SUZUKI OUTBOARD MOTOR

DF 25
DF 30 FOUR STROKE

SERVICE MANUAL

99500-89J02-01E

FOREWORD

This manual contains an introductory description on SUZUKI Outboard motor DF25/30 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 2000 (Y) model.

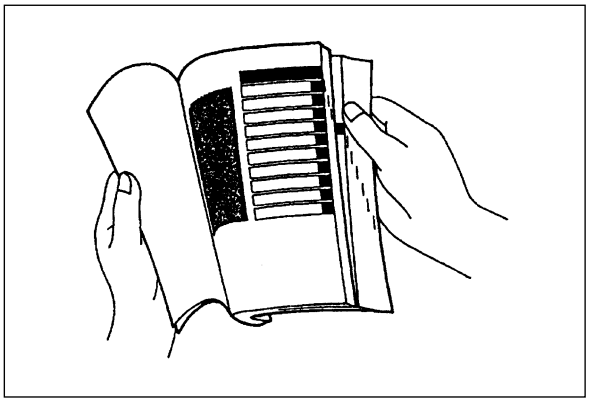
Marine & Power Products Division

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.

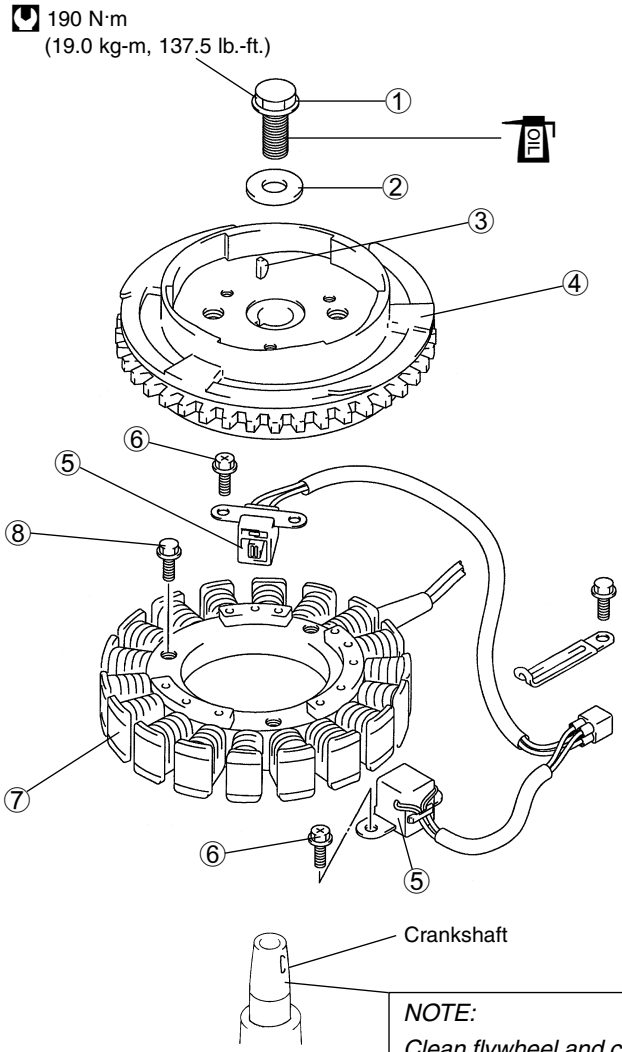


COMPONENT PARTS AND IMPORTANT ITEM ILLUSTRATIONS

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 :

① **Flywheel bolt**
② **Washer**
③ **Key**
④ **Flywheel**
⑤ **CKP sensor**
⑥ **Screw**
⑦ **Battery charge & Power source coil**
⑧ **Bolt**



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

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

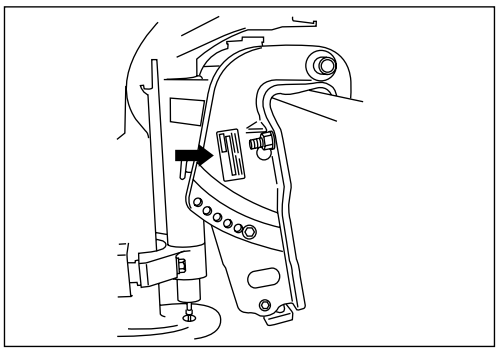
- **If parts replacement is necessary, replace the parts with Suzuki Genuine Parts or their equivalent.**
- **When removing parts that are to be reused, keep them arranged in an orderly manner so that they may be reinstalled in the proper order and orientation.**
- **Be sure to use special tools when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

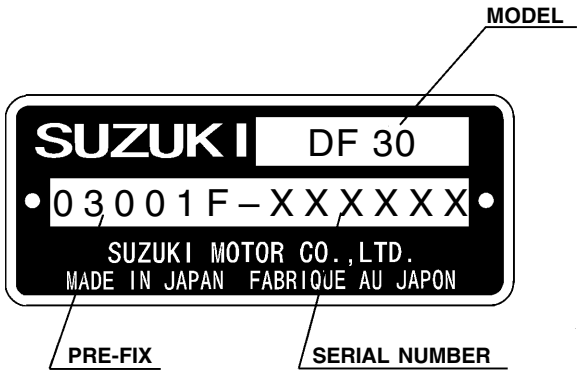
IDENTIFICATION NUMBER LOCATION

MODEL, PRE-FIX, SERIAL NUMBER

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

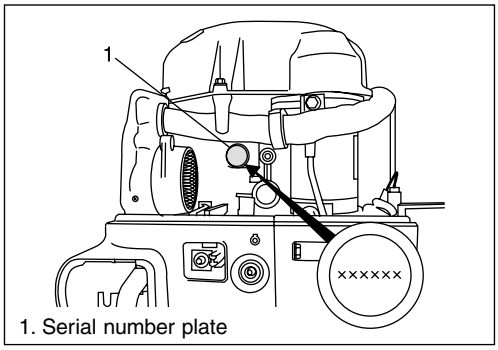


Example



ENGINE SERIAL NUMBER

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



1. Serial number plate

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

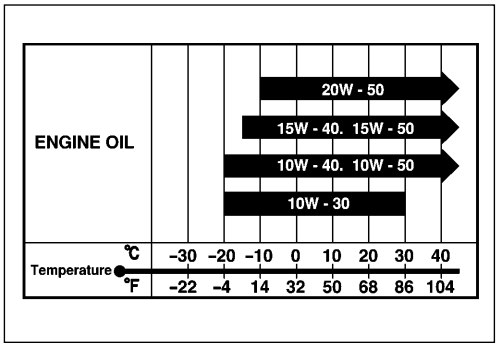
If leaded gasoline is used, engine damage may result. Use only unleaded gasoline.

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 DF25 / 30 models are shown below.

Recommended full throttle speed range	**DF25**	**5000 – 5600 r/min**
	DF30	**5500 – 6100 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	×	10 - ¼	×	9	(P901)
3	×	10 - ¼	×	10	(P1001)
3	×	10 - ¼	×	11	(P1101)
3	×	10 - ¼	×	12	(P1201)
3	×	10 - ¼	×	13	(P1301, PS1301)
3	×	10 - ¼	×	14	(P1401)
3	×	10 - ¼	×	15	(P1501)

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.
For DF30 specification, see page 1-9.

Item	Unit	Data			
		DF25Q	DF25QE	DF25QR	DF25T
PRE-FIX		02501F			

DIMENSIONS & WEIGHT

Overall length (front to back)		mm (in)	707 (27.8) : with tiller handle raised		655 (25.8)	
Overall width (side to side)		mm (in)	380 (15.0)			
Overall height	S	mm (in)	1215 (47.8)			
	L	mm (in)	1342 (52.8)			
	UL	mm (in)	————			
Weight (without engine oil)	S	kg (lbs)	93 (205)	95 (209)	92 (203)	93 (205)
	L	kg (lbs)	96 (212)	98 (216)	95 (209)	96 (212)
	UL	kg (lbs)	————			
Transom height	S	mm (inch type)	414 (15)			
	L	mm (inch type)	541 (20)			
	UL	mm (inch type)	————			

PERFORMANCE

Maximum output	kW (PS)	18.4 (25)
Recommended operating range	r/min	5000 – 5600
Idle speed	r/min	900 ± 50 (in-gear : approx. 850)

POWERHEAD

Engine type		4-stroke SOHC			
Number of cylinders		3			
Bore	mm (in)	65 (2.56)			
Stroke	mm (in)	60 (2.36)			
Total displacement	cm^3 (cu in)	597 (36.4)			
Compression ratio	: 1	9.2			
Spark plug	NGK	DCPR6E			
Ignition system		SUZUKI PEI			
Fuel supply system		Carburetor (Number of carb. : 3)			
Exhaust system		Through prop exhaust			
Cooling system		Water cooled			
Lubrication system		Wet sump by trochoid pump			
Starting system		Manual	Electric	Electric	Electric
Choke system		Manual	Manual	Electric	Electric
Throttle control		Twist grip	Twist grip	Remote control	Remote control

Item	Unit	Data			
		DF25Q	DF25QE	DF25QR	DF25T

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.
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating 10W-40
Engine oil amounts	L (US/Imp. qt)	3.0 (3.2/2.6) : Oil change only 3.2 (3.4/2.8) : Oil filter change
Gear oil		SUZUKI Outboard Motor Gear Oil (SAE #90 hypoid gear oil)
Gearcase oil amounts	ml (US/Imp. oz)	230 (7.8/8.1)

BRACKET

Trim angle		8° – 28° (Manual Trim and Gas Assisted Tilt system)	(PTT system)
Number of tilt pin position	Adjustable	6	
Maximum tilt angle	degree	73	

LOWER UNIT

Reversing system	Gear
Transmission	Forward-Neutral-Reverse
Reduction system	Bevel gear
Gear ratio	11 : 23 (2.09)
Drive line impact protection	Spline drive rubber hub
Propeller	Blade × Diam. (in.) × Pitch (in.)
P : Aluminum propeller PS : Stainless steel propeller	3 × 10 1/4 × 9 (P901) 3 × 10 1/4 × 10 (P1001) 3 × 10 1/4 × 11 (P1101) 3 × 10 1/4 × 12 (P1201) 3 × 10 1/4 × 13 (P1301, PS1301) 3 × 10 1/4 × 14 (P1401) 3 × 10 1/4 × 15 (P1501)

* These specifications are subject to change without notice.
For DF25 specification, see page 1-7.

Item	Unit	Data			
		DF30Q	DF30QE	DF30QR	DF30T
PRE-FIX		03001F			

DIMENSIONS & WEIGHT

Overall length (front to back)		mm (in)	707 (27.8) : With tiller handle raised		655 (25.8)	
Overall width (side to side)		mm (in)	380 (15.0)			
Overall height	S	mm (in)	1215 (47.8)			
	L	mm (in)	1342 (52.8)			
	UL	mm (in)	————			
Weight (without engine oil)	S	kg (lbs)	93 (205)	95 (209)	92 (203)	93 (205)
	L	kg (lbs)	96 (212)	98 (216)	95 (209)	96 (212)
	UL	kg (lbs)	————			
Transom height	S	mm (inch type)	414 (15)			
	L	mm (inch type)	541 (20)			
	UL	mm (inch type)	————			

PERFORMANCE

Maximum output	kW (PS)	22.1 (30)
Recommended operating range	r/min	5500 – 6100
Idle speed	r/min	900 ± 50 (in-gear : approx. 850)

POWERHEAD

Engine type		4-stroke SOHC			
Number of cylinders		3			
Bore	mm (in)	65 (2.56)			
Stroke	mm (in)	60 (2.36)			
Total displacement	cm^3 (cu in)	597 (36.4)			
Compression ratio	: 1	9.2			
Spark plug	NGK	DCPR6E			
Ignition system		SUZUKI PEI			
Fuel supply system		Carburetor (Number of carb. : 3)			
Exhaust system		Through prop exhaust			
Cooling system		Water cooled			
Lubrication system		Wet sump by trochoid pump			
Starting system		Manual	Electric	Electric	Electric
Choke system		Manual	Manual	Electric	Electric
Throttle control		Twist grip	Twist grip	Remote control	Remote control

Item	Unit	Data			
		DF30Q	DF30QE	DF30QR	DF30T

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.
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating 10W-40
Engine oil amounts	L (US/Imp. qt)	3.0 (3.2/2.6) : Oil change only 3.2 (3.4/2.8) : Oil filter change
Gear oil		SUZUKI Outboard Motor Gear Oil (SAE #90 hypoid gear oil)
Gearcase oil amounts	ml (US/Imp. oz)	230 (7.8/8.1)

BRACKET

Trim angle		8° – 28° (Manual Trim and Gas Assisted Tilt system)	(PTT system)
Number of tilt pin position	Adjustable	6	
Maximum tilt angle	degree	73	

LOWER UNIT

Reversing system	Gear
Transmission	Forward-Neutral-Reverse
Reduction system	Bevel gear
Gear ratio	11 : 23 (2.09)
Drive line impact protection	Spline drive rubber hub
Propeller	Blade × Diam. (in.) × Pitch (in.)
	3 × 10 1/4 × 9 (P901) 3 × 10 1/4 × 10 (P1001) 3 × 10 1/4 × 11 (P1101) 3 × 10 1/4 × 12 (P1201) 3 × 10 1/4 × 13 (P1301, PS1301) 3 × 10 1/4 × 14 (P1401) 3 × 10 1/4 × 15 (P1501)
P : Aluminum propeller PS : Stainless steel propeller	

*SERVICE DATA

*These service data are subject to change without notice.

Item	Unit	Data			
		DF25Q/25QE	DF25QR/25T	DF30Q/30QE	DF30QR/30T

POWERHEAD

Recommended operating range	r/min	5000 – 5600	5500 – 6100
Idle speed	r/min	900 ± 50 (in-gear: approx. 850)	
**Cylinder compression	kPa (kg/cm², psi)	1000 – 1400 (10 – 14, 142 – 199)	
**Cylinder compression max. difference between any other cylinders	kPa (kg/cm², psi)	100 (1.0, 14)	
**Engine oil pressure	kPa (kg/cm², psi)	400 – 500 (4.0 – 5.0, 57 – 71) at 3000 r/min (at normal operating temp.)	
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating SAE 10W-40	
Engine oil amounts	L (US/Imp. qt)	3.0 (3.2/2.6) : Oil change only 3.2 (3.4/2.8) : Oil filter change	
Thermostat operating temperature	°C (°F)	58 – 62 (136 – 144)	

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

CARBURETOR

Item	Unit	Data			
		DF25Q/25QE	DF25QR/25T	DF30Q/30QE	DF30QR/30T

[Pilot screw covered type]

Type	MIKUNI	B25TI-20		B25TI-22	
I.D mark		89J00	89J00	89J10	89J10
Main jet	#	135		110	
Pilot jet	#	38.8		40	
Pilot screw	Turns open	PRE-SET			
Float height	mm	14.6 ± 1			

[Pilot screw uncovered type]

Type	MIKUNI	B25TI-20		B25TI-22	
I.D mark		89J40	89J40	89J50	89J50
Main jet	#	135		110	
Pilot jet	#	38.8		40	
Pilot screw	Turns open	1½ ± ¼		1½ ± ¼	
Float height	mm	14.6 ± 1			

Item		Unit	Data			
			DF25Q/25QE	DF25QR/25T	DF30Q/30QE	DF30QR/30T

CYLINDER HEAD / CAMSHAFT

Cylinder head distortion		Limit	mm (in)	0.05 (0.002)	
Manifold seating faces distortion		Limit	mm (in)	—	
Cam height	IN	STD	mm (in)	35.185 – 35.345 (1.3852 – 1.3915)	36.076 – 36.236 (1.4203 – 1.4266)
		Limit	mm (in)	35.085 (1.3813)	35.976 (1.4164)
	EX	STD	mm (in)	34.506 – 34.666 (1.3585 – 1.3648)	35.271 – 35.431 (1.3886 – 1.3949)
		Limit	mm (in)	34.406 (1.3546)	35.171 (1.3847)
Camshaft journal oil clearance		STD	mm (in)	0.050 – 0.100 (0.0020 – 0.0039)	
		Limit	mm (in)	0.160 (0.0060)	
Camshaft journal inside diameter (from MAG side)	Top	STD	mm (in)	43.500 – 43.525 (1.7126 – 1.7136)	
		Limit	mm (in)	43.534 (1.7139)	
	2nd	STD	mm (in)	43.700 – 43.725 (1.7205 – 1.7215)	
		Limit	mm (in)	43.734 (1.7218)	
	3rd	STD	mm (in)	43.900 – 43.925 (1.7283 –1.7293)	
		Limit	mm (in)	43.934 (1.7300)	
	4th	STD	mm (in)	44.100 – 44.125 (1.7362 – 1.7372)	
		Limit	mm (in)	44.134 (1.7376)	
Camshaft journal outside diameter (from MAG side)	Top	STD	mm (in)	43.425 – 43.450 (1.7096 – 1.7106)	
		Limit	mm (in)	43.375 (1.7077)	
	2nd	STD	mm (in)	43.625 – 43.650 (1.7175 – 1.7185)	
		Limit	mm (in)	43.575 (1.7156)	
	3rd	STD	mm (in)	43.825 – 43.850 (1.7254 –1.7264)	
		Limit	mm (in)	43.775 (1.7234)	
	4th	STD	mm (in)	44.025 – 44.050 (1.7333 – 1.7343)	
		Limit	mm (in)	43.975 (1.7313)	
Camshaft runout		Limit	mm (in)	0.10 (0.004)	
Rocker arm shaft to rocker arm clearance	IN, EX	STD	mm (in)	0.012 – 0.045 (0.0005 – 0.0018)	
		Limit	mm (in)	0.090 (0.0035)	
Rocker arm shaft outside diameter	IN, EX	STD	mm (in)	15.973 –15.988 (0.6289 – 0.6294)	
Rocker arm inside diameter	IN, EX	STD	mm (in)	16.000 – 16.018 (0.6299 – 0.6306)	
Rocker arm shaft runout	IN, EX	STD	mm (in)	0.12 (0.005)	

Item			Unit	Data			
				DF25Q/25QE	DF25QR/25T	DF30Q/30QE	DF30QR/30T
VALVE / VALVE GUIDE							
Valve diameter		IN	mm (in)	23.1 (0.91)			
		EX	mm (in)	29.6 (1.17)			
Valve clearance (Cold engine condition)	IN	STD	mm (in)	0.13 – 0.17 (0.005 – 0.007)			
	EX	STD	mm (in)	0.13 – 0.17 (0.005 – 0.007)			
Valve seat angle		IN	degree	15°, 45°			
		EX	degree	15°, 45°			
Valve guide to valve stem clearance	IN	STD	mm (in)	0.020 – 0.047 (0.0008 – 0.0019)			
		Limit	mm (in)	0.070 (0.0028)			
	EX	STD	mm (in)	0.035 – 0.062 (0.0014 – 0.0024)			
		Limit	mm (in)	0.090 (0.0035)			
Valve guide inside diameter	IN,EX	STD	mm (in)	5.500 – 5.512 (0.2165 – 0.2170)			
Valve guide protrusion	IN,EX	STD	mm (in)	14.0 (0.55)			
Valve stem outside diameter	IN	STD	mm (in)	5.465 – 5.480 (0.2152 – 0.2157)			
	EX	STD	mm (in)	5.450 – 5.465 (0.2146 – 0.2152)			
Valve stem end length	IN	Limit	mm (in)	7.00 (0.276)			
	EX			6.00 (0.236)			
Valve stem end deflection	IN	Limit	mm (in)	0.14 (0.006)			
	EX	Limit	mm (in)	0.18 (0.007)			
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	STD	mm (in)	1.0 (0.04)			
		Limit	mm (in)	0.5 (0.02)			
	EX	STD	mm (in)	1.3 (0.05)			
		Limit	mm (in)	0.7 (0.03)			
Valve seat contact width	IN	STD	mm (in)	1.3 – 1.5 (0.05 – 0.06)			
	EX	STD	mm (in)	1.3 – 1.5 (0.05 – 0.06)			
Valve spring free length		STD	mm (in)	47.38 (1.865)			
		Limit	mm (in)	45.48 (1.791)			
Valve spring tension		STD	N (kg, lbs)	193 – 223 (19.3 – 22.3, 42.5 – 49.2) for 37.5 mm (1.48 in)			
		Limit	N (kg, lbs)	177 (17.7, 39.0) for 37.5 mm (1.48 in)			
Valve spring squareness		Limit	mm (in)	2.0 (0.08)			

Item	Unit	Data			
		DF25Q/25QE	DF25QR/25T	DF30Q/30QE	DF30QR/30T

CYLINDER / PISTON / PISTON RING

Cylinder distortion		Limit	mm (in)	0.030 (0.0012)
Piston to cylinder clearance		STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)
		Limit	mm (in)	0.100 (0.0039)
Cylinder bore		STD	mm (in)	65.000 – 65.020 (2.5591 – 2.5598)
Cylinder measuring position			mm (in)	50 (2.0) from cylinder top surface
Piston skirt diameter		STD	mm (in)	64.970 – 64.990 (2.5579 – 2.5587)
Piston measuring position			mm (in)	19 (0.7) from piston skirt end.
Cylinder bore wear		Limit	mm (in)	0.100 (0.0039)
Piston ring end gap	1st	STD	mm (in)	0.12 – 0.27 (0.005 – 0.011)
		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	STD	mm (in)	Approx. 9.1 (0.36)
		Limit	mm (in)	7.3 (0.29)
	2nd	STD	mm (in)	Approx. 9.0 (0.35)
		Limit	mm (in)	7.2 (0.28)
Piston ring to groove clearance	1st	STD	mm (in)	0.03 – 0.07 (0.001 – 0.003)
		Limit	mm (in)	0.12 (0.005)
	2nd	STD	mm (in)	0.02 – 0.06 (0.001 – 0.002)
		Limit	mm (in)	0.10 (0.004)
Piston ring groove width	1st	STD	mm (in)	1.02 – 1.04 (0.040 – 0.041)
	2nd	STD	mm (in)	1.21 – 1.23 (0.0476 – 0.0484)
	Oil	STD	mm (in)	2.01 – 2.03 (0.079 – 0.080)
Piston ring thickness	1st	STD	mm (in)	0.97 – 0.99 (0.038 – 0.039)
	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)	15.995 – 16.000 (0.6297 – 0.6299)
		Limit	mm (in)	15.980 (0.6291)
Piston pin hole diameter		STD	mm (in)	16.006 – 16.014 (0.6302 – 0.6305)
		Limit	mm (in)	16.030 (0.6311)
Pin clearance in conrod small end		STD	mm (in)	0.003 – 0.016 (0.0001 – 0.0006)
		Limit	mm (in)	0.050 (0.0020)
Conrod small end bore		STD	mm (in)	16.003 – 16.011 (0.6300 – 0.6304)

Item		Unit	Data			
			DF25Q/25QE	DF25QR/25T	DF30Q/30QE	DF30QR/30T

CRANKSHAFT / CONROD

Conrod small end inside diameter	STD	mm (in)	16.003 – 16.011 (0.6300 – 0.6304)
Conrod big end oil clearance	STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)
	Limit	mm (in)	0.065 (0.0026)
Conrod big end inside diameter	STD	mm (in)	39.000 – 39.018 (1.5354 – 1.5361)
Crank pin outside diameter	STD	mm (in)	35.982 – 36.000 (1.4166 – 1.4173)
Crank pin outside diameter difference (out of round and taper)	Limit	mm (in)	0.010 (0.0004)
Conrod bearing thickness	STD	mm (in)	1.486 – 1.502 (0.0585 – 0.0591)
Conrod big end side clearance	STD	mm (in)	0.100 – 0.250 (0.0039 – 0.0098)
	Limit	mm (in)	0.350 (0.0138)
Conrod big end width	STD	mm (in)	21.950 – 22.000 (0.8642 – 0.8661)
Crank pin width	STD	mm (in)	22.100 – 22.200 (0.8700 – 0.8740)
Crankshaft center journal runout	Limit	mm (in)	0.04 (0.002)
Crankshaft journal oil clearance	STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)
	Limit	mm (in)	0.065 (0.0026)
Crankcase bearing holder inside diameter	STD	mm (in)	44.000 – 44.018 (1.7323 – 1.7330)
Crankshaft journal outside diameter	STD	mm (in)	39.982 – 40.000 (1.5741 – 1.5748)
Crankshaft journal outside diameter difference (out of round and taper)	Limit	mm (in)	0.010 (0.0004)
Crankshaft bearing thickness	STD	mm (in)	1.996 – 2.012 (0.0768 – 0.0792)
Crankshaft thrust play	STD	mm (in)	0.11 – 0.31 (0.004 – 0.012)
	Limit	mm (in)	0.35 (0.014)
Crankshaft thrust bearing thickness	STD	mm (in)	2.470 – 2.520 (0.0972 – 0.0992)

Item	Unit	Data			
		DF25Q/25QE	DF25QR/25T	DF30Q/30QE	DF30QR/30T

ELECTRICAL

Ignition timing		Degrees at r/min	BTDC 5° – 31°	BTDC 5° – 29°
Over revolution limiter		r/min	6300	6500
CKP sensor resistance		Ω at 20°C	148 – 222 [R – B, W/B – R/W]	
Power source coil resistance		Ω at 20°C	10.1 – 15.1 [Br – G, W – G]	
Ignition coil resistance	Primary	Ω at 20°C	0.17 – 0.23	
	Secondary	kΩ at 20°C	3.3 – 5.0	
Spark plug cap resistance		kΩ at 20°C	4 – 6	
Battery charge coil resistance		Ω at 20°C	Manual start model : 0.20 – 0.30 [R – Y] Electric start model : 0.27 – 0.40 [R – Y]	
Battery charge coil output (12V)		Watt	Manual start model : 80 Electric start model : 180	
Standard spark plug	Type	NGK	DCPR6E	
	Gap	mm (in)	0.8 – 0.9 (0.031 – 0.035)	
Fuse amp. rating		A	25 (Applicable model)	
Recommended battery capacity (12V)		Ah (kC)	40 (144) or larger	
Cylinder temp. sensor resistance (Thermistor characteristic)		kΩ at 25°C	1.8 – 2.3	
Choke solenoid coil resistance		Ω at 20°C	3.8 – 4.2 (Applicable model)	
Starter motor relay coil resistance		Ω at 20°C	3.5 – 5.1 (Applicable model)	
PTT motor relay coil resistance		Ω at 20°C	3.0 – 4.5 (Applicable model)	

STARTER MOTOR (Applicable model)

Max. continuous time of use		Sec	30
Motor output		kW	0.6
Brush length	STD	mm (in)	12.5 (0.49)
	Limit	mm (in)	9.0 (0.35)
Commutator undercut	STD	mm (in)	0.5 – 0.8 (0.02 – 0.03)
	Limit	mm (in)	0.2 (0.01)
Commutator outside diameter	STD	mm (in)	30.0 (1.18)
	Limit	mm (in)	29.0 (1.14)
Commutator outside diameter difference	STD	mm (in)	0.05 (0.002)
	Limit	mm (in)	0.40 (0.016)
Pinion to ring gear gap	STD	mm (in)	3.0 – 5.0 (0.12 – 0.20)

PTT MOTOR (Applicable model)

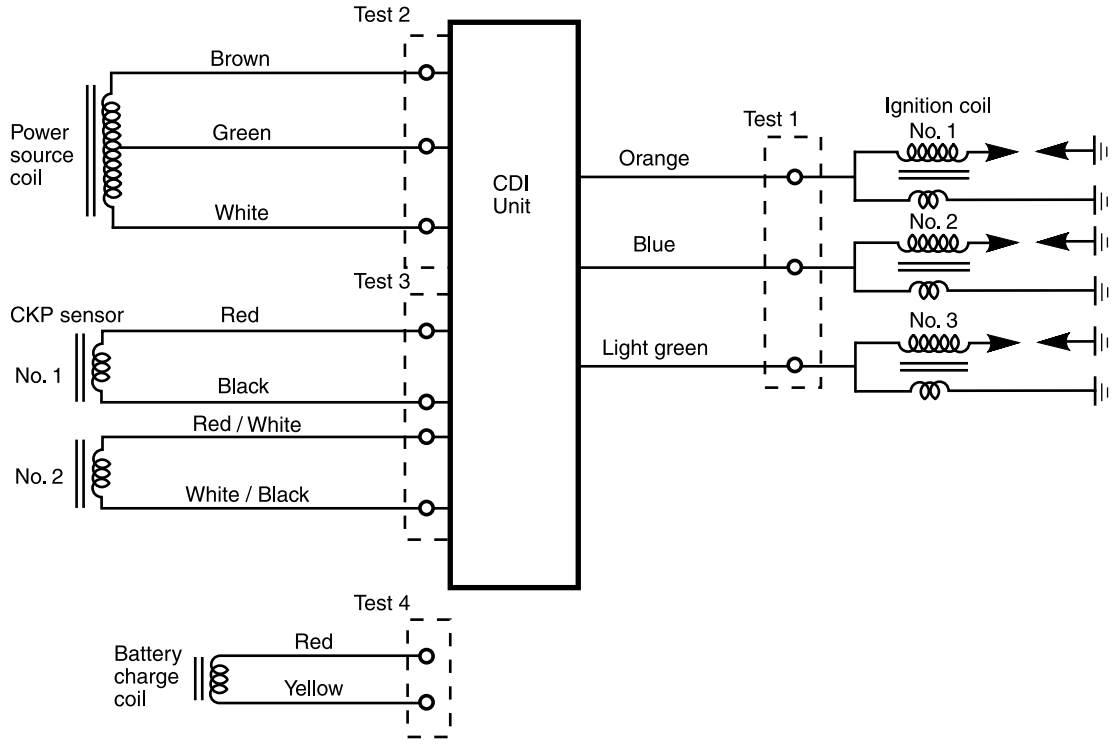
Brush length	STD	mm (in)	9.8 (0.39)
	Limit	mm (in)	4.8 (0.19)
Commutator outside diameter	STD	mm (in)	19.5 (0.77)
	Limit	mm (in)	18.5 (0.73)

PEAK VOLTAGE

Requirements for peak voltage measurement

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

Testing sequence			Tester probe connection + (Red)	Tester probe connection – (Black)	Peak voltage	Tester range	Remarks
1	CDI output	No.1	Orange	Black	64V or over	POS 500	With ignition coil connected.
		No.2	Blue				
		No.3	Light green				
2	Power source coil output		Brown	Green	21V or over	POS 500	With CDI unit disconnected.
			White				
3	CKP sensor output	No.1	Red	Black	3V or over	SEN 50	
		No.2	Red/White	White/Black			
4	Battery charge coil output	Manual start	Yellow	Red	4V or over	POS 50	With rectifier disconnected.
		Electric start			8V or over		



TIGHTENING TORQUE

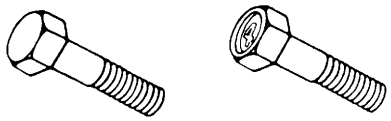
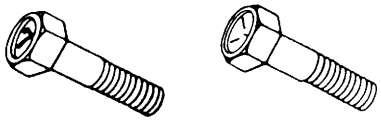
Tightening Torque – Important Fasteners

ITEM		THREAD DIAMETER	TIGHTENING TORQUE		
			N · m	kg-m	lb-ft
Cylinder head cover bolt		6 mm	11	1.1	8.0
Cylinder head bolt	(Outside)	8 mm	25	2.5	18.0
	(Inside)	10 mm	62	6.2	45.0
Crankcase bolt	(Outside)	8 mm	25	2.5	18.0
	(Inside)	10 mm	53	5.3	38.5
Conrod cap nut		8 mm	35	3.5	25.5
Rocker arm shaft bolt		7 mm	19	1.9	13.5
Valve adjusting lock nut		6 mm	11	1.1	8.0
Camshaft timing sprocket bolt		6 mm	11	1.1	8.0
Timing chain tensioner adjuster bolt		6 mm	11	1.1	8.0
Timing chain guide bolt		6 mm	10	1.0	7.0
Exhaust cover plate		6 mm	11	1.1	8.0
Oil pressure switch		——	13	1.3	9.5
Oil relief valve		14 mm	27	2.7	19.5
Inlet case bolt		6 mm	11	1.1	8.0
Carburetor mounting nut		6 mm	10	1.0	7.0
Fuel pump bolt		6 mm	10	1.0	7.0
Thermostat cover bolt		6 mm	10	1.0	7.0
Flywheel bolt		16 mm	190	19.0	137.5
Starter motor mounting bolt		6 mm	11	1.1	8.0
		8 mm	23	2.3	16.5
Engine oil filter		——	14	1.4	10.0
Engine oil drain plug		12 mm	13	1.3	9.5
Oil pump stopper		——	50	5.0	36.0
Power unit mounting bolt		8 mm	23	2.3	16.5
		10 mm	50	5.0	36.0
Water pressure valve cover bolt		6 mm	10	1.0	7.0
Driveshaft housing bolt		8 mm	23	2.3	16.5
Upper mount nut		10 mm	35	3.5	25.5
Upper mount cover bolt		6 mm	10	1.0	7.0
Lower mount nut	Front	12 mm	60	6.0	43.5
	Rear	12 mm	40	4.0	29.0
Clamp bracket shaft nut		22 mm	43	4.3	31.0

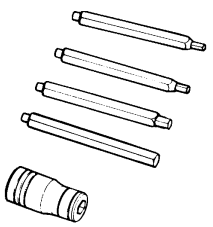
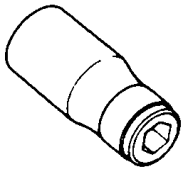
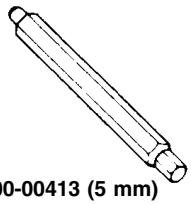
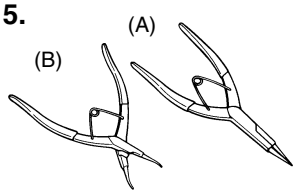
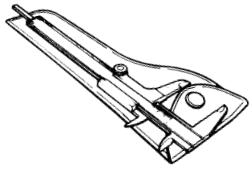
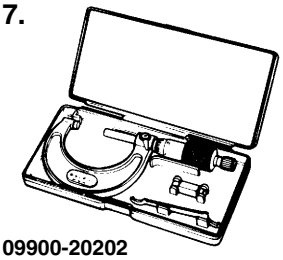
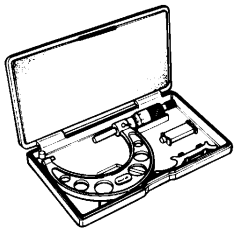
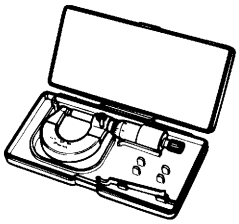
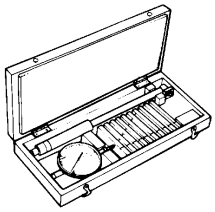
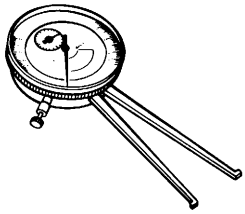
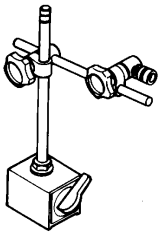
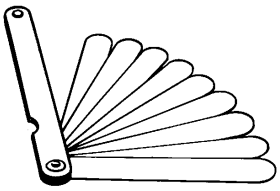
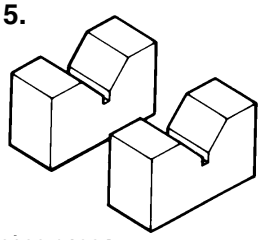
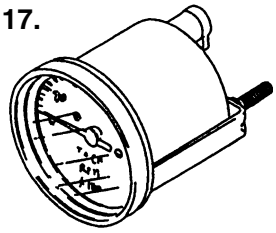
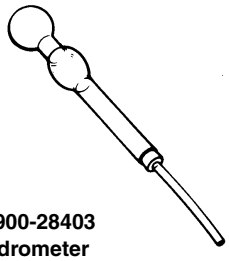
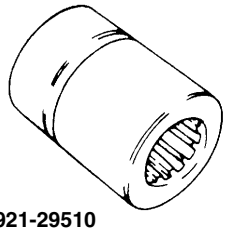
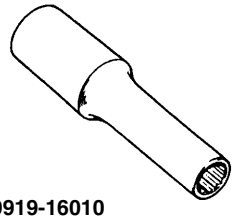
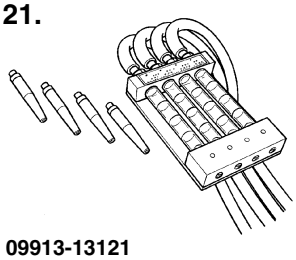
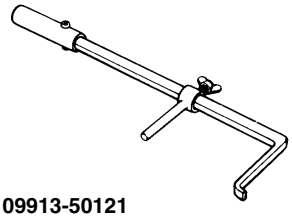
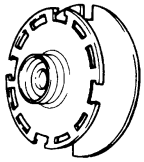
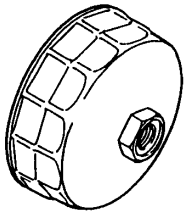
ITEM	THREAD DIAMETER	TIGHTENING TORQUE		
		N · m	kg-m	lb-ft
Water pump case nut	6 mm	8	0.8	6.0
Gearcase bolt	8 mm	23	2.3	16.5
Propeller shaft bearing housing bolt	6 mm	8	0.8	6.0
Pinion nut	8 mm	18	1.8	13.0
Propeller nut	14 mm	18	1.8	13.0

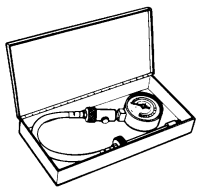
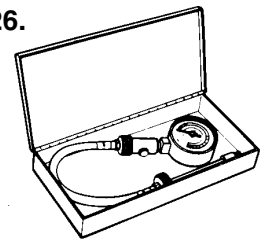
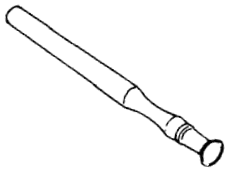
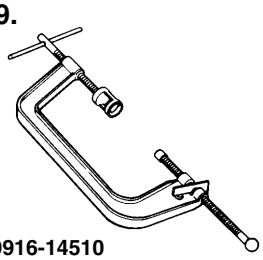
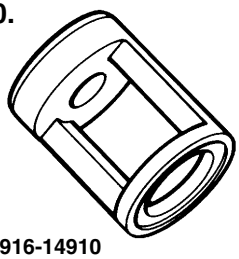
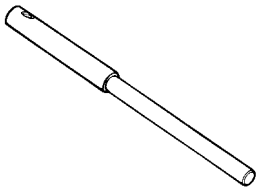
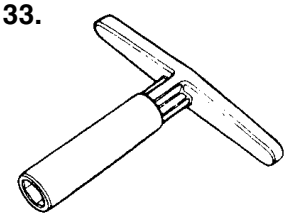
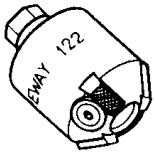
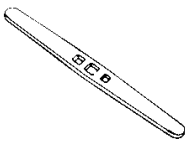
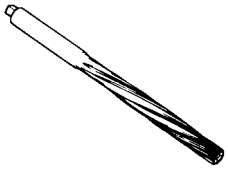
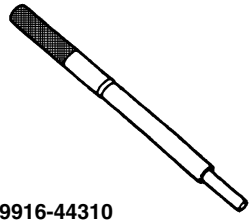
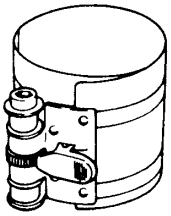
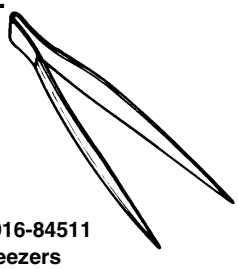
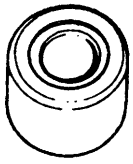
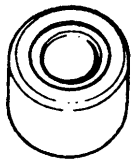
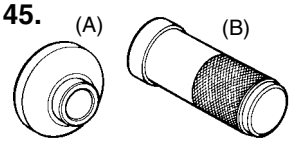
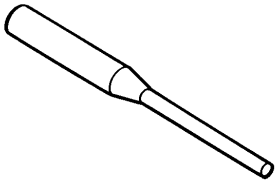
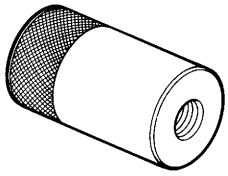
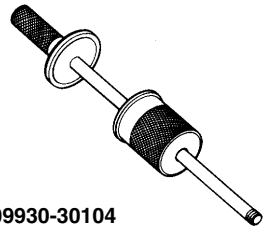
Tightening torque – general bolt

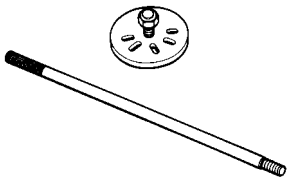
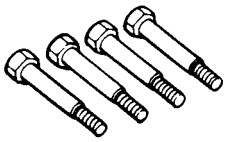
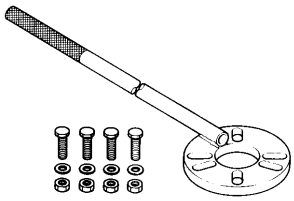
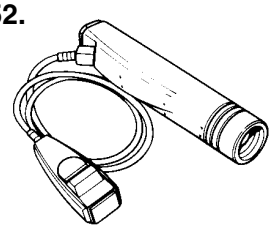
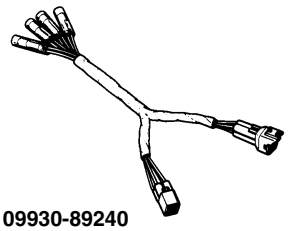
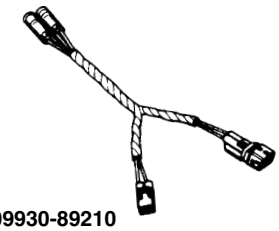
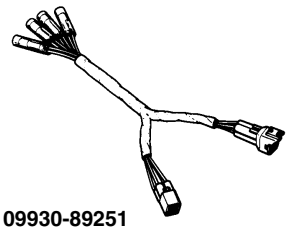
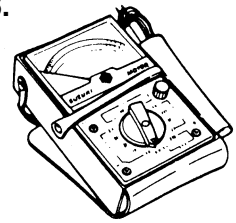
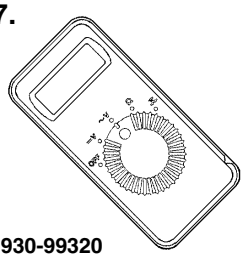
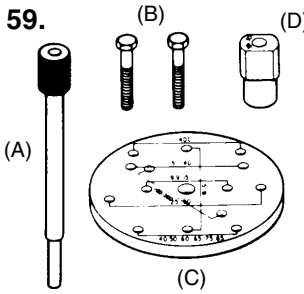
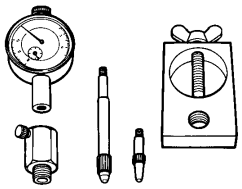
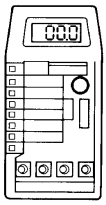
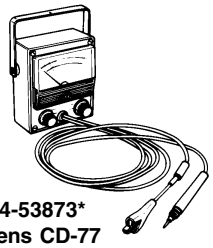
NOTE:
These values are only applicable when torque for a general bolt is not listed in the "Important Fasteners" table.

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 ⅄ marked bolt)	5 mm	3 – 6	0.3 – 0.6	2.0 – 4.5
	6 mm	8 – 12	0.8 – 1.2	6.0 – 8.5
	8 mm	18 – 28	1.8 – 2.8	13.0 – 20.0
	10 mm	40 – 60	4.0 – 6.0	29.0 – 43.5

SPECIAL TOOLS

1.	2.  09900-00410 Hexagon wrench set	3.  09900-00411 Hexagon socket (included in 09900-00410)	4.  09900-00413 (5 mm) 09900-00414 (6 mm) Hexagon bit (included in 09900-00410)
5.  (A) 09900-06107 (B) 09900-06108 Snap ring pliers	6.  09900-20101 (150 mm) 09900-20102 (200 mm) Vernier calipers	7.  09900-20202 Micrometer (25 – 50 mm)	8.  09900-20203 Micrometer (50 – 75 mm)
9.  09900-20205 Micrometer (0 – 25 mm)	10.  09900-20508 Cylinder gauge set (40 – 80 mm)	11.  09900-20605 Dial calipers (10 – 34 mm)	12.  09900-20602 Dial gauge
13.  09900-20701 Magnetic stand	14.  09900-20803 Thickness gauge	15.  09900-21304 Steel “V” block set	16.  09900-22302 (0.051 – 0.125 mm) 09900-22301 (0.025 – 0.076 mm) Plastigauge
17.  34200-92E02 Engine tachometer	18.  09900-28403 Hydrometer	19.  09921-29510 Driveshaft holder	20.  09919-16010 Deep socket wrench
21.  09913-13121 Carburetor balancer set	22.  09913-50121 Oil seal remover	23.  09914-79831 Test wheel 58120-96313 Bush 57632-96312 Stopper	24.  09915-47340 Oil filter wrench

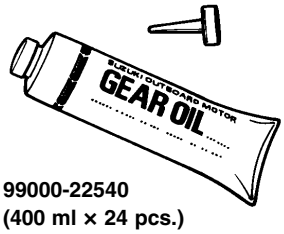
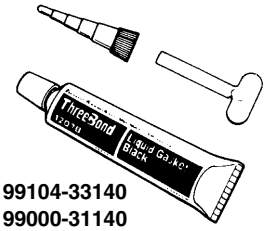
25.  09915-64512 Compression gauge 09915-63210 Adaptor	**26.**  09915-77310 Oil pressure gauge	**27.**  09915-78211 Oil pressure gauge adapter	**28.**  09916-10911 Valve lapper
29.  09916-14510 Valve lifter	**30.**  09916-14910 Valve lifter attachment	**31.**  09916-24450 Solid pilot (N-100-5.52)	**32.**  09916-24440 Handle adaptor (N-503-1)
33.  09916-54910 Handle (N-505)	**34.**  09916-20620 Valve seat cutter (Neway 122)	**35.**  09916-20610 Valve seat cutter (Neway 121)	**36.**  09916-34550 Valve guide reamer (ϕ 5.5 mm)
37.  09916-34542 Valve guide reamer handle	**38.**  09916-37320 Valve guide reamer (ϕ 10.5 mm)	**39.**  09916-44310 Valve guide remover	**40.**  09916-58210 Valve guide installer
41.  09916-77310 Piston ring compressor	**42.**  09916-84511 Tweezers	**43.**  09917-88230 Valve guide installer attachment	**44.**  09917-98221 Valve guide stem seal installer attachment
45. (A) (B)  (A) 09922-59410 Propeller shaft housing installer (B) 09922-59420 Housing installer handle	**46.**  09922-89810 Shift lock pin remover	**47.**  09950-59310 Propeller shaft remover	**48.**  09930-30104 Sliding hammer

49.  **09930-39411** **Flywheel rotor remover**	**50.**  **09930-39420** **Rotor remover bolt**	**51.**  **09930-48720** **Flywheel holder**	**52.**  **09930-76420** **Timing light**
53.  **09930-89240** **4-pin connector test cord**	**54.**  **09930-89210** **2-pin connector test cord**	**55.**  **09930-89251** **6-pin connector test cord**	**56.**  **09900-25002** **Pocket tester**
57.  **09930-99320** **Digital tester**	**58.**  **09950-69512** **Gearcase oil leakage tester**	**59.**  	**Pinion bearing installer and remover** **(A) 09951-59910** **Pinion bearing installer shaft** **(B) 01500-08403** **Bolt** **(C) 09951-39914** **Pinion bearing plate** **(D) 09951-19611** **Attachment**
60.  **09951-09511** **Gear adjusting gauge**	**61.**  **99954-53008-820*** **Digital voltmeter**	**62.**  **99954-53873*** **Stevens CD-77** **Peak reading voltmeter**	**63.**  **99954-53883*** **Gear oil filler**

NOTE:

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

MATERIALS REQUIRED

SUZUKI OUTBOARD MOTOR GEAR OIL  **99000-22540** **(400 ml × 24 pcs.)**	**SUZUKI SUPER GREASE "A"**  ***99000-25030** **99000-25010** **(500 g)**	**WATER RESISTANT GREASE**  **99000-25160** **(250 g)**	**SUZUKI SILICONE SEAL**  **99000-31120** **(50 g)**
SUZUKI BOND "1207B"  *** 99104-33140** **99000-31140** **(100 g)**	**THREAD LOCK "1342"**  **99000-32050** **(50 g)**	**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

2

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 & Bonding wires	—	I	I	I
Battery	—	I	I	I
Engine oil filter	R	—	—	R
Fuel filter	—	I	I	I
	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
Bolt & Nuts	T	—	T	T

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

MAINTENANCE AND TUNE-UP PROCEDURES

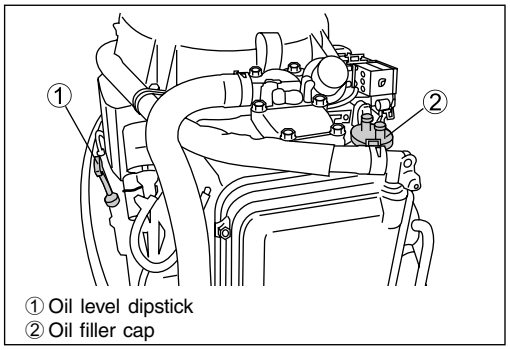
This section describes the servicing procedures for each of the periodic maintenance requirements.

ENGINE OIL / ENGINE OIL FILTER

ENGINE OIL LEVEL CHECK

Inspect oil level before every use.

(1) Place the outboard motor upright on a level surface.
(2) Remove the motor cover.
(3) Remove the oil level dipstick and wipe it clean.
(4) Insert it fully into the dipstick hole, then remove it to check oil level.

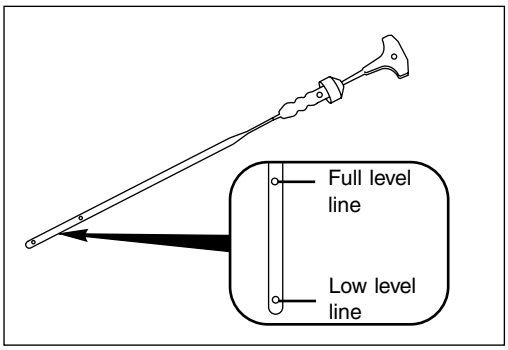


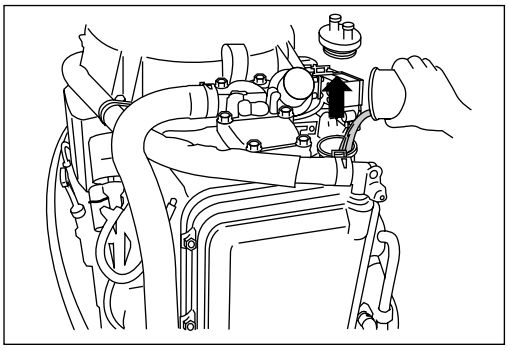
① Oil level dipstick
② Oil filler cap

(5) Oil level should be between the full level line (Max.) and low level line (Min.)

If the level is low, add recommended oil to full level line.

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





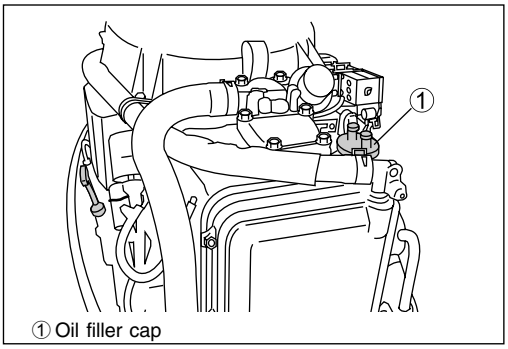
ENGINE OIL CHANGE / ENGINE OIL FILTER REPLACEMENT

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

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

NOTE:
- *Engine oil should be changed while the engine is warm.*
- *When replacing the engine oil filter, change engine oil at the same time.*

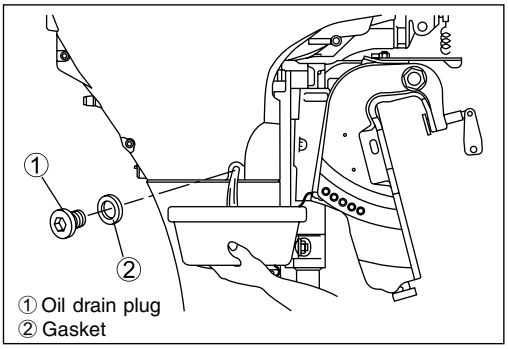
1. Place the outboard motor upright on a level surface.
2. Remove the oil filler cap.



① Oil filler cap

3. Place a container under the engine oil drain plug.

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

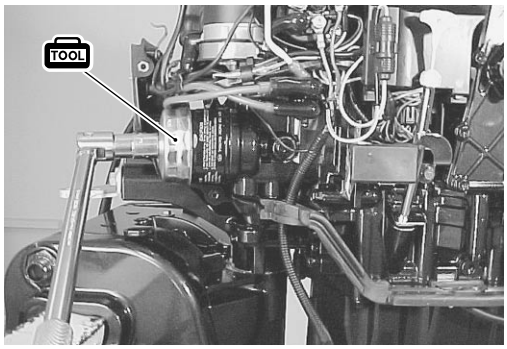


① Oil drain plug
② Gasket

5. ENGINE OIL FILTER REPLACEMENT

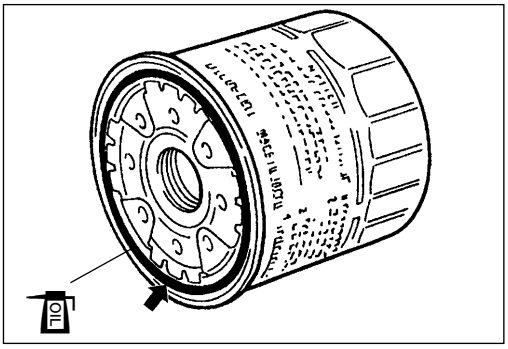
NOTE:
For engine oil change only, go to step 6.

To replace the engine oil filter :
(1) Remove the PORT side lower cover. (See page 8-2)
(2) Using oil filter wrench, loosen the oil filter.



TOOL 09915-47340 : Oil filter wrench

NOTE:
Before fitting new oil filter, be sure to oil O-ring.



(3) Screw new filter on by hand until the filter O-ring contacts the Mounting surface.

(4) Tighten the filter 3/4 turn from the point of contact with the mounting surface using an oil filter wrench.

Engine oil filter : 14 N·m (1.4 kg-m, 10.0 lb.-ft.), 3/4 turn.

(5) Install the PORT side lower cover.

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

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

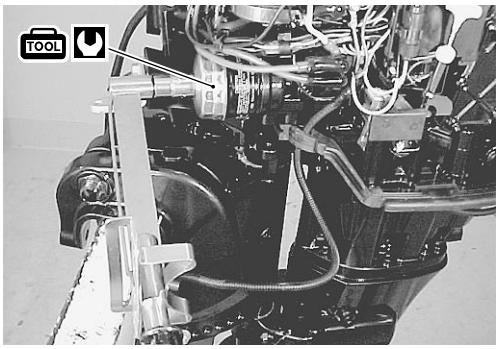
CAUTION

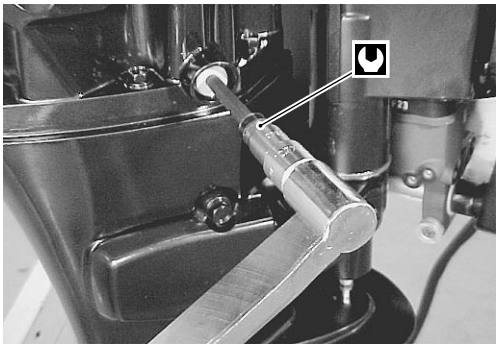
Do not re-use gasket. Always replace with a new gasket.

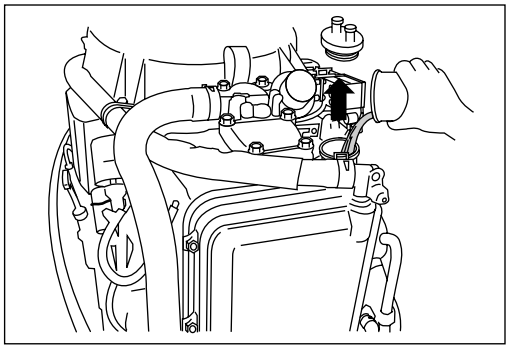
7. Pour recommended engine oil into the oil filler opening, then install the oil filler cap.

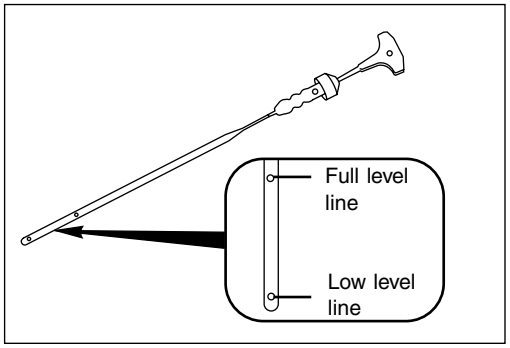
   Engine oil amounts
   Oil change only : 3.0 L (3.2 / 2.6 US / Imp. qt)
   Oil filter change : 3.2 L (3.4 / 2.8 US / Imp. qt)

8. Start the engine and allow it to run for several minutes at idle speed.
   Check oil filter for oil leakage.
   Turn off the engine and wait for approx. two minutes, then re-check the engine oil level.







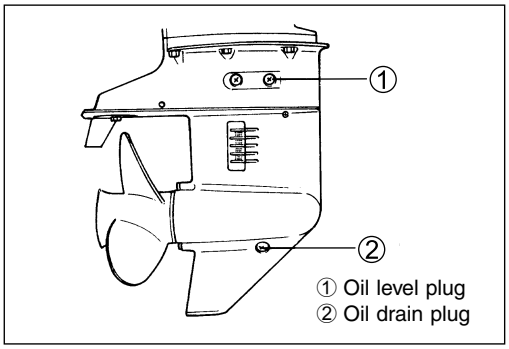


GEAR OIL

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.

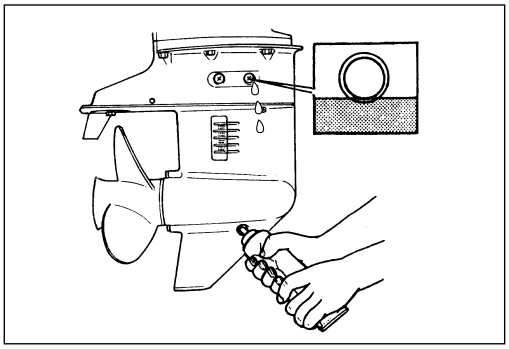
(3) Remove the lower gear oil drain plug before the gear oil level plug and drain the gear oil.



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

Gear oil amount : 230 ml (7.8 / 8.1 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 gaskets. Always use a new gasket.

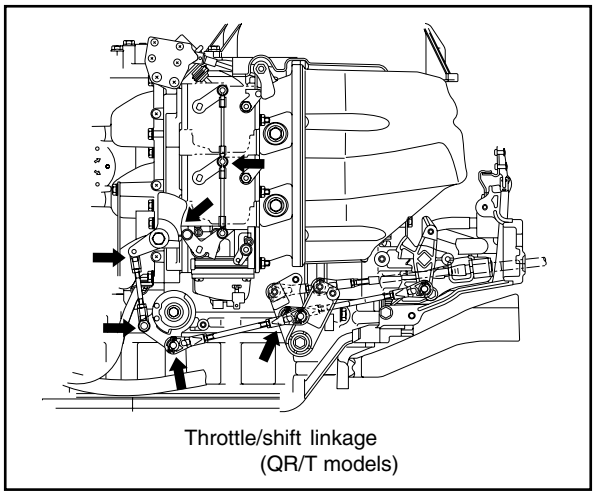
NOTE:
To avoid insufficient injection of gear oil, check the gear oil level 10 minutes after doing the procedure in the step (6). If the oil level is low, slowly inject the gear oil up to the correct level.

LUBRICATION

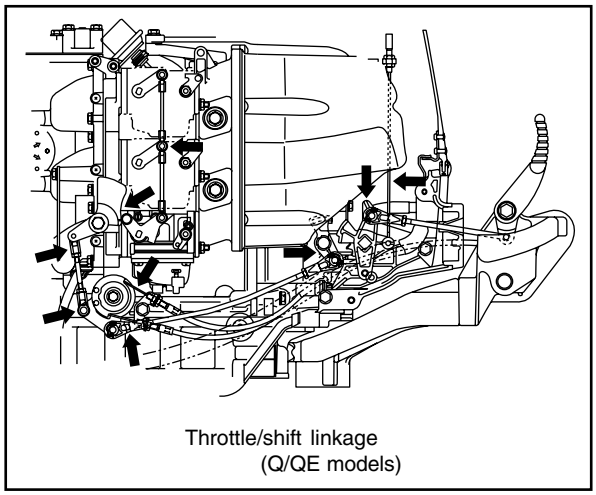
Inspect every 50 hours (3 months).

Apply Suzuki Water Resistant Grease to the following points.

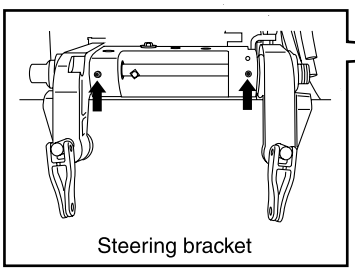
W/R G's 99000-25160 : Water Resistant Grease



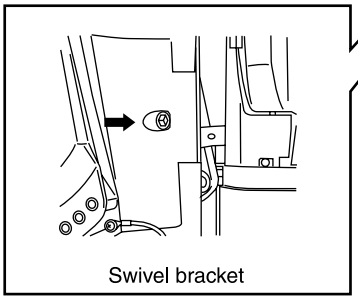
Throttle/shift linkage (QR/T models)



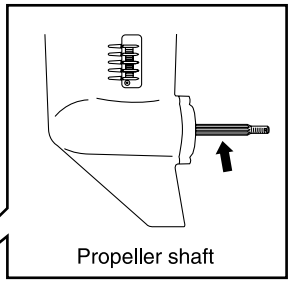
Throttle/shift linkage (Q/QE models)



Steering bracket

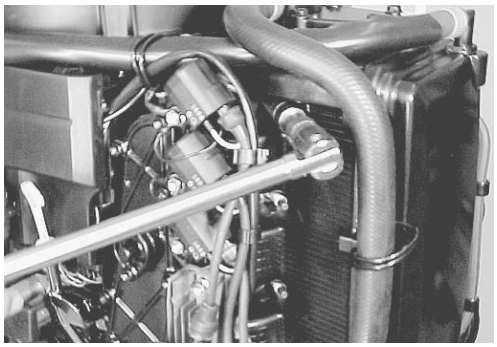


Swivel bracket



Propeller shaft

SPARK PLUG

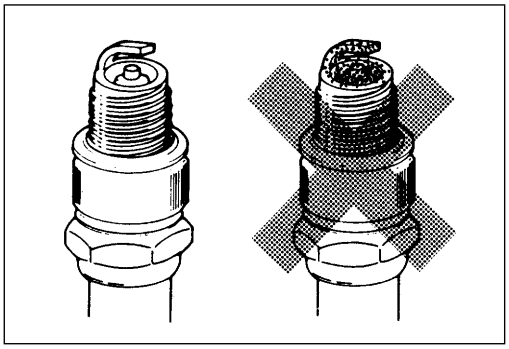


- **Inspect every 100 hours (6 months).**
- **Replace every 200 hours (12 months).**

Standard spark plug : NGK DCPR6E

CAUTION

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

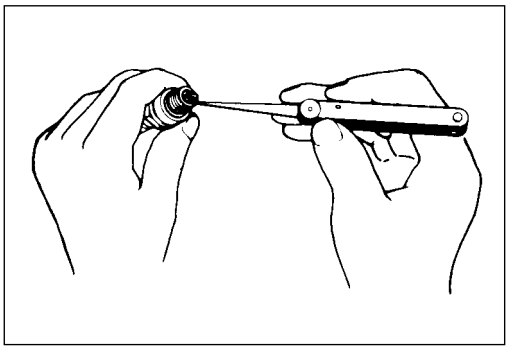


CARBON DEPOSIT

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

SPARK PLUG GAP

Use a thickness gauge to measure for correct spark plug gap.
Adjust to within the specified range if the gap is out of specification.

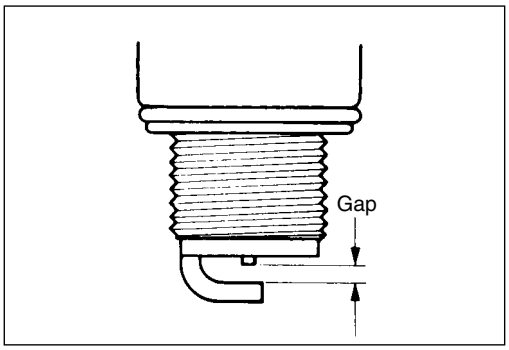


Spark plug gap : 0.8 – 0.9 mm (0.031 – 0.035 in.)

09900-20803 : Thickness gauge

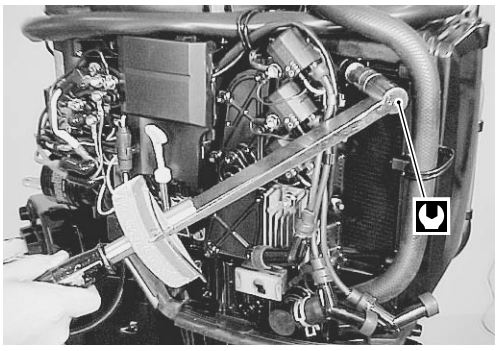
CONDITION OF ELECTRODE

Check the electrode for a worn or burnt condition.
If it is extremely worn or burnt, replace the spark plug.
Also, be sure to replace the plug if it has a broken insulator, damaged thread, etc.



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 : 18 N · m (1.8 kg-m, 13.0 lb.-ft.)

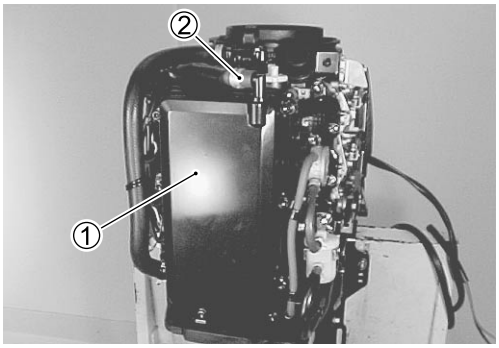
VALVE CLEARANCE

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

CHECKING AND ADJUSTING VALVE CLEARANCE

Checking

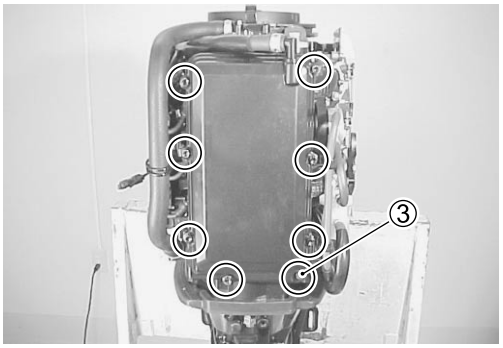
(1) Remove following parts :
- Engine side lower cover (see page 8-2)
- Recoil starter (Manual start model)
- Flywheel cover (Electric start model)
- Spark plugs



(2) Remove breather hose ② from cylinder head cover ①.

(3) Remove the eight (8) bolts ③ securing the cylinder head cover to the cylinder head and remove cylinder head cover ①.

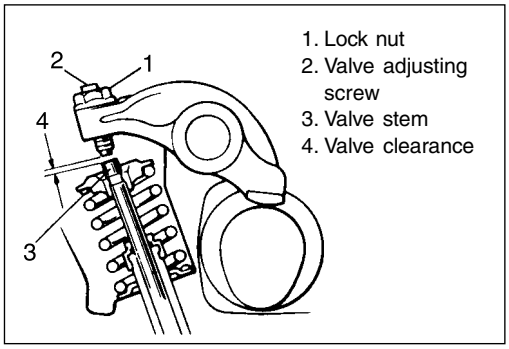
(4) Rotate crankshaft clockwise to bring each piston to Top Dead Center (TDC) on compression stroke.



CAUTION

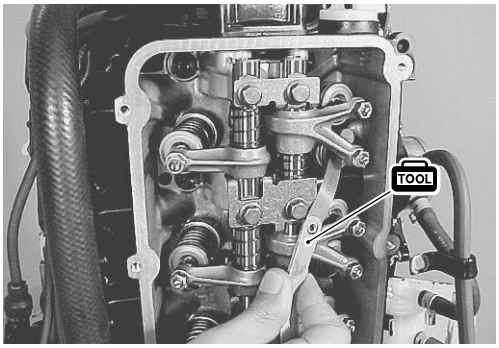
Rotate crankshaft clockwise to prevent water pump impeller damage.

NOTE :
- *Piston must be at its TDC on compression stroke to check or adjust valve clearance.*
- *Valve clearance specification is for COLD engine condition.*



(5) Measure valve clearance by inserting thickness gauge between valve stem end and valve adjusting screw on rocker arm.

TOOL 09900-20803 : Thickness gauge

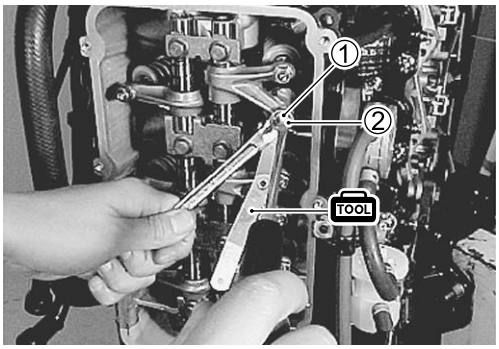


Valve clearance (cold engine condition) :
IN. 0.13 – 0.17 mm (0.005 – 0.007 in.)
EX. 0.13 – 0.17 mm (0.005 – 0.007 in.)

If out of specification, adjust valve clearance.

Adjustment

(6) Loosen valve adjusting lock nut ①.
(7) Turn valve adjusting screw ② to bring valve clearance to within the specification.



TOOL 09900-20803 : Thickness gauge

(8) Tighten valve adjusting lock nut ① to specified torque while holding valve adjusting screw ②.

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

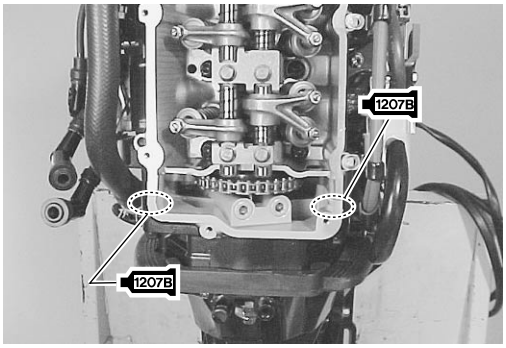
(9) Recheck valve clearance.

Reassembly

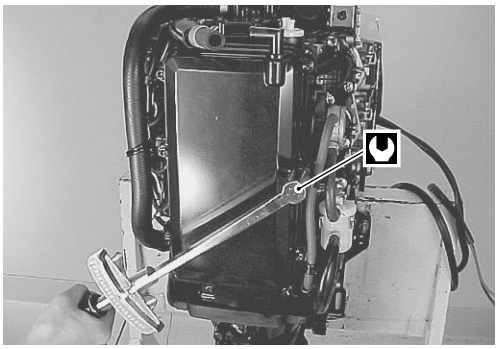
After checking and adjusting all valves, reverse removal procedure for installation.

- Install the cylinder head cover. (See page 7-9)

NOTE :
Examine cylinder head cover gasket for damage. Always replace gasket if sealing performance is suspect.



- Tighten cylinder head cover bolts to specification.



Cylinder head cover bolt :
11 N·m (1.1 kg-m, 8.0 lb.-ft.)

IDLE SPEED

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

Checking

NOTE :

- *Before checking the idle speed, the engine should be allowed to warm up.*
- *Check and / or adjust the idle speed after the engine speed has stabilized.*

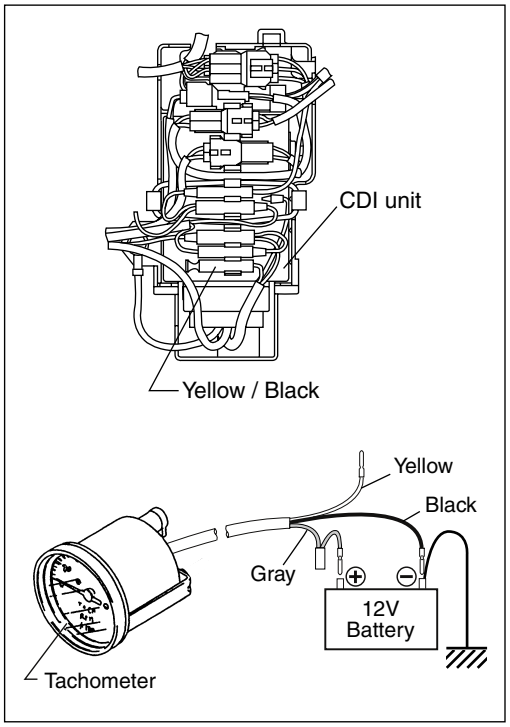
1. Check link mechanism and carburetor throttle valves for smooth operation.
2. Connect the tachometer lead wires as follows:

TOOL 34200-92E02 : Engine tachometer

- Yellow lead wire to the Yellow/Black lead wire of CDI unit.
- Gray lead wire to DC 12V power source positive terminal.
- Black lead wire to DC 12V power source negative terminal.
- Set the pole selection switch in the tachometer to “12”.

3. Start the outboard motor.
4. Check the idle speed.

Idle speed (in neutral gear) : 850 – 950 r/min



Adjustment

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

NOTE :

- *Before adjusting idle speed, make sure carburetor throttle valves are properly synchronized.*
  (See the “SYNCHRONIZING THROTTLE VALVES” section on page 2-13.)
- *Adjust the idle speed by rotating the idle adjusting screw only.*
- *Do not rotate the throttle valve screws in Top & 2nd carburetor to adjust idle speed.*

NOTE :
There are two types of carburetor as follows :
(A) . Carburetor with covered pilot screw
The pilot screw turns open are preset at factory and the screw is covered by plate.
Do not try to remove the cover over the pilot screw.
(B) . Carburetor with uncovered pilot screw
For this type of carburetor, the pilot screw turns open are adjustable.

1. Turn the pilot screw to bring it to the standard specification. (for applicable carburetor only)

Pilot screw initial setting
DF25 1-½ turns open
DF30 1-½ turns open

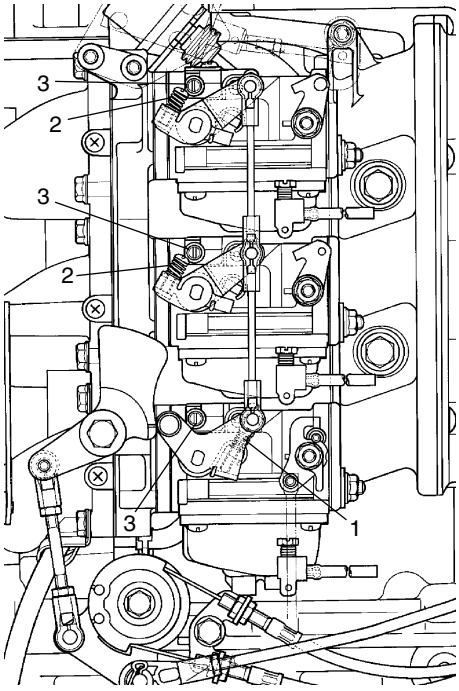
NOTE :
When turning pilot screws fully in, lightly seat them only. Do not over tighten to avoid damaging needle valve and seat.

2. Turn the idle adjusting screw.
   - Turning inward : Engine speed becomes higher (clockwise)
   - Turning outward: Engine speed becomes lower (counterclockwise)

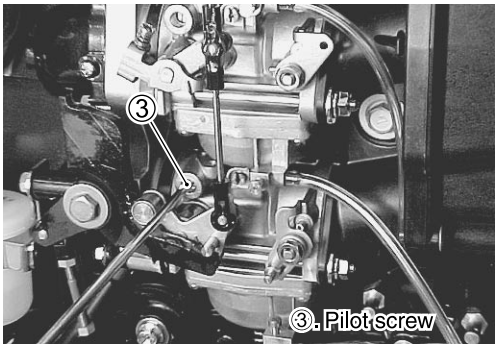
3. Adjust pilot screws in small increments until a stable engine speed is achieved.

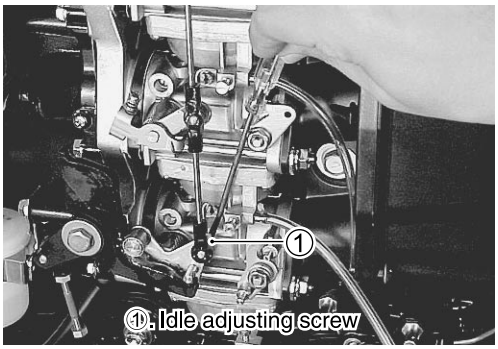
NOTE :
Turning pilot screw inward (clockwise):
- *The fuel / air mixture becomes leaner.*

Turning pilot screw outward (counterclockwise):
- *The fuel /air mixture becomes richer.*



1. Idle adjusting screw
2. Throttle valve screw
3. Pilot screw





CARBURETOR

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

EXTERNAL CHECK

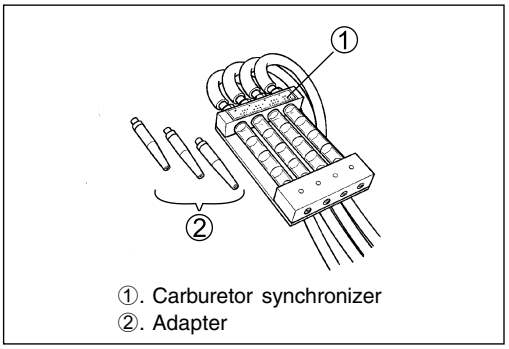
If crack or other damage on carburetor body / lever / rod / connector / fuel inlet or silencer, replace.

SYNCHRONIZING THROTTLE VALVES

09913-13121 : Carburetor synchronizer

NOTE:
Before synchronizing the throttle valve, check link mechanism and carburetor valves for smooth operation.

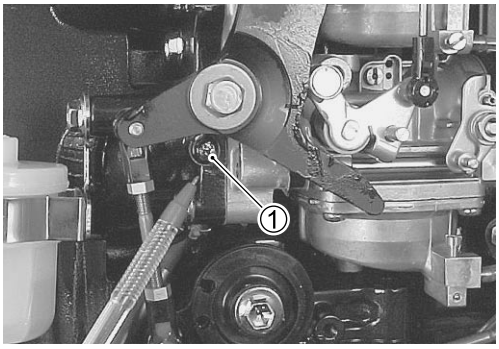
Prior to this service work
- **Remove the STBD side lower cover.**



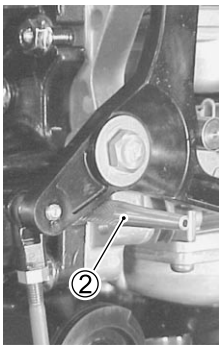
①. Carburetor synchronizer
②. Adapter

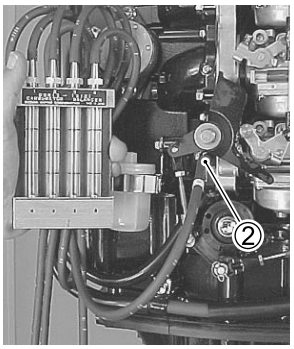
[Calibrate carburetor synchronizer]

1. Remove the impulse plug ① of No.3 intake manifold.



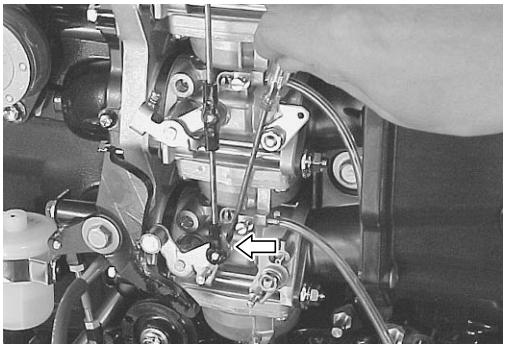
2. Install carburetor synchronizer gauge adapter ② to impulse plug hole of No.3 intake manifold.
3. Connect the hose of No.3 tube in carburetor synchronizer to the adapter ②.



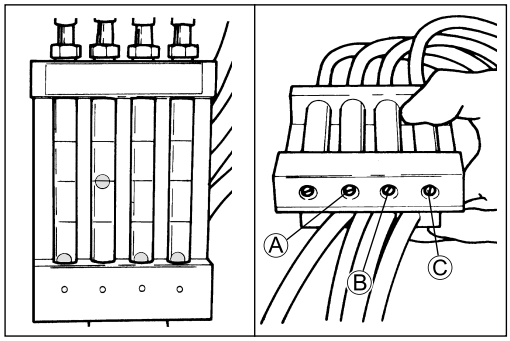


4. Start the engine and warm it up enough.
   Make sure the choke valve is fully open.
5. Check idle speed, then rotate idle adjusting screw of No.3 carburetor to set the engine at the specified idle speed.

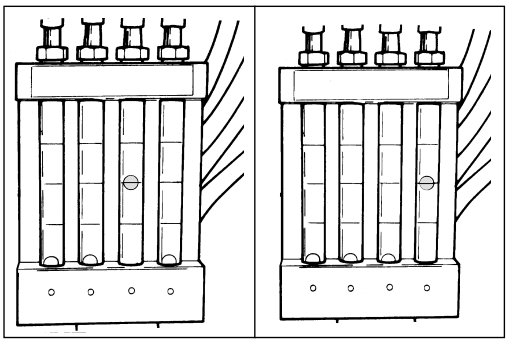
Idle speed (in neutral gear) : 850 – 950 r/min



Turn balancer air screw Ⓐ to left/right to bring the steel ball to the center line of the tube.

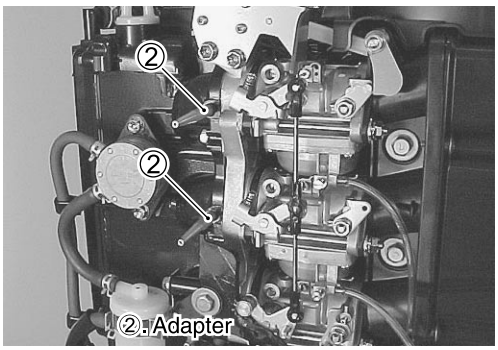


6. Connect each hose of No.1 tube and No.2 tube in synchronizer to the adapter ② in turn.
   Turn each balancer air screw Ⓑ · Ⓒ to bring the steel ball to the center line of each tube.

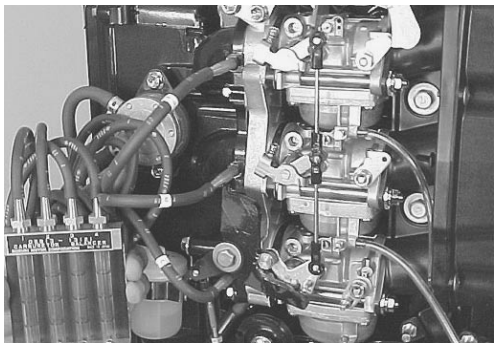


[Synchronizing throttle valves]

7. Remove the remaining impulse plugs from No.1 & No.2 intake manifold, then install carburetor synchronizer gauge adapters.



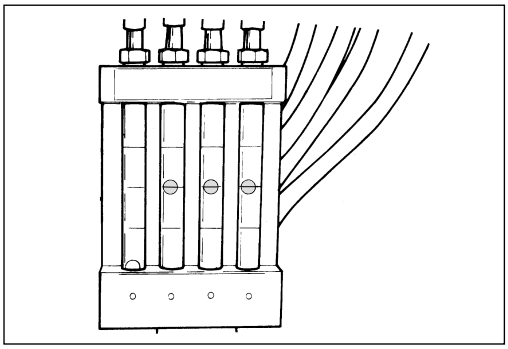
8. Connect each synchronizer hose to corresponding intake manifold adapter by marked number.



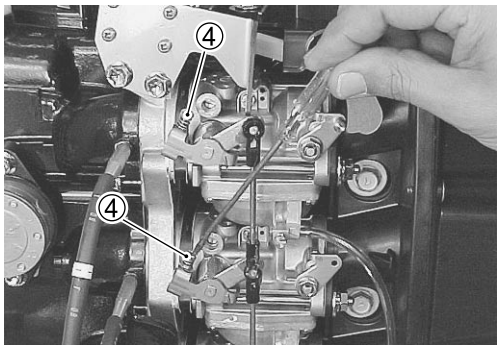
9. Start the engine.

NOTE:
When synchronizing the throttle valves, it is very important to synchronize them in the idle position rather than any other throttle position.

10. With the engine warmed up and idling at specified speed, the steel balls must be at the same height in each of the tubes.



11. Adjust the throttle valve screw(s) ④ until the carburetors are synchronized (steel balls at the same height in each of the tubes) and the engine idles smoothly.



NOTE:
If the engine speed has been raised or lowered due to the adjustment, it is necessary to reset the engine at the specified idle speed by turning idle adjusting screw of No.3 carburetor. (See page 2-11)

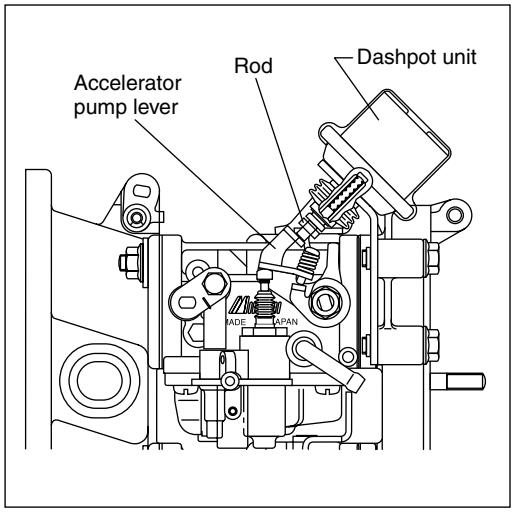
12. Shift into the "Forward" position, then check the in-gear idle speed.

In-gear idle speed: Approx. 850 r/min

13. After stopping engine, remove the synchronizer from the impulse plug hole; then install the impulse plugs.

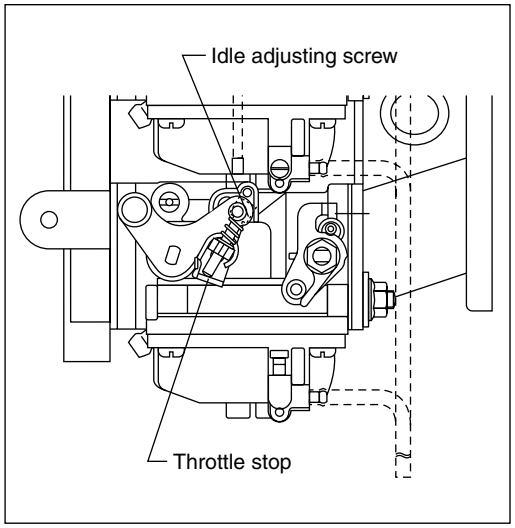
DASHPOT ADJUSTMENT

The purpose of the dashpot is to provide a controlled return to idle speed when the throttle is closed. The effect of a properly functioning and adjusted dashpot will be engine speed holding shortly at approximately 1500 r/min and then slowly dropping to idle. The dashpot's ability to perform a controlled return to idle as designed should always be checked and adjusted if necessary after synchronizing carburetor throttle valves.



Adjust the dashpot effect using the following procedures.

1. Start the engine and bring it up to normal operating temperature.
2. Turn the No.3 carburetor idle adjust screw to set engine speed at 4000 r/min., counting the number of idle adjust screw turns between idle and 4000 r/min.



NOTE:
Dashpot adjustments must be made in neutral gear.

3. Stop the engine.
4. Remove the flywheel cover or recoil starter.
5. Operate the throttle control grip (or throttle lever) to bring the throttle to full open position.
6. Return the throttle gradually while watching the tip of the dashpot unit rod. The dashpot rod tip must contact the accelerator pump lever at the same time the No 3 carburetor idle adjust screw contacts the throttle stop.

7. If these two contacts do not occur at the same time, adjust the dashpot unit rod in or out as necessary.

   Turning dashpot rod clockwise ..... Rod retracts (in)
   Turning dashpot rod counterclockwise .. Rod extends (out)

8. To reset engine idle speed, return the No.3 carburetor idle adjust screw to its original position (i.e. the number of turns counted in step 2).
9. Install the flywheel cover or recoil starter.
10. Start the engine and, if necessary, adjust engine rpm to the specified in-gear idle speed.
11. As a final check of proper adjustment, shift into forward gear and quickly decelerate to full closed throttle from several different throttle positions, checking the dashpot's ability to provide a controlled return to idle speed each time the throttle is closed.

IGNITION TIMING

Inspect every 200 hours (12 months)

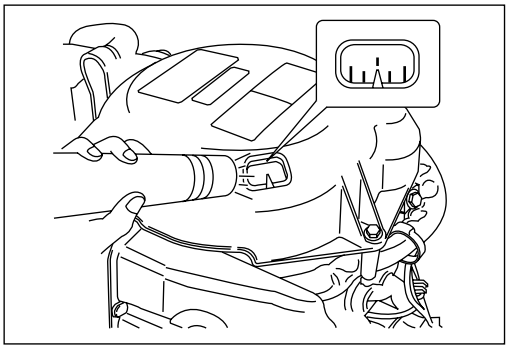
NOTE:
- *Before checking ignition timing, the engine should be allowed to warm up.*
- *Before checking the ignition timing, make sure idle speed is adjusted within the specification.*

(1) Start the engine.
(2) Attach the timing light cord to the No.1 ignition coil H-T cord.

09930-76420 : Timing light

(3) Check the ignition timing while operating the engine at 900 r / min.

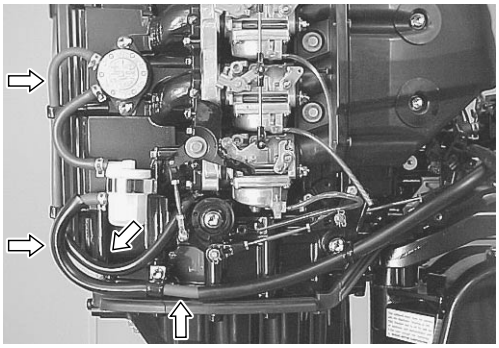
Ignition timing : Approx. BTDC 5° at 900 r / min.

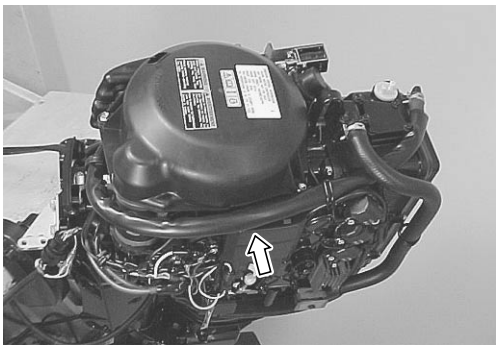


BREATHER AND FUEL LINE

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

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

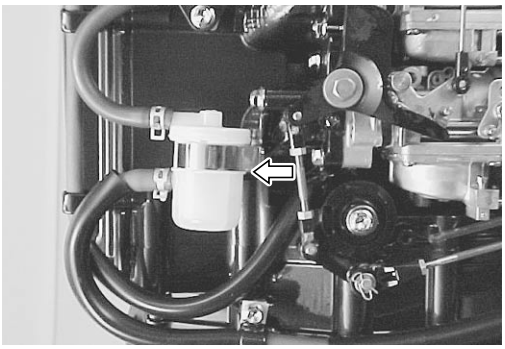




FUEL FILTER

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

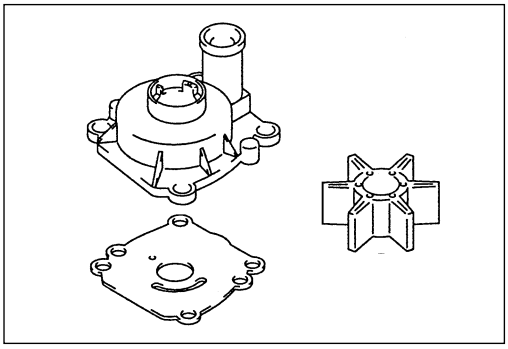
If water accumulation, sediment, leakage, cracks, or other damage is found, replace the fuel filter.



WATER PUMP / WATER PUMP IMPELLER

WATER PUMP
Inspect every 200 hours (12 months).

Inspect case and under panel.
Replace If wear, cracks, distortion or corrosion is found.



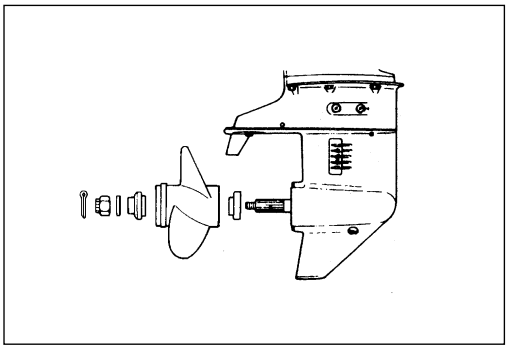
WATER PUMP IMPELLER
Replace every 200 hours (12 months).

Inspect water pump impeller.
Replace if vanes are cut, torn or worn.

PROPELLER / NUT / COTTER PIN

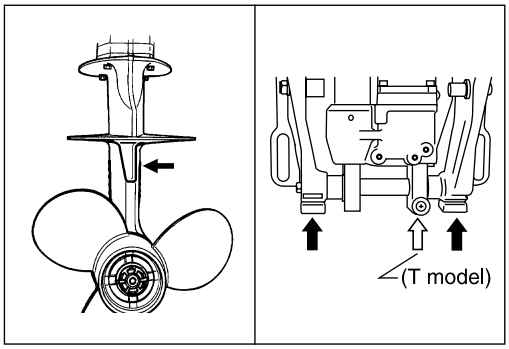
Inspect initially after 20 hours (1 month) and every 100 hours (6 months) thereafter.

- Inspect the propeller for bent ,chipped or broken blades. Replace propeller if damage noticeably affects operation.
- Inspect propeller splines. Replace propeller if splines are worn or damaged.
- Inspect propeller bush for slippage. Replace if necessary.
- Make sure the propeller nut is torqued to specification and cotter pin is installed securely.



ANODES AND BONDING WIRES

Inspect every 50 hours (3 months).

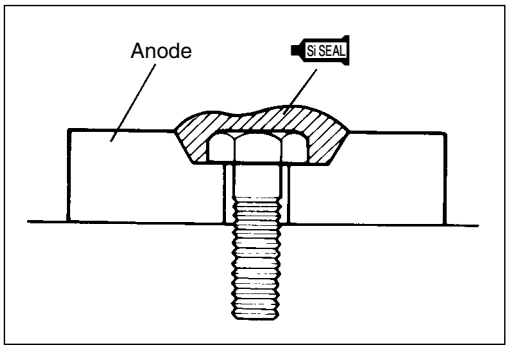


ANODES

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

CAUTION

Never paint the anode.

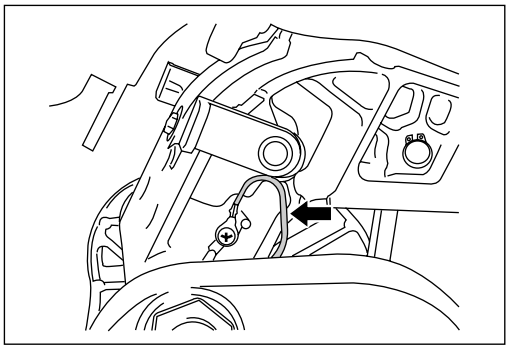


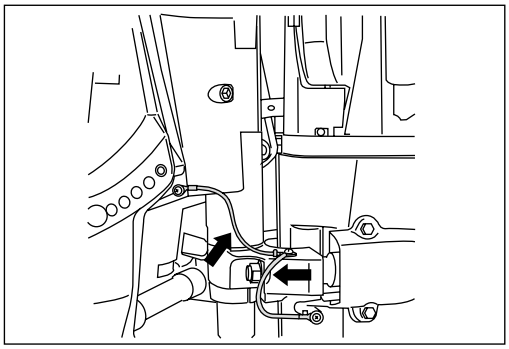
NOTE:
The anode securing bolt should be covered with Suzuki Silicone Seal.

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

BONDING WIRES

- If breakage or other damage is found on the wire, replace the wire.
- If rust, corrosion, or other damage is found on terminal, clean with cleaning solvent or replace the wire.





BATTERY

Inspect every 50 hours (3 months)

⚠ WARNING

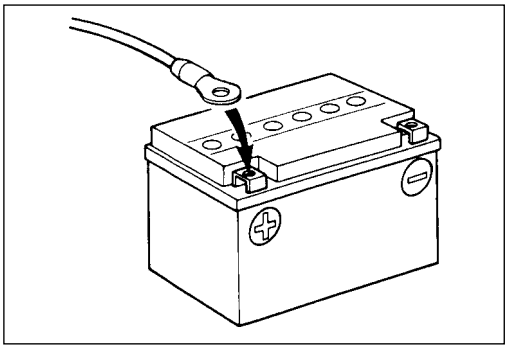
- **Never expose battery to open flame or electric spark as batteries generate gas, which is flammable and explosive.**
- **Battery acid is poisonous and corrosive. Avoid contact with eyes, skin, clothing, and painted surfaces. If battery acid comes in contact with any of these, flush immediately with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

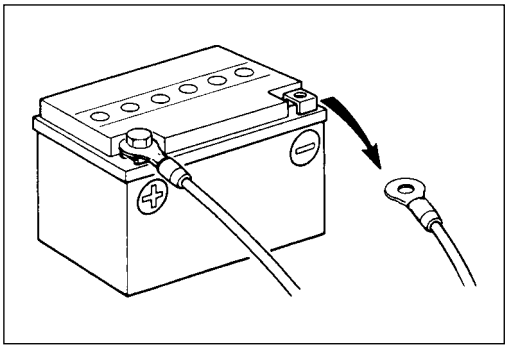
Recommended battery :
12 V 40 Ah (144 kC) or larger

CONNECTING BATTERY

Upon completion of connection, lightly apply grease to the battery terminals.
How to connect :
(1) Connect the positive (+) terminal first.
(2) Connect the negative (–) terminal second.

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



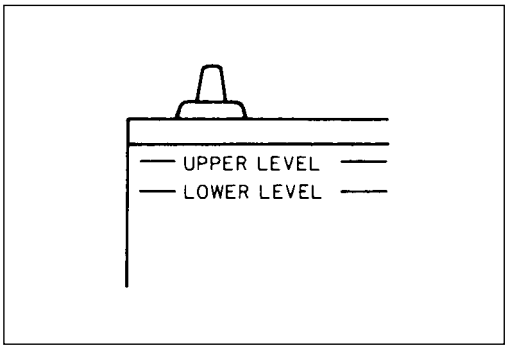


CAUTION

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

BATTERY SOLUTION LEVEL CHECK

Battery solution level should be between the UPPER level and LOWER level.
If the level is low, add distilled water only.



CAUTION

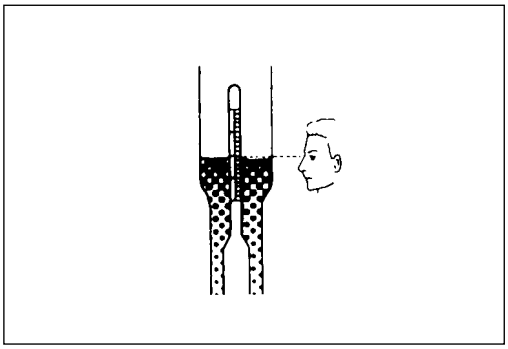
Once the battery has been initially serviced, NEVER add diluted sulfuric acid, or you will damage the battery. Follow the battery manufacture's instructions for specific maintenance procedures.

BATTERY SOLUTION GRAVITY CHECK

Measure the gravity of battery solution using a hydrometer.

Battery solution gravity : 1.28 at 20°C

09900-28403 : Hydrometer



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 their specified torque.

ITEM		THREAD DIAMETER	TIGHTENING TORQUE		
			N · m	kg-m	lb-ft
Cylinder head cover bolt		6 mm	11	1.1	8.0
Cylinder head bolt	out side	8 mm	25	2.5	18.0
	inside	10 mm	62	6.2	45.0
Flywheel bolt		16 mm	190	19.0	137.5
Power unit mounting bolt		8 mm	23	2.3	16.5
		10 mm	50	5.0	36.0
Clamp bracket shaft nut		22 mm	43	4.3	31.0
Gearcase bolt		8 mm	23	2.3	16.5
Propeller nut		14 mm	18	1.8	13.0

OIL PRESSURE

Oil pressure (at normal operating temp.):
400 – 500 kPa (4.0 – 5.0 kg / cm², 57 – 71 psi.)
at 3000 r/min.

NOTE:
The figure shown above is a guideline only, not an absolute service limit.

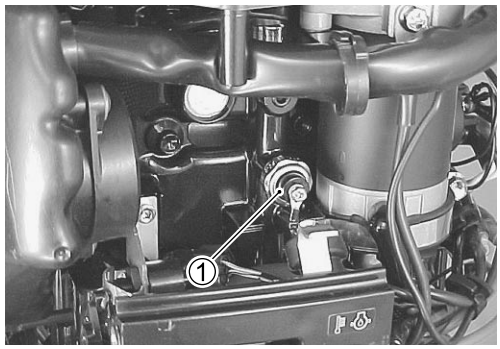
If oil pressure is lower or higher than specification, the following causes may be considered.
(See page 7-62 for oil passage locations)

Low oil pressure
- Clogged oil filter
- Leakage from oil passages
- Defective oil pump
- Defective oil pressure regulator
- Damaged O-ring
- Combination of above items.

High oil pressure
- Using an engine oil of too high viscosity
- Clogged oil passage
- Clogged oil pressure regulator
- Combination of above items

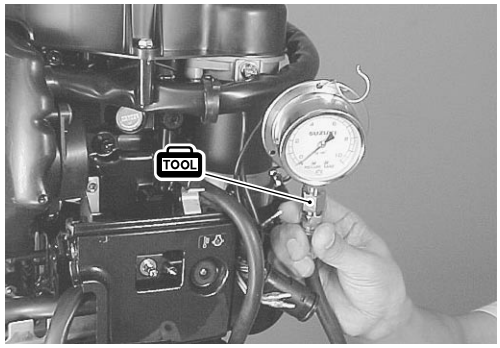
TEST PROCEDURE

(1) Check the engine oil level.
(2) Loosen screw and disconnect blue / yellow lead wire from switch.
(3) Remove oil pressure switch ①.



(4) Install the oil pressure gauge in oil pressure switch hole.

09915-77310 : Oil pressure gauge
09915-78211 : Oil pressure gauge adapter



(5) Connect the tachometer lead wires as follows:

TOOL 34200-92E02 : Engine tachometer

- Yellow lead wire to the Yellow/Black lead wire of CDI unit.
- Gray lead wire to DC 12V power source positive terminal.
- Black lead wire to DC 12V power source negative terminal.
- Set the pole selection switch in the tachometer to “12”.

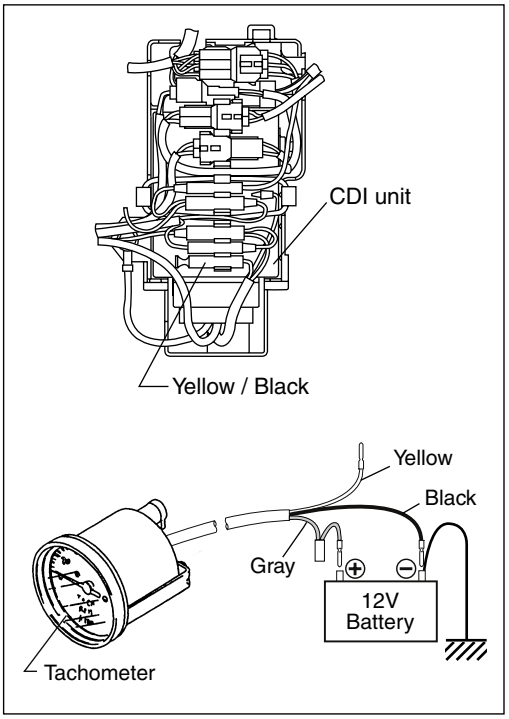
(6) Start the engine and warm up engine as follow :

Summer : 5 min. at 2000 r/min.

Winter : 10 min. at 2000 r/min.

(7) After warming up, shift into forward gear and increase the engine speed to 3000 r/min. then compare the pressure indicated on the gauge to specifications.

(8) After testing, reinstall oil pressure switch (See page 3-19).



CYLINDER COMPRESSION

Cylinder compression :
Standard : 1000 – 1400 kPa (10 – 14 kg / cm², 142 – 199 psi.)
Max. difference between any other cylinders : 100kPa (1.0 kg / cm², 14 psi.)

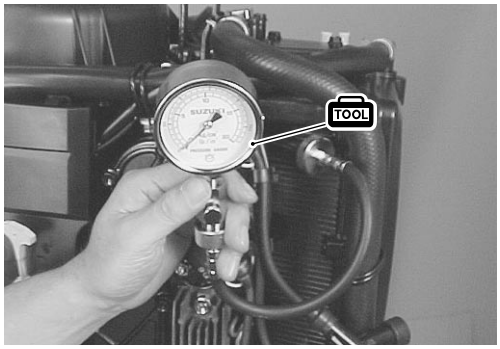
NOTE:
Figures shown are guidelines only, not absolute service limits.

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 engine and allow to warm up, then shut engine off.
(2) Remove the STBD / PORT engine side lower cover.
(3) Remove all spark plugs.
(4) Install the compression gauge into the plug hole.

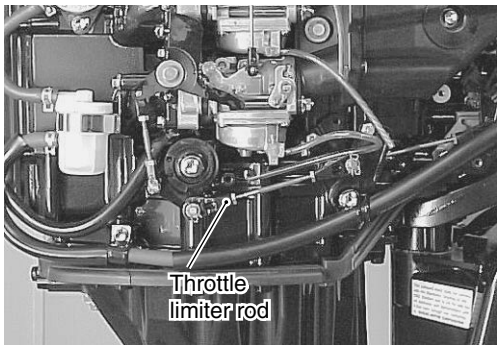
TOOL **09915-64510 : Compression gauge**
09915-63210 : Compression gauge adaptor



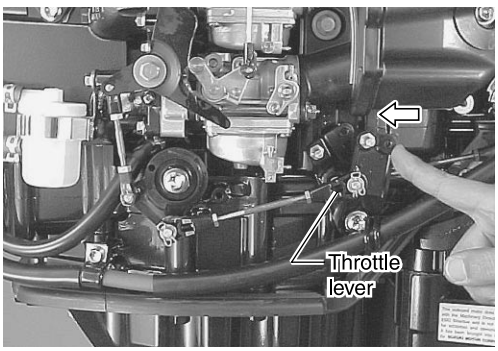
(5) Disconnect the safety lanyard from the emergency stop switch.

⚠ 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.



(6) • Disconnect the remote control throttle cable from the throttle lever. (R model)
• Disconnect the throttle limiter rod from throttle drum. (Tiller handle model.)
(7) • Move and hold the throttle lever in the full-open position. (R model)
• Move and hold the throttle control grip in the full-open position. (Tiller handle model.)
(8) While cranking the engine with the starter motor or recoil starter, note the maximum compression pressure reading on the gauge for each cylinder.
(9) Reinstall parts removed earlier. (spark plug, side lower cover, etc.)



ENGINE CONTROL SYSTEM

CONTENTS

IGNITION SYSTEM

SYSTEM COMPONENTS

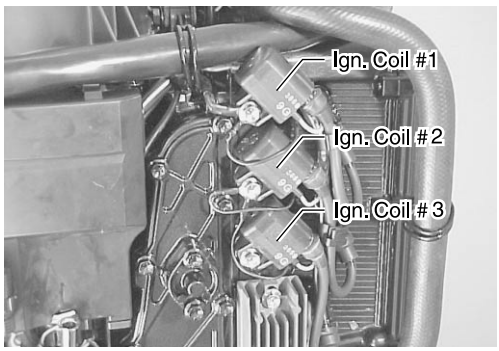
Ignition system consists of power source coil, CKP sensor, CDI unit, ignition coil and engine stop switch.

FUNCTION AND FAILURE SYMPTOMS

IGNITION COIL

Function

There is an independent coil for each cylinder.
Voltage from the CDI unit is greatly increased to produce the power needed for a spark at the plug.



Failure symptoms

A failed coil will produce no spark at that particular cylinder.
Starting will be difficult and idling / acceleration will be poor.

POWER SOURCE COIL

Function

This coil provides the power source for the engine control system.

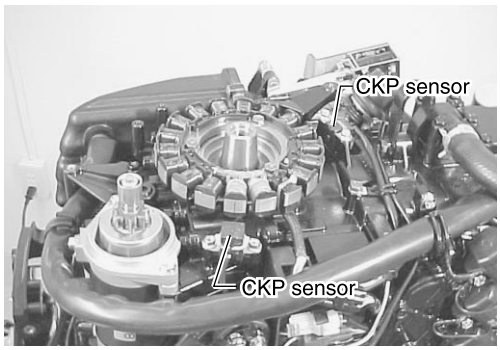
Failure symptoms

The ignition and caution systems will not function.

CKP (Crankshaft position) SENSOR

Function

There are two (2) CKP sensor installed below the flywheel rotor.
When the reluctor bar on the flywheel passes the sensors, a signal (voltage pulse) is generated and sent to CDI unit.
This is the fundamental signal used to judge the engine speed and crankshaft angle.
CKP sensor sends basic signal for determining ignition timing to CDI unit.



Failure symptoms

When No.1 CKP sensor is NG:

- Spark on No.2 and No.3 cylinders only.
- Ignition timing fixed at BTDC5°

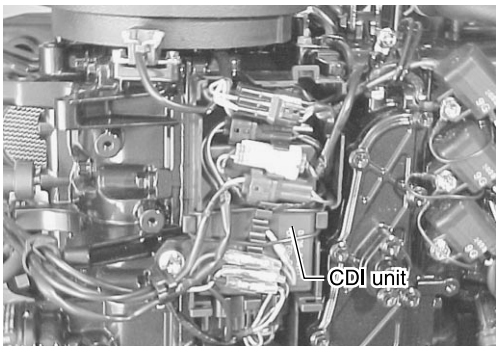
When No.2 CKP sensor is NG:

- Spark on No.1cylinder only. (Less than 1000 r/min)
- Spark on No.1 and No.2 cylinders only. (1000 r/min or over)
- Ignition timing fixed at BTDC5°

CDI UNIT

Function

This is the single most important component in the ignition system.
Its function is to store and discharge current to each ignition coil and operate the caution system.



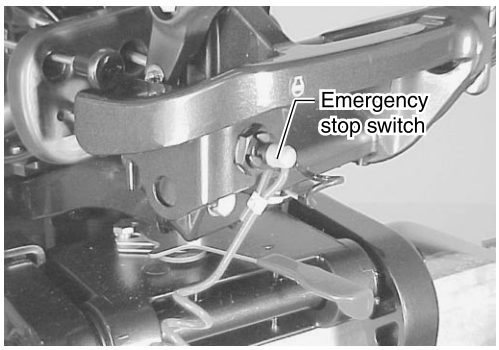
Failure symptoms

- No spark.
- Erratic timing or non- operation of the RPM limiter and caution lamp when caution system activates.

EMERGENCY STOP SWITCH

Function

When the cord from the plate of the switch is secured to the operator, the plate will be pulled off if the operator is suddenly thrown overboard.
Switch will be closed circuit when the plate is removed, power to all cylinders will cease and the motor will stop instantly.



Failure symptoms

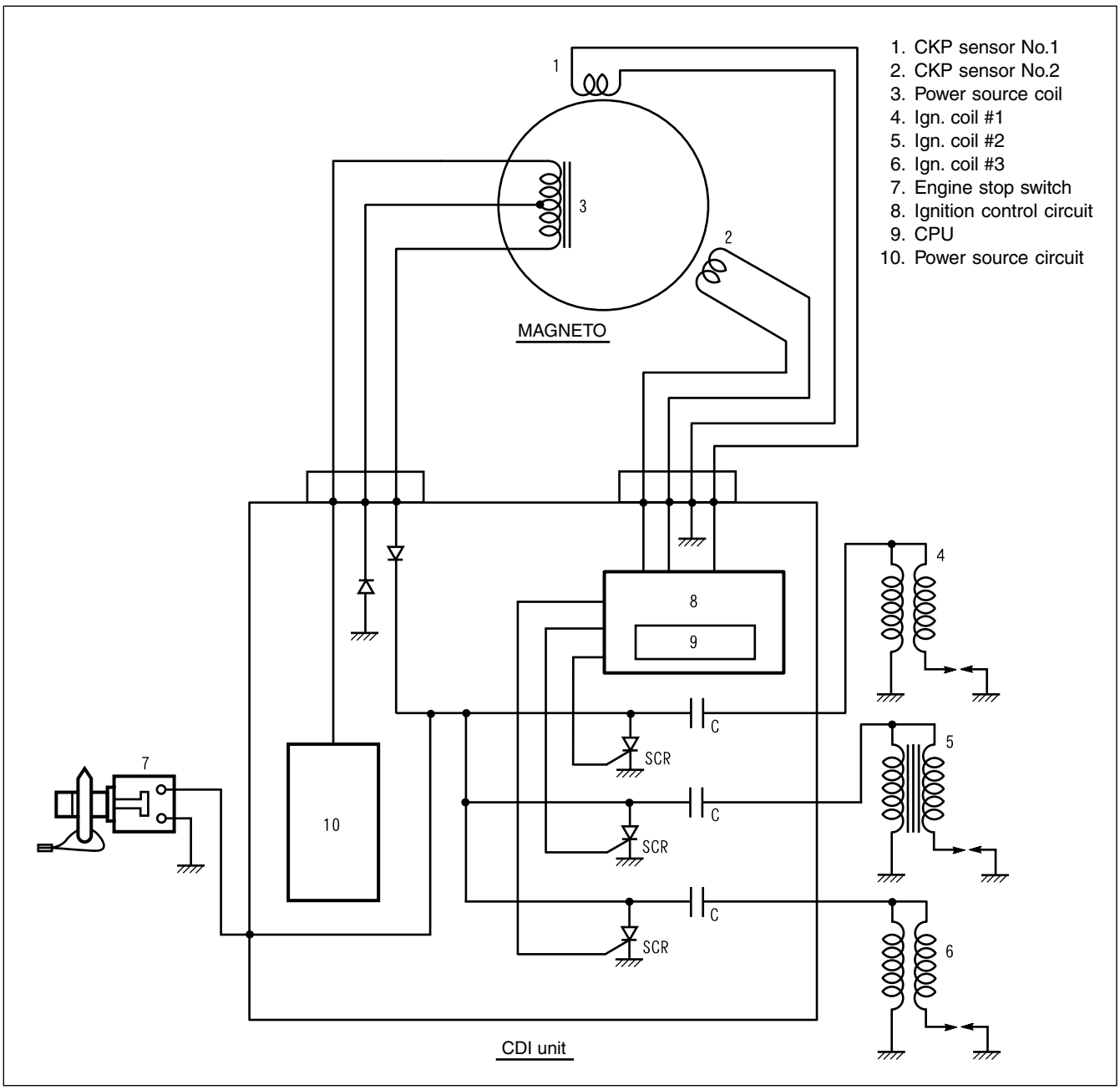
A switch short circuit will not allow the motor to start.

PRINCIPLES OF OPERATION

The ignition system is a condenser discharge type.
The condenser built in the CDI unit stores the electrical energy generated by the power source coil.
The electrical energy stored in the condenser is released to the ignition coil primary windings by the ignition timing signal calculated by the CDI microcomputer from the CKP (Crankshaft position) sensor signals.

SPECIFICATION

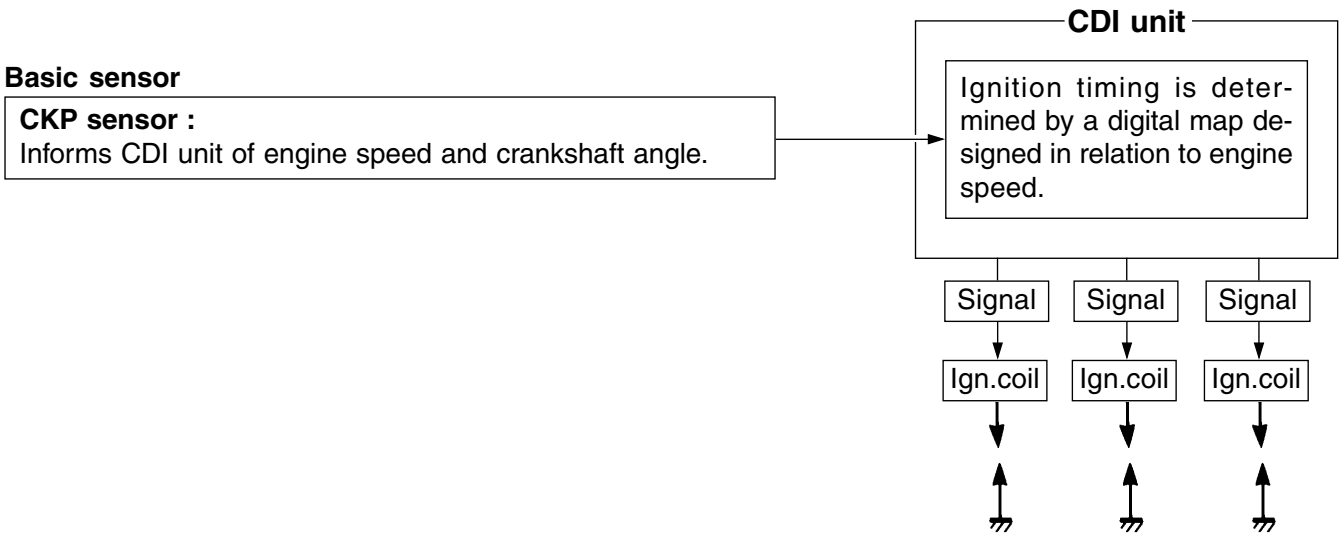
Ignition type	CDI
Advance	Electronic microcomputer control
Ignition timing	DF 25 : BTDC 5° – 31° DF 30 : BTDC 5° – 29°
Firing order	1 – 3 – 2



IGNITION TIMING CONTROL

Outline

The ignition timing varies based upon engine speed.
The CKP sensors monitor current engine speed and send signals to the CDI unit.
Based on this signal, the CDI unit determines the optimum ignition timing and supplies voltage to the primary winding of the ignition coil.



Control mode

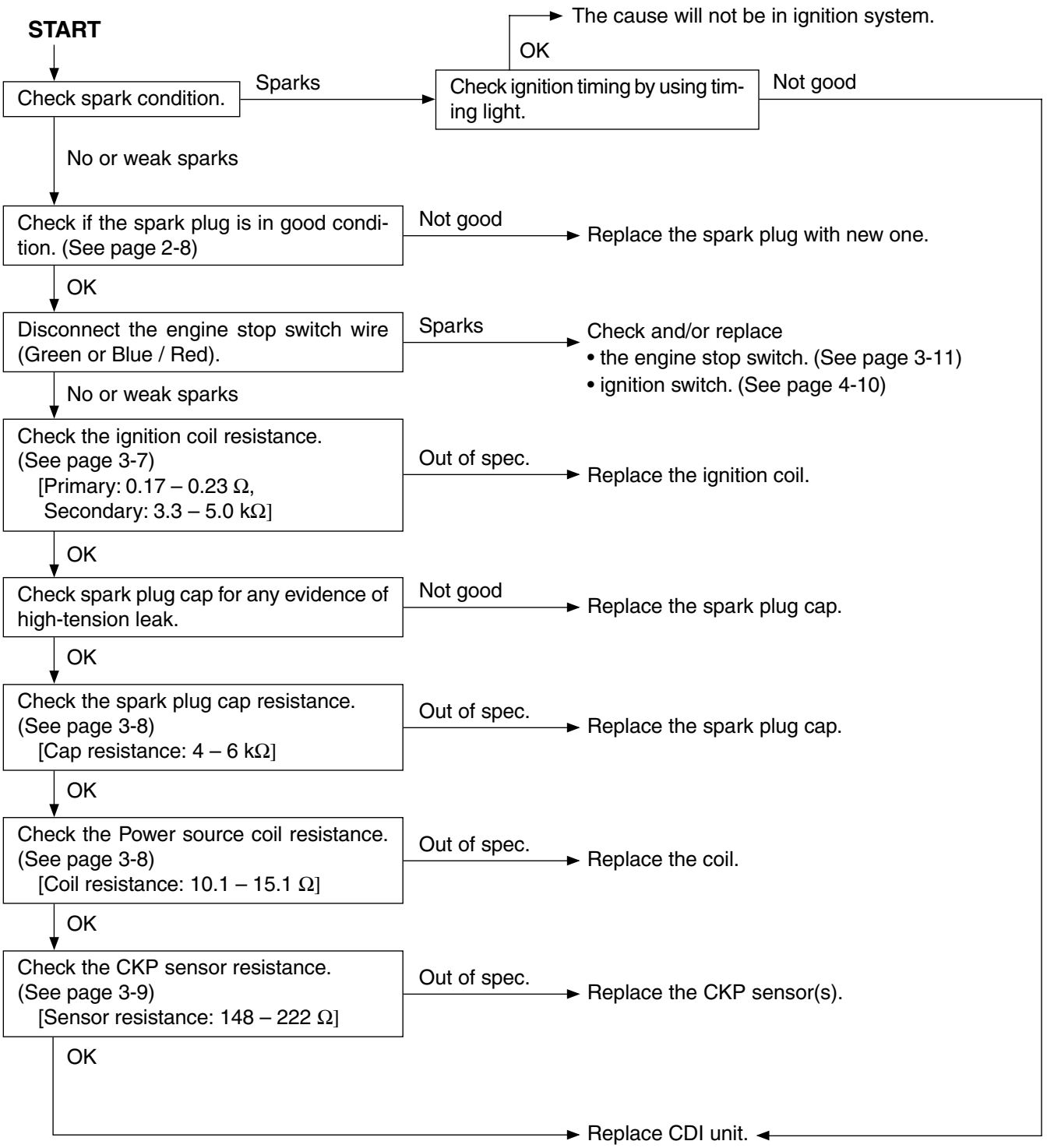
When starting (at the time of cranking):
The ignition timing is fixed at BTDC 5° until the engine starts.

When operating (normal operation):
The ignition timing varies in the range of BTDC 5° – 31° (DF25) or 29° (DF30) according to the engine operating condition.

TESTING IGNITION SYSTEM

IGNITION TROUBLESHOOTING

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



CHECKING COIL RESISTANCE

CAUTION

Always disconnect the battery cable from battery before commencing electrical resistance check.

IGNITION COIL

09930-99320 : Digital tester

Tester range : Ω (Resistance)

Primary side

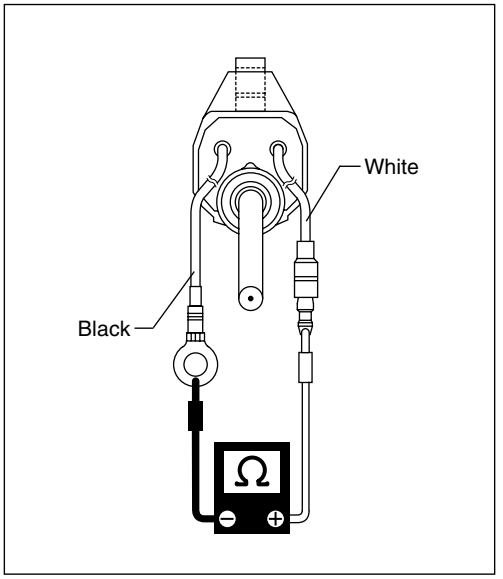
1. Disconnect primary coil lead wires from CDI unit.
2. Connect tester probe to coil lead wires as shown.

Ignition coil	Tester probe connection	
	Red (+)	Black (–)
No.1	White	Black
No.2		
No.3		

3. Measure resistance.

Primary coil resistance : 0.17 – 0.23 Ω

If measurement exceeds specification, replace ignition coil.



Secondary side

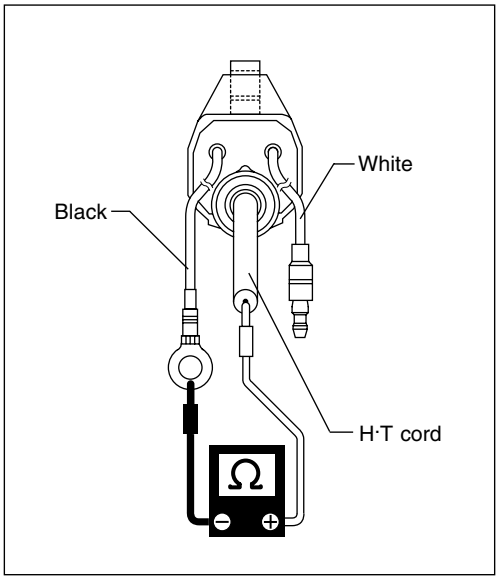
1. Remove spark plug cap from high tension cord.
2. Connect tester probe to Black coil lead wire and high tension cord as shown.

Ignition coil	Tester probe connection	
	Red (+)	Black (–)
No.1	High tension cord	Black
No.2		
No.3		

3. Measure resistance.

Secondary coil resistance : 3.3 – 5.0 kΩ

If measurement exceeds specification, replace ignition coil.

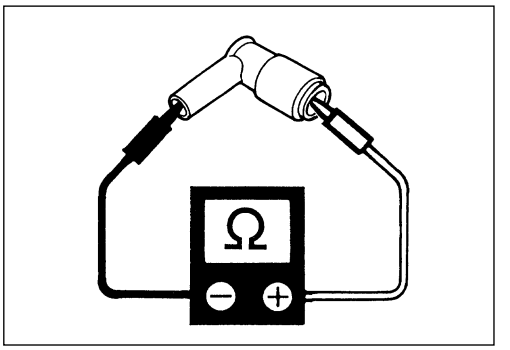


Spark plug cap

1. Remove spark plug cap from high tension cord.
2. Connect tester probes to both contact ends of cap.
3. Measure resistance.

Spark plug cap resistance : 4 – 6 k Ω

If measurement exceeds specification, replace spark plug cap.



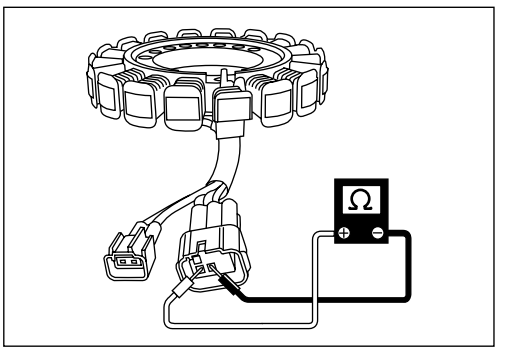
POWER SOURCE COIL

09930-99320 : Digital tester

Tester range : Ω (Resistance)

1. Disconnect power source coil lead wire connector from CDI unit.
2. Connect tester probe to coil lead wires as shown.

Tester probe connection	
Red (+)	**Black (–)**
White	Green
Brown	Green



3. Measure resistance

Power source coil resistance :

White – Green 10.1 – 15.1 Ω

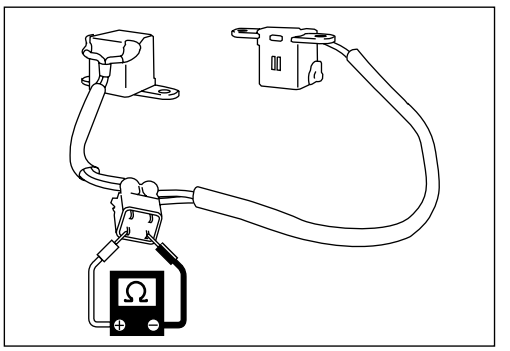
Brown – Green 10.1 – 15.1 Ω

If measurement exceeds specification, replace power source coil.

CKP SENSOR

09930-99320 : Digital tester

Tester range : Ω (Resistance)



1. Disconnect CKP sensor lead wire connector from CDI unit.
2. Connect tester probe to sensor lead wires as shown.

CKP sensor	Tester probe connection	
	Red (+)	Black (–)
No.1	Red	Black
No.2	Red/White	White/Black

3. Measure resistance

CKP sensor resistance :

Red – Black 148 – 222 Ω

Red / White – White / Black 148 – 222 Ω

If measurement exceeds specification, replace CKP sensor.

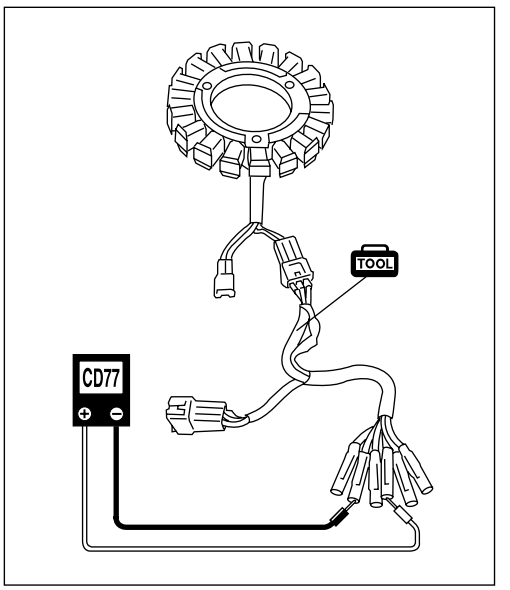
CHECKING COIL / CDI UNIT OUTPUT

POWER SOURCE COIL

09930-89251 : 6 pin connector test cord

Peak voltmeter Stevens CD-77

Tester range : POS 500



1. Disconnect power source coil lead wire connector from CDI unit.
2. Connect the test cord as shown.
3. Connect tester probe to coil lead wires as shown.

Tester probe connection	
Red (+)	Black (–)
White	Green
Brown	Green

4. Remove all spark plugs.
5. Crank with recoil starter or starter motor , then measure voltage.

Power source coil output :

White – Green 21 V or over

Brown – Green 21 V or over

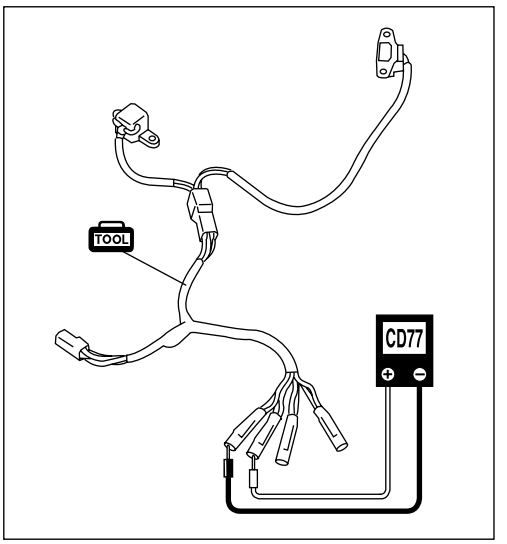
If measurement exceeds specification, replace power source coil.

CKP SENSOR

09930-89240 : 4 pin connector test cord

Peak voltmeter Stevens CD-77
Tester range : SEN 50

1. Disconnect CKP sensor lead wire connector from CDI unit.
2. Connect the test cord as shown.
3. Connect tester probe to sensor lead wires as shown.



CKP sensor	Tester probe connection	
	Red (+)	Black (–)
No.1	Red	Black
No.2	Red/White	White/Black

4. Remove all spark plugs.
5. Crank with recoil starter or starter motor, then measure voltage.

CKP sensor output

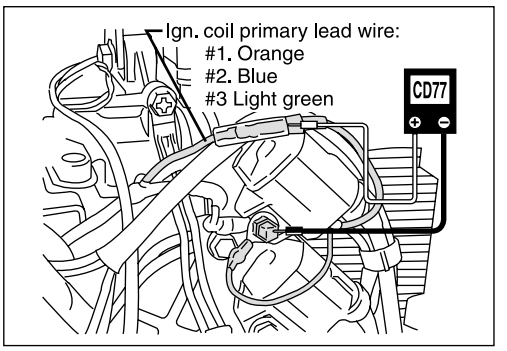
Red – Black	**3 V or over**
Red/White – White/Black	**3 V or over**

If measurement exceeds specification, replace CKP sensor.

CDI UNIT

Peak voltmeter Stevens CD-77
Tester range : POS 500

1. CDI unit must be connected to ignition coils.
2. Connect tester probe to ignition coil primary lead wires as shown.



Ignition coil	Tester probe connection	
	Red (+)	Black (–)
No.1	Orange	Black (GND)
No.2	Blue	
No.3	Light green	

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

CDI unit output

Orange – Black	**64 V or over**
Blue – Black	**64 V or over**
Light green – Black	**64 V or over**

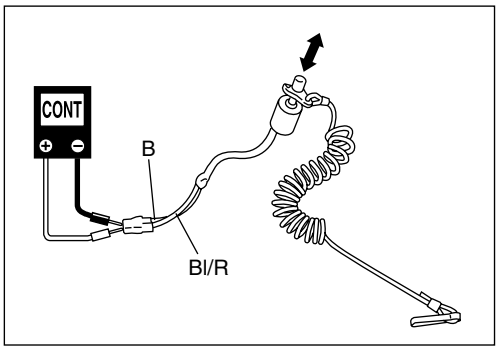
ENGINE STOP & EMERGENCY STOP SWITCH

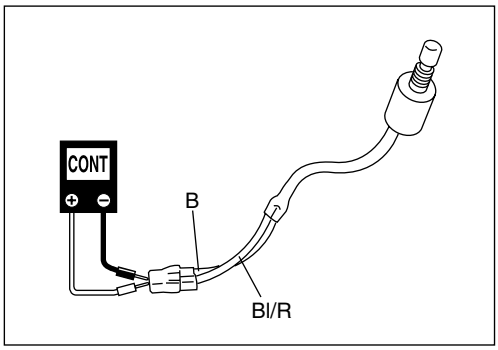
09930-99320 : Digital tester

Tester range : (Continuity)

1. Disconnect the emergency stop switch lead wire.
2. Check continuity / infinity between the wiring leads under the condition shown below.

	Tester probe connection		Tester indicates
	Red (+)	**Black (–)**	
Lock plate installed	Blue/Red	Black	Infinity
Lock plate removed			Continuity
Lock plate installed and stop button depress (Note 1)	Green (Note 2)		Continuity





NOTE:

1) Tiller handle model.

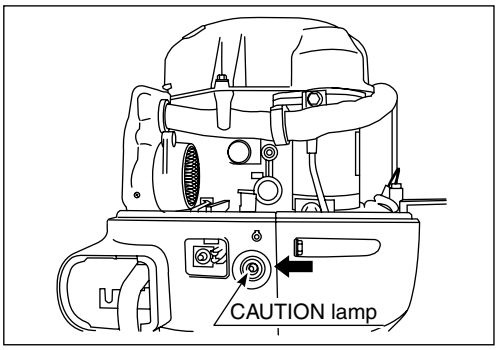
2) Remote control model.

3. If out of specification, replace switch.

CAUTION SYSTEMS

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

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



CAUTION TYPE	CAUTION LAMP	CAUTION BUZZER (R / T model only)	OVER-REV LIMITER (3000 r/min)
Over-revolution	Yes	No	Yes
Low oil pressure	Yes	Yes	Yes
Overheat	Yes	Yes	Yes

Lamp check / Buzzer check

Two (2) seconds after starting engine:

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

OVER- REVOLUTION CAUTION SYSTEM

The over-revolution caution control function activates when the engine speed detected by the CDI exceeds the preset maximum engine speed value.

Maximum engine speed
DF25 : 6300 r/min.
DF30 : 6500 r/min.

The control system operates as follows.

- If the engine is operated at a speed above the over-revolution systems preset maximum value for more than 10 seconds , the engine speed will be automatically controlled by ignition interruption and lowered to approximately 3000 r/min.
- If the operator decreases engine speed to less than the over-revolution systems maximum preset value within 10 seconds , the over-revolution caution control will be cancelled.
- During operation of the over-revolution caution control, the caution lamp is on.

To cancel the over-revolution caution control system when activated by excessive engine speed only, close throttle to reduce engine speed below approx.2500 r/ min for one second.

LOW OIL PRESSURE CAUTION SYSTEM

The low oil pressure caution control activates when internal engine oil lubricating pressure is 49kPa (0.5 kg/cm^2) or lower, during engine operation.

When the oil pressure is higher than the preset value of 49kPa (0.5 kg/cm^2), the oil pressure switch is OFF (no continuity).
When the oil pressure decreases below this preset value, the oil pressure switch is on (continuity) and the low oil pressure caution activates.

The low oil pressure caution control operates as follows.

- The caution lamp turns on.
- The caution buzzer sounds. (Remote control model)
- If the engine speed is higher than 3000 r/min, the over-rev caution control activates. This interrupts the ignition and automatically lowers engine speed to approximately 3000 r/min.

To cancel the low oil pressure caution control,
immediately stop the engine and check that engine oil level is at the specified level.
If insufficient, replenish.

NOTE:
If the low oil pressure caution control has activated with engine oil filled to the specified level, check for abnormal condition in the low oil pressure caution circuit, leakage in the oil passages, and worn or damaged oil pump.

OVERHEAT CAUTION SYSTEM

The overheat caution activates when the cylinder wall temperature sensor has detected any of the following conditions.

- Cylinder wall temperature is at 98 – 110°C (208 – 230°F) or higher.
- The rate of cylinder wall temperature variation within a given time exceeds the preset rate.

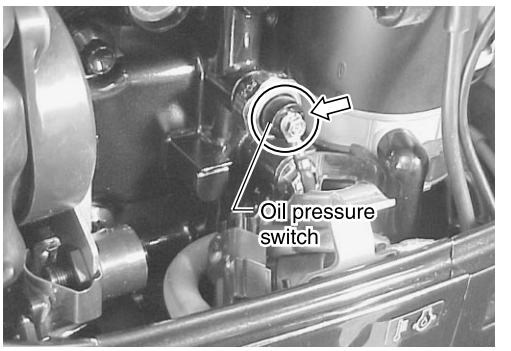
When the overheat caution control activates, the following conditions occur.

- The caution lamp turns on.
- The caution buzzer sounds. (Remote control model)
- If the engine speed is higher than 3000 r/min, the over-rev caution control activates. This interrupts the ignition and automatically lowers engine speed to approximately 2000 r/min.

To cancel the overheat caution control,
the cylinder wall temperature must be reduced to less than 70°C (158°F) and, at the same time, engine speed must be decreased to 1500 r/min. or lower.

TESTING OIL PRESSURE CAUTION SYSTEM

To check the oil pressure caution circuit, follow the procedure below.

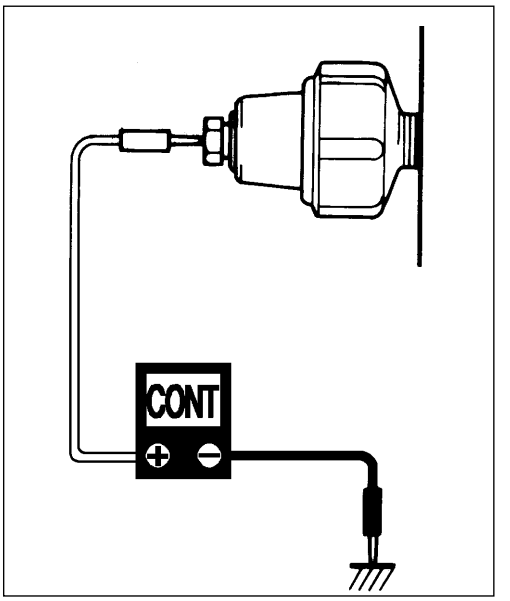


NOTE:
Before checking the oil pressure caution circuit, make sure the engine oil pressure is within specification.

OIL PRESSURE SWITCH

1. Remove the blue/yellow lead wire from the oil pressure switch.
2. Check the continuity between the switch terminal and the engine body ground.

09930-99320 : Digital circuit tester
Tester range : continuity



During engine running	Infinity
At engine stop	Continuity

If measurement exceeds specification, replace oil pressure switch.

OIL LAMP CIRCUIT

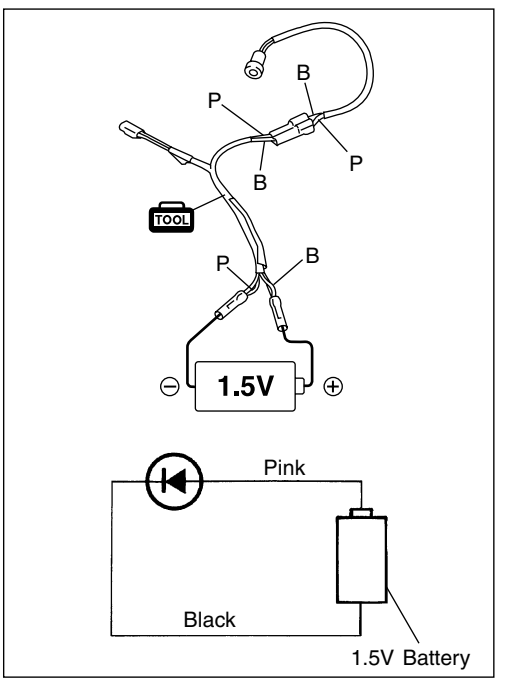
1. Remove the blue/yellow lead wire from the oil pressure switch.
2. Start the engine.
3. Touch the blue/yellow lead wire to the engine body ground. If the caution lamp comes on, the oil pressure switch circuit and the oil pressure caution lamp are normal.

CAUTION LAMP

Check for illumination of the caution lamp.

09930-89210 : 2 pin connector test cord

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



CAUTION

Do not use Battery larger than 2V.

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

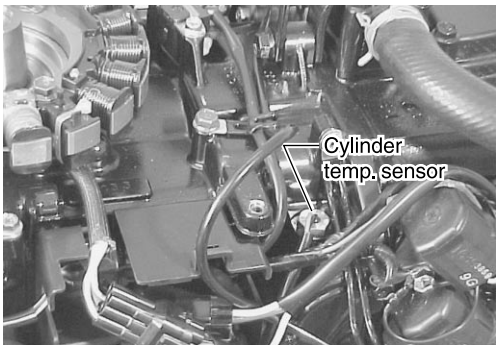
When 1.5 V applied → Lamp ON

If out of specification, replace the caution lamp.

CYLINDER TEMPERATURE SENSOR

FUNCTION

The cylinder temperature sensor is installed on cylinder and used to detect the cylinder temperature.
This is a thermistor type sensor (resistance of which changes depending on the temperature) and inputs a signal to the CDI unit as a voltage value.
This input signal is used to detect engine over-heat as the CDI unit detects both the temperature and temperature change gradient (temperature rise VS time).



FAILURE SYMPTOMS

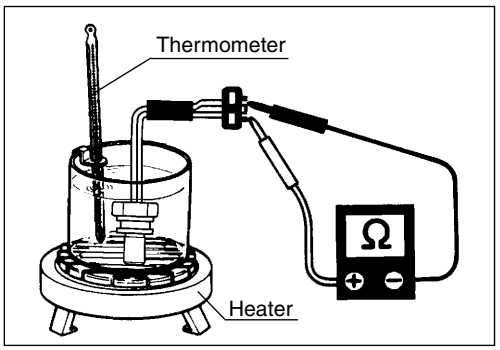
- No over heat detection function.

TESTING CYLINDER TEMP. SENSOR

09930-99320 : Digital tester

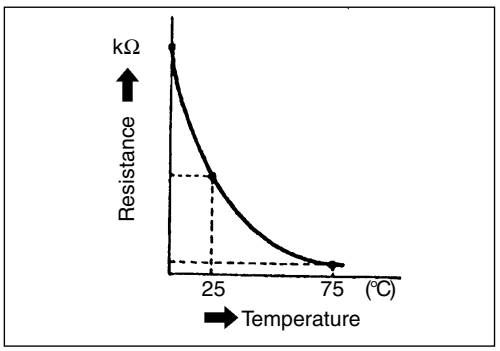
Tester range : Ω (Resistance)

1. Remove the cylinder temp. sensor from cylinder.
2. Connect tester probe to sensor lead wires as shown.



Tester probe connection	
Red (+)	**Black (–)**
Violet	Black

3. Immerse the sensor's tip in water and gradually heat the water while monitoring the changes in sensor resistance. Check if resistance indicated matches specification.



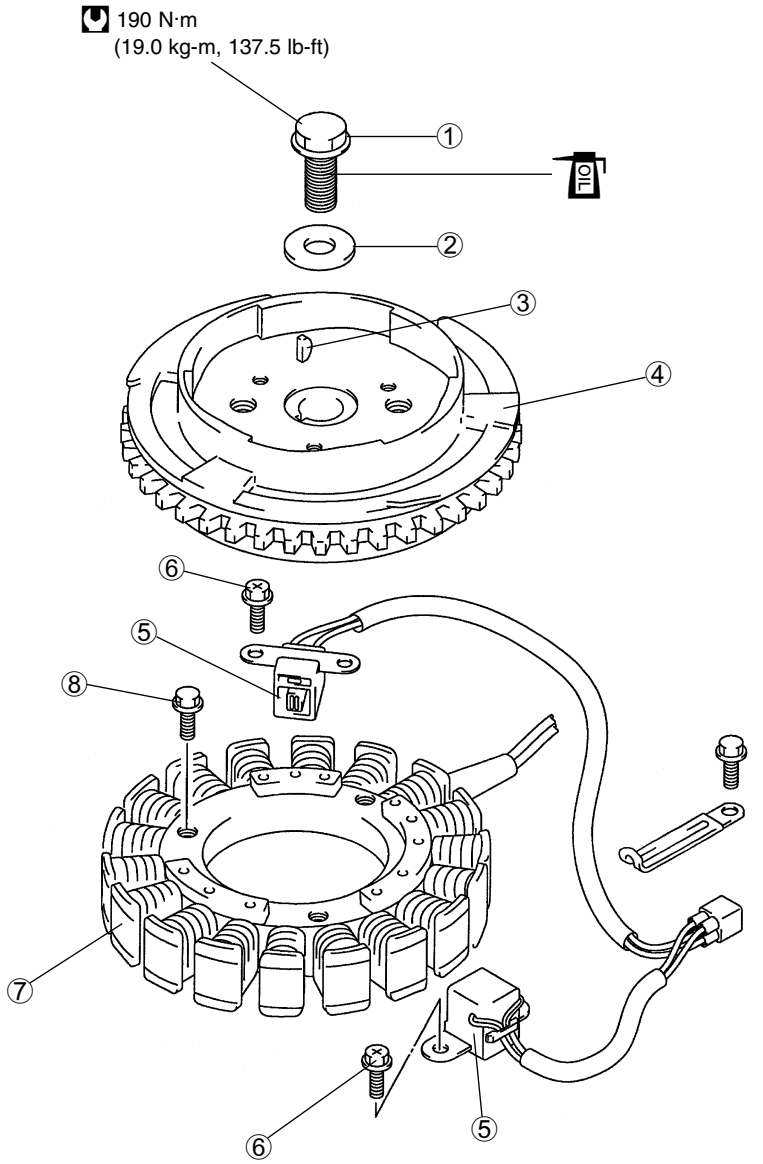
Sensor resistance:

Water temperature °C(°F)	0 (32)	25 (77)	50 (122)	75 (135)
Resistance kΩ	5.3 – 6.6	1.8 – 2.3	0.73 – 0.96	0.33 – 0.45

REMOVAL / INSTALLATION

FLYWHEEL / BATTERY CHARGE & POWER SOURCE COIL / CKP SENSOR

① **Flywheel bolt**
② **Washer**
③ **Key**
④ **Flywheel**
⑤ **CKP sensor**
⑥ **Screw**
⑦ **Battery charge & Power source coil**
⑧ **Bolt**

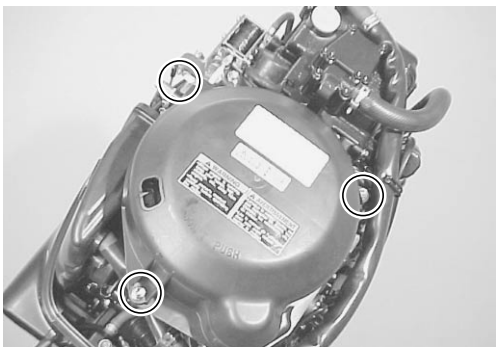


NOTE:
Clean flywheel and crankshaft mating surfaces with cleaning solvent.

REMOVAL

Prior to removing Flywheel :
- **Disconnect battery cables from battery**.
- **Remove all spark plug caps from the spark plug.**

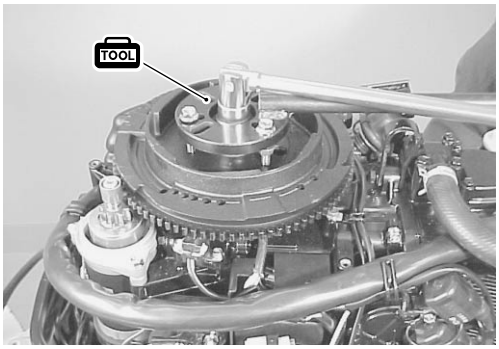
1. Remove flywheel cover. (Electric start model)
   Remove recoil starter. (Manual start model)



2. Loosen flywheel bolt 2 – 3 turns.

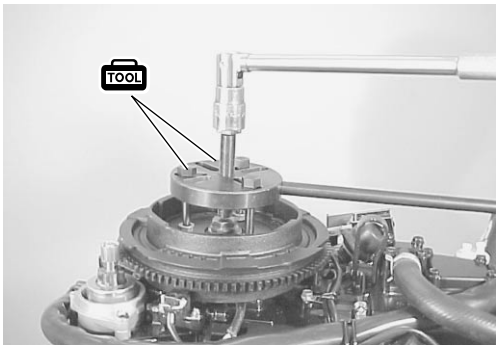
09930-48720 : Flywheel holder

NOTE:
Do not remove flywheel bolt at this time.
This bolt prevents damage to the crankshaft when using flywheel remover tools.

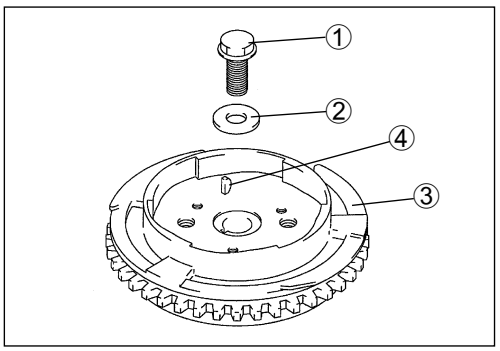


3. Using special tools, loosen flywheel from crankshaft.

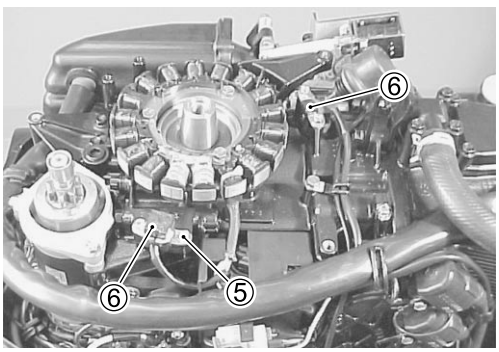
09930-39411 : Flywheel remover
09930-39420 : Flywheel remover bolt



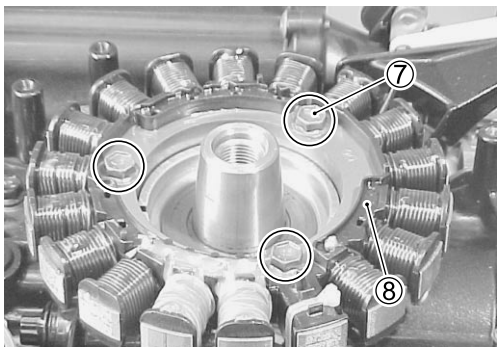
4. Remove flywheel bolt ①, washer ②, flywheel ③ and key ④.



5. Remove screws ⑤ and CKP sensors ⑥, then disconnect CKP sensor connector.



6. Remove three bolts ⑦, battery charge and power source coils ⑧, then disconnect coil lead wire connectors.



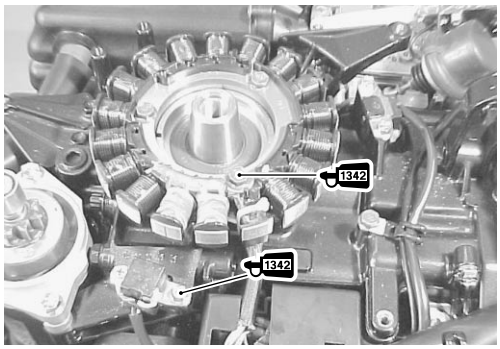
INSTALLATION

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

Battery charge & power source coil

- Apply Thread Lock 1342 to the coil securing screws.

1342 99000-32050 : Thread Lock 1342



CKP sensors

Apply Thread Lock 1342 to the sensor mounting screws.

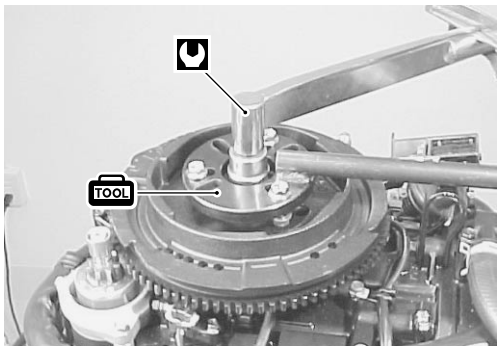
1342 99000-32050 : Thread Lock 1342

Flywheel

- Clean flywheel and crankshaft mating surfaces with cleaning solvent.
- Apply engine oil lightly to flywheel bolt before installing.
- Tighten flywheel bolt to specified torque.

TOOL 09930-48720 : Flywheel holder

Flywheel bolt : 190 N·m (19.0 kg-m, 137.5 lb- ft)



Wire routing

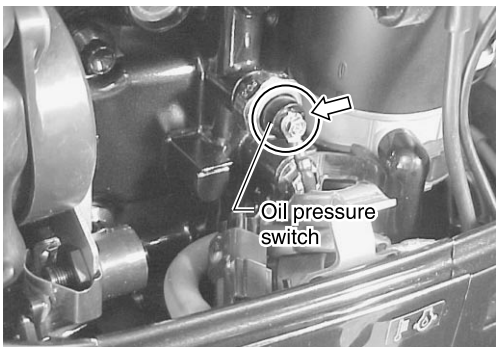
Check wire routing. (See page. 11-2 to 11-12)

OIL PRESSURE SWITCH

REMOVAL

Loosen screw and disconnect blue/yellow lead wire from switch.

Remove oil pressure switch from crankcase.



INSTALLATION

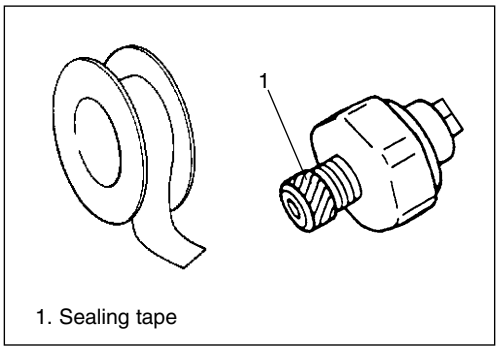
Installation is reverse order of removal with special attention to the following steps.

- Before installing oil pressure switch , wrap screw threads with sealing tape then tighten switch to specified torque.

NOTE:
Cut off any excess sealing tape from switch threads before installation .

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

- Start engine and check oil pressure switch for oil leakage. Reseal switch if oil leakage is found.



1. Sealing tape

ELECTRICAL

CONTENTS

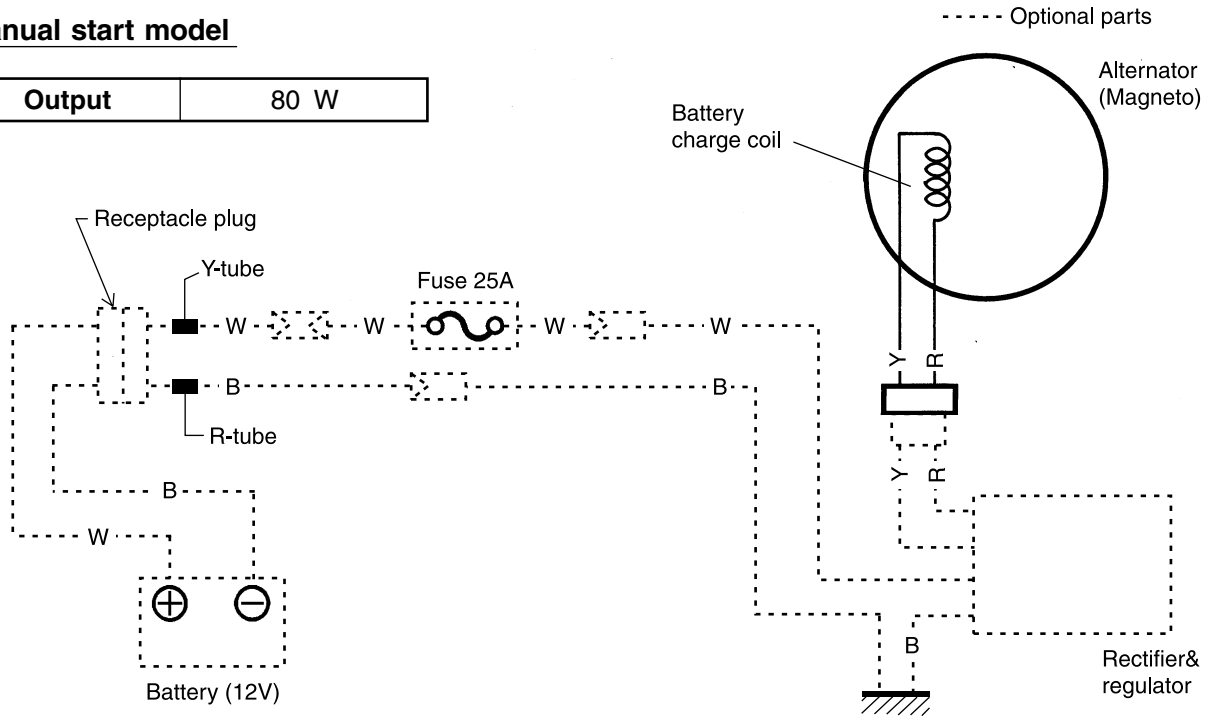
BATTERY CHARGING SYSTEM

OUTLINE

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

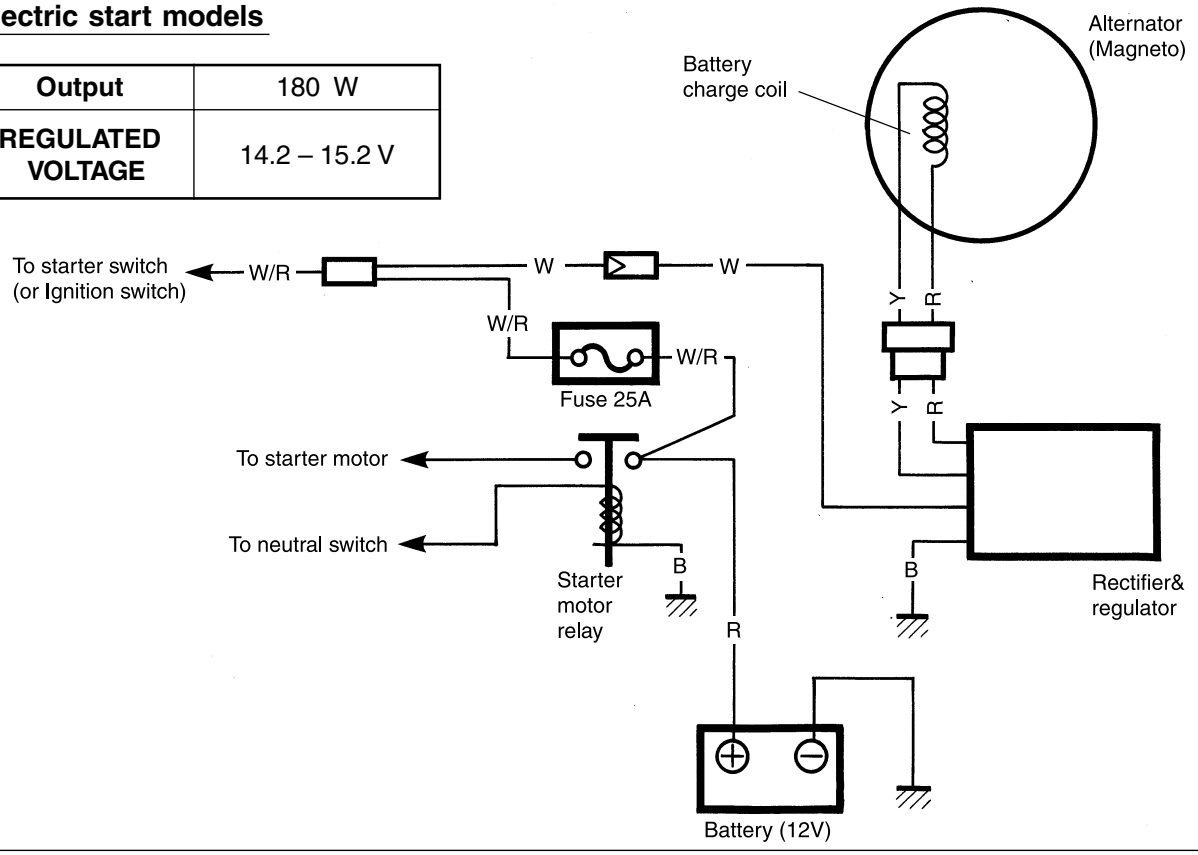
Manual start model

Output	80 W



Electric start models

Output	180 W
REGULATED VOLTAGE	14.2 – 15.2 V



INSPECTION

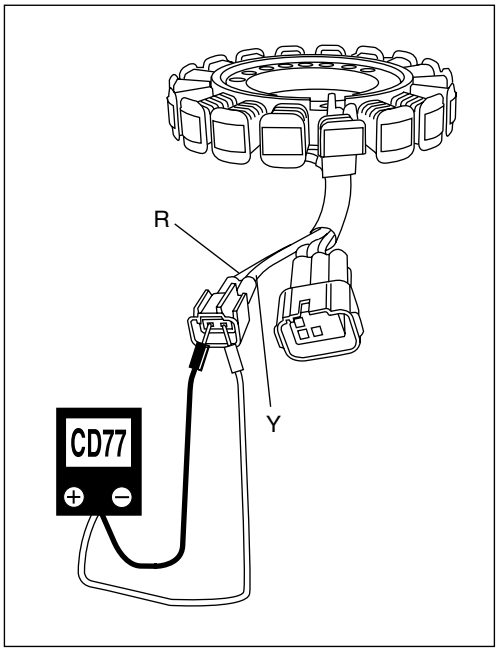
BATTERY CHARGE COIL

Two methods can be used to inspect coil condition.

Checking coil output

Peak voltmeter stevens CD-77

Tester range : POS 50



1. Disconnect battery charge coil leads from rectifier & regulator.
2. Connect the peak voltage tester between coil leads.
3. Remove all spark plugs.
4. Measure coil output at cranking.

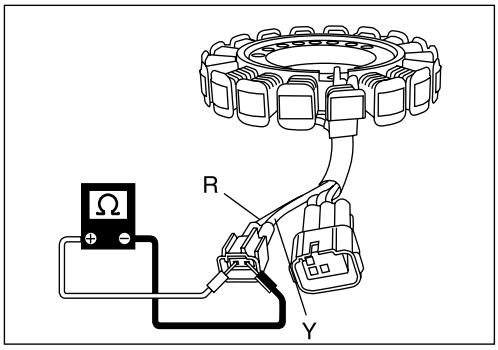
Battery charge coil output

Tester probe connection		Coil output
Red ⊕	Black ⊖	
Yellow	Red	Manual start model : 4V or over Electric start model : 8V or over

If measurement exceeds specification, replace battery charge coil.

Checking coil resistance

Measure battery charge coil resistance.



09930-99320 : Digital tester

Tester range : Ω (Resistance)

1. Disconnect battery charge coil leads from rectifier & regulator.
2. Measure resistance between coil leads.

Battery charge coil resistance :

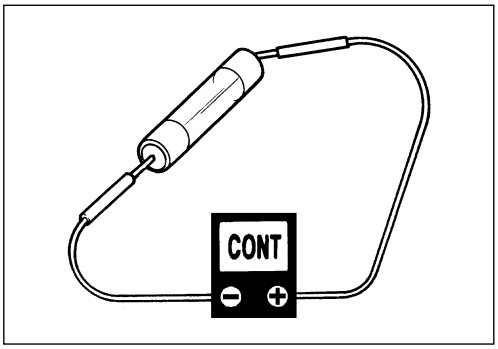
Tester probe connection		Resistance
Red ⊕	Black ⊖	
Red	Yellow	Manual start model: 0.20 – 0.30 Ω Electric start model: 0.27 – 0.40 Ω

If measurement exceeds specification, replace battery charge coil.

FUSE CASE / FUSE

09930-99320 : Digital tester

Tester range : (Continuity)



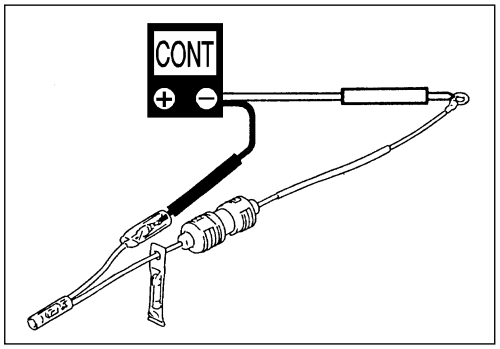
Fuse

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

Fuse case

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

Tester range : (Continuity)



If no continuity is indicated, replace fuse case.

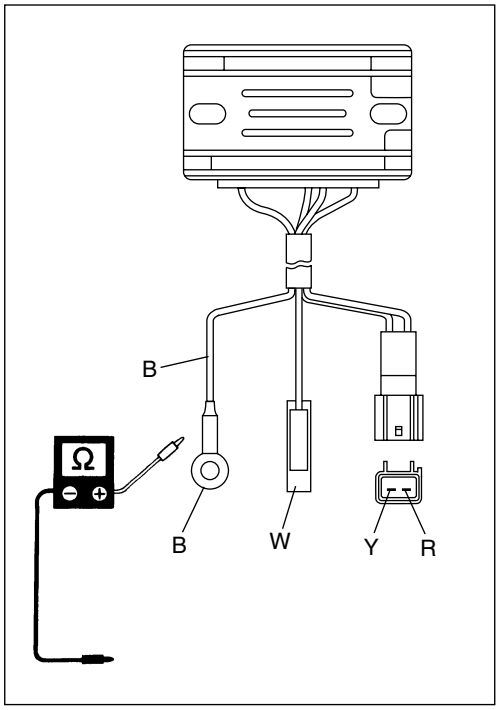
RECTIFIER & REGULATOR

09900-25002 : Pocket tester

Tester range : × 1k Ω (Resistance)

1. Disconnect all lead wires of rectifier & regulator.
2. Measure resistance between leads in the combinations shown.

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



Rectifier & regulator resistance :

Unit : Approx. k Ω

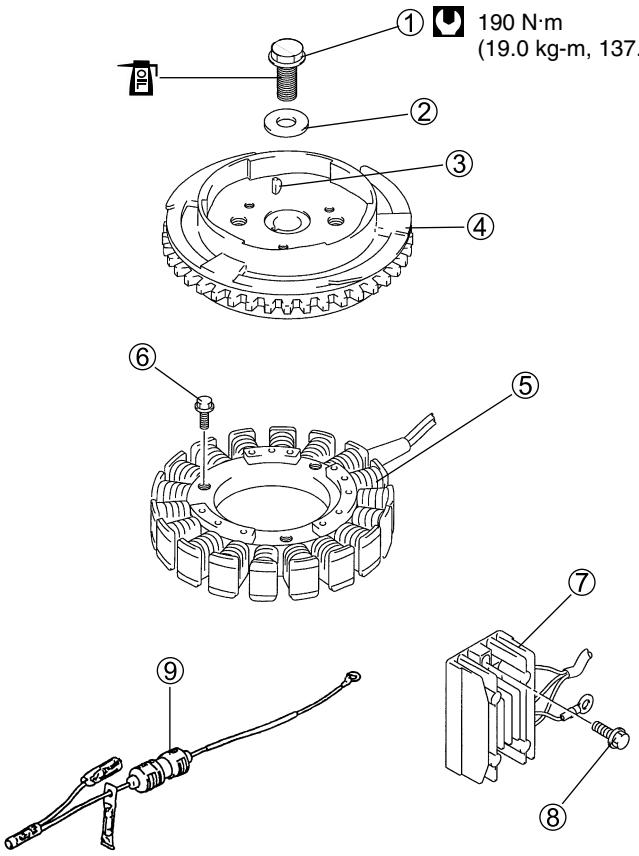
	Tester probe ⊕ (Red)				
Tester probe ⊖ (Black)		Black	White	Yellow	Red
	Black		ON (3)	ON (2.5)	ON (2.5)
	White	∞		∞	∞
	Yellow	∞	ON (2.6)		∞
	Red	∞	ON (2.8)	∞	

∞ : Infinity

If measurement exceeds specification, replace rectifier & regulator.

REMOVAL / INSTALLATION

System construction

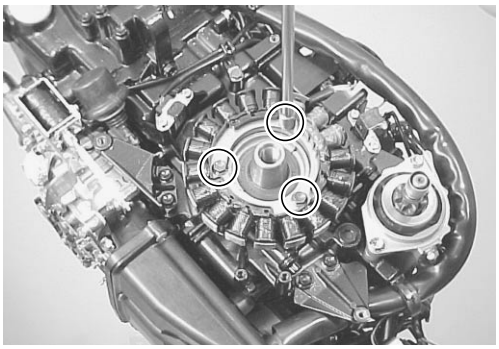


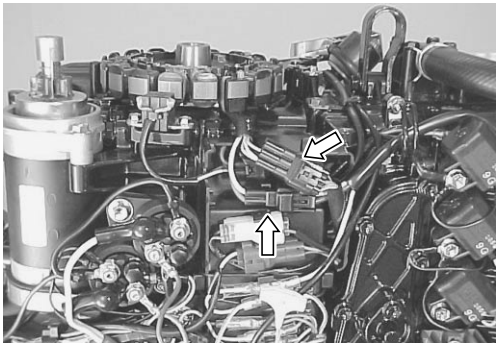
① Bolt (1)
② Washer (1)
③ Key (1)
④ Flywheel (1)
⑤ Battery charge coil (1)
⑥ Screw (3)
⑦ Rectifier & regulator (1)
⑧ Bolt (2)
⑨ Fuse case (1)

REMOVAL

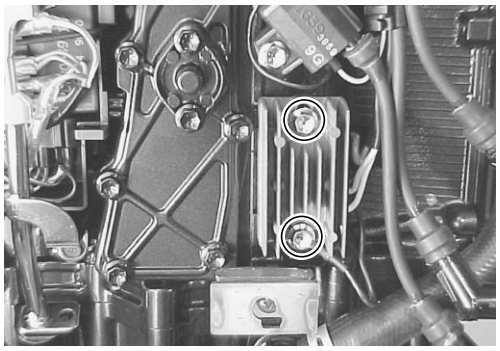
Prior to removing electrical parts :
- **Disconnect battery cables from battery.**
- **Disconnect spark plug cap from all spark plugs.**

Battery charge coil
- Remove flywheel. (See page 3-17.)
- Remove three (3) screws securing the battery charge coil.
- Disconnect charge coil lead wire connectors from rectifier & regulator and CDI unit.

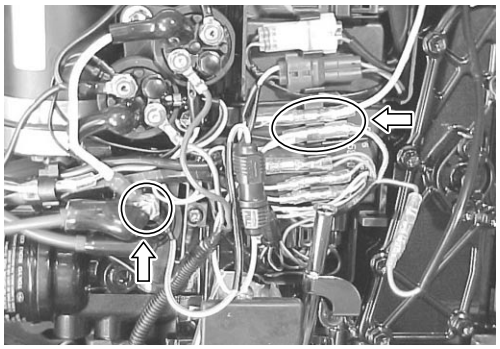




Rectifier & regulator
- Remove two bolts securing the Rectifier & regulator.
- Disconnect lead wire connectors.



Fuse case
- Disconnect fuse case lead wires from engine wiring harness and starter motor relay terminal.



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

- **Battery charge coil**
  - Apply Thread Lock 1342 to the coil securing screws.

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

- **Wire routing**
  - Check wire routing. (See page 11-2 to 11-13)

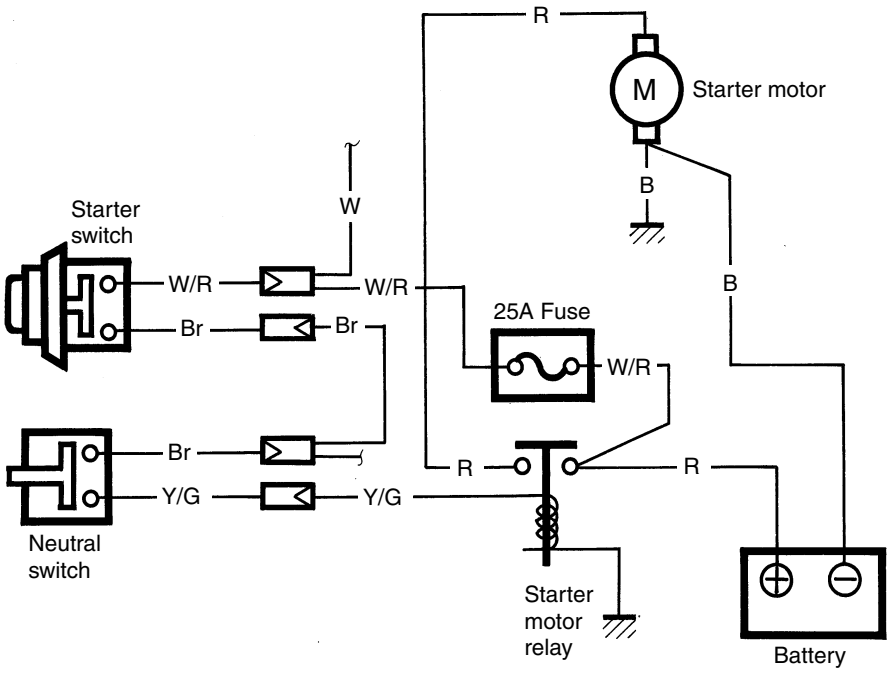
ELECTRIC STARTER SYSTEM

OUTLINE

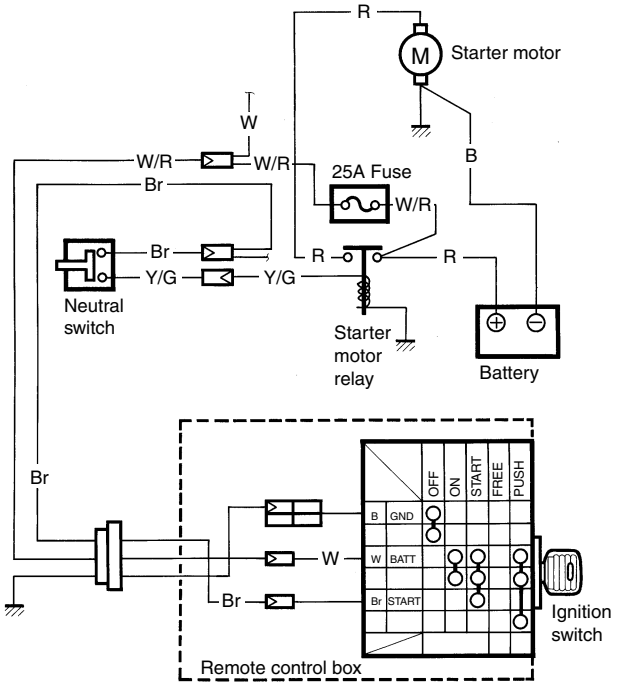
The circuit of the electric starter system is illustrated below.

This circuit is mainly composed of Battery, Starter motor, Relay, Neutral switch and Ignition switch (or starter switch).

Tiller handle model



Remote control (R) models



TROUBLESHOOTING

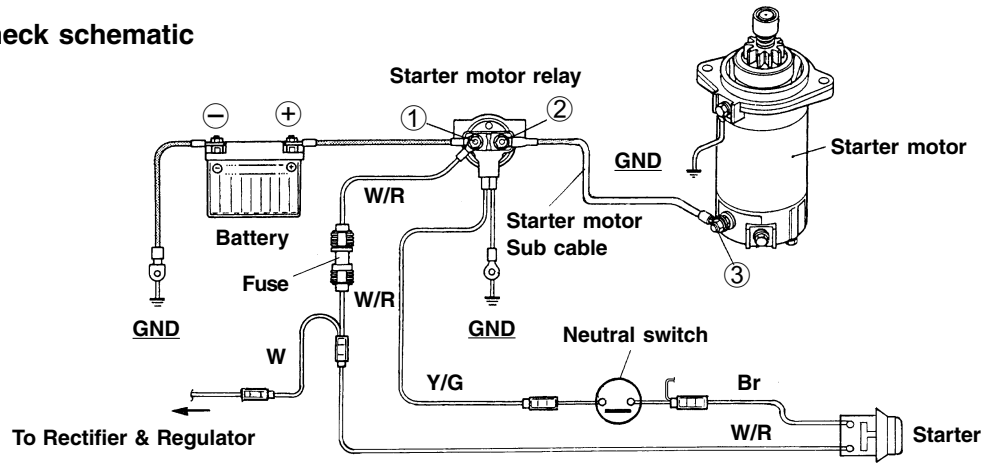
NOTE:

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

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

■ Tiller handle model

Circuit check schematic



Starter motor will not run.

Check for relay "click" sound when starter button depressed.
Is there "click" sound?

NO → Measure voltage at terminal ①. It must be above 12V.
Is result OK?

NO → Battery cable failure

YES → Check 25A fuse and fuse case.
(See page 4-4.)
Is result OK?

NO → 25A fuse or fuse case failure

YES → Check starter switch function.
(See page 4-10.)
Is result OK?

NO → Starter switch failure

YES → Check function of neutral switch.
(See page 4-11.)
Is result OK?

NO → Neutral switch failure

YES → Starter motor relay failure

Check starter motor relay.
(See page 4-12.)

YES → Measure voltage at terminal ② with starter button depressed. It must be above 12 V.
Is result OK?

NO → Starter motor relay failure

YES → Measure voltage at terminal ③ with starter button depressed. It must be above 12 V.
Is result OK?

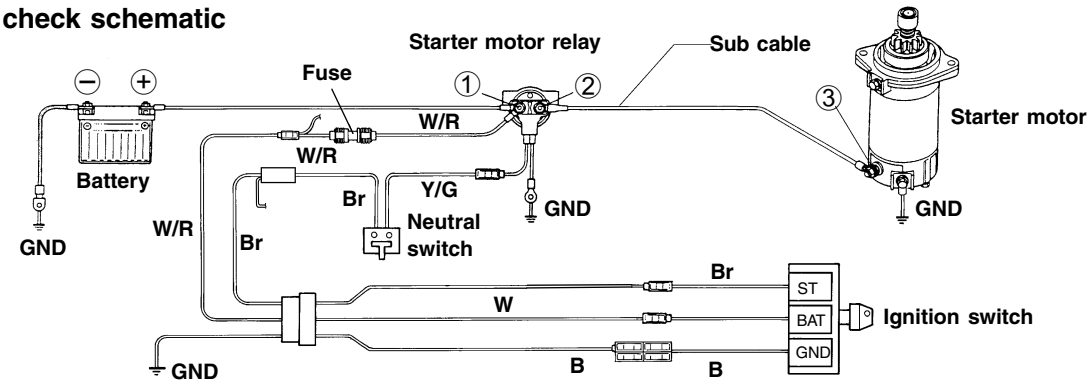
YES → Starter motor failure

Check starter motor.
(See page 4-16.)

NO → Sub cable failure

■ Remote control models

Circuit check schematic



Starter motor will not run.

Check for relay “click” sound when turning ignition switch to “START”.
Is there “click” sound?

NO → Measure voltage at terminal ①. It must be above 12V.
Is result OK?

NO → Battery cable failure

YES → Check 25A fuse and fuse case.
(See page 4-4.)
Is result OK?

NO → 25A fuse or fuse case failure

YES → Check ignition switch function.
(See page 4-10.)
Is result OK?

NO → Ignition switch failure

YES → Check function of neutral switch.
(See page 4-11.)
Is result OK?

NO → Neutral switch failure

YES → Starter motor relay failure

Check starter motor relay.
(See page 4-12.)

YES

Measure voltage at terminal ② with ignition switch at “START”. It must be above 12 V.
Is result OK?

NO → (to Measure voltage at terminal ①)

YES

Measure voltage at terminal ③ with ignition switch at “START”. It must be above 12 V.
Is result OK?

YES → Starter motor failure

Check starter motor.
(See page 4-16.)

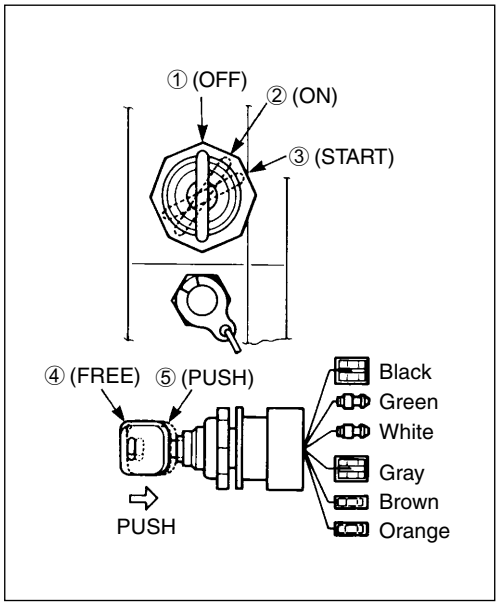
NO → Sub cable failure

INSPECTION

IGNITION SWITCH (Remote control model)

09930-99320 : Digital tester

Tester range : (Continuity)



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

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

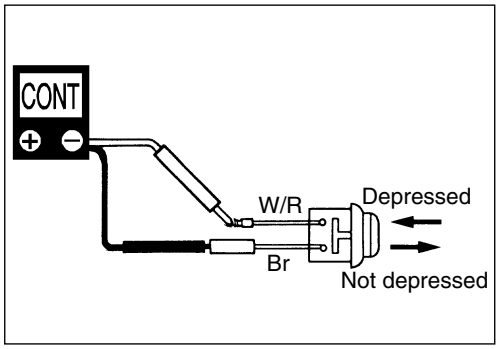
○——○ : Continuity

If out of specification, replace ignition switch.

STARTER SWITCH (Tiller handle model)

09930-99320 : Digital tester

Tester range : (Continuity)



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

	Tester probe connection		Tester indicates
	Red ⊕	Black ⊖	
Starter button not depressed	White/Red	Brown	Infinity
Starter button depressed			Continuity

NEUTRAL SWITCH

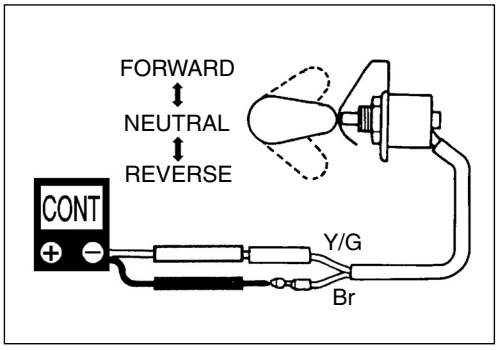
Check for continuity / infinity of the neutral switch.

09930-99320 : Digital tester

Tester range : (Continuity)

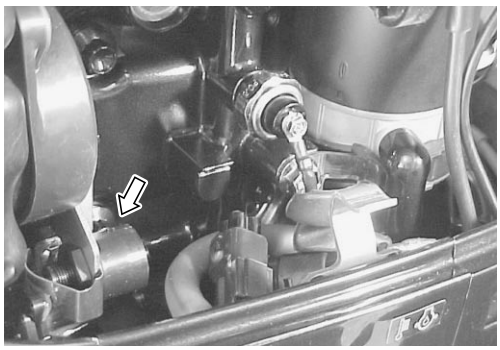
1. Disconnect neutral switch lead wires.
2. Check continuity / infinity between Yellow / Green and Brown lead wires while operating shift lever or remo-con handle.

Shift position	Tester indicates
Neutral	Continuity
Forward	Infinity
Reverse	Infinity



If out of specification:

- 1st Check switch position adjustment, readjust if necessary.
- 2nd Replace neutral switch.



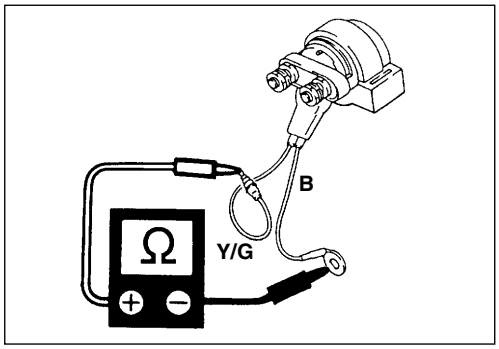
NOTE:

After installing neutral switch, check for proper correct function by operating remo-con handle or shift lever.

STARTER MOTOR RELAY

Two methods can be used to test starter motor relay.

09930-99320 : Digital tester



Method 1

1. Disconnect all cables / lead wires from starter motor relay.
2. Measure resistance between relay wiring leads.

Tester range : Ω (Resistance)

Tester probe connection	
Red ⊕	**Black ⊖**
Yellow / Green	**Black**

Starter motor relay solenoid coil resistance :

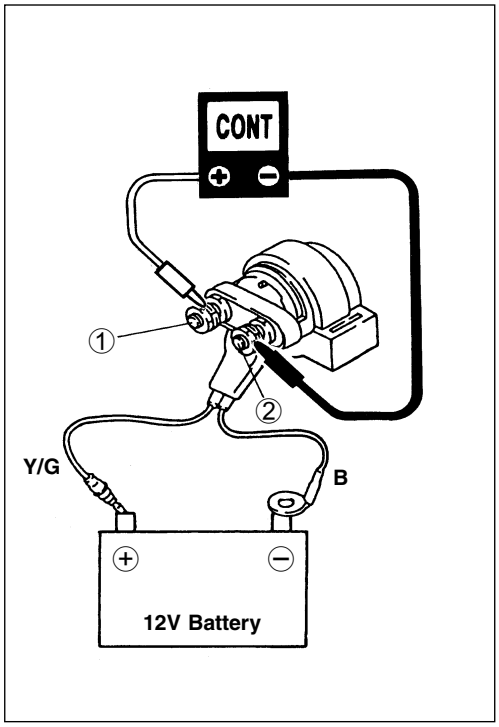
3.5 – 5.1 Ω

If measurement exceeds specification, replace starter motor relay.

Method 2

Connect the wiring leads of the relay to battery (12V) and check relay operation.

Tester range : (Continuity)



1. Disconnect all cables / wires from starter motor relay.
2. Connect Yellow /Green wire to positive ⊕ terminal, and Black wire to negative ⊖ terminal of battery.

When 12V applied : Continuity between relay terminal ① and ②.

3. Disconnect wiring leads from battery.

No voltage applied : No continuity between relay terminal ① and ②.

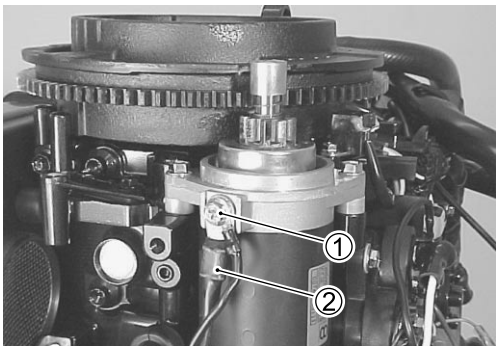
If out of specification, replace starter motor relay.

STARTER MOTOR

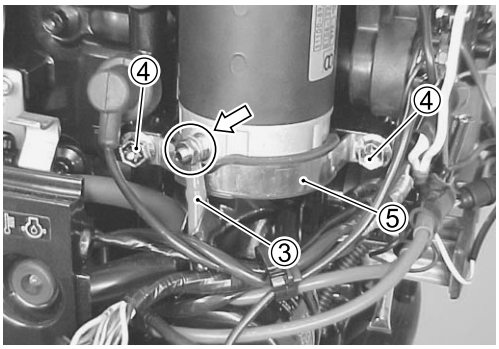
REMOVAL

Prior to removing starter motor :
- **Disconnect battery cables from battery.**

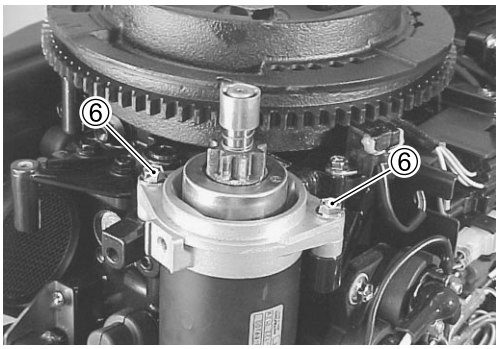
1. Remove three bolts and flywheel cover.
2. Remove bolt ① and negative ⊖ battery cable ②.

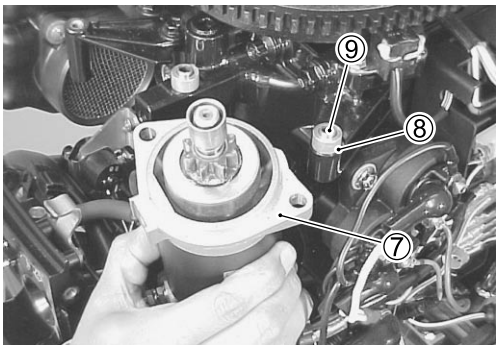


3. Remove starter motor sub cable ③.
4. Remove two bolts ④ and starter motor band ⑤.



5. Remove two bolts ⑥ , starter motor ⑦ , spacers ⑧ and dowel pins ⑨.



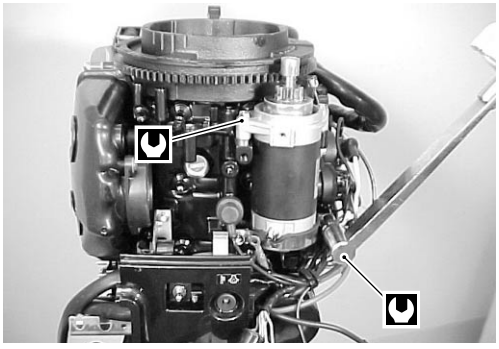


INSTALLATION

Installation is reverse order of removal with special attention to the following steps.
- Install starter motor and tighten starter motor mounting bolts securely.

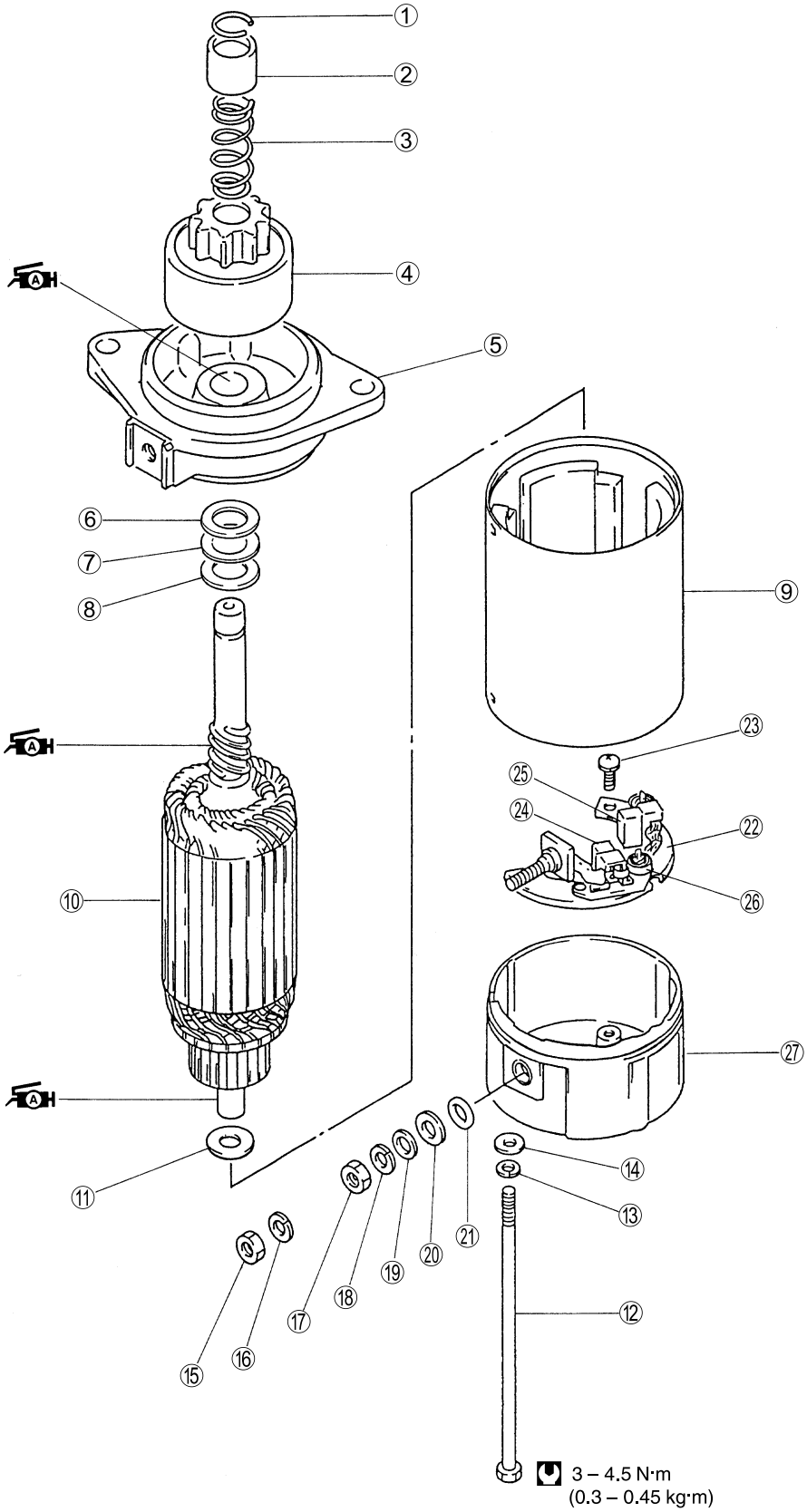
Starter motor mounting bolt :

6 mm	**11 N · m (1.1 kg-m, 8.0 lb.-ft.)**
8 mm	**23 N · m (2.3 kg-m, 16.5 lb.-ft.)**



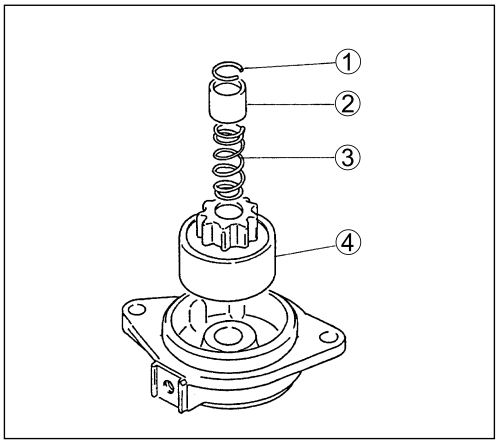
DISASSEMBLY

Motor construction



① Stopper ring
② Pinion stopper (1)
③ Spring (1)
④ Pinion (1)
⑤ Front cover (1)
⑥ Washer (1)
⑦ Shim (1)
⑧ Washer
⑨ Stator (1)
⑩ Armature (1)
⑪ Washer
⑫ Bolt (2)
⑬ Washer (2)
⑭ Washer (2)
⑮ Nut (1)
⑯ Washer (1)
⑰ Nut (1)
⑱ Washer (1)
⑲ Washer (1)
⑳ Washer (1)
㉑ O-ring
㉒ Brush holder (1)
㉓ Screw (2)
㉔ Brush (1)
㉕ Brush (1)
㉖ Brush spring (2)
㉗ Rear cover (1)

Push down the pinion stopper ②, remove stopper ring ①.
Remove pinion stopper ②, spring ③, and pinion ④.

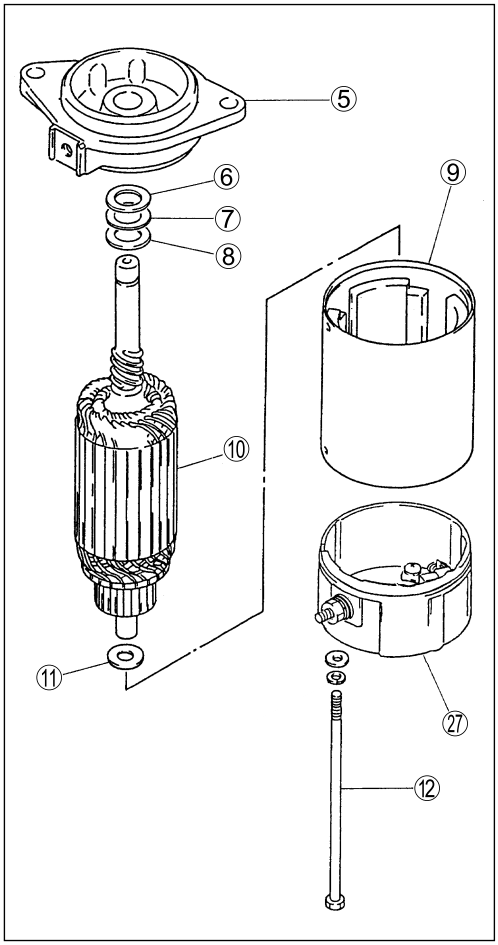


⚠ WARNING

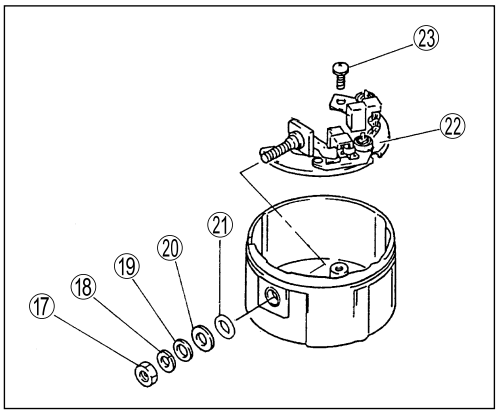
Wear safety grasses when disassembling and assembling stopper ring.

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

Remove two bolts ⑫.
Remove following parts :
- Front cover ⑤
- Washer ⑥, shim ⑦, washer ⑧
- Stator ⑨
- Armature ⑩
- Washer ⑪
- Rear cover ㉗



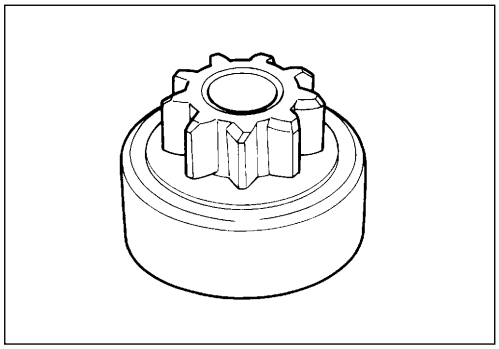
Remove the nut ⑰, washers ⑱ / ⑲, plastic washer ⑳ and O-ring ㉑ from rear cover.
Remove two screws ㉓ and brush holder assembly ㉒.



INSPECTION & SERVICING

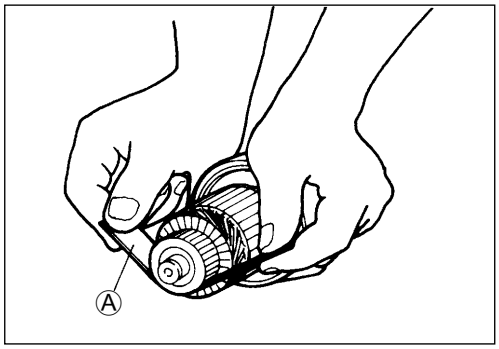
Pinion

Inspect pinion.
Replace pinion if damaged or worn.



Armature and Commutator

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

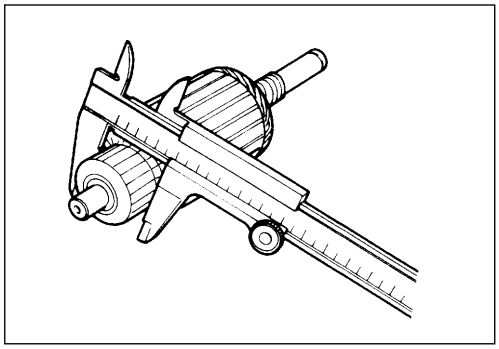


Measure commutator outside diameter.

TOOL 09900-20101 : Vernier calipers

Commutator outside diameter:
Standard : 30 mm (1.18 in.)
Service limit : 29 mm (1.14 in.)

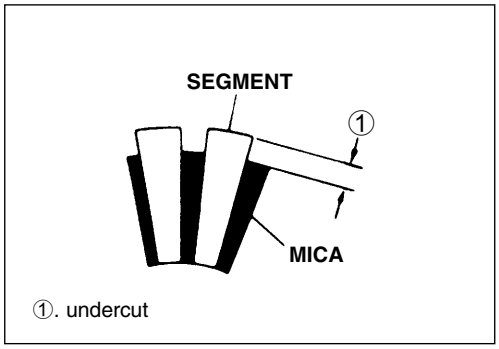
If measurement exceeds service limit, replace armature.



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

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

If measurement exceeds service limit, cut to specified depth.



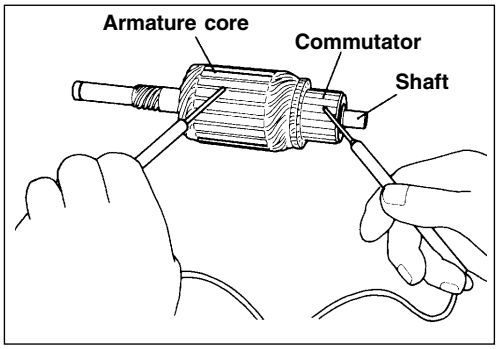
①. undercut

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

⚠ WARNING

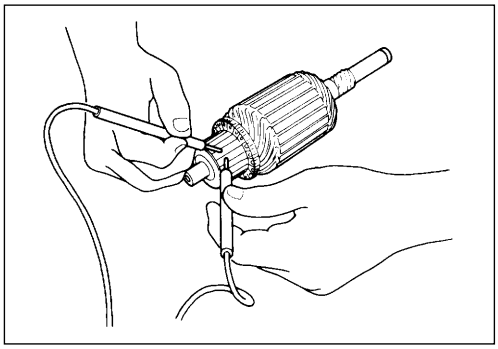
Wear safety grasses when using compressed air.

Check for continuity between the commutator and the armature core / shaft.
Replace armature if continuity is indicated.



Check for continuity between the adjacent commutator segments.
Replace armature if no continuity is indicated.

09930-99320 : Digital tester
Tester range : (Continuity)

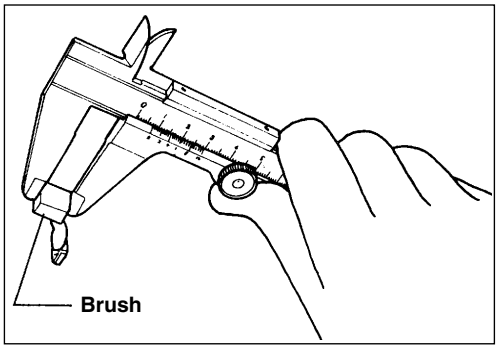


BRUSHES
Check the length of each brush.

09900-20101 : Vernier calipers

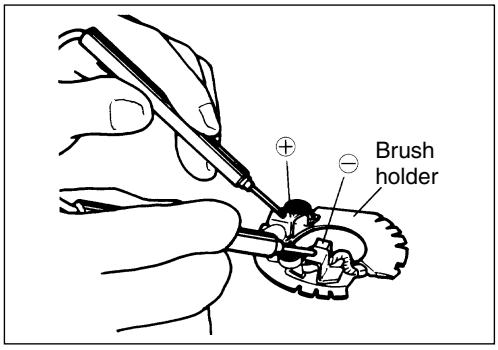
Brush length:
Standard : 12.5 mm (0.49 in.)
Service limit : 9.0 mm (0.35 in.)

If brushes are worn down to the service limit, they must be replaced.



BRUSH HOLDER
Check brush holder continuity.

09930-99320 : Digital tester
Tester range : (Continuity)



Brush holder continuity :

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

Replace brush holder if the tester doesn't show the above.

ASSEMBLY

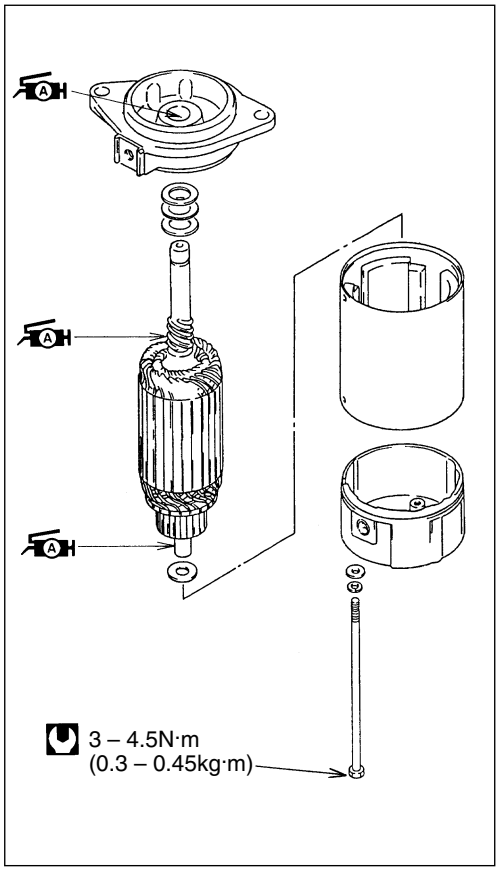
Assembly is reverse of disassembly with special attention to following steps.

CAUTION

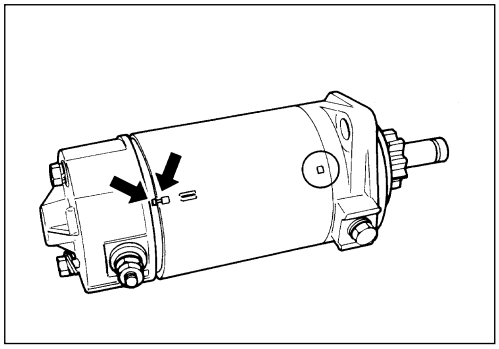
When installing armature, exercise care to avoid breaking brushes.

Apply grease to armature shaft and shaft holes.

99000-25010 : Suzuki Super Grease "A"



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



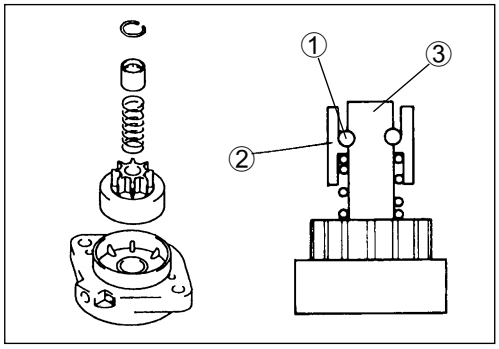
WARNING

Wear safety grasses when disassembling and reassembling stopper ring.

Install pinion, spring, pinion stopper and stopper ring.

NOTE:

Make sure stopper ring ① fit tightly in pinion stopper ② and armature shaft 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.

- **Disconnect battery cables except when battery power is required for servicing / inspection.**
- **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.**
- **Always use appropriate safety equipment and wear safety glasses when working around pressurized fuel system.**
- **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 fuel hoses.

CAUTION

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

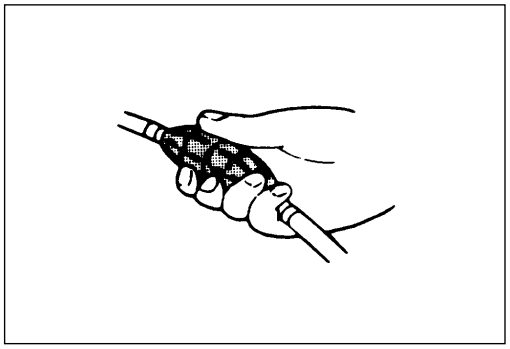
NOTE:

- *Check fuel hose routing. (See page 11-14 and 11-17)*
- *Check for fuel leakage.*

FUEL LEAKAGE CHECK PROCEDURE

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

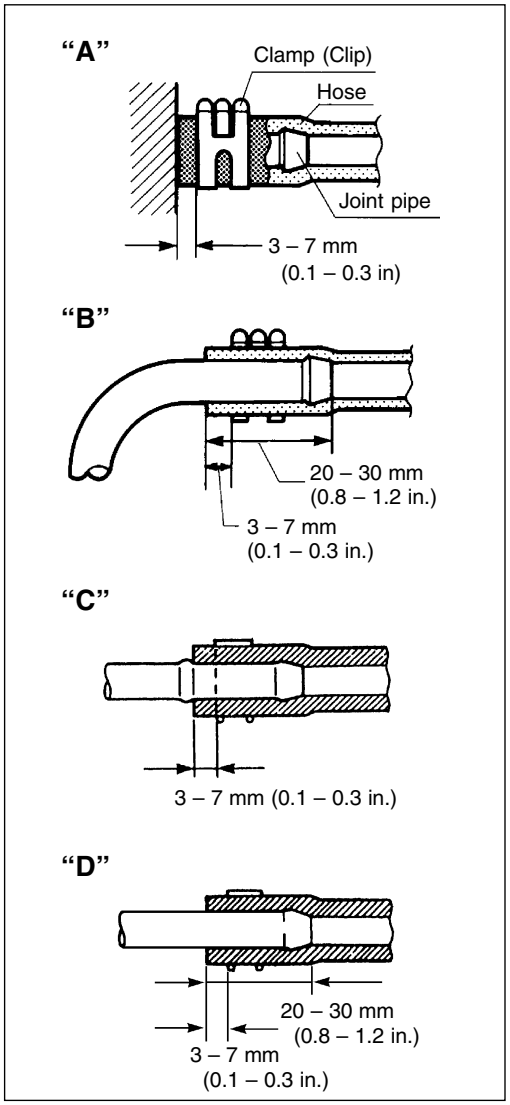
1. Squeeze fuel primer bulb until you feel resistance.
2. Once pressurized, check all connections and components for any signs of leakage.



FUEL HOSE CONNECTION

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

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



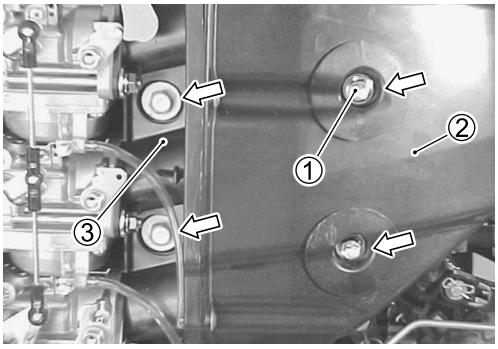
CARBURETORS

⚠ WARNING

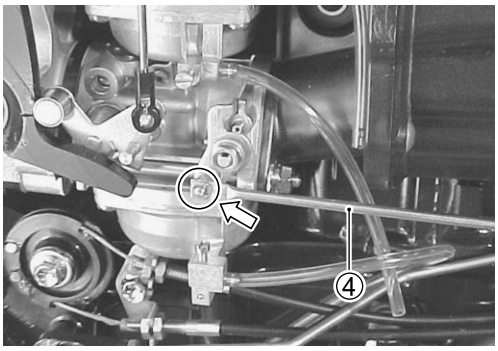
Before servicing the fuel system, read and understand "PRECAUTION ON FUEL SYSTEM SERVICE" in the previous section.

REMOVAL

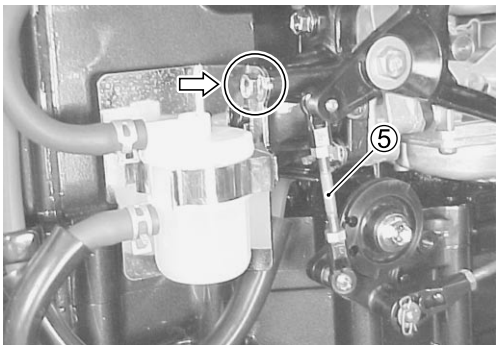
1. Remove recoil starter. (Manual start model)
   Remove flywheel cover. (Electric start model)
   Remove the STBD side lower cover.
2. Remove the bolts ① securing silencer case ②.
3. Remove the bolts securing the air silencer pipe ③ to crank case.



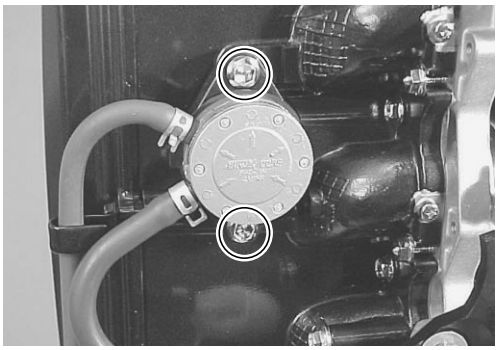
4. Remove the E-ring and choke rod ④ from the bottom carburetor. (Tiller handle model)



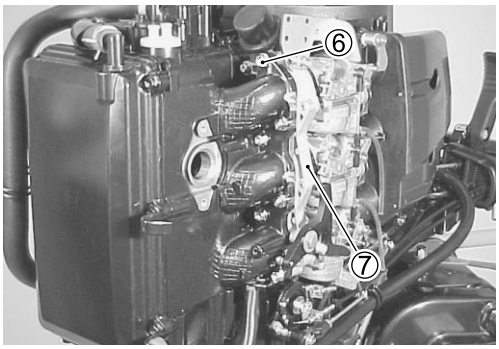
5. Remove throttle link rod ⑤ from throttle cam.
   Remove the bolt and fuel filter bracket.



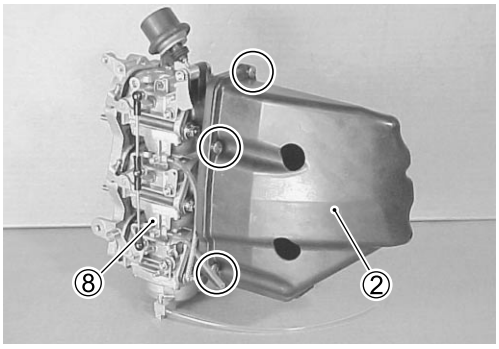
6. Remove fuel pump. (See page 5-14)



7. Remove the four (4) bolts ⑥ and two (2) nuts securing inlet case ⑦ to intake manifold.

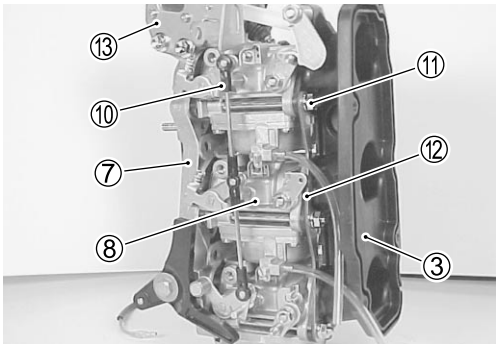


8. Remove three (3) carburetors ⑧ with inlet case, then remove the fuel inlet hose from the bottom 3-way joint.
9. Remove four (4) screws and silencer case ②.

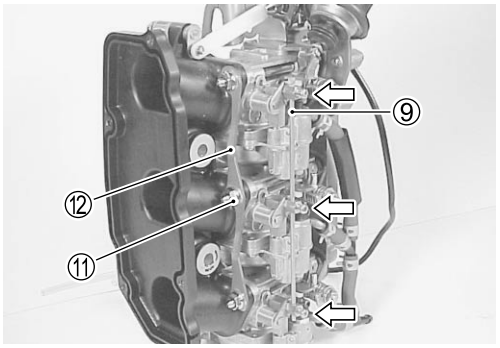


10. Take off the choke and throttle link rods ⑨ · ⑩ from each carburetor.

    Remove the bolts and choke solenoid ⑬. (R / T models)
    Remove the bolts and carburetor protector ⑬. (Tiller handle model.)

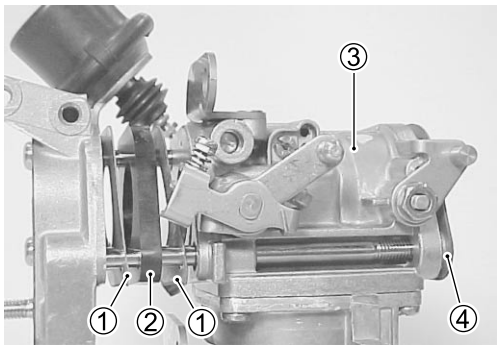


11. Loosen the carburetor flange nuts ⑪ and remove them. Remove the plates ⑫, air silencer pipe ③, carburetors ⑧ and insulators from inlet case ⑦, and then discard the carburetor gaskets.



INSTALLATION

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

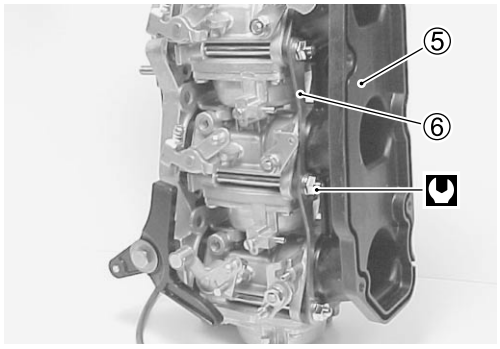


CAUTION

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

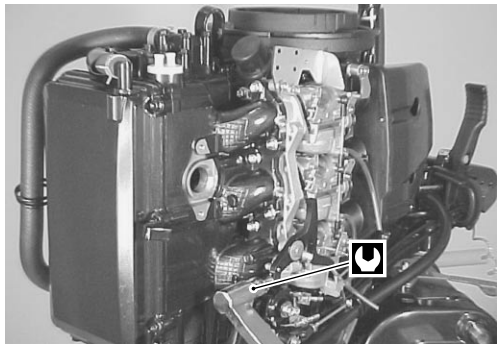
- Install carburetor gaskets ①, insulators ②, gaskets ①, carburetors ③, gaskets ④ , silencer pipe ⑤ and plates ⑥, then tighten carburetor mounting nuts to specified torque.

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



- Install carburetor / inlet case assembly to intake manifold, then tighten mounting bolts and nuts securely.

Inlet case bolt / nut : 11 N·m (1.1 kg-m, 8.0 lb.-ft.)



FINAL ASSEMBLY CHECK

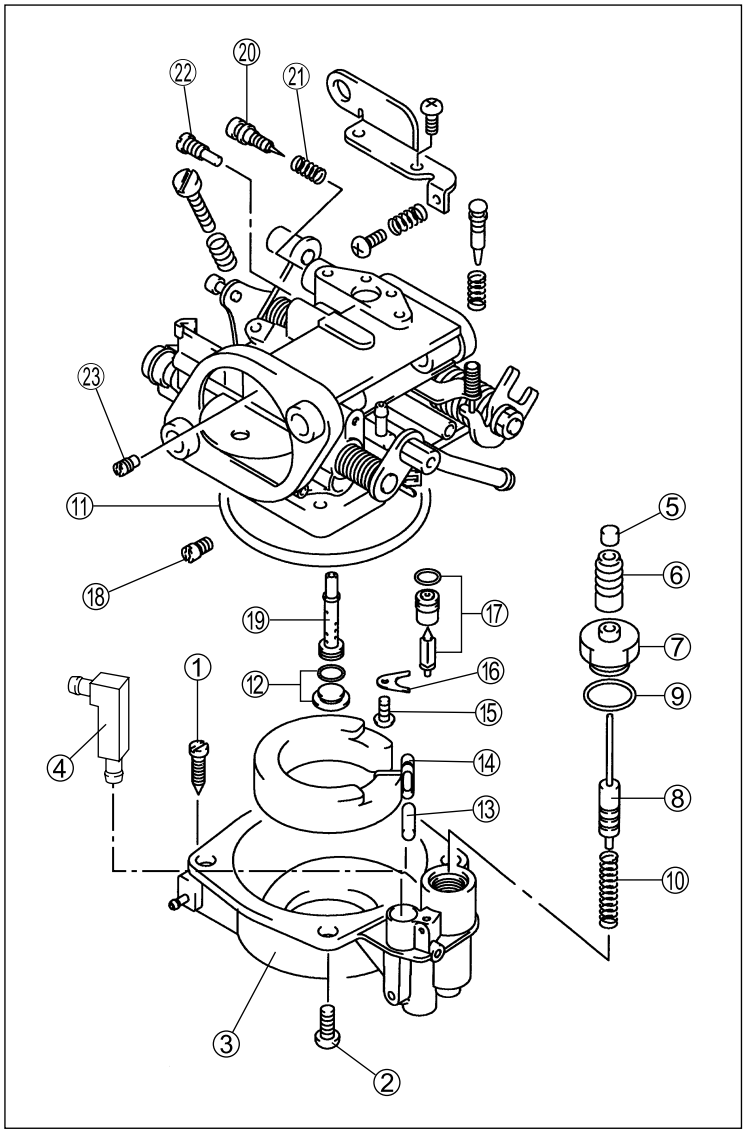
Perform the following checks to ensure proper and safe operation.

- All parts removed have been returned to their original positions.
- No fuel leakage is evident when fuel system is pressurized. (See page 5-3)
- Check the carburetor synchronization.
  (See the “SYNCHRONIZING THROTTLE VALVES” section on page 2-13)

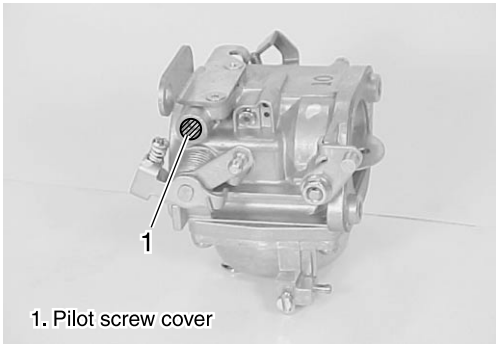
DISASSEMBLY

When disassembling carburetor, refer to the construction diagram.

Remove :
- Drain screw ①
- Screw ②
- Float chamber ③
- Tube ④
- Cap ⑤
- Cap ⑥
- Holder ⑦
- Plunger ⑧
- O-ring ⑨
- Spring ⑩
- Float chamber gasket ⑪
- Main nozzle cap and O-ring ⑫
- Float pin ⑬
- Float ⑭
- Screw ⑮
- Plate ⑯
- Needle valve assembly ⑰
- Main jet ⑱
- Main nozzle ⑲
- Pilot screw ⑳
- Spring ㉑
- Pilot jet ㉒
- Main air jet ㉓



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



1. Pilot screw cover

CLEANING & INSPECTION

Clean thoroughly with cleaning solvent and compressed air before inspection.

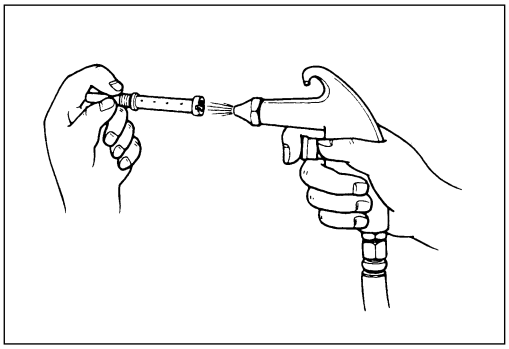
⚠ WARNING

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

CAUTION

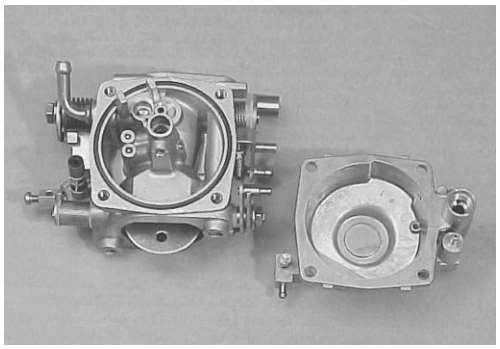
Do not place any rubber, plastic and non-metallic parts in cleaning solvent, as severe damage or deterioration will result.

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



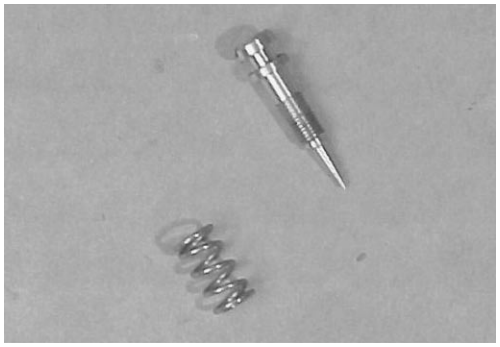
CARBURETOR BODY

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



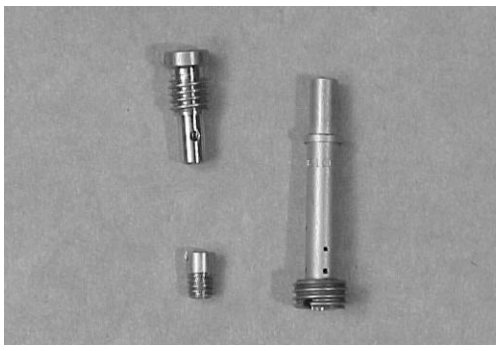
PILOT SCREW (for applicable carburetor only)

Check pilot screws for wear, damaged threads, broken tips and replace if necessary.



JET, NOZZLE

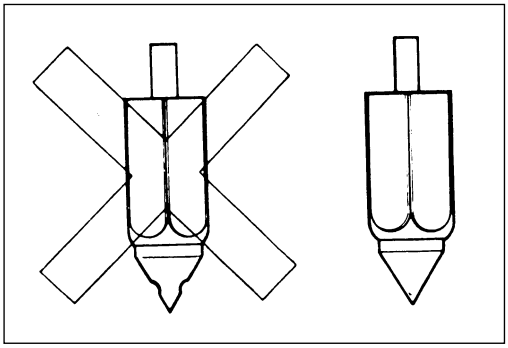
Inspect the jet and nozzle. If cracks or other damage are found on the jet and nozzle, replace them.
Clean the jet and nozzle thoroughly so that there is no obstruction.



NEEDLE VALVE ASSEMBLY

Inspect the needle valve assembly.

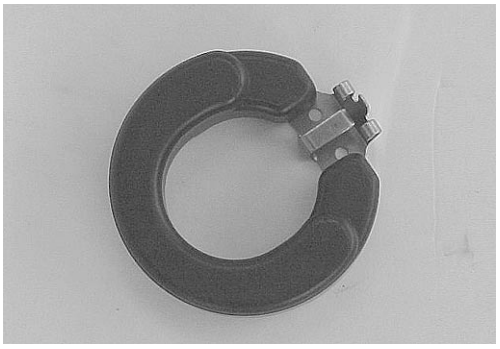
If broken tips or wear are found on the needle valve assembly, replace it.



FLOAT

Inspect the float.

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



REASSEMBLY

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

PILOT SCREW (for applicable carburetor only)

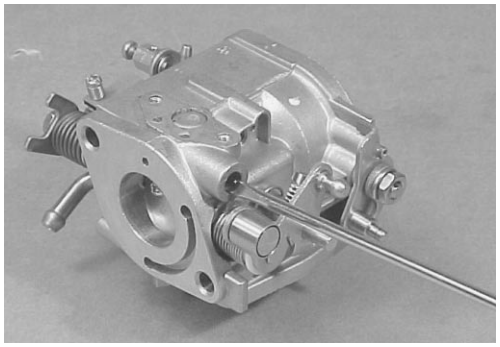
Install the pilot screw and spring in the carburetor.

Turn the screw clockwise until lightly seated; then turn the screw counterclockwise to the specified value for the initial setting.

Pilot screw initial setting:

DF25 1-½ turns open

DF30 1-½ turns open



NOTE:

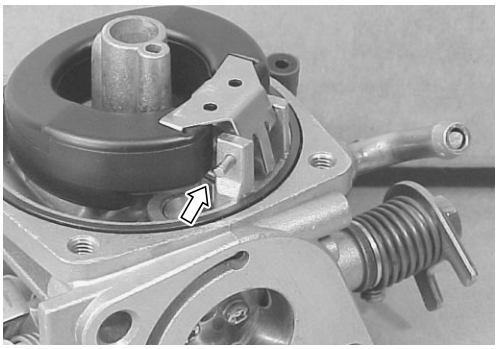
When turning pilot screw fully in, lightly seat them only. Do not over tighten to avoid damaging needle valve and seat.

FLOAT

Install the float and the float pin.

NOTE :

After installing float, inspect for smooth movement of float.



CHECKING FLOAT HEIGHT

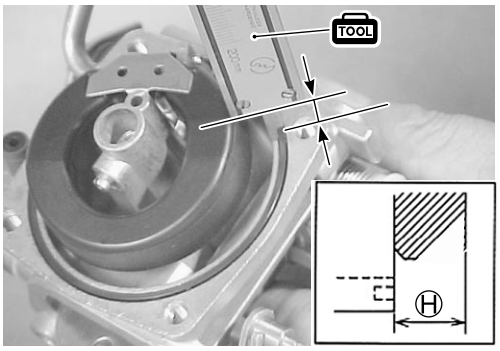
Measure the float height.

NOTE :

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

09900-20101 : Vernier calipers

Float height Ⓗ : 14.6 ± 1 mm

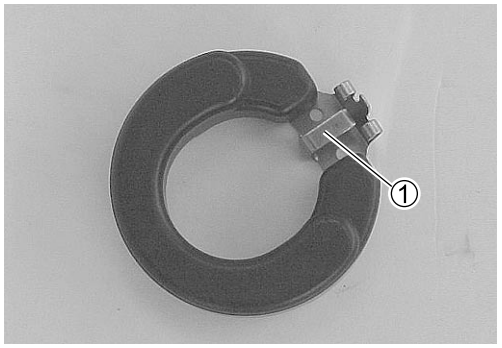


SETTING FLOAT HEIGHT

To correct specification, bend only the adjustment tab ①.

CAUTION

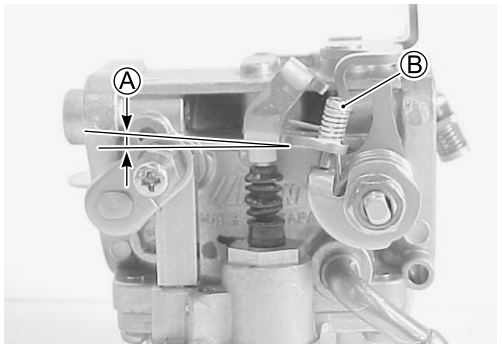
When adjusting tab, do not bend to the point that it applies pressure to the needle and seat.



ADJUSTING ACCELERATION PUMP LEVER GAP

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

Gap Ⓐ (at throttle valve fully closed)	0 mm



NOTE :

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

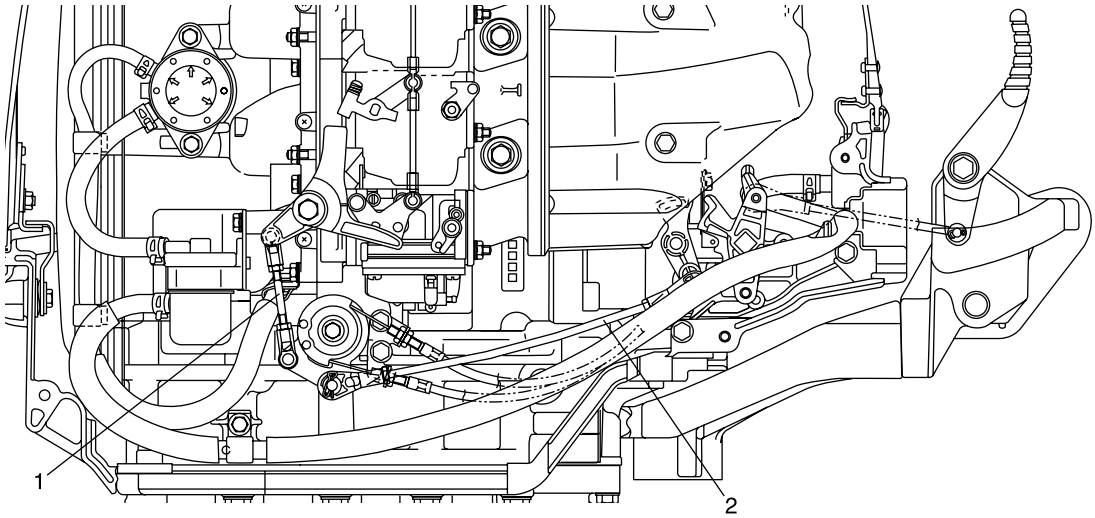
THROTTLE CONTROL

THROTTLE LINK

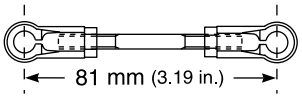
When replacing a link rod and/or connector, see the illustration below to adjust the link rod length to specification.

NOTE:
- *Be sure an equal length of link rod is threaded into each connector.*
- *Tighten lock nut against the connector after adjusting the link rod length.*

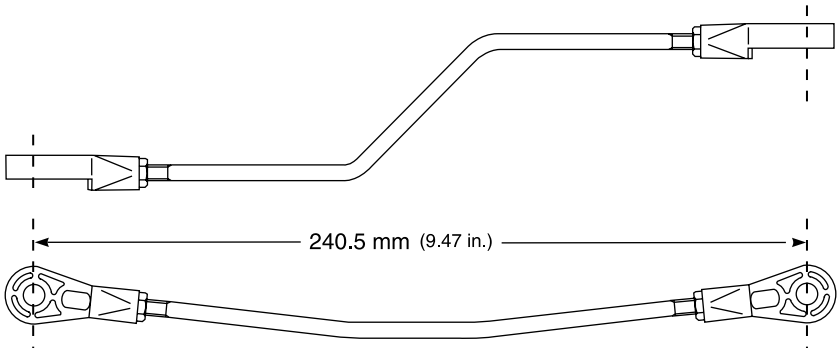
Tiller handle models



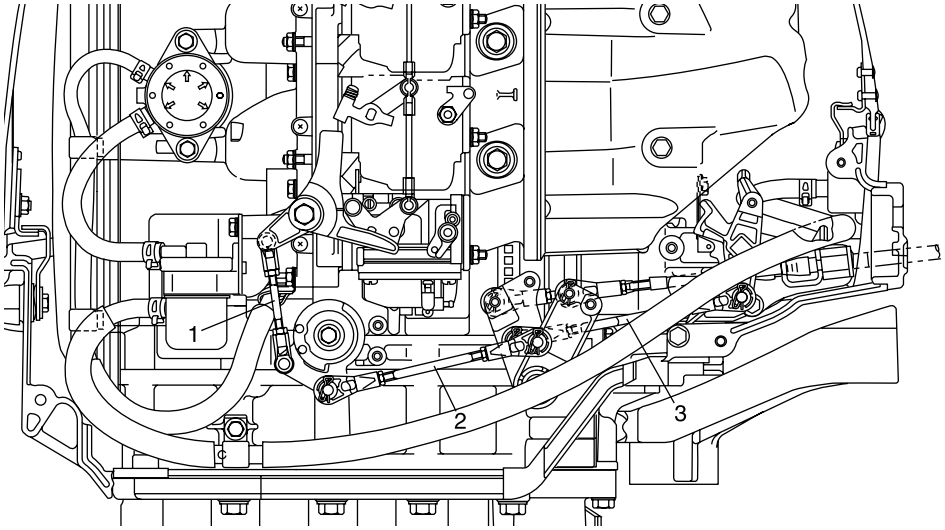
1. Throttle cam rod



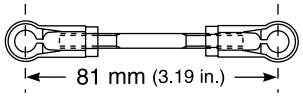
2. Throttle limiter rod



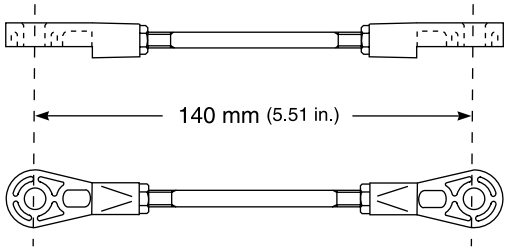
Remote control models



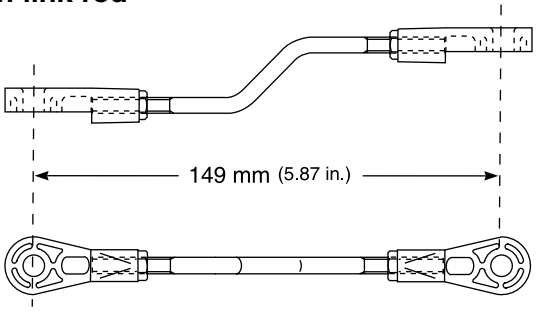
1. Throttle cam rod



2. Throttle rod



3. Clutch link rod

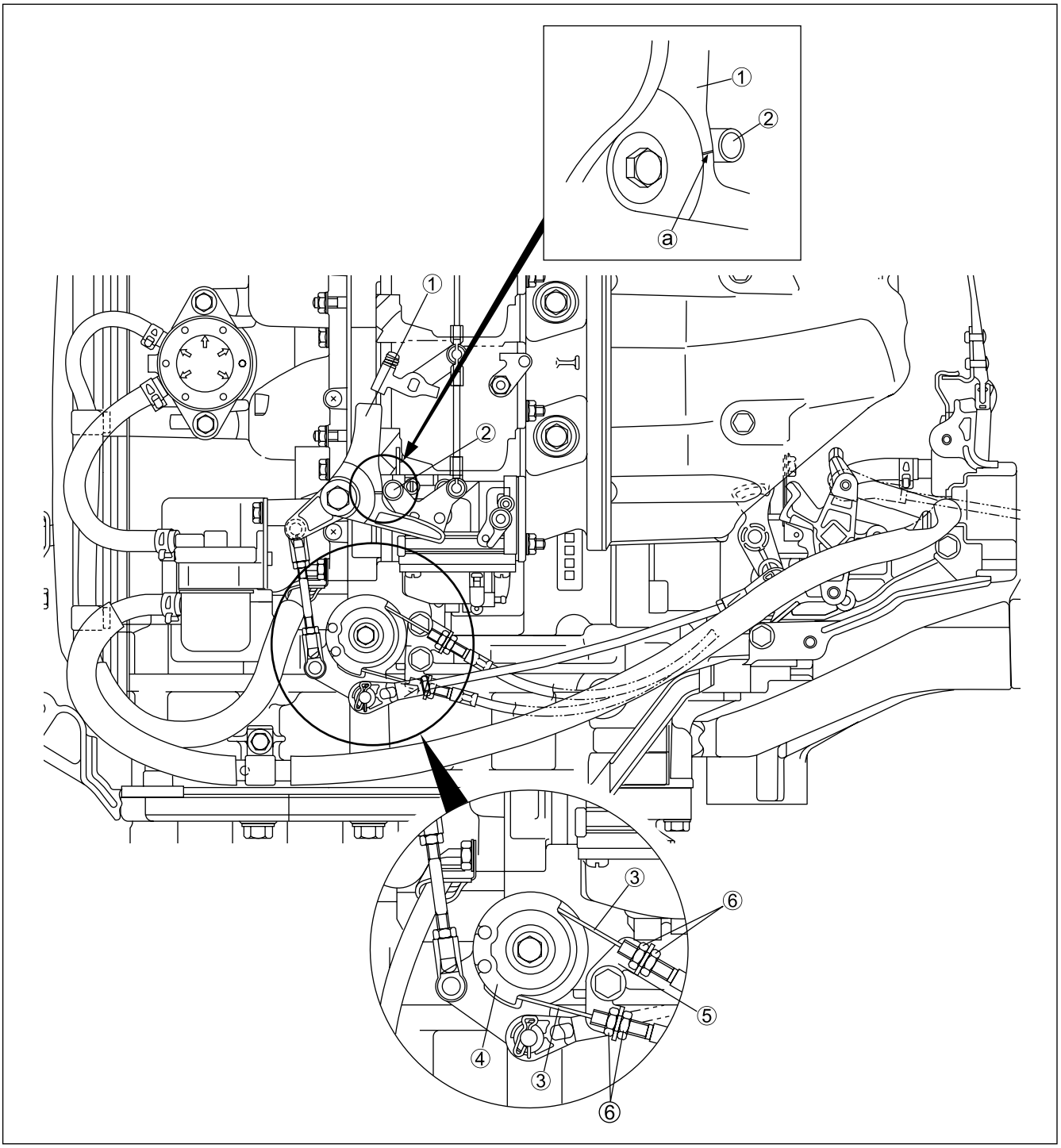


THROTTLE CONTROL CABLE

Installation and Adjustment

1. Rotate throttle control grip to bring the throttle to full close.
2. Align the match mark ⓐ on throttle cam ① with the center of throttle lever roller ② and hold this position.
3. Install throttle control cables ③ to throttle drum ④ and cable holder ⑤.
4. Turn lock nut ⑥ in the appropriate direction to install inner cable with no sag.
5. Tighten the lock nut to secure throttle cable to cable bracket.
6. Rotate the throttle control grip from fully closed position to fully open position several times.

With the throttle control grip at full close, make sure the match mark ⓐ on throttle cam ① aligns with the center of throttle lever roller ②.



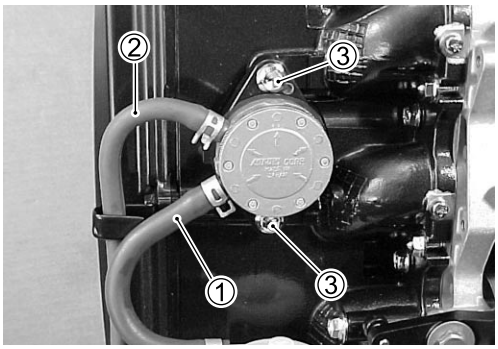
FUEL PUMP
REMOVAL / INSTALLATION

⚠ WARNING

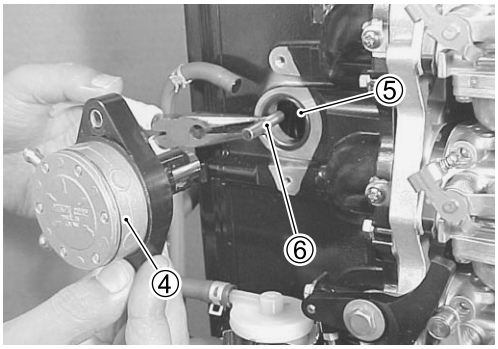
Before servicing the fuel system, read and understand "PRECAUTION ON FUEL SYSTEM SERVICE" in the previous section.

REMOVAL

1. Disconnect inlet hose ① and outlet hose ② from fuel pump.
2. Remove two bolts ③.



3. Remove fuel pump ④ and O-ring ⑤.
   Note position before removing pump rod ⑥.

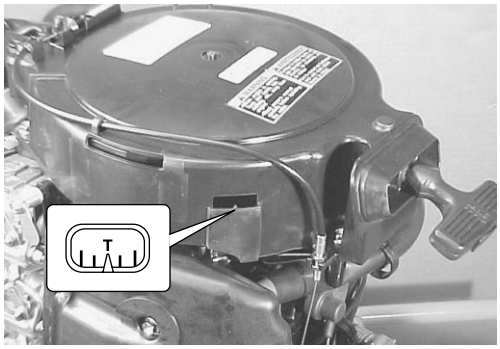


INSTALLATION

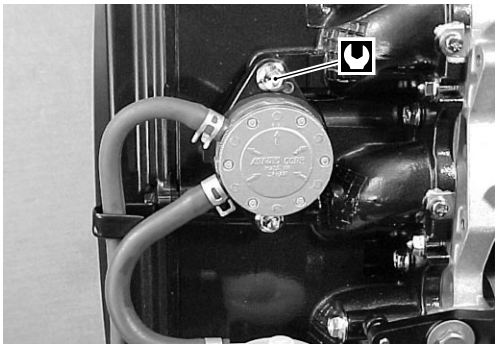
Installation is reverse order of removal with special attention to the following steps.

CAUTION

- **Before installing fuel pump, rotate the crankshaft to bring No.1 (top cylinder) piston to Top Dead Center on compression stroke.**
- **Discard O-rings after removal. always use new O-ring to ensure proper sealing.**



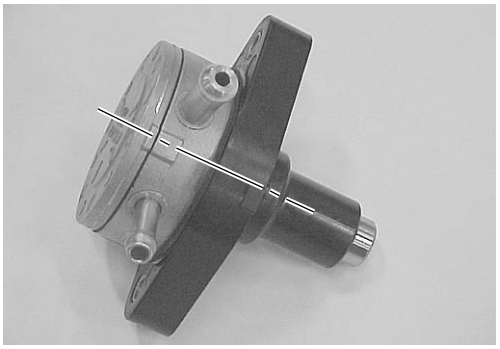
Fuel pump bolt : 10 N·m (1.0 kg-m, 7.0 lb.-ft.)



DISASSEMBLY / REASSEMBLY

DISASSEMBLY

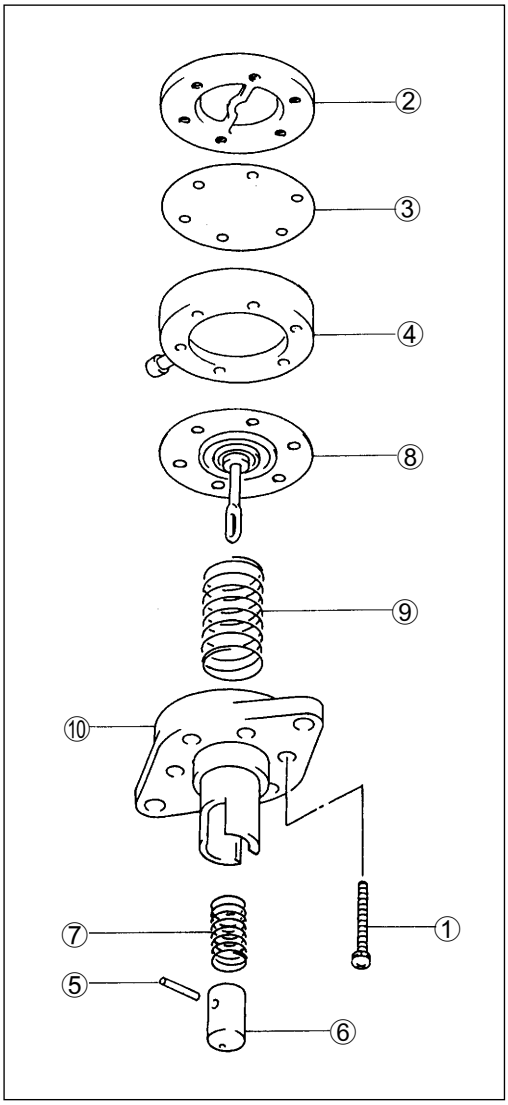
NOTE:
For correct assembly, scribe an alignment mark on each part of fuel pump.



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

Turn piston ⑥ until pin ⑤ comes out through cutaway of pump body ⑩.

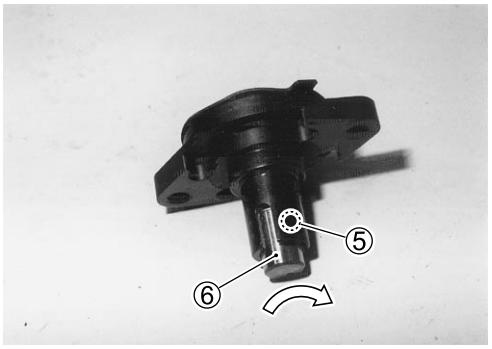
Remove following parts :
- Pin ⑤
- Piston ⑥
- Spring ⑦
- Diaphragm ⑧
- Spring ⑨



ASSEMBLY

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

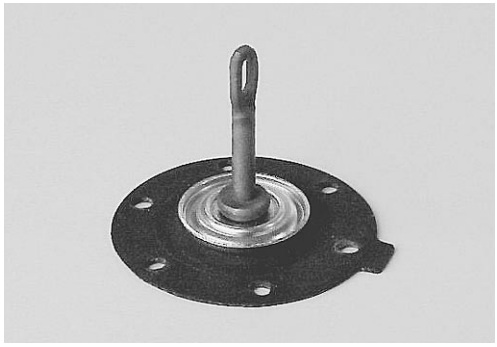
NOTE:
After connecting diaphragm rod ⑧ to piston ⑥ with pin ⑤, align the six diaphragm holes to pump body holes by turning piston ⑥ and diaphragm ⑧ together. Turning them together prevents the pin from coming out through pump body ⑩ cutaway.



INSPECTION

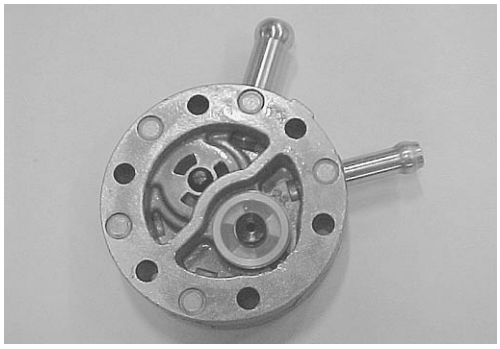
Diaphragm

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



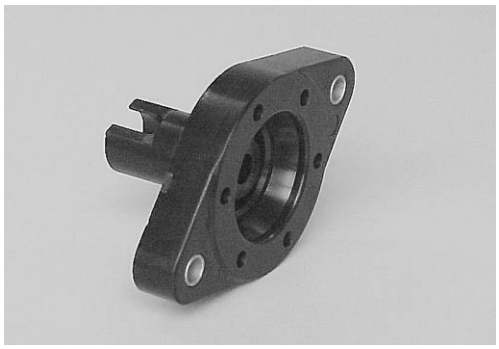
Check-valves

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



Pump body

Inspect each fuel pump body and outer plate.
If cracks, nicks, distortion or damage is found, replace fuel pump.

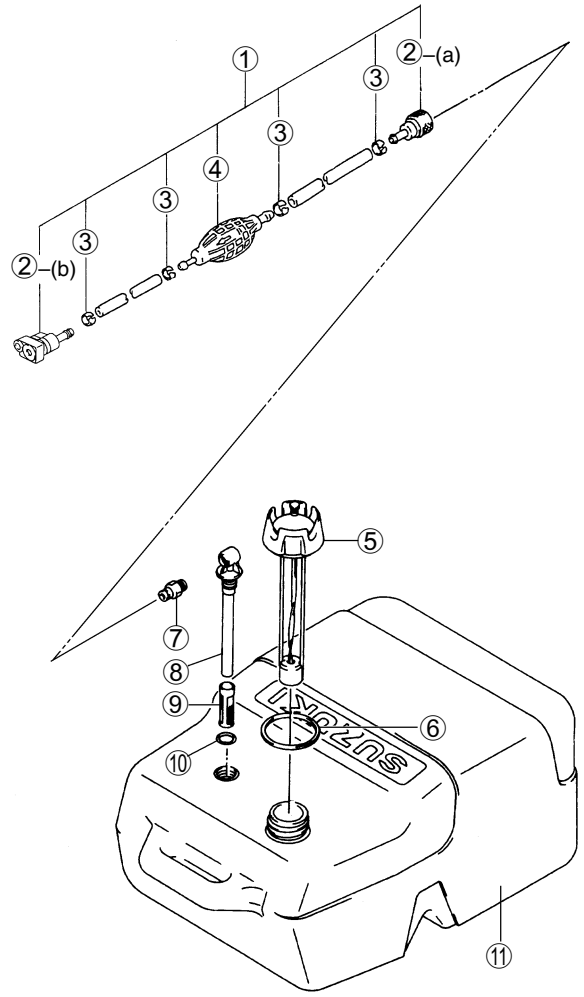


FUEL TANK

DISASSEMBLY / REASSEMBLY

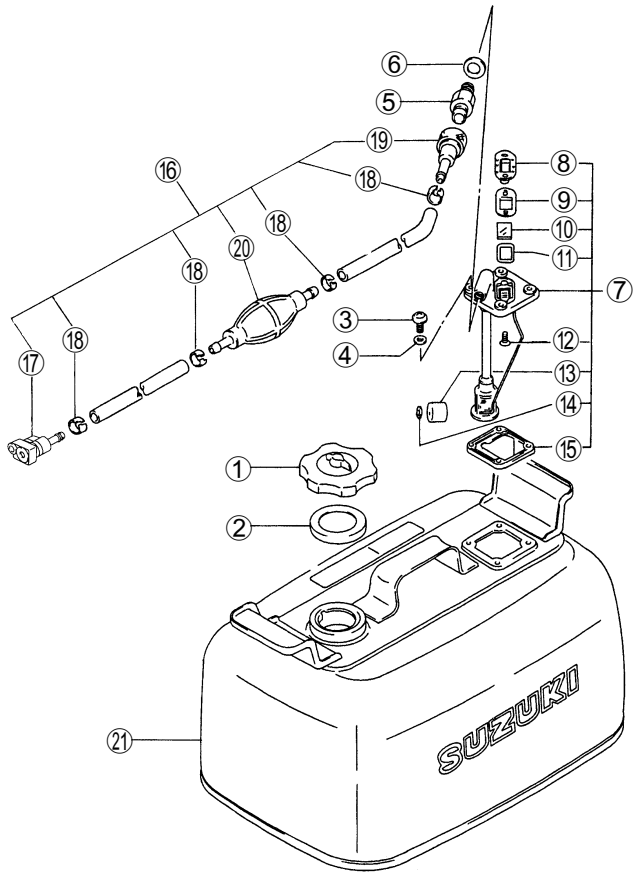
When disassembling or reassembling fuel tank, refer to the construction diagram below.

Plastic tank



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

Steel tank

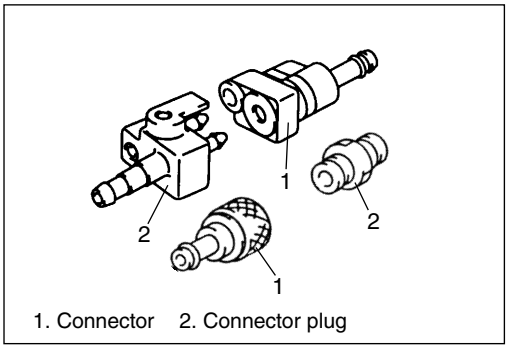


① **Tank cap (1)**
② **Gasket (1)**
③ **Screw (4)**
④ **Gasket (4)**
⑤ **Connector plug (1)**
⑥ **Gasket (1)**
⑦ **Fuel gauge assy (1)**
[⑧ **Cover (1)**]
[⑨ **Gasket (1)**]
[⑩ **Lens (1)**]
[⑪ **Gasket (1)**]
[⑫ **Screw (2)**]
[⑬ **Float (1)**]
[⑭ **Push nut (1)**]
[⑮ **Gasket (1)**]
⑯ **Fuel hose assy (1)**
[⑰ **Connector (1)**]
[⑱ **Clip (4)**]
[⑲ **Connector (1)**]
[⑳ **Primer bulb (1)**]
[㉑ **Fuel tank (1)**]

INSPECTION

Fuel connector

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

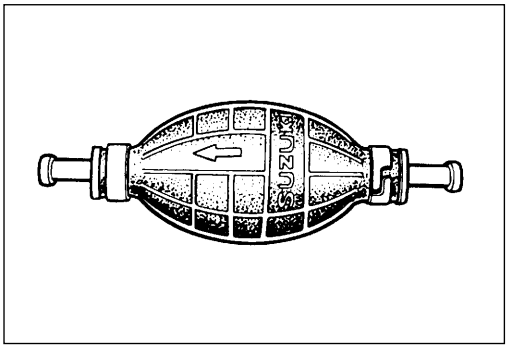


1. Connector 2. Connector plug

Fuel primer bulb

Inspect fuel primer bulb. If cracks, leakage, or deterioration is found, replace primer bulb.

If check valve function is defective, replace primer bulb.



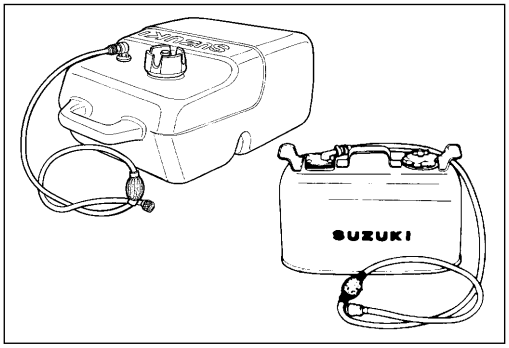
Fuel hose

Inspect fuel hose. If cuts, cracks, leakage, tears or deterioration is found, replace fuel hose.

Fuel tank

Inspect fuel tank. if cracks, leakage or deterioration is found, replace fuel tank.

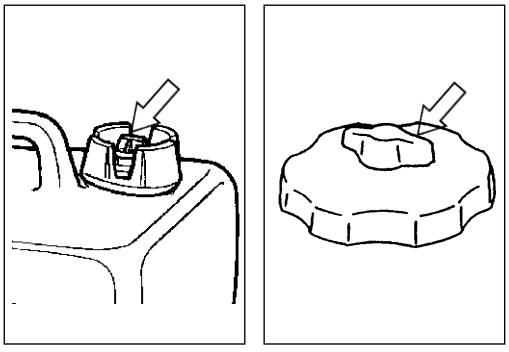
If water or other contamination is found, drain and clean fuel tank.



Tank cap

Check that the fuel tank vent opens and relieves internal tank pressure properly.

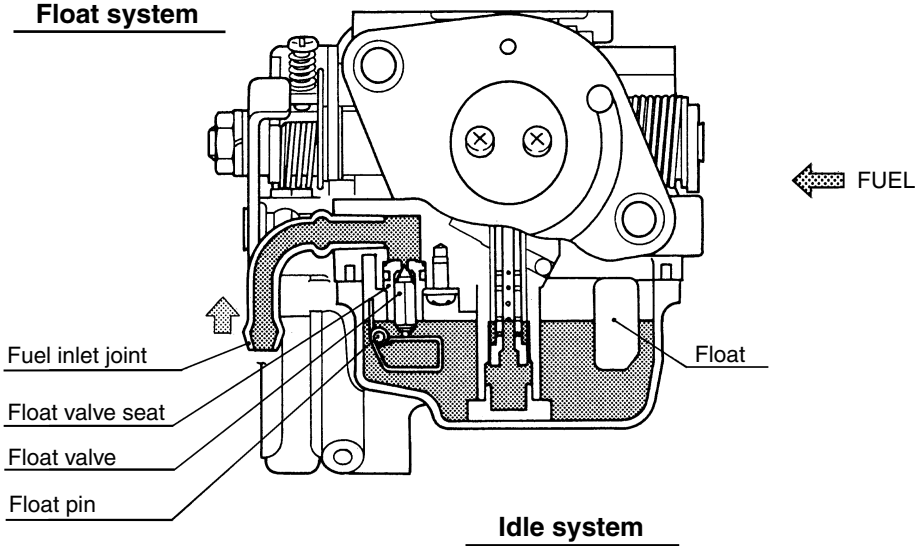
Replace tank cap if vent is suspect.



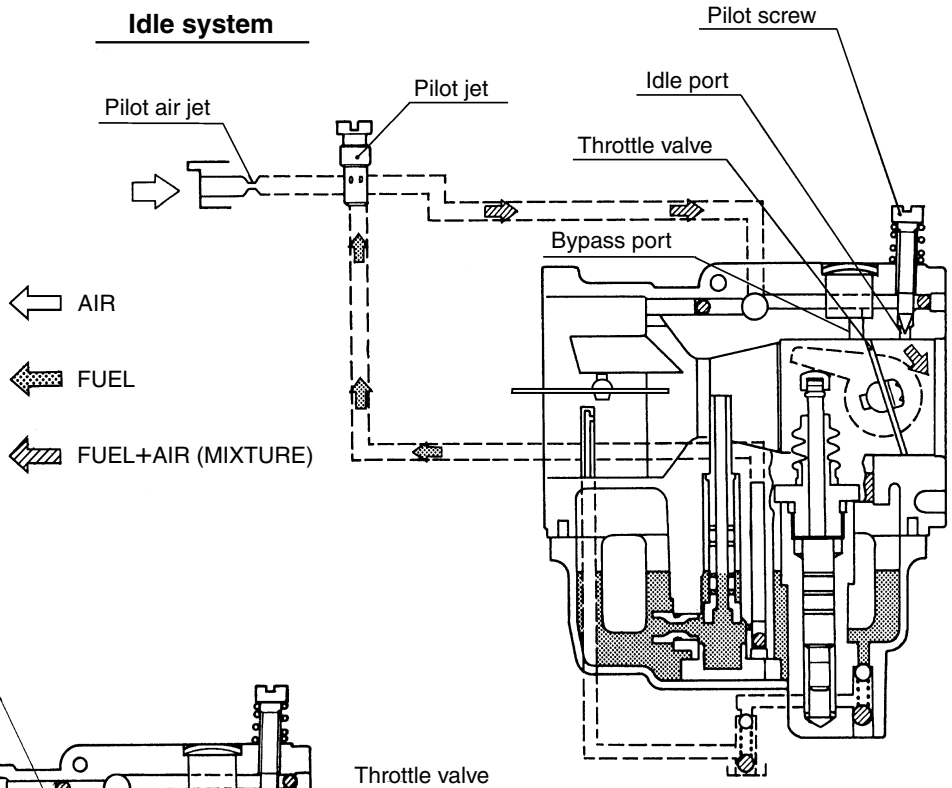
OPERATION

CARBURETOR

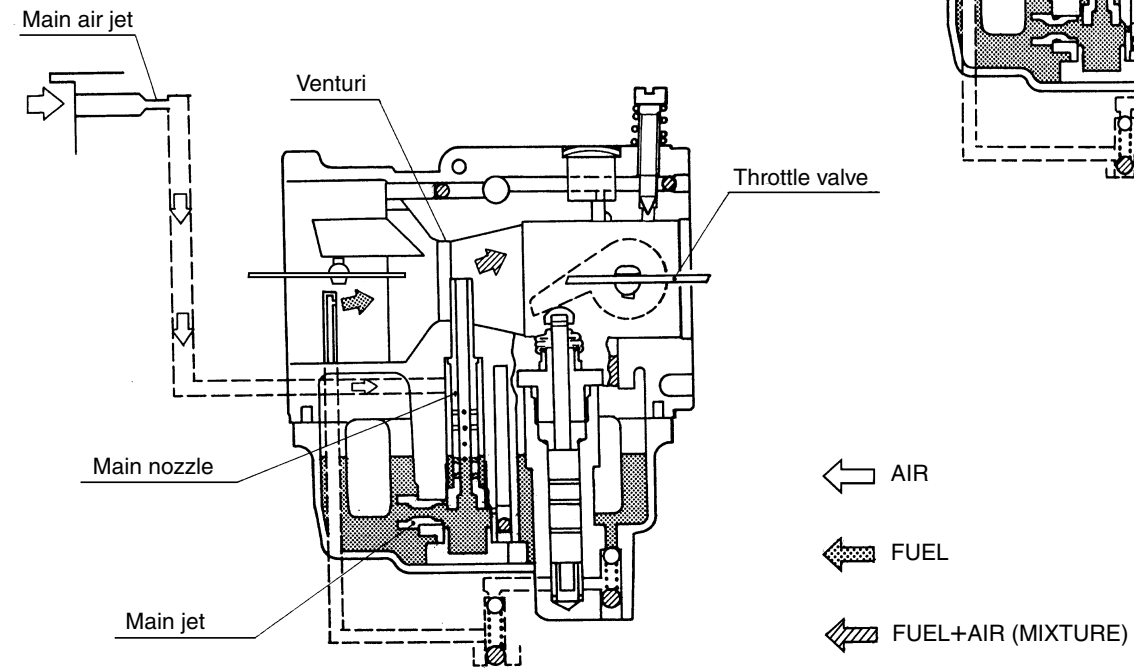
Float system



Idle system



Main Metering system

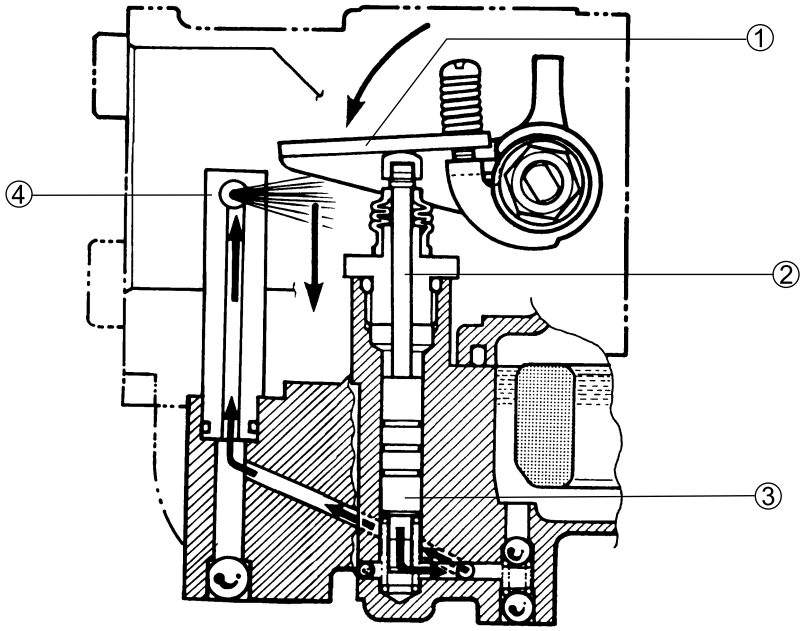


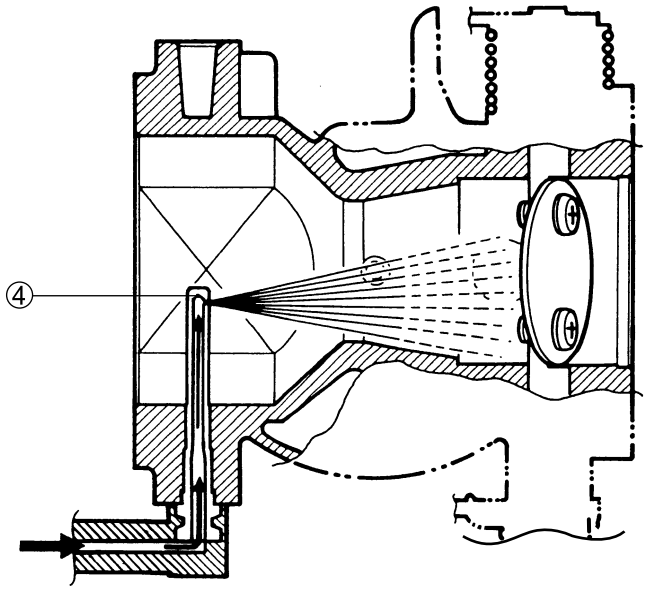
ACCELERATOR PUMP SYSTEM

The DF25/30 models are equipped with an accelerator pump system. This system is composed of an accelerator pump on each carburetor with brass tubes connecting the pump to the fuel output nozzles on each carburetor. A normal engine characteristic during hard acceleration is hesitation caused by an imbalance in the fuel/air ratio. This is due to the rapid rate of increase in intake air volume when the throttle is opened quickly with the air velocity and fuel flow rate following at a slower rate of increase. The accelerator pump system overcomes this characteristic.

Accelerator pump operation

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



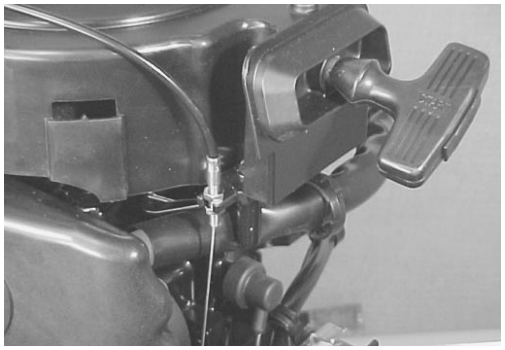


RECOIL STARTER

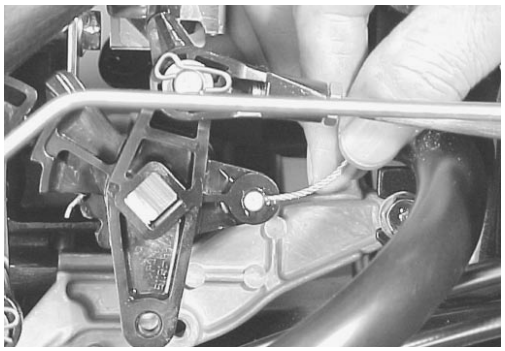
CONTENTS

REMOVAL

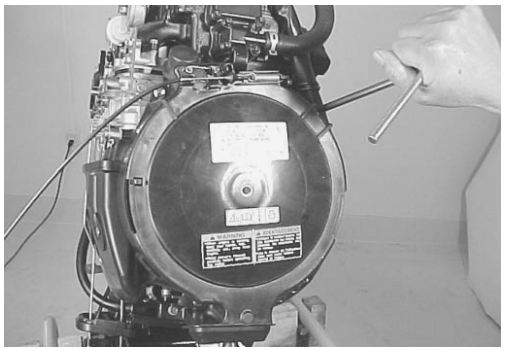
1. Loosen the lock nuts ① and remove NSI cable ② from the cable bracket ③.



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



3. Loosen and remove the three (3) bolts securing the recoil starter.
4. Remove recoil starter assembly ⑤.

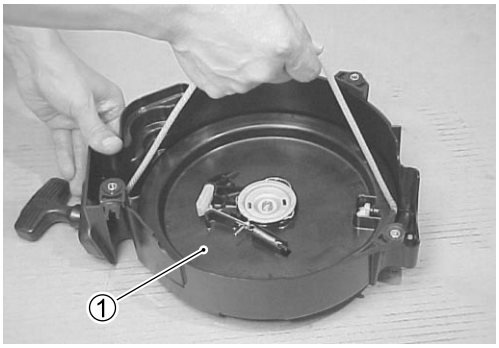


DISASSEMBLY

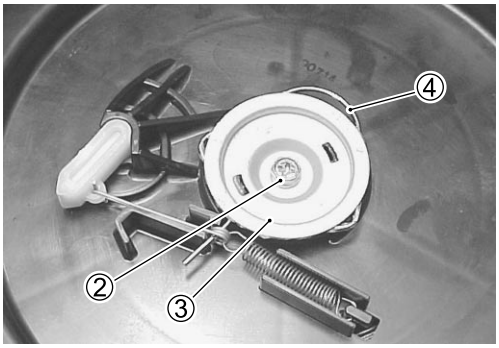
CAUTION

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

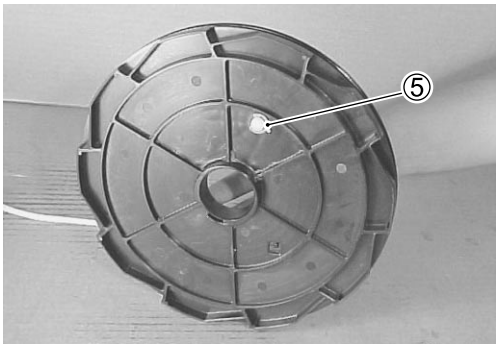
1. Turn the reel ① clockwise to release the coiled tension in the recoil spring.

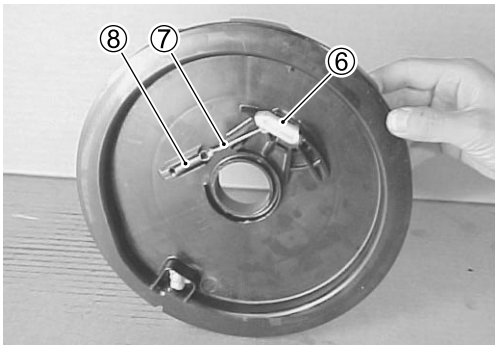


2. Unscrew and remove the bolt ②, then remove the friction plate ③ with the friction spring ④.
3. Remove the reel ①.



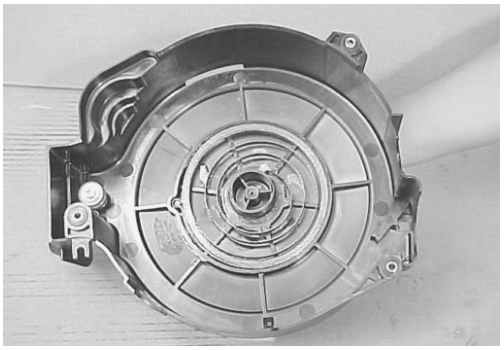
4. Remove the E-ring ⑤ first, and then take off the ratchet (pawl) ⑥, ratchet guide ⑦ and return spring ⑧.



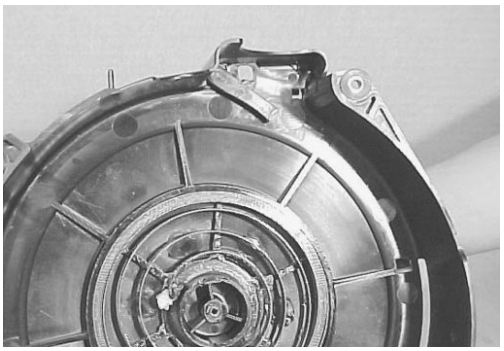


5. Remove the recoil spring ⑨.

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

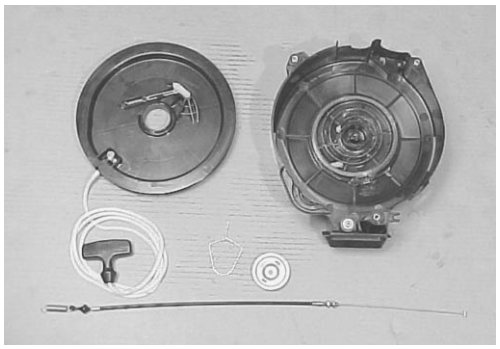


6. Remove NSI cable ⑩ from the recoil case ⑪. Take off the reel stopper spring ⑫ and the reel stopper ⑬.



INSPECTION

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



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

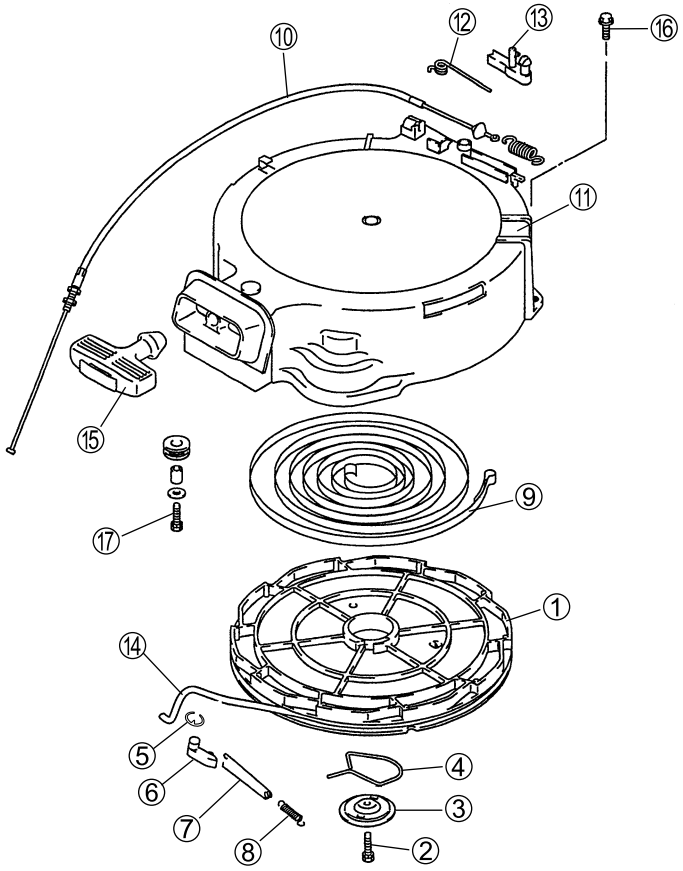
- Inspect the reel, recoil case.
  If any cracks or damage is found on them, replace it.

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

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

REASSEMBLY

System construction



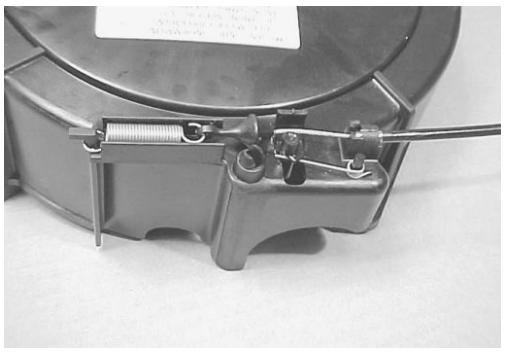
① Reel
② Bolt
③ Friction plate
④ Friction spring
⑤ E-ring
⑥ Ratchet (Pawl)
⑦ Ratchet guide
⑧ Return spring
⑨ Recoil spring
⑩ NSI cable
⑪ Recoil case
⑫ Spring
⑬ Reel stopper
⑭ Rope
⑮ Grip
⑯ Bolt
⑰ Bolt

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

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

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

- Install the reel stopper ⑬, reel stopper spring ⑫ and then NSI cable ⑩.

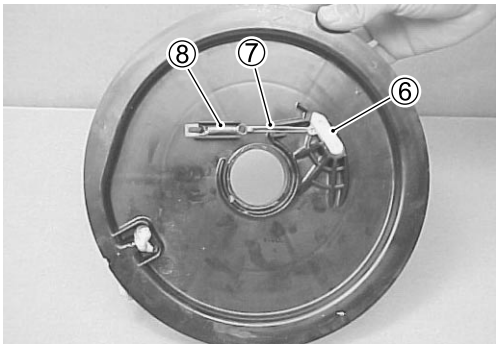


- Secure the outer end of the recoil spring ⑨ on the boss in the recoil case ⑪ and wind spring inward towards the center of the case in a counterclockwise direction.

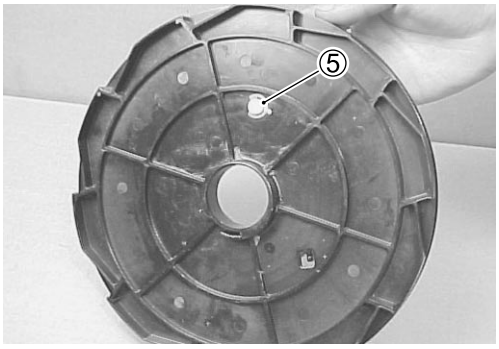
CAUTION

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

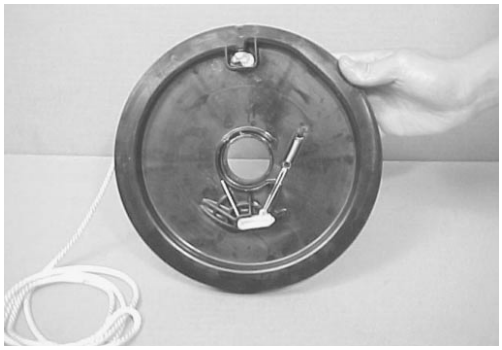
- Install the return spring ⑧, ratchet guide ⑦ and ratchet ⑥.



- Secure the ratchet with E-ring ⑤.

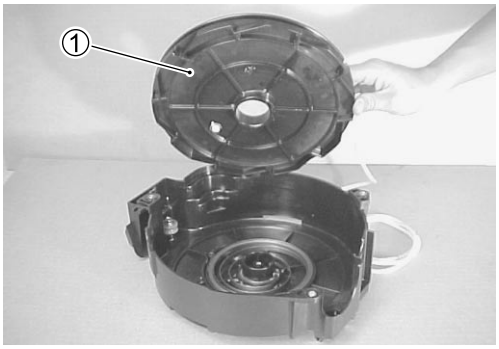


- Install the recoil rope.

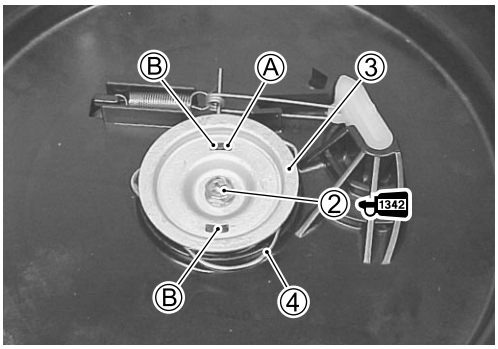


- Install the reel ①.

NOTE :
Align groove in reel with bent end of spring.

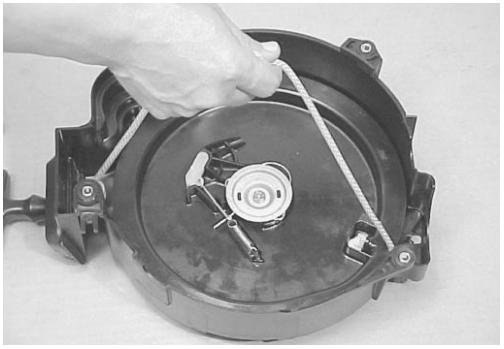


- Install the friction plate ③ (with friction spring ④) and secure it with the bolt ②.
  Apply Thread Lock 1342 to the thread of the bolt.



NOTE :

- *Twist friction plate slightly to align holes Ⓐ in plate with square lugs Ⓑ on center boss.*
- *After assembling, guide the rope into notch in reel and rotate reel approximately 5 turns counterclockwise until spring is tensioned.*



INSTALLATION

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

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

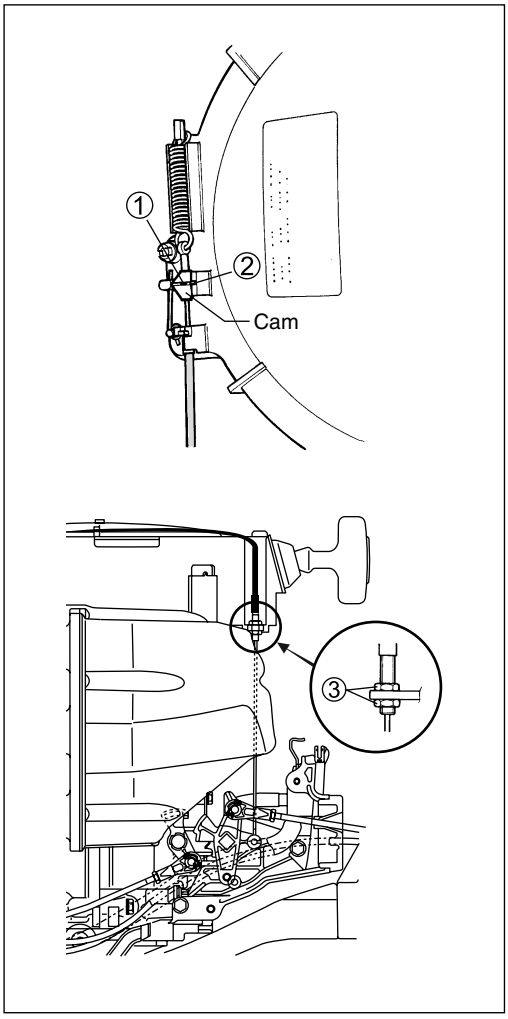
NEUTRAL START INTERLOCK (NSI)
INSTALLATION / ADJUSTMENT

1. Shift into “NEUTRAL” position.
2. Install the NSI cable in the recoil starter, clutch notch plate, and the cable bracket.
3. Loosen the adjustment nut ③.
4. Turn the adjustment nut to align the center ① of the cam with the match mark ② on the recoil starter case.
5. Pull the recoil starter and make sure that the starter does not work when the shift lever is in “FORWARD” and “REVERSE” position.
6. Tighten the adjustment nut.
7. Apply Suzuki Water Resistant Grease to inner cable, cable end, and cam.

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

CAUTION

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

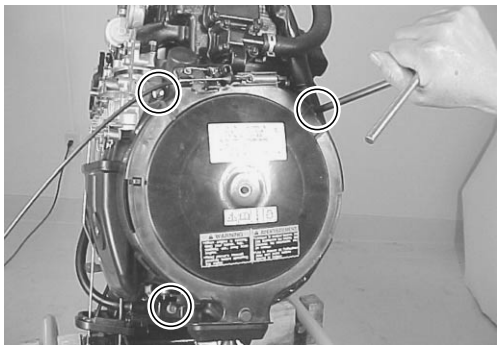


POWER UNIT

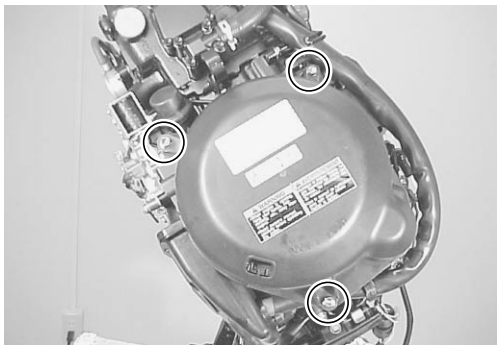
CONTENTS

POWER UNIT
REMOVAL

Before removing power unit :
- **Drain engin oil.**
- **Disconnect battery cable from battery.**
- **Remove both side lower covers. (see page.8-2)**

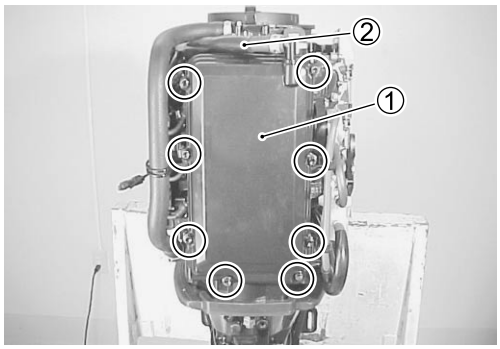


[Manual start model]
- Remove recoil starter. (see page 6-2)

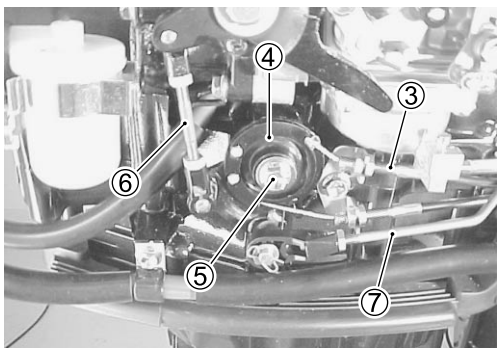


[Electric start model]
- Remove Flywheel cover.

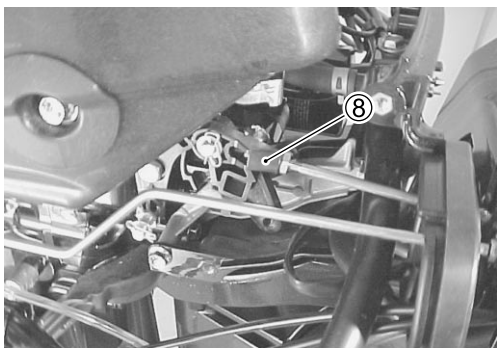
Remove the eight (8) cylinder head cover bolts, and then cylinderhead cover ① and breather hose ② .



[Tiller handle model]
- Remove throttle cables ③ from throttle drum ④ .
- Remove bolt ⑤ , throttle drum ④, throttle cam link rod⑥ and throttle limiter rod ⑦ .

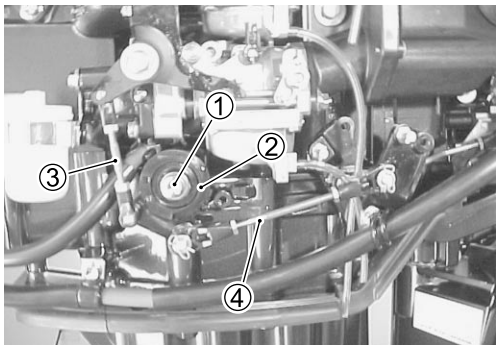


- Remove shift lever link rod ⑧ .

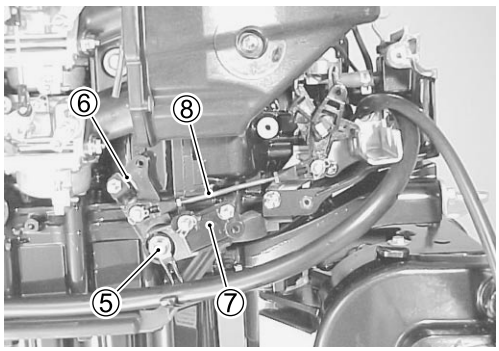


[Remote control model]

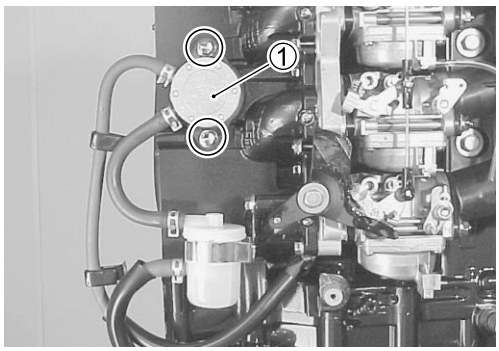
- Remove bolt ① , throttle drum ②, throttle cam link rod③ and remote control throttle link rod ④ .



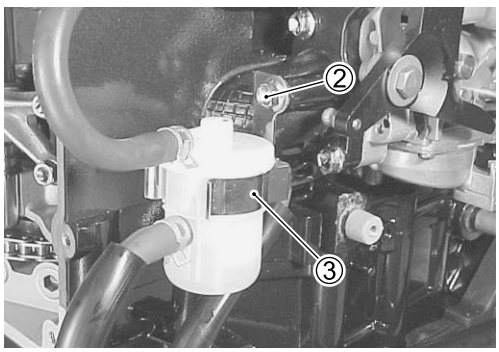
- Remove bolt ⑤ , clutch control lever ⑥ , throttle control lever ⑦ and clutch lever link rod ⑧ .



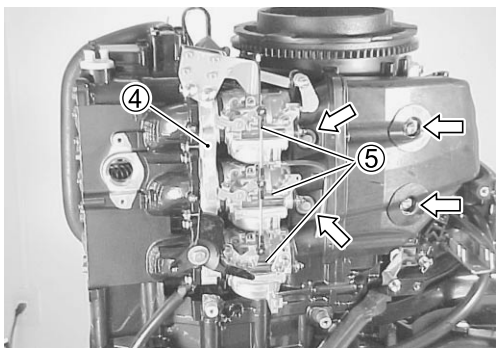
Remove fuel pump ① (see page 5-14)



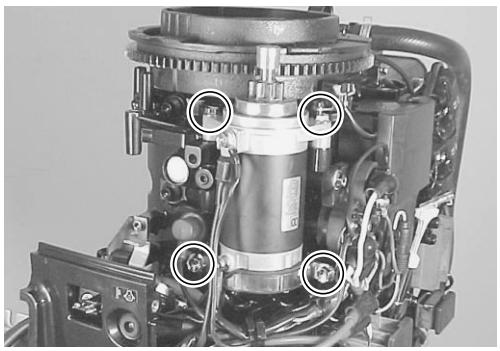
Remove bolt ② and fuel filter bracket ③ .



Remove inlet case ④ and three carburetor assembly ⑤ . (see page 5-4)
Disconnect choke solenoid lead wire. (Remote control models)

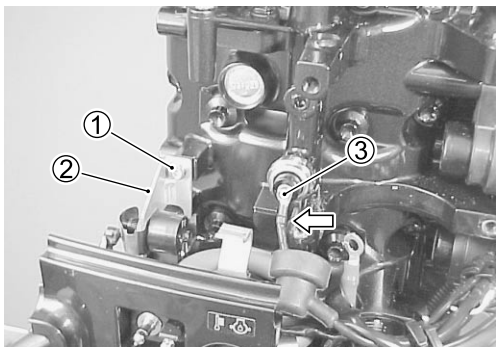


Remove starter motor. (see page 4-13)

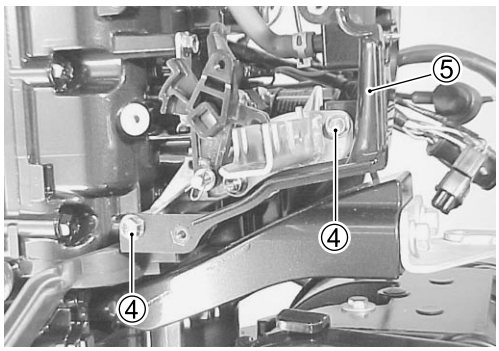


Remove bolt ① , neutral switch / switch bracket ② .
Disconnect the switch lead wire connector.

Loosen screw ③ and disconnect oil pressure switch lead wire.

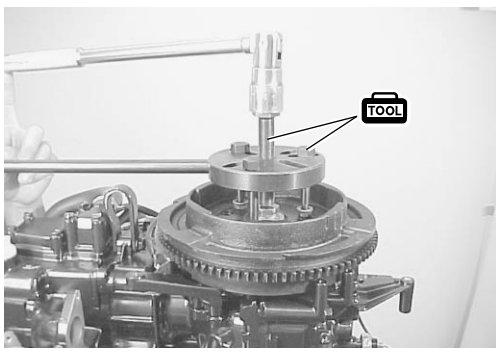


Remove the two bolts ④ securing front panel ⑤ .



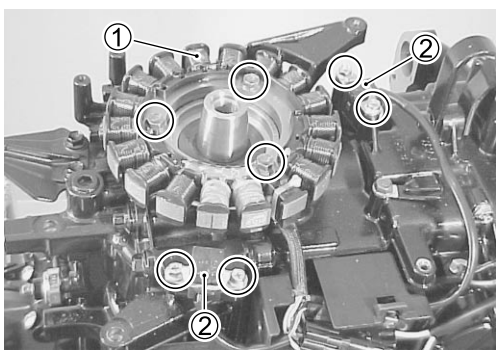
Remove flywheel. (see page 3-16)

TOOL **09930-48720 : Flywheel holder**
09930-39411 : Flywheel remover
09930-39420 : Flywheel remover bolt

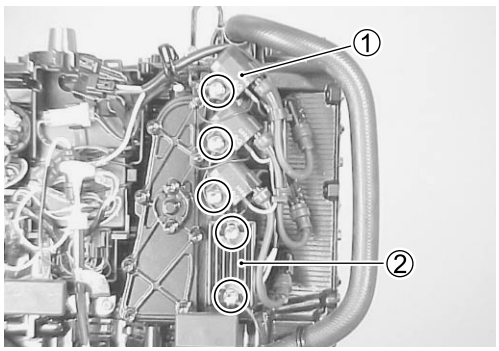


Remove battery charge & power source coil ①.(see page 3-16)

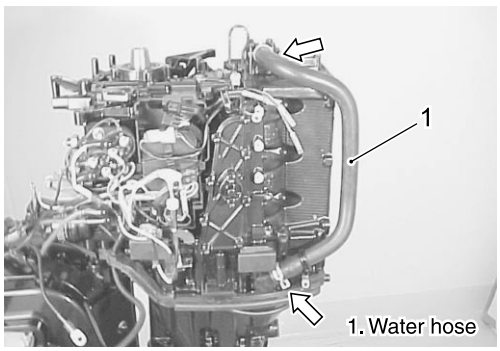
Disconnect CKP sensor connector and remove sensors ② .



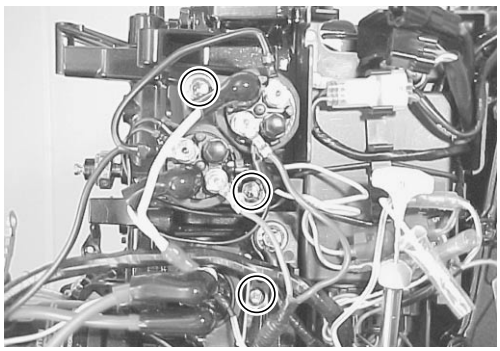
Remove three (3) ignition coils ① and disconnect primary lead wire.
Remove two bolts and rectifier & regulator ② .



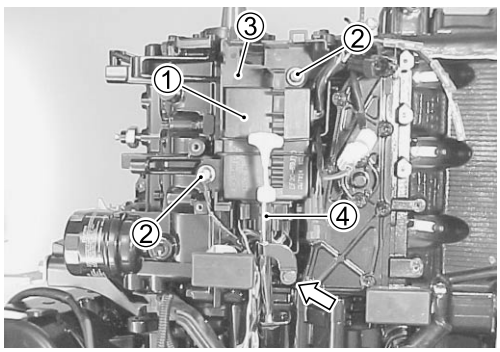
Disconnect water hose from thermostat cover and engine holder.



Remove screw, starter motor relay and relay bracket.
Remove bolts and PTT motor relay bracket. (PTT model)

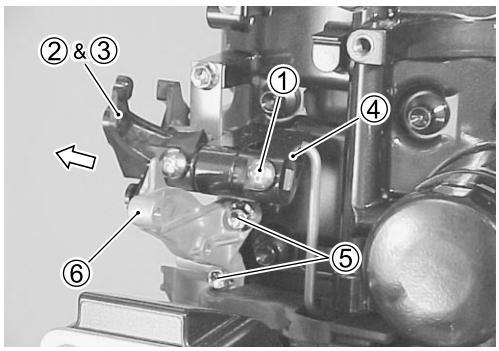


Disconnect all engine wiring harness connector from CDI unit, then remove CDI unit ① .
Remove bolts ② and electric parts holder ③ .
Remove bolt and oil level gauge guide ④ .

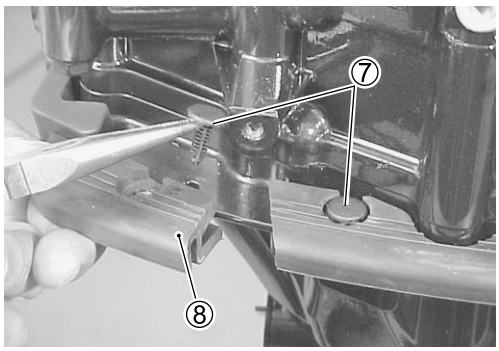


Disconnect clutch rod from shift rod by loosening lock nut and turn buckle.

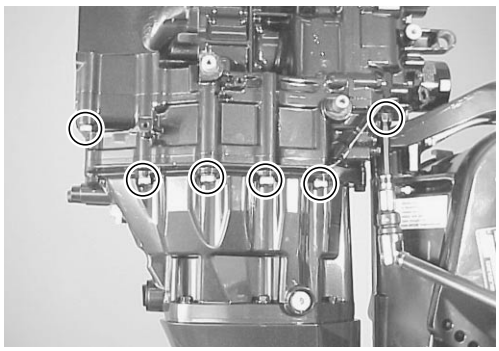
Remove screw ①, clutch arm shaft ②, clutch notch plate ③ and clutch arm ④.
Remove pins ⑤ and front panel bracket ⑥.

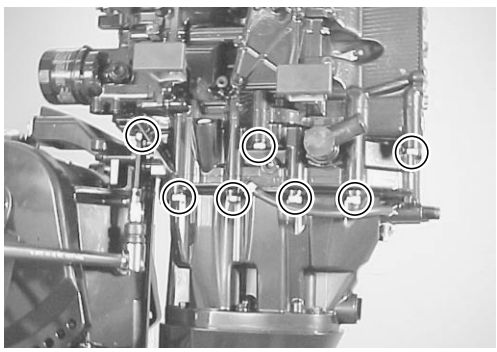


Remove pins ⑦ and side cover seal ⑧.



Remove thierteen (13) bolts.
Lift up remove power unit from engine holder.





INSTALLATION

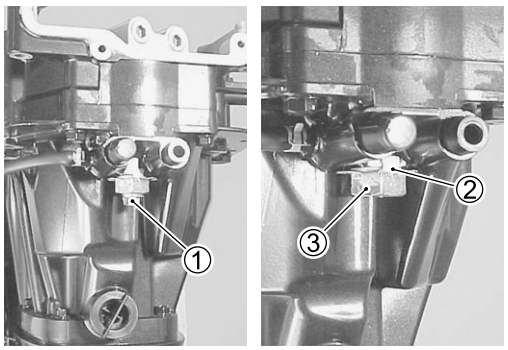
Installation is reverse order of removal with special attention to the following steps.

CAUTION

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

BEFORE INSTALLATION

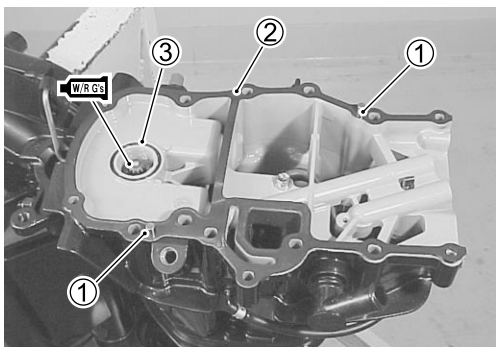
Remove plug ①.
Using screw driver, drive locking edges of lock washer ② upward, and then remove oil pump stopper ③ from oil pan.



POWER UNIT

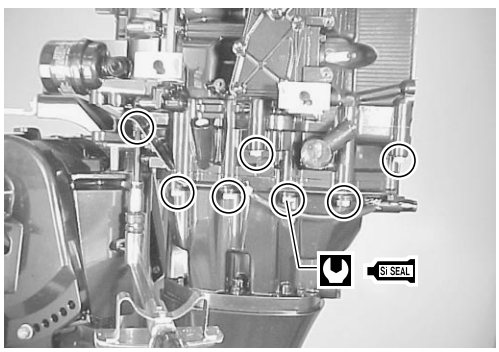
Install dowel pins ① , gasket ② and O-ring ③ .
Apply Suzuki Water Resistant Grease to driveshaft splines.

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



Lower the power unit onto engine holder.

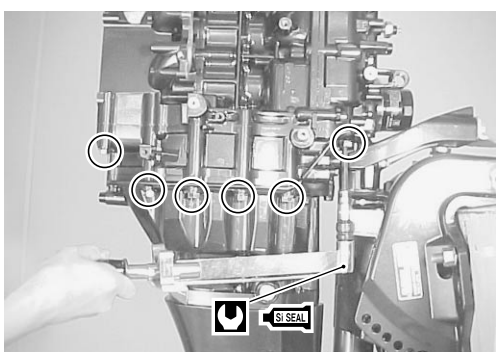
NOTE :
Rotate crankshaft to aid alignment of driveshaft and crankshaft splines.



Apply Suzuki Silicone Seal to power unit mounting bolts and tighten bolts to specified torque.

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

Power unit mounting bolt :
8 mm 23 N·m (2.3 kg-m, 16.5 lb.-ft.)
10 mm 50 N·m (5.0 kg-m, 36.0 lb.-ft.)



OIL PUMP SHAFT ENGAGEMENT

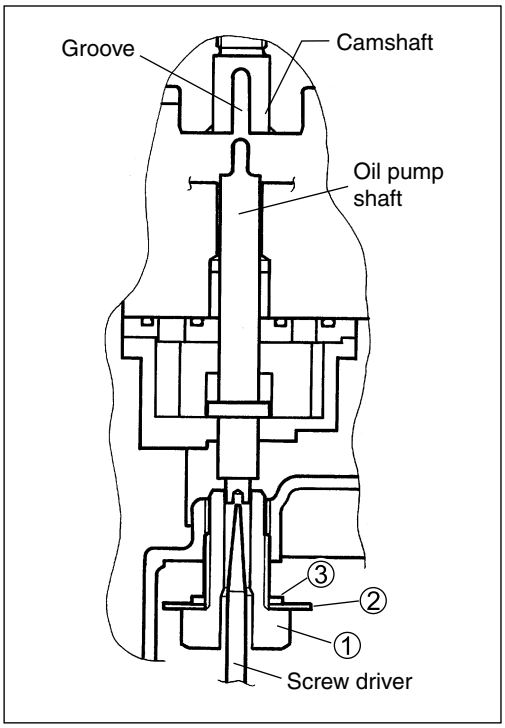
Install lock washer ② and gasket ③ to oil pump stopper①, and then screw (2-3 turns) the oil pump stopper ① onto oil pan.

CAUTION

Do not screw oil pump shaft stopper fully before engagingoil pump shaft with groove in camshaft. la leva.

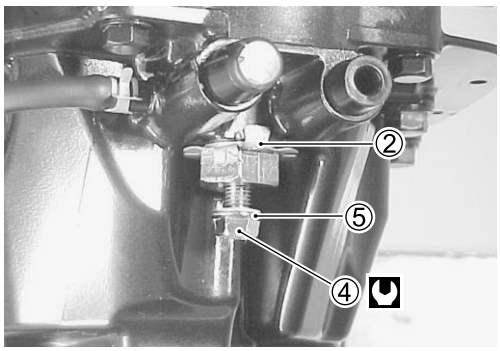
Engage oil pump shaft with groove in camshaft by rotating screw driver as shown.
While holding screw driver, tighten oil pump stopper ① .

Oil pump stopper : 50 N·m (5.0 kg-m, 36.0 lb.-ft.)



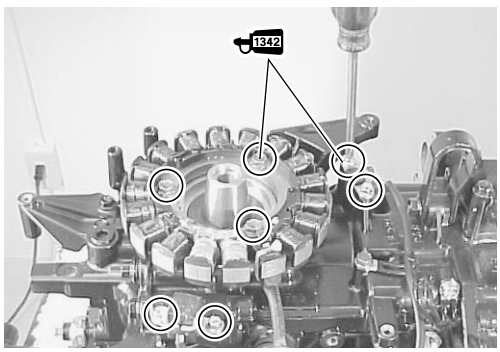
After torquing stopper, bend two lock washer ② tabs in the opposite
directions each other. (one upward and one down).
Tighten plug ④ with gasket ⑤ .

Oil pump stopper plug : 23 N·m (2.3 kg-m, 16.5 lb.-ft.)



FLYWHEEL

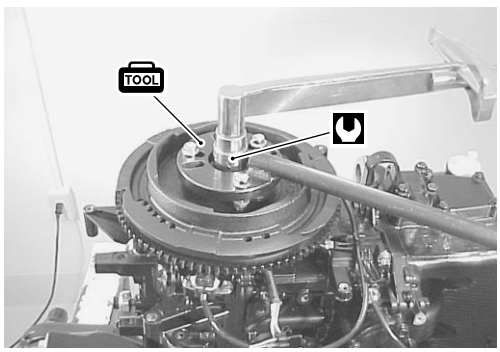
Install battery charge & power source coil. (See page 3-18)
Install CKP sensors. (See page 3-18)



Install flywheel and tighten flywheel bolt to specified torque. (See page 3-18)
Apply engine oil lightly to flywheel bolt before installing.

09930-48720 : Flywheel holder

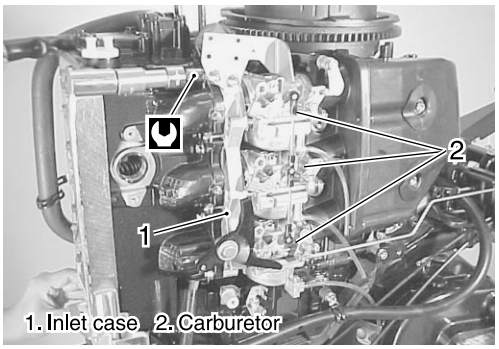
Flywheel bolt : 190 N·m (19.0 kg-m, 137.5 lb.-ft.)



CARBURETOR / INLET CASE ASSEMBLY

Install carburetor / inlet case assembly. (See page 5-6)

Inlet case bolt / nut : 11 N·m (1.1 kg-m, 8.0 lb.-ft.)



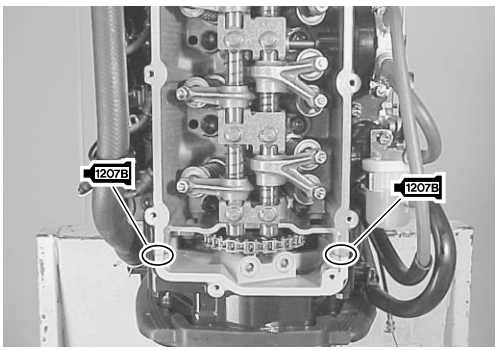
1. Inlet case 2. Carburetor

CYLINDER HEAD COVER

NOTE:
Before installing cylinder head cover, check valve clearance. *(See page 2-9)*

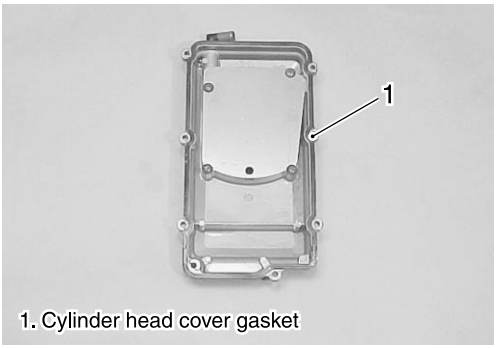
Apply Suzuki bond to area as shown in figure.

1207B **99000-31140 : Suzuki Bond No.1207B**



Assemble cylinder head cover gasket to cylinder head cover.

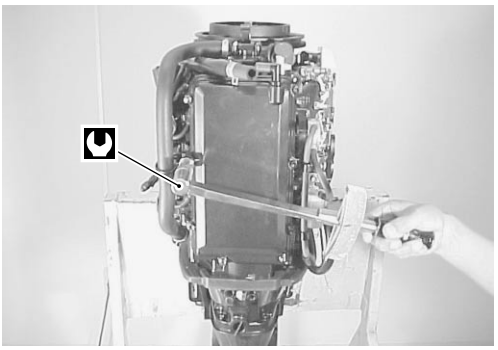
NOTE:
Be sure to check head cover gasket for wear or any damage before installation and replace any found defective.



1. Cylinder head cover gasket

Install cylinder head cover to cylinder head and tighten cover bolts to specified torque.

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



FINAL ASSEMBLY CHECK

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

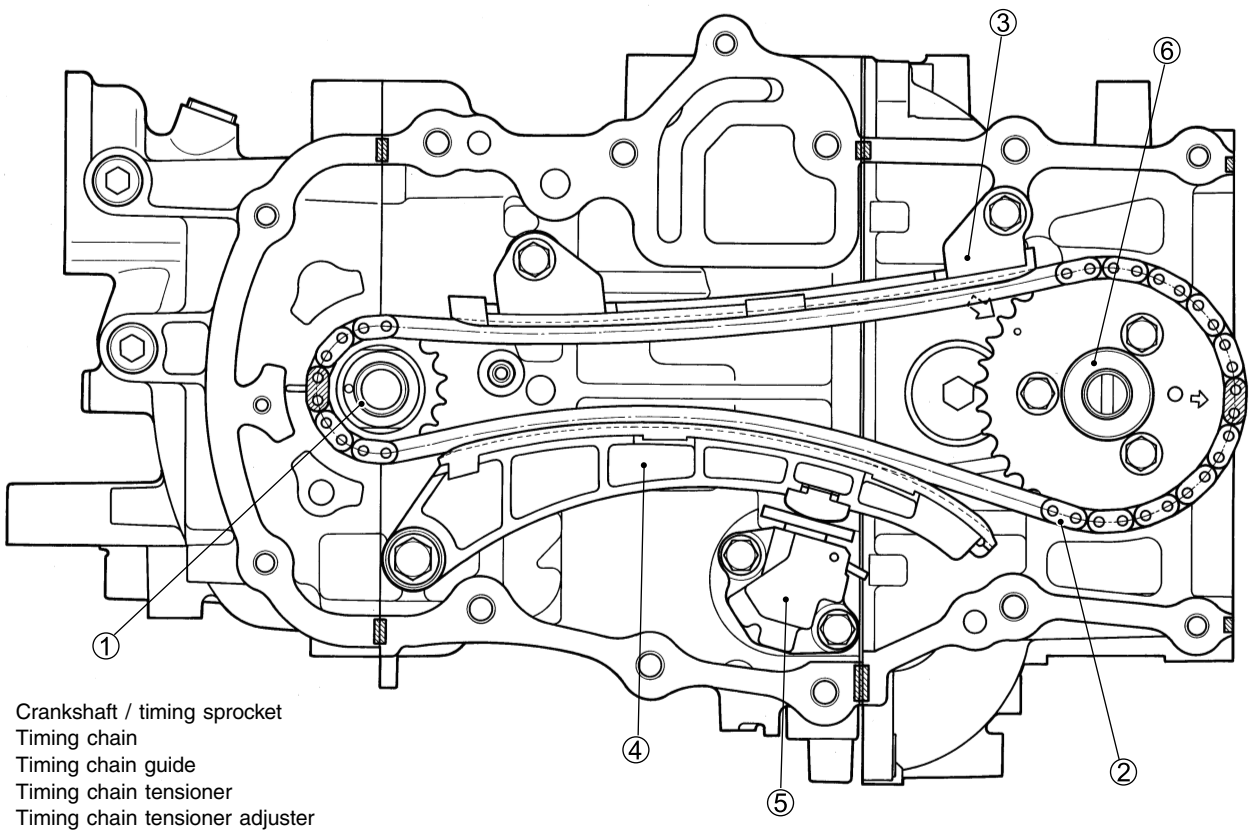
- All parts removed have been returned to their original positions.
- Lower unit gear engagement is properly adjusted. (See page 10-21)
- Fuel and water hose routing match's service manual illustration. (See page 11-14 to 11-17)
- Wire routing match's service manual illustration. (See page 11-2 to 11-13)
- No fuel leakage is evident when fuel system is pressurized.(See page 5-3)
- Check the carburetor synchronization.
  (See the "SYNCHRONIZING THROTTLE VALVES" section on page 2-13)
- No water leakage is evident during final test running.

TIMING CHAIN / TENSIONER

REMOVAL

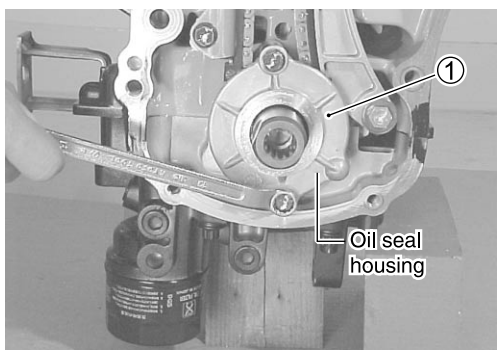
Prior to this service work :

• remove the power unit. (see page 7-2 to 7-6)

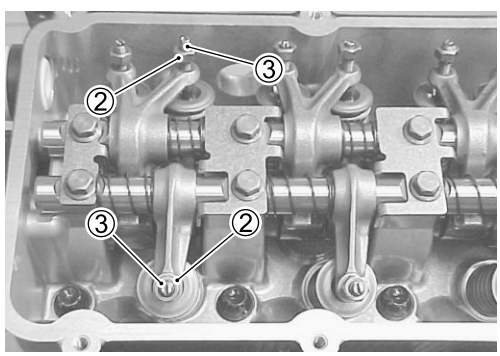


① Crankshaft / timing sprocket
② Timing chain
③ Timing chain guide
④ Timing chain tensioner
⑤ Timing chain tensioner adjuster
⑥ Camshaft and timing sprocket

1. Remove the two (2) bolts securing the under oil seal housing ① , then remove the under oil seal housing.



2. Loosen all valve adjusting lock nuts ② .
   Loosen the nine (9) valve adjusting screws ③ fully.
   Leave the screws in place.



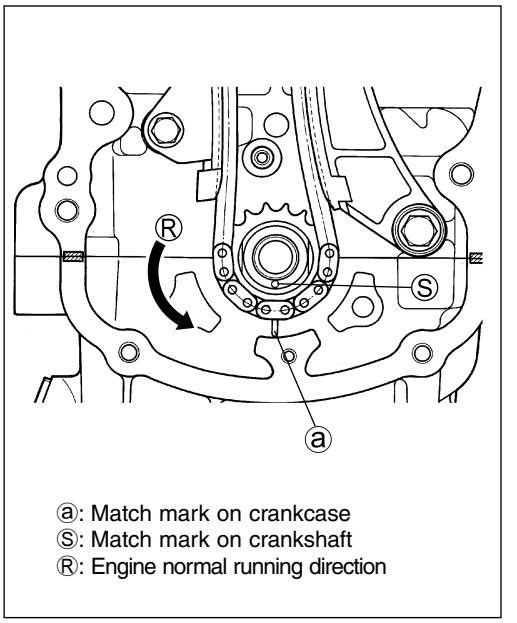
CAUTION

To prevent valve damage, loosen valve adjusting screws fully before removing timing chain.

3. Turn the crankshaft in its normal running direction (Ⓡ direction) until No.1 cylinder reaches top dead center.

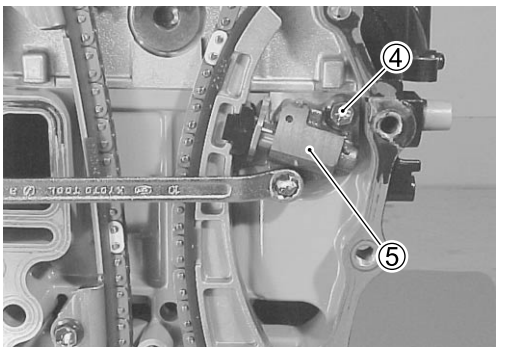
NOTE:
To bring No.1 cylinder top dead center, align mark S *on the crankshaft with mark* a *on the crank case.*

NOTE:
After timing chain has been removed, do not turn crankshaft or camshaft.

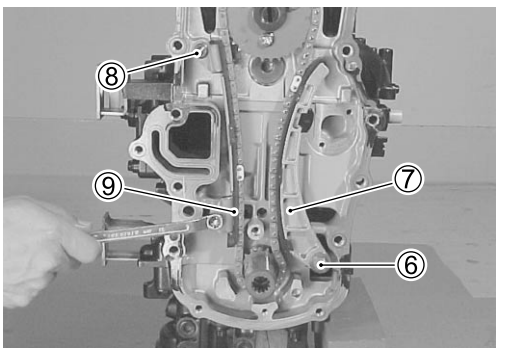


ⓐ: Match mark on crankcase
Ⓢ: Match mark on crankshaft
Ⓡ: Engine normal running direction

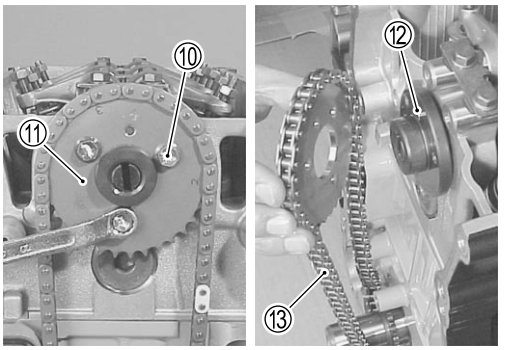
4. Remove the bolts ④ and tensioner adjuster ⑤ .



5. Remove the bolt ⑥ and timing chain tensioner ⑦ .
6. Remove the bolts ⑧ and timing chain guide ⑨ .

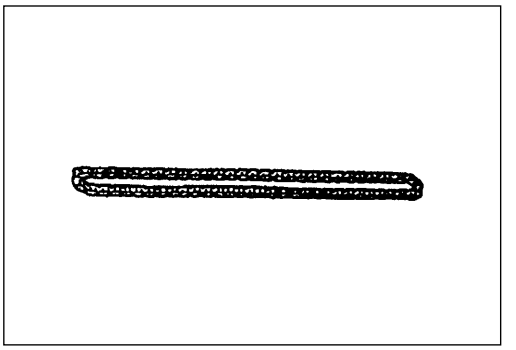


7. Remove the three (3) bolts ⑩ securing the timing sprocket to camshaft.
Remove the timing sprocket ⑪ , dowel pin ⑫ and timing chain ⑬.



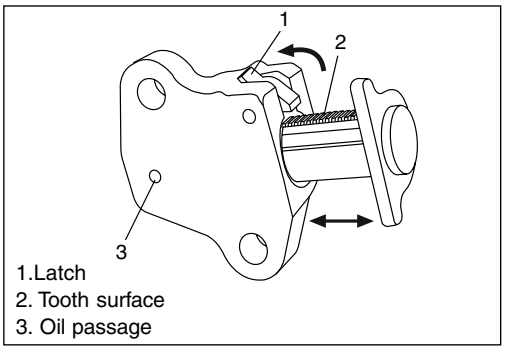
INSPECTION

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



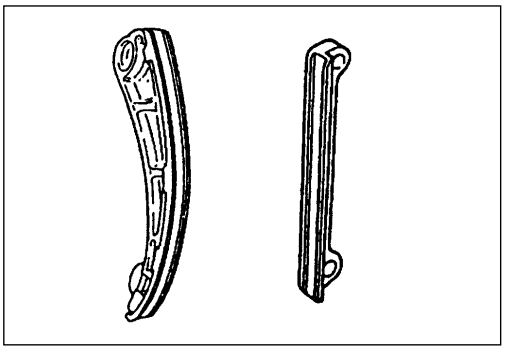
Timing chain
Inspect timing chain.
Replace if worn or damaged.

Tensioner adjuster
Inspect tensioner adjuster for smooth operation.
Replace if faulty.
Check oil delivery passage to tensioner.

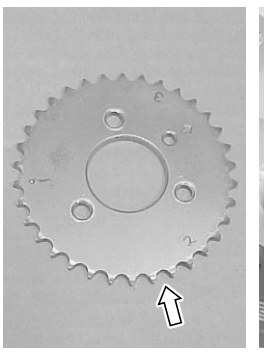


1.Latch
2. Tooth surface
3. Oil passage

Timing chain tensioner / chain guide
Check shoe for wear or damage.

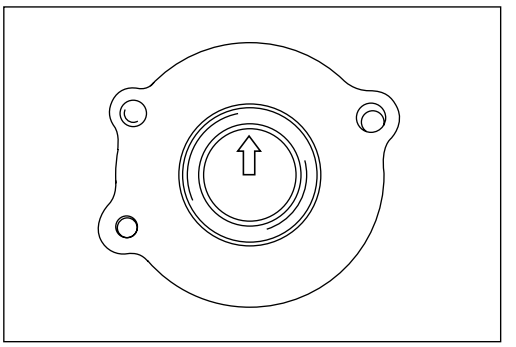


Timing chain sprocket
Check teeth of sprocket for wear or damage.



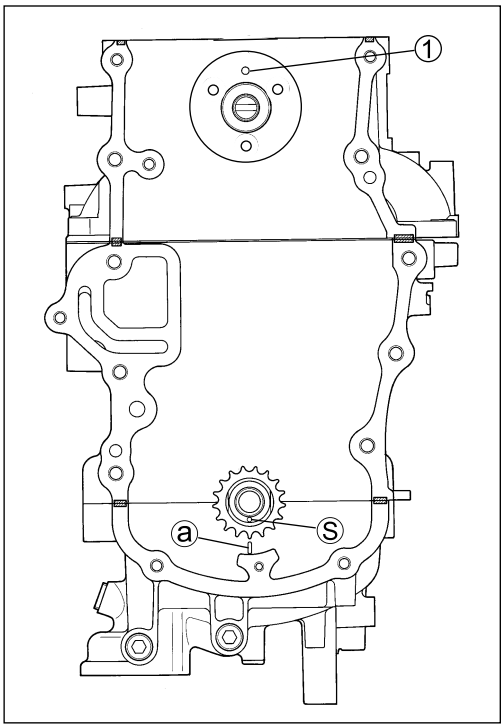
Oil seal housing
Check oil seal lip for wear or other damage.
Replace if necessary.

NOTE:
The lipped portion of the seal must face toward the timing chain sprocket.



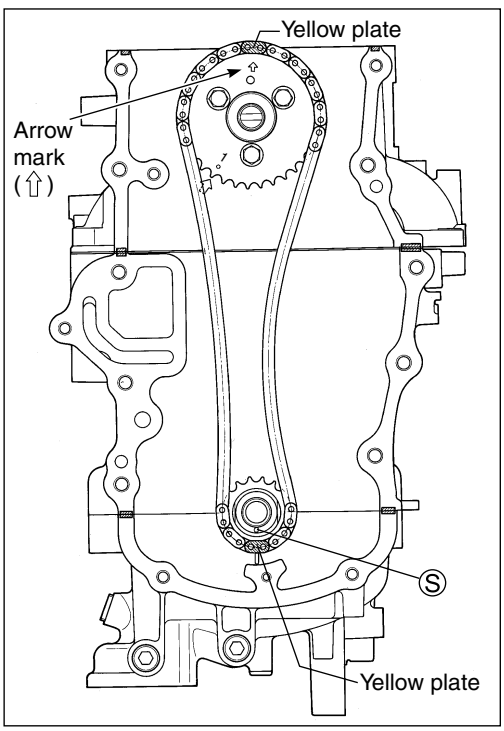
INSTALLATION

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



(1) Align crankshaft timing mark Ⓢ with timing mark ⓐ on crankcase as shown in figure by turning crankshaft.

(2) Install dowel pin ① into camshaft.
Then turn the camshaft to locate the dowel pin position at the top as shown in figure.

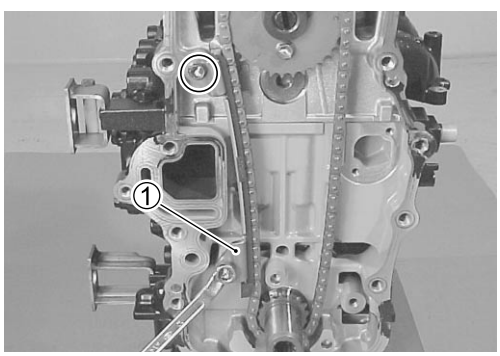


(3) Align yellow plate of timing chain and crankshaft timing mark S as shown in figure, then install the timing chain.

(4) Bring another yellow plate of timing chain into alignment with arrow mark on camshaft timing sprocket, then install camshaft timing sprocket into camshaft.
Tighten sprocket bolts, pre-coated with thread lock, to specified torque.

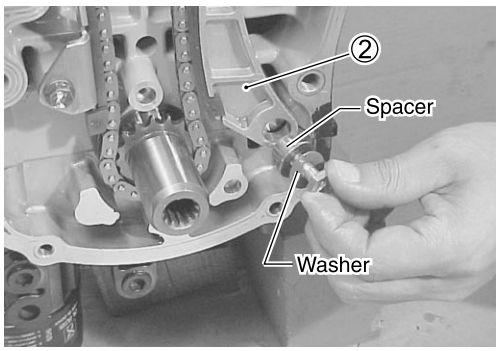
1342 99000-32050 : Thread Lock "1342"

Camshaft timing sprocket bolt :
11 N·m (1.1 kg-m, 8.0 lb.-ft.)

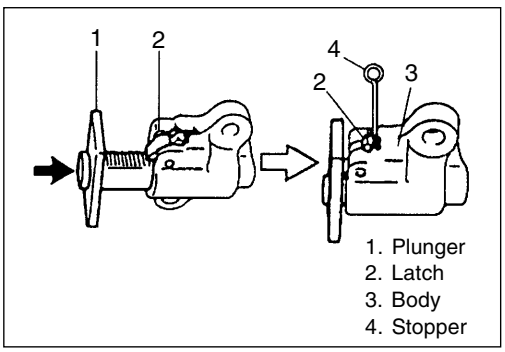


(5) Install timing chain guide ① , then tighten bolts securely.

(6) Insert spacer into chain tensioner.
Install chain tensioner ② as shown in figure.
Apply oil to chain tensioner.



(7) With latch of tensioner adjuster returned and plunger pushed back into body, insert stopper into latch and body.
After inserting stopper, check to make sure that plunger will not come out.



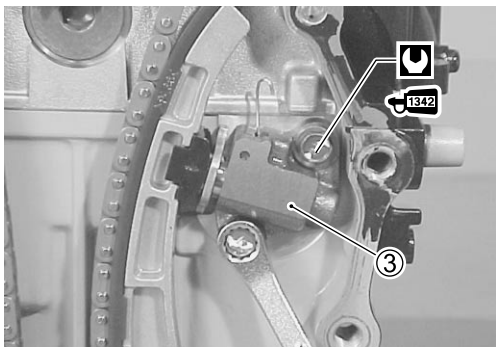
(8) Install timing chain tensioner adjuster ③ .
Tighten bolts, pre-coated with thread lock, to specified torque.

1342 99000-32050 : Thread Lock "1342"

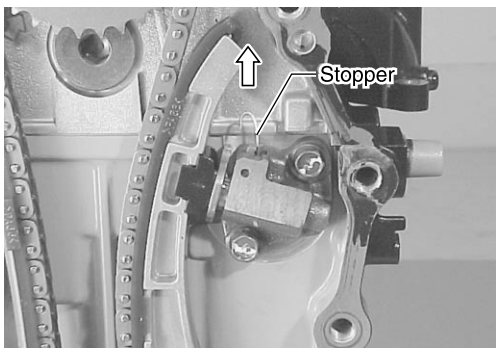
Tensioner adjuster bolt :

11 N·m (1.1kg.m, 8.0 lb.-ft.)

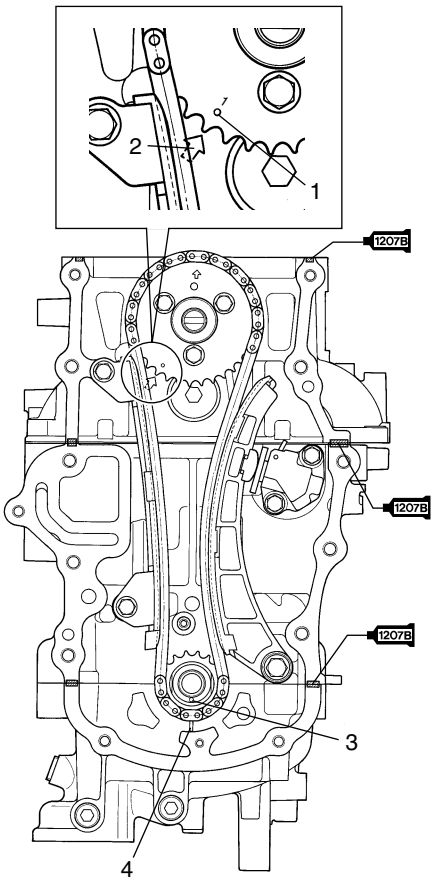
Apply engine oil to timing chain.



(9) Pull out stopper from adjuster.



(10) Turn crankshaft normal running direction 2 revolutions and check that match marks are aligned as shown in figure.



1. Match mark (• 1) on camshaft sprocket
2. Match mark (⇧) on cylinder head
3. Match mark on crank shaft
4. Match mark on crankcase

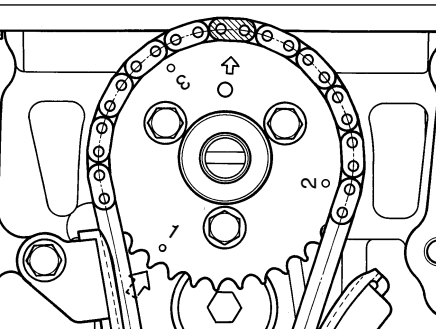
NOTE:
Before installing power unit, apply sealant to hatched part (6 parts) shown in the illustration right.

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

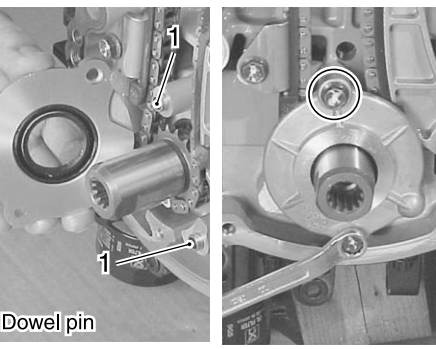
(11) Adjust valve clearance (see page 2-9)

To bring each piston to Top Dead Center (TDC) on compression stroke, align each match mark on camshaft sprocket with match mark on cylinder head block.

Match mark	TDC cylinder number
• 1	No. 1 cylinder
• 2	No. 2 cylinder
• 3	No. 3 cylinder

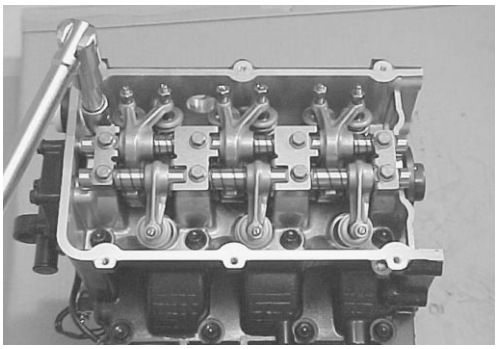


(12) Apply oil to oil seal lip.
Install dowel pins and under oil seal housing, then tighten bolts securely.



CYLINDER HEAD ASSEMBLY

(Cylinder head / valve / camshaft)



REMOVAL

Prior to removing cylinder head:

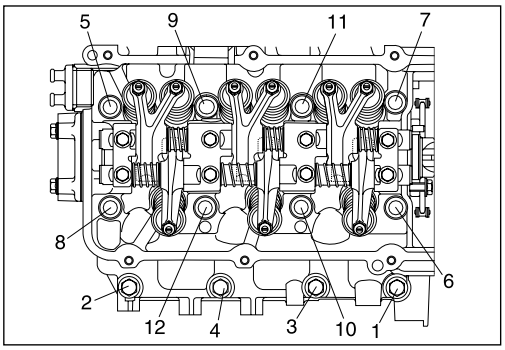
- **Remove the power unit.**
  (see page 7-2 to 7-6)
- **Remove the timing chain.**
  (see page 7-11 to 7-12)

1. Loosen twelve (12) cylinder head bolts in the order indicated in figure and remove them.
2. Remove cylinder head assembly and head gasket.

NOTE:

Use a special tool (10mm deep socket wrench) when loosening the cylinder head bolts.

TOOL **09919-16010 : Deep socket wrench (10 mm)**



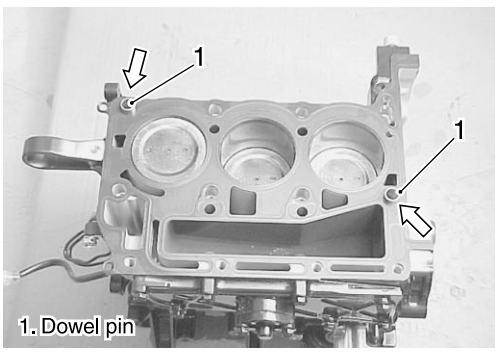
ASSEMBLY

Assemble in reverse order of removal paying special attention to the following steps.

CAUTION

No reutilice las juntas. Siempre utilize partes nuevas.

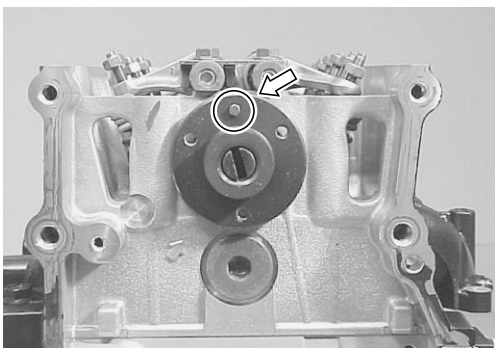
1. Insert the dowel pins and place a new cylinder head gasket into position on the cylinder.



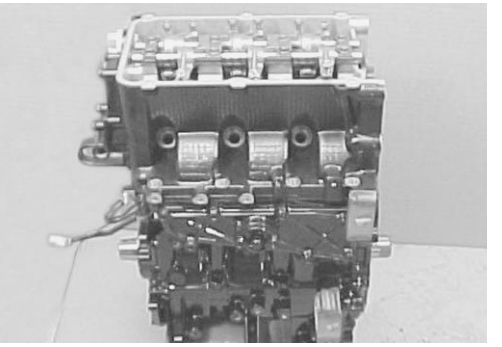
NOTE:

Before installing cylinder head:

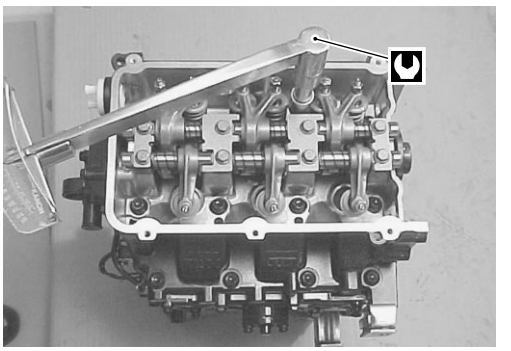
- *Make the piston of No.1 cylinder reach to top dead center. (see page 7-12)*
- *Turn the camshaft to locate the dowel pin hole position at the top as shown in figure.*



2. Position cylinder head on cylinder.



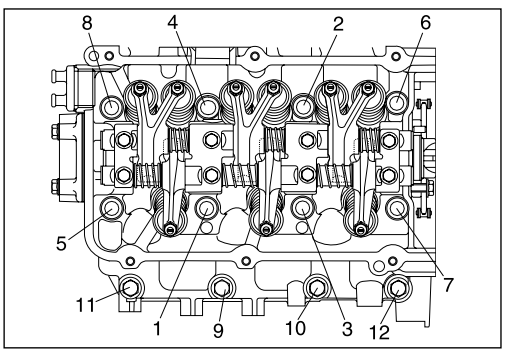
3. Apply engine oil to cylinder head bolts and tighten them gradually as follows.



(a) Tighten all bolts to 50 percent (%) of specified torque according to numerical order in figure.

Cylinder head bolt :
1 st step 10 mm 30 N·m (3.0 kg-m, 21.5 lb.-ft.)
8 mm 12 N·m (1.2 kg-m, 8.5 lb.-ft.)

(b) Loosen all bolts to 0 N . m (0 kg-m , 0 lb.-ft.) according to reverse order in figure.



(c) Again tighten all bolts to 50 percent (%) of specified torque according to numerical order in figure.

Cylinder head bolt :
3 st step 10 mm 30 N·m (3.0 kg-m, 21.5 lb.-ft.)
8 mm 12 N·m (1.2 kg-m, 8.5 lb.-ft.)

(d) Finally tighten all bolts to specified torque according to numerical order in figure.

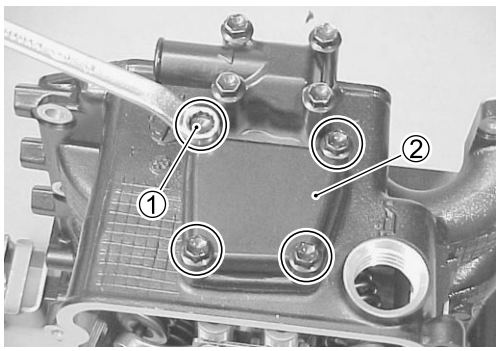
Cylinder head bolt :
Final step 10 mm 62 N·m (6.2 kg-m, 45.0 lb.-ft.)
8 mm 25 N·m (2.5 kg-m, 18.0 lb.-ft.)

4. Install timing chain. (see page 7-14)

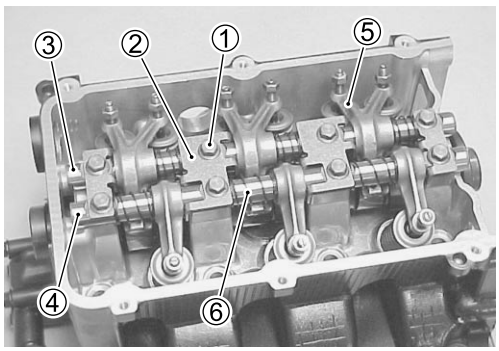
5. Adjust valve clearance. (see page 2-9)

DISASSEMBLY

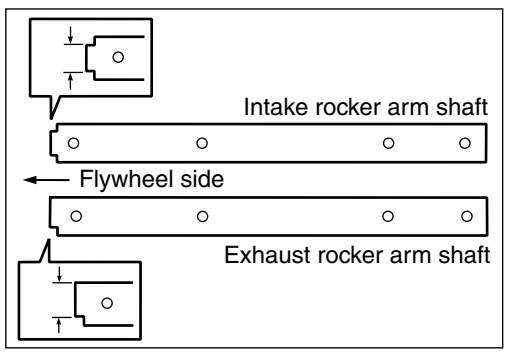
1. Remove four (4) bolts ① and upper cylinder head cover ② .



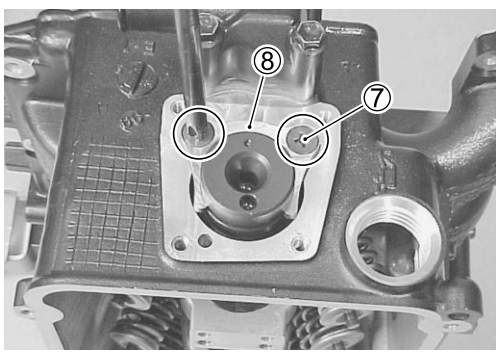
2. Remove the eight (8) bolts ① securing rocker arm shaft brackets, then remove rocker arm shaft brackets ② .
   Remove intake rocker arm shaft ③ and exhaust rocker arm shaft ④ .
   Remove all rocker arms ⑤ and springs ⑥ .



NOTE:
Intake rocker arm shaft is different from exhaust rocker arm shaft. Take note of shaft shape difference and placement.

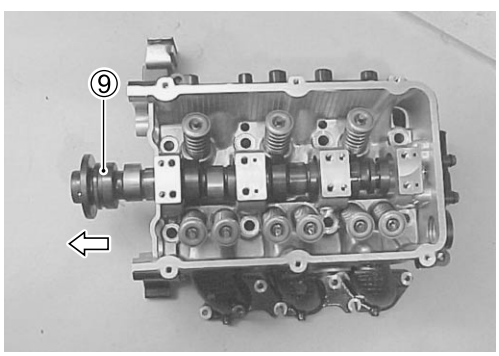


3. Remove two (2) screws ⑦ and camshaft thrust plate ⑧ .

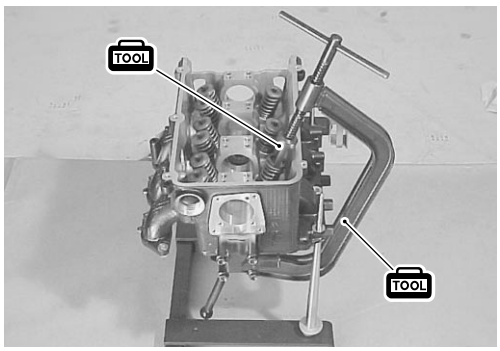


4. Remove camshaft ⑨ pulling toward the timing sprocket side.

NOTE:
Pull out camshaft toward timing sprocket side.

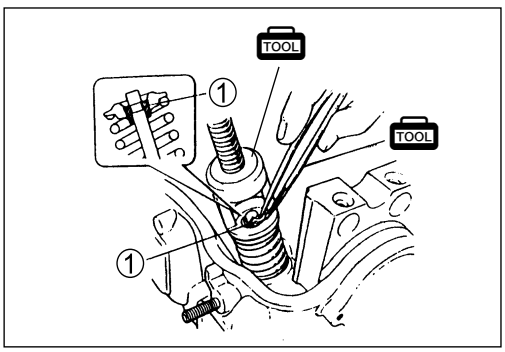


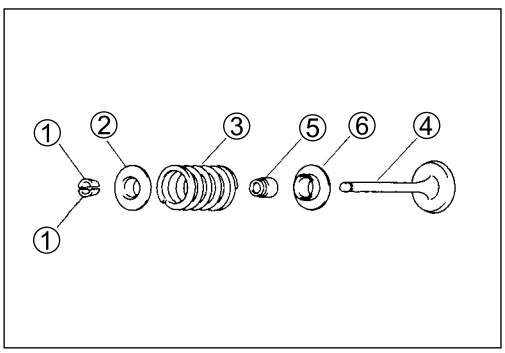
5. Using valve lifter and attachment, remove valve cotters ① while compressing valve spring.



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

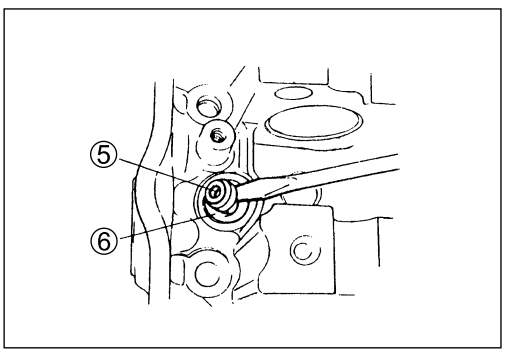
6. Remove valve spring retainer ② , valve spring ③ and valve ④ .





7. Remove valve stem seal ⑤ and valve spring seat ⑥ .

NOTE:
Reassemble each valve and valve spring in their original posi-tions.

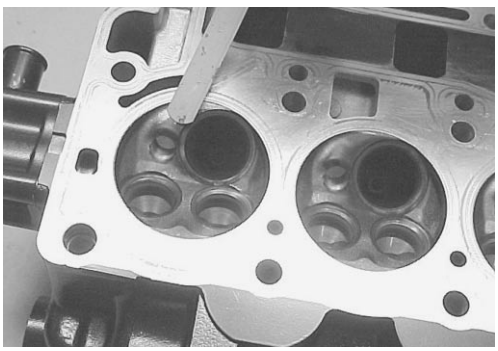


INSPECTION / SERVICING

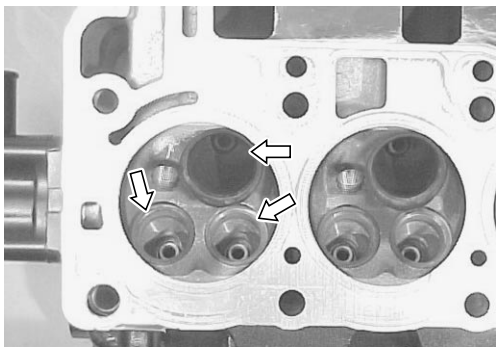
NOTE:
If cracks, excessive wear or other damage is found on any com-ponent, replace component.

CYLINDER HEAD
Remove all carbon from combustion chambers.

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

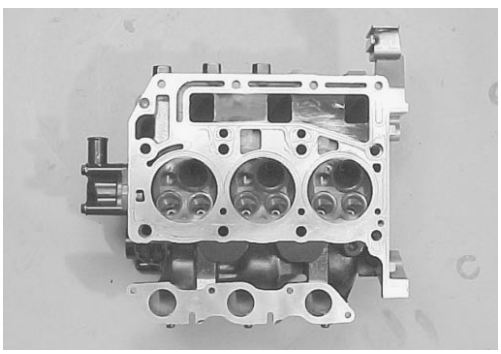


Check cylinder head for cracks in intake and exhaust ports, combustion chambers, and head surface.



Valve seat
Check valve seat, if cracks or other damage is found, replace cylinder head.

Cylinder head distortion
Using a straightedge and thickness gauge, measure cylinder head distortion (gasket surface) at a total of six (6) locations as shown.

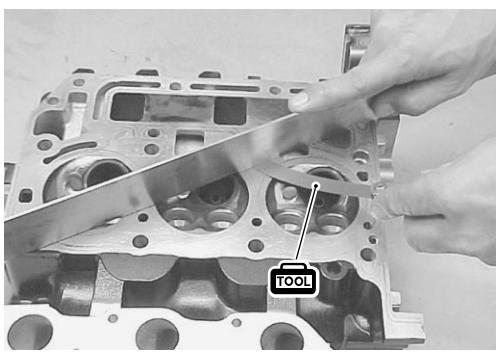


TOOL **09900-20803 : Thickness gauge**

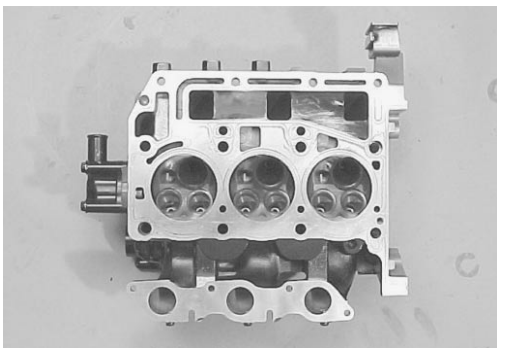
Cylinder head distortion
Service limit : 0.05 mm (0.002 ft.)

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

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



Water jackets
Check water jackets. If clogged or obstructed, clean water jackets.

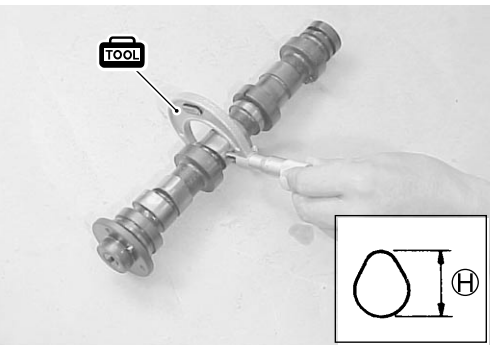


CAMSHAFT

Cam face
Inspect cam face for scratches and wear.

Cam wear
Using micrometer, measure cam height Ⓗ.

TOOL **09900-20202 : Micrometer**



Cam height
Standard:

DF25	**AD**	**35.185 – 35.345 mm (1.3852 – 1.3915 in.)**
	ES	**34.506 – 34.666 mm (1.3585 – 1.3648 in.)**
DF30	**AD**	**36.076 – 36.236 mm (1.4203 – 1.4266 in.)**
	ES	**35.271 – 35.431 mm (1.3886 – 1.3949 in.)**

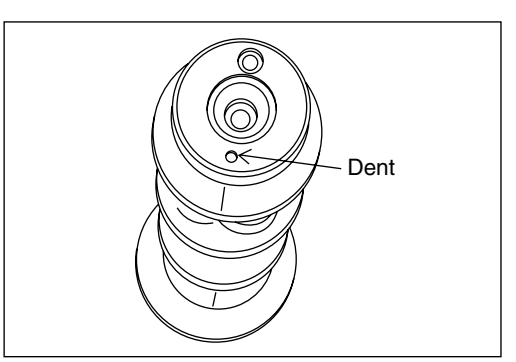
Service limit:

DF25	**AD**	**35.085 mm (1.3813 in.)**
	ES	**34.406 mm (1.3546 in.)**
DF30	**AD**	**35.976 mm (1.4164 in.)**
	ES	**35.171 mm (1.3847 in.)**

If measurement exceeds service limit, replace camshaft.

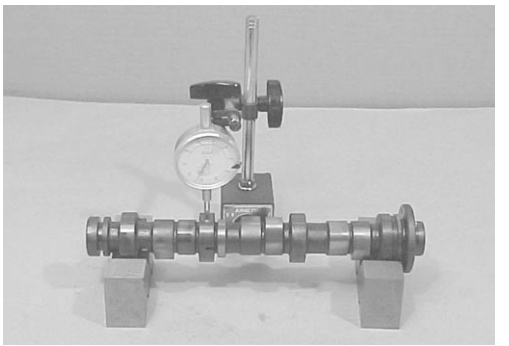
Camshaft identification
DF25 and DF30 camshafts differ as indicated below.

Model	Identification mark
DF25	No dent
DF30	Dent



Camshaft runout

Using a set of V-blocks, support the camshaft on a surface plate. Measure runout using a dial gauge.



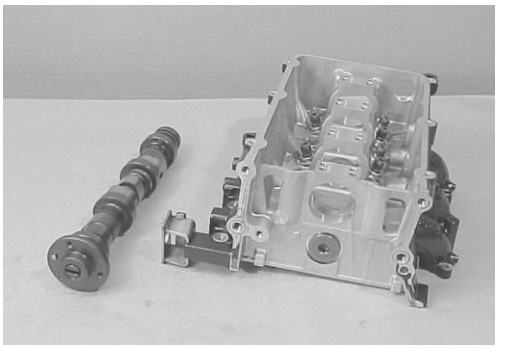
TOOL **09900-20602 : Dial gauge**
09900-21304 : "V" block set
09900-20701 : Magnetic stand

Camshaft runout
Service limit : 0.10 mm (0.004 in.)

If measurement exceeds service limit, replace camshaft.

CAMSHAFT JOURNAL

Check camshaft journals and camshaft journal bores for pitting, scratches, wear or damage.
If any of the above conditions are found, replace camshaft and / or cylinder head.



Camshaft journal oil clearance

TOOL **09900-20202 : Micrometer**

Using a micrometer and bore gauge, measure the journal diameters(O.D.) in two directions at four places, and journal bore diameters (I.D) in cylinder head.

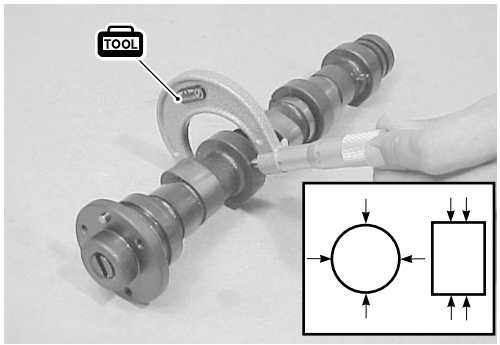
This produces four readings for each journal.

Subtract the journal diameter measurement from the journal bore measurement to determine the journal oil clearance.
If the journal oil clearance exceeds the service limit, replace camshaft and if necessary, cylinder head.

Camshaft journal oil clearance
Standard : 0.050 – 0.100 mm (0.0020 – 0.0039 in.)
Service limit : 0.160 mm (0.0060 in.)

Camshaft journal outside diameter

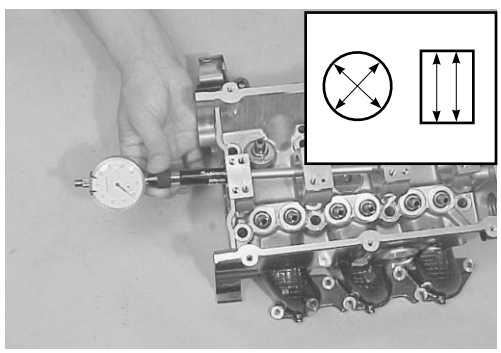
Journal No.	Diámetro exterior de los muñones
Top	STD : 43.425 – 43.450 mm (1.7096 – 1.7106 in.) Límite : 43.375 mm (1.7077 in.)
2nd	STD : 43.625 – 43.650 mm (1.7175 – 1.7185 pulg.) Límite : 43.575 mm (1.7156 in.)
3rd	STD : 43.825 – 43.850 mm (1.7254 – 1.7264 in.) Límite : 43.775 mm (1.7234 in.)
4th	STD : 44.025 – 44.050 mm (1.7333 – 1.7343 in.) Límite : 43.975mm (1.7313 in.)



NOTE:
The location No.s of journal are in order from the flywheel magnet to the bottom of cylinder.

Camshaft journal bore diameter

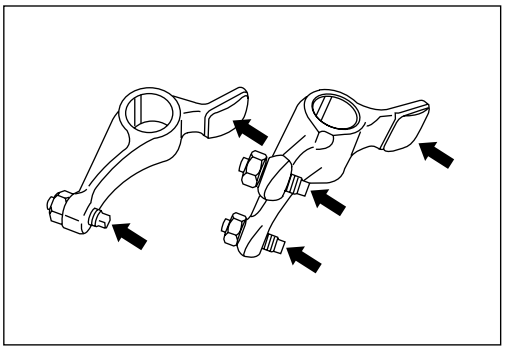
Journal No.	Diámetro interior del orificio de los asientos
Top	STD : 43.500 – 43.525 mm (1.7126 – 1.7136 in.) Límite : 43.534 mm (1.7139 in.)
2nd	STD : 43.700 – 43.725 mm (1.7205 – 1.7215 in.) Límite : 43.734 mm (1.7218 in.)
3rd	STD : 43.900 – 43.925 mm (1.7283 – 1.7293 in.) Límite : 43.934 mm (1.7300 in.)
4th	STD : 44.100 – 44.125 mm (1.7362 – 1.7372 in.) Límite : 44.134 mm (1.7376 in.)



ROCKER ARM / SHAFT

Rocker arm and adjusting screw

- If the tip of adjusting screw shows excessive wear, replace the screw.
- The arm must be replaced if its cam-riding face is badly worn.

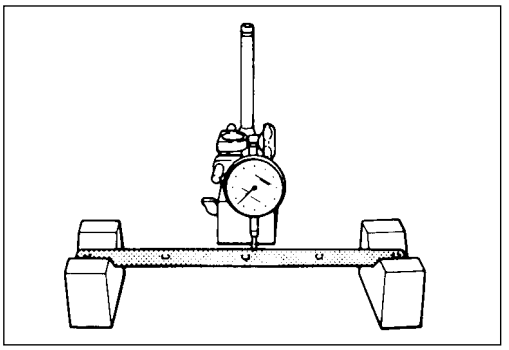


Rocker arm shaft runout

Using a set of V-blocks, support the rocker arm shaft on a surface plate.
Measure runout using a dial gauge.

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

Rocker arm shaft runout
Service limit : 0.12 mm (0.005 in.)



If measurement exceeds service limit, replace rocker arm shaft.

Rocker arm shaft to rocker arm clearance [IN & EX]

Using a micrometer and bore gauge, measure rocker arm shaft outside diameter and rocker arm inside diameter. The difference between the two readings is the rocker arm to arm shaft clearance.

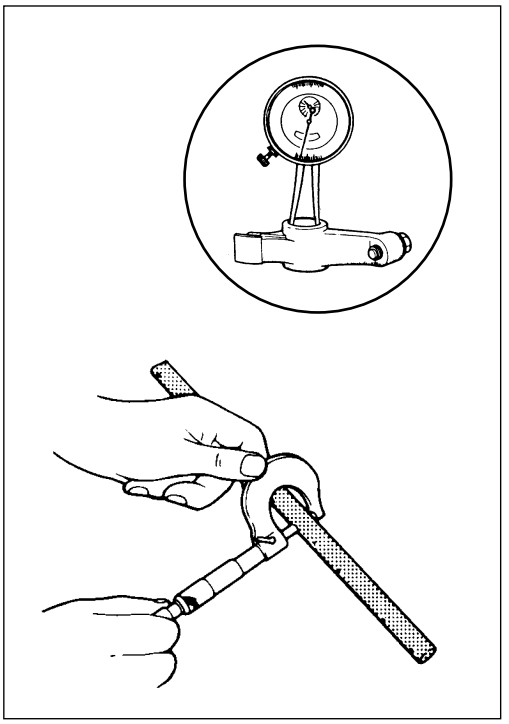
TOOL **09900-20205 : Micrometer**

If measurement exceeds service limit, replace shaft or arm, or both.

Rocker arm shaft to rocker arm clearance (IN & EX)
Standard : 0.012 – 0.045 mm (0.005 – 0.0018 in.)
Service limit : 0.090 mm (0.0035 in.)

Rocker arm shaft outer diameter (IN & EX)
Standard : 15.973 – 15.988 mm (0.6289 – 0.6294 in.)

Rocker arm inside diameter
Standard : 16.000 – 16.018 mm (0.6299 – 0.6306 in.)



VALVE / VALVE GUIDE

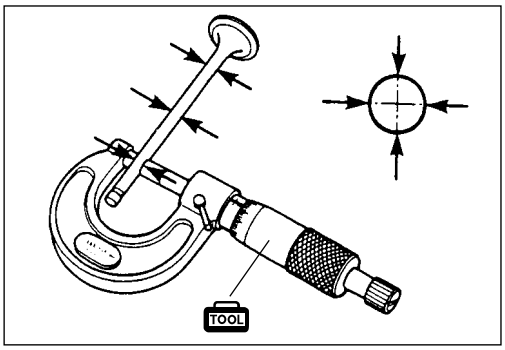
Valve guide to valve stem clearance

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

TOOL 09900-20205 : Micrometer

Valve stem outside diameter

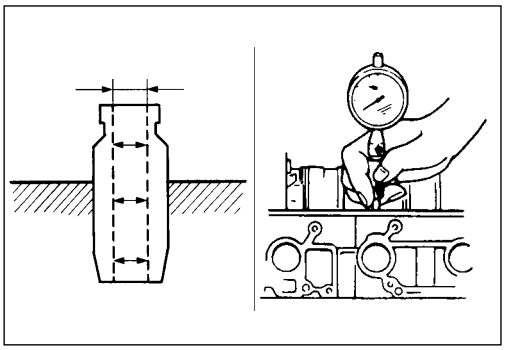
Using micrometer, measure valve stem outside diameter.



Valve stem outside diameter
Standard :
IN 5.465 – 5.480 mm (0.2152 – 0.2157 in.)
EX 5.450 – 5.465 mm (0.2146 – 0.2152 in.)

Valve guide inside diameter

Using a small bore gauge, measure valve guide inside diameter.



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

Valve guide to valve stem clearance

Valve guide to valve stem clearance
Standard :
IN 0.020 – 0.047 mm (0.0008 – 0.0019 in.)
EX 0.035 – 0.062 mm (0.0014 – 0.0024 in.)

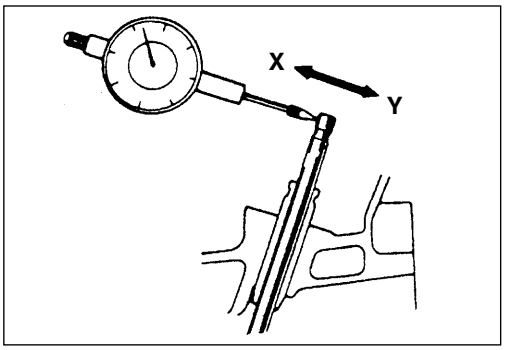
Service limit :
IN 0.070 mm (0.0028 in.)
EX 0.090 mm (0.0035 in.)

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

NOTE:
For valve guide replacement, see "VALVE GUIDE REPLACEMENT" section on page 7-31.

Valve stem end deflection

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



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

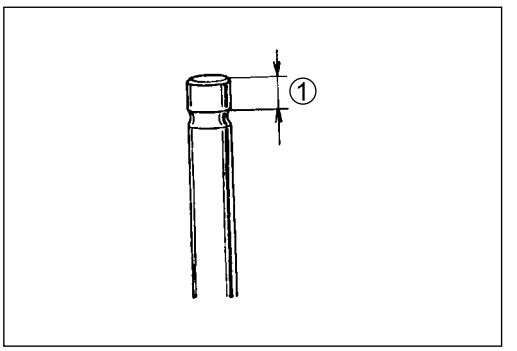
Measure valve stem end deflection as follows:
(1) Install valve into valve guide.
(2) Position valve head at approx. 5mm away from valve seat.
(3) Move stem end in the directlon “X-Y”, and measure deflection.

Valve stem end deflection
Service limit :
IN 0.14 mm (0.006 in.)
EX 0.18 mm (0.007 in.)

If measurement exceeds service limit, replace valve.
If measurement still exceeds service limit with newv alve, replace valve guide.

Valve stem end length

Inspect valve stem end face for pitting and wear.
If pitting or wear is found, valve stem end may be resurfaced.
Use caution when resurfacing, do not grind away stem end chamfer.
When chamfer has been worn away, replace valve.



TOOL **09900-20101 : Vernier calipers**

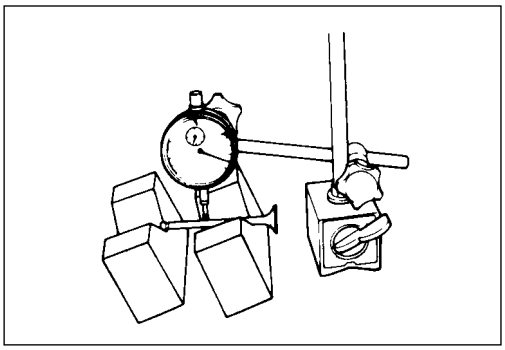
Valve stem end length ①
Service limit :
IN 7.00 mm (0.276 in.)
EX 6.00 mm (0.236 in.)

Valve stem runout

Measure valve stem runout.

TOOL **09900-20602 : Dial gauge**
09900-20701 : Magnetic stand
09900-21304 : "V"blockset

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



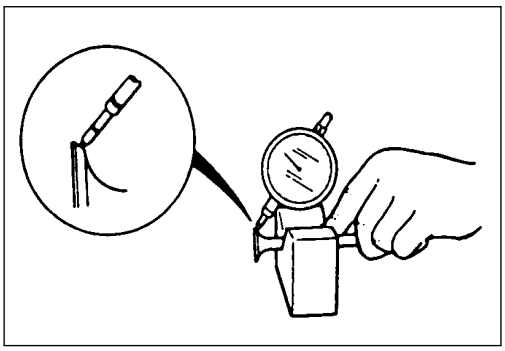
If measurement exceeds service limit, replace valve.

Valve head radial runout

Measure valve head radial runout.

TOOL **09900-20602 : Dial gauge**
09900-20701 : Magnetic stand
09900-21304 : "V"blockset

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



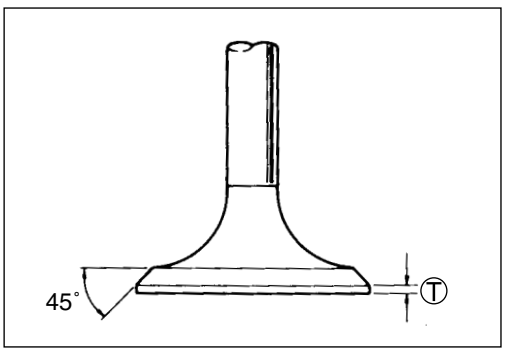
If measurement exceeds service limit, replace valve.

Valve head thickness

Measure thickness Ⓣ of valve head.

TOOL **09900-20101 : Vernier calipers**

Valve head thickness
Standard :
IN 1.0 mm (0.04 in.)
EX 1.3 mm (0.05 in.)
Service limit :
IN 0.5 mm (0.02 in.)
EX 0.7 mm (0.03 in.)

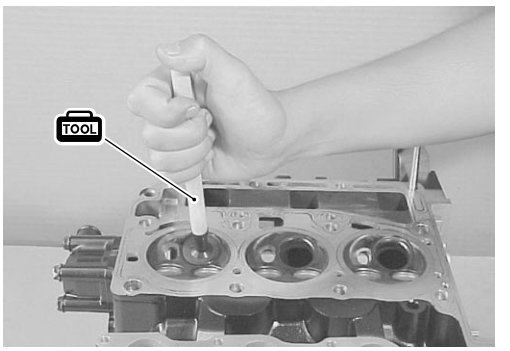


If measurement exceeds service limit, replace valve.

Valve seat contact width

Measure valve seat contact width as follows:

(1) Remove all carbon from valve and seat.
(2) Coat valve seat evenly with Prussian blue (orequivalent)
(3) Install valve into valve guide.
(4) Put valve lapper on valve.

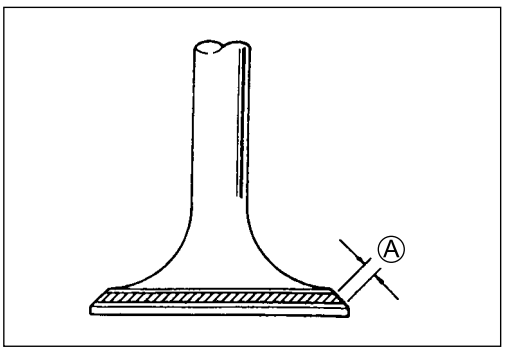


TOOL **09916-10911 : Valve lapper**

(5) Rotate valve while gently tapping valve contact area against seat.

(6) Repeat until a continuous pattern in the Prussian blue is seen.

(7) Measure valve seat contact width Ⓐ.



TOOL **09900-20101 : Vernier calipers**

Valve seat contact width Ⓐ

Standard :

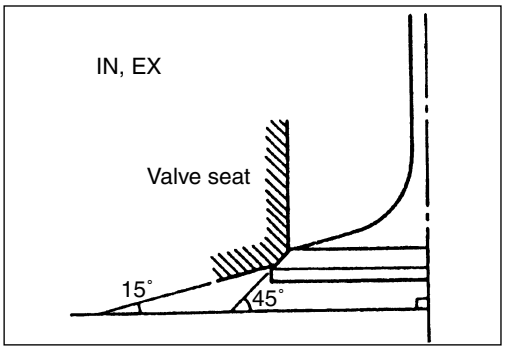
IN	**1.3 – 1.5 mm (0.05 – 0.06 in.)**
EX	**1.3 – 1.5 mm (0.05 – 0.06 in.)**

If measurement exceeds specification, repair valve seat.

NOTE:
For valve seat repair, see "Valve seat servicing" section on page 7-30.

VALVE SEAT SERVICING

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



- **Valve seat angle**
  Intake side : 15°, 45°
  Exhaust side : 15°, 45°

TOOL **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 cutter clockwise, never counterclockwise.

(1) Remove all carbon from valve and valve seat.

(2) Using 45° angle cutter, reface valve seat.

(3) Check valve seat contact width Ⓐ.
See the "Valve seat contact width" section on page 7-29.

(4) If width Ⓐ is too high (or wide), reface valve seat using 15°.
If width Ⓐ is too low (or narrow), reface valve seat using 45° angle cutter.

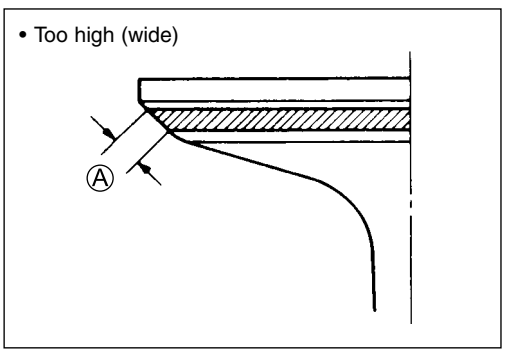
(5) Clean up any burrs using 45° angle cutter very lightly.

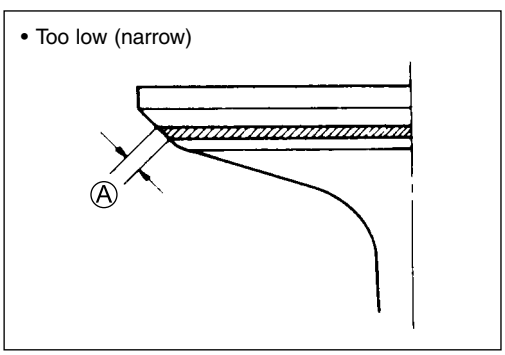
CAUTION

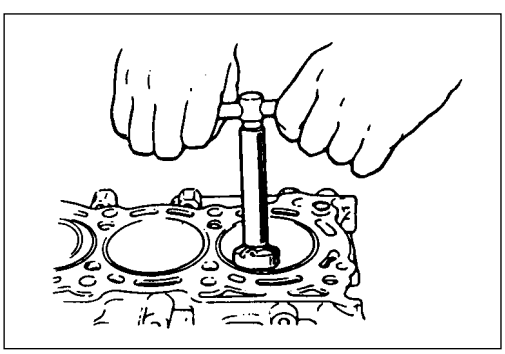
Grind seat areas minimally only.
Do not grind more than necessary.

(6) Lap valve on seat in two steps, first with coarse grit lapping compound applied to face and the second with fine grit compound.

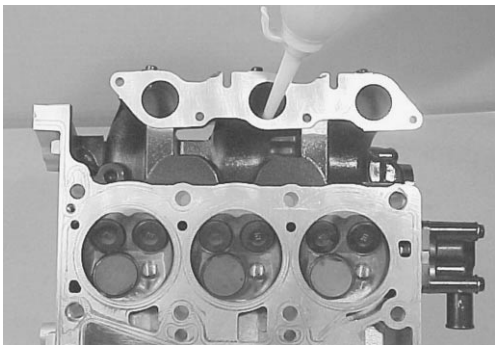
(7) Recheck valve seat contact width Ⓐ.







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



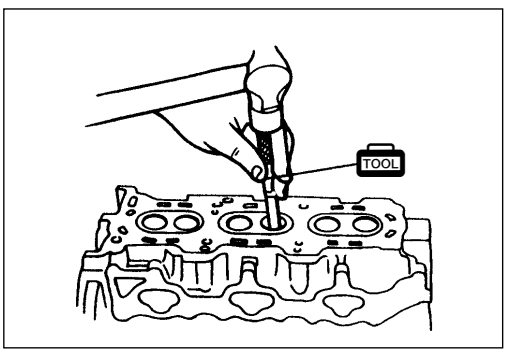
VALVE GUIDE REPLACEMENT

CAUTION

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

(1) Using valve guide remover, drive valve guide out from combustion chamber side towards valve spring side.

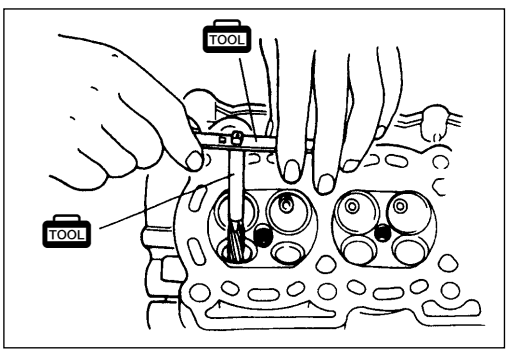
TOOL **09916-44310 : Valve guide remover**



NOTE:
Do not reuse valve guide once it has been removed.
Always use a new valve guide (oversize) when assembling.

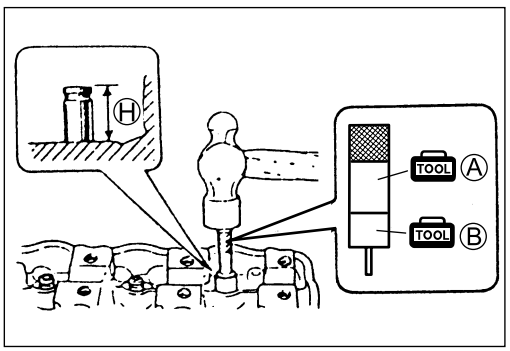
(2) Ream valve guide hole with ϕ10.5 mm reamer to true hole and remove burrs.

TOOL **09916-37320 : Valve guide reamer (ϕ10.5 mm)**
09916-34542 : Reamer handle



NOTE:
Turn reamer clockwise, never counterclockwise.

(3) Install valve guide to cylinder head.
- Heat cylinder head to a temperature of 80 – 100°C (176 – 212°F).
  Apply heat uniformly so that head will not be distorted.
- Use special tools to drive new valve guide into hole.
  Drive in new valve guide until special tool (valve guide installer attachment) contacts cylinder head.
- After installing, check valve guide protrusion Ⓗ.



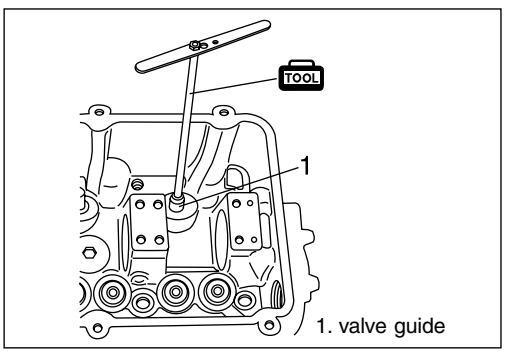
TOOL 09916-58210 : Valve guide installer handle Ⓐ
09917-88230 : Valve guide installer attachment Ⓑ

Valve guide protrusion Ⓗ
Standard :
IN & EX 14.0 mm (0.55 in.)

(4) Ream valve guide bore with ϕ 5.5 mm reamer.

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

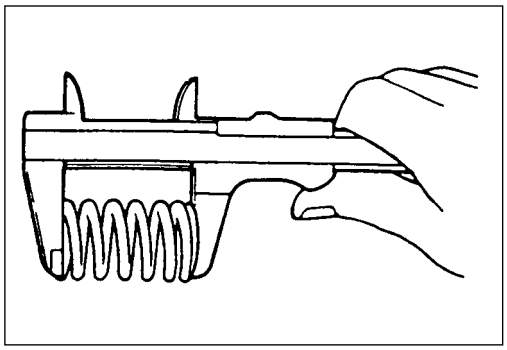
NOTE:
Clean and oil valve guide bore after reaming.



VALVE SPRING

Valve spring free length

Check spring strength by measuring free length.



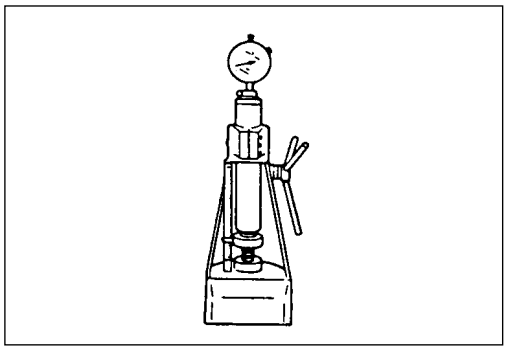
TOOL **09900-20101 : Vernier calipers**

Valve spring free length
Standard :
IN & EX 47.38 mm (1.865 in.)
Service limit :
IN & EX 45.48 mm (1.791 in.)

If lower than service limit, replace valve spring.

Valve spring preload

Measure valve spring preload.



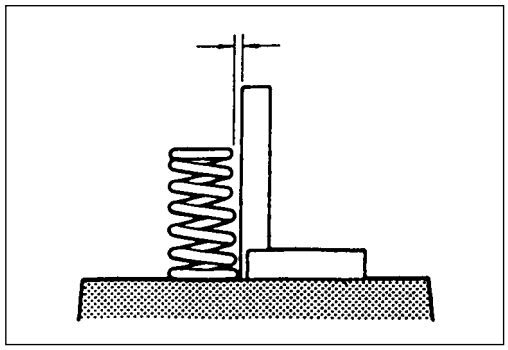
TOOL **09900-20101 : Vernier calipers**

Valve spring preload
Standard :
IN & EX 193 – 223 N (19.3 – 22.3 kg , 42.5 – 49.2 lbs.) for 37.5 mm (1.48 in.)
Servicelimit :
IN & EX 177 N (17.7 kg, 39.0 lbs.)for 37.5 mm (1.48 in.)

If lower than service limit, replace valve spring.

Valve spring squareness

Use a square and surface plate to check each spring for squareness (clearance between end of valve spring and square).



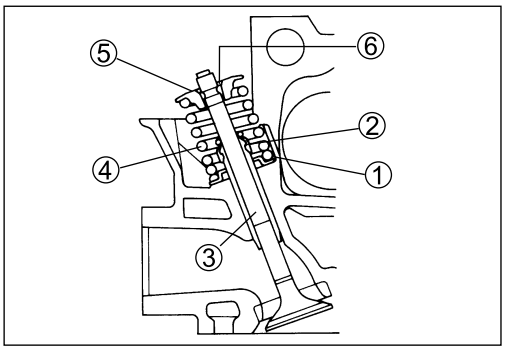
TOOL **09900-20101 : Vernier calipers**

Valve spring squareness
Service limit:
IN & EX 2.0 mm (0.08 in.)

If measurement exceeds service limit, replace valve spring.

REASSEMBLY

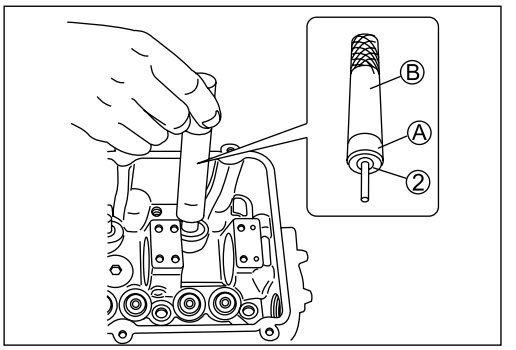
Reassemble in reverse order of disassembly pay special attention to the following steps.



VALVE

Install valve spring seat ① to cylinder head.

After applying engine oil to stem seal ② and spindle of special tool (installer attachment), fit stem seal to spindle.
Then, pshing special tool by hand ,install stem seal to valve guide.
Check to be sure that seal is properly fixed to valve guide.

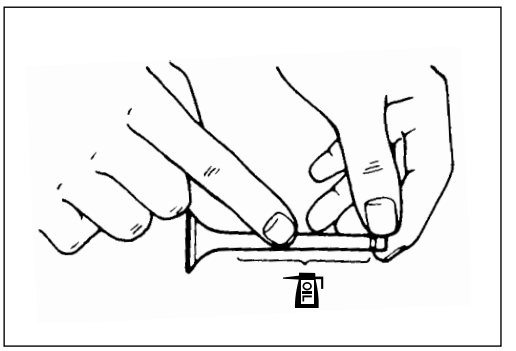


TOOL **09917-98221 : Installer attachment** Ⓐ
09916-58210 : Installer handle Ⓑ

CAUTION

Do not reuse stem seal once removed.
Always install new seal.

Apply engine oil to stem seal, valve guide bore and valve stem.

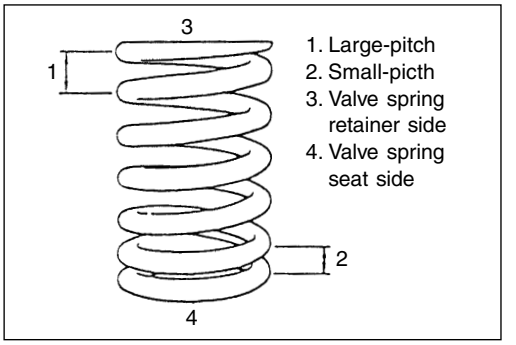


Install valve ③ to valve guide.

NOTE:
Reassemble each valve andevalve spring to their original position.

Install valve spring ④, and valve retainer ⑤.

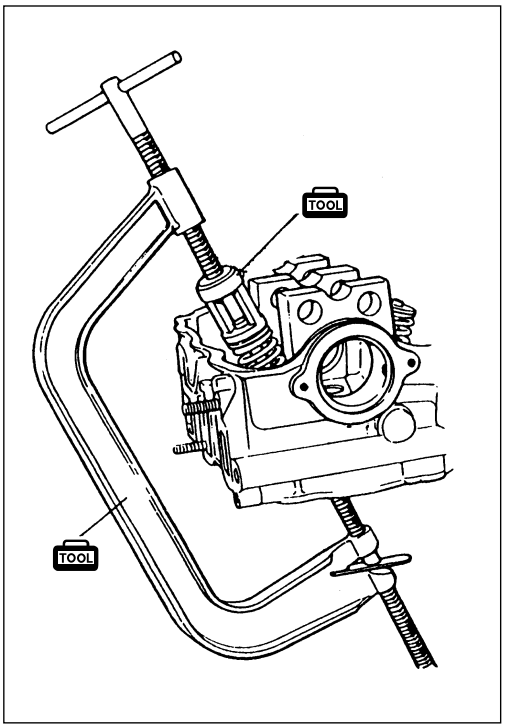
NOTE:
Set valve spring in place with narrow spiral area facing valve seat.

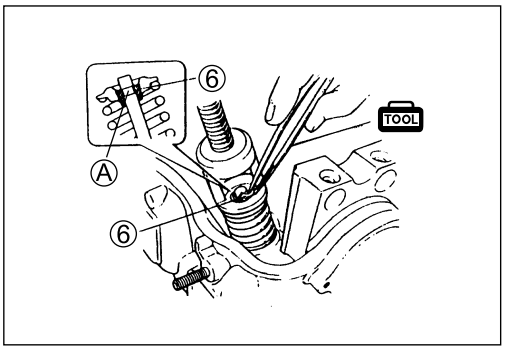


Hold valve spring compressed with special tool and install valve cotters ⑥.

Make sure valve cotters are properly seated in groove Ⓐ.

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

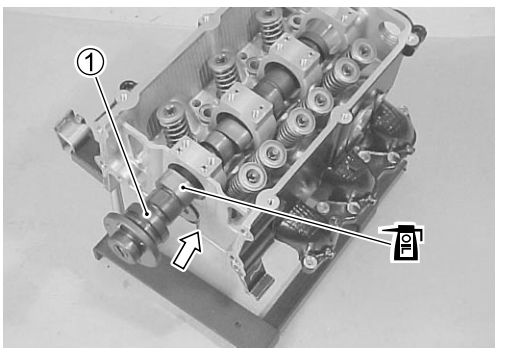




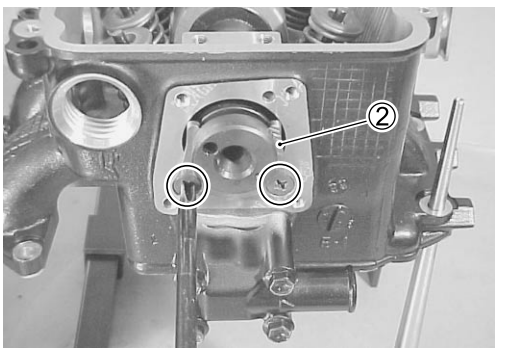
CAMSHAFT

Apply engine oil to the surface of each camshaft lobe and journal.

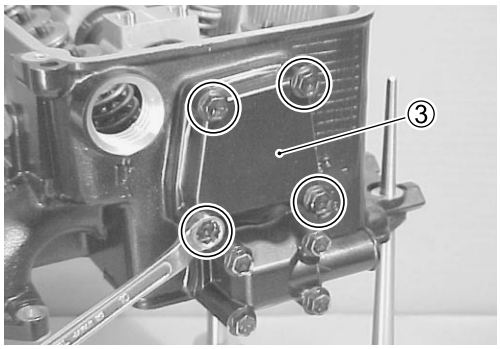
Install camshaft ① from timing sprocket side.



Install camshaft thrust plate ②, then tighten screws securelyRO

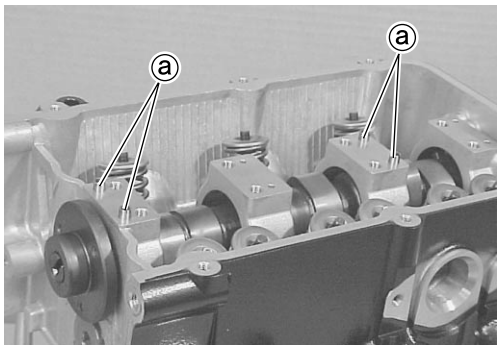


Install gasket and upper cylinder head cover ③, then tighten bolts securely.



ROCKER ARM / SHAFT

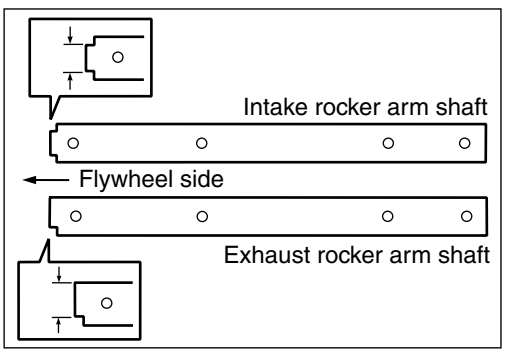
Install dowel pins ⓐ.

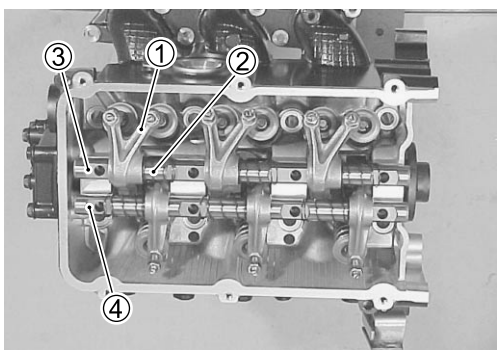


Apply engine oil to rocker arms and rocker arm shaft.
Install rocker arms ①, rocker arm springs ②, intake rocker arm shaht ③ and exhaust rocker arm shaft ④.

NOTE:

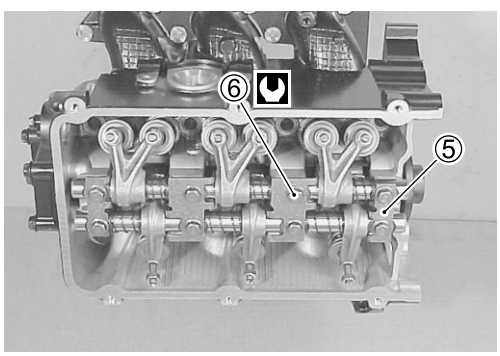
- *Reassemble each rocker arm to its original position.*
- *Intake rocker arm shaft differs from exhast one in shape as shown. When assembling, make sure of shaft shape and installing direction.*





Install rocker arm shaft breackets ⑤, and bolts ⑥, then tighten rocker arm shaft bolts securely.

Rocker arm shaft bolt : 19 N·m (1.9 kg-m, 13.5 lb.-ft.)



CYLINDER / CRANKSHAFT / PISTON

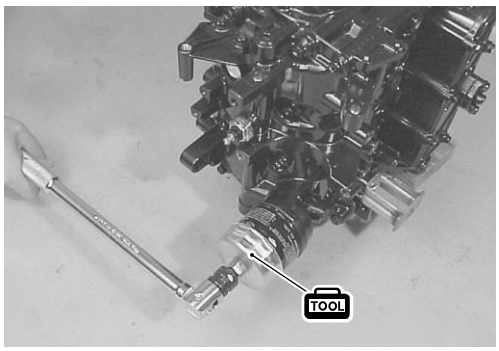
DISASSEMBLY

Before performing service work in this section:

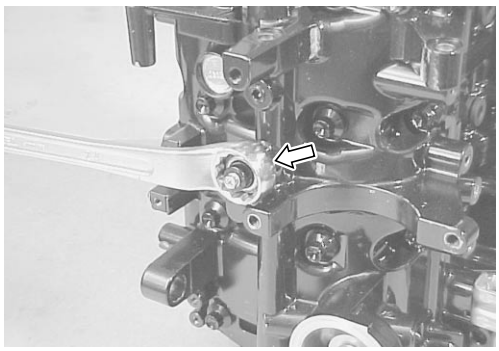
- **Remove power unit (see page 7-2 to 7-6)**
- **Remove timing chain (see page 7-11 to 7-12)**
- **Remove cylinder head (see page 7-17)**

Remove oil filter

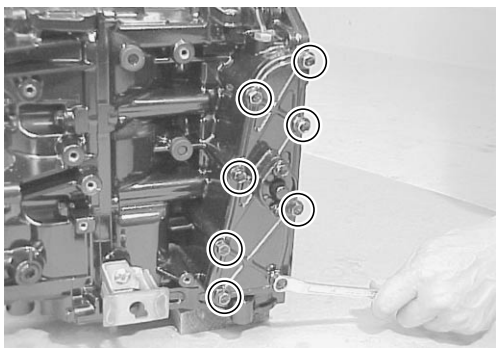
TOOL **09915-47340 : Oil filter wrench**



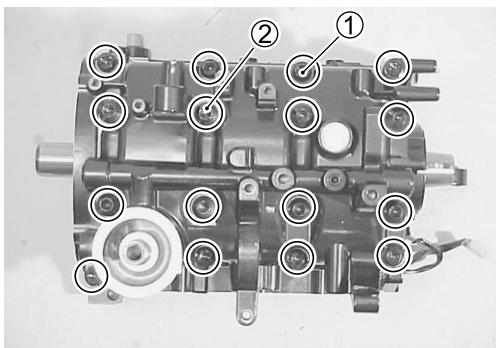
Remove oil pressure switch.



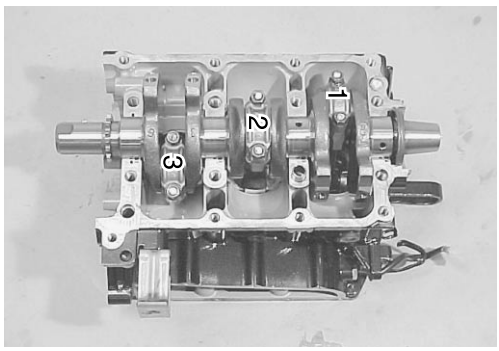
Remove the eight (8) bolts securing the exhaust cover plate to cylinder, then remove the exhaust cover plate.



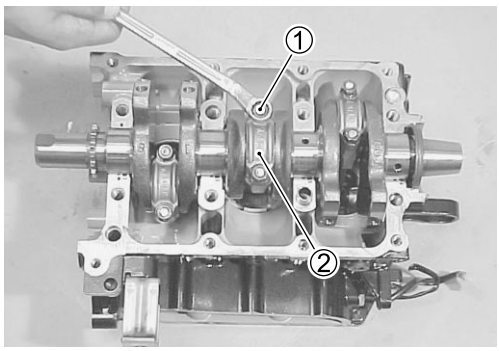
Remove eight (8) bolts ①.
Remove eight (8) bolts ②.
Remove crankcase from cylinder block.



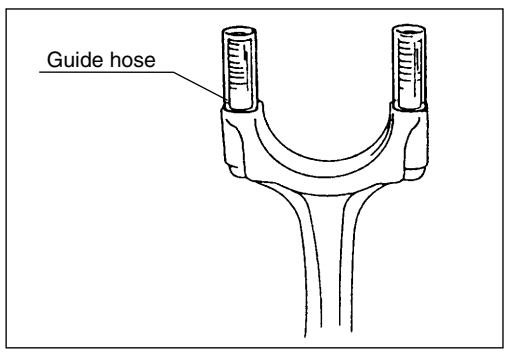
NOTE:
For proper assembly, mark cylinder number on all pistons, conrods, and conrod caps, using quick drying paint.



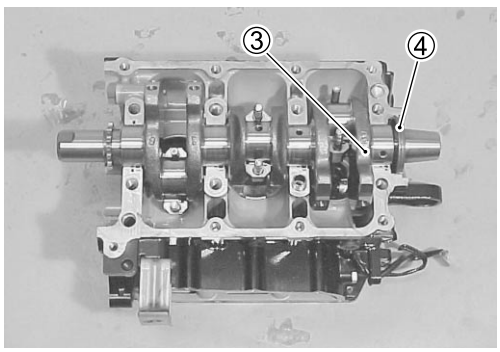
Remove all conrod cap nuts ① and conrod caps ②.



NOTE:
To prevent damage to crank pin and cylinder walls, install a piece of hose over threads of rod bolts.

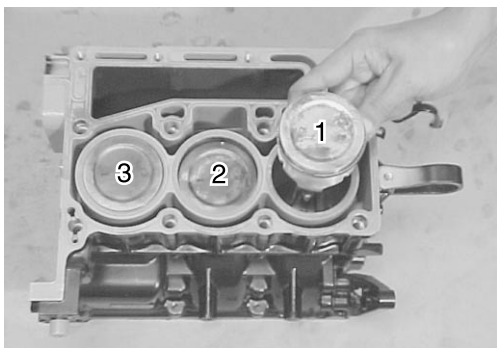


Remove cranckshaft ③.
Remove oil seal ④ form cranckshaft.

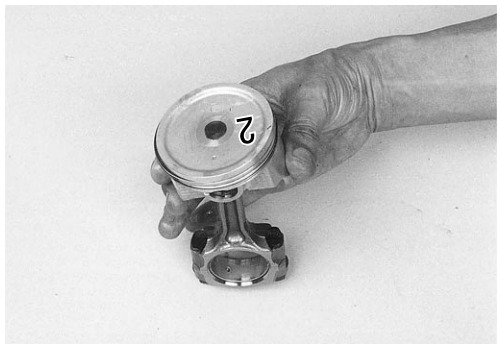


Mark cylinder number on pistons using quick dry paint.
Push piston (with conrod) out through the top of cylinder bore.
NOTE:

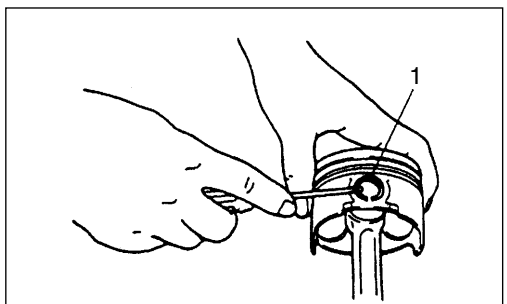
- *To prevent damage to piston rings, decarbon top of cylinder bore wall before removing piston.*
- *Reassemble each conrod cap to its original position after removing piston form boer.*



Remove two compression rings (top and 2nd) and oil ring form piston.



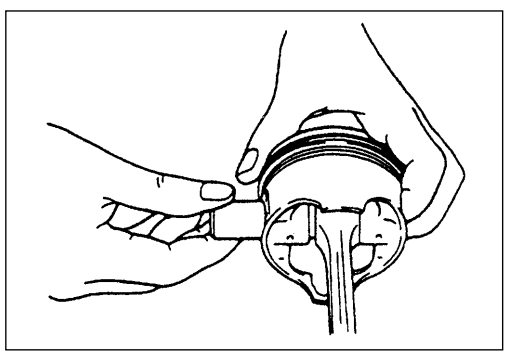
Mark cylinder number on conrod using quick drying paint.
Remove piston pin circlips as shown.



1. Piston pin circlip

Remove piston pin from conrod.

NOTE:
Reassemble each piston, piston pin conrod in their original combination and position.

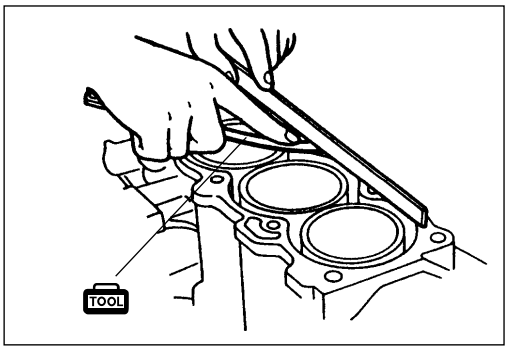


INSPECTION / SERVICING

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

CYLINDER

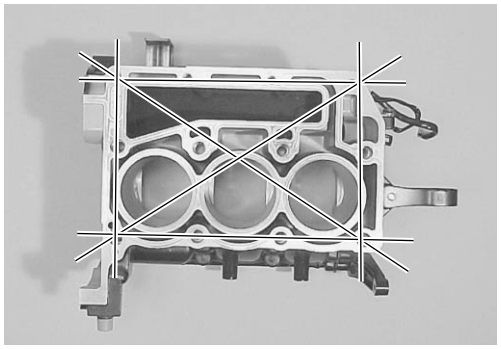
- **Cylinder distortion**
  Using a straightedge and thickness gauge, measure cylinder distortion (gasketed surface) at a total of six (6) location as shown.



TOOL **09900-20803 : Thickness gauge**

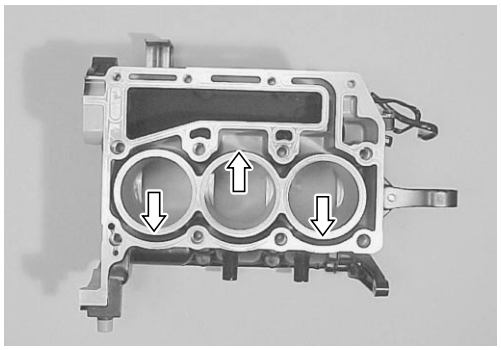
Cylinder distortion
Service limit : 0.030 mm (0.0012 in.)

If measurement exceeds service limit, resurface or replace cylinder.



NOTE:
Cylinder can be resurfaced, using a sureface plate and #400 grit wet sand paper.
Use a figure eight sanding pattern when resurfacing.

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



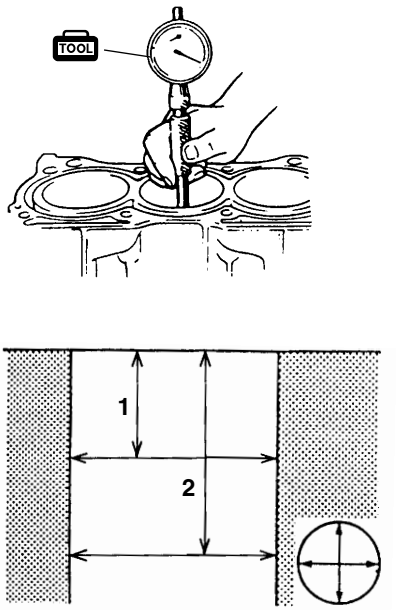
- **Cylinder bore**
  Inspect cylinder walls for scratches, roughness, or ridges which indicate excessive wear.
  If cylinder bore is very rough or deeply scratched, or ridges, rebore cylinder and use oversize piston.

- **Cylinder bore wear (difference)**
  Using cylinder gauge, measure cylinder bore in both axial (Vertical line, following crankshaft) and transverse (horizontal line across crankshaft) direction at two posirions as shown in figure.

TOOL 09900-20508 : Cylinder gauge set

Check for following :
- Difference between measurements at the two positions (taper).
- Difference between axial and transverse measurement (out-of-round).

Cylinder bore wear (diferencia)
Service limit : 0.100 mm (0.0039 in.)
If measurement exceeds service limit, rebore or replace cylinder.

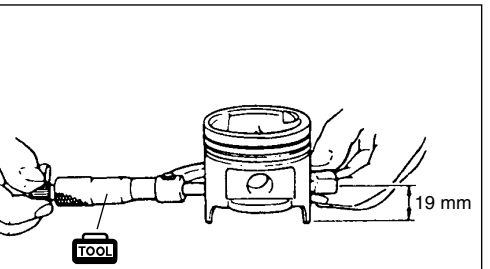


1. 50 mm (1.96 in.)
2. 90 mm (3.54 in.)

PISTON TO CYLINDER CLEARANCE
(1) Measure the piston diameter at a point 19mm (0.748 in.) above the piston skirt at a right angle to the piston pin bore.

TOOL 09900-20203 : Micrometer

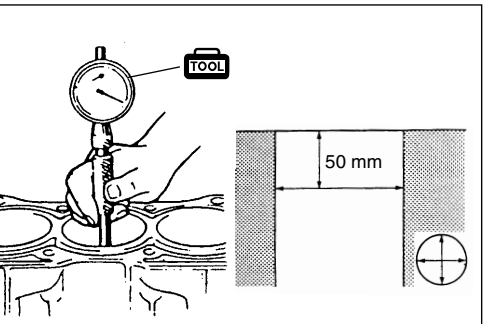
Piston skirt diameter
Standard : 64.970 – 64.990 mm (2.5579 – 2.5587 in.)



(2) Measure the cylinder bore at 50mm (1.969 in.) bellow the cylinder head gasket sureface at a right angle to the crankshaft pin.

TOOL 09900-20508 : Cylinder gauge set

Cylinder bore
Standard : 65.000 – 65.020 mm (2.5591 – 2.5598 in.)



(3) Calculate the piston / cylinder clearance
(Clearance equals difference between piston diameter and cylinder bore measurements.)

Piston to cylinder clearance
Standard : 0.020 – 0.040 mm (0.0008 – 0.0016 in.)
Service limit : 0.100 mm (0.0039 in.)

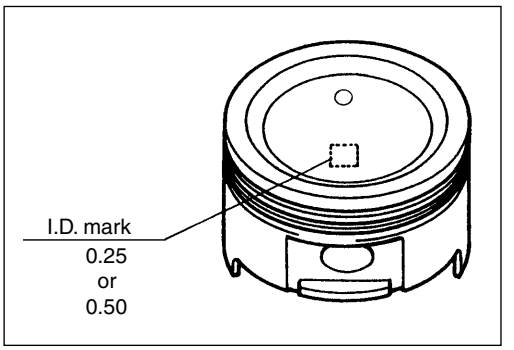
If clearance exceeds service limit, replace piston and / or cylinder or rebore cylinder.

Identification of oversize piston / piston ring

Two oversize piston / piston ring components, 0.25 mm and 0.50mm, are available.
Oversize piston / piston ring are marked as show, below.

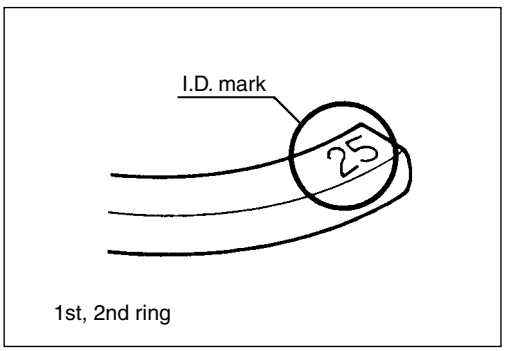
- **Piston**

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



- **1st & 2nd Piston ring**

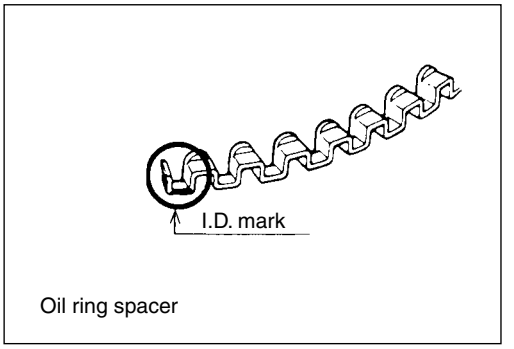
Oversize	I.D.mark
0.25 mm	25
0.50 mm	50



1st, 2nd ring

- **Oil ring**

Over size	I.D.mark
0.25 mm	Two (2) Blue paints
0.50 mm	Red paint

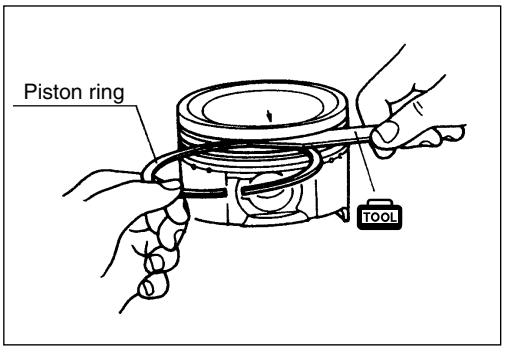


Oil ring spacer

PISTON

- Inspect piston for faults, cracks or other damage.
  Damaged or faulty piston(s) should be replaced.

- **Piston ring to groove clearance**
  Before checking, piston grooves must be clean, dry and free of carbon.
  Fit piston ring into piston groove, and measure clearance between ring and ring groove using thickness gauge.



TOOL **09900-20803 : Thickness gauge**

Piston ring to groove clearance
Standard:
1st. 0.03 – 0.07 mm (0.001 – 0.003 in.)
2nd. 0.02 – 0.06 mm (0.001 – 0.002 in.)
Service limit :
1st. 0.12 mm (0.005 in.)
2nd. 0.10 mm (0.004 in.)

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

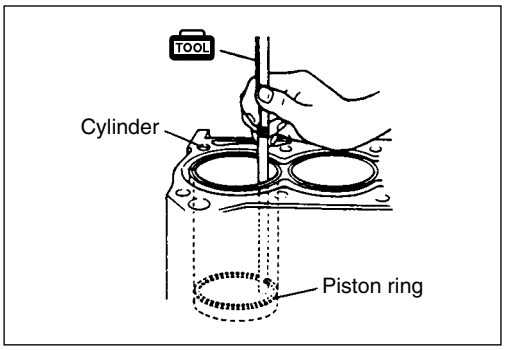
Piston ring groove width
Standard :
1st. 1.02 – 1.04 mm (0.040 – 0.041 in.)
2nd. 1.21 – 1.23 mm (0.0476 – 0.0484 in.)
Oil 2.01 – 2.03 mm (0.079 – 0.080 in.)

Piston ring thickness
Standard :
1st. 0.97 – 0.99 mm (0.038 – 0.039 in.)
2nd 1.17 – 1.19 mm (0.046 – 0.047 in.)

PISTON RING

Piston ring end gap

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



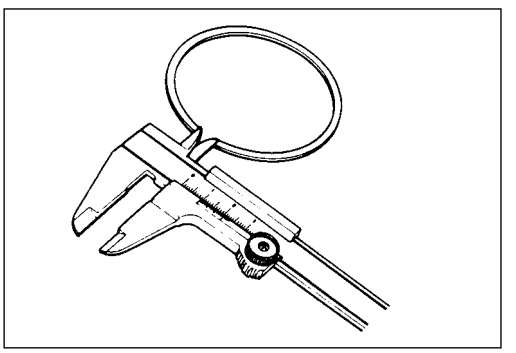
TOOL **09900-20803: Thickness gauge**

Piston ring end gap
Standard:
1st. 0.12 – 0.27 mm (0.005 – 0.011 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 measurement exceeds service limit, replace position ring.

Piston ring free end gap

Measure piston ring free end gap using vernier calipers.



TOOL **09900-20101 : Vernier calipers**

Piston ring free end gap
Standard :
1st. Approx. 9.1 mm (0.36 in.)
2nd. Approx. 9.0 mm (0.35 in.)
Service limit :
1st. 7.3 mm (0.29 in.)
2nd. 7.2 mm (0.28 in.)

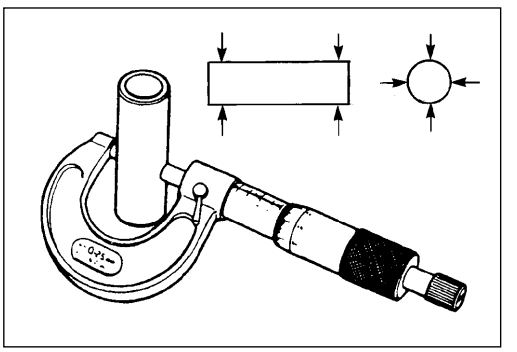
If measurement exceeds service limits, replace piston ring.

PISTON PIN

Check piston pin, conrod small end bore and piston pin hole for wear or damage.
If badly worn or damaged ,replace component.

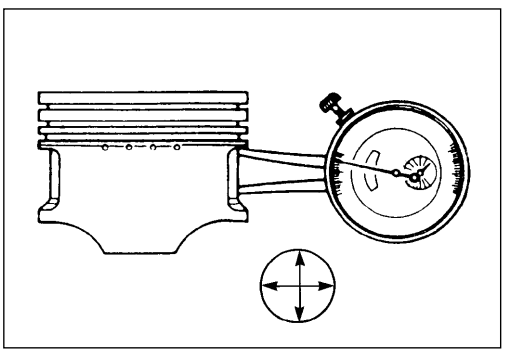
Piston pin clearance

- Check the piston pin clearance in the conrod small end . Replace the conrod if its small end is badly worn or damaged or if clearance exceeds service limit.



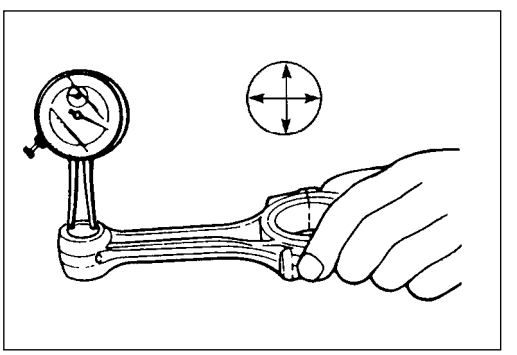
TOOL **09900-20205 : Micrometer**
09900-20605 : Dial calipers

Piston pin outside diameter
Standard : 15.995 – 16.000 mm (0.6297 – 0.6299 in.)
Service limit : 15.980 mm (0.6291 in.)



Piston pin hole diameter
Standard : 16.006 – 16.014 mm (0.6302 – 0.6305 in.)
Service limit : 16.030 mm (0.6311 in.)

Conrod small end bore
Standard : 16.003 – 16.011 mm (0.6300 – 0.6304 in.)

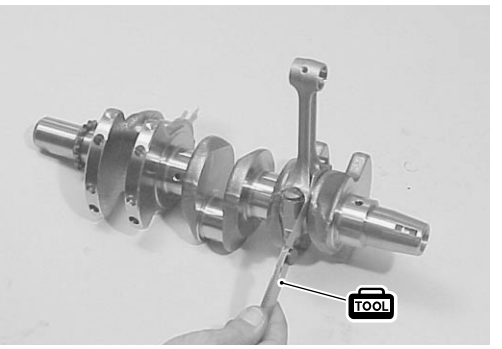


Pin clearance in piston pin hole
Standard : 0.006 – 0.019 mm (0.0002 - 0.0007 in.)
Service limit : 0.040 mm (0.0016 in.)

Pin clearance in conrod small end
Standard : 0.003 – 0.016 mm (0.0001 – 0.0006 in.)
Service limit : 0.050 mm (0.0020 in.)

CONROD BIG END SIDE CLEARANCE

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



TOOL **09900-20803 : Thickness gauge**

Conrod big end side clearance
Standard : 0.100 – 0.250 mm (0.0039 – 0.0098 in.)
Service limit : 0.350 mm (0.0138 in.)

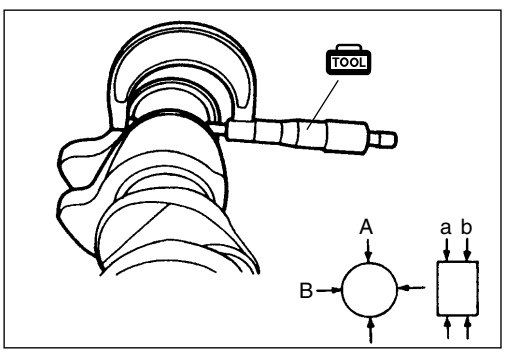
If measurement exceecs service limit, replace conrod and / or crankshaft.

Conrod big end width
Standard : 21.950 – 22.000 mm (0.8642 – 0.8661 in.)

Crank pin width
Standard : 22.100 – 22.200 mm (0.8700 – 0.8740 in.)

CRANK PIN

Inspect crank pin for uneven wear or damage.
Measure crank pin for out - of - round or taper with micrometer.
If crank pin is damaged, out - of - round or taper is out of service limit, replace crankshaft.



TOOL **09900-20202 : Micrometer**

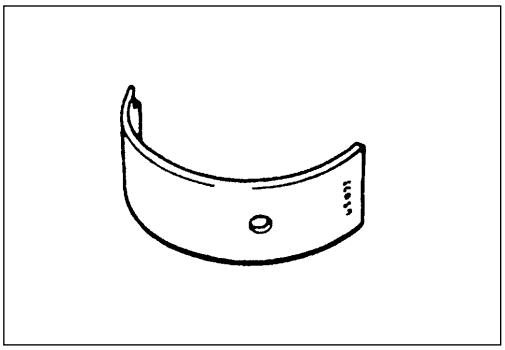
Out -of- round : A – B
Taper : a – b

Out-of-round and taper
Service limit : 0.010 mm (0.0004 in.)

Crank pin diameter
Standard : 35.982 – 36.000 mm (1.4166 – 1.4173 in.)

CONROD BEARING

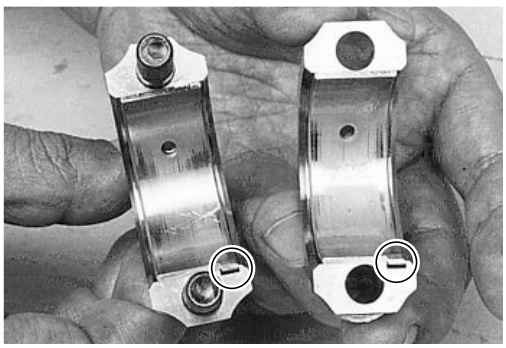
Inspect bearing shell for proper contact pattern and signs of fusion, pitting, burning or flanking.
Bearing shells forund in defective condition must be replaced.



Conrod big end oil clearance

Check coonrod big end oil clearance as follows:

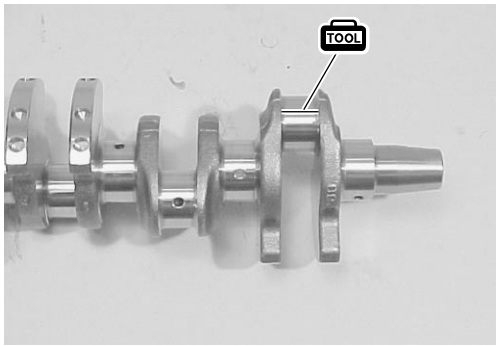
(1) Clean surface of conrod, conrod cap, conrod bearing, and crank pin.



(2) Install conrod bearing onto conrod and conrod cap.

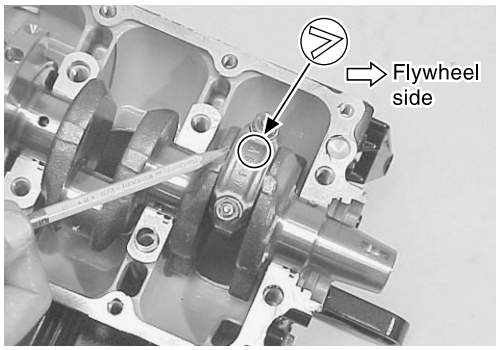
NOTE:
- *Reassemble each bearing and conrod cap to their original position.*
- *Do not apply oil to bearing.*

(3) Plece a piece of plastigauge on crank pin parallel to crankshaft. Avoid placing Plastigauge over oil hole.



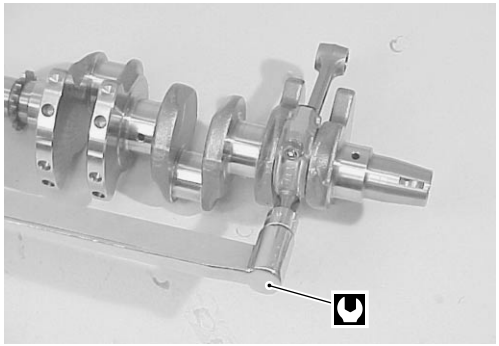
TOOL **09900-22301 : Plastigauge**

(4) Install conrod cap (with bearing) to conrod with the arrow mark on cap toward flywheel side.



(5) Apply engine oil to conrod bolts and tibhten nut in two steps.

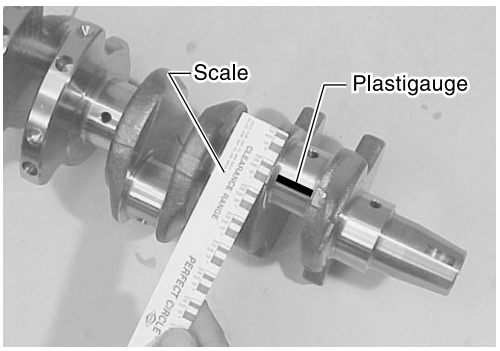
Conrod cap nut :
1 st step 18 N · m (1.8 kg-m, 13.0 lb.-ft.)
Final step 35 N · m (3.5 kg-m, 25.5 lb.-ft.)



NOTE:
Do not rotate conrod with Plastigauge in place.

(6) Remove conrod and conrod cap from crank pin.

(7) Using scale on Plastigauge envelop, measure Plastigauge with at its widest point



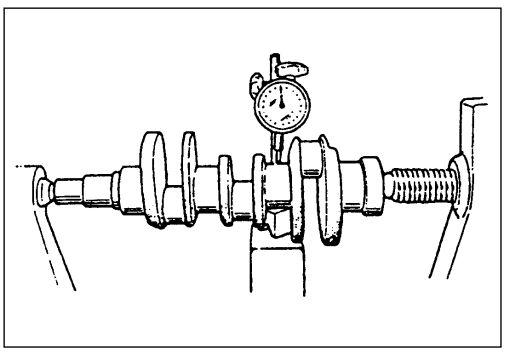
Conrod big end oil clrearance
Standard : 0.020 – 0.040 mm (0.0008 – 0.0016 in.)
Service limit : 0.065 mm (0.0026 in.)

If measurement exceeds service limit, replace conrod bearing.

CRANKSHAFT

Crankshaft center journal runout

Using a dial gauge, meausre runout at center journal.



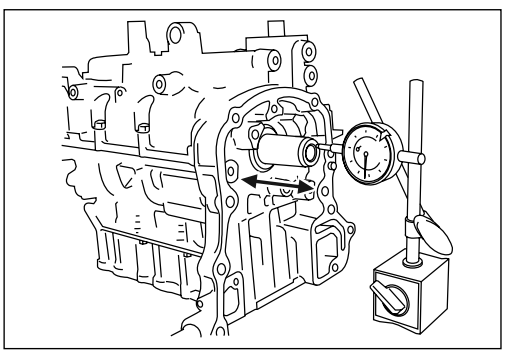
TOOL **09900-20602 : Dial gauge**
09900-20701 : Magnetic stand

Crankshaft center journal runout
Service limit : 0.04 mm (0.002 in.)

If measurement exceeds service limit, replace crankshaft.

Crankshaft thrust play

Measure thrust play with crankshaft, thrust bearing, journal bearing and crankcase/cylinder block assembled in a normal manner.
Tighten crankcase bolts to specified torque.



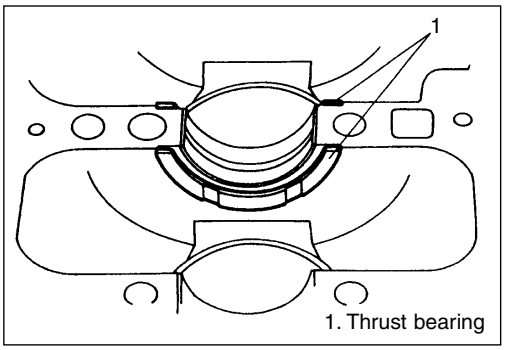
Crankcase bolt :
8 mm 25 N · m (2.5 kg-m, 18.0 lb.-ft.)
10 mm 53 N · m (5.3 kg-m, 38.5 lb.-ft.)

Use a dial gauge to read displacement in axial (thrust) direction of crankshaft.

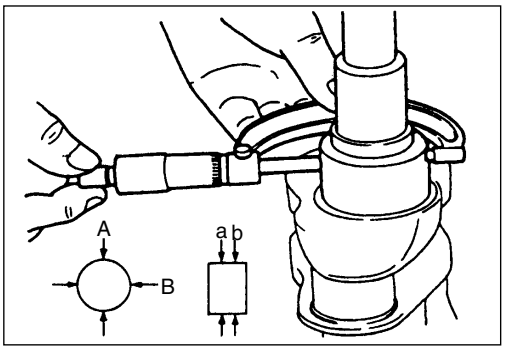
Crankshaft thrust play
Standard : 0.11 – 0.31 mm (0.004 – 0.012 in.)
Service limit : 0.35 mm (0.014 in.)

If measurement exceeds service limit, replace crankshaft thrust bearing.

Crankshaft thrust bearing thickness
Standard : 2.470 – 2.520 mm (0.0972 – 0.0992 in.)



■ **Out - of - round and taper (uneven wear) of jurnals**
An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both).
This difference, if any, is determined by taking micrometer readings.
If any journal is badly damaged or if measurements exceed service limit, replace crankshaft.



TOOL **09900-20202 : Micrometer**

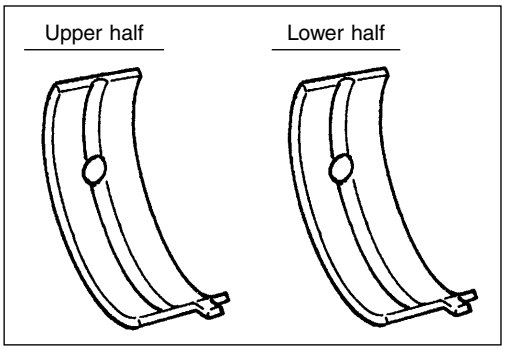
Out - of - round : A – B
Taper : a – b

Out - of - round and taper
Service limit : 0.010 mm (0.0004 in.)

Crankshaft journal outside diameter
Standard : 39.982 – 40.000 mm (1.5741 – 1.5748 in.)

CRANKSHAFT MAIN BEARING

Check bearings for pitting, scratches, wear or damage.
If any improper condition is found, replace both upper and lower halves.
Always replace both bearing halves, never only one half of a bearing set.

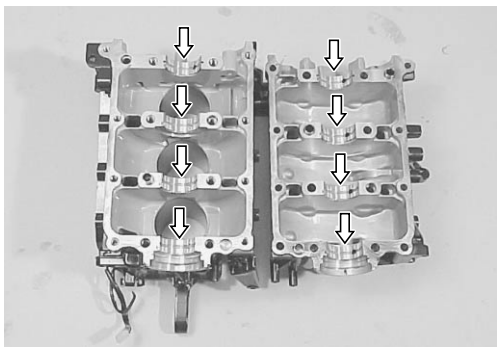


CRANKSHAFT JOURNAL OIL CLEARANCE

Check clearance using Plastigauge according to the following procedure.

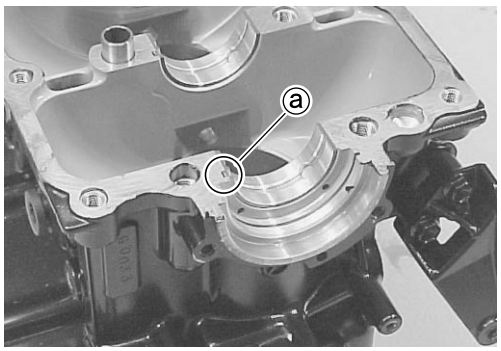
NOTE:
Assemble each bearing in its original position before checking clearance.

(1) Clean surface of bearing holder (crankcace, and cylinder), bearing, and main bearing journal.



(2) Install main bearing to cylinder and crankcase.

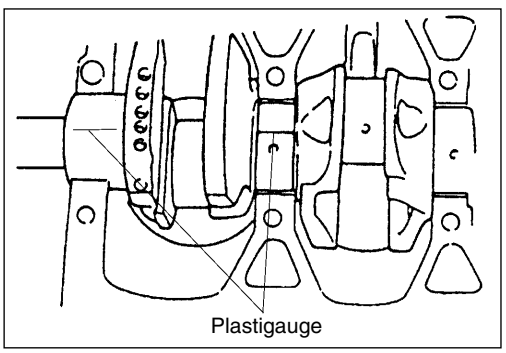
NOTE:
- *Align the tab ⓐ of bearing with notch in cylinder and crankcase.*
- *Do not apply engine oil to bearing.*



(3) Install crankshaft to cylinder.

(4) Place piece of Plastigauge across full width of bearing (paralel to crankshaft) on journal.
Do not place Plastigauge over oil hole.

09900-22301 : Plastigauge

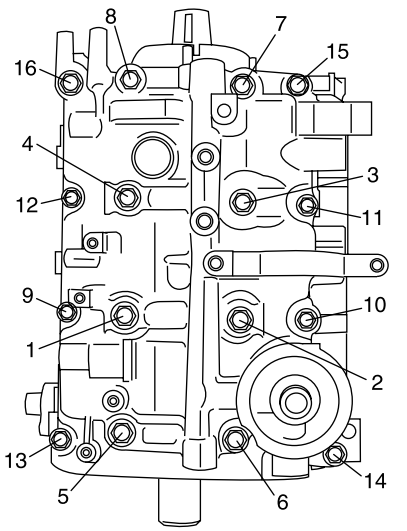


NOTE:
Do not rotate crankshaft while Plastigauge is installed.

(5) Assemble crankcase to cylinder.

(6) Apply eingine oil crankcase bolts.
Tighten crankcase bolts in three (3) steps following the order indicated below.

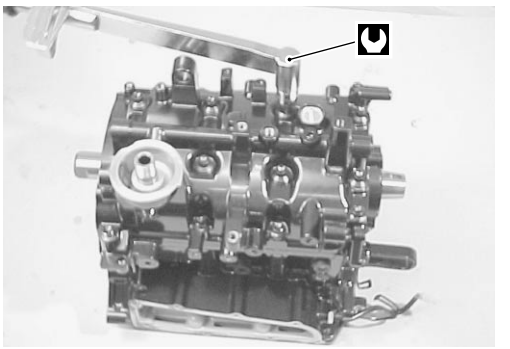
Tightening order



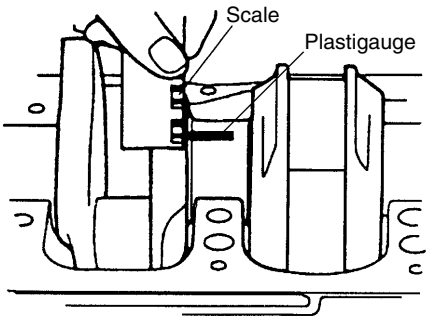
Crankcase:

1st step	**8 mm**	**5 N · m (0.5 kg-m, 3.5 lb.-ft.)**
	10 mm	**11 N · m (1.1 kg-m, 8.0 lb.-ft.)**
2nd step	**8 mm**	**20 N · m (2.0 kg-m, 14.5 lb.-ft.)**
	10 mm	**43 N · m (4.3 kg-m, 31.0 lb.-ft.)**
Final step	**8 mm**	**25 N · m (2.5 kg-m, 18.0 lb.-ft.)**
	10 mm	**53 N · m (5.3 kg-m, 38.5 lb.-ft.)**

NOTE:
Crankcase must be torqued to specification order to assure proper compression of Plastigauge and accurate reading of clearance.



(7) Remove crankcase form cylinder.



(8) Using scale on Plastigauge envelope, measure Plastigauge width at its widest point.

Crankshaft journal oil clearance
Standard : 0.020 – 0.040 mm (0.0008 – 0.0016 in.)
Service limit : 0.065 mm (0.0026 in.)

If measurement exceeds service limit, replace crankshaft main bearing.

NOTE:
For bearing replacement, see the "SELECTION OF MAIN BEARING" section on page 7-52.

SELECTIN OF MAIN BEARING

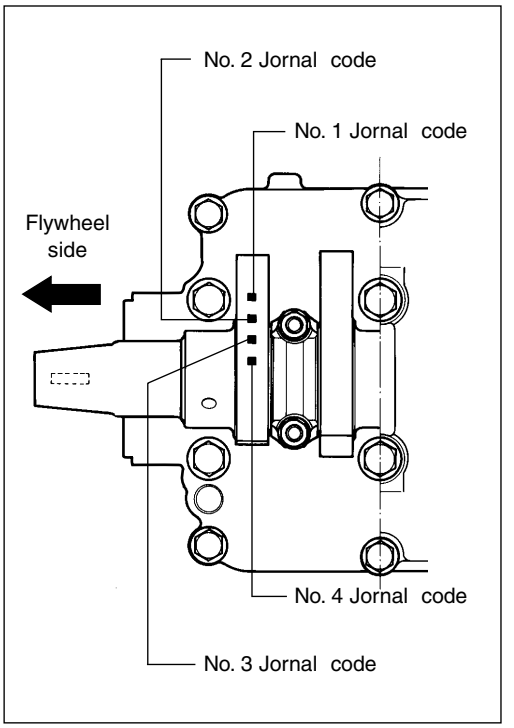
Whenever a bearing requires replacement, select a new bearing according to following procedure.

(1) First check journal diameter.

As show in figure, upper (flywheel side) crank web of No.1 cylinder has four (4) stamped numerals.

The numerals (1, 2 & 3) represent the journal diameters shown below.

Numeral stamped	Journal diameter
1	39.994 – 40.000 mm (1.5746 – 1.5748 in.)
2	39.988 – 39.994 mm (1.5743 – 1.5746 in.)
3	39.982 – 39.988 mm (1.5741 – 1.5743 in.)

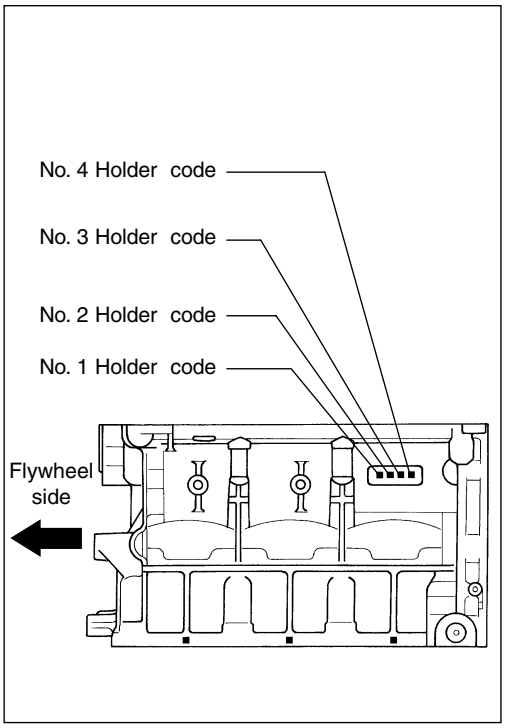


(2) Next, check bearing holder inside diameter without bearing.

As shown in figure, the STBD side of cylinder block has four (4) stamped codes letters.

The letters (A, B & C) represent the bearing holder inside diameter shown below.

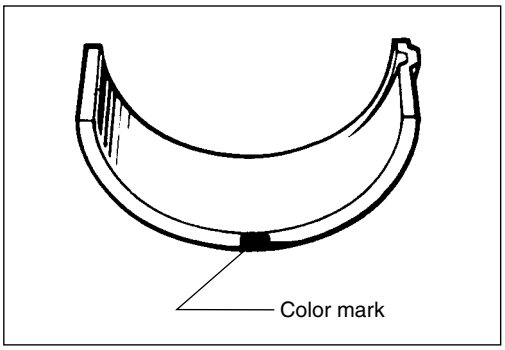
Code	Crank bearing holder inside diameter (w / o bearing)
A	44.000 – 44.006 mm (1.7323 – 1.7325 in.)
B	44.006 – 44.012 mm (1.7325 – 1.7328 in.)
C	44.012 – 44.018 mm (1.7328 – 1.7330 in.)



(3) There are five (5) main bearing available, each of differing thickness.

To distinguish them, a color mark is painted at the position indicated in figure.

Each color represents the following thickness measured at the center of the bearing.



Color mark	Bearing thickness
Green	1.996 – 2.000 mm (0.0768 – 0.0787 in.)
Black	1.999 – 2.003 mm (0.0787 – 0.0789 in.)
No Color mark	2.002 – 2.006 mm (0.0788 – 0.0790 in.)
Yellow	2.005 – 2.009 mm (0.0789 – 0.0791 in.)
Blue	2.008 – 2.012 mm (0.0791 – 0.0792 in.)

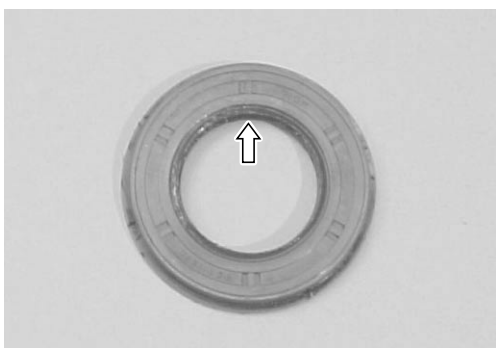
(4) Select crankshaft main bearing referring the below table.

		Numeral stamped on crank web (journal outside diameter)		
		1	**2**	**3**
Code stamped on cylinder block (Bearing holder inside diameter)	**A**	Green	Black	NO Color
	B	Black	NO Color	Yellow
	C	NO Color	Yellow	Blue

NOTE:
Measure crankshaft journal oil clearance agian after installing new bearing selected. (see page 7-50)

OIL SEAL

Inspect condition. If cracked, cut or damaged, replace.



REASSEMBLY

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

CAUTION

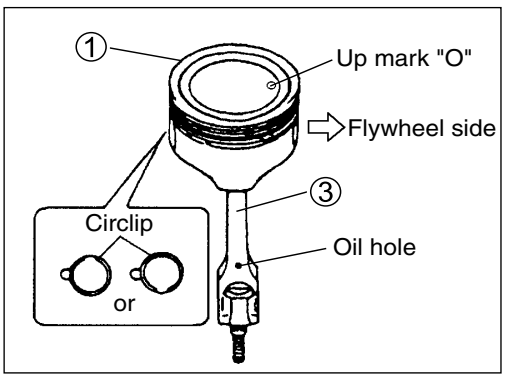
If original components are not replaced, each piston, piston pin and conrod is to be assembled and installed in its original order and position.

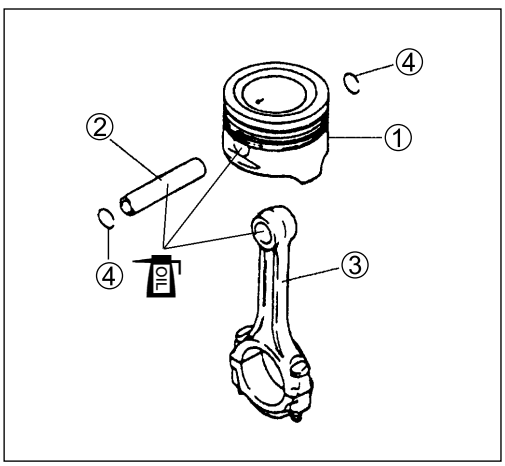
PISTON TO CONROD

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

NOTE:

- *Make sure conrod is installed in the direction shown.*
- *Circlip should be installed with gap facing either up or down as shown in figure.*
- *Always use new piston pin circlip.*

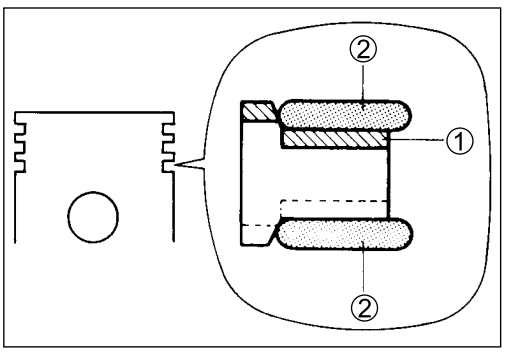




PISTON RING TO PISTON

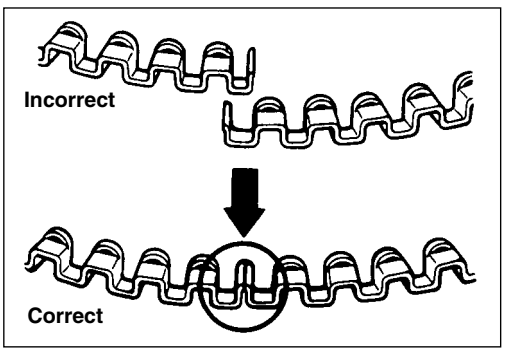
■ Oil ring

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



CAUTION

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



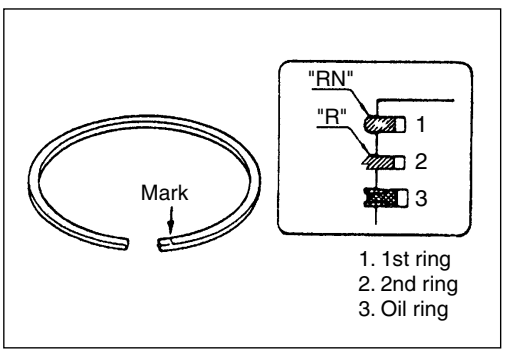
■ 1st ring and 2nd ring

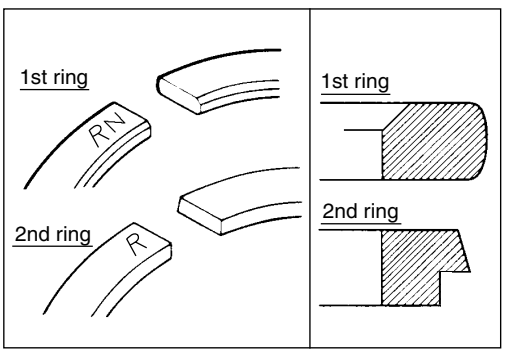
- Apply engine oil to piston ring.
- Install 2nd ring and 1st ring to piston.

NOTE:

- *1st ring ditters from 2nd ring in shape and color of surface contacting cylinder wall.*
  Distinguish 1st ring from 2nd ring by referring to figure.

- *As indicated in figure, 1st and 2nd ring are marked, "RN" or "R".*
  When installing these piston rings, the marked side of each ring must face towards top of piston.

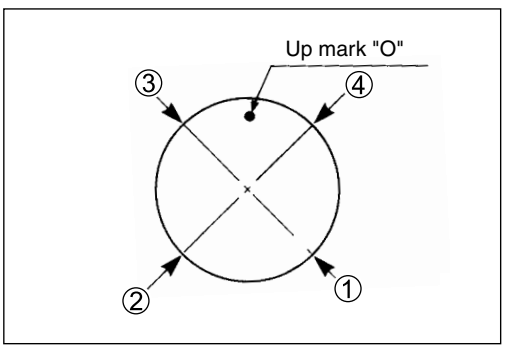




■ Ring gap direction

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

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

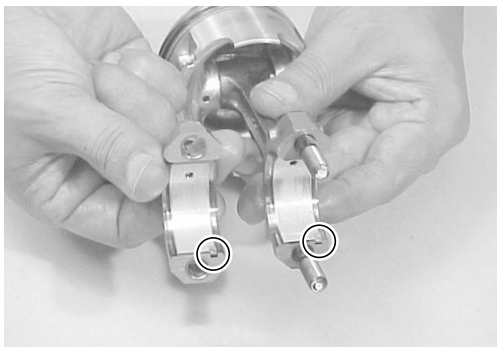


CAUTION

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

PISTON TO CYLINDER

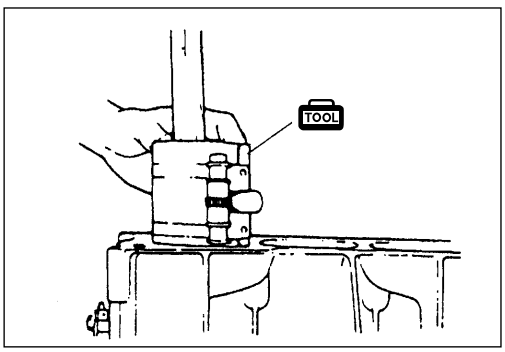
Install conrod bearing to conrod and conrod cap.



CAUTION

- **Assemble each conrod bearing to its original position.**
- **Dont apply oil between conrod and bearing or between bearing cap and bearing.**

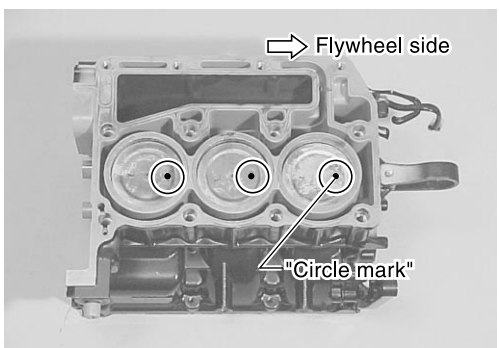
Apply engin oil to piston and cylinder walls.



Insert piston and conrod assembly into cylinder bore from cylinder head side using special tool.

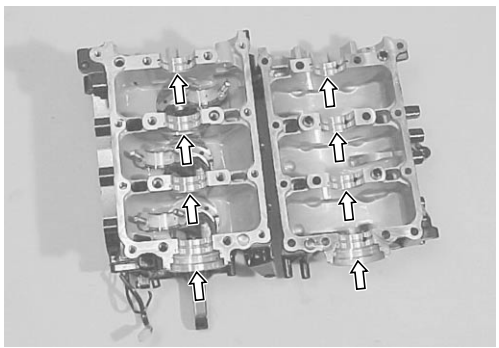
TOOL **09916-77310 : Piston ring compressor**

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



CRANKSHAFT TO CYLINDER

Install crankshaft main bearing in cylinder and crankcase.
Apply engine oil to bearings.

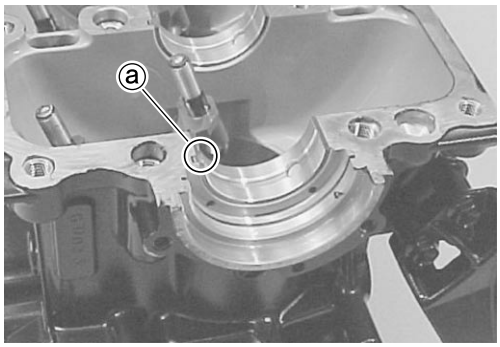


CAUTION

- **Assemble each bearing to its original position.**
- **Do not apply oil between crank bearing holder and crank main bearing.**

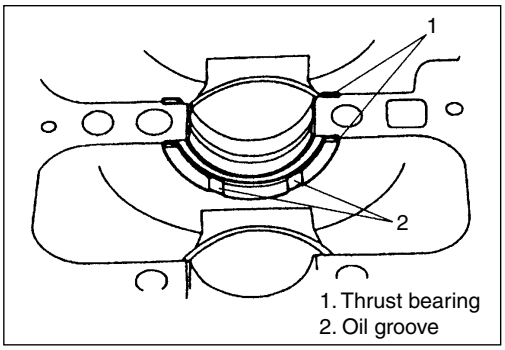
NOTE:

Align bearing tab ⓐ with notch in cylinder and crankcase.



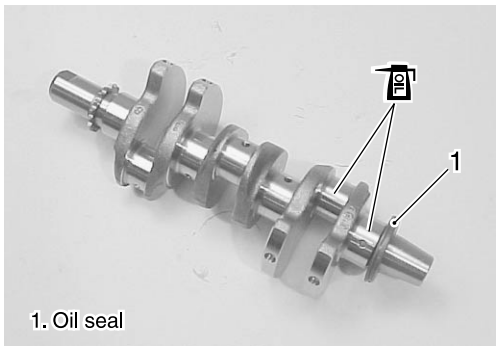
Thrust bearing

Apply engine oil to bearing and install in cylinder block between the No.2 and No.3 cylinders.
Oil groove sides of thrust bearing must face towards crank webs.



Crankshaft

Apply engine oil to upper oil seal lip.
Install upper oil seal to crankshaft.



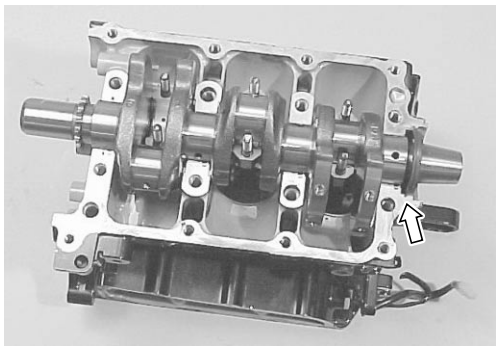
CAUTION

Do not re-user seal removed. Be sure to use new seal.

NOTE:

Install upper oil seal with its spring/lipped side facing inward.

Apply engine oil to crank pin and crankshaft main journal and install crankshaft in cylinder.

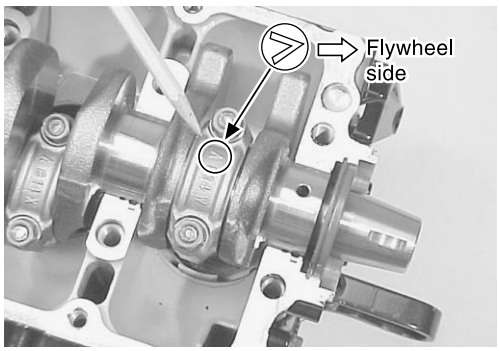


NOTE:

When installing crankshaft to cylinder, be sure to fit tab of seal in groove of cylinder.

CONROD CAP

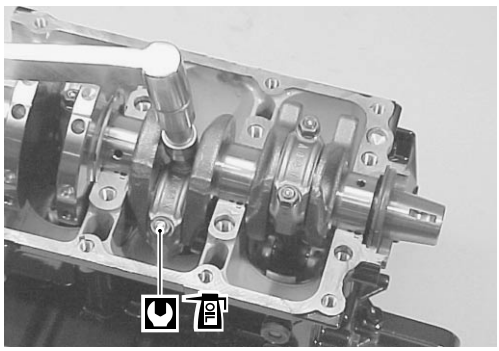
Apply engine oil to crank pin and conrod bearing.
Install conrod cap (with bearing) to conrod with arrow mark on cap toward flywheel side.



CAUTION

Reassemble each conrod cap its original position.

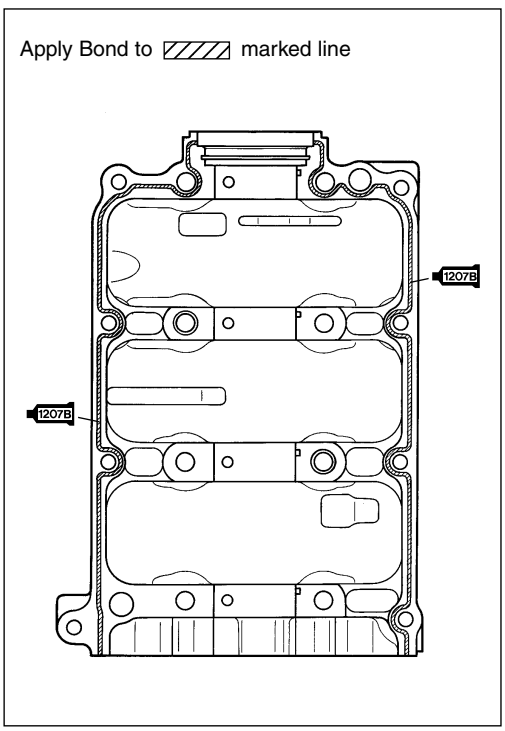
Apply engine oil to conrod bolts.
Tighten conrod cap nuts in two setps.



Conrod cap nut :
1st step 18 N · m (1.8 kg-m, 13.0 lb.-ft.)
Final step 35 N · m (3.5 kg-m, 25.5 lb.-ft.)

CRANKCASE TO CYLINDER

Clean mating surface of cylinder and crankcase.
Apply SUZUKI BOND to mating surface of crankcase as shown.

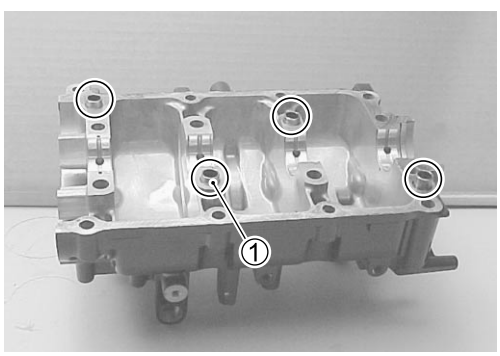


CAUTION

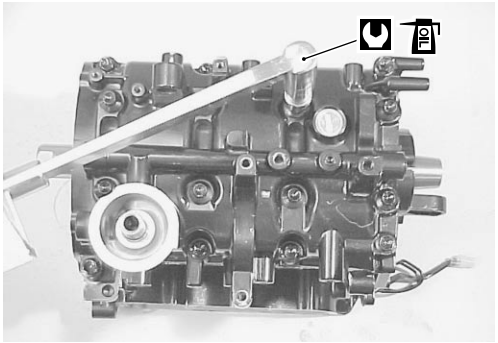
Apply bond to mating surface only.
Do not allow bond to contact surface of bearing.

1207B 99000-31140 : Suzuki Bond 1207B

Install four (4) dowel pins ①.



Install crankcase to cylinder.
Apply engine oil to crankcase bolts.
Tighten crankcase bolts in three (3) steps following the order indicated below.

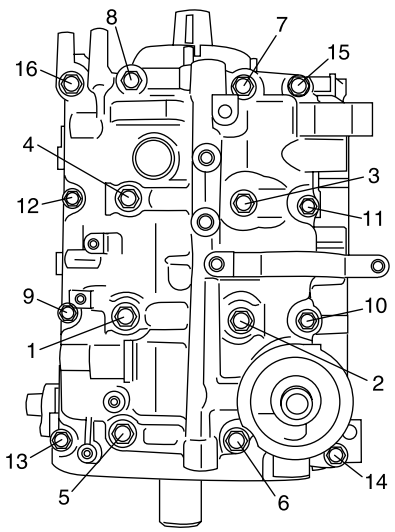


NOTE:
After tightening crankcase bolts, check to be sure that crankshatf rotates smoothy when turned by hand.

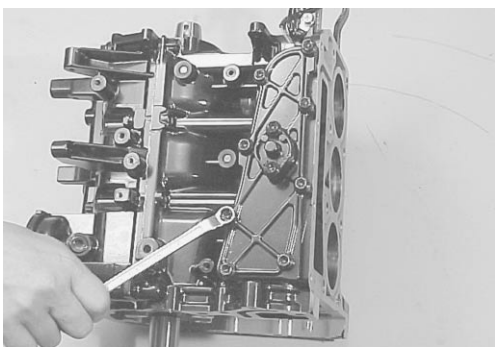
Crankcase bolt

1st step	**8 mm**	**5 N · m (0.5 kg-m, 3.5 lb.-ft.)**
	10 mm	**11 N · m (1.1 kg-m, 8.0 lb.-ft.)**
2nd step	**8 mm**	**20 N · m (2.0 kg-m, 14.5 lb.-ft.)**
	10 mm	**43 N · m (4.3 kg-m, 31.0 lb.-ft.)**
Final step	**8 mm**	**25 N · m (2.5 kg-m, 18.0 lb.-ft.)**
	10 mm	**53 N · m (5.3 kg-m, 38.5 lb.-ft.)**

Orden de apriete



EXHAUST COVER PLATE
Install gasket and exhaust cover plate, then tighten bolts securely.



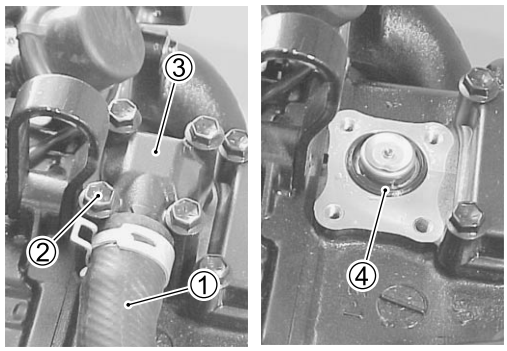
CYLINDER HEAD
Install cylinder head. (see page 7-17 to 7-18)

TIMING CHAN
Install timing chain. (see page 7-14 to 7-16)

POWER UNIT
Install power unit. (see page 7-7 to 7-10)

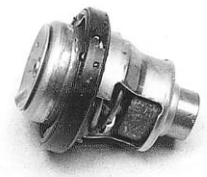
THERMOSTAT

REMOVAL

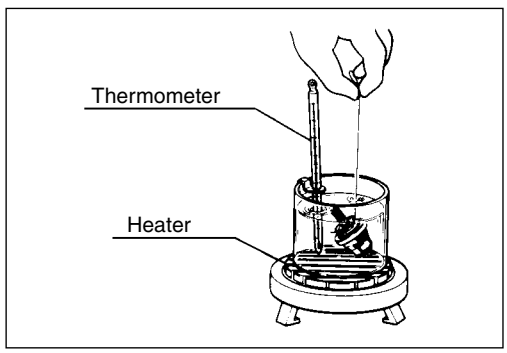


- Disconnect water hose ① from thermostat cover.
- Remove the four (4) bolts ② securing the thermostat cover, then remove the cover ③ and thermostat ④.

INSPECTION



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



- **Thermostat operation**
  Check thermostat opening temperature as follows:

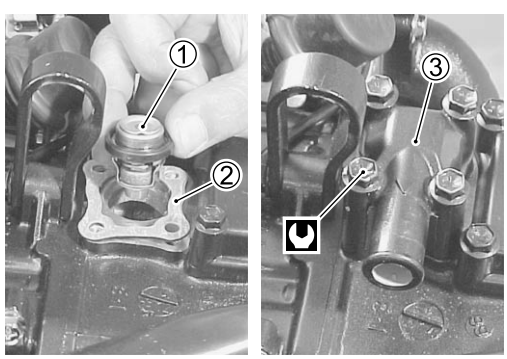
  • Insert a length of thread between thermostat valve / body and suspend thermostat in a container filled with water.

  • Place thermometer in container and heat water.
  Observe water temperature when thermostat valve opens and releases thread.

  Thermostat operating temperature
  Standard : 58 – 62 °C (136 – 144 °F)

INSTALLATION

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



- Assemble thermostat ①, gasket ② and thermostat cover ③ to cylinder head block and secure with bolts.

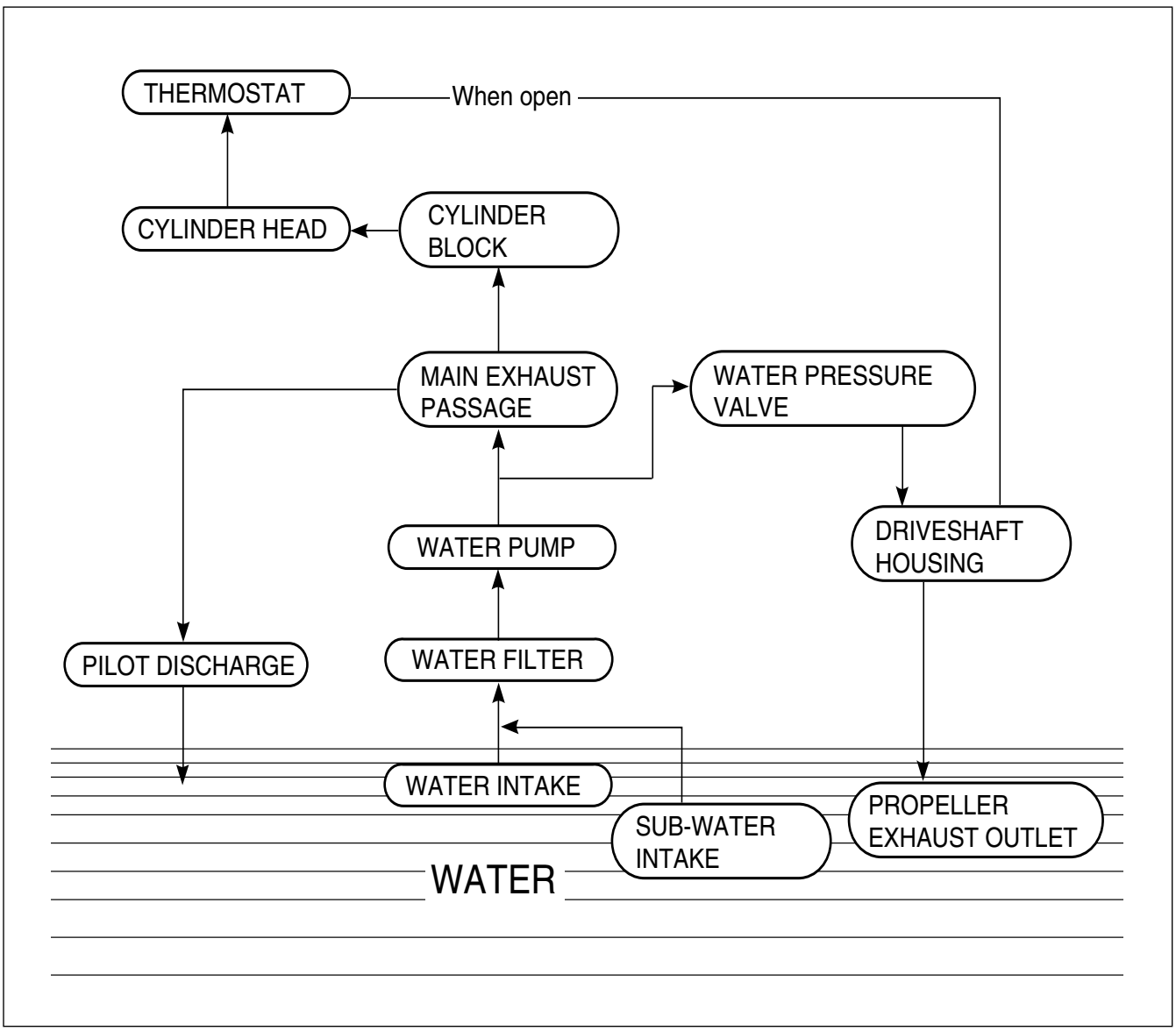
Thermostat cover bolt : 10 N·m (1.0 kg-m, 7.0 lb.-ft.)

OPERATION

WATER COOLING SYSTEM

The water cooling system includes the lower unit water pump, lower unit to power unit water supply tube, oil pan water pressure valve, power unit water passages and 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 buidup or component damage.

Component inspection	Refer to page
Water pump / Impeller	10-10
Water tube	8-13
Thermostat	7-60
Water pressure valve	8-13
Cylinder head	7-22
Cylinder block	7-40



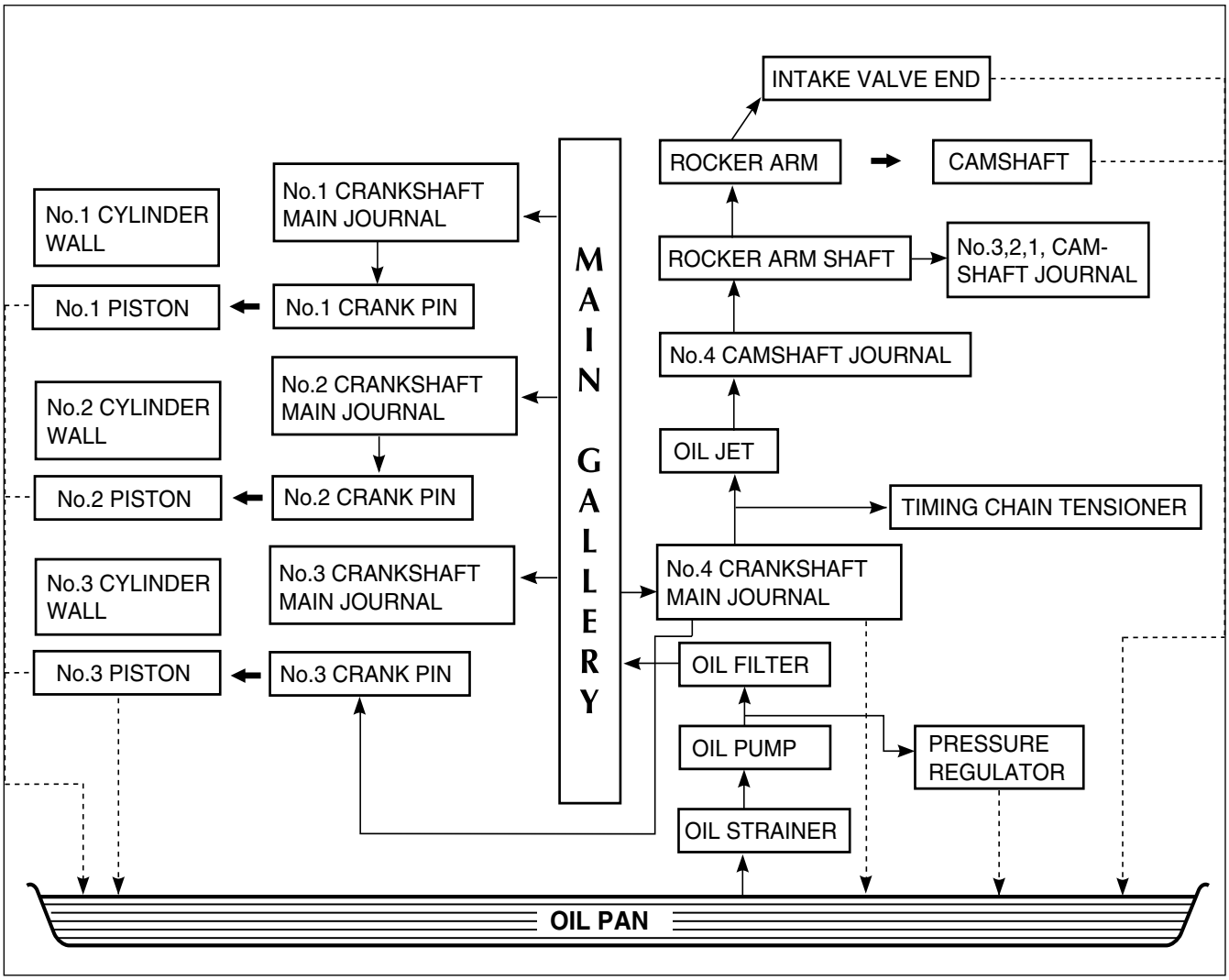
ENGINE LUBRICATION SYSTEM

Acamshaft driven trochoid type pump provides engine oil to all power unit components requiring lubrication. Oil form the oil pan is drawn theough the oil strainer and passed through a spin-on type oil filter before entering the main oil gallery.

A pressure regulator (relief valve) is positioned between the oil pump and oil filter maintaion oil pressure at a constant level.

From the main gallery, oil flow is deirected through either drilled internal passage or by splash method to those surface requiring lubrication.

ENGINE OIL LUBRICATION CHART



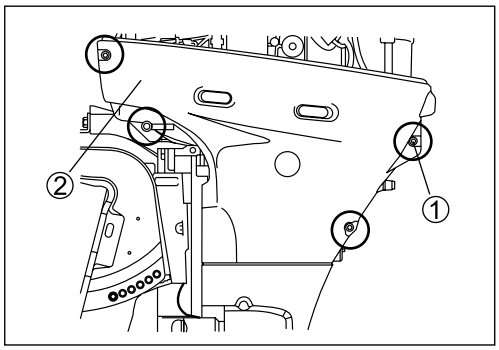
MID UNIT

CONTENTS

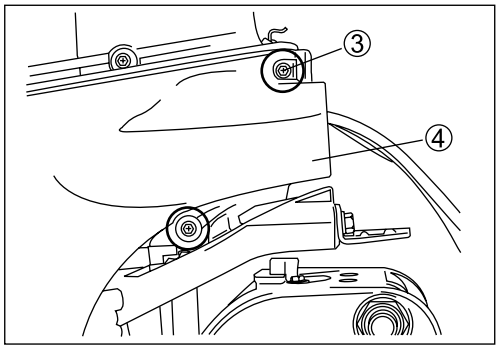
ENGINE SIDE COVER

REMOVAL

Remove four (4) screws ① and PORT side cover ②.

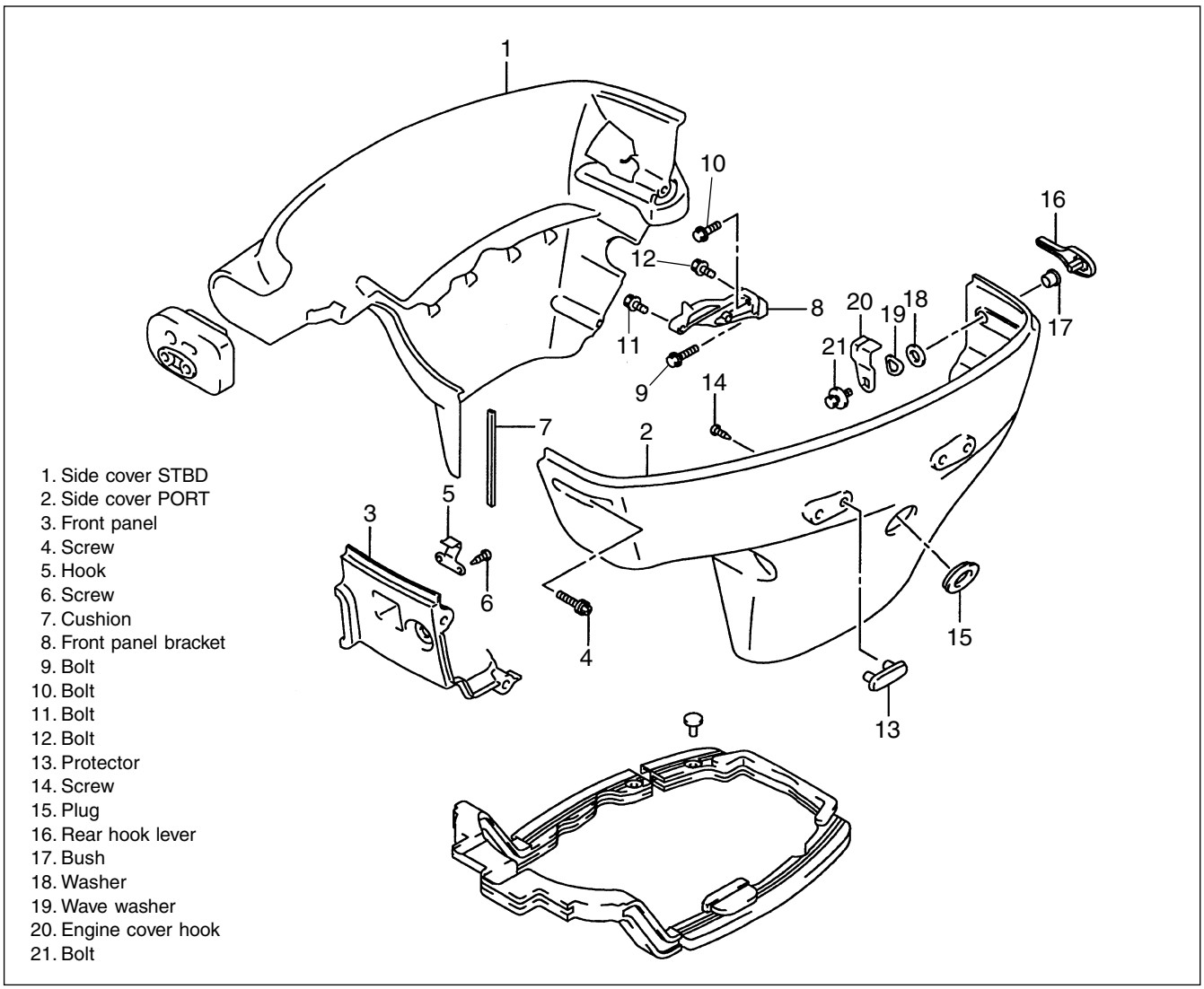


Remove two (2) screws ③ and STBD side cover ④.



INSTALLATION

Installation is reverse order of removal.

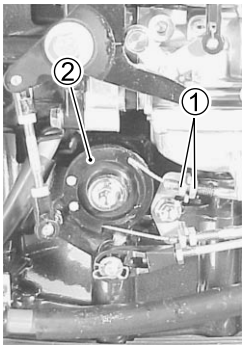


1. Side cover STBD
2. Side cover PORT
3. Front panel
4. Screw
5. Hook
6. Screw
7. Cushion
8. Front panel bracket
9. Bolt
10. Bolt
11. Bolt
12. Bolt
13. Protector
14. Screw
15. Plug
16. Rear hook lever
17. Bush
18. Washer
19. Wave washer
20. Engine cover hook
21. Bolt

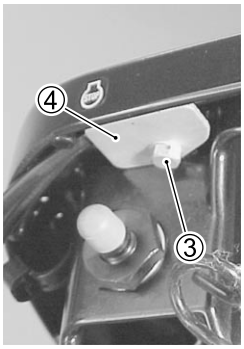
TILLER HANDLE / HANDLE BRACKET

REMOVAL

Remove the STBD side lower cover.
Loosen lock nut ①.
Remove throttle cables from throttle drum ②.

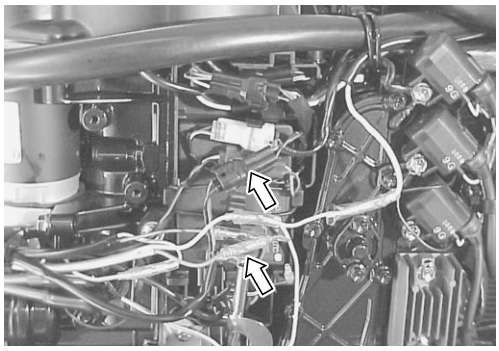


Remove bolt ③ and plate ④.

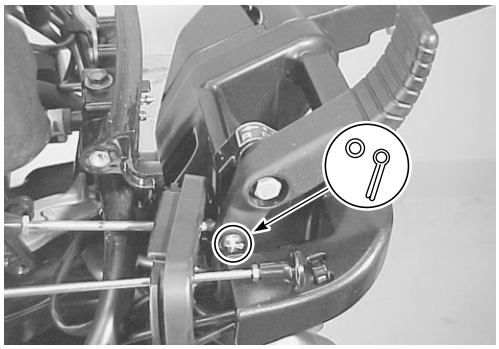


Remove two bolts and handle cover.
Remove tiller handle and throttle cable assembly.

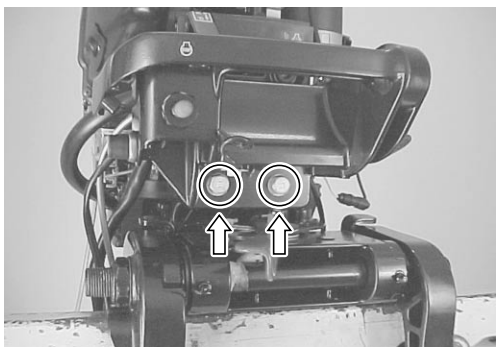
Disconnect emergency stop switch lead wire.
Disconnect engine start button lead wire.



Remove cotter pin and washer from shift link rod.
Remove shift link rod from shift lever.

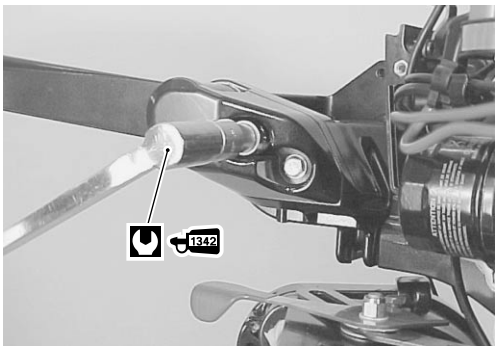


Remove two bolts and handle bracket.



INSTALLATION

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



- **Tiller handle cover**
  Install tiller handle and handle cover.
  Tighten handle cover bolts, pre-coated with thread lock, to the specified torque.

1342 **99000-32050 : Thread lock "1342"**

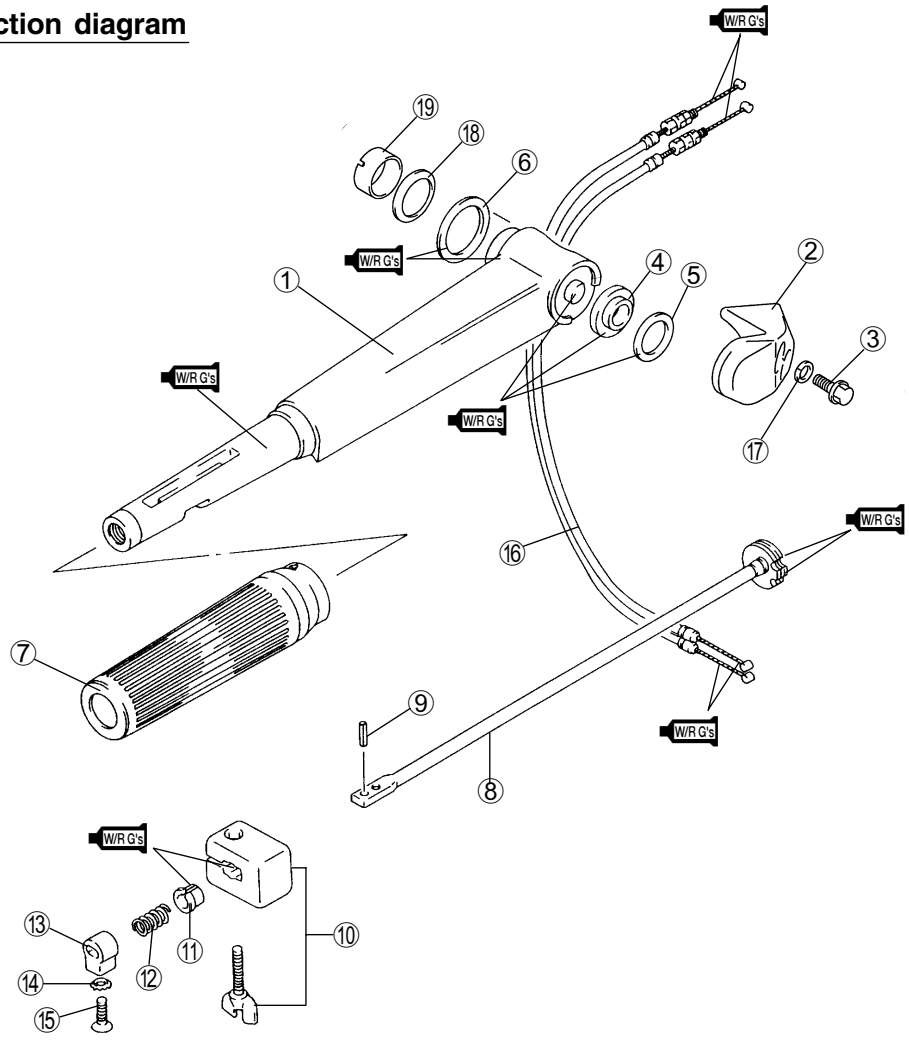
TOOL **Tiller handle bolt : 23 N·m (2.3 kg-m, 16.5 lb.-ft.)**

- Installation of throttle cable (see page 5-13).
- Check shift linkage and lower unit gear engagement.
- Check wire and cable routing (see page 11-2 to 11-13).

TILLER HANDLE DISASSEMBLY / ASSEMBLY

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

Construction diagram



① Tiller handle
② Tiller handle cover
③ Bolt
④ Spacer
⑤ Shim
⑥ Washer
⑦ Handle grip
⑧ Handle rod
⑨ Pin
⑩ Adjuster
⑪ Bush
⑫ Spring
⑬ Stopper
⑭ Washer
⑮ Screw
⑯ Throttle cable
⑰ Washer
⑱ Wave washer
⑲ Bush

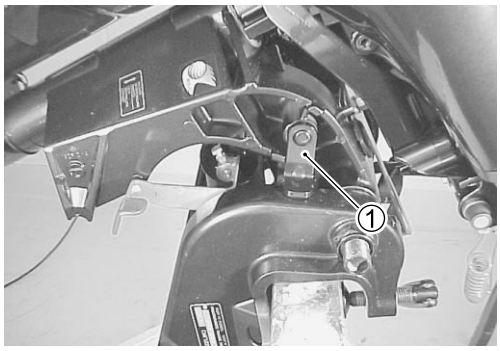
GAS ASSISTED TILT CYLINDER

⚠ WARNING

This gas assist tilt cylinder contains high pressure gas and it must not be disassembled, punctured, incinerated or exposed to heat.

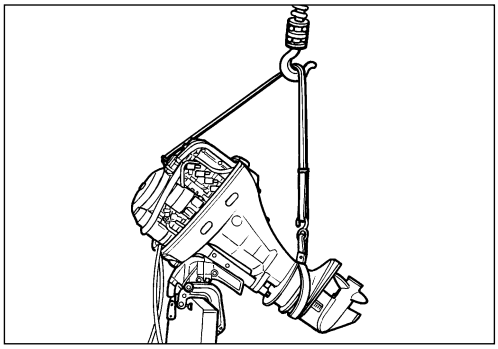
REMOVAL

Tilt engine fully up and lower the manual tilt lock levers ①.



⚠ WARNING

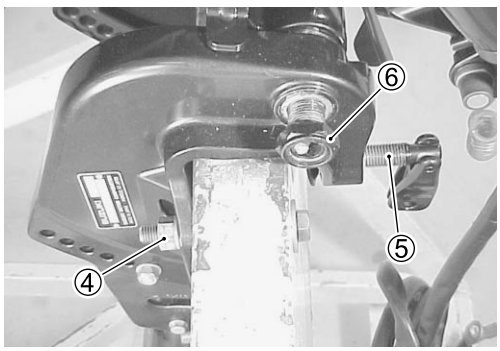
During the following procedure , firmly secure the engine and support its weight. (see right)



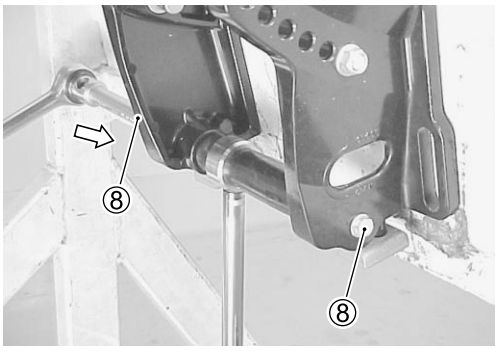
Remove the snap ring ② and push tilt cylinder upper shaft pin ③ out.

Remove the two STBD motor mounting bolts ④.
Loosen the STBD clamp screw ⑤.
Loosen the clamp bracket shaft nut ⑥.

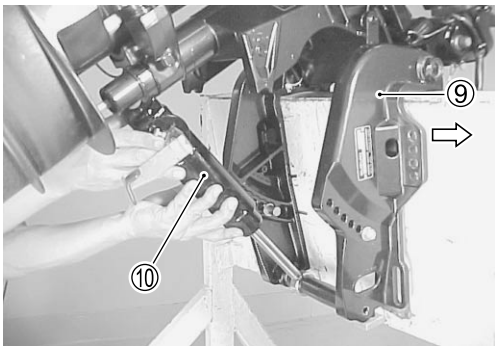
NOTE:
Complete removal of the clamp bracket shaft nut is not required. Nut should only be loosened as far as the end of the shaft threads to facilitate removal of the gas cylinder.



Remove the tilt cylinder lower shaft bolts ⑧.



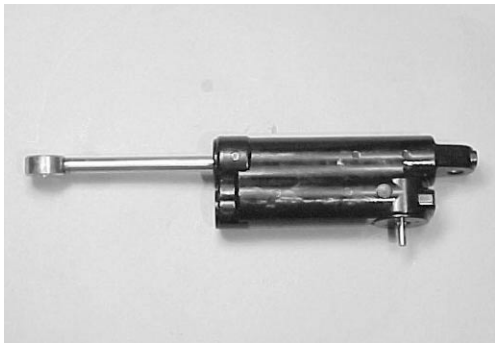
Slide the STBD clamp bracket ⑨ fully outward to the right hand side.
Remove the gas cylinder ⑩ from between the clamp brackets.



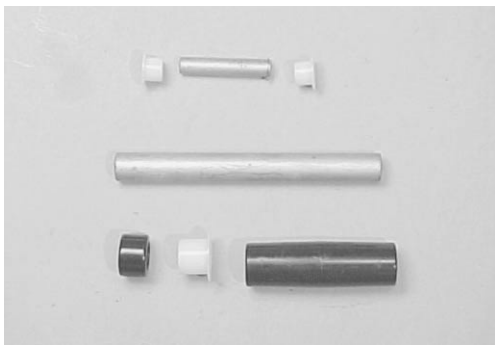
INSPECTION

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

Gas assist tilt cylinder
Check gas assist tilt cylinder.
If cracks, defects or other damage is found, replace the cylinder assembly complete.

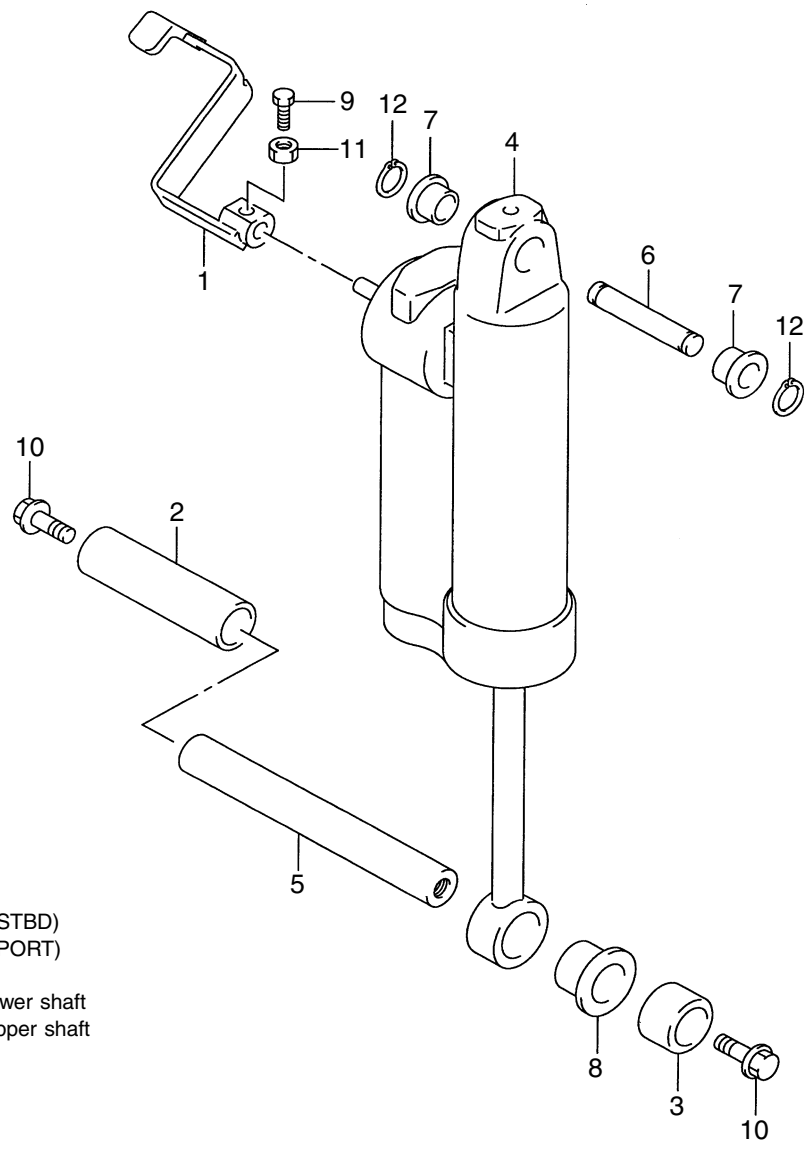


Bushings
Check all bushings.
If excessive wear or other damage is found, replace bushing.
If bushing fit is loose when installing, replace bushing.



INSTALLATION

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

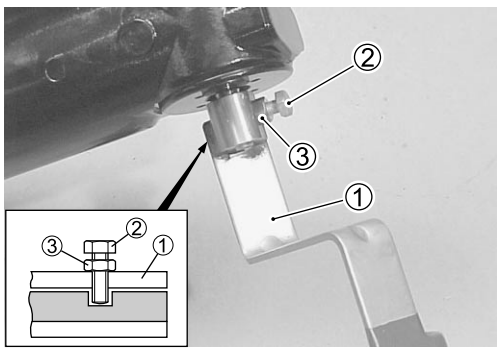


1. Release lever
2. Lower coller (STBD)
3. Lower coller (PORT)
4. Gas cylinder
5. Tilt cylinder lower shaft
6. Tilt cylinder upper shaft
7. Upper bush
8. Lower bush
9. Bolt
10. Bolt
11. Nut
12. Snap ring

Release lever

Install release lever ①, bolt ② and lock nut ③ as shown in figure.

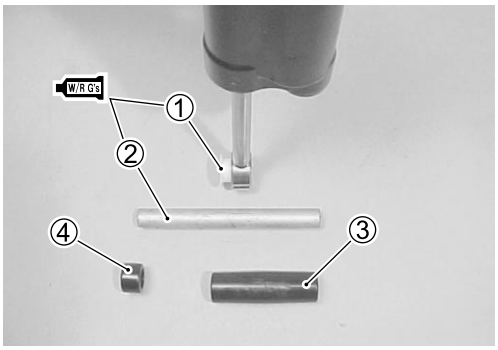
Tighten lever bolt ② and lock nut ③ securely.



Gas assist tilt cylinder

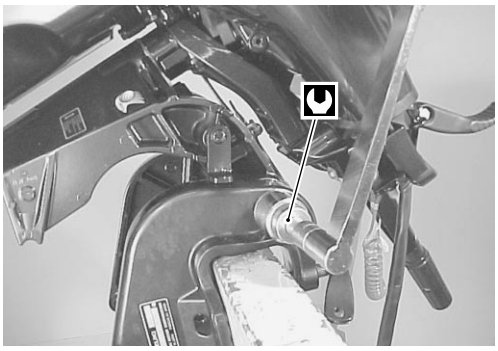
Apply grease to each lower bush, cylinder lower shaft.
Install bushes ①, cylinder lower shaft ②, STBD lower collar ③, PORT lower collar ④ to gas cylinder.

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



Place the gas cylinder in position between the clamp brackets.
Tighten clamp bracket shaft nut to specified torque.

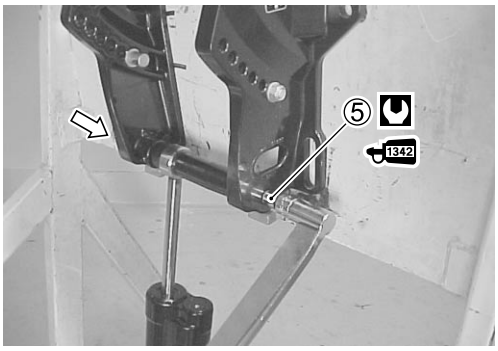
Clamp bracket shaft nut : 43 N·m (4.3 kg-m, 31.0 lb.-ft.)



Tighten lower shaft bolts ⑤, pre-coated with thread lock, to specified torque.

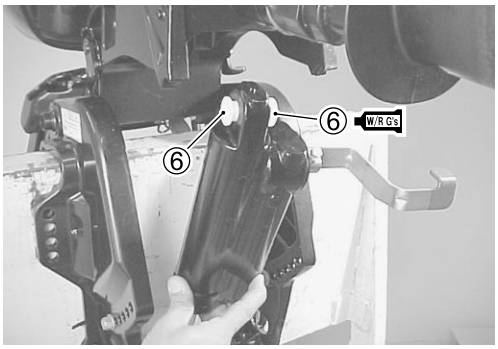
1342 **99000-32050 : Thread lock "1342"**

Cylinder lower shaft bolt : 23 N·m (2.3 kg-m, 16.5 lb.-ft.)



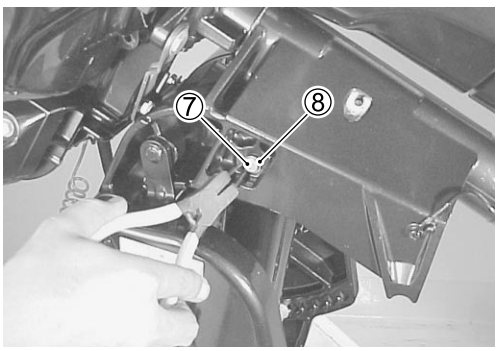
Apply Water Resistant Grease to cylinder upper bush ⑥, then install bush in cylinder upper eyelet.

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



Align the cylinder upper eyelet with the hole in the swivel bracket.
Apply Water Resistant Grease to cylinder upper shaft ⑦, then insert the upper shaft through the swivel bracket and gas cylinder.
Secure the upper shaft with the snap ring ⑧.

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

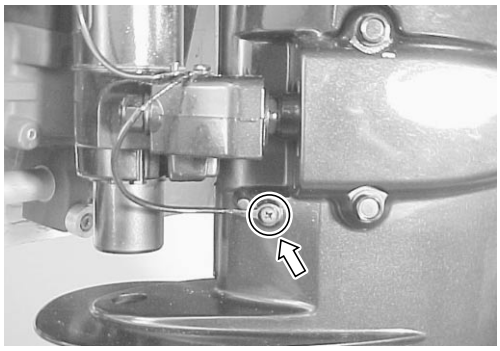


DRIVESHAFT HOUSING AND OIL PAN

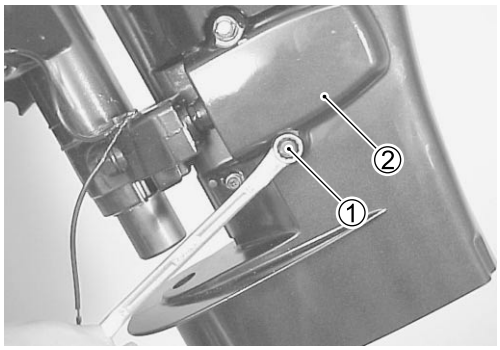
REMOVAL

Remove power unit. (See pages 7-2 to 7-6)
Remove lower unit. (See pages 10-2)

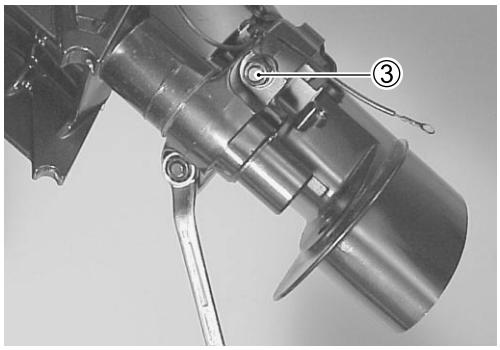
Remove screw and bonding wire from driveshaft housing.



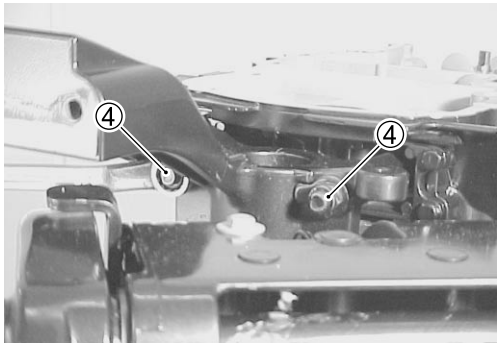
Unscrew the lower mount cover bolts ① and remove PORT/STBD lower mount covers ②.



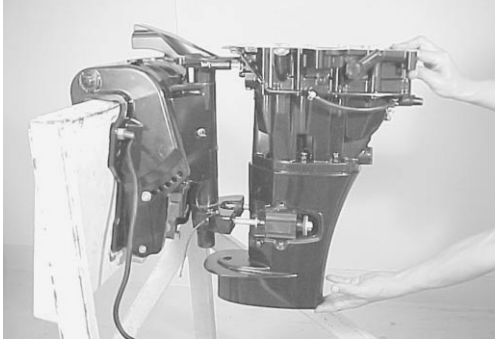
Remove two lower mount nuts ③.



Remove two upper mount nuts ④ and washers.

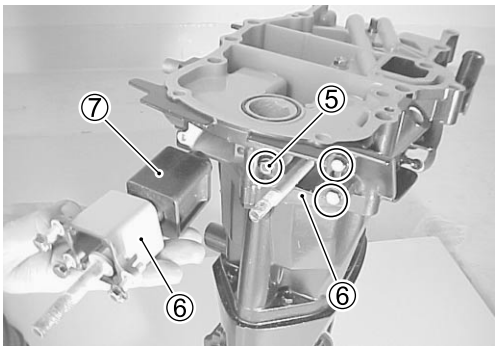


Remove driveshaft housing with oil pan.

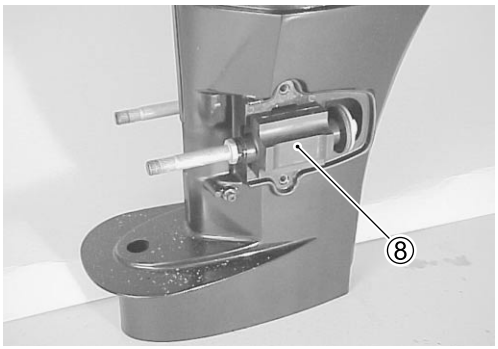


Remove bolts ⑤ and upper mount cover ⑥.

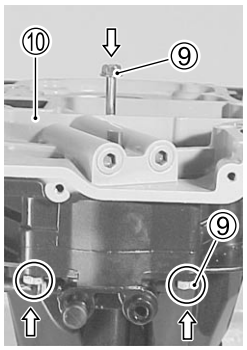
Remove upper mount assembly ⑦.

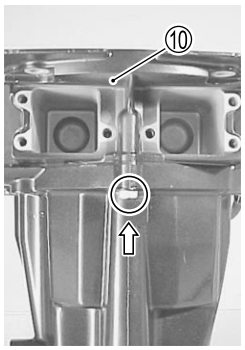


Remove lower mount assembly ⑧.

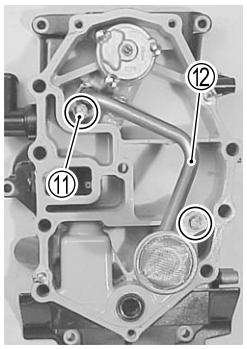


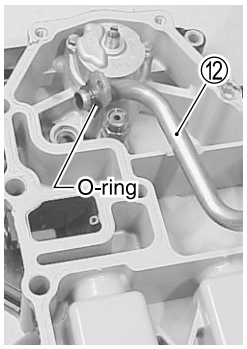
Remove four bolts ⑨ and engine holder ⑩.



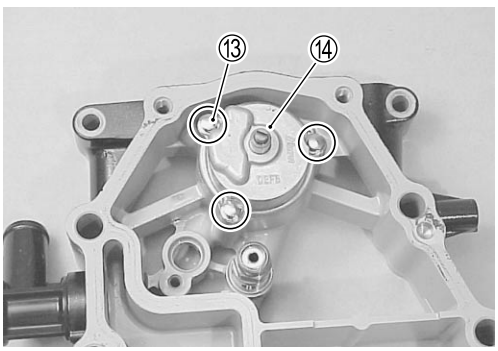


Remove bolts ⑪ and oil strainer ⑫.
Note the position of O-ring and remove it.

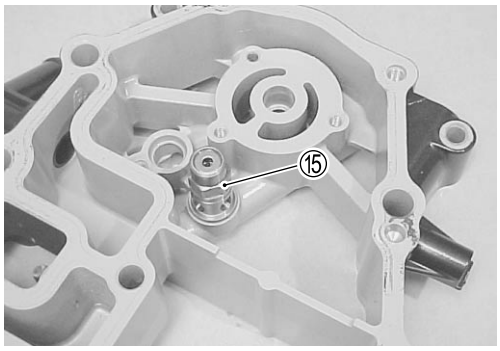




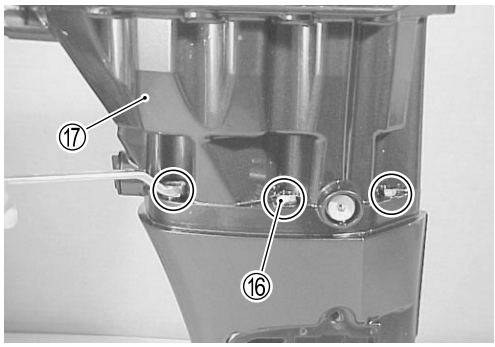
Remove three bolts ⑬ and oil pump assembly ⑭.



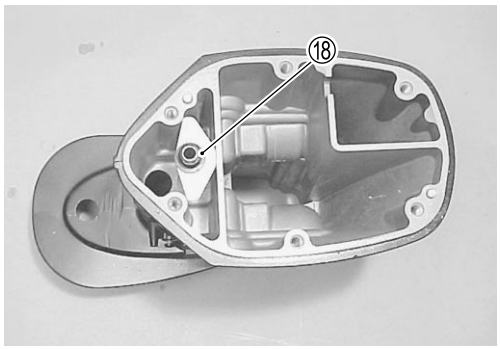
Remove oil relief valve ⑮.



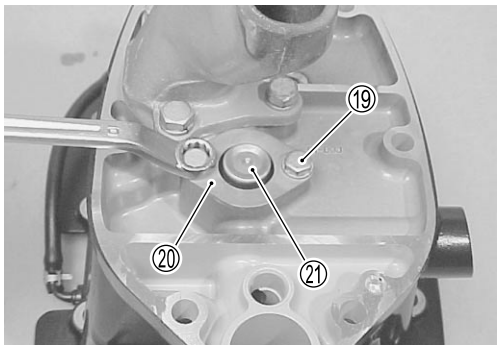
Remove six bolts ⑯ and oil pan ⑰.



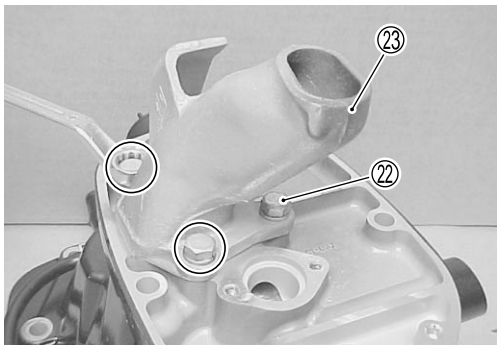
Remove water tube ⑱.



Remove bolts ⑲, water pressure valve cover ⑳, pressure valve ㉑.



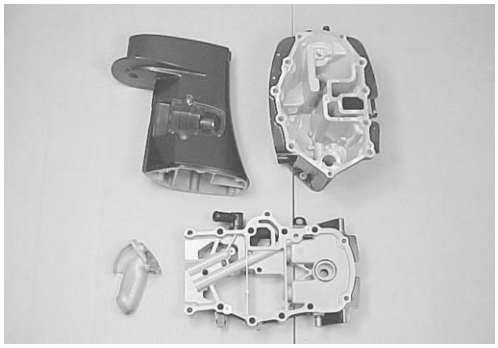
Remove bolts ㉒ and exhaust tube ㉓.
(Transom L type only)



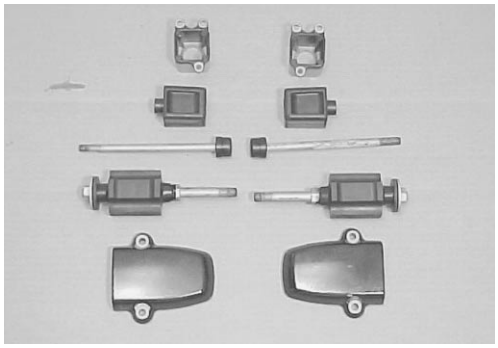
INSPECTION

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

Mid unit component
Check oil pan, driveshaft housing, engine holder and mount covers.
If cracks, defects or other damage is found, replace it.



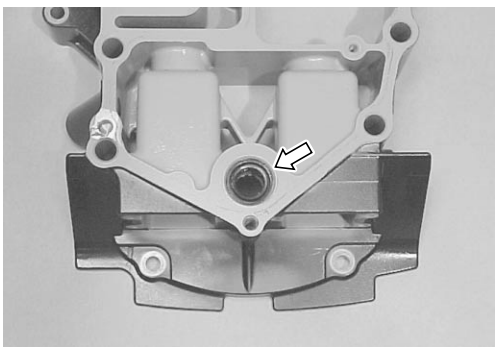
Mount
Check upper and lower mount.
If excessive wear, corrosion, or other damage is found, replace mount.



O-ring
Check O-ring for oil strainer and oil pump.
If excessively wear or other damage is found, replace O-ring.

Oil seal
Check driveshaft upper oil seal for leakage or damage.
If cracks, cuts or other damage is found, replace seal.

NOTE:
Install oil seal with lip (spring side) facing downward.

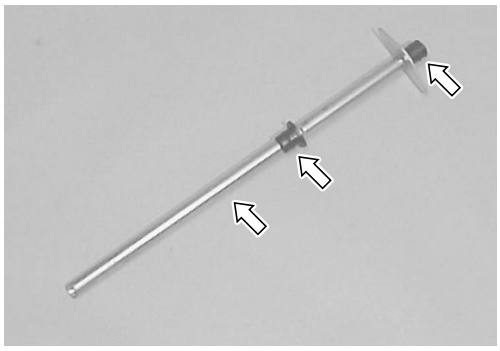


Water tube

Check water tube.

If a clog or obstruction is found, clean water tube.

If cracks, corrosion or other damage is found, replace water tube.

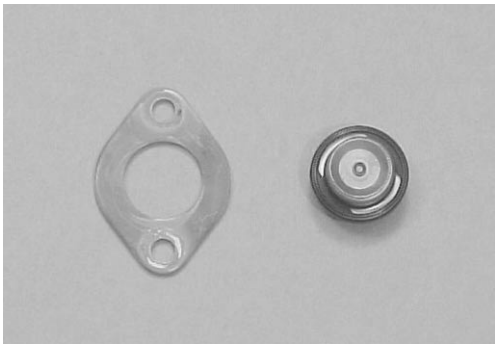


Check water tube grommet.

If excessive wear or other damage is found, replace grommet.

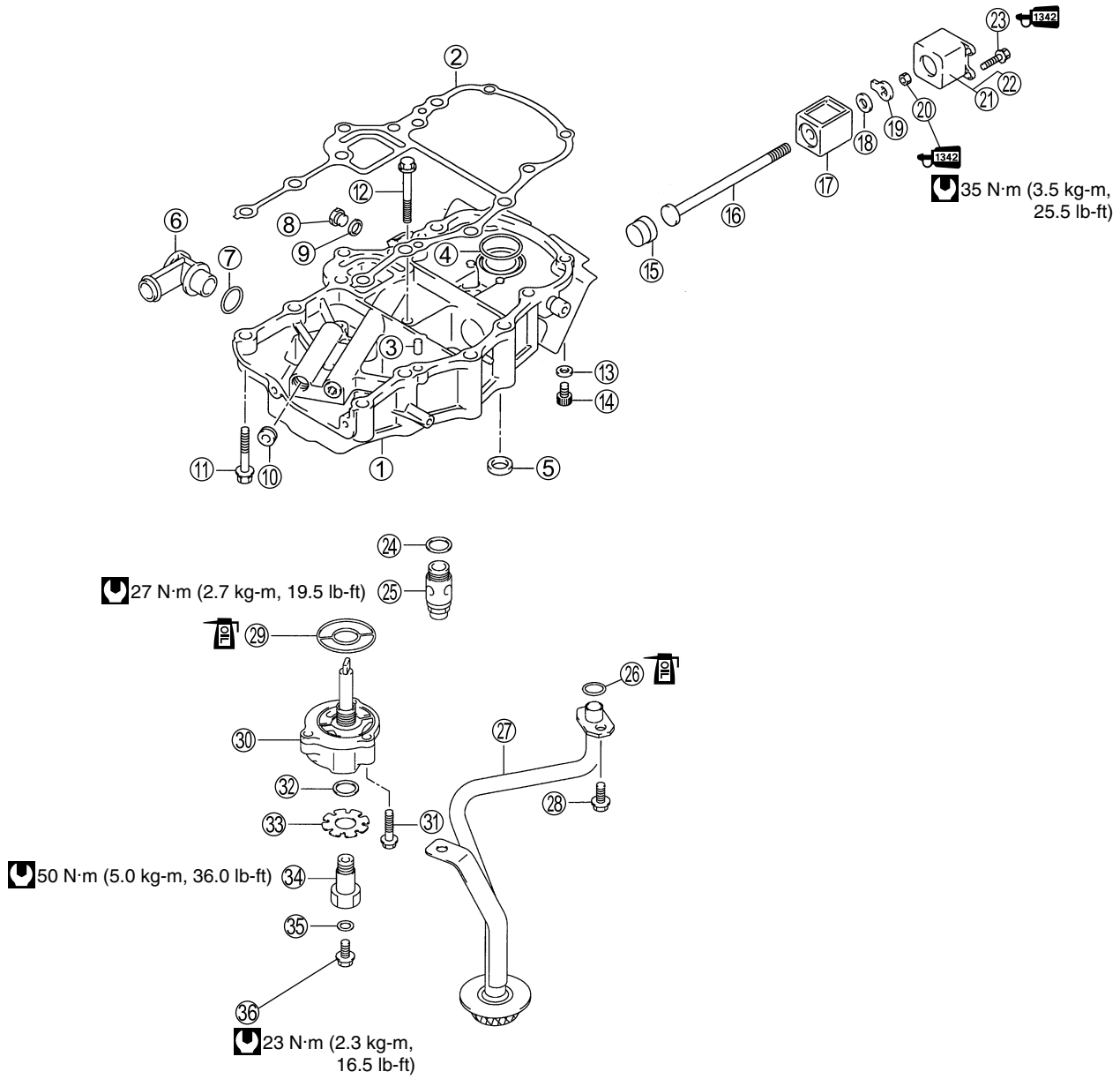
Water pressure valve

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

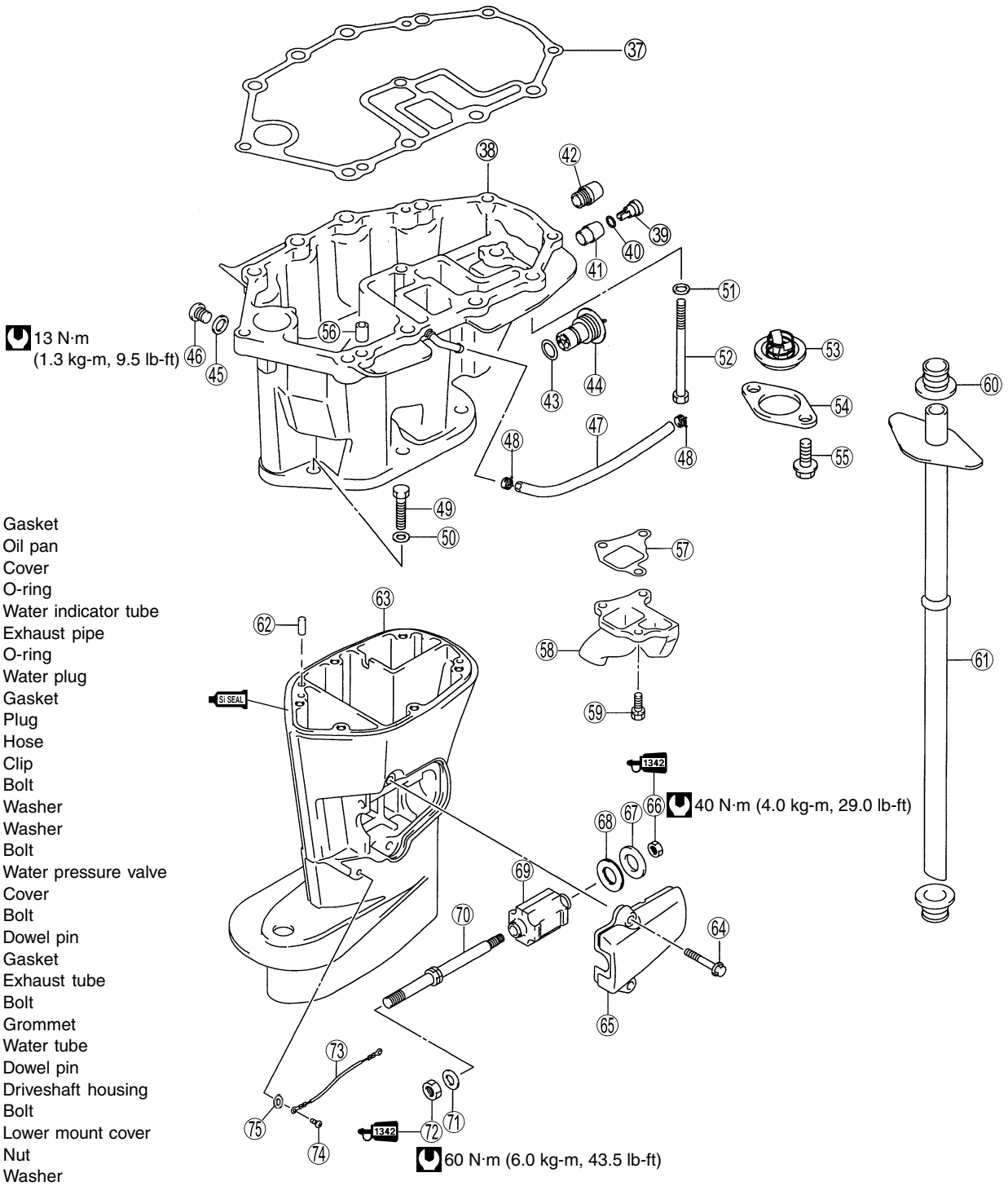


ASSEMBLY

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



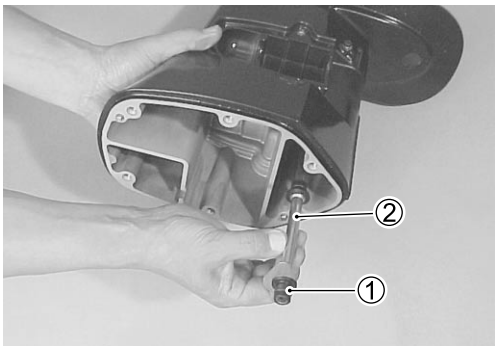
① Engine holder
② Gasket
③ Dowel pin
④ O-ring
⑤ Oil seal
⑥ Pipe
⑦ O-ring
⑧ Plug
⑨ Gasket
⑩ Plug
⑪ Bolt
⑫ Bolt
⑬ Washer
⑭ Bolt
⑮ Reverse thrust upper mount
⑯ Upper mount bolt
⑰ Upper mount
⑱ Washer
⑲ Washer
⑳ Nut
㉑ Upper mount cover (STBD)
㉒ Upper mount cover (PORT)
㉓ Bolt
㉔ Gasket
㉕ Oil pressure regulator
㉖ O-ring
㉗ Oil strainer
㉘ Bolt
㉙ O-ring
㉚ Oil pump assembly
㉛ Bolt
㉜ Gasket
㉝ Lock washer
㉞ Oil pump stopper
㉟ Gasket
㊱ Bolt



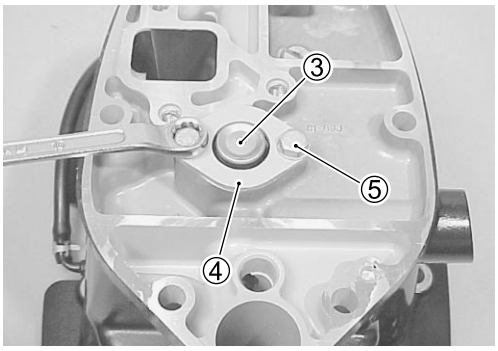
㊲ Gasket
㊳ Oil pan
㊴ Cover
㊵ O-ring
㊶ Water indicator tube
㊷ Exhaust pipe
㊸ O-ring
㊹ Water plug
㊺ Gasket
㊻ Plug
㊼ Hose
㊽ Clip
㊾ Bolt
㊿ Washer
(51) Washer
(52) Bolt
(53) Water pressure valve
(54) Cover
(55) Bolt
(56) Dowel pin
(57) Gasket
(58) Exhaust tube
(59) Bolt
(60) Grommet
(61) Water tube
(62) Dowel pin
(63) Driveshaft housing
(64) Bolt
(65) Lower mount cover
(66) Nut
(67) Washer
(68) Damper
(69) Lower mount
(70) Lower mount bolt
(71) Washer
(72) Nut
(73) Bonding wire
(74) Screw
(75) Insulation washer

OIL PAN TO DRIVESHAFT HOUSING

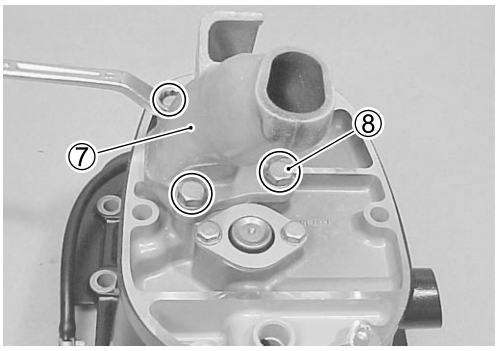
Install water tube grommet ①, water tube ②.



Install water pressure valve ③, and pressure valve cover ④, then securely tighten the two (2) valve cover bolts ⑤.

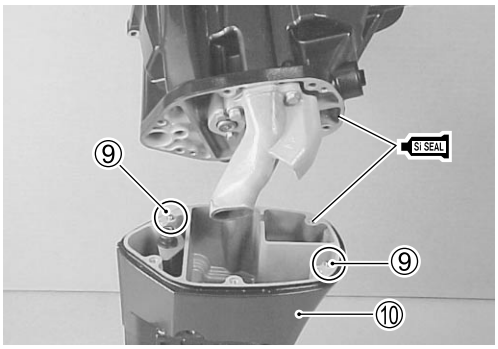


Install the gasket and exhaust tube ⑦, then securely tighten the bolts ⑧. (Transom L type only)

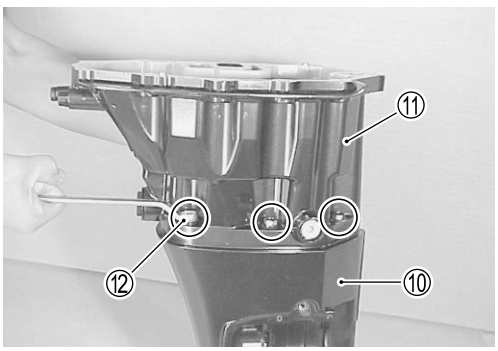


Install two dowel pins ⑨ to driveshaft housing ⑩.
Apply sealant to mating surfaces of driveshaft housing and oil pan.

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



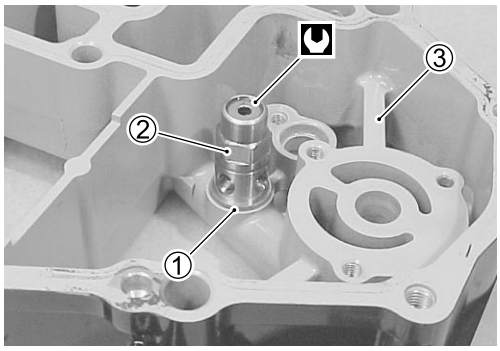
Install oil pan ⑪ to driveshaft housing ⑩, then tighten six (6) bolts ⑫ securely.



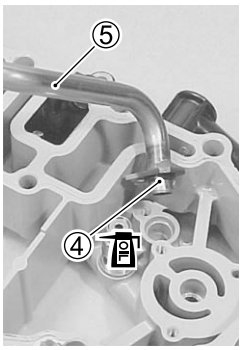
ENGINE HOLDER TO OIL PAN

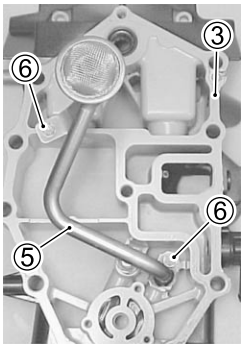
Install gasket ① and oil relief valve ② to engine holder ③, then tighten valve securely.

Oil relief valve : 27 N·m (2.7 kg-m, 19.5 lb.-ft.)

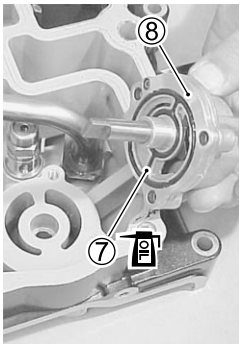


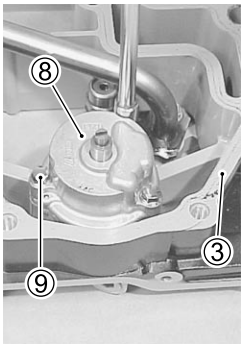
Apply engine oil to O-ring ④, then install O-ring ④ to oil strainer ⑤.
Install oil strainer ⑤ to engine holder ③, then tighten bolts ⑥ securely.





Apply engine oil to O-ring ⑦.
Install O-ring ⑦ and oil pump ⑧ to engine holder ③, then tighten three bolts ⑨ securely.

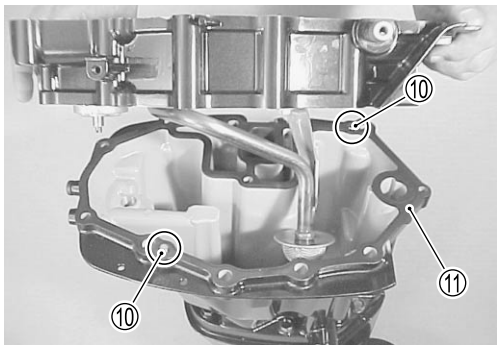




Install dowel pin ⑩ and gasket ⑪ to oil pan.

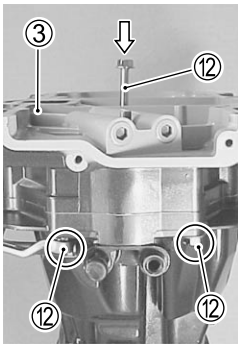
CAUTION

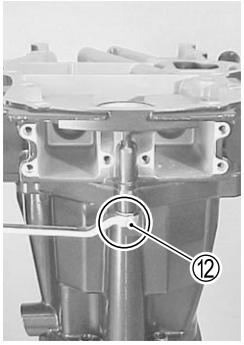
Do not re-use gasket. Always assemble with a new gasket.



Install engine holder ③ to oil pan, then securely tighten it with engine holder bolts ⑫.

Engine holder bolt : 23 N·m (2.3 kg-m, 16.5 lb.-ft.)



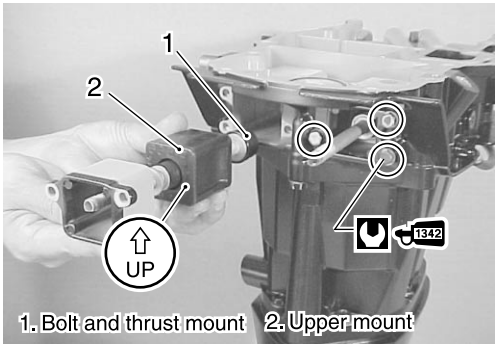


UPPER AND LOWER MOUNT

Upper mount and mount cover

Install upper mount (with upper mount bolt and thrust mount).
Install upper mount cover.
Tighten mount cover bolt , pre-coated with thread lock , to specified torque .

NOTE:
Install the upper mount to the engine holder with the UP mark (arrow) pointing upside.

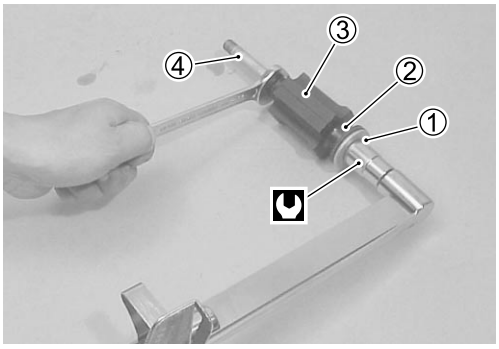


1342 99000-32050 : Thread lock "1342"

Upper mount cover bolt :
10 N·m (1.0 kg-m, 7.0 lb.-ft.)

Lower mount

Assemble these items in the following sequence:
place washer ①, damper ② and lower mount ③ on lower mount bolt ④.
Tighten lower mount rear nut, pre-coated with thread lock, to specified torque.

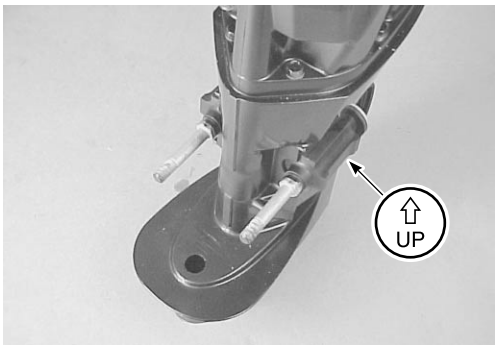


1342 99000-32050 : Thread Lock "1342"

Lower mount (rear) nut :
40 N · m (4.0 kg-m, 29.0 lb.-ft.)

Place lower mount into driveshaft housing.
Install lower mount cover to driveshaft housing.
At this time only lightly tighten the mount cover bolts to temporarily hold it in place.

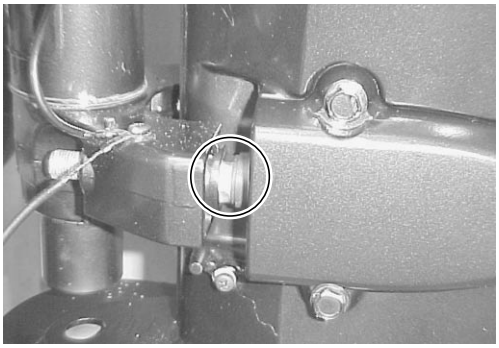
NOTE:
Install the lower mount to the driveshaft housing with the UP mark (arrow) pointing upside.



DRIVESHAFT HOUSING / OIL PAN

Install driveshaft housing / oil pan to steering bracket.

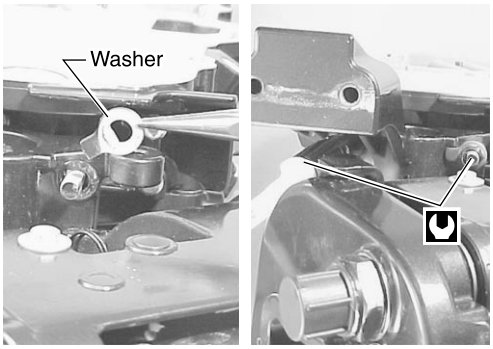
NOTE:
When installing the driveshaft housing / oil pan assembly, be sure lower mount hex head bolt properly fits into the lower mount bracket groove.



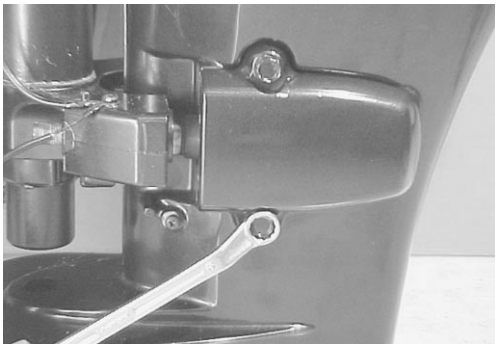
Install upper mount nuts. Tighten nuts, pre-coated with thread lock, to specified torque.

1342 99000-32050 : Thread Lock "1342"

Upper mount nut : 35 N · m (3.5 kg-m, 25.5 lb.-ft.)



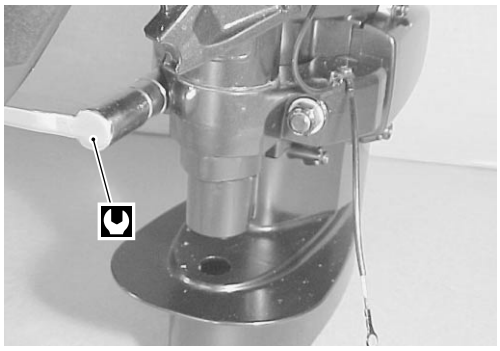
Tighten lower mount cover bolts securely.



Install lower mount front nuts. Tighten nuts, pre-coated with thread lock, to specified torque.

1342 99000-32050 : Thread Lock "1342"

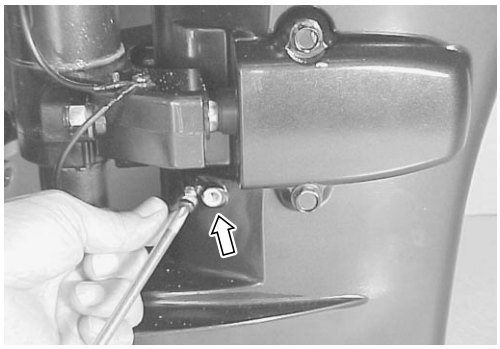
Lower mount front nut : 60 N · m (6.0 kg-m, 43.5 lb.-ft.)



BONDING WIRE

Reattach bonding wire to driveshaft housing.
Tighten screw securely.

NOTE:
Insulation washer must be installed between the bonding wire terminal and housing.



POWER UNIT

Install power unit. (See page 7-7 to 7-10)
Tighten power unit mounting bolts and engine holder bolts to specified torque.

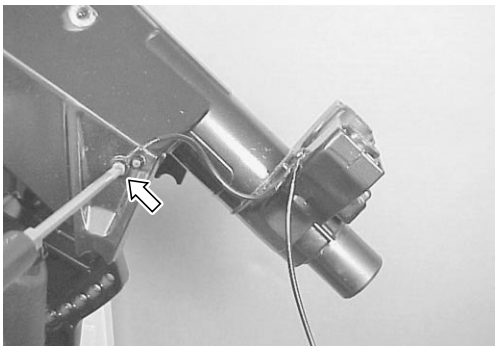
Power unit mounting bolt & Engine holder bolt :

8 mm 23 N · m (2.3 kg-m, 16.5 lb.-ft.)
10 mm 50 N · m (5.0 kg-m, 36.0 lb.-ft.)

SWIVEL BRACKET, STEERING BRACKET AND CLAMP BRACKET

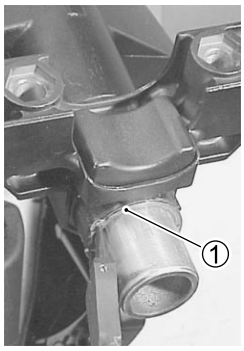
REMOVAL

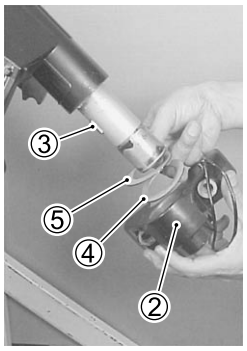
Remove driveshaft housing / oil pan. (See page 8-9)
Remove screw and bonding wire from swivel bracket.



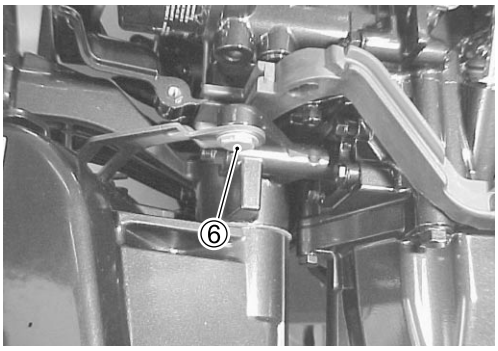
Remove circlip ①.
Remove lower mount bracket ② from the steering shaft.
Account for key ③, shim ④ and washer ⑤.

NOTE:
Before removing lower mount bracket, tear black paint off from pilot shaft lower portion with sand paper for easy removing.

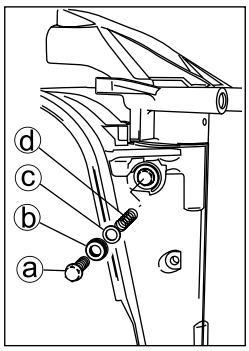


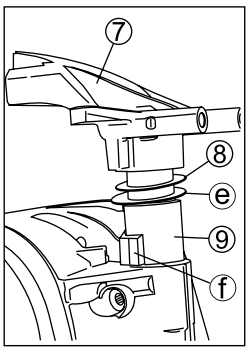


Remove the bolt ⑥ securing steering adjuster plate to the steering bracket. (Tiller handle model)

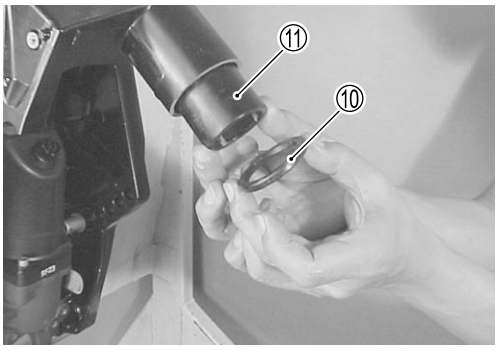


Remove steering adjuster bolt ⓐ, cover ⓑ, washer ⓒ and spring ⓓ.
Lift steering bracket ⑦ upward to remove from swivel bracket.
Remove washer ⑧, plate ⓔ, upper bush ⑨ and steering adjuster ⓕ from bracket.

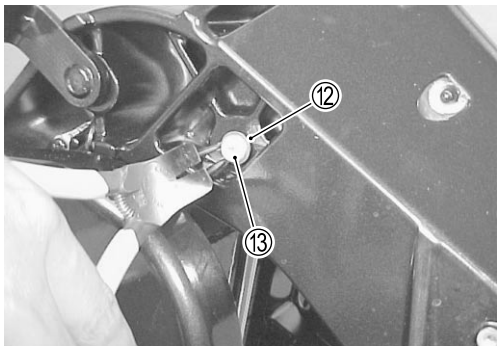




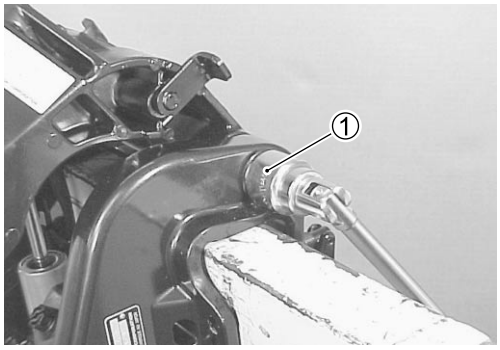
Remove swivel bracket seal ⑩ and lower bush ⑪.



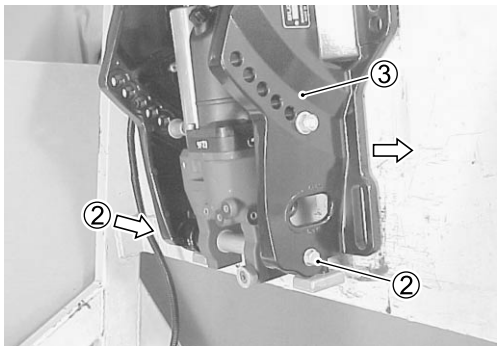
Remove circlip ⑫ and push out tilt cylinder upper rod ⑬.



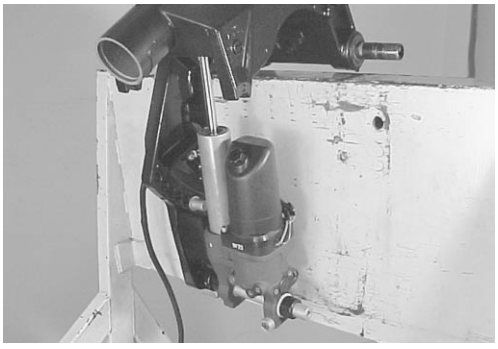
Remove nut ① from clamp bracket shaft.



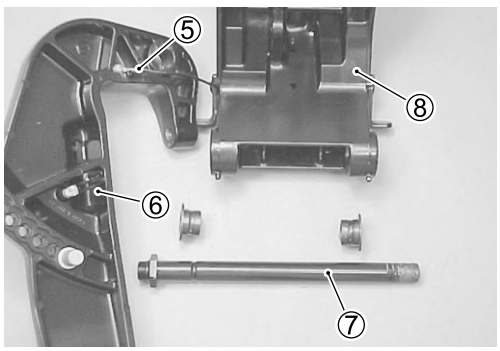
Remove tilt cylinder lower shaft bolts ②.
Slide STBD clamp bracket ③ off clamp bracket shaft.



Remove the PTT unit assembly. (T model)
Remove the gas assisted tilt cylinder. (Q model)



Remove bonding wire ⑤ from PORT clamp bracket.
Pull PORT clamp bracket ⑥ outward to remove clamp bracket and bracket shaft ⑦ from swivel bracket ⑧.
Remove bushings from each side of swivel bracket.



INSPECTION

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

BUSHINGS
Check all bushings.
If excessive wear or other damage is found, replace bushing.
If bushing fit is loose when installing, replace bushing.

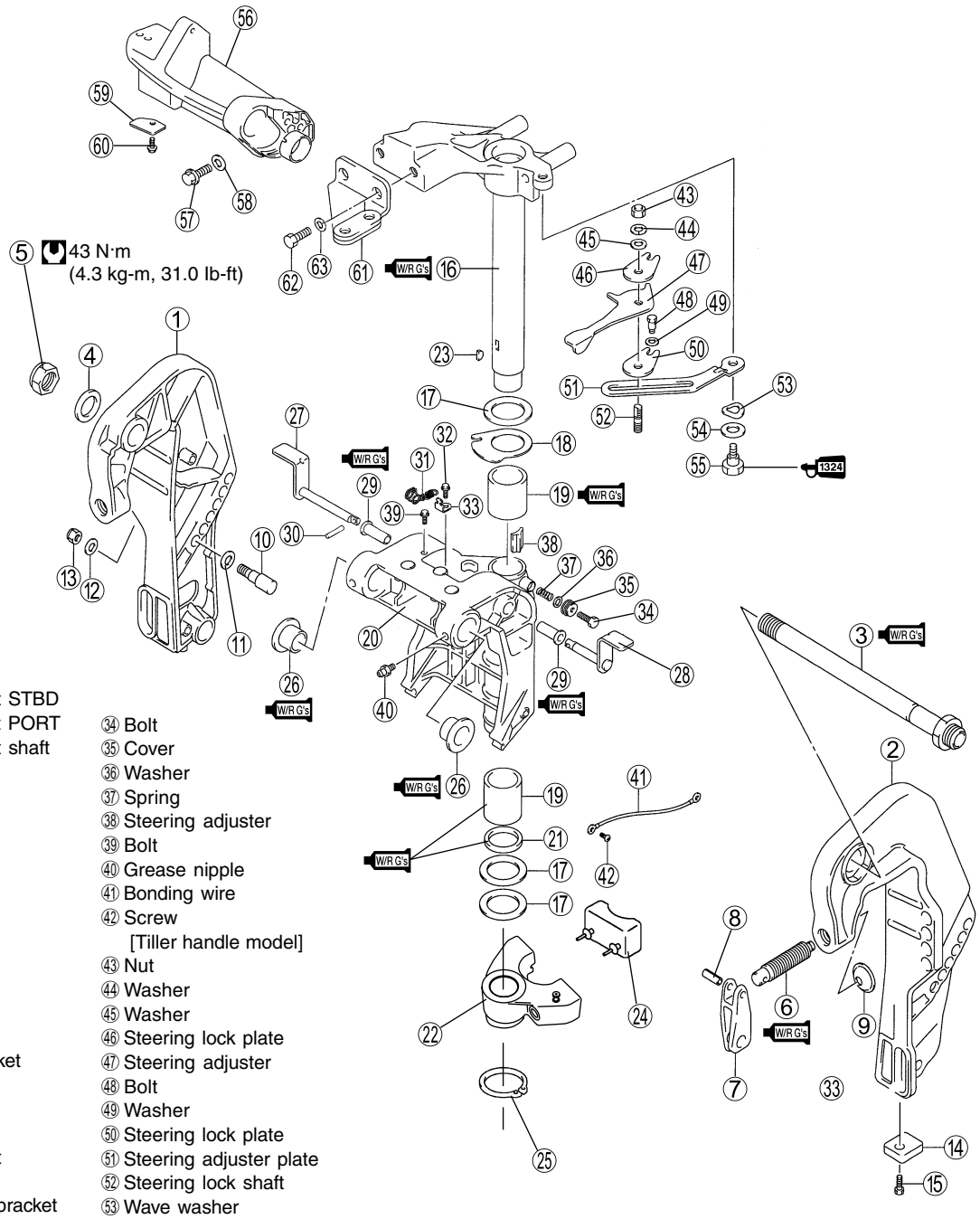
OIL SEAL
Check swivel bracket seal.
If excessive wear or other damage is found, replace seal.

CLAMP BRACKET SHAFT
Check clamp bracket shaft.
If clamp bracket shaft is bend or twisted, replace shaft.

BRACKET
Check clamp brackets, steering bracket and swivel bracket.
If cracks or other damage is found, replace bracket (s).

REASSEMBLY

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

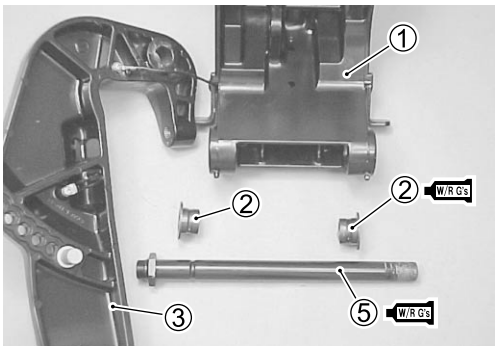


① Clamp bracket STBD
② Clamp bracket PORT
③ Clamp bracket shaft
④ Washer
⑤ Nut
⑥ Clamp screw
⑦ Clamp handle
⑧ Pin
⑨ Clamp plate
⑩ Tilt pin
⑪ Washer
⑫ Washer
⑬ Nut
⑭ Anode
⑮ Bolt
⑯ Steering Bracket
⑰ Washer
⑱ Upper plate
⑲ Bush
⑳ Swivel bracket
㉑ Oil seal
㉒ Lower mount bracket
㉓ Key
㉔ Lower thrust mount
㉕ Circlip
㉖ Bush
㉗ Tilt lock lever STBD
㉘ Tilt lock lever PORT
㉙ Bush
㉚ Pin
㉛ Tilt lock spring
㉜ Bolt
㉝ Plate
㉞ Bolt
㉟ Cover
㊱ Washer
㊲ Spring
㊳ Steering adjuster
㊴ Bolt
㊵ Grease nipple
㊶ Bonding wire
㊷ Screw
[Tiller handle model]
㊸ Nut
㊹ Washer
㊺ Washer
㊻ Steering lock plate
㊼ Steering adjuster
㊽ Bolt
㊾ Washer
㊿ Steering lock plate
(51) Steering adjuster plate
(52) Steering lock shaft
(53) Wave washer
(54) Washer
(55) Bolt
(56) Tiller handle bracket
(57) Bolt
(58) Washer
(59) Throttle cable plate
(60) Bolt
[R/T model]
(61) Steering bracket attachment
(62) Bolt
(63) Washer

CLAMP BRACKET

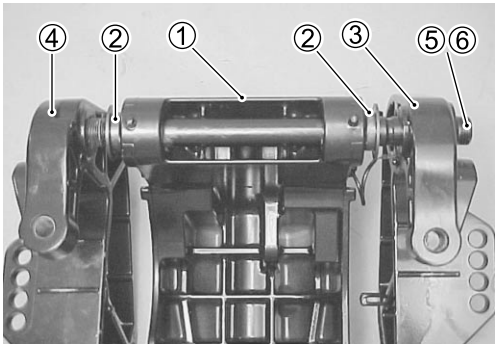
Insert PORT and STBD bushings ② into the swivel bracket ①. Install clamp bracket ③, ④ and clamp bracket shaft ⑤ to swivel bracket ①.

Install clamp bracket shaft nut ⑥. Leave nut loose for easier installation of PTT unit (or gas assist tilt cylinder).



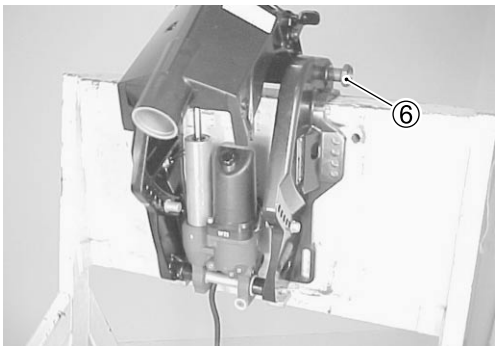
W/R G's **99000-25160 : Suzuki Water Resistant Grease**

NOTE:
Before installing clamp bracket to swivel bracket, apply grease to clamp bracket shaft and bushings.



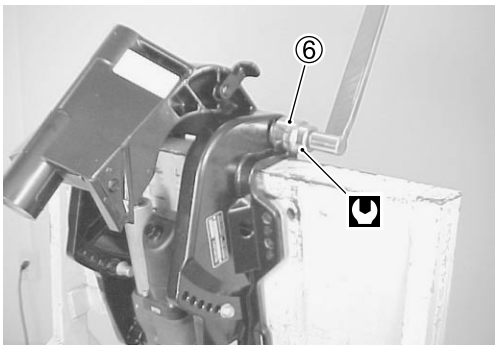
Install PTT unit assembly (or gas assist tilt cylinder) in position between clamp brackets.

- For Gas assist tilt cylinder installation, see page 8-7 to 8-8.
- For PTT unit installation, see page 9-10 to 9-11.



Tighten clamp bracket shaft nut ⑥ to specified torque.

Clamp bracket shaft nut :
43 N · m (4.3 kg-m, 31.0 lb.-ft.)



STEERING BRACKET

Apply Water Resistant Grease to steering bracket shaft.

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

NOTE:
Apply grease to bushings, oil seal lip and pilot shaft portion of steering bracket.

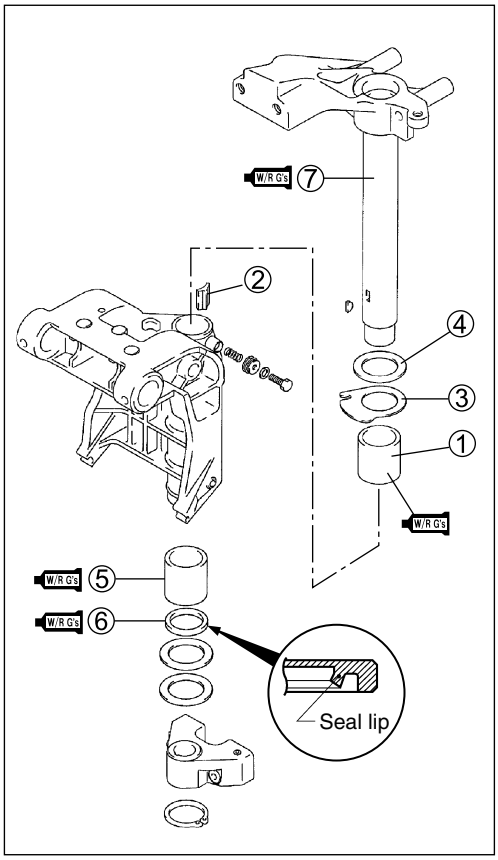
Install upper bushing ①, steering adjuster ②, upper plate ③ and washer ④ to swivel bracket.

NOTE:
- *The bushing ①·⑤ outside face is tapered.*
  Install the bushing into the swivel bracket with the smaller diameter side being inserted first.
- *Be certain that steering adjuster ② is placed between upper bushing ① and swivel bracket casing.*

Install lower bushing ⑤ and swivel bracket seal ⑥ to swivel bracket.

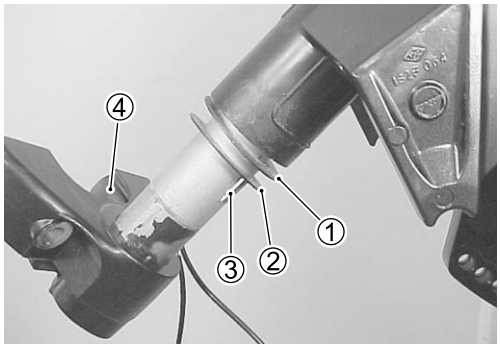
NOTE:
Install seal ⑥ with lip (spring side) facing downward.

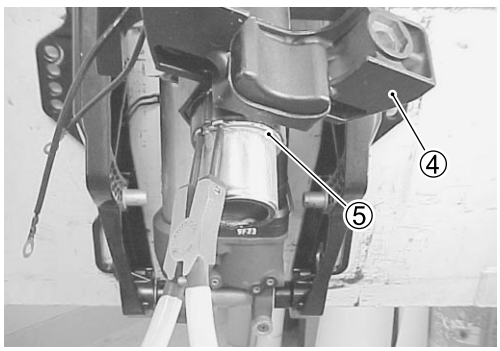
Install steering bracket ⑦ to swivel bracket.



LOWER MOUNT BRACKET

Install washer ① and shim ②, then insert key ③ into groove on steering bracket shaft.
Align key with channel in lower mount bracket ④ and install lower mount bracket.
Install circlip ⑤ to retain bracket.

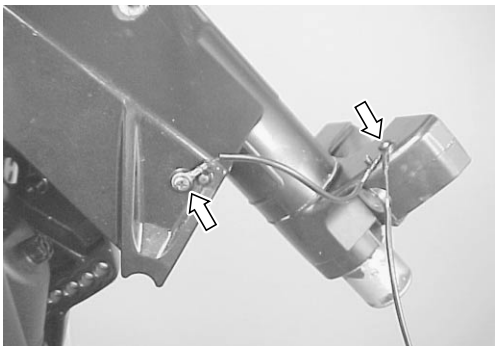


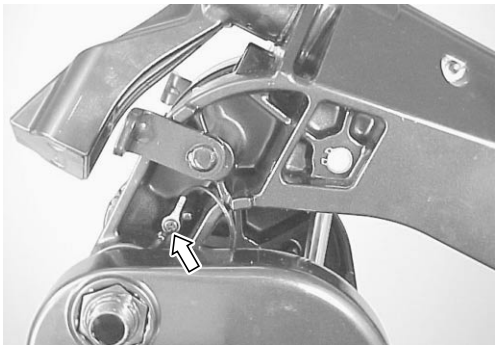


BONDING WIRE

Reattach bonding wire to clamp bracket and swivel bracket, then tighten screw securely.

Reattach bonding wire to swivel bracket and lower mount bracket, then tighten screw securely.

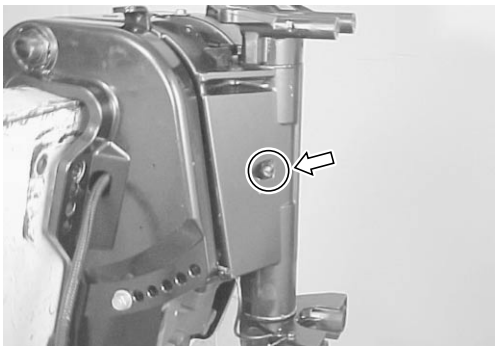


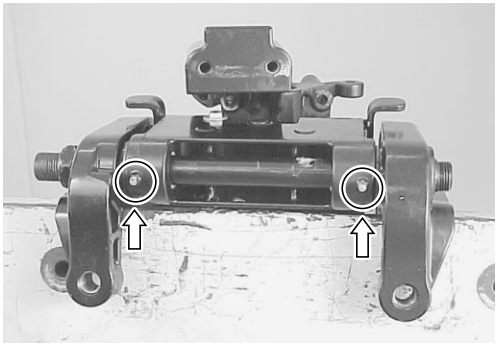


LUBRICATION

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

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

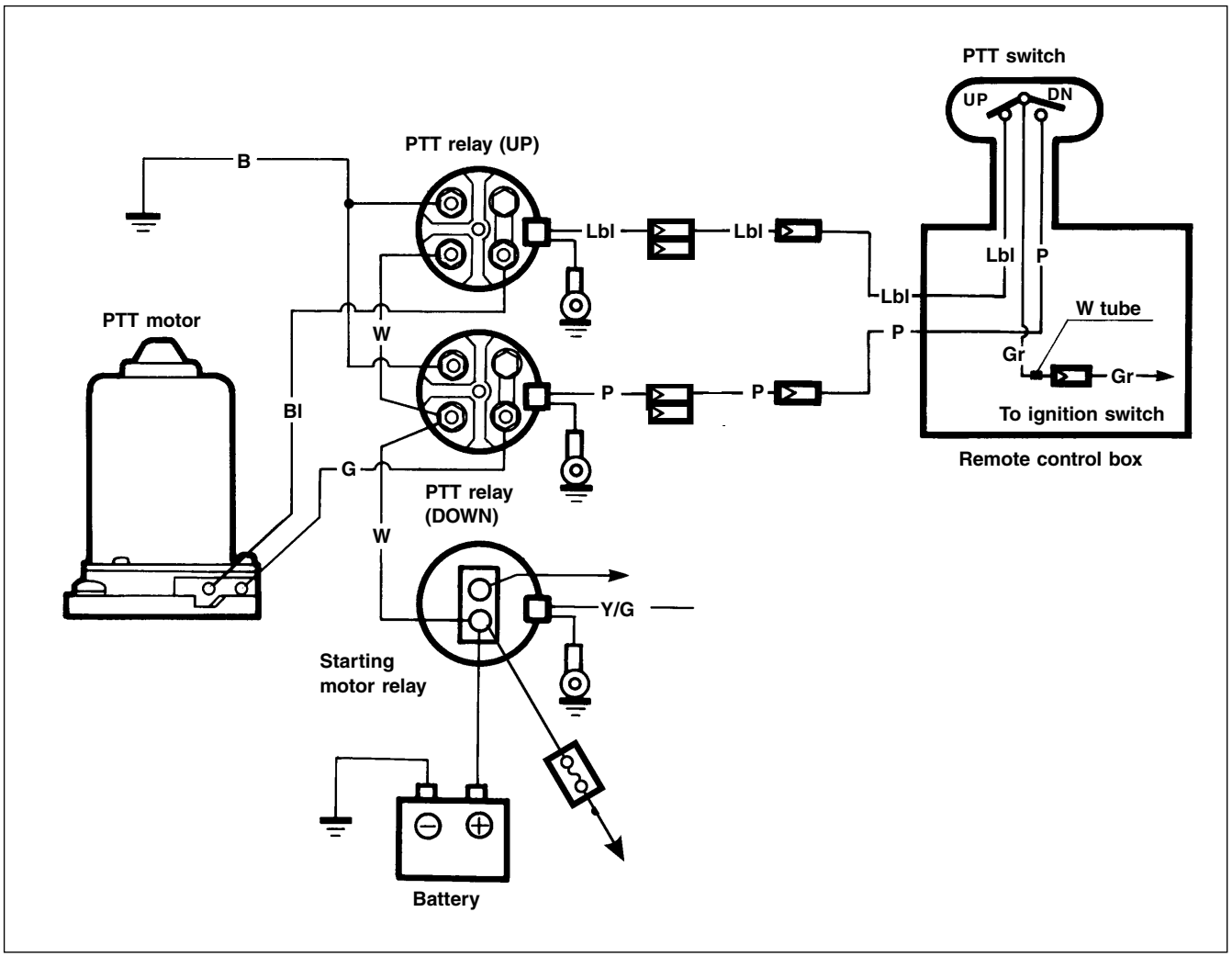




POWER TRIM AND TILT

CONTENTS

SYSTEM WIRING DIAGRAM

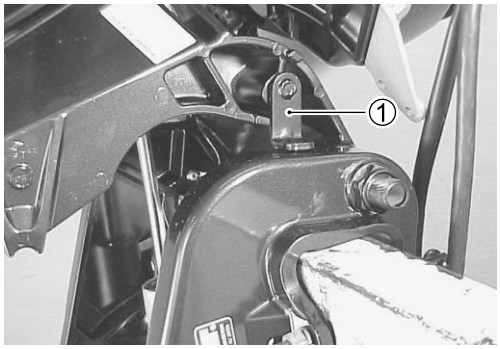


SERVICE PROCEDURE

OIL LEVEL

To check the oil level :

1. Raised the engine to a full-tilt position.
2. Lower the manual tilt lock lever ①.
3. Remove the oil filler plug ② and oil level plug ③.
4. If oil can be seen at level plug hole level, the unit is full.
5. If oil level is low, refill with the recommended oil.

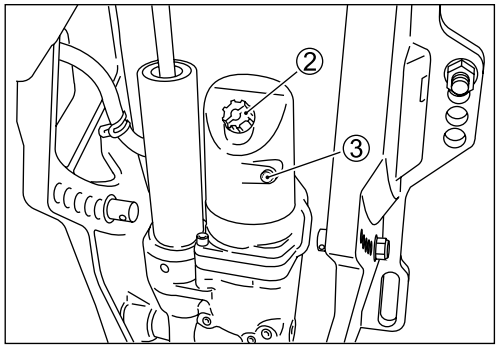


Recommended oil :

Dexron Ⅲ automatic transmission fluid or equivalent

CAUTION

To ensure consistent pump operation, do not mix different types of oil.

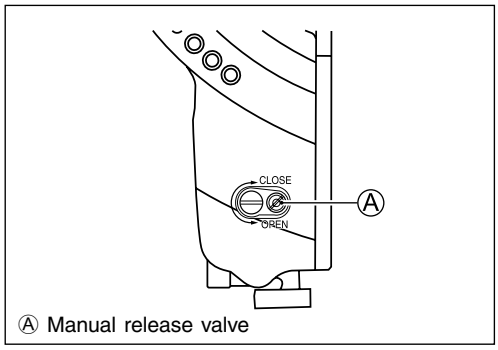


6. Reinstall oil level plug and oil filler plug.

AIR BLEEDING

1. Check that the manual release valve is tightened to the specified torque.

Manual release valve : 1.8 N · m (0.18 kg-m, 1.3 lb.-ft.)



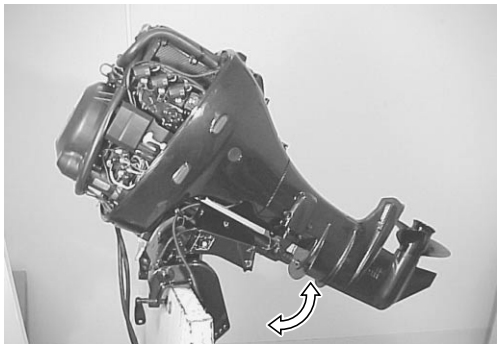
Ⓐ Manual release valve

CAUTION

Do not over-tighten manual release valve.

Counterclockwise = open
Clockwise = close

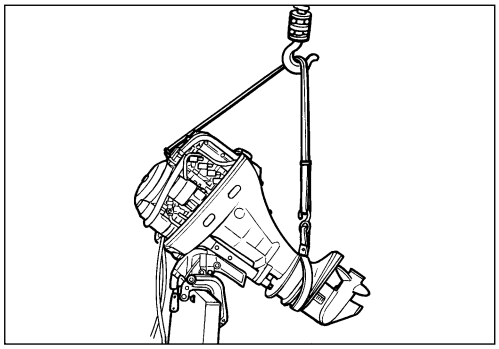
2. Operate the PTT switch, raising and lowering the motor up and down (full tilt position to full trim down position) 4 to 5 times.
3. Check oil level, topping off if necessary.
4. Reinstall oil filler plug and oil level plug.



POWER TRIM AND TILT UNIT

REMOVAL

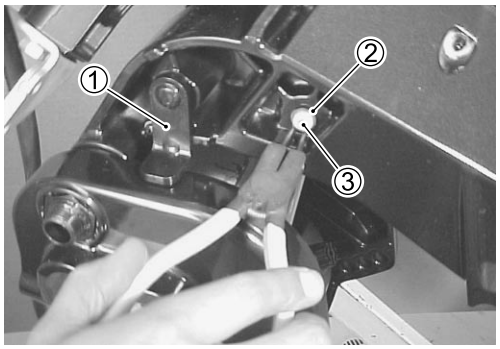
Raise the engine to the full tilt position and lower the manual tilt lock levers ①.



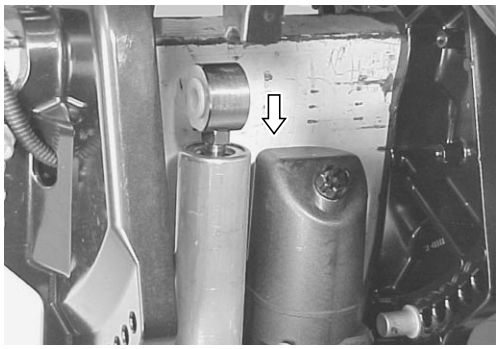
⚠ WARNING

During the following procedures, the engine must be firmly secured and its weight fully supported. (see right)

Remove the tilt rod snap ring ② and push tilt cylinder upper shaft pin ③ out.



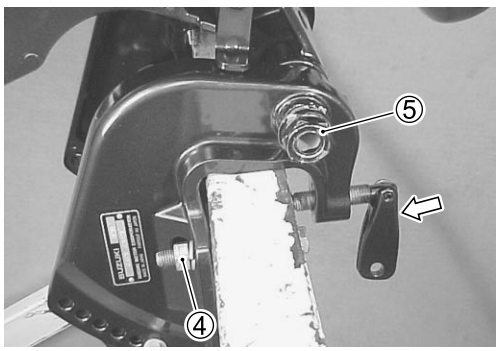
Lower tilt rod to full down position and disconnect the battery cable.



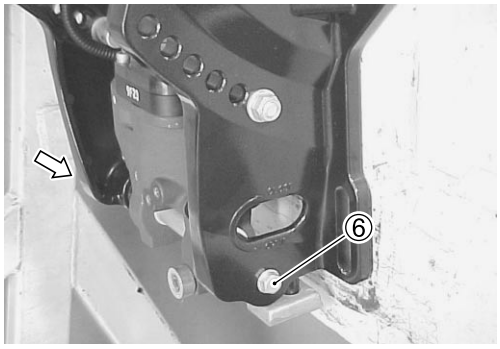
Disconnect the PTT motor cable wire leads (G, Bl) from the PTT relays.
Remove the PTT motor cable from engine lower cover.

Remove the two STBD motor mounting bolts ④.
Loosen the STBD clamp screw.
Loosen the clamp bracket shaft nut ⑤.

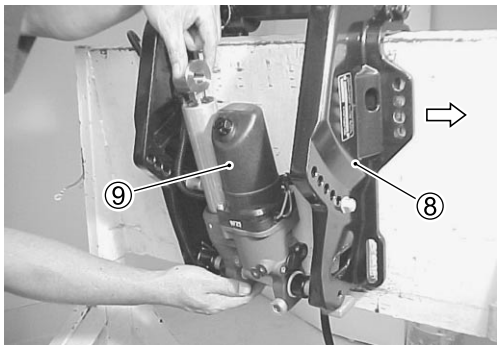
NOTE:
Complete removal of the clamp bracket shaft nut is not required. Nut need only be loosened as far as the end of the shaft threads to facilitate removal of the PTT unit.



Remove the PTT cylinder lower shaft bolts ⑥.



Slide the STBD clamp bracket ⑧ fully outward to the right hand side.
Remove the PTT unit ⑨ from between the clamp brackets.

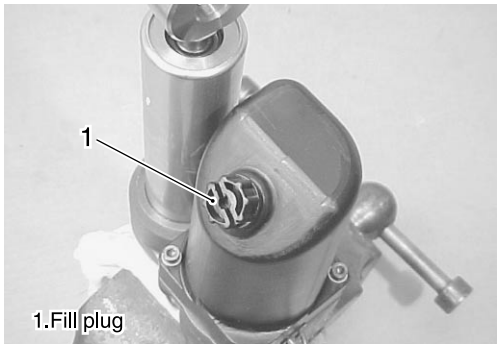


PTT MOTOR

REMOVAL

NOTE:
Before removing PTT motor, wash the PTT body with a stiff bristle brush and hot, soapy water to remove sand or dirt and dry the PTT body with compressed air .

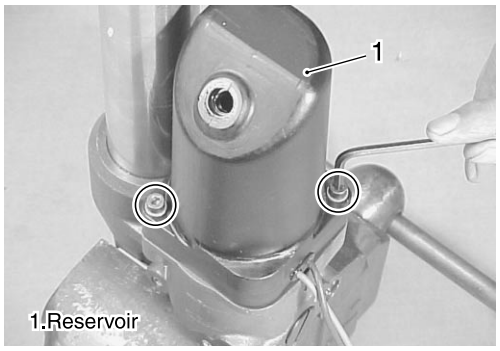
Unscrew the fill plug and drain PTT oil into suitable container .



Place the lower mounting eye of the PTT cylinder in a vise. Tighten the vise only enough to secure the PTT unit, do not over tighten.

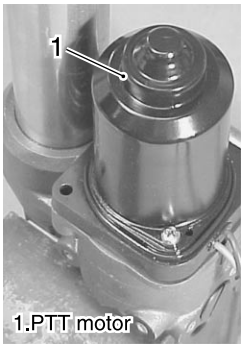
NOTE:
To prevent damage to the PTT cylinder use wood blocks, vise jaw protectors, etc., between the vise jaws and PTT components before tightening vise.

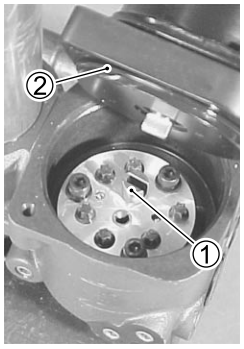
Remove two screws, then detach the reservoir.



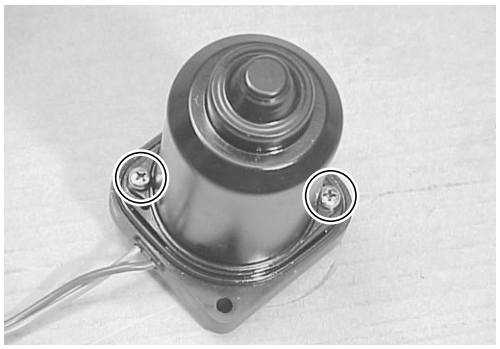
Detach the PTT motor from pump & reservoir.
Note the position of drive joint ① and O-ring ② and remove them.

NOTE:
Do not lay PTT components out on a rag , as dirt or lint may be transferred to these items which may cause possible system operating problems.



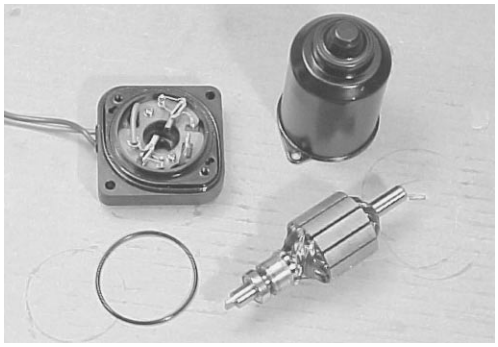


MOTOR DISASSEMBLY
For correct assembly, scribe an alignment mark on the field case and brush holder.
Remove the two (2) screws securing the field case to the brush holder.



Using a soft face hammer, gently tap the field case from side to side to unseat it from the brush holder.
Slide the field case upward and away from the brush holder.
Note the position of the O-ring encircling the brush holder.

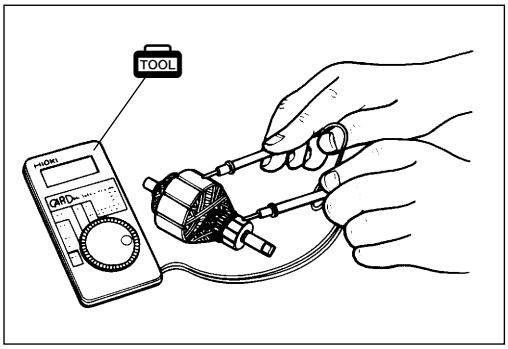
Slide the armature free of the brushes.



INSPECTION

Armature and Commutator

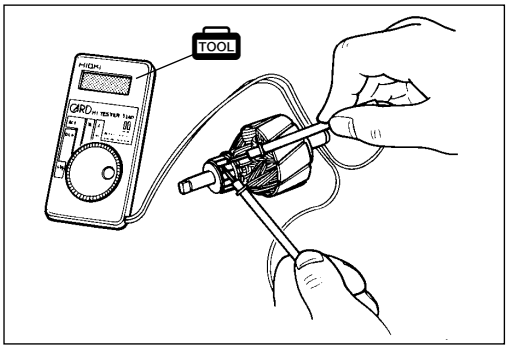
Check for continuity between the commutator and the armature core / shaft.
Replace armature if continuity is indicated.



09930-99320 : Digital tester

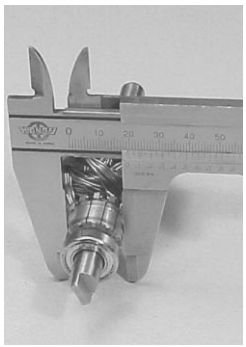
Tester range : (Continuity)

Check continuity between the adjacent commutator segments.
Replace armature if no continuity is indicated.



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

Measure commutator outside diameter.



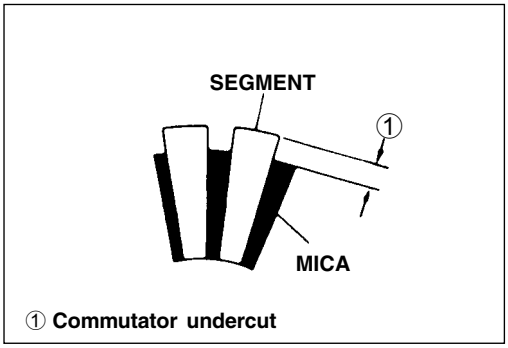
09900-20101 : Vernier calipers

Commutator outside diameter :

Standard	**19.5 mm (0.77 in.)**
Service limit	**18.5 mm (0.73 in.)**

If measurement exceeds service limit, replace armature.

Ensure that the mica (insulator) between the segments is undercut to specified depth.



① **Commutator undercut**

Commutator undercut :

Standard	**1.3 – 1.6 mm (0.05 – 0.06 in.)**
Service limit	**0.5 mm (0.02 in.)**

If undercut is less than service limit, cut to specified depth.

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

⚠ WARNING

Wear safety grasses when using compressed air.

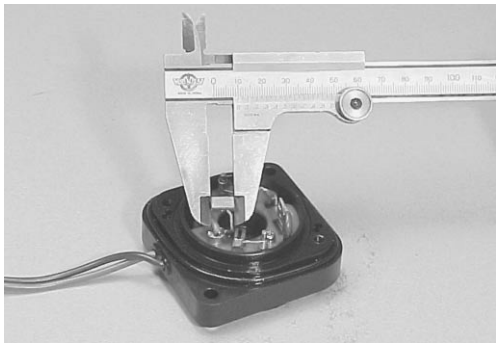
Brushes
Check the length of each brush.

09900-20101 : Vernier calipers

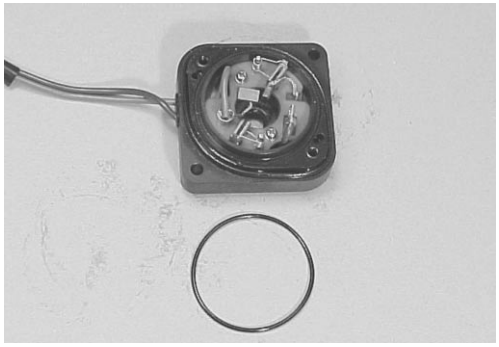
Brush length :

Standard	**9.8 mm (0.39 in.)**
Service limit	**4.8 mm (0.19 in.)**

If brushes are worn down to the service limit, they must be replaced .

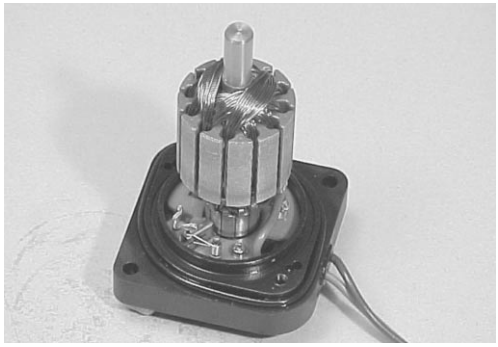


O-ring
Inspect the O-ring between the PTT motor and pump & reservoir. Replace if cuts, nicks or tears are found.



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

When installing the armature, exercise care not to break the brushes.

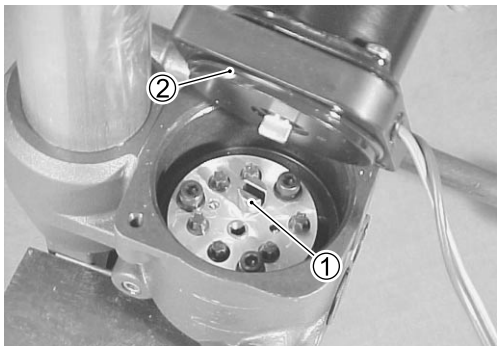


CAUTION

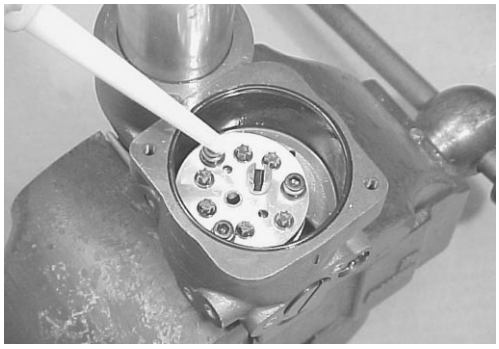
When installing armature, execise care to avoid breaking brushes.

REASSEMBLY

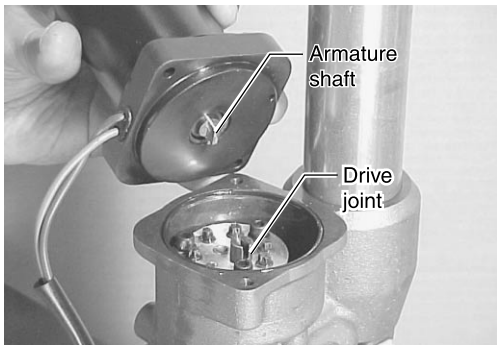
Reassembly is reverse of removal with special attention to following steps.



- Ensure that the drive joint ① is aligned and firmly inserted into the gear pump assembly.
- Fit O-ring ② to PTT motor.
- Check the level of PTT fluid contained in the pump & reservoir. If level is low, add recommended PTT fluid until level with mating surface of PTT motor.

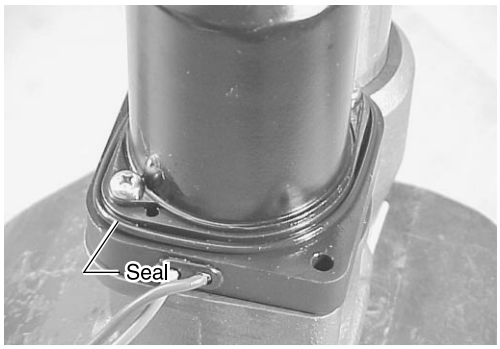


- Ensure that the faces of the PTT motor and reservoir are free of dirt or debris.
  When attaching the PTT motor to the pump & reservoir, ensure that the tip of armature shaft fits firmly into the drive joint.

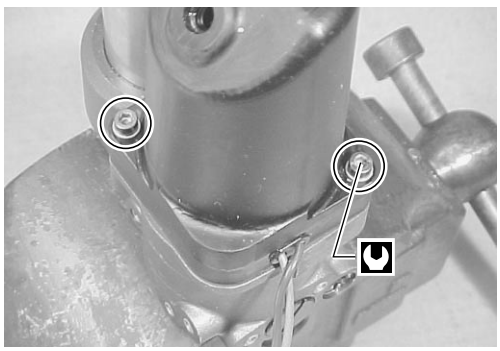


- Install seal and reservoir, then tighten the two (2) screws to specified torque.

Reservoir screw : 4.5 N · m (0.45 kg-m, 3.3 lb.-ft.)



- Pour recommended PTT fluid into reservoir until specified level.
- Carry out the air bleeding.
  For air bleeding, see page 9-3.



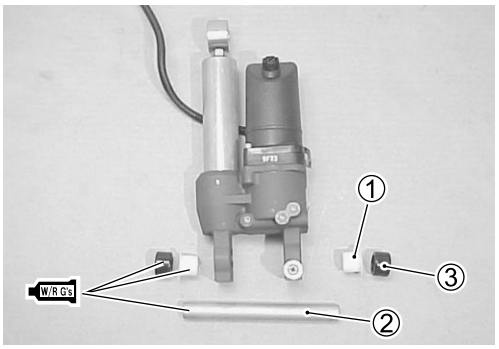
INSTALLATION

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

Lower tilt rod full down position.

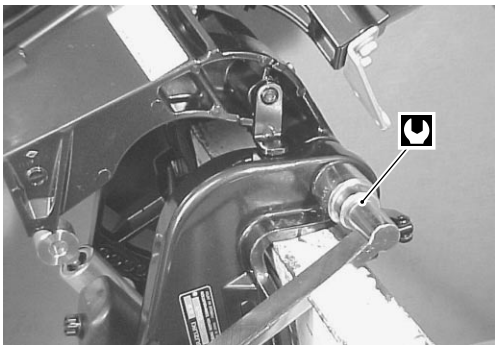
Apply Water Resistant Grease to the tilt cylinder lower shaft and lower shaft bushes.
Install bushes ①, cylinder lower shaft ② and lower collars ③ to PTT unit.

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



Place the PTT unit in position between the clamp brackets.
Tighten the clamp bracket shaft nut to specified torque.

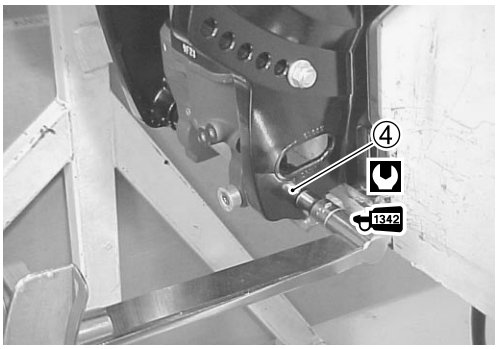
Clamp bracket shaft nut :
43 N·m (4.3 kg-m, 31.0 lb.-ft.)



Tighten lower shaft bolts ④, pre-coated with thread lock, to specified torque.

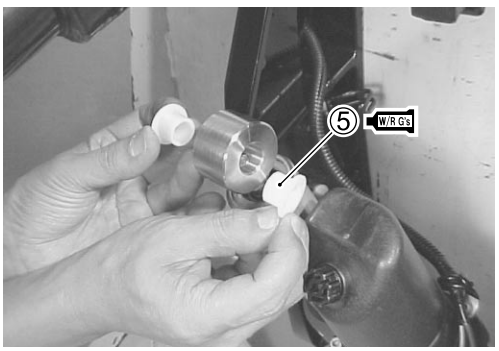
1342 99000-32050 : Thread Lock "1342"

Cylinder lower shaft bolt : 23 N·m (2.3 kg-m, 16.5 lb.-ft)



Apply Water Resistant Grease to tilt rod upper bushes ⑤, then install bushes in tilt rod.
Operate the PTT motor to extend the PTT rod upward.
Align the tilt rod with the hole in the swivel bracket as the tilt rod extends.

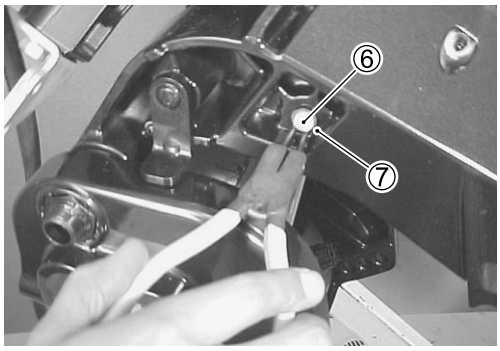
W/R G's 99000-25160 : Water Resistant Grease



Apply Water Resistant Grease to the PTT rod upper shaft ⑥, then insert the shaft through the swivel bracket and tilt rod.

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

Secure the upper shaft with the snap ring ⑦.



Route the PTT motor cable in through the lower cover and connect the terminals to the PTT relays.
(Cable routing – see the WIRE / HOSE ROUTING section on page 11-5 to 11-13.)

PTT MOTOR RELAY

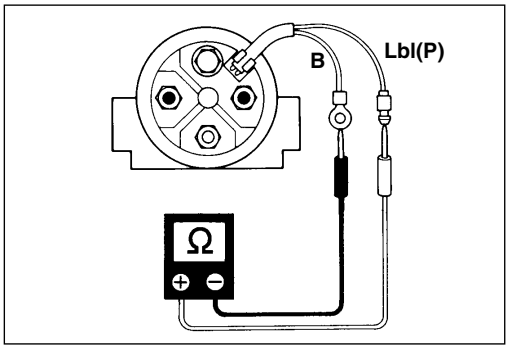
Two methods can be used to test PTT relays.

Method 1.
Measure resistance between wiring leads of the relay.

09930-99320 : Digital tester

Tester range : Ω(Resistance)

	Tester probe connection	
	Red (+)	**Black (–)**
UP	Light Blue	Black
DOWN	Pink	Black

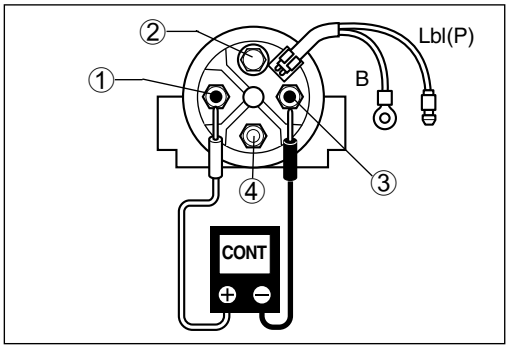


PTT relay solenoid coil resistance :
Standard 3.0 – 4.5 Ω

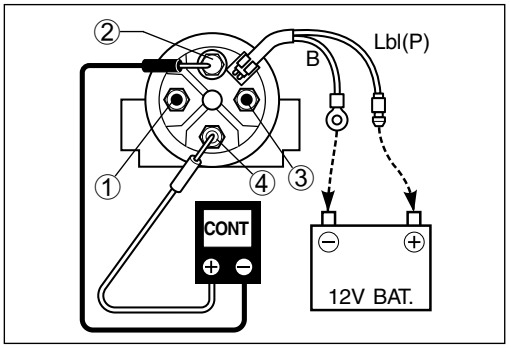
Method 2.
Connect the wiring leads of the relay to battery (12V) and check relay operation.

09930-99320 : Digital tester

Tester range : (Continuity)
When there is continuity between terminals ① ↔ ② ↔ ③, the unit is considered to be without defect.



With Black lead wire connected to the battery negative (–) terminal and Light blue or Pink lead wires are connected to battery positive (+) terminal there should be continuity between ② ↔ ③ ↔④.
With the lead wires are disconnected from the battery there should be no continuity between ③ ↔④.
The relay is considered to be without defect if continuity test results are as stated above.

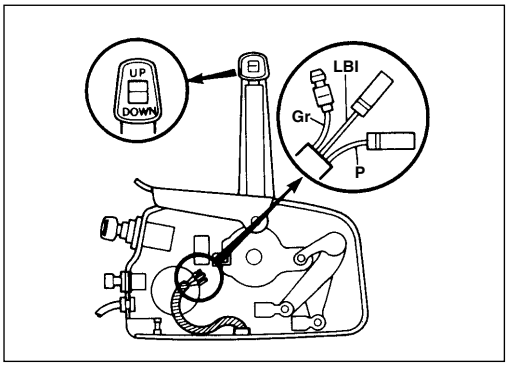


PTT SWITCH

Test continuity between the wires at each of the three switch positions.

09930-99320 : Digital tester

Tester range : (Continuity)



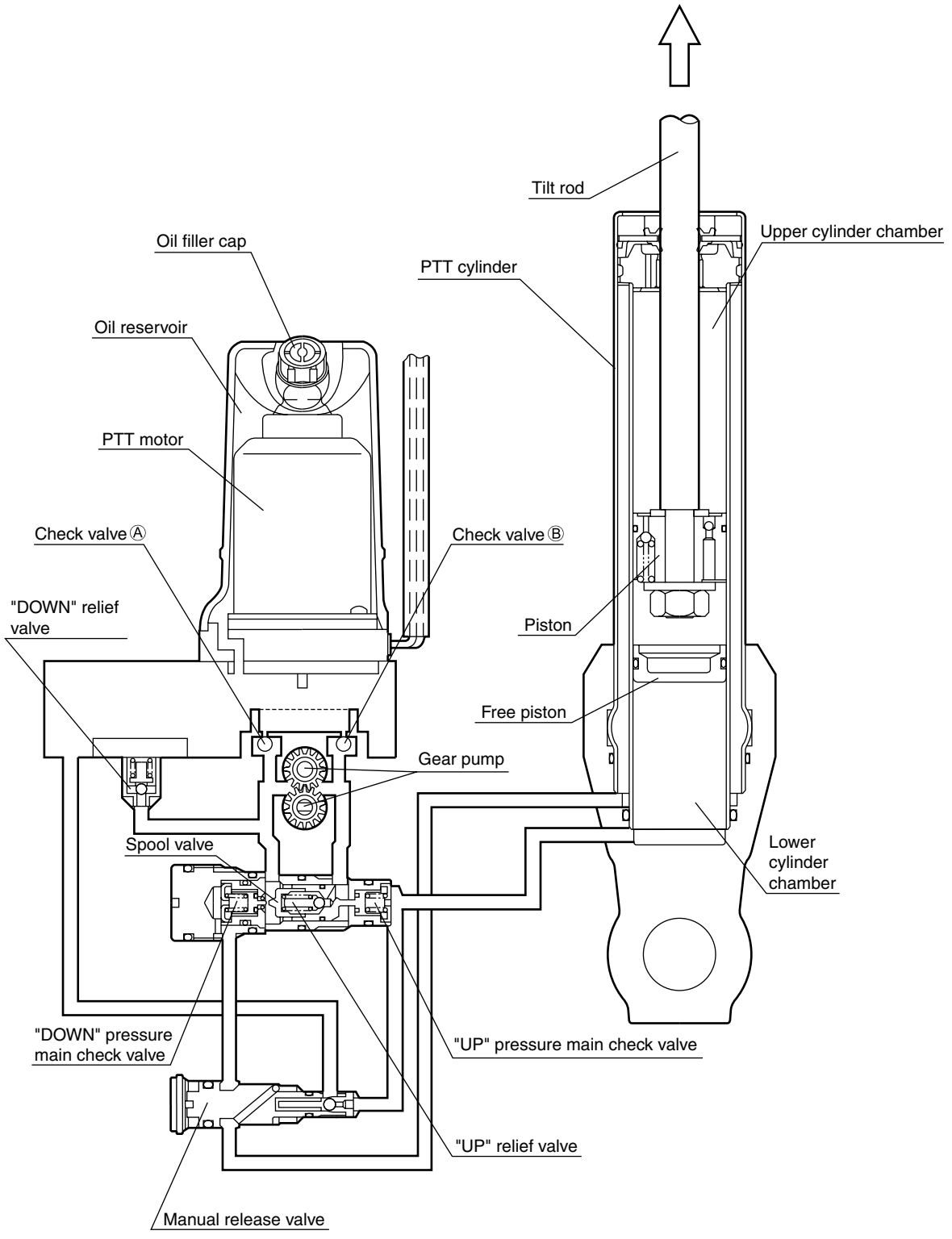
	Tester probe connection		Tester indicates
	Red (+)	Black (–)	
"DN" side depressed	Pink	Gray	**Continuity**
"UP" side depressed	Light Blue	Gray	**Continuity**
not depressed	Pink	Gray	**Infinity**
	Light Blue		

OPERATION

The power trim and tilt system is operated by a “rocker” type switch (protected by a rubber thumb pad) on top of the remote control box handle.

When the switch is depressed, power is delivered to the electric motor via the relevant relay. The relay with the Blue wire connected to the PTT pump is for trim/ tilt “up”, while the relay with the Green wire is for trim/tilt “down”.

COMPONENTS



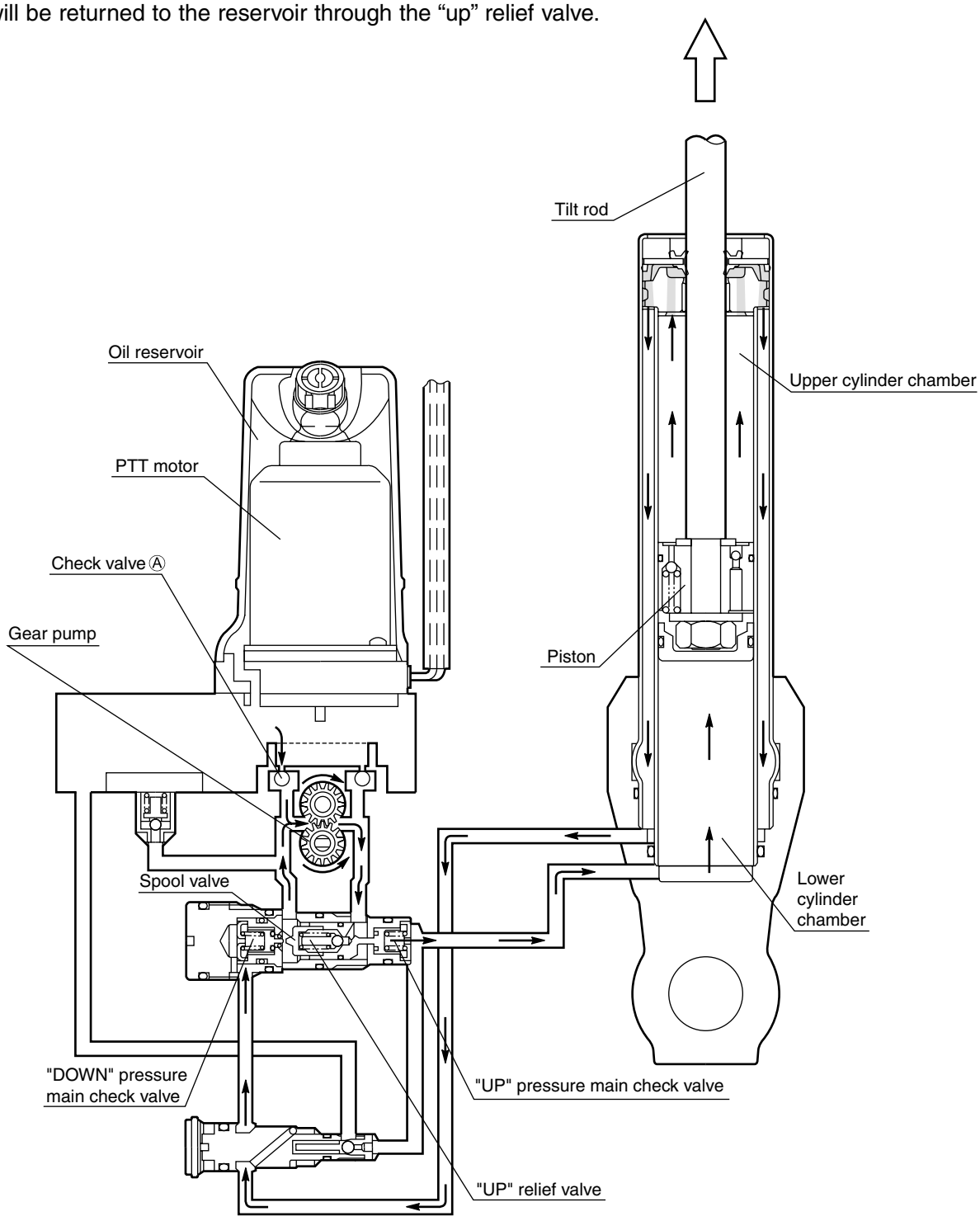
PRINCIPLES OF OPERATION

TRIM/TILT "UP" CIRCUIT

The electric motor is operating in a clockwise direction. Check valve Ⓐ will open, allowing oil to flow from the reservoir to the pump. Oil flow from the pump enters the spool valve, moving it to the left, opening the "down" pressure main check valve and returning oil from the upper cylinder chamber (plus oil from the reservoir) to the pump. Pressure built up by the pump will then open the "up" pressure main check valve and oil will enter the lower cylinder chamber.

When trim motor stops, both the "DOWN" pressure main check valve and the "up" pressure main check valve will close to retain tilt/trim position.

When full trim/tilt "up" position is attained, sustained operation of the "up" relay will have no effect, as pump oil flow will be returned to the reservoir through the "up" relief valve.

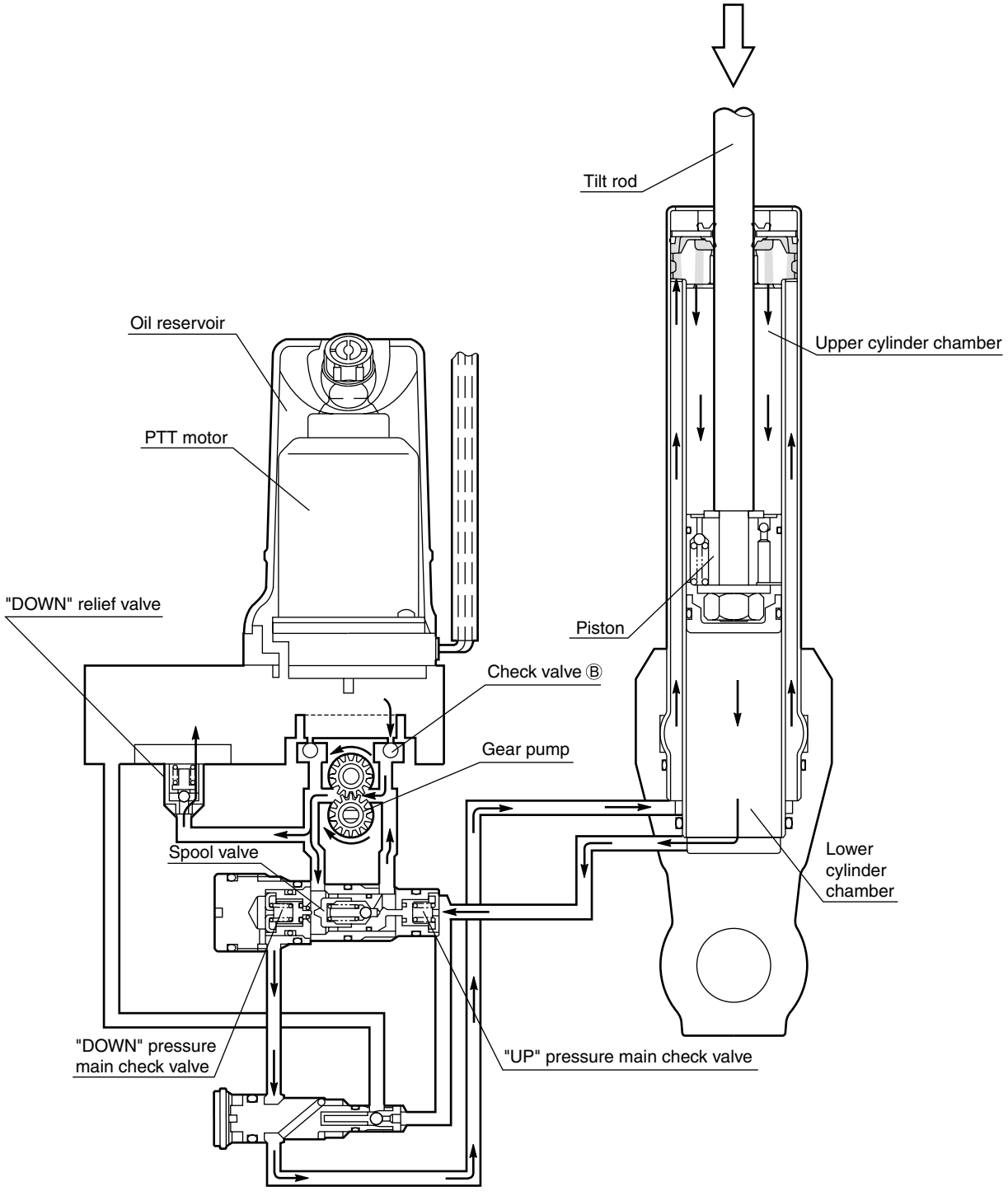


TRIM/TILT "DOWN" CIRCUIT

The electric motor is operating in a counterclockwise direction. Check valve Ⓑ will open, allowing oil to flow from the reservoir to the pump. Oil flow from the pump enters the spool valve, moving it to the right, thereby opening the "up" pressure main check valve. Oil from the lower cylinder chamber will go through the "up" pressure main check valve to the pump.

Pressure built up by the pump will open the "down" pressure main check valve and oil will enter the upper cylinder chamber. The piston will retract (move inward), which will tilt the outboard down. Oil in the lower cylinder chamber is returned to the pump through the "up" pressure main check valve.

When full "down" position is reached, continued operation of the "down" relief valve will have no effect, as pump oil flow will be returned to the reservoir through the "down" relief valve.



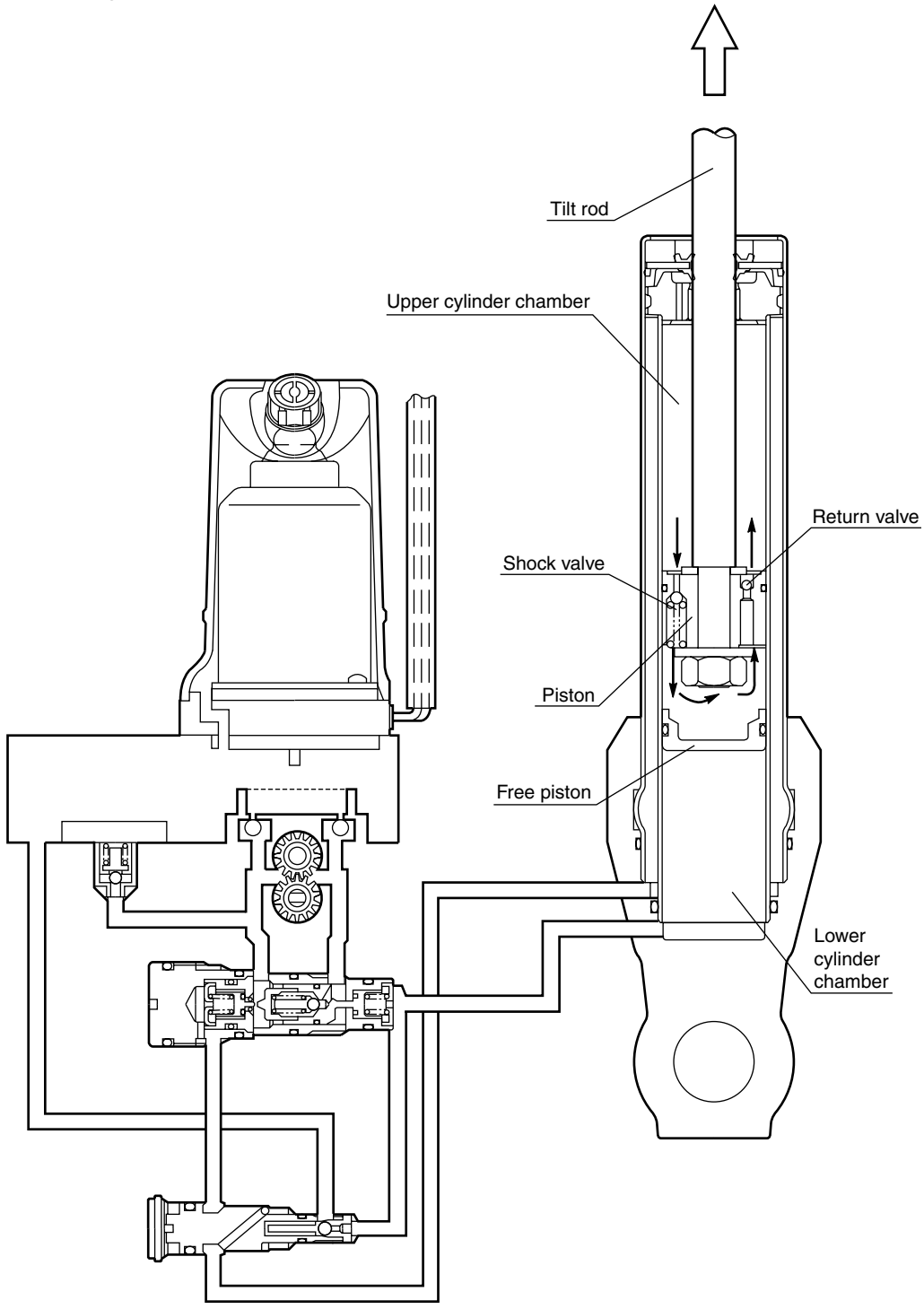
SHOCK ABSORBER CIRCUIT

(i) Shock valve

Should the lower unit strike an underwater object whilst in motion, the piston will rise abruptly, creating a sudden high impact pressure in the upper cylinder chamber. The shock valve will then open, allowing oil to flow into the area between the tilt ram piston and the free piston, thereby dampening (absorbing) the impact.

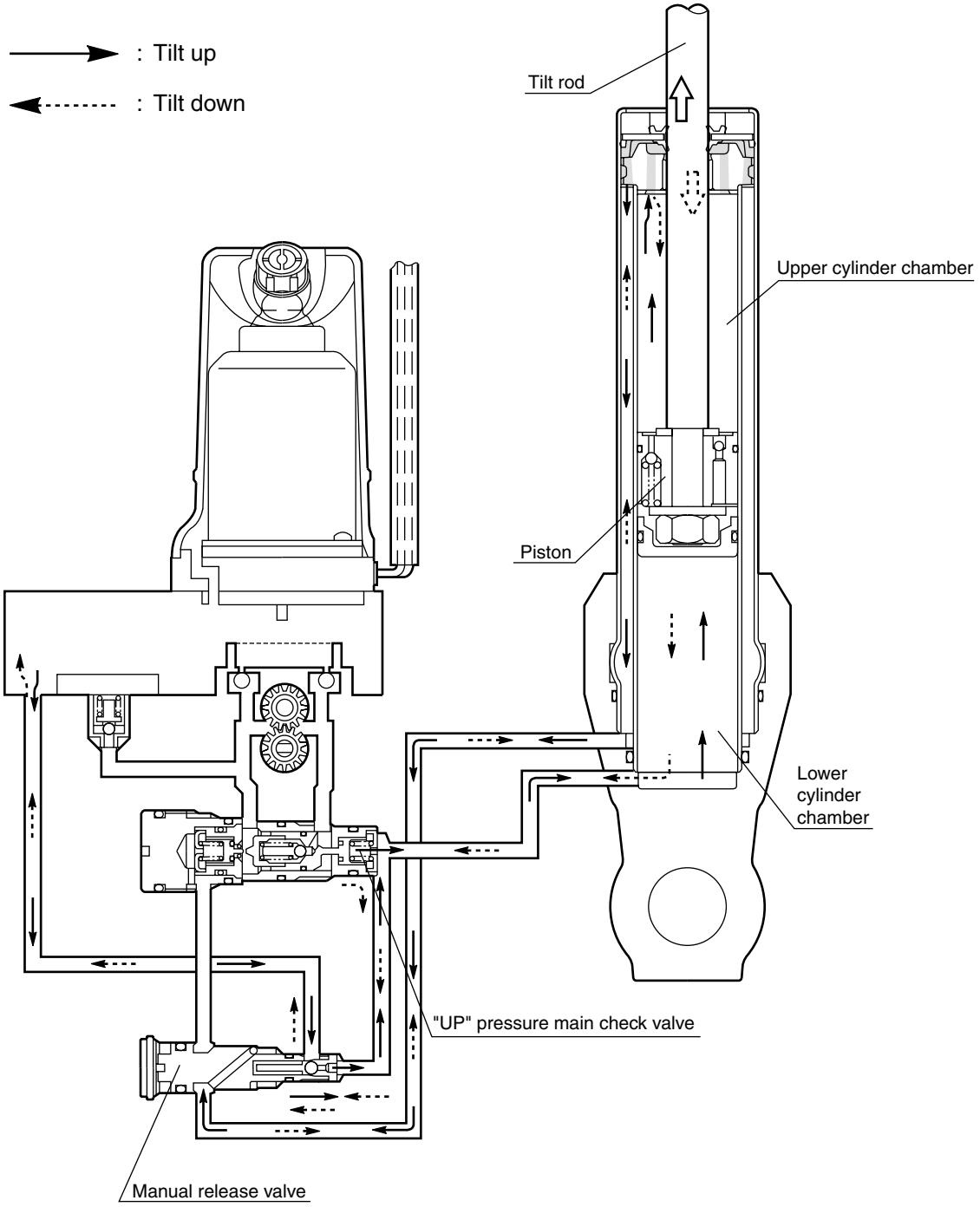
(ii) Return valve

When the point of impact has passed, propeller thrust and motor weight will force the tilt ram piston back downwards. The oil from between the ram piston and the free piston is then expelled through the return valve before flowing into the upper cylinder chamber.



MANUAL RELEASE CIRCUIT (MANUAL VALVE)

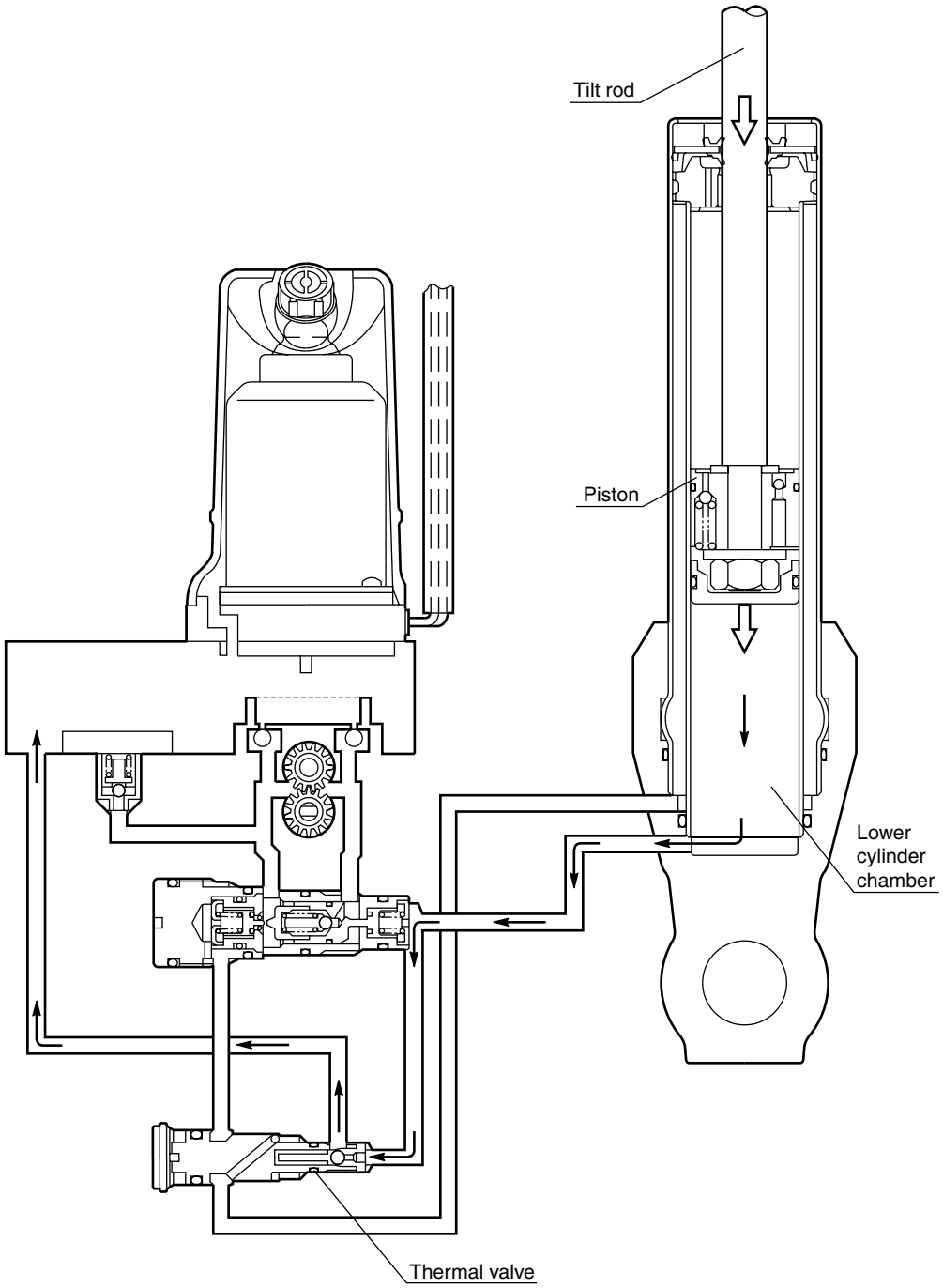
Operation:Turn manual valve maximum three (3) full turns counterclockwise.
When the manual valve is loosened, oil will flow unimpeded (without resistance) through the internal pump tubes, thereby facilitating manual tilting or lowering of the outboard. To hold the engine in a selected position, the manual valve must be closed again.



THERMAL VALVE

The PTT system incorporates a thermal valve for protection of the internal components, should excessive downward force be exerted on the lower unit with the motor in a tilted position, or (in the case of an impact in reverse gear), the outboard clamp/swivel brackets and the boat transom.

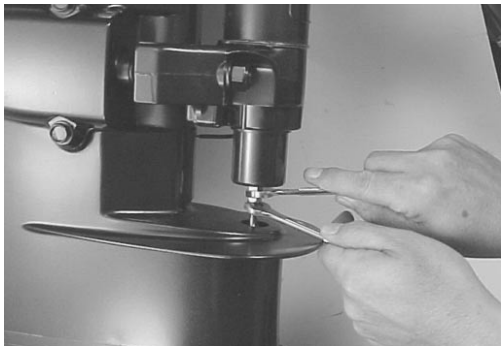
Should the propeller strike an underwater object whilst in reverse gear, a build up of pressure will be induced in the lower cylinder chamber, whereby the outboard mounting bracket and/or the boat transom may sustain damage. To prevent this, the thermal valve will open to relieve the oil pressure, thereby softening the impact. Internal PTT circuits are protected, as the thermal valve will open to reduce oil pressure (caused by either hot climate or abnormally heavy usage).



LOWER UNIT

CONTENTS

REMOVAL & DISASSEMBLY

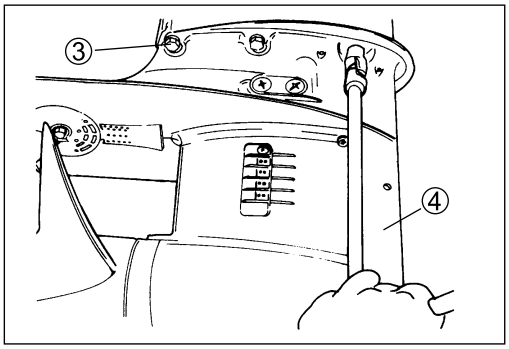


⚠ WARNING

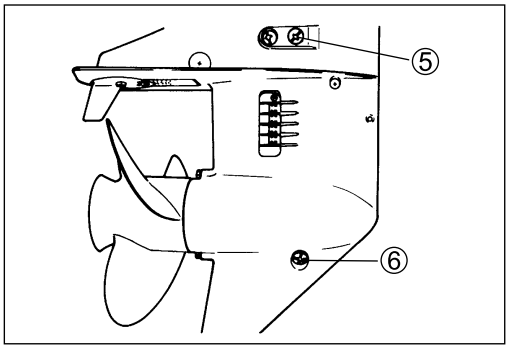
Before removing lower unit:
- **Disconnect spark plug caps from all spark plugs.**
- **Disconnect the battery cable.**

Loosen the clutch rod lock nut ①.
To separate the clutch rod from the shift rod, unscrew the turnbuckle ②.

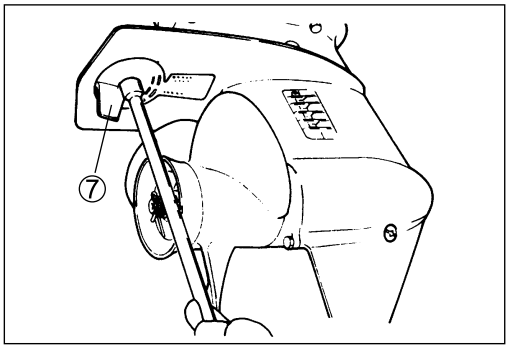
Remove six(6) bolts ③ and separate gearcase ④ from driveshaft housing.



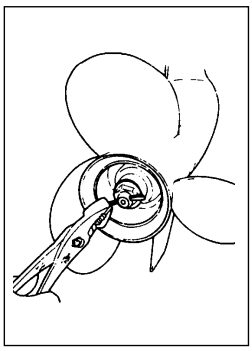
Place a drain pan under the oil drain plug.
Remove oil drain plug first ⑥ then oil level plug ⑤ and allow gear oil to drain.

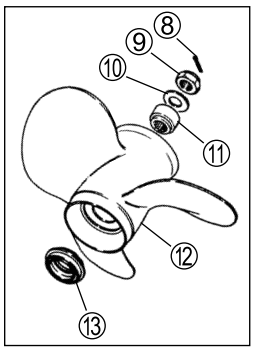


Remove bolt and trim tab ⑦ (if necessary).



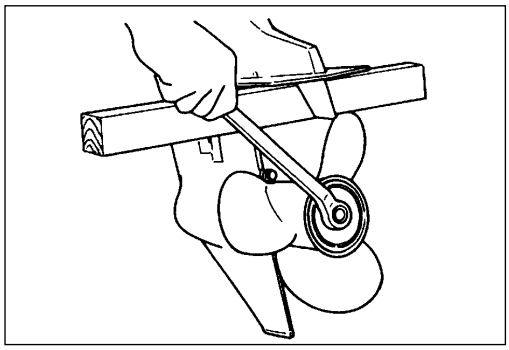
Remove cotter pin ⑧ from propeller nut and remove propeller nut ⑨.
Remove washer ⑩, spacer ⑪, propeller ⑫ and stopper ⑬ from the propeller shaft.



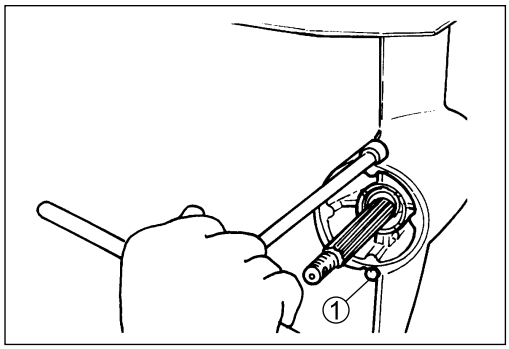


⚠ WARNING

To prevent injury from propeller blades, wear gloves and place a block of wood between the anti - cavitation plate and the propeller blade tips to lock the propeller in place.

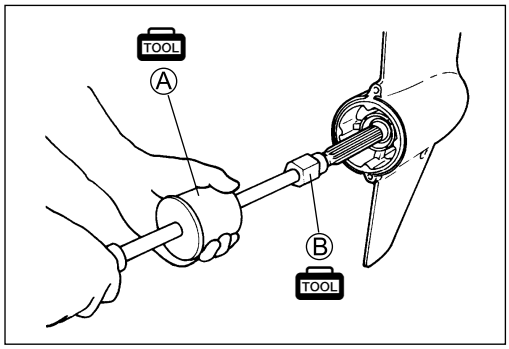


Remove the two (2) bolts ① securing the propeller shaft bearing housing to the gearcase.

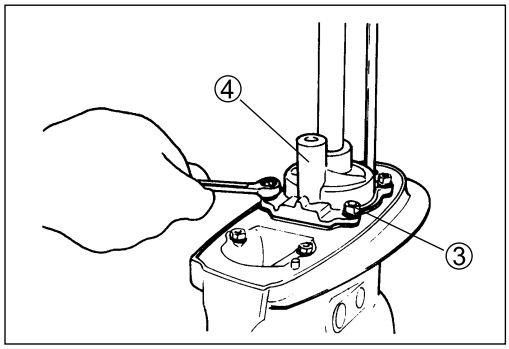


Using special tools, draw out the propeller shaft bearing housing.
Remove the propeller shaft and bearing housing assembly.

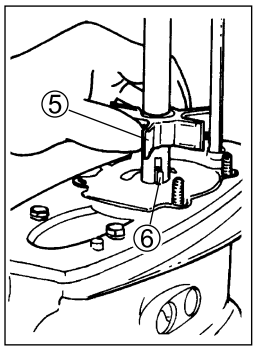
09930-30104 : Sliding hammer – Ⓐ
09950-59310 : Propeller shaft remover – Ⓑ

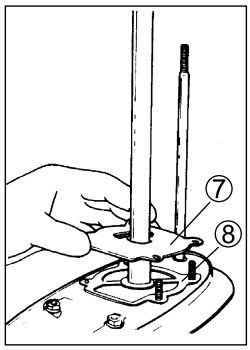


Loosen the four (4) nuts ③, then remove the water pump case ④, impeller ⑤, key ⑥ and pump under plate ⑦.



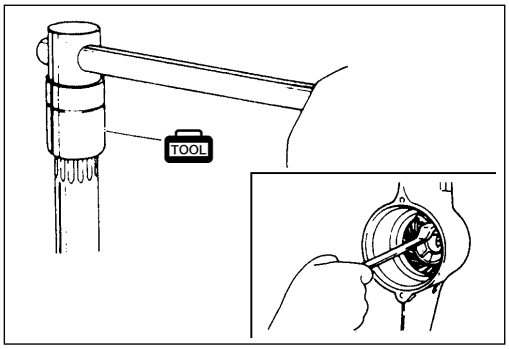
Keep the impeller key ⑥ for reuse and discard the plate gasket ⑧.



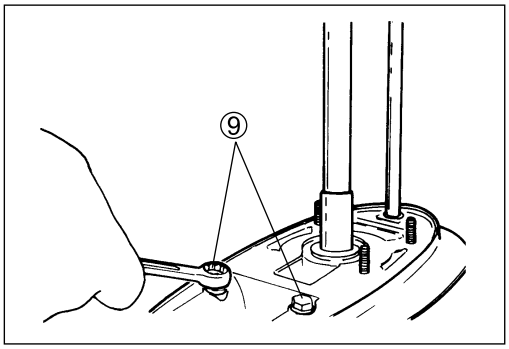


Hold the pinion nut securely, then fit special tool to the driveshaft and loosen the pinion nut.

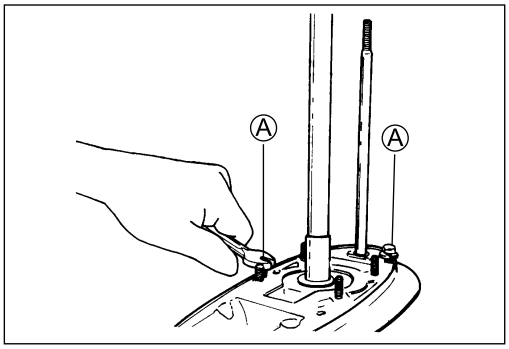
TOOL 09921-29510 : Driveshaft holder



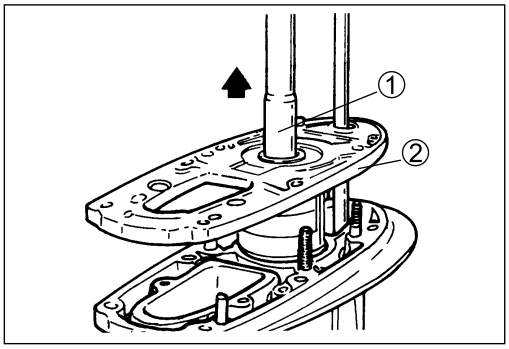
Remove the two (2) bolts ⑨ securing the driveshaft bearing housing to the gearcase.



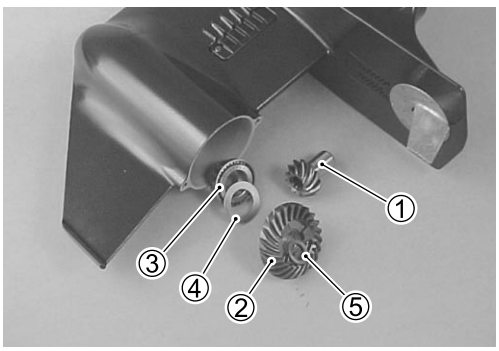
To separate the bearing housing from the gearcase, use two (2) 6mm bolts Ⓐ as screw jacks, by alternately turning each one equally.
This will keep the housing level as it pushed off the gearcase.



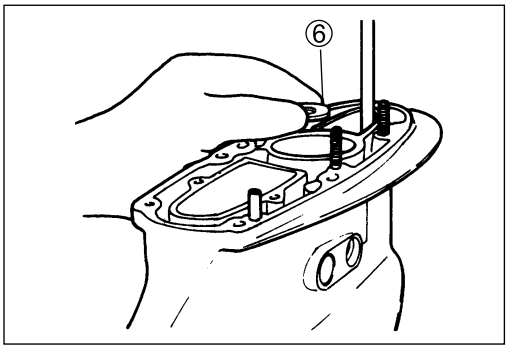
Lift out driveshaft ① and driveshaft bearing housing assembly ②.



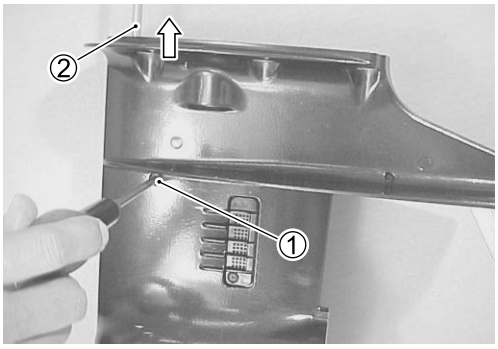
Remove the pinion gear ①.
Remove the forward gear ② (with thrust washer ⑤, back-up shim ④ and bearing ③)



Take the pinion shim ⑥ out from the gearcase.

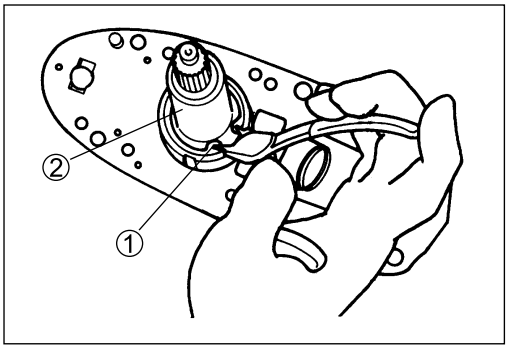


Remove the screws ① securing the shift rod guide stopper.
Pull out the shift rod assembly ②.

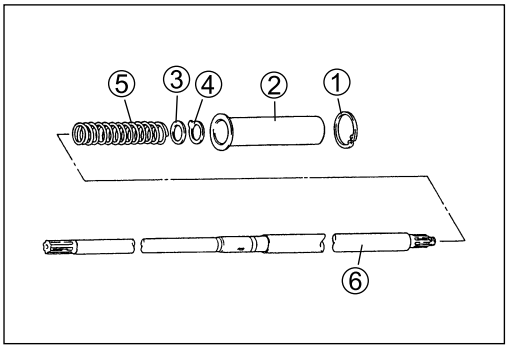


Disassembling drive shaft

Remove the circlip ① and pre-load spring collar ②, washer ③, tab lock washer ④ and pre-load spring ⑤.
Note the position of tab lock washer before removing them.

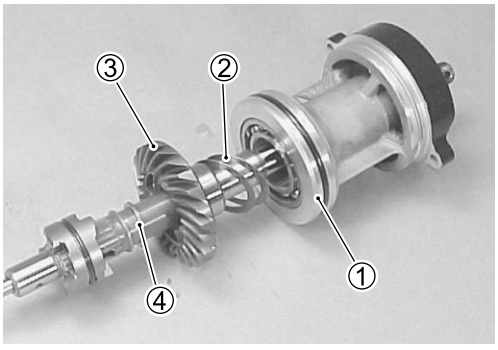


Detach driveshaft ⑥ from the bearing housing.

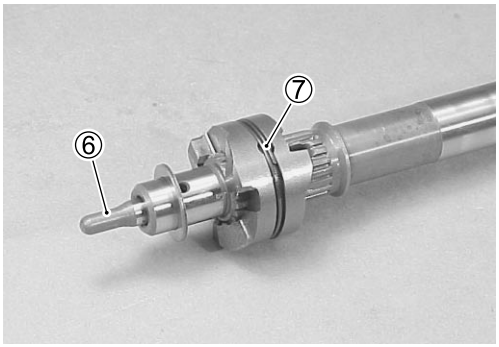


Disassembly of propeller shaft components

Slide propeller shaft away from reverse gear ③ and bearing housing assembly ①.
Account for the reverse gear back-up shim ② and reverse gear thrust washer ④.

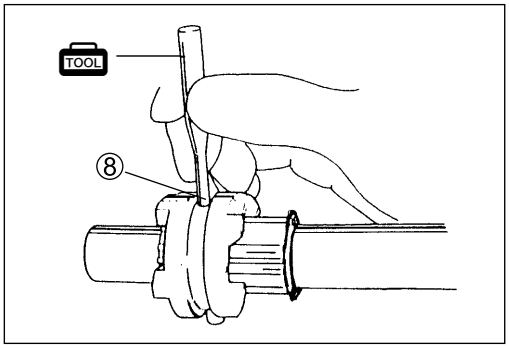


To disassemble propeller shaft components, refer to the following:
(a) Pull the push rod ⑥ out of the propeller shaft.
(b) Remove the spring ⑦ from the clutch dog shifter.

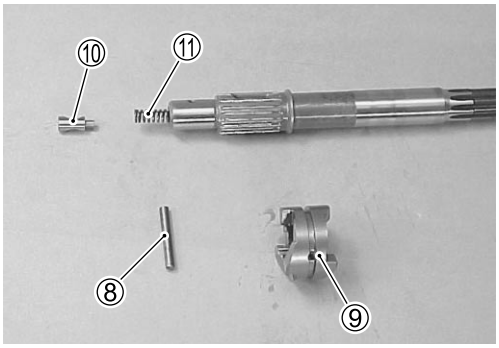


(c) Use special tool to push the dog pin ⑧ out of the clutch dog shifter.

09922-89810 : Shift pin remover



(d) Remove the clutch dog shifter ⑨, push pin ⑩, and return spring ⑪ from propeller shaft.

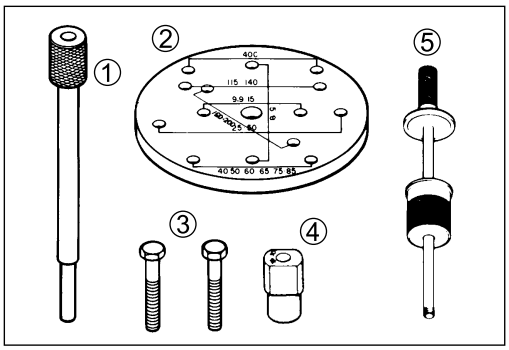


PINION BEARING

Removal / Installation is in following procedure.

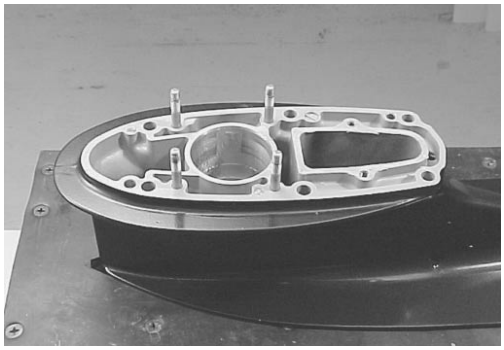
Removal & Installation Tools

09951-59910 : Shaft (removal & installation) ①
09951-39914 : plate ②
01500-08403 : Bolt ③
09951-19611 : Attachment ④
09930-30104 : Sliding hammer ⑤



REMOVAL

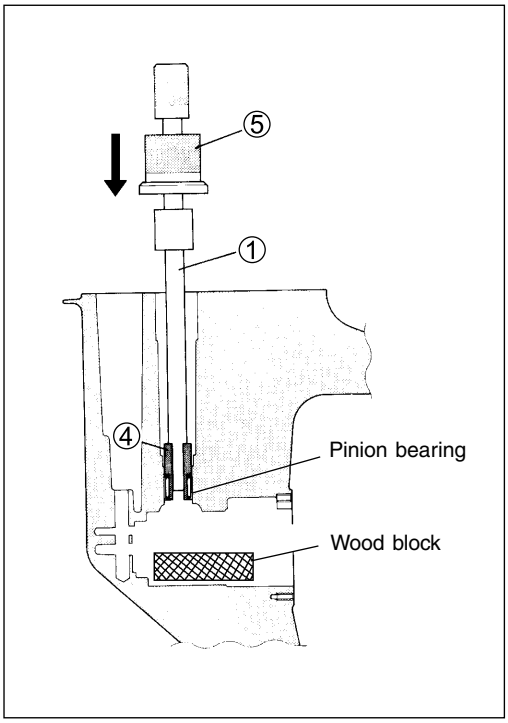
1. Remove the water pump stud bolts ⓐ.



2. Place the attachment ④ inside the pinion bearing.
3. Insert the removal shaft ① into attachment.
4. Thread sliding hammer ⑤ into top of removal shaft.
5. Put wood block under pinion bearing.
6. Drive the pinion bearing out by striking top of shaft with sliding hammer.

CAUTION

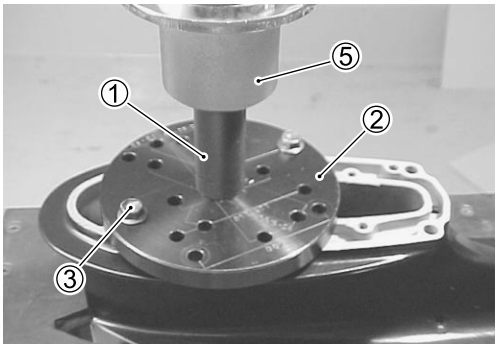
When removing the pinion bearing, use care to avoid damaging the gearcase.



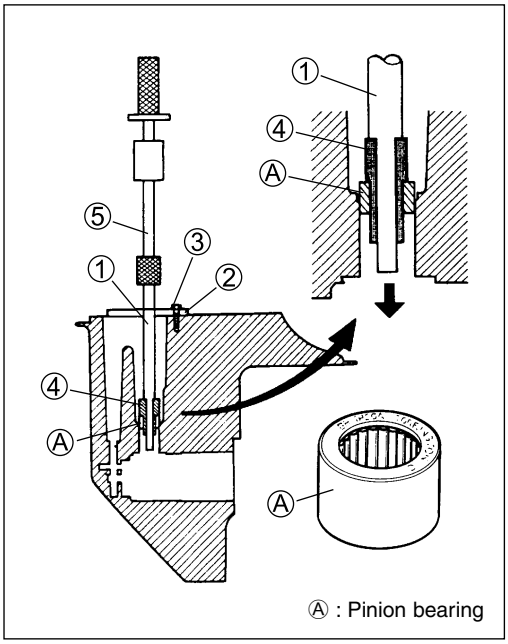
INSTALLATION

CAUTION

Before installing bearing, ensure that inside of gear case is clean and free of debris.



7. Set the installer shaft ①, plate ②, attachment ④ and pinion bearing as shown.
8. Place the installer shaft (with pinion bearing on end of installer) into the gearcase.
9. Secure the plate ② by tightening the bolts ③.
10. Thread the sliding hammer ⑤ into the top of the installer shaft.
11. Drive the bearing down into position by gently striking the installer shaft until the coupler touches the plate.



INSPECTION

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

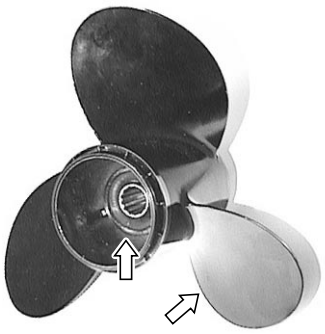
NOTE:
Thoroughly wash all metal components with cleaning solvent and dry with compressed air.

⚠ WARNING

Wear safety grasses when using compressed air.

PROPELLER

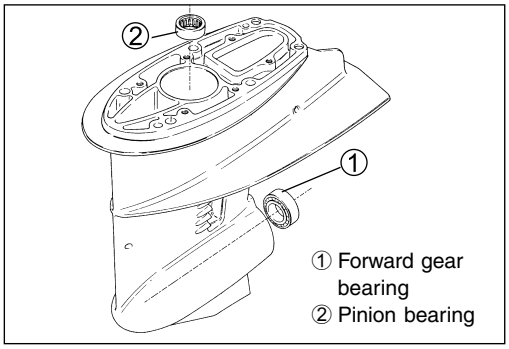
- Inspect the propeller for bent, chipped or broken blades. Replace or repair propeller if in damaged condition.
- Inspect propeller bush splines. Replace or repair propeller if splines are worn or damaged.
- Inspect propeller bush for deterioration or slipping. Replace if necessary.



GEARCASE

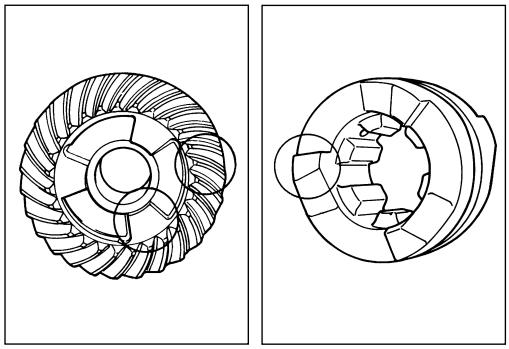
- Inspect the gearcase. Replace if cracked or damaged.
- Visually check the pinion bearing. Replace if pitted, noisy or rough.

NOTE:
If removal and replacement are required, see the "PINION BEARING" section on page 10-6.

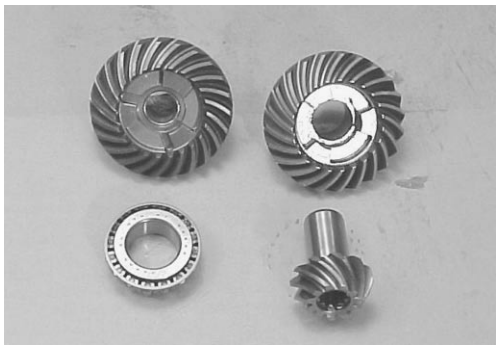


GEAR

- Inspect forward, reverse and pinion gear teeth and engaging dogs.
  Replace gears if damaged or worn.

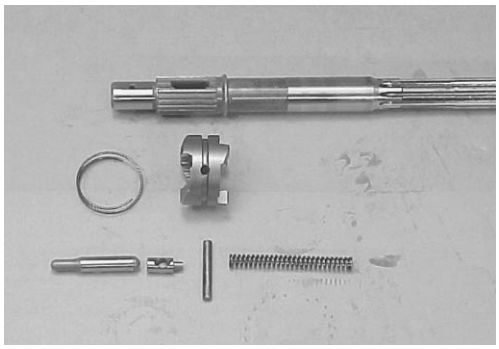


- Inspect forward gear bearing. Replace bearing if pitted, noisy or rough.



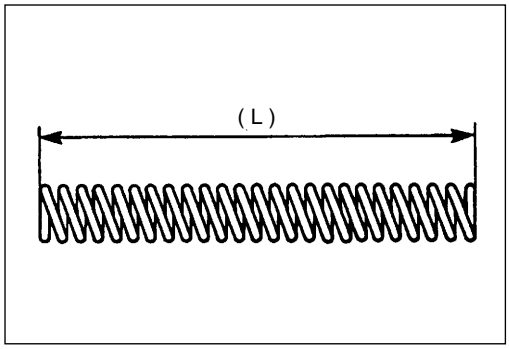
PROPELLER SHAFT COMPONENTS

- Inspect push rod / push pin, replace if worn, broken, or tip is flattened.
- Inspect clutch dog shifter. Replace if chipped, worn or damaged.
- Inspect dog pin. Replace if bent or worn.
- Inspect propeller shaft / splines. Replace if worn, twisted or damaged.



- Check clutch return spring by measuring its free length.
  If free length is not within specifications, replace the return spring.

Clutch return spring free length (L)
Standard : 58.5 mm (2.30 in.)
Service limit : 56.5 mm (2.22 in.)



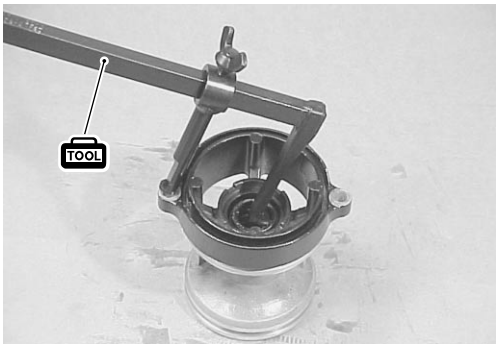
PROPELLER SHAFT BEARING HOUSING

- Inspect housing. Replace if cracked or damaged.
- Inspect reverse gear bearing. Replace bearing if pitted, noisy or rough.
- Inspect bearing. Replace bearing if pitted, noisy or rough.
- Check condition of oil seal and O-ring.
  Replace the seals if nicked, cut or worn.

Replacing propeller shaft oil seal

1. Extract the seals with oil seal remover.

09913-50121 : Oil seal remover

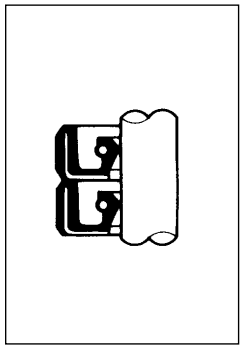


CAUTION

Do not reuse oil seal once removed.
Always use new oil seals.

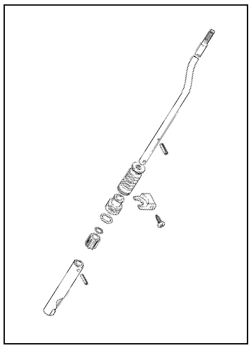
2. Apply Water Resistant Grease to the inner circumference of the housing.
3. Using an oil seal installer, drive the two oil seals (one at a time) into the propeller shaft bearing housing.
   The lipped portion of the seal must face towards the propeller.
   Apply Water Resistant Grease to the seal lips.

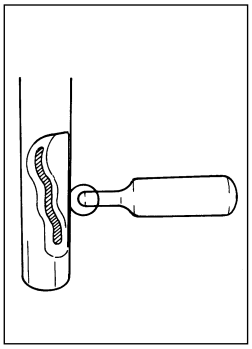
99000-25160: Water Resistant Grease



SHIFT ROD AND SHIFT CAM

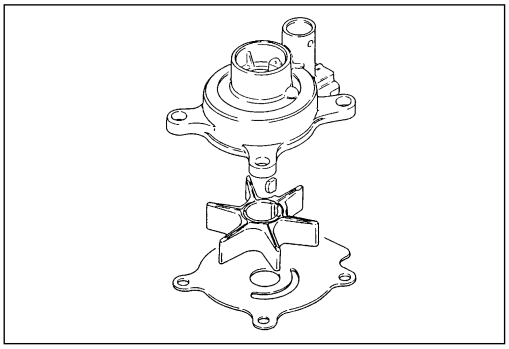
- Inspect the “stepped” surfaces of the shift cam.
  Replace if chipped, damaged or excessively worn.
- Inspect shift rod guide. Replace if pitted, stiff or corroded.
- Inspect O-ring. Replace if nicked, cut, torn or swelled.
- Inspect shift rod boot. Replace if cracked or damaged.



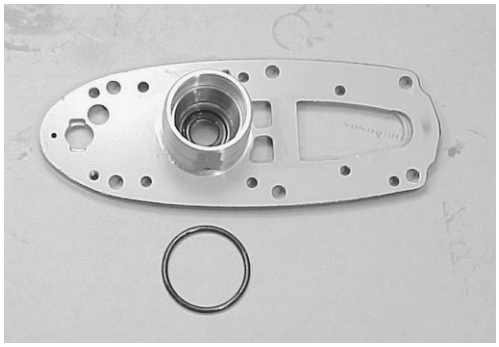


WATER PUMP AND RELATED ITEMS

- Inspect impeller. Replace if vanes are cut, torn or worn.
- Inspect pump case. Replace if cracked, distorted or corroded.
- Inspect under panel. Replace if cracked, distorted or corroded.



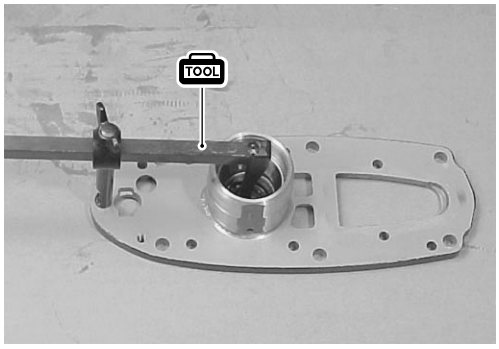
DRIVESHAFT BEARING HOUSING



- Inspect housing. Replace if cracked or damaged.
- Check condition of oil seals. Replace if nicked, cut or worn.
- Inspect O-ring. Replace if worn, nicked or cut.

Replacing driveshaft oil seal

1. With the oil seal remover, draw the two oil seals out of the driveshaft bearing housing.

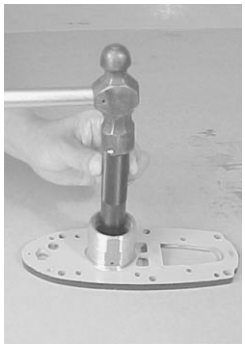


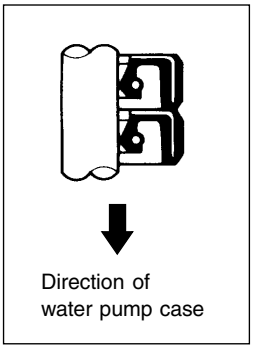
TOOL **09913-50121 : Oil seal remover**

2. Apply Water Resistant Grease to the inner circumference of the driveshaft bearing housing.

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

3. Grease the inner lips of the seal.
   With the lips facing away from driveshaft bearing, place seal in position and drive it into the bearing housing.

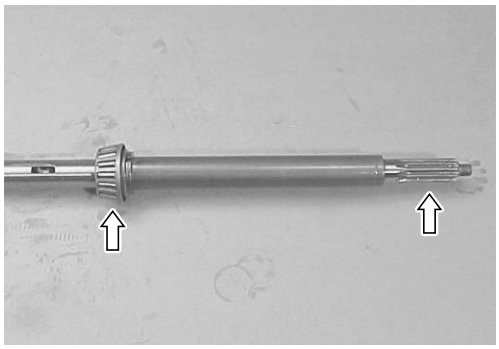


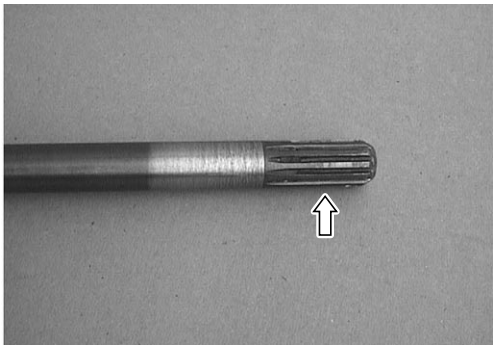


DRIVESHAFT

Inspect driveshaft / splines. Replace if worn, twisted or damaged.

Inspect driveshaft bearing, replace if pitted, noisy or rough.



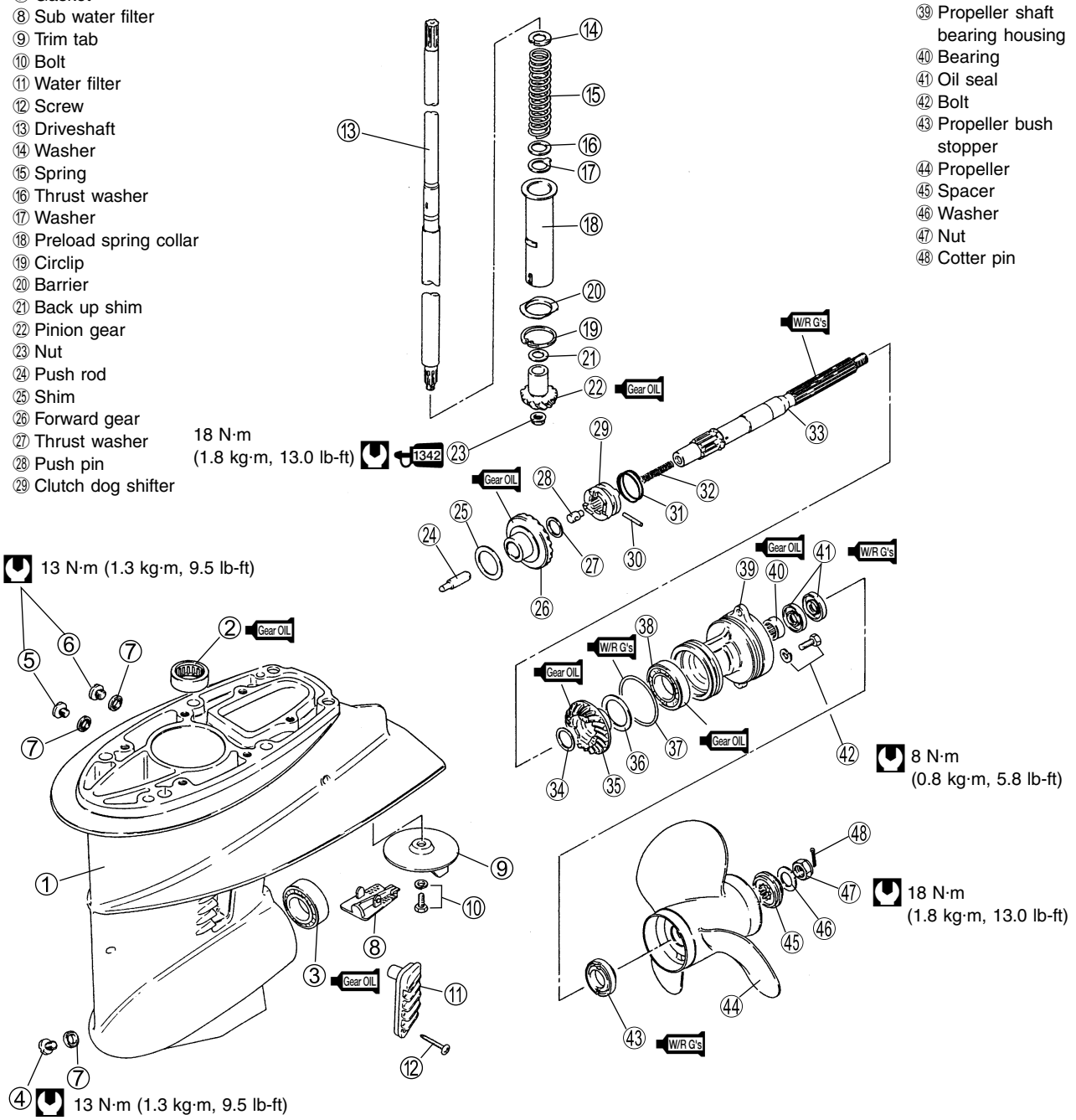


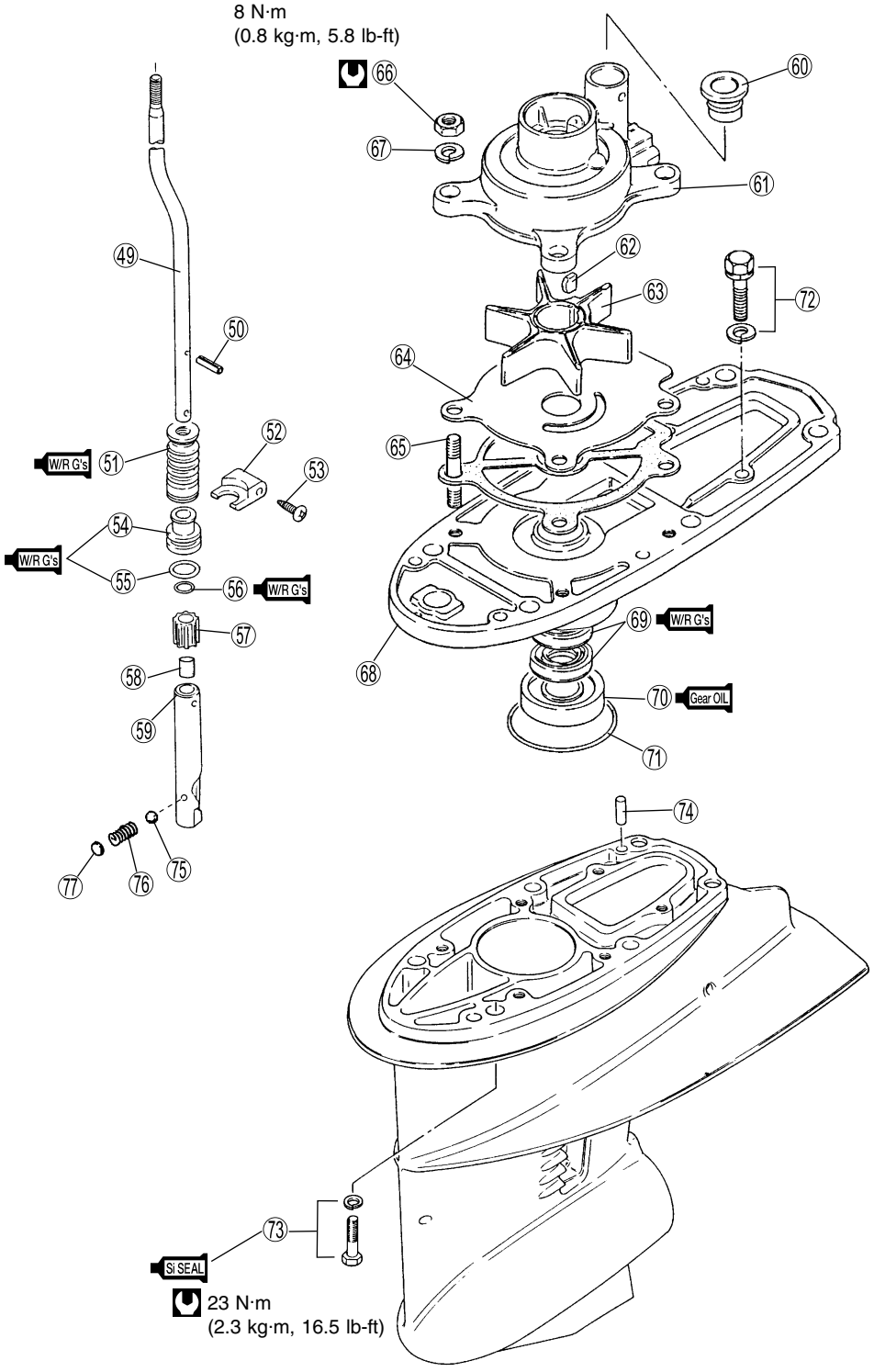
ASSEMBLY & INSTALLATION

Assembly & Installation are reverse of disassembly with special attention to following steps.

System construction

① Gearcase
② Bearing
③ Bearing
④ Drain plug
⑤ Level plug
⑥ Flush plug
⑦ Gasket
⑧ Sub water filter
⑨ Trim tab
⑩ Bolt
⑪ Water filter
⑫ Screw
⑬ Driveshaft
⑭ Washer
⑮ Spring
⑯ Thrust washer
⑰ Washer
⑱ Preload spring collar
⑲ Circlip
⑳ Barrier
㉑ Back up shim
㉒ Pinion gear
㉓ Nut
㉔ Push rod
㉕ Shim
㉖ Forward gear
㉗ Thrust washer
㉘ Push pin
㉙ Clutch dog shifter
㉚ Dog pin
㉛ Dog spring
㉜ Return spring
㉝ Propeller shaft
㉞ Thrust washer
㉟ Reverse gear
㊱ Shim
㊲ O-ring
㊳ Bearing
㊴ Propeller shaft bearing housing
㊵ Bearing
㊶ Oil seal
㊷ Bolt
㊸ Propeller bush stopper
㊹ Propeller
㊺ Spacer
㊻ Washer
㊼ Nut
㊽ Cotter pin





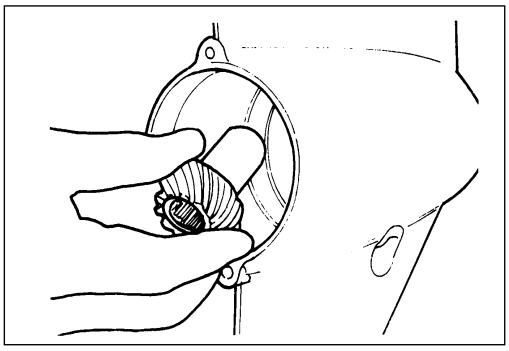
㊾ Shift rod
㊿ Pin
(51) Boot
(52) Stopper
(53) Screw
(54) Shift rod guide
(55) O-ring
(56) O-ring
(57) Magnet
(58) Holder
(59) Shift cam
(60) Grommet
(61) Water pump case
(62) Key
(63) Water pump impeller
(64) Under panel
(65) Stud bolt
(66) Nut
(67) Washer
(68) Driveshaft bearing housing
(69) Oil seal
(70) Bearing
(71) O-ring
(72) Bolt
(73) Bolt
(74) Dowel pin
(75) Ball
(76) Spring
(77) Notch plate

CAUTION

- **Make sure that all parts used in assembly are clean and lubricated.**
- **After assembly, check parts for tightness and smoothness of operation.**
- **Before final assembly, be absolutely certain that all gear contact, shim adjustments and tolerances are correct.**
  Failure to correctly adjust these areas will result in lower unit damage.
  (See the "GEARS SHIMMING AND ADJUSTMENT" section on page 10-23)

PINION GEAR

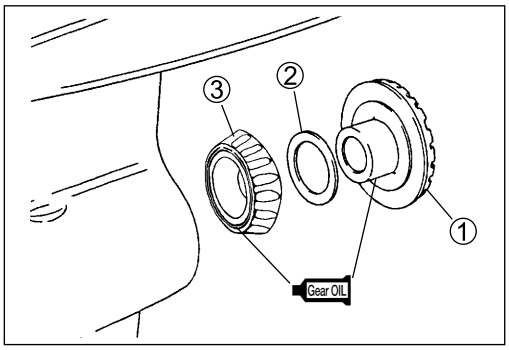
Place pinion gear and pinion back-up shim in gearcase.



FORWARD GEAR

Place the forward gear bearing ③ and back-up shim ② in position, then install forward gear ①.

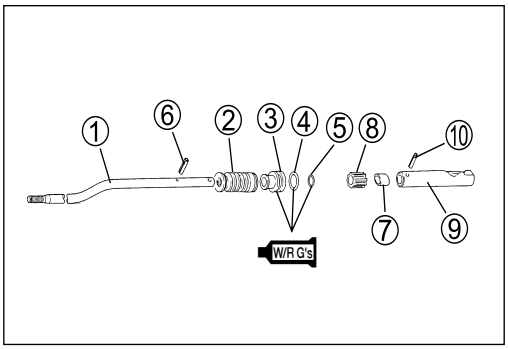
Gear OIL **99000-22540 : Suzuki Outboard Motor Gear Oil**



SHIFT ROD ASSEMBLY

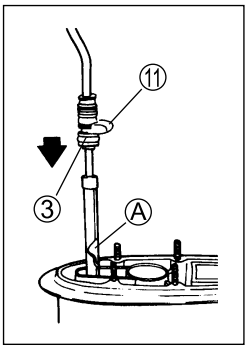
- Apply Water Resistant Grease to the shift rod guide O-ring ④·⑤ and the inside of the dust boot ②.
- Slide complete dust boot and shift rod guide onto the shift rod ①, then install pin ⑥.
- Attach magnet ⑧, magnet holder ⑦ to shift rod.
- Attach shift cam ⑨ to shift rod, then insert pin ⑩.

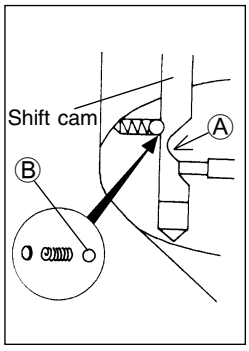
W/R G's **99000-25160 : Water Resistant Grease**

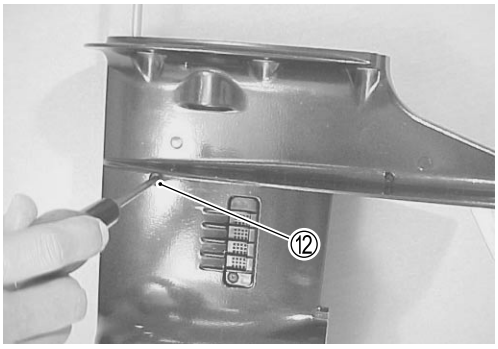


- Attach stopper ⑪ to the shift rod guide ③.
- Install shift rod assembly to the gearcase and secure stopper to the gearcase with screws ⑫.

NOTE:
Be sure the stepped section Ⓐ of shift cam faces towards propeller shaft.
Also be sure the rear side of the shift cam (with detent notch) is positioned over the detent ball Ⓑ in the gearcase.



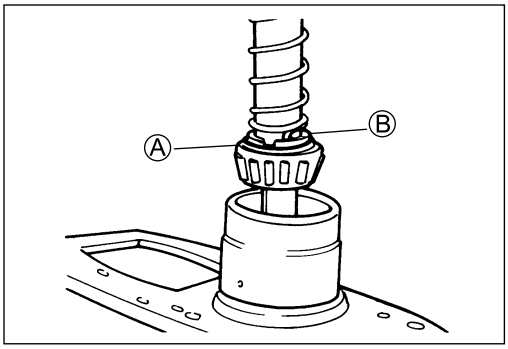




DRIVESHAFT / DRIVESHAFT BEARING HOUSING

Pre-load Spring

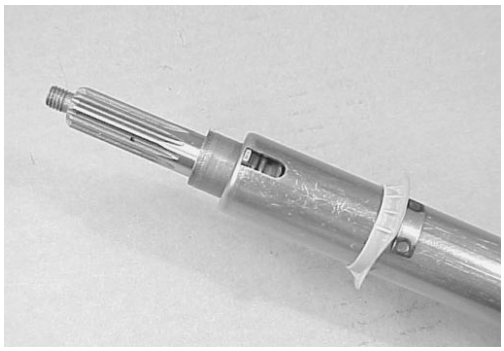
When installing the pre-load spring to the driveshaft, fit the end of spring Ⓑ into the notch Ⓐ on the thrust washer.



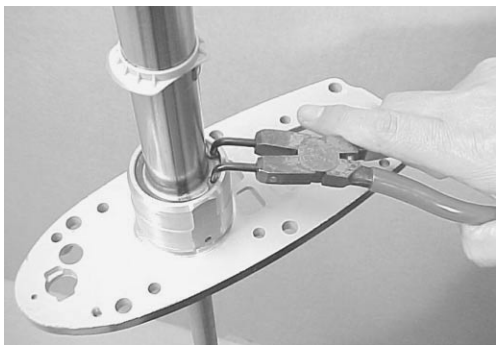
Pre-load Spring Collar

Place tab lock washer ① and plain thrust washer ② in spring collar ③, then slide pre-load spring collar on to driveshaft.

NOTE:
The lock washer tab must slot into the side opening at the bottom end (pinion gear side) of the spring collar.



Firmly push down pre-load spring collar, then snap on circlip.



Installation

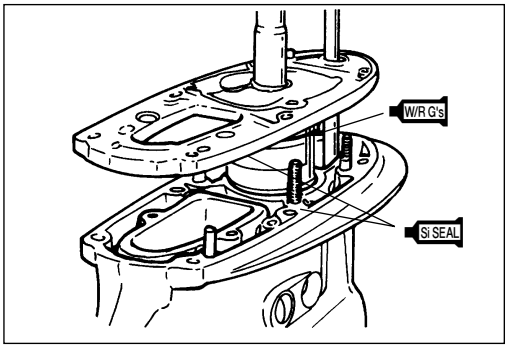
Apply Suzuki Water Resistant Grease to the O-ring of the housing.

Install complete driveshaft and driveshaft bearing housing assembly to the gearcase.

Apply Suzuki Silicone Seal to gearcase and driveshaft bearing housing surfaces.

Si SEAL 99000-31120 : Suzuki Silicone Seal

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



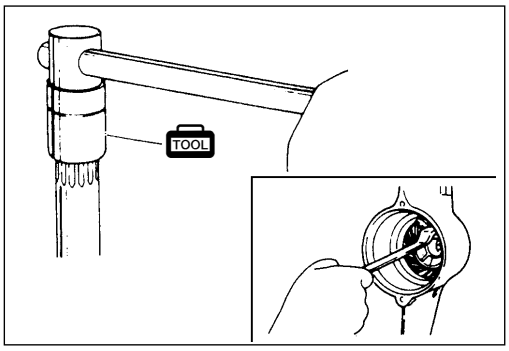
PINION NUT

Apply Thread Lock 1342 to the threads of the pinion nut before threading it onto the driveshaft.
Tighten nut to the specified torque.

Pinion nut : 18 N·m (1.8 kg-m, 13.0 lb.-ft.)

99000-32050 : Thread Lock 1342

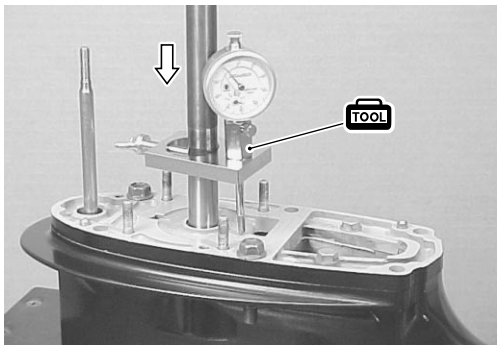
09921-29510 : Drive shaft holder



CHECKING DRIVESHAFT THRUST PLAY

Before installing reverse gear, driveshaft thrust play should be checked.
(See the “GEARS-SHIMMING AND ADJUSTMENT / CHECKING DRIVESHAFT THRUST PLAY” section on page 10-26)

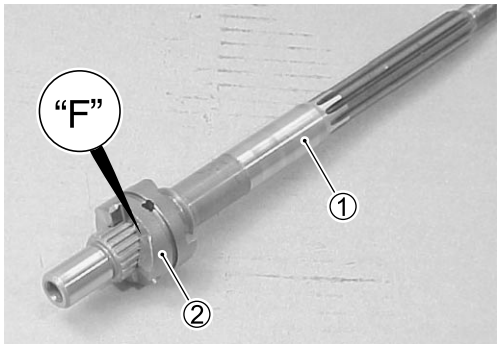
09951-09511 : Gear adjusting gauge



PROPELLER SHAFT

Slide the clutch dog shifter ② onto the propeller shaft ①.

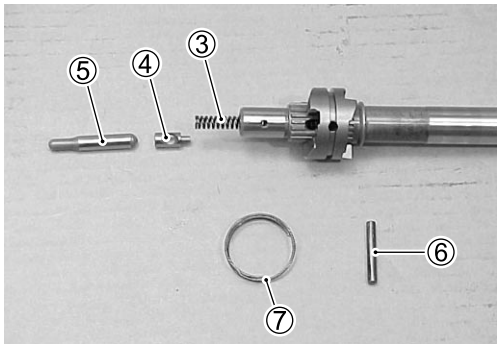
NOTE:
For correct installation, the side of the clutch dog shifter which must face towards forward gear is marked with the letter “F”.



Insert the return spring ③, push pin ④ and push rod ⑤ into propeller shaft.

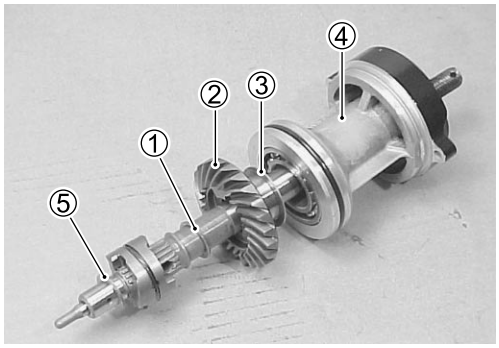
Align the holes in the shifter dog and push pin. Depress the push rod and slide the dog pin ⑥ through both dog and push pin.

Install the dog pin retaining spring ⑦, ensuring that it fits snugly into the groove on the dog shifter.



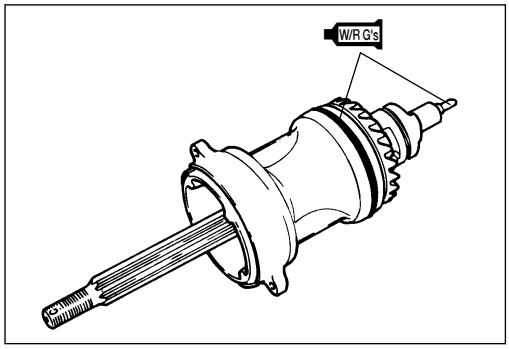
PROPELLER SHAFT / BEARING HOUSING

Assemble the propeller shaft in the following sequence : forward thrust washer ⑤, reverse thrust washer ①, reverse gear ②, reverse gear back-up shim ③ and propeller shaft housing ④.



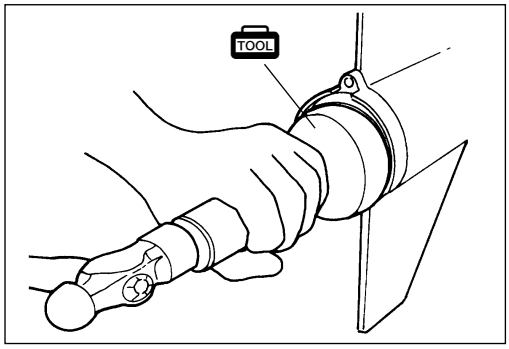
W/R G's **99000-25160 : Water Resistant Grease**
Gear OIL **99000-22540 : Suzuki Outboard Motor Gear Oil**

NOTE:
Before installing propeller shaft / bearing housing assembly, bring shift cam to the forward position by moving shift rod up or down.



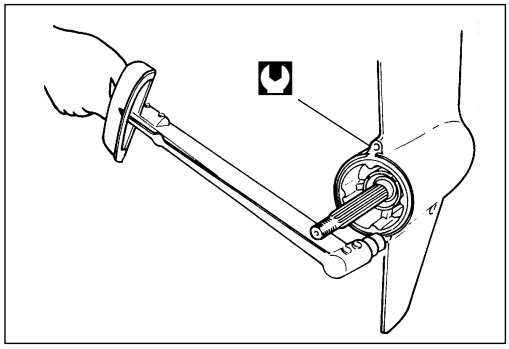
Using special tools, install the propeller shaft and housing assembly in the gear case.

TOOL **09922-59410 : Propeller shaft housing installer**
09922-59420 : Housing Installer Handle



When the housing is fully seated, tighten both retaining bolts to the specified torque.

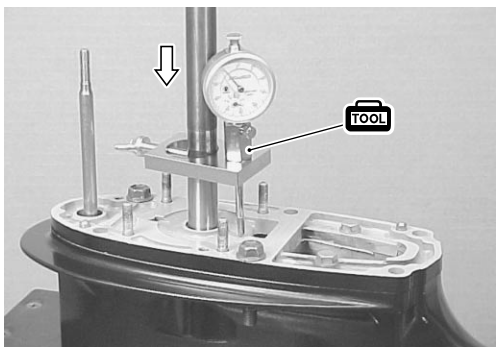
Bearing housing bolt : 8 N·m (0.8 kg-m, 5.8 lb.-ft.)



RECHECKING DRIVESHAFT THRUST PLAY

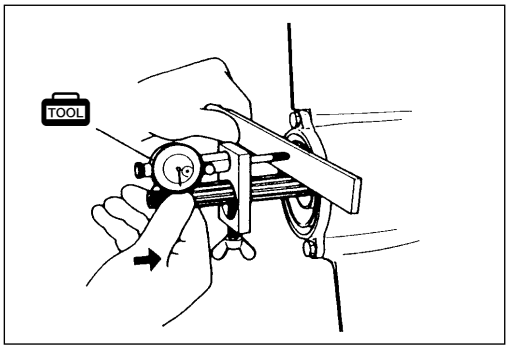
Recheck the driveshaft thrust play.
This should not be less than previously checked. If less, reduce the number / thickness of reverse gear back-up shims.

TOOL **09951-09511 : Gear adjusting gauge**



CHECKING PROPELLER SHAFT THRUST PLAY

See the "GEARS - SHIMMING AND ADJUSTMENT / CHECKING PROPELLER SHAFT THRUST PLAY" section on page 10-27.



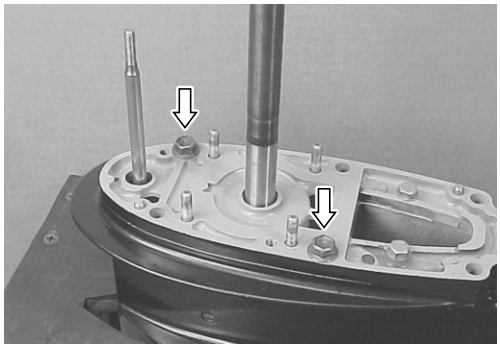
LEAKAGE CHECK

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

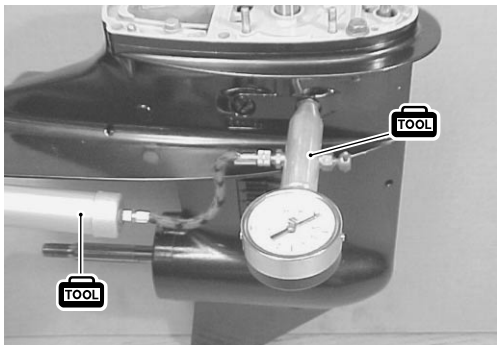
TOOL 09950-69511 : Oil leakage tester
: Air Pump

Procedure

1. Temporarily fasten the driveshaft bearing housing to gearcase using two bolts and nuts (placed through the two diagonally opposite gearcase mounting holes).
2. Install the test tool into the oil level hole.
3. Connect the air pump to the tester.
4. Rotate driveshaft and propeller shaft clockwise several times and then apply 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 specified pressure.



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

CAUTION

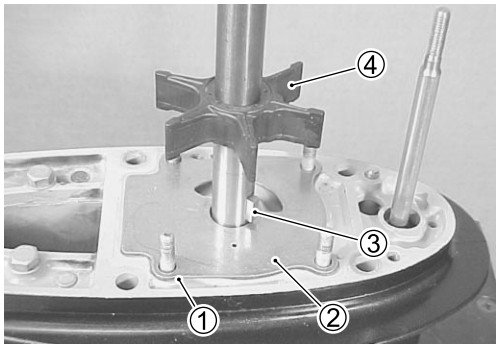
Do not exceed pressure of 110 kPa (1.1kg/cm², 15.6 psi) or damage to oil seals will result.

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

WATER PUMP (Impeller & Case)

Place the under panel gasket ① and under panel ② in position.

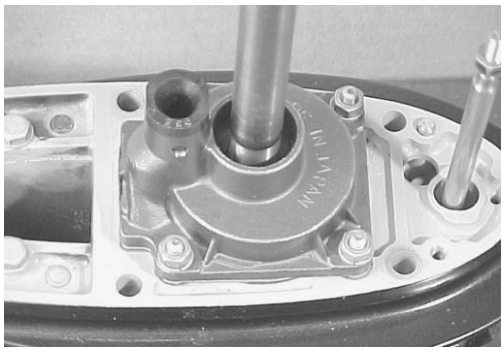
Insert the key ③ in the driveshaft and slide the impeller ④ onto driveshaft, ensuring that key and keyway are aligned.



Install the pump case ⑤ while rotating driveshaft clockwise to flex the impeller vanes in the correct direction.

Securely tighten the four (4) pump case nuts to the specified torque.

Pump case nut : 8 N·m (0.8 kg·m, 5.8 lb.-ft.)



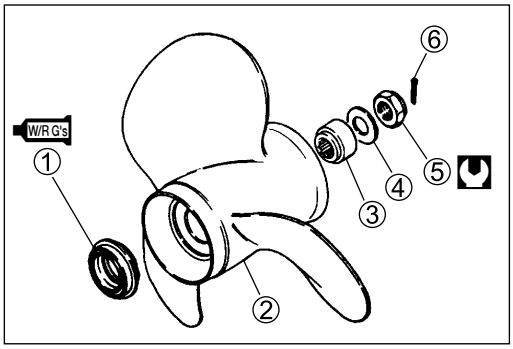
PROPELLER INSTALLATION

Apply Water Resistant Grease to the propeller shaft.
Install propeller stopper ①, propeller ②, spacer ③, washer ④ and nut ⑤ in turn.
Tighten the propeller nut to the specified torque.

99000-25160 : Water Resistant Grease

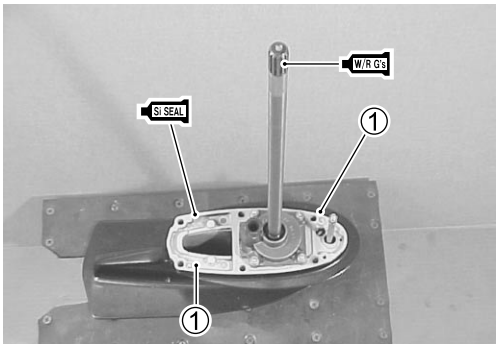
Propeller nut : 18 N·m (1.8 kg·m 13.0 lb.-ft.)

Push cotter pin ⑥ through nut and shaft, then bend to secure.



LOWER UNIT INSTALLATION

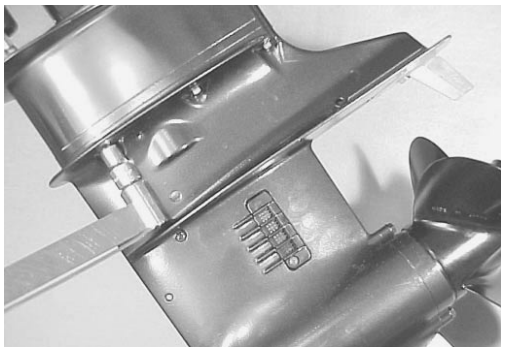
Insert dowel pins ①.



Coat the driveshaft splines with Water Resistant Grease.

Apply a light coat of Suzuki Silicone Seal to mating surfaces of gearcase and driveshaft housing.

Slide the lower unit ② into place, making sure that the top of the driveshaft engages properly with the crankshaft and that water tube locates in the water pump case outlet.



Apply Suzuki Silicone Seal to the retaining bolts ③ and tighten them to specified torque.

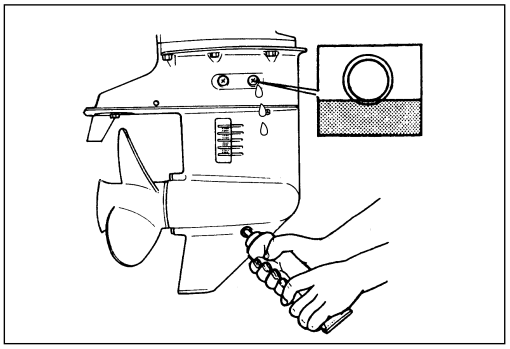
W/R G's 99000-25160 : Water Resistant Grease
Si SEAL 99000-31120 : Suzuki Silicone Seal
Gearcase bolt : 23 N · m (2.3 kg-m, 16.5 lb.-ft.)

NOTE:
Apply Suzuki Silicone Seal to the six (6) gearcase bolts.

GEAR OIL

Fill the gearcase with specified gear oil.
(See the "PERIODIC MAINTENANCE / GEAR OIL" section on page 2-6.)

Gear OIL 99000-22540 : Suzuki Outboard Motor Gear Oil

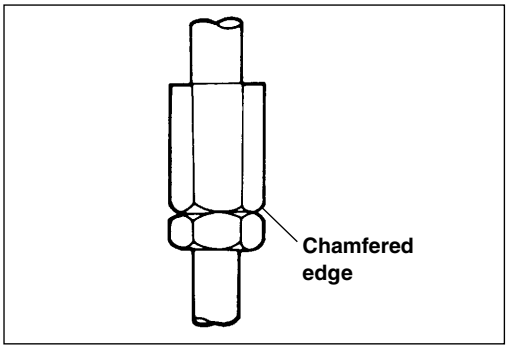


CLUTCH ADJUSTMENT

Connect clutch rod to shift rod as shown.

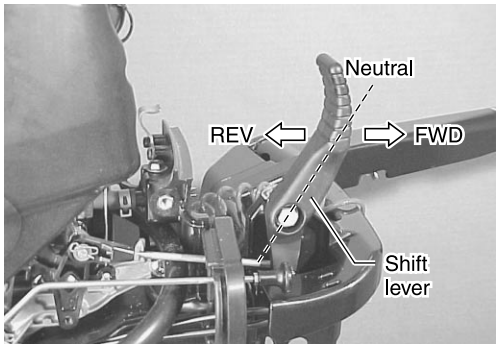
CAUTION

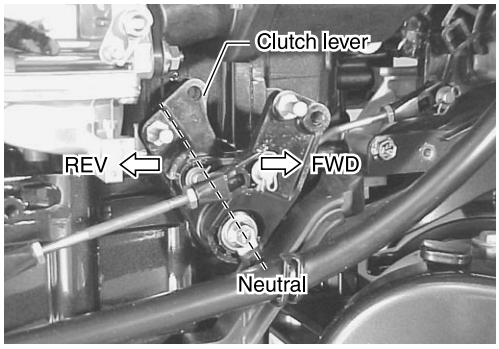
Make sure that chamfered edge of the turnbuckle faces downward to seat against the lower nut when tightened.

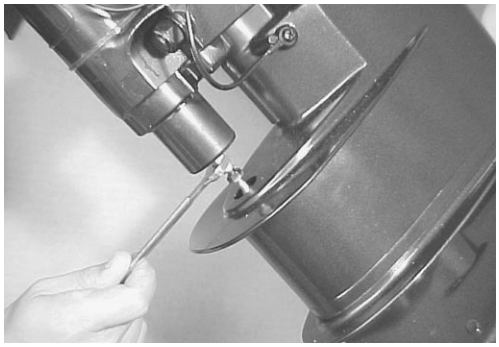


Adjustment step :

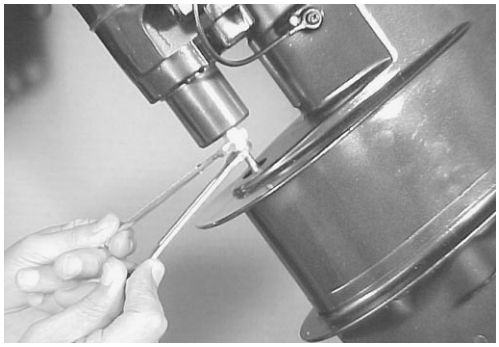
1. Shift the clutch lever from Neutral through Forward and Reverse to check that proper engagement of both gears is at an equal angle from Neutral.
   - If Forward gear engages earlier (at a smaller angle) than Reverse, the turnbuckle should be rotated clockwise until both gears engage with the same amount of clutch lever travel.
   - If Reverse gear engages earlier than Forward, the turnbuckle should be rotated counterclockwise.







2. Lock the lower nut securely against the turnbuckle when clutch lever adjustment is correct.



TRIM TAB

The trim tab counteracts or minimizes propeller torque “pull” felt through the steering system.

If the steering is pulled to starboard or port side, adjust trim tab with following procedure:

Adjusting

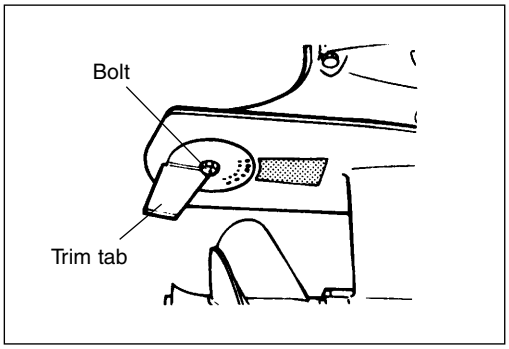
1. Loosen the bolt of trim tab.

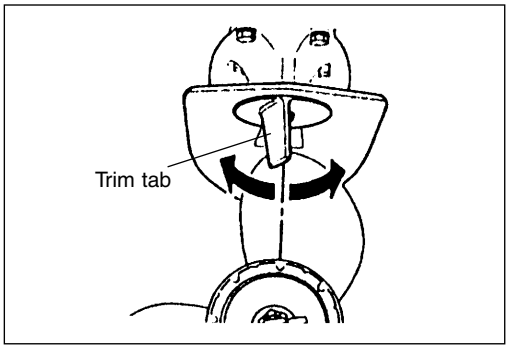
2. Change the direction of trim tab.
   - To compensate for a veer to starboard, set trailing edge of tab to the right (as viewed from behind).
   - To compensate for a veer to port, set trailing edge of tab to the left.

3. Tighten the bolt of trim tab.

4. Test ride the boat and repeat the procedure 1– 3 to set the trim tab in the best position.

With a properly adjusted trim tab, steering should be neutral and there should be no tendency for the steering to be pulled to either port or starboard.



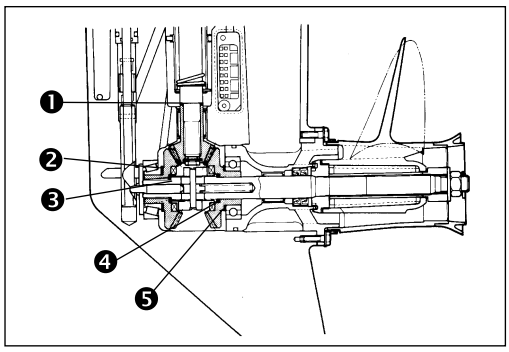


LOWER UNIT GEARS- SHIMMING AND ADJUSTMENT

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

Shim / Washer & Mounting position

	Numerical index / item	Available thickness (mm)	Design specification Thickness (mm)
❶	Pinion gear back up shim	1.7, 1.8, 1.9, 2.0, 2.1, 2.2	2.0
❷	Forward gear back up shim	0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1,5	1.2
❸	Forward gear thrust washer	2.0	2.0
❹	Reverse gear thrust washer	1.6, 1.8, 2.0, 2.2, 2.4, 2.6	2.0
❺	Reverse gear back up shim	0.2, 0.5, 0.8, 1.0	1.5



FORWARD GEAR / PINION GEAR

Follow the procedure below to adjust forward gear / pinion gear.

Step to prior to adjustment

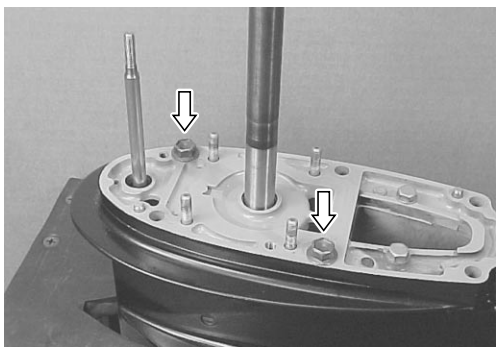
1. Correctly assemble driveshaft bearing housing, driveshaft, forward gear, pinion gear and related components (see page 10-14 to 10-16).

NOTE:
When installing forward gear back-up shim, choose shim thinner than design specification for calculating adjustment.

2. Tighten pinion nut to specified torque.

Pinion nut : 18 N·m (1.8 kg-m, 13.0 lb.-ft.)

3. Temporarily fasten the driveshaft bearing housing to the gearcase with two bolts and nuts.
   Place the bolts diagonally to the lower unit mounting hole.

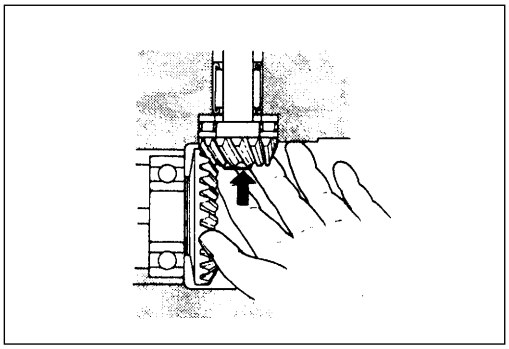


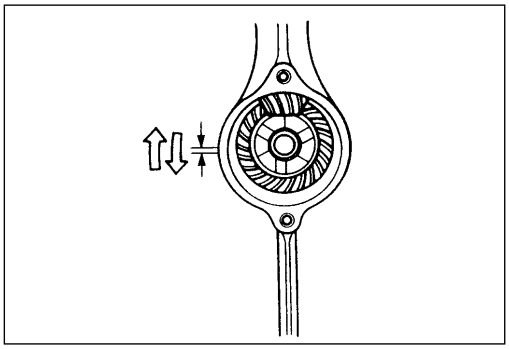
Adjusting gear backlash

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, thickness of forward gear back-up shim must be increased.
- If backlash is smaller, back-up shim thickness must be decreased.

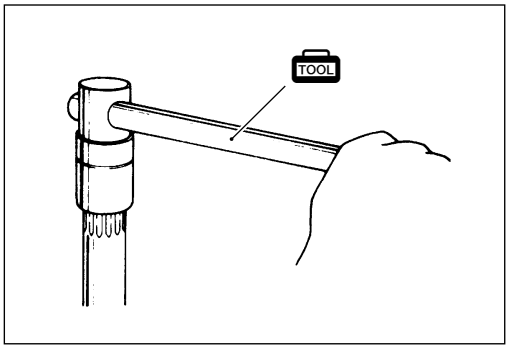




Checking and adjusting tooth contact pattern (Pinion and Forward gear)

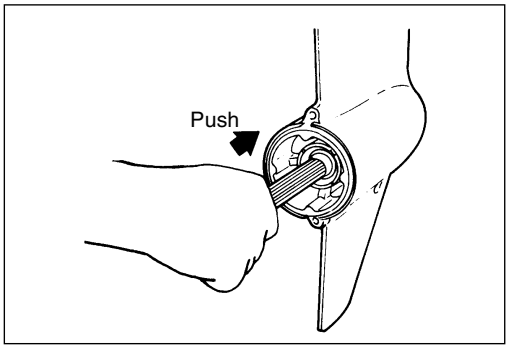
Check tooth contact pattern by using the following procedure:

1. To assess tooth contact, apply a light coat of Prussian Blue on the convex surface of forward gear.

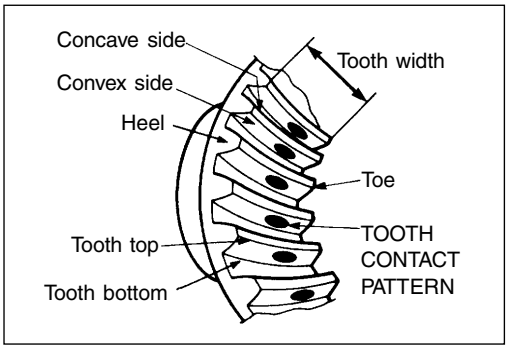


2. Install propeller shaft and housing assembly (minus reverse gear and internal components).
3. Push propeller shaft inward and hold in position.
4. Using driveshaft holder tool, rotate the driveshaft 5 - 6 times.

TOOL **09921-29510 : Driveshaft holder**



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



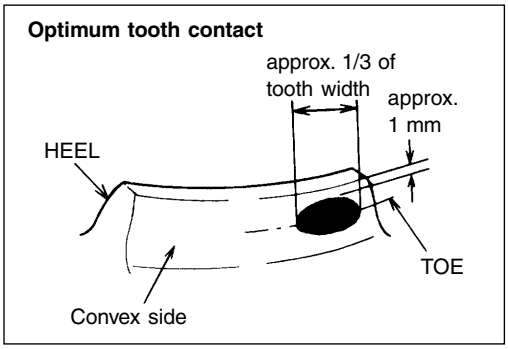
Optimum tooth contact

The optimum tooth contact is shown at right.

A shim adjustment may be necessary to obtain this contact pattern.

CAUTION

The backlash of the gear should be checked when increasing or decreasing the thickness of the shim to adjust tooth contact.



Example(1)

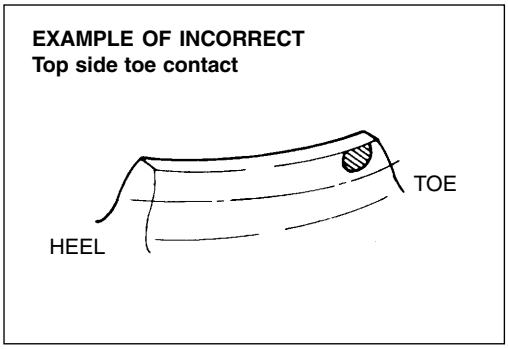
Incorrect topside toe contact:

Correction measures:

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

CAUTION

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



Example(2)

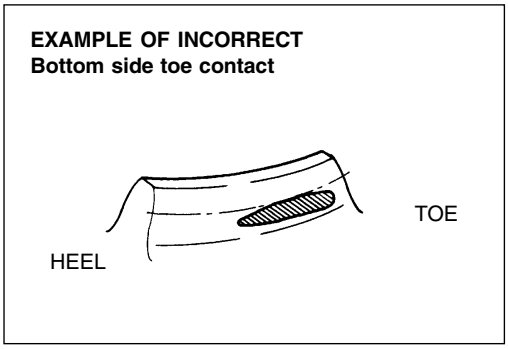
Incorrect bottom side toe contact:

Correction measures:

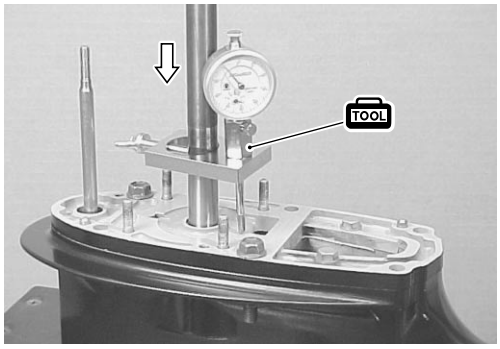
- Increase thickness of forward gear shim.
- Slightly decrease pinion gear shim thickness.

CAUTION

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



CHECKING DRIVESHAFT THRUST PLAY



After obtaining optimum tooth contact, driveshaft thrust play should be measured.

1. Affix gear adjusting gauge to driveshaft.

TOOL **09951-09511 : Gear adjusting gauge**

2. Slowly push driveshaft downward.
   Read the maximum play. Designate this amount of play as (A).

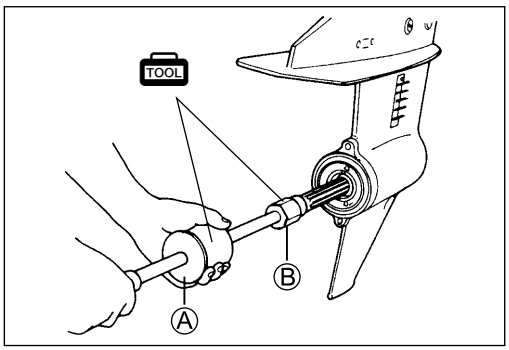
Driveshaft thrust play : Approx. 0.20 – 0.40 mm (0.008 – 0.016 in.)

NOTE:

Driveshaft thrust play (A) must be known to adjust reverse gear shim.

RECHECKING DRIVESHAFT THRUST PLAY
(Reverse gear back-up shim adjustment)

1. After adjusting forward gear tooth contact pattern, correctly assemble propeller shaft, housing assembly, reverse gear and related components (see page 10-16 to 10-17).



2. Screw sliding hammer assembly onto propeller shaft and strike a few gentle outward taps.

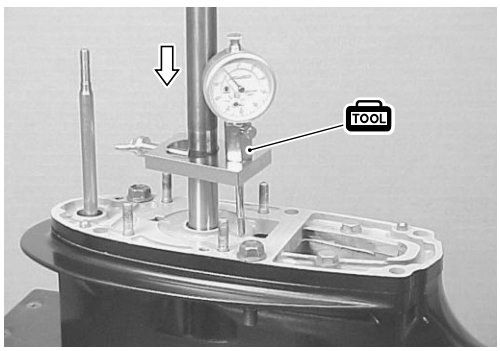
TOOL **09950-59310 : Propeller shaft remover – Ⓑ**
09930-30104 : Sliding hammer – Ⓐ

3. Affix gear adjusting gauge to driveshaft.

TOOL **09951-09511 : Gear adjusting gauge**

4. Push shaft downward and read maximum play. Designate this measurement as play (B).

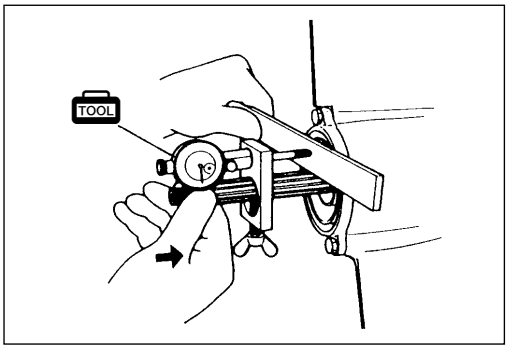
5. Compare play (B) to play (A)(page 10-26).



6. Reverse gear back-up shim adjustment is correct if (B) is equal to (A).
   - If (B) is less than (A), reduce reverse gear back-up shim thickness.

CHECKING PROPELLER SHAFT THRUST PLAY

After adjusting all gear positions, measure the propeller shaft thrust play. if not within the following specification, a shim adjustment is required.



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

NOTE:
Maintain the forward gear thrust washer at standard thickness (2.0 mm) and adjust only the reverse gear thrust washer with shim.

Measurement step:

1. Assemble gear adjusting gauge to the propeller shaft.

TOOL **09951-09511 : Gear adjusting gauge**

2. Push propeller shaft inward.

3. Hold shaft in and set dial gauge pointer to zero.

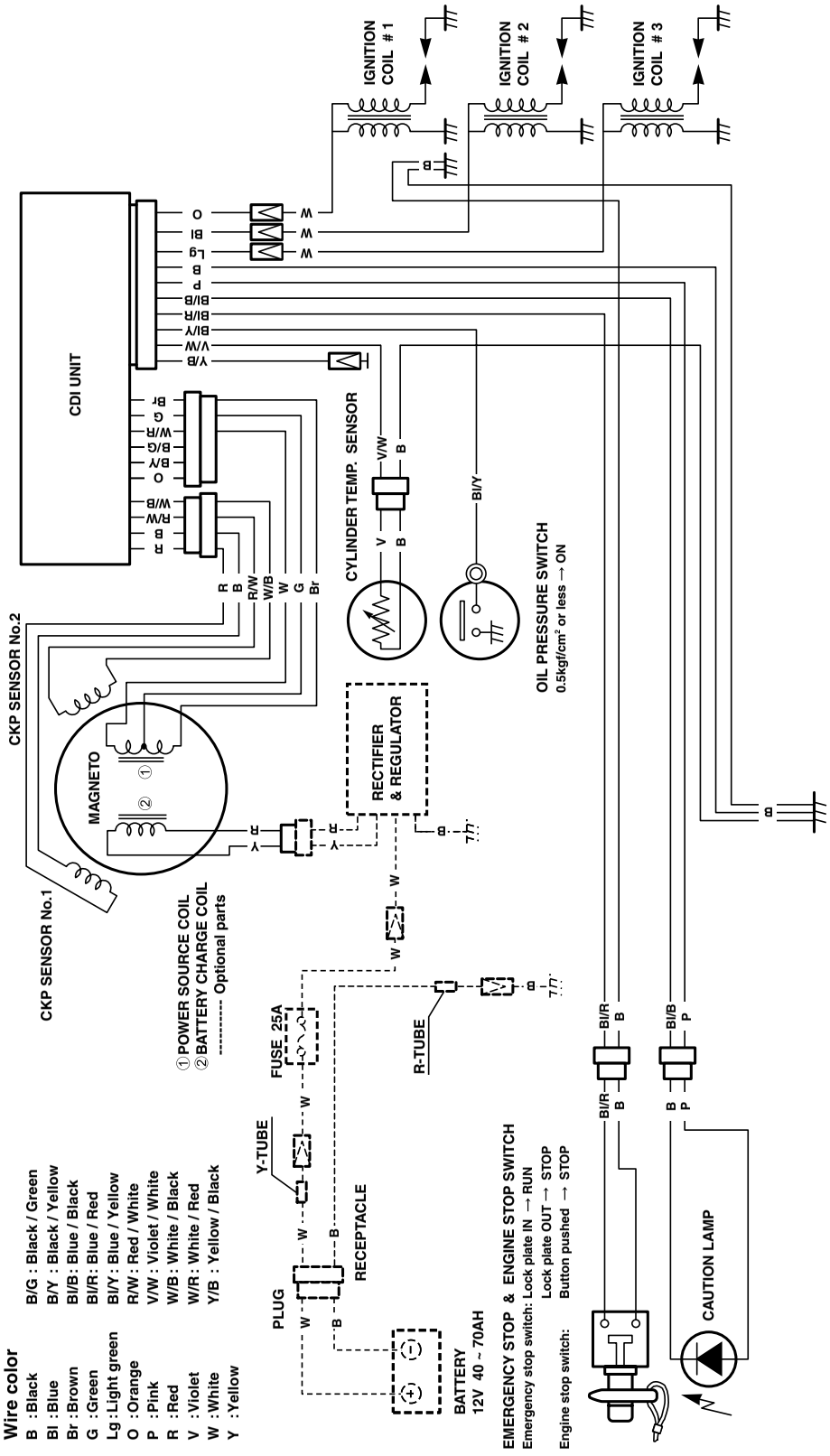
4. Slowly pull shaft outward and read the maximum thrust play on the dial.
   - If measurement is more than specification, increase reverse gear thrust washer thickness.
   - If measurement is less than specification, reduce reverse gear thrust washer thickness.

WIRE / HOSE ROUTING

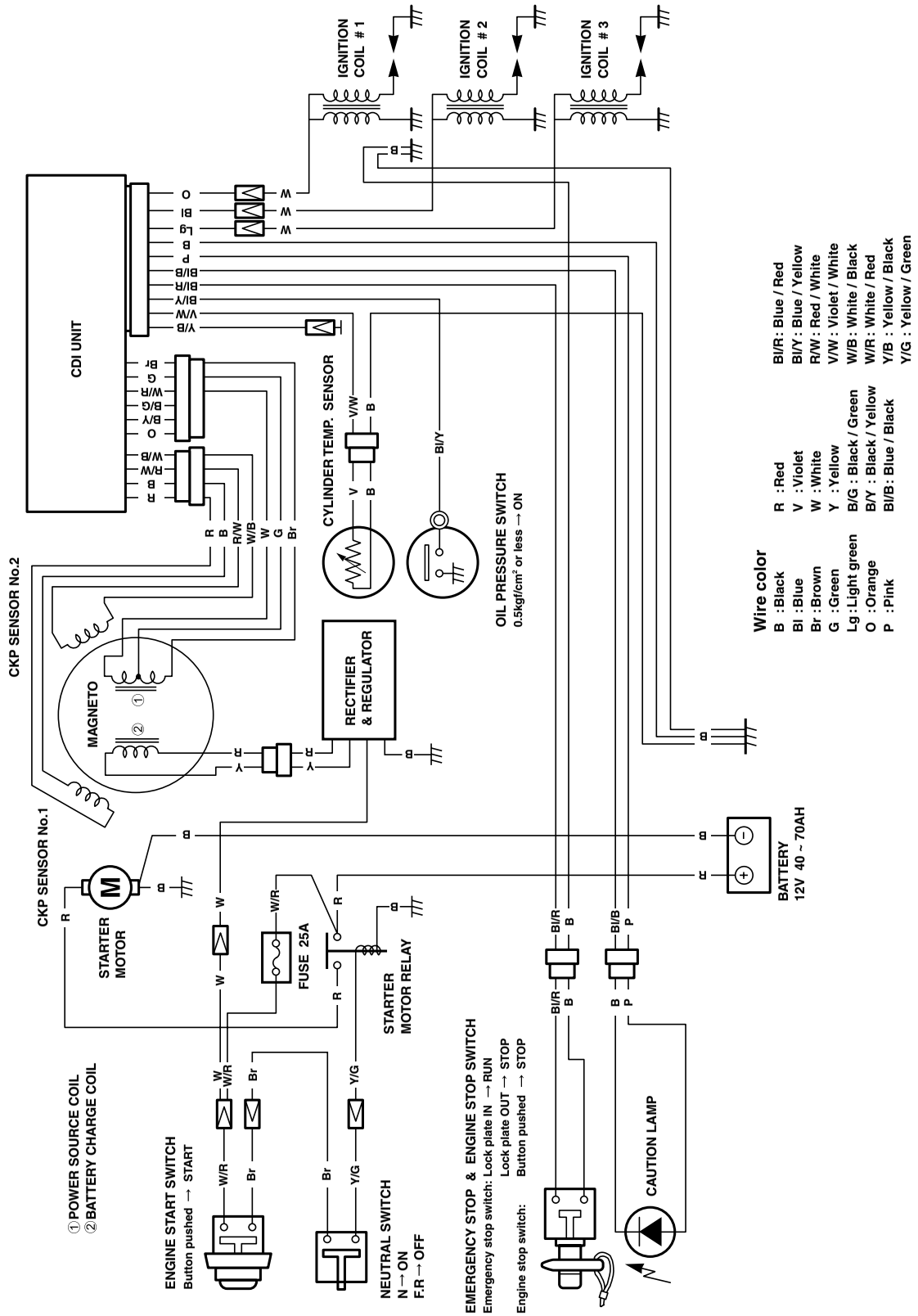
CONTENTS

WIRING DIAGRAM

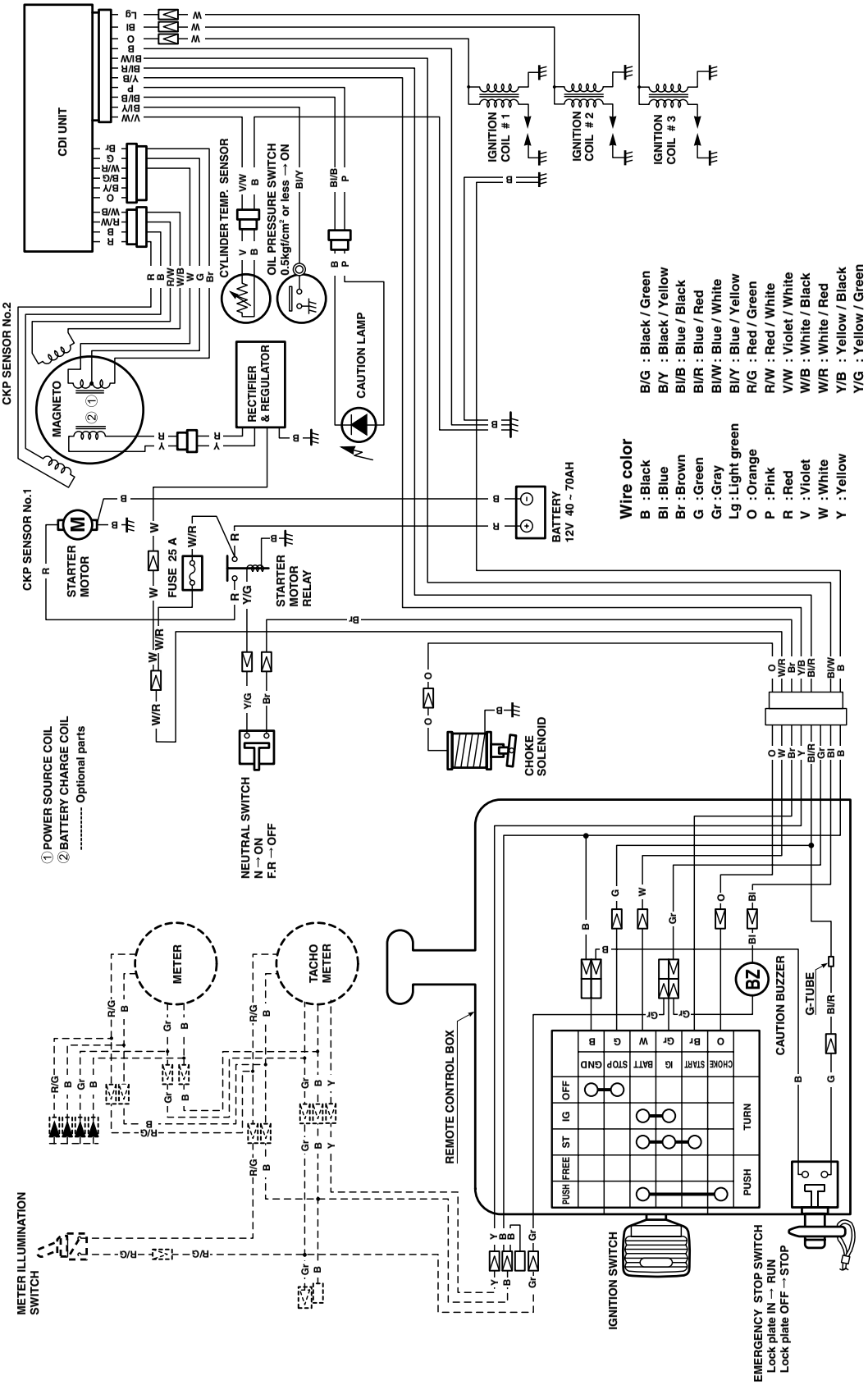
DF25Q / DF30Q



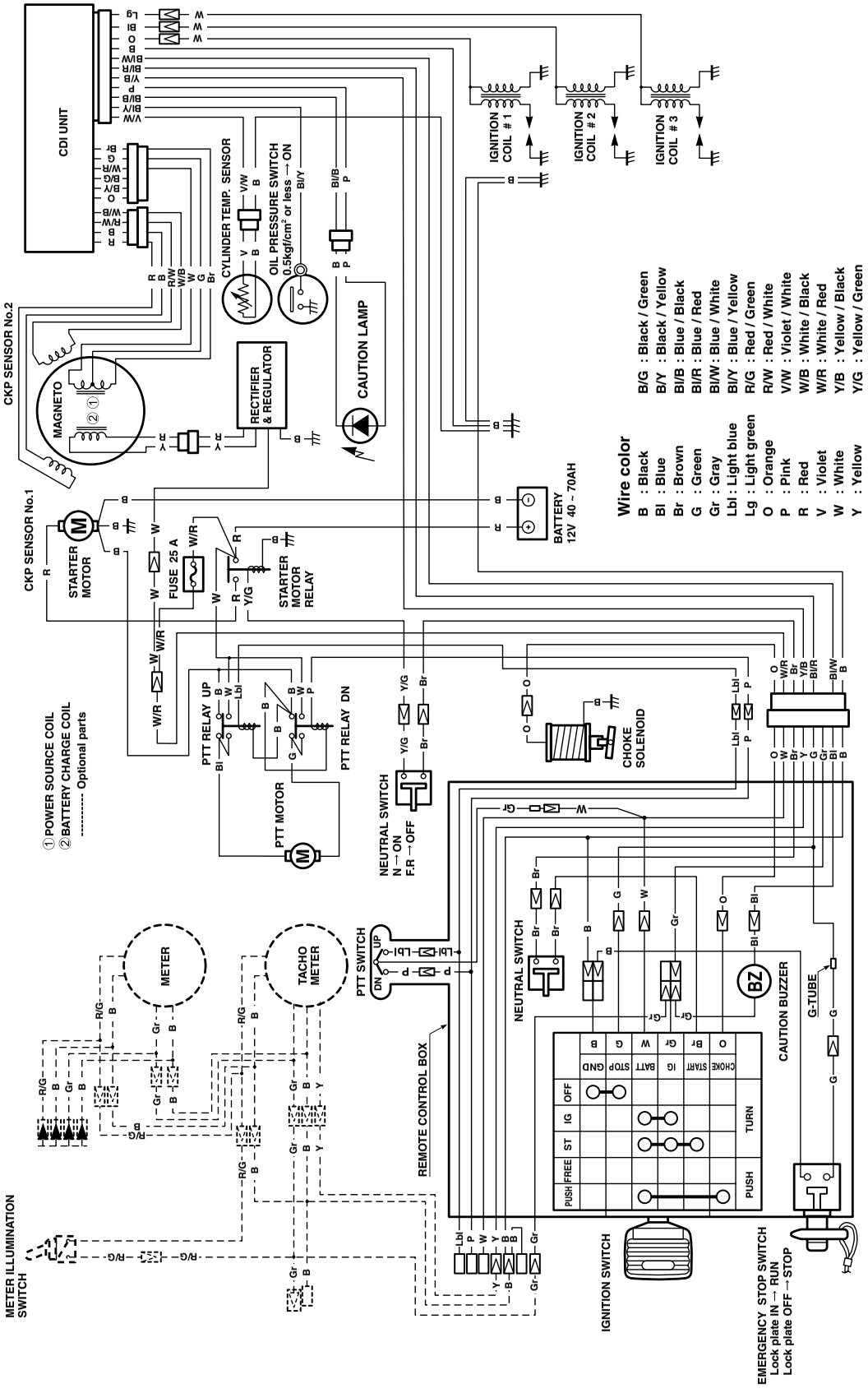
DF25QE /DF30QE



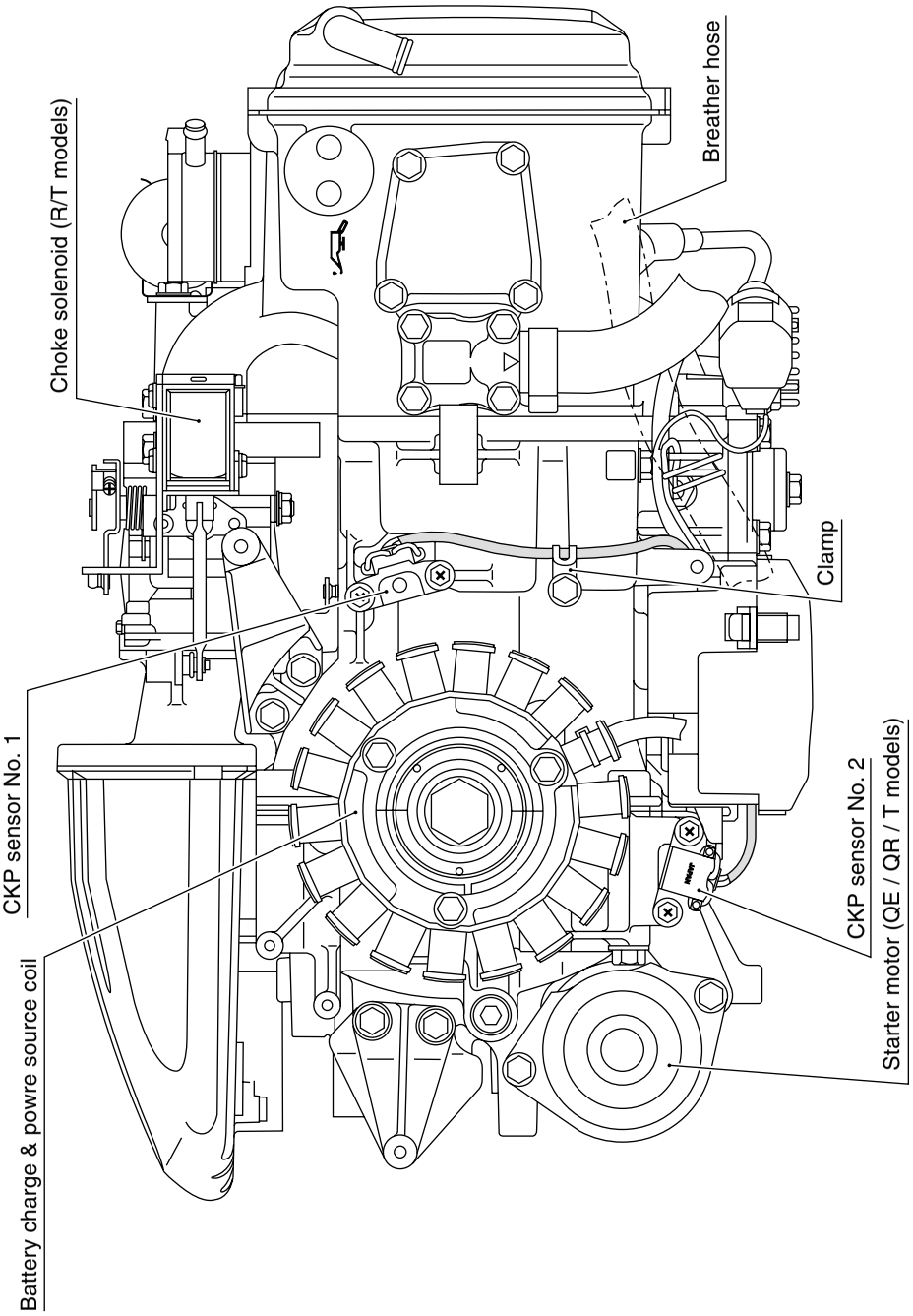
DF25QR / DF30QR



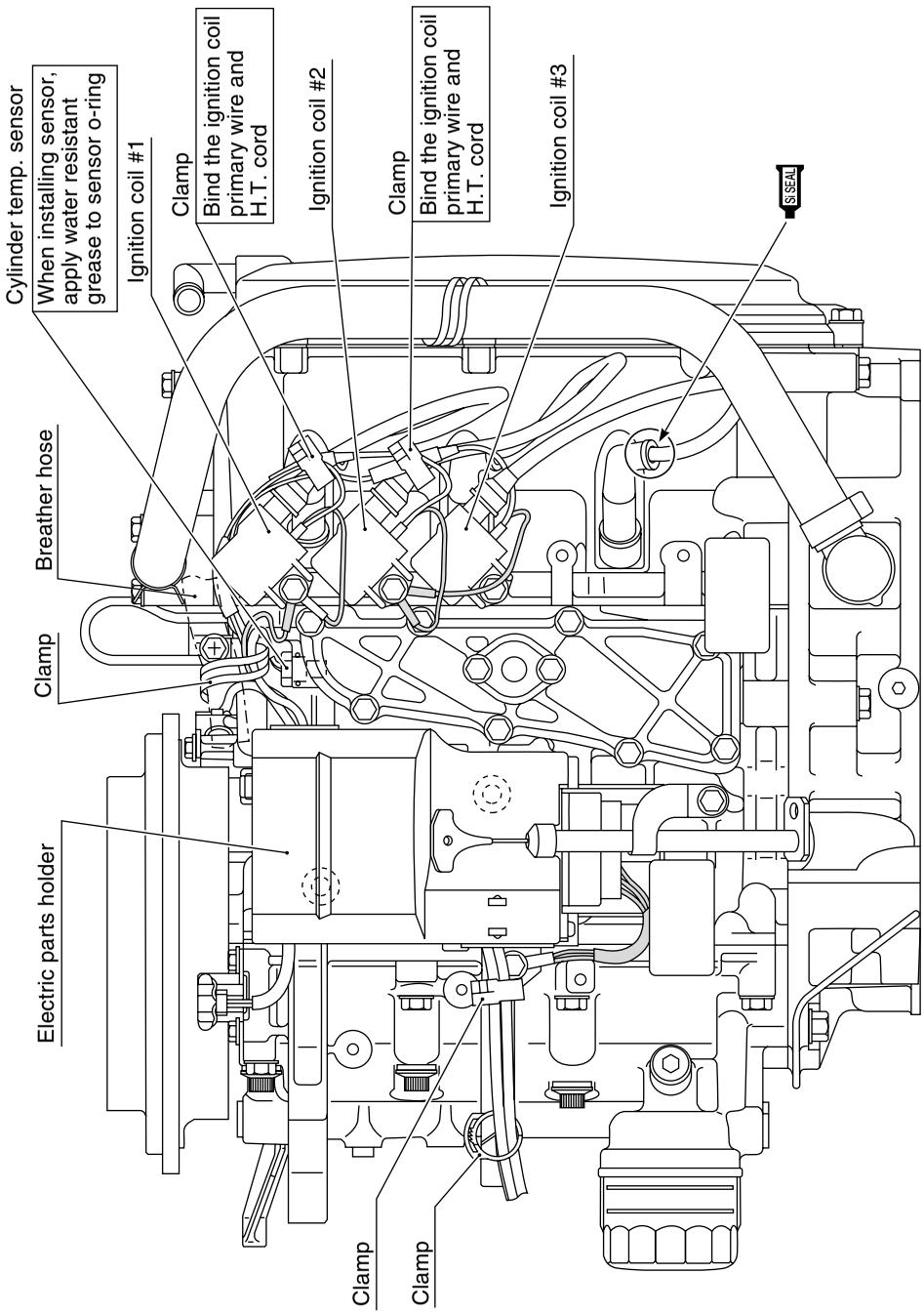
DF25T / DF30T


CDI UNIT
IGNITION COIL #1
IGNITION COIL #2
IGNITION COIL #3
CYLINDER TEMP. SENSOR
OIL PRESSURE SWITCH
0.5kgf/cm² or less → ON
CAUTION LAMP
CKP SENSOR No.2
MAGNETO
RECTIFIER & REGULATOR
CKP SENSOR No.1
STARTER MOTOR
FUSE 25 A
STARTER MOTOR RELAY
BATTERY 12V 40 ~ 70AH
PTT RELAY UP
PTT RELAY DN
PTT MOTOR
CHOKE SOLENOID
NEUTRAL SWITCH N → ON F.R → OFF
PTT SWITCH
METER
TACHO METER
REMOTE CONTROL BOX
NEUTRAL SWITCH
CAUTION BUZZER
G-TUBE
METER ILLUMINATION SWITCH
IGNITION SWITCH
EMERGENCY STOP SWITCH
Lock plate IN → RUN
Lock plate OFF → STOP
① POWER SOURCE COIL
② BATTERY CHARGE COIL
Optional parts
Wire color
B : Black
Bl : Blue
Br : Brown
G : Green
Gr : Gray
Lbl : Light blue
Lg : Light green
O : Orange
P : Pink
R : Red
V : Violet
W : White
Y : Yellow
B/G : Black / Green
B/Y : Black / Yellow
Bl/B : Blue / Black
Bl/R : Blue / Red
Bl/W : Blue / White
Bl/Y : Blue / Yellow
R/G : Red / Green
R/W : Red / White
V/W : Violet / White
W/B : White / Black
W/R : White / Red
Y/B : Yellow / Black
Y/G : Yellow / Green

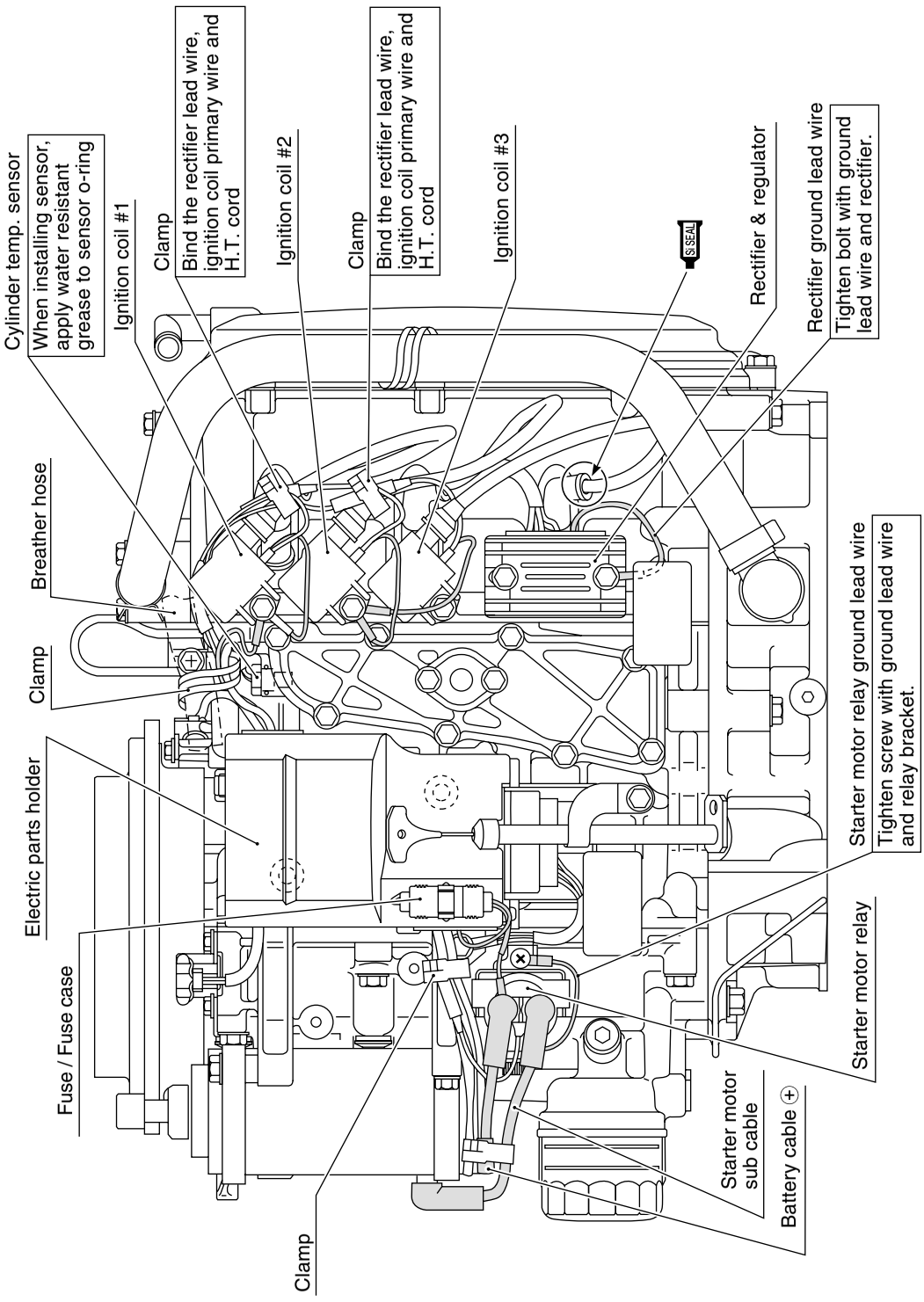
WIRE ROUTING



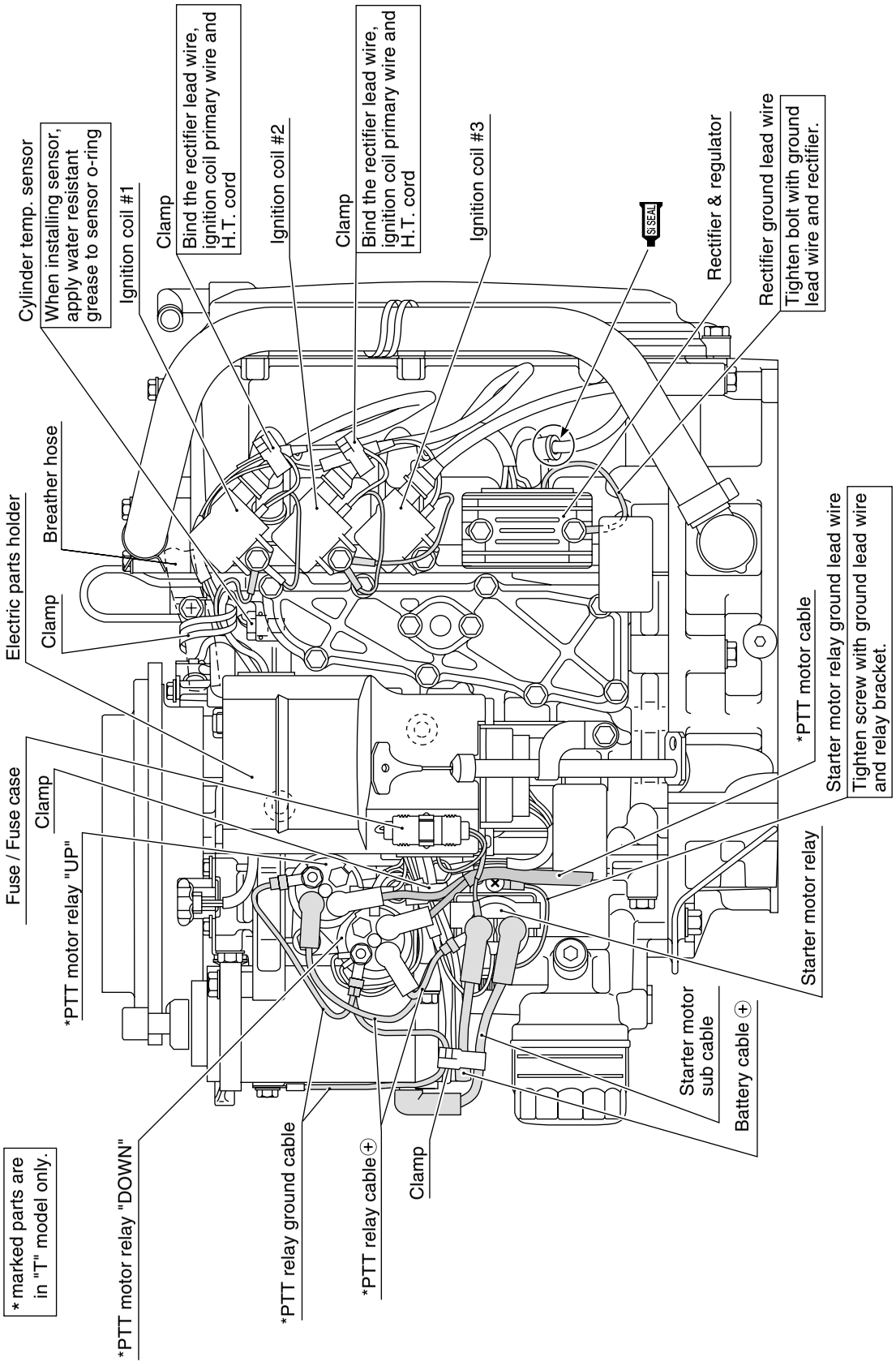
DF25Q/DF30Q


Cylinder temp. sensor
When installing sensor, apply water resistant grease to sensor o-ring
Ignition coil #1
Clamp
Bind the ignition coil primary wire and H.T. cord
Ignition coil #2
Clamp
Bind the ignition coil primary wire and H.T. cord
Ignition coil #3
SI SEAL
Breather hose
Clamp
Electric parts holder
Clamp
Clamp

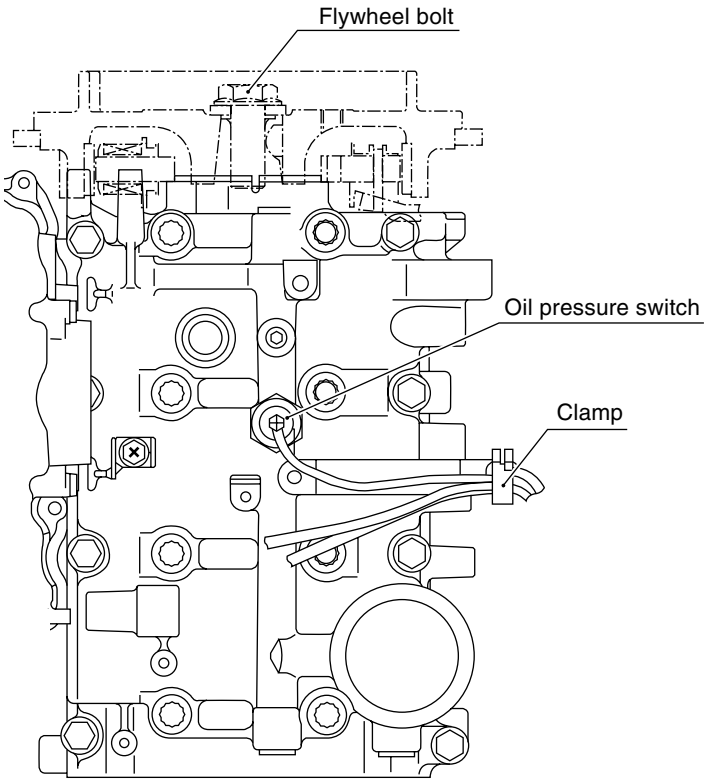
DF25QE / DF30QE



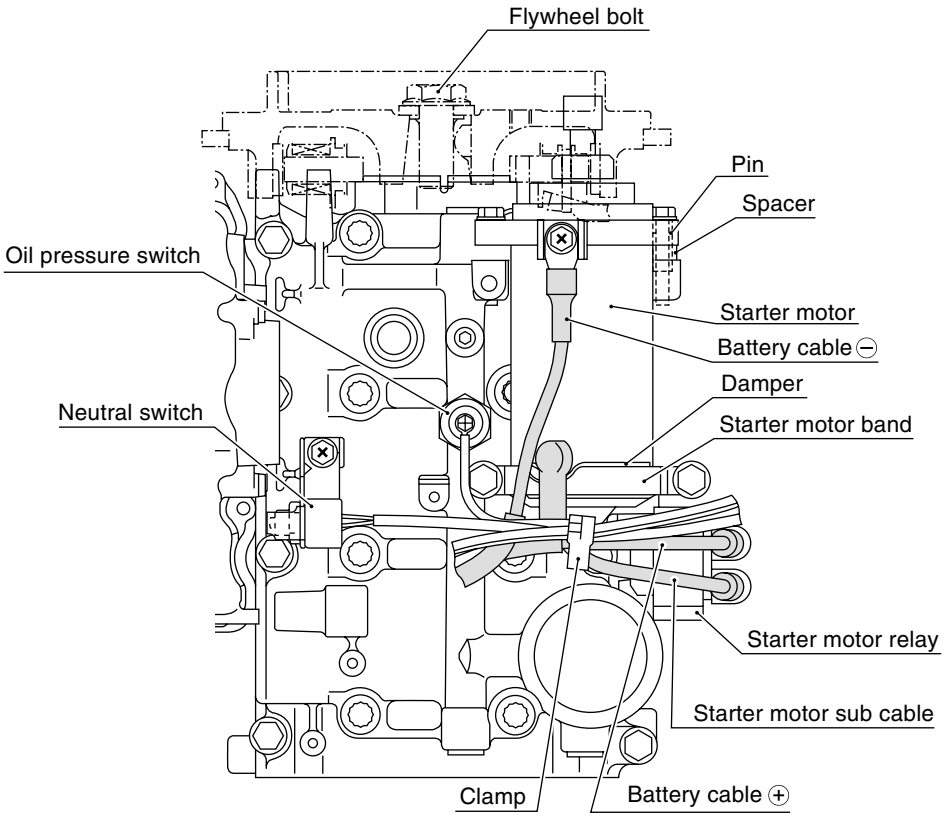
DF25QR / DF30QR, DF25T / DF30T



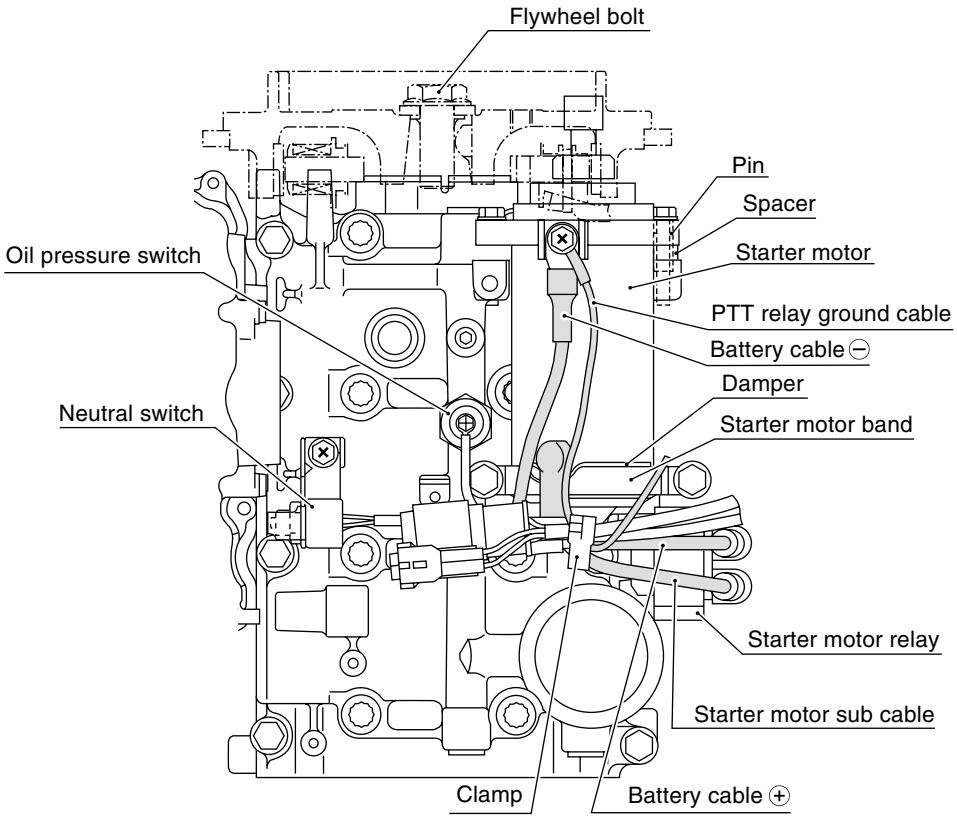
DF25Q / DF30Q



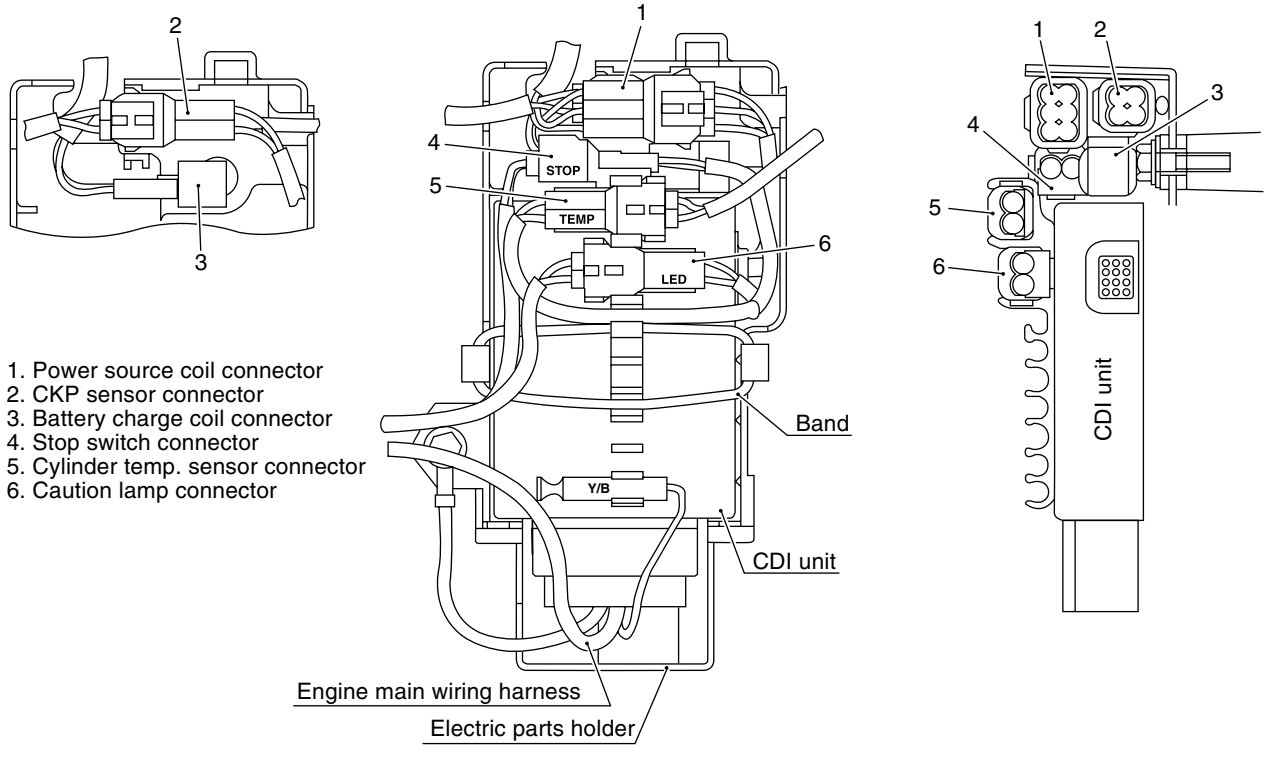
DF25QE / DF30QE



DF25QR / DF30QR, DF25T / DF30T

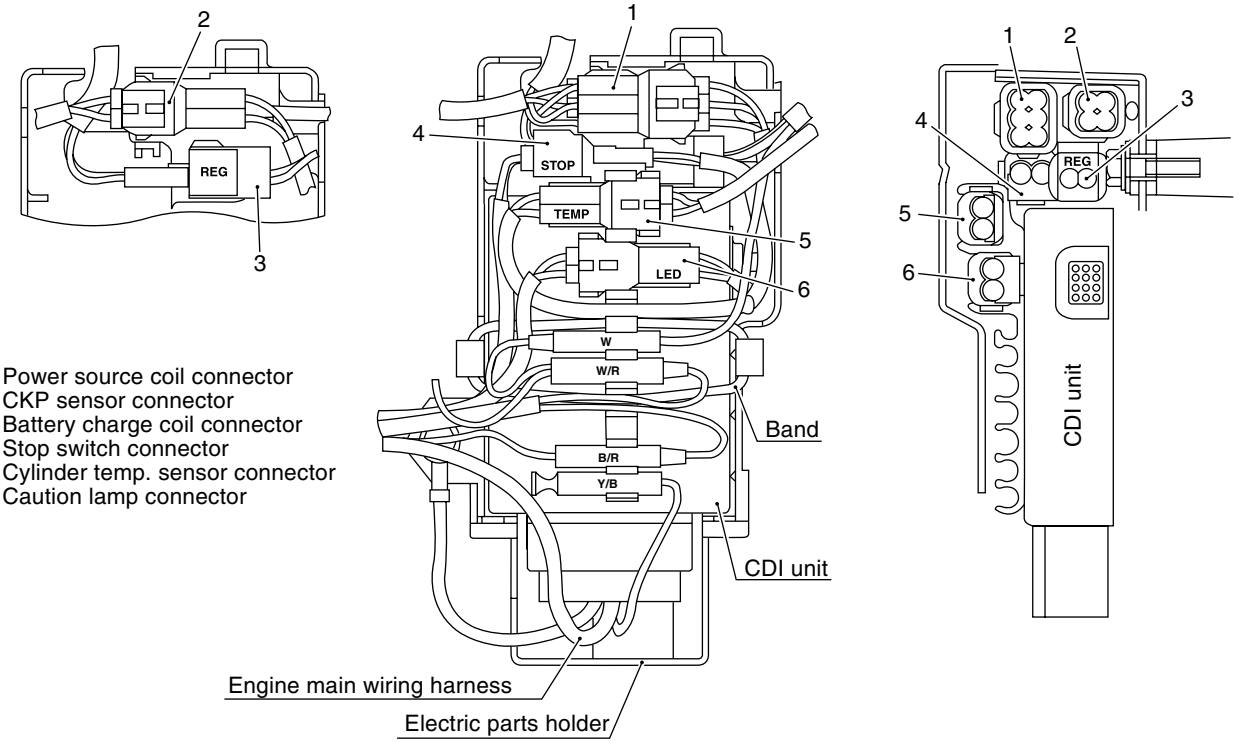


DF25Q / DF30Q



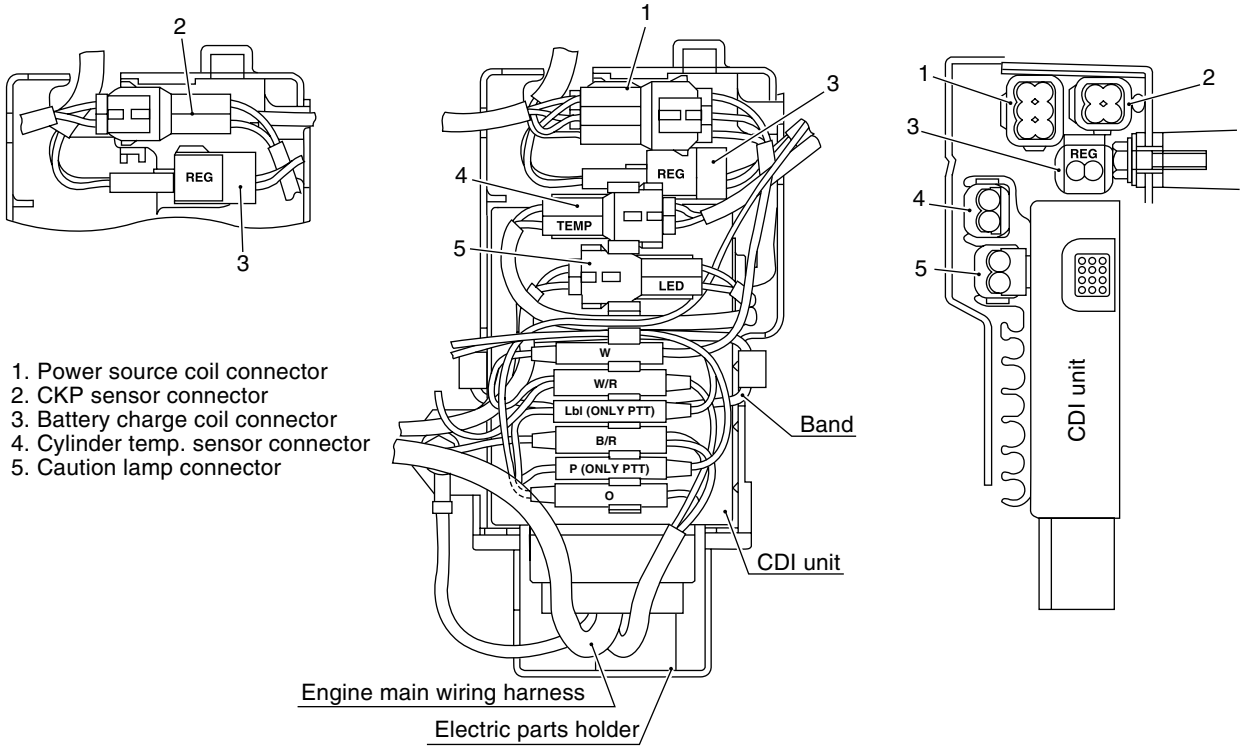
1. Power source coil connector
2. CKP sensor connector
3. Battery charge coil connector
4. Stop switch connector
5. Cylinder temp. sensor connector
6. Caution lamp connector

DF25QE / DF30QE



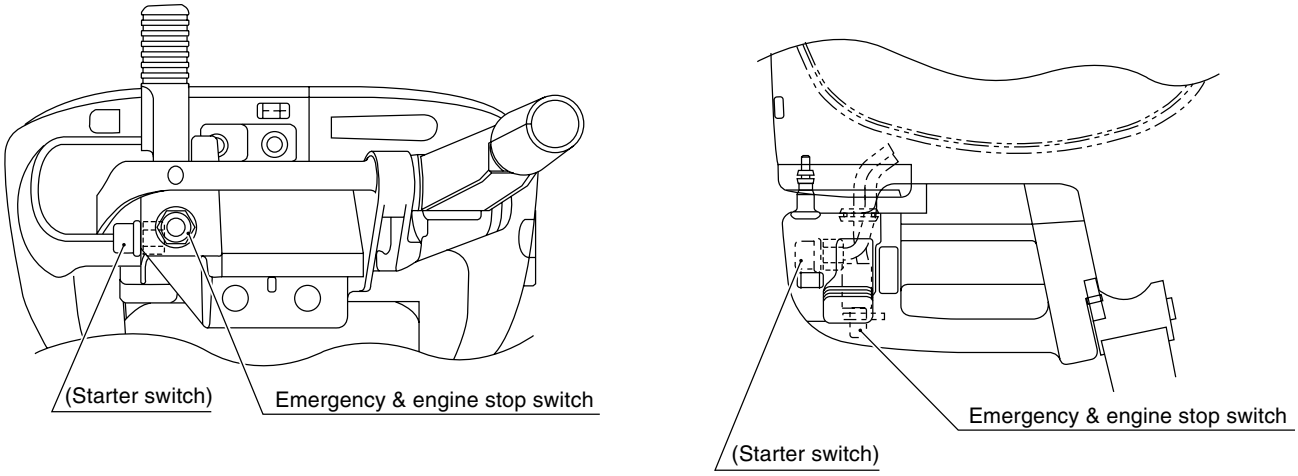
1. Power source coil connector
2. CKP sensor connector
3. Battery charge coil connector
4. Stop switch connector
5. Cylinder temp. sensor connector
6. Caution lamp connector

DF25QR / DF30QR, DF25T / DF30T

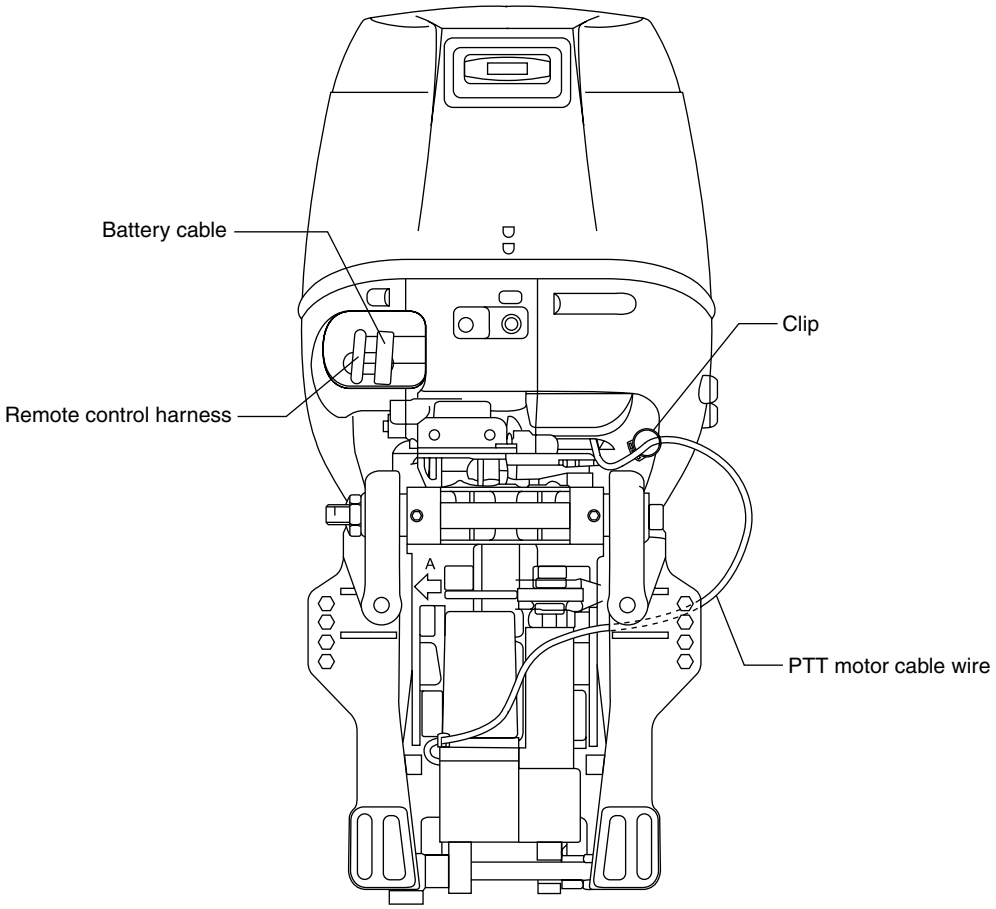


1. Power source coil connector
2. CKP sensor connector
3. Battery charge coil connector
4. Cylinder temp. sensor connector
5. Caution lamp connector

DF25Q / DF30Q, DF25QE / DF30QE



DF25T / DF30T

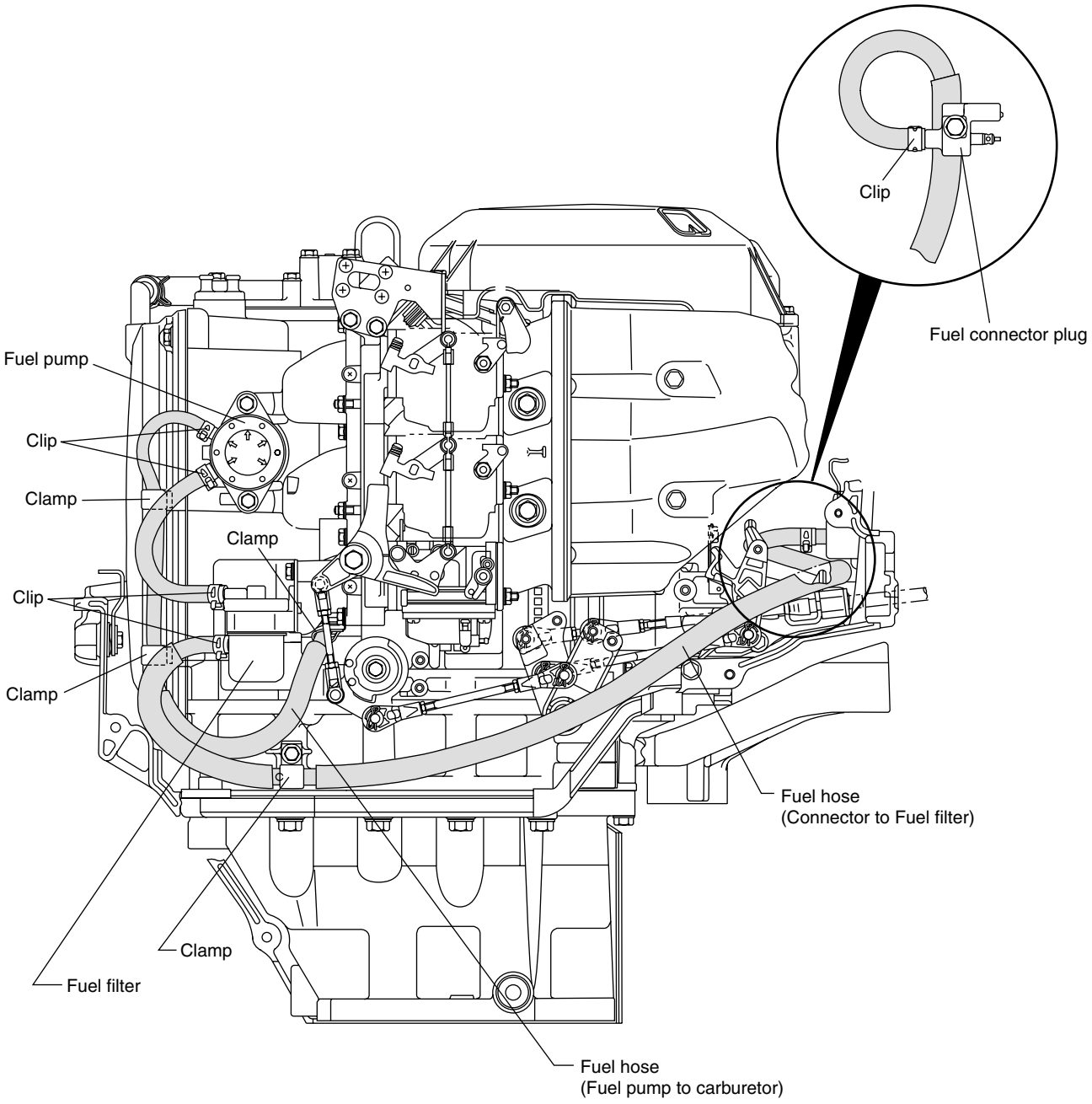


FUEL / WATER HOSE ROUTING

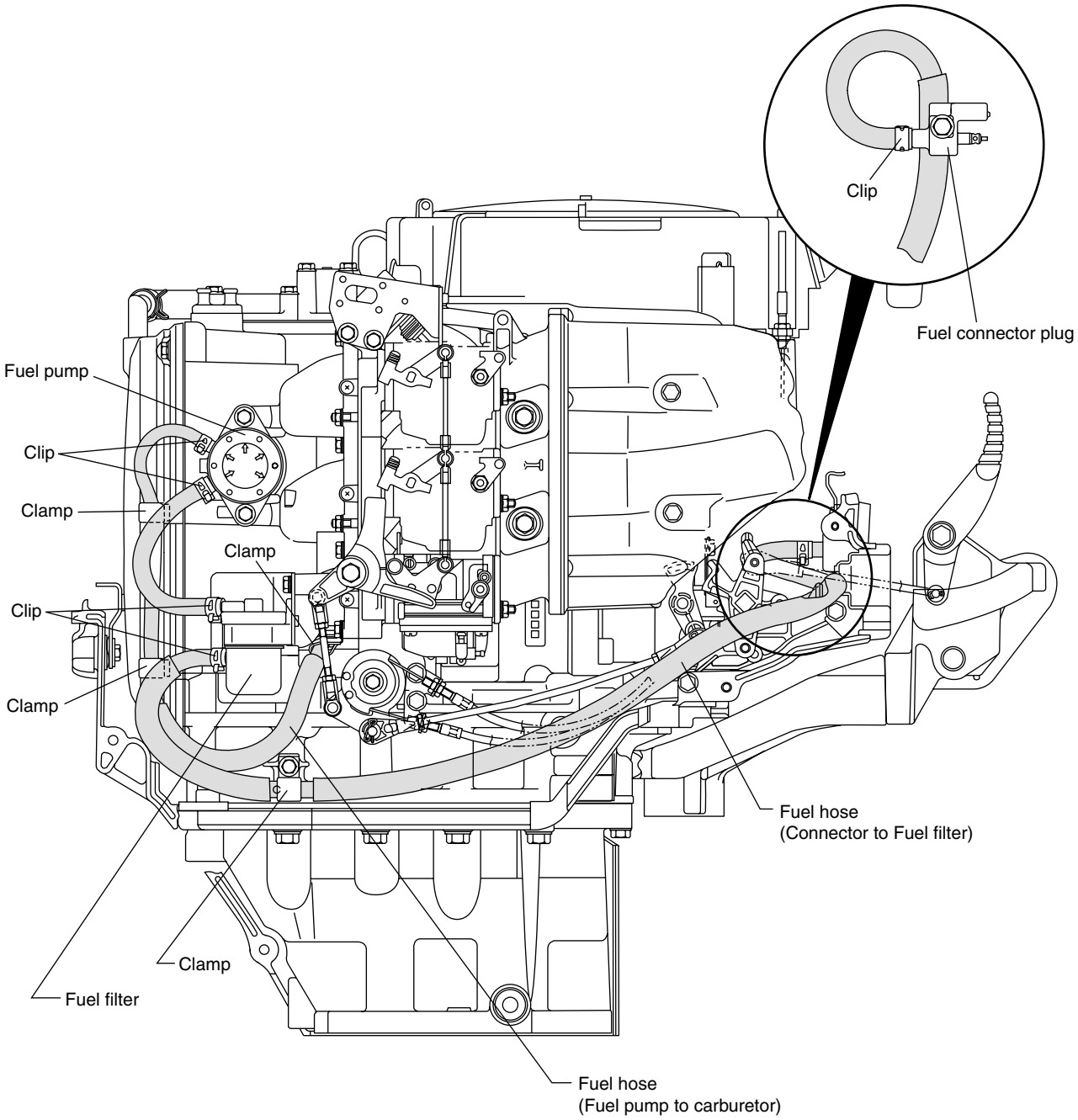
CAUTION

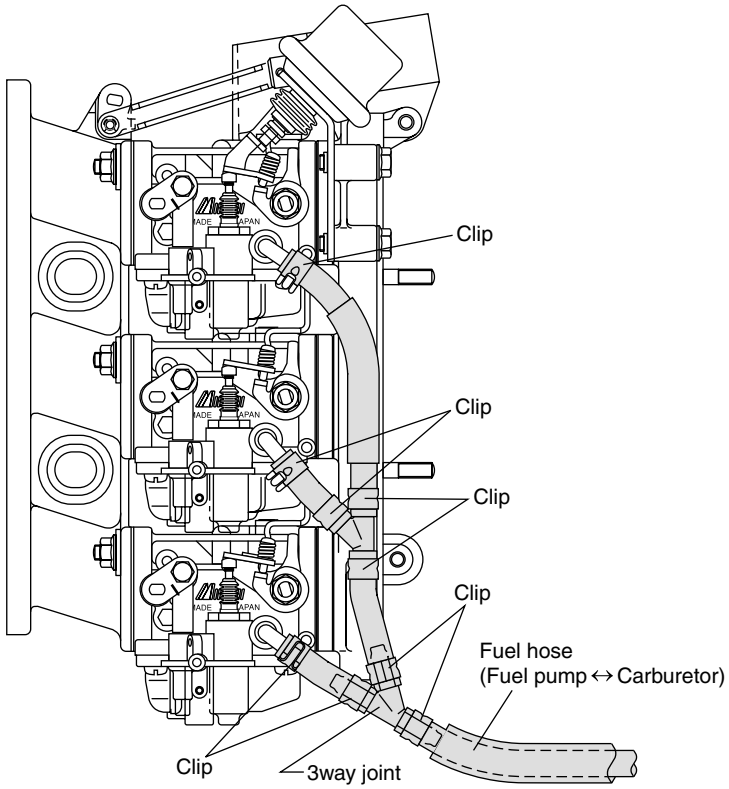
- **Do not over-bend (kink) or twist hoses when installing.**
- **When installing hose clips, position tabs to avoid contact with other parts.**
- **Check that hoses do not contact rods and levers during either engine operation or standstill.**
- **Extreme care should be taken not to cut, abrade or cause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

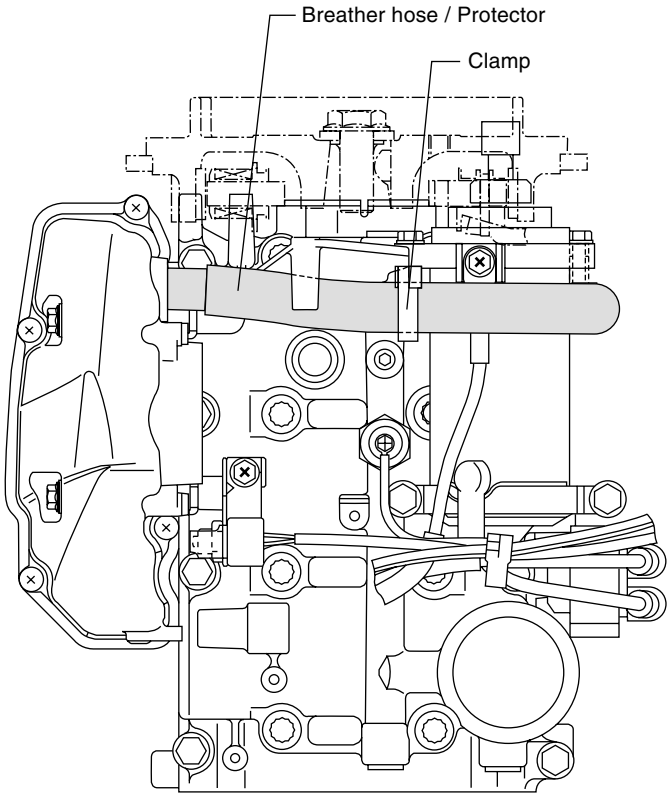
DF25QR / DF30QR, DF25T / DF30T

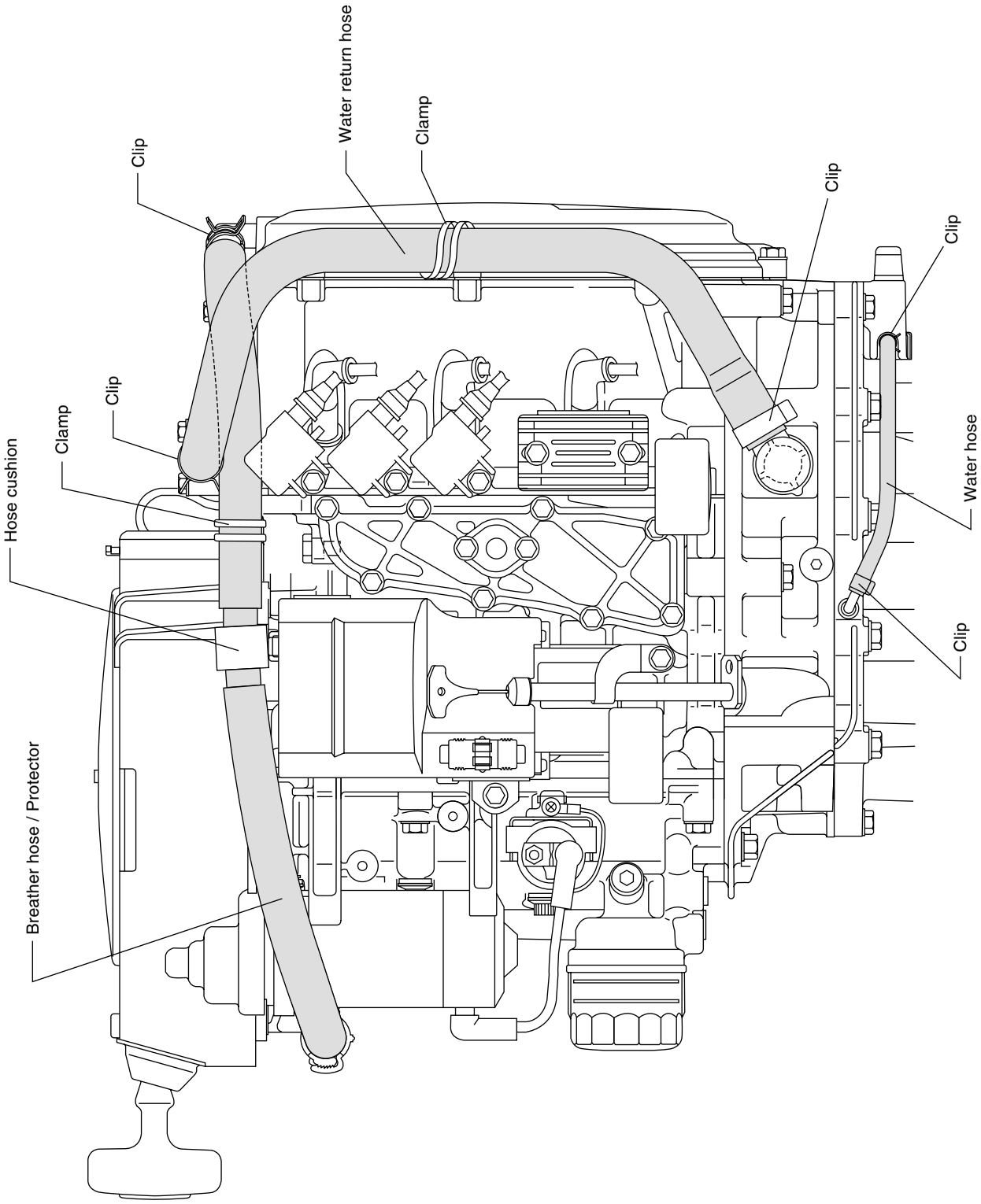


DF25Q / DF30Q, DF25QE / DF30QE




Clip
Clip
Clip
Clip
Fuel hose
(Fuel pump ↔ Carburetor)
Clip
3way joint


Breather hose / Protector
Clamp


Water return hose
Clamp
Clip
Clip
Clip
Clip
Clamp
Clip
Hose cushion
Water hose
Clip
Breather hose / Protector

DF25/30 “K3” (2003) MODEL

CONTENTS

*SPECIFICATIONS

*These specifications are subject to change without notice.

Item	Unit	Data		
		DF25Q	DF25QE	DF25T

PRE-FIX	02501F

DIMENSIONS & WEIGHT

Overall length (front to back)		mm (in)	707 (27.8) : with tiller handle raised	655 (25.8)	
Overall width (side to side)		mm (in)	380 (15.0)		
Overall height	S	mm (in)	1215 (47.8)		
	L	mm (in)	1342 (52.8)		
	UL	mm (in)	————		
Weight (without engine oil)	S	kg (lbs)	93 (205)	95 (209)	93 (205)
	L	kg (lbs)	96 (212)	98 (216)	96 (212)
	UL	kg (lbs)	————		
Transom height	S	mm (inch type)	414 (15)		
	L	mm (inch type)	541 (20)		
	UL	mm (inch type)	————		

PERFORMANCE

Maximum output	kW (PS)	18.4 (25)
Recommended operating range	r/min	5000 – 5600
Idle speed	r/min	900 ± 50 (in-gear : approx. 850)

POWERHEAD

Engine type		4-stroke SOHC		
Number of cylinders		3		
Bore	mm (in)	65 (2.56)		
Stroke	mm (in)	60 (2.36)		
Total displacement	cm^3 (cu in)	597 (36.4)		
Compression ratio	: 1	9.2		
Spark plug	NGK	DCPR6E		
Ignition system		SUZUKI PEI		
Fuel supply system		Carburetor (Number of carb. : 3)		
Exhaust system		Through prop exhaust		
Cooling system		Water cooled		
Lubrication system		Wet sump by trochoid pump		
Starting system		Manual	Electric	Electric
Choke system		Manual	Manual	Electric
Throttle control		Twist grip	Twist grip	Remote control

Item	Unit	Data		
		DF25Q	DF25QE	DF25T

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.
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating 10W-40
Engine oil amounts	L (US/Imp. qt)	3.0 (3.2/2.6) : Oil change only 3.2 (3.4/2.8) : Oil filter change
Gear oil		SUZUKI Outboard Motor Gear Oil (SAE #90 hypoid gear oil)
Gearcase oil amounts	ml (US/Imp. oz)	230 (7.8/8.1)

BRACKET

Trim angle		8° – 28° (Manual Trim and Gas Assisted Tilt system)	(PTT system)
Number of tilt pin position	Adjustable	6	
Maximum tilt angle	degree	73	

LOWER UNIT

Reversing system		Gear
Transmission		Forward-Neutral-Reverse
Reduction system		Bevel gear
Gear ratio		11 : 23 (2.09)
Drive line impact protection		Spline drive rubber hub
Propeller		Blade × Diam. (in) × Pitch (in)
		3 × 10 1/4 × 9 (P901) 3 × 10 1/4 × 10 (P1001) 3 × 10 1/4 × 11 (P1101) 3 × 10 1/4 × 12 (P1201) 3 × 10 1/4 × 13 (P1301, PS1301) 3 × 10 1/4 × 14 (P1401) 3 × 10 1/4 × 15 (P1501)
P : Aluminum propeller PS : Stainless steel propeller		

Item	Unit	Data		
		DF30Q	DF30QE	DF30T

PRE-FIX	03001F

DIMENSIONS & WEIGHT

Overall length (front to back)		mm (in)	707 (27.8) : With tiller handle raised		655 (25.8)
Overall width (side to side)		mm (in)	380 (15.0)		
Overall height	S	mm (in)	1215 (47.8)		
	L	mm (in)	1342 (52.8)		
	UL	mm (in)	————		
Weight (without engine oil)	S	kg (lbs)	93 (205)	95 (209)	93 (205)
	L	kg (lbs)	96 (212)	98 (216)	96 (212)
	UL	kg (lbs)	————		
Transom height	S	mm (inch type)	414 (15)		
	L	mm (inch type)	541 (20)		
	UL	mm (inch type)	————		

PERFORMANCE

Maximum output	kW (PS)	22.1 (30)
Recommended operating range	r/min	5500 – 6100
Idle speed	r/min	900 ± 50 (in-gear : approx. 850)

POWERHEAD

Engine type		4-stroke SOHC		
Number of cylinders		3		
Bore	mm (in)	65 (2.56)		
Stroke	mm (in)	60 (2.36)		
Total displacement	cm^3 (cu in)	597 (36.4)		
Compression ratio	: 1	9.2		
Spark plug	NGK	DCPR6E		
Ignition system		SUZUKI PEI		
Fuel supply system		Carburetor (Number of carb. : 3)		
Exhaust system		Through prop exhaust		
Cooling system		Water cooled		
Lubrication system		Wet sump by trochoid pump		
Starting system		Manual	Electric	Electric
Choke system		Manual	Manual	Electric
Throttle control		Twist grip	Twist grip	Remote control

Item	Unit	Data		
		DF30Q	DF30QE	DF30T

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.
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating 10W-40
Engine oil amounts	L (US/Imp. qt)	3.0 (3.2/2.6) : Oil change only 3.2 (3.4/2.8) : Oil filter change
Gear oil		SUZUKI Outboard Motor Gear Oil (SAE #90 hypoid gear oil)
Gearcase oil amounts	ml (US/Imp. oz)	230 (7.8/8.1)

BRACKET

Trim angle		8° – 28° (Manual Trim and Gas Assisted Tilt system)	(PTT system)
Number of tilt pin position	Adjustable	6	
Maximum tilt angle	degree	73	

LOWER UNIT

Reversing system	Gear
Transmission	Forward-Neutral-Reverse
Reduction system	Bevel gear
Gear ratio	11 : 23 (2.09)
Drive line impact protection	Spline drive rubber hub
Propeller	Blade × Diam. (in.) × Pitch (in.)
	3 × 10 1/4 × 9 (P901) 3 × 10 1/4 × 10 (P1001) 3 × 10 1/4 × 11 (P1101) 3 × 10 1/4 × 12 (P1201) 3 × 10 1/4 × 13 (P1301, PS1301) 3 × 10 1/4 × 14 (P1401) 3 × 10 1/4 × 15 (P1501)
P : Aluminum propeller PS : Stainless steel propeller	

*SERVICE DATA

*These service data are subject to change without notice.

Item	Unit	Data			
		DF25Q/25QE	DF25T	DF30Q/30QE	DF30T

POWERHEAD

Recommended operating range	r/min	5000 – 5600	5500 – 6100
Idle speed	r/min	900 ± 50 (in-gear: approx. 850)	
**Cylinder compression	kPa (kg/cm², psi)	1000 – 1400 (10 – 14, 142 – 199)	
**Cylinder compression max. difference between any other cylinders	kPa (kg/cm², psi)	100 (1.0, 14)	
**Engine oil pressure	kPa (kg/cm², psi)	400 – 500 (4.0 – 5.0, 57 – 71) at 3000 r/min (at normal operating temp.)	
Engine oil		API classification SE, SF, SG, SH, SJ Viscosity rating SAE 10W-40	
Engine oil amounts	L (US/Imp. qt)	3.0 (3.2/2.6) : Oil change only 3.2 (3.4/2.8) : Oil filter change	
Thermostat operating temperature	°C (°F)	58 – 62 (136 – 144)	

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

CARBURETOR

Item	Unit	Data			
		DF25Q/25QE	DF25T	DF30Q/30QE	DF30T

[Pilot screw covered type]

Type	MIKUNI	B25TI-20		B25TI-22	
I.D mark		89J00	89J00	89J10	89J10
Main jet	#	135		110	
Pilot jet	#	38.8		40	
Pilot screw	Turns open	PRE-SET			
Float height	mm	14.6 ± 1			

[Pilot screw uncovered type]

Type	MIKUNI	B25TI-20		B25TI-22	
I.D mark		89J40	89J40	89J50	89J50
Main jet	#	135		110	
Pilot jet	#	38.8		40	
Pilot screw	Turns open	1½ ± ¼		1½ ± ¼	
Float height	mm	14.6 ± 1			

Item		Unit		Data			
				DF25Q/25QE	DF25T	DF30Q/30QE	DF30T

CYLINDER HEAD / CAMSHAFT

Cylinder head distortion		Limit	mm (in)	0.05 (0.002)	
Manifold seating faces distortion		Limit	mm (in)	—	
Cam height	IN	STD	mm (in)	35.185 – 35.345 (1.3852 – 1.3915)	36.076 – 36.236 (1.4203 – 1.4266)
		Limit	mm (in)	35.085 (1.3813)	35.976 (1.4164)
	EX	STD	mm (in)	34.506 – 34.666 (1.3585 – 1.3648)	35.271 – 35.431 (1.3886 – 1.3949)
		Limit	mm (in)	34.406 (1.3546)	35.171 (1.3847)
Camshaft journal oil clearance		STD	mm (in)	0.050 – 0.100 (0.0020 – 0.0039)	
		Limit	mm (in)	0.160 (0.0060)	
Camshaft journal inside diameter (from MAG side)	Top	STD	mm (in)	43.500 – 43.525 (1.7126 – 1.7136)	
		Limit	mm (in)	43.534 (1.7139)	
	2nd	STD	mm (in)	43.700 – 43.725 (1.7205 – 1.7215)	
		Limit	mm (in)	43.734 (1.7218)	
	3rd	STD	mm (in)	43.900 – 43.925 (1.7283 –1.7293)	
		Limit	mm (in)	43.934 (1.7300)	
	4th	STD	mm (in)	44.100 – 44.125 (1.7362 – 1.7372)	
		Limit	mm (in)	44.134 (1.7376)	
Camshaft journal outside diameter (from MAG side)	Top	STD	mm (in)	43.425 – 43.450 (1.7096 – 1.7106)	
		Limit	mm (in)	43.375 (1.7077)	
	2nd	STD	mm (in)	43.625 – 43.650 (1.7175 – 1.7185)	
		Limit	mm (in)	43.575 (1.7156)	
	3rd	STD	mm (in)	43.825 – 43.850 (1.7254 –1.7264)	
		Limit	mm (in)	43.775 (1.7234)	
	4th	STD	mm (in)	44.025 – 44.050 (1.7333 – 1.7343)	
		Limit	mm (in)	43.975 (1.7313)	
Camshaft runout		Limit	mm (in)	0.10 (0.004)	
Rocker arm shaft to rocker arm clearance	IN, EX	STD	mm (in)	0.012 – 0.045 (0.0005 – 0.0018)	
		Limit	mm (in)	0.090 (0.0035)	
Rocker arm shaft outside diameter	IN, EX	STD	mm (in)	15.973 –15.988 (0.6289 – 0.6294)	
Rocker arm inside diameter	IN, EX	STD	mm (in)	16.000 – 16.018 (0.6299 – 0.6306)	
Rocker arm shaft runout	IN, EX	STD	mm (in)	0.12 (0.005)	

Item			Unit	Data			
				DF25Q/25QE	DF25T	DF30Q/30QE	DF30T
VALVE / VALVE GUIDE							
Valve diameter		IN	mm (in)	23.1 (0.91)			
		EX	mm (in)	29.6 (1.17)			
Valve clearance (Cold engine condition)	IN	STD	mm (in)	0.13 – 0.17 (0.005 – 0.007)			
	EX	STD	mm (in)	0.13 – 0.17 (0.005 – 0.007)			
Valve seat angle		IN	——	15°, 45°			
		EX	——	15°, 45°			
Valve guide to valve stem clearance	IN	STD	mm (in)	0.020 – 0.047 (0.0008 – 0.0019)			
		Limit	mm (in)	0.070 (0.0028)			
	EX	STD	mm (in)	0.035 – 0.062 (0.0014 – 0.0024)			
		Limit	mm (in)	0.090 (0.0035)			
Valve guide inside diameter	IN,EX	STD	mm (in)	5.500 – 5.512 (0.2165 – 0.2170)			
Valve guide protrusion	IN,EX	STD	mm (in)	14.0 (0.55)			
Valve stem outside diameter	IN	STD	mm (in)	5.465 – 5.480 (0.2152 – 0.2157)			
	EX	STD	mm (in)	5.450 – 5.465 (0.2146 – 0.2152)			
Valve stem end length	IN	Limit	mm (in)	7.00 (0.276)			
	EX			6.00 (0.236)			
Valve stem end deflection	IN	Limit	mm (in)	0.14 (0.006)			
	EX	Limit	mm (in)	0.18 (0.007)			
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	STD	mm (in)	1.0 (0.04)			
		Limit	mm (in)	0.5 (0.02)			
	EX	STD	mm (in)	1.3 (0.05)			
		Limit	mm (in)	0.7 (0.03)			
Valve seat contact width	IN	STD	mm (in)	1.3 – 1.5 (0.05 – 0.06)			
	EX	STD	mm (in)	1.3 – 1.5 (0.05 – 0.06)			
Valve spring free length		STD	mm (in)	47.38 (1.865)			
		Limit	mm (in)	45.48 (1.791)			
Valve spring tension		STD	N (kg, lbs)	193 – 223 (19.3 – 22.3, 42.5 – 49.2) for 37.5 mm (1.48 in)			
		Limit	N (kg, lbs)	177 (17.7, 39.0) for 37.5 mm (1.48 in)			
Valve spring squareness		Limit	mm (in)	2.0 (0.08)			

Item			Unit	Data			
				DF25Q/25QE	DF25T	DF30Q/30QE	DF30T
CYLINDER / PISTON / PISTON RING							
Cylinder distortion		Limit	mm (in)	0.030 (0.0012)			
Piston to cylinder clearance		STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)			
		Limit	mm (in)	0.100 (0.0039)			
Cylinder bore		STD	mm (in)	65.000 – 65.020 (2.5591 – 2.5598)			
Cylinder measuring position			mm (in)	50 (2.0) from cylinder top surface			
Piston skirt diameter		STD	mm (in)	64.970 – 64.990 (2.5579 – 2.5587)			
Piston measuring position			mm (in)	19 (0.7) from piston skirt end.			
Cylinder bore wear		Limit	mm (in)	0.100 (0.0039)			
Piston ring end gap	1st	STD	mm (in)	0.12 – 0.27 (0.005 – 0.011)			
		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	STD	mm (in)	Approx. 9.1 (0.36)			
		Limit	mm (in)	7.3 (0.29)			
	2nd	STD	mm (in)	Approx. 9.0 (0.35)			
		Limit	mm (in)	7.2 (0.28)			
Piston ring to groove clearance	1st	STD	mm (in)	0.03 – 0.07 (0.001 – 0.003)			
		Limit	mm (in)	0.12 (0.005)			
	2nd	STD	mm (in)	0.02 – 0.06 (0.001 – 0.002)			
		Limit	mm (in)	0.10 (0.004)			
Piston ring groove width	1st	STD	mm (in)	1.02 – 1.04 (0.040 – 0.041)			
	2nd	STD	mm (in)	1.21 – 1.23 (0.0476 – 0.0484)			
	Oil	STD	mm (in)	2.01 – 2.03 (0.079 – 0.080)			
Piston ring thickness	1st	STD	mm (in)	0.97 – 0.99 (0.038 – 0.039)			
	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)	15.995 – 16.000 (0.6297 – 0.6299)			
		Limit	mm (in)	15.980 (0.6291)			
Piston pin hole diameter		STD	mm (in)	16.006 – 16.014 (0.6302 – 0.6305)			
		Limit	mm (in)	16.030 (0.6311)			
Pin clearance in conrod small end		STD	mm (in)	0.003 – 0.016 (0.0001 – 0.0006)			
		Limit	mm (in)	0.050 (0.0020)			
Conrod small end bore		STD	mm (in)	16.003 – 16.011 (0.6300 – 0.6304)			

Item		Unit	Data			
			DF25Q/25QE	DF25T	DF30Q/30QE	DF30T

CRANKSHAFT / CONROD

Conrod small end inside diameter	STD	mm (in)	16.003 – 16.011 (0.6300 – 0.6304)
Conrod big end oil clearance	STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)
	Limit	mm (in)	0.065 (0.0026)
Conrod big end inside diameter	STD	mm (in)	39.000 – 39.018 (1.5354 – 1.5361)
Crank pin outside diameter	STD	mm (in)	35.982 – 36.000 (1.4166 – 1.4173)
Crank pin outside diameter difference (out of round and taper)	Limit	mm (in)	0.010 (0.0004)
Conrod bearing thickness	STD	mm (in)	1.486 – 1.502 (0.0585 – 0.0591)
Conrod big end side clearance	STD	mm (in)	0.100 – 0.250 (0.0039 – 0.0098)
	Limit	mm (in)	0.350 (0.0138)
Conrod big end width	STD	mm (in)	21.950 – 22.000 (0.8642 – 0.8661)
Crank pin width	STD	mm (in)	22.100 – 22.200 (0.8700 – 0.8740)
Crankshaft center journal runout	Limit	mm (in)	0.04 (0.002)
Crankshaft journal oil clearance	STD	mm (in)	0.020 – 0.040 (0.0008 – 0.0016)
	Limit	mm (in)	0.065 (0.0026)
Crankcase bearing holder inside diameter	STD	mm (in)	44.000 – 44.018 (1.7323 – 1.7330)
Crankshaft journal outside diameter	STD	mm (in)	39.982 – 40.000 (1.5741 – 1.5748)
Crankshaft journal outside diameter difference (out of round and taper)	Limit	mm (in)	0.010 (0.0004)
Crankshaft bearing thickness	STD	mm (in)	1.996 – 2.012 (0.0768 – 0.0792)
Crankshaft thrust play	STD	mm (in)	0.11 – 0.31 (0.004 – 0.012)
	Limit	mm (in)	0.35 (0.014)
Crankshaft thrust bearing thickness	STD	mm (in)	2.470 – 2.520 (0.0972 – 0.0992)

Item	Unit	Data			
		DF25Q/25QE	DF25T	DF30Q/30QE	DF30T

ELECTRICAL

Ignition timing		Degrees at r/min	BTDC 5° – 31°	BTDC 5° – 29°
Over revolution limiter		r/min	6300	6500
CKP sensor resistance		Ω at 20°C	148 – 222 [R – B, W/B – R/W]	
Power source coil resistance		Ω at 20°C	10.1 – 15.1 [Br – G, W – G]	
Ignition coil resistance	Primary	Ω at 20°C	0.17 – 0.23	
	Secondary	kΩ at 20°C	4.8 – 7.2	
Spark plug cap resistance		kΩ at 20°C	4 – 6	
Battery charge coil resistance		Ω at 20°C	Manual start model : 0.20 – 0.30 [R – Y] Electric start model : 0.27 – 0.40 [R – Y]	
Battery charge coil output (12V)		Watt	Manual start model : 80 Electric start model : 180	
Standard spark plug	Type	NGK	DCPR6E	
	Gap	mm (in)	0.8 – 0.9 (0.031 – 0.035)	
Fuse amp. rating		A	25 (Applicable model)	
Recommended battery capacity (12V)		Ah (kC)	40 (144) or larger	
Cylinder temp. sensor resistance (Thermistor characteristic)		kΩ at 25°C	1.8 – 2.3	
Choke solenoid coil resistance		Ω at 20°C	3.8 – 4.2 (Applicable model)	
Starter motor relay coil resistance		Ω at 20°C	3.5 – 5.1 (Applicable model)	
PTT motor relay coil resistance		Ω at 20°C	3.0 – 4.5 (Applicable model)	

STARTER MOTOR (Applicable model)

Max. continuous time of use		Sec	30
Motor output		kW	0.6
Brush length	STD	mm (in)	12.5 (0.49)
	Limit	mm (in)	9.0 (0.35)
Commutator undercut	STD	mm (in)	0.5 – 0.8 (0.02 – 0.03)
	Limit	mm (in)	0.2 (0.01)
Commutator outside diameter	STD	mm (in)	30.0 (1.18)
	Limit	mm (in)	29.0 (1.14)
Commutator outside diameter difference	STD	mm (in)	0.05 (0.002)
	Limit	mm (in)	0.40 (0.016)
Pinion to ring gear gap	STD	mm (in)	3.0 – 5.0 (0.12 – 0.20)

PTT MOTOR (Applicable model)

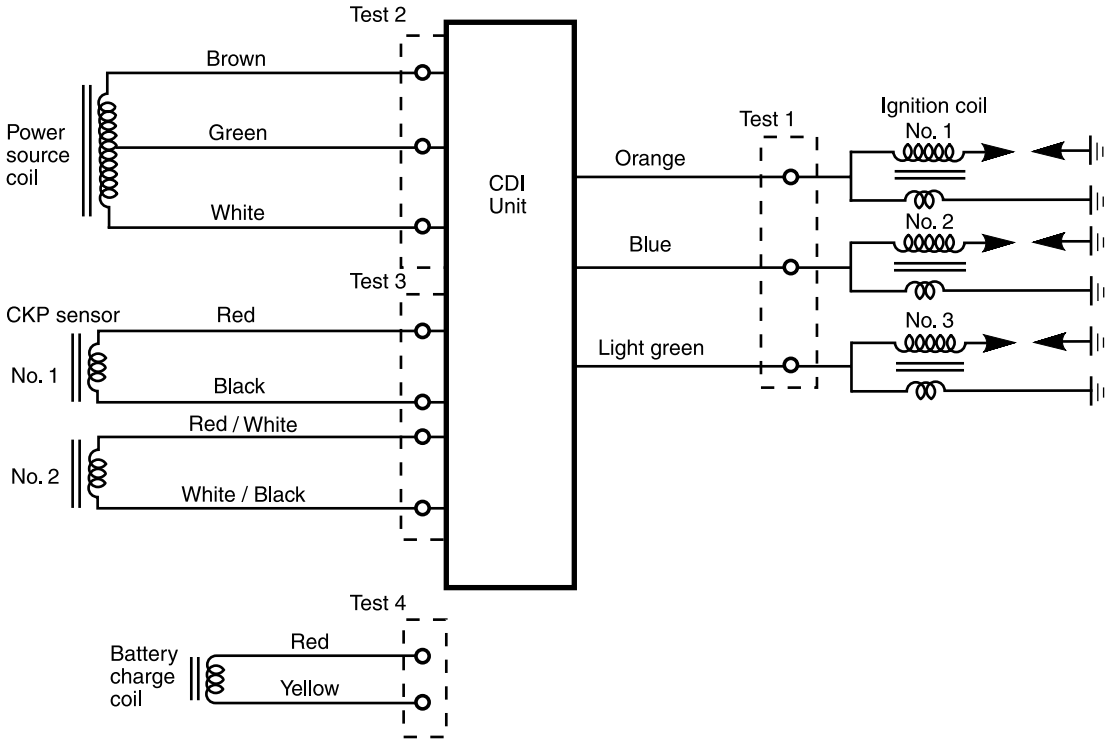
Brush length	STD	mm (in)	9.8 (0.39)
	Limit	mm (in)	4.8 (0.19)
Commutator outside diameter	STD	mm (in)	19.5 (0.77)
	Limit	mm (in)	18.5 (0.73)

PEAK VOLTAGE

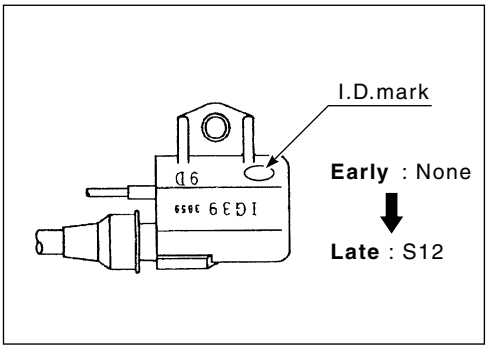
Requirements for peak voltage measurement

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

Testing sequence			Tester probe connection		Peak voltage	Tester range	Remarks
			+ (Red)	– (Black)			
1	CDI output	No.1	Orange	Black	64V or over	POS 500	With ignition coil connected.
		No.2	Blue				
		No.3	Light green				
2	Power source coil output		Brown	Green	21V or over	POS 500	With CDI unit disconnected.
			White				
3	CKP sensor output	No.1	Red	Black	3V or over	SEN 50	
		No.2	Red/White	White/Black			
4	Battery charge coil output	Manual start	Yellow	Red	4V or over	POS 50	With rectifier disconnected.
		Electric start			8V or over		



ENGINE CONTROL AND ELECTRICAL



IGNITION COIL

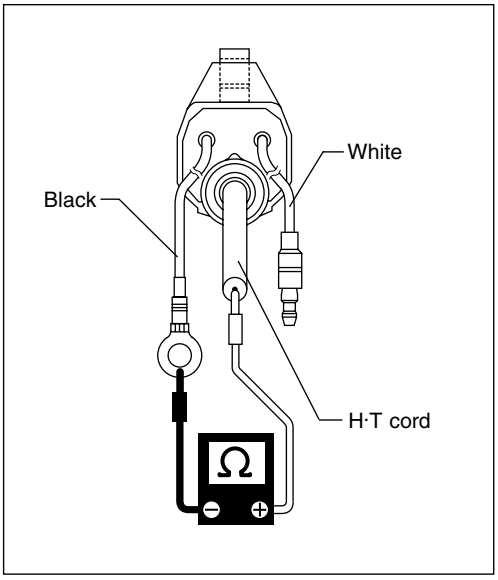
The ignition coil has been changed in secondary coil resistance.

09930-99320 : Digital tester

Tester range : Ω (Resistance)

Secondary side

1. Remove spark plug cap from high tension cord.
2. Connect tester probe to Black coil lead wire and high tension cord as shown.



Ignition coil	Tester probe connection	
	Red (+)	Black (–)
No.1	High tension cord	Black
No.2		
No.3		

3. Measure resistance.

Secondary coil resistance : 4.8 – 7.2 kΩ

If measurement exceeds specification, replace ignition coil.

NOTE:
Primary coil resistance has not been changed.

CDI UNIT

The CDI unit has been changed in internal circuit for buzzer.

Early: Continuous signal is output to buzzer when the caution system activates.

⬇

Late : Intermittent signals are output to buzzer when the caution system activates.

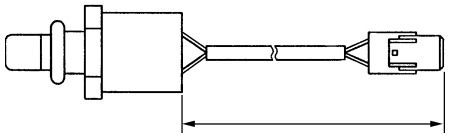
NOTE:
The buzzer sounding pattern when the caution system activates is the same as the pattern on the earlier year model.

EMERGENCY STOP SWITCH AND STARTER SWITCH

Emergency stop switch (with engine stop button) and starter switch have been changed in length of lead wire.

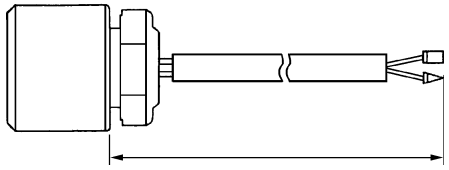
In relation to this modification, clamps have been added and wire routing has been changed. See the WIRE ROUTING section.

Emergency stop switch (Q and QE models)



Eary: 610 mm → **Late**: 710 mm

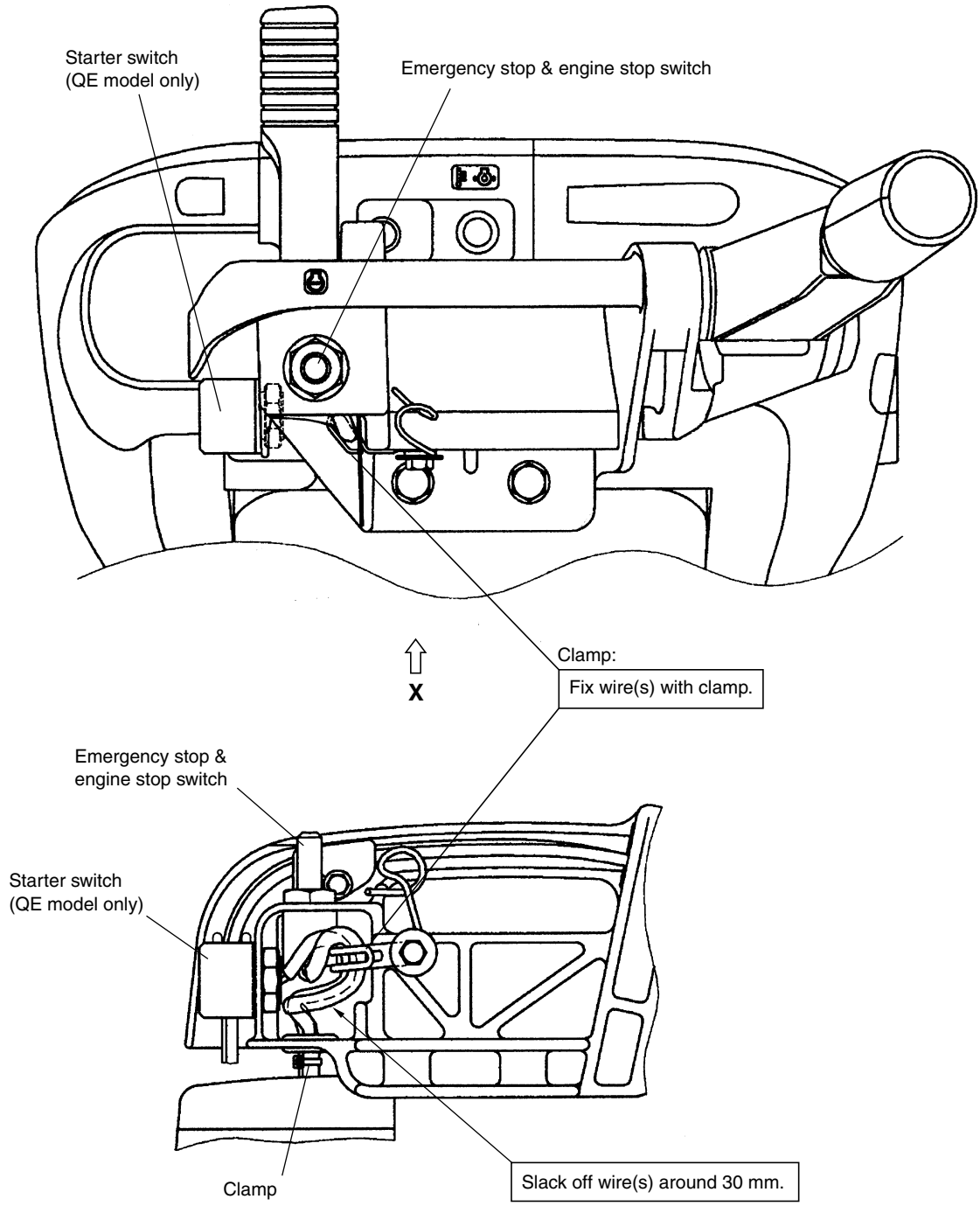
Starter switch (QE model)



Eary: 574 mm → **Late**: 674 mm

WIRE ROUTING

DF25Q/DF30Q, DF25QE/DF30QE



VIEW X

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