓐ.
5. Tighten the nuts ②.
6. Pull the recoil starter and make sure that the starter does not work when the shift lever ④ is in “FORWARD” and “REVERSE” position.
7. Apply the Water Resistant Grease to the inner cable, the clutch notch plate ⑤ and the reel stopper ③.

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

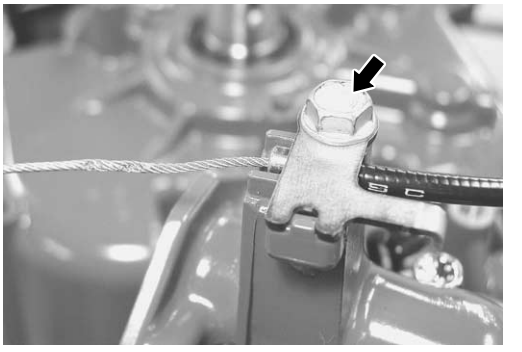
CONTENTS

REMOVAL

Before removing the power unit :
- **Drain the engine oil. (See the page 2-4)**
- **Shift into “NEUTRAL” position.**

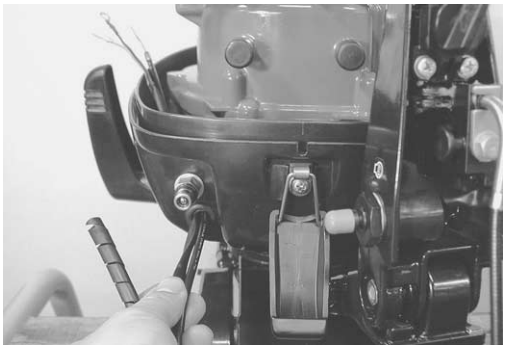
1. Remove the recoil starter. (See the page 5-2)
2. Remove the spark plug. (See the page 2-8)
3. Rotate the flywheel clockwise to bring the position to the TDC on a compression stroke. (See the page 2-9)
4. Remove the flywheel. (See the page 3-6)
5. Remove the built-in fuel tank. (See the page 4-13)
6. Remove the carburetor. (See the page 4-4)

7. Loosen the bolt and detach the throttle control cable from the intake manifold.
8. Remove the fuel pump. (See the page 4-10)
9. Remove the fuel cock. (See the page 4-13)
10. Remove the CDI & coil unit. (See the page 3-6)

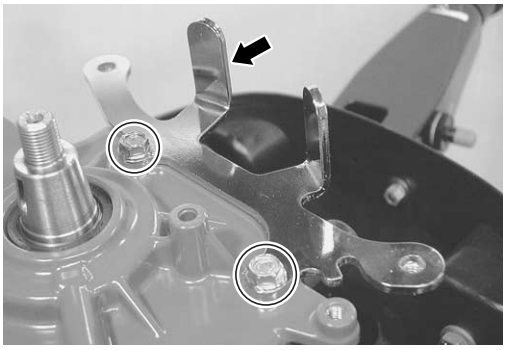


NOTE:
- *The power unit is detached from the driveshaft housing with the lower cover as a set.*
- *If the disassembly of the power unit is not required, the following steps are the minimum procedure in order to detach the power unit from the driveshaft housing, instead of the above ten steps.*
  - *Remove the recoil starter.*
  - *Disconnect the Blue/Red and Black lead wires from the CDI & coil unit.*
  - *Disconnect the choke rod from the carburetor.*
  - *Remove the throttle control cable from the carburetor and the intake manifold.*
  - *Disconnect the inlet fuel hose from the fuel pump.*
  - *Take out the lead wires and the throttle control cable from the lower cover. (See the page 6-3)*
  - *Remove the nine engine mounting bolts. (See the page 6-3)*

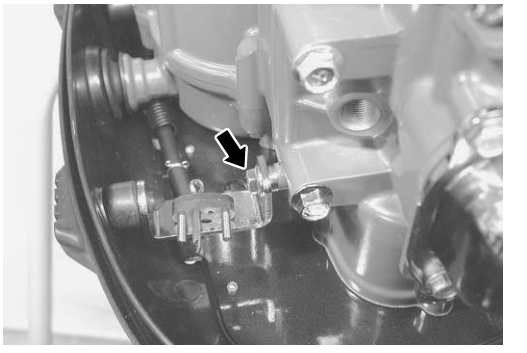
11. Remove the cable binder, then take out the lead wires and the throttle control cable from the lower cover.



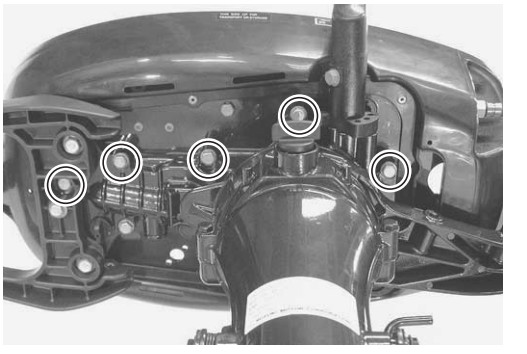
12. Remove the two bolts and the fuel tank bracket.



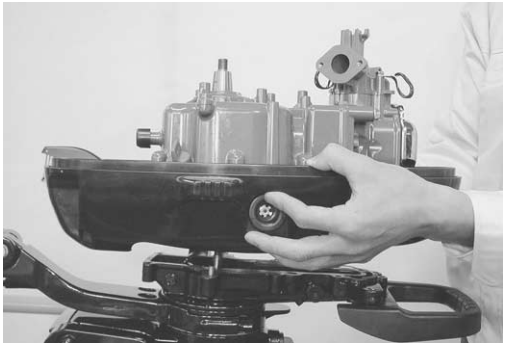
13. Remove the bolt and the port side plate.



14. Remove the nine engine mounting bolts.

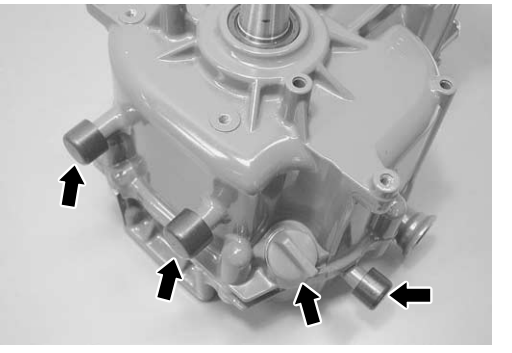


15. Detach the power unit with the lower cover.

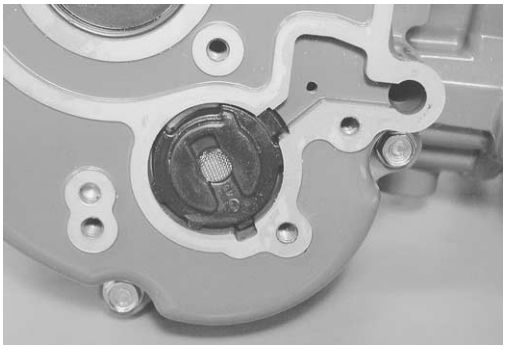


16. Remove the two bolts, then detach the power unit and the gasket from the lower cover.

17. Remove the cushion rubbers and the oil filler cap.



INSTALLATION



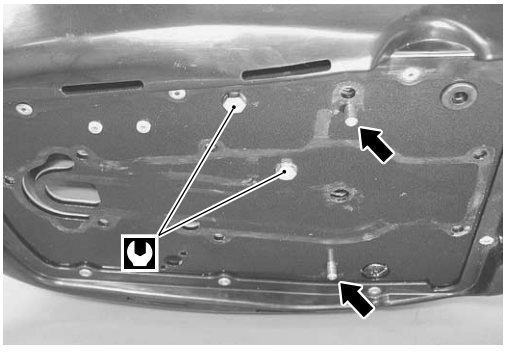
Installation is reverse order of removal with the special attention to the following steps.

CAUTION

Do not re-use the gasket and the O-ring.
Always use new parts.

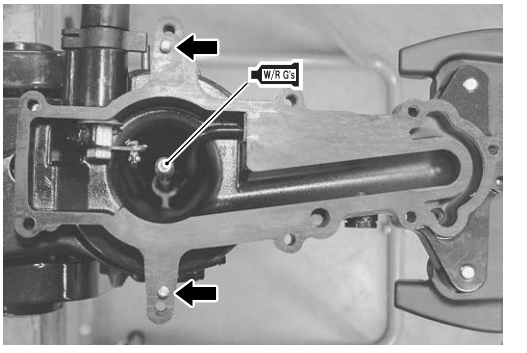
1. Check that the oil pump, the plate and the oil filter / holder are installed in the original position.
2. Install the two dowel pins and the lower cover gasket to the bottom of the power unit.
3. Install the power unit to the lower cover, then tighten the two bolts to the specified torque.

Lower cover mounting bolt :
10 N·m (1.0 kg-m, 7.0 lb-ft)



4. Remove the two dowel pins from the lower cover, then install the pins and the gasket onto the driveshaft housing.
5. Apply the Water Resistant Grease to the driveshaft splines.

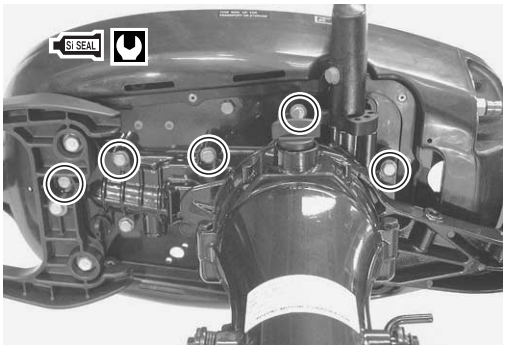
W/R G's 09900-25160 : Suzuki Water Resistant Grease



6. Install the power unit / lower cover assembly onto the driveshaft housing.
7. Apply the Silicone Seal to the nine power unit mounting bolts and tighten the bolts to the specified torque.

Si SEAL 99000-31120 : Suzuki Silicone Seal

Power unit mounting bolt :
10 N·m (1.0 kg-m, 7.0 lb-ft)



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. (See the page 8-16)
- Fuel hose routing match's service manual illustration. (See the page 9-2 and 9-3)
- Wire routing match's service manual illustration. (See the page 9-2 and 9-3)
- No fuel leakage is evident.
- No water leakage is evident during final test running.

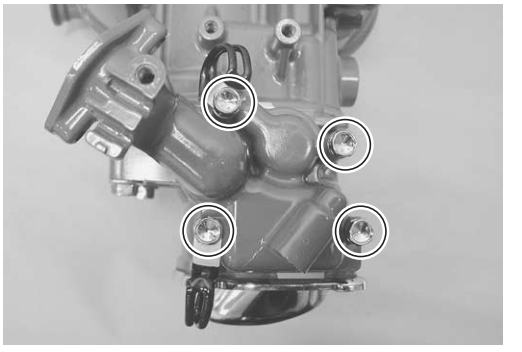
DISASSEMBLY

OIL FILTER / OIL PUMP

Remove the oil filter / holder, the plate and the inner / outer oil pump from the crankcase.

INTAKE MANIFOLD / THERMOSTAT

1. Remove the four bolts, the intake manifold and the gasket.



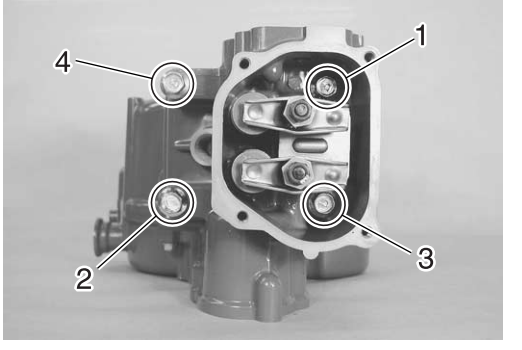
2. Take out the thermostat.

CYLINDER HEAD / VALVE / ROCKER ARM

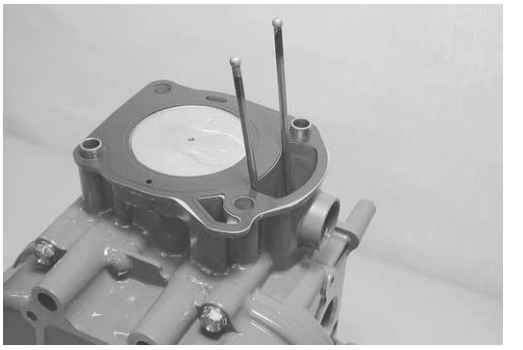
1. Remove the four bolts, the cylinder head cover and the gasket.

NOTE:
Make sure that the piston is at the TDC position on a compression stroke. (See the page 2-9)

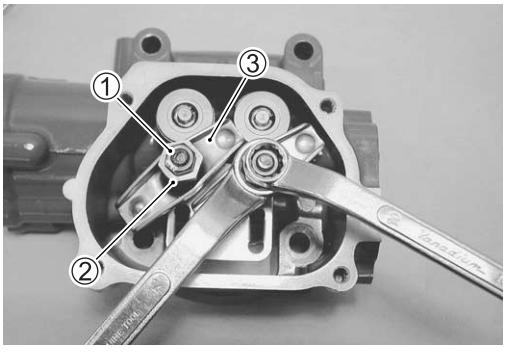
2. Loosen the four cylinder head bolts in the order indicated and remove the bolts.
3. Remove the cylinder head assembly from the cylinder block.



4. Remove the gasket, the dowel pins and the push rods from the cylinder block.

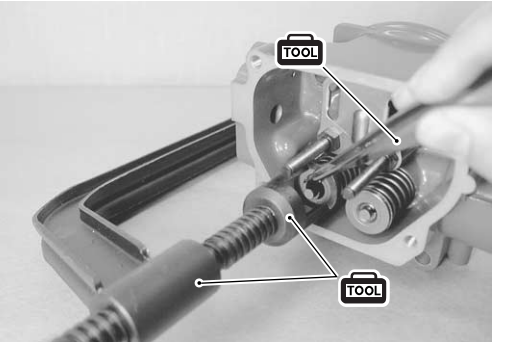


5. Remove the valve adjusting lock nuts ①, then remove the pivot nuts ② and the rocker arms ③.

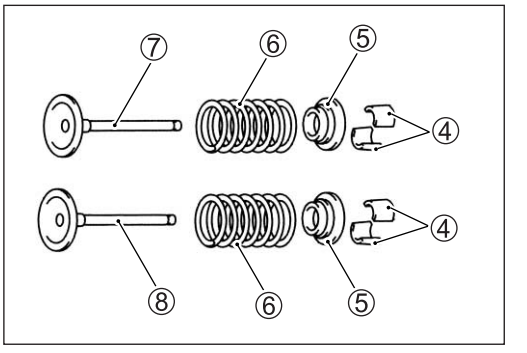


6. Using the special tools, remove the valve cotters ④ while compressing the valve spring.

TOOL **09916-14510 : Valve lifter**
09916-14910 : Attachment
09916-84511 : Tweezers

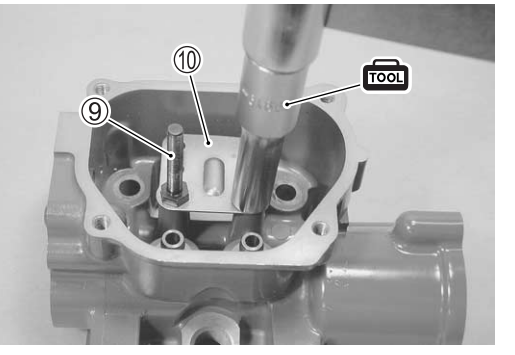


7. Remove the valve spring retainers ⑤, the valve springs ⑥, and the valves ⑦ / ⑧.



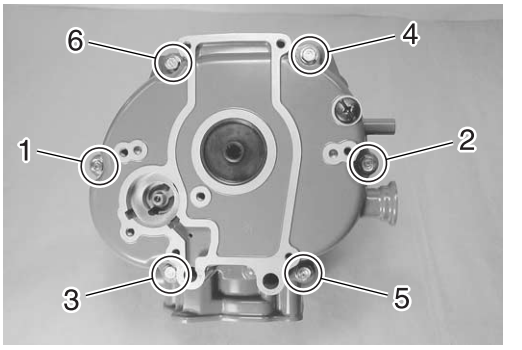
8. Remove the rocker arm pivot bolts ⑨ and the rod guide plate ⑩.

TOOL **09919-16010 : Deep socket wrench**



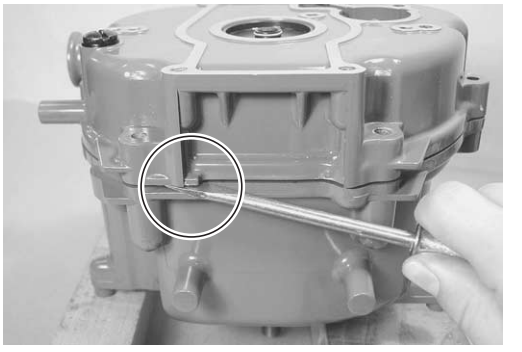
CYLINDER / PISTON / CRANKSHAFT / CONROD / CAMSHAFT

1. Loosen the six crankcase bolts in the order indicated and remove the bolts.

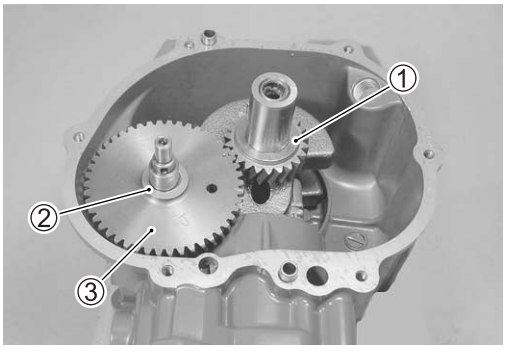


2. Remove the crankcase from the cylinder block.

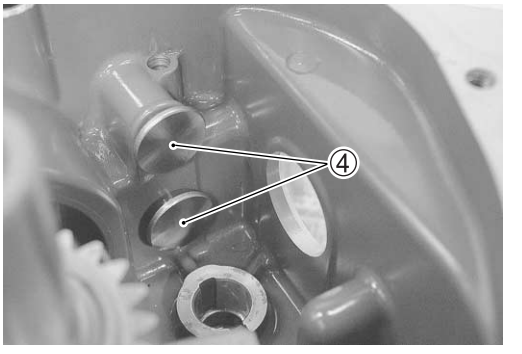
NOTE:
Pry the crankcase with a screwdriver as shown in the figure.



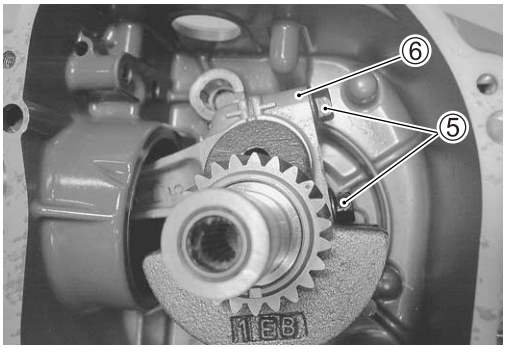
3. Remove the crankshaft thrust washer ① and the camshaft thrust washer ②.
4. Remove the camshaft ③ from the cylinder block.



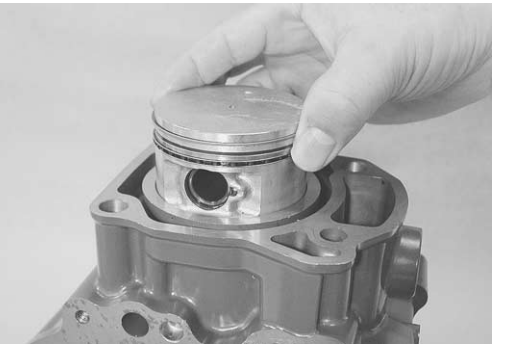
5. Remove the two tappets ④.



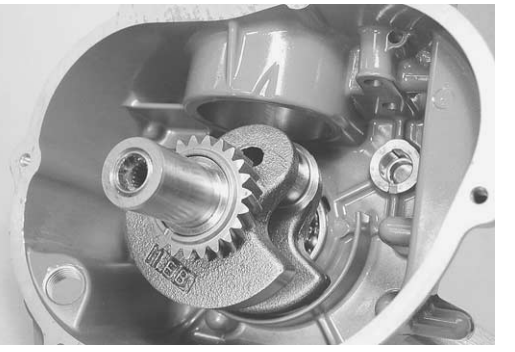
6. Remove the two conrod bolts ⑤ and the conrod cap ⑥.



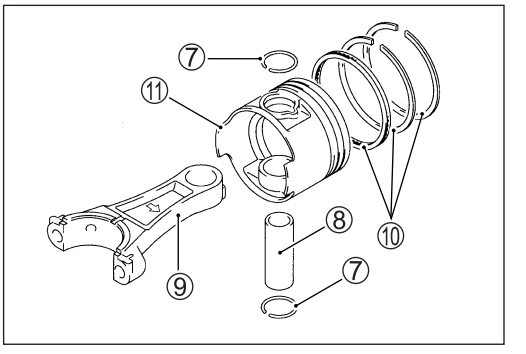
7. Remove the piston with the conrod through the top of the cylinder bore.



8. Remove the crankshaft from the cylinder block.



9. Remove the circlips ⑦, the piston pin ⑧, the conrod ⑨ and the piston ring set ⑩ from the piston ⑪.

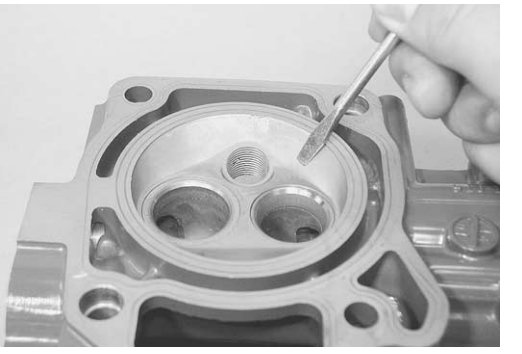


INSPECTION & SERVICING

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

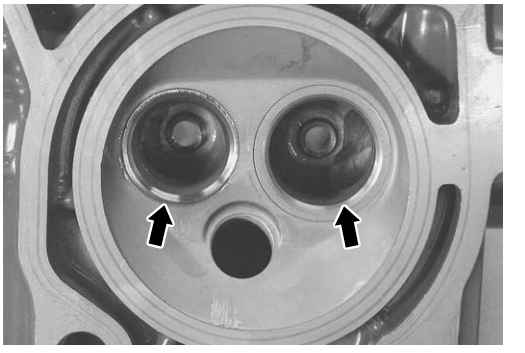
CYLINDER HEAD

1. Remove all carbon from the combustion chamber.



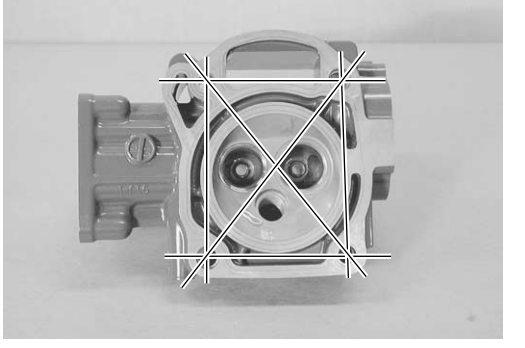
NOTE:
- *Do not use any sharp edged tool in order to scrape carbon off the cylinder head or the head components.*
- *Be careful not to scuff or nick the metal surfaces when decarboning.*

2. Inspect the cylinder head for crack in the intake and the exhaust ports, the combustion chamber and the head surface.



Valve seat
Inspect the valve seats for crack or other damage.

Cylinder head distortion
Using a straightedge and the thickness gauge, measure the gasket surface of the cylinder head at a total of six locations as shown in the figure.



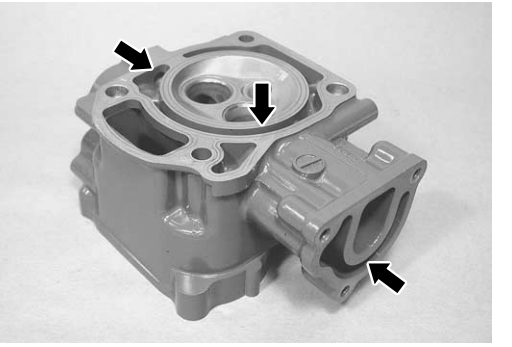
09900-20803 : Thickness gauge

Cylinder head distortion :
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 a #400 grit wet sandpaper.
Move the cylinder head in a figure eight pattern when sanding.

Water jacket
Inspect the water jackets for clog or obstruction. Clean the water jackets if necessary.



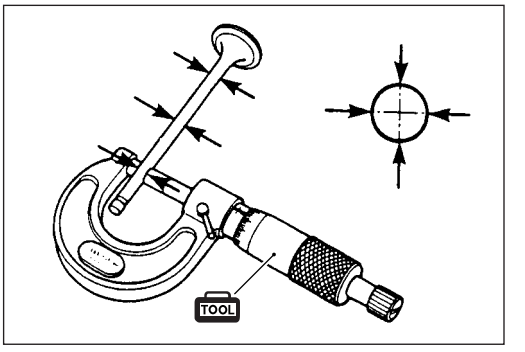
VALVE / VALVE GUIDE

Using the micrometer and a bore gauge, take the diameter readings on the valve stems and the guides in order to check the guide to stem clearance. Be sure to take readings at more than one place along length of each stem and guide.

TOOL **09900-20205 : Micrometer**

Valve stem outside diameter
Measure the valve stem outside diameter using the micrometer.

Valve stem outside diameter :
Standard :
IN 5.460 – 5.475 mm (0.2150 – 0.2156 in)
EX 5.440 – 5.455 mm (0.2142 – 0.2148 in)



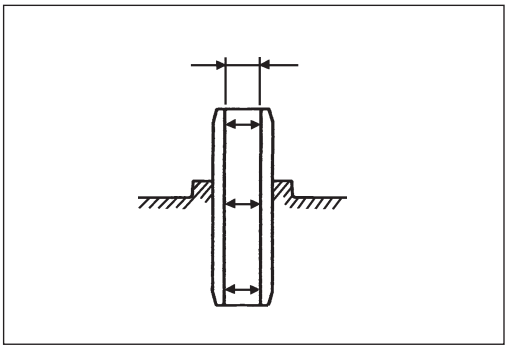
Valve guide inside diameter
Measure the valve guide inside diameter using a small bore gauge.

Valve guide inside diameter :
Standard :
IN, EX 5.500 – 5.512 mm (0.2165 – 0.2170 in)

Valve guide to valve stem clearance

Standard :
IN 0.025 – 0.052 mm (0.0010 – 0.0020 in)
EX 0.045 – 0.072 mm (0.0018 – 0.0028 in)

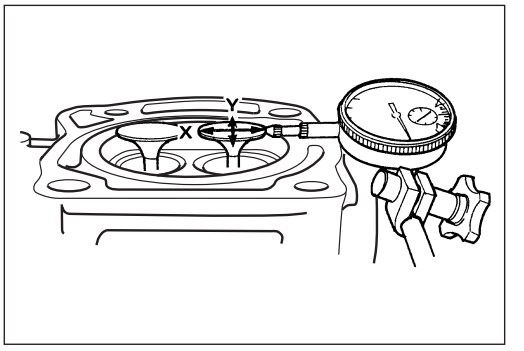
Service limit : IN 0.075 mm (0.0030 in)
EX 0.090 mm (0.0035 in)



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

Valve stem deflection

If unable to measure the valve guide inside diameter, measure the “Valve stem deflection”.



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

1. Install the valves into the valve guide.
2. Lift the valves 8 – 10 mm off seat.
3. Move the valve head in the direction “X - Y” and measure the deflection.

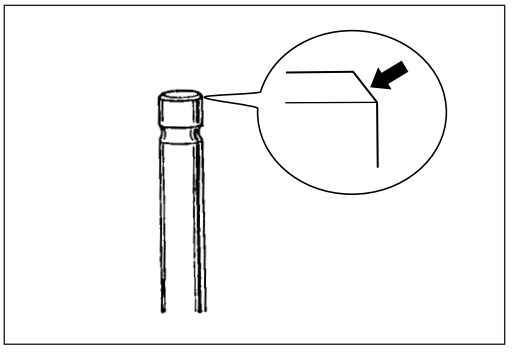
Valve stem deflection :
Service limit : IN & EX 0.35 mm (0.014 in)

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

NOTE:
For the valve clearance replacement, see the “VALVE GUIDE REPLACEMENT” section on the page 6-17.

Valve stem end

Inspect the valve stem end face for pitting and wear. If pitting or wear is found, the valve stem end may be resurfaced.
If the chamfer of stem end has been worn away, replace the valve.



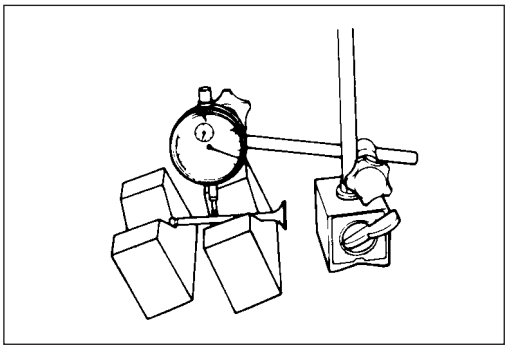
Valve stem runout

Measure the valve stem runout.

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

Valve stem runout :
Service limit : 0.05 mm (0.002 in)

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



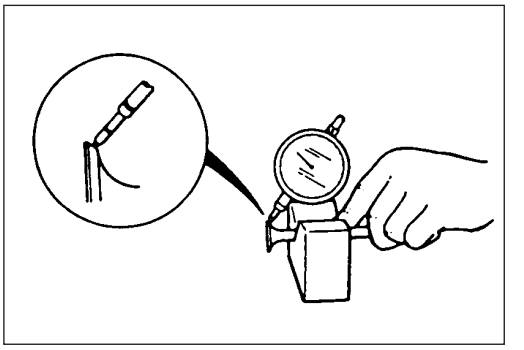
Valve head radial runout

Measure the valve head radial runout.

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

Valve head radial runout :
Service limit : 0.08 mm (0.003 in)

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



Valve head thickness

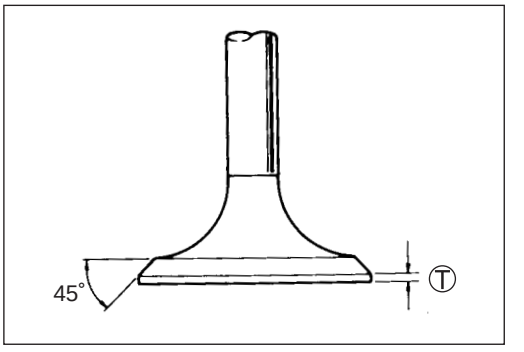
Measure the thickness Ⓣ of the valve head.

TOOL 09900-20101 : Vernier calipers

Valve head thickness :
Standard : IN 1.0 mm (0.04 in)
EX 1.0 mm (0.04 in)

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

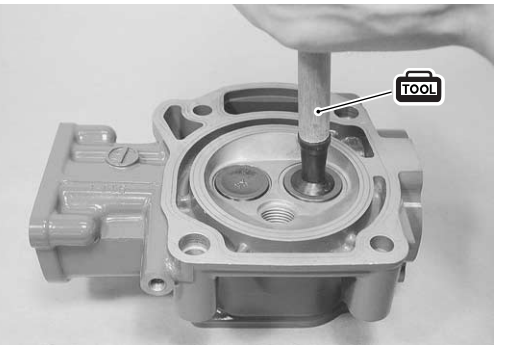
If the measurement exceeds the service limit, replace the valve.



Valve seat contact width

Measure the valve seat contact width as follows.

1. Remove all carbon from the valve and seat.
2. Coat the valve seat evenly with Prussian Blue (or equivalent).
3. Install the valve into the valve guide.
4. Put the valve lapper on the valve head.



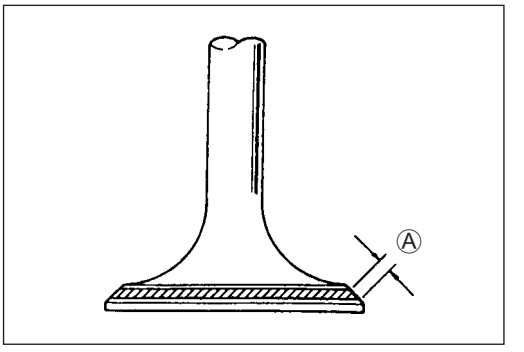
TOOL **09916-10911 : Valve lapper**

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

TOOL **09900-20101 : Vernier calipers**

Valve seat contact width Ⓐ :
Standard : IN 0.8 – 1.0 mm (0.03 – 0.04 in)
EX 1.0 – 1.2 mm (0.04 – 0.05 in)

If measurement exceeds specification, repair valve seat.



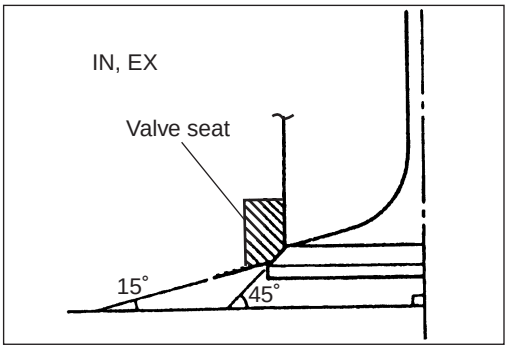
NOTE:
For valve seat repair, see "Valve seat servicing" section on the page 6-16.

VALVE SEAT SERVICING

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

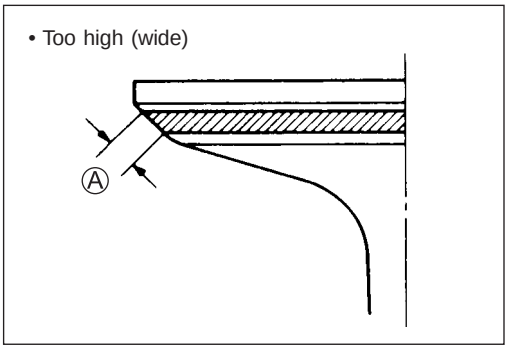
Valve seat angle : IN 15°, 45°
EX 15°, 45°

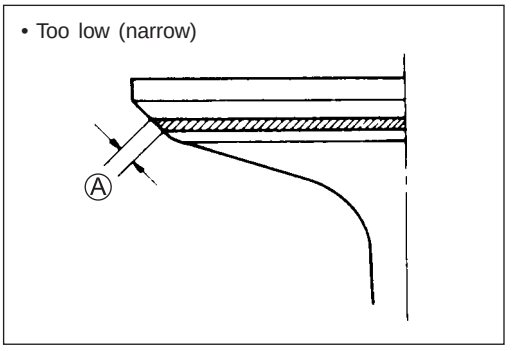
09916-20620 : Valve seat cutter 45° (NEWAY122)
09916-20610 : Valve seat cutter 15° (NEWAY121)
09916-24440 : Handle adaptor (N-503-1)
09916-24450 : Solid pilot (N-100-5.52)
09916-54910 : Handle (N-505)



NOTE:
Turn the cutter clockwise, never counterclockwise.

1. Remove all carbon from the valve and the valve seat.
2. Using the 45° angle cutter, reface the valve seat.
3. Check the valve seat contact width Ⓐ.
   See the “Valve seat contact width” section on the page 6-15.
4. If the width Ⓐ is too high (or wide), reface the valve seat using the 15° angle cutter.
   If the width Ⓐ is too low (or narrow), reface the valve seat using the 45° angle cutter.
5. Clean up any burrs using the 45° angle cutter very lightly.





CAUTION

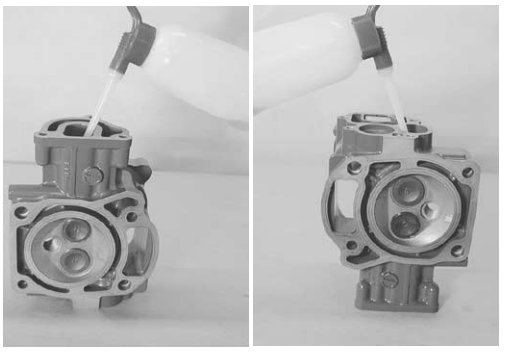
Grind the seat areas minimally only.
Do not grind more than necessary.

6. 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 the valve components.
Fill the intake and the exhaust ports with solvent in order to check for leaks between the valve seat and the valve.
If any leaks occur, inspect the valve seat and the face for burrs or other things that could prevent the valve from sealing.



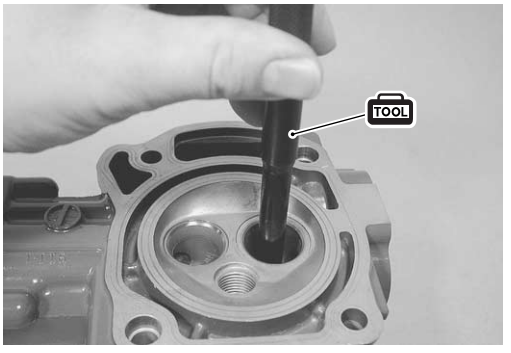
VALVE GUIDE REPLACEMENT

CAUTION

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

1. Using the valve guide remover, drive the valve guide out from the combustion chamber side toward the valve spring side.

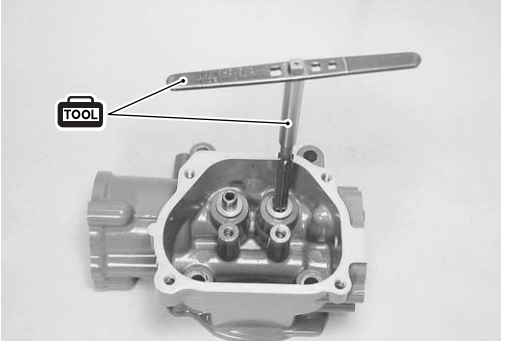
TOOL **09916-44310 : Valve guide remover & installer**



NOTE:
Do not reuse the valve guide once removed.
Always use a new oversize valve guide when assembling.

2. Ream the valve guide hole with the ϕ9.3 mm reamer in order to true the hole and remove burrs.

TOOL **09916-49030 : Valve guide reamer (ϕ9.3 mm)**
09916-34542 : Reamer handle

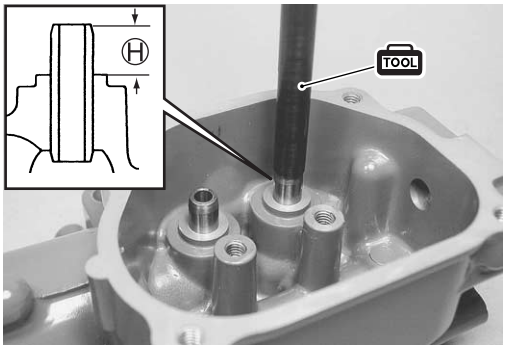


NOTE:
Turn the reamer clockwise, never counterclockwise.

3. Lubricate the new oversize valve guide.
4. Using the valve guide installer, drive into the valve guide from the valve spring side toward the combustion chamber side. Position the valve guide as shown in the figure.

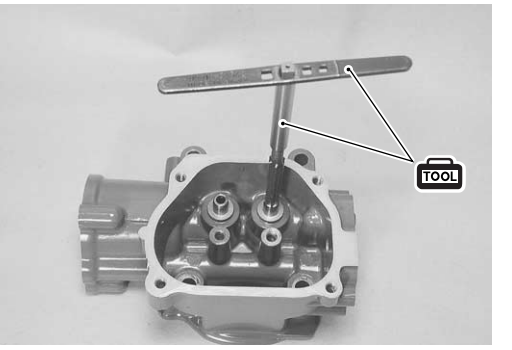
TOOL **09916-44310 : Valve guide remover & installer**

Valve guide protrusion Ⓗ : IN & EX 11.0 mm (0.43 in)



5. Ream the valve guide bore with the ϕ5.5 mm reamer.

09916-34550 : Valve guide reamer (ϕ5.5 mm)
09916-34542 : Reamer handle



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

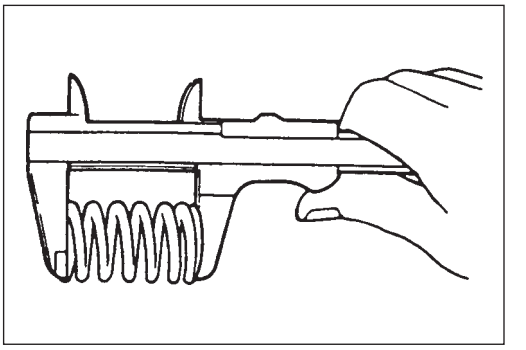
VALVE SPRING

Valve spring free length

Measure the valve spring free length.

09900-20101 : Vernier calipers

Valve spring free length :
Standard : IN & EX 29.5 mm (1.16 in)
Service limit : IN & EX 28.3 mm (1.11 in)



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

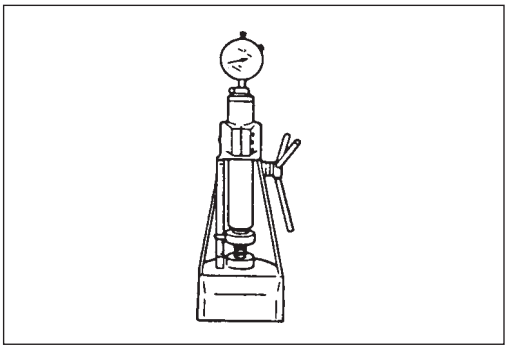
Valve spring preload

Measure the valve spring preload.

09900-20101 : Vernier calipers

Valve spring preload :
Standard :
IN & EX 139 – 159 N (13.9 – 15.9 kg, 30.6 – 35.1 lbs) for 19.3 mm (0.76 in)

Service limit :
IN & EX 127 N (12.7 kg, 28.0 lbs) for 19.3 mm (0.76 in)



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

CAMSHAFT

Cam face

Inspect the cam face for scratches and wear.

Cam wear

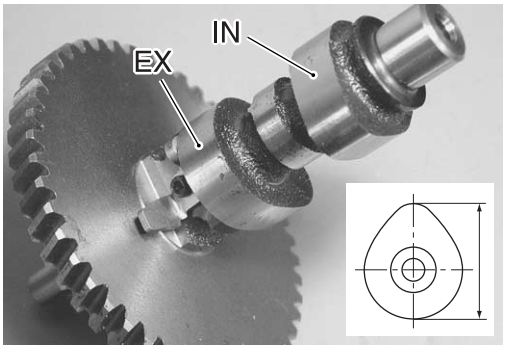
Measure the cam height Ⓗ.

TOOL 09900-20202 : Micrometer

Cam height :
Standard :
IN 32.460 – 32.520 mm (1.2780 – 1.2803 in)
EX 32.538 – 32.598 mm (1.2810 – 1.2834 in)

Service limit : IN 32.160 mm (1.2661 in)
EX 32.238 mm (1.2692 in)

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



Camshaft journal oil clearance

To check the clearance, measure the following items.

- Camshaft journal (upper and lower) outside diameter.
- Camshaft holders (cylinder block and crankcase) inside diameter.

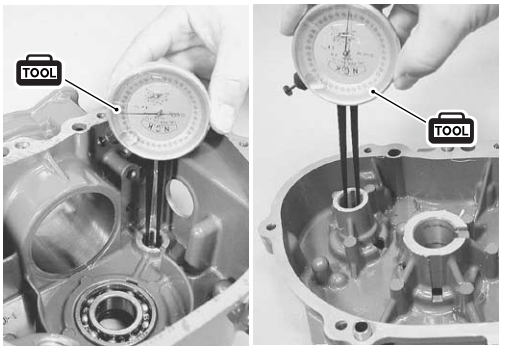
TOOL 09900-20205 : Micrometer
09900-20605 : Dial caliper

Camshaft journal oil clearance :

Standard :
Upper 0.016 – 0.062 mm (0.0006 – 0.0024 in)
Lower 0.016 – 0.052 mm (0.0006 – 0.0020 in)

Service limit : Upper 0.150 mm (0.0059 in)
Lower 0.150 mm (0.0059 in)

If the clearance exceeds the service limit, replace the camshaft, the cylinder block and/or the crankcase.



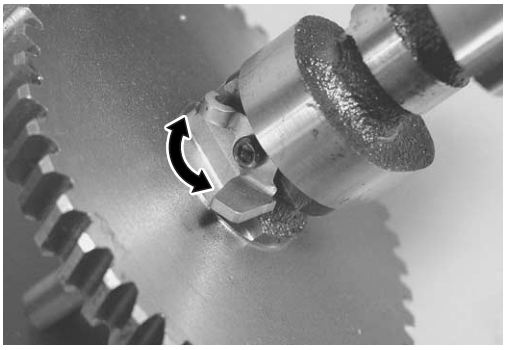
Camshaft holder inside diameter :

Standard :
Upper 15.000 – 15.028 mm (0.5906 – 0.5917 in)
Lower 16.000 – 16.018 mm (0.6299 – 0.6306 in)

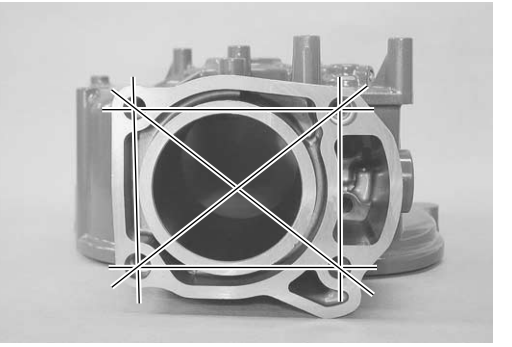
Camshaft journal outside diameter :
Standard :
Upper 14.966 – 14.984 mm (0.5892 – 0.5899 in)
Lower 15.966 – 15.984 mm (0.6286 – 0.6293 in)

Decompression parts

Inspect the decompression parts in the camshaft.
If abnormal movement is found, replace the camshaft.



CYLINDER / PISTON / PISTON RING



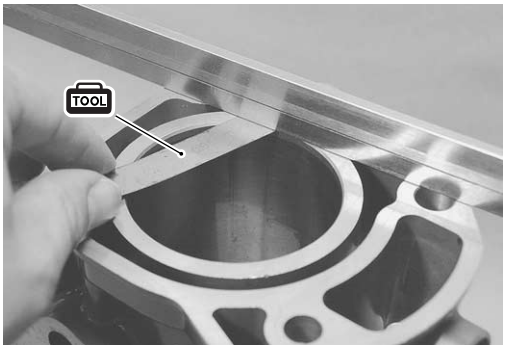
Cylinder distortion

Using a straightedge and the thickness gauge, measure the gasket surface of the cylinder at a total of six locations as shown in the figure.

09900-20803 : Thickness gauge

Cylinder distortion :
Service limit : 0.05 mm (0.002 in)

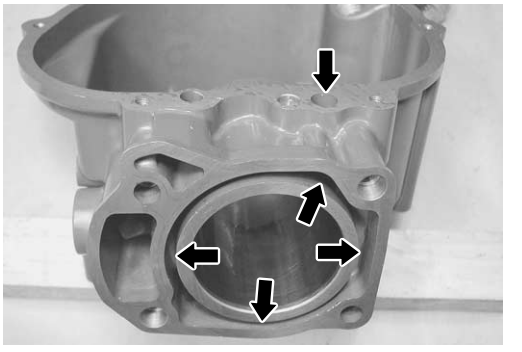
If the measurement exceeds the service limit, resurface or replace the cylinder.



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

Water jacket

Inspect the water jackets for clog or obstruction.
Clean the water jackets if necessary.

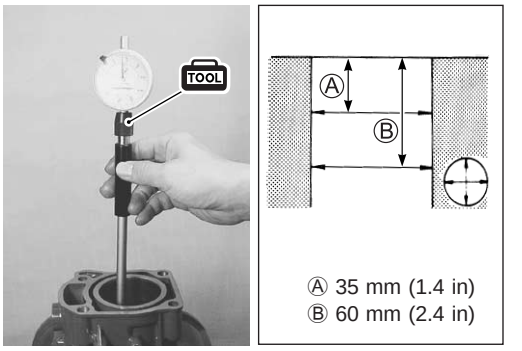


Cylinder bore

Inspect the cylinder wall for scratches, roughness or ridges which indicate excessive wear.
If the cylinder bore is very rough or deeply scratched or ridged, rebore the cylinder and use a oversize piston.

Cylinder bore wear (difference)

Using the cylinder bore gauge, measure the cylinder bore in the thrust and axial directions at the two positions Ⓐ and Ⓑ.



TOOL **09900-20508 : Cylinder gauge set**

Check for the followings.

- Difference between the measurements at the two positions (taper).
- Difference between the thrust and axial measurements (out-of-round).

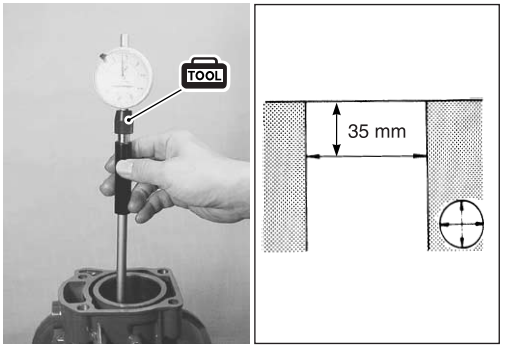
Cylinder bore wear (difference) :
Service limit : 0.100 mm (0.0039 in)

If the wear (difference) exceeds the service limit, rebore or replace the cylinder.

Piston to cylinder clearance

To check the clearance, measure the following items.

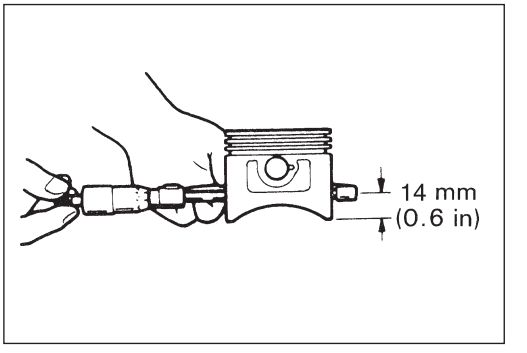
- Cylinder bore at 35 mm elevation from the gasket surface at a right angle to the crankshaft pin.
- Piston skirt diameter at 14 mm elevation from the skirt end.



TOOL **09900-20508 : Cylinder gauge set**
09900-20203 : Micrometer

Piston to cylinder clearance :
Standard : 0.010 – 0.040 mm (0.0004 – 0.0016 in)
Service limit : 0.100 mm (0.0039 in)

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



Cylinder bore :
Standard : 62.000 – 62.015 mm (2.4409 – 2.4415 in)

Piston skirt diameter
Standard : 61.975 – 61.990 mm (2.4400 – 2.4406 in)

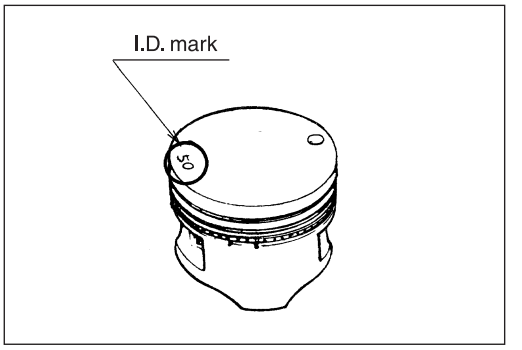
Identification of oversize piston / piston ring

Two oversize piston / piston ring components, 0.25 mm and 0.50 mm, are available.

Oversize piston / piston ring are marked as show in the figures.

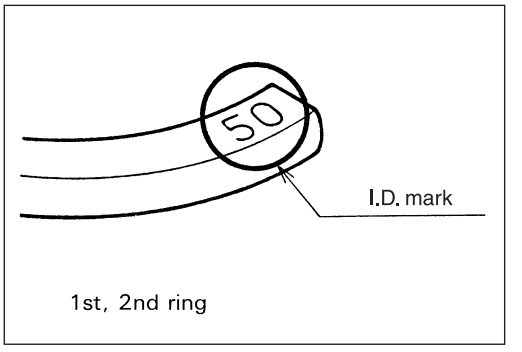
Piston

Oversize	I.D. mark
0.25 mm	0.25
0.50 mm	0.50



1st ring & 2nd ring

Oversize	I.D. mark
0.25 mm	25
0.50 mm	50



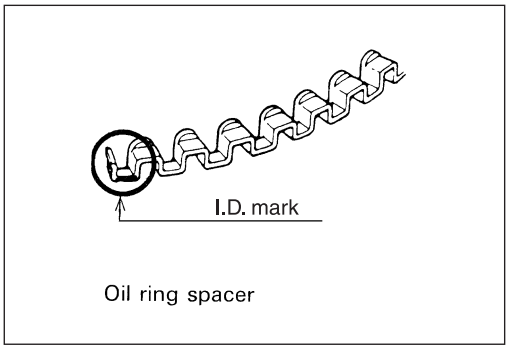
1st, 2nd ring

Oil ring

Oversize	I.D. mark
0.25 mm	White paint
0.50 mm	Blue paint

NOTE:

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

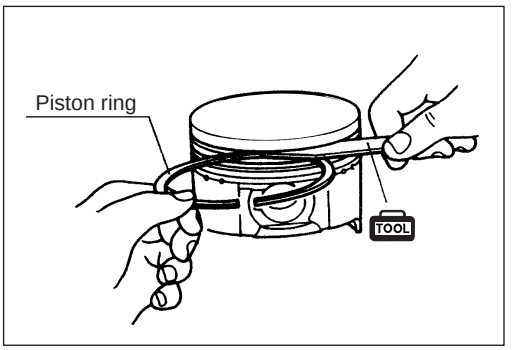


Oil ring spacer

Piston ring to groove clearance

Before checking, the piston grooves must be clean, dry and free of carbon.

Fit the piston ring into the piston groove, and measure the clearance between the ring and the ring groove using the thickness gauge.



TOOL 09900-20803 : Thickness gauge

Piston ring to groove clearance

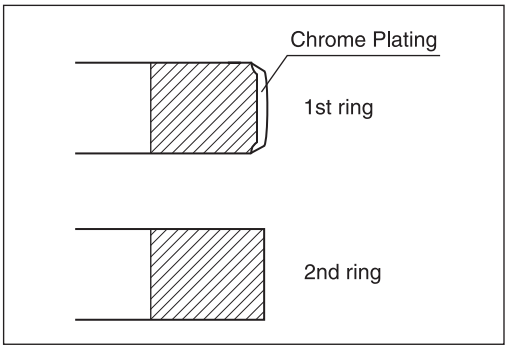
Standard :

1st & 2nd 0.03 – 0.07 mm (0.001 – 0.003 in)

Service limit :

1st & 2nd 0.12 mm (0.005 in)

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



Piston ring groove width

Standard :

1st & 2nd 1.22 – 1.24 mm (0.048 – 0.049 in)

Oil 2.51 – 2.53 mm (0.099 – 0.100 in)

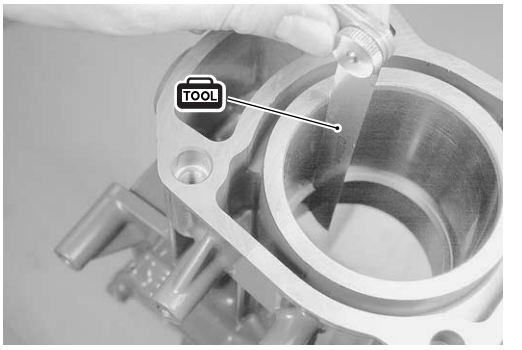
Piston ring thickness

Standard :

1st & 2nd 1.17 – 1.19 mm (0.046 – 0.047 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

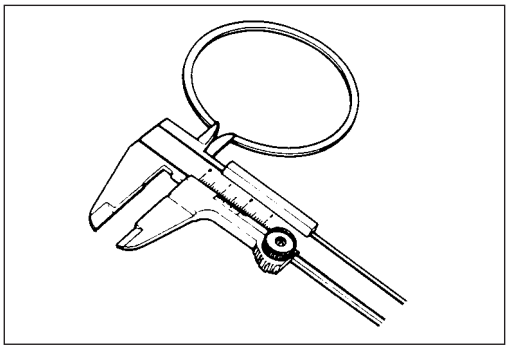
Piston ring end gap
Standard :
1st 0.20 – 0.35 mm (0.008 – 0.014 in)
2nd 0.35 – 0.50 mm (0.014 – 0.020 in.)

Service limit :
1st 0.70 mm (0.028 in)
2nd 1.00 mm (0.039 in)

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

Piston ring free end gap

Measure the piston ring free end gap.

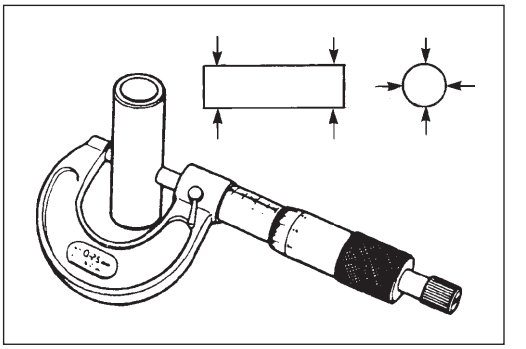


TOOL 09900-20101 : Vernier calipers

Piston ring free end gap
Standard : 1st & 2nd Approx. 8.5 mm (0.33 in)
Service limit : 1st & 2nd 6.8 mm (0.27 in)

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

PISTON PIN / CONROD / CRANKSHAFT



Piston pin clearance

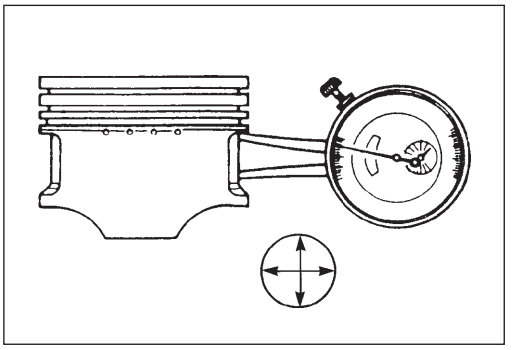
To check the clearance, measure the following items.

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

09900-20205 : Micrometer
09900-20605 : Dial calipers

Pin clearance in piston pin hole :
Standard : 0.006 – 0.019 mm (0.0002 – 0.0007 in)
Service limit : 0.040 mm (0.0016 in)

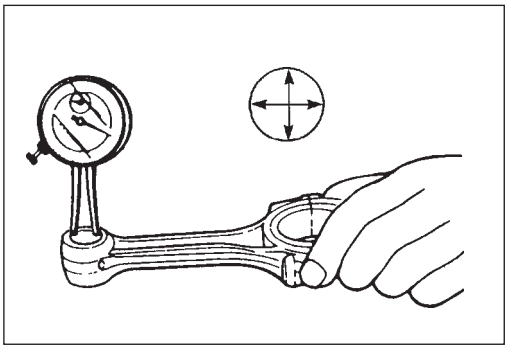
Pin clearance in conrod small end :
Standard : 0.006 – 0.019 mm (0.0002 – 0.0007 in)
Service limit : 0.050 mm (0.0020 in)



If the clearance exceeds the service limit, replace the piston, the piston pin and/or the conrod assembly.

Piston pin outside diameter :
Standard : 17.995 – 18.000 mm (0.7085 – 0.7087 in)
Service limit : 17.980 mm (0.7079 in)

Piston pin hole diameter :
Standard : 18.006 – 18.014 mm (0.7089 – 0.7092 in)
Service limit : 18.030 mm (0.7098 in)

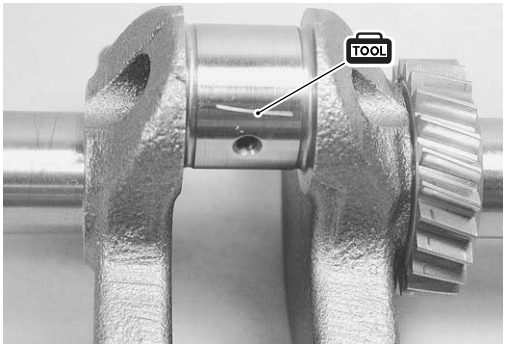


Conrod small end inside diameter :
Standard : 18.006 – 18.014 mm (0.7089 – 0.7092 in)
Service limit : 18.040 mm (0.7102 in)

Conrod big end oil clearance

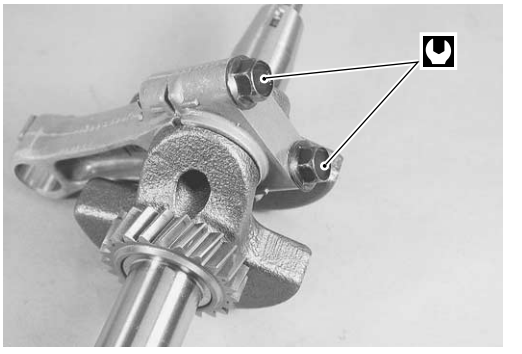
Check the clearance as follows.

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 parallel to the crankshaft, avoiding the oil hole.



TOOL **09900-22301 : Plastigauge**

3. Install the conrod and the conrod cap to the crank pin.
4. Install the two conrod bolts and tighten the bolts to the specified torque in two steps.



NOTE:

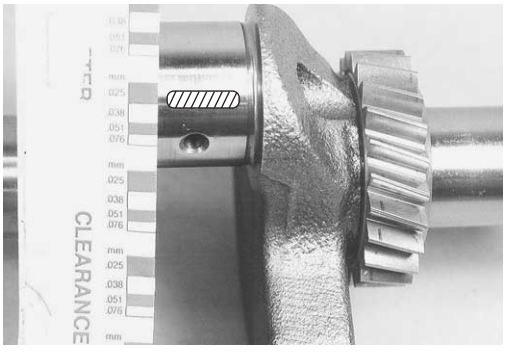
Do not rotate the conrod with the plastigauge in place.

Conrod bolt :

1st step 10 N·m (1.0 kg-m, 7.0 lb-ft)

2nd step 20 N·m (2.0 kg-m, 14.5 lb-ft)

5. Remove the conrod and the conrod cap from the crank pin.
6. Using the scale on the plastigauge envelop, measure the plastigauge with the widest point.



Conrod big end oil clearance :

Standard : 0.015 – 0.035 mm (0.0006 – 0.0014 in)

Service limit : 0.080 mm (0.0031 in)

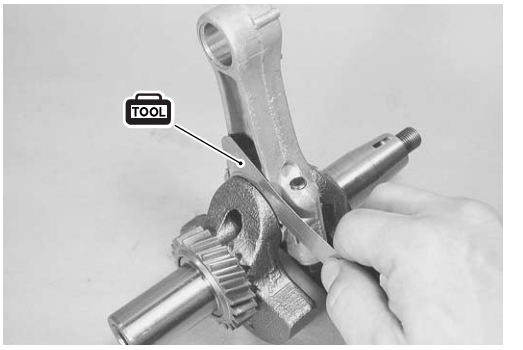
If the measurement exceeds the service limit replace the conrod assembly and/or crankshaft.

Conrod big end inside diameter :

Standard : 28.015 – 28.025 mm (1.1030 – 1.1033 in)

Conrod big end side clearance

Measure the clearance with the conrod installed on the crank pin as shown in the figure.



TOOL **09900-20803 : Thickness gauge**

Conrod big end side clearance :
Standard : 0.20 – 0.90 mm (0.008 – 0.035 in)
Service limit : 1.20 mm (0.047 in)

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

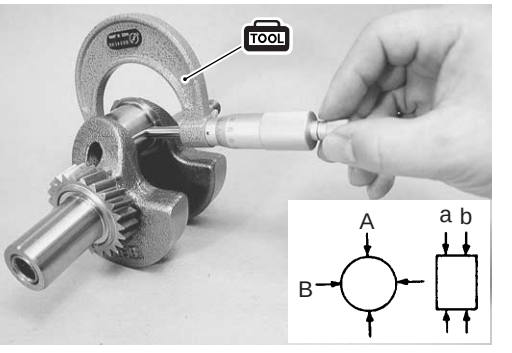
Conrod big end width :
Standard : 23.30 – 23.80 mm (0.917 – 0.937 in)

Crank pin width :
Standard : 24.00 – 24.20 mm (0.945 – 0.953 in)

Crank pin

Inspect the crank pin for uneven wear or damage. Measure the crank pin outside diameter for out-of-round or taper using the micrometer.

Out-of-round : A – B
Taper : a – b



TOOL **09900-20202 : Micrometer**

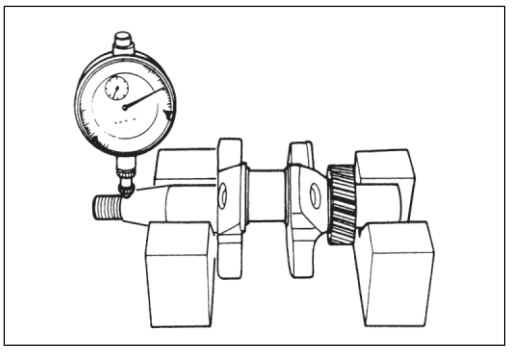
Crank pin outside diameter difference
(Out-of-round and Taper) :
Service limit : 0.010 mm (0.0004 in)

If the out-of-round or the taper is exceeds the service limit, replace the crankshaft.

Crank pin outside diameter
Standard : 27.990 – 28.000 mm (1.1020 – 1.1024 in)

Crankshaft runout

Measure the crankshaft runout as shown in the figure.



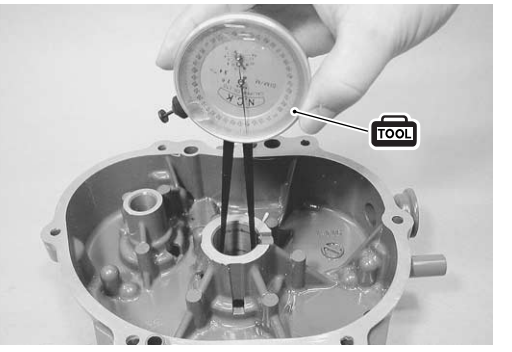
TOOL **09900-20602 : Dial gauge**
09900-20701 : Magnetic stand
09900-21304 : Steel "V" block set

Crankshaft runout :
Service limit : 0.05 mm (0.002 in)

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

Crankshaft lower journal oil clearance

To check the clearance, measure the following items.
- Crankshaft lower holder (crankcase) inside diameter.
- Crankshaft lower journal outside diameter.



TOOL **09900-20205 : Micrometer**
09900-20605 : Dial caliper

Crankshaft lower journal oil clearance :
Standard : 0.020 – 0.062 mm (0.0008 – 0.0024 in)
Service limit : 0.100 mm (0.0039 in)

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

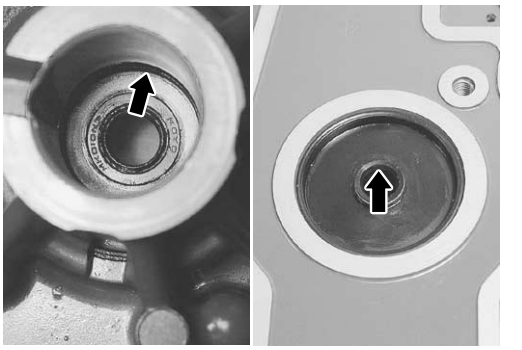
Crankshaft lower holder inside diameter :
Standard : 25.000 – 25.021 mm (0.9843 – 0.9851 in)

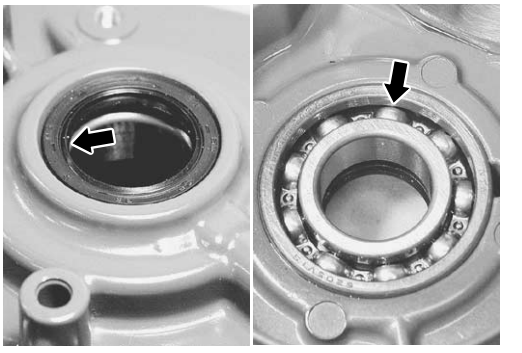
Crankshaft lower journal outside diameter :
Standard : 24.959 – 24.980 mm (0.9826 – 0.9835 in)

OIL SEAL / BEARING

Visually check the oil seals installed in the cylinder block and crankcase for cut, nick, excessive wear or other damage.
Visually check the crankshaft upper bearing for pitting, noisy, rough or other damage.

NOTE:
If neither defective nor any damage is found on the oil seals and the bearing, do not remove the oil seals and the bearing.





CAUTION

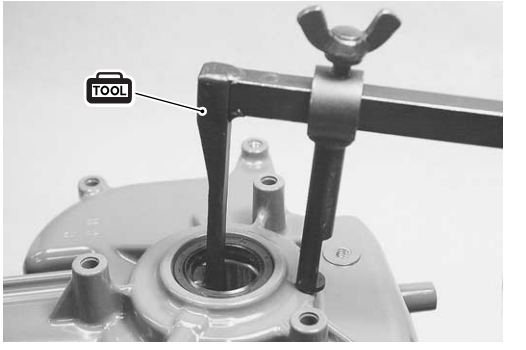
Do not re-use the oil seal once removed. Always use a new oil seal.

Replacing crankshaft upper oil seal / bearing

W/R G's 99000-25160 : Suzuki Water Resistant Grease

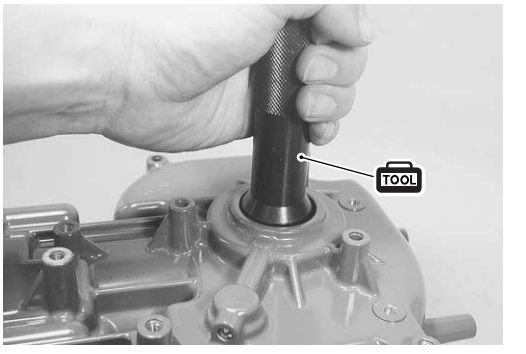
1. Remove the crankshaft upper oil seal.

TOOL 09913-50121 : Oil seal remover



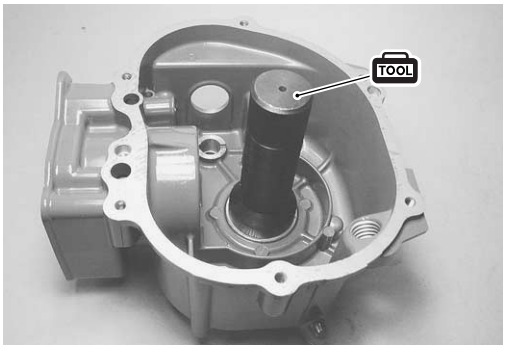
2. Drive the bearing out downward.

TOOL 09913-75821 : Remover & installer



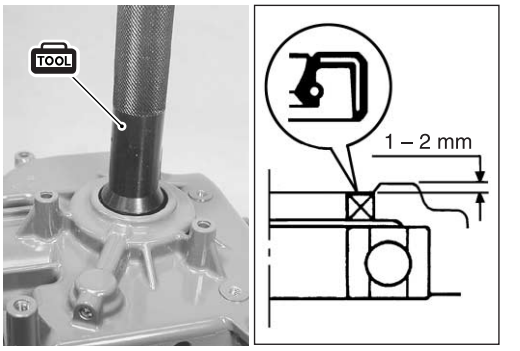
3. Apply the engine oil to the outer circumference of the bearing.
4. Drive the bearing down into the position until the bearing has stopped.

TOOL 09913-75810 : Remove & installer



5. Apply the Water Resistant Grease to the outer circumference of the oil seal.
6. Drive the oil seal down into the position as shown in the figure. Do not contact the oil seal to the bearing.

TOOL **09913-75821 : Remover & installer**



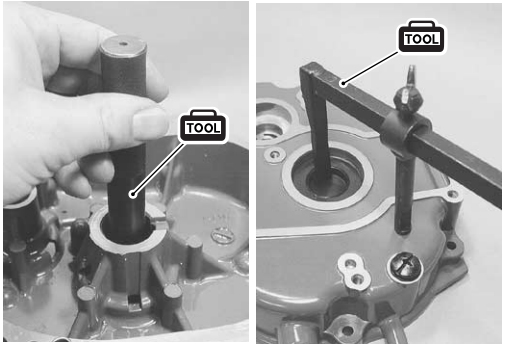
Replacing lower oil seals

1. Drive the driveshaft oil seal out downward.

TOOL **09943-88211 : Remover & installer**

2. Remove the crankshaft lower oil seal.

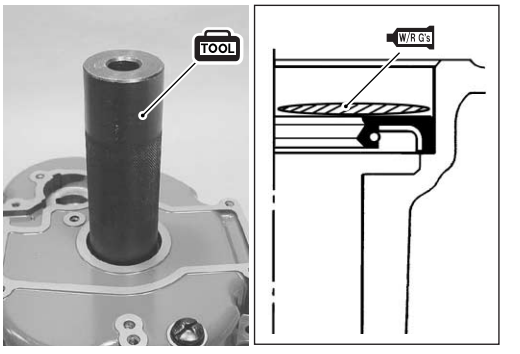
TOOL **09913-50121 : Oil seal remover**



3. Apply the Water Resistant Grease to the outer circumference of the oil seals.
4. Drive the crankshaft lower oil seal down into the position until the oil seal has stopped.

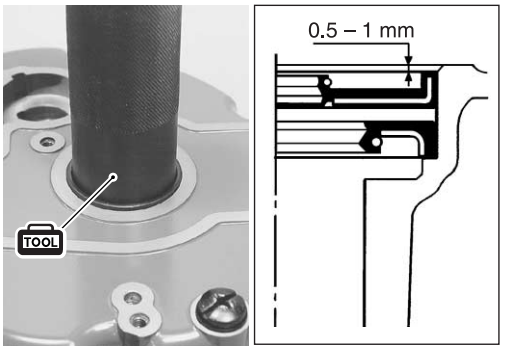
TOOL **09914-79610 : Remover & installer**

5. Apply the Water Resistant Grease to the crankshaft lower oil seal as shown in the figure.



6. Drive the driveshaft oil seal down into the position as shown in the figure. Do not over-drive the oil seal in order to avoid contacting with the crankshaft end.

TOOL **09914-79610 : Remover & installer**



THERMOSTAT

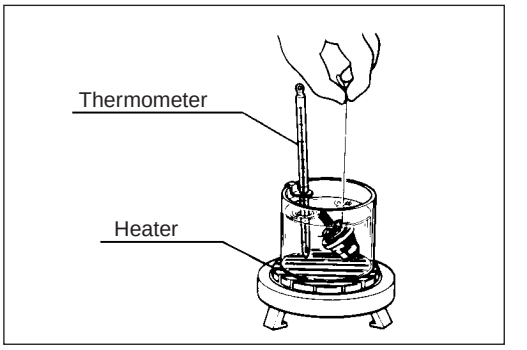
If salt deposits, corrosion, wear or other damage is found, clean or replace the thermostat.

Thermostat operation

Check the thermostat operating 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 : 48 – 52°C (118 – 126°F)



REASSEMBLY

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

CAUTION

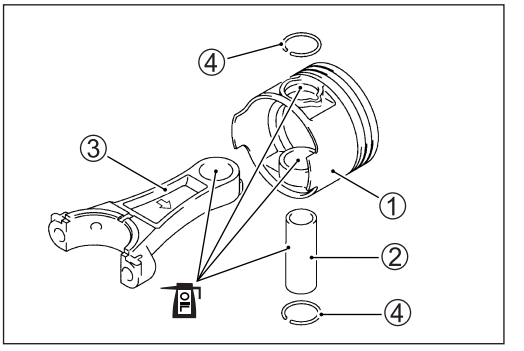
- **If the original components are not replaced, each piston, piston pin and conrod is to be assembled and installed in the original order and position.**
- **Do not re-use the gasket, the oil seal, the O-ring and the circlip once removed. Always use new parts.**

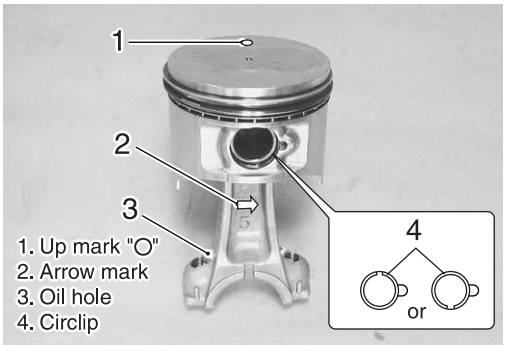
PISTON TO CONROD

1. Apply engine oil to the piston pin ②, the 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.*
- *Install the circlips with a gap facing either up or down as shown in the figure.*

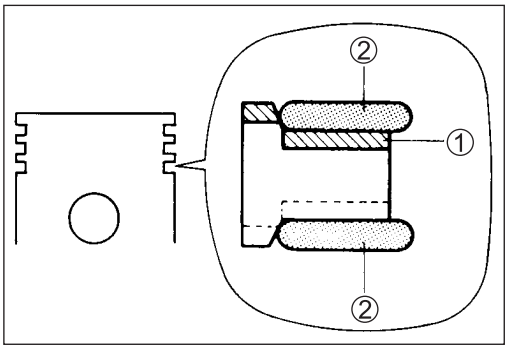




PISTON RING TO PISTON

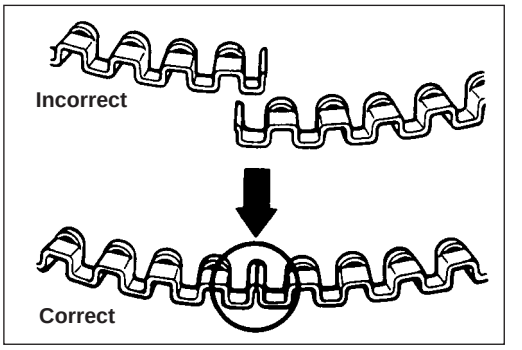
Oil ring

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



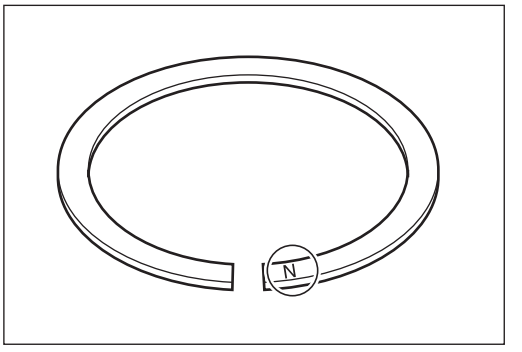
CAUTION

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

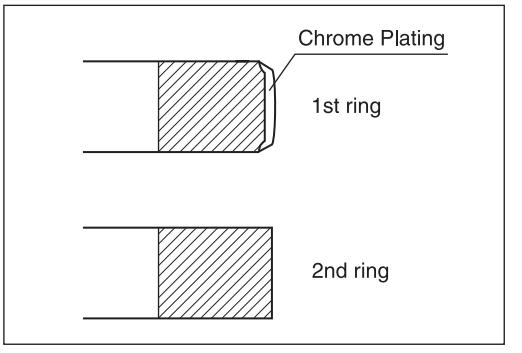


1st ring and 2nd ring

1. Apply engine oil to the piston rings.
2. Install the 2nd ring and the 1st ring to the piston with the “N” mark toward the piston head side.



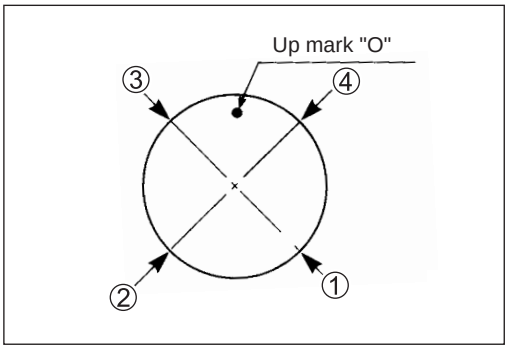
NOTE:
The 1st ring ditters from the 2nd ring in shape.
Distinguish the 1st ring from the 2nd ring by referring to the figure.



Ring gap direction

Position the piston rings so that the ring gaps are staggered at approximately 90 degree angles as shown in the figure.

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



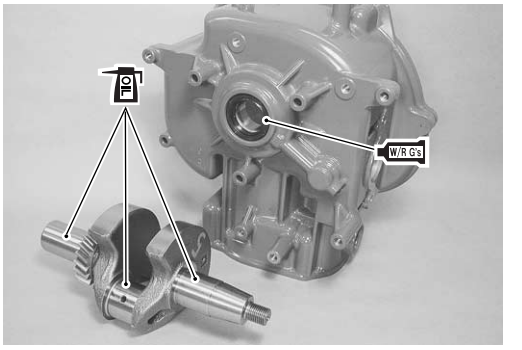
CAUTION

Failure to a stagger the piston ring gaps may result in the crankcase oil dilution.

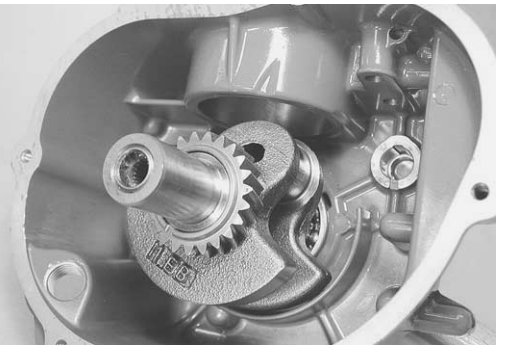
CRANKSHAFT AND PISTON TO CYLINDER

1. Apply engine oil to the crankshaft journals and pin.
2. Apply the Water Resistant Grease to the lip of the upper oil seal.

W/R G's 09900-25160 : Suzuki Water Resistant Grease



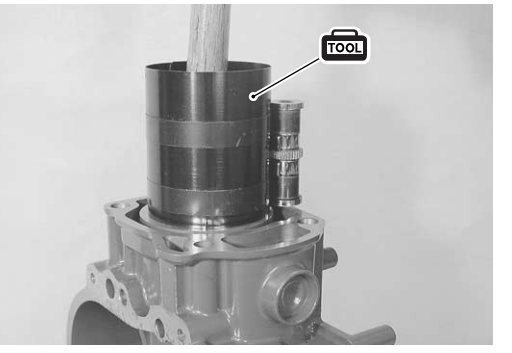
3. Install the crankshaft to the cylinder block.



4. Apply engine oil to the piston and the cylinder wall.
5. Insert the piston / conrod assembly into the cylinder bore from the cylinder head side using the special tool.

TOOL 09916-77310 : Piston ring compressor

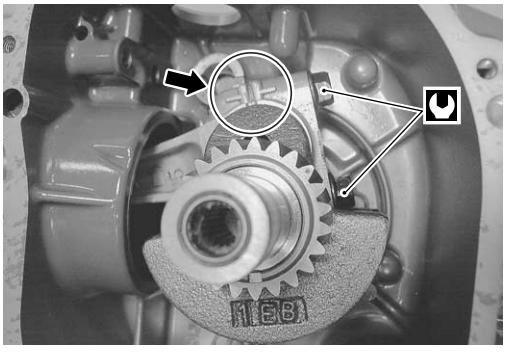
NOTE:
Position the "circle" mark on the piston head to the flywheel side.



CONROD CAP

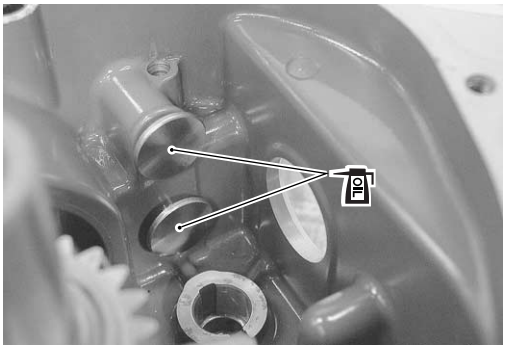
1. Apply engine oil lightly to the conrod bolts.
2. Install the conrod cap in the direction as shown in the figure.
3. Tighten the two conrod bolts to the specified torque in two steps.

Conrod bolt :
1st step 10 N·m (1.0 kg-m, 7.0 lb-ft)
2nd step 21 N·m (2.1 kg-m, 15.0 lb-ft)



CAMSHAFT TO CYLINDER

1. Apply engine oil to the tappets.
2. Install the tappets to the cylinder block.

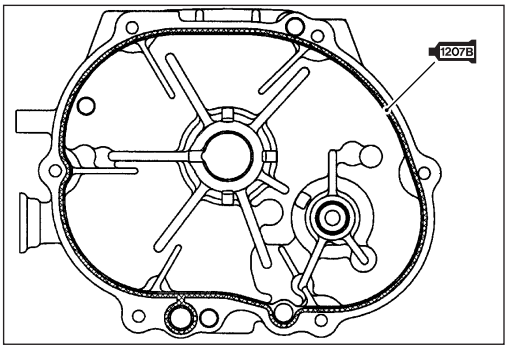


3. Apply engine oil to the cam faces and the cam journals.
4. While aligning each punch marks on the camshaft gear and the crankshaft gear, install the camshaft to the cylinder block.

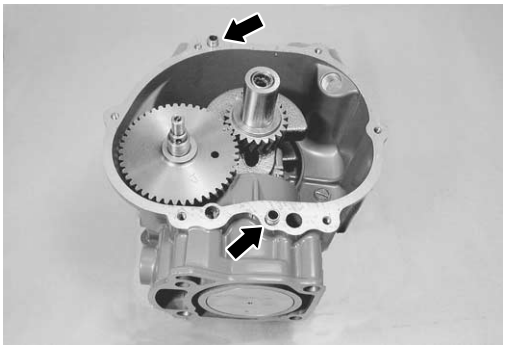
CRANKCASE TO CYLINDER

1. Clean the mating surfaces of the cylinder block and the crankcase.
2. Apply the Suzuki Bond to the mating surface of the crankcase as shown in the figure.

1207B 99000-31140 : Suzuki Bond "1207B"



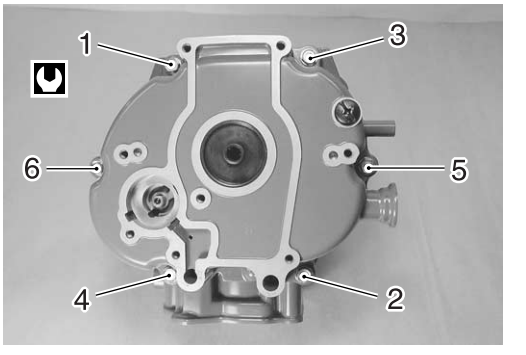
3. Install the two dowel pin to the cylinder block.



4. Install the crankcase to the cylinder block.
5. Tighten the six crankcase bolts to the specified torque in the order indicated.

Crankcase bolt : 10 N·m (1.0 kg-m, 7.0 lb-ft)

NOTE:
Do not apply engine oil to the crankcase bolts.



CYLINDER HEAD / VALVE

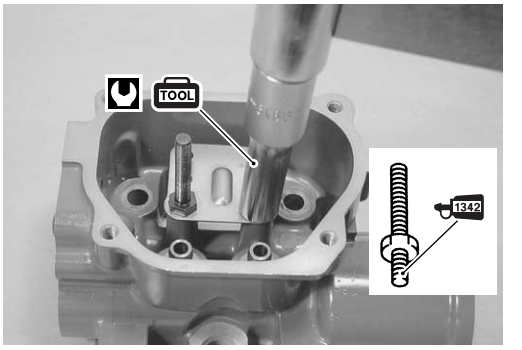
1. Apply the Thread Lock to the mounting side threads of the rocker arm pivot bolts.

1342 99000-32050 : Thread Lock "1342"

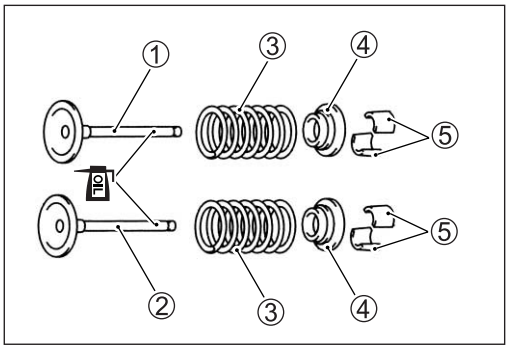
2. Tighten the bolts with the rod guide plate to the specified torque.

TOOL 09919-16010 : Deep socket wrench

Rocker arm pivot bolt : 10 N·m (1.0 kg-m, 7.0 lb-ft)

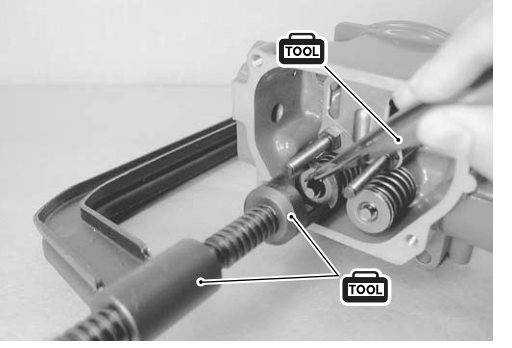


3. Apply engine oil to the valve stems.
4. Install the valves ① / ②, the valve springs ③ and the valve spring retainers ④ to the cylinder head.

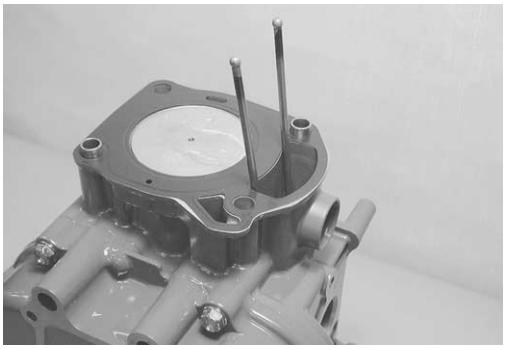


5. Install the valve cotters ⑤ while compressing the valve spring using the special tools.

TOOL 09916-14510 : Valve lifter
09916-14910 : Attachment
09916-84511 : Tweezers

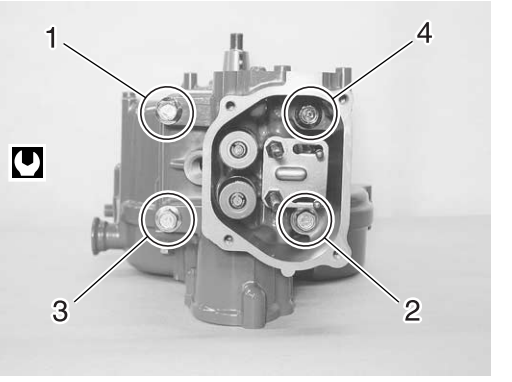


CYLINDER HEAD TO CYLINDER



1. Install the two dowel pins and the gasket to the cylinder block.
2. Install the two push rods onto the end of the tappets in the cylinder block.

NOTE:
Before installing the cylinder head, make sure that the piston is at the TDC position on a compression stroke.



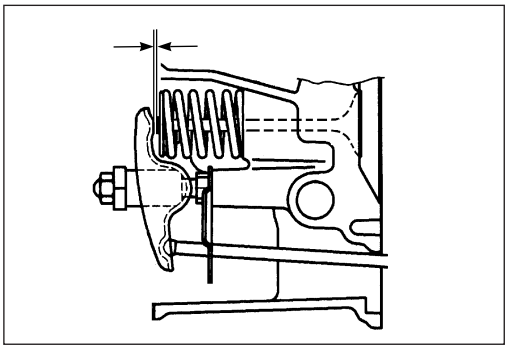
3. Install the cylinder head to the cylinder block.
4. Apply engine oil lightly to the cylinder head bolts.
5. Tighten the bolts to 50 percent (%) of the specified torque according to the numerical order in the figure.

Cylinder head bolt (50% torque) :
1st step 14 N·m (1.4 kg-m, 10.0 lb-ft)

6. Loosen the all bolts to 0 N·m (0 kg-m, 0 lb-ft) according to the reverse order. (2nd step)
7. Finally tighten the bolts to the specified torque in two steps according to the numerical order in the figure.

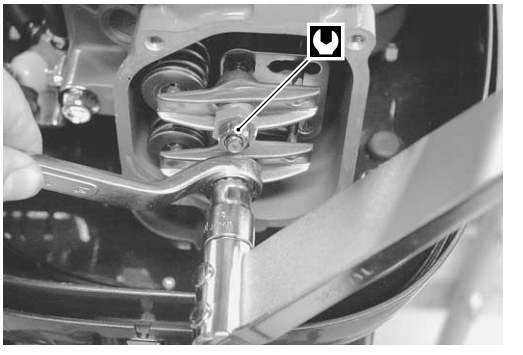
Cylinder head bolt :
3rd step 14 N·m (1.4 kg-m, 10.0 lb-ft)
Final step 28 N·m (2.8 kg-m, 20.5 lb-ft)

PIVOT NUT / ROCKER ARM / VALVE CLEARANCE



1. Install the rocker arms, the pivot nuts and the valve adjusting lock nuts onto the pivot bolts.
2. Adjust the valve clearance. (See the page 2-10)

Valve adjusting lock nut : 11 N·m (1.1 kg-m, 8.0 lb-ft)

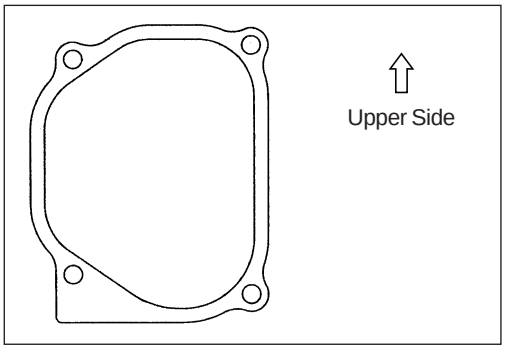


CYLINDER HEAD COVER

Install the cylinder head cover and the gasket, then tighten the four cylinder head cover bolts diagonally to the specified torque.

Cylinder head cover bolt : 8 N·m (0.8 kg-m, 6.0 lb-ft)

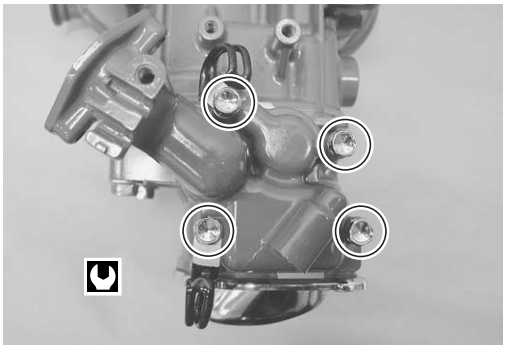
NOTE:
Make sure that the cylinder head cover gasket is installed as shown direction in the figure.



INTAKE MANIFOLD / THERMOSTAT

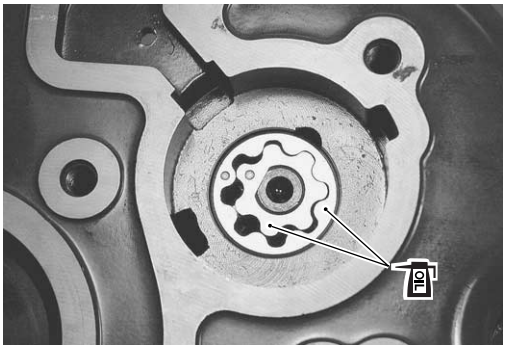
1. Install the thermostat to the cylinder block.
2. Install the intake manifold and the gasket, then tighten the four intake manifold bolts diagonally to the specified torque.

Intake manifold bolt : 10 N·m (1.0 kg-m, 7.0 lb-ft)

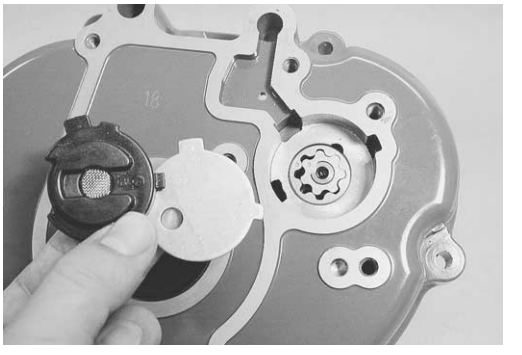


OIL PUMP / OIL FILTER

1. Apply engine oil to the inner / outer oil pump.
2. Install the inner / outer oil pump to the crankcase as shown in the figure.



3. Install the plate and the oil filter / holder to the crankcase.

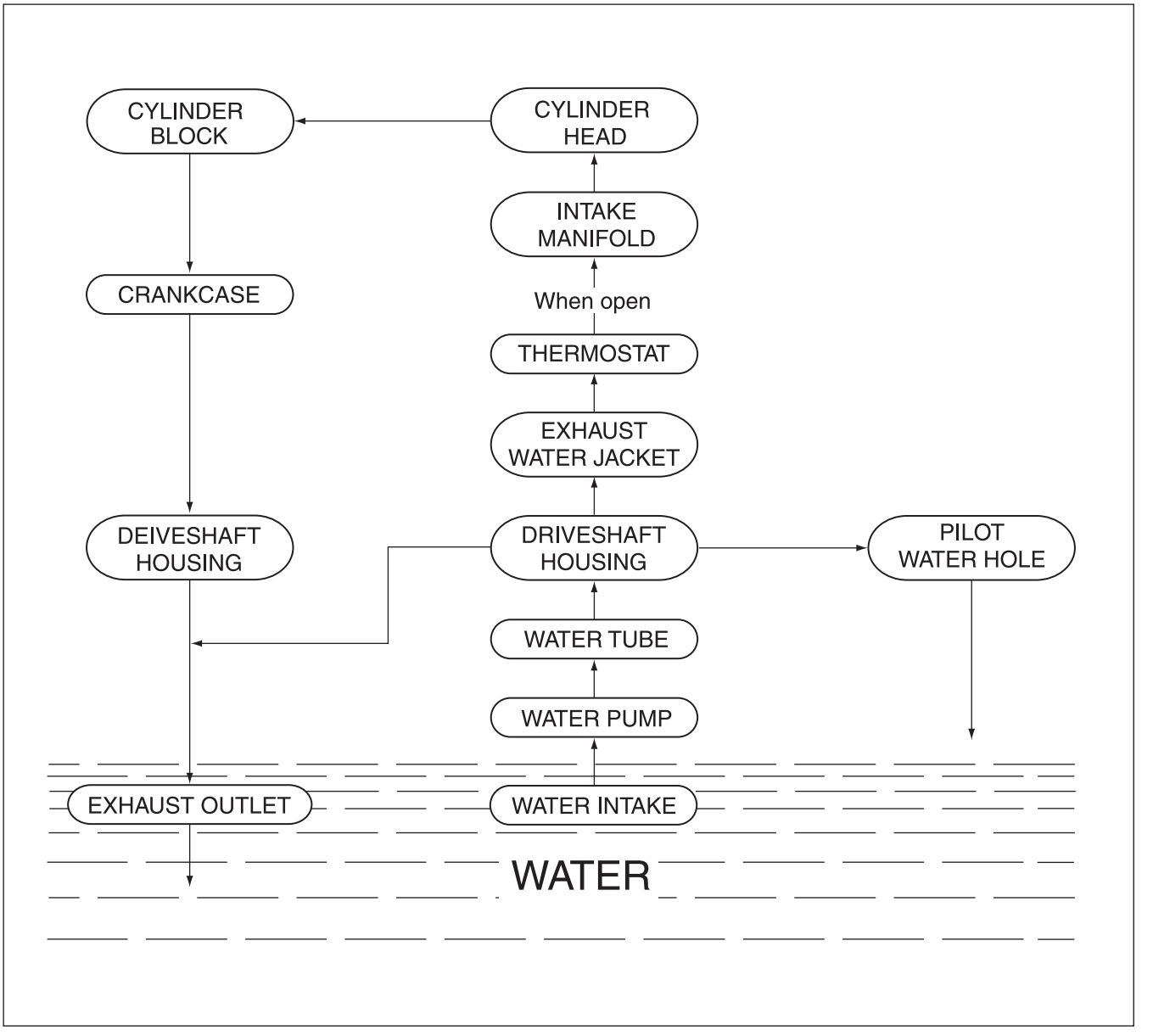


OPERATION

WATER COOLING SYSTEM

The water cooling system includes the lower unit water pump, the water supply tube, the power unit water passages and the thermostat.
This system cools both the power unit and exhaust and is shown in schematic from below.
If overheating occurs, the components of the cooling system must be inspected for blockage, corrosion build-up or component damage.

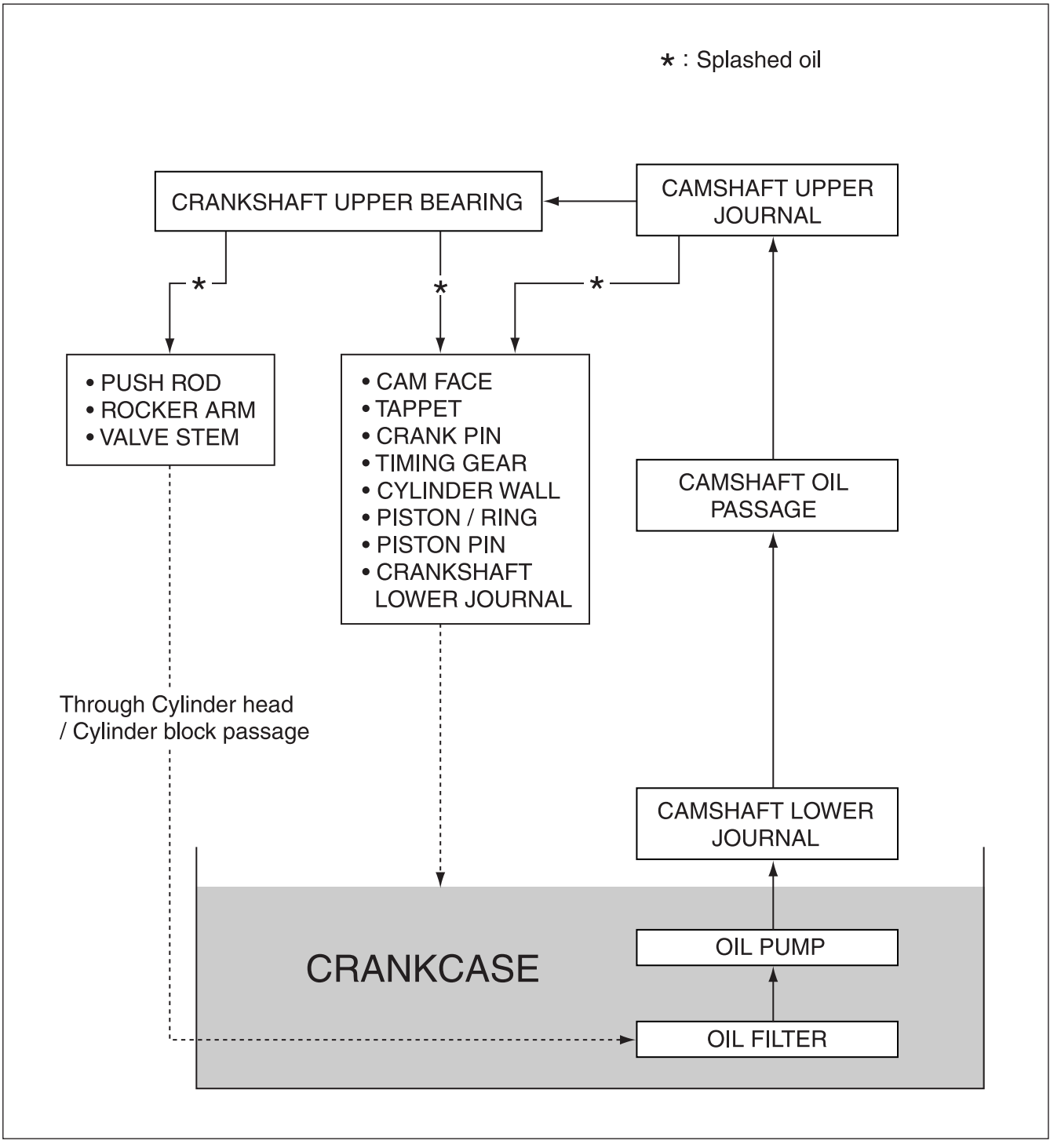
[Component inspection] [Refer to page]
Water pump / Impeller 8-8
Water tube 7-10
Thermostat 6-31
Cylinder head 6-12
Cylinder block 6-21



ENGINE LUBRICATION SYSTEM

A camshaft driven trochoid type pump provides engine oil to all power unit components requiring lubrication. Oil from the bottom of the crankcase is drawn through the oil filter and is pumped.
The oil is passed through the passage in the camshaft lubricating the journals, then through the internal passage in the top of the cylinder to the crankshaft upper bearing.
From the periphery of crankshaft upper bearing and the camshaft upper journal, the oil runs down and lubricates the each component by splash method.

ENGINE OIL LUBRICATION CHART



MID UNIT

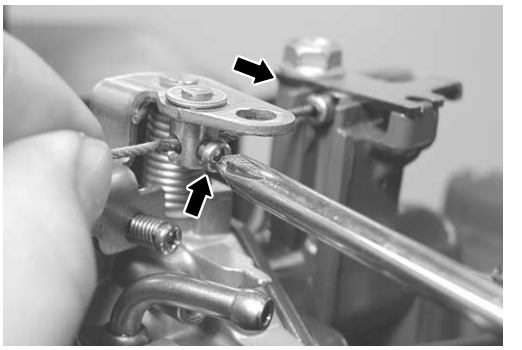
CONTENTS

TILLER HANDLE

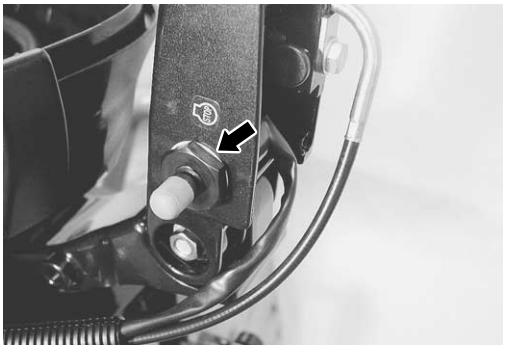
REMOVAL / INSTALLATION

REMOVAL

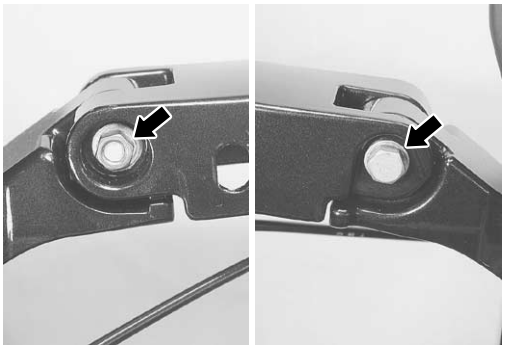
1. Remove the throttle cable from the carburetor and the intake manifold.
2. Remove the lead wires / cable binder, then take out the throttle control cable from the lower cover.
   (See the page 6-3)



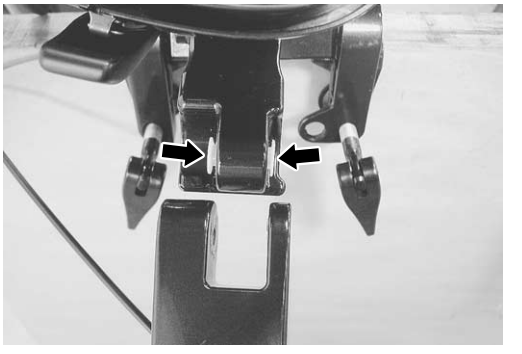
3. Remove the engine stop switch from the tiller handle.



4. Remove the pivot nut and the washer.
5. Remove the pivot bolt.



6. Remove the tiller handle from the steering bracket.
7. Remove the two bushings.



INSTALLATION

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

- Apply the Water Resistant Grease to the bushings.

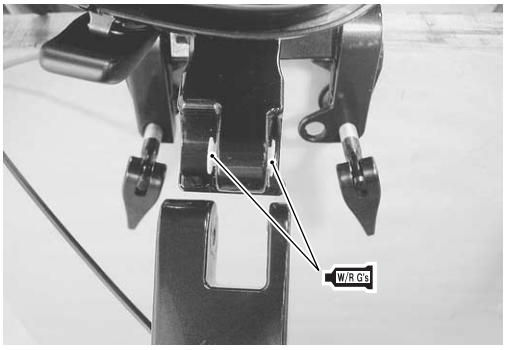
W/R G's 99000-25160 : Suzuki Water Resistant Grease

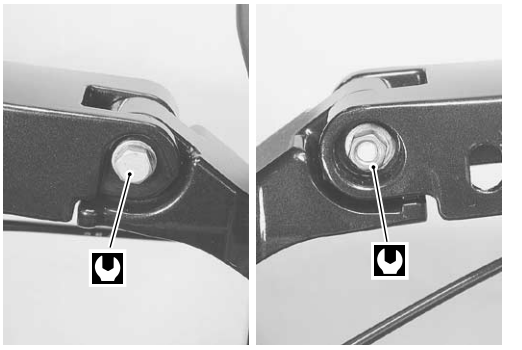
- Tighten the pivot bolt and the pivot nut to the specified torque.

Tiller handle pivot bolt : 12 N·m (1.2 kg-m, 8.5 lb-ft)

Tiller handle pivot nut : 17 N·m (1.7 kg-m, 12.5 lb-ft)

- Install the throttle control inner cable to the carburetor. (See the page 4-5)
- Check that the throttle control is smoothly operated from the full closed position to the full opened position.

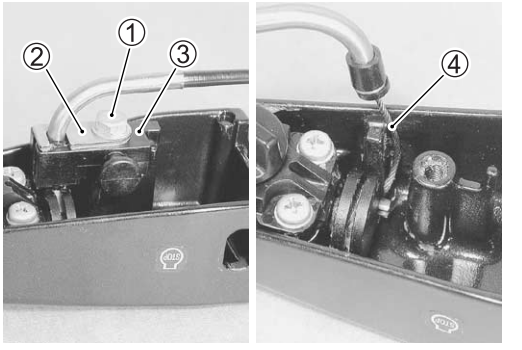




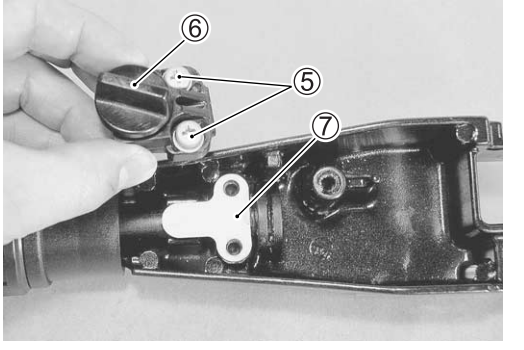
DISASSEMBLY / REASSEMBLY

DISASSEMBLY

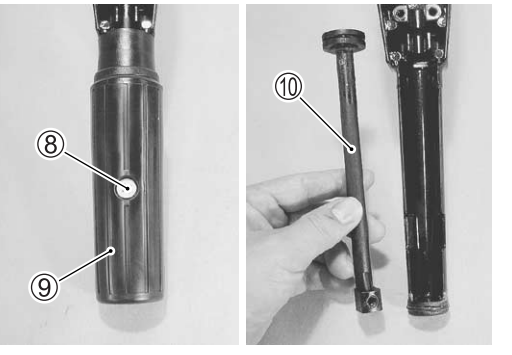
1. Remove the bolt ①, the plate ② and the cable stopper ③.
2. Remove the throttle control cable ④ from the drum of the handle rod.



3. Remove the two screws ⑤, the throttle adjuster ⑥ and the adjuster plate ⑦.



4. Remove the screw ⑧ and the control grip ⑨.
5. Remove the handle rod ⑩.



REASSEMBLY

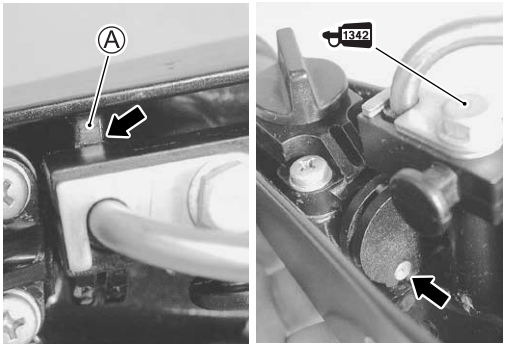
Reassembly is reverse order of disassembly with the special attention to the following steps.

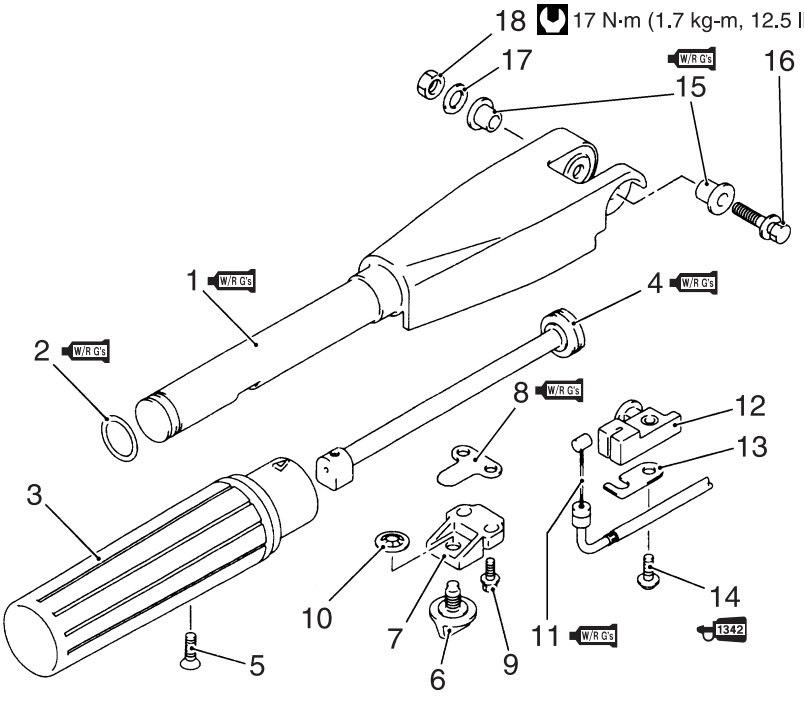
- Install the cable stopper to avoid being on the boss Ⓐ of the handle body.
- Apply the Thread Lock to the cable stopper bolt.

W/R G's 99000-32050 : Thread Lock "1342"

- Make sure that the throttle control inner cable fits in the groove on the drum of the handle rod.

1342 99000-25160 : Suzuki Water Resistant Grease





1. Tiller handle (1)
2. O-ring (1)
3. Control grip (1)
4. Handle rod (1)
5. Screw (1)
6. Adjusting knob (1)
7. Support (1)
8. Plate (1)
9. Screw (2)
10. Nut (1)
11. Throttle control cable (1)
12. Cable stopper (1)
13. Plate (1)
14. Bolt (1)
15. Bushing (2)
16. Bolt (1)
17. Washer (1)
18. Nut (1)

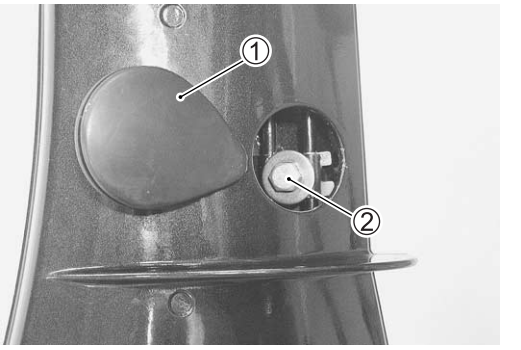
CLUTCH LEVER / ROD

REMOVAL

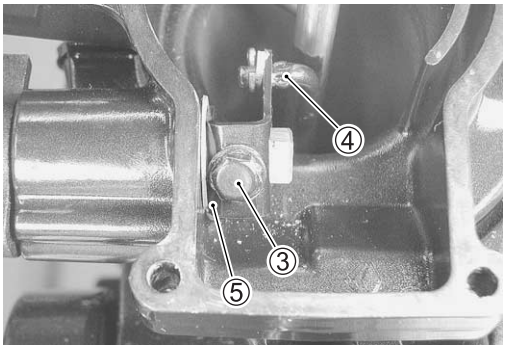
1. Remove the power unit. (See the page 6-2)
2. Shift the clutch lever in the Neutral position.
3. Remove the clutch adjust hole cover ①, then loosen the clutch rod connecting plate bolt ②.

NOTE:

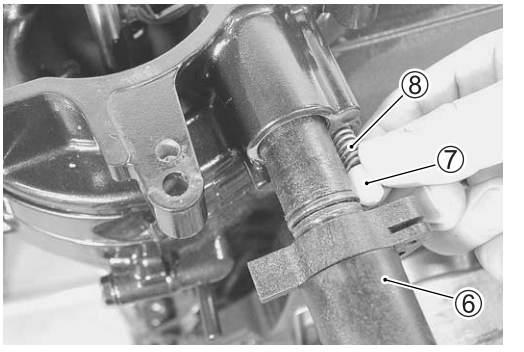
Do not over-loosen the rod connecting plate bolt. Loosen the bolt approximately 1-turn.



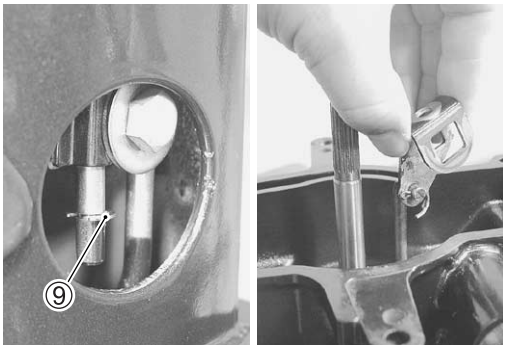
4. Remove the bolt ③, the clutch rod / arm ④ and the spacer ⑤ from the shaft of the clutch notch plate.



5. Remove the clutch lever ⑥ with the clutch notch plate, the notch pin ⑦ and the spring ⑧ from the driveshaft housing.



6. Remove the E-ring ⑨.
7. Take out the clutch rod / arm from the upside.



INSTALLATION

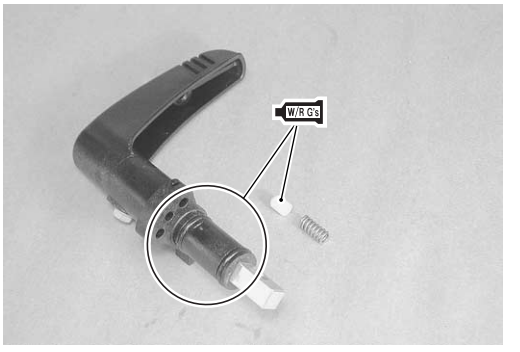
Installation is reverse order of removal with the special attention to the following steps.

CAUTION

Do not re-use the O-ring, the E-ring and the cotter pin once removed. Always use new parts.

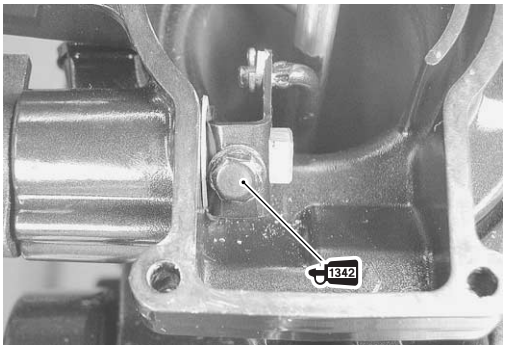
- If excessive wear or other damage is found on the notch pin or clutch lever notch plate, replace.
- Apply the Water Resistant Grease to the notch pin, the notch holes and the O-rings on the clutch notch plate.

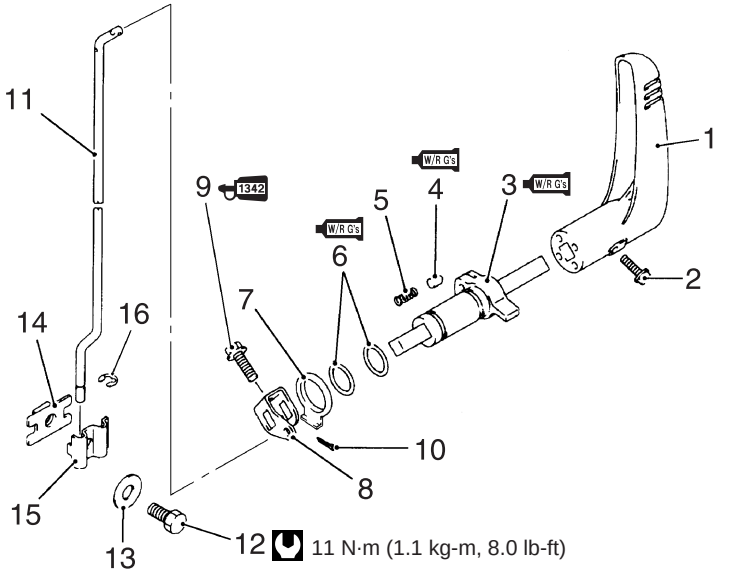
W/R G's 99000-25160 : Suzuki Water Resistant Grease



- Apply the Thread Lock to the clutch rod arm bolt.

1342 99000-32050 : Thread Lock "1342"



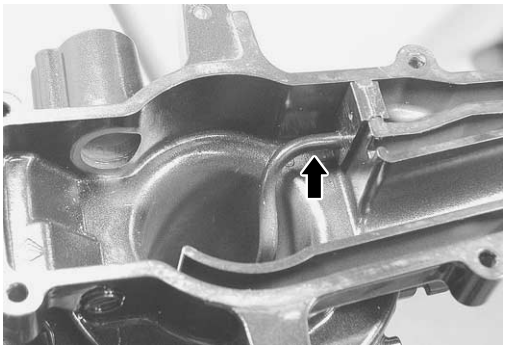


1. Clutch lever (1)
2. Bolt (1)
3. Clutch notch plate (1)
4. Notch pin (1)
5. Spring (1)
6. O-ring (2)
7. Spacer (1)
8. Clutch rod arm (1)
9. Bolt (1)
10. Cotter pin (1)
11. Clutch rod (1)
12. Bolt (1)
13. Washer (1)
14. Connector nut (1)
15. Connector plate (1)
16. E-ring (1)

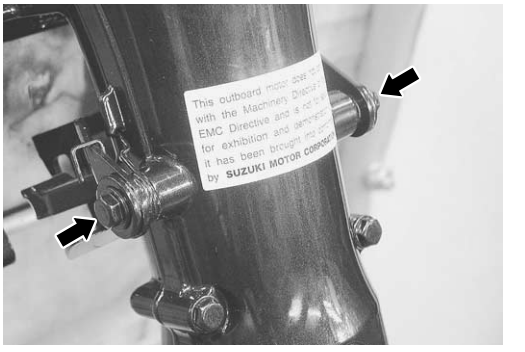
STEERING BRACKET / DRIVESHAFT HOUSING / SWIVEL BRACKET / CLAMP BRACKET

DISASSEMBLY

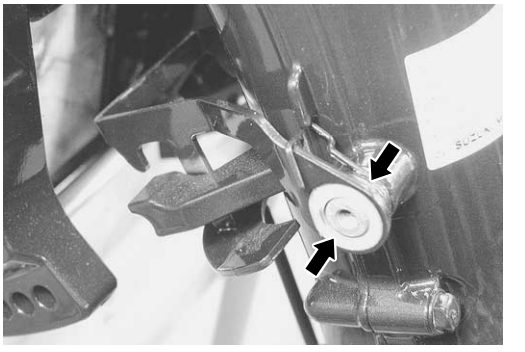
1. Remove the power unit. (See the page 6-2)
2. Remove the lower unit. (See the page 8-2)
3. Remove the tiller handle. (See the page 7-2)
4. Remove the clutch lever / rod. (See the page 7-5)
5. Remove the three bolts and the rear handle grip.
6. Remove the water tube with the grommet upside.



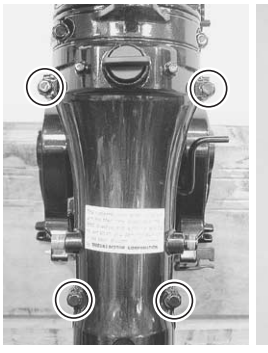
7. Remove the bolts and the washers.



8. Remove the reverse lock arm and the springs.

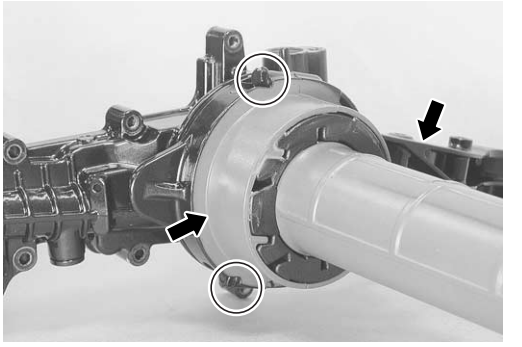


9. Remove the four bolts, the swivel bracket cover and the steering adjuster.

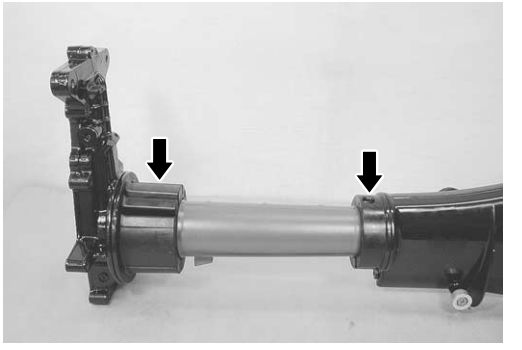


10. Remove the driveshaft housing / steering bracket assembly and the bushings from the swivel / clamp bracket assembly.

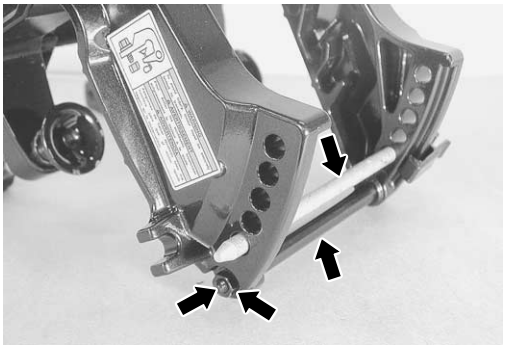
11. Remove the two bolts, the steering bracket and the bracket cover.



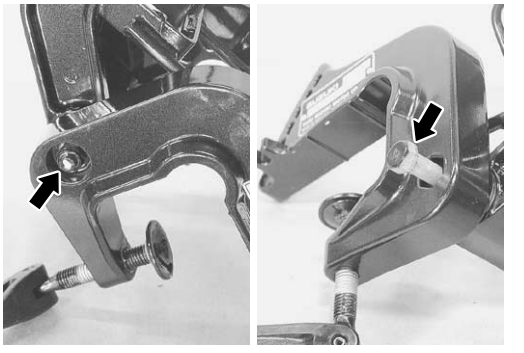
12. Remove the upper mount and the lower mount.



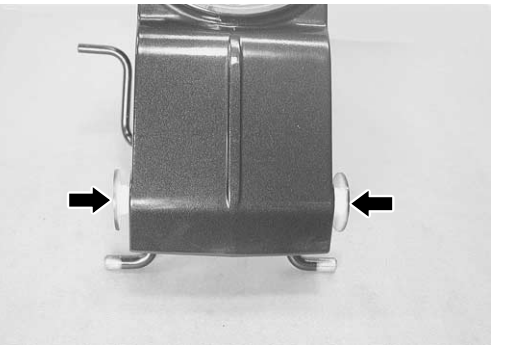
13. Remove the tilt pin.
14. Remove the nut, the washer, the lower rod and the through bolt.



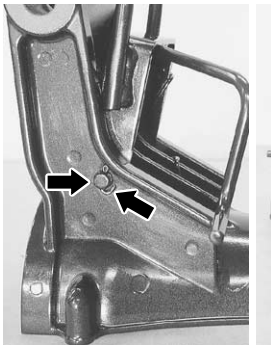
15. Remove the nut and the washer, then detach the port clamp bracket.
16. Remove the clamp bracket shaft bolt and the starboard clamp bracket.

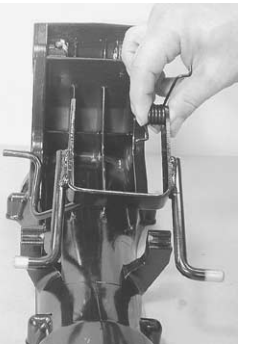


17. Remove the two bushings.



18. Remove the cotter pin and the shaft.
19. Remove the shallow drive lever, the washer and the spring.





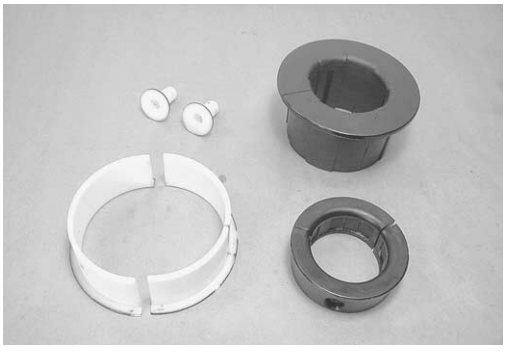
INSPECTION

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

DRIVESHAFT HOUSING / STEERING BRACKET
Inspect the driveshaft housing, steering bracket and the bracket cover.
If crack or other damage is found, replace.

CLAMP BRACKET / SWIVEL BRACKET
Inspect the clamp brackets, swivel bracket and the bracket cover.
If crack or other damage is found, replace.

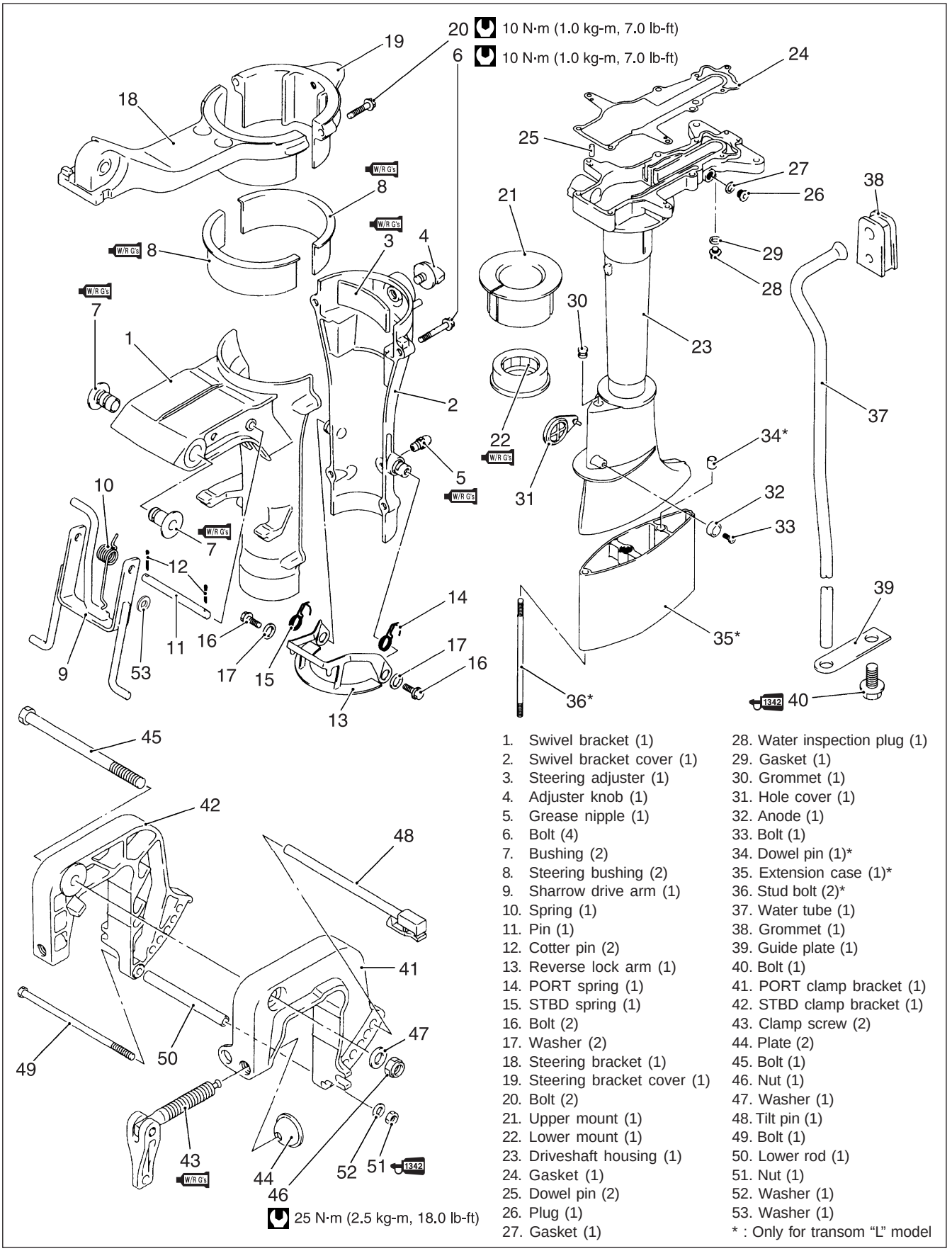
MOUNT / BUSHING
Inspect the mounts and bushings.
If crack, excessive wear, deterioration or other damage is found, replace.



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

REASSEMBLY

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



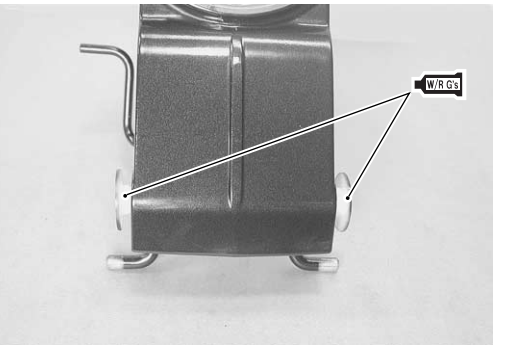
1. Swivel bracket (1)
2. Swivel bracket cover (1)
3. Steering adjuster (1)
4. Adjuster knob (1)
5. Grease nipple (1)
6. Bolt (4)
7. Bushing (2)
8. Steering bushing (2)
9. Sharrow drive arm (1)
10. Spring (1)
11. Pin (1)
12. Cotter pin (2)
13. Reverse lock arm (1)
14. PORT spring (1)
15. STBD spring (1)
16. Bolt (2)
17. Washer (2)
18. Steering bracket (1)
19. Steering bracket cover (1)
20. Bolt (2)
21. Upper mount (1)
22. Lower mount (1)
23. Driveshaft housing (1)
24. Gasket (1)
25. Dowel pin (2)
26. Plug (1)
27. Gasket (1)
28. Water inspection plug (1)
29. Gasket (1)
30. Grommet (1)
31. Hole cover (1)
32. Anode (1)
33. Bolt (1)
34. Dowel pin (1)*
35. Extension case (1)*
36. Stud bolt (2)*
37. Water tube (1)
38. Grommet (1)
39. Guide plate (1)
40. Bolt (1)
41. PORT clamp bracket (1)
42. STBD clamp bracket (1)
43. Clamp screw (2)
44. Plate (2)
45. Bolt (1)
46. Nut (1)
47. Washer (1)
48. Tilt pin (1)
49. Bolt (1)
50. Lower rod (1)
51. Nut (1)
52. Washer (1)
53. Washer (1)

* : Only for transom "L" model

SWIVEL BRACKET / CLAMP BRACKET

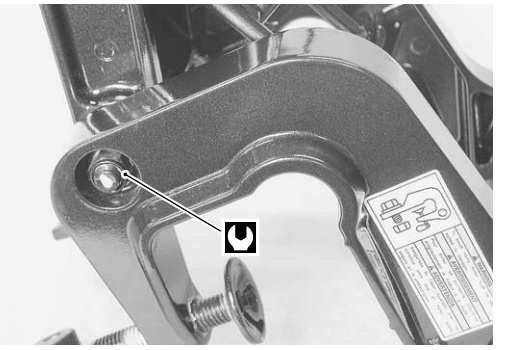
CAUTION

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



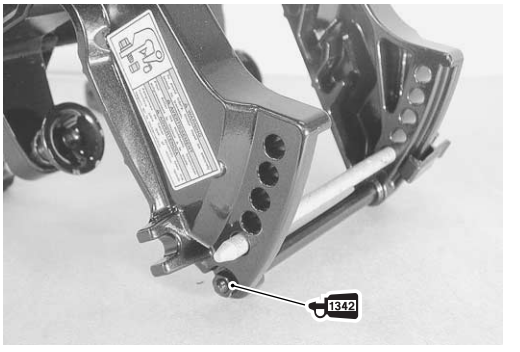
- Apply the Water Resistant Grease to the clamp bracket bushings.

W/R G's 99000-25160 : Suzuki Water Resistant Grease



- Tighten the clamp bracket shaft nut to the specified torque.

Clamp bracket shaft nut : 25 N·m (2.5 kg-m, 18.0 lb-ft)



- Apply the Thread Lock to the clamp bracket lower rod nut.

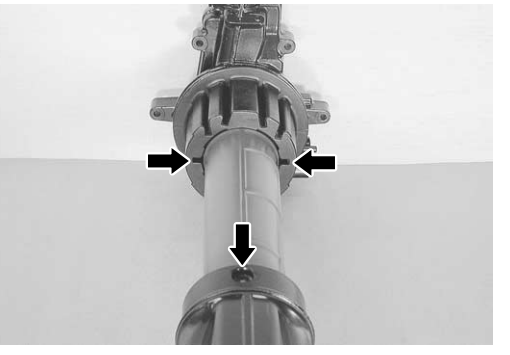
1342 99000-32050 : Thread Lock "1342"

DRIVESHAFT HOUSING / STEERING BRACKET

- Apply the Water Resistant Grease to the following parts.
  - Inside and outside surfaces of the bushings.
  - Inside surface of the lower mount
  - Steering adjuster

W/R G's 99000-25160 : Suzuki Water Resistant Grease

- Install the upper mount and the lower mount with the position as shown in the figure.

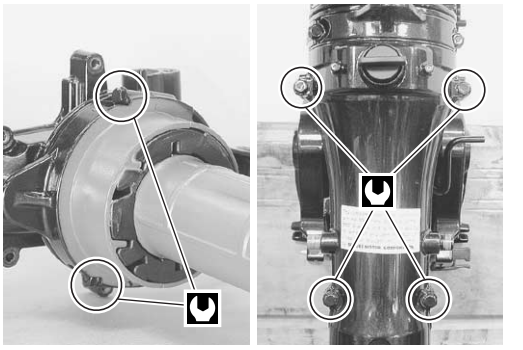


- Tighten the two steering bracket cover bolts to the specified torque.

Steering bracket cover bolt : 10 N·m (1.0 kg-m, 7.0 lb-ft)

- Tighten the four swivel bracket cover bolts to the specified torque.

Swivel bracket cover bolt : 10 N·m (1.0 kg-m, 7.0 lb-ft)



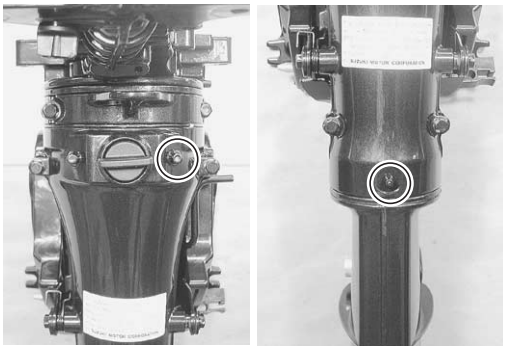
- Apply the Thread Lock to the water tube guide plate bolt and tighten the bolt.

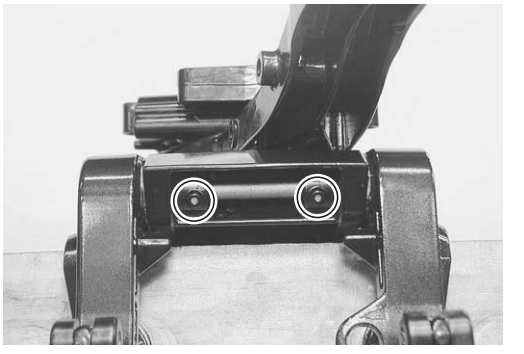
99000-32050 : Thread Lock "1342"

LUBRICATION

After completing reassembly of the mid unit, apply the Water Resistant Grease through each grease nipple.

99000-25160 : Suzuki Water Resistant Grease





LOWER UNIT

CONTENTS

REMOVAL & DISASSEMBLY

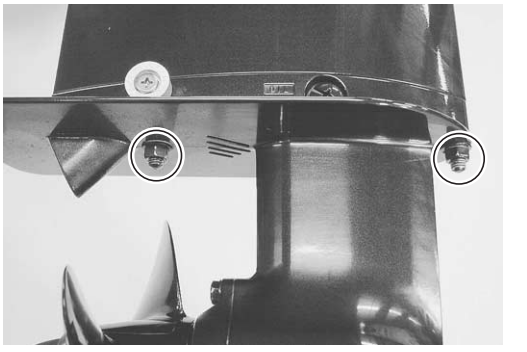
⚠ WARNING

Disconnect the spark plug cap from the spark plug before removing the lower unit.

1. Drain the gear oil. (See the page 2-6.)
2. Remove the clutch adjust hole cover, then loosen the rod connecting plate bolt.

NOTE:
Do not over-loosen the rod connecting plate bolt.
Loosen the bolt approximately 1-turn.

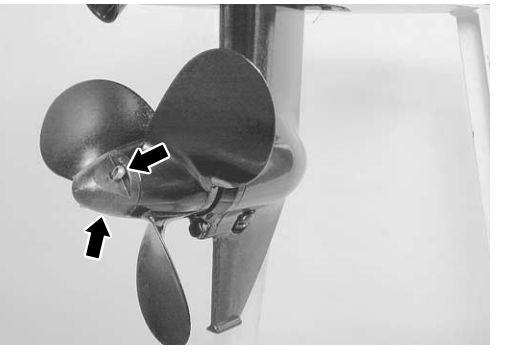
3. Remove the two nuts and washers. (for the transom “L” model)
   Remove the two bolts. (for the transom “S” model)
4. Separate the gearcase assembly from the driveshaft housing.



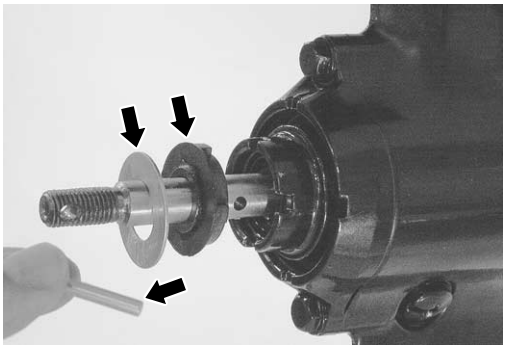
5. Remove the cotter pin and the propeller nut, then detach the propeller.

⚠ WARNUNG

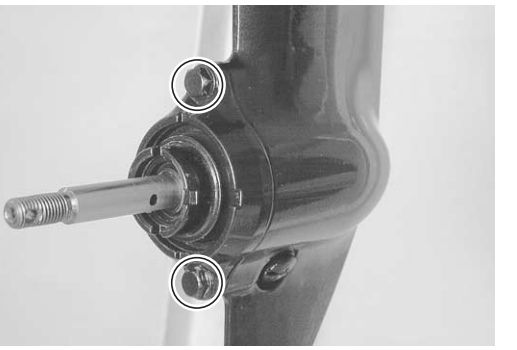
To prevent injury from the propeller blades, wear gloves.



6. Remove the shear pin, the washer and the seal protector.

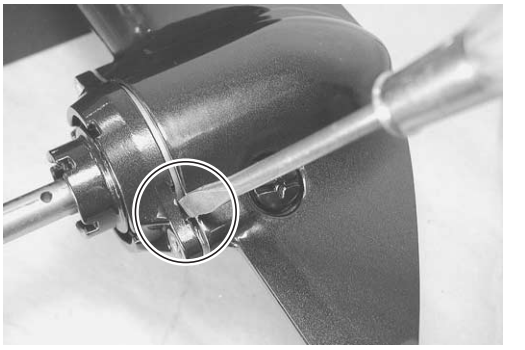


7. Remove the two bolts securing the propeller shaft bearing housing.

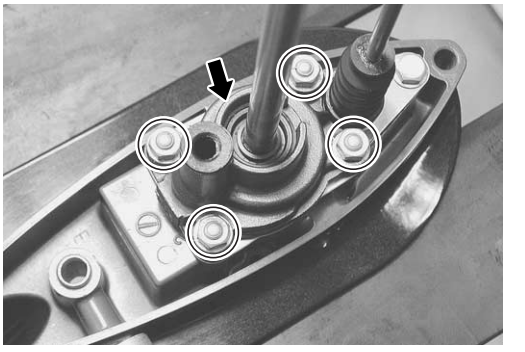


8. Remove the propeller shaft bearing housing.

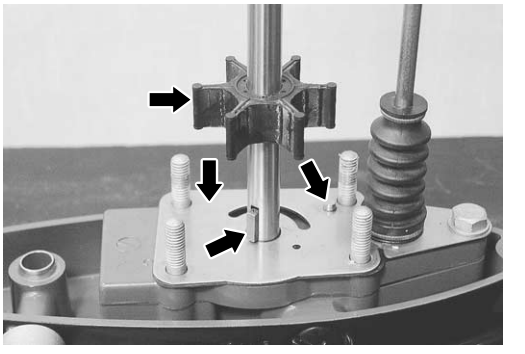
NOTE:
Pry the housing with a screwdriver into the groove as shown in the figure. (2-positions)



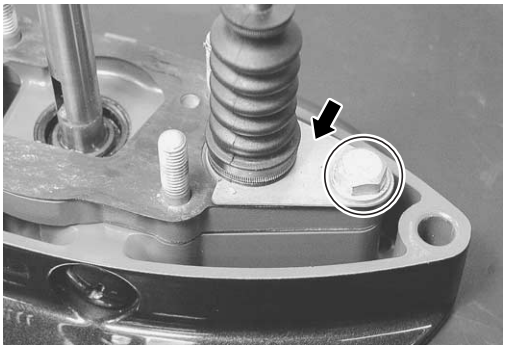
9. Remove the four nuts and washers.
10. Remove the water pump case.



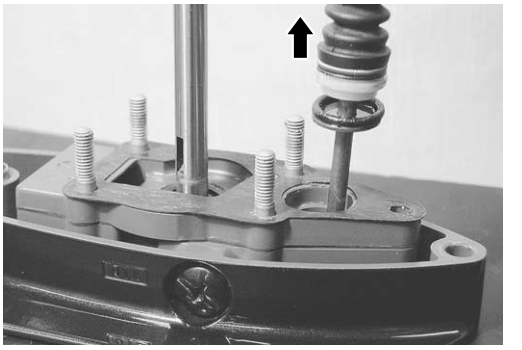
11. Remove the following parts.
    - Water pump impeller
    - Key
    - Dowel pin
    - Pump under panel



12. Remove the bolt and the shift rod guide stopper.

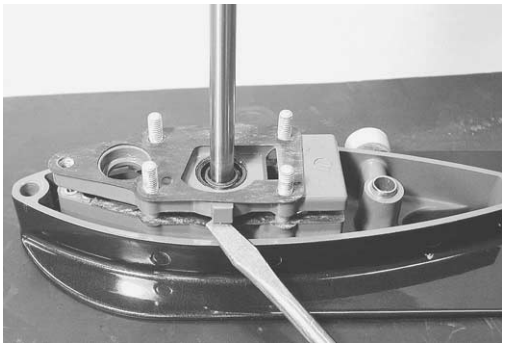


13. Pull out the shift rod assembly.

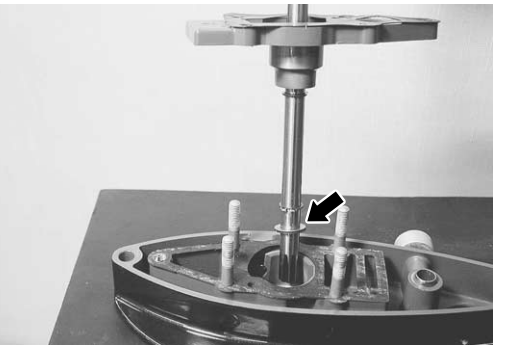


14. Remove the driveshaft support housing.

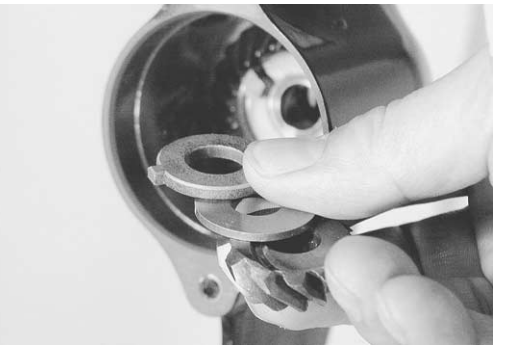
NOTE:
Pry the housing with a screwdriver as shown in the figure.



15. Pull out the driveshaft with the driveshaft support housing and remove the washer.



16. Take out the following parts.
    - Pinion gear
    - Pinion gear backup shim
    - Pinion gear thrust washer



17. Take out the following parts.
    - Forward gear thrust washer
    - Forward gear
    - Forward gear backup shim

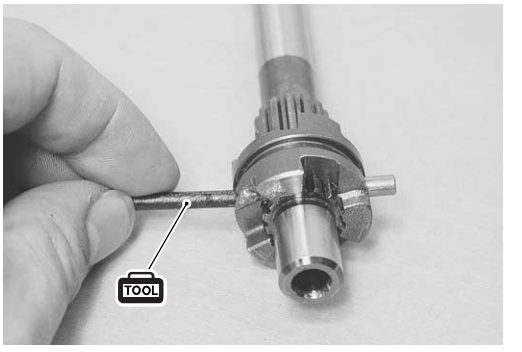
DISASSEMBLY OF PROPELLER SHAFT COMPONENTS

1. Separate the following parts.
   - Bearing housing
   - Reverse gear backup shim
   - Reverse gear
   - Reverse gear thrust washer
   - Push rod
   - Push rod pin

2. Remove the dog spring.

3. Drive the dog pin out of the clutch dog shifter.

TOOL **09922-89810 : Pin remover**



4. Remove the clutch dog shifter and the dog spring.

INSPECTION

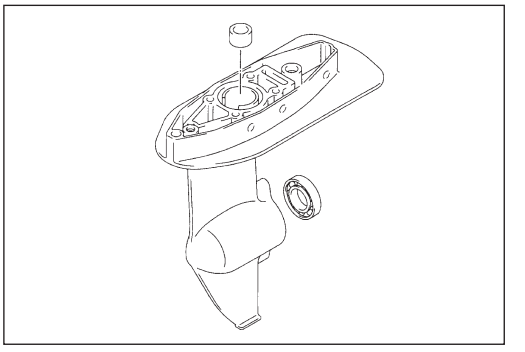
NOTE:
If excessive wear, crack, defective or other damage is found on any component, replace.

PROPELLER

- Inspect the propeller. If bend, chip or other damage is found on the blades, replace or repair the propeller.
- Inspect the propeller bushing. If excessive wear or other damage is found on the splines, replace the bushing. If deterioration or evidence of slipping on the rubber part, replace the bushing.
- Inspect the shear pin. If bend or other damage is found, replace the shear pin.

GEARCASE

- Inspect the gearcase. If crack or other damage is found, replace the gearcase.
- Visually check the forward gear bearing. If pitting, noisy, rough or other damage is found, replace the bearing.
- Visually check the driveshaft bushing. If excessive wear, pitting or other damage is found, replace the bushing.

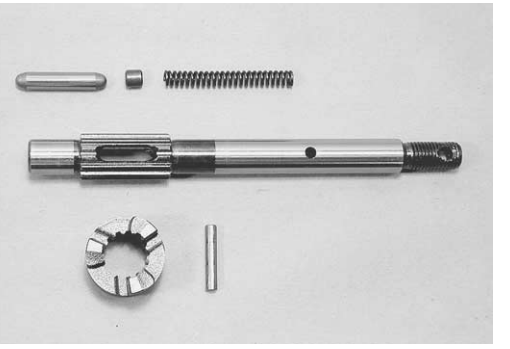


GEAR

- Inspect the teeth of the forward, reverse and pinion gear. Inspect the engaging dogs of the forward and reverse gear. If excessive wear, chip or other damage is found, replace.

- Inspect the forward gear bushing. If excessive wear, pitting or other damage is found, replace.

PROPELLER SHAFT COMPONENTS

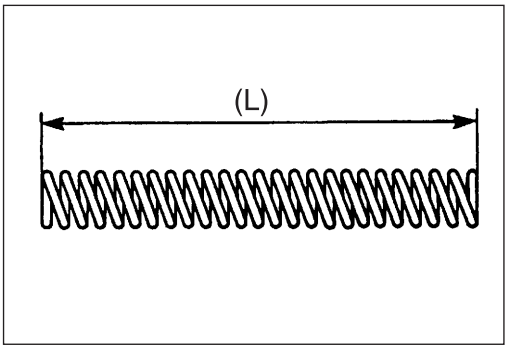


- Inspect the push rod and the push rod pin. If excessive wear or other damage is found, replace.
- Inspect the clutch dog shifter. If excessive wear, crack, chip or other damage is found, replace.
- Inspect the dog pin. If excessive wear, bend or other damage is found, replace.
- Inspect the propeller shaft. If excessive wear, twist or other damage is found, replace.

- Measure the return spring free length.

Clutch return spring free length (L)
Standard : 46 mm (18.1 in)
Service limit : 43 mm (16.9 in)

If the measurement exceeds the service limit, replace.



PROPELLER SHAFT BEARING HOUSING

- Inspect the housing. If crack or other damage is found, replace the housing.
- Visually check the oil seals. If cut, nick, excessive wear or other damage is found, replace the oil seal.
- Visually check the bearings. If pitting, noisy, rough or other damage is found, replace the bearing.

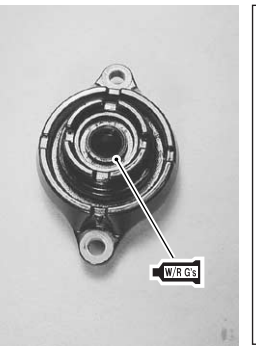
CAUTION

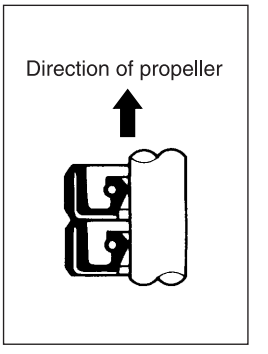
Do not re-use the oil seal and the O-ring once removed. Always use new parts.

Replacing propeller shaft bearing housing oil seal

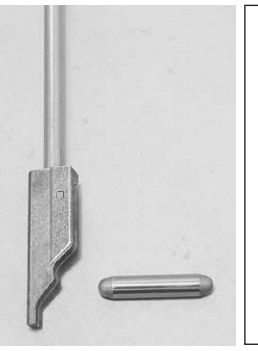
1. Remove the oil seals using a screwdriver.
2. Apply the Water Resistant Grease to the outer circumference of the oil seal.
3. Drive the oil seals down into the housing with the lipped portion toward the propeller. (one at a time)
4. Apply the Water Resistant Grease to the seal lips.

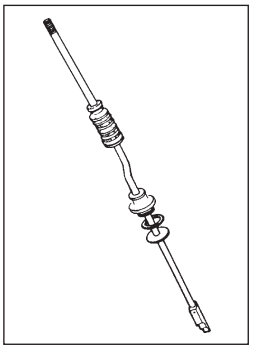
W/R G's **99000-25160 : Suzuki Water Resistant Grease**





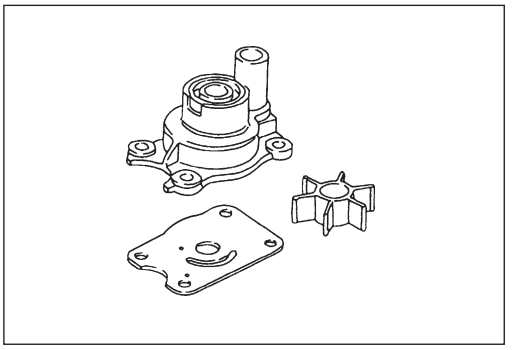
SHIFT ROD AND SHIFT CAM





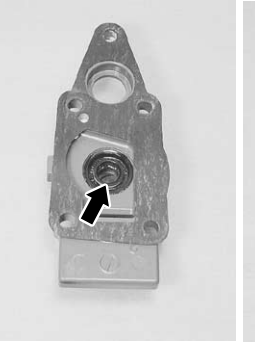
- Inspect the “stepped” surfaces of the shift cam. If excessive wear, chip or other damage is found, replace the cam.
- Inspect the shift rod guide. If excessive wear, pitting, corrosion or other damage is found, replace the guide.
- Inspect the shift rod boot. If crack, tear or other damage is found, replace the boot.

WATER PUMP AND RELATED ITEMS



- Inspect the impeller. If cut, tear or excessive wear is found, replace the impeller.
- Inspect the pump case and the under panel. If wear, crack, distortion or corrosion is found, replace.

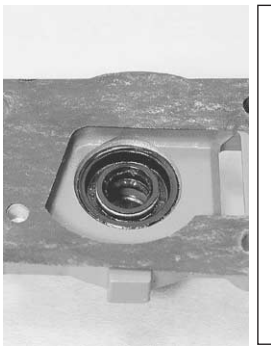
DRIVESHAFT SUPPORT HOUSING

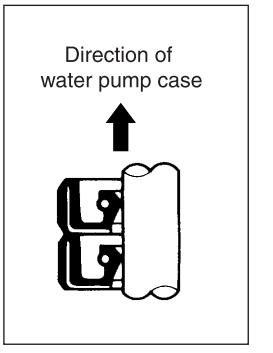


- Inspect the housing. If crack, corrosion or other damage is found, replace the housing.
- Visually check the oil seals. If cut, nick, excessive wear or other damage is found, replace the oil seal.
- Visually check the bushing. If excessive wear, pitting or other damage is found, replace the housing.

CAUTION

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





Replacing driveshaft support housing oil seal

1. Remove the oil seals using a screwdriver.
2. Apply the Water Resistant Grease to outer circumference of the oil seal.
3. Drive the oil seals down into the housing with lipped portion toward the water pump case. (one at a time)
4. Apply the Water Resistant Grease to the seal lips.

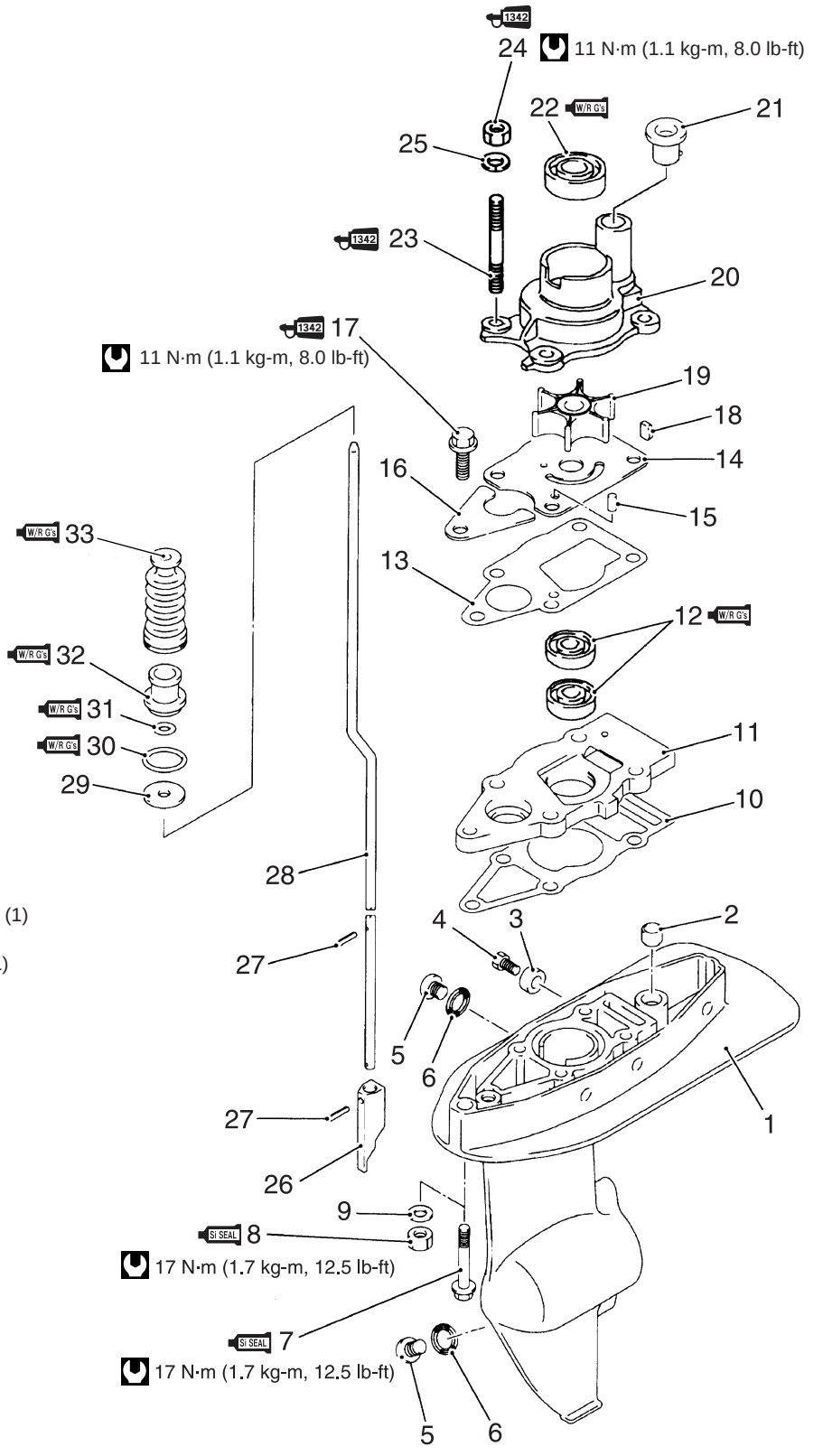
W/R G's **99000-25160 : Suzuki Water Resistant Grease**

DRIVESHAFT

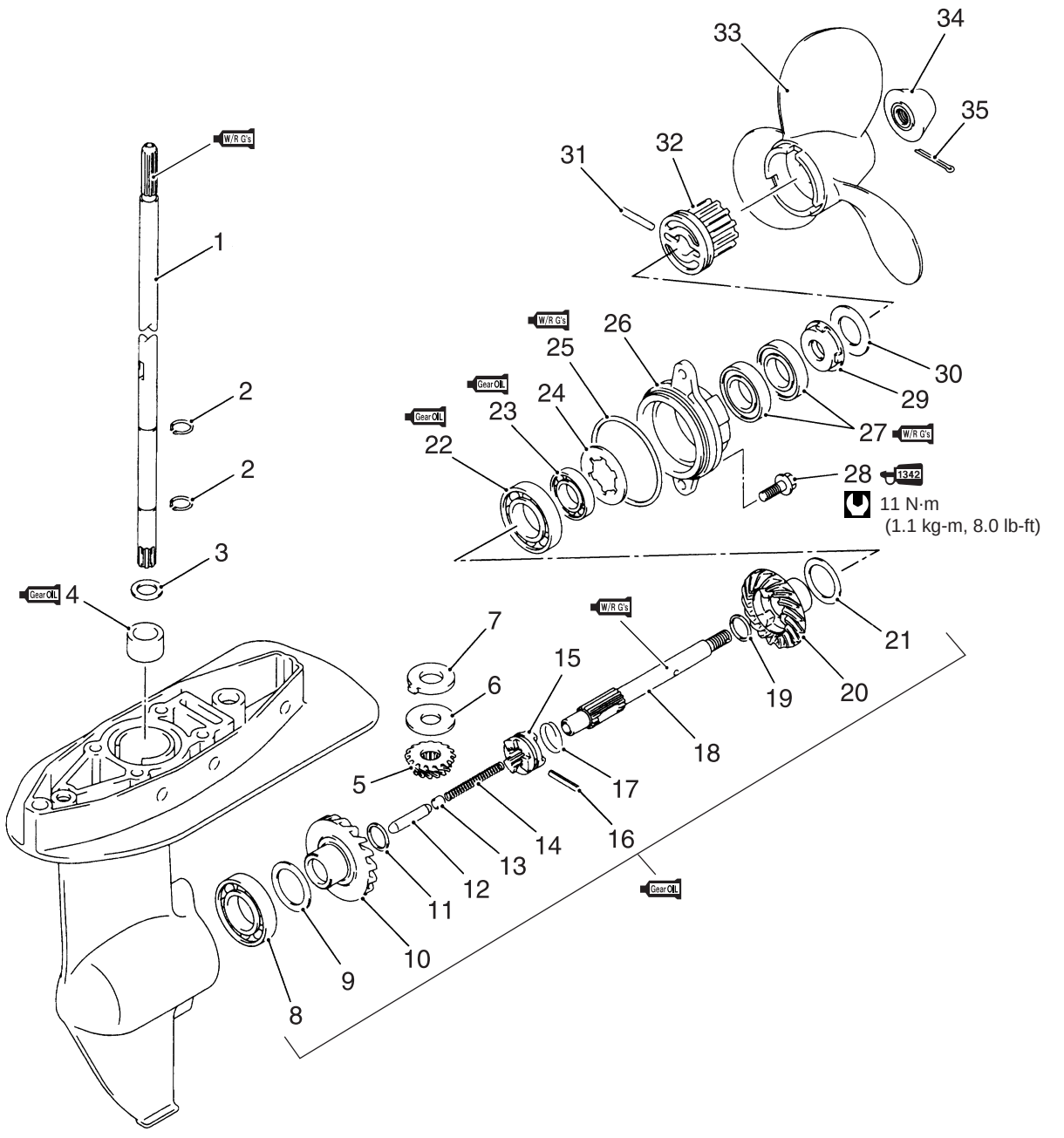
Inspect the driveshaft. If wear, twist or other damage is found on the splines, replace the driveshaft.

REASSEMBLY & INSTALLATION

Reassembly & installation is reverse of removal & disassembly with the special attention to the following steps.



1. Gearcase (1)
2. Dowel pin (1)
3. Anode (1)
4. Bolt (1)
5. Plug (1)
6. Gasket (1)
7. Bolt (2) for “S” model
8. Nut (2) for “L” model
9. Washer (2) for “L” model
10. Support housing gasket (1)
11. Driveshaft support housing (1)
12. Oil seal (2)
13. Pump case panel gasket (1)
14. Pump case panel (1)
15. Dowel pin (1)
16. Guide stopper (1)
17. Bolt (1)
18. Key (1)
19. Water pump impeller (1)
20. Water pump case (1)
21. Grommet (1)
22. Oil seal (1)
23. Stud bolt (4)
24. Nut (4)
25. Washer (4)
26. Shift cam (1)
27. Pin (2)
28. Shift rod (1)
29. Washer (1)
30. O-ring (1)
31. O-ring (1)
32. Shift rod guide (1)
33. Shift rod boot (1)



1. Driveshaft (1)
2. Circlip (2)
3. Washer (1)
4. Driveshaft bushing (1)
5. Pinion gear (1)
6. Pinion gear backup shim (1)
7. Pinion gear thrust washer (1)
8. Forward gear bearing (1)
9. Forward gear backup shim (1)
10. Forward gear (1)
11. Forward gear thrust washer (1)
12. Push rod (1)
13. Push rod pin (1)
14. Spring (1)
15. Clutch dog shifter (1)
16. Dog pin (1)
17. Spring (1)
18. Propeller shaft (1)
19. Reverse gear thrust washer (1)
20. Reverse gear (1)
21. Reverse gear backup shim (1)
22. Bearing (1)
23. Bearing (1)
24. Washer (1)
25. O-ring (1)
26. Propeller shaft bearing housing (1)
27. Oil seal (2)
28. Bolt (2)
29. Protector (1)
30. Washer (1)
31. Shear pin (1)
32. Propeller bushing (1)
33. Propeller (1)
34. Propeller nut (1)
35. Cotter pin (1)

CAUTION

- **Make sure that all parts used in assembly are clean and lubricated.**
- **After assembly, check the 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 "LOWER UNIT GEARS-SHIMMING AND ADJUSTMENT" section on the page 8-17.)
- **Do not re-use the gasket, the O-ring and the cotter pin once removed. Always use new parts.**

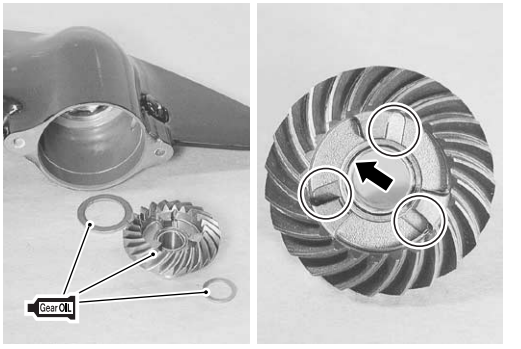
FORWARD GEAR

Apply the gear oil to the following parts.

- Forward gear backup shim
- Forward gear
- Forward gear thrust washer

Gear OIL **99000-22540 : Suzuki Outboard Motor Gear Oil**

NOTE:
The forward gear has the bushing and the dents at the side of the dog bosses.

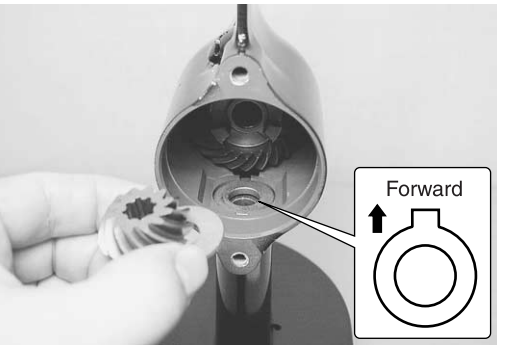


PINION GEAR

Apply the gear oil to the following parts.

- Pinion gear thrust washer
- Pinion gear backup shim
- Pinion gear

Gear OIL **99000-22540 : Suzuki Outboard Motor Gear Oil**



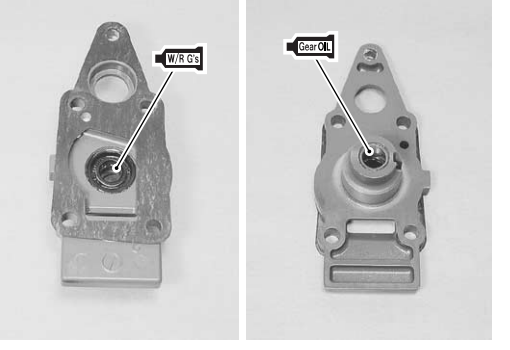
DRIVESHAFT / DRIVESHAFT SUPPORT HOUSING

- Apply the Water Resistant Grease to the oil seal lips.

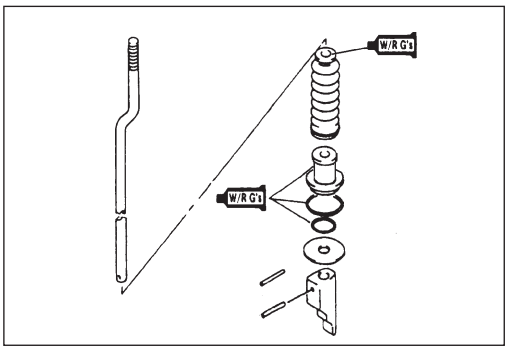
W/R G's **99000-25160 : Suzuki Water Resistant Grease**

- Apply the gear oil to the bushing in the housing.

Gear OIL **99000-22540 : Suzuki Outboard Motor Gear Oil**



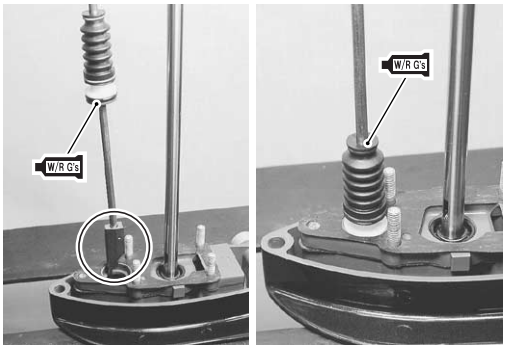
SHIFT ROD ASSEMBLY



- Apply the Water Resistant Grease to the shift rod guide, O-rings and the top of the dust boot.

W/R G's 99000-25160 : Suzuki Water Resistant Grease

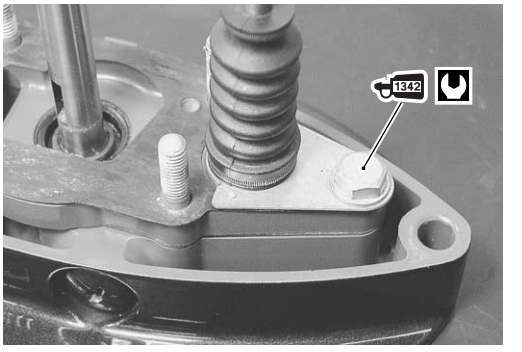
- Install the shift rod assembly with the stepped section of the shift cam toward the propeller shaft.



- Apply the Thread Lock to the shift rod guide stopper bolt and tighten the bolt to the specified torque.

1342 99000-32050 : Thread Lock "1342"

Shift rod guide stopper bolt :
8 N·m (0.8 kg-m, 6.0 lb-ft)

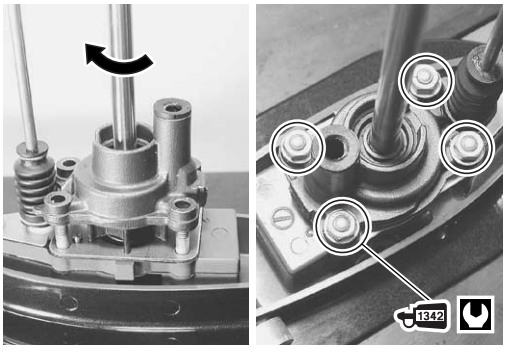


WATER PUMP AND RELATED ITEMS

- Install the water pump case while rotating the driveshaft clockwise in order to flex the impeller vanes in the correct direction.
- Apply the Thread Lock to the water pump case nuts and tighten the nuts to the specified torque.

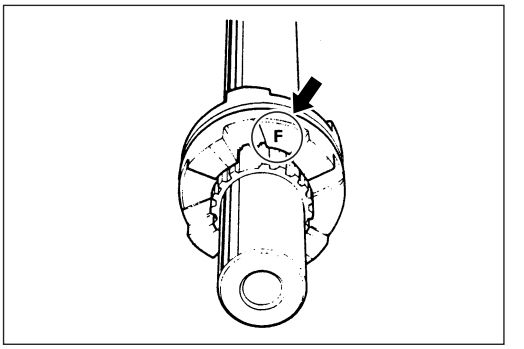
1342 99000-32050 : Thread Lock "1342"

Water pump case nut : 8 N·m (0.8 kg-m, 6.0 lb-ft)



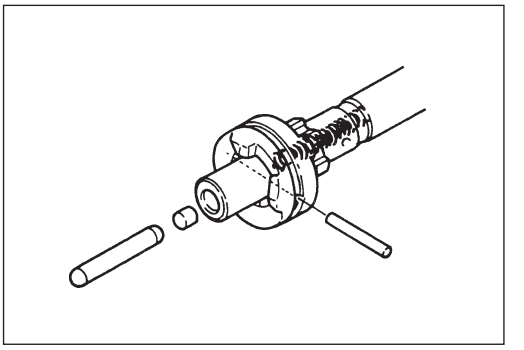
PROPELLER SHAFT COMPONENTS

- Install the clutch dog shifter with the mark “F” toward the forward gear side.



- Apply the gear oil to the following parts.
  - Push rod pin
  - Push rod
  - Clutch dog shifter sliding area of the propeller shaft
  - Reverse gear thrust washer
  - Reverse gear
  - Reverse gear backup shim
  - Propeller shaft bearings

Gear OIL **99000-22540 : Suzuki Outboard Motor Gear Oil**



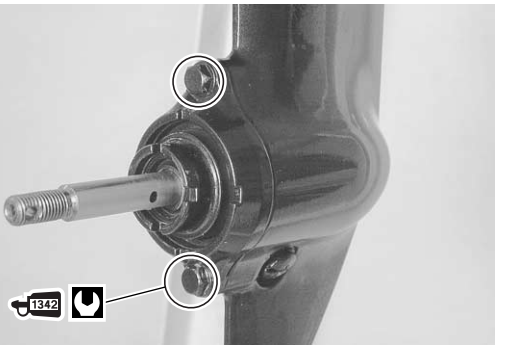
- Apply the Water Resistant Grease to the O-ring and the oil seals of the bearing hausing.

W/R G's **99000-25160 : Suzuki Water Resistant Grease**

- Install the propeller shaft / housing assembly to the gearcase and tighten the two bolts to the specified torque after applying the Thread Lock to the bolts.

1342 **99000-32050 : Thread Lock “1342”**

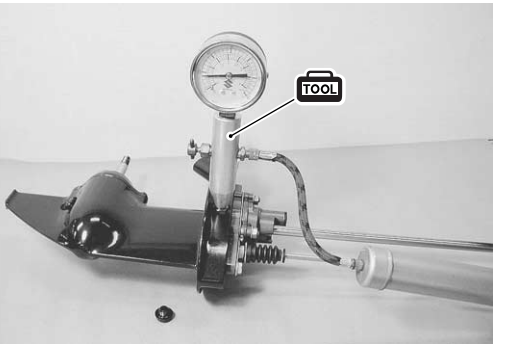
Propeller shaft bearing housing bolt : 8 N·m (0.8 kg-m, 6.0 lb-ft)



LEAKAGE CHECK

Check for leakage of the oil seals and O-ring when applying the specified pressure inside of the gearcase.

TOOL 09950-69512 : Oil leakage tester
: Air pump



Procedure

1. Install the special tool into the oil level hole.
2. Connect an air pump into the special tool.
3. Rotate the driveshaft and the propeller shaft clockwise several times and then apply the specified pressure for the test.

NOTE:
Apply low initial pressure of 20 – 40 kPa (0.2 – 0.4 kg/cm², 2.8 – 5.7 psi) first, then apply the specified pressure.

Leakage test pressure : 100 kPa (1.0 kg/cm², 14.2 psi)

CAUTION

Do not exceed pressure of 110 kPa (1.1 kg/cm², 15.6 psi) or damage to oil seals will result.

4. Once stabilized, the pressure should remain steady for at least 5 minutes.
   If the pressure does not fall, sealing performance is correct.

PROPELLER

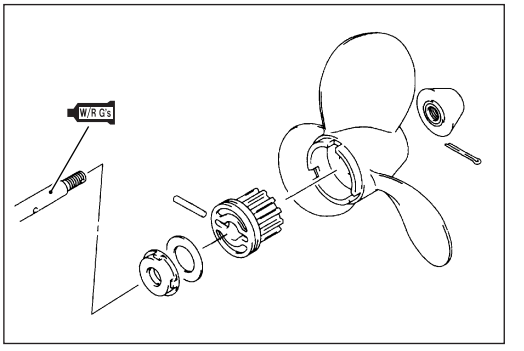
- Apply the Water Resistant Grease to the propeller shaft.

W/R G's 99000-25160 : Suzuki Water Resistant Grease

- Push the cotter pin through the nut and propeller shaft, then bend the pin securely.

⚠ WARNUNG

To prevent injury from the propeller blades, wear gloves.



LOWER UNIT INSTALLATION

- Apply the Water Resistant Grease to the driveshaft splines.

W/R G's **09900-25160 : Suzuki Water Resistant Grease**

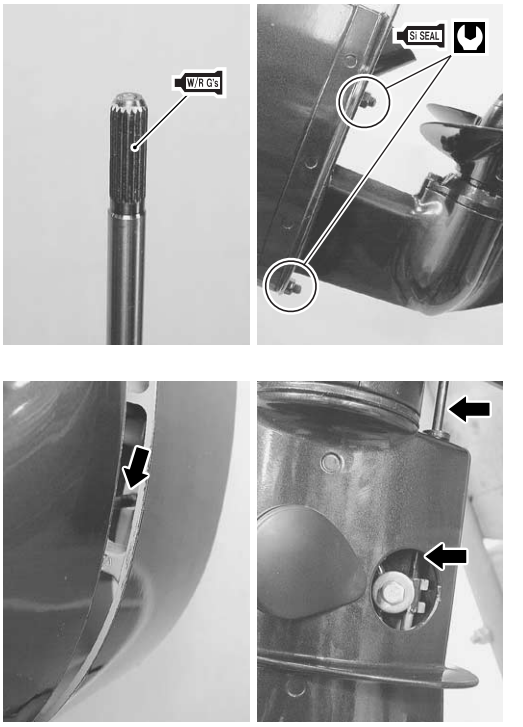
- Apply the Silicone Seal to the gearcase retaining nuts and tighten the nuts to the specified torque. (retaining bolts for the transom "S" model)

Si SEAL **09900-31120 : Suzuki Silicone Seal**

Gearcase nut / bolt : 17 N·m (1.7 kg-m, 12.5 lb-ft)

NOTE:
When installing the gearcase to the driveshaft housing, check for the following points.

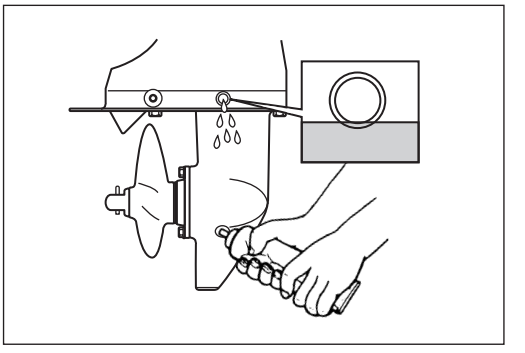
- *The water tube is through the hole in the guide plate.*
- *The water tube lower end is installed into the water pump outlet hole.*
- *The shift rod is through the rod connecting plate.*



GEAR OIL

Fill the gearcase with the specified gear oil. (See the page 2-6)

Gear OIL **99000-22540 : Suzuki Outboard Motor Gear Oil**



CLUTCH ADJUSTMENT

Adjustment procedure

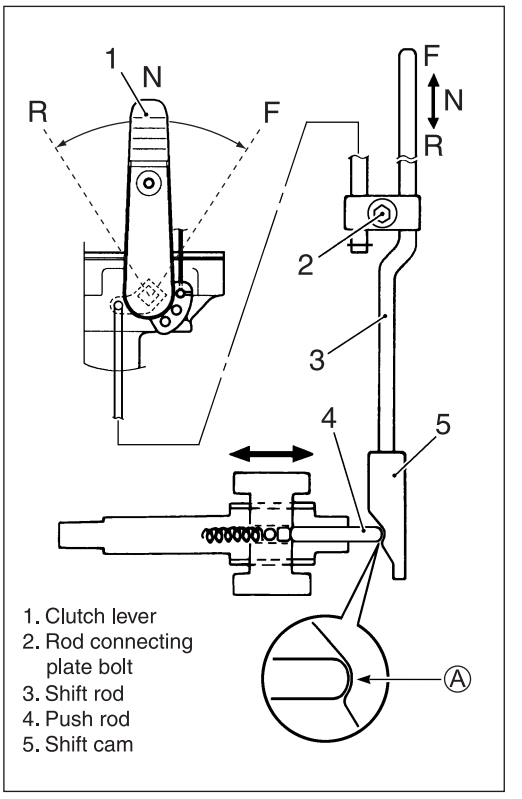
⚠ WARNUNG

- **Disconect the spark plug cap from the spark plug in order to eliminate the chance of accidental engine starting.**
- **To prevent injury from the propeller blades, wear gloves.**

1. Loosen the rod connecting plate bolt approximately 1-turn.
2. Shift the clutch lever in the Neutral position.
3. Move the shift rod so that the push rod is exactly on the Neutral position Ⓐ of the shift cam while rotating the propeller clockwise by hand.
4. Tighten the plate bolt to the specified torque.

Rod connecting plate bolt : 11 N·m (1.1 kg-m, 8.0 lb-ft)

5. Make sure that the clutch lever engages with the Forward, Neutral or Reverse gear by rotating the propeller clockwise by hand while sifting the clutch lever.

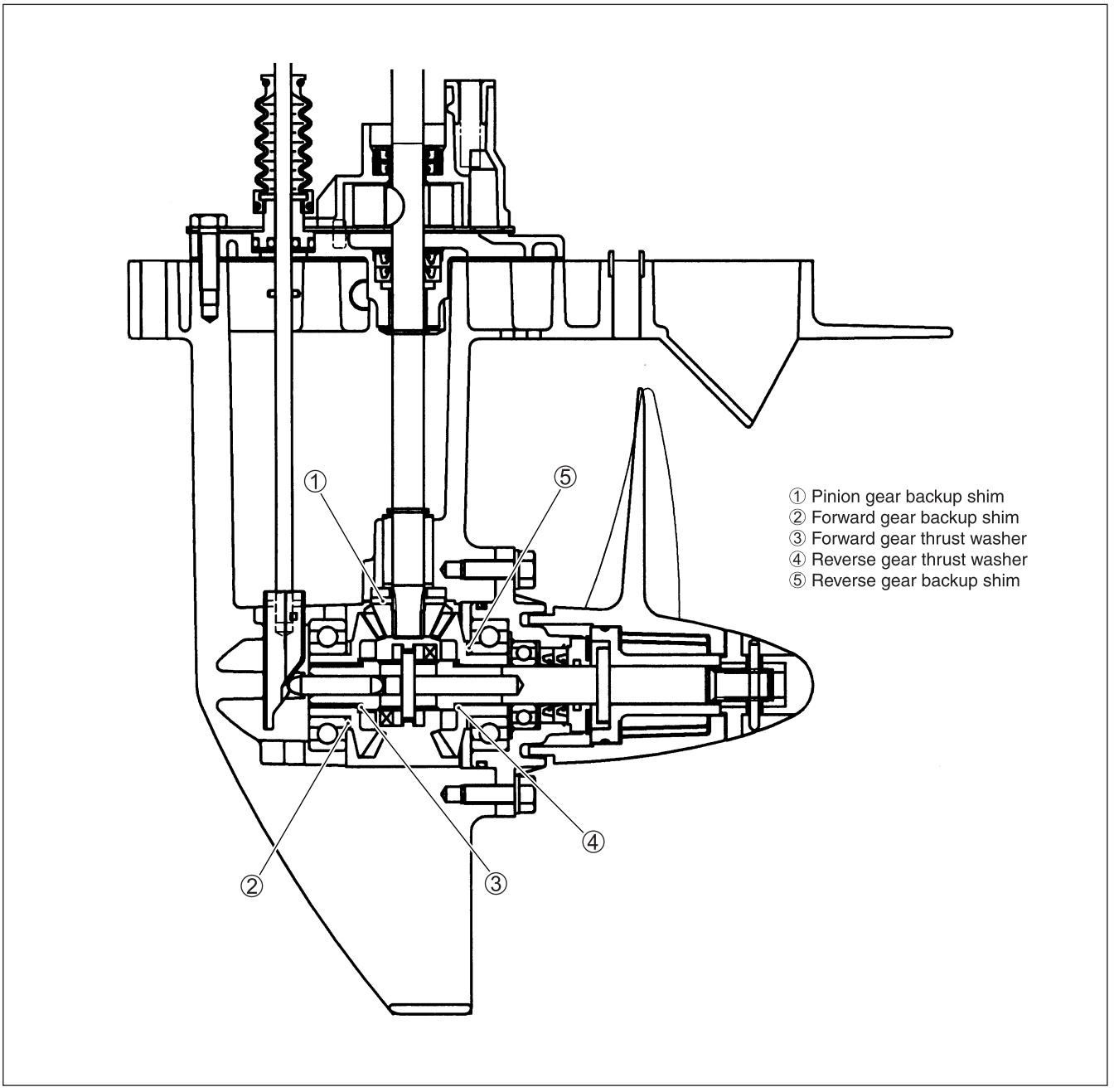


LOWER UNIT GEARS-SHIMMING AND ADJUSTMENT

If the lower unit has been rebuilt or has had components replaced, shimming for correct gear contact and backlash will have to be adjusted in order to ensure smooth, reliable operation of gears.

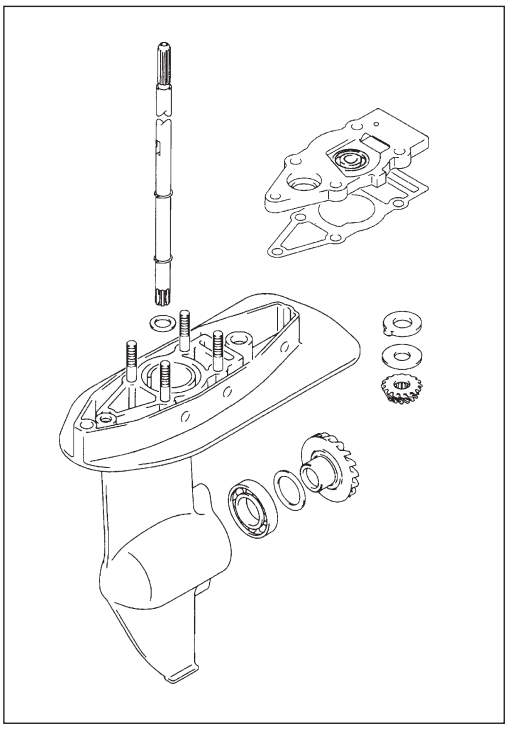
Shim / Washer & Mounting position

Numerical index / item		Available thickness (mm)	Design specification thickness (mm)
①	Pinion gear backup shim	1.7, 1.8, 1.9, 2.0, 2.1	2.0
②	Forward gear backup shim	0.8, 0.9, 1.0, 1.1, 1.2	1.2
③	Forward gear thrust washer	1.0	1.0
④	Reverse gear thrust washer	0.6, 0.8, 1.0	1.0
⑤	Reverse gear backup shim	0.6, 0.7, 0.8, 0.9, 1.0	0.8



FORWARD GEAR / PINION GEAR SHIM ADJUSTMENT

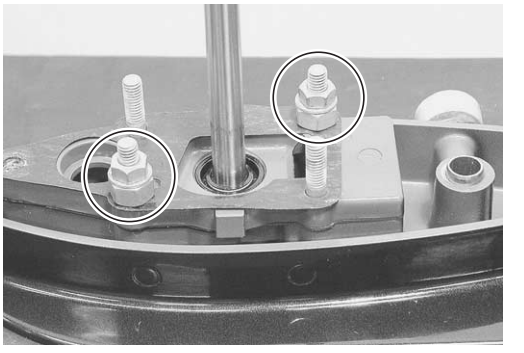
Adjust the forward gear / pinion gear shimming as shown below.



Step to prior to adjustment

1. Install the following parts to the gearcase.
   - Forward gear bearing (if removed)
   - Forward gear backup shim
   - Forward gear
   - Pinion gear thrust washer
   - Pinion gear backup shim
   - Pinion gear
   - Driveshaft lower washer
   - Driveshaft (with two circlips)
   - Driveshaft support housing gasket
   - Driveshaft support housing

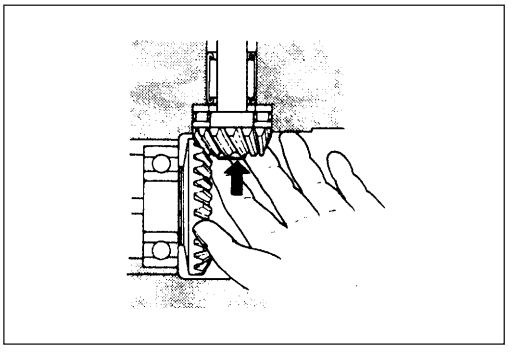
2. Install the driveshaft support housing with the two nuts diagonally.



NOTE:
Use a spacer (such as a M8 nut) in order to secure the housing onto the gearcase without the water pump case.

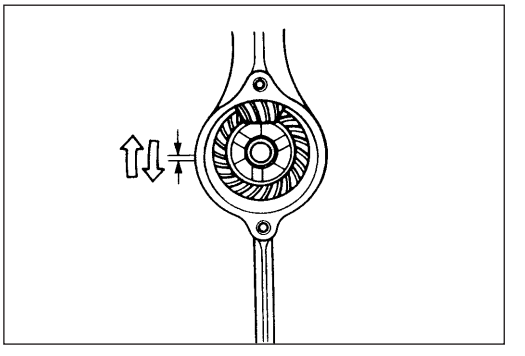
Adjusting gear backlash (Pinion and Forward gear)

To check the backlash, hold the driveshaft by hand, then gently rock forward gear back and forth by hand.



Gear backlash : 0.10 - 0.20 mm (0.004 - 0.008 in.)

- If backlash is larger than the specified, the thickness of the forward gear backup shim must be increased.
- If backlash is smaller, the thickness of the backup shim must be decreased.



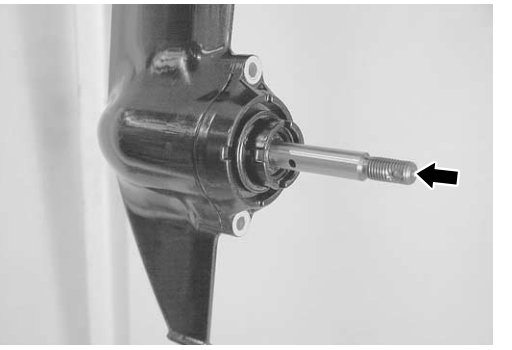
Checking and adjusting tooth contact pattern (Pinion and Forward gear)

Check tooth contact pattern by using the following procedure.

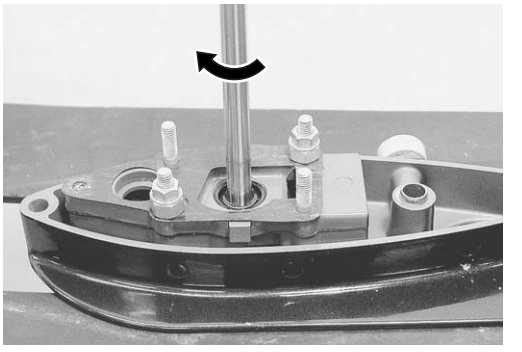
1. To assess tooth contact, apply a light coat of Prussian Blue on the convex surface of the forward gear.
2. Install the propeller shaft, the forward gear thrust washer and the housing assembly.
   Do not install the following parts.
   - Reverse gear and related shim / washer
   - Push rod
   - Push rod pin

NOTE:
Securing the propeller shaft housing with the bolts is not required.

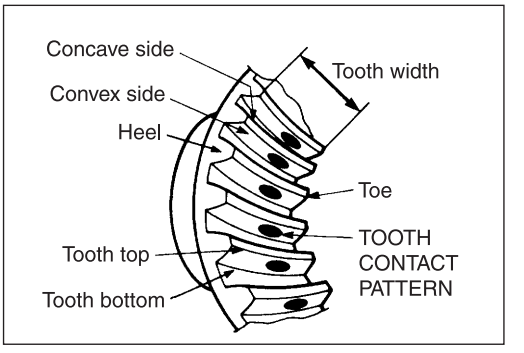
3. Push the propeller shaft inward and hold in position.



4. Rotate the driveshaft 5 - 6 times clockwise.



5. Carefully pull out propeller shaft and housing to check tooth contact pattern.



Optimum tooth contact

The optimum tooth contact is shown in the figure.

A shim adjustment may be necessary in order 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 top side toe contact:

Correction measures:

- Decrease the thickness of the forward gear shim.
- Slightly increase the pinion gear shim thickness.

CAUTION

Do not set tooth contact in the top side toe contact position. Damage and chipping of the forward and pinion gear may result.

Example (2)

Incorrect bottom side toe contact:

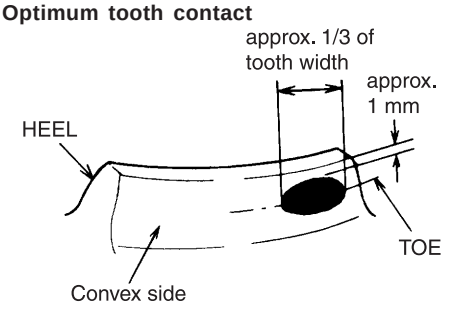
Correction measures:

- Increase the thickness of the forward gear shim.
- Slightly decrease the pinion gear shim thickness.

CAUTION

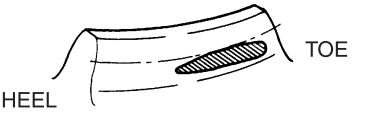
Do not set tooth contact in the bottom side toe contact position. Chipping of the pinion gear may result.

Optimum tooth contact

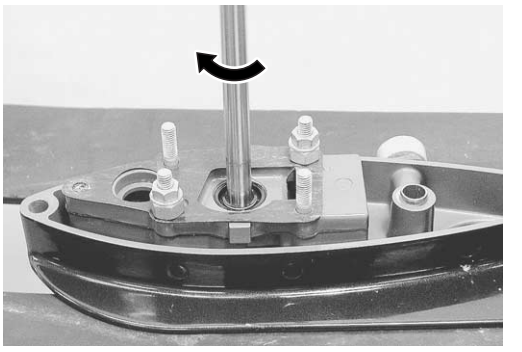


EXAMPLE OF INCORRECT
Top side toe contact

EXAMPLE OF INCORRECT
Bottom side toe contact



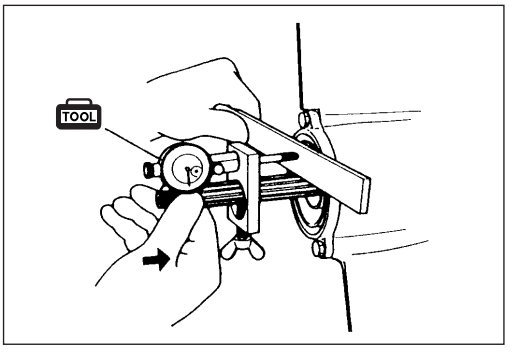
CHECKING REVERSE GEAR



Check the reverse gear / pinion gear shimming as shown below.

1. Re-check your hand feeling when rotating the driveshaft in condition of the optimum forward gear tooth contact. (See the page 8-18 and 8-19)
2. Install the following parts to the propeller shaft.
   - Reverse gear thrust washer
   - Reverse gear
   - Reverse gear backup shim
3. Install the propeller shaft and housing assembly to the gearcase with the two bolts.
4. Rotate the driveshaft clockwise, then compare your hand feeling with the feeling in the step 1.
   - If you feel that the rotating load is almost same as the load in the step 1, the reverse gear / pinion gear shimming is right.
   - If you feel that the load is larger, reduce the reverse gear backup shim thickness.

CHECKING PROPELLER SHAFT THRUST PLAY



After adjusting all gear positions, measure the propeller shaft thrust play.

Propeller shaft thrust play :
0.20 – 0.40 mm (0.008 – 0.016 in)

NOTE:
Maintain the forward gear thrust washer at the standard thickness (1.0 mm) and adjust only the reverse gear thrust washer with the shim.

Measurement step:

1. Assemble the gear adjusting gauge to the propeller shaft as shown in the figure.

TOOL 09951-09511 : Gear adjusting gauge

2. Push the propeller shaft inward.
3. Hold the propeller shaft in and set the dial gauge pointer to zero.
4. Slowly pull the propeller shaft outward and read the maximum thrust play on the dial.
   - 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.

WIRE / HOSE ROUTING

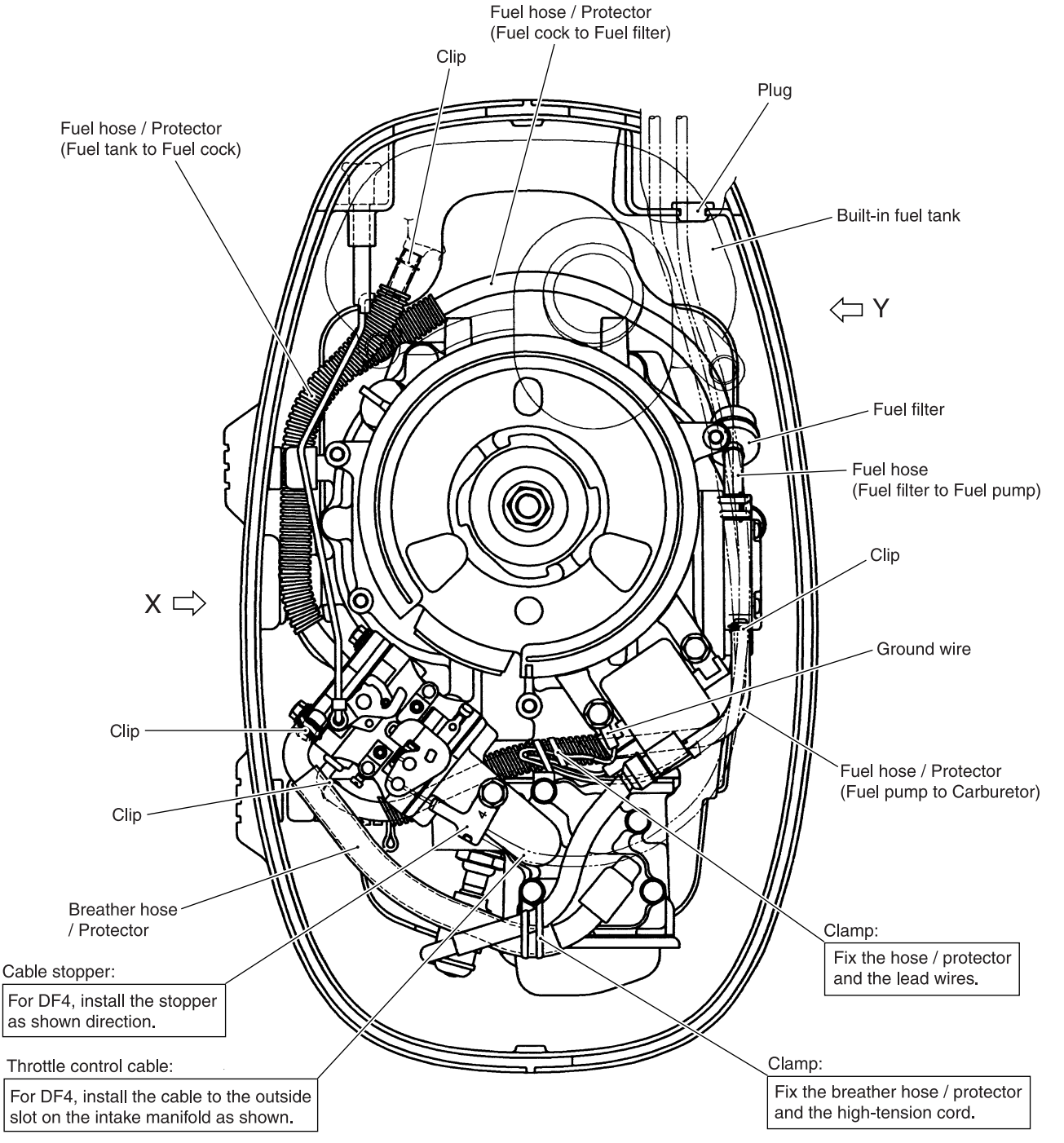
CONTENTS

WIRE AND HOSE ROUTING

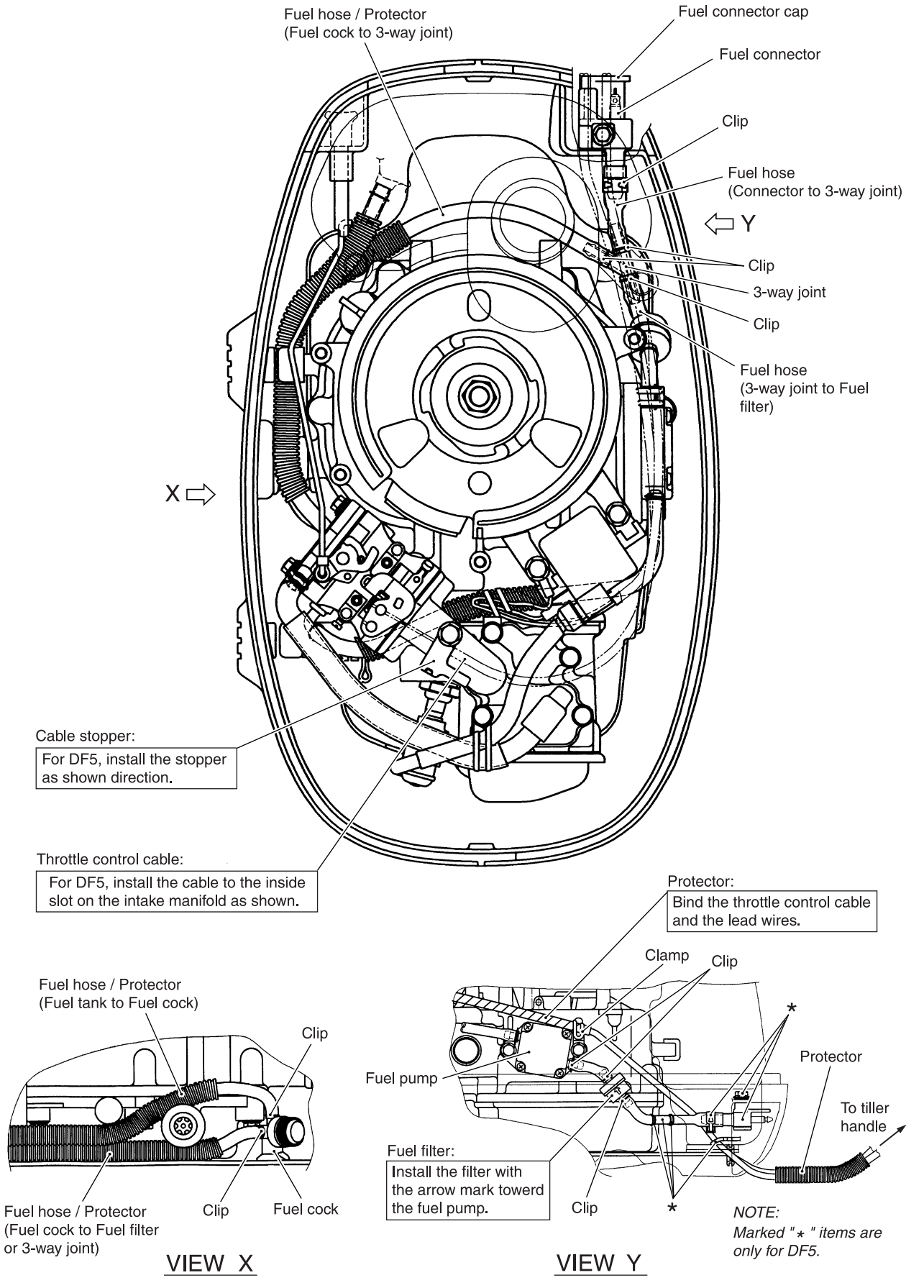
CAUTION

- **Do not over-bend (kink) or twist hoses when installing.**
- **When installing hose clips, position tabe to avoid contact with other parts.**
- **Check that hoses do not contact rods and levers during either engine operation or standstill.**
- **Extreme care should be taken not to cut, abrade or cause any other damage on hoses.**
- **Care should be taken not to cause hoses to be compressed excessively by any clamp when fitted.**

DF4

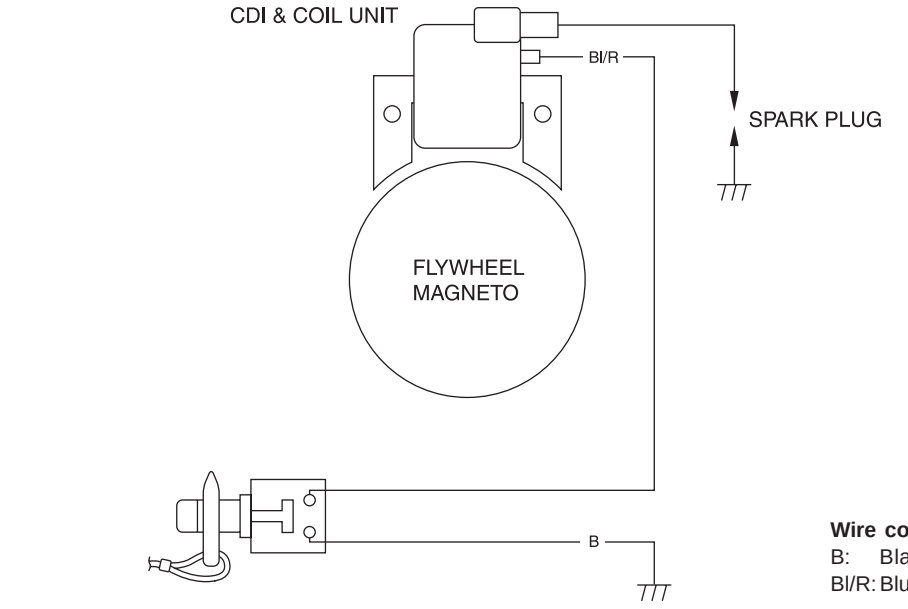


DF5

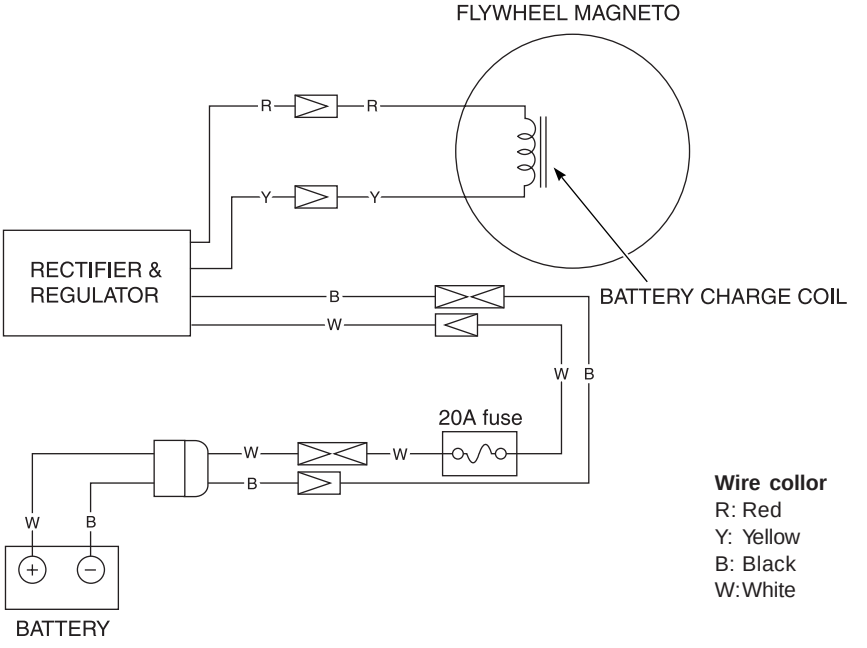

Fuel hose / Protector
(Fuel cock to 3-way joint)
Fuel connector cap
Fuel connector
Clip
Fuel hose
(Connector to 3-way joint)
Y
Clip
3-way joint
Clip
Fuel hose
(3-way joint to Fuel filter)
X
Cable stopper:
For DF5, install the stopper as shown direction.
Throttle control cable:
For DF5, install the cable to the inside slot on the intake manifold as shown.
Protector:
Bind the throttle control cable and the lead wires.
Fuel hose / Protector
(Fuel tank to Fuel cock)
Clip
Fuel hose / Protector
(Fuel cock to Fuel filter
or 3-way joint)
Clip
Fuel cock
VIEW X
Clamp
Clip
Fuel pump
Protector
To tiller handle
Fuel filter:
Install the filter with the arrow mark towerd the fuel pump.
Clip
*
NOTE:
Marked "* " items are only for DF5.
VIEW Y

WIRING DIAGRAM

DF4 / DF5



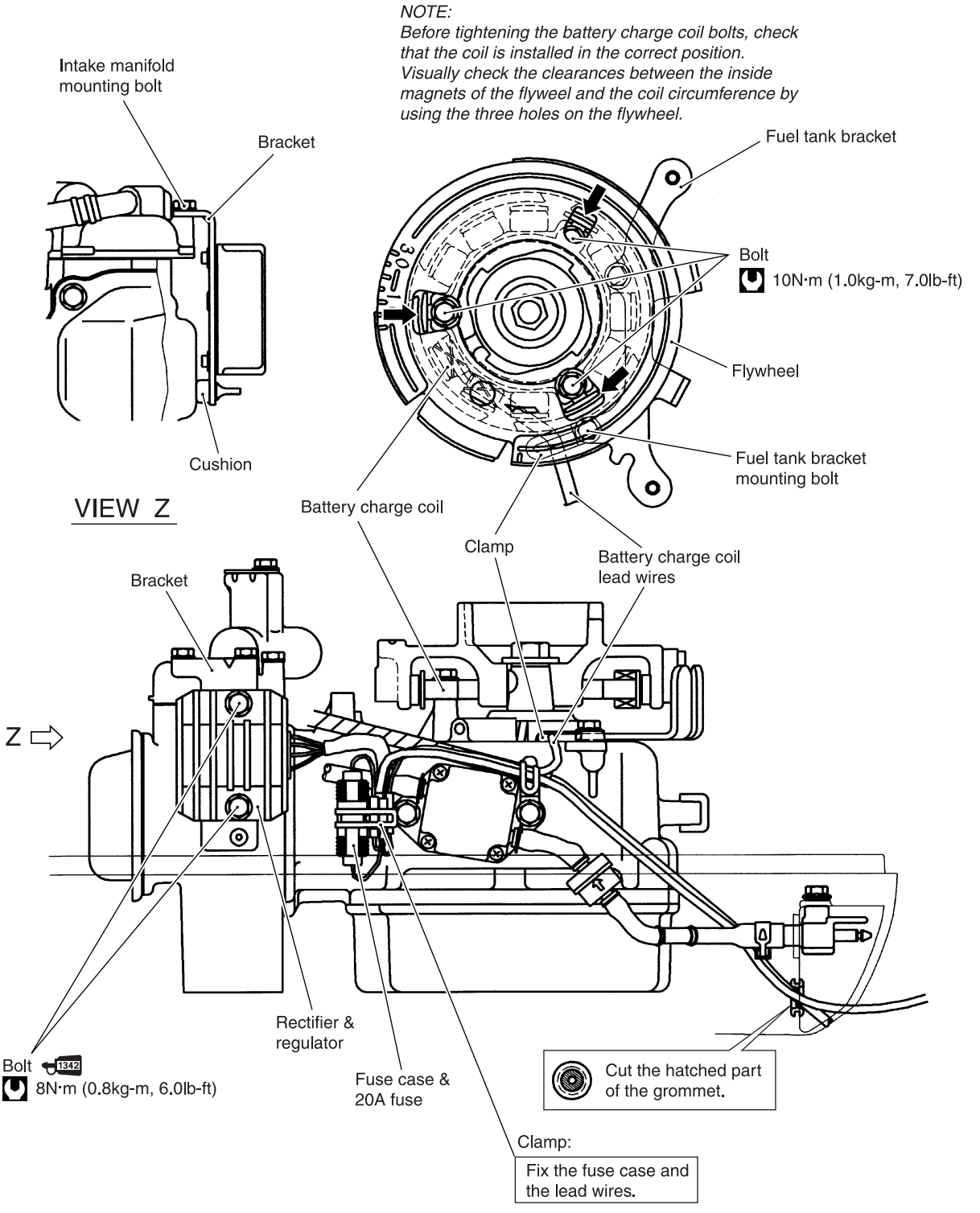
DF4 / DF5 (Optional parts)



NOTE:

If installing the optional battery charge coil, the rectifier & regulator and related items, replace the original flywheel with the optional flywheel.

OPTIONAL ELECTRICAL PARTS INSTALLATION



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