

## PREFACE

This manual covers the construction, function and servicing procedures of the Honda BF75A / BF90A outboard motors.

Careful observance of these instructions will result in better, safer service work.

Illustrations in this manual are based primarily on the BF90A LRTC.

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**1. SPECIFICATIONS**
**2. DIMENSIONAL DRAWINGS**

## 1. SPECIFICATIONS

### DIMENSIONS AND WEIGHTS

Item	Model	BF75A							
	Description code	BBAL							BBAU
	Type	LHD	LHTD	LHTC	LRTD	LRTG	LRTB	LRTC	XRTC
Overall length		*1: 910 mm (35.8 in) *2: 1,365 mm (53.7 in)			760 mm (29.9 in)				
Overall width		590 mm (23.2 in)			480 mm (18.9 in)				
Overall height		1,590 mm (62.6 in)							1,720 mm (67.7 in)
Dry weight		169 kg (373 lbs)	174 kg (384 lbs)		169 kg (373 lbs)			174 kg (384 lbs)	
Operating weight (including oil)		174 kg (384 lbs)	179 kg (395 lbs)		174 kg (384 lbs)			179 kg (395 lbs)	

\*1: With Tiller Handle raised

\*2: With Tiller Handle extended

Item	Model	BF90A							
	Description code	BBBL						BBBU	
	Type	LHD	LHTD	LHTC	LRTD	LRTB	LRTC	XRTD	XRTC
Overall length		*1: 910 mm (35.8 in) *2: 1,365 mm (53.7 in)			760 mm (29.9 in)				
Overall width		590 mm (23.2 in)			480 mm (18.9 in)				
Overall height		1,590 mm (62.6 in)						1,720 mm (67.7 in)	
Dry weight		169 kg (373 lbs)	174 kg (384 lbs)		169 kg (373 lbs)			174 kg (384 lbs)	
Operating weight (including oil)		174 kg (384 lbs)	179 kg (395 lbs)		174 kg (384 lbs)			179 kg (395 lbs)	

\*1: With Tiller Handle raised

\*2: With Tiller Handle extended



### FRAME

Model		BF75A							
Item	Type	LHD	LHTD	LHTC	LRTD	LRTG	LRTB	LRTC	XRTC
Transom height (*1)		537 mm (21.1 in)							664 mm (26.1 in)
Transom angle		5 stage adjustment (8°,12°,16°,20°,24°)							
Tilting angle		72°							
Tilting stage		Stage less							
Swivel angle		30° right and left							
Trim angle (*1)		—4°—16°							

(\*1) Transom angle is at 12°.

Model		BF90A							
Item	Type	LHD	LHTD	LHTC	LRTD	LRTB	LRTC	XRTD	XRTC
Transom height (*1)		537 mm (21.1 in)							664 mm (26.1 in)
Transom angle		5 stage adjustment (8°,12°,16°,20°,24°)							
Tilting angle		72°							
Tilting stage		Stage less							
Swivel angle		30° right and left							
Trim angle (*1)		—4°—16°							

(\*1) Transom angle is at 12°.

### TYPES OF HONDA BF75A / 90A OUTBOARD MOTORS

It may be necessary to refer to this chart for reference purposes when reading this manual.

Model	Type	Shaft Length		Tiller Handle	Remote Control	Gas assisted Tilt	Power Trim / Tilt	Tachometer	Trimmer
		Long	Extra-Long						
BF75A	LHD	●		●		●		(●)	
	LHTD	●		●			●	(●)	(●)
	LHTC	●		●			●	(●)	(●)
	LRTD	●			●		●	●	●
	LRTG	●			●		●	●	●
	LRTB	●			●		●	●	●
	LRTC	●			●		●	●	●
	XRTC		●		●		●	●	●
BF90A	LHD	●		●		●		(●)	
	LHTD	●		●			●	(●)	(●)
	LHTC	●		●				(●)	(●)
	LRTD	●			●		●	●	●
	LRTB	●			●		●	●	●
	LRTC	●			●		●	●	●
	XRTD		●		●		●	●	●
	XRTC		●		●		●	●	●

H: Tiller Handle    R: Remote Control    T: Power Trim / Tilt    ( ): Optional part

The gas assisted tilt type motors use a gas spring/damper to assist when manually tilting the motor.

The power trim / tilt type motors use an electric / hydraulic power cylinder to trim or tilt the motor.

# HONDA

## BF75A·90A

### ENGINE

Model	BF75A	BF90A
Type	4-stroke, O.H.C., 4-cylinder	
Displacement	1,590 cm <sup>3</sup> (97.0 cu in)	
Bore x stroke	75 x 90 mm (3.0 x 3.5 in)	
Rated power *1	75 HP (55.2 kW) at 5,000 – 6,000 min <sup>-1</sup> (rpm)	90 HP (66.8 kW) at 5,000 – 6,000 min <sup>-1</sup> (rpm)
Maximum torque	117.6 N·m(12.0 kgf·m, 87 lbf·ft) at 4,000 min <sup>-1</sup> (rpm)	125.5 N·m(12.8 kgf·m, 93 lbf·ft) at 4,500 min <sup>-1</sup> (rpm)
Compression ratio	8.8 : 1	
Fuel consumption ratio	241 g/HP·hr (8.5 oz/HP·hr) [Except LRTG type] 222 g/HP·hr (7.8 oz/HP·hr) [LRTG type only]	227 g/HP·hr (8.0 oz/HP·hr)
Cooling system	Forced water circulation by impeller pump with thermostat	
Ignition system	CDI	
Ignition timing	5–29° B.T.D.C.	
Spark plug	DR7EA (NGK), X22ESR-U (NIPPONDENSO)	
Carburetor	Horizontal type, butterfly valve (4 carburetor)	
Lubrication system	Pressure lubrication by trochoid pump	
Lubrication capacity	4.0 ℓ (4.2 US qt, 3.5 Imp qt) [with oil filter replacement: 4.5 ℓ (4.8 US qt, 4.0 Imp qt)]	
Starter system	Electric starter	
Stopping system	Grounding of primary circuit	
Fuel	Unleaded gasoline with a pump octane rating of 86 or higher.	
Optional fuel tank capacity	25 ℓ (6.6 US gal, 5.5 Imp gal)	
Fuel pump	Mechanical plunger type	
Exhaust system	Underwater type	
Recommended oil	SAE 10 W – 30 / 40	

\*1: Full throttle range.

### LOWER UNIT

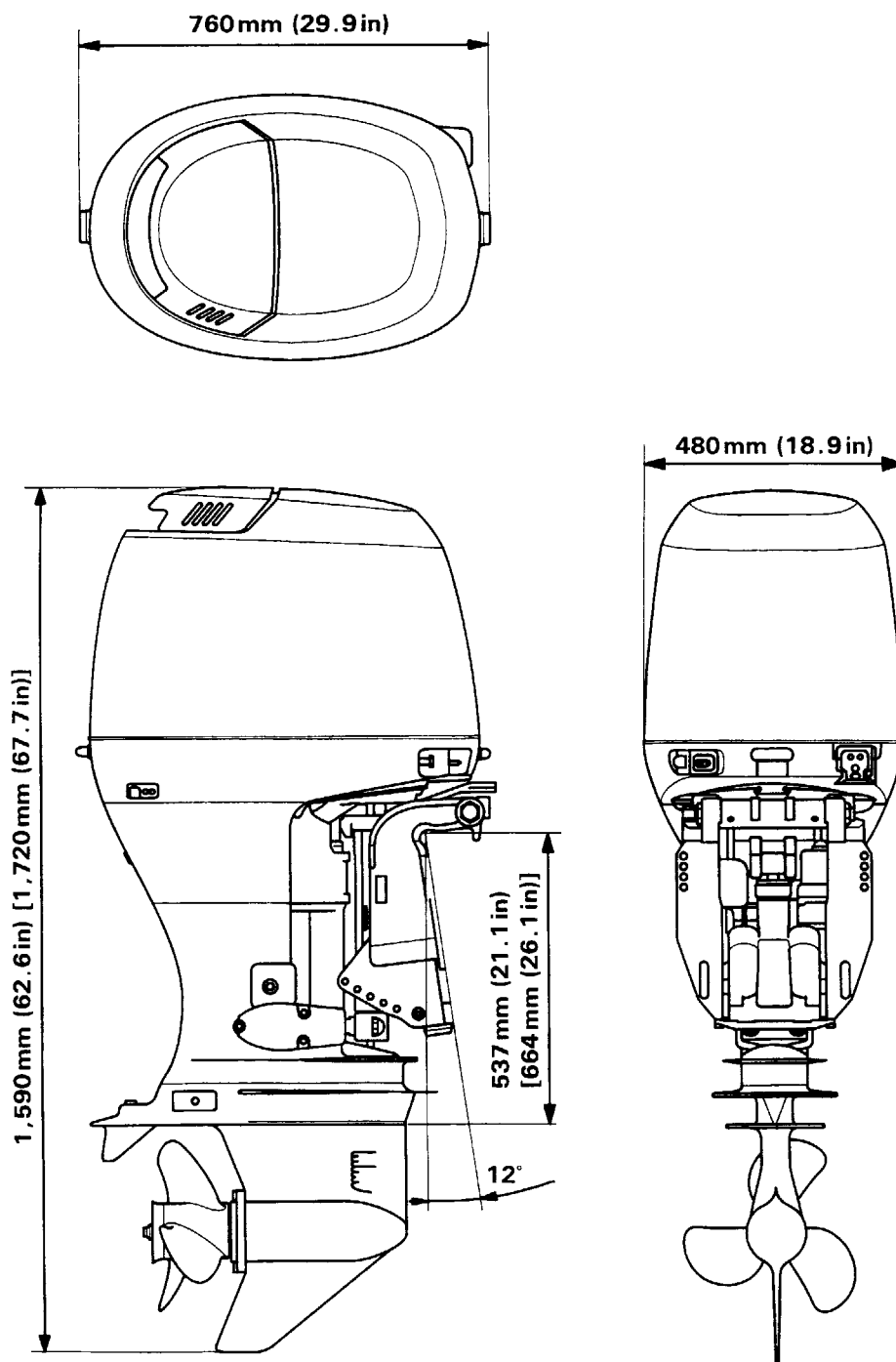
Clutch	Dog clutch (Forward–Neutral–Reverse)
Gear ratio	0.43 (13 / 30)
Reduction	Spiral bevel
Gear case oil capacity	0.66 ℓ (0.70 US qt, 0.58 Imp qt)
Propeller rotating direction	Clockwise (viewed from rear)
Propeller driving system	Spline

## 2. DIMENSIONAL DRAWINGS

Unit: mm (in)

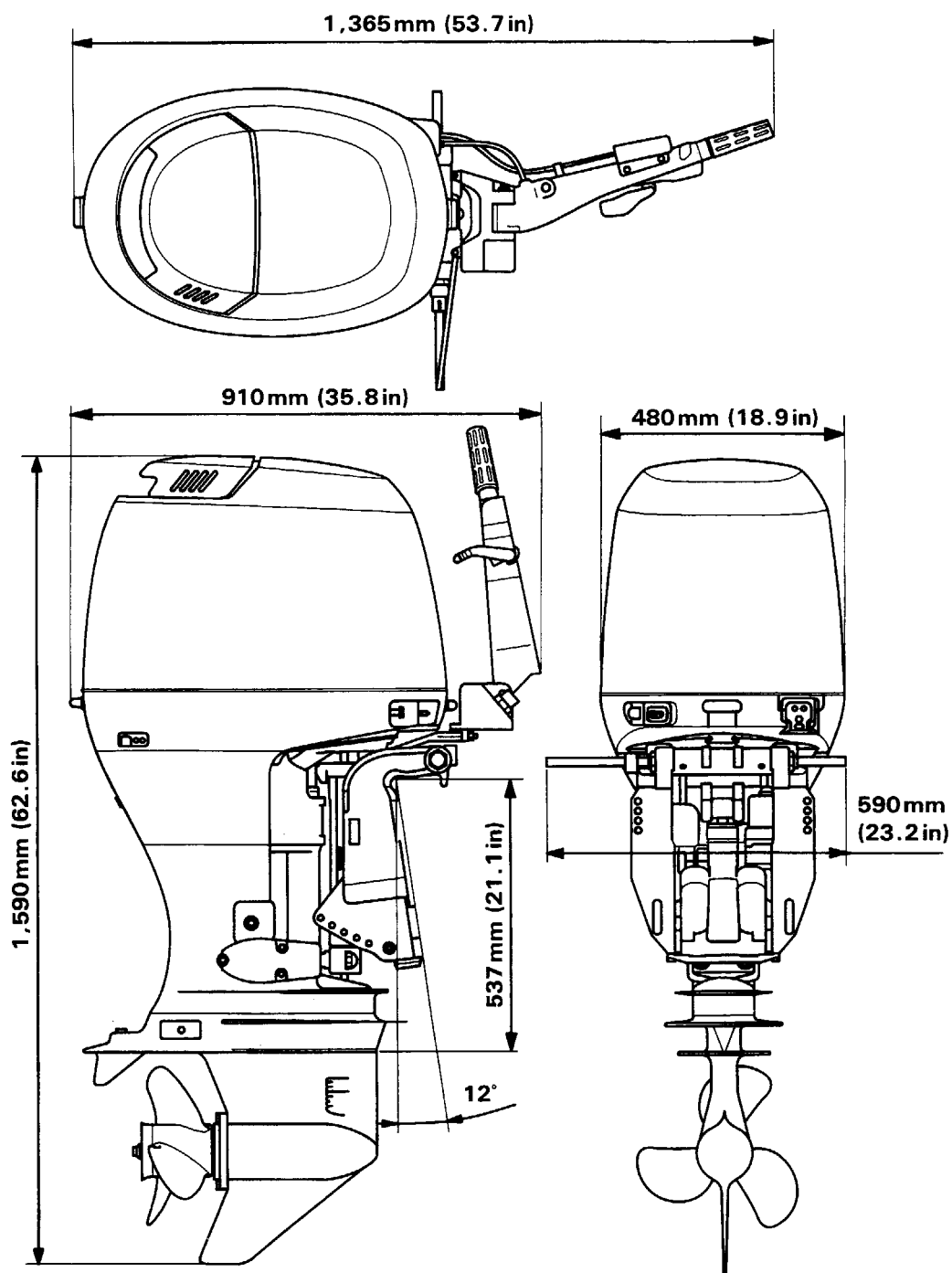
Remote control type

[ ] : Extra-long shaft type



### Tiller handle type

Unit: mm (in)



- |                                       |   |
|---------------------------------------|---|
| 1. THE IMPORTANCE OF PROPER SERVICING | D. ENGINE DOES NOT RUN SMOOTHLY                 |
| 2. IMPORTANT SAFETY PRECAUTIONS       | E. ALERT SYSTEMS                                |
| 3. SERVICE RULES                      | Oil Pressure Test                               |
| 4. SERIAL NUMBER LOCATION             | F. SHIFT LEVER                                  |
| 5. MAINTENANCE STANDARDS              | G. ASSIST TILT LOAD                             |
| 6. TORQUE VALUES                      | H. THE ASSIST TILT DOES NOT HOLD                |
| 7. SPECIAL TOOLS                      | I. POWER TRIM / TILT ASSEMBLY DOES NOT MOVE     |
| 8. TROUBLESHOOTING                    | J. THE POWER TRIM / TILT ASSEMBLY DOES NOT HOLD |
| A. HARD STARTING                      | 9. CABLE / HARNESS ROUTING                      |
| Cylinder Compression Test             | 10. TUBE ROUTING                                |
| B. IGNITION SYSTEM                    | 11. LUBRICATION                                 |
| Spark Test                            |   |
| C. STARTER MOTOR                      |   |

## 1. THE IMPORTANCE OF PROPER SERVICING

Proper servicing is essential to the safety of the operator and the reliability of the outboard motor. Any error or oversight made by the technician while servicing can easily result in faulty operation, damage to the outboard motor, or injury to the operator.

### ⚠ WARNING

- Improper servicing can cause an unsafe condition that can lead to serious injury or death.
- Follow the procedures and precautions in this shop manual carefully.

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

### ⚠ WARNING

- Failure to follow maintenance instructions and precautions can cause you to be seriously hurt or killed.
- Follow the procedures and precautions in this shop manual carefully.

## 2. IMPORTANT SAFETY PRECAUTIONS

Be sure you have a clear understanding of all basic shop safety practices and that you are wearing appropriate clothing and safety equipment. When performing maintenance or repairs, be especially careful of the following:

- Read the instructions before you begin, and be sure you have the tools and skills required to perform the tasks safely.

Be sure the engine is off before you begin any maintenance or repairs. This will reduce the possibility of several hazards:

- Carbon monoxide poisoning from engine exhaust.  
Be sure there is adequate ventilation whenever you run the engine.
- Burns from hot parts.  
Let the engine cool before you touch it.
- Injury from moving parts.  
Do not run the engine unless the instruction tells you to do so. Even then, keep your hands, fingers, and clothing away.

To reduce the possibility of a fire or explosion, be careful when working around gasoline. Use only a nonflammable solvent, not gasoline, to clean parts. Keep all cigarettes, sparks, and flames away from the battery and all fuel-related parts.

### 3. SERVICE RULES

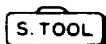
1. Use genuine Honda or Honda-recommended parts and lubricants or their equivalents. Parts that do not meet Honda's design specifications may damage the unit.
2. Use the special tools designed for the product.
3. Install new gaskets, O-rings, etc. when assembling.
4. When torquing bolts or nuts, begin with larger-diameter or inner bolts first, and tighten to the specified torque diagonally, unless a particular sequence is specified.
5. Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before assembly.
6. After assembly, check all parts for proper installation and operation.
7. Many screws used in this machine are self-tapping. Be aware that cross-threading or overtightening these screws will strip the female threads and ruin the hole.
8. Use only metric tools when servicing this unit. Metric bolts, nuts and screws are not interchangeable with nonmetric fasteners. The use of incorrect tools and fasteners will damage the unit.
9. Follow the instructions represented by these symbols when they are used:



OXO (O)

P. [ ]

: Apply oil



: Use special tool



: Apply grease

: Indicates the type, length, and number of the flange bolt used.

: Indicates the reference page.

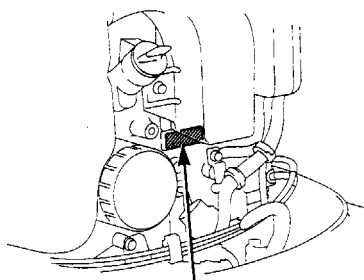


(Molybdenum disulfide oil)

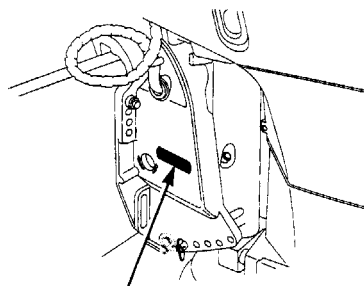
: Use molybdenum oil solution (mixture of the engine oil and molybdenum grease with the ratio 1 : 1).

### 4. SERIAL NUMBER LOCATION

The engine serial number is stamped on the cylinder block and the product identification number is located on the L. stern bracket. Always specify these numbers when inquiring about the engine or when ordering parts in order to obtain the correct parts for the outboard motor being serviced.



ENGINE SERIAL NUMBER



PRODUCT IDENTIFICATION NUMBER

## 5. MAINTENANCE STANDARDS

### ENGINE

Unit : mm (in)

Part	Item		Standard	Service limit
Engine	Idle speed (in neutral)		950 ± 50 min <sup>-1</sup> (rpm)	————
	Cylinder compression		1,471 ± 98 kPa (15 ± 1 kgf/cm <sup>2</sup> , 213 ± 14 psi) at 300 min <sup>-1</sup> (rpm)	————
Carburetor	Main jet	BF75A	# 128 (Except LRTG type)	————
			# 122 (LRTG type only)	————
		BF90A	# 132	————
	Pilot screw opening	BF75A	1 – 7/8 turns out (Except LRTG type)	————
			2 turns out (LRTG type only)	————
		BF90A	2 – 1/4 turns out	————
	Float height		11.5 (0.45)	————
Spark plug	Gap		0.6 – 0.7 (0.024 – 0.028)	————
Valves	Valve clearance	IN	0.18 – 0.22 (0.007 – 0.009)	————
		EX	0.26 – 0.30 (0.010 – 0.012)	————
	Stem O.D.	IN	5.475 – 5.490 (0.2156 – 0.2161)	5.45 (0.215)
		EX	6.555 – 6.570 (0.2581 – 0.2587)	6.53 (0.258)
	Guide I.D.	IN	5.500 – 5.512 (0.2165 – 0.2170)	5.54 (0.218)
		EX	6.600 – 6.615 (0.2598 – 0.2604)	6.64 (0.261)
	Seat width	IN/EX	1.25 – 1.55 (0.049 – 0.061)	2.0 (0.08)
	Spring free length	IN	46.0 (1.81)	————
		EX	Inner	41.7 (1.64)
			Outer	44.1 (1.74)
	Stem-to-guide clearance	IN	0.010 – 0.037 (0.0004 – 0.0014)	0.07 (0.0028)
		EX	0.030 – 0.060 (0.0012 – 0.0024)	0.12 (0.005)
Rocker arm	Rocker arm I.D.		17.000 – 17.018 (0.6693 – 0.6700)	17.04 (0.671)
	Rocker arm shaft O.D.		16.962 – 16.980 (0.6678 – 0.6685)	16.92 (0.666)
	Rocker arm shaft-to-rocker arm clearance		0.020 – 0.056 (0.0008 – 0.0022)	0.07 (0.0028)
Piston	Skirt O.D.		74.980 – 74.990 (2.9520 – 2.9524)	74.92 (2.950)
	Piston-to-cylinder clearance		0.010 – 0.035 (0.0004 – 0.0013)	0.1 (0.004)
	Pin bore I.D.		19.010 – 19.016 (0.7484 – 0.7487)	————
	Pin O.D.		18.996 – 19.000 (0.7479 – 0.7480)	18.97 (0.747)
	Pin-to-pin bore clearance		0.010 – 0.020 (0.0004 – 0.0008)	————

Unit : mm (in)

Part	Item		Standard	Service limit
Piston ring	Ring side clearance	Top	0.030 – 0.060 (0.0012 – 0.0024)	0.1 (0.004)
		Second	0.030 – 0.055 (0.0012 – 0.0022)	0.1 (0.004)
		Oil	0.045 – 0.145 (0.0018 – 0.0057)	0.2 (0.008)
	Ring end gap	Top	0.15 – 0.30 (0.006 – 0.012)	0.6 (0.024)
		Second	0.15 – 0.30 (0.006 – 0.012)	0.6 (0.024)
		Oil	0.20 – 0.80 (0.008 – 0.031)	0.9 (0.035)
	Ring thickness	Top	1.170 – 1.190 (0.0461 – 0.0469)	1.08 (0.043)
		Second	1.475 – 1.490 (0.0581 – 0.0587)	1.38 (0.054)
Cylinder/ cylinder head	Cylinder sleeve I.D.		75.000 – 75.015 (2.9528 – 2.9533)	75.055 (2.9549)
	Distortion of cylinder head		0.05 (0.0019)	0.1 (0.004)
	I.D. of camshaft journal  (Oil pump journal)	#1	32.000 – 32.025 (1.2598 – 1.2608)	32.06 (1.262)
		#2	48.000 – 48.025 (1.8898 – 1.8907)	48.06 (1.892)
		#3	48.500 – 48.525 (1.9094 – 1.9104)	48.56 (1.912)
		#4	49.000 – 49.025 (1.9291 – 1.9301)	49.06 (1.931)
		#5	36.000 – 36.025 (1.4173 – 1.4183)	36.06 (1.420)
Connecting rod	Small end I.D.		18.960 – 18.980 (0.7465 – 0.7472)	————
	Small end press fitting clearance		0.016 – 0.040 (0.0006 – 0.0016)	————
	Big end axial clearance		0.15 – 0.30 (0.006 – 0.012)	0.4 (0.02)
	Connecting rod big end oil clearance		0.020 – 0.038 (0.0008 – 0.0015)	0.05 (0.0019)
Crankshaft	Journal O.D.	Main	54.976 – 55.000 (2.1644 – 2.1654)	54.96 (2.164)
		Pin	44.976 – 45.000 (1.7707 – 1.7717)	44.96 (1.770)
	Crankshaft main bearing oil clearance		0.025 – 0.043 (0.0010 – 0.0017)	0.06 (0.0024)
	Crankshaft side clearance		0.10 – 0.35 (0.004 – 0.014)	0.45 (0.018)
Camshaft	Shaft axial clearance		0.03 – 0.11 (0.0012 – 0.0043)	0.3 (0.012)
	Shaft runout		0.03 (0.0012) Max	0.05 (0.0019)
	Journal O.D.	#1	31.950 – 31.975 (1.2579 – 1.2589)	31.93 (1.257)
		#2	47.930 – 47.955 (1.8870 – 1.8880)	47.90 (1.886)
		#3	48.430 – 48.455 (1.9067 – 1.9077)	48.40 (1.906)
		#4	48.930 – 48.955 (1.9264 – 1.9274)	48.90 (1.925)
		#5	35.950 – 35.975 (1.4154 – 1.4163)	35.93 (1.415)



Unit : mm (in)

Part	Item		Standard	Service limit
Camshaft	Cam height	IN	40.008 – 40.248 (1.5751 – 1.5846)	39.808 (1.5672)
		EX	39.857 – 40.097 (1.5691 – 1.5786)	39.657 (1.5613)
	Shaft oil clearance	#1	0.025 – 0.075 (0.0010 – 0.0030)	0.10 (0.004)
		#2	0.045 – 0.095 (0.0018 – 0.0037)	0.12 (0.005)
		#3	0.045 – 0.095 (0.0018 – 0.0037)	0.12 (0.005)
		#4	0.045 – 0.095 (0.0018 – 0.0037)	0.12 (0.005)
		#5	0.025 – 0.075(0.0010 – 0.0030)	0.10 (0.004)
Oil pump	Body I.D.		80.00 – 80.04 (3.150 – 3.151)	80.06 (3.152)
	Inner rotor-to-outer rotor clearance		0.02 – 0.16 (0.0008 – 0.0063)	0.2 (0.008)
	Outer rotor-to-body clearance		0.10 – 0.19 (0.004 – 0.007)	0.23 (0.009)
	Outer rotor height		17.98 – 18.00 (0.708 – 0.709)	17.96 (0.707)
	Pump body depth		18.02 – 18.05 (0.709 – 0.711)	18.09 (0.712)
	Pump end clearance		0.02 – 0.07 (0.0008 – 0.0028)	0.10 (0.004)
Ignition coil	Resistance	Primary coil	0.35 – 0.43 $\Omega$	————
		Secondary coil	23.1 – 34.7 k $\Omega$	————
Pulser coil	Resistance		168 – 252 $\Omega$	————
Alternator	Stator resistance		0.46 – 0.69 $\Omega$	————
Starter motor	Brush length		12.3 (0.48)	7.0 (0.3)
	Insulation depth		0.4 – 0.5 (0.016 – 0.020)	0.2 (0.010)
	Commutator O.D.		29.4 (1.15)	28.8 (1.13)
	Commutator runout		————	0.1 (0.004)

# HONDA

## BF75A•90A

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### FRAME

Unit : mm (in)

Part	Item		Standard	Service limit
Vertical shaft	Shaft O.D. (at needle bearing)		28.562 – 28.575 (1.1245 – 1.1250)	28.541 (1.1237)
Propeller shaft	Shaft O.D. (at needle bearing)	Forward bevel gear	25.390 – 25.425 (0.9996 – 1.0010)	25.369 (0.9988)
		Holder	30.149 – 30.162 (1.1870 – 1.1875)	30.128 (1.1861)

## 6. TORQUE VALUES

Item	Thread Dia. (mm) and pitch (length)	Torque values			
		N · m	kgf · m	lbf · ft	
• ENGINE					
Crankcase bolt	*1 *3 M10 x 1.25	25	2.5	18	
		44	4.5	33	
		26	2.7	20	
Oil filter	M22 x 1.5	22	2.2	16	
Cylinder head bolt	M10 x 1.25	69	7.0	51	
	M8 x 1.25	26	2.7	20	
Connecting rod nut	M8 x 0.75	31	3.2	23	
Valve adjusting lock nut	M7 x 0.75	23	2.3	17	
Oil drain plug	M12 x 1.5	23	2.3	17	
Oil strainer nut	M10 x 1.25	39	4.0	29	
Flywheel bolt	M12 x 1.0	103	10.5	76	
Oil pump bolt	M8 x 1.25	26	2.7	20	
	M6 x 1.0	12	1.2	9	
18mm sealing bolt	M18 x 1.5	39	4.0	29	
Starter pulley bolt	M6 x 1.0	12	1.2	9	
Alternator rotor bolt	*2 *3 M14 x 1.25	20	2.0	14	
		181	18.5	134	
Timing belt driven pulley bolt	M10 x 1.25	56	5.7	41	
Timing belt tensioner bolt	M10 x 1.25	44	4.5	33	
Timing belt adjusting spring bolt	M6 x 1.0	12	1.2	9	
Throttle cam bolt	M6 x 1.0	12	1.2	9	
Choke arm bolt	M6 x 1.0	12	1.2	9	
Choke solenoid bracket bolt (Remote control type only)	M6 x 1.0	9	0.9	6.5	
Engine mount bolt, nut	M10 x 1.25	39	4.0	29	
Intake manifold bolt, nut	M8 x 1.25	26	2.7	20	
Carburetor bolt	M6 x 1.0	10	1.0	7	
Diaphragm torx. bolt	M6 x 1.0	9	0.9	6.5	
Fuel pump bolt	M6 x 1.0	9	0.9	6.5	
Thermoswitch	M16 x 1.5	12	1.2	9	
Oil pressure switch	PT1/8	9	0.9	6.5	
Starter magnetic switch nut	M6 x 1.0	5	0.5	3.6	
CDI unit bolt	M6 x 1.0	5	0.5	3.6	
Starter motor bolt	M10 x 1.25	39	4.0	29	
Rear bracket bolt	M5 x 0.8	5	0.5	3.6	
Starter solenoid screw nut	M6 x 1.0	6	0.6	4.3	
	M8 x 1.25	10	1.0	7	

\*1 : Tighten the crankcase bolts to 25N · m (2.5 kgf · m, 18 lbf · ft) first, then tighten them an additional 40° (Snag torque [Angle method]).

\*2 : Tighten the alternator rotor bolts to 20N · m (2.0 kgf · m, 14 lbf · ft) first, then tighten them an additional 90° (Snag torque [Angle method]).

\*3 : Tighten to the specified torque (Torque method).

# HONDA

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Item	Thread Dia. (mm) and pitch (length)	Torque values		
		N · m	kgf · m	lbf · ft
<b>• GEAR CASE</b> Propeller shaft nut Propeller shaft holder nut Gear case bolt nut (UL type only) Extension separator stud bolt (UL type only) Oil drain bolt Oil level screw Vent screw Trim tab bolt Anode metal nut Seal holder bolt Pinion gear nut Impeller housing bolt Water pump housing bolt	M18 x 1.5 M8 x 1.25 M10 x 1.25 M10 x 1.25 M10 x 1.25 M8 x 1.25 M8 x 1.25 M8 x 1.25 7/16 – 14 UNC M6 x 1.0 M6 x 1.0 5/8 – 18 UNF M6 x 1.0 M6 x 1.0	75 30 34 34 15 7 7 7 29.8 7 7 95 7 7	7.6 3.1 3.5 3.5 1.5 0.7 0.7 0.7 3.0 0.7 0.7 9.7 0.7 0.7	55 22 25 25 11 5.1 5.1 5.1 22 5.1 5.1 70 5.1 5.1
<b>• EXTENSION/MOUNT</b> Lower rubber motor mount nut Lower rubber motor mount housing bolt Extension case bolt Under cover bolt Upper rubber mount nut	M12 x 1.25 M8 x 1.25 M10 x 1.25 M6 x 1.0 M12 x 1.25	83 22 34 6.4 83	8.5 2.2 3.5 0.65 8.5	61 16 25 4.7 61
<b>• STERN BRACKET</b> Stern bracket nut	M25 x 2.0 7/8 – 14 UNC M10 x 1.25	17 17 34	1.7 1.7 3.5	12 12 25
<b>• POWER TRIM/TILT ASSEMBLY</b> Cylinder cap Rod guide comp. Manual valve Socket bolt A/B Power tilt motor assembly bolt Oil tank bolt Oil tank cap	_____ _____ M14 x 1.5 _____ 1/4 – 20 UNC _____ _____	162 78 3.5 8.3 5 5 2.5	16.5 8.0 0.35 0.85 0.5 0.5 0.25	119 58 2.5 6.1 3.6 3.6 1.8
<b>• GAS ASSISTED ASSEMBLY</b> Tilt lever nut	M6 x 1.0	10	1.0	7
<b>• FRAME/ELECTRICAL</b> Separate top cover bolt Steering rod bolt/nut (Remote control type only) Remote control lever bolt (Panel-mount/single top-mount/dual top-mount remote control type only) Shoulder bolt (Panel-mount/single top-mount/dual top-mount remote control type only) Tiller handle bolt/nut (Tiller handle type only)	M6 x 1.0 (Flange) (Hex.) 3/8 – 24 UNF _____ _____ M10 x 1.25 M8 x 1.25	12 10 22 17 4 35 22	1.2 1.0 2.2 1.7 0.4 3.6 2.2	9 7 16 12 2.9 26 16



Item	Thread Dia. (mm) and pitch (length)	Torque values		
		N · m	kgf · m	lbf · ft
• <b>FRAME / ELECTRICAL</b>				
Steering bracket nut (Tiller handle type only)	M12 X 1.25	31	3.2	23
Shift link cover screw (Tiller handle type only)	M6 x 1.0	3	0.3	2.2
Tilt handle nut	M6 x 1.0	6.4	0.65	4.7
Ignition switch nut	M22 x 1.0	4.8	0.49	3.5
Emergency stop switch nut	M16 x 1.0	1.5	0.15	1.1
Neutral switch nut	M20 x 1.0	2.5	0.25	1.8
Grease fitting	M6 x 1.0	3	0.3	2.2

NOTE : Use standard torque values for fasteners that the are not listed in this table.

### STANDARD TORQUE VALUES


Item	Thread Dia. (mm) and pitch (length)	Torque values		
		N · m	kgf · m	lbf · ft
Bolt and nut	5 mm	5.2	0.52	3.8
	6 mm	10	1.0	7
	8 mm	21.5	2.15	15.6
	10 mm	34	3.5	25
	12 mm	54	5.5	40
Flange bolt and nut	6 mm (SH Flange bolt)	9	0.9	6.5
	6 mm	12	1.2	9
	8 mm	26	2.7	20
	10 mm	39	4.0	29
Screw	5 mm	4.2	0.42	3.0
	6 mm	9	0.9	6.5

## 7. SPECIAL TOOLS

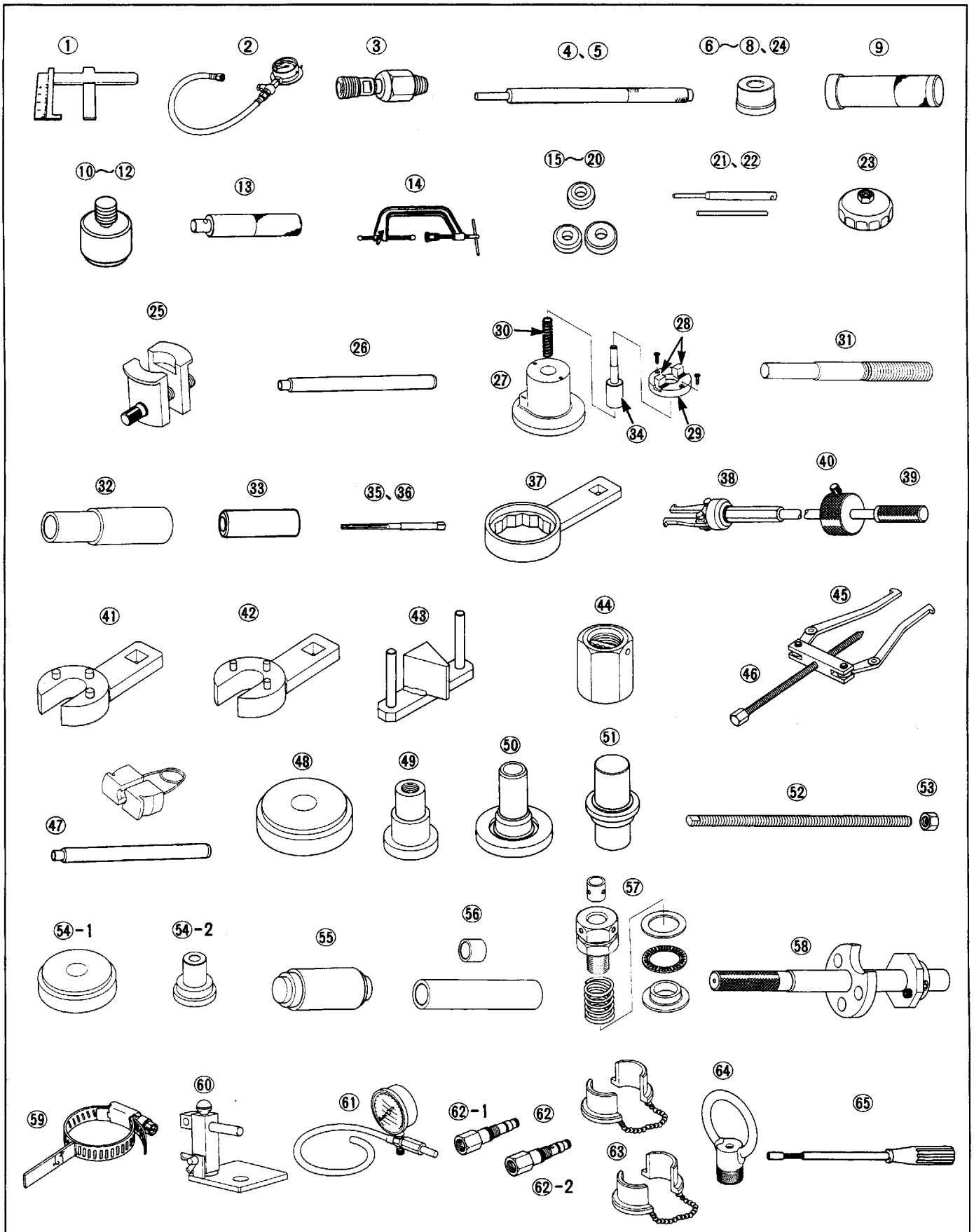
Tool name	Tool number	Application
1. Float level gauge 2. Oil pressure gauge 3. Oil pressure gauge attachment 4. Valve guide driver, 5.5 mm 5. Valve guide driver, 6.6 mm 6. Attachment, 32 x 35 mm  7. Attachment, 37 x 40 mm 8. Attachment, 52 x 55 mm 9. Driver, 40 mm I.D. 10. Pilot, 25 mm  11. Pilot, 30 mm 12. Pilot, 22 mm 13. Driver 14. Valve spring compressor 15. Valve seat cutter, 45° ø29 16. Valve seat cutter, 45° ø33 17. Valve seat cutter, 32° ø30 18. Valve seat cutter, 32° ø35 19. Valve seat cutter, 60° ø30 20. Valve seat cutter, 60° ø37.5 21. Cutter holder, 5.5 mm 22. Cutter holder, 6.6 mm 23. Oil filter wrench 24. Attachment, 28 x 30 mm  25. Bearing race remover 26. Driver 27. Piston base 28. Head 29. Head base 30. Return spring 31. Insert adjuster 32. Insert pin 33. Pilot collar, 19 mm 34. Pilot pin 35. Valve guide reamer, 5.5 mm 36. Valve guide reamer, 6.6 mm 37. Lock nut wrench, 56 mm 38. Bearing race puller 39. Remover handle 40. Remover weight 41. ø6 pin type wrench 42. ø4 pin type wrench 43. Ring gear holder	07401-0010000 07506-3000000 07406-0030000 07742-0010100 07742-0012000 07746-0010100  07746-0010200 07746-0010400 07746-0030100 07746-0040600  07746-0040700 07746-0041000 07749-0010000 07757-0010000 07780-0010300 07780-0010800 07780-0012200 07780-0012300 07780-0014000 07780-0014100 07781-0010101 07781-0010202 07912-6110001 07946-1870100  07946-3710500 07949-3710001 07973-6570500 07PAF-0010500 07PAF-0010400 07973-6570600 07PAF-0010800 07PAF-0010700 07PAF-0010650 07PAF-0010300 07984-2000001 07984-ZE20001 07LPA-ZV30200 07LPC-ZV30100 07936-3710100 07741-0010201 07SPA-ZW10100 07SPA-ZW10200 07SPB-ZW10100	Inspection for carburetor float level Inspection for oil pressure Inspection for oil pressure Valve guide removal/installation (IN) Valve guide removal/installation (EX) 22x35x7 mm water seal installation, propeller shaft holder needle bearing, propeller shaft holder water innner/outer seal, lower mount center housing removal Taper roller bearing (inner race) removal Taper roller bearing (inner race) installation Lower mount center housing installation Taper roller bearing (inner race) removal, forward bevel gear roller bearing installation Lower mount center housing removal 22x35x7 mm water seal installation Driver for 6,7,8,10,11,12 and 24 Valve cotter removal/installation Valve seat reconditioning (IN) Valve seat reconditioning (EX) Valve seat reconditioning (IN) Valve seat reconditioning (EX) Valve seat reconditioning (IN) Valve seat reconditioning (EX) Valve seat reconditioning (IN) Valve seat reconditioning (EX) Oil filter replacement Forward bevel gear roller bearing installation, propeller shaft holder roller bearing removal Propeller shaft holder roller bearing removal Driver for 6 and 24   Piston pin removal/installation  Valve guide reaming (IN) Valve guide reaming (EX) Timing belt driven pulley removal/installation   Gear case taper roller bearing (outer race) removal  Piston rod comp. removal/installation Rod guide comp. removal/installation Alternator rotor, starter pulley, flywheel removal/installation

# HONDA

## BF75A·90A

Tool name	Tool number	Application
44. Vertical shaft holder 45. Puller jaws	07SPB-ZW10200 07SPC-ZW0010Z	Vertical shaft pinion gear nut removal/installation Propeller shaft holder assembly removal, forward bevel gear backlash inspection
46. Puller bolt	07SPC-ZW0011Z	Propeller shaft holder assembly removal, forward bevel gear backlash inspection
47. Bearing race puller	07SPC-ZW0020Z	Gear case taper bearing (outer race) removal
48. Mandrel	07SPD-ZW0010Z	Gear case taper roller bearing (outer race) installation
49. Mandrel	07SPD-ZW0020Z	Propeller shaft holder needle bearing installation
50. Bearing installation tool	07SPD-ZW0030Z	Propeller shaft holder needle bearing, propeller shaft holder water inner/outer seal, propeller shaft holder roller bearing installation
51. Oil seal driver	07SPD-ZW0040Z	Propeller shaft holder water inner/outer seal installation
52. Rod	07SPD-ZW0050Z	Gear case bearing assembly, gear case taper bearing (outer race) installation
53. Nut	07SPD-ZW0060Z	Gear case bearing assembly, gear case taper bearing (outer race) installation
54. Bearing installation tool kit	07SPD-ZW0070Z	Use the mandrel (91-13780, 91-13781) only
54-1. Mandrel	91-13780 *	Gear case bearing assembly, gear case taper bearing (outer race) installation
54-2. Mandrel	91-13781 *	Gear case bearing assembly, gear case taper bearing (outer race) installation
55. Water seal driver	07SPD-ZW0080Z	Water pump housing upper/lower water seal installation
56. Wear sleeve installation tool	07SPF-ZW0010Z	Wear sleeve installation
57. Bearing preload tool	07SPJ-ZW0010Z	Pinion gear shim adjustment, forward bevel gear backlash inspection
58. Pinion gear locating tool	07SPJ-ZW0020Z	Pinion gear shim adjustment
59. Backlash indicator tool	07SPJ-ZW0030Z	Forward bevel gear backlash inspection
60. Dial indicator adapter kit	07SPJ-ZW0040Z	Forward bevel gear backlash inspection
61. Leakage tester	07SPJ-ZW0050Z	Gear case pressure test (Use the tip of the gear lubricant pump, too).
62. Oil pressure gauge set	07SPJ-ZW10000	 Power Trim/tilt assembly blow pressure inspection
62-1. -Oil pressure gauge joint A	07SPJ-ZW10100	
62-2. -Oil pressure gauge joint B	07SPJ-ZW10200	
63. Vertical shaft indicator attachment	07SPK-ZW10100	Pinion gear shim adjustment, forward bevel gear backlash inspection
64. Lifting eye	07SPZ-ZW0010Z	Engine removal/installation
65. Pilot screw wrench	07KMA-MS60101	Pilot screw adjustment (Bodensee type only)

\* Tools contained in the bearing installation tool kit (07SPD-ZW0070Z).

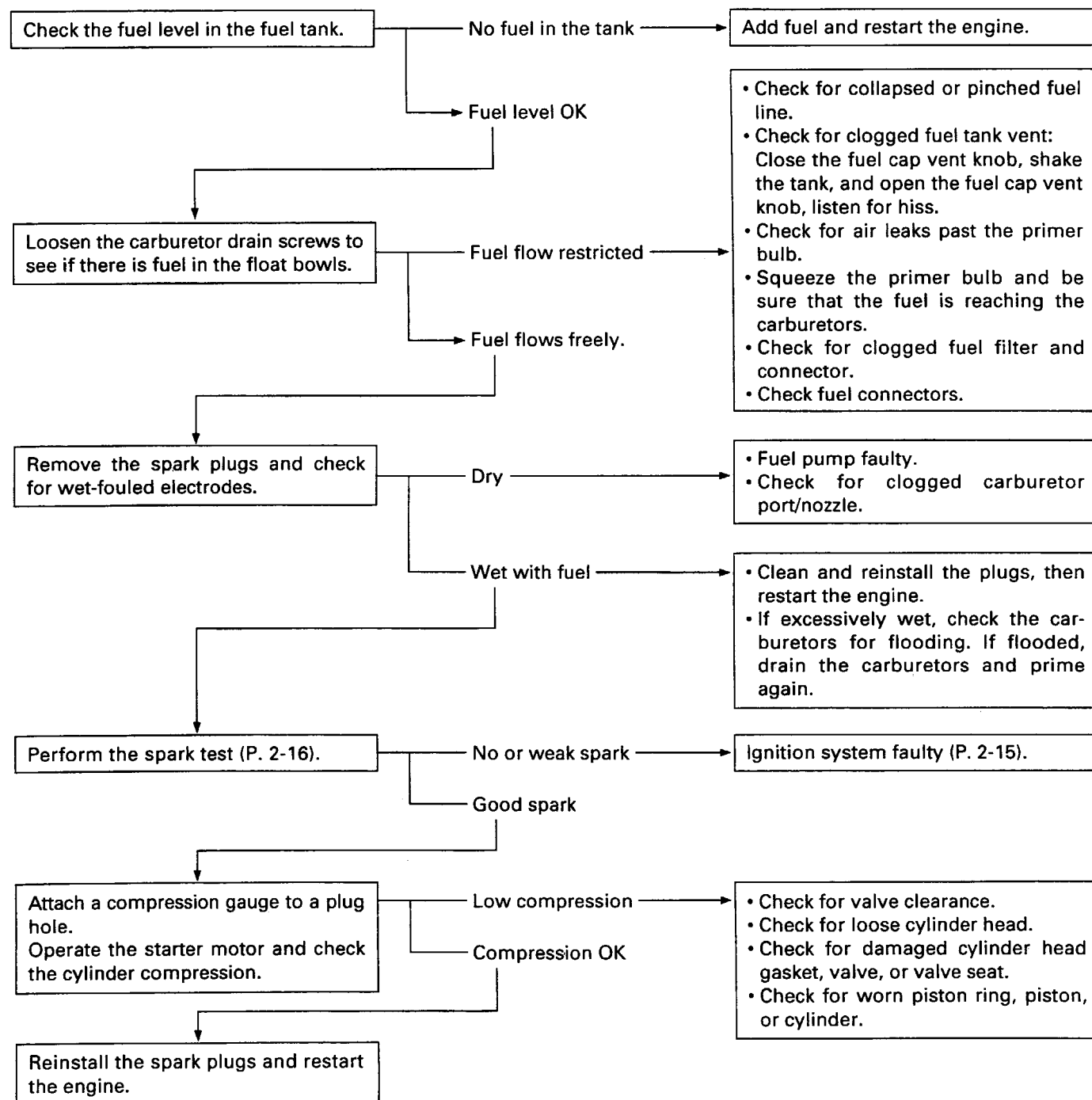




## 8. TROUBLESHOOTING

### ENGINE

#### A. HARD STARTING



### CYLINDER COMPRESSION TEST

- 1) Put the remote control lever or gearshift lever in the "N" (Neutral) position.
- 2) Disengage the emergency stop switch clip from the emergency stop switch.
- 3) Put the choke knob or choke/fast idle lever in the normal run position.
- 4) Remove the engine cover and all the spark plugs.
- 5) Install a compression gauge in the No.1 spark plug hole.
- 6) Manually hold the throttle cam in the wide open throttle position.
- 7) Turn the ignition key to the "START" position and operate the engine until the highest compression reading is obtained.

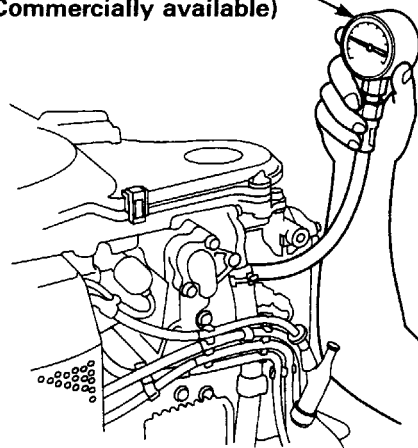
Cylinder compression	1,471 ± 98 kPa (15 ± 1 kgf/cm <sup>2</sup> , 213 ± 14 psi) at 300 min <sup>-1</sup> (rpm)
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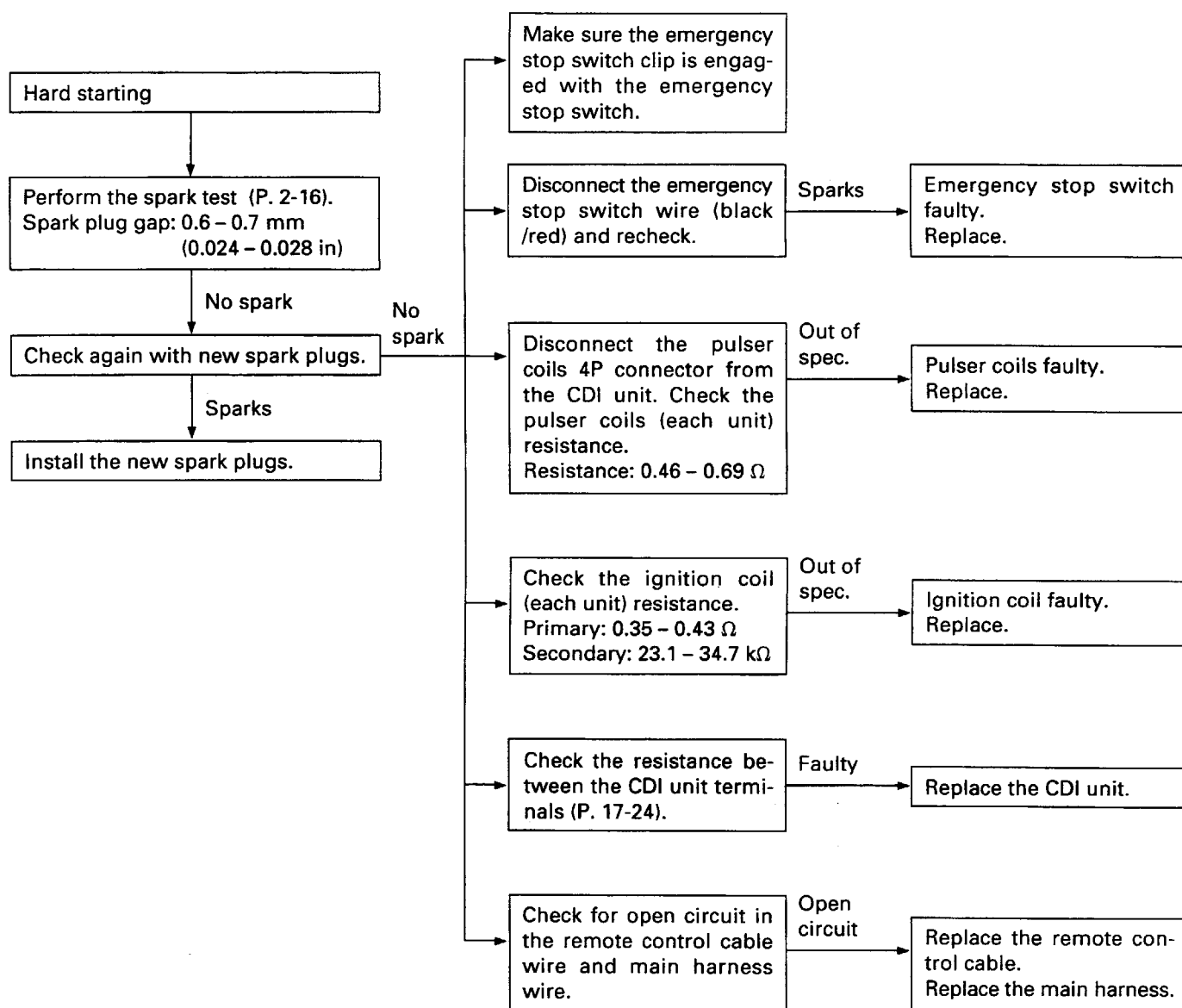
#### NOTE:

On the remote control type, have an assistant operate the starter motor using the ignition key.
---

- 8) Install the compression gauge in the other spark plug holes and repeat step 6) and 7).
- 9) Check the compression on all cylinders.

COMPRESSION GAUGE  
(Commercially available)



**B. IGNITION SYSTEM**

### SPARK TEST

- 1) Put the remote control lever or gearshift lever in the "N" (Neutral) position.
- 2) Disconnect the spark plug caps from the spark plugs.
- 3) Remove all the spark plugs from the engine.
- 4) Attach one of the removed spark plugs to the No.1 spark plug cap.
- 5) Ground the negative (-) electrode of the No.1 spark plug (threads) to the cylinder head cover bolt.
- 6) Turn the ignition key to the "START" position and operate the engine to see if sparks jump across the spark plug electrodes.

#### WARNING

**Gasoline is highly flammable and explosive.**

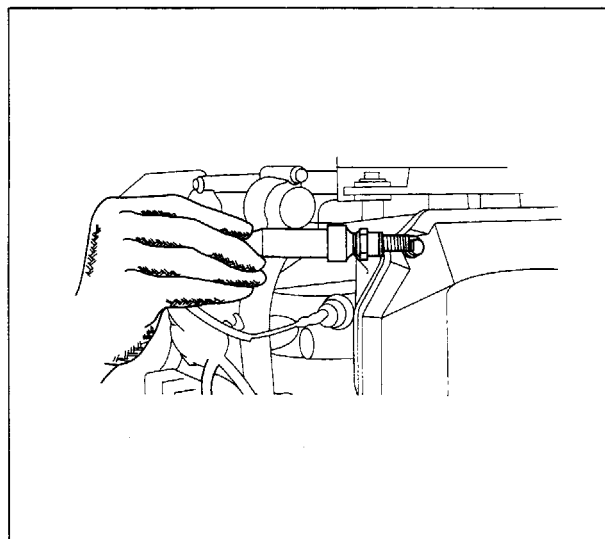
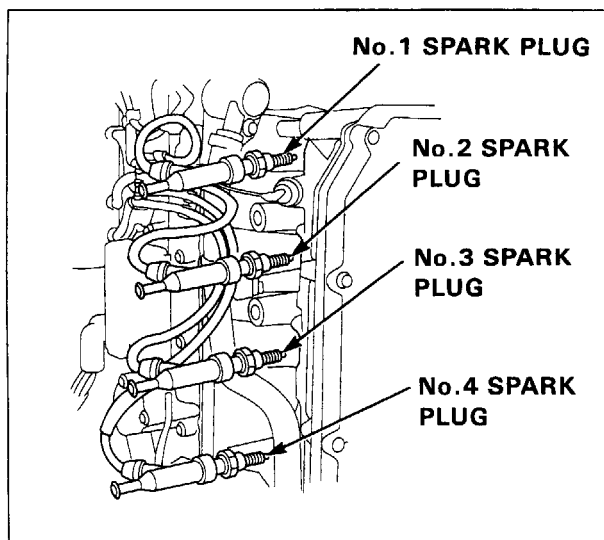
**If ignited, gasoline can burn you severely.**

- **Be sure there is no spilled fuel near the engine.**
- **Place the spark plug away from the spark plug holes.**

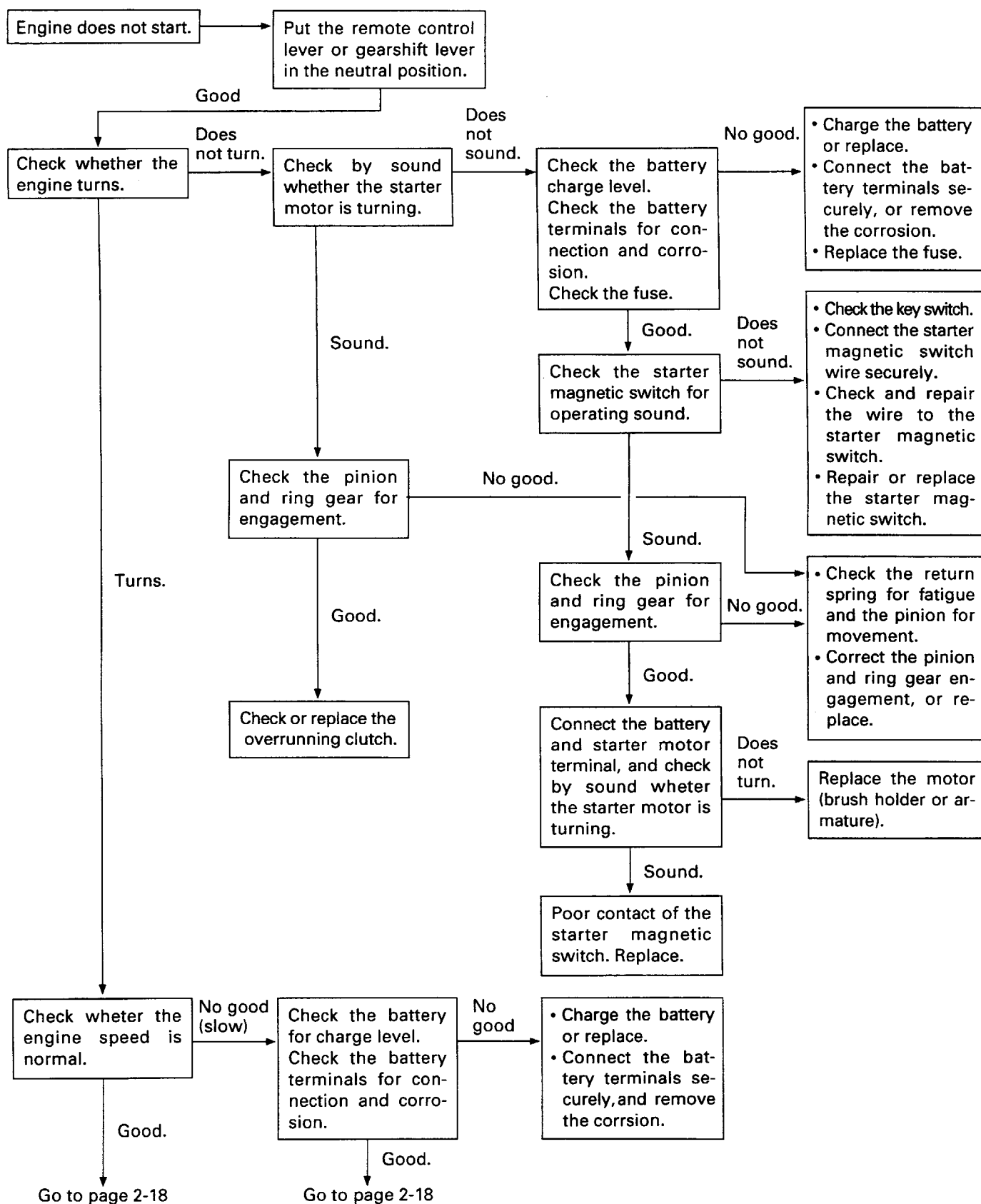
#### NOTE:

- On the remote control type have an assistant operate the starter motor using the ignition key.
- Be sure the lanyard clip is installed in the emergency stop switch.

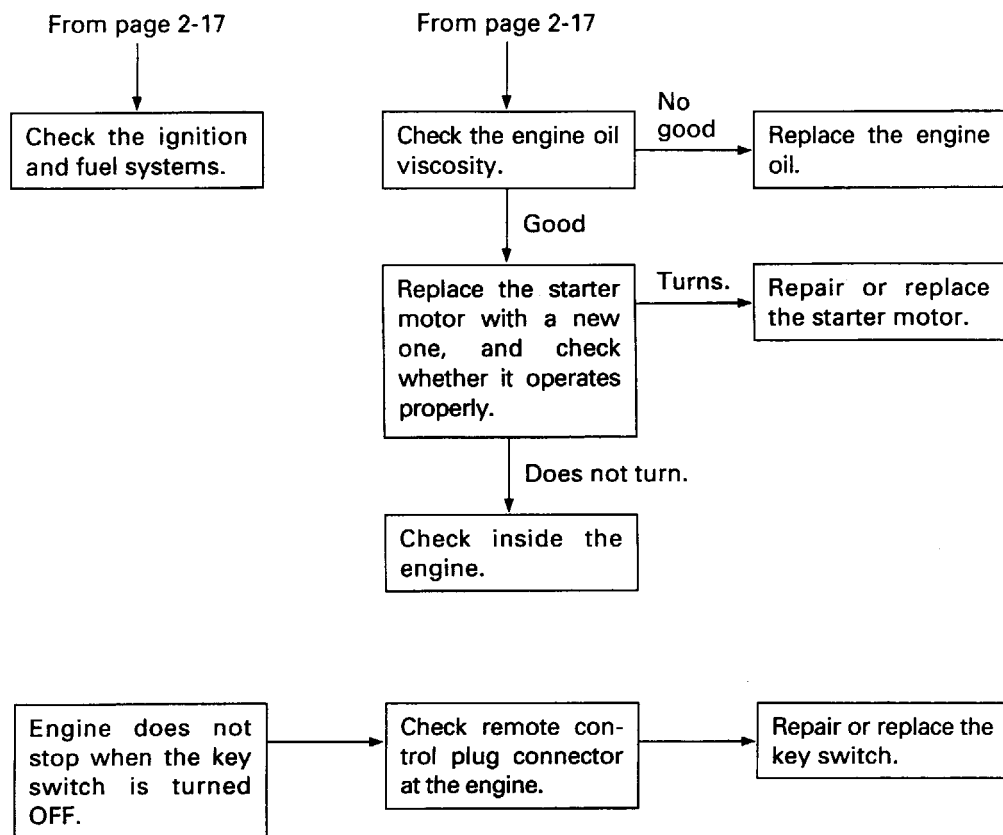
- 7) Check for sparks on the No.2, No.3 and No.4 cylinders in the same manner.
- 8) Install the spark plug caps properly (P.17-9).



### C. STARTER MOTOR



NOTE: When a problem occurs, disconnect the battery.



NOTE: When a problem occurs, disconnect the battery.

### D. ENGINE DOES NOT RUN SMOOTHLY

Engine starts but stops soon. Poor idle performance.

- |  |  |
|--|--|
| 1) Wet fouled spark plug caused from excessive choke application | → Start the engine with the choke fully open and the throttle fully closed.                                |
| 2) Faulty spark plug   | → Clean, adjust, or replace.   |
| 3) Carburetor synchronization misadjusted                        | → Adjust properly.   |
| 4) Carburetor pilot screw/stop screw misadjusted                 | → Adjust properly.   |
| 5) Carburetor slow circuit clogged with dirt                     | → Overhaul.  |
| 6) Overflowed carburetor   | → Drain the carburetor and prime again. If still not good, overhaul the carburetor. Check carburetor vent. |
| 7) Air leak due to damaged carburetor insulator gasket           | → Replace.   |

Engine speed does not increase.

- |  |   |
|--|---|
| 1) Choke not returned properly   | → Return.   |
| 2) Throttle cable misadjusted  | → Adjust properly.                                |
| 3) Propeller mismatched  | → Select correct propeller.                       |
| 4) Engine overheats, engine oil pressure drops abnormally. (Alert system functions.) |   |
| 5) Faulty spark plug   | → Clean, adjust, or replace.                      |
| 6) Clogged fuel filter   | → Replace.  |
| 7) Water/dirt in carburetor  | → Drain the carburetor. Rebuild if NECESSARY.     |
| 8) Incorrect valve timing  | → Reinstall the timing belt and time valve train. |

Engine speed does not decrease.

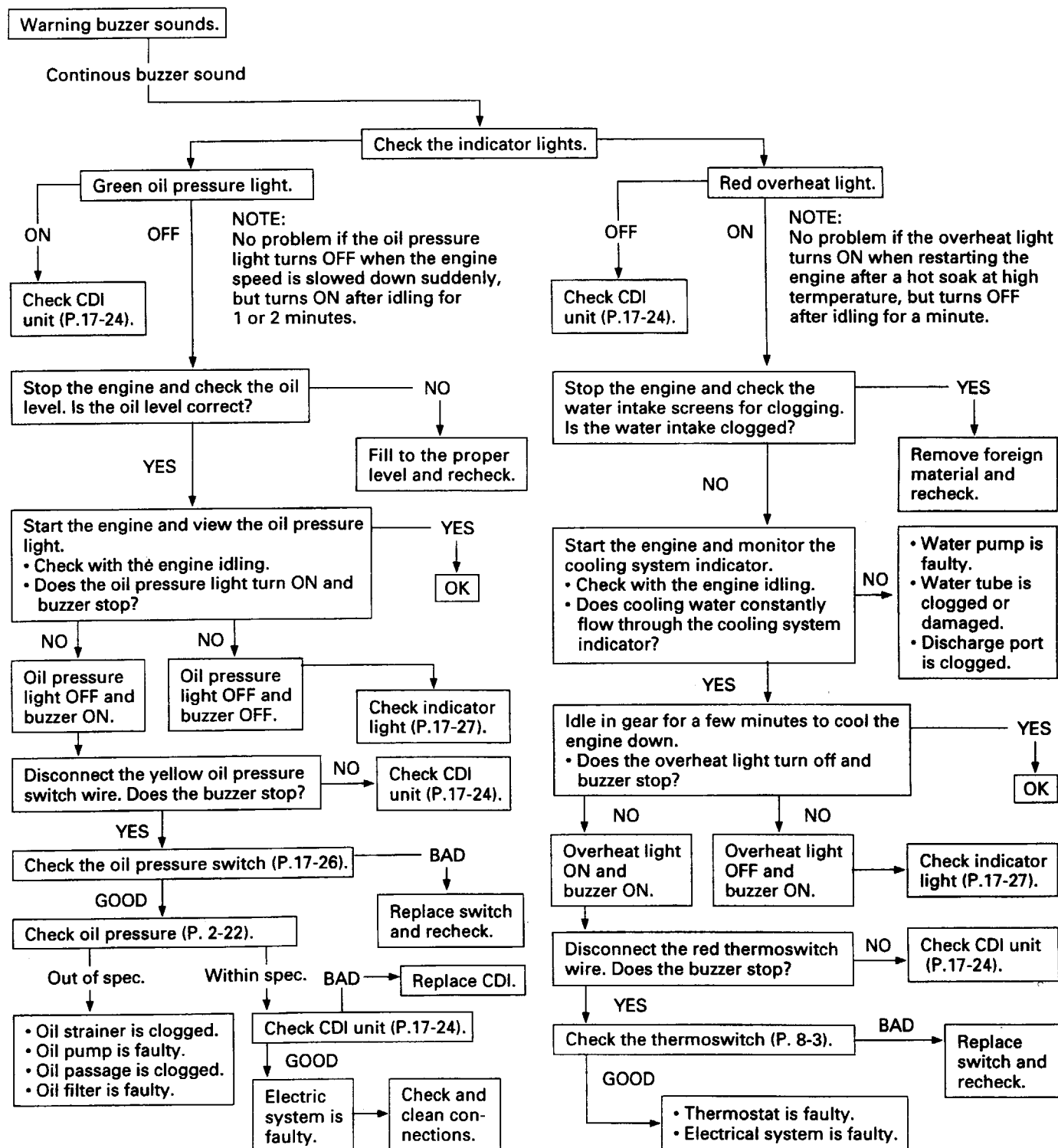
- |  |                      |
|--|----------------------|
| 1) Acceleration/deceleration system misadjusted      | → Readjust properly. |
| 2) Clogged dash pot check valve                      | → Replace.           |
| 3) Throttle cable stuck                              | → Replace.           |
| 4) Carburetor throttle shaft does not move smoothly. | → Replace.           |

Excessive engine speed, engine speed fluctuates.

- |  |                             |
|--|-----------------------------|
| 1) Mismatched propeller  | → Select correct propeller. |
| (Rev-limiter functions when over-revving.)   |                             |
| 2) Propeller excessively worn  | → Replace.                  |
| 3) Propeller damper rubber slipping  | → Replace.                  |
| 4) Improperly installed outboard engine (incorrect transom height, tilt angle, etc.) | → Adjust properly.          |

### E. ALERT SYSTEMS

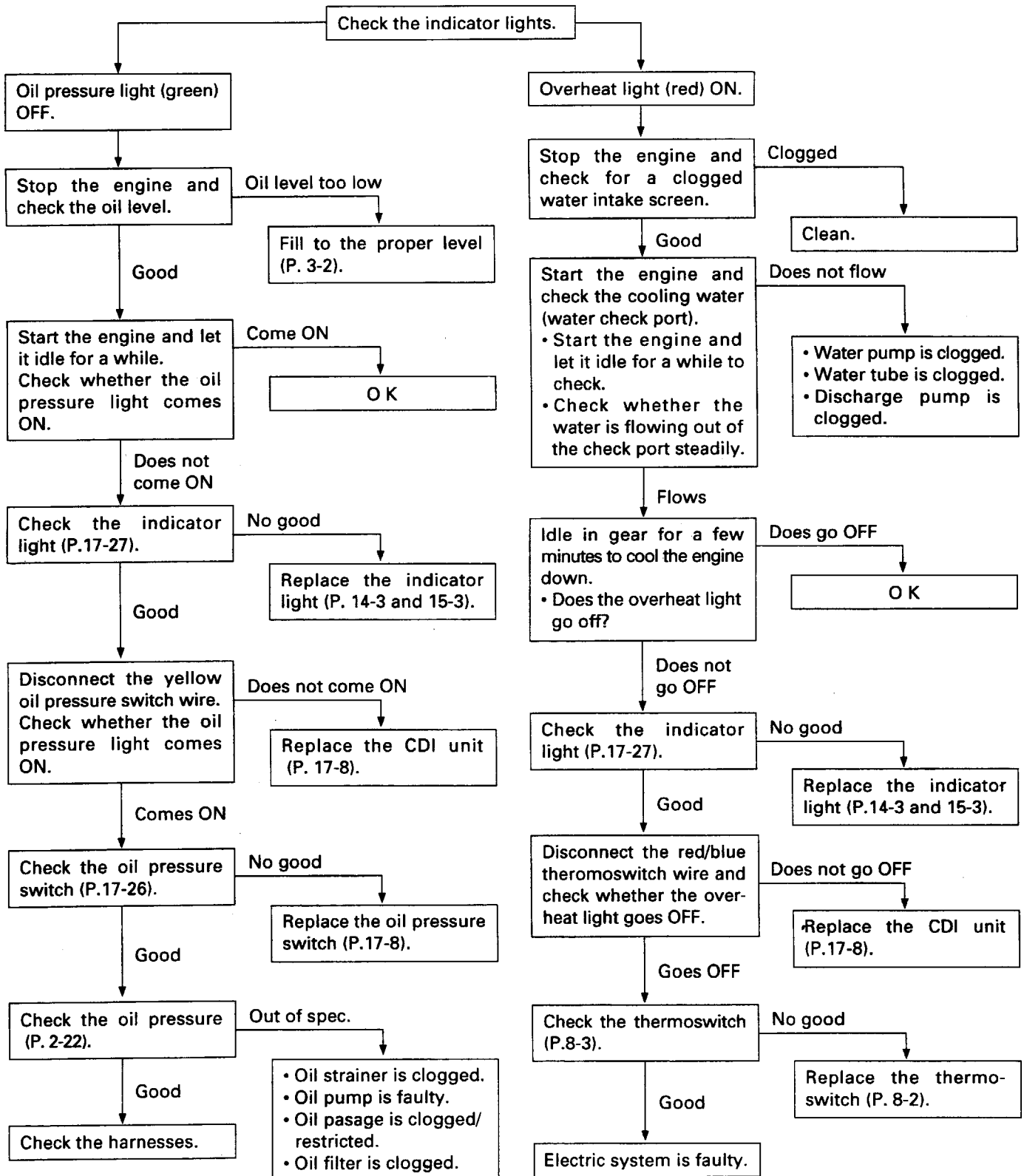
(Remote control type)



NOTE: These outboard motors are equipped with an engine over-rev limiter. The over-rev limiter is activated when the engine rpm exceeds 6,600 rpm. When activated, the spark is eliminated to all cylinders. The over-rev limiter may be activated under such conditions as light propeller load or propeller ventilation.



(Tiller handle type)



### OIL PRESSURE TEST

- 1) Check the engine oil level (P. 3-2).
- 2) Remove the 4 x 8 mm screw and oil pressure switch.

- 3) Install a pressure gauge attachment (special tool) on an oil pressure gauge that has a scale calibrated to a maximum of 196–490 kPa (2–5 kgf/cm<sup>2</sup>, 28–71 psi) to the outboard motor.

#### CAUTION:

- Tighten the gauge attachment to 9 N·m (0.9 kgf·m, 6.5 lbf·ft)
- Overtightening will damage the threads.

- 4) Remove the propeller (P. 11-1).  
Run the outboard motor in a test tank with the water level at least 4 inches above the antiventilation plate.

Allow the engine to warm up to normal operating temperature.

- 5) Check the oil pressure with the engine speed at  $950 \pm 50$  min<sup>-1</sup> (rpm).  
It should be 147 kPa (1.5 kgf/cm<sup>2</sup>, 21 psi) or above.

Oil pressure [Engine speed $950 \pm 50$ min <sup>-1</sup> (rpm) in neutral]	147 kPa (1.5 kgf/cm <sup>2</sup> , 21 psi) min.
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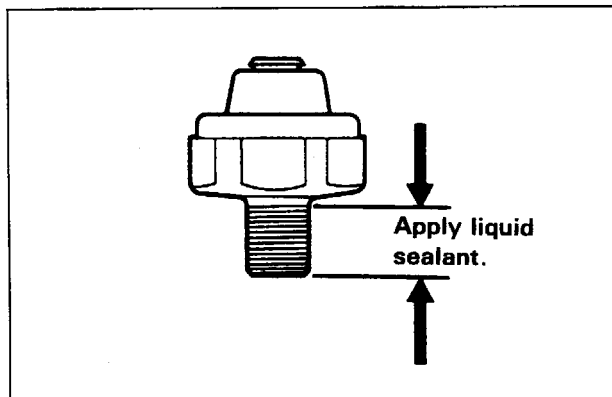
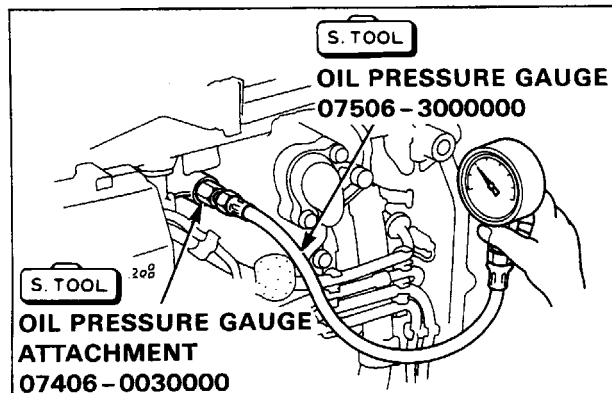
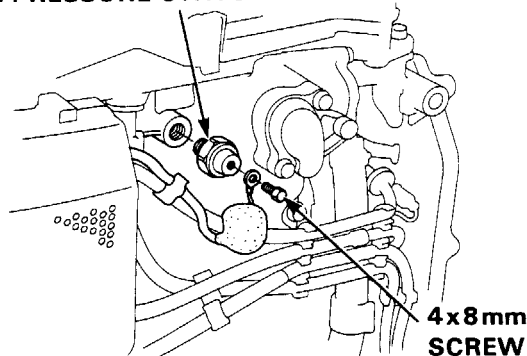
- 6) If the oil pressure is less than the specification, check the oil pump rotors and body for wear.
- 7) Clean the oil pressure switch threads and apply liquid sealant (THREE BOND 1215) to the threads. Tighten the oil pressure switch to the specified torque.

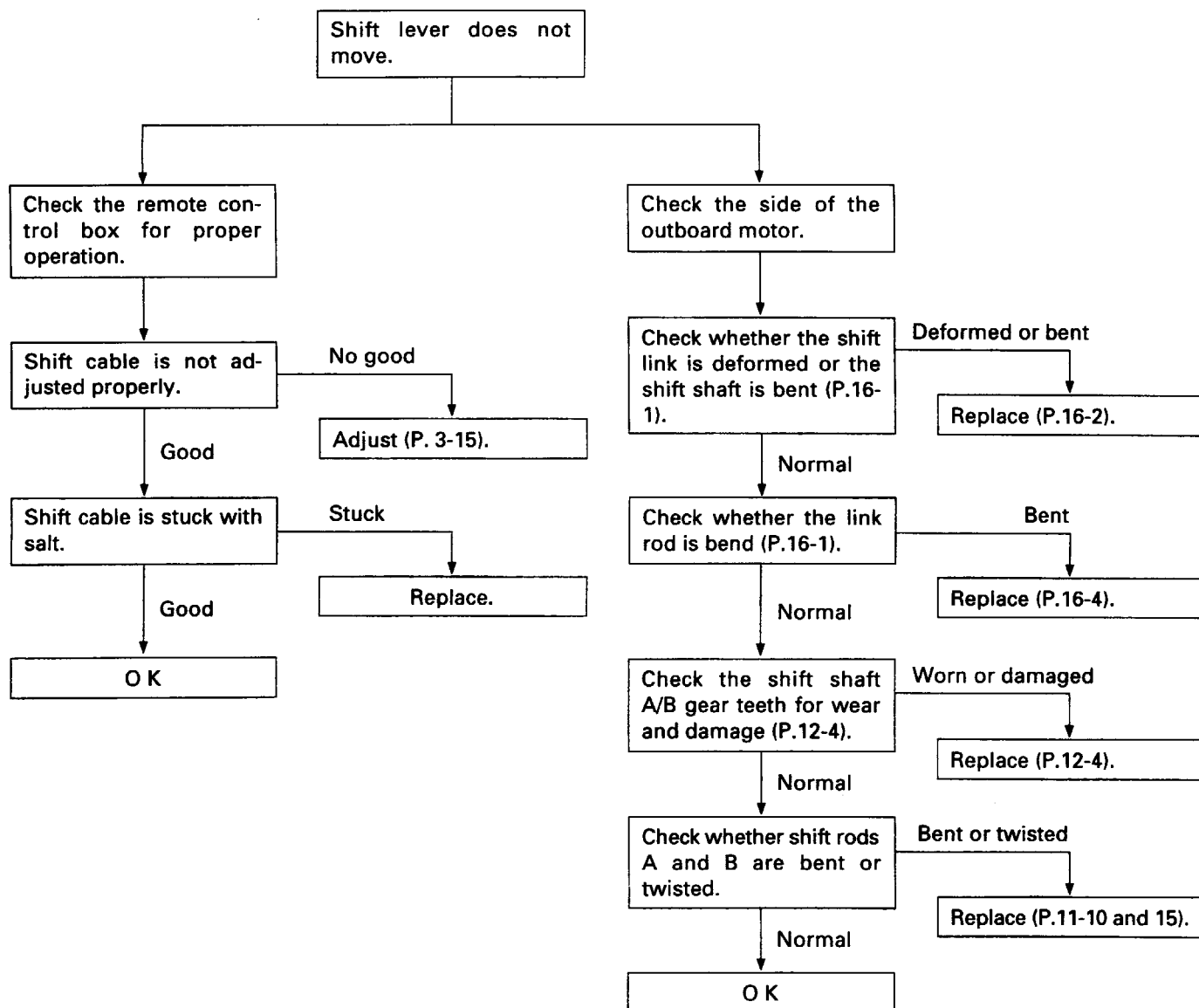
**TORQUE: 9 N·m (0.9 kgf·m, 6.5 lbf·ft)**

#### CAUTION:

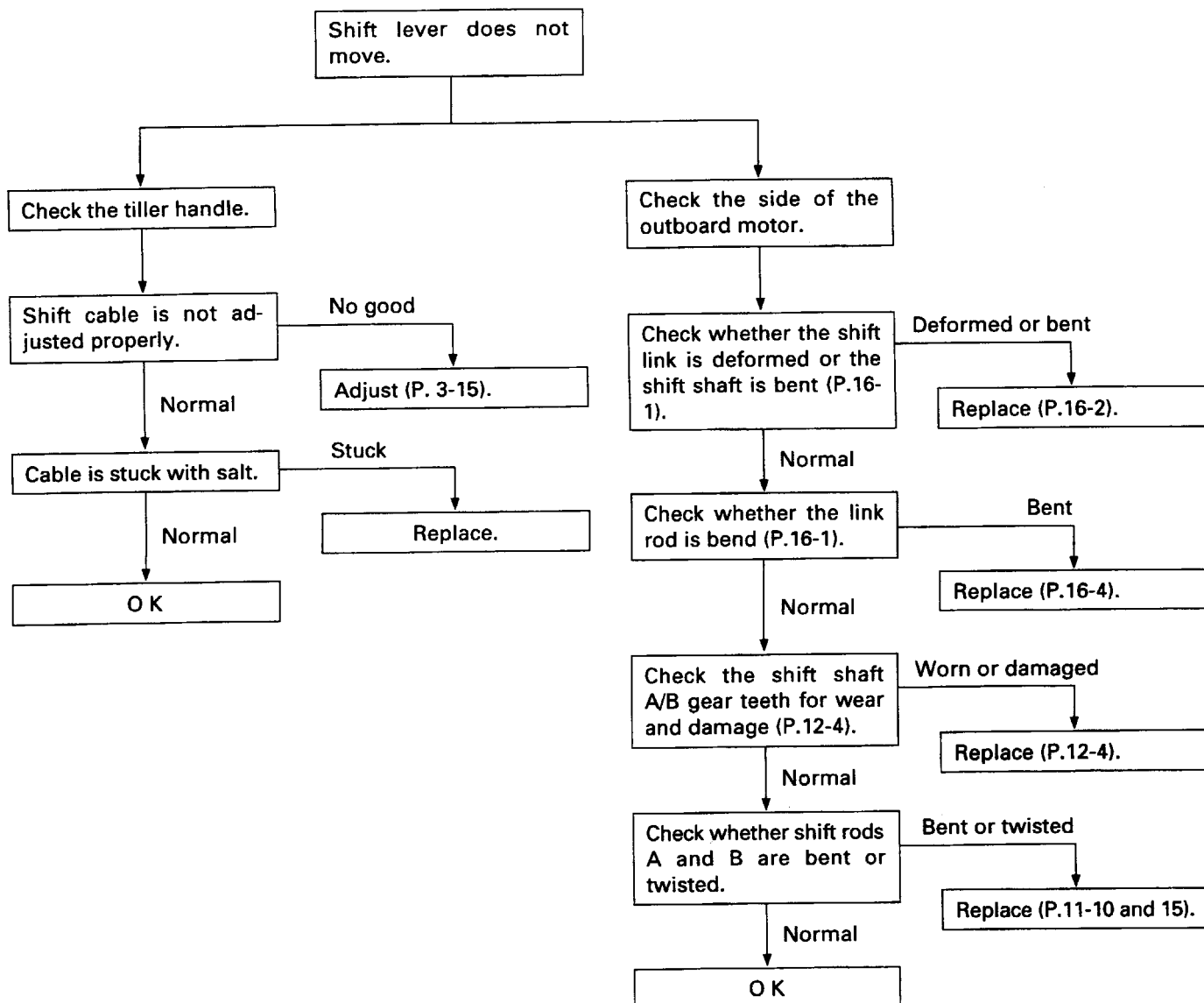
- Be sure to use a torque wrench to tighten the switch.
- Overtightening will damage the crankcase.

#### OIL PRESSURE SWITCH

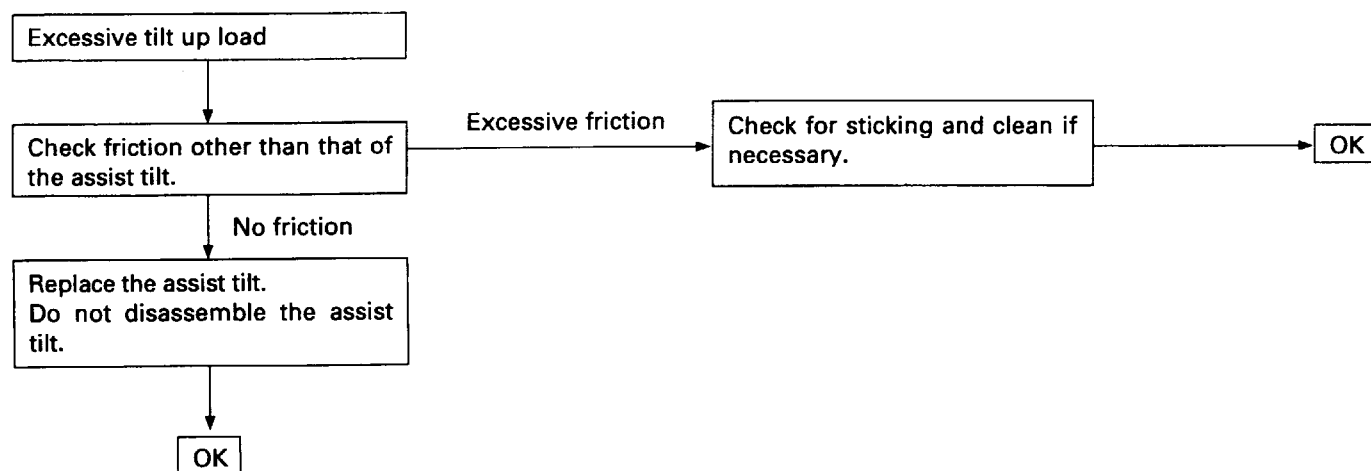


**F. SHIFT LEVER**  
**(Remote control type)**

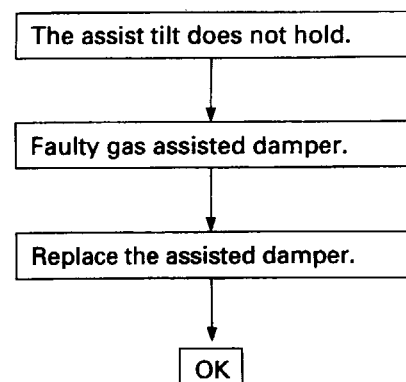
(Tiller handle type)



**G. ASSIST TILT LOAD (Gas assisted type)**

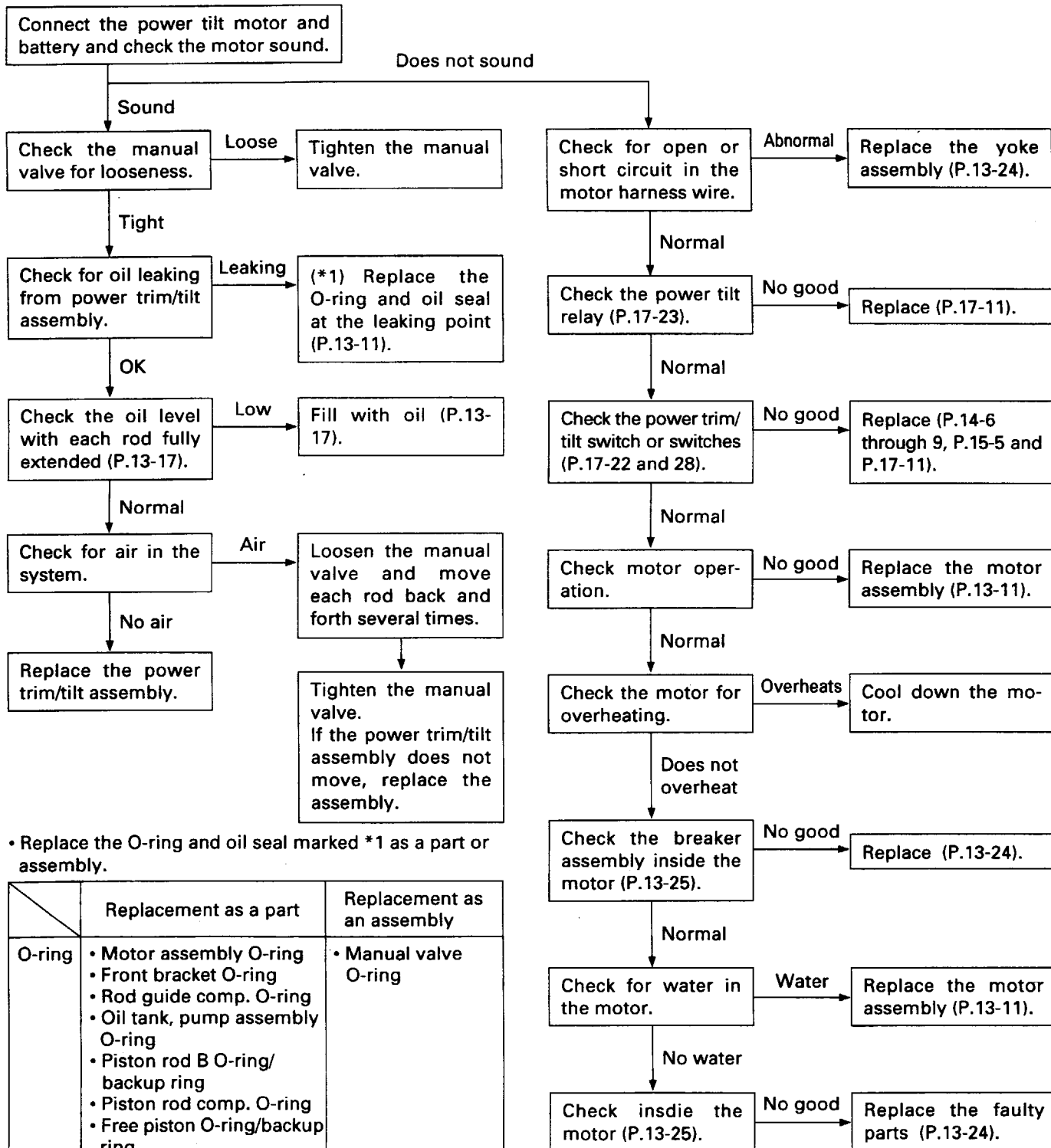


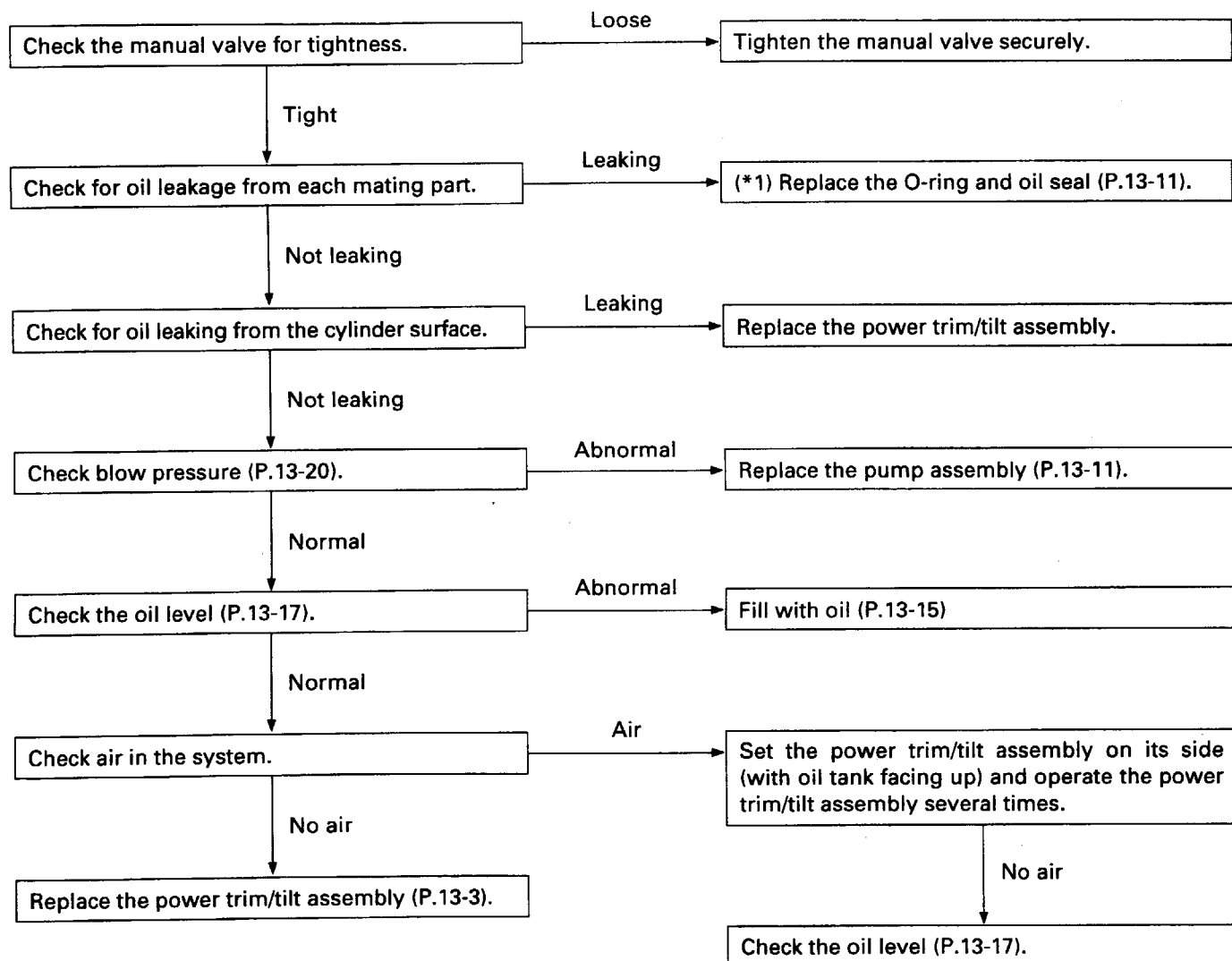
**H. THE ASSIST TILT DOES NOT HOLD (Gas assisted type)**



### I. POWER TRIM / TILT ASSEMBLY DOES NOT MOVE (Power trim/tilt type only)

- Use a fully charged 12V battery.



**J. THE POWER TRIM / TILT ASSEMBLY DOES NOT HOLD**  
**(Power trim / tilt type only)**


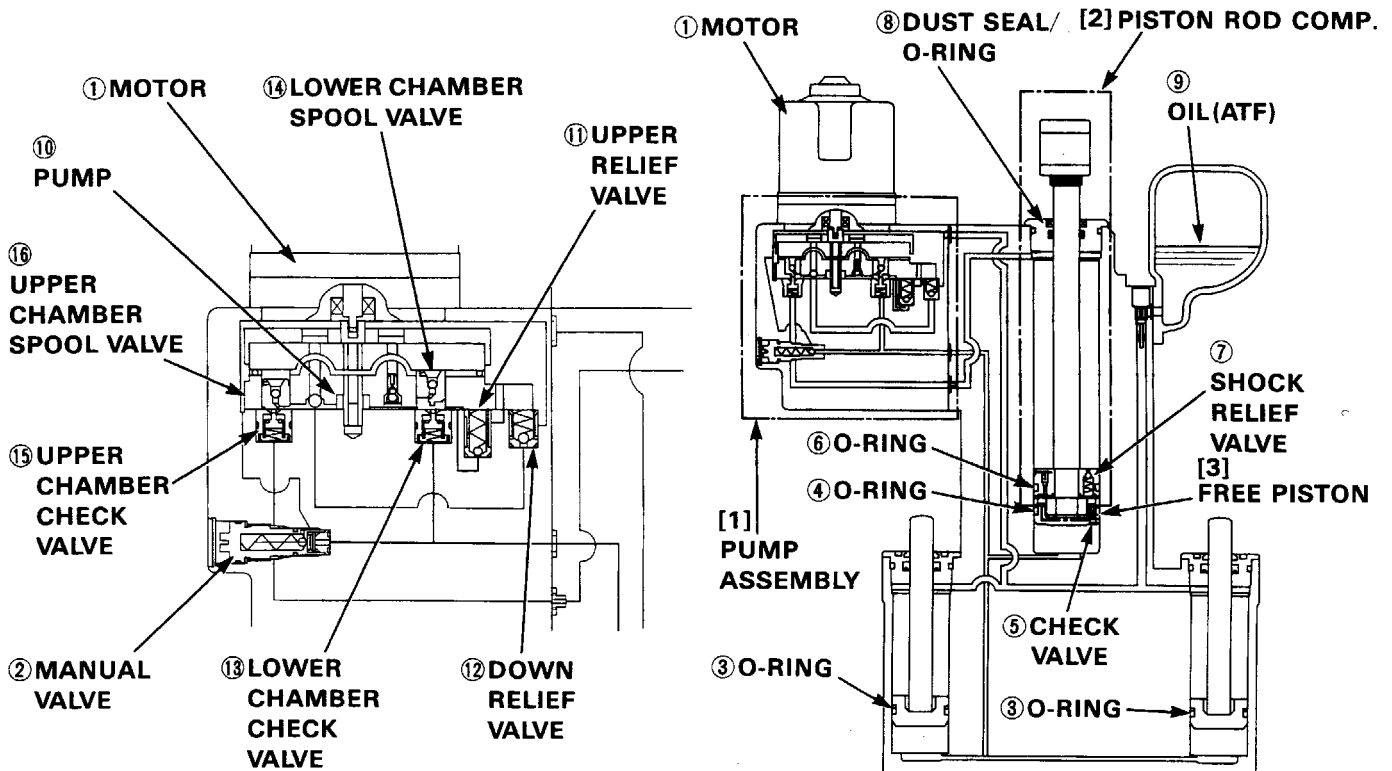
• Replace the O-ring and oil seal marked \*1 as a part or assembly.

	Replacement as a part	Replacement as an assembly
O-ring	<ul style="list-style-type: none"> <li>• Motor assembly O-ring</li> <li>• Front bracket O-ring</li> <li>• Rod guide comp. O-ring</li> <li>• Oil tank, pump assembly O-ring</li> <li>• Piston rod B O-ring/backup ring</li> <li>• Piston rod comp. O-ring</li> <li>• Free piston O-ring/backup ring</li> </ul>	<ul style="list-style-type: none"> <li>• Manual valve O-ring</li> </ul>
Oil seal	<ul style="list-style-type: none"> <li>• Front bracket oil seal</li> <li>• Rod guide comp. oil seal/dust seal</li> </ul>	<ul style="list-style-type: none"> <li>• Piston rod comp. (cylinder cap) oil seal</li> </ul>

# HONDA

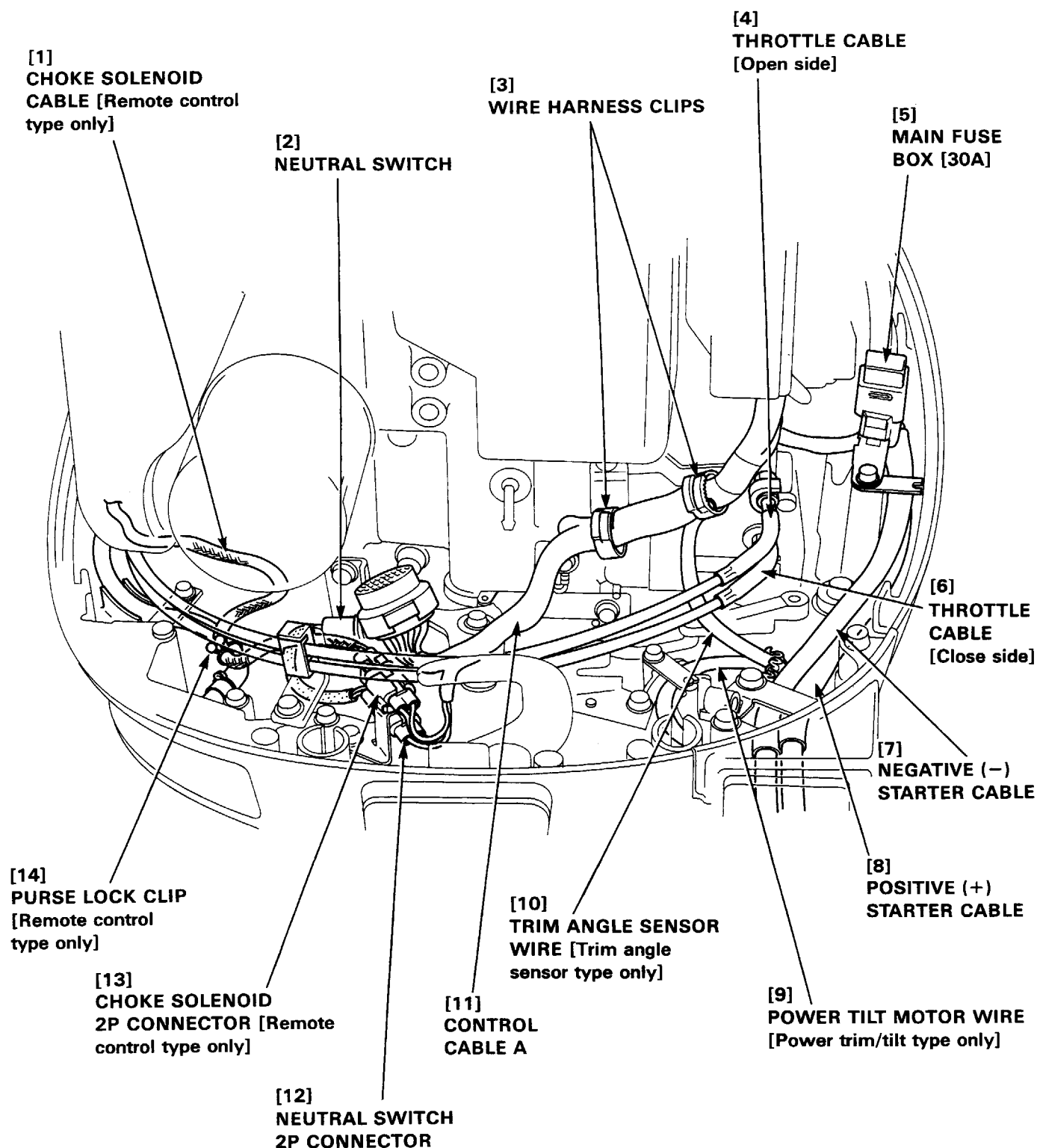
## BF75A·90A

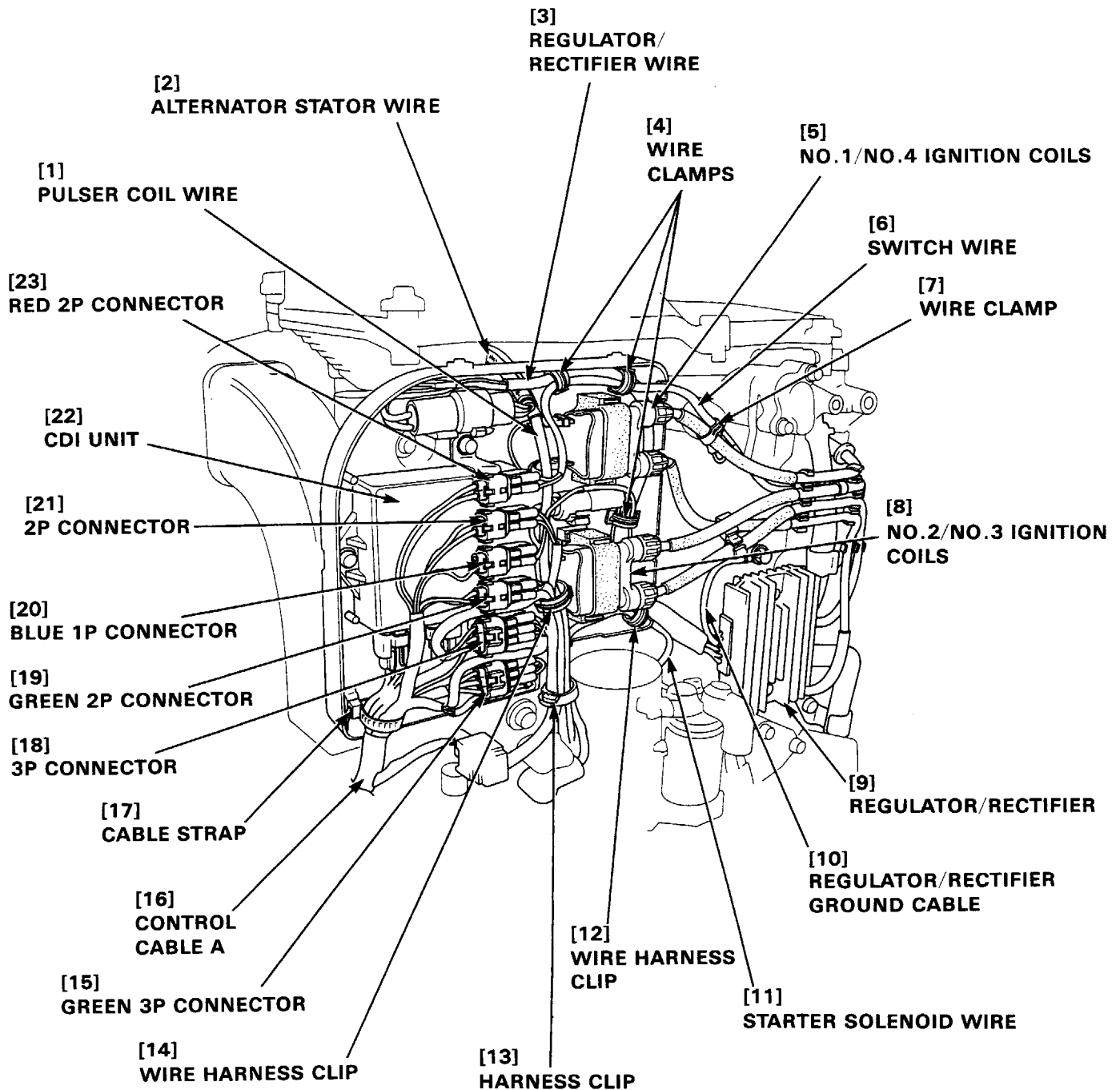
Symptom				Pressure check		Check point	Check/repair method
Does not tilt up.	Does not tilt down.	Does not hold.		Lower chamber blow-off pressure lower than spec. or pressure drops.	Upper chamber blow-off pressure lower than spec. or pressure drops.		
Low.	Extends.						
○	○			○	○	① Motor	Check according to the motor check procedure.
○	○	○	○	○	○	② Manual valve	Check the manual valve for foreign material and the O-ring surface for damage. Wash or replace the manual valve if necessary.
○	○	○		○		③ O-ring	Check the O-ring surface for damage or foreign material and replace if necessary.
○		○		○		④ O-ring	
○		○		○		⑤ Check valve	Do not disassemble the free piston as it is the guaranteed part of the assembly. Check the ball seat for damage or foreign material. Wash or replace the free piston if necessary.
	○		○		○	⑥ O-ring	Check the O-ring surface for damage and foreign material. Replace if necessary.
	○		○		○	⑦ Shock relief valve	Do not disassemble the piston rod comp. as it is the guaranteed part of the assembly. Check the ball seat for damage or foreign material. Wash the shock relief valve or replace the piston rod comp. if necessary.
	○		○		○	⑧ Dust seal/ O-ring	Do not disassemble the piston rod comp. as it is the guaranteed part of the assembly. Check the O-ring surface for damage or foreign material. Replace the piston rod comp. if necessary.
○	○					⑨ Oil	Check the oil level and add the oil if necessary.
○	○			○	○	⑩ Pump	Do not disassemble the pump assembly as it is the guaranteed part of the assembly. Replace the pump assembly if necessary.
○				○		⑪ Upper relief valve	
	○				○	⑫ Down relief valve	
○	○	○		○		⑬ Lower chamber check valve	
○	○	○		○		⑭ Lower chamber spool valve	
○	○		○		○	⑮ Upper chamber check valve	
○	○		○		○	⑯ Upper chamber spool valve	

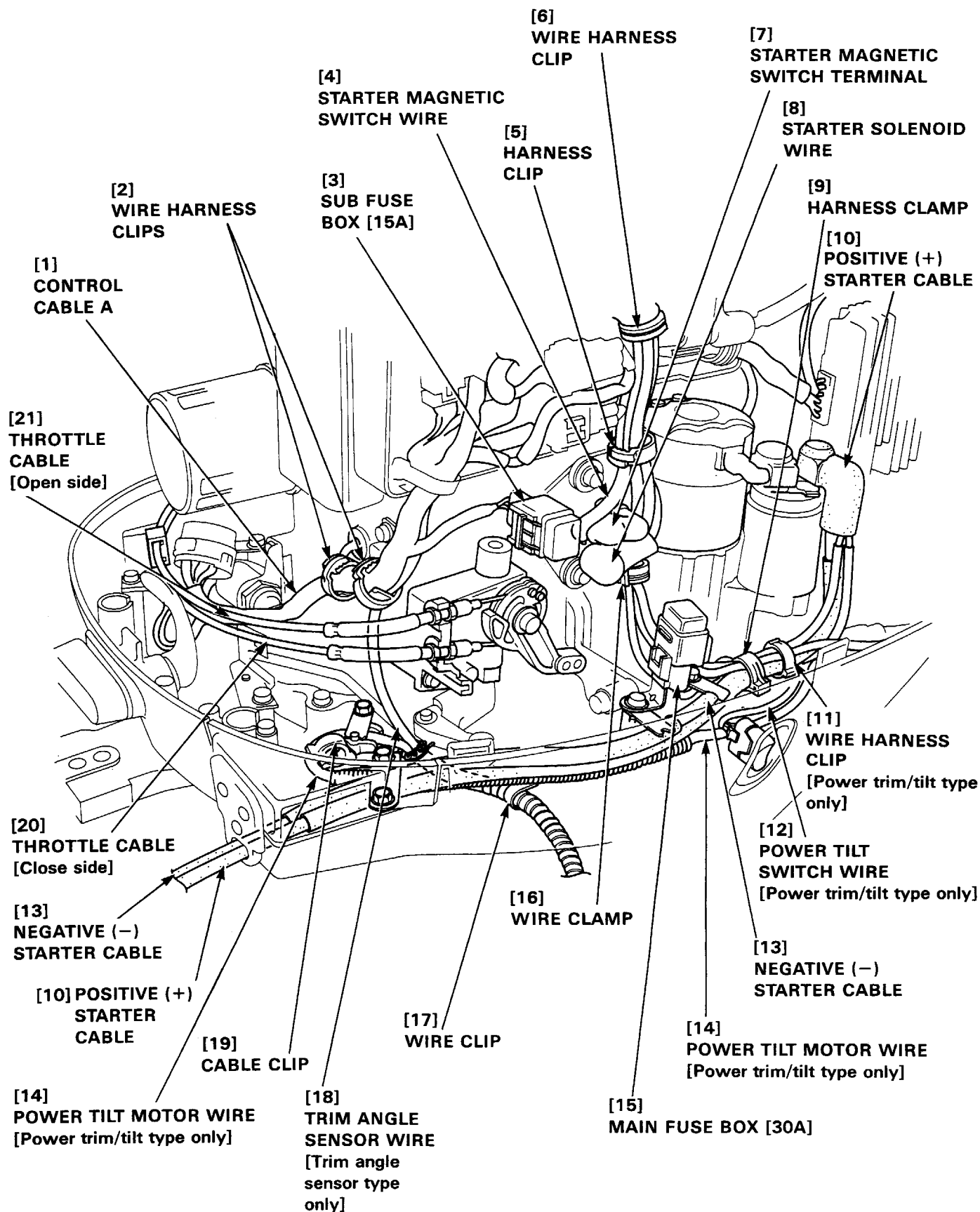


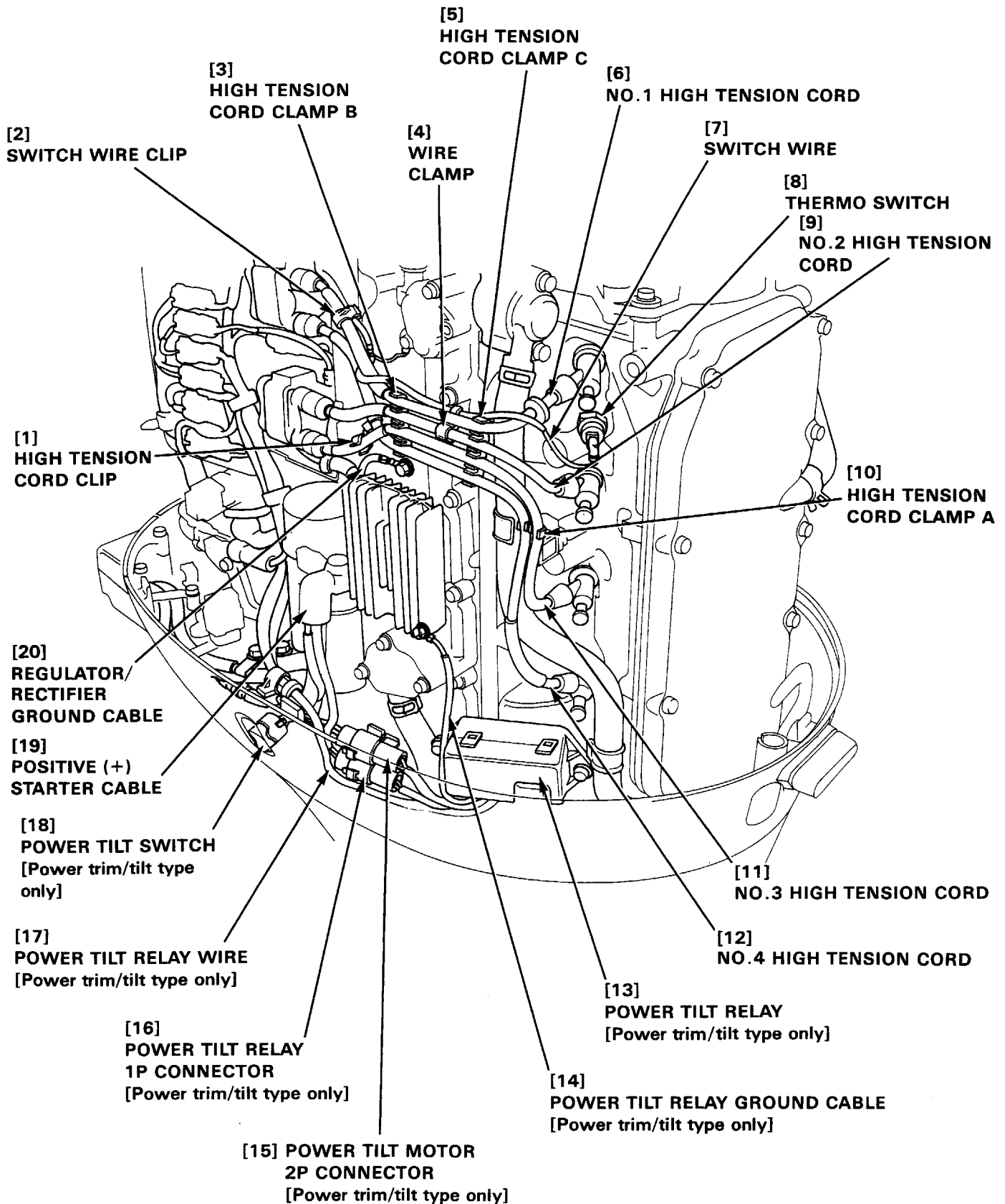


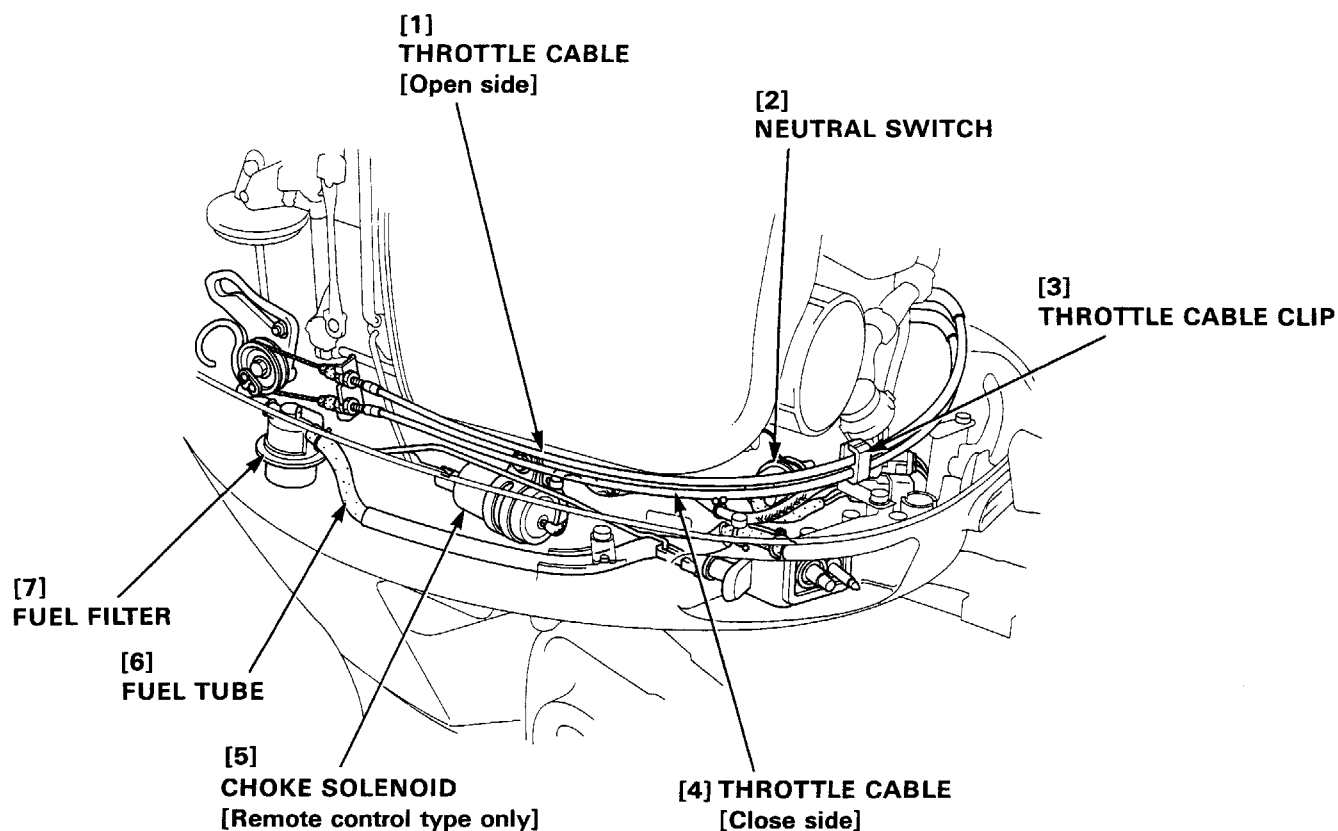
## 9. CABLE / HARNESS ROUTING



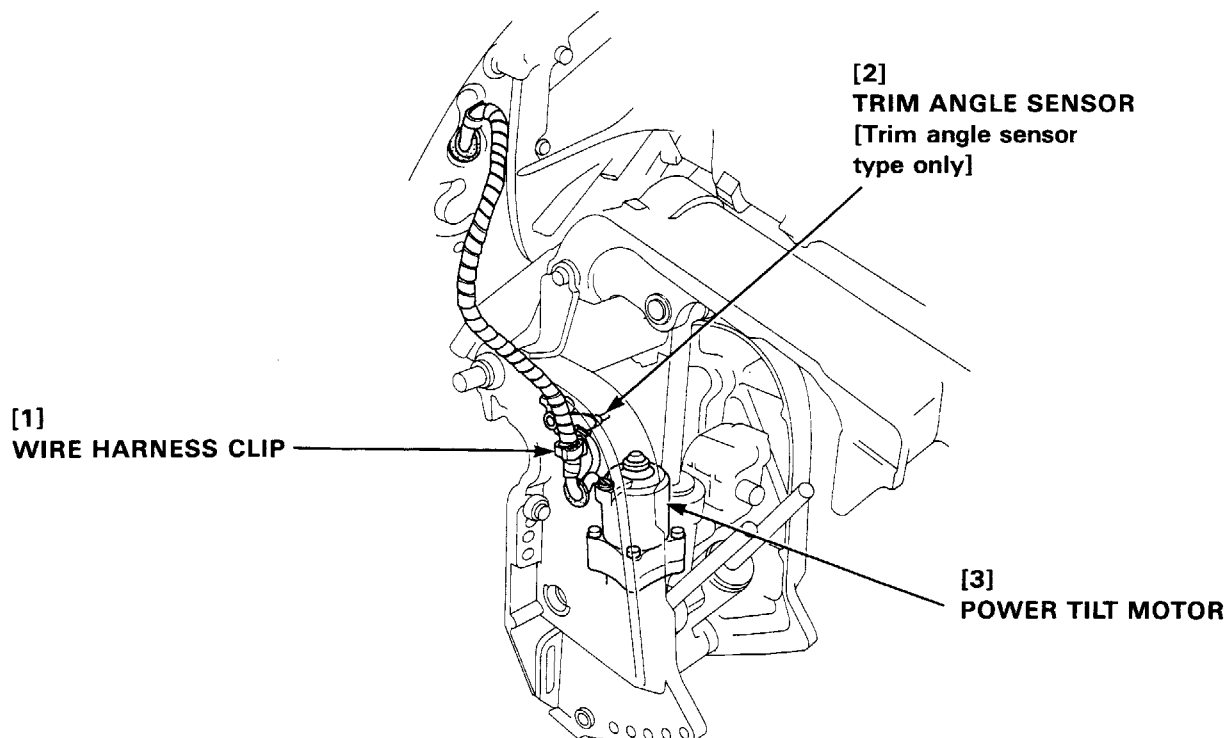




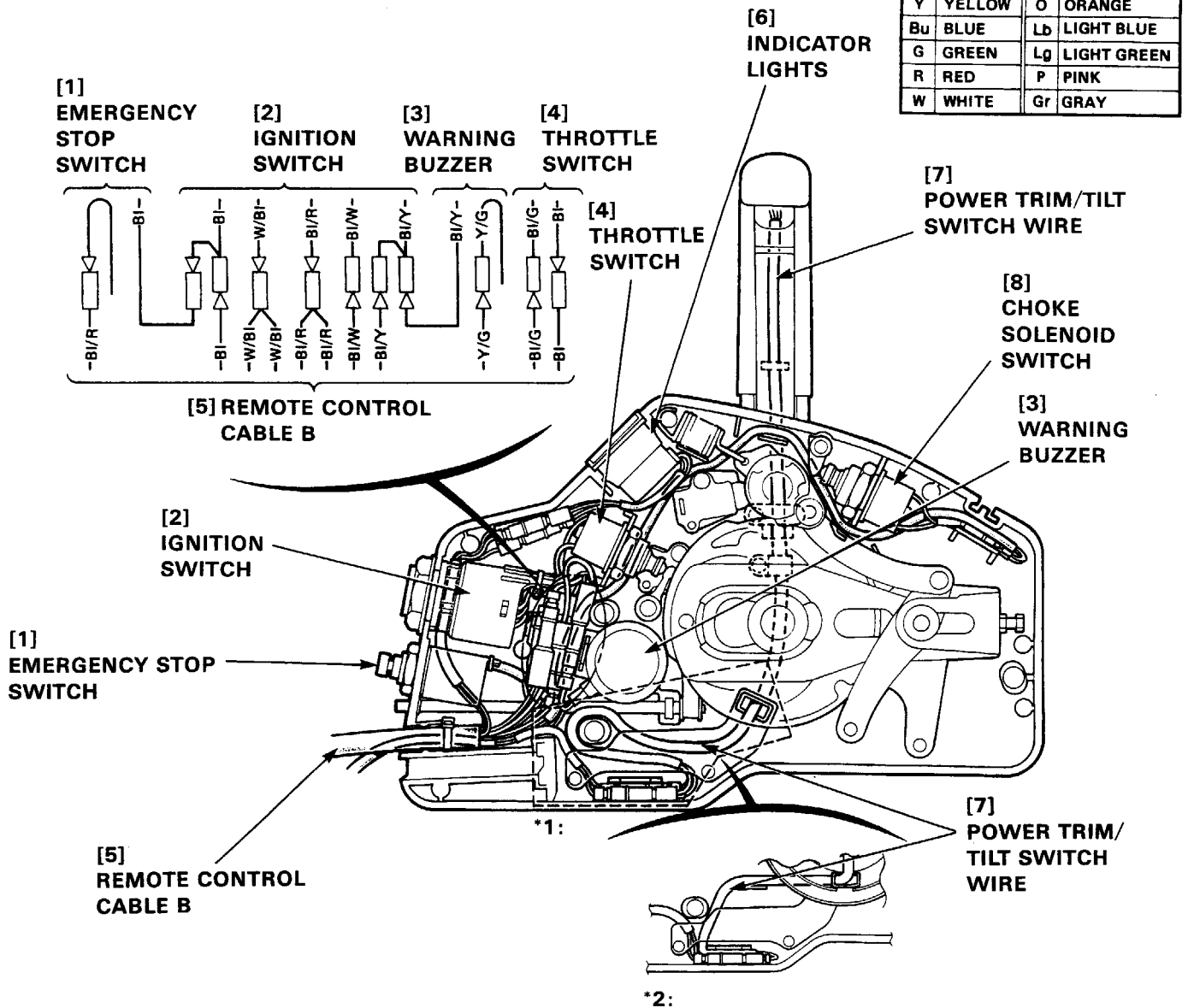




• Power trim/tilt type only

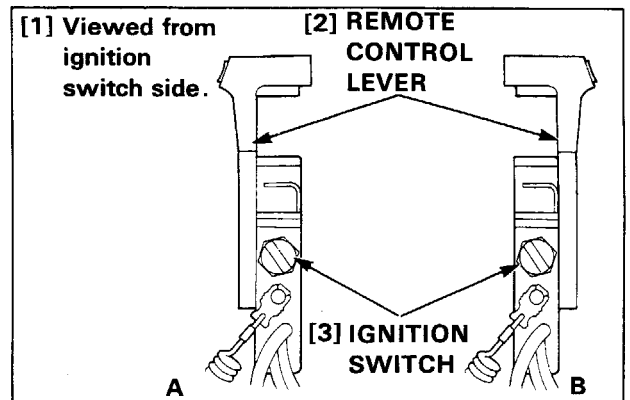


• Side-mount remote control type only

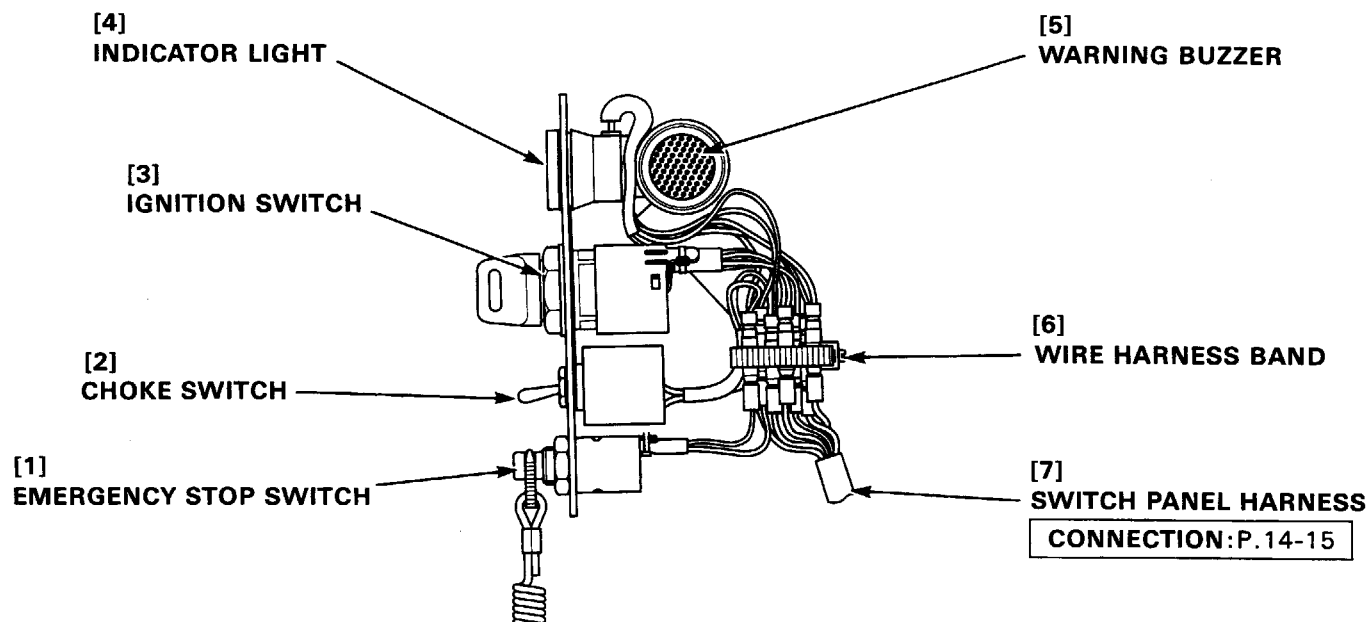


\*1: Power trim/tilt switch wire routing with remote control lever set as shown by A.

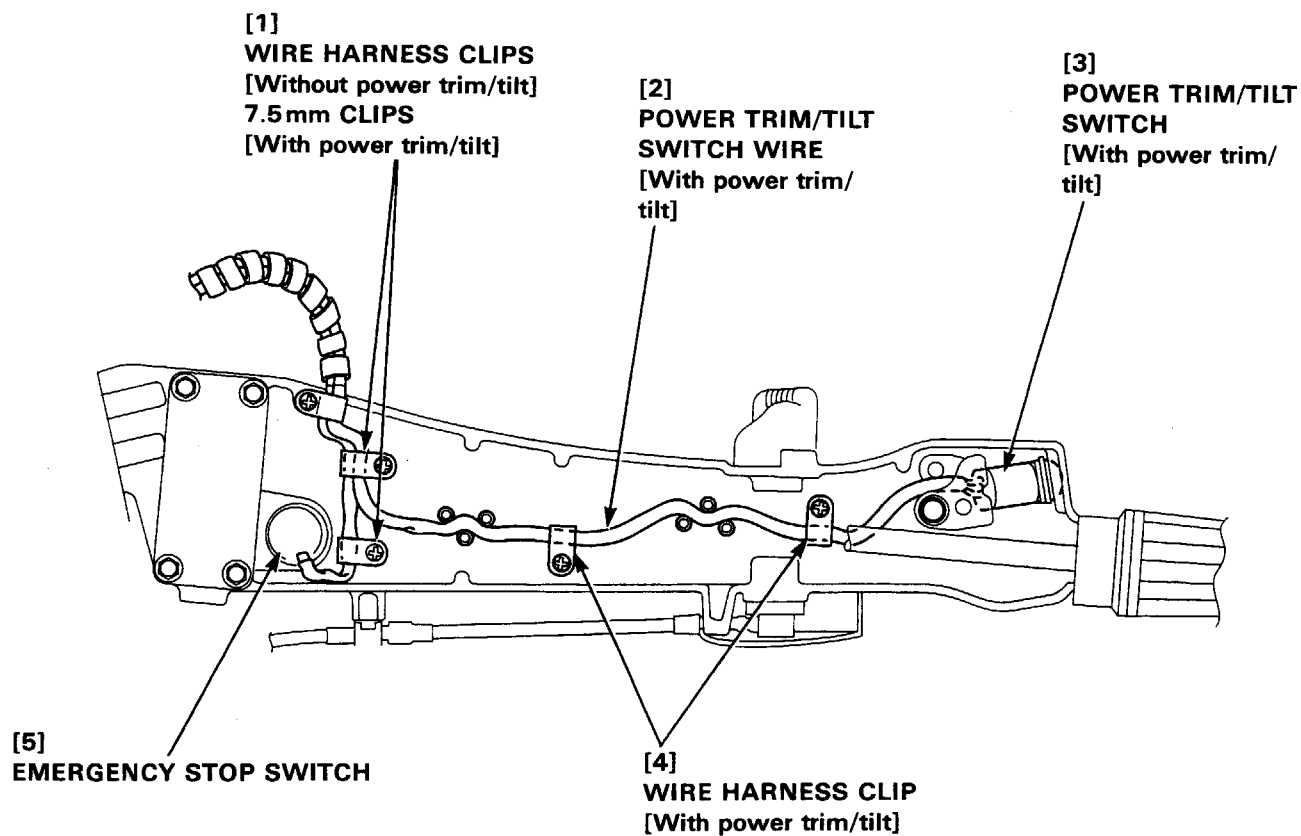
\*2: Power trim/tilt switch wire routing with remote control lever set as shown by B.



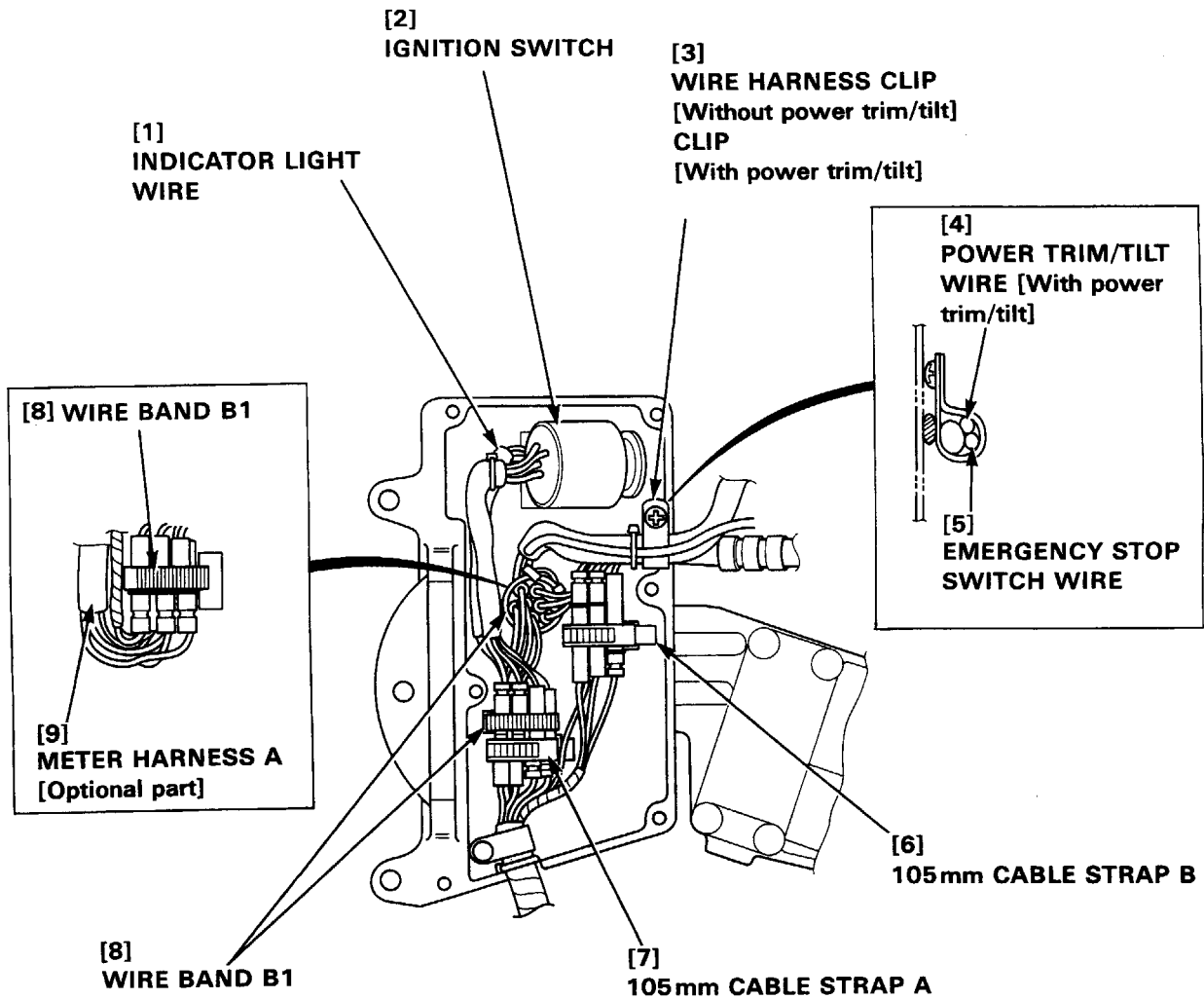
• Panel-mount / single top-mount / dual top-mount remote control type only



• Tiller handle type only

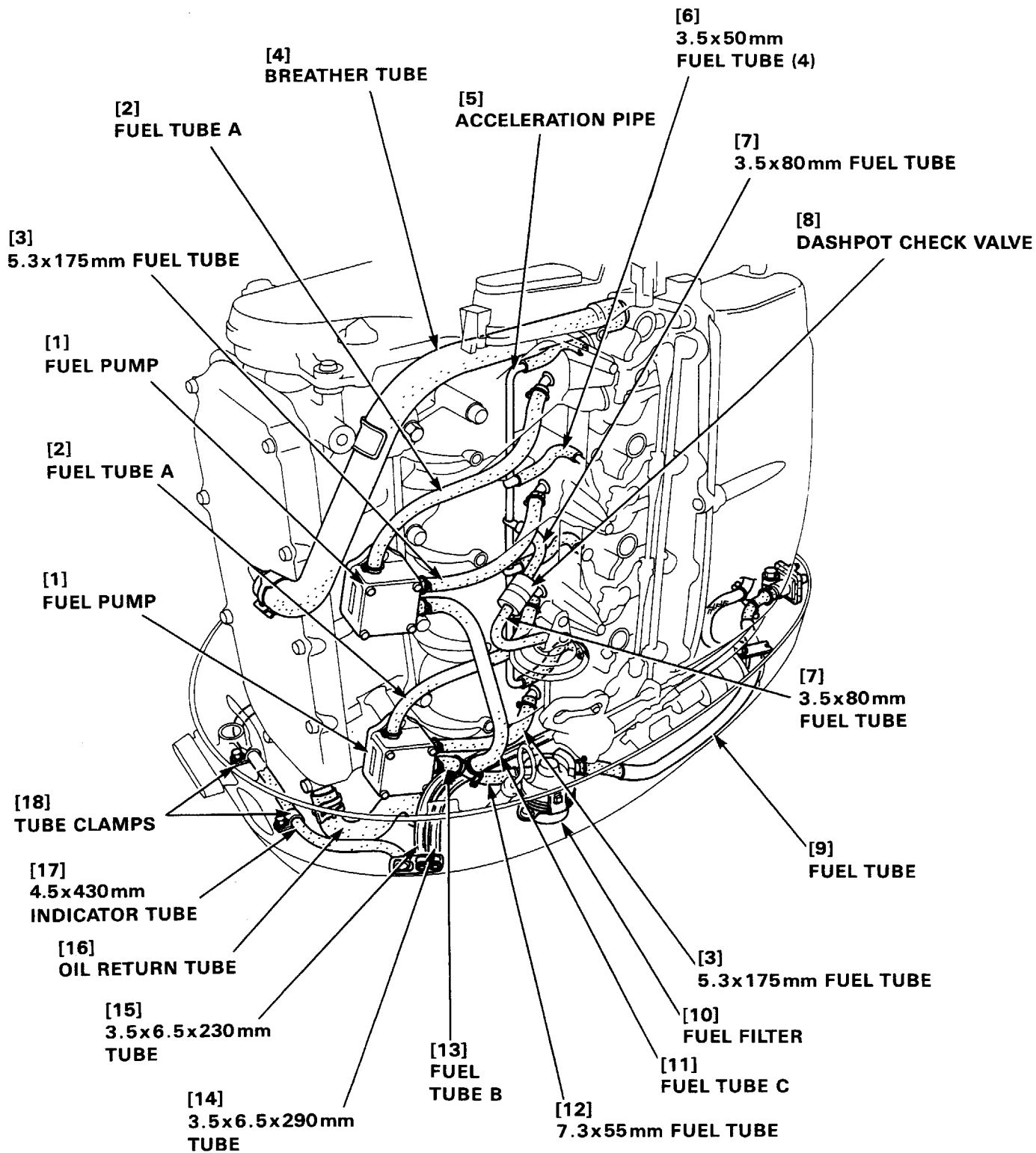


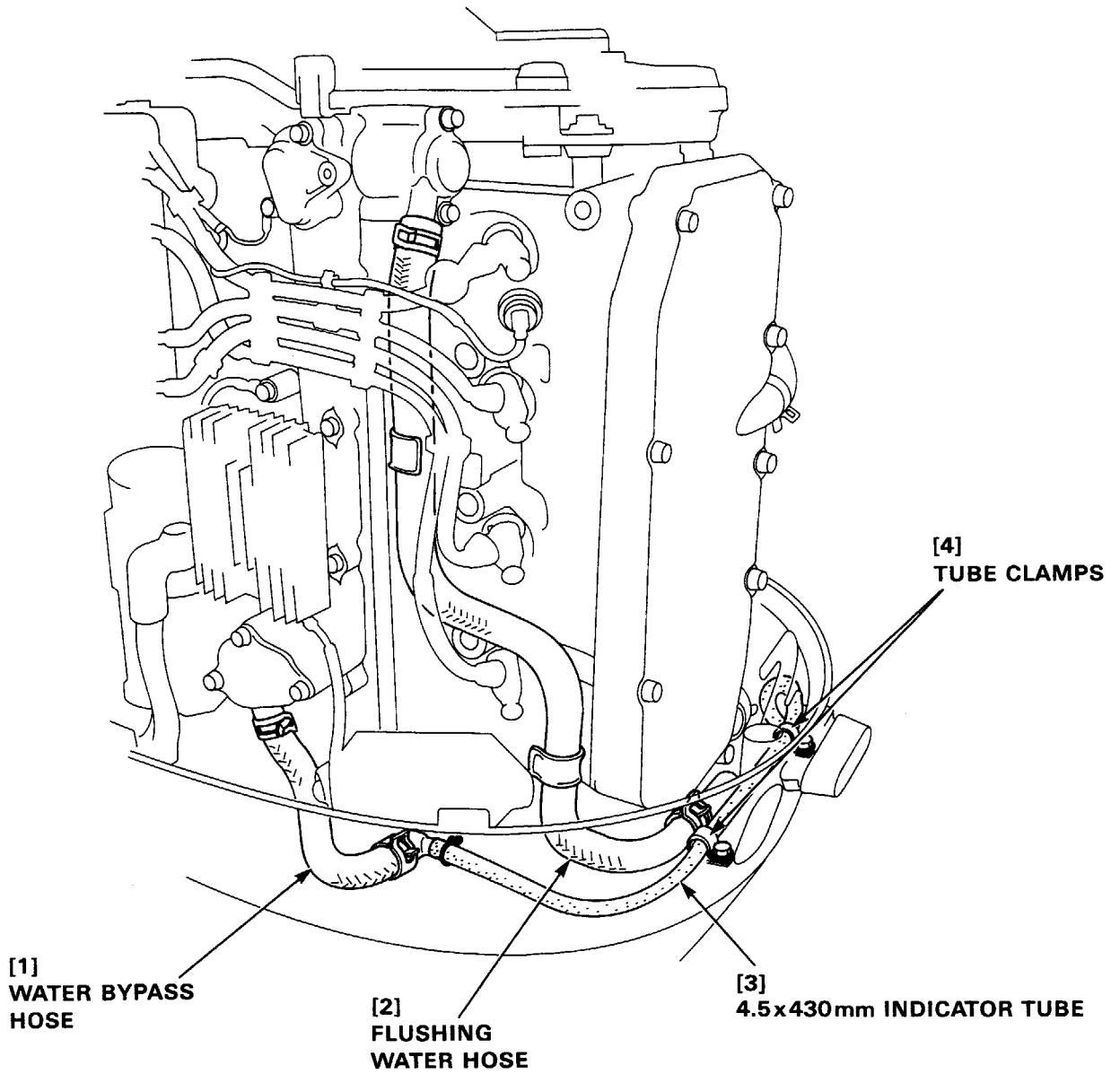
- Tiller handle type only





## 10. TUBE ROUTING

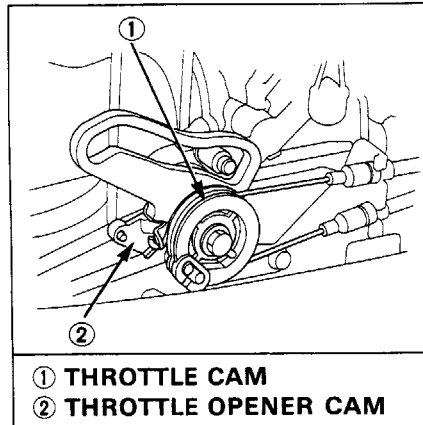




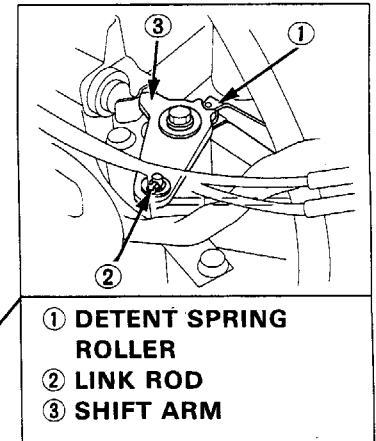
### 11. LUBRICATION

Apply marine grease to the following parts:

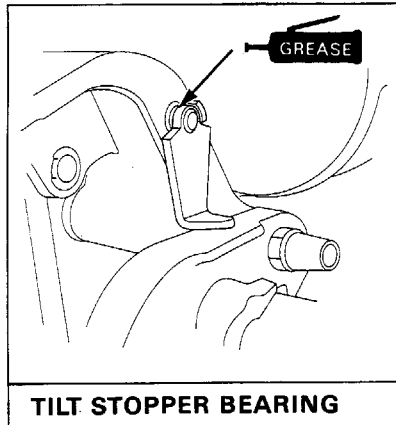
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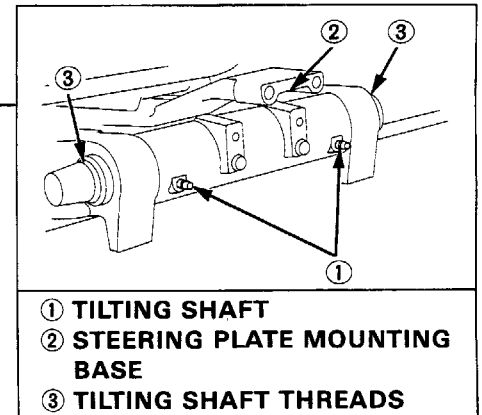
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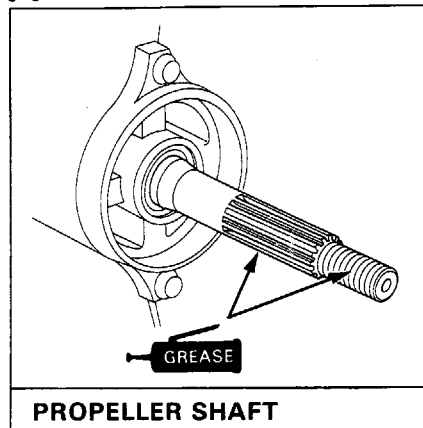
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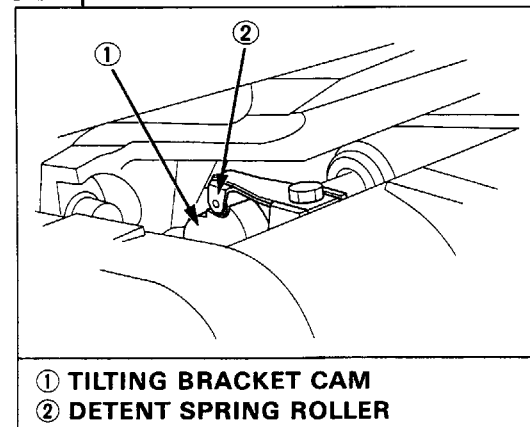
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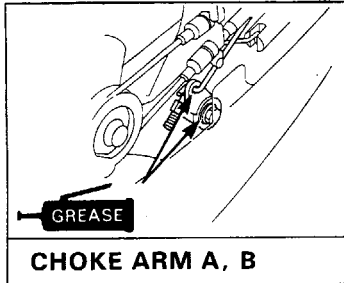
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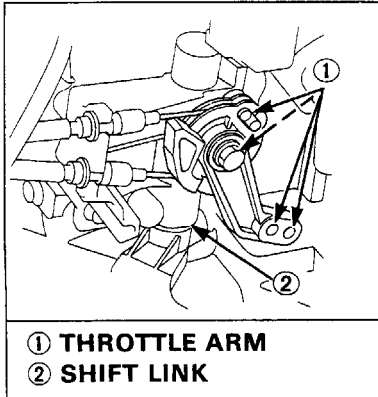
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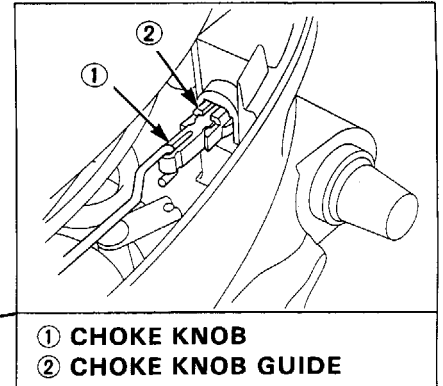
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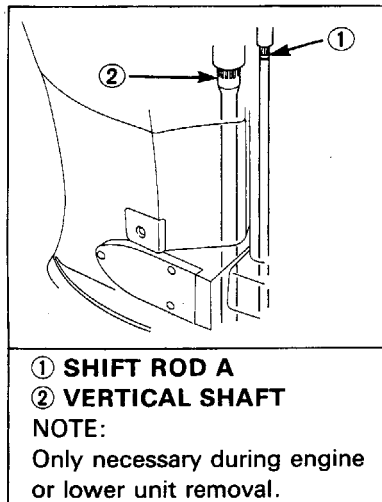
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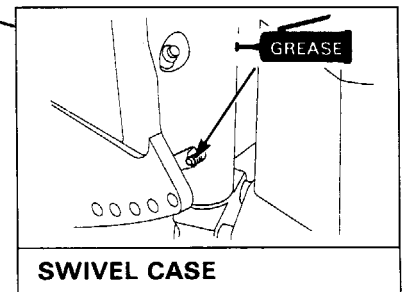
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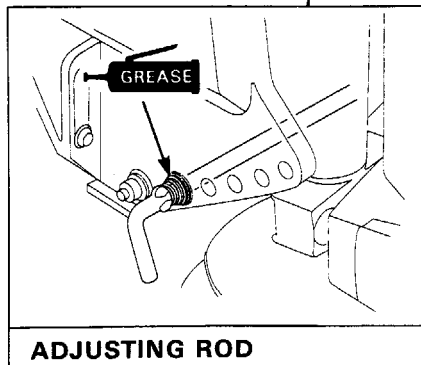
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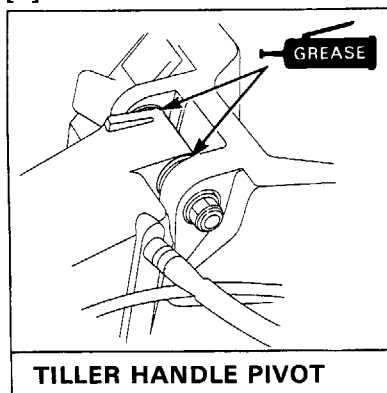


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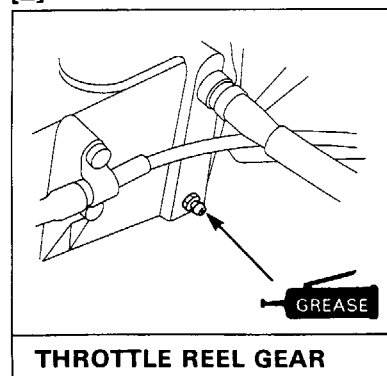


• Tiller handle type only

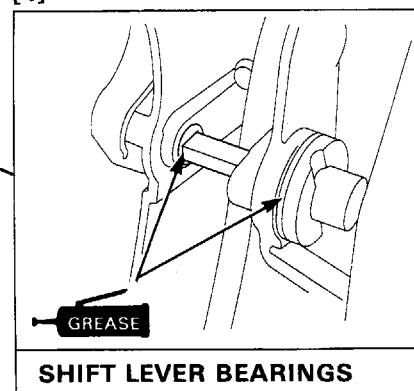
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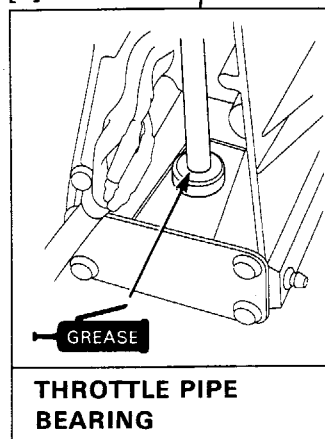
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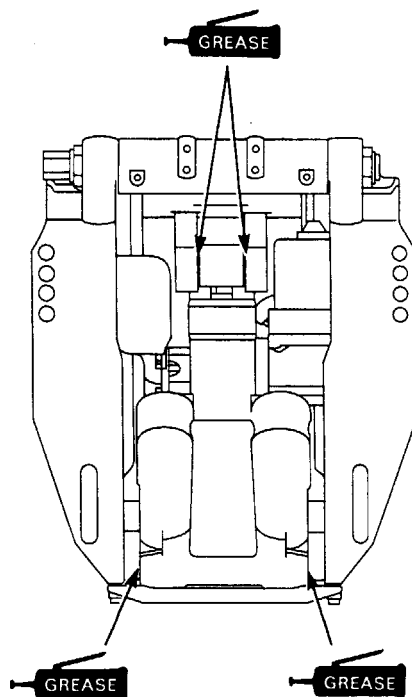
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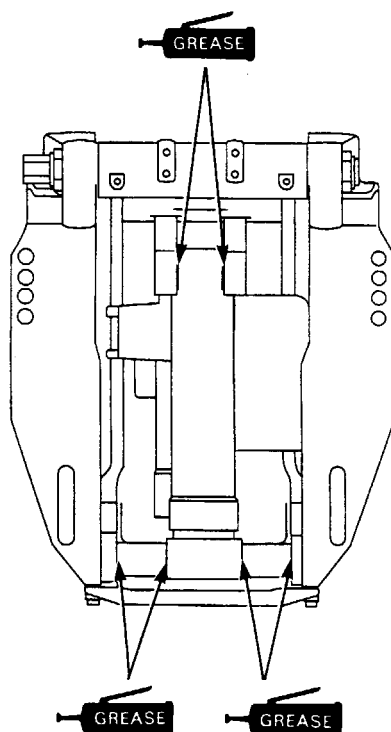
[3]



• Power trim/tilt type only



• Gas assisted type only



# 3. MAINTENANCE

**HONDA**  
**BF75A•90A**

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>1. MAINTENANCE SCHEDULE</li> <li>2. ENGINE OIL</li> <li>3. OIL FILTER</li> <li>4. GEAR OIL</li> <li>5. SPARK PLUGS</li> <li>6. VALVE CLEARANCE</li> <li>7. FUEL FILTER</li> <li>8. FUEL TANK STRAINER</li> <li>9. CARBURETOR</li> <li>10. CARBURETOR SYNCHRONIZATION</li> <li>11. ACCELERATION DEVICE / DIAPHRAGM ASSEMBLY</li> </ul> | <ul style="list-style-type: none"> <li>12. THROTTLE CABLE ADJUSTMENT</li> <li>13. SHIFT CABLE ADJUSTMENT</li> <li>14. CHOKE KNOB ROD ADJUSTMENT</li> <li>15. CHOKE SOLENOID ADJUSTMENT (REMOTE CONTROL TYPE)</li> <li>16. TIMING BELT</li> <li>17. CRANKCASE BREATHER (BODENSEE TYPE ONLY)</li> <li>18. EXHAUST EMISSION (BODENSEE TYPE ONLY)</li> </ul> |
|--|--|

## 1. MAINTENANCE SCHEDULE

REGULAR SERVICE PERIOD (2)		EACH USE	FIRST 20 HRS or MONTH	EVERY 100 HRS or 6 MONTH	EVERY 200 HRS or YEAR	EVERY 400 HRS or 2 YEARS	Refer to page
ITEM	Perform at every indicated month or operating hour interval, whichever comes first.						
Engine oil	Check level	○					3-2
	Change		○	○			
Engine oil filter	Change				○ (2)	○	3-3
Gear case oil	Check level and Check for water contamination			○			3-4
	Change		○		○		
Carburetor	Check		○	○			3-9
Idle	Adjust		○	○			
Valve clearance	Check-Adjust		○		○		3-5
Engine timing belt	Check-Adjust				○		3-17
Spark plugs	Check-clean (Replace if necessary)		○		○		3-5
Propeller and Tab washer	Check	○					11-1
Lubrication	Grease		○ (1)	○ (1)			2-38
Optional fuel tank and Tank strainer	Clean				○		3-8
Fuel filter	Check			○			3-7
	Change					○	
Thermostat	Check				○		8-3
Fuel line	Check	○					5-11
	(Replace if necessary)					○	
Battery fluid	Check-filling (if necessary)		○				—
Cable connection	Check-tightness		○	○			
Bolts and Nuts	Check-tightness		○	○			—

(1) Lubricate more frequently when used in salt water.

(2) For professional commercial use, log hours of operation to determine proper maintenance intervals.

## 2. ENGINE OIL

### Oil Level Inspection

Check the engine oil level with the engine stopped and the outboard motor in the vertical position.

- 1) Remove the engine cover.
- 2) Remove the dipstick and wipe it clean.
- 3) Insert the dipstick all the way in, then pull it out and read the oil level.
- 4) If the oil level is low, remove the oil filler cap, and add the recommended oil (P.3-3) to reach the upper limit mark on the dipstick.
- 5) Reinstall the oil filler cap and dipstick.

### Oil change

Drain the used oil while the engine is warm. Warm oil drains quickly and completely.

- 1) Remove the oil filler cap and the drain plug cover.
- 2) Place a suitable oil container next to the outboard motor, and remove the oil drain plug.

Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash, pour it on the ground, or down a drain.

#### CAUTION:

**Used engine oil contains substances that have been identified as carcinogenic.**

**If repeatedly left in contact with the skin for prolonged periods, it may cause skin cancer.**

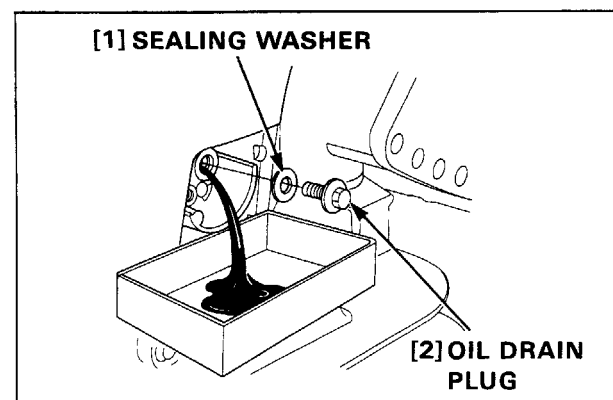
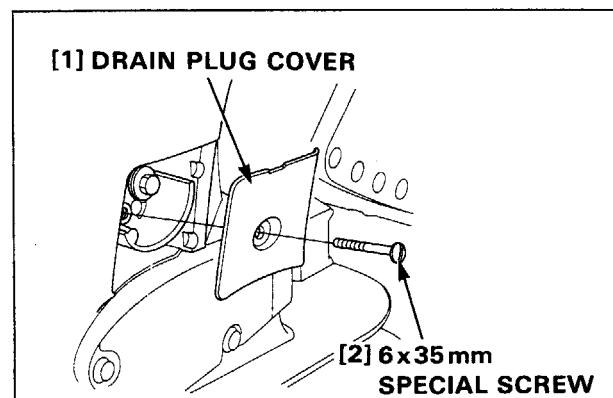
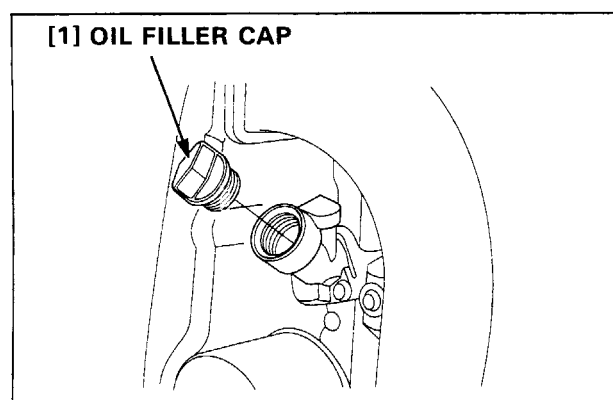
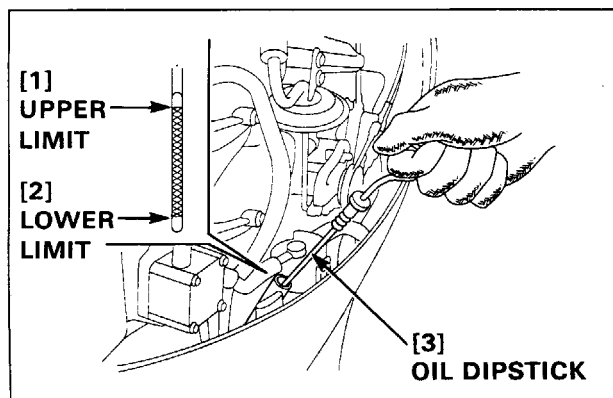
**Wash your hands thoroughly with soap and water as soon as possible after contact with used engine oil.**

- 3) Replace the drain plug washer with a new one, and reinstall the oil drain plug. Tighten the oil drain plug to the specified torque value.

**TORQUE : 23 N·m (2.3 kgf·m, 17 lbf·ft)**

- 4) Reinstall the drain plug cover. Tighten the 6 x 35 mm special screw to the specified torque value.

**TORQUE : 6.4 N·m (0.65 kgf·m, 4.7 lbf·ft)**





- 5) Refill with the recommended engine oil to the upper limit mark on the dipstick.

Engine oil capacity	4.0 l (4.2 US qt, 3.5 Imp qt) With oil filter replacement: 4.5 l (4.8 US qt, 4.0 Imp qt)
Recommended engine oil	SEA 10W – 30/40 API Service classification SH

**NOTE:**

Using nondetergent oil can shorten the engine's service life, and using 2-stroke oil can damage the engine.

- 6) Reinstall the oil filler cap and dipstick.  
7) Reinstall the engine cover.

## 3. OIL FILTER

### Replacement

- 1) Drain the engine oil, then reinstall the oil drain plug and cover, as described in the oil change procedure.
- 2) Place a shop towel under the oil filter to absorb any spilled oil, then remove the oil filter with a special tool.

**TOOL:**

**Oil filter wrench** **07912 – 6110001**

- 3) Drain the used oil filter into a suitable container for oil disposal (P.3-2).
- 4) Clean the filter mounting base, and coat the seal of the new oil filter with clean engine oil.

**NOTE:**

Use only a genuine Honda oil filter or a filter of equivalent quality specified for your model. Using the wrong Honda filter, or a non-Honda filter which is not of equivalent quality, may cause engine damage.

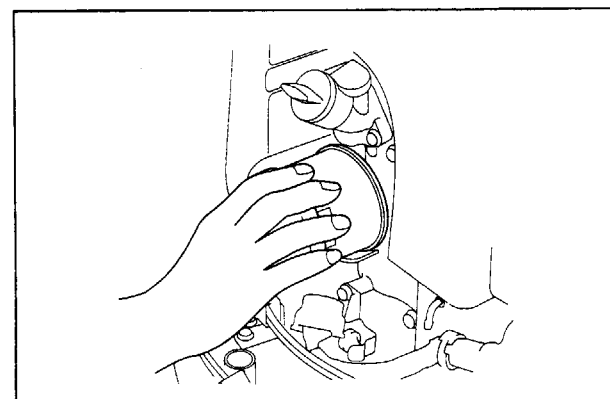
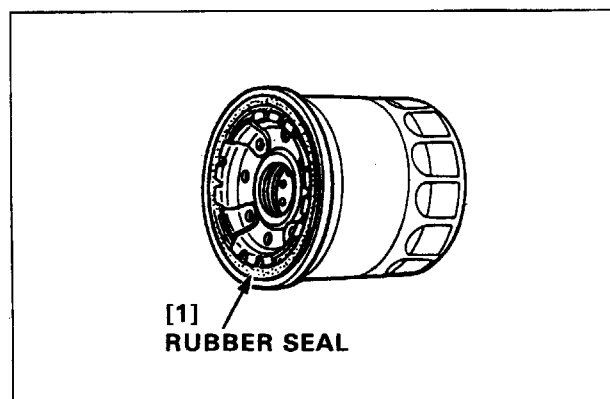
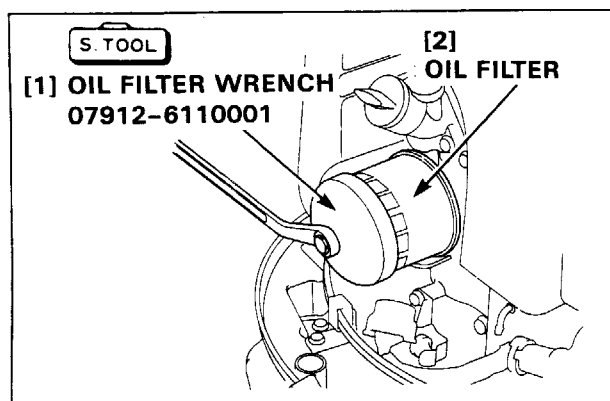
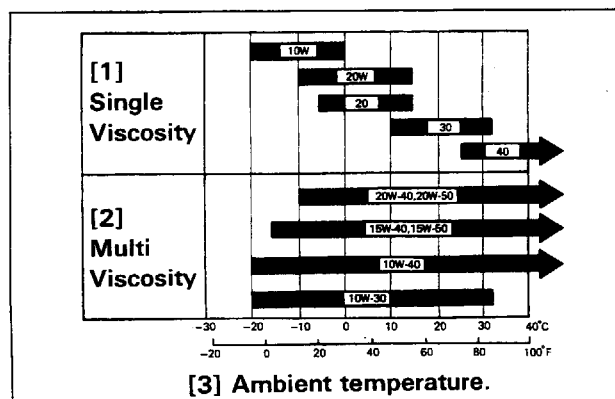
- 5) Screw on the new oil filter by hand, until the seal contacts the filter mounting base, then use a special tool to tighten the filter an additional 7/8 turn.

**TORQUE : 22 N·m (2.2 kgf·m, 16 lbf·ft)**

**TOOL:**

**Oil filter wrench** **07912 – 6110001**

- 6) Refill the engine with the specified amount of the recommended oil, as described in the oil change procedure. Reinstall the oil filter cap and dipstick.
- 7) Start the engine, and check for leaks.
- 8) Stop the engine, and check the oil level as described on page 3-2. If necessary, add oil to the upper limit mark on the dipstick.
- 9) Reinstall the engine cover.



## 4. GEAR OIL

### Inspection

- 1) Position the outboard motor vertically.
- 2) Remove the oil level screw, and check whether the gear oil flows out.  
Add the gear oil if it does not flow out.

### Addition of gear oil

- 1) Remove the oil drain screw, and install the adapter of the gear oil pump in the oil drain screw hole.
- 2) Remove the oil level screw and vent screw.
- 3) Add the oil until it flows through the oil level screw hole.

Gear oil capacity	0.66 ℓ (0.70 US qt, 0.58 Imp qt)
Recommended gear oil	Quicksilver Gear Lubricant or Quicksilver Super-Duty Lower Unit Lubricant

- 4) After adding the gear oil, install the oil level screw and vent screw, then install the oil drain screw.

**TORQUE : 7 N·m (0.7 kgf·m, 5.1 lbf·ft)**

### Replacement

#### NOTE:

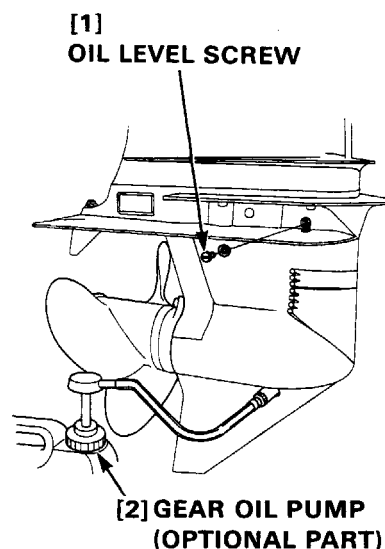
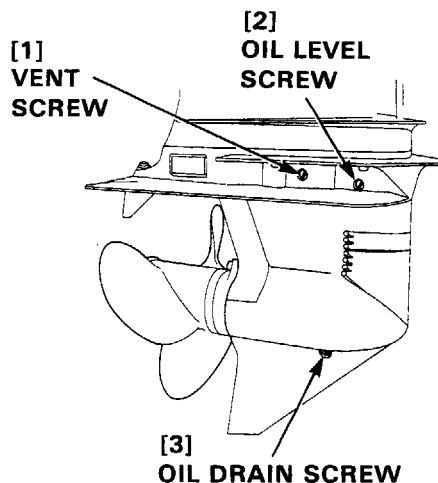
If there is water in the oil, the water will flow out first when the oil drain plug is removed, or the oil will be a milky color. If water is detected, check the oil level and oil drain plug gaskets, gear case gaskets, and gear case seals. Also check the torque on the gear case bolts.

- 1) Position the outboard motor vertically.
- 2) Install the adapter of the gear oil pump in the oil drain screw hole.
- 3) Remove the oil level screw, vent screw and oil drain screw.
- 4) Add the oil until the oil flows out of the oil level screw hole.

Gear oil capacity	0.66 ℓ (0.70 US qt, 0.58 Imp qt)
Recommended gear oil	Quicksilver Gear Lubricant or Quicksilver Super-Duty Lower Unit Lubricant

- 5) After adding the oil, install the oil level screw and vent screw, then install the oil drain screw.

**TORQUE : 7 N·m (0.7 kgf·m, 5.1 lbf·ft)**



### OIL DRAIN SCREW (MAGNET END) INSPECTION

- 1) Remove the oil drain screw and check the magnet end of the screw for chipping and metal particles.
- 2) If there is chipping or metal particles on the magnet end of the oil drain screw, disassemble the gear case assembly and check (P.11-15 and 16).

## 5. SPARK PLUGS

- 1) Remove the engine cover and spark plug caps.
- 2) Clean any dirt from around the spark plug bases.
- 3) Use a spark plug wrench to remove the spark plugs.
- 4) Visually inspect the spark plugs. Discard the plugs if the insulators are cracked or chipped.
- 5) Remove carbon or other deposits with a stiff wire brush.
- 6) Measure the plug gap with a wire-type feeler gauge.

Spark plug gap	0.6 – 0.7 mm (0.024 – 0.028 in)
----------------	---------------------------------

Recommended spark plug	DR7EA (NGK) X22ESR-U (NIPPONDENSO)
------------------------	---------------------------------------

If necessary, adjust the gap by bending each side electrode.

- 7) Make sure each sealing washer is in good condition. With each spark plug sealing washer attached, thread the spark plugs in by hand to seat the sealing washers and prevent cross-threading.

Then tighten with a plug wrench (an additional 1/2 turn if a new plug) to compress the sealing washer. If you are reusing a plug, tighten 1/8-1/4 turn after the plug seats.

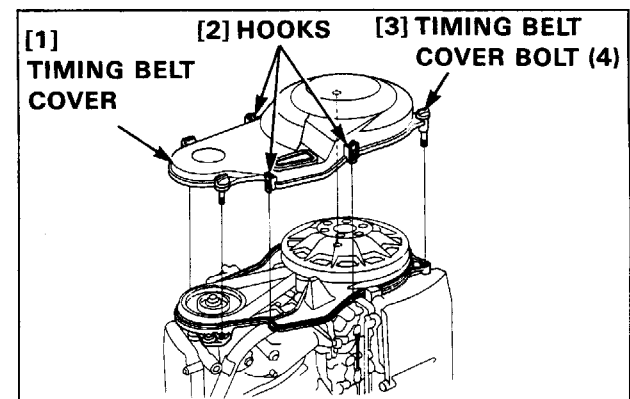
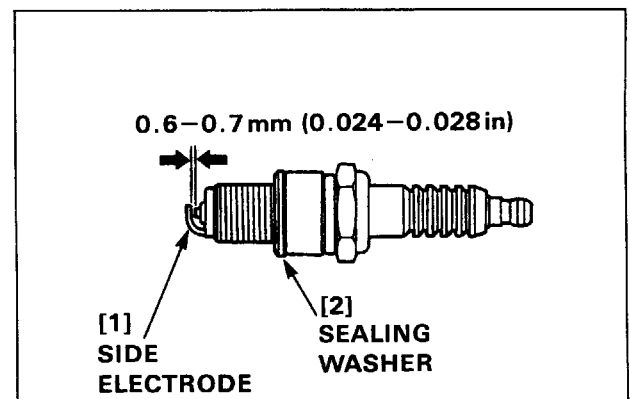
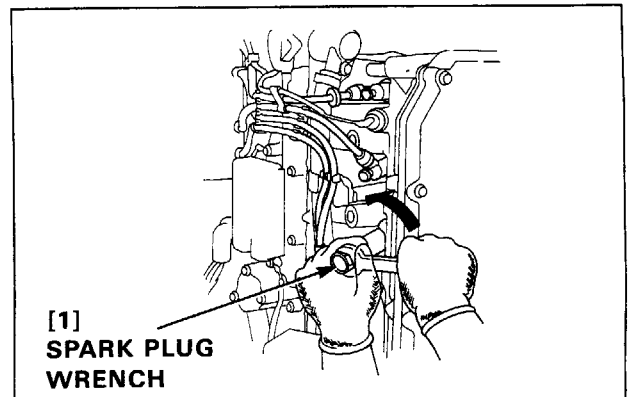
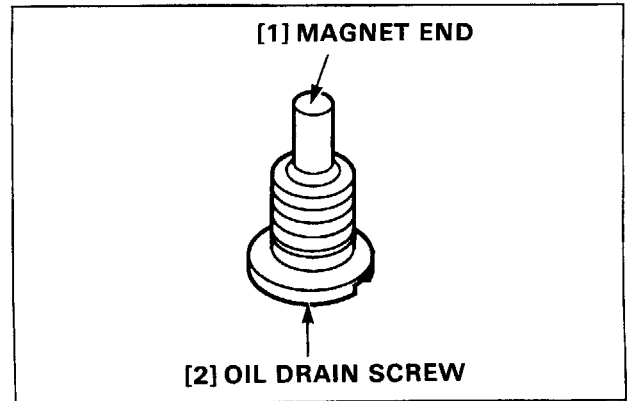
#### CAUTION:

- The spark plugs must be securely tightened. Improperly tightened plugs can become very hot and possibly damage the engine.
- Never use spark plugs with an improper heat range.

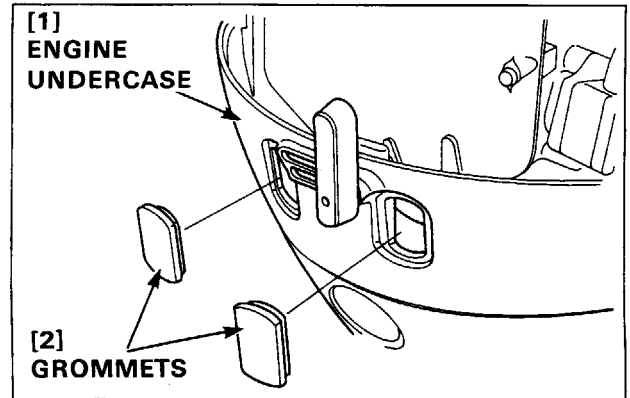
## 6. VALVE CLEARANCE

Valve clearance inspection and adjustment must be performed with the engine cold.

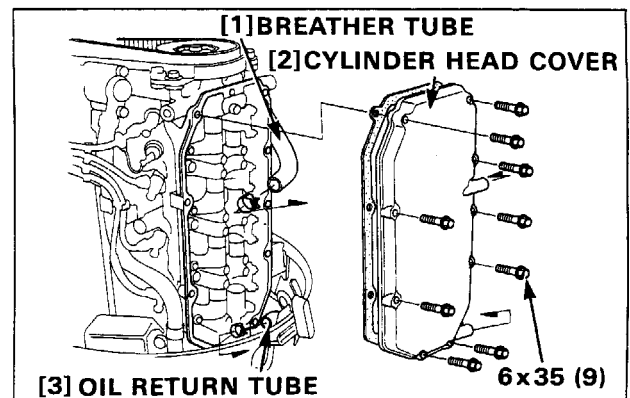
- 1) Remove the engine cover.
- 2) Move the remote control lever or gearshift lever to the "N" (Neutral) position.
- 3) Loosen the four timing belt cover bolts. Release the three hooks on the timing belt cover and remove the timing belt cover.



- 4) Remove the two grommets from the engine undercase.



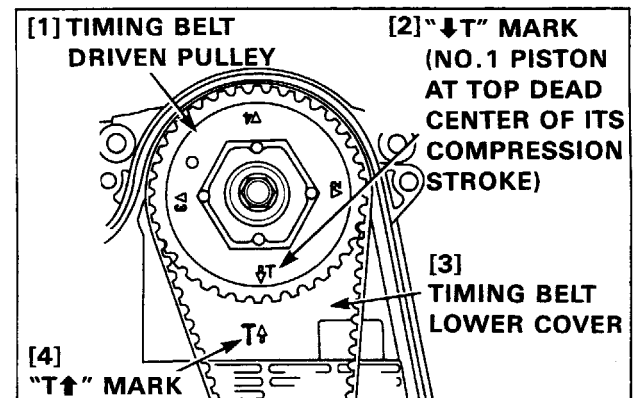
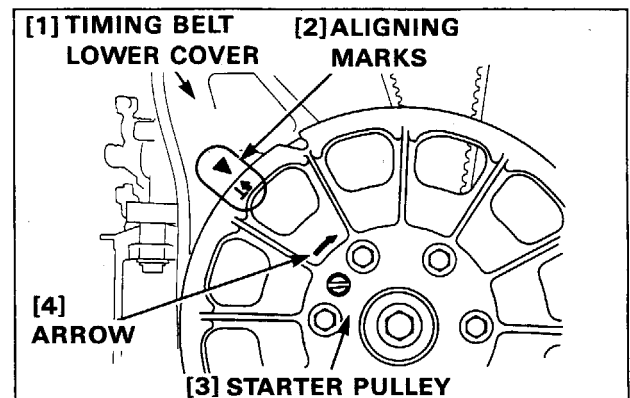
- 5) Disconnect the breather tube and oil return tube from the cylinder head cover. Remove the nine 6 x 35 mm flange bolts, and remove the cylinder head cover. Remove the spark plugs.



- 6) Manually turn the starter pulley clockwise (i.e. the same direction as the arrow on the starter pulley), and align the "↓T" mark on the starter pulley with the "▲" mark on the timing belt lower cover as shown. Be sure that the "↓T" mark on the timing belt driven pulley aligns with the "T↑" mark on the timing belt lower covers this time. In this position the No.1 piston is at the top dead center of its compression stroke.

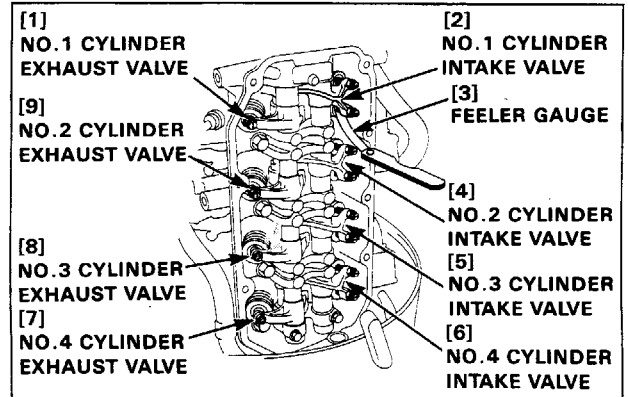
**NOTE:**

Do not turn the starter pulley counterclockwise.



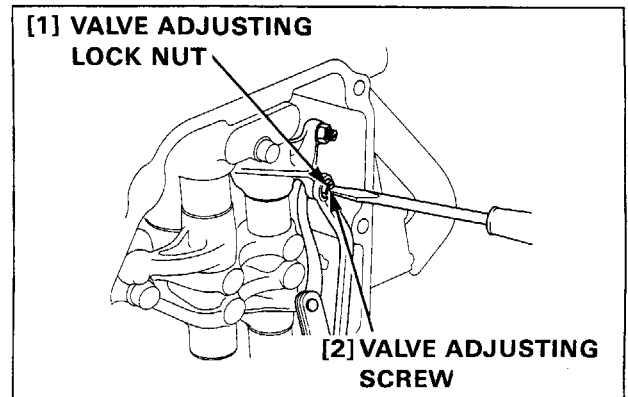
- 7) With the engine in the position described in step 6, check the intake and exhaust valve clearances on No.1 cylinder with a feeler gauge and adjust if necessary.

Valve clearance	IN	0.18 – 0.22 mm (0.007 – 0.009 in)
	EX	0.26 – 0.30 mm (0.010 – 0.012 in)

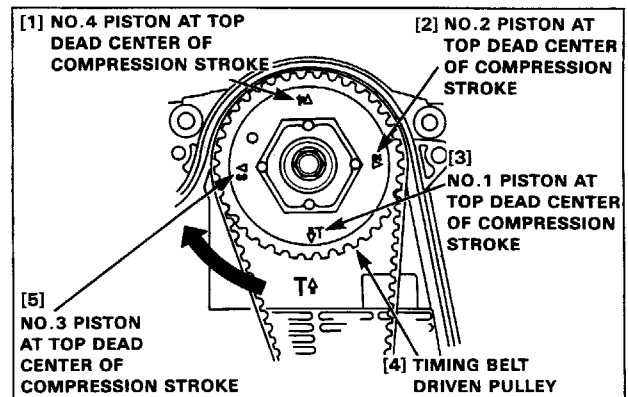


- 8) If adjustment is needed, loosen the valve adjusting lock nut, and adjust the intake and exhaust valve clearances by turning the valve adjusting screw right or left.
- 9) After adjustment, secure the adjusting screw and loosely tighten the lock nut.
- 10) Recheck the valve clearances and tighten the valve adjusting lock nut securely.

**TORQUE : 23 N·m (2.3 kgf·m, 17 lbf·ft)**



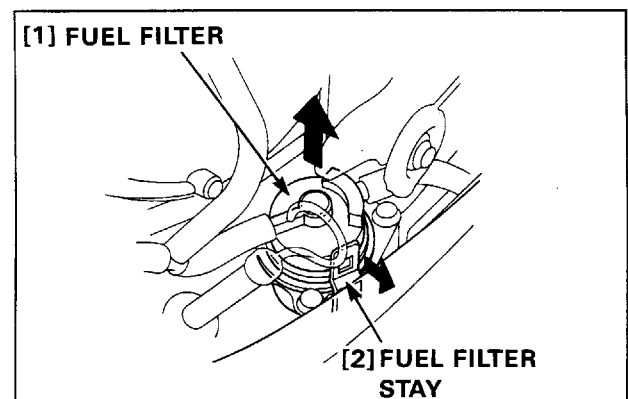
- 11) After adjusting the intake and exhaust valve clearances on the No.1 cylinder, turn the driven pulley an additional 90° to align the "▼2" mark with the "T↑" mark on the timing belt lower cover. This will put the No.2 piston at the top dead center of its compression stroke. Check the intake and exhaust valve clearances on the No.2 cylinder.
- 12) After adjusting the intake and exhaust valve clearances on the No.2 cylinder, adjust the intake and exhaust valve clearances on the No.4 and No.3 cylinders in this order by repeating the above steps 6 through 10.



## 7. FUEL FILTER

### Inspection

- 1) Remove the engine cover.
- 2) Pull the fuel filter stay toward you, and lift the fuel filter up from the engine undercase.
- 3) Check the fuel filter for water accumulation or sediment. If no water or sediment is found, lower the fuel filter back down into the engine under case properly.



### Replacement

If water or sediment is found in the fuel filter proceed as follows:

- 1) Disconnect the fuel hose connector from the motor.
- 2) Pinch off the fuel lines at the fuel filter with two commercially available Fuel Hose Clips as shown.
- 3) Being careful to prevent fuel leakage, disconnect the fuel hoses from the fuel filter and remove fuel filter.

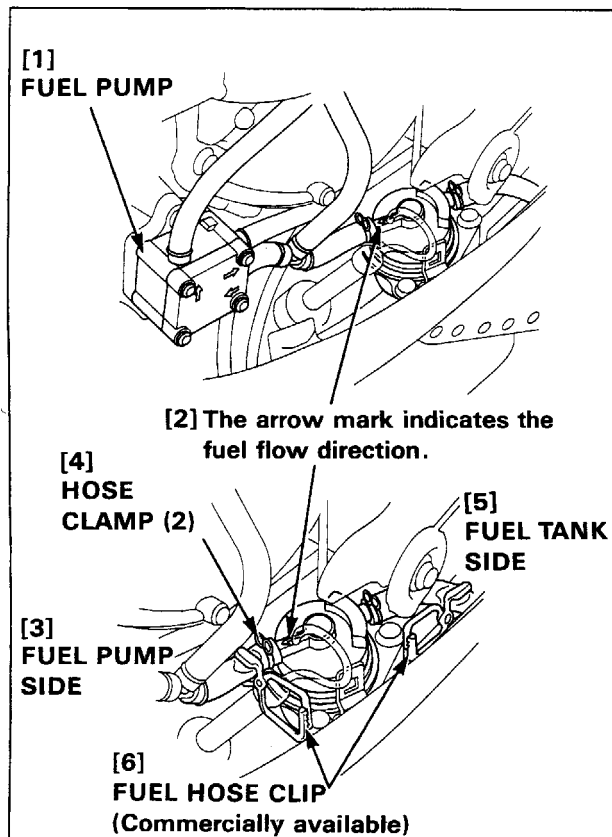
#### ⚠ WARNING

**Gasoline is highly flammable and explosive.**

**You can be burned or seriously injured when handling fuel.**

- Stop the engine and keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

- 4) Install the new fuel filter so the arrow mark on the fuel filter points toward the fuel pump. Connect the fuel hoses to the fuel filter and remove the fuel hose clips. Secure the fuel hoses to the fuel filter with the hose clamps.
- 5) Lower the fuel filter into the engine undercase properly.
- 6) Connect the fuel hose connector to the motor with the clip to the outside. Pump the primer bulb, and check for leaks. Repair any fuel leaks before starting the engine.



### 8. FUEL TANK STRAINER

- 1) Drain the fuel tank into an approved gasoline container.

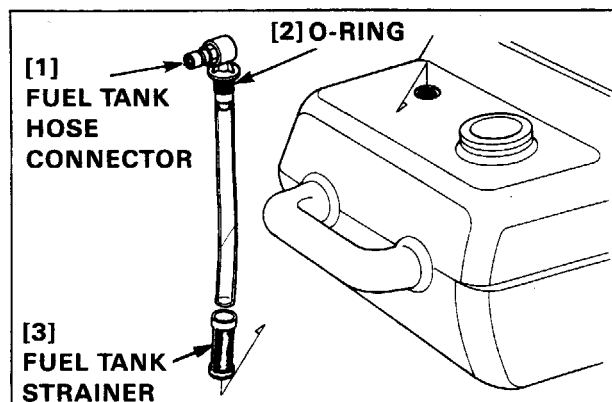
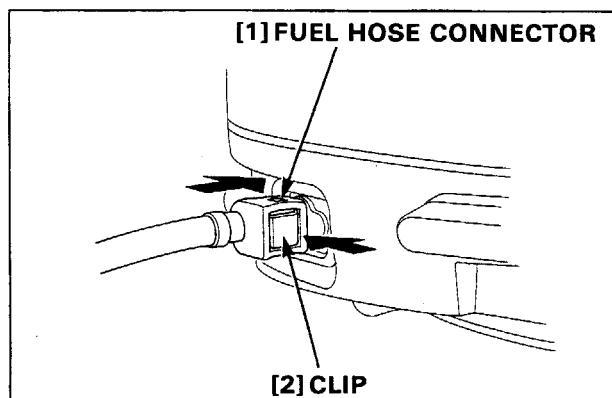
#### ⚠ WARNING

**Gasoline is highly flammable and explosive.**

**You can be burned or seriously injured when handling fuel.**

- Stop the engine and keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

- 2) Remove the fuel tank hose connector and fuel tank strainer from the fuel tank.
- 3) Remove any dirt or foreign material from the fuel tank strainer and check for tears in the strainer mesh. Replace the strainer if it is torn or damaged.



## 9. CARBURETOR

### CAUTION:

Running the outboard motor without sufficient cooling water will damage the water pump and overheat the engine. Be sure that water flows from the cooling system indicator while the engine is running. If not, stop the engine and determine the cause of the problem.

### Idle Speed

- 1) Remove the propeller (P.11-1).  
Run the outboard motor in a outboard test tank with the water level at least 4 inches above the anti-ventilation plate.

Allow the engine to warm up to normal operating temperature (Approx. 10 minutes).

- 2) Stop the engine and remove the engine cover. On the tiller handle type, turn the throttle grip to the SLOW position.
- 3) Attach an engine tachometer and restart the engine.

### NOTE:

Follow the tachometer manufacturer's instructions.

- 4) After the engine speed has stabilized, turn the throttle stop screw to obtain the specified idle speed. If the engine idle speed will not stabilize, perform carburetor synchronization adjustment (P.3-10).

Specified idle speed in neutral.

950 ± 50 min<sup>-1</sup> (rpm)

### Pilot Screw

### CAUTION:

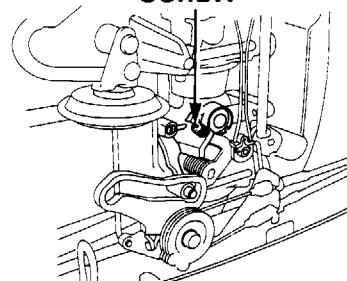
Damage to the pilot screw or carburetor will occur if the pilot screw is tightened against the seat.

- 1) If the pilot screws have been removed or replaced, turn each pilot screw clockwise until it seats lightly.

Initial pilot screw setting	BF75A	1 – 7/8 turns out (Except LRTG type)
		2 turns out (LRTG type only)
	BF90A	2 – 1/4 turns out

- 2) Start the engine and allow it to warm up to normal operating temperature. Turn the throttle stop screw to obtain the specified idle speed.
- 3) Run the engine at idle, and turn the No.4 carburetor pilot screw in 1/8 turn increments, in or out, until the engine runs at the highest idle speed. If necessary, turn the idle stop screw to obtain the specified idle speed. Perform the same pilot screw adjustment on the No.1 through No.3 carburetors.
- 4) Lightly snap the throttle several times, and let the engine return to idle. Turn the throttle stop screw to obtain the specified idle speed.

[1] THROTTLE STOP SCREW

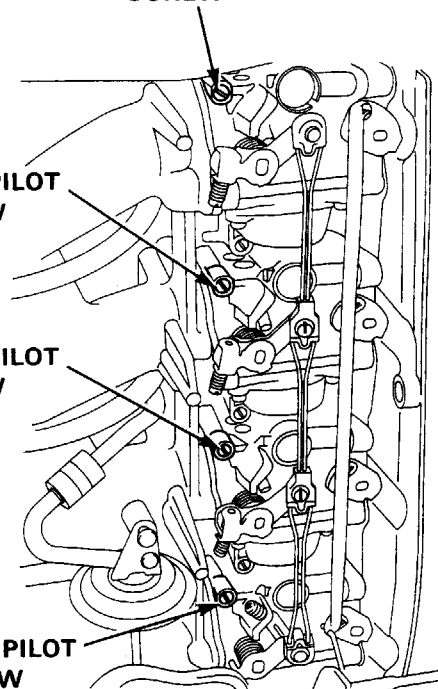


[1] NO.1 PILOT SCREW

[2] NO.2 PILOT SCREW

[3] NO.3 PILOT SCREW

[4] NO.4 PILOT SCREW



# 10. CARBURETOR SYNCHRONIZATION

## CAUTION:

Running the outboard motor without sufficient cooling water will damage the water pump and overheat the engine. Be sure that water flows from the cooling system indicator while the engine is running. If not, stop the engine and determine the cause of the problem.

- 1) Remove the engine cover.
- 2) Remove the four 5 x 10 mm phillips head plugs and sealing washers from the intake manifolds of each cylinder.
- 3) Attach the vacuum gauge adapters to each intake manifold plug hole, and connect the vacuum gauge hoses to the adapters.

## NOTE:

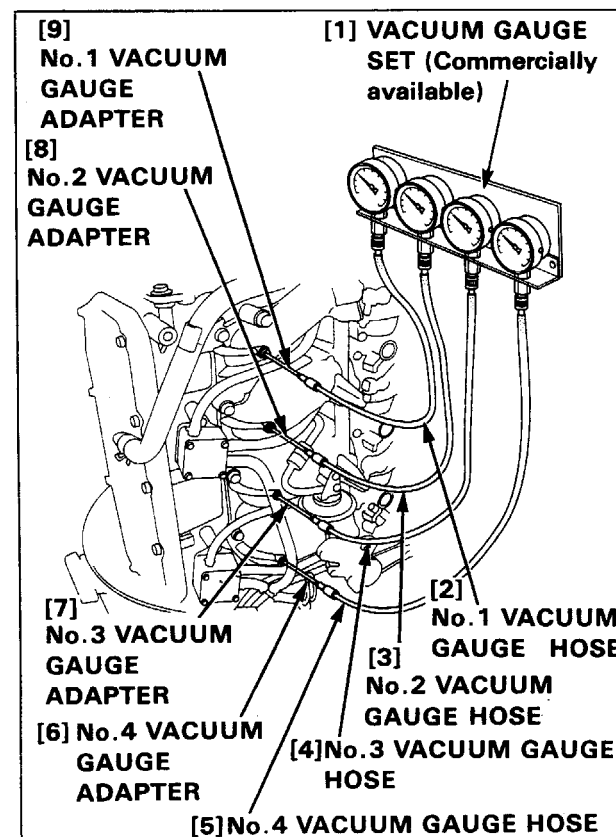
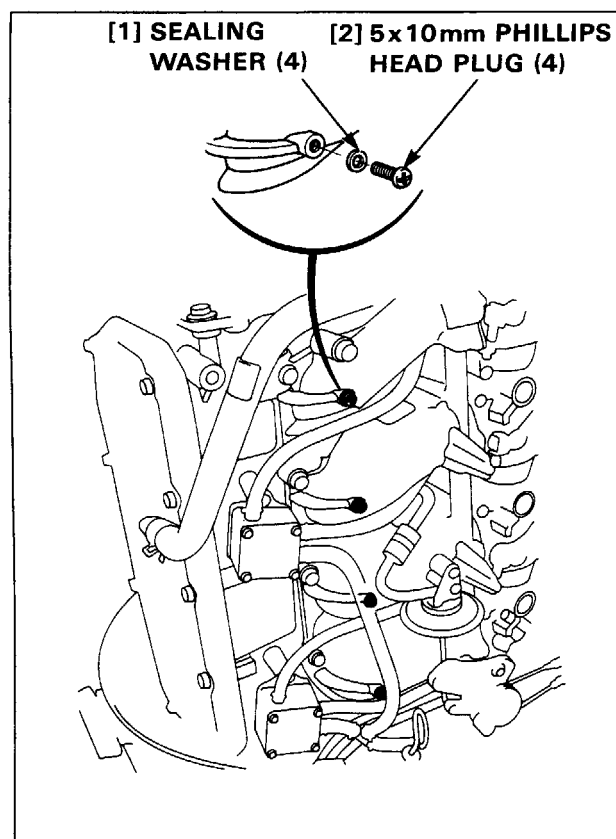
- Connect:  
The No.1 vacuum gauge hose to the No.1 vacuum gauge adaptor.
- The No.2 vacuum gauge hose to the No.2 vacuum gauge adaptor.
- The No.3 vacuum gauge hose to the No.3 vacuum gauge adaptor.
- The No.4 vacuum gauge hose to the No.4 vacuum gauge adaptor.
- All vacuum gauge hoses must be the same in length.
- All four vacuum gauges must be calibrated equally.

- 4) Attach an engine tachometer to the engine.
- 5) Place the outboard motor in a vertical position with the gearshift lever or control lever in the "N". (Neutral) position. Start the outboard motor in a outboard test tank with the water level at least 4 inches above the anti-ventilation plate. Allow the engine to warm up to normal operating temperature (Approx. 10 minutes).
- 6) Check the standard idle speed (page 3-9).
- 7) Check the intake manifold vacuum difference between cylinders. The maximum vacuum difference between all cylinders should be 20 mm (0.75 in) Hg or less.

Maximum allowable  
vacuum difference  
between cylinders

20 mm (0.75 in) Hg or less

- 8) If the vacuum difference between cylinders is not 20 mm (0.75 in) Hg or less, adjust as follows.





### NOTE:

- The No.4 carburetor is the synchronization base carburetor. This carburetor will not have a carburetor synchronization adjuster screw.
- Adjust the carburetors to get the least amount of vacuum difference between cylinders. As the manifold vacuum difference decreases, the idle speed will become more stable.
- Each increment on the vacuum gauges indicates 25.4 mm (1 in) Hg.

- 9) Turn the No.1, No.2 and No.3 carburetor adjusting screws so that the vacuum difference between all cylinders is 20 mm (0.75 in) Hg or less.

- 10) After each adjustment, check the idle speed and adjust if necessary by turning the No.4 carburetor throttle stop screw (page 3-9).

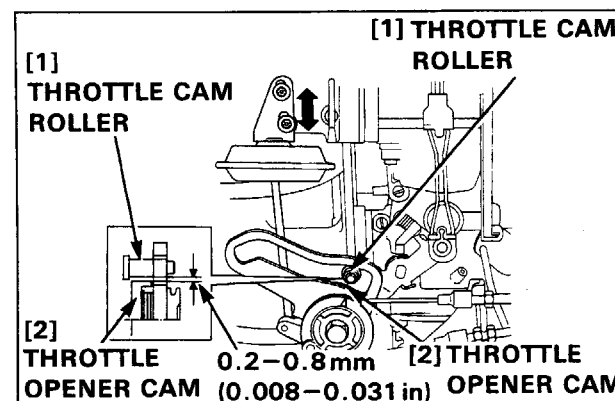
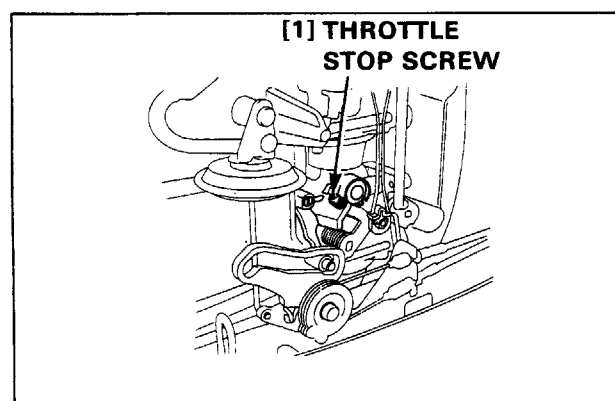
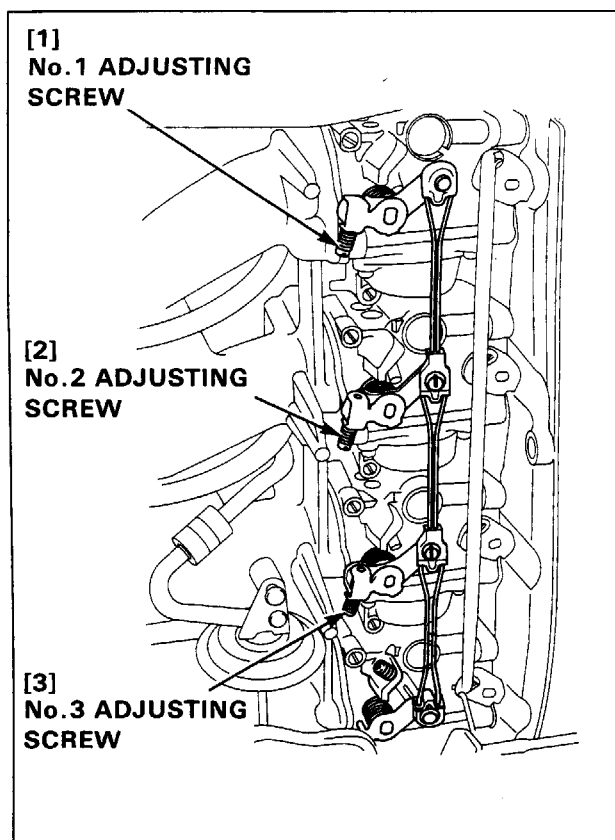
- 11) Snap the throttle several times and allow the engine to return to idle. Check to be sure that the vacuum difference between all cylinders stays within 20 mm (0.75 in) Hg or less. Readjust if necessary.

- 12) Stop the engine, remove the vacuum gauge adapters. Install the 5 x 10 mm phillips head plugs and sealing washers.

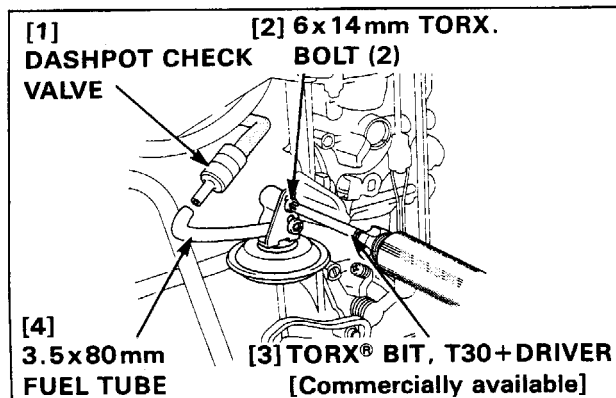
## 11. ACCELERATION DEVICE / DIAPHRAGM ASSEMBLY

Adjust the acceleration device/diaphragm after adjusting the idle speed.

- 1) Be sure that the remote control lever or gearshift lever is in the "N" (Neutral) position.
- 2) Check the carburetor throttle lever. It should be in the "fully closed" position.
- 3) Measure the clearance between the throttle opener cam and throttle cam roller. It should be 0.2 – 0.8 mm (0.008 – 0.031 in).  
If the measurement is outside the specification, adjust.



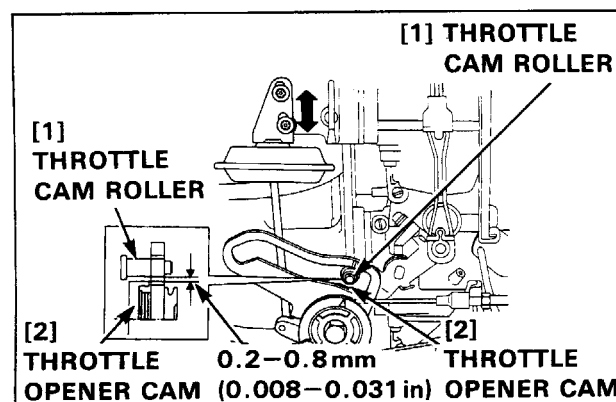
- 4) Disconnect the 3.5 x 80 mm fuel tube from the dashpot check valve.
- 5) Loosely tighten the two 6 x 14 mm torx. bolts using a commercially available torx® bit driver (T30).



- 6) Holding the throttle cam at the position where the throttle cam and throttle cam roller do not contact, adjust the clearance between the throttle opener cam and throttle cam roller to 0.2 – 0.8 mm (0.008 – 0.031 in) by moving the diaphragm up or down.

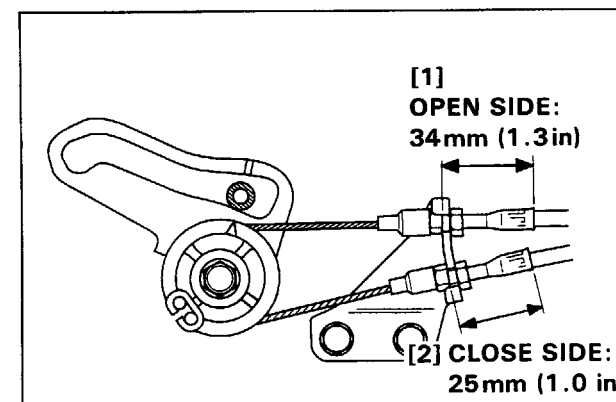
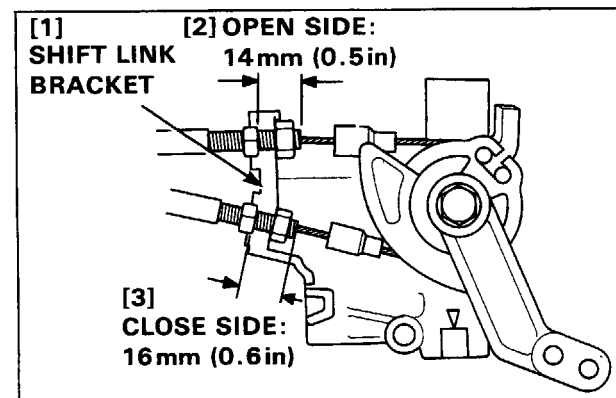
After adjustment, tighten the 6 x 14 mm torx. bolts to the specified torque using a commercially available torx® bit driver (T30).

**TORQUE : 9 N·m (0.9 kgf·m, 6.5 lbf·ft)**



## 12. THROTTLE CABLE ADJUSTMENT

- 1) Measure the length of the throttle cable connection part at the open side and close side of the throttle arm side. It should be 14 mm (0.5 in) from the threaded end to the lock nut end at the open side, while it should be 16 mm (0.6 in) at the close side as shown.
- 2) If the measurement is outside the specification, adjust by loosening the adjusting nut at the open or close side.
- 3) Measure the length of the throttle cable connection part at the open side and close side of the throttle cam side. It should be 34 mm (1.3 in) at the open side and 25 mm (1.0 in) at the close side.
- 4) If the measurement is outside the specification, adjust by loosening the adjusting nut at the open or close side.



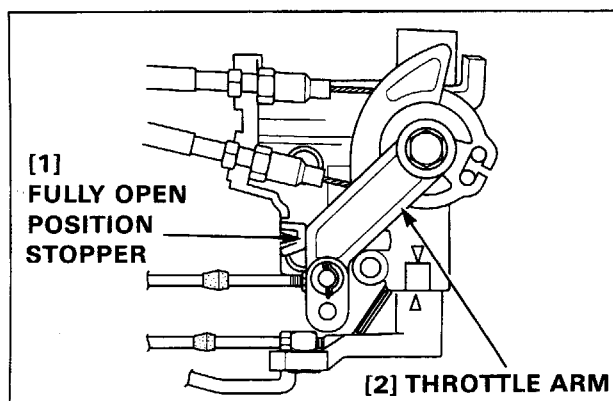
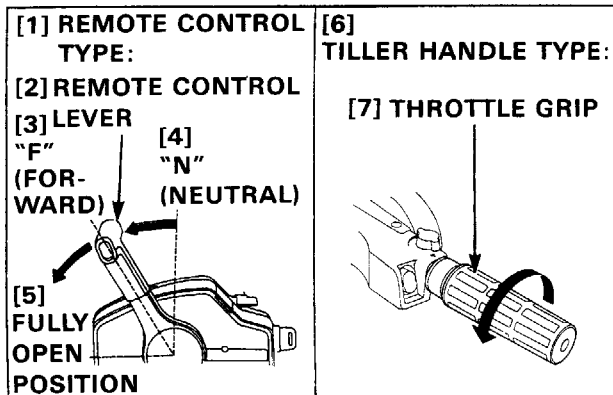
- 5) Move the remote control lever to the "F" (Forward) fully open position (Remote control type).

Move the throttle grip to the fully open position (Tiller handle type).

**NOTE:**

If it is hard to move the remote control lever to the "F" (Forward) position with the engine stopped, move the lever while turning the propeller or propeller shaft. Do not move the remote control lever with force or damage to the gearshift system can result.

- 6) Check whether the throttle arm is in contact with the fully open position stopper this time. If it is not, adjust as follows.



- 7) To adjust:

Remote control type: Move the remote control lever to the "N" (Neutral) position.

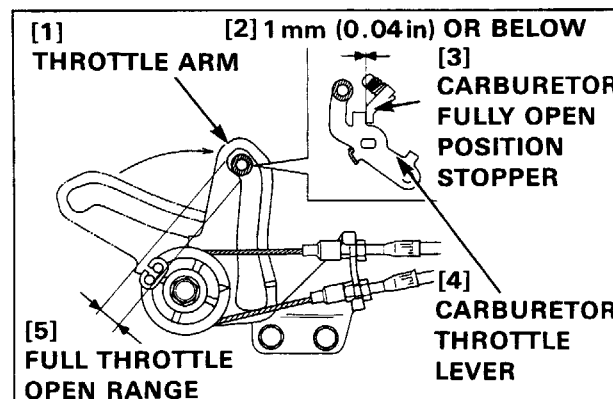
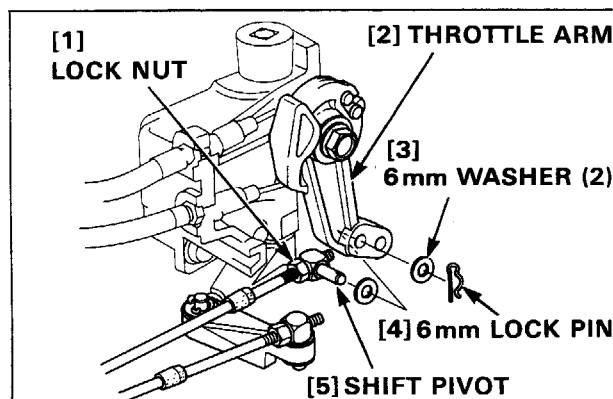
Tiller handle type: Move the throttle grip to the fully closed position.

- 8) Loosen the shift pivot lock nut, and remove the 6 mm lock pin and 6 mm washer from the shift pivot. Disconnect the shift pivot from the throttle arm and adjust by turning the shift pivot.

- 9) Set the shift pivot on the throttle arm, and move the remote control lever or throttle grip to the fully open position. The throttle arm should be in contact with the fully open position stopper.

Move the remote control lever to "N" (Neutral) position (Remote control type) or throttle grip to the fully closed position (Tiller handle type), and tighten the shift pivot lock nut. (See P.16-3 for shift pivot installation position.)

- 10) Check the clearance between the carburetor throttle lever and carburetor fully open position stopper with the throttle arm in contact with the fully open position stopper. It should be 1 mm (0.04 in) or less. Adjust, if the clearance is not 1 mm (0.04 in) or less.



### 11) To adjust:

Remote control type: Move the remote control lever to "N" (Neutral) position.

Tiller handle type: Move the throttle grip to fully closed position.

### 12) Loosen the adjusting nuts at the open side and close side of the throttle cable.

Move the remote control lever or throttle grip to the fully open position.

### 13) Adjust the clearance between the carburetor throttle lever and carburetor fully open position stopper to 1 mm (0.04 in) or less by turning the adjusting nut at the open side of the throttle cable.

### 14) Remote control type: Return the remote control lever to "N" (Neutral) position.

Tiller handle type: Return the throttle grip to the fully closed position.

### 15) Check whether the two throttle cam alignment marks align with the center of the throttle cam roller.

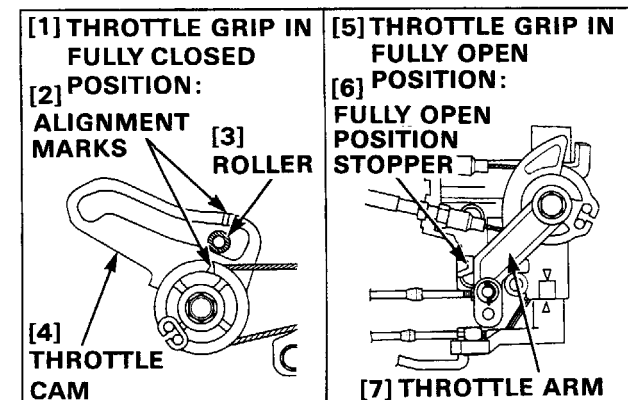
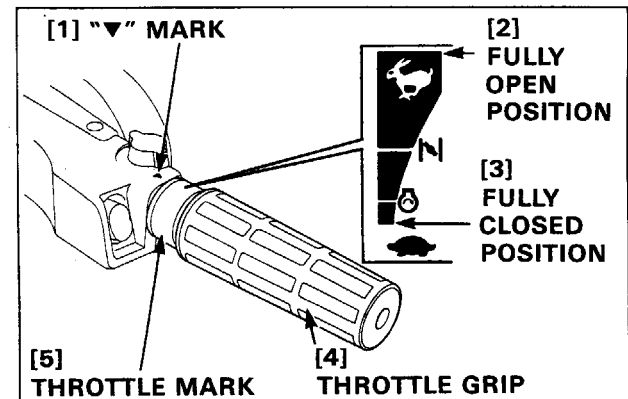
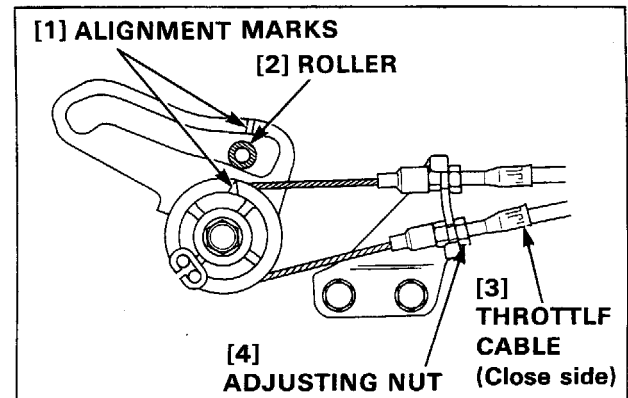
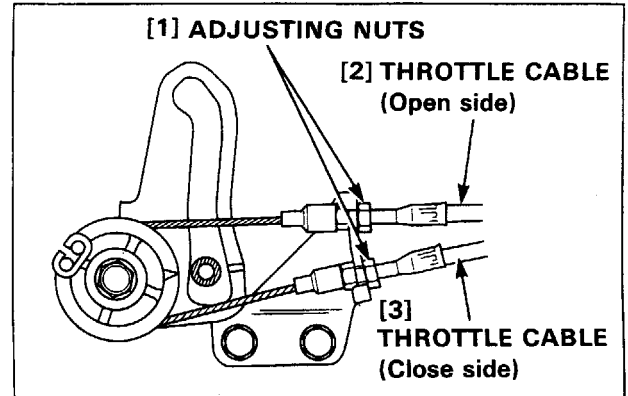
If they do not align, adjust by turning the adjusting nut at the close side of the throttle cable.

### 16) After adjustment, tighten the adjusting nuts at the open side and close side of the throttle cable securely.

## • Check item

Tiller handle type only:

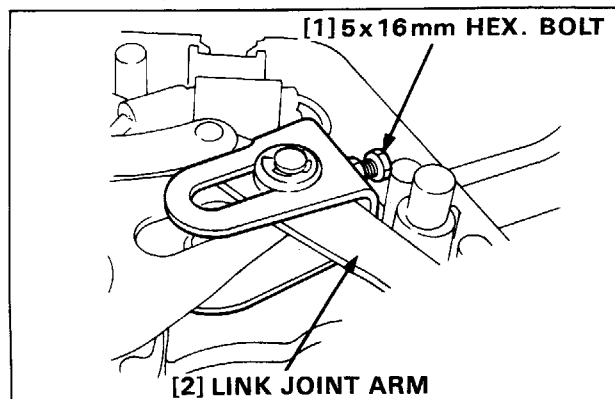
- 1) Move the throttle grip to the fully closed position and align the "▼" mark on the steering handle with the throttle mark idling position. The two alignment marks on the throttle cam should align with the center of the throttle cam roller. If not in alignment, perform step 14 (above) to adjust.
- 2) Then move the throttle grip to the fully open position, and align the "▼" mark on the steering handle with the throttle mark fully open position. The throttle arm should be in contact with the fully open position stopper. If not, perform steps 5 through 9 on page 3-13 to adjust.



Side-mount remote control type only:

- 1) Remove the remote control box cover B and C (P.14-2).
- 2) Move the remote control lever to the full open position and be sure that the link joint arm is in contact with the 5 x 16 mm hex. bolt.

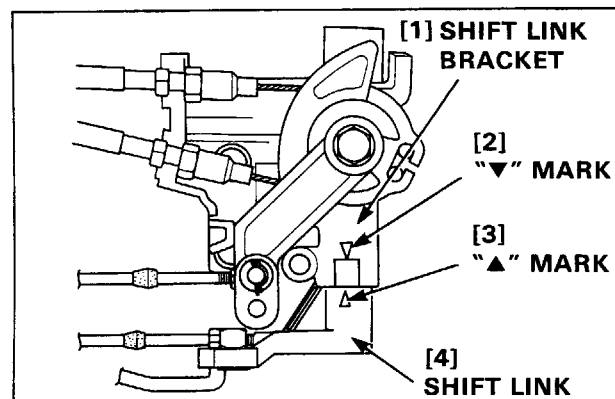
If it is not, tighten the 5 x 16 mm hex. bolt until it contacts the link joint arm.



### 13. SHIFT CABLE ADJUSTMENT

- 1) Move the remote control lever or gearshift lever to the "N" (Neutral) position.
- 2) The "▼" mark on the shift link bracket should align with the "▲" mark on the shift link.

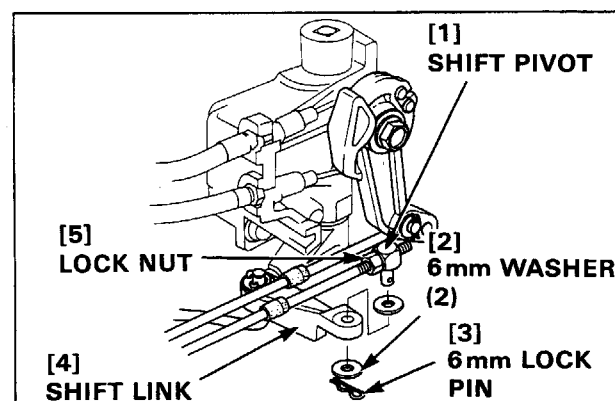
If the marks are not in alignment, adjust as follows.



- 3) To adjust, loosen the shift pivot lock nut, and remove the 6 mm lock pin and 6 mm washers from the shift pivot.

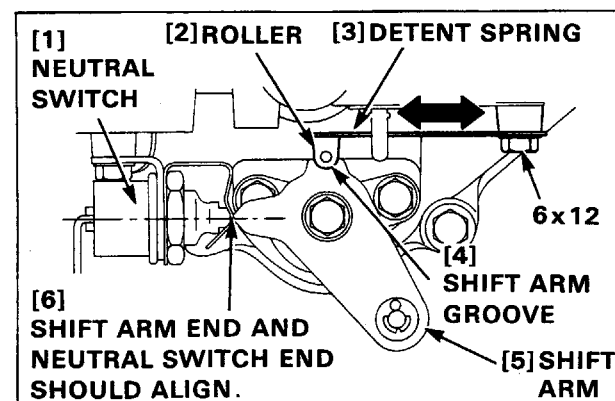
Remove the shift pivot from the shift link, and adjust by turning the shift pivot in or out.

- 4) Set the shift pivot on the shift link. The "▼" mark on the shift link bracket should align with the "▲" mark on the shift link. Tighten the lock nut.



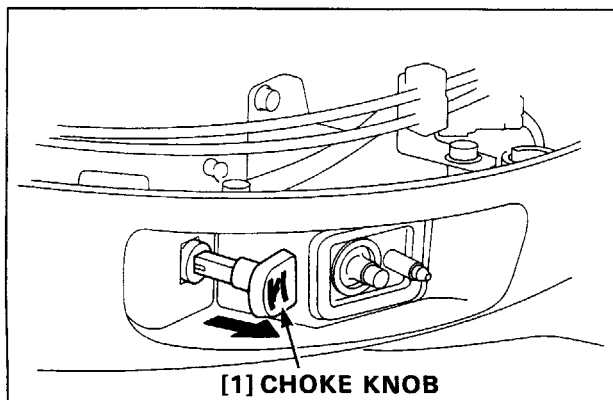
- 5) Check whether the detent spring roller is in the shift arm groove ["N" (Neutral) position] with the "▼" mark on the shift link bracket in alignment with the "▲" mark on the shift link. (The shift arm end should align with the neutral switch end.)
- 6) If the detent spring roller is not in the shift arm groove, loosen the 6 x 12 mm flange bolt, and move the detent spring right or left to adjust.

After adjustment, tighten the 6 x 12 mm flange bolt securely.

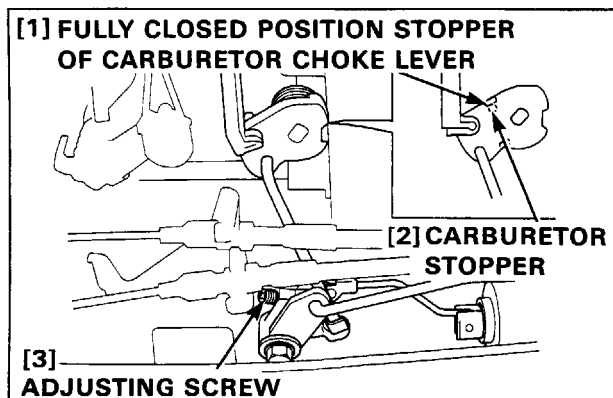


## 14. CHOKE KNOB ROD ADJUSTMENT

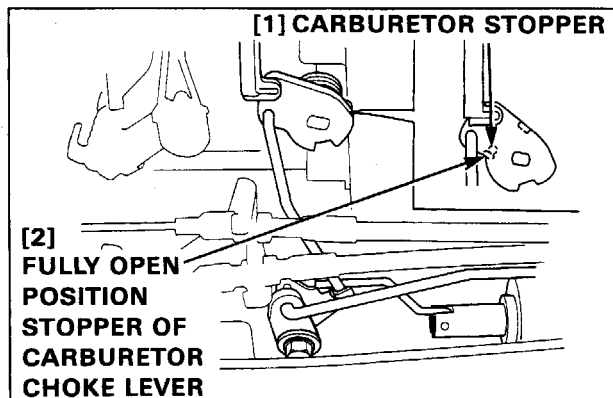
- 1) Pull the choke knob all the way out to the fully closed position.



- 2) Check that the carburetor stopper is in contact with the fully closed position stopper of the carburetor choke lever. If they are not, turn the adjusting screw until they contact.



- 3) After adjustment, push the choke knob all the way in to the fully open position. Be sure that the carburetor stopper is in contact with the fully open position stopper of the carburetor choke lever.



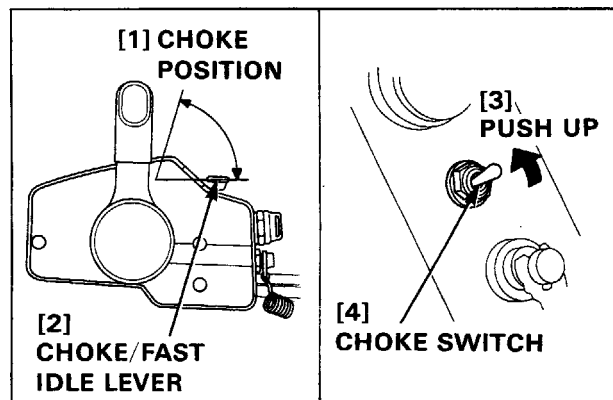
## 15. CHOKE SOLENOID ADJUSTMENT (REMOTE CONTROL TYPE)

Perform the remote choke solenoid adjustment after adjusting the choke rod.

- 1) Turn the ignition switch to the "START" position. Move the choke/fast idle lever on the remote control box to the choke position (Side-mount remote control type).

Push up the choke switch and hold it in position (Panel-mount /single top-mount / dual top-mount remote control type).

- 2) Check whether the choke solenoid functions properly. If not, adjust as follows.
- 3) Pull the choke knob to the fully closed position.

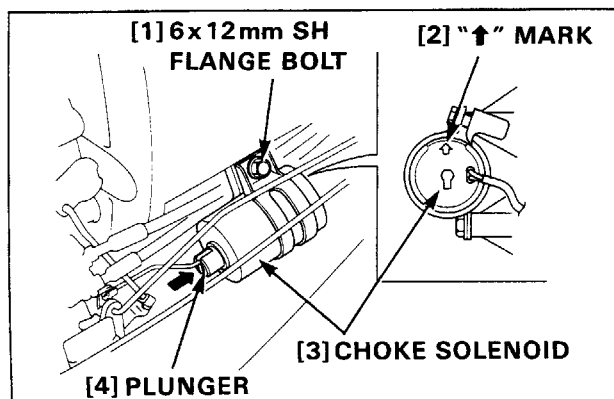


- 4) Loosen the 6 x 12 mm SH flange bolt on the choke solenoid bracket.

Check that the "↑" mark on the reverse side of the choke solenoid is pointing up.

- 5) Push the plunger into the choke solenoid and hold the plunger in this position. Then, move the choke solenoid toward the plunger until the choke solenoid stops.
- 6) Tighten the 6 x 12 mm SH flange bolt to the specified torque.

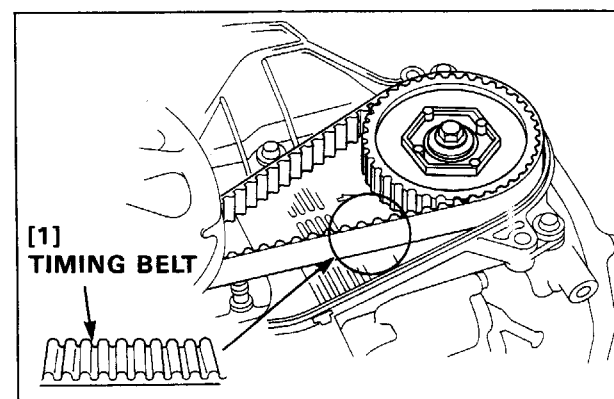
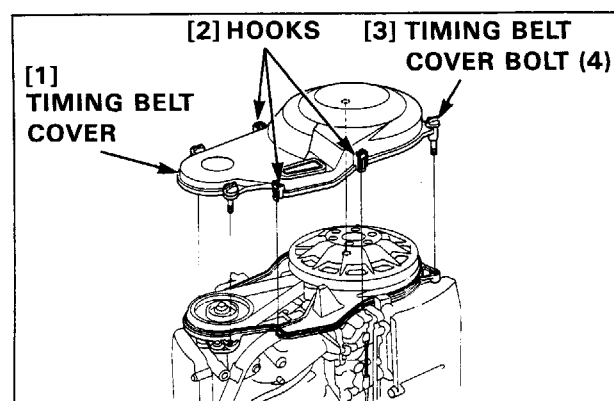
**TORQUE : 9 N·m (0.9 kgf·m, 6.5 lbf·ft)**



## 16. TIMING BELT

### Inspection

- 1) Remove the engine cover.
- 2) Move the remote control lever or gearshift lever to the "N" (Neutral) position.
- 3) Loosen the four timing belt cover bolts. Release the three hooks on the timing belt cover, and remove the timing belt cover.
- 4) Check the timing belt for damage and wear and replace if necessary.



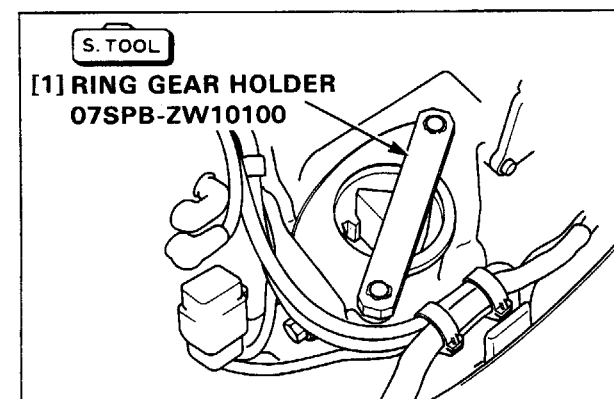
### Disassembly and Belt Removal

- 1) Remove the starter motor assembly (P.17-13).
- 2) Set the special tool in the hole made for installation of the starter motor assembly, and fix the flywheel securely.

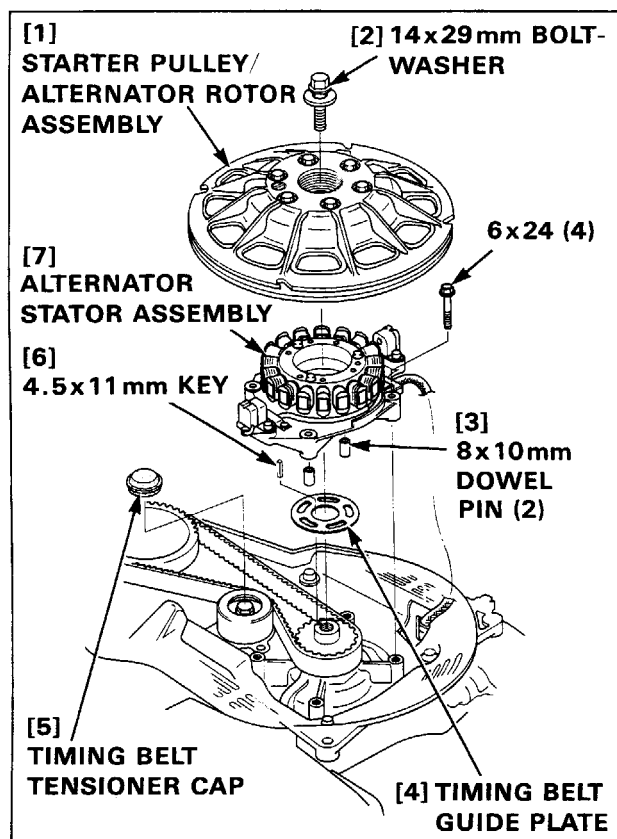
#### TOOL:

Ring gear holder

**07SPB - ZW10100**



- 3) Remove the 14 x 29 mm bolt-washer from the alternator rotor, and remove the starter pulley/alternator rotor assembly.
- 4) Remove the four 6 x 24 mm flange bolts from the alternator stator assembly, and remove the alternator stator assembly.
- 5) Remove the two 8 x 10 mm dowel pins, 4.5 x 11 mm key, timing belt guide plate and timing belt tensioner cap.
- 6) Remove the special tool from the hole provided for installation of the starter motor assembly.



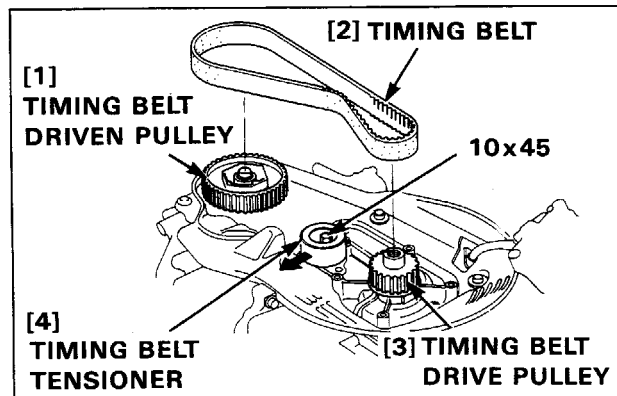
- 7) Loosen the 10 x 45 mm flange bolts from the timing belt tensioner. Pushing the belt tensioner in the same direction as the arrow, tighten the 10 x 45 mm flange bolt.
- 8) Remove the timing belt from the timing belt driven pulley first, then from the timing belt drive pulley.

### CAUTION:

**Do not use force when removing the timing belt. Do not pry with a screw driver or other device.**

### NOTE:

- Do not contaminate the timing belt with oil or grease.
- Do not bend the timing belt.
- Store the timing belt by hanging it on the wall.
- Do not reuse a worn or damaged timing belt.





### Belt installation and Assembly

- 1) Remove the spark plug caps and spark plugs.
- 2) Attach the special tool to the timing belt driven pulley as shown and align the "↓T" mark on the driven pulley and the "T↑" mark on the timing belt lower cover by turning the driven pulley.

**TOOL:**

Lock nut wrench, 56 mm

07LPA - ZV30200

- 3) Align the "I" mark on the timing belt drive pulley and the "I" mark on the cylinder block.

- 4) Set the new timing belt on the timing belt drive pulley first, then on the timing belt driven pulley with care not to let the aligning marks out of alignment.
- 5) Loosen the 10 x 45 mm flange bolt on the timing belt tensioner (loose enough that spring pressure moves the tensioner), then tighten the 10 x 45 mm flange bolt again. Do not tighten the 10 x 45 mm flange bolt to the specified torque before belt tension is adjusted.

**NOTE:**

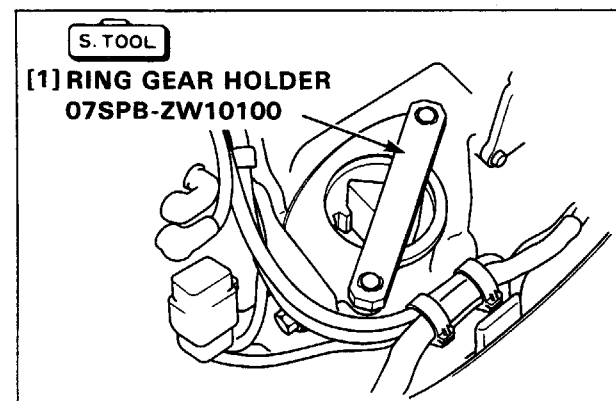
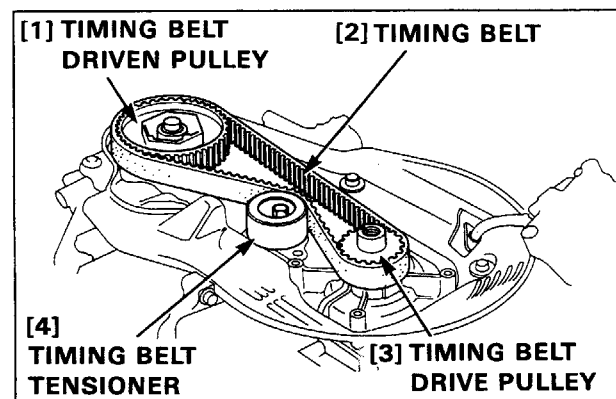
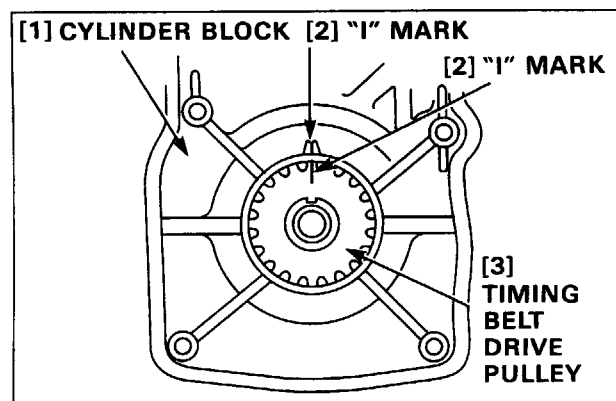
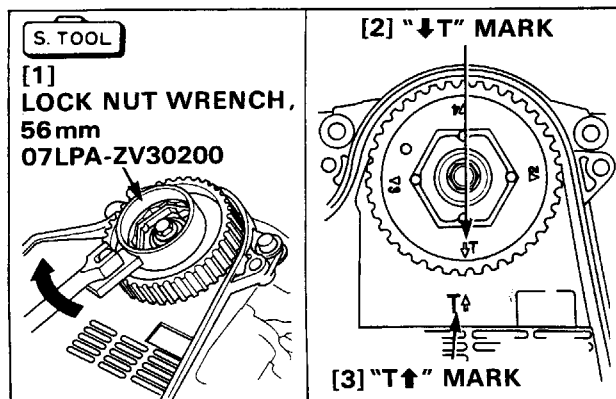
The correct tension for the timing belt is automatically adjusted by the tensioner.  
Do not push the tensioner toward the belt with force.

- 6) Set the special tool in the hole provided for installation of the starter motor and fix the flywheel securely.

**TOOL:**

Ring gear holder

07SPB - ZW10100



### [DEGREASING / CLEANING / LUBRICATION]

Be sure to degrease, clean or lubricate the following parts before installation.

#### <14 x 29 mm bolt-washer>

- Wipe the entire surface of the bolt-washer (especially the washer and alternator rotor surface) with a clean shop towel.
- Apply oil to the flanged part, washer and threaded part of the bolt.

#### <Alternator rotor>

- Remove oil from the bottom of the boss inside the alternator rotor thoroughly using a degreasing cleaning agent.
- Wipe the bolt-washer mounting surface at the boss inside the alternator rotor using a clean shop towel.

#### <Timing belt guide plate [Upper (alternator rotor side) plate]>

- Remove oil from the entire surface using a degreasing cleaning agent.

#### <Timing belt drive pulley/timing belt guide plate [Lower (crankshaft side) plate]>

- Wipe the entire surface of the timing belt drive pulley and timing belt guide plate (lower plate) using a clean shop towel.

#### <Crankshaft>

- Spray a degreasing cleaning agent over a clean shop towel, and wipe the entire surface of the crankshaft to remove oil thoroughly.

#### NOTE:

- Do not let the oil seals and other rubber parts get sprayed or contaminated with the degreasing cleaning agent.
- Do not spray the degreasing cleaning agent directly over the crankshaft. Be sure to wipe the crankshaft with a clean shop towel sprayed with the degreasing agent.

[1]

○ : WIPE WITH SHOP TOWEL

× : DEGREASE

● : LUBRICATE WITH OIL

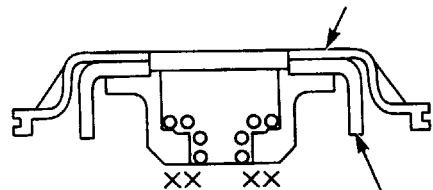
[2] 14x29mm

BOLT-WASHER

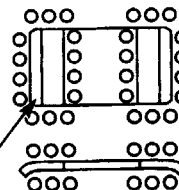
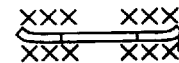


[3]

STARTER PULLEY



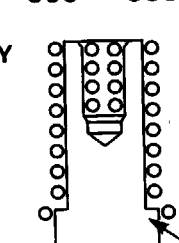
[4] ALTERNATOR ROTOR



[7]

TIMING BELT DRIVE PULLEY

[5] TIMING BELT GUIDE PLATE



[6]

CRANKSHAFT



7) Wipe the entire surface of the timing belt guide plate (alternator rotor side) clean with a degreasing cleaning agent, and install the guide plate. Note the installation direction of the guide plate (P.6-6).

8) Set the two 8 x 10 mm dowel pins, and install the alternator stator assembly.

9) Wipe the bottom of the boss inside the alternator rotor clean with a degreasing cleaning agent.

Wipe the bolt-washer mounting base at the boss inside the alternator rotor using a clean shop towel.

10) Set the 4.5 x 11 mm key in the crankshaft groove and install the alternator rotor.

11) Wipe the entire surface of the 14 x 29 mm bolt-washer (especially the washer and alternator rotor surface) clean with a clean shop towel.

Apply oil to the flanged part, washer and threaded part of the bolt.

12) Tighten the 14 x 29 mm bolt-washer with the snag torque (angle method). After tightening with the snag torque, mark on the bolt and alternator rotor and tighten the bolt an additional 90°.

### SNAG TORQUE (ANGLE METHOD):

20 N·m (2.0 kgf·m, 14 lbf·ft) + 90°

### NOTE:

If tightening the 14 x 29 mm bolt-washer to the specified torque (torque method), tighten to 181 N·m (18.5 kgf·m, 134 lbf·ft).

13) After installation, be sure that the 14 x 29 mm bolt-washer is tightened securely.

After checking, mark the bolt head (at the point in line with the "↓T" mark on the starter pulley) with a paint mark as shown.

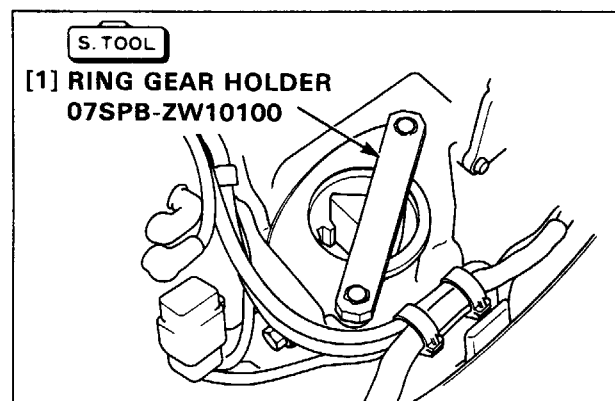
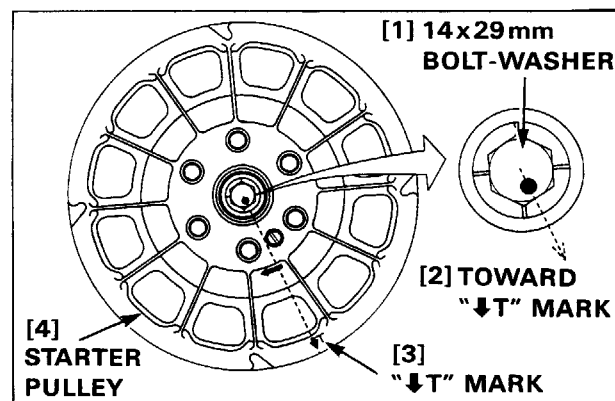
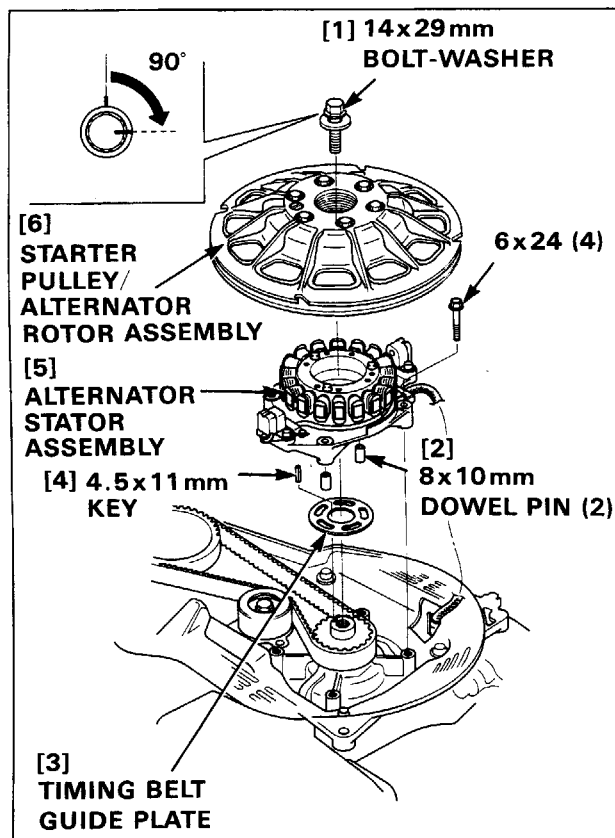
14) Remove the special tool from the hole provided for installation of starter motor.

### TOOL:

Ring gear holder

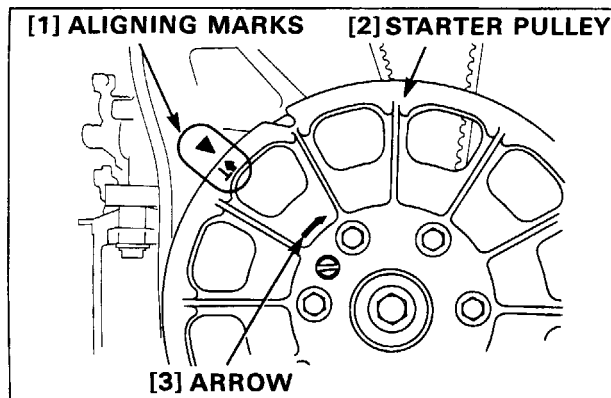
07SPB - ZW10100

15) After installation of each part, adjust the belt tension (P.3-23).



### Belt installation without Disassembly / Assembly

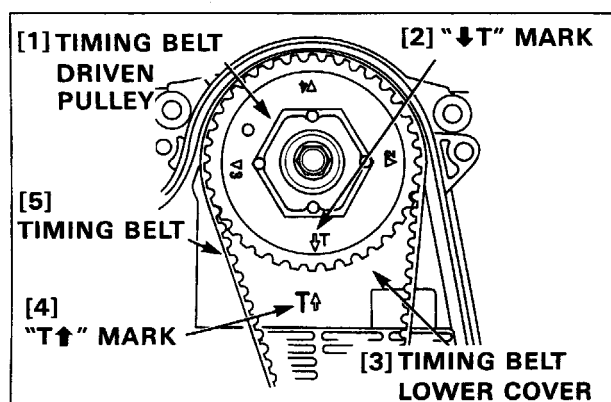
- 1) Check whether the "↓T" mark on the starter pulley aligns with the "▲" mark on the timing belt lower cover. If they do not, adjust by turning the starter pulley clockwise (in the same direction as the arrow on the starter pulley).



- 2) Turn the timing belt driven pulley clockwise to align the "↓T" mark on the timing belt driven pulley with the "T↑" mark on the timing belt lower cover.
- 3) Set the timing belt on the timing belt driven pulley with care not to let the aligning marks on the timing belt driven pulley and on the starter pulley come out of alignment.

**NOTE:**

Check whether the timing belt is securely set on the timing belt drive pulley on the starter pulley side, then set the belt on the timing belt driven pulley.

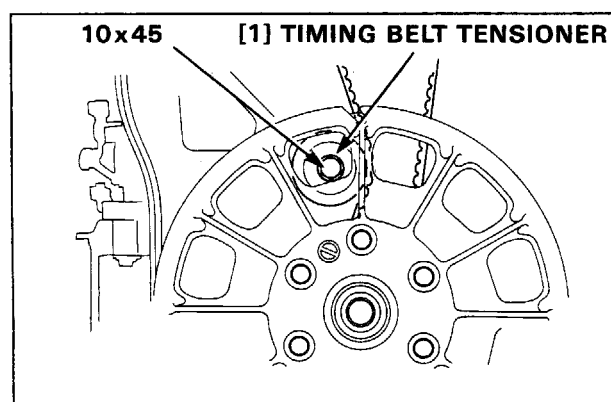


- 4) After installing the timing belt, loosen the 10 x 45 mm flange bolt on the timing belt tensioner (loose enough that spring pressure moves the tensioner), then tighten the 10 x 45 mm flange bolt again. Do not tighten the 10 x 45 mm flange bolt to the specified torque before belt tension adjustment.

**NOTE:**

The correct tension for the timing belt is automatically adjusted by the tensioner.  
Do not push the tensioner toward the belt with your hands.

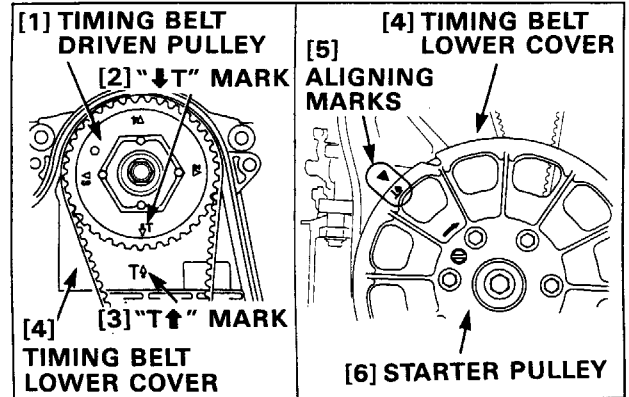
- 5) Adjust the belt tension (P.3-23).



### Timing Belt Tension Adjustment

Be sure that the intake and exhaust valve clearances are correct before performing the timing belt tension adjustment (P.3-5).

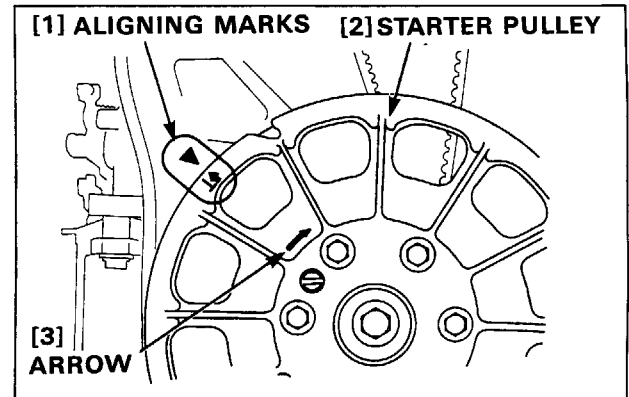
- 1) Align the "↓T" mark on the timing belt driven pulley with the "T↑" mark on the timing belt lower cover. Align the "↓T" mark on the starter pulley with the "▲" mark on the timing belt lower cover.



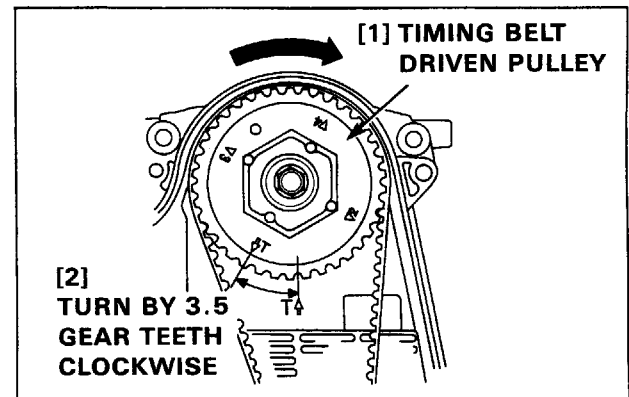
- 2) Turn the starter pulley two turns clockwise (in the same direction as the arrow on the starter pulley) from the position where the aligning marks are in proper alignment.

#### NOTE:

- With the position where the "↓T" mark on the starter pulley aligns with the "▲" mark on the timing belt lower cover used as the reference position, turn the starter pulley two turns clockwise.
- Do not turn the starter pulley counterclockwise (in the opposite direction from the arrow on the starter pulley).



- 3) After turning the starter pulley two turns, turn the starter pulley clockwise by an additional 3.5 gear teeth of the timing belt driven pulley slowly by hand.

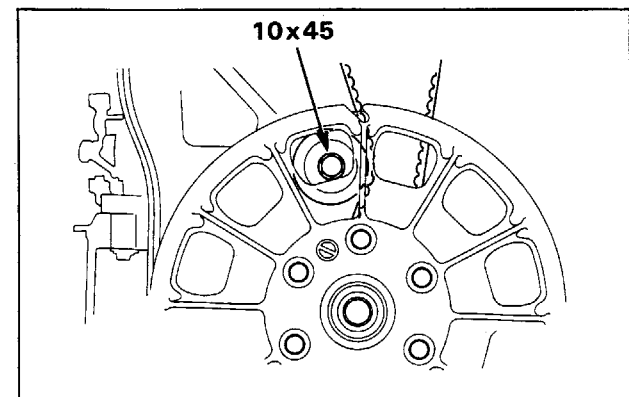


- 4) Loosen the 10 x 45 mm flange bolt on the timing belt tensioner, then tighten the 10 x 45 mm flange bolt to the specified torque.

**TORQUE : 44 N·m (4.5 kgf·m, 33 lbf·ft)**

#### NOTE:

The correct tension for the timing belt is automatically adjusted by the tensioner.  
Do not push the tensioner toward the belt with your hands.



- 5) Install the timing belt tensioner cap.
- 6) Install the timing belt cover and engine cover.

## 17. CRANKCASE BREATHER (BODENSEE TYPE ONLY)

Check the crankcase breather tube, and replace the breather tube which shows deterioration, damage or loose.

## 18. EXHAUST EMISSION (BODENSEE TYPE ONLY)

### NOTE:

Before this operation perform the following maintenances.

- Ignition timing.
- Spark plugs.
- Valve clearances.
- Crankcase breather.
- Carburetor synchronization.
- Idle speed.

### ⚠ WARNING

- Engine, exhaust system and analyzer become very hot.
- Wear insulation gloves to avoid severe burns.

- 1) Remove the extension grommet, and then remove the sampling probe cap and 14 mm sealing washer.
- 2) Connect the sampling tube end to the sampling probe pipe.

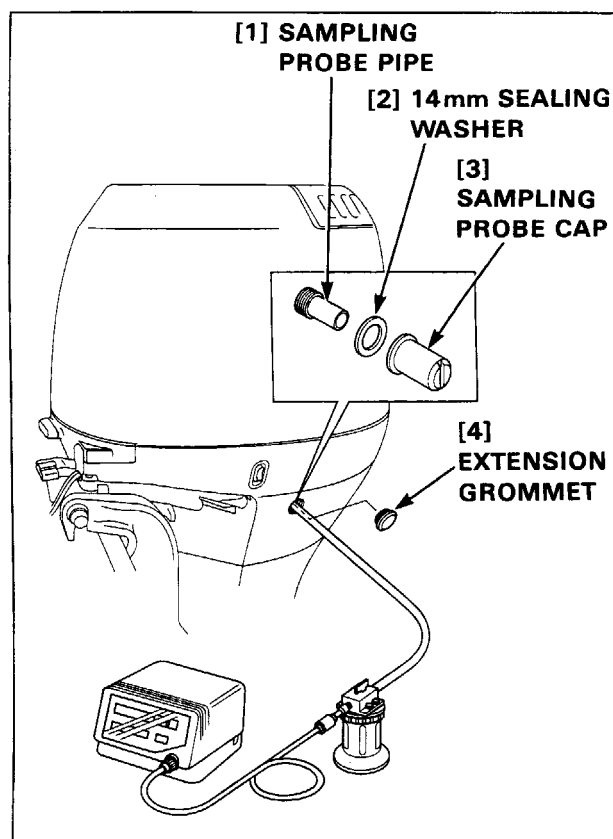
### NOTE:

Pinch the sampling tube using a tube clip to avoid leaking exhaust gas.

- 3) Start the engine and run at  $3,500 - 4,000 \text{ min}^{-1}$  (rpm) for about 7 minutes to warm up the engine.  
[cf. Engine oil temperature:  $65 \pm 5^{\circ}\text{C}$  ( $149 \pm 41^{\circ}\text{F}$ )]
- 4) Connect the sampling tube to an analyzer for exhaust emission according to the manufacturer's instructions.
- 5) Remove the tube pinch to free the sampling tube and measure value of CO, HC and CO<sub>2</sub> at idle with the engine cover installed.

	STANDARD VALUE
CO	$4.1 \pm 1.6 \%$
HC	Max. 280 ppm
CO <sub>2</sub>	Min. 11.3 %
Idle speed	$950 \pm 50 \text{ min}^{-1}$ (rpm)

- 6) If the measurements are out of specifications, adjust as following.



### ADJUSTMENT

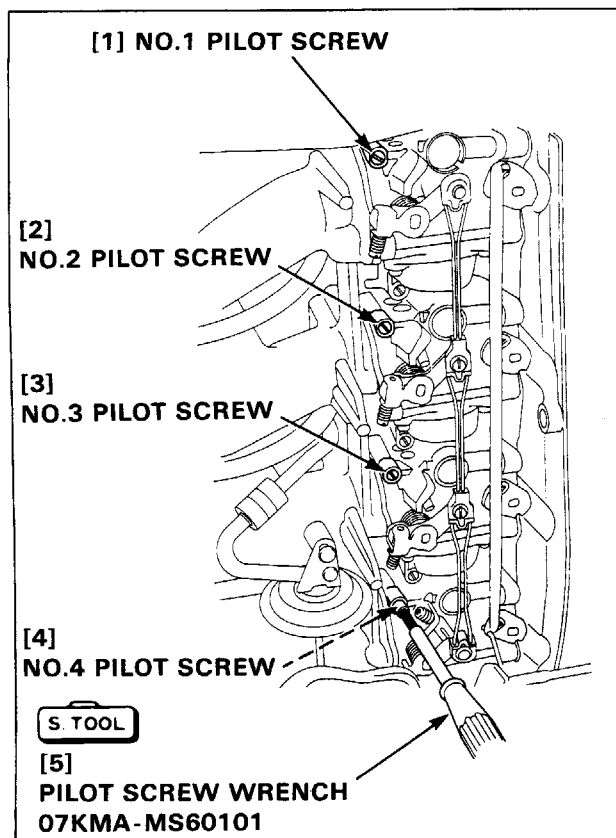
- 1) Turn the pilot screws in or out to obtain the standard values using the pilot screw wrench according to the pilot screw adjustment procedures (P. 3-9).

**TOOL:**

**Pilot screw wrench**

**07KMA - MS60101**

- 2) If the specified value is not obtained, inspect and repair the following in order of number and recheck.
  - (1) Decarbonization from the combustion chamber.
  - (2) Refacing valve seats and lapping valve and valve seat.
  - (3) Checking valve stem seal condition.
  - (4) Checking piston ring conditions.



# 4. ENGINE COVER/THROTTLE/CHOKE

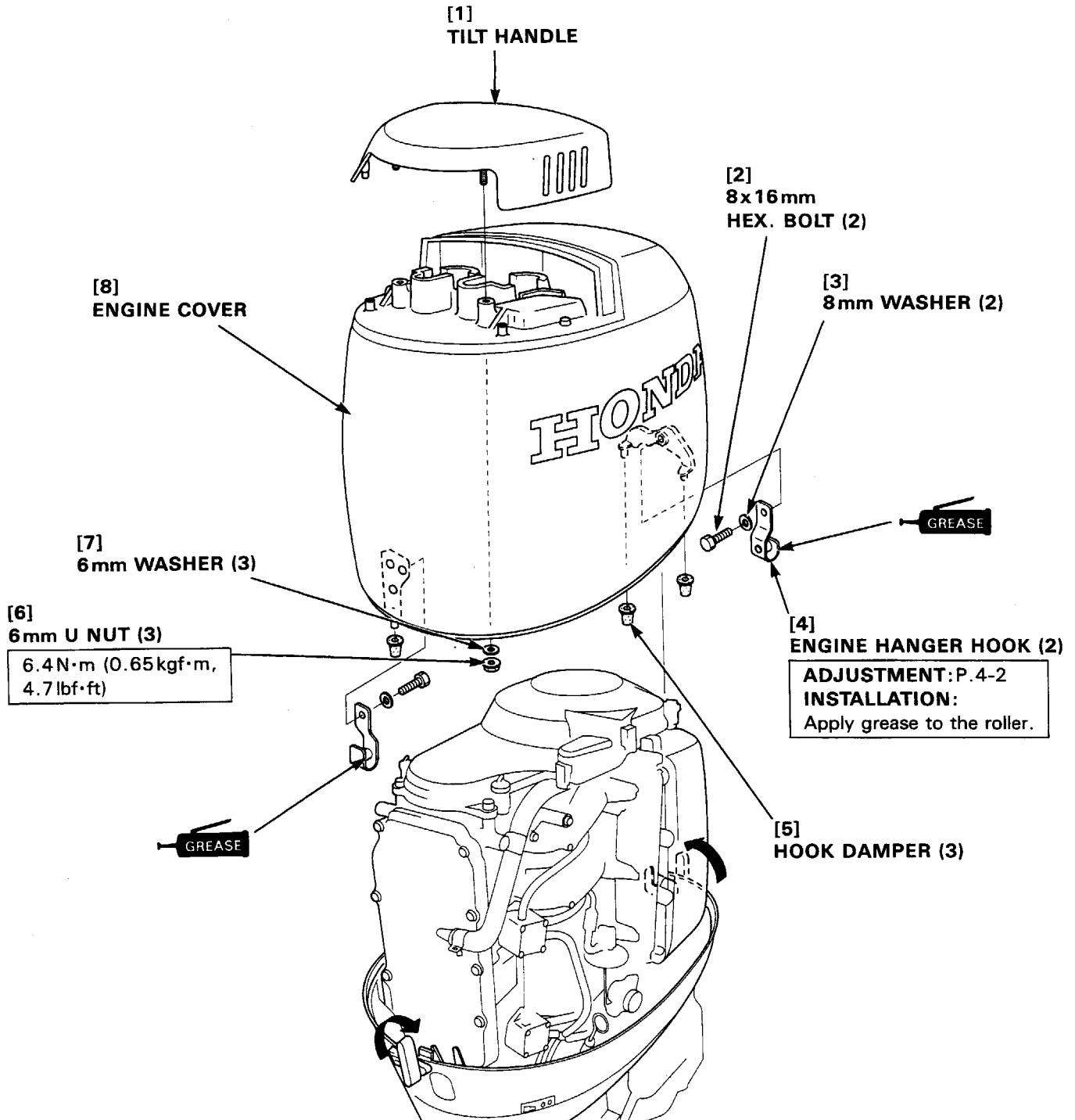
**HONDA**  
**BF75A•90A**

- 1. ENGINE COVER
- 2. THROTTLE CAM / THROTTLE CABLE

- 3. CHOKE KNOB ROD

## 1. ENGINE COVER

### a. DISASSEMBLY / ASSEMBLY





### b. ADJUSTMENT

#### • ENGINE HANGER HOOK

- 1) Set the 8 mm washer over the 8 x 16 mm hex. bolt, and tighten the 8 x 16 mm hex. bolt in the center of the long hole in the engine hanger hook.
- 2) Install the engine cover on the outboard motor and fix the front/rear cover lock levers securely.
- 3) Measure the clearance between the engine cover and engine undercase at the center of the engine cover as shown. It should be 4.8 – 5.8 mm (0.19 – 0.23 in).

#### NOTE:

Measure the clearance on the front side and rear side respectively.

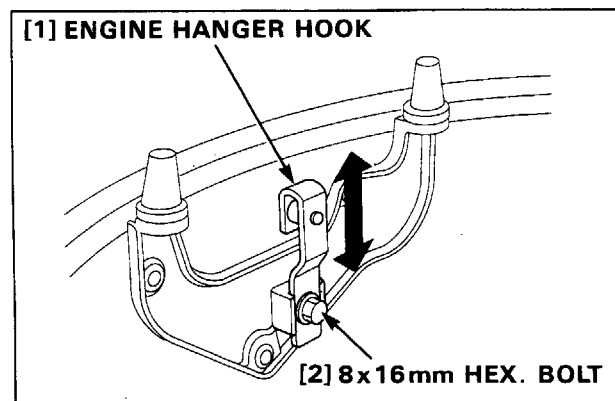
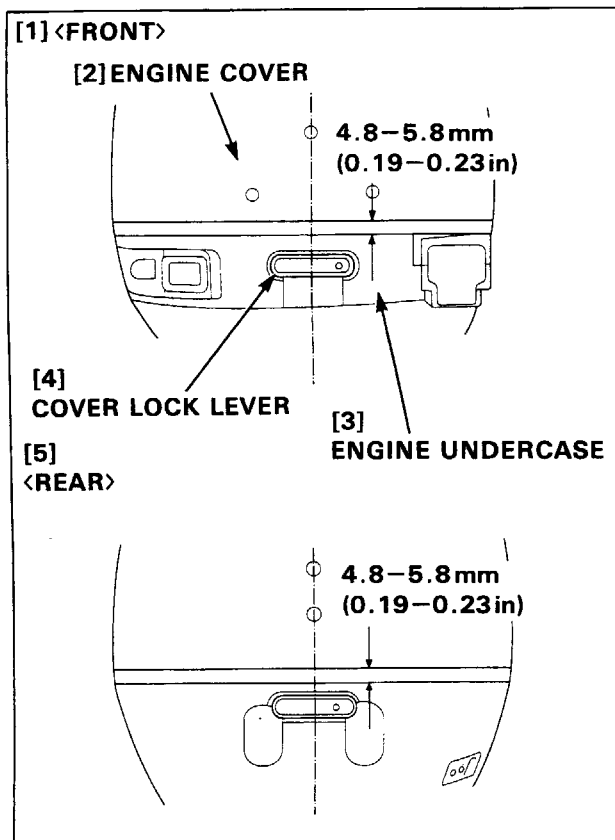
- 4) If the measurement is outside the specification, adjust as follows.

- 5) To adjust, remove the engine cover and loosen the 8 x 16 mm hex. bolt. Mover the engine hanger hook up or down to bring the clearance to 4.8 – 5.8 mm (0.19 – 0.23 in).

#### NOTE:

Measure the clearance on the front side and rear side respectively.

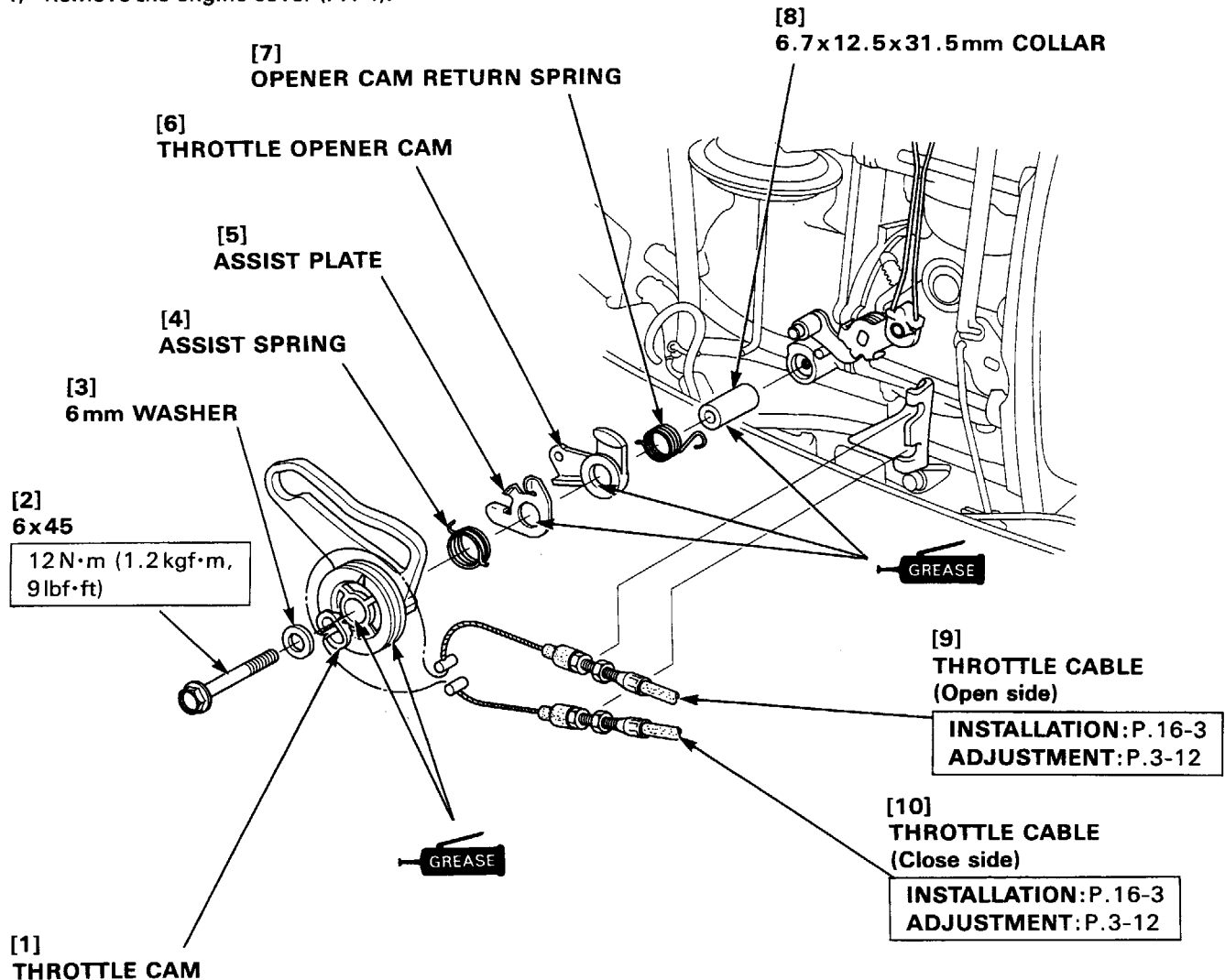
- 6) After adjustment, tighten the 8 x 16 mm hex. bolt securely.



## 2. THROTTLE CAM / THROTTLE CABLE

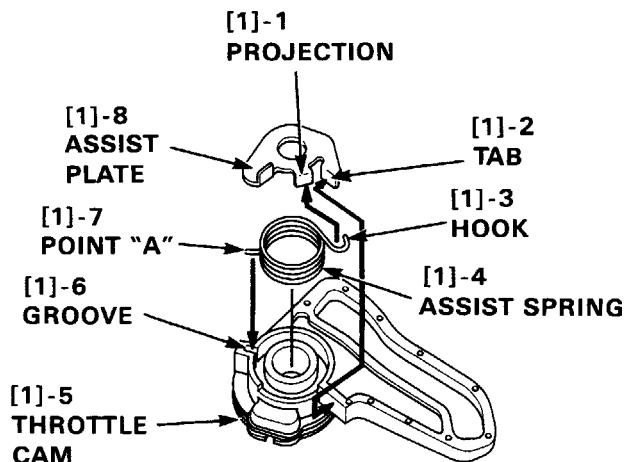
### a. DISASSEMBLY / ASSEMBLY

- 1) Remove the engine cover (P.4-1).



#### ASSEMBLY:

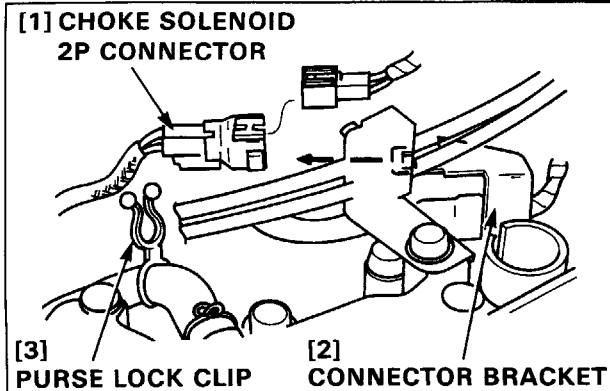
- 1) Align the point "A" of the assist spring with the groove in the throttle cam.
- 2) Set the projection of the assist plate in the hook of the assist spring, and align the flat surface of the throttle cam with the tab of the assist plate. Then, assemble with the collar and tighten the bolt.



### 3. CHOKE KNOB ROD

#### a. REMOVAL / INSTALLATION

- 1) Remove the carburetor assembly (P.5-1).
- 2) Disconnect the choke solenoid 2P connector and release the choke solenoid wire from the purse lock clip. Disconnect the choke solenoid 2P connector from the connector bracket (Remote control type only).



[1] **PLUNGER**  
[Remote control type only]

**REMOVAL:**  
Remove the plunger and rod joint in the same manner as the choke rod removal (P.5-1).

[2] **CHOKE SOLENOID**  
[Remote control type only]

**INSPECTION:**P.17-25  
**ASSEMBLY:**P.4-5  
**ADJUSTMENT:**P.3-16

[3] **CHOKE KNOB ROD**  
**REMOVAL/**  
**INSTALLATION:**P.4-5

[4] **CHOKE KNOB GUIDE**

[18] **THROTTLE CABLE STAY**

6x16 (2)

[17] **ROD JOINT**

[16] **CHOKE ARM ADJUSTING SPRING**

[15] **4x16mm SCREW**  
**ADJUSTMENT:**  
P.3-16

[14] **6x30**  
**12 N·m (1.2 kgf·m, 9 lbf·ft)**

[13] **6mm WASHER (2)**

[12] **6.5x10.5x16mm COLLAR**

[10] **CHOKE ARM B**

[11] **CHOKE ARM A**

[9] **LINKAGE BUSHING**

[6] **CHOKE SOLENOID BRACKET** [Remote control type only]

[7] **6x12mm SH FLANGE BOLT**  
[Remote control type only]  
**9 N·m (0.9 kgf·m, 6.5 lbf·ft)**

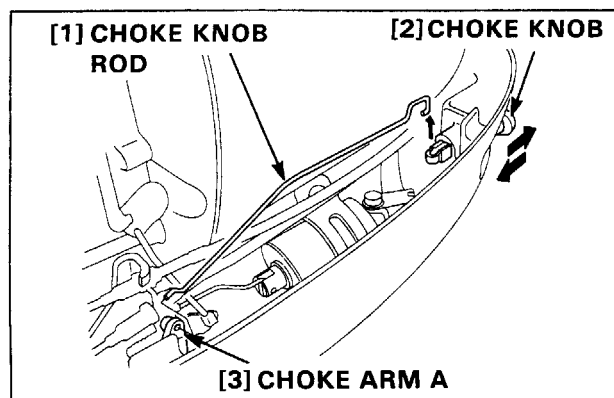
[8] **6x14 (2)** [Remote control type only]

[5] **CHOKE KNOB**

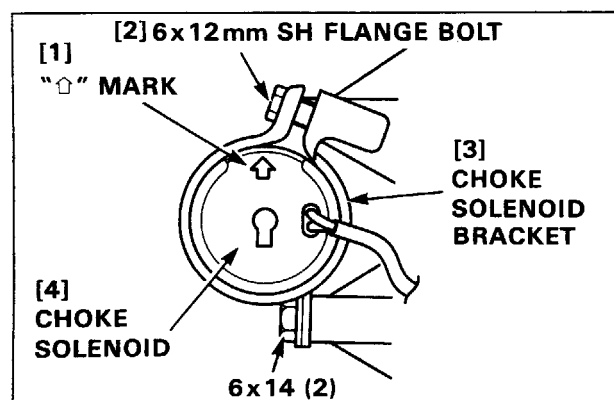
GREASE

**• CHOKE KNOB ROD****DISASSEMBLY / ASSEMBLY:**

- 1) Pull the choke knob, then push it while holding the choke knob rod. Pull up the choke knob rod, and disconnect it from the choke knob and choke arm A.
- 2) To install the choke knob rod, set it into choke arm A, push in the choke knob, and connect the choke knob rod to the choke knob. Pull the choke knob as far as it will go.

**• CHOKE SOLENOID (Remote control type only)****ASSEMBLY:**

- 1) Set the choke solenoid bracket on the engine, and tighten with the two 6 x 14 mm flange bolts.
- 2) Set the choke solenoid in the choke solenoid bracket with the "↑" mark on the reverse side of the choke solenoid pointing up, then loosely tighten it with the 6 x 12 mm SH flange bolt.
- 3) Connect the plunger rod to the choke arm B, and clamp it with the rod joint.
- 4) Adjust the choke solenoid following step 5) and the subsequent steps of the choke solenoid adjustment (P. 3-17).



# 5. FUEL SYSTEM

**HONDA**  
**BF75A·90A**

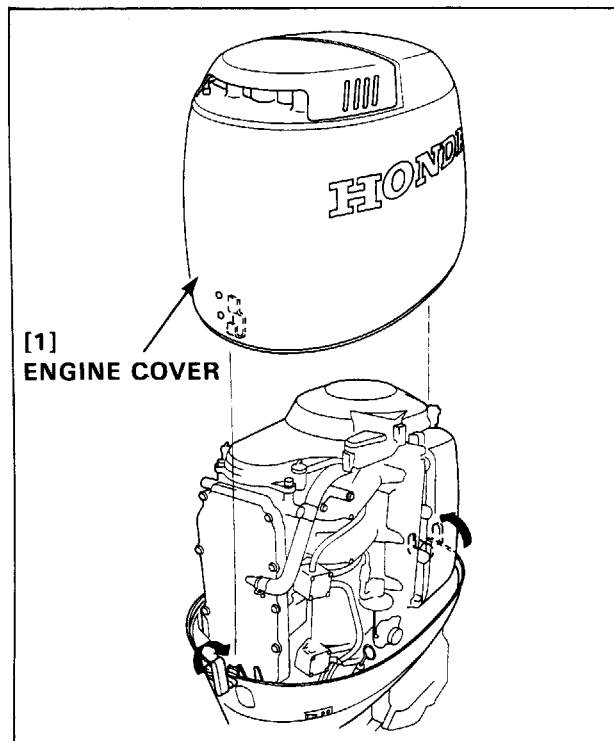
1. CARBURETOR REMOVAL / INSTALLATION
2. CARBURETOR DISASSEMBLY / ASSEMBLY
3. FUEL PUMP

4. FUEL FILTER / FUEL TUBE
5. FUEL TANK (EQUIPED TYPE)

## 1. CARBURETOR REMOVAL / INSTALLATION

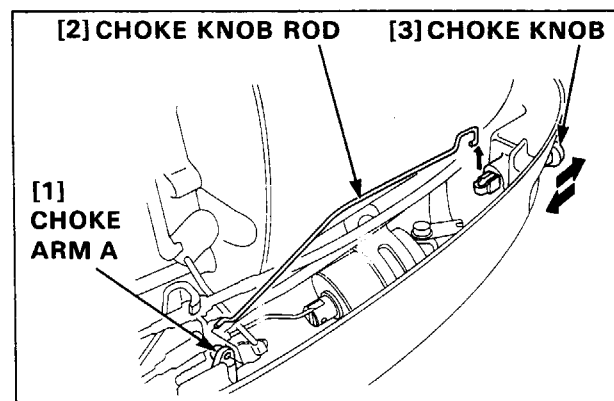
### • REMOVAL

- 1) Remove the engine cover. Remove the timing belt cover (P. 3-5).



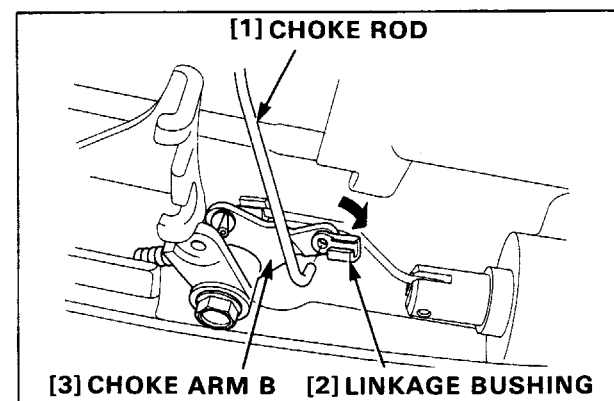
- 2) Pull the choke knob, then push it while holding the choke knob rod. Pull up the choke knob rod, and disconnect it from the choke knob and choke arm A.

- 3) Disconnect the two throttle cables at the throttle cam side (P. 4-3).



- 4) Hold the choke rod, and remove the linkage bushing from the choke rod by pushing the linkage bushing down. Disconnect the choke rod from the choke arm B.

- 5) Drain the carburetor into an approved gasoline container. To drain, connect a tube to the drain spout on each carburetor float bowl, and loosen each drain screw.



### ⚠ WARNING

**Gasoline is highly flammable and explosive.**

**You can be burned or seriously injured when handling fuel.**

- Keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

- 6) Disconnect the two fuel tube A's and two 5.3 x 175 mm fuel tubes from each fuel pump (P. 5-10).
- 7) Disconnect the 3.5 x 6.5 x 290 mm tube and 3.5 x 6.5 x 230 mm tube from the water check grommet.
- 8) Disconnect the breather tube from the cylinder head cover.
- 9) Remove the two 6 x 25 mm flange bolts and remove the silencer duct.
- 10) Remove the six 8 x 35 mm flange bolts, 8 x 70 mm flange bolt and two 8 mm cap nuts. While lifting the No. 1 carburetor timing belt lower cover a little, remove the carburetor assembly from the engine.

### [2] BREATHER TUBE

#### INSTALLATION:

Check for cracks and deterioration before connecting.

### [3] TIMING BELT LOWER COVER

### [1] TUBE CLIP D22

### [14] 8x70

26N·m (2.7 kgf·m,  
20 lbf·ft)

### [13] 8x35 (6)

26N·m (2.7 kgf·m,  
20 lbf·ft)

### [12] TUBE CLAMP

#### INSTALLATION:

Clamp the breather tube.

### [11] 8mm CAP NUT (2)

26N·m (2.7 kgf·m,  
20 lbf·ft)

### [10] 3.5x6.5x230mm TUBE

### [9] 3.5x6.5x290mm TUBE

### [8] CARBURETOR ASSEMBLY

DISASSEMBLY/  
ASSEMBLY: P. 5-4

### [4] INTAKE MANIFOLD GASKET

Do not reuse.

### [5] SILENCER DUCT

### [6] GROMMET (2)

6x25 (2)

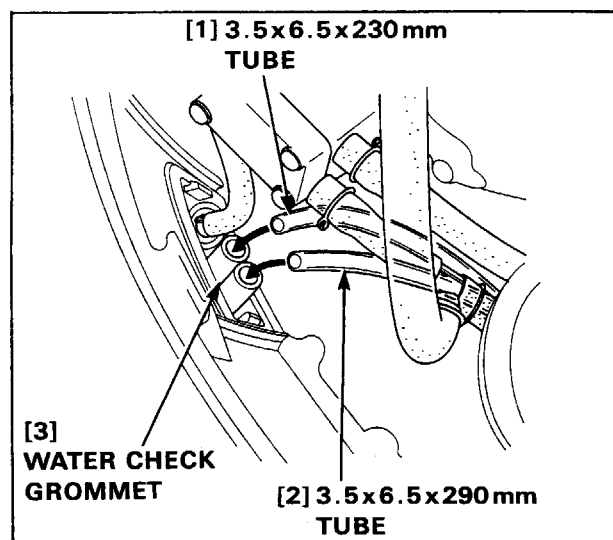
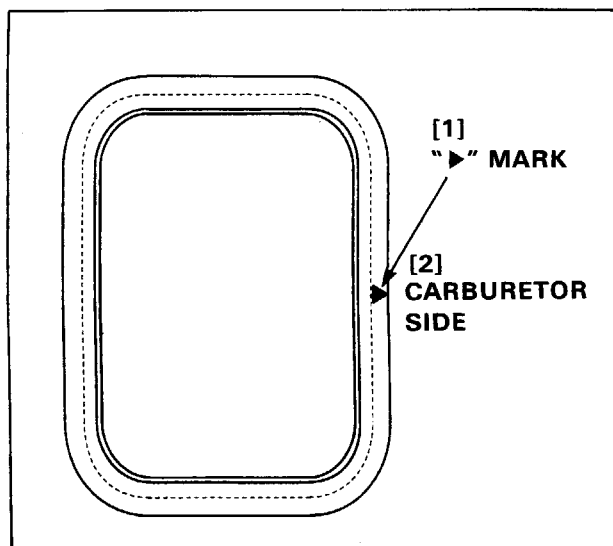
### [7] SILENCER DUCT GROMMET

INSTALLATION: P. 5-3

### • INSTALLATION

Install the carburetor assembly in the reverse order of removal. Replace the intake manifold gasket with a new one.

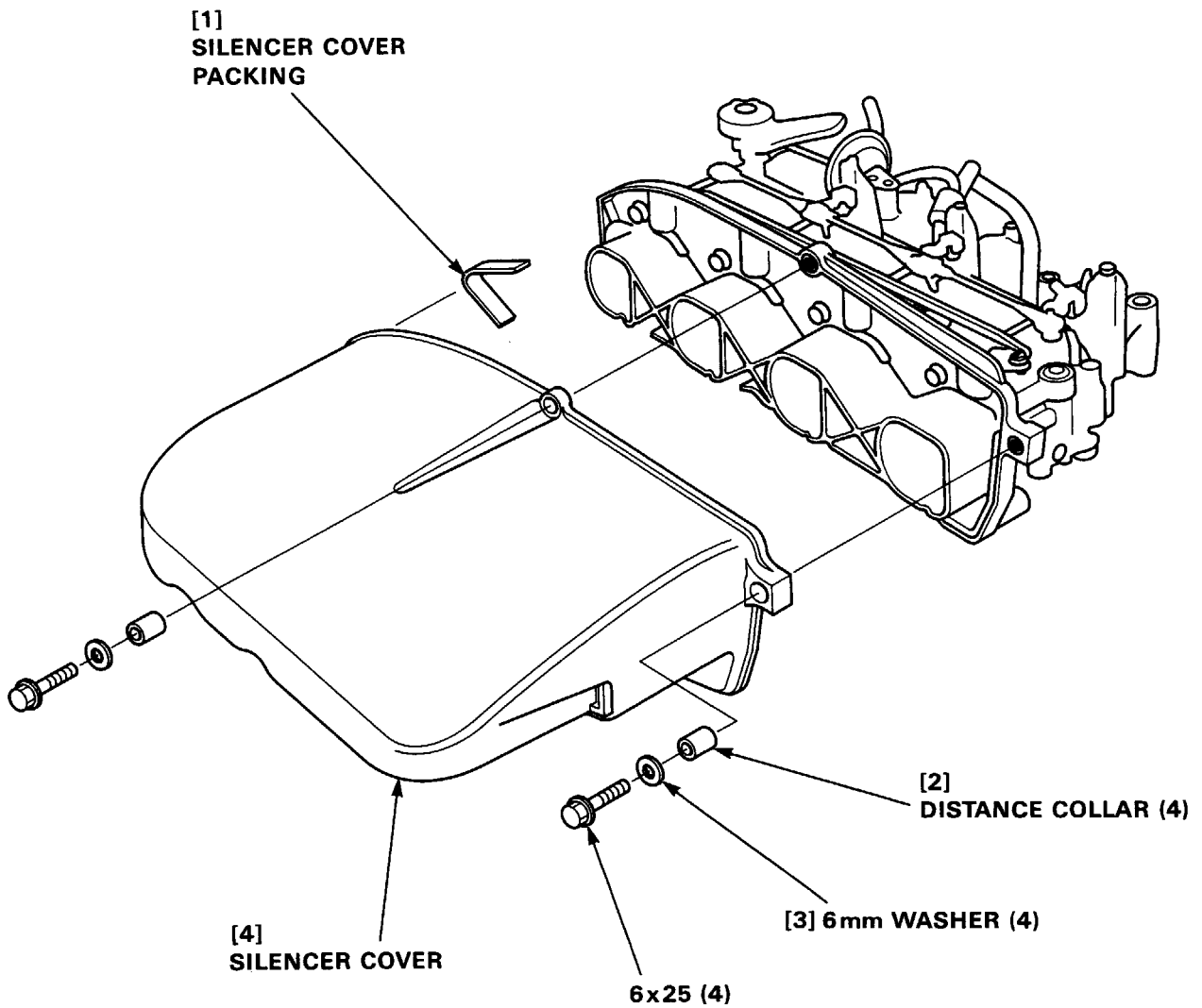
- 1) Install the silencer duct grommet on the silencer cover with the "►" mark on the silencer duct grommet toward the carburetor side.
- 2) Connect the 3.5 x 6.5 x 230 mm tube and 3.5 x 6.5 x 290 mm tube to the water check grommet as shown.
- 3) After installing the carburetor assembly, adjust the throttle cable (P. 3-12).



## 2. CARBURETOR DISASSEMBLY / ASSEMBLY

### • SILENCER COVER

Remove the carburetor assembly (P. 5-1).



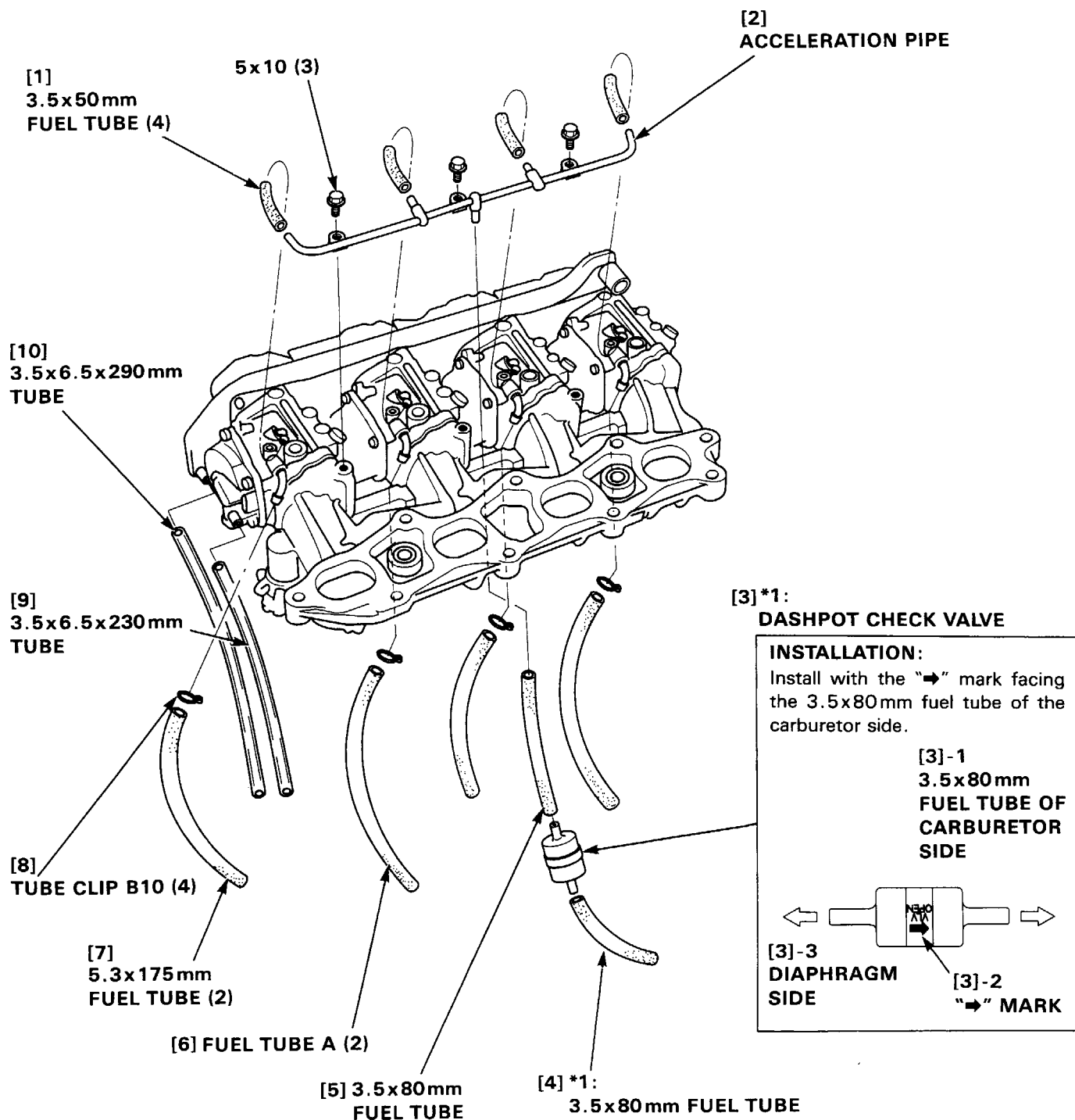


### • FUEL LINE

Before installing the fuel tubes, check for deterioration or damage. Replace if necessary.

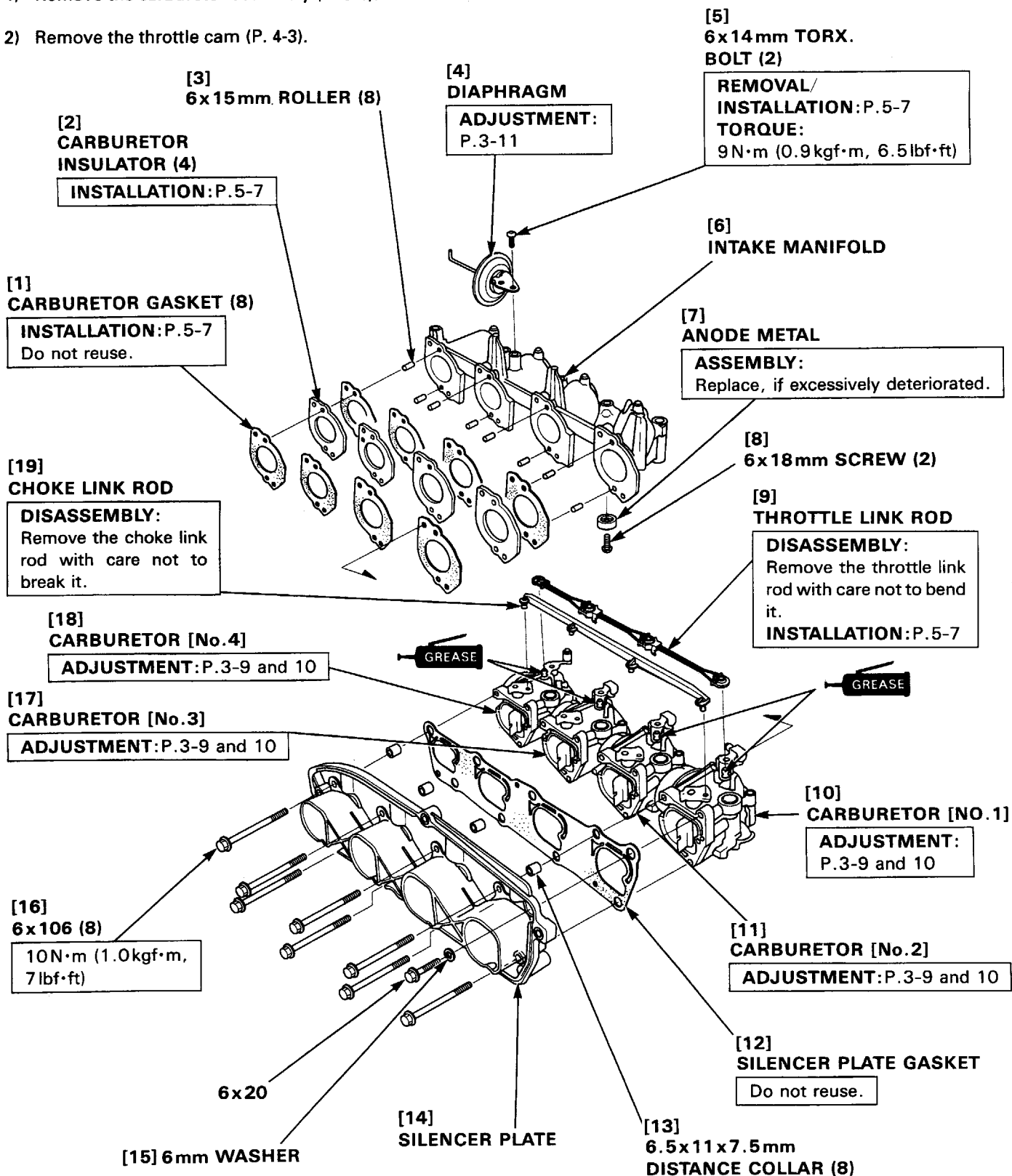
- 1) Remove the carburetor assembly (P. 5-1).

Parts marked with " \*1: " can be disassembled and assembled with the carburetor mounted to the intake manifold.



### • MANIFOLD

- 1) Remove the carburetor assembly (P. 5-1).
- 2) Remove the throttle cam (P. 4-3).

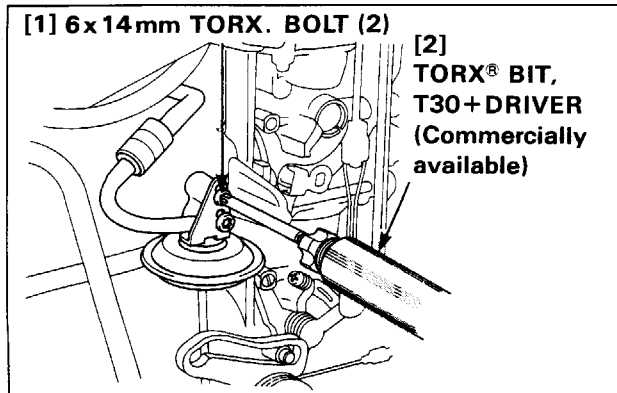


### • 6 x 14 mm TORX. BOLT

#### REMOVAL/INSTALLATION :

Remove/install the 6 x 14 mm torx. bolts using a commercially available torx® driver (T30).

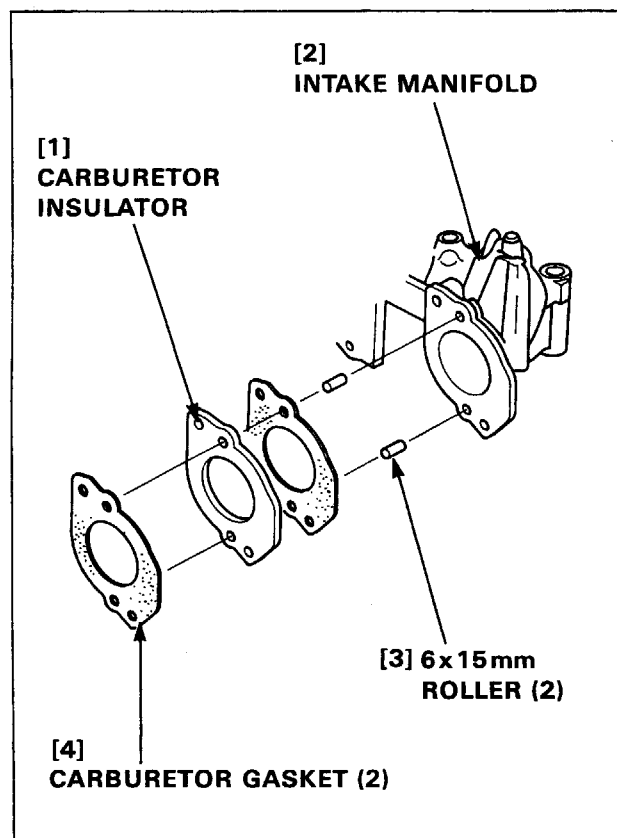
**TORQUE : 9 N·m (0.9 kgf·m, 6.5 lbf·ft)**



### • CARBURETOR GASKET / CARBURETOR INSULATOR

#### INSTALLATION :

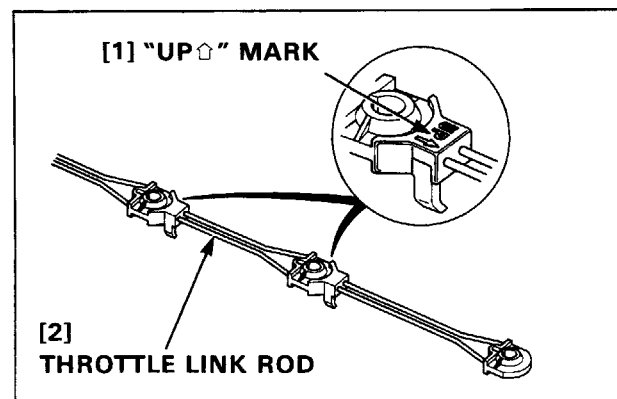
Install the carburetor gaskets and carburetor insulator as shown.



### • THROTTLE LINK ROD

#### INSTALLATION :

Install the throttle link rod with the two "UP⇧" marks at the center of the rod facing up as shown.



### • CARBURETOR

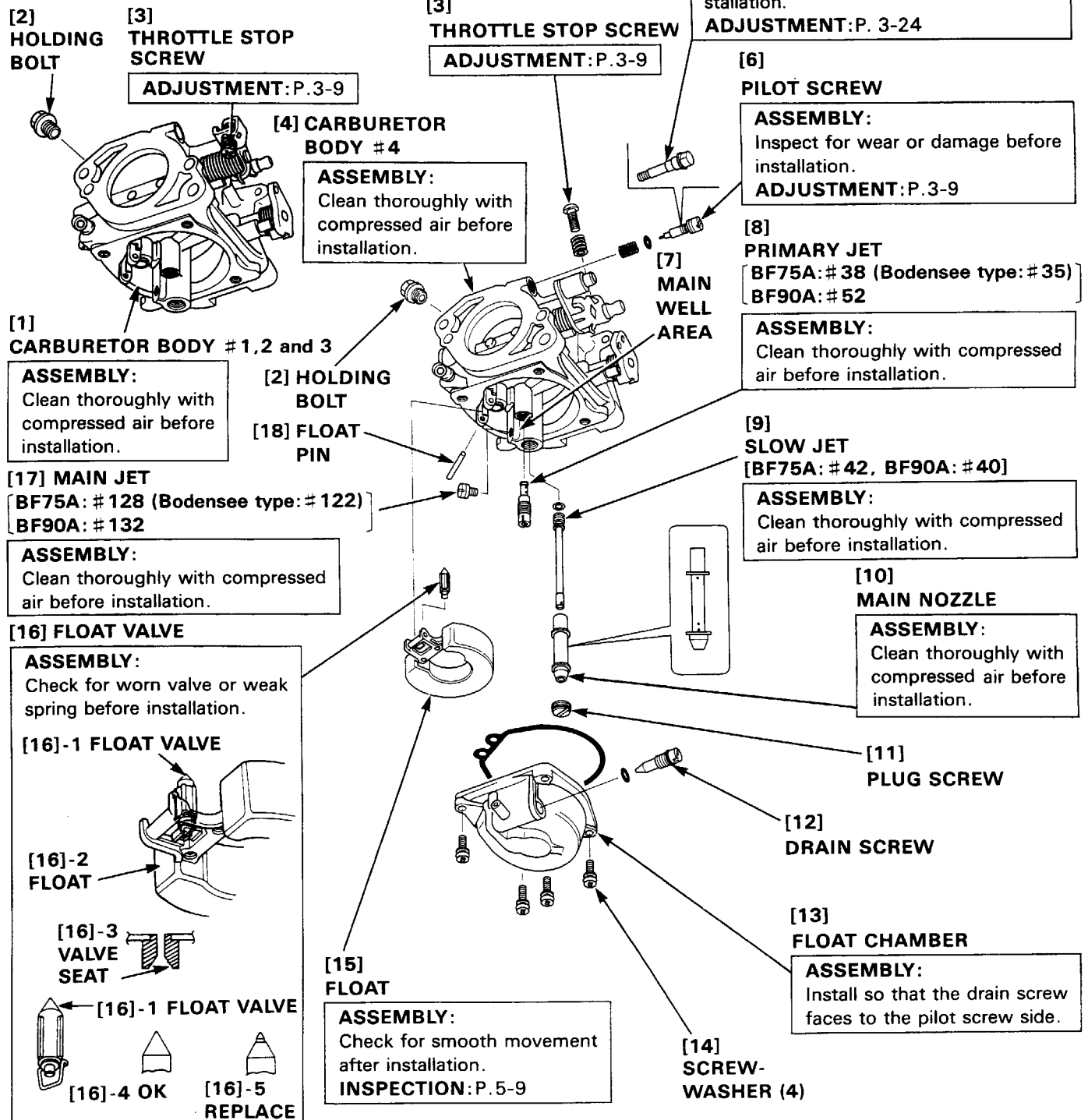
Drain gasoline from the carburetor (P.5-1) before disassembly.

#### ⚠ WARNING

**Gasoline is highly flammable and explosive.**  
**You can be burned or seriously injured when handling fuel.**

- Keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

Remove the manifold (P. 5-6).



### • INSPECTION

#### FLOAT LEVEL HEIGHT

With the carburetor in an upright position, measure the distance between the float bottom and the carburetor body when the float just contacts the float valve.

Standard float height	11.5 mm (0.45 in)
-----------------------	-------------------

If the height is outside the specification, gently bend the brass float tab to adjust the float height.  
Check the float operation.

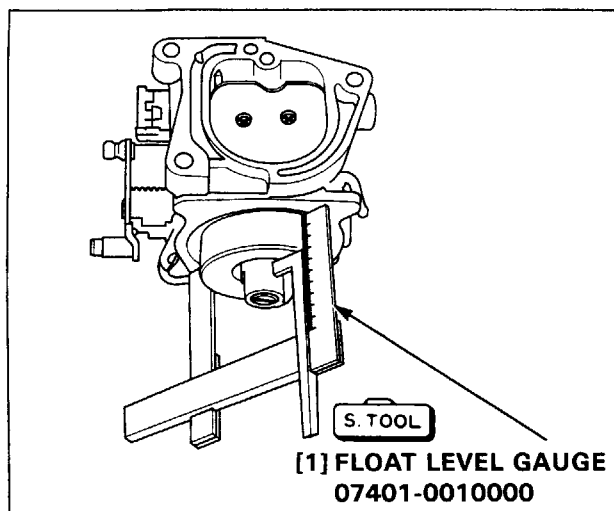
#### NOTE:

Take care not to damage the float when you adjust the float height by bending the float tab.

#### TOOL :

Float level gauge

07401-0010000





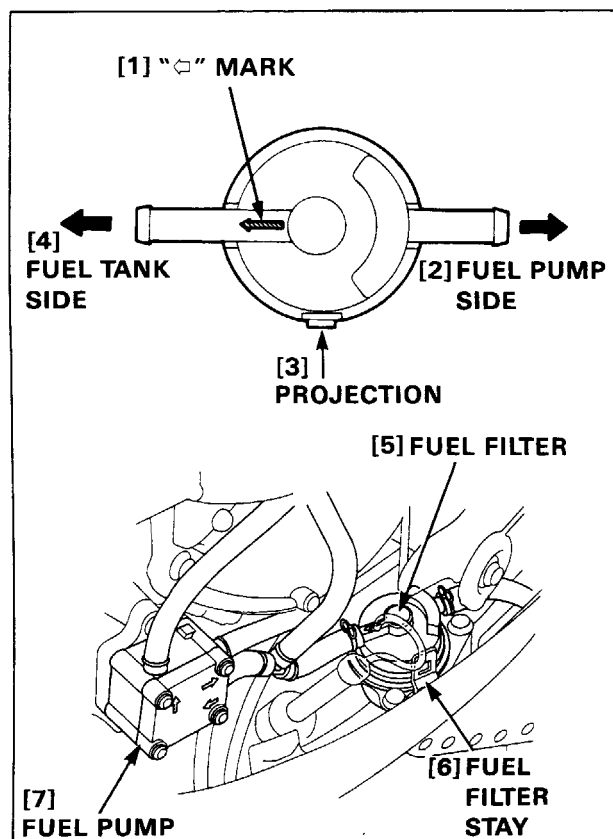


### • FUEL FILTER

#### INSTALLATION :

Install the fuel filter with the "↔" mark facing the fuel pump.

Be sure that the fuel filter projection is secured in the fuel filter stay.



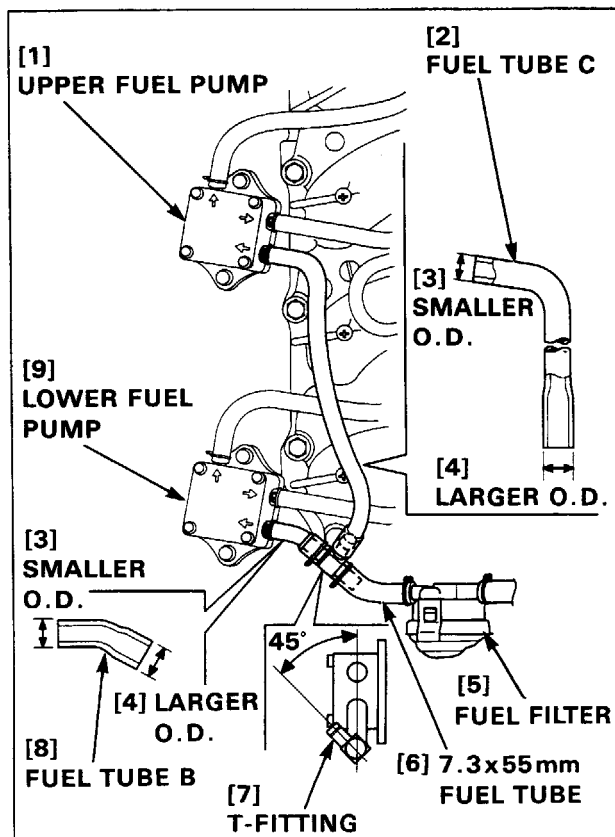
### • FUEL TUBE B / C, T-FITTING

#### INSTALLATION :

- 1) Connect the 7.3 x 55 mm fuel tube to the fuel filter.
- 2) Connect the T-fitting to the 7.3 x 55 mm fuel tube at an angle of 45° outward. Connect the fuel tube B to the T-fitting so that the larger diameter end of the tube faces down.

Connect the smaller diameter end of the fuel tube B to the lower fuel pump of the side marked with "↔".

- 3) Connect the fuel tube C to the fuel pump so that the smaller diameter end of the tube is facing the upper fuel pump of the side marked with "↔" and the straight portion of the tube toward down. Connect the larger diameter end of the fuel tube C to the T-fitting.
- 4) After connecting the fuel tubes, check each tube for interference with the surrounding parts, especially with the intake manifold port, rib and bolts.





## 5. FUEL TANK (EQUIPED TYPE)

### a. DISASSEMBLY / ASSEMBLY

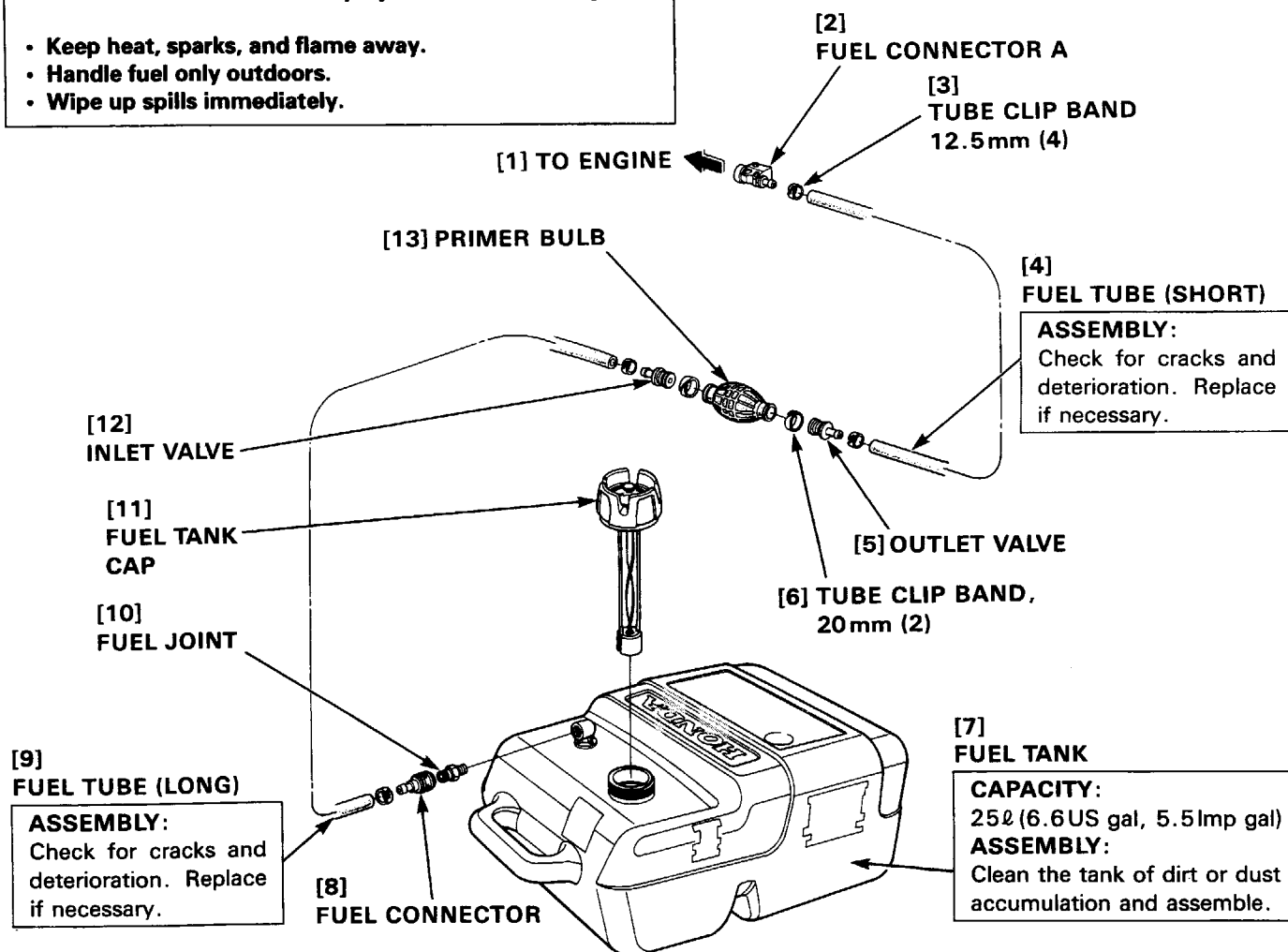
Drain the fuel tank and fuel line completely before disassembly.

#### ⚠ WARNING

**Gasoline is highly flammable and explosive.**

**You can be burned or seriously injured when handling fuel.**

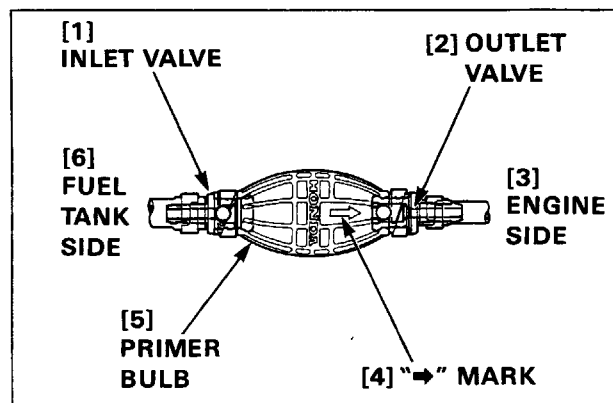
- Keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.



### • INLET / OUTLET VALVE

#### INSTALLATION :

Do not interchange the inlet valve with the outlet valve. Install the primer bulb so that "➡" mark is pointing to the engine side.



# 6. ALTERNATOR/TIMING BELT

**HONDA**  
**BF75A·90A**

1. TIMING BELT COVER / STARTER PULLEY / ALTERNATOR ROTOR / TIMING BELT / DRIVEN PULLEY / DRIVE PULLEY / TIMING BELT LOWER COVER

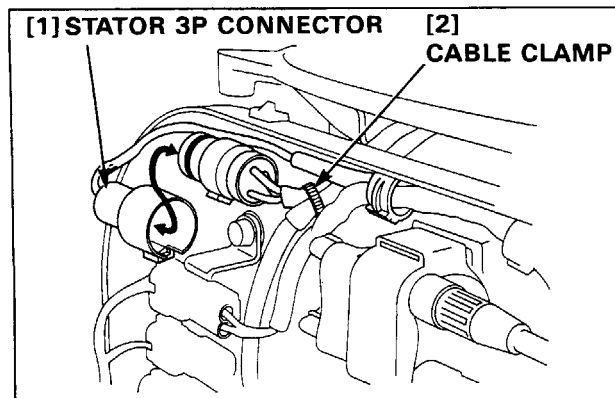
## 1. TIMING BELT COVER / STARTER PULLEY / ALTERNATOR ROTOR / TIMING BELT / DRIVEN PULLEY / DRIVE PULLEY / TIMING BELT LOWER COVER

### a. REMOVAL / INSTALLATION

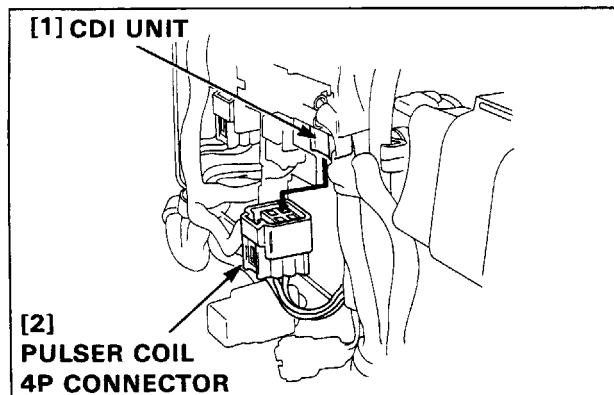
- 1) Remove the engine cover (P. 4-1).
- 2) Remove the CDI unit cover (P. 17-8).
- 3) Disconnect the stator 3P connector and cut open the cable clamp.

#### NOTE:

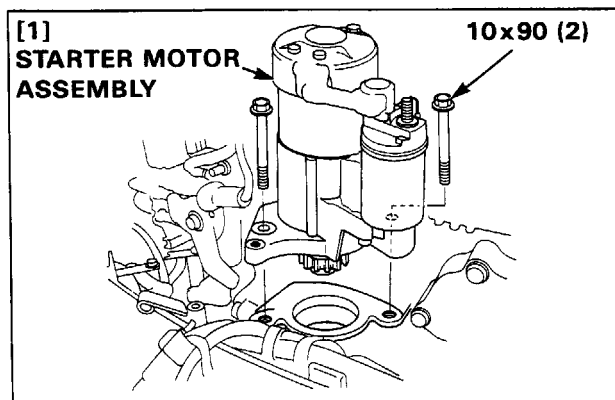
Replace the cable clamp with a new one.



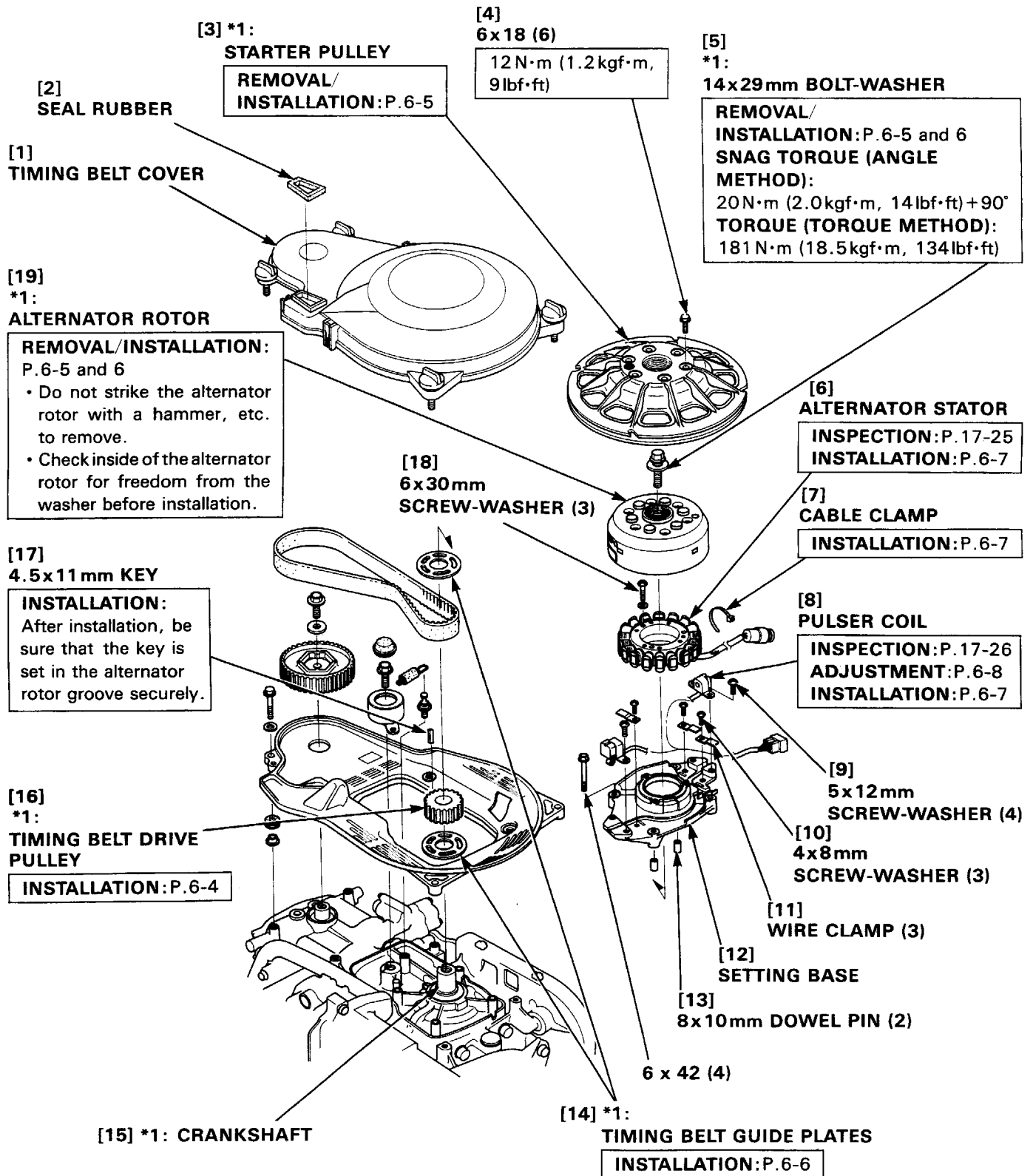
- 4) Disconnect the pulser coil 4P connector from the CDI unit.



- 5) Disconnect the positive (+) and negative (-) sides of the starter cable (P. 17-13).
- 6) Disconnect the starter solenoid wire from the starter solenoid (P. 17-13).
- 7) Remove the two 10 x 90 mm flange bolts and remove the starter motor assembly.



Degrease, clean and / or lubricate the parts marked with \*1 according to the INSTALLATION instructions. Do not lubricate any part unless instructed to do so (P. 6-4).



Degrease, clean and / or lubricate the parts marked with \*1 according to the INSTALLATION instructions. Do not lubricate any part unless instructed to do so (P. 6-4).

### [16] TIMING BELT

#### ASSEMBLY:

Check that the belt is not worn or cracked and do not bend or twist the belt.

Use a genuine Honda timing belt.

INSTALLATION: P.3-19

ADJUSTMENT: P.3-23

[1]  
\*1:  
TIMING BELT GUIDE PLATE  
INSTALLATION: P.6-6

[2]  
\*1:  
14x29mm BOLT-WASHER

REMOVAL/  
INSTALLATION: P.6-5 and 6  
SNAG TORQUE (ANGLE  
METHOD):  
20 N·m (2.0 kgf·m, 14 lbf·ft) + 90°  
TORQUE (TORQUE METHOD):  
181 N·m (18.5 kgf·m, 134 lbf·ft)

[15]  
10x32

56 N·m (5.7 kgf·m,  
41 lbf·ft)

[14]  
10x28x5mm  
WASHER

[13]  
TIMING BELT  
DRIVEN PULLEY

REMOVAL/INSTALLATION:  
P.6-4

[12]  
10x45

44 N·m (4.5 kgf·m,  
33 lbf·ft)

6x25 (6)

[11]  
TIMING BELT TENSIONER

[10]  
UNDER CASE GROMMET (6)

[9] COLLAR (6)

[8]  
\*1:  
TIMING BELT DRIVE PULLEY  
INSTALLATION: P.6-4

[1]  
\*1:  
TIMING BELT GUIDE PLATE  
INSTALLATION: P.6-6

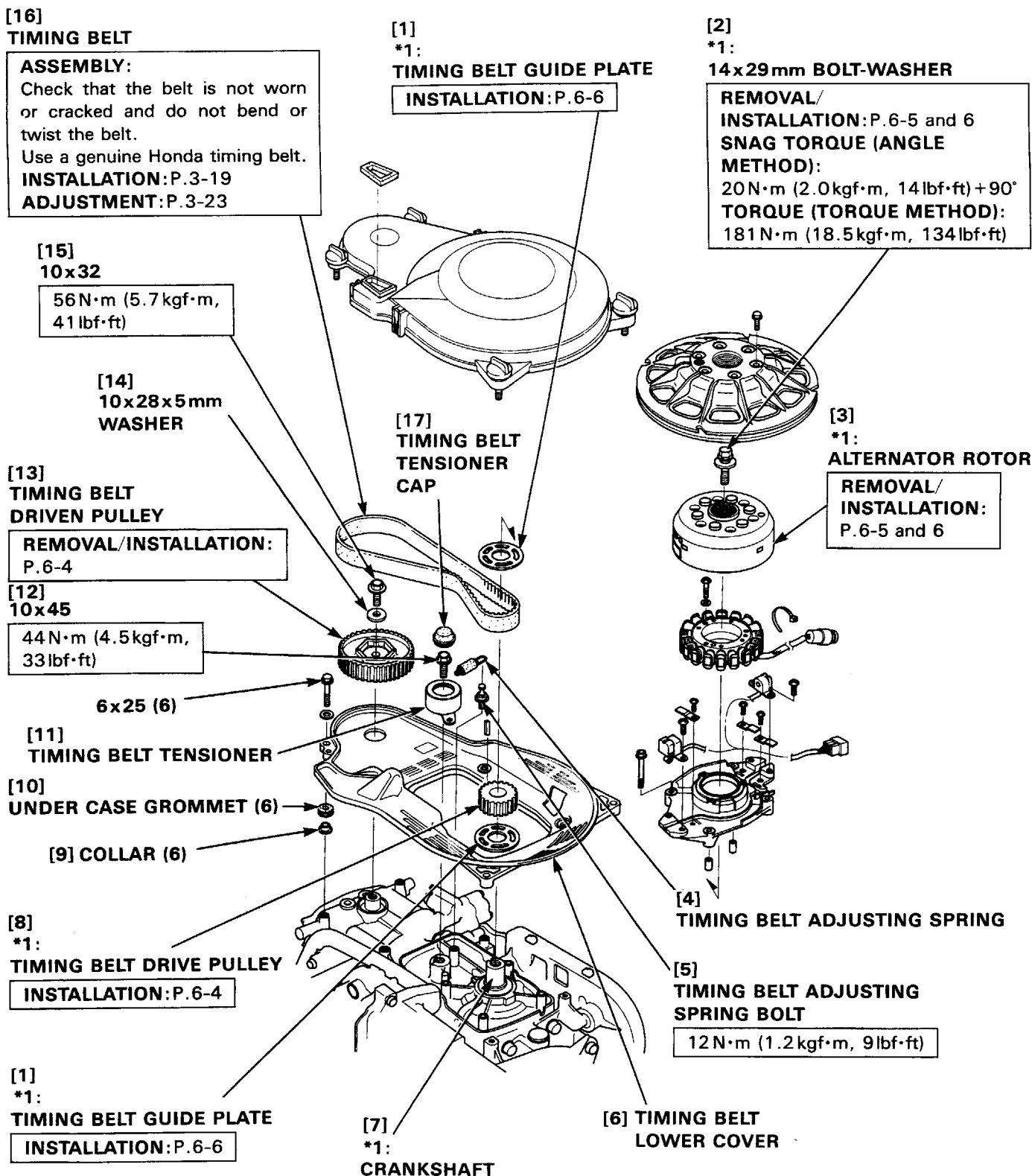
[7]  
\*1:  
CRANKSHAFT

[6] TIMING BELT  
LOWER COVER

[4] TIMING BELT ADJUSTING SPRING

[5]  
TIMING BELT ADJUSTING  
SPRING BOLT  
12 N·m (1.2 kgf·m, 9 lbf·ft)

[3]  
\*1:  
ALTERNATOR ROTOR  
REMOVAL/  
INSTALLATION:  
P.6-5 and 6



### • INSTALLATION

#### [DEGREASING / CLEANING / LUBRICATION]

Be sure to degrease, clean or lubricate the following parts before installation.

##### <14 x 29 mm bolt-washer>

- Wipe the entire surface of the bolt-washer (especially the washer and alternator rotor surface) with a clean shop towel.
- Apply oil to the flanged part, washer and threaded part of the bolt.

##### <Alternator rotor>

- Remove oil from the bottom of the boss inside the alternator rotor thoroughly using a degreasing cleaning agent.
- Wipe the bolt-washer mounting surface at the boss inside the alternator rotor using a clean shop towel.

##### <Timing belt guide plate [Upper (alternator rotor side) plate]>

- Remove oil from the entire surface using a degreasing cleaning agent.

##### <Timing belt drive pulley / timing belt guide plate [Lower (crankshaft side) plate]>

- Wipe the entire surface of the timing belt drive pulley and timing belt guide plate (lower plate) using a clean shop towel.

##### <Crankshaft>

- Spray a degreasing cleaning agent over a clean shop towel, and wipe the entire surface of the crankshaft to remove oil thoroughly.

#### NOTE:

- Do not let the oil seals and other rubber parts get sprayed or contaminated with the degreasing cleaning agent.
- Do not spray the degreasing cleaning agent directly over the crankshaft. Be sure to wipe the crankshaft with a clean shop towel sprayed with the degreasing agent.

### • TIMING BELT DRIVEN PULLEY

#### REMOVAL:

- 1) Remove the timing belt (P. 3-17).
- 2) Attach the special tool to the timing belt driven pulley as shown, and remove the 10 x 32 mm flange bolt.
- 3) Remove the timing belt driven pulley.

#### TOOL:

Lock nut wrench, 56 mm

07LPA-ZV30200

#### INSTALLATION:

Installation is the reverse order of removal.

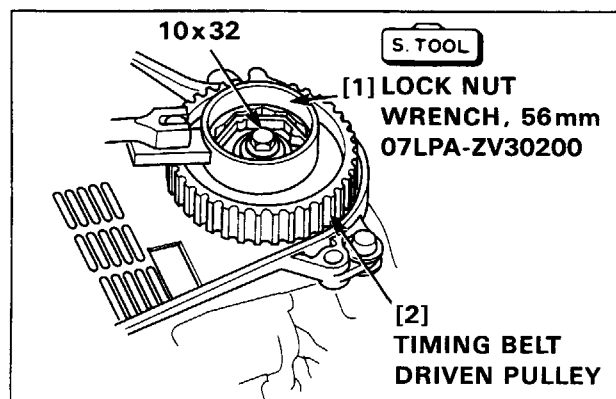
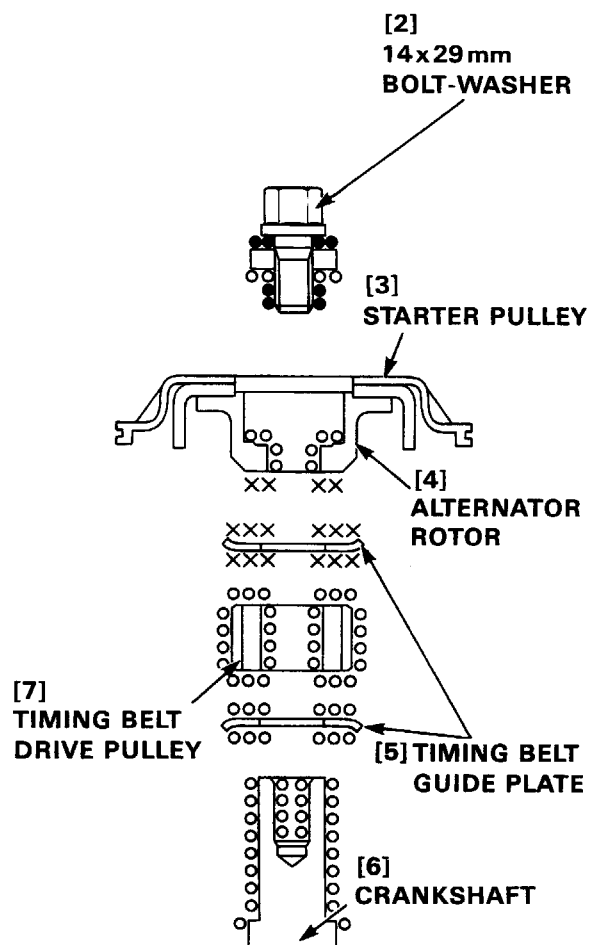
**TORQUE : 56 N·m (5.7 kgf·m, 41 lbf·ft)**

[1]

○ : WIPE WITH SHOP TOWEL

× : DEGREASE

● : LUBRICATE WITH OIL



### • STARTER PULLEY

#### REMOVAL:

- 1) Attach the special tool to the hole provided for starter motor installation.

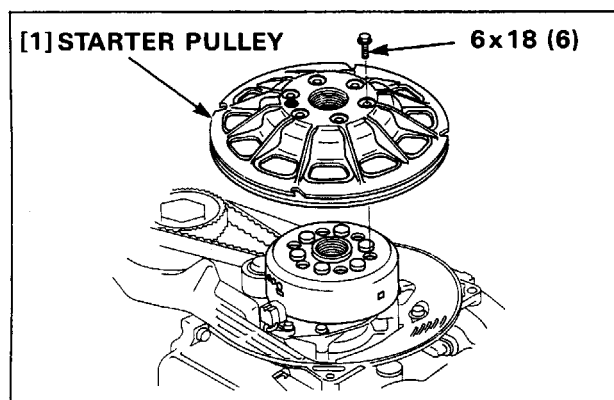
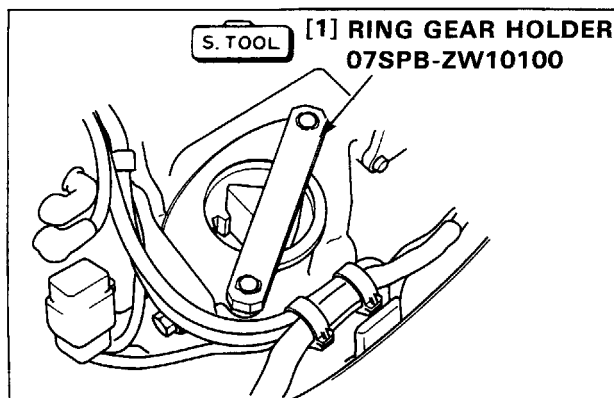
#### TOOL:

Ring gear holder **07SPB-ZW10100**

#### CAUTION:

Do not use a screwdriver or equivalent to hold the starter pulley. Use the special tool.

- 2) Remove the six 6 x 18 mm flange bolts and remove the starter pulley.



#### INSTALLATION:

- 1) Set the special tool used for starter pulley removal in the hole provided for starter motor installation.

#### TOOL:

Ring gear holder **07SPB-ZW10100**

- 2) Install the starter pulley by aligning the projection on the reverse side of the starter pulley with the concave on the alternator rotor. Tighten the six 6 x 18 mm flange bolts to the specified torque.

**TORQUE: 12 N-m (1.2 kgf-m, 9 lbf-ft)**

### • 14 x 29 mm BOLT-WASHER / ALTERNATOR ROTOR

#### REMOVAL:

Removal and installation of the 14 x 29 mm bolt-washer / alternator rotor can be performed without removing the starter pulley.

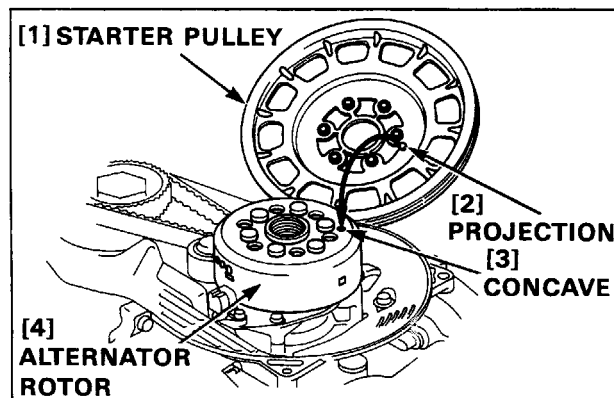
Using the special tool, remove the 14 x 29 mm bolt-washer and alternator rotor by the same procedure as the starter pulley removal.

#### TOOL:

Ring gear holder **07SPB-ZW10100**

#### CAUTION:

Do not try to remove the alternator rotor by striking it with a hammer.



### INSTALLATION:

Degrease, clean or lubricate the 14 x 29 mm bolt-washer and alternator rotor according to the INSTALLATION instructions before installation of these parts (P. 6-4).  
Check inside of the alternator rotor to be sure the washer is unobstructed.

- 1) Attach the special tool to the hole provided for starter motor installation (P. 6-5).

#### TOOL:

Ring gear holder

07SPB-ZW10100

- 2) Set the 4.5 x 11 mm key on the crankshaft (P. 6-2).  
Install the alternator rotor.
- 3) Tighten the 14 x 29 mm bolt-washer with the snag torque (angle method).  
After tightening with snag torque, mark the bolt and alternator rotor and tighten the bolt an additional 90°.

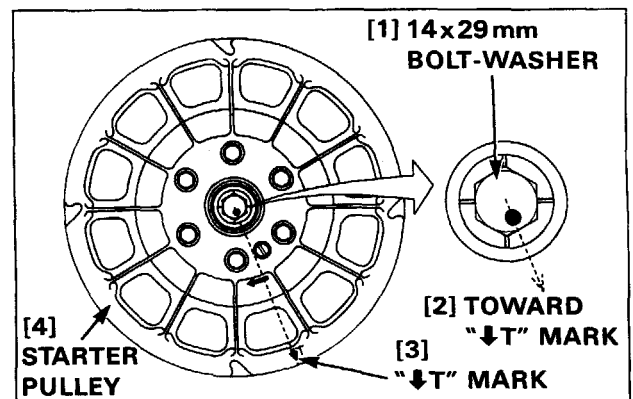
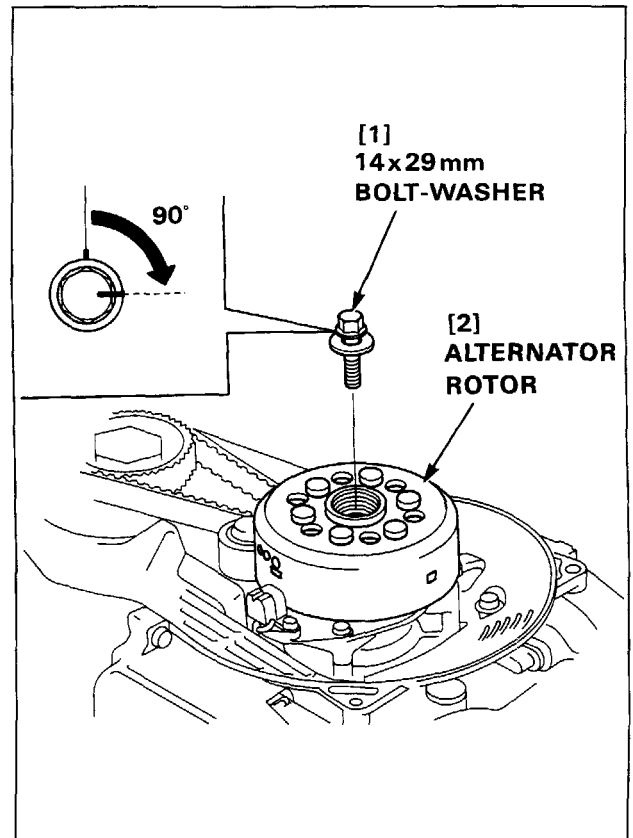
#### SNAG TORQUE (ANGLE METHOD):

20 N·m (2.0 kgf·m, 14 lbf·ft) + 90°

#### NOTE:

If tightening the 14 x 29 mm bolt-washer to the specified torque (torque method), tighten to 181 N·m (18.5 kgf·m, 134 lbf·ft).

- 4) Install the starter pulley (P. 6-5).
- 5) After installation, be sure that the 14 x 29 mm bolt-washer is tightened securely.  
After checking, mark the bolt head (at the point in line with the "↓T" mark on the starter pulley) with a paint mark as shown.

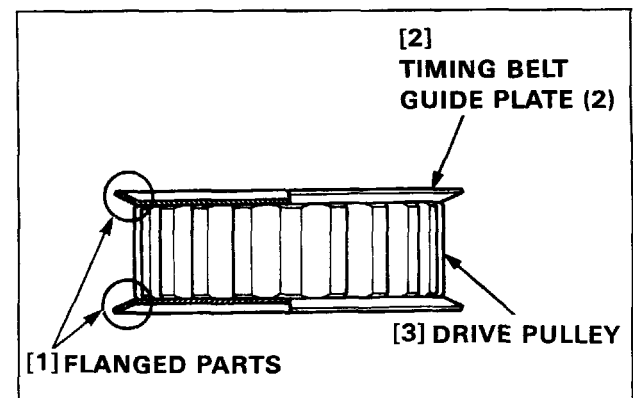


### • TIMING BELT GUIDE PLATE

#### INSTALLATION:

Degrease, clean or lubricate the guide plate according to the INSTALLATION instructions before installation (P. 6-4).

Install the timing belt guide plates so that the flanged parts face out.



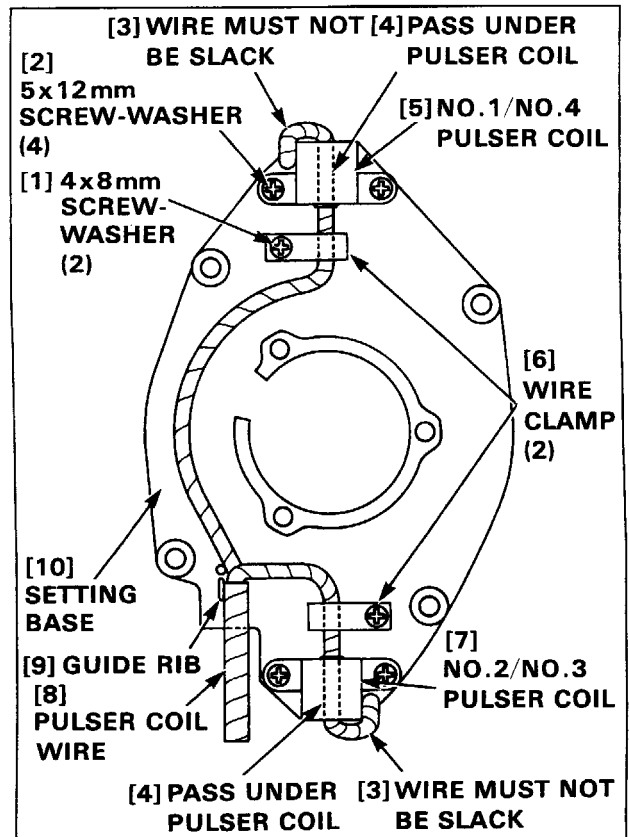
### • PULSER COIL

#### INSTALLATION:

- 1) Pass the pulser coil wire under each pulser coil, and install the pulser coils on the setting base using the 5 x 12 mm screw-washers.
- 2) Set the pulser coil wire in the groove of the setting base, and secure with the two wire clamps.

Be sure that the pulser coil wire is not slack at the wire pick-up parts.

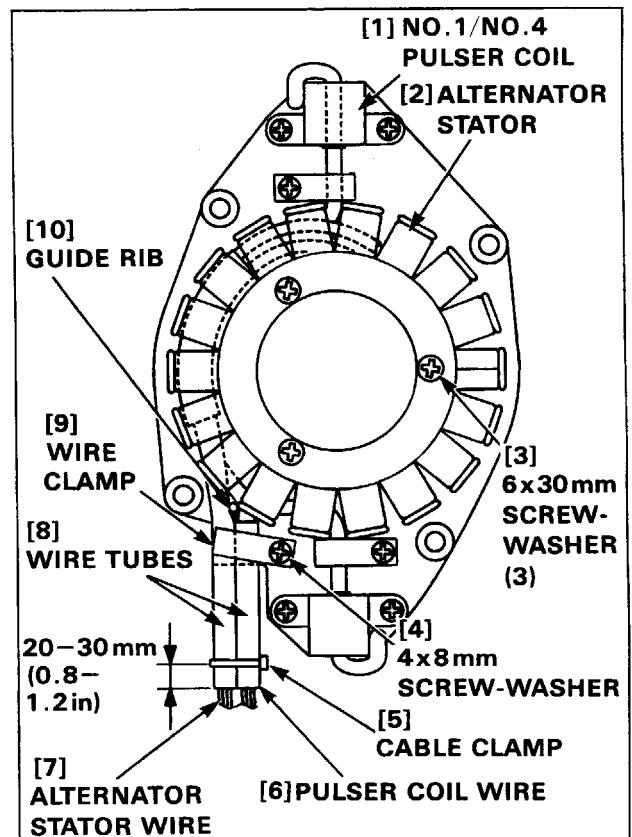
- 3) Be sure that the pulser coil wire passes on the right of the guide rib.



### • ALTERNATOR STATOR / CABLE CLAMP

#### INSTALLATION:

- 1) Install the alternator starter so that the alternator stator wire pick-up part is at the No.1 / No.4 pulser coil side as shown, and tighten the 6 x 30 mm screw-washers.
- 2) Pass the alternator stator wire on the left of the guide rib, and tighten the wire clamp with the 4 x 8 mm screw-washer.
- 3) Align the wire tube ends of the pulser coil wire and alternator stator wire.
- 4) Set the cable clamp on the wire tubes at 20 - 30 mm (0.8 - 1.2 in) from the aligned tube ends.





### b. ADJUSTMENT

#### • PULSER COIL

Remove the starter pulley before adjustment of the pulser coil.

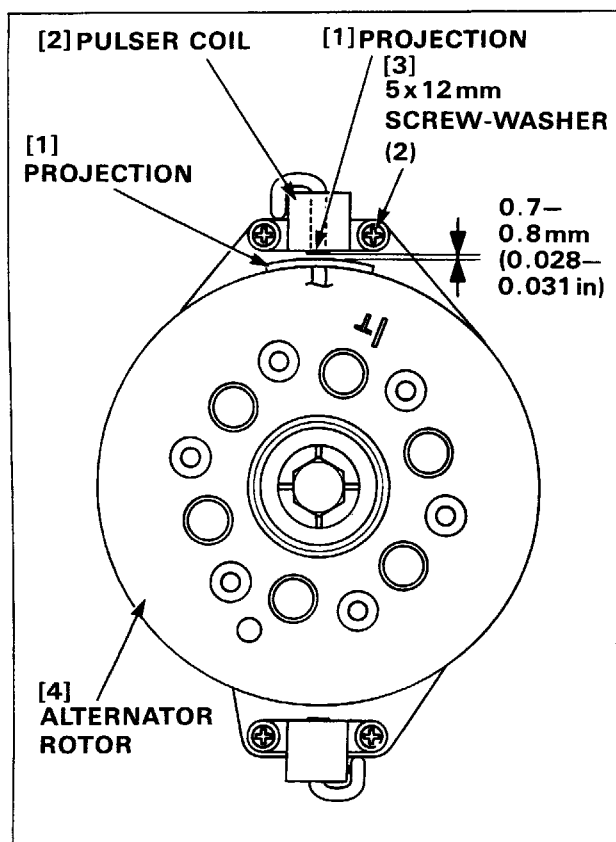
- 1) Turn the alternator rotor clockwise until the center of projection on the pulser coil aligns with the center of projection on the alternator rotor.
- 2) Adjust the clearance between the pulser coil projection and alternator rotor projection to 0.7 – 0.8 mm (0.028 – 0.031 in).
- 3) To adjust, loosen the 5 x 12 mm screw-washer and move the pulser coil.

Adjust the clearance on the other pulser coil by the same procedure.

#### NOTE:

When adjusting the pulser coil, take care not to move the center of projection on the pulser coil and the center of projection on the alternator rotor out of alignment.

Specified clearance	0.7 – 0.8 mm (0.028 – 0.031 in)
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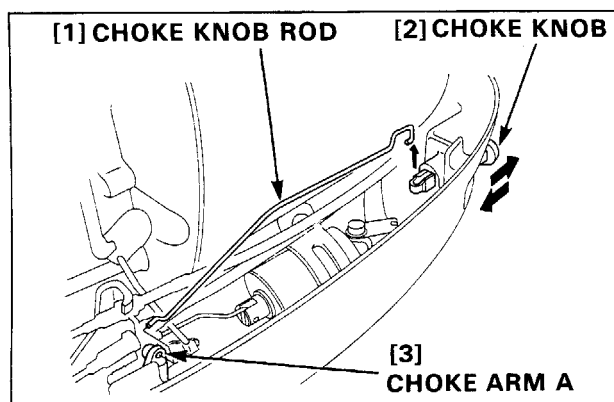
**1. REMOVAL****2. INSTALLATION**

## 1. REMOVAL

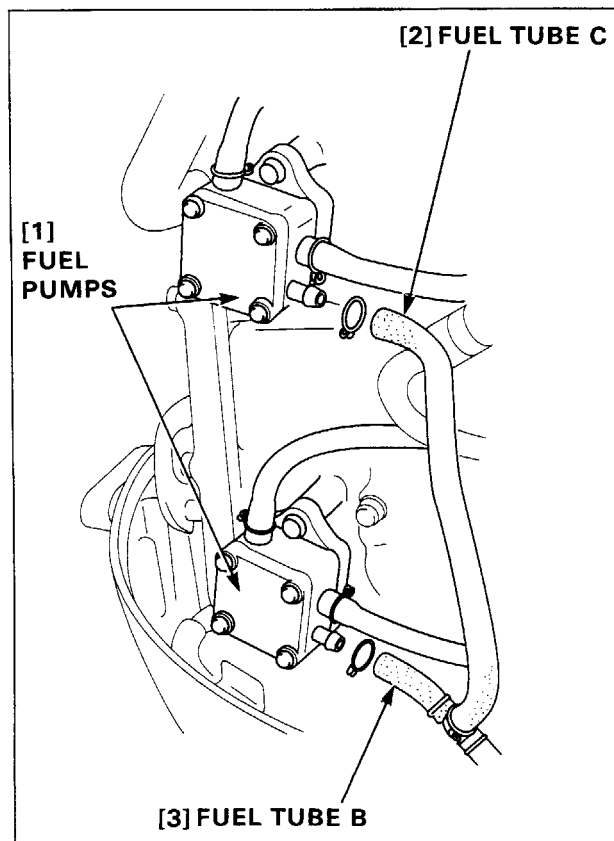
Remove the following parts.

- Engine cover, timing belt cover (P. 3-5).
- Remote control cable (Remote control type) / Shift, throttle cable (Tiller handle type) (P. 16-1).
- Gear case assembly (P. 11-10).
- Lower rubber motor mount (P. 11-30).
- Extension case / under cover (P. 11-31).
- Oil pan / exhaust pipe / water tube (P. 12-1).

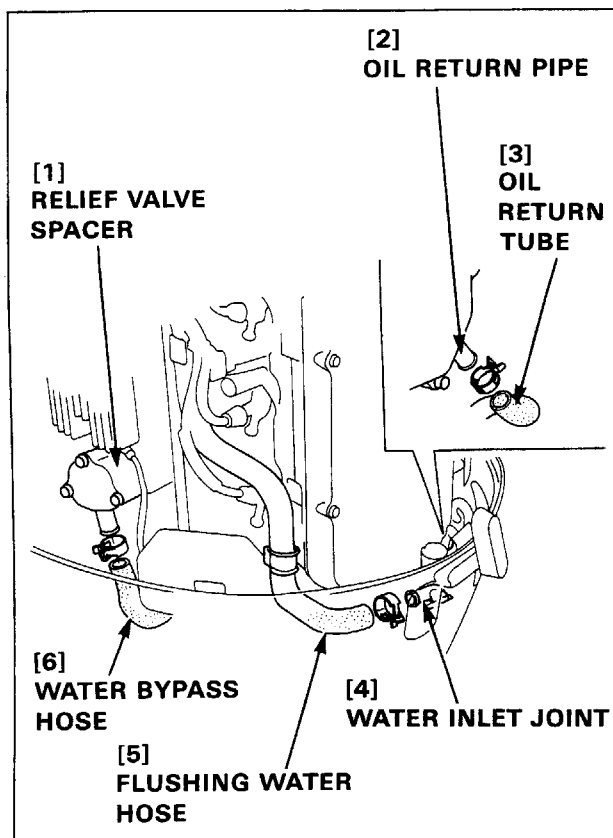
- 1) Pull the choke knob, then push it while holding the choke knob rod. Pull up the choke knob rod, and disconnect it from the choke knob and choke arm A.



- 2) Disconnect the fuel tube C from the upper fuel pump and the fuel tube B from the lower fuel pump.



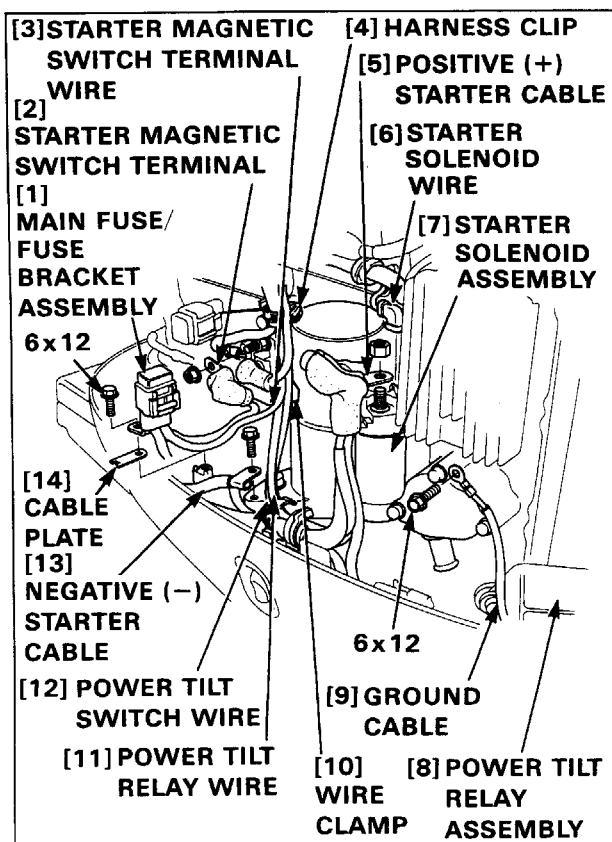
- 3) Disconnect the oil return tube from the cylinder head cover oil return pipe.
- 4) Disconnect the flushing water hose from the water inlet joint on the engine undercase.
- 5) Disconnect the water bypass hose from the relief valve spacer joint.



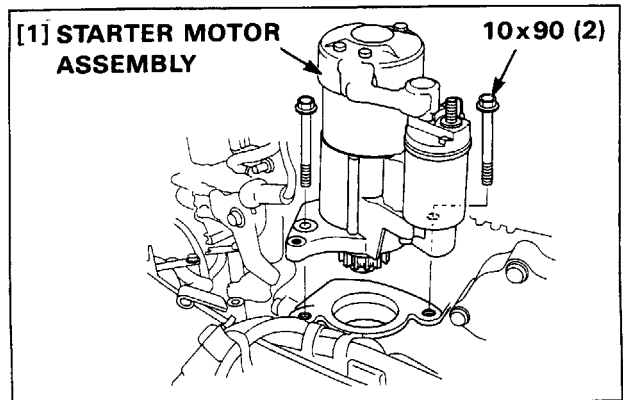
- 6) Disconnect the ground cable that comes from the power tilt relay assembly (Power trim / tilt type only).
- 7) Remove the CDI unit cover (P.17-8).
- 8) Disconnect the positive (+) starter cable and starter solenoid wire from the starter solenoid assembly.
- 9) Remove the main fuse / fuse bracket assembly and cable plate.

Remove the starter magnetic switch terminal from the starter magnetic switch.

- 10) Open the harness clip. Release the power tilt relay wire and power tilt switch wire from the harness clip and wire clamp (Power trim / tilt type only).
- 11) Release the starter magnetic switch terminal wire from the harness clip and wire clamp. Disconnect the negative (-) starter cable.



- 12) Remove the two 10 x 90 mm flange bolts from the starter motor, and remove the starter motor assembly.

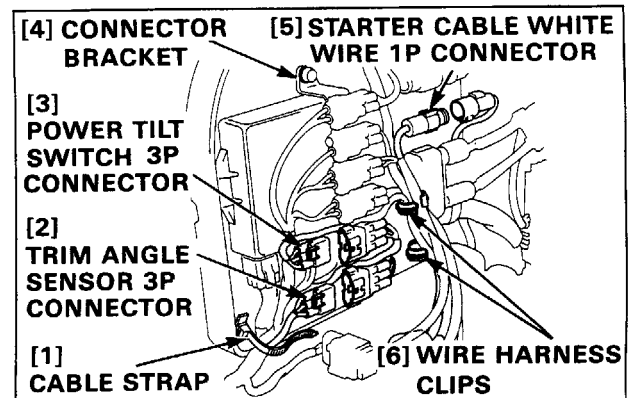


- 13) Remove the cable strap.

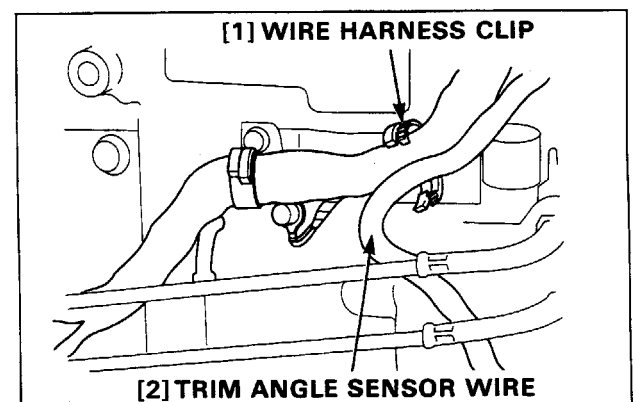
- 14) Disconnect the power tilt switch 3P connector and trim angle sensor 3P connector, and remove each connector from the connector bracket (Except gas assisted type). Release the two 3P connectors from the connector bracket (Gas assisted type only).

- 15) Disconnect the starter cable white wire 1P connector.

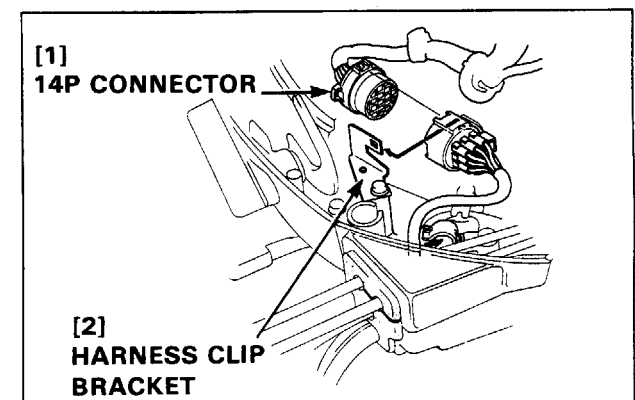
- 16) Release the two 3P connector wires and 1P connector wire from the wire harness chips.



- 17) Open the wire harness clip that secures the trim angle sensor wire. Release the trim angle sensor wire from the wire harness clip (Trim angle sensor type only).

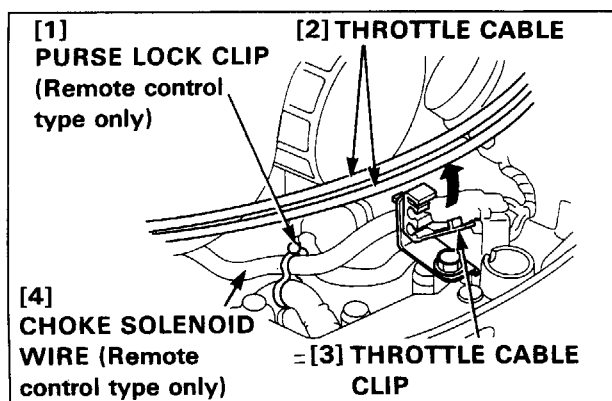


- 18) Remove the 14P connector for control cable harness A from the harness clip bracket and disconnect the 14P connector.



- 19) Open the throttle cable clip and release the two throttle cables.

Release the choke solenoid wire from the purse lock clip (Remote control type only).



- 20) Remove the 2.0 mm cotter pin, and remove the link rod from the shift arm.

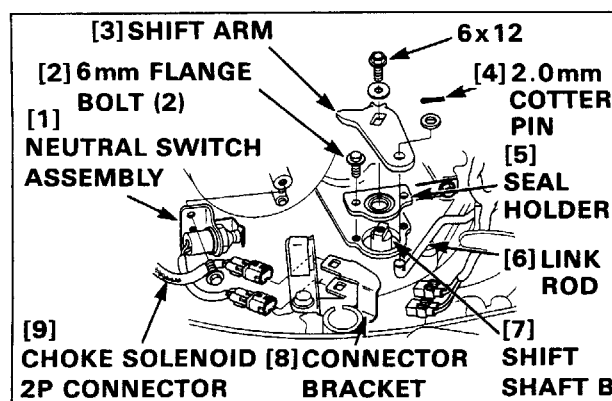
Remove the 6 x 12 mm flange bolt, and remove the shift arm.

Remove the two 6 mm flange bolts, and remove the seal holder while holding the head of the shift shaft B.

- 21) Disconnect the choke solenoid 2P connector, and remove the 2P connector from the connector bracket (Remote control type only).

Remove the 2P connector from the top of the connector bracket (Tiller handle type only).

Disconnect the neutral switch 2P connector, and remove the 2P connector from the connector bracket. Remove the neutral switch assembly.



- 22) Attach the special tool to the starter pulley.

### TOOL:

Lifting eye

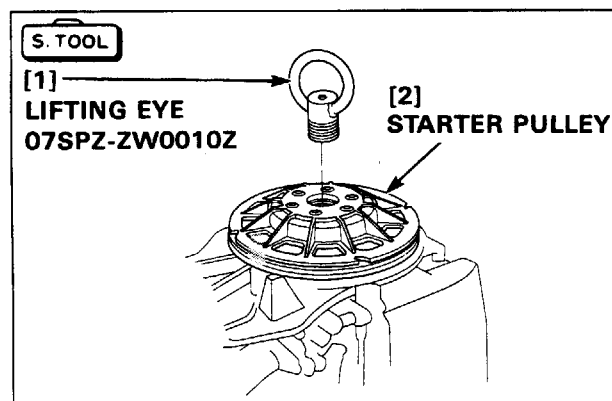
07SPZ-ZW0010Z

### CAUTION:

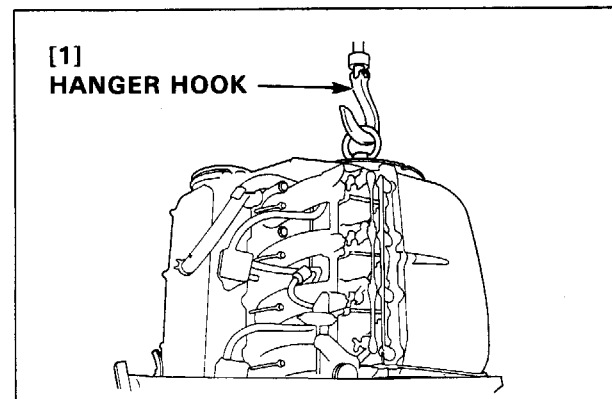
Do not use a hole around the starter pulley as an engine hanger.

### NOTE:

- Attach the special tool to the starter pulley securely.
- Use a crane with a lifting capacity of 227 kg (500 lbs) or above.



- 23) Attach the hanger hook to the special tool.

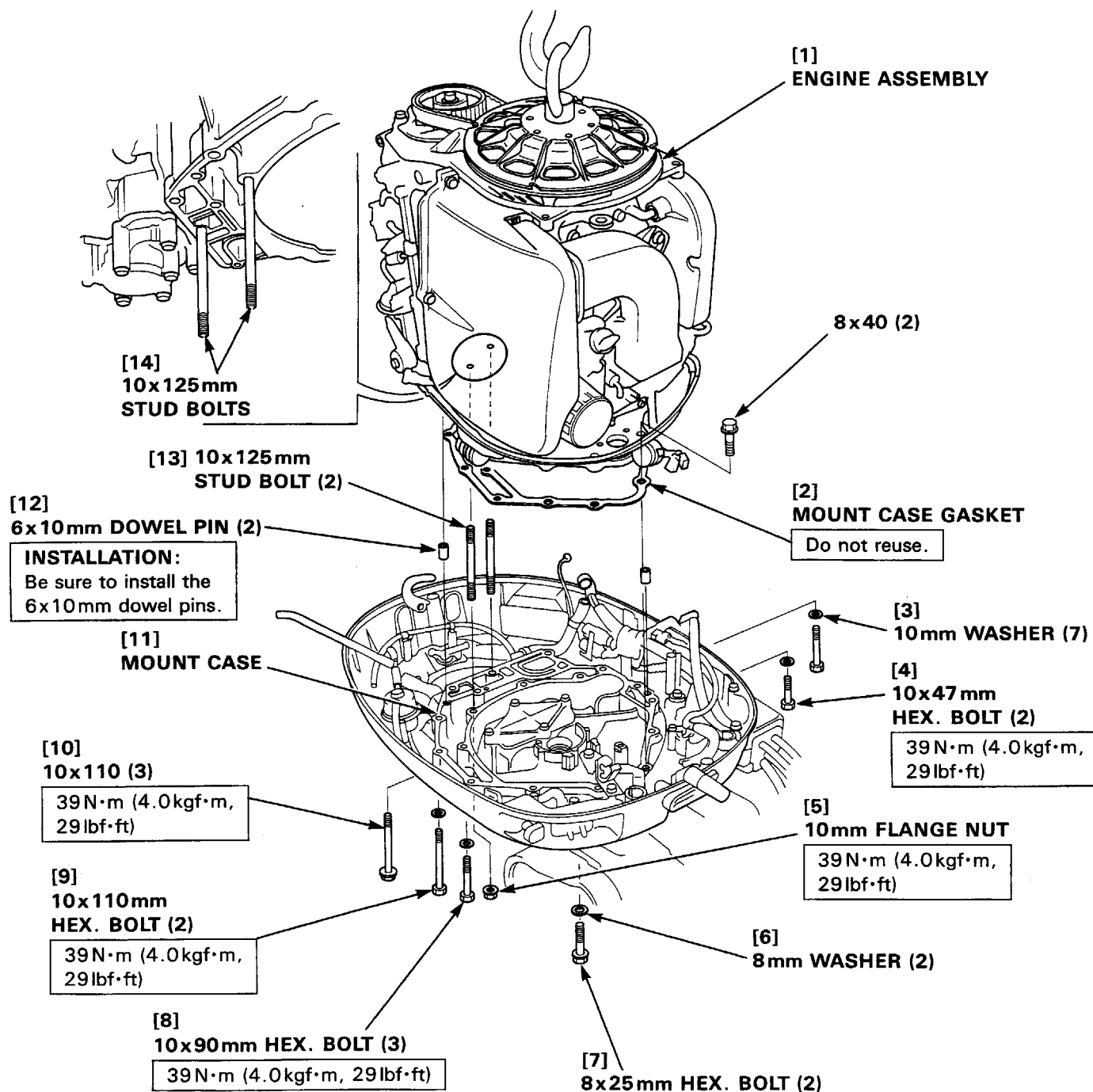


- 24) Remove the 10 mm flange nut, three 10 x 110 mm flange bolts, two 10 x 110 mm hex. bolts, three 10 x 90 mm hex. bolts, two 10 x 47 mm hex. bolts, two 8 x 25 mm hex. bolts and two 8 x 40 mm flange bolts, then remove the engine assembly from the mount case.

Remove the 6 x 10 mm dowel pin and mount case gasket.

**NOTE:**

Apply oil to the seating surface and threads of the engine mount bolt / nut (10 mm bolt / nut) before tightening.



## 2. INSTALLATION

Engine installation is the reverse order of removal. Note the following instructions.

**NOTE:**

Do not reuse the mount case gasket.

- 1) Align the punch mark on the shift shaft A with the punch mark on the shift shaft B.

**NOTE:**

Be sure to align the punch marks when installing the engine assembly. Take care not to let the punch marks get out of alignment during installation. Shifting cannot be performed unless the punch marks are aligned.

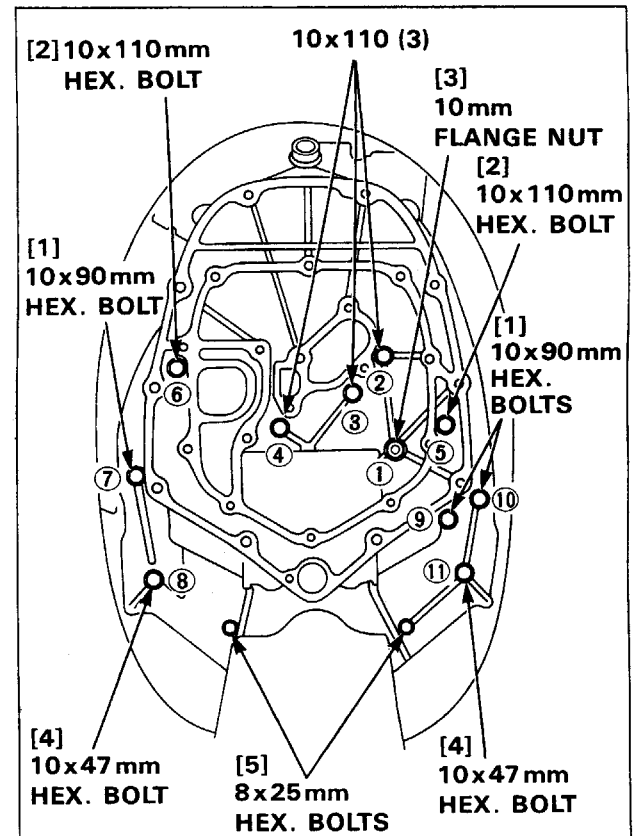
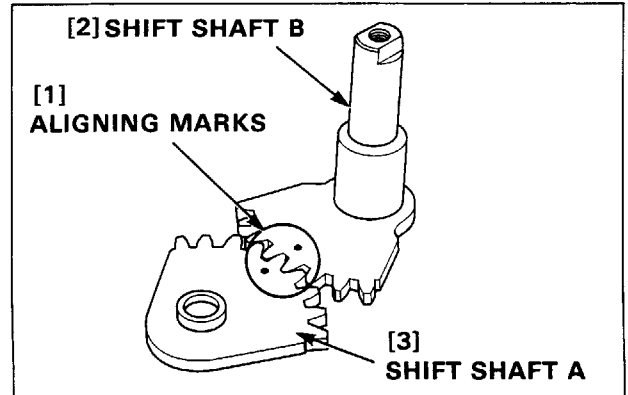
- 2) After installing the engine assembly on the mount case, install the shift holder.
- 3) Set the engine mount bolts and nuts, and tighten the bolts to the specified torque in two or three steps in the numbered sequence shown.

**TORQUE : 39 N·m (4.0 kgf·m, 29 lbf·ft) [10 mm bolts and nut only]**

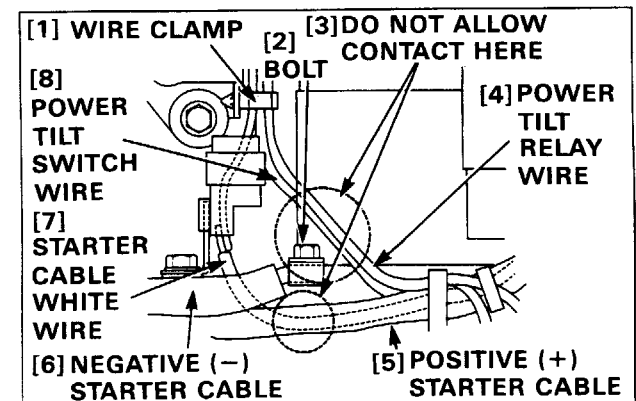
Tighten the two 8 x 40 mm flange bolts at the side of the seat holder.

Install the starter motor.

**TORQUE : 39 N·m (4.0 kgf·m, 29 lbf·ft)**

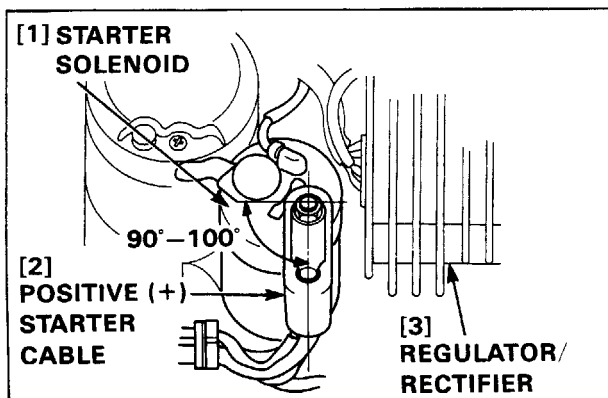


- 4) Clamp the power tilt switch wire and power tilt relay wire with the harness clip and wire clamp, and close the harness clip. Be sure that the power tilt switch wire and power tilt relay wire do not contact the negative (-) starter cable bolt (Power trim / tilt type only). Be sure that the positive (+) starter cable and starter cable white wire do not contact the negative (-) terminal of the starter cable, either.



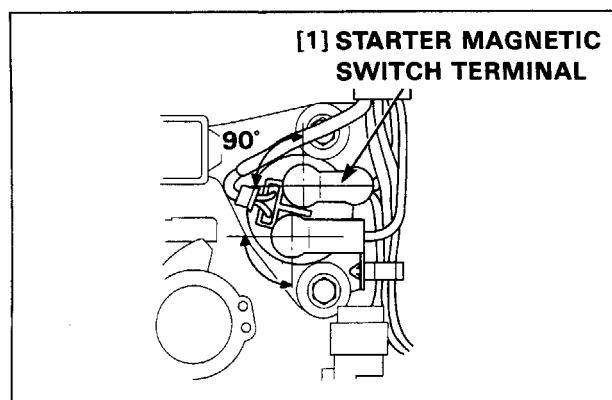
- 5) Connect the positive (+) starter cable to the starter solenoid assembly at an angle of  $90^{\circ} - 100^{\circ}$  from the horizontal line as shown. Be sure there is clearance between the positive starter cable and regulator / rectifier, and between the positive starter cable and starter solenoid.

**TORQUE : 10 N·m (1.0 kgf·m, 7 lbf·ft)**

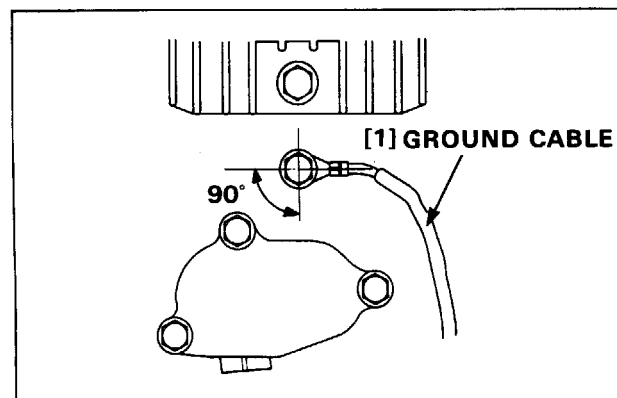


- 6) Connect the starter magnetic switch terminal to the starter magnetic switch at an angle of  $90^{\circ}$  from the vertical line as shown.

**TORQUE : 5 N·m (0.5 kgf·m, 3.6 lbf·ft)**

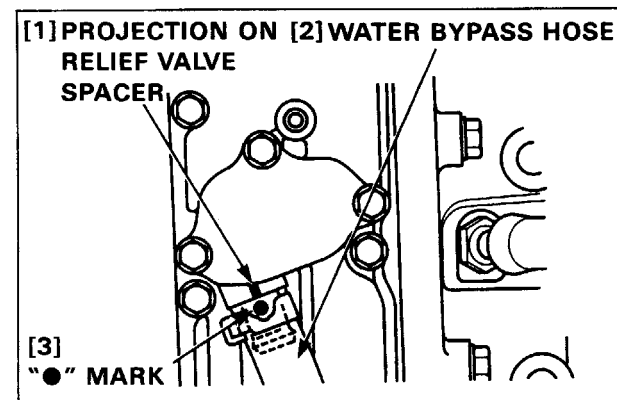


- 7) Connect the ground cable of the power tilt relay assembly at an angle of  $90^{\circ}$  from the vertical line as shown (Power trim / tilt type only).



- 8) Connect the water bypass hose by aligning the "●" mark on the water bypass hose with the projected part of the relief valve spacer. Be sure to insert the hose deeply onto the joint base.

- 9) Install the oil return tube (P. 9-5).  
Install the fuel tube B and C (P. 5-12).





# 8. WATER JACKET COVER/THERMOSTAT/THERMOSWITCH

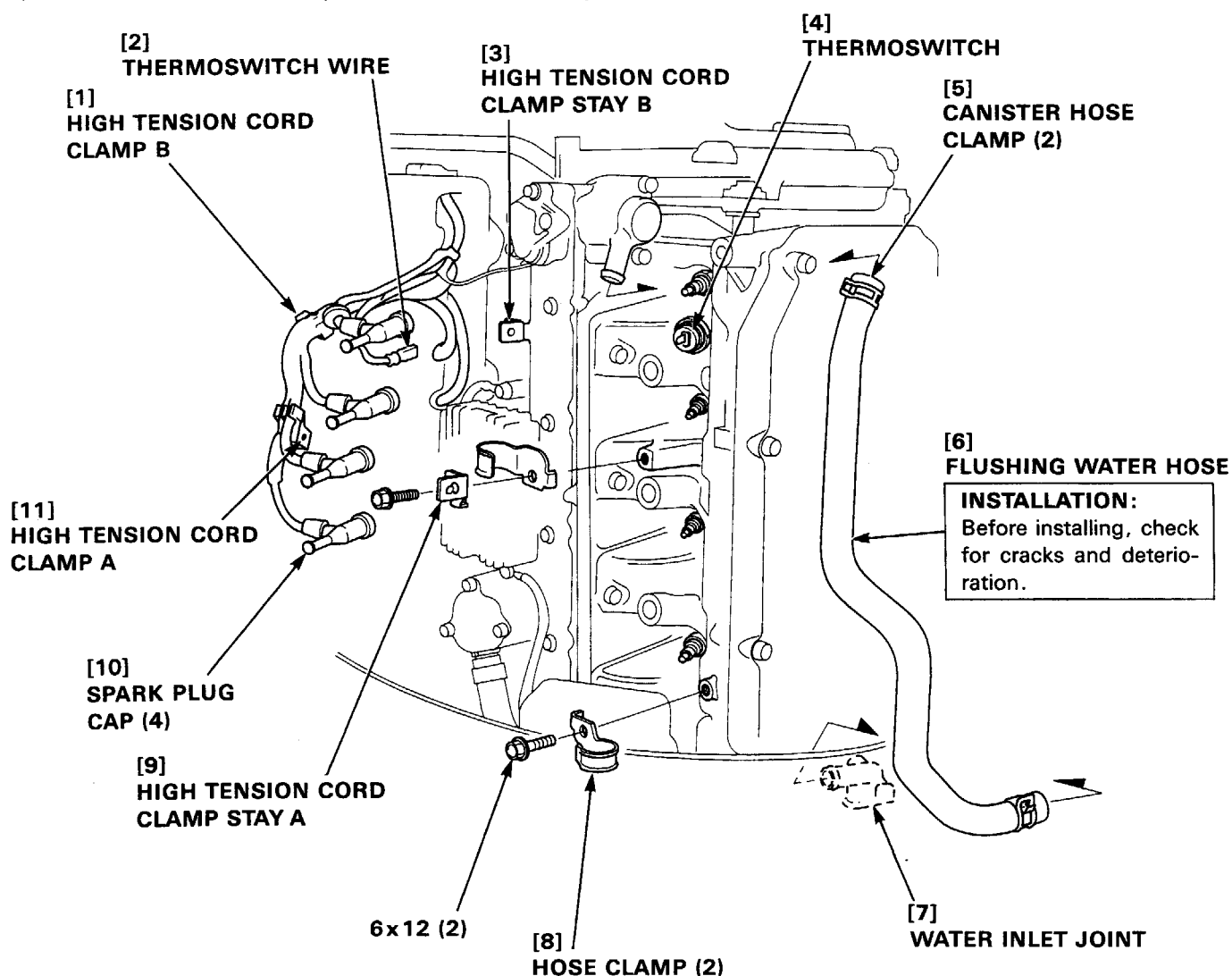
**HONDA**  
**BF75A·90A**

- |  |                                     |
|--|-------------------------------------|
| 1. FLUSHING WATER HOSE                     | 3. RELIEF VALVE / WATER BYPASS HOSE |
| 2. THERMOSTAT / THERMOSWITCH / FLUSH VALVE | 4. WATER JACKET COVER               |

## 1. FLUSHING WATER HOSE

### a. REMOVAL / INSTALLATION

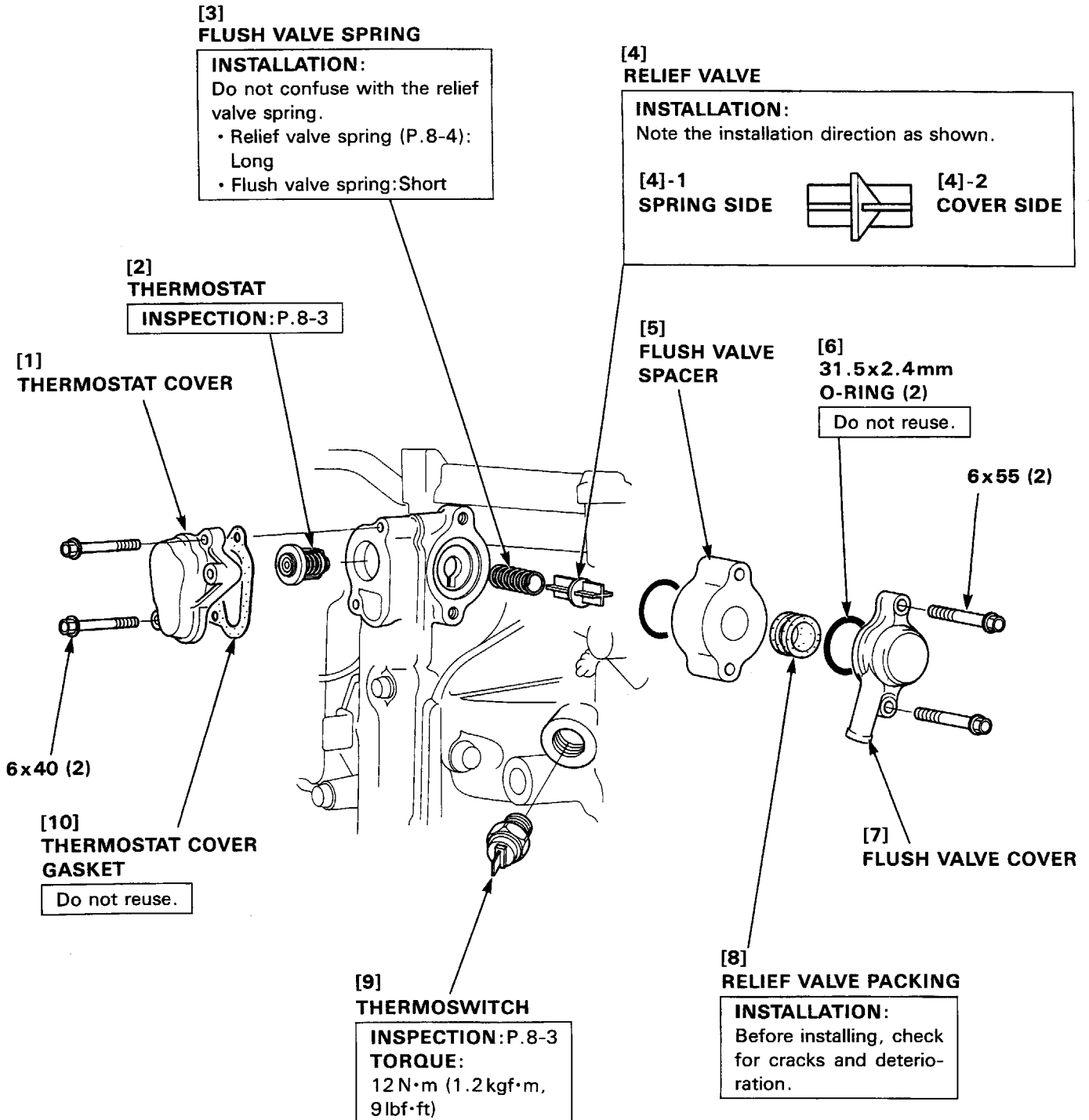
- 1) Remove the engine cover (P. 4-1), and remove the spark plug caps.
- 2) Disconnect the thermoswitch wire from the thermoswitch.
- 3) Remove the high tension cord clamp A and B from the respective stays.
- 4) Remove the two hose clamps that secure the flushing water hose, and remove the flushing water hose.



## 2. THERMOSTAT / THERMOSWITCH / FLUSH VALVE

### a. REMOVAL / INSTALLATION

Remove the engine cover (P. 4-1), and remove the flushing water hose (P. 8-1).



### b. INSPECTION

#### • THERMOSWITCH

<Continuity check>

Attach the tester leads to the thermoswitch terminal and body and check for continuity. There should be no continuity.

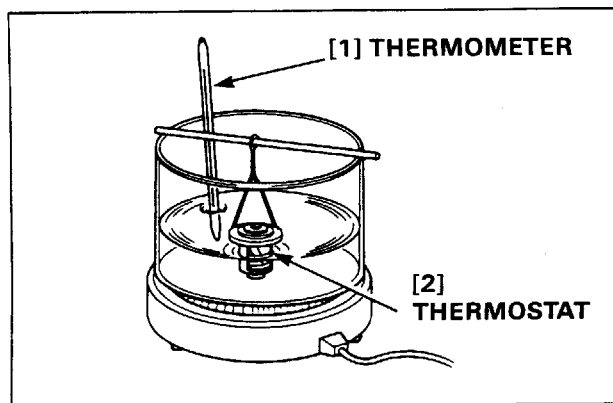
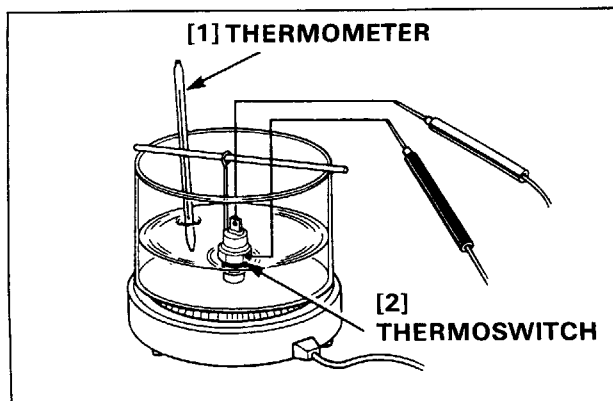
<Operation check>

- 1) Suspend the thermoswitch in a container of coolant or oil. Be sure the switch does not touch the container.
- 2) Heat the liquid and note its temperature when the thermoswitch closes and there is continuity between the thermoswitch lead and body.

NOTE:

Don't allow the thermometer to touch the container.

Continuity (ON)	$117 \pm 2^{\circ}\text{C}$ ( $243 \pm 3.6^{\circ}\text{F}$ ) min.
No continuity (OFF)	$3 - 7^{\circ}\text{C}$ ( $37 - 45^{\circ}\text{F}$ ) below the temperature when continuity exists.



#### • THERMOSTAT

- 1) Immerse the thermostat in water.
- 2) Heat the water and observe the operation of the thermostat as the water temperature increases.
- 3) Measure the water temperature when the thermostat starts opening.

NOTE:

Don't let the thermometer or the thermostat touch the container; this may cause a false reading.

- 4) Measure lift height when fully open.

Start opening	$72^{\circ}\text{C}$ ( $162^{\circ}\text{F}$ )
Fully open	$82^{\circ}\text{C}$ ( $180^{\circ}\text{F}$ )
Lift height	More than 3.0 mm (0.12 in)

### 3. RELIEF VALVE / WATER BYPASS HOSE

#### a. REMOVAL / INSTALLATION

Remove the engine cover (P. 4-1).

#### [2] RELIEF VALVE

##### INSTALLATION:

Note the installation direction.

[2]-1

COVER SIDE

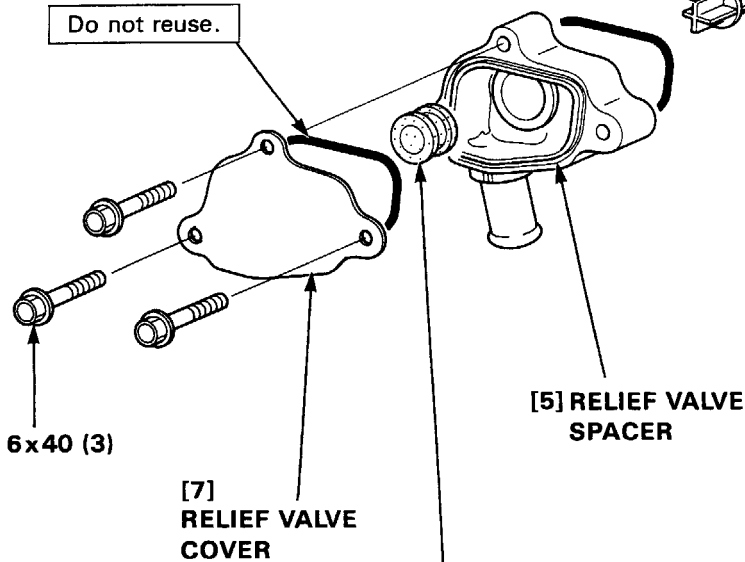


[2]-2

SPRING SIDE

#### [1] RELIEF VALVE COVER PACKING (2)

Do not reuse.



6x40 (3)

#### [7] RELIEF VALVE COVER

#### [6] RELIEF VALVE PACKING

##### INSTALLATION:

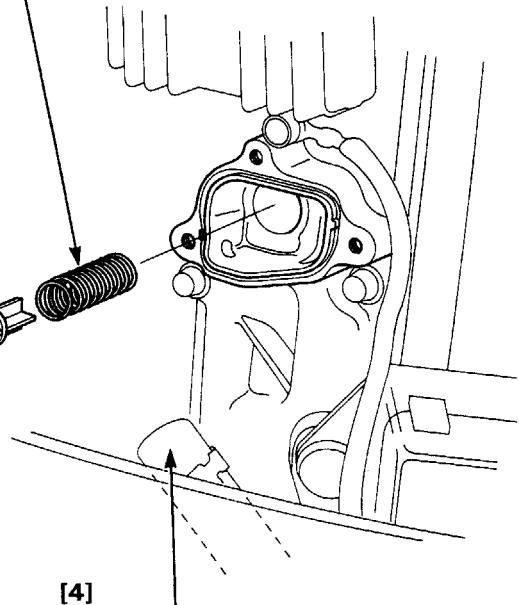
Before installing, check for cracks and deterioration.

#### [3] RELIEF VALVE SPRING

##### INSTALLATION:

Do not confuse with the flush valve spring.

- Relief valve spring: Long
- Flush valve spring (P.8-2): Short

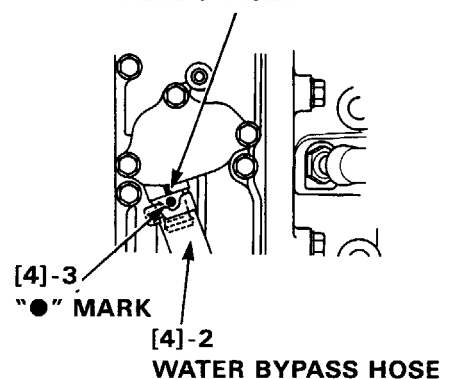


#### [4] WATER BYPASS HOSE

##### WATER BYPASS HOSE REMOVAL/ INSTALLATION: P.8-5 INSTALLATION AT RELIEF VALVE SPACER SIDE ONLY:

Connect the water bypass hose by aligning the "●" mark on the water bypass hose with the projected part of the relief valve spacer. Be sure to insert the hose deeply onto the joint base.

#### [4]-1 PROJECTION OF RELIEF VALVE SPACER



[4]-3  
"●" MARK

[4]-2  
WATER BYPASS HOSE

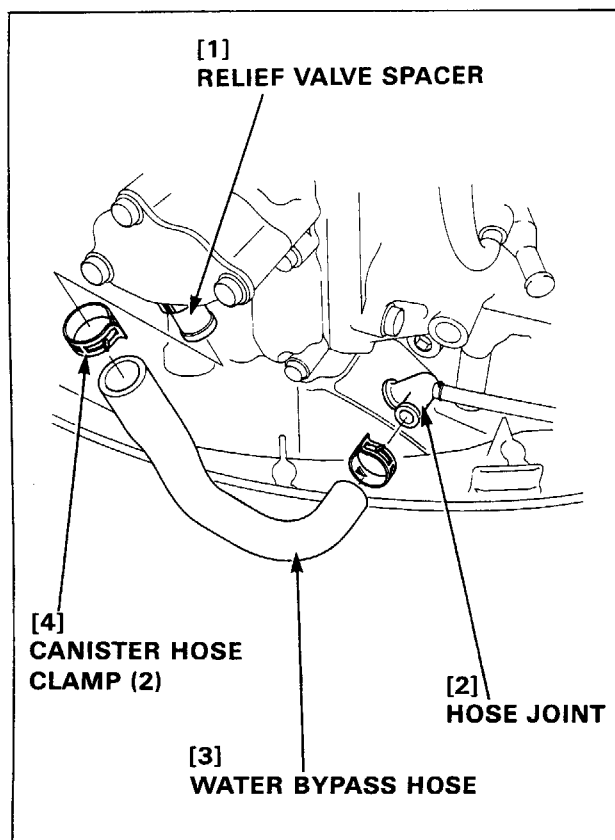
### • WATER BYPASS HOSE REMOVAL / INSTALLATION

#### REMOVAL:

- 1) Disconnect the power tilt relay 1P connector and 2P connector, and remove the clip bracket B.

Remove the power tilt relay and relay bracket as a set (P. 17-11).

- 2) Remove the water bypass hose from the relief valve spacer and hose joint.



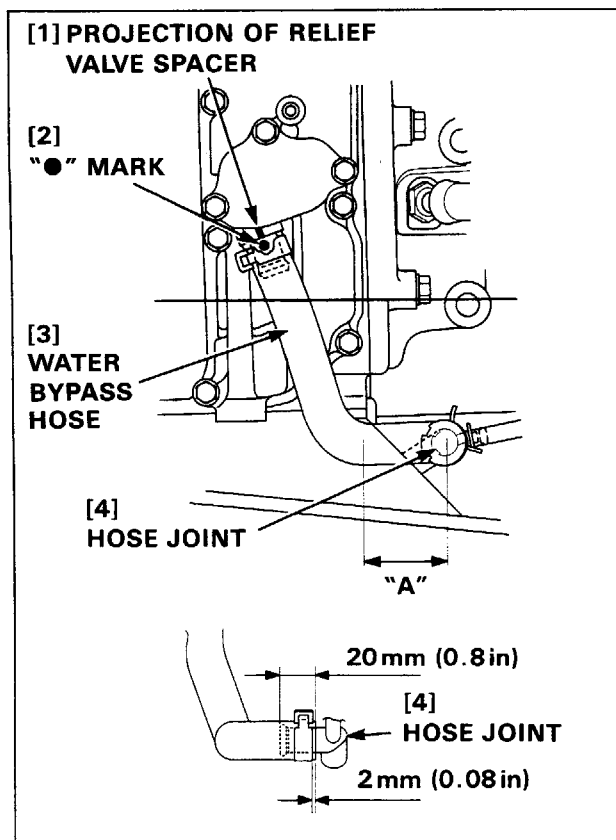
#### INSTALLATION:

Install the water bypass hose in the reverse order of removal. Note the following instructions.

- 1) Insert the water bypass hose about 20 mm (0.8 in) into the hose joint of the mount case, so that the part "A" of the water bypass hose is horizontal.
- 2) Insert the water bypass hose joint deeply onto the joint base by aligning the "●" mark on the water bypass hose with the projected part of the relief valve spacer.
- 3) Clamp the water bypass hose at 2 mm (0.08 in) from the hose ends using the two canister hose clamps.

#### NOTE:

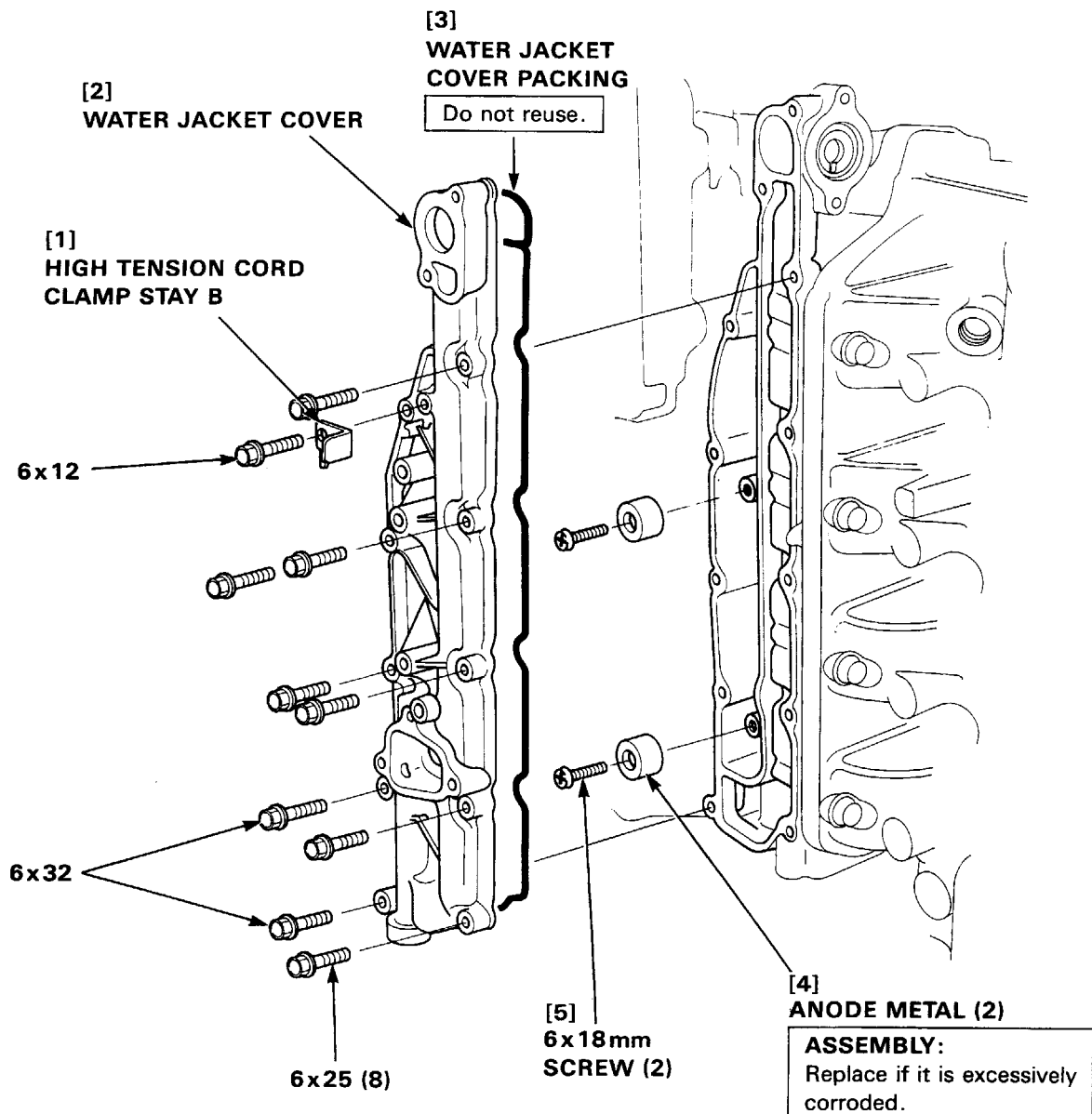
After installation, be sure that the hose is not interfering with the engine undercase and other surrounding parts.



## 4. WATER JACKET COVER

### a. REMOVAL / INSTALLATION

- 1) Remove the engine cover (P. 4-1). Remove the spark plug caps, then remove the high tension cord clamp A and B and the thermoswitch wire (P. 8-1).
- 2) Remove the thermostat cover and thermostat (P. 8-2). Remove the relief valve / water bypass hose (P.8-4).
- 3) Disconnect the regulator / rectifier ground cable, and remove the two regulator / rectifier mounting bolts (P. 17-11).
- 4) Disconnect the power tilt relay 1P connector and 2P connector, and remove the clip bracket B. Remove the power tilt relay and relay bracket as a set (P. 17-11). [Power trim / tilt type only]  
Disconnect the 1P connector from the clip bracket B, and remove the clip bracket B (P. 17-11). [Gas assisted type only]



# 9. CYLINDER HEAD/VALVES/ OIL PUMP

**HONDA**  
**BF75A·90A**

## 1. CYLINDER HEAD ASSEMBLY REMOVAL / INSTALLATION

### 2. OIL PUMP

### 3. CYLINDER HEAD DISASSEMBLY / ASSEMBLY

### 4. INSPECTION

### 5. VALVE GUIDE REPLACEMENT

### 6. VALVE SEAT RECONDITIONING

## 1. CYLINDER HEAD ASSEMBLY REMOVAL / INSTALLATION

### • REMOVAL

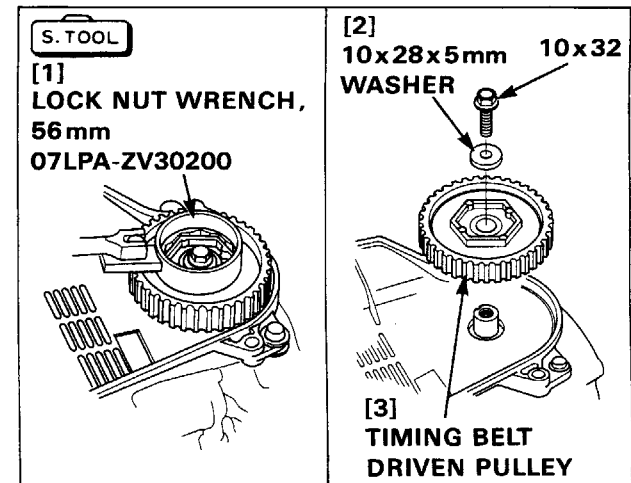
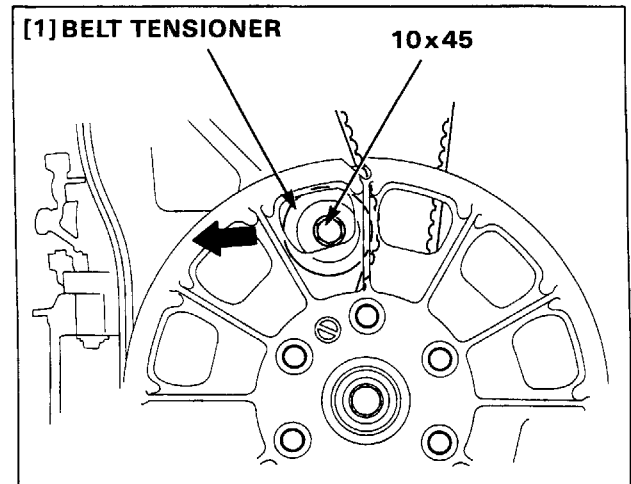
Perform the cylinder head assembly removal and installation when the engine is cold.

- 1) Remove the engine cover and timing belt cover (P. 3-5).
- 2) Remove the timing belt tensioner cap. Loosen the 10 x 45 mm flange bolt on the timing belt tensioner, then tighten the 10 x 45 mm flange bolt while pushing the belt tensioner in the same direction as the arrow.
- 3) Remove the timing belt from the timing belt driven pulley.
- 4) Remove the 10 x 32 mm flange bolt and 10 x 28 x 5 mm washer from the timing belt driven pulley using the special tool, and remove the timing belt driven pulley.

#### TOOL :

Lock nut wrench, 56 mm

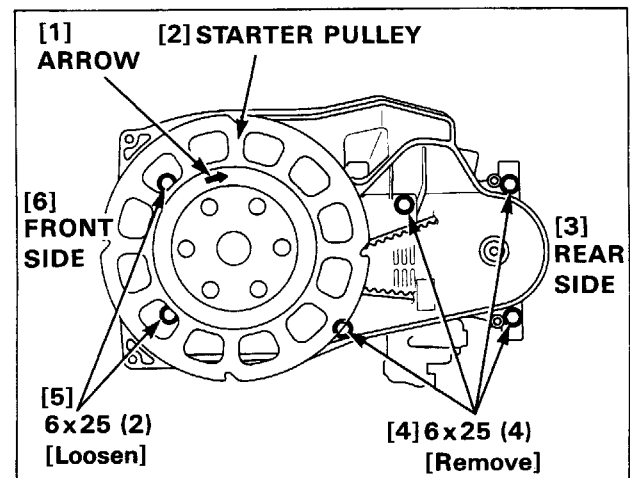
07LPA-ZV30200



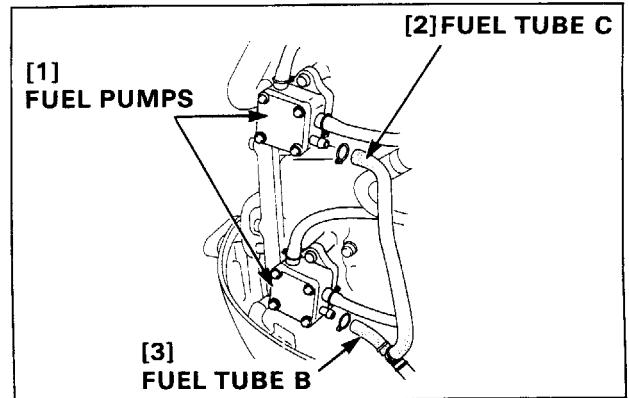
- 5) Remove four of the six 6 x 25 mm flange bolts that secure the timing belt lower cover, and loosen the remaining two bolts.

#### NOTE:

To loosen the two bolts at the front side, align the starter pulley holes with the bolts by turning the starter pulley manually in the same direction as the arrow.



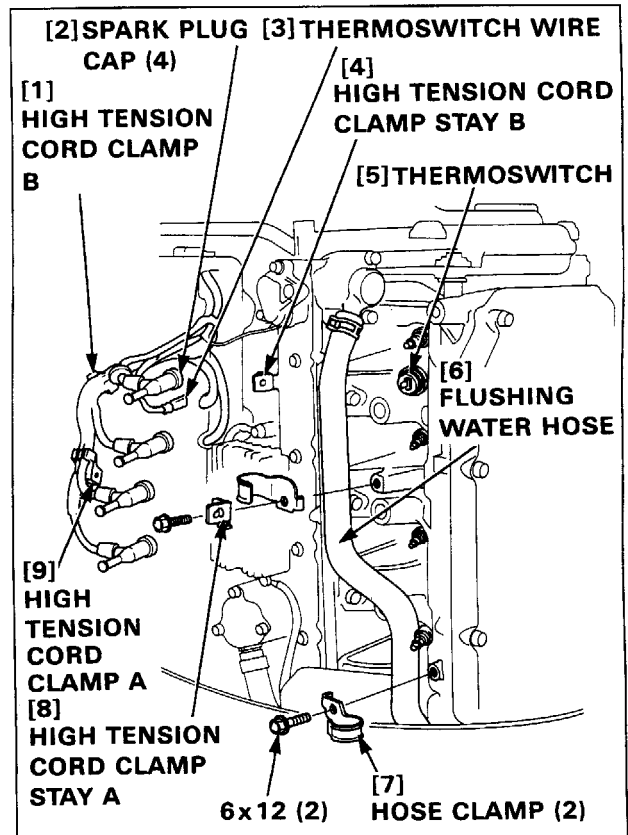
- 6) Disconnect fuel tube C from the upper fuel pump and fuel tube B from the lower fuel pump.
- 7) Remove the carburetor assembly and breather tube (P. 5-1).



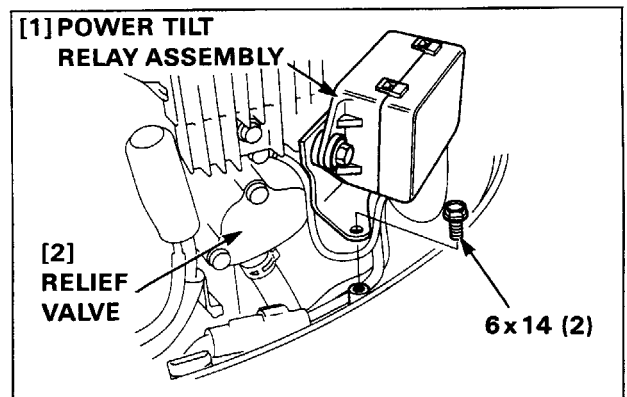
- 8) Remove the spark plug caps.  
Disconnect the thermoswitch wire from the thermoswitch.

Remove the high tension cord clamp A and B from the respective stays.

- 9) Remove the two hose clamps from the flushing water hose.

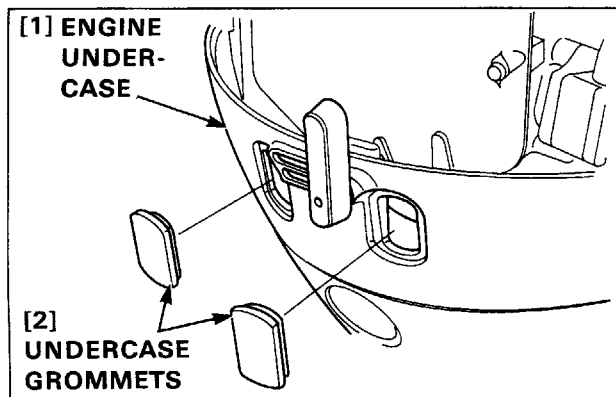


- 10) Remove the two 6 x 14 mm flange bolts, and move the power tilt relay assembly to the relief valve side without disconnecting the wire (Power trim / tilt type only).

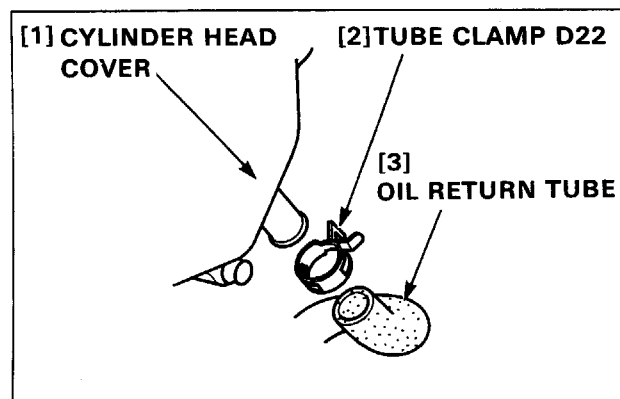




- 11) Remove the two undercase grommets from the engine under-case.
- 12) Tilt up the engine until the cylinder head slightly faces up. Place a shop towel or an equivalent material under the oil pump.



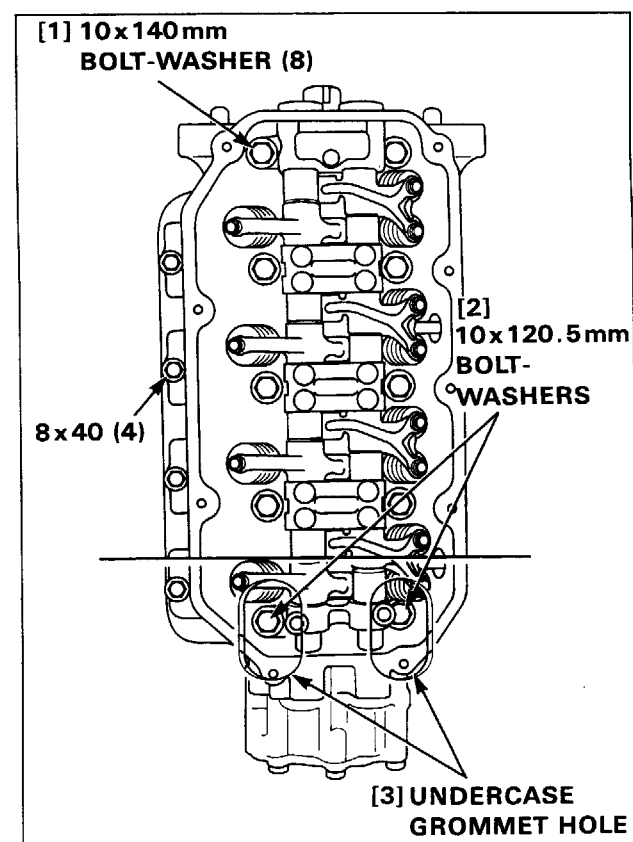
- 13) Disconnect the oil return tube from the cylinder head cover.



- 14) Remove the nine 6 x 35 mm flange bolts and remove the cylinder head cover (P. 3-6).
- 15) Remove the two 10 x 120.5 mm bolt-washers, eight 10 x 140 mm bolt-washers and four 8 x 40 mm flange bolts from the cylinder head assembly.

**NOTE:**

Remove/install the 10 x 120.5 mm bolt-washers by inserting the tool through the undercase grommet holes.



16) Remove the cylinder head assembly, and remove the cylinder head gasket and two 12 x 16 mm dowel pins.

### [2] OIL PATH ORIFICE

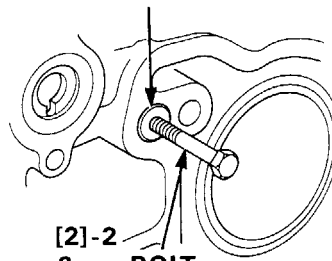
#### REMOVAL:

Remove the oil path orifice by inserting a 6 mm bolt (pitch: 1.0 mm) in the orifice.

#### INSTALLATION:

Blow air through the oil passage before installation.

#### [2]-1 OIL PATH ORIFICE



[2]-2  
6 mm BOLT  
(PITCH: 1.0 mm)

[1]  
10.8x2.4 mm  
O-RING

Do not reuse.

[3] 10x140 mm  
BOLT-WASHER (8)

INSTALLATION: P.9-5  
TORQUE:  
69 N·m (7.0 kgf·m, 51 lbf·ft)

[4]  
CYLINDER HEAD  
COVER GASKET

[11]  
SPARK PLUG CAP (4)

[10]  
12x16 mm  
DOWEL PIN (2)

[9]  
CYLINDER HEAD GASKET

Do not reuse.

[8]  
8x40 (4)

INSTALLATION:  
P.9-5  
TORQUE:  
26 N·m (2.7 kgf·m,  
20 lbf·ft)

[7]  
CYLINDER HEAD  
ASSEMBLY

DISASSEMBLY/  
ASSEMBLY: P.9-7

[6]  
10x120.5 mm BOLT-WASHER (2)

INSTALLATION: P.9-5  
TORQUE:  
69 N·m (7.0 kgf·m, 51 lbf·ft)

[5]  
CYLINDER HEAD COVER

6x35 (9)

### • INSTALLATION

Install the cylinder head assembly in the reverse order of removal. Note the following.

- 1) Apply engine oil to the threads and seating surface of the eight 10 x 140 mm bolt-washers, two 10 x 120.5 mm bolt-washers and four 8 x 40 mm flange bolts. Tighten the bolts to the specified torque in 2 or 3 steps and in the numbered sequence shown.

#### TORQUE :

10 x 140 mm, 10 x 120.5 mm bolt-washer :

69 N·m (7.0 kgf·m, 51 lbf·ft)

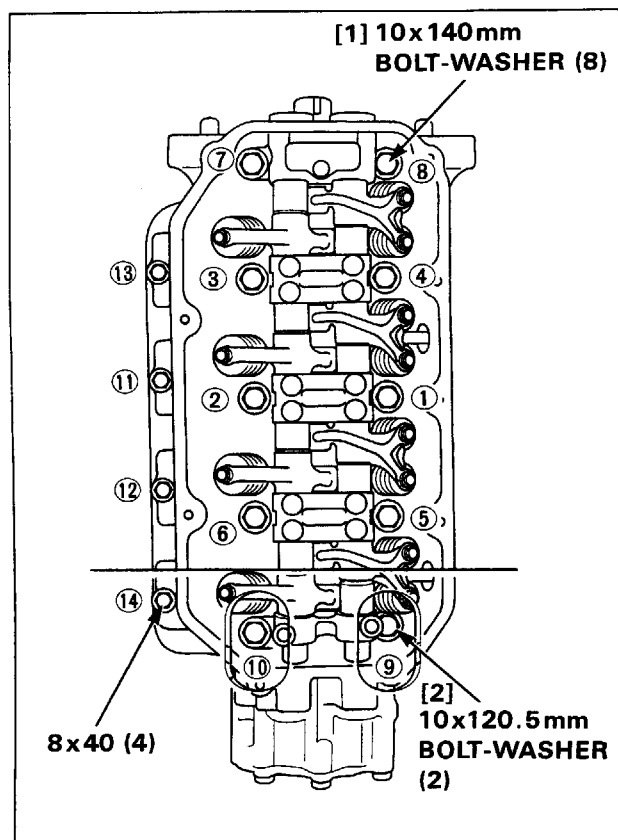
8 x 40 mm flange bolt :

26 N·m (2.7 kgf·m, 20 lbf·ft)

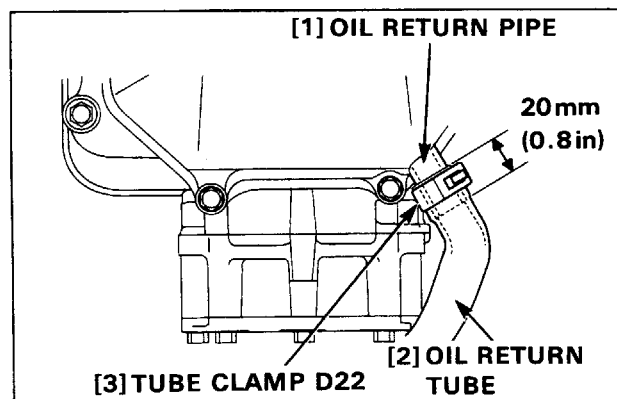
- 2) Install the cylinder head cover on the cylinder head assembly.

#### NOTE:

Be sure that the cylinder head cover gasket is securely set before installing the cylinder head cover.



- 3) Insert the oil return tube approximately 20 mm (0.8in) into the oil return pipe on the cylinder head cover. Clamp the tube clamp D22 at the straight portion of the oil return pipe.
- 4) Install the fuel tube B and C (P. 5-12). Install the carburetor assembly (P. 5-2 and 3). After installing the carburetor assembly, adjust the throttle cable (P. 3-12).



- 5) Tighten the six 6 x 25 mm flange bolts on the timing belt lower cover.
- 6) Set the timing belt driven pulley on the camshaft. Apply engine oil to the threads and seating surface of the 10 x 32 mm flange bolt, and tighten the 10 x 32 mm flange bolt using the special tool.

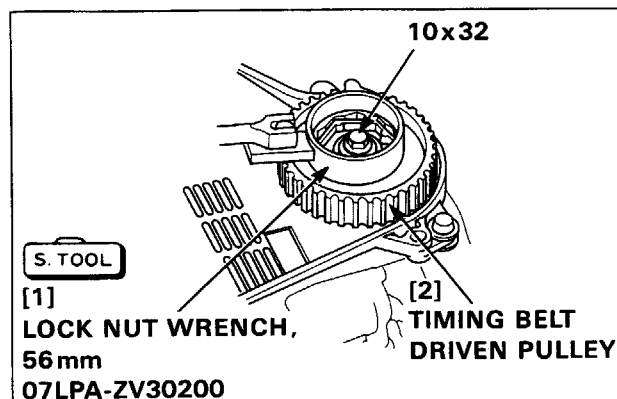
**TORQUE : 56 N·m (5.7 kgf·m, 41 lbf·ft)**

#### TOOL :

Lock nut wrench, 56 mm

07LPA-ZV30200

- 7) After installing the timing belt driven pulley, install the timing belt (P. 3-22).



## 2. OIL PUMP

### a. DISASSEMBLY/ASSEMBLY

Remove the cylinder head assembly (P. 9-1).

After assembling the oil pump and before installing it on the cylinder head, pour approximately 5 cm<sup>3</sup> (0.3 cu in) of oil into the oil pump body.

#### [2] OIL PUMP SHAFT

##### ASSEMBLY:

Install by aligning the projection on the oil pump shaft with the concave in the camshaft. If they do not align, adjust by turning the oil pump shaft.

#### [4] OIL PUMP BODY

**INSPECTION:**  
P.9-15 and 16

#### [6] OUTER ROTOR

**ASSEMBLY:**  
Clean the rotor thoroughly.  
**INSPECTION:**P.9-16

#### [7] INNER ROTOR

**ASSEMBLY:**  
Clean the rotor thoroughly.  
**INSPECTION:**P.9-16

#### [8] OIL PUMP COVER O-RING

[9]  
8x65 (4)  
26 N·m (2.7 kgf·m,  
20 lbf·ft)

#### [11] OIL PUMP COVER

[10]  
6x18 (2)  
12 N·m (1.2 kgf·m, 9 lbf·ft)

8x40 (2)

#### [16] 5x17.8mm ROLLER

**ASSEMBLY:**  
Do not forget to install.

#### [15] 18mm SEALING BOLT

**ASSEMBLY:**  
Apply locking agent.  
**TORQUE:**  
39 N·m (4.0 kgf·m,  
29 lbf·ft)

#### [14] 18mm SEALING WASHER

**ASSEMBLY:**  
Replace if worn.

#### [12] RELIEF VALVE

#### [13] RELIEF VALVE SPRING

#### [5] 13mm THRUST WASHER

#### [3] OIL PUMP O-RING

#### [1] CAMSHAFT

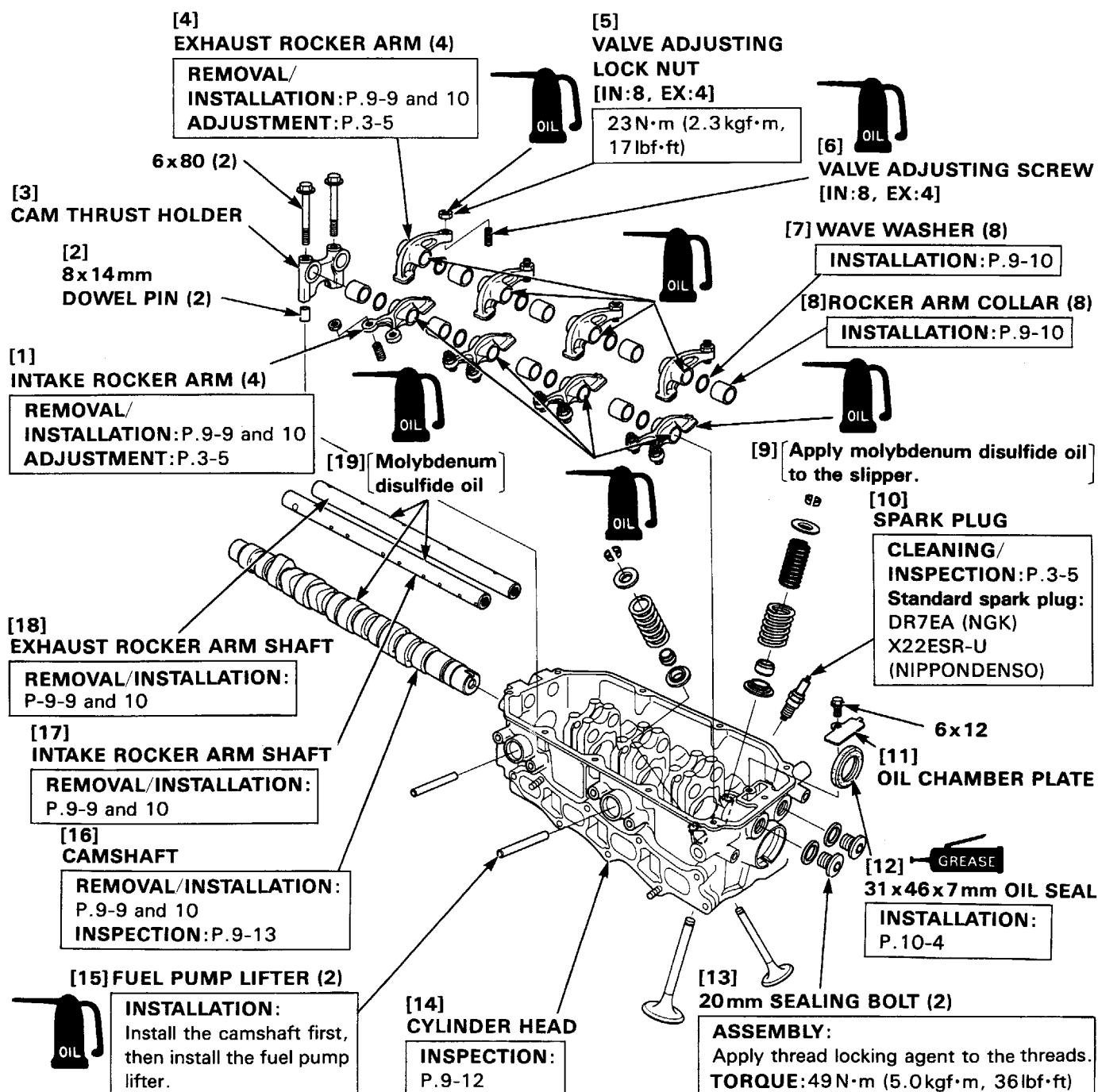
### 3. CYLINDER HEAD DISASSEMBLY / ASSEMBLY

Remove the cylinder head assembly, and remove the oil pump (P. 9-1 through 6).

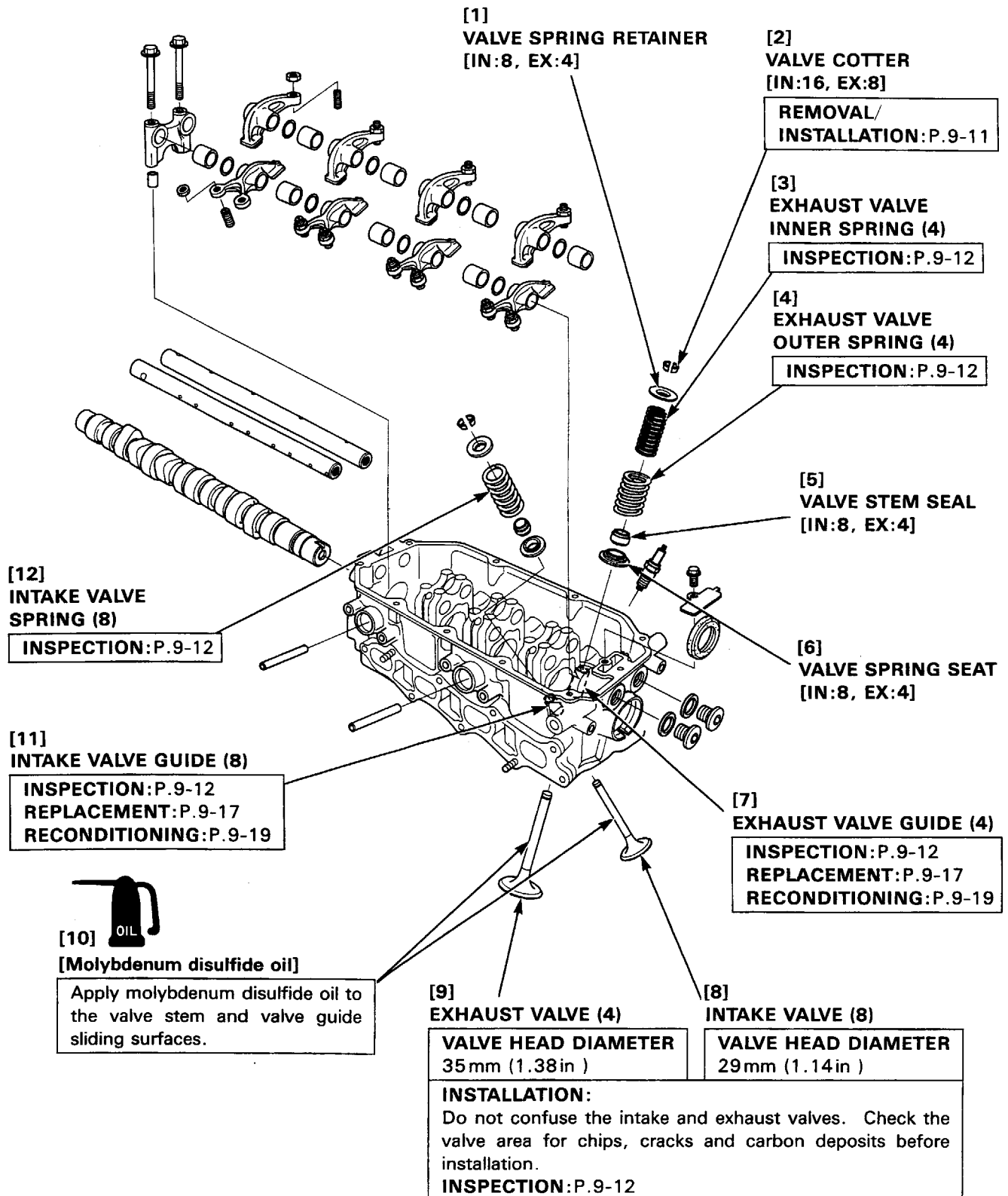
- Separate the removed parts into the intake side parts and the exhaust side parts of each cylinder respectively.
- Note that the intake side of the following parts are smaller than those of the exhaust side. Do not confuse on reassembly.  
Valve cotter, valve spring retainer, valve stem seal, valve spring seat.
- Do not reuse the removed stem seal.
- Apply engine oil to each part before reassembly.

#### CAUTION:

Turning a valve too fast can damage the stem seals.



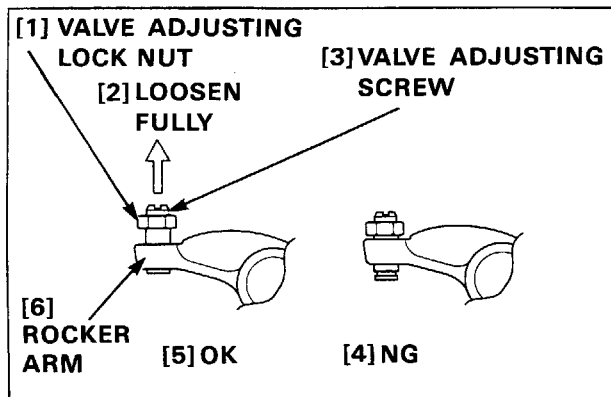
Install the intake valve springs and exhaust valve inner/outer springs with the side marked with the paint (white) mark toward the valve spring retainer (up).



### • CAMSHAFT / ROCKER ARM / ROCKER ARM SHAFT / ROCKER ARM COLLAR / WAVE WASHER

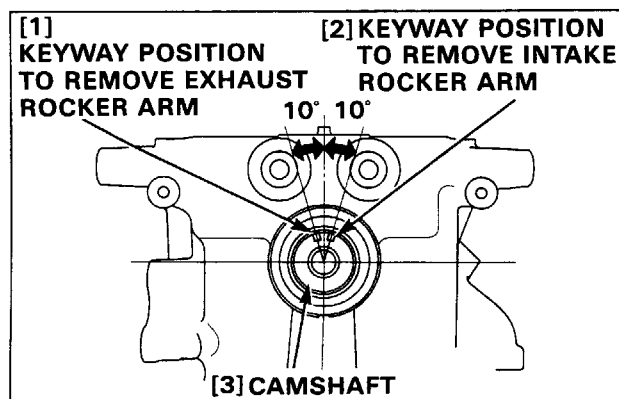
#### REMOVAL :

- 1) Loosen the intake and exhaust valve adjusting lock nuts, and loosen the valve adjusting screws until flush with the rocker arms as shown.



- 2) Remove the two 6 x 80 mm flange bolts.
- 3) To remove the intake and exhaust rocker arms, set the camshaft keyway at the timing belt driven pulley side at the position shown respectively.

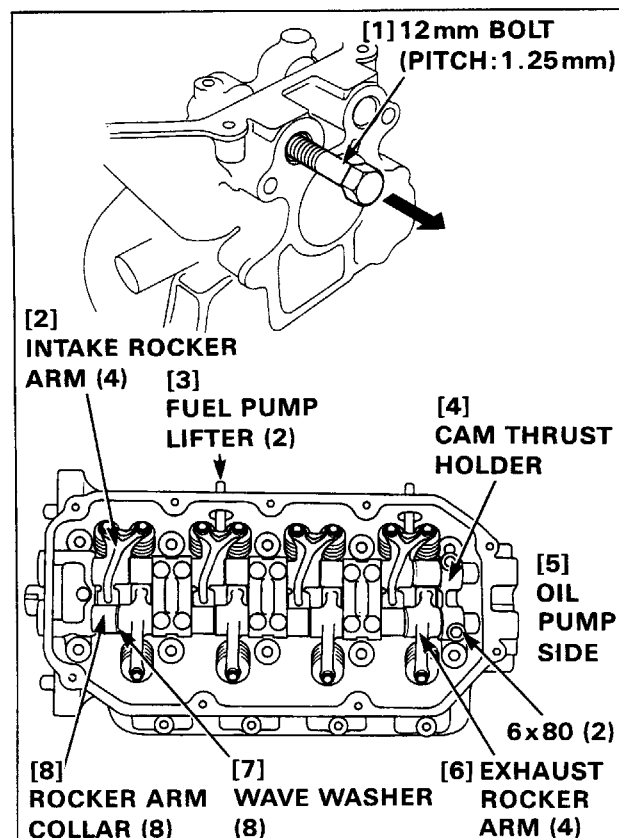
- To remove the intake rocker arm, set the camshaft at the position where it is inclined 10° clockwise.
- To remove the exhaust rocker arm, set the camshaft at the position where it is inclined 10° counterclockwise.



- 4) Insert a 12 mm bolt (pitch : 1.25 mm) in the intake/exhaust rocker arm shaft from the oil pump mounting side. Remove the rocker arm collars, wave washers and rocker arms while pulling out the intake/exhaust rocker arm shaft.

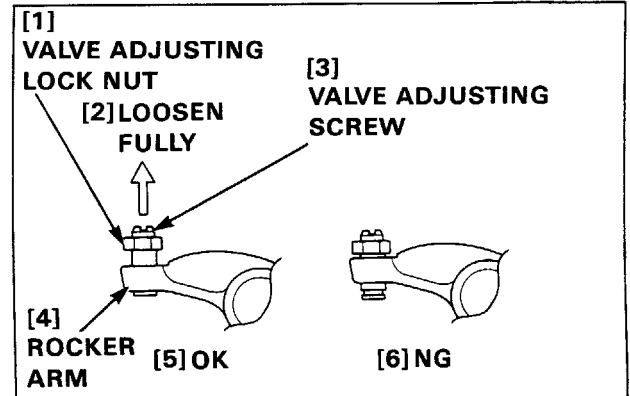
- 5) Remove the cam thrust holder.

- 6) Remove the fuel pump lifter and remove the camshaft from the oil pump side.



### INSTALLATION :

- 1) Be sure that the valve adjusting screws of the intake/exhaust rocker arms are loosened until flush with the rocker arms as shown.



- 2) Apply molybdenum disulfide oil to the camshaft journal and cam surface, and install the camshafts in the cylinder head.
- 3) Set the two 8 x 14 mm dowel pins on the cam thrust holder, and loosely install the cam thrust holder in the cylinder head (P. 9-7).
- 4) Apply molybdenum disulfide oil to the slipper surface of each rocker arm and to the outer surface of the rocker arm shaft.

#### <Intake rocker arm installation>

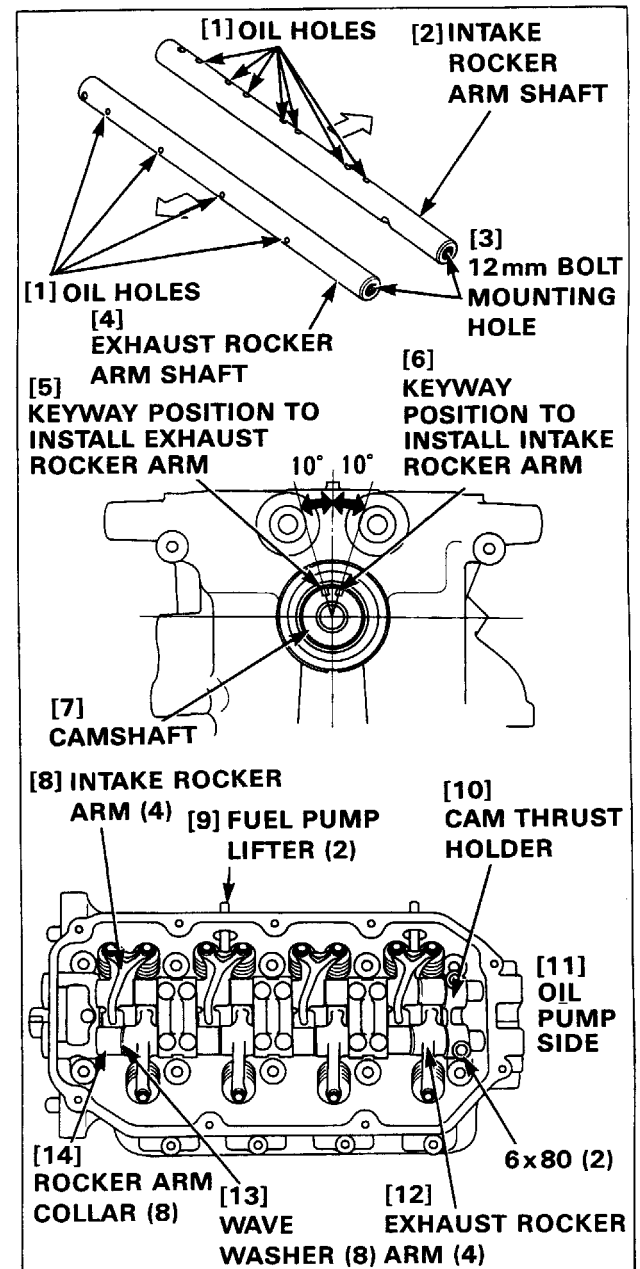
- 5) Set the camshaft keyway of the timing belt driven pulley side at the position where it is inclined 10° clockwise.
- 6) Insert the intake rocker arm shaft (with seven oil holes) of the side without the 12 mm bolt hole from the oil pump side, and starting with the No.4 cylinder, install the rocker arm collars, wave washers, and intake rocker arms in the listed order on each cylinder.

#### <Exhaust rocker arm installation>

- 7) After installing the intake rocker arm, set the camshaft keyway of the timing belt driven pulley side at the position where it is inclined 10° counterclockwise.
- 8) Insert the exhaust rocker arm shaft (with four oil holes) of the side without the 12 mm bolt hole from the oil pump side, and starting with the No. 4 cylinder, install the exhaust rocker arms, wave washers and rocker arm collars in the listed order in each cylinder.

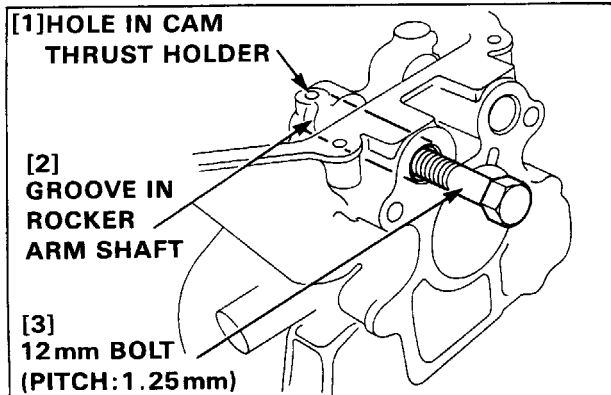
#### NOTE:

When installing the intake and exhaust rocker arms, be sure to set the keyways at the position where they are inclined 10° clockwise/counterclockwise respectively. Or, the rocker arm gets on the cam lobe, which prevents smooth insertion of the rocker arm shaft.





- 9) Set the 6 x 80 mm flange bolt on the cam thrust holder. If it is hard to set the 6 x 80 mm flange bolt, set the 12 mm bolt (pitch : 1.25 mm) from the oil pump mounting side, and turn the 12 mm bolt in the tightening direction to the position where the 6 x 80 mm flange bolt is installed (i.e. where the groove in the rocker arm shaft aligns with the hole in the cam thrust holder).
- 10) After tightening the 6 x 80 mm flange bolt, remove the 12 mm bolt.



### • VALVE COTTERS

#### REMOVAL :

<Exhaust side>

Compress the valve spring, and remove the valve cotters using the special tool.

#### TOOL :

Valve spring compressor

07757-0010000

<Intake side>

Remove the attachment from the special tool (valve spring compressor), then use the special tool to compress the valve spring and remove the cotters.

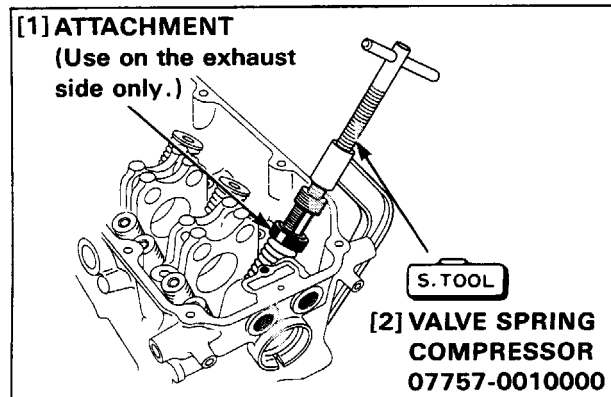
#### TOOL :

Valve spring compressor

07757-0010000

#### NOTE:

After removing the valve cotters, store the valves, valve springs and other related parts for each cylinder. Install these parts at the same position for each cylinder.



#### INSTALLATION :

Be sure that the valve cotters are securely set in the groove of the valve.

### 4. INSPECTION

#### • VALVE SPRING FREE LENGTH

Measure the free length of the valve springs.

		STANDARD	SERVICE LIMIT
EX	IN	46.0 mm (1.81 in)	Replace if below the STANDARD value.
	Inner	41.7 mm (1.64 in)	
	Outer	44.1 mm (1.74 in)	

Replace the springs if they are shorter than the service limit.

#### • VALVE FACE / STEM O.D.

Inspect each valve face for pitting or wear irregularities. Inspect each valve stem for bending or abnormal stem wear. Replace the valve if necessary.

Measure and record each valve stem O.D.

		STANDARD	SERVICE LIMIT
IN		5.475 – 5.490 mm (0.2156 – 0.2161 in)	5.45 mm (0.215 in)
EX		6.555 – 6.570 mm (0.2581 – 0.2587 in)	6.53 mm (0.258 in)

Replace the valves if their O.D. is smaller than the service limit.

#### • VALVE GUIDE I.D.

NOTE:

Ream the valve guides to remove any carbon deposits before measuring (P. 9-17).

Measure and record each valve guide I.D.

		STANDARD	SERVICE LIMIT
IN		5.500 – 5.512 mm (0.2165 – 0.2170 in)	5.54 mm (0.218 in)
EX		6.600 – 6.615 mm (0.2598 – 0.2604 in)	6.64 mm (0.261 in)

Replace the guides if they are over the service limit (P. 9-17).

#### • GUIDE-TO-STEM CLEARANCE

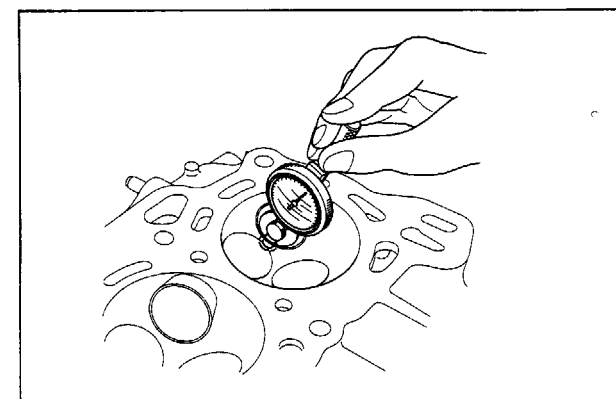
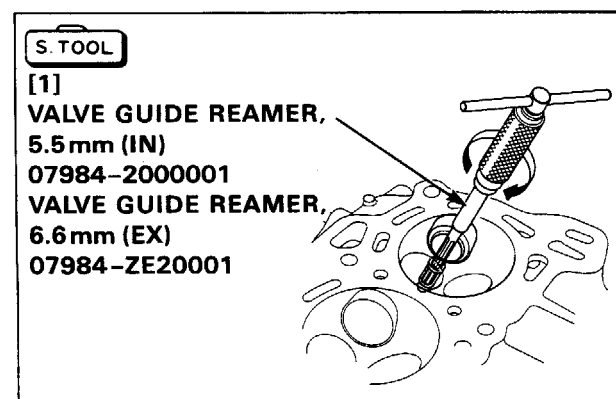
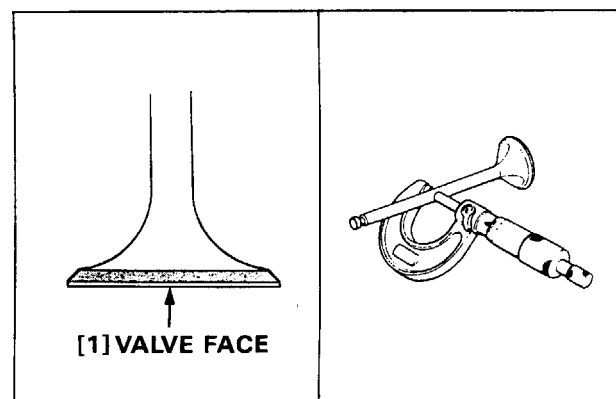
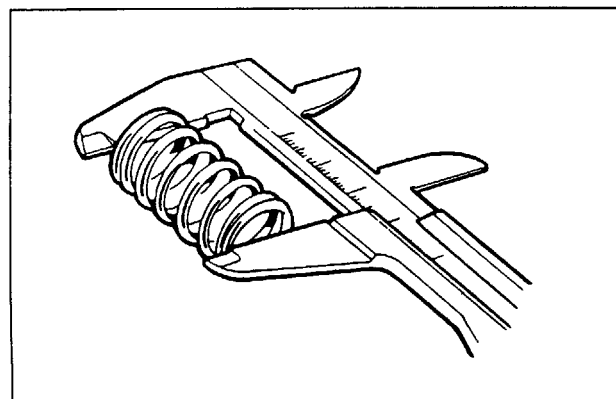
Subtract each valve stem O.D. from the corresponding guide clearance.

		STANDARD	SERVICE LIMIT
IN		0.010 – 0.037 mm (0.0004 – 0.0014 in)	0.07 mm (0.0028 in)
EX		0.030 – 0.060 mm (0.0012 – 0.0024 in)	0.12 mm (0.005 in)

If the stem-to-guide clearance exceeds the service limit, determine if the new guide with standard dimensions would bring the clearance within tolerance. If so, replace any guide as necessary and ream to fit. If the stem-to-guide clearance exceeds the service limit with new guides, replace the valves as well.

NOTE:

Recondition the valve seats whenever the valve guides are replaced.

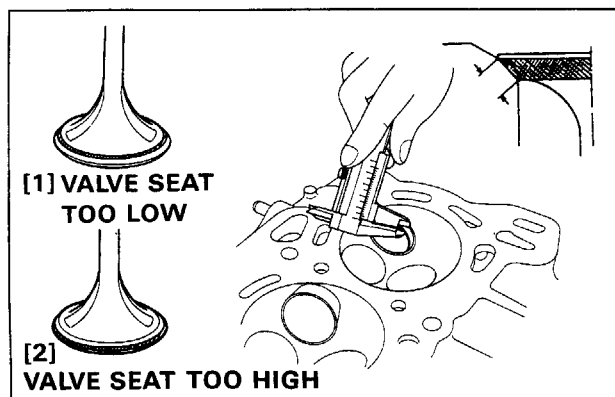


### • VALVE SEAT WIDTH

Measure the valve seat width.

	STANDARD	SERVICE LIMIT
IN/ EX	1.25 – 1.55 mm (0.049 – 0.061 in)	2.0 mm (0.08 in)

If the valve seat width is under the standard, or over the service limit, or if the valve seat is too high/low, recondition the valve seat (P. 9-19).

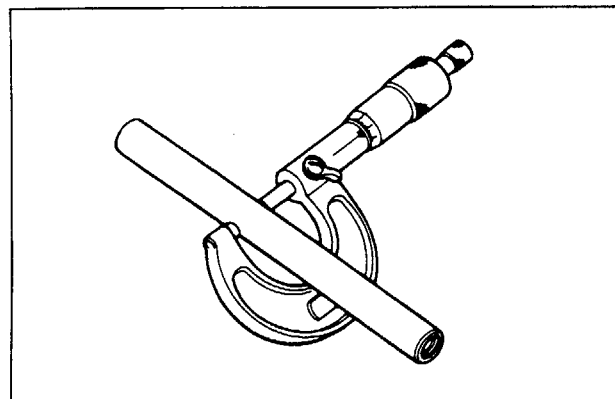


### • ROCKER ARM SHAFT O.D.

Measure the O.D. of the rocker arm shaft.

STANDARD	SERVICE LIMIT
16.962 – 16.980 mm (0.6678 – 0.6685 in)	16.92 mm (0.666 in)

Replace the rocker arm shaft if its O.D. is smaller than the service limit.



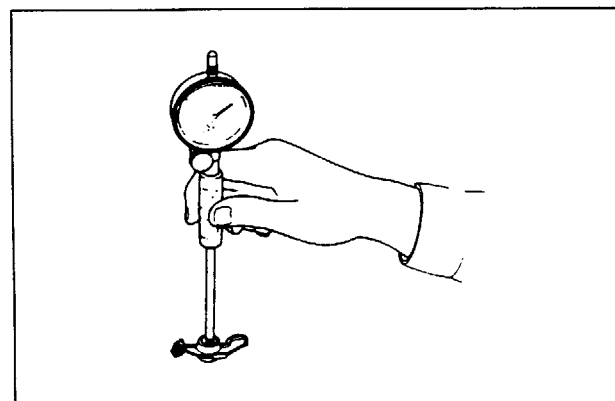
### • ROCKER ARM I.D.

Measure the I.D. of the rocker arm.

STANDARD	SERVICE LIMIT
17.000 – 17.018 mm (0.6693 – 0.6700 in)	17.04 mm (0.671 in)

Replace the rocker arms if their I.D. is larger than the service limit.

Also check the rocker arm-to-cam contact surface for any wear or scratches.



### • ROCKER ARM SHAFT-TO-ROCKER ARM CLEARANCE

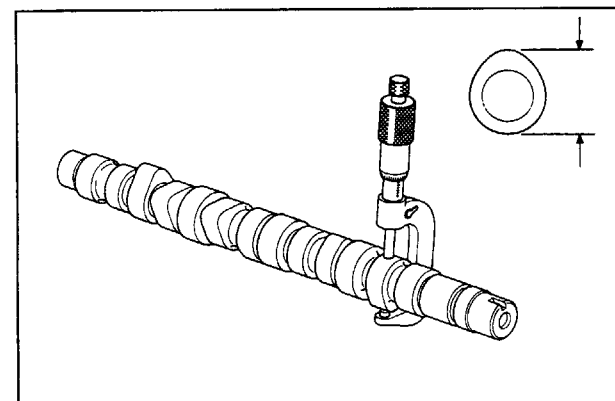
STANDARD	SERVICE LIMIT
0.020 – 0.056 mm (0.0008 – 0.0022 in)	0.07 mm (0.0028 in)

### • CAM HEIGHT

Measure the cam height.

	STANDARD	SERVICE LIMIT
IN	40.008 – 40.248 mm (1.5751 – 1.5846 in)	39.808 mm (1.5672 in)
EX	39.857 – 40.097 mm (1.5691 – 1.5786 in)	39.657 mm (1.5613 in)

Replace the camshaft if the cam height is lower than the service limit.



### • CAMSHAFT JOURNAL O.D.

Measure the camshaft O.D.

	STANDARD	SERVICE LIMIT
# 1	31.950 – 31.975 mm (1.2579 – 1.2589 in)	31.93 mm (1.257 in)
# 2	47.930 – 47.955 mm (1.8870 – 1.8880 in)	47.90 mm (1.886 in)
# 3	48.430 – 48.455 mm (1.9067 – 1.9077 in)	48.40 mm (1.906 in)
# 4	48.930 – 48.955 mm (1.9264 – 1.9274 in)	48.90 mm (1.925 in)
# 5	35.950 – 35.975 mm (1.4154 – 1.4163 in)	35.93 mm (1.415 in)

Replace the camshaft if its O.D. is smaller than the service limit.

### • CAMSHAFT JOURNAL I.D.

Measure the camshaft I.D.

	STANDARD	SERVICE LIMIT
# 1	32.000 – 32.025 mm (1.2598 – 1.2608 in)	32.06 mm (1.262 in)
# 2	48.000 – 48.025 mm (1.8898 – 1.8907 in)	48.06 mm (1.892 in)
# 3	48.500 – 48.525 mm (1.9094 – 1.9104 in)	48.56 mm (1.912 in)
# 4	49.000 – 49.025 mm (1.9291 – 1.9301 in)	49.06 mm (1.931 in)
# 5 (Oil pump journal)	36.000 – 36.025 mm (1.4173 – 1.4183 in)	36.06 mm (1.420 in)

### • CAMSHAFT OIL CLEARANCE

	STANDARD	SERVICE LIMIT
# 1	0.025 – 0.075 mm (0.0010 – 0.0030 in)	0.10 mm (0.004 in)
# 2, # 3, # 4	0.045 – 0.095 mm (0.0018 – 0.0037 in)	0.12 mm (0.005 in)
# 5	0.025 – 0.075 mm (0.0010 – 0.0030 in)	0.10 mm (0.004 in)

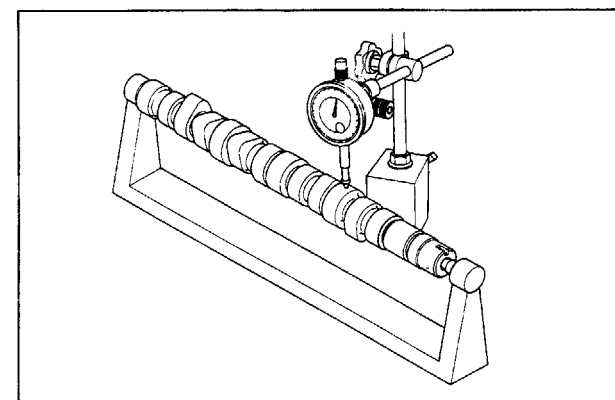
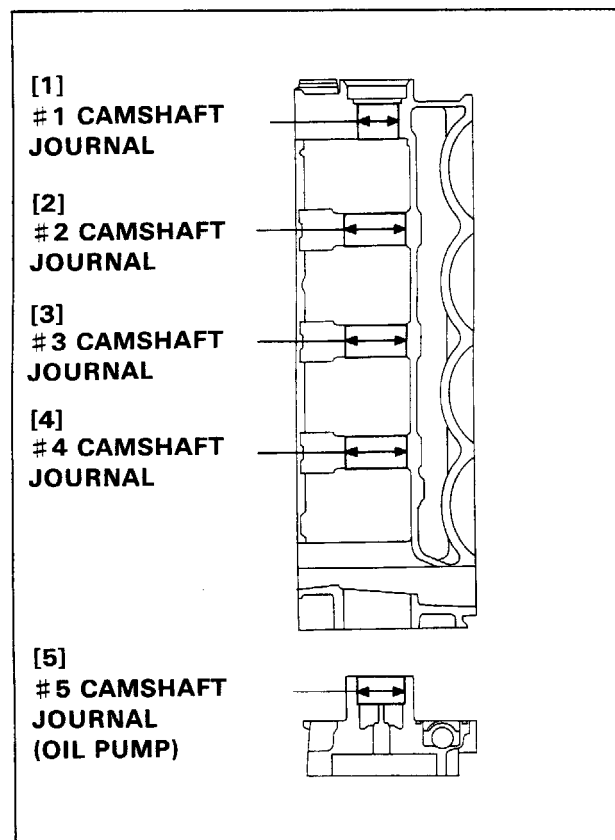
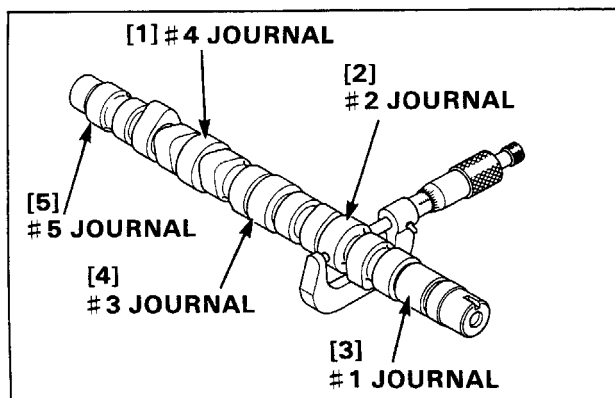
If the camshaft oil clearance exceeds the service limit, replace the camshaft.

Measure the cam height of the new camshaft. If the oil clearance exceeds the service limit, replace the cylinder head or oil pump body.

### • CAMSHAFT RUNOUT

STANDARD	SERVICE LIMIT
0.03 mm (0.0012 in) Max.	0.05 mm (0.0019 in)

Camshaft runout is half of maximum gauge reading.



### • CAMSHAFT AXIAL CLEARANCE

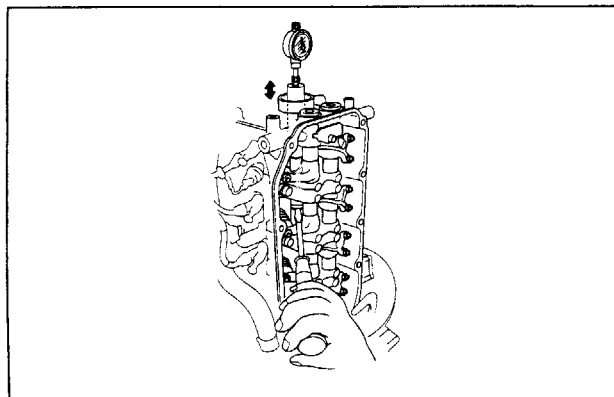
Measure the camshaft axial runout before removing the cylinder head assembly.

Loosen the valve adjusting lock nuts, and loosen the valve adjusting screws fully before inspection.

STANDARD	SERVICE LIMIT
0.03 – 0.11 mm (0.0012 – 0.0043 in)	0.3 mm (0.012 in)

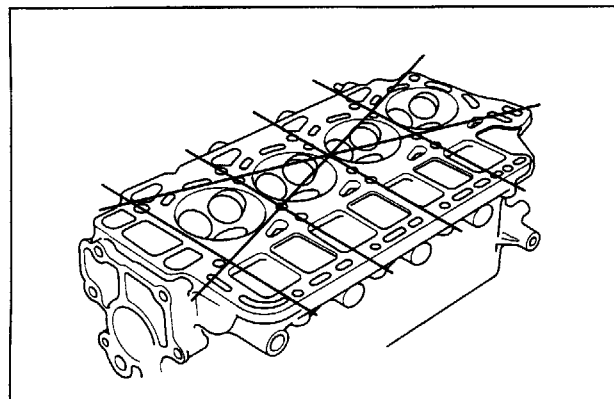
Replace the camshaft if the measurement is above the service limit.

Install the new camshaft and recheck the axial clearance. If it exceeds the service limit, replace the cam thrust holder.



### • CYLINDER HEAD

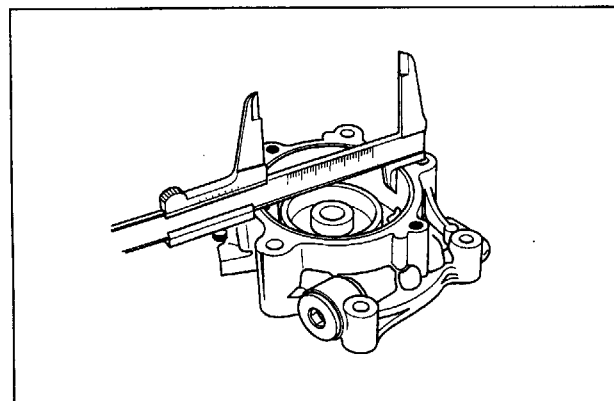
- 1) Remove the carbon deposits from the combustion chamber. Clean off any gasket material from the cylinder head surface.
- 2) Check the spark plug holes and valve areas for cracks.
- 3) Check the cylinder head for warpage using a straight edge and a feeler gauge.



STANDARD	SERVICE LIMIT
0.05 mm (0.0019 in)	0.1 mm (0.004 in)

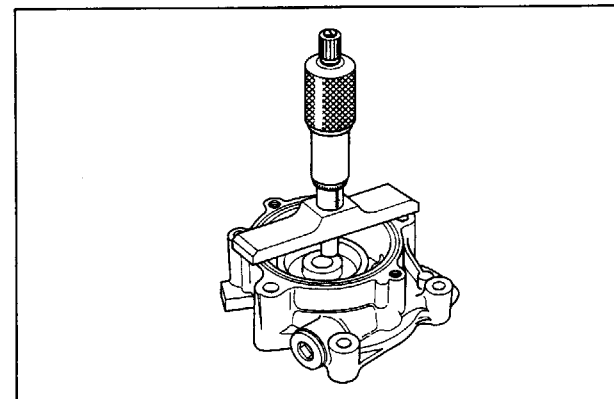
### • OIL PUMP BODY I.D.

STANDARD	SERVICE LIMIT
80.00 – 80.04 mm (3.150 – 3.151 in)	80.06 mm (3.152 in)



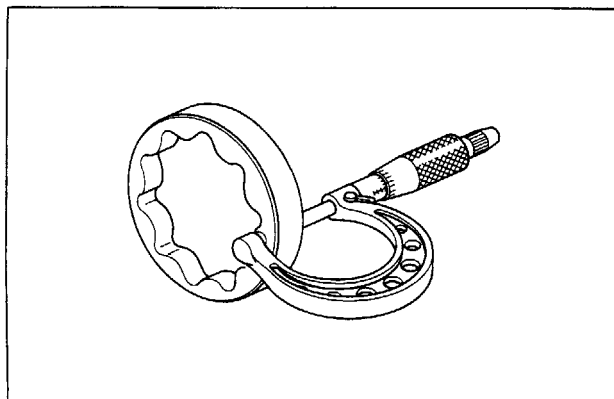
### • OIL PUMP BODY DEPTH

STANDARD	SERVICE LIMIT
18.02 – 18.05 mm (0.709 – 0.711 in)	18.09 mm (0.712 in)

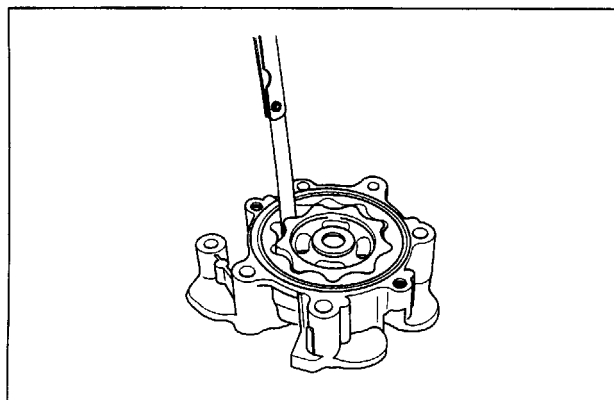


**• OUTER ROTOR HEIGHT**

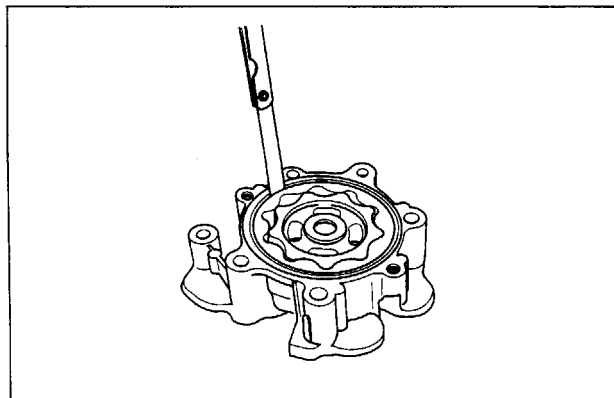
STANDARD	SERVICE LIMIT
17.98 – 18.00 mm (0.708 – 0.709 in)	17.96 mm (0.707 in)

**• INNER ROTOR-TO-OUTER ROTOR CLEARANCE**

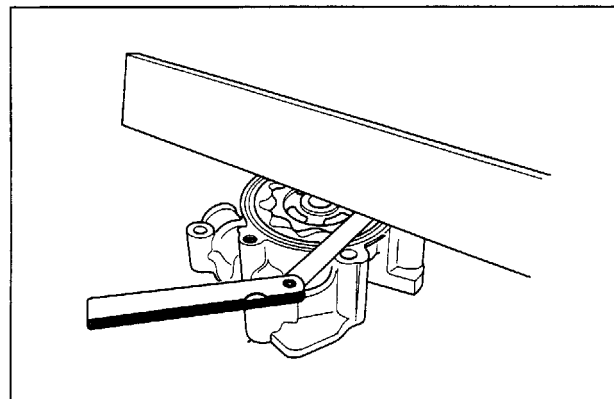
STANDARD	SERVICE LIMIT
0.02 – 0.16 mm (0.0008 – 0.0063 in)	0.2 mm (0.008 in)

**• OUTER ROTOR-TO-PUMP BODY CLEARANCE**

STANDARD	SERVICE LIMIT
0.10 – 0.19 mm (0.004 – 0.007 in)	0.23 mm (0.009 in)

**• PUMP END CLEARANCE**

STANDARD	SERVICE LIMIT
0.02 – 0.07 mm (0.0008 – 0.0028 in)	0.10 mm (0.004 in)



## 5. VALVE GUIDE REPLACEMENT

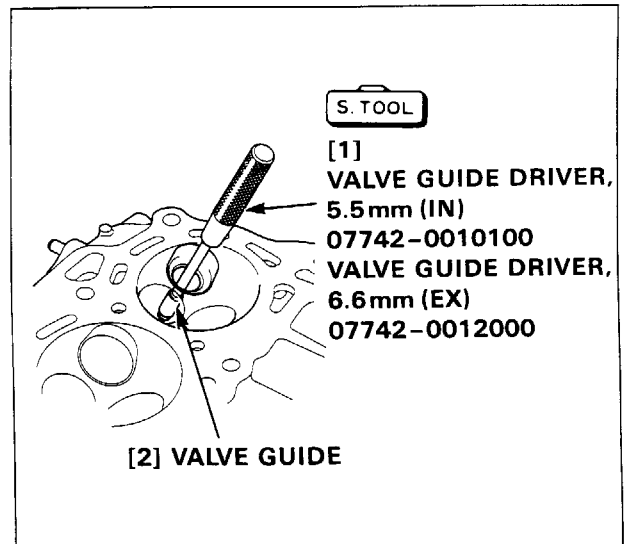
- 1) Chill the replacement valve guides in the freezer section of a refrigerator for about an hour.
- 2) Drive the valve guide out of the combustion chamber side using a valve guide drivers (special tool).

### CAUTION:

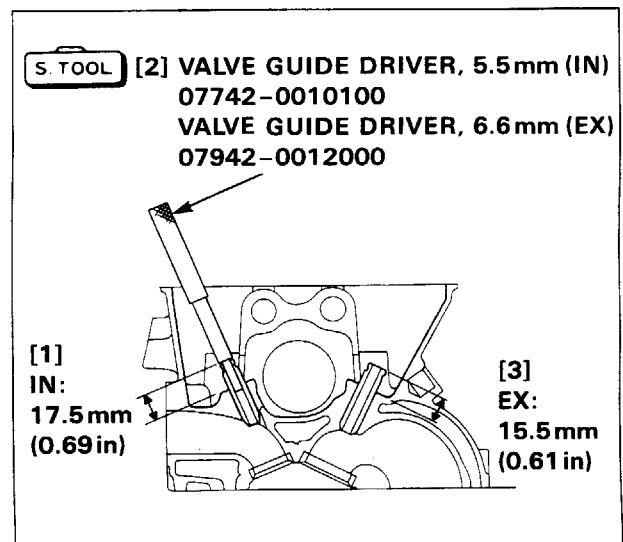
When driving the valve guides out, be careful not to damage head.

### TOOLS :

Valve guide driver, 5.5 mm (IN)      07742-0010100  
Valve guide driver, 6.6 mm (EX)      07742-0012000



- 3) Remove the new valve guides from the refrigerator one at a time as needed.
- 4) Install the new valve guides from the valve spring side of the cylinder head. Drive each valve guide as shown.
- 5) After installation, inspect the valve guide for damage. Replace any damaged valve guide.



## • VALVE GUIDE REAMING

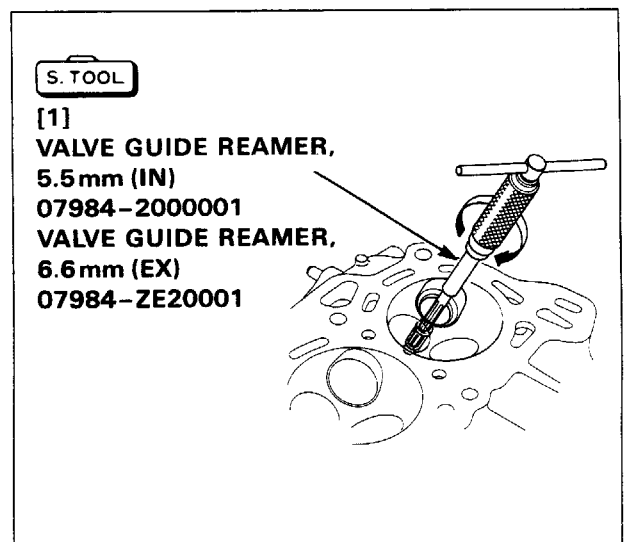
### NOTE:

For best results, be sure the cylinder head is at room temperature before reaming valve guides.

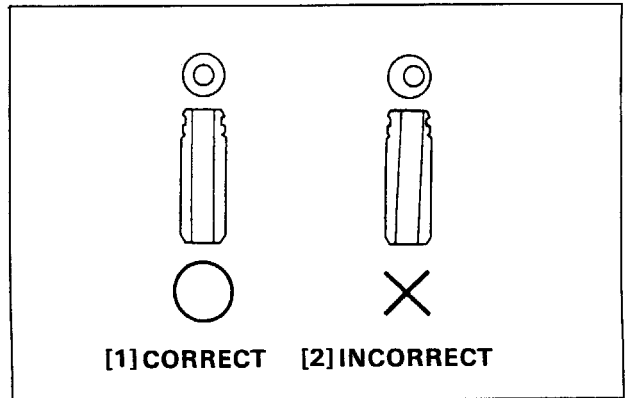
- 1) Coat the reamer and valve guide with cutting oil.
- 2) Rotate the reamer clockwise through the valve guide for the full length of the reamer.
- 3) Continue to rotate the reamer clockwise while removing it from the valve guide.

### TOOLS :

Valve guide reamer, 5.5 mm (IN)      07984-2000001  
Valve guide reamer, 6.6 mm (EX)      07984-ZE20001



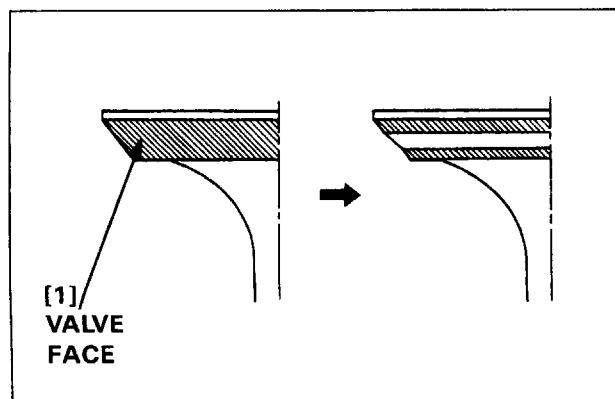
- 4) Thoroughly clean the cylinder head to remove any cutting residue.
- 5) Check the valve guide bore ; it should be straight, round and centered in the valve guide, insert the valve and check operation. If the valve does not operate smoothly, the guide may have been bent during installation. Replace the valve guide if it is bent or damaged.
- 6) Check the Valve Guide-to-Stem Clearance. See page 9-12.





## 6. VALVE SEAT RECONDITIONING

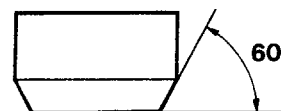
- 1) Thoroughly clean the combustion chambers and valve seats to remove carbon deposits. Apply a light coat of Prussian Blue compound or erasable felt-tipped marker ink to the valve faces.
- 2) Insert the valves, and then lift them and snap them closed against their seats several times. Be sure the valve does not rotate on the seat. The transferred marking compound will show any area of the seat that is not concentric.
- 3) Using a 45° cutter, remove enough material to produce a smooth and concentric seat. Follow the Valve Seat Cutter Manufacturer's Instructions. Turn the cutter clockwise, never counterclockwise. Continue to turn the cutter as you lift it from the valve seat.



**S. TOOL** [1] CUTTER HOLDER, 5.5 mm (IN)  
07781-0010101  
CUTTER HOLDER, 6.6 mm (EX)  
07781-0010202

**S. TOOL** [2] VALVE SEAT CUTTERS

[3] IN: 07780-0014000 ( $\phi 30$ )  
EX: 07780-0014100 ( $\phi 37.5$ )



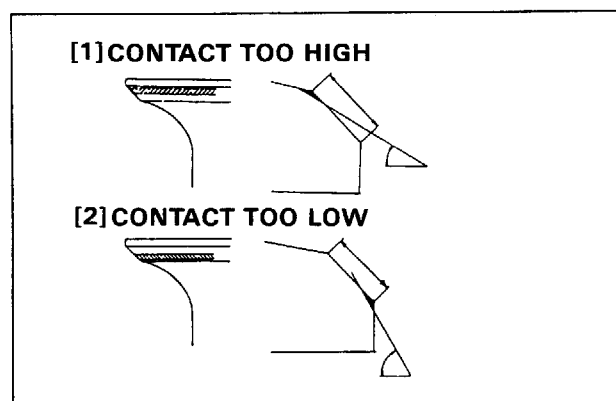
[4] IN: 07780-0012200 ( $\phi 30$ )  
EX: 07780-0012300 ( $\phi 35$ )



[5] IN: 07780-0010300 ( $\phi 29$ )  
EX: 07780-0010800 ( $\phi 33$ )



- 4) Use the 30° – 32° and 60° cutters to narrow and adjust the valve seat so that it contacts the middle of the valve face. The 30° – 32° cutter removes material from the top edge. The 60° cutter removes material from the bottom edge. Be sure that the width of the finished valve seat is within specification.



### • VALVE SEAT WIDTH

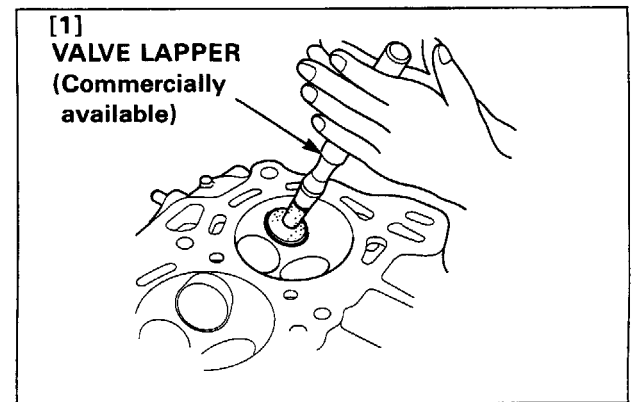
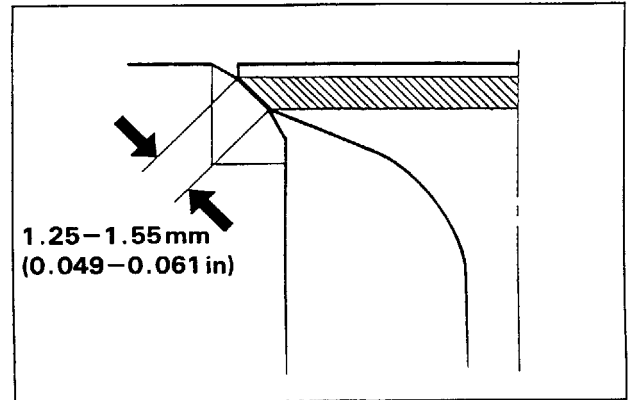
STANDARD	SERVICE LIMIT
1.25 – 1.55 mm (0.049 – 0.061 in)	2.0 mm (0.08 in)

- 5) Make a light pass with the 45° cutter to remove any possible burrs at the edges of the seat.
- 6) After resurfacing the seats, inspect for even valve seating. Apply Prussian Blue compound or erasable felt-tipped marker ink to the valve faces. Insert the valves, and then lift them and snap them closed against their seats several times. Be sure the valve does not rotate on the seat. The seating surface, as shown by the transferred marking compound, should have good contact all the way around.
- 7) Lap the valves into their seats, using a hand valve lapper and lapping compound (commercially available).

#### CAUTION:

**To avoid severe engine damage, be sure to remove all lapping compound from the cylinder head before assembly.**

- 8) Check valve clearance after assembly.



# 10. CRANKCASE/CYLINDER BLOCK/ CRANKSHAFT/PISTON/FLYWHEEL

**HONDA**  
**BF75A·90A**

- |                                |                      |
|--------------------------------|----------------------|
| 1. CRANKCASE                   | 4. INSPECTION        |
| 2. CYLINDER BLOCK / CRANKSHAFT | 5. BEARING SELECTION |
| 3. PISTON                      |                      |

## 1. CRANKCASE

### a. DISASSEMBLY / ASSEMBLY

- 1) Remove the engine (P. 7-1).
- 2) Remove the cylinder head (P. 9-1).

[2]  
8x35 (2)

**INSTALLATION:**P.10-3  
**TORQUE:**  
26 N·m (2.7 kgf·m,  
20 lbf·ft)

[1]  
CRANKCASE

**INSTALLATION:**P.10-2

[15] CRANKSHAFT MAIN  
BEARINGS

#### REMOVAL:

Store the main bearings  
separately for each journal.

#### INSTALLATION:

- Use care not to damage the bearings.
- Make sure the locking lug on each bearing fits in the notch in the crankcase and the cylinder block.

**SELECTION:**P.10-16

[14]  
12mm BOLT (6)

103 N·m  
(10.5 kgf·m,  
76 lbf·ft)

[13]  
FLYWHEEL

**REMOVAL/  
INSTALLATION:**P.10-2

[12]

#### NOTE:

Clean the crankshaft/flywheel  
mating surface with the  
degreasing cleaning agent.

[11]  
18x22mm  
DOWEL PIN

[10] 12x18mm  
DOWEL PIN (10)

[4]  
OIL FILTER

**REMOVAL/INSTALLATION:**P.10-2

Apply oil to the rubber seal before  
installation.

**REPLACEMENT:**P.3-3

#### TORQUE:

22 N·m (2.2 kgf·m, 16 lbf·ft)

6x22 (2)

[5]  
OIL FILLER CAP

[6]  
OIL FILLER EXTENSION

[7] OIL FILLER EXTENSION  
GASKET

Do not reuse.

[8] 10x112mm BOLT-WASHER (10)

**INSTALLATION:**P.10-3

- Apply oil to the bolts and tighten with snag torque (angle method).
- After tightening with snag torque, mark on the bolt and crankcase and tighten an additional 40°.

**SNAG TORQUE(ANGLE METHOD):**

25 N·m (2.5 kgf·m, 18 lbf·ft) + 40°

**TORQUE (TORQUE METHOD):**

44 N·m (4.5 kgf·m, 33 lbf·ft)

[9]  
Molybdenum  
disulfide oil

Apply oil to the mating surface  
with the crankshaft. Do not  
apply oil to the mating surface  
with the crankcase.

### • OIL FILTER

#### REMOVAL / INSTALLATION:

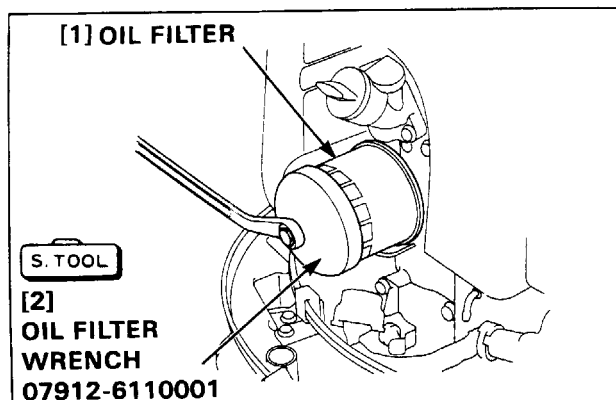
Remove / install the oil filter using the special tool.

#### TOOL:

Oil filter wrench **07912-6110001**

Before installation, coat the rubber seal and threads with clean engine oil.

**TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)**



### • FLYWHEEL

#### REMOVAL:

- 1) To remove / install the flywheel, attach the special tool to the starter motor mounting base as shown.
- 2) Remove the six 12 mm bolts and remove the flywheel.

#### TOOL:

Ring gear holder **07SPB-ZW10100**

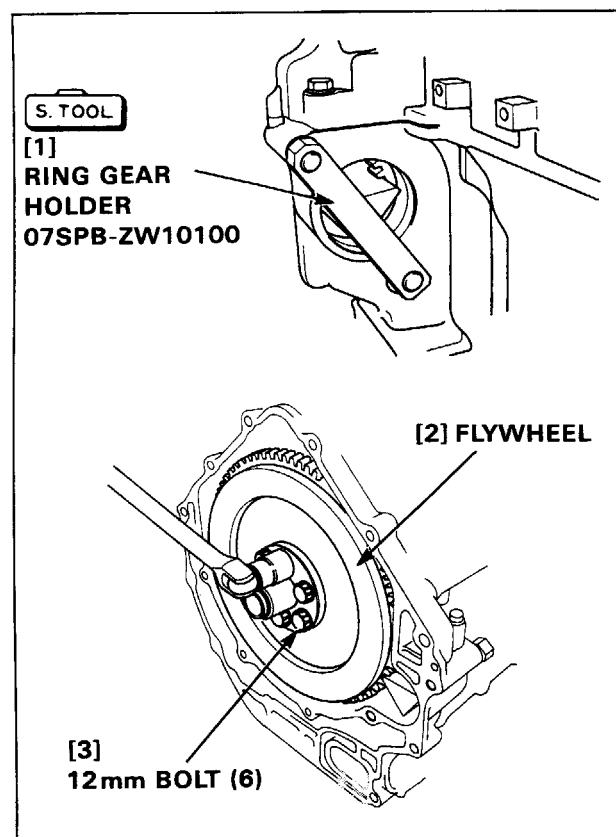
#### INSTALLATION:

- 1) Clean the crankshaft / flywheel mating surface with a degreasing cleaning agent, and install the flywheel on the crankshaft.
- 2) Apply engine oil to the seating surface and threads of the 12 mm bolts. Loosely tighten the six 12 mm bolts, attach the special tool used for removal to the starter motor mounting base, and tighten the six 12 mm bolts to the specified torque.

**TORQUE: 103 N·m (10.5 kgf·m, 76 lbf·ft)**

#### NOTE:

Be sure to clean the crankshaft / flywheel mating surface with a degreasing cleaning agent.



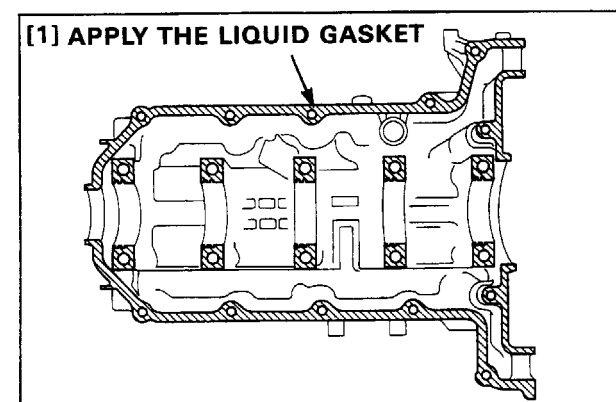
### • CRANKCASE

#### INSTALLATION:

Before installation, apply Three Bond #1141C to the area shown in the drawing.

#### CAUTION:

Do not apply the liquid gasket to the crankshaft main journals or the bolt holes.



- 10 x 112 mm BOLT-WASHER / 8 x 50mm, 8 x 35 mm FLANGE BOLTS

### INSTALLATION:

- 1) Apply oil to the bolts, and loosely tighten the twenty two bolts in the numbered sequence.
- 2) Tighten the two 8 x 35 mm flange bolts and ten 8 x 50 mm flange bolts to the specified torque (torque method). Tighten the ten 10 x 112 mm bolt-washers with snag torque (angle method) in the numbered sequence.
- 3) After tightening the ten 10 x 112 mm bolt-washers, mark on the bolts and crankcase, then tighten the ten bolts an additional 40° in the numbered sequence.

### TORQUE (TORQUE METHOD):

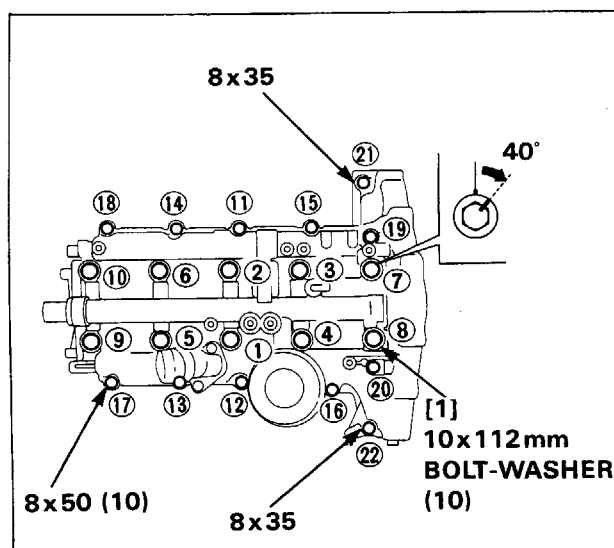
26 N·m (2.7 kgf·m, 20 lbf·ft) [8 x 35 mm, 8 x 50 mm flange bolts]

### SNAG TORQUE (ANGLE METHOD):

25 N·m (2.5 kgf·m, 18 lbf·ft) + 40° [10 x 112 mm bolt-washers only]

### NOTE:

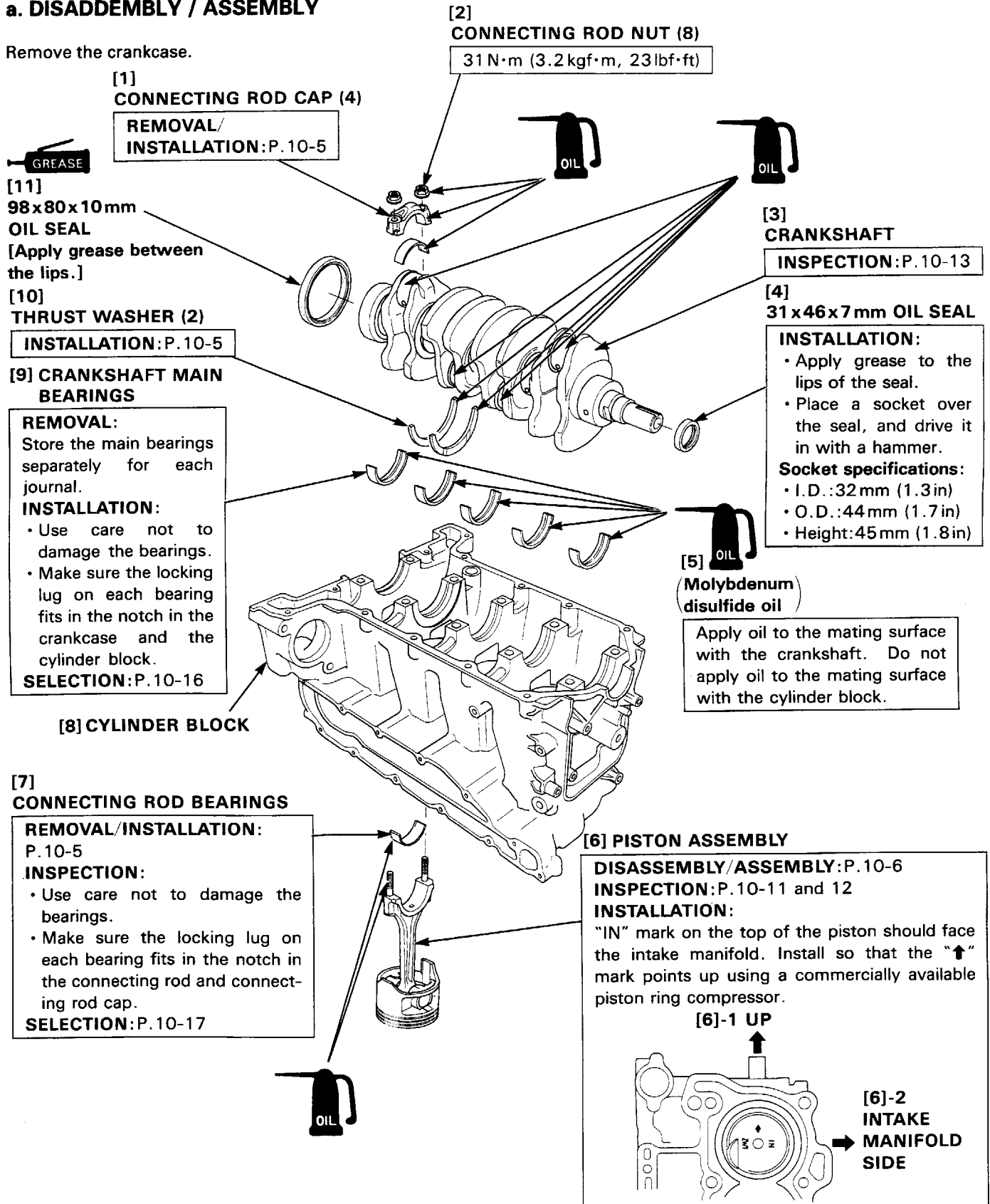
If tightening the 10 x 112 mm bolt-washers to the specified torque (torque method), tighten to 44 N·m (4.5 kgf·m, 33 lbf·ft).



## 2. CYLINDER BLOCK / CRANKSHAFT

### a. DISASSEMBLY / ASSEMBLY

Remove the crankcase.



### • CONNECTING ROD CAP / BEARING

#### REMOVAL:

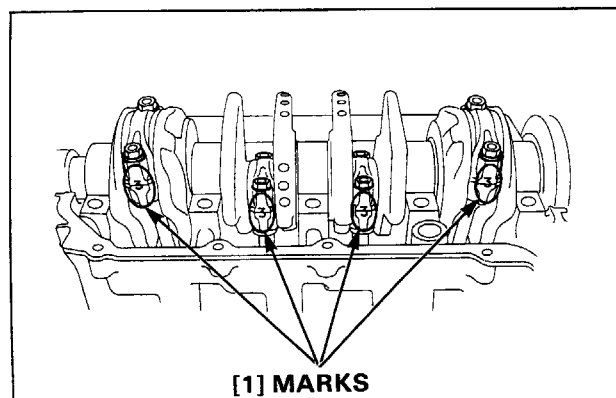
Store the connecting rod caps and bearings separately for each cylinder after removal.

#### CAUTION:

**Do not confuse the connecting rod cap and bearing with those of the other cylinders, or crankshaft seizure can result.**

#### INSTALLATION:

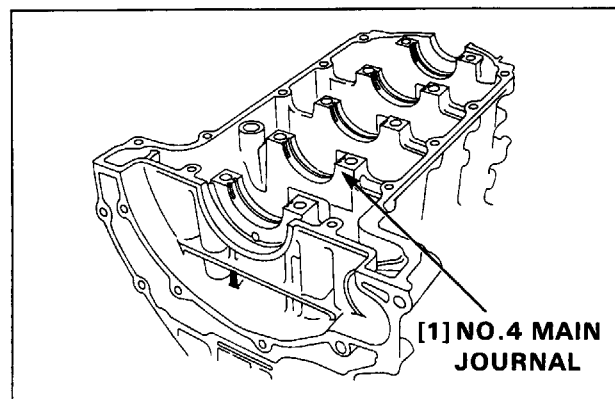
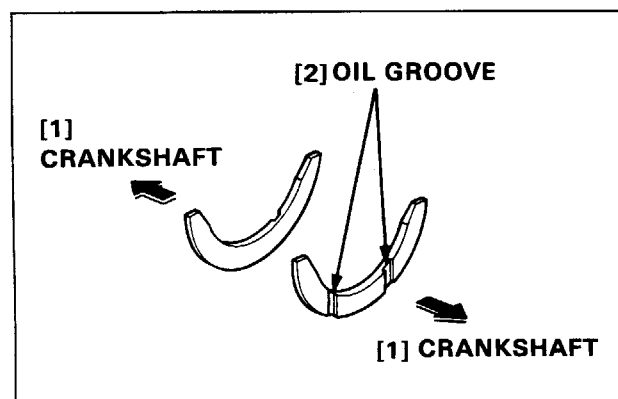
- 1) Apply engine oil to the outer surface of the connecting rod bearings. Install the bearings aligning the aligning lug of the bearings with the cutout in the connecting rod caps or connecting rods.
- 2) Install the connecting rod caps aligning the numerical marks of the connecting rods and caps.



### • THRUST BEARING

#### INSTALLATION:

Install the thrust bearings on the No.4 main journal with the grooved side toward the crankshaft.



### 3. PISTON

#### a. DISASSEMBLY / ASSEMBLY

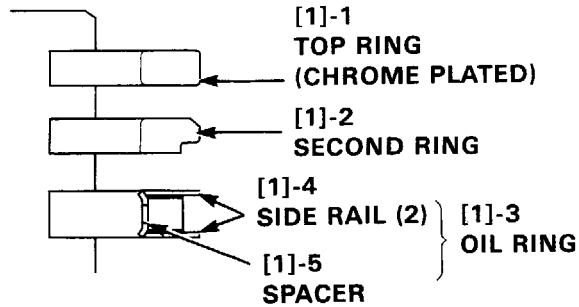
After installing the pistons and connecting rods in the cylinder block, secure the rods to the crankshaft.

#### [1] PISTON RINGS

**INSPECTION:** P.10-11 and 12

##### ASSEMBLY:

- Install with the maker mark facing upward as shown.
- Do not interchange the top ring and the second ring.
- After assembly, check for smooth movement of the piston ring.
- Stagger the piston ring end gaps 120° apart. Do not align with the piston pin.



#### [2] TOP RING

##### ASSEMBLY:

Chrome plated. Do not interchange with SECOND RING.

#### [3] MAKER MARK

#### [4] SECOND RING

#### [5] OIL RING

##### ASSEMBLY:

Space the side rail end gaps 15° apart right and left from the spacer end gap.

#### [8] PISTON PIN

##### DISASSEMBLY/

ASSEMBLY: P.10-7  
INSPECTION: P.10-12

#### [6] PISTON

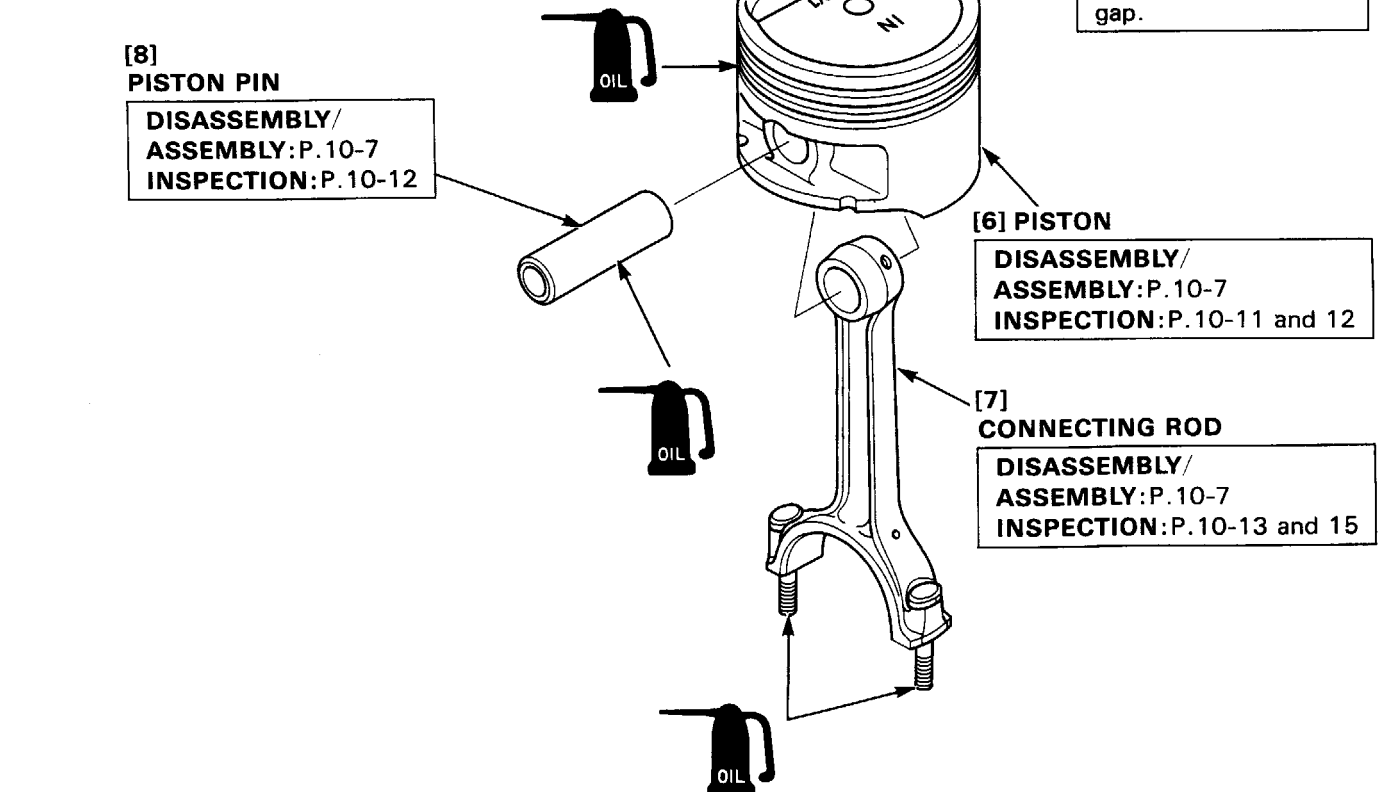
##### DISASSEMBLY/

ASSEMBLY: P.10-7  
INSPECTION: P.10-11 and 12

#### [7] CONNECTING ROD

##### DISASSEMBLY/

ASSEMBLY: P.10-7  
INSPECTION: P.10-13 and 15





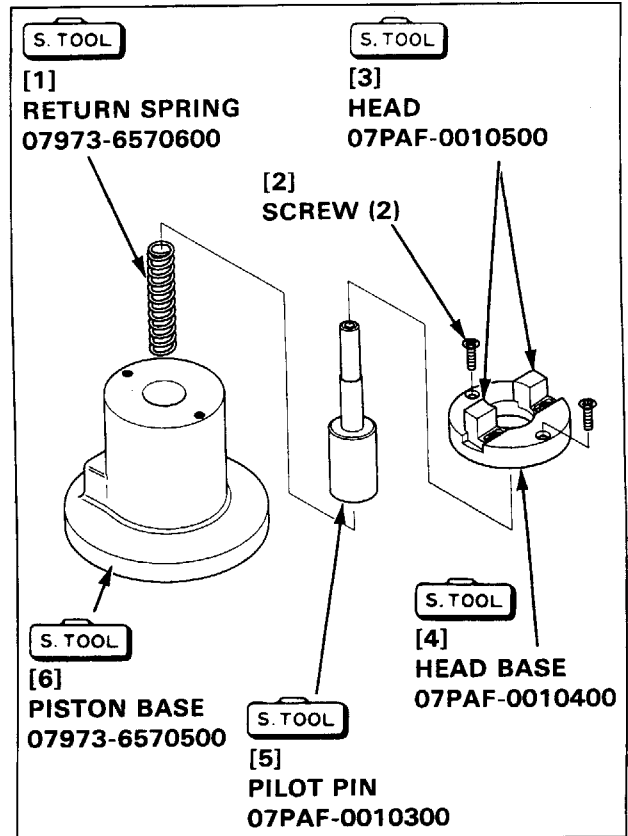
### • CONNECTING ROD / PISTON / PISTON PIN

#### DISASSEMBLY:

- 1) Set the return spring and pilot pin on the piston base.  
Set the two heads on the head base, and loosely tighten the screws.  
Set the head base on the piston base, and tighten with the mounting screws.

#### TOOLS:

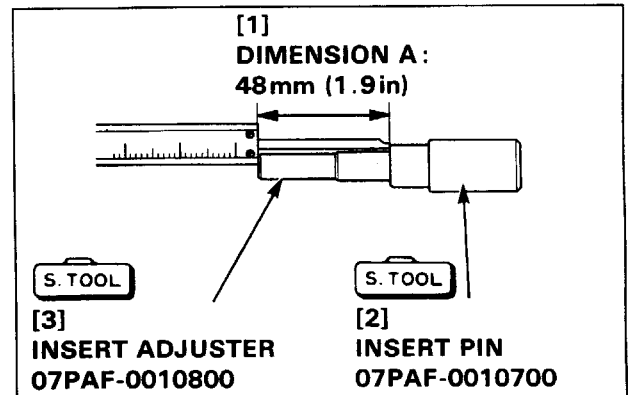
Piston base	07973-6570500
Return spring	07973-6570600
Pilot pin	07PAF-0010300
Head base	07PAF-0010400
Head	07PAF-0010500



- 2) Attach the insert adjuster to the insert pin, and adjust the dimension A to 48 mm (1.9 in) by turning the insert adjuster.

#### TOOLS:

Insert pin	07PAF-0010700
Insert adjuster	07PAF-0010800

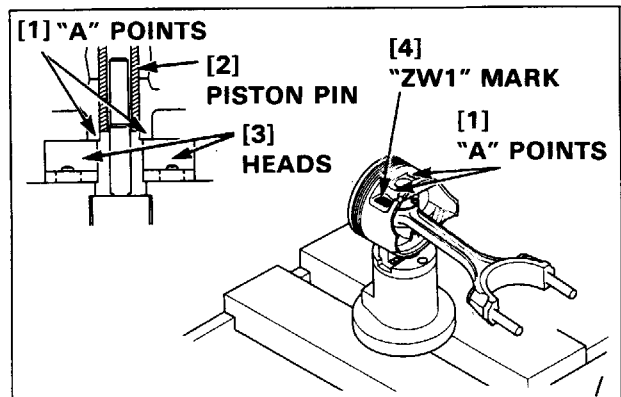


- 3) Attach the piston assembly to the special tool to adjust the head width.
- 4) Align the heads with the "A" points of the piston pin hole (opposite from the "ZW1" mark) as shown. Note that the right and left heads must be larger than the piston pin hole.
- 5) Remove the piston assembly with care not to allow the heads to come out of position.
- 6) Tighten the screws and secure the heads.

#### NOTE:

Align the "A" points with the opposite side from the "ZW1" mark by the piston pin hole.

- 7) Be sure that the right and left heads are set outside the piston pin hole with the "ZW1" mark by the piston pin hole facing up.



- 8) Set the pilot collar, 19 mm on the insert adjuster, and remove the piston pin from the connecting rod using a hydraulic press as shown.

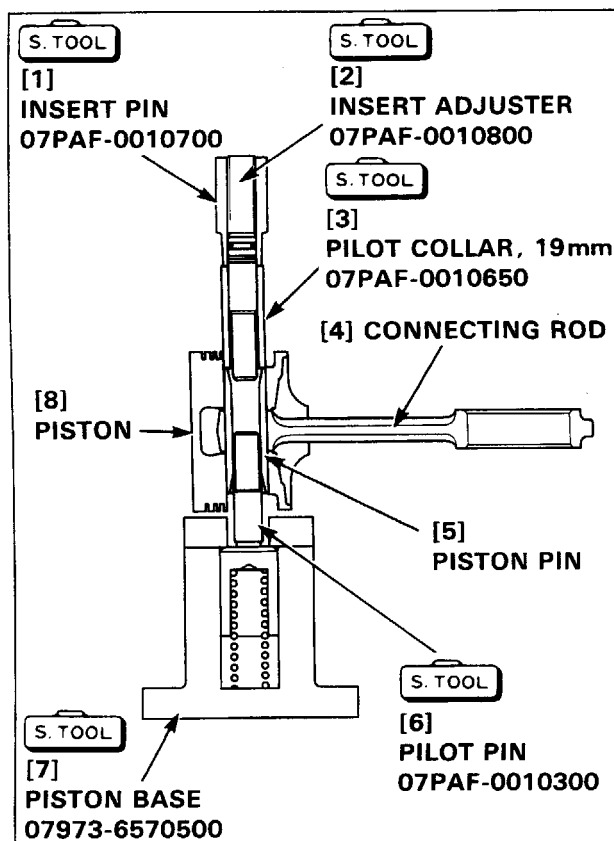
### NOTE:

- Make sure that the piston pin is not in contact with the head (special tool), and remove the piston pin.
- Apply engine oil to the outer surface of the pilot collar, 19 mm (special tool).

### TOOLS:

Insert pin  
Insert adjuster  
Pilot collar, 19 mm  
Pilot pin  
Piston base

07PAF-0010700  
07PAF-0010800  
07PAF-0010650  
07PAF-0010300  
07973-6570500



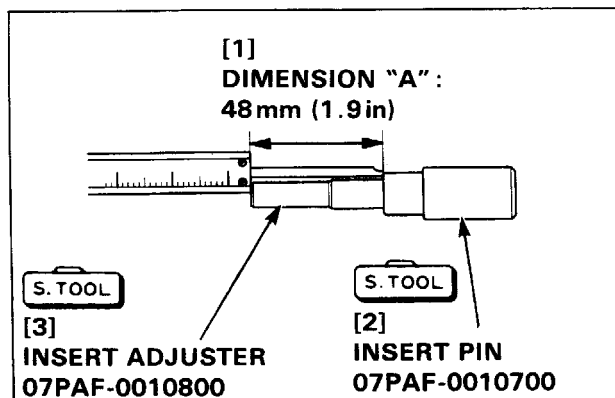
### ASSEMBLY:

- 1) Adjust dimension "A" of the insert adjuster to 48 mm (1.9 in) by turning the insert pin.

### TOOLS:

Insert pin  
Insert adjuster

07PAF-0010700  
07PAF-0010800

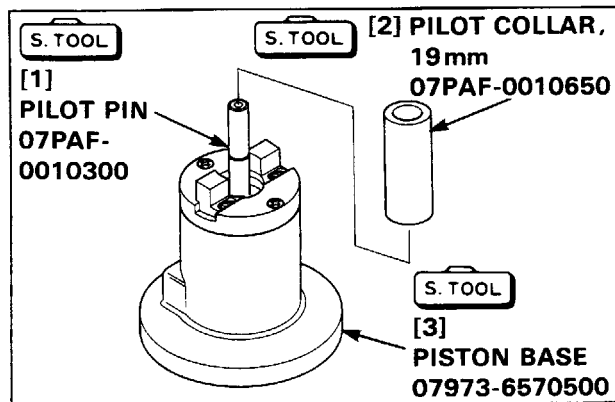


- 2) Set the pilot collar, 19 mm on the pilot pin of the piston base.

### TOOLS:

Pilot pin  
Pilot collar, 19 mm  
Piston base

07PAF-0010300  
07PAF-0010650  
07973-6570500

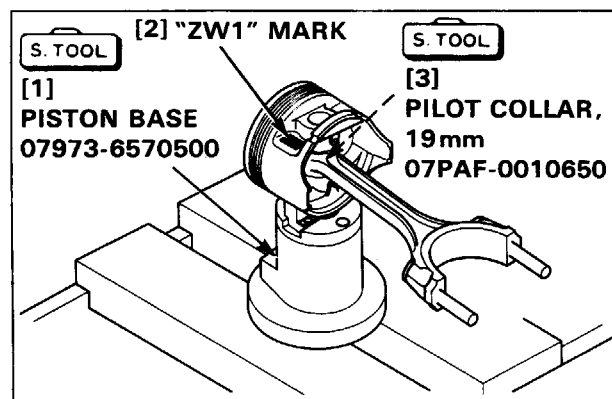
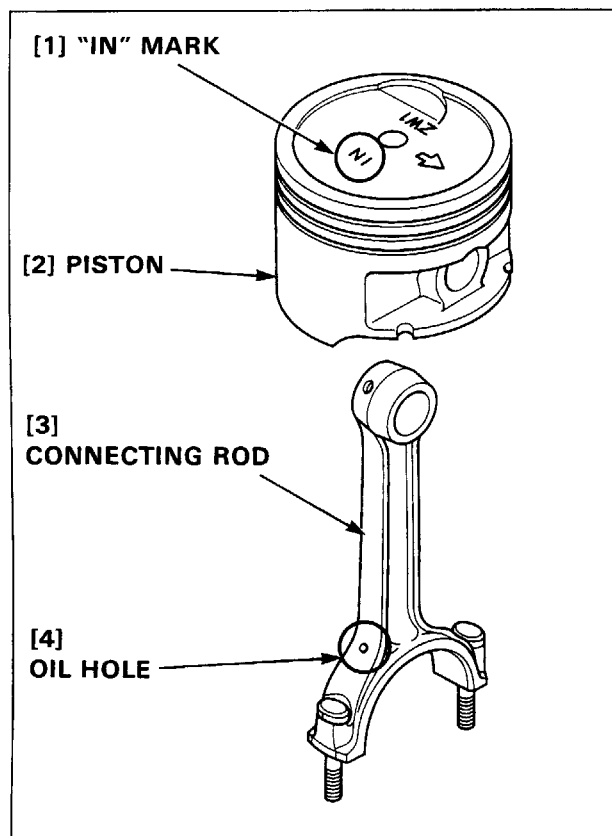


- 3) Place the rod and piston assembly onto the pilot collar, 19 mm, with the "IN" mark on the top of the piston and the connecting rod oil hole pointing in the same direction.
- 4) Be sure that the "ZW1" mark by the piston pin hole is facing up.

**TOOL:**

Pilot collar, 19 mm

07PAF-0010650



- 5) Make sure that the "A" points of the piston are securely set on the head (special tool).

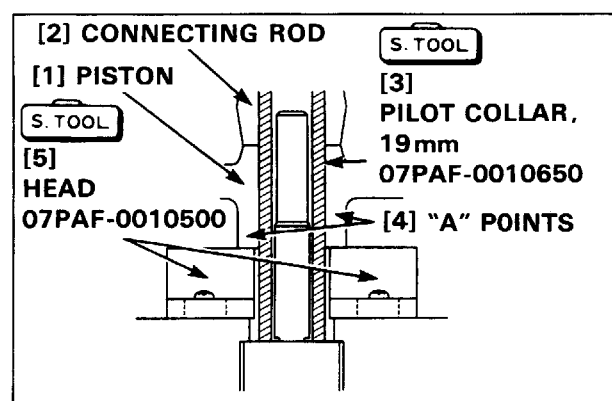
**TOOLS:**

Head

Pilot collar, 19 mm

07PAF-0010500

07PAF-0010650

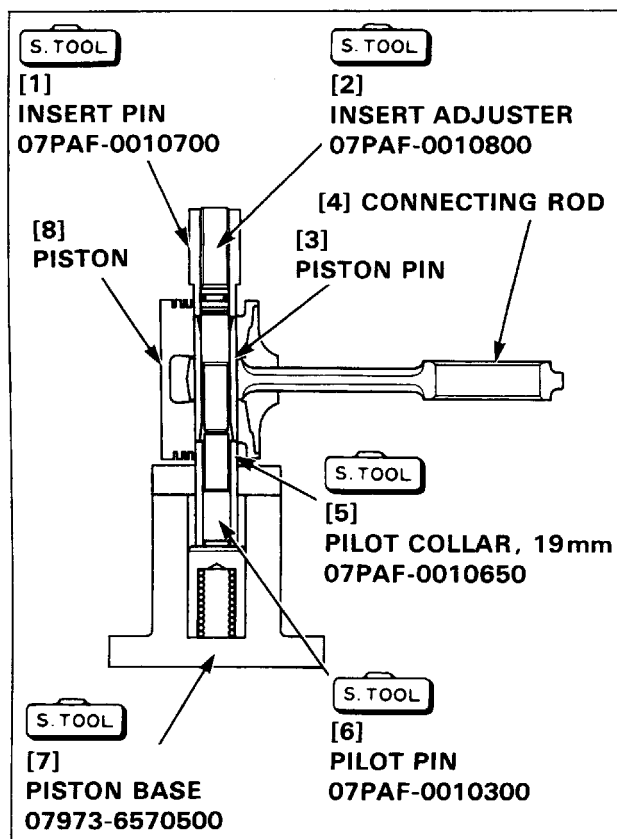


- 6) Apply engine oil to the outer surface of the piston pin, and insert it into the piston.  
Set the insert adjuster and insert pin on the piston pin.
- 7) Using a hydraulic press, insert the piston pin into the connecting rod until the pilot pin contacts the piston base (until pressure of the hydraulic press rises slightly).

**TOOLS:**

Insert pin  
Insert adjuster  
Pilot collar, 19 mm  
Pilot pin  
Piston base

07PAF-0010700  
07PAF-0010800  
07PAF-0010650  
07PAF-0010300  
07973-6570500



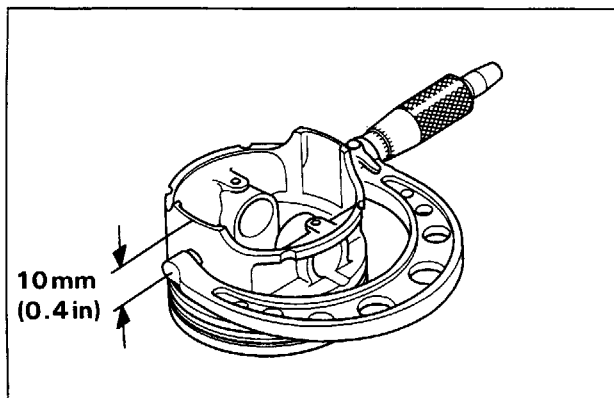
### 4. INSPECTION

For pistons, crankshaft, and cylinder inspection, measure the following. If needed, replace them.

#### • PISTON SKIRT O.D.

Measure and record the piston O.D. at a point 10 mm (0.4 in) from the bottom, and 90° to the piston pin bore.

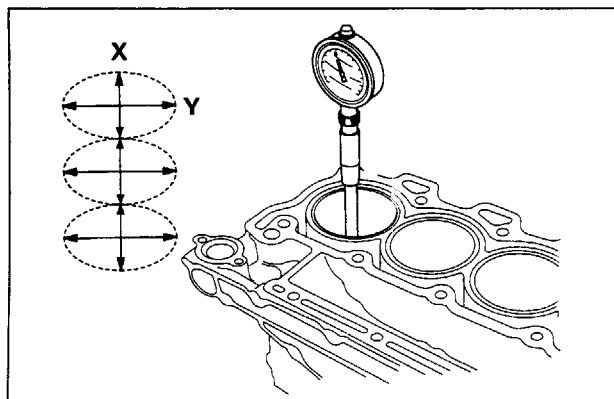
STANDARD	SERVICE LIMIT
74.980 – 74.990 mm (2.9520 – 2.9524 in)	74.92 mm (2.950 in)



#### • CYLINDER I.D.

Measure and record the cylinder I.D. at three levels in both X and Y axis. Take the maximum reading to determine the cylinder wear.

STANDARD	SERVICE LIMIT
75.000 – 75.015 mm (2.9528 – 2.9533 in)	75.055 mm (2.9549 in)

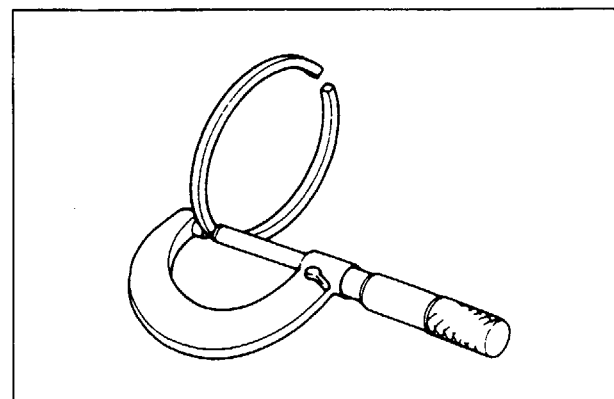


#### • PISTON-TO-CYLINDER CLEARANCE

STANDARD	SERVICE LIMIT
0.010 – 0.035 mm (0.0004 – 0.0013 in)	0.1 mm (0.004 in)

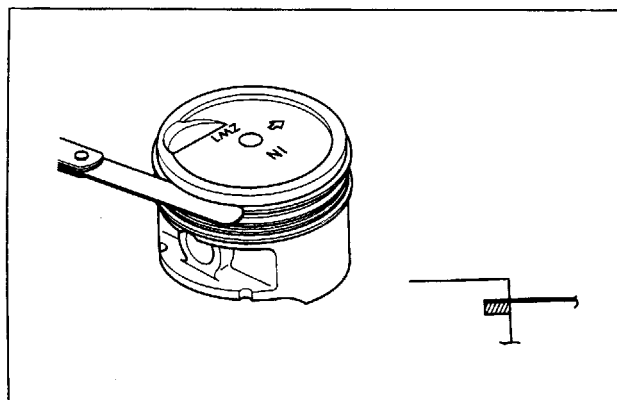
#### • PISTON RING THICKNESS

	STANDARD	SERVICE LIMIT
TOP	1.170 – 1.190 mm (0.0461 – 0.0469 in)	1.08 mm (0.043 in)
SECOND	1.475 – 1.490 mm (0.0581 – 0.0587 in)	1.38 mm (0.054 in)



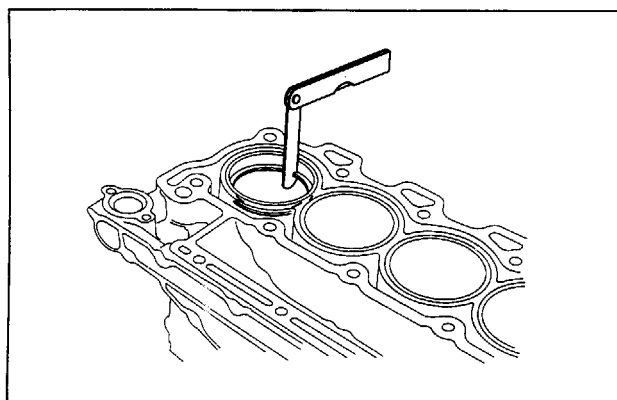
### • PISTON RING SIDE CLEARANCE

	STANDARD	SERVICE LIMIT
TOP	0.030 – 0.060 mm (0.0012 – 0.0024 in)	0.1 mm (0.004 in)
SECOND	0.030 – 0.055 mm (0.0012 – 0.0022 in)	0.1 mm (0.004 in)
OIL	0.045 – 0.145 mm (0.0018 – 0.0057 in)	0.2 mm (0.008 in)



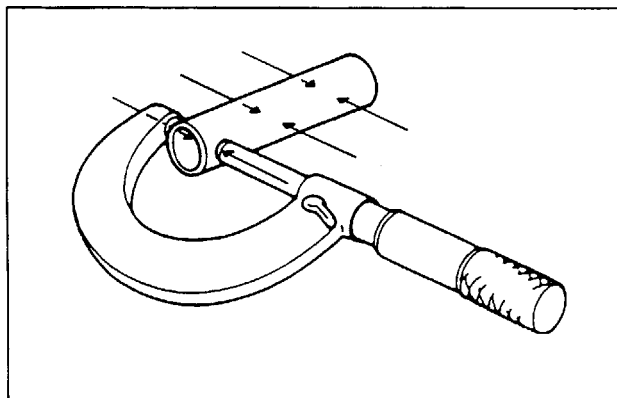
### • PISTON RING END GAP

	STANDARD	SERVICE LIMIT
TOP	0.15 – 0.30 mm (0.006 – 0.012 in)	0.6 mm (0.024 in)
SECOND	0.15 – 0.30 mm (0.006 – 0.012 in)	0.6 mm (0.024 in)
OIL	0.20 – 0.80 mm (0.008 – 0.031 in)	0.9 mm (0.035 in)



### • PISTON PIN O.D.

STANDARD	SERVICE LIMIT
18.996 – 19.000 mm (0.7479 – 0.7480 in)	18.97 mm (0.747 in)

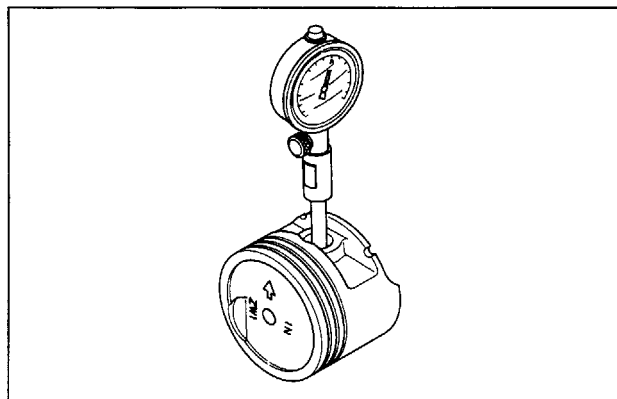


### • PISTON PIN BORE I.D.

STANDARD	19.010 – 19.016 mm (0.7484 – 0.7487 in)
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### • PISTON PIN-TO-PIN BORE CLEARANCE

STANDARD	SERVICE LIMIT
0.010 – 0.020 mm (0.0004 – 0.0008 in)	Replace if exceeding the STANDARD value.

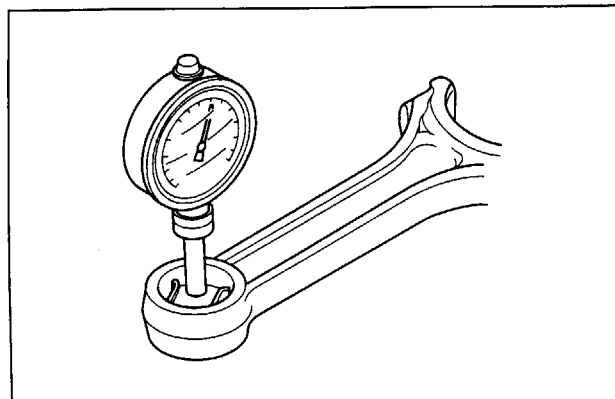


### • CONNECTING ROD SMALL END I.D.

STANDARD	18.960 – 18.980 mm (0.7465 – 0.7472 in)
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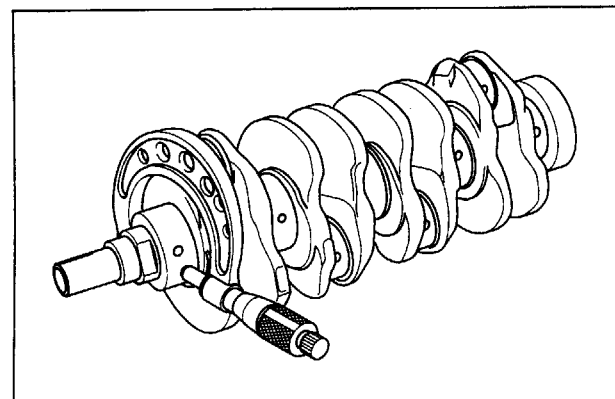
### • CONNECTING ROD SMALL END PRESS FITTING CLEARANCE

STANDARD	SERVICE LIMIT
0.016 – 0.040 mm (0.0006 – 0.0016 in)	Replace if exceeding the STANDARD value.



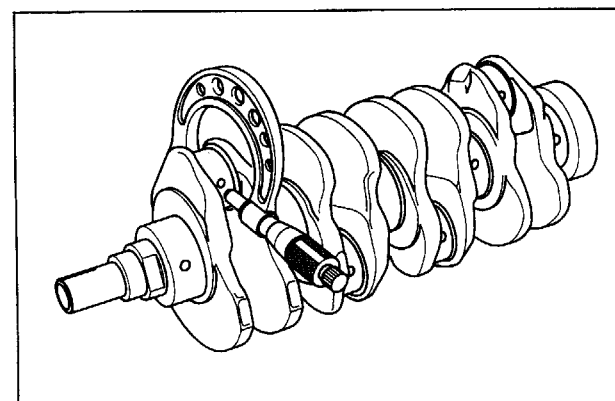
### • CRANKSHAFT MAIN JOURNAL O.D.

STANDARD	SERVICE LIMIT
54.976 – 55.000 mm (2.1644 – 2.1654 in)	54.96 mm (2.164 in)



### • CRANK PIN O.D.

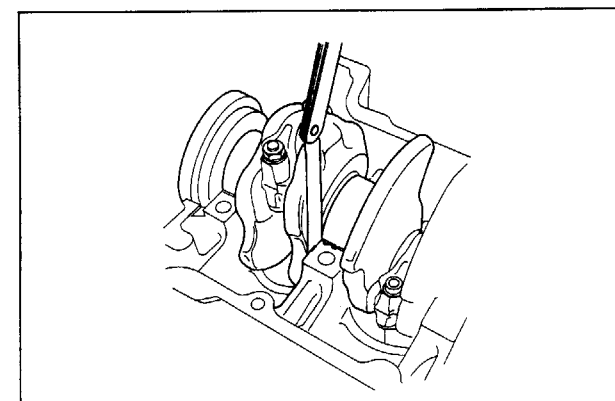
STANDARD	SERVICE LIMIT
44.976 – 45.000 mm (1.7707 – 1.7717 in)	44.96 mm (1.770 in)



### • CRANKSHAFT SIDE CLEARANCE

Measure the clearances with a feeler gauge.

STANDARD	SERVICE LIMIT
0.10 – 0.35 mm (0.004 – 0.014 in)	0.45 mm (0.018 in)

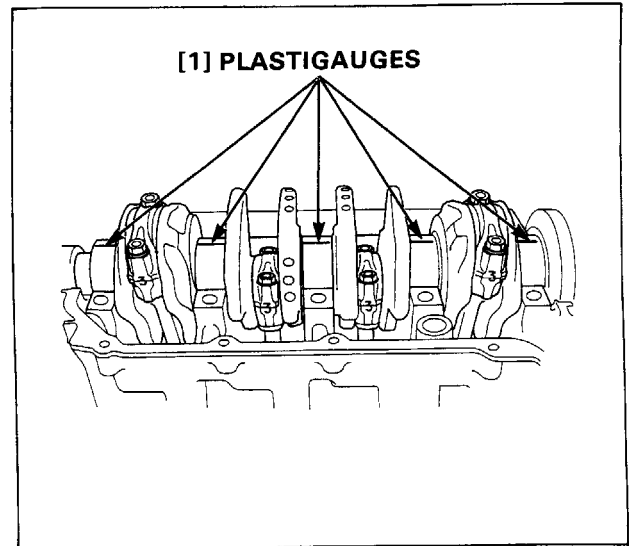


### • CRANKSHAFT MAIN BEARING OIL CLEARANCE

- 1) Place the crankshaft main bearings on the crankcase and cylinder block. Wipe oil off the main bearing surface.
- 2) Wipe oil off the crankshaft main journal and place the crankshaft on the cylinder block.  
Install the 31 x 46 x 7 mm oil seal, 98 x 80 x 10 mm oil seal and two thrust washers on the crankshaft.
- 3) Place the plastigauges on the main journal of each crankshaft. Install the crankcase.

#### NOTE:

- Align the 18 x 22 mm dowel pins and the ten 12 x 18 mm dowel pins between the crankcase and cylinder block securely.
- Set the plastigauges axially.



- 4) Apply oil to the bolts, and tighten the twenty two bolts in the numbered sequence shown.
- 5) Tighten the two 8 x 35 mm flange bolts and ten 8 x 50 mm flange bolts to the specified torque (torque method), and tighten the ten 10 x 112 mm bolt-washers with snag torque (angle method) in the numbered sequence shown.
- 6) After tightening the ten 10 x 112 mm bolt-washers with snag torque, mark on the bolts and the crankcase, and tighten the ten bolts an additional 40° in the numbered sequence shown.

#### TORQUE (TORQUE METHOD):

26 N·m (2.7kgf·m, 20 lbf·ft) [8 x 35 mm, 8 x 50 mm flange bolt]

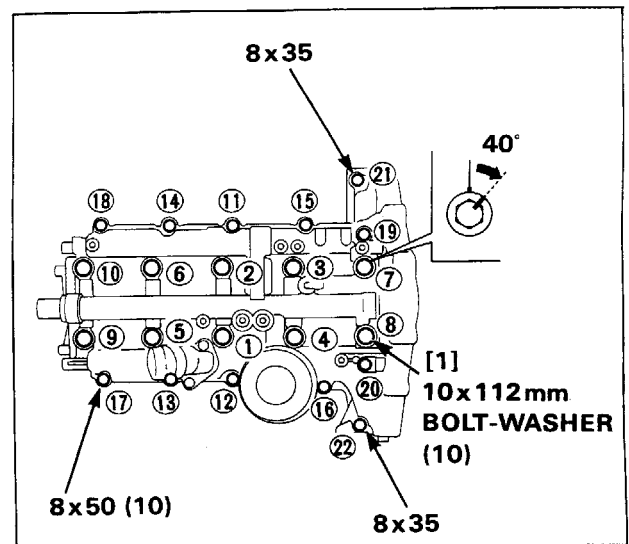
#### SNAG TORQUE (ANGLE METHOD):

25 N·m (2.5 kgf·m, 18 lbf·ft) + 40° [10 x 112 mm bolt-washer only]

If tightening the 10 x 112 mm bolt-washers to the specified torque (torque method), tighten to 44 N·m (4.5 kgf·m, 33 lbf·ft).

#### NOTE:

Tighten the bolts while holding the crankshaft to keep it from turning.

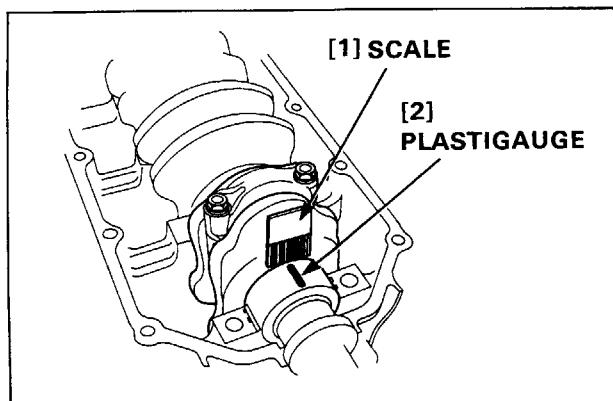




- 7) Remove the crankcase and measure the plastigauge with the scale.

STANDARD	SERVICE LIMIT
0.025 – 0.043 mm (0.0010 – 0.0017 in)	0.06 mm (0.0024 in)

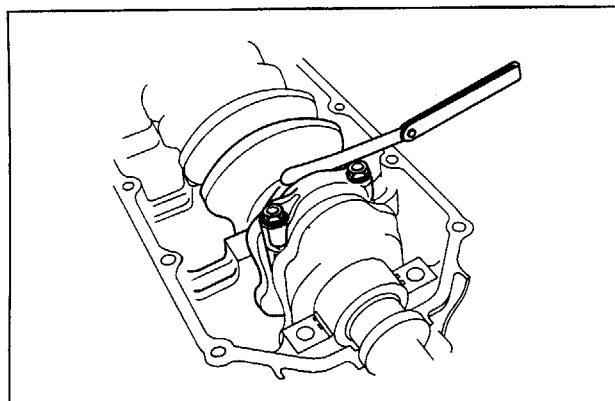
If the measurement exceeds the service limit, check the crankcase and cylinder block's main bearing I.D., and check the crankshaft main journal O.D. If they are OK, replace with the undersize bearing by referring to the main bearing selection table and recheck the oil clearance.



### • CONNECTING ROD BIG END AXIAL CLEARANCE

Measure the clearances with a feeler gauge.

STANDARD	SERVICE LIMIT
0.15 – 0.30 mm (0.006 – 0.012 in)	0.4 mm (0.02 in)



### • CONNECTING ROD BIG END OIL CLEARANCE

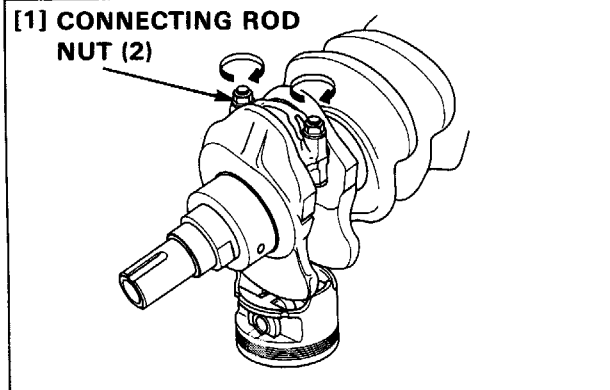
- 1) Wipe oil off the crank pin and connecting rod bearing mating surface.
- 2) Place the plastigauge on the crank pin. Set the connecting rod and cap, and tighten the connecting rod nut to the specified torque.

**TORQUE: 31 N·m (3.2 kgf·m, 23 lbf·ft)**

NOTE:

- Place the plastigauge axially.
- Tighten the two nuts equally while holding the crankshaft to keep it from turning.

[1] CONNECTING ROD NUT (2)

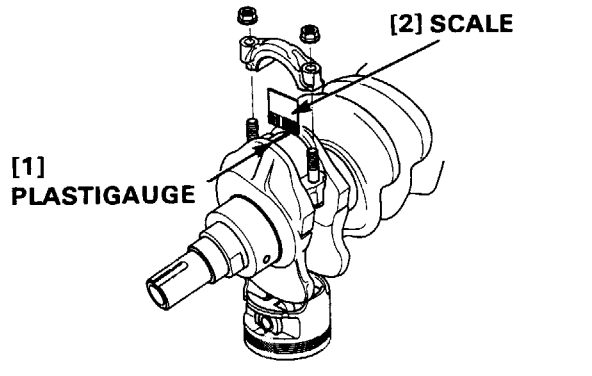


- 3) Remove the connecting rod cap and measure the plastigauge with the scale.

STANDARD	SERVICE LIMIT
0.020 – 0.038 mm (0.0008 – 0.0015 in)	0.05 mm (0.0019 in)

- 4) If the measurement exceeds the service limit, check the connecting rod big end I.D. and crank pin O.D. If they are OK, replace with the undersize bearing by referring to the connecting rod bearing selection table (P. 10-17) and recheck the oil clearance.

[2] SCALE



## 5. BEARING SELECTION

### a. CRANKSHAFT MAIN BEARING

- 1) Record the crankshaft main journal O.D. code numbers (or measure the main journal O.D.).

Main journal O.D. code numbers (stamped) are for the No.1 and the subsequent number journals when viewed from the timing belt driven pulley side.

- 2) Record the crankcase I.D. code letters.

Crankcase I.D. code letters (stamped) are for the No.1 and the subsequent number journals when viewed from the lowermost code.

- 3) Cross reference the main journal O.D. code and crankcase I.D. code to determine the replacement bearing color code.

STANDARD OIL CLEARANCE	0.025 – 0.043 mm (0.0010 – 0.0017 in)
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Unit: mm (in)

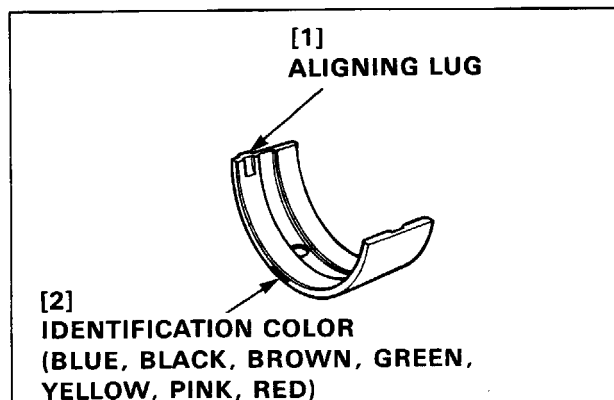
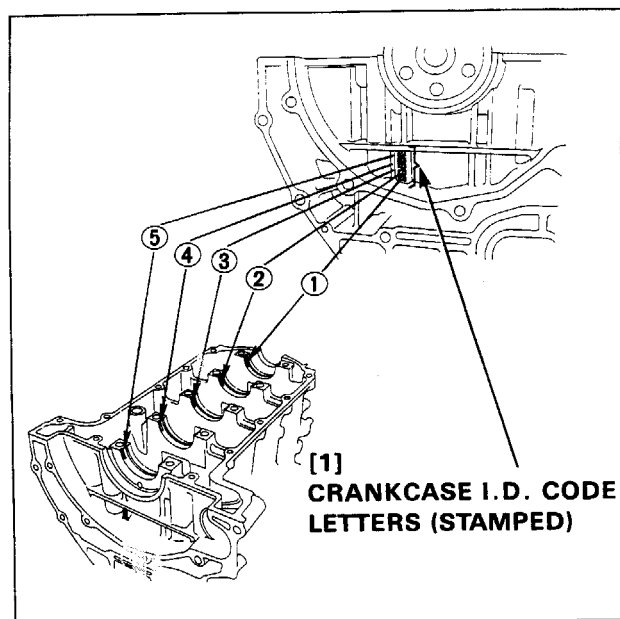
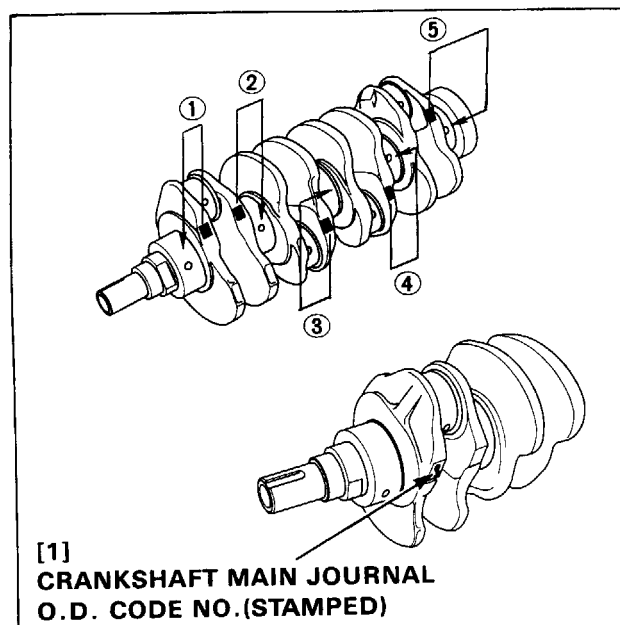
Crankcase I.D. 59ø		Mark A	Mark B	Mark C	Mark D
		-0.006 (-0.0002) -Less than 0	0- Less than 0.006 (0.0002)	0.006 (0.0002)- Less than 0.012 (0.0005)	0.012 (0.0005)- Less than 0.018 (0.0007)
Crankshaft O.D. 55ø					
Mark 1	Less than 0 - -0.006 (-0.0002)	RED	PINK	YELLOW	GREEN
Mark 2	Less than -0.006 (-0.0002)- -0.012 (0.0005)	PINK	YELLOW	GREEN	BROWN
Mark 3	Less than -0.012 (-0.0005)- -0.018 (-0.0007)	YELLOW	GREEN	BROWN	BLACK
Mark 4	Less than -0.018 (-0.0007)- -0.024 (-0.0009)	GREEN	BROWN	BLACK	BLUE

Note that the bearings are selected so the oil clearance is in the range between 0.025 – 0.043 mm (0.0010 – 0.0017 in).

Be sure to measure the oil clearance after installing the selected bearing(s).

- 4) Apply molybdenum disulfide oil to the crankshaft mating surface. Do not apply the oil to the crankcase mating surface.

Align the bearing lug with the grooves in the crankcase and cylinder block, and assemble carefully to avoid damaging the sliding surface.



### d. CONNECTING ROD BEARING

- 1) Record the crank pin O.D. code letters or measure the crank pin O.D.

Crank pin O.D. code letters (stamped) are for the No.1 and the subsequent number crank pins when viewed from the timing belt driven pulley side.

- 2) Record the connecting rod I.D. code numbers or measure the connecting rod big end I.D.

Connecting rod I.D. code numbers (stamped) are for the No.1 and the subsequent number journals when viewed from the timing belt driven pulley side.

- 3) Cross reference the crank pin O.D. code and connecting rod I.D. code and determine the replacement bearing color code from the table below.

STANDARD OIL CLEARANCE	0.020 – 0.038 mm (0.0008 – 0.0015 in)
------------------------	--

Unit: mm (in)

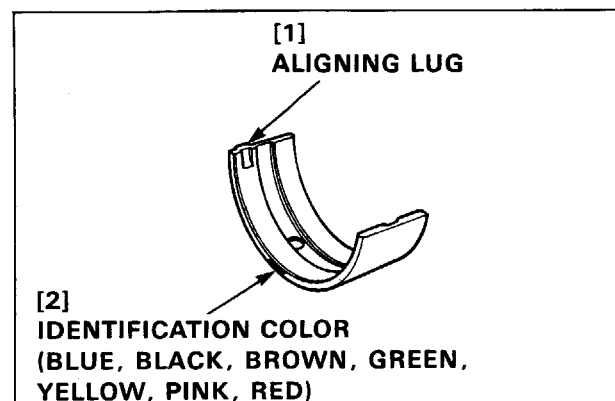
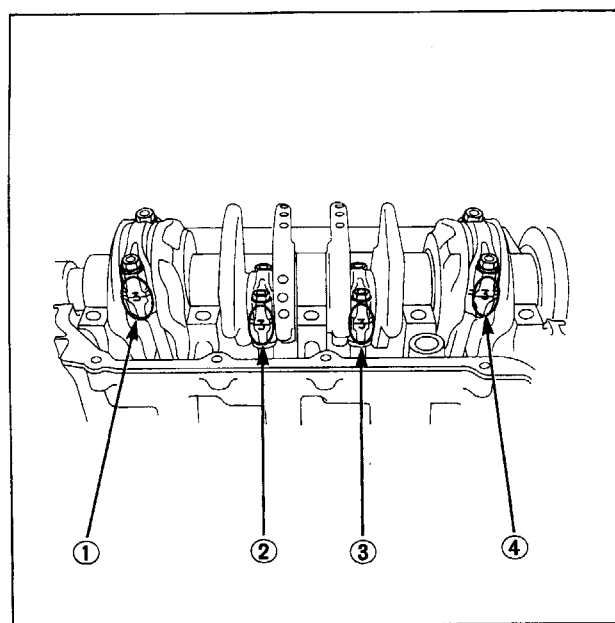
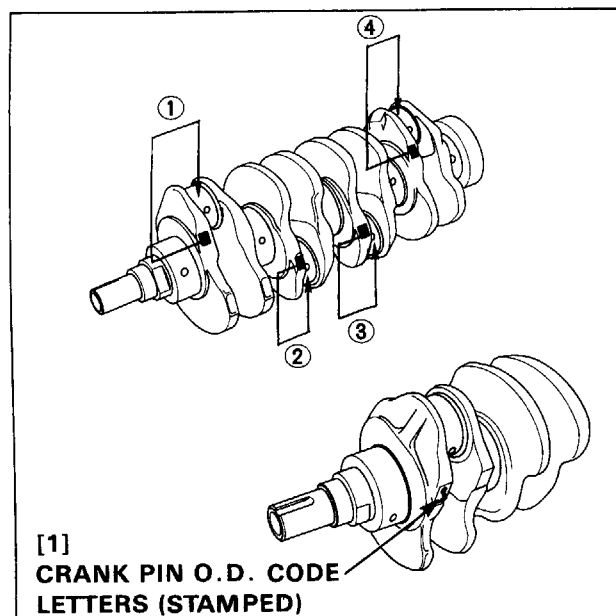
Crank pin O.D. 45Ø		Mark A	Mark B	Mark C	Mark D
Connecting rod I.D. 48Ø		Less than 0- -0.006 (-0.0002)	Less than -0.006 (-0.0002) -0.012 (-0.0005)	Less than -0.012 (0.0005) -0.018 (-0.0007)	Less than -0.018 (-0.0007) -0.024 (-0.0009)
Mark 1	0 – Less than 0.006 (0.0002)	RED	PINK	YELLOW	GREEN
Mark 2	0.006 (0.0002)– Less than 0.012 (0.0005)	PINK	YELLOW	GREEN	BROWN
Mark 3	0.012 (0.0005)– Less than 0.018 (0.0007)	YELLOW	GREEN	BROWN	BLACK
Mark 4	0.018 (0.0007)– Less than 0.024 (0.0009)	GREEN	BROWN	BLACK	BLUE

Note that the bearings are selected so the oil clearance is in the range between 0.020 – 0.038 mm (0.0008 – 0.0015 in).

Be sure to measure the oil clearance after installing the selected bearing (s).

- 4) Apply engine oil to the outer surface of the bearing.

Align the bearing lug with the cutout in the connecting rod or cap and install carefully to avoid damaging the sliding surface.



# 11. PROPELLER/GEAR CASE/ EXTENSION CASE

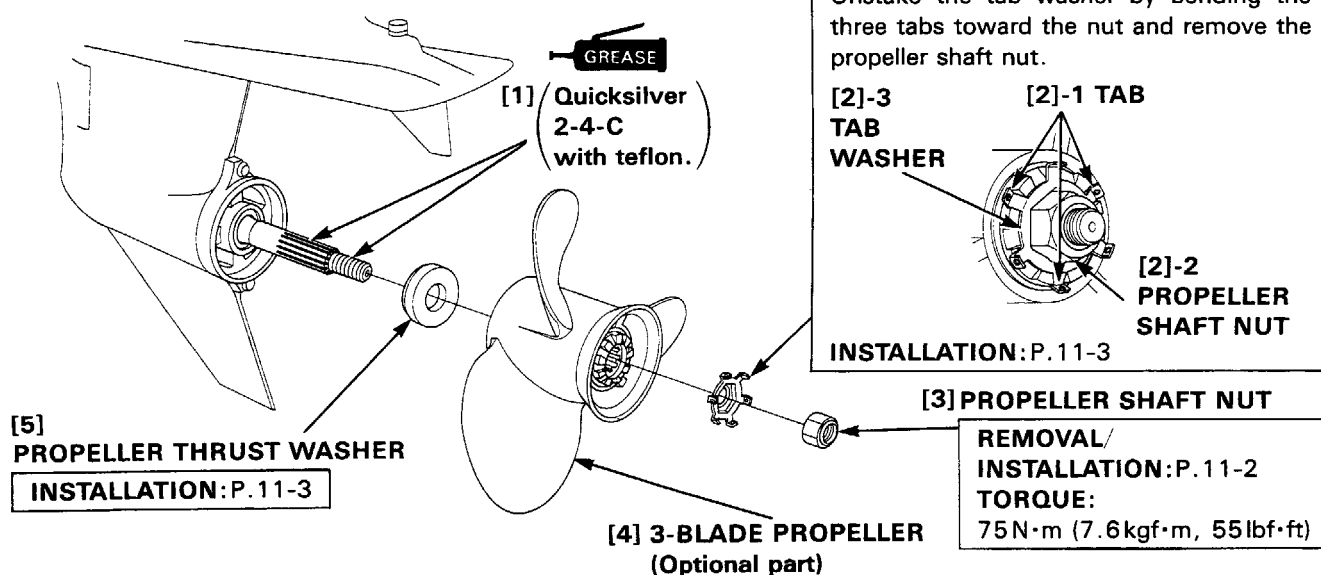
**HONDA**  
**BF75A·90A**

- |  |                                  |
|--|----------------------------------|
| 1. PROPELLER / PROPELLER SHAFT HOLDER ASSEMBLY | 6. SHIM SELECTION                |
| 2. PROPELLER SHAFT / PROPELLER SHAFT HOLDER    | 7. SHIM POSITION                 |
| 3. GEAR CASE ASSEMBLY                          | 8. BACKLASH ADJUSTMENT           |
| 4. WATER PUMP                                  | 9. GEAR CASE PRESSURE TEST       |
| 5. VERTICAL SHAFT / BEVEL GEAR                 | 10. LOWER RUBBER MOTOR MOUNT     |
|  | 11. EXTENSION CASE / UNDER COVER |

## 1. PROPELLER / PROPELLER SHAFT HOLDER ASSEMBLY

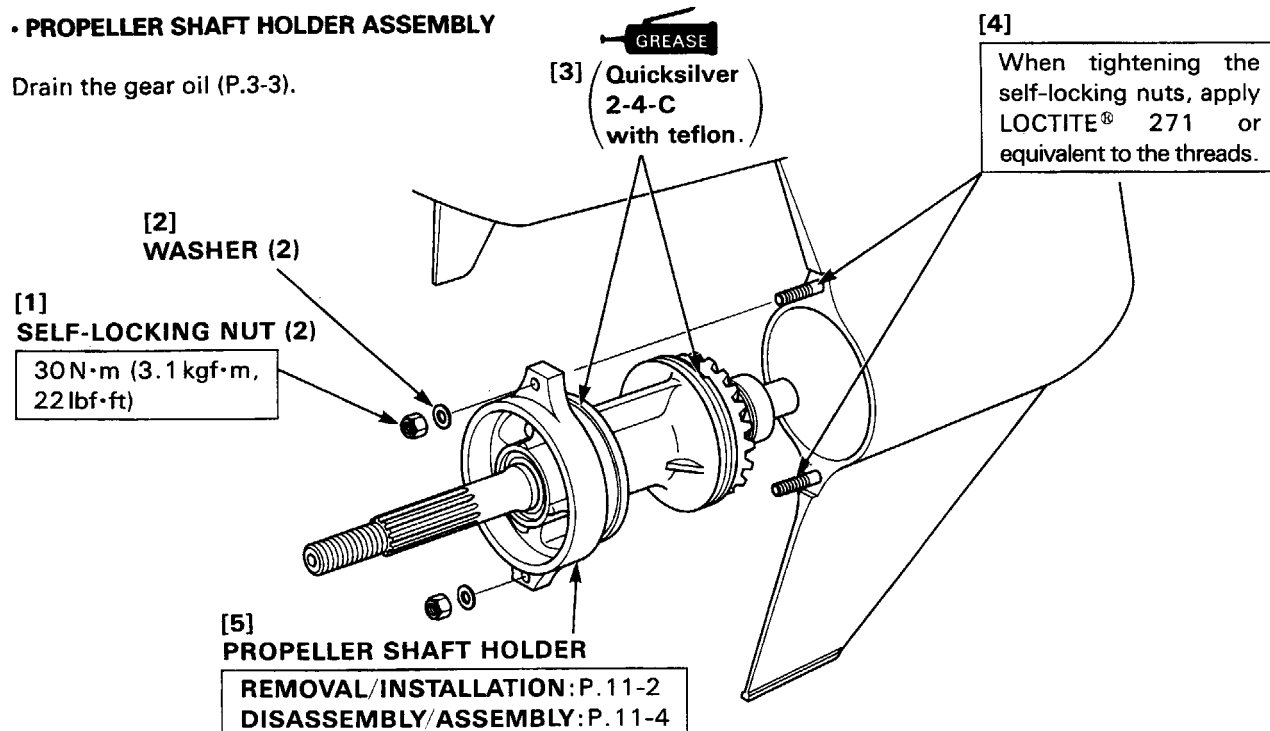
### a. REMOVAL / INSTALLATION

#### • PROPELLER



#### • PROPELLER SHAFT HOLDER ASSEMBLY

Drain the gear oil (P.3-3).

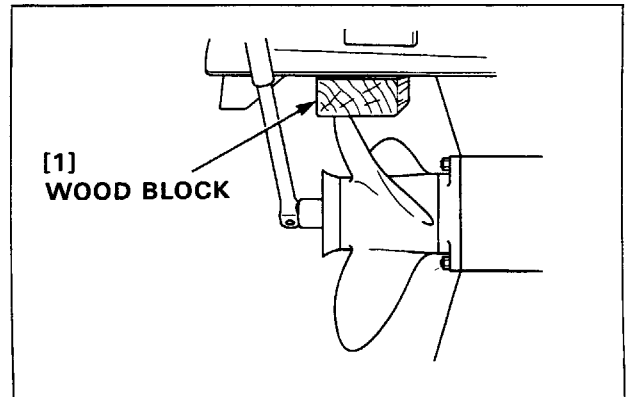


### • PROPELLER SHAFT NUT

#### REMOVAL / INSTALLATION :

Place a block of wood as shown to prevent the propeller from rotating and to protect the hands during removal of the nut. Remove / install the propeller shaft nut.

**TORQUE : 75 N·m (7.6 kgf·m, 55 lbf·ft)**



### • PROPELLER SHAFT HOLDER ASSEMBLY

#### REMOVAL:

- 1) Adjust the outboard motor so that the propeller shaft is held at the horizontal position.
- 2) Set the propeller thrust washer on the propeller shaft.
- 3) Hook the jaws of the special tool on the inside of the propeller shaft holder and set the special tool as shown.
- 4) Tighten the special tool (puller bolt) and remove the propeller shaft holder assembly.

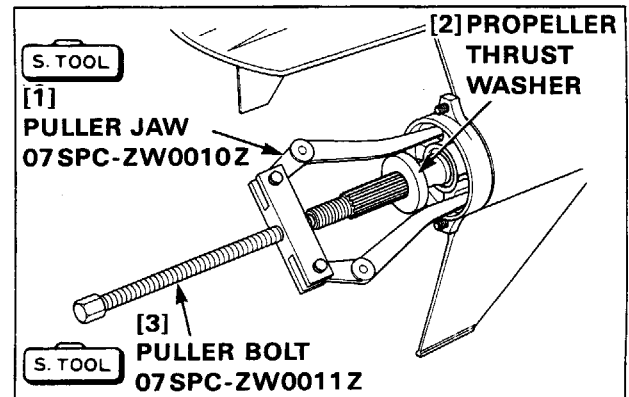
#### NOTE:

Remove the propeller shaft assembly from the gear case with care not to lose the shift slider and the three steel balls.

#### TOOLS :

Puller jaw  
Puller bolt

07SPC - ZW0010Z  
07SPC - ZW0011Z

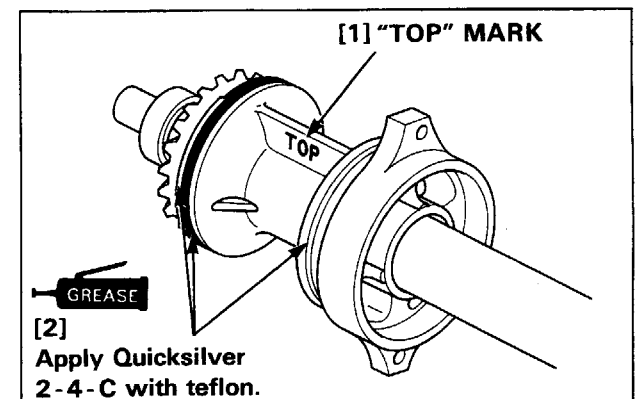
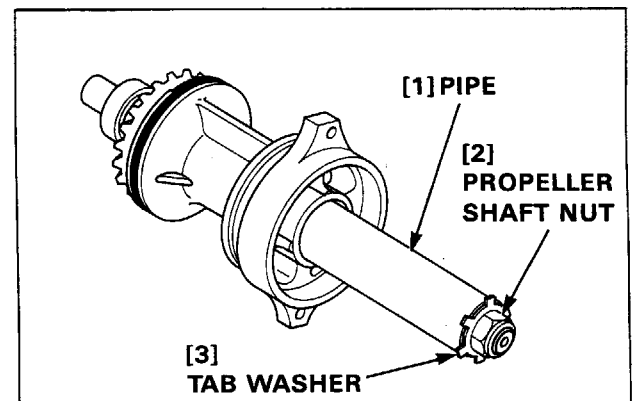


#### INSTALLATION:

- 1) Prepare a pipe with the following specifications.  
**Length : 152 mm (6.0 in)**  
**I. D. : 32 - 38 mm (1.3 - 1.5 in)**
- 2) Set the pipe on the propeller shaft as shown. Set the tab washer and propeller shaft nut on the propeller shaft.
- 3) Apply Quicksilver 2-4-C with teflon to the propeller shaft holder's O-ring and the surface of the gear case where contacts the ground. Install the propeller shaft holder on the gear case with the "TOP" mark facing up.

#### NOTE:

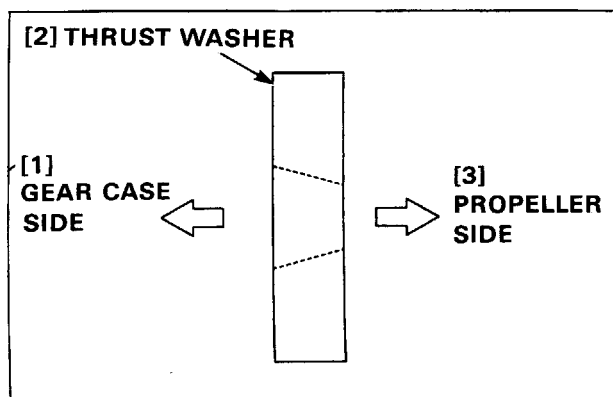
If the propeller shaft holder assembly is installed without using the pipe, install on the gear case while pulling the propeller shaft and pushing the holder in. This will prevent the thrust bearing and thrust washer from coming out of position.



### • PROPELLER THRUST WASHER

#### INSTALLATION :

Install the thrust washer with the wide side of the tapered hole toward the gear case.



### • TAB WASHER

#### INSTALLATION :

- 1) Apply Quicksilver 2-4-C with teflon to the threads and spline of the propeller shaft.

Assemble the propeller shaft nut with a new tab washer, and install the propeller shaft nut on the propeller.

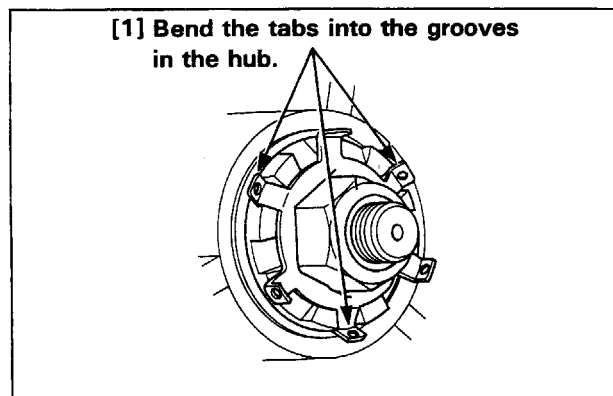
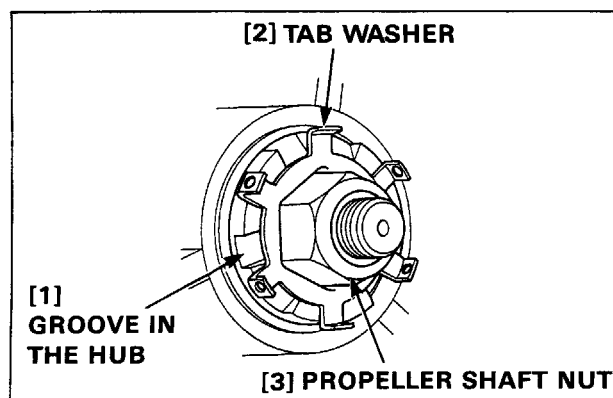
- 2) Tighten the propeller shaft nut to the specified torque.

Be sure that the three tabs of the tab washer align with the grooves in the propeller hub.

**TORQUE : 75 N·m (7.6 kgf·m, 55 lbf·ft)**

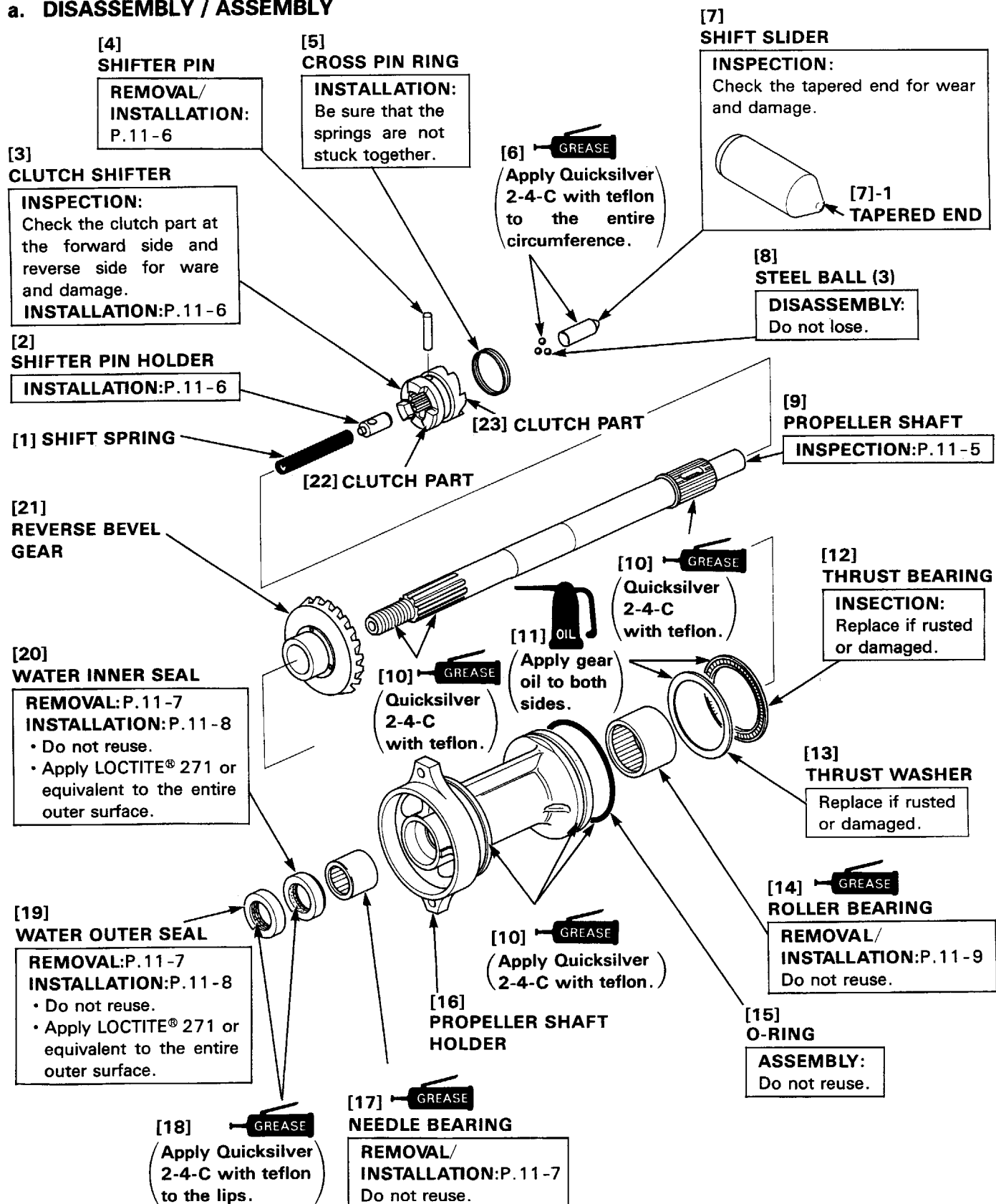
- 3) Bend three tabs of the tab washer into the grooves of the propeller hub.

If three tabs do not align with the grooves, tighten the nut a little more to obtain alignment and then bend the tabs.



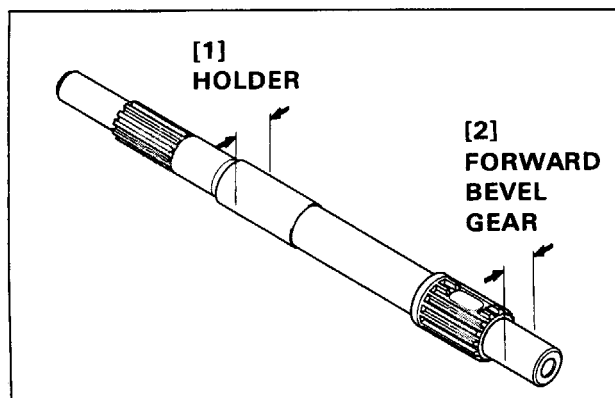
## 2. PROPELLER SHAFT / PROPELLER SHAFT HOLDER

### a. DISASSEMBLY / ASSEMBLY

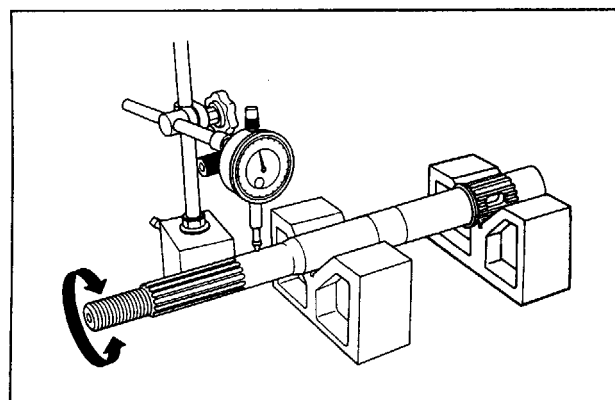


**b. INSPECTION****• PROPELLER SHAFT O. D. (At needle bearing)**

	STANDARD	SERVICE LIMIT
Forward bevel gear	25.390 – 25.425 mm (0.9996 – 1.0010 in)	25.369 mm (0.9988 in)
Holder	30.149 – 30.162 mm (1.1870 – 1.1875 in)	30.128 mm (1.1861 in)

**• PROPELLER SHAFT RUNOUT**

SERVICE LIMIT	0.15 mm (0.006 in) Min.
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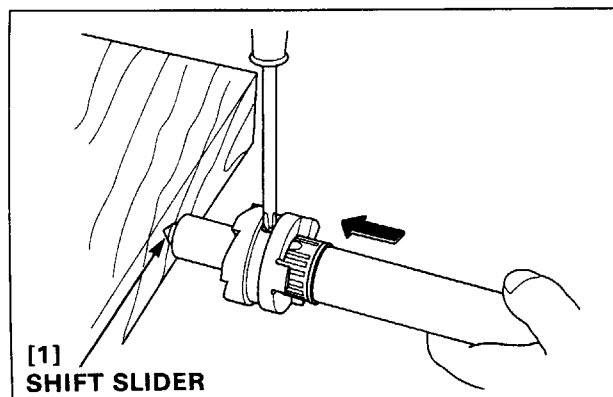




### • SHIFTER PIN

#### REMOVAL:

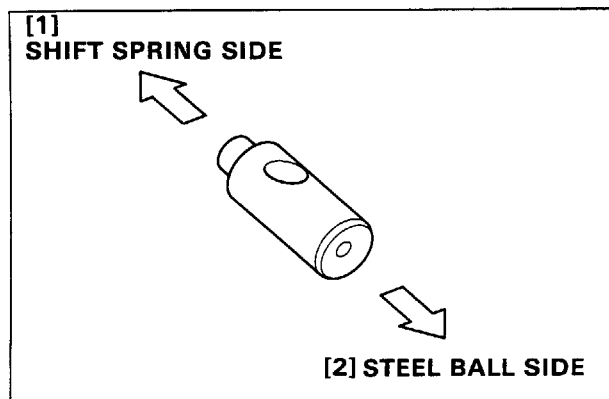
- 1) Remove the cross pin ring.
- 2) With the shift slider pushed in, remove the shifter pin using a screw driver or equivalent tool.



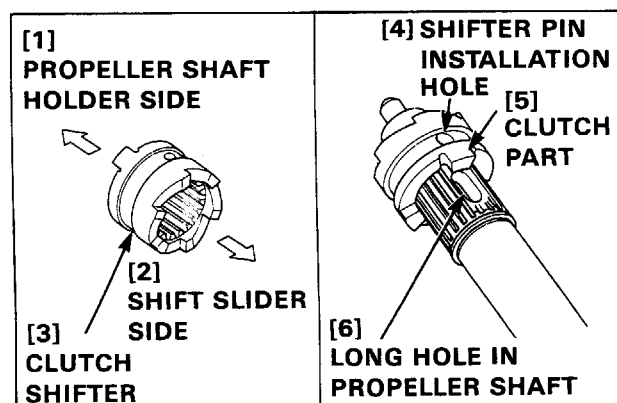
### • SHIFTER PIN HOLDER / CLUTCH SHIFTER / SHIFTER PIN

#### INSTALLATION :

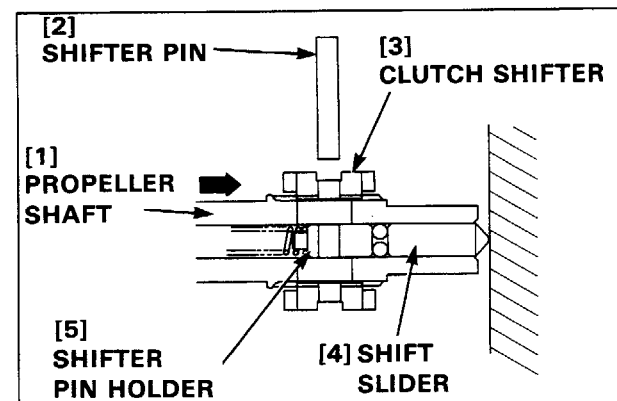
- 1) Set the shift spring on the propeller shaft.
- Note the installation direction of the shifter pin holder, and set the shifter pin holder on the propeller shaft.



- 2) Apply Quicksilver 2-4-C with teflon to the entire surface of the three steel balls and shift slider, and assemble them with the propeller shaft.
- 3) Assemble the clutch shifter and the propeller shaft by aligning the long hole in the propeller shaft with the shifter pin hole (hole by the clutch part). Note the installation direction of the clutch shifter.



- 4) Pushing the propeller shaft in the direction of the arrow shown in the drawing, align the clutch shifter hole and the hole in the shifter pin holder, and install the shifter pin.



### • WATER OUTER SEAL / WATER INNER SEAL / NEEDLE BEARING

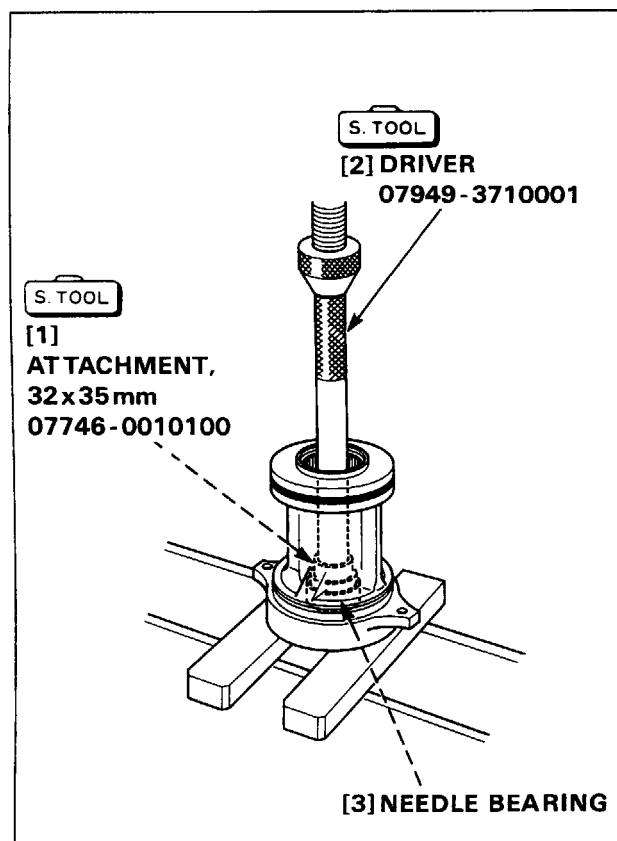
#### REMOVAL :

Using a hydraulic press and the special tools as shown, remove the water outer seal, water inner seal and needle bearing as a set.

#### TOOLS:

Driver  
Attachment, 32 x 35 mm

07949 - 3710001  
07746 - 0010100



#### INSTALLATION :

<Needle bearing>

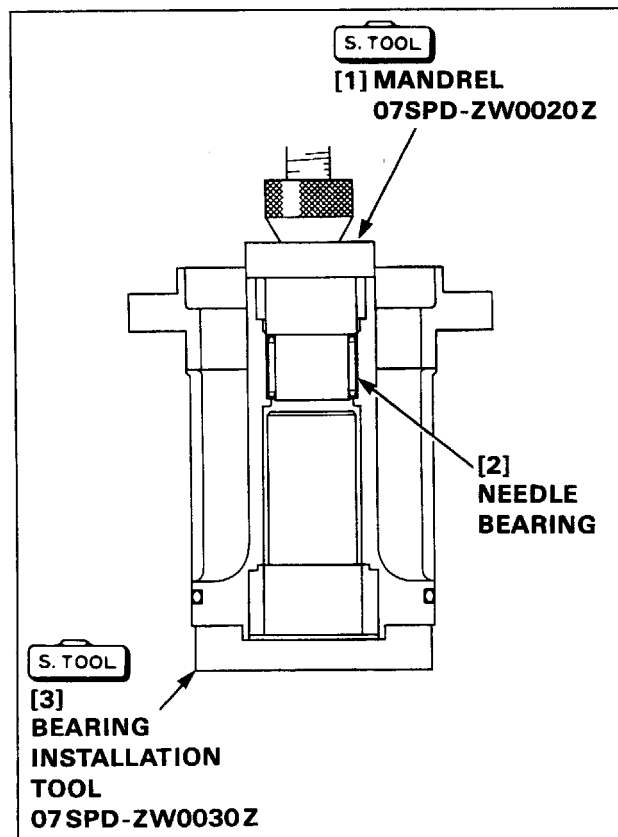
- 1) Set the special tool (bearing installation tool) on the reverse bevel gear installation side.
- 2) Apply Quicksilver 2-4-C with teflon to the circumference of a new needle bearing.
- 3) Set the needle bearing in the propeller shaft holder with the stamp mark at the end of the needle bearing facing up.

Press the needle bearing in the propeller shaft holder using the special tools and hydraulic press.

#### TOOLS :

Mandrel  
Bearing Installation tool

07SPD - ZW0020Z  
07SPD - ZW0030Z



### <Water inner seal>

- 1) Position the propeller shaft holder on the special tool as shown to protect the lip of the holder.
- 2) Apply a light coat of Quicksilver 2-4-C with teflon to the surface of the special tool.
- 3) Slide the water inner seal onto the end of the special tool which has the longer shoulder.

Apply LOCTITE® 271 or equivalent to the circumference of the seal.

- 4) Place the special tool and seal on the propeller shaft holder as shown, and press in the seal.
- 5) Apply Quicksilver 2-4-C with teflon to the lips of the seal.

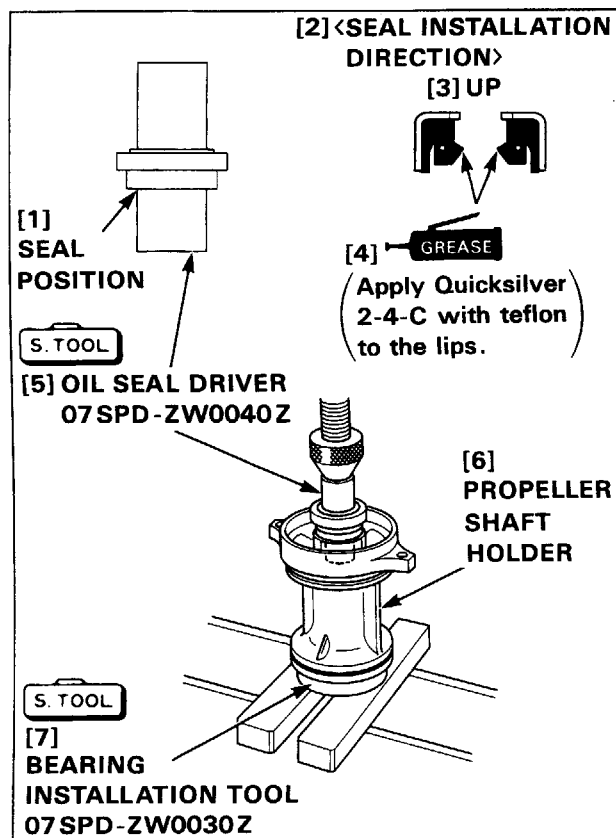
#### TOOLS :

Oil seal driver

07SPD - ZW0040Z

Bearing installation tool

07SPD - ZW0030Z



### <Water outer seal>

- 1) Position the propeller shaft holder on the special tool as shown to protect the lip of the holder.
- 2) Apply a light coat of Quicksilver 2-4-C with teflon to the surface of the special tool.
- 3) Slide the water outer seal onto the end of the special tool which has the shorter shoulder.

Apply LOCTITE® 271 or equivalent to the circumference of the seal.

- 4) Place the special tool and seal on the propeller shaft holder as shown, and press in the seal.
- 5) Apply Quicksilver 2-4-C with teflon to the lips of the seal.

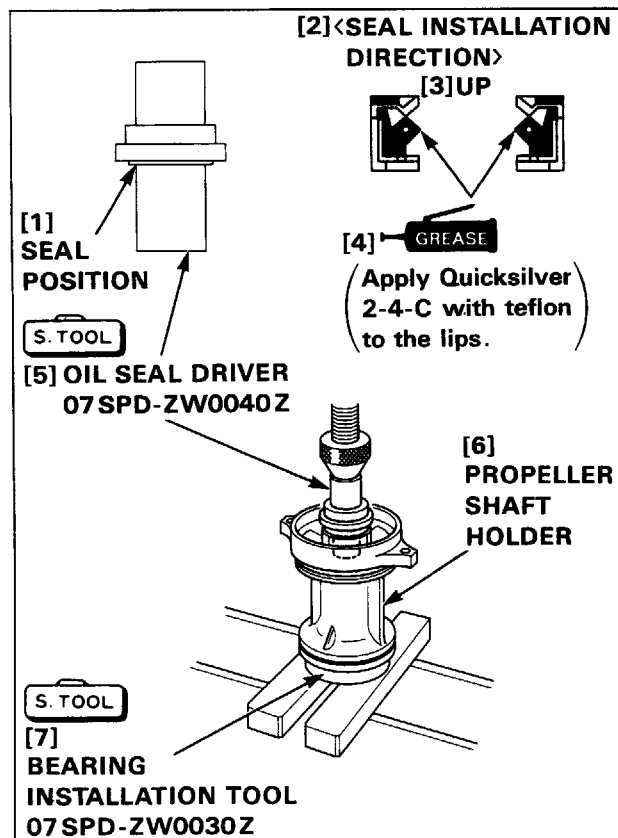
#### TOOLS :

Oil seal driver

07SPD - ZW0040Z

Bearing installation tool

07SPD - ZW0030Z



### • ROLLER BEARING

#### REMOVAL :

Remove the roller bearing using the special tools and hydraulic press as shown.

#### CAUTION:

Remove the roller bearing using a hydraulic press. Do not try to remove the bearing by striking with a hammer.

#### NOTE:

- Set the jaws of the special tool (bearing race remover) against the roller bearing securely.
- Replace the bearing with a new one.

#### TOOLS :

Driver

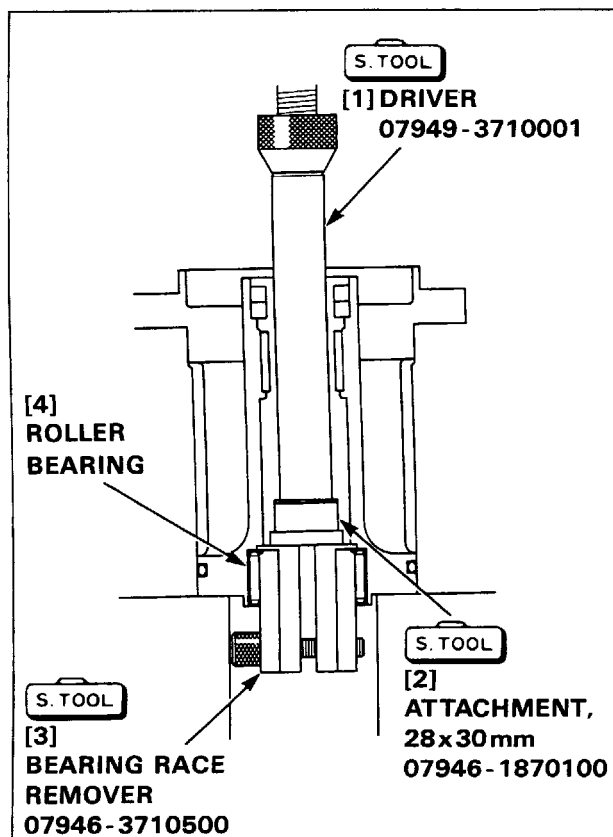
07949 - 3710001

Attachment, 28 x 30 mm

07946 - 1870100

Bearing race remover

07946 - 3710500



#### INSTALLATION :

- 1) Apply Quicksilver 2-4-C with teflon to the circumference of a new roller bearing.
- 2) Using a hydraulic press and special tool as shown, press in the bearing until the end of the special tool contacts the end of the propeller shaft holder.

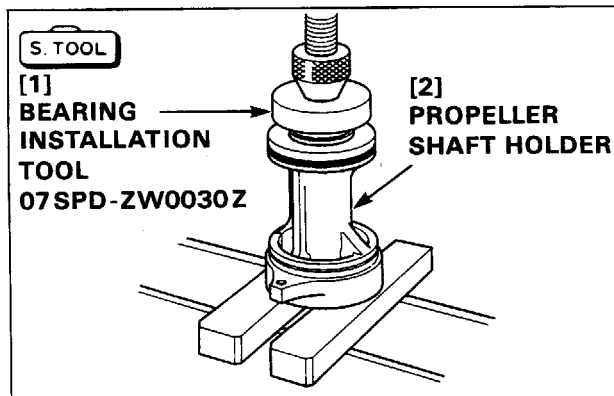
#### CAUTION:

Be sure to install the roller bearing using a hydraulic press. Never try to install it by striking with a hammer.

#### TOOL :

Bearing installation tool

07SPD - ZW0030Z



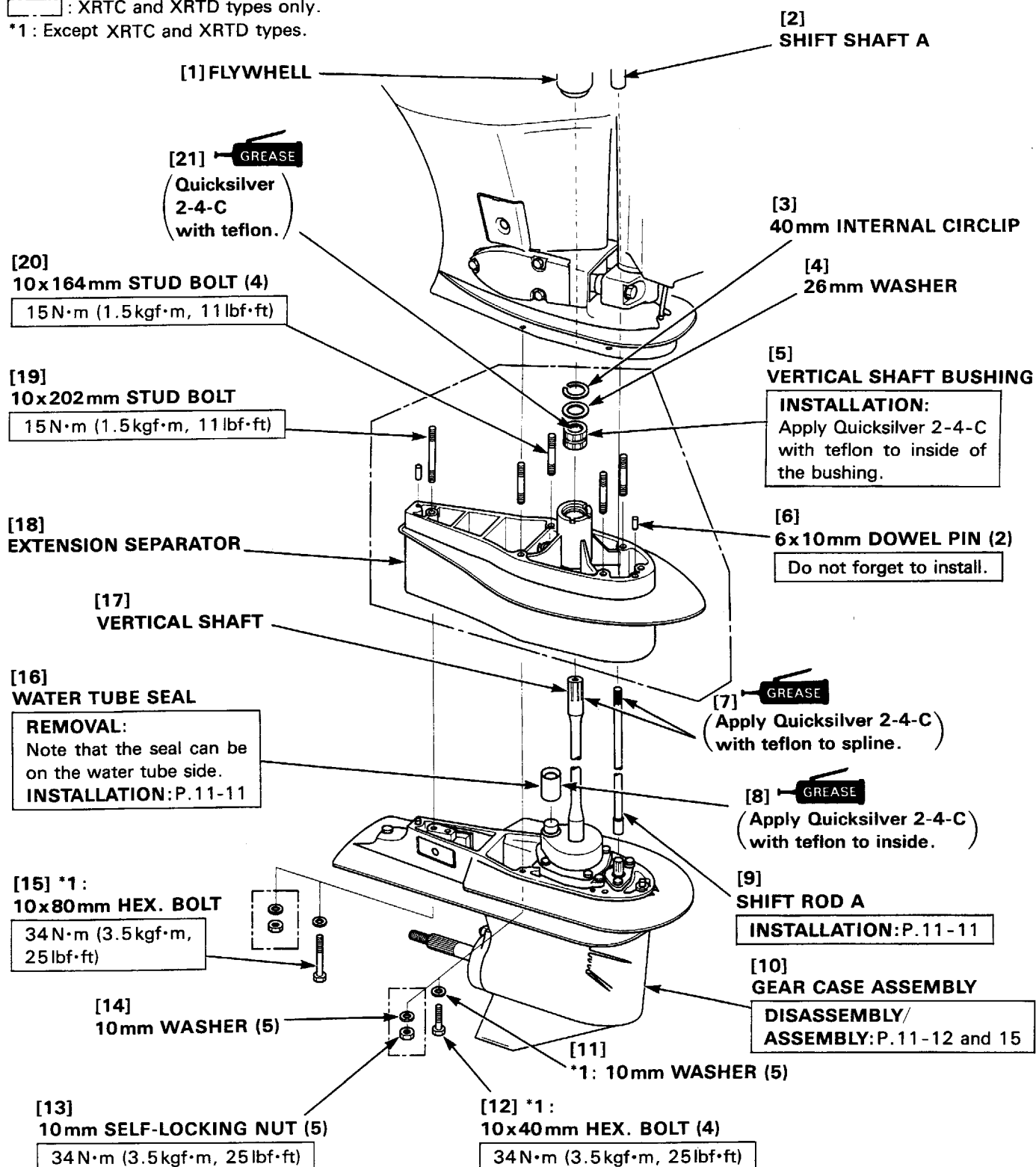
### 3. GEAR CASE ASSEMBLY

#### a. REMOVAL / INSTALLATION

Place the remote control lever or gearshift lever in the "N" (Neutral) position.

[ ] : XRTC and XRTD types only.

\*1: Except XRTC and XRTD types.



### • SHIFT ROD A

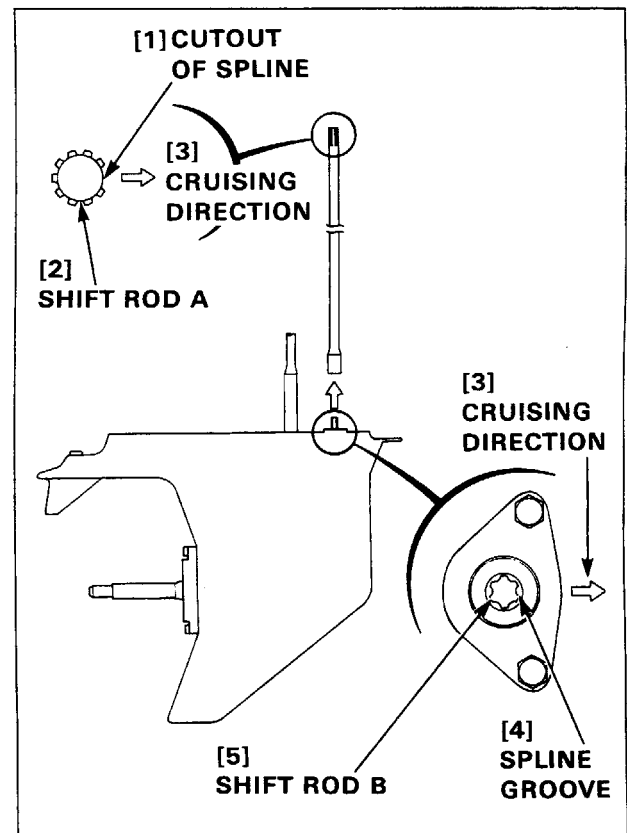
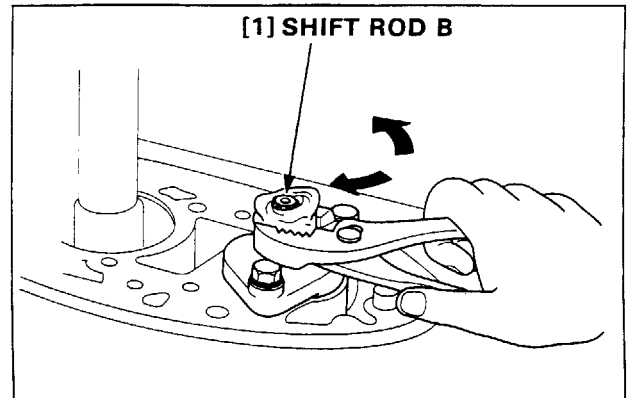
#### INSTALLATION :

- 1) Set the remote control lever or gearshift lever in the "N" (Neutral) position.
- 2) Check that shift rod B of the gear case is at the "N" (Neutral) position.

To check :

Shift rod B is at the "N" position when it turns freely right and left while holding the vertical shaft.

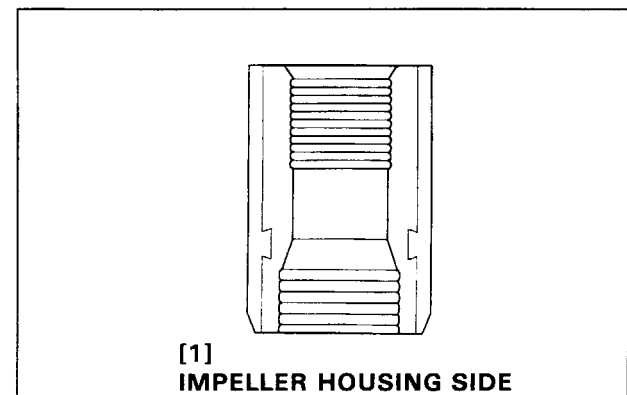
- 3) When shift rod B is not at the "N" (Neutral) position, protect the end of shift rod B with a shop towel or equivalent cloth, and set shift rod B at the "N" position by turning shift rod B right and left using a wrench.
- 4) Check that the spline groove of shift rod B is as shown in the drawing .
- 5) Install shift rod A so that the cutout of the spline of the shift rod A and the spline groove of shift rod B face in the same direction (cruising direction).
- 6) Install the water tube seal on the gear case assembly, and install the gear case assembly on the outboard motor.



### • WATER TUBE SEAL

#### INSTALLATION :

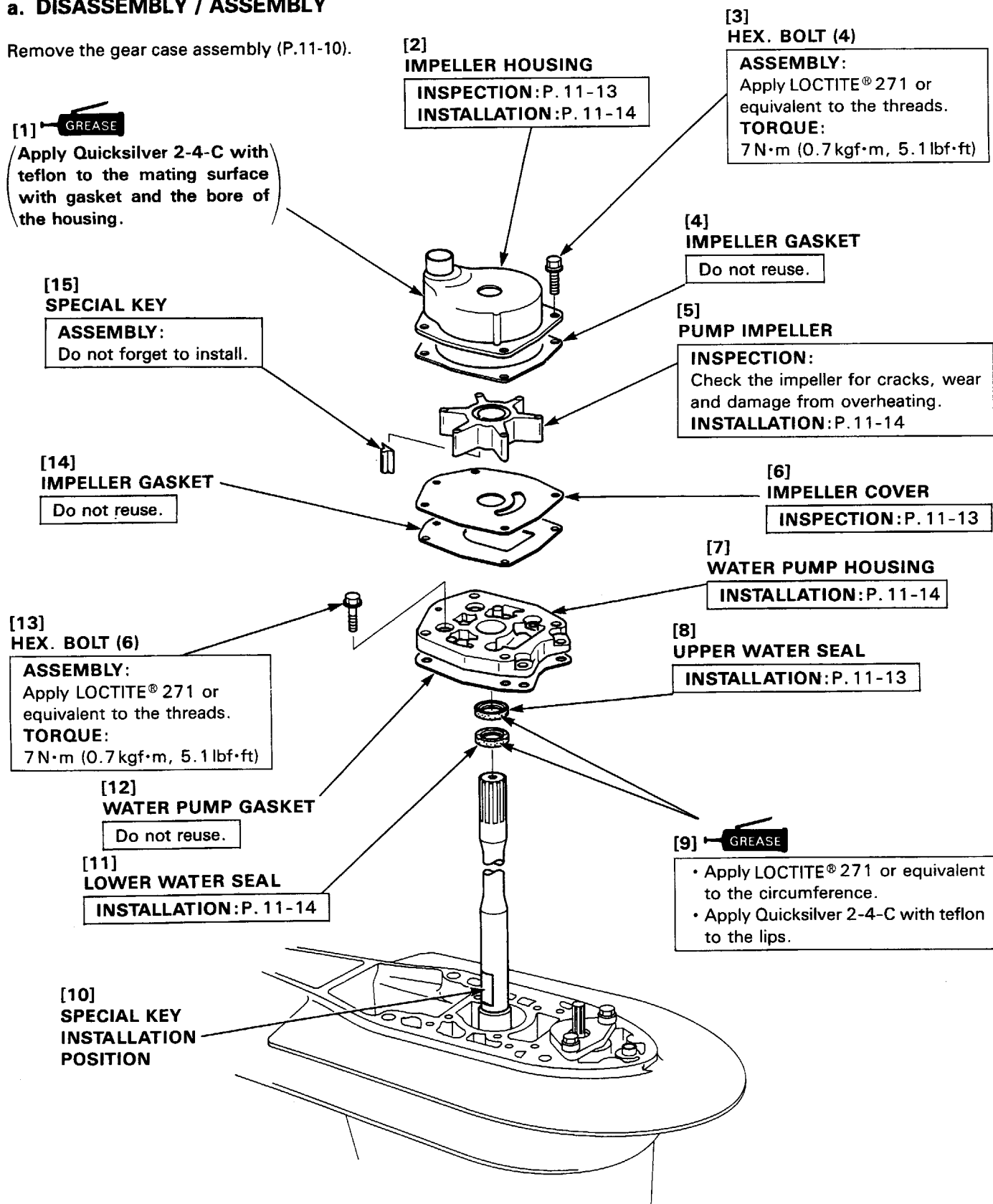
- 1) Check the inner surface of the water tube seal for damage, and replace if necessary.
- 2) Apply Quicksilver 2-4-C with teflon to the inner surface of the water tube seal. Install the water tube seal with the larger I. D. side toward the impeller housing.



### 4. WATER PUMP

#### a. DISASSEMBLY / ASSEMBLY

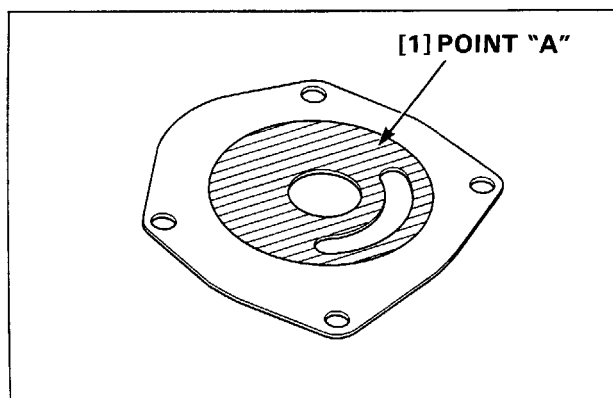
Remove the gear case assembly (P.11-10).



### b. INSPECTION

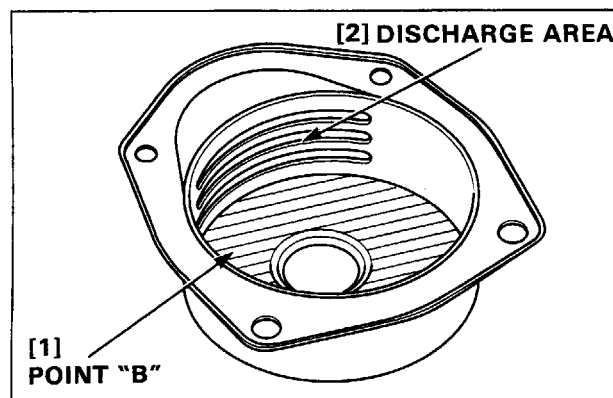
#### • IMPELLER COVER

Measure the groove depth at point "A" shown in the drawing. Replace the impeller cover if the measurement is 0.7mm (0.028 in) or more.



#### • IMPELLER HOUSING

- 1) Check the impeller housing for damage and dents, and replace if necessary.
- 2) Measure the thickness of the discharge area of the impeller housing. Replace the housing if the measurement is less than 1.5mm (0.06 in).  
Replace the housing, too, if the groove depth at point "B" of the impeller housing is 0.7mm (0.028in) or more.



### c. INSTALLATION

#### • UPPER / LOWER WATER SEAL

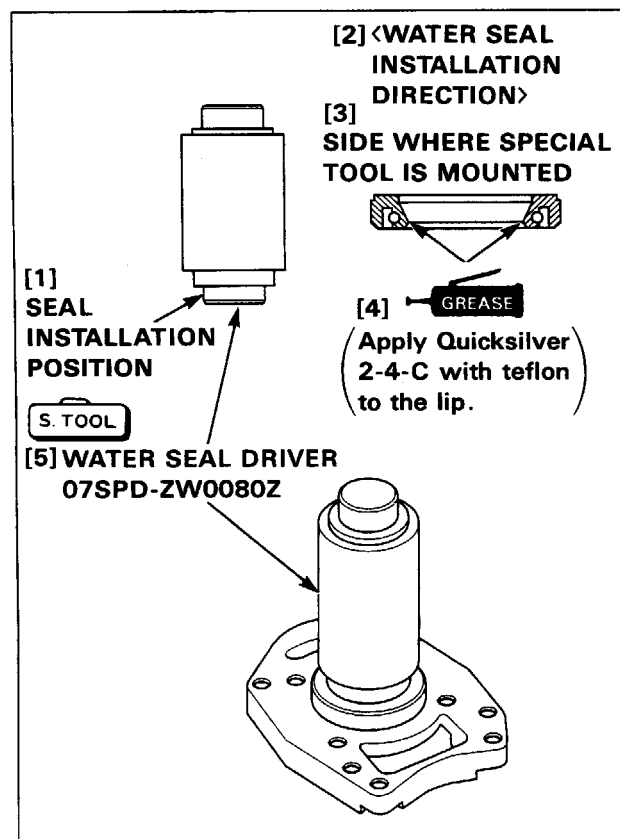
##### <UPPER WATER SEAL>

- 1) Apply LOCTITE® 271 or equivalent to the circumference of a new upper water seal.
- 2) Set the special tool on the upper water seal, noting the installation direction of the seal. Drive the upper water seal into the water pump housing until it bottoms.
- 3) After installation of the water seal, apply Quicksilver 2-4-C with teflon to the seal lip.

##### TOOL :

Water seal driver

07SPD - ZW0080Z





### <LOWER WATER SEAL>

- 1) Apply LOCTITE® 271 or equivalent to the circumference of a new lower water seal.
- 2) Set the special tool on the lower water seal, noting the installation direction of the seal. Drive the lower water seal into the water pump housing until it bottoms.
- 3) After installation of the water seal, apply Quicksilver 2-4-C with teflon to the seal lip.

#### TOOL :

Water seal driver

07SPD - ZW0080Z

### • PUMP IMPELLER / IMPELLER HOUSING

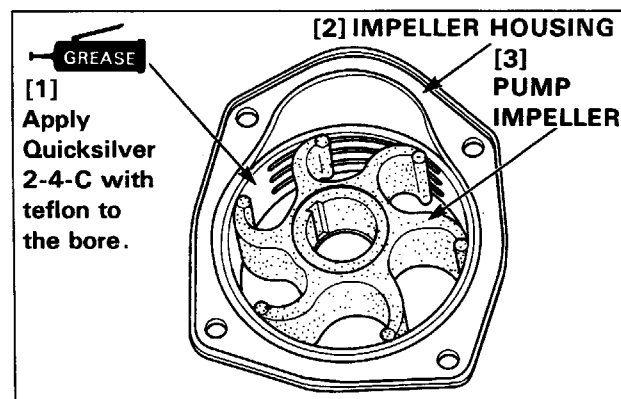
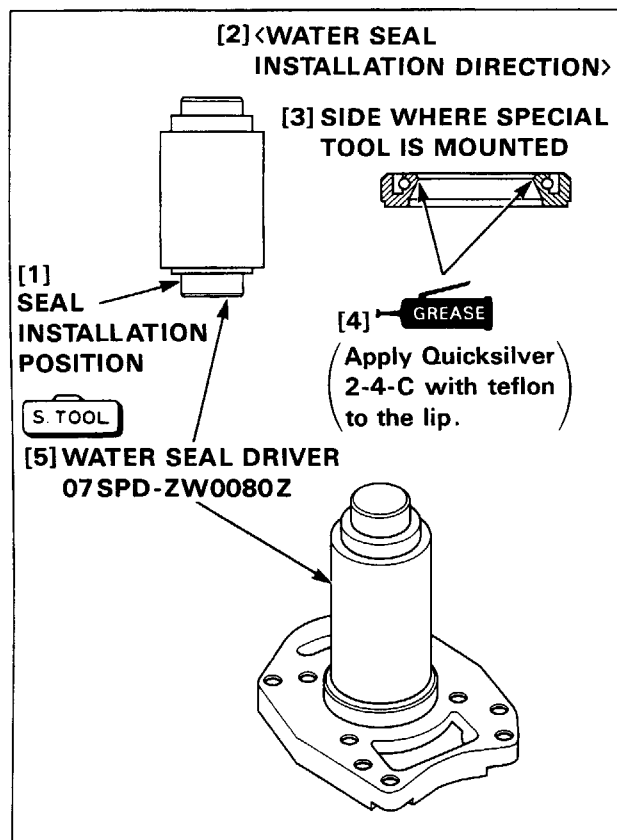
#### INSTALLATION :

- 1) Check the impeller for cracks, wear or damage from overheating.
- 2) Apply Quicksilver 2-4-C with teflon to the impeller housing bore, and install the pump impeller in the impeller housing as shown. Be sure to align the hole in the impeller housing with the hole in the pump impeller.
- 3) Set the impeller housing over the vertical shaft, and set the special key in the position shown in the drawing (P.11-12).

Align the groove in the pump impeller with the special key, and install the impeller housing on the pump housing by turning the impeller housing clockwise viewed from the top of the housing.

#### NOTE:

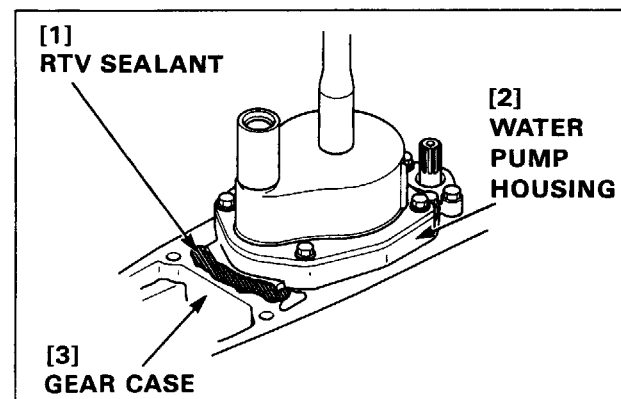
- Do not turn the impeller housing counterclockwise with the pump impeller installed in the impeller housing.
- After installation, check that the impeller gasket is set in the proper position.



### • WATER PUMP HOUSING

#### INSTALLATION :

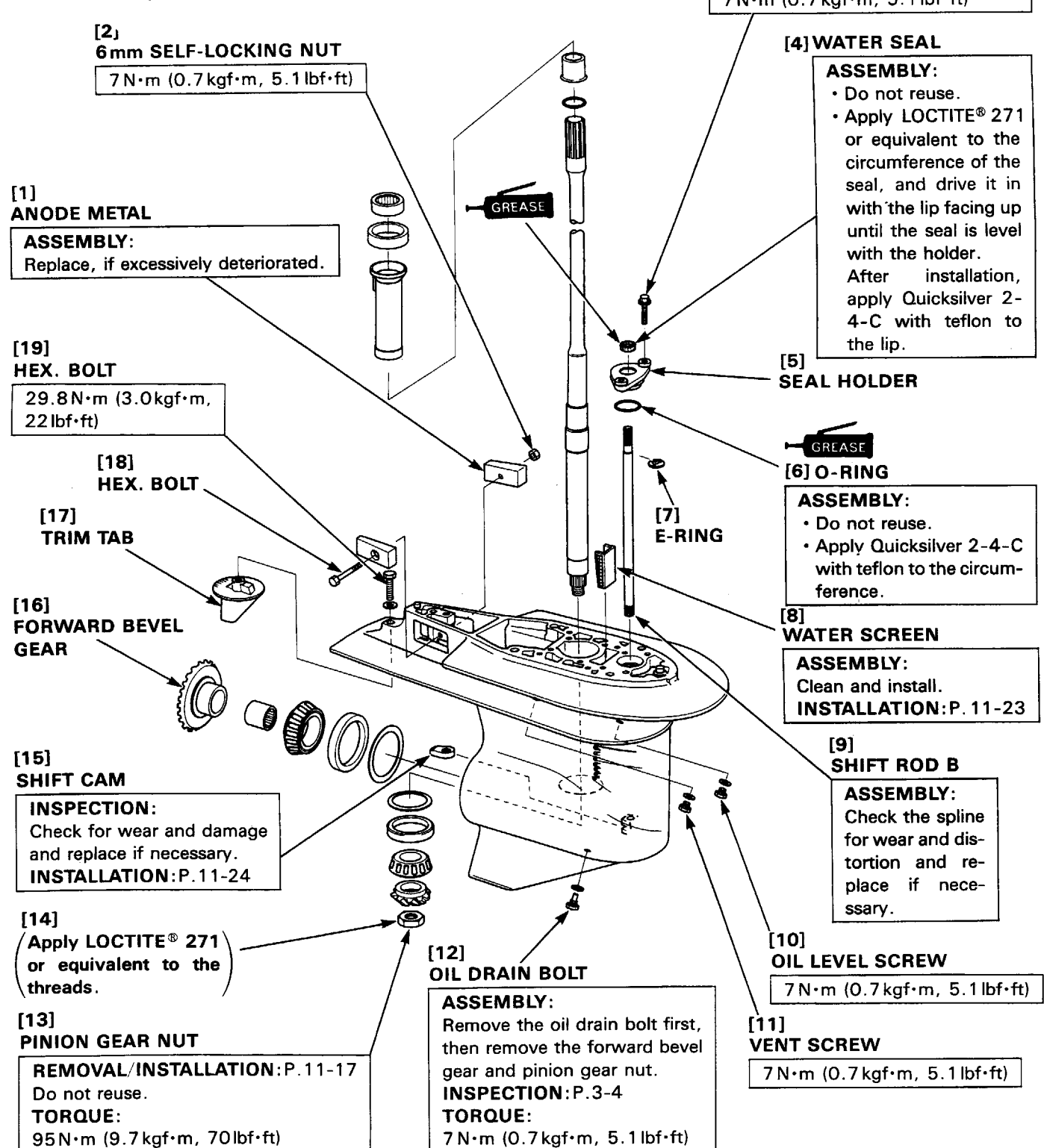
Apply beads of RTV sealant to the mating surface of the water pump housing and gear case as shown.

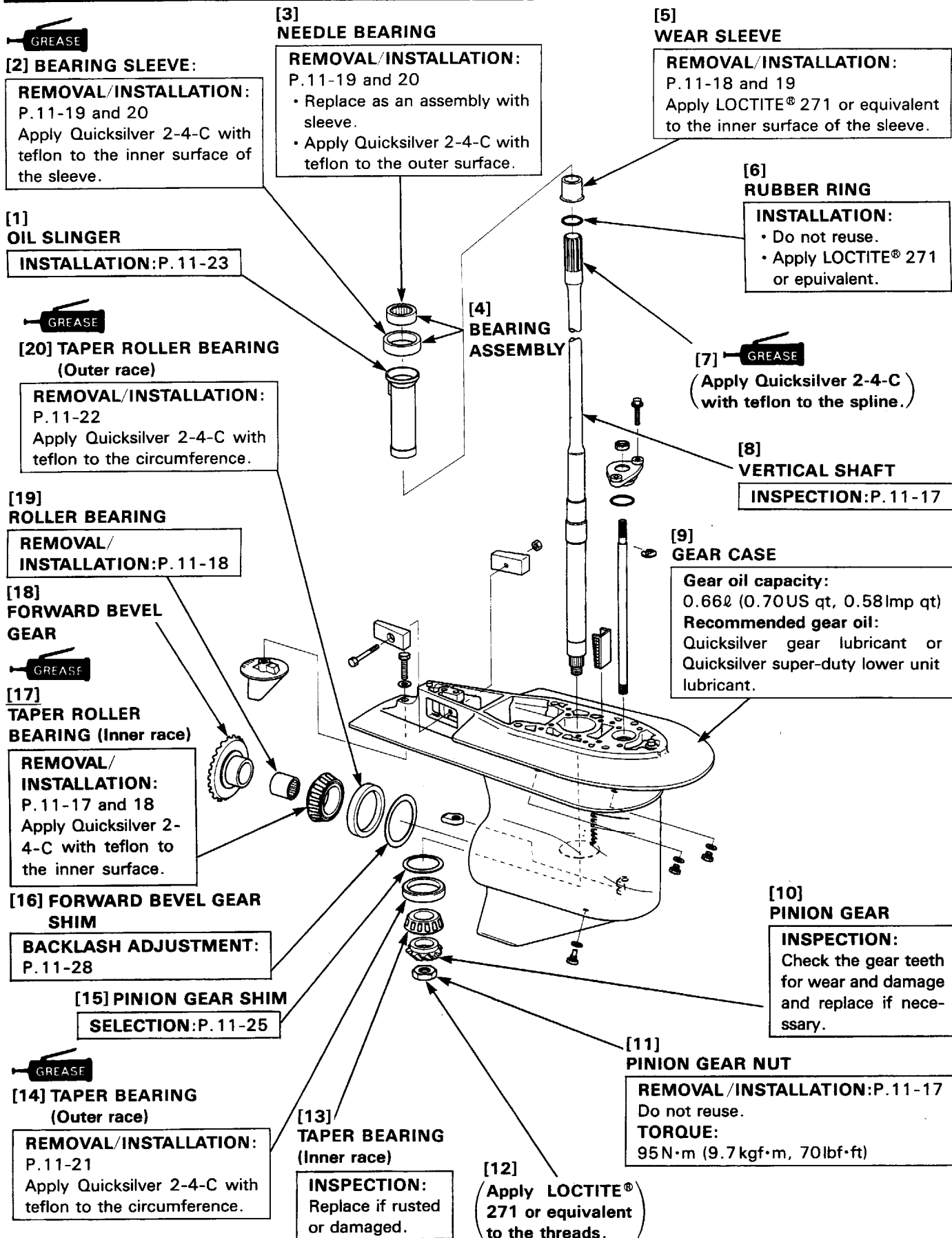


### 5. VERTICAL SHAFT / BEVEL GEAR

#### a. DISASSEMBLY / ASSEMBLY

- 1) Remove the propeller / propeller shaft holder assembly (P.11-1).
- 2) Remove the gear case assembly (P.11-10) and water pump (P.11-12).





### b. INSPECTION

#### • VERTICAL SHAFT O. D. (At roller bearing)

STANDARD	SERVICE LIMIT
28.562 – 28.575 mm (1.1245 – 1.1250 in)	28.541 mm (1.1237 in)

### c. REMOVAL / INSTALLATION

#### • PINION GEAR NUT

##### REMOVAL :

- 1) Attach the special tool to the vertical shaft end.
- 2) Use a shop towel or equivalent cloth to protect the gear case as shown.
- 3) Holding the special tool, remove the pinion gear nut.

##### TOOL :

Vertical shaft holder 07SPB – ZW10200

##### INSTALLATION :

Be sure that the forward bevel gear is installed in position.

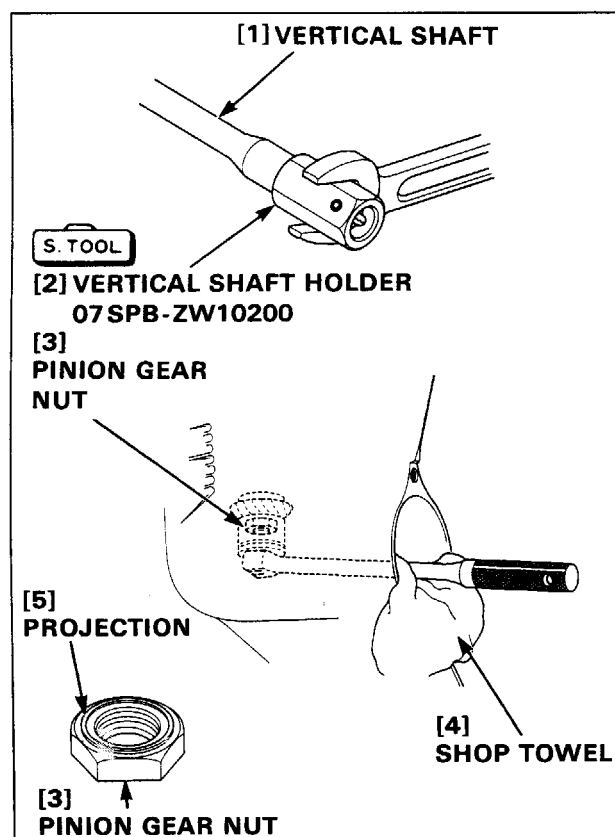
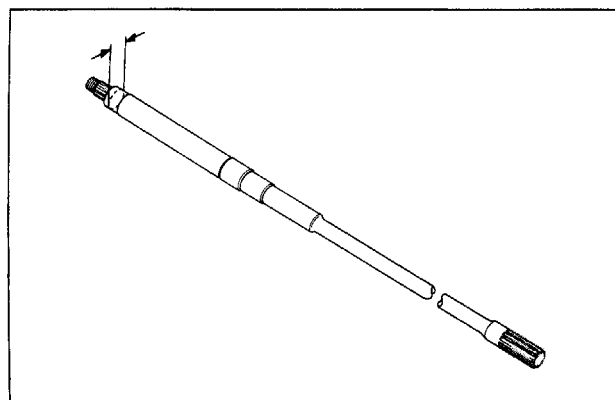
- 1) Apply LOCTITE® 271 or equivalent to the threads of a new pinion gear nut.
- 2) Install the pinion gear nut on the vertical shaft with the projection on the pinion gear nut facing the pinion gear.

Tighten the pinion gear nut to the specified torque in the same manner as removal.

**TORQUE : 95 N·m (9.7 kgf·m, 70 lbf·ft)**

##### TOOL :

Vertical shaft holder 07SPB – ZW10200



#### • TAPER ROLLER BEARING (Inner race)

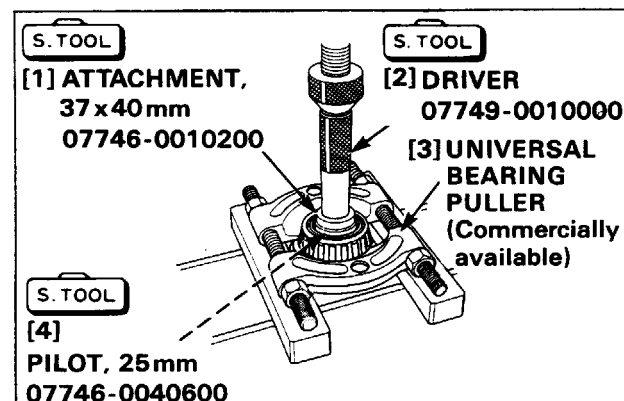
##### REMOVAL :

Attach the special tools to the taper roller bearing (inner race) as shown.

Remove the taper roller bearing using the hydraulic press and the special tools.

##### TOOLS :

Driver 07749 – 0010000  
Attachment, 37 x 40 mm 07746 – 0010200  
Pilot, 25 mm 07746 – 0040600



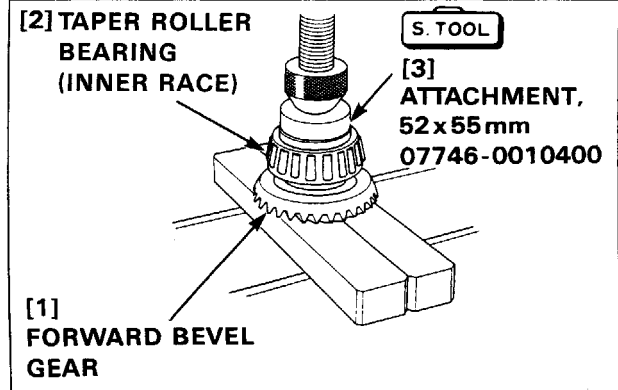
### INSTALLATION :

Install the taper roller bearing (inner race) on the forward bevel gear using the special tool as shown.

#### TOOL :

Attachment, 52 x 55mm

07746 - 0010400



### • ROLLER BEARING

#### REMOVAL :

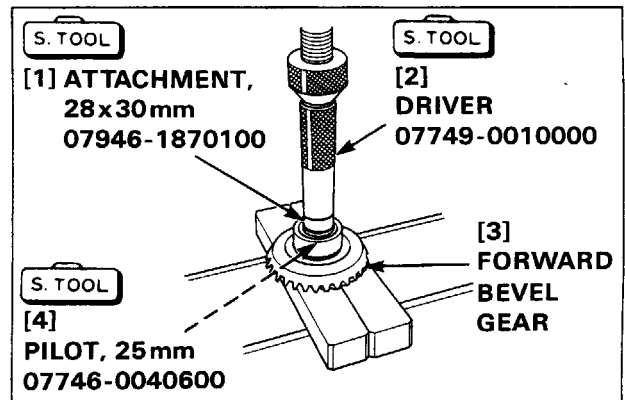
Drive out the roller bearing by tapping it with a punch.

#### INSTALLATION :

Install the roller bearing on the forward bevel gear using the special tools as shown.

#### NOTE:

Install with the stamp at the end of the roller bearing facing the special tools.



#### TOOLS :

Driver

07749 - 0010000

Attachment, 28 x 30 mm

07946 - 1870100

Pilot, 25 mm

07746 - 0040600

### • WEAR SLEEVE

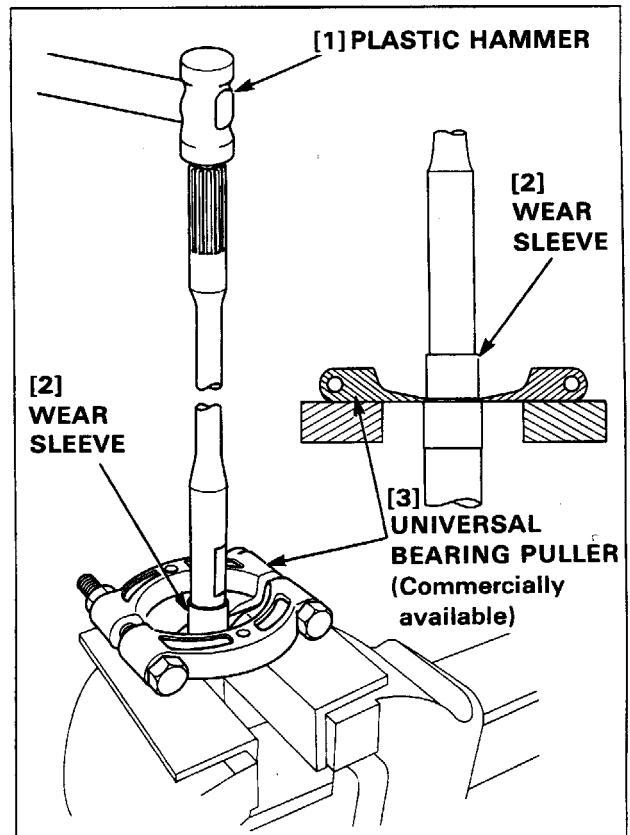
#### REMOVAL :

Remove the wear sleeve by tapping on the vertical shaft end using a plastic hammer and a universal bearing puller (commercially available).

#### NOTE:

Do not hold the vertical shaft with a vise. Use a plastic hammer to tap on the end of the vertical shaft.

Discard the used wear sleeve.



### INSTALLATION :

- 1) Apply a thin coat of LOCTITE® 271 or equivalent to a new rubber ring and install it on the vertical shaft.
- 2) Apply a thin coat of LOCTITE® 271 or equivalent to the wear sleeve installation position on the vertical shaft.

Apply LOCTITE® 271 or equivalent to the inner surface of a new wear sleeve, too.

- 3) Set the wear sleeve on the special tool.

#### NOTE:

Be sure to use a new wear sleeve.

#### TOOL :

Wear sleeve installation tool      07SPF - ZW0010Z

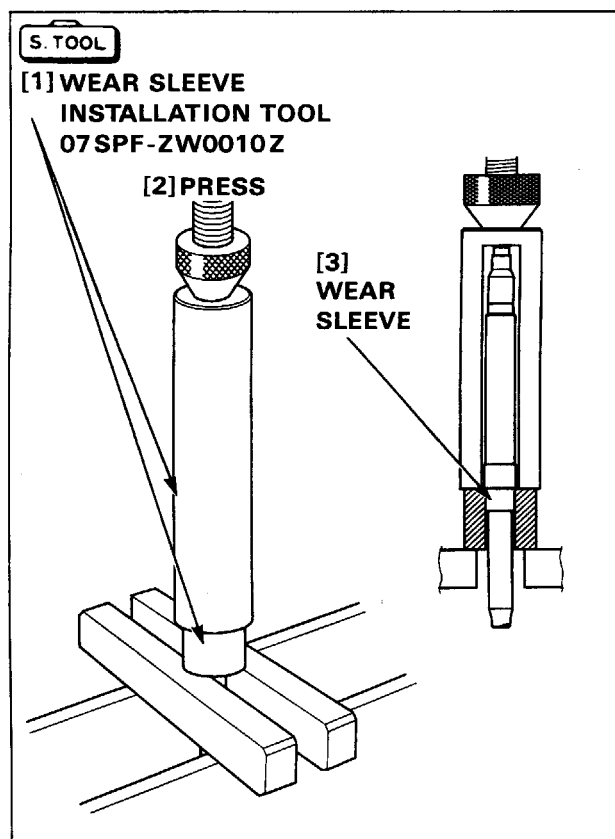
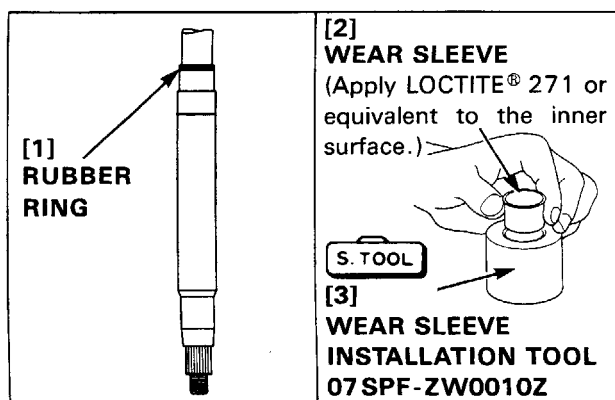
- 4) Set the vertical shaft in the special tool on which the wear sleeve is mounted, and pass the other special tool over the vertical shaft.
- 5) Set the vertical shaft mounted with the special tool on a hydraulic press as shown, and press in the shaft with the hydraulic press until the special tools contact each other.
- 6) After installation, remove the excessive LOCTITE® from the vertical shaft.

#### CAUTION:

Do not try to install the wear sleeve on the vertical shaft by striking with a hammer. Install with a hydraulic press.

#### TOOL :

Wear sleeve installation tool      07SPF - ZW0010Z

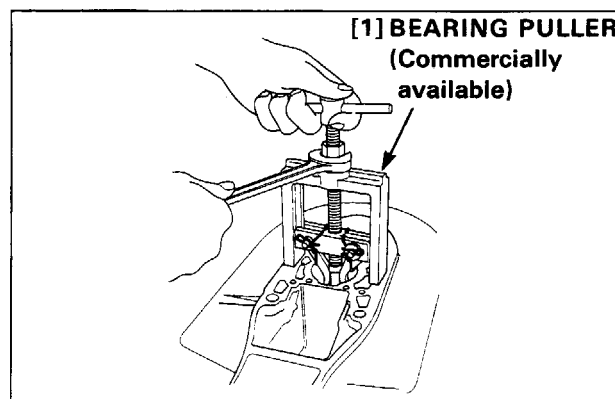


### • BEARING ASSEMBLY (BEARING SLEEVE / NEEDLE BEARING)

#### REMOVAL :

Remove the bearing assembly using a bearing puller (commercially available).

Remove the needle bearing from inside of the bearing sleeve by tapping the needle bearing with a punch.



### INSTALLATION :

#### NOTE:

Check the needle bearing and bearing sleeve. If both or either one of the needle bearing and bearing sleeve are / is worn or damaged, replace as an assembly.

- 1) Apply Quicksilver 2-4-C with teflon to the circumference of a new needle bearing and the inner surface of the bearing sleeve.
- 2) Set the bearing sleeve with the chamfered side facing down and the needle bearing with the stamped surface facing up.
- 3) Install the needle bearing in the bearing sleeve using the mandrel (No.13781) included in the special tool (bearing installation tool kit).

#### TOOL :

**Mandrel (No. 13781) included in the Bearing installation tool kit (No. 91-14309A7).**

- 4) Check that the oil slinger is mounted in the gear case. If not, install the oil slinger (P.11-23).
- 5) Attach the special tools and bearing assembly to the gear case as shown.

Tighten the special tool (nut) to install the bearing assembly in the gear case.

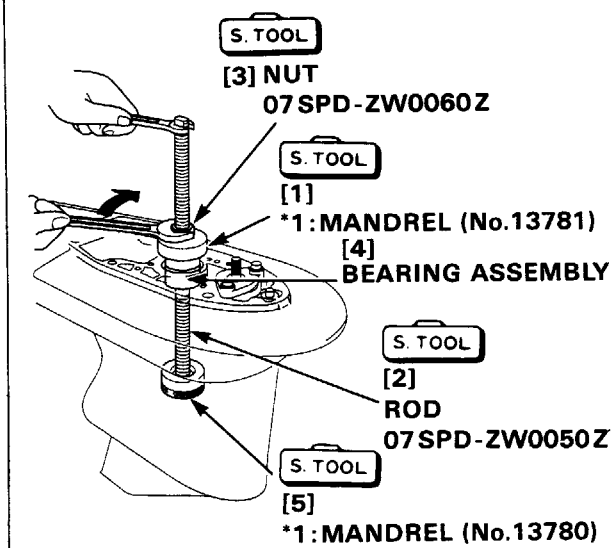
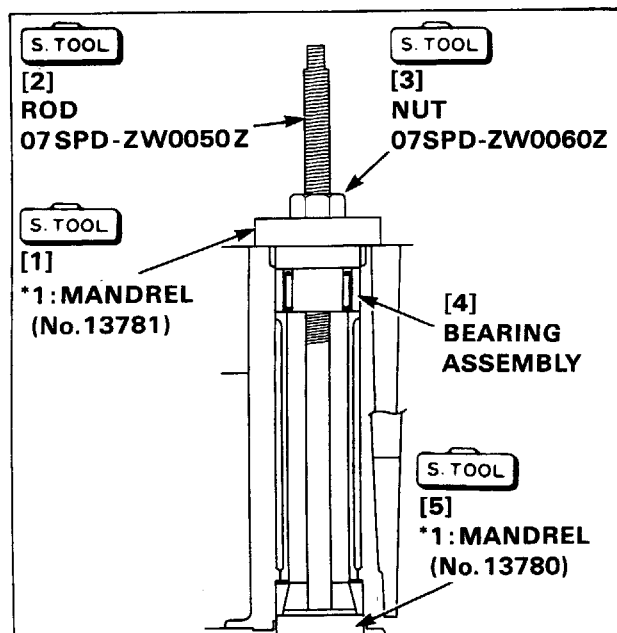
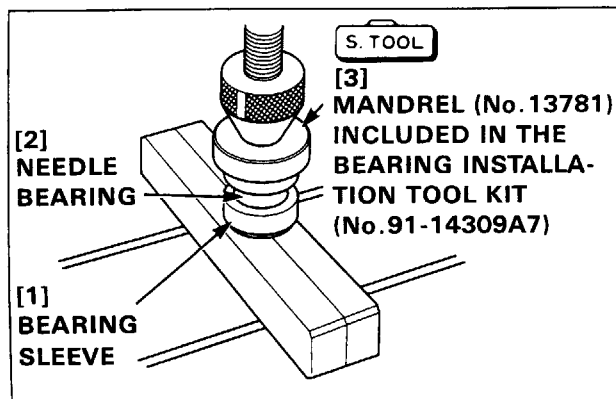
#### NOTE:

The bearing assembly can be mounted on the gear case whether the taper bearing (outer race) is set in place or not.

**\* 1 : Mandrel included in the special tool (bearing installation tool kit)**

#### TOOLS :

Rod	07SPD - ZW0050Z
Nut	07SPD - ZW0060Z
*1 : Mandrel	13780
*1 : Mandrel	13781



### • TAPER BEARING (Outer race)

#### REMOVAL:

##### NOTE:

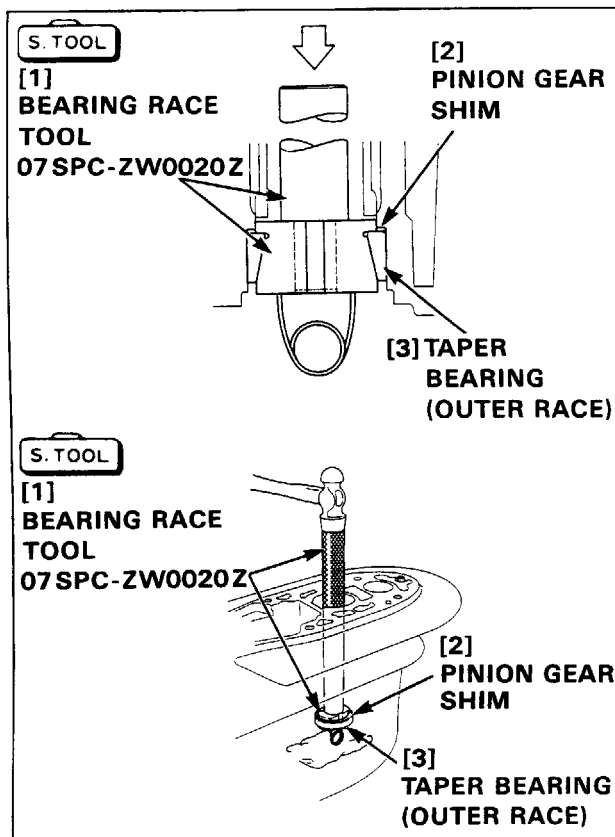
- Taper bearing can be removed/ installed without removing the bearing assembly and oil slinger.
- Set a shop towel or equivalent cloth under the taper bearing, and remove the taper bearing with care not to damage the gear case.
- Replace the taper bearing with a new one.

Remove the taper bearing (outer race) and pinion shim using the special tool as shown.

#### TOOL :

Bearing race tool

07SPC - ZW0020Z



#### INSTALLATION:

##### NOTE:

When the pinion gear shim is missing or damaged or the gear case is replaced with a new one, adjust the shim as instructed on P.11-25.

- 1) Apply quicksilver 2-4-C with teflon to the circumference of a new taper bearing.
- 2) Attach the special tools, taper bearing and pinion gear shim to the gear case as shown. Tighten the special tool (nut), and install the taper bearing (outer race) and pinion gear shim in the gear case.

\*1: Mandrel included in the special tool (bearing installation tool kit)

#### TOOLS:

Rod

Nut

\*1:Mandrel

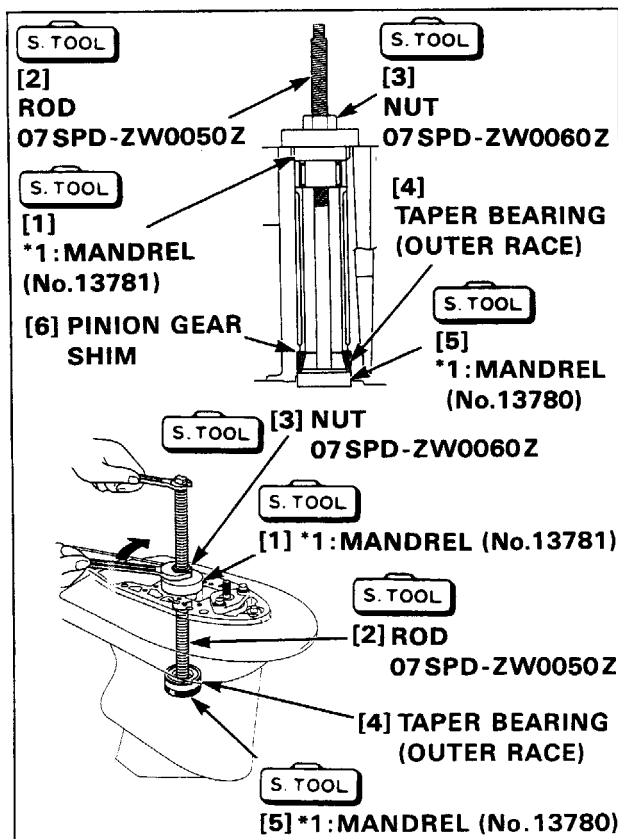
\*1:Mandrel

07SPD - ZW0050Z

07SPD - ZW0060Z

13780

13781





### • TAPER ROLLER BEARING (Outer race)

#### REMOVAL :

Remove the taper roller bearing (outer race) using the special tools. Remove the forward bevel gear shim.

#### NOTE:

Remove the gear oil drain bolt before removal / installation of the taper roller bearing. Removing or installing the taper roller bearing without removing the gear oil drain bolt can damage the magnetic part of the bolt.

#### TOOLS :

Bearing race puller	07LPC - ZV30100
Remover weight	07741 - 0010201
Remover handle	07936 - 3710100

Discard the used taper roller bearing.

#### INSTALLATION :

#### NOTE:

When the forward gear shim is damaged or missing, or the gear case is replaced with a new one, temporarily use a forward bevel gear shim of 0.25mm (0.01in) in thickness. Install the new taper roller bearing with the larger I. D. side facing out.

- 1) Place the forward bevel gear shim in the gear case.
- 2) Apply Quicksilver 2-4-C with teflon to the circumference of a new taper roller bearing, and set the bearing in the gear case.
- 3) Remove the propeller shaft assembly from the propeller shaft holder assembly (P. 11-4).

Remove the shift slider, three steel balls, cross pin ring, shifter pin, clutch shifter, shifter pin holder, shift spring thrust bearing and thrust washer.

Install the propeller shaft in the propeller shaft folder assembly.

- 4) Apply Quicksilver 2-4-C with teflon to the propeller shaft holder and O-ring.
- 5) Attach the special tool to the propeller shaft as shown, and install the propeller shaft holder assembly in the gear case.
- 6) Install the taper roller bearing in the gear case by tapping on the propeller shaft end with a copper hammer.

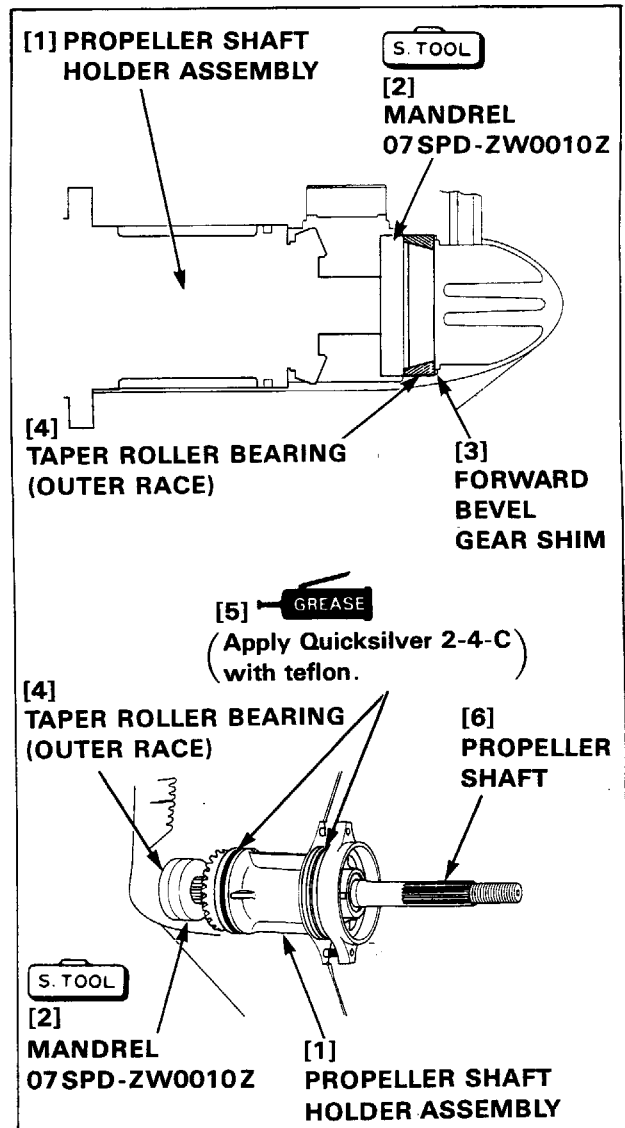
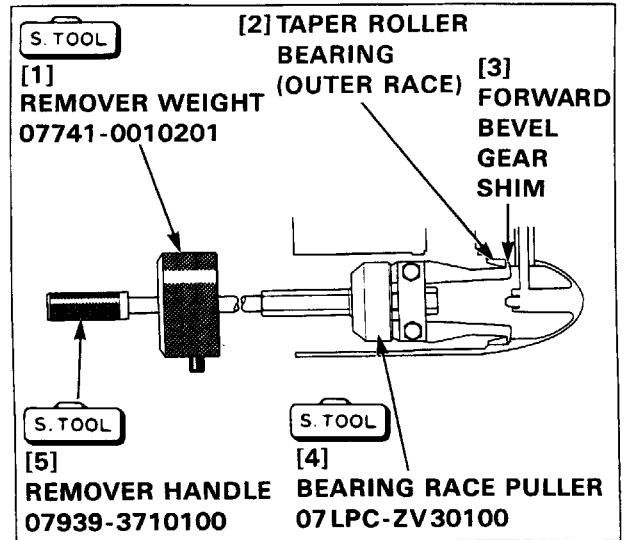
#### CAUTION:

Tap on the propeller shaft end with a copper hammer with care not to damage the shaft end.

- 7) After installing the taper roller bearing, remove the propeller shaft holder assembly from the gear case.

#### TOOL :

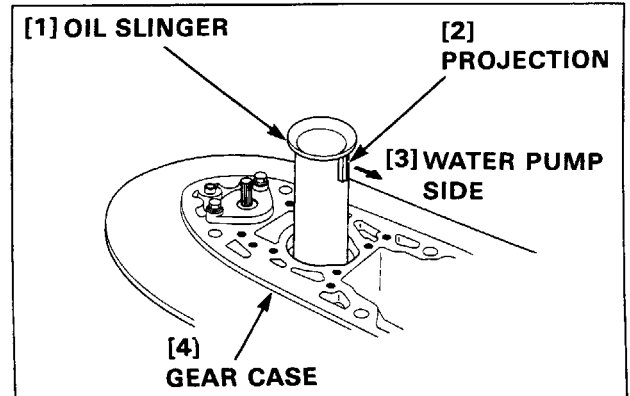
Mandrel	07SPD - ZW0010Z
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### • OIL SLINGER

#### INSTALLATION :

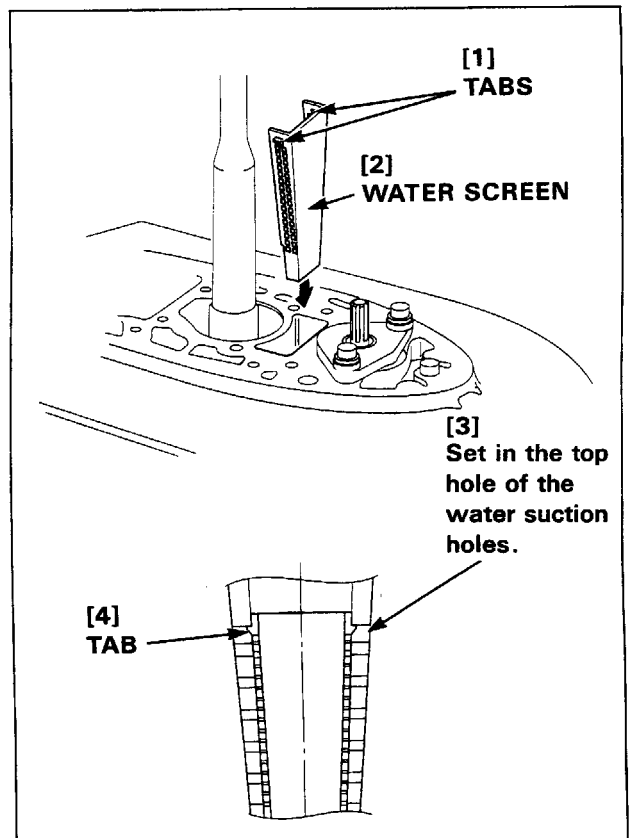
Install the oil slinger in the gear case with the projection facing the water pump side.



### • WATER SCREEN

#### INSTALLATION :

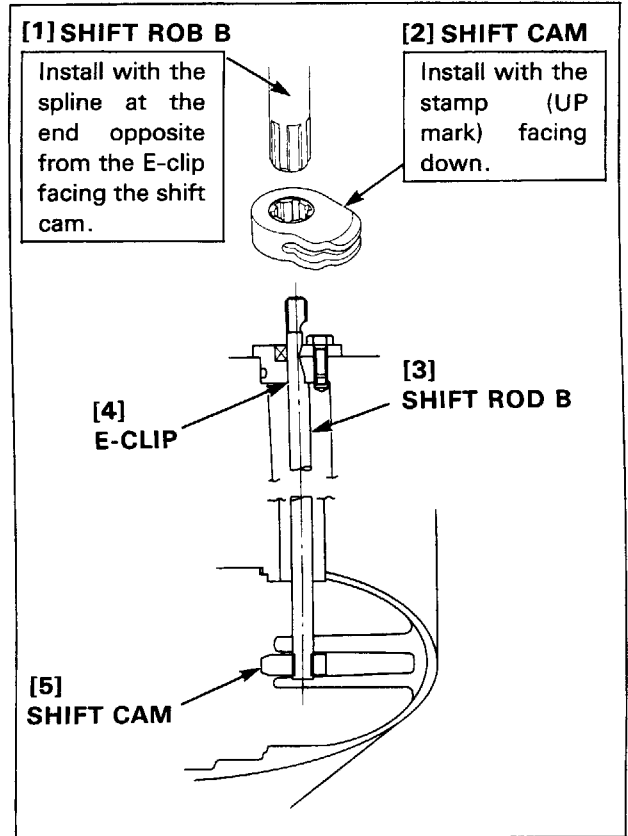
- 1) Install the water screen in the gear case with the two tabs at the upper side and the water screen's flat surface facing the shift rod B.
- 2) Check whether the two tabs of the water screen are set in the top hole of the water suction holes in the gear case.



### • SHIFT CAM

#### INSTALLATION :

- 1) Install the shift cam in the gear case with the stamp (UP mark) on the cam facing down.
- 2) Install the shift rod B by aligning the spline (at the end opposite from the E-clip) with the splined hole in the shift cam.



## 6. SHIM SELECTION

### • PINION GEAR SHIM ADJUSTMENT

Install the parts, other than the water pump and propeller shaft holder assembly, in the gear case before making the pinion gear shim adjustment (P.11-15).

- 1) Set the vertical shaft vertically.
- 2) Raise the adjusting nut, i. e. part ⑤ of the special tool, to the uppermost position.
- 3) Check whether the part ⑥ of the special tool is set on the part ⑤ securely.  
If not, tighten the set screw by aligning with the hole in the part ⑥.

**NOTE:**

Tighten with care not to let the end of the two set screws come out of the part 6 of the special tool.

- 4) Set the parts from ① to ⑤ of the special tool on the vertical shaft.

**TOOL:**

**Bearing preload tool**

**07SPJ - ZW0010Z**

- 5) Set the special tool (vertical shaft indicator attachment) on the special part ⑥, and tighten the set screws.

**NOTE:**

Do not tighten the set screws with the part 5 of the special tool pushing down.

**TOOL :**

**Vertical shaft indicator attachment 07SPK - ZW10100**

- 6) Measure the clearance (distance A) between the end of the nut of the special tool part ⑤ and end of the adjusting nut as shown.

Calculate the amount of tightening the adjusting nut using the following formula.

**Formula :**

Clearance (distance A) + 25mm (0.9 in)

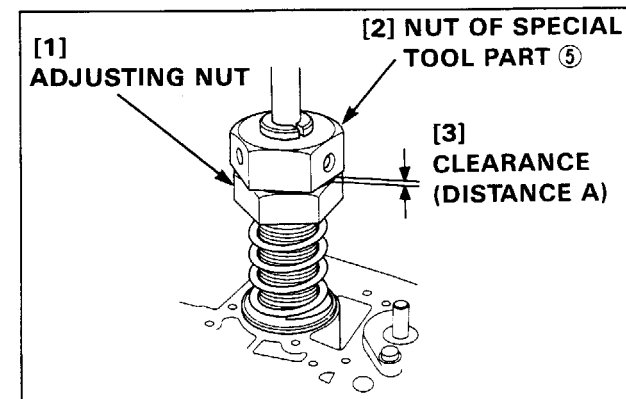
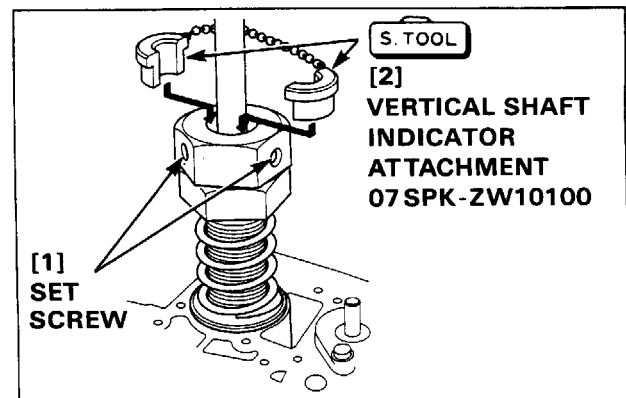
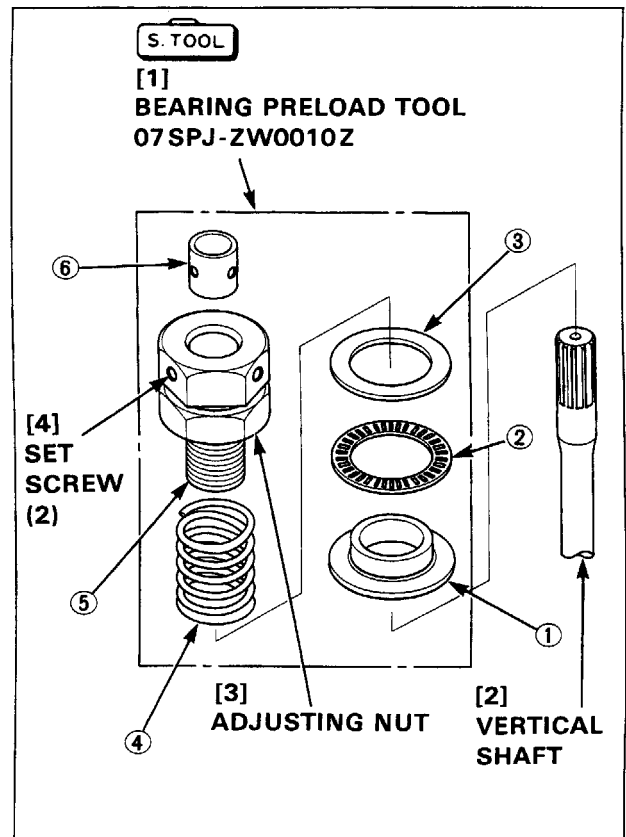
= Amount of tightening adjusting nut

( Clearance between the end of the nut of the special tool part ⑤ and end of the adjusting nut. )

**Example :**

When clearance (distance A) is 1 mm (0.04 in) :  $1 + 25 = 26$   
Therefore, the amount of tightening of the adjusting nut should be 26 mm (1.0 in).

- 7) Tighten the adjusting nut until the clearance between the end of the nut of the special tool part ⑤ and end of the adjusting nut is the calculated value.
- 8) After tightening, turn the vertical shaft 5 to 10 turns.



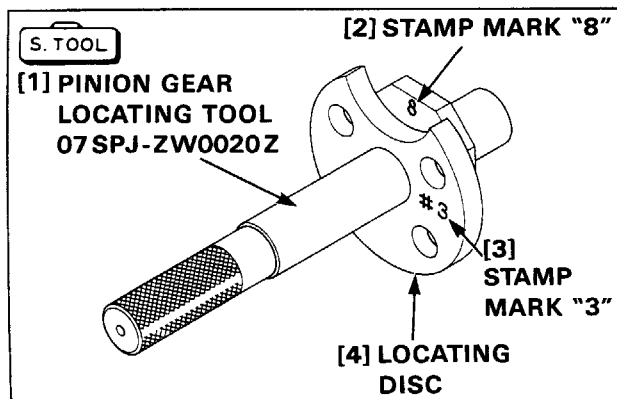
- 9) Set the locating disc stamped with "3" on the shaft of the special tool.

Set the special tool so that the stamp mark of "8" is visible.

**TOOL :**

**Pinion gear locating tool**

**07SPJ - ZW0020Z**



- 10) Insert the special tool in the gear case so that the stamp mark "8" comes under the pinion gear as shown.

- 11) Insert the feeler gauge between the pinion gear and special tool as shown. The clearance should be 0.64 mm (0.025 in). See P.11-27 for the shim position.

**Example :**

When the clearance is 0.54 mm (0.021 in):

$$0.54 - 0.64 = -0.1$$

Reduce the shim thickness by 0.1 mm (0.004 in).

When the clearance is 0.74 mm (0.029 in) :

$$0.74 - 0.64 = 0.1$$

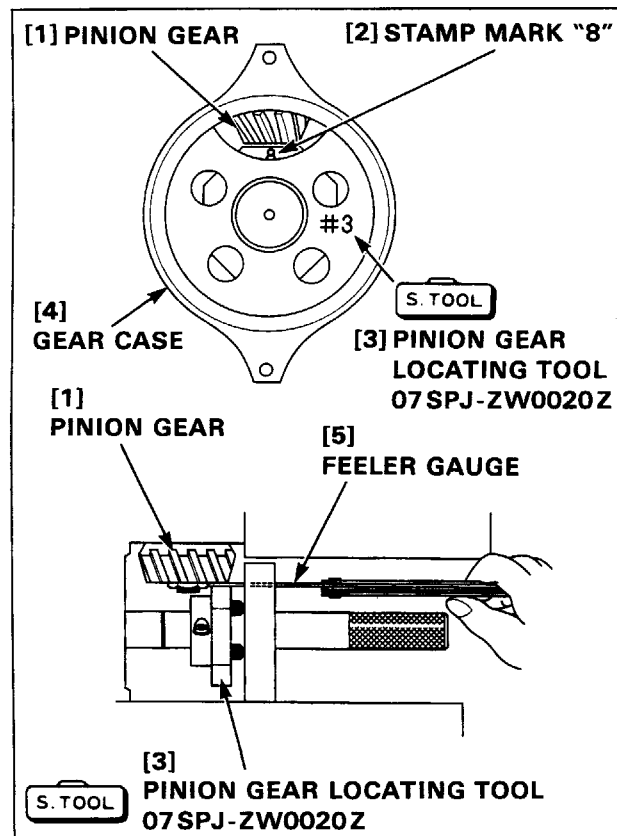
Increase the shim thickness by 0.1 mm (0.004 in).

- 12) When the clearance is correct, remove the special tool (pinion gear locating tool) on the propeller shaft holder assembly and adjust the backlash (P.11-28). Do not remove the special tools from the gear case (special tools on the water pump installation section) at this time.

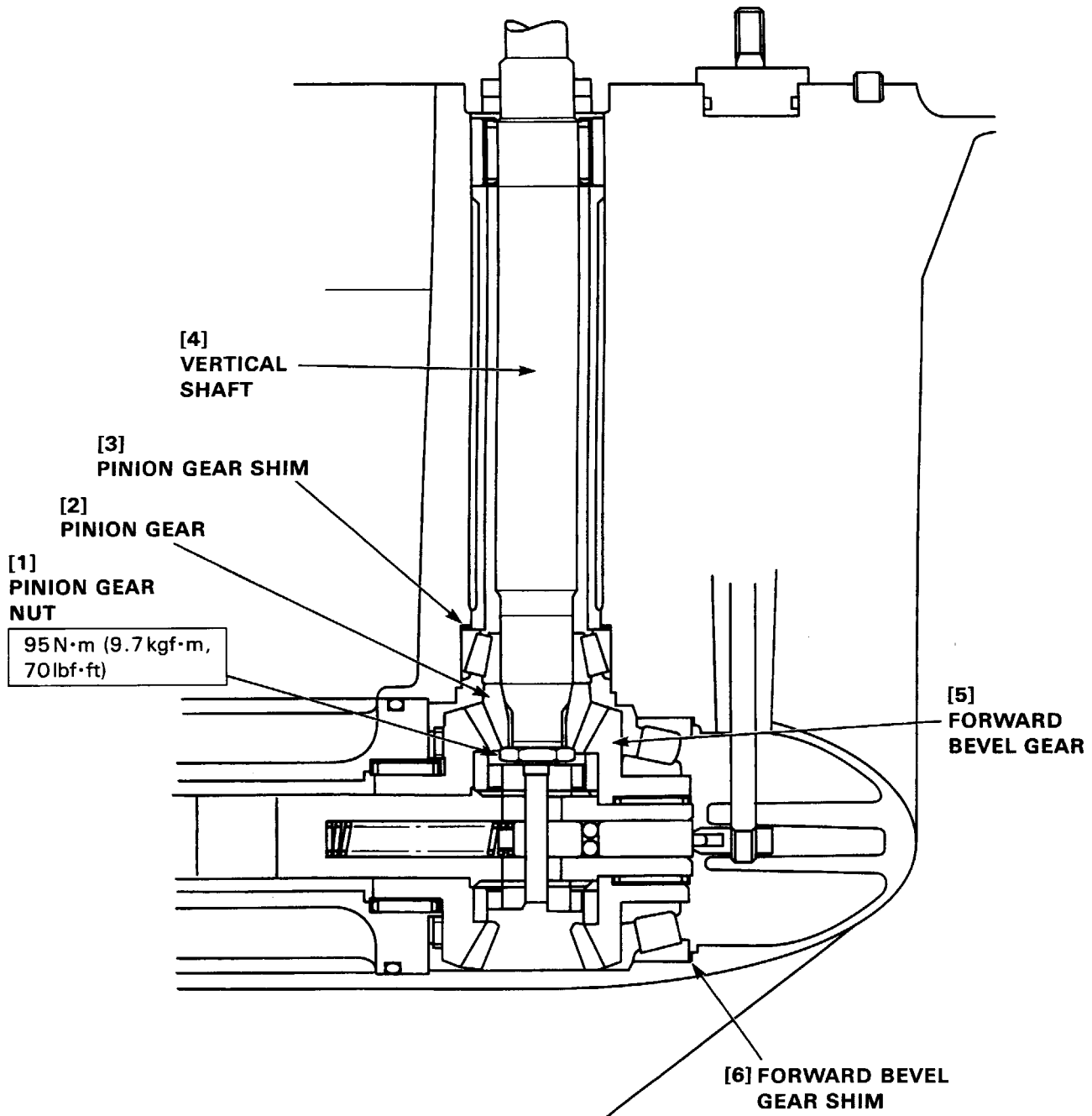
**TOOL :**

**Pinion gear locating tool**

**07SPJ - ZW0020Z**



## 7. SHIM POSITION



## 8. BACKLASH ADJUSTMENT

### • FORWARD BEVEL GEAR BACKLASH

Backlash adjustment should be made after pinion gear shim adjustment (P. 11-25).

Be sure that the special tools are attached to the vertical shaft. If they have been removed, install them as described on page 11-25.

- 1) Attach the propeller shaft holder assembly to the gear case, and tighten the self-locking nuts to the specified torque (P. 11-1).

**TORQUE : 30 N·m (3.1 kgf·m, 22 lbf·ft)**

- 2) Hold the propeller shaft securely with the special tool as shown, and tighten the puller bolt (special tool) to the specified torque.

**TORQUE : 5 N·m (0.5 kgf·m, 3.6 lbf·ft)**

Turn the vertical shaft 5 to 10 turns.

#### TOOLS :

<b>Puller jaw</b>	<b>07SPC - ZW0010Z</b>
<b>Puller bolt</b>	<b>07SPC - ZW0011Z</b>

- 3) Attach the special tool to the vertical shaft as shown, and adjust the dial gauge so its needle is at line "4" of the special tool.
- 4) Turn the vertical shaft lightly right or left and record the dial gauge reading.

Measure the backlash at the four points (by turning the vertical shaft 90°) in the same manner.

#### NOTE:

Do not turn the propeller shaft when turning the vertical shaft.

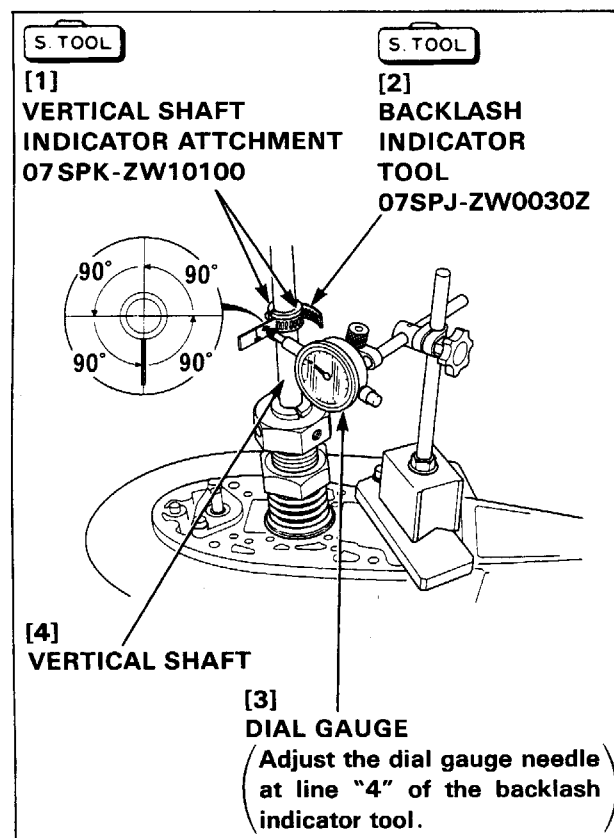
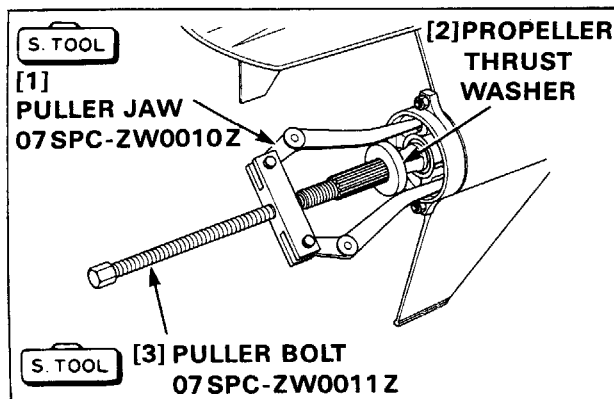
- 5) The measurement of backlash should be within the range of 0.30 - 0.48mm (0.012 - 0.019in).

If the backlash is too large, increase the forward bevel gear shim thickness and recheck the backlash.

If the backlash is too small, reduce the forward bevel gear shim thickness and recheck the backlash.

#### TOOLS :

<b>Vertical shaft indicator attachment</b>	<b>07SPK - ZW10100</b>
<b>Backlash indicator tool</b>	<b>07SPJ - ZW0030Z</b>



## 9. GEAR CASE PRESSURE TEST

Assemble the gear case and perform the pressure test before installing the gear case on the outboard motor.

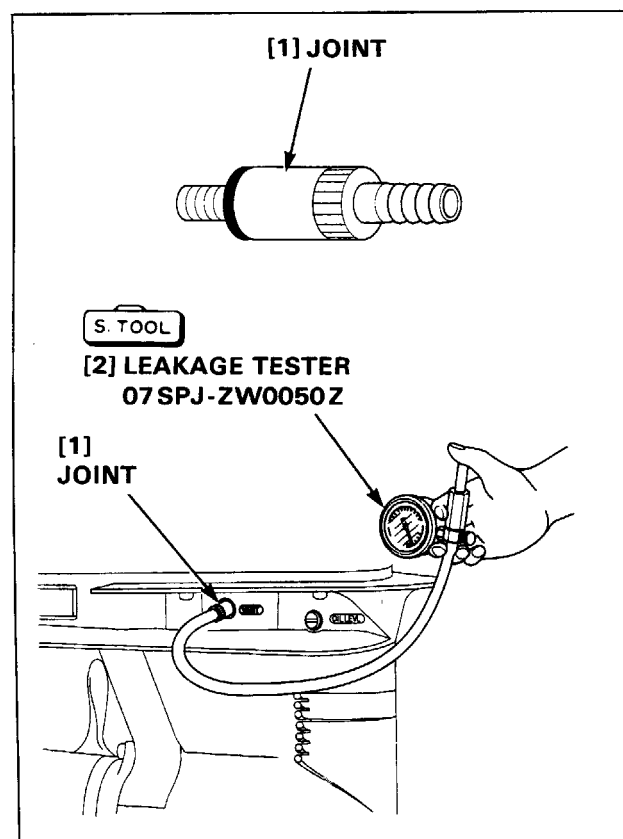
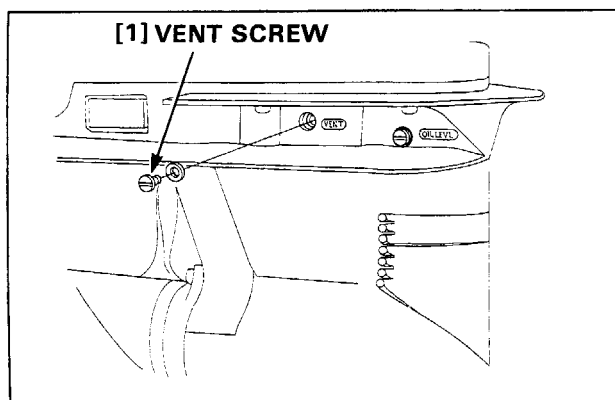
- 1) Remove the vent screw.
- 2) Install the joint provided on the gear lubricant (gear oil pump) in the vent screw mounting hole.
- 3) Attach the special tool to the joint as shown.
- 4) Pressurize the gear case to 69 – 82 kPa (0.70 – 0.84 kgf / cm<sup>2</sup>, 10 – 12 psi), and observe the special tool (gauge) for 5 minutes.
- 5) Move shift rod B, and rotate the vertical shaft and propeller shaft while the gear case is pressurized to check for leaks. The pressure should not drop.
- 6) If pressure drop is noted, immerse the gear case in water.
- 7) Repressurize the gear case to 69 – 82 kPa (0.70 – 0.84 kgf / cm<sup>2</sup>, 10 – 12 psi), and check for air bubbles.
- 8) If air is leaking, replace the seal of the leaking part.
- 9) After replacement of the seal, pressurize the gear case to 69–82 kPa (0.70 – 0.84 kgf/cm<sup>2</sup>, 10 – 12psi) again and observe the pressure. The gear case should hold the pressure for 5 minutes.
- 10) Remove the joint from the gear case, and tighten the vent screw to the specified torque.

**TORQUE : 7 N·m (0.7 kgf·m, 5.1 lbf·ft)**

**TOOL :**

**Leakage tester**

**07SPJ – ZW0050Z**

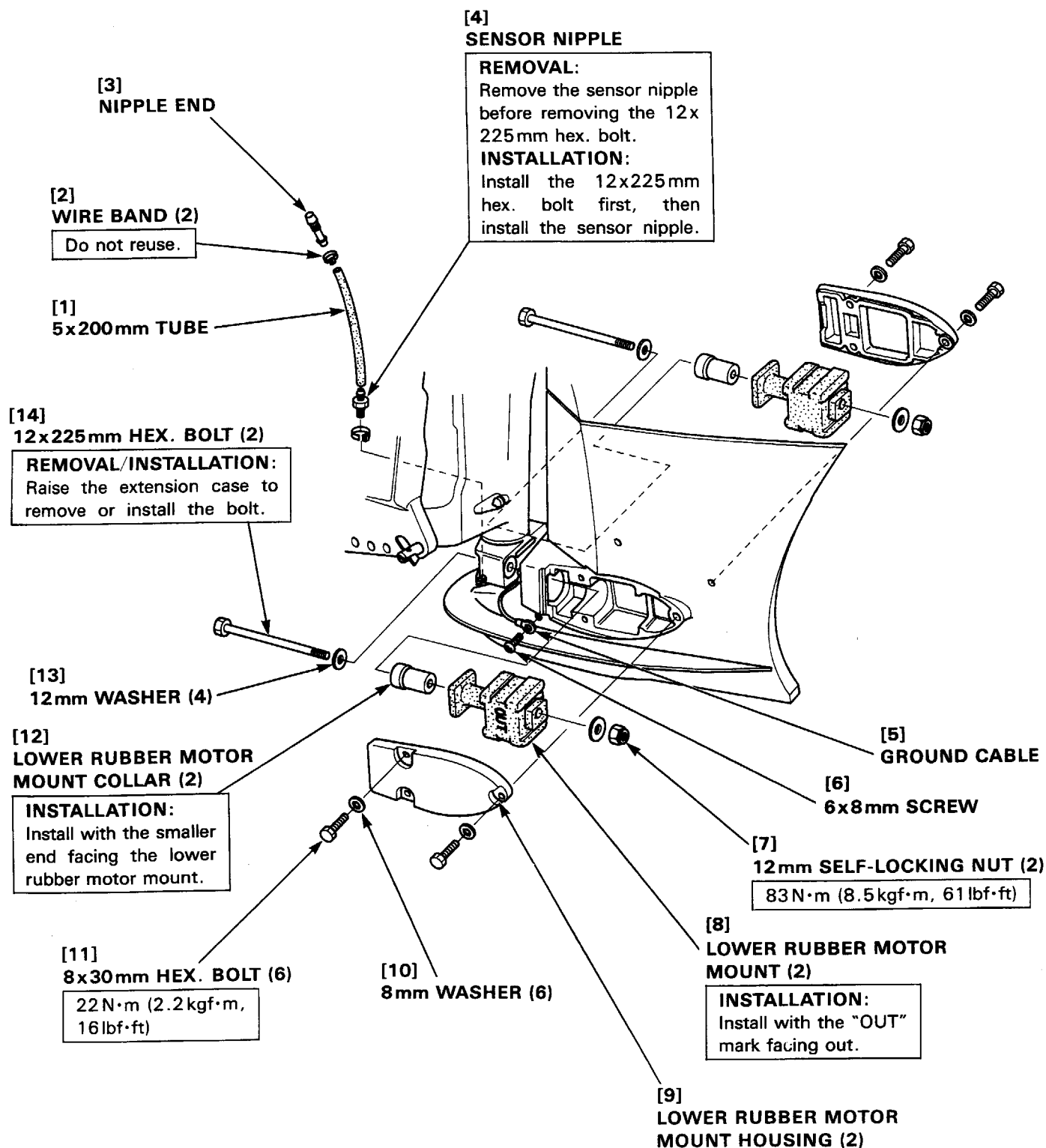




### 10. LOWER RUBBER MOTOR MOUNT

#### a. DISASSEMBLY / ASSEMBLY

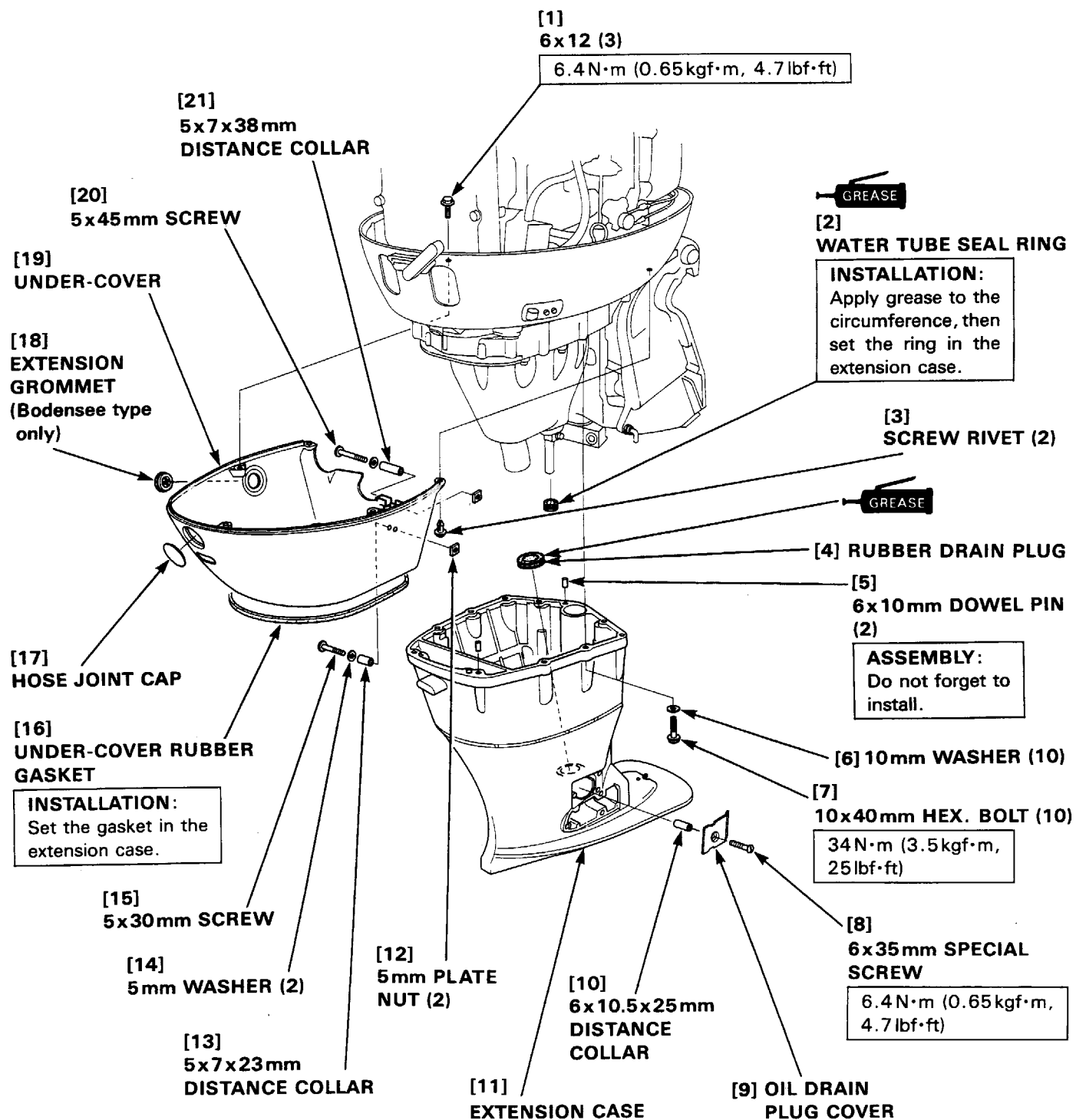
Remove the gear case assembly (P.11-10).



### 11. EXTENSION CASE / UNDER COVER

#### a. DISASSEMBLY / ASSEMBLY

- 1) Remove the gear case assembly (P.11-10).
- 2) Remove the lower rubber motor mount (P.11-30).



# 12. OIL PAN/ENGINE UNDER-CASE/MOUNT CASE

**HONDA**  
**BF75A·90A**

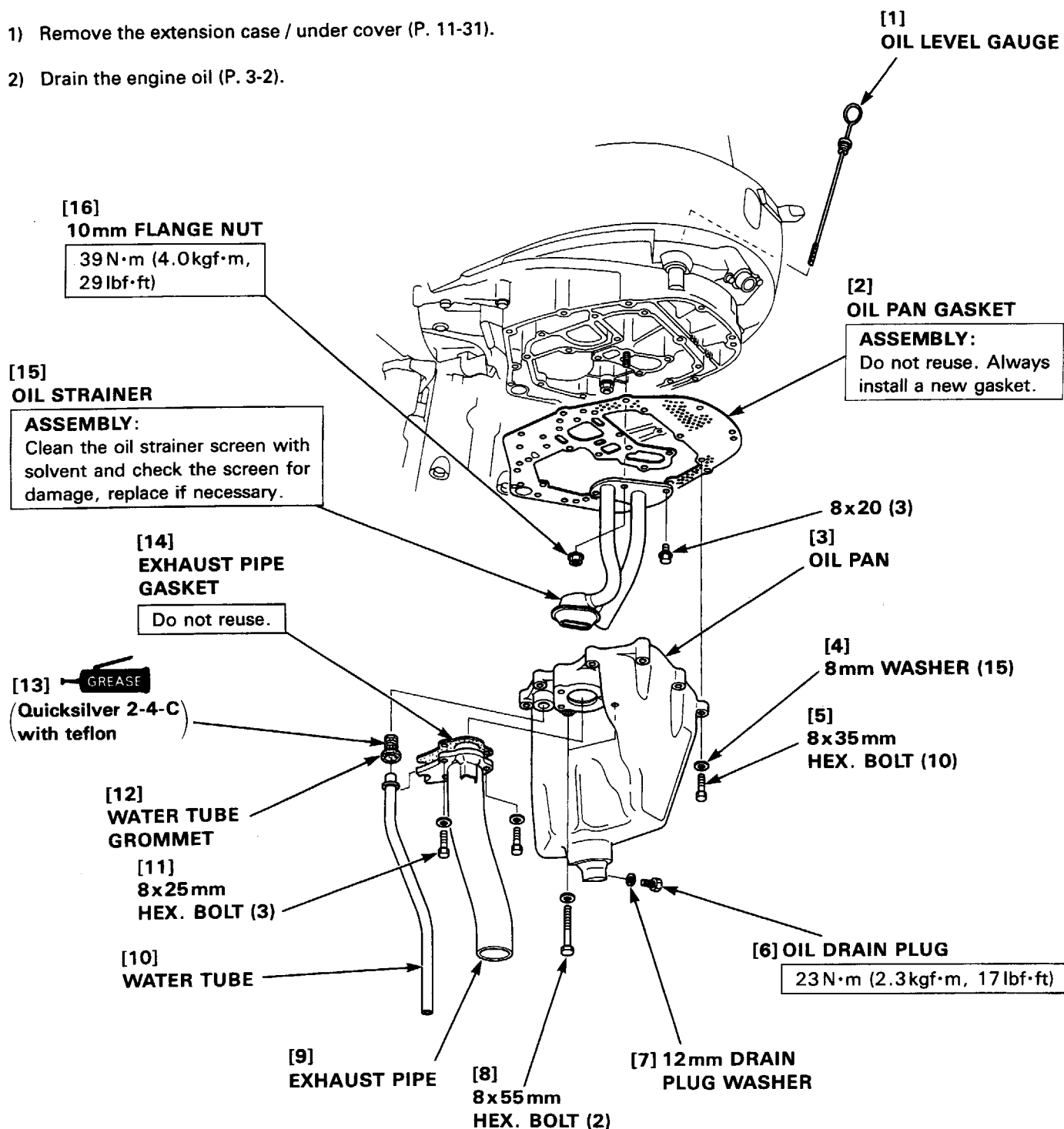
1. OIL PAN / EXHAUST PIPE / WATER TUBE
2. ENGINE UNDERCASE

3. COVER LOCK LEVER
4. MOUNT CASE / UPPER RUBBER MOUNT / SHIFT SHAFT A, B

## 1. OIL PAN / EXHAUST PIPE / WATER TUBE

### a. REMOVAL / INSTALLATION

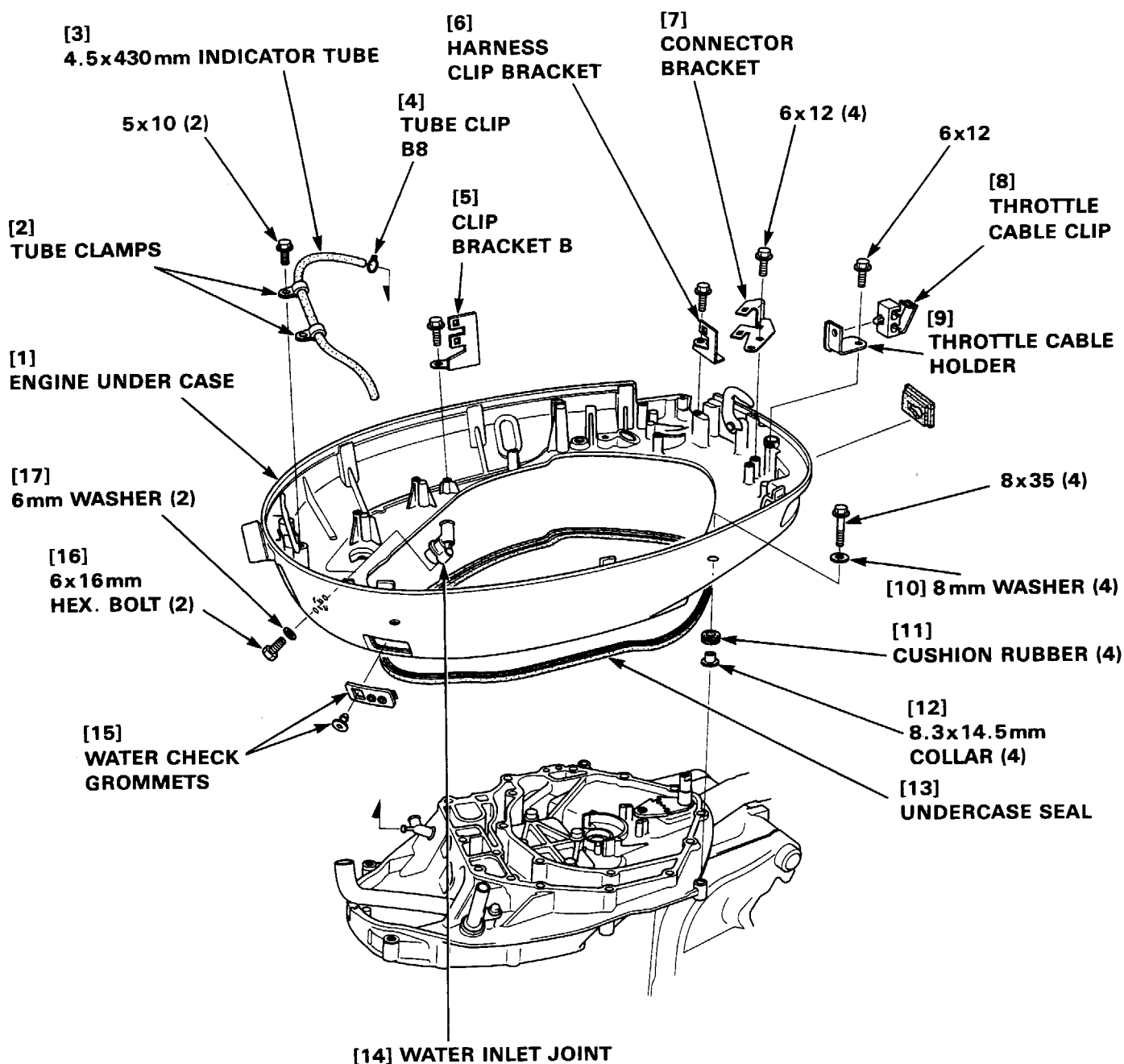
- 1) Remove the extension case / under cover (P. 11-31).
- 2) Drain the engine oil (P. 3-2).



## 2. ENGINE UNDERCASE

### a. REMOVAL / INSTALLATION

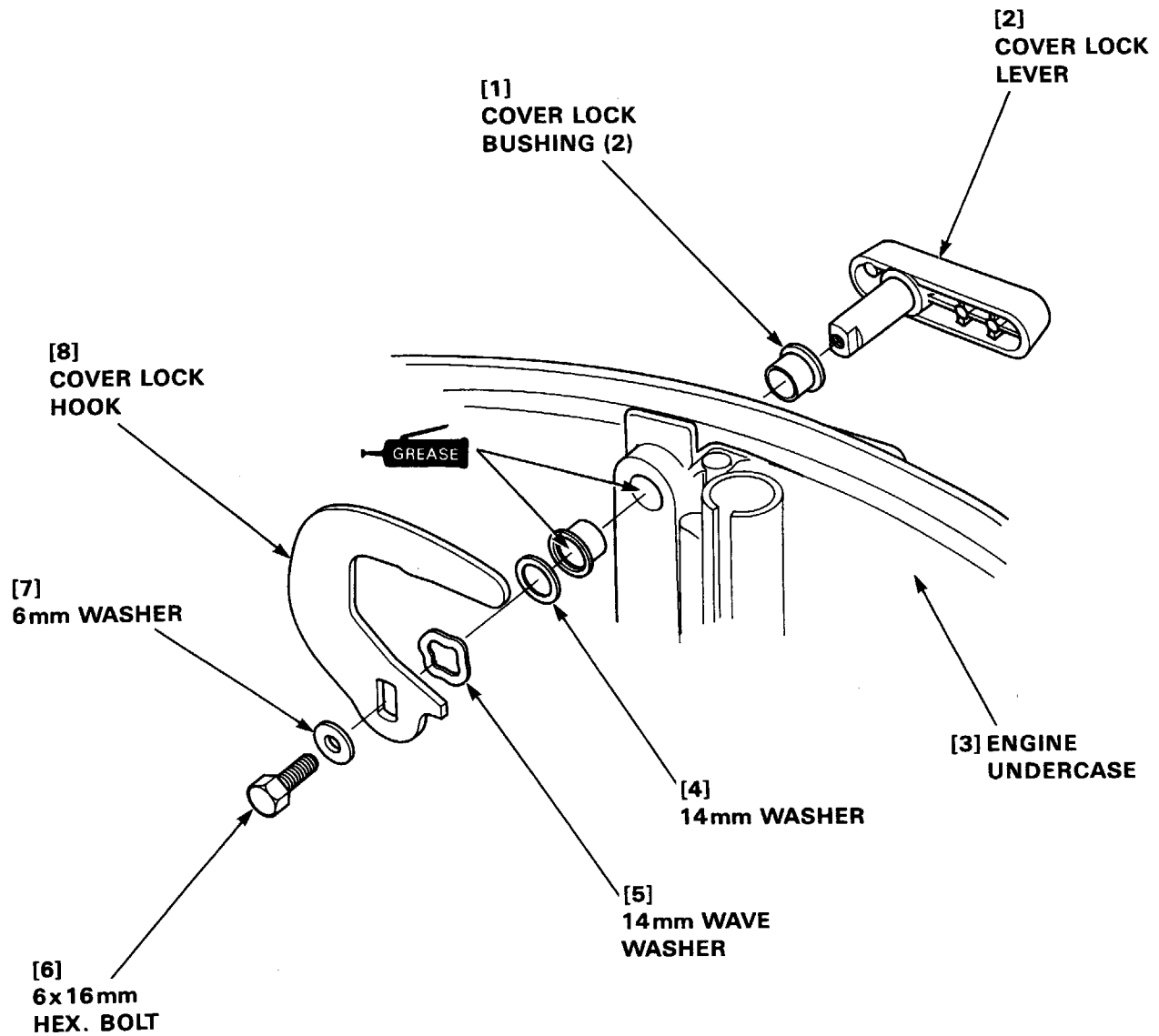
- 1) Remove the engine (P. 7-1).
- 2) Disconnect the starter cable, remote control cable, and shift and throttle cables (P. 17-5).
- 3) Remove the fuel filter and fuel tube (P. 5-11).
- 4) Remove the power tilt relay and power tilt switch [Power trim / tilt type only] (P. 17-11).
- 5) Pull the trim angle sensor wire and power tilt motor wire out of the hole in the engine undercase [Except gas assisted type] (P. 13-1).



### 3. COVER LOCK LEVER

#### a. REMOVAL / INSTALLATION

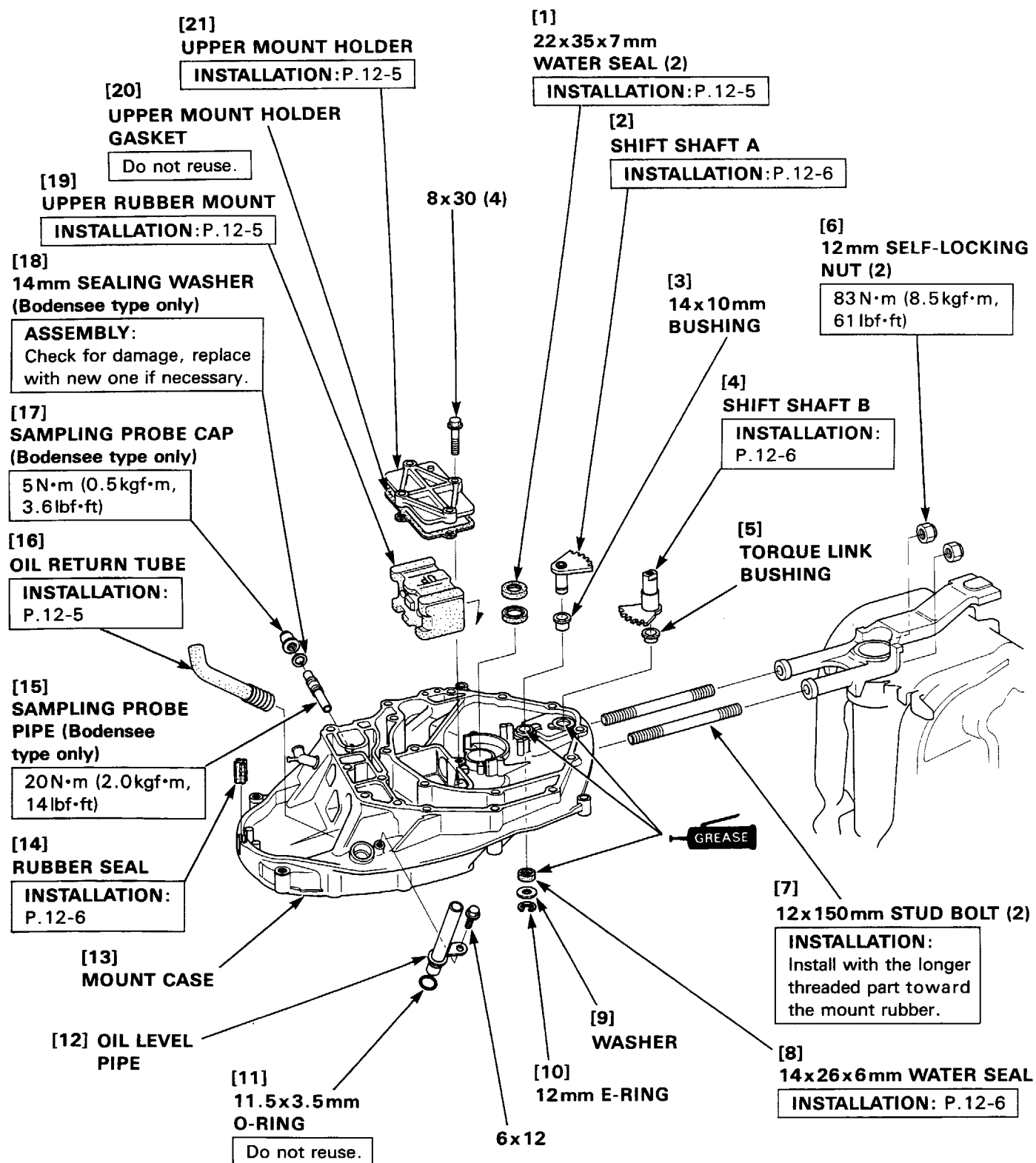
Remove the engine cover (P. 5-1).



### 4. MOUNT CASE / UPPER RUBBER MOUNT / SHIFT SHAFT A, B

#### a. REMOVAL / INSTALLATION

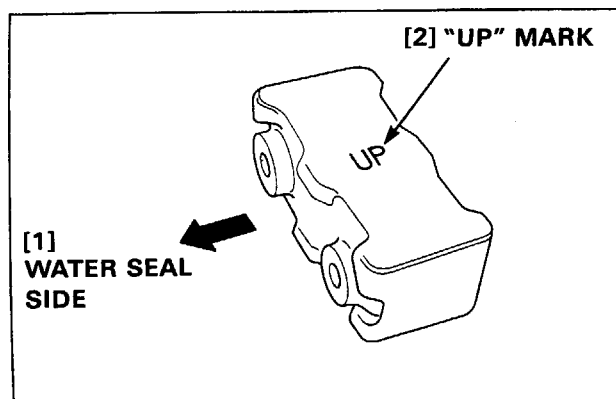
1) Remove the engine undercase (P. 12-2).



### • UPPER RUBBER MOUNT

#### INSTALLATION :

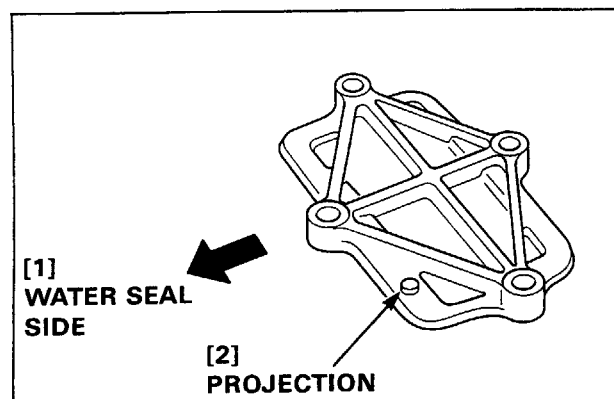
Install on the mount case with the "UP" mark facing up.



### • UPPER MOUNT HOLDER

#### INSTALLATION :

Install the upper mount holder with the projection facing the water seal side as shown.



### • OIL RETURN TUBE

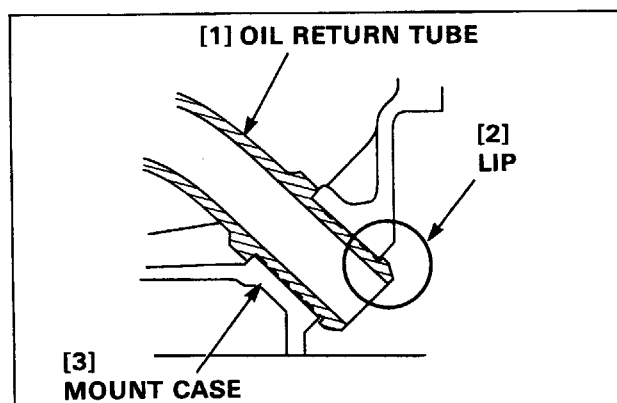
#### INSTALLATION :

Insert the oil return tube into the mount case securely.

Be sure that the lip of the tube end sets on the mount case securely.

#### NOTE:

Apply soapy water to the tube end for easy installation of the tube. Do not apply oil to the tube end.



### • 22 x 35 x 7 mm WATER SEAL

#### INSTALLATION :

- 1) Apply grease to the new water seal.
- 2) Set the new water seals in the mount case using the special tools as shown.

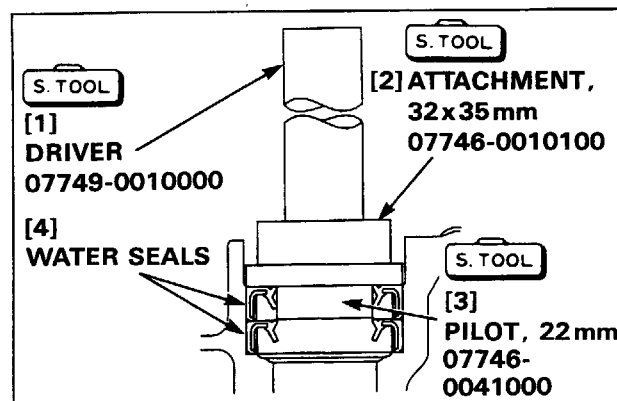
#### NOTE:

Note the installation direction of the water seals. Replace the water seals with new ones when they are removed.

#### TOOLS :

Driver  
Attachment, 32 x 35mm  
Pilot, 22mm

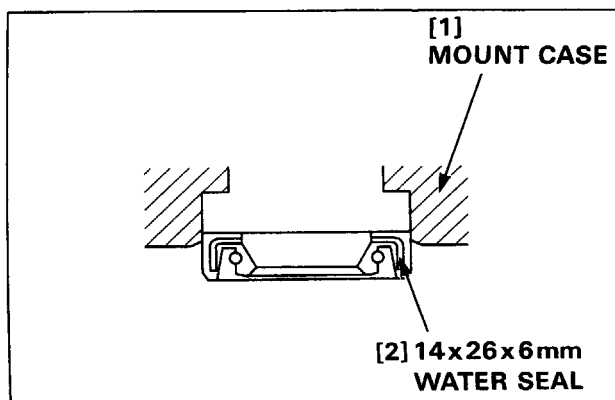
07749-0010000  
07746-0010100  
07746-0041000



### • 14 x 26 x 6 mm WATER SEAL

#### INSTALLATION :

Install the water seal in the mount case as shown. Note the installation direction of the water seal.



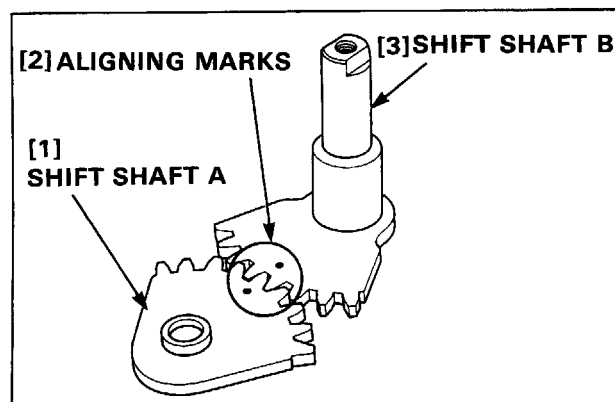
### • SHIFT SHAFT A, B

#### INSTALLATION :

Install shift shaft A and B by aligning the punch marks on the respective shift shafts.

#### NOTE:

- Do not install the engine assembly without aligning the punch marks. Take care not to let the punch marks get out of alignment during the engine installation.
- Note that proper shifting cannot occur unless the punch marks are aligned.



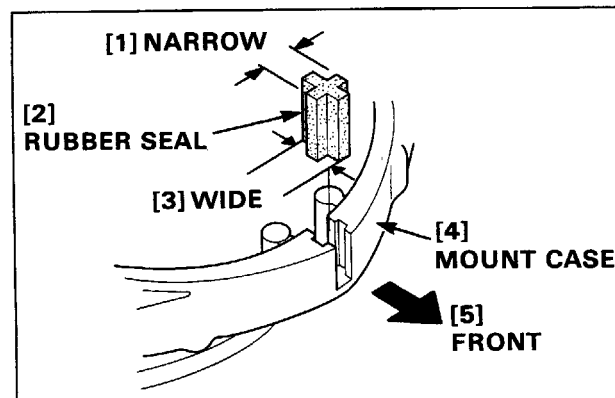
### • RUBBER SEAL

#### INSTALLATION :

Set the rubber seal in the mount case with the narrow side facing the front as shown.

#### NOTE:

Set the rubber seal correctly, or water can enter the mount case.





# 13. SWIVEL CASE / POWER TRIM / TILT ASSEMBLY / GAS ASSISTED ASSEMBLY

**HONDA**  
**BF75A·90A**

- |   |   |
|---|---|
| 1. SWIVEL CASE / STERN BRACKET<br>ASSEMBLY REMOVAL / INSTALLATION                                 | 4. SWIVEL CASE / MOUNT FRAME                              |
| 2. POWER TRIM/TILT ASSEMBLY /<br>STERN BRACKET / SWIVEL CASE ASSEMBLY<br>(POWER TRIM / TILT TYPE) | 5. POWER TRIM / TILT ASSEMBLY<br>(POWER TRIM / TILT TYPE) |
| 3. GAS ASSISTED DAMPER ASSEMBLY /<br>STERN BRACKET / SWIVEL CASE<br>ASSEMBLY (GAS ASSISTED TYPE)  | 6. POWER TILT MOTOR ASSEMBLY<br>(POWER TRIM / TILT TYPE)  |

## 1. SWIVEL CASE / STERN BRACKET ASSEMBLY REMOVAL / INSTALLATION

### • REMOVAL

Place the outboard motor level to the ground by adjusting the adjusting rod position.

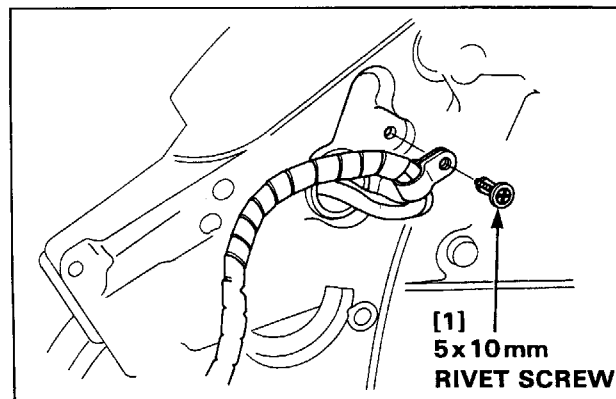
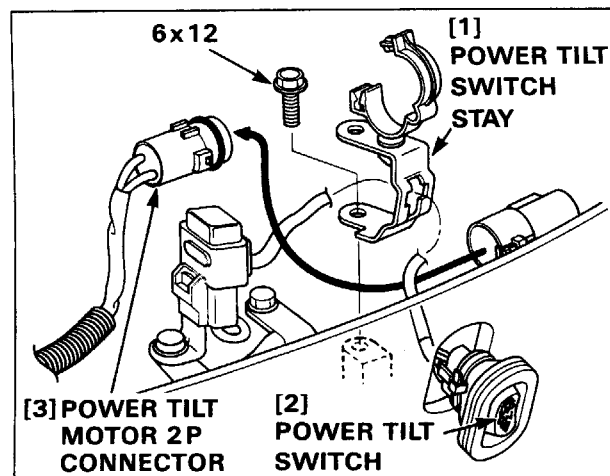
Remove the following parts.

- Engine cover (P.5-1).
- Timing belt cover (P.3-5).
- Gear case assembly (P.11-10).
- Lower rubber motor mount (P.11-30).
- Starter cable / remote control cable / shift, throttle cables (P.17-5).

### NOTE:

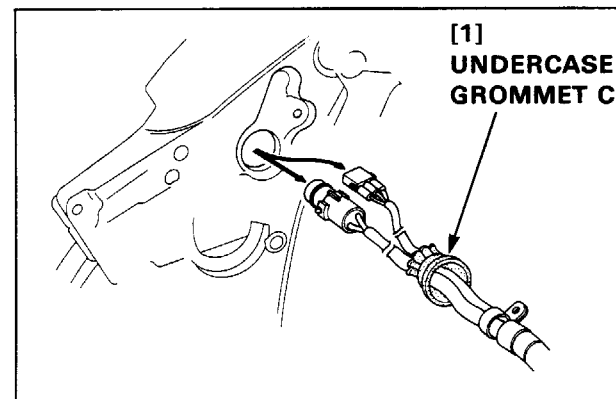
Be sure to remove the sensor nipple from the extension case (P.11-30).

- 1) Disconnect the trim angle sensor 3P connector. Open the cable strap, and wire harness clip and remove the trim angle sensor wire [Trim angle sensor type only] (P.7-3).
- 2) Remove the 6 x 12 mm flange bolt and power tilt switch stay, and disconnect the power tilt motor 2P connector. Disconnect the power tilt motor wire that passes under the power tilt switch [Power trim / tilt type only].



- 3) Remove the cable plate and clip bracket A (P.17-5).

Remove the 5 x 10 mm rivet screw from the engine undercase [Power trim / tilt type only].



- 4) Remove the undercase grommet C from the engine undercase. Remove the trim angle sensor wire (trim angle sensor type only) and / or the power tilt motor wire (power trim / tilt type only) from the hole in the engine undercase.

- 5) Attach the special tool to the starter pulley.

**TOOL :**  
Lifting eye

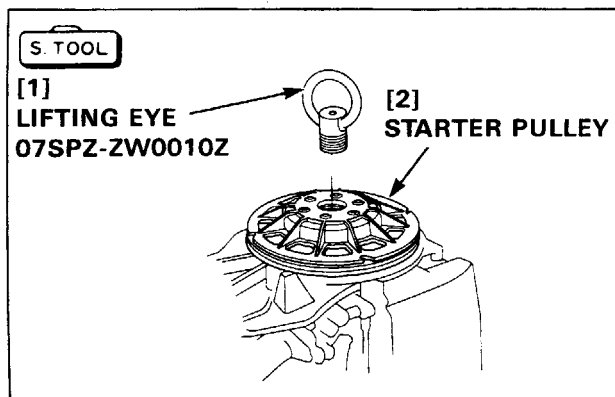
07SPZ - ZW0010Z

**CAUTION:**

Do not use a hole around the starter pulley as an engine hanger.

**NOTE:**

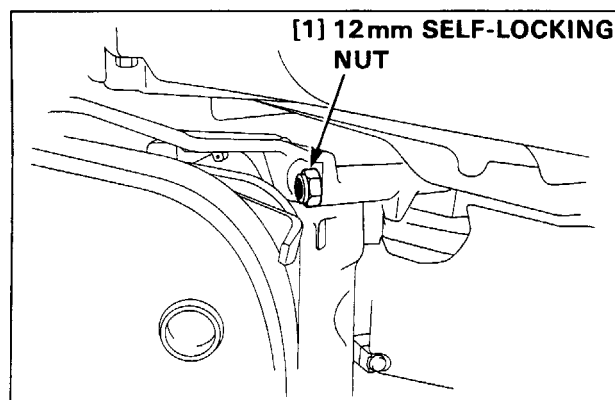
- Attach the special tool to the starter pulley securely.
- Use a crane with a lifting capacity of 227 kg (500 lbs) or above.



- 6) Set the hanger hook in the special tool (P.7-4).

Raise the crane to take up the slack in the chain.

- 7) Remove the two 12 mm self-locking nuts from the mounting frame.



- 8) Holding the outboard motor securely, remove the swivel case / stern bracket assembly from the outboard motor stand.

If it is hard to remove the swivel case / stern bracket assembly, inch the crane up and down slowly and remove.

**NOTE:**

Take care not to let the outboard motor stand get off the ground while lifting the outboard motor with the crane.

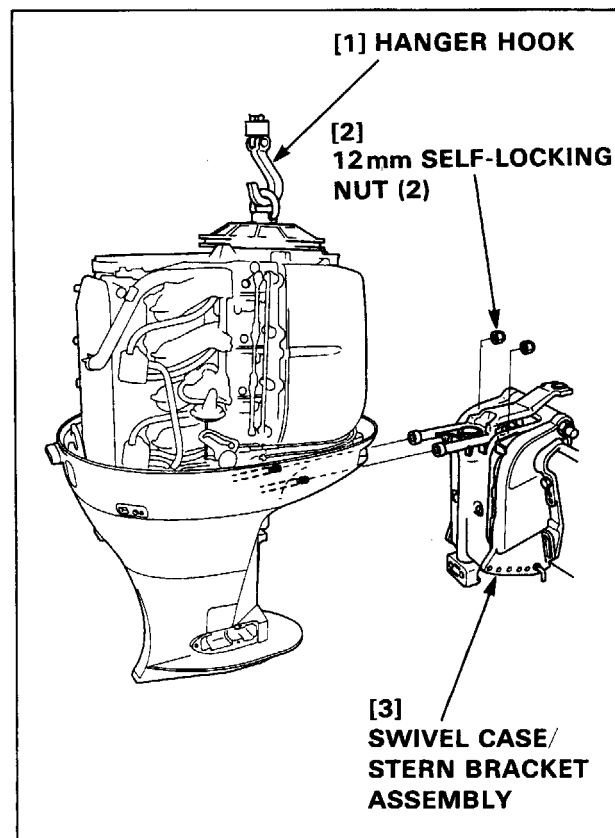
- 9) After removing the swivel case / stern bracket assembly, lower the crane slowly until the bottom of the extension case (i.e. gear case assembly mounting section) contacts the ground.

### • INSTALLATION

Installation is the reverse order of removal.

**TORQUE :**

12 mm self-locking nut : 83 N·m (8.5 kgf·m, 61 lbf·ft)

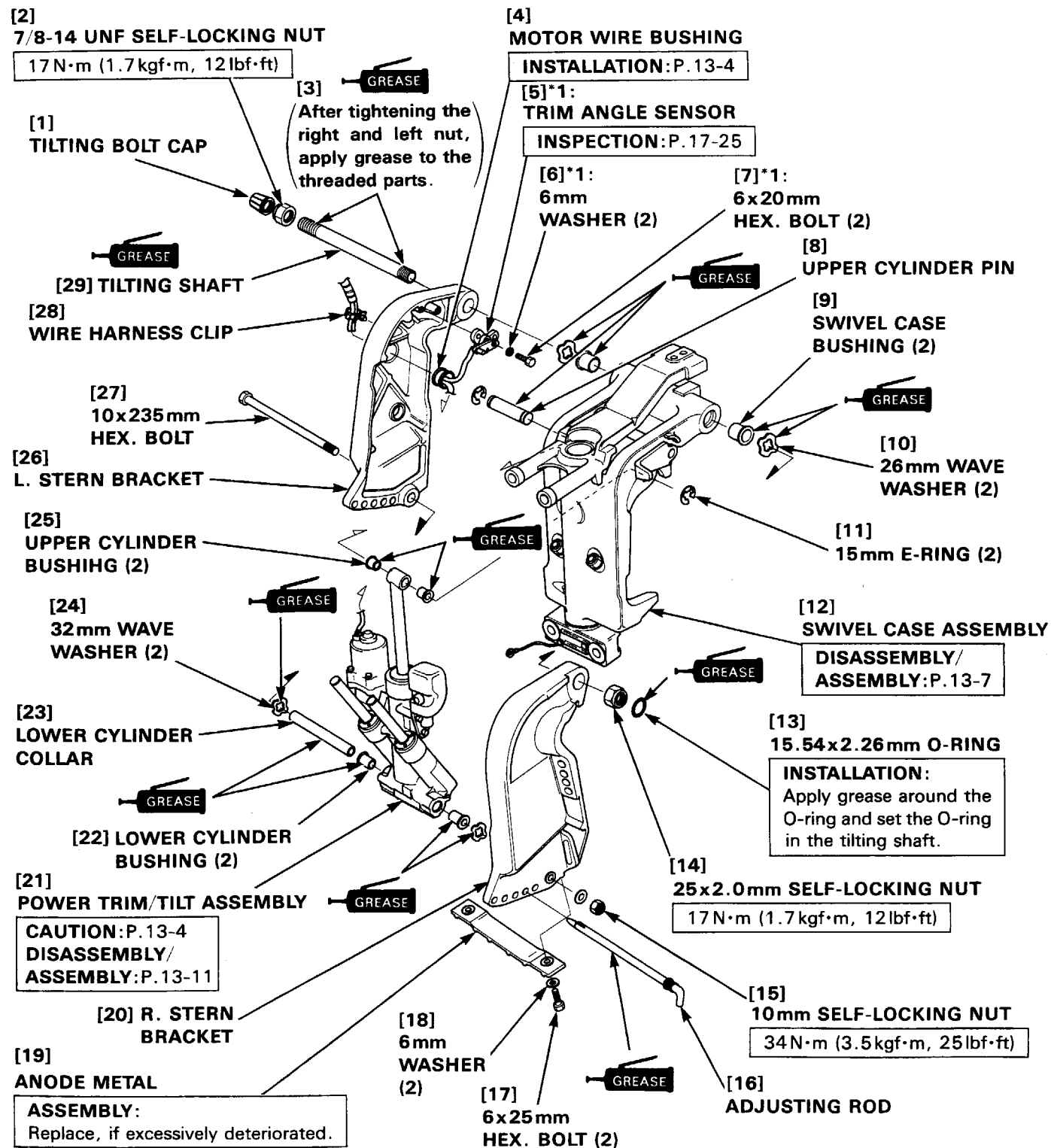


## 2. POWER TRIM / TILT ASSEMBLY / STERN BRACKET / SWIVEL CASE ASSEMBLY (POWER TRIM / TILT TYPE)

### a. DISASSEMBLY / ASSEMBLY

Loosen the manual valve fully and raise the swivel case to the uppermost position to remove the power trim / tilt assembly.

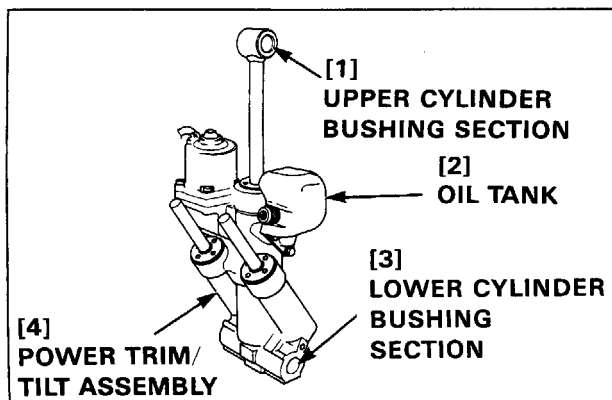
\*1: Trim angle sensor type only



### • POWER TRIM / TILT ASSEMBLY

#### CAUTION:

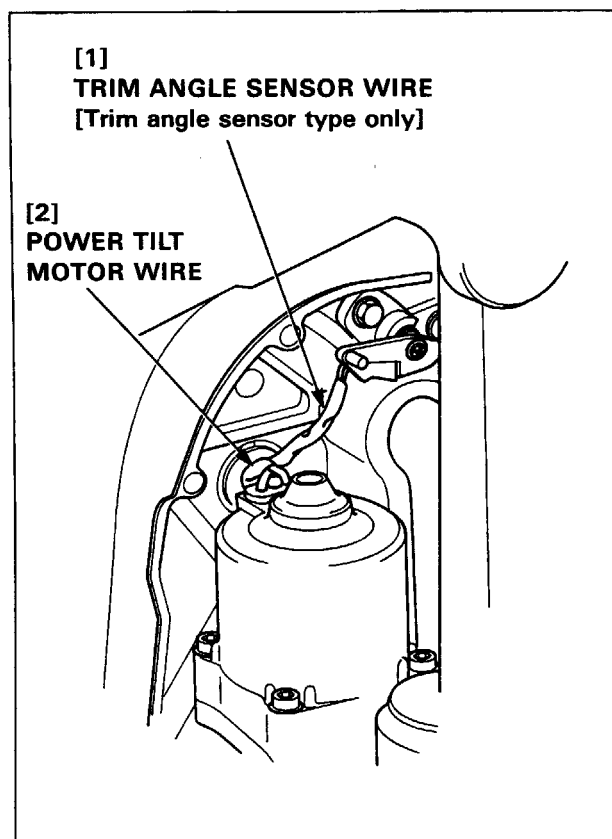
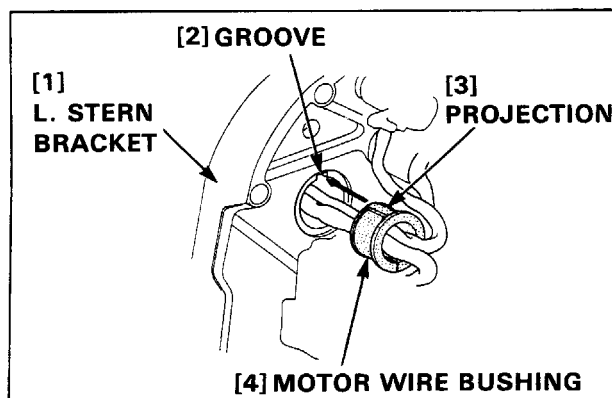
Store the power trim / tilt assembly vertical with the upper cylinder bushing section facing up after removal. Never store the power trim / tilt assembly with the motor assembly facing up or with the lower cylinder bushing section facing up.



### • MOTOR WIRE BUSHING

#### INSTALLATION :

- 1) Pass each wire through the motor wire bushing.
- 2) Install the motor wire bushing by aligning the projection on the motor wire bushing with the groove in the left stern bracket.
- 3) After installing the power trim / tilt assembly, check each wire and be sure they are not slack.



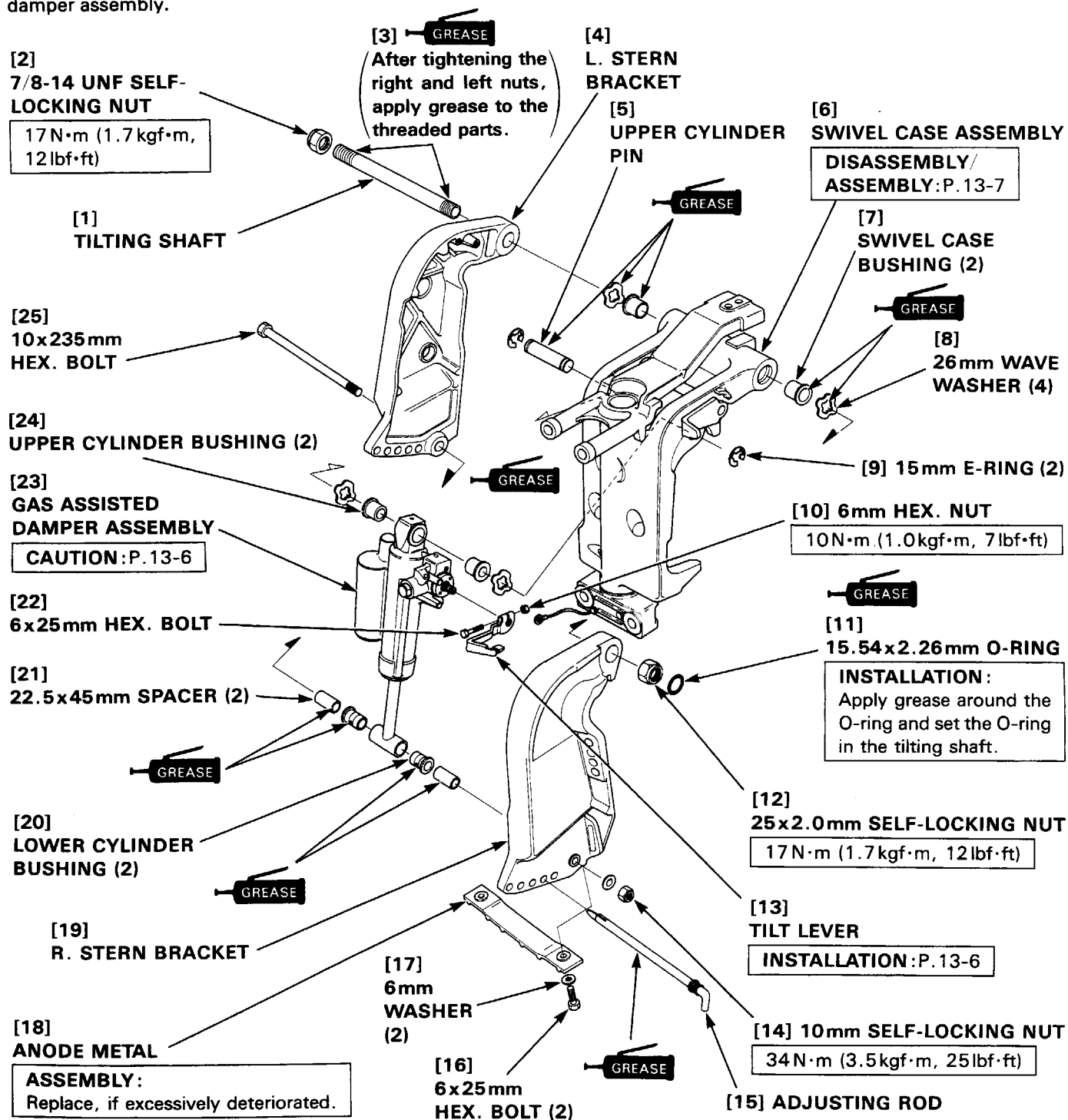
### 3. GAS ASSISTED DAMPER ASSEMBLY / STERN BRACKET / SWIVEL CASE ASSEMBLY (GAS ASSISTED TYPE)

#### a. DISASSEMBLY / ASSEMBLY

##### ⚠ WARNING

Do not disassemble the gas assisted damper assembly as it is filled with high pressure gas.

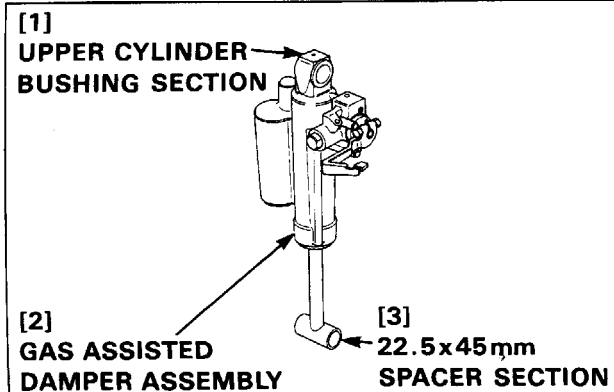
Move the tilt lever to the "FREE" position and raise the swivel case to the uppermost position to remove the gas assisted damper assembly.



### • GAS ASSISTED DAMPER ASSEMBLY

#### CAUTION:

Store the gas assisted damper assembly vertically with the upper cylinder bushing section facing up. Do not store it horizontally or with the 22.5 x 45 mm spacer section facing up.

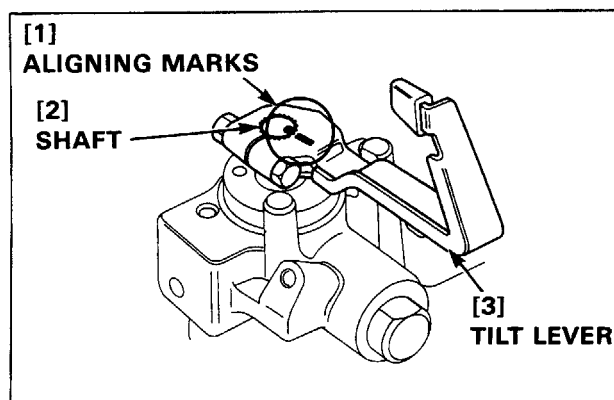


### • TILT LEVER

#### INSTALLATION:

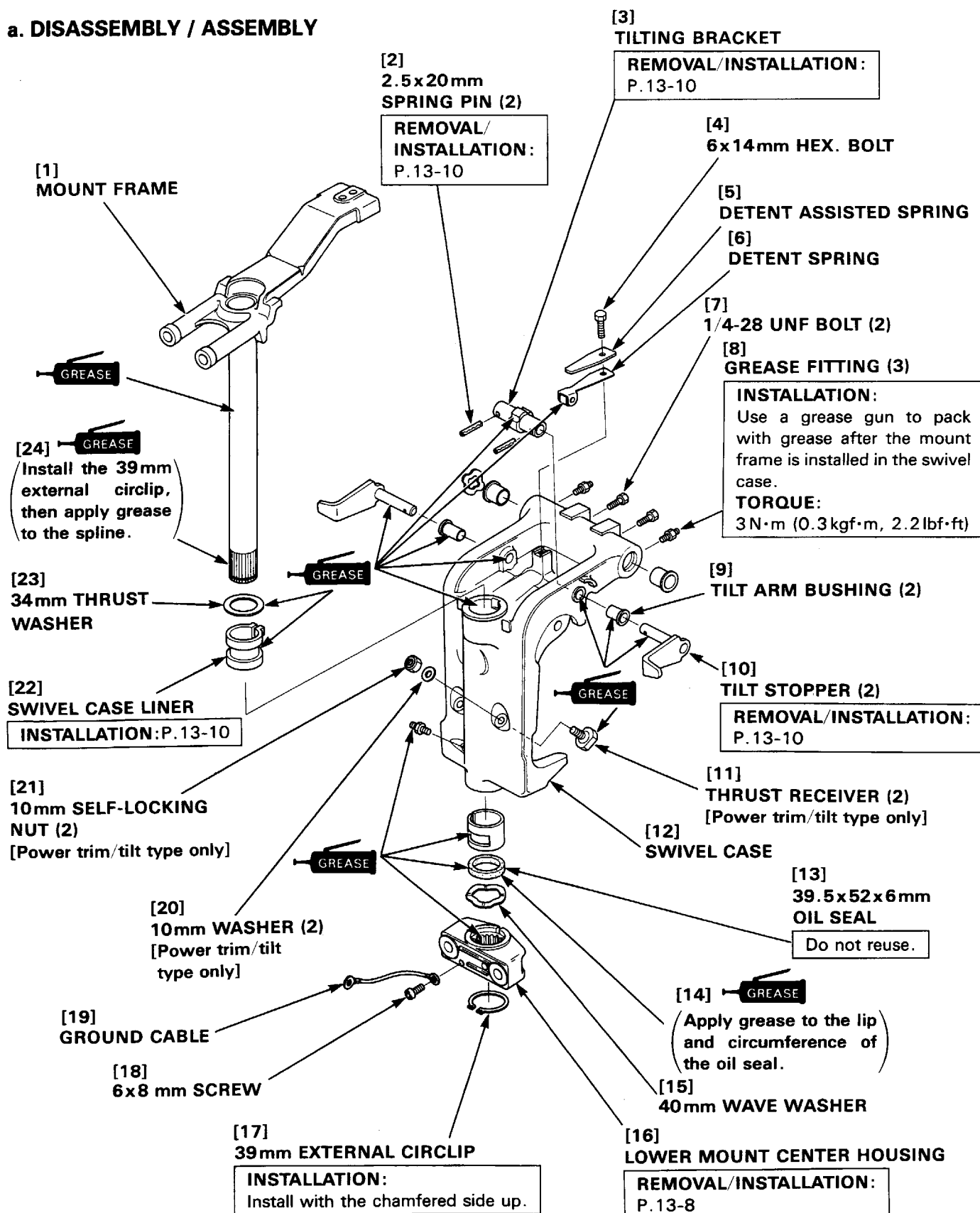
Install the tilt lever by aligning the "I" mark on the tilt lever with the punch mark on the shaft.

**TORQUE:** 10 N·m (1.0 kgf·m, 7 lbf·ft)



### 4. SWIVEL CASE / MOUNT FRAME

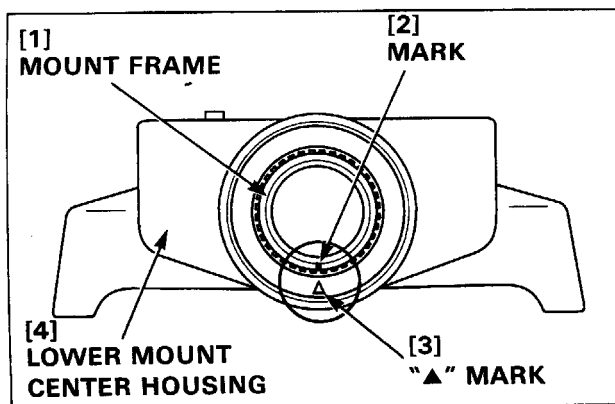
#### a. DISASSEMBLY / ASSEMBLY



### • LOWER MOUNT CENTER HOUSING

#### REMOVAL :

- 1) Remove the 39 mm external circlip.
- 2) Mark the mount frame so that it aligns with the "▲" mark on the lower mount center housing.



- 3) Remove the lower mount center housing using a hydraulic press and the special tools as shown.

#### TOOLS :

Driver

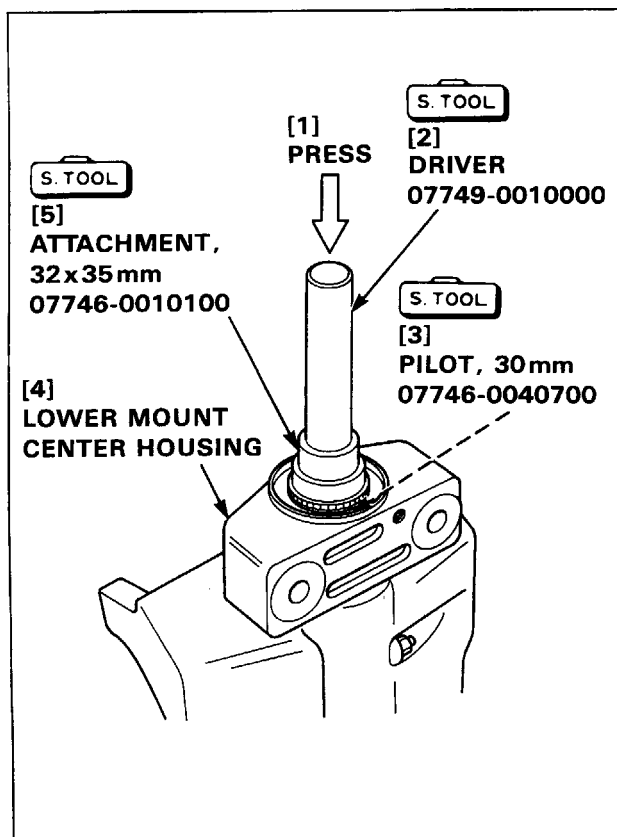
07749 - 0010000

Attachment, 32 x 35 mm

07746 - 0010100

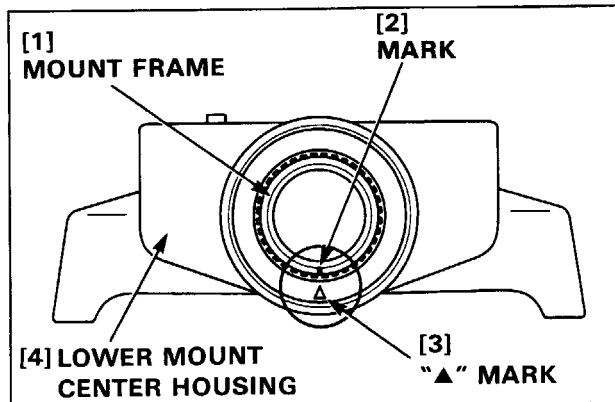
Pilot, 30 mm

07746 - 0040700



#### INSTALLATION :

- 1) Apply grease to the circumference and spline of the mount frame shaft, and set the mount frame in the swivel case.
- 2) Apply grease to the spline of the lower mount center housing. Set the lower mount center housing on the mount frame by aligning the mark put on the mount frame during removal with the "▲" mark on the lower mount center housing.





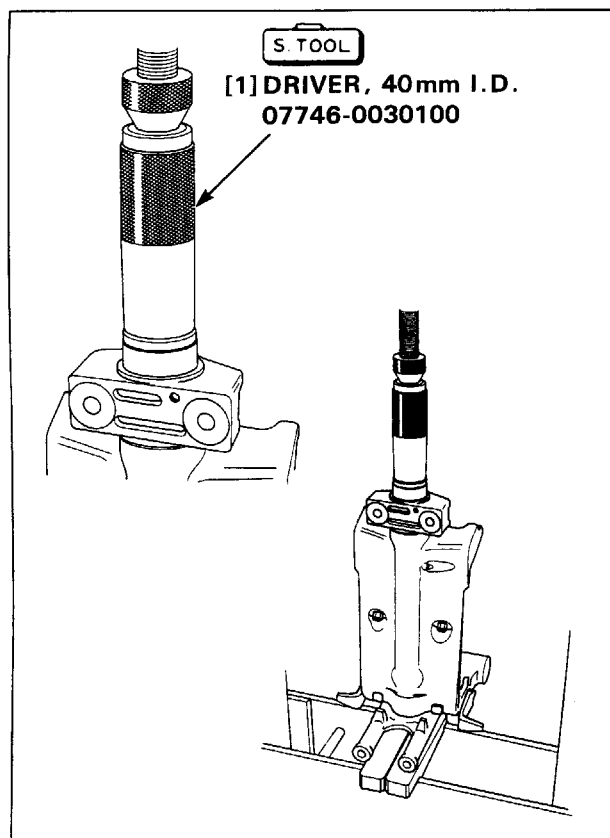
3) Set the swivel case / mount frame on a hydraulic press as shown.

4) Set the special tool on the lower mount center housing as shown, and press the lower mount center housing until it contacts the swivel case (i.e. until the hydraulic pressure of the press rises slightly).

**TOOL :**

**Driver, 40 mm I.D.**

**07746 - 0030100**



5) Remove the swivel case assembly and the special tool from the hydraulic press.

6) Check the mount frame for smooth rotation. Check whether the 39 mm external circlip can be installed.

**TOOLS :**

**Driver**

**07749 - 0010000**

**Attachment, 32 x 35 mm**

**07746 - 0010100**

**Pilot, 30 mm**

**07746 - 0040700**

<When the mount frame turns smoothly and the circlip can be installed>

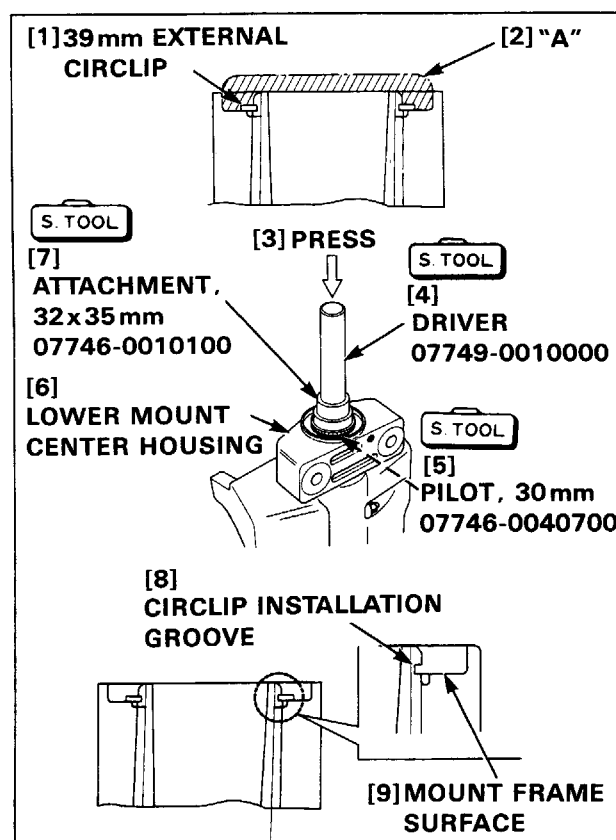
- Install the 39 mm external circlip, and apply grease to the part of "A" shown in the drawing.

<When the circlip can be installed but the mount frame does not turn smoothly>

(1) Attach the special tools to the lower mount center housing.

(2) Press until the circlip installation groove in the mount frame aligns with the lower mount center housing face. Remove the puller and the special tools.

(3) Install the 39 mm external circlip, and apply grease to the part "A" shown in the drawing.



### • TILT STOPPER / 2.5 x 20 mm SPRING PIN / TILTING BRACKET

#### REMOVAL :

Remove the 2.5 x 20 mm spring pins using a commercially available 2.5 mm or 3/32-inch pin punch. Remove the tilt stopper and tilting bracket.

#### INSTALLATION :

- 1) Place the tilt arm bushing and the tilt stoppers on both sides of the swivel case.
- 2) Insert the tilting bracket into the right and left tilt stopper shafts, so that the projection on the tilting bracket is at the right side and facing up when viewed from the mount frame installation hole side in the swivel case.
- 3) Drive in the 2.5 x 20 mm spring pins using a commercially available 2.5 mm or 3/32-inch pin punch.

Drive in the pins so that 1 – 2 mm (0.04 – 0.08 in) of the pin end is out of the tilting bracket at the opposite side from the driving side.

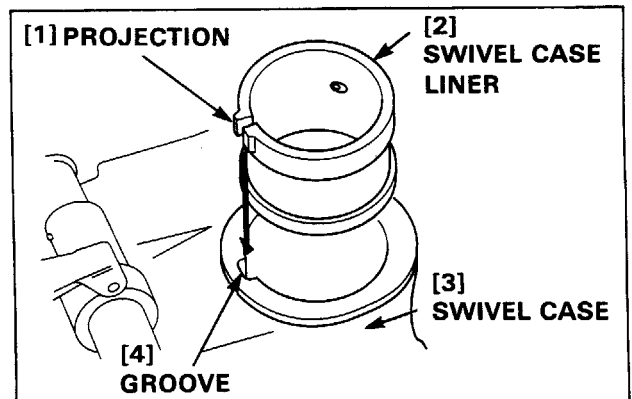
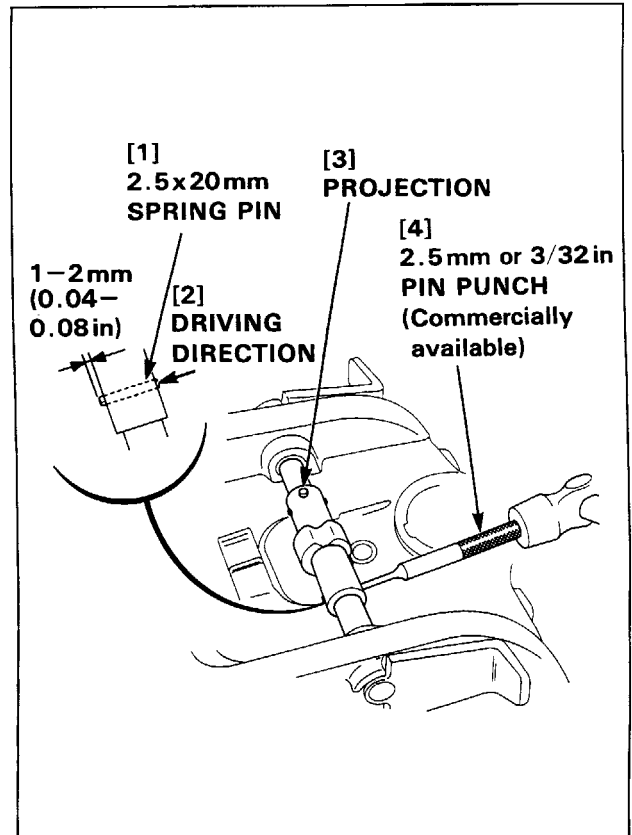
#### NOTE:

Do not drive in the spring pins excessively. The tilt stopper cannot operate properly if the extrusion length of the pin end is more than 1 – 2 mm (0.04 – 0.08 in).

### • SWIVEL CASE LINER

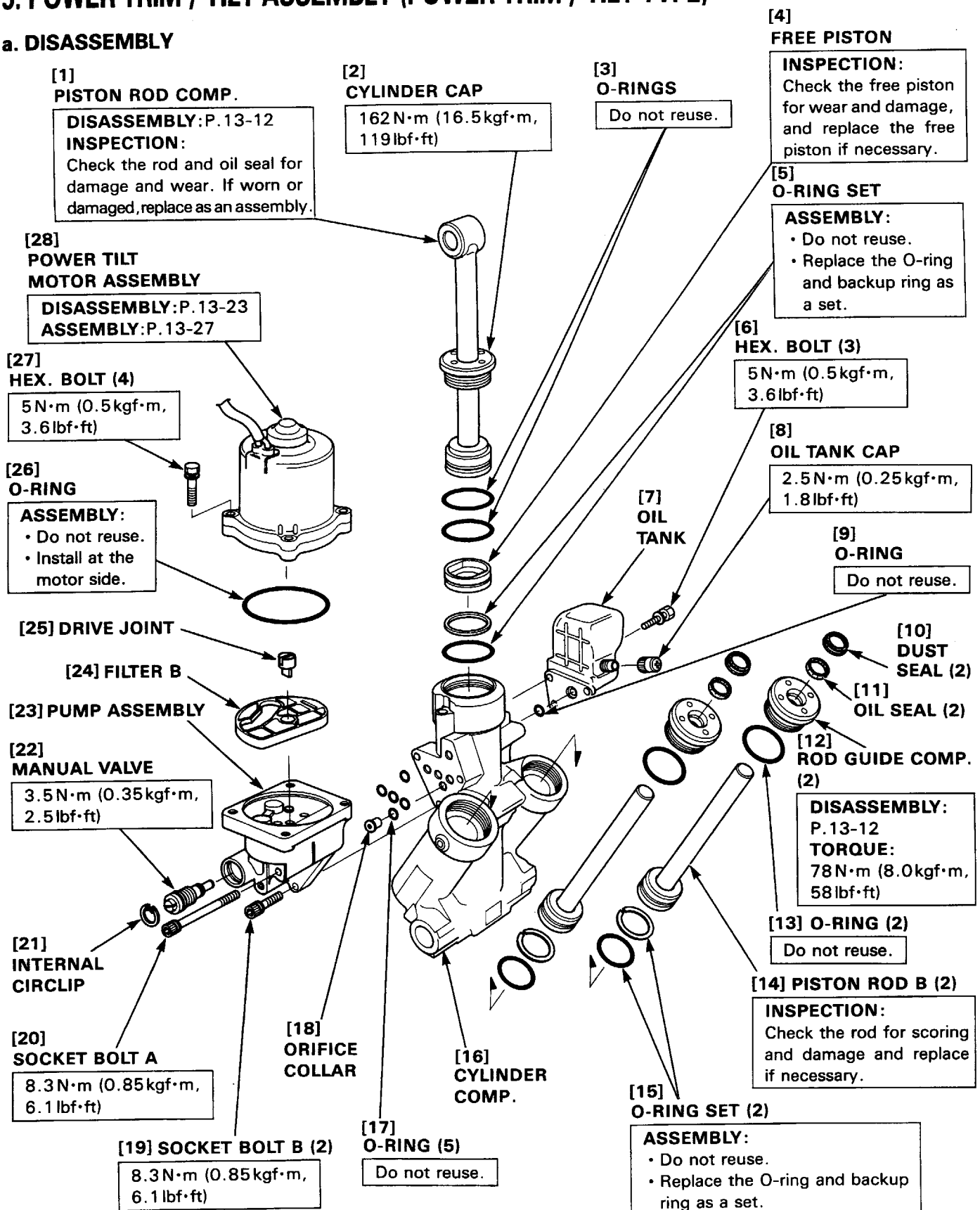
#### INSTALLATION :

- 1) Apply grease to the circumference of the swivel case liner.
- 2) Install the swivel case liner by aligning the projection on the swivel case liner with the groove in the swivel case.



### 5. POWER TRIM / TILT ASSEMBLY (POWER TRIM / TILT TYPE)

#### a. DISASSEMBLY



### • PISTON ROD COMP

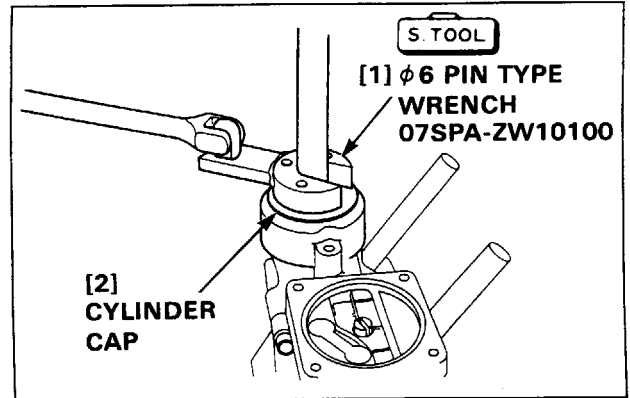
#### DISASSEMBLY :

- 1) Hold the cylinder comp with a vice (P.13-13).
- 2) The piston rod comp. must be extended fully.
- 3) Set the special tool on the cylinder cap as shown, and remove the piston rod comp.

#### TOOL :

ø6 pin type wrench

07SPA - ZW10100



### • ROD GUIDE COMP

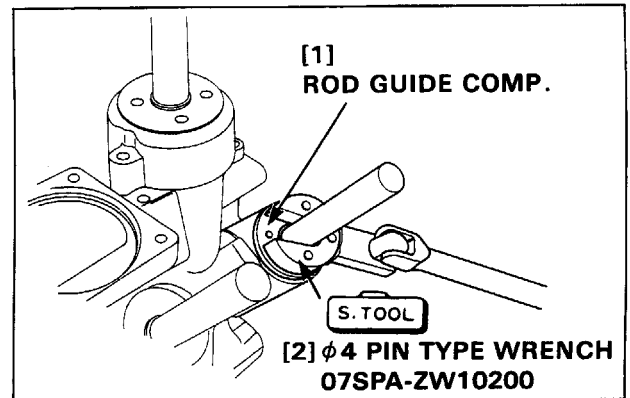
#### DISASSEMBLY :

- 1) Hold the cylinder comp with a vice (P.13-13).
- 2) The right and left piston rod B must be extended fully.
- 3) Remove the rod guide comp. using the special tool as shown.

#### TOOL :

ø4 pin type wrench

07SPA - ZW10200



### b. ASSEMBLY

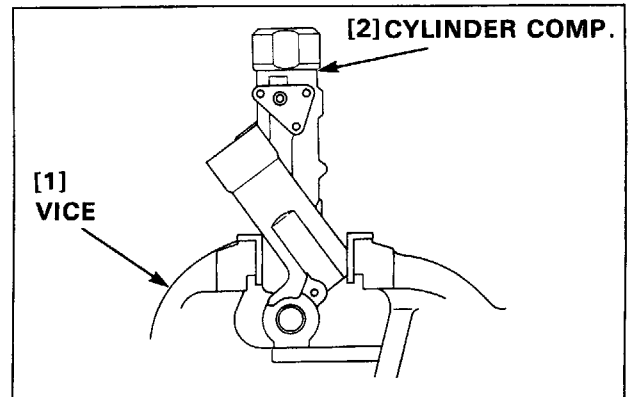
#### NOTE:

- Do not reuse the O-rings.
- Assemble with the rods of the piston rod comp. and the piston rod B extended fully. Do not push in the extended rods after pouring the oil in each cylinder.
- Apply Automatic Transmission Fluid (ATF) to the new O-rings on assembly.
- Do not use a shop towel or equivalent cloth, and do not wear gloves during this operation.
- Do not reuse the drained Automatic Transmission Fluid (ATF).
- After assembly, coat the joints or mating sections of the parts and the sections where the paint came off with rust preventive paint of the same color.

- 1) Hold the cylinder comp. with in a vice as shown.

#### NOTE:

Take care not to tighten the vice excessively, as it damages the cylinder comp.

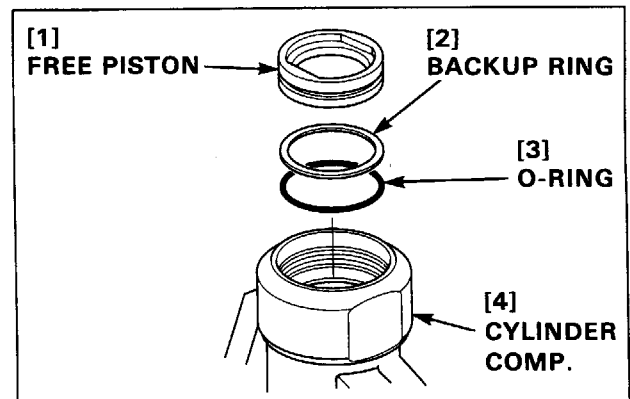


- 2) Pour approximately 30 cm<sup>3</sup> (1.0 fl oz) of Automatic Transmission Fluid (ATF) into the piston rod of the cylinder comp.

Recommended oil	Genuine Honda Automatic Transmission Fluid (ATF) DEXRON® or equivalent
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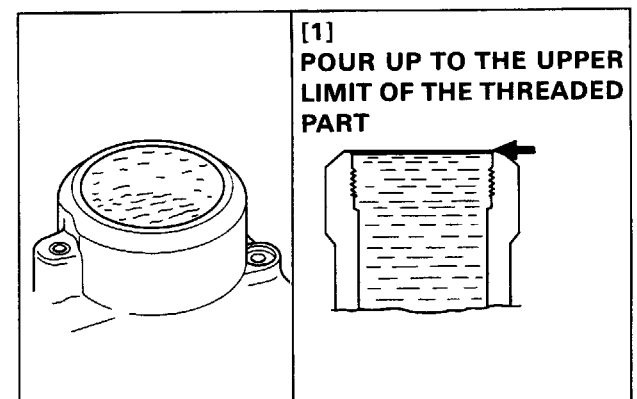
- 3) Check the free piston for wear and damage and replace if necessary.

Install a new backup ring and O-ring on the free piston.



- 4) After inspection, push in the free piston slowly until it bottoms out.

- 5) Pour new Automatic Transmission Fluid (ATF) up to the upper limit (i.e. lower edge of the threaded section) of the piston rod.



- 6) Install a new O-ring at the bottom (i.e. nut side) of the piston rod comp.
- 7) Install a new O-ring on the cylinder cap of the piston rod comp.
- 8) Set the cylinder cap at the bottom (i.e. nut side) of the piston rod comp., and install the piston rod comp. in the cylinder comp.

**NOTE:**

When installing the piston rod comp., do not push the piston rod comp. into the cylinder comp.

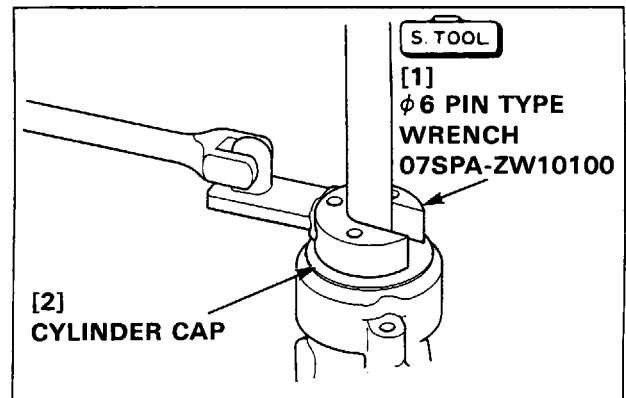
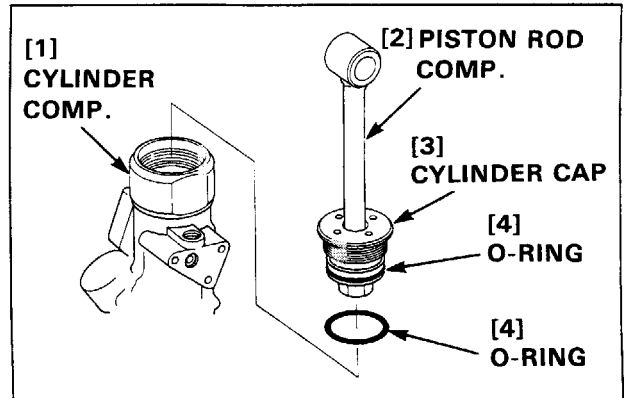
- 9) Using the special tool, tighten the cylinder cap to the specified torque.

**TORQUE : 162 N·m (16.5 kgf·m, 119 lbf·ft)**

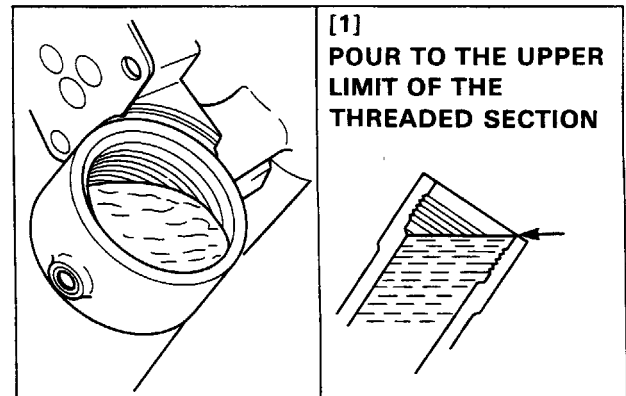
**TOOL :**

ø6 pin type wrench

07SPA - ZW10100



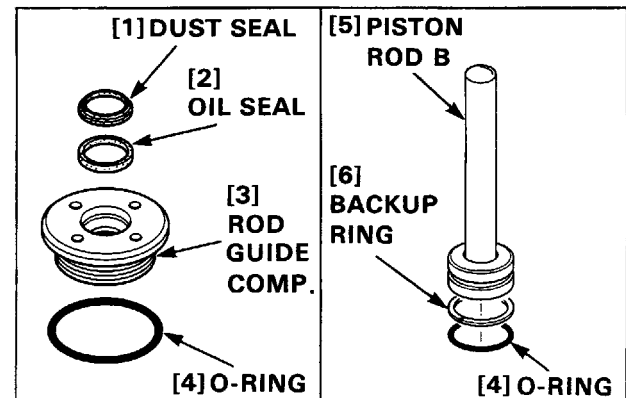
- 10) Pour new Automatic Transmission Fluid (ATF) to the upper limit of the right and left trim cylinders.



- 11) Install a new dust seal inside the rod guide comp.

Install a new O-ring and oil seal on the rod guide comp.

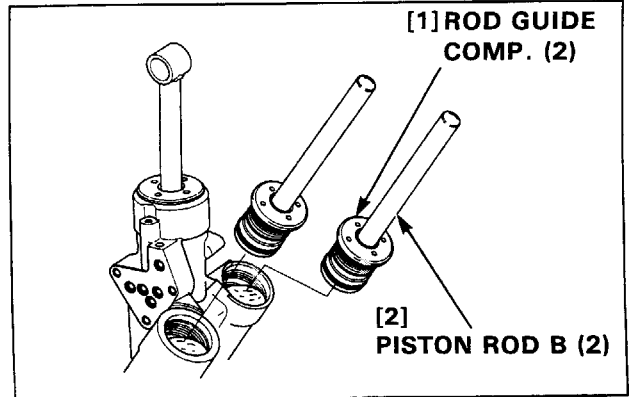
- 12) Install a new backup ring and O-ring on piston rod B.



- 13) Set the rod guide comp. on each piston rod B. Hold the right and left trim cylinders at an angle, and insert each piston rod B in the respective trim cylinders.

**NOTE:**

Do not install the piston rod Bs by pushing them into the respective trim cylinders.



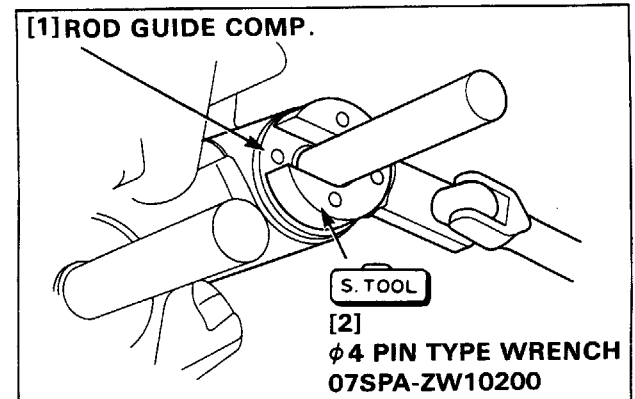
- 14) Install piston rod B in the right and left trim cylinders slowly.

- 15) Holding piston rod B in place, tighten the rod guide comp. against the cylinder comp.

Tighten the other rod guide comp. against the cylinder comp. in the same manner.

**NOTE:**

Take care not to push the piston rod B into the trim cylinders when tightening the rod guide comp. against the cylinder comp.



- 16) Using the special tool, tighten the right and left rod guide comps. to the specified torque.

**TORQUE : 78 N·m (8.0 kgf·m, 58 lbf·ft)**

**TOOL :**

4 pin type wrench

07SPA - ZW10200

- 17) Check the manual valve for wear and damage and replace if necessary.

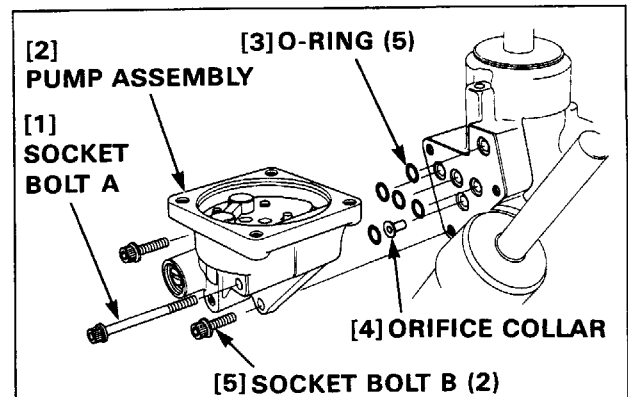
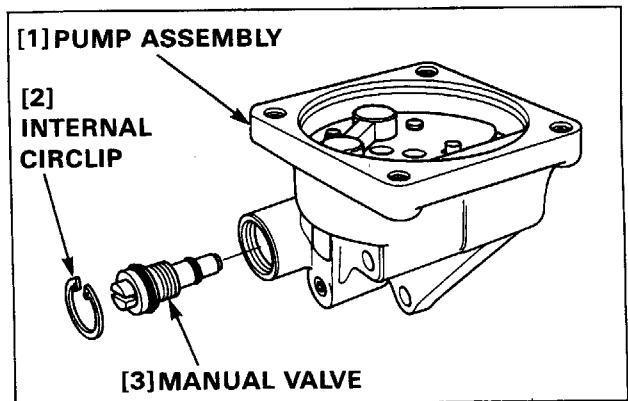
- 18) Tighten the manual valve against the pump assembly securely.

**TORQUE : 3.5 N·m (0.35 kgf·m, 2.5 lbf·ft)**

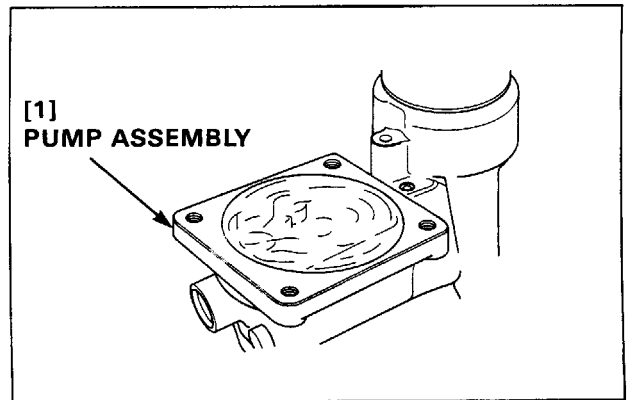
Install the internal circlip.

- 19) Install the five new O-rings and orifice collar in the cylinder comp., and install the pump assembly on the cylinder comp. using socket bolts A and B.

**TORQUE : 8.3 N·m (0.85 kgf·m, 6.1 lbf·ft)**



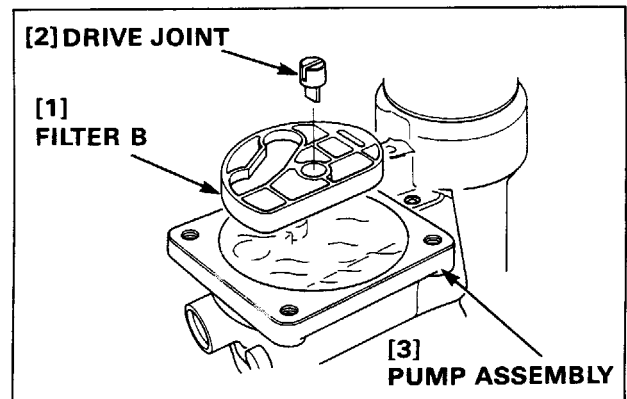
- 20) Fill the pump assembly fully with new Automatic Transmission Fluid (ATF).



- 21) Check filter B for clogging and damage. Replace filter B if it is damaged.

Blow air through filter B if it is clogged. Clean filter B carefully to avoid damage.

- 22) Install filter B and the drive joint on the pump assembly.

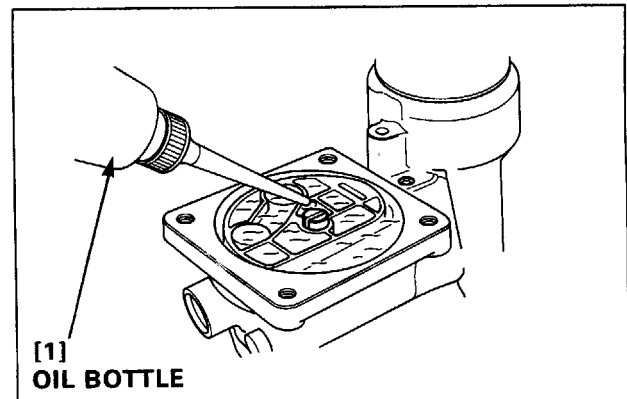


- 23) After installation, check filter B for bubbles. Remove the bubbles with the oil bottle or an equivalent tool if necessary.

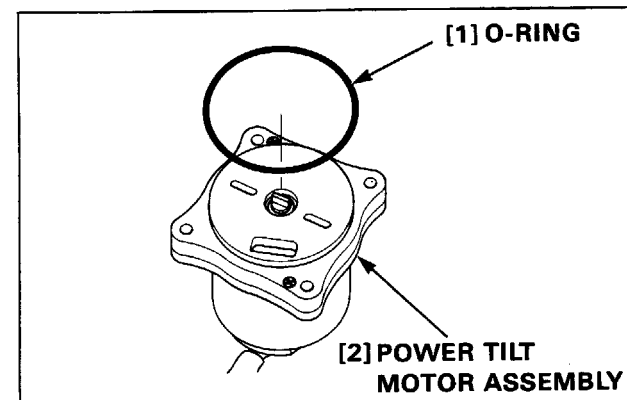
**NOTE:**

Be sure to remove the air bubbles, or it will cause air in the system.

- 24) After removing the air bubbles, fill the pump assembly fully with Automatic Transmission Fluid (ATF) again.



- 25) Install a new O-ring on the power tilt motor assembly.

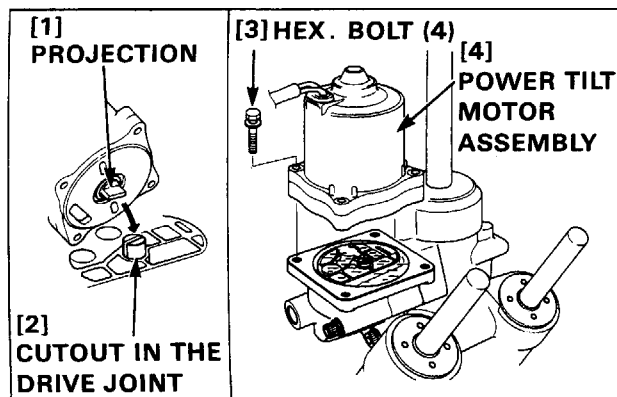




- 26) Install the power tilt motor assembly on the pump assembly by aligning the projection on the motor assembly with the cutout in the drive joint.

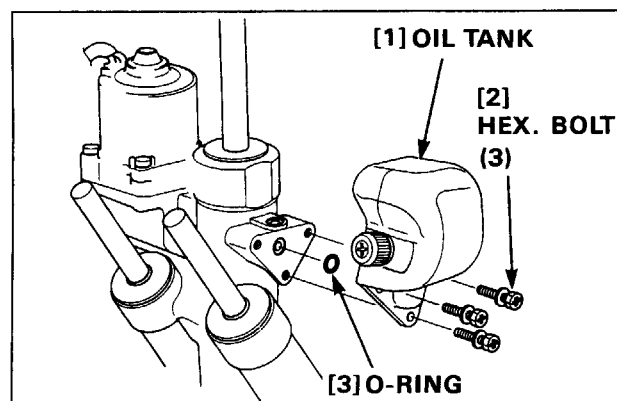
Tighten the four hex. bolts to the specified torque.

**TORQUE : 5 N·m (0.5 kgf·m, 3.6 lbf·ft)**



- 27) Install a new O-ring on the cylinder comp. Install the oil tank on the cylinder comp., and tighten the three hex. bolts to the specified torque.

**TORQUE : 5 N·m (0.5 kgf·m, 3.6 lbf·ft)**



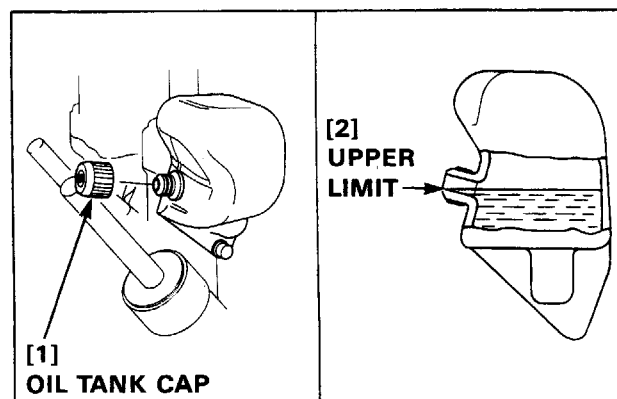
- 28) Remove the oil tank cap. Pour new Automatic Transmission Fluid (ATF) to the upper limit of the oil tank filler port.

Oil capacity	0.68 ℓ (0.72 US qt, 0.60 Imp qt)
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**NOTE:**

Do not overfill with ATF. Pouring the ATF while it is flowing out of the filler port will overfill the tank, and that will damage the oil seal of the motor when each rod is compressed.

- 29) After filling the oil tank with ATF, bleed air from the power tilt / trim assembly (without mounting on the outboard motor) (P.13-18).



**c. AIR BLEEDING**

<Power trim / tilt assembly not mounted on the outboard motor>

- Bleed air from the unit whenever the power trim / tilt assembly is disassembled.
- Be sure to perform the air bleeding in the following order. Air bleeding without mounting the unit on the outboard motor ; Check on blow pressure ; Air bleeding after mounting the unit on the outboard motor.

Connect each cable to operate the power trim / tilt assembly.

- Connect the positive (+) and negative (-) starter cables (P.17-6).
- Connect the power tilt motor 2p connector and starter cable 1P connector to the power tilt relay.
- Be sure that the starter cables are connected to the battery.

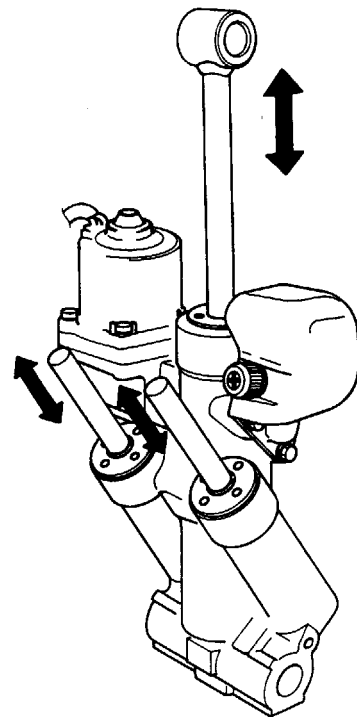
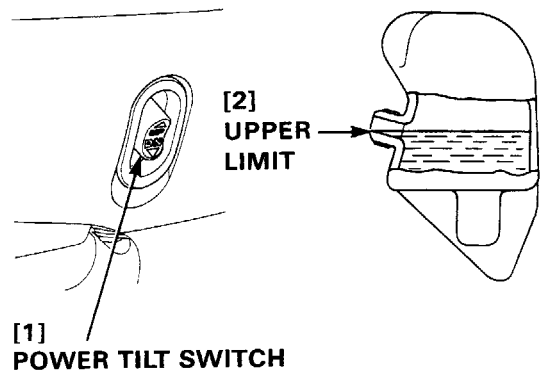
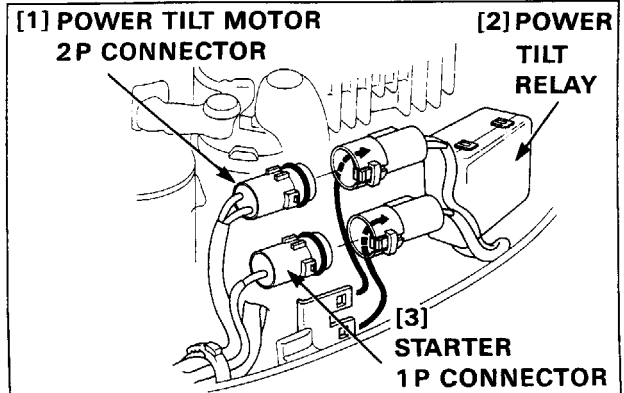
- 1) Hold the power trim / tilt assembly vertically.
- 2) Push the "DN" side of the power tilt switch to compress each rod fully.
- 3) Push the "UP" side of the power tilt switch to extend each rod fully.
- 4) Remove the oil tank cap with each rod extended fully. Check whether the Automatic Transmission Fluid (ATF) is at the upper limit of the filler port.

If ATF does not flow out of the filler port, add ATF until it flows out.

**NOTE:**

Check the fluid level with the rods fully extended.  
Note that ATF will spurt out when the oil tank cap is removed with the rods fully compressed.

- 5) After adding ATF, repeat the procedure from step 2 through 4 two or three times to bleed air from the unit.
- 6) Be sure that the rods extend and compress during the step 5 operation.
  - When the rods extend and compress fully, perform the blow pressure check (P.13-20) and air bleeding with the unit mounted on the outboard motor (P.13-19).
  - When the rods do not compress fully, perform the procedure explained under <when the rods do not compress fully>(P.13-19).



**<When the rods do not compress fully>**

- 1) With the rods extended fully, push the "UP" side of the power tilt switch until the unit blows again. Push the "DN" side of the power tilt switch, and be sure that the rods compress.

If the rods compress fully, go to the blow pressure check (P.13-20).

- 2) If the rods do not compress after the step 1 operation, push the "DN" side of the power tilt switch while pushing the piston rod B, and check whether the rods compress.

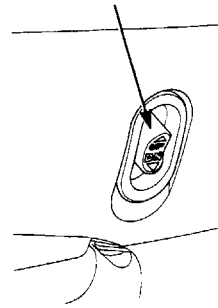
If the rods compress fully, go to the blow pressure check (P.13-20).

- 3) If the rods still do not compress after the step 2 operation, loosen the manual valve and compress each rod. Tighten the manual valve securely again. Push the "UP" side of the power tilt switch to extend the rods fully, then push the "DN" side of the switch and check whether the rods compress fully.

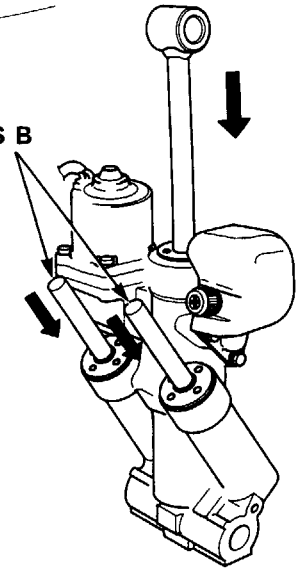
If the rods compress fully, go to the blow pressure check (P.13-20).

- 4) If the rods do not compress after the above operations, disassemble and reassemble the power trim / tilt assembly (P. 13-11 through 17), and bleed air with the power trim / tilt assembly not mounted on the outboard motor (P.13-18).

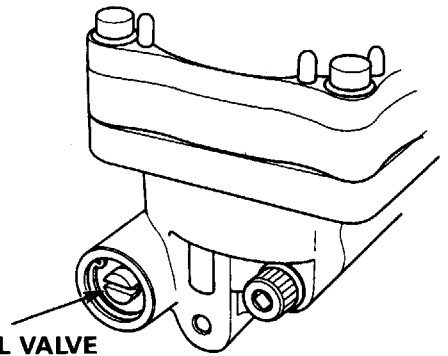
[1] POWER TILT SWITCH



[2] PISTON RODS B



[3] MANUAL VALVE



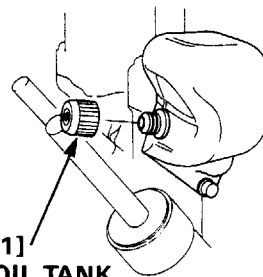
**<Air bleeding with the power trim / tilt assembly mounted on the outboard motor >**

Perform the following procedure after bleeding air without mounting the power trim / tilt assembly on the outboard motor and after checking the blow pressure.

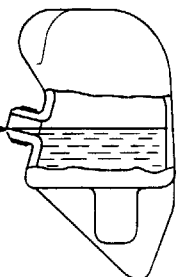
- 1) Install the power trim / tilt assembly on the outboard motor securely (P.13-2).
- 2) Push the "UP" side of the power tilt switch, and raise the outboard motor to the uppermost position.

Remove the oil tank cap, and check whether the Automatic Transmission Fluid (ATF) is at the upper limit of the oil filler port. Add ATF if necessary.

[1] OIL TANK CAP



[2] UPPER LIMIT



- 3) Lower the outboard motor slowly to the lowermost position by loosening the manual valve.
- 4) Tighten the manual valve securely.
- 5) Hold the outboard motor in the lowermost position for five minutes.
- 6) Then, push the "UP" side of the power tilt switch, and raise the outboard motor to the uppermost position. Hold the outboard motor in this position for five minutes. After five minutes, check the fluid level in the oil tank.
- 7) Repeat the procedure from steps 3 through 6 five times.

### d. BLOW PRESSURE CHECK

After bleeding air from the power trim / tilt assembly without mounting on the outboard motor and checking each rod for proper compression, perform the following operation in the same manner as bleeding air without mounting on the outboard motor.

- Be sure each rod is extended fully.
- Check the blow pressure both at the upper and lower chambers.

#### <Lower chamber blow pressure>

- 1) Remove the internal circlip and manual valve from the power trim / tilt assembly.

#### NOTE:

A small amount of oil will flow out when the manual valve is removed. Catch it with a container or suitable material.

- 2) Tighten the special tool (oil pressure gauge joint B) to the manual valve installation section as shown.

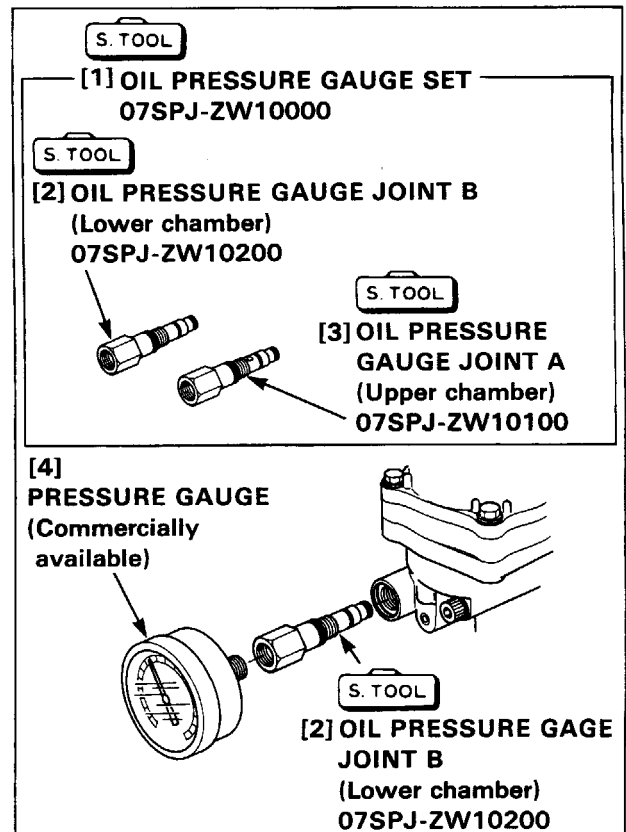
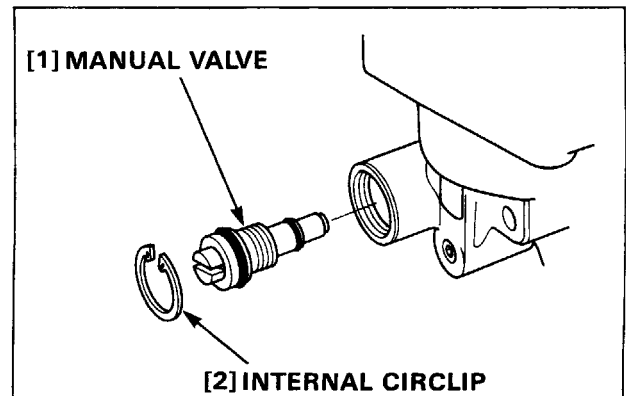
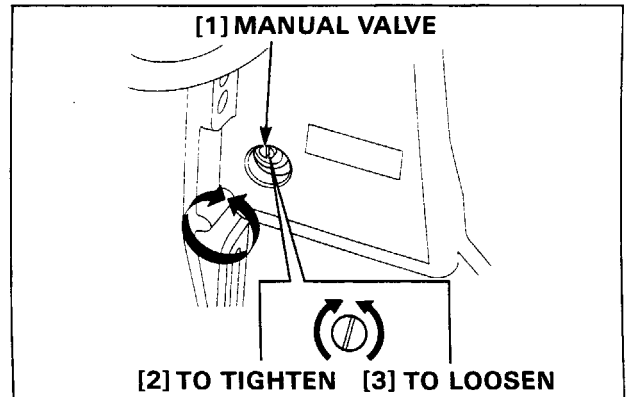
**TORQUE : 9 N·m (0.9 kgf·m, 6.5 lbf·ft)**

- 3) Attach the pressure gauge (commercially available) which measures 14,710 kPa (150 kgf/cm<sup>2</sup>, 2,133 psi) or above [P/F 1/4] to the special tool (oil pressure gauge joint B).

#### TOOLS :

**Oil pressure gauge set**  
**– Oil pressure gauge joint B**

**07SPJ – ZW10000**  
**07SPJ – ZW10200**



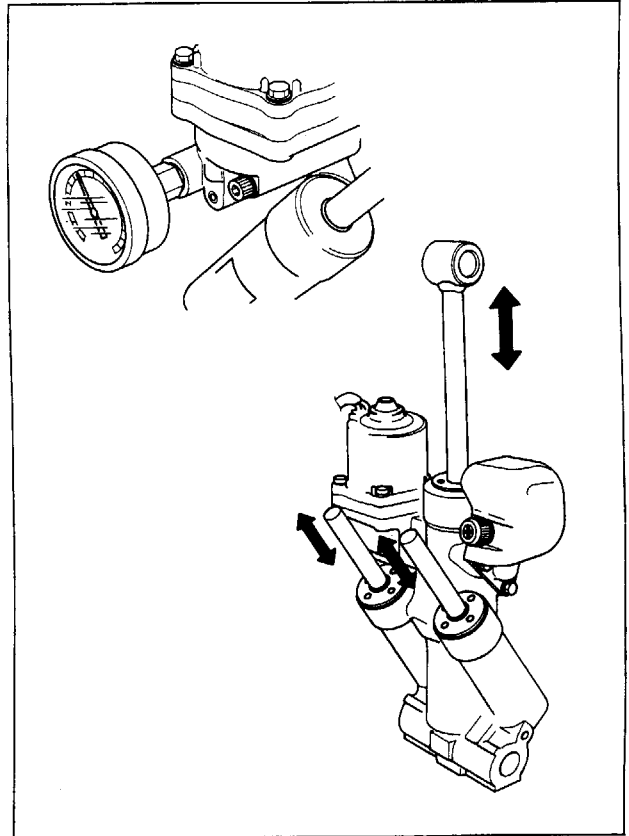
- 4) Remove the oil tank cap and check whether the Automatic Transmission Fluid (ATF) is at the upper limit of the filler port (P.13-17).
- 5) Push the "DN" side of the power tilt switch to compress each rod fully.
- 6) Push the "UP" side of the power tilt switch to extend each rod fully again, and measure the lower chamber blow pressure.

Lower chamber blow pressure	8,826 – 11,768 kPa (90 – 120 kgf/cm <sup>2</sup> , 1,280 – 1,707 psi)
-----------------------------	---

- 7) If a sharp pressure drop is observed, check the power tilt motor for a damaged oil seal (P.13-24).

If the blow pressure is lower than the specified pressure, check for oil leaks.

- 8) Measure the upper chamber blow pressure.



### <Upper chamber blow pressure>

- 1) After measuring the lower chamber blow pressure, remove the special tool (oil pressure gauge joint B) and the pressure gauge with each rod fully extended.
- 2) Tighten the upper chamber special tool (oil pressure gauge joint A).

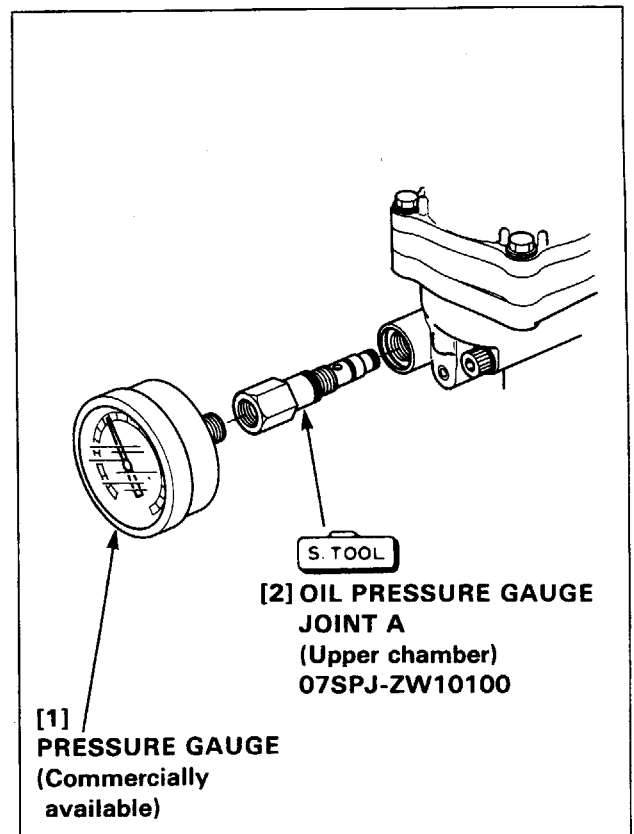
**TORQUE : 9 N·m (0.9 kgf·m, 6.5 lbf·ft)**

- 3) Attach the pressure gauge (commercially available) which measures 14,710 kPa (150 kgf/cm<sup>2</sup>, 2,133 psi) or above [P/F 1/4] to the special tool (oil pressure gauge joint A).

### TOOLS :

Oil pressure gauge set  
– Oil pressure gauge joint A

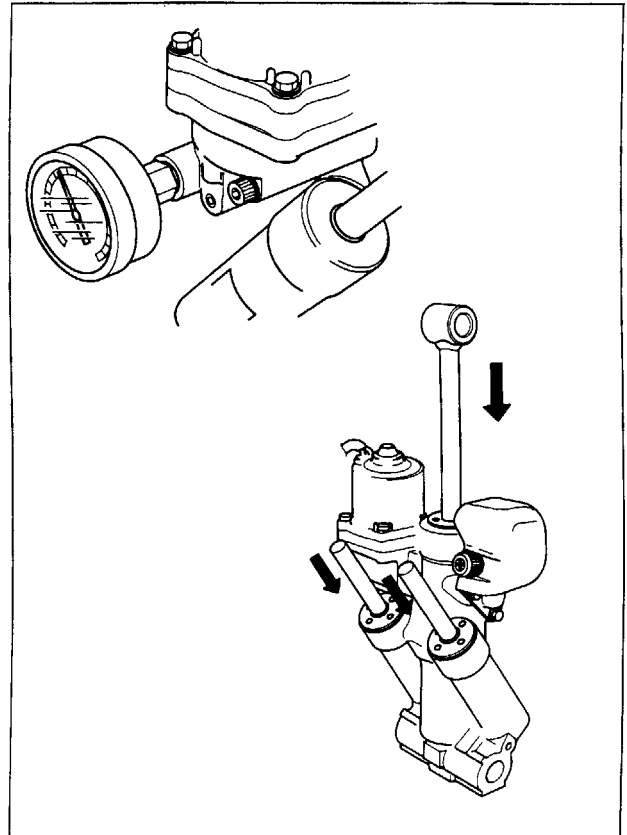
07SPJ – ZW10000  
07SPJ – ZW10100



- 4) Remove the oil tank cap and check whether the Automatic Transmission Fluid (ATF) is at the upper limit of the filler port (P.13-17).
- 5) Push the "DN" side of the power tilt switch to compress each rod fully, and measure the upper chamber blow pressure.

Upper chamber blow pressure	3,923 – 7,355 kPa (40 – 75 kgf/cm <sup>2</sup> , 569 – 1,067 psi)
--------------------------------	--

- 6) If the blow pressure is lower than the specified pressure, check for oil leaks.
- 7) After checking, push the "UP" side of the power tilt switch. With each rod extended fully, remove the special tool and install the manual valve and internal circlip.
- 8) Recheck the Automatic Transmission Fluid (ATF) level (P. 13-17).



## 6. POWER TILT MOTOR ASSEMBLY (POWER TRIM / TILT TYPE)

### a. DISASSEMBLY

- 1) Untape the varnished teflon tube, and pull the tube to the connector side.
- 2) Remove the 4 x 16 mm screw. Pull out the wire holder and the two grommets from the yoke assembly, and move them to the tube side.

**NOTE:**

Pull out the grommets with care not to damage them.

- 3) Remove the two 4 x 16 mm screws (P. 13-24).
- 4) Wrap the armature shaft with a shop towel or equivalent material to protect, and hold the shaft with pliers.

Pushing the two motor wires toward the yoke assembly, remove the armature / front bracket assembly from the yoke assembly.

- 5) Remove the armature from the front bracket.

**NOTE:**

Do not allow the commutator to become contaminated with oil or grease.

- 6) Disconnect the blue wire terminal while holding the breaker assembly with a screw driver.

**NOTE:**

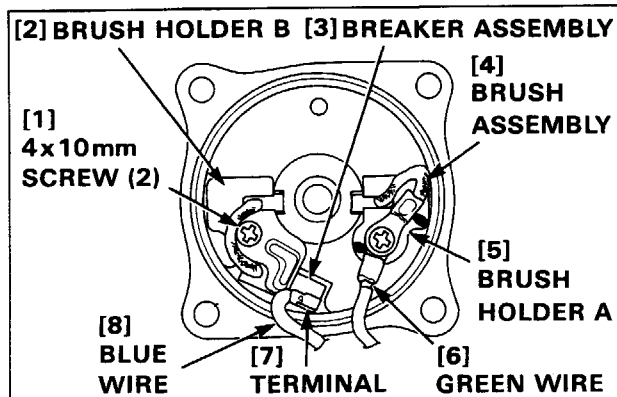
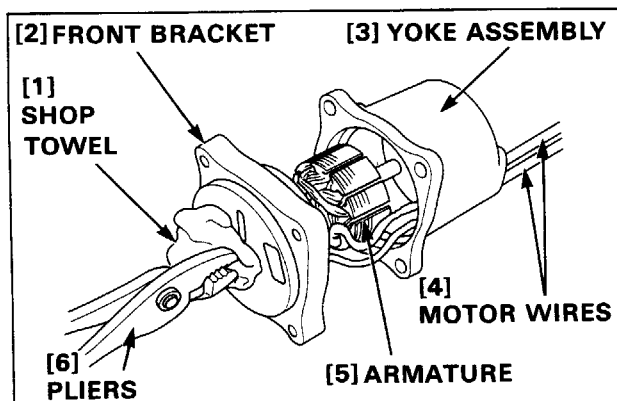
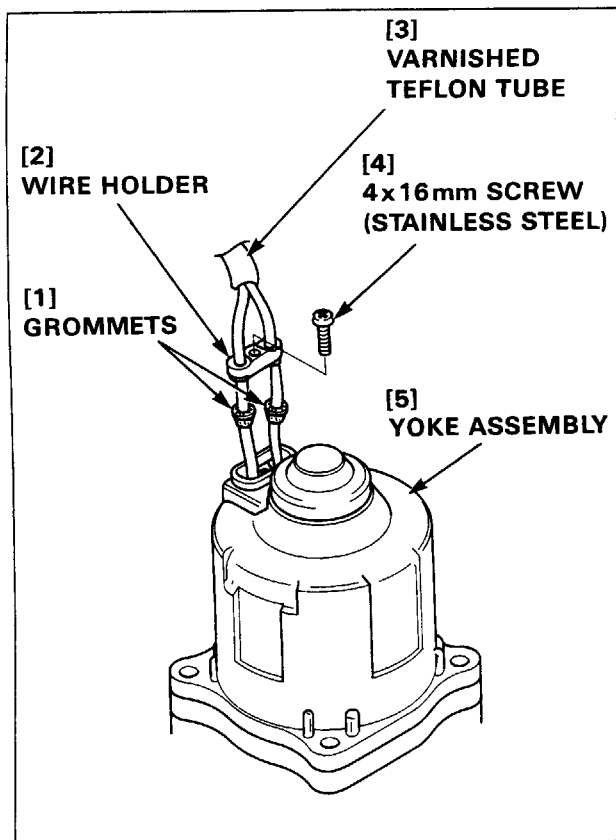
Do not disconnect the blue wire terminal without holding the breaker assembly, or it can cause damage to brush holder B. Be sure to disconnect the terminal while holding the breaker assembly.

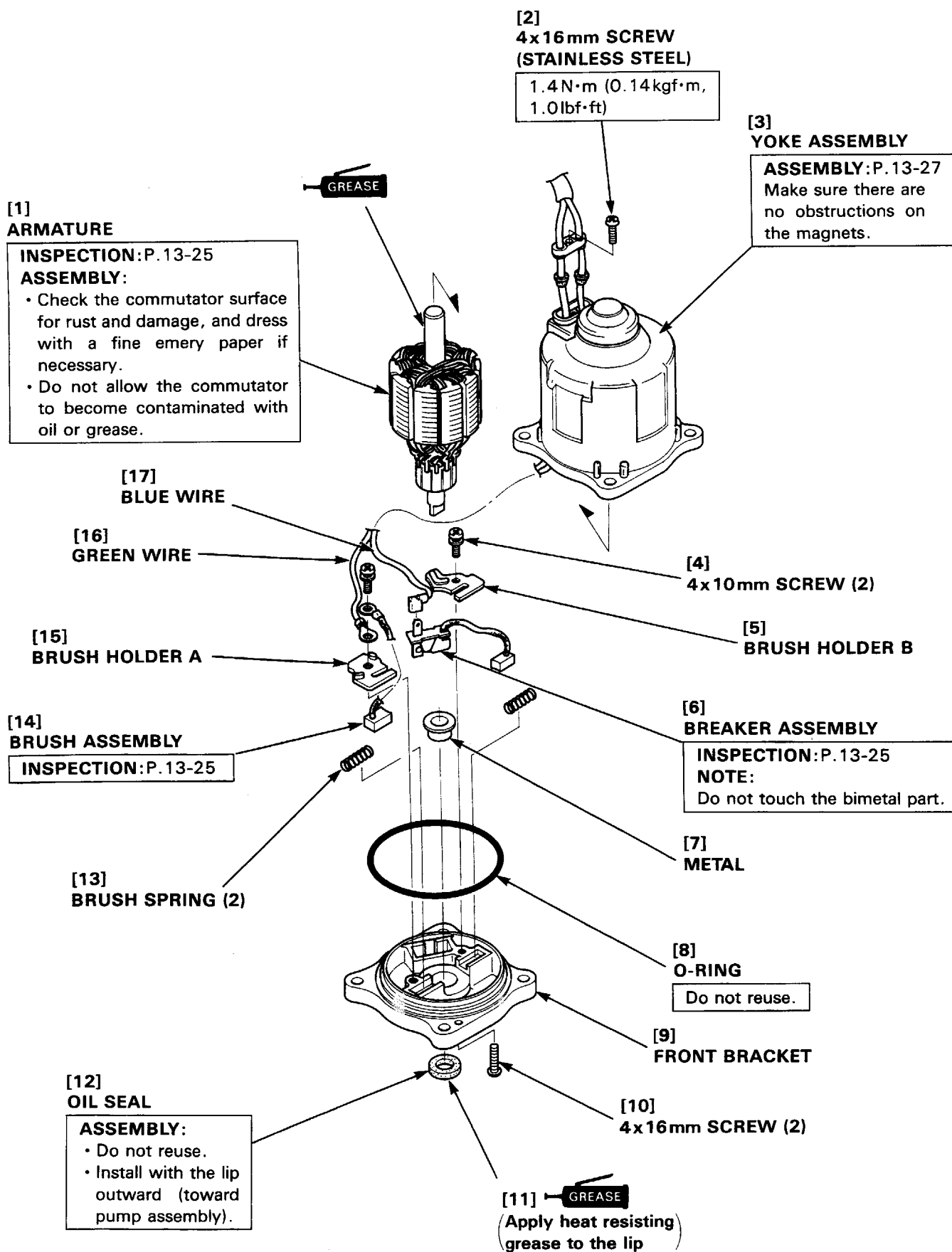
- 7) Remove the two screws. Remove brush holder A and B, brush assembly, two springs and the breaker assembly.

**NOTE:**

Take care not to touch the bimetal part of the breaker assembly.

- 8) Remove the oil seal and metal from the front bracket (P.13-24).





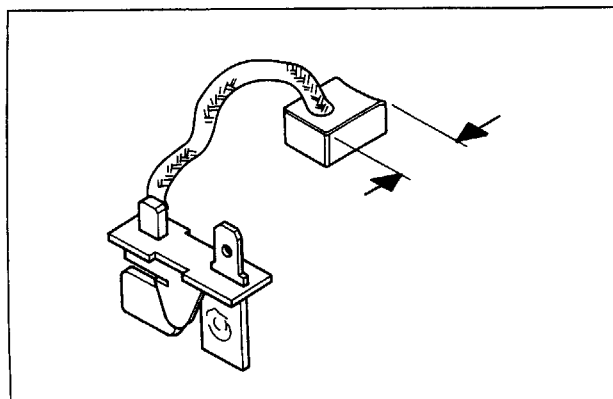


**b. INSPECTION****• BRUSH LENGTH**

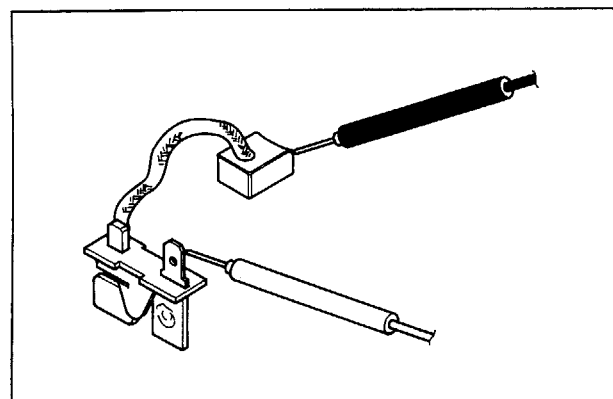
Measure the brush length.

If brush length is less than the service limit, replace the brush.

STANDARD	SERVICE LIMIT
9.8 mm (0.39 in)	4.8 mm (0.19 in)

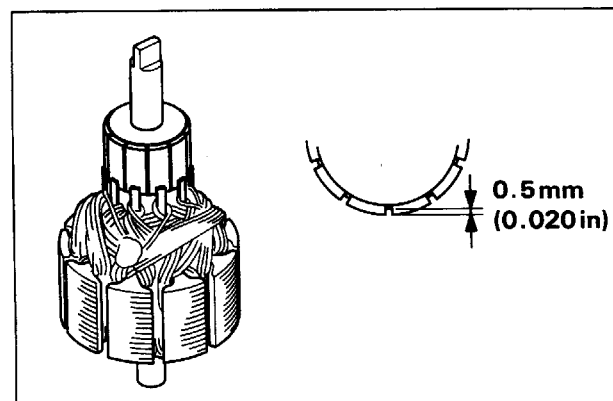
**• BREAKER ASSEMBLY**

Check for continuity between the brush and terminal. Replace the breaker assembly if there is no continuity.

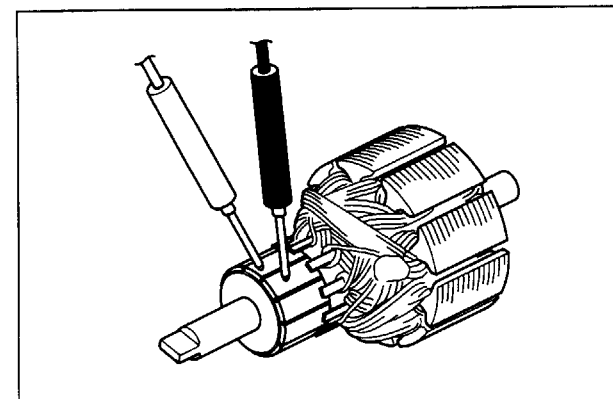
**• MICA DEPTH**

If the grooves are clogged or mica depth is less than the service limit, recut the grooves using a hacksaw blade or a small file.

SERVICE LIMIT	0.5 mm (0.020 in)
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**• ARMATURE****CONTINUITY CHECK-SEGMENTS**

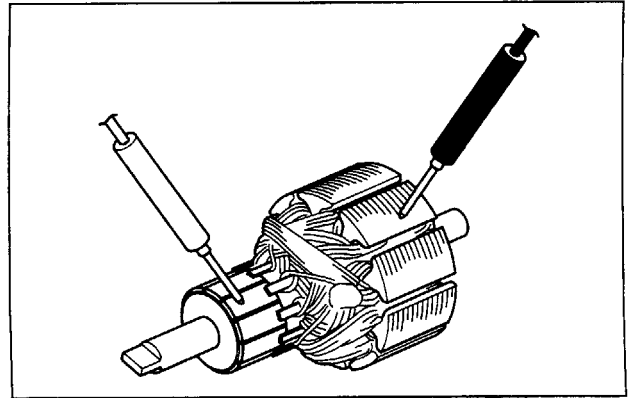
Check for continuity between each segment. If an open circuit exists between any two segments, replace the armature.



#### SHORT CIRCUIT TEST-CORE-TO-COMMUTATOR

Check for continuity between the commutator and armature coil core.

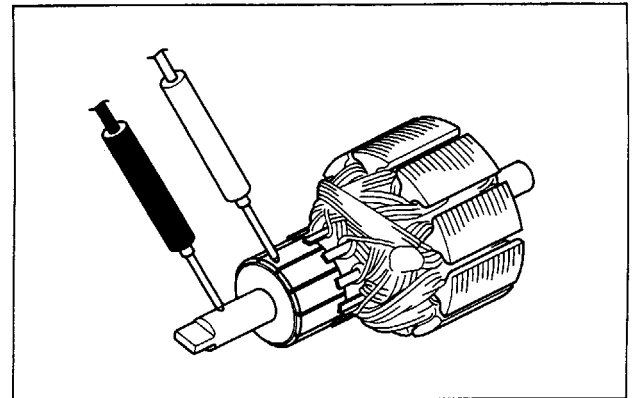
If continuity exists, replace the armature.



#### SHORT CIRCUIT TEST-SHAFT-TO-COMMUTATOR

Check for continuity between the commutator and armature shaft.

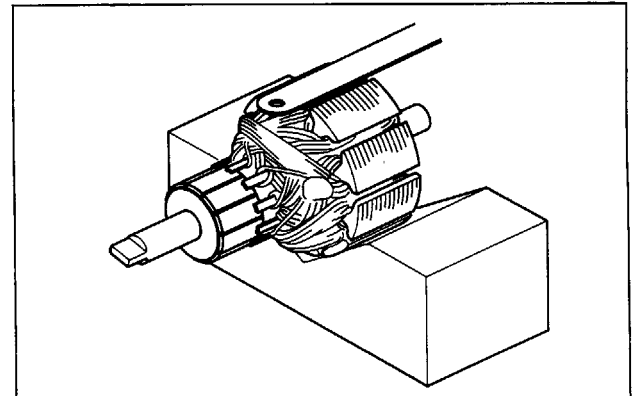
If there is continuity, replace the armature.



#### SHORT CIRCUIT TEST-ARMATURE

Place the armature on an armature tester (commercially available).

Hold a hacksaw blade close to the armature core. If the blade is attracted to the core or vibrates when the core is turned, the armature is shorted. Replace the armature.



### c. ASSEMBLY

- 1) Install the O-ring, oil seal and metal on the front bracket (P.13-24).
- 2) Install the breaker assembly and brush holder B, and tighten the screws.

Connect the blue wire terminal to the breaker assembly.

#### NOTE:

Do not touch the bimetal part of the breaker assembly.

- 3) Install the brush holder A on the front bracket. With the brush assembly terminal above the green wire terminal, tighten together with the green wire terminal.

Be sure that the brush assembly terminal and the green wire terminal contact the respective projections as shown.

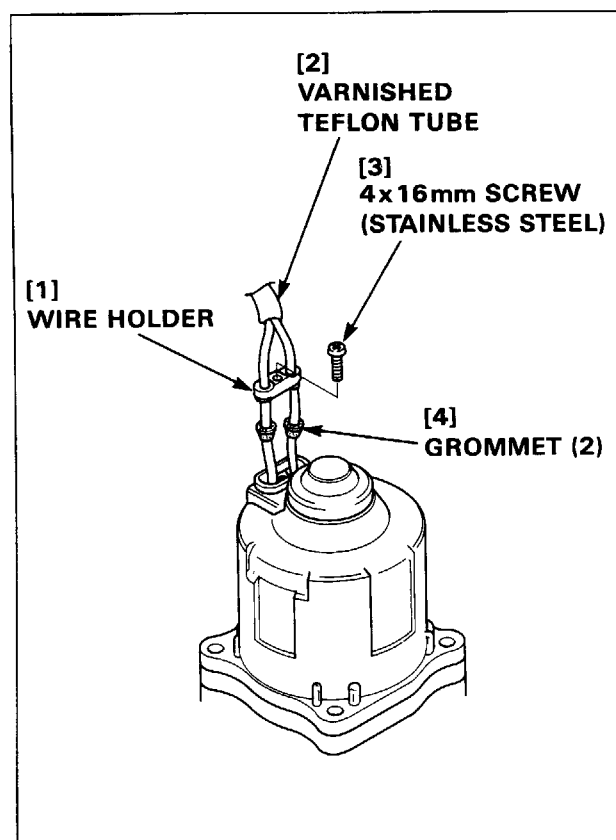
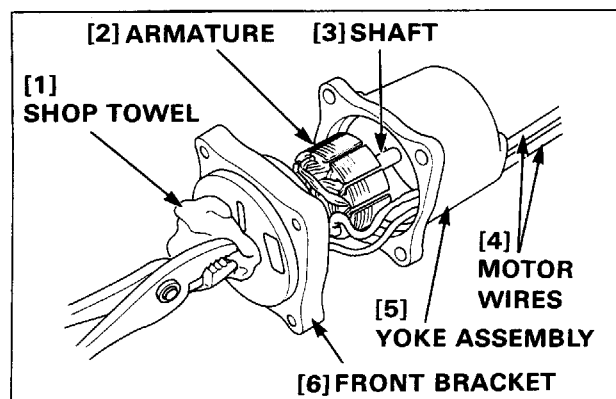
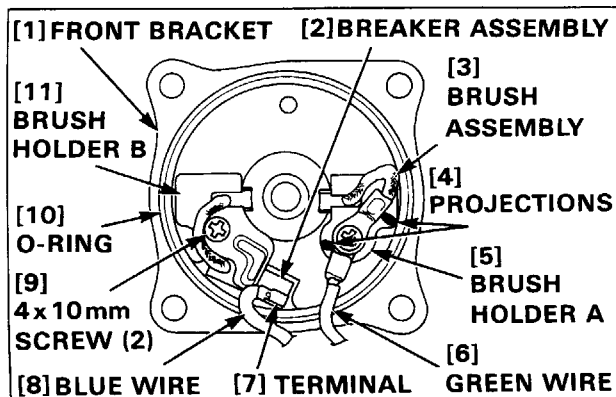
- 4) Install the two springs and install the armature on the front bracket while pushing the brush terminal into the holder.
- 5) Wrap the armature shaft with a shop towel or equivalent material, and hold the shaft with pliers.
- 6) Pulling the two motor wires of the yoke assembly side, install the armature / front bracket assembly on the yoke assembly.

If it is hard to install the armature / front bracket assembly on the yoke assembly, check whether the armature shaft is out of position.

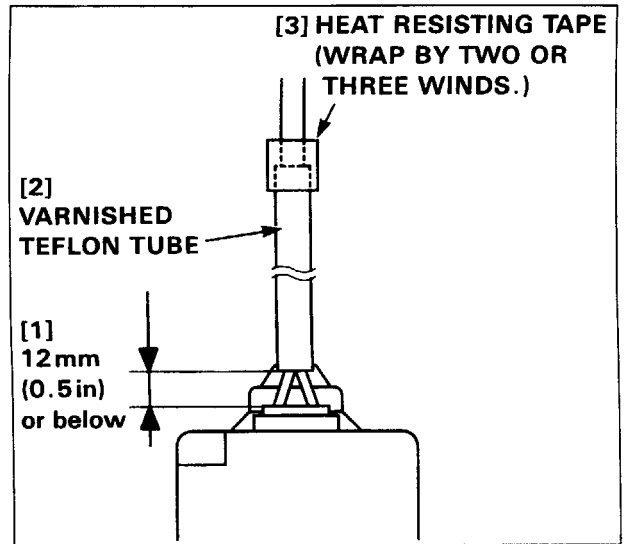
- 7) After installation, check the armature for smooth rotation, and tighten the two 4 x 16 mm screws.
- 8) After tightening the two 4 x 16 mm screws, connect the motor assembly 2P connector and check whether the motor turns. If the motor does not turn, disassemble the power tilt motor assembly again, and check whether the blue wire terminal is disconnected.
- 9) Install the two grommets and wire holder on the yoke assembly.

Tighten the 4 x 16 mm screw (stainless steel screw) to the specified torque. Do not overtighten it.

**TORQUE : 1.4 N·m (0.14 kgf·m, 1.0 lbf·ft)**



- 10) Tape the varnished teflon tube with heat resisting tape, so that the distance from the wire holder end to the tube end is 12 mm (0.5 in) or less as shown.
- 11) Install the power tilt motor assembly on the power trim / tilt assembly. Coat the joints or mating sections of the parts and the sections where the paint came off with rust preventive paint of the same color.
- 12) Bleed air from the power trim / tilt assembly without mounting on the outboard motor (P.13-18).



# 14. STEERING ROD/REMOTE CONTROL BOX (REMOTE CONTROL TYPE ONLY)

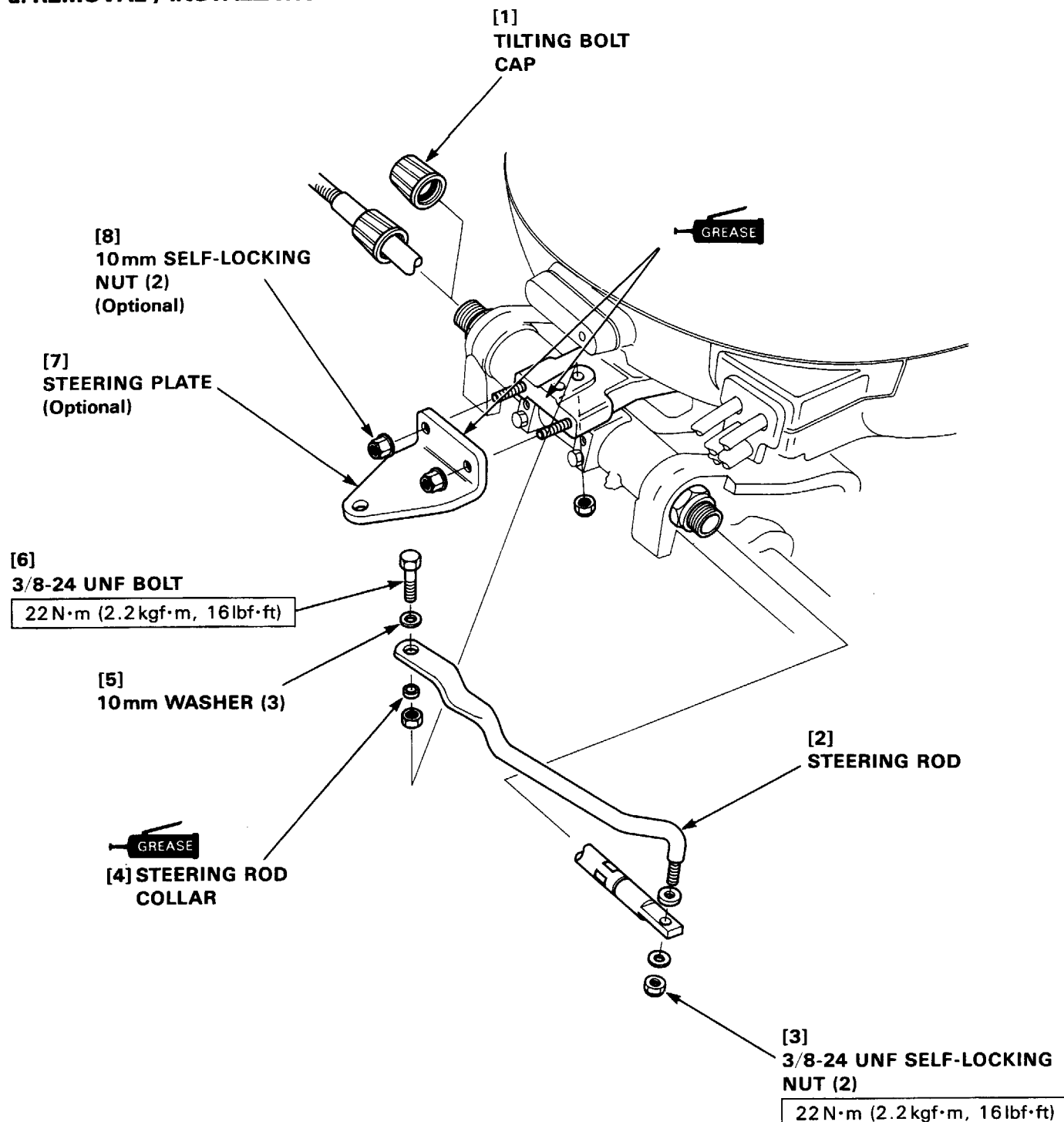
**HONDA**  
BF75A·90A

1. STEERING ROD
2. REMOTE CONTROL BOX
3. INNER HOUSING

4. CONTROL PANEL (PANEL-MOUNT / SINGLE TOP-MOUNT / DUAL TOP-MOUNT REMOTE CONTROL BOX TYPE)

## 1. STEERING ROD

### a. REMOVAL / INSTALLATION

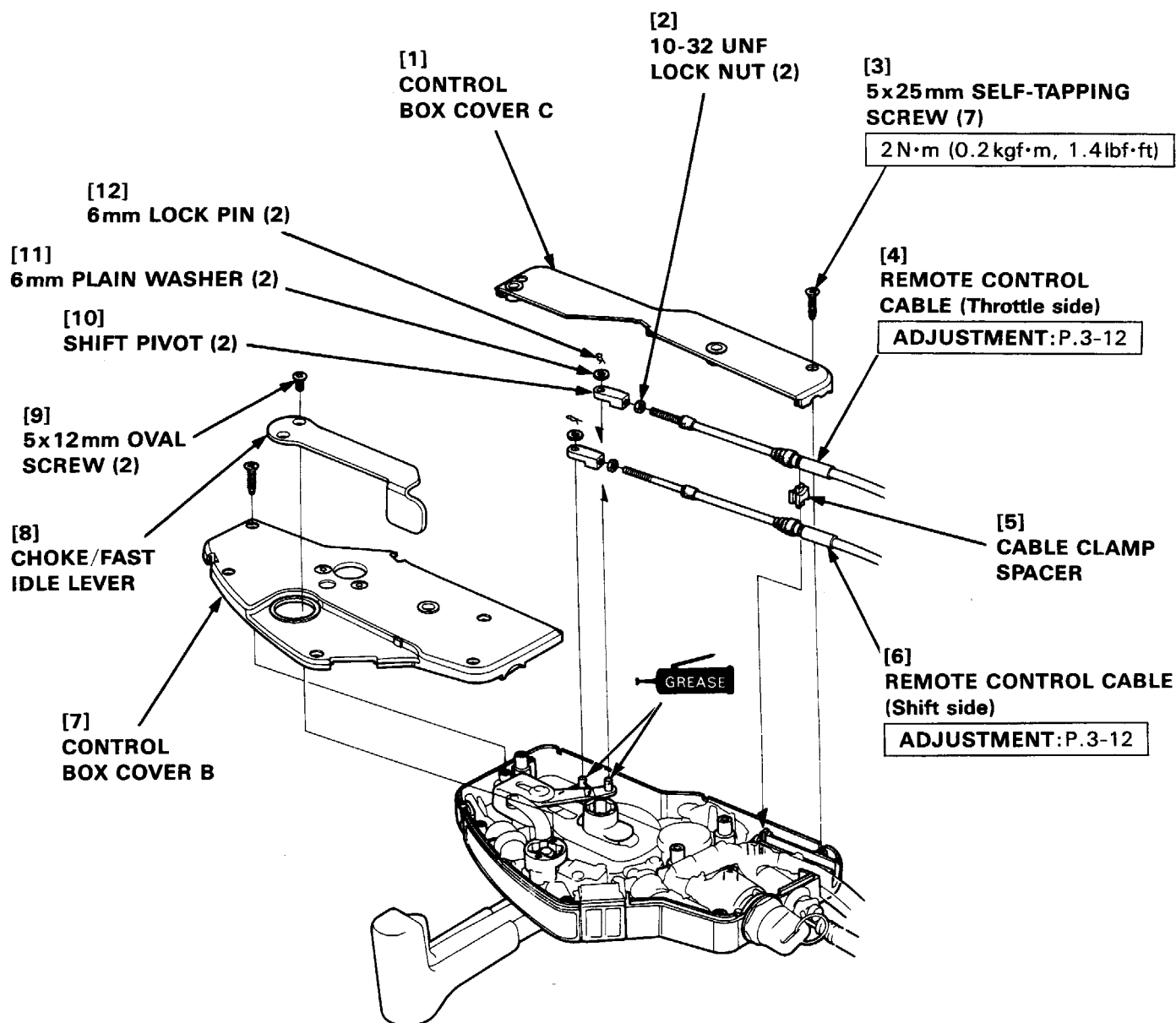


## 2. REMOTE CONTROL BOX

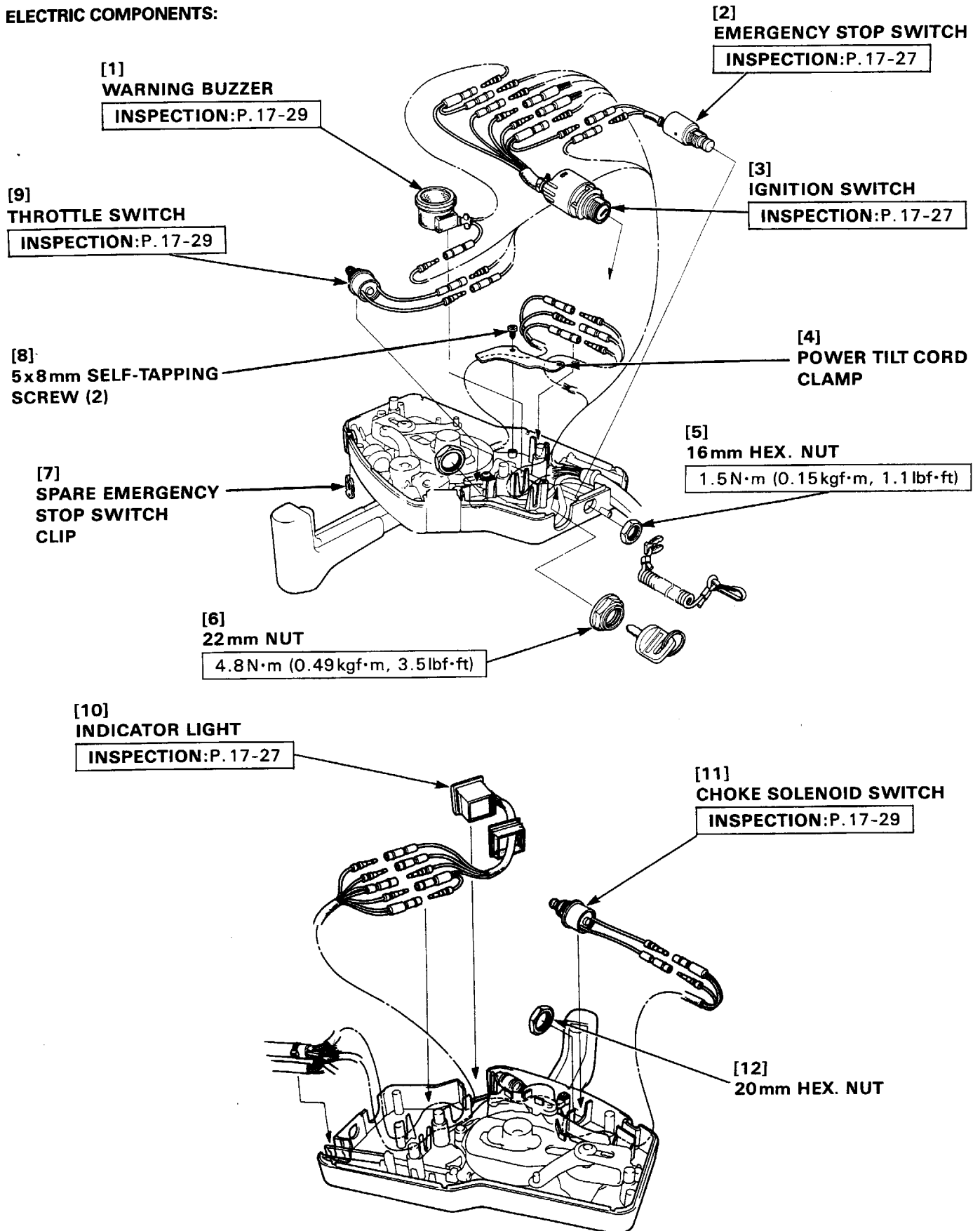
### a. DISASSEMBLY / ASSEMBLY

#### • SIDE-MOUNT REMOTE CONTROL BOX

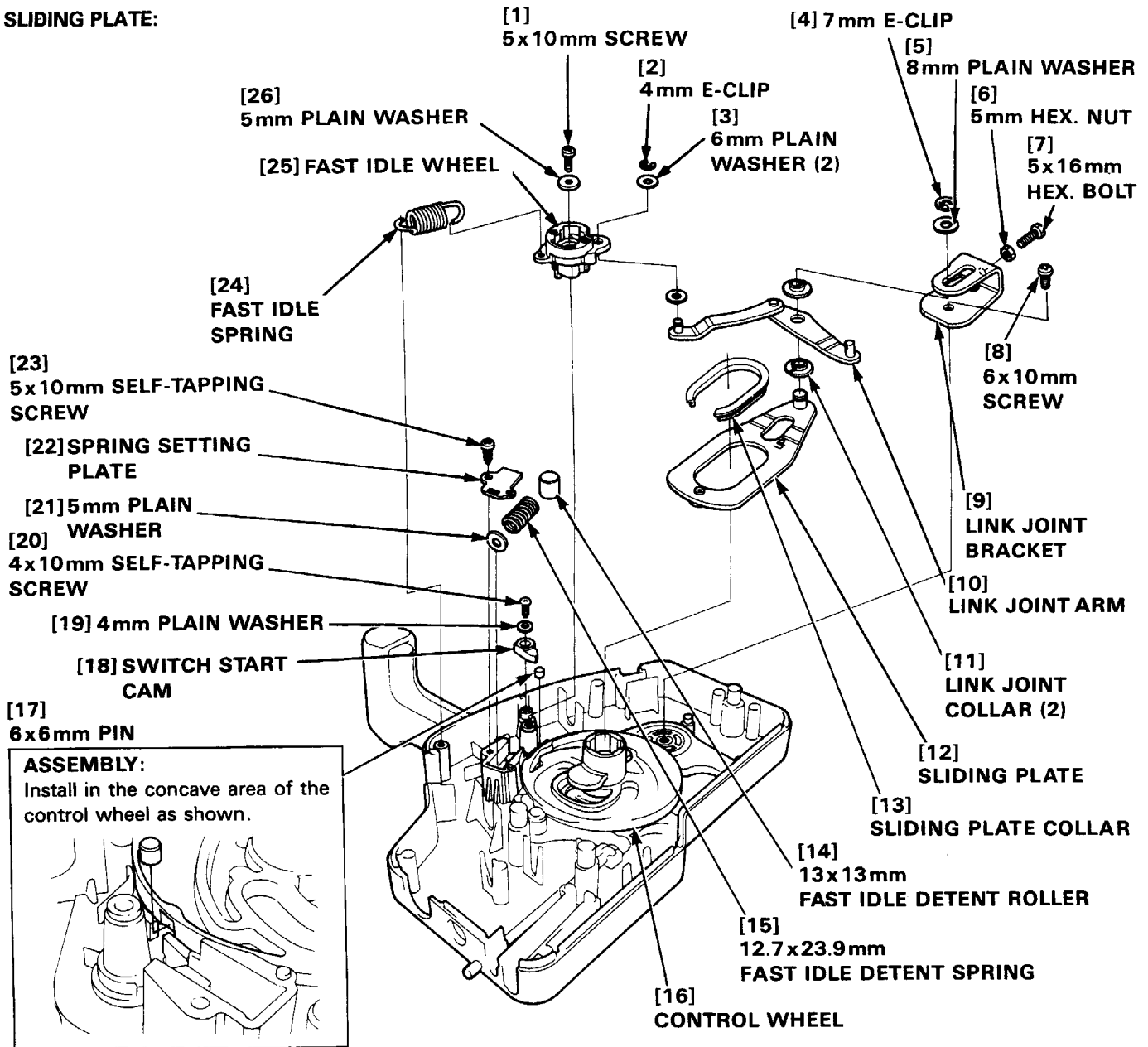
REMOTE CONTROL CABLE:



### ELECTRIC COMPONENTS:

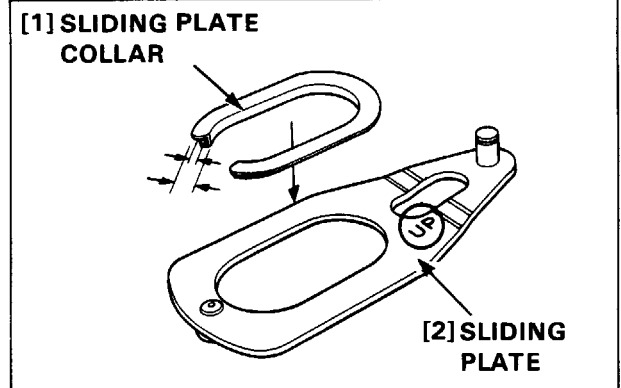


### SLIDING PLATE:



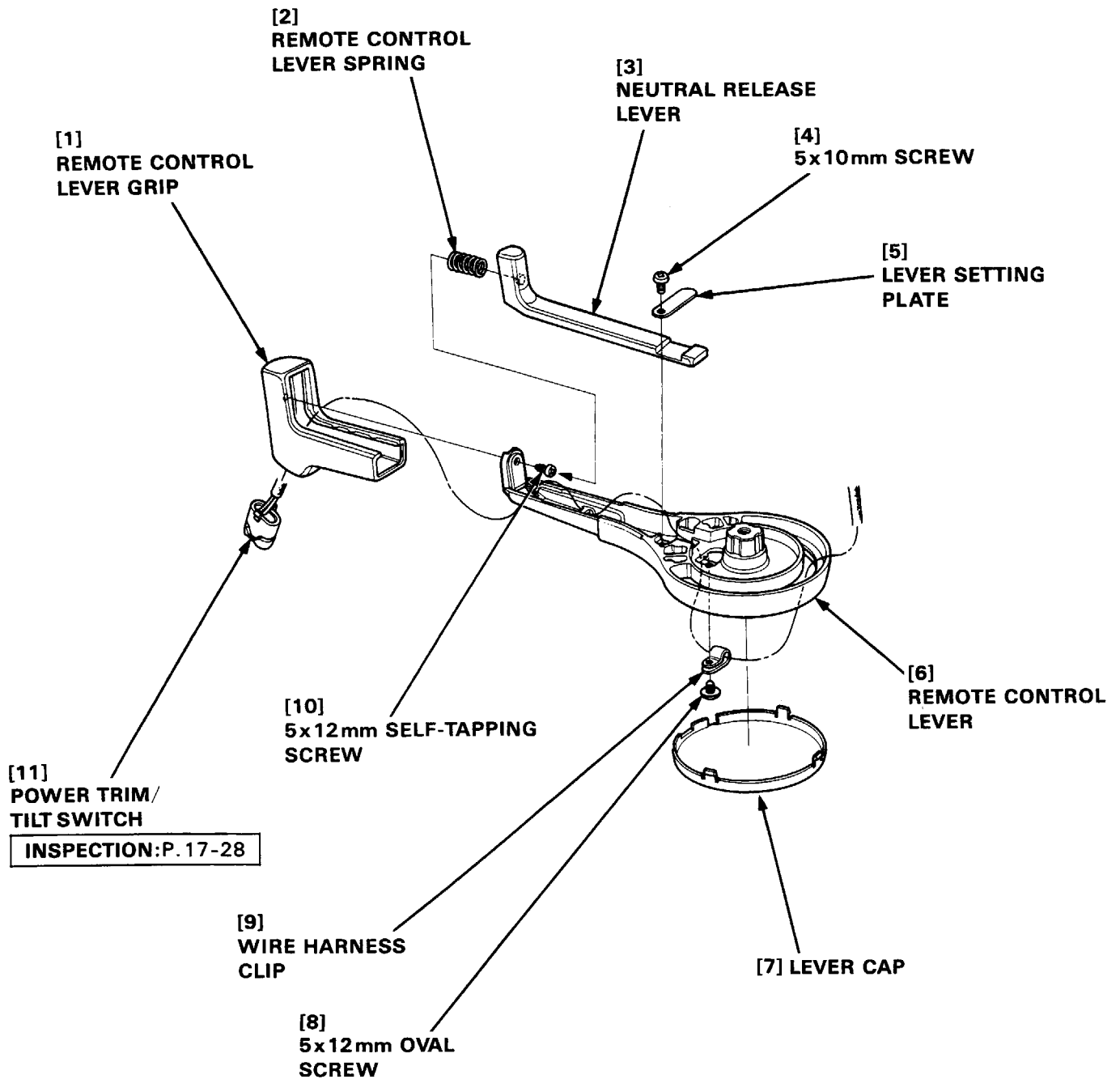
### • SLIDING PLATE / COLLAR INSTALLATION

Install the sliding plate with the "UP" mark facing up. Attach the sliding plate collar to the sliding plate with its opening toward the opposite end of the "UP" mark side of the sliding plate and the lip facing down.

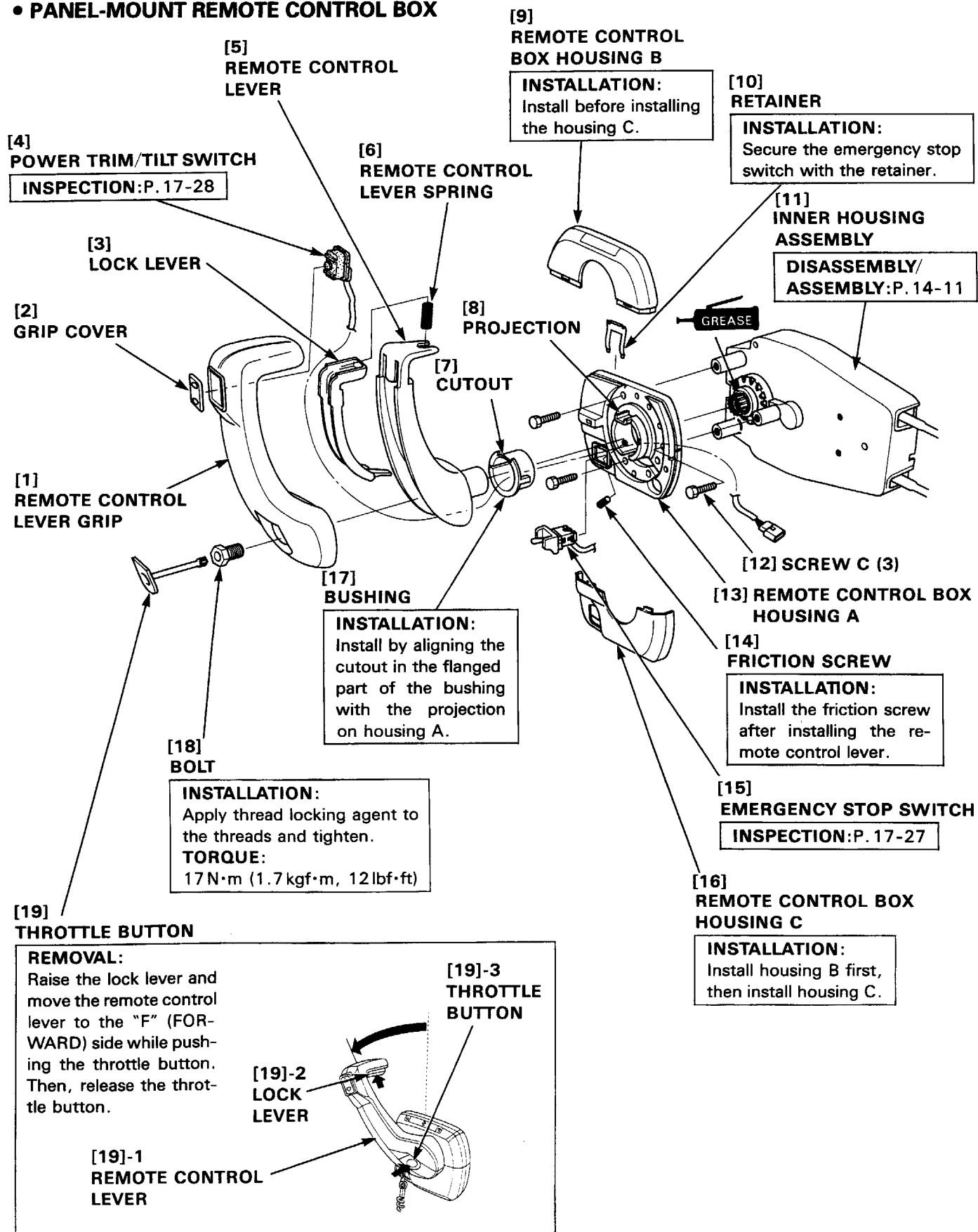




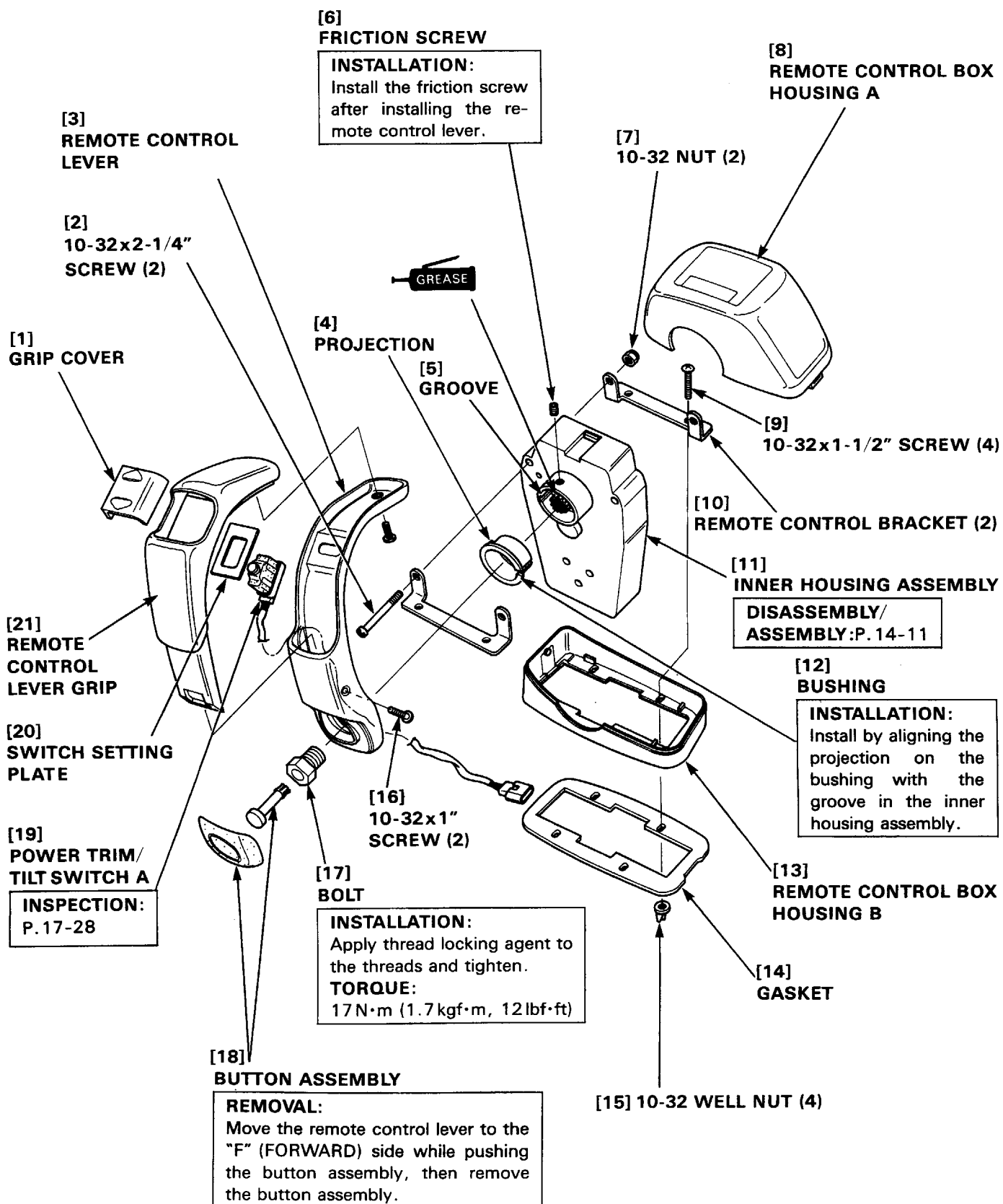




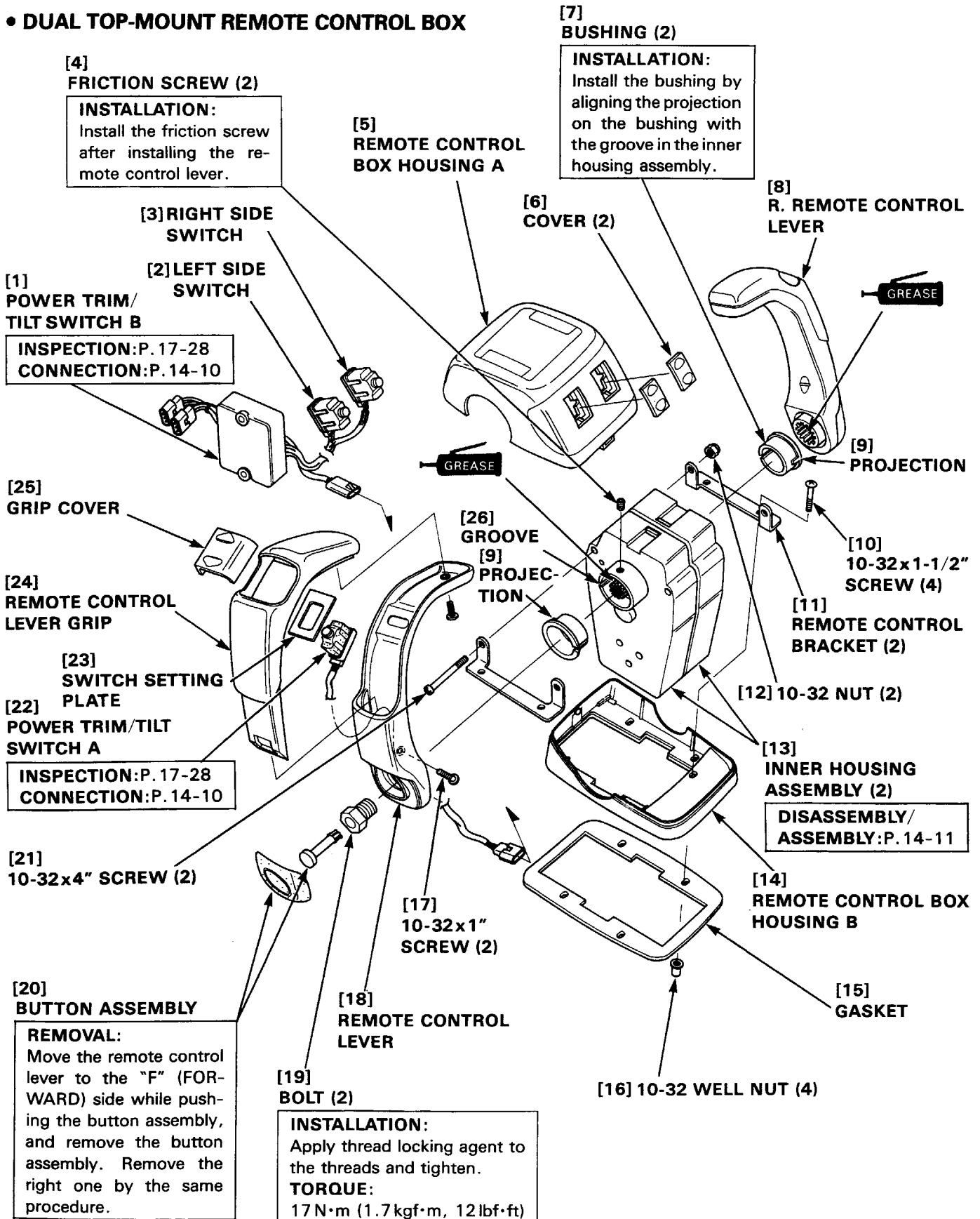
### • PANEL-MOUNT REMOTE CONTROL BOX



### • SINGLE TOP-MOUNT REMOTE CONTROL BOX



### • DUAL TOP-MOUNT REMOTE CONTROL BOX



### • CONNECTION OF POWER TRIM / TILT SWITCH A / B [DUAL TOP-MOUNT REMOTE CONTROL TYPE ONLY]

Connect the power trim / tilt switch A and B as shown.

[1]  
POWER TRIM/  
TILT SWITCH A

[2]  
LEFT POWER TRIM/  
TILT SWITCH

[3]  
RIGHT POWER TRIM/  
TILT SWITCH

[4]  
POWER TRIM/  
TILT SWITCH B

[5]  
TO LEFT CONTROL  
PANEL

[6]  
TO RIGHT CONTROL  
PANEL

Bl	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY
Pu	PURPLE		

### 3. INNER HOUSING

#### a. DISASSEMBLY / ASSEMBLY

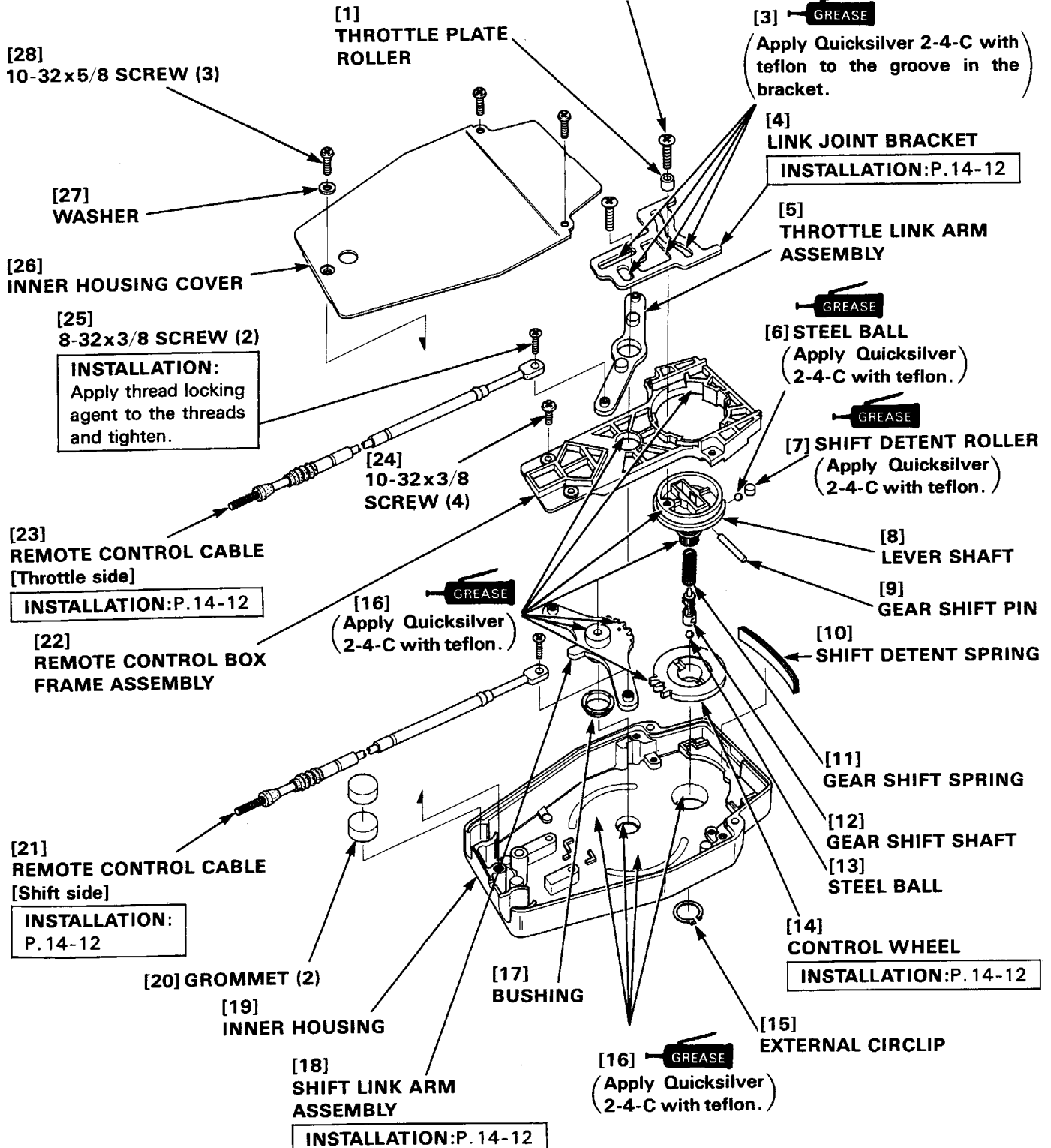
[2]  
SHOULDER BOLT (2)

#### INSTALLATION:

Apply thread locking agent to the threads and tighten.

#### TORQUE:

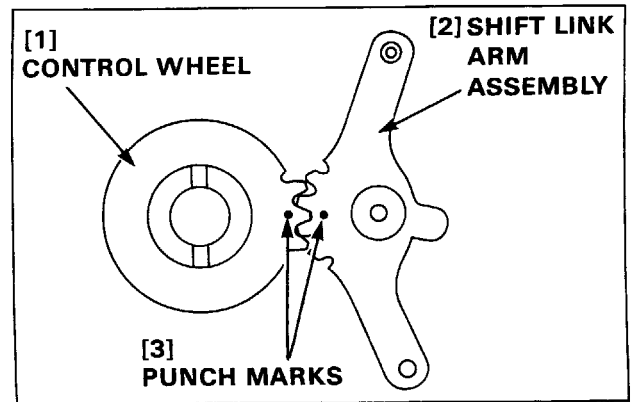
4 N·m (0.4 kgf·m, 2.9 lbf·ft)



### • SHIFT LINK ARM ASSEMBLY / CONTROL WHEEL

#### INSTALLATION:

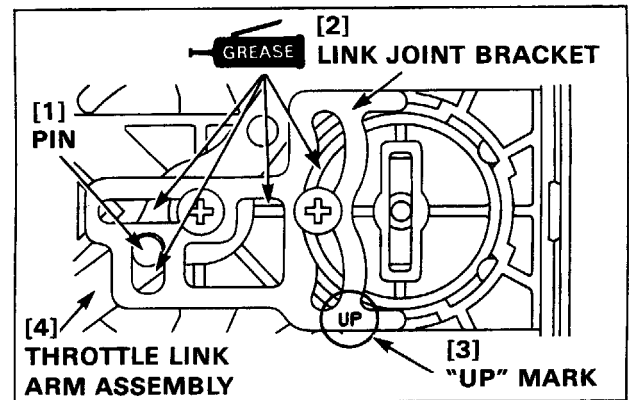
- 1) Apply Quicksilver 2-4-C with teflon to the circumference of the control wheel and the gear and bearing of the shift link arm assembly.
- 2) Install the shift link arm assembly and the control wheel by aligning the punch marks.



### • LINK JOINT BRACKET

#### INSTALLATION:

- 1) Apply Quicksilver 2-4-C with teflon to the groove in the bracket.
- 2) Install the link joint bracket by aligning the throttle link arm pin with the groove in the bracket with the "UP" mark on the link joint bracket facing up.

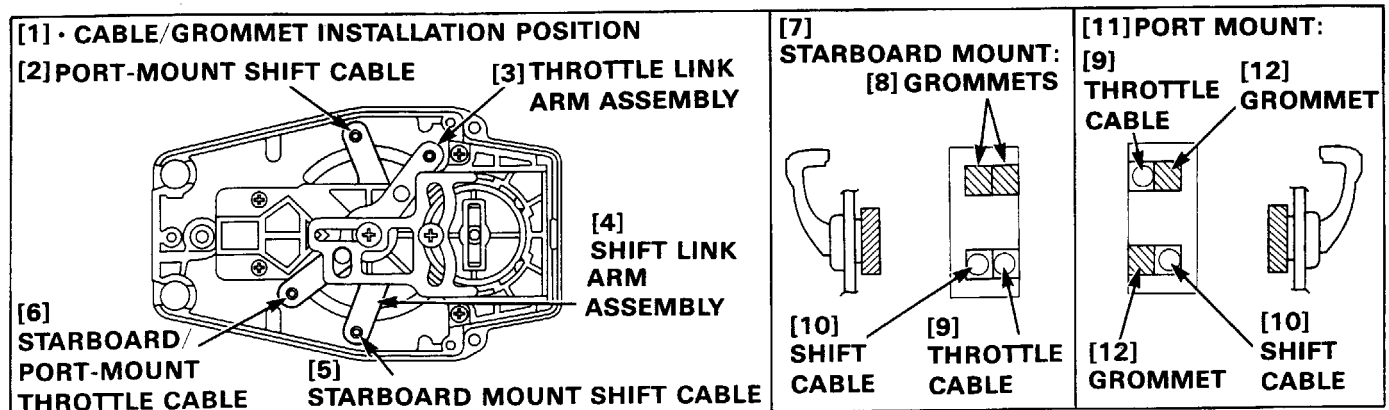


### • REMOTE CONTROL CABLE [Shift side / throttle side]

#### INSTALLATION:

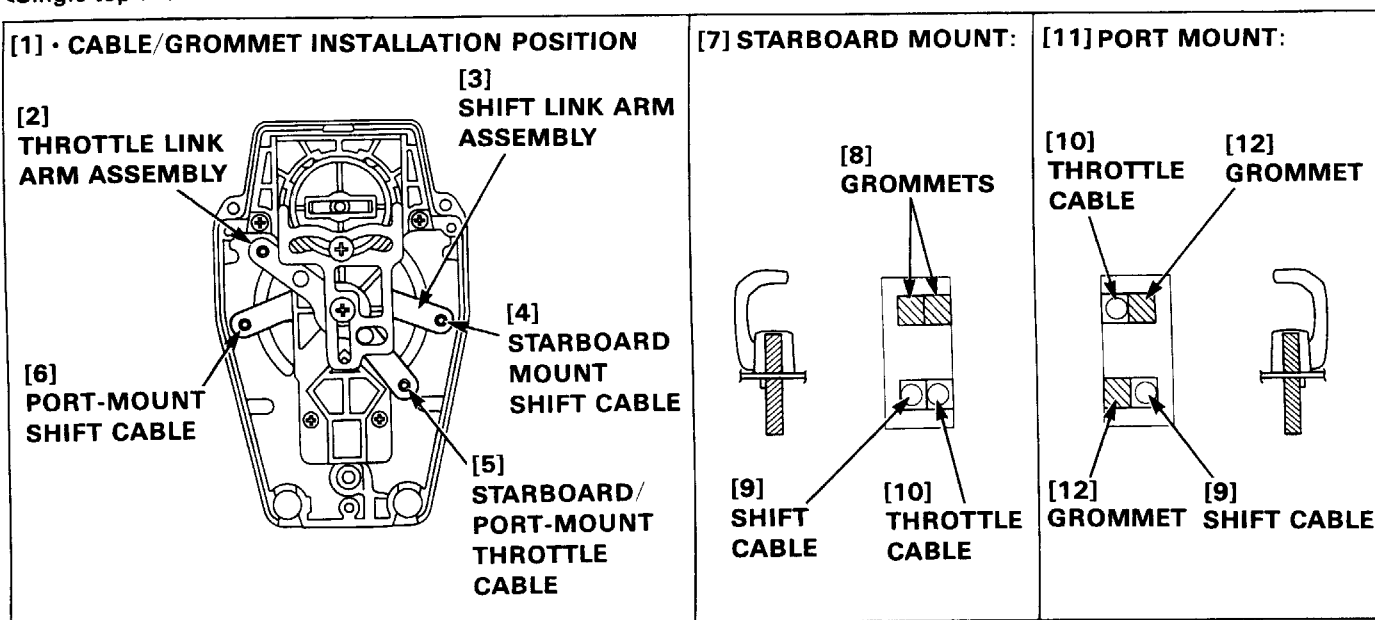
Note that the position of the throttle / shift link arm assembly and grommet, where the remote control cables [shift side / throttle side] are connected, is different according to the type and installation direction of the remote control box.

#### <Panel-mount remote control>

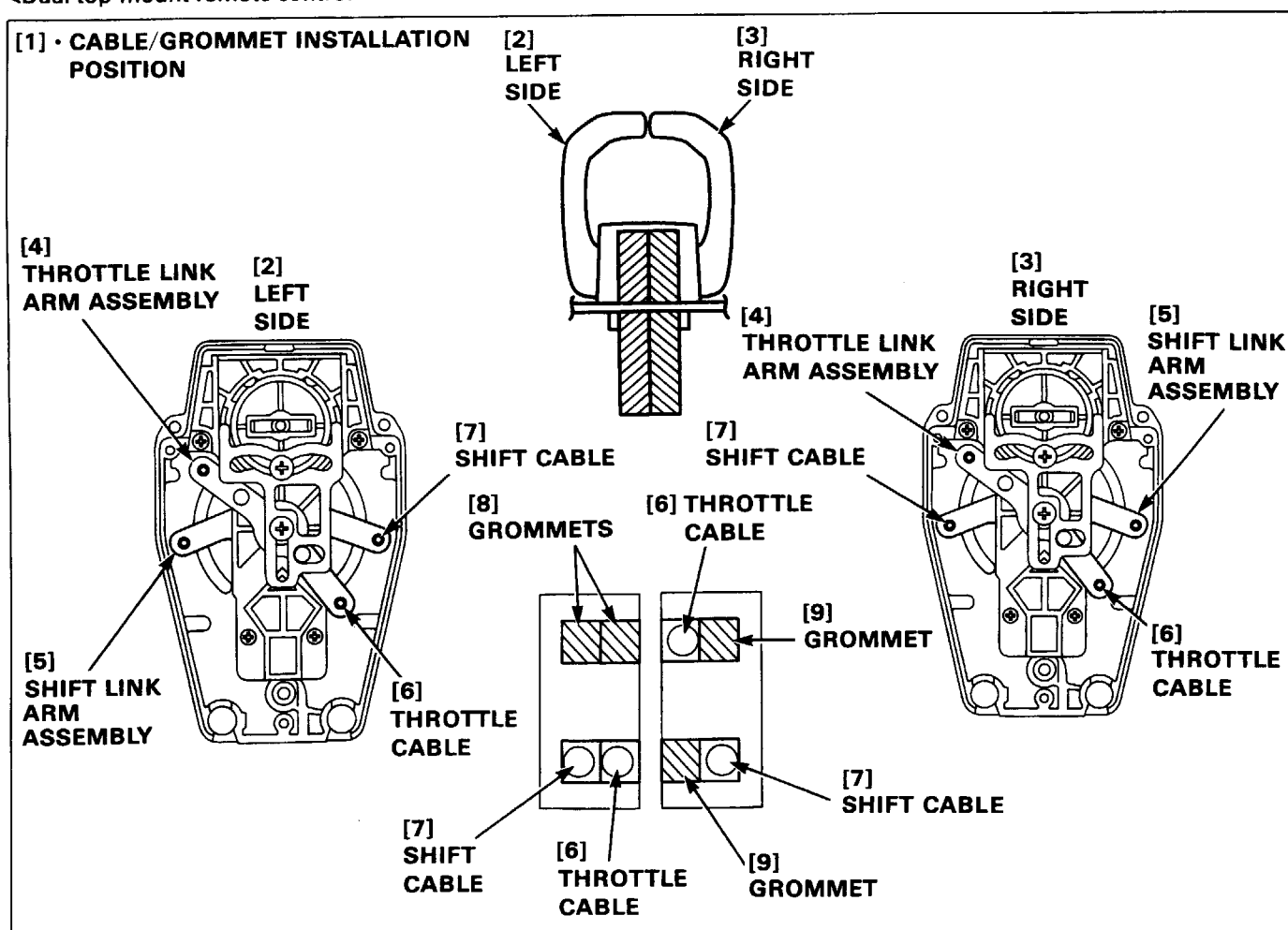




### <Single top-mount remote control>

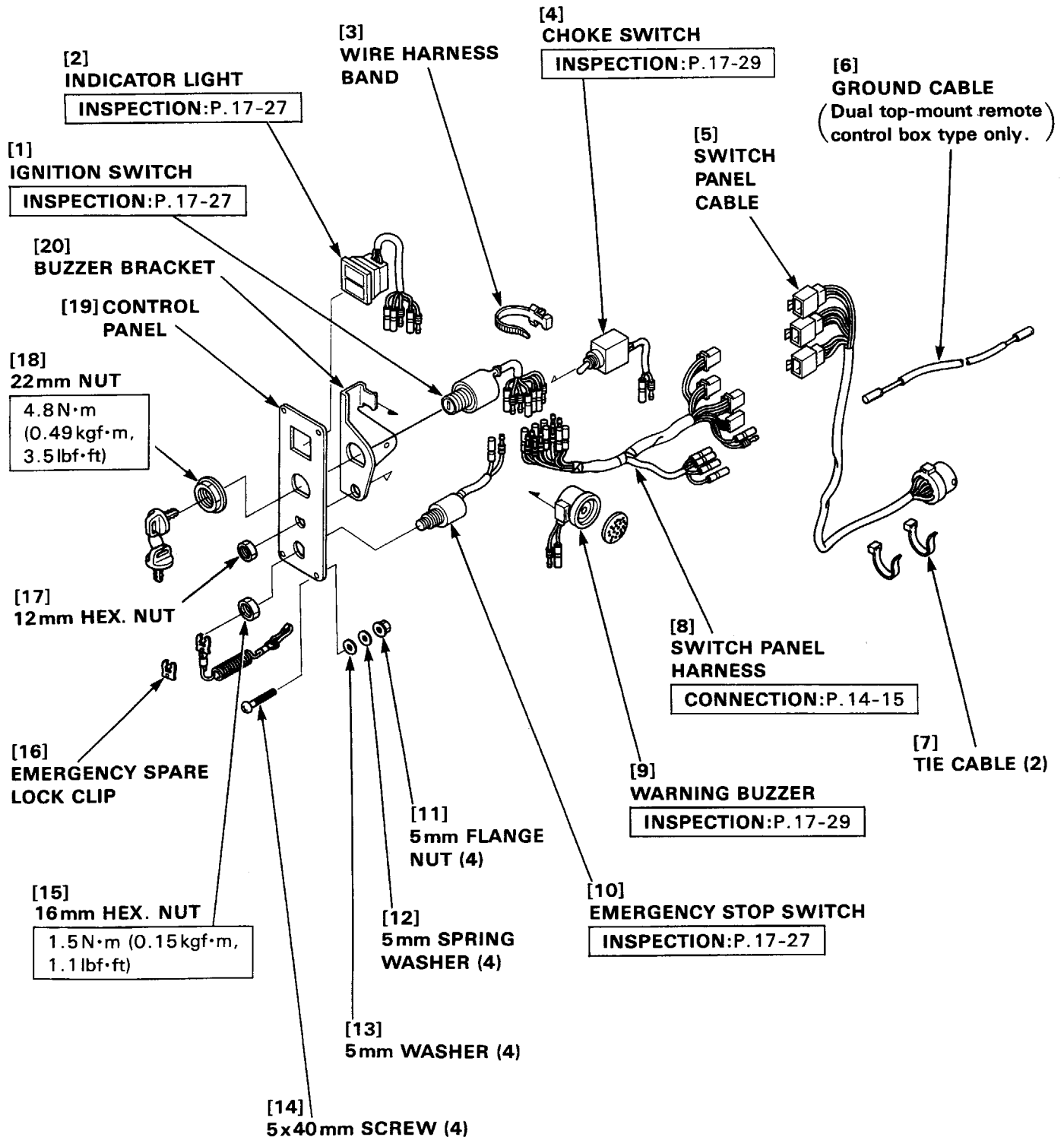


### <Dual top-mount remote control>



## 4. CONTROL PANEL (PANEL-MOUNT / SINGLE TOP-MOUNT / DUAL TOP-MOUNT REMOTE CONTROL BOX TYPE)

### a. DISASSEMBLY / ASSEMBLY

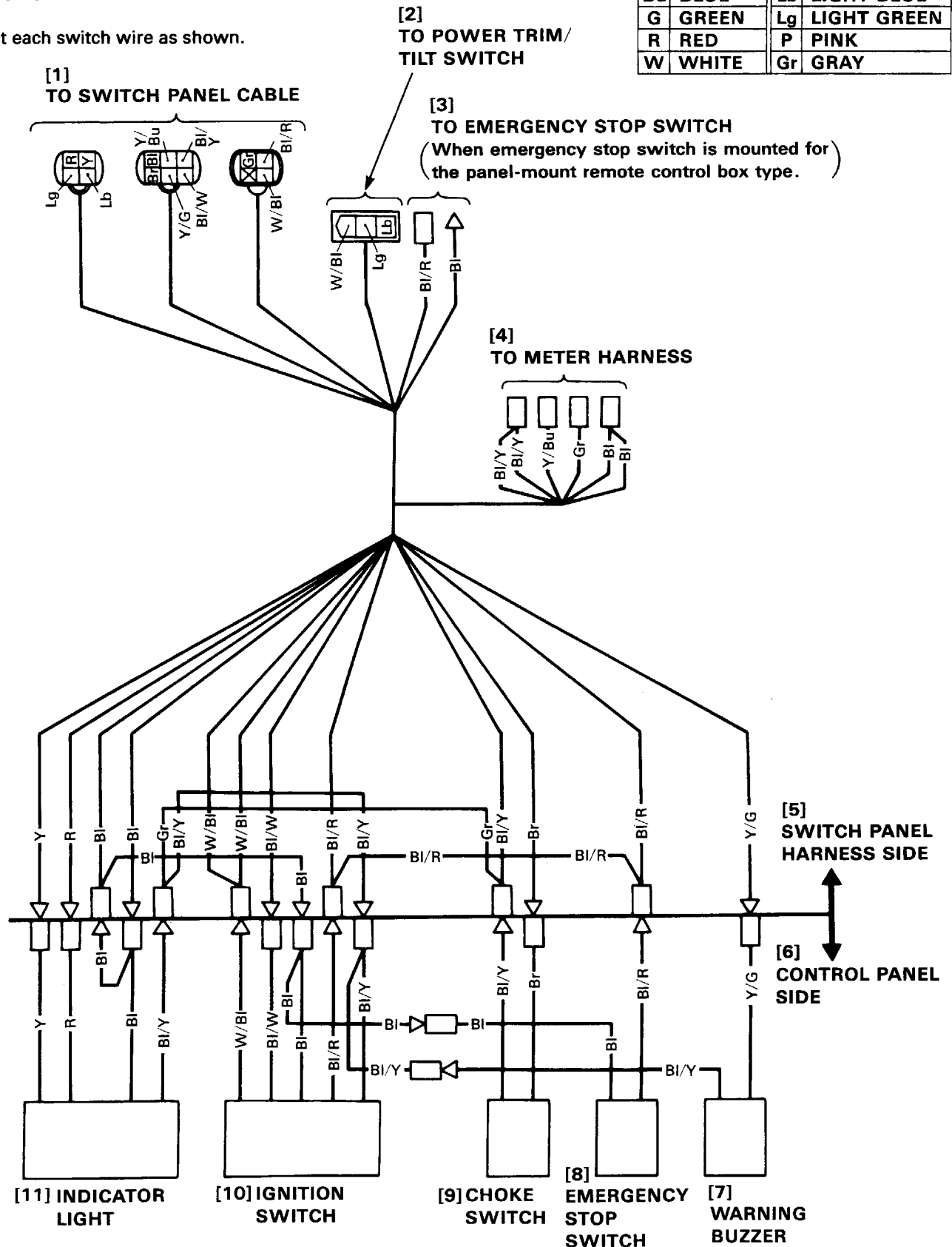


### • SWITCH PANEL HARNESS

#### CONNECTION:

Connect each switch wire as shown.

Bl	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY



# 15. STEERING FRICTION SHAFT/ TILLER HANDLE (TILLER HANDLE TYPE ONLY)

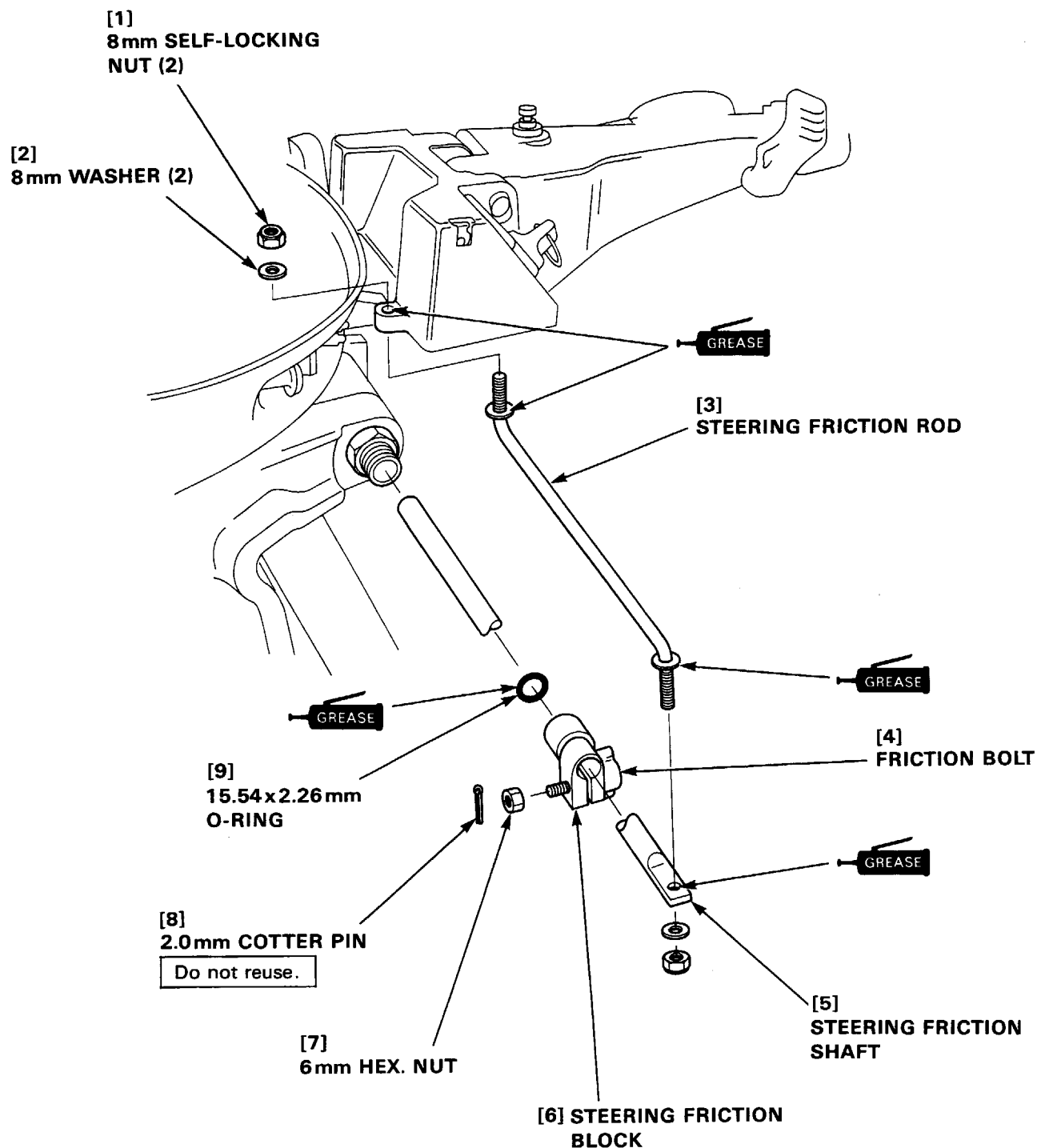
**HONDA**  
BF75A·90A

## 1. STEERING FRICTION SHAFT

## 2. TILLER HANDLE

### 1. STEERING FRICTION SHAFT

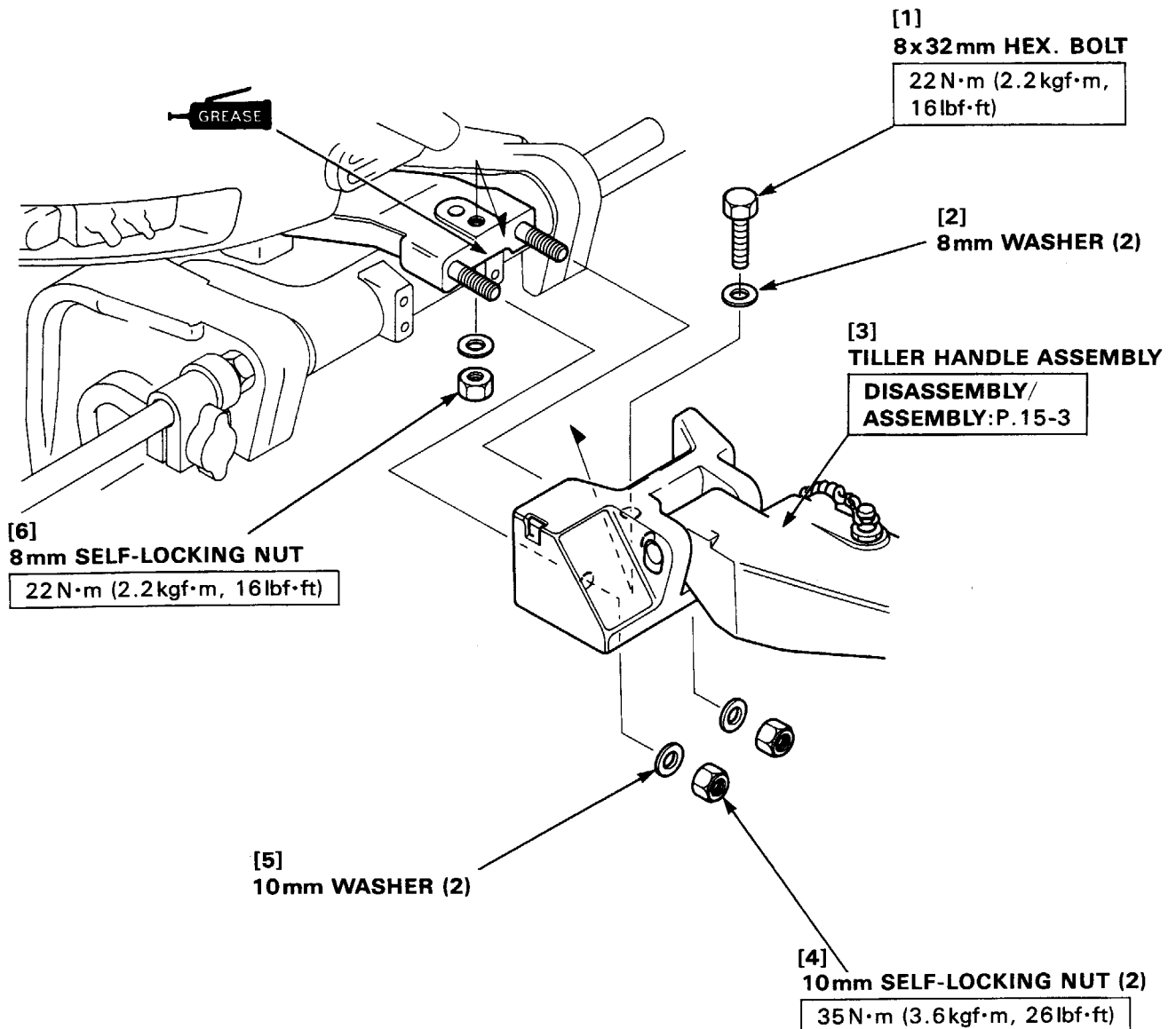
#### a. REMOVAL / INSTALLATION



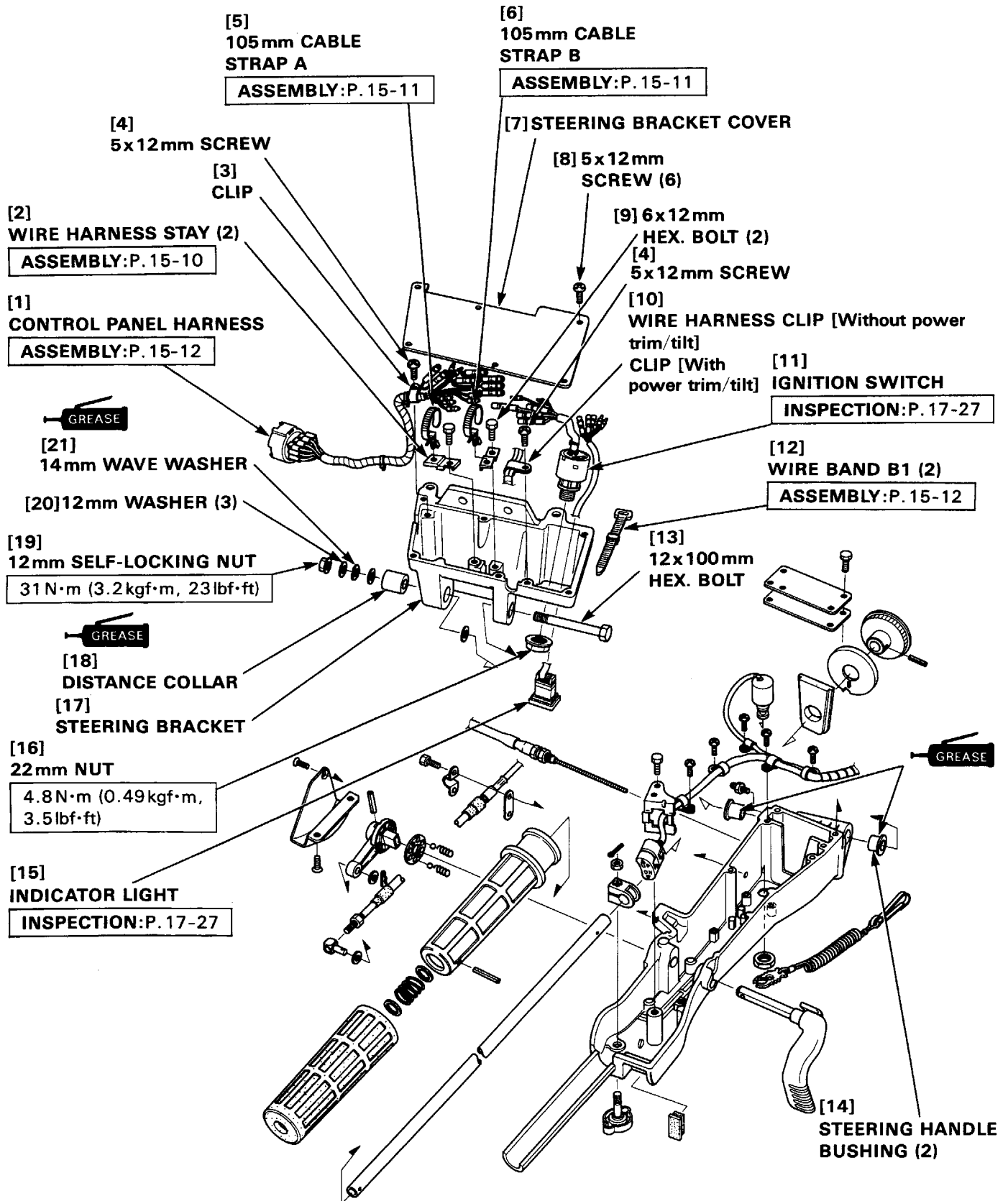
## 2. TILLER HANDLE

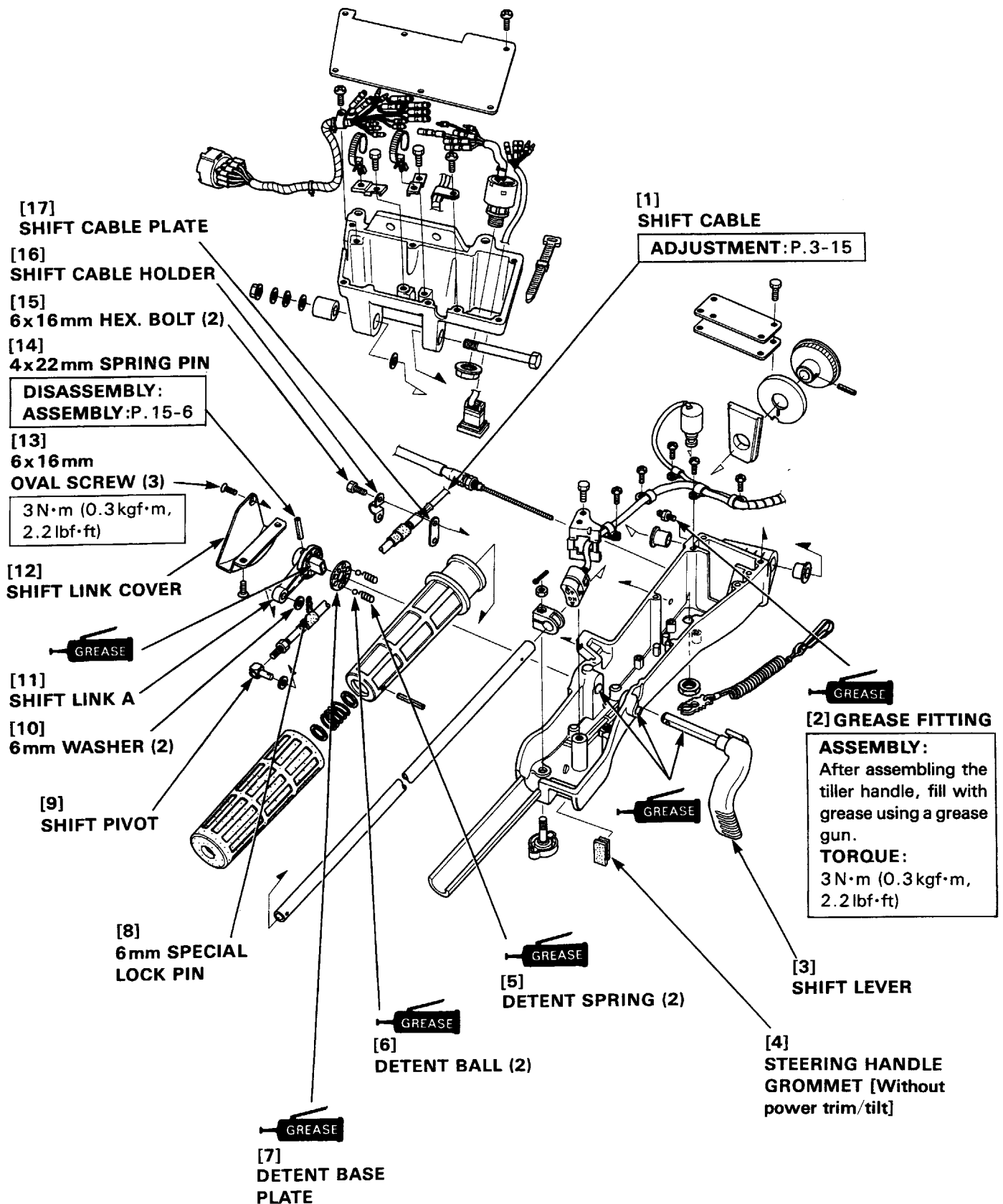
### a. REMOVAL / INSTALLATION

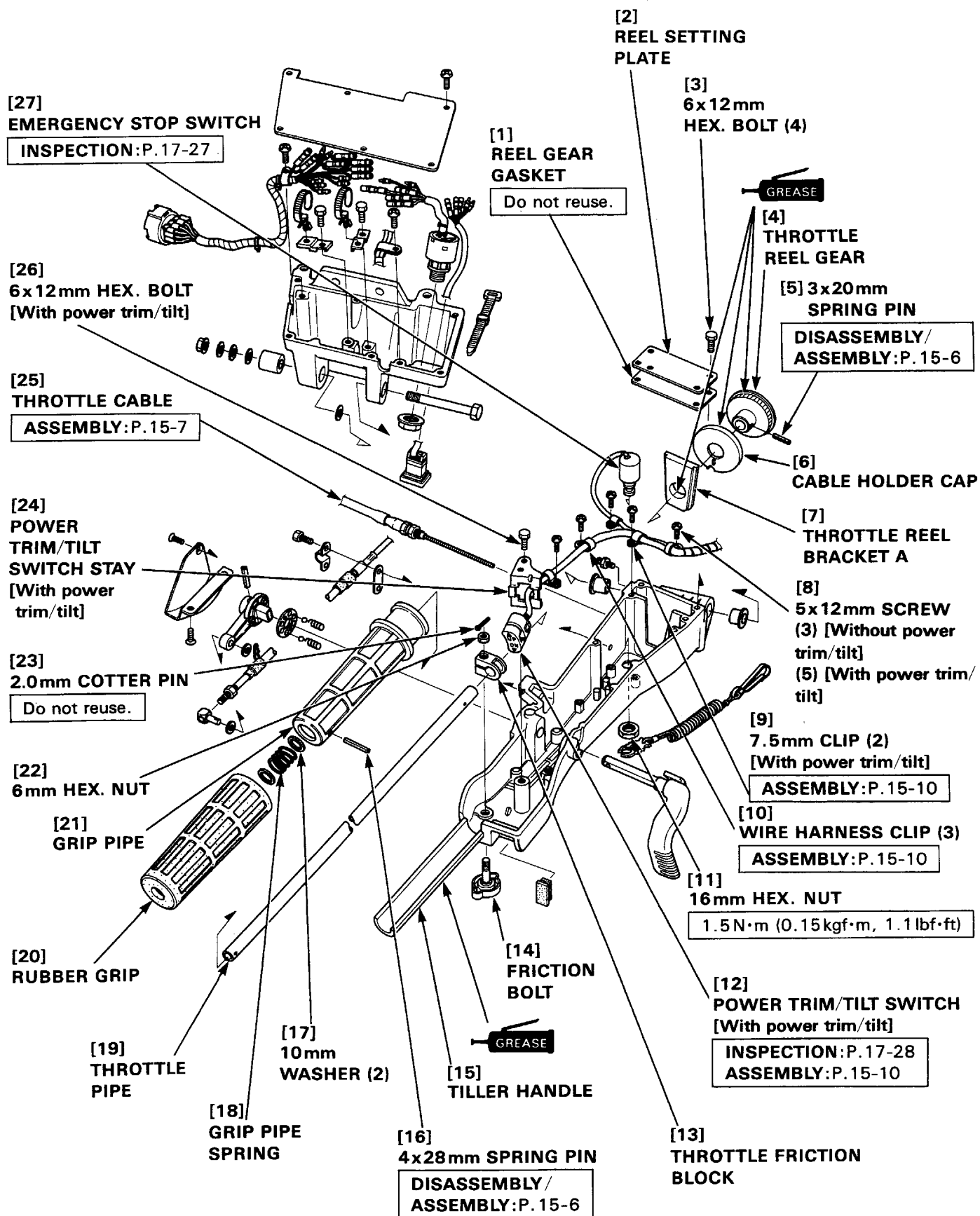
- 1) Remove the engine cover (P. 4-1).
- 2) Disconnect the control cable A 14P connector, and disconnect the throttle cable and shift cable (P. 17-5).
- 3) Remove the steering friction rod (P. 15-1).



### b. DISASSEMBLY / ASSEMBLY





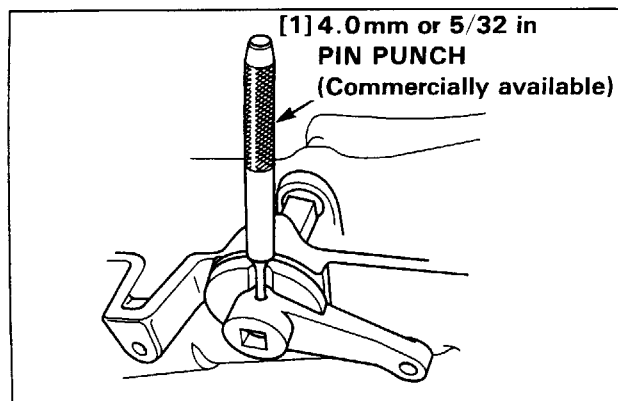




- **SHIFT LEVER / SHIFT LINK A**  
**4 x 22 mm SPRING PIN**

**DISASSEMBLY / ASSEMBLY:**

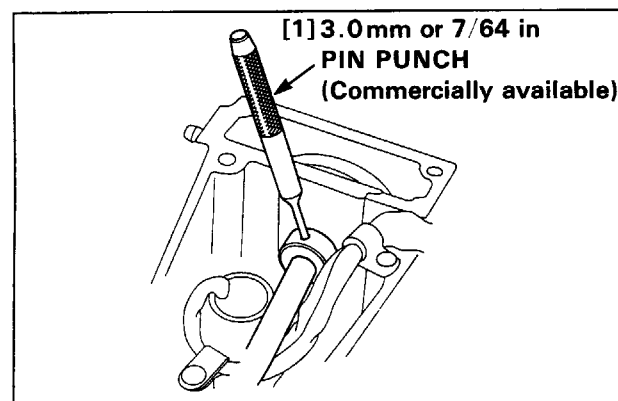
Disassemble and reassemble the 4 x 22 mm spring pin using a commercially available 4.0 mm or 5/32-inch pin punch.



- **THROTTLE PIPE / THROTTLE REEL GEAR**  
**3 x 20 mm SPRING PIN**

**DISASSEMBLY / ASSEMBLY:**

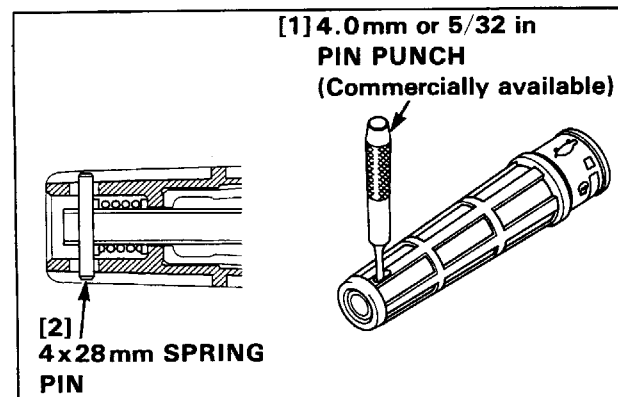
Disassemble and reassemble the 3 x 20 mm spring pin using a commercially available 3.0 mm or 7/64-inch pin punch.



- **THROTTLE PIPE / GRIP PIPE**  
**4 x 28 mm SPRING PIN**

**DISASSEMBLY / ASSEMBLY:**

Disassemble and reassemble the 4 x 28 mm spring pin using a commercially available 4.0 mm or 5/32-inch pin punch.

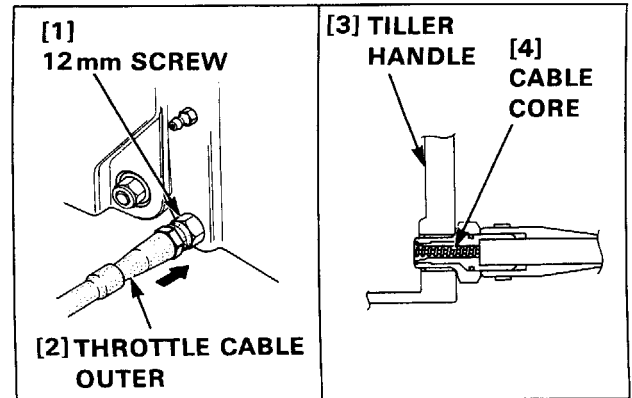


### • THROTTLE CABLE / TILLER HANDLE ASSEMBLY PROCEDURE

- 1) Install the throttle cable outer's 12 mm screw in the tiller handle and tighten to the specified torque.

**TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)**

- 2) Pull out the cable core until it is not visible from the throttle cable outer's 12 mm screw end you tightened.

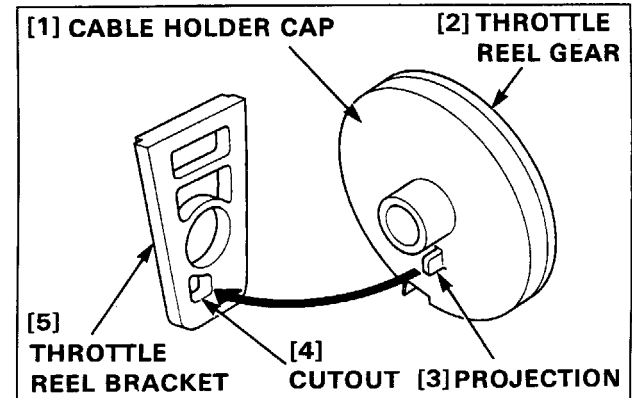


- 3) Apply grease to the circumference of the throttle reel gear and cable holder cap.

Assemble the cable holder cap with the throttle reel gear.

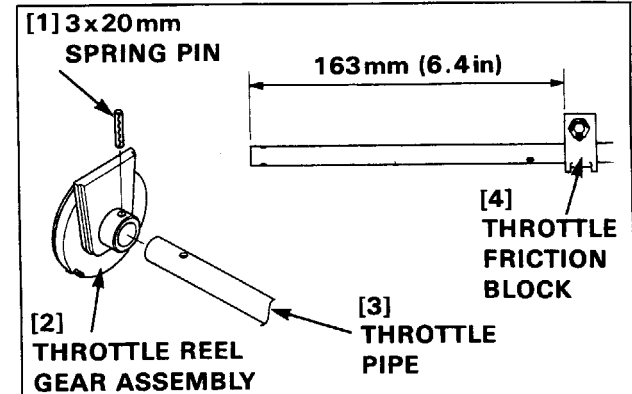
Apply grease to the throttle reel gear installation section of the throttle reel bracket.

- 4) Assemble the cable holder cap with the throttle reel bracket by aligning the projection on the cable holder cap with the cutout in the throttle reel bracket.



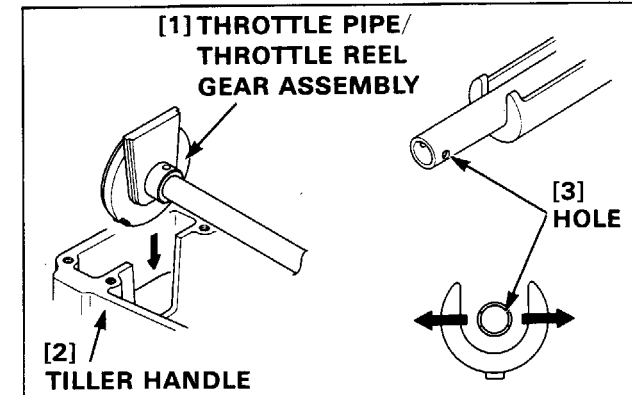
- 5) Install the throttle pipe in the throttle reel gear assembly, and install the 3 x 20 mm spring pin in the throttle pipe using a commercially available 3.0 mm or 7/64-inch pin punch (P. 15-6).

- 6) Install the throttle friction block on the throttle pipe at the position shown.



- 7) Install the throttle pipe / throttle reel gear assembly in the tiller handle.

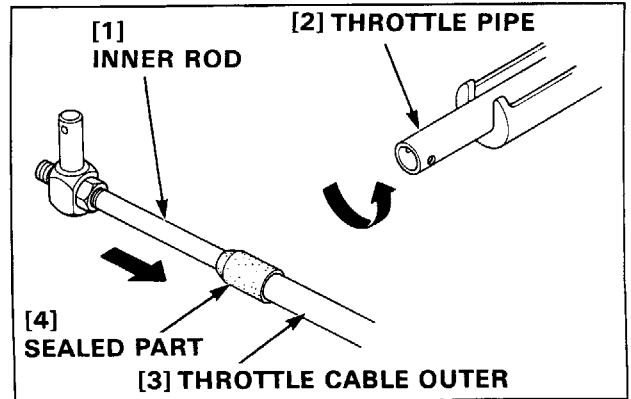
- 8) Install the throttle pipe / throttle reel gear assembly so that the 4 x 28 mm spring pin installation holes in the throttle pipe are on the radial line when viewing the tiller handle from the grip pipe installation side.



- 9) While pushing in the throttle cable inner rod, turn the throttle pipe 180° counterclockwise until it contacts the sealed part of the throttle cable outer.

**NOTE:**

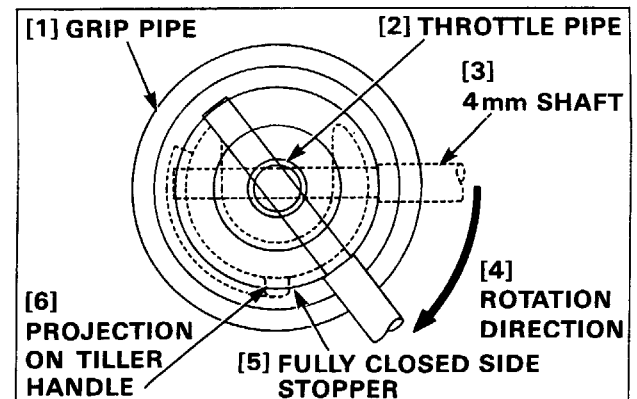
Push in the inner rod with care not to damage the sealed part of the throttle cable outer.



- 10) Temporarily assemble the grip pipe with the tiller handle, using a 4 mm-diameter shaft.

- 11) Insert the 4 mm shaft through the throttle pipe by aligning the hole in the grip pipe with the holes in the throttle pipe.

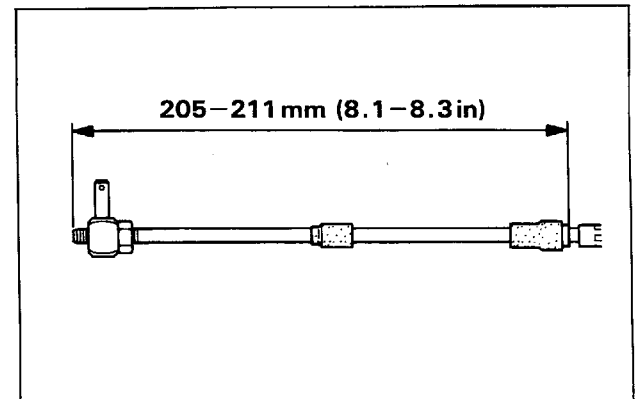
Move the throttle pipe to the "FULLY CLOSED" position. Be sure that the projection on the tiller handle contacts the fully closed side stopper of the grip pipe.



- 12) With the throttle pipe at the fully closed position, measure the length between the inner rod end and the cable outer groove. It should be 205 – 211 mm (8.1 – 8.3 in).

- 13) If the measurement is within 205–211 mm (8.1 – 8.3 in), go to step 14.

If the measurement is less than 205 mm (8.1 in) or more than 211 mm (8.3 in), see the following instructions and proceed accordingly.



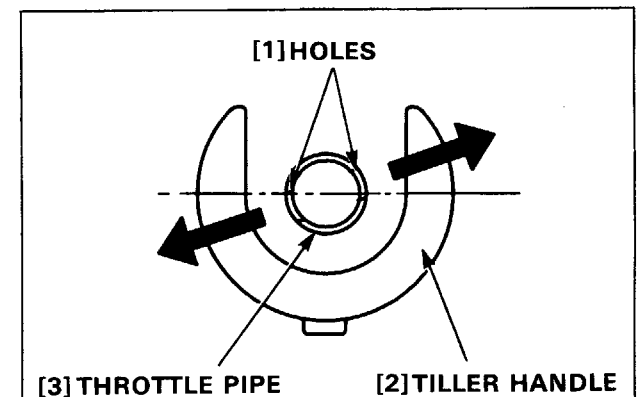
<When cable length is less than 205 mm (8.1 in)>

- (1) Disassemble the assembly again to the condition of step 8.
- (2) Turn the throttle pipe so that the 4 x 28 mm spring pin installation holes in the throttle pipe are on an ascending line (right side up) when viewing the tiller handle from the grip pipe installation side as shown.

**NOTE:**

Be sure that the throttle cable core is in the position described in step 2 (P. 15-7) at this time.

- (3) With the throttle pipe set as explained in step (2), perform steps 9 through 13.



<When cable length is more than 211 mm (8.3 in)>

- (1) Disassemble the assembly again to the condition of step 8 (P. 15-7).

- (2) Turn the throttle pipe so that the 4 x 28 mm spring pin installation holes in the throttle pipe are on a descending line (left side up) when viewing the tiller handle from the grip pipe installation side as shown.

**NOTE:**

Be sure that the throttle cable core is in the position described in step 2 (P. 15-7) at this time.

- (3) With the throttle pipe set as explained in step (2), perform steps 9 through 13 (P. 15-8).

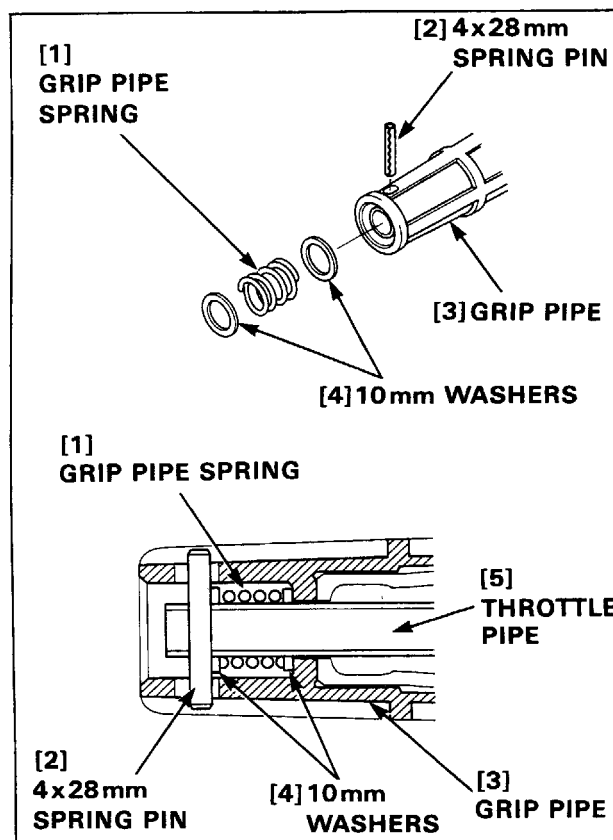
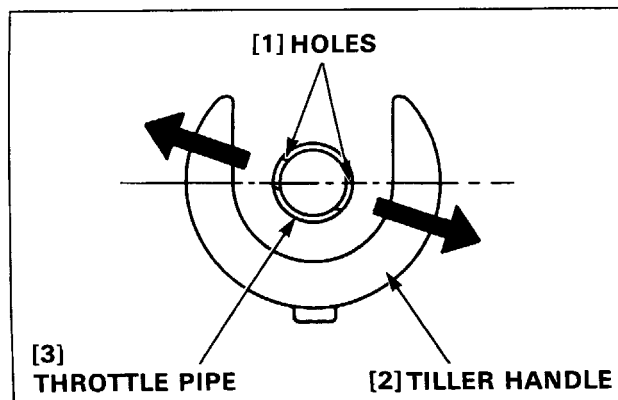
Note that the following steps must be made only when the cable length is within 205 – 211 mm (8.1 – 8.3 in)

- 14) Install the grip pipe on the tiller handle. Place the spring and washers in the grip pipe in the correct order. Pushing the washers into the pipe, drive the 4 x 28 mm spring pin into the throttle pipe (P. 15-6).

- 15) Install the rubber grip and grease fitting.

- 16) Install a new reel gear gasket on the tiller handle, and install the reel setting plate.

Set a grease gun on the grease fitting, and fill the throttle reel cavity with grease.



### • WIRE HARNESS CLIP [Without power trim / tilt]

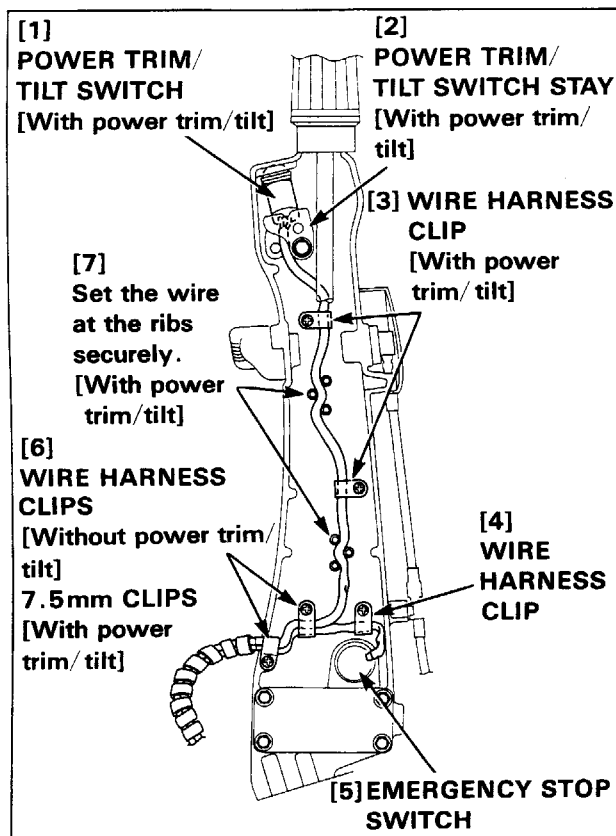
#### ASSEMBLY:

Secure the emergency stop switch wire with the three wire harness clips.

### • WIRE HARNESS CLIP / 7.5 mm CLIP / POWER TRIM / TILT SWITCH [With power trim / tilt]

#### ASSEMBLY:

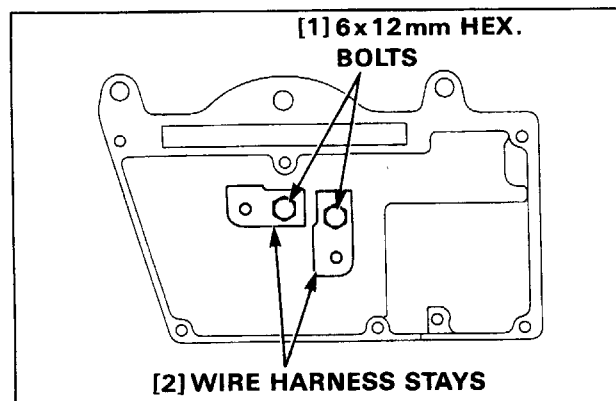
- 1) Install the power trim / tilt switch in the switch stay, and install the switch stay on the tiller handle.
- 2) Set the power trim / tilt switch wire at the ribs on the tiller handle as shown.
- 3) Secure the emergency stop switch wire and power trim / tilt switch wire with the two 7.5 mm clips in the positions shown.
- 4) Install the wire harness clips in the positions shown.



### • WIRE HARNESS STAY

#### ASSEMBLY:

Install the wire harness stays, using 6 x 12 mm hex. bolts as shown.



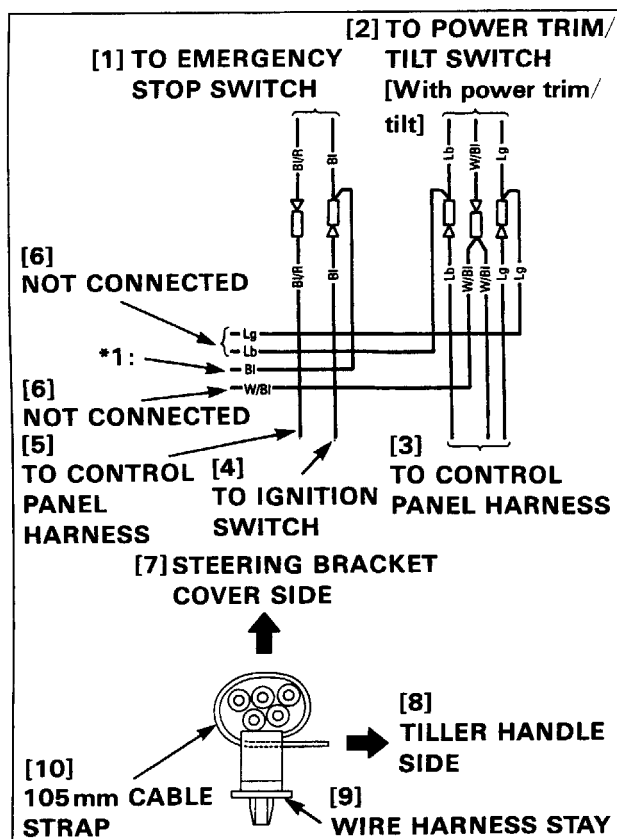
### • 105 mm CABLE STRAP B

#### ASSEMBLY:

Connect each connector as shown.

Secure the connector section with a 105 mm cable strap, and set the 105 mm cable strap on the wire harness stay.

\*1: Goes to the meter harness A [Optional part].



### • 105 mm CABLE STRAP A

#### ASSEMBLY:

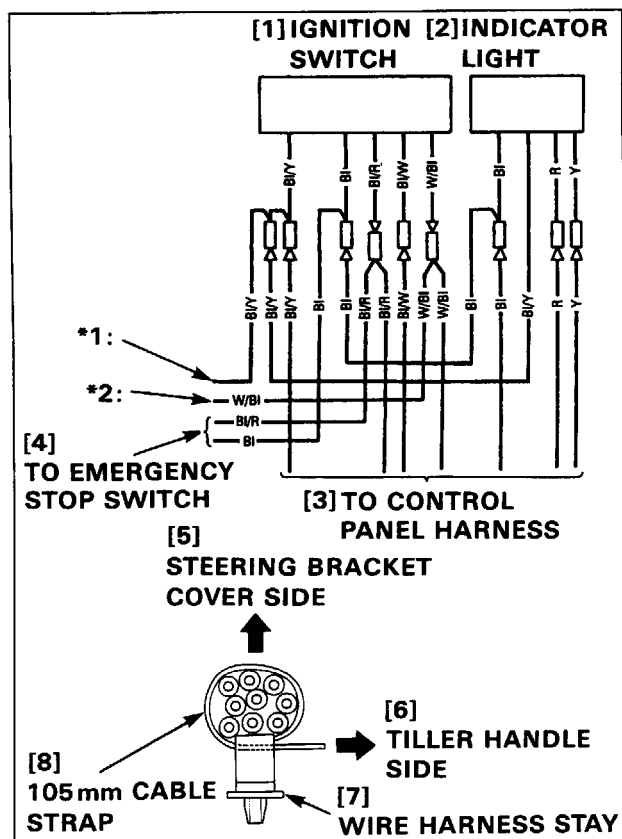
Connect each connector as shown.

Secure the connector section with a 105 mm cable strap, and set the 105 mm cable strap on the wire harness stay.

\*1: Goes to the meter harness A [Optional part].

\*2: Goes to the power trim / tilt switch.

Bi	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY

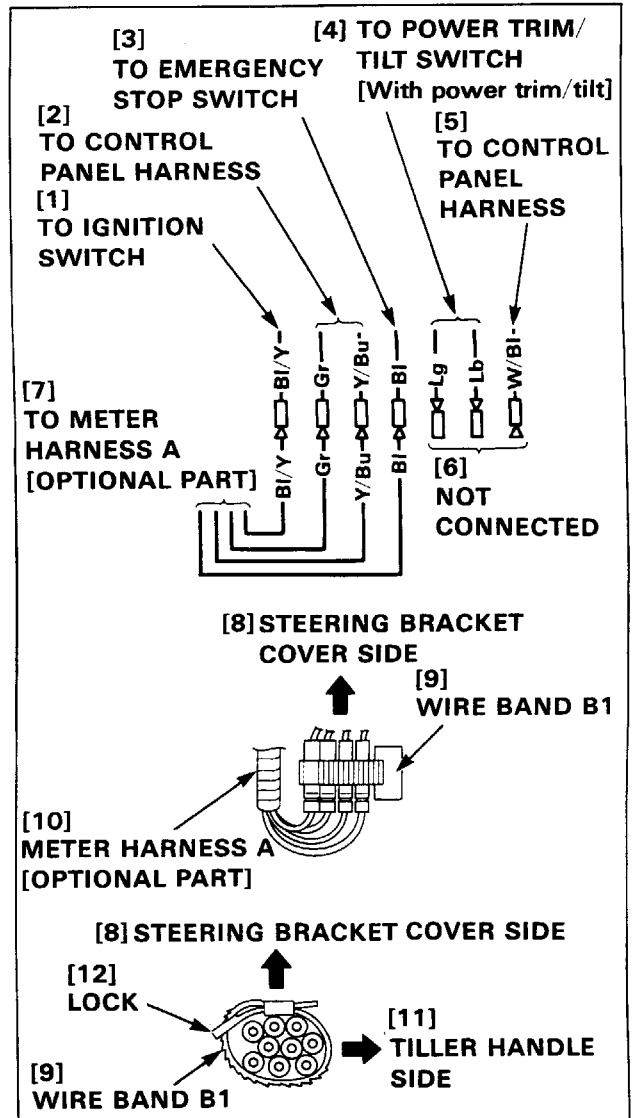


### • WIRE BAND B1

#### ASSEMBLY:

Connect each connector as shown, and secure the connector section with the wire band B1.

Install so that the band lock does not interfere with the steering bracket as shown.

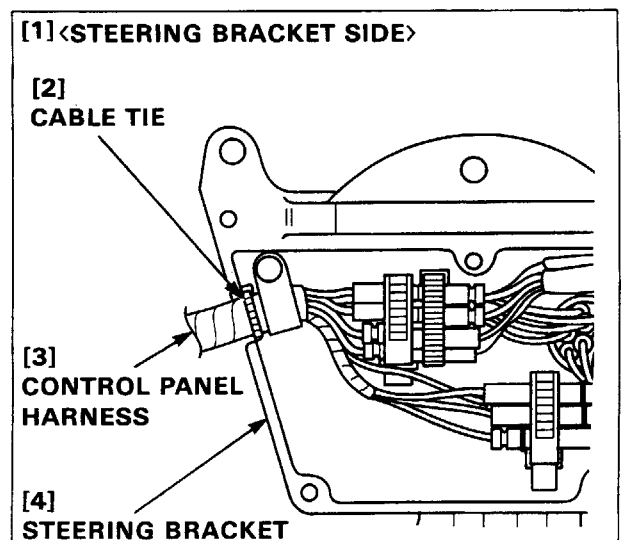


### • CONTROL PANEL HARNESS

#### ASSEMBLY:

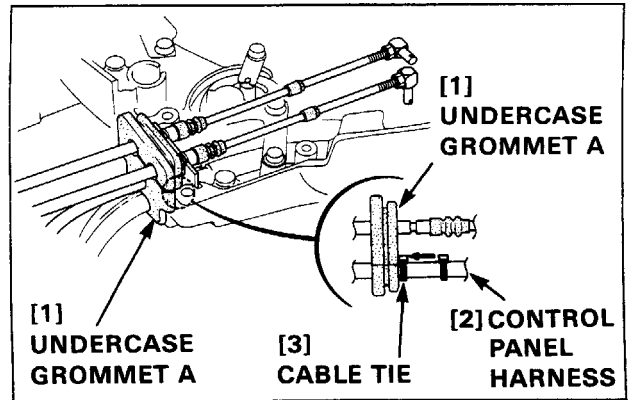
#### <STEERING BRACKET SIDE>

Position the control panel harness so that the cable tie is inside the steering bracket as shown.



## &lt;14P CONNECTOR SIDE&gt;

Position the control panel harness so that the cable tie is inside undercase grommet A as shown.





# 16. CABLES/SHIFT LINK BRACKET/SHIFT ARM

**HONDA**  
**BF75A·90A**

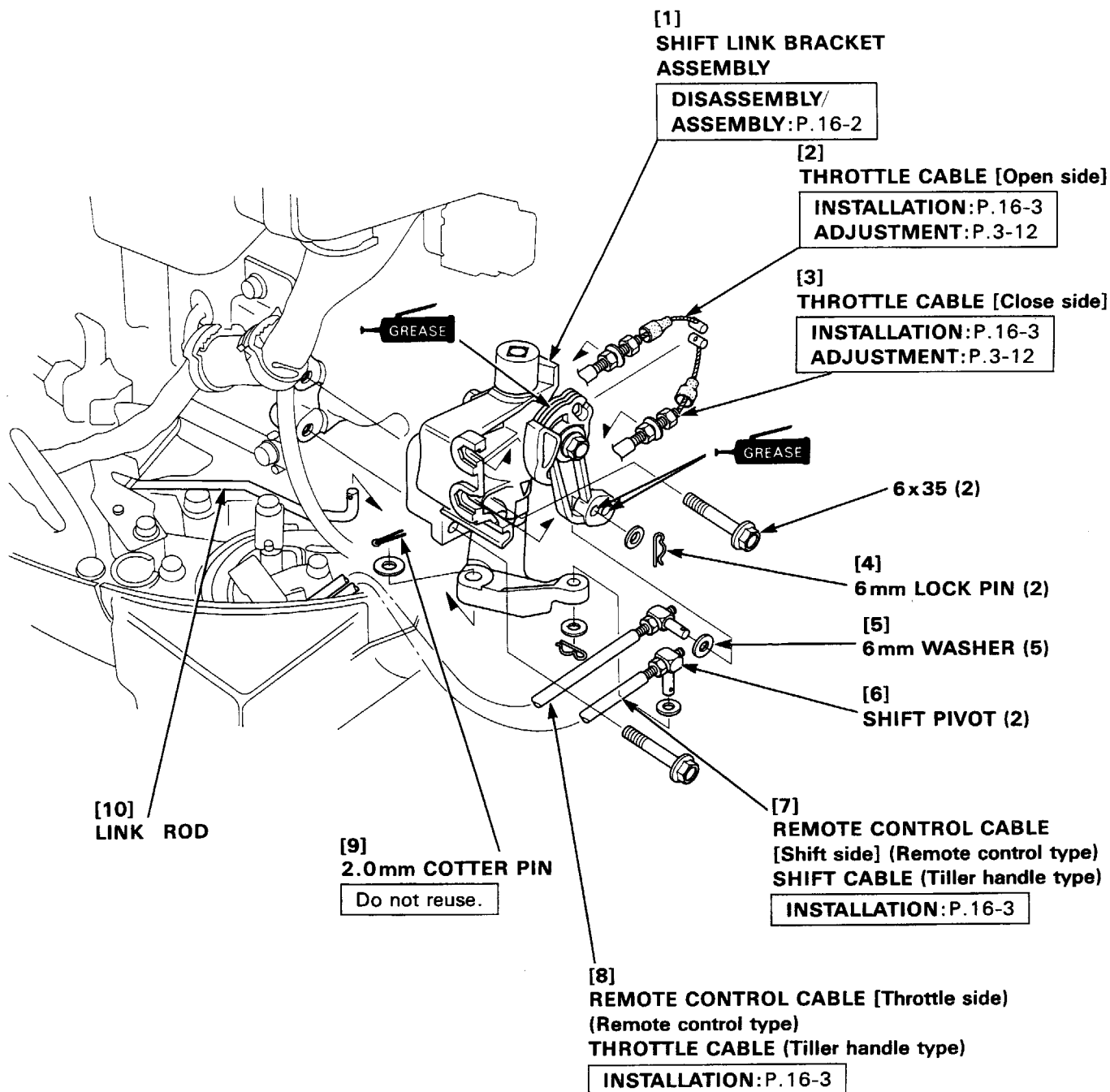
## 1. SHIFT LINK BRACKET

## 2. SHIFT ARM/LINK ROD/NEUTRAL SWITCH

### 1. SHIFT LINK BRACKET

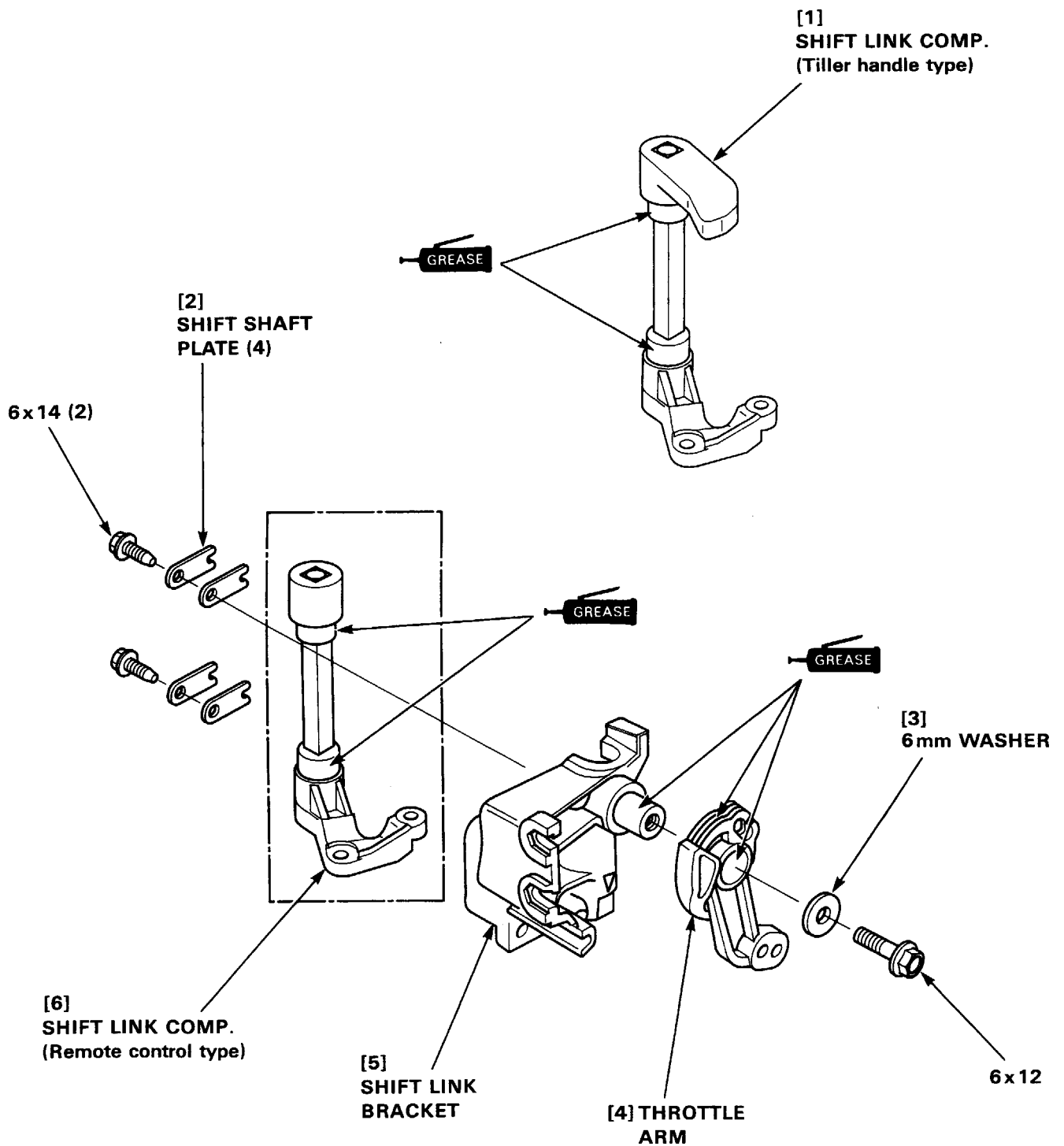
#### a. REMOVAL/INSTALLATION

Remove the engine cover (P. 4-1).



**b. DISASSEMBLY/ASSEMBLY**

**• SHIFT LINK BRACKET ASSEMBLY**

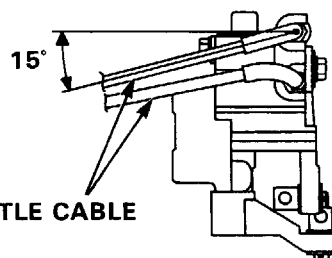


### • THROTTLE CABLE

#### INSTALLATION:

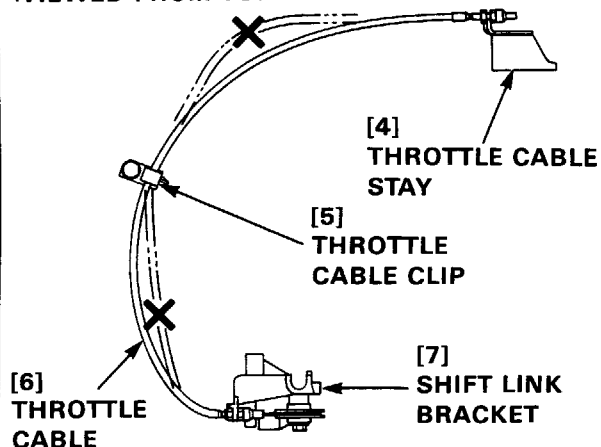
Install the throttle cable with care not to bend it or pull it taut as shown.

[1] <VIEWED FROM FRONT SIDE>



[2] THROTTLE CABLE

[3] <VIEWED FROM TOP>

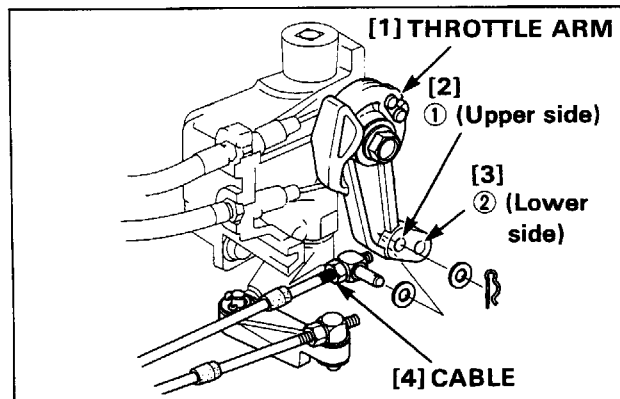


### • REMOTE CONTROL CABLE [Throttle side] (Remote control type)/THROTTLE CABLE (Tiller handle type)

#### INSTALLATION:

Note that the connecting point of the remote control cable (remote control type) or throttle cable (tiller handle type) differs according to the type of the remote control box or tiller handle. Connect the cable properly.

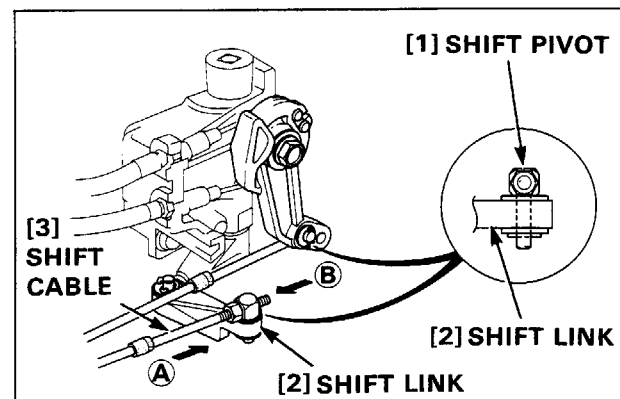
Type	Connecting point
Tiller handle, side-mount remote control box	① (Upper hole)
Panel-mount / single top-mount / dual top-mount remote control box	② (Lower hole)



### • REMOTE CONTROL CABLE [Shift side] (Remote control type) / SHIFT CABLE (Tiller handle type)

#### INSTALLATION:

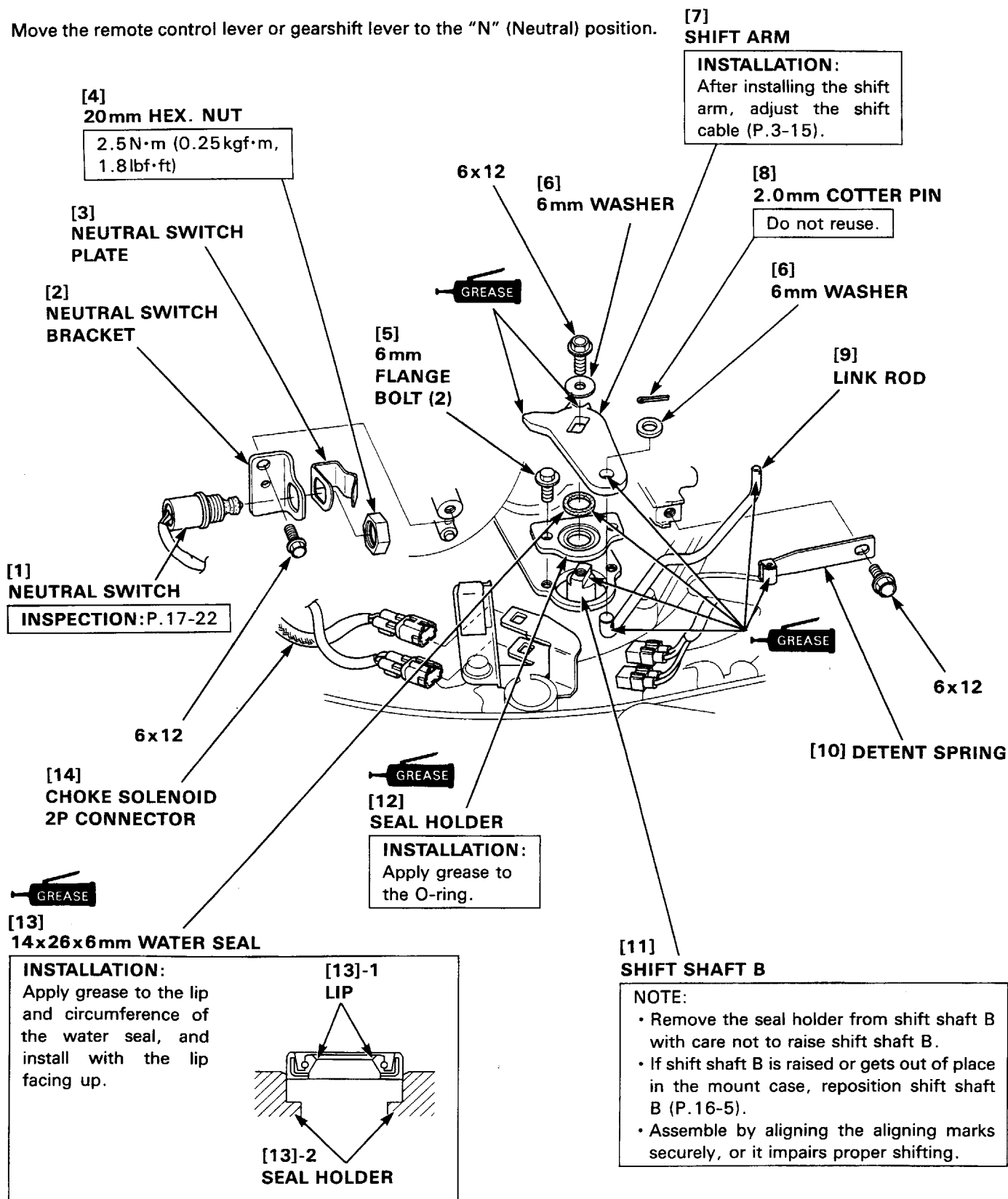
Pushing the shift link lightly in the same direction as the arrow ①, align the shift pivot pin with the hole in the shift link, and install the remote control cable / shift cable as shown.



## 2. SHIFT ARM / LINK ROD / NEUTRAL SWITCH

### a. REMOVAL / INSTALLATION

Move the remote control lever or gearshift lever to the "N" (Neutral) position.



### • SHIFT SHAFT B ALIGNMENT

Correct shift shaft B from the condition of the seal holder being out of position.

- 1) Turn shift shaft B until shift shafts A and B contact the stoppers in the mount case as shown.

**NOTE:**

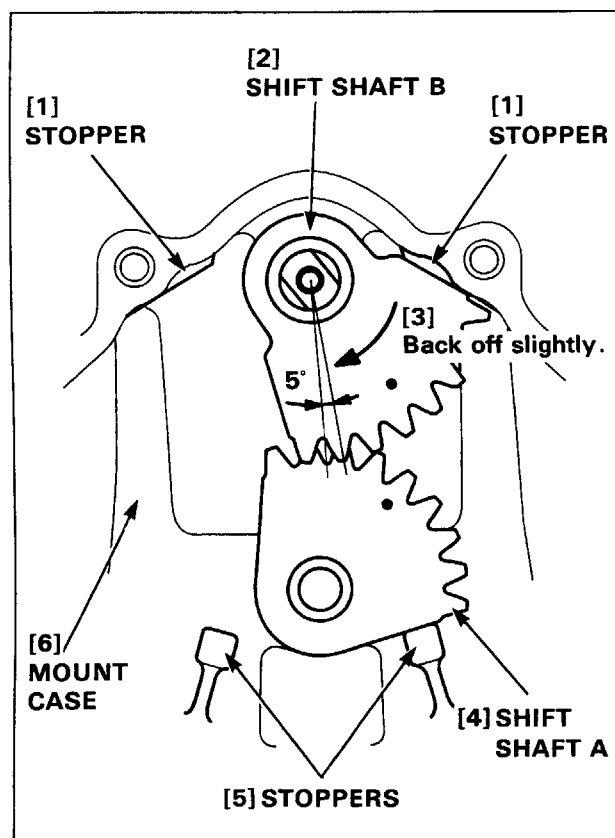
When turning in the same direction, it is all right for shift shafts A and B to be in contact with either the right or left stopper.

- 2) With shift shafts A and B in contact with their respective stoppers, turn shift shaft B so that its gear is above the gear of shift shaft A. Then, back off shift shaft B slightly until the gear of shift shaft B engages with the gear of shift shaft A.

**NOTE:**

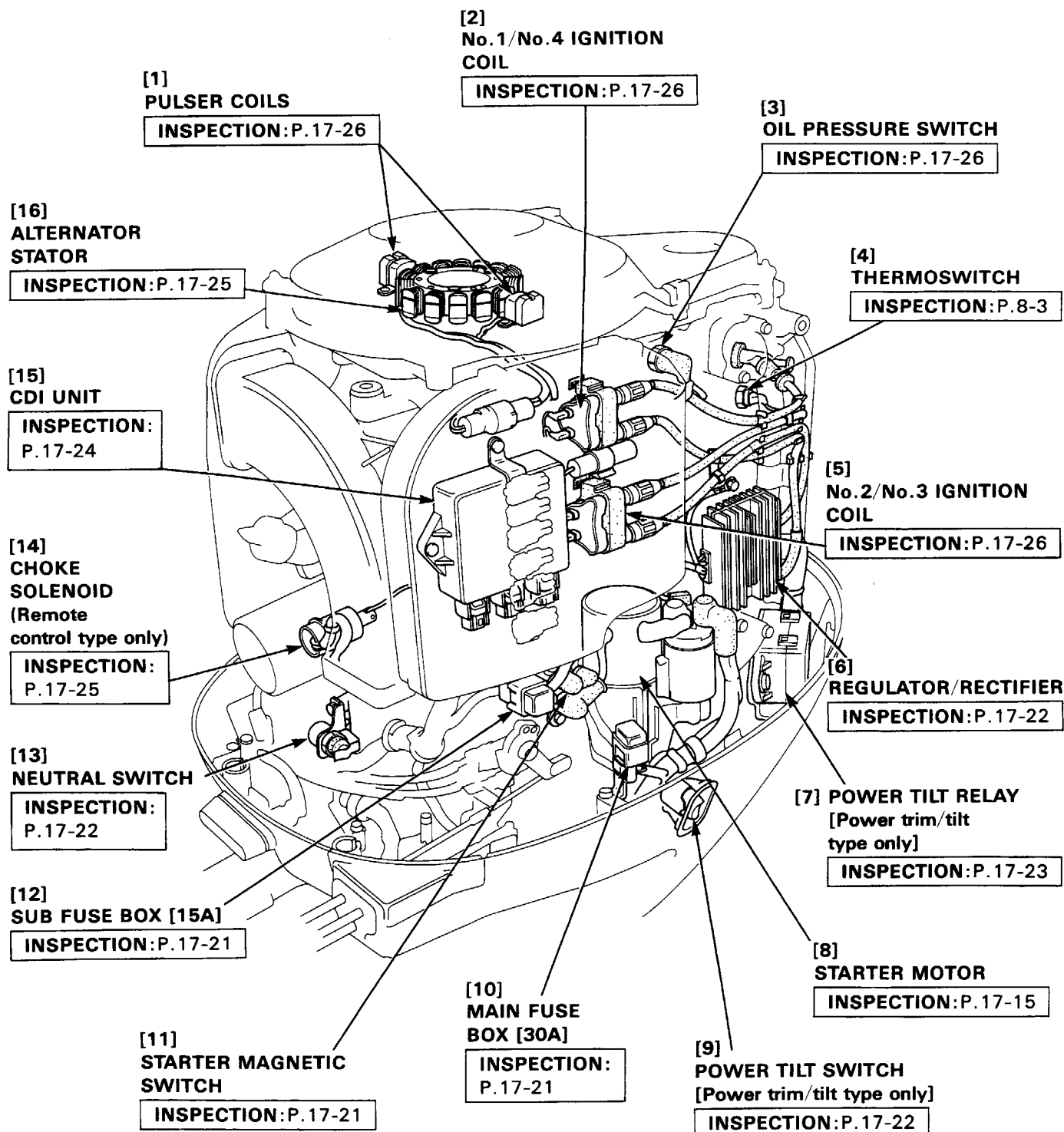
Engage the gears with care not to move shift shaft A.

- 3) After correcting shift shaft B, check whether shifting can be made properly.
- 4) Install the seal holder.

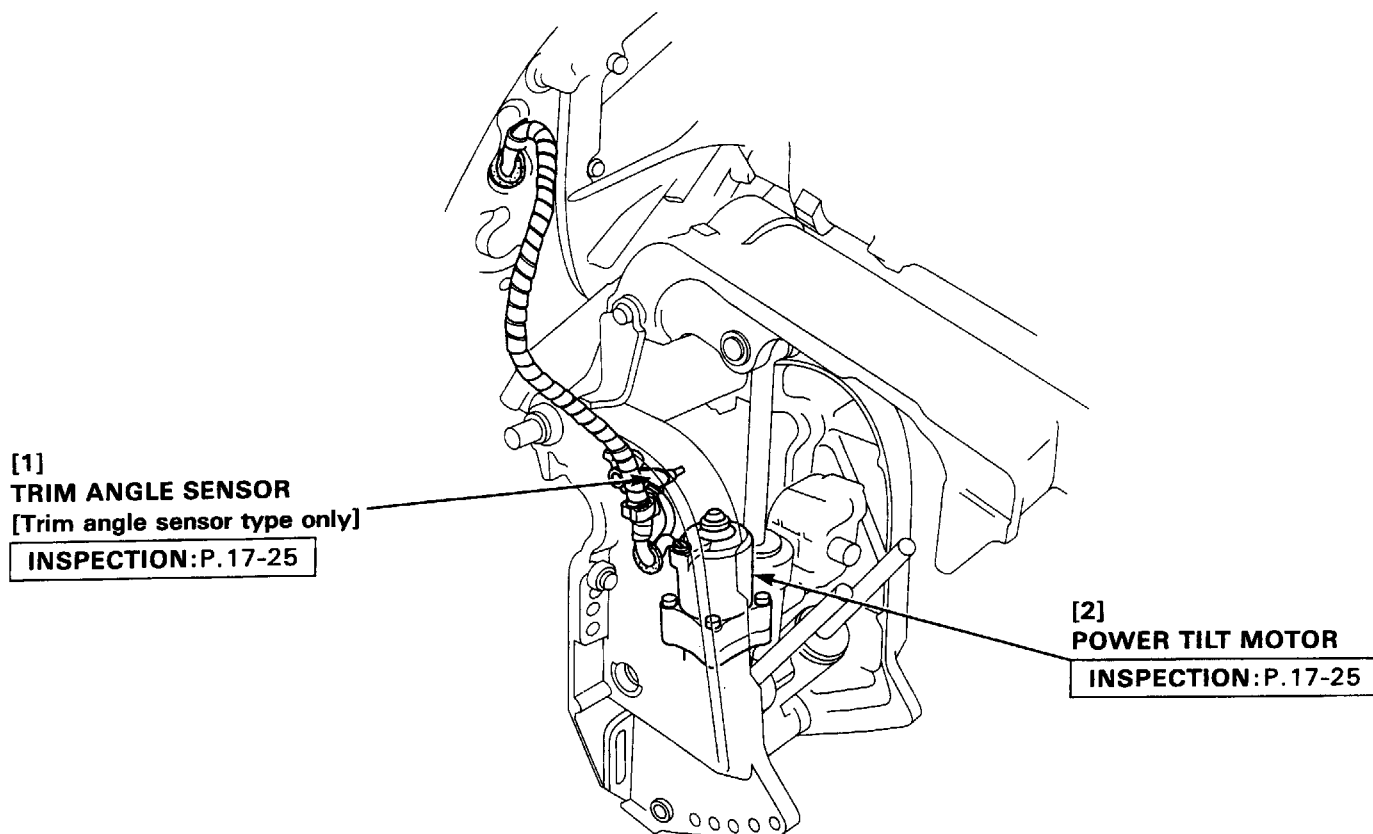


- |   |  |
|---|--|
| 1. COMPONENT LOCATION   | 4. POWER TILT RELAY (POWER TRIM / TILT TYPE) / REGULATOR / RECTIFIER |
| 2. STARTER CABLE / REMOTE CONTROL CABLE / SHIFT, THROTTLE CABLE | 5. STARTER MOTOR   |
| 3. CDI UNIT / IGNITION COIL                                     | 6. INSPECTION  |

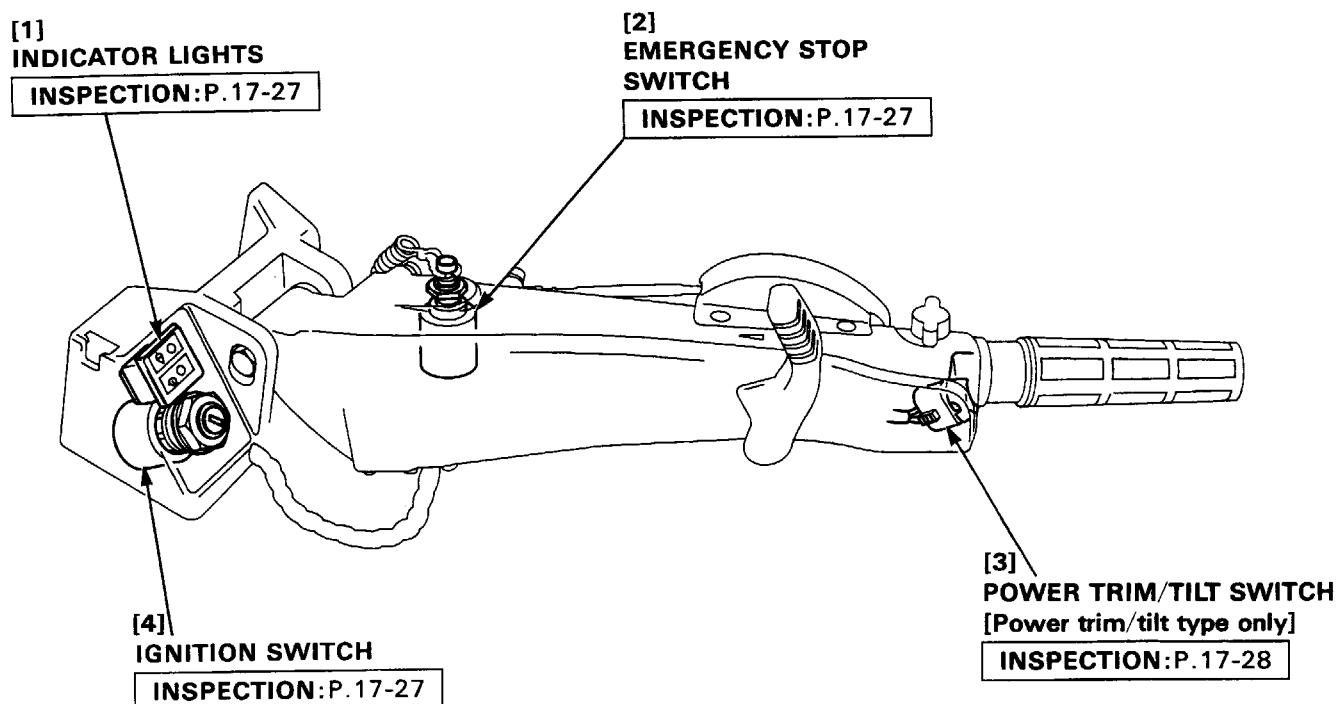
## 1. COMPONENT LOCATION



• **POWER TRIM / TILT TYPE**

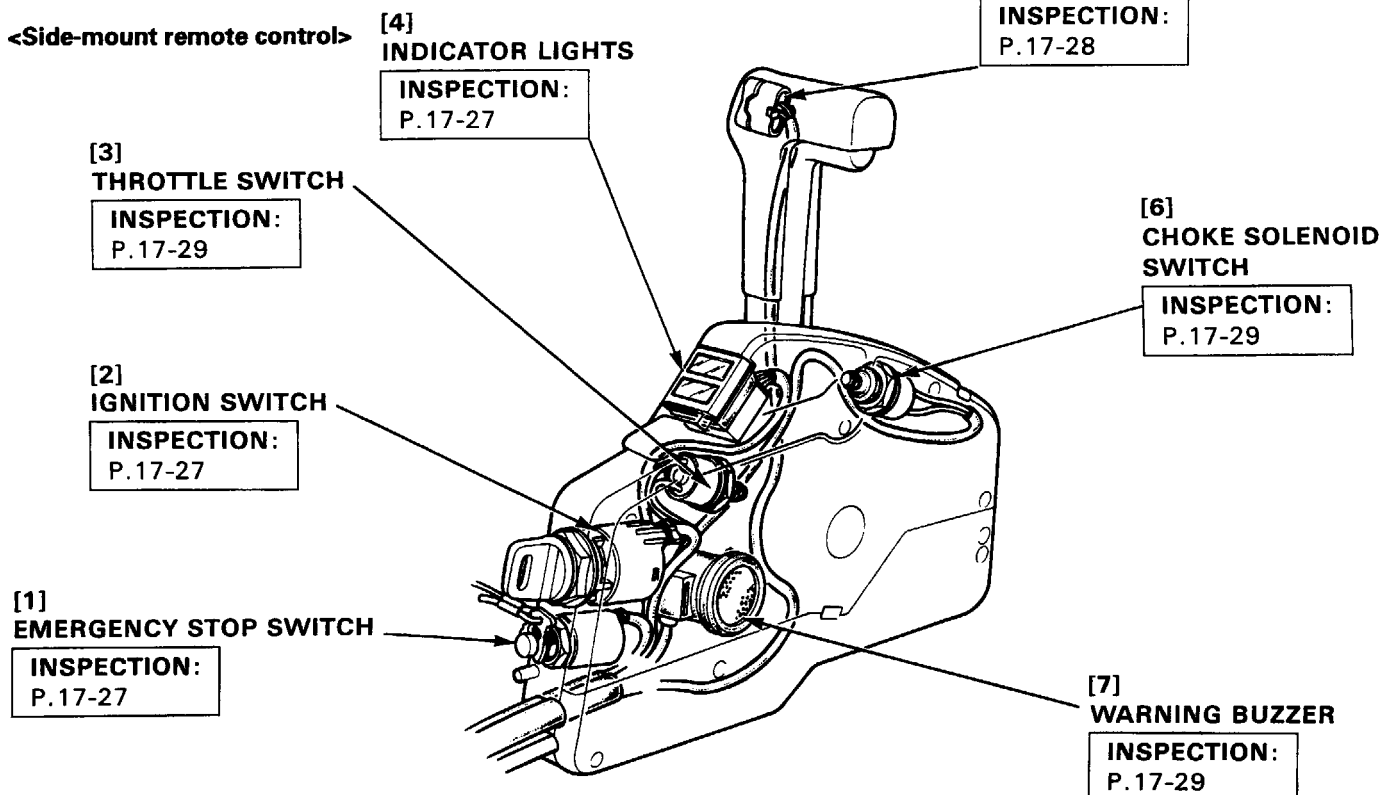


• **TILLER HANDLE TYPE**



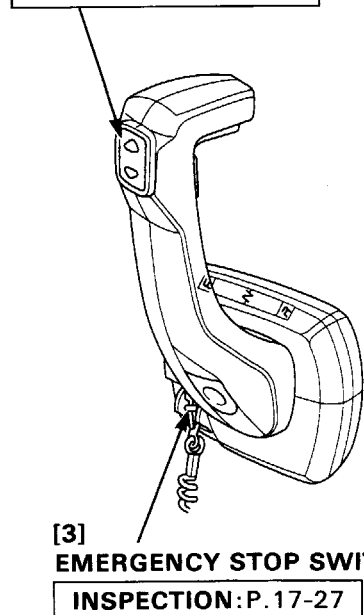
### • REMOTE CONTROL BOX

<Side-mount remote control>



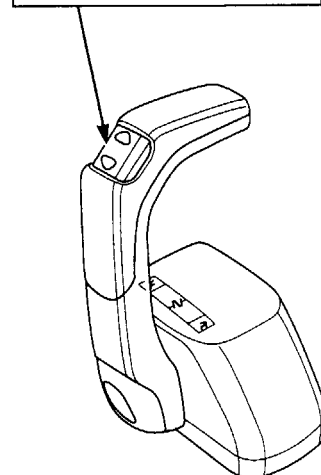
[1] <Panel-mount remote control>

[2] POWER TRIM/TILT SWITCH  
INSPECTION: P.17-28



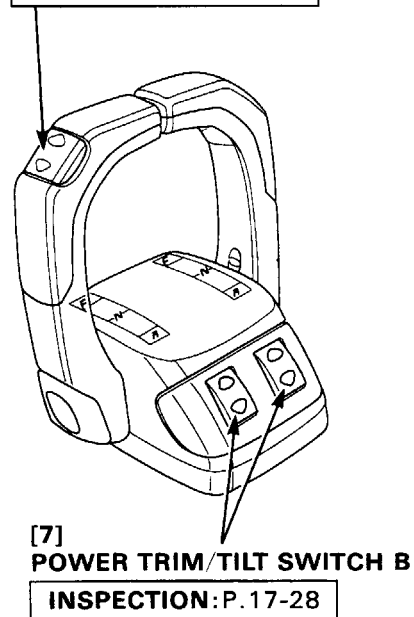
[4] <Single top-mount remote control>

[5] POWER TRIM/TILT SWITCH A  
INSPECTION: P.17-28



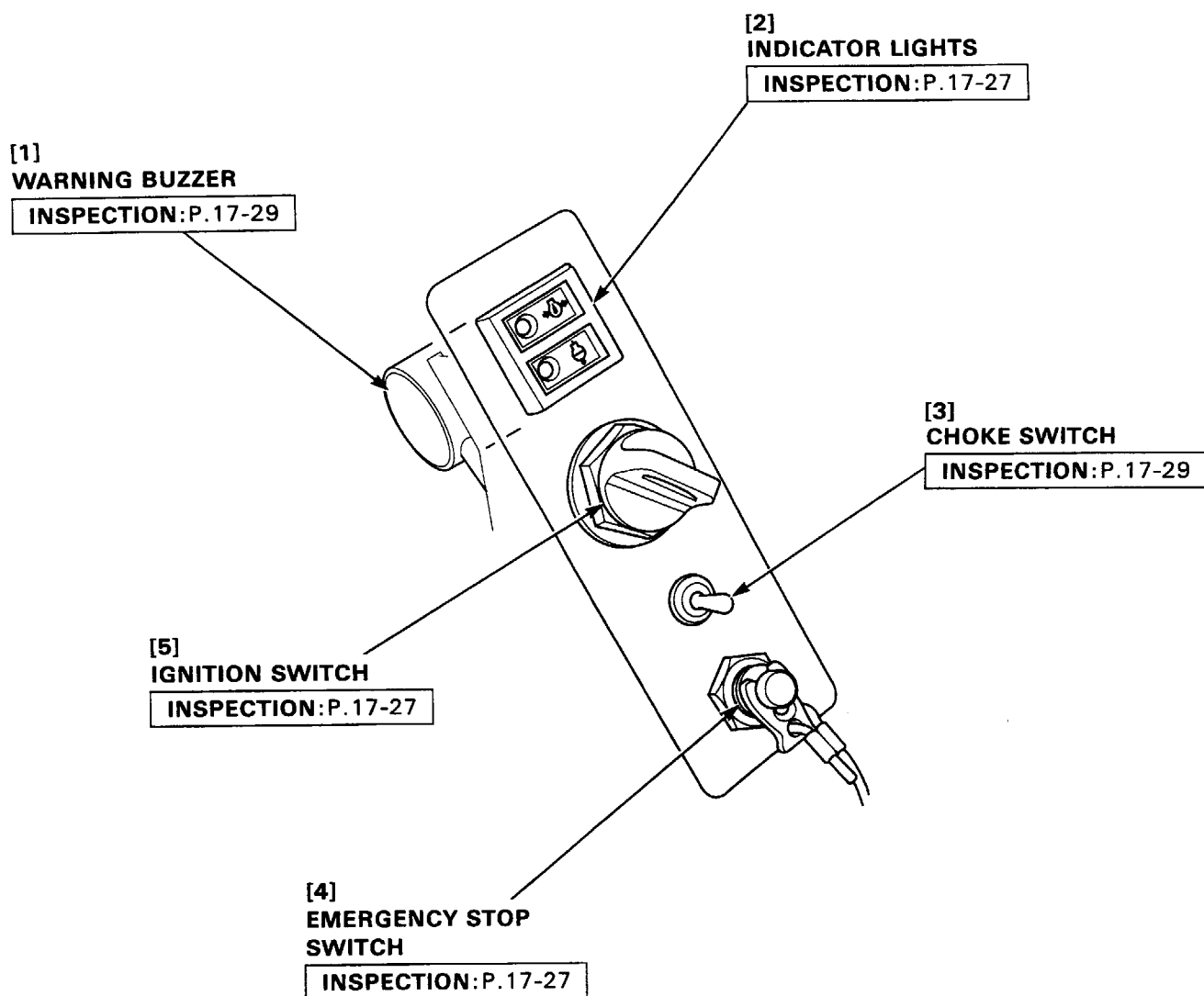
[6] <Dual top-mount remote control>

[5] POWER TRIM/TILT SWITCH A  
INSPECTION: P.17-28



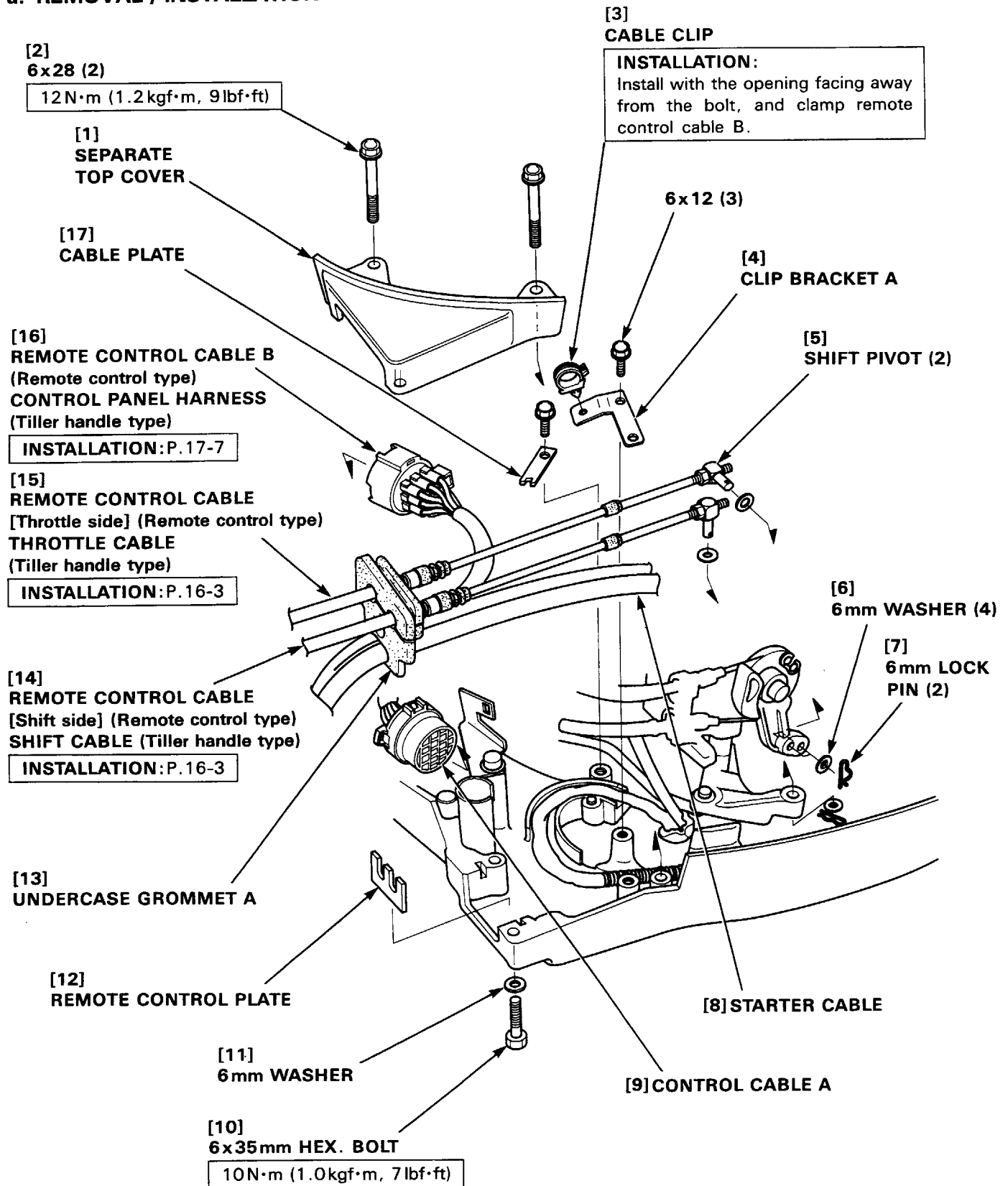


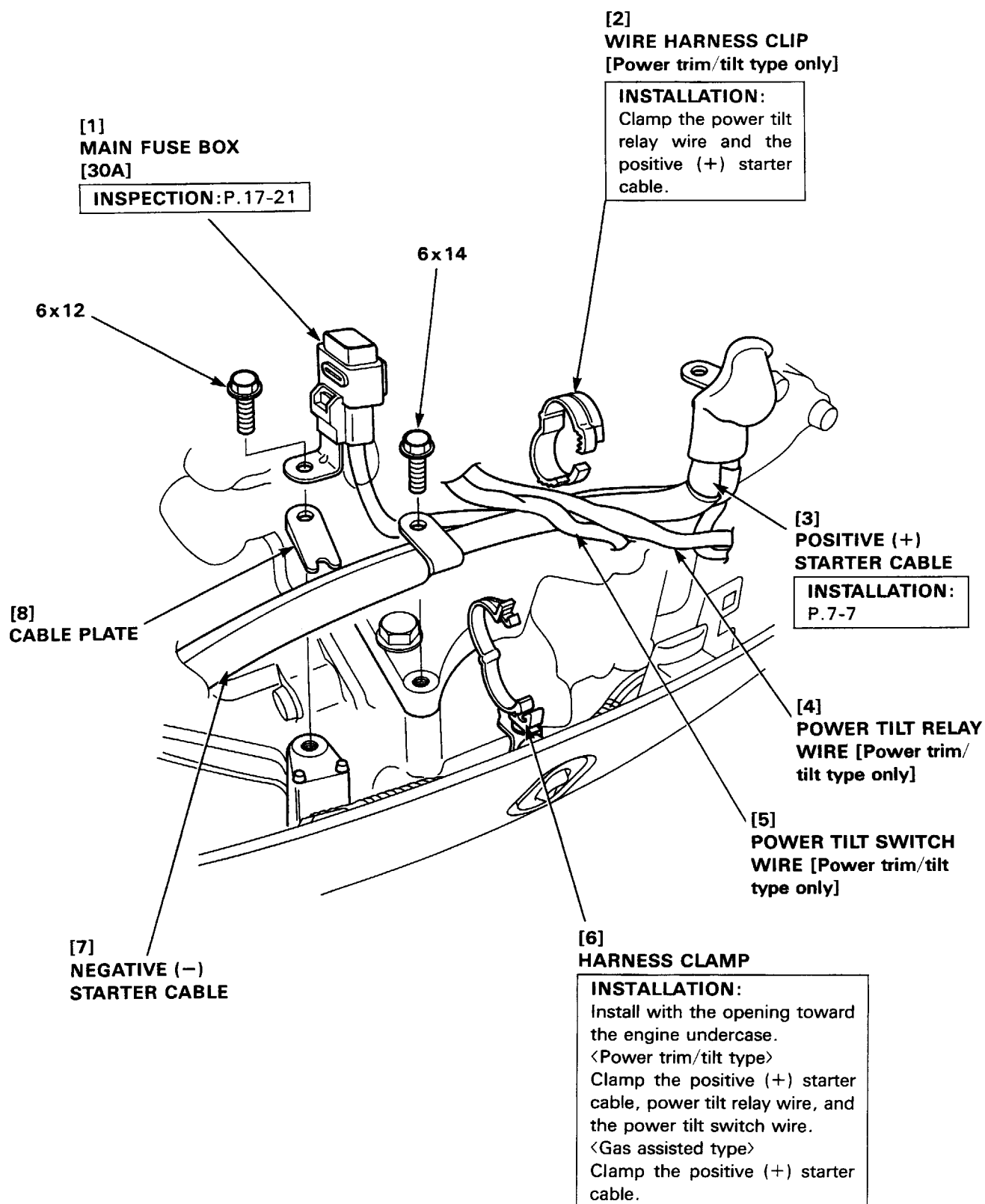
- CONTROL PANEL [Panel-mount/single top-mount/dual top-mount remote control box type only]



## 2. STARTER CABLE / REMOTE CONTROL CABLE / SHIFT, THROTTLE CABLE

### a. REMOVAL / INSTALLATION

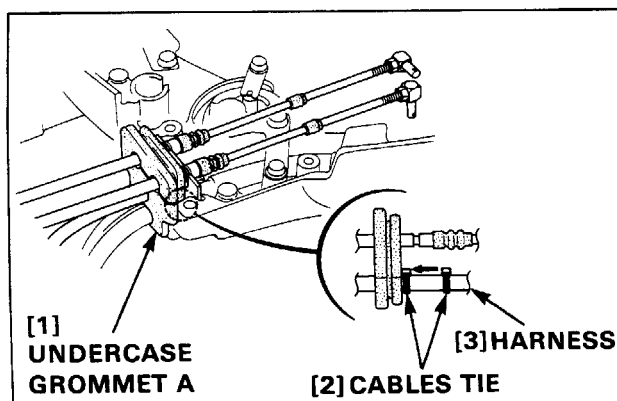




- **REMOTE CONTROL CABLE B (Remote control type)/ CONTROL PANEL HARNESS (Tiller handle type)**

### INSTALLATION :

Position the harness so that the cable ties on the harness are on the inner side of undercase grommet A as shown.

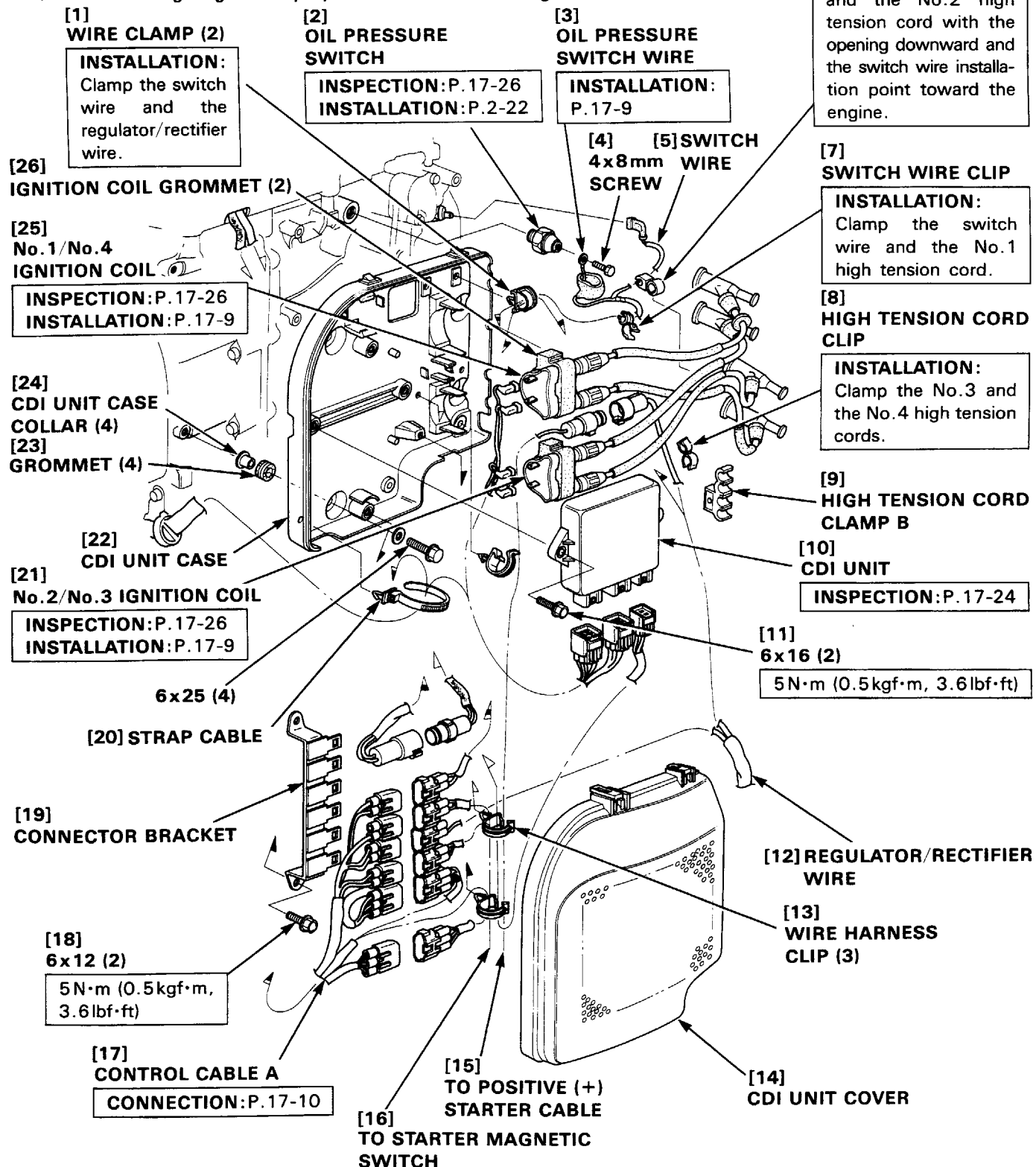


### 3. CDI UNIT / IGNITION COIL

#### a. DISASSEMBLY / ASSEMBLY

1) Remove the engine cover (P.4-1).

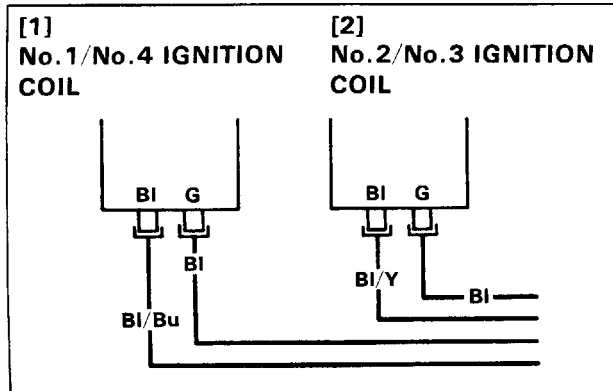
• Refer to the wiring diagram for proper cable / harness routing (P.2-29).



### • IGNITION COIL

#### INSTALLATION:

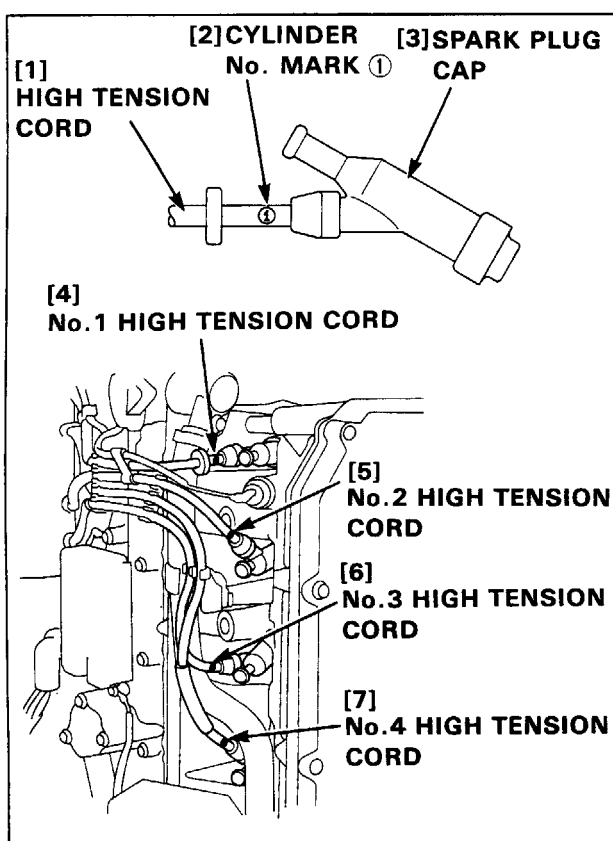
- 1) Connect the ignition coil wires to each ignition coil as shown.



- 2) Install the ignition coils with high tension cords marked ① or ④ at the upper part of the CDI unit case.

Install the ignition coils with high tension cords marked ② or ③ at the lower part of the CDI unit case.

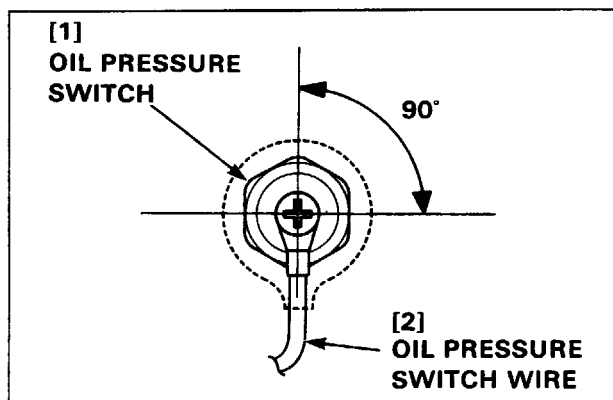
- 3) Connect the high tension cords to each of the spark plugs of the corresponding number.



### • OIL PRESSURE SWITCH

#### INSTALLATION :

Connect the oil pressure switch wire to the oil pressure switch at an angle of 90° from the horizontal line as shown.

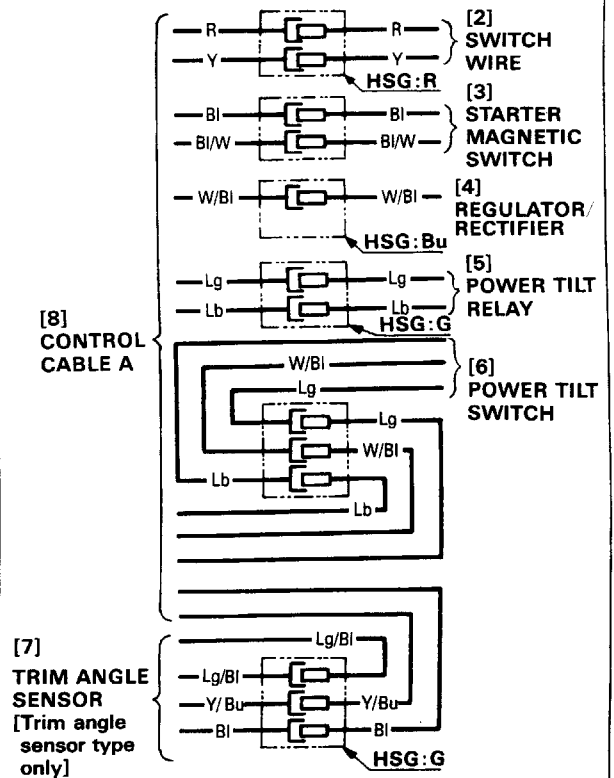


### • CONTROL CABLE A

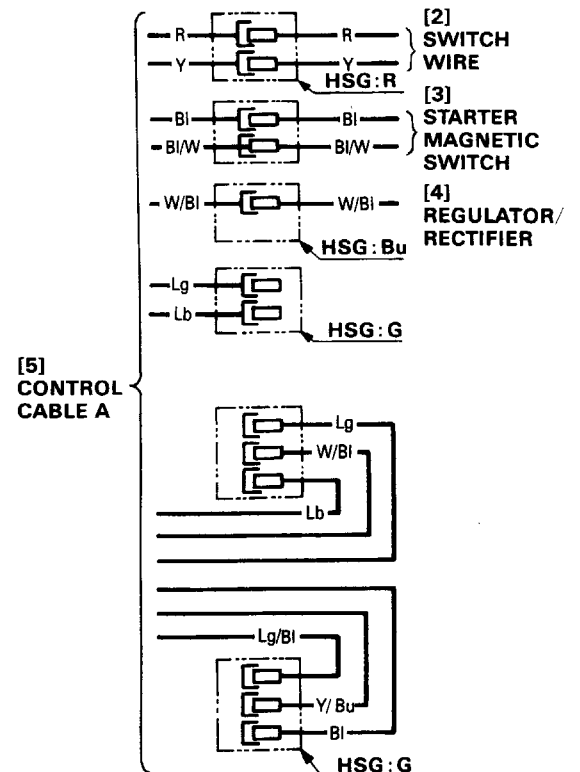
#### CONNECTION :

Connect each connector and install on the connector bracket as shown.

#### [1] <Power trim/tilt type>



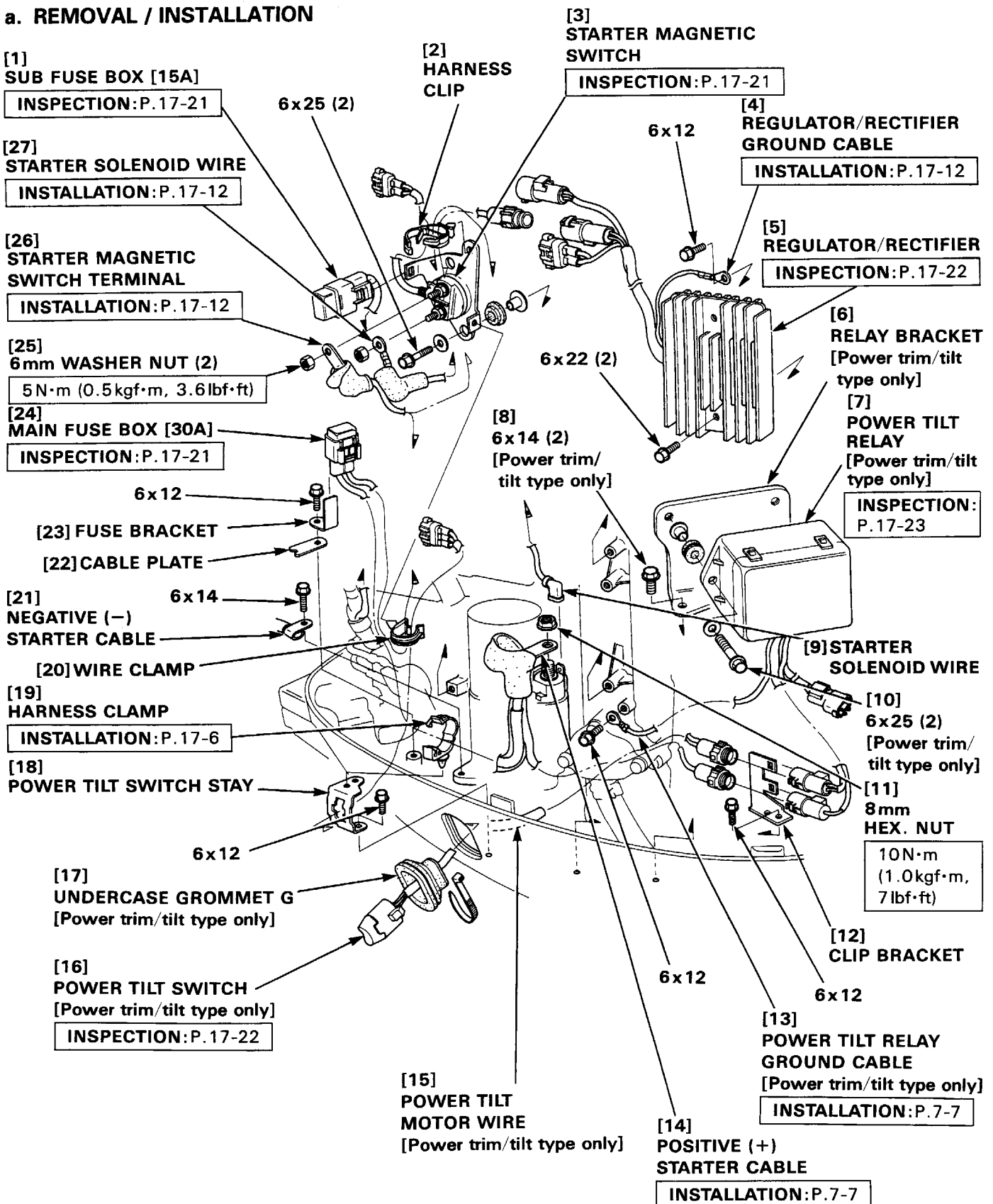
#### [1] <Gas assisted type>



BI	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY

## 4. POWER TILT RELAY (POWER TRIM / TILT TYPE) / REGULATOR / RECTIFIER

### a. REMOVAL / INSTALLATION





### • STARTER MAGNETIC SWITCH TERMINAL / STARTER SOLENOID WIRE

#### INSTALLATION :

<Starter magnetic switch terminal>

Connect the starter magnetic switch terminal to the starter magnetic switch at an angle of 90° from the vertical line as shown.

**TORQUE : 5 N·m (0.5 kgf·m, 3.6 lbf·ft)**

<Starter solenoid wire>

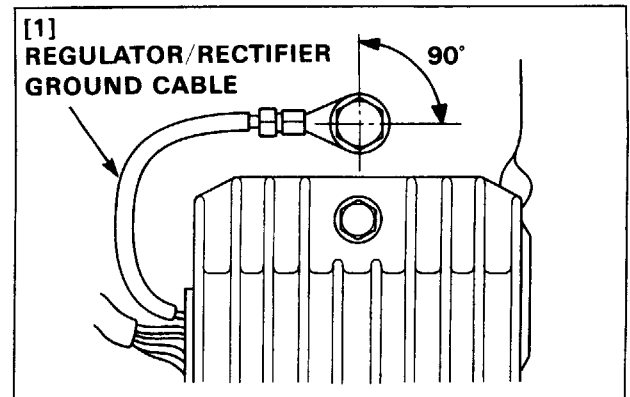
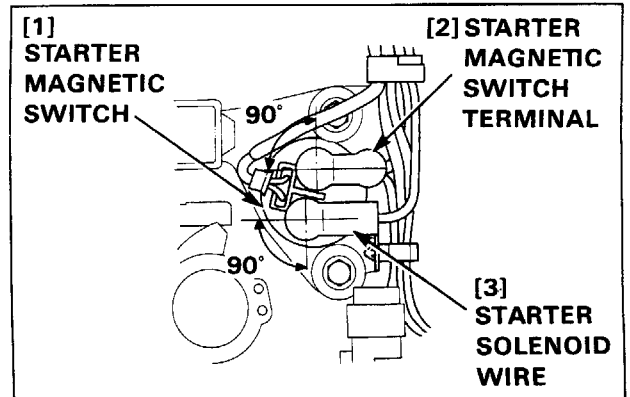
Connect the starter solenoid wire to the starter magnetic switch at an angle of 90° from the vertical line as shown.

**TORQUE : 5 N·m (0.5 kgf·m, 3.6 lbf·ft)**

### • REGULATOR / RECTIFIER GROUND CABLE

#### INSTALLATION :

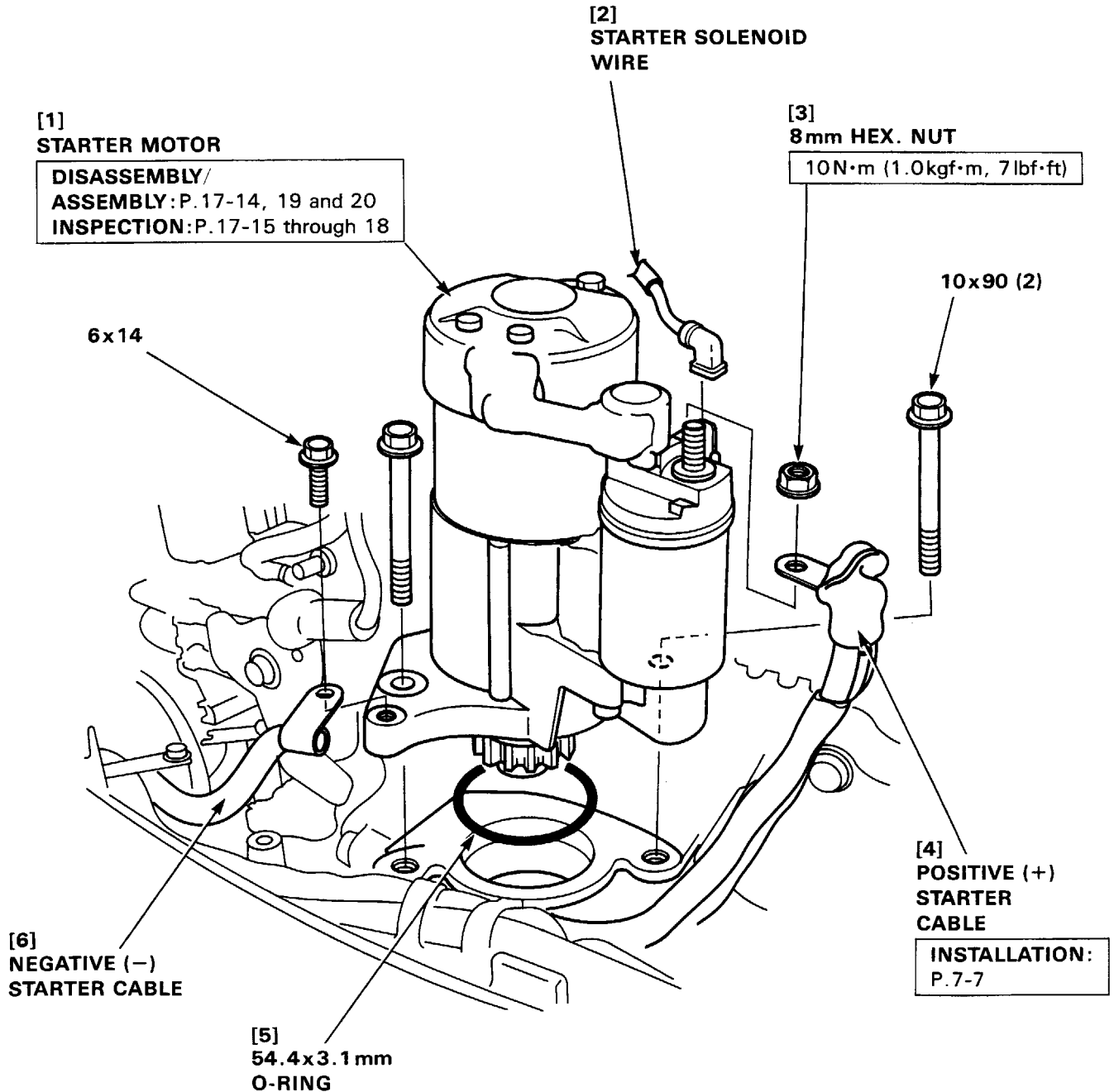
Connect the regulator / rectifier ground cable to the cylinder head at an angle of 90° from the vertical line as shown.



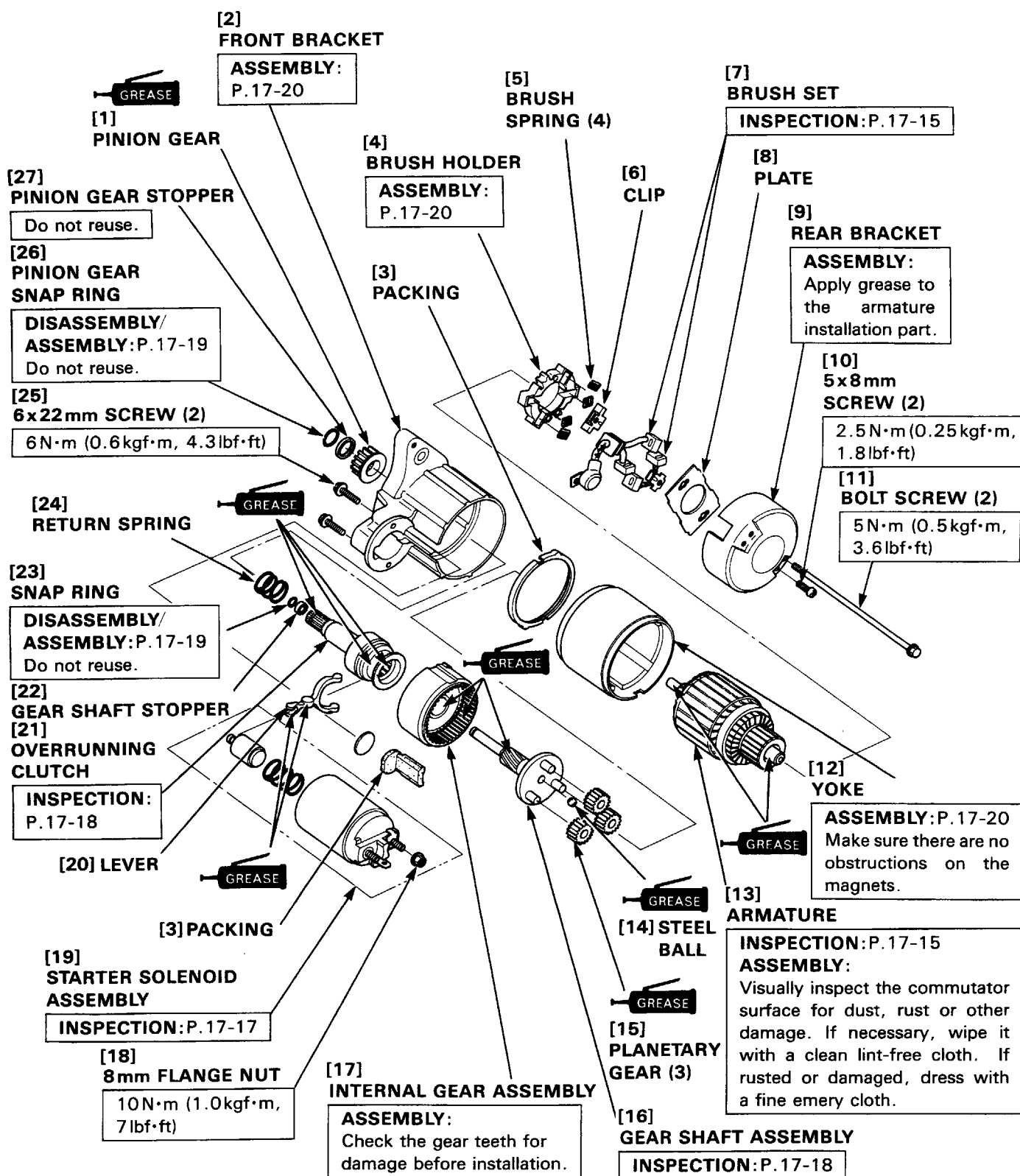
## 5. STARTER MOTOR

### a. REMOVAL / INSTALLATION

Remove the engine cover (P.4-1).



### b. DISASSEMBLY / ASSEMBLY



#### NOTE:

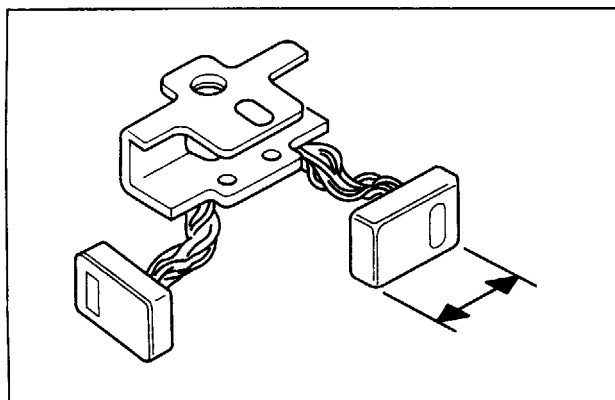
After assembling the starter motor, apply waterproof sealing agent (Sumitomo 3M padding sealer No. 8533 or equivalent) to the mating surface of each part (P.17-18).

**c. INSPECTION****• BRUSH LENGTH**

Measure brush length.

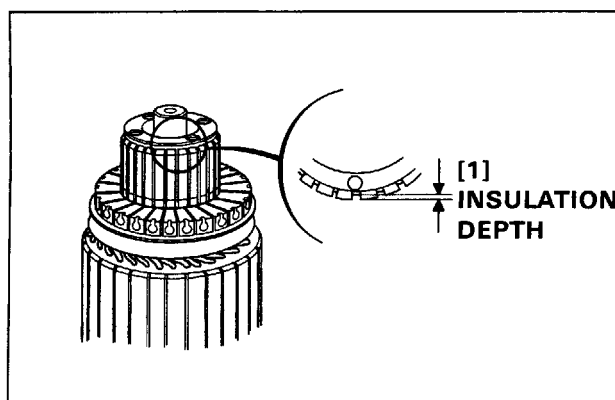
If brush length is less than the service limit, replace the brushes as a set.

STANDARD	SERVICE LIMIT
12.3 mm (0.48 in)	7.0 mm (0.3 in)

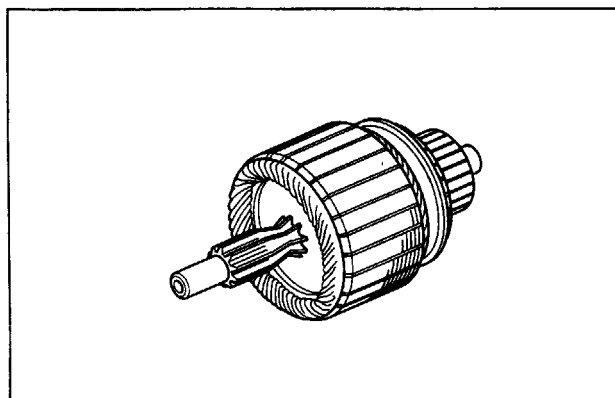
**• INSULATION DEPTH**

If the grooves are clogged or insulation depth is less than the service limit, recut the grooves using a hacksaw blade or a small file.

STANDARD	SERVICE LIMIT
0.4 – 0.5 mm (0.016 – 0.020 in)	0.2 mm (0.010 in)

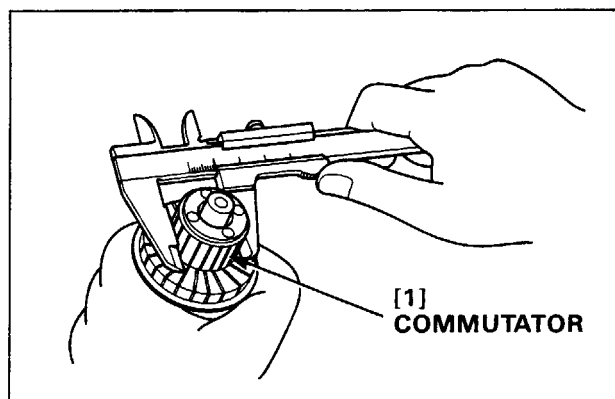
**• ARMATURE**

Check the armature and shaft gear for wear and damage.

**• COMMUTATOR O. D.**

Measure the commutator O. D. If the measurement is less than the service limit, replace the armature with a new one.

STANDARD	SERVICE LIMIT
29.4 mm (1.15 in)	28.8 mm (1.13 in)

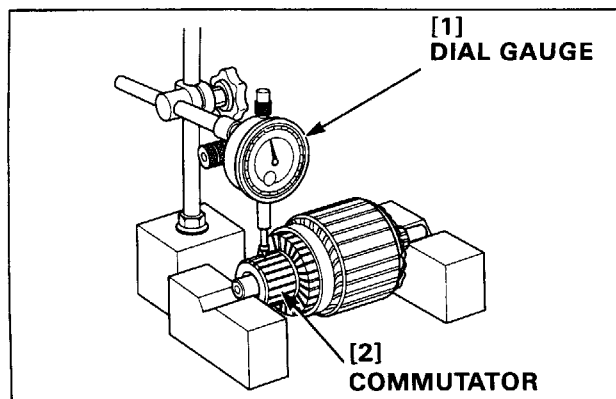


### • COMMUTATOR RUNOUT

Measure commutator runout using a dial gauge.

If the measurement is more than the service limit, replace the

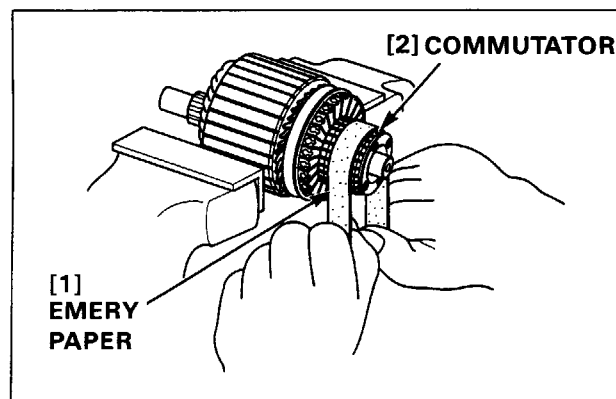
SERVICE LIMIT	0.1 mm (0.004 in)
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### • COMMUTATOR CLEANING

Check the commutator for damage, dust, dirt and metal particles.

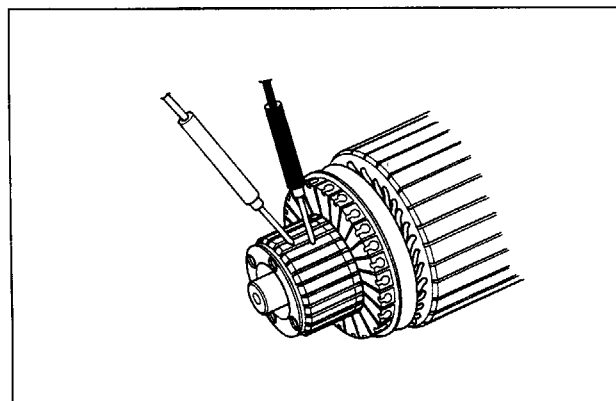
If there is stain, irregularity and / or evidence of burning, clean with an emery paper #500 or #600.



### • ARMATURE

#### CONTINUITY CHECK - SEGMENTS

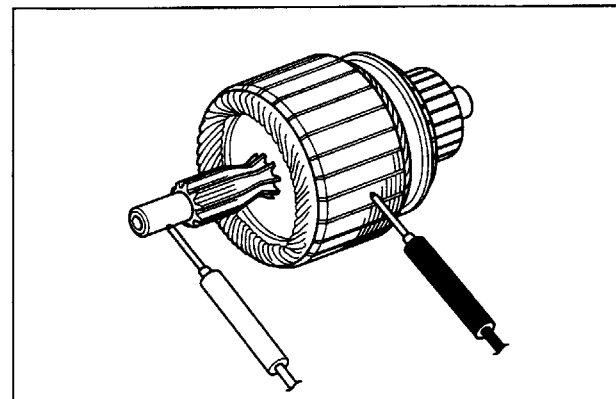
Check for continuity between each segment. If an open circuit exists between any two segments, replace the armature.



#### SHORT CIRCUIT TEST - SHAFT - TO - ARMATURE

Check for continuity between the armature and armature shaft.

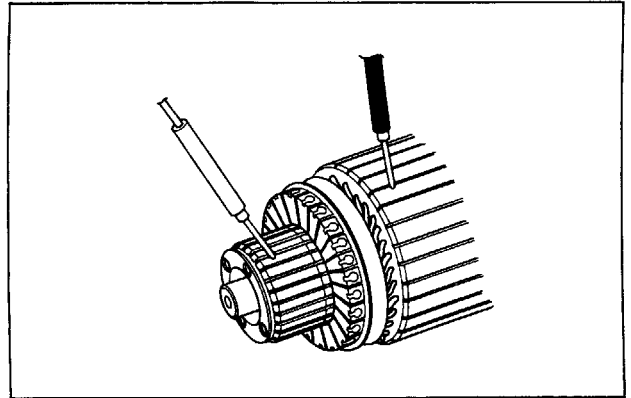
If there is continuity, replace the armature.



### SHORT CIRCUIT TEST – CORE – TO – COMMUTATOR

Check for continuity between the commutator and armature coil core.

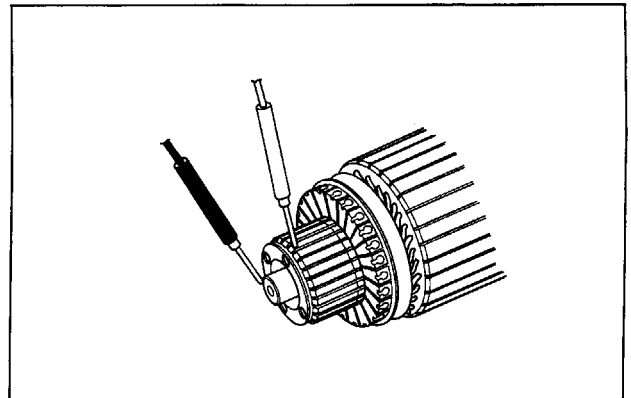
If continuity exists, replace the armature.



### SHORT CIRCUIT TEST – SHAFT – TO – COMMUTATOR

Check for continuity between the commutator and armature shaft.

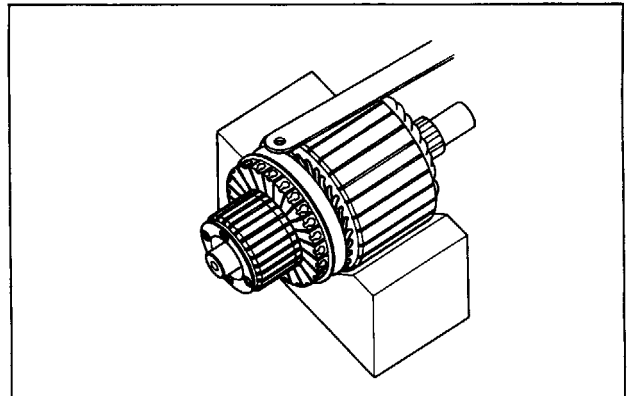
If there is continuity, replace the armature.



### SHORT CIRCUIT TEST – ARMATURE

Place the armature in an armature tester (commercially available).

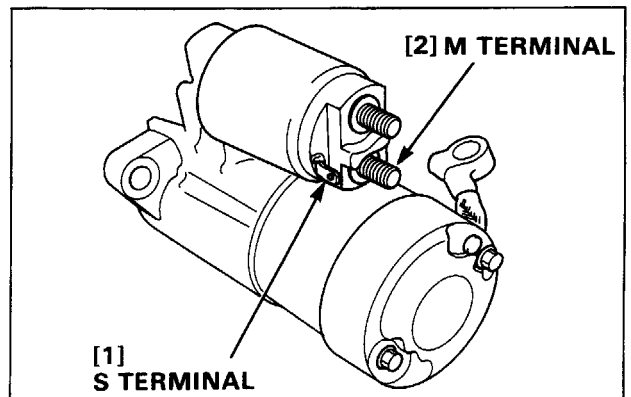
Hold a hacksaw blade close to the armature core. If the blade is attracted to the core or vibrates when the core is turned, the armature is shorted. Replace the armature.



### • STARTER SOLENOID

Check for continuity between the S terminal and yoke (ground) as shown. There should be continuity.

Check whether there is continuity between the S terminal and M terminal as well.



### • OVERRUNNING CLUTCH

- 1) Check the overrunning clutch for smooth axial movement.

Clean or apply grease to the spline, if necessary.

If the overrunning clutch does not move smoothly after cleaning or coated with grease, replace the overrunning clutch or the gear shaft assembly.

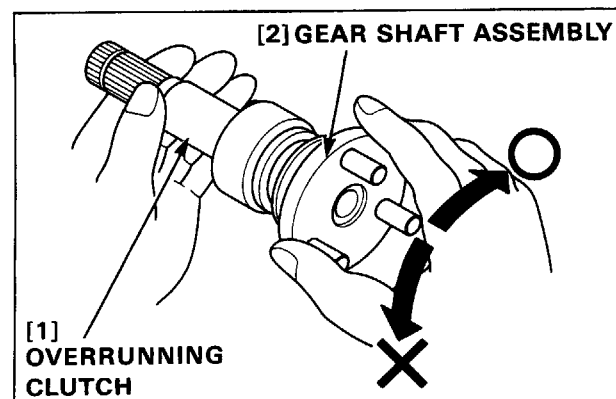
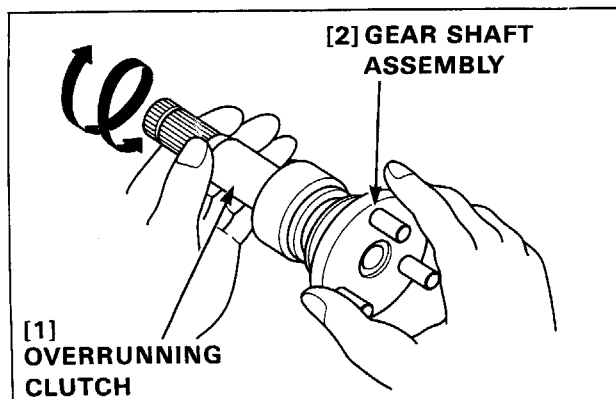
- 2) Turn the gear shaft assembly by holding the overrunning clutch. The gear shaft assembly should turn only clockwise.

If the clutch turns freely in both directions or if it does not turn at all, replace the overrunning clutch.

- 3) Check the pinion gear teeth for wear and damage and replace if necessary.

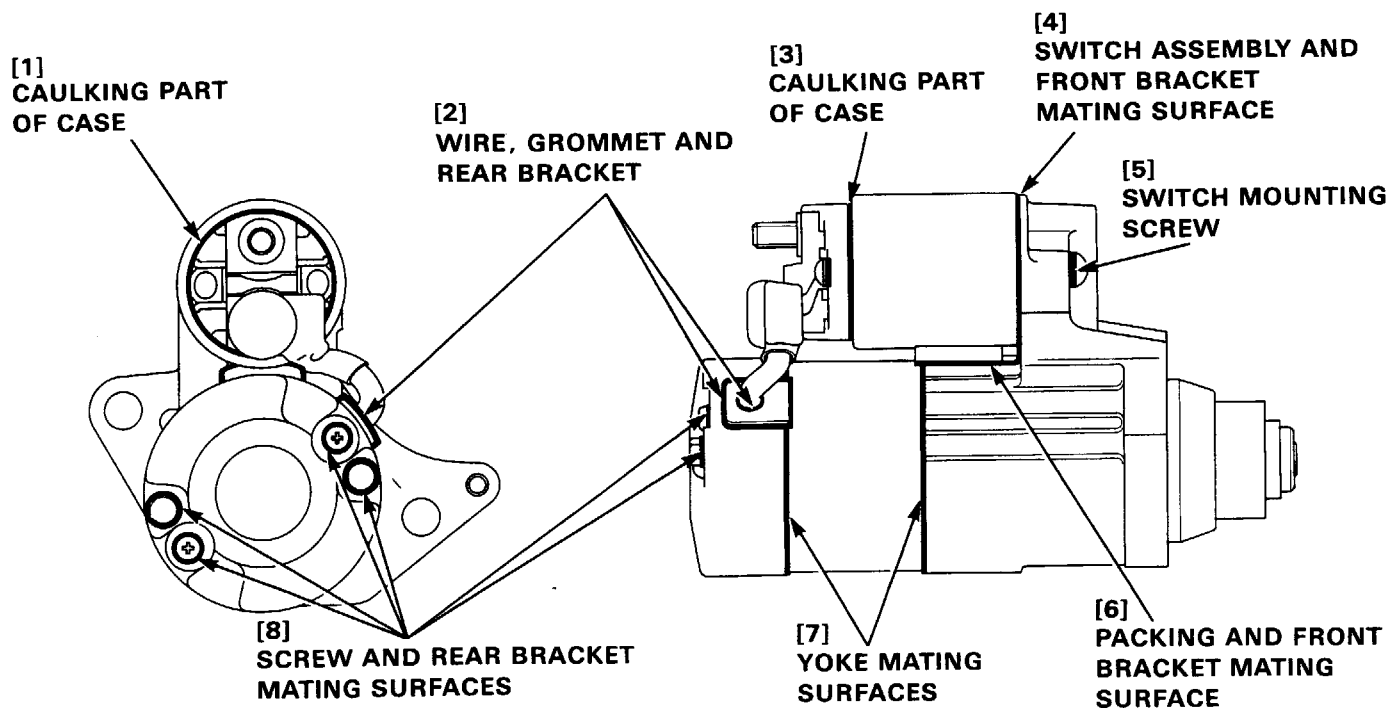
#### NOTE:

If the pinion gear is worn or damaged, the flywheel ring gear must be inspected.



### • WATER-RESISTING SEALANT APPLICATION POINTS

After assembling the starter motor, apply a sufficient amount of water-resisting sealant (Sumitomo Three-M Padding Sealer 8533 or equivalent) to the mating surfaces shown below.



### • PINION GEAR SNAP RING

#### DISASSEMBLY :

Pinion gear snap ring disassembly and reassembly must be made with the pinion gear extended.

- 1) Connect to the battery as shown. Turn the switch ON and let the pinion gear extend.

#### CAUTION:

**Do not turn the switch ON for more than 10 seconds.**

- 2) With the pinion gear extended, attach a commercially available socket or equivalent to the pinion gear.

Remove the pinion gear stopper from the snap ring by tapping on the socket or equivalent.

- 3) Remove the snap ring from the groove of the overrunning clutch.

#### ASSEMBLY :

- 1) Let the pinion gear extend in the same procedure as disassembly.
- 2) Install a new pinion gear stopper on the overrunning clutch. Install a new pinion gear snap ring in the groove of the overrunning clutch.
- 3) Install the snap ring in the groove of the pinion gear stopper.

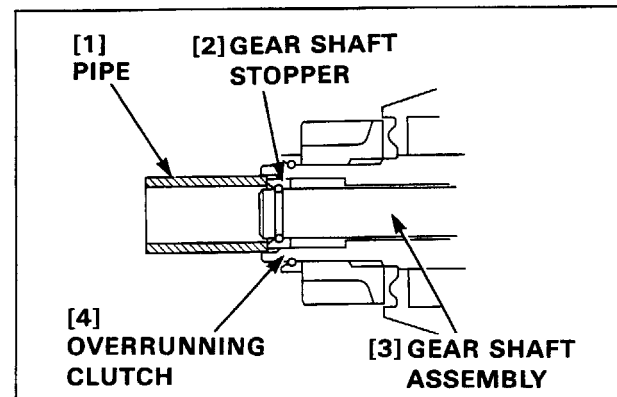
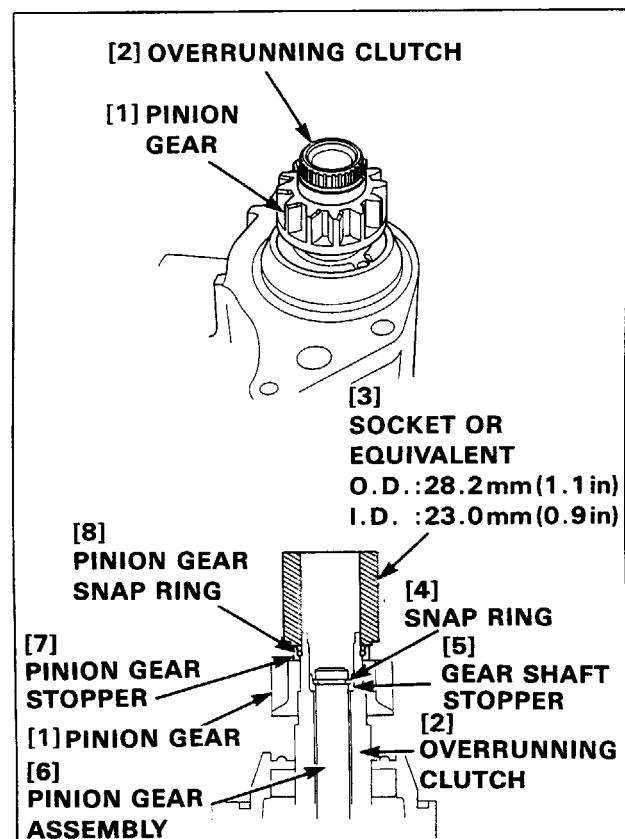
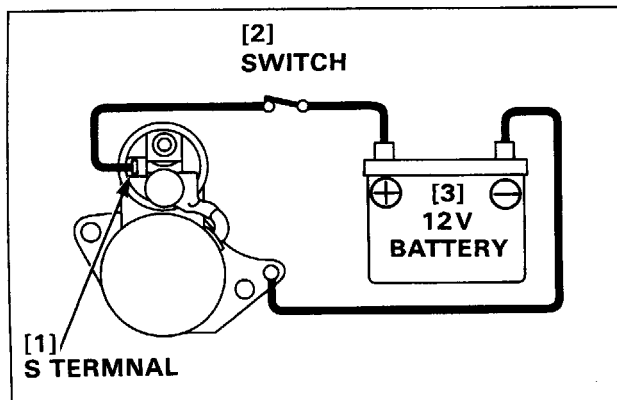
### • SNAP RING

#### DISASSEMBLY :

- 1) Prepare a pipe to the following specifications.
  - I. D. : approx. 11 mm (0.4 in)
  - O. D. : approx. 15 mm (0.6 in)
  - Length : approx. 20 mm (0.8 in)
- 2) Raise the gear shaft assembly. Note that the end of the gear shaft assembly must be out of the overrunning clutch end a little at this time.

#### NOTE:

**Take care not to hit the internal gear assembly.**





3) Set the pipe prepared in the step 2 over the gear shaft stopper, and remove the gear shaft stopper from the snap ring by tapping on the pipe.

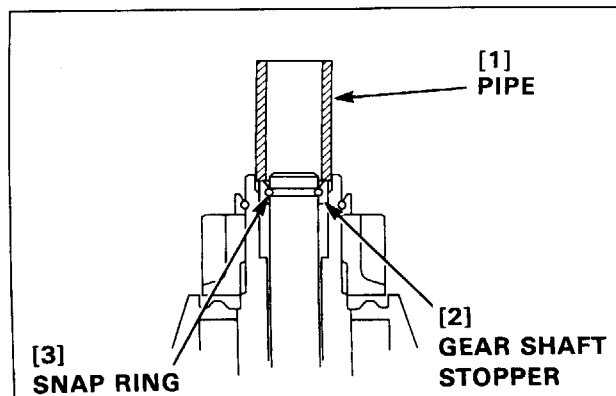
4) Remove the snap ring from the groove of the gear shaft assembly.

### ASSEMBLY :

1) Install a new gear shaft stopper on the gear shaft assembly in the same procedure as DISASSEMBLY.

Install a new snap ring in the groove of the gear shaft assembly.

2) Raise the overrunning clutch, and install the snap ring in the groove of the gear shaft stopper.

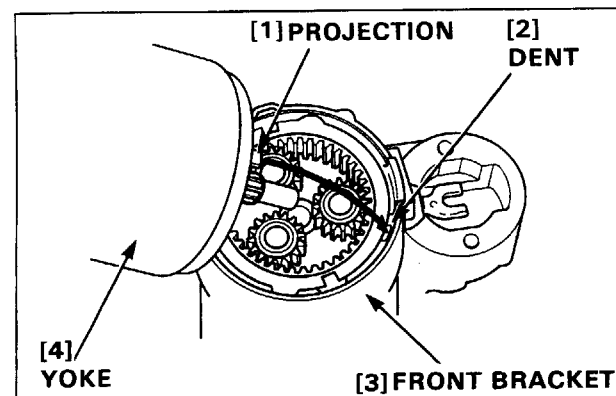


### • FRONT BRACKET / YOKE / BRUSH HOLDER

#### ASSEMBLY :

1) Install the armature in the yoke.

2) Assemble the yoke and front bracket by aligning the projections on the yoke with the dents in the front bracket.



3) Assemble the brush set and spring plate with the brush holder, and secure with the clips.

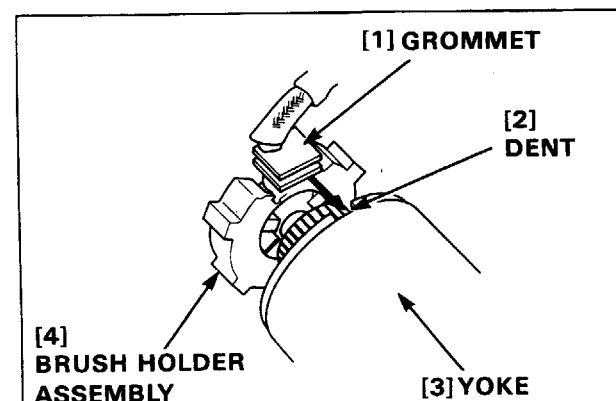
4) Assemble the brush holder assembly with the armature's commutator by aligning the grommets on the brush holder assembly with the dents in the yoke.

5) Install the rear bracket, and tighten the two 5 x 8mm screws and the two bolt - screws to the specified torque.

#### TORQUE :

Bolt screw : 5 N·m (0.5 kgf·m, 3.6 lbf·ft)

5 x 8 mm screw : 2.5 N·m (0.25 kgf·m, 1.8 lbf·ft)



## 6. INSPECTION

### • STARTER MAGNETIC SWITCH

#### NOTE:

Be sure the battery is in good condition before performing this test.

Connect the black / white terminal of the starter magnetic switch 2P connector to the positive (+) terminal of the battery and the black terminal to the negative (-) terminal of the battery, and check for continuity. There should be continuity between the terminals.

There should be no continuity when the battery is disconnected.

### • FUSES

Check the fuse for continuity.

Connect the fuse to the fuse box, and check the box for continuity.

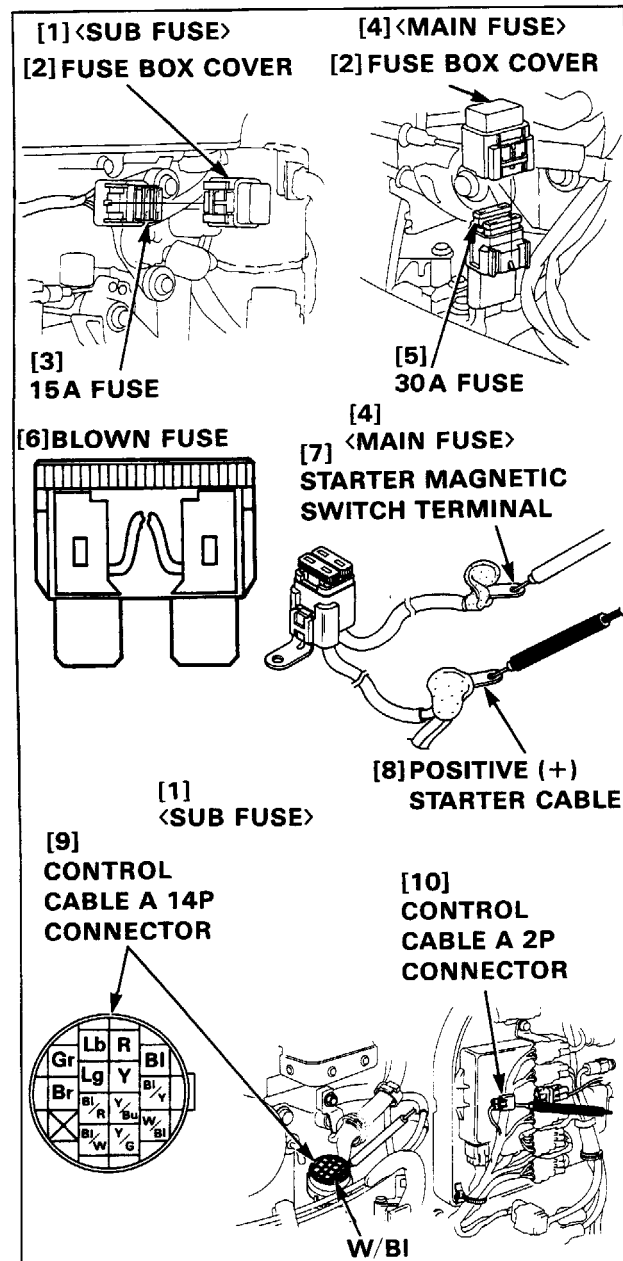
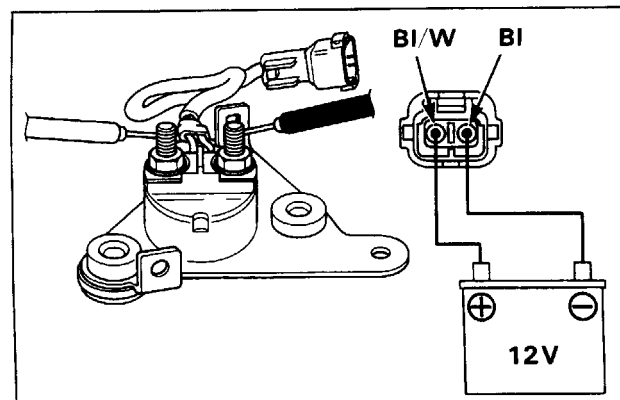
#### INSPECTION :

##### <Main fuse>

There should be continuity between the starter cable (positive: +) and the starter magnetic switch terminal.

##### <Sub fuse>

There should be continuity between the white / black terminal of the control cable A 14P connector and the white / black terminal of the control cable A 2P connector.



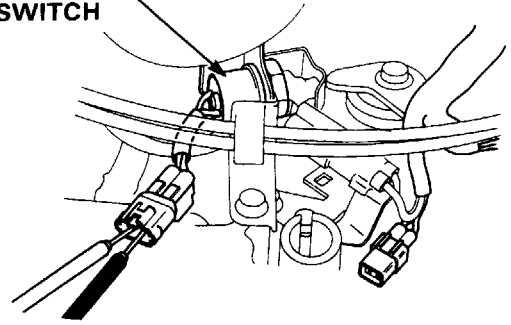
Bl	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY

### • NEUTRAL SWITCH

Attach the tester leads to the two terminals at the neutral switch and check for continuity. There should be continuity when the switch knob is pushed.

SWITCH PUSHED (Shift lever in "N")	CONTINUITY
SWITCH RELEASED (Shift lever in "F" or "R")	NO CONTINUITY

[1] NEUTRAL SWITCH



### • REGULATOR / RECTIFIER

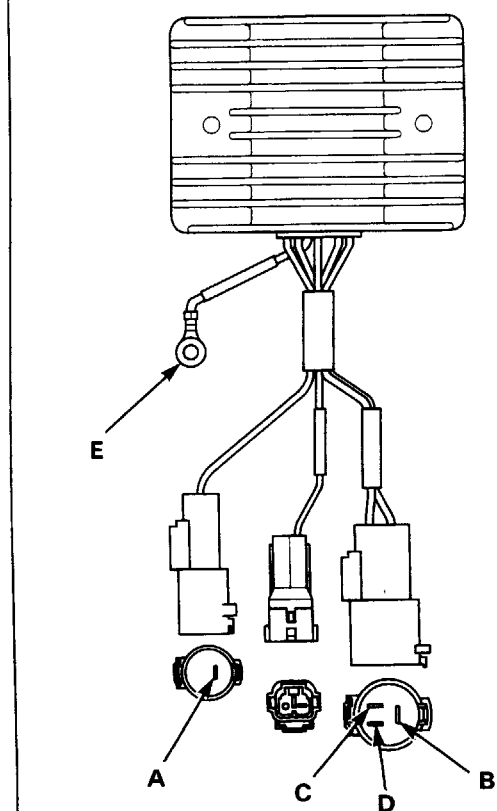
Measure the resistance between the connectors. Replace the regulator if the measurement is out of the specified range shown in the table below.

Unit :  $\Omega$

TESTER(+)		A	B	C	D	E
TESTER(-)		W	Gr	Gr	Gr	Bl
A	W		$\infty$	$\infty$	$\infty$	$\infty$
B	Gr	500-15 k		$\infty$	$\infty$	$\infty$
C	Gr	500-15 k	$\infty$		$\infty$	$\infty$
D	Gr	500-15 k	$\infty$	$\infty$		$\infty$
E	Bl	500-20 k	500-15 k	500-15 k	500-15 k	

#### NOTE:

- Use only the specified tester listed below.  
– Tester manufactured by kowa:  
KS - TH - 5H - 2 Analog volt-ohmmeter
- Select the x 100  $\Omega$  range.



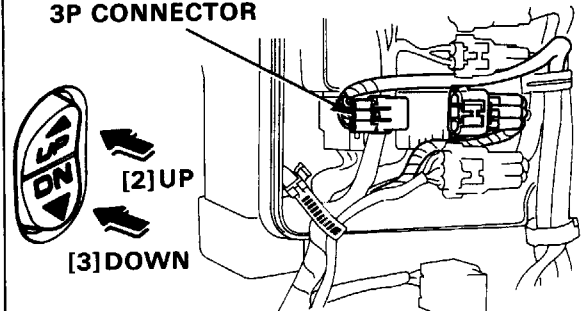
### • POWER TILT SWITCH [Power trim / tilt type only]

Attach the tester lead to each terminal and check for continuity.

When the switch is pushed "UP" or "DN" there should be continuity between the terminals marked with a circle in the table below.

	Lg	W/Bl	Lb
UP			
DOWN			

[1] POWER TILT SWITCH  
3P CONNECTOR

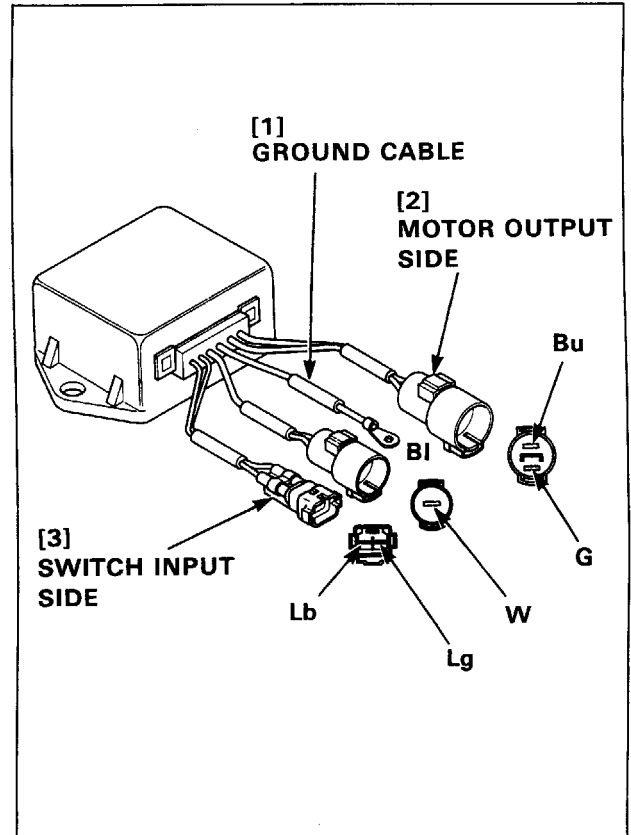


### • POWER TILT RELAY

- 1) Check for continuity and resistance between the terminals.

To measure the resistance, connect the tester positive (+) terminal to the switch input side light blue / light green terminal, and the tester negative (–) terminal to the black terminal of the ground cable.

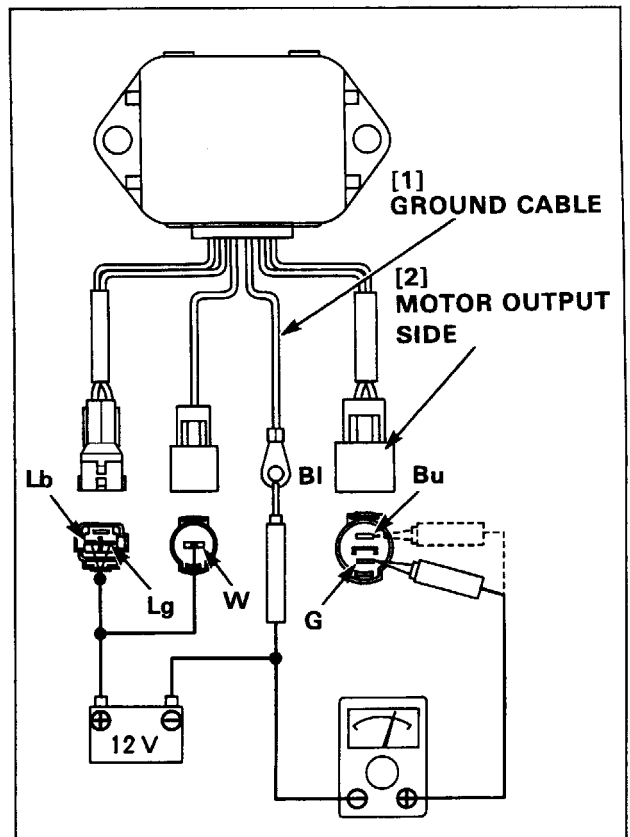
Between G (motor output side) and BI	Continuity
Between Bu (motor output side) and BI	Continuity
Between Lg (switch input side) and BI	36 – 40 $\Omega$
Between Lb (switch input side) and BI	36 – 40 $\Omega$
Between W and BI	No continuity



#### NOTE:

Be sure the battery is in good condition before performing this test.

- 2) Check that there is battery voltage between the ground cable BI and the motor output side G and Bu in the circuit shown to the right.



### • CDI UNIT

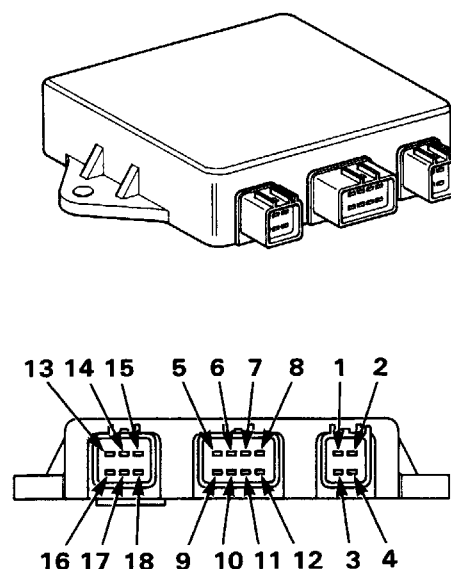
Measure the resistance between the CDI unit terminals, and be sure that measurements conform to the ranges shown in the table below.

Unit : k $\Omega$

		TESTER (+)																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
TESTER (-)	1		10-30	10-30	10-30	11-32	18-50	18-50	10-30	$\infty$	18-50	6-17	10-30	9-25	$\infty$	10-30	6-17	$\infty$	6-17
	2	10-30		10-30	10-30	11-32	18-50	18-50	10-30	$\infty$	18-50	6-17	10-30	10-30	$\infty$	9-25	6-17	$\infty$	6-17
	3	10-30	10-30		2-8	1.5-5	8-22	8-22	6-17	$\infty$	7-20	4-12	8-22	9-25	$\infty$	9-25	4-12	$\infty$	4-12
	4	10-30	10-30	2-8		1.5-5	8-22	8-22	6-17	$\infty$	7-20	4-12	8-22	9-25	$\infty$	9-25	4-12	$\infty$	4-12
	5	10-30	10-30	1.5-5	1.5-5		5-19	5-19	6-23	$\infty$	5-19	3-10	8-22	9-25	$\infty$	9-25	3-10	$\infty$	3-10
	6	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$		$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$
	7	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$		$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$
	8	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$		$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$
	9	14-40	14-40	4-11	4-11	2-9	12-33	10-30	10-30		11-32	7-18	12-33	15-42	$\infty$	15-42	7-18	$\infty$	7-18
	10	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$		$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$
	11	5-13	5-13	4-10	4-10	4-10	10-30	10-30	2-7	$\infty$	10-30		3-10	2-7	$\infty$	2-7	0	$\infty$	0
	12	9-25	9-25	5-13	5-13	3-12	13-26	14-40	7-20	$\infty$	13-36	3-10		8-22	$\infty$	8-22	3-10	$\infty$	3-10
	13	18-50	18-50	17-47	17-47	19-53	36-100	36-100	20-57	$\infty$	30-80	10-30	16-43		$\infty$	22-60	10-30	$\infty$	10-30
	14	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$		$\infty$	$\infty$	$\infty$	$\infty$
	15	18-50	18-50	17-47	17-47	19-53	36-100	36-100	20-57	$\infty$	30-80	10-30	16-43	22-60	$\infty$		10-30	$\infty$	10-30
	16	5-13	5-13	3-10	3-10	3-10	10-30	10-30	2-7	$\infty$	10-30	0	3-10	2-7	$\infty$	2-7		$\infty$	0
	17	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$	$\infty$		$\infty$
	18	5-13	5-13	3-10	3-10	3-10	10-30	10-30	2-7	$\infty$	10-30	0	3-10	2-7	$\infty$	2-7	0	$\infty$	

#### NOTE:

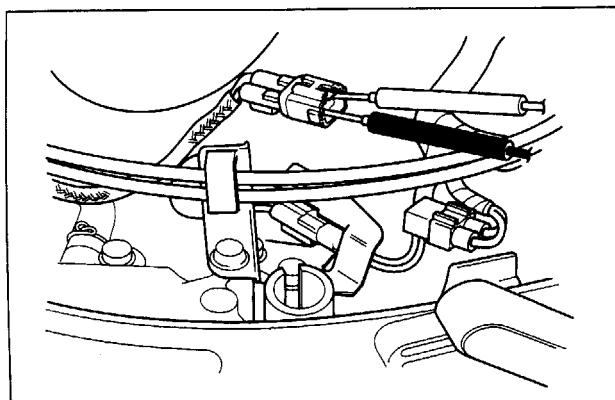
- **RECOMMENDED MULTITESTERS :**
  - Commercially available analog volt-ohmmeter with an impedance of 20 k $\Omega$  / V dc or higher.
  - Select the x k $\Omega$  range.



### • CHOKE SOLENOID [Remote control type only]

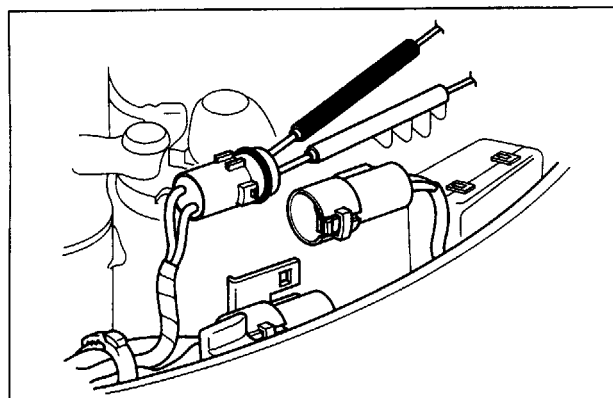
Measure the resistance between the terminals.

Resistance	2.8 – 3.4 $\Omega$
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### • POWER TILT MOTOR [Power trim / tilt type only]

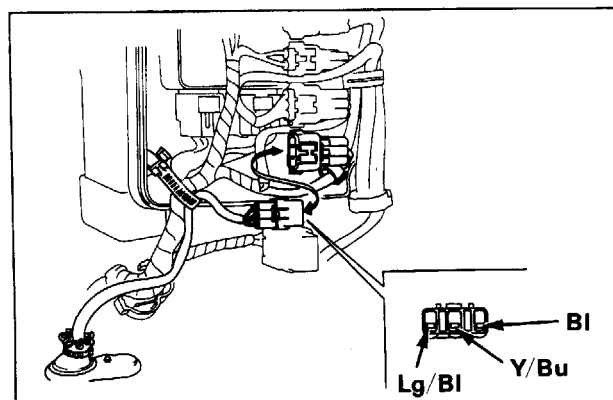
Check for continuity between the terminals.



### • TRIM ANGLE SENSOR [Trim angle sensor type only]

Attach the tester leads to the trim angle sensor connectors and measure the resistance.

Resistance between Lg/Bl and Bl	4 – 6 k $\Omega$
Resistance between Y/Bu and Bl	2.7 – 4.3 k $\Omega$

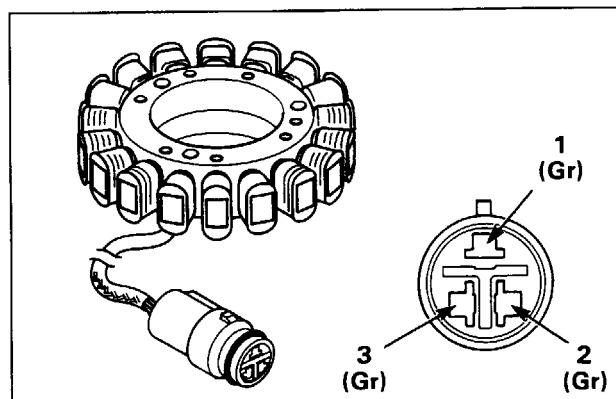


### • ALTERNATOR STATOR

Attach the tester leads to each terminal, and measure the resistance between the terminals.

Resistance between 1 (Gr) and 2 (Gr)	0.46 – 0.69 k $\Omega$
Resistance between 1 (Gr) and 3 (Gr)	
Resistance between 2 (Gr) and 3 (Gr)	

Bl	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY



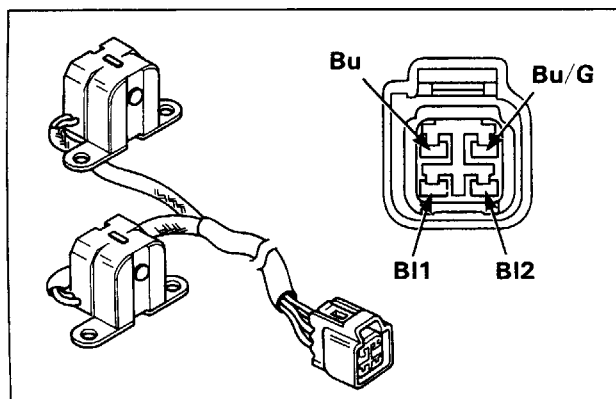
### • PULSER COIL

Attach a tester lead to each terminal, and measure the resistance between the terminals.

	Bu	Bu/G
BI 2		168 – 252 $\Omega$
BI 1	168 – 252 $\Omega$	

#### NOTE:

For pulser coil replacement, see page 6-2.



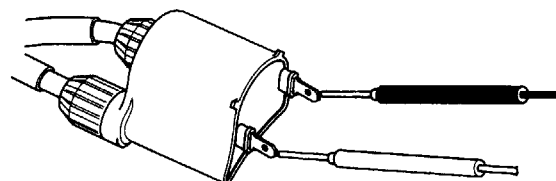
### • IGNITION COIL

<Primary side resistance>

Measure the resistance of the primary coil between the two

Resistance	0.35 – 0.43 $\Omega$
------------	----------------------

#### [1] <PRIMARY SIDE>

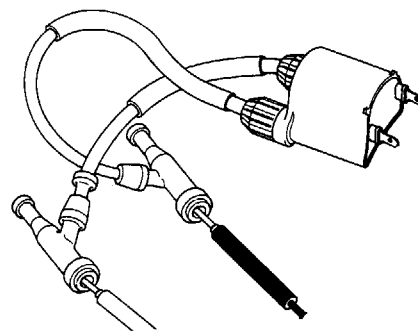


<Secondary resistance>

With the spark plug caps installed, attach the tester leads to the inside of the respective spark plug caps, and measure the secondary resistance of the coil.

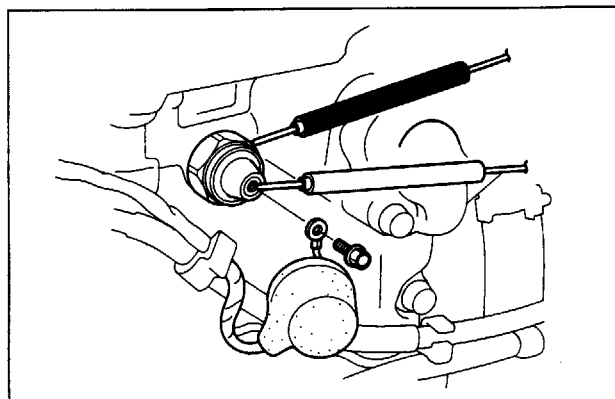
Resistance	23.1 – 34.7 k $\Omega$
------------	------------------------

#### [2] <SECONDARY SIDE>



### • OIL PRESSURE SWITCH

- 1) Remove the oil pressure switch wire.
- 2) Attach the tester leads to the terminal joint and switch body and check for continuity. There should be continuity.



### • IGNITION SWITCH

Check for continuity between the terminals with the switch in each position.

Color Position	E (BI)	IG (BI/R)	BAT (W/BI)	LO (BI/Y)	ST (BI/W)
OFF	○	○			
ON			○	○	
START			○	○	○

○ — ○ : Continuity

### • INDICATOR LIGHTS

#### NOTE:

Be sure the battery is in good condition before performing this test.

Apply 12V to the BI / Y [Gr] terminal and connect the switches 1, 2, and 3 to the BI, R, and Y terminals respectively.

When SW1 is ON : The green lamp should turn on.  
When SW1 and SW3 are ON : The green lamp should go off.  
When SW2 is ON : The red lamp should turn on.

The color in brackets is for the side-mount remote control type only.

### • EMERGENCY STOP SWITCH

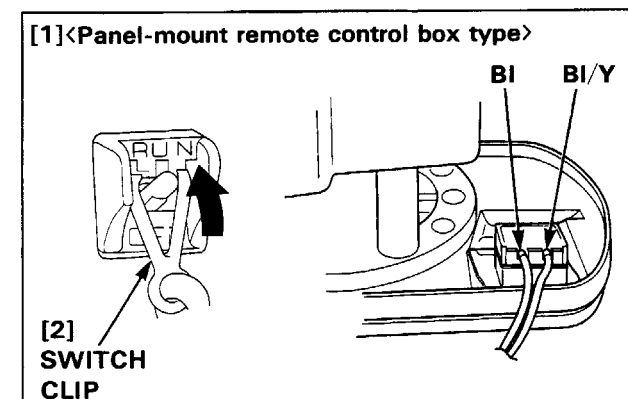
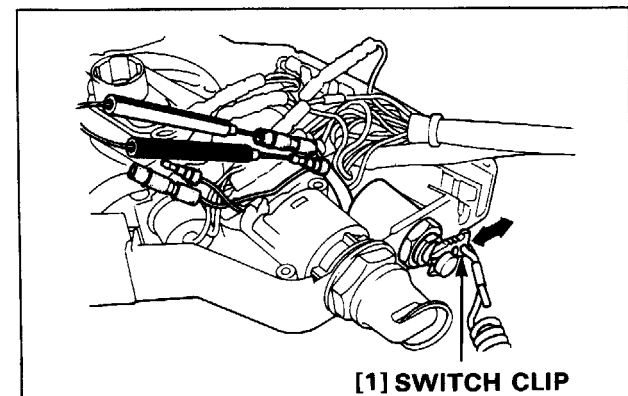
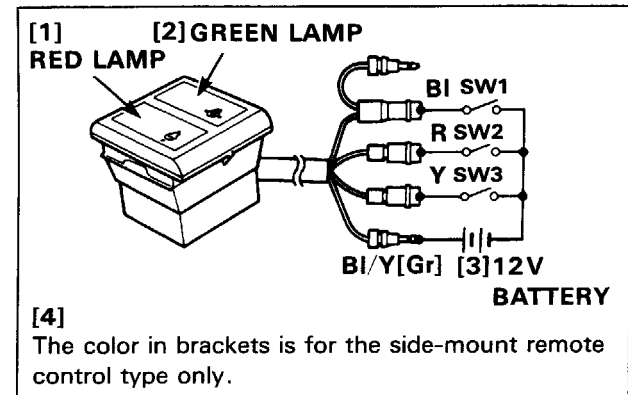
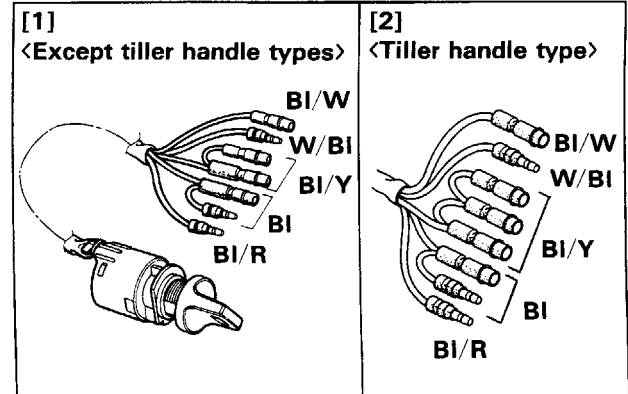
Attach the tester leads to the two terminals of the emergency stop switch and check for continuity.

<Tiller handle type / Side-mount remote control box type / Control panel>

Emergency stop switch clip	Continuity
Engaged	No
Disengaged	Yes
Engaged and button pushed	Yes

<Panel-mount remote control box type>

Emergency stop switch clip	Continuity
Engaged	No
Disengaged	Yes





### • POWER TRIM / TILT SWITCH

#### [Power trim / tilt type only]

<Tiller handle type / Side mount remote control box only>

Check for continuity between the terminals with the switch in each position.

	Lg	W/BI	Lb
UP	○	○	
DOWN		○	○

<Panel-mount / Single top-mount remote control box only>

Check for continuity between the terminals with the switch in each position.

	Pu	R	G
UP	○	○	
DOWN		○	○

### • POWER TRIM/TILT SWITCH A/B

<Dual top-mount remote control box only>

Check for continuity between the terminals with the switch in each position.

Power trim / tilt switch A :

	Pu	R	G
UP	○	○	
DOWN		○	○

Power trim / tilt switch B :

• Right side switch

	Pu	R	G
UP	○	○	
DOWN		○	○

There should be no continuity between the red and purple / white terminals when the right switch is at the "UP" position.

There should be no continuity between the red and green / white terminals when the switch is at the "DOWN" position.

• Left side switch

	Pu/W	R	G/W
UP	○	○	
DOWN		○	○

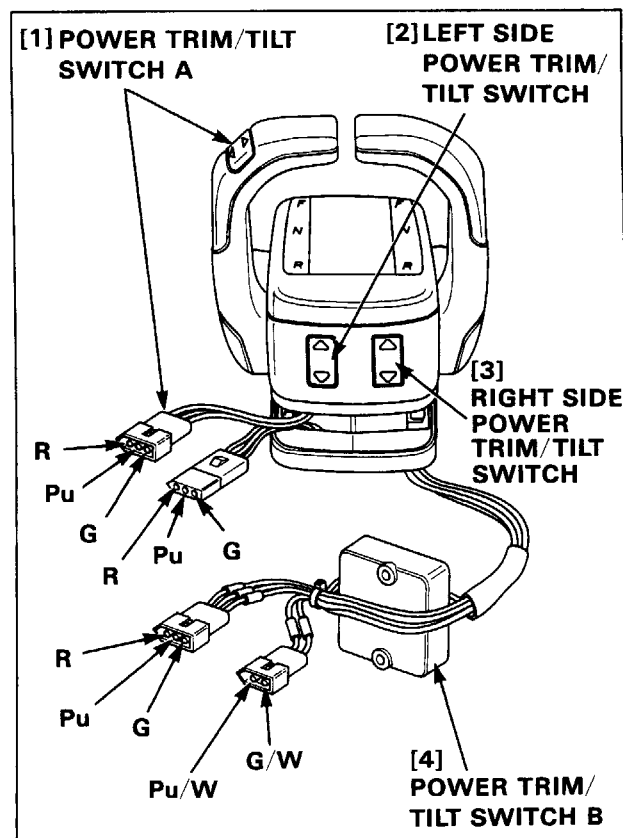
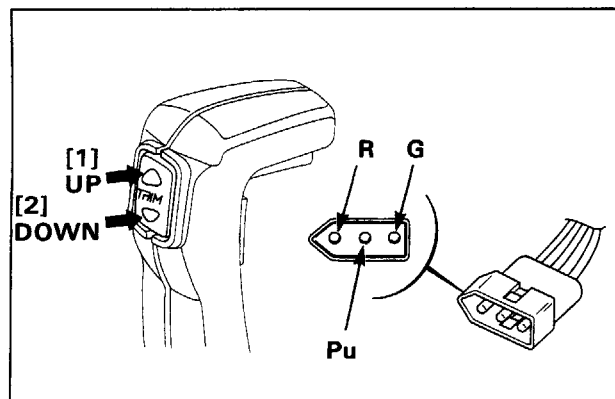
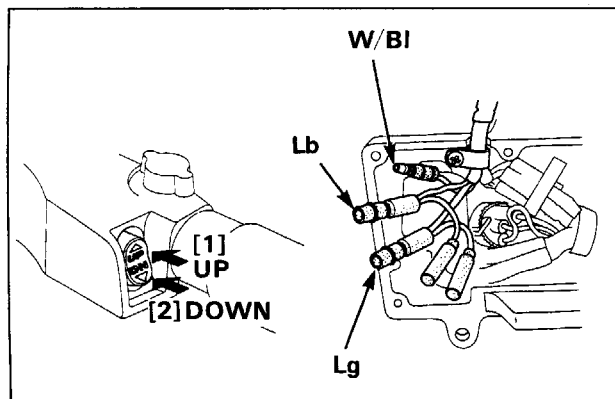
There should be no continuity between the red and purple terminals when the left switch is at the "UP" position.

There should be no continuity between the red and green terminals when the switch is at the "DOWN" position.

### • SIMULTANEOUS CHECK OF POWER TRIM / TILT SWITCH A AND B

Check for continuity between the terminals with the switch A connected.

	Pu	Pu/W	R	G	G/W
UP	○	○	○		
DOWN			○	○	○

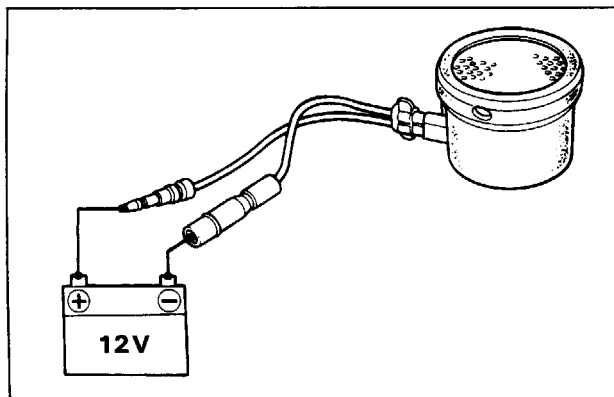


### • WARNING BUZZER [Side-mount remote control / Control panel only]

#### NOTE:

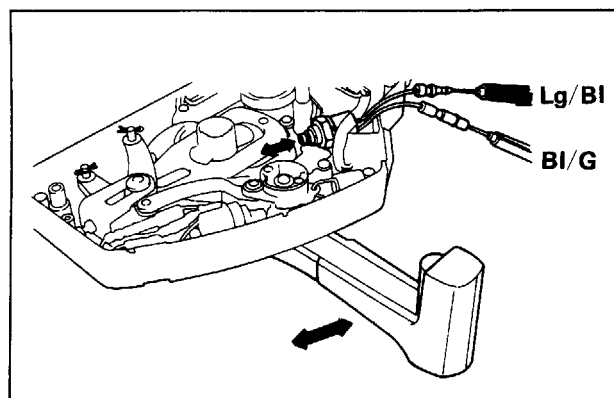
Be sure the battery is in good condition before performing this test.

Connect the black / yellow terminal of the warning buzzer to the positive (+) terminal of the 12 V battery and the yellow / green terminal to the negative (-) terminal of the battery. The warning buzzer should sound.



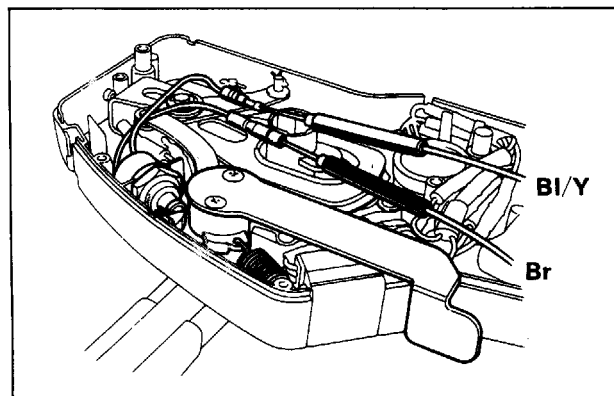
### • THROTTLE SWITCH [Side-mount remote control type only]

Attach the tester leads to the two terminals at the throttle switch and check for continuity. There should be continuity when the switch knob is pushed.



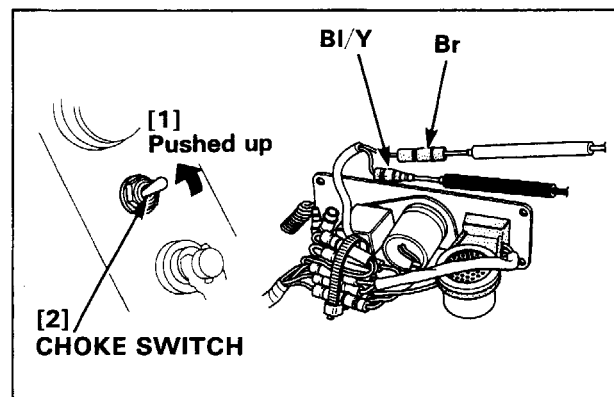
### • CHOKE SOLENOID SWITCH [Side-mount remote control type only]

Attach the tester leads to the two terminals at the choke solenoid switch and check for continuity. There should be continuity when the switch knob is pushed.



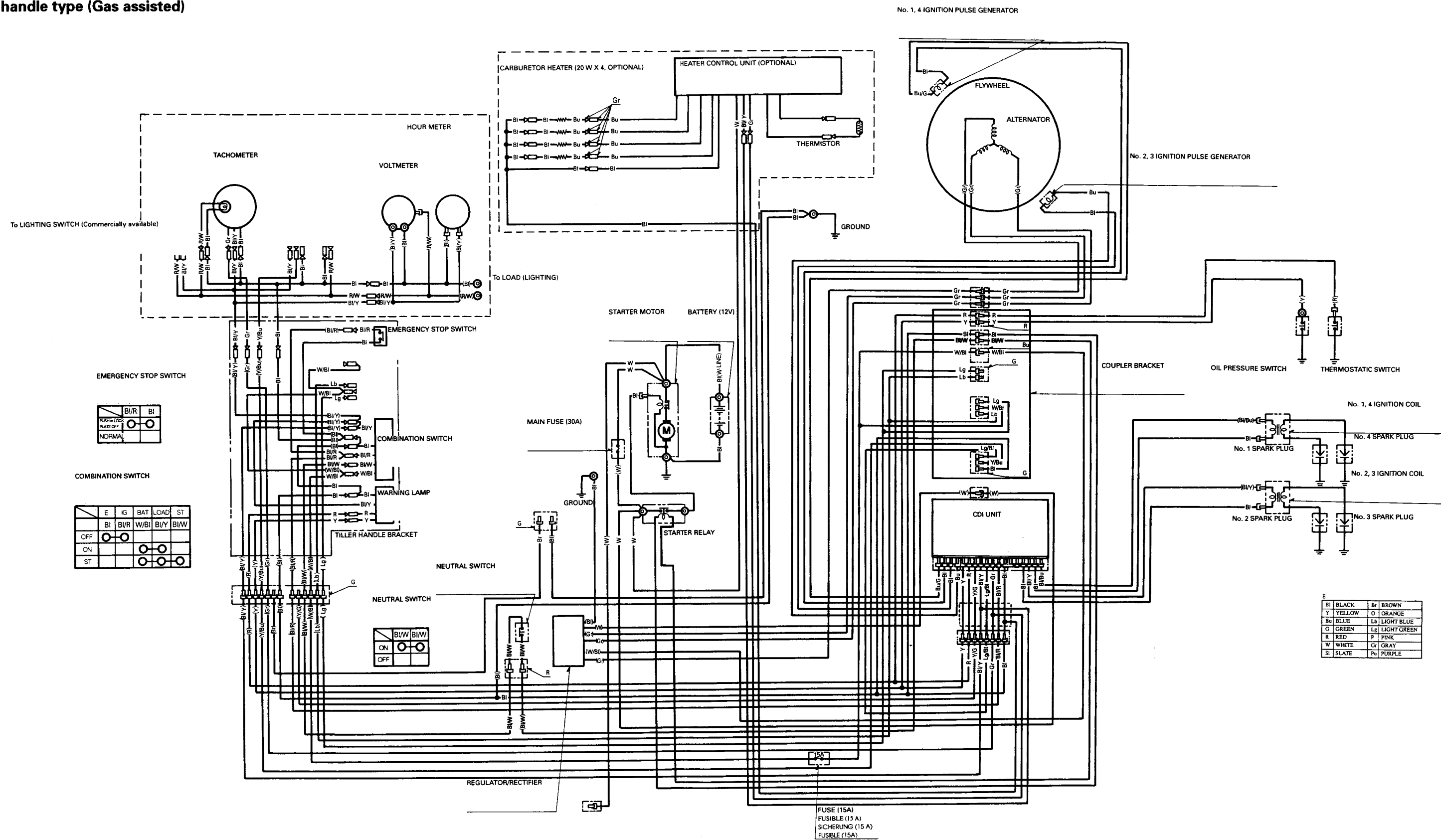
### • CHOKE SWITCH [Control panel type only]

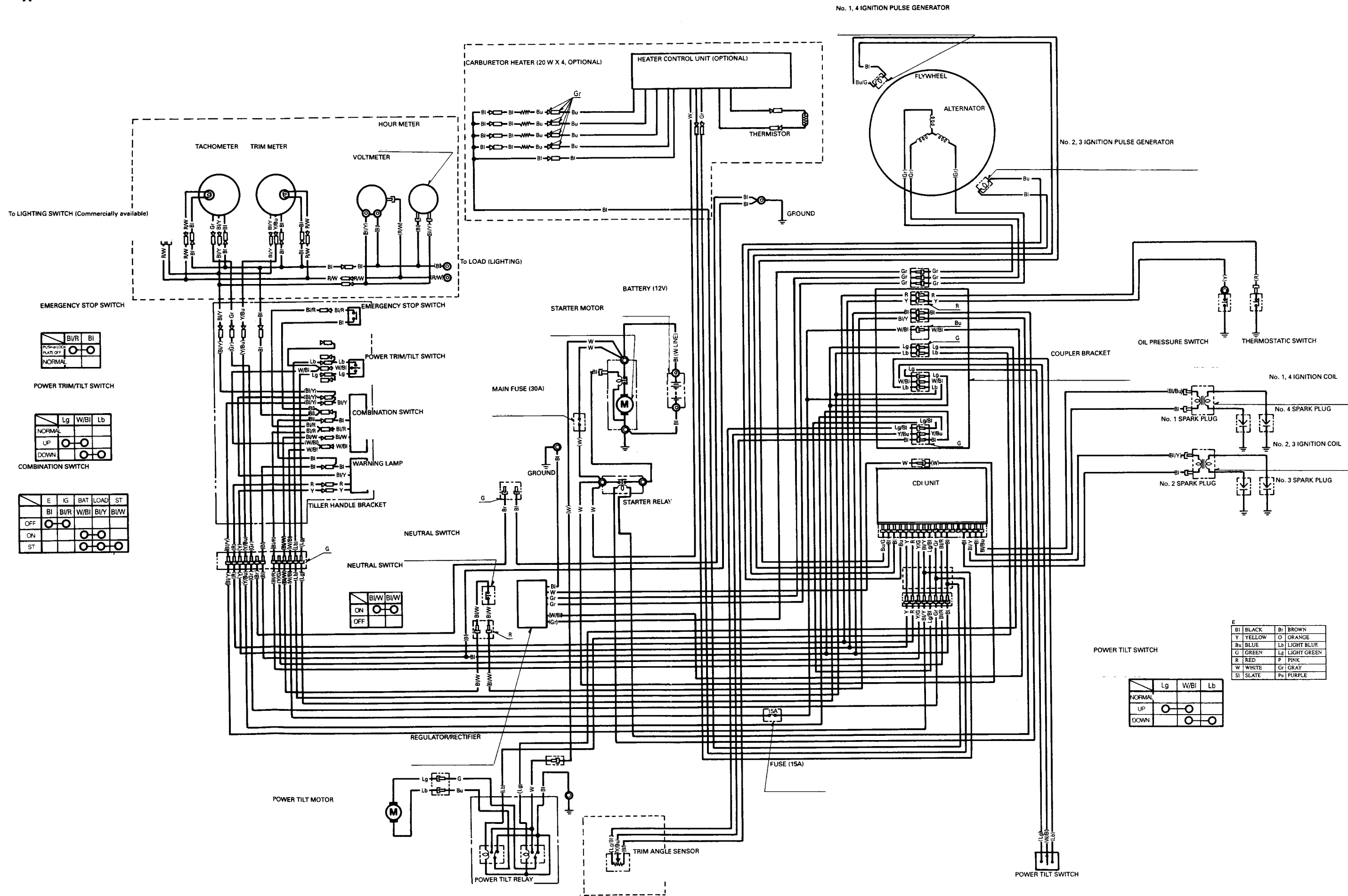
Attach the tester leads to the two terminals at the choke switch and check for continuity. There should be continuity when the choke switch is pushed up and no continuity when the switch is released.

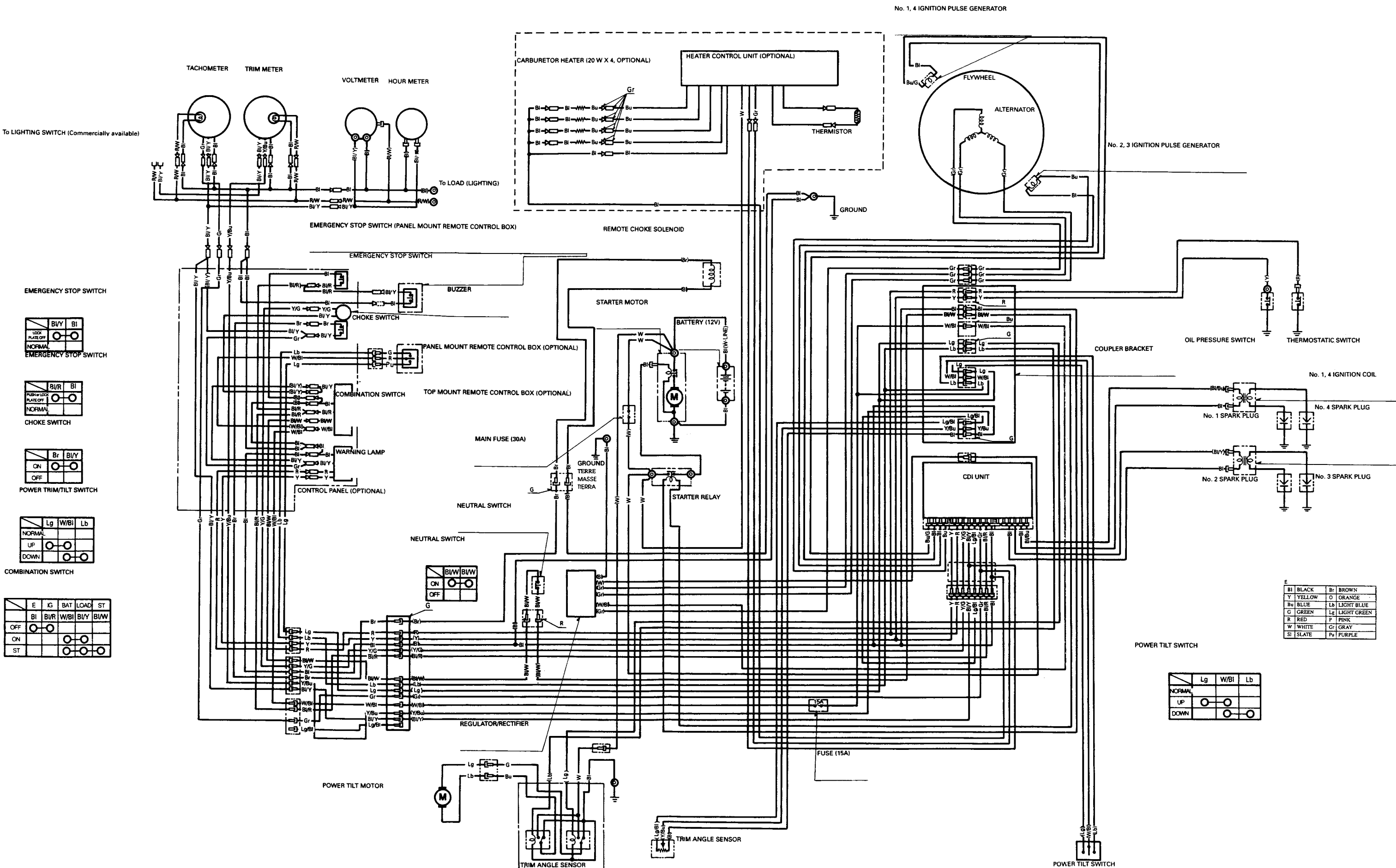


18. WIRING DIAGRAM

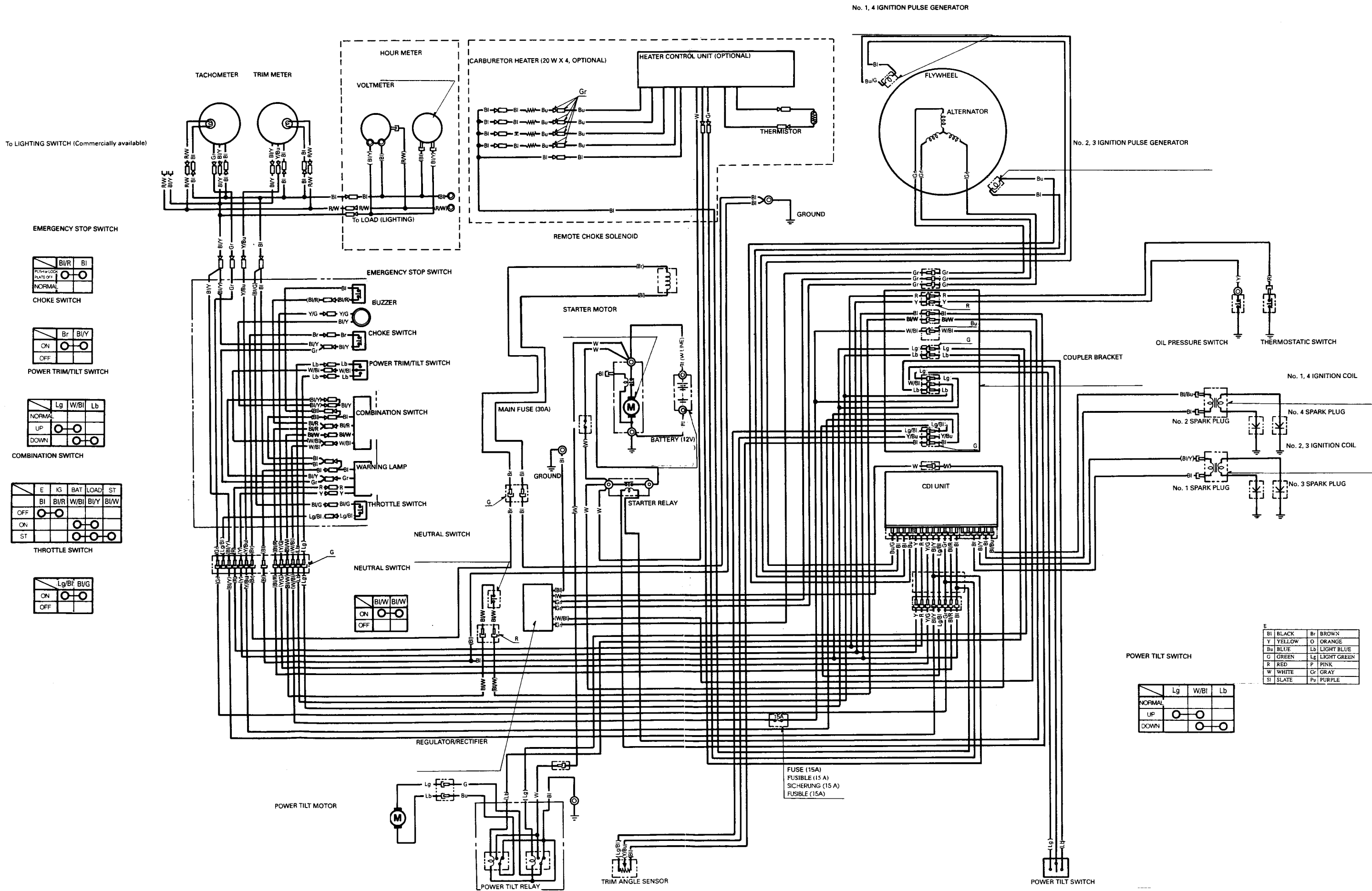
Tiller handle type (Gas assisted)

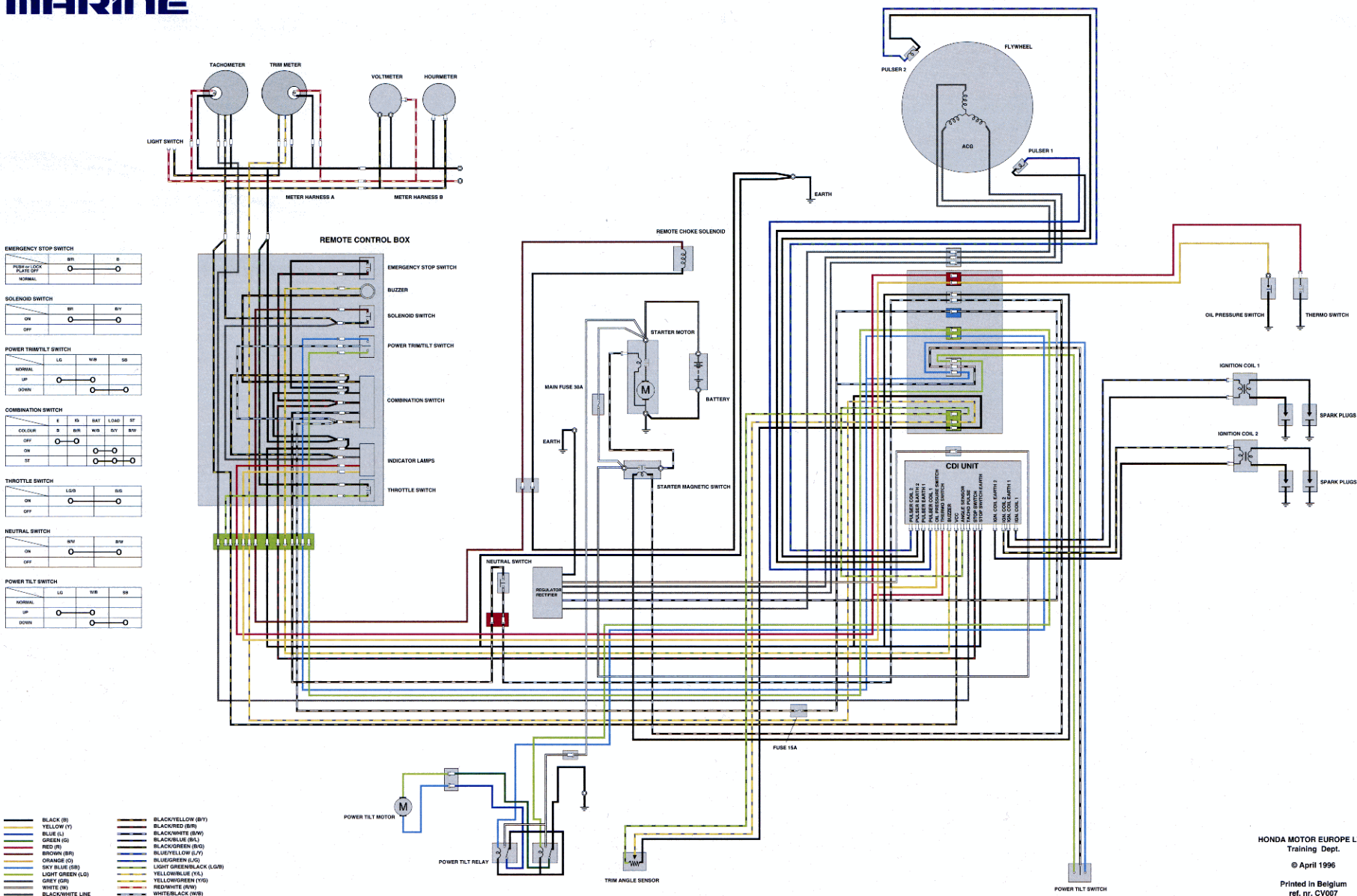




**Remote control type (Panel-mount / single top-mount / dual top-mount remote control)**

Remote control type (Sid-mount remote control)





## PREFACE

The supplement describes service procedures for the Honda BF75AV and BF90AV Outboard Motors.

For service information which is not covered in this supplement, please refer to the base manuals, part number 66ZW000.

ALL INFORMATION, ILLUSTRATIONS, DIRECTIONS AND SPECIFICATIONS INCLUDED IN THIS PUBLICATION ARE BASED ON THE LATEST PRODUCT INFORMATION AVAILABLE AT THE TIME OF APPROVAL FOR PRINTING. HONDA MOTOR CO., LTD. RESERVES THE RIGHT TO MAKE CHANGES WITHOUT INCURRING ANY OBLIGATION WHATSOEVER. NO PART OF THIS PUBLICATION MAY BE REPRODUCED WITHOUT WRITTEN PERMISSION.

**HONDA MOTOR CO., LTD.**  
**SERVICE PUBLICATIONS OFFICE**

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■ The marked sections contain no changes. They are not covered in this manual.



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# 1. SPECIFICATIONS

**HONDA**  
**BF75A·90A**

## 1. SPECIFICATIONS

## 1. SPECIFICATIONS

### DIMENSIONS AND WEIGHTS

Item	Model	BF75AV					
	Description code	BBAL					BBAU
	Type	LHD	LHTD	LRTD	LRTG	LRTB	XRTD
Overall length		*1: 910 mm (35.8 in) *2: 1,365 mm (53.7 in)		760 mm (29.9 in)			
Overall width		590 mm (23.2 in)		480 mm (18.9 in)			
Overall height		1,590 mm (62.6 in)					1,720 mm (67.7 in)
Dry weight (*3)		172 kg (379 lbs)	177 kg (390 lbs)	172 kg (379 lbs)			177 kg (390 lbs)
Operating weight (including oil)		174 kg (384 lbs)	179 kg (395 lbs)	174 kg (384 lbs)			179 kg (395 lbs)

\*1: With Tiller Handle raised.

\*2: With Tiller Handle extended.

\*3: With Propeller mounted.

Item	Model	BF90AV				
	Description code	BBBL				BBBU
	Type	LHD	LHTD	LRTD	LRTB	XRTD
Overall length	* 1: 910 mm (35.8 in) * 2: 1,365 mm (53.7 in)			760 mm (29.9 in)		
Overall width	590 mm (23.2 in)			480 mm (18.9 in)		
Overall height	1,590 mm (62.6 in)					1,720 mm (67.7 in)
Dry weight (*3)	172 kg (379 lbs)	177 kg (390 lbs)	172 kg (379 lbs)		177 kg (390 lbs)	
Operating weight (including oil)	174 kg (384 lbs)	179 kg (395 lbs)	174 kg (384 lbs)		179 kg (395 lbs)	

\*1: With Tiller Handle raised.

\*2: With Tiller Handle extended.

\*3: With Propeller mounted.

# HONDA

## BF75A·90A

### FRAME

Model		BF75AV					
Item	Type	LHD	LHTD	LRTD	LRTG	LRTB	XRTD
Transom height (*1)		537 mm (21.1 in)					664 mm (26.1 in)
Transom angle		5 stage adjustment (8°, 12°, 16°, 20°, 24°)					
Tilting angle		72°					
Tilting stage		Stage less					
Swivel angle		30° right and left					
Trim angle (*1)		—	-4°—16°				

(\*1) Transom angle is at 12°.

Model		BF90AV					
Item	Type	LHD	LHTD	LRTD	LRTB	XRTD	
Transom height (*1)		537 mm (21.1 in)					664 mm (26.1 in)
Transom angle		5 stage adjustment (8°, 12°, 16°, 20°, 24°)					
Tilting angle		72°					
Tilting stage		Stage less					
Swivel angle		30° right and left					
Trim angle (*1)		—	−4° − 16°				

(\*1) Transom angle is at 12°.

### TYPES OF HONDA BF75AV/90AV OUTBOARD MOTORS

It may be necessary to refer to this chart for reference purposes when reading this manual.

Model	Type	Shaft Length		Tiller Handle	Remote Control	Gas Assist- ed Tilt	Power Trim/Tilt	Tachometer	Trimmer
		Long	Extra-Long						
BF75AV	LHD	●		●		●		(●)	
	LHTD	●		●			●	(●)	(●)
	LRTD	●			●		●	●	●
	LRTG	●			●		●	●	●
	LRTB	●			●		●	●	●
	XRTD		●		●		●	●	●
BF90AV	LHD	●		●		●		(●)	
	LHTD	●		●			●	(●)	(●)
	LRTD	●			●		●	●	●
	LRTB	●			●		●	●	●
	XRTD		●		●		●	●	●

H: Tiller Handle    R: Remote Control    T: Power Trim/Tilt    ( ): Optional part

The gas assisted tilt type motors use a gas spring/damper to assist when manually tilting the motor.

The power trim/tilt type motors use an electric/hydraulic power cylinder to trim or tilt the motor.

**ENGINE**

Model	BF75AV	BF90AV
Type	4-stroke, O.H.C., 4-cylinder	
Displacement	1,590 cm <sup>3</sup> (97.0 cu in)	
Bore x stroke	75 x 90 mm (3.0 x 3.5 in)	
Rated power	75 HP (55.2 kW)	90 HP (66.2 kW)
Maximum torque	117.6 N·m(12.0 kgf·m, 87 lbf·ft) at 4,000 min <sup>-1</sup> (rpm)	125.5 N·m(12.8 kgf·m, 93 lbf·ft) at 4,500 min <sup>-1</sup> (rpm)
Compression ratio	8.8 : 1	
Fuel consumption ratio	241 g/HP·hr (8.5 oz/HP·hr) [Except LRTG type] 222 g/HP·hr (7.8 oz/HP·hr) [LRTG type only]	227 g/HP·hr (8.0 oz/HP·hr)
Cooling system	Forced water circulation by impeller pump with thermostat	
Ignition system	CDI	
Ignition timing	5–29° B.T.D.C.	
Spark plug	DR7EA (NGK), X22ESR-U (DENSO)	
Carburetor	Horizontal type, butterfly valve (4 carburetor)	
Lubrication system	Pressure lubrication by trochoid pump	
Lubrication capacity	4.0 ℓ (4.2 US qt, 3.5 Imp qt) [with oil filter replacement: 4.5 ℓ (4.8 US qt, 4.0 Imp qt)]	
Starter system	Electric starter	
Stopping system	Grounding of primary circuit	
Fuel	Unleaded gasoline with a pump octane rating of 86 or higher.	
Optional fuel tank capacity	25 ℓ (6.6 US gal, 5.5 Imp gal)	
Fuel pump	Mechanical plunger type	
Exhaust system	Underwater type	
Recommended oil	SAE 10 W – 30 / 40	

**LOWER UNIT**

Clutch	Dog clutch (Forward–Neutral–Reverse)
Gear ratio	0.43 (12/28)
Reduction	Spiral bevel
Gear case oil capacity	1.0 ℓ (1.1 US qt, 0.9 Imp qt)
Propeller rotating direction	Clockwise (viewed from rear)
Propeller driving system	Spline

# 2. SERVICE INFORMATION

**HONDA**  
**BF75A·90A**

## 1. MAINTENANCE STANDARDS

## 3. SPECIAL TOOLS

## 2. TORQUE VALUES

## 1. MAINTENANCE STANDARDS

### FRAME

Unit: mm (in)



Part	Item	Standard	service limit
Vertical shaft	Shaft O.D. (at needle bearing)	28.566—28.575 (1.1246—1.1250)	28.545 (1.1238)
Propeller shaft	Shaft O.D.	Forward bevel gear	25.957—25.970 (1.0219—1.0224)
		At needle bearing	25.936 (1.0211)
Bevel gear	Gear I.D.	Forward	29.99 (1.181)
			26.04 (1.025)

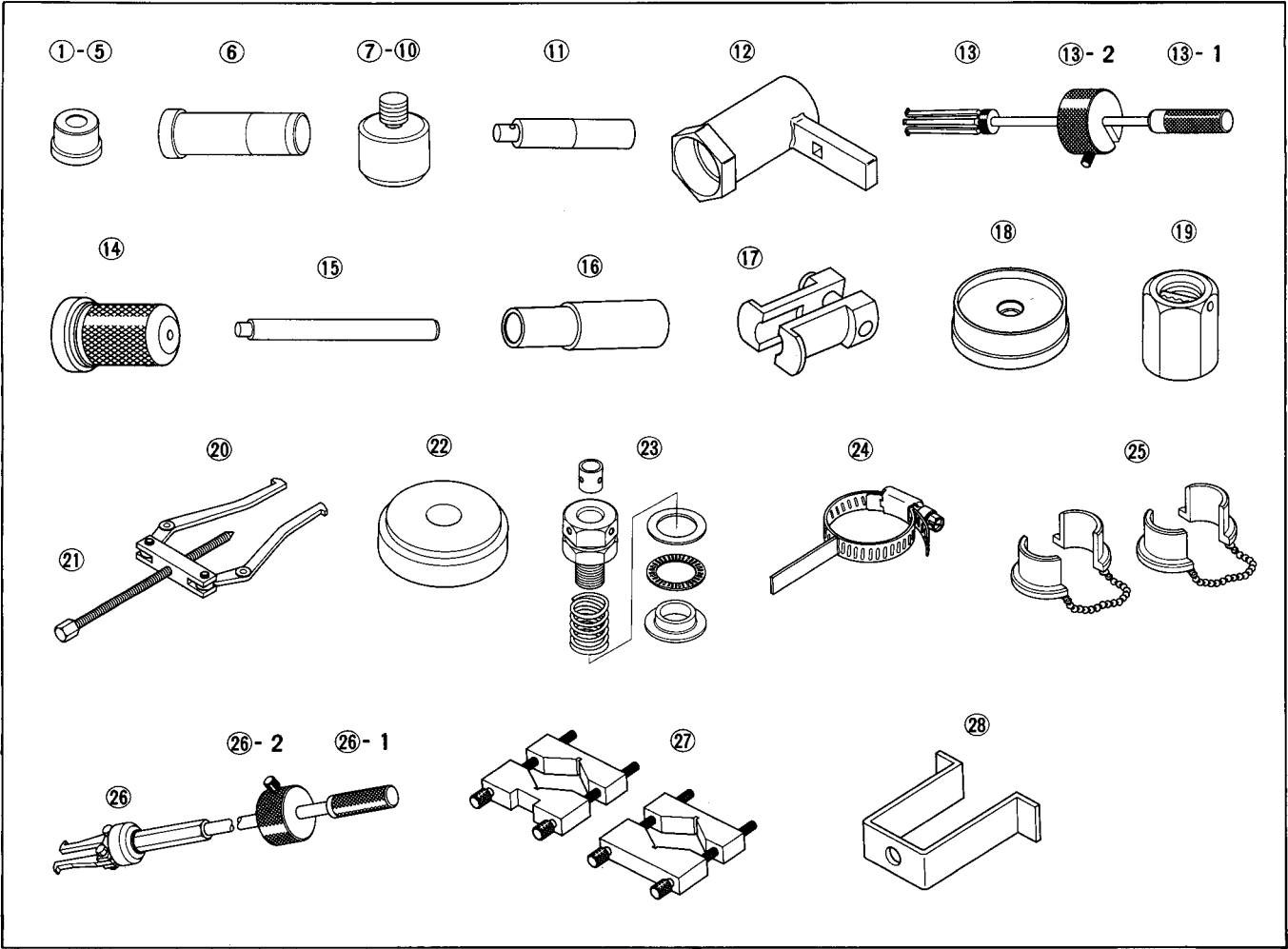
## 2. TORQUE VALUES

Item	Thread Dia. (mm) and pitch (length)	Torque values		
		N·m	kgf·m	lbf·ft
• GEAR CASE				
18 mm castle nut	M18 x 1.5	1	0.1	0.7
Propeller shaft holder bolt	M10 x 1.25	34	3.5	25
Gear case bolt	M10 x 1.25	34	3.5	25
nut (XRTD type only)	M10 x 1.25	34	3.5	25
Extension separator stud bolt (XRTD type only)	M10 x 1.25	15	1.5	11
Oil drain bolt	M8 x 1.25	3.4	0.35	2.5
Oil leveld bolt	M8 x 1.25	3.4	0.35	2.5
Oil vent bolt	M8 x 1.25	3.4	0.35	2.5
Trim tab bolt	M8 x 1.25	22	2.2	16
Anode metal nut	M6 x 1.0	9.8	1.0	7
64 mm lock nut	M64 x 1.5	98	10.0	72
Pinion gear nut	M16 x 1.5	103	10.5	76
Impeller housing bolt	M8 x 1.25	19.7	2.0	14
Water screen screw	M5 x 0.8	1	0.1	0.7

\*1: If the split pin cannot be set by tightening the 18 mm castle nut to the specified torque, tighten the castle nut additionally until the split pin can be set. Note that the maximum torque of the 18 mm castle nut is 44 N·m (4.5 kgf·m, 33 lbf·ft)

### 3. SPECIAL TOOLS

Tool name	Tool number	Application
1. Attachment, 32 x 35 mm	07746-0010100	23 x 36 x 6 mm water seal installation, 1-1/8 x 1-1/2 x 1-1/4 needle bearing removal/installation
2. Attachment, 37 x 40 mm	07746-0010200	30 x 37 x 26 mm needle bearing installation, reverse bevel gear/6208 radial ball bearing removal
3. Attachment, 42 x 47 mm	07746-0010300	50 x 85 x 21.5 taper bearing (inner race) removal
4. Attachment, 52 x 55 mm	07746-0010400	50 x 82 x 21.5 taper bearing (outer race) installation
5. Attachment, 24 x 26 mm	07746-0010700	Reverse bevel gear/6208 radial ball bearing removal
6. Driver, 40 mm I.D.	07746-0030100	Reverse bevel gear/6208 radial ball bearing installation
7. Pilot, 17 mm	07746-0040400	Reverse bevel gear/6208 radial ball bearing removal
8. Pilot, 25 mm	07746-0040600	50 x 82 x 21.5 taper bearing (outer race) installation
9. Pilot, 30 mm	07746-0040700	30 x 37 x 26 mm needle bearing installation, reverse bevel gear/6208 radial ball bearing removal
10. Pilot, 28 mm	07746-0041100	1-1/8 x 1-1/2 x 1-1/4 needle bearing removal/installation
11. Driver	07749-0010000	Driver for 1, 2, 3, 5, 7, 9 and 18
12. Lock nut wrench, 64 mm	07916-MB00002	64 mm lock nut removal/installation
13. Bearing remover, 30 mm	07936-8890300	
13-1. — Remover handle	07936-3710100	 30 x 37 x 26 mm needle bearing removal
13-2. — Remover weight	07741-0010201	
14. Oil seal driver	07947-SB00100	30 x 45 x 7 mm water seal installation
15. Driver	07949-3710001	1-1/8 x 1-1/2 x 1-1/4 needle bearing removal/installation, 50 x 82 x 21.5 taper bearing (outer race) installation
16. Drive shaft B	07964-MB00200	30 x 62 x 21.25 taper roller bearing (inner race) installation
17. Bearing remover	07HMC-MR70100	Reverse bevel gear/6208 radial ball bearing removal
18. Bearing driver	07NAD-P200100	50 x 82 x 21.5 taper bearing (inner race) installation
19. Vertical shaft holder	07SPB-ZW10200	Pinion gear nut removal/installation
20. Puller jaws	07SPC-ZW0010Z	Forward bevel gear backlash adjustment
21. Puller bolt	07SPC-ZW0011Z	Forward bevel gear backlash adjustment
22. Mandrel	07SPD-ZW0010Z	50 x 82 x 21.5 taper bearing (outer race) installation
23. Bearing preload tool	07SPJ-ZW0010Z	Forward/reverse bevel gear backlash adjustment
24. Backlash indicator tool	07SPJ-ZW0030Z	Forward/reverse bevel gear backlash adjustment
25. Vertical shaft indicator attachment	07SPK-ZW10100	Forward/reverse bevel gear backlash adjustment
26. Bearing race puller	07LPC-ZV30100	
26-1. — Remover handle	07936-3710100	 50 x 82 x 21.5 taper bearing (outer race) removal
26-2. — Remover weight	07741-0010201	
27. Vertical shaft gauge	07TPJ-ZW10100	Pinion gear shim adjustment
28. Propeller shaft holder	07TPB-ZW10100	Reverse bevel gear backlash adjustment



# 3. MAINTENANCE

**HONDA**  
**BF75A·90A**

## 1. GEAR OIL

### 1. GEAR OIL

#### • Inspection

- 1) Position the outboard motor vertically.
- 2) Remove the oil level bolt, and check whether the gear oil flows out.
- 3) Add the gear oil if it does not flow out.

#### • Addition of gear oil

- 1) Remove the oil drain bolt, and install the commercially available gear oil pump in the oil drain bolt hole.
- 2) Remove the oil level bolt, and add the gear oil until it flows out of the oil level bolt hole.

Gear oil capacity	1.0 l (1.06 US qt, 0.88 Imp qt)
-------------------	---------------------------------

Recommended gear oil	MARINE SEA 90 Hypoid gear oil API Service Classification (GL-4 or GL-5)
----------------------	---

- 3) After adding the gear oil, install the oil drain bolt and oil level bolt securely.

**TORQUE: 3.4 N·m (0.35 kgf·m, 2.5 lbf·ft)**

#### • Replacement

- 1) Position the outboard motor vertically. Remove the oil level bolt and oil drain bolt, and drain the old oil.
- 2) Install the commercially available gear oil pump in the oil drain bolt hole, and add the oil until it flows out of the oil level bolt hole.

Gear oil capacity	1.0 l (1.06 US qt, 0.88 Imp qt)
-------------------	---------------------------------

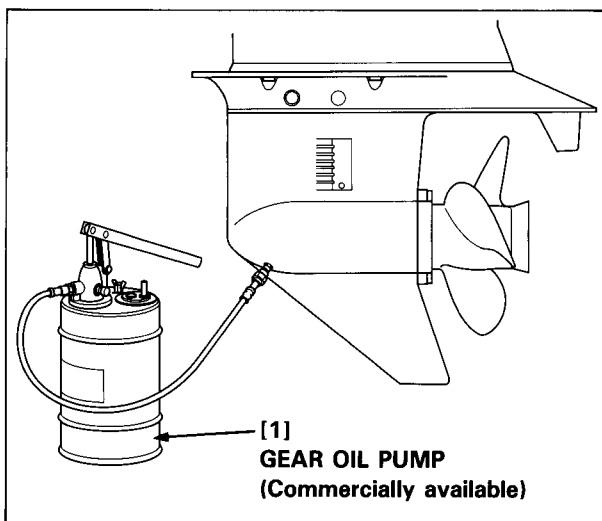
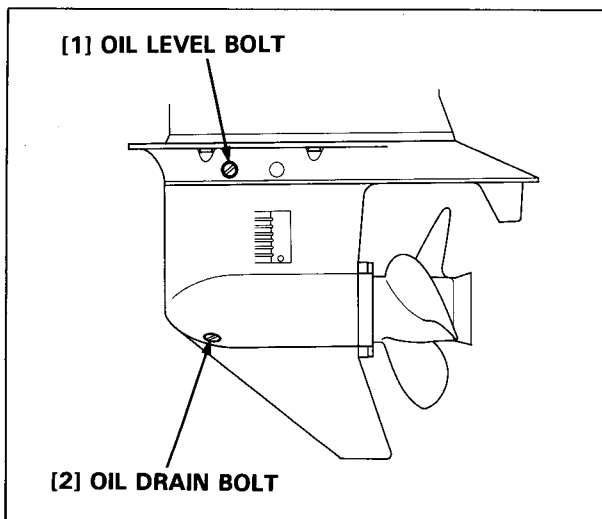
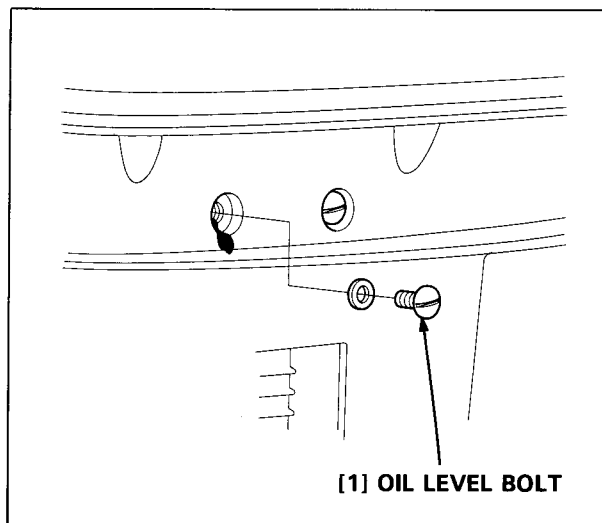
Recommended gear oil	MARINE SEA 90 Hypoid gear oil API Service Classification (GL-4 or GL-5)
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- 3) After adding the gear oil, install the oil drain bolt and oil level bolt securely.

**TORQUE: 3.4 N·m (0.35 kgf·m, 2.5 lbf·ft)**

#### NOTE:

If there is water in the oil, the water will flow out first when the oil drain bolt is removed, or the oil will be a milky color. If water in the gear oil is detected, check the gaskets and water seals for damage, and check the torque on the gear case bolts.





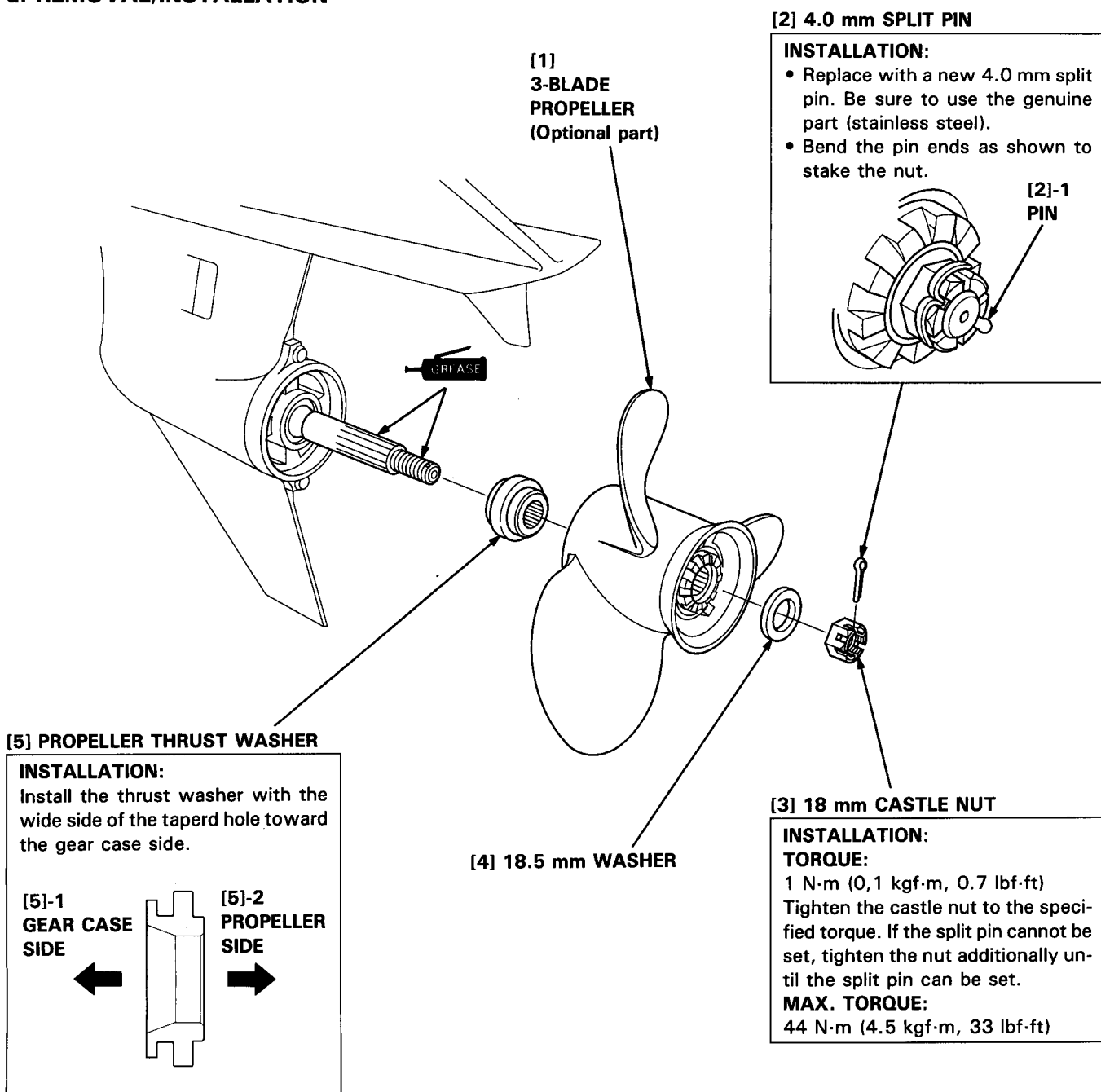
# 11. PROPELLER/GEAR CASE/ EXTENSION CASE

**HONDA**  
BF75A·90A

- |  |                              |
|--|------------------------------|
| 1. PROPELLER                                 | 6. VERTICAL SHAFT/BEVEL GEAR |
| 2. GEAR CASE ASSEMBLY                        | 7. SHIM SELECTION            |
| 3. WATER PUMP/SHIFT ROD                      | 8. SHIM POSITION             |
| 4. PROPELLER SHAFT HOLDER ASSEMBLY           | 9. BACKLASH ADJUSTMENT       |
| 5. PROPELLER SHAFT/PROPELLER<br>SHAFT HOLDER |                              |

## 1. PROPELLER

### a. REMOVAL/INSTALLATION

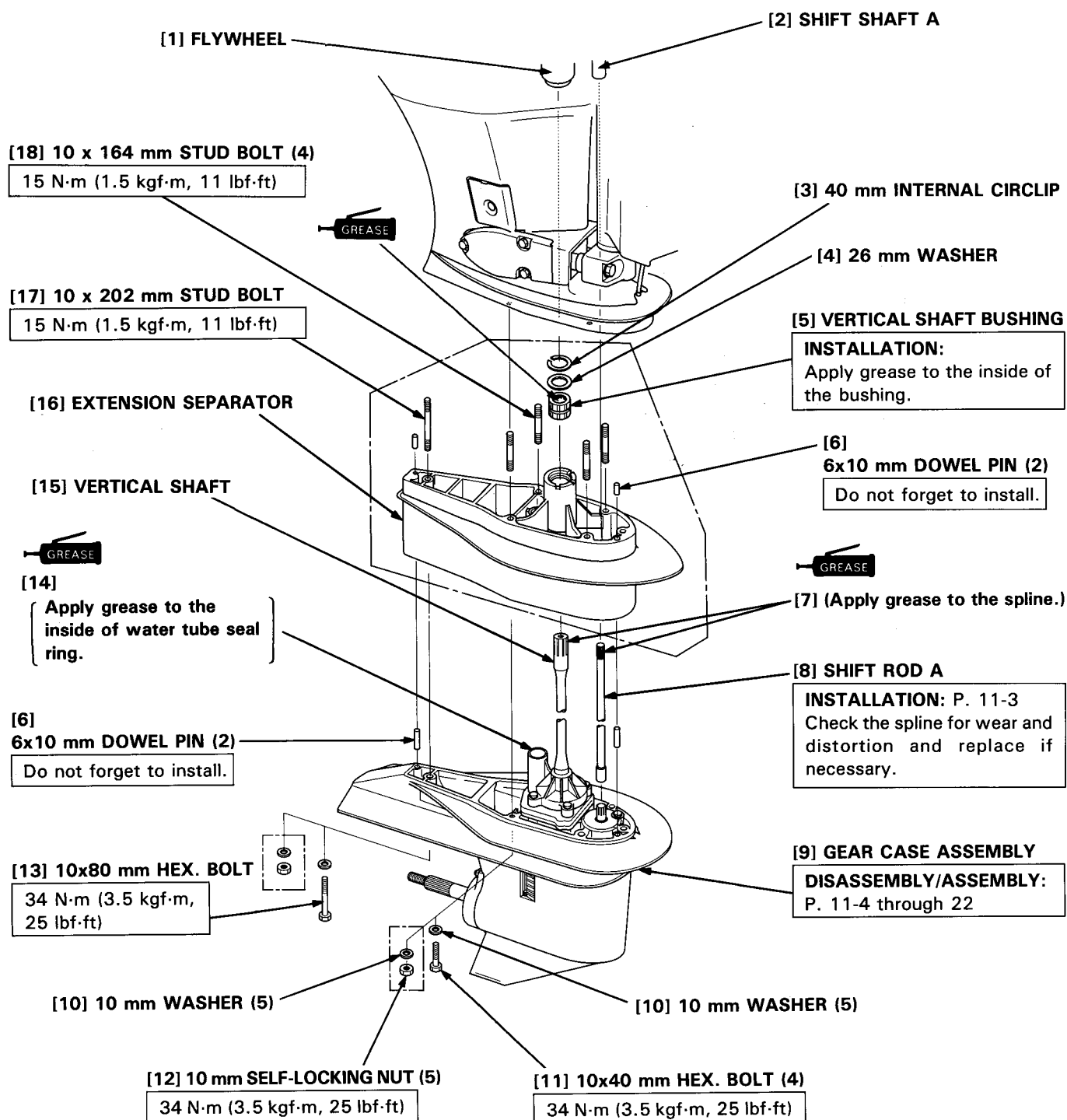


## 2. GEAR CASE ASSEMBLY

Place the remote control lever or gearshift lever in the "N" (Neutral) position.

 : XRTD type only.

\*1: Except XRTD type.



### • SHIFT ROD A

#### INSTALLATION:

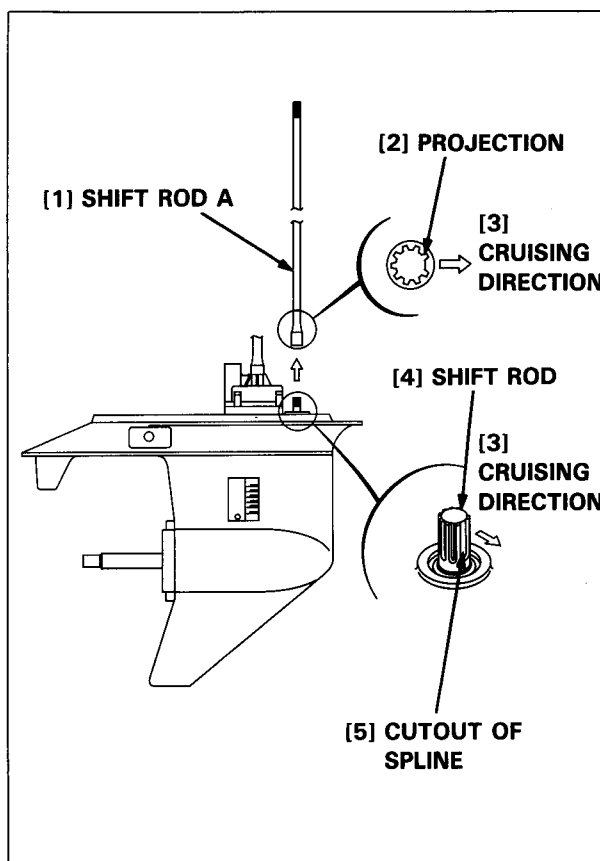
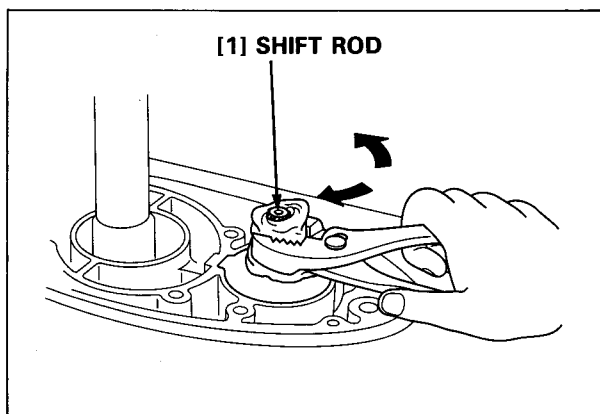
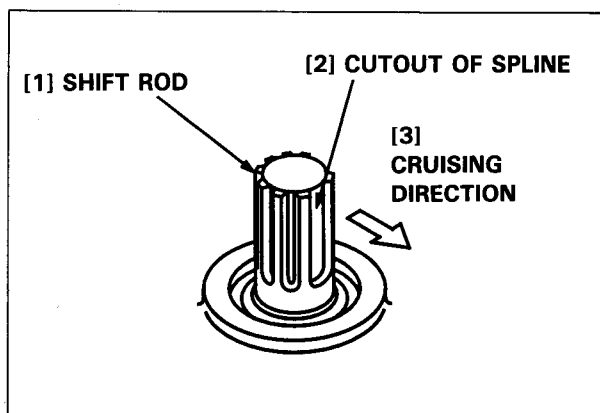
- 1) Set the remote control lever or gearshift lever in the "N" (Neutral) position.
- 2) Check that shift rod of the gear case is at the "N" (Neutral) position.

#### To check:

Check whether the cutout of the shift rod spline faces in the direction shown. (It indicates that the shift rod is at the "N" (Neutral) position.)

- 3) If the cutout of the spline is not in the direction shown, protect the spline with a shop towel or equivalent material and turn the shift rod right and left with a wrench until the cutout faces toward the specified direction.

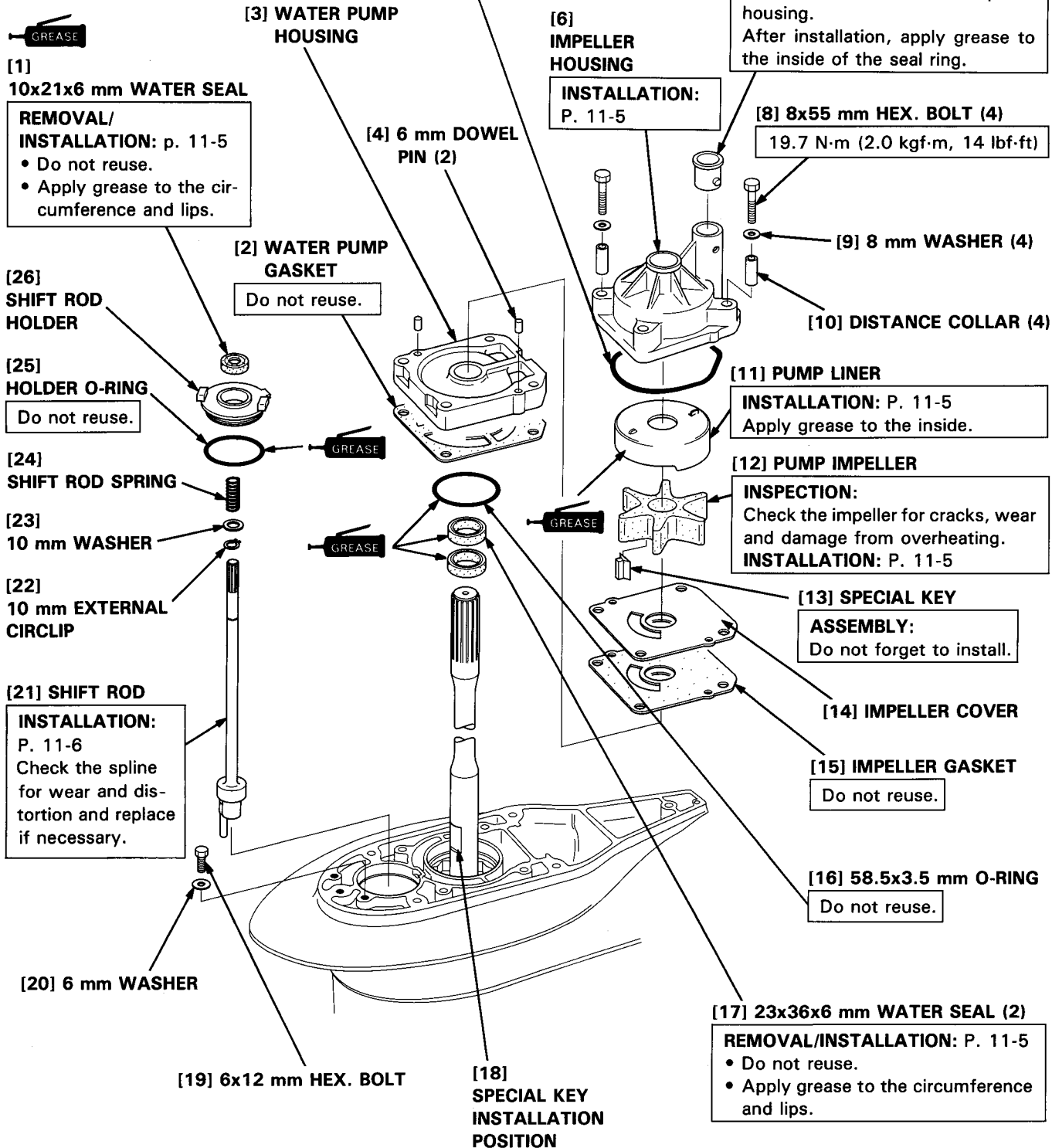
- 4) Install the shift rod A by aligning the cutout of the shift rod spline with the projection of the spline of the shift rod A (i.e. part set on the shift rod).



### 3. WATER PUMP/SHIFT ROD

#### a. DISASSEMBLY/ASSEMBLY

Remove the gear case assembly (P. 11-2).



### b. REMOVAL/INSTALLATION

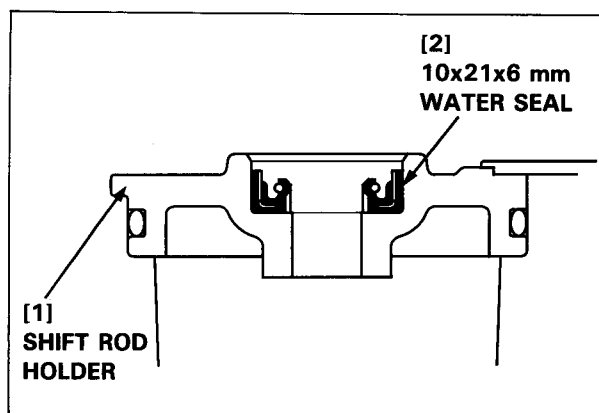
#### • 10 x 21 x 6 mm WATER SEAL

##### REMOVAL:

Remove the 10 x 21 x 6 mm water seal using the commercially available oil seal remover.

##### INSTALLATION:

- 1) Apply grease to the circumference and lips of the new water seal.
- 2) With the lips facing up, drive the water seal into the shift rod holder as shown.



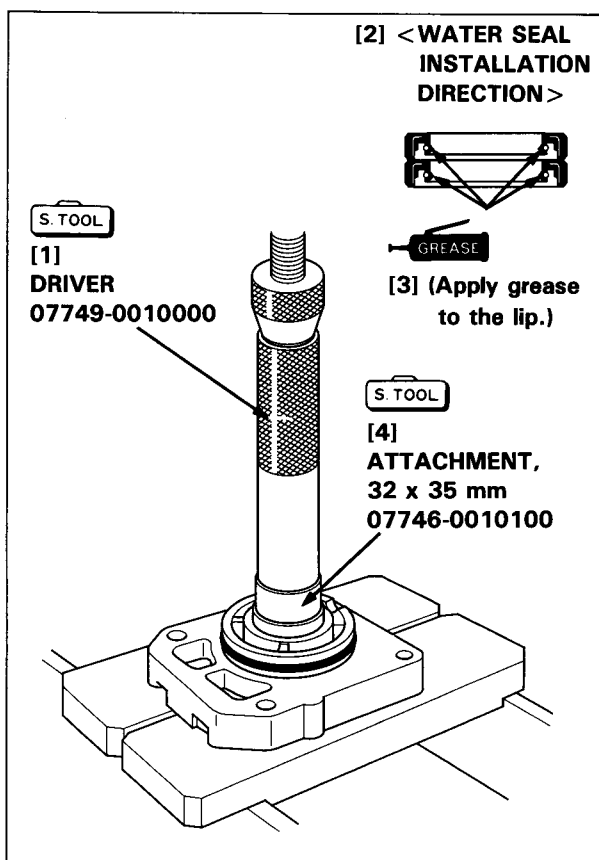
#### • 23 x 36 x 6 mm WATER SEAL

##### REMOVAL:

Remove the 23 x 36 x 6 mm water seals using the commercially available oil seal remover.

##### INSTALLATION:

- 1) Apply grease to the circumference of the new water seals.
- 2) Drive the water seals one by one into the water pump housing using the special tools. Note the installation direction of the water seals.
- 3) After installation, apply grease to the lip of the seals.



##### TOOLS:

Driver

Attachment, 32 x 35 mm

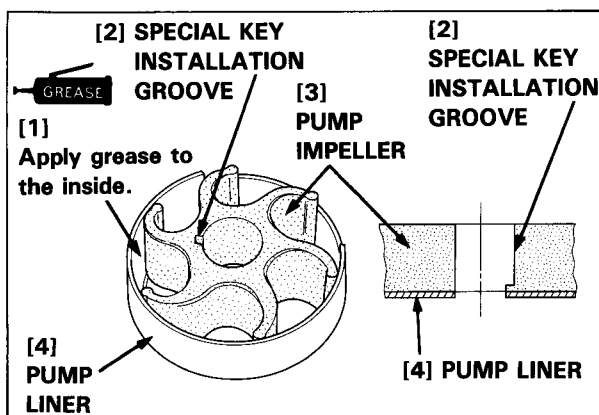
07749-0010000

07746-0010100

#### • PUMP IMPELLER/IMPELLER HOUSING/PUMP LINER

##### INSTALLATION:

- 1) Check the impeller for cracks, wear or damage from overheating.
- 2) Apply grease to the inner wall of the pump liner and install the pump impeller in the pump liner with the side that has the special key installation groove facing up. Be sure to align the hole in the pump liner with the hole in the pump impeller.



- 3) Install the pump liner in the impeller housing by aligning the two projections on the pump liner with the two grooves in the impeller housing.

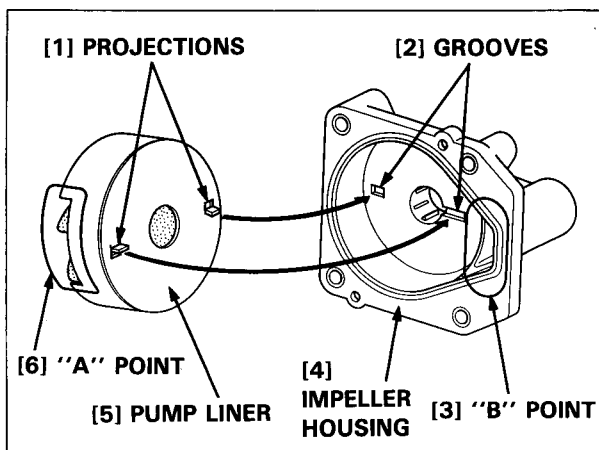
Be sure that the part "A" of the pump liner is in alignment with the part "B" of the impeller housing, too.

- 4) Set the impeller housing over the vertical shaft, and set the special key in the position shown in the drawing (P. 11-4).

Align the groove in the pump impeller with the special key, and install the impeller housing on the pump housing by turning the impeller housing clockwise viewed from the top of the housing.

**NOTE:**

- Do not turn the impeller housing counterclockwise with the pump impeller installed in the impeller housing.
- After installation, check that the impeller gasket is set in the proper position.



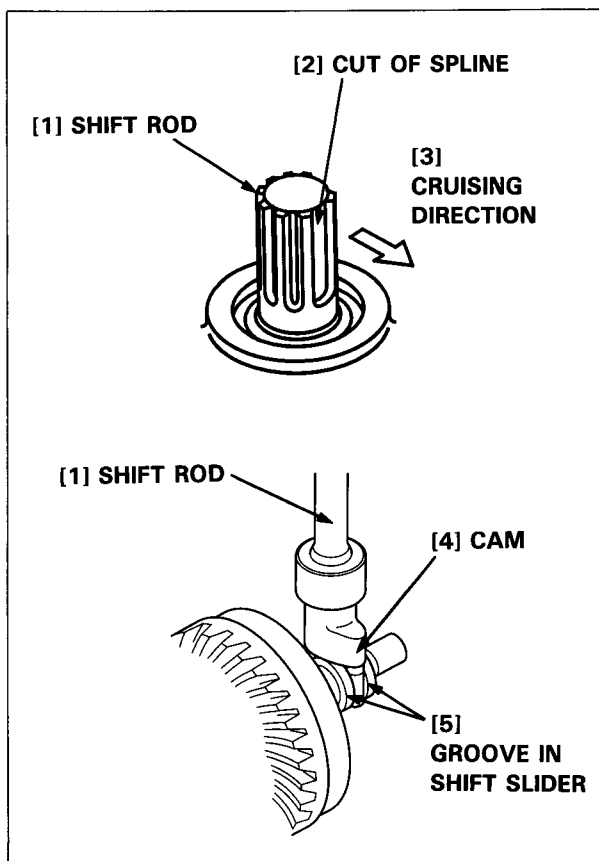
**• SHIFT ROD**

**INSTALLATION:**

Install the shift rod by aligning the shift cam of the shift rod with the groove in the shift slider so that the cutout of the shift rod spline faces in the cruising direction.

**NOTE:**

If the shift cam is in alignment with the shift slider groove but the cutout of the spline is not in the cruising direction, see the step 3 on page 11-3 and adjust accordingly.



## 4. PROPELLER SHAFT HOLDER ASSEMBLY

### a. REMOVAL/INSTALLATION

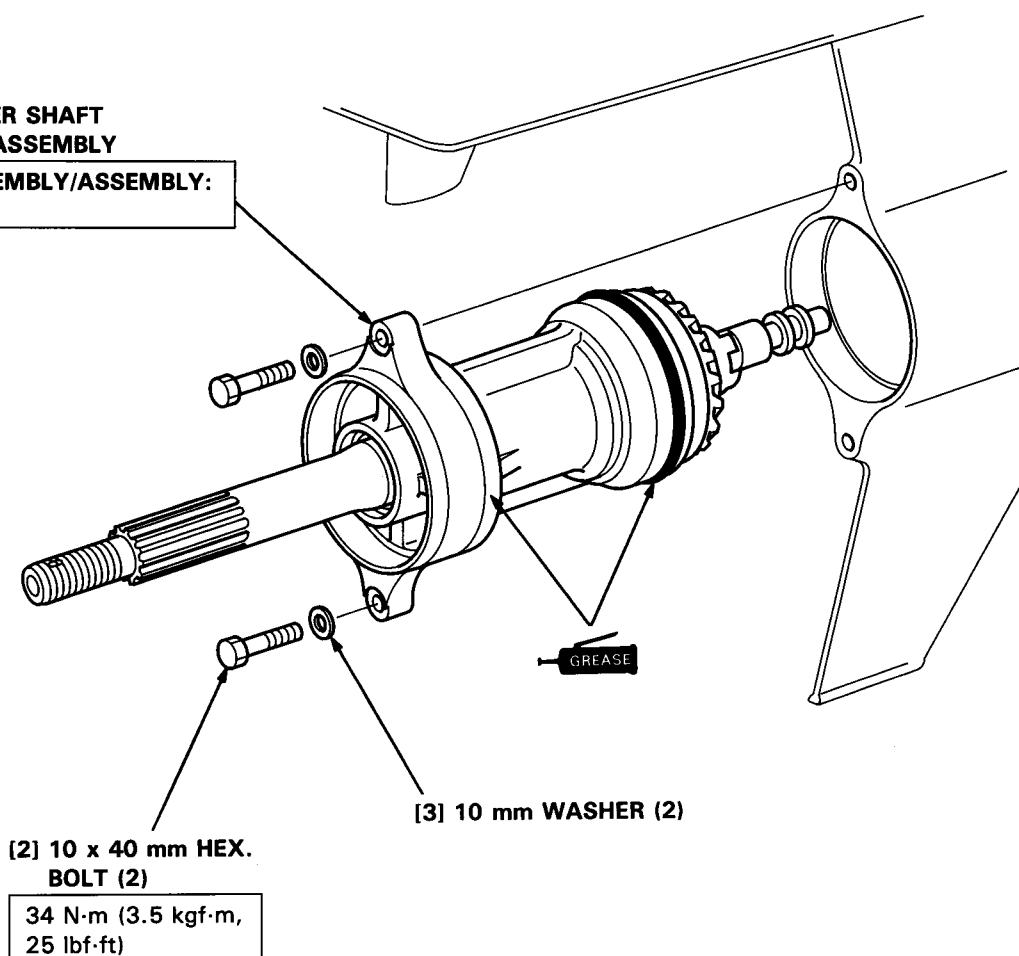
- 1) Remove the propeller (P. 11-1) and gear case assembly (P. 11-2).
- 2) Remove the water pump/shift rod (P. 11-4).

#### NOTE:

Remove the shift rod before removal/installation of the propeller shaft holder assembly.

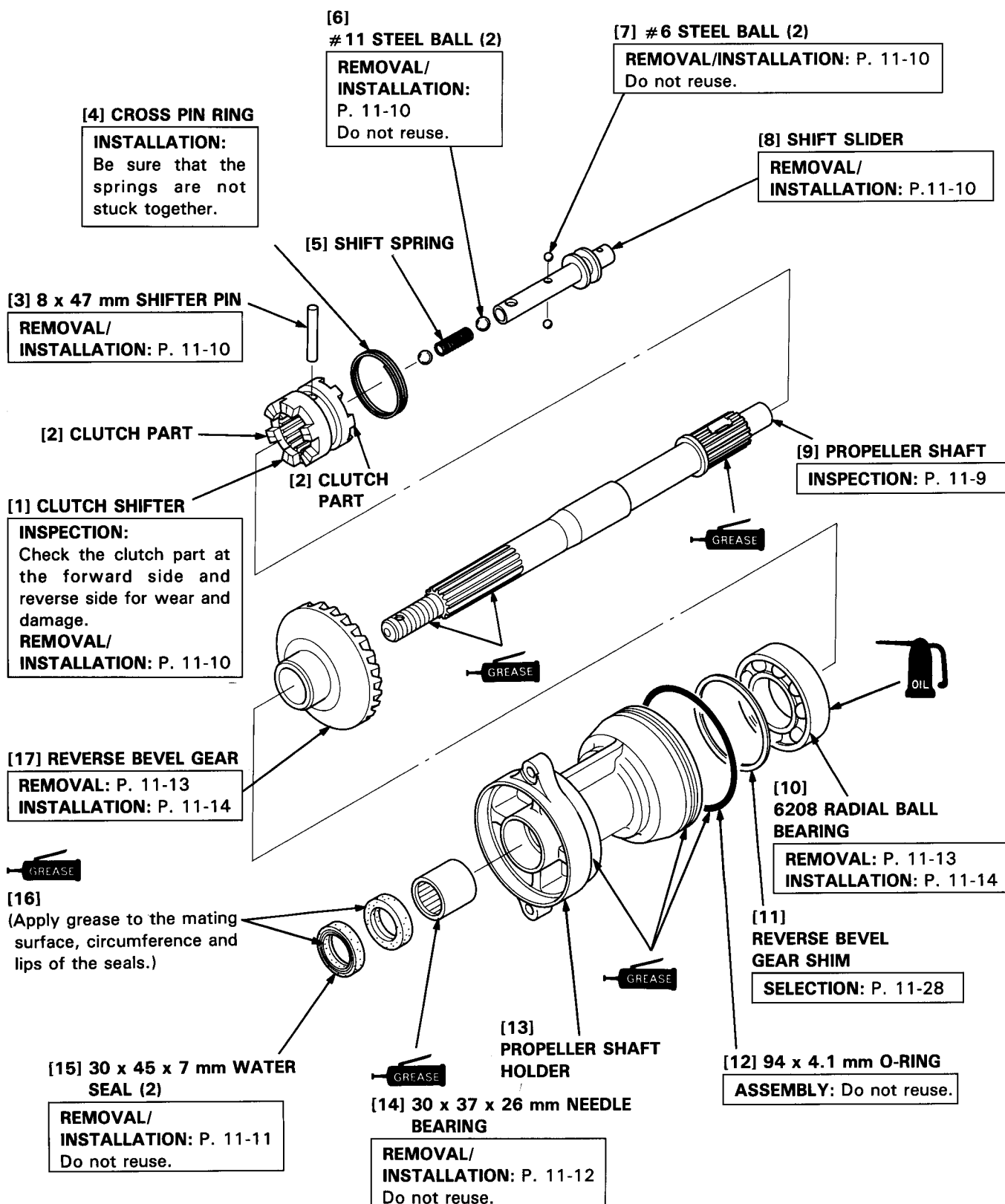
#### [1] PROPELLER SHAFT HOLDER ASSEMBLY

DISASSEMBLY/ASSEMBLY:  
P. 11-8



## 5. PROPELLER SHAFT/PROPELLER SHAFT HOLDER

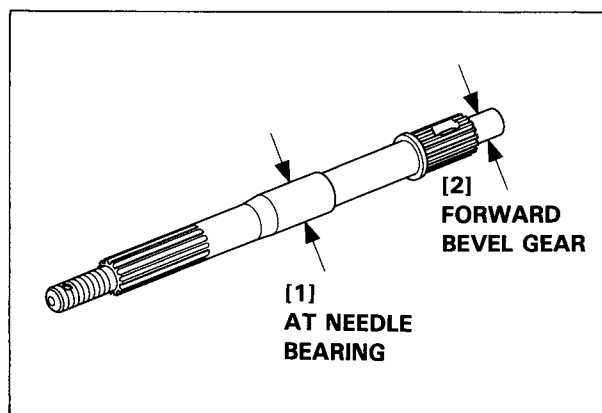
### a. DISASSEMBLY/ASSEMBLY





**b. INSPECTION****• PROPELLER SHAFT O.D.**

	STANDARD	SERVICE LIMIT
Forward bevel gear	25.957 – 25.970 mm (1.0219 – 1.0224 in)	25.936 mm (1.0211 in)
At needle bearing	30.007 – 30.020 mm (1.1814 – 1.1819 in)	29.99 mm (1.181 in)

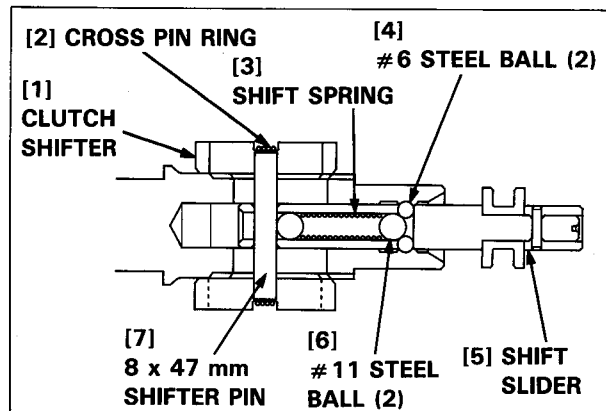


### c. REMOVAL/INSTALLATION

#### • CLUTCH SHIFTER/SHIFT SLIDER/SHIFTER PIN

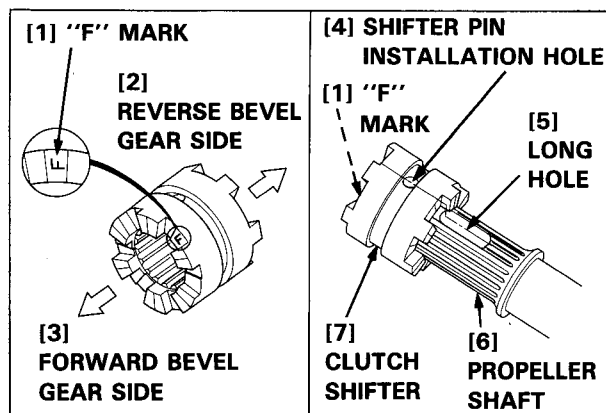
##### REMOVAL:

- 1) Pull the shift slider with care not to let the #6 steel balls pop out, and remove the #6 steel balls.
- 2) Remove the cross pin ring and 8 x 47 mm shifter pin, and remove the clutch shifter, shift slider, two #11 steel balls and the shift spring.

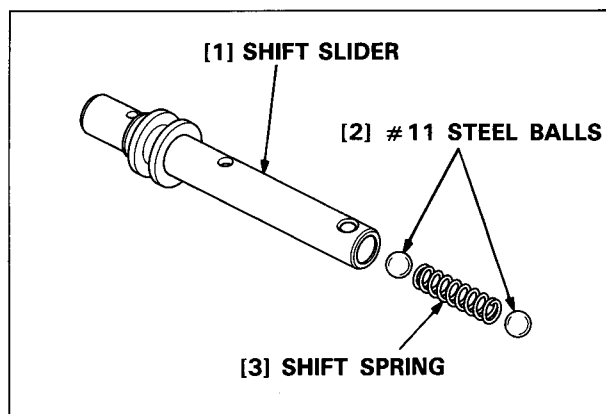


##### INSTALLATION:

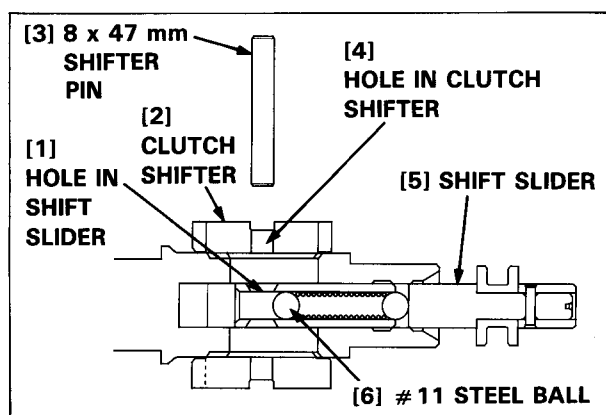
- 1) With the "F" mark on the clutch shifter toward you (i.e. forward bevel gear), assemble the clutch shifter and the propeller shaft by aligning the long hole in the propeller shaft with the 8 x 47 mm shifter pin hole.



- 2) Install the #11 steel ball, shift spring and the #11 steel ball in the shift slider in the order shown.



- 3) Taking care not to let the #11 steel balls come out of the shift slider, align the clutch shifter hole and the hole in the shift slider, and install the 8 x 47 mm shifter pin.



- 4) Position the propeller shaft vertically so the shift slider is facing up.
- 5) Pull up the shift slider until the #6 steel ball installation holes in the shift slider appear.
- 6) Set the #6 steel balls in the right and left #6 steel ball installation holes respectively, and push the shift slider into the propeller shaft slowly.

**NOTE:**

Push in the shift slider with care not to let the steel balls pop out.

- 7) be sure that the #6 steel balls are in the groove in the propeller shaft securely as shown.

**Check procedure:**

- Be sure that the clutch shifter is not at the reverse bevel gear installation side.  
If it is at the reverse bevel gear installation side, pull up the shift slider slowly.
- Be sure that the steel balls cannot be checked though the gap between the propeller shaft and shift slider.  
If the steel balls can be checked, push in the shift slider slowly again.

• **30 x 45 x 7 mm WATER SEAL**

**REMOVAL:**

remove the 30 x 45 x 7 mm water seals using the commercially available oil seal remover.

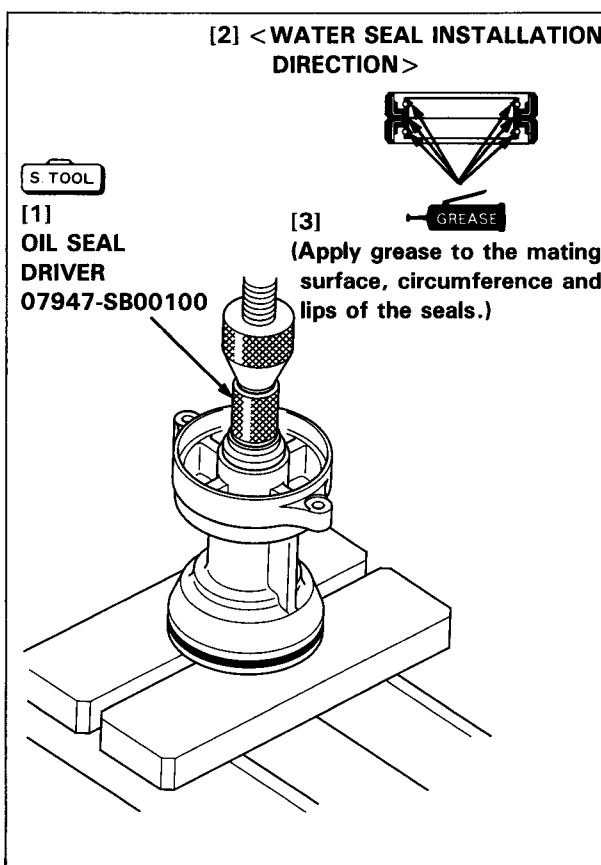
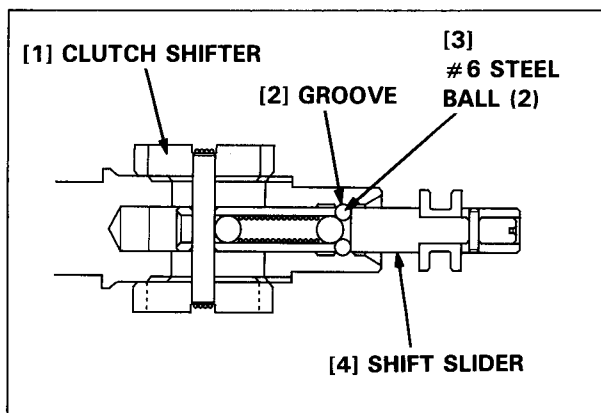
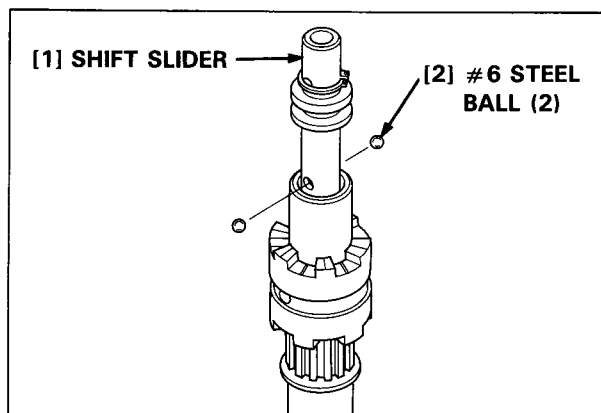
**INSTALLATION:**

- 1) Apply grease to the circumference of the new water seals.
- 2) Drive the water seals into the propeller shaft holder one by one using the special tools. Note the installation direction of the water seals.
- 3) After installation of the water seals, apply grease to the lips of the seals.

**TOOL:**

Oil seal driver

07947-SB00100



### • 30 x 37 x 26 mm NEEDLE BEARING

#### REMOVAL:

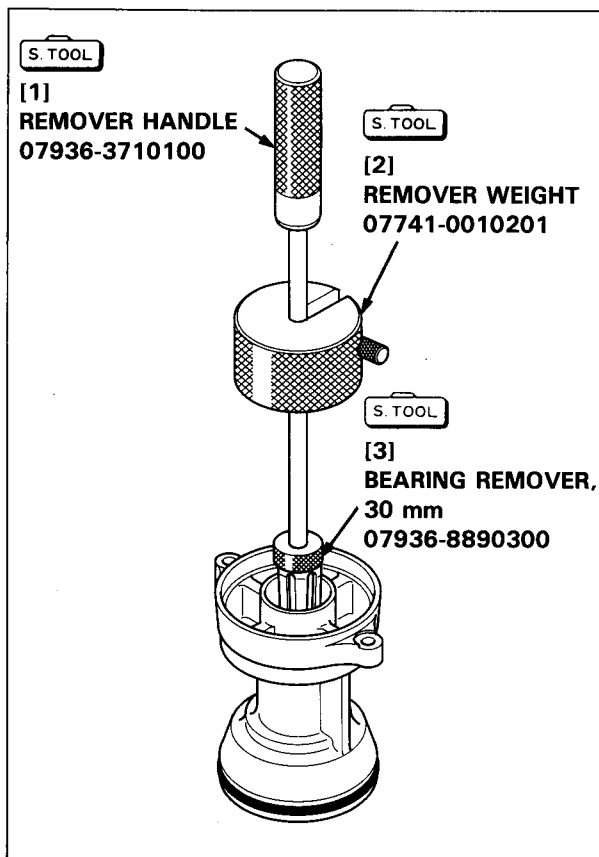
- 1) Remove the 30 x 45 x 7 mm water seals (P. 11-11).
- 2) Remove the needle bearing using the special tools.

#### NOTE:

- Set the jaws of the special tool (bearing remover, 30 mm) against the needle bearing.
- Replace the needle bearing with a new one.

#### TOOLS:

Bearing remover, 30 mm	07936-8890300
Remover weight	07741-0010201
Remover handle	07936-3710100



#### INSTALLATION:

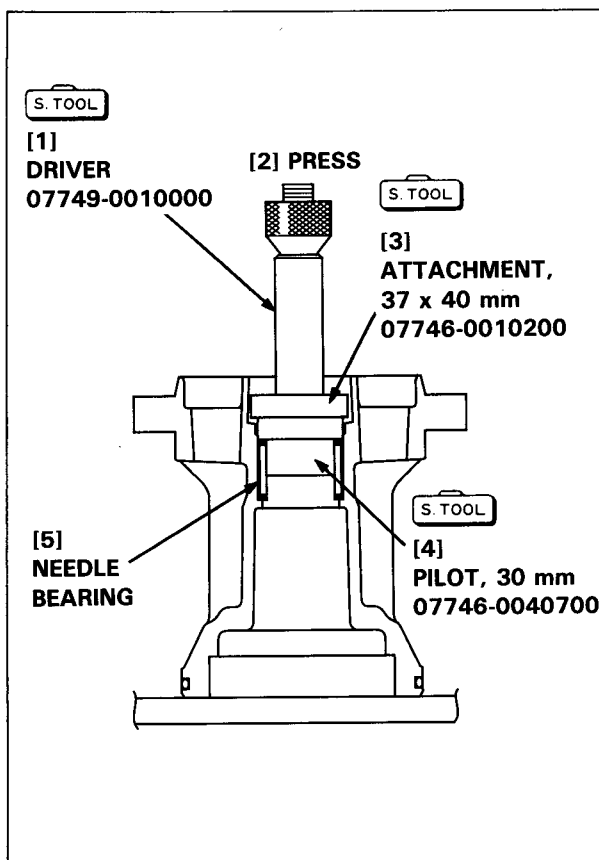
- 1) Apply grease to the circumference of a new needle bearing.
- 2) Press the needle bearing in the propeller shaft holder using the special tools and hydraulic press.
- 3) Install the 30 x 45 x 7 mm water seals (P. 11-11).

#### NOTE:

Install the needle bearing with the stamp mark at the end of the needle bearing facing the special tool (attachment, 37 x 40 mm)

#### TOOLS:

Driver	07749-0010000
Attachment, 37 x 40 mm	07746-0010200
Pilot, 30 mm	07746-0040700



### • REVERSE BEVEL GEAR/6208 RADIAL BALL BEARING

#### REMOVAL:

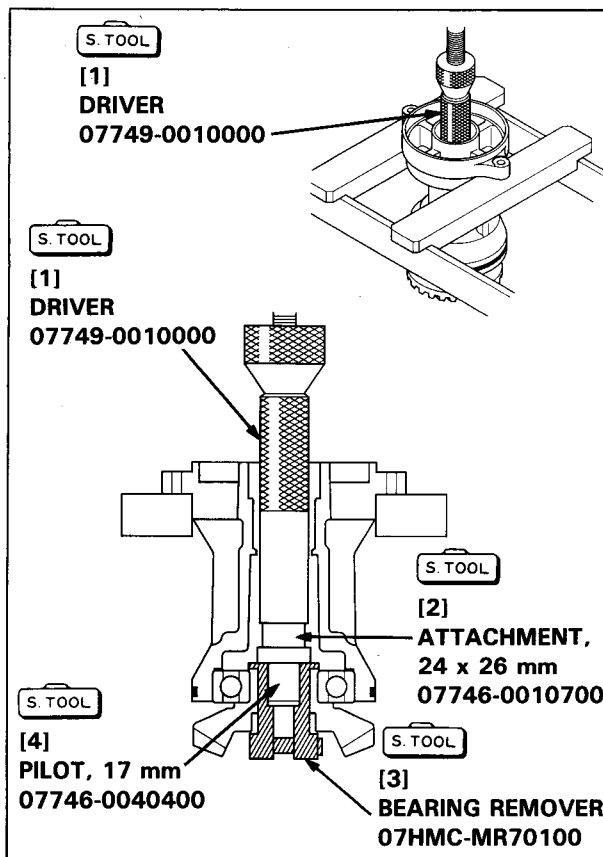
- 1) Remove the 30 x 45 x 7 mm water seals (P. 11-11).
- 2) Using the hydraulic press and the special tools as shown, remove the reverse bevel gear and 6208 radial ball bearing as an assembly.

#### CAUTION:

Remove the reverse bevel gear/6208 radial ball bearing using a hydraulic press. Do not try to remove the reverse bevel gear/6208 radial ball bearing by striking with a hammer.

#### TOOLS:

Driver	07749-0010000
Attachment, 24 x 26 mm	07746-0010700
Pilot, 17 mm	07746-0040400
Bearing remover	07HMC-MR70100

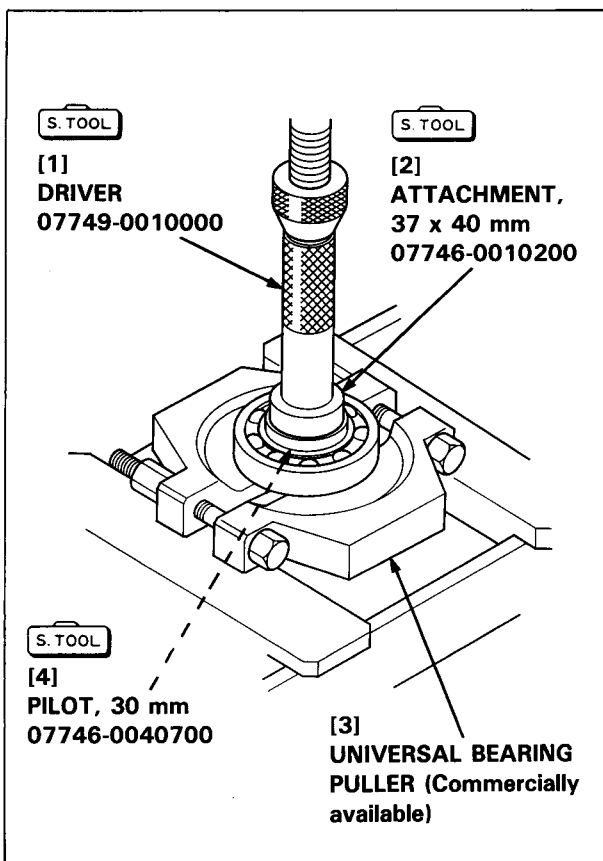


- 3) Set the commercially available universal bearing puller between the reverse bevel gear and the bearing.

- 4) Remove the reverse bevel gear from the bearing using the hydraulic press and the special tools.

#### TOOLS:

Driver	07749-0010000
Attachment, 37 x 40 mm	07746-0010200
Pilot, 30 mm	07746-0040700



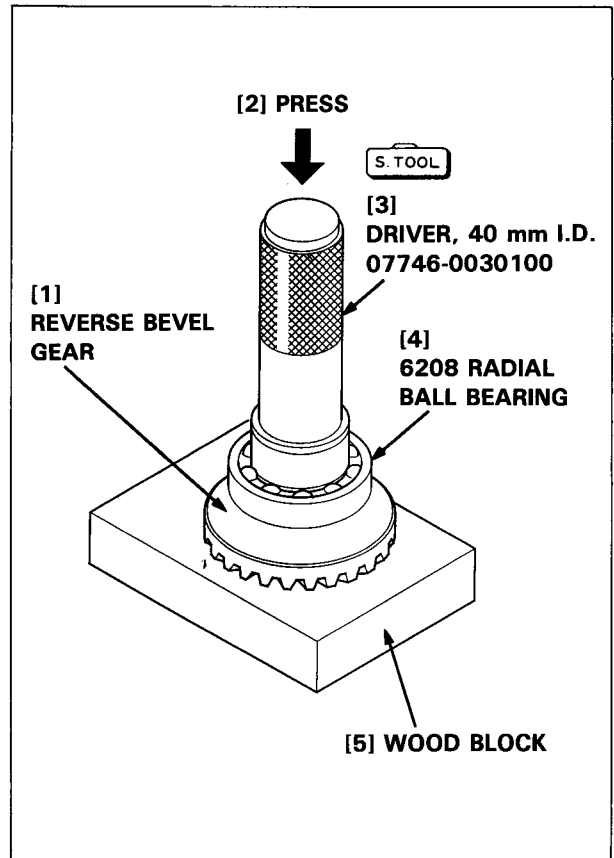
### INSTALLATION:

- 1) Place a wood block under the reverse bevel gear.
- 2) Check the bearing for play and abnormal sound by turning it by hand. Replace the bearing with a new one if necessary.
- 3) Apply gear oil to the entire surface of the bearing, and drive the bearing into the reverse bevel gear using the special tool and hydraulic press.
- 4) Remove the 94 x 4.1 mm O-ring from the propeller shaft holder (P. 11-8).

### TOOL:

Driver, 40 mm I.D.

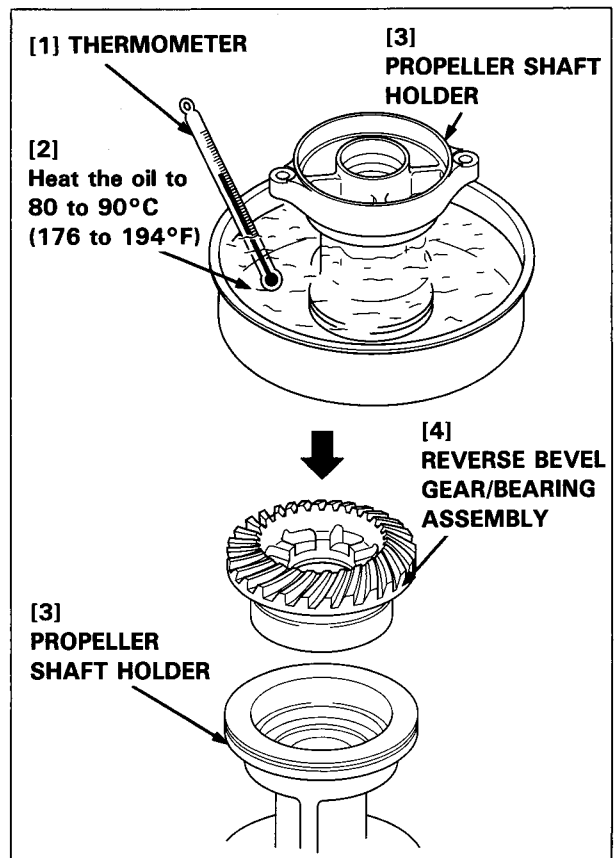
07746-0030100



- 5) Soak the propeller shaft holder in the container filled with oil with the bearing installation side toward down.
- 6) Heat the oil to 80 to 90°C (176 to 194 °F).
- 7) After the entire of the propeller shaft holder becomes hot, remove the holder from the container and install the reverse bevel gear/bearing assembly on the propeller shaft holder quickly.

### CAUTION:

- Do not heat the oil above 90°C (194°F).
- The entire of the holder becomes hot. Be sure to wear the gloves during the operation.



## 6. VERTICAL SHAFT/BEVEL GEAR

### a. DISASSEMBLY/ASSEMBLY

- 1) Remove the propeller (P. 11-1) and gear case assembly (P. 11-2).
- 2) Remove the water pump/shift rod (P. 11-4), and remove the propeller shaft holder assembly (P. 11-7).

#### [1] VERTICAL SHAFT

##### INSPECTION: P. 11-17

##### INSTALLATION:

Clean the taper of the pinion gear installation section with degreasing cleaning agent before installation.

#### [2] 64 mm LOCK NUT

##### REMOVAL/ INSTALLATION: P. 11-18

##### TORQUE:

98 N·m (10.0 kgf·m, 72 lbf·ft)

#### [3] 30 x 62 x 21.25 TAPER ROLLER BEARING (Outer race)

##### INSTALLATION:

Apply gear oil to the circumference of the taper roller bearing.

#### [14] OIL SLINGER

##### INSTALLATION:

Install by aligning the projection on the inner wall of the oil slinger with the groove of the vertical shaft.



#### [13] 1-1/8 x 1-1/2 x 1-1/4 NEEDLE BEARING

##### REMOVAL: P. 11-20

##### INSTALLATION: P. 11-21

Apply grease to the circumference of the bearing.

#### [4]

#### 30 x 62 x 21.25 TAPER ROLLER BEARING (Inner race)

##### REMOVAL: P. 11-21

##### INSTALLATION: P. 11-22

- Check for rust and damage. Replace together with the outer race as a set if necessary.
- Apply gear oil to the inner wall and roller.

#### [5] PINION GEAR SHIM

##### SELECTION: P. 11-23

#### [6] FORWARD BEVEL GEAR

##### INSPECTION: P. 11-17

Check the gear for wear and damage. Replace if necessary.



#### [7]

#### 50 x 82 x 21.5 TAPER BEARING (Inner race)

##### REMOVAL/

##### INSTALLATION: P. 11-19

Apply grease to the inner wall of the bearing.

#### [12] GEAR CASE

##### Gear oil capacity:

1.0 l (1.06 US qt, 0.88 Imp qt)

##### Recommended gear oil:

MARINE SEA 90 Hypoid gear oil  
API service Classification  
(GL-4 or GL-5)

#### [11] PINION GEAR

##### INSPECTION:

Check the gear for wear and damage, and replace if necessary.

##### INSTALLATION:

Clean the taper with degreasing cleaning agent before installation.

#### [10] PINION GEAR NUT

##### REMOVAL/ INSTALLATION: P. 11-18

##### TORQUE:

103 N·m (10.5 kgf·m, 76 lbf·ft)

#### [9] FORWARD BEVEL GEAR SHIM

##### SELECTION: P. 11-27



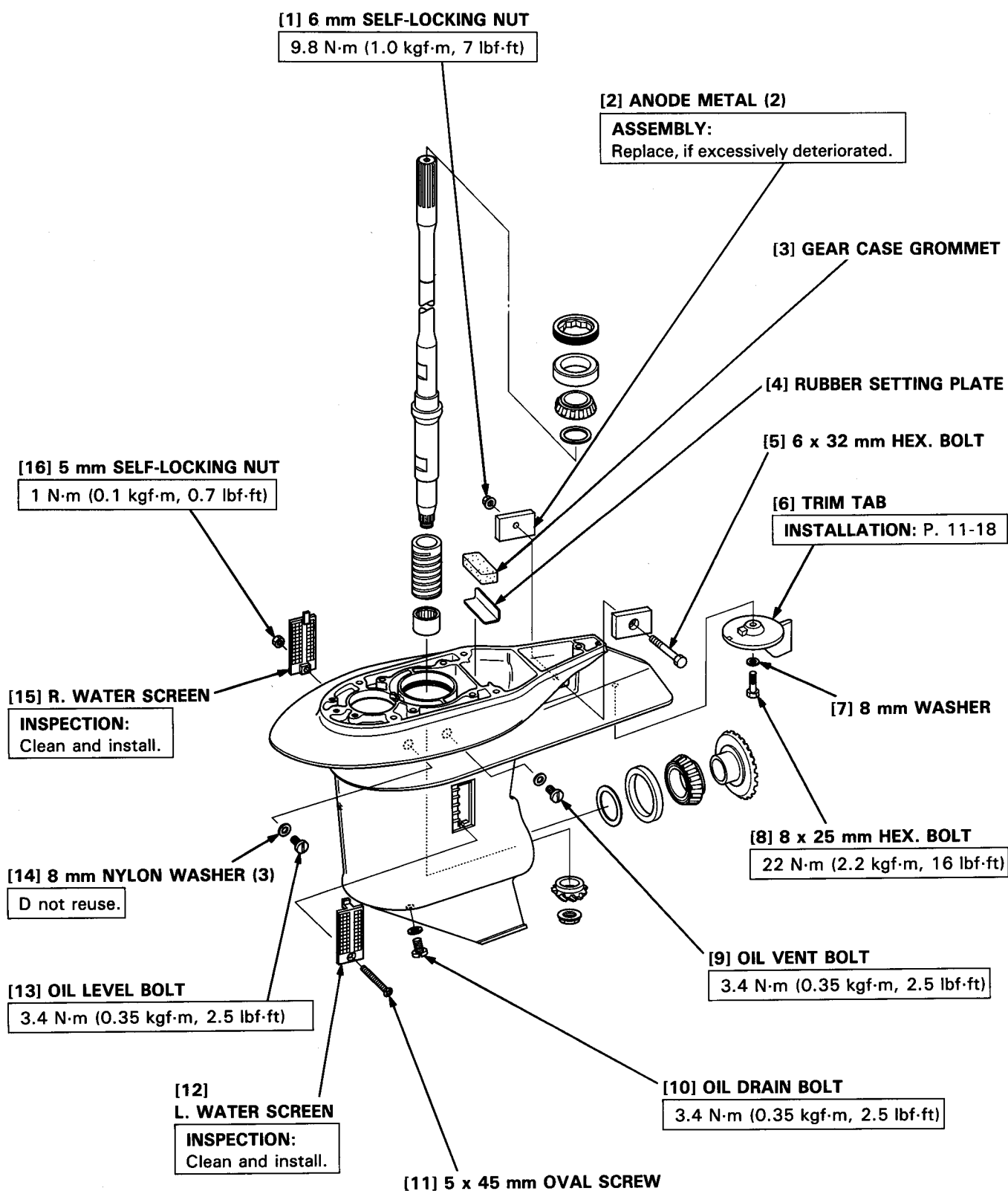
#### [8]

#### 50 x 82 x 21.5 TAPER BEARING (Outer race)

##### REMOVAL/

##### INSTALLATION: P. 11-20

- Replace together with the inner race as a set.
- Apply grease to the circumference of the bearing.

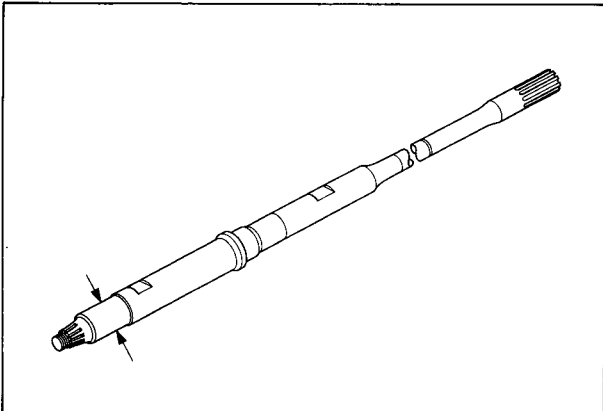




**b. INSPECTION**

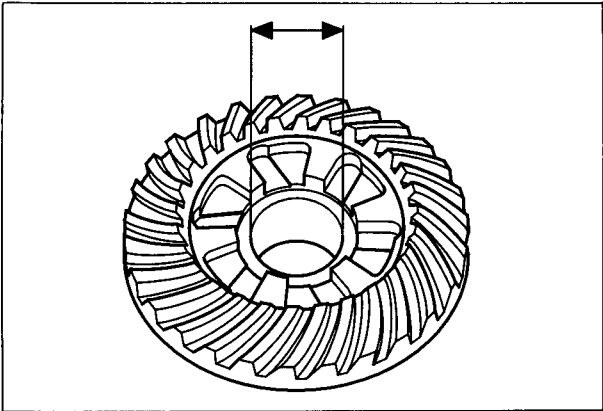
- **VERTICAL SHAFT O.D. (At needle bearing)**

STANDARD	SERVICE LIMIT
28.566 – 28.575 mm (1.1246 – 1.1250 mm)	28.545 mm (1.1238 in)



- **FORWARD BEVEL GEAR I.D.**

STANDARD	SERVICE LIMIT
26.000 – 26.021 mm (1.0236 – 1.0244 in)	26.04 mm (1.025 in)



### c. REMOVAL/INSTALLATION

#### • PINION GEAR NUT

##### REMOVAL:

- 1) Attach the special tool to the vertical shaft end.
- 2) Use a shop towel or equivalent cloth to protect the gear case as shown.
- 3) Holding the special tool, remove the pinion gear nut.

##### TOOL:

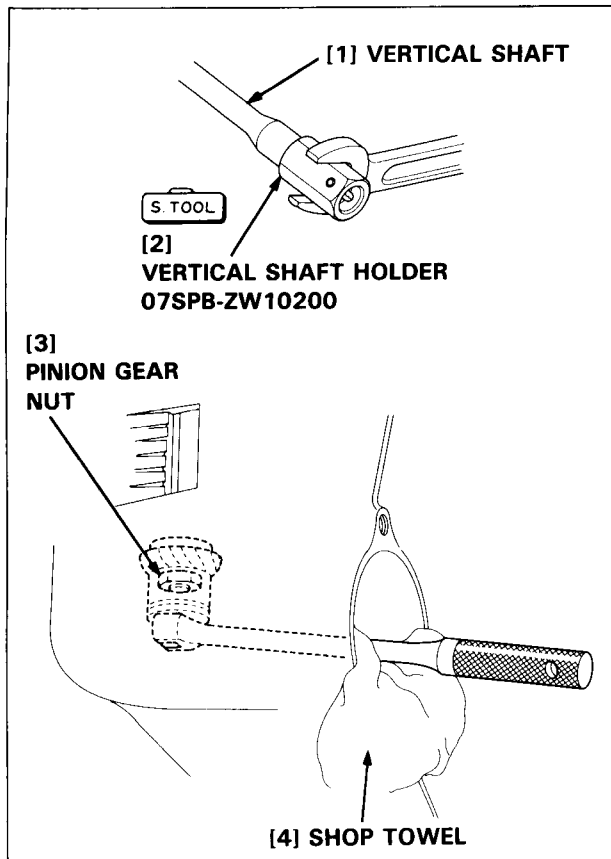
Vertical shaft holder 07SPB-ZW10200

##### INSTALLATION:

Be sure that the forward bevel gear is mounted properly.

- 1) Clean the vertical shaft and the tapered part of the pinion gear thoroughly with degreasing cleaning agent.
- 2) Tighten the pinion gear nut to the specified torque in the same procedure as of removal.

**TORQUE: 103 N·m (10.5 kgf·m, 76 lbf·ft)**



#### • 64 mm LOCK NUT

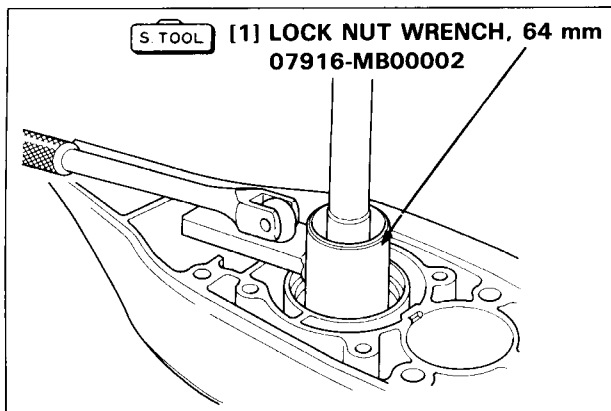
##### REMOVAL/INSTALLATION:

Remove/install the 64 mm lock nut using the special tool.

**TORQUE: 98 N·m (10.0 kgf·m, 72 lbf·ft)**

##### TOOL:

Lock nut wrench, 64 mm 07916-MB00002

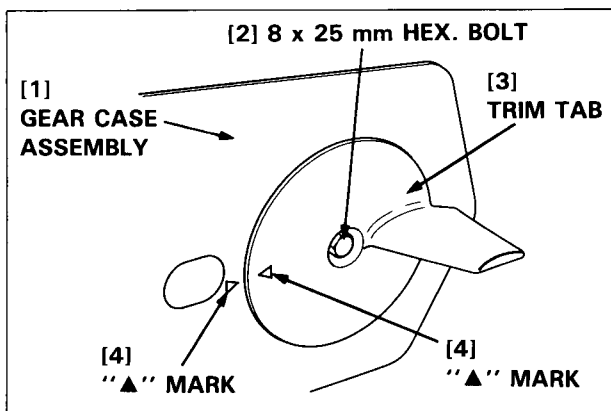


#### • TRIM TAB

##### INSTALLATION:

Align the "▲" mark on the trim tab with the "▲" mark on the gear case assembly, then install the trim tab. Tighten the 8 x 25 mm hex. bolt to the specified torque.

**TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)**



### • 50 x 82 x 21.5 TAPER BEARING (Inner race)

#### REMOVAL:

- 1) Set the commercially available universal bearing puller between the taper bearing (inner race) and forward bevel gear.
- 2) Set the special tools on the taper bearing (inner race) as shown, and drive out the taper bearing (inner race) using the hydraulic press.

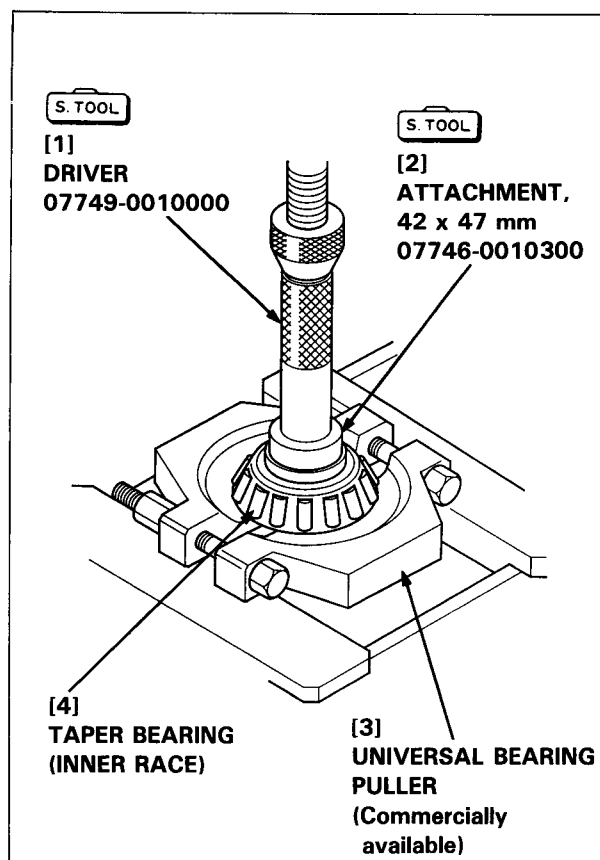
#### TOOLS:

Driver

07749-0010000

Attachment, 42 x 47 mm

07746-0010300



#### INSTALLATION:

- 1) Apply grease to the inner wall of the taper bearing (inner race).
- 2) Place a wood block under the forward bevel gear.
- 3) Drive the taper bearing into the forward bevel gear using the special tools and hydraulic press as shown.

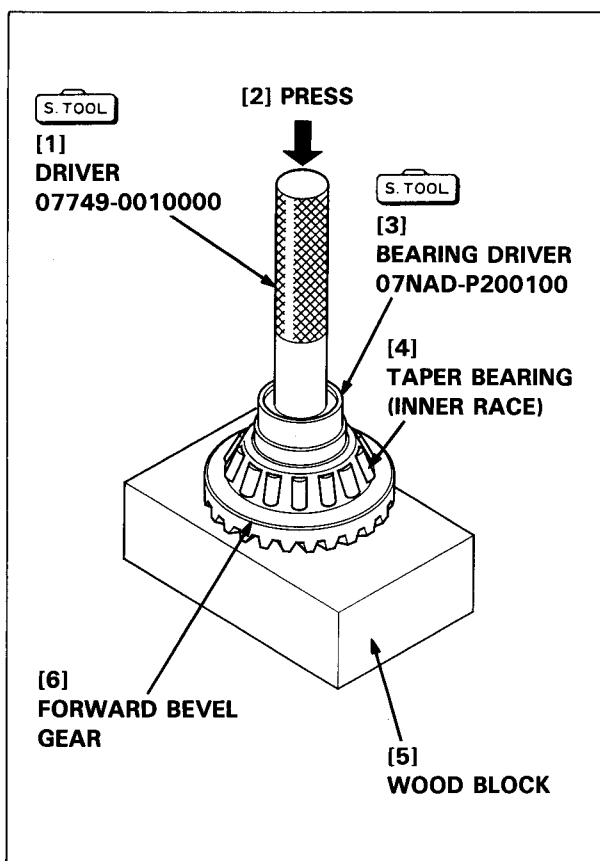
#### TOOLS:

Driver

07749-0010000

Bearing driver

07NAD-P200100



### • 50 x 82 x 21.5 TAPER BEARING (Outer race)

#### REMOVAL:

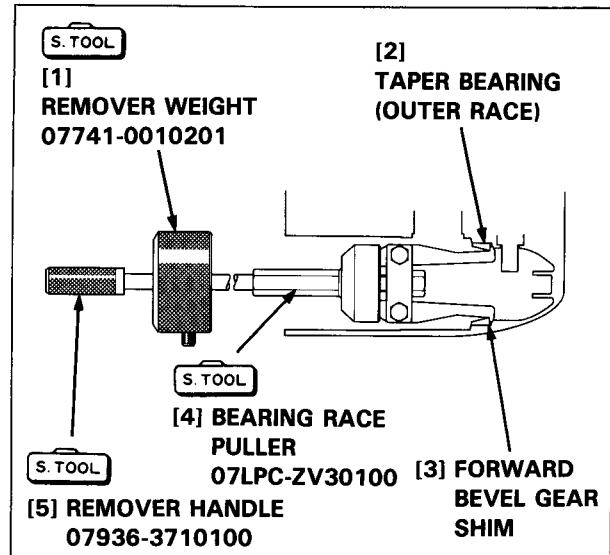
- 1) Remove the vertical shaft (P. 11-15).
- 2) Remove the taper bearing (outer race) using the special tools.  
Remove the forward bevel gear shim.

#### NOTE:

Replace the taper bearing (outer race) and the taper bearing (inner race) as a set on disassembly.

#### TOOLS:

Bearing race puller	07LPC-ZV30100
Remover weight	07741-0010201
Remover handle	07936-3710100



#### INSTALLATION:

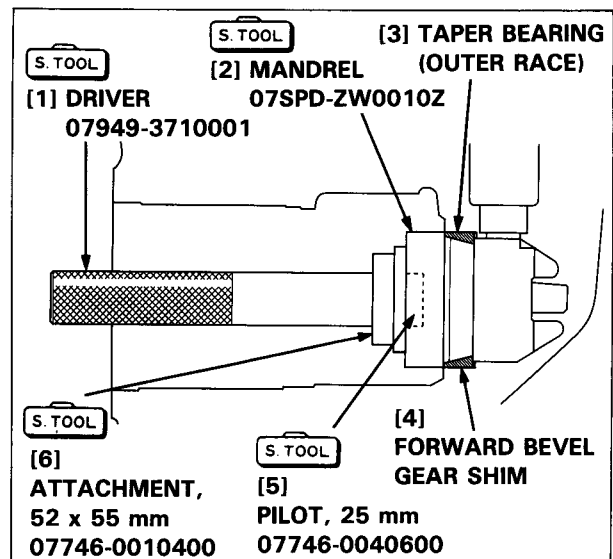
#### NOTE:

Install the new taper bearing with the larger I.D. side facing out.

- 1) Place the forward bevel gear shim in the gear case.
- 2) Apply grease to the circumference of a new taper bearing, and set the bearing in the gear case.
- 3) Install the taper bearing (outer race) in the gear case using the special tools as shown.

#### TOOLS:

Driver	07949-3710001
Attachment, 52 x 55 mm	07746-0010400
Pilot, 25 mm	07746-0040600
Mandrel	07SPD-ZW0010Z



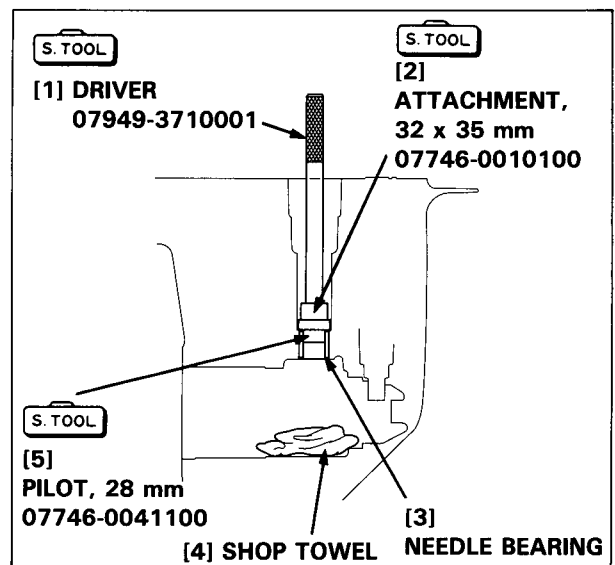
### • 1-1/8 x 1-1/2 x 1-1/4 NEEDLE BEARING

#### REMOVAL:

- 1) Set the special tools on the needle bearing as shown.  
Place a shop towel or equivalent material under the needle bearing.

#### TOOLS:

Driver	07949-3710001
Attachment, 32 x 35 mm	07746-0010100
Pilot, 28 mm	07746-0041100



- 2) Before removing the needle bearing, mark the special tool (driver) in the same position as on the gear case end using a straight edge or equivalent tool as shown.

- 3) Remove the needle bearing from the gear case using the special tools.

**NOTE:**

- Remove the needle bearing with care not to damage the gear case.
- Replace the needle bearing.

**TOOLS:**

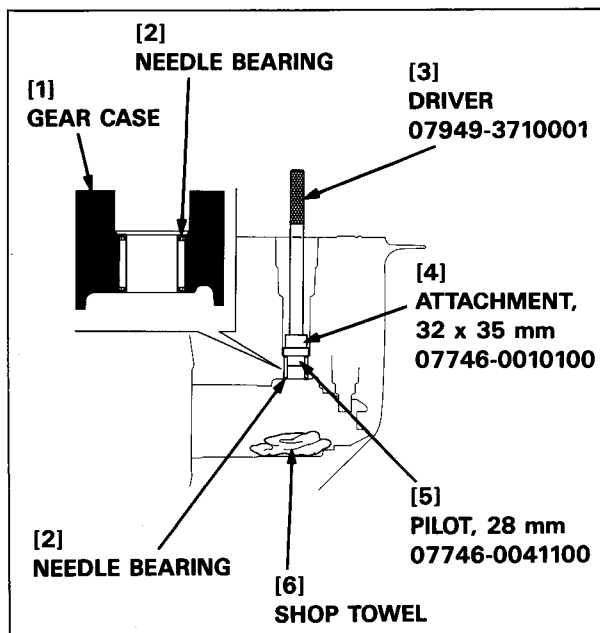
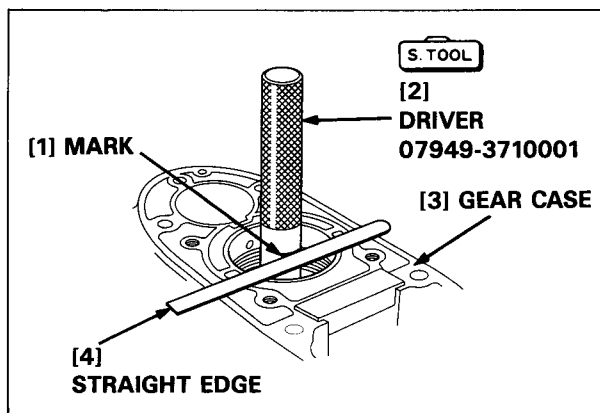
Driver	07949-3710001
Attachment, 32 x 35 mm	07746-0010100
Pilot, 28 mm	07746-0041100

**INSTALLATION:**

- 1) Apply grease to the circumference of the new needle bearing.
- 2) Using the special tools, drive in the needle bearing deep to the marked level on the special tool (driver) that was marked on removal.
- 3) After installation of the needle bearing, check whether the underside of the bearing is level with the bottom of the gear case.

**TOOLS:**

Driver	07949-3710001
Attachment, 32 x 35 mm	07746-0010100
Pilot, 28 mm	07746-0041100



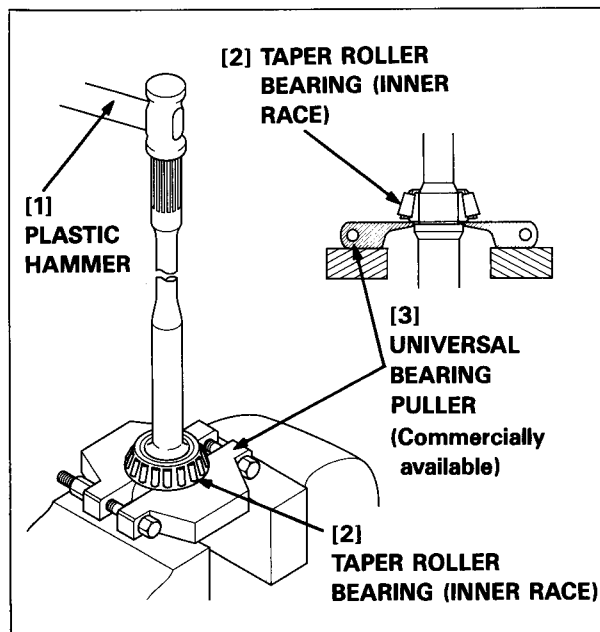
**• 30 x 62 x 21.25 TAPER ROLLER BEARING (Inner race)**

**REMOVAL:**

- 1) Set the commercially available universal bearing puller on the taper roller bearing (inner race), then set the universal bearing puller on the vice.
- 2) Remove the taper roller bearing by tapping on the end of the vertical shaft using a plastic hammer.

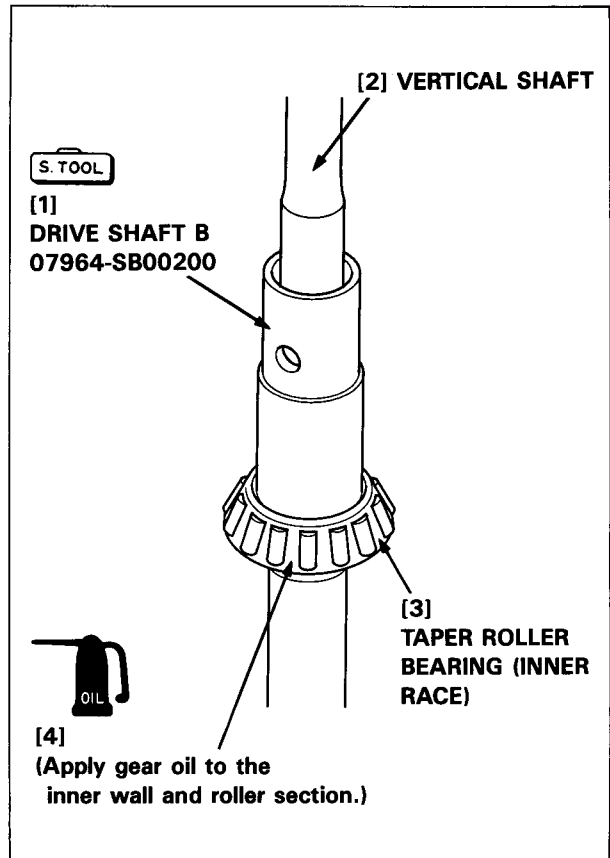
**NOTE:**

- Do not hold the vertical shaft with a vise. Use a plastic hammer to tap on the end of the vertical shaft.



### INSTALLATION:

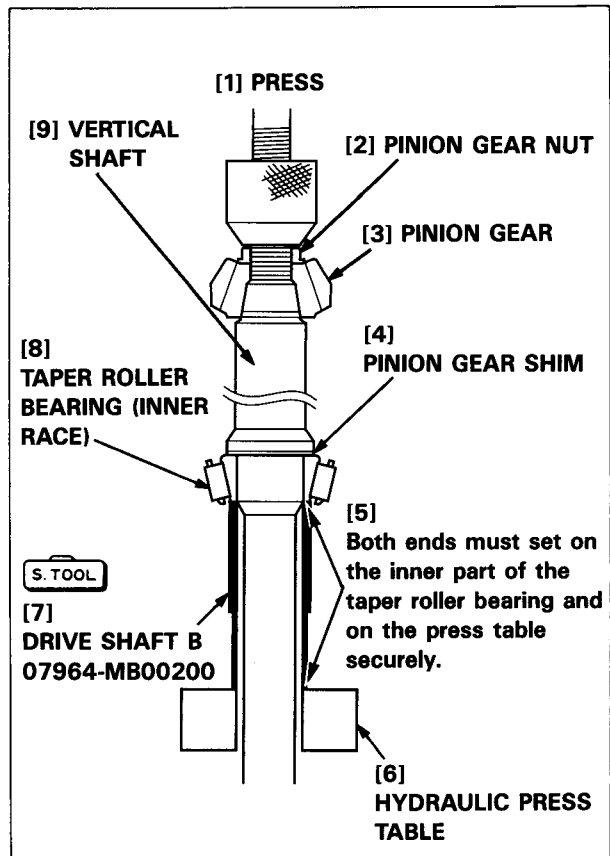
- 1) Set the pinion gear on the vertical shaft and temporarily tighten the pinion gear nut by hand.
- 2) Apply gear oil to the inner wall and the roller section of the taper roller bearing (inner race).
- 3) Set the pinion gear shim, taper roller bearing (inner race) and the special tool on the vertical shaft.



- 4) Set the vertical shaft upright on the hydraulic press with the pinion gear side toward up as shown.
- 5) Install the taper roller bearing (inner race) on the vertical shaft using the hydraulic press.

### NOTE:

- Be sure that the ends of the special tool securely set on the inner part of the taper roller bearing and on the hydraulic press table respectively.
- Take care not to damage the threaded part (i.e. pinion gear nut installation part) at the end of the vertical shaft.



## 7. SHIM SELECTION

### • PINION GEAR SHIM

Remove the 30 x 62 x 21.25 taper roller bearing (inner race) if it is mounted on the vertical shaft (P. 11-15).

- 1) Wipe the tapered part of the vertical shaft and pinion gear with a shop towel and a degreasing cleaning solvent to clean.
- 2) Install the pinion gear on the vertical shaft and tighten the pinion gear nut to the specified torque.

**TORQUE: 103 N·m (10.5 kgf·m, 76 lbf·ft)**

#### NOTE:

- Do not install the vertical shaft in the gear case.
- We recommend that you attach the special tool (vertical shaft holder) at the end of the vertical shaft to facilitate tightening of the pinion gear nut to the specified torque (P. 11-18).

- 3) Note that the special tool stamped A is for the taper roller bearing side.  
The special tool stamped B is for the pinion gear side.

- 4) Push the special tool against the pinion gear with the side stamped B toward up (i.e. taper roller bearing side) as shown, and tighten the bolts by hands.

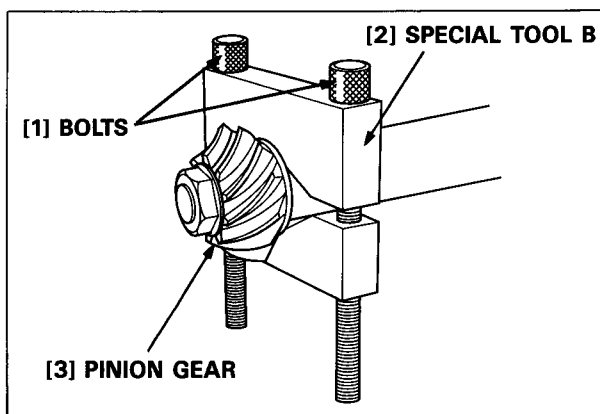
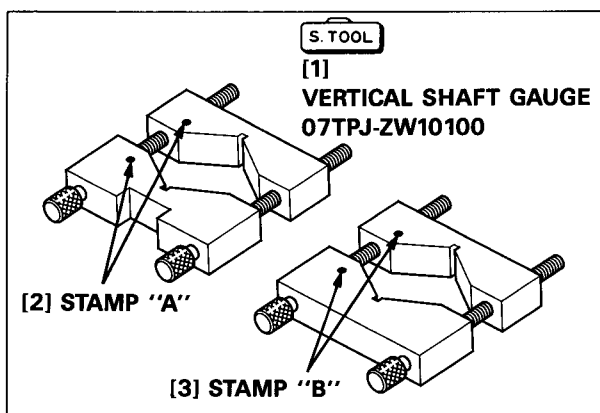
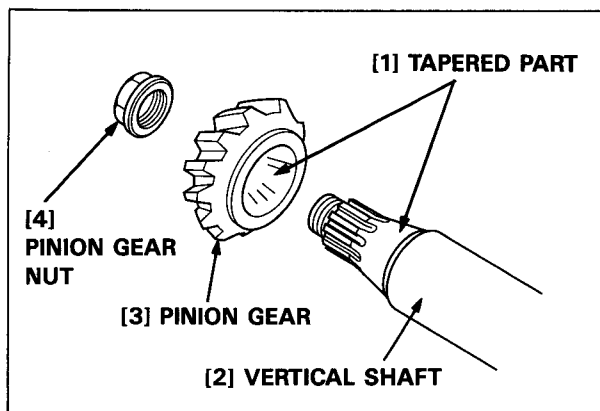
#### NOTE:

- Do not tighten the bolts with a tool.
- There must be no wobbling in the special tool. It must securely set on the pinion gear.

#### TOOL:

Vertical shaft gauge

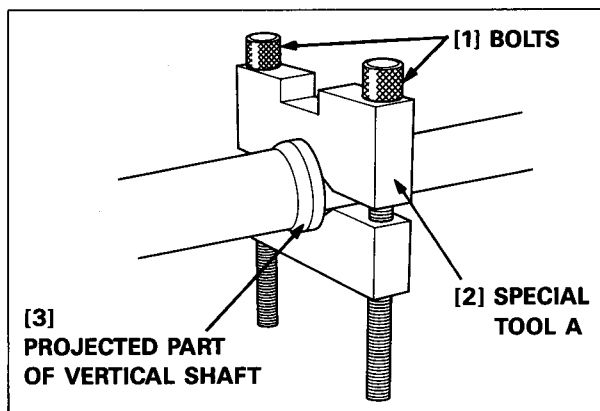
07TPJ-ZW10100



- 5) Push the special tool against the projected part (i.e. pinion gear side) of the vertical shaft with the side stamped A toward up (i.e. opposite side from the pinion gear) as shown, and tighten the bolts by hands.

#### NOTE:

- Do not tighten the bolts with a tool.
- There must be no wobbling in the special tool. It must securely set on the vertical shaft.



- 6) Hold the vertical shaft upright (with the pinion gear toward down).
- 7) Set the commercially available depth gauge in the concave of the upper special tool, and measure and record the height (actual measurement value) between the special tools.

- 8) Record the check size stamped on the side of the special tool A and B.
- 9) Calculate the vertical shaft length (distance D) using the measurement obtained in the above step 7 and 8 and the following formula.

**Formula:**

Height between the special tools (actual measurement) -  
Check size on the special tool A + Check size on the special tool B = Vertical shaft length (distance D)

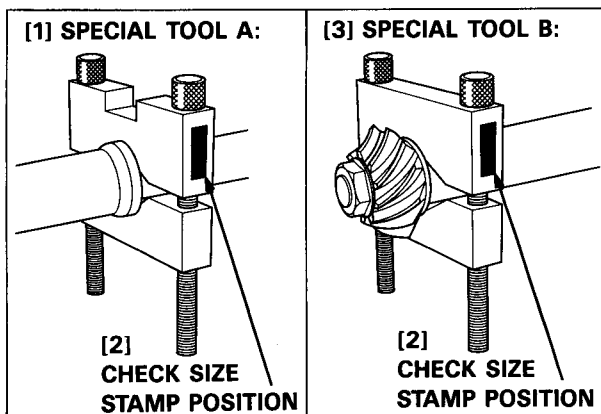
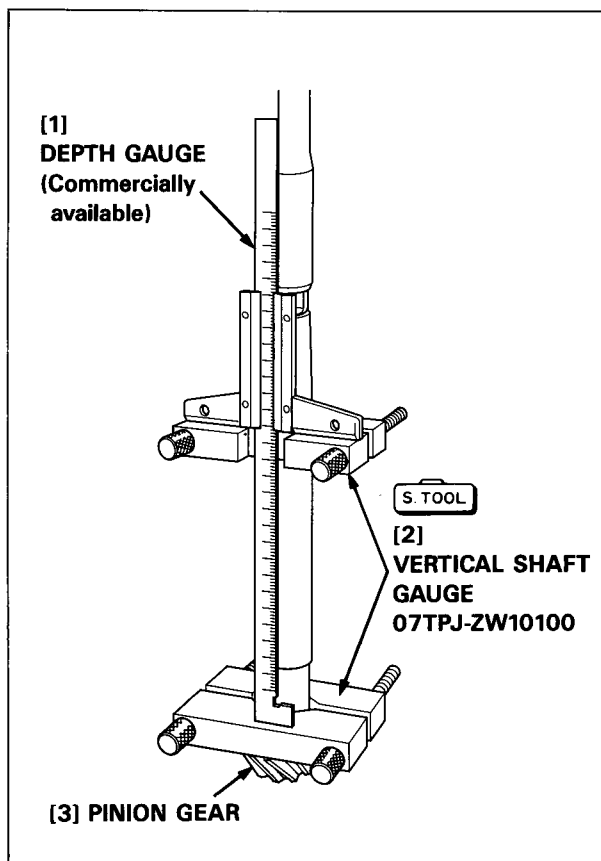
**Example:**

When, Height between the special tools (actual measurement) is 158.6 mm (6.244 in), Check size stamped on the special tool A is 15.8 mm (0.62 in),

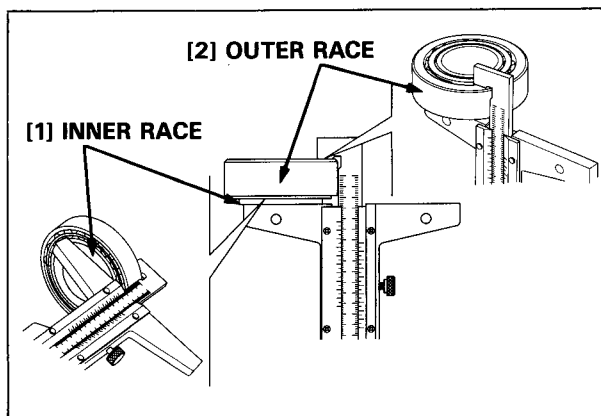
And, Check size stamped on the special tool B is 15.7 mm (0.61 in):

$$158.6 - 15.8 + 15.7 = 158.5$$

Therefore, the vertical shaft length (distance D) is 158.5 mm (6.240 in).



- 10) Assemble the outer race and inner race of the 30 x 62 x 21.25 taper roller bearing.
- 11) Measure the bearing height from the outer race end to the inner race end as shown, and record the measurement.





12) Measure the height of the 30 x 62 x 21.25 taper roller bearing outer race and record the measurement.

13) Calculate the gap (distance E) between the outer race and inner race using the measurements obtained in the step 11 and 12 and the following formula.

**Formula:**

Bearing height — Outer race height = Gap (distance E)

**Example:**

When, bearing height from the outer race end to the inner race end is 21.25 mm,

And, outer race height is 17.00 mm (0.669 in):

$$21.25 - 17.00 = 4.25$$

Therefore, the gap (distance E) is 4.25 mm (0.167 in).

14) Determine the calculation value using the vertical shaft length (distance D) obtained in step 9 and the gap (distance E) obtained in step 13 and the following formula.

**Formula:**

Vertical shaft length (distance D) + Gap (distance E) — 162.95 = Calculation value.

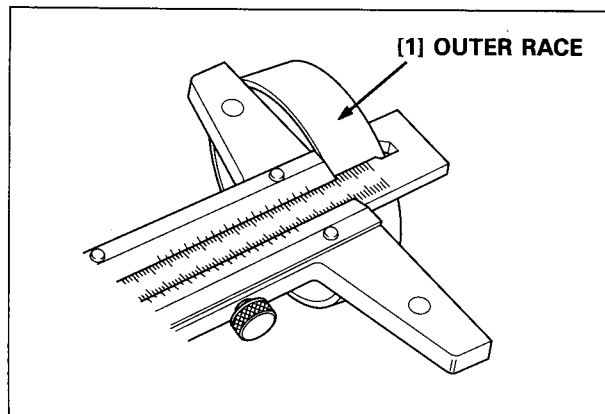
**Example:**

When, vertical shaft length (distance D) is 158.5 mm (6.240 in),

And, gap (distance E) is 4.25 mm (0.167 in):

$$158.5 + 4.25 - 162.95 = -0.20$$

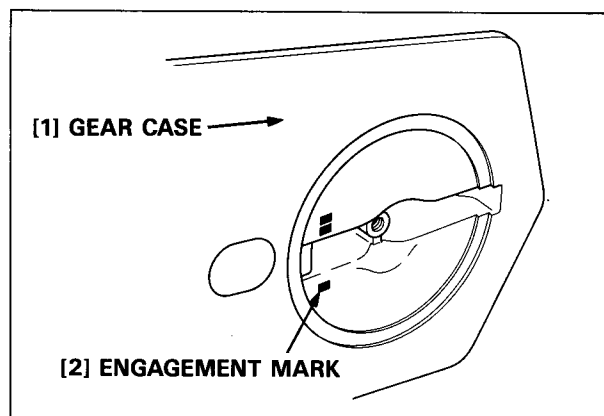
Therefore, the calculation value is —0.20 mm (—0.008 in).



15) Cross reference the calculation value and the engagement mark located on the trim tab installation part of the gear case, and select the shim of the appropriate thickness from the shim selection table accordingly.

• Shim type table

[1] Parts name	[2] Thickness
[3] Pinion gear shim A	0.10 mm (0.0039 in)
[4] Pinion gear shim B	0.15 mm (0.0060 in)
[5] Pinion gear shim C	0.30 mm (0.0118 in)
[6] Pinion gear shim D	0.50 mm (0.0197 in)



### • Pinion gear shim selection table

[3] Unit: mm (in)

		[2] Calculation value								
		0.57 (0.022) – 0.55 (0.021)	0.55 (0.021) – 0.50 (0.020)	0.50 (0.020) – 0.45 (0.018)	0.45 (0.018) – 0.40 (0.016)	0.40 (0.016) – 0.35 (0.014)	0.35 (0.014) – 0.30 (0.012)	0.30 (0.012) – 0.25 (0.010)	0.25 (0.010) – 0.20 (0.008)	0.20 (0.008) – 0.15 (0.006)
[1] Engagement mark on the gear case	F	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)	0.60 (0.024)	0.65 (0.026)	0.70 (0.028)	0.75 (0.030)
	E	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)	0.60 (0.024)	0.65 (0.026)	0.70 (0.028)
	D	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)	0.60 (0.024)	0.65 (0.026)
	C	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)	0.60 (0.024)
	B	0.15 (0.006)	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)
	A	0.10 (0.004)	0.15 (0.006)	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)

[3] Unit: mm (in)

		[2] Calculation value							
		0.15 (0.006) – 0.10 (0.004)	0.10 (0.004) – 0.05 (0.002)	0.05 (0.002) – 0 (0.000)	0 (0.000) – –0.05 (–0.002)	–0.05 (–0.016) – –0.10 (–0.004)	–0.10 (–0.004) – –0.15 (–0.006)	–0.15 (–0.006) – –0.20 (–0.008)	–0.20 (–0.008) – –0.25 (–0.010)
[1] Engagement mark on the gear case	F	0.80 (0.031)	0.85 (0.033)	0.90 (0.035)	0.95 (0.037)	1.00 (0.039)	1.05 (0.041)	1.10 (0.043)	1.15 (0.045)
	E	0.75 (0.030)	0.80 (0.031)	0.85 (0.033)	0.90 (0.035)	0.95 (0.037)	1.00 (0.039)	1.05 (0.041)	1.10 (0.043)
	D	0.70 (0.028)	0.75 (0.030)	0.80 (0.031)	0.85 (0.033)	0.90 (0.035)	0.95 (0.037)	1.00 (0.039)	1.05 (0.041)
	C	0.65 (0.026)	0.70 (0.028)	0.75 (0.030)	0.80 (0.031)	0.85 (0.033)	0.90 (0.035)	0.95 (0.037)	1.00 (0.039)
	B	0.60 (0.024)	0.65 (0.026)	0.70 (0.028)	0.75 (0.030)	0.80 (0.031)	0.85 (0.033)	0.90 (0.035)	0.95 (0.037)
	A	0.55 (0.022)	0.60 (0.024)	0.65 (0.026)	0.70 (0.028)	0.75 (0.030)	0.80 (0.031)	0.85 (0.033)	0.90 (0.035)

### • How to read shim selection table

When the engagement mark on the gear case is E and the calculation value is  $-0.2$  mm ( $-0.008$  in) or more, the shim thickness is  $1.05$  mm ( $0.041$  in). (See Example 1 below.)

When the calculation value is less than  $-0.2$  mm ( $-0.008$  in), the shim thickness is  $1.10$  mm ( $0.043$  in). (See Example 2 below.)

#### [1] Example 1:

[6] Unit: mm (in)

		[2] Calculation value	
		[3] $-0.20$ mm ( $-0.008$ in) or above to less than $-0.15$ mm ( $-0.006$ in)	
	F		
	E	1.05 (0.041)	

#### [4] Example 2:

[6] Unit: mm (in)

		[2] Calculation value	
		[5] $-0.25$ mm ( $-0.010$ in) or above to less than $-0.20$ mm ( $-0.008$ in)	
	F		
	E	1.10 (0.043)	

### • Shim combination

To obtain  $1.05$  mm ( $0.041$  in) of shim thickness, combine five gear shim Bs and one gear shim C, or combine three gear shim Bs, one gear shim A and one gear shim D by referring to the shim type table.

### • FORWARD BEVEL GEAR SHIM

- 1) Assemble the outer race and the inner race of the new 50 x 82 x 21.5 taper bearing.
- 2) Measure the bearing height (distance F) from the outer race end to the inner race end as shown, and record the measurement.
- 3) Determine the calculation value using the bearing height (distance F) and the following formula.

#### Formula:

Bearing height (distance F) – 21.5 = Calculation value

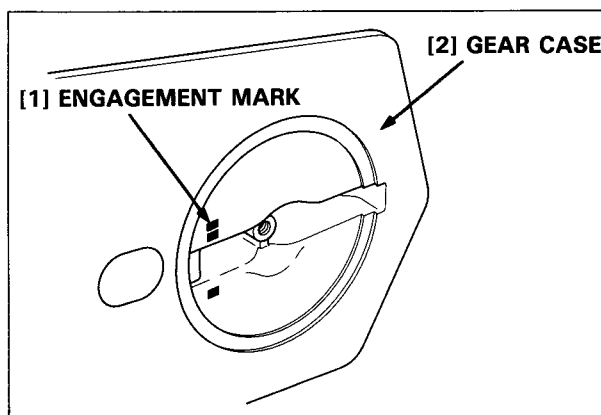
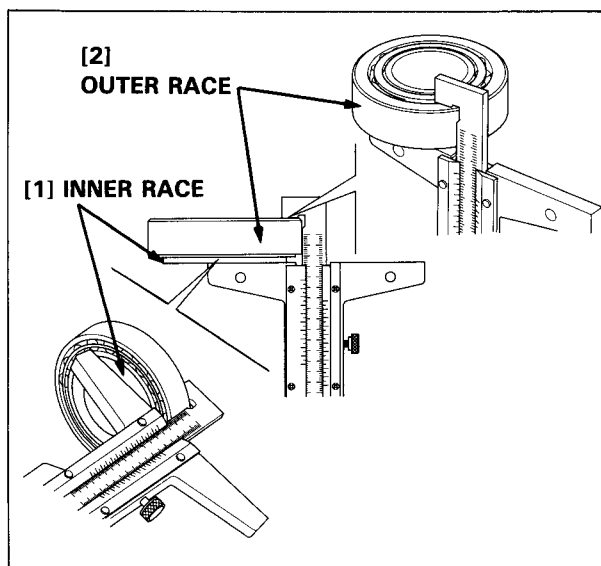
#### Example:

When bearing height (distance F) is 21.55 mm (0.848 in).

$$21.55 - 21.5 = 0.05$$

Therefore, the calculation value is 0.05 mm (0.002 in).

- 4) Cross reference the calculation value and the engagement mark located on the trim tab installation part of the gear case, and select the shim of the appropriate thickness from the shim selection table accordingly.



### • Shim type table

[1] Parts name	[2] Thickness
[3] Forward bevel gear shim A	0.10 mm (0.0039 in)
[4] Forward bevel gear shim B	0.15 mm (0.0060 in)
[5] Forward bevel gear shim C	0.30 mm (0.0118 in)
[6] Forward bevel gear shim D	0.50 mm (0.0197 in)

### • Forward bevel gear shim selection table

[3] Unit: mm (in)

		[2] Calculation value			
		0.20–0.15 (0.008–0.006)	0.15–0.10 (0.006–0.004)	0.10–0.05 (0.004–0.002)	0.05–0 (0.002–0.000)
[1] Engagement mark on the gear case	1	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)	0.60 (0.024)
	2	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)
	3	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)
	4	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)
	5	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)
	6	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)

Refer to page 11-26 for information on how to read the shim selection table and shim combination.

**• REVERSE BEVEL GEAR SHIM**

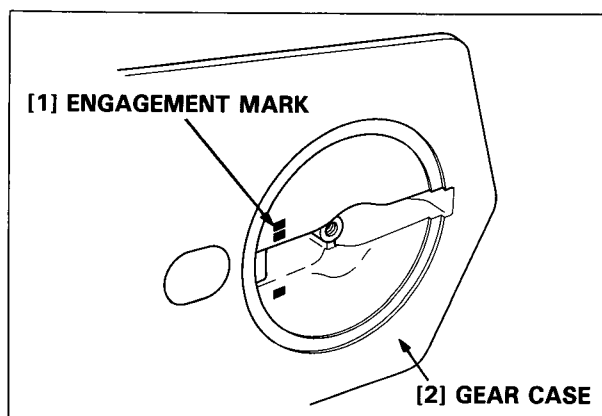
- 1) Refer to the engagement mark located on the trim tab installation part of the gear case, and select the shim of the appropriate thickness from the shim selection table accordingly.

**Example:**

When the engagement mark on the gear case is C, the appropriate shim thickness should be 0.25 mm (0.010 in).

**• Reverse bevel gear shim selection table**

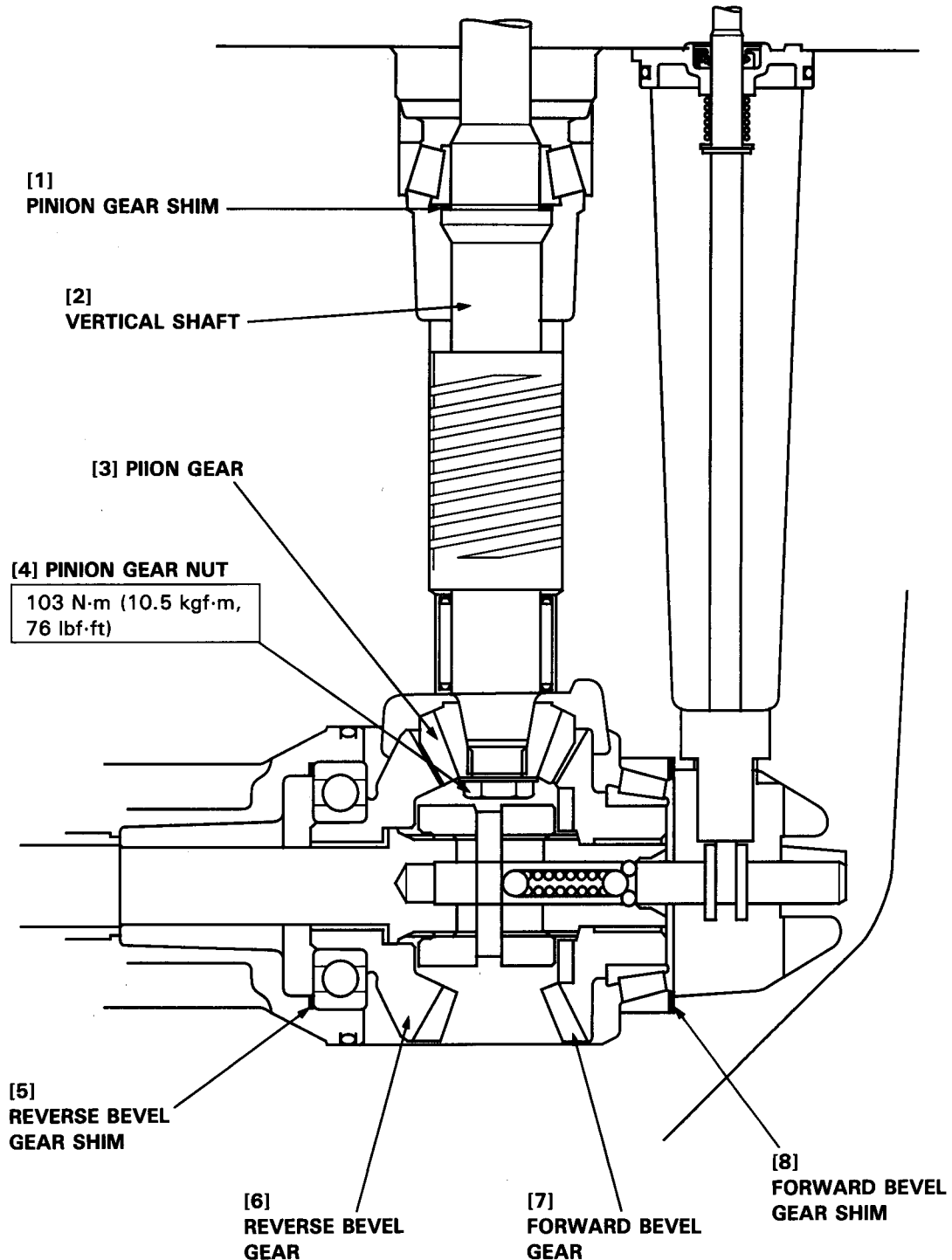
[1] Engagement mark on the gear case	[2] Thickness
A	0.15 mm (0.006 in)
B	0.20 mm (0.008 in)
C	0.25 mm (0.010 in)
D	0.30 mm (0.012 in)
E	0.35 mm (0.014 in)
F	0.40 mm (0.016 in)

**• Shim type table**

[1] Parts name	[2] Thickness
[3] Reverse bevel gear shim A	0.10 mm (0.0039 in)
[4] Reverse bevel gear shim B	0.15 mm (0.0060 in)
[5] Reverse bevel gear shim C	0.30 mm (0.0118 in)
[6] Reverse bevel gear shim D	0.50 mm (0.0197 in)

Refer to page 11-26 for information on how to read the shim selection table and shim combination.

## 8. SHIM POSITION



## 9. BACKLASH ADJUSTMENT

### • FORWARD BEVEL GEAR BACKLASH

Backlash adjustment must be made after adjustment of each gear shim (p. 11-23 through 28).

Install the parts except the water pump in the gear case (p. 11-7 and 15).

- 1) Set the vertical shaft vertically.
- 2) Raise the adjusting nut, i.e. part ⑤ of the special tool, to the uppermost position.
- 3) Check whether the part ⑥ of the special tool is set on the part ⑤ securely.  
If not, tighten the set screw by aligning with the hole in the part ⑥.

#### NOTE:

Tighten with care not to let the end of the two set screws come out of the part ⑥ of the special tool.

- 4) Set the parts from ① to ⑤ of the special tool on the vertical shaft.

#### TOOL:

**Bearing preload tool**

**07SPJ-ZW0010Z**

- 5) Set the special tool (vertical shaft indicator attachment) on the special part ⑥, and tighten the set screws (Except XRTD type).

#### NOTE:

Do not not tighten the set screws with the part ⑤ of the special tool pushing down.

#### TOOL:

**Vertical shaft indicator attachment 07SPK – ZW10100**

- 6) Measure the clearance (distance A) between the end of the nut of the special tool part ⑤ and end of the adjusting nut as shown.

Calculate the amount of tightening the adjusting nut using the following formula.

#### Formula:

Clearance (distance A) + 25 mm (0.9 in)

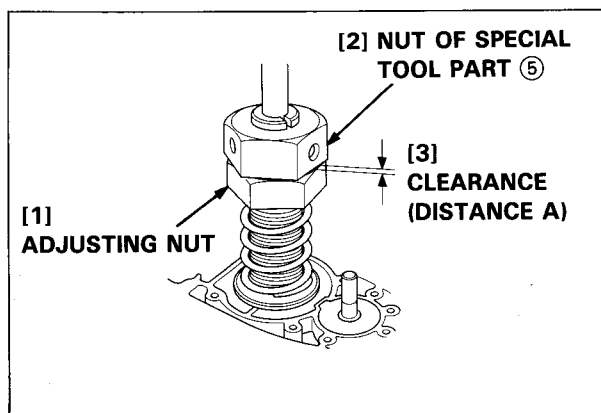
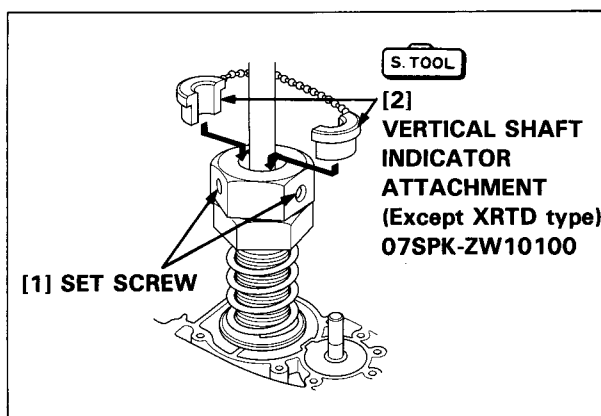
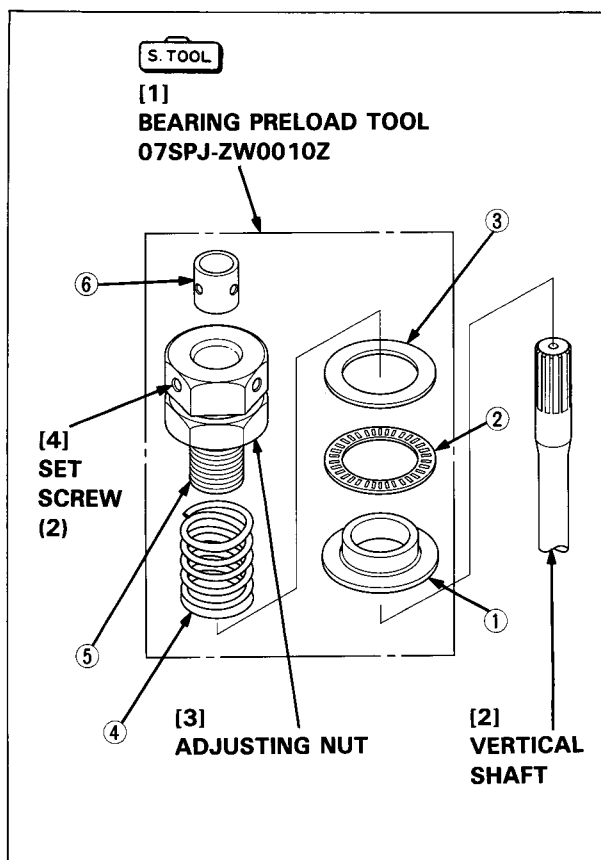
= Amount of tightening adjusting nut

Clearance between the end of the nut of the special tool part ⑤ and end of the adjusting nut.

#### Example:

When clearance (distance A) is 1 mm (0.04 in) :  $1 + 25 = 26$   
Therefore, the amount of tightening of the adjusting nut should be 26 mm (1.0 in).

- 7) Tighten the adjusting nut until the clearance between the end of the nut of the special tool part ⑤ and end of the adjusting nut is the calculated value.
- 8) After tightening the adjusting nut, turn the vertical shaft 5 to 10 times clockwise.



- 9) Hold the propeller shaft securely with the special tool as shown, and tighten the puller bolt (special tool) to the specified torque.

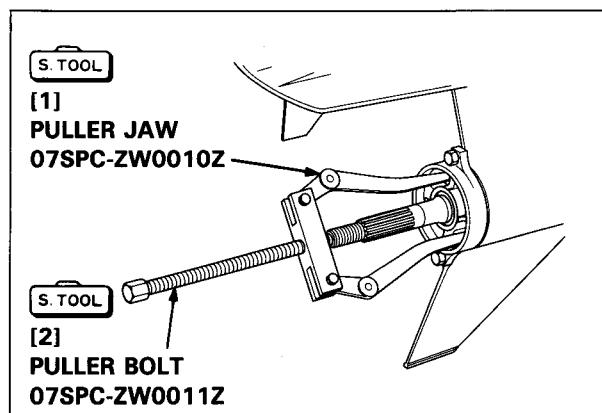
**TORQUE:** 5 N·m (0.5 kgf·m, 3.6 lbf·ft)

Turn the vertical shaft 5 to 10 times clockwise.

**TOOLS:**

Puller jaw  
Puller bolt

07SPC-ZW0010Z  
07SPC-ZW0011Z



- 10) Attach the special tool to the vertical shaft as shown, and adjust the dial gauge so its needle is at line "1" of the special tool.

- 11) Turn the vertical shaft lightly right or left and record the dial gauge reading.

Measure the backlash at the four points (by turning the vertical shaft 90°) in the same manner.

**NOTE:**

Do not turn the propeller shaft when turning the vertical shaft.

- 12) Obtain the forward bevel gear backlash using the dial gauge runout and the following formula.

**Formula:**

Dial gauge runout x 0.8 = Backlash

**Example:**

When, Dial gauge runout is 0.3 mm (0.012 in):  
0.3 x 0.8 = 0.24

Therefore, the backlash is 0.24 mm (0.009 in).

Standard value	0.10–0.28 mm (0.004–0.011 in)
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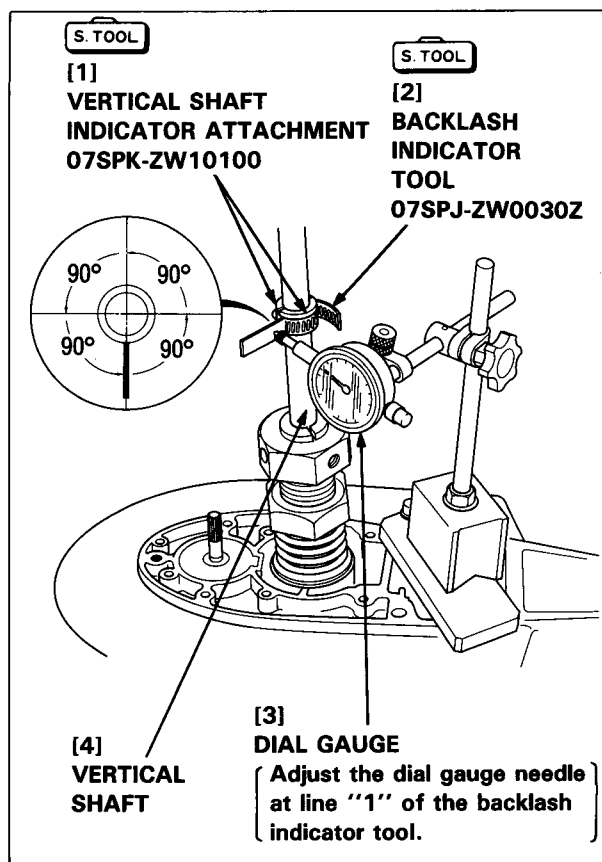
If the backlash is too large, increase the forward bevel gear shim thickness and recheck the backlash.

If the backlash is too small, reduce the forward bevel gear shim thickness and recheck the backlash.

**TOOLS:**

Vertical shaft indicator attachment  
Backlash indicator tool

07SPK-ZW10100  
07SPJ-ZW0030Z



### • REVERSE BEVEL GEAR BACKLASH

Reverse bevel gear backlash adjustment should be made after adjusting the forward bevel gear backlash (P. 11-30). Be sure that the special tools of the water pump mounting part and the vertical shaft are attached to the vertical shaft. If they are removed, install the special tools following the steps 1 through 8 and the step 10 on page 11-30.

- 1) Hold the propeller shaft with the special tool securely as shown.
- 2) Tighten the 18 mm castle nut to the specified torque.

**TORQUE: 1 N·m (0.1 kgf·m, 0.7 lbf·ft)**

If it is hard to set the split pin by tightening the castle nut to the specified torque, tighten the nut additionally until the split pin can be set.

Turn the vertical shaft 5 to 10 times clockwise.

#### TOOL:

**Propeller shaft holder** **07TPB-ZW10100**

- 3) Attach the tip of the dial gauge perpendicularly on the line of "1" of the special tool (backlash indicator tool).
- 4) Turn the vertical shaft lightly right or left and record the dial gauge reading.

Measure the backlash at the four points (by turning the vertical shaft 90°) in the same manner.

#### NOTE:

Do not turn the propeller shaft when turning the vertical shaft.

- 5) Obtain the reverse bevel gear backlash using the dial gauge runout and the following formula.

#### Formula:

Dial gauge runout x 0.8 = Backlash

#### Example:

When, Dial gauge runout is 0.3 mm (0.012 in):

$0.3 \times 0.8 = 0.24$

Therefore, the backlash is 0.24 mm (0.009 in)

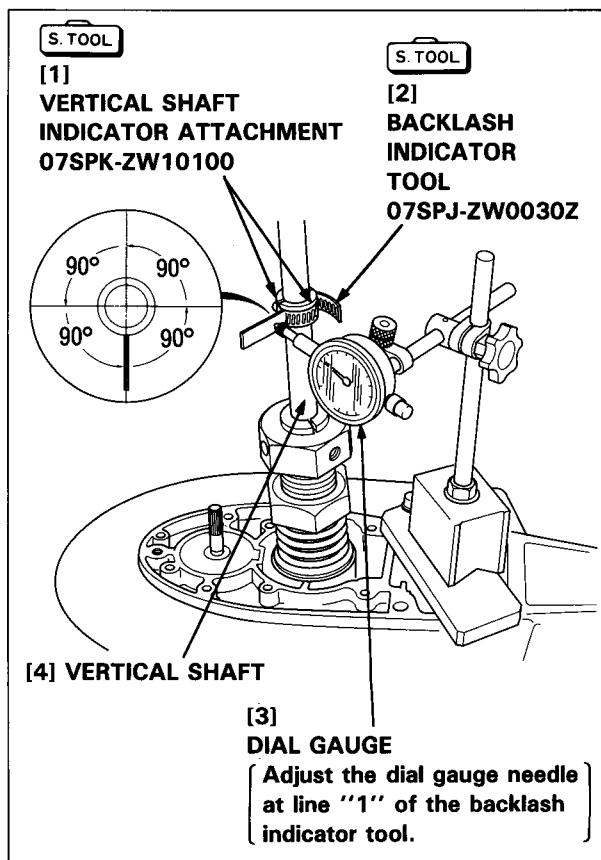
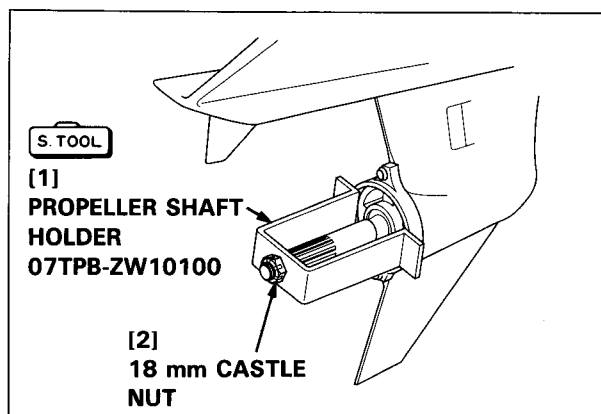
Standard value	0.10–0.38 mm (0.004–0.015 in)
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- 6) If the backlash is too large, increase the reverse bevel gear shim thickness and recheck the backlash.

If the backlash is too small, reduce the reverse bevel gear shim thickness and recheck the backlash.

#### TOOLS:

**Vertical shaft indicator attachment** **07SPK-ZW10100**  
**Backlash indicator tool** **07SPJ-ZW0030Z**





# 16. CABLES/SHIFT LINK BRACKET/SHIFT ARM

**HONDA**  
**BF75A·90A**

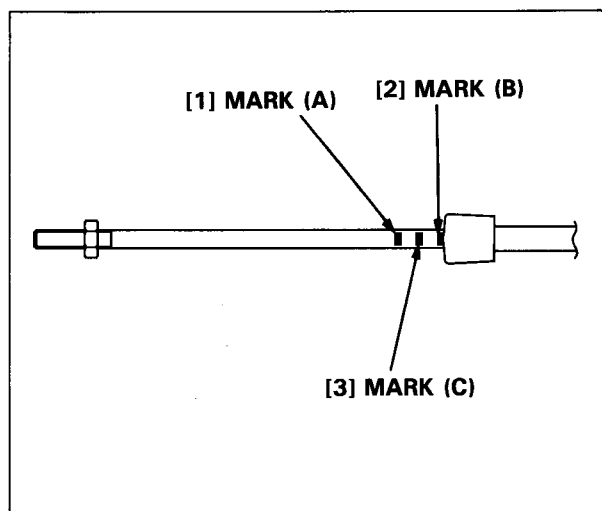
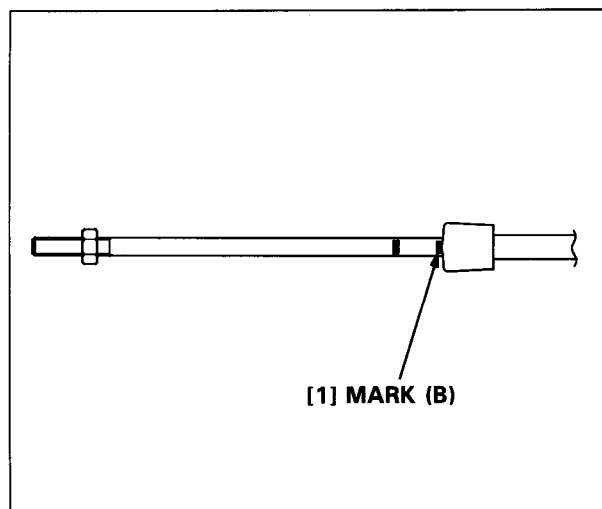
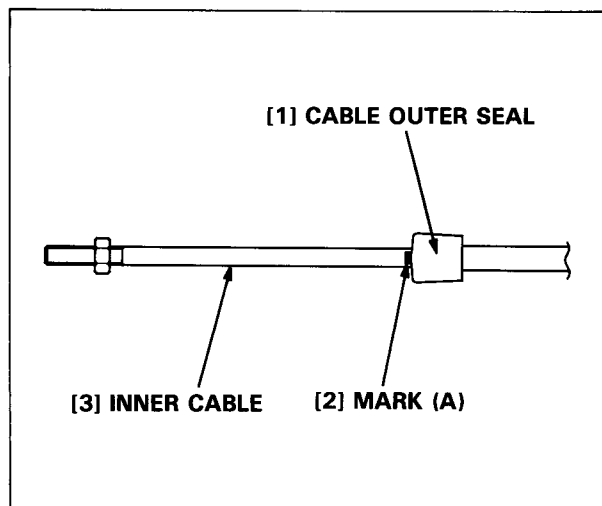
## 1. REMOTE CONTROL CABLE [SHIFT/THROTTLE] (REMOTE CONTROL TYPE)/SHIFT, THROTTLE CABLE (TILLER HANDLE TYPE) INSTALLATION.

### 1. REMOTE CONTROL CABLE [SHIFT/THROTTLE] (REMOTE CONTROL TYPE)/SHIFT, THROTTLE CABLE (TILLER HANDLE TYPE) INSTALLATION

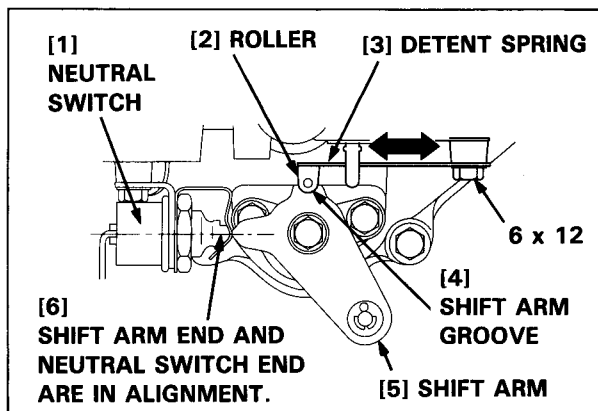
#### • SHIFT SIDE CABLE

Before connecting the cable to the outboard motor, be sure that the cable is connected to the remote control box side or the tiller handle side securely.

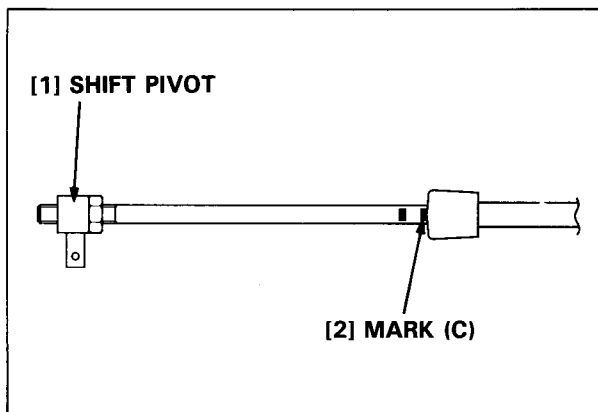
- 1) Move the remote control lever or gear shift lever fully to the "F" (Forward) side.
- 2) Return the lever to the "N" (Neutral) position slowly.
- 3) With the lever returned to the "N" (Neutral) position, mark at the cable outer seal end of the inner cable [Mark (A)].
- 4) Move the remote control lever or gear shift lever fully to the "R" (Reverse) side.
- 5) Return the lever to the "N" (Neutral) position slowly.
- 6) With the lever returned to the "N" (Neutral) position, mark at the cable outer seal end of the inner cable [Mark (B)].
- 7) Mark at the mid point between the mark (A) and mark (B) of the inner cable [Mark (C)].



- 8) Be sure that the shift arm end aligns with the neutral switch end as shown. (Note that the detent spring roller must be set in the shift arm groove ["N" (Neutral) position] securely.
- 9) If the shift arm end and neutral switch end are not in alignment, loosen the 6 x 12 mm flange bolt and adjust by moving the detent spring right or left.  
After adjustment, tighten the 6 x 12 mm flange bolt.



- 10) Install the shift pivot on the shift side cable.
- 11) Align the mark (C), that was made in the step 7, with the cable outer seal end.
- 12) Push on the shift link end lightly and check for play. If there is play in the shift link, set the link at the center of the play.
- 13) With the shift side cable in the condition of the above step 7, connect the shift side cable to the shift link while turning the shift pivot so the shift pivot sets on the shift link smoothly.



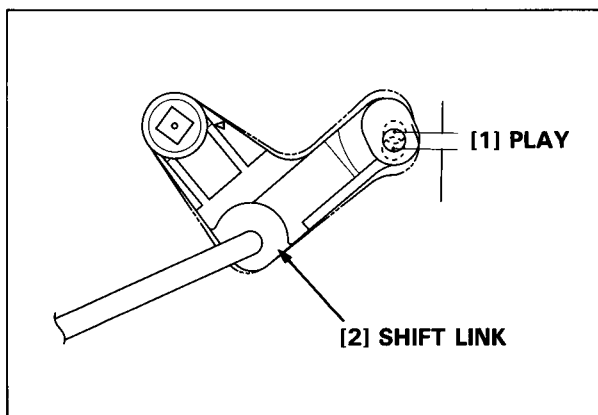
**NOTE:**

Take care not to move the mark (C) and outer seal end out of alignment. Hold the shift link at the center of the play, too.

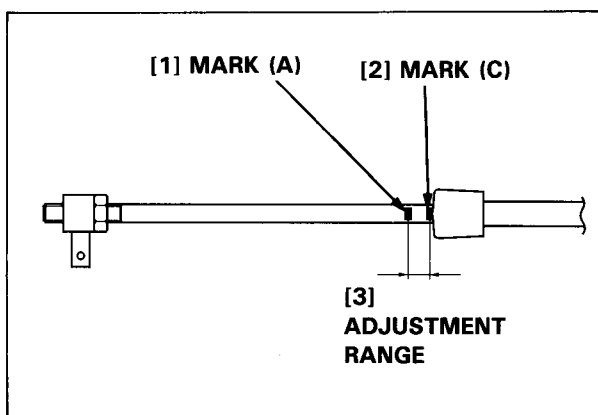
- 14) After connecting the cable, move the remote control lever or gear shift lever back and forth and check for shift.

**NOTE:**

When it is hard to put the remote control lever or gear shift lever in the "F" (Forward) or "R" (Reverse) position with the engine stopped, shift the gear while turning the propeller or propeller shaft. Do not shift the gear with force, or damage to the shift system can result.

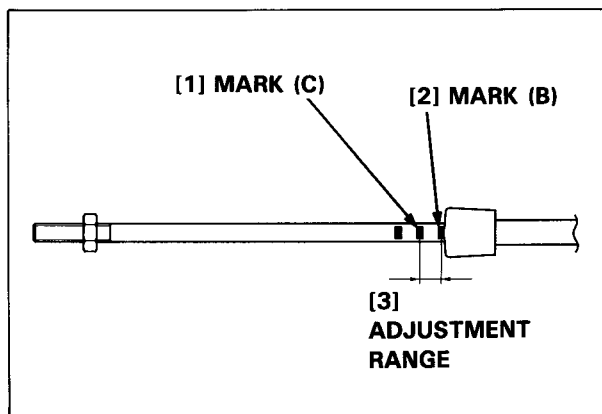


- 15) If the gear is not in neutral by moving the remote control lever or gear shift lever from the "F" (Forward) to the "N" (Neutral) position, remove the shift side cable and move the inner cable toward the mark (A). Repeat the procedure from the step 12.



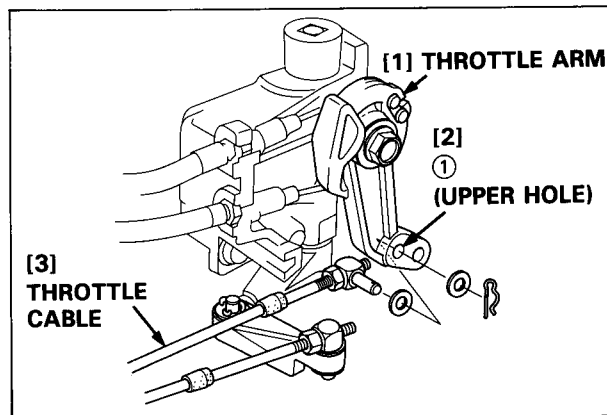
16) If the gear is not in neutral by moving the remote control lever or gear shift lever from the "R" (Reverse) to the "N" (Neutral) position, remove the shift side cable and move the inner cable toward the mark (B). Repeat the procedure from the step 12 (P. 16-2).

17) After adjustment, check operation of each lever. If the gear is not in neutral securely, perform the step 15 or 16 again.



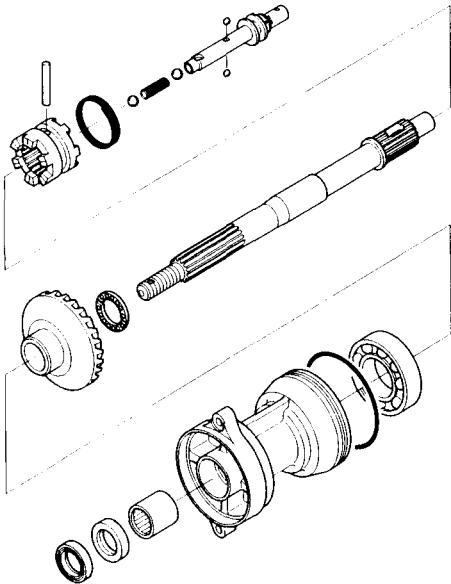
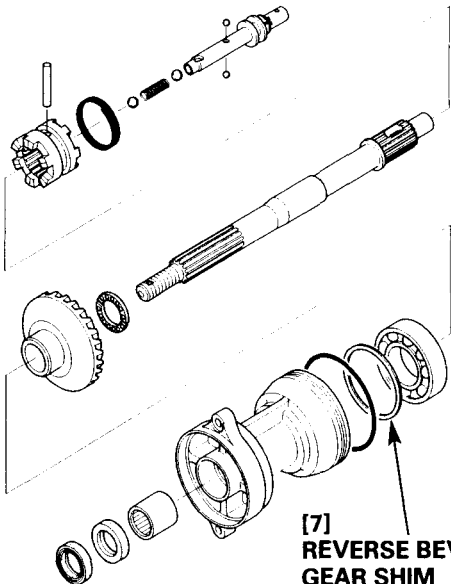
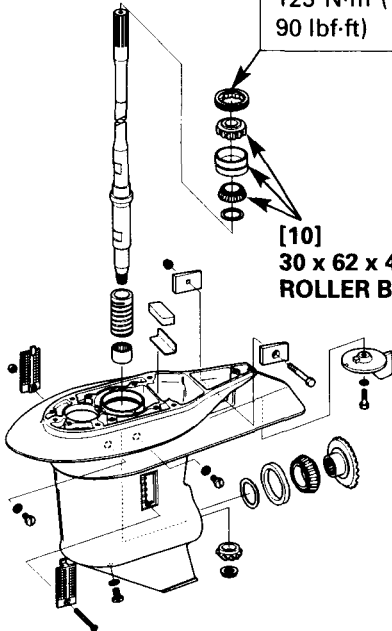
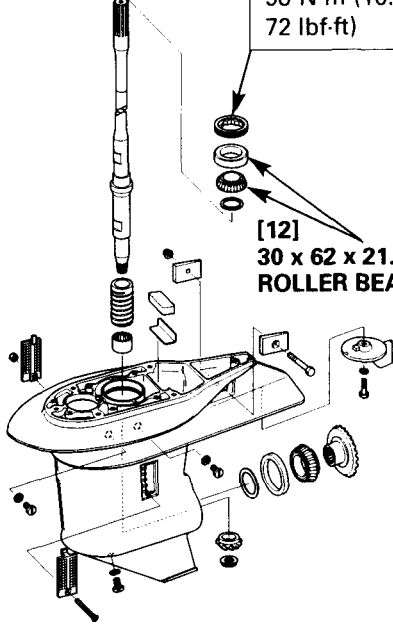
### • THROTTLE SIDE CABLE

Connect the throttle cable to the hole ① (upper hole) of the throttle arm (Common to Remote control type and Tiller handle type).





OUTLINE OF CHANGES .....	1
11. PROPELLER/GEAR CASE/EXTENSION CASE .....	11-1
1. VERTICAL SHAFT/BEVEL GEAR .....	11-1
2. SHIM SELECTION .....	11-4
3. SHIM POSITION .....	11-9
4. BACKLASH ADJUSTMENT .....	11-10

<div>[2] Model</div> <div>[1] Item</div>	<div>[3] After modifications</div>	<div>[4] Before modifications</div>
<div>[5]</div> <div>Reverse bevel gear</div>	<div>[6] Reverse bevel gear shim being eliminated:</div> 	 <div>[7] REVERSE BEVEL GEAR SHIM</div>
<div>[8]</div> <div>Taper roller bearing</div>	<div>[9] PINION GEAR NUT</div> <div>123 N·m (12.5 kgf·m, 90 lbf·ft)</div> <div>[10] 30 x 62 x 40 TAPER ROLLER BEARING</div> 	<div>[11] PINION GEAR NUT</div> <div>98 N·m (10.0 kgf·m, 72 lbf·ft)</div> <div>[12] 30 x 62 x 21.25 TAPER ROLLER BEARING</div> 

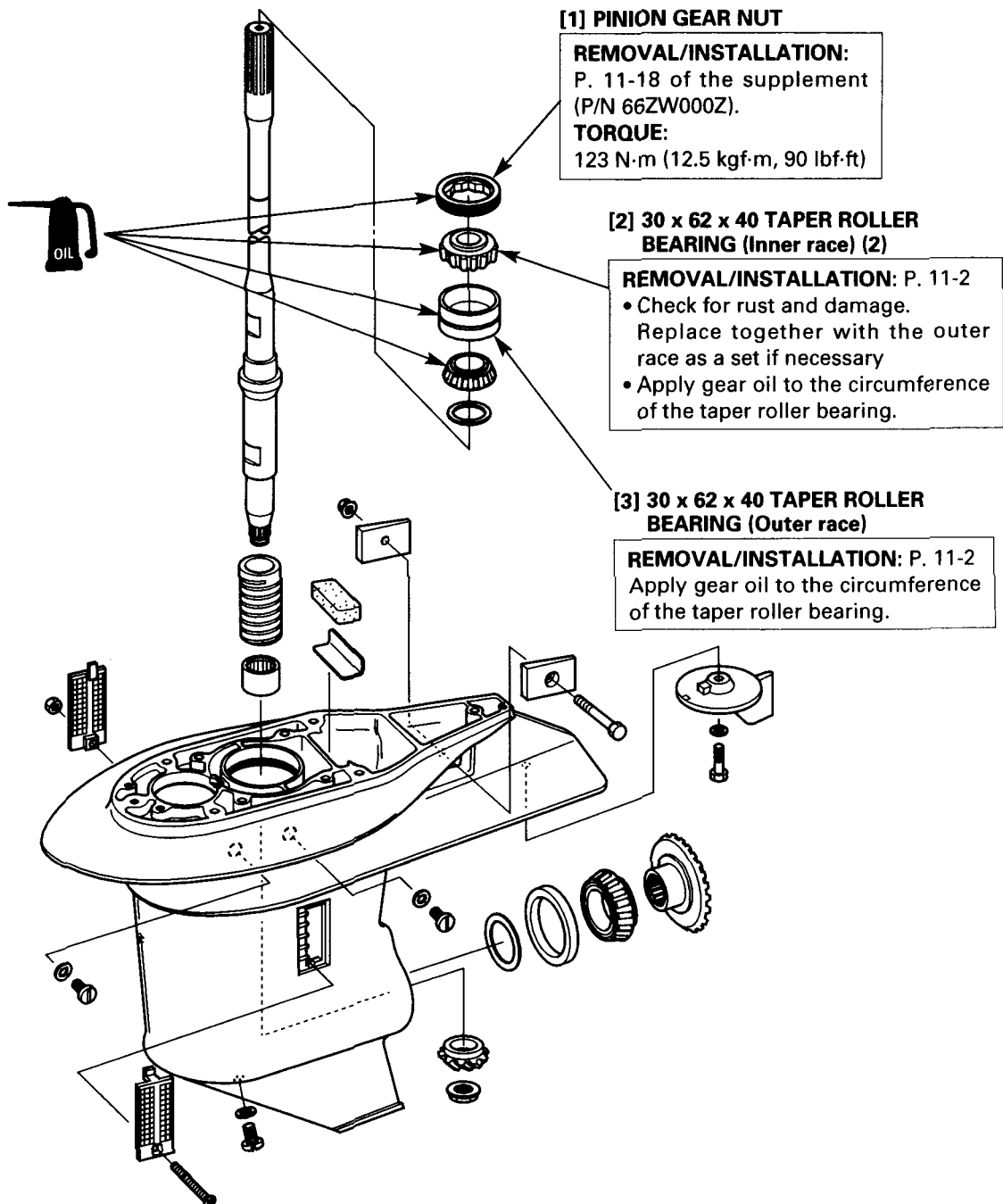
1. VERTICAL SHAFT/BEVEL GEAR
2. SHIM SELECTION

3. SHIM POSITION
4. BACKLASH ADJUSTMENT

## 1. VERTICAL SHAFT/BEVEL GEAR

### a. DISASSEMBLY/REASSEMBLY

- 1) Remove the propeller [P. 11-1 of the supplement (P/N 66ZW000Z)] and gear case assembly [P. 11-2 of the supplement (P/N 66ZW000Z)].
- 2) Remove the water pump/shift rod [P. 11-4 of the supplement (P/N 66ZW000Z)] and remove the propeller shaft holder assembly [P. 11-7 of the supplement (P/N 66ZW000Z)].
- 3) Remove the 64 mm lock nut using the special tool [P. 11-18 of the supplement (P/N 66ZW000Z)].

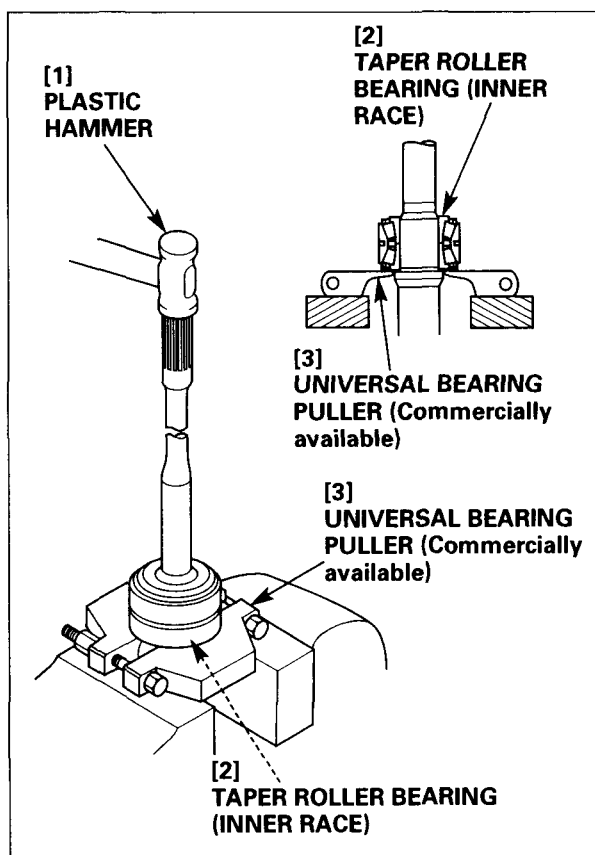


**•30 x 62 x 40 TAPER ROLLER BEARING****REMOVAL:**

- 1) Set the commercially available universal bearing puller on the taper roller bearing (inner race), then set the universal bearing puller on the vice.
- 2) Remove the taper roller bearing by tapping on the end of the vertical shaft using a plastic hammer.

**NOTE:**

Do not hold the vertical shaft with a vise. Use a plastic hammer to tap on the end of the vertical shaft.

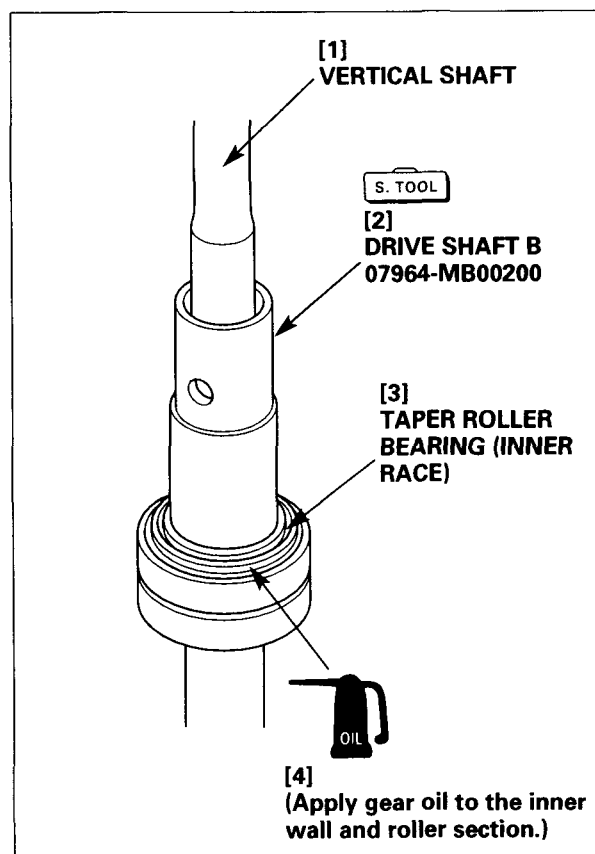
**INSTALLATION:**

- 1) Set the pinion gear on the vertical shaft and temporarily tighten the pinion gear nut by hand.
- 2) Apply gear oil to the inner wall and the roller section of the taper roller bearing (inner race).
- 3) Set the pinion gear shim, taper roller bearing and the special tool on the vertical shaft.

**TOOL:**

Drive shaft B

07964-MB00200

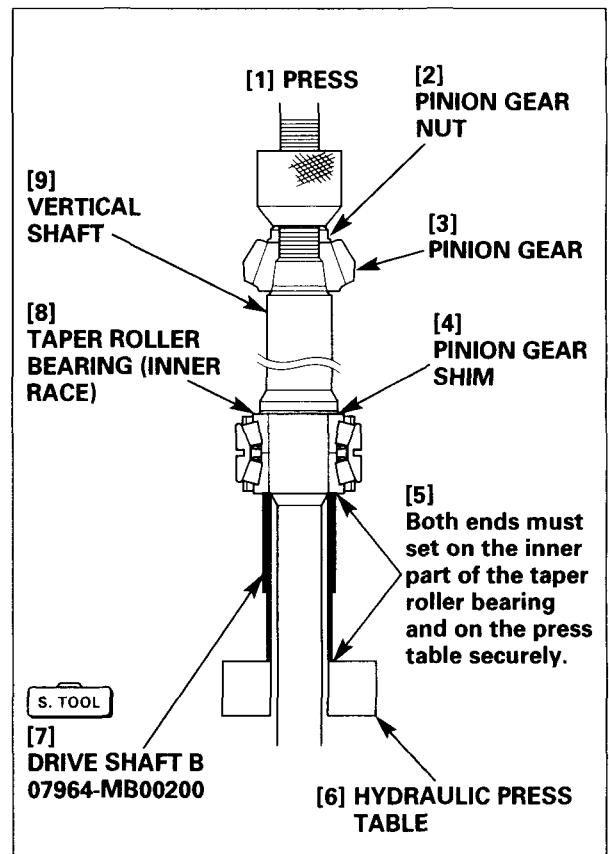




- 4) Set the vertical shaft upright on the hydraulic press with the pinion gear side toward up as shown.
- 5) Install the taper roller bearing on the vertical shaft using the hydraulic press.

**NOTE:**

- Be sure that the ends of the special tool securely set on the inner part of the taper roller bearing and on the hydraulic press table respectively.
- Take care not to damage the threaded part (i.e. pinion gear nut installation part) at the end of the vertical shaft.

**TOOL:****Drive shaft B****07964-MB00200**

## 2. SHIM SELECTION

### •PINION GEAR SHIM

Remove the 30 x 62 x 40 taper roller bearing (inner race) if it is mounted on the vertical shaft [P. 11-15 of the supplement (P/N 66ZW000Z)].

- 1) Wipe the tapered part of the vertical shaft and pinion gear with a shop towel and a degreasing cleaning solvent.
- 2) Install the pinion gear on the vertical shaft and tighten the pinion gear nut to the specified torque.

**TORQUE: 103 N·m (10.5 kgf·m, 76 lbf·ft)**

- Do not install the vertical shaft in the gear case.
  - We recommend that you attach the special tool (vertical shaft holder) at the end of the vertical shaft to facilitate tightening of the pinion gear nut to the specified torque [P. 11-18 of the supplement (P/N 66ZW000Z)].
- 3) Be sure that the side of the special tool (i.e. side with the stamped tool number) is facing to the opposite side from the pinion gear, and be sure that the tool of the pinion gear nut side is not set on the nut.

Tighten the bolts by hands while pushing both tools toward the pinion gear side.

- Do not confuse the pinion gear side and the taper roller bearing side of the special tool.
- Do not score and scratch the opposite side (measurement side) from the side where the tool number is stamped.
- Do not tighten the bolts with a tool.
- There must be no wobbling in the special tool. It must securely set on the pinion gear.

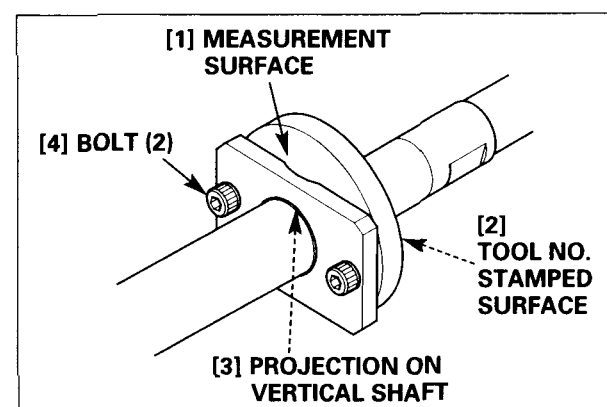
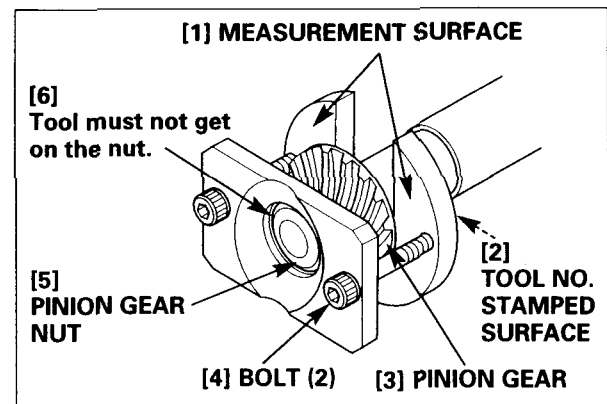
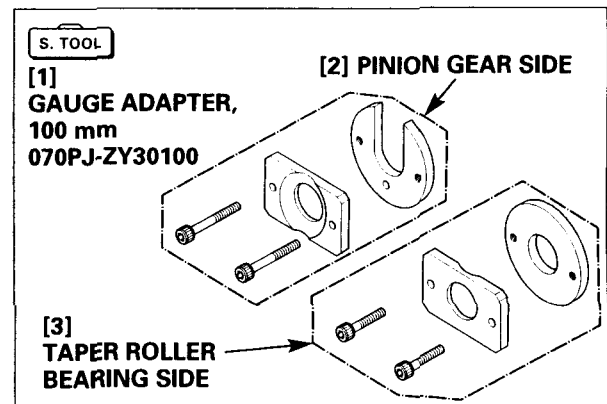
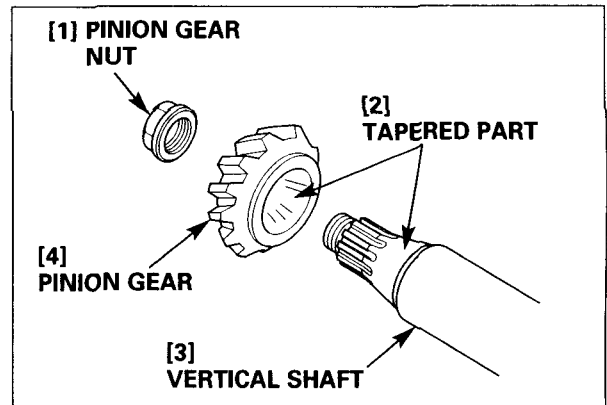
#### TOOL:

Gauge adapter, 100 mm

070PJ-ZY30100

- 4) Set the both tools on both sides of the projection on the vertical shaft so that the side of the special tool stamped with the tool number faces and tapered faces to the opposite side from the pinion gear as shown. Tighten the bolts by hands.

- Do not tighten the bolts with a tool.
- There must be no wobbling in the special tool. It must securely set on the pinion gear.

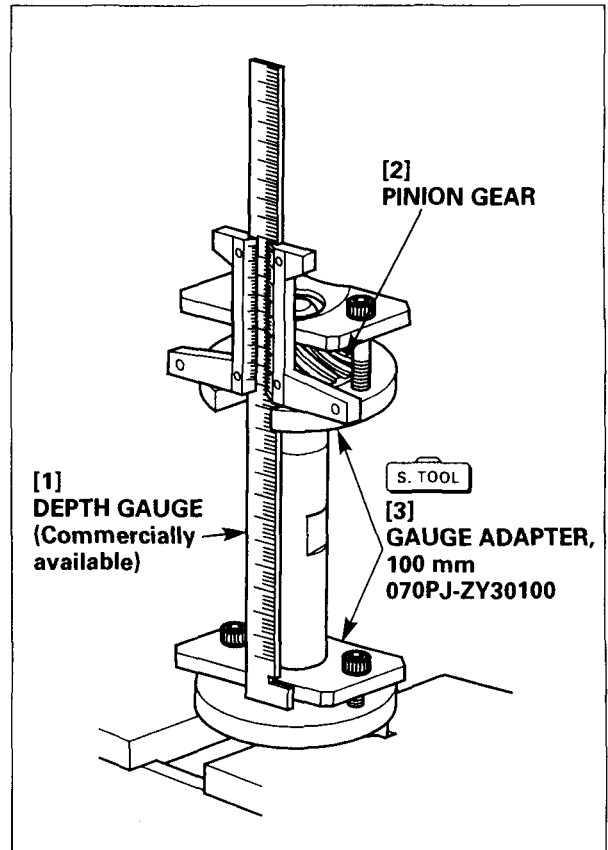


- 5) Hold the vertical shaft upright (with the pinion gear toward up) and secure the vertical shaft.
- 6) Set the commercially available depth gauge at the gauge adapter of the pinion gear side as shown. Measure the vertical shaft length (dimension "D") and record it.

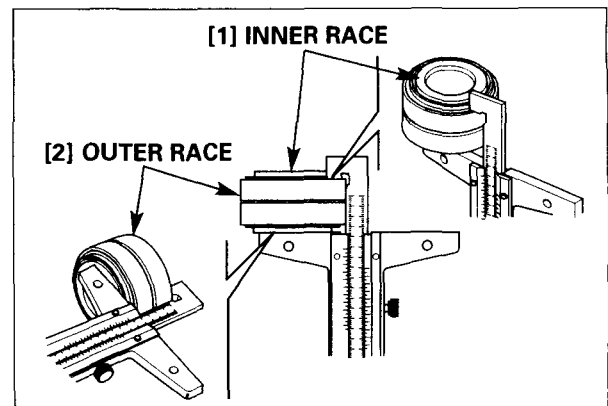
**TOOL:**

Gauge adapter, 100 mm

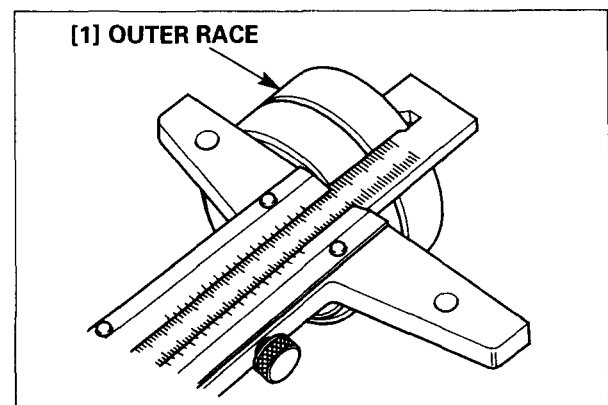
070PJ-ZY30100



- 7) Assemble the outer race and inner race of the 30 x 62 x 40 taper roller bearing.
- 8) Measure the bearing height from the outer race end to the inner race end as shown, and record the measurement.



- 9) Measure the height of the 30 x 62 x 40 taper roller bearing outer race and record the measurement.



- 10) Calculate the gap (distance E) between the outer race and inner race using the measurements obtained in the step 8 and 9 and the following formula.

**Formula:**

Bearing height – Outer race height = Gap (distance E)

**Example:**

When, bearing height from the outer race end to the inner race end is 40.1 mm (1.58 in),

And, outer race height is 34.9 mm (1.37 in):

$$40.1 - 34.9 = 5.2$$

Therefore, the gap (distance E) is 5.2 mm (0.20 in).

- 11) Determine the calculation value using the vertical shaft length (distance D) obtained in step 6 and the gap (distance E) obtained in step 10 and the following formula.

**Formula:**

Vertical shaft length (distance D) + Gap (distance E) – 147.45 = Calculation value.

**Example:**

When, vertical shaft length (distance D) is 142.3 mm (5.60 in),

And, gap (distance E) is 5.2 mm (0.20 in):

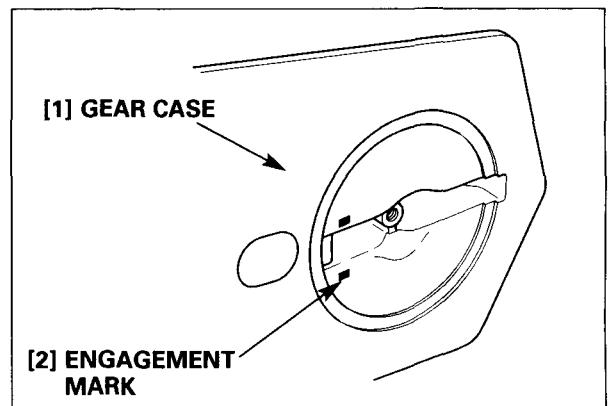
$$142.3 + 5.2 - 147.45 = 0.05$$

Therefore, the calculation value is 0.05 mm (0.002 in)

- 12) Cross reference the calculation value and the engagement mark located on the trim tab installation part of the gear case, and select the shim of the appropriate thickness from the shim selection table accordingly.

• Shim type table

[1] Parts name	[2] Thickness
[3] Pinion gear shim A	0.10 mm (0.0039 in)
[4] Pinion gear shim B	0.15 mm (0.0060 in)
[5] Pinion gear shim C	0.30 mm (0.0118 in)
[6] Pinion gear shim D	0.50 mm (0.0197 in)



## • Pinion gear shim selection table

[3] Unit: mm (in)

		[2] Calculation value						
		0.41 (0.016) – 0.35 (0.014)	0.35 (0.014) – 0.30 (0.012)	0.30 (0.012) – 0.25 (0.010)	0.25 (0.010) – 0.20 (0.008)	0.20 (0.008) – 0.15 (0.006)	0.15 (0.006) – 0.10 (0.004)	0.10 (0.004) – 0.05 (0.002)
[1] Engagement mark on the gear case	F	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.012)	0.60 (0.024)	0.65 (0.026)
	E	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)	0.60 (0.024)
	D	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)
	C	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)
	B	0.15 (0.006)	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)
	A	0.10 (0.004)	0.15 (0.006)	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)

[3] Unit: mm (in)

		[2] Calculation value						
		0.05 (0.002) – 0 (0.000)	0 (0.000) – –0.05 (–0.002)	–0.05 (–0.002) – –0.10 (–0.004)	–0.10 (–0.004) – –0.15 (–0.006)	–0.15 (–0.006) – –0.20 (–0.008)	–0.20 (–0.008) – –0.25 (–0.010)	–0.25 (–0.010) – –0.30 (–0.012)
[1] Engagement mark on the gear case	F	0.70 (0.028)	0.75 (0.030)	0.80 (0.031)	0.85 (0.033)	0.90 (0.035)	0.95 (0.037)	1.00 (0.039)
	E	0.65 (0.026)	0.70 (0.028)	0.75 (0.030)	0.80 (0.031)	0.85 (0.033)	0.90 (0.035)	0.95 (0.037)
	D	0.60 (0.024)	0.65 (0.026)	0.70 (0.028)	0.75 (0.030)	0.80 (0.031)	0.85 (0.033)	0.90 (0.035)
	C	0.55 (0.022)	0.60 (0.024)	0.65 (0.026)	0.70 (0.028)	0.75 (0.030)	0.80 (0.031)	0.85 (0.033)
	B	0.50 (0.020)	0.55 (0.022)	0.60 (0.024)	0.65 (0.026)	0.70 (0.028)	0.75 (0.030)	0.80 (0.031)
	A	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)	0.60 (0.024)	0.65 (0.026)	0.70 (0.028)	0.75 (0.030)

## • How to read shim selection table

When the engagement mark on the gear case is E and the calculation value 0.20 mm (0.008 in) or more and less than 0.25 mm (0.01 in), the shim thickness is 0.45 mm (0.018 in). (See Example 1 below.)

When the calculation value is 0.15 mm (0.006 in) or more and less than 0.20 mm (0.008 in), the shim thickness is 0.50 mm (0.020 in). (See Example 2 below.)

## [1] Example 1: [4] Unit: mm (in)

		[2] Calculation value
		[3] 0.25 mm (0.010 in) or above to less than 0.20 mm (0.008 in)
	F	_____
	E	0.45 mm (0.018 in)

## [5] Example 2: [4] Unit: mm (in)

		[2] Calculation value
		[6] 0.20 mm (0.008 in) or above to less than 0.15 mm (0.006 in)
	F	_____
	E	0.50 mm (0.020 in)

## • Shim combination

To obtain 0.45 mm (0.018 in) of shim thickness, combine one gear shim B and gear shim C, or combine three gear shim A and one gear shim B by referring to the shim type table.

### • FORWARD BEVEL GEAR SHIM

- 1) Assemble the outer race and the inner race of the new 50 x 82 x 21.5 taper bearing.
- 2) Measure the bearing height (distance F) from the outer race end to the inner race end as shown, and record the measurement.
- 3) Determine the calculation value using the bearing height (distance F) and the following formula.

#### Formula:

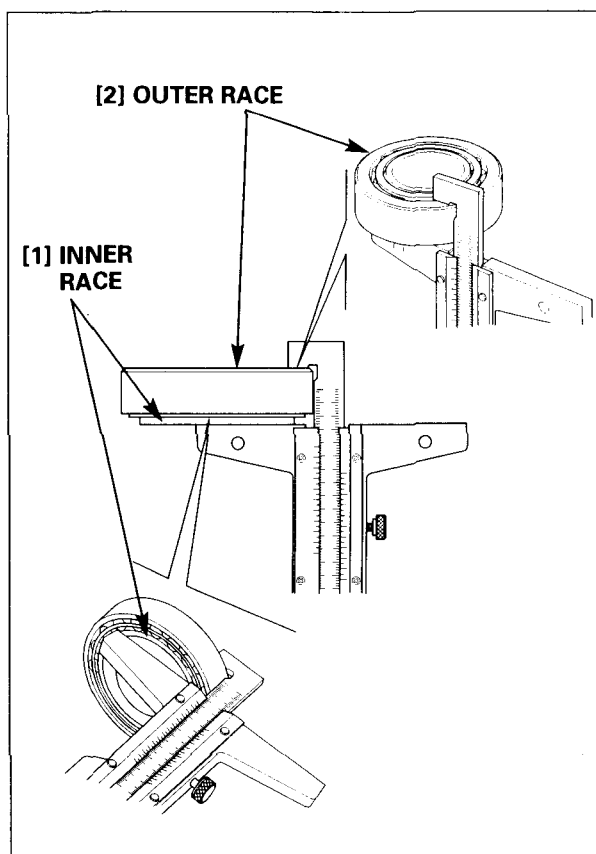
Bearing height (distance F) – 21.5 = Calculation value

#### Example:

When bearing height (distance F) is 21.55 mm (0.848 in).

$21.55 - 21.5 = 0.05$

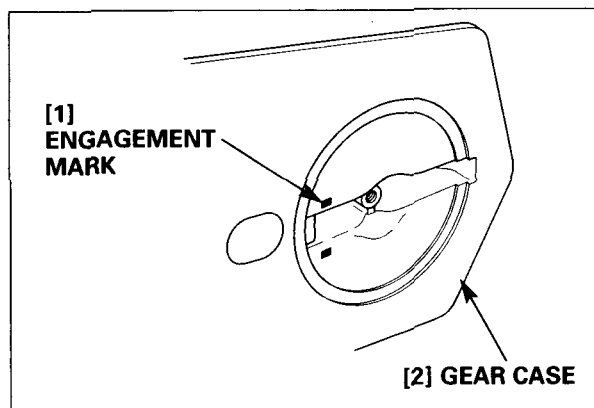
Therefore, the calculation value is 0.05 mm (0.002 in)



- 4) Cross reference the calculation value and the engagement mark located on the trim tab installation part of the gear case, and select the shim of the appropriate thickness from the shim selection table accordingly.

#### • Shim type table

[1] Parts name	[2] Thickness
[3] Forward bevel gear shim A	0.10 mm (0.0039 in)
[4] Forward bevel gear shim B	0.15 mm (0.0060 in)
[5] Forward bevel gear shim C	0.30 mm (0.0118 in)
[6] Forward bevel gear shim D	0.50 mm (0.0197 in)



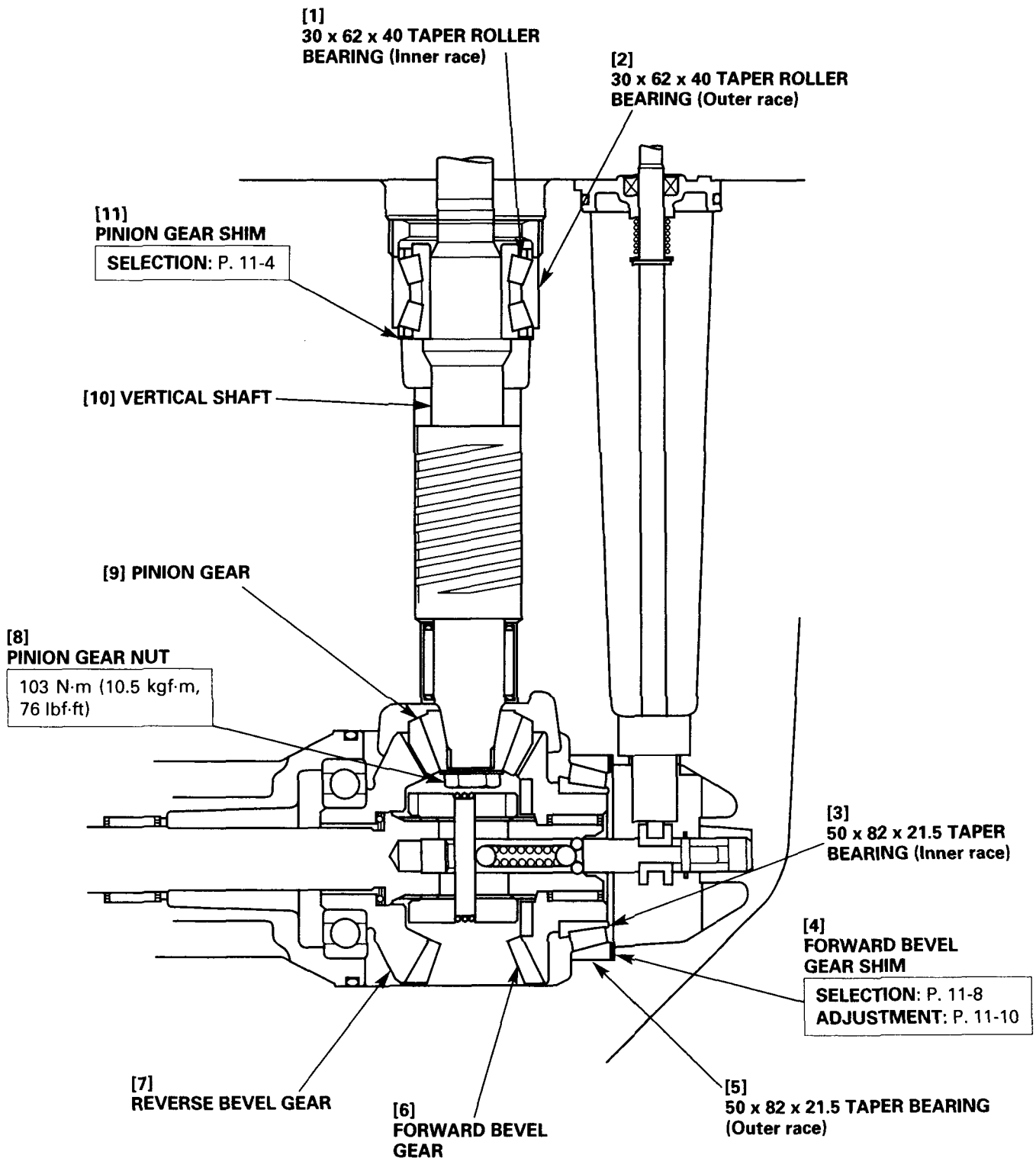
[3] Unit: mm (in)

#### • Forward bevel gear shim selection table

		[2] Calculation value			
		0.20 (0.008) – 0.15 (0.006)	0.15 (0.006) – 0.10 (0.004)	0.10 (0.004) – 0.05 (0.002)	0.05 (0.002) – 0 (0.000)
[1] Engagement mark on the gear case	1	0.45 (0.018)	0.50 (0.020)	0.55 (0.012)	0.60 (0.024)
	2	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.012)
	3	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)
	4	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)
	5	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)
	6	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)

Refer to page 11-7 for information on how to read the shim selection table and shim combination.

### 3. SHIM POSITION



## 4. BACKLASH ADJUSTMENT

### • FORWARD BEVEL GEAR BACKLASH

- Backlash adjustment must be made after adjustment of each gear shim (P. 11-4 through 8).
- Install the parts except the water pump in the gear case [P. 11-7 and 15 of the supplement (P/N 66ZW000Z)].

- 1) Hold the propeller shaft securely with the special tool as shown, and tighten the puller bolt (special tool) to the specified torque.

**TORQUE: 5 N·m (0.5 kgf·m, 3.6 lbf·ft)**

Turn the vertical shaft 5 to 10 turns clockwise.

#### TOOLS:

**Puller jaws** 07SPC-ZW0010Z  
**Puller bolt** 07SPC-ZW0011Z

- 2) Attach the special tool to the vertical shaft as shown, and adjust the dial gauge so its needle is at line "1" of the special tool.
- 3) Turn the vertical shaft lightly right or left and record the dial gauge reading.

Measure the backlash at the four points (by turning the vertical shaft 90°) in the same manner.

#### NOTE:

Do not turn the propeller shaft when turning the vertical shaft.

- 4) Obtain the forward bevel gear backlash using the dial gauge runout and the following formula.

#### Formula:

Dial gauge runout x 0.8 = Backlash

#### Example:

When dial gauge runout is 0.3 mm (0.012 in):

$0.3 \times 0.8 = 0.24$

Therefore, the backlash is 0.24 mm (0.009 in).

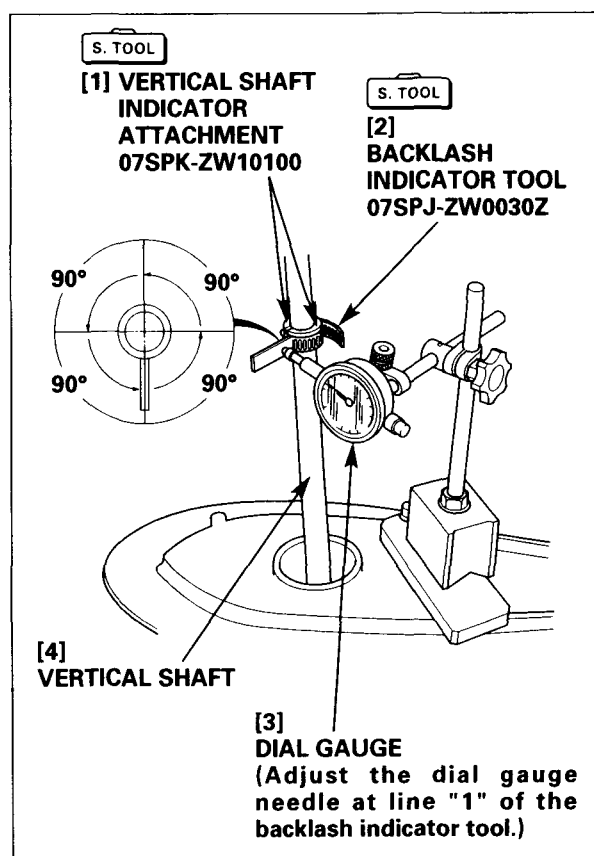
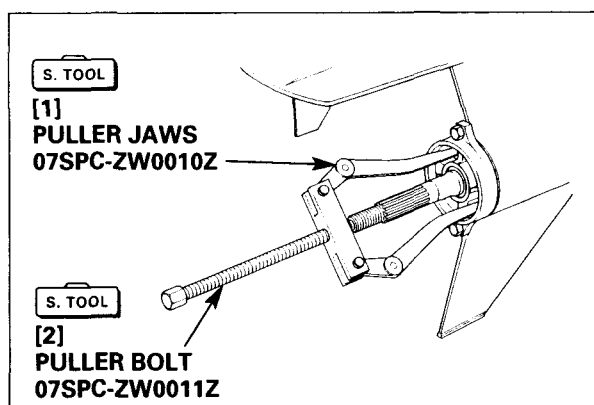
Standard value	0.10 – 0.28 mm (0.004 – 0.011 in)
----------------	-----------------------------------

If the backlash is too large, increase the forward bevel gear shim thickness and recheck the backlash.

If the backlash is too small, reduce the forward bevel gear shim thickness and recheck the backlash.

#### TOOLS:

**Vertical shaft indicator attachment** 07SPK-ZW10100  
**Backlash indicator tool** 07SPJ-ZW0030Z





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**Note: Make sure to select  Shrink to fit in the printer dialog box when printing wiring diagrams.**

## HONDA OUTBOARD MOTOR

### Power Equipment

News No.  
P/P-067

Issue Date  
MAR. '00

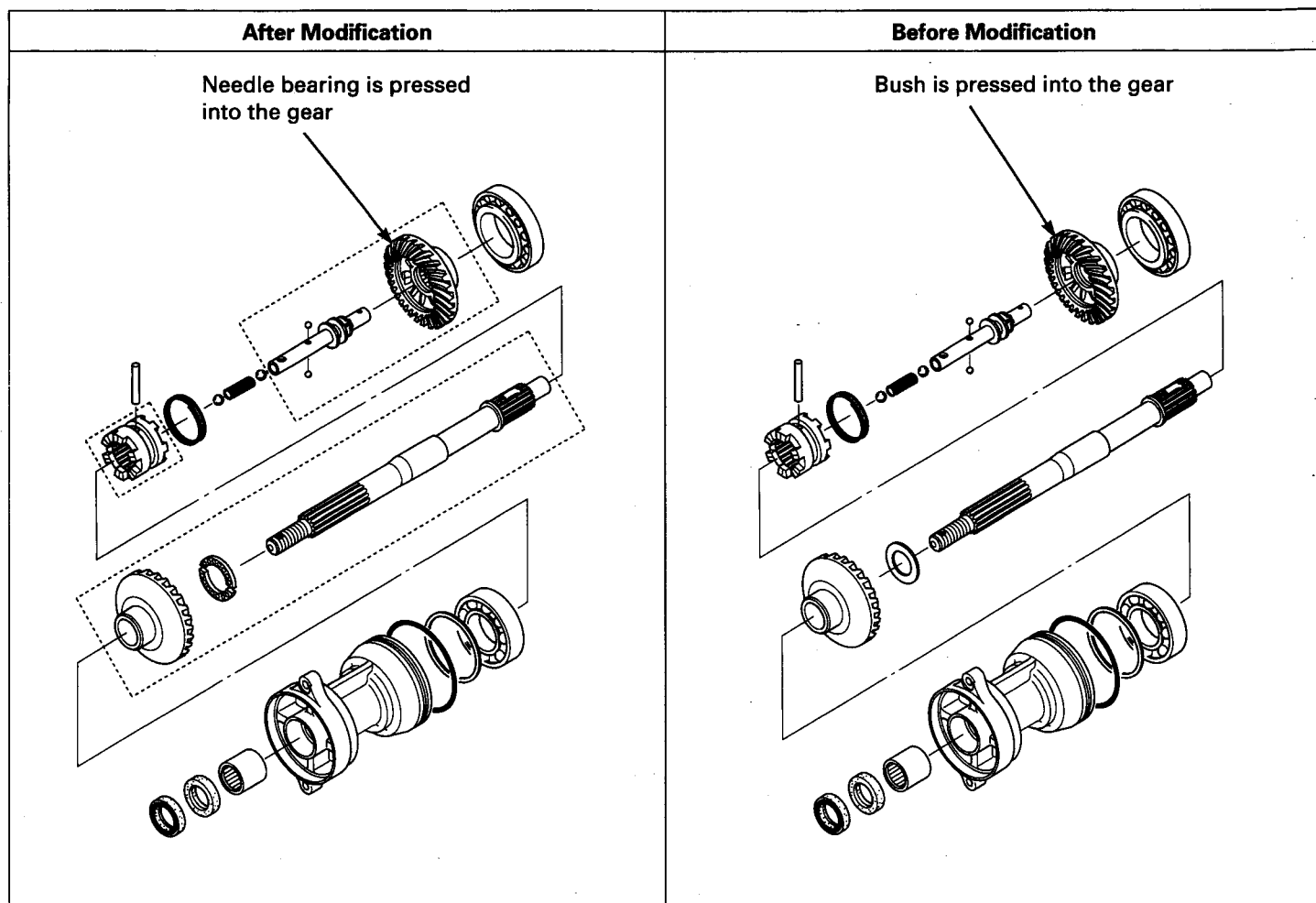
### SOME PARTS OF CHANGES

The related parts of the propeller shaft have been changed on the product listed below which have following frame serial number.

Applicable Information	Frame Serial No.	Publication Number
BF75A	BBAL-2001070 and subsequent	66ZW000Z
	BBAL-4001824 and subsequent	
BF90A	BBBL-2002417 and subsequent	
	BBBL-4004256 and subsequent	

### CHANGE LOCATIONS

The enclosed parts with a dotted line have been changed.



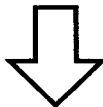
## 5. PROPELLER SHAFT/PROPELLER SHAFT HOLDER

### b. INSPECTION

#### • PROPELLER SHAFT O. D.

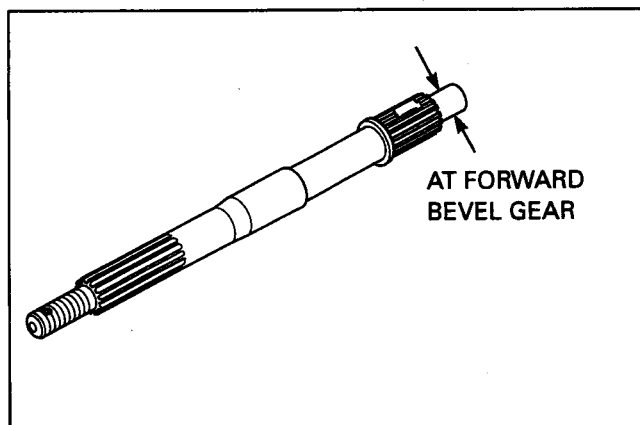
BEFORE

	STANDARD	SERVICE LIMIT
At forward bevel gear	25.957 – 25.970 mm (0.9996 – 1.0010 in)	25.936 mm (1.0211 in)



AFTER

	STANDARD	SERVICE LIMIT
At forward bevel gear	24.987 – 25.000 mm (0.9837 – 0.9843 in)	24.966 mm (0.9829 in)



## HONDA OUTBOARD MOTOR

### Power Equipment

News No.  
P/P-068

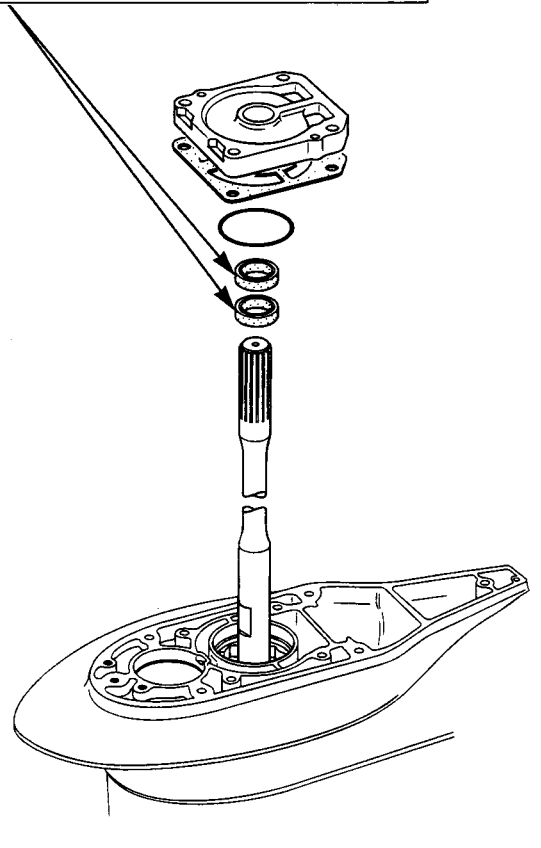
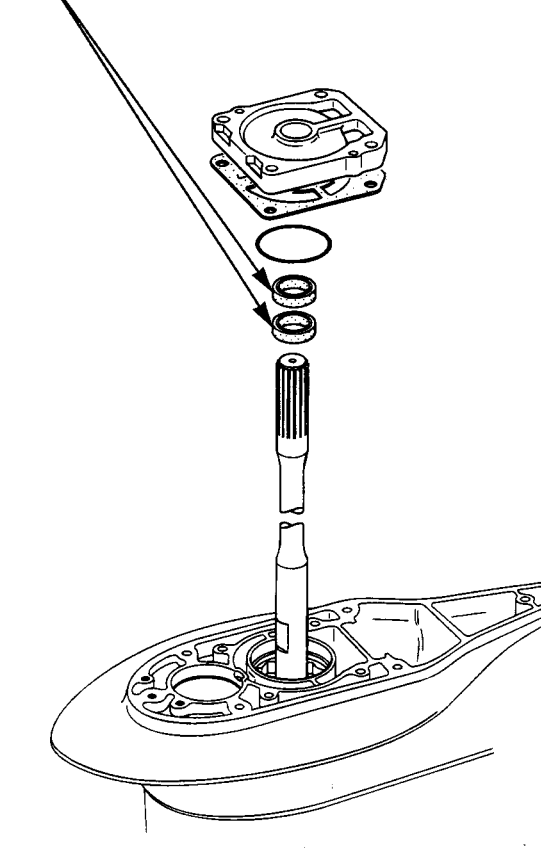
Issue Date  
MAR. '00

### SOME PARTS OF CHANGES

Applicable Information	Publication Number	Applicable Pages
BF75A/BF90A	66ZW000Z	11-4, 11-5
BF115A/BF130A	66ZW500	12-4, 12-6

### CHANGE LOCATIONS

The liquid applied to the circumference of water seals has been changed on the procedure of the water pump assembly.

After Modification	Before Modification
<p><b>23 x 36 x 6 mm WATER SEAL (2)</b></p> <ul style="list-style-type: none"><li>• Do not reuse.</li><li>• Apply grease to the lips.</li><li>• Apply soapy water to the sealing circumference.</li></ul> 	<p><b>23 x 36 x 6 mm WATER SEAL (2)</b></p> <ul style="list-style-type: none"><li>• Do not reuse.</li><li>• Apply grease to the sealing surface, circumference and lips.</li></ul> 

## HONDA OUTBOARD MOTOR

## Power Equipment

News No.  
P/P-074

Issue Date  
May. '00

### SOME PARTS OF CHANGES

Applicable Information	Engine Serial No.	Publication No.	Applicable Pages
BF75A/BF90A	BF75A: BBAE-2100001 and subsequent BF90A: BBBE-2100001 and subsequent	66ZW000	2-3, 3-20, 5-8, 6-3, 6-4, 6-5, 6-6, 10-4

### CHANGE LOCATIONS

### MAINTENANCE STANDARDS

Part	Item	After Modification	Before Modification
Carburetor	Main jet (BF75A)	#135 (except LRTG type) #130 (LRTG type only)	#128 (except LRTG type) #122 (LRTG type only)
	Primary jet (BF75A)	#40	#38
Connecting rod	Connecting rod bearing oil clearance	0.024 – 0.042 mm (0.0009 – 0.0017 in)	0.020 – 0.038 mm (0.0008 – 0.0015 in)

### CRANKSHAFT AND RELATED PARTS

- No change has been made in the bearings installation order.
- Only modified points shown in the illustrations.

After Modification	Before Modification
<p><b>CONNECTING ROD NUT (8)</b> 33 N·m (3.3 kgf·m, 24 lbf·ft)</p> <p>4.5 x 18 mm KEY</p> <p>38 x 50 x 8 mm OIL SEAL</p> <p>14 x 36 mm BOLT-WASHER</p>	<p><b>CONNECTING ROD NUT (8)</b> 32 N·m (3.3 kgf·m, 24 lbf·ft)</p> <p>4.5 x 11 mm KEY</p> <p>31 x 46 x 7 mm OIL SEAL</p> <p>14 x 29 mm BOLT-WASHER</p>

# **HONDA**

## **OUTBOARD**

### **MOTOR**

# **Shop Manual News**

## **Power Equipment**

**News No.**  
**P/P-076**

**Issue Date**  
**JUL. '00**

### **SOME PARTS OF CHANGES**

<b>Applicable Information</b>	<b>Engine Serial No.</b>	<b>Publication No.</b>	<b>Applicable Pages</b>
BF75A/BF90A	BF75A: BBAE-2100001 and subsequent BF90A: BBBE-2100001 and subsequent	66ZW000	2-3, 3-9

### **CHANGE LOCATIONS**

#### **MAINTENANCE STANDARDS**

<b>Part</b>	<b>Item</b>		<b>After Modification</b>	<b>Before Modification</b>
Carburetor	Pilot screw opening	BF75A	2-3/8 turns out (Except LRTG type)	1-7/8 turns out (Except LRTG type)
			2-1/2 turns out (LRTG type only)	2 turns out (LRTG type only)
		BF90A	2-5/8 turns out	2-1/4 turns out

### SOME PARTS OF CHANGES

The method of installing the water seal which had been described to the undermentioned shop manual was changed.

Applicable Information	Publication No.	Applicable Pages	Size of Water Seal
BF2D	66ZW600	15-1, 15-2	11 x 21 x 8 mm
BF20A/25A	66ZV700	12-2, 12-5	22 x 35 x 7 mm
		12-8, 12-9	17 x 30 x 7 mm
		12-8	6 mm
BF35A/45A	66ZV300	11-5, 11-8	22 x 35 x 7 mm
		11-10, 11-11	17 x 30 x 7 mm
BF75A/90A	66ZW000Z	11-4, 11-5	10 x 21 x 6 mm
		11-8, 11-11	30 x 45 x 7 mm
BF115A/130A	66ZW500	12-5, 12-6	10 x 21 x 6 mm
		12-10, 12-15	30 x 45 x 7 mm

### CHANGE LOCATIONS

The liquid applied to the circumference of water seals has been changed.

After Modification	Before Modification
<b>INSTALLATION:</b> <ul style="list-style-type: none"> <li>Do not reuse.</li> <li>Apply grease to the mating surface and lips of the seals.</li> <li>Apply soapy water to the circumference of the seals.</li> </ul>	<b>INSTALLATION:</b> <ul style="list-style-type: none"> <li>Do not reuse.</li> <li>Apply grease to the mating surface, circumference and lips of the seals.</li> </ul>

## OUTBOARD MOTOR

## Power Equipment

News No.	Issue Date
P/P-165	Jul. 2003

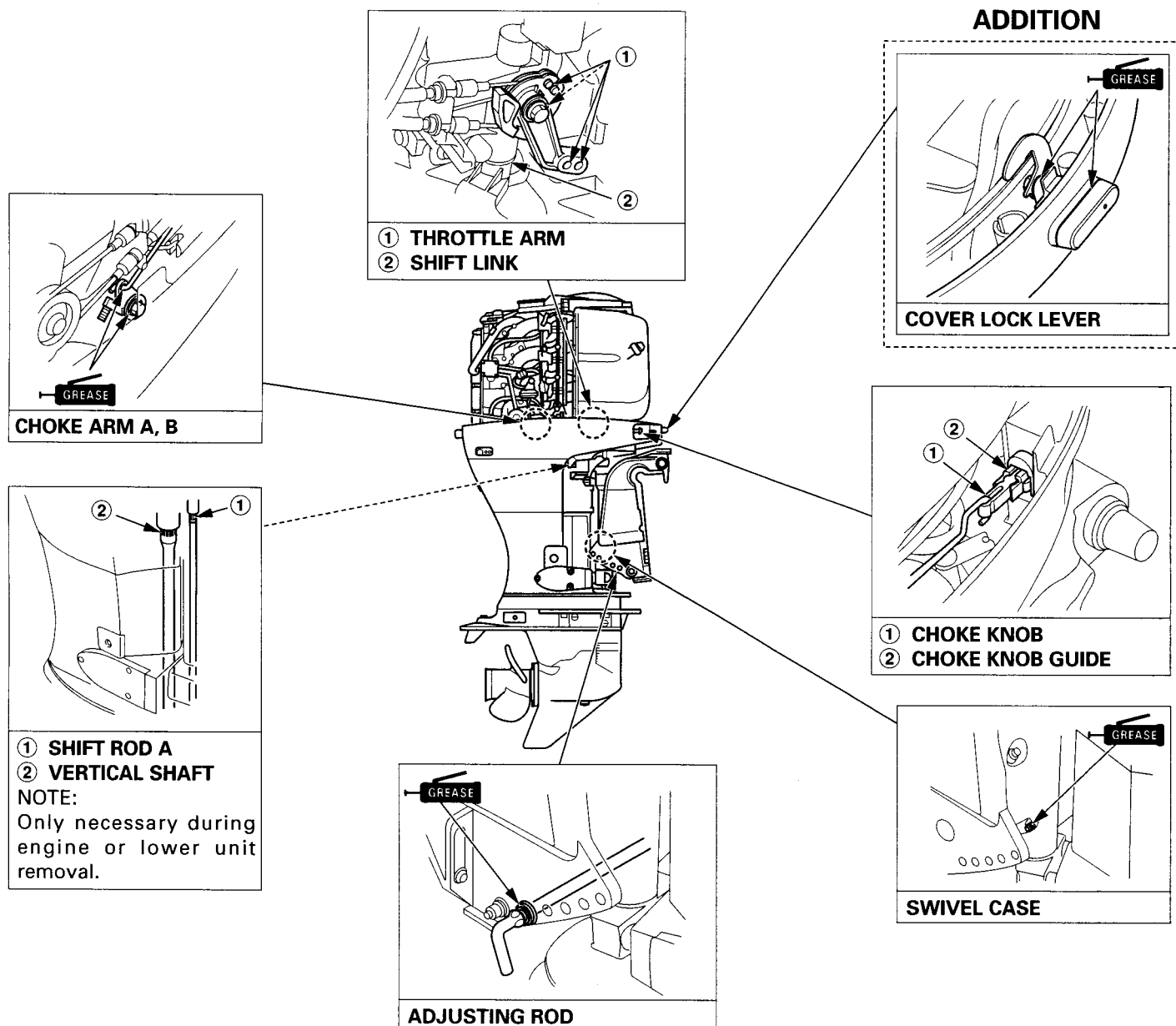
### SOME PARTS OF CHANGES

Applicable Information	Publication No.	Applicable Page
BF75A-BF90A	66ZW000	2-40, 12-3

### CHANGE LOCATIONS

- Grease application on the cover lock lever has been added.

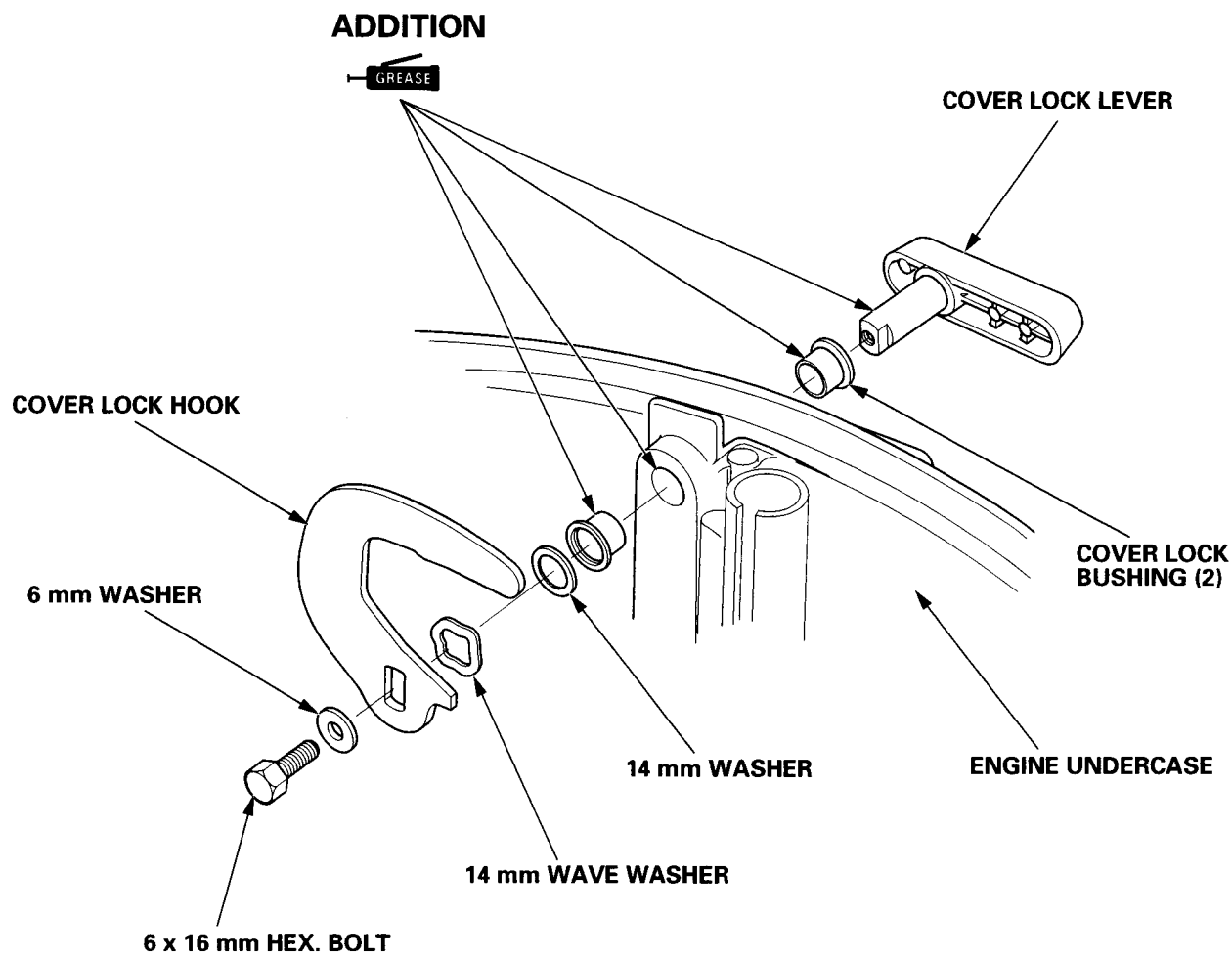
### LUBRICATION (P. 2-40)





**COVER LOCK LEVER (P. 12-3)**

**a. REMOVAL/INSTALLATION**



Model: BF75/90A1

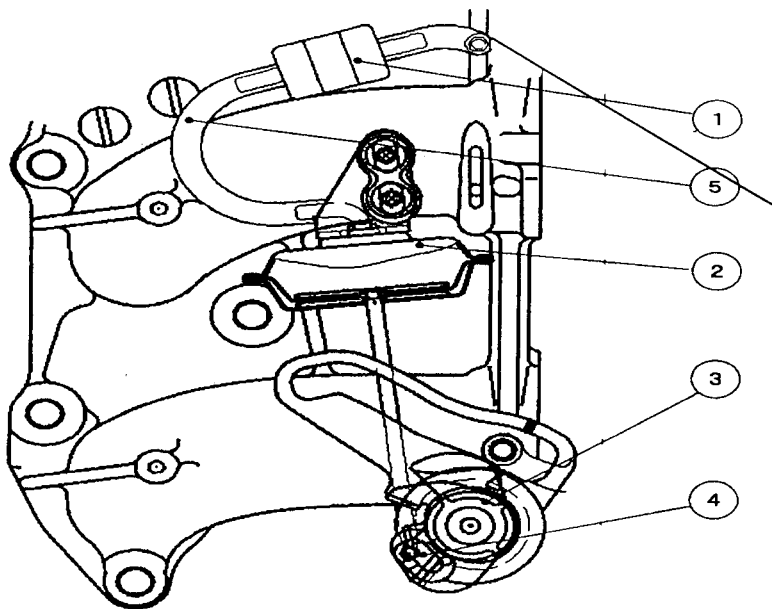
Re: Diaphragm parts change

Contents: We would like to inform you that the diaphragm-related parts have been changed from the following model numbers on to improve the acceleration stability.

Old	New	Compatibility	
		Old to new	New to old
VALVE, DASHPOT SOLENOID	VALVE, DASHPOT SOLENOID	No	No
DIAPHRAGM ASSY.	DIAPHRAGM ASSY.	No	No
SPRING, ASSIST	SPRING, ASSIST	No	No
CAM, THROTTLE OPENER	CAM, THROTTLE OPENER	No	No
- TUBE, FUEL, x	TUBE, FUEL	No	No

Note: In regard to BF75, use the parts to and the carburetor assembly 16100ZW1L01ZA when an old model is to be modified for improved acceleration stability.

VALVE, DASHPOT SOLENOID	VALVE, DASHPOT SOLENOID	No	No
DIAPHRAGM ASSY.	DIAPHRAGM ASSY.	Yes	Yes
SPRING, ASSIST	SPRING, ASSIST	Yes	Yes
CAM, THROTTLE OPENER	CAM, THROTTLE OPENER	Yes	Yes
- TUBE, FUEL, x	TUBE, FUEL	No	No



Applicable model numbers

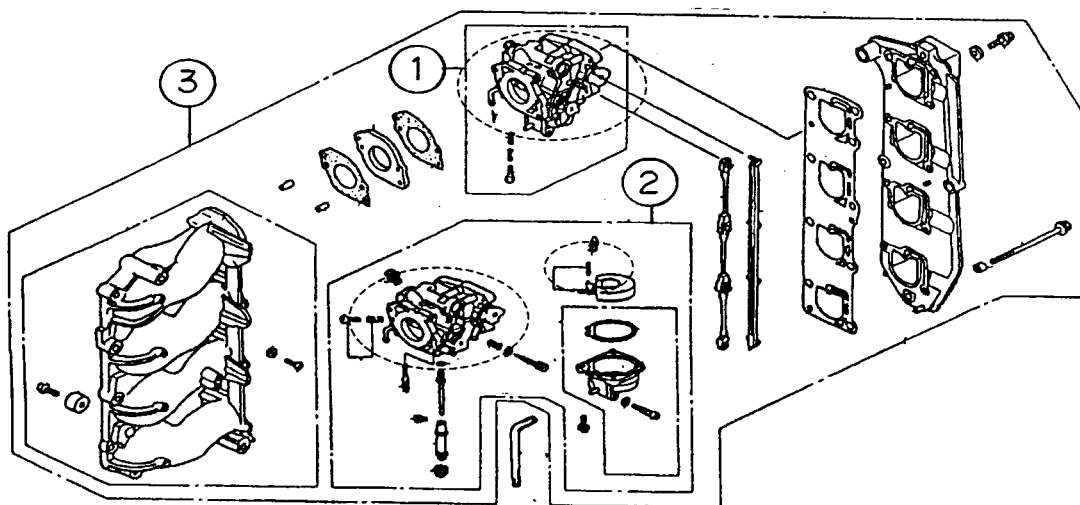
(From the production of June 2000 on.)

Model: BF75/90A1

Re: Carburetor assembly parts change

Contents: We would like to inform you that the carburetor assembly parts have been changed from the following model numbers on.

Old	New	Compatibility	
		Old to new	New to old
CARBURETOR ASSY. (#1 #2 #3)	CARBURETOR ASSY. (#1 #2 #3)	No	No
CARBURETOR ASSY. (# )	CARBURETOR ASSY. (# )	No	No
CARBURETOR ASSY.	CARBURETOR ASSY.	No	Yes
CARBURETOR ASSY. (#1 #2 #3)	CARBURETOR ASSY. (#1 #2 #3)	No	No
CARBURETOR ASSY. (# )	CARBURETOR ASSY. (# )	No	No
CARBURETOR ASSY.	CARBURETOR ASSY.	No	Yes



Change contents: Change of the passage of the pilot screw part  
Change to light pressure fit for the float pin

Applicable model numbers

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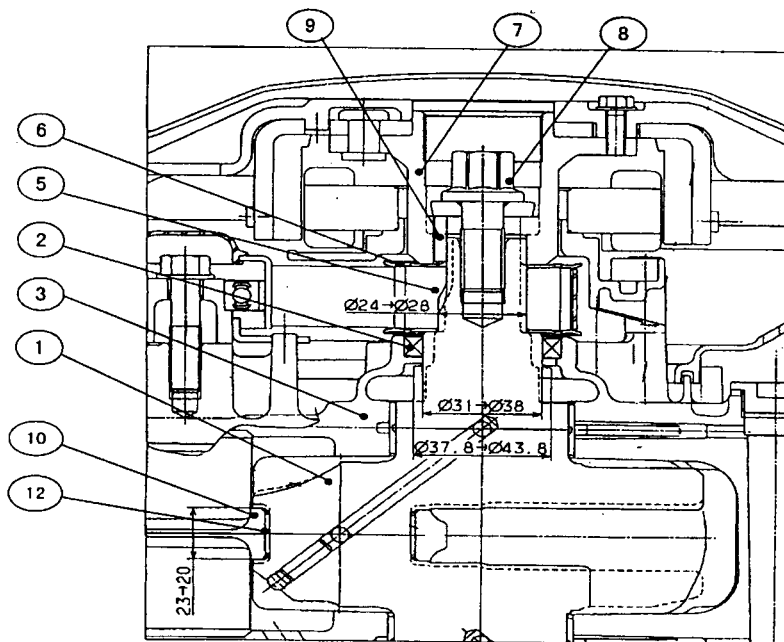
(From the production of June 2000 on.)

Model: BF75/90A1

Re: Crankshaft parts change

Contents: We would like to inform you that the parts around the crankshaft have been changed from the following model numbers on.

Old	New	Compatibility	
		Old to new	New to old
CRANKSHAFT COMP.	CRANKSHAFT COMP.	No	No
OIL SEAL, x x	OIL SEAL, x x	No	No
BLOCK ASSY., CYLINDER	BLOCK ASSY., CYLINDER	No	No
PULLEY, TIMING BELT DRIVE	PULLEY, TIMING BELT DRIVE	No	No
PLATE, TIMING BELT GUIDE	PLATE, TIMING BELT GUIDE	No	No
ROTOR	ROTOR	No	No
BOLT-WASHER x	BOLT-WASHER 1 x	No	No
KEY, x	KEY, x	No	No
ROD COMP., CONNECTING	ROD COMP., CONNECTING	No	No
BEARING A to G, MAIN	BEARING A to G, MAIN	No	No



Change contents: Increased outer diameter of the crankshaft

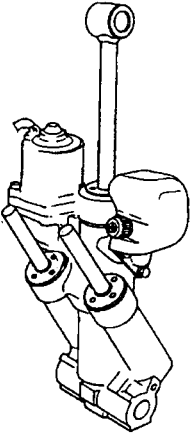
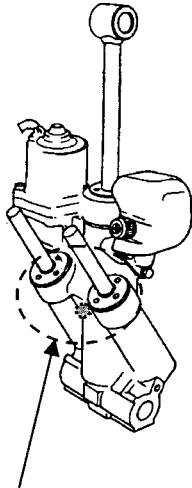
Applicable model numbers

(From the production of June 2000 on.)

Model: BF75/90AV

Re: Power trim tilt assembly parts change

Contents: We would like to inform you that the specifications for the blind plug of the cylinder part of the power trim tilt assembly have been changed from the following model numbers on to improve the rust resistance.

Old	New	Compatibility	
		Old to new	New to old
ZA TRIM-TILT ASSY., POWER	ZA TRIM-TILT ASSY., POWER	No	Yes
	 <p>Changed specifications for the blind plug of the cylinder part</p>		

Applicable model numbers

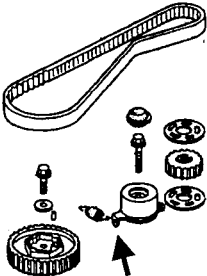
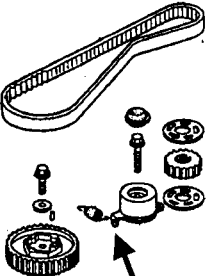
V

(From the production of May 1999 on.)

Model: BF75/90A1

Re: Timing belt adjustment spring comp parts change

Contents We would like to inform you that the timing belt adjustment spring COMP parts have been changed from the following model numbers on.

Old	New	Compatibility	
		Old to new	New to old
SPRING COMP., TIMING BELT ADJUSTING	SPRING COMP., TIMING BELT ADJUSTING	No	Yes
 <p>Spring surface: Gray color without gloss</p>	 <p>Spring surface: Gray color with gloss</p>		

Change purpose:

Improved rust resistance

Change contents:

Material: SWP-B spring steel + Dacro coating

Material: SUS304 stainless steel

Applicable model numbers

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(From the production of February 2000 on.)

(From the production of March 2000 on.)

In case of occurrence of rusting for the old model numbers, inspect and replace according to the service manual.