PREFACE

This manual covers the construction, function and servicing procedures of the Honda BF20A/BF25A outboard motors.
Careful observance of these instructions will result in better, safer service work.
Illustrations in this manual are based primarily on the BF25A LRS.

HONDA MOTOR CO., LTD.
SERVICE PUBLICATIONS OFFICE

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Data of Issue April 1994

SHOP MANUAL NEWS

HONDA OUTBOARD MOTOR BF20A · BF25A

Power Equipment

News No. P/P-035	Issue Date September '94

SOME PARTS OF CHANGES

Applicable information	Publication No.
BF20A · BF25A	66ZV700

CHANGE LOCATIONS
P.12-21
8. BACKLASH ADJUSTMENT
•FORWARD GEAR

BEFORE MODIFICATION

3) Turn the vertical shaft right and left while pressing it down with approximately 5 kg (11.0 lb) of force and measure the backlash.

Standard	0.10–0.29 mm (0.004–0.011 in)

4) If the backlash is too large, increase the forward gear shim thickness and recheck the backlash.
If the backlash is too small, decrease the forward gear shim thickness and recheck the backlash.

AFTER MODIFICATION

3) Turn the vertical shaft right and left while pressing it down with approximately 5 kg (11.0 lb) of force and measure the backlash.

$$\text{Backlash} = \text{Dial Gauges measures} \times \frac{17.43^{*1}}{23^{*2}}$$

*1 The pinion gear radious of pitch circle
*2 The special tools (07MGJ-0010100) lever-length

Standard	0.10–0.29 mm (0.004–0.011 in)

4) If the backlash is too large, increase the forward gear shim thickness and recheck the backlash.
If the backlash is too small, decrease the forward gear shim thickness and recheck the backlash.

Service limit	0.30 mm (0.012 in)

P.12-22
•REVERSE GEAR

3) Turn the vertical shaft right and left while pressing it down with approximately 5 kg (11.0 lb) of force and measure the backlash.

Standard	0.10–0.39 mm (0.004–0.015 in)

4) If the backlash is too large, increase the reverse gear shim thickness and recheck the backlash.
If the backlash is too small, decrease the reverse gear shim thickness and recheck the backlash.

3) Turn the vertical shaft right and left while pressing it down with approximately 5 kg (11.0 lb) of force and measure the backlash.

$$\text{Backlash} = \text{Dial Gauges measures} \times \frac{17.43}{23}$$

Standard	0.10–0.39 mm (0.004–0.015 in)

4) If the backlash is too large, increase the reverse gear shim thickness and recheck the backlash.
If the backlash is too small, decrease the reverse gear shim thickness and recheck the backlash.

Service limit	0.40 mm (0.016 in)

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SERVICE PUBLICATIONS

HONDA OUTBOARD MOTOR BF20A · BF25A

SHOP MANUAL NEWS

Power Equipment

News No.	Issue Date
P/P-032	August '94

SOME PARTS OF CHANGES

Applicable information	Publication No.
BF20A · BF25A	66ZV700

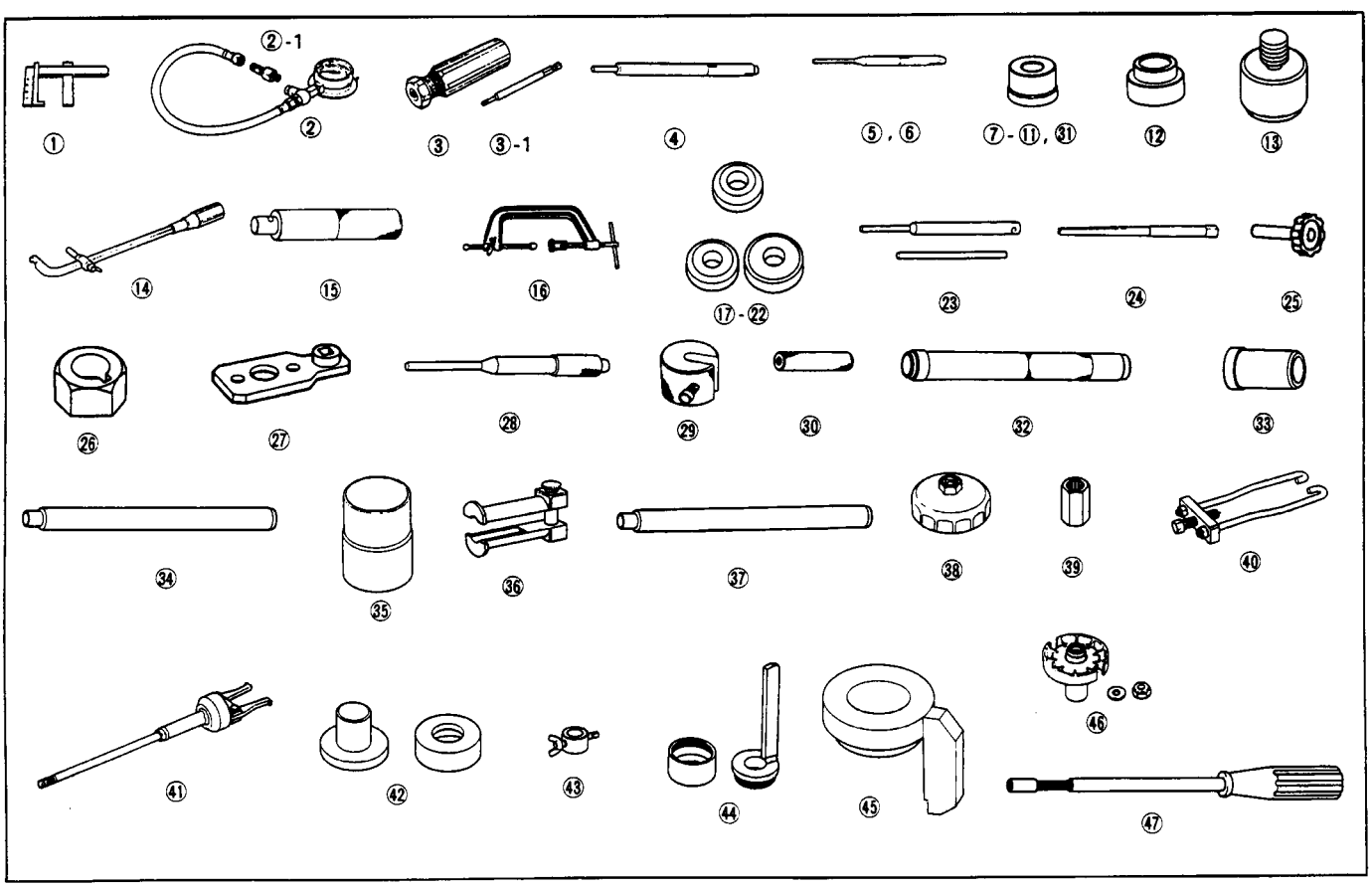
CHANGE LOCATIONS

The part numbers of the pin driver, 4mm and the special tool illustrations have been corrected as follows.

- Pin driver , 4mm

BEFORE MODIFICATION		AFTER MODIFICATION
07944–9350200	⟶	07744–0010300 or 07944–SA00000

- Special tool illustrations



HONDA MOTOR CO., LTD.
SERVICE PUBLICATIONS

1. SPECIFICATIONS

DIMENSIONS AND WEIGHTS

Item \ Model	BF20A					
Description code	BAHS	BAHL	BAHS	BAHL	BAHS	BAHL
Type	SH	LH	SHS	LHS	SRS	LRS
Overall length	*1: 675 mm (26.6 in) *2: 1,005 mm (39.6 in)				640 mm (25.2 in)	
Overall width	380 mm (15.0 in)				375 mm (14.8 in)	
Overall height	1,190 mm (46.9 in)	1,315 mm (51.8 in)	1,190 mm (46.9 in)	1,315 mm (51.8 in)	1,190 mm (46.9 in)	1,315 mm (51.8 in)
Dry weight	67 kg (147.7 lb)	69 kg (152.1 lb)	70 kg (154.3 lb)	72 kg (158.8 lb)	69 kg (152.1 lb)	71 kg (156.6 lb)
Operating weight (incld. oil)	69 kg (152.1 lb)	71 kg (156.6 lb)	72 kg (158.8 lb)	74 kg (163.2 lb)	71 kg (156.6 lb)	73 kg (161.0 lb)

*1: With Tiller Handle raised
*2: With Tiller Handle extended

DIMENSIONS AND WEIGHTS

Item \ Model	BF25A					
Description code	BAJS	BAJL	BAJS	BAJL	BAJS	BAJL
Type	SH	LH	SHS	LHS	SRS	LRS
Overall length	*1: 675 mm (26.6 in) *2: 1,005 mm (39.6 in)				640 mm (25.2 in)	
Overall width	380 mm (15.0 in)				375 mm (14.8 in)	
Overall height	1,190 mm (46.9 in)	1,315 mm (51.8 in)	1,190 mm (46.9 in)	1,315 mm (51.8 in)	1,190 mm (46.9 in)	1,315 mm (51.8 in)
Dry weight	67 kg (147.7 lb)	69 kg (152.1 lb)	70 kg (154.3 lb)	72 kg (158.8 lb)	69 kg (152.1 lb)	71 kg (156.6 lb)
Operating weight (incld. oil)	69 kg (152.1 lb)	71 kg (156.6 lb)	72 kg (158.8 lb)	74 kg (163.2 lb)	71 kg (156.6 lb)	73 kg (161.0 lb)

*1: With Tiller Handle raised
*2: With Tiller Handle extended

FRAME

Item \ Model / Type	BF20A/BF25A					
	SH	LH	SHS	LHS	SRS	LRS
Transom height	431 mm (17.0 in)	552 mm (21.7 in)	431 mm (17.0 in)	552 mm (21.7 in)	431 mm (17.0 in)	552 mm (21.7 in)
Transom angle	5 stage adjustment (4°, 8°, 12°, 16°, 20°)					
Tilting angle	75°					
Swivel angle	40° right and left					

TYPES OF HONDA BF20A/BF25A OUTBOARD MOTORS

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

Models	Types	Shaft Length		Tiller Handle	Remote Control	Electric Starter	Recoil Starter
		Short	Long				
BF20A/BF25A	SH	●		●			●
	LH		●	●			●
	SHS	●		●		●	●
	LHS		●	●		●	●
	SRS	●			●	●	●
	LRS		●		●	●	●

S: Short Shaft L: Long Shaft H: Tiller Handle R: Remote Control

ENGINE

Model	BF20A	BF25A
Type	4-stroke, O.H.C, 3-cylinder	
Displacement	499 cm^3 (30.5 cu in)	
Bore x stroke	58 x 63 mm (2.3 x 2.5 in)	
Rated power *1	20 HP (14.9 kw)/4,500—5,500 min^{-1} (rpm)	25 HP (18.7 kw)/5,000—6,000 min^{-1} (rpm)
Maximum torque	3.55 kg-m (25.7 ft-lb)/3,000 min^{-1} (rpm)	3.59 kg-m (26.0 ft-lb)/4,000 min^{-1} (rpm)
Compression ratio	9.2 : 1	
Fuel consumption ratio	214 g/PSh (7.5 oz/PSh)	239 g/PSh (8.4 oz/PSh)
Cooling system	Forced water circulation by impeller pump with thermostat	
Ignition system	CDI	
Ignition timing	5—26° B.T.D.C.	
Spark plug	DR7EA (NGK), X22ESR-U (NIPPONDENSO)	
Carburetor	Horizontal type, butterfly valve (3 carburetor)	
Lubrication system	Pressure lubrication by trochoid pump	
Lubrication capacity	1.9ℓ (2.00 US qt, 1.67 Imp qt)	
Starter system	Electric starter or Recoil starter	
Stopping system	Grounding of primary circuit	
Fuel	Regular automotive gasoline (86 pump octane; unleaded preferred)	
Fuel tank capacity	25 ℓ (6.6 US gal, 5.5 Imp gal)	
Fuel pump	Mechanical plunger type	
Exhaust system	Under water type	
Recommended oil	SAE 10W-30	

*1: Full throttle range.

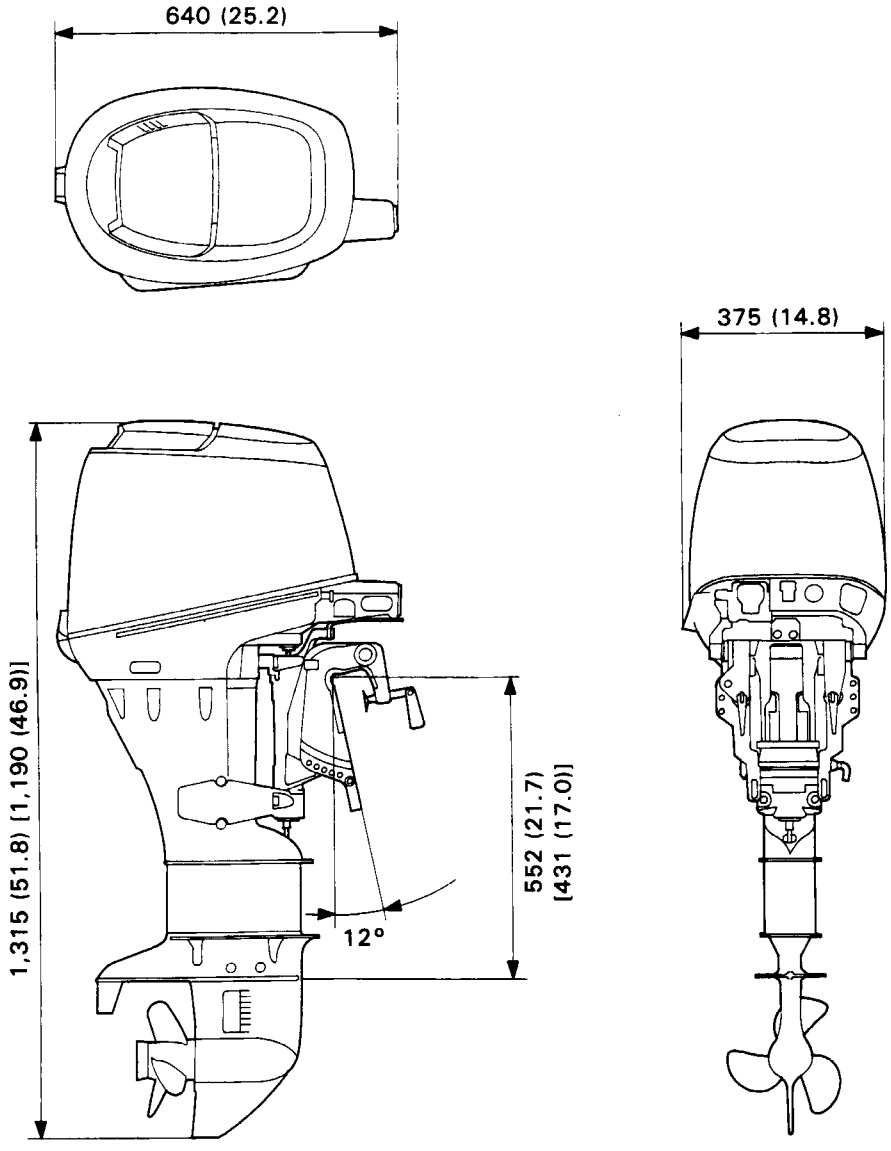
LOWER UNIT

Clutch	Dog clutch (Forward—Neutral—Reverse)
Gear ratio	0.48 (13/27)
Reduction	Spiral bevel
Gear case oil capacity	0.29 ℓ(0.307 US qt, 0.255 Imp qt)
Propeller No. of blades-Dia. x Pitch	3-235 x 305 mm (9-1/4 x 12.0 in)
Propeller rotating direction	Clockwise (viewed from rear)
Propeller driving system	Spline

2. DIMENSIONAL DRAWINGS

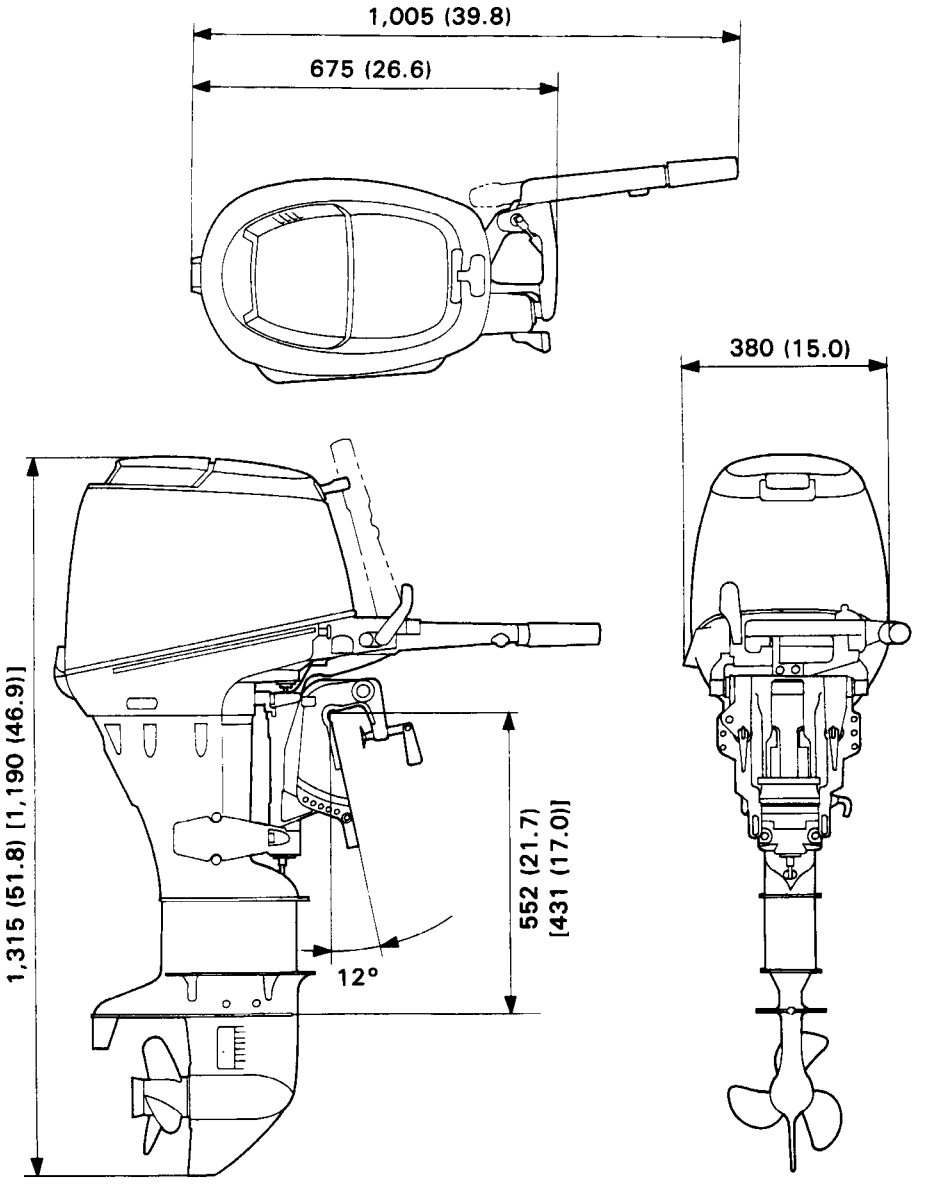
Unit: mm (in)

Remote control type
[ ]: Short shaft type



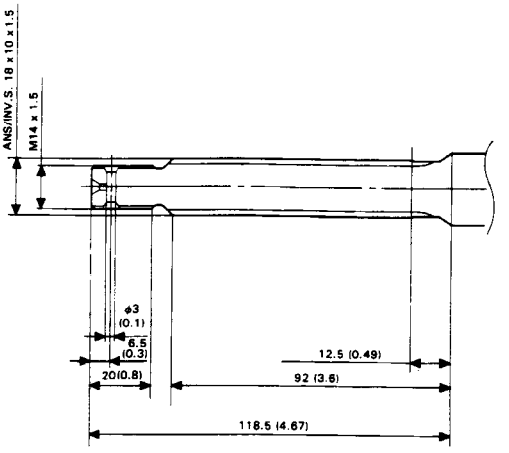
Tiller handle type
[ ]: Short shaft type

Unit: mm (in)



PROPELLER SHAFT

Unit: mm (in)



1. GENERAL SAFETY

Pay attention to these symbols and their meanings:

⚠WARNING **Indicates a strong possibility of severe personal injury or death if instructions are not followed.**
CAUTION: **Indicates a possibility of personal injury or equipment damage if instructions are not followed.**

⚠WARNING

- **Stop the engine, and remove the spark plug caps and ignition key before servicing the outboard motor.**
- **If the motor must be running to do some work, make sure the area is well ventilated. Never run the engine in a closed area; the exhaust contains poisonous carbon monoxide gas.**
- **Gasoline is extremely flammable and is explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.**

CAUTION

- **Keep away from rotating or hot parts and high voltage wires when the engine is run with the engine cover off.**

2. 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 reassembling.
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 reassembly.
6. After reassembly, 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 bolt, 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:

: Apply oil (S.TOOL) : Use special tool 

: Apply grease

O x O (O) : Indicates the type, length, and number of the flange bolt used.

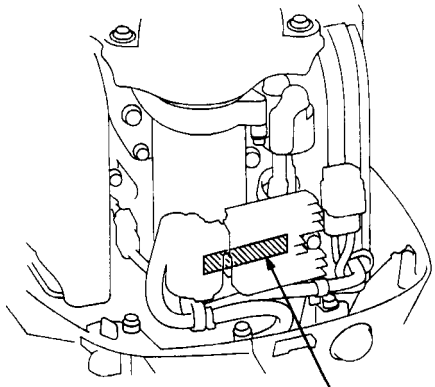
(P) : Indicates the reference page.

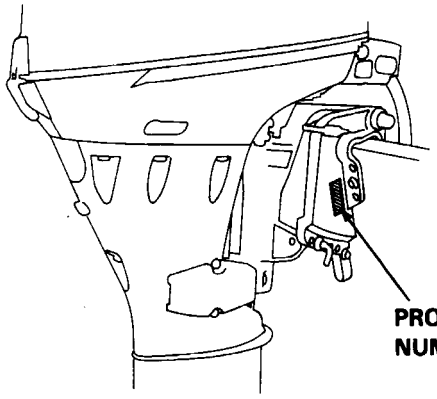
: Use molybdenum oil solution (mixture of the engine oil and molybdenum grease with the ratio 1 : 1).

(Molybdenum disulfide oil)

3. SERIAL NUMBER LOCATION

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





4. MAINTENANCE STANDARDS

ENGINE

Unit: mm (in)

Part	Item		Standard	Service limit
Engine	Idle speed (in neutral)		900 ± 50 min^{-1} (rpm)	——
	Cylinder compression		15 ± 1 kg/cm^2 (212 ± 14 psi) at 500 min^{-1} (rpm)	——
Carburetor	Main jet		#100	——
	Pilot screw opening		2 turns out	——
	Float height		14 (0.6)	——
Spark plug	Gap		0.6–0.7 (0.024–0.028)	——
Valves	Valve clearance	IN	0.10–0.14 (0.004–0.006)	——
		EX	0.18–0.22 (0.007–0.009)	——
	Stem O.D.	IN	5.475–5.490 (0.2156–0.2161)	5.45 (0.215)
		EX	5.455–5.470 (0.2148–0.2154)	5.43 (0.214)
	Guide I.D.	IN/EX	5.500–5.512 (0.2165–0.2170)	5.54 (0.218)
	Seat width	IN	0.9–1.1 (0.035–0.043)	2.0 (0.08)
		EX	0.9–1.1 (0.035–0.043)	2.0 (0.08)
	Spring free length	IN/EX	36.8 (1.45)	35.3 (1.39)
	Stem-to-guide clearance	IN	0.010–0.037 (0.0004–0.0015)	0.07 (0.003)
		EX	0.030–0.057 (0.0012–0.0022)	0.12 (0.005)
Rocker arm	Rocker arm I.D.		13.000–13.018 (0.5118–0.5125)	13.04 (0.513)
	Rocker arm shaft O.D.		12.962–12.980 (0.5103–0.5110)	12.92 (0.509)
	Rocker arm shaft-to-rocker arm clearance		0.020–0.056 (0.0007–0.0022)	0.07 (0.003)
Piston	Skirt O.D.		57.970–57.990 (2.2823–2.2831)	57.92 (2.280)
	Piston-to-cylinder clearance		0.010–0.045 (0.0004–0.0018)	0.1 (0.004)
	Pin bore I.D.		14.002–14.008 (0.5513–0.5515)	14.02 (0.552)
	Pin O.D.		13.994–14.000 (0.5509–0.5512)	13.97 (0.550)
	Pin-to-pin bore clearance		0.002–0.014 (0.0001–0.0006)	0.04 (0.002)
Piston ring	Ring side clearance	Top	0.025–0.055 (0.0010–0.0022)	0.1 (0.004)
		Second	0.025–0.055 (0.0010–0.0022)	0.1 (0.004)
		Oil	0.055–0.14 (0.0022–0.006)	0.2 (0.008)
	Ring end gap	Top	0.15–0.3 (0.006–0.012)	0.5 (0.02)
		Second	0.35–0.50 (0.014–0.020)	0.7 (0.03)
		Oil	0.20–0.80 (0.008–0.031)	1.0 (0.04)
	Ring thickness	Top	1.175–1.190 (0.0463–0.0469)	1.08 (0.043)
		Second	1.175–1.190 (0.0463–0.0469)	1.08 (0.043)
Cylinder/ cylinder head	Cylinder sleeve I.D.		58.000–58.015 (2.2835–2.2841)	58.055 (2.2856)
	Distortion of cylinder head		0.05 (0.002)	0.1 (0.004)
	I.D. of camshaft journal	#1	20.000–20.021 (0.7874–0.7882)	20.05 (0.789)
		#2	30.000–30.025 (1.1811–1.1821)	30.06 (1.183)
	(Oil pump journal)	#3	18.000–18.027 (0.7087–0.7097)	18.06 (0.711)

Unit: mm (in)

Part	Item		Standard	Service limit
Connecting rod	Small end I.D.		14.010 – 14.022 (0.5516 – 0.5520)	14.05 (0.553)
	Big end oil clearance		0.010 – 0.028 (0.0004 – 0.0011)	0.4 (0.01)
	Big end axial clearance		0.12 – 0.27 (0.005 – 0.011)	0.4 (0.01)
	Connecting rod bearing oil clearance		0.018 – 0.042 (0.0007 – 0.0017)	0.8 (0.03)
Crankshaft	Journal O.D.	Main	35.986 – 36.002 (1.4168 – 1.4174)	35.96 (1.416)
		Pin	31.987 – 32.011 (1.2593 – 1.2603)	31.96 (1.258)
	Crankshaft main bearing oil clearance		0.020 – 0.044 (0.0008 – 0.0017)	0.06 (0.002)
	Crankshaft side clearance		0.05 – 0.30 (0.002 – 0.012)	0.45 (0.018)
Camshaft	Shaft axial clearance		0.15 – 0.40 (0.006 – 0.016)	0.6 (0.02)
	Shaft runout		0.03 (0.001) Max.	0.05 (0.002)
	Journal O.D.	#1	19.959 – 19.980 (0.7858 – 0.7866)	19.93 (0.785)
		#2	29.939 – 29.960 (1.1787 – 1.1795)	29.9 (1.18)
		#3	17.966 – 17.984 (0.7073 – 0.7080)	17.94 (0.706)
	Cam height	IN	24.073 – 24.313 (0.9478 – 0.9572)	23.843 (0.9387)
		EX	24.105 – 24.345 (0.9490 – 0.9585)	23.905 (0.9411)
	Shaft oil clearance	#1	0.020 – 0.062 (0.0008 – 0.0024)	0.08 (0.003)
		#2	0.040 – 0.086 (0.0016 – 0.0034)	0.11 (0.004)
		#3	0.016 – 0.061 (0.0006 – 0.0024)	0.08 (0.003)
Oil pump	Body I.D.		40.71 – 40.74 (1.603 – 1.604)	40.76 (1.605)
	Inner rotor-to-outer rotor clearance		0.15 (0.006) Max.	0.2 (0.01)
	Outer rotor-to-body clearance		0.15 – 0.21 (0.006 – 0.008)	0.26 (0.010)
	Outer rotor height		14.98 – 15.00 (0.590 – 0.591)	14.96 (0.589)
	Pump body depth		15.02 – 15.05 (0.591 – 0.593)	15.09 (0.594)
	Pump end clearance		0.02 – 0.07 (0.001 – 0.003)	0.1 (0.004)
Ignition coil	Resistance	Primary coil	0.19 – 0.23 Ω	—
		Secondary coil	10.3 – 15.9 kΩ	—
Exciter coil	Resistance		272 – 368 Ω	—
Pulser coil	Resistance		290 – 355 Ω	—

FRAME

Unit: mm (in)

Part	Item		Standard	Service limit
Vertical shaft	Shaft O.D. (at needle bearing)		22.217–22.230 (0.8747–0.8752)	22.196 (0.8739)
Bevel gear	Gear I.D.	Forward	19.000–19.021 (0.7480–0.7489)	19.04 (0.750)
		Reverse	22.05–22.30 (0.868–0.878)	22.35 (0.880)
Propeller shaft	Shaft O.D.	Front	18.967–18.980 (0.7467–0.7472)	18.946 (0.7459)
		Rear	20.9–21.2 (0.82–0.83)	20.85 (0.821)
	Shaft O.D. (at needle bearing)		22.007–22.020 (0.8664–0.8669)	21.99 (0.866)

5. TORQUE VALUES

Item	Thread Dia. (mm) and pitch (length)	Torque values		
		N•m	kg-m	ft-lb
• ENGINE				
Crankcase bolt *1	M8 x 1.25	29	2.9	21.0
	M6 x 1.0	12	1.2	8.7
Oil filter cartridge	M20 x 1.5	11	1.1	8.0
Water jacket cover bolt	M6 x 1.0	12	1.2	8.7
Thermostat cover bolt	M6 x 1.0	12	1.2	8.7
Cylinder head bolt *1	M8 x 1.25	29	2.9	21.0
	M8 x 1.25	27	2.7	19.5
Cylinder head cover bolt	M6 x 1.0	12	1.2	8.7
Fuel pump bolt	M6 x 1.0	10	1.0	7.2
Throttle cam	M6 x 1.0	12	1.2	8.7
Choke arm bolt	M6 x 1.0	12	1.2	8.7
Intake manifold bolt, nut	M6 x 1.0	12	1.2	8.7
Carburetor bolt	M6 x 1.0	10	1.0	7.2
Connecting rod nut	M7 x 0.75	24	2.4	17.4
Valve adjusting nut	M5 x 0.5	8	0.8	5.8
Oil drain bolt	M12 x 1.5	23	2.3	16.6
Exhaust pipe bolt	M6 x 1.0	10	1.0	7.2
Oil pan bolt	M6 x 1.0	10	1.0	7.2
Oil pump bolt	M6 x 1.0	13	1.3	9.4
Oil strainer bolt	M6 x 1.0	13	1.3	9.4
Timing pulley nut	M34 x 1.0	65	6.5	47.0
Timing belt tensioner bolt	M10 x 1.25	44	4.4	31.8
Timing belt adjusting spring bolt	M6 x 1.0	12	1.2	8.7
Flywheel nut	M16 x 1.5	115	11.5	83.2
Cam pulley bolt	M8 x 1.25	27	2.7	19.5
Oil pressure switch	PT 1/8	9	0.9	6.5
Thermo switch	M16 x 1.5	12	1.2	8.7
Starter solenoid cable				
(starter solenoid side)	M6 x 1.0	5	0.5	3.6
(electric starter side)	M8 x 1.25	27	2.7	19.5
CDI unit bolt	M6 x 1.0	5	0.5	3.6
Choke solenoid bracket bolt (Remote control type only)	M6 x 1.0	9	0.9	6.5

*1: Tighten the crankcase bolts to 29 N·m (2.9 kg-m, 21.0 ft-lb) and the cylinder head bolts to 29 N·m (2.9 kg-m, 21.0 ft-lb) first, then tighten them an additional $90° {}^{+30}_{0}$.

Item	Thread Dia. (mm) and pitch (length)	Torque values		
		N·m	kg-m	ft-lb
•GEAR CASE				
Pinion gear nut	M10 × 1.0	40	4.0	28.9
Gear case bolt	M10 × 1.25	35	3.5	25.3
Oil check plug	M8 × 1.25	3.5	0.35	2.5
Oil drain plug	M8 × 1.25	3.5	0.35	2.5
Wash plug	M8 × 1.25	3.5	0.35	2.5
Impeller housing bolt	M6 × 1.0	11	1.1	8.0
Propeller shaft castle nut	M14 × 1.5	1	0.1	0.7
•EXTENSION/MOUNT				
Extension case bolt	M8 × 1.25	22	2.2	15.9
Lower rubber motor mount nut	M12 × 1.25	55	5.5	39.8
Lower motor mount housing nut	M8 × 1.25	22	2.2	15.9
Upper rubber motor mount nut	M10 × 1.25	45	4.5	32.5
•STERN BRACKET				
Stern bracket nut (L.side)	7/8-14 UNF	17.5	1.75	12.7
(R.side)	7/8-14 UNF	32.5	3.25	23.5
	M8 x 1.25	22	2.2	15.9
•FRAME/ELECTRICAL				
Emergency stop switch nut	M16 × 1.0	1.5	0.15	1.1
Starter button nut (tiller handle type only)	M16 × 1.0	1.5	0.15	1.1
Water hose joint	PT1/8	9	0.9	6.5
Sampling probe cap (Bodensee type only)	M14 x 1.25	5	0.5	3.6
Sampling probe pipe (Bodensee type only)	M14 x 1.25	20	2.0	14.5

*1: First, tighten to the specified torque. If the cotter pin does not set in the hole, tighten additionally until the cotter pin sets in the hole securely.
Specified torque: 1 N·m (0.1 kg-m, 0.7 ft-lb)
Maximum torque: 35 N·m (3.5 kg-m, 25.3 ft-lb)

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

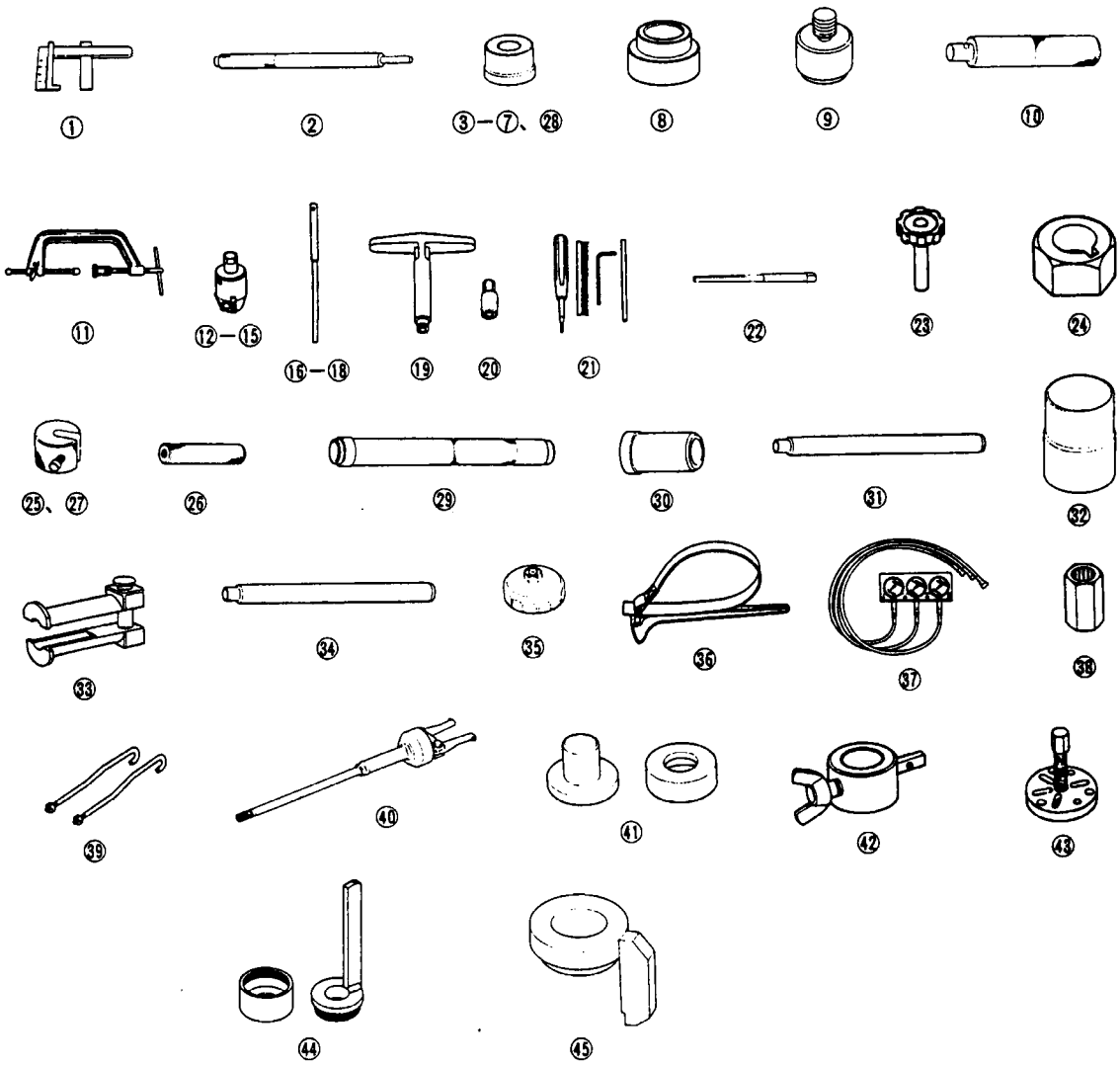
STANDARD TORQUE VALUES

Item	Thread Dia.	Torque values		
		N•m	kg-m	ft-lb
Bolt and nut	5 mm	5	0.5	3.6
	6 mm	10	1.0	7.2
	8 mm	21	2.1	15.2
	10 mm	35	3.5	25.3
	12 mm	55	5.5	39.8
Flange bolt and nut	6 mm (SH Flange bolt)	9	0.9	6.5
	6 mm	12	1.2	8.7
	8 mm	27	2.7	19.5
	10 mm	35	3.5	25.3
	12 mm	60	6.0	43.4
Screw	5 mm	4	0.4	2.9
	6 mm	9	0.9	6.5

6. SPECIAL TOOLS

Tool name	Tool number	Application
1. Float level gauge	07401—0010000	Inspection for carburetor float level
2. Oil pressure gauge	07506—3000000	Inspection for oil pressure
2-1. -attachment	07406—0030000	
3. Torx bit handle	07703—0010300	Handle for 3-1
3-1. -screw T20H	07703—0010400	Fuel pump disassembly/reassembly
4. Valve guide driver, 5.5 mm	07742—0010100	Valve guide removal/installation
5. Pin driver, 2.5 mm	07744—0010100	2.5 x 22 mm, 2.5 x 25 mm spring pin, 25 x 13.8 mm roller removal/installation
6. Pin driver, 3.0 mm	07744—0010200	3 x 20 mm, 3 x 25 mm spring pin removal/installation
7. Attachment, 32 x 35 mm	07746—0010100	22 x 35 x 7 mm water seal, lower motor mount center housing installation
8. Attachment, 37 x 40 mm	07746—0010200	Gear case inner race installation
9. Attachment, 42 x 47 mm	07746—0010300	Vertical shaft outer race installaiton
10. Attachment, 62 x 68 mm	07746—0010500	Gear case outer race installation
11. Attachment, 24 x 26 mm	07746—0010700	7/8 x 1-1/8 x 1 mm needle bearing installation, reverse gear removal/installation, 17 x 26 x 7 mm water seal installation
12. Attachment, 35 mm I.D.	07746—0030400	32 x 58 x 13 mm bearing, gear case inner race installation
13. Pilot, 22 mm	07746—0041000	7/8 x 1-1/8 x 1 mm removal/installation, 22 x 28 x 20 mm needle bearing installation
14. Oil seal driver	07748—0010001	Oil seal, water seal removal
15. Driver	07749—0010000	Driver for 7, 8, 9, 10, 11 and 31
16. Valve spring compressor	07757—0010000	Valve keeper removal/installation
17. Valve seat cutter, 45° ϕ24.5	07780—0010100	Valve seat reconditioning EX
18. Valve seat cutter, 45° ϕ29	07780—0010300	Valve seat reconditioning IN
19. Valve seat cutter, 32° ϕ25	07780—0012000	Valve seat reconditioning EX
20. Valve seat cutter, 32° ϕ28	07780—0012100	Valve seat reconditioning IN
21. Valve seat cutter, 60° ϕ30	07780—0014000	Valve seat reconditioning IN
22. Valve seat cutter, 60° ϕ26	07780—0014500	Valve seat reconditioning EX
23. Cutter holder, 5.5 mm	07781—0010101	Valve seat reconditioning
24. Valve guide reamer	07984—2000001	Valve guide reaming
25. Valve adjusting screw	07908—KE90000	Valve clearance adjustment
26. Crankshaft holder	07923—ZA00100	34 mm lock nut removal/installation
27. Holder	07926—VA20001	Flywheel removal/installation
28. Pin driver, 4 mm	07944—9350200	4 x 22 mm, 4 x 28 mm spring pin illation removal/installation
29. Remover weight	07741—0010201	Constituents of Bearing race puller (item 41).
30. Remover handle	07936—3710100	
31. Attachment, 28 x 30 mm	07946—1870100	22 x 28 x 20 mm needle bearing, 17 x 30 x 7 mm water seal installation
32. Stem race driver	07946—GC40000	Vertical shaft inner race installation
33. Driver head	07946—KM40701	22 x 28 x 20 mm needle bearing installation
34. Driver shaft	07946—MJ00100	22 x 28 x 20 mm needle bearing installation

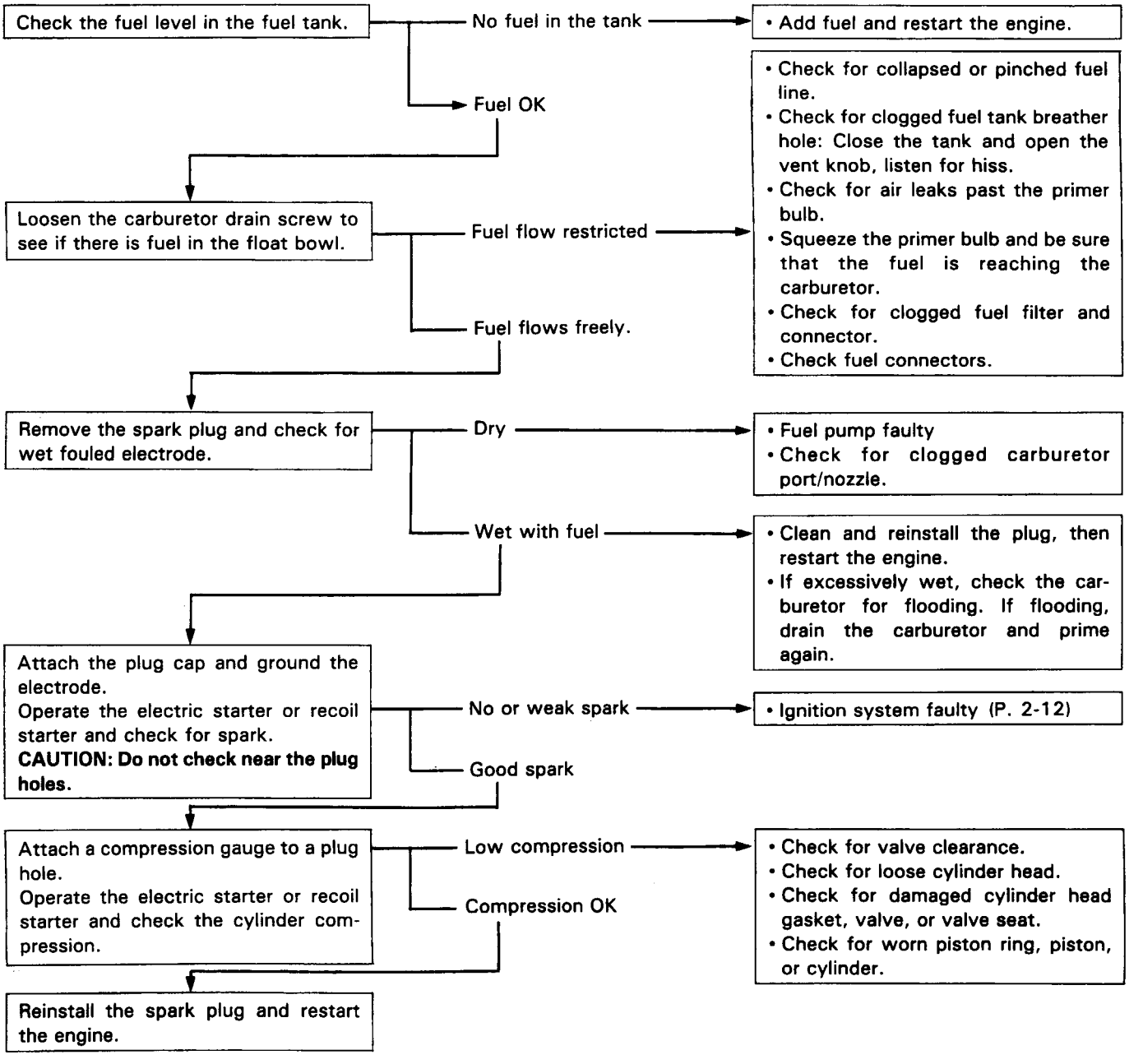
Tool name	Tool number	Application
35. Support base	07965—SD90100	Reverse gear removal
36. Remover attachment, 22 mm I.D.	07GMD—KT70200	Reverse gear removal
37. Driver	07949—3710001	7/8 x 1-1/8 x 1 mm needle bearing removal/installation, gear case outer race installation, reverse gear removal
38. Oil filter wrench	07HAA—PJ70100	Oil filter replacing
39. Vertical shaft holder	07LPB—ZV30200	Vertical shaft lock nut removal/installation
40. Propeller shaft holder	07LPB—ZV30300	Forward gear backlash inspection
41. Bearing race puller	07LPC—ZV30100	Vertical shaft, gear case outer race, 32 x 58 x 13 mm bearing removal
42. Bearing height gauge	07LPJ—ZV30200	Forward gear shim adjustment
43. Backlash inspection attachment	07MGJ—0010100	Forward/reverse gear backlash inspection
44. Vertical shaft gauge	07PPJ—ZV70100	Vertical shaft shim adjustment
45. Propeller shaft gauge	07PPJ—ZV70200	Propeller shaft shim adjustment
46. Test propeller	07PPZ—ZV70100	For test operation in water tank
47. Pilot screw wrench	07KMA—MS60101	Pilot screw adjustment (Bodenss type only)



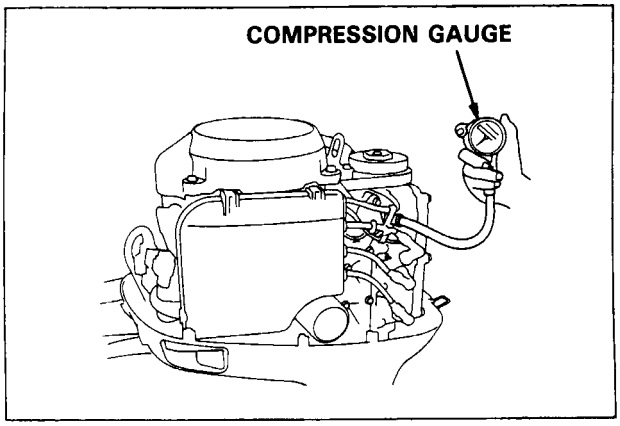
7. TROUBLESHOOTING

ENGINE

A. HARD STARTING



CYLINDER COMPRESSION



1) Put the remote control lever or gearshift lever in the 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 plug caps. Remove the all spark plugs.
5) Carefully disconnect the throttle rod from the throttle cam (P. 3-10).
6) Install a compression gauge in one of the spark plug holes.
7) Manually hold the throttle cam in the wide open throttle position.
8) Using the ignition key, starter button, or recoil starter, operate the starter until the highest compression reading is obtained.

Cylinder compression	15 ± 1 kg/cm^2 (212 – 14 psi) at 500 min^{-1} (rpm)

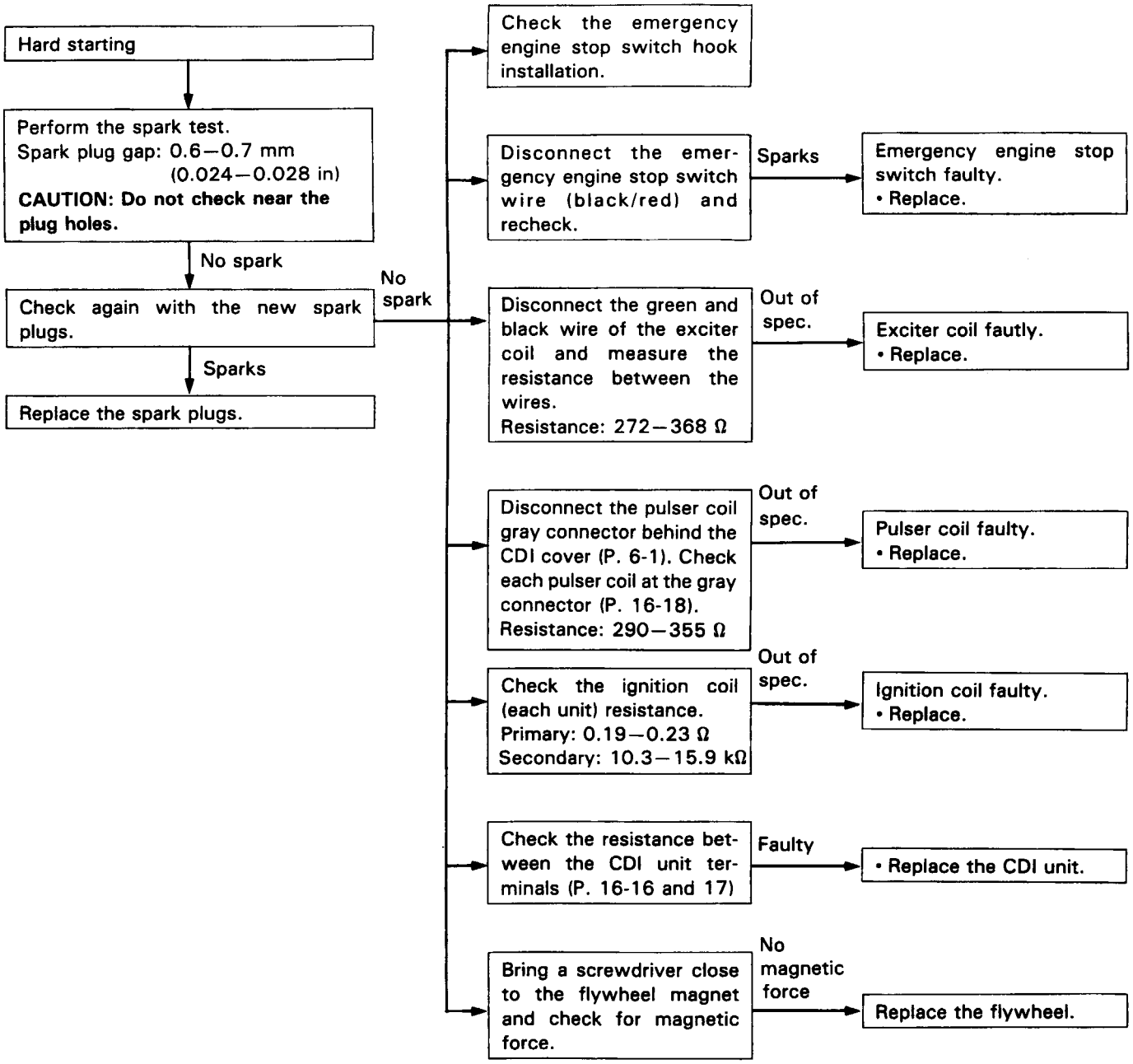
NOTE

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

9) Install the compression gauge in the other spark plug holes and repeat step 7) and 8).

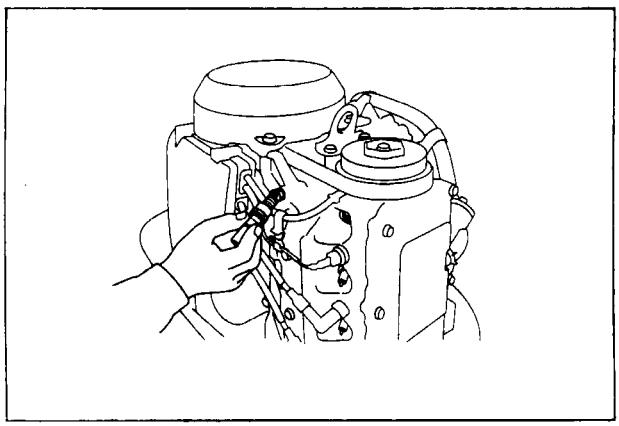
10) Check the compression on all cylinders.

B. IGNITION SYSTEM



SPARK TEST

1) Put the remote control lever or gearshift lever in the neutral position.
2) Disconnect all the spark plug caps from the spark plugs.
3) Remove one of the spark plugs from the engine.
4) Attach a removed spark plug to a spark plug cap. Ground the negative (—) terminal of the spark plug (threads) to the water jacket cover bolt as shown.
5) Using the ignition key, starter button or recoil starter, operate the electric starter and check to see if sparks jump across the spark plug electrode.



NOTE

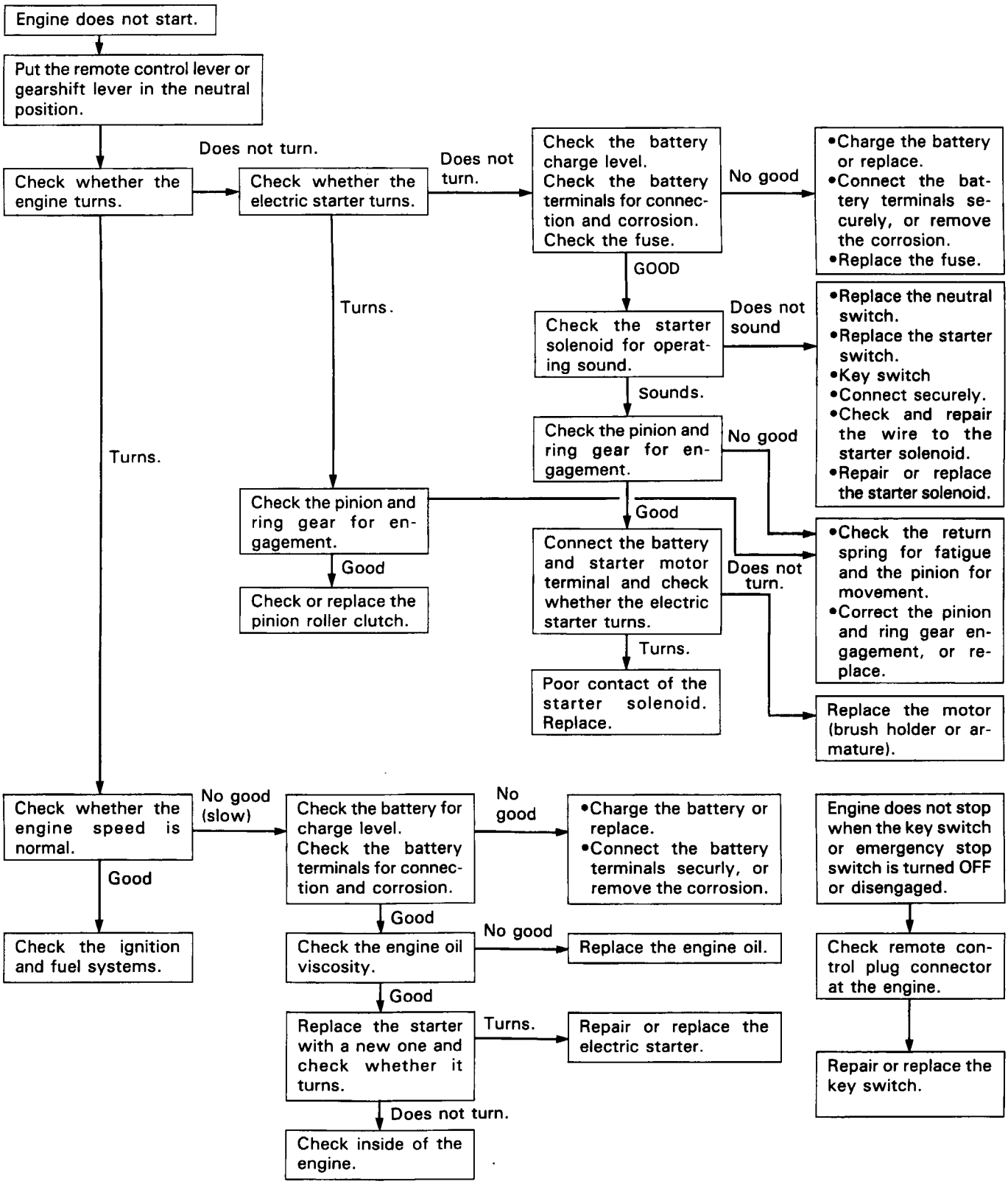
- On the remote control type, have an assistant operate the electric starter using the ignition key.

6) Remove the spark plug from the spark plug cap and repeat steps 4 and 5 for the other cylinders.

⚠ WARNING

- **Never hold the spark plug wire with wet hands while performing this test.**
- **Make sure that no fuel is spilled on the engine and that the plug is not wet with fuel.**
- **To avoid fire hazards, do not allow sparks near the plug holes.**
- **Stand clear of the spark plug holes while rotating the engine.**

C. ELECTRIC STARTER (Electric starter type only)



NOTE: Before repairing a problem, 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.
7) Secondary air sucked caused from 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.(Alert system function.)
5) Faulty spark plug → Clean, adjust, or replace.
6) Clogged fuel filter → Replace.
7) Water/dirt in carburetor → Drain the carburetor. Overhaul if it is still no good.
8) Incorrect valve timing → Reinstall the timing belt.

Engine speed does not decrease.

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

Excessive engine speed, engine speed fluctuates.

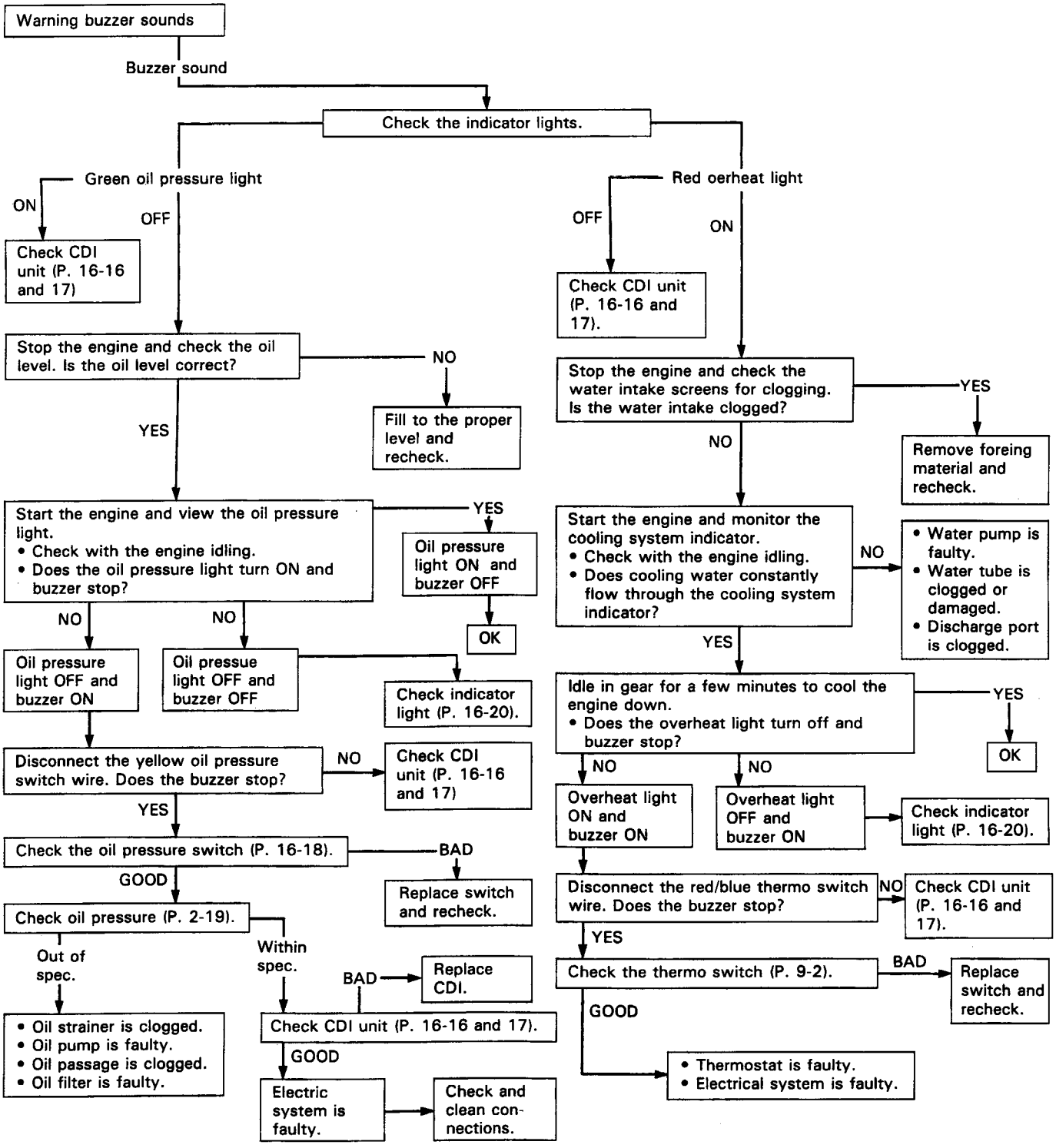
1) Mismatched propeller → Select correct propeller.

(Rev-limiter functions when over-revving.)

2) Propeller excessively worn → Replace.
3) Propeller damper rubber slippery → Replace.
4) Improperly installed outboard engine (incorrect transom height, tilt angle, etc.) → Adjust properly.

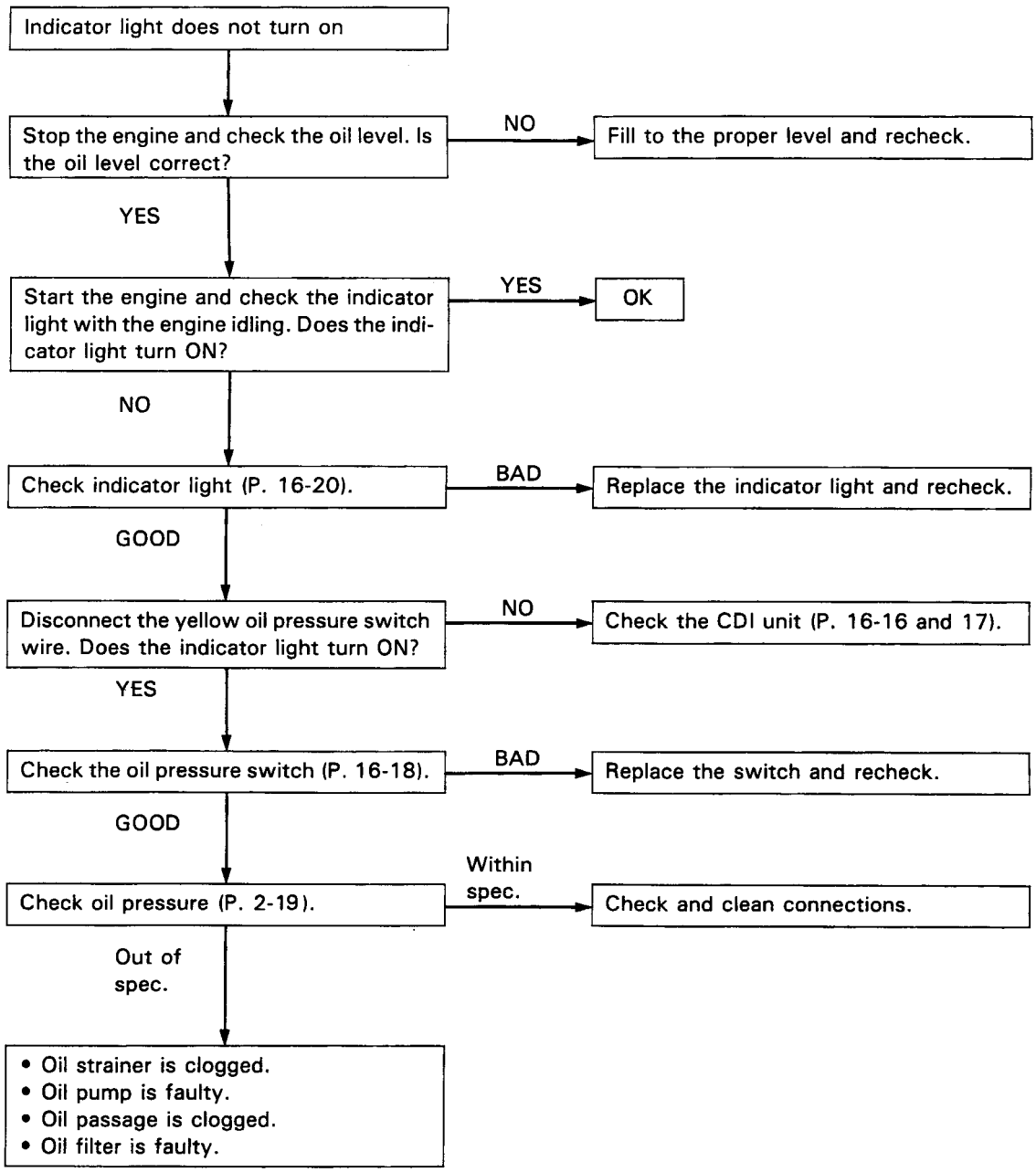
E. ALERT SYSTEMS

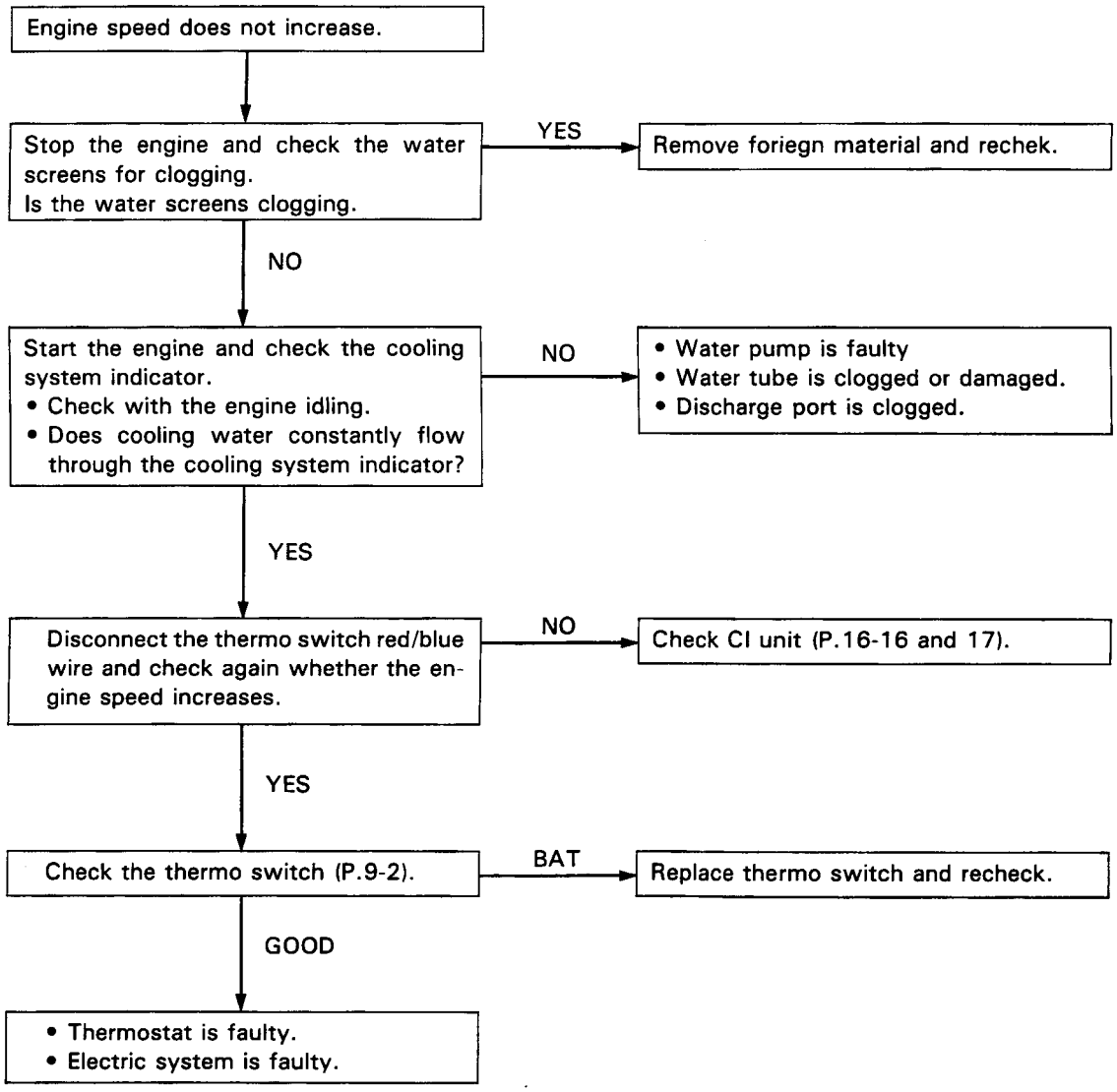
Remote control type



NOTE: These outboard motors are equipped with an engine over-rev limiter. The over-rev limiter is activated when the engine rpm exceeds 6,300 min^{-1} (rpm). When activated the spark is emitted to the No. 2 and No. 3 cylinders. The over-rev limiter may be activated under such conditions as; light propeller load or propeller ventilation (refer to P. 17-3 for details on the over-rev limiter).

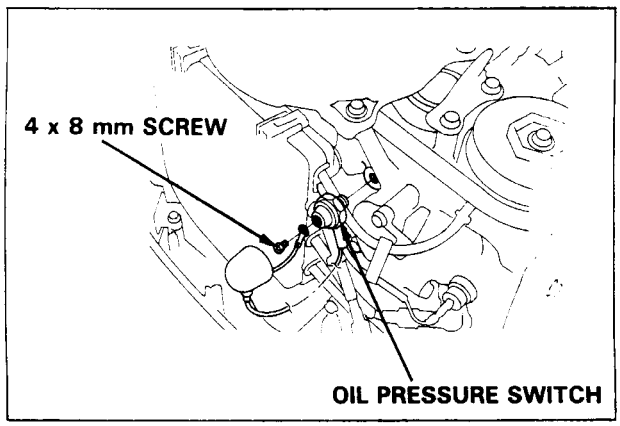
Tiller handle type



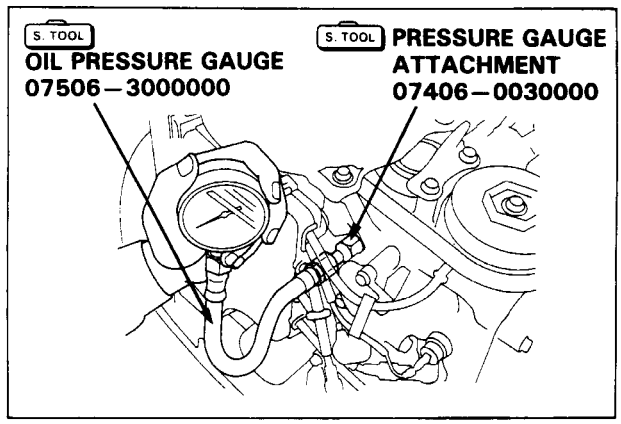

Engine speed does not increase.
Stop the engine and check the water screens for clogging.
Is the water screens clogging.
YES
Remove foriegn material and rechek.
NO
Start the engine and check the cooling system indicator.
• Check with the engine idling.
• Does cooling water constantly flow through the cooling system indicator?
NO
• Water pump is faulty
• Water tube is clogged or damaged.
• Discharge port is clogged.
YES
Disconnect the thermo switch red/blue wire and check again whether the engine speed increases.
NO
Check CI unit (P.16-16 and 17).
YES
Check the thermo switch (P.9-2).
BAT
Replace thermo switch and recheck.
GOOD
• Thermostat is faulty.
• Electric system is faulty.

OIL PRESSURE TEST

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



3) Install the pressure gauge attachment (special tool) on the oil pressure gauge that has a scale calibrated to a maximum of 0—7 kg/cm^2 (0—100 psi) scale and on the outboard motor.

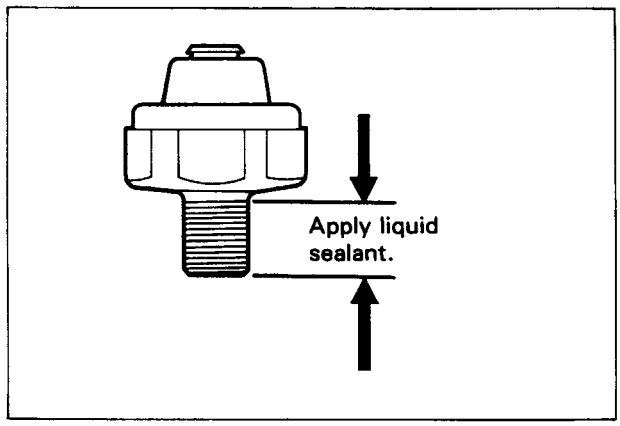


CAUTION

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

4) Remove the propeller and set the outboard motor in a water tank or apply water to the outboard motor with the rinsing plug, and start the engine.
5) Measure the oil pressure when its temperature reaches 80°C (216.0°F)

Oil pressure [Engine speed 900 ± 50 min^{-1} (rpm) in neutral]	1.1 kg/cm^2 (15.6 psi) min.



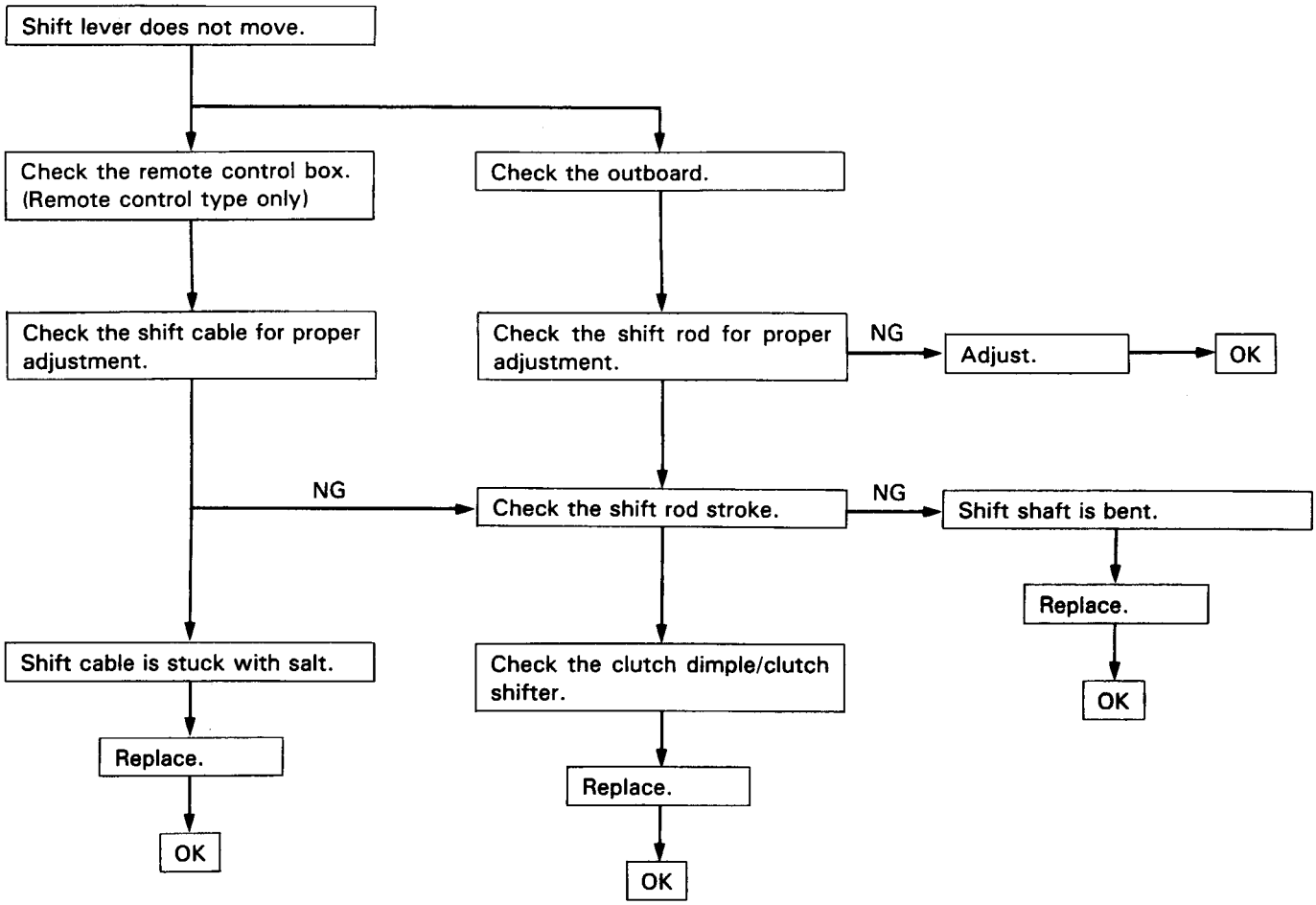
6) If the oil pressure is less than the specification, check the oil pump rotors and body for wear.
7) Clean the oil pressure switch threads and apply liquid sealant (THREE BOND 1215 or equivalent) to the threads. Tighten the oil pressure switch to the specified torque.

TORQUE: 9 N·m (0.9 kg-m, 6.5 ft-lb)

CAUTION

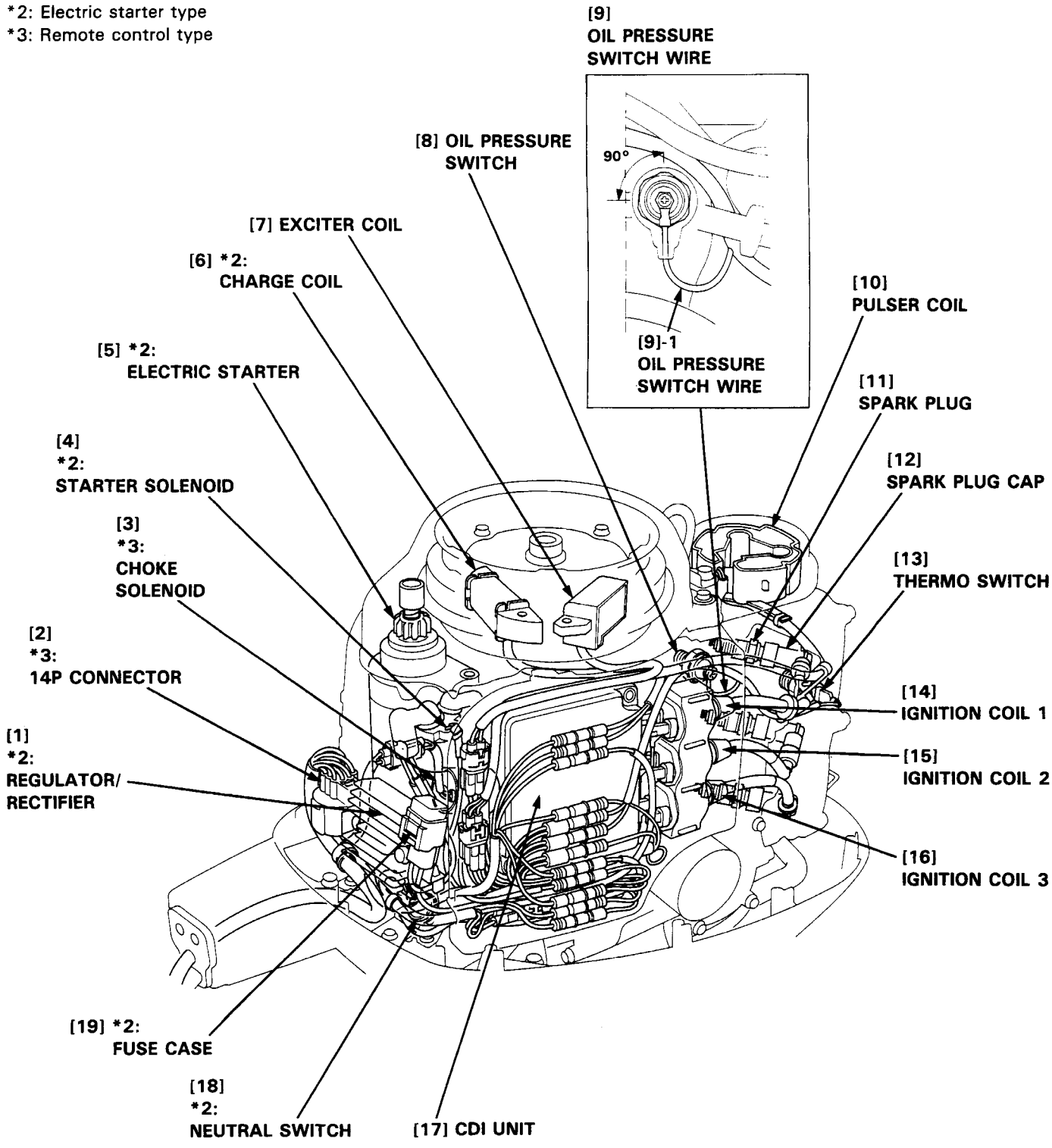
- **Be sure to use a torque wrench to tighten the switch.**
- **Overtightening will damage the starter case.**

F. SHIFT LEVER

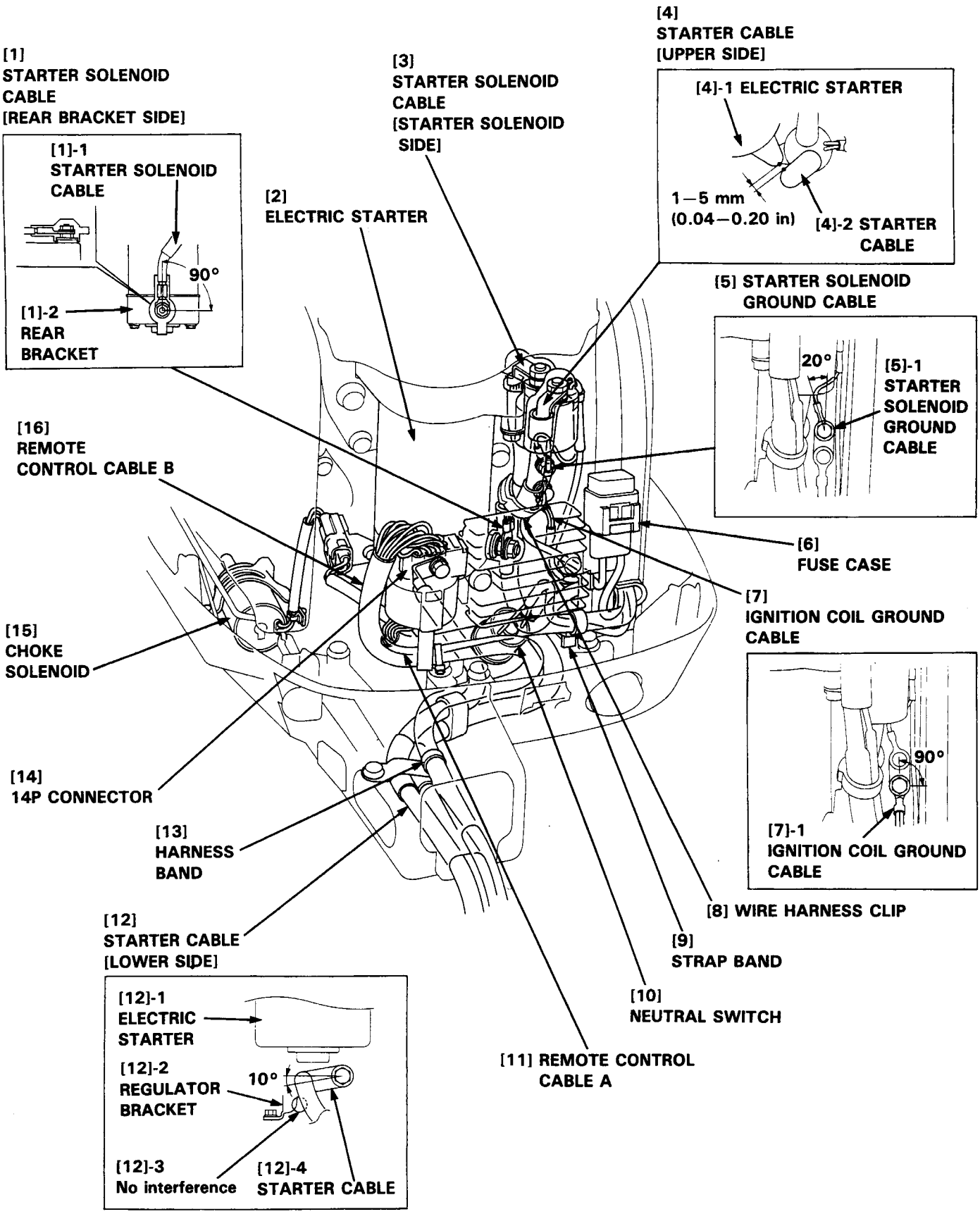


8. CABLE/HARNESS ROUTING

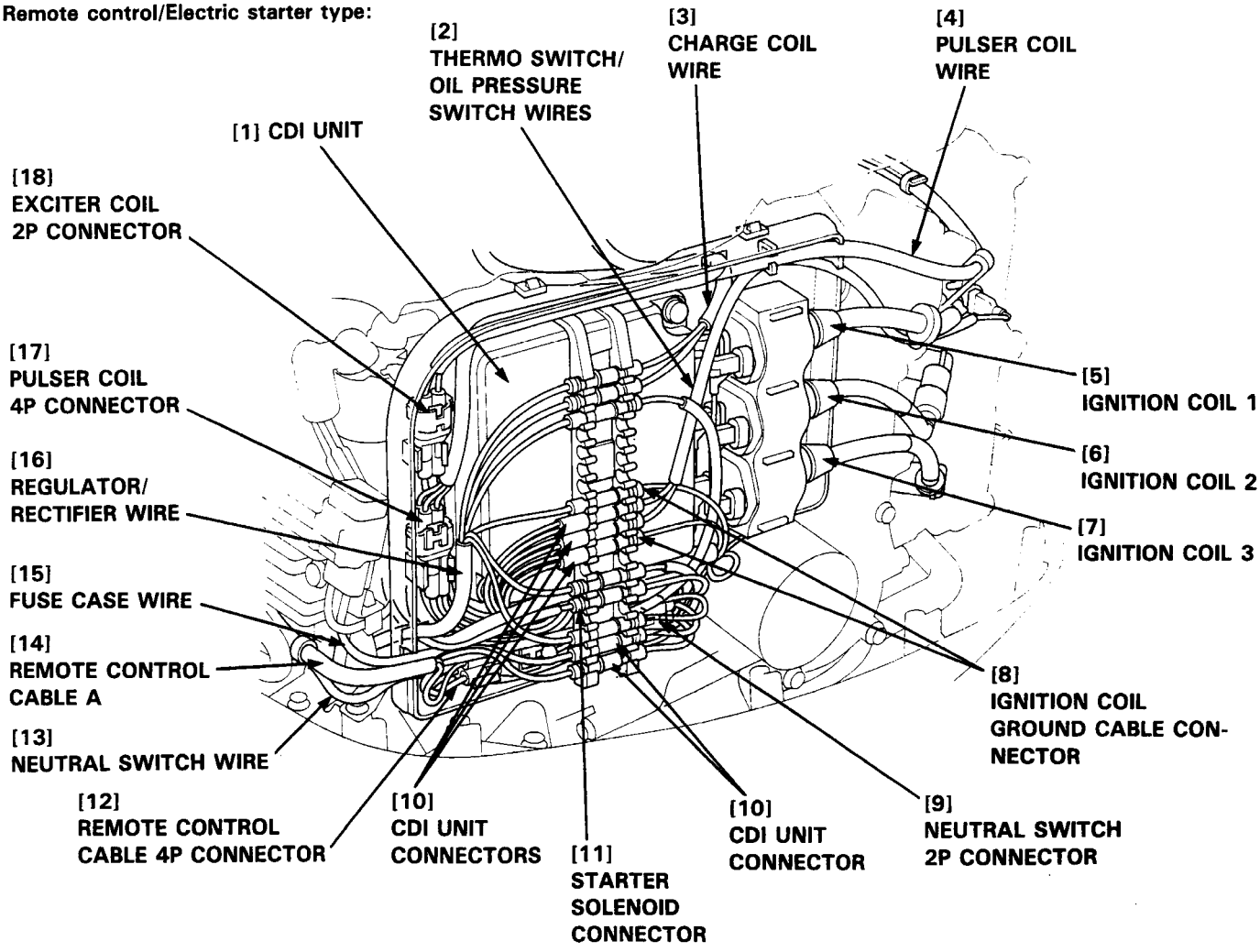
*1: Recoil starter type
*2: Electric starter type
*3: Remote control type

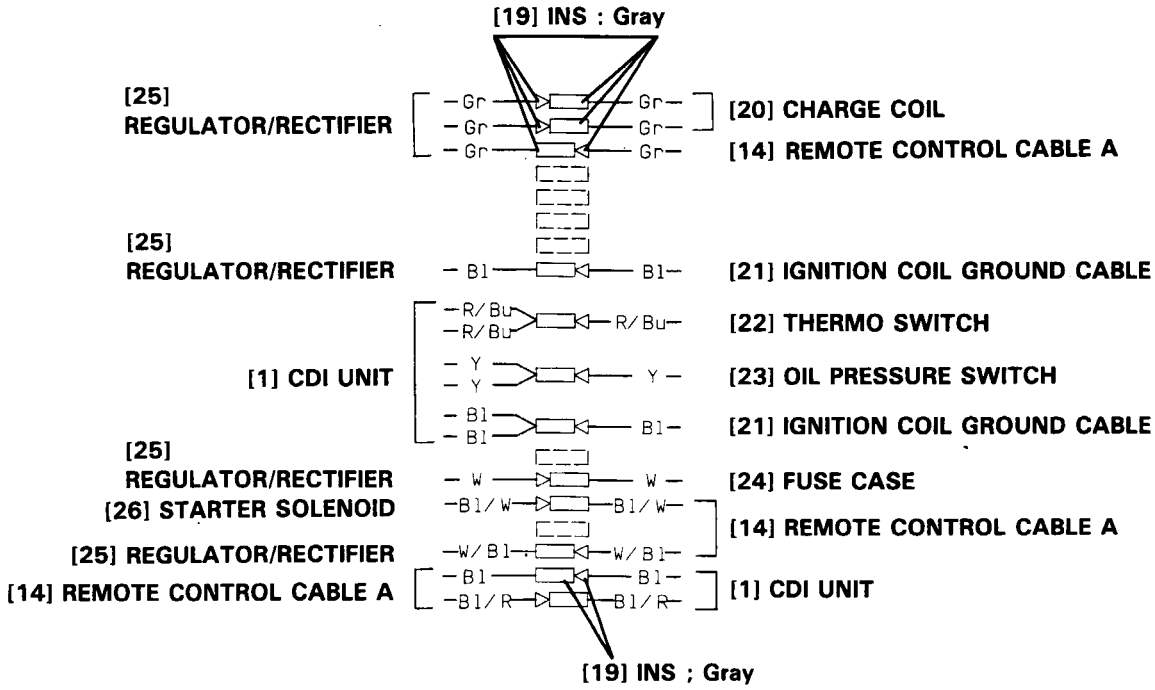


Remote control/Electric starter type:

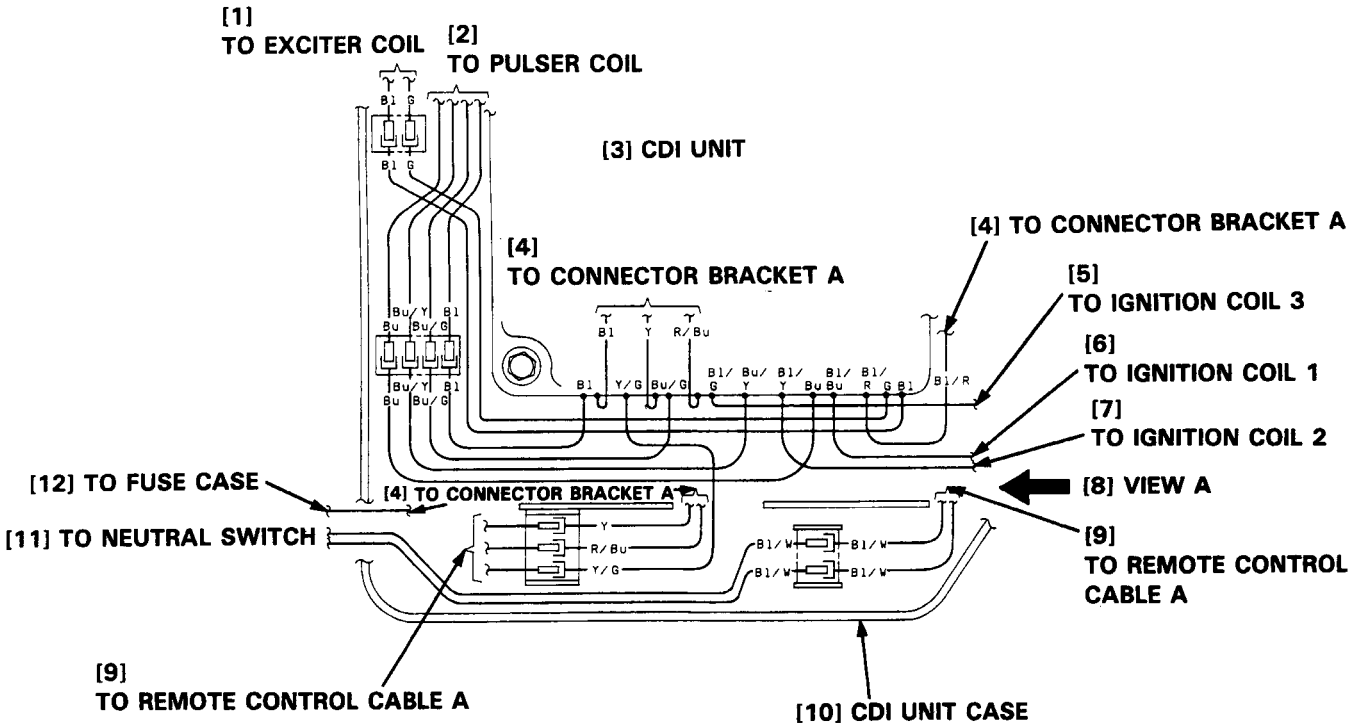


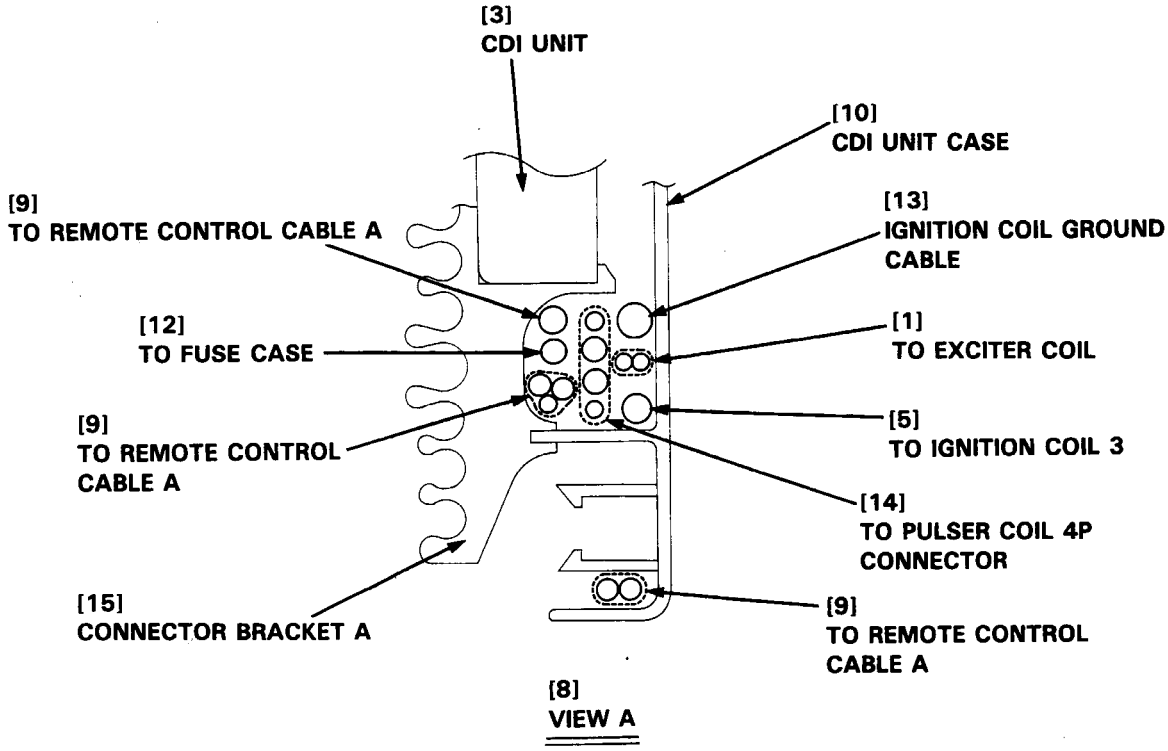
Remote control/Electric starter type:



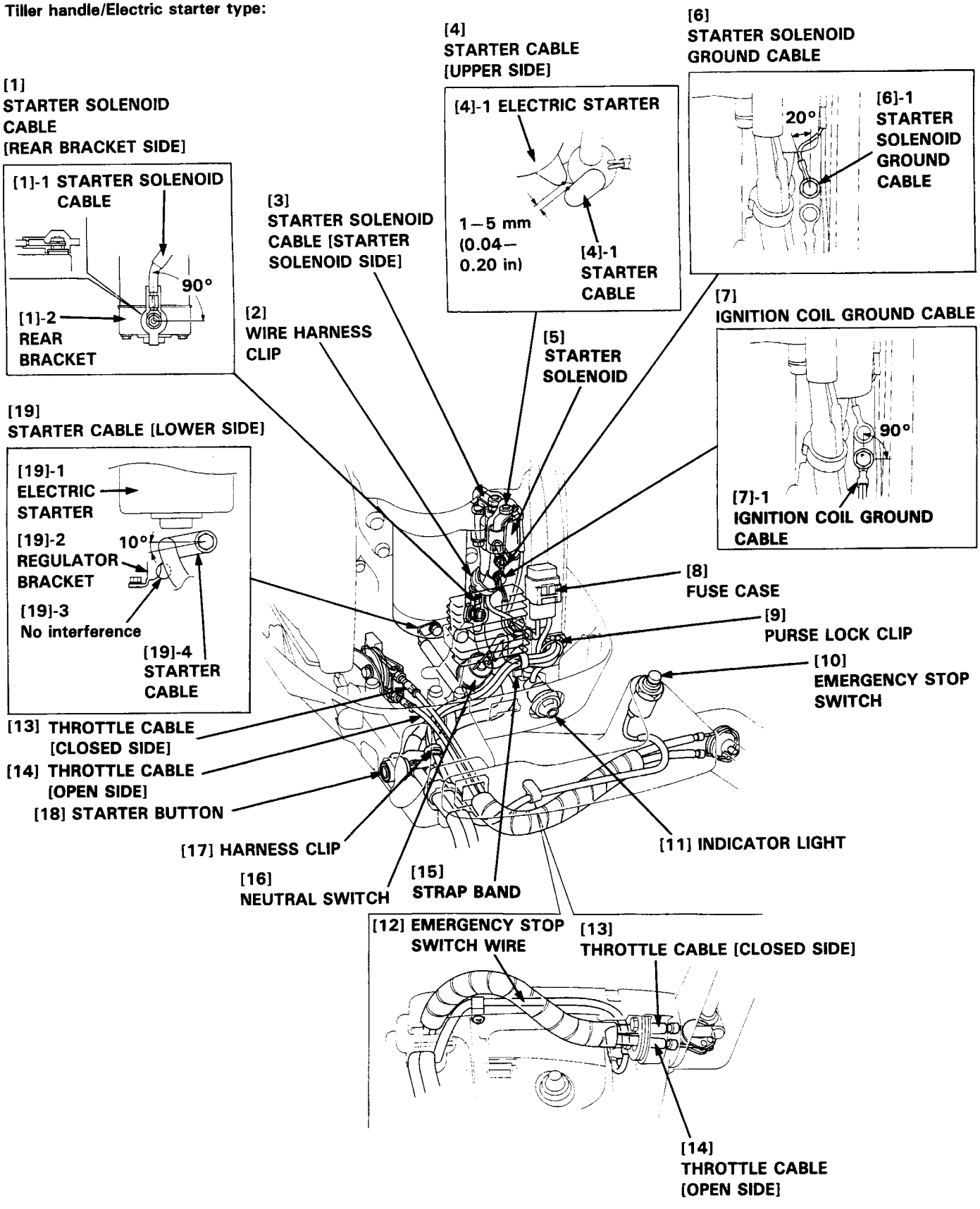


Remote control/Electric starter type:

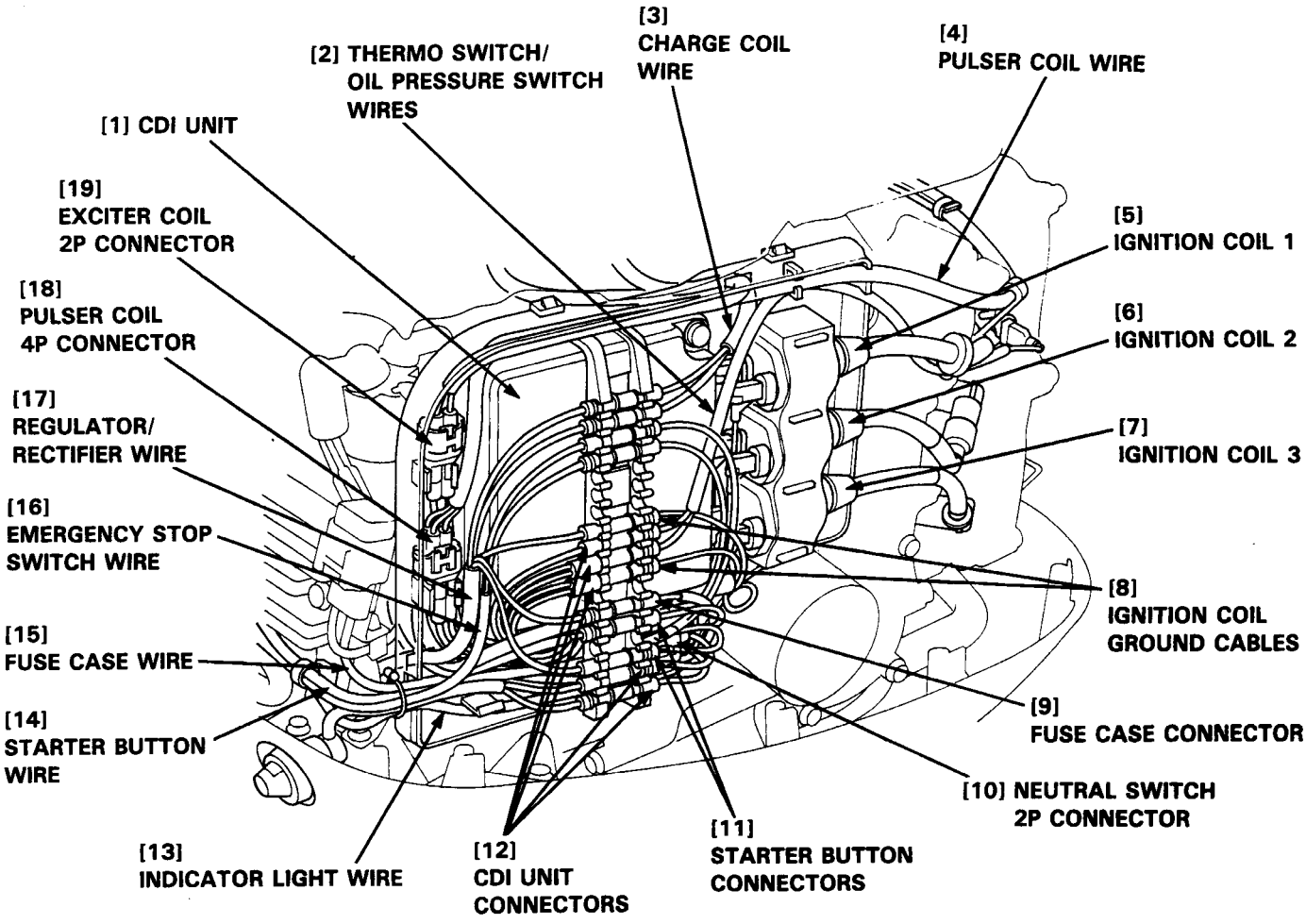


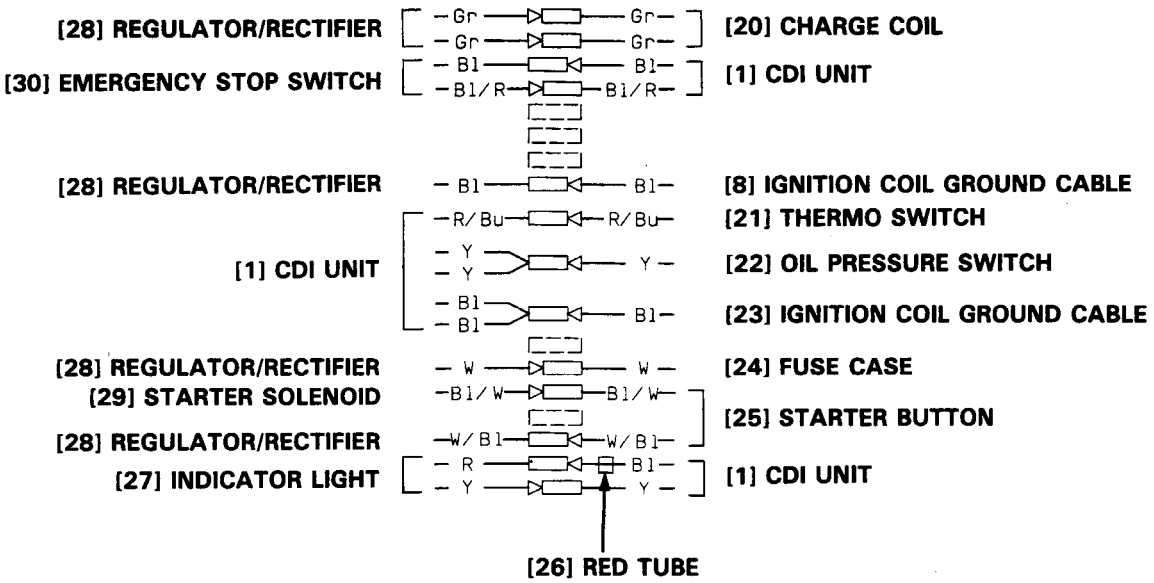


Tiller handle/Electric starter type:

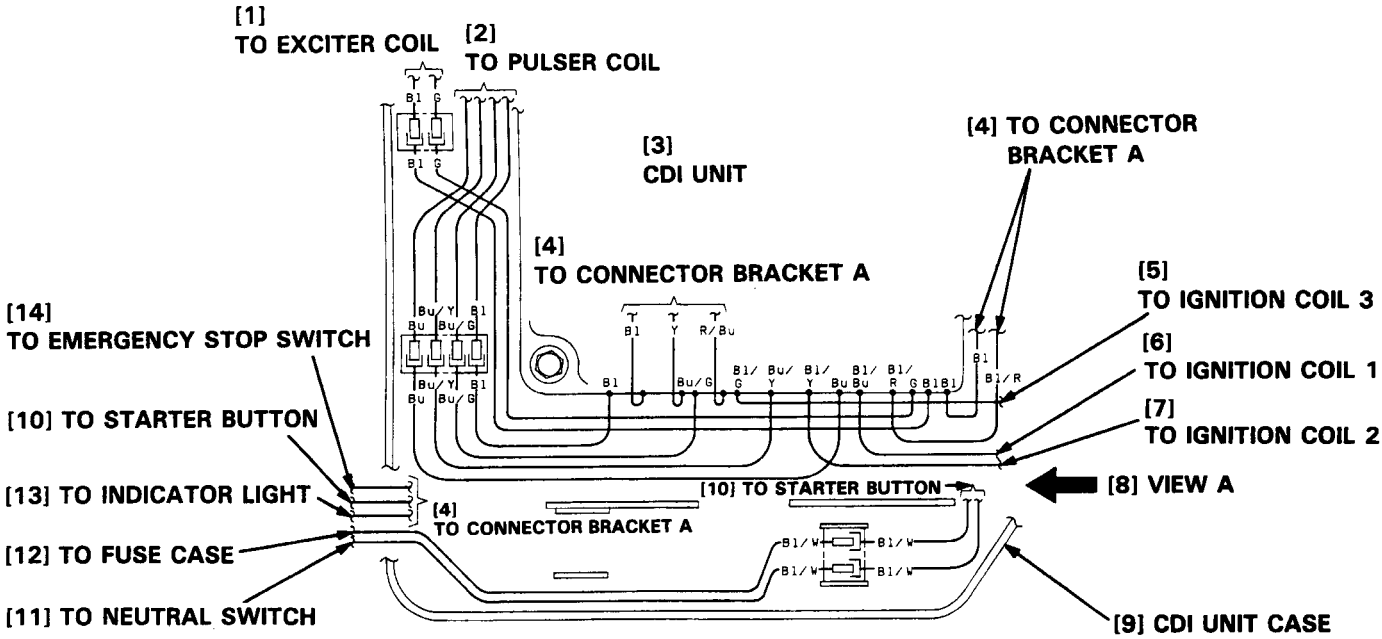


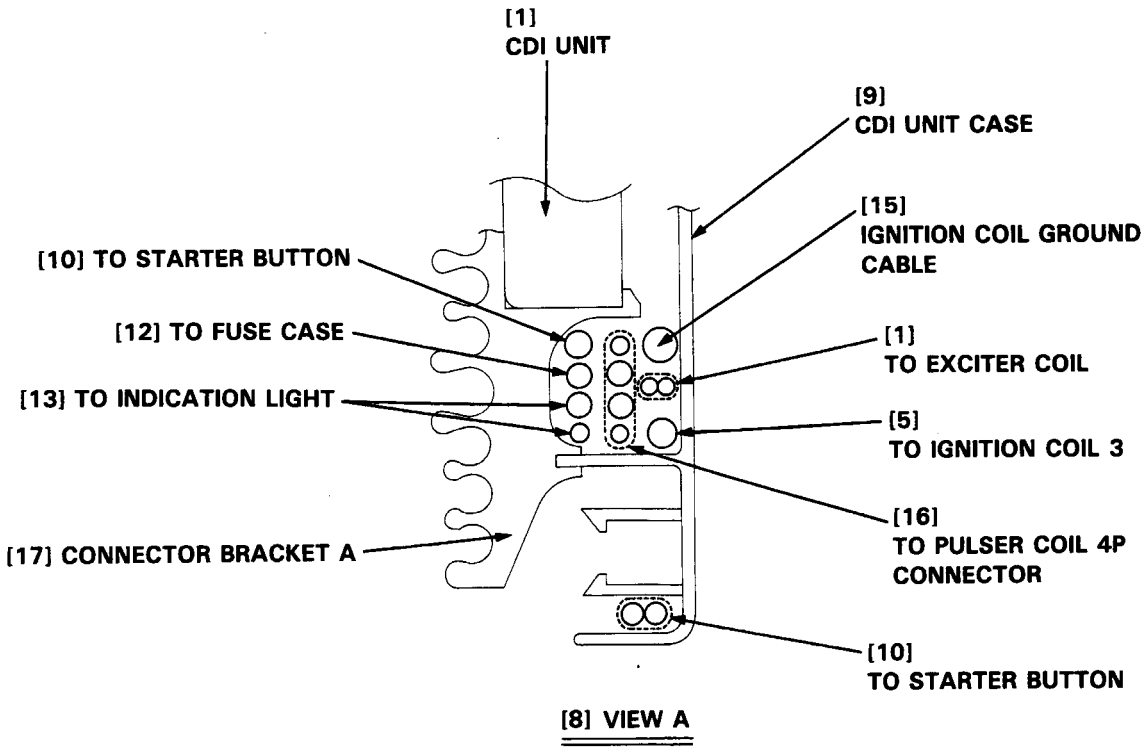
Tiller handle/Electric starter type:





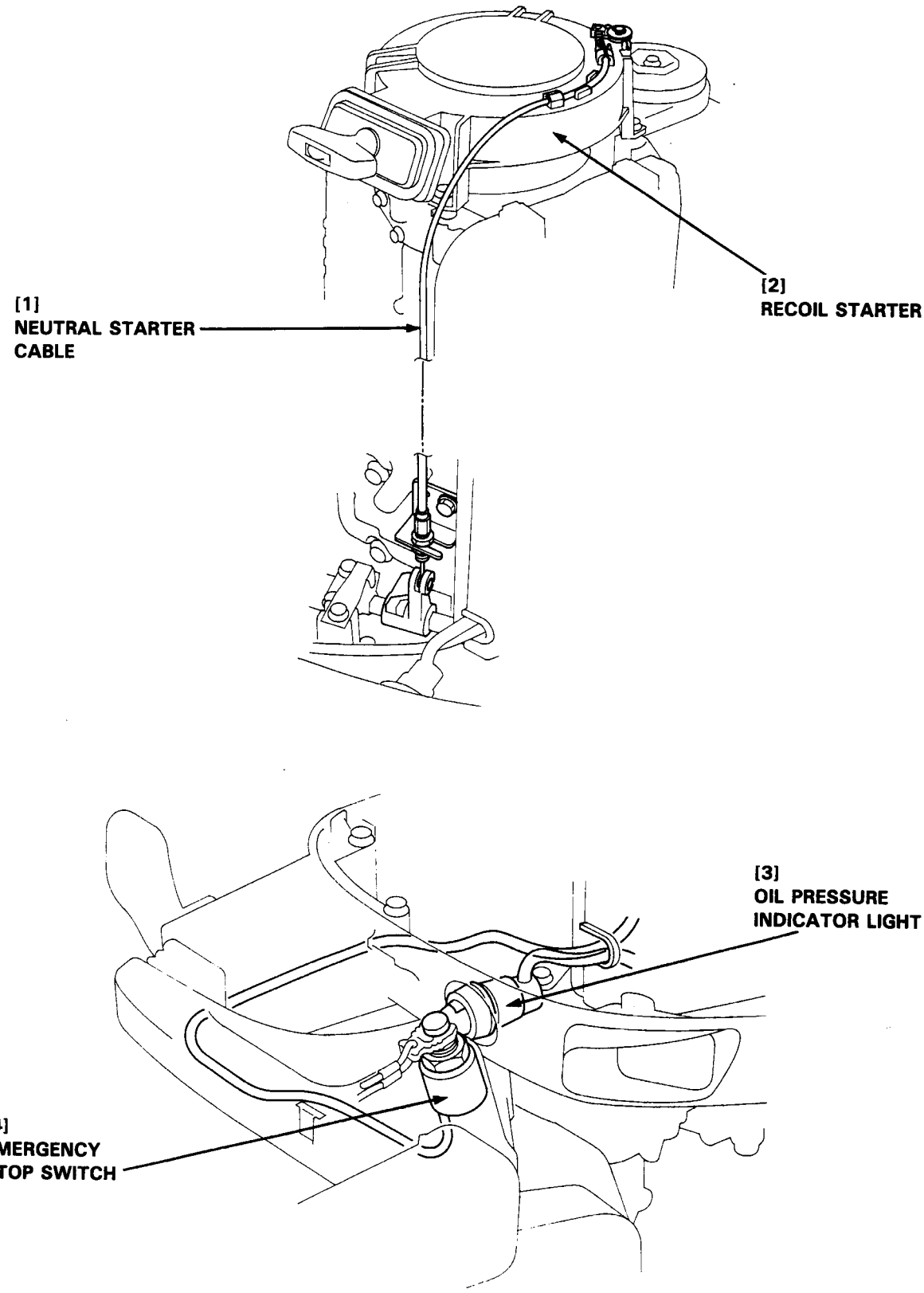
Tiller handle/Electric starter type:



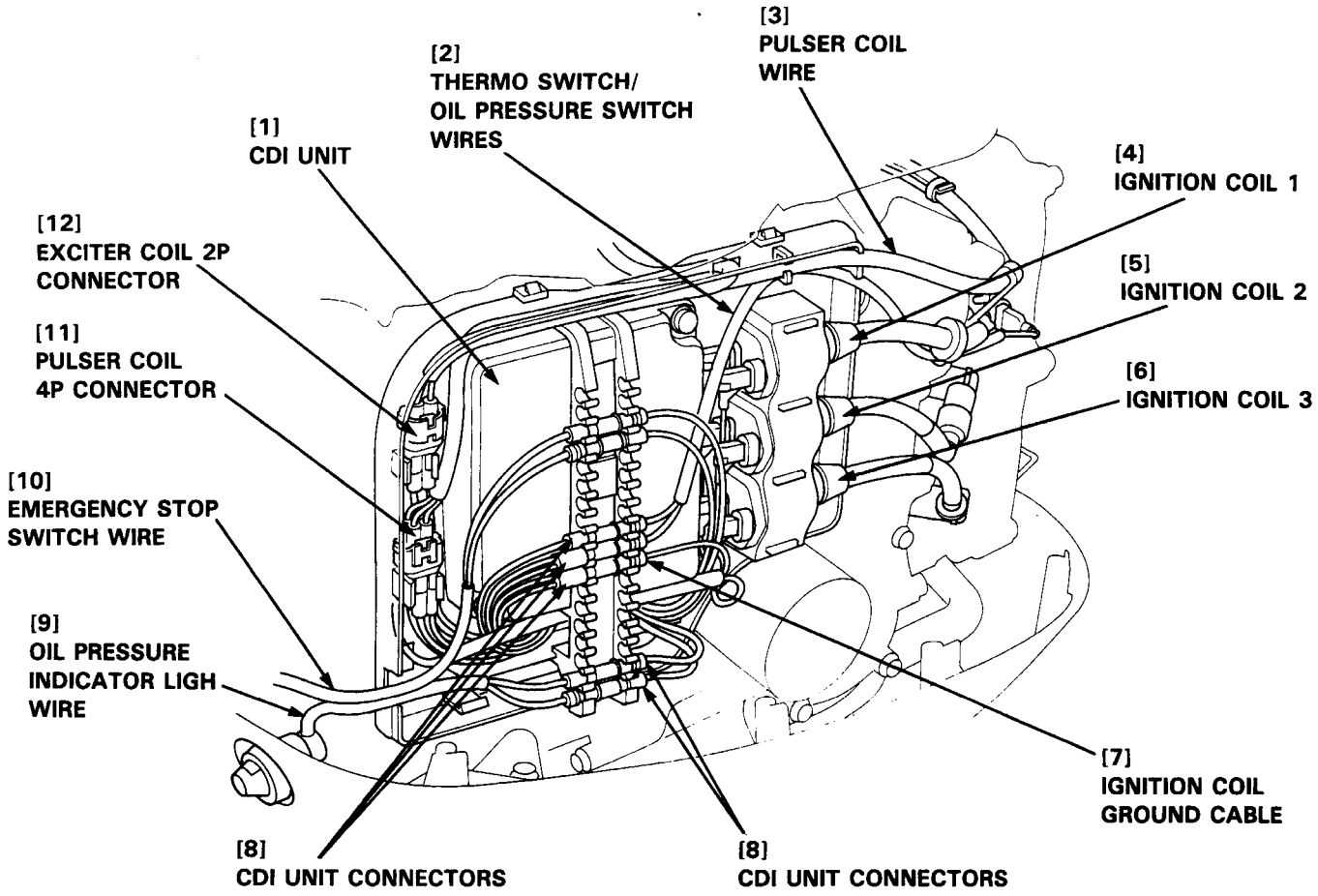


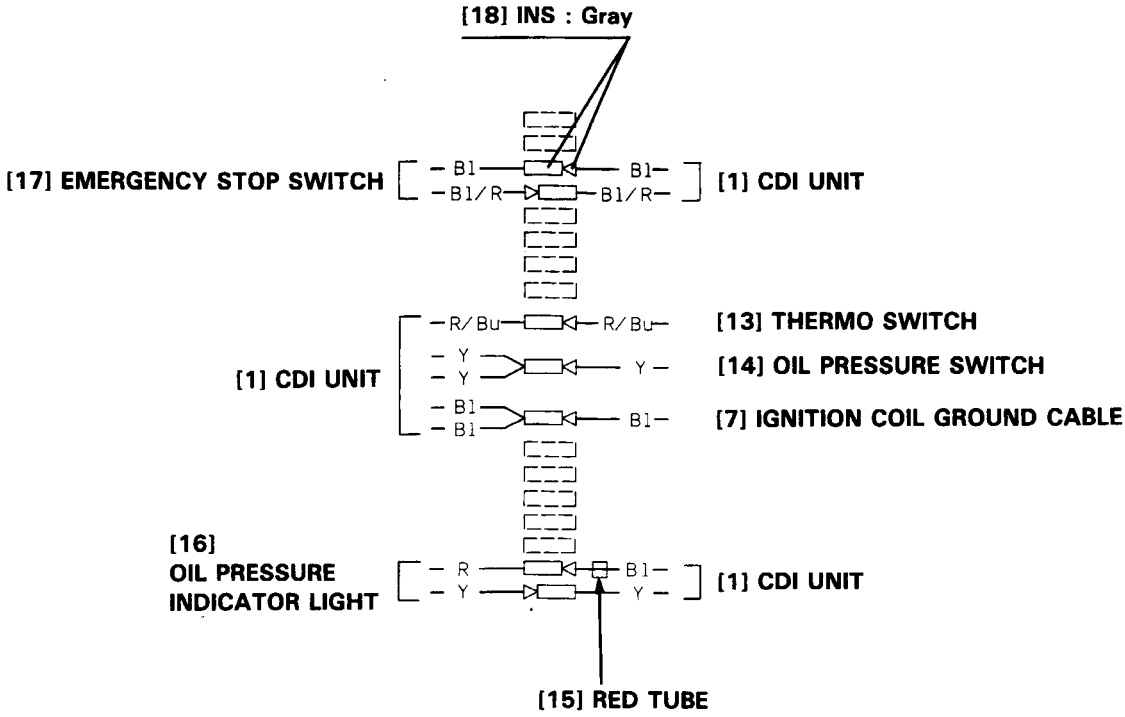
[8] VIEW A

Tiller handle/ Recoil starter type:

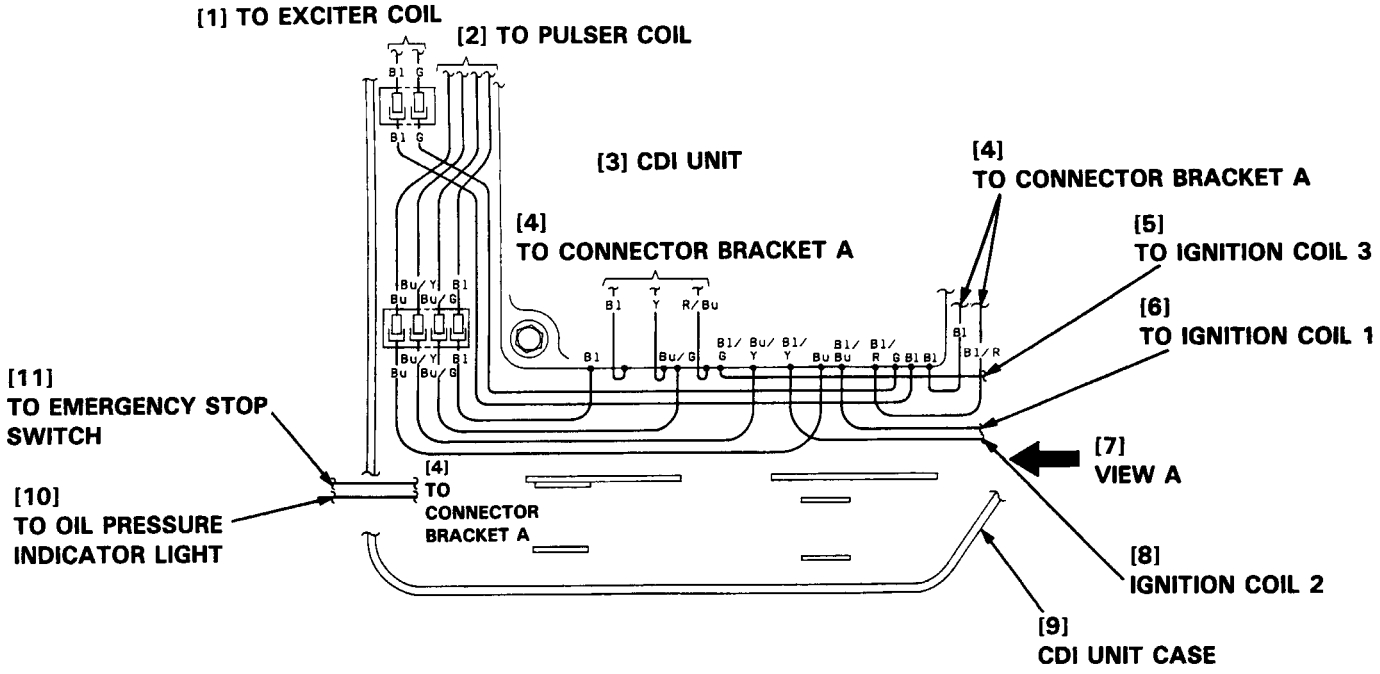


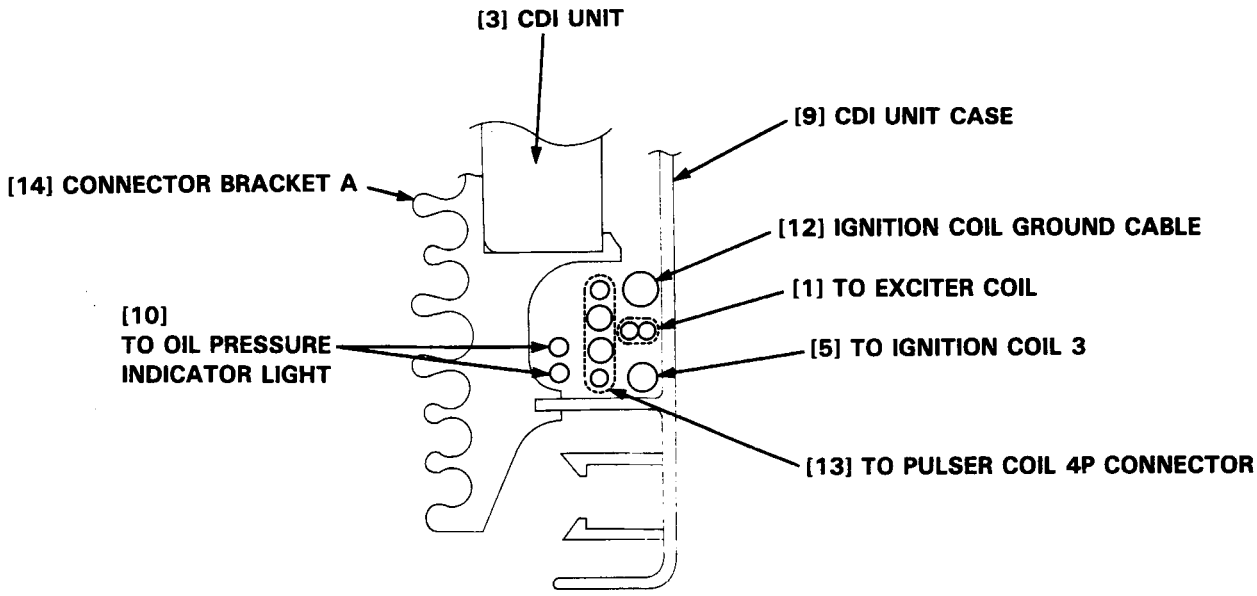
Tiller hande/Recoil starter type:





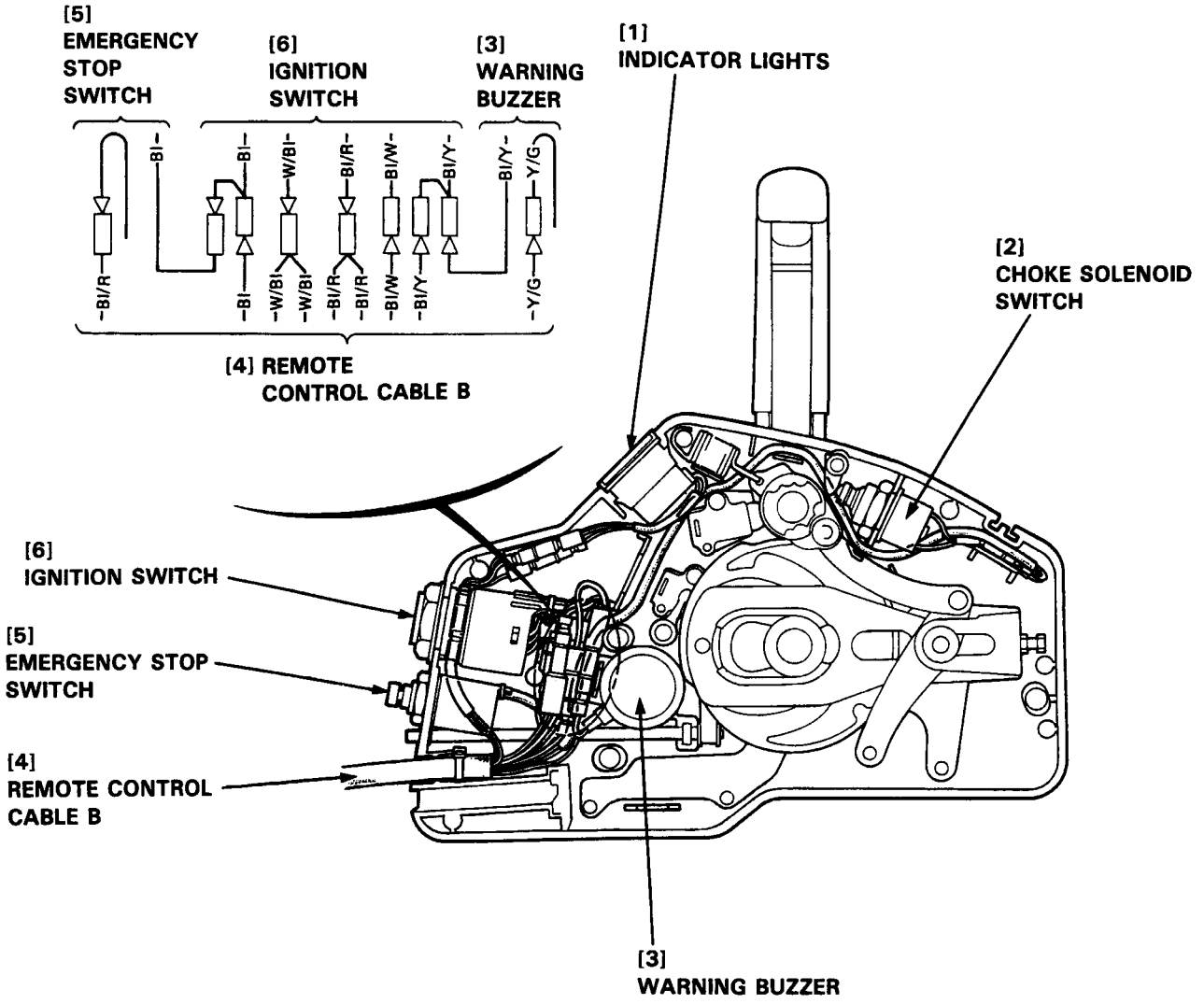
Tiller hande/Recoil starter type:



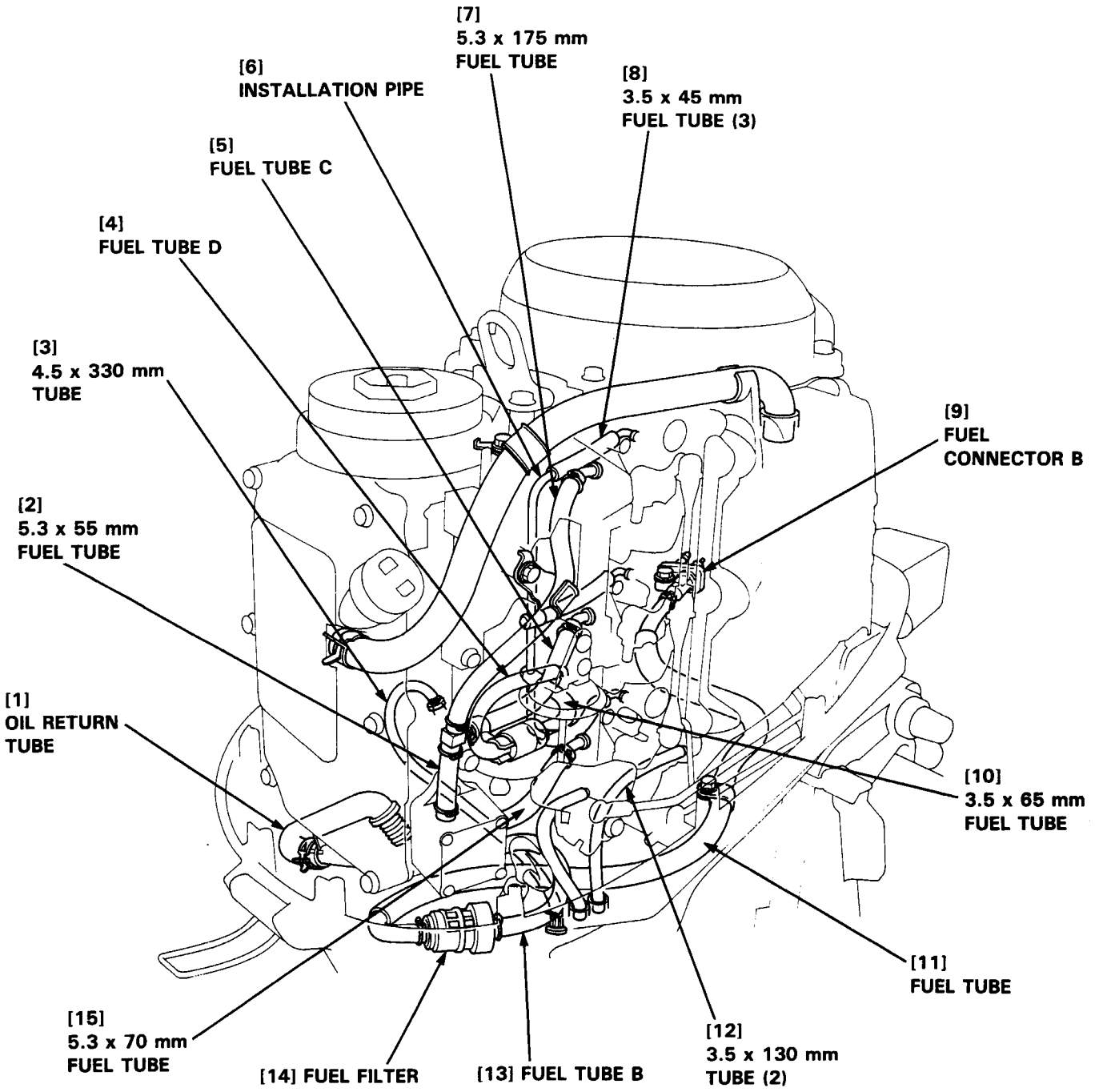


[7] VIEW A

Remote control type:

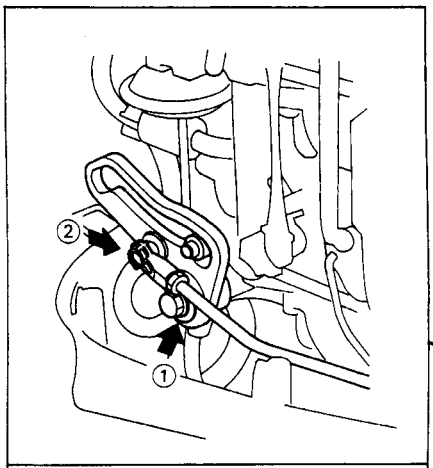


9. TUBE ROUTING



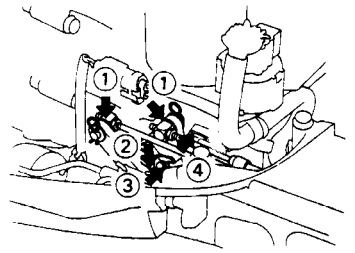
10. LUBRICATION

Apply marine grease to the following parts:

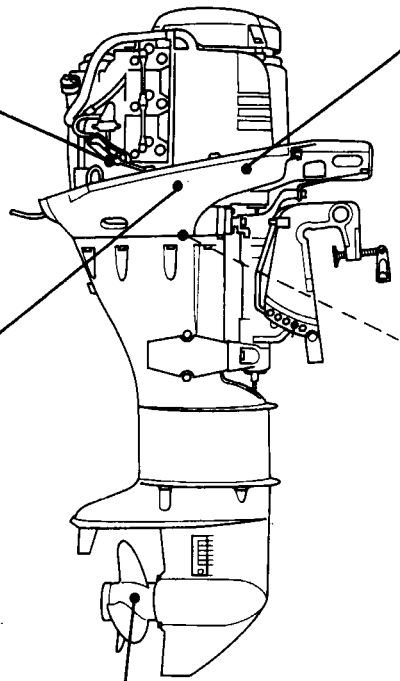


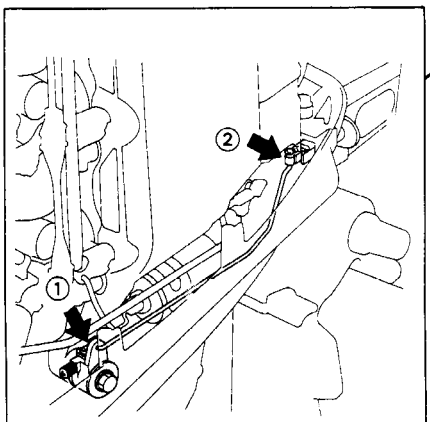
① THROTTLE CAM/OPENER CAM
② LINKAGE PIVOT

Remote control type only:

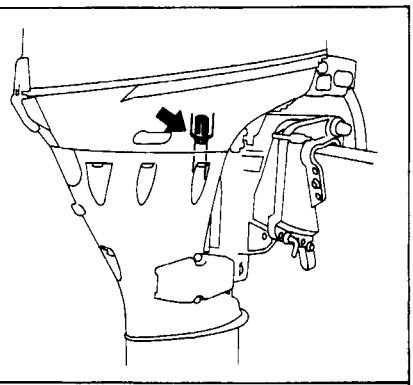


① SHIFT PIVOT
② THROTTLE ARM
③ SHIFT LINK B
④ CLICK SPRING

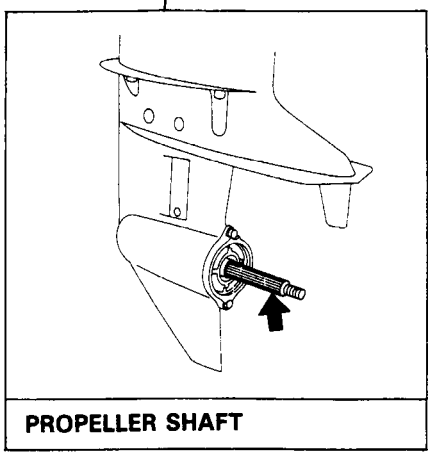




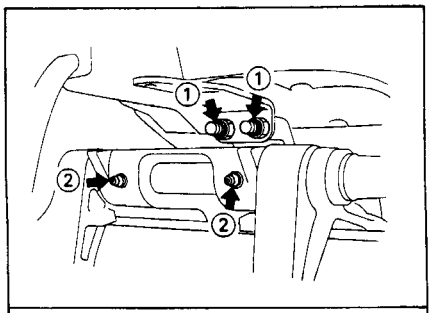
① CHOKE ARM A, B
② CHOKE KNOB



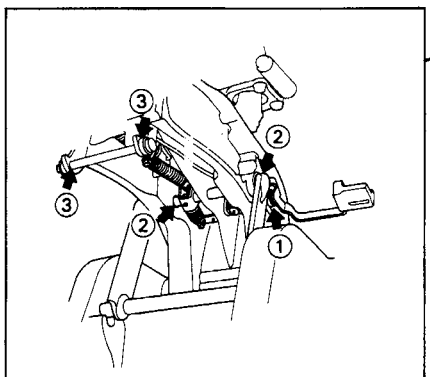
VERTICAL SHAFT
NOTE:
Only necessary during engine or lower unit removal.



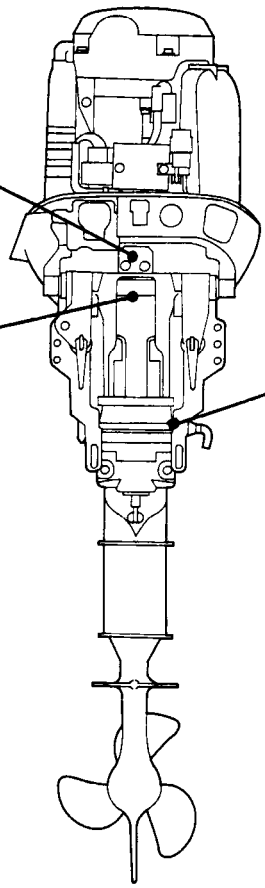
PROPELLER SHAFT

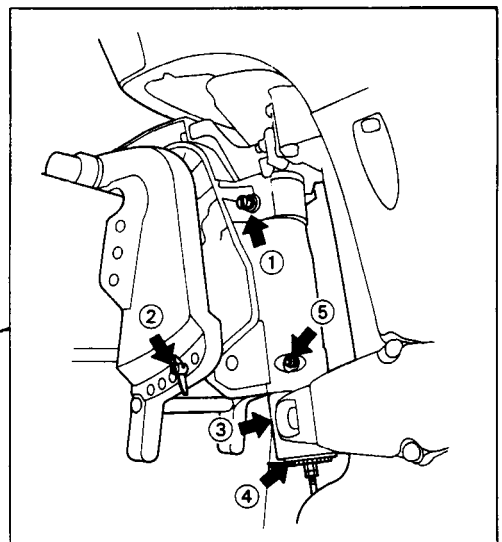


① 10 mm SELF-LOCKING NUT
(Remote control type only)
② GREASE NIPPLE

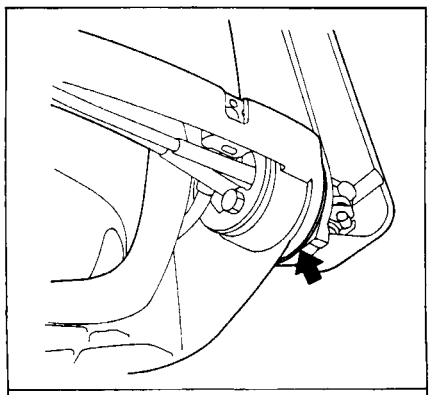


① TILT LEVER SHAFT
② TILT SHAFT, TILT ARM
③ REVERSE LOCK SHAFT A, B

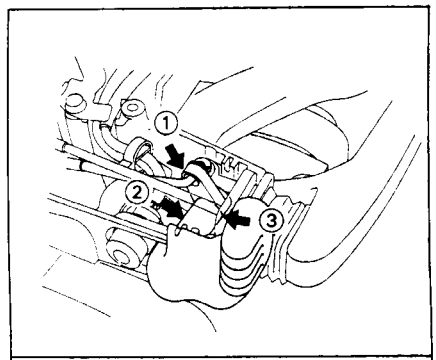




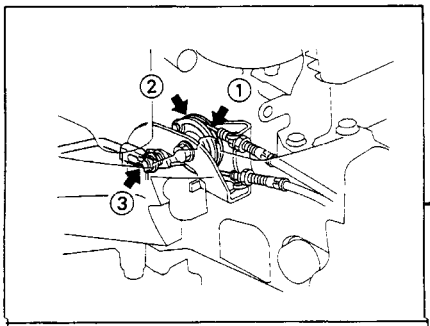
① 8 x 20 mm SPECIAL BOLT
② TRANSOM ANGLE ADJUSTING ROD
③ LOWER MOUNT CENTER HOUSING
④ MOUNT FRAME
⑤ SWIVEL CASE INSIDE



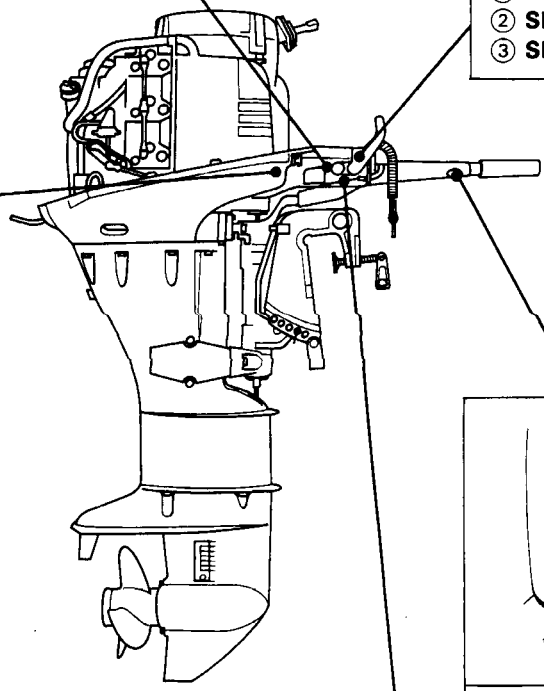
TILLER HANDLE

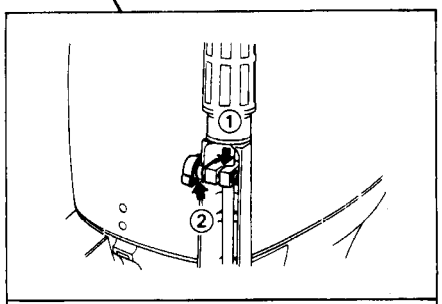


① THROTTLE ROD
② SHIFT LEVER PIVOT
③ SHIFT LINK A

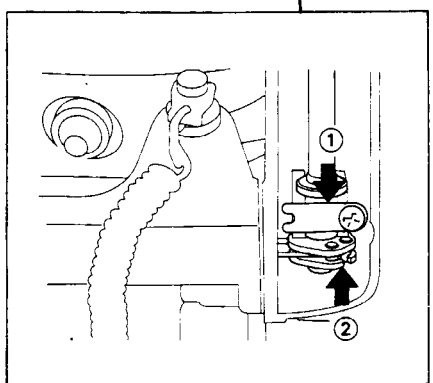


① THROTTLE CABLE
② THROTTLE ARM
③ THROTTLE ROD





① THROTTLE FRICTION BRACKET
② FRICTION KNOB



① THROTTLE REEL PLATE
② THROTTLE REEL

11. MAINTENANCE SCHEDULE

ITEM / REGULAR SERVICE PERIOD (2) Perform at every indicated monty or operating hour interval, whichever comes first.		EACH USE	FIRST MONTH OR 20 HRS	EVERY 6 MONTHS OR 100 HRS	EVERY YEAR OR 200 HRS	EVERY 2 YEARS OR 400 HRS	Refer to page
Engine oil	Check level	O					3-1
	Change		O	O			
Gear case oil	Check level and Check for water contamination			O			3-3
	Change		O		O		
Engine oil filter	Change					O	3-2
Engine timing belt	Check-Adjust				O		3-15
Carburetor linkage and idle speed	Check		O	O			3-10
	Adjust		O	O			3-7
Valve clearance	Check-Adjust		O		O		3-4
Spark plugs	Check-clean (Replace if necessary)		O		O		3-3
Propeller and Cotter pin	Check	O					12-1
	(Replace if necessary)			O			
Lubrication	Grease		O(1)	O(1)			2-33
Fuel tank and tank strainer	Clean				O		3-6
	(Replace if necessary)				O		
Fuel filter	Check			O			3-5
	Change					O	
Thermostat	Check				O		9-2
Fuel line	Check	O					5-14
	(Replace if necessary)					O	
Battery fluid	Check-fill if necessary	O					—
Cable connection	Check-tightness		O	O			
Bolts and Nuts	Check-tightness		O	O			—

NOTE:
(1) Lubricate more frequency when used in salt water.
(2) For professional commercial use, log hours of operation to determine proper maintenance intervals.

1. ENGINE OIL

INSPECTION

⚠ WARNING

- **Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil. KEEP OUT OF REACH OF CHILDREN.**

1) Place the outboard motor in the vertical position.
2) Remove the engine cover.
3) Remove the oil dipstick and wipe it clean.
4) Insert it all the way down the dipstick hole, then pull it out and read the oil lvel.
5) If the oil level is low, add the necessary recommended engine oil to bring the oil level to the upper level on the dipstick. Do not overfill.

Engine oil capacity	1.9 ℓ (2.00 US qt, 1.67 Imp qt)

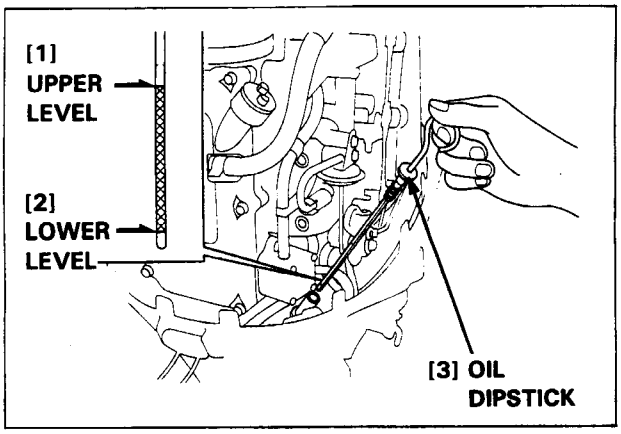
Recommended engine oil	SAE 10W−30 API Service classification SG, SF/CC, CD

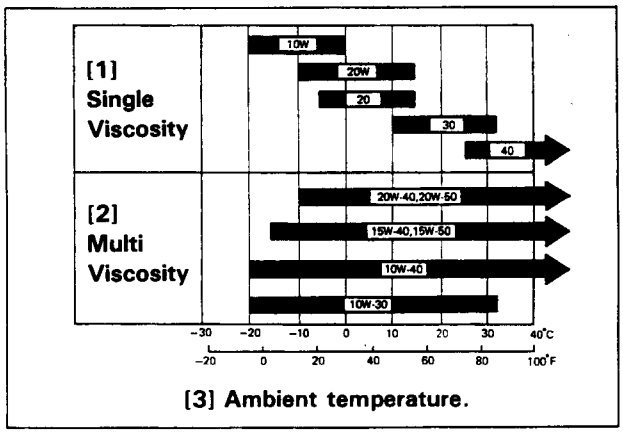
NOTE

- When a new oil filter has been installed, recheck the engine oil level after running the engine for a few minutes.
- Draining can be performed rapidly and completely when the engine is still warm.
- Place a shop towel under the oil filter when removing the oil filter.

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.**
- **Keep clear of moving parts.**





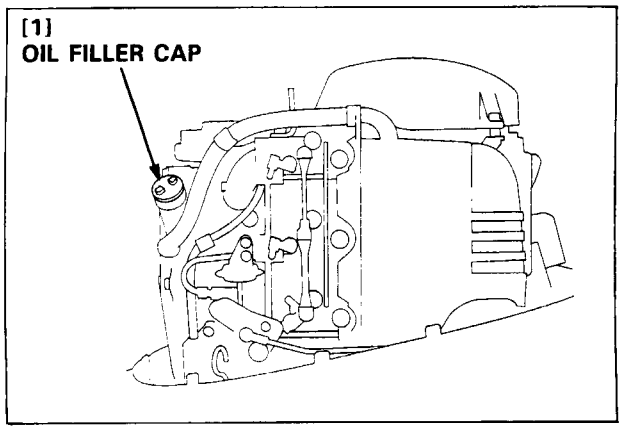
[3] Ambient temperature.

OIL CHANGE

1) Remove the oil filler cap.
2) Remove the oil drain plug and drain the oil into a suitable container.
3) Replace the drain plug washer with a new one and install the oil drain plug. Tighten to the specified torque.

   TORQUE: 23 N·m (2.3 kg-m, 16.6 ft-lb)

4) Refill to the upper mark on the oil dipstick with the recommended engine oil.
   Tighten the oil filler cap securely.
5) Install the engine cover.

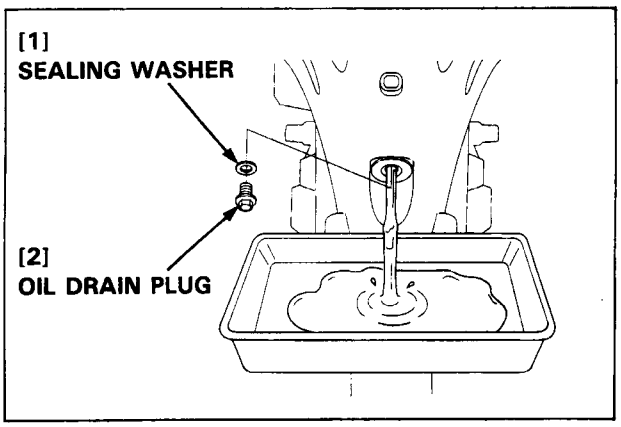


2. OIL FILTER

1) Remove the engine cover.
2) Drain the engine oil.

NOTE

- Before removing the oil filter, place a shop towel under the filter to trap oil leakage.
- Replace the oil filter as an assembly cartridge.



3) Attach the oil filter wrench to the oil filter and remove and discard the oil filter.

   TOOL:
   Oil filter wrench **07HAA—PJ70100**

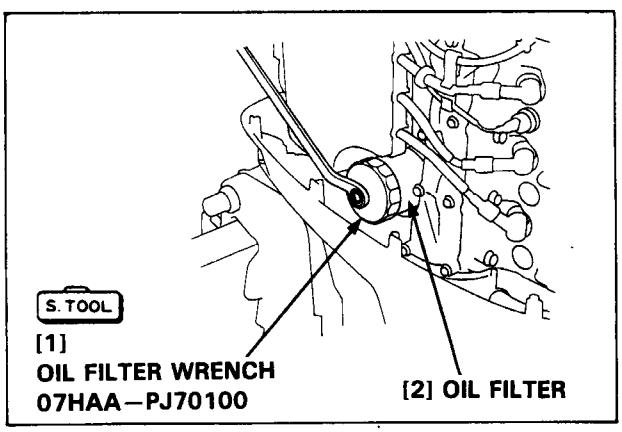
4) Clean the installation section of a new cartridge and apply a light coating of engine oil to the rubber seal, screw on and tighten the cartridge by hand.
5) Use the oil filter wrench to tighten to the specified torque.

   TORQUE: Oil filter 11 N·m (1.1 kg-m, 8.0 ft-lb)

6) Check that the sealing washer and the drain plug have been installed and tightened to the specified torque.

   TORQUE: Drain plug 23 N·m (2.3 kg-m, 16.6 ft-lb)

7) Fill with the specified capacity of engine oil and run the engine for a few minutes. At this time, check for oil leaks from the oil filter cartridge.

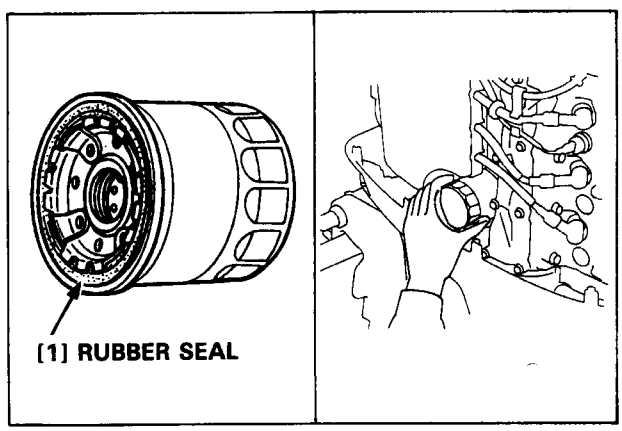


Oil capacity	1.6 ℓ (1.69 US qt, 1.41 Imp qt) [with oil filter cartridge replacement: 1.9 ℓ (2.00 US qt, 1.67 Imp qt)]

8) After stopping the engine, check the engine oil level and add oil if necessary.

NOTE

- Dispose of used motor oil in a manner that is compatible with the environment. We suggest that you take it in sealed container to your local waste disposal site, or service station reclamation center.
- Do not throw it in the trash or pour it on to the ground, down sewers or drains, or into the water.



3. GEAR OIL

1) Position the outboard motor vertically.
2) Remove the oil level plug and the oil drain plug and allow the gear oil to thoroughly drain into a suitable container.

NOTE

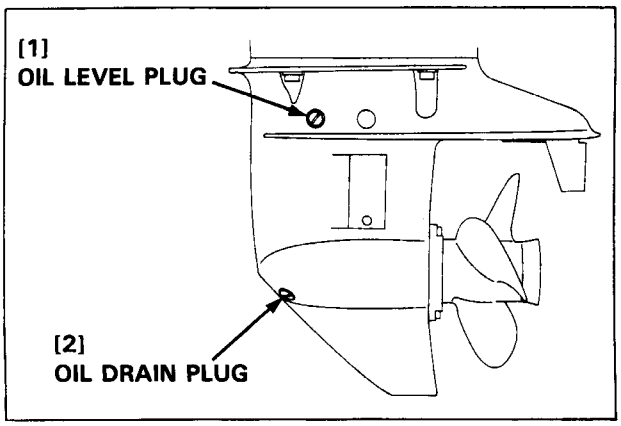
- If there is water in the oil, the water will flow out first when the oil drain plug is removed, or the oil will be a milky color. If water is detected, check the oil level and oil drain plug gaskets, gear case gaskets, and gear case seals. Also check the torque on the gear case bolts.

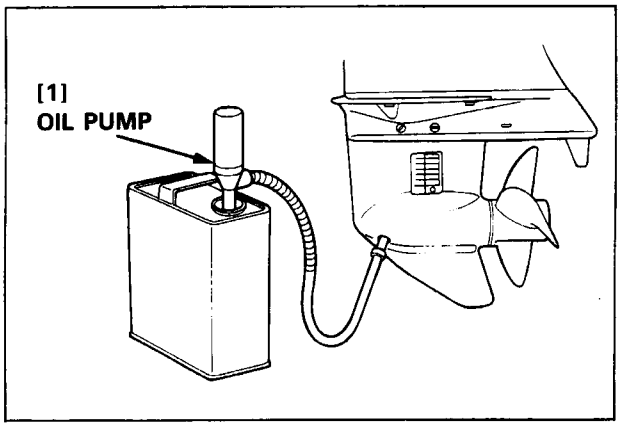
3) Remove all metal particles from the magnet end of the oil drain plug.
4) Use a commercially available oil pump or squeeze tube to fill the gear case with the recommended gear oil. Pump or squeeze fresh oil through the OIL DRAIN plug hole until oil begins flowing out through the OIL LEVEL plug hole. Use new sealing washers and install the oil level plug first and then the oil drain plug. Tighten to the specified torque.

TORQUE: 3.5 N·m (0.35 kg-m, 2.5 ft-lb)

Gear oil capacity	0.29 ℓ (0.307 US qt, 0.255 Imp qt.)

Recommended gear oil	MARINE SEA 90 Hypoid gear oil API Service Classification (GL-4 or GL-5)





4. 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)

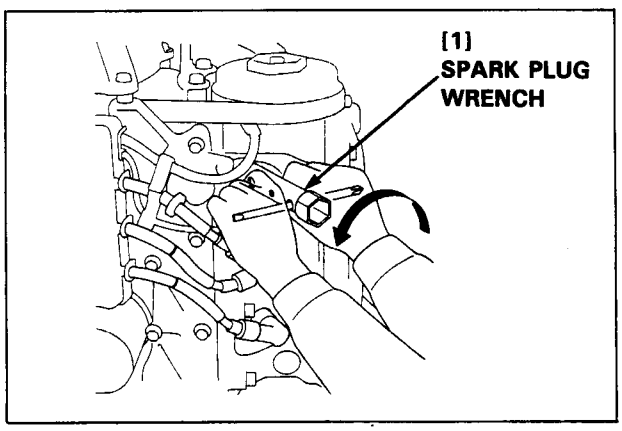
Recommended spark plug	DR7EA (NGK) X22ESR-U (NIPPONDENSO)

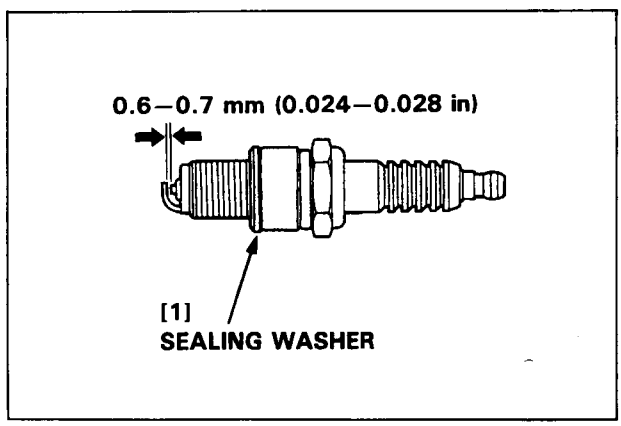
If necessary, adjust the gap by bending the side electrode.

7) Make sure the sealing washer is in good condition.
With the spark plug sealing washer attached, thread the spark plug in by hand to seat the sealing washer 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 re-using a plug, tighten 1/8-1/4 turn after the plug seats.

CAUTION

- **The spark plug must be securely tightened. An improperly tightened plug can become very hot and possibly damage the engine.**
- **Never use a spark plug with an improper heat range.**



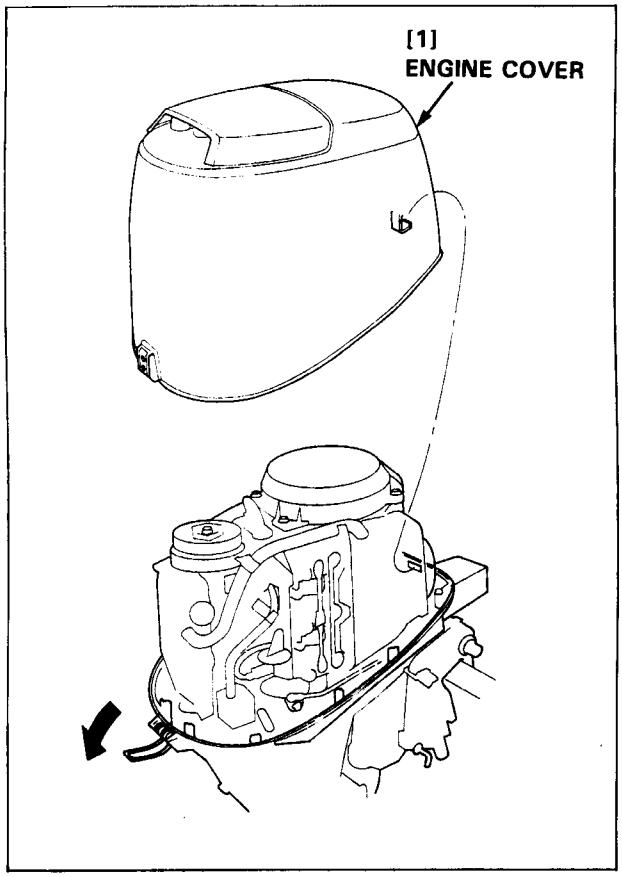


5. VALVE CLEARANCE

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

INSPECTION

1) Remove the engine cover.
Remove the flywheel cover or recoil starter.

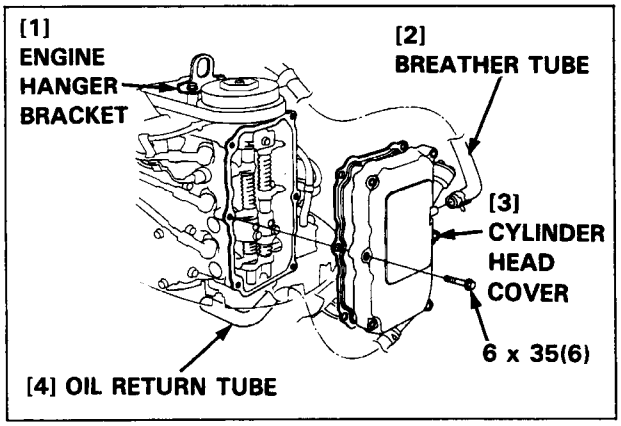


2) Disconnect the breather tube and oil return tube from the cylinder head cover. Remove the six 6 x 35 mm flange bolts and cylinder head cover.

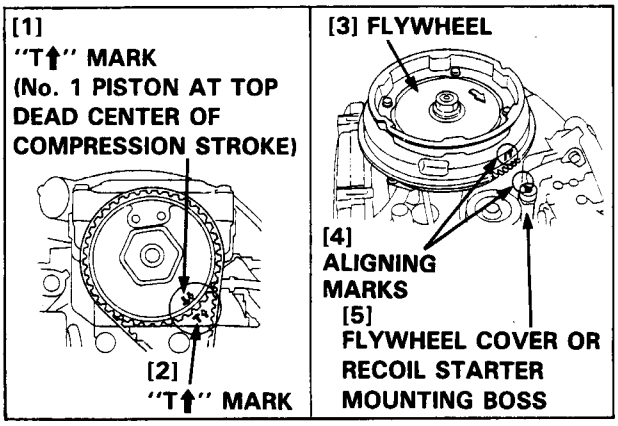
3) Remove the sparks plugs and engine hanger bracket.

CAUTION

- **To avoid water pump impeller damage, always turn the crankshaft in a clockwise direction.**



4) Manually turn the flywheel clockwise in the same direction as the arrow on the flywheel. Align the "T▮" mark on the flywheel with the "▮" mark on top of the flywheel cover or recoil starter mounting boss. The "T⬆" mark on the cam pulley will align with the "T⬆" mark on the cylinder head. In this position the No. 1 piston is at top dead center of its compression stroke.



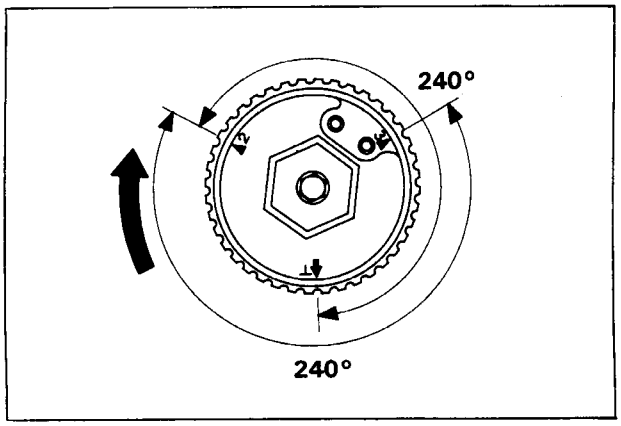
5) With the engine in this position, check the intake and exhaust valve clearances by inserting a feeler gauge between the valve stem and the adjusting screw on the rocker arm.

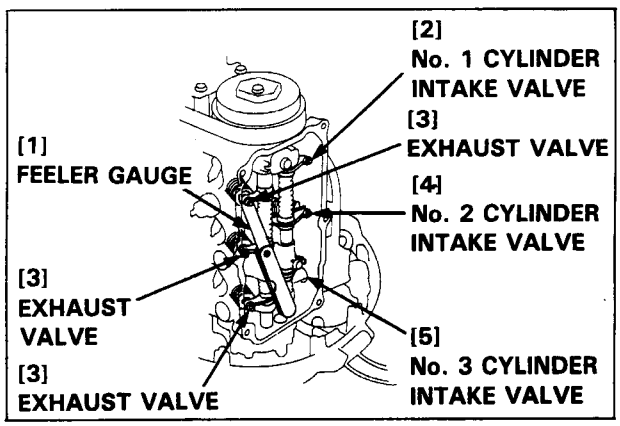
Valve clearance	IN	0.10—0.14 mm (0.004—0.006 in)
	EX	0.18—0.22 mm (0.007—0.009 in)

6) Turn the flywheel clockwise until the cam pulley turns an additional 240° and the "▲2" mark align with the "T⬆" mark on the cylinder head. This will put the No. 2 piston at top dead center of its compression stroke. Check the intake and exhaust valve clearances on the No. 2 cylinder.

7) Turn the flywheel clockwise until the cam pulley turns an additional 240° and the "▲2" mark aligns with the "T⬆" mark on the cylinder head. This will put the No. 3 piston at top dead center of its compression stroke. Check the intake and exhaust valve clearances on the No. 3 cylinder.

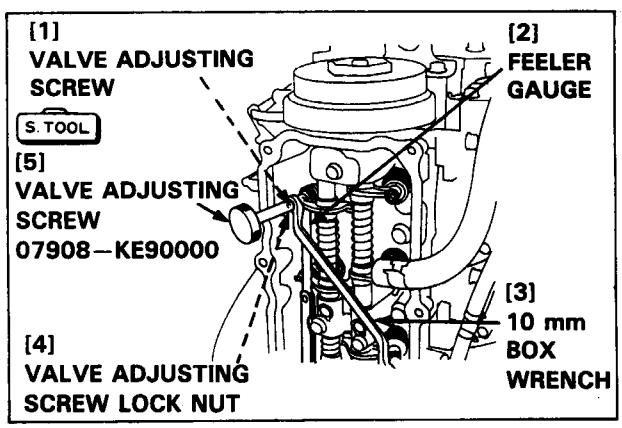
8) Proceed to adjustment if necessary or install the removed parts in the reverse order of disassembly.





ADJUSTMENT

1) With the cyinder at top dead center of its compression stroke, loosen the adjusting screw lock nut, and turn the adjusting screw to obtain the specified intake and exhaust valve clearance.
2) Hold the adjusting screw using a special tool, and tighten the lock nut.
   TOOL:
   Valve adjusting screw **07908—KE90000**
3) Recheck valve clearance after tightening the lock nut.
4) Install the removed parts in the reverse order of disassembly.
   TORQUE: 8 N·m (0.8 kg-m, 5.8 ft-lb)



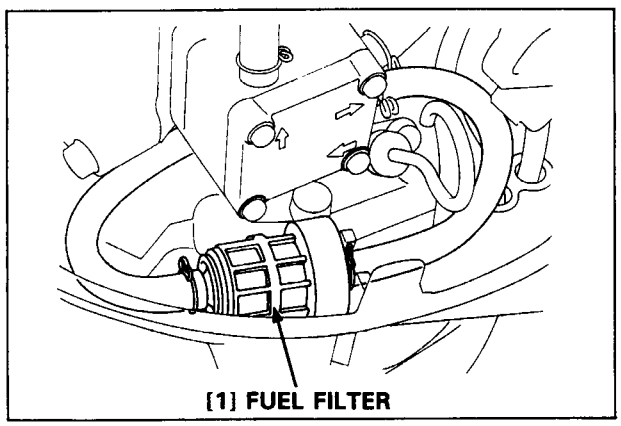
6. FUEL FILTER

⚠ WARNING

- **Gasoline is extremely flammable, and gasoline vapor can explode, causing serious injury or death. Do not smoke or allow flames or sparks in your area. KEEP OUT OF REACH OF CHILDREN.**

INSPECTION

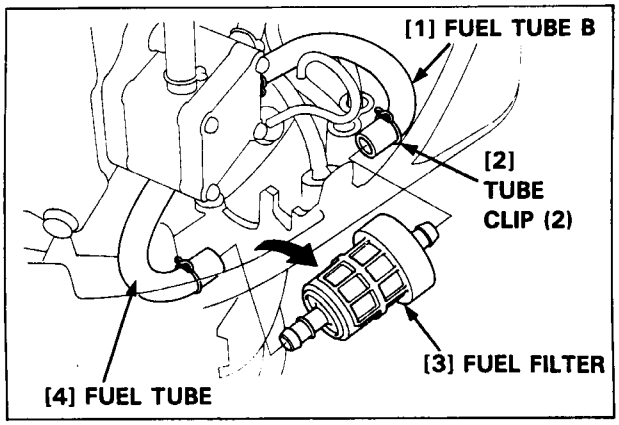
1) Remove the engine cover.
2) Check the fuel filter for water accumulation or sediment. If water or sediment is found, replace the fuel filter.



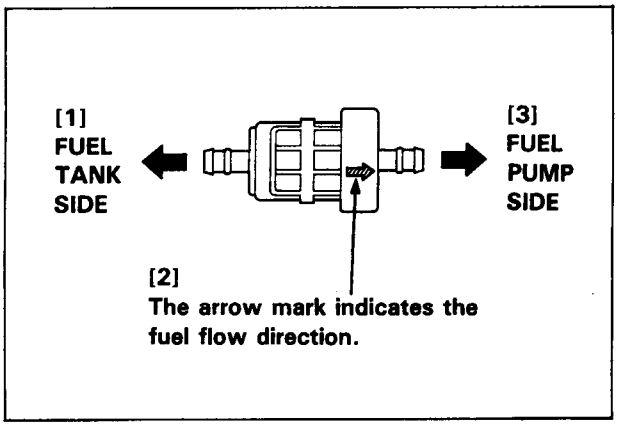
REPLCEMENT

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

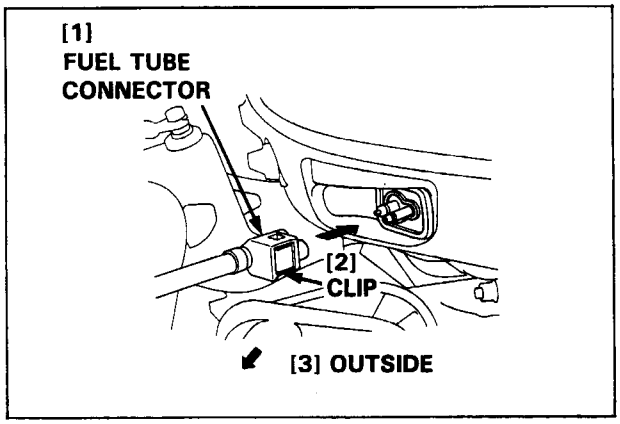
1) Disconnect the fuel tube connector from the motor.
2) Pinch off the fuel lines at the fuel filter with two commercially available Fuel Hose Clips.
3) Being careful to prevent fuel leakage, disconnect the fuel tubes from the fuel filter and remove fuel filter.



4) Install the new fuel filter so the arrow mark on the fuel filter points toward the fuel pump. Connect the fuel tubes to the fuel filter and remove the fuel hose clips.
Secure the fuel tubes to the fuel filter with the tube clips.



5) Connect the fuel tube 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.

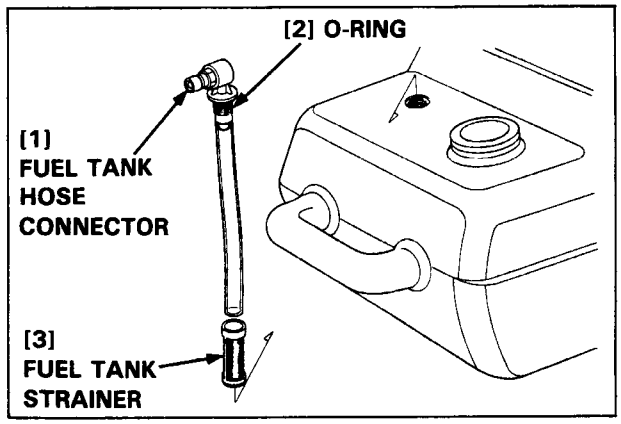


7. FUEL TANK STRAINER

⚠ WARNING

- **Gasoline is flammable and explosive under certain conditions. Do not smoke or allow flames or sparks near the outboard motor while draining fuel.**
- **Always work in a well-ventilated area.**
- **Be sure that any fuel drained from the outboard motor is stored in a safe container.**

1) Drain the fuel tank.
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.



8. 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.**
- **Keep clear of moving parts.**

Idle Speed

1) Run the outboard motor in an outboard test tank with the water level at least 4 inches above the anti-ventilation plate or use the flush attachment (optional part) and connect a fresh water supply to the WASH plug hole. 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 engien idle speed will not stabilize, perform carburetor synchronization adjustment (page 3-8).

Specified idle speed in neutral.	900 ± 50 mm^{-1} (rpm)

Pilot Screw

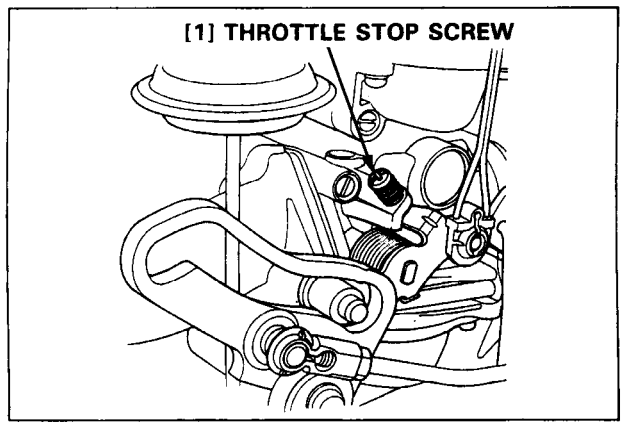
CAUTION

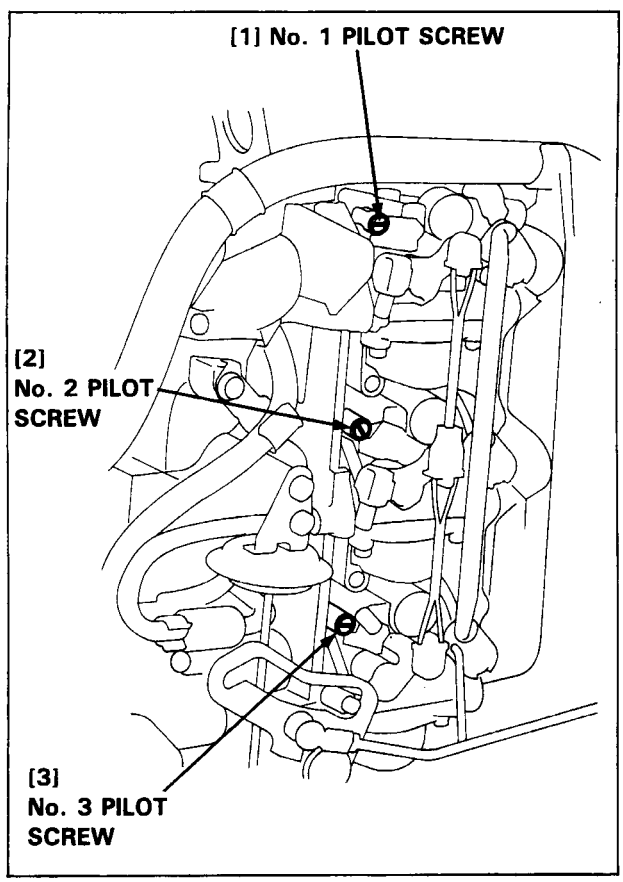
- **Damage to the pilot screw or carburetor will occur if the pilot screw is tightened against the seat. .**

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

Initial pilot screw setting	2 turns out

2) Run 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. 3 carburetor pilot screw 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 and No. 2 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.



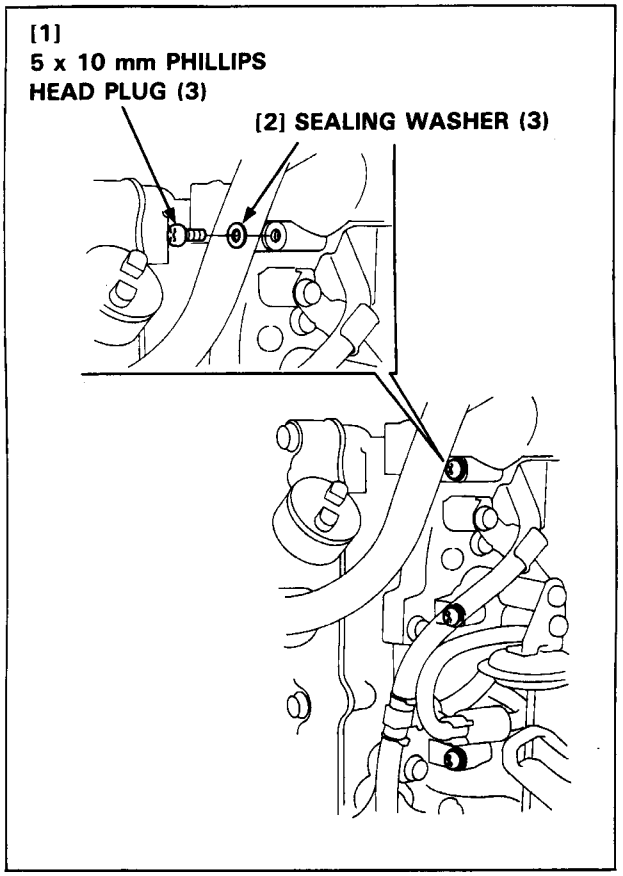


9. CARBURETOR SYNCHRONIZATION

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.**
- **Keep clear of moving parts.**

1) Remove the engine cover.
2) Remove the three 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

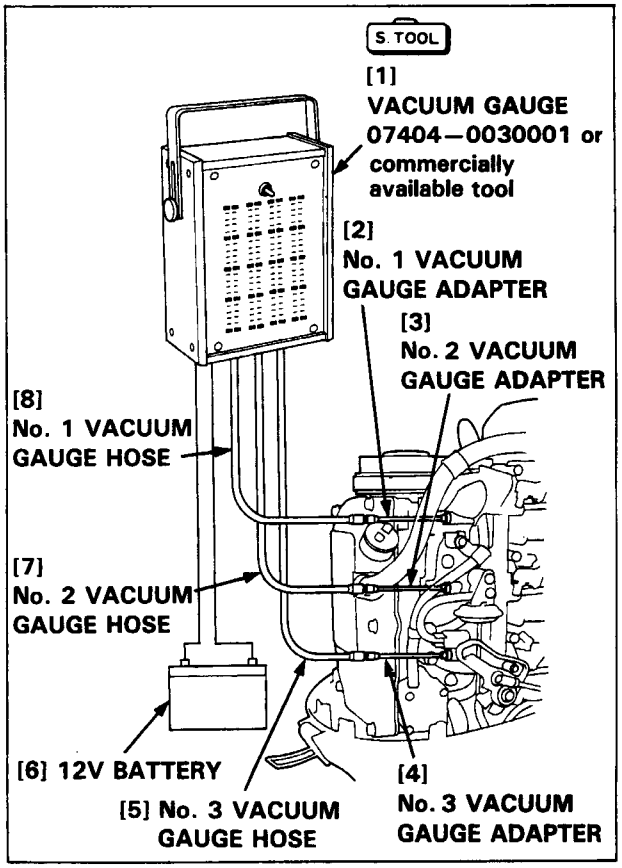
- Connect:
  The No. 1 vacuum gauge hose to the No. 1 vacuum gauge adaptor.
  The No. 2 vacuum gauge hose to the No. 2 vacuum gauge adaptor.
  The No. 3 vacuum gauge hose to the No. 3 vacuum gauge adaptor.

TOOL:
Vacuum gauge **07404—0030001**
or commercially available tool

4) Attach an engine tachometer to the engine.
5) Place the outboard motor in a vertical position with the gear-shift lever or control lever in the NEUTRAL position.
   Start the outboard motor in an outboard test tank with the water level at least 4 inches above the anti-ventilaiton plate or use the flush attachment (optional part) and connect a fresh water supply to the WASH plug hole. Start the engine and allow the engine to warm up to normal operating temperature (Approx. 10 minutes).
6) Check the standard idle speed (page 3-7).
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

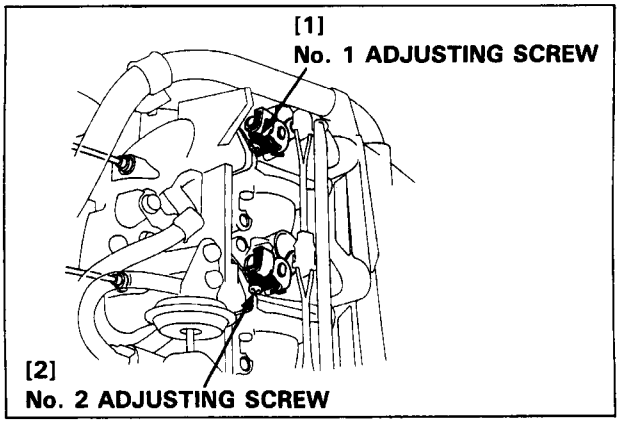
8) If the vacuum difference between cylinders is not 20 mm (0.75 in) Hg or less, adjust as follows.

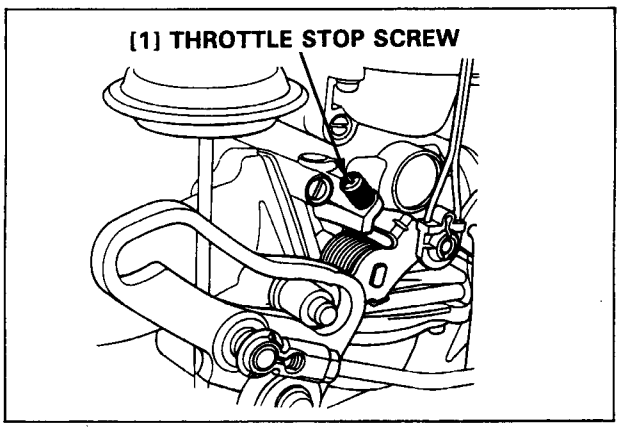


NOTE

- The No. 3 carburetor is the synchronization base carburetor. This carburetor will not have 3 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 and No. 2 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. 3 carburetor throttle stop screw (page 3-7).
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 and remove the vacuum gauge adapters. Install the 5 x 10 mm phillips head plugs and sealing washers.





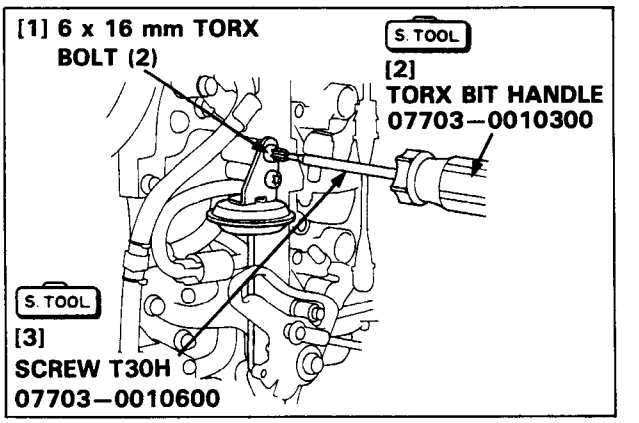
10. ACCELERATION DEVICE/ DIAPHRAGEM ADJUSTMENT

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

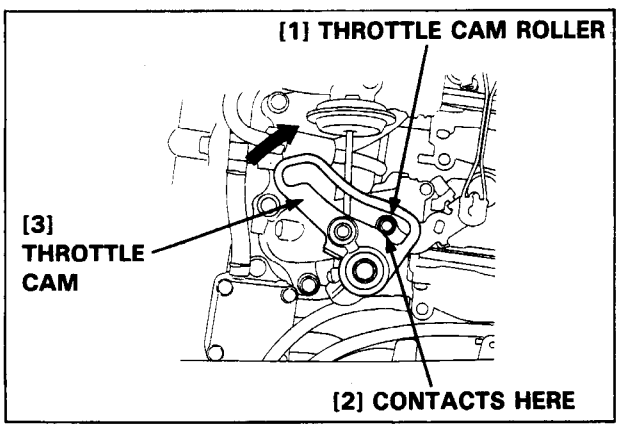
1) Loosen the 6 x 16 mm torx bolts using the special tools.

TOOLS:

Torx bit handle	**07703–0010300**
Screw T30H	**07703–0010600**



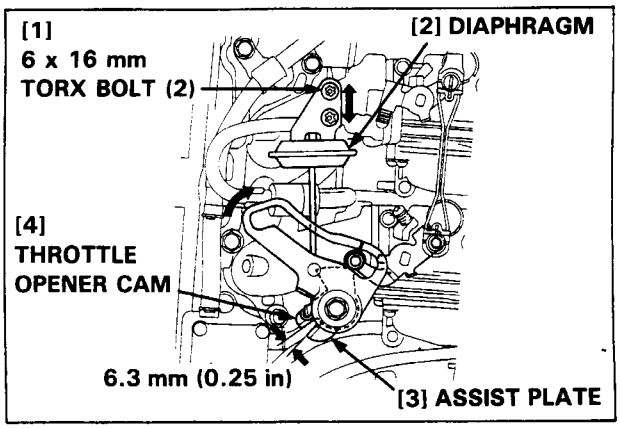
2) Remove the throttle rod from the throttle cam.
3) Move the throttle cam in the direction pointed by arrow until it contacts the throttle cam roller.



4) Move the diaphragm up or down slowly until the clearance between the assist plate and throttle opener cam is 6.3 mm (0.25 in). While holding the clearance, tighten the 6 x 16 mm torx bolts using the special tools.
Attach the throttle rod to the throttle cam.

TOOLS:

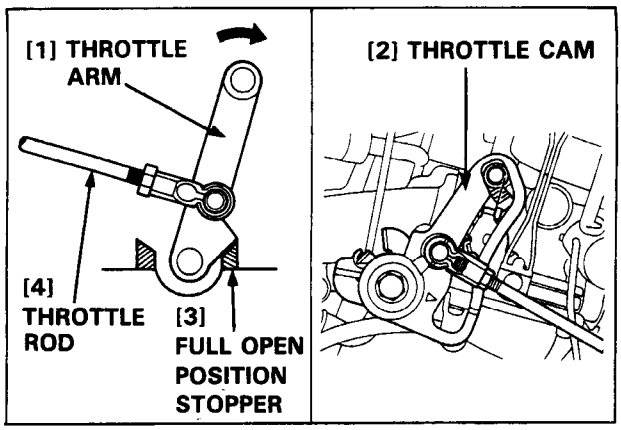
Torx bit handle	**07703–0010300**
Screw T30H	**07703–0010600**

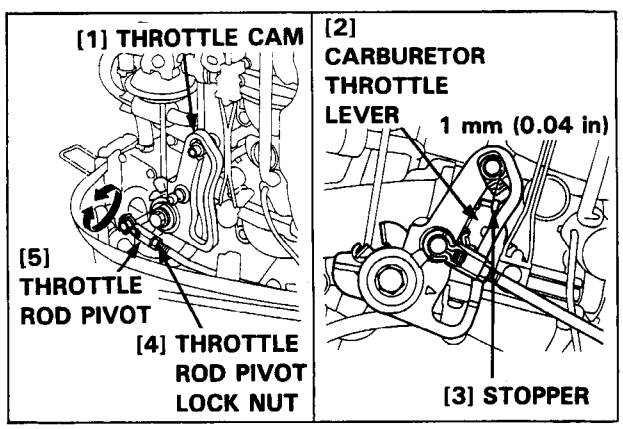


11. THROTTLE LINKAGE ADJUSTMENT (REMOTE CONTROL TYPE)

Throttle rod length adjustment:

1) Disconnect the remote control throttle cable from the throttle arm.
2) Move the throttle arm to the fully open position and be sure that the arm contacts the full open position stopper.
3) Check that the throttle cam is also at the full open position.
4) If either the throttle arm or the throttle cam is not at the full open position, adjust as follows.
Perform the linkage pivot assembly procedure before tightening the lock nut.
Tighten the lock nut securely (P. 4-2).
5) Loosen the throttle rod pivot lock nut, detach the throttle rod pivot from the throttle cam, and adjust by turning the throttle rod pivot.
6) After adjustment, move the carburetor throttle lever to the fully open position and be sure that there is clearance of 1 mm (0.04 in) or less between the carburetor throttle lever and the fully open position stopper on the No. 3 carburetor.
7) If the clearance is more than 1 mm (0.04 in), readjust by turning the throttle rod pivot.



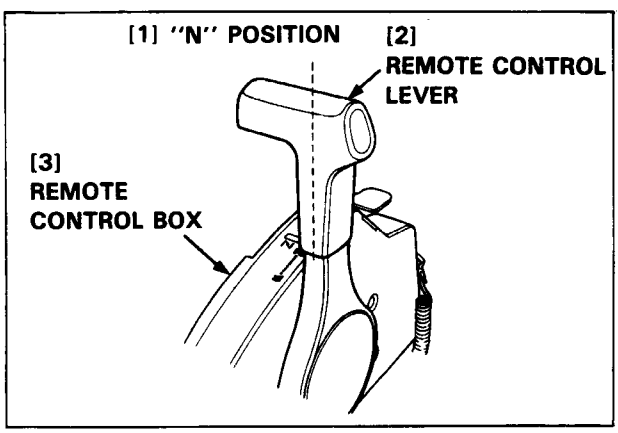


Remote control cable length adjustmen:

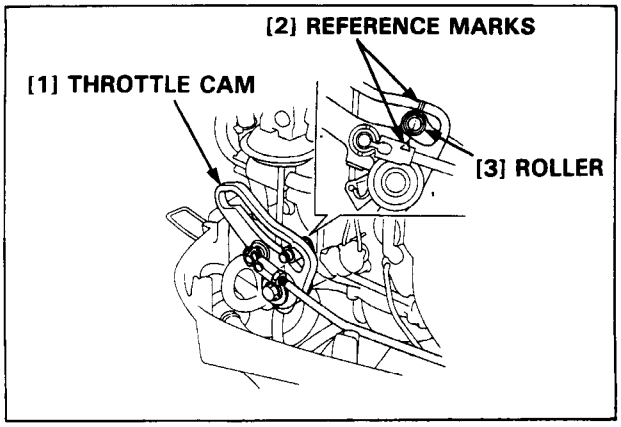
NOTE

- Remote control cable length adjustment must be performed after adjusting the throttle rod.

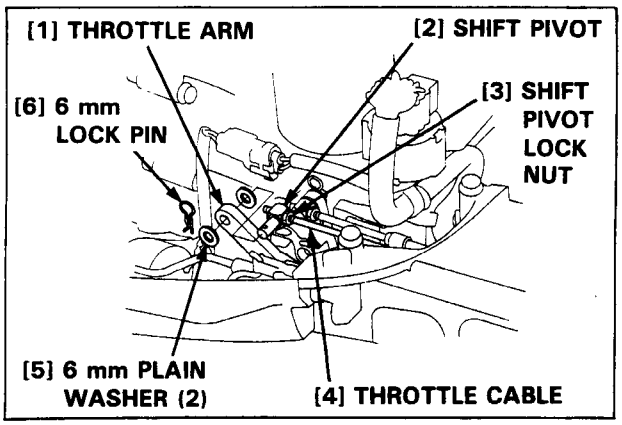
1) Move the remote control lever to the "N" position.



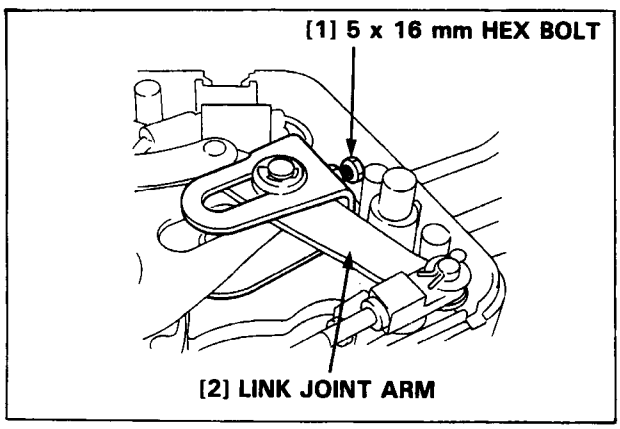
2) Check that the two reference marks on the throttle cam align with the center of the roller.
If they do not align, adjust as follows.



3) Remove the 6 mm lock pin and 6 mm plain washers from the shift pivot, and detach the shift pivot from the throttle arm.
4) Loosen the shift pivot lock nut and adjust by turning the shift pivot.
After adjustment, tighten the lock nut and attach the shift pivot to the throttle arm.



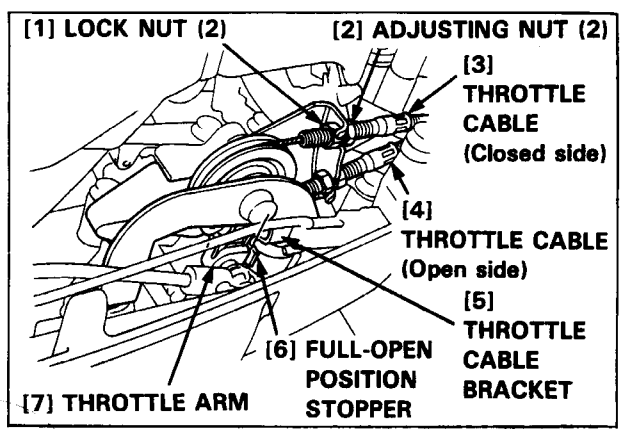
5) Remove the remote control box cover B and C (P. 14-3).
6) Move the remote control lever to the full open position and be sure that the link joint arm is in contact with the 5 x 16 mm hex. bolt.
If it is not, tighten the 5 x 16 mm hex bolt until it contacts the link joint arm.



12. THROTTLE LINKAGE ADJUSTMENT (TILLER HANDLE TYPE)

Throttle cable adjustment:

1) Move the gearshift lever to the "F" position.
2) Move the throttle grip to the fully open position and confirm that the throttle arm contacts the full-open position stopper located on the throttle cable bracket.
3) If the throttle arm does not contact the full-open position stopper, loosen the open side throttle cable lock nut and adjust by turning the adjusting nut.

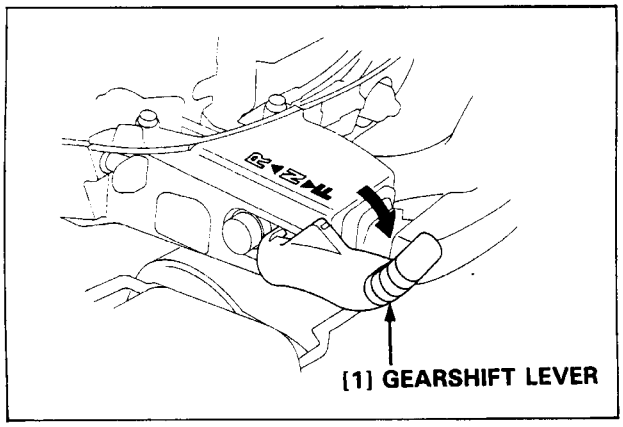


Throttle rod length adjustment:

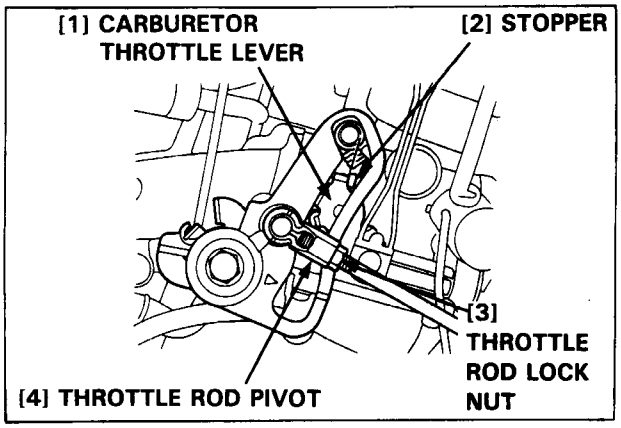
NOTE

- The throttle rod length adjustment must be performed after adjusting the throttle cable.

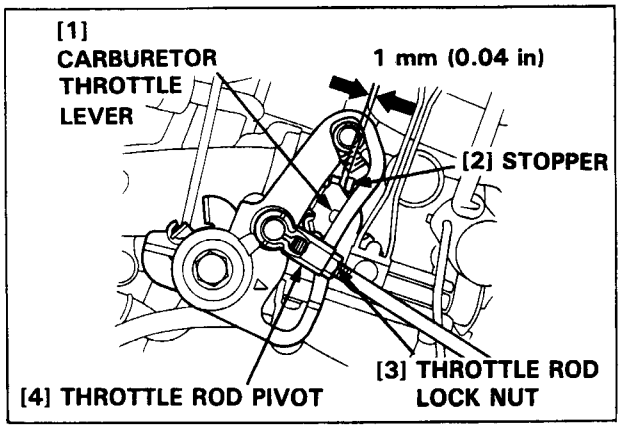
1) Move the gearshift lever to the "F" position.
2) Turn the throttle grip to the full-open position, and confirm that the throttle arm contacts the full-open position stopper on the throttle cable bracket (P. 3-11).



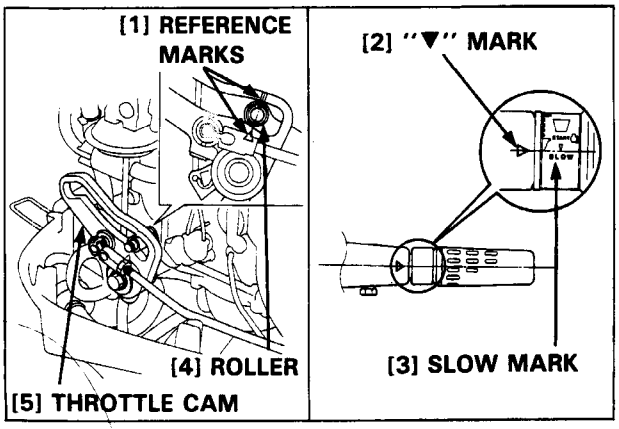
3) Be sure that the carburetor throttle lever contacts the full open position stopper on the No. 3 carburetor.
4) If the carburetor throttle lever does not contact the stopper, loosen the throttle rod lock nut and adjust the throttle rod length by turning the throttle rod pivot.
   Perform the linkage pivot assembly procedure before tightening the lock nut.
   Tighten the lock nut securely (P. 4-2).



5) Check that the throttle lever moves the entire range from the fully open position to the fully closed position without binding. Then, move the carburetor throttle lever to the fully open position and be sure that there is clearance of 1 mm (0.04 in) or less between the throttle lever and the full open position stopper on the No. 3 carburetor.
6) If the clearance is more than 1 mm (0.04 in), readjust by turning the throttle rod pivot.

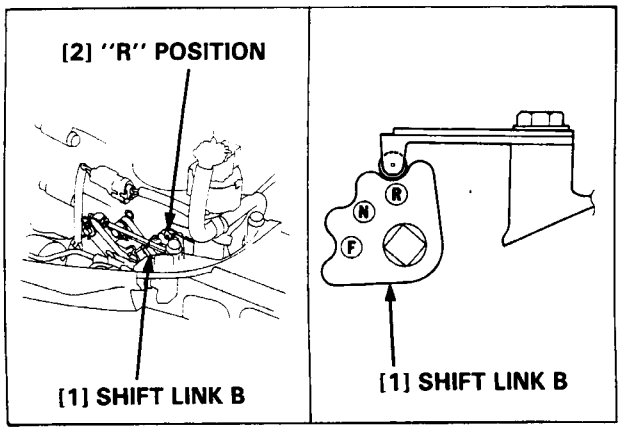


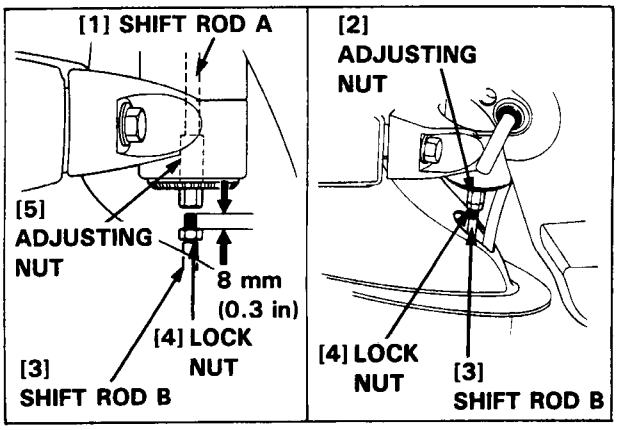
7) Turn the throttle grip to the fully closed position and align the "▼" mark on the tiller handle with the throttle slow mark.
   Be sure that the two reference marks on the throttle cam align with the center of the roller.
   If they do not align, loosen the lock nut on the closed side throttle cable and adjust by turning the adjusting nut.
8) After adjustment, turn the throttle grip and make sure that the carburetor throttle lever moves without binding over the entire range, from the fully-closed to the fully-open position.



13. SHIFT ROD ADJUSTMENT

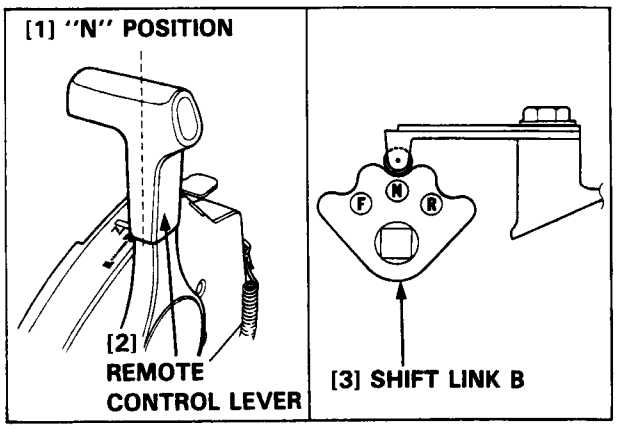
1) Move the gearshift lever or remote control lever to the "R" position.
2) Loosen the lock nut and adjusting nut connecting shift rod A to shift rod B.
3) Disconnect shift rod A from shift rod B by backing off the adjusting nut. Back off the adjusting nut until it is approximately 3 mm (0.1 in) above the top of shift rod B.
4) Turn the lock nut on shift rod B to obtain 8 mm (0.3 in) between the top of the lock nut and the top of shift rod B as shown.
5) Thread the adjusting nut onto shift rod B until the adjusting nut comes in contact with the lock nut. When the adjusting nut contacts the lock nut, tighten the lock nut and adjusting nut together.
   After adjustment, be sure that the gearshift lever or remote control lever moves smoothly into all positions.

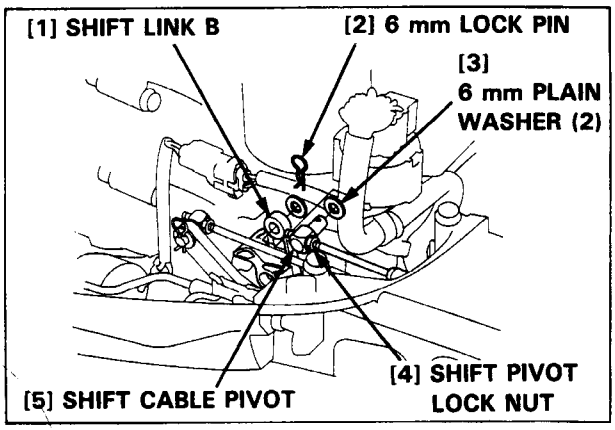




Remote control shift cable adjustment (motor side)

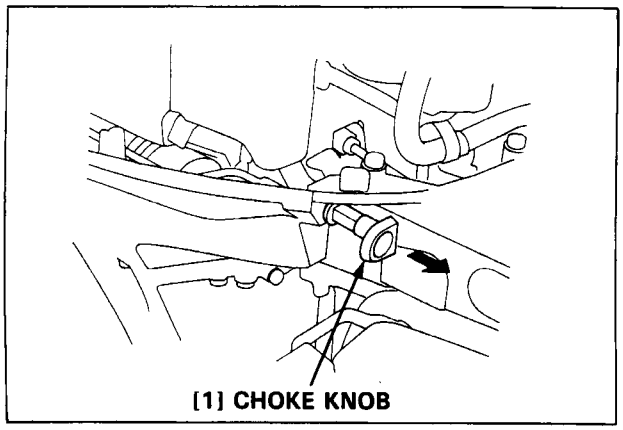
1) With the remote control lever in the "N" position, disconnect the shift cable pivot from shift link B.
2) Loosen the shift pivot lock nut.
3) With the shift link B in the "N" position, rotate the shift cable pivot the necessary amount until it will easily insert into shift link B.
4) Install a washer on the shift cable pivot and connect the shift cable pivot to shift link B. Install a washer over the shift cable pivot and secure to shift link B using the 6 mm lock pin.
5) Tighten the shift pivot lock nut.
   After adjustment, be sure that the remote control lever moves smoothly into all positions.



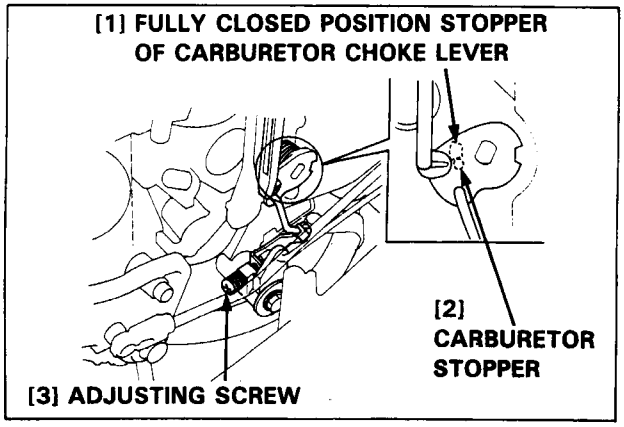


14. CHOKE KNOB ROD ADJUSTMENT

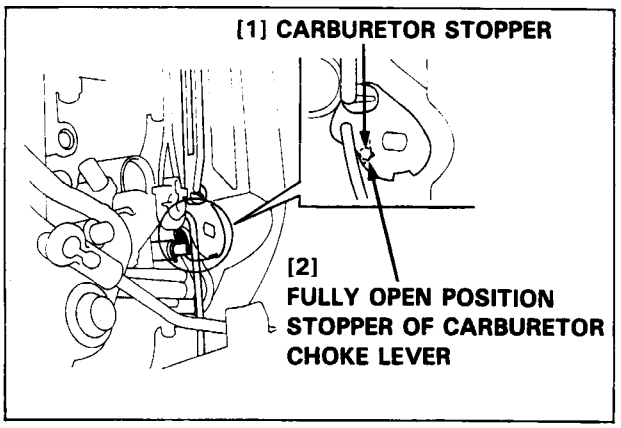
1) Pull the choke knob all the way out to the fully closed position.



2) Check that the carburetor stopper is in contact witht 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.

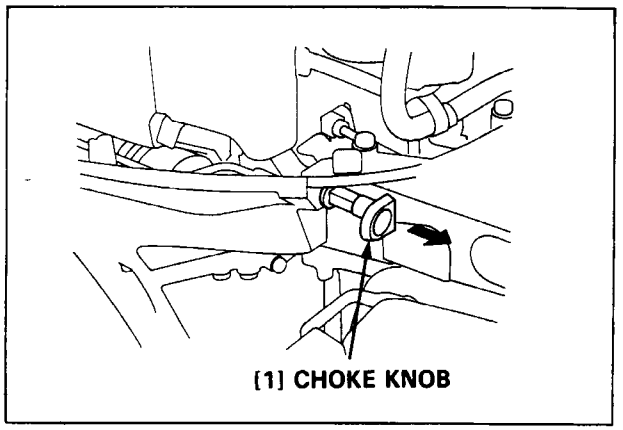


15. CHOKE SOLENOID ADJUSTMENT (REMOTE CONTROL TYPE)

NOTE

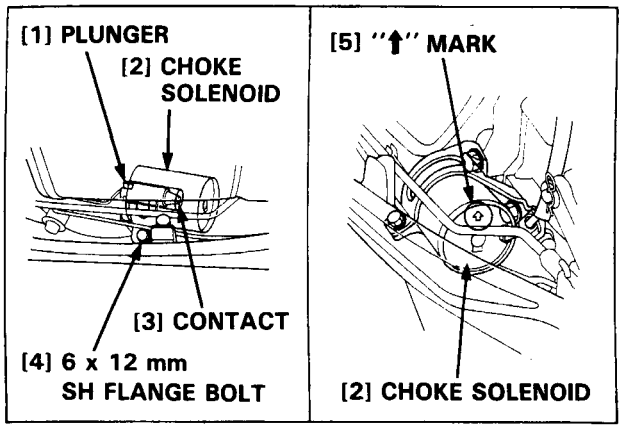
- Perform the choke solenoid adjustment after adjusting the choke knob rod.

1) Turn the ignition switch to the "ON" position.
2) Move the choke/fast idle lever all the way up and check the choke solenoid for proper operation.
   If it does not operate properly, adjust as follows.
3) Pull the choke knob all the way out 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 kg-m, 6.5 ft-lb)



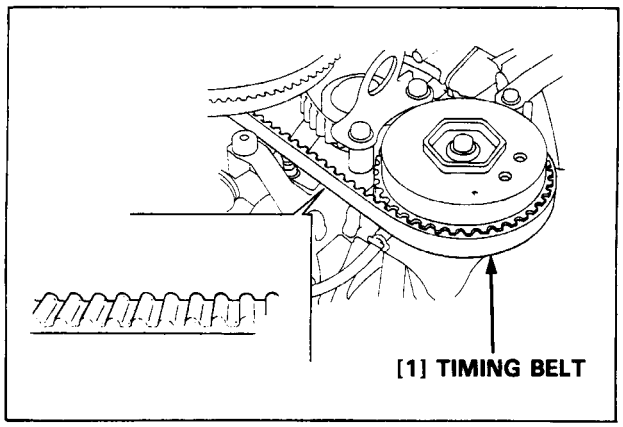
16. TIMING BELT

a. INSPECTION

1) Remove the engine cover and spark plugs.

CAUTION

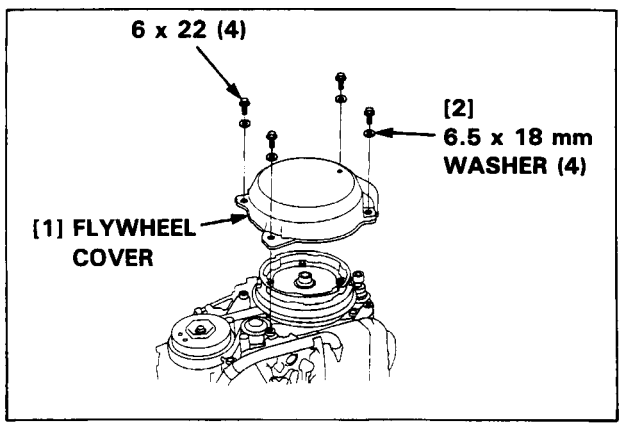
- **The starter stopper collar is close to the flywheel and the starter ring gear can become sharp. Avoid hand contact with the starter stopper collar or flywheel when rotating the engine.**
- **To avoid water pump impeller damage, always turn the crankshaft in clockwise direction.**



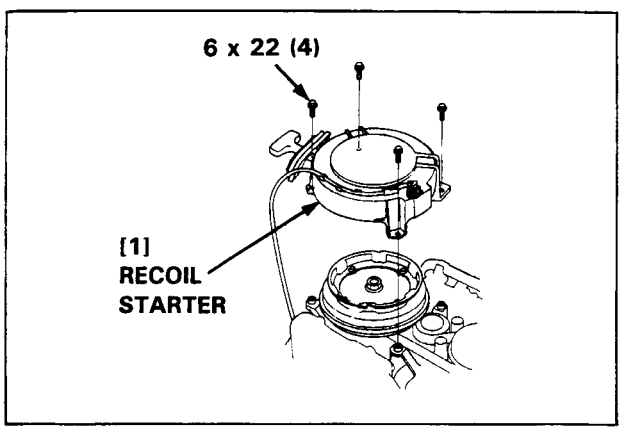
2) Rotate the engine clockwise (page 3-4), using the flywheel, and inspect the full length of the timing belt for wear or damage. Replace the timing belt if necessary.

b. REPLACEMENT

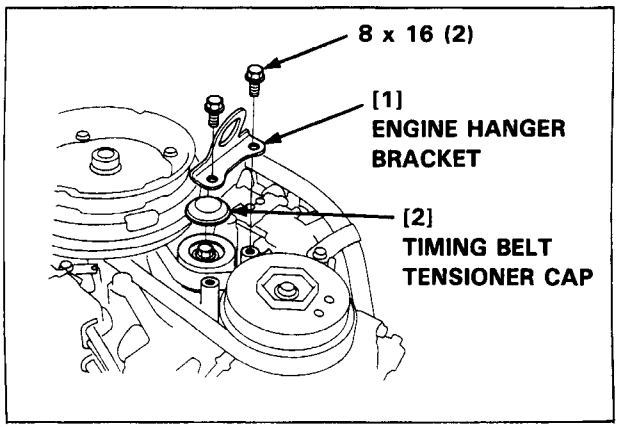
1) Remove the four 6 x 22 mm flange bolts, four 6.5 x 18 mm washers and flywheel cover (Electric starter type).



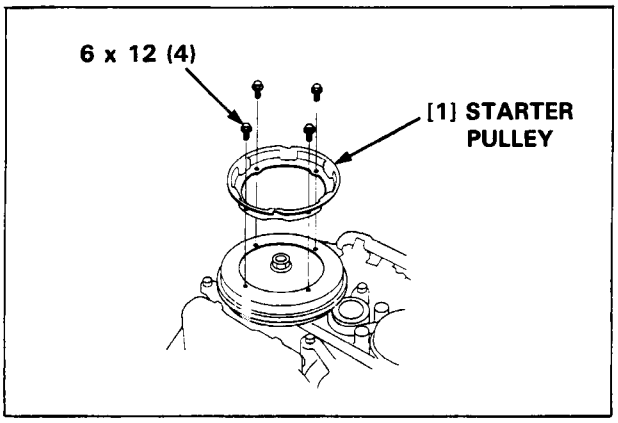
2) Remove the four 6 x 22 mm flange bolts and recoil starter (Recoil starter type).



3) Remove the two 8 x 16 mm flange bolts and engine hanger bracket.
4) Rotate the engine clockwise, using the flywheel, until the No. 1 cylinder timing marks align (P. 3-4).
5) Remove the timing belt tensioner cap.

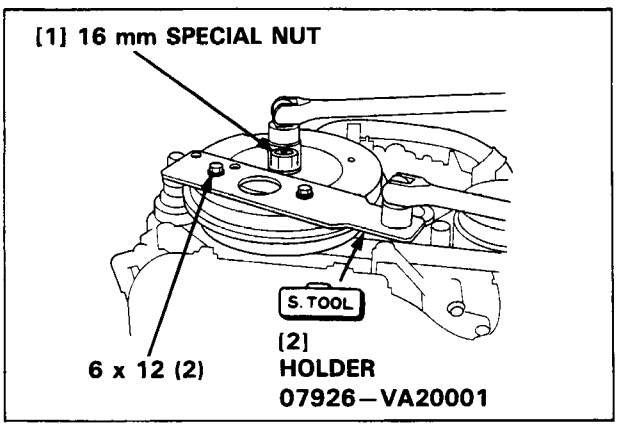


6) Remove the 6 x 12 mm flange bolts and starter pulley.



7) Set the special tool on the flywheel as shown using the two 6 x 12 mm flange bolts that tighten the starter pulley, then remove the 16 mm special nut.

TOOL:
Holder **07926—VA20001**



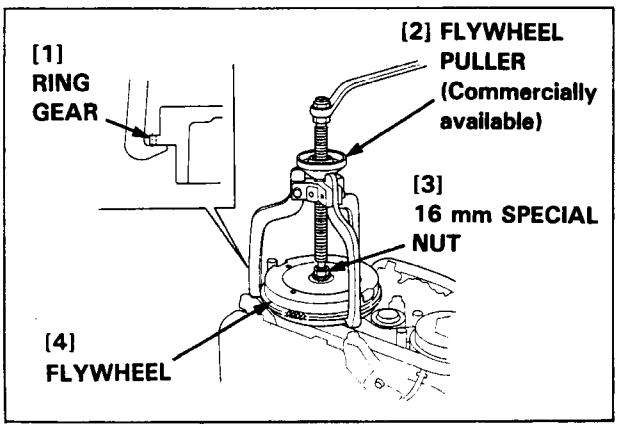
8) Loosely tighten the 16 mm special nut with care not to tighten the flywheel excessively against the crankshaft as shown. Remove the flywheel using a commercially available flywheel pullery.

CAUTION

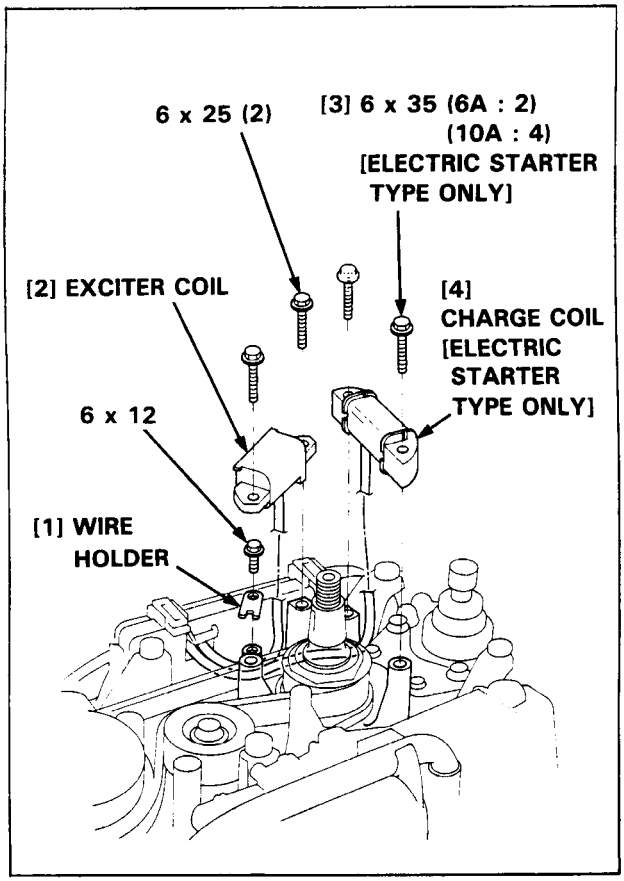
- **Set the flywheel puller against the flywheel equally and securely. Take care not to damage the flywheel ring gear teeth.**

NOTE

- Do not hit on the flywheel with a hammer to remove it.
- Take care not to lose the woodruff key after the flywheel is removed.



9) Disconnect and remove the 6A or 10A charge coil (Electric starter type only) and exciter coil (P. 6-1).
Remove the wire holder.

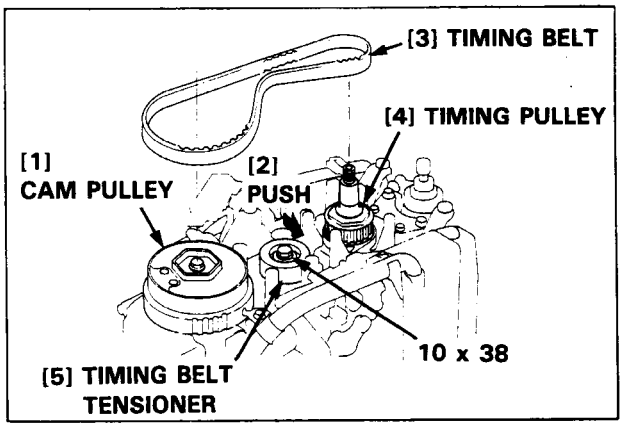


10) Loosen the 10 x 38 mm flange bolt on the timing belt tensioner. Then while pushing the belt tensioner in the direction of the arrow, tighten the 10 x 38 mm flange bolt.

CAUTION

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

11) Lift the timing belt from the timing belt tensioner first, then remove the timing belt from the cam pulley, and last from the timing pulley.



NOTE

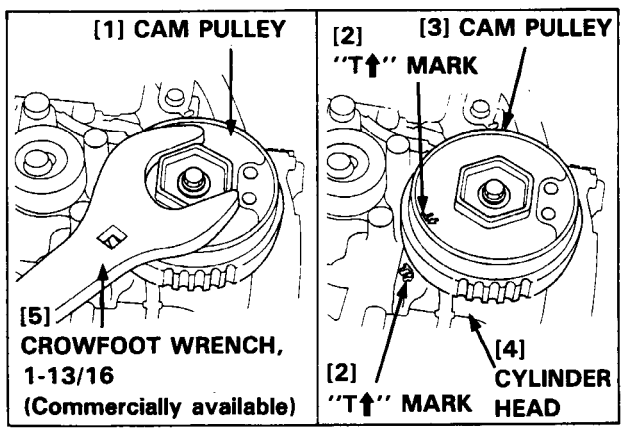
- Do not contaminate the timing belt with oil or grease.
- Do not bend the timing belt.
- Store the timing belt by hanging it on the wall.
- Do not reuse a worn or damaged timing belt.

C. INSTALLAITON

CAUTION

- **The valves may become bent if the cam pulley or crankshaft is rotated with the timing belt removed or incorrectly installed. If the timing marks have become substantially misaligned, it may be necessary to loosen the valve adjusting screw lock nuts and back off the valve adjusting screws before aligning the No. 1 cylinder timing marks.**

1) The spark plugs should be removed.
2) Check and align the cam pulley "T↑" timing mark with the "T↑" timing mark on the cylinder head.

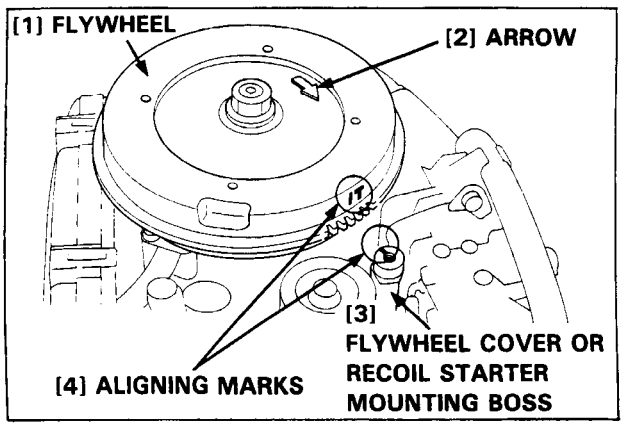


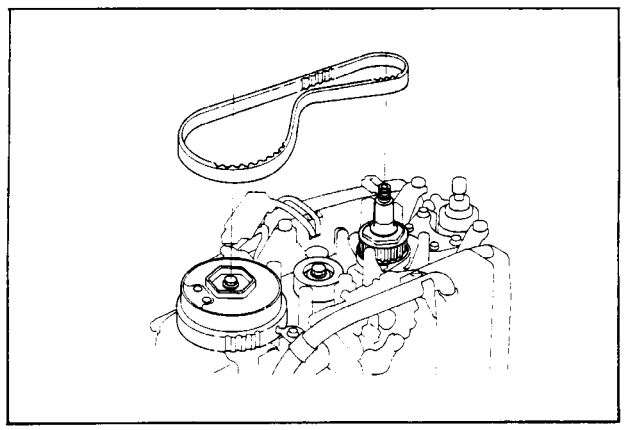
3) Install the flywheel on the crankshaft by aligning the 25 x 18 mm special woodruff key.
4) Install and hand tighten the 16 mm special nut.

CAUTION

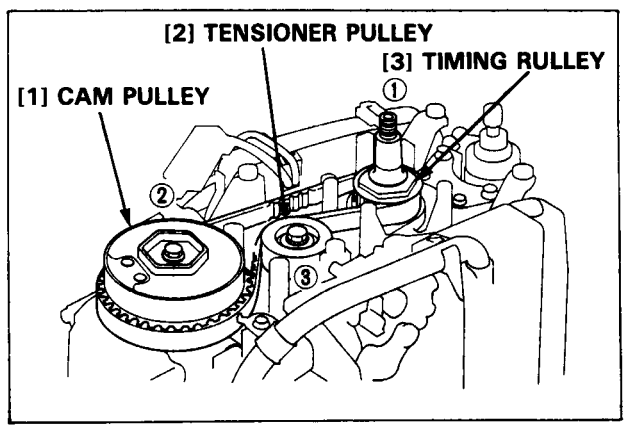
- **The starter stopper collar is close to the flywheel and the starter ring gear can become sharp. Avoid hand contact with the starter stopper collar or flywheel ring gear. Hold the upper portion of the flywheel when rotating the engine.**
- **To avoid water pump impeller damage, always turn the crankshaft in a clockwise direction.**

5) Check and align the flywheel "T▮" timing mark with the "▮" timing mark on top of the flywheel cover or recoil starter mounting boss.
6) Remove the flywheel with care not to change the timing mark alignment.





7) Install the timing belt on the timing pulley first, then over the cam pulley, and last over the tensioner pulley.
After installing the timing belt, proceed to the timing belt adjustment procedure.



d. TIMING BELT ADJUSTMENT

1) Install the flywheel on the crankshaft aligning the 25 x 18 mm special woodruff key.
2) Install and hand tighten the 16 mm special flange nut.
3) Check to be sure that the No. 1 cylinder timing marks are aligned properly.

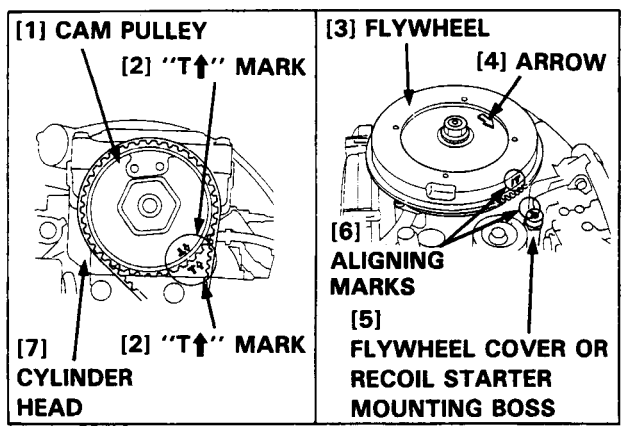
NOTE

- If the valve adjusting screws and lock nuts were loosened during timing belt installation, tighten the timing belt tensioner 10 x 38 mm flange bolt. Adjust the valves (P. 3-5), then proceed with timing belt adjustment.

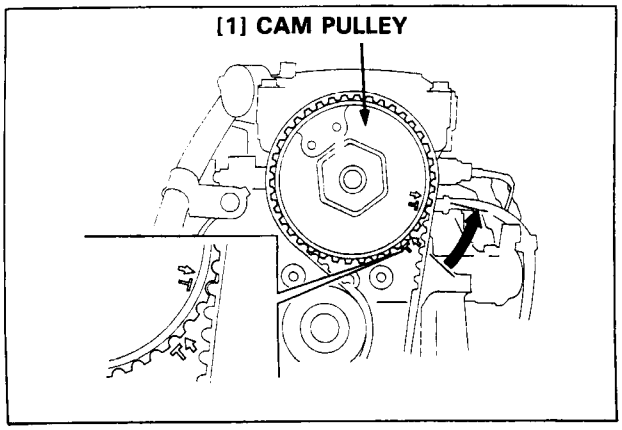
4) The timing belt tensioner 10 x 38 mm flange bolt should be loose at this time.

CAUTION

- **The starter stopper collar is close to the flywheel and the starter ring gear can become sharp. Avoid hand contact with the starter stopper collar or flywheel ring gear. Hold the upper portion of the flywheel when rotating the engine.**
- **To avoid water pump impeller damage, always turn the crankshaft in a clockwise direction.**



5) Turn the camshaft counterclockwise by 5 cam pulley gear teeth or more, then turn the camshaft clockwise until the timing mark is at the 3 gear teeth before the cylinder head "T↑" mark, i.e, 3 gear teeth before the top dead center of the No. 1 cylinder.



NOTE

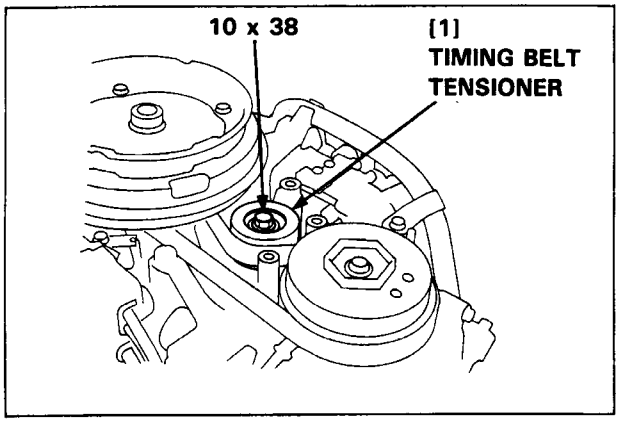
- The correct tension for the timing belt is automatically adjusted by the tensioner. Do not apply additional force to the timing belt tensoner.

6) Tighten the belt tensioner 10 x 38 mm flange bolt to the specified torque.

TORQUE: 45 N·m (4.5 kg-m, 32.5 ft-lb)

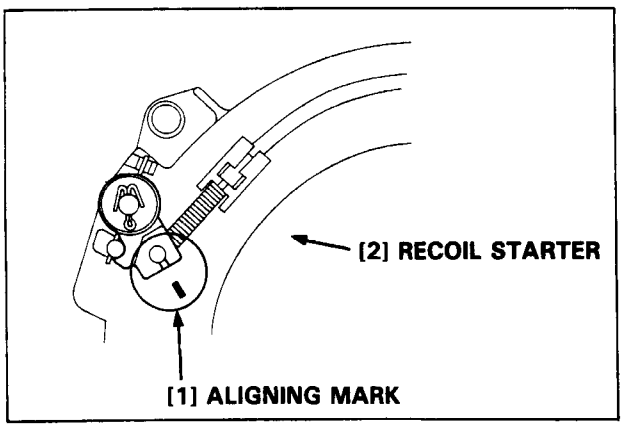
After adjustment, install the following parts:

- Exciter coil, charge coil [Electric starter type], flywheel, starter pulley and flywheel cover [Electric starter type] (P.6-1).
- Recoil starter (P.7-1), engine hanger bracket (P.6-3) and engine cover (P.4-1).
- Spark plugs.

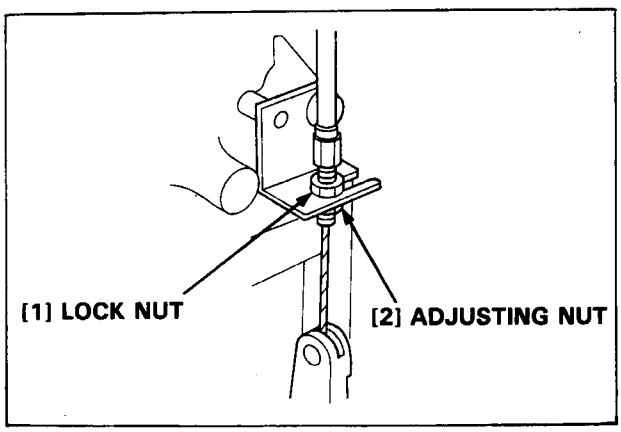


17. NEUTRAL STARTER CABLE ADJUSTMENT (RECOIL STARTER TYPE)

1) Set the gearshift lever in the "N" position.
2) Remove the engine cover.
3) Check whether the " ▮ " mark on the recoil starter case aligns with the cutout in the stopper arm.
Adjust, if necessary.



4) To adjust, loosen the lock nut of the neutral starter cable bracket side and turn the adjusting nut until the " ▮ " mark on the recoil starter case aligns with the cutout in the stopper arm.



18. CRANKCASE BREATHER (BODENSEE TYPE ONLY)

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

19. 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.

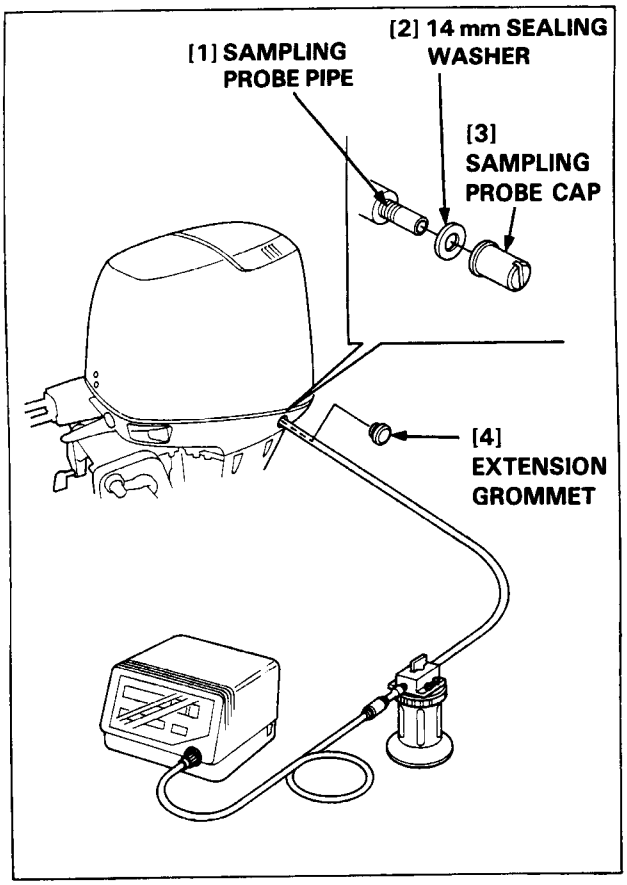
NOTE

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

3) Start the engine and run at 3,500−4,000 min^{-1} (rpm) for about 7 minutes to warm up the engine.
(cf. Engine oil temperature: 65±5°C)
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_2 at idle with the engine cover installed.

STANDARD VALUE	
CO	6.8±2.7 %
HC	Max. 770 ppm
CO_2	Min. 9.2 %
Idle speed	900±50 min^{-1} (rpm)

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

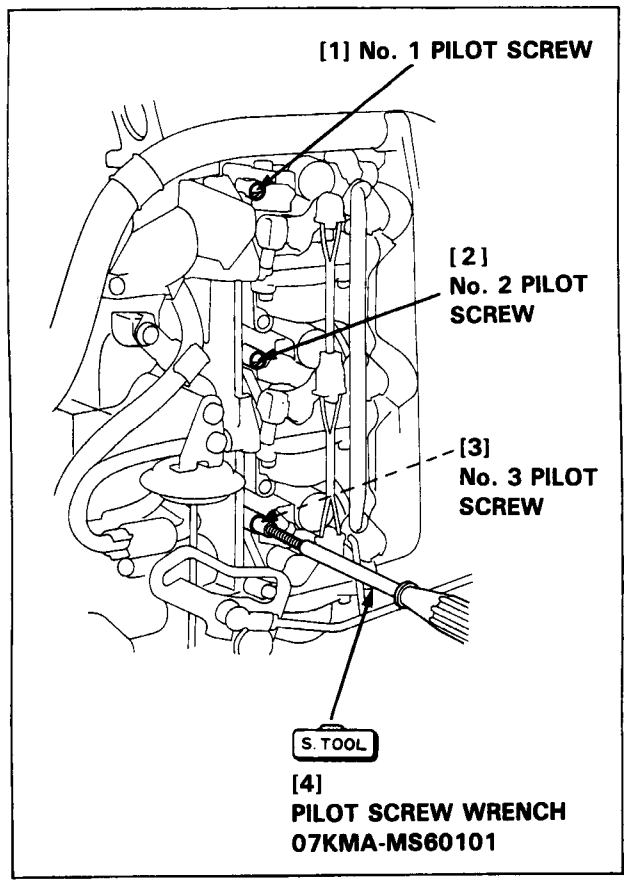


ADJUSTMENT

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 (see base shop manual).

   TOOL:
   Pilot screw wrench **07KMA-MS60101**

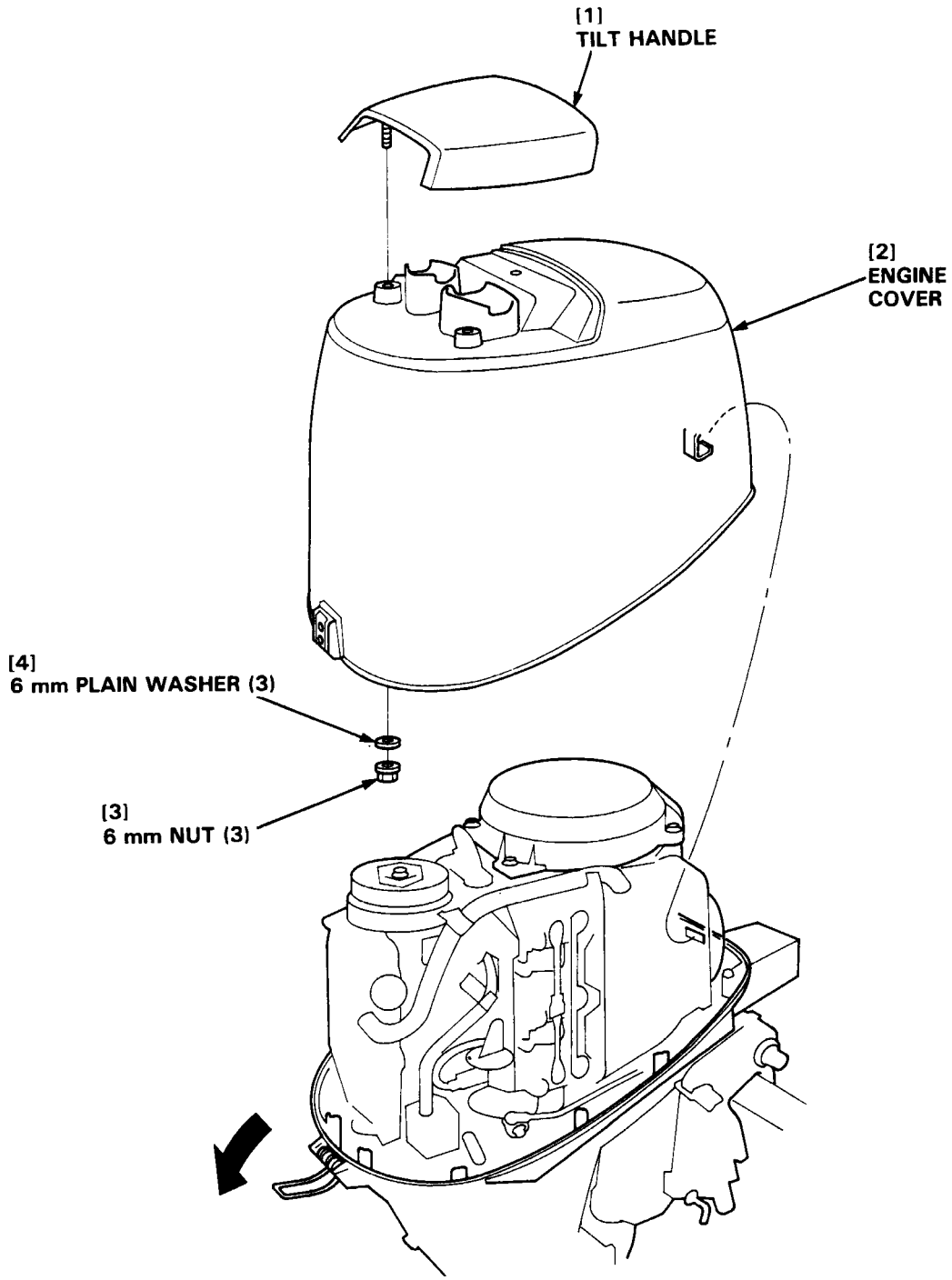
2) If the specified value is not obtained, inspect and repair the following in order of number and recheck.
   (1) Decarbonization from the combustion chamber.
   (2) Refacing valve seats and lapping valve and valve seat.
   (3) Checking valve stem seal condition.
   (4) Checking piston ring conditions.



4. ENGINE COVER/THROTTLE/CHOKE

1. ENGINE COVER	3. CHOKE KNOB ROD
2. THROTTLE CAM	

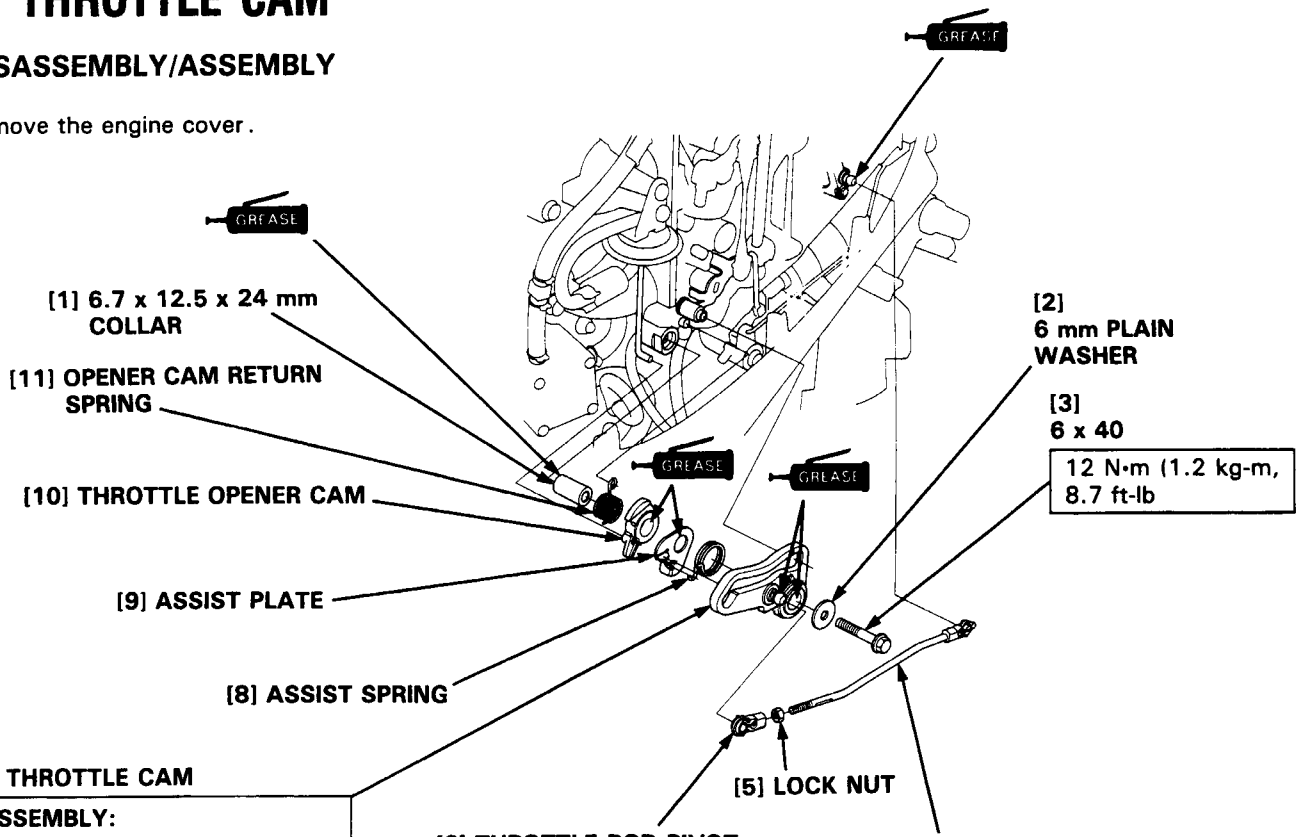
1. ENGINE COVER



2. THROTTLE CAM

DISASSEMBLY/ASSEMBLY

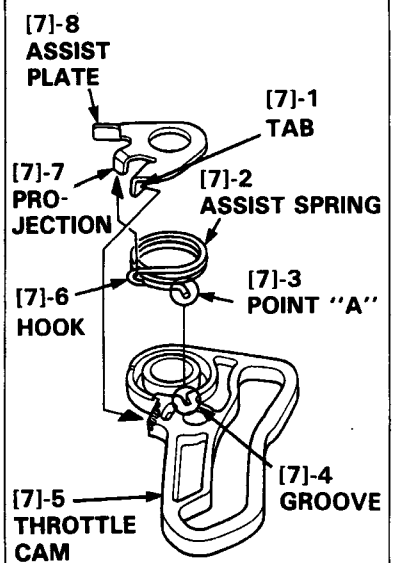
Remove the engine cover.



[7] THROTTLE CAM

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.

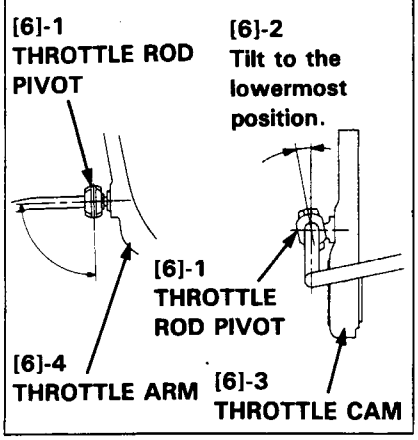


[6] THROTTLE ROD PIVOT

ASSEMBLY:

- Perform the following adjustment after adjusting the throttle and before tightening the lock nut.

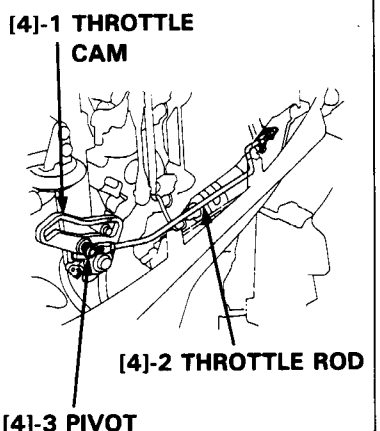
1) Set the throttle rod pivot of the throttle arm side at an angle of 90°.
2) Tilt down the throttle rod pivot of the throttle cam side as far as it goes and tighten the lock nut securely as shown.



[4] THROTTLE ROD

ASSEMBLY:

Install the throttle rod with the pivot facing the throttle cam.

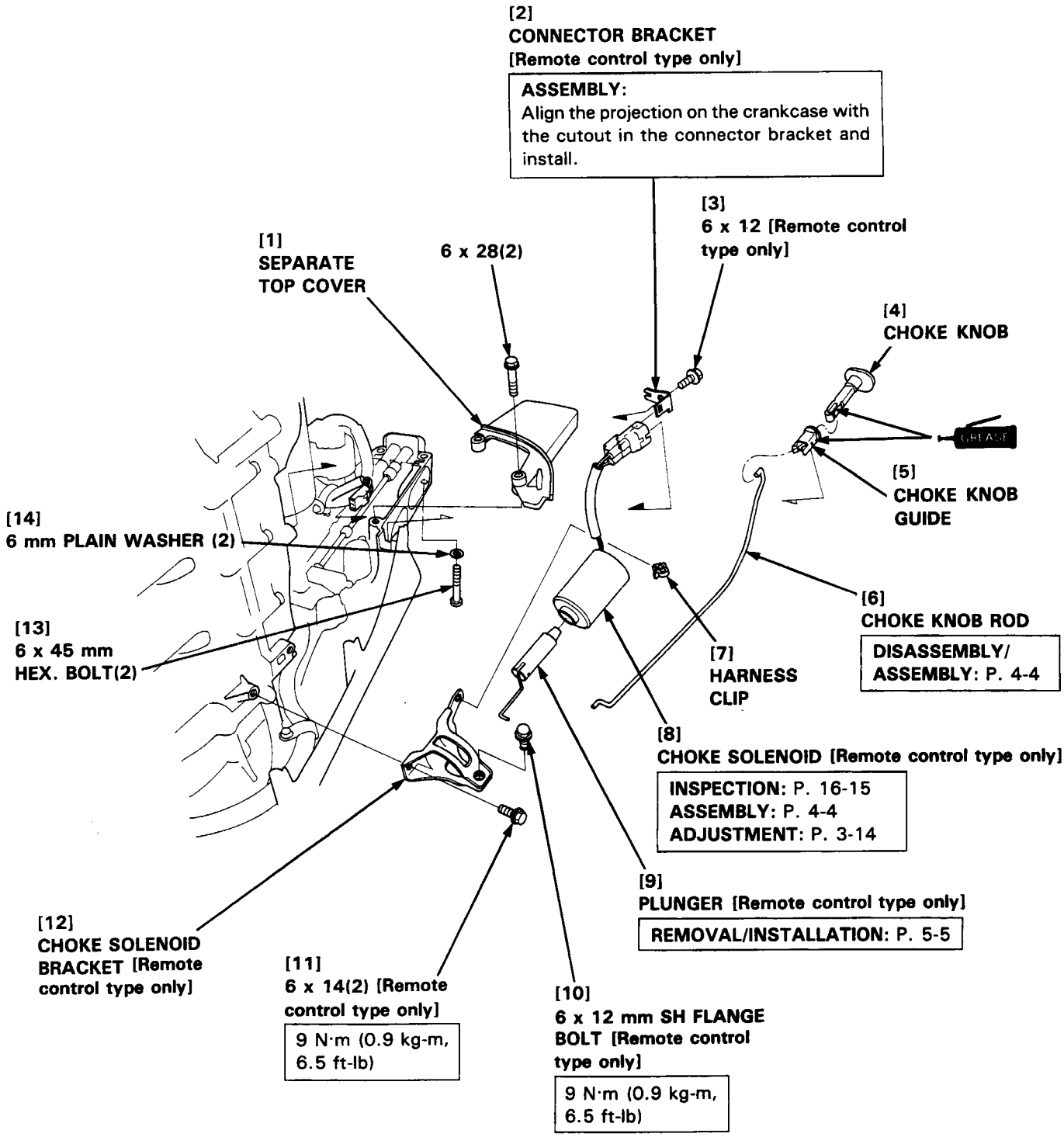


ADJUSTMENT: P. 3-10

3. CHOKE KNOB ROD

DISASSEMBLY/ASSEMBLY

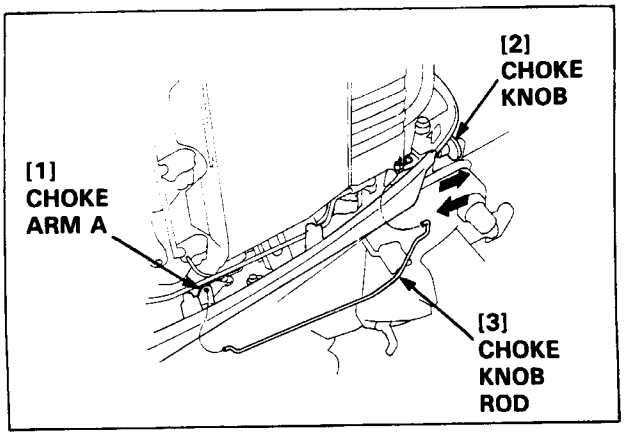
1) Remove the engine cover (P. 4-1).
2) Remove the carburetor assembly (P. 5-1).
3) Disconnect the remote choke solenoid 2P connector (Remote control type only).



• 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 on the 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.



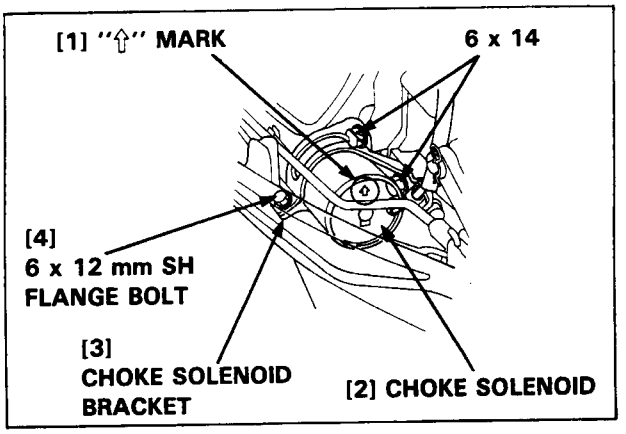
• CHOKE SOLENOID (Remote control type only)

ASSEMBLY:

1) Set the choke solenoid bracket on the engine and tightend with the two 6 x 14 mm flange bolts.

   TORQUE: 9 N·m (0.9 kg-m, 6.5 ft-lb)

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. 3-15).



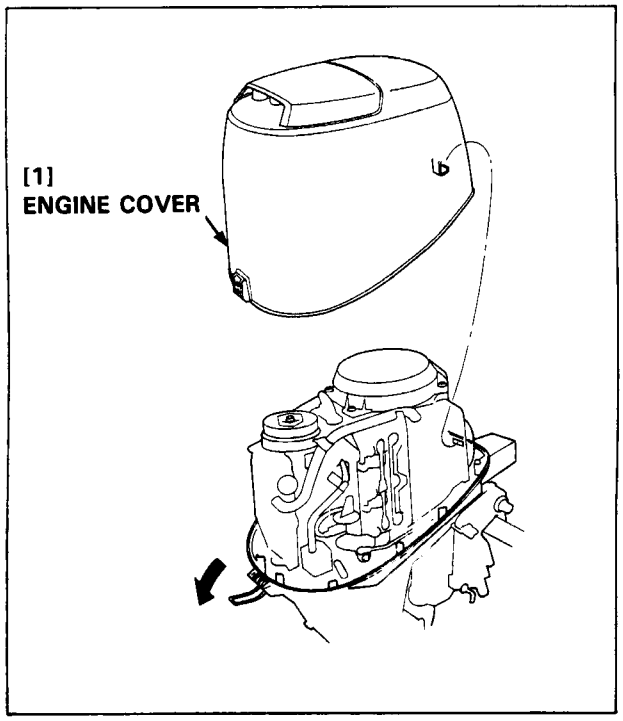
1. CARBURETOR

a. REMOVAL/INSTALLATION

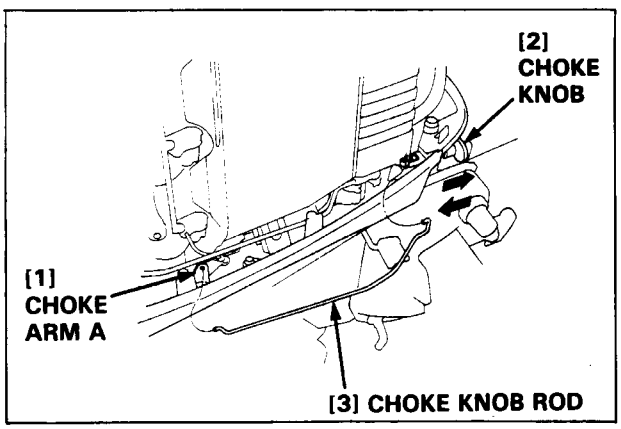
⚠ WARNING

- **Remove the drain screws and drain the carburetor before removal.**
- **Gasoline is extremely flammable and is explosive under certain conditions. Do not smoke or allow flames or sparks in the area.**

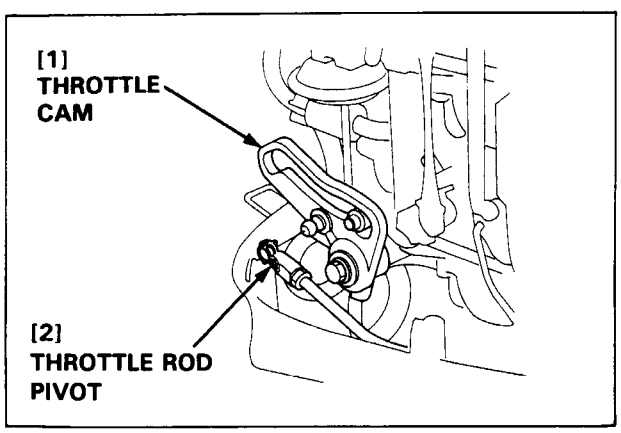
1)Remove the engine cover.



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.



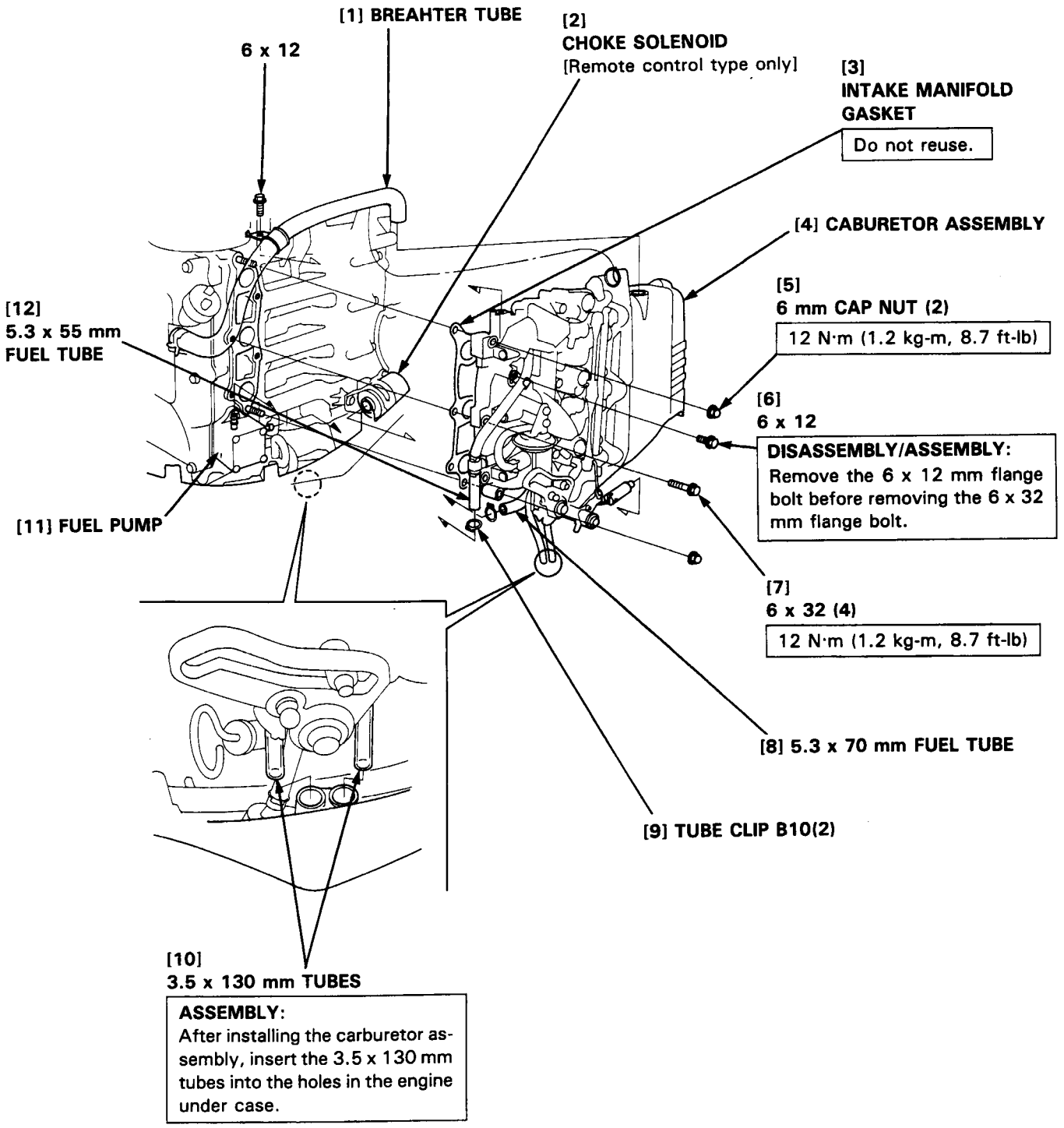
3) Remove the throttle rod pivot from the throttle cam.



4) Loosen the 6 x 12 mm flange bolt (Remote control type only).
5) Slide the choke solenoid rearward (Remote control type only).
6) Disconnect the breather tube. Disconnect the 5.3 x 70 mm fuel tube and 5.3 x 55 mm fuel tube from the fuel pump. Remove the two 6 x 12 mm flange bolts, four 6 x 32 mm flange bolts and two 6 mm cap nuts. Remove the carburetor assembly from the engine.

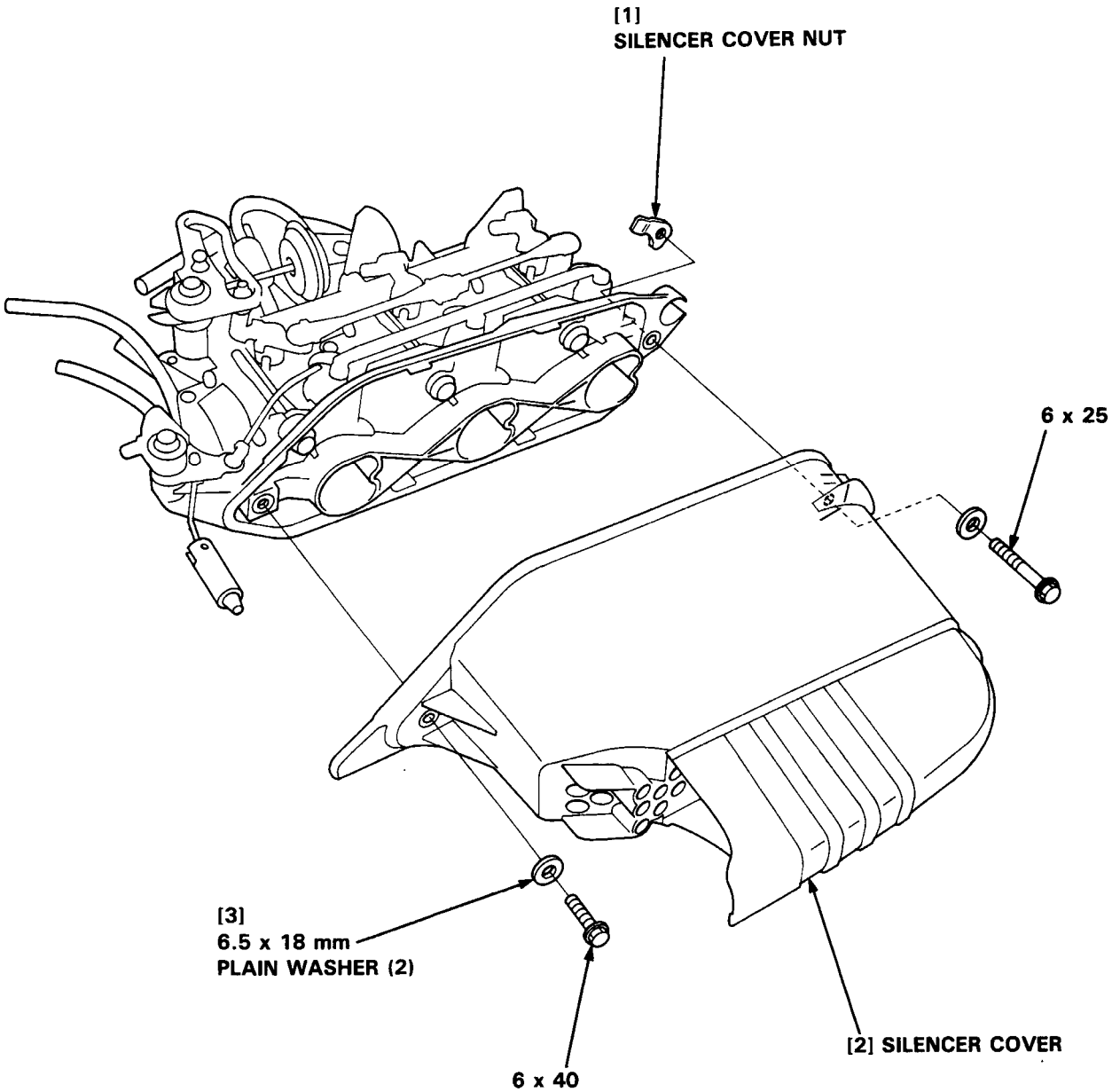
CAUTION:

- **Take care not to bend the plunger rod when removing the carburetor assembly.**



b. DISASSEMBLY/ASSEMBLY

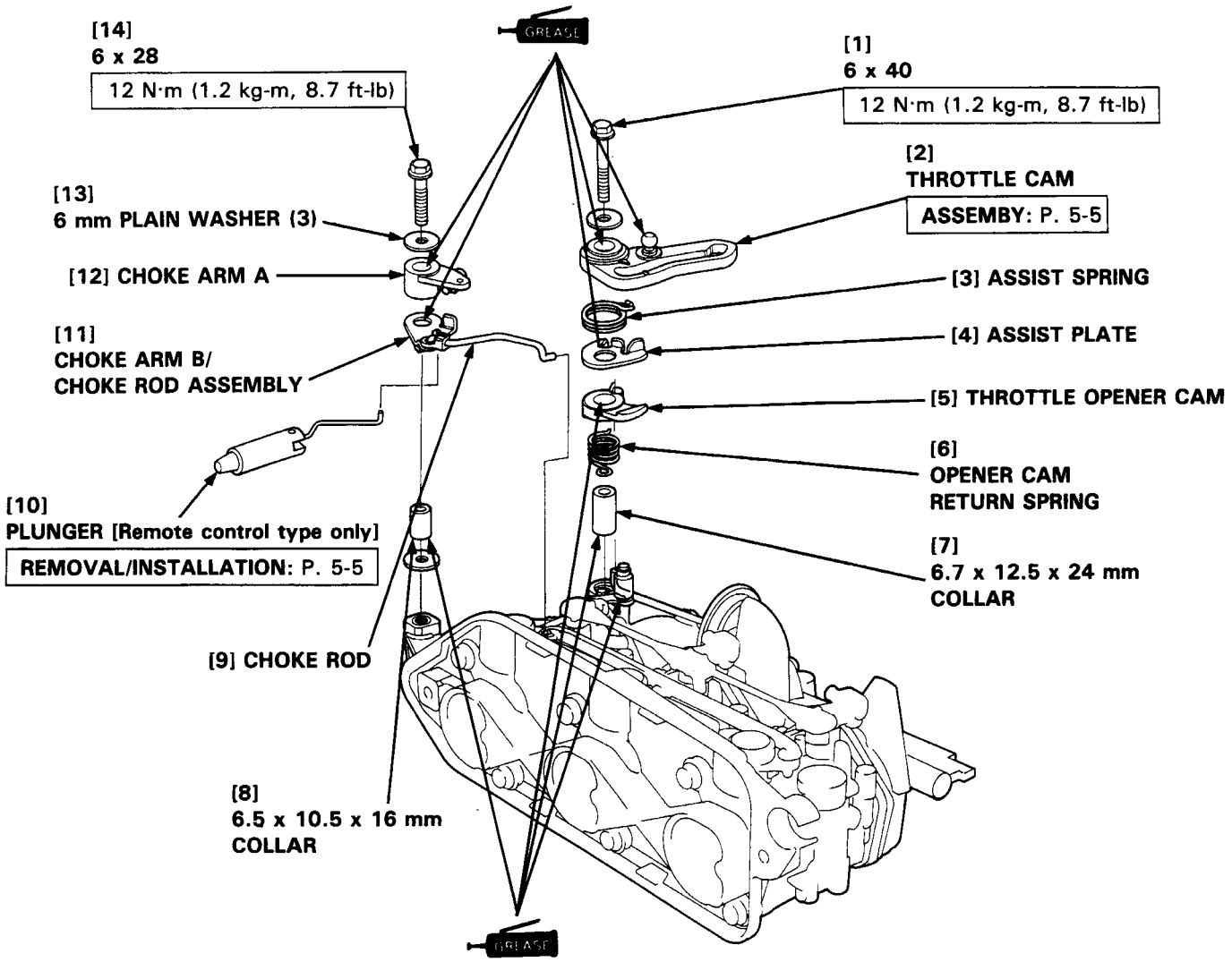
• SILENCER COVER



• THROTTLE CAM/CHOKE ARM

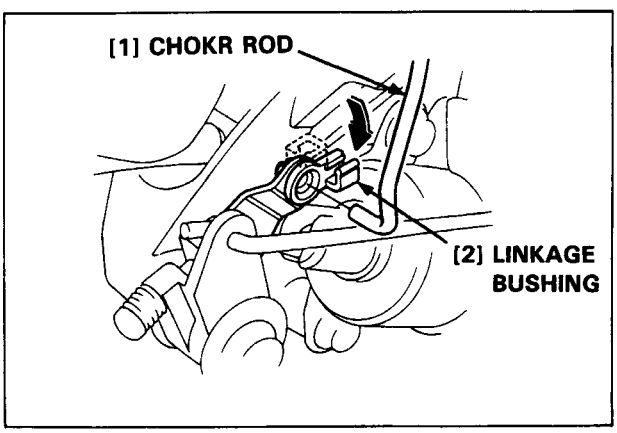
• The throttle cam/choke arm can be disassembled and assembled with the carburetor mounted on the intake manifold.

Remove the engine cover and carburetor assembly (P. 5-1).



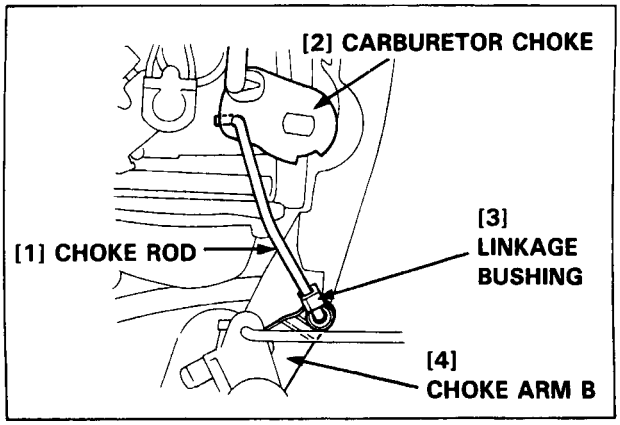
• CHOKE ROD

REMOVAL:
Hold the choke rod and push down the linkage bushing to remove it from the rod.



INSTALLATION:

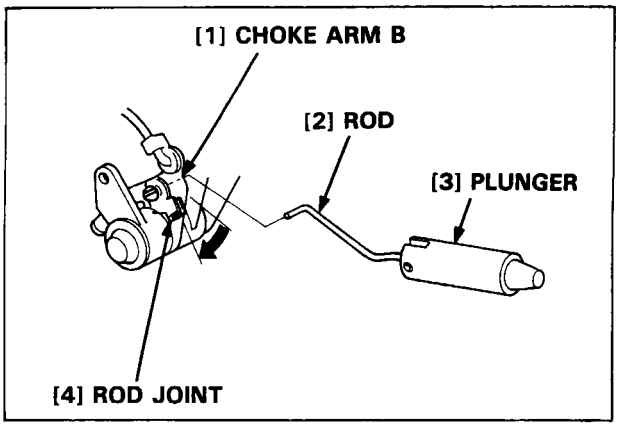
1) Connect the choke rod to the carburetor choke, then connect it to the choke arm.
2) Push the linkage bushing up and set the linkage bushing on the choke rod.



• PLUNGER [Remote control type only]

REMOVAL/INSTALLATION:

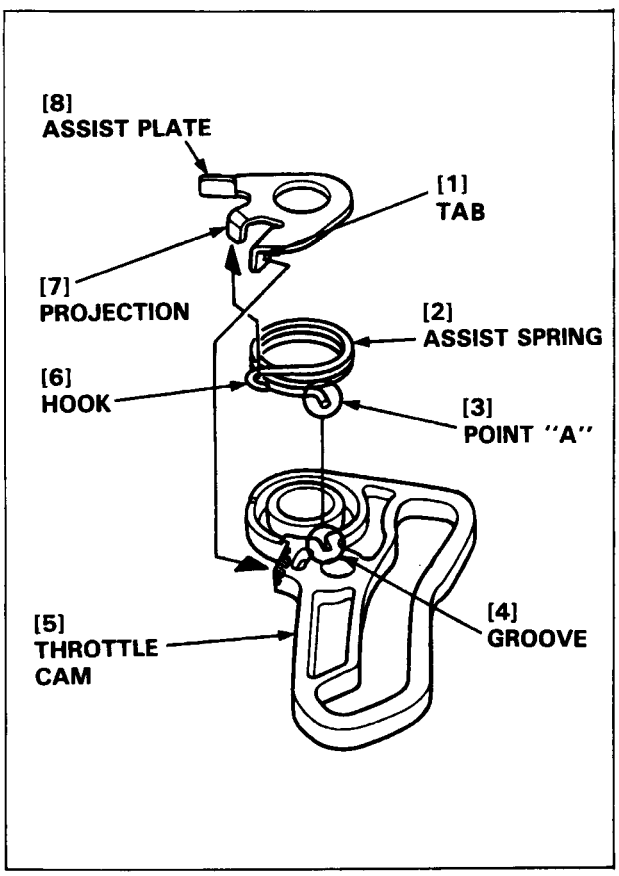
Hold the plunger rod and push down the rod joint to remove it from the rod.
Remove the plunger rod from the choke arm B.
Installation is the reverse oder of removal.



• THROTTLE CAM

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.



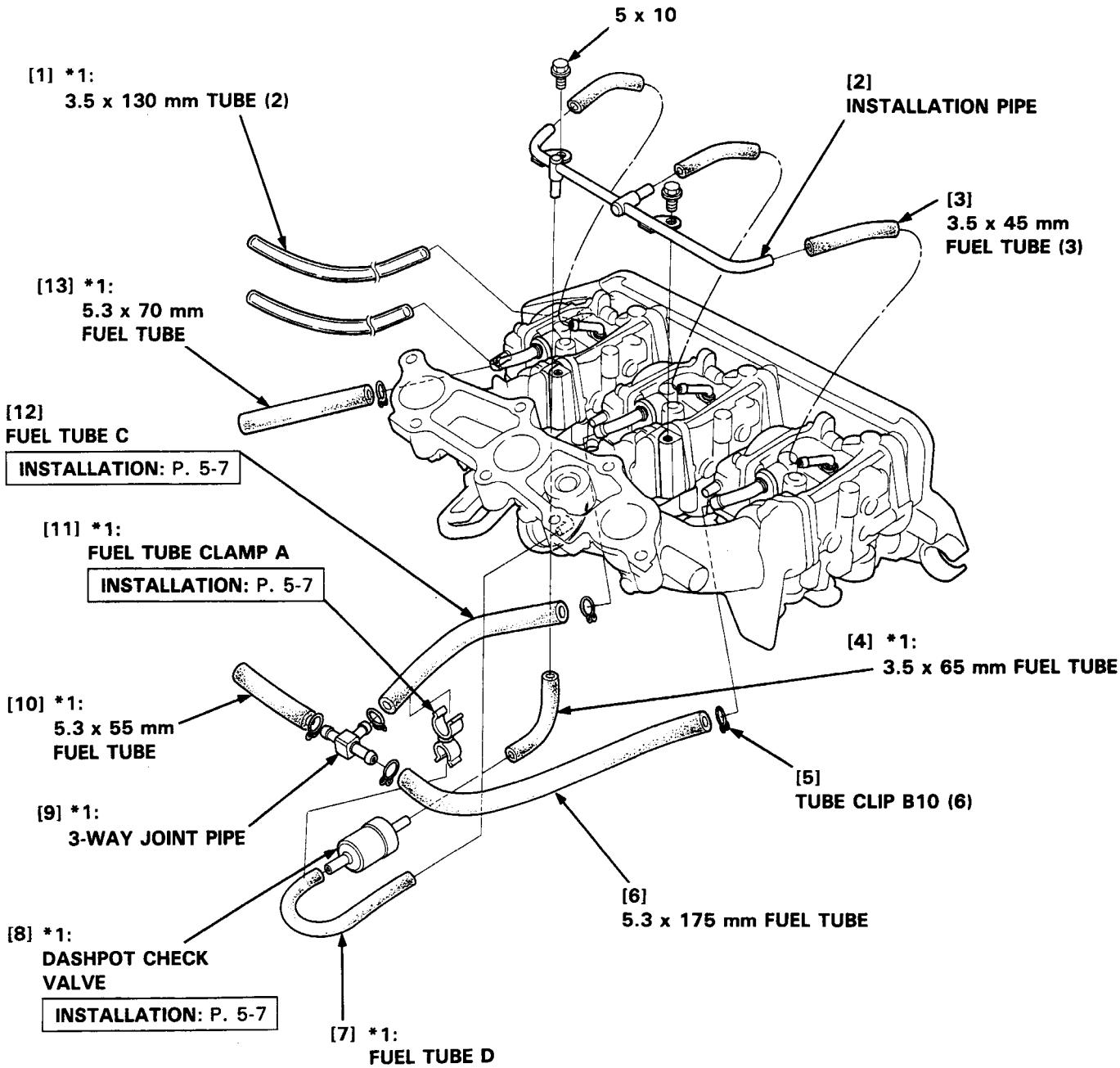
• FUEL LINE

NOTE

• 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.

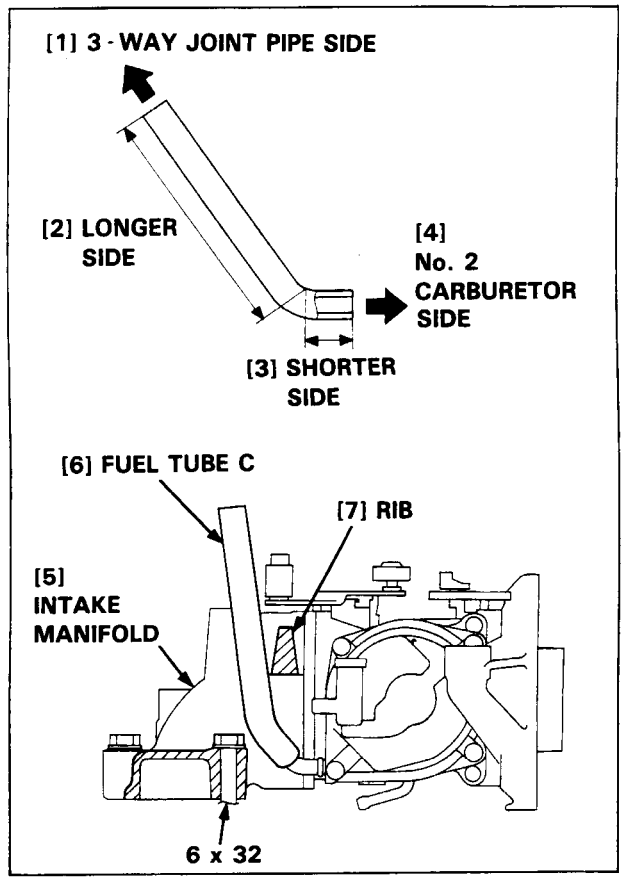


• FUEL TUBE C INSTALLATION

1) Install the fuel tube C so that its longer straight side is toward the 3-way joint pipe side and the shorter straight side is toward the No. 2 carburetor side.

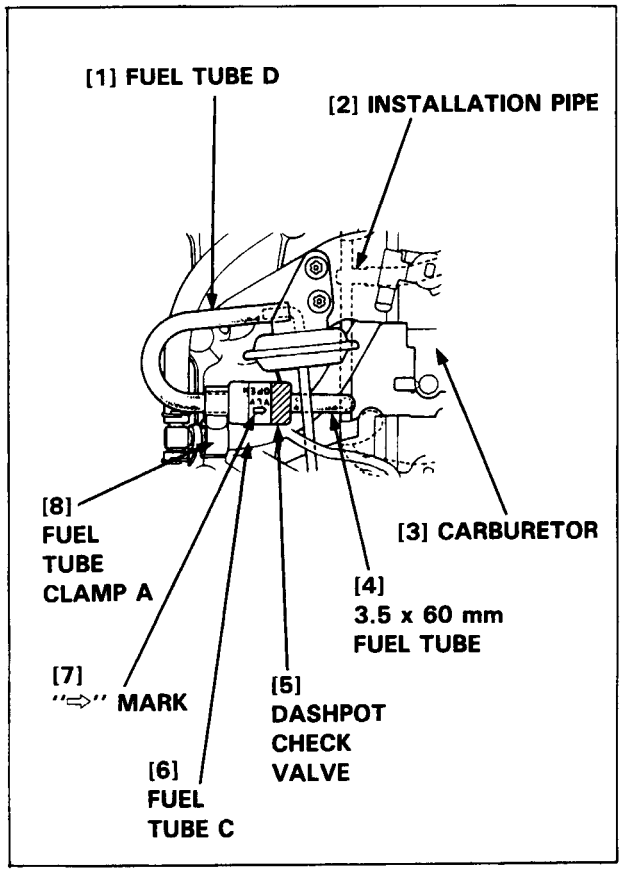
2) After installing the carburetor assembly on the outboard motor, check that the fuel tube C is not interfering with the 6 x 32 mm flange bolt that is tighening the intake manifold.

3) After tightening each fuel tube, check that the tubes are not in contact with the port, rib and/or bolt of the intake manifold. Adjust by turning the tube, if necessary.



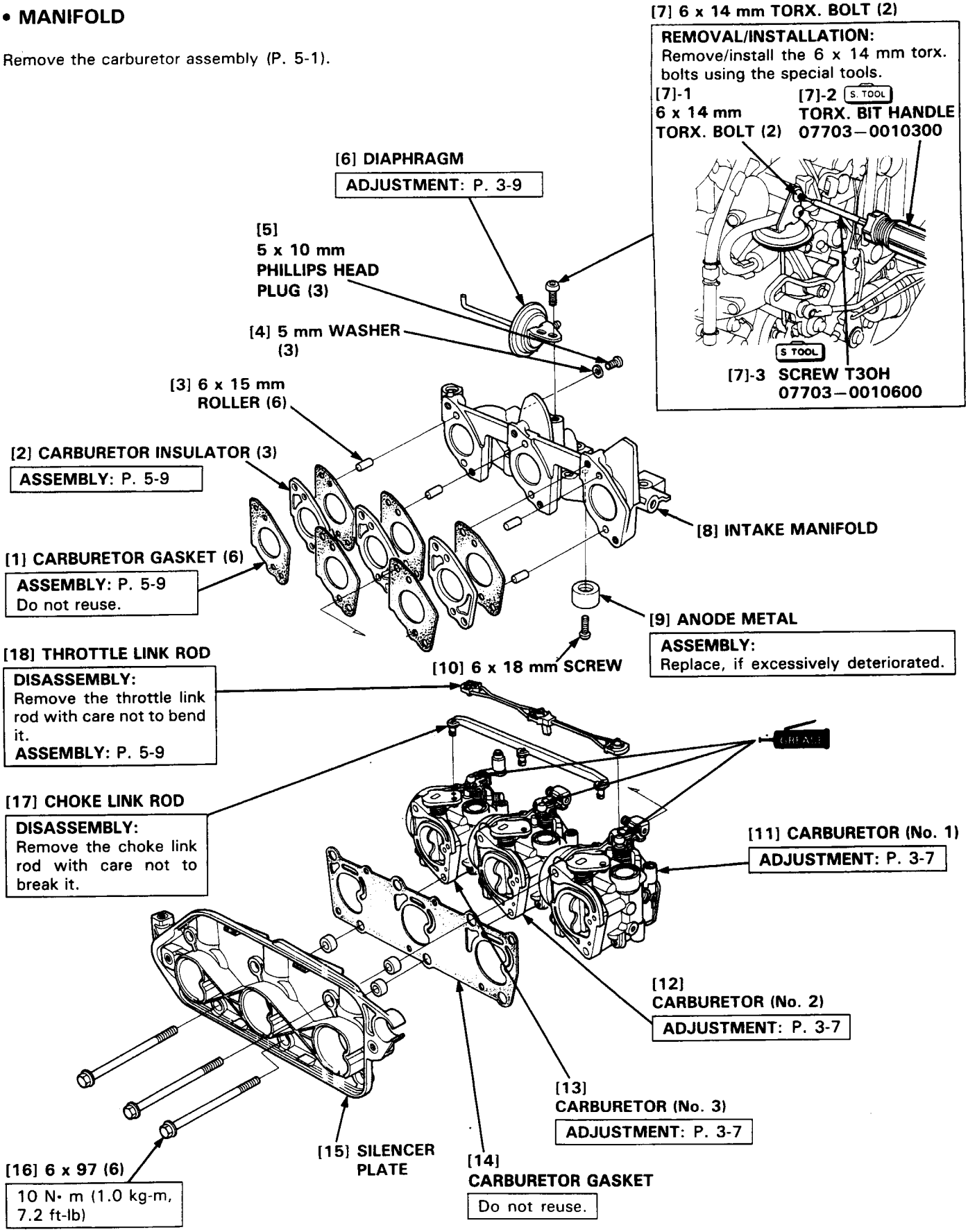
• DASHPOT CHECK VALVE/FUEL TUBE CLAMP A INSTALLATION

Install the dashpot check valve so that "⇨" mark is toward the carburetor side.
Clamp the fuel tubes with the fuel tube clamp A as shown.



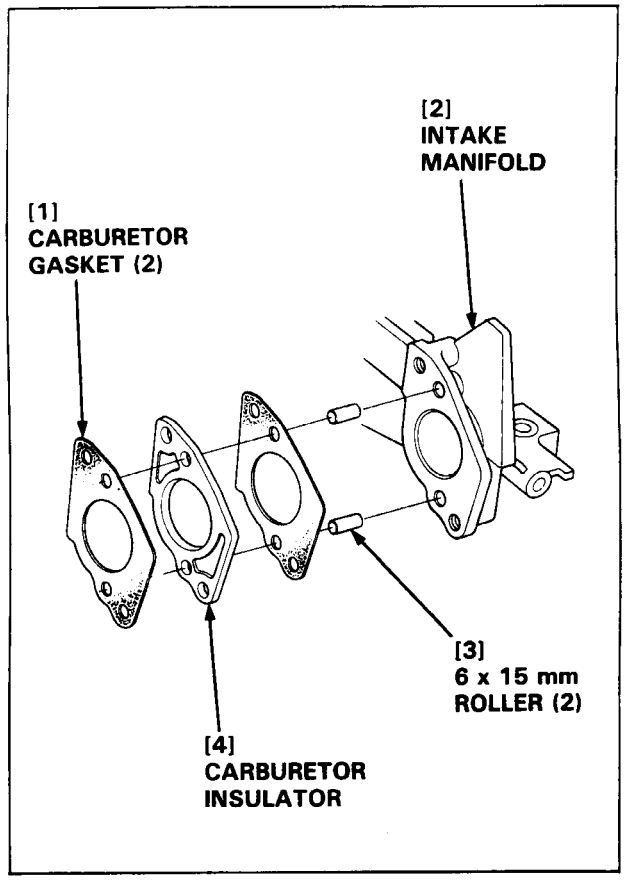
• MANIFOLD

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



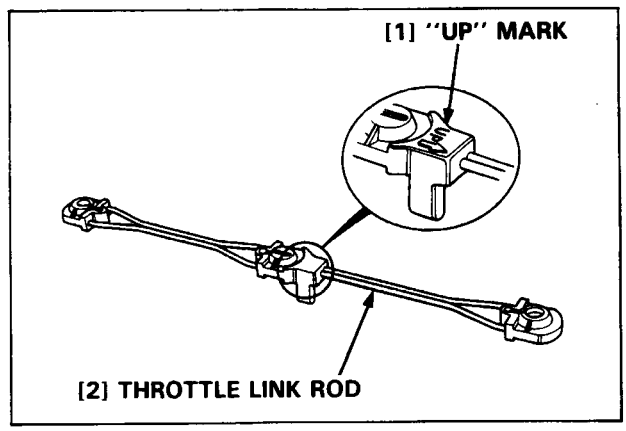
• CARBURETOR GASKET/INSULATOR

ASSEMBLY:
Note the installation direction.



• THROTTLE LINK ROD

ASSEMBLY:
Install the throttle link rod with the "UP" mark at the center of the rod facing up.



• CARBURETOR

⚠ WARNING

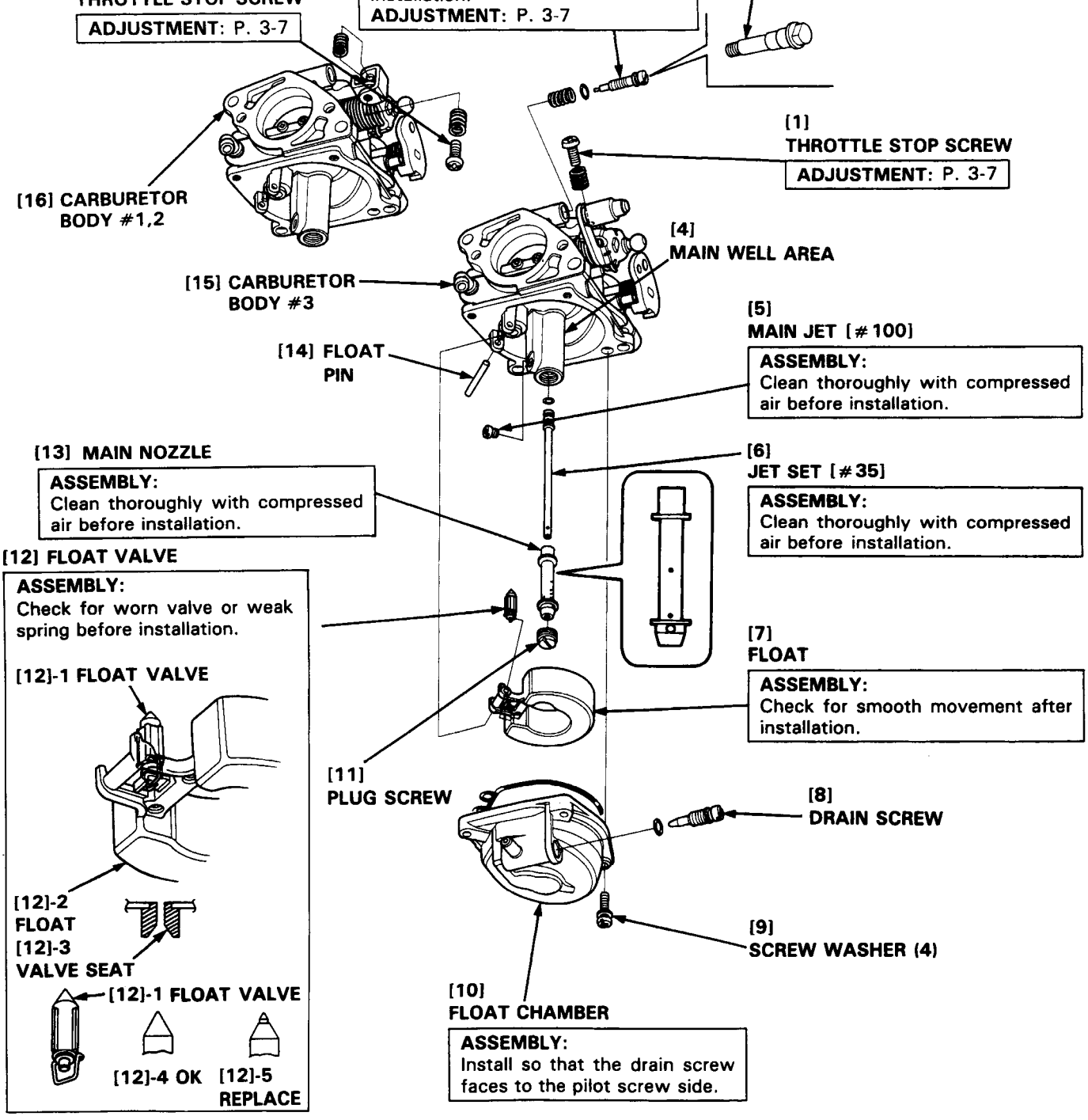
- **Remove the drain screw and drain the carburetor before disassembling.**
- **Gasoline is extremely flammable and is explosive under certain conditions. Do not smoke or allow flames or sparks in the area.**

Remove the manifold (P. 5-8).

[1] THROTTLE STOP SCREW
ADJUSTMENT: P. 3-7

[2] PILOT SCREW
ASSEMBLY:
Inspect for wear or damage before installation.
ADJUSTMENT: P. 3-7

[3] PILOT SCREW (Bodensee type only)
DISASSEMBLY/ASSEMBLY:
Remove/install the pilot screw using the special tool.
S. TOOL [3]-1
PILOT SCREW WRENCH
07KMA-MS60101
Inspect for wear or damage before installation.
ADJUSTMENT: P. 3-20



c. INSPECTION

• FLOAT LEVEL HEIGHT

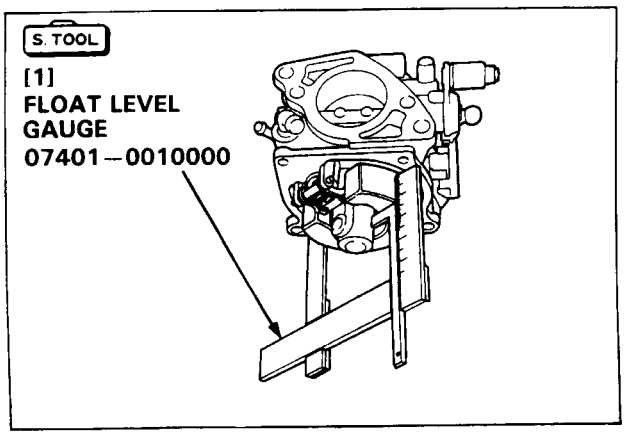
With the carburetor in an upright position, measure the distance between the float top and the carburetor body when the float just contacts the float valve.

Standard float height	14 mm (0.6 in)

If the height is out of 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.



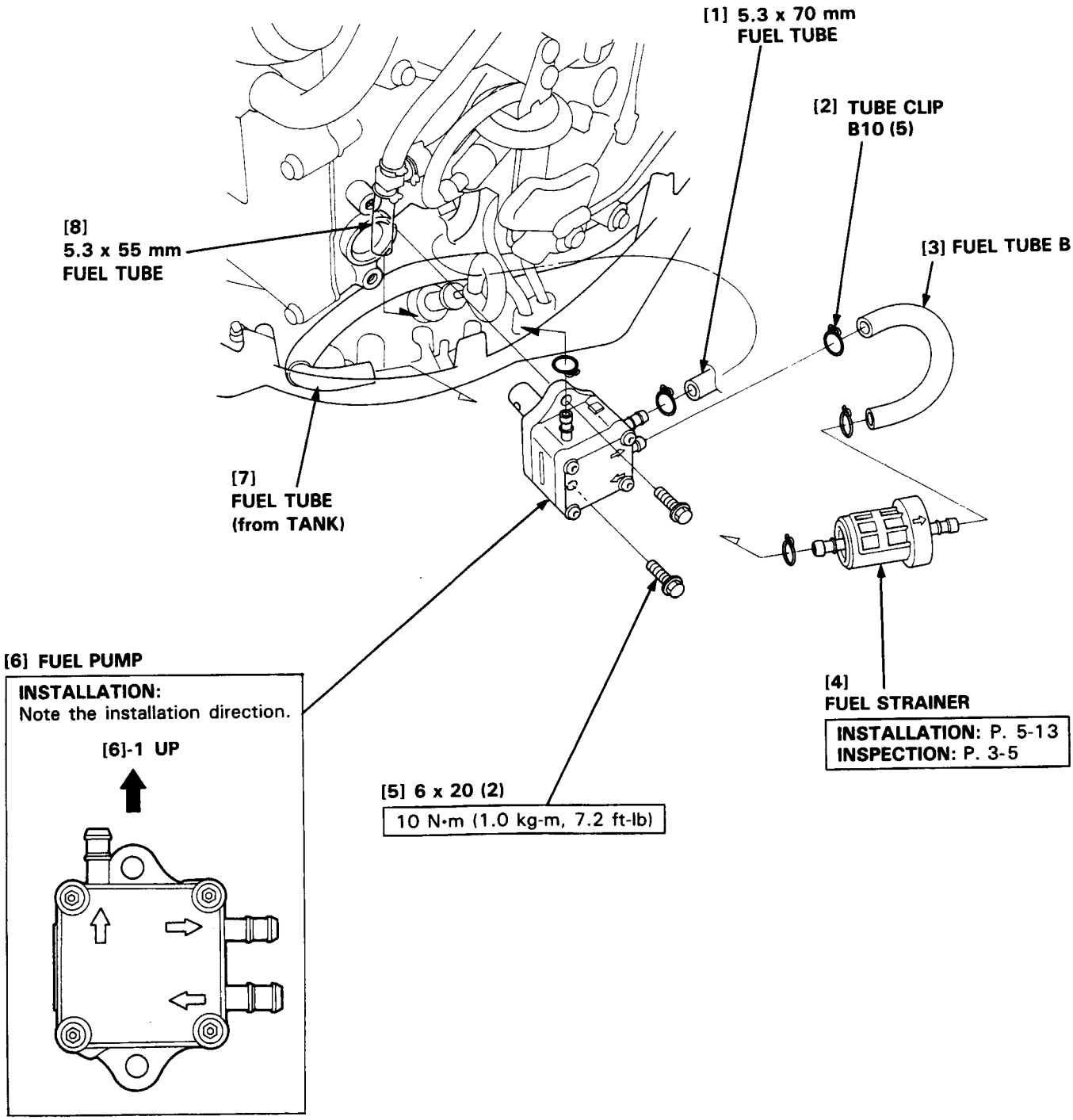
2. FUEL PUMP/FILTER

DISASSEMBLY/ASSEMBLY

NOTE

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

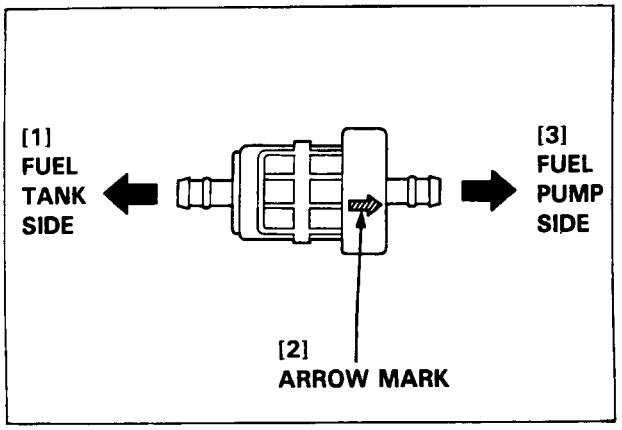
Remove the engine cover.



• **FUEL FILTER**

INSTALLATION:

Install the fuel filter so that "⇨" mark is on the fuel pump side.



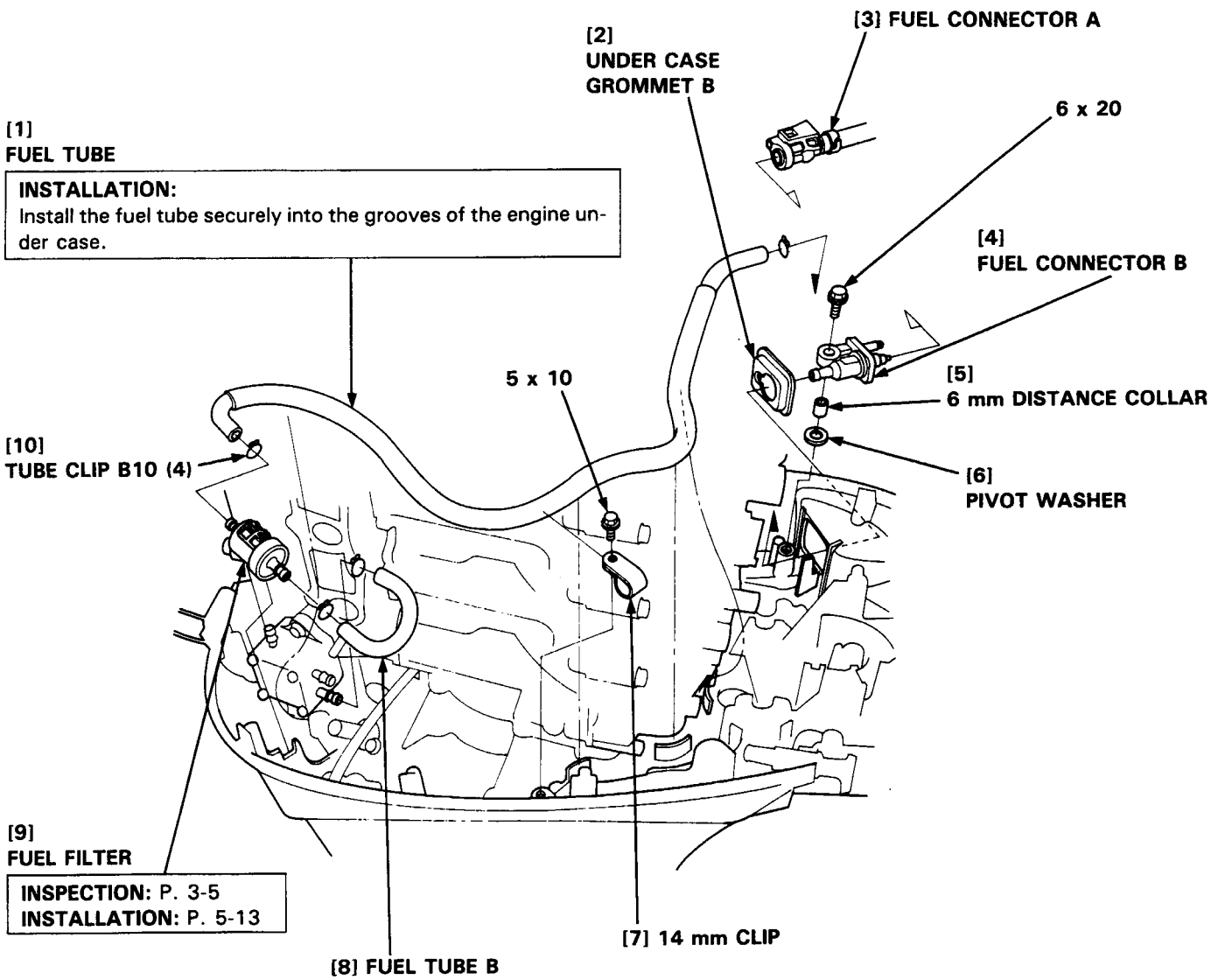
3. FUEL TUBE

DISASSEMBLY/ASSEMBLY

NOTE

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

1) Remove the engine cover.
2) Remove the carburetor assembly (P. 5-1).
3) Remove the electric starter [Electric starter type only] (P. 16-9).

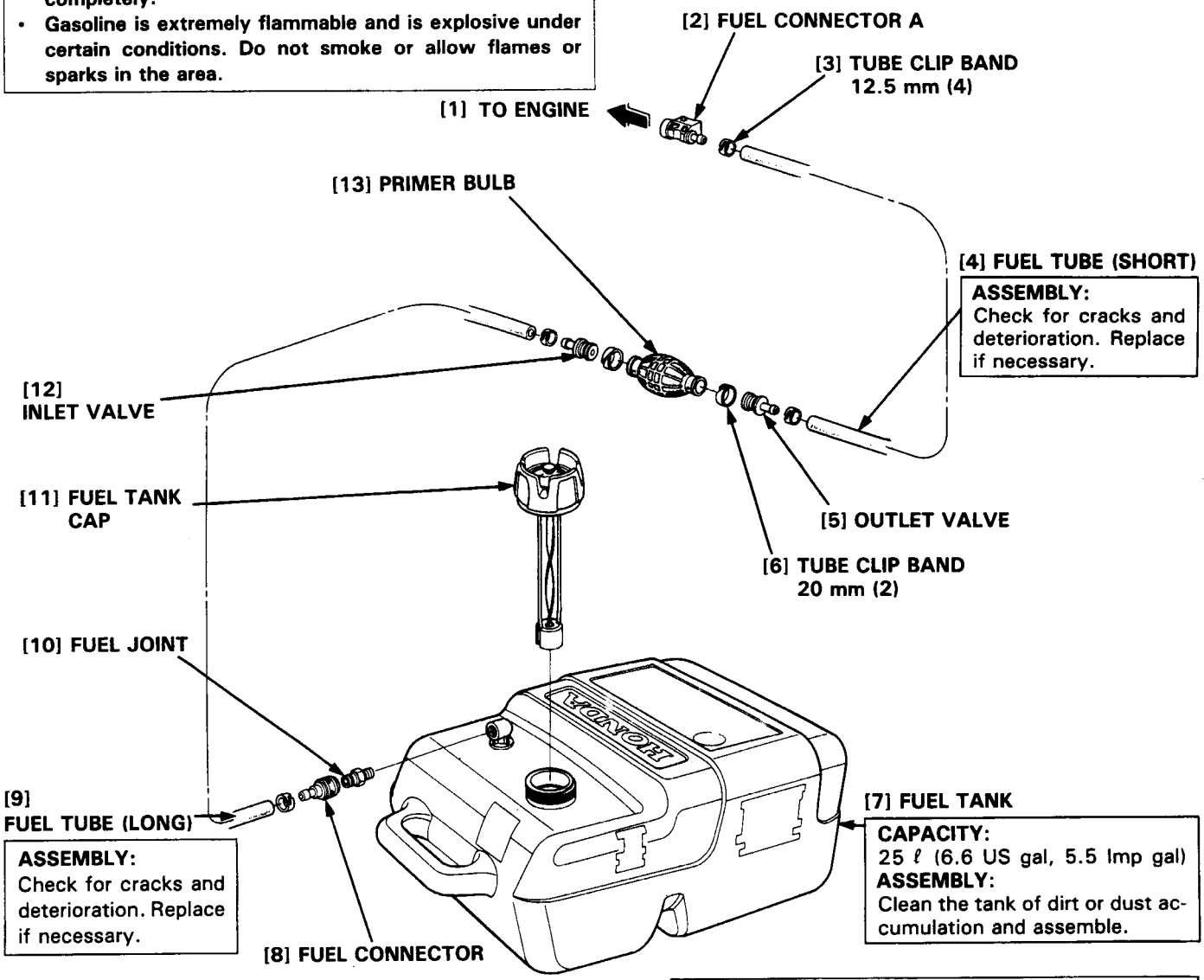


4. FUEL TANK

DISASSEMBLY/ASSEMBLY

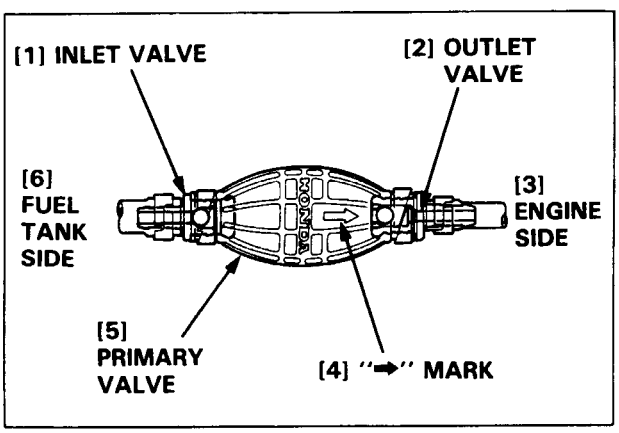
⚠ WARNING

- **Before disassembly, drain the fuel tank and fuel line completely.**
- **Gasoline is extremely flammable and is explosive under certain conditions. Do not smoke or allow flames or sparks in the area.**



• INLET/OUTLET VALVE INSTALLATION

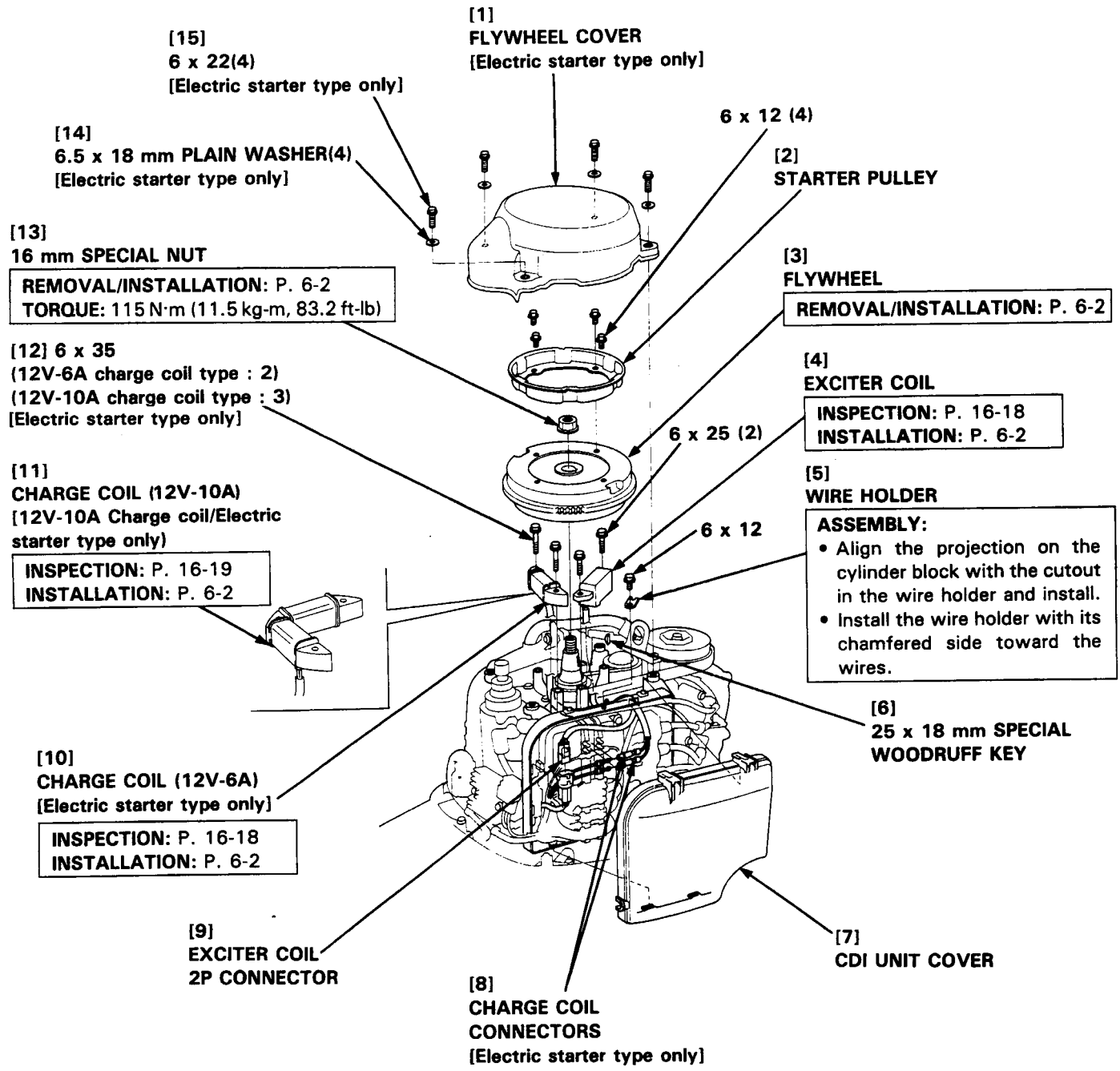
Do not interchange the inlet valve with the outlet valve.
Install the primer bulb so that "➡" mark is pointing to the engine side.



1. FLYWHEEL

DISASSEMBLY/ASSEMBLY

1) Remove the engine cover and CDI unit cover.
2) Disconnect the exciter coil 2P connector.
3) Disconnect the charge coil connectors (Electric starter type only).

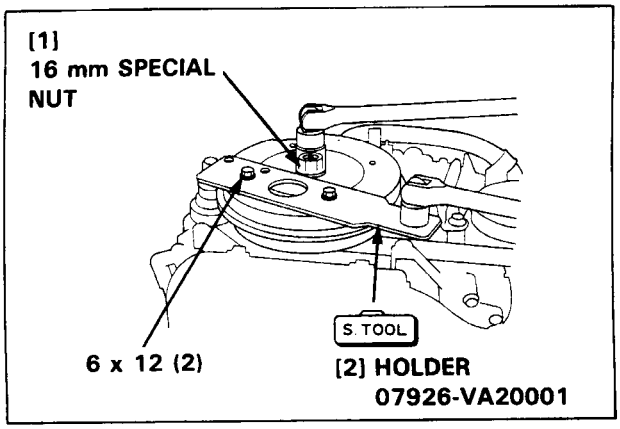


• 16 mm SPECIAL NUT

REMOVAL:
Set the special tool on the flywheel as shown using the two 6 x 12 mm flange bolts that tighten the starter pulley, then remove the 16 mm special nut.

TOOL:
Holder **07926-VA20001**

INSTALLATION:
1) Apply oil to the threads.
2) Install the 16 mm special nut using the special tool.
   TOOL:
   Holder **07926-VA20001**
3) Tighten to the specified torque.
   TORQUE: 115 N·m (11.5 kg-m, 83.2 ft-lb)



• FLYWHEEL

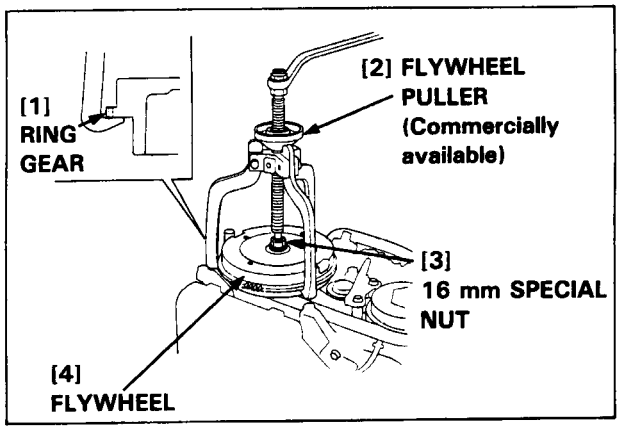
REMOVAL:
Loosely tighten the 16 mm special nut with care not to tighten the flywheel excessively against the crankshaft as shown. Remove the flywheel using a commercially available flywheel puller.

CAUTION

- **Set the flywheel puller against the flywheel equally and securely. Take care not to damage the flywheel ring gear teeth.**
- **When removing the flywheel, take care not to strike the electric starter end with the flywheel. It will damage the electric starter.**

NOTE

- Do not hit on the flywheel with a hammer to remove it.
- Take care not to lose the woodruff key after the flywheel is removed.



INSTALLATION:
1) Clean the taper on the crankshaft and the tapered hole in the flywheel, then install the flywheel.

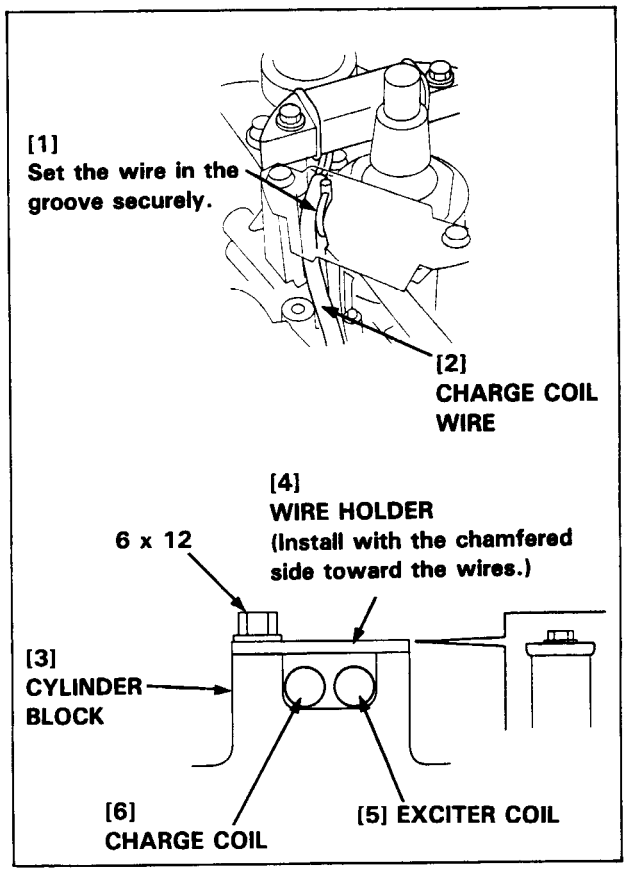
CAUTION

- **The flywheel may push the key out of its slot; check after installation.**

2) Hold the flywheel with the special tool, and torque the 16 mm special nut.
   TORQUE: 115 N·m (11.5 kg-m, 83.2 ft-lb)

• CHARGE COIL (Electric starter type only)/ EXCITER COIL

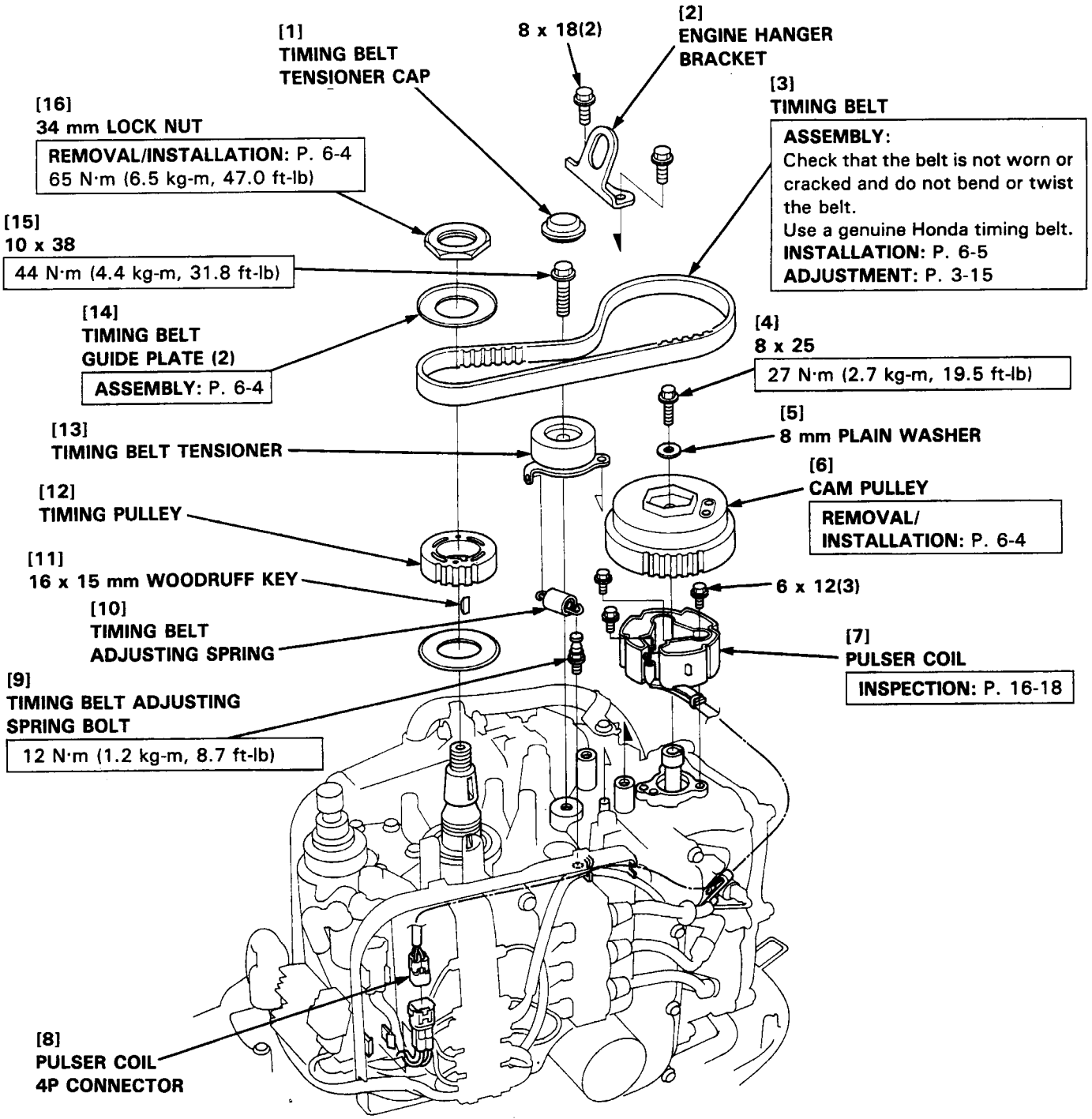
INSTALLATION:
1) Set the charge coil wire in the groove in the cylinder block as shown.
2) Set the charge coil wire and exciter coil wire between the bosses on the cylinder block as shown. Install the wire holde with its chamfered side toward the wires and tighten with the 6 x 12 mm flange bolt securely.



2. TIMING BELT

DISASSEMBLY/ASSEMBLY:

1) Remove the spark plugs.
2) Align the timing marks to put the No. 1 piston at the top dead center of its compression stroke (P. 3-4).
3) Remove the flywheel, charge coil and exciter coil (P. 6-1), and disconnect the pulser coil wire.



• CAM PULLEY

REMOVAL:

CAUTION

> **• The valves may become bent if the cam pulley or crankshaft is rotated with the timing belt removed or incorrectly installed. If the timing marks have become substantially misaligned, it may be necessary to loosen the valve adjusting screw lock nuts and back off the valve adjusting screws before aligning the No. 1 cylinder timing marks.**

1) Hold the cam pulley using the crowfoot wrench 1-13/16 (commercially available) as shown and remove the 8 x 25 mm flange bolt.

NOTE

> • The timing marks should be aligned at this time (P. 3-4).

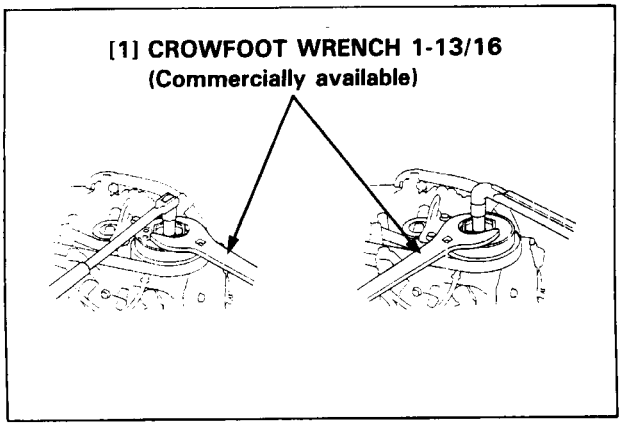
2) Remove the timing belt (P. 3-15).
3) Remove the cam pulley.

INSTALLATION:

1) Position the cam pulley over the camshaft and align the alignment pin in the cam pulley with the notch in the camshaft.
2) Install and hand tighten the 8 x 25 mm flange bolt.
3) Check the timing mark alignment and install the timing belt (P. 3-18).
4) Hold the cam pulley using the crowfoot wrench 1-13/16 (commercially available) as shown and tighten the 8 x 25 mm flange bolt.

   TORQUE: 27 N·m (2.7 kg-m, 19.5 ft-lb)

5) Adjust the timing belt (P. 3-15).



• 34 mm LOCK NUT/TIMING BELT GUIDE PLATE

REMOVAL:

1) Hold the crankshaft and remove the 34 mm lock nut using the special tool and commercially available tool as shown.

NOTE

> • The timing marks should be aligned at this time (P. 3-4).

TOOL:

Crankshaft holder	**07923-ZA00100**

2) Remove the timing belt (P. 3-15).
3) Remove the timing pulley.

INSTALLATION:

1) Position timing pulley over crankshaft aligning the 16 x 15 mm woodruff key with the keyway in the timing pulley.

NOTE

> • Install the timing belt guide plate with the curved surfaces toward the timing pulley as shown.

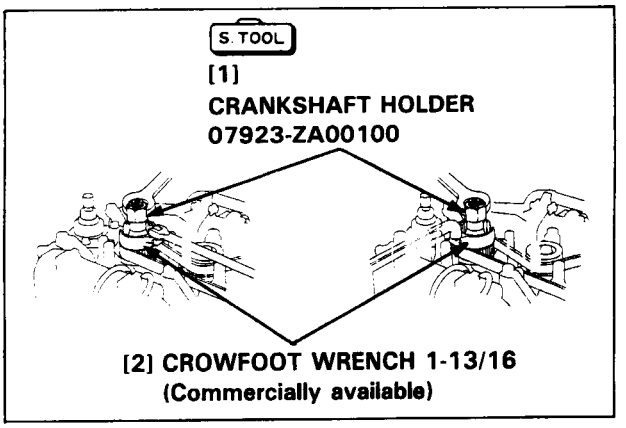
2) Install and hand tighten the 34 mm lock nut.
3) Check the timing mark alignment and install the timing belt (P. 3-17).
4) Hold the crankshaft and tighten the 34 mm lock nut using the special tool and commercially available tool as shown.

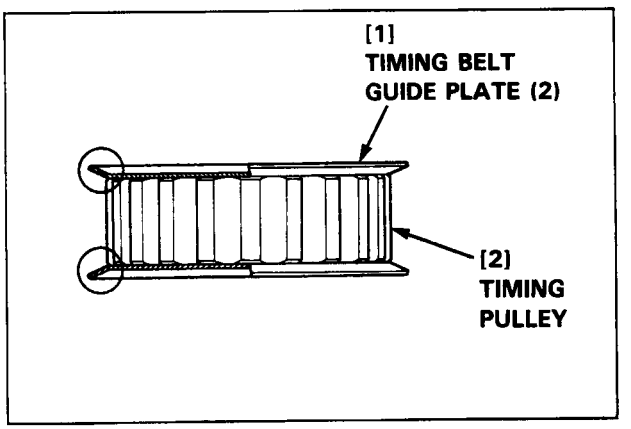
   TOOL:

Crankshaft holder	**07923-ZA00100**

   TORQUE: 65 N·m (6.5 kg-m, 47.0 ft-lb)

5) Adjust the timing belt (P. 3-15).





• TIMING BELT

INSTALLATION:

CAUTION

> **• The valves may become bent if the cam pulley or crankshaft is rotated with the timing belt removed or incorrectly installed. If the timing marks have become substantially misaligned, it may be necessary to loosen the valve adjusting screw lock nuts and back off the valve adjusting screws before aligning the No. 1 cylinder timing marks.**

1) The spark plugs should be removed at this time.
2) Install the cam pulley (P. 6-4).

3) Align the cam pulley timing marks as shown (P. 3-17).

CAUTION

> **• To avoid water pump impeller damage, always turn the crankshaft in a clockwise direction.**

4) Install the timing belt guide plate, 16 x 15 mm woodruff key, and the timing pulley on the crankshaft (P. 6-3).
5) Align the "●" mark on the timing pulley with the "I" mark on the cylinder block.
6) Install the timing belt (P. 3-17).

NOTE

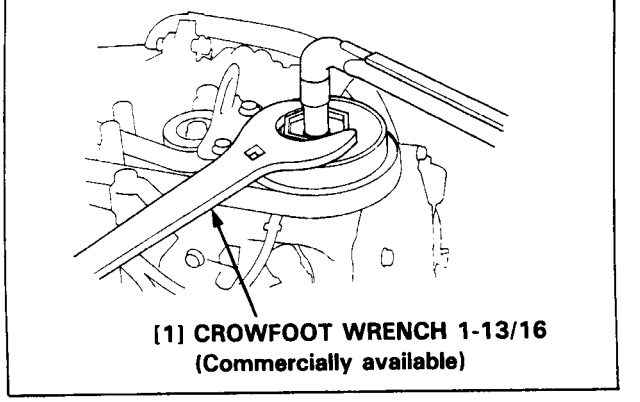
> • When installing the timing belt, do not move the timing marks out of alignment.

7) After installing the timing belt, check each mark for proper alignment.

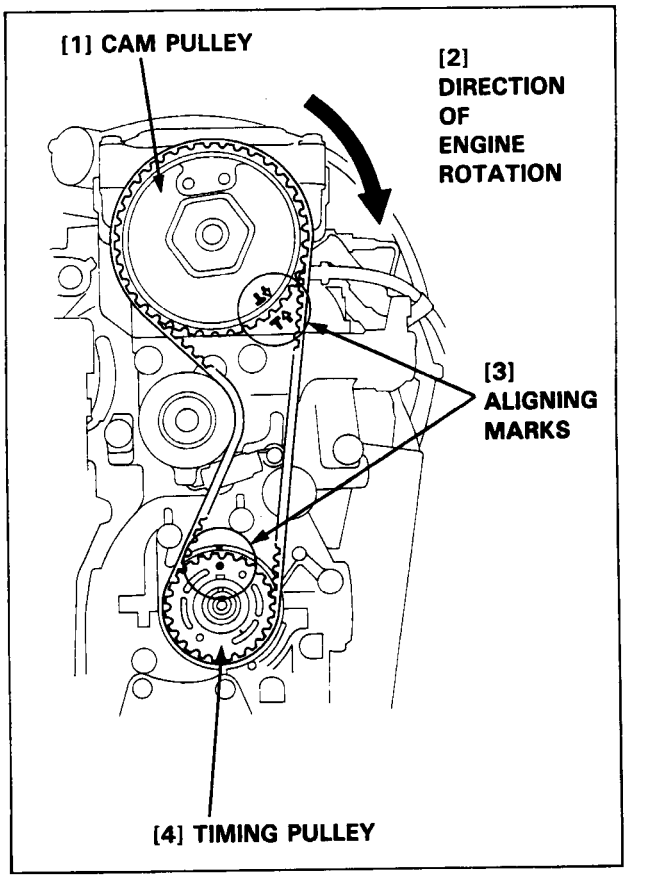
8) Install the 34 mm lock nut (P. 6-6).

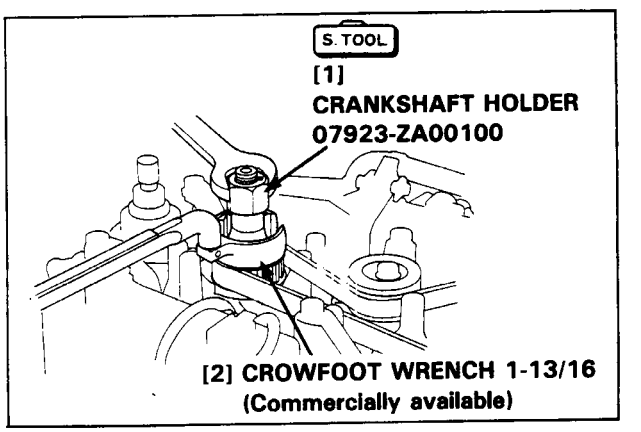
TOOL:
Crankshaft holder 07923-ZA00100
TORQUE: 65 N·m (6.5 kg-m, 47.0 ft-lb)

9) After tightening the lock nut, adjust the timing belt (P. 3-18).



[1] CROWFOOT WRENCH 1-13/16 (Commercially available)





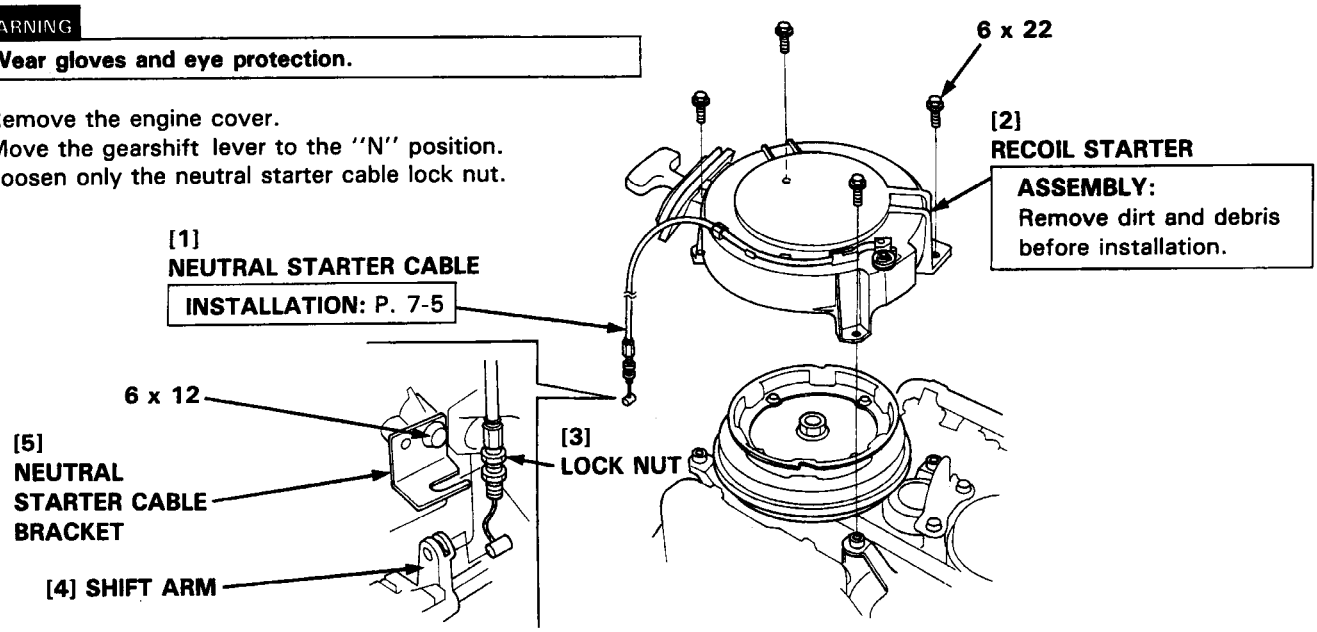
1. RECOIL STARTER (RECOIL STARTER TYPE ONLY)

a. REMOVAL/INSTALLATION

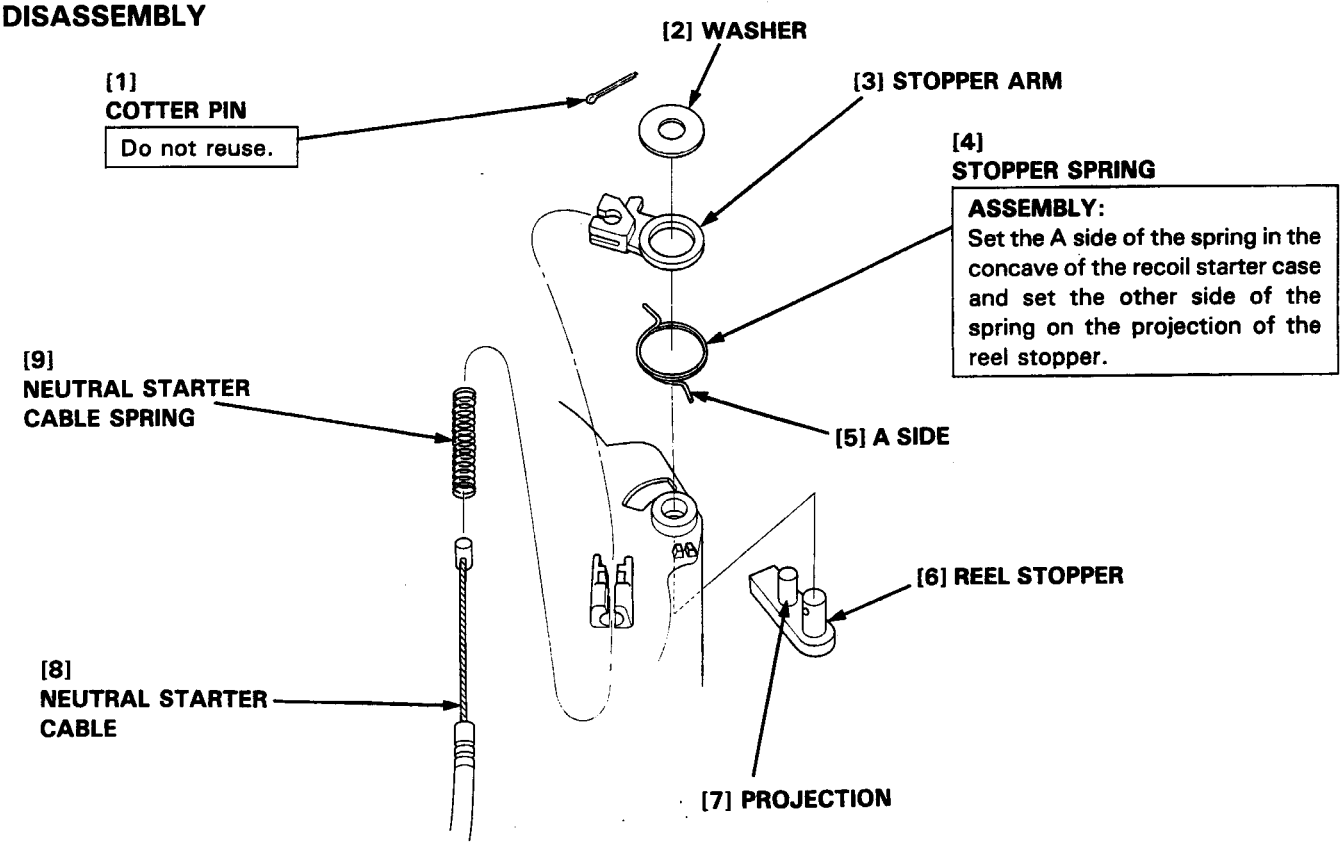
⚠ WARNING

- **Wear gloves and eye protection.**

1) Remove the engine cover.
2) Move the gearshift lever to the "N" position.
3) Loosen only the neutral starter cable lock nut.

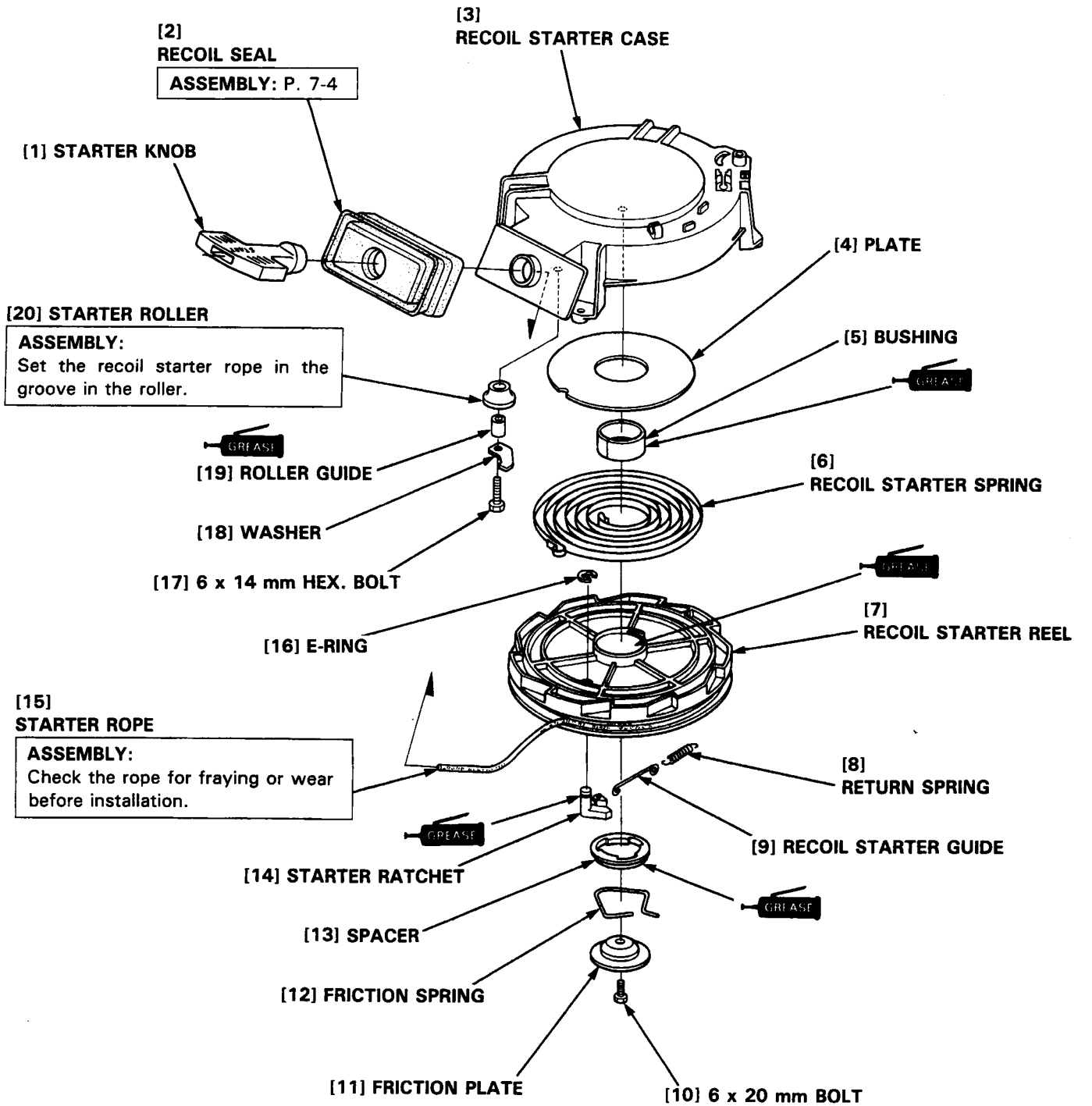


b. DISASSEMBLY



⚠ WARNING

- **Wear gloves and eye protection.**

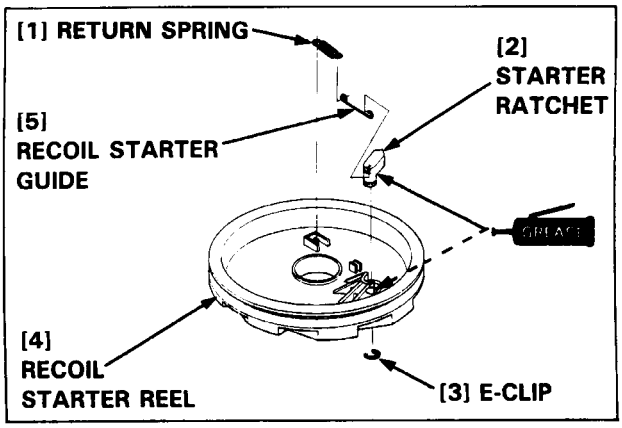


c. RECOIL STARTER ASSEMBLY

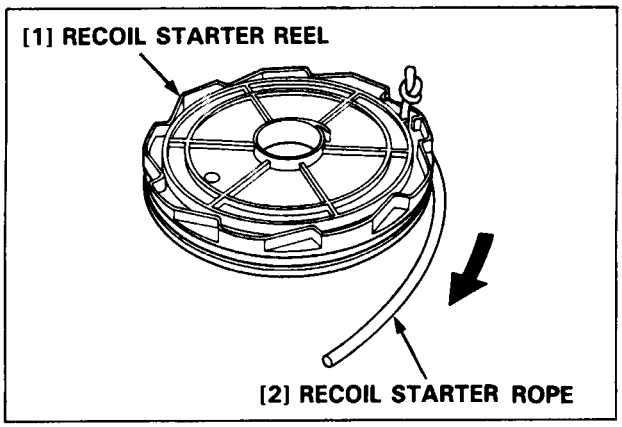
⚠ WARNING

- **Wear gloves and eye protection.**

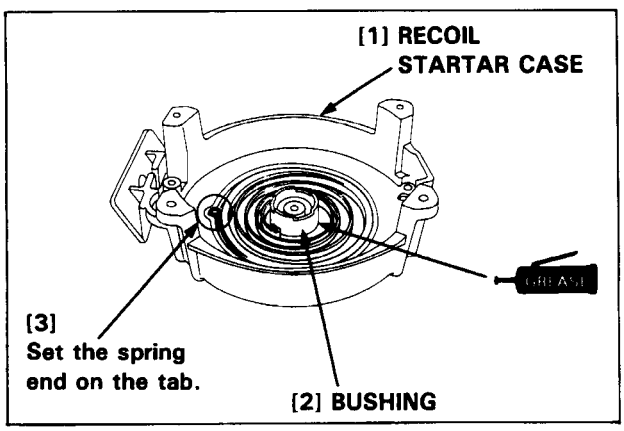
1) Install the starter ratchet, E-ring, recoil starter guide and return spring on the recoil starter reel.



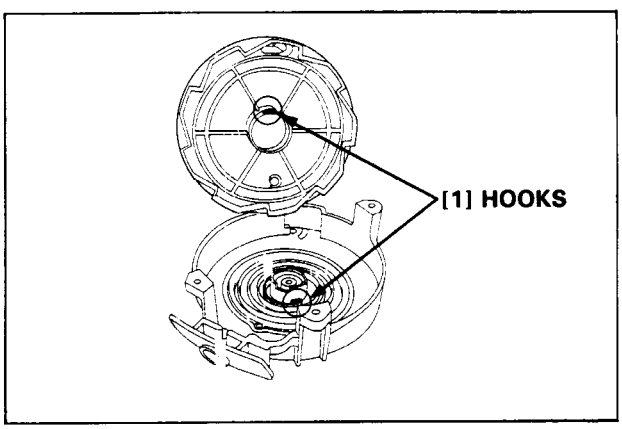
2) Route one end of the recoil starter rope through the hole in the recoil starter reel and tie a knot in the end. Wind the starter rope on the reel in the direction of the arrow.



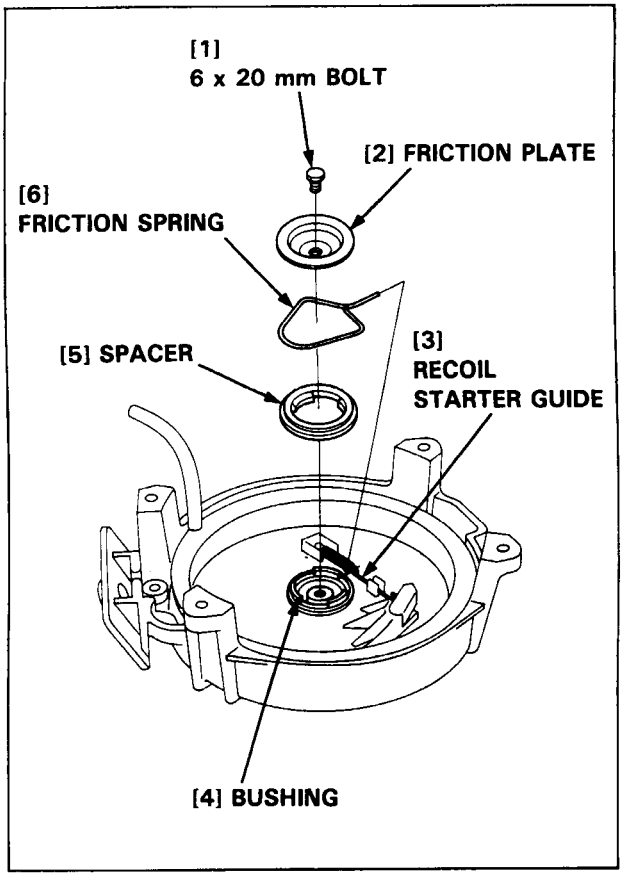
3) Set the recoil starter spring end on the recoil starter case tab and wind the spring so that it is installed in the case securely.
4) Apply grease to the bushing. Install the bushing on the recoil starter case.



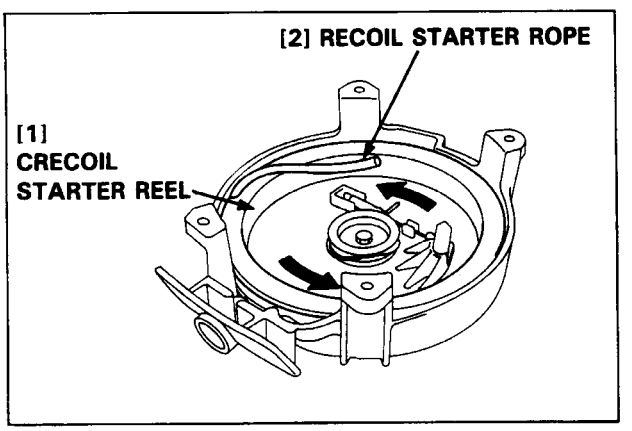
5) Align the hook on the recoil starter spring with the hook on the recoil starter reel and install the reel in the recoil starter case.
Pull the rope end out of the cutout in the reel.



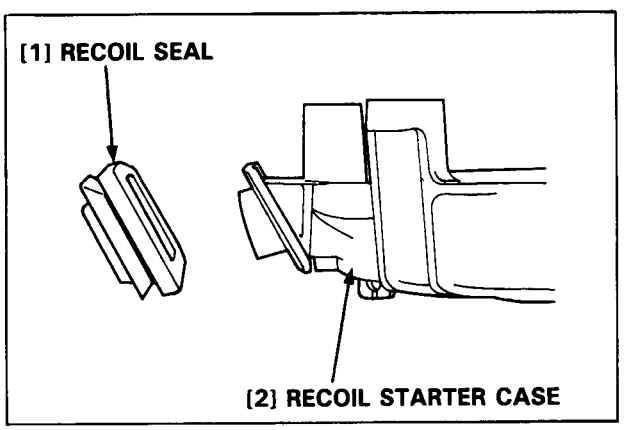
6) Set the spacer on the bushing and set the friction spring on the spacer. Be sure to set the friction spring end at the end of the recoil starter guide.
7) Set the friction plate on the spacer and tighten the 6 x 20 mm bolt.



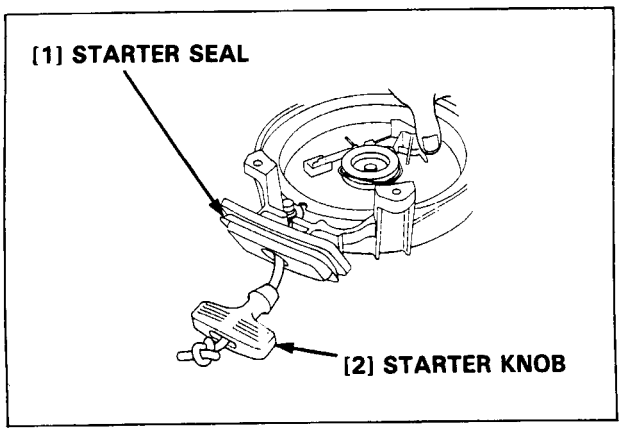
8) While holding the rope end in the cutout in the reel, rotate the reel 5 turns in the direction of the arrow to preload the spring.



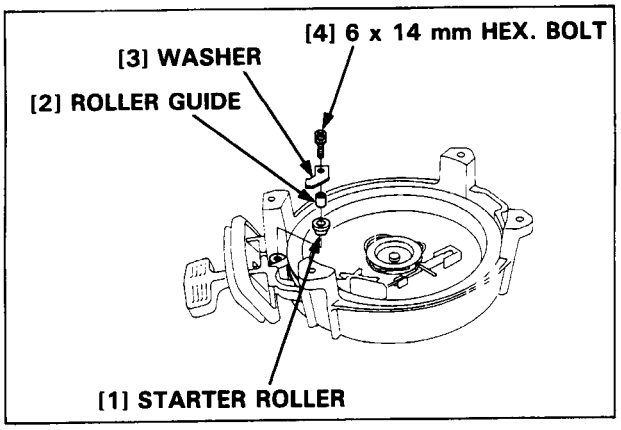
9) Note the installation direction as shown.



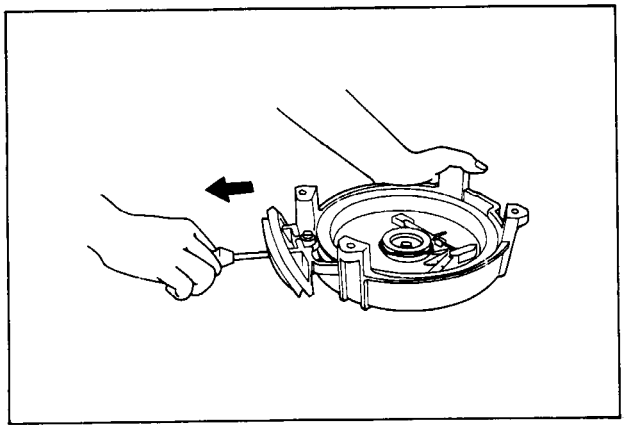
10) Pass the starter rope end through the rope hole in the starter case, recoil seal and recoil starter knob and tie a knot in the end of the rope.



11) Install the starter roller, roller guide and washer and tighten the 6 x 14 mm hex. bolt.
Check whether the recoil starter rope is securely set in the groove of the starter roller.

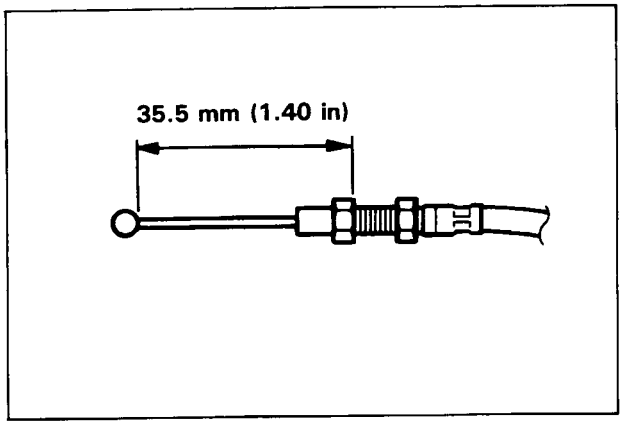


12) Pull the starter knob to be sure that the recoil starter reel rotates smoothly. Release the knob and be sure that it returns smoothly.
13) Install the reel stopper, stopper spring, stopper arm and washer on the recoil starter case and secure them with the cotter pin (P. 7-1).

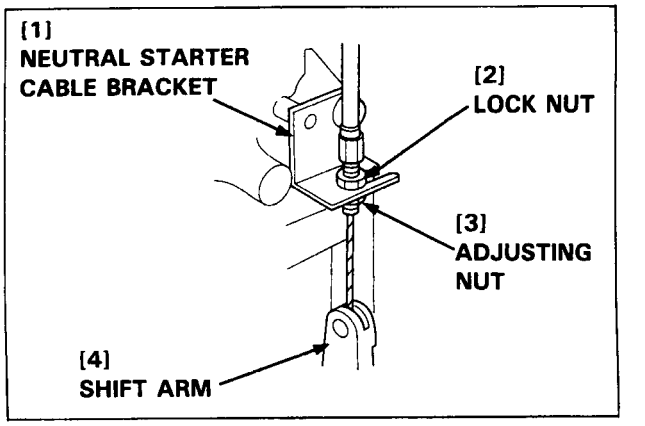


d. INSTALLATION

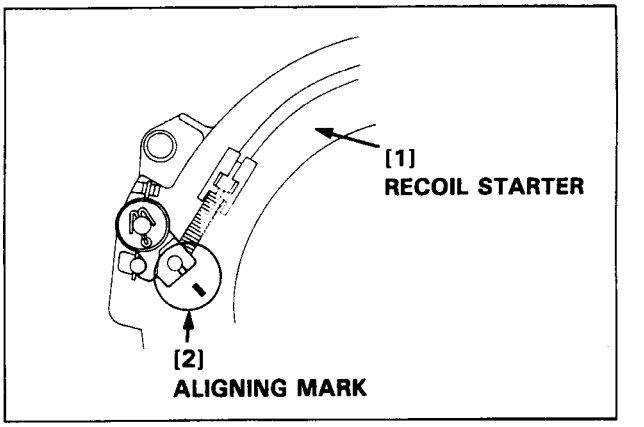
1) After assembling the recoil starter, set the neutral starter cable on the stopper arm. Install the recoil starter on the engine.
2) Adjust the cable of the neutral starter bracket side to the length shown.



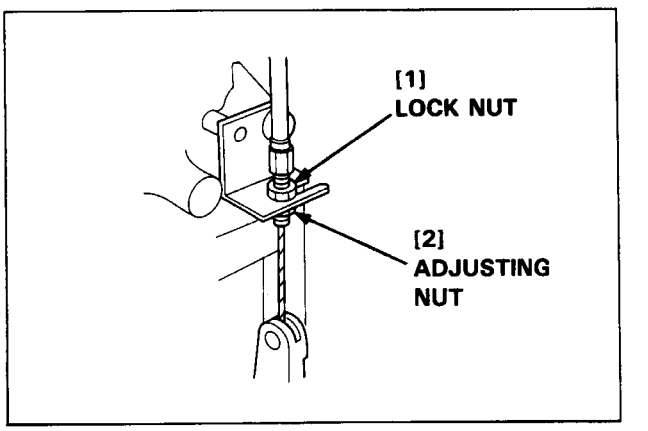
3) Taking care not to change the cable length adjusted in step 2, pass the cable through the shift arm and neutral starter cable bracket and tighten the lock nut.



4) After installing the cable, check whether the cutout in the stopper arm is aligning with the " ▮ " mark on the recoil starter case.

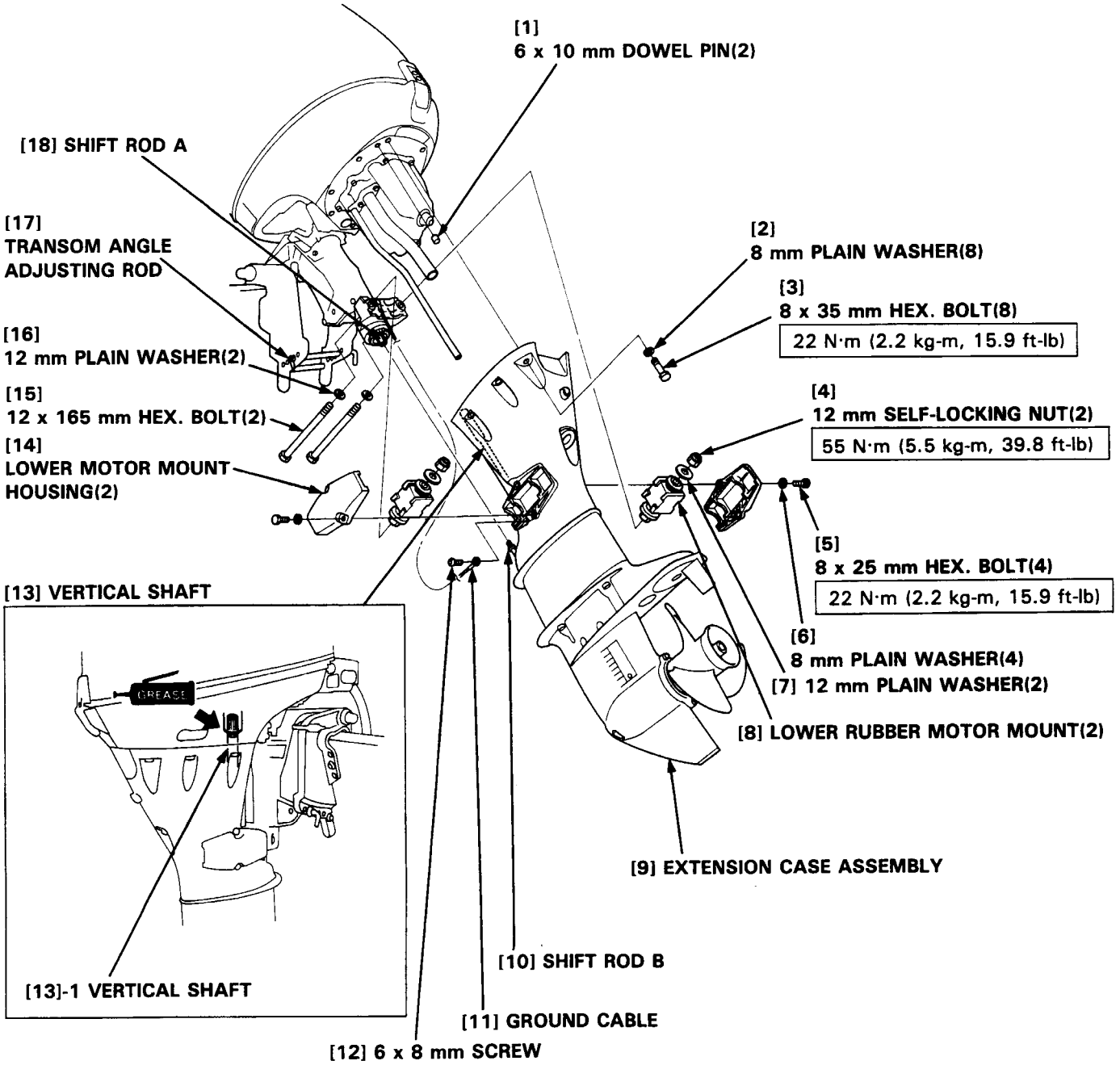


5) If not aligning, adjust by loosening the lock nut of the neutral starter cable bracket side and turning the adjusting nut right or left.
6) After adjustment, set the gearshift lever at the "F" position. Pull the recoil starter slowly and check whether the reel stopper operates preventing the recoil starter from pulling.
Set the gearshift lever at the "R" position and pull the recoil starter slowly. Be sure that the reel stopper operates the same way preventing the recoil starter from pulling.
7) If the reel stopper does not operate properly when the gearshift lever is set either or both at the "F" and/or "R" position, recheck the cable length adjusted in step 2.
If necessary, adjust the cable length by loosening the lock nut of the bracket side and turning the adjusting nut until the reel stopper operates to prevent the recoil starter from pulling.
Repeat the step 6 operation.

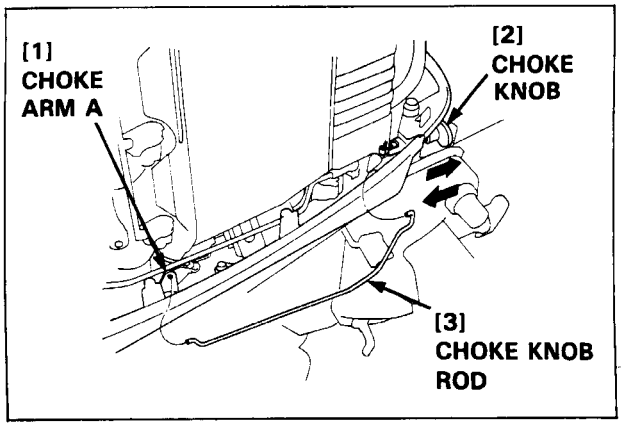


1. REMOVAL

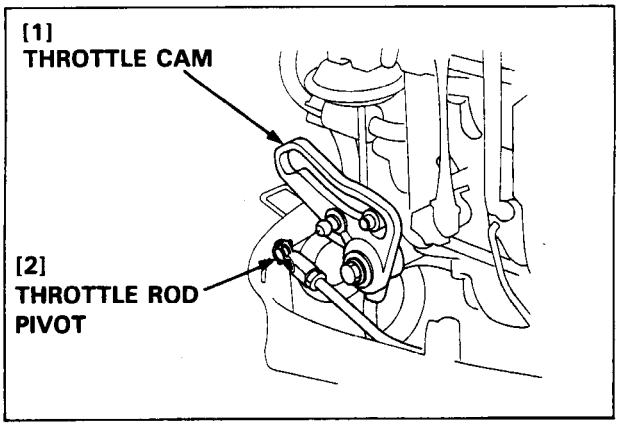
1) Set the transom angle adjusting rod in the second hole from the rear of the stern bracket as shown.
2) Move the gearshift lever to the "R" position, loosen the lock nut and adjusting nut connecting shift rod A and B, and disconnect the shift rods.
3) Remove the four 8 x 25 mm hex. bolts and the left/right lower motor mount housings, and disconnect the ground cable from the left side of the extension case assembly.
4) Remove the two 12 x 162 mm hex. bolts and the left/right lower rubber motor mounts.
5) Remove the eight 8 x 35 mm hex. bolts and the extension case assembly.
6) Remove the exhaust pipe, oil pan and oil strainer (P. 13-1).



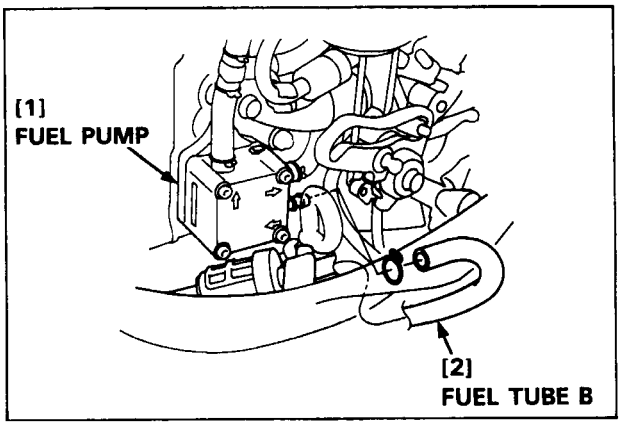
7) Remove the engine cover.
8) Pull the choke knob, then push it while holding the choke knob rod. Pull up the choke knob rod and disconnect it from the choke knob and choke arm A.



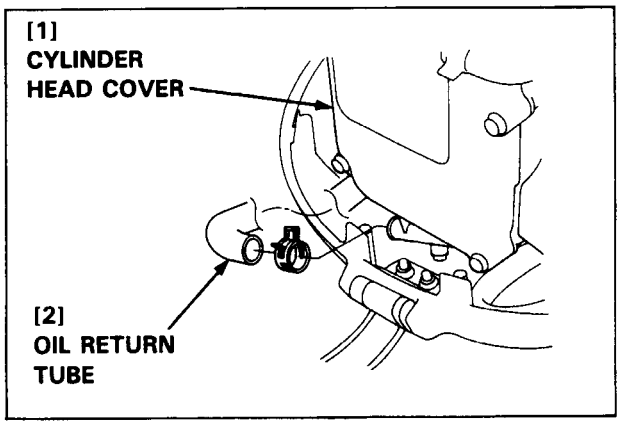
9) Remove the throttle rod pivot from the throttle cam.



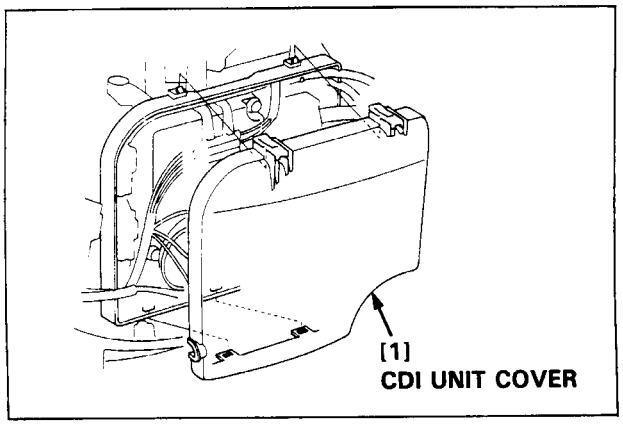
10) Disconnect the fuel tube B from the fuel pump.

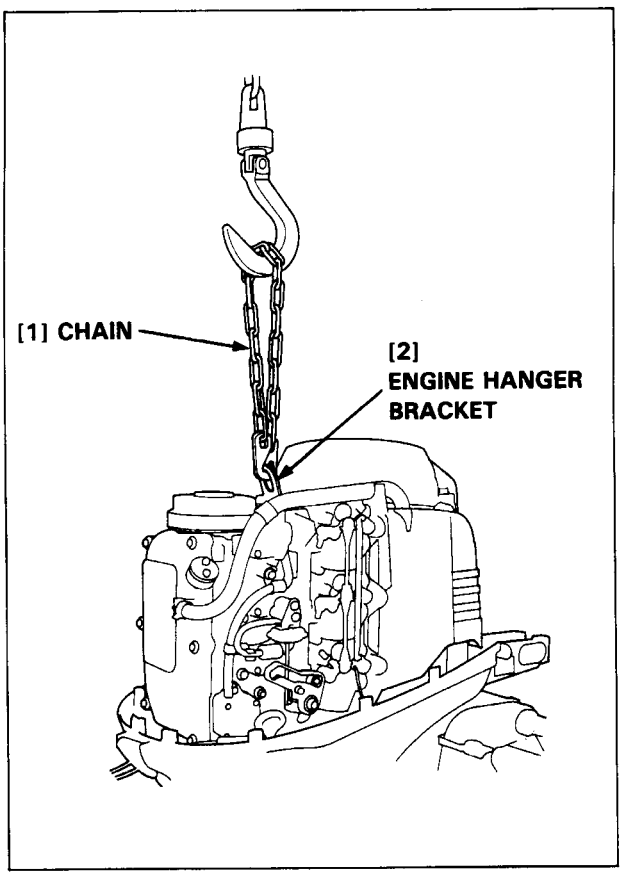


11) Disconnect the oil return tube from the cylinder head cover.

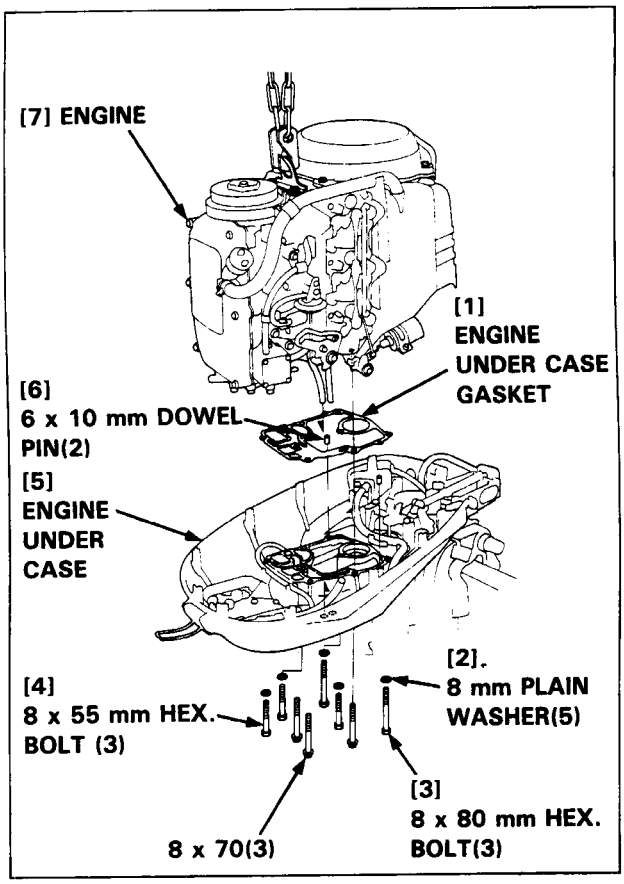


12) Remove the CDI unit cover.
13) Disconnect the starter solenoid ground cable [Electric starter type only] (P. 16-9).
    Disconnect the ignition coil ground cable (P. 16-3).
14) Disconnect the regulator/rectifier connectors, neutral switch 2P connector and fuse case connector and remove each part [Electric starter type only] (P. 16-6).
    Disconnect the remote control cable A connector/4P connector [Remote control type only] (P. 16-3).
15) Remove the starter cable (lower side). Open the wire harness clip and remove the starter cable (upper side) from the starter solenoid [Electric starter type only] (P. 16-6).
16) Disconnect the starter button connectors [Electric starter type only] (P. 15-3).
17) Disconnect the emergency stop switch connectors and oil pressure indicator light connectors [Tiller handle type only] (P. 15-4).
18) Attach a chain to the engine hanger bracket.





19) Remove the three 8 x 55 mm hex. bolts, three 8 x 70 mm flange bolts, two 8 x 80 mm hex. bolts and five 8 mm plain washers, and remove the engine from the engine under case. Remove the engine under case gasket and two 6 x 10 mm dowel pins.



2. INSTALLATION

Installation procedures are the reverse of removal but care must be taken during the following.

NOTE

- Do not reuse the engine under case gasket (See above).

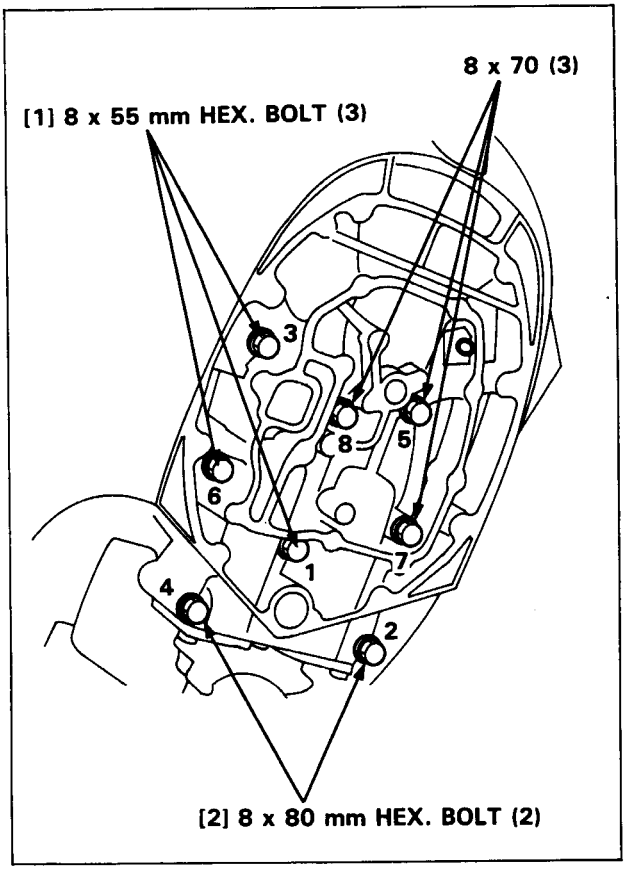
1) Remove the remaining gasket material from the engine under case gasket installation surface.
Apply the liquid gasket to the installation surface and install the gasket and the two 6 x 10 mm dowel pins securely.

CAUTION

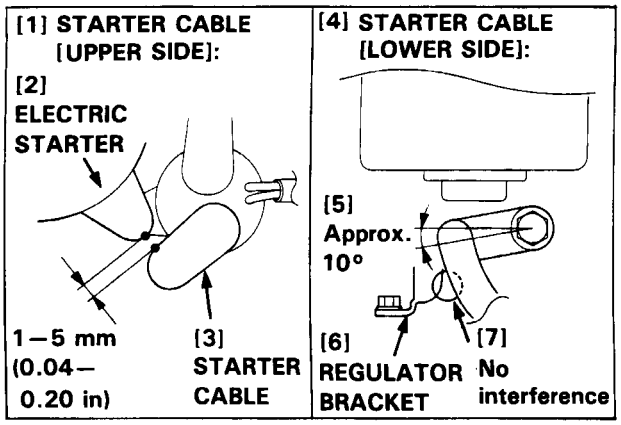
- **Clean the gasket installation surface with care not to let the crumbs of the old liquid gasket material enter the engine and engine under case.**

2) Note the engine mounting bolts installation location and tighten the eight bolts in the numbered sequence shown in the drawing.
Install the oil strainer, oil pan and exhaust pipe (P. 13-1).

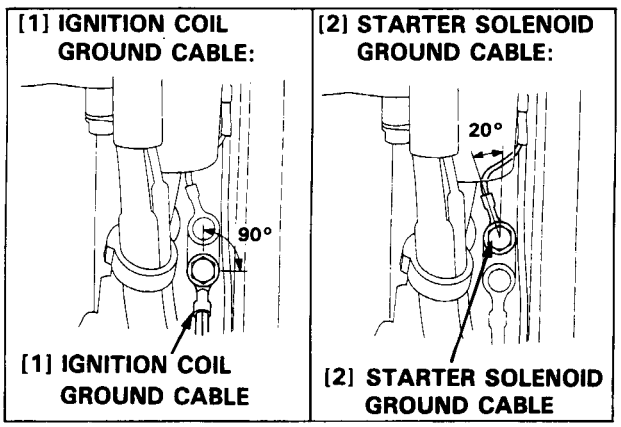
TORQUE:
Oil pan bolt/exhaust pipe bolt: 10 N·m (1.0 kg-m, 7.2 ft-lb)
Oil strainer bolt: 13 N·m (1.3 kg-m, 9.4 ft-lb)



3) Connect the starter cable so that there is 1—5 mm (0.04—0.20 in) of clearance between the starter cable positive (+) side and the electric starter. [Electric starter type only].
4) Connect the starter cable negative (−) side to the cylinder block at an angle of approximately 10° from the horizontal line. Take care not to let the starter cable interfere with the regulator bracket [Electric starter type only].

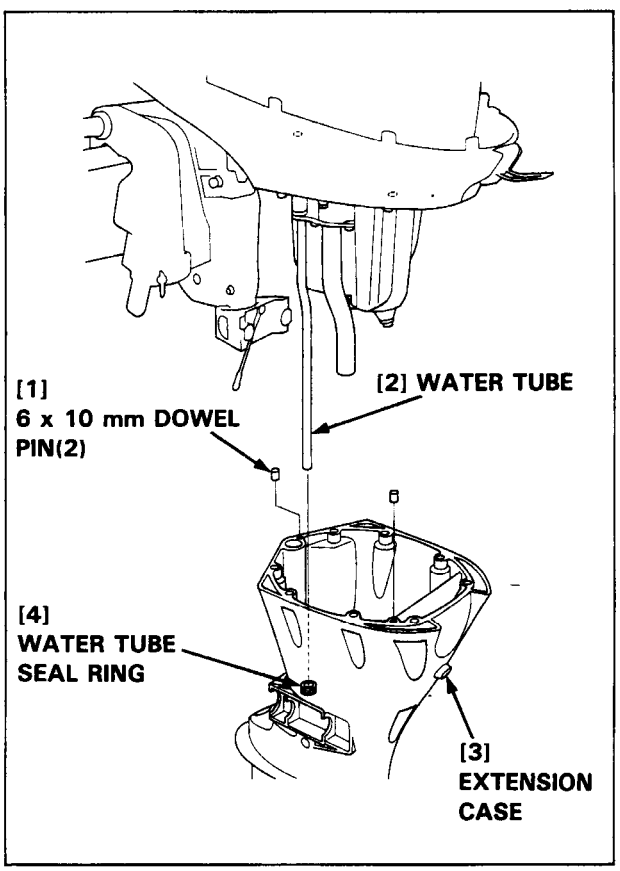


5) Connect the ignition coil ground cable at an angle of 90° from the horizontal line as shown.
6) Connect the starter solenoid ground cable at an angle of 20° from the horizontal line as shown [Electric starter type only].



7) Install the extension case assembly being careful to align the water tube with the water tube seal ring in the water pump. Install the 8 x 35 mm hex bolts and washers and tighten the extension case securely.

TORQUE: 22 N·m (2.2 kg-m, 15.9 ft-lb)



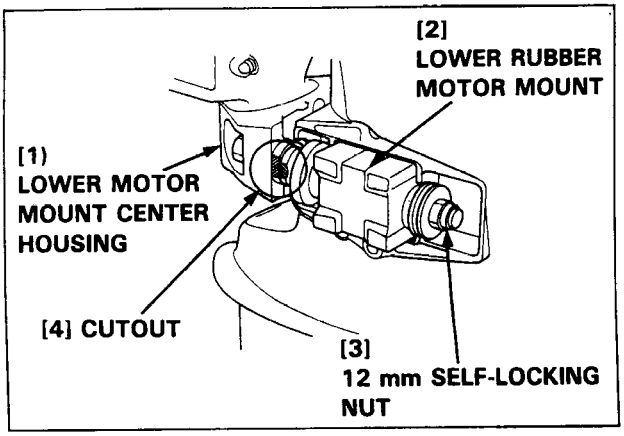
8) Align the cutouts on the lower rubber motor mount and the lower motor mount center housing for installation, and tighten the self locking nut securely.

TORQUE: 55 N·m (5.5 kg-m, 39.8 ft-lb)

9) Install the lower motor mount housing.

TORQUE: 22 N·m (2.2 kg-m, 15.9 ft-lb)

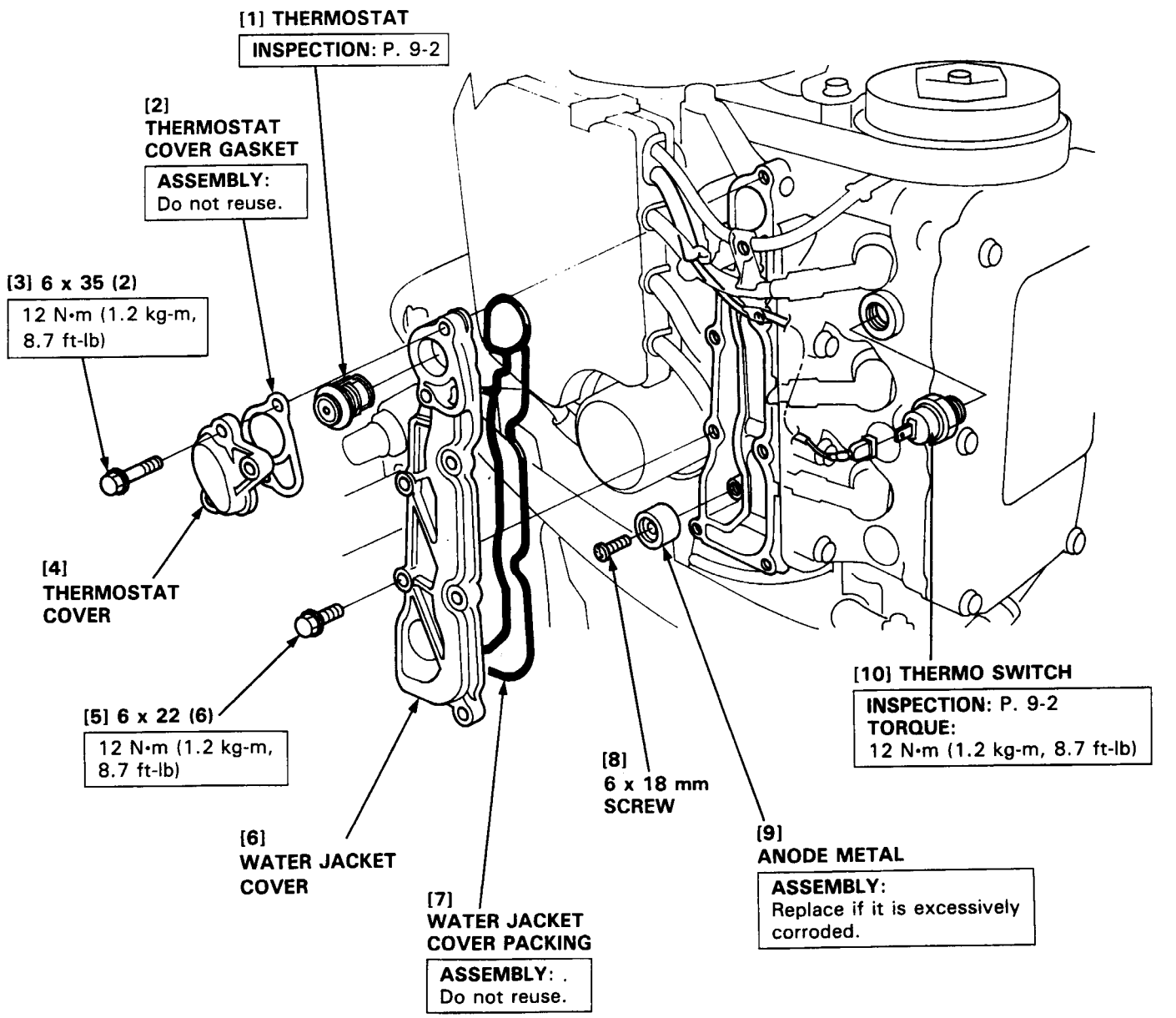
10) After installation, adjust the shift rod (P. 3-13).



1. WATER JACKET COVER/THERMOSTAT/THERMO SWITCH

a. DISASSEMBLY/ ASSEMBLY

1) Remove the engine cover.



b. INSPECTION

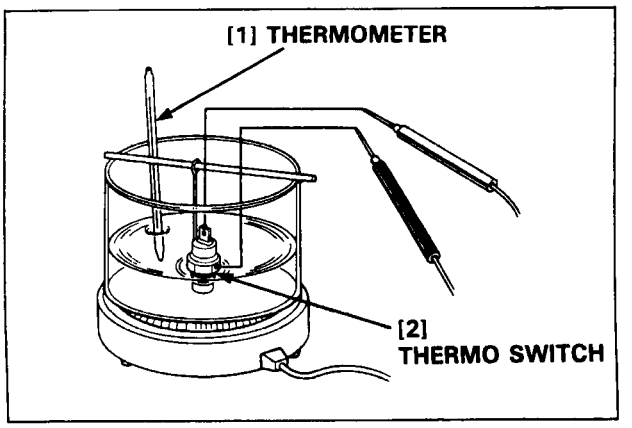
● THERMO SWITCH

1) Suspend the thermo switch 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 thermo switch closes and there is continuity between the thermo switch lead and body.

NOTE

• Don't allow the thermometer to touch the container.

Continuity (ON)	100°C ± 2°C (212° ± 36°F)
No continuity (OFF)	−3−7°C (27−45°F) below the temperature when continuity exists.

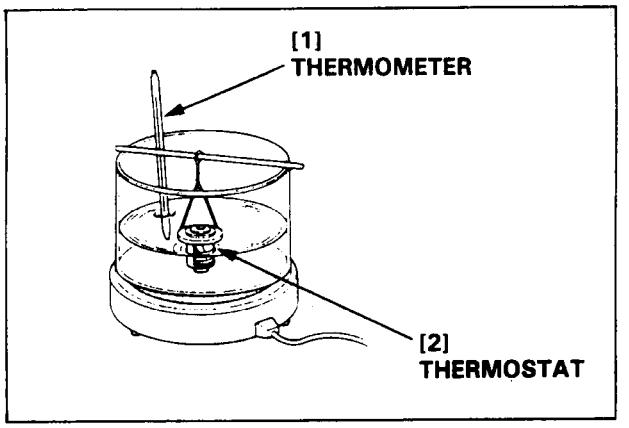


● THERMOSTAT

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.



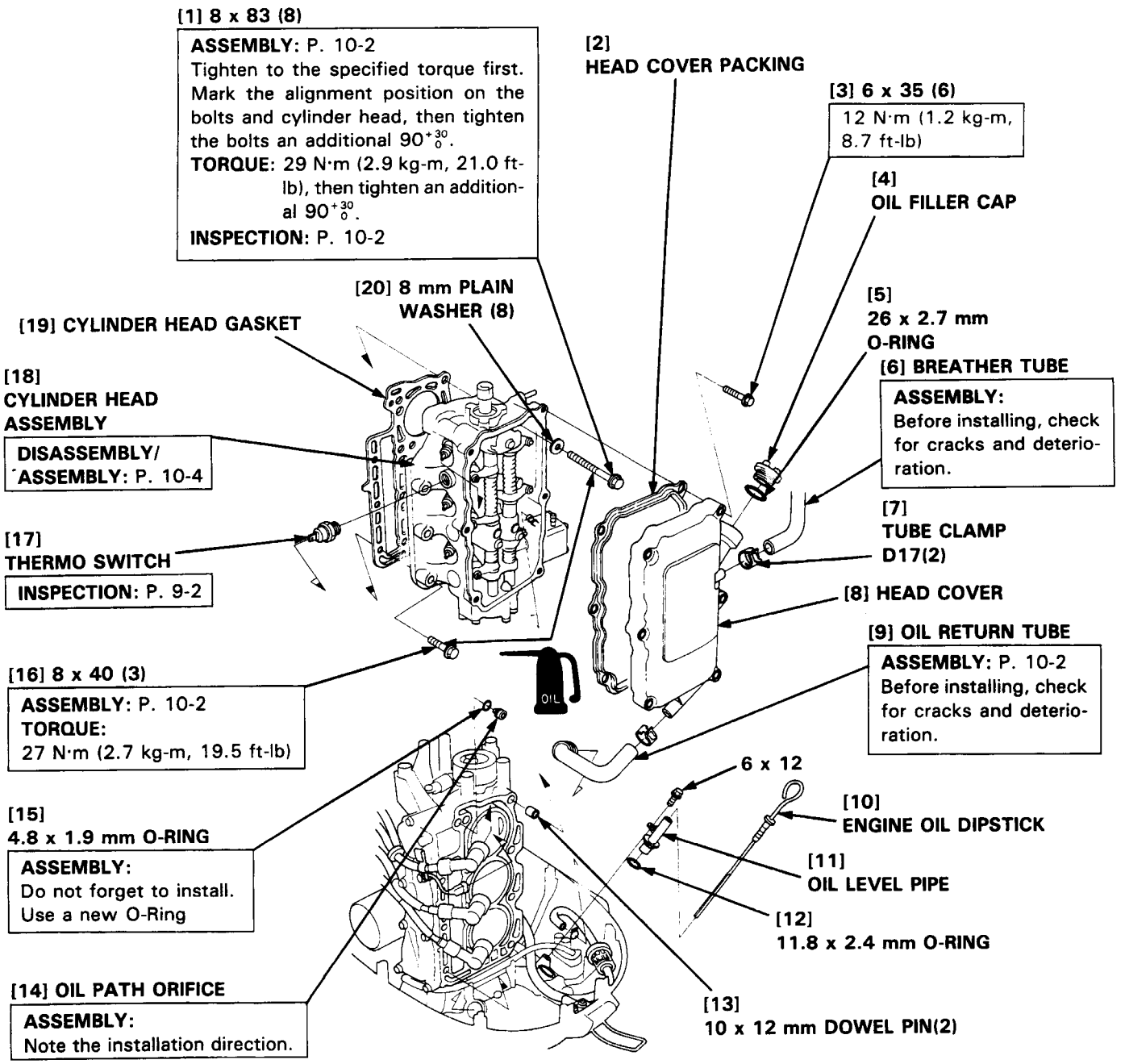
4) Measure the lift height when fully open.

Start opening	72°C (162°F)
Fully open	82°C (180°F)

Lift height	More than 3.0 mm (0.12 in)

1. REMOVAL/INSTALLATION

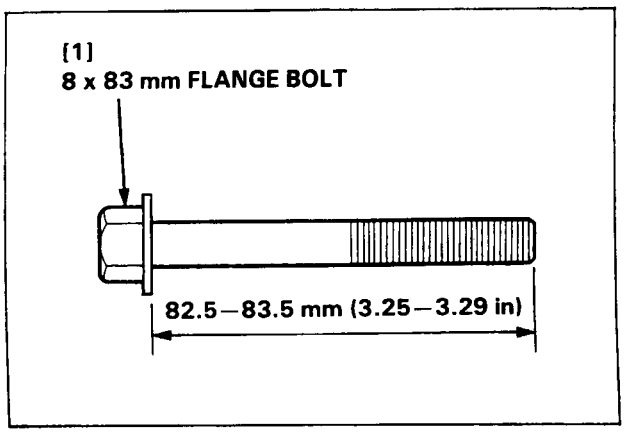
1) Remove the engine cover and the flywheel cover (P. 6-1). Remove the spark plug caps from the spark plugs.
2) Remove the cam pulley and the pulser coil (P. 6-3).
3) Remove the choke knob rod, throttle rod pivot and the carburetor assembly (P. 5-1).
4) Remove the cylinder head cover, eight 8 x 83 mm flange bolts and eight plain washers, and the cylinder head assembly.



• INSPECTION

8 x 83 mm FLANGE BOLT
Measure bolt length. If not within service limit, replace the bolt.

STANDARD	SERVICE LIMIT
82.5 – 83.5 mm (3.25 – 3.29 in)	84.9 mm (3.34 in)



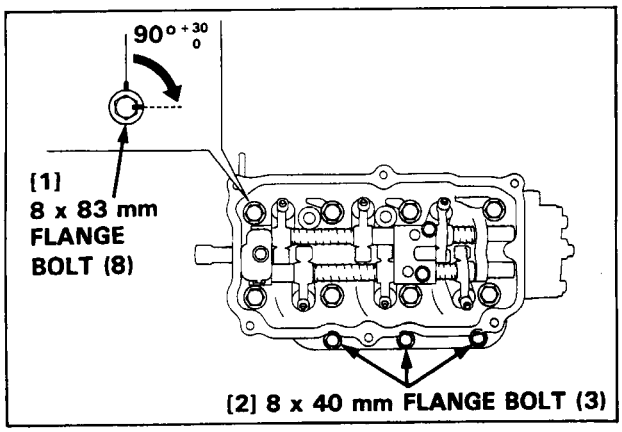
ASSEMBLY:
Tighten the eight 8 x 83 mm flange bolts and the three 8 x 40 mm flange bolts to the specified torque in the numbered sequence shown in the drawing. After tightening the 8 x 83 mm flange bolts to the specified torque, mark the alignment position on the bolts and the cylinder head. Tighten the 8 x 83 mm flange bolts an additional $90^{\circ}{}^{+30}_{0}$.

NOTE

- Only the 8 x 83 mm flange bolts are turned an additional $90^{\circ}{}^{+30}_{0}$.

TORQUE:
8 x 83 mm flange bolt
29 N·m (2.9 kg-m, 21.0 ft-lb) then tighten an additional $90^{\circ}{}^{+30}_{0}$.

8 x 40 mm flange bolt
27 N·m (2.7 kg-m, 19.5 ft-lb)



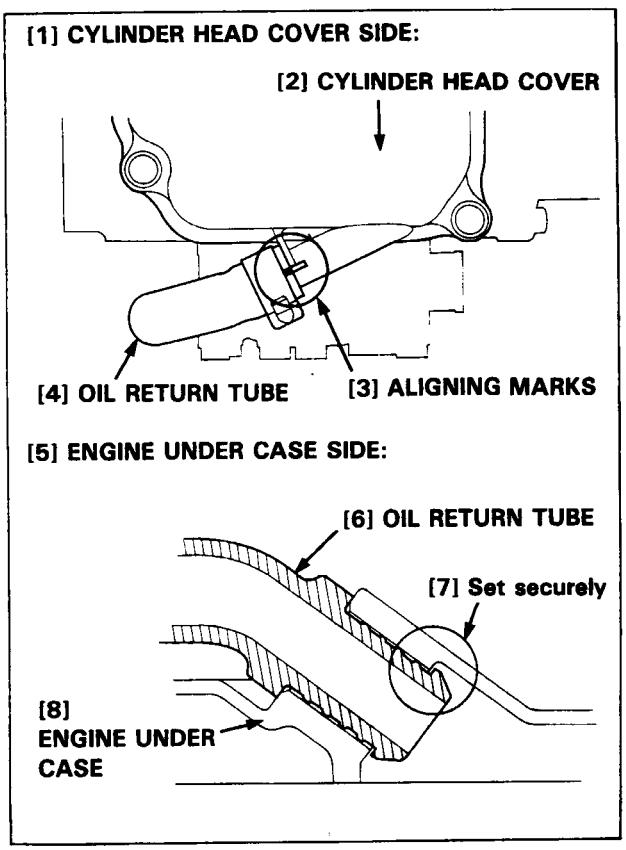
• OIL RETURN TUBE

ASSEMBLY:
<Cylinder head cover side>
Connect the oil return tube by aligning its "I" mark with the "I" mark on the cylinder head cover.

<Engine under case side>
Connect the oil return tube to the engine under case securely as shown.

CAUTION

- **If it is hard to connect the oil return tube, we recommend that you apply soapy water to the end of tube for easy connection.**
- **Do not apply oil to the end of the tube.**

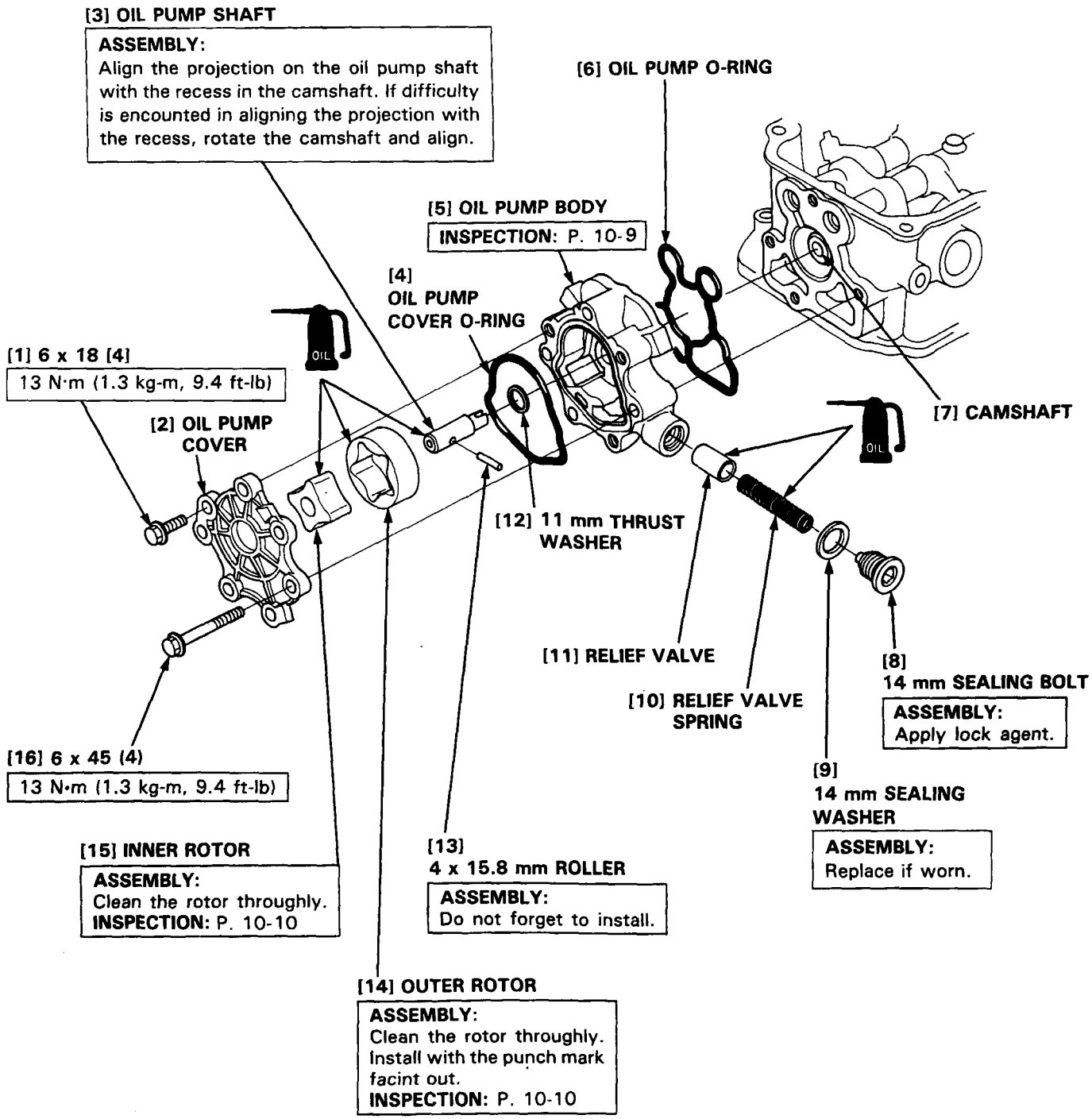


2. OIL PUMP

1) *Remove the cylinder head assembly (P. 10-1).*

NOTE

- After assembling the oil pump and before installing it on the cylinder head, pour approximately 5 cc (0.3 cu in) of oil into the oil pump body.



3. DISASSEMBLY/ASSEMBLY

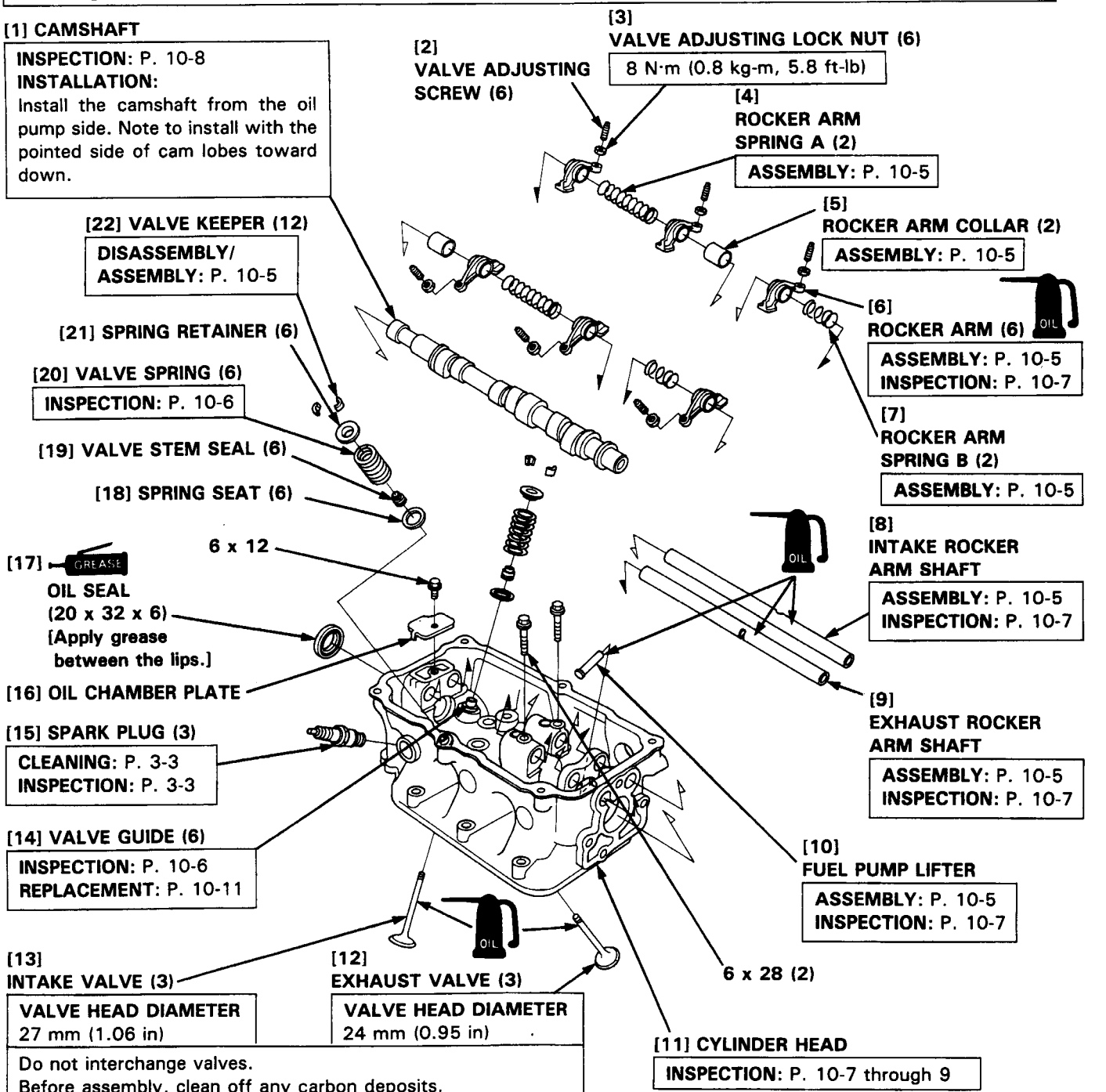
Remove the cylinder head assembly (P. 10-1).

NOTE

• Do not reuse the removed valve stem seal.

CAUTION

• Turning a valve too fast can damage the valve stem seals.

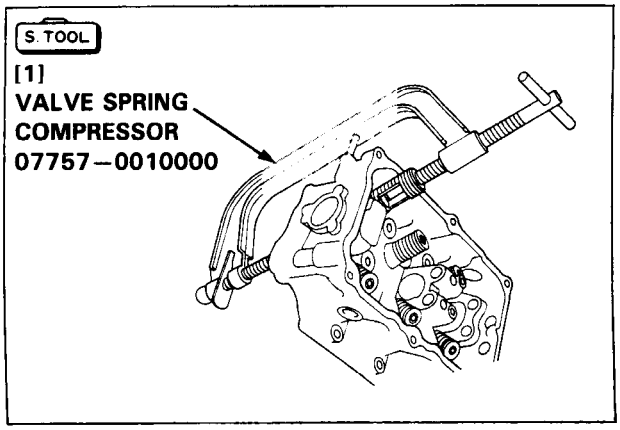


• VALVE KEEPER

DISASSEMBLY/ASSEMBLY:
Use the special tool to compress the spring and install the keepers.
Make sure the keepers seat in the groove properly.

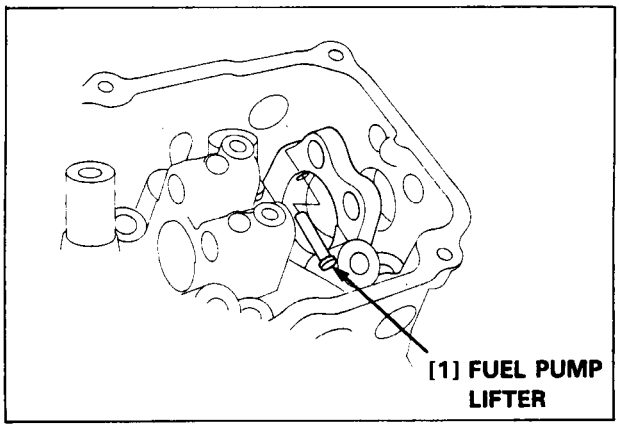
TOOL:

Valve spring compressor	**07757–0010000**



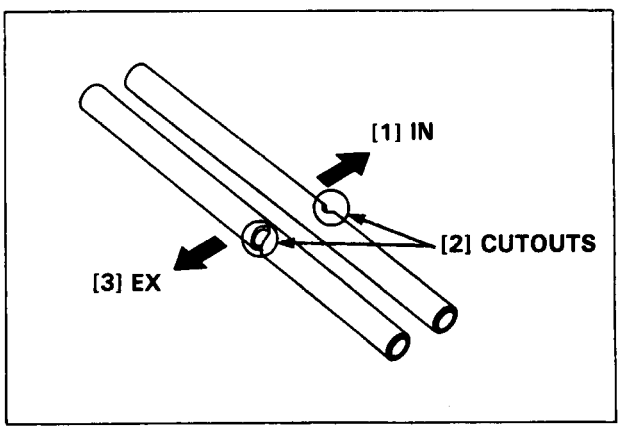
• FUEL PUMP LIFTER

ASSEMBLY:
Install the fuel pump lifter from inside of the cylinder head. Do not forget to install.



• ROCKER ARM SHAFT

ASSEMBLY:
Install the intake and exhaust rocker arm shafts with the cutouts facing outside.

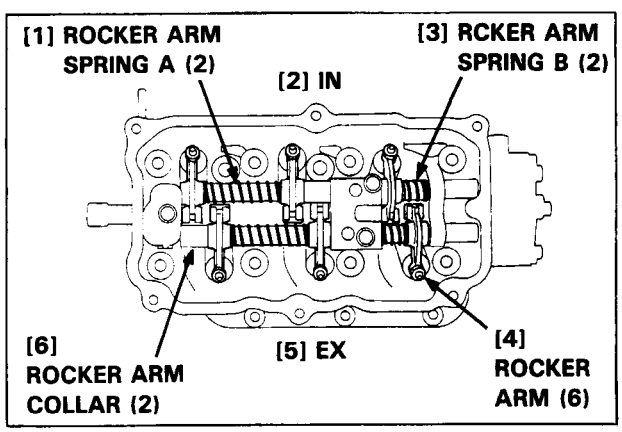


• ROCKER ARM/ROCKER ARM SPRING A, B/ ROCKER ARM COLLAR

ASSEMBLY:
Note the installation direction as shown.

NOTE

- Loosen the valve adjusting screw of each locker arm fully before installation.



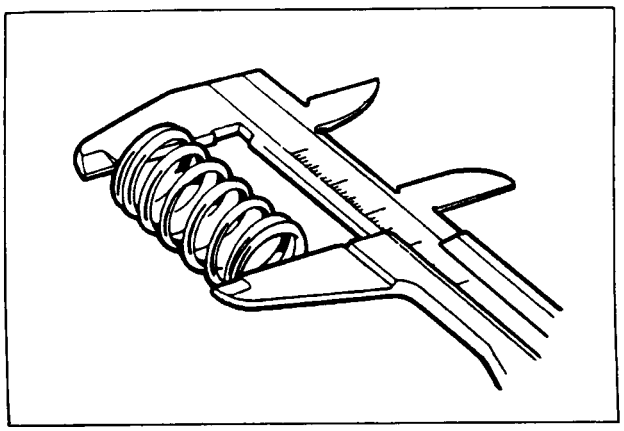
4. INSPECTION

• VALVE SPRING FREE LENGTH

Measure the free length of the valve springs.

	STANDARD	SERVICE LIMIT
IN/EX	36.8 mm (1.46 in)	35.3 mm (1.39 in)

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

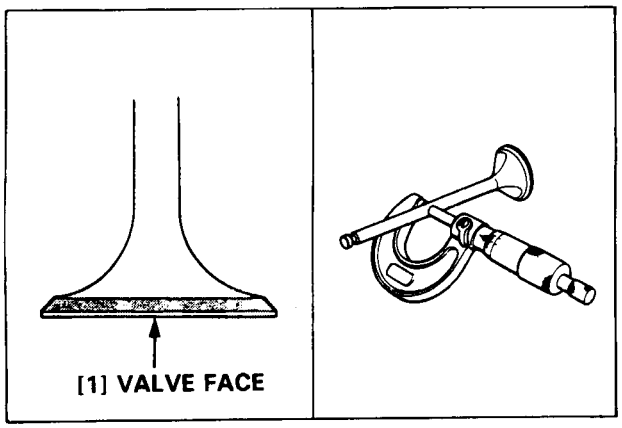


• VALVE FACE/STEM O.D.

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	5.455—5.470 mm (0.2148—0.2154 in)	5.43 mm (0.214 in)

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



• VALVE GUIDE I.D.

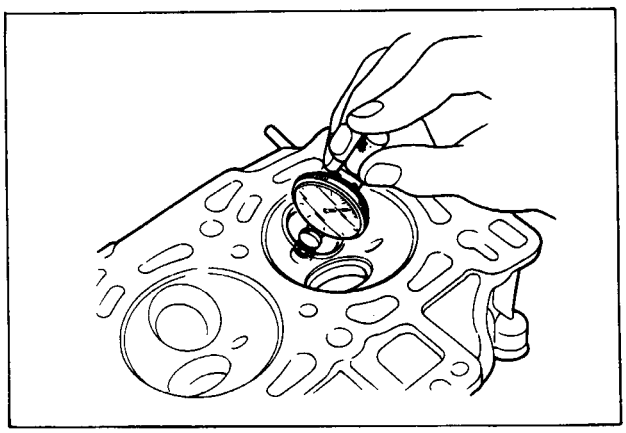
NOTE

- Ream the valve guides to remove any carbon deposits before measuring (P. 10-11).

Measure and record each valve guide I.D.

	STANDARD	SERVICE LIMIT
IN/ EX	5.500—5.512 mm (0.2165—0.2170 in)	5.54 mm (0.218 in)

Replace the guides if they are over the service limit (P. 10-11).



• 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— 0.0015 in)	0.07 mm (0.003 in)
EX	0.030— 0.057 mm (0.0012— 0.0022 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

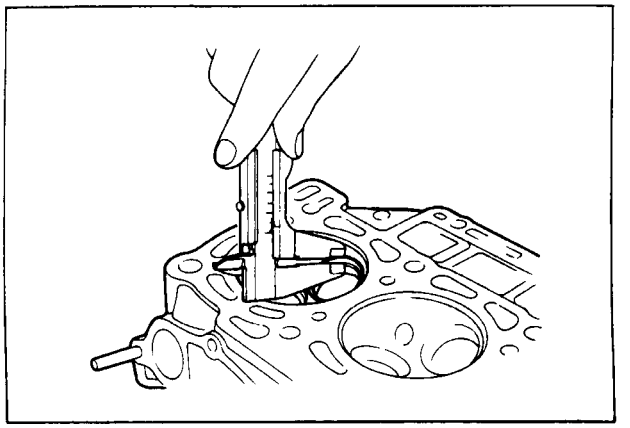
- Recondition the valve seats whenever the valve guides are replaced.

• VALVE SEAT WIDTH

Measure the valve seat width.

	STANDARD	SERVICE LIMIT
IN/ EX	0.9 – 1.1 mm (0.035 – 0.043 in)	2.0 mm (0.08 in)

If the valve seat width is under the standard, or over the service limit, recondition the valve seat. See page 10-12.

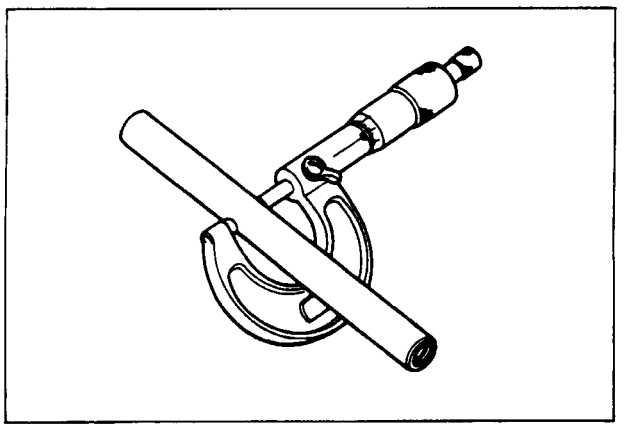


• ROCKER ARM SHAFT O.D.

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

STANDARD	SERVICE LIMIT
12.962 – 12.980 mm (0.5103 – 0.5110 in)	12.92 mm (0.509 in)

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

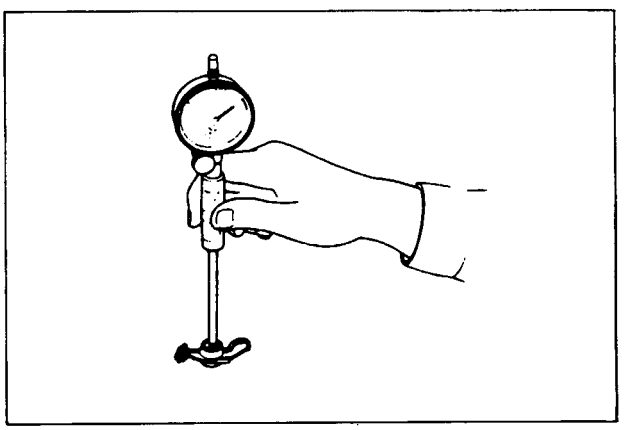


• ROCKER ARM I.D.

Measure the I.D. of the rocker arm.

STANDARD	SERVICE LIMIT
13.000 – 13.018 mm (0.5118 – 0.5125 in)	13.04 mm (0.513 in)

Replace the rocker arms if their I.D. is larger than the service limit.
Also check the rocker arm slipper surface for any wear or scraches.

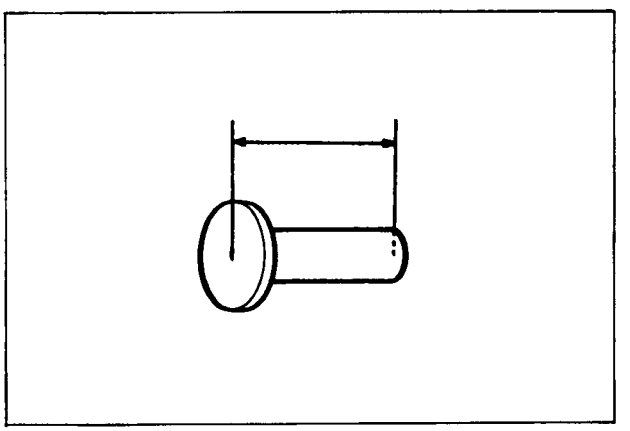


• ROCKER ARM SHAFT-TO-ROCKER ARM CLEARANCE

STANDARD	SERVICE LIMIT
0.020 – 0.056 mm (0.0007 – 0.0022 in)	0.07 mm (0.003 in)

• FUEL PUMP LIFTER

STANDARD	SERVICE LIMIT
28.45 – 28.50 mm (1.120 – 1.122 in)	28.40 mm (1.118 in)

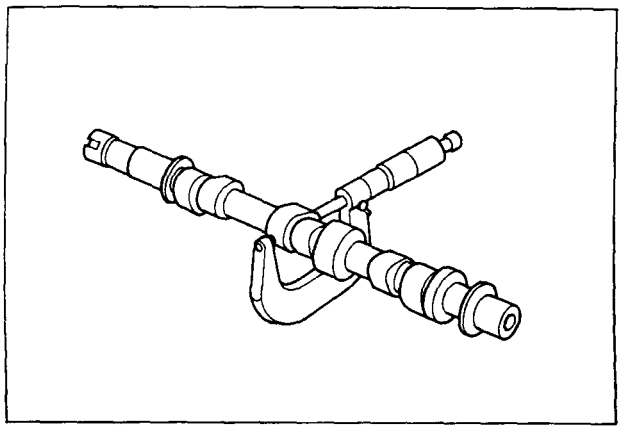


• CAM HEIGHT

Measure the camshaft runout.

	STANDARD	SERVICE LIMIT
IN	24.073–24.313 mm (0.9478–0.9572 in)	23.843 mm (0.9387 in)
EX	24.105–24.345 mm (0.9490–0.9585 in)	23.905 mm (0.9411 in)

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

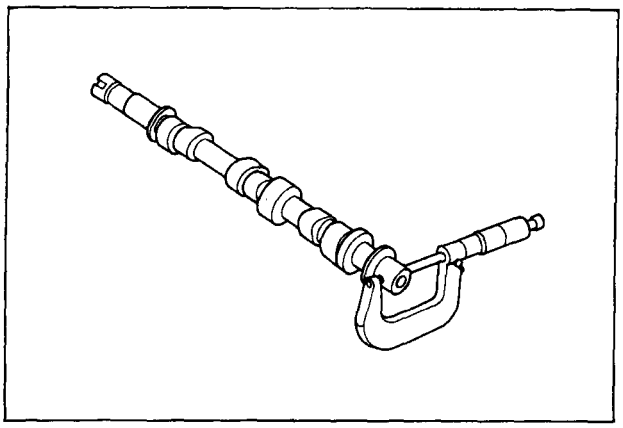


• CAMSHAFT JOURNAL O.D.

Measure the camshaft O.D.

	STANDARD	SERVICE LIMIT
#1	19.959–19.980 mm (0.7858–0.7866 in)	19.93 mm (0.785 in)
#2	29.939–29.960 mm (1.1787–1.1795 in)	29.9 mm (1.18 in)
#3	17.966–17.984 mm (0.7073–0.7080 in)	17.94 mm (0.706 in)

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

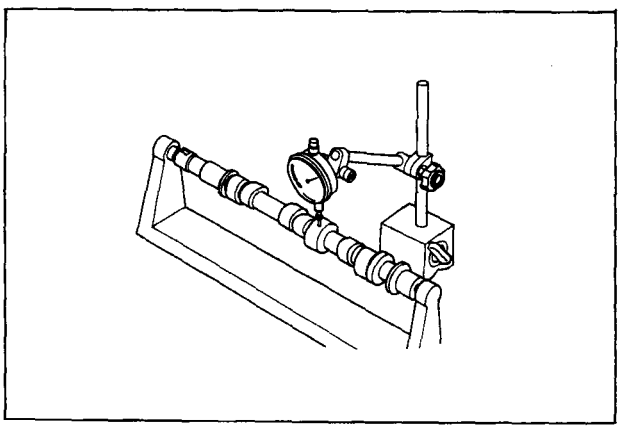


• CAMSHAFT RUNOUT

Measure the camshaft runout.

STANDARD	SERVICE LIMIT
0.03 mm (0.001 in) MAX.	0.05 mm (0.002 in)

Camshaft runout is half of maximum gauge reading.

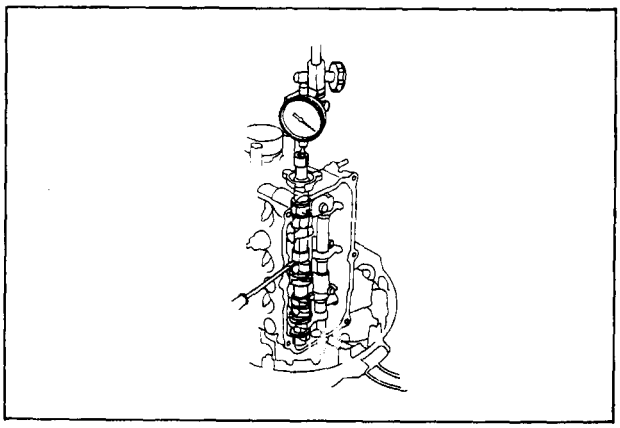


• CAMSHAFT AXIAL CLEARANCE

Measure the camshaft axial runout before removing the cylinder head from the cylinder block.
Loosen the valve adjusting lock nuts and back off the valve adjusting screws before inspection.

STANDARD	SERVICE LIMIT
0.15–0.40 mm (0.006–0.016 in)	0.6 mm (0.02 in)

Install the new camshaft and recheck the axial clearance.
If it exceeds the service limit, replace the cylinder head.



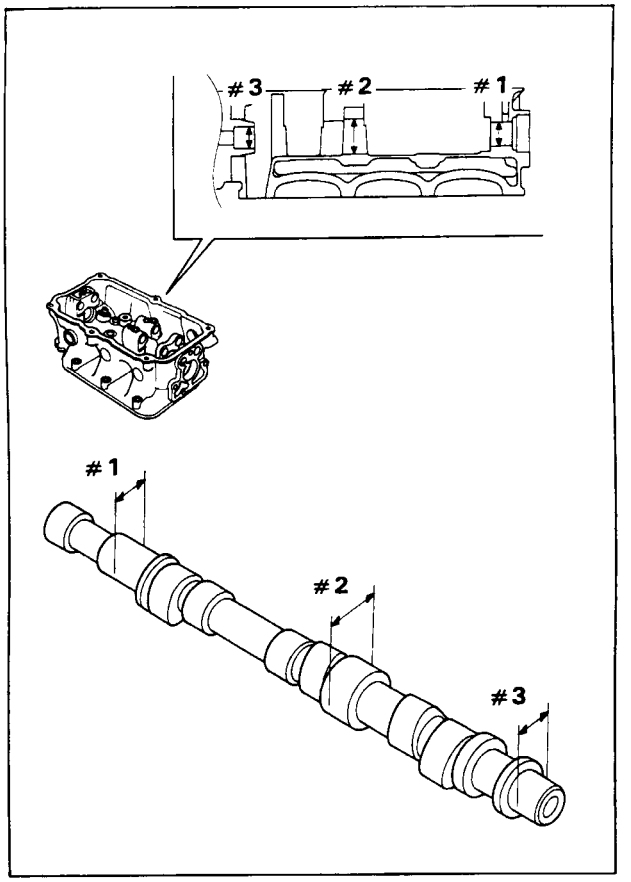
• CAMSHAFT OIL CLEARANCE

Cylinder head I.D. of camshaft journal:

	STANDARD	SERVICE LIMIT
#1	20.000–20.021 mm (0.7874–0.7882 in)	20.05 mm (0.789 in)
#2	30.000–30.025 mm (1.1811–1.1821 in)	30.06 mm (1.183 in)
#3 (Oil pump journal)	18.000–18.027 mm (0.7087–0.7097 in)	18.06 mm (0.711 in)

Camshaft oil clearance:

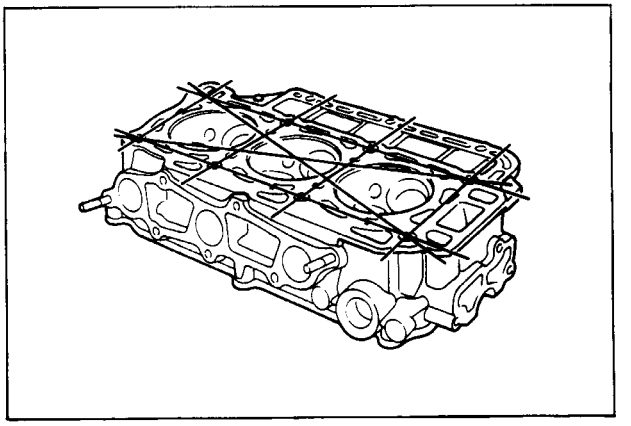
	STANDARD	SERVICE LIMIT
#1	0.020–0.062 mm (0.0008–0.0024 in)	0.08 mm (0.003 in)
#2	0.040–0.086 mm (0.0016–0.0034 in)	0.11 mm (0.004 in)
#3 (Oil pump journal)	0.016–0.061 mm (0.0006–0.0024 in)	0.08 mm (0.003 in)



• CYLINDER HEAD

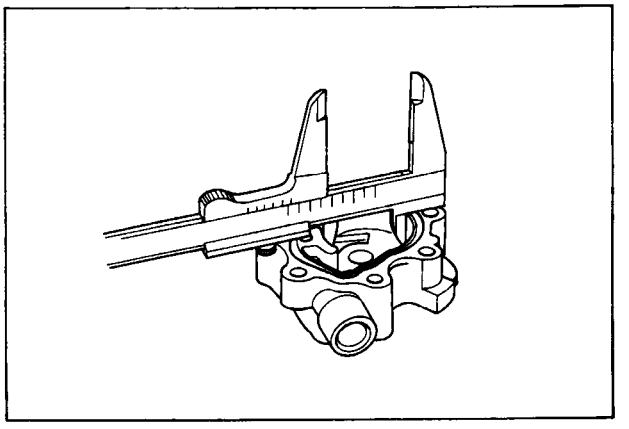
Remove carbon deposits from the combustion chamber. Clean off any gasket material from the cylinder head surface. Check the spark plug holes and valve areas for cracks. Check the cylinder head for warpage with a straight edge and a feeler gauge.

SERVICE LIMIT	0.05 mm (0.002 in)



• PUMP BODY I.D.

STANDARD	SERVICE LIMIT
40.71–40.74 mm (1.603–1.604 in)	40.76 mm (1.605 in)



• INNER ROTOR-TO-OUTER ROTOR CLEARANCE

STANDARD	SERVICE LIMIT
0.15 mm (0.006 in) Max.	0.20 mm (0.01 in)

• OUTER ROTOR-TO-BODY CLEARANCE

STANDARD	SERVICE LIMIT
0.15 – 0.21 mm (0.006 – 0.008 in)	0.26 mm (0.010 in)

• OUTER ROTOR HEIGHT

STANDARD	SERVICE LIMIT
14.98 – 15.00 mm (0.590 – 0.591 in)	14.96 mm (0.589 in)

• PUMP BODY DEPTH

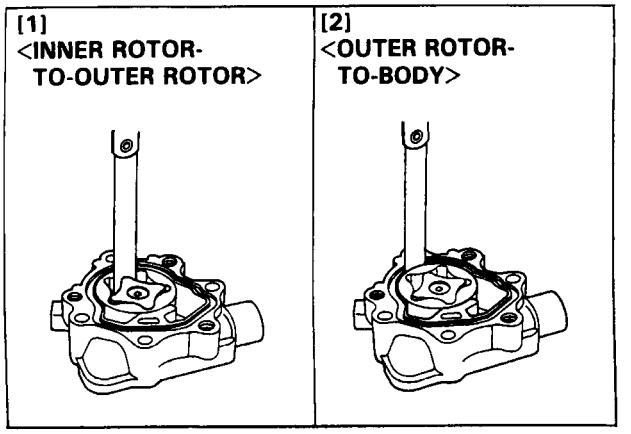
STANDARD	SERVICE LIMIT
15.02 – 15.05 mm (0.591 – 0.593 in)	15.09 mm (0.594 in)

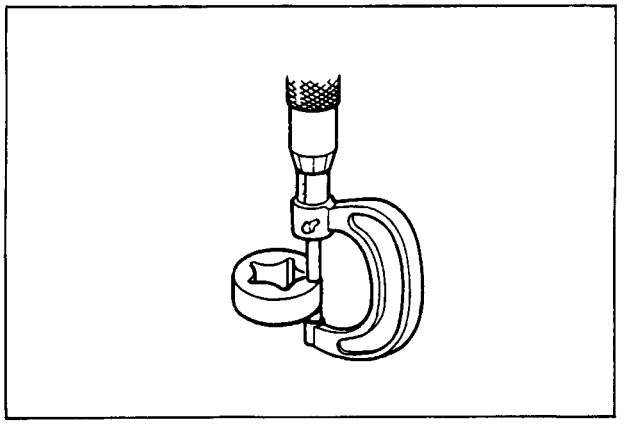
• PUMP END CLEARANCE

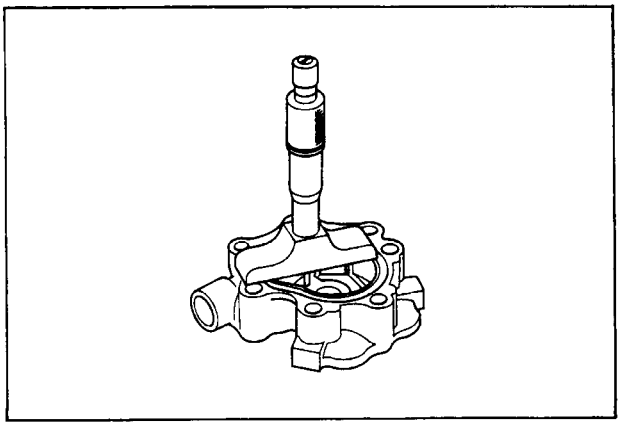
STANDARD	SERVICE LIMIT
0.02 – 0.07 mm (0.001 – 0.003 in)	0.1 mm (0.004 in)

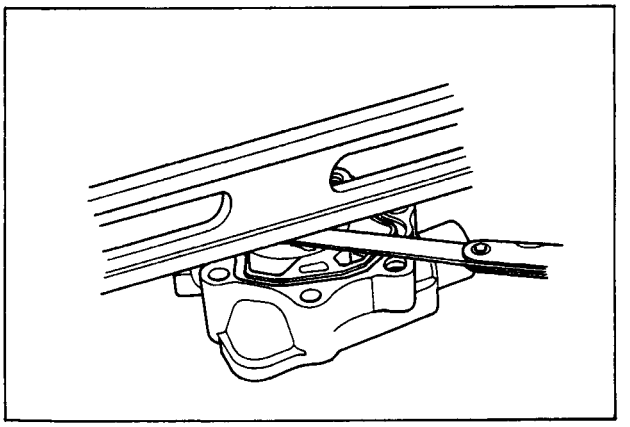
[1] <INNER ROTOR-TO-OUTER ROTOR>

[2] <OUTER ROTOR-TO-BODY>



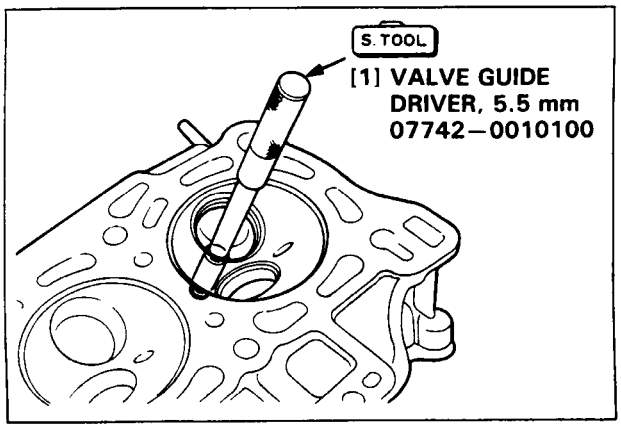






5. VALVE GUIDE REPLACEMENT

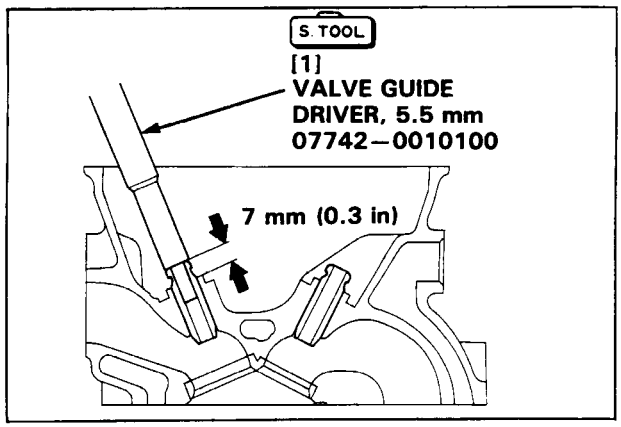
1) Chill the replacement valve guides in the freezer section of a refrigerator for about an hour.
2) Drive the valve guide out of the combustion chamber side using a valve guide driver (special tool).



CAUTION

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

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 the guide if damaged.

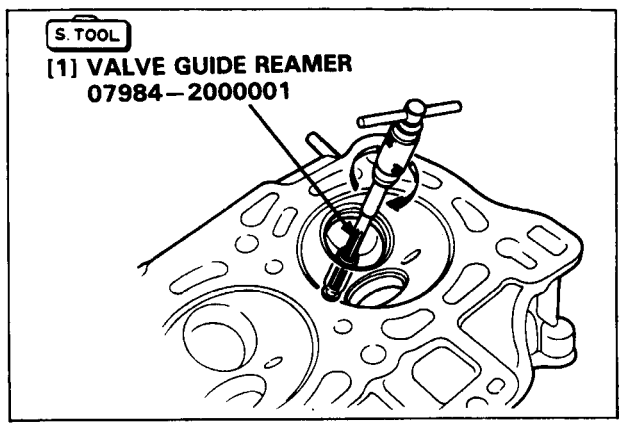


• VALVE GUIDE REAMING

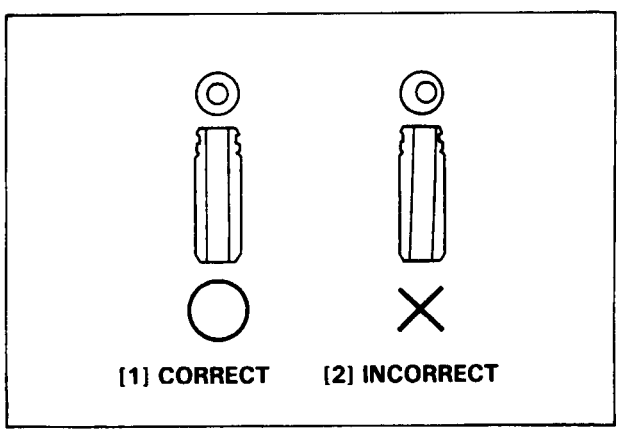
NOTE

- 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 the full length of the reamer.
3) Continue to rotate the reamer clockwise while removing it from the valve guide.

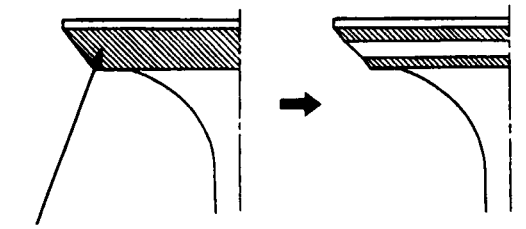


4) Throughly clean the cylinder head to remove any cutting residue.
5) Check the valve guide bore; it should be straight, round and centered in the valve guide, insert the valve and check operation. If the valve does not operate smoothly, the guide may have been bent during installation. Replace the valve guide if it is bent or damaged.
6) Check the Valve Guide-to-Stem Clearance. See page 10-6.



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 transfered marking compound will show any area of the seat that is not concentric.



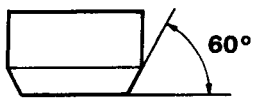
NOTE

- Follow Valve Seat Cutter Manufacturer's Instructions.

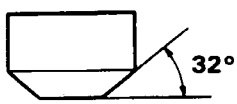
3) Using a 45° cutter, remove enough material to produce a smooth and concentric seat. Turn the cutter clockwise, never counterclockwise. Continue to turn the cutter as you lift it from the valve seat.

S. TOOL [1] CUTTER HOLDER
07781–0010101

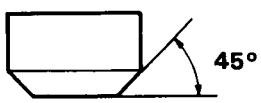
S. TOOL [2] VALVE SEAT CUTTERS



[3] IN: 07780–0014100
ϕ30.0
EX: 07780–0014000
ϕ26.0



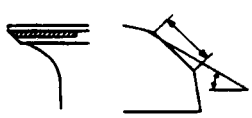
[4] IN: 07780–0012900
ϕ28.0
EX: 07780–0012200
ϕ25.0



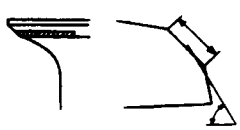
[5] IN: 07780–0010800
ϕ29.0
EX: 07780–0010300
ϕ24.5

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.

[1] CONTACT TOO HIGH



[2] CONTACT TOO LOW



• VALVE SEAT WIDTH

STANDARD	SERVICE LIMIT
0.9 – 1.1 mm (0.035 – 0.043 in)	2.0 mm (0.08 in)

5) Make a light pass with 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 transfered marking compound, should have good contact all the way around.

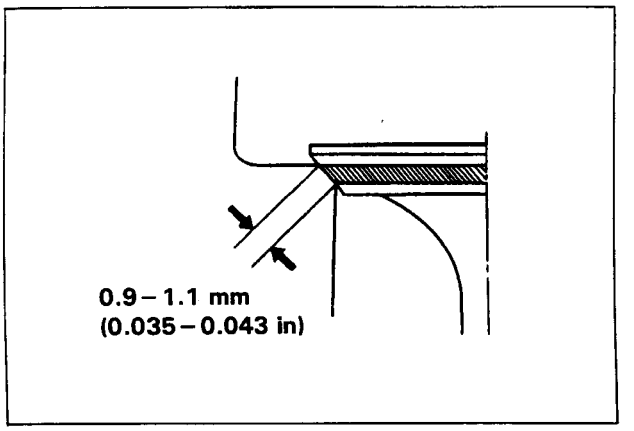
7) Lap the valves into their seats, using a hand valve lapper and lapping compound (commercially available).

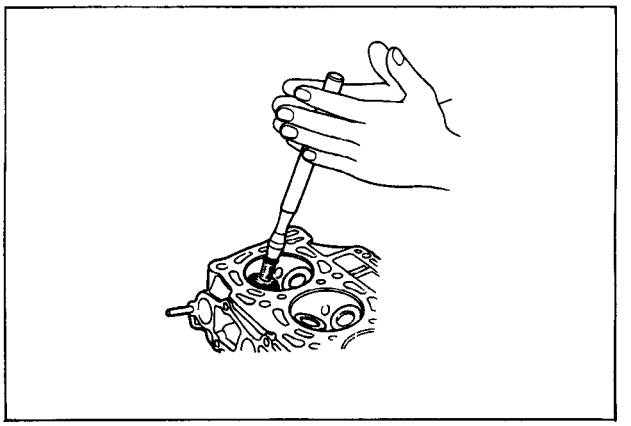
CAUTION

- **To avoid severe engine damage, be sure to remove all lapping compound from the engine before reassembly.**

NOTE

- Check valve clearance after reassembly.

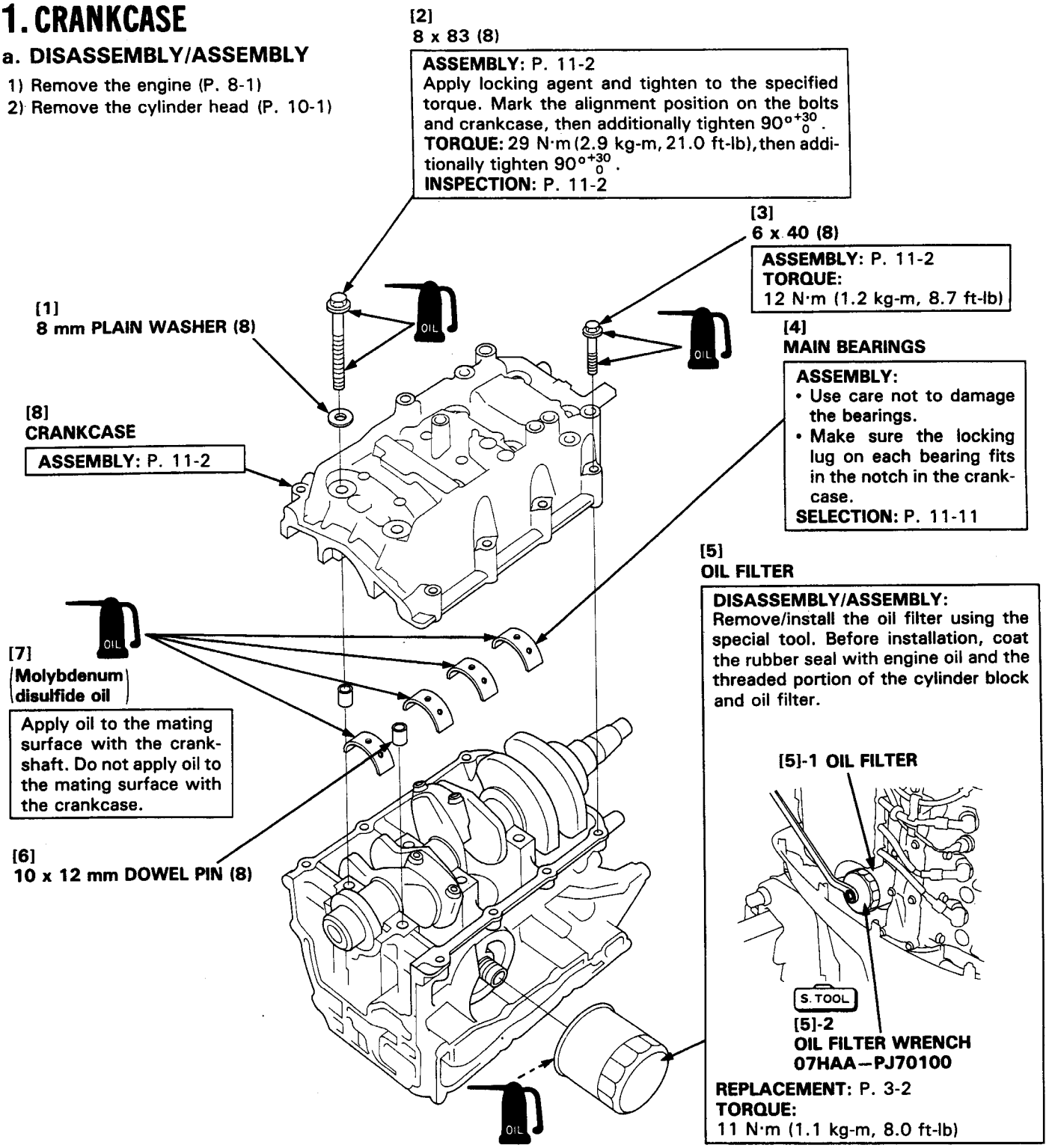




1. CRANKCASE

a. DISASSEMBLY/ASSEMBLY

1) Remove the engine (P. 8-1)
2) Remove the cylinder head (P. 10-1)

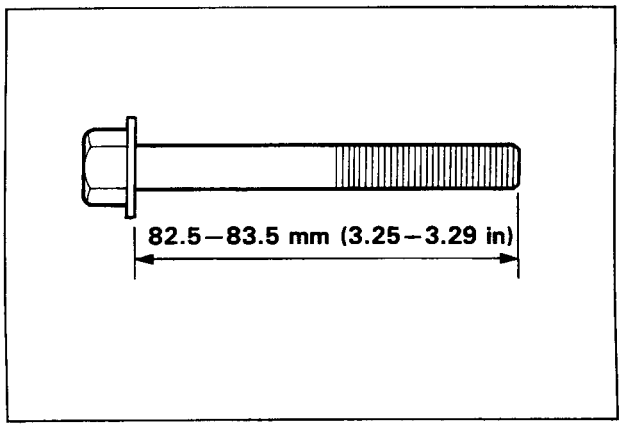


b. INSPECTION

• 8 x 83 mm FLANGE BOLT

Measure bolt length. If not within service limit, replace the bolt.

STANDARD	SERVICE LIMIT
82.5 – 83.5 mm (3.25 – 3.29 in)	84.9 mm (3.34 in)



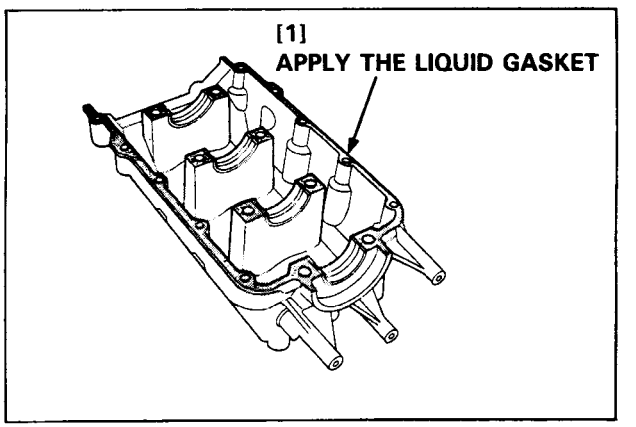
• CRANKCASE

ASSEMBLY:

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

CAUTION

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



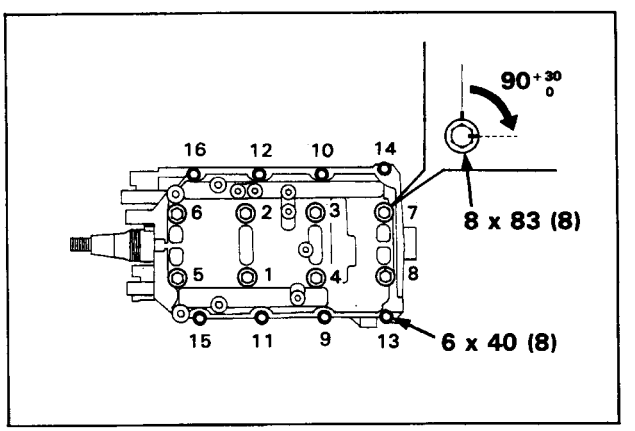
• 8 x 83 mm/6 x 40 mm FLANGE BOLT

ASSEMBLY:

Tighten the eight 8 x 83 mm flange bolts and the eight 6 x 40 mm flange bolts to the specified torque in the numbered sequence shown in the drawing. After tightening the 8 x 83 mm flange bolts to the specified torque, mark the alignment position on the bolts and crankcase, then tighten the bolts an additional $90^{\circ}{}^{+30}_{0}$.

NOTE

- Only the 8 x 83 mm flange bolts are turned an additional $90^{\circ}{}^{+30}_{0}$.



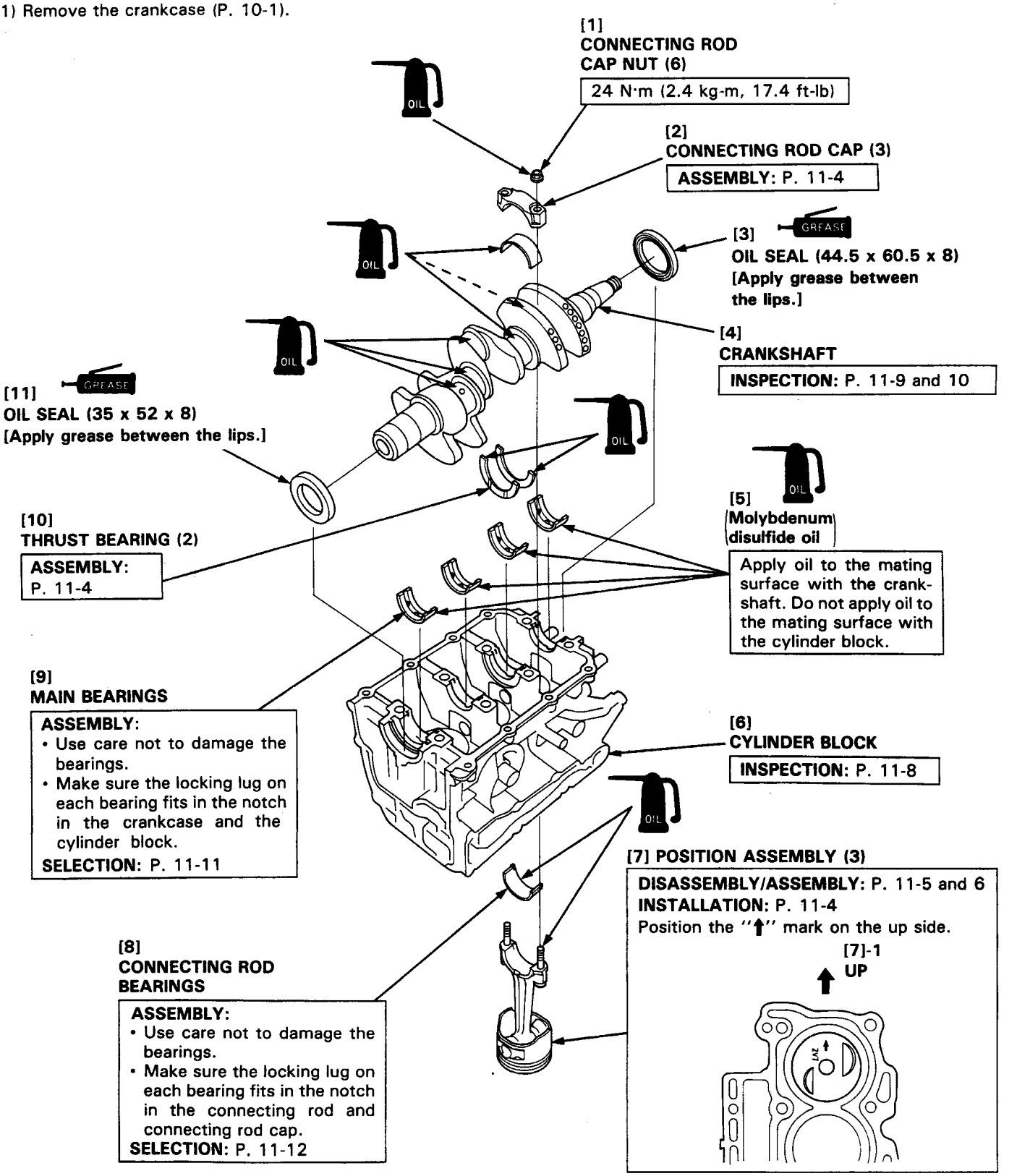
TORQUE:

8 x 83 mm flange bolt:
29 N·m (2.9 kg-m, 21.0 ft-lb) then tighten an additional $90^{\circ}{}^{+30}_{0}$.
6 x 40 mm flange bolt:
12 N·m (1.2 kg-m, 8.7 ft-lb)

2. CYLINDER BLOCK/CRANKSHAFT

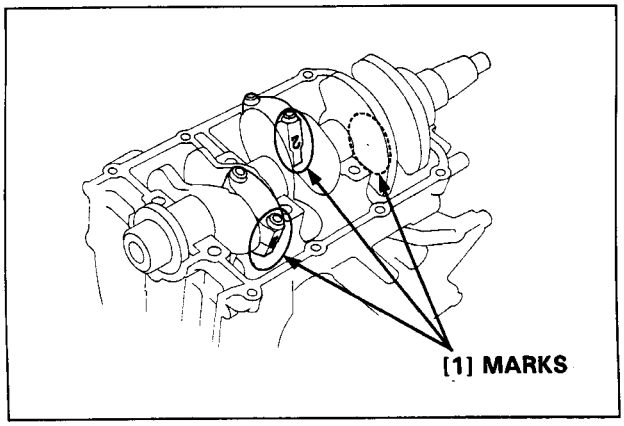
a. DISASSEMBLY/ASSEMBLY

1) Remove the crankcase (P. 10-1).



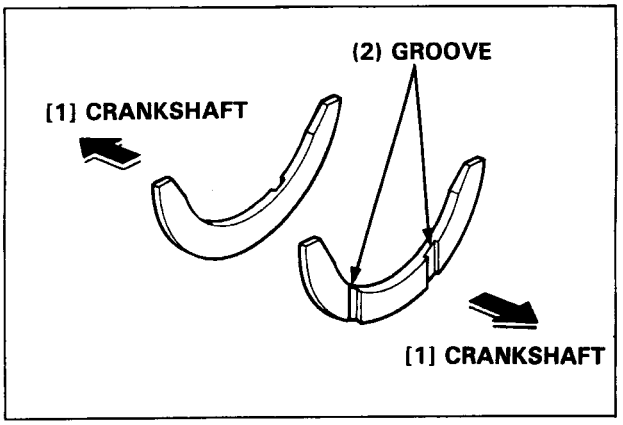
• **CONNECTING ROD CAP**

ASSEMBLY:
Install the connecting rod caps aligning the numerical marks of the connecting rods and caps.



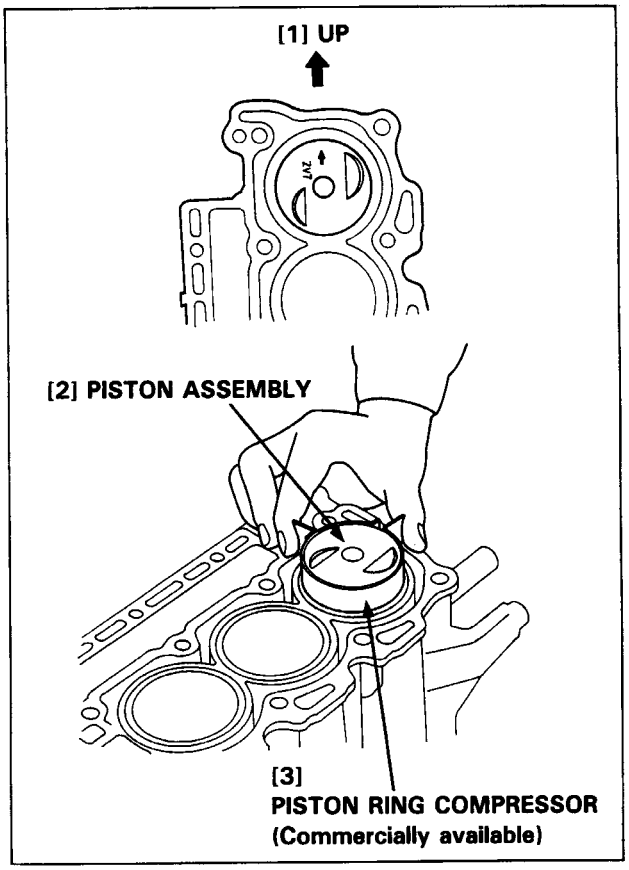
• **THRUST BEARING**

ASSEMBLY:
Install with the grooved side toward the crankshaft.



• **PISTON ASSEMBLY**

INSTALLATION:
Position the "⬆" mark on the up side, then install the piston assembly using a commercially available piston ring compressor.



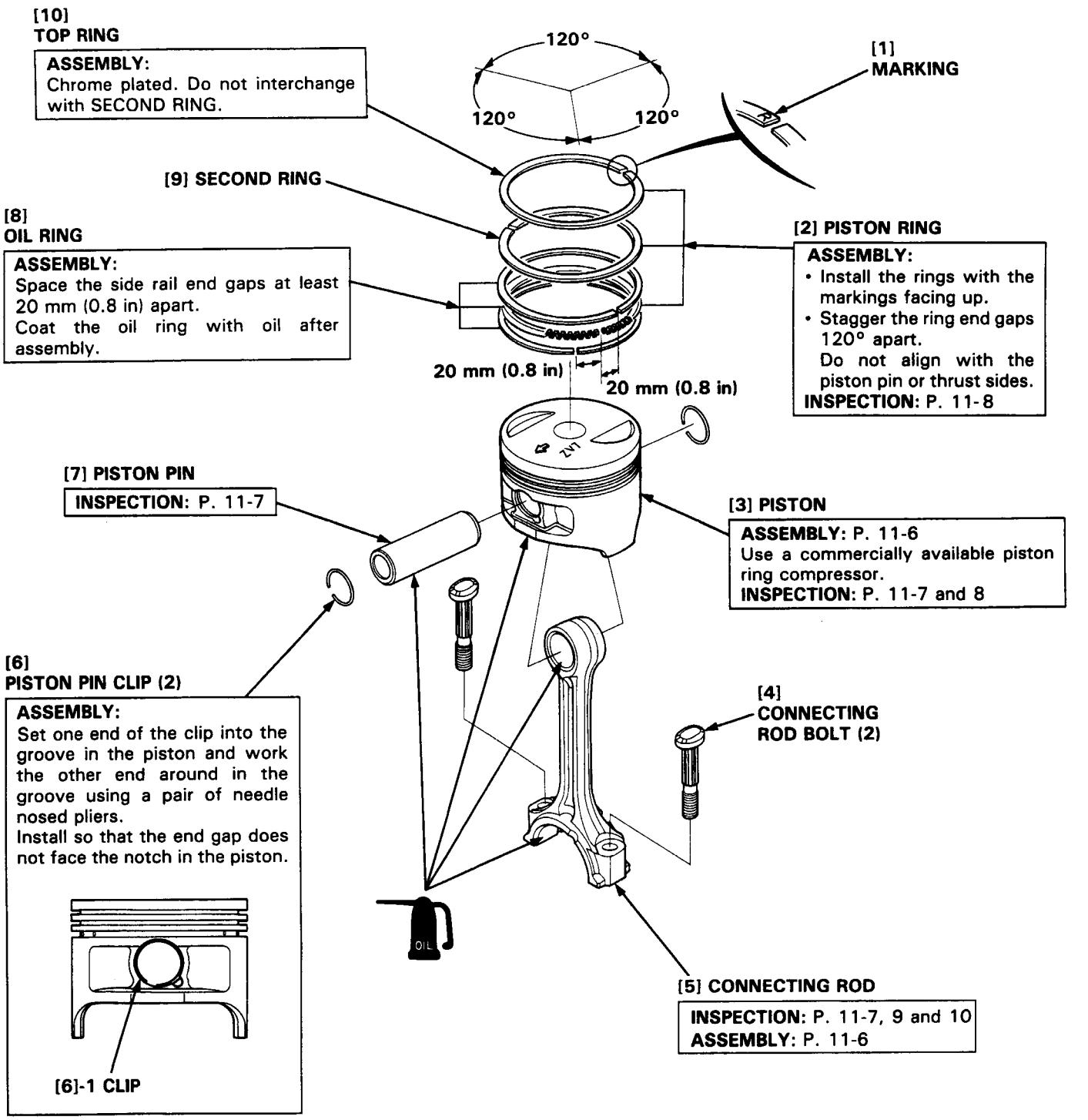
3. PISTON

DISASSEMBLY/ASSEMBLY

NOTE

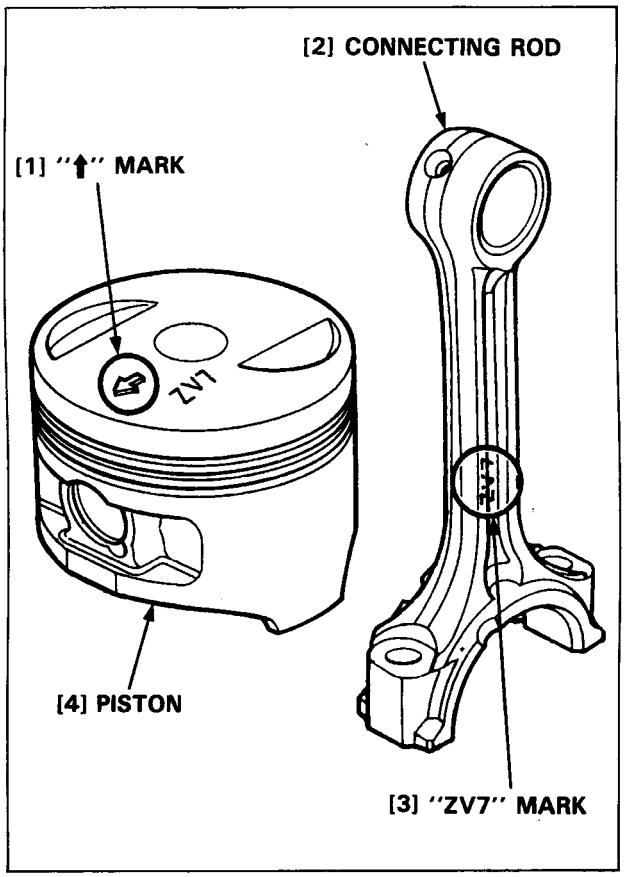
- After installing the pistons and connecting rods in the cylinder block, secure the rods to the crankshaft.

Remove the piston assembly (P. 11-3).



• **PISTON/CONNECTING ROD**

ASSEMBLY:
Assemble so that "⬆" mark on the piston points in the same direction as "ZV7" mark on the connecting rod.



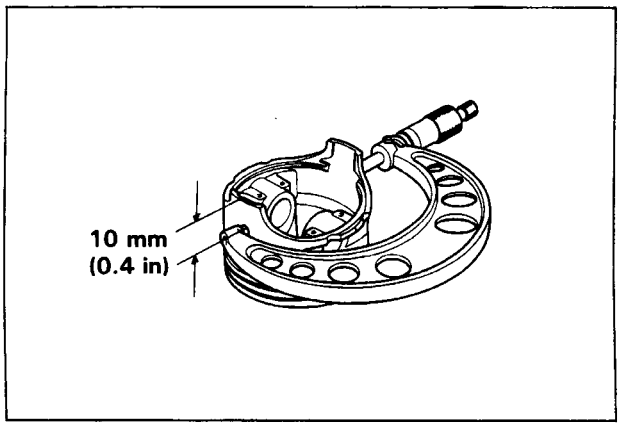
4. INSPECTION

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

• PISTON SKIRT O.D.

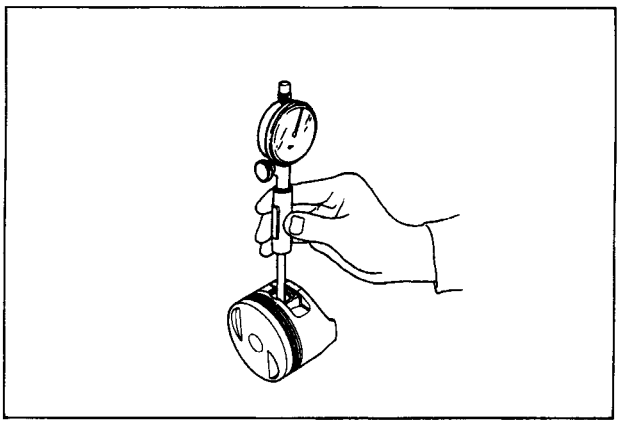
Measure and record the piston O.D. at a point 10 mm (0.4 in) from the bottom, and 90° to the piston pin bore.

STANDARD	SERVICE LIMIT
57.970 – 57.990 mm (2.2823 – 2.2831 in)	57.92 mm (2.280 in)



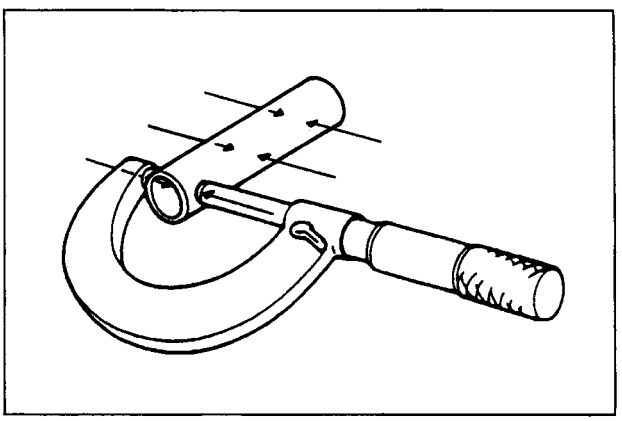
• PISTON PIN HOLE I.D.

STANDARD	SERVICE LIMIT
14.002 – 14.008 mm (0.5513 – 0.5515 in)	14.02 mm (0.552 in)



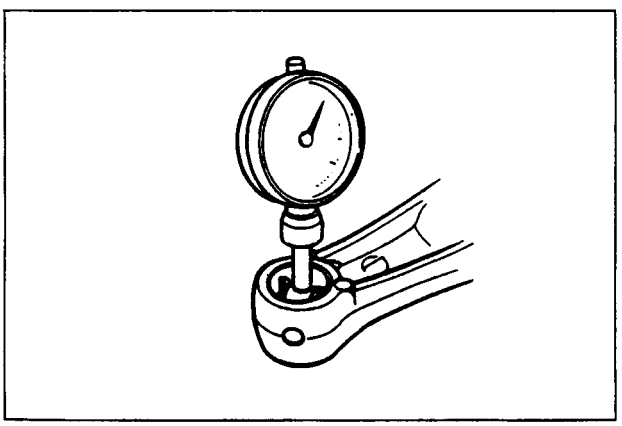
• PISTON PIN O.D.

STANDARD	SERVICE LIMIT
13.994 – 14.000 mm (0.5509 – 0.5512 in)	13.97 mm (0.550 in)



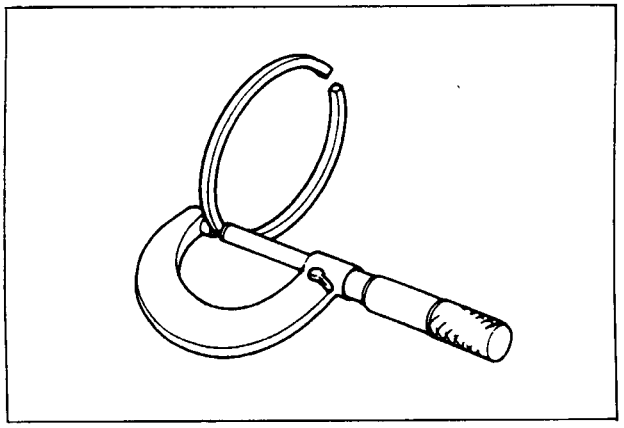
• CONNECTING ROD SMALL END I.D.

STANDARD	SERVICE LIMIT
14.010 – 14.022 mm (0.5516 – 0.5520 in)	14.05 mm (0.553 in)



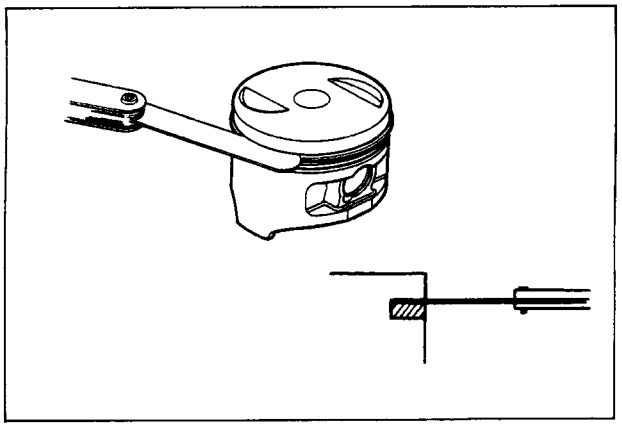
• PISTON RING WIDTH

	STANDARD	SERVICE LIMIT
TOP	1.175 – 1.190 mm (0.0463 – 0.0469 in)	1.08 mm (0.043 in)
SECOND	1.175 – 1.190 mm (0.0463 – 0.0469 in)	1.08 mm (0.043 in)



• PISTON RING SIDE CLEARANCE

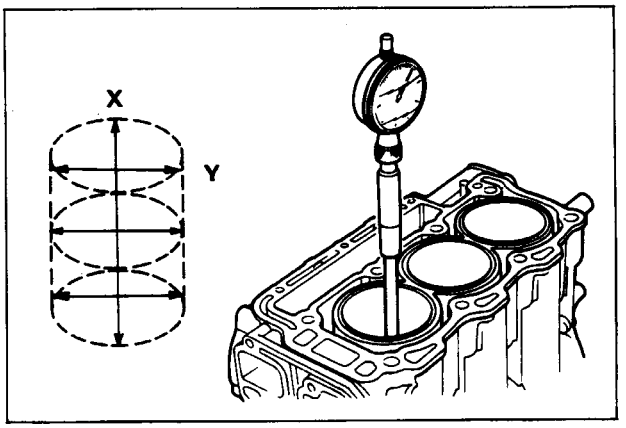
	STANDARD	SERVICE LIMIT
TOP	0.025 – 0.055 mm (0.0010 – 0.0022 in)	0.1 mm (0.004 in)
SECOND	0.025 – 0.055 mm (0.0010 – 0.0022 in)	0.1 mm (0.004 in)
OIL	0.055 – 0.140 mm (0.0022 – 0.0055 in)	0.2 mm (0.008 in)



• 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
58.000 – 58.015 mm (2.2835 – 2.2841 in)	58.055 mm (2.2856 in)

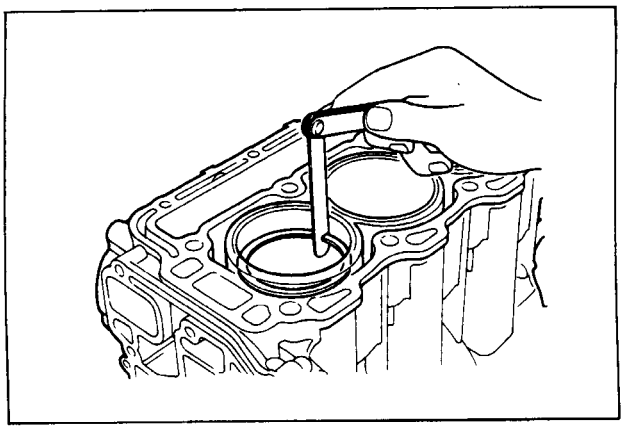


• PISTON-TO-CYLINDER CLEARANCE

STANDARD	SERVICE LIMIT
0.010 – 0.045 mm (0.0004 – 0.0018 in)	0.1 mm (0.004 in)

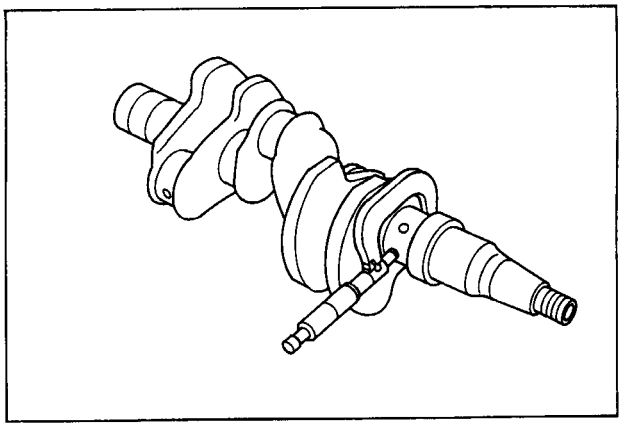
• PISTON RING END GAP

	STANDARD	SERVICE LIMIT
TOP	0.15 – 0.30 mm (0.006 – 0.012 in)	0.5 mm (0.02 in)
SECOND	0.35 – 0.50 mm (0.014 – 0.020 in)	0.7 mm (0.03 in)
OIL	0.20 – 0.80 mm (0.008 – 0.031 in)	1.0 mm (0.04 in)



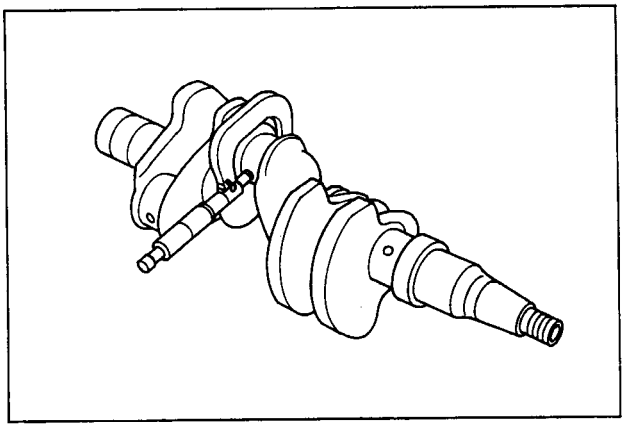
• CRANKSHAFT MAIN JOURNAL O.D.

STANDARD	SERVICE LIMIT
35.986 – 36.002 mm (1.4168 – 1.4174 in)	35.96 mm (1.416 in)



• CRANKPIN O.D.

STANDARD	SERVICE LIMIT
31.987 – 32.011 mm (1.2593 – 1.2603 in)	31.96 mm (1.258 in)



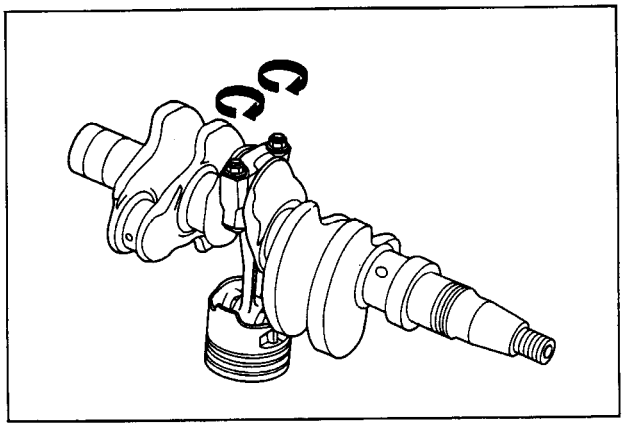
• CONNECTING ROD BIG END OIL CLEARANCE

1) Clean all oil from the crankpin and connecting rod bearing surfaces.
2) Place a piece of plastigauge on the crankpin, install the connecting rod and cap and tighten the nuts.

TORQUE: 24 N·m (2.4 kg-m, 17.4 ft-lb)

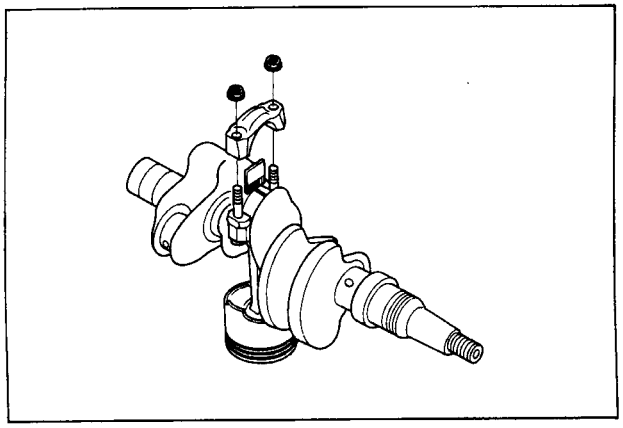
NOTE

- Do not rotate the crankshaft while the plastigauge is in place.



3) Remove the connecting rod and measure the plastigauge.

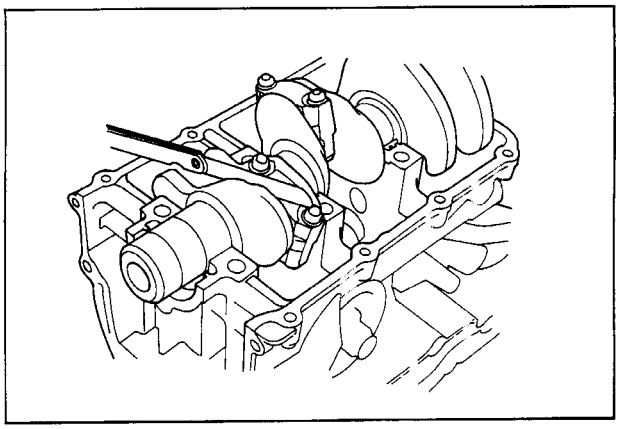
STANDARD	SERVICE LIMIT
0.010 – 0.028 mm (0.0004 – 0.0011 in)	0.4 mm (0.01 in)



• CONNECTING ROD BIG END AXIAL CLEARANCE

Measure the clearances with a feeler gauge.

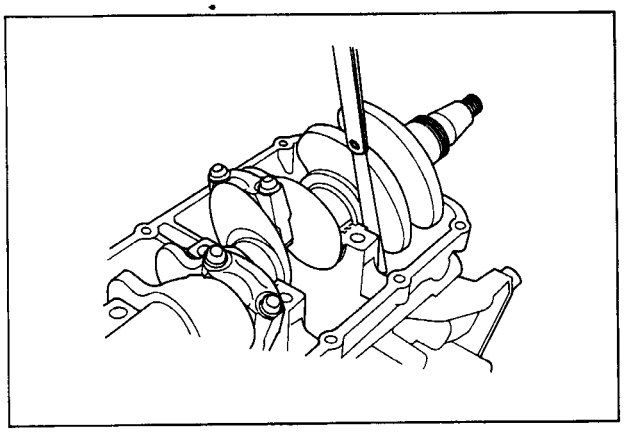
STANDARD	SERVICE LIMIT
0.12 – 0.27 mm (0.005 – 0.011 in)	0.4 mm (0.01 in)



• CRANKSHAFT SIDE CLEARANCE

Measure the clearances with a feeler gauge.

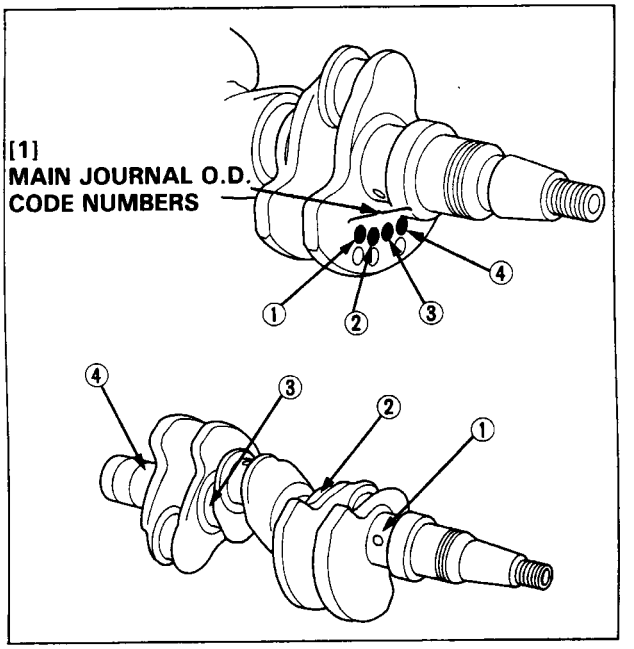
STANDARD	SERVICE LIMIT
0.05 – 0.30 mm (0.002 – 0.012 in)	0.45 mm (0.018 in)



5. BEARING SELECTION

a. MAIN BEARING

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



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

NOTE

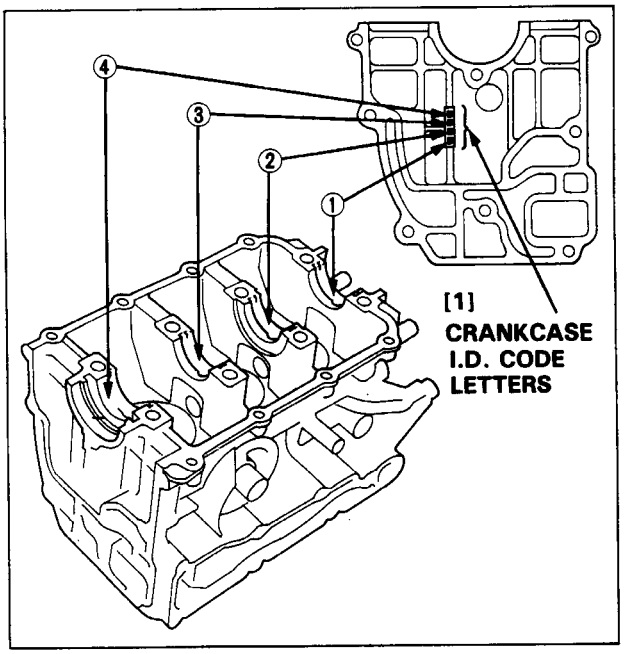
- Numbers on the crankcase are the codes for main journal I.D.s from front to rear.

3) Cross reference the case and journal codes to determine the replacement bearing color code.

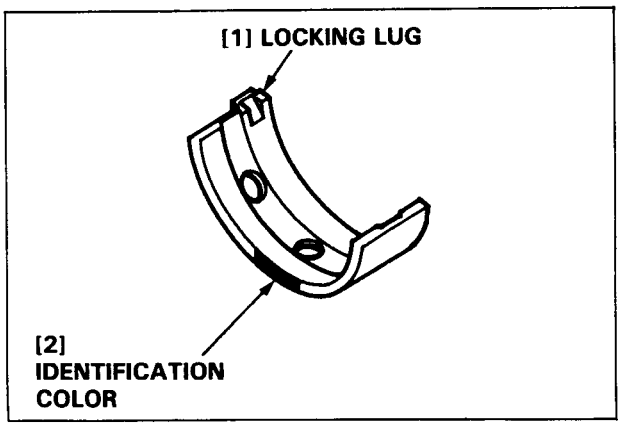
STANDARD OIL CLEARANCE	0.020—0.044 mm (0.0008—0.0017 in)

Unit: mm (in)

Crankcase I.D. 39φ / Crankshaft O.D. 36φ		Mark A	Mark B	Mark C
		O-Less than 0.008 (0.0003)	0.008 (0.0003)-Less than 0.016 (0.0006)	0.016 (0.0006)-Less than 0.024 (0.0009)
Mark 1	Less than 0.002 (0.00008)--0.006 (-0.0002)	RED	PINK	YELLOW
Mark 2	Less than -0.006 (-0.0002)--0.014 (-0.0006)	PINK	YELLOW	GREEN

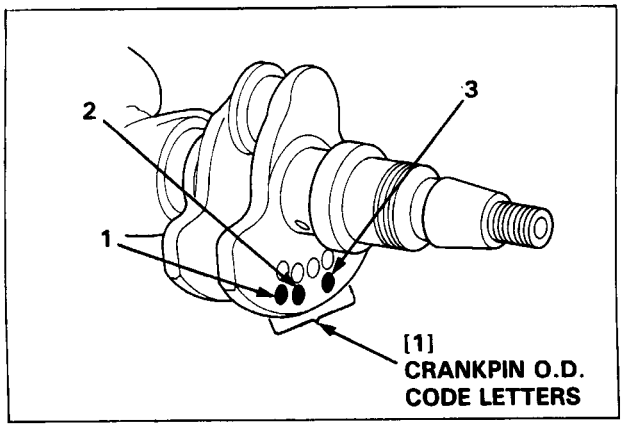


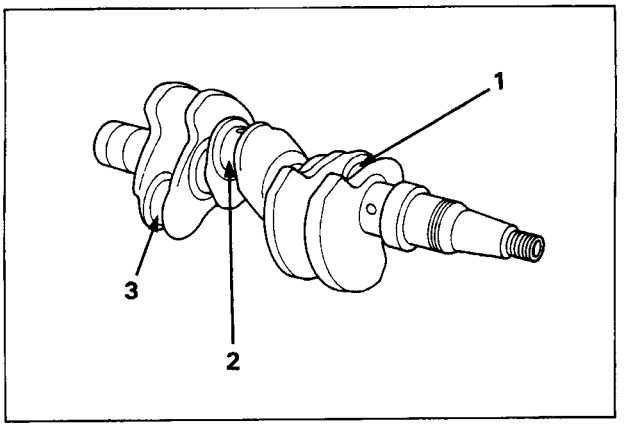
ASSEMBLY:
Make sure the locking lug on each bearing fits in the notch in the bearing saddle.
Be careful not to damage the bearings.



b. CONNECTING ROD BEARING

1) Record the crankpin O.D. code letters (or measure the crankpin journal O.D.)



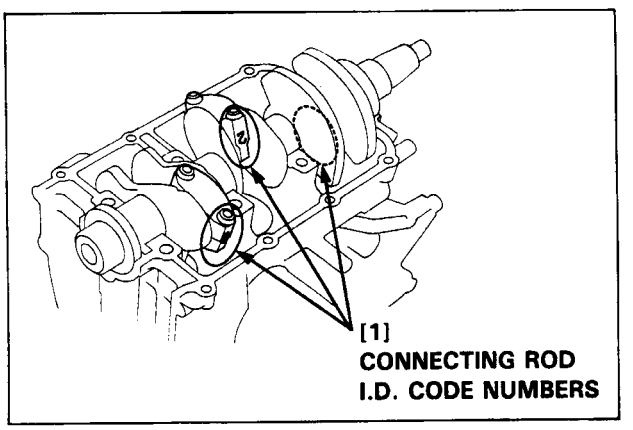


2) Record the connecting rod I.D. code numbers or measure the I.D. with the bearing cap installed without bearing inserts.
3) Cross-reference the crankpin and rod codes to determine the replacement bearing color.

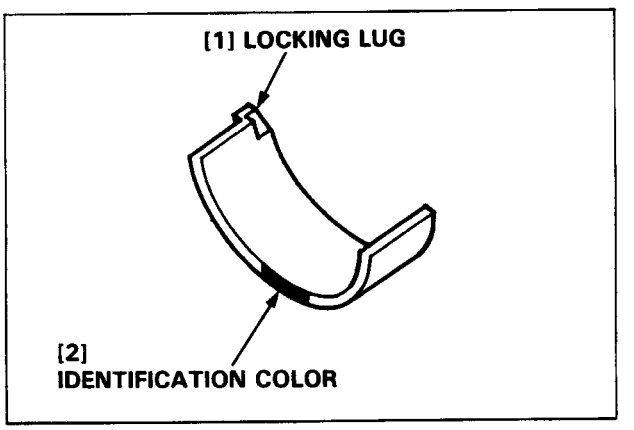
STANDARD OIL CLEARANCE	0.018—0.042 mm (0.0007—0.0017 in)

Unit: mm (in)

Crank pin O.D. 32φ / Connecting rod I.D. 38φ		Mark A	Mark B	Mark C
		Less than 0.011(0.0004)— 0.003(0.0001)	Less than 0.003(0.0001)— —0.005(—0.0002)	Less than —0.005(0.0002)— —0.013(0.0005)
Mark 1	O-Less than 0.008(0.0003)	RED	YELLOW	GREEN
Mark 2	0.008(0.0003)— Less than 0.016(0.0006)	YELLOW	GREEN	BROWN
Mark 3	0.016(0.0006)— Less than 0.024(0.0009)	GREEN	BROWN	BLACK



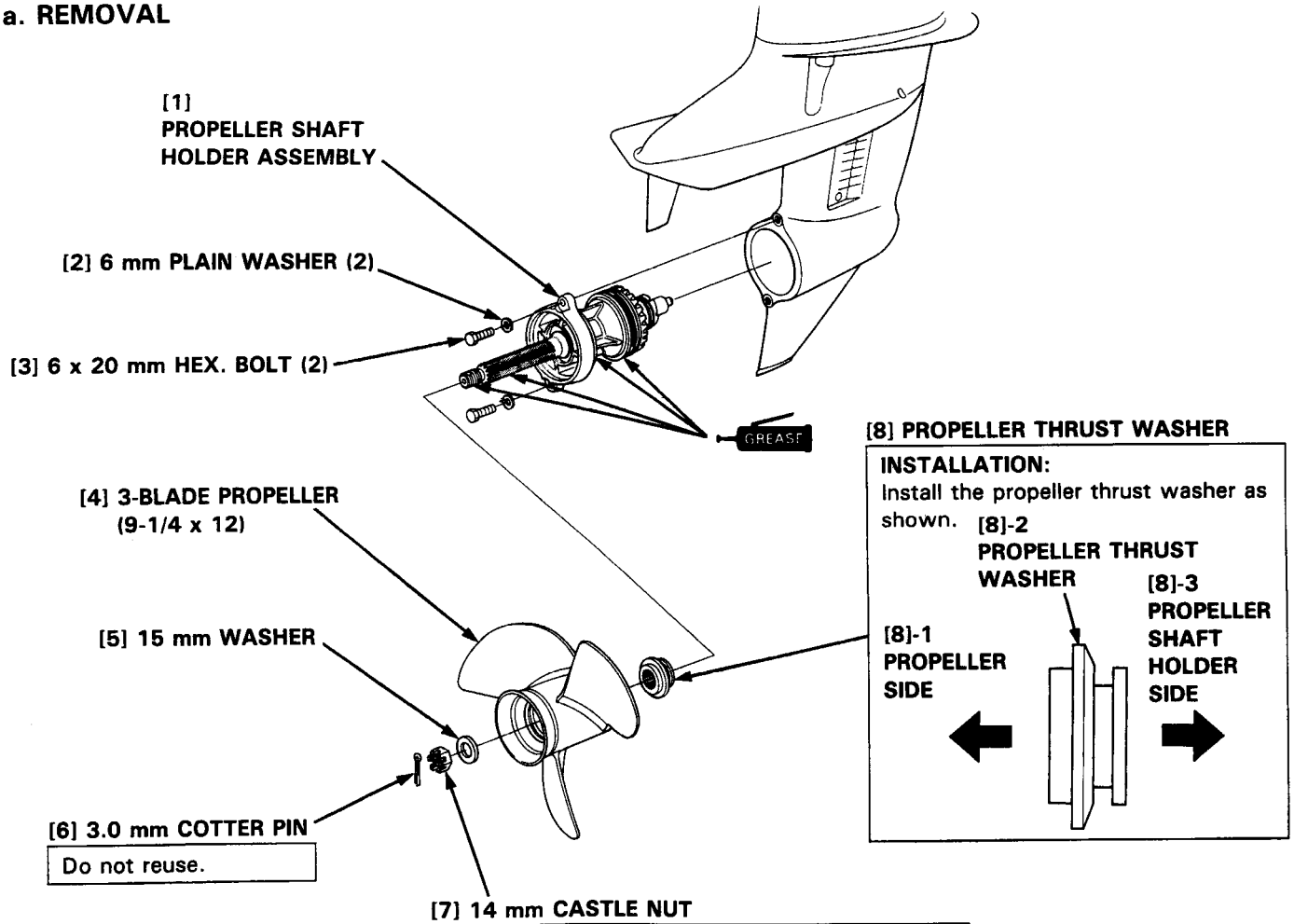
ASSEMBLY:
Be careful not to damage the bearings.
Make sure the locking lug on each bearing fits into the notch in the connecting rod.



NOTE:
When replacing any parts in the lower unit, refer to the Lower Unit Shimming Guide page 12-15.

1. PROPELLER/PROPELLER SHAFT HOLDER ASSEMBLY

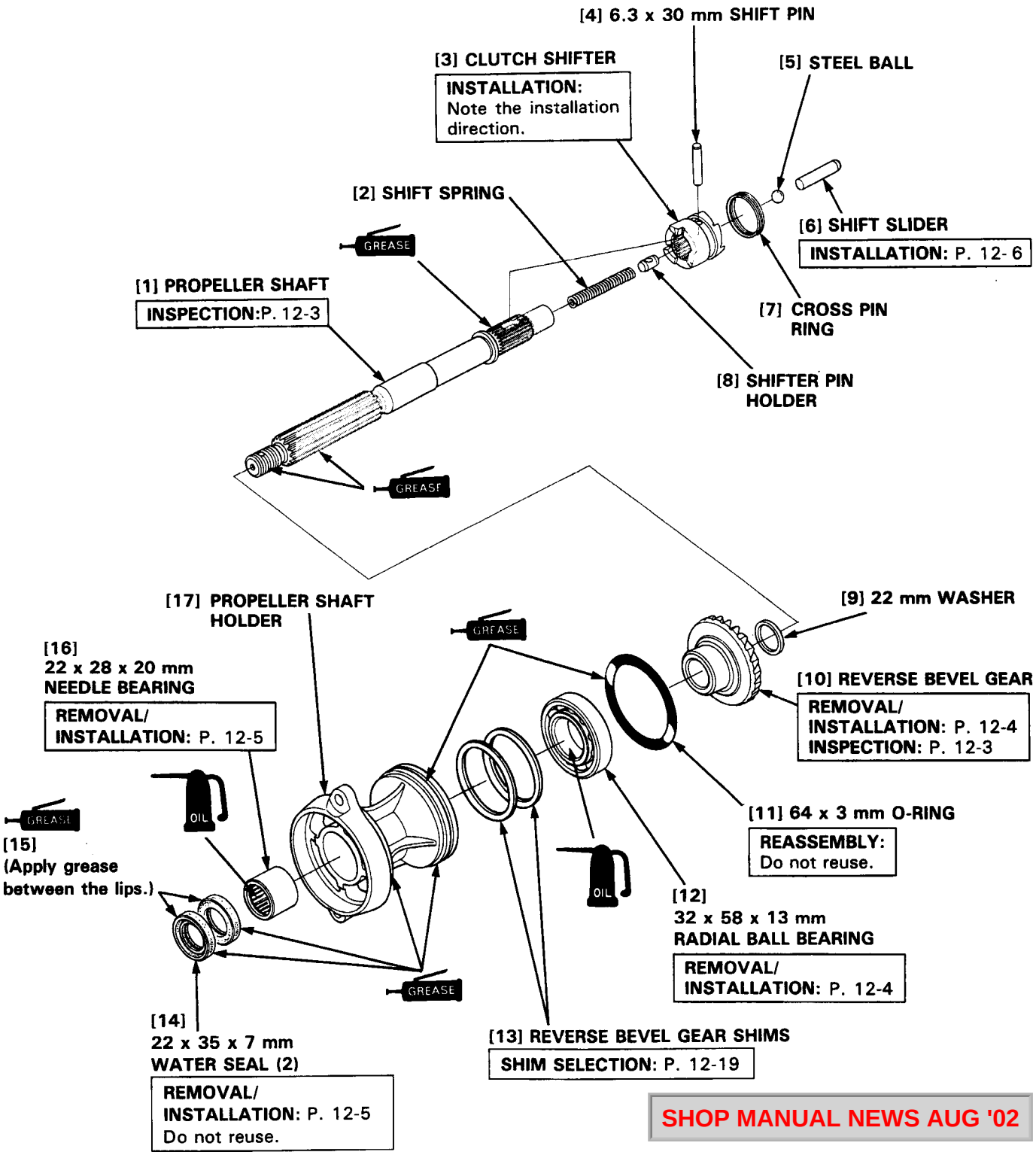
a. REMOVAL



NOTE:
When replacing any parts in the lower unit, refer to the Lower Unit Shimming Guide page 12-15.

2. PROPELLER SHAFT/PROPELLER SHAFT HOLDER

a. DISASSEMBLY/ASSEMBLY



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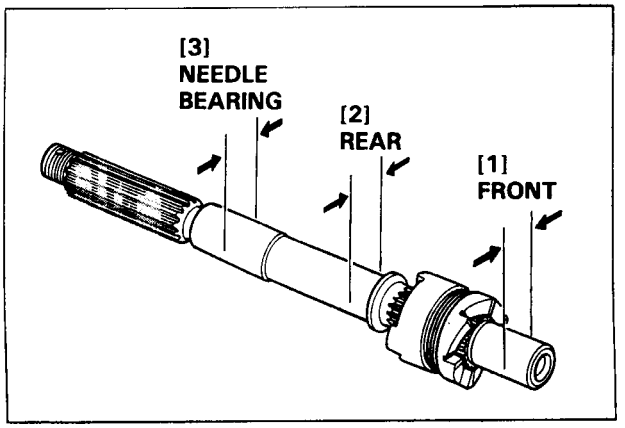
NOTE:
When replacing any parts in the lower unit, refer to the Lower Unit Shimming Guide page 12-15.

b. INSPECTION

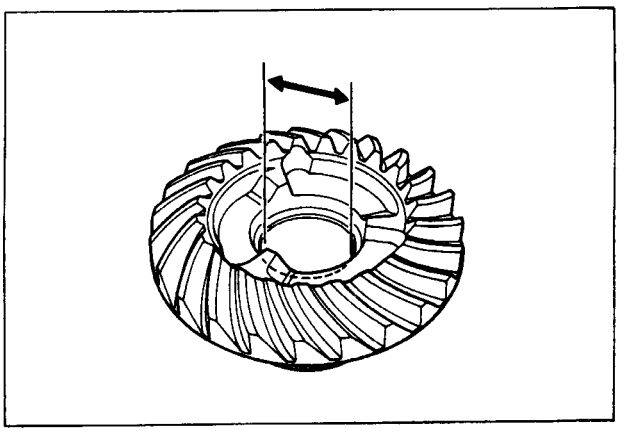
• PROPELLER SHAFT O.D.

	STANDARD	SERVICE LIMIT
Front	18.967—18.980 mm (0.7467—0.7472 in)	18.946 mm (0.7459 in)
Rear	20.9—21.2 mm (0.82—0.83 in)	20.85 mm (0.821 in)
At needle bearing	22.007—22.020 mm (0.8664—0.8669 in)	21.99 mm (0.866 in)



• REVERSE BEVEL GEAR I.D.

STANDARD	SERVICE LIMIT
22.05—22.30 mm (0.868—0.878 in)	22.35 mm (0.880 in)



• REVERSE BEVEL GEAR/32 x 58 x 13 mm RADIAL BALL BEARING

REMOVAL:

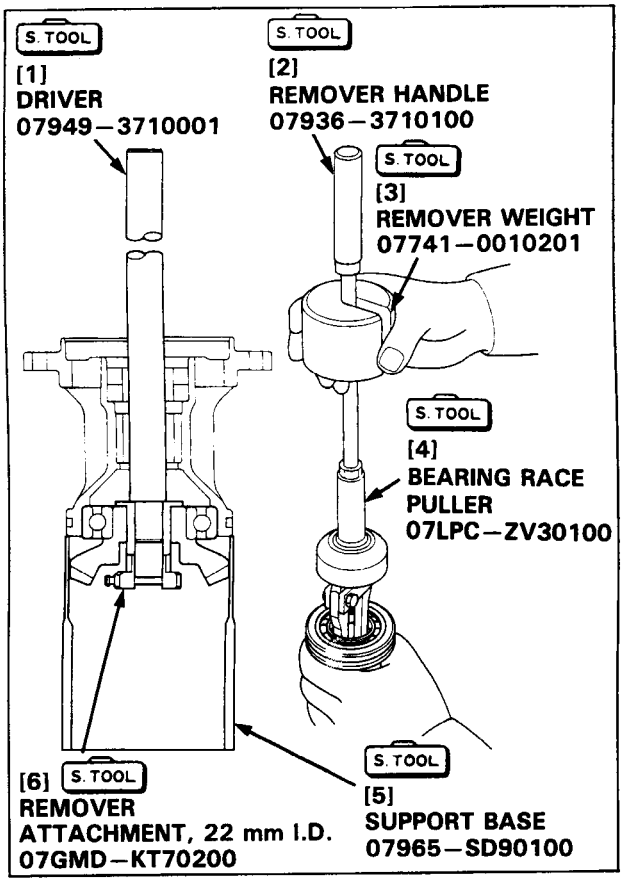
1) Remove the reverse bevel gear using a hydraulic press and the special tools.
2) Remove the bearing using the special tools.

CAUTION

- **Remove the reverse bevel gear using a hydraulic press. Never remove it by striking with a hammer.**
- **Replace the bearing on disassembly.**

TOOLS:

Driver	07949–3710001
Remover attachment, 22 mm I.D.	07GMD–KT70200
Support base	07965–SD90100
Bearing race puller	07LPC–ZV30100
Remover weight	07741–0010201
Remover handle	07936–3710100

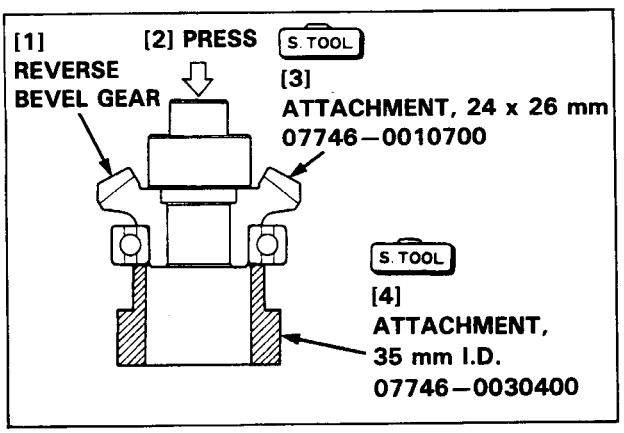


INSTALLATION:

1) Install the reverse bevel gear on the bearing using the special tools.

TOOLS:

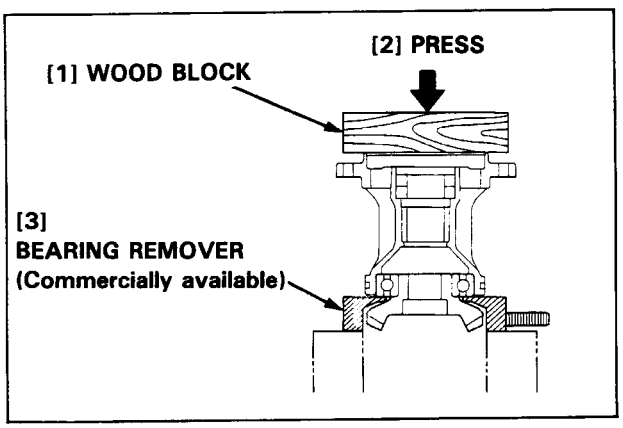
Attachment, 35 mm I.D.	07746–0030400
Attachment, 24 x 26 mm	07746–0010700



2) Set the bearing/gear assembly from step 1 above, and install the bearing/gear assembly on the propeller shaft holder using the bearing remover (commercially available) and a hydraulic press.

CAUTION

- **Install the bearing/gear assembly using a hydraulic press. Never install it by striking with a hammer. Take care not to damage the O-ring.**

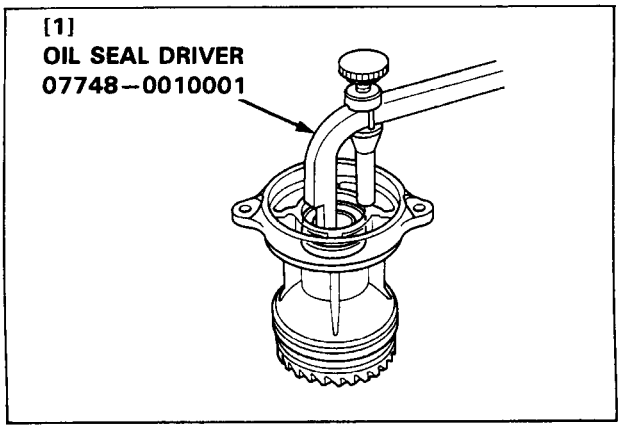


• 22 x 35 x 7 mm WATER SEAL

REMOVAL/INSTALLATION:
Remove/install the water seals using the special tools.

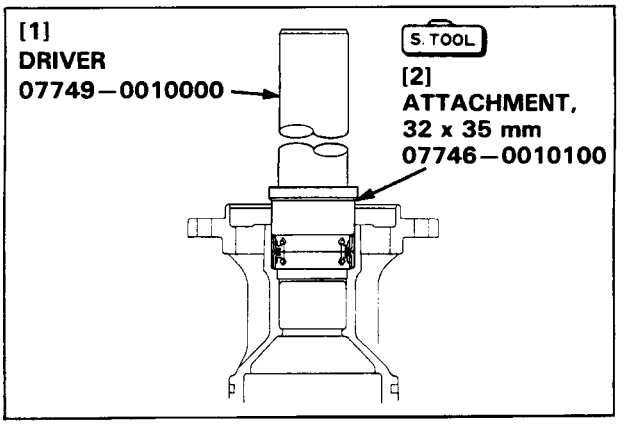
TOOLS:

Oil seal remover	**07748—0010001**
Driver	**07749—0010000**
Attachment, 32 x 35 mm	**07746—0010100**



NOTE

- Replace the water seals on removal.
- Install the water seals in the direction as shown.

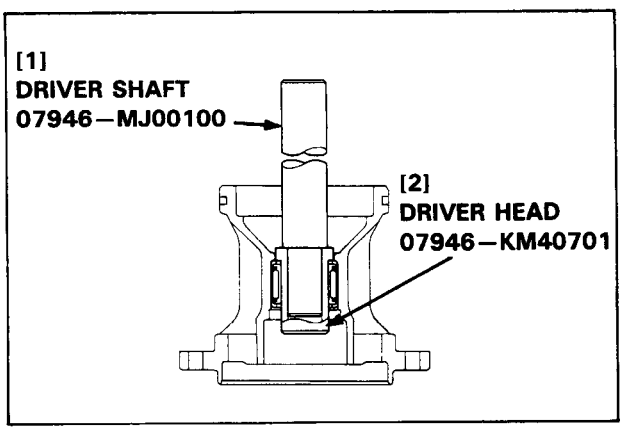


• 22 x 28 x 20 mm NEEDLE BEARING

REMOVAL:
Attach the special tools to the gear case side and drive out the needle bearing.

TOOLS:

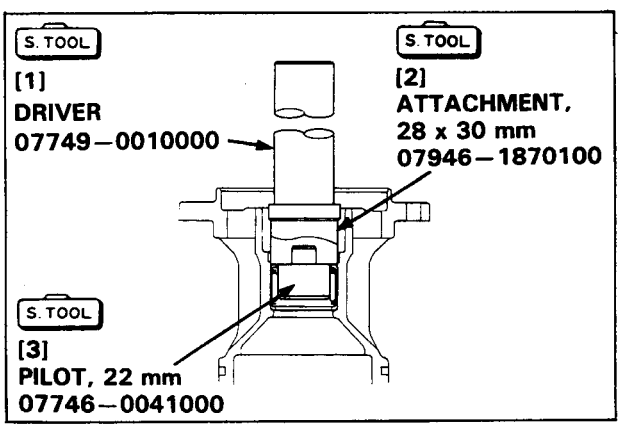
Driver shaft	**07946—MJ00100**
Driver head	**07946—KM40701**



INSTALLATION:
Drive in the needle bearing from the propeller side using the special tools.

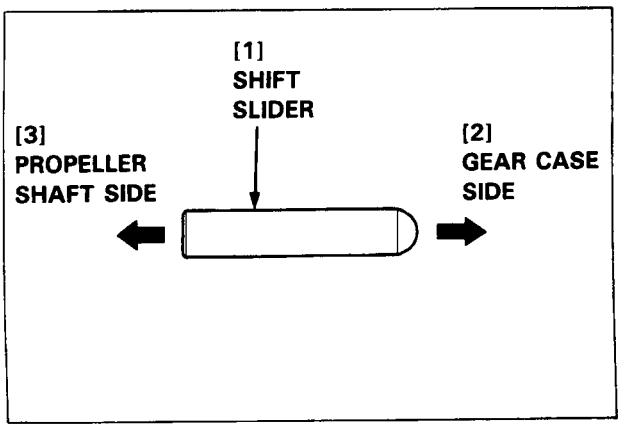
TOOLS:

Driver	**07749—0010000**
Attachment, 28 x 30 mm	**07946—1870100**
Pilot, 22 mm	**07746—0041000**



• **SHIFT SLIDER**

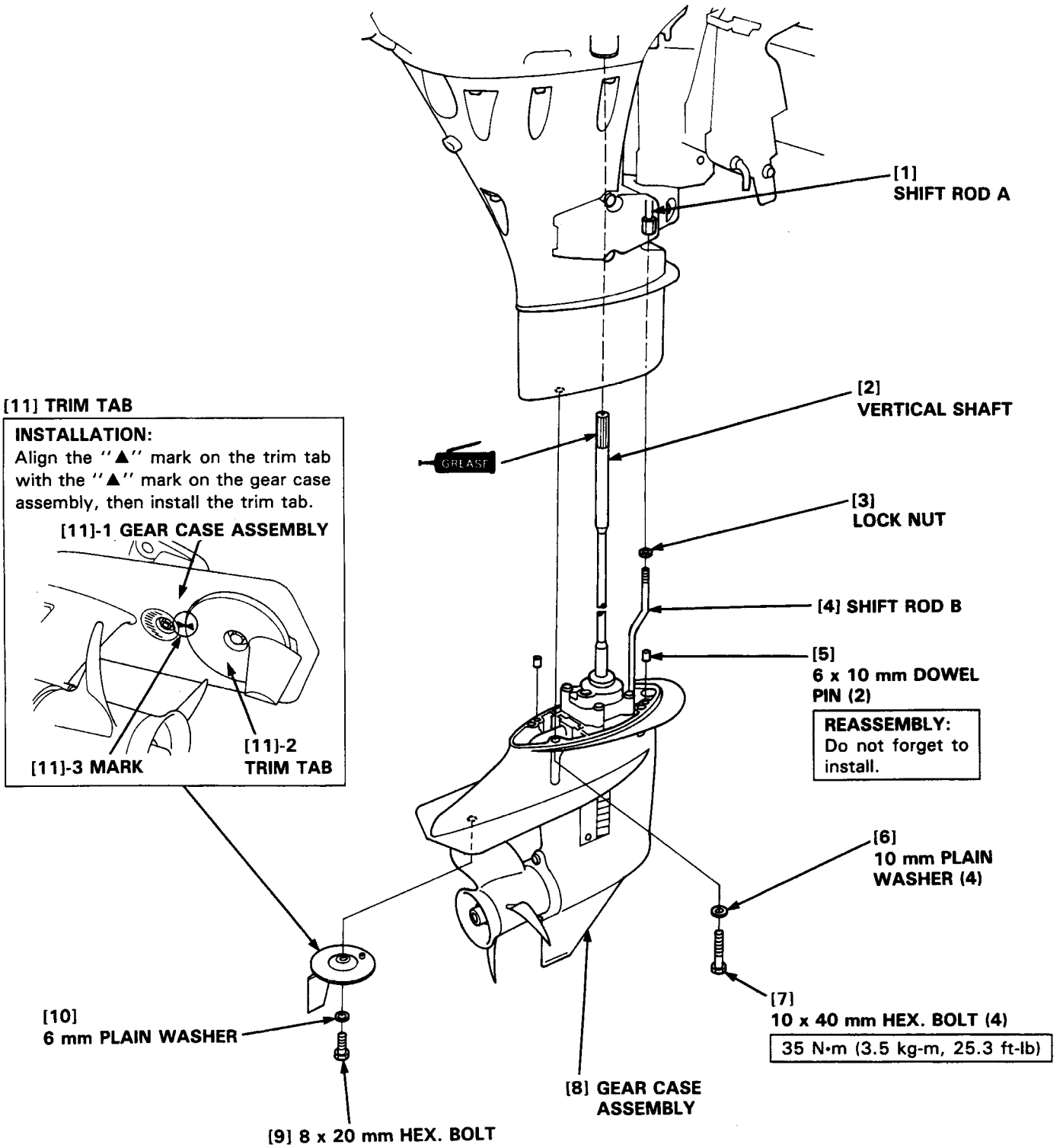
INSTALLATION:
Note the installation direction.



3. GEAR CASE ASSEMBLY

REMOVAL/INSTALLATION

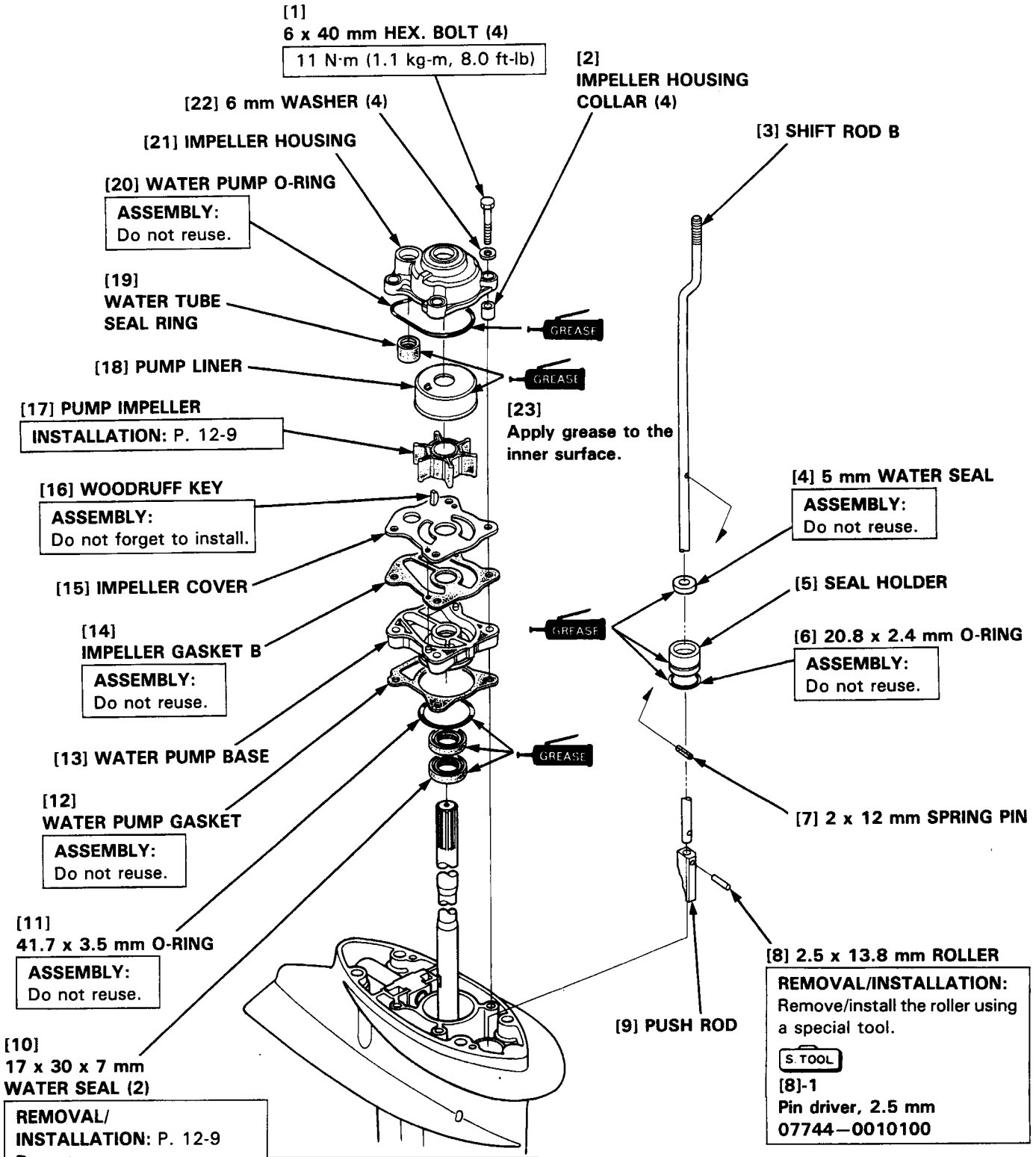
1) Move the shift lever to the "R" position, loosen the lock nut and adjusting nut connecting the shift rod A and B, and disconnect the shift rods.



4. WATER PUMP

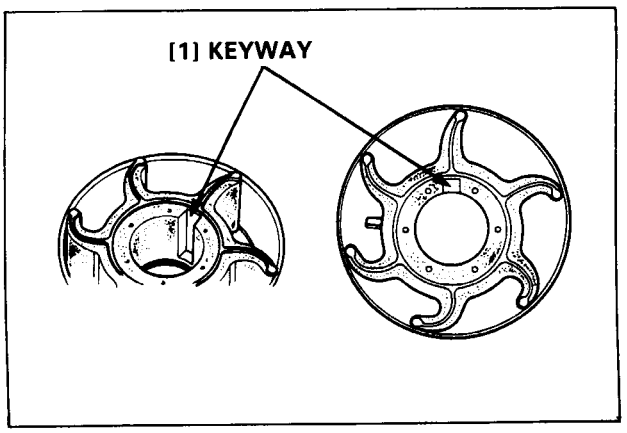
DISASSEMBLY/ASSEMBLY

Remove the gear case assembly (P. 12-7).



• **IMPELLER**

INSTALLATION:
Check the impeller for wear or cracks.
Install the impeller by turning it counterclockwise with the open end of the keyway toward the bottom of the outboard motor.



• **17 x 30 x 7 mm WATER SEAL**

REMOVAL/INSTALLATION:
Remove/install the water seals using the special tools.

TOOLS:

Oil seal remover	**07748—0010001**
Driver	**07749—0010000**
Attachment, 28 x 30 mm	**07946—1870100**

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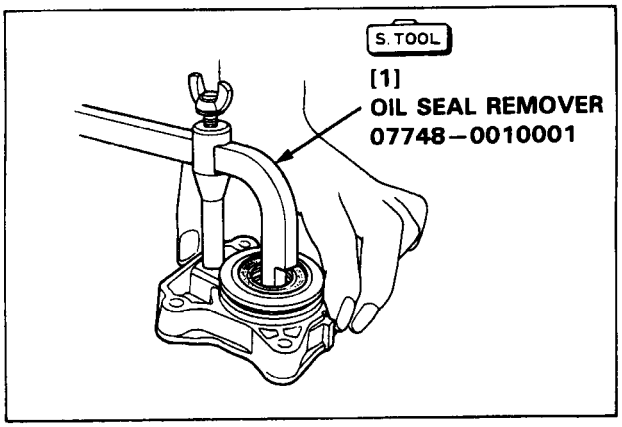
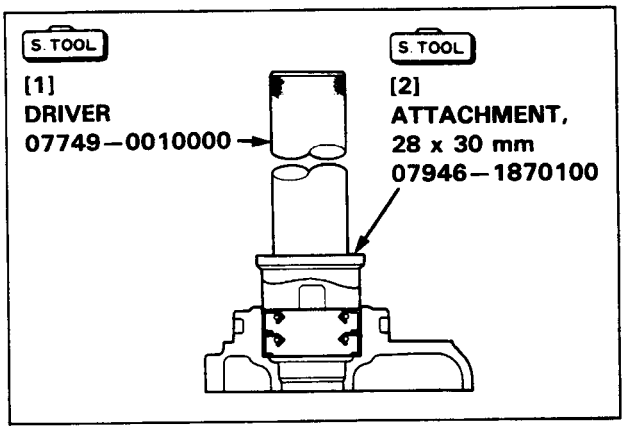


NOTE

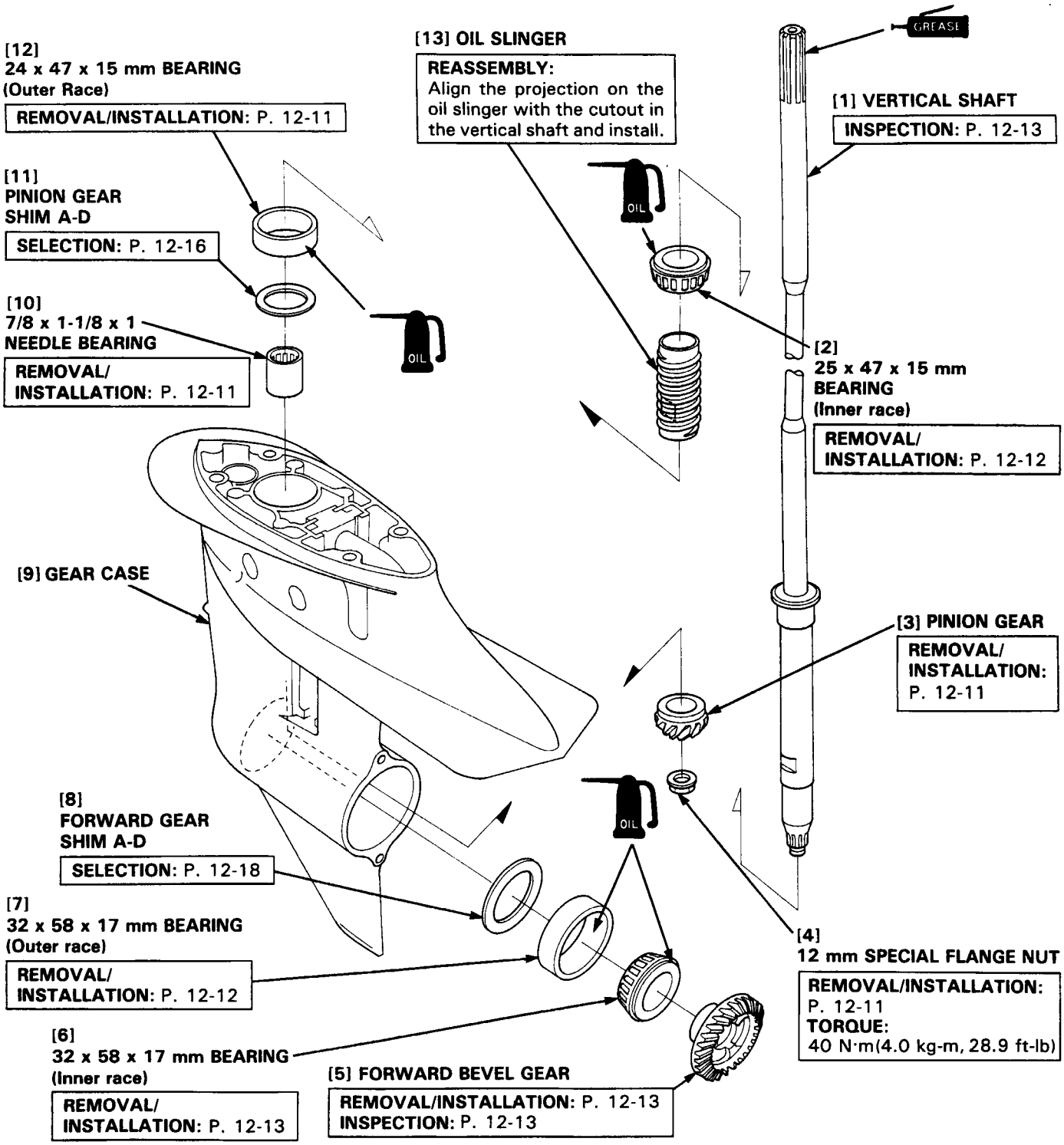
- Replace the water seals on removal.
- Install the water seals in the direction as shown.



5. VERTICAL SHAFT/BEVEL GEAR

a. DISASSEMBLY/ASSEMBLY

1) Remove the gear case assembly (P. 12-7) and the propeller shaft holder assembly (P. 12-1).



NOTE:
When replacing any parts in the lowe unit, refer to the Lower Unit Shimming Guide page 12-15.

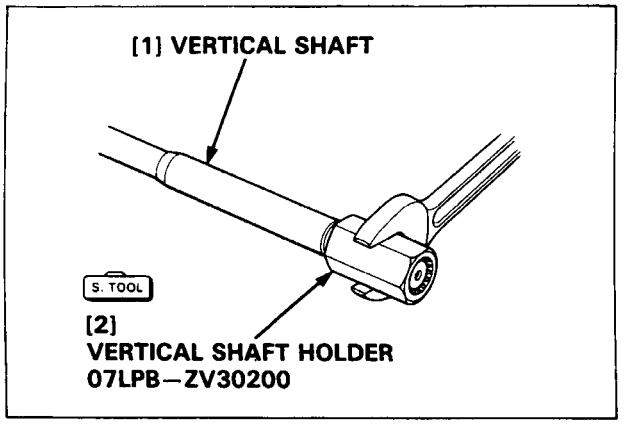
• 10 mm SPECIAL FLANGE NUT

REMOVAL/INSTALLATION:

Remove/install the 10 mm special flange nut by holding the vertical shaft with the special tool.

TOOL:

Vertical shaft holder	**07LPB–ZV30200**



• 7/8 x 1-1/8 x 1 NEEDLE BEARING

REMOVAL/INSTALLATION:

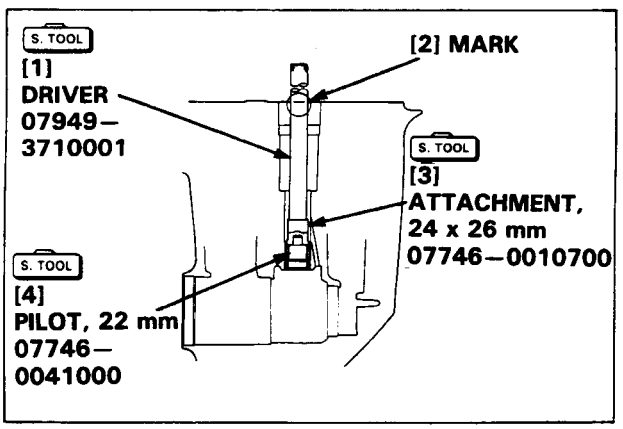
Remove/install the needle bearing using the special tools.

NOTE

- Mark the gear case upper surface position on the driver (special tool) before removing the bearing. Drive in the bearing to the marked position and install the bearing so that the bottom surface of the bearing is flush with the bottom surface of the gear case.

TOOLS:

Driver	**07949–3710001**
Attachment, 24 x 26 mm	**07746–0010700**
Pilot, 22 mm	**07746–0041000**



• 25 x 47 x 15 mm BEARING (Outer race)

REMOVAL/INSTALLATION:

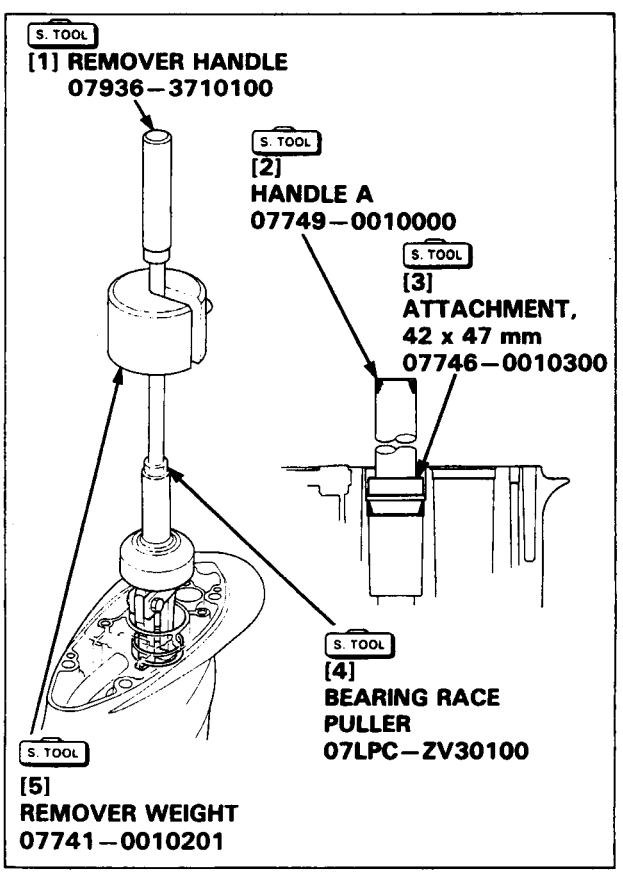
Remove/install the bearing (outer race) using the special tools.

NOTE

- Drive in the bearing with the larger I.D. side toward out.

TOOLS:

Bearing race puller	**07LPC–ZV30100**
Remover weight	**07741–0010201**
Remover handle	**07936–3710100**
Handle A	**07749–0010000**
Attachment, 42 x 47 mm	**07746–0010300**



• 32 x 58 x 17 mm BEARING (Outer race)

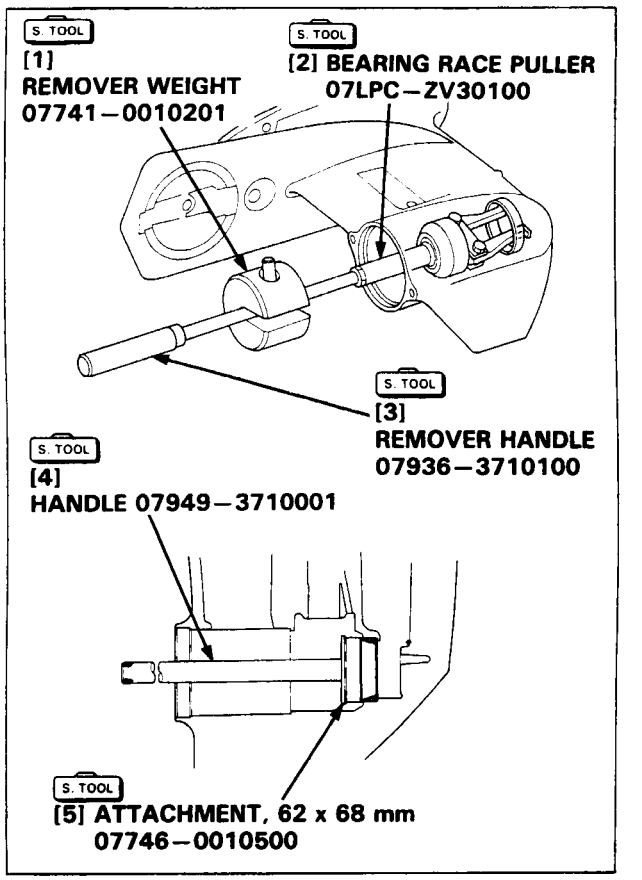
REMOVAL/INSTALLATION:
Remove/install the bearing (outer race) using the special tools.

NOTE

- Drive in the bearing with the larger I.D. side toward out.

TOOLS:

Bearing race puller	**07LPC–ZV30100**
Remover weight	**07741–0010201**
Remover handle	**07936–3710100**
Handle	**07949–3710001**
Attachment, 62 x 68 mm	**07746–0010500**



• 25 x 47 x 15 mm BEARING (Inner race)

REMOVAL:
Set the 10 mm special flange nut on the pinion gear installation section of the vertical shaft, set the special tool as shown, and remove the bearing (inner race) using the hydraulic press.

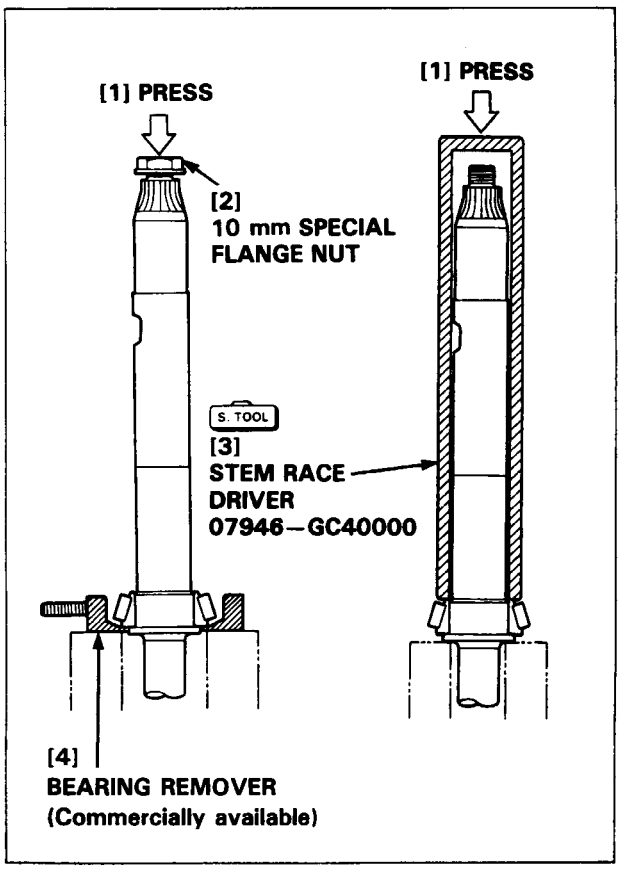
TOOL:

Universal bearing puller	**07631–0010000**

INSTALLATION:
Install the bearing (inner race) using the special tool.

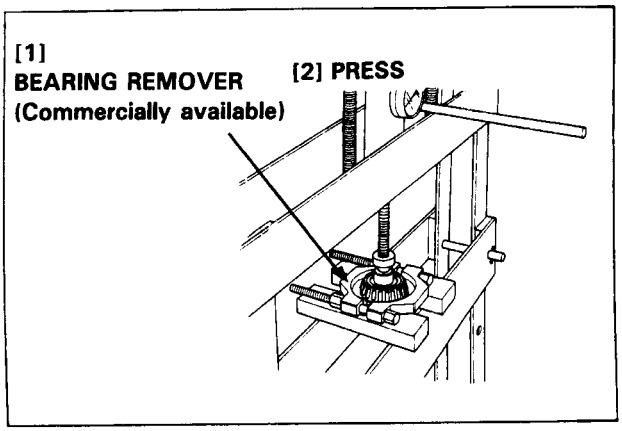
TOOL:

Stem race driver	**07946–GC40000**



• 32 x 58 x 17 mm BEARING (Inner race)

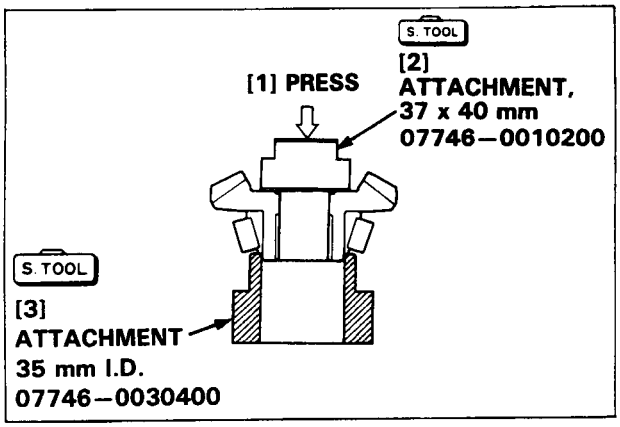
REMOVAL:
Set the special tool as shown and remove the 32 x 58 x 17 mm bearing using the hydraulic press.



INSTALLATION:
Set the special tools as shown and install the 32 x 58 x 17 mm bearing using the hydraulic press.

TOOLS:

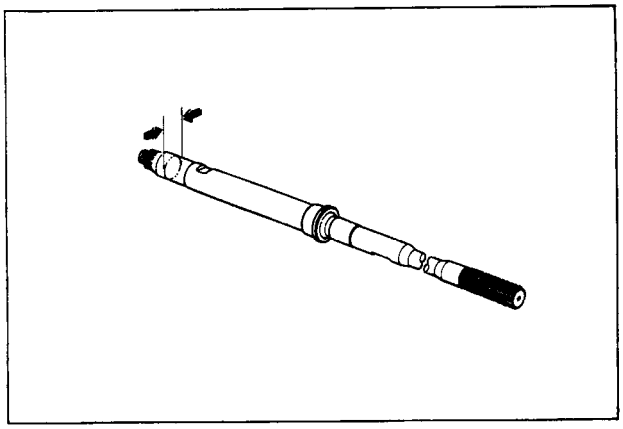
Inner driver, 35 mm	**07746–0030400**
Attachment, 37 x 40 mm	**07746–0010200**



b. INSPECTION

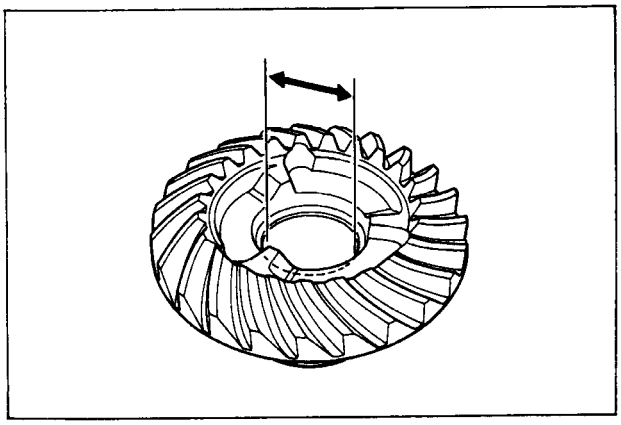
• VERTICAL SHAFT O.D. (at needle bearing)

STANDARD	SERVICE LIMIT
22.217–22.230 mm (0.8747–0.8752 in)	22.196 mm (0.8739 in)



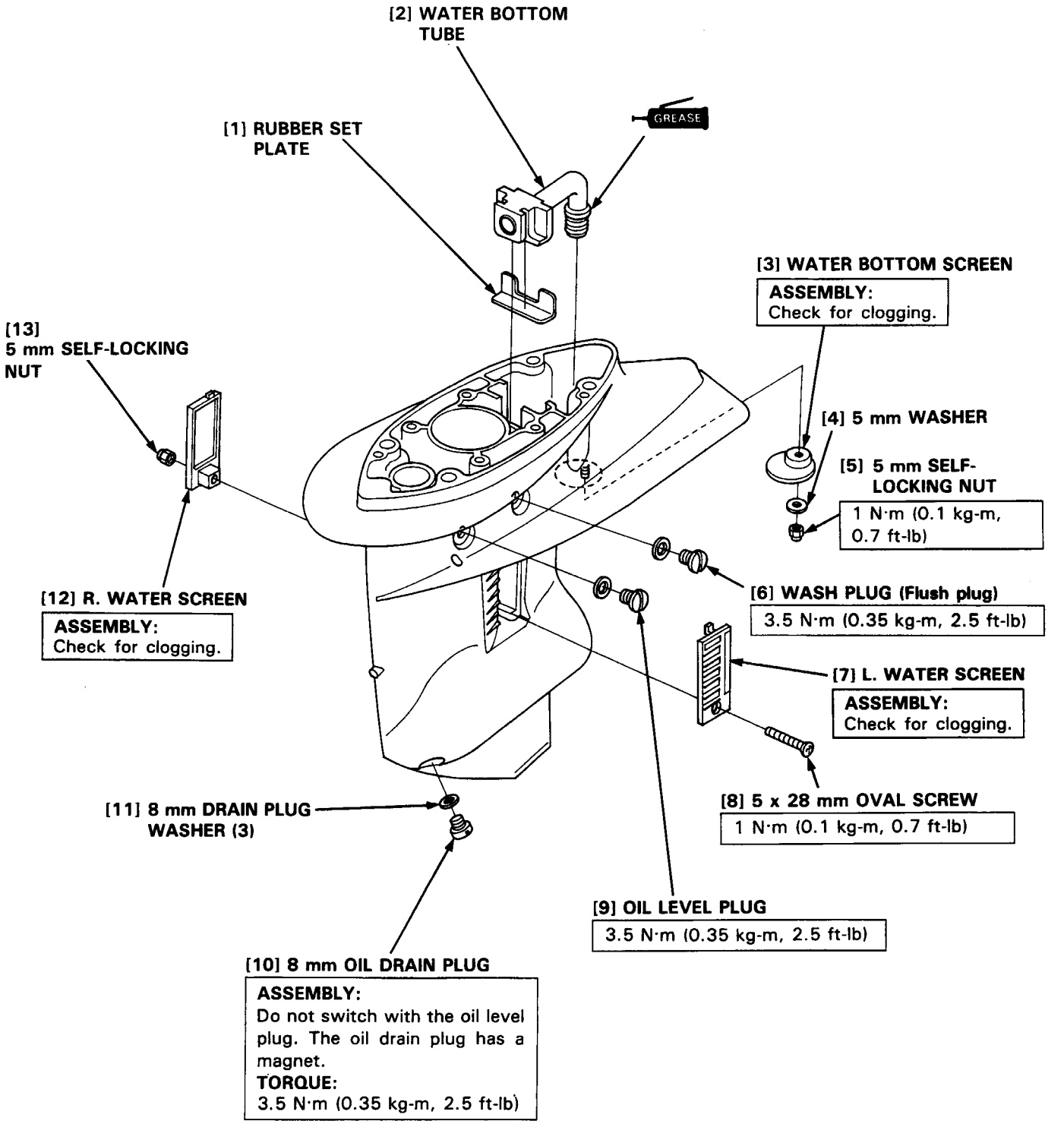
• FORWARD BEVEL GEAR I.D.

STANDARD	SERVICE LIMIT
19.000–19.021 mm (0.7480–0.7489 in)	19.04 mm (0.750 in)



6. WATER SCREEN

DISASSEMBLY/ASSEMBLY

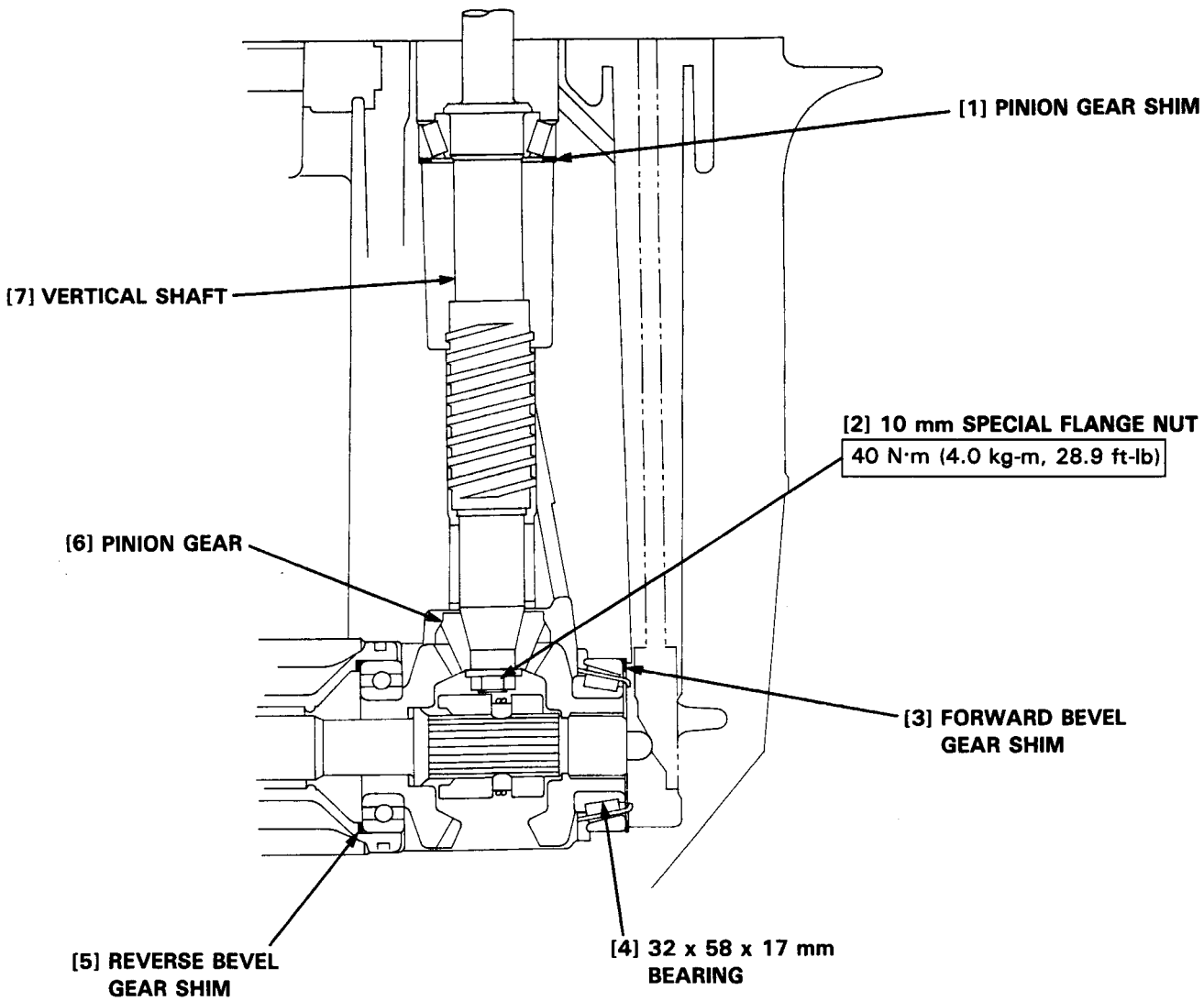


7. SHIM SELECTION

When replacing any parts in the lower unit, refer to the Lower Unit Shimming Guide below.

LOWER UNIT SHIMMING GUIDE			
Legend		REPLACEMENT PART	SHIMMING OPERATION REQUIRED
Operation	Gode		
Pinion Gear Shim	P	Gear Case	P, F, R, and BL
Forward Bevel Gear Shim	F	Vertical Shaft, Bearing, and or Pinion gear	P and BL
Reverse Bevel Gear Shim	R	Forward Bevel Gear Bearing	F and BL
Backlash Check-Adjust	BL	Forward or Reverse Bevel Gear	BL
		Propeller Shaft Holder and or Bearing(s)	BL

NOTE:
Shimming is not required when any of the remaining parts in the lower unit are replaced.

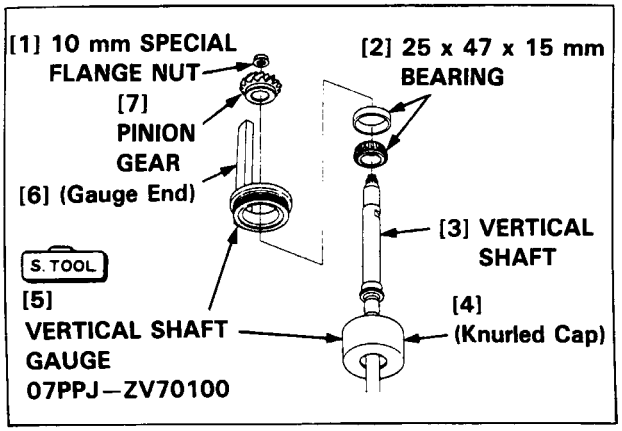


• PINION GEAR SHIM SELECTION

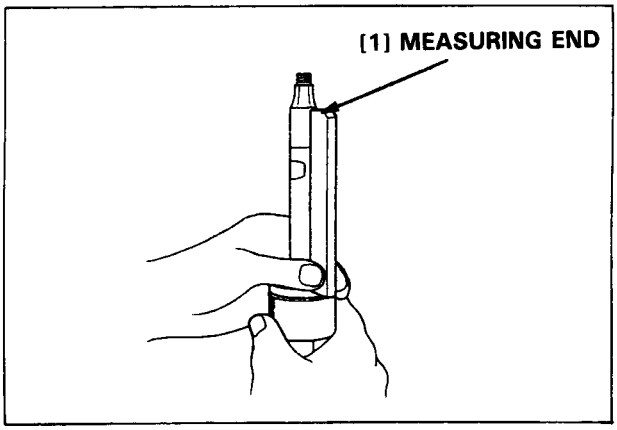
1) Clean and lightly oil all items shown in the illustration. Install the 25 x 47 x 15 mm bearing (inner race) on the vertical shaft (P. 12-12). Place the bearing outer race over the bearing inner race.

TOOL:
Vertical shaft gauge **07PPJ–ZV70100**

2) Position the gauge end of the special tool over the vertical shaft and slide the knurled cap over the vertical shaft as shown.



3) Hold the gauge end of the special tool as shown. Then hand tighten the knurled cap onto the gauge end securely. After tightening, there should be no side play at the measuring end.

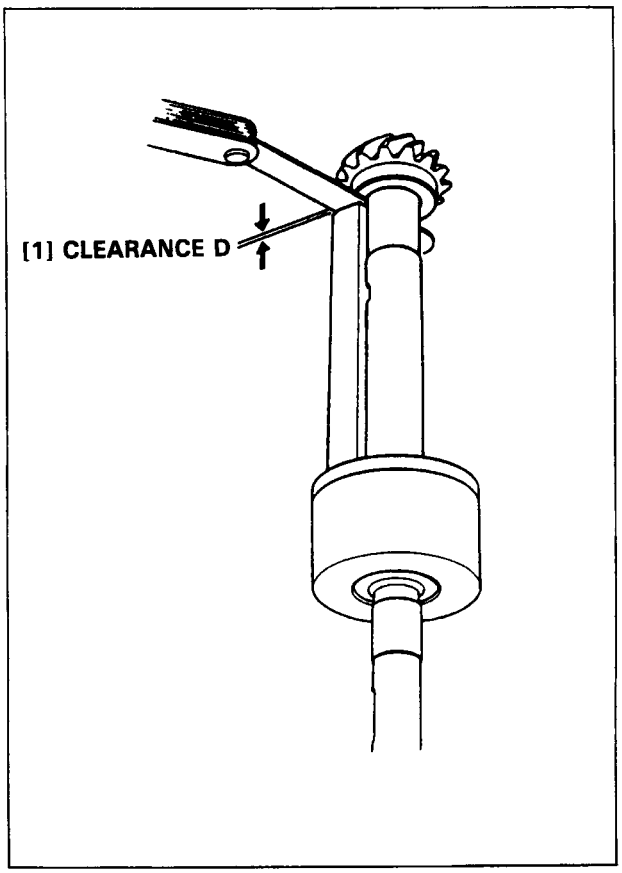


4) Install the pinion gear on the vertical shaft aligning the spline. Install and torque the 10 mm special flange nut (P. 12-11).

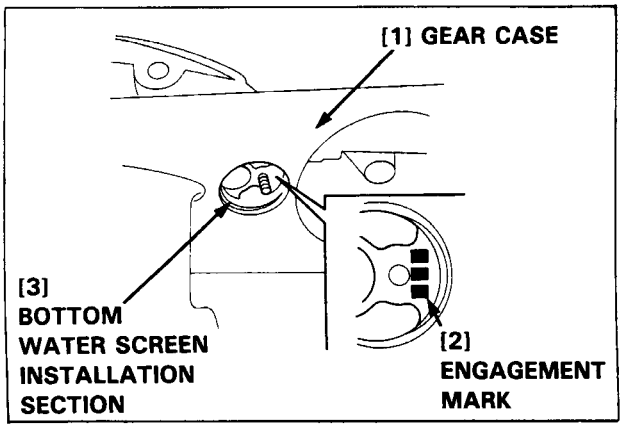
TORQUE: 40 N·m (4.0 kg-m, 28.9 ft-lb)

5) Measure the clearance (clearance D) between the pinion gear and the special tool as shown. Then obtain the calculation value using the following formula.

Formula:
Clearance D−0.5 mm = Calculation value
Example:
When clearance D is 0.3 mm
0.3 mm−0.5 mm = −0.2 mm
Therefore, the calculation value is −0.2 mm (−0.008 in).



6) Cross reference the calculation value and engagement mark located on the bottom water screen installation section of the gear case, and select the shim of the appropriate thickness from the shim selection tables.



- **Shim type table**

Parts name	Parts number	Thickness
Gear shim A	90518–ZV5–000	0.10 mm (0.0039 in)
Gear shim B	90519–ZV5–000	0.15 mm (0.0060 in)
Gear shim C	90520–ZV5–000	0.30 mm (0.0118 in)
Gear shim D	90521–ZV5–000	0.50 mm (0.0197 in)

- **Pinion gear shim selection tables**

Unit: mm (in)

Engagement mark on gear case	(+) Calculation value: +0.45~0.00 mm (+0.018~0.00 in)								
	0.45~0.40 (0.018~0.016)	0.40~0.35 (0.016~0.014)	0.35~0.30 (0.014~0.012)	0.30~0.25 (0.012~0.010)	0.25~0.20 (0.0010~0.008)	0.20~0.15 (0.008~0.006)	0.15~0.10 (0.006~0.004)	0.10~0.05 (0.004~0.002)	0.05~0.00 (0.002~0.000)
A	1.20 (0.047)	1.15 (0.045)	1.10 (0.043)	1.05 (0.041)	1.00 (0.039)	0.95 (0.037)	0.90 (0.035)	0.85 (0.033)	0.80 (0.031)
B	1.15 (0.045)	1.10 (0.043)	1.05 (0.041)	1.00 (0.038)	0.95 (0.037)	0.90 (0.035)	0.85 (0.033)	0.80 (0.031)	0.75 (0.030)
C	1.10 (0.043)	1.05 (0.041)	1.00 (0.039)	0.95 (0.037)	0.90 (0.035)	0.85 (0.033)	0.80 (0.031)	0.75 (0.030)	0.70 (0.028)
D	1.05 (0.041)	1.00 (0.039)	0.95 (0.037)	0.90 (0.035)	0.85 (0.033)	0.80 (0.031)	0.75 (0.030)	0.70 (0.028)	0.65 (0.026)
E	1.00 (0.039)	0.95 (0.037)	0.90 (0.035)	0.85 (0.033)	0.80 (0.031)	0.75 (0.030)	0.70 (0.028)	0.65 (0.026)	0.60 (0.024)
F	0.95 (0.037)	0.90 (0.035)	0.85 (0.033)	0.80 (0.031)	0.75 (0.030)	0.70 (0.028)	0.65 (0.26)	0.60 (0.024)	0.55 (0.022)

Unit: mm (in)

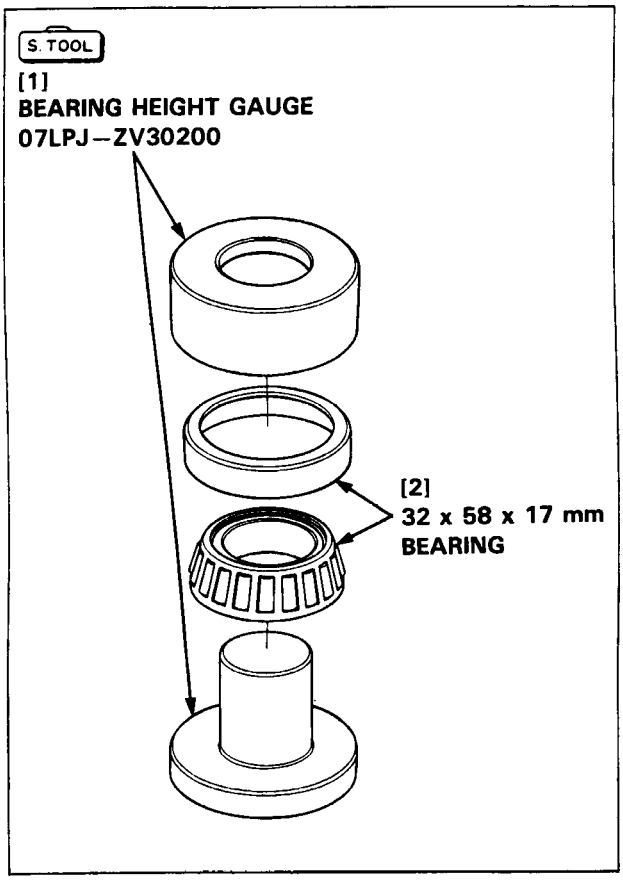
Engagement mark on gear case	(−) Calculation value: 0.00~−0.45 mm (0.000~−0.018 in)								
	0.00~−0.05 (0.000~−0.002)	−0.05~−0.10 (−0.002~−0.004)	−0.10~−0.15 (−0.004~−0.006)	−0.15~−0.20 (−0.006~−0.008)	−0.20~−0.25 (−0.008~−0.010)	−0.25~−0.30 (−0.010~−0.012)	−0.30~−0.35 (−0.012~−0.014)	−0.35~−0.40 (−0.014~−0.016)	−0.40~−0.45 (−0.016~−0.018)
A	0.75 (0.030)	0.70 (0.028)	0.65 (0.026)	0.60 (0.024)	0.55 (0.022)	0.50 (0.020)	0.45 (0.018)	0.40 (0.016)	0.35 (0.014)
B	0.75 (0.028)	0.70 (0.026)	0.65 (0.024)	0.60 (0.022)	0.55 (0.020)	0.50 (0.018)	0.45 (0.16)	0.40 (0.014)	0.35 (0.012)
C	0.65 (0.026)	0.60 (0.024)	0.55 (0.022)	0.50 (0.020)	0.45 (0.018)	0.40 (0.016)	0.35 (0.014(	0.30 (0.012)	0.25 (0.010)
D	0.60 (0.024)	0.55 (0.022)	0.50 (0.20)	0.45 (0.018)	0.40 (0.016)	0.35 (0.014)	0.30 (0.012)	0.25 (0.010)	0.20 (0.008)
E	0.55 (0.022)	0.50 (0.020)	0.45 (0.018)	0.40 (0.016)	0.35 (0.014)	0.30 (0.012)	0.25 (0.010)	0.20 (0.008)	0.15 (0.006)
F	0.50 (0.020)	0.45 (0.018)	0.40 (0.016)	0.35 (0.014)	0.30 (0.012)	0.25 (0.010)	0.20 (0.008)	0.15 (0.006)	0.10 (0.004)

- **How to read shim selection table and shim combination:**
When the engagement mark on the gear case is B and the calculation value is −0.20 mm (−0.008 in), the shim thickness is 0.55 mm (0.022 in).
After determining the required shim thickness, refer to the above shim type table; the correct combination of gear shims should be A, B and C to bring the total thickness of the shim to 0.55 mm (0.022 in).

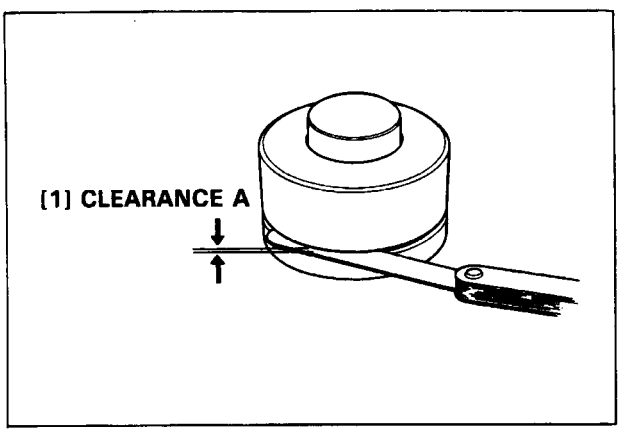
• FORWARD GEAR SHIM SELECTION

1) Clean the special tool and bearing. Set the 32 x 58 x 17 mm bearing on the special tool as shown.

TOOL:
Bearing height gauge **07LPJ–ZV30200**



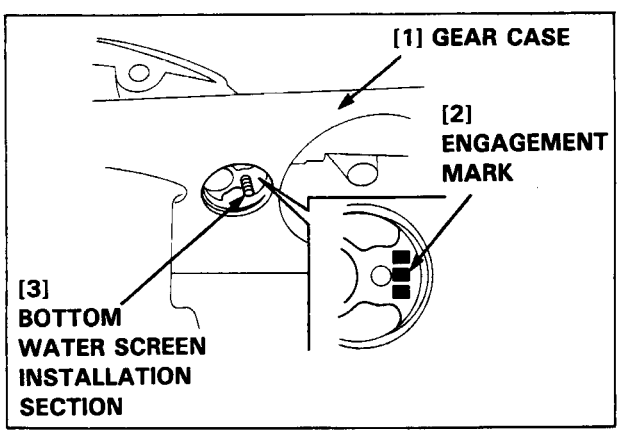
2) Rotate the upper part of the special tool 2 full revolutions to center the bearing. Measure the clearance between the upper and lower parts of the special tool (clearance A) using a feeler gauge.
3) Obtain the calculation value by subtracting 0.5 mm (0.02 in) from the measured clearance A.
Example:
When the clearance A is 0.3 mm (0.012 in);
0.3–0.5 = –0.2
Therefore, the calculation value is –0.2 mm (–0.008 in).



4) Cross reference the calculation value and engagement mark located on the bottom water screen installation section of the gear case, and select the shim of the appropriate thickness from the shim selection table.

• Shim type table

Parts name	Parts number	Thickness
Forward gear shim A	90528–ZV5–000	0.10 mm (0.0039 in)
Forward gear shim B	90529–ZV5–000	0.15 mm (0.0060 in)
Forward gear shim C	90530–ZV5–000	0.35 mm (0.0118 in)
Forward gear shim D	90531–ZV5–000	0.50 mm (0.0197 in)



• **Forward gear shim selection table**

Unit: mm (in)

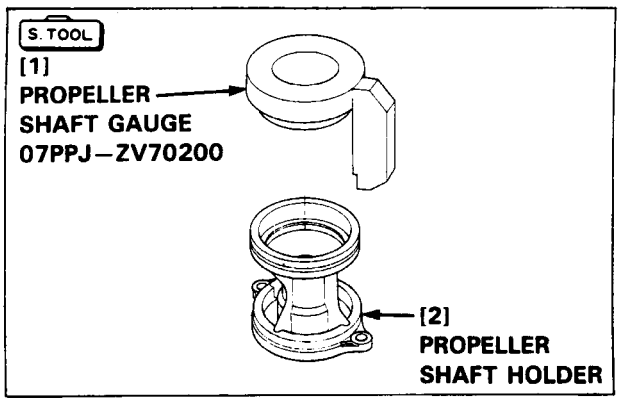
Engagement mark on gear case	(+) Calculation value +0.20~0.00 mm (+0.008~0.000 in)				(−) Calculation Value 0.00~−0.20 mm (0.000~−0.008 in)			
	0.20~0.15 (0.008~0.006)	0.15~0.10 (0.006~0.004)	0.10~0.05 (0.004~0.002)	0.05~0.00 (0.002~0.000)	0.00~−0.05 (0.000~−0.002)	−0.05~−0.10 (−0.002~−0.004)	−0.10~−0.15 (−0.004~−0.006)	−0.15~−0.20 (−0.006~−0.008)
1	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)
2	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)
3	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)
4	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)
5	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)
6	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)

Refer to pages 12-17 for information on how to read the shim selection table and shim combination.

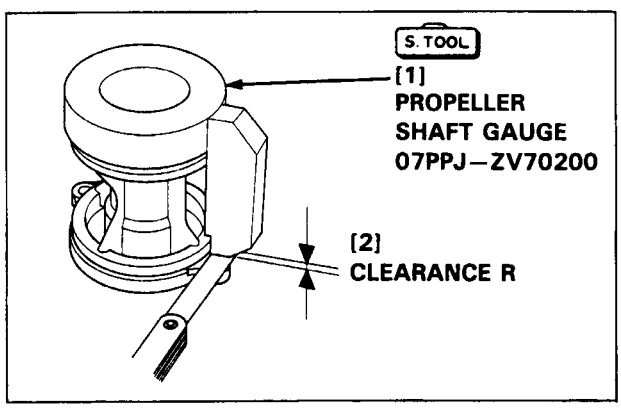
• REVERSE GEAR SHIM SELECTION

<Using the special tool>

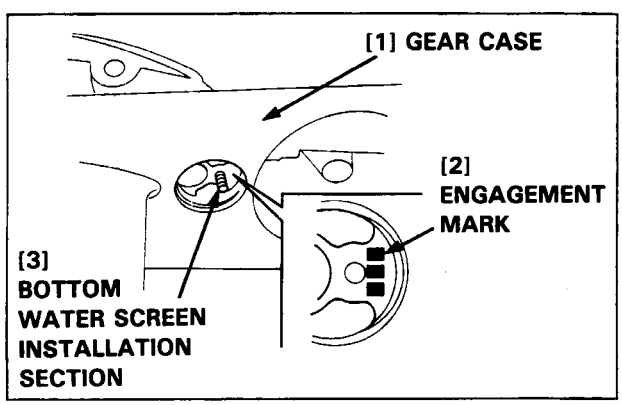
1) Set the special tool on the propeller shaft holder as shown.



2) Measure the clearance (clearance R) between the propeller shaft holder and the special tool as shown. Then obtain the calculation value using the following formula.
Formula:
Clearance R − 0.2 mm (0.008 in) = Calculation value
Example:
When clearance R is 0.3 mm (0.012 in).
0.3 − 0.2 = 0.1
Therefore, the calculation value is 0.1 mm (0.004 in).



3) Cross reference the calculation value and engagement mark located on the bottom water screen installation section of the gear case, and select the shim of the appropriate thickness from the shim selection table.



• **Shim type table**

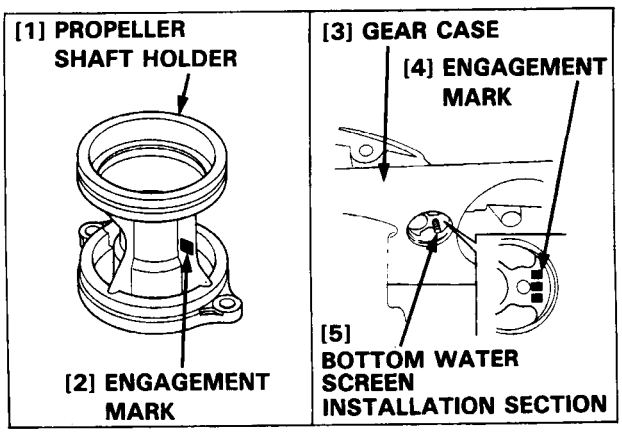
Parts name	Parts number	Thickness
Forward gear shim A	90528−ZV5−000	0.10 mm (0.0039 in)
Forward gear shim B	90529−ZV5−000	0.15 mm (0.0060 in)
Forward gear shim C	90530−ZV5−000	0.35 mm (0.0118 in)
Forward gear shim D	90531−ZV5−000	0.50 mm (0.0197 in)

• **Reverse gear shim selection table**

Unit: mm (in)

Engagement mark on gear case	(+) Calculation value			(−) Calculation value		
	+0.15~0.00 mm (+0.006~0.000 in)			0.00~−0.15 mm (0.000~−0.006 in)		
	0.15~0.10 (0.006~0.004)	0.10~0.05 (0.004~0.002)	0.05~0.00 (0.002~0.000)	0.00~−0.05 (0.000~−0.002)	−0.05~−0.10 (−0.002~−0.004)	−0,10~−0,15 (−0.004~−0.006)
A	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	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)
C	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)
D	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)
E	0.15 (0.006)	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)
F	0.10 (0.004)	0.15 (0.006)	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)

Refer to page 12-17 for information on how to read the shim selection table and shim combination.



<Without using the special tool>
Cross reference the engagement mark of the propeller shaft holder and the engagement mark located on the bottom water screen installation section of the gear case, and select the shim of the appropriate thickness from the shim selection table.

• **Shim type table**

Parts name	Parts number	Thickness
Forward gear shim A	90528−ZV5−000	0.10 mm (0.0039 in)
Forward gear shim B	90529−ZV5−000	0.15 mm (0.0060 in)
Forward gear shim C	90530−ZV5−000	0.35 mm (0.0118 in)
Forward gear shim D	90531−ZV5−000	0.50 mm (0.0197 in)

• **Reverse gear shim selection table**

Unit: mm (in)

Engagement mark on gear case	Engagement mark on propeller shaft holder					
	1	2	3	4	5	6
A	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	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)	0.55 (0.022)
C	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)	0.50 (0.020)
D	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)	0.45 (0.018)
E	0.15 (0.006)	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)	0.40 (0.016)
F	0.10 (0.004)	0.15 (0.006)	0.20 (0.008)	0.25 (0.010)	0.30 (0.012)	0.35 (0.014)

8. BACKLASH ADJUSTMENT

• FORWARD GEAR

After selecting of the shim(s), remove the water pump (see page 12-8) and install the following parts on the gear case securely.
– Vertical shaft/bevel gear (page 12-10)
– Propeller shaft/propeller shaft holder (page 12-2)
– Propeller/propeller shaft holder assembly (page 12-1)

1) Tighten the 6 x 20 mm hex. bolts.

Hold the propeller shaft securely with the special tool as shown.

Tighten the special tool center bolt to 5 N·m (0.5 kg-m, 3.6 ft-lb).

TOOL:
Propeller shaft holder **07LPB-ZV30300**

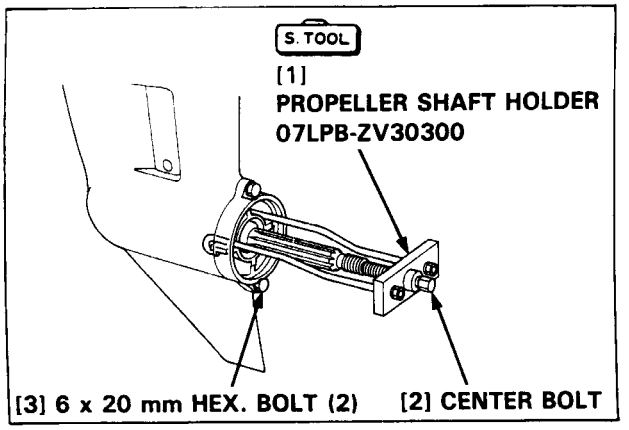
2) Set the special tool on the vertical shaft as shown and attach the tip of the dial gauge to the special tool.

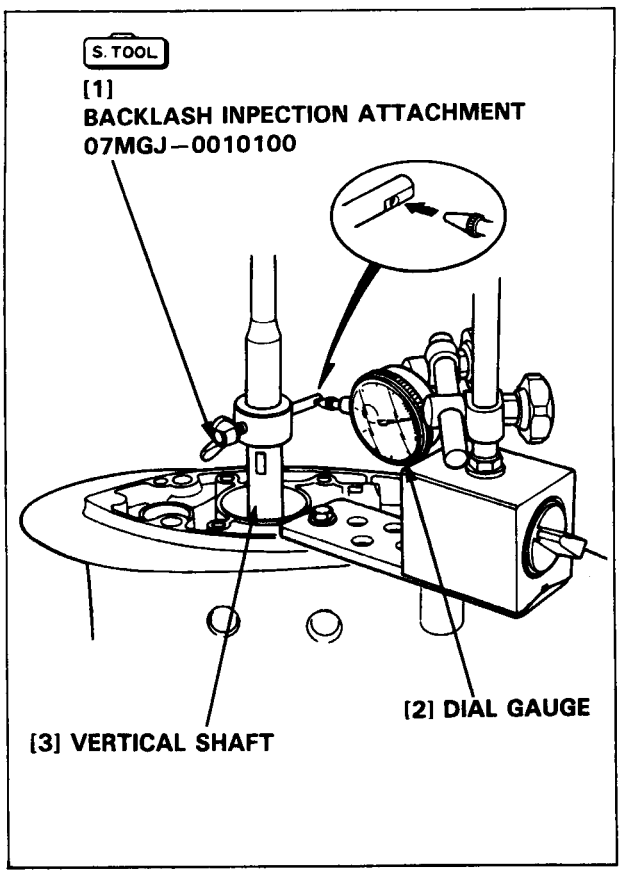
TOOL:
Backlash inspection attachment **07MGJ-0010100**

3) Turn the vertical shaft right and left while pressing it down with approximately 5 kg (11.0 lb) of force and measure the backlash.

Standard	0.10—0.29 mm (0.004—0.011 in)

4) If the backlash is too large, increase the forward gear shim thickness and recheck the backlash.
If the backlash is too small, decrease the forward gear shim thickness and recheck the backlash.





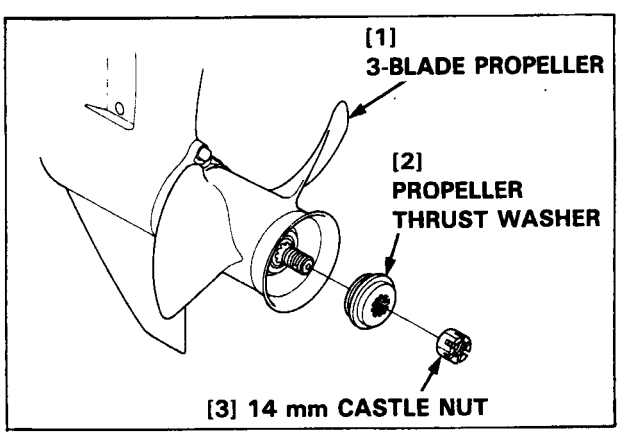
• REVERSE GEAR

1) Install the 3-blade propeller and propeller thrust washer on the propeller shaft, then tighten the 14 mm castle nut securely.

TORQUE: 1 N·m (0.1 kg-m, 0.7 ft-lb)

First, tighten to the specified torque. If the cotter pin does not set in the hole, tighten additionally until the cotter pin sets in the hole securely.

Specified torque: 1 N·m (0.1 kg-m, 0.7 ft-lb)
Maximum torque: 35 N·m (3.5 kg-m, 25.3 ft-lb)



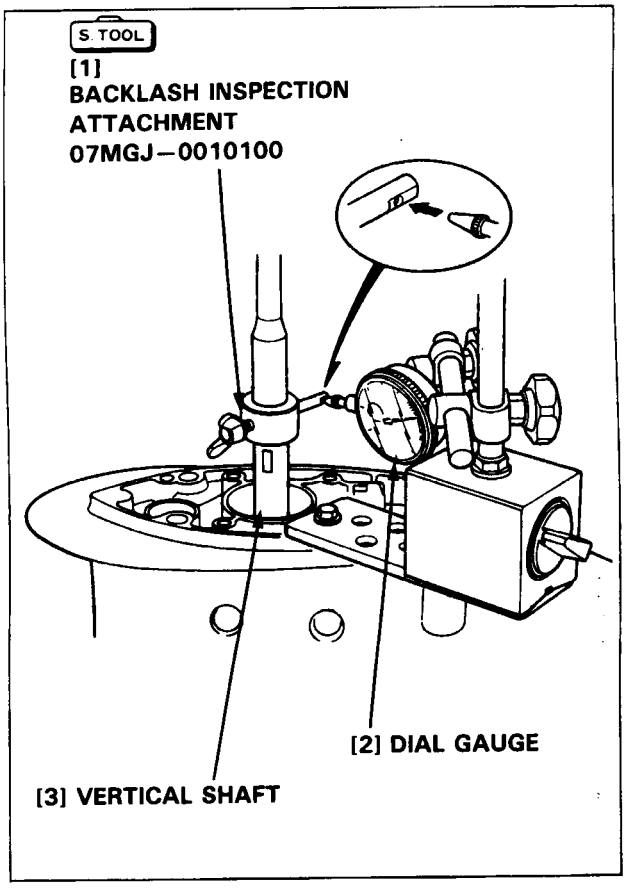
2) Set the special tool on the vertical shaft as shown and attach the tip of the dial gauge to the special tool.

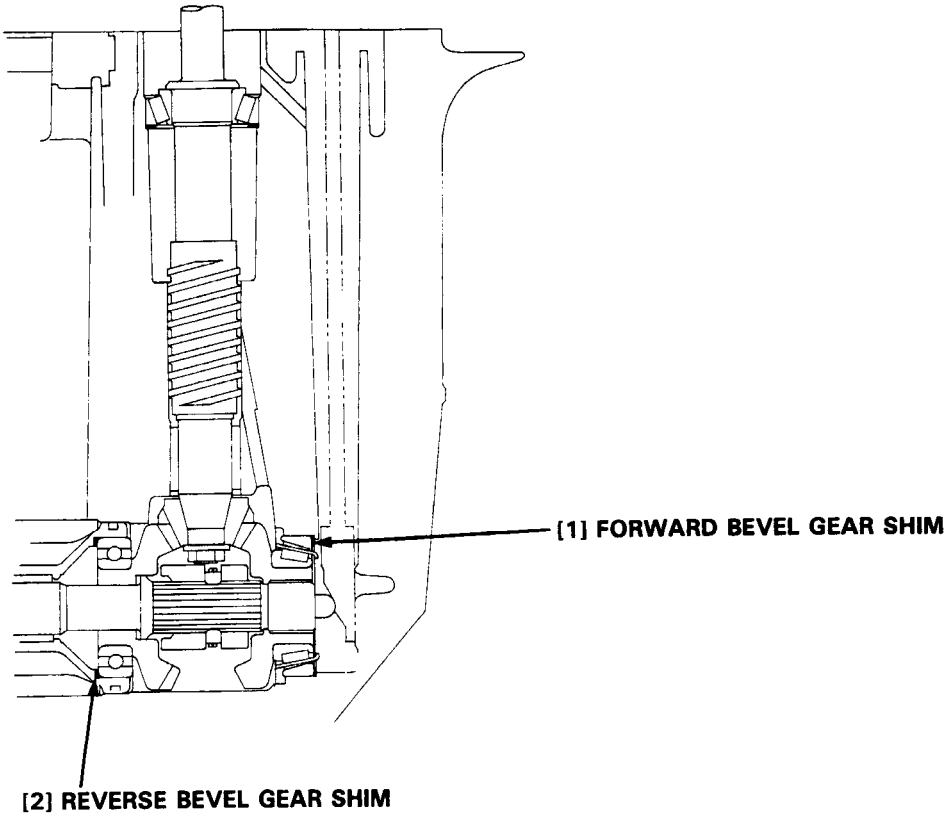
TOOL:
Backlash inspection attachment 07MGJ–0010100

3) Turn the vertical shaft right and left while pressing it down with approximately 5 kg (11.0 lb) of force and measure the backlash.

Standard	0.10–0.39 mm (0.004–0.015 in)

4) If the backlash is too large, increase the reverse gear shim thickness and recheck the backlash.
If the backlash is too small, decrease the reverse gear shim thickness and recheck the backlash.



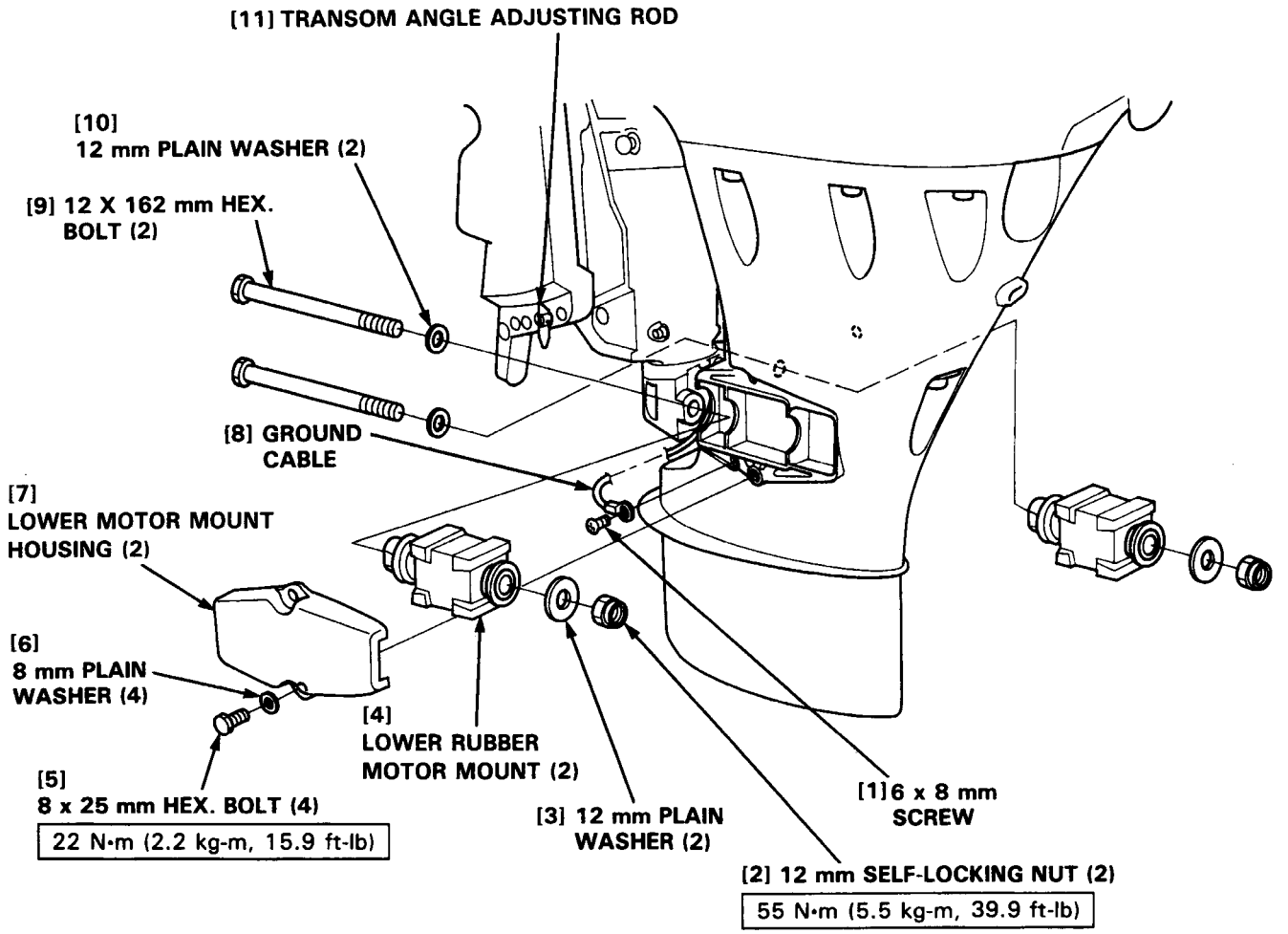


9. EXTENSION CASE/UNDER COVER

DISASSEMBLY/ASSEMBLY

• LOWER MOUNT RUBBER

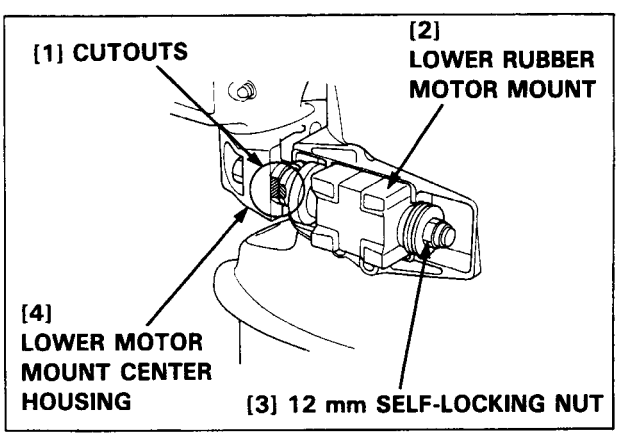
1) Remove the gear case assembly (P. 12-7).
2) Set the adjusting rod in the second hole from the rear as shown.



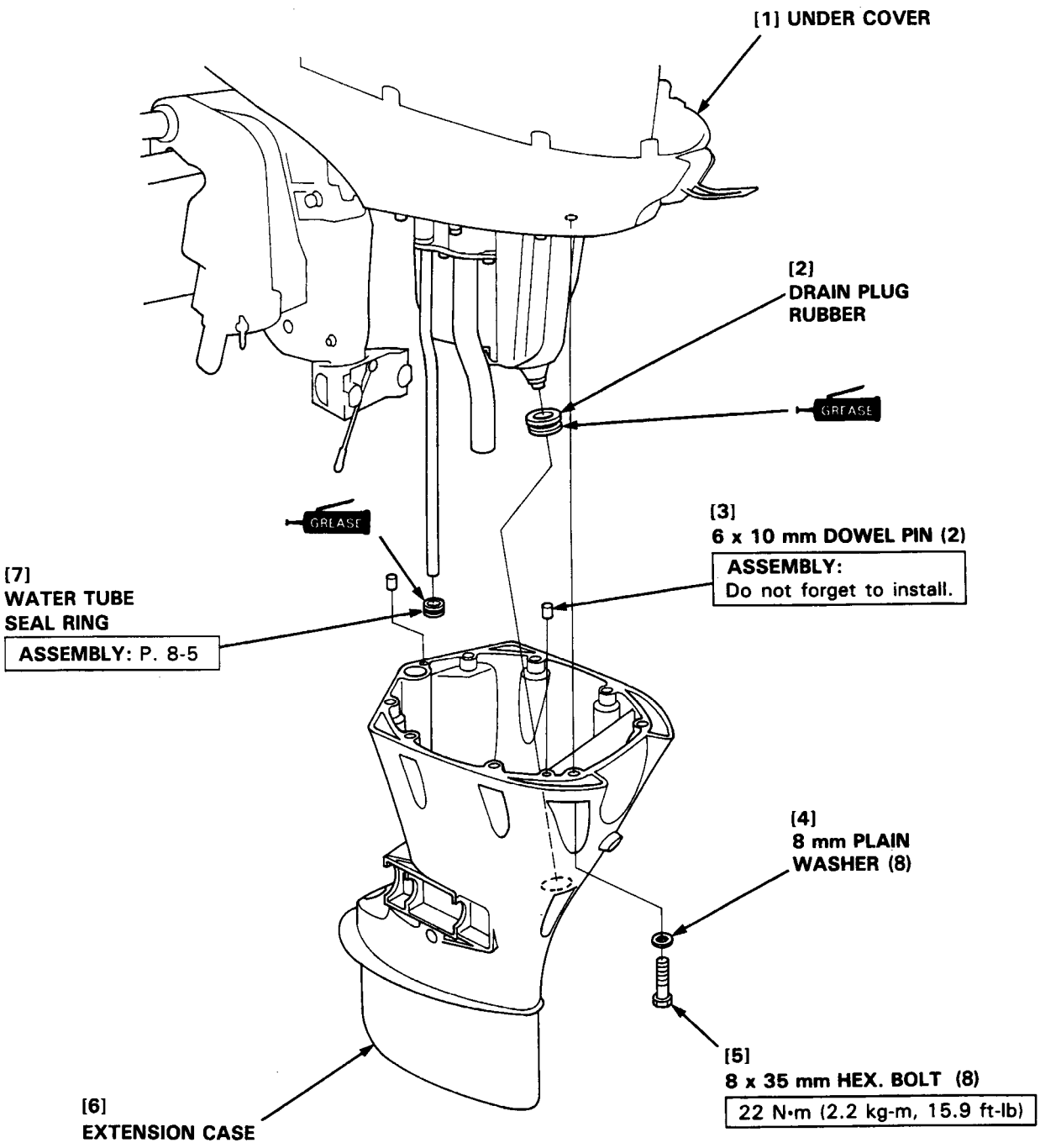
• LOWER RUBBER MOTOR MOUNT INSTALLATION

Install the lower rubber motor mount by aligning its cutout with the cutout in the lower motor mount center housing, then tighten the self-locking nut securely.

TORQUE: 55 N·m (5.5 kg-m, 39.8 ft-lb)



• EXTENSION CASE



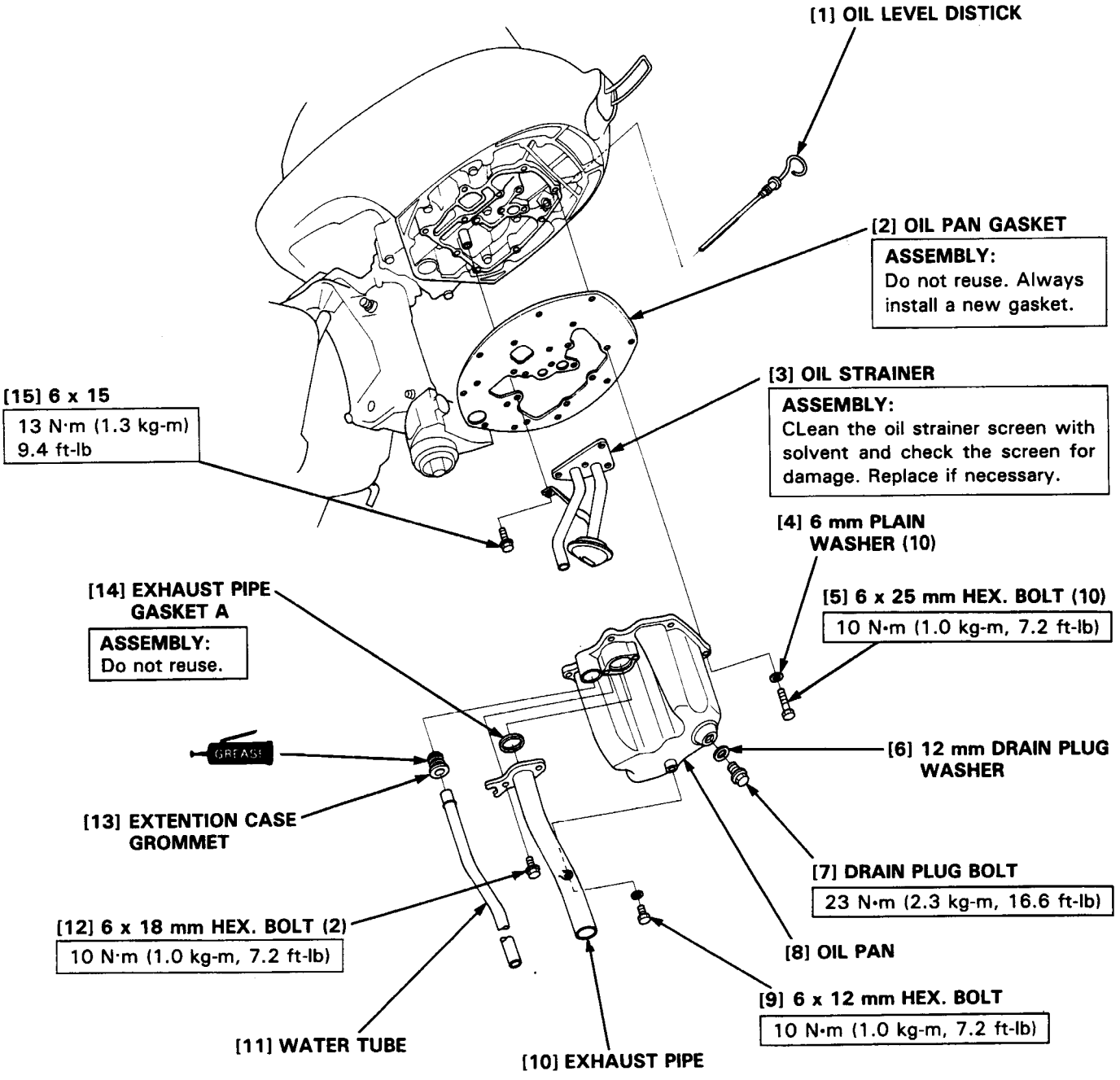
13. OIL PAN/ENGINE UNDER CASE/ SWIVEL CASE

1. OIL PAN/MUFFLER
2. SHIFT RODS
3. ENGINE UNDER CASE
4. MOUNT FRAME
5. STERN BRACKET
6. SWIVEL CASE

1. OIL PAN/MUFFLER

DISASSEMBLY/ASSEMBLY

1) Remove the extension case assembly (P. 8-1).

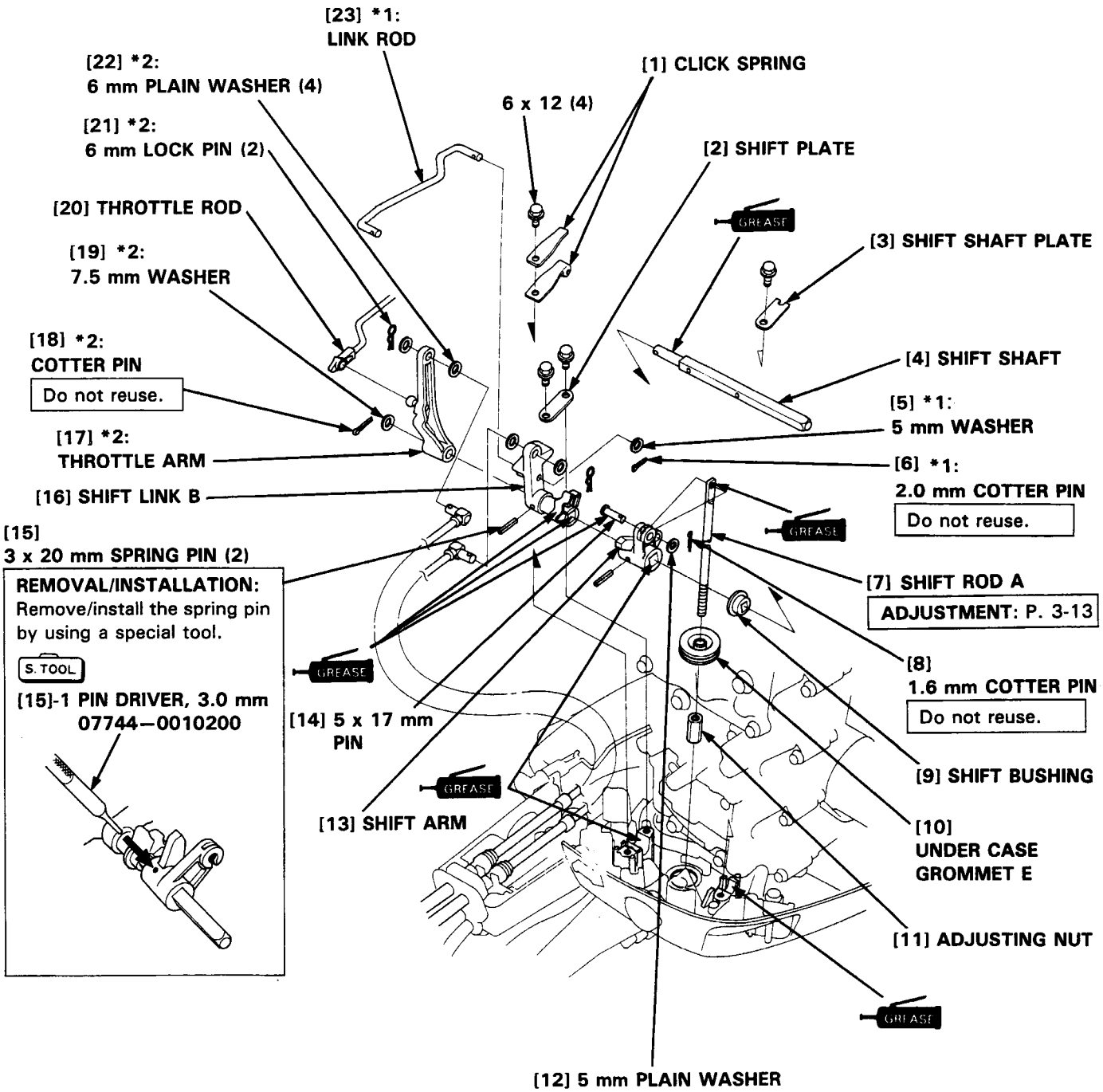


2. SHIFT RODS

DISASSEMBLY/ASSEMBLY:

- Recoil starter type
  Remove the throttle cable bracket and disconnect the shift rod A and B (P. 15-1).
- Electric starter type
  Remove the CDI unit/ignition coil (P. 16-3). Disconnect the shift rod A and B.

*1: Tiller handle type only
*2: Remote control type only

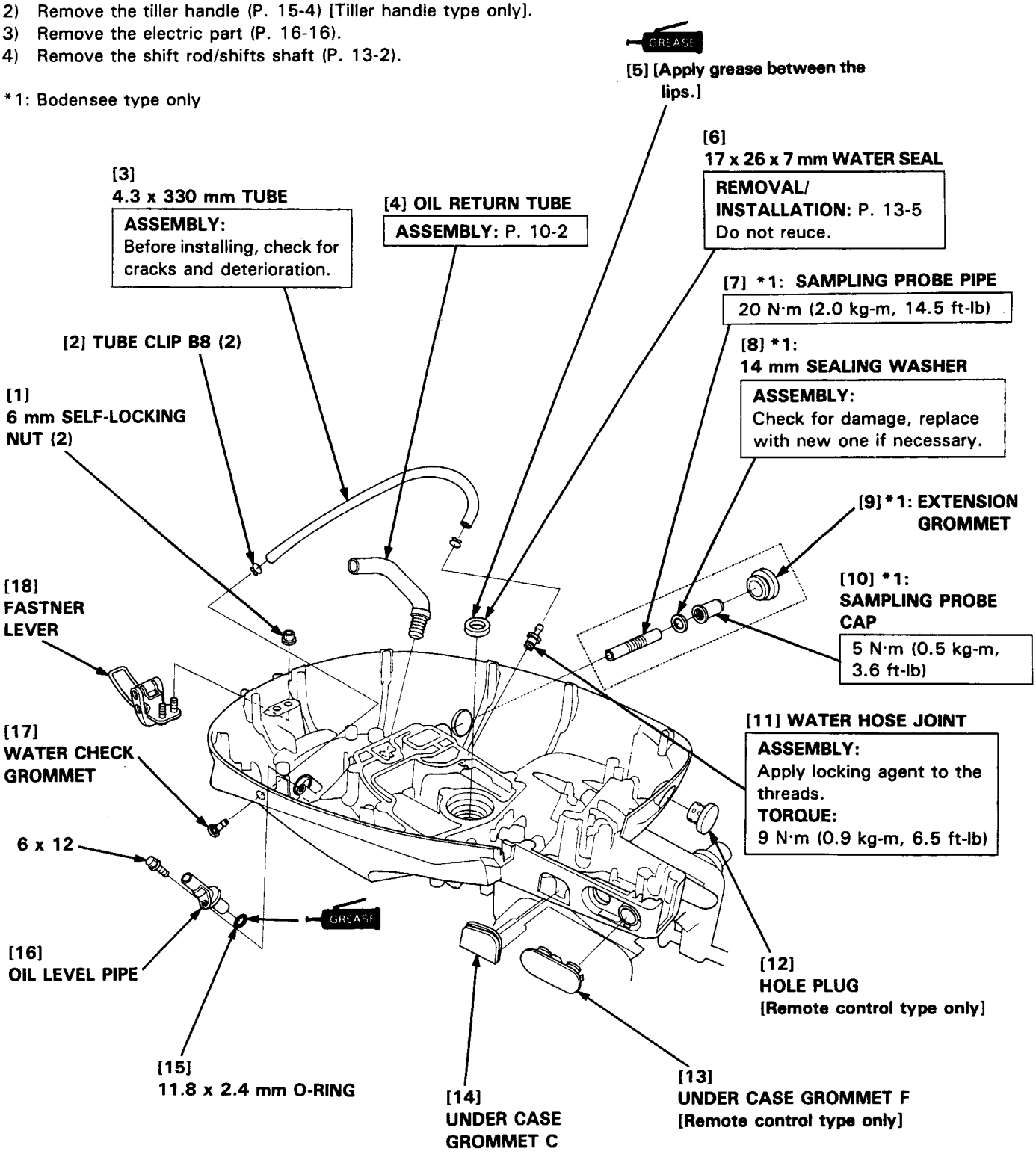


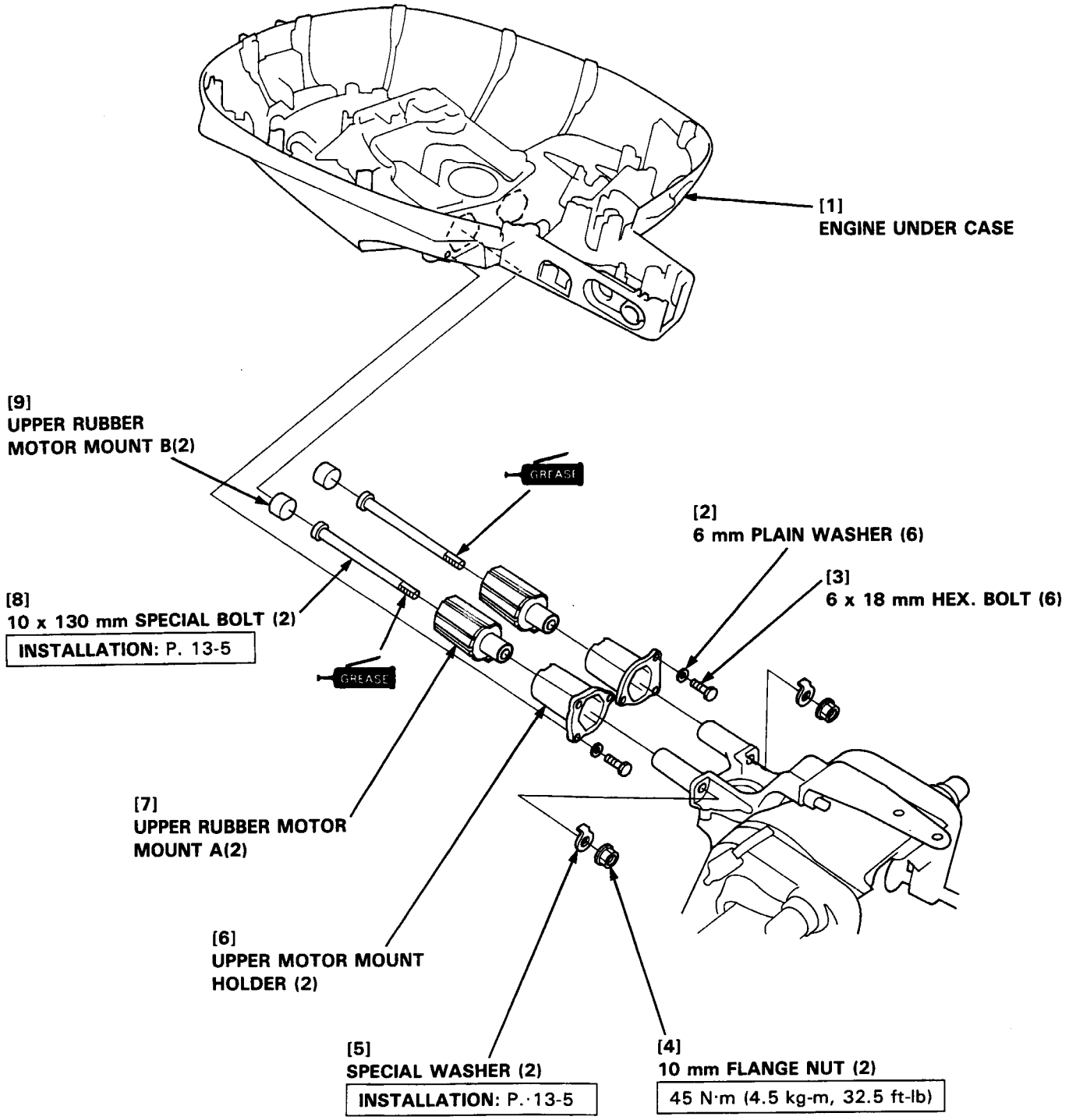
3. ENGINE UNDER CASE

DISASSEMBLY/ASSEMBLY:

1) Remove the engine (P. 8-1).
2) Remove the tiller handle (P. 15-4) [Tiller handle type only].
3) Remove the electric part (P. 16-16).
4) Remove the shift rod/shifts shaft (P. 13-2).

*1: Bodensee type only



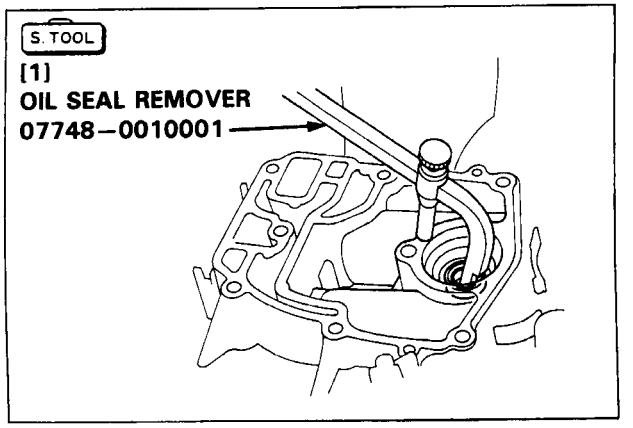

[1]
ENGINE UNDER CASE
[9]
UPPER RUBBER
MOTOR MOUNT B(2)
GREASE
[2]
6 mm PLAIN WASHER (6)
[3]
6 x 18 mm HEX. BOLT (6)
[8]
10 x 130 mm SPECIAL BOLT (2)
INSTALLATION: P. 13-5
GREASE
[7]
UPPER RUBBER MOTOR
MOUNT A(2)
[6]
UPPER MOTOR MOUNT
HOLDER (2)
[5]
SPECIAL WASHER (2)
INSTALLATION: P. 13-5
[4]
10 mm FLANGE NUT (2)
45 N·m (4.5 kg-m, 32.5 ft-lb)

• 17 x 26 x 7 mm WATER SEAL

REMOVAL:
Remove the water seal by using the special tool as shown.

TOOL:

Oil seal remover	**07748–0010001**



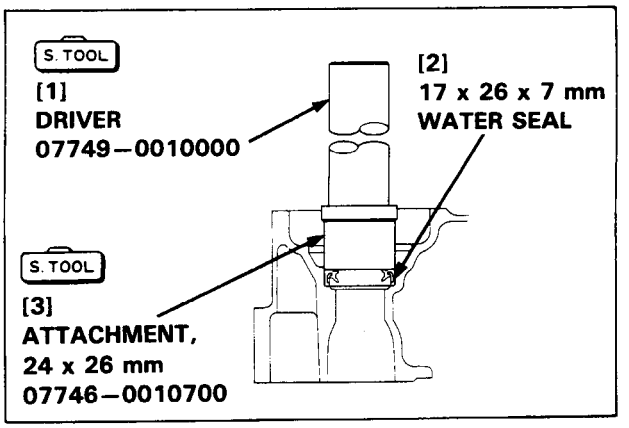
INSTALLATION:
Drive the water seal into the engine under case by using the special tools as shown.

TOOLS:

Driver	**07749–0010000**
Attachment, 24 x 26 mm	**07746–0010700**

NOTE

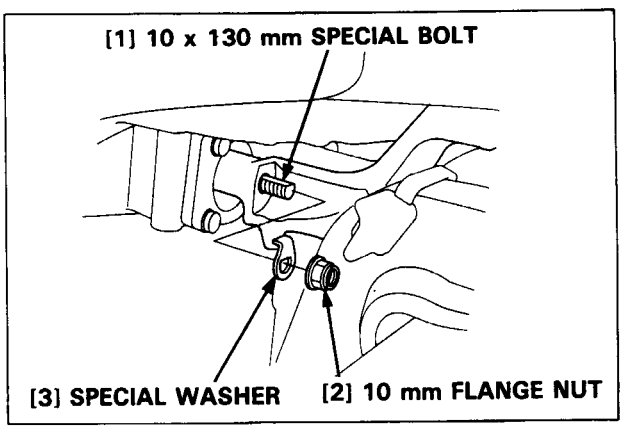
- Replace the water seal on removal.
- Install the water seal in the direction as shown.



• 10 x 130 mm SPECIAL BOLT/SPECIAL WASHER

INSTALLATION:
Install the 10 x 130 mm special bolt/special washer with the cutout side toward up and tighten the 10 mm flange nut.

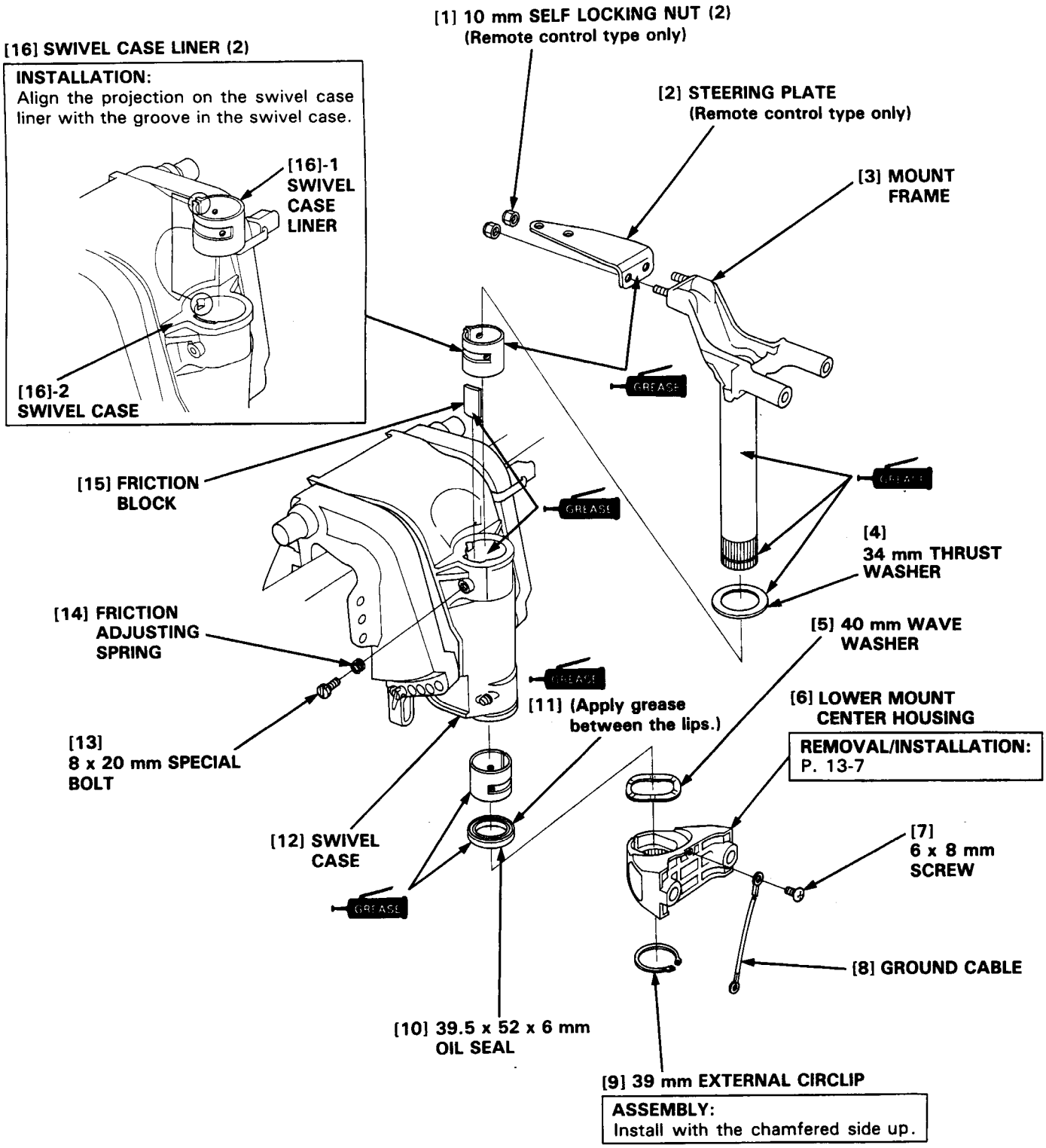
TORQUE: 45 N·m (4.5 kg-m, 32.5 ft-lb)



4. MOUNT FRAME

DISASSEMBLY/ASSEMBLY

1) Remove the engine under case (P. 13-3).



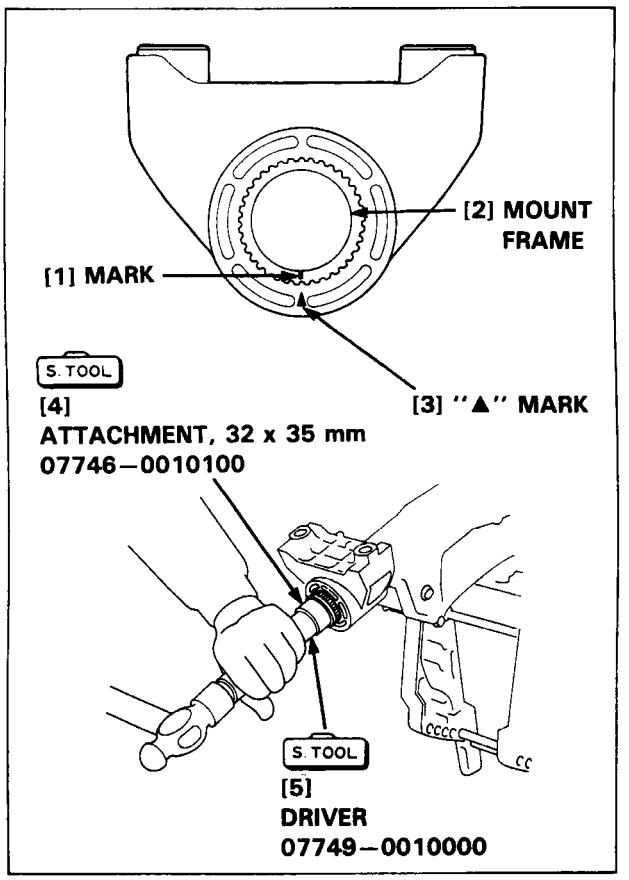
• LOWER MOTOR MOUNT CENTER HOUSING

REMOVAL:

1) Remove the 39 mm external circlip.
2) Mark the mount frame so that it aligns with the "▲" mark on the lower motor mount center housing.
3) Drive the mount frame out of the lower motor mount center housing using the special tools.

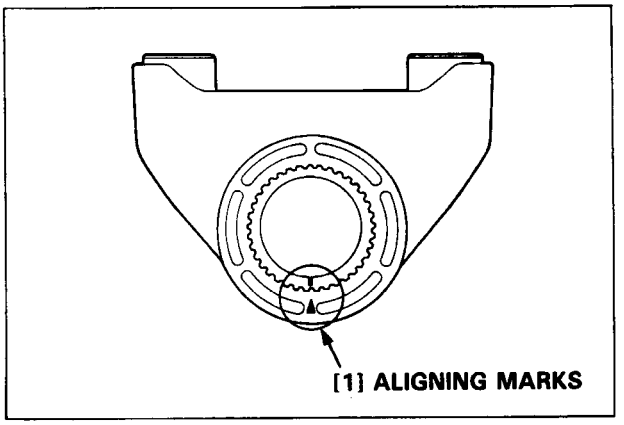
TOOLS:

Driver	**07749–0010000**
Attachment, 32 x 35 mm	**07746–0010100**



INSTALLATION:

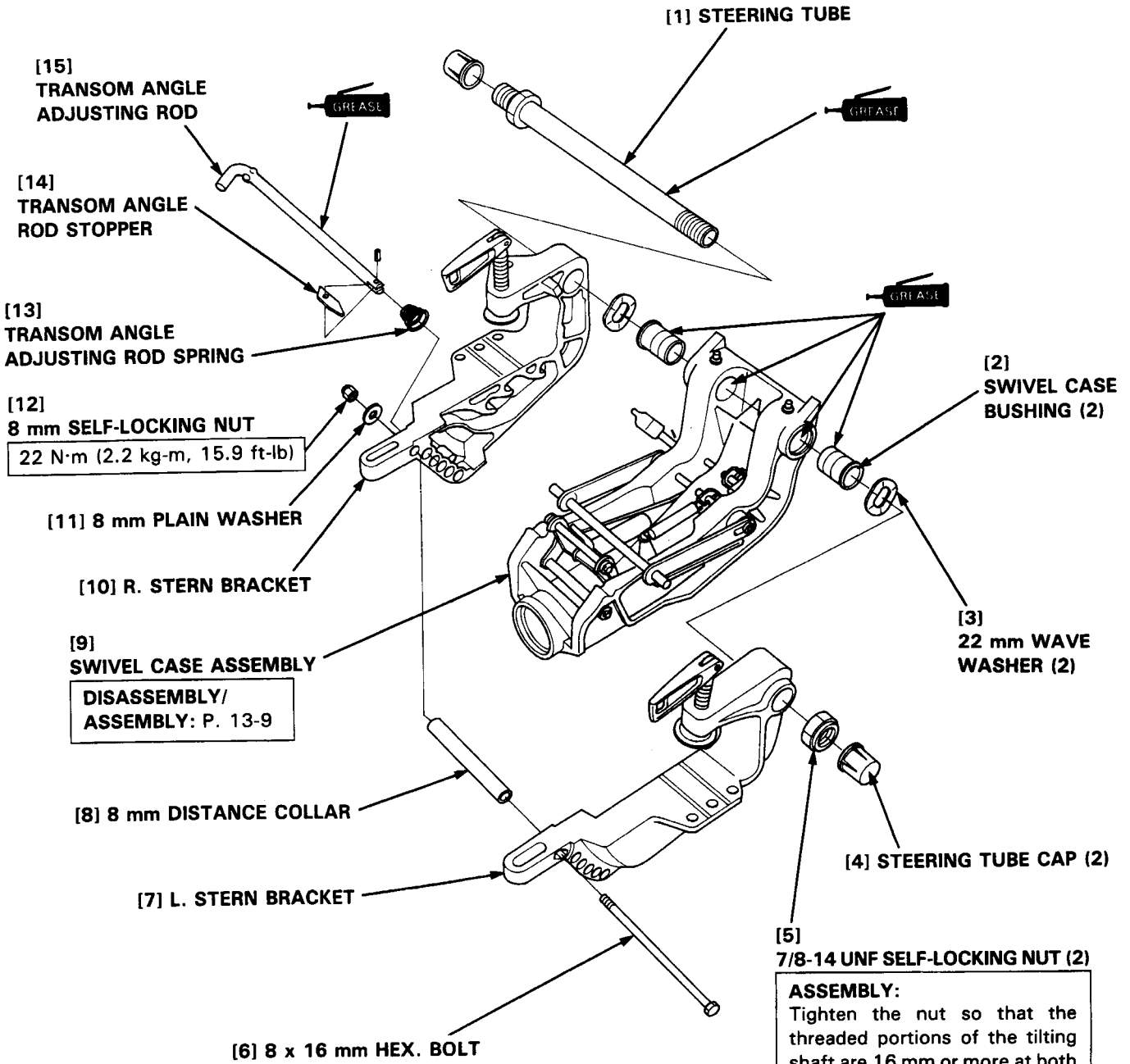
1) Install the mount frame on the swivel case.
2) Align the mark on the mount frame, which was marked on disassembly, with the "▲" mark on the lower motor mount center housing, and assemble them.



5. STERN BRAKCET

DISASSEMBLY/ASSEMBLY

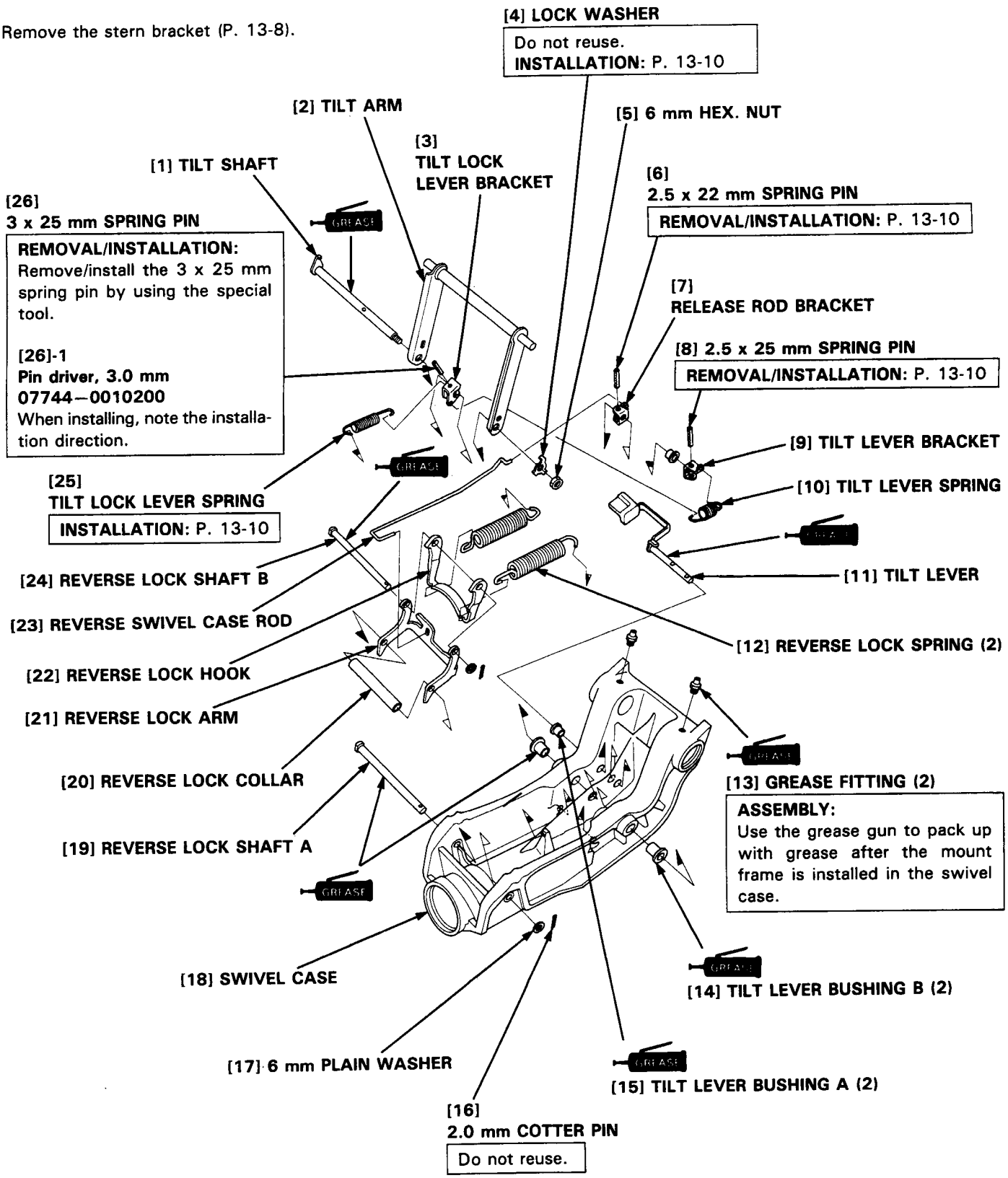
Remove the mount frame (P. 13-6).



6. SWIVEL CASE

DISASSEMBLY/ASSEMBLY

Remove the stern bracket (P. 13-8).



• **2.5 x 22 mm/2.5 x 25 mm SPRING PIN**

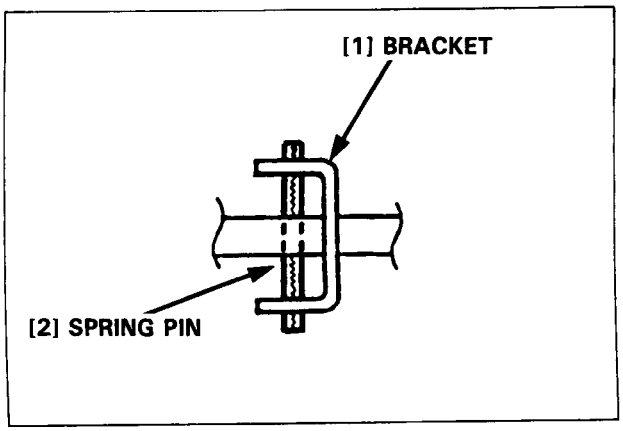
REMOVAL/INSTALLATION:
Remove/install the 2.5 x 22 mm/2.5 x 25 mm spring pin by using a special tool.

TOOL:

Pin driver 2.5 mm	**07744–0010100**

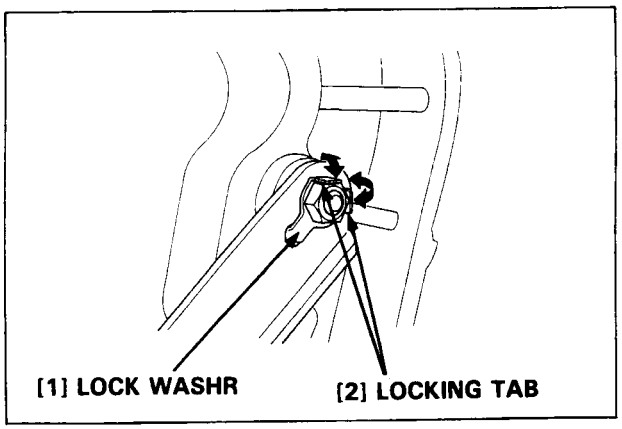
NOTE

• Note the installation direction.



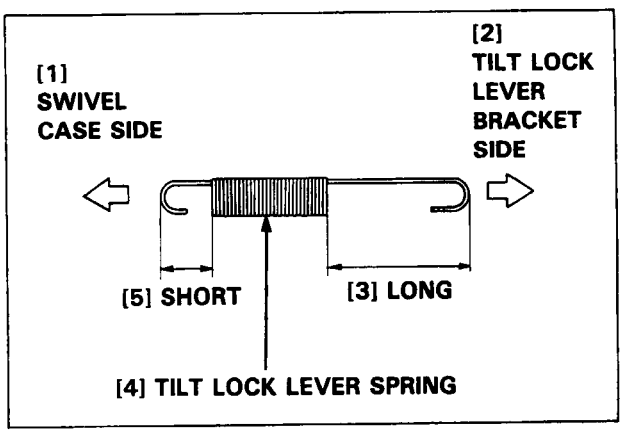
• **LOCK WASHER**

INSTALLATION:
Install the new lock washer, then bend the locking tab as shown.



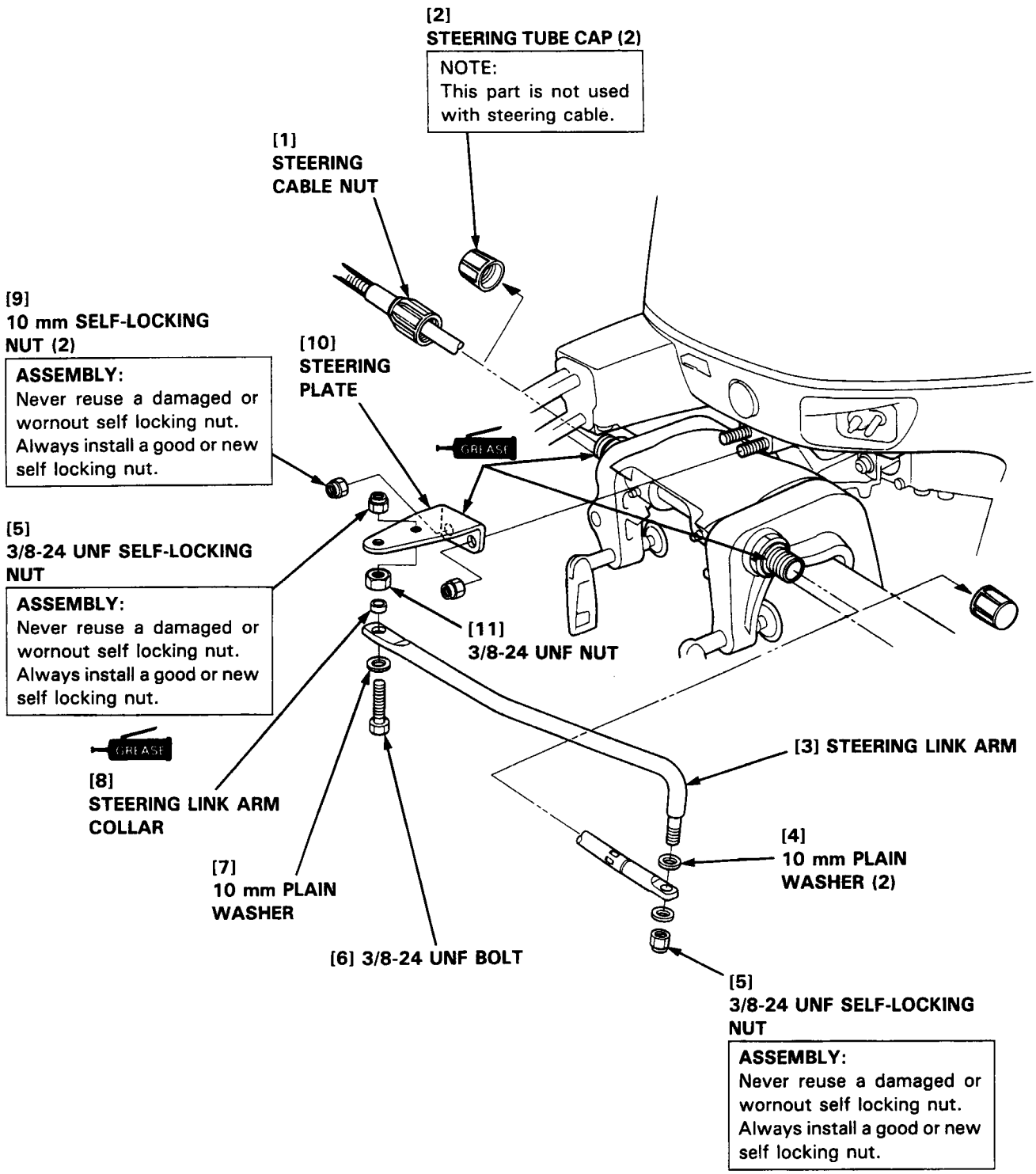
• **TILT LOCK LEVER SPRING**

INSTALLATION:
Install the long side of the hook so that it faces toward the tilt lock lever bracket.



1. STEERING LINK ARM

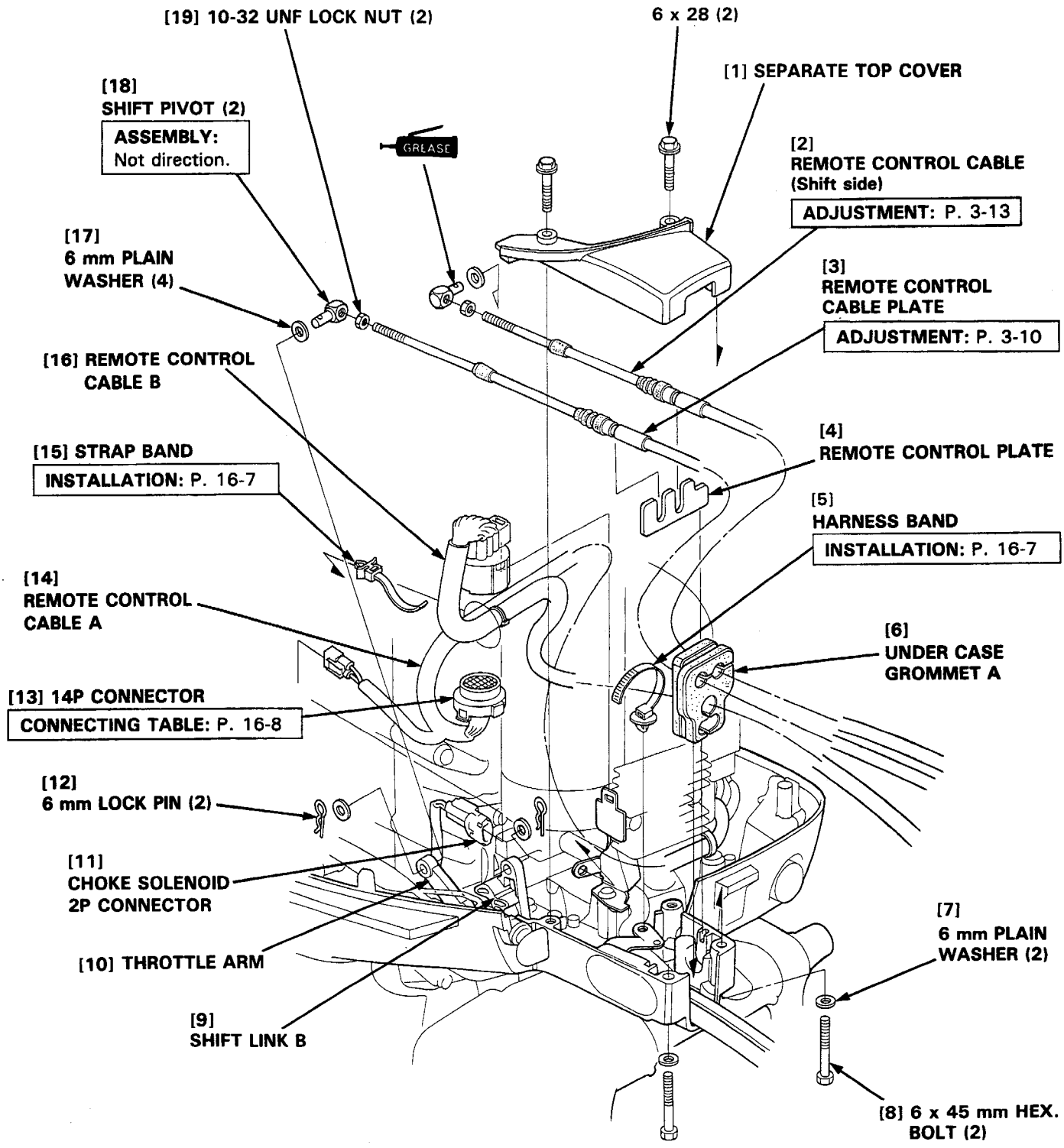
DISASSEMBLY/ASSEMBLY



2. REMOTE CONTROL CABLE

DISASSEMBLY/ASSEMBLY

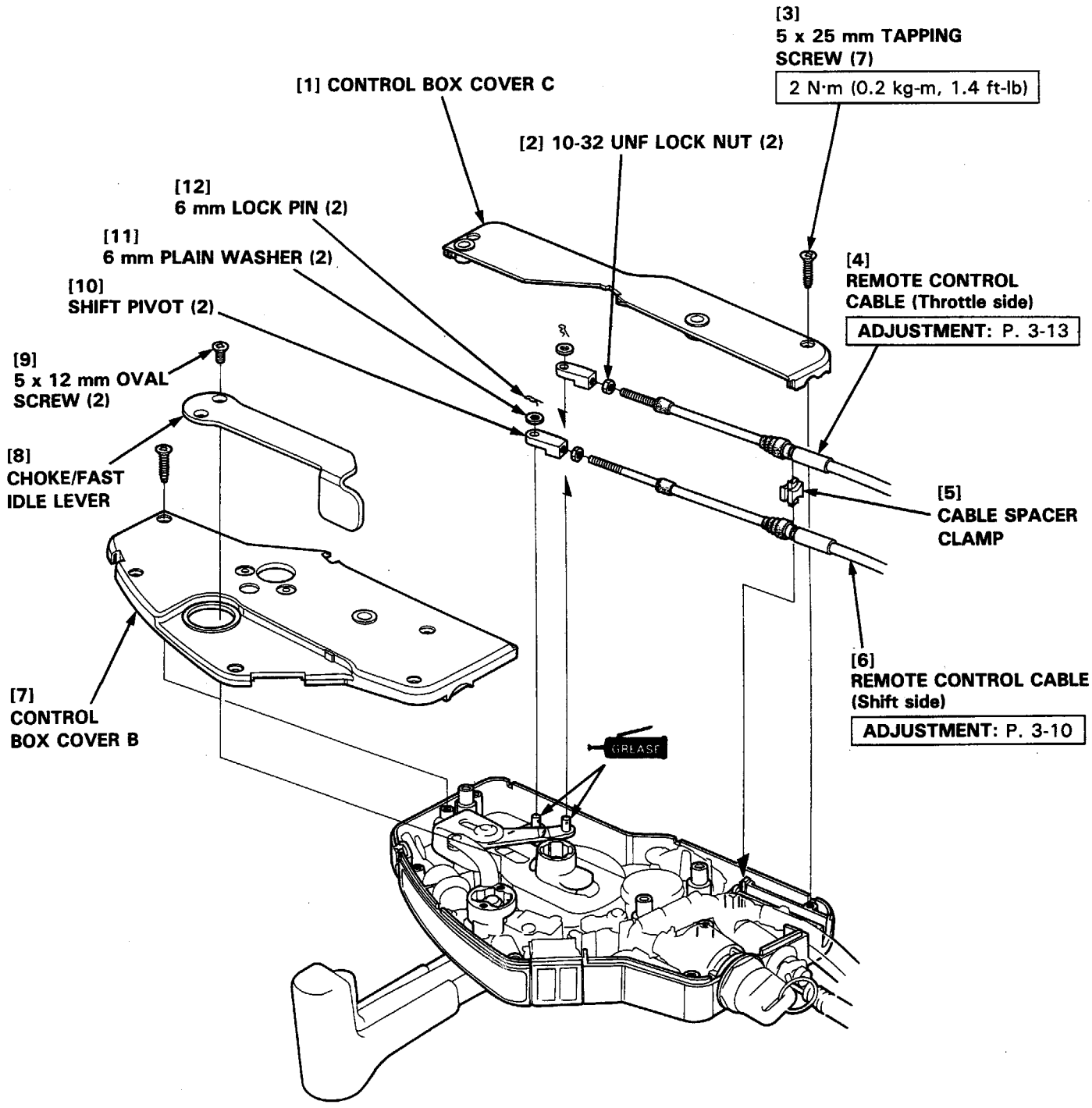
1) Remove the engine cover.



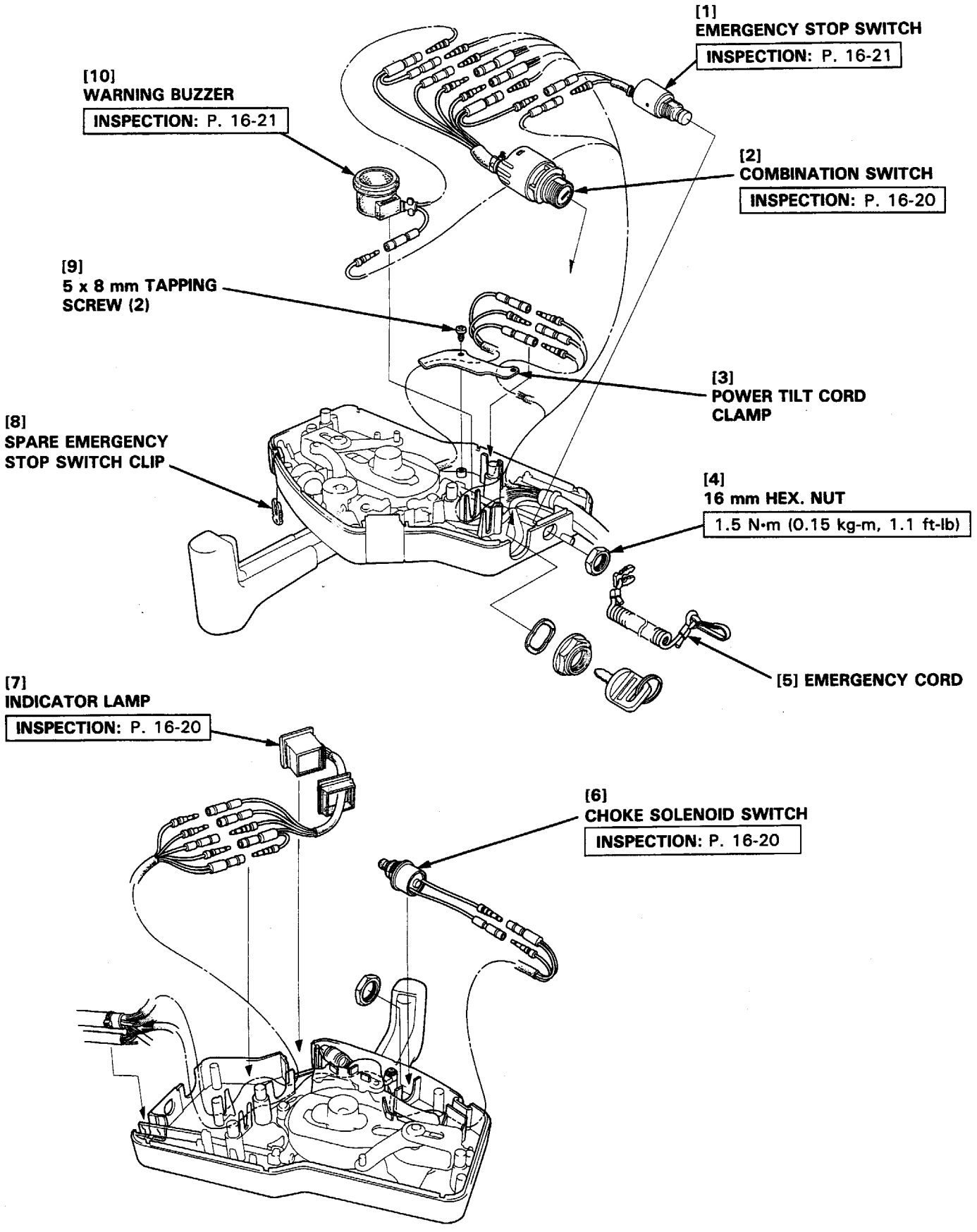
3. REMOTE CONTROL BOX

DISASSEMBLY/ASSEMBLY

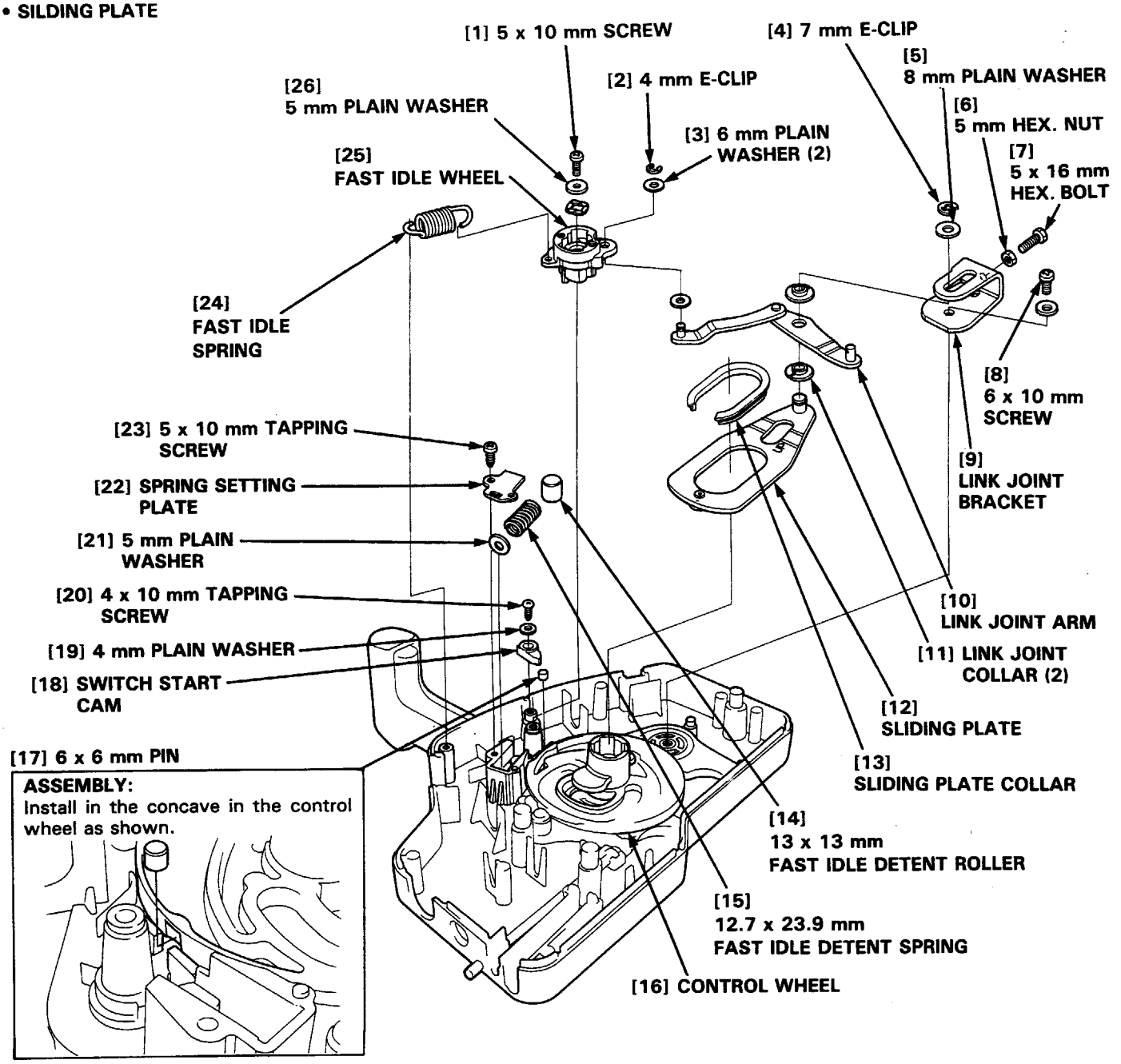
• REMOTE CONTROL CABLE



• ELECTRIC COMPONENTS



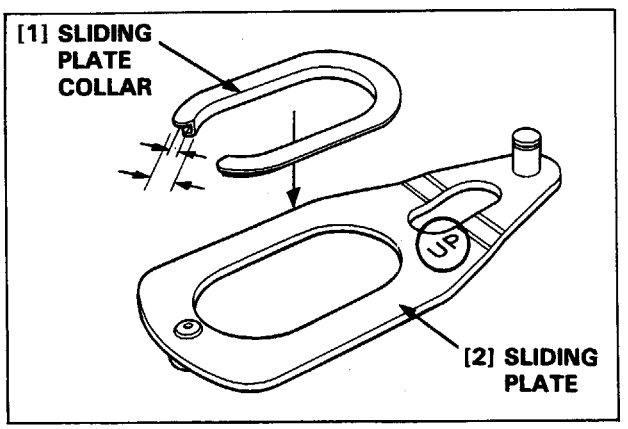
• SILDING PLATE



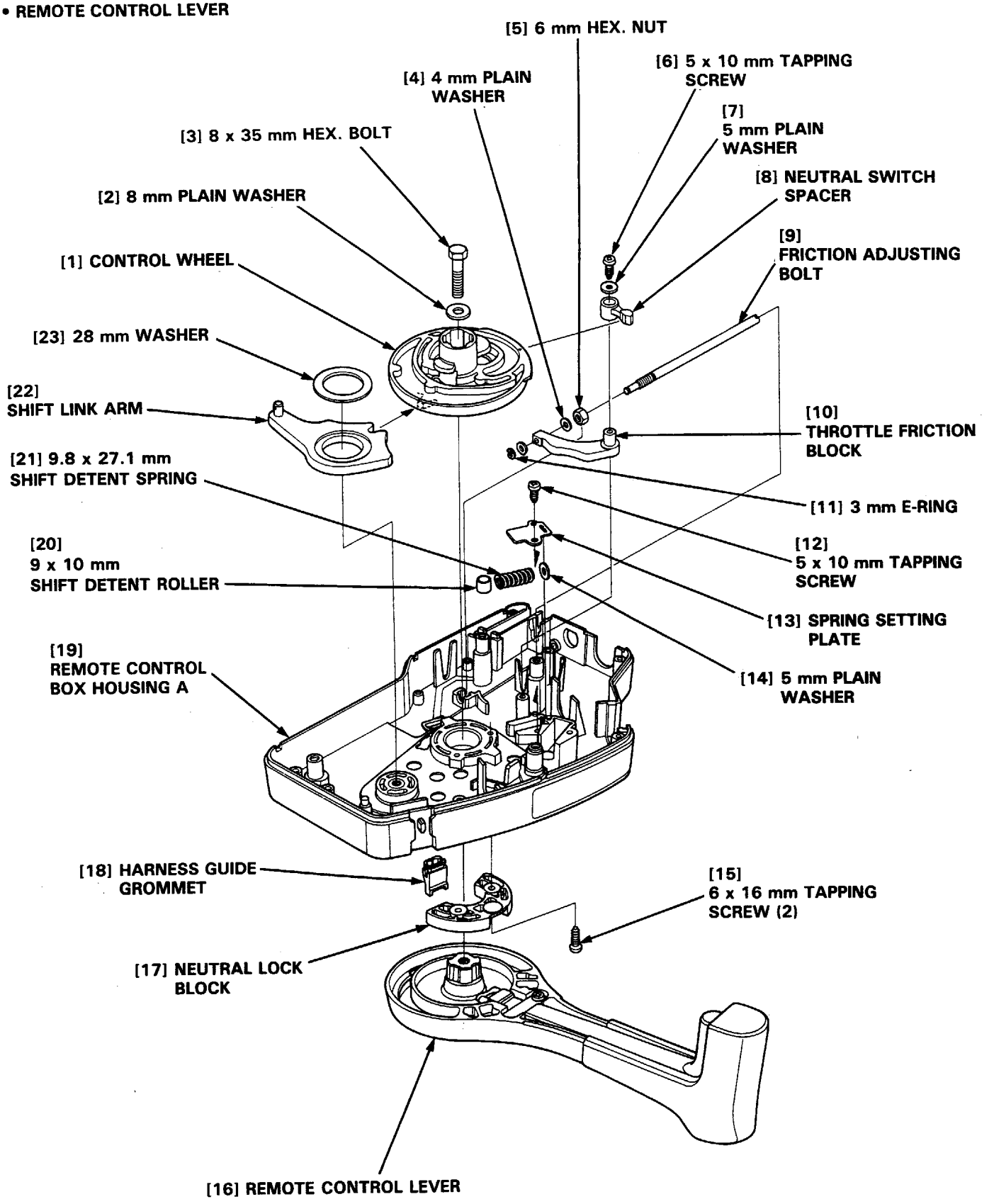
ASSEMBLY:
Install in the concave in the control wheel as shown.

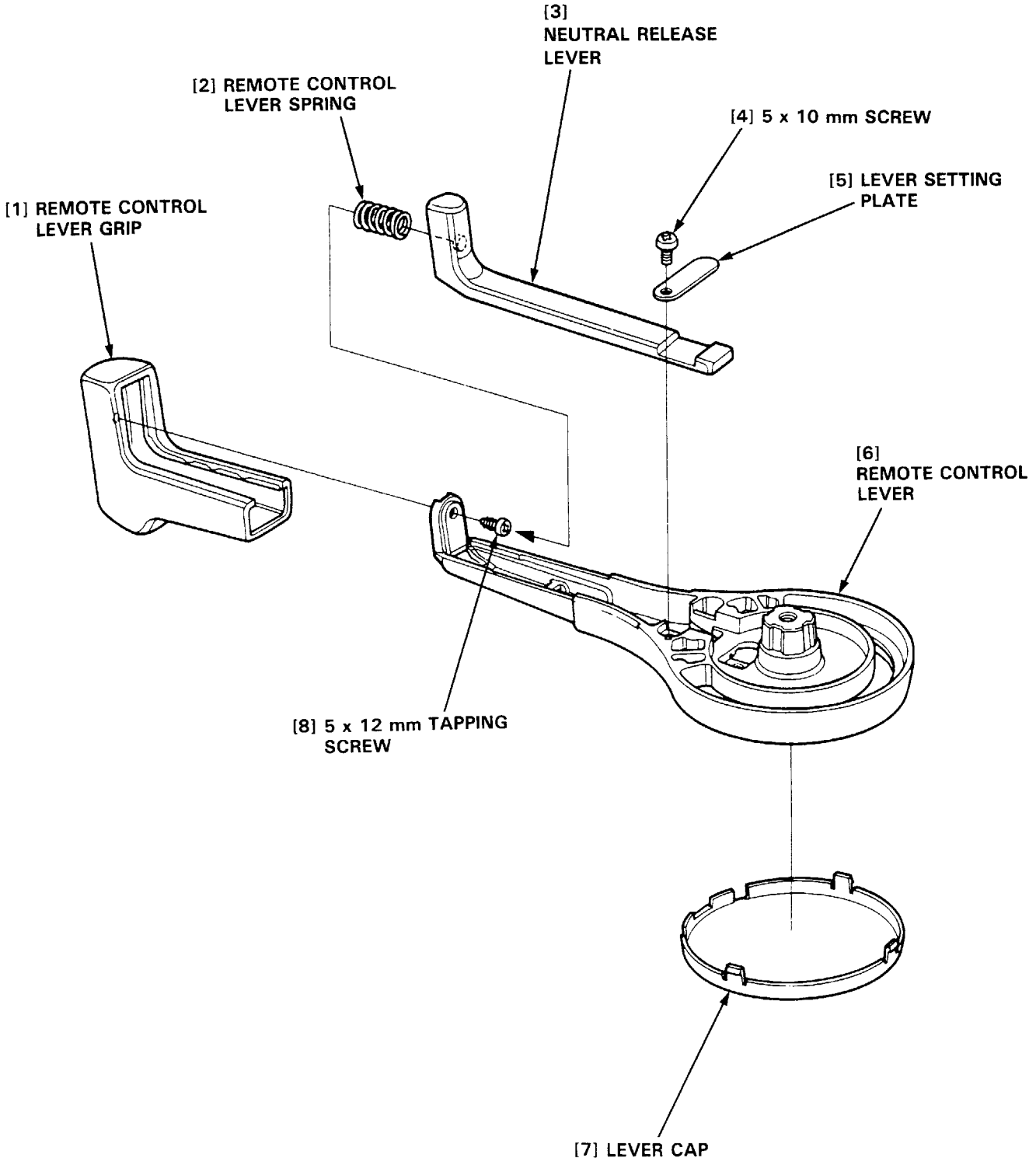
• SLIDING PLATE/COLLAR INSTALLATION

Install the sliding plate with the "UP" mark toward up. Attach the sliding plate collar to the sliding plate with its opening toward the opposite from the "UP" mark side of the sliding plate and the wide lip toward up.



• REMOTE CONTROL LEVER

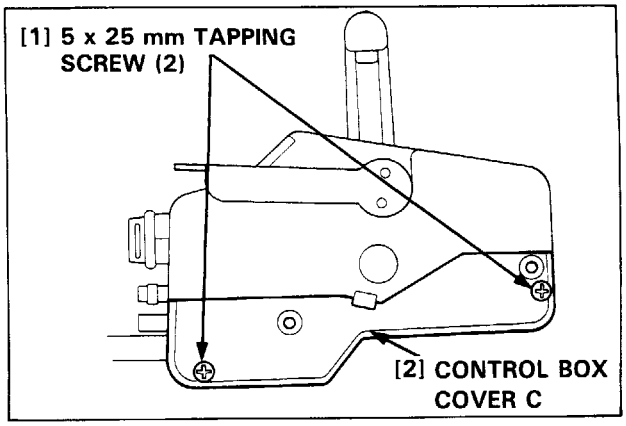



[3]
NEUTRAL RELEASE
LEVER
[2] REMOTE CONTROL
LEVER SPRING
[4] 5 x 10 mm SCREW
[5] LEVER SETTING
PLATE
[1] REMOTE CONTROL
LEVER GRIP
[6]
REMOTE CONTROL
LEVER
[8] 5 x 12 mm TAPPING
SCREW
[7] LEVER CAP

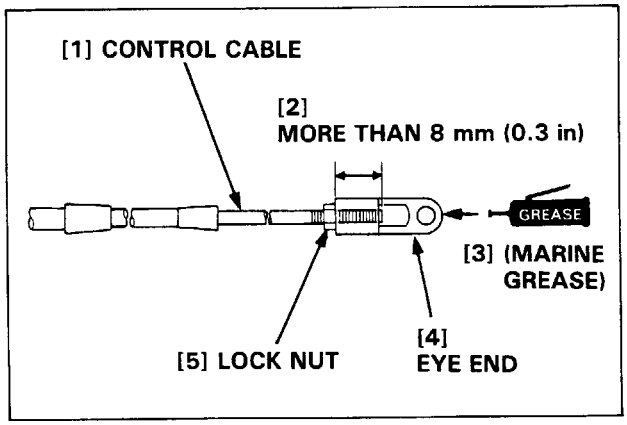
4. REMOTE CONTROL CABLE INSTALLATION

• **REMOTE CONTROL BOX SIDE**

1) Remove the two screws and control box cover C.



2) Screw the lock nuts and eye ends more than 8 mm (0.3 in) onto the thread of the remote control cable and tighten the lock nut securely to hold the pivot. Apply marine grease to the hole of the eye end.



3) Install the shift cable by aligning the groove of the control cable with the cable guide plate. Then connect the eye end to the shift arm pin using the two washers and 6 mm lock pin.

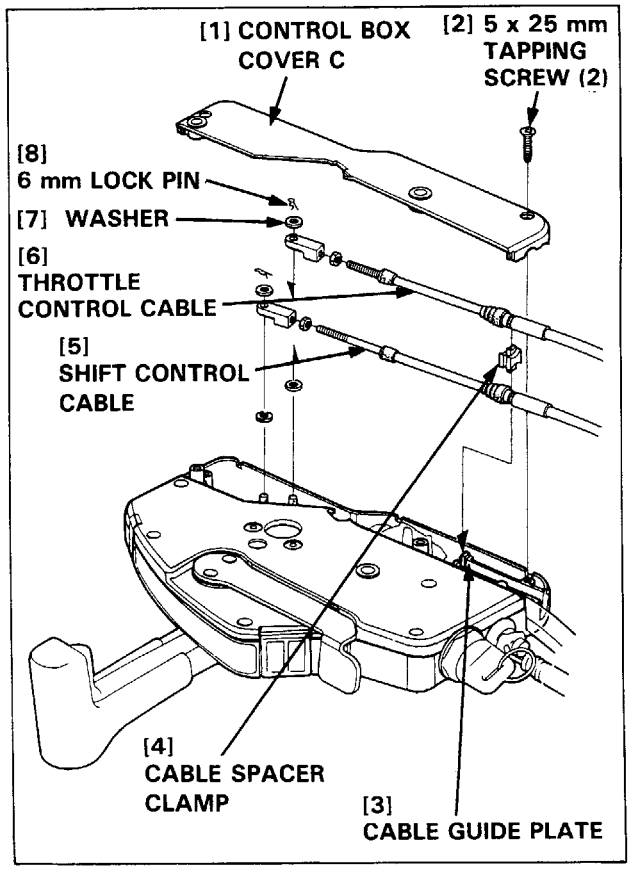
4) Install the cable spacer clamp and throttle control cable by aligning the groove with the cable guide plate. Then connect the eye end to the throttle arm pin using the two washers and 6 mm lock pin.

NOTE

• Make sure to insert the two washers and secure them with the 6 mm lock pins.

5) Install the control box cover C and tighten the screws.

TORQUE: 2 N•m (0.2 kg-m, 1.4 ft-lb)

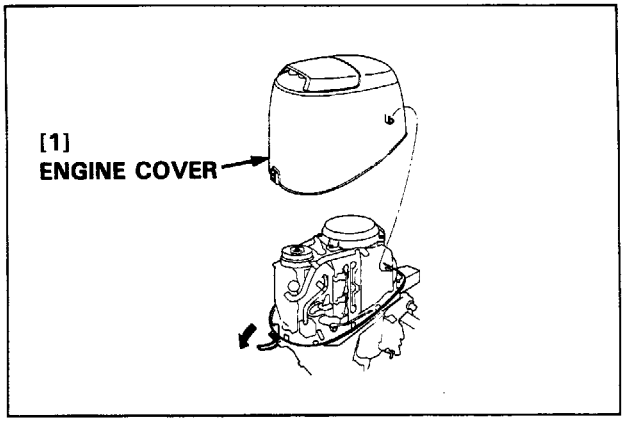


• **OUTBOARD MOTOR SIDE**

NOTE

- After installing the control cable to the remote control box, install the control cable to the outboard motor.
- Connect the control cable to the outboard motor with the remote control lever in "N" position and Choke/Fast idle lever in fully closed position (idle).

1) Remove the engine cover.



2) Pass the remote control cable B and control cables through the grommet as shown.

3) Attach the control cable plate to the control cables by aligning the groove with the control control cable, and then install them in the case.

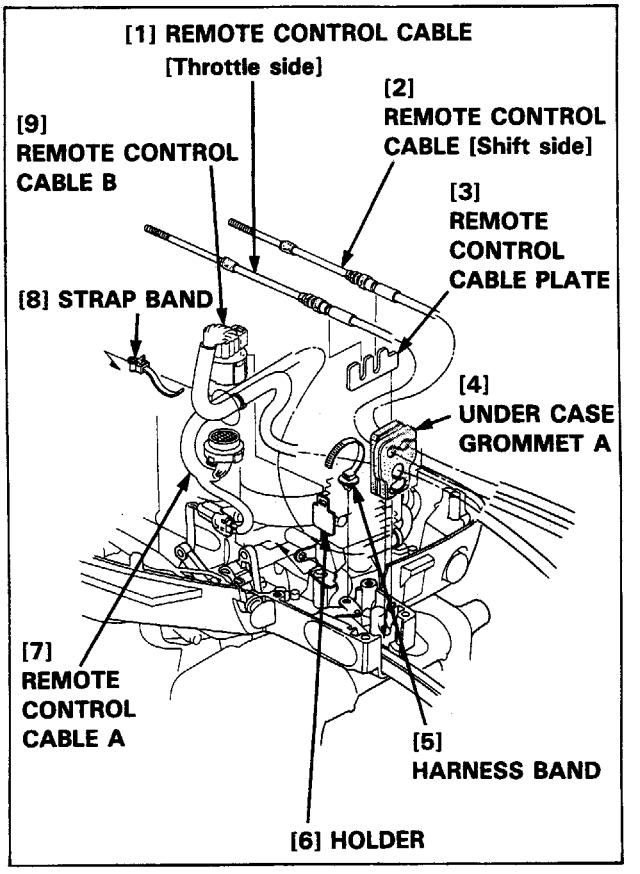
NOTE

- The starter cables go through the bottom hole in the rubber grommet.

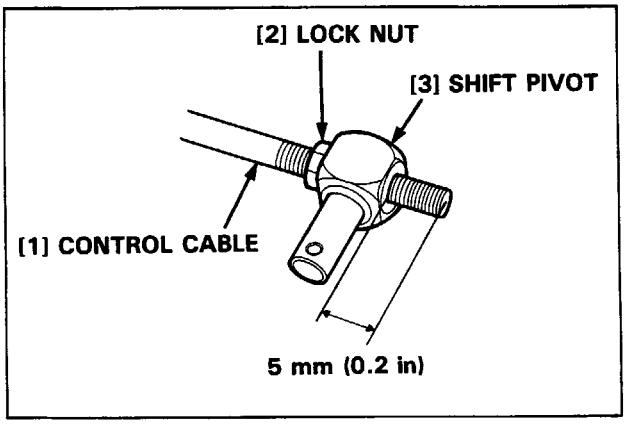
4) Connect the remote control cable A to the remote control cable B and attach the connector to the holder.

5) Clamp the remote control cable A and B in the strap band securely.

6) Clamp the remote control cable B in the harness band securely.



7) Screw the shift pivot onto the threaded portion of the throttle and shift cable as shown.



8) Make sure that the shift arm on the outboard motor side is in the neutral position (N), and that the control lever at the remote control box is in the neutral position (N).

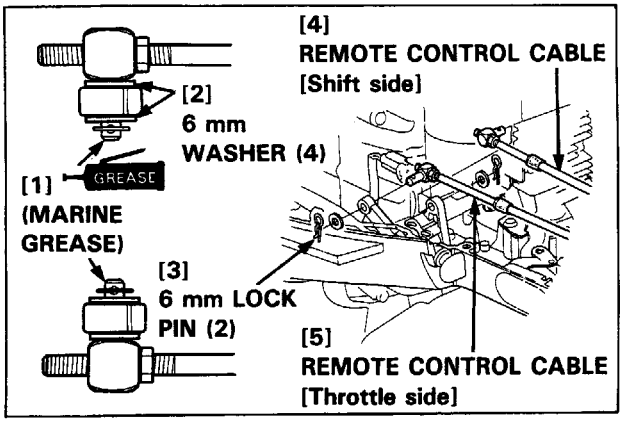
9) Apply marine grease to the pins of the shift pivot.

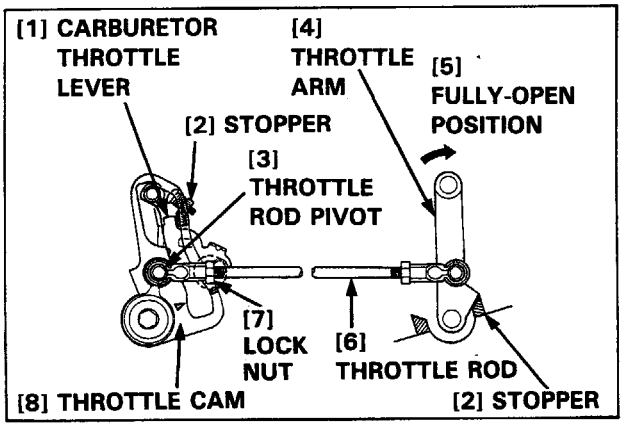
10) Connect the control cables to the shift link and throttle arm using 6 mm washers and lock pins as shown. Tighten the lock nuts securely.

NOTE

- Use the 6 mm washers on both sides of the arm as shown.
- If the holes in the shift link and the pivot pin do not align, adjust by turning the shift pivot in or out, as required.
- The pivot pin on the shift control cable must point inward while the pivot pin on the throttle control cable must point outward.

11) Install the four bolts, two washers, and separate top cover.





CONTROL CABLE LENGTH ADJUSTMENT

• THROTTLE CONTROL CABLE

1) Disconnect the throttle control cable from the throttle arm.

2) Move the throttle arm to the fully-open position until it touches the stopper and check that the carburetor throttle lever touches the stopper at the fully-open position.

3) If no, disconnect the throttle rod from the throttle cam, loosen the lock nut and adjust the rod length by turning the throttle rod pivot.

4) After adjustment tighten the lock nut securely and connect the throttle rod to the throttle cam.

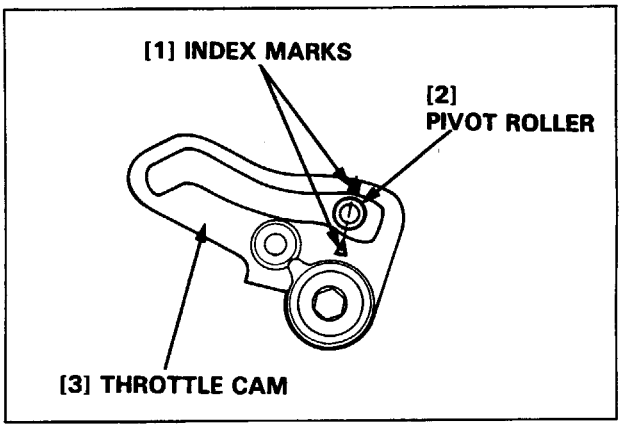
5) Reconnect the throttle control cable to the throttle arm and set the remote control lever is the "N" position.

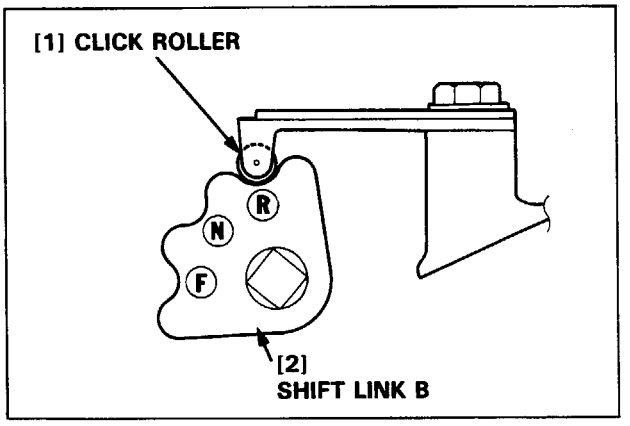
6) Check that the center of the pivot roller aligns with the index marks on the throttle cam.

7) If not disconnect the throttle control cable, loosen the lock nut and turn the shift pivot to adjust.

8) After adjustment, tighten the lock nut securely and reconnect the throttle control cable.

9) Move the remote control lever and check that control lever moves smoothly and that the carburetor throttle lever moves smoothly without binding from the fully-open to the fully-closed position.





• SHIFT CONTROL CABLE

1) Disconnet the shift control cable from the shift arm. Set shift link B in the "R" position and visually inspect that the click roller is in the center of the groove of shift link B.

2) Loosen the lock nut and adjusting nut connecting shift rod A to shift rod B.

3) Disconnect shift rod A from shift rod B by backing off the adjusting nut. Back off the adjusting nut nutil it is approximately 3 mm (0.1 in) above the top of shift rod B.

4) Turn the lock nut on shift rod B to obtain 8 mm (0.3 in) between the top of the lock nut and the top of shift rod B as shown.

5) Thread the adjusting nut onto shift rod B until the adjusting nut comes in contact with the lock nut. When the adjusting nut contacts the lock nut, tighten the lock nut and adjusting nut together.
After the adjustment, be sure that the remote control lever moves smoothly into all positions.

6) Reconnect the shift control cable and set the remote control lever is the neutral position (N).

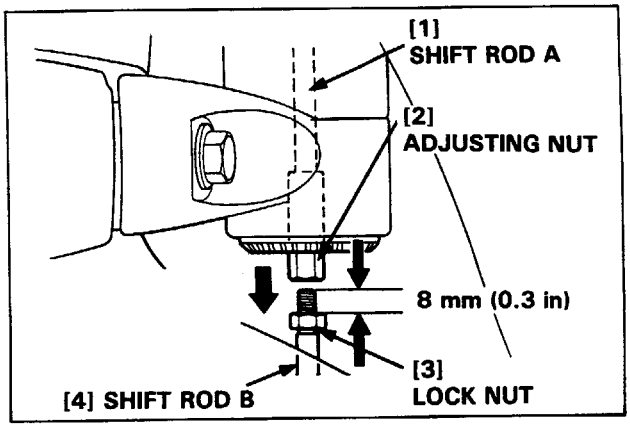
7) Check that the click roller sits in the (N) groove of the shift link B.

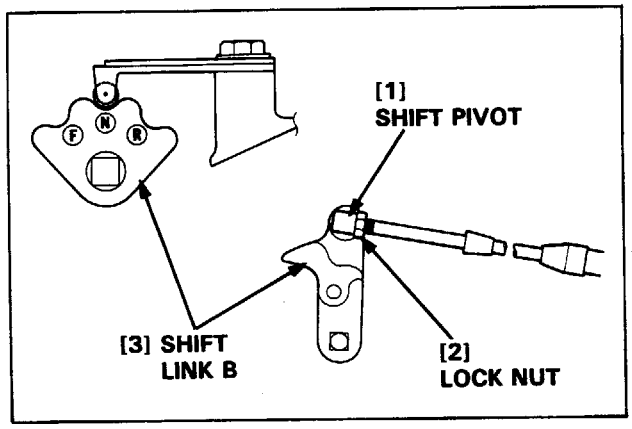
8) If not, disconnect the shift pivot, loosen the lock nut, and turn the shift pivot as required.

9) Tighten lock nut securely and reconnect the shift pivot.

10) After the adjustment, ensure that the shift lever operates correctly.

11) Install the engine cover.





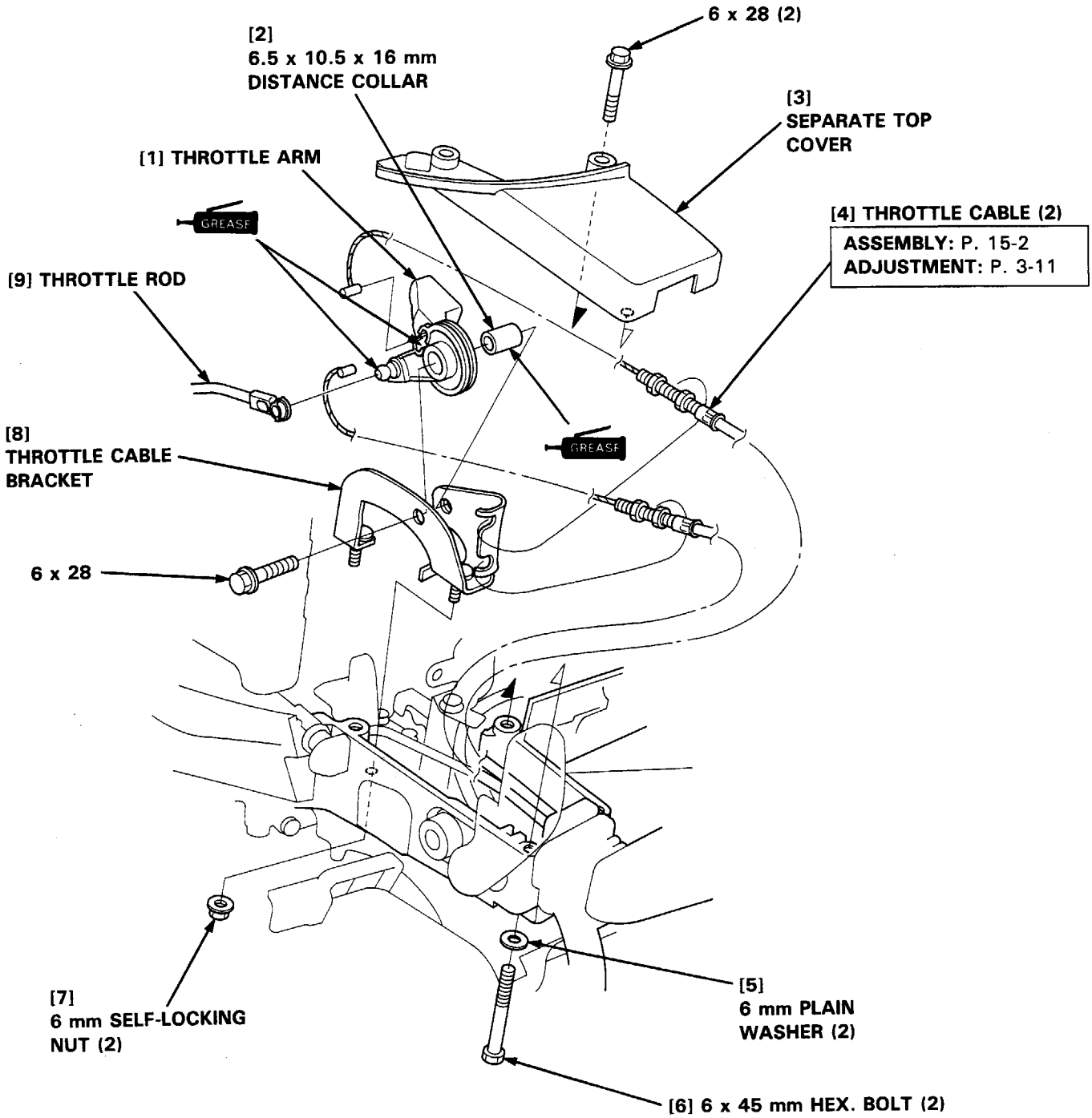
15. THROTTLE CABLE BRACKET/ SHIFT LEVER/ TILLER HANDLE (TILLER HANDLE TYPE ONLY)

1. THROTTLE CABLE BRACKET
2. SHIFT LEVER
3. TILLER HANDLE

1. THROTTLE CABLE BRACKET

DISASSEMBLY/ASSEMBLY

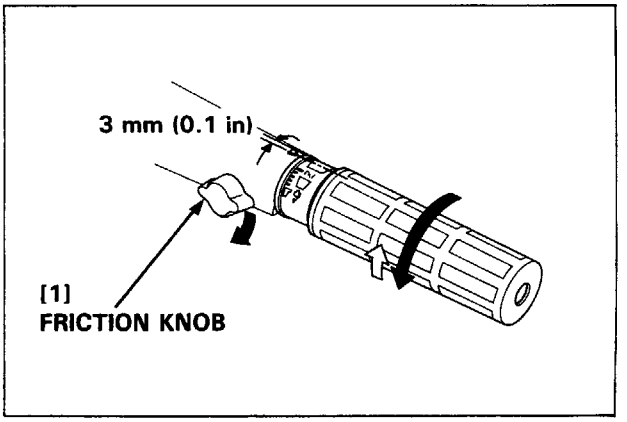
Remove the engine cover (P. 5-1).



• THROTTLE CABLE

ASSEMBLY:

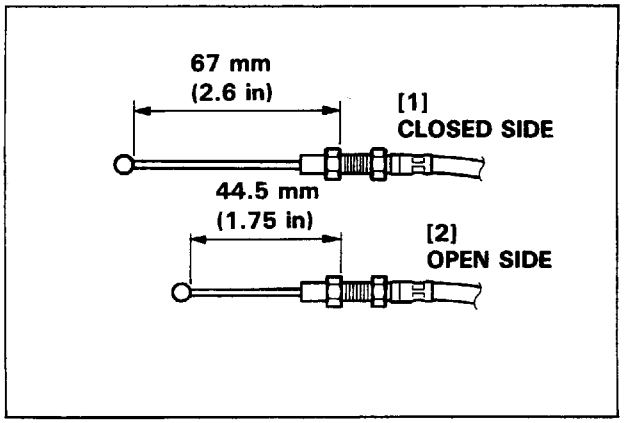
1) Turn the throttle grip to the full open position, then back it off 3 mm (0.1 in) from the fully open position and tighten the friction bolt.



2) Adjust the closed side and open side of the throttle cables to the length shown in the drawing.

NOTE

- Before adjusting the throttle cable length, be sure that throttle cables are connected to the outboard motor securely (page 15-4).



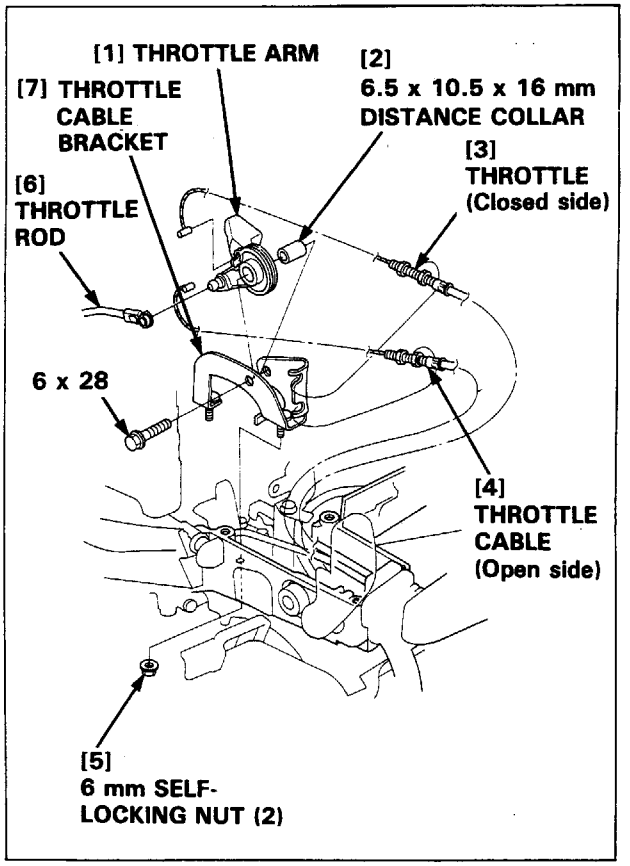
3) Connect the throttle cables to the throttle arm.

4) Connect the throttle cables to the throttle cable bracket.

NOTE

- Connect the throttle cables to the throttle cable bracket with care not to change the length of the cables.

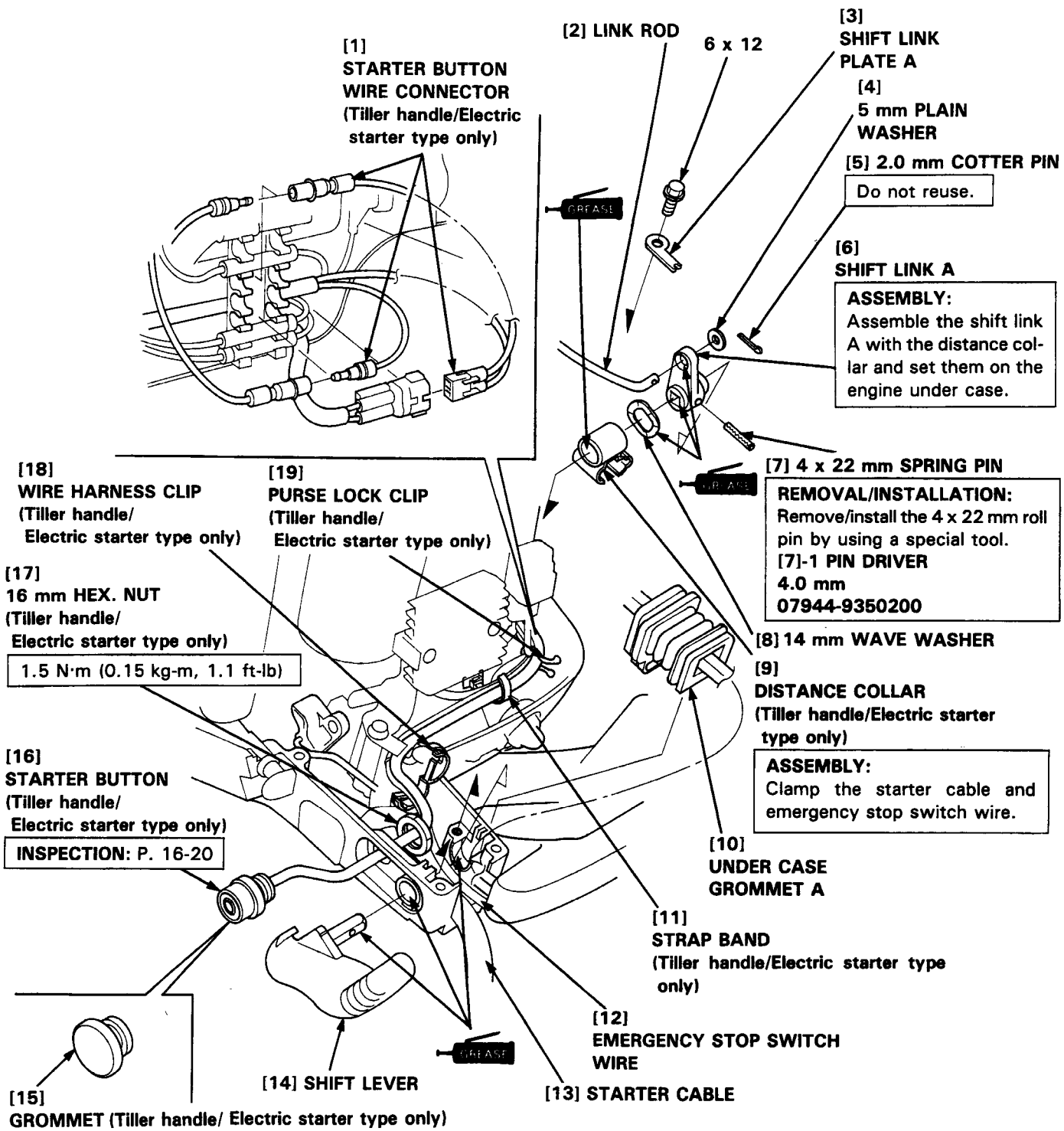
5) Loosen the friction knob and install the 6.5 x 10.5 x 16 mm distance collar on the throttle cam.
6) Install the throttle cam on the throttle cable bracket and tighten the 6 x 28 mm flange bolt.
7) Install the throttle cable bracket on the engine under case and tighten the 6 mm self-locking nuts.
   Install the throttle rod.
8) After installing the throttle cable bracket, adjust the throttle (P. 3-11).



2. SHIFT LEVER

DISASSEMBLY/ASSEMBLY

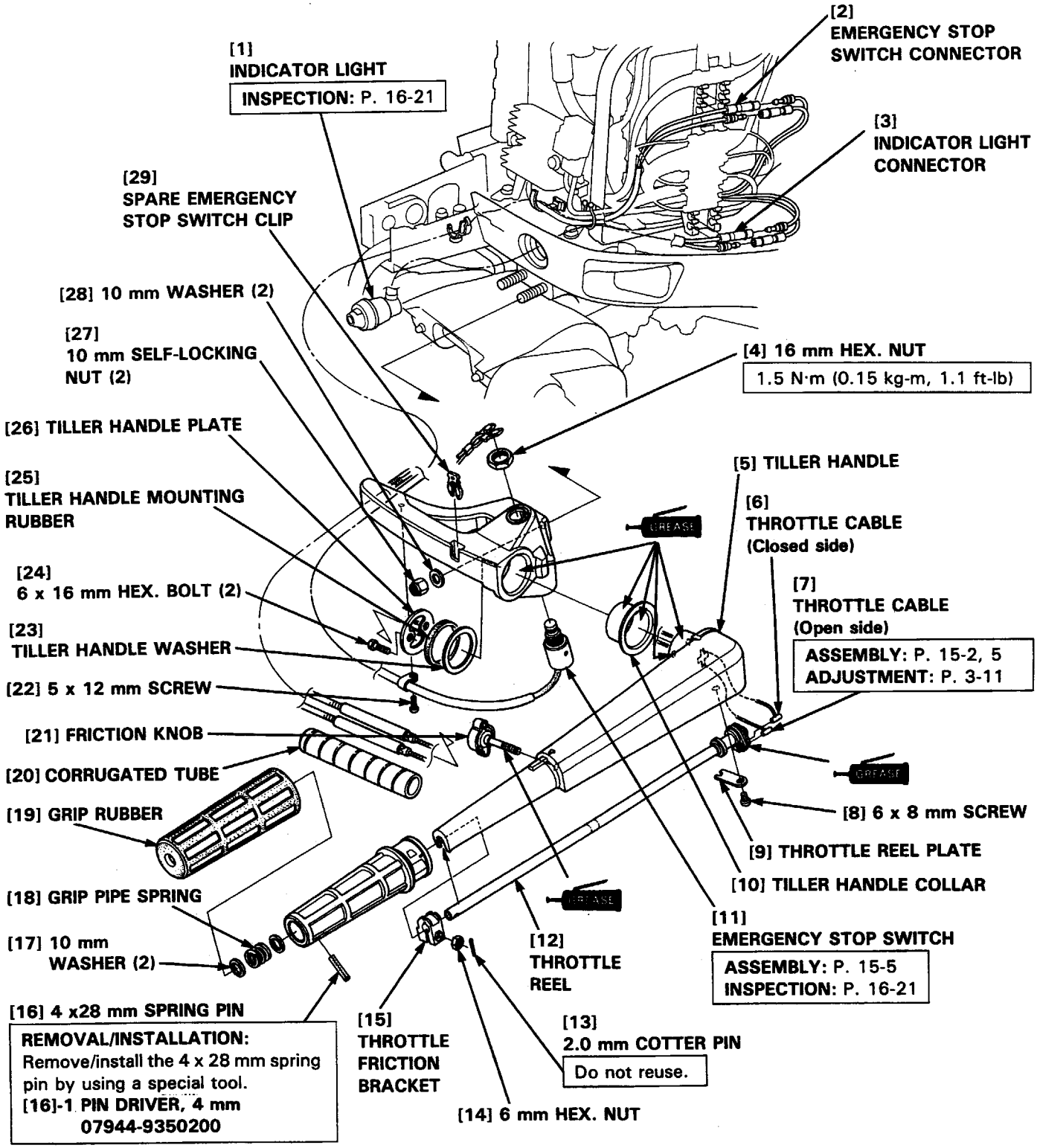
1) Remove the engine cover and separate top cover (P. 15-1).
2) Remove the CDI unit cover and disconnect the starter button wire connectors (Tiller handle/Electric starter type only).
3) Remove the throttle cable bracket (P. 15-1).
4) Move the shift lever to the "R" position.
5) Open the harness clip, strap band and purse lock clip (Tiller handle/Electric starter type only).



3. TILLER HANDLE

DISASSEMBLY/ASSEMBLY

1) Remove the shift lever (P. 15-4).
2) Disconnect the indicator light connectors, wire connector and emergency stop switch connectors.



• EMERGENCY STOP SWITCH/ THROTTLE CABLE

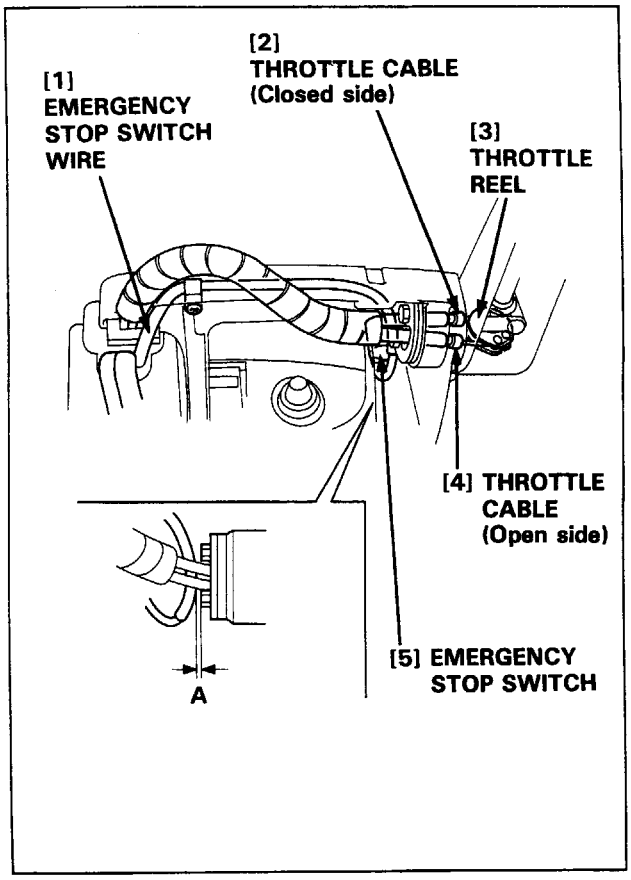
ASSEMBLY:

Connect the open side and closed side of the throttle cables to the throttle reel as shown.

Route the emergency stop switch wire as shown.

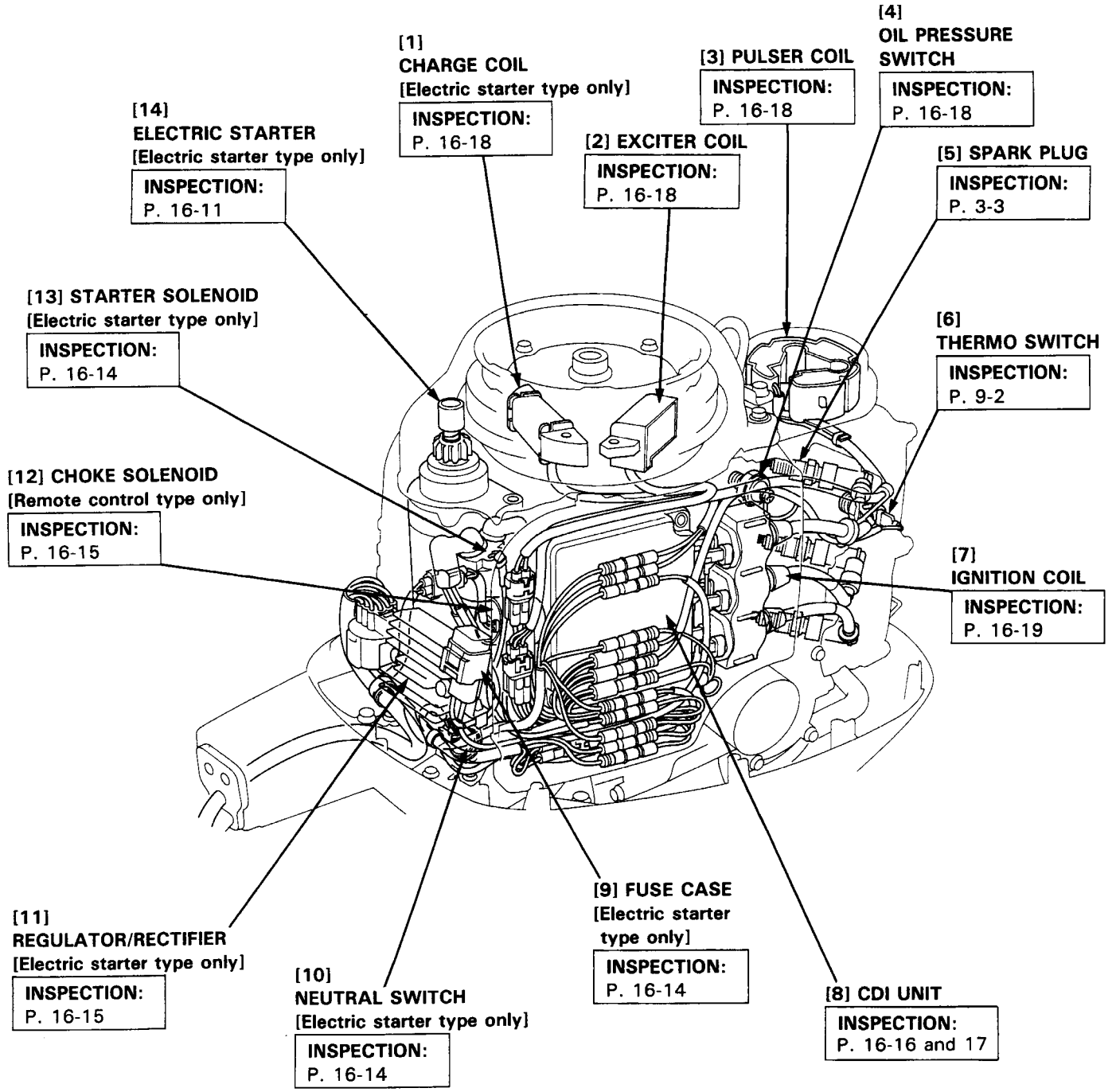
NOTE

- Move the tiller handle up and down and be sure that the clearance between the emergency stop switch wire and bolt (A in the drawing) is 1 mm (0.04 in) or more.

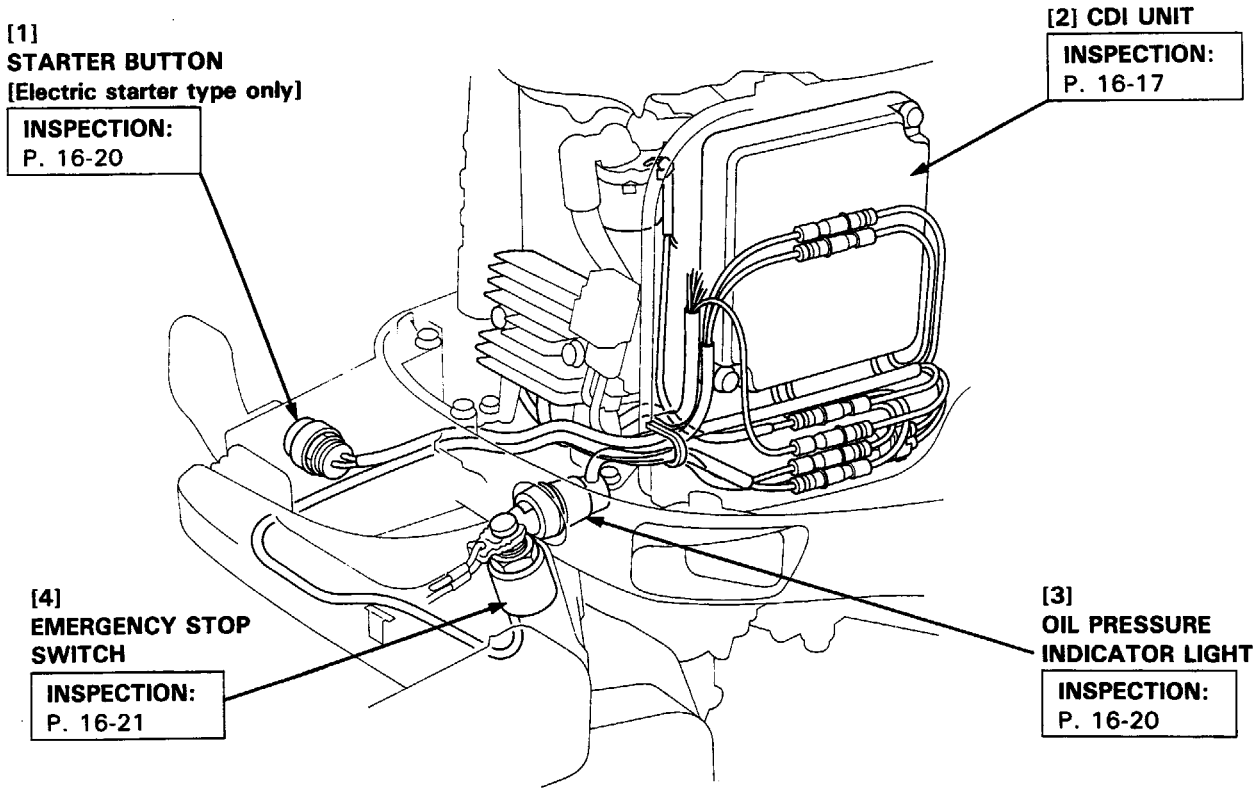


16. ELECTRICAL EQUIPMENT

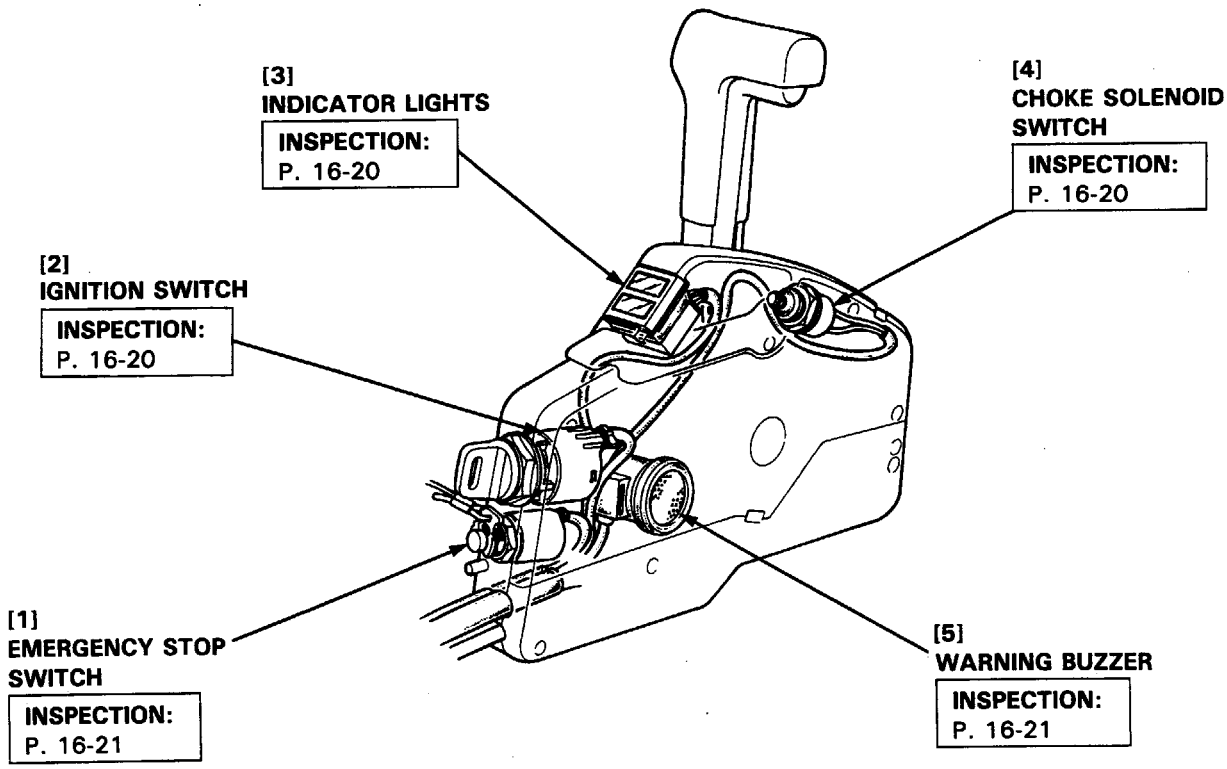
1. COMPONENT LOCATION



• TILLER HANDLE TYPE



• REMOTE CONTROL

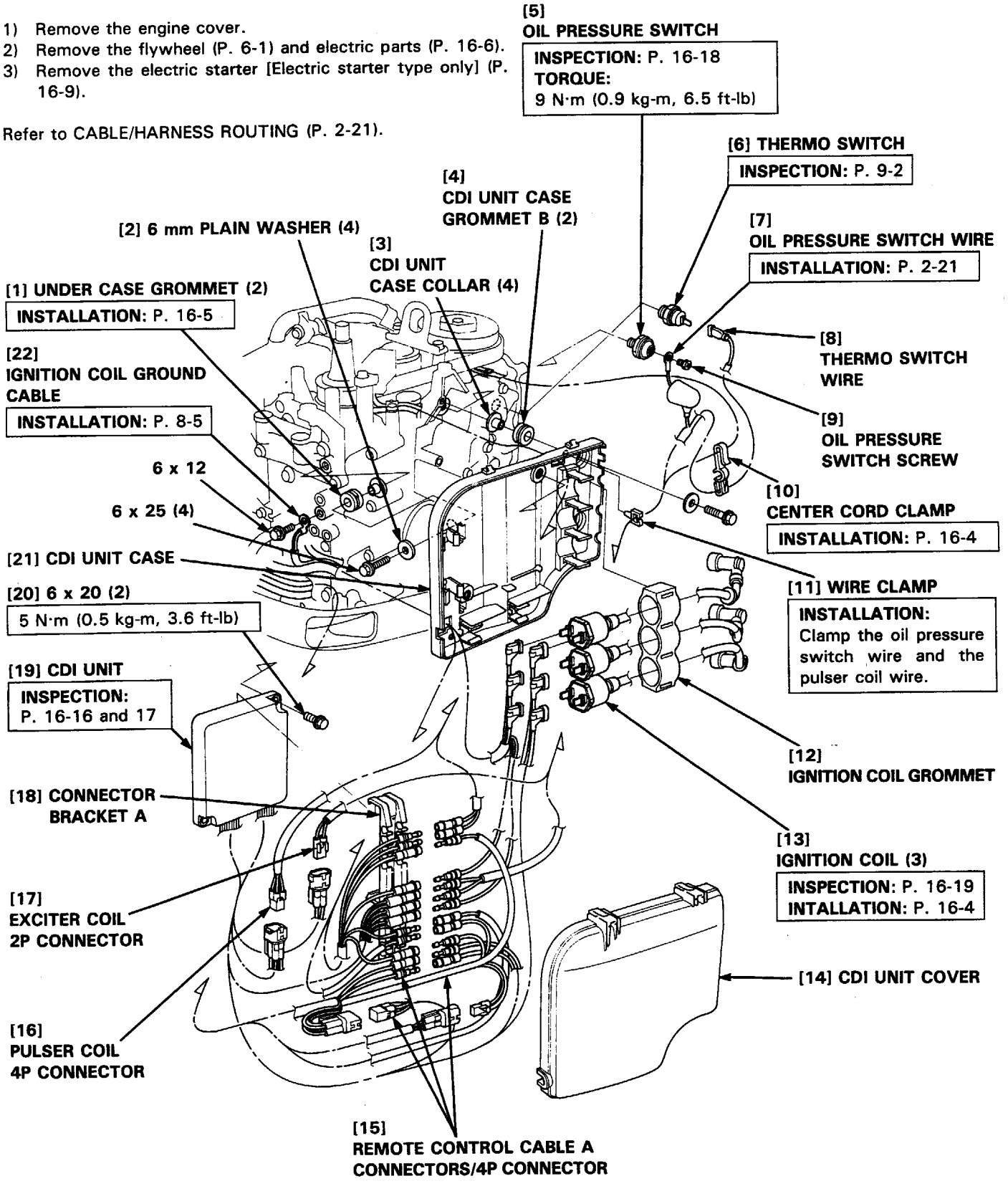


2. CDI UNIT/IGNITION COIL

a. DISASSEMBLY/ASSEMBLY

1) Remove the engine cover.
2) Remove the flywheel (P. 6-1) and electric parts (P. 16-6).
3) Remove the electric starter [Electric starter type only] (P. 16-9).

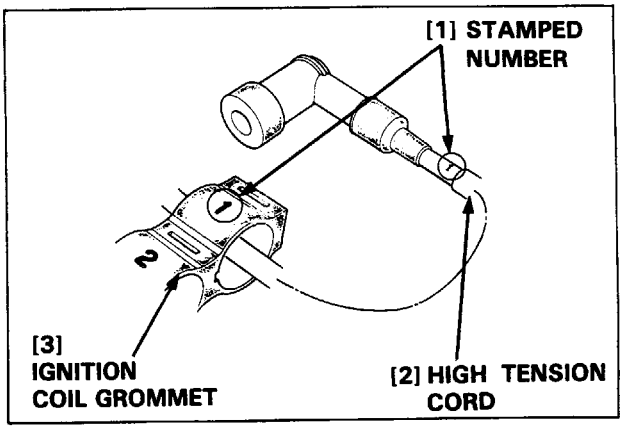
Refer to CABLE/HARNESS ROUTING (P. 2-21).



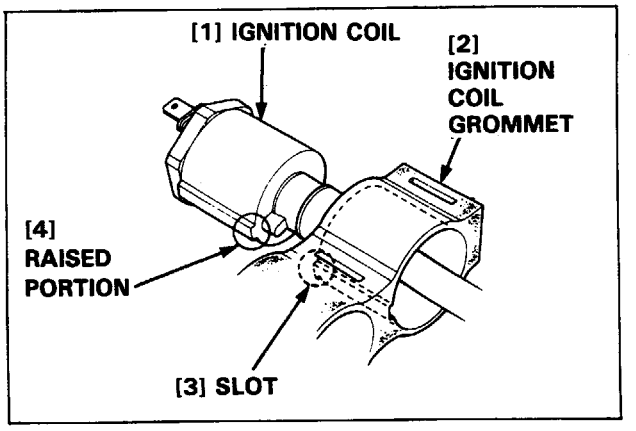
b. INSTALLATION

• **IGNITION COIL**

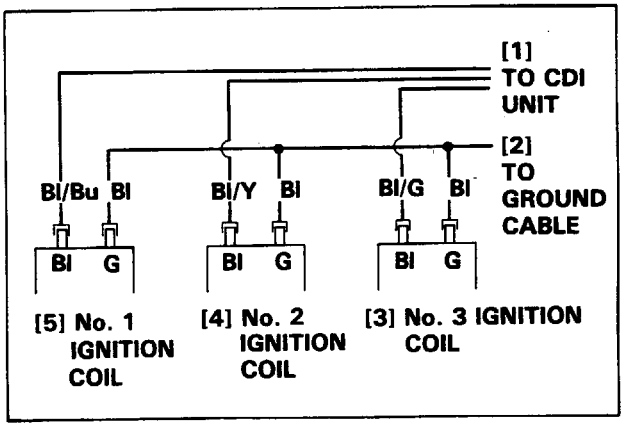
1) Cross-reference the number stamped on the high tension cord and the number on the ignition coil grommet, and pass the ignition coil through the grommet stamped with the same number.



2) Align the slot in the ignition coil grommet with the raised portion on the ignition coil, and assemble the ignition coil with the ignition coil grommet securely.

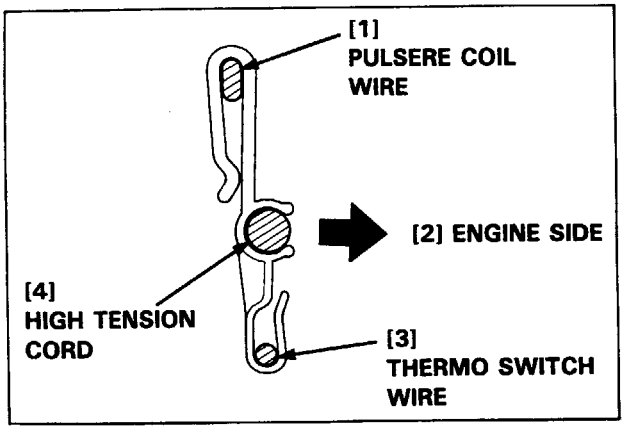


3) Connect the ignition coil wires to ignition coils as shown.



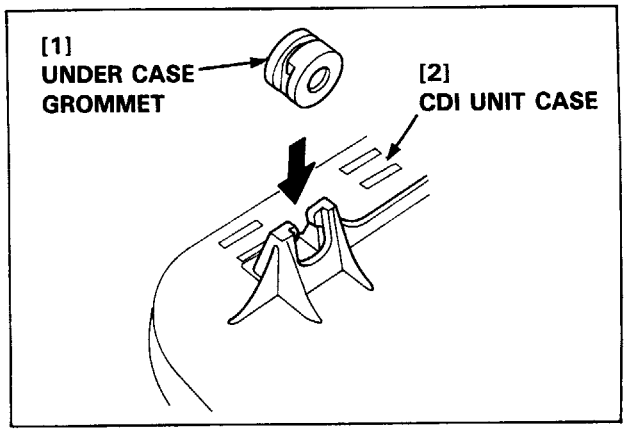
• **CENTER CORD CLAMP**

Clamp each wire as shown, and install the center cord clamp noting the installation direction.



• **UNDER CASE GROMMET**

Install the under case grommet on the CDI unit case as shown.

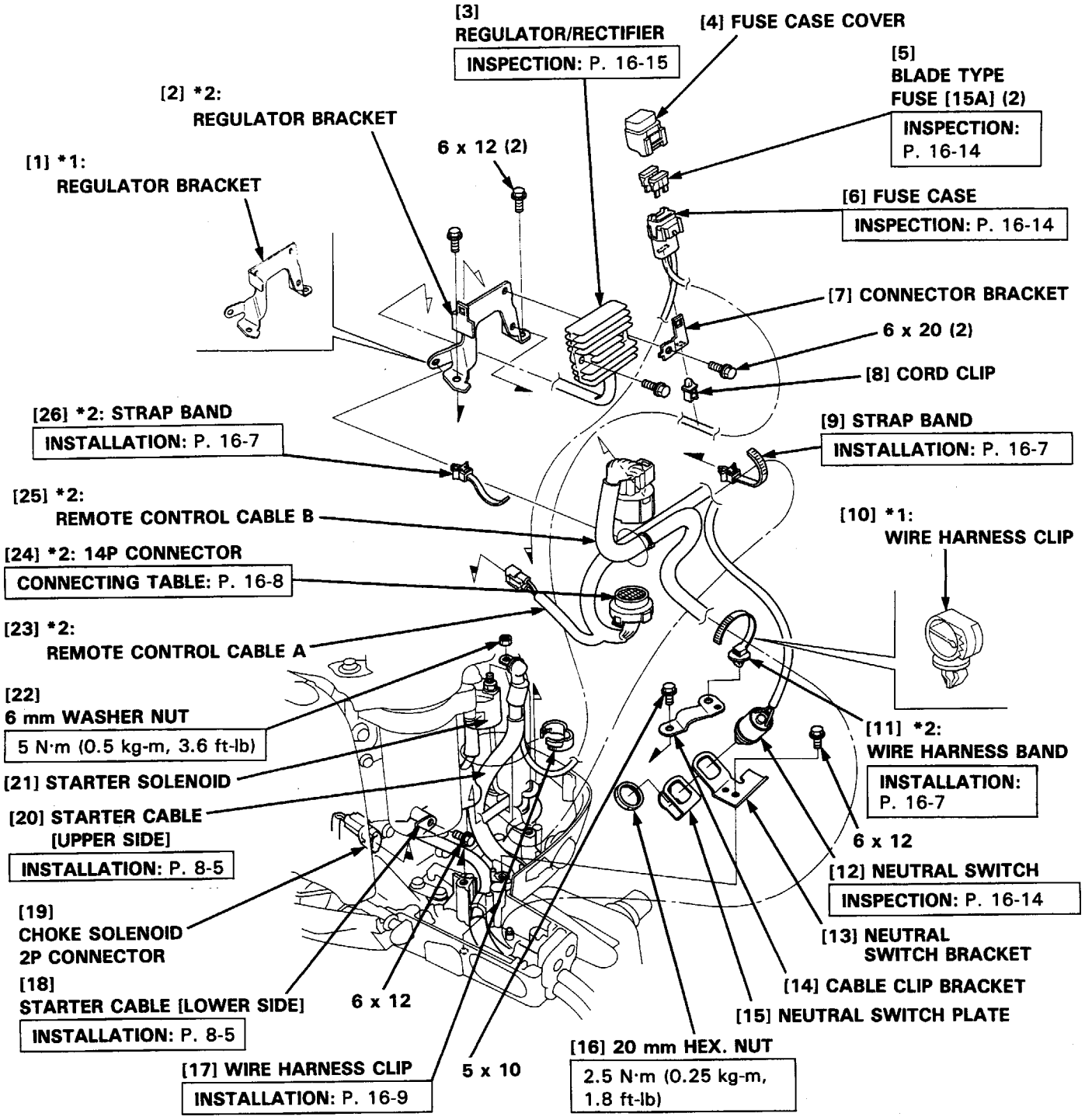


3. ELECTRIC PARTS

DISASSEMBLY/ASSEMBLY

1) Remove the engine cover and CDI unit cover (P. 16-3).
2) Disconnect the remote control cable A connectors /4P connector [Remote control type only], regulator/rectifier connector, neutral switch 2P connector and fue case connectors [Electric starter type only].

*1: Tiller handle/Electric starter type only
*2: Remote control/Electric starter type only

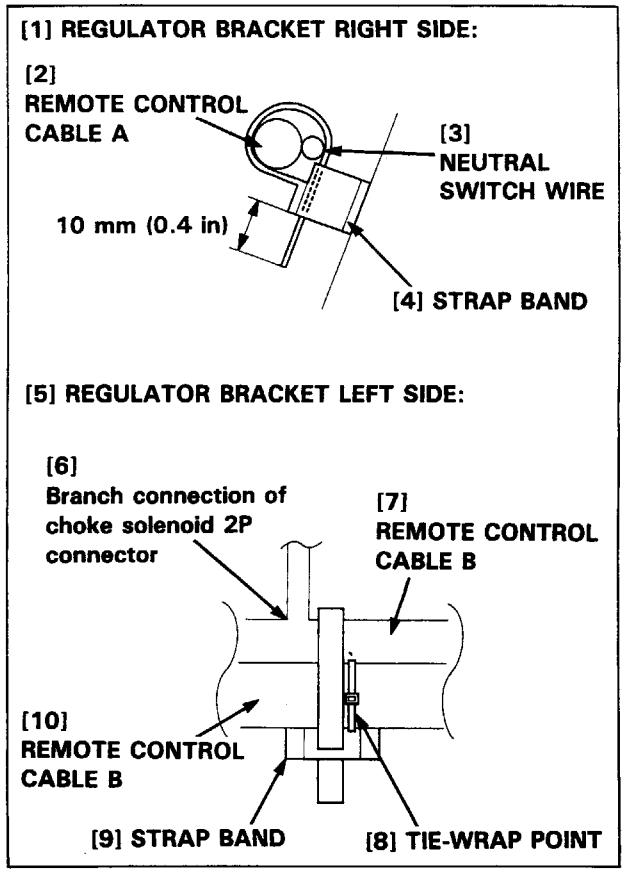


• **SATRAP BAND**

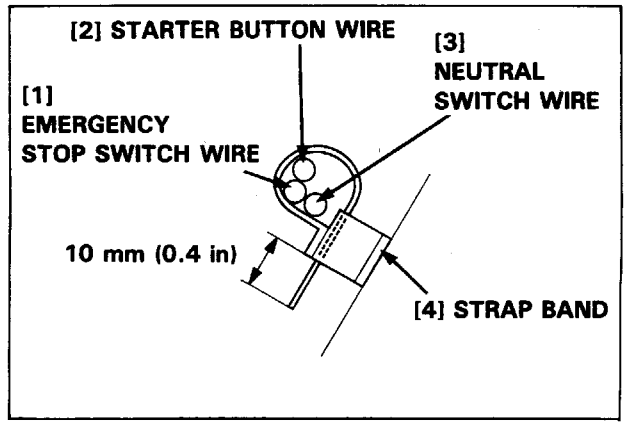
INSTALLATION:
<Remote control/Electric starter type>
Strap band at the right of the regulator bracket:
Clamp the remote control cable A and neutral switch wire.

Strap band at the left of the regulator bracket:
Clamp the remote control cable A and remote control cable AB. Tighten the strap band at the part between the tie-wrap of the remote control cable B and the branch connection of the choke solenoid 2P connector. After tightening the banb, cut excess of the band so that the band end length is approximately 10 mm (0.4 in).

After tightening the left strap band, be sure that there is clearance of approximately 5 mm (0.2 in) between the remote control cable assembly A/B and the shift side/throttle side of the remote control cable.

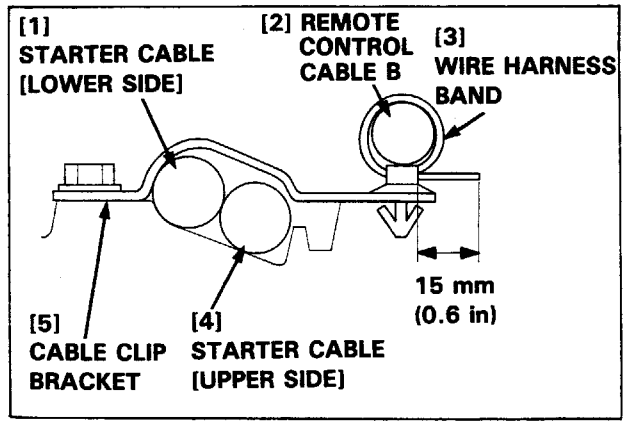


<Tiller handle/Electric starter type>
Clamp the starter button wire, emergency stop switch wire and neutral switch wire.
After tightening the band, cut excess of the band so that the band end length is approximately 10 mm (0.4 in).



• **WIRE HARNESS BAND [Remote control/Electric starter type]**

INSTALLATION:
Clamp the remote control cable B.
After tightening the band, cut excess of the band so that the band end length is approximately 15 mm (0.6 in).



• 14P CONNECTOR

CONNECTING TABLE:
Each terminal of the 14P connector is connected to the part shown below.

Outboard motor side:

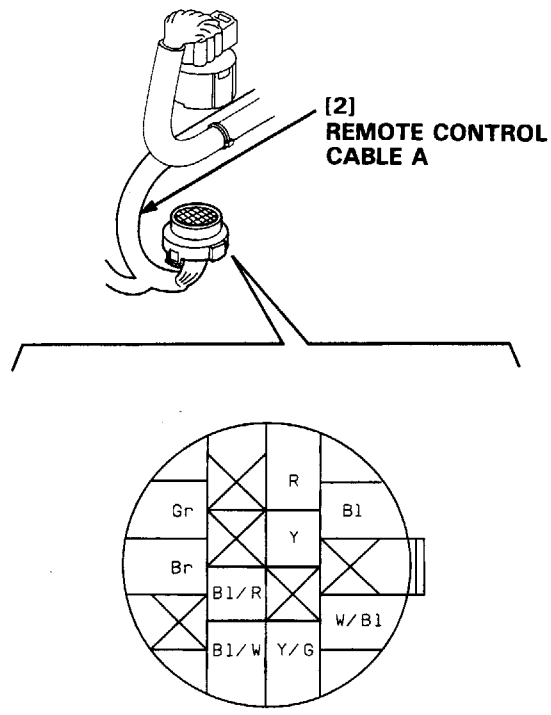
14P CONNECTOR	OUTBOARD MOTOR SIDE
Gr	TO REGULATOR/RECTIFIER
Br	TO CHOKE SOLENOID SWITCH
Bl/R	TO CDI UNIT
Bl/W	TO NEUTRAL SWITCH
W/Bl	TO REGULATOR/RECTIFIER
Y/G	TO CDI UNIT
Bl	TO GROUND
R	TO CDI UNIT
Y	

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

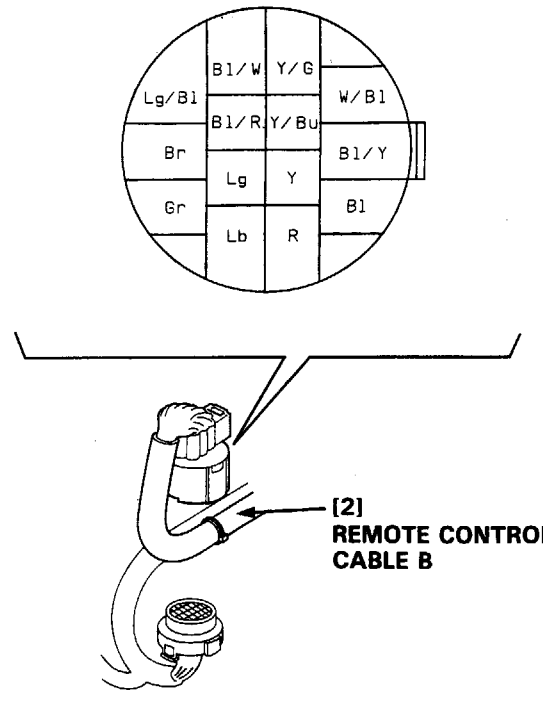
Remote control box side:

14P CONNECTOR	REMOTE CONTROL BOX SIDE
Lg/Bl	
Br	TO CHOKE SOLENOID SWITCH
Gr	
Bl/W	TO IGNITION SWITCH
Bl/R	
Lg	
Lb	
Y/G	TO WARNING BUZZER
Y/Bu	TO TACHOMETER (OPTIONAL PART)
Y	TO INDICATOR LIGHT
R	
W/Bl	TO IGNITION SWITCH
Bl/Y	
Bl	TO INDICATOR LIGHT

[1] OUTBOARD MOTOR SIDE:



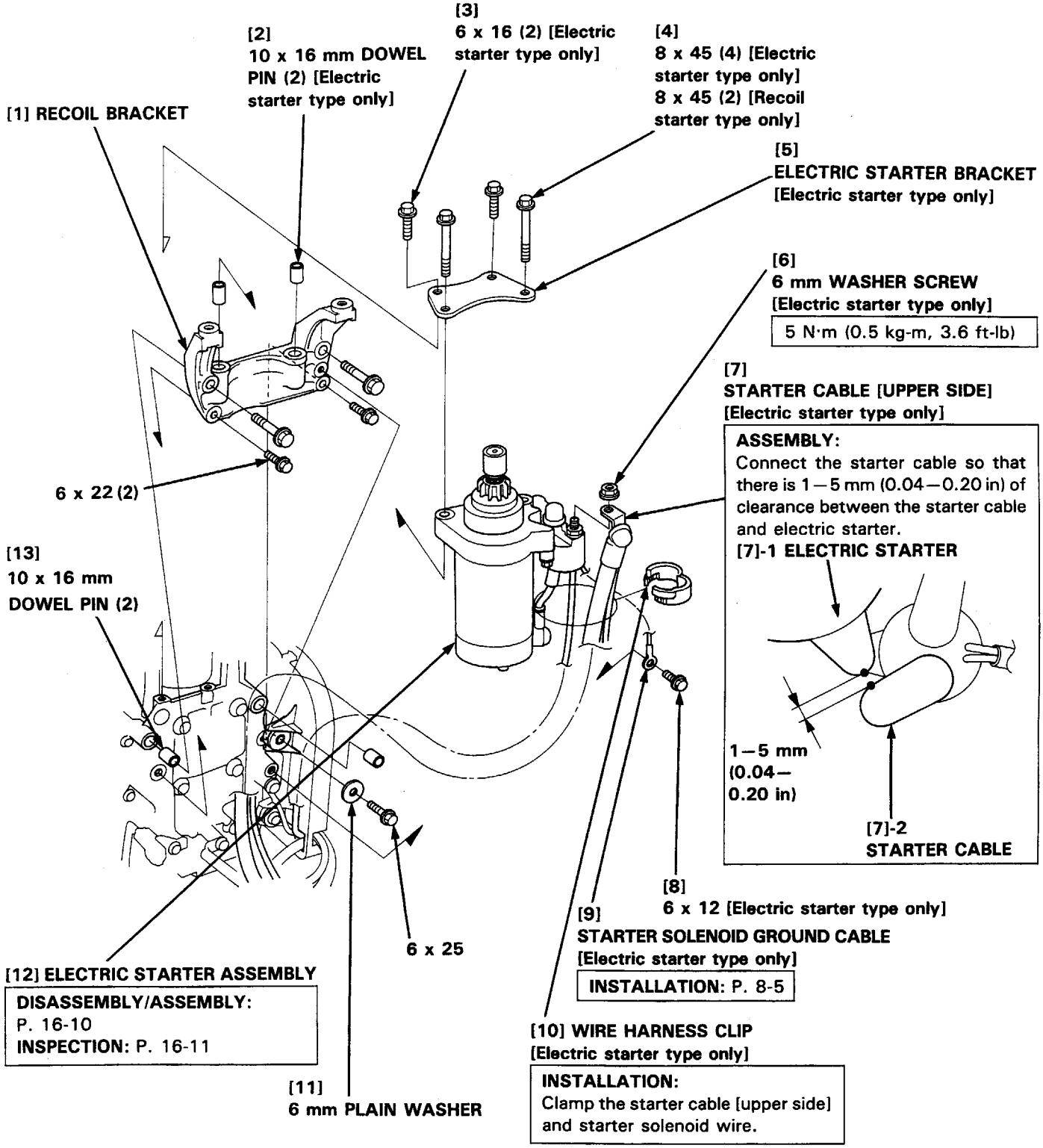
[1] REMOTE CONTROL BOX SIDE:



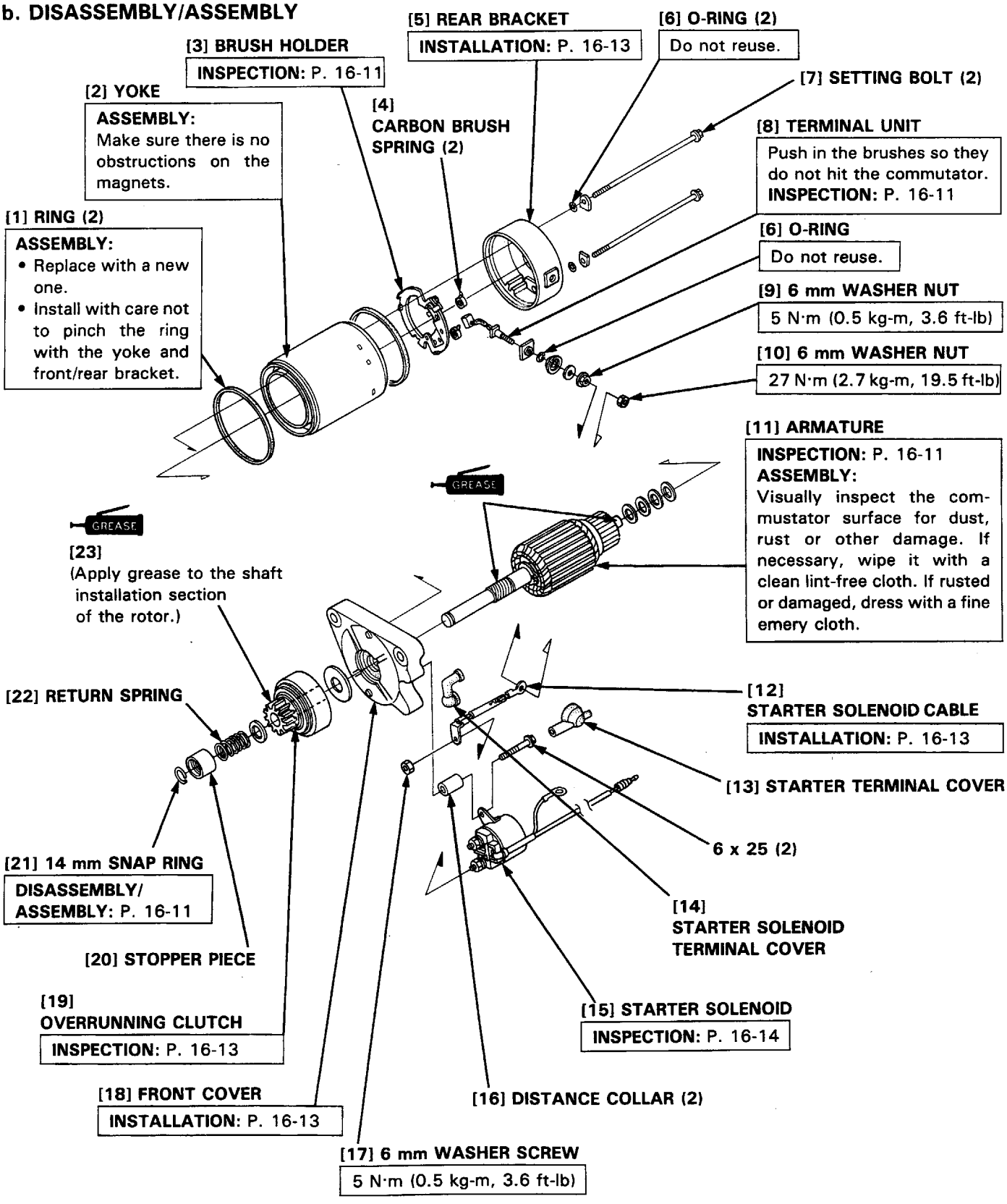
4. ELECTRIC STARTER [ELECTRIC STARTER TYPE ONLY]

a. REMOVAL/INSTALLATION

1) Remove the engine cover and flywheel (P. 6-1).
2) Remove the carburetor assembly (P. 5-1) and electrical parts (P. 16-6).



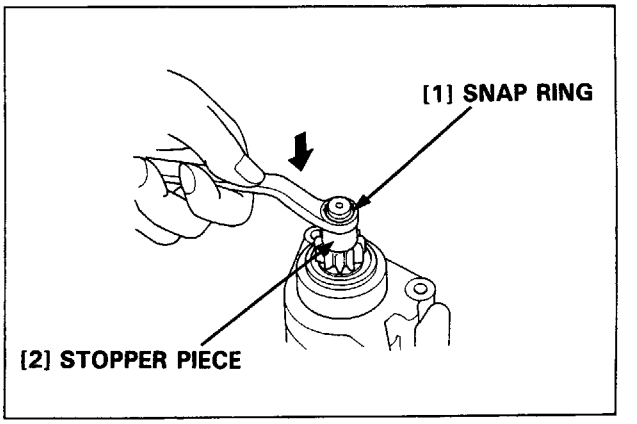
b. DISASSEMBLY/ASSEMBLY



• **14 mm SNAP RING**

DISASSEMBLY:
Hold the armature upright, place an offset box wrench over the stopper piece and push the stopper piece down exposing the snap ring. Remove the snap ring; then, remove the stopper piece and clutch.

ASSEMBLY:
Check for smooth movement in axial direction by rotating the clutch. Check the gear teeth for wear or damage; replace if necessary.
Also, check the flywheel ring gear teeth if the pinion gear teeth are damaged.

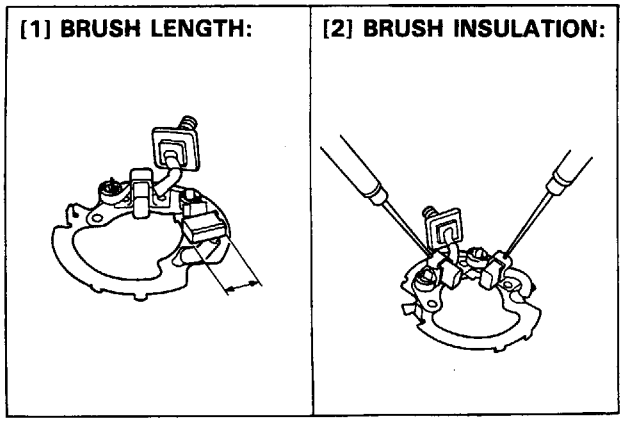


c. INSPECTION

• **BRUSH LENGTH**

Measure the brush length.
If brush length is less than standard, replace the brush holder.

STANDARD	SERVICE LIMIT
12.5 mm (0.49 in)	8.5 mm (0.33 in)



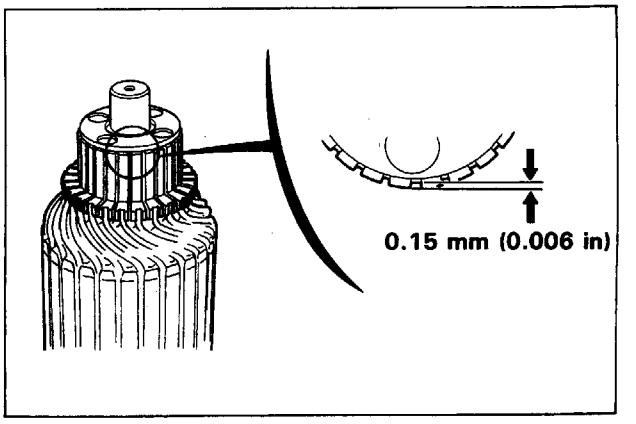
• **BRUSH INSULATION**

Check for continuity between the brushes.
There should be no continuity.

• **MICA DEPTH**

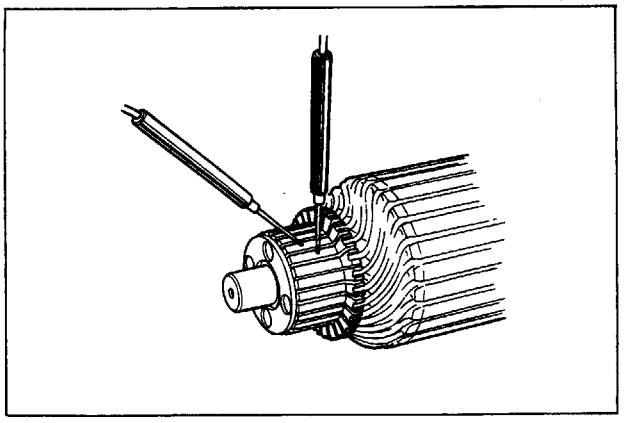
If the grooves are clogged or mica depth is less than the service limit, recut the grooves using a hacksaw blade or a small file.

SERVICE LIMIT	0.15 mm (0.006 in)

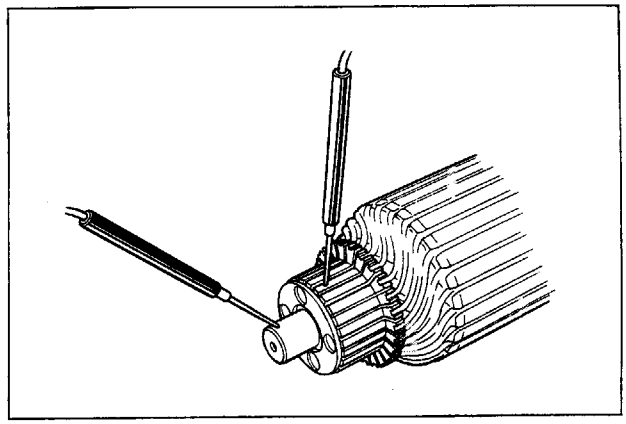


• **ARMATURE**

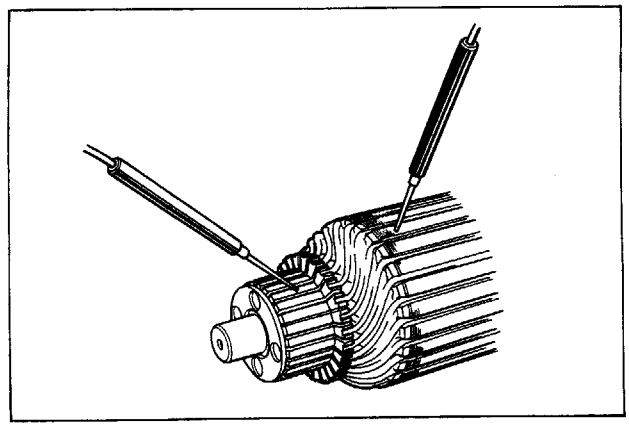
CONTINUITY CHECK—SEGMENTS
Check for continuity between each segment. If an open circuit exists between any two segments, replace the armature.



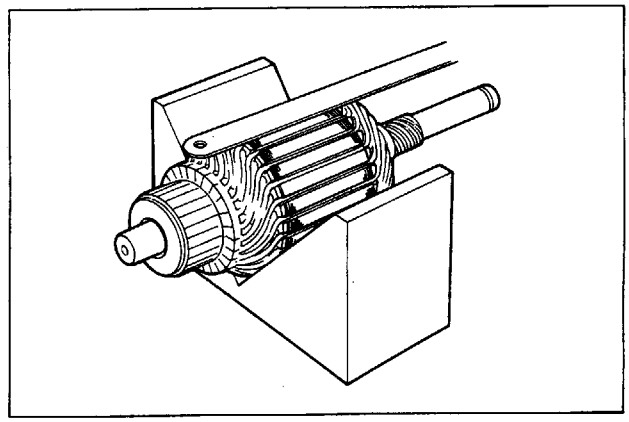
SHORT CIRCUIT TEST—CORE-TO-COMMUTATOR
Check for continuity between the commutator and armature coil core.
If continuity exists, replace the armature.



SHORT CIRCUIT TEST—SHAFT-TO-COMMUTATOR
Check for continuity between the commutator and amature shaft.
If there is continuity, replace the armature.

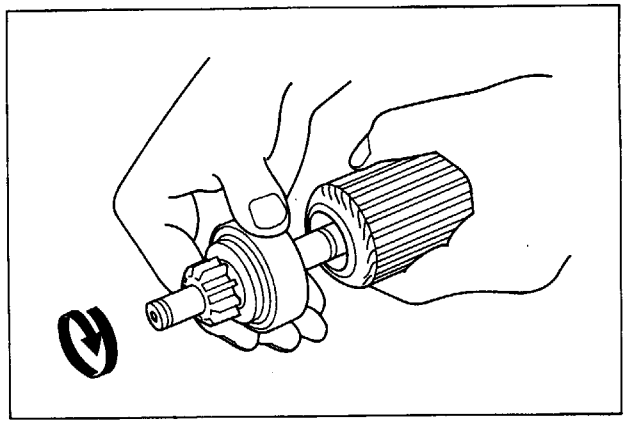


SHORT CIRCUIT TEST—ARMATURE
Place the armature in an armature tester (commercially available).
Hold a hacksaw blade close to the armature core. If the blade is attracted to the core or vibrates when the core is turned, the armature is shorted. Replace the armature.



• OVERRUNNING CLUTCH

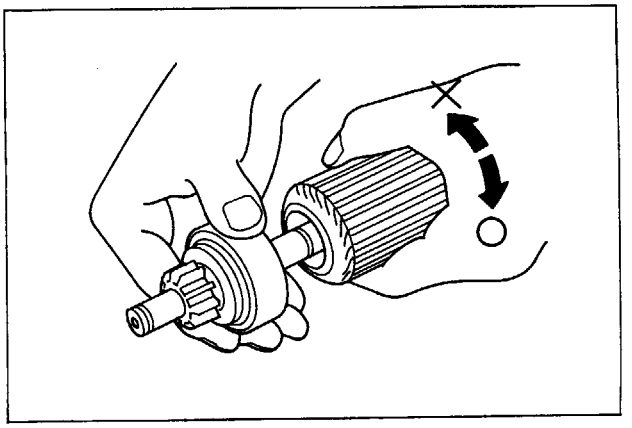
1) Check the overrunning clutch for smooth axial movement. Apply oil or replace the overrunning clutch if necessary.



2) Check the clutch movement by holding the rotor and turning the clutch. The clutch should turn freely counterclockwise and should not turn clockwise.
3) Check the pinion gear for wear or damage and replace if necessary.

NOTE

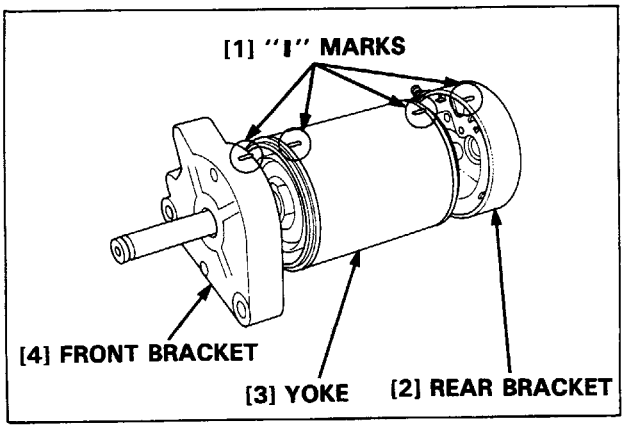
- If the pinion gear is worn or damaged, the flywheel ring gear must be inspected.



d. INSTALLATION

• FRONT BRACKET/REAR BRACKET

Align the "▮" marks on the front bracket and rear brcket with the "▮" marks on the yoke.



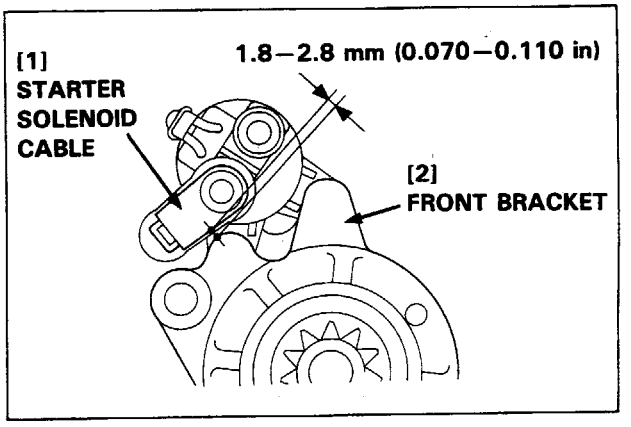
• STARTER SOLENOID

<Starter solenoid side>
Tighten the 6 mm washer nut to the specified torque so that there is clearance of 1.8—2.8 mm (0.070—0.110 in) between the starter solenoid cable and front brcket as shown.

TORQUE: 5 N·m (0.5 kg-m, 3.6 ft-lb)

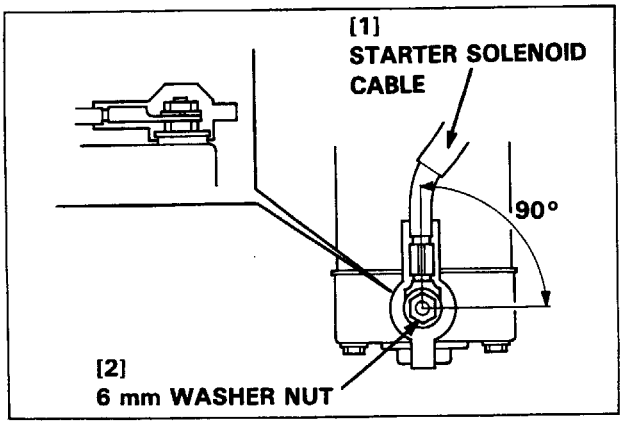
CAUTION

- **After installing the electric starter assembly, be sure that cable and terminal are not interfering or pinched by the recoil bracket, CDI unit case and other adjacent parts.**

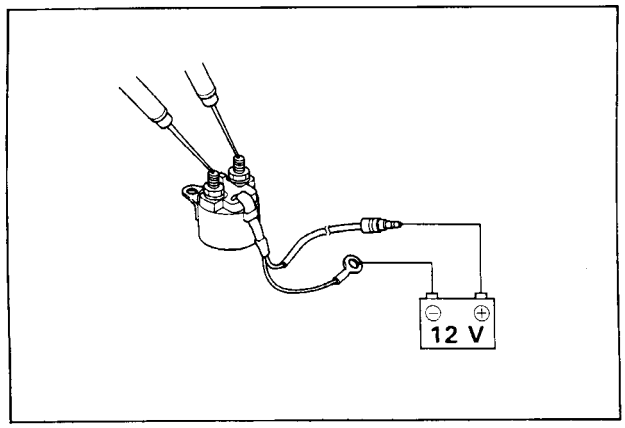


<Rear bracket side>
Connect the starter solenoid cable at an angle of 90° from the horizontl line as shown.
Tighten the 6 mm washer nut to the specified torque.

TORQUE: 27 N·m (2.7 kg-m, 19.5 ft-lb)



5. INSPECTION

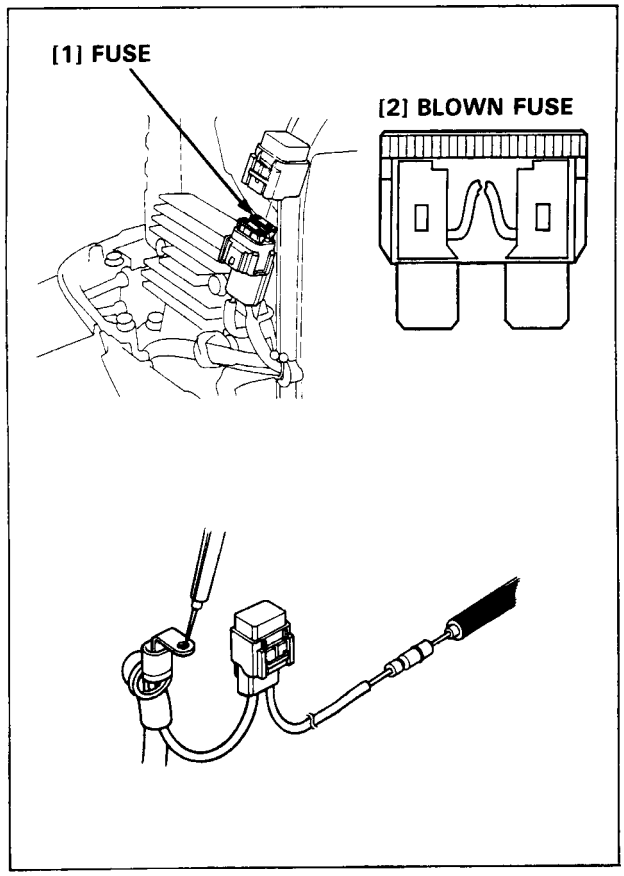


• STARTER SOLENOID

NOTE

- Be sure the battery is in good condition before performing this test.

Connect the black/white wire of the solenoid to the positive (+) terminal of the battery and black wire to the negative (−) terminal and check for continuity. There should be continuity between the terminals.
There should be no continuity when the battery is disconnected.



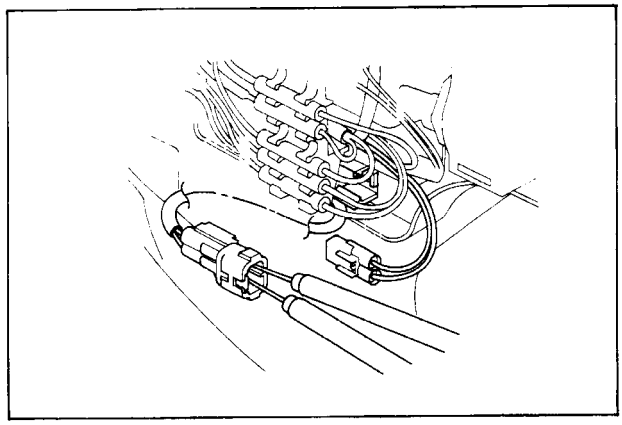
• FUSE/FUSE CASE

Check the fuse for continuity.
Connect the fuse to the fuse case and check the case for continuity.

• 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 "F" or "R")	CONTINUITY
SWITCH RELEASED (Shift lever in "N")	NO CONTINUITY



• 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.

(Ω)

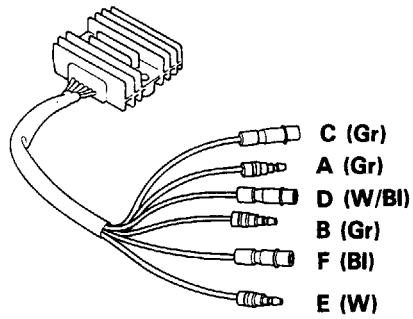
TESTER (+) / TESTER (−)		GR	Gr	W/Bl, W	Bl
		A	B	D/E	F
Gr	A		∞	∞	∞
Gr	B	∞			∞
W/Bl, W	D/E	1k – 200k	1k – 200k		500 – 100k
Bl	F	500 – 50k	100 – 50k	∞	

Check the regulator/rectifier for continuity.
The regulator/rectifier is normal if there is continuity between C and A, or C and B.

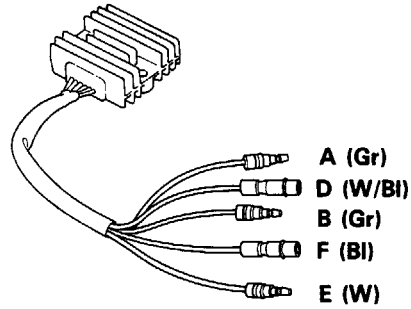
NOTE

- use only the specified testers listed below.
  - Tester manufactured by Kowa
    KS – TH – 5H – 2 Analog volt-ohmmeter
- Set the measured range as follows.
  - R x 100 Ω range

[1] Remote control/Electric starter type:



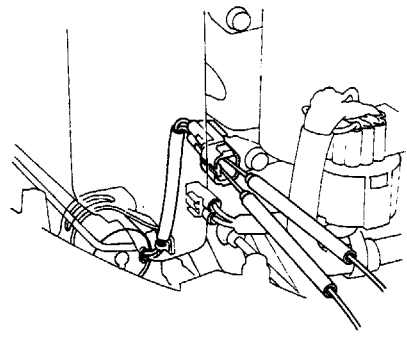
[1] Tiller handle/Electric starter type:



• CHOKE SOLENOID (Remote control type only)

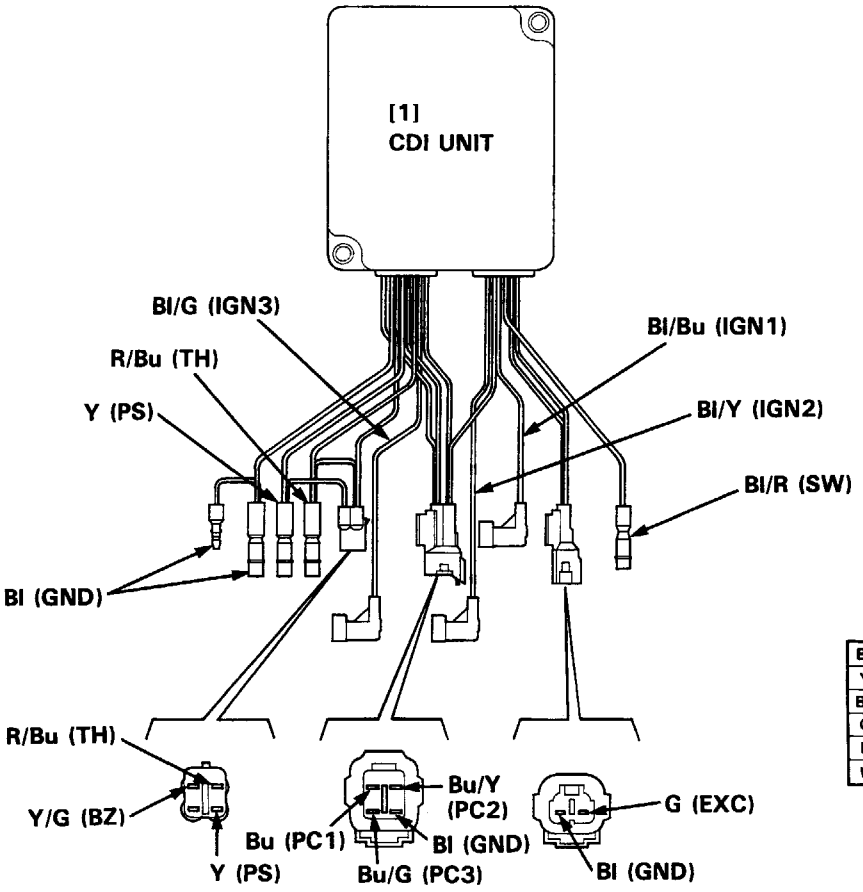
Measure the resistance between the terminals.

Resistance	2.8 – 3.4 Ω



• CDI UNIT (Except tiller handle type)

Measure the resistance between the CDI unit terminals and be sure that measurements conform to the ranges shown in the table below.



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

(KΩ)

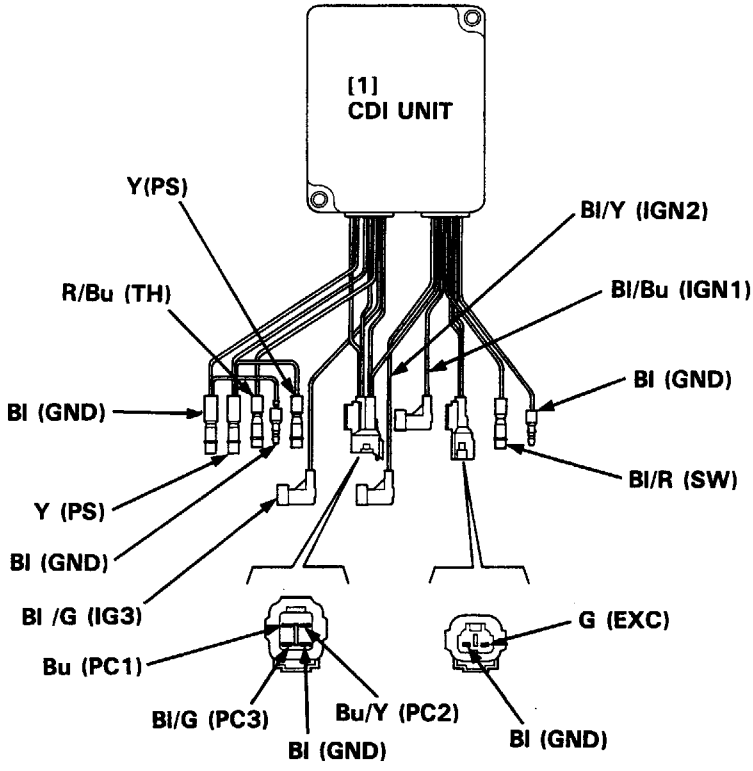
COLOR	Tester (−) / Tester (+)	PC1	PC2	PC3	EXC	SW	IG1	IG2	IG3	PS	TH	GND	BZ
Bu	PC1		10−500	10−500	10−500	∞	∞	∞	∞	∞	∞	3−300	∞
Bu/Y	PC2	10−500		10−500	10−500	∞	∞	∞	∞	∞	∞	3−300	∞
Bu/G	PC3	10−500	10−500		10−500	∞	∞	∞	∞	∞	∞	3−300	∞
G	EXC	∞	∞	∞		∞	∞	∞	∞	∞	∞	0.5−50	∞
Bl/R	SW	20−500	20−500	20−500	0.5−50		∞	∞	∞	∞	∞	0.5−50	∞
Bl/Bu	IG1	∞	∞	∞	∞	∞		∞	∞	∞	∞	∞	∞
Bl/Y	IG2	∞	∞	∞	∞	∞	∞		∞	∞	∞	∞	∞
Bl/G	IG3	∞	∞	∞	∞	∞	∞	∞		∞	∞	∞	∞
Y	PS	10−500	10−500	10−500	10−500	∞	∞	∞	∞		∞	0.5−50	∞
R/Bu	TH	3−300	3−300	3−300	3−300	∞	∞	∞	∞	∞		0.5−50	∞
Bl	GND	3−300	3−300	3−300	3−300	∞	∞	∞	∞	∞	∞		∞
Y/G	BZ	10−500	10−500	10−500	10−500	∞	∞	∞	∞	∞	∞	0.5−500	

TESTER (−) / TESTER (+)	PC.E	EXC.E.	IND.E.	SW.E.
GND	Continuity	Continuity	Continuity	Continuity

- RECOMMENDED MULTITESTERS:
  TH−5H (KOWA Analogue type)
  SP−10D (SANWA Analogue type)
- Select the following range.
  Kowa: R x 100 Ω
  Sanwa: kΩ

• CDI UNIT (Tiller handle type only)

Measure the resistance between the CDI unit terminals and be sure that measurements conform to the ranges shown in the table below.



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

(KΩ)

COLOR	Tester (−) / Tester (+)	PC1	PC2	PC3	EXC	SW	IG1	IG2	IG3	PS	TH	GND
Bu	PC1		10−500	10−500	10−500	∞	∞	∞	∞	∞	∞	3−300
Bu/Y	PC2	10−500		10−500	10−500	∞	∞	∞	∞	∞	∞	3−300
Bu/G	PC3	10−500	10−500		10−500	∞	∞	∞	∞	∞	∞	3−300
G	EXC	∞	∞	∞		∞	∞	∞	∞	∞	∞	0.5−50
Bl/R	SW	20−500	20−500	20−500	0.5−50		∞	∞	∞	∞	∞	0.5−50
Bl/Bu	IG1	∞	∞	∞	∞	∞		∞	∞	∞	∞	∞
Bl/Y	IG2	∞	∞	∞	∞	∞	∞		∞	∞	∞	∞
Bl/G	IG3	∞	∞	∞	∞	∞	∞	∞		∞	∞	∞
Y	PS	10−500	10−500	10−500	10−500	∞	∞	∞	∞		∞	0.5−50
R/Bu	TH	3−300	3−300	3−300	3−300	∞	∞	∞	∞	∞		0.5−50
Bl	GND	3−300	3−300	3−300	3−300	∞	∞	∞	∞	∞	∞	

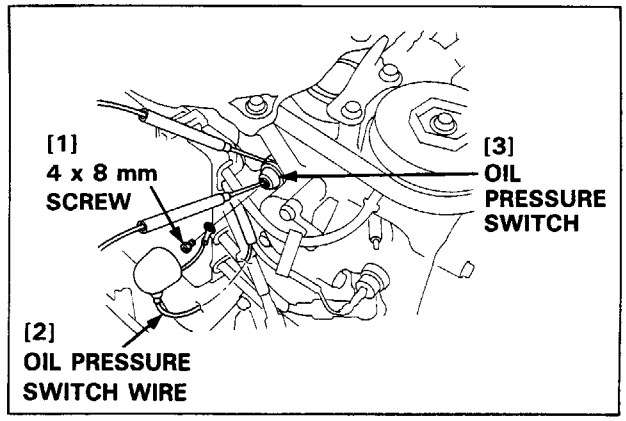
TESTER (−) / TESTER (+)	PC.E	EXC.E.	IND.E.
GND	Continuity	Continuity	Continuity

- RECOMMENDED MULTITESTERS:
  TH−5H (KOWA Analogue type)
  SP−10D (SANWA Analogue type)
- Select the following range.
  Kowa: R x 100 Ω
  Sanwa: kΩ

• 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.



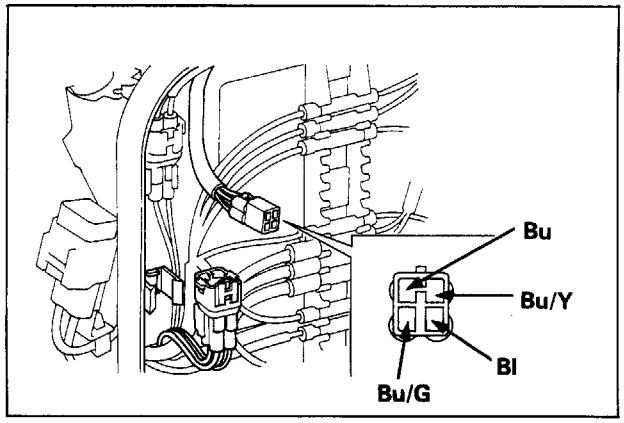
• PULSER COIL

NOTE

- It is not necessary to remove the coil:
  Remove the engine cover and disconnect the pulser coil connector from the right side of the engine (P. 6-2).

Attach the tester lead to each terminal and measure the resistance between the terminals.

	PC1 (Bu)	PC2 (Bu/Y)	PC3 (Bu/G)
GND (Bl)	290–355 Ω	290–355 Ω	290–355 Ω



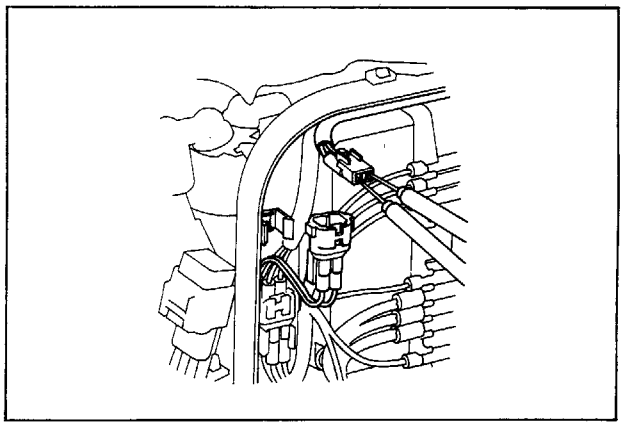
• EXCITER COIL

NOTE

- For exciter coil replacement, see page 6-1.

Measure the resistance between each terminal of the exciter coil with the tester.

Resistance	272–368 Ω



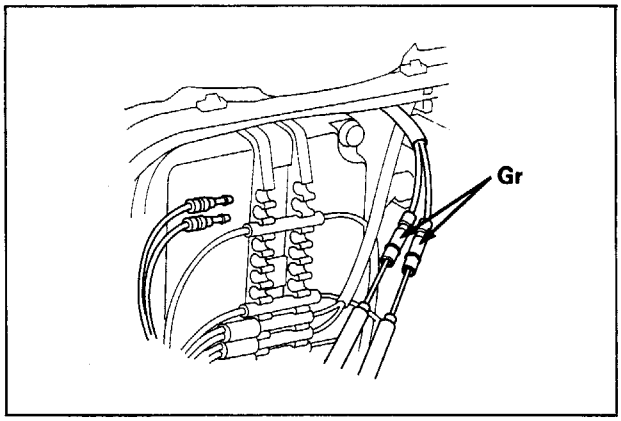
• CHARGE COIL 12V-6A (Electric starter type only)

NOTE

- It is not necessary to remove the coil:
  Remove the engine cover and disconnect the charge coil connector from the right side of the engine (P. 6-1).

Measure the resistance between each terminal of the charge coil with the tester.

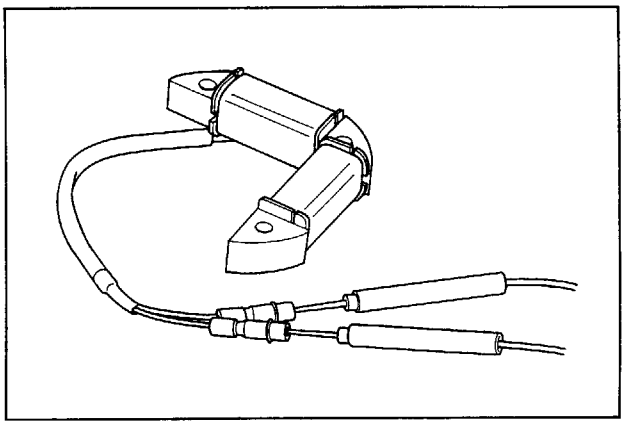
Resistance	0.45–0.54 Ω



• **CHARGE COIL 12V-10A (12V-10A Charge coil/ Electric starter type only)**

Measure the resistance between each terminal of the charge coil kit with the tester.

Resistance	0.27—0.33 Ω



• **IGNITION COIL**

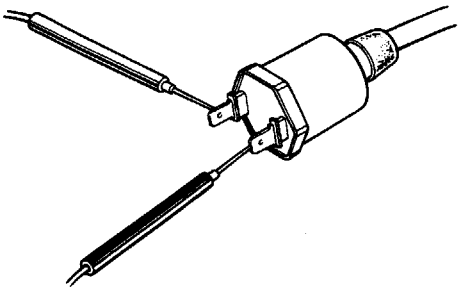
NOTE

• For ignition coil replacement, see page 16-3.

<Primary side resistance>
Measure the resistance of the primary coil between the two terminals at the igniton coil.

Resistance	0.19—0.23 Ω

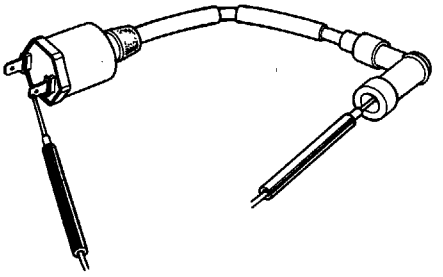
[1] <PRIMARY SIDE>



<Secondary side resistance>
Attach the tester leads to the spark plug cap end and green terminal and measure the secondary coil resistance.

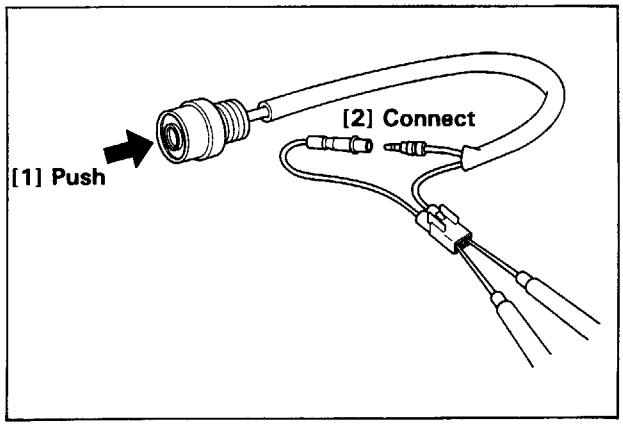
Resistance	10.3—15.9 kΩ

[2] <SECONDARY SIDE>



• STARTER BUTTON (Tiller handle type only)

Connect the starter button 2P connector, attach the tester leads to the 2P connector terminal joints, and push the starter button. The switch is normal if there is continuity when the button is pushed.

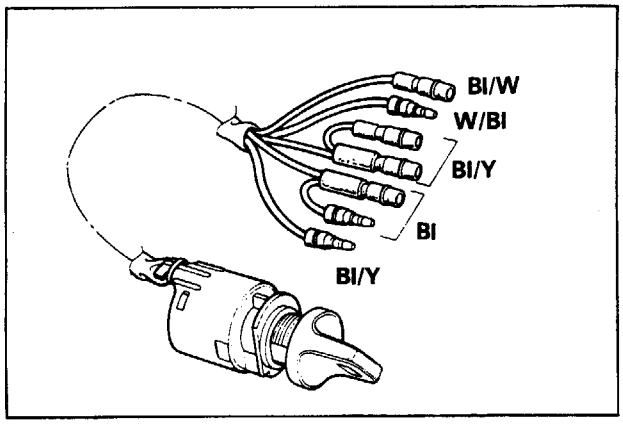


• IGNITION SWITCH (Remote control type)

Check for continuity between the terminals with the switch in each position.

Position \ Color	E (Bl)	IG (Bl/R)	BAT (W/Bl)	LO (Bl/Y)	ST (Bl/W)
OFF	○—○				
ON			○—○		
START			○—○	○—○	○—○

○—○: Continuity



• INDICATOR LIGHTS

Remote control type:

NOTE

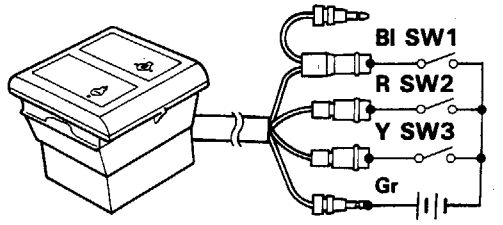
- Be sure the battery is in good condition before performingj this test.

Apply 12V to the Gr terminal and connect the switches 1, 2, and 3 to the Bl, 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.

Tiller handle type:
Check the oil pressure switch and CDI unit. If they are normal but the indicator light does not turn ON when the engine is running, replace the indicator light.

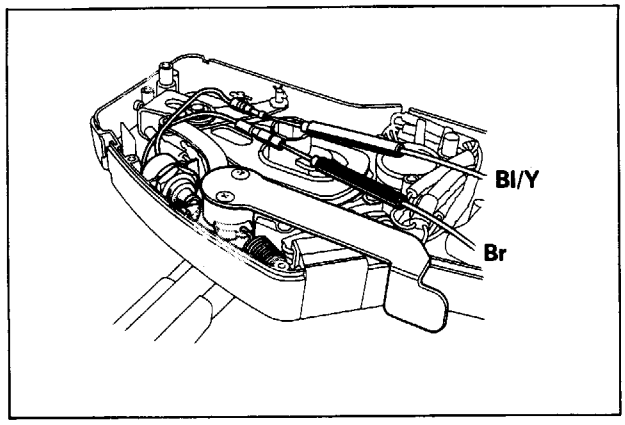
[1] Remote control type:



[2] 12 V BATTERY

• CHOKE SOLENOID SWITCH (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.

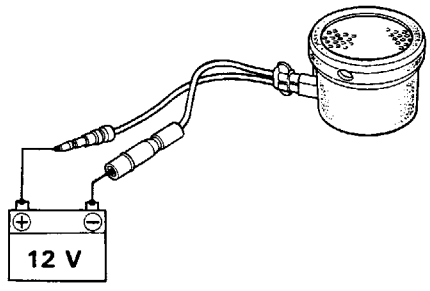


• **WARNING BUZZER (Remote control type only)**

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.

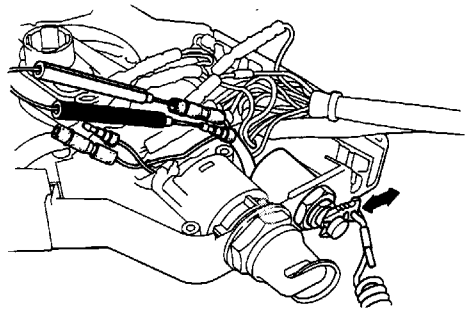


• **EMERGENCY STOP SWITCH**

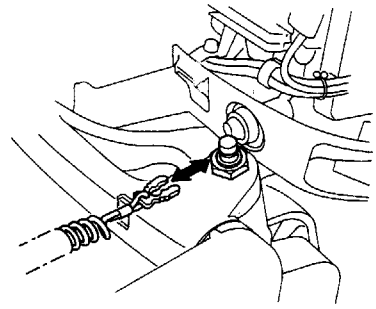
Attach the tester leads to the two terminals of the emergency stop switch and check for continuity.

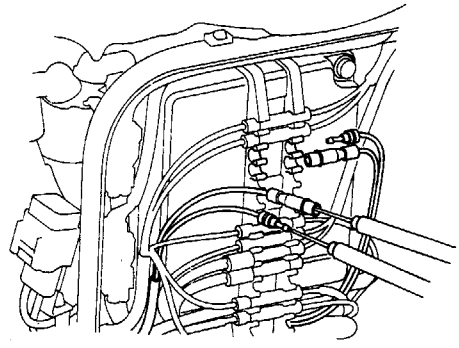
Emergency stop switch clip	Continuity
Engaged	No
Disengaged	Yes
Engaged and button pushed	Yes

[1] Remote control type:



[1] Tiller handle type:





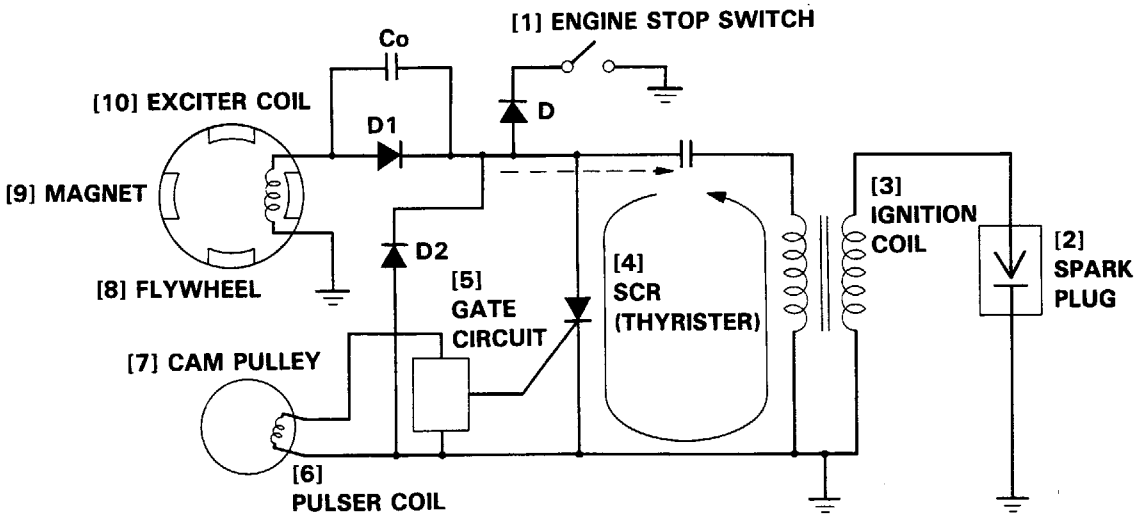
1. ELECTRICAL SYSTEM

1. ELECTRICAL SYSTEM

~ 1. Electronic advance CDI system

The BF25A is equipped with the electronic advance maintenance free CDI system which is excellent in sparking performance and has no mechanical contacts.

<Basic circuit diagram (for one cylinder)>



<Operation>

1) When the flywheel rotates, the electric power generated at the exciter coil is rectified by the diode (D) and charged into the ignition condenser (C) (shown by the broken line in the above diagram). The thyrister (SCR) is OFF at this time.

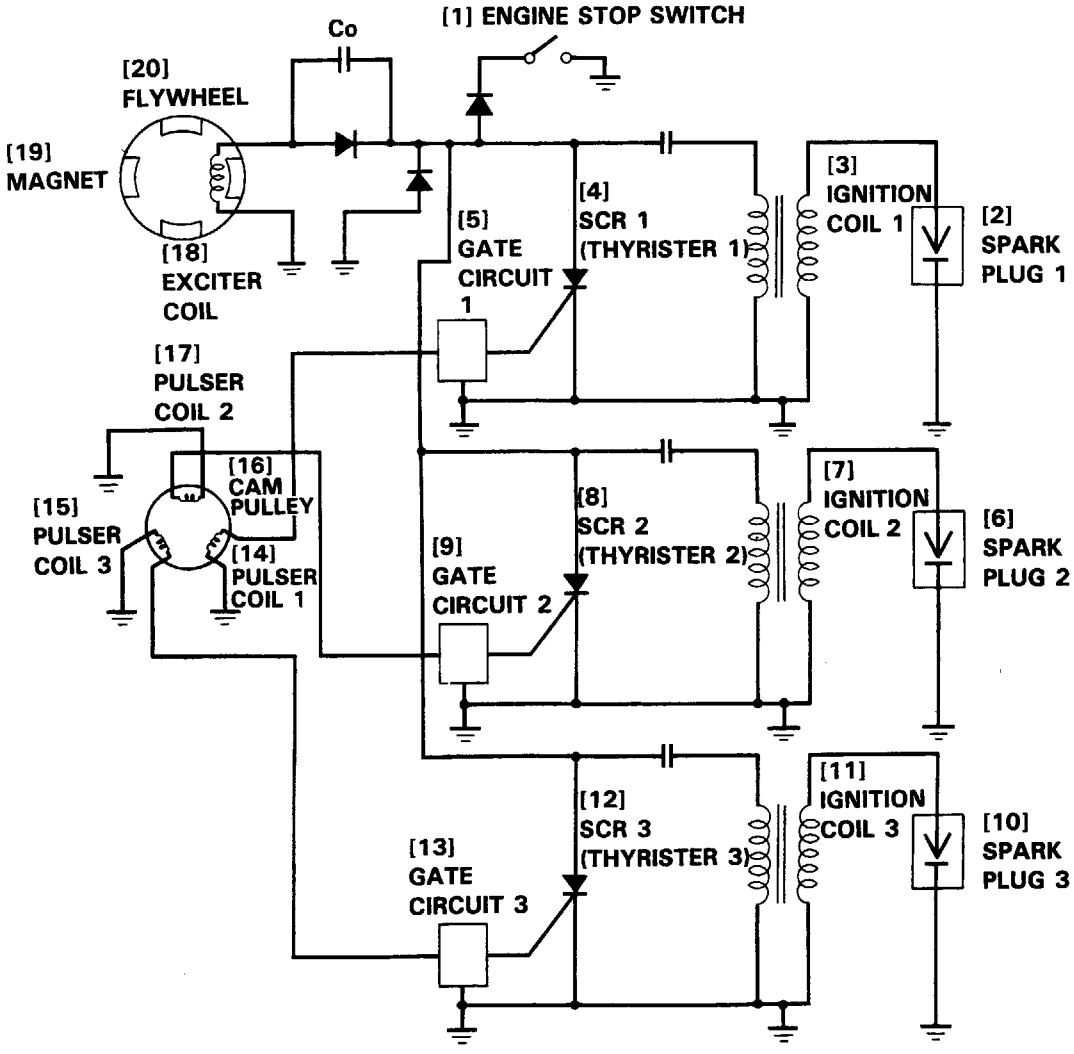
2) When the magnet on the cam pulley passes the pulser coil, the electric pulser coil signal is emitted by the magnetic force. This signal passes the gate circuit, turns ON the thyrister, and discharges the electric charge from the condenser. When the discharged current flows through the ignition coil primary circuit, high voltage is generated in the secondary circuit and the spark plug sparks (shown by the solid line in the above diagram).

3) Spark advance
The BF25A is equipped with the electronic advance spark system, which advances the ignition timing when the gate circuit turns ON the thyrister according to the engine speed to obtain high speed power.

<3 cylinder ignition system>

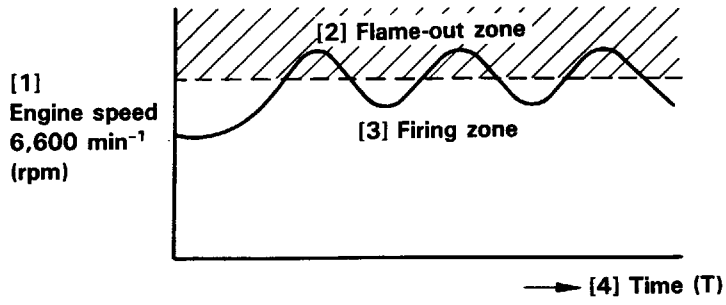
This system is equipped with the three ignition condensers and one voltage doubler condenser, and an independent ignition system is provided for each cylinder.

- **Basic circuit diagram**

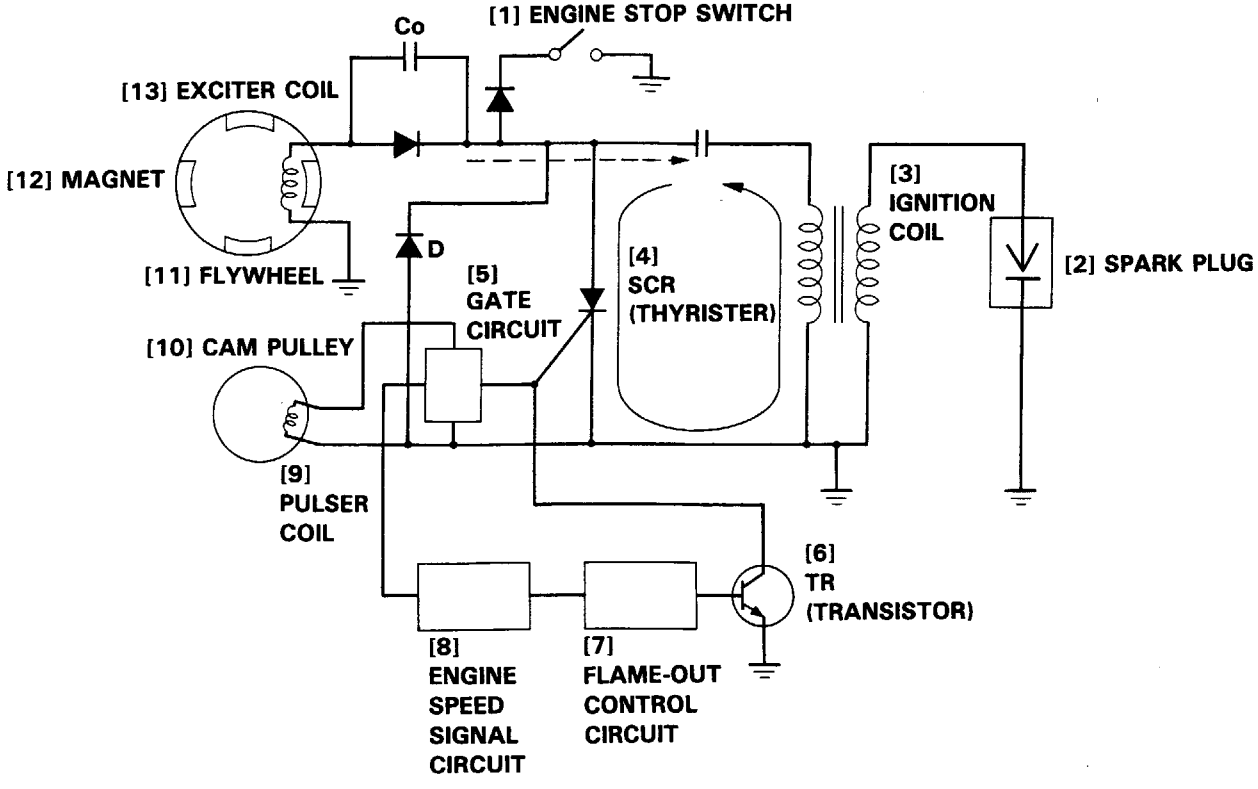


~2. Overrev limiter

The overrev limiter is provided in the CDI unit circuit to prevent engine overrevving.
Set speed of overrev limiter: 6,600 ±300 min^{-1} (rpm).



<Basic circuit diagram (for one cylinder)>



<Operation>

1) Getting the engine speed signal from the pulser coil gate circuit, the flame-out control circuit detects whether it is over or below the set speed.

2) When the speed is over the set speed, the transistor (TR) turns ON and short circuits the thyrister (SCR) trigger signal to ground to flame out.

- The above procedures are performed to flame out the No. 2 and No. 3 cylinders. Stable engine speed while under way is thereby obtained.

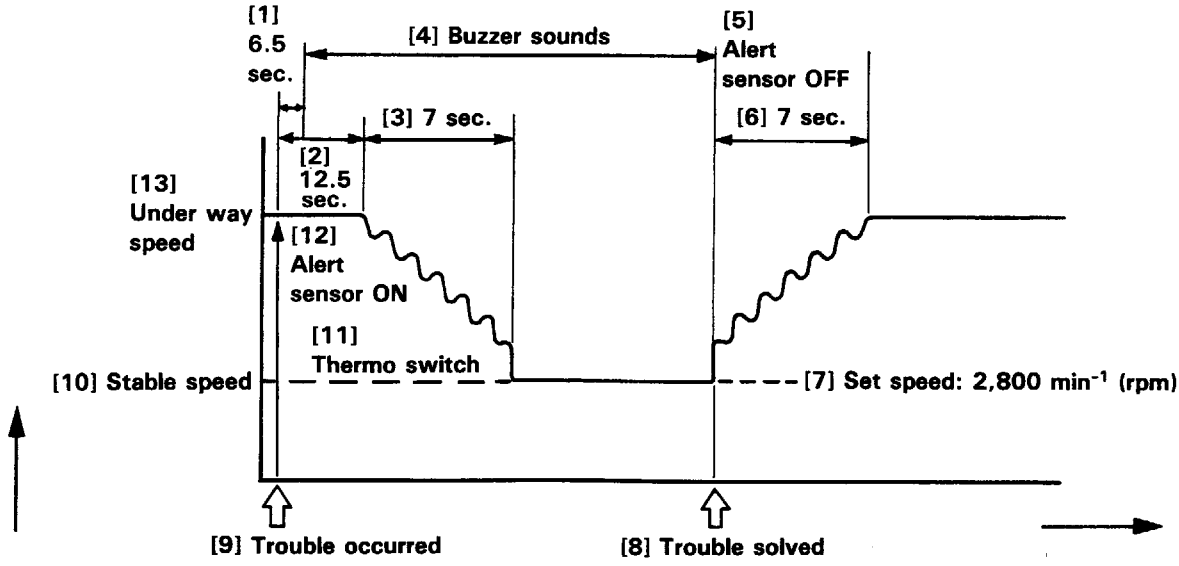
~3. Overheat alert system

The BF25A is equipped with the overheat alert system which protects the engine by controlling the engine speed in the CDI circuit when the engine is overheated.

<Principal operation>

When a trouble occurs, the system slows down the engine speed gradually, as a sharp drop of the engine speed is very dangerous for the operator as if the boat is slowed suddenly. The system is provided with an indicator light and buzzer sound (remote control type) to indicate the cause of trouble to the operator.

1) Engine speed control



Boat slows down as engine speed drops

Firing and flaming out are repeated electrically to control the engine speed.

1) Engine speed: below the stable speed
   When the engine speed is below the stable speed, it will increase to the stable speed but will not exceed the stable speed.

2) Engine speed: above stable speed
   The engine speed will slow down gradually from the under way speed and stabilizes at the stable speed [approximately 2,800 min^{-1} (rpm)]. The engine speed will not increase regardless of the throttle angle.

1) Alert system (Alert indicator light ON circuit)

—1. Basic system

When the oil pressure switch or thermo switch operates, the alert system turns the indicator light ON/OFF to notify the operator of the oil pressure switch/thermo switch operation.

Item	Color of the lamp	When faulty
Oil pressure switch	Green	OFF
Thermo switch	Red	ON

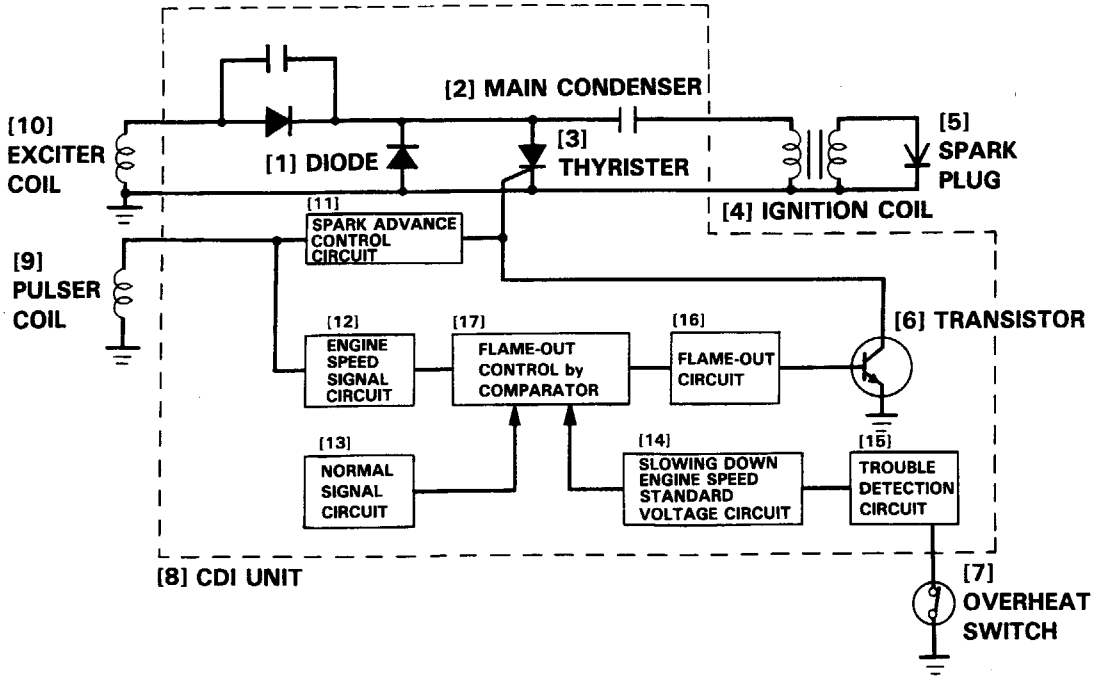
Thermo switch: ON when temperature is above the set temperature

Oil pressure switch: ON when oil pressure is below the set pressure

- When the outboard is a tiller handle type, the oil pressure indicator light is mounted on the outboard. It turns OFF when the oil pressure is abnormal. Note that the engine speed control is performed as a countermeasure against a faulty thermo switch on the tiller handle type. The tiller handle type outboard is not provided with a faulty thermo switch alert indication system.
- If the outboard is the remote control type, the operator does not notice the trouble easily before the engine speed control is started, as he must frequently turn back while driving if the indicator lights were mounted on the outboard. Therefore, the indicator lights are mounted on the remote control box and a buzzer in the remote control box sounds after the indicator lights turn ON (OFF).

<Unit alert system operation (for one cylinder)>

1) Basic circuit diagram



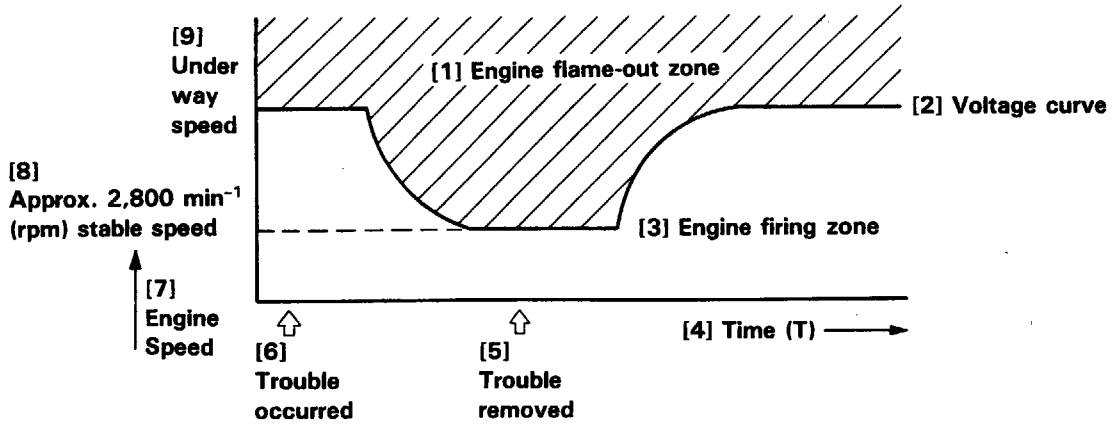
2) Operation

The comparator circuit compares the condenser discharged voltage curve of the slowing down engine speed standard voltage circuit with the engien speed voltage signal and it detects whether the speed is above or below the specified speed.

2) Getting the signal from the comparator, the flame-out circuit turns the transistor (TR) ON or OFF and controls the thyrister gate.

3) The slowing down engine speed standard voltage stabilizes at a preset voltage in accordance with the stable engine speed and flaming-out and firing are repeated at this stable engine speed.

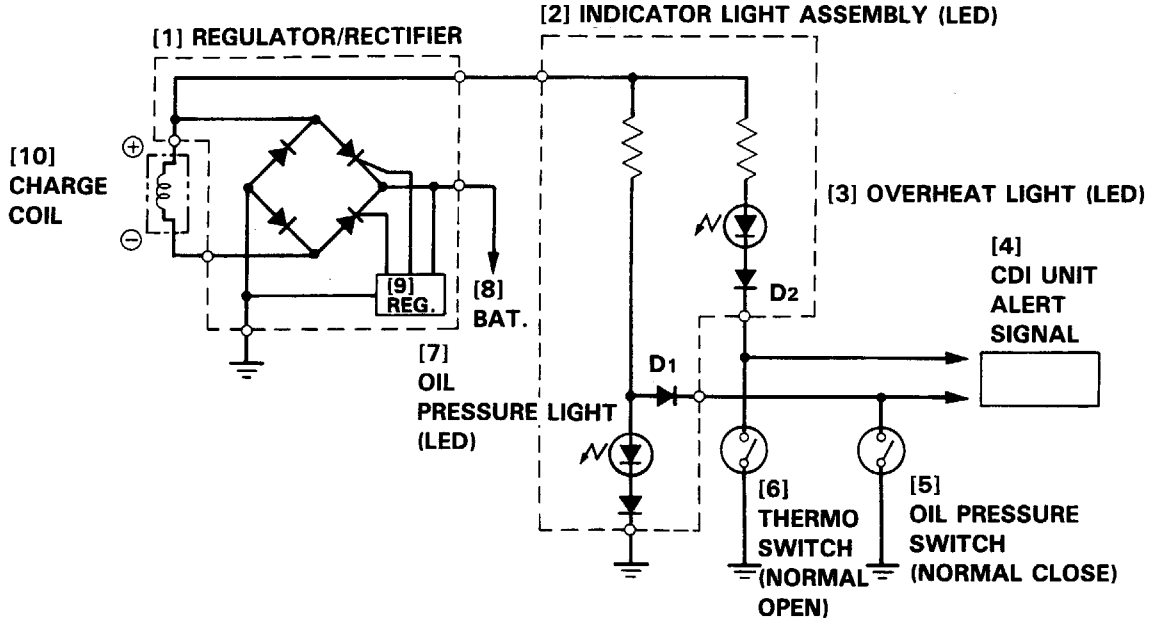
4) When the trouble is removed and the trouble signal stops, the unit alert system performs the reverse operation of the above step 1 and 2, comparing the condenser charged voltage curve of the slowing down engine speed standard voltage circuit with the engine speed voltage signal.



~2. Brief description of remote control type operation

<Alert indicator light circuit>

1) Basic circuit diagram



2) Operation

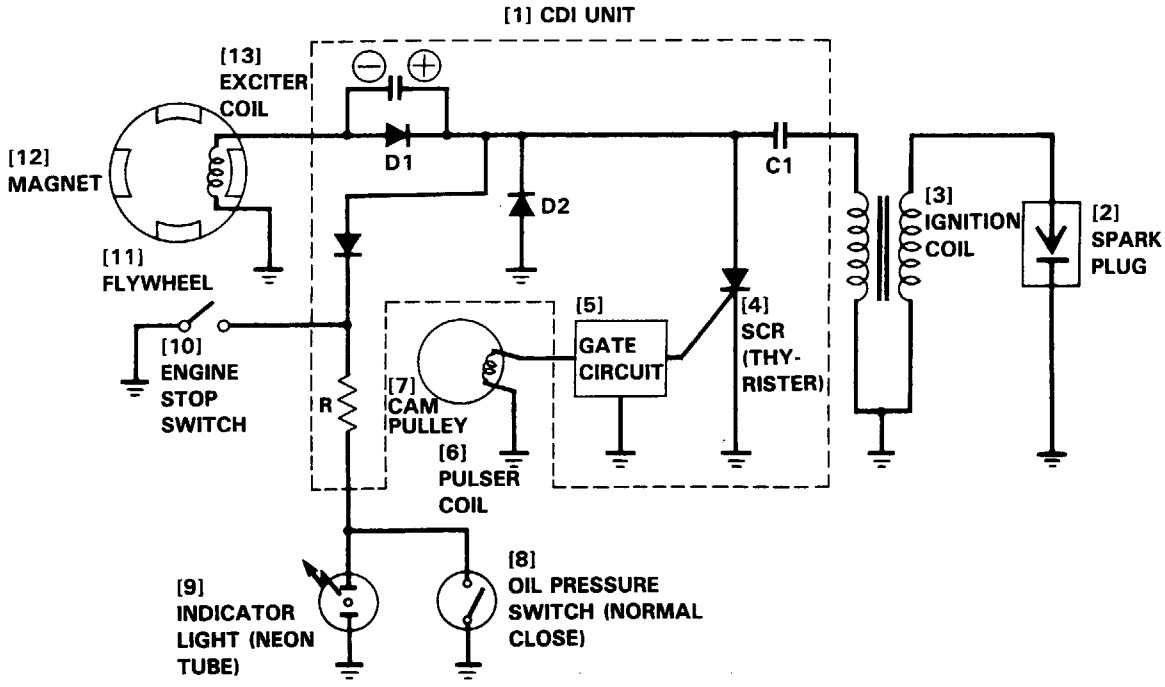
1. With the charge coil as the power source, the system supplies the DC current, that is rectified at the regulator/rectifier, to turn the thermo switch light and oil pressure switch light ON.

2. The thermo switch turns ON when the temperature is above the set temperature and the current flows to the light ON circuit to turn the indicator light ON. When the thermo switch is ON, the alert ON signal is transmitted to the CDI unit.

3. When hydraulic pressure is applied to the engine oil pressure switch during operation, the oil pressure switch is OFF and the current flows to the oil pressure light to turn it ON. The oil pressure switch turns ON when the oil pressure drops below the set pressure, and the current flows through the diode D1 to the oil pressure switch. This shuts off the current flow to the oil pressure light and thereby turns the indicator light OFF.

—3. Brief description of tiller handle type operation

1) Basic circuit diagram



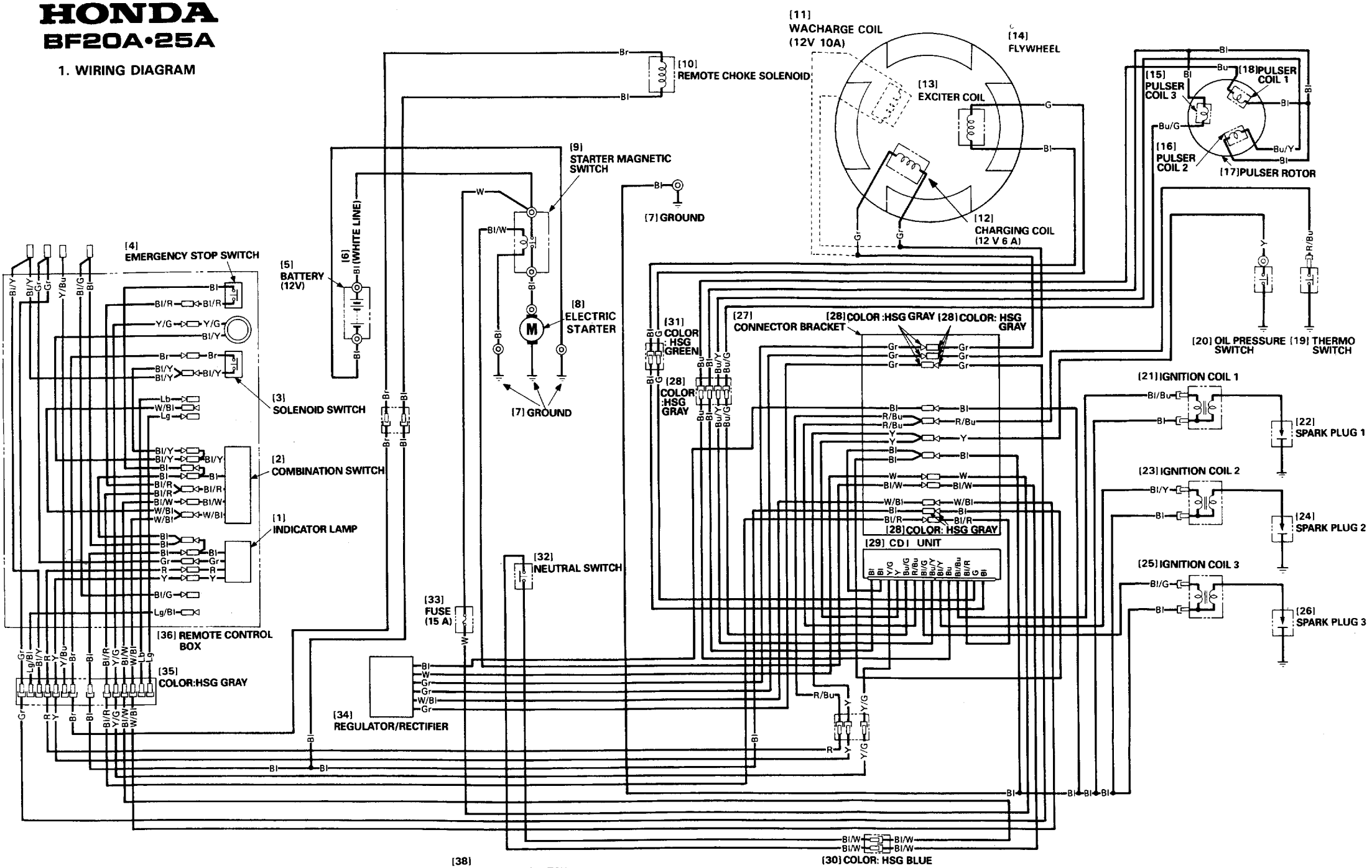
2) Operation

1. With the exciter coil as the power source, the current flows to the indicator light (neon tube) to turn it ON via the internal resistance of the CDI unit.

2. When hydraulic pressure is applied to the engine oil pressure switch during operation, the oil pressure switch is OFF and the current flows to the indicator light to turn it ON. The oil pressure switch turns ON when the oil pressure drops below the set pressure, and the current flows to the oil pressure switch.
   This shuts off the current flow to the indicator light and thereby turns the indicator light OFF.

HONDA
BF20A•25A

1. WIRING DIAGRAM



[36] EMERGENCY STOP SWITCH

	BI/R	BI
PUSH or LOCK PLATE OFF	○	○
NORMAL		

[37] SOLENOID SWITCH

	Br	BI/Y
ON	○	○
OFF		

[38] COMBINATION SWITCH

	E	IG	BAT	LOAD	ST
COLOR	BI	BI/R	W/BI	BI/Y	BI/W
OFF	○	○			
ON			○	○	
ST			○	○	○

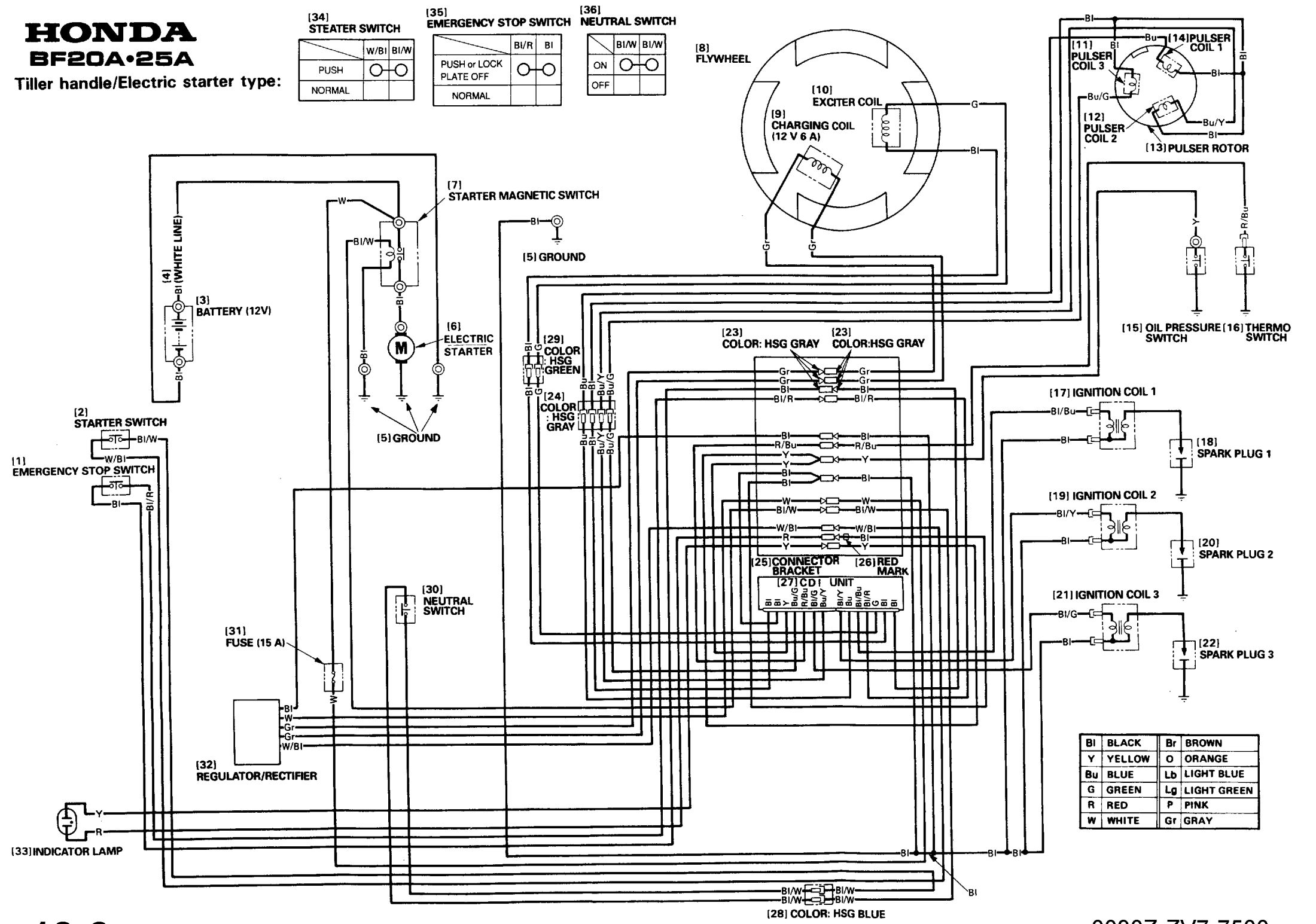
[39] NEUTRAL SWITCH

	BI/W	BI/W
ON	○	○
OFF		

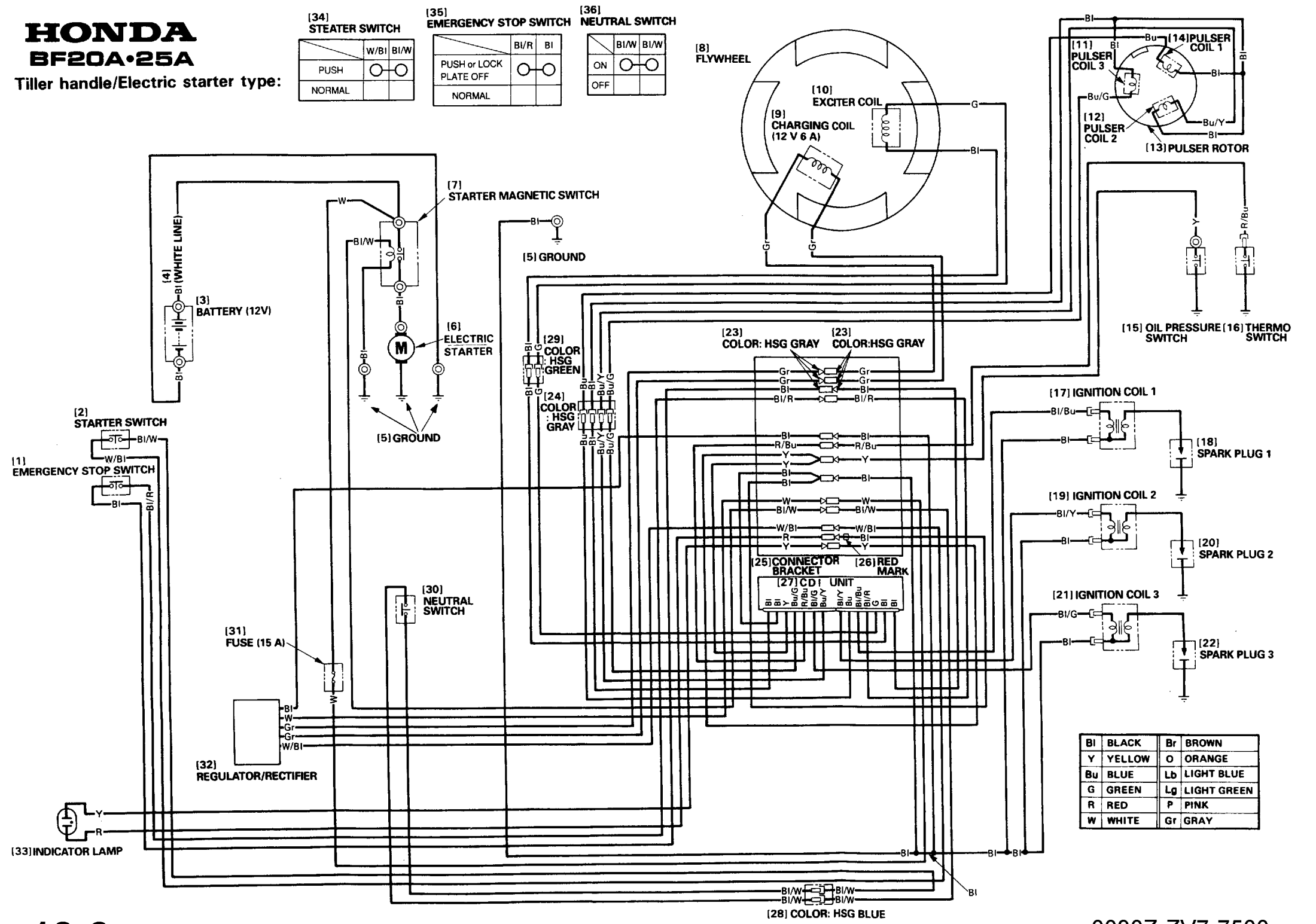
BI	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY

0030Z-ZV7-7800

HONDA
BF20A•25A
Tiller handle/Electric starter type:

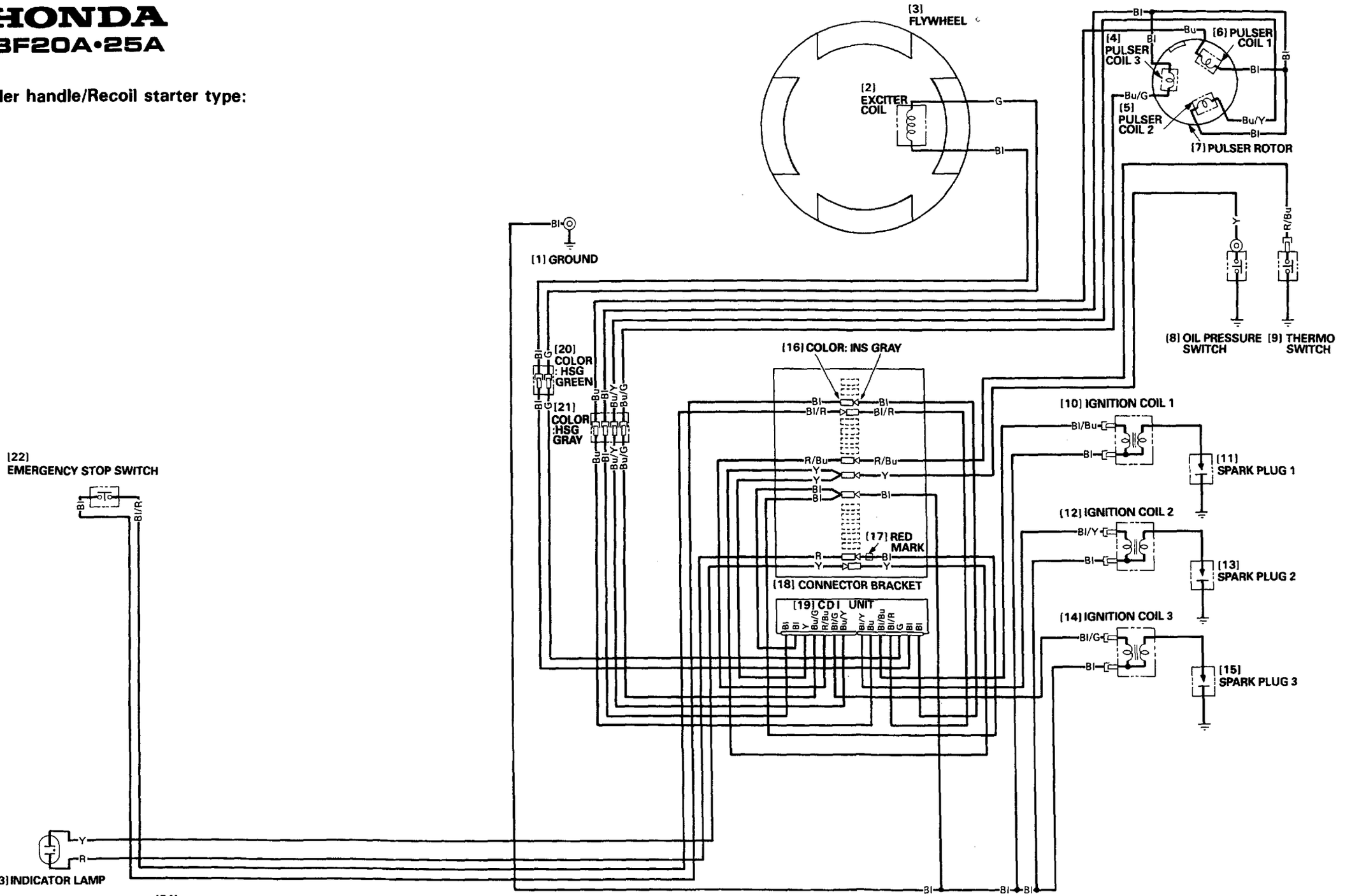


HONDA
BF20A•25A
Tiller handle/Electric starter type:



HONDA
BF20A•25A

Tiller handle/Recoil starter type:



[24] EMERGENCY STOP SWITCH

	BI/R	BI
PUSH or LOCK PLATE OFF	○	○
NORMAL		

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

Paper book Part No. 66ZV700Z

PREFACE

This supplement describes service procedures for the Honda BF30A Outboard Motor.

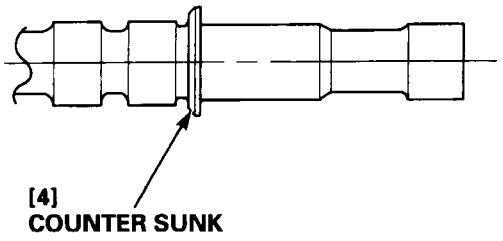
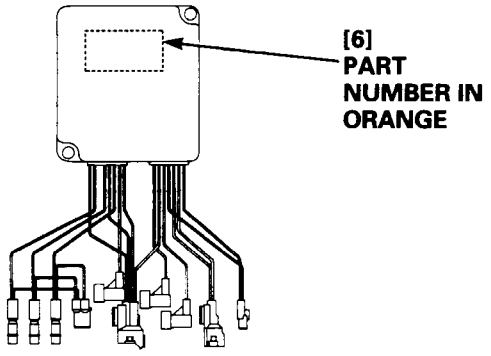
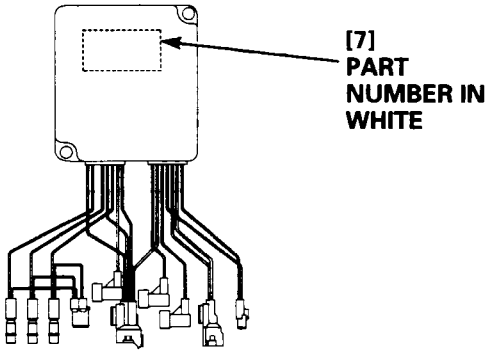
For service information which is not covered in this supplement, please refer to the base manuals, part number 66ZV700.

HONDA MOTOR CO., LTD.
SERVICE PUBLICATIONS OFFICE

CONTENTS

The marked sections contain no changes. They are not covered in this manual.

Date of Issue: March, 1995

[2] Model / [1] Item	BF30A	BF20A•25A
[3] CAMSHAFT		
[5] CDI UNIT		

1. SPECIFICATIONS

1. SPECIFICATIONS

DIMENSIONS AND WEIGHTS

Item \ Model	BF30A					
Description code	BAWS	BAWL	BAWS	BAWL	BAWS	BAWL
Type	SH	LH	SHS	LHS	SRS	LRS
Overall length	*1: 675 mm (26.6 in) *2: 1,005 mm (39.6 in)				640 mm (25.2 in)	
Overall width	380 mm (15.0 in)				375 mm (14.8 in)	
Overall height	1,190 mm (46.9 in)	1,315 mm (51.8 in)	1,190 mm (46.9 in)	1,315 mm (51.8 in)	1,190 mm (46.9 in)	1,315 mm (51.8 in)
Dry weight	67 kg (147.7 lb)	69 kg (152.1 lb)	70 kg (154.3 lb)	72 kg (158.8 lb)	69 kg (152.1 lb)	71 kg (156.6 lb)
Operating weight (incld. oil)	69 kg (152.1 lb)	71 kg (156.6 lb)	72 kg (158.8 lb)	74 kg (163.2 lb)	71 kg (156.6 lb)	73 kg (161.0 lb)

*1: With Tiller Handle raised
*2: With Tiller Handle extended

FRAME

Item \ Model	BF30A					
Type	SH	LH	SHS	LHS	SRS	LRS
Transom height	431 mm (17.0 in)	552 mm (21.7 in)	431 mm (17.0 in)	552 mm (21.7 in)	431 mm (17.0 in)	552 mm (21.7 in)
Transom angle	5 stage adjustment (4°, 8°, 12°, 16°, 20°)					
Tilting angle	75°					
Swivel angle	40° right and left					

TYPES OF HONDA BF30A OUTBOARD MOTOR
It may be necessary to refer to this chart for reference purposes when reading this manual.

Models	Types	Shaft Length		Tiller Handle	Remote Control	Electric Starter	Recoil Starter	Tachometer
		Short	Long					
BF30A	SH	●		●			●	
	LH		●	●			●	
	SHS	●		●		●		
	LHS		●	●		●		
	SRS	●			●	●		(●)
	LRS		●		●	●		(●)

S: Short Shaft L: Long Shaft H: Tiller Handle R: Remote Control
( ): Optional part

ENGINE

Model	BF30A
Type	4-stroke, O.H.C., 3-cylinder
Displacement	499 cm^3 (30.5 cu in)
Bore x stroke	58 x 63 mm (2.3 x 2.5 in)
Rated power	*1: 30 PS (22.1 kW) at 5,700 – 6,200 min^{-1} (rpm)
Maximum torque	36.3 N·m (3.7 kg-m, 26.8 ft-lb) at 4,500 min^{-1} (rpm)
Compression ratio	9.2:1
Fuel consumption ratio	291 g/kWh (214 g/PS·h, 0.48 lb/hp·h)
Cooling system	Forced water circulation by impeller pump with thermostat
Ignition system	CDI
Ignition timing	5 – 32° B.T.D.C.
Spark plug	DR7EA (NGK), X22ESR-U (NIPPONDENSO)
Carburetor	Horizontal type, butterfly valve (3 carburetor)
Lubrication system	Pressure lubrication by trochoid pump
Lubrication capacity	1.9 ℓ (2.00 US qt, 1.67 Imp qt)
Starter system	Electric starter or Recoil starter
Stopping system	Grounding of primary circuit
Fuel	Regular automotive gasoline (86 pump octane; unleaded preferred)
Fuel tank capacity	25 ℓ (6.6 US gal, 5.5 Imp gal)
Fuel pump	Mechanical plunger type
Exhaust system	Thru-hub
Recommended oil	SAE 5W – 30 (API Classification Fuel Efficient SG, SH)

*1: Full throttle range.

LOWER UNIT

Clutch	Dog clutch (Forward-Neutral-Reverse)
Gear ratio	0.48 (13/27)
Reduction	Spiral bevel
Gear case oil capacity	0.29 ℓ (0.307 US qt, 0.255 Imp qt)
Propeller No. of blades-Dia. x Pitch	3 – 235 x 305 mm (9 – 1/4 x 12 in)
Propeller rotating direction	Clockwise (viewed from rear)
Propeller driving system	Spline

1. MAINTENANCE STANDARDS

SHOP MANUAL NEWS

ENGINE

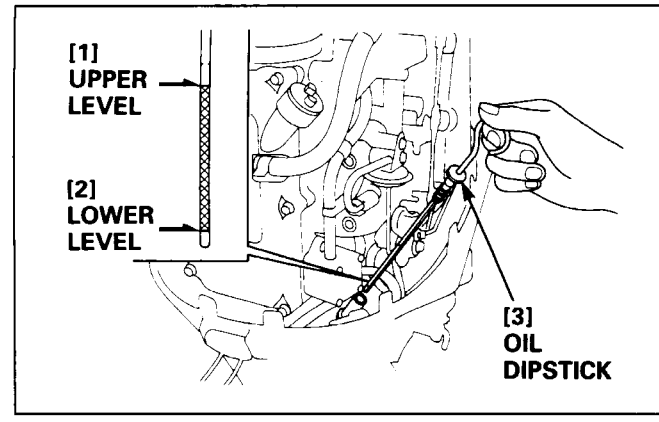
Part	Item		Standard	Service limit
Carburetor	Main jet		#110	———
	Jet set		#38	———
	Pilot screw opening		3 turns out	———
	Float height		13 mm (0.5 in)	———
Valves	Valve head diameter	IN	27 mm (1.06 in)	———
		EX	24 mm (0.95 in)	———
Camshaft	Cam height	IN	24.225 – 24.465 mm (0.9537 – 0.9632 in)	23.995 mm (0.9447 in)
		EX	24.256 – 24.496 mm (0.9550 – 0.9626 in)	24.056 mm (0.9471 in)

1. ENGINE OIL

INSPECTION

⚠ WARNING

- **Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil. KEEP OUT OF REACH OF CHILDREN.**



1) Place the outboard motor in the vertical position.
2) Remove the engine cover.
3) Remove the oil dipstick and wipe it clean.
4) Insert it all the way down the dipstick hole, then pull it out and read the oil level.
5) If the oil level is low, add the necessary recommended engine oil to bring the oil level to the upper level on the dipstick. Do not overfill.

Engine oil capacity	1.9 ℓ (2.00 US qt, 1.67 Imp qt)

Recommended engine oil	SAE5W – 30 API Service classification Fuel Efficient SG, SH.

NOTE

- This oil is usually identified by words such as: "Energy Conserving II.""Gas Saving,""Fuel Saving," etc.
- When a new oil filter has been installed, recheck the engine oil level after running the engine for a few minutes.
- Draining can be performed rapidly and completely when the engine is still warm.
- Place a shop towel under the oil filter when removing the oil filter.

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.**
- **Keep clear of moving parts.**

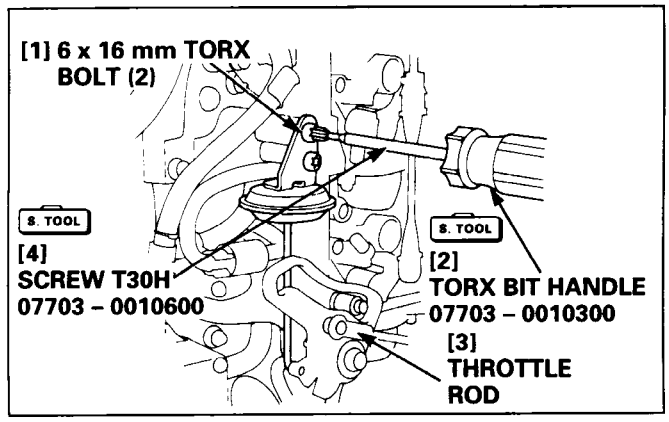
2. ACCELERATION DEVICE/DIAPHRAGM ASSEMBLY

Adjust the acceleration device/diaphragm assembly after adjusting the idle speed (P. 3-7 of the base shop manual).

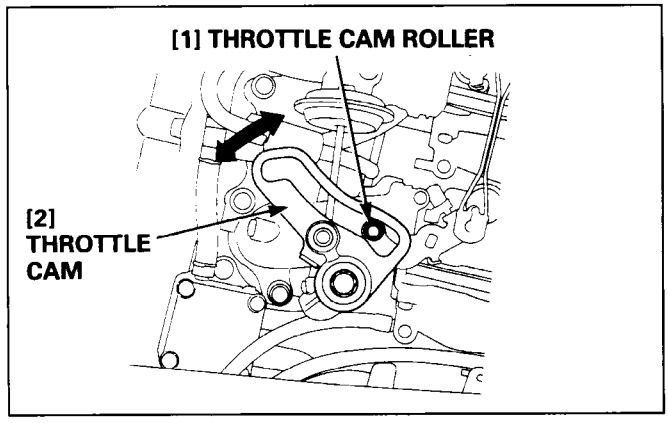
1) Loosen the 6 x 16 mm torx bolts using the special tools.

TOOLS:

Torx bit handle	**07703 – 0010300**
Screw T30H	**07703 – 0010600**



2) Remove the throttle rod from the throttle cam.
3) Move the throttle cam and hold it in a position where it does not contact the throttle cam roller.

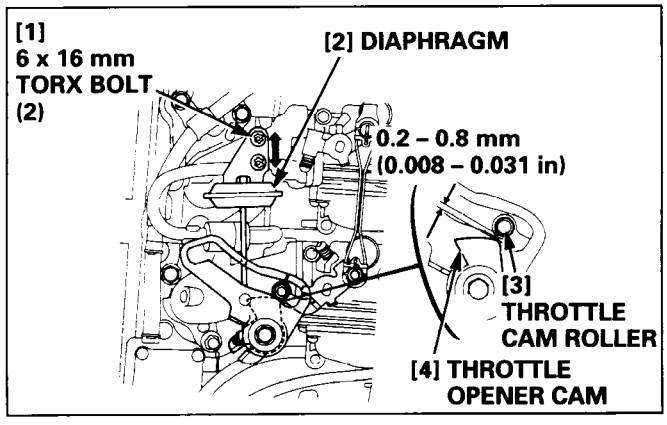


4) Move the diaphragm up or down slowly until the clearance between the throttle cam roller and throttle opener cam is 0.2 – 0.8 mm (0.008 – 0.031 in).
While holding the clearance, tighten the 6 x 16 mm torx bolts using the special tools.

TOOLS:

Torx bit handle	**07703 – 0010300**
Screw T30H	**07703 – 0010600**

Attach the throttle rod to the throttle cam.



PREFACE

This manual covers the construction, function and servicing procedures of the Honda BF25D, BF30D outboard motors.

For service information which is not covered in this supplement, please refer to the base shop manual (Part numbers 66ZV700 and 66ZV700Z).

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

Pay attention to these symbols and their meaning:

⚠ WARNING Indicates a strong possibility of severe personal injury or loss of life if instructions are not followed.

CAUTION: Indicates a possibility of personal injury or equipment damage if instructions are not followed.

Honda Motor Co., Ltd
Service Publication Office

CONTENTS

The marked sections contain no changes. They are not covered in this manual.

Date of Issue: Sep. 2003

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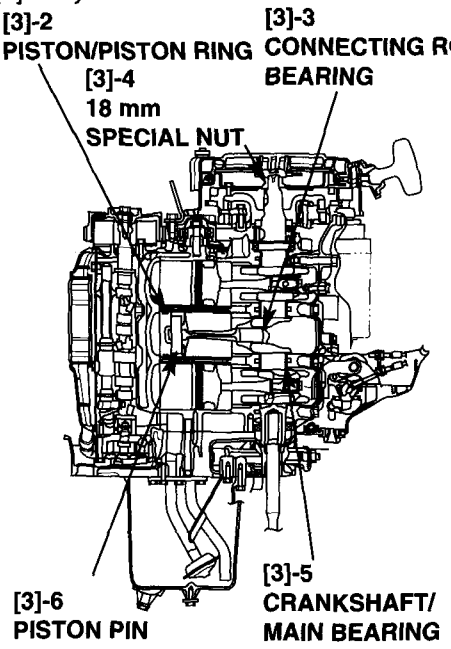
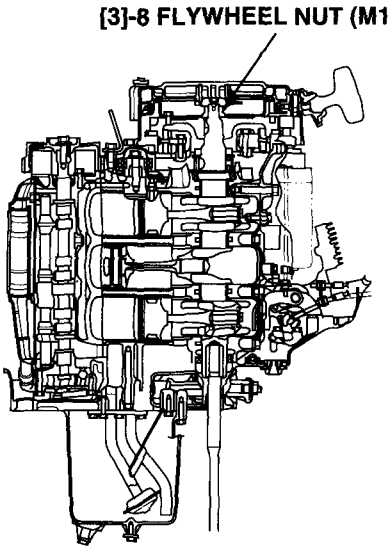
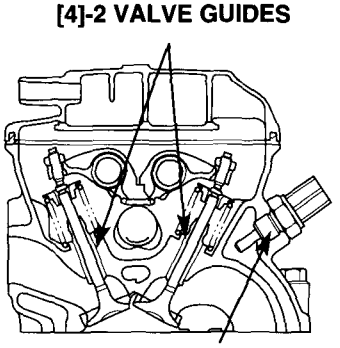
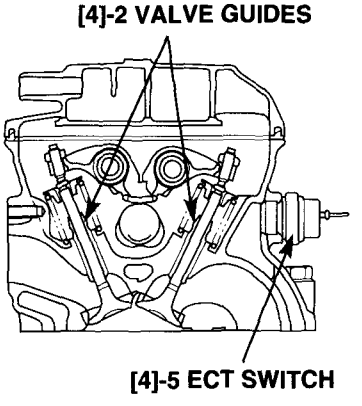
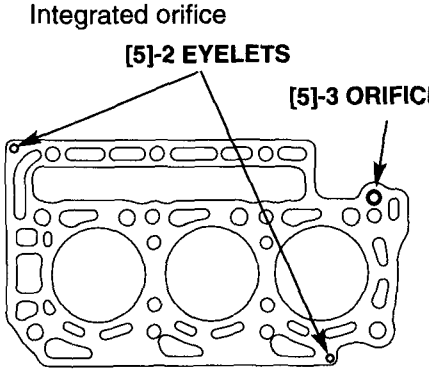
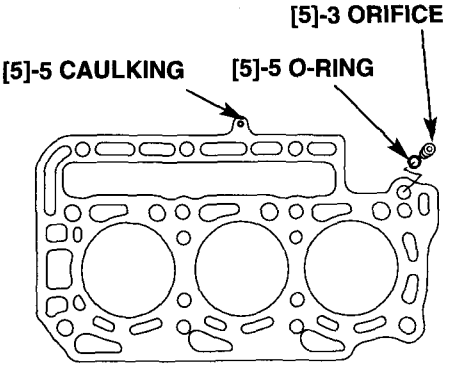
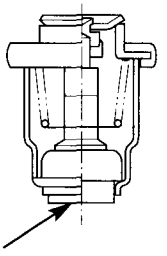
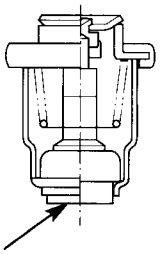
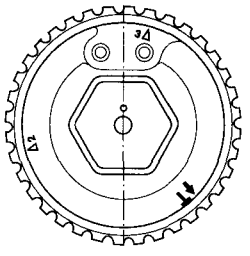
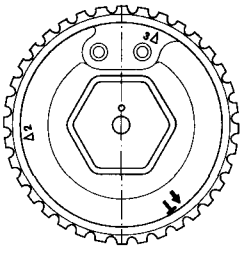
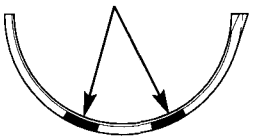
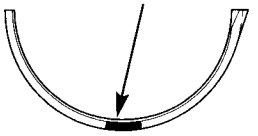
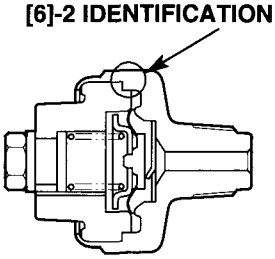
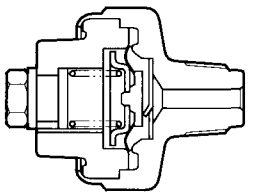
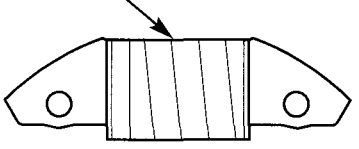
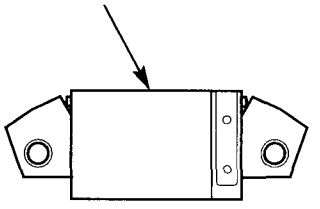
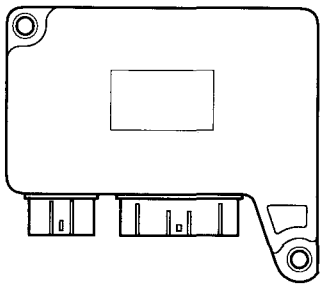
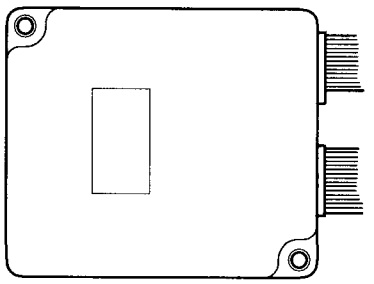
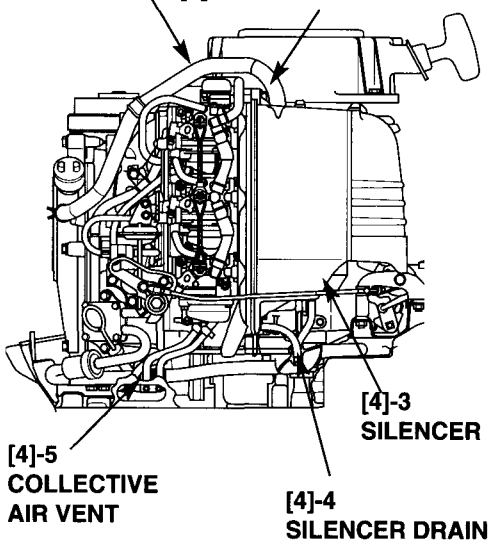
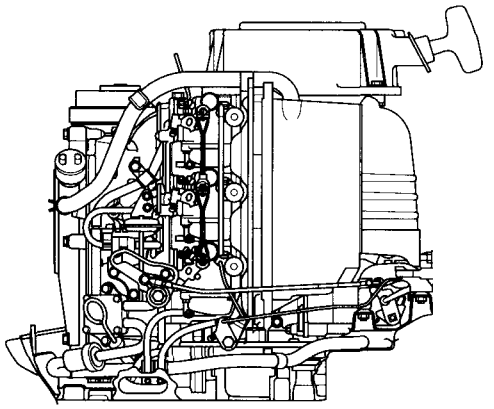
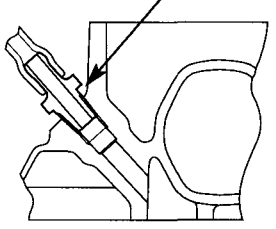
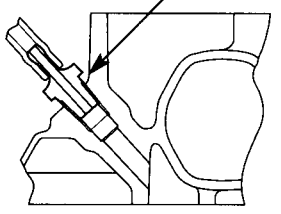
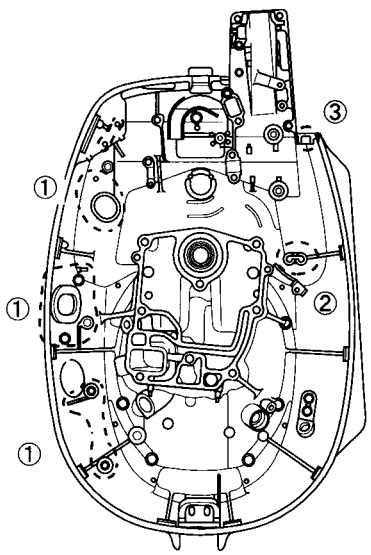
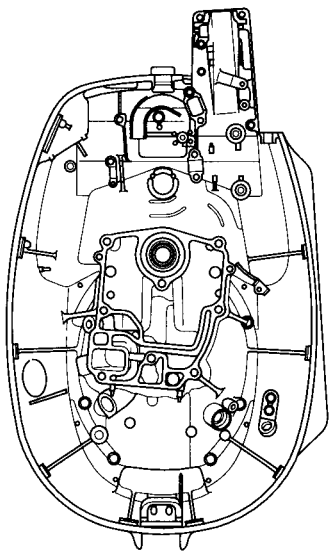
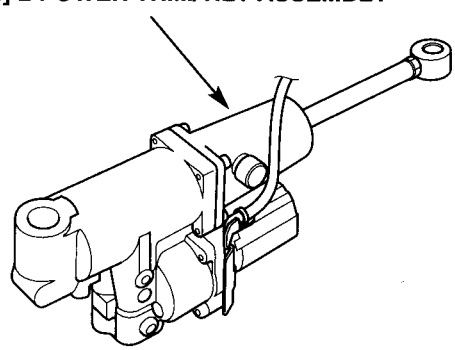
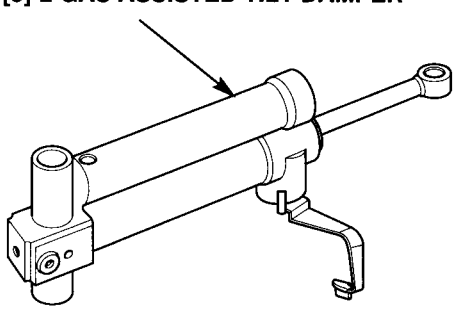
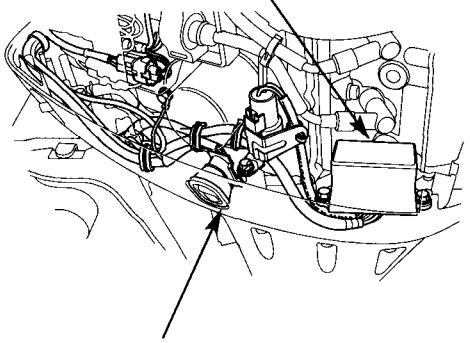
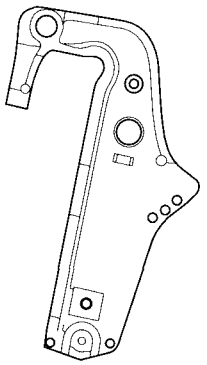
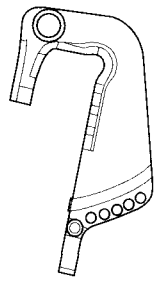
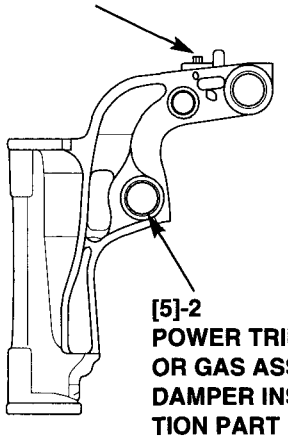
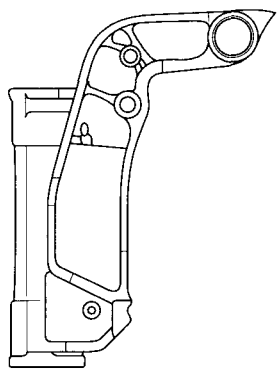
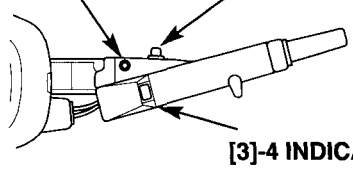
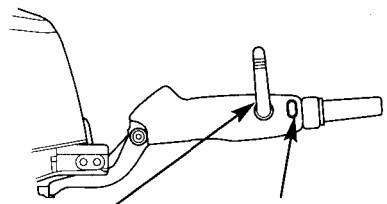
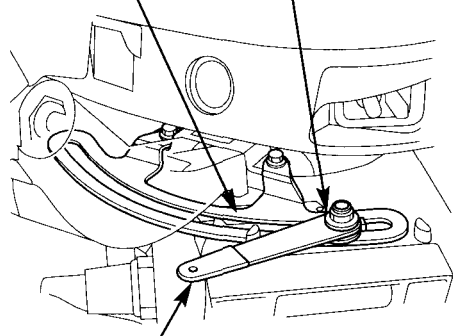
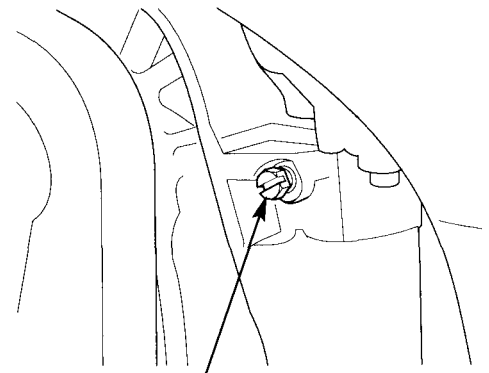
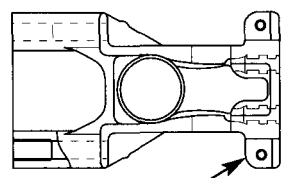
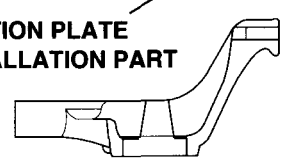
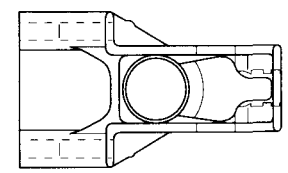
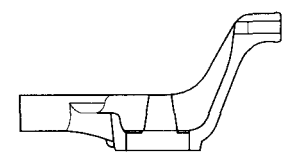
[2] Item \ [1] Model	BF25D/30D	BF25A/30A
[3] Cylinder block Piston Piston ring Piston pin Connecting rod Crankshaft Flywheel nut	[3]-1 Cylinder bore: ø 61 mm  	[3]-7 Cylinder bore: ø 58 mm 
[4] Cylinder head	[4]-1 Valve guide ID: 5 mm (0.20 in)  	[4]-4 Valve guide ID: 5.5 mm (0.22 in) 
[5] Cylinder head gasket	[5]-1 Bore changed Pre-coating type Integrated orifice  	[5]-4 After-coating type Separate type 

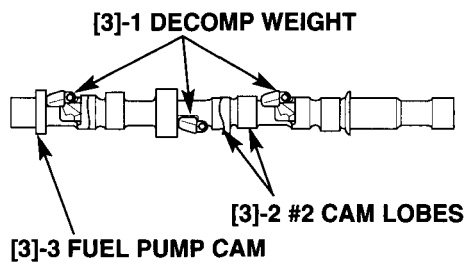
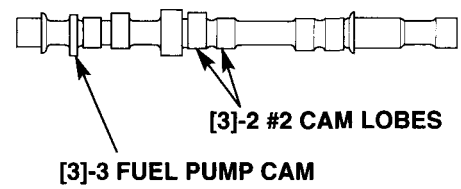
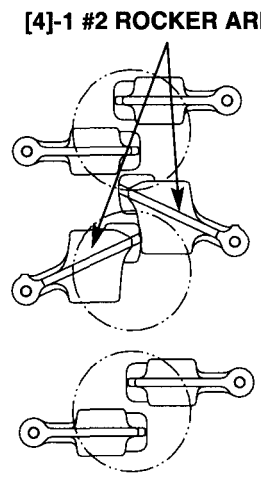
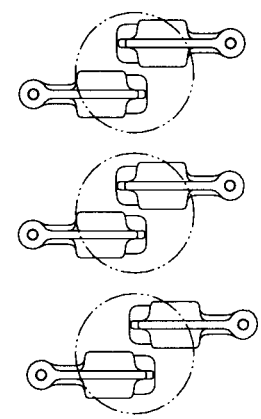
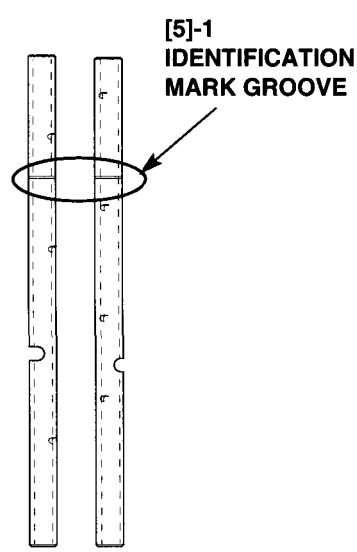
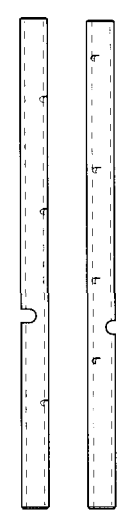
[1] Model / [2] Item	BF25D/30D	BF25A/30A
[3] Thermostat	[3]-1 Start to open: 60°C Full open: 70°C  **[3]-2 STAMP: 60°C**	[3]-3 Start to open: 72°C Full open: 82°C  **[3]-4 STAMP: 72°C**
[4] Cam pulley	[4]-1 TDC mark position, tooth phase changed 	
[5] Connecting rod metal	**[5]-1 IDENTIFICATION COLOR: 2 PLACES** 	**[5]-2IDENTIFICATION COLOR: 1 PLACE** 
[6] Oil pressure switch	[6]-1 Contact point changed **[6]-2 IDENTIFICATION MARK** 	
[7] Power coil	[7]-2 Coil changed in connection with adoption of the digital CDU unit. **[7]-2 POWER COIL** 	**[7]-3 EXCITER COIL** 

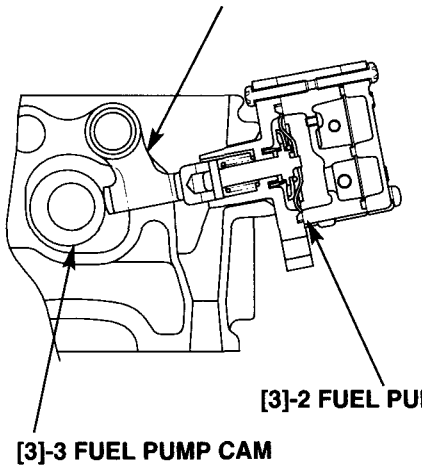
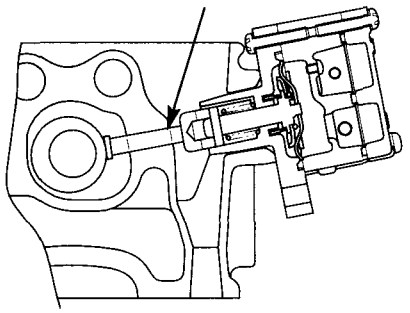
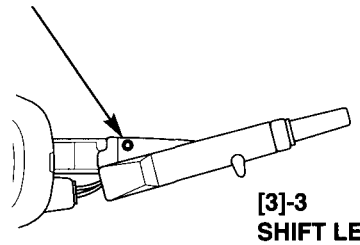
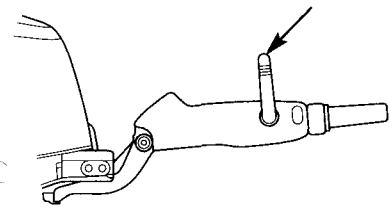
[1] Model / [2] Item	BF25D/30D	BF25A/30A
[3] CDI UNIT	[3]-1 Digital CDI 	
[4] Carburetor, Silencer	[4]-1 SE (Starter Enrichment) TYPE CARBURETOR [4]-2 BREATHER TUBE  [4]-3 SILENCER [4]-5 COLLECTIVE AIR VENT [4]-4 SILENCER DRAIN	
[5] Water hose joint	[5]-1 ID increased [5]-2 WATER HOSE JOINT 	[5]-2 WATER HOSE JOINT 

[1] Model / [2] Item	[1]-1 BF25D/30D (Power torim/tilt and gas assisted tilt types)	BF25A/30A
[3] Engine under case	[3]-1 Power trim/tilt switch, relay, harness, clip mounting boss and hole added.① Silencer drain hose boss added.....② Choke knob installation groove eliminated.....③ 	
[4] Power trim/tilt	[4]-1 Power trim/tilt type added **[4]-2 POWER TRIM/TILT ASSEMBLY** 	
[5] Gas assisted tilt	[5]-1 Gas assisted tilt type added **[5]-2 GAS ASSISTED TILT DAMPER** 	

[1] Model / [2] Item	[1]-1 BF25D/30D (Power torim/tilt and gas assisted tilt types)	BF25A/30A
[[3] Power trim/tilt relay, Power tilt switch	**[3]-1 POWER TRIM/TILT RELAY**  **[3]-2 POWER TILT SWITCH**	
[4] Stern bracket	[4]-1 Power trim/tilt, gas assisted tilt type added 	[4]-2 Mechanical tilt type 
[5] Swivel case	**[5]-1 STEERING FRICTION INSTALLATION PART**  **[5]-2 POWER TRIM/TILT OR GAS ASSISTED DAMPER INSTALLATION PART**	

[1] Model / [2] Item	[1]-1BF25D/30D (Long tiller handle type withpower torim/tilt or gas assisted tilt)	BF25A/30A
[3] Long tiller handle	[3]-1 Long tiller handle type added **[3]-2 EMERGENCY STOP SWITCH** **[3]-3 IGNITION SWITCH**  **[3]-4 INDICATOR**  **[3]-6 SHIFT LEVER** **[3]-5 POWER TRIM/TILT SWITCH**	
[4] Steering friction adjustment	**[4]-1 FRICTION PAD** **[4]-2 FRICTION PLATE**  **[4]-3 ADJUSTING LEVER**	 **[4]-4 ADJUSTING BOLT**
[5] Mount frame	 **[5]-1 FRICTION PLATE INSTALLATION PART** 	 

[1] Model / [2] Item	[1]-1 BF25D/30D (Mechanical tilt type)	BF25A/30A
[3] Camshaft		
[4] Rocker arm		
[5] Rocker arm shaft		

[1] Model / [2] Item	[1]-1 BF25D/30D (Mechanical tilt type)	BF25A/30A
[3] Fuel pump	[3]-1 FUEL PUMP ROCKER ARM  [3]-2 FUEL PUMP [3]-3 FUEL PUMP CAM	[3]-4 FUEL PUMP LIFTER 
[4] Long tiller handle	[3]-2 EMERGENCY STOP SWITCH  [3]-3 SHIFT LEVER 	

1. SPECIFICATIONS

• DIMENSIONS AND WEIGHTS

Model	BF25D			
Description code	BATJ			
Type	SH	SG	SHG	SRT
Overall length	720 mm (28.3 in) (*1)			640 mm (25.2 in)
Overall width	375 mm (14.8 in)			
Overall height	1,195 mm (47.0 in)			
Dry weight (*2)	70.5 kg (155 lb)	78.5 kg (173 lb)	81.5 kg (180 lb)	79.0 kg (174 lb)
Operating weight	72.5 kg (160 lb)	80.5 kg (178 lb)	83.5 kg (184 lb)	81.0 kg (179 lb)

Model	BF25D				
Description code	BATJ				
Type	LH	LHT	LG	LHG	LRT
Overall length	720 mm (28.3 in) (*1)				640 mm (25.2 in)
Overall width	375 mm (14.8 in)				
Overall height	1,320 mm (52.0 in)				
Dry weight (*2)	72.5 kg (160 lb)	85.5 kg (189 lb)	80.5 kg (178 lb)	83.5 kg (184 lb)	81.0 kg (179 lb)
Operating weight	74.5 kg (162 lb)	87.5 kg (193 lb)	82.5 kg (182 lb)	85.5 kg (189 lb)	83.0 kg (183 lb)

Model	BF30D				
Description code	BAUJ				
Type	SH	SHT	SG	SHG	SRT
Overall length	720 mm (28.3 in) (*1)				640 mm (25.2 in)
Overall width	375 mm (14.8 in)				
Overall height	1,195 mm (47.0 in)				
Dry weight (*2)	70.5 kg (155 lb)	83.5 kg (184 lb)	78.5 kg (173 lb)	81.5 kg (180 lb)	79.0 kg (174 lb)
Operating weight	72.5 kg (160 lb)	85.5 kg (178 lb)	80.5 kg (178 lb)	83.5 kg (184 lb)	81.0 kg (179 lb)

Model	BF30D				
Description code	BAUJ				
Type	LH	LHT	LG	LHG	LRT
Overall length	720 mm (28.3 in) (*1)				640 mm (25.2 in)
Overall width	375 mm (14.8 in)				
Overall height	1,320 mm (52.0 in)				
Dry weight (*2)	72.5 kg (160 lb)	85.5 kg (189 lb)	80.5 kg (178 lb)	83.5 kg (184 lb)	81.0 kg (179 lb)
Operating weight	74.5 kg (162 lb)	87.5 kg (193 lb)	82.5 kg (182 lb)	85.5 kg (189 lb)	83.0 kg (183 lb)

*1: With handle raised
*2: With propeller mounted

• FRAME

Model	BF25D								
Type	SH	LH	LG	SG	SHG	LHG	LHT	SRT	LRT
Transom height	431 mm (17.0 in)	552 mm (21.7 in)		431 mm (17.0 in)		552 mm (21.7 in)		431 mm (17.0 in)	552 mm (21.7 in)
Transom angle	4°, 8°, 12°, 16°, 20°		8°, 12°, 16°, 20°						
No. of tilting stages	2 stage adjustment 20°, 37° (*1)		Stageless						
Tilting angle	67° (*1)		–4° ~ 64° (*1)						
Swivel angle	40° each right and left								
Trimming angle	—						–4° ~ 12° (*1)		

*1: with transom angle 12°

Model	BF30D									
Type	SH	LH	LG	SG	SHG	LHG	SHT	SRT	LHT	LRT
Transom height	431 mm (17.0 in)	552 mm (21.7 in)		431 mm (17.0 in)		552 mm (21.7 in)	431 mm (17.0 in)		552 mm (21.7 in)	
Transom angle	4°, 8°, 12°, 16°, 20°		8°, 12°, 16°, 20°							
No. of tilting stages	2 stage adjustment 20°, 37° (*1)		Stageless							
Tilting angle	67° (*1)		–4° ~ 64° (*1)							
Swivel angle	40° each right and left									
Trimming angle	—						–4° ~ 12° (*1)			

*1: with transom angle 12°

Types of Honda BF25D and BF30D Outboard Motors

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

Model	BF25D								
Type	SH	LH	LG	SG	SHG	LHG	LHT	SRT	LRT
Shaft length	S	L	L	S	S	L	L	S	L
Remote control								○	○
Long tiller handle	○	○	○	○	○	○	○		
Gas assisted tilt			○	○	○	○			
Power trim/tilt							○	○	○
Mechanical tilt	○	○							
Electric starter					○	○	○	○	○

Model	BF30D									
Type	SH	LH	LG	SG	SHG	LHG	SHT	SRT	LHT	LRT
Shaft length	S	L	L	S	S	L	S	S	L	L
Remote control								○		○
Long tiller handle	○	○	○	○	○	○	○		○	
Gas assisted damper			○	○	○	○			○	
Power trim/tilt							○	○	○	○
Mechanical tilt	○	○								
Electric starter					○	○	○	○	○	○

S: Short, L: Long

• ENGINE

Model	BF25D	BF30D
Description code	BEATJ	BEAUJ
Type	Water cooled, 4-stroke, 3-cylinder overhead cam	
Displacement	552 cm^3 (86.6 cu in)	
Bore x stroke	61 x 63 mm (2.4 x 2.5 in)	
Rated horsepower	18.4 kW (25 PS) at 5,500 min^{-1} (rpm)	22.1 kW (30 PS) at 6,000 min^{-1} (rpm)
Maximum torque	40.2 N·m (4.10 kgf·m, 29.7 lbf·ft) at 3,500 min^{-1} (rpm)	40.8 N·m (4.16 kgf·m, 30.1 lbf·ft) at 4,000 min^{-1} (rpm)
Compression ratio	9.2 : 1	
Fuel consumption	327 g/kW·h at 5,500 min^{-1} (rpm)	365 g/kW·h at 6,000 min^{-1} (rpm)
Cooling system	Water cooled	
Ignition system	Digital CDI	
Ignition timing	5° ± 2° B.T.D.C at 1,000 min^{-1} (rpm)	
Spark plug	DR7EA (NGK), X22ESR-U (DENSO)	
Carburetor	Horizontal butterfly valve type, 3 carburetors	
Lubricating system	Forced lubrication	
Engine oil capacity	1.9 lit. (2.01 US qt, 1.67 Imp qt), 1.6 lit. (1.69 US qt, 1.41 Imp qt) at oil change	
Starting system	Electric starter and/or Recoil starter	
Stopping system	Ground type	
Fuel used	Automotive unleaded gasoline	
Fuel tank capacity	25 lit. (6.6 US gal, 5.5 Imp gal)	
Exhaust system	Under water type	

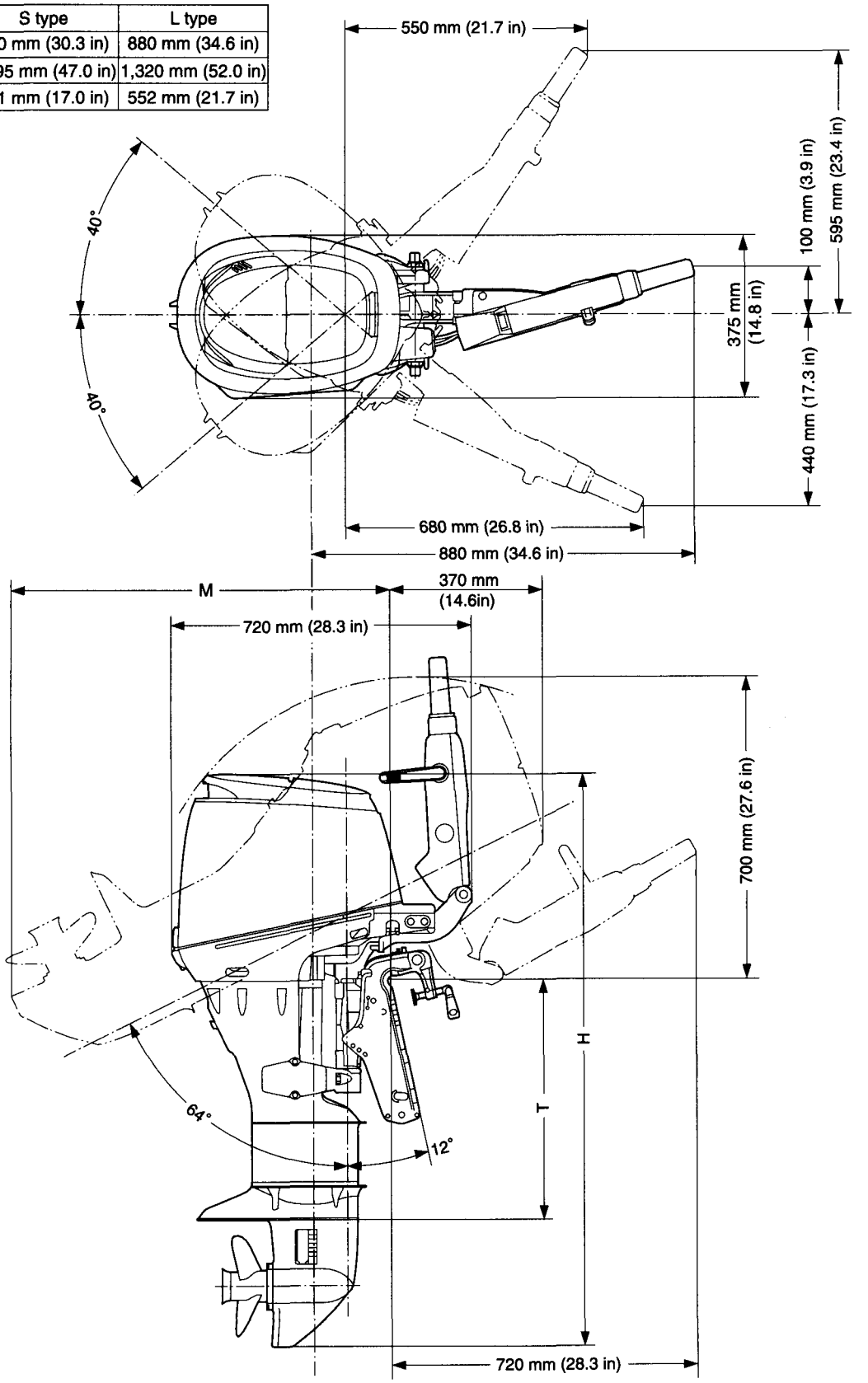
• LOWER UNIT

Clutch	Dog clutch
Gear ratio	0.48 (13/27)
Reduction type	Spiral bevel gear
Gear case oil capacity	0.27 lit. (0.29 US qt, 0.24 Imp qt)
Propeller rotating direction	Clockwise (viewed from rear)

2. DIMENSIONAL DRAWING

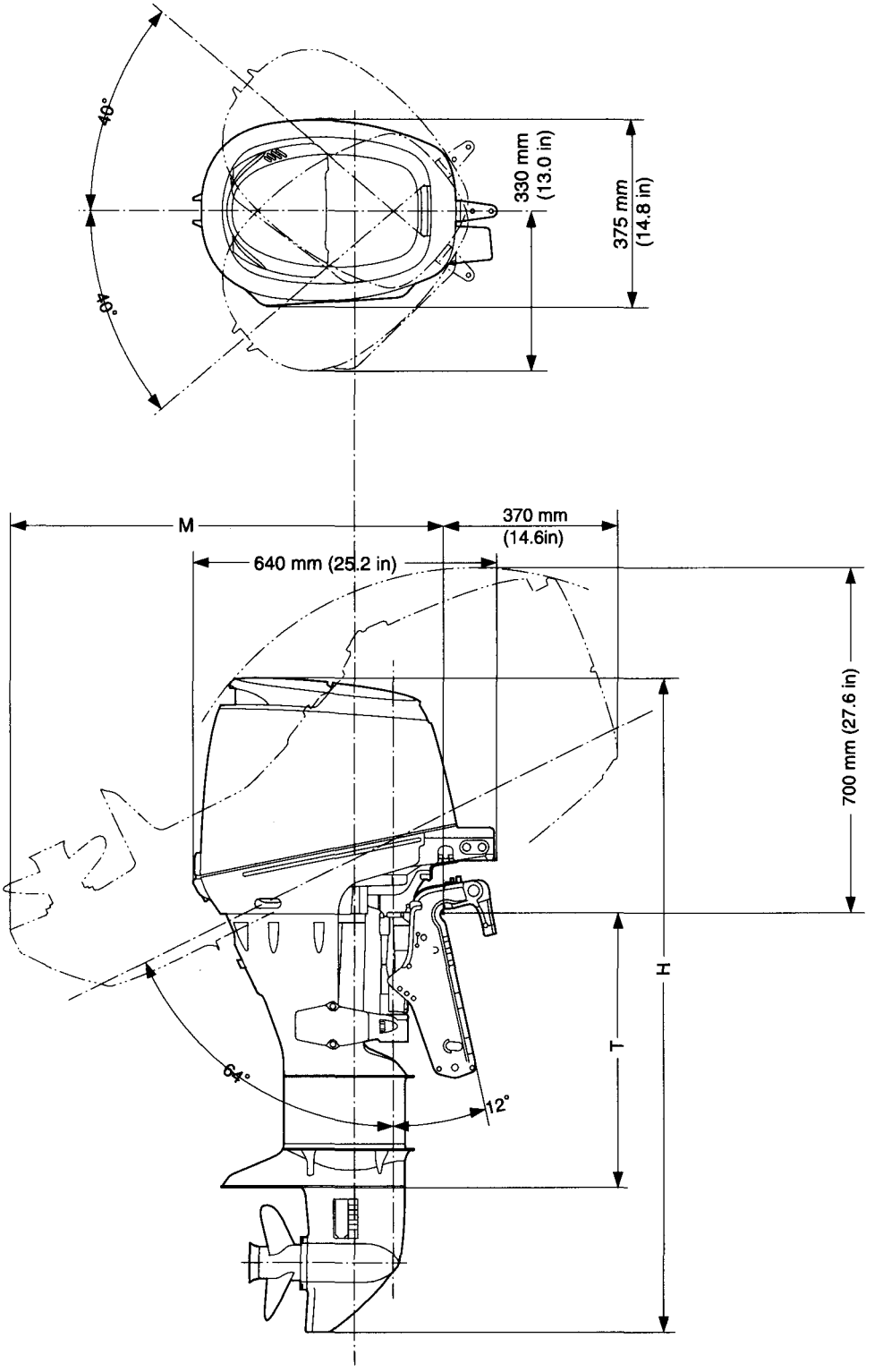
Tiller Handle Type With Gas Assisted Tilt and With Power Trim/Tilt

	S type	L type
M	770 mm (30.3 in)	880 mm (34.6 in)
H	1,195 mm (47.0 in)	1,320 mm (52.0 in)
T	431 mm (17.0 in)	552 mm (21.7 in)



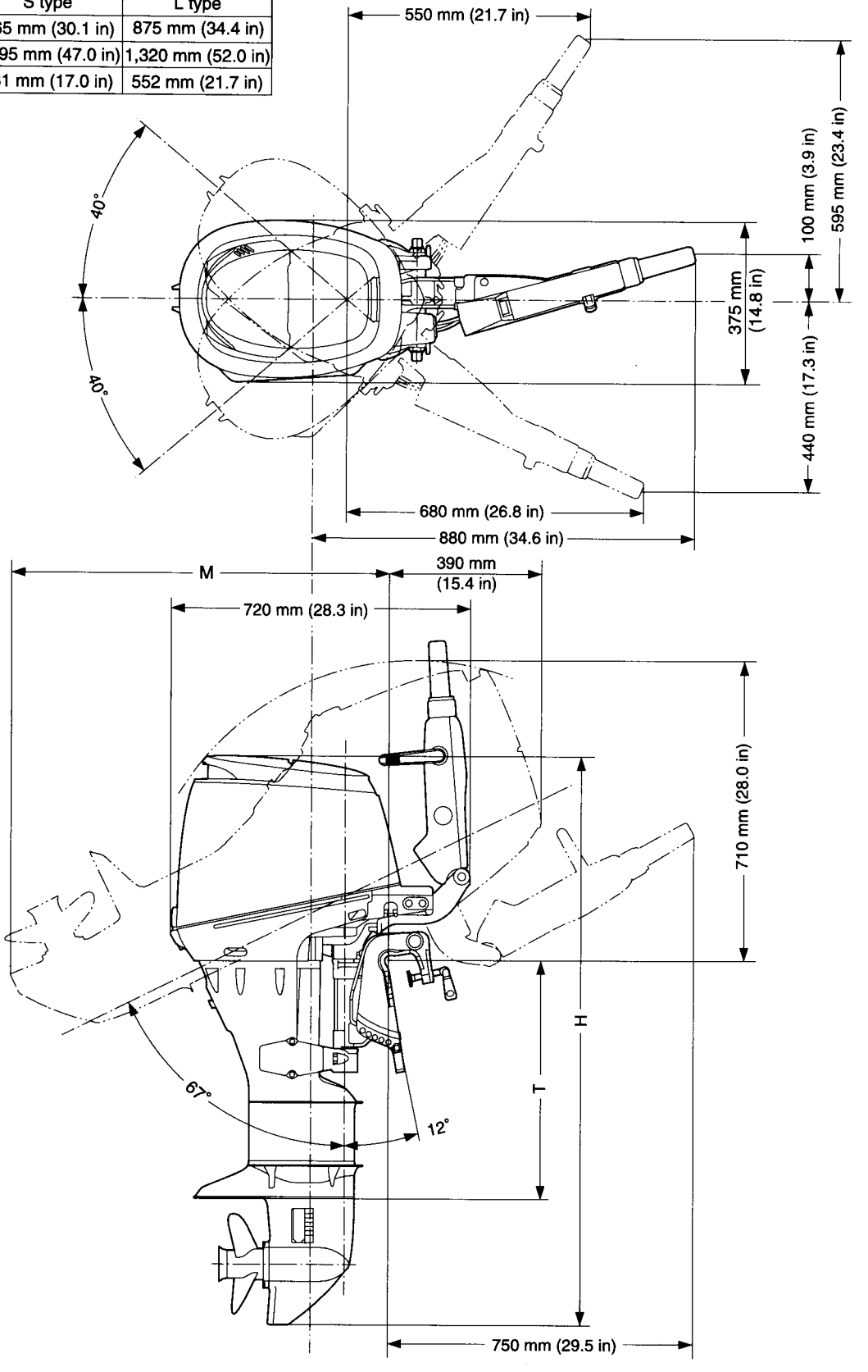
Remote Control Type

	S type	L type
M	770 mm (30.3 in)	880 mm (34.6 in)
H	1,195 mm (47.0 in)	1,320 mm (52.0 in)
T	431 mm (17.0 in)	552 mm (21.7 in)



Tiller Handle Type With Mechanical Tilt

	S type	L type
M	765 mm (30.1 in)	875 mm (34.4 in)
H	1,195 mm (47.0 in)	1,320 mm (52.0 in)
T	431 mm (17.0 in)	552 mm (21.7 in)



1. MAINTENANCE STANDARDS

• ENGINE

Part	Item			Standard	Service limit
Engine	Idle speed			950 ± 50 min^{-1} (rpm)	—
	Cylinder compression Electric starter type			1,470 ± 98 kPa (15 ± 1 kgf/cm^2, 213 ± 14 psi) at 500 min^{-1} (rpm)	—
	Cylinder compression Recoil starter type			883 ± 98 kPa (9 ± 1 kgf/cm^2, 128 ± 14 psi) at 400 min^{-1} (rpm)	—
Carburetor	Main jet	BF30D		#105	—
		BF25D	Bodensee type	#92	—
			Except Bodensee type	#98	—
	Pilot screw opening	BF30D		1-7/8 turns out	—
		BF25D	Bodensee type	2-1/8 turns out	—
			Except Bodensee type	2-1/4 turns out	—
	Float level height		BF30D	13 mm (0.51 in)	—
			BF25D	14 mm (0.55 in)	—
	SE thermal valve heater coil resistance			15.8 - 24.2Ω	—
Exhaust emission (Bodensee typ only)	CO_2			10% Min.	—
	HC			686 ppm Max.	—
	CO			6.6% Max.	
	Measuring engine idle rpm			950 - 1,150 min^{-1} (rpm)	—
Valves	Valve stem O.D.		IN	4.975 - 4.990 mm (0.1959 - 0.1965 in)	4.95 mm (0.195 in)
			EX	4.955 - 4.970 mm (0.1951 - 0.1957 in)	4.93 mm (0.194 in)
	Valve guide I.D .		IN/EX	5.000 - 5.012 mm (0.1969 - 0.1973 in)	5.04 mm (0.198 in)
	Valve stem-to-guide		IN	0.010 - 0.037 mm (0.0004 - 0.0015 in)	0.07 mm (0.003 in)
			EX	0.030 - 0.057 mm (0.0012 - 0.0022 in)	0.12 mm (0.005 in)
Piston	Skirt O.D.			60.97 - 60.99 mm (2.400 - 2.401 in)	60.92 mm (2.400 in)
	Piston-to-cylinder clearance			0.010 - 0.045 mm (0.0004 - 0018 in)	0.10 mm (0.004 in)
	Piston pin bore I.D.			16.002 - 16.008 mm (0.6300 - 0.6302 in)	16.02 mm (0.631 in)
	Piston pin O.D.			15.994 - 16.000 mm (0.1959 - 0.1965 in)	15.97 mm (0.1956 in)
	Piston-to-piston pin clearance			0.002 - 0.014 mm (0.0001 - 0.0006 in)	0.04 mm (0.002 in)
Cylinder block	Cylinder I.D.			61.000 - 61.015 mm (2.4016 - 2.4022 in)	61.055 mm (2.4037 in)
Connecting rod	Small end I.D.			16.010 - 16.022 mm (0.6303 - 0.6308 in)	16.05 mm (0.632 in)
Camshaft	Cam height	BF30D	IN	24.185 - 24.525 mm (0.9522 - 0.9655 in)	24.045 mm (0.9467 in)
			EX	24.216 - 24.556 mm (0.9538 - 0.9668 in)	24.076 mm (0.9479 in)
		BF25D	IN	23.513 - 23.853 mm (0.9257 - 0.9391 in)	23.373 mm (0.9202 in)
			EX	23.364 - 23.704 mm (0.9198 - 0.9332 in)	23.224 mm (0.9143 in)
Fuel pump rocker arm	Rocker arm I.D.			13.000 - 13.018 mm (0.5118 - 0.5125 in)	13.04 mm (0.513 in)
	Rocker arm-to-shaft clearance			0.020 - 0.056 mm (0.0008 - 00.0022 in)	0.07 mm (0.003 in)

• **ELECTRICAL**

Part	Item		Standard	Service limit
Power coil	Resistance		6.12 - 7.48 Ω	—
Pulser coil	Resistance		617.5 - 753.5 Ω	—
Charge coil	Resistance	Electric starter type	0.27 - 0.33 Ω	—
		Recoil starter type	0.15 - 0.19 Ω	—
SE thermalve heater coil	Resistance		1.7 - 2.1 Ω	—

2. TORQUE VALUES

Item	Thread dia. x pitch	Torque			Remark
		N·m	kgf·m	lbf·ft	
• Engine					
Crankcase	M8 x 1.25	27	2.8	20	*1 Apply oil to the threads and seating surface.
Crankcase	M6 x 1.0	12	1.2	9	
Oil filter holder	M20 x 1.5	18	1.8	13	
Oil filter cartridge	M20 x 1.5	11	1.1	8	
Cylinder head bolt (L=83 mm)	M8 x 1.25	27	2.8	20	*1 Apply oil to the threads and seating surface.
Cylinder head bolt (L=40 mm)	M8 x 1.25	27	2.8	20	Apply oil to the threads and seating surface.
Carburetor bolt	M6 x 1.0	10	1.0	7	
Connecting rod nut	M7 x 0.75	24	2.4	17	Apply oil to the threads and seating surface.
Tappet adjusting lock nut	M5 x 0.5	8	0.8	5.8	Apply oil to the threads and seating surface.
Drain plug bolt	M12 x 1.5	23	2.3	17	
Exhaust pipe bolt	M8 x 1.25	22	2.2	16	
Oil pan bolt	M6 x 1.0	10	1.0	7	
Oil pump bolt	M6 x 1.0	13	1.3	9	
Oil strainer bolt	M6 x 1.0	13	1.3	9	
Timing pulley nut	M34 x 1.0	64	6.5	47	Apply oil to the threads and seating surface.
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	
18 mm Special nut (flywheel nut)	M18 x 1.5	39	4.0	29	*2 Apply oil to the threads and seating surface.
Oil pressure switch	PT1/8	9	0.9	6.5	
ECT sensor	M12 x 1.5	18	1.8	13	Apply oil to the threads.
Spark plug	M12 x 1.25	18	1.8	13	
Starter cable terminal nut	M6 x 1.0	5	0.5	3.6	
CDI unit bolt	M6 x 1.0	5	0.5	3.6	
• Gear case					
Pinion gear nut	M10 x 1.0	39	4.0	29	
Gear case bolt	M10 x 1.25	34	3.5	25	
Oil check bolt	M8 x 1.25	3.5	0.35	2.5	
Drain plug	M8 x 1.25	3.4	0.35	2.5	
Water screen nut	M5 x 0.8	1	0.1	0.7	
Impeller housing bolt	M6 x 1.0	11	1.1	8	
Water bottom screen nut	M5 x 0.8	1	0.1	0.7	
Propeller castle nut	M14 x 1.5	1 - 35	0.1 - 3.5	0.7 - 25	*3

Item	Thread dia. x pitch	Torque			Remark
		N·m	kgf·m	lbf·ft	
• Extension case/mount					
Extension case bolt	M8 x 1.25	22	2.2	16	
Lower mount rubber bolt	M12 x 1.25	54	5.5	40	
Lower mount housing bolt	M8 x 1.25	22	2.2	16	
Upper mount rubber bolt	M10 x 1.25	44	4.5	33	
Extension separator bolt	M10 x 1.25	34	3.5	25	
Steering friction lever nut	M8 x 0.75	8.5	0.85	6.1	*4
• Stern bracket					
Tilting shaft self-locking nut	7/8-14 UNF	39	4.0	29	*5
Stern bracket nut	M8 x 1.25	22	2.2	16	
10 mm self-locking nut	M10 x 1.25	34	3.5	25	
Grease nipple	M6 x 1.0	3	0.3	2.2	
• Long tiller handle					
Steering bracket lock nut	M12 x 1.25	54	5.5	40	
Steering bracket bolt	M12 x 1.25	29	3.0	22	
Long tiller handle nut	M10 x 1.25	34	3.5	25	
Under cover screw	M5 x 0.8	2.2	0.22	1.6	
Connector bracket bolt	M6 x 1.0	7	0.7	5.1	
Emergency stop switch nut	M16 x 1.0	1.3	0.13	0.9	
Grip pipe bolt	M6 x 1.0	7	0.7	5.1	
Switch bracket bolt	M6 x 1.0	4.5	0.45	3.3	
Throttle rod lock nut	M6 x 1.0	1.3	0.13	0.9	
Guide plate bolt	M6 x 1.0	4.5	0.45	3.3	
• Gas assisted damper assembly					
Tilt lever nut	M6 x 1.0	6.5	0.65	4.7	
• Power tilt/trim assembly					
Joint metal lock nut	M14 x 1.5	44	4.5	33	Apply thread locking agent.
• Electrical equipment					
Neutral switch nut	M20 x 1.0	2.5	0.25	1.8	
Water hose joint	PT1/8	9	0.9	6.5	
Fastener lever lock nut	M6 x 1.0	12	1.2	9	

NOTE:

*1: Tighten to the specified torque first, then tighten to an additional 90° - 120°.

*2: Clean off oil or grease from the flywheel and crankshaft mating surfaces. Apply oil to the seating surface and thread of the nut, and tighten to the specified torque. Then, tighten to an additional 75° - 105°.

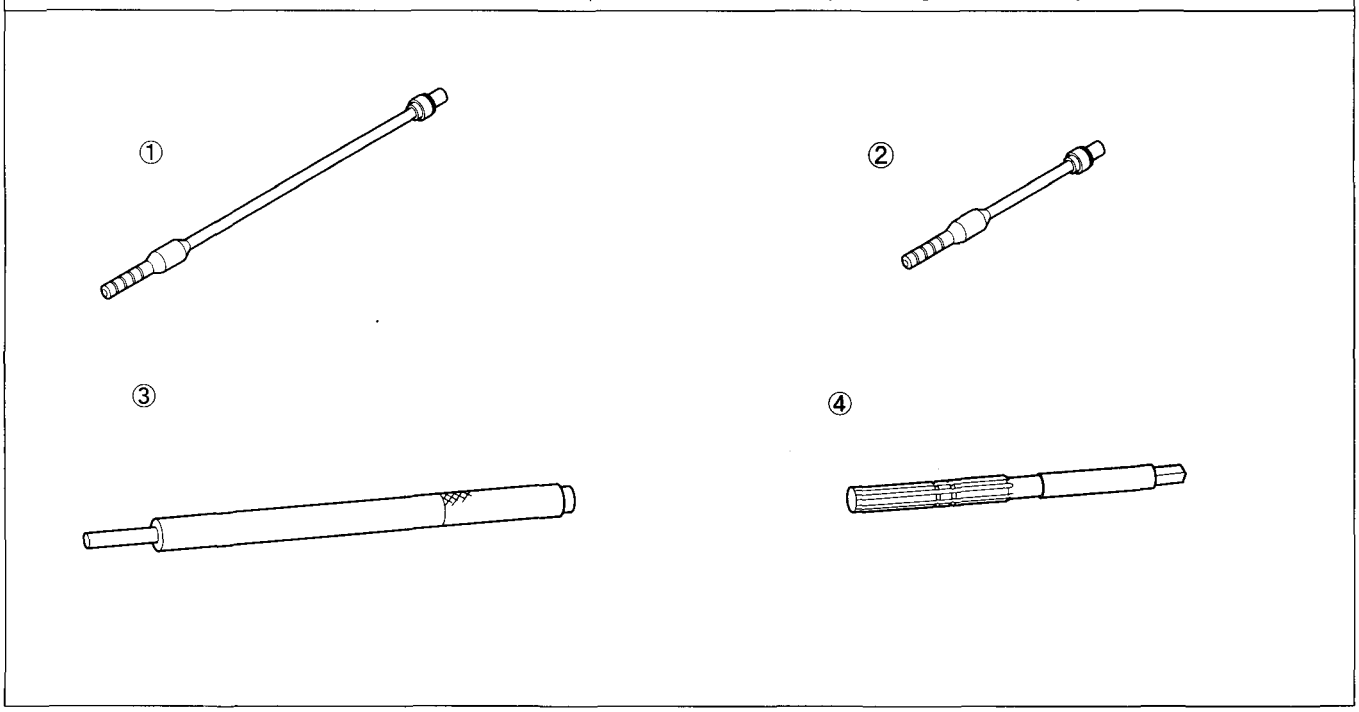
*3: If the split pin cannot be set by tightening the castle nut to the specified torque, tighten the castle nut additionally until the split pin can be set. Maximum torque of the 16 mm castle nut is 34 N•m (3.5 kgf•m, 25 lbf•ft).

*4: Turn the steering friction lever to the lock position (i.e. fully to the left side where the lever contacts the stopper). Hold the steering friction lever in this position and tighten the friction lever nut to the specified torque.

*5: Tighten the 7/8-14 UNF self-locking nut to the specified torque first, then back it off to 180° - 210°.

3. SPECIAL TOOLS

No.	Tool name	Tool number	Application/Remark
①	Vacuum gauge attachment 5 x 08 x 120L	07510-3000100 or 07510-3000200	Carburetor synchronization
②	Vacuum gauge attachment 5 x 08 x 50L		
③	Valve guide driver 5.0 mm	07942-8920000	Valve guide removal/installation
④	Valve guide reamer 5.0 mm	07984-MA60001	Valve guide reaming



4. APPLYING LIQUID SEALANT

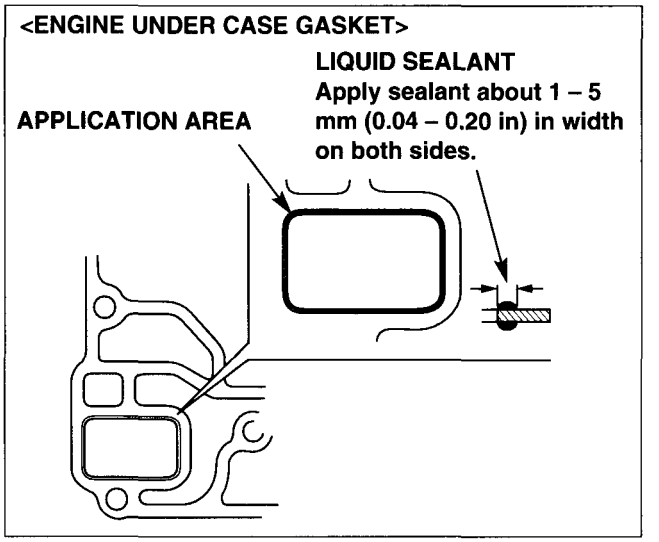
Apply liquid sealant (ThreeBond #1211, #1216 or equivalent) to the engine under case gasket and oil pan gasket as follows:

- Apply about 1 - 5 mm (0.04 - 0.20 in) width.
- Assemble the engine under case and oil pan within the specified time after application of a sealing agent.
  Example:
  - Within 90 minutes when using ThreeBond #1211.
  - Within 30 minutes when using ThreeBond #1216.
- Wait for 15 minutes after assembly. Do not add oil during this period.

• ENGINE UNDER CASE GASKET

1) Clean the cylinder block and engine under case mating surfaces and clean a new gasket with a degreasing cleaning agent and a clean shop towel.
2) Apply liquid sealant to both sides around the exhaust passage (i.e. position shown) of the new gasket.
3) Install the engine under case (see P. 8-4 of the base shop manual).

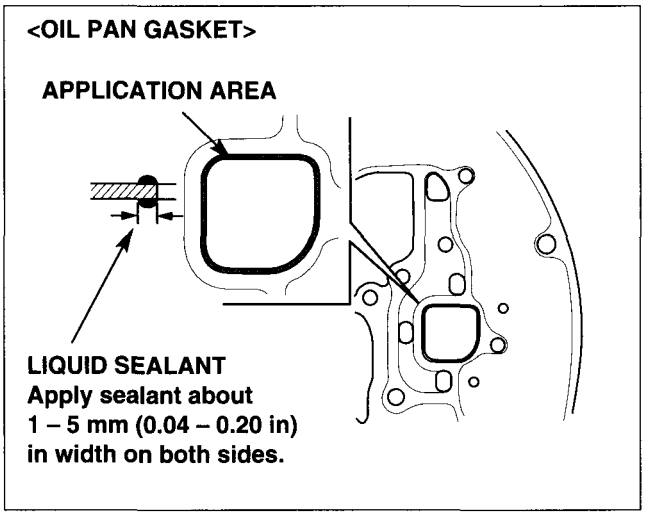
<ENGINE UNDER CASE GASKET>



• OIL PAN GASKET

1) Clean the engine under case and oil pan mating surfaces and clean a new gasket with a degreasing cleaning agent or a clean shop towel.
2) Apply liquid sealant to both sides around the exhaust passage (i.e. position shown) of the new gasket.
3) Install the oil pan (see P. 13-1 of the base shop manual).

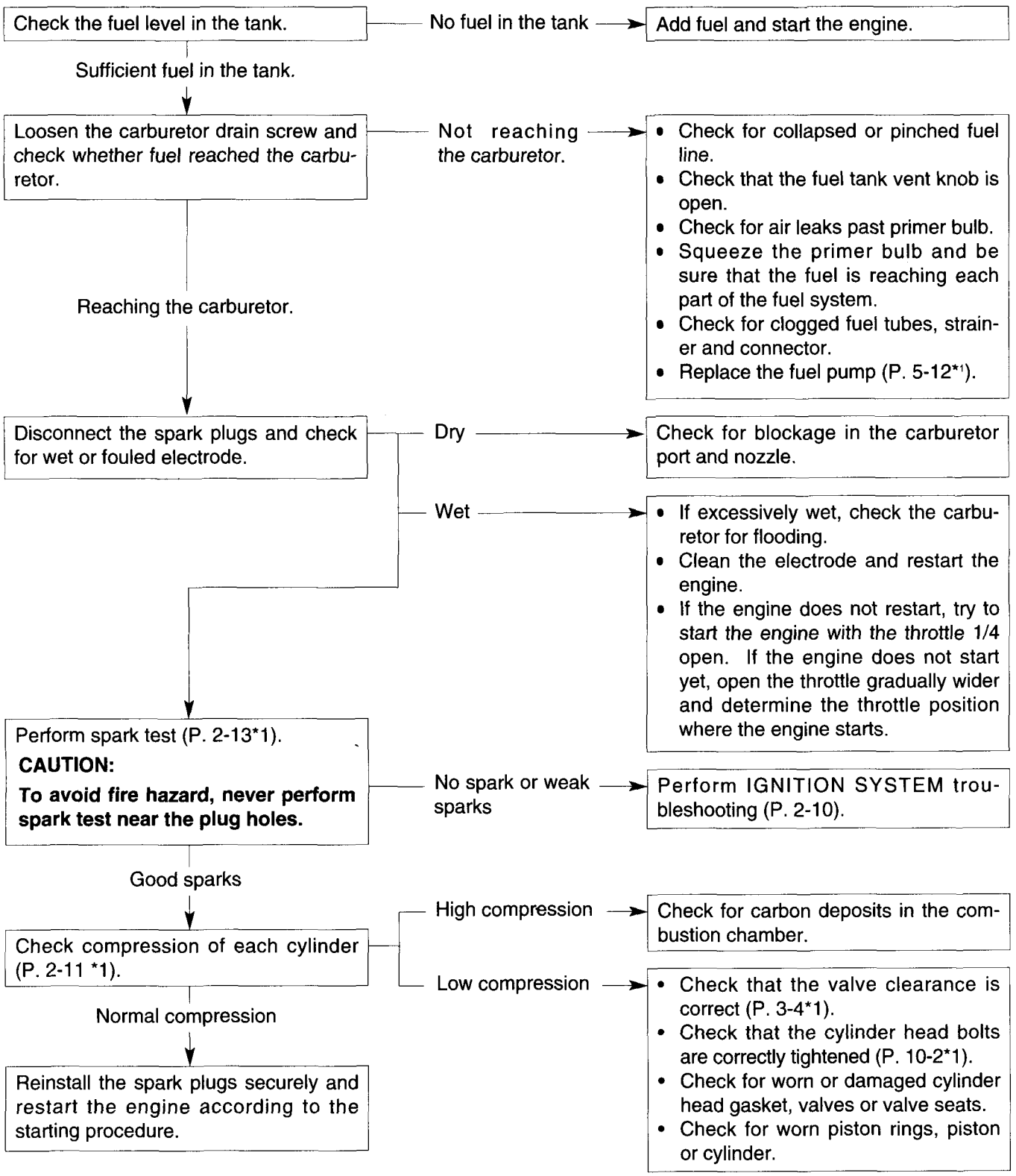
<OIL PAN GASKET>



5. TROUBLESHOOTING

a. ENGINE

• Hard Starting



*1: Indicates reference page of the base shop manual.

• Engine Does Not Run Smoothly

Engine starts, but stalls soon. Idle speed is not stable or stalls.	Faulty automatic SE valve.	Inspect and replace: P. 5-10, 14 and 15
	Spark plug faulty.	Replace or clean and adjust: (P. 3-3 *1)
	Carburetor throttle stop screw misadjusted.	Adjust: P. 3-2
	Carburetor slow circuit clogged.	Overhaul the carburetor. (Section 5)
	Carburetor flooded.	Drain the carburetor and prime again. If still not good, overhaul the carburetor (Section 5).
	Carburetors out of synchronization.	Inspect and adjust: P. 3-2 thru. 3-4
	Secondary air from loose carburetor mounting bolts and/or damaged carburetor insulator and gasket.	• Retighten the carburetor mounting bolts securely (P. 5-3 and 5-17). • Replace the insulator or gasket (P. 5-8 and 9).
Engine speed does not increase.	Throttle cable misadjusted.	Adjust: P. 3-6
	Propeller mismatched.	Replace with the correct propeller.
	Overheat (Alert system function).	Perform ALERT SYSTEM troubleshooting (P. 2-12 thru 2-16).
	Oil pressure abnormal (Alert system function).	Perform ALERT SYSTEM troubleshooting (P. 2-12 thru 2-16).
	Spark plug faulty.	Replace or clean and adjust: (P. 3-3 *1)
	Fuel filter clogged.	Inspect and replace: (P. 3-5 and 6 *1)
	Water or deposits in carburetor.	Disassemble and clean: Section 5
	Valve clearance misadjusted.	Adjust: (P. 3-4 *1)

*1: Indicates reference page of the base shop manual.

Engine speed does not decrease.	Throttle cable sticky or interfered.	Check the throttle cable for restriction or interference.
	Throttle arm or rod not move smoothly.	Replace: (P. 13-2*1)

Engine speed increased excessively and it fluctuates.	Boat and propeller mismatched causing overrev of the engine.	Replace with the correct propeller.
	Propeller excessively worn.	Replace the propeller.
	Propeller bushing rubber slipping.	Replace the propeller.
	Setting of outboard motor incorrect (Transom height, tilt angle, etc. incorrect).	Adjust.

• **Overheat**

Overheat	Engine oil level low.	Add: (P. 3-1*1)
	Oil pump faulty.	Replace: (P. 10-3*1)
	Water tube clogged, faulty.	Replace: (P. 13-1*1)
	Water pump faulty.	Replace: (P. 12-8*1)
	Thermostat faulty.	Replace: (P. 9-1*1)
	Cooling water inlet port clogged.	Remove the blockage.

*1: Indicates reference page of the base shop manual.

b. IGNITION SYSTEM

• Weak or No Sparks

Measure the spark plug gap and perform the spark test (P. 2-13 *1).
Spark plug gap: 0.6 – 0.7 mm (0.24 – 0.28 in)

No spark or weak sparks

Perform the spark test again using a new spark plug. — Good sparks → Replace the spark plug with a new one.

No spark

Check that the switch clip is installed on the emergency stop switch correctly. — Disengaged. → Install the clip securely.

Installed.

Disconnect the black/red wire of the emergency stop switch and perform the spark test again. — Good sparks → Emergency stop switch faulty.
- Replace:(Remote control type: P. 14-4*1, Long tiller handle type: P. 15-6).

No spark

Disconnect the power coil 2P connector and measure resistance between the terminals.
Standard resistance: 6.12 – 7.48 Ω — Abnormal → Power coil faulty.
- Replace: (P. 6-1*1 See EXCITER COIL replacement.)

Normal

Disconnect pulser coil 4P connector and measure resistance between the terminals.
Standard resistance: 617.5 – 753.5 Ω — Abnormal → Pulser coil faulty
- Replace: (P. 6-3*1)

Normal

Measure ignition coil resistances.
Primary: 0.19 – 0.23 Ω
Secondary: 2.8 – 3.4k Ω — Abnormal → Ignition coil faulty.
- Replace: (P. 16-3*1)

Normal

Measure resistances between each terminal of the CDI unit (P. 16-1 and 2). — Abnormal → CDI unit faulty.
- Replace (P. 16-3*1)

Normal

Bring a screwdriver or equivalent tool close to the magnetic section of the flywheel, and check the magnetic force. — No magnetic force → Flywheel faulty.
- Replace: (P. 6-1)

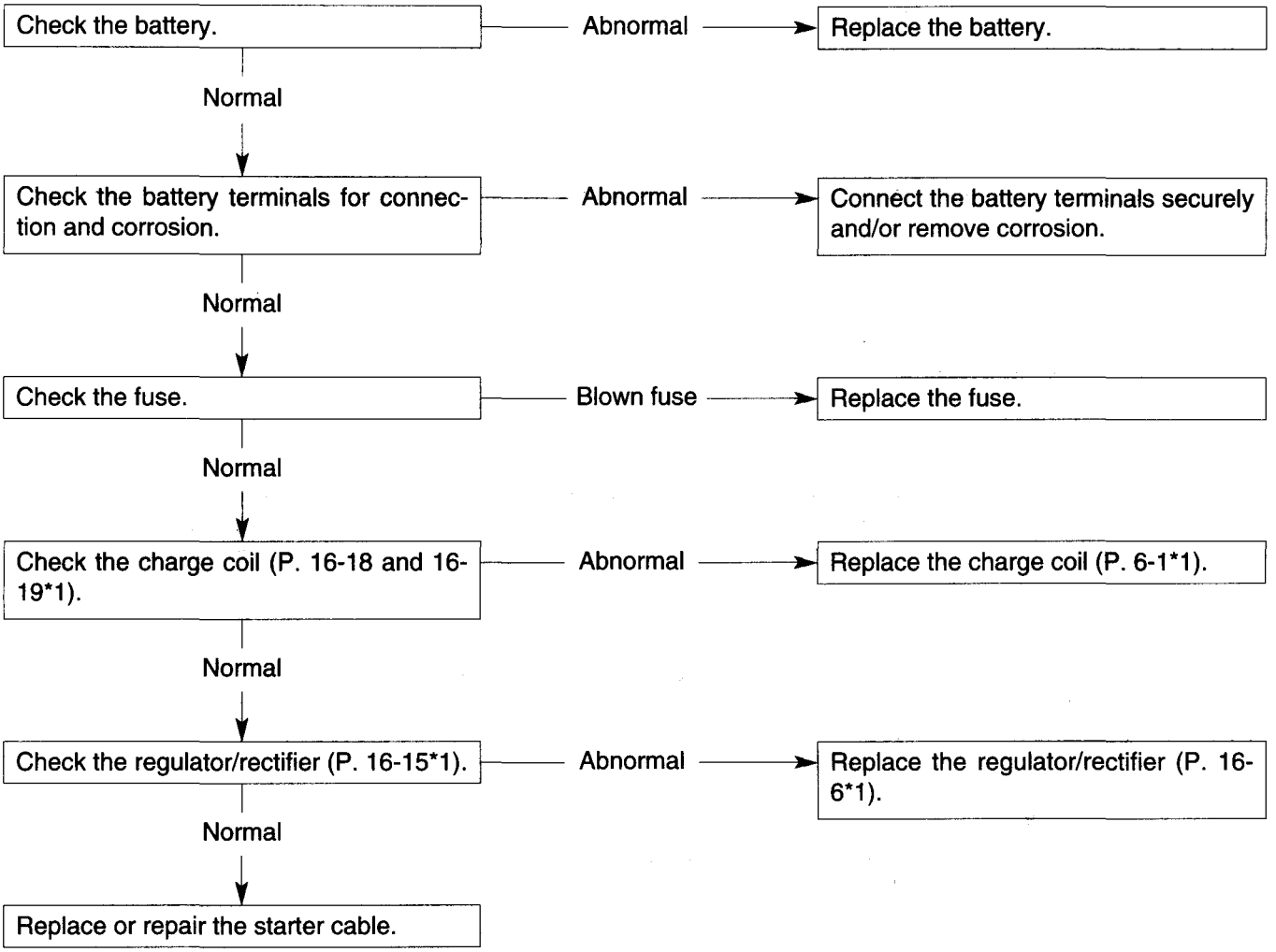
Normal

Replace or repair the wire harness.

*1: Indicates reference page of the base shop manual.

c. CHARGING SYSTEM

• Charged Insufficiently



*1: Indicates reference page of the base shop manual.

d. ALERT SYSTEM

These models are equipped with the alert system. The CDI unit controls the engine speed when the low engine oil pressure or overheat is detected.

• Oil Alert System

When the oil pressure switch detects low oil pressure, the CDI unit receives the signal of low oil pressure and it gradually decreases the engine speed to 1,800 min^{-1} (rpm). When the problem is removed, the CDI unit gradually increases the engine speed until the engine is restored to normal operation.

• Overheat Alert System

The ECT sensor mounted on the cylinder head transmits the electric signal of the engine temperature to the CDI unit. When the CDI unit detects overheat, it gradually decreases the engine speed to 1,800 min^{-1} (rpm). If the problem is not removed within 20 seconds, the CDI unit decreases the engine speed further until the engine stops. When the overheat problem is removed during this control, the CDI unit gradually increases the engine speed until the engine is restored to normal operation.

• Alert System

Long tiller handle type:

It alerts the abnormal condition by turning the indicators on or off.

Remote control type:

It alerts the abnormal condition by turning the buzzer or indicators on or off.

Condition	Indicator		Buzzer
	Oil pressure indicator (Green)	Overheat indicator (Red)	(Remote control type only)
Normal operation	ON	OFF	Stop
Low oil pressure	OFF	OFF	Continuous sound (*)
Overheat	ON	ON	Continuous sound
Low oil pressure and overheat	OFF	ON	Continuous sound

*: The buzzer does not sound when the engine speed is 1,400 min^{-1} (rpm) or below.

• Long Tiller Handle Type

Oil pressure indicator light goes off while the engine is running.

NOTE: No problem if the oil pressure indicator light goes off when the engine speed is slowed down suddenly but comes on after idling for 1 or 2 minutes.

Stop the engine and check the oil level.
- Low level → Add the oil to the specified level.
- Correct level ↓

Start the engine and check the oil pressure indicator with the engine idling. Does the oil pressure indicator comes on?
- Yes → System is OK (Temporary alert was removed).
- No ↓

Disconnect the yellow wire from the oil pressure switch. Does the oil pressure indicator come on?
- No → Check the CDI unit (P. 16-1 and 2). If it is OK, replace or repair the wire harness.
- Yes ↓

Perform the oil pressure test (P. 2-19*1).
OIL PRESSURE:
108 kPa (1.1 kgf/cm²) at 900±50 min⁻¹ (rpm)
- Normal → Replace the oil pressure switch (P. 2-19*1).
- Abnormal ↓

- Clogged oil strainer
- Faulty oil pump
- Clogged oil passage
- Clogged oil filter

*1: Indicates reference page of the base shop manual.

Overheat indicator light comes on while the engine is running.

NOTE: No problem if the overheat indicator comes on when restarting the engine after hot soak at high temperature but goes off after idling for a few minutes.

Stop the engine and check the water intake screen for clogging. Is the water intake screen clogged?
- Yes → Remove the blockage.
- No ↓

Start the engine and check whether the cooling water constantly flows through the check port with the engine idling. Does the water constantly flow through the check port?
- No →
  - Faulty water pump
  - Clogged or damaged water tube
  - Clogged check port
- Yes ↓

Idle in gear for a few minutes to cool down the engine. Does the overheat indicator go off?
- Yes → System is OK (Overheat problem was removed).
- No ↓

Check the thermostat (P. 9-2*1).
- Abnormal → Replace the thermostat (P. 9-1*1).
- Normal ↓

Disconnect the ECT sensor 2P connector. Check the overheat indicator. Does the overheat indicator go off?
- No → Check the CDI unit (P. 16-1 and 2). *If it is normal, replace or repair the* wire harness.
- Yes ↓

Check the ECT sensor (P. 9-1). Is the ECT sensor in good condition?
- No → Replace the ECT sensor (P. 9-1).
- Yes ↓

Repair or replace the wire harness.

*1: Indicates reference page of the base shop manual.

• Remote Control Type

Warning buzzer sounds while the engine is running.

NOTE:
No problem if the buzzer sounds, but the engine speed temporarily drops, the buzzer stops sounding and the engine speed gradually rises after a few seconds.

↓

Stop the engine and check the indicator.

- Oil pressure indicator (Green) is OFF.
- Oil pressure indicator (Green) is ON.
- Overheat indicator (Red) is OFF.
- Overheat indicator (Red) is ON. → Go to P. 2-16.

(Oil pressure indicator (Green) is ON. / Overheat indicator (Red) is OFF.) → Check the CDI unit (P. 16-1 and 2). If it is normal, replace or repair the wire harness.

Stop the engine and check the oil level. Is the oil level correct?
- Low level → Add the oil to the specified level.
- Yes ↓

Start the engine and check the buzzer and oil pressure indicator with the engine idling.
- Buzzer stops and the oil pressure indicator comes on. → Normal (Temporary problem was removed).
- Buzzer stops but the oil pressure indicator is OFF. → Check the indicator (P. 16-20*1).
- Buzzer does not stop and the oil pressure indicator is OFF. ↓

Disconnect the yellow wire from the oil pressure switch. Does the buzzer stop sounding?
- No → Check the CDI unit (P. 16-1 and 2). If it is normal, replace or repair the wire harness.
- Yes ↓

Perform the oil pressure test (P. 2-19*1).
OIL PRESSURE:
108 kPa (1.1 kgf/cm², 15.6 psi) at 900 ± 50 min⁻¹ (rpm)
- Normal → Replace the oil pressure switch.
- Abnormal ↓

- Clogged oil strainer
- Faulty oil pump
- Clogged oil passage
- Clogged oil filter

*1: Indicates reference page of the base shop manual.

From P. 2-15

Stop the engine and check the water intake screen for clogging. Is the water intake screen clogged?
- Yes → Remove the blockage.
- No ↓

Start the engine and check whether the cooling water constantly flows through the check port with the engine idling. Does the water constantly flow through the check port?
- No → • Faulty water pump • Clogged or damaged water tube • Clogged check port
- Yes ↓

Idle in gear for a few minutes to cool down the engine. Does the overheat indicator go off?
- Buzzer stops and the overheat indicator goes off. → Normal (Overheat problem was removed).
- Buzzer stops but the overheat indicator stays ON. → Check the indicator (P. 16-20*1).
- Buzzer does not stop and the overheat indicator stays ON. ↓

Check the thermostat (P. 9-2*1). Is the thermostat in good condition?
- No → Replace the thermostat (P. 9-1*1).
- Yes ↓

Disconnect the ECT sensor 2P connector and check the buzzer. Does the buzzer stop sounding?
- Yes → Check the CDI unit (P. 16-1 and 2). If it is normal, replace or repair the wire harness.
- No ↓

Check the ECT sensor (P. 9-1). Is the ECT sensor in good condition?
- No → Replace the ECT sensor (P. 9-1).
- Yes ↓

Repair or replace the wire harness.

Overheat indicator comes on or oil pressure indicator goes off but the buzzer does not sound while the engine is running.
- CDI unit faulty → Inspect: P. 16-1
- Buzzer faulty → Replace: (P. 14-4 *1)
- Open circuit in the wire harness (buzzer circuit) → Replace or repair the wire harness.

*1: Indicates reference page of the base shop manual.

e. SHIFT LEVER

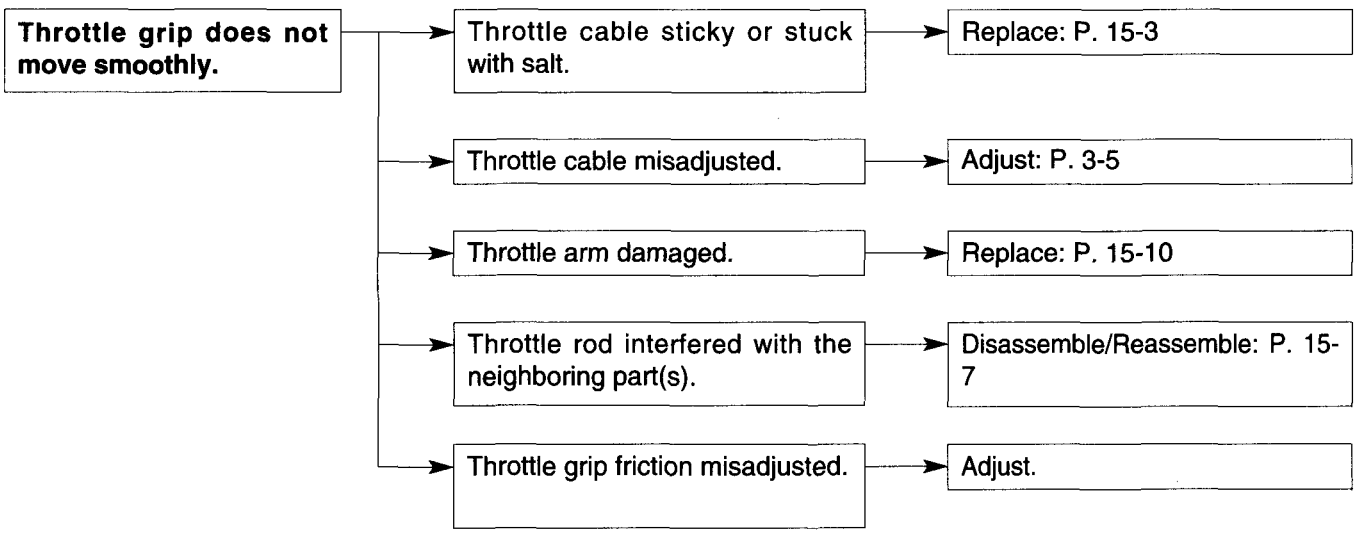
• Long Tiller Handle Type

Shift lever does not move smoothly.	Shift cable sticky or stuck with salt.	Replace: P. 15-3
	Shift cable misadjusted.	Adjust: P. 3-8
	Shift gear and/or shift arm damaged.	Replace: P. 15-10
	Shift lever and/or shift unit stuck.	Replace: P. 15-10
	Shift rod A and/or B bent, dislocated or stuck.	Replace: P. 12-8, 13-2*1
	Shift rod misadjusted.	Adjust: P. 3-13*1
	Shift shaft bent.	Replace: P. 13-2*1
	Shift arm damaged.	Replace: P. 13-2*1
	Shift link B (in concave) worn or damaged.	Replace: P. 13-2*1
	In gear case assembly: • Clutch shifter damaged. • Push rod damaged.	Replace: P. 12-8*1

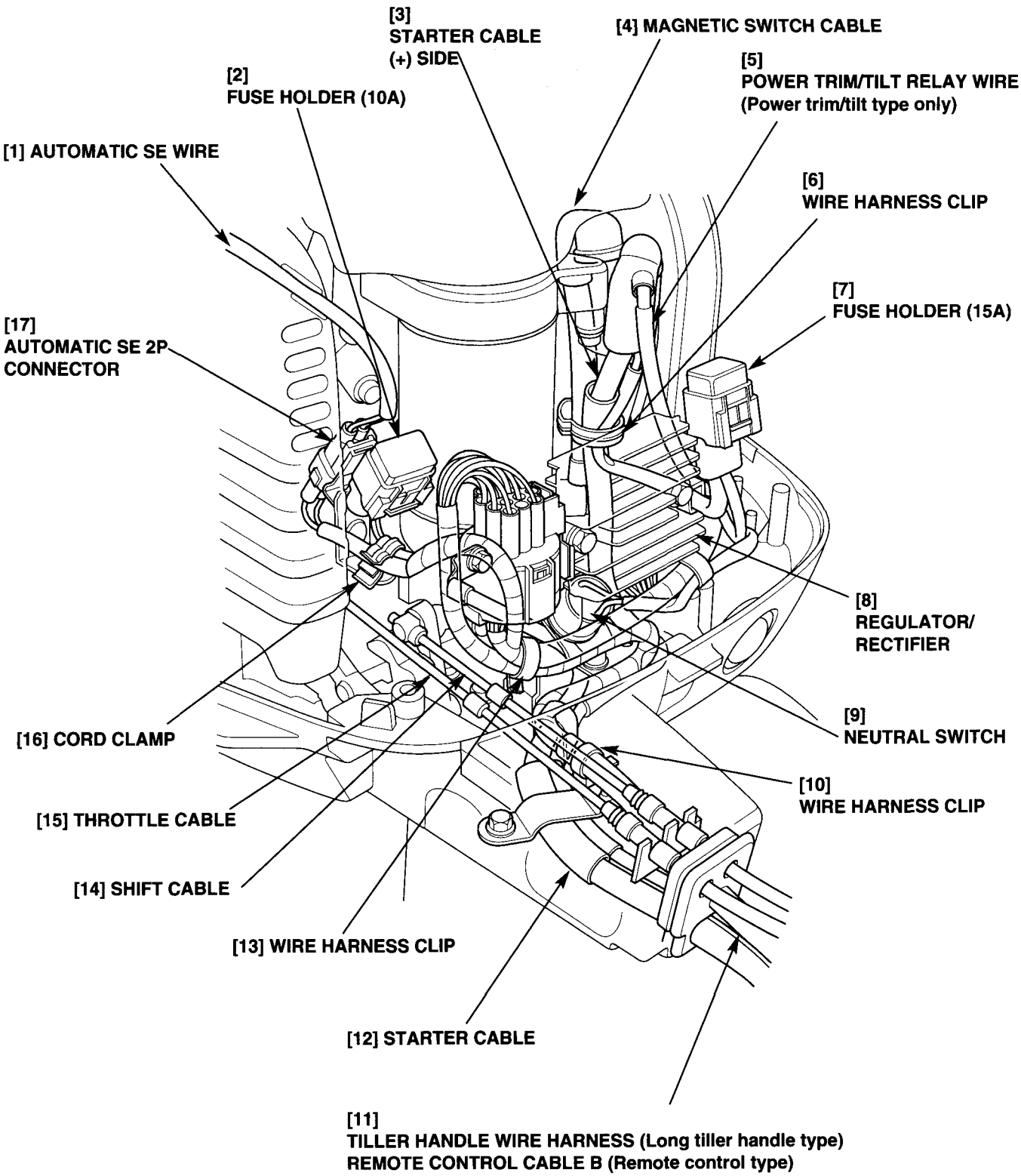
*1: Indicates reference page of the base shop manual.

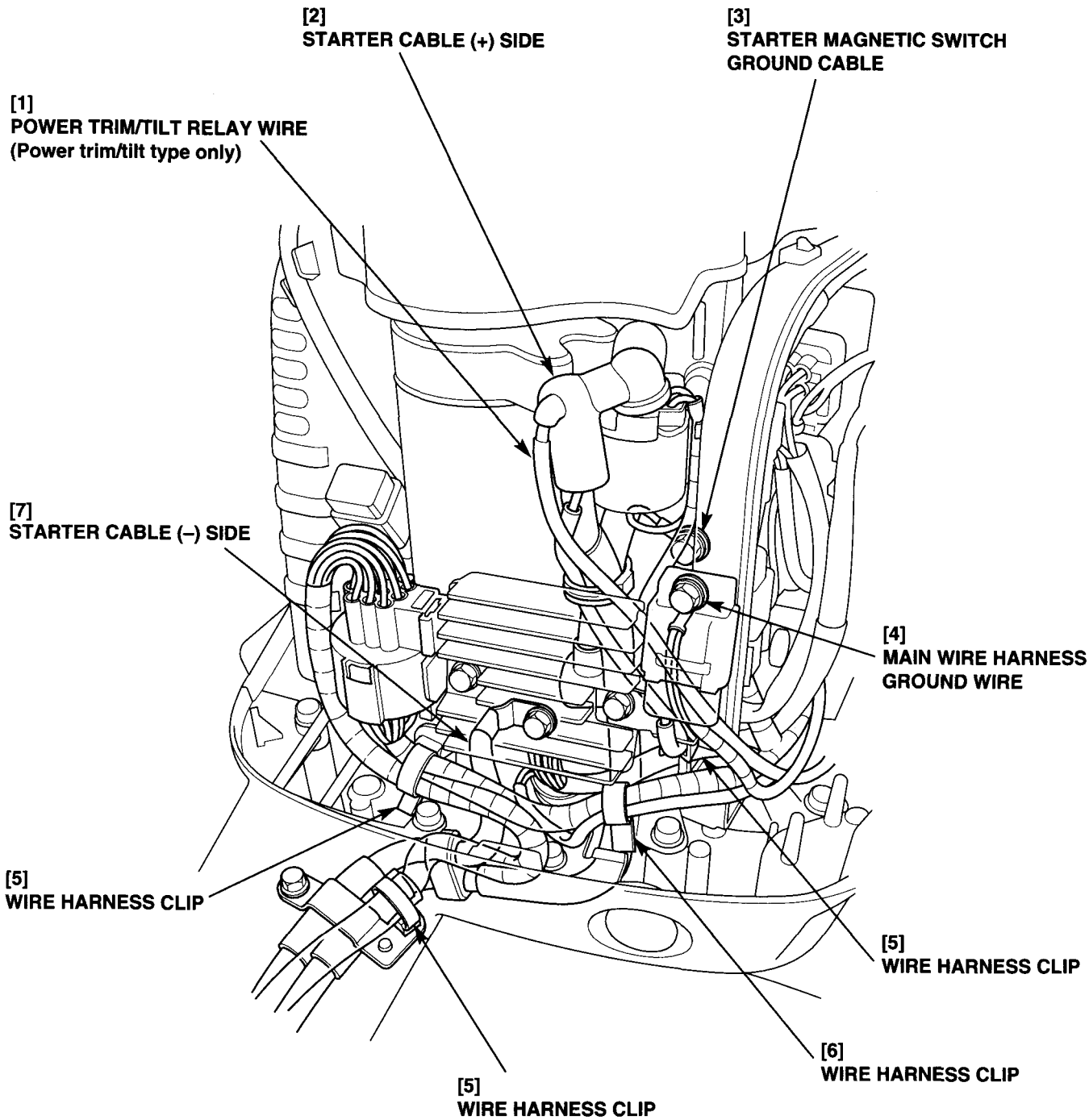
f. THROTTLE GRIP

• Long Tiller Handle Type



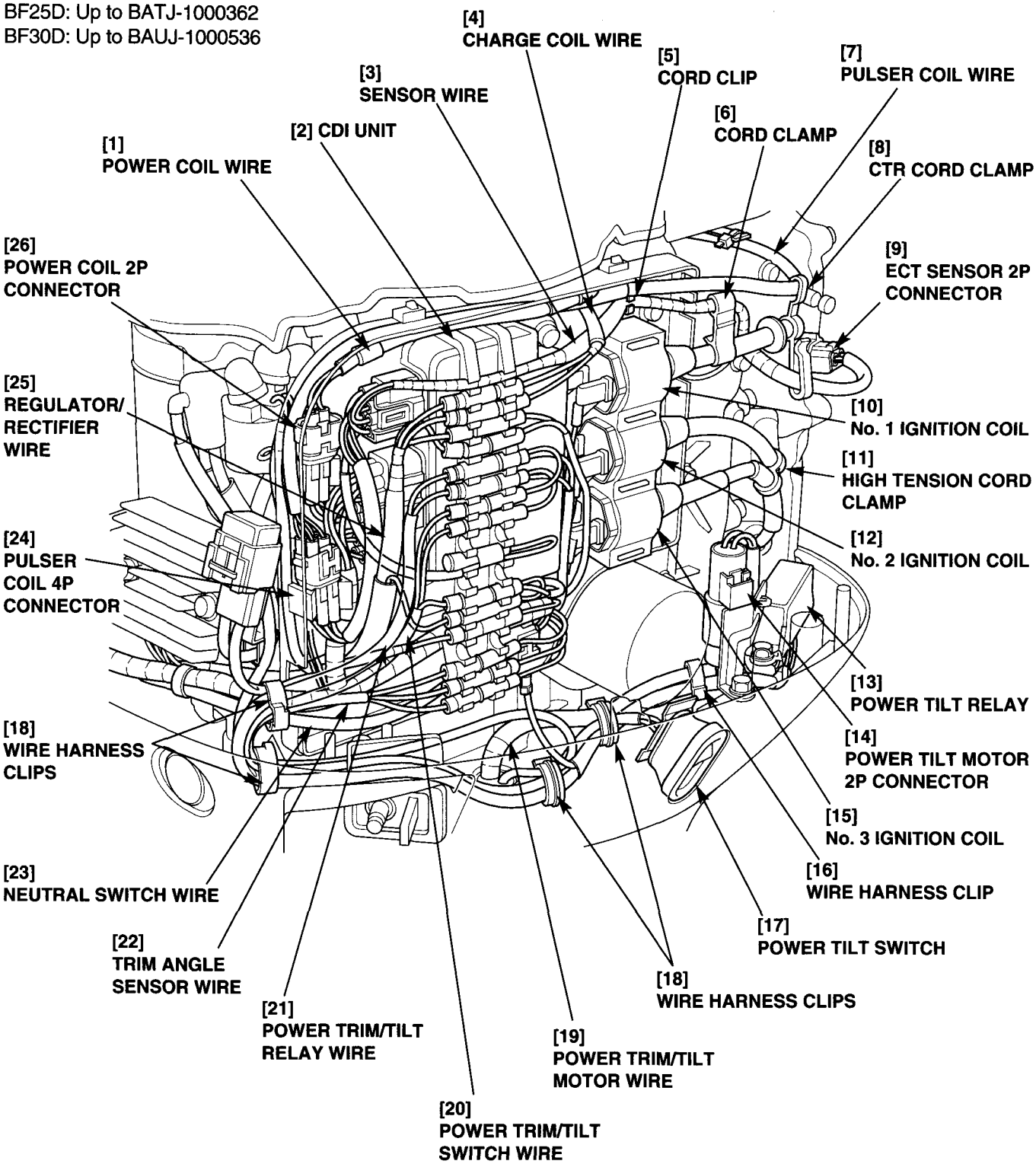
6. CABLE & HARNESS ROUTING



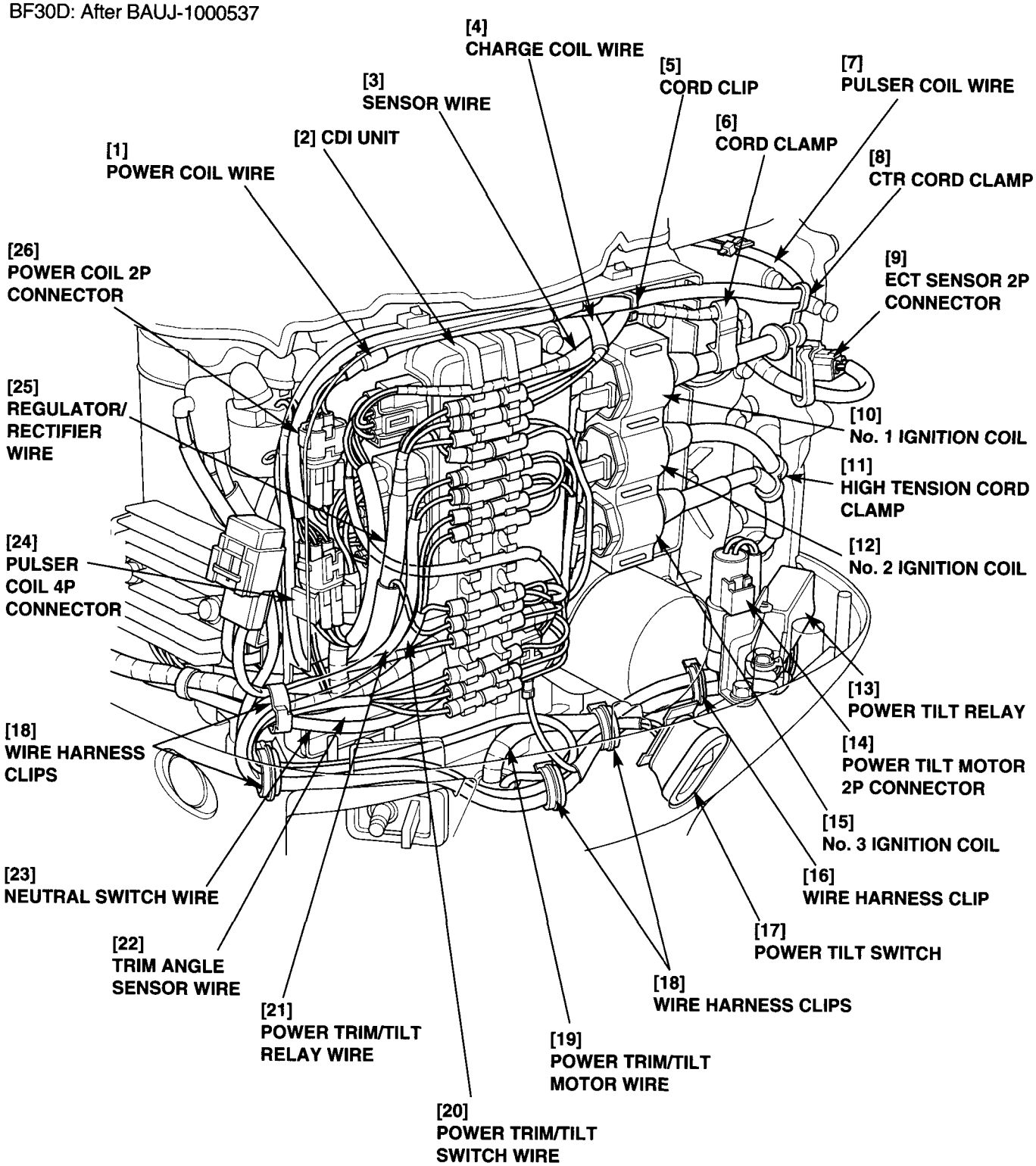

[2]
STARTER CABLE (+) SIDE
[3]
STARTER MAGNETIC SWITCH
GROUND CABLE
[1]
POWER TRIM/TILT RELAY WIRE
(Power trim/tilt type only)
[7]
STARTER CABLE (–) SIDE
[4]
MAIN WIRE HARNESS
GROUND WIRE
[5]
WIRE HARNESS CLIP
[5]
WIRE HARNESS CLIP
[6]
WIRE HARNESS CLIP
[5]
WIRE HARNESS CLIP

• Power Trim/Tilt Type

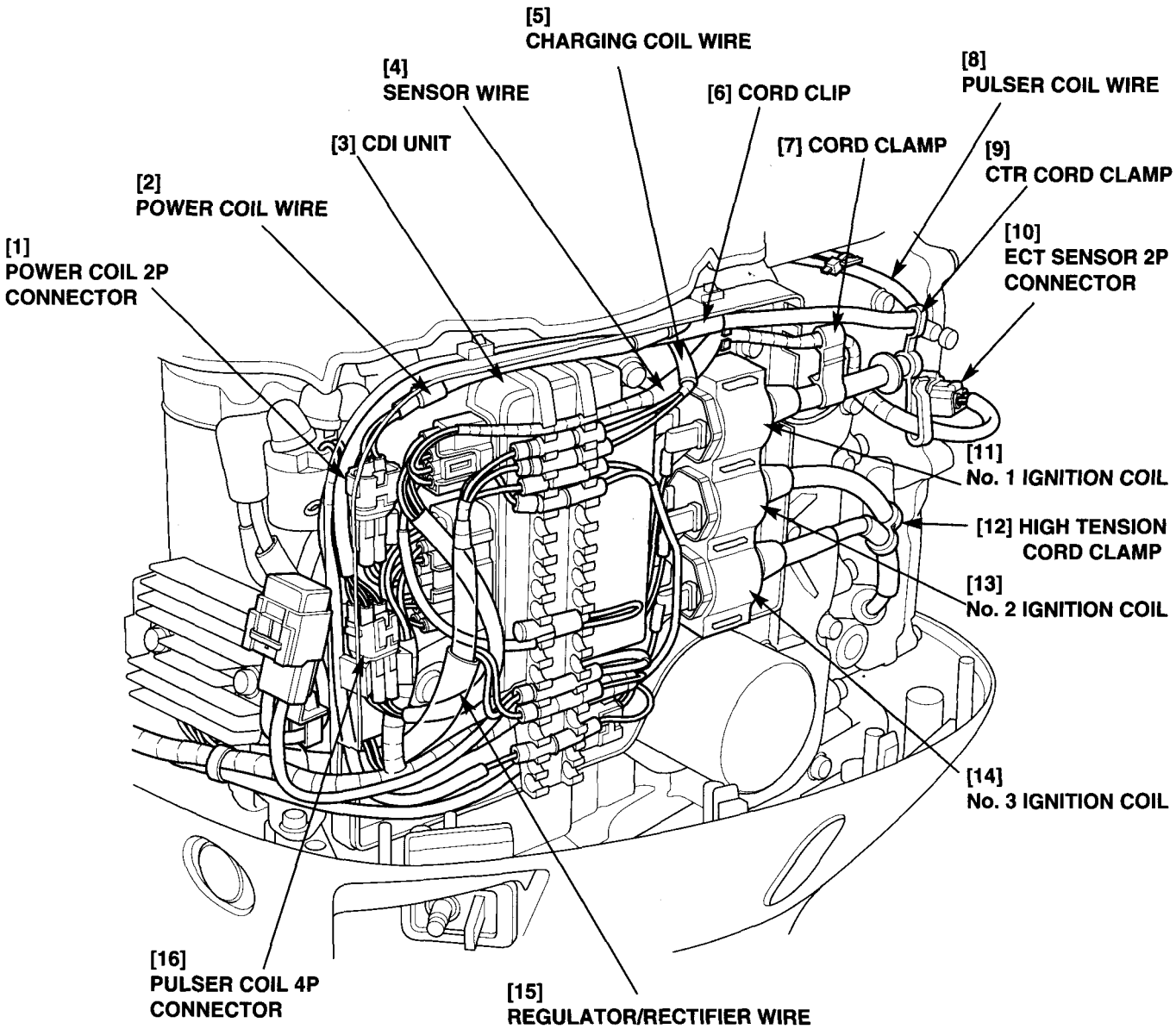
Frame serial numbers:
BF25D: Up to BATJ-1000362
BF30D: Up to BAUJ-1000536



Frame serial numbers:
BF25D: After BATJ-1000363
BF30D: After BAUJ-1000537



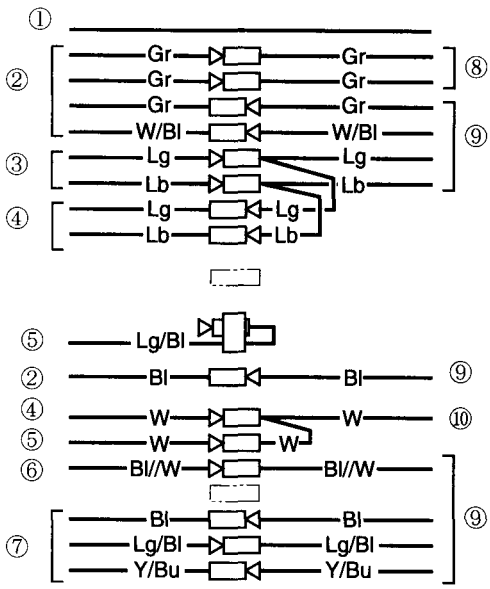
• Gas Assisted Tilt Type



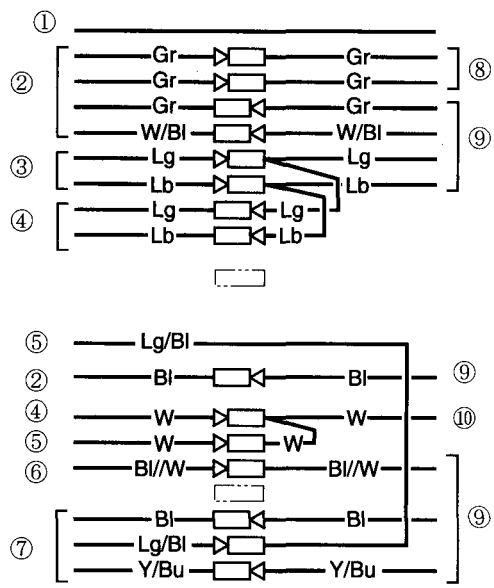
• Connector Layout

Power Trim/Tilt Type:

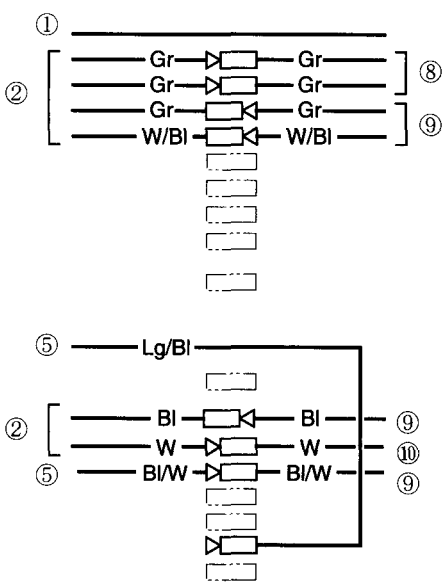
[1] Frame serial numbers:
BF25D: Up to BATJ-1000362
BF30D: Up to BAUJ-1000536



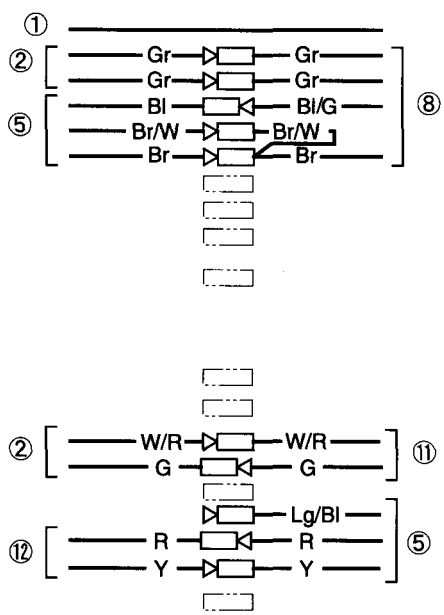
[2] Frame serial numbers:
BF25D: After BATJ-1000363
BF30D: After BAUJ-1000537



[3] Gas Assisted Tilt Type:

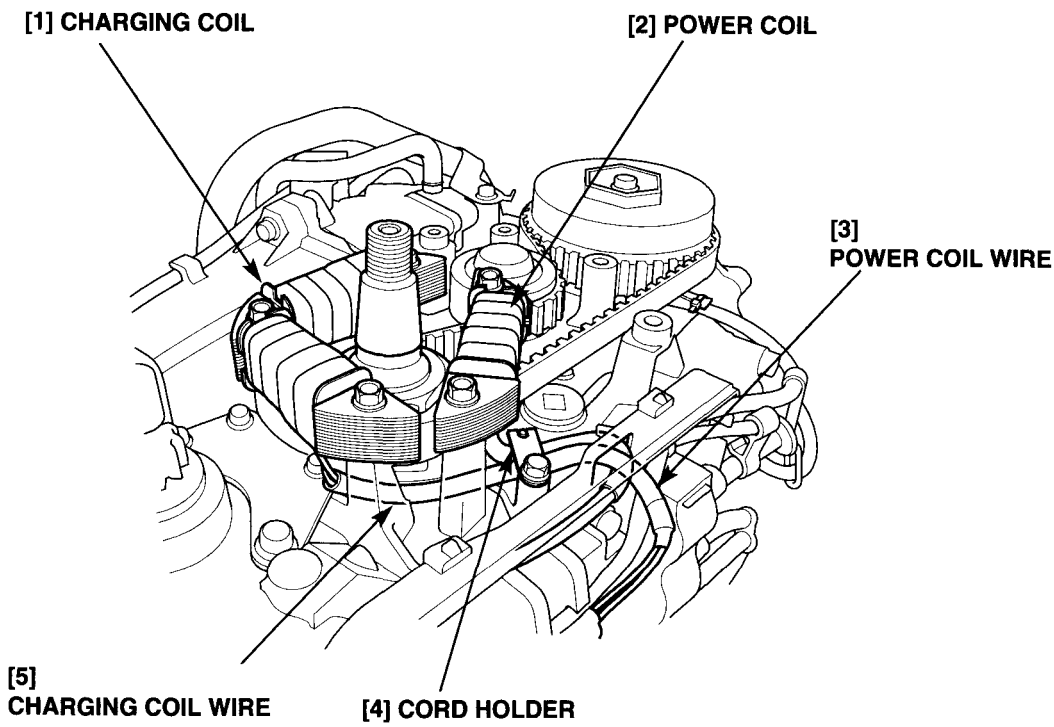


[4] Mechanical Tilt Type:

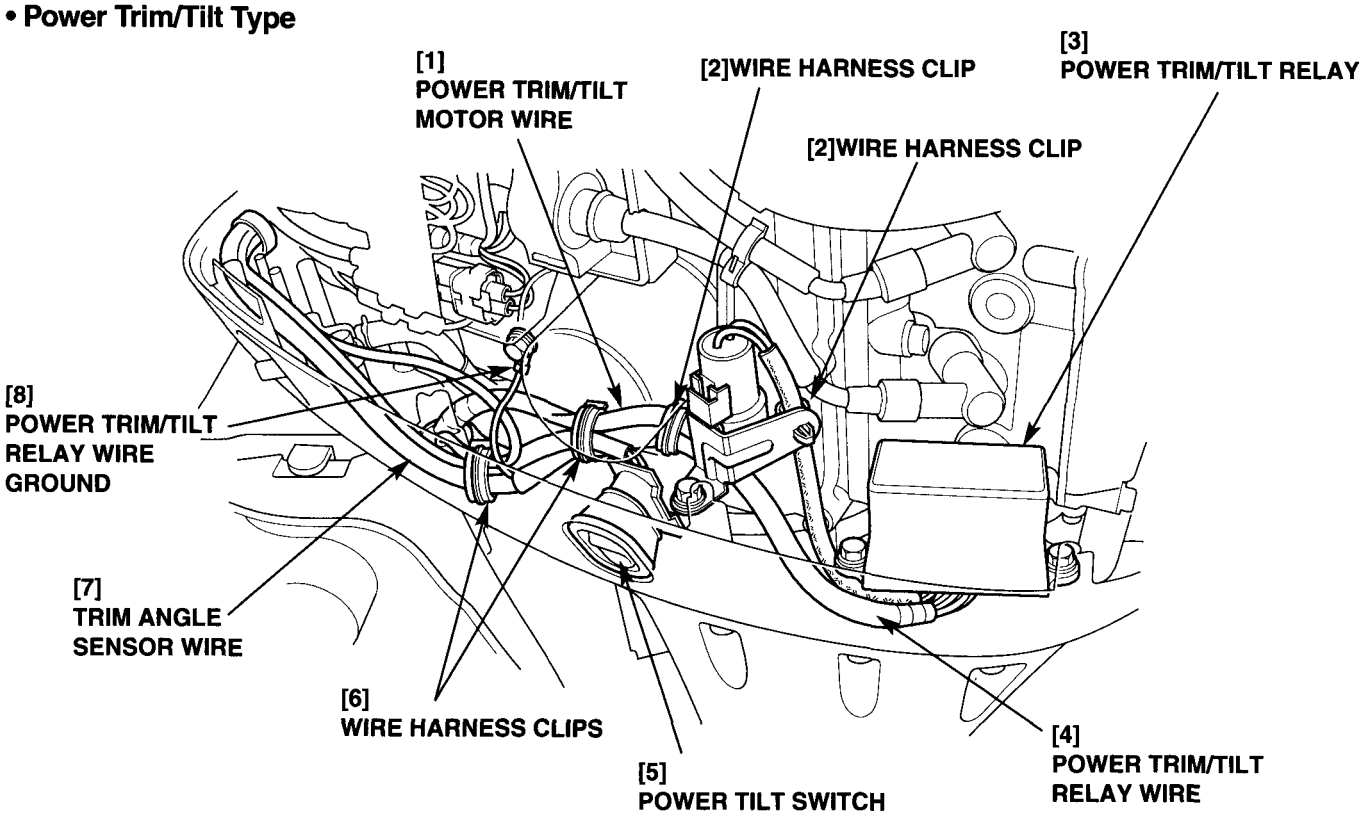


① **SENSOR WIRE**
② **REGULATOR/RECTIFIER WIRE**
③ **POWER TRIM/TILT RELAY WIRE**
④ **POWER TILT SWITCH WIRE**
⑤ **CDI UNIT WIRE**
⑥ **STARTER MAGNETIC SWITCH WIRE**
⑦ **TRIM ANGLE SENSOR WIRE**
⑧ **CHARGE COIL WIRE**
⑨ **MAIN WIRE HARNESS**
⑩ **BATTERY CABLE**
⑪ **CHARGE RECEPTACLE WIRES**
⑫ **INDICATOR WIRES**

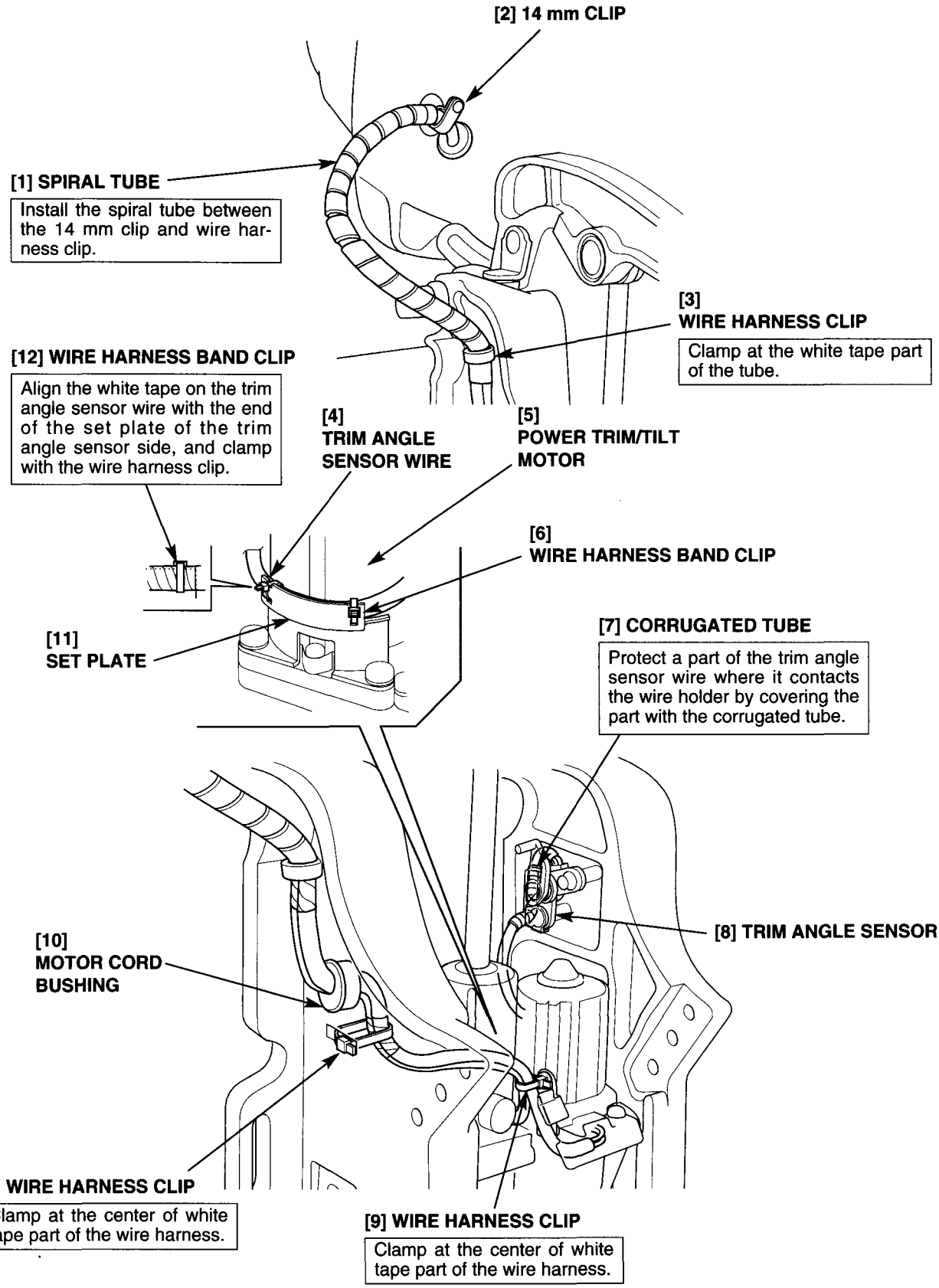
Bl	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY



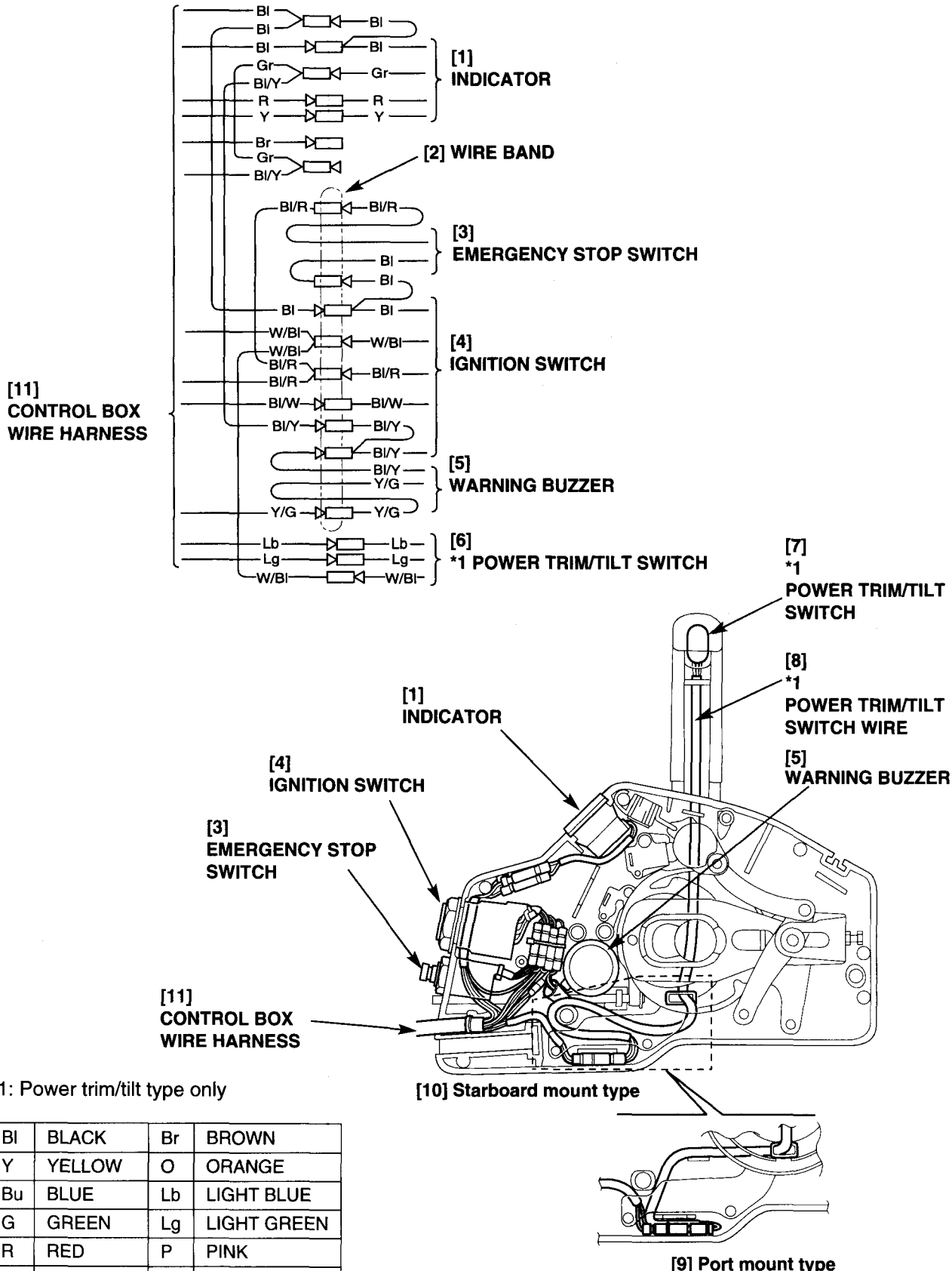
• **Power Trim/Tilt Type**



• **Power Trim/Tilt Type**



• **Remote Control Type**



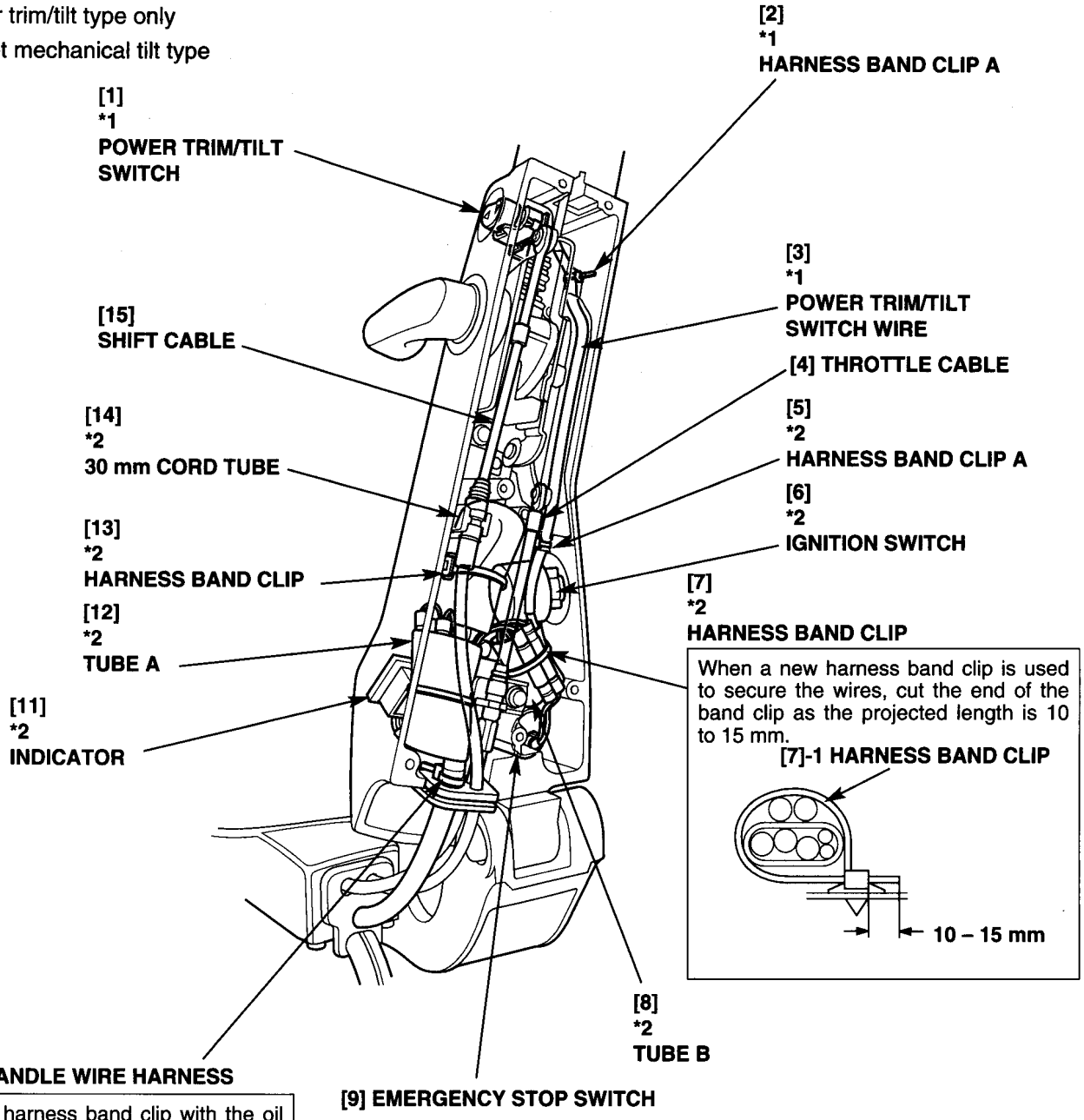
*1: Power trim/tilt type only

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

• Long Tiller Handle Type

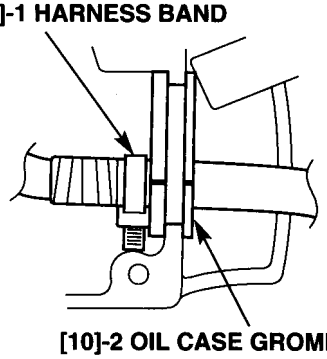
*1: Power trim/tilt type only

*2: Except mechanical tilt type

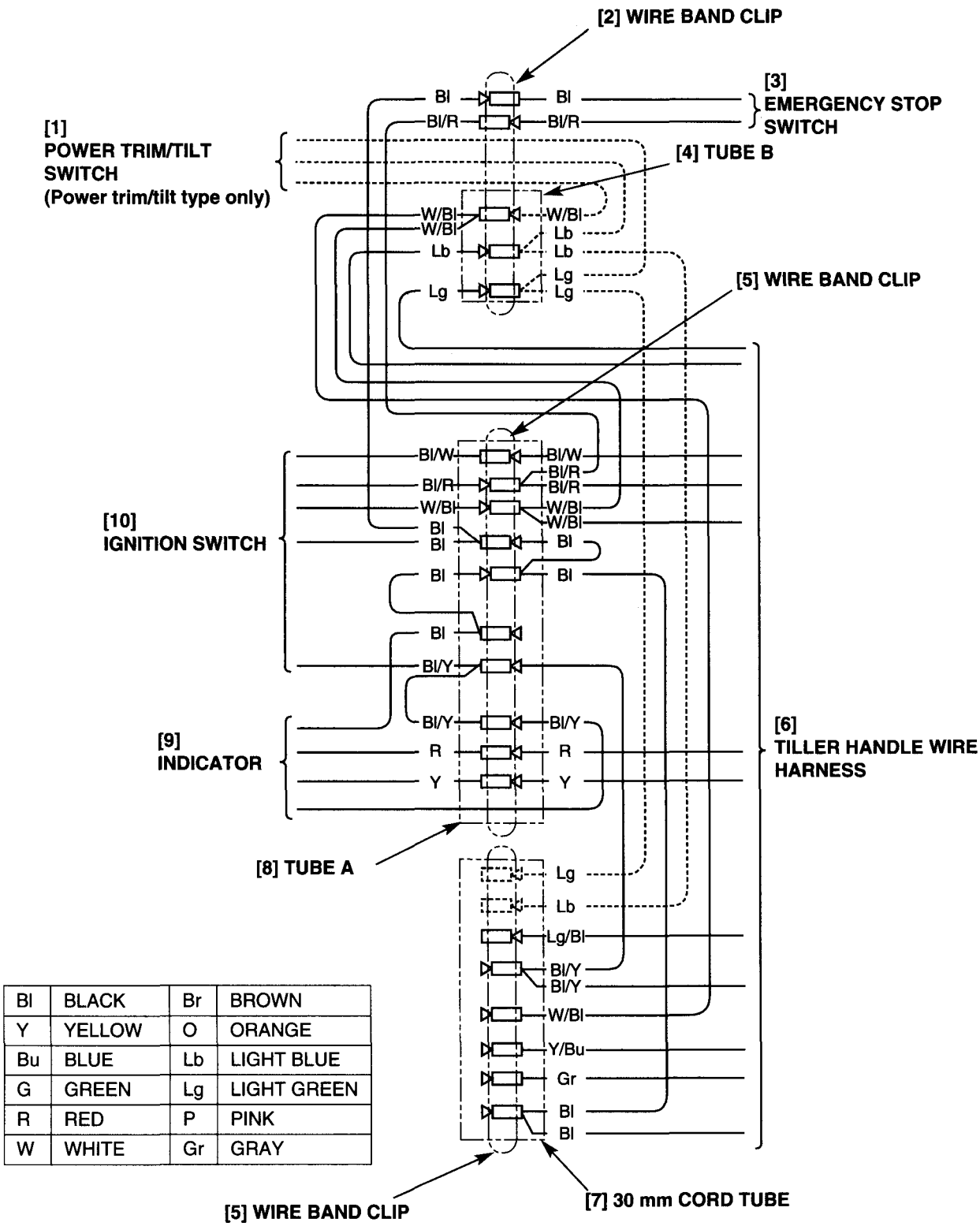


When a new harness band clip is used to secure the wires, cut the end of the band clip as the projected length is 10 to 15 mm.

Align the harness band clip with the oil case grommet as shown.

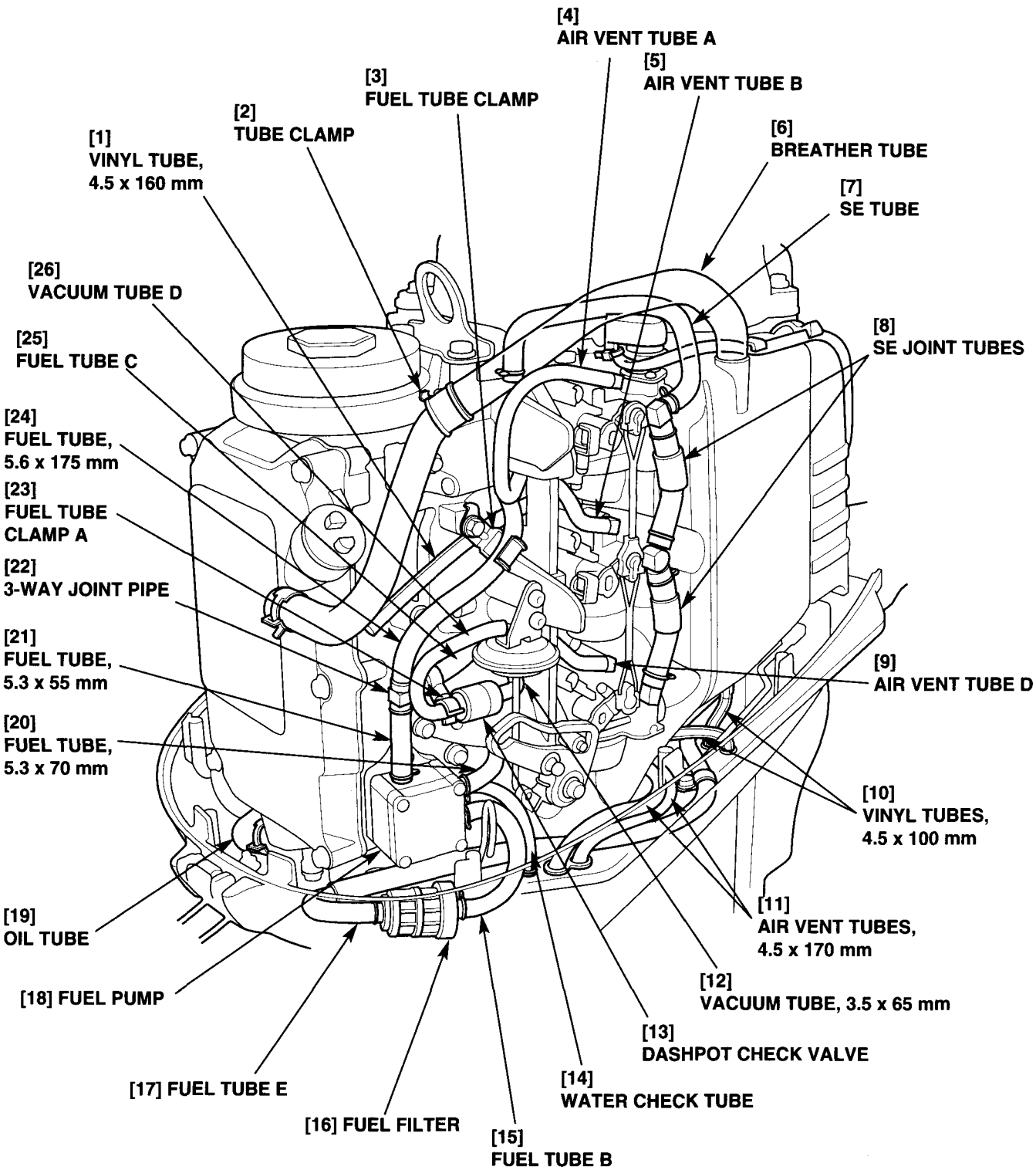


• Wire Connection in the Long Tiller Handle

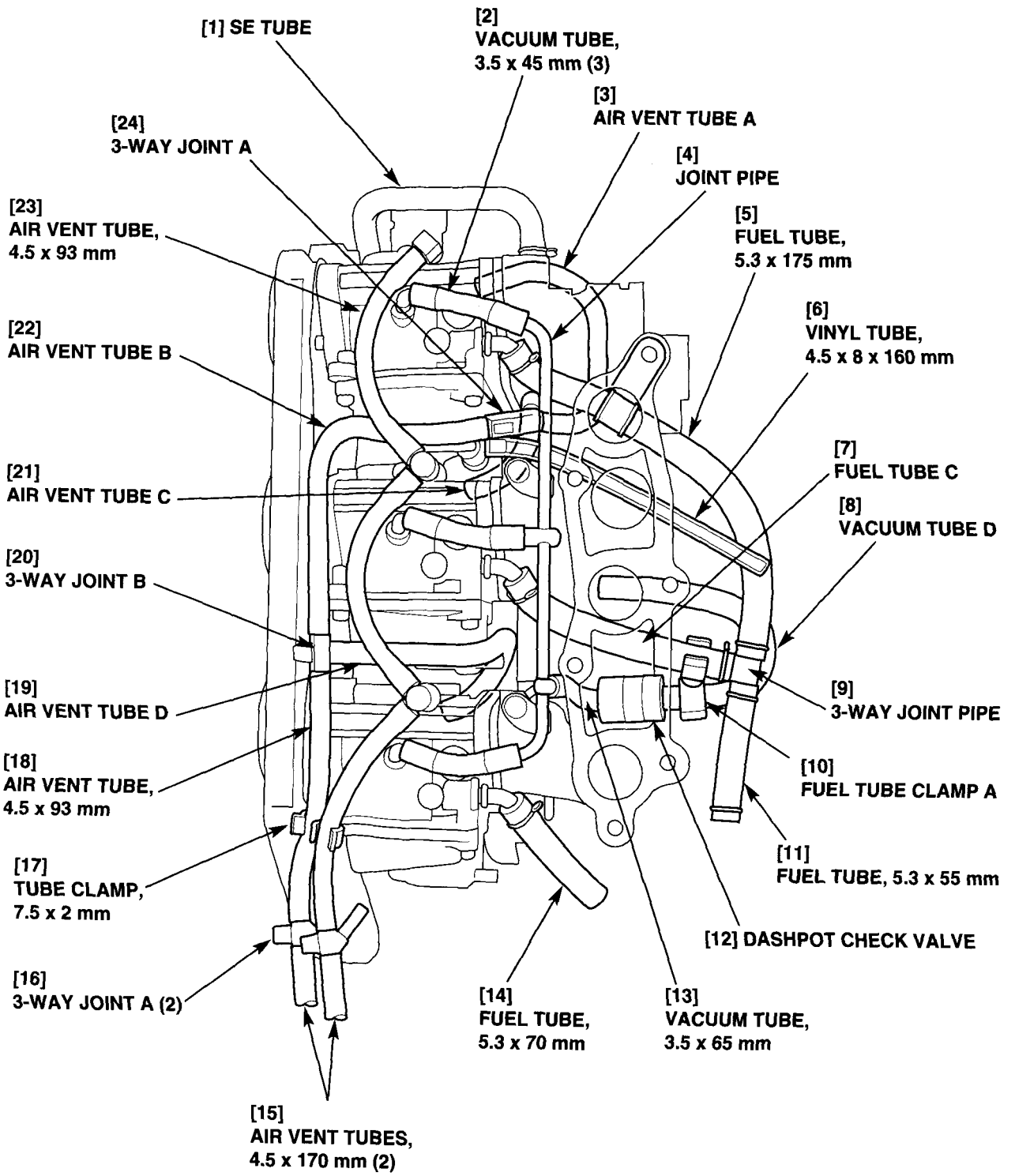


Bl	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY

7. TUBE ROUTING



Back Side of Carburetor



1. MAINTENANCE SCHEDULE

	ITEM / REGULAR SERVICE PERIOD (1) Perform at every indicated moth or operating hour interval, whichever comes first.		Each use	After use	First month or 20 Hrs	Every 6 months or 100 Hrs	Every year or 200 Hrs	Every 2 years or 400 Hrs	Refer to page
•	Engine oil	Check level	○						3-1*1
		Change			○	○			
	Gear case oil	Change			○	○			3-3*1
	Engine oil filter	Change					○		3-2*1
	Starter rope	Check				○			—
	Timing belt	Check-adjust					○		3-15*1
•	Carburetor linkage	Check-adjust			○	○			3-5
	Idle speed	Check-adjust			○	○			3-2
•	Valve clearance	Check-adjust			○		○		3-4*1
•	Spark plug	Check-adjust				○			3-3*1
		Replace					○		
	Propeller and sprit pin	Check	○						12-1*1
	Anode	Check	○						—
	Lubrication	Grease			○(2)	○(2)			2-33*1
•	Fuel tank and tank filter	Clean					○		3-6*1
	Thermostat	Check					○		9-2*1
•	Fuel filter	Check				○			3-5*1
		Replace						○	
•	Fuel line	Check	○						5-6
		Replace	Every 2 years (if necessary)						
	Battery and cable connection	Check level-tighten	○						—
	Bolts and nuts	Check-tighten			○	○			—
•	Crankcase breather tube	Check					○		—
	Cooling water passage	Clean		○(3)					—

•: Emission related items (Bodensee type only)

(1) For professional commercial use, log hours of operation to determine proper maintenance interval.
(2) Lubricate more frequently when used in salty water.
(3) When operating in salt water, turbit or muddy water, the engine should be flushed with clean water after each use.

*1: Indicates reference page of the base shop manual.

2. 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

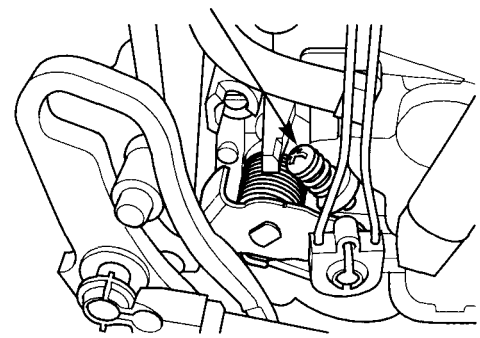
1) Remove the propeller. Seal the right and left water screens and the water bottom screen with gummed cloth tape or equivalent. Start the engine while distributing the water throughout the outboard motor by using the flushing plug (optional part) or with the outboard motor soaked in the outboard test tank.
2) Remove the engine cover.
3) After the engine speed stabilizes, adjust the idle speed to the specified speed by turning the throttle stop screw.

Specified idle speed (in neutral)	950 ± 50 min-1 (rpm)

- If the idle speed is not stabilized, perform the carburetor synchronization (see below).

4) After adjustment, adjust the acceleration device/ diaphragm (P. 3-4).

[1] THROTTLE STOP SCREW



• Carburetor Synchronization

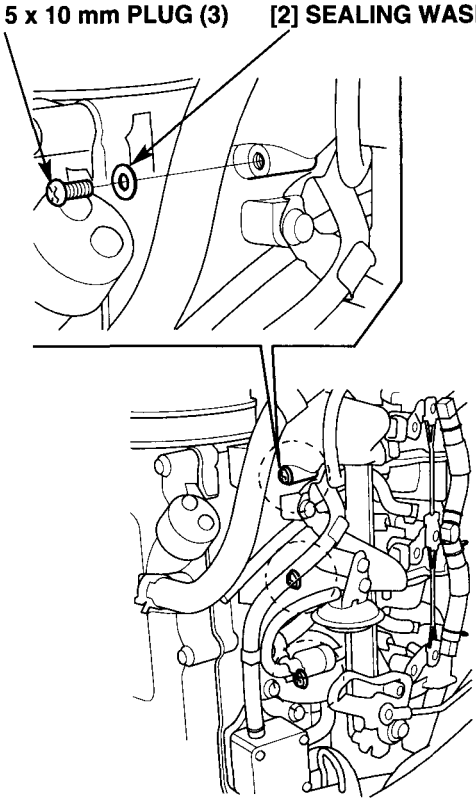
CAUTION

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.

Start the engine and let it run to warm up to normal operating temperature. Stop the engine and perform carburetor synchronization.

1) Set the shift lever in the "Neutral" position.
2) Remove the 5 x 10 mm plugs and sealing washers from the intake manifold of each cylinder.

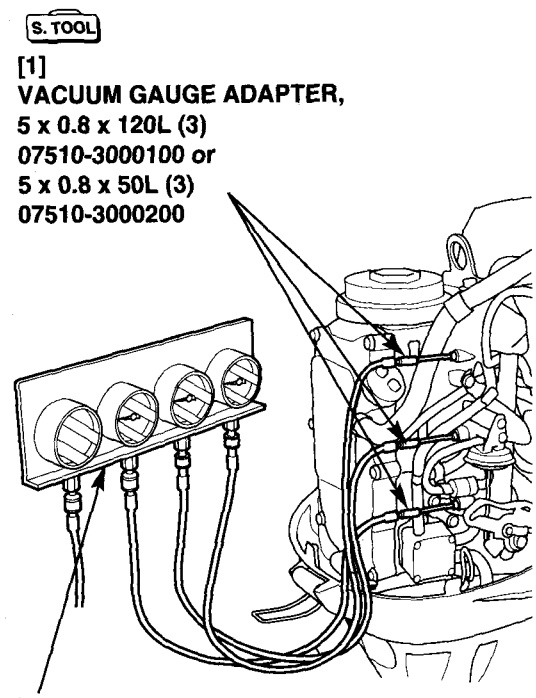
[1] 5 x 10 mm PLUG (3) [2] SEALING WASHER (3)



3) Attach the vacuum gauge adapters to each intake manifold plug hole and connect the vacuum gauge hoses to the adapters.

   • **Connect:**

   The No.1 vacuum gauge hose to the No.1 vacuum gauge adapter.
   The No.2 vacuum gauge hose to the No.2 vacuum gauge adapter.
   The No.3 vacuum gauge hose to the No.3 vacuum gauge adapter.



4) Start the engine and adjust the idle speed (P. 3-2).

5) Clamp the two SE joint tube B using the commercially available tube clips keeping away from the tube protectors as shown.

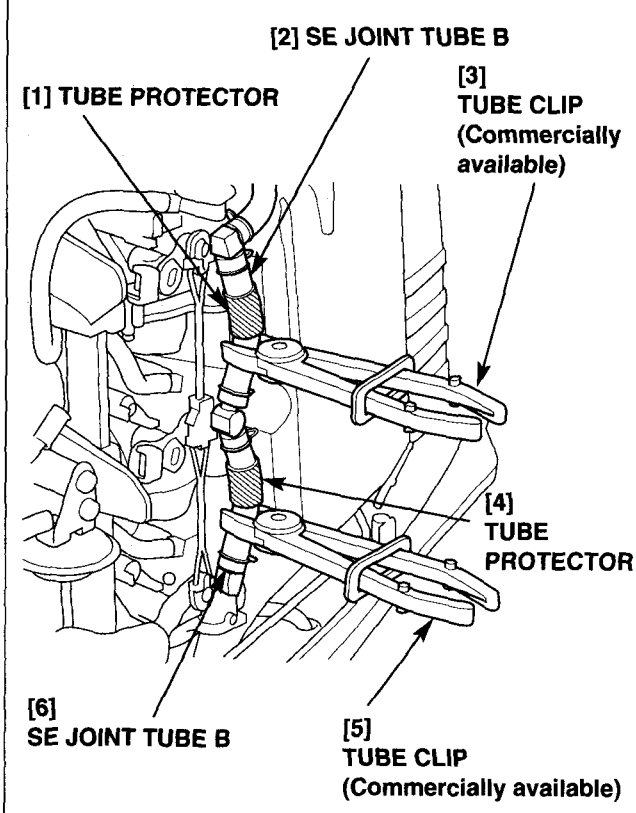
   NOTE:

   - Avoid clamping on the tube protectors.
   - Warm up the engine sufficiently before clamping the SE joint tubes.
   - Do not clamp the SE joint tubes with the engine cold, or it will cause poor start of the engine.

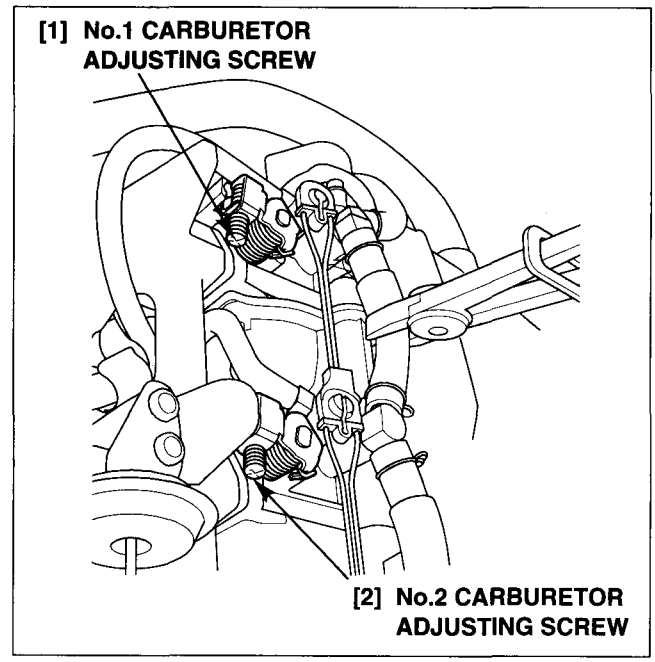
6) Check the intake manifold vacuum difference between the cylinders. Take the maximum reading.

Vacuum difference	20 mmHg (0.75 inHg) or less

7) If the vacuum difference between the cylinders is not 20 mmHg (0.75 inHg) or less, adjust as follows.



8) The No.3 carburetor is the synchronization base carburetor. Turn the No.1 and No.2 adjusting screws so that the vacuum difference between each cylinder is 20 mmHg (0.75 inHg) or less.
   Snap the throttle several times and allow the engine to return to idle. Check to be sure that the vacuum difference between each cylinder stays within 20 mmHg (0.75 inHg) or less. Readjust if necessary.
9) Stop the engine and remove the two tube clips.
10) Remove the vacuum gauge adapters from the intake manifold, and install the 5 x 10 mm plugs and 5 mm sealing washers.
11) After adjustment, perform idle speed inspection and adjustment (P. 3-2).

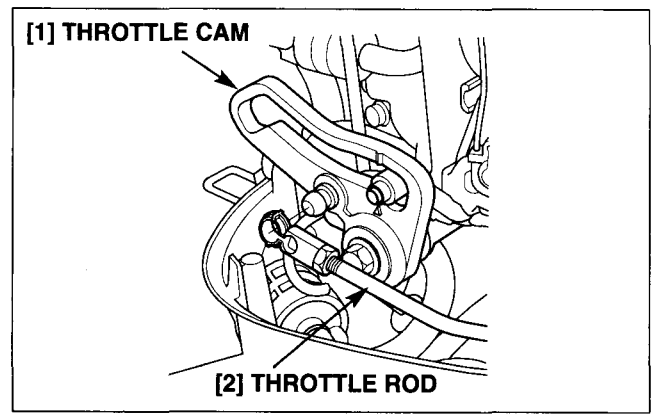


3. ACCELERATION DEVICE/ DIAPHRAGM

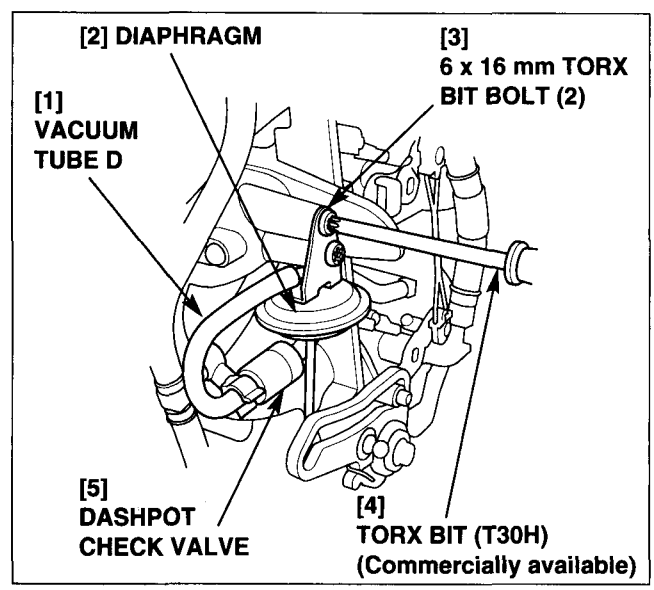
• Adjustment

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

1) Remove the engine cover.
2) Remove the throttle rod from the throttle cam.



3) Loosen the two 6 x 16 mm torx bit bolts using a commercially available torx bit (T30H).
4) Disconnect the vacuum tube D from the dashpot check valve.

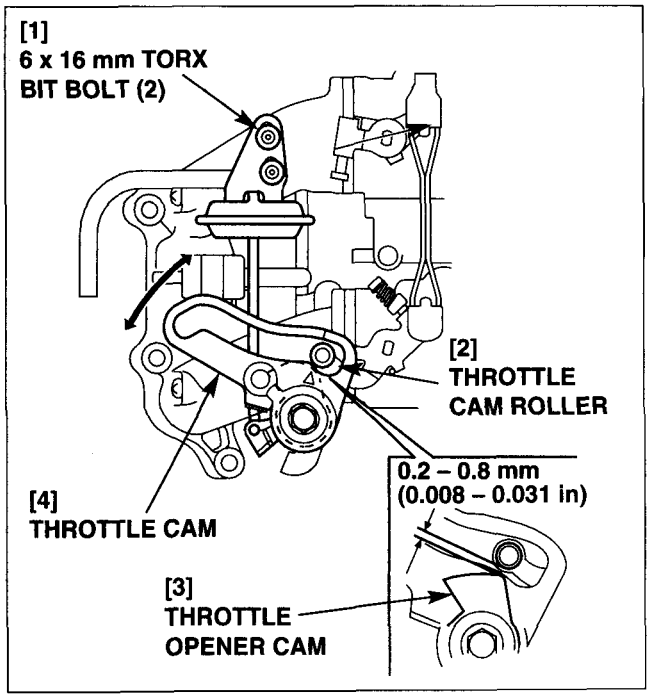


5) Move the throttle cam slowly in the direction pointed by arrow until the throttle cam roller is set free from the throttle cam, and hold the throttle cam.

6) Move the diaphragm up and down slowly until the clearance between the throttle cam roller and throttle opener cam is 0.2 – 0.8 mm (0.008 – 0.031 in). While holding the clearance, tighten the 6 x 16 mm torx bit bolts to the specified torque using a commercially available torx bit (T30H).

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

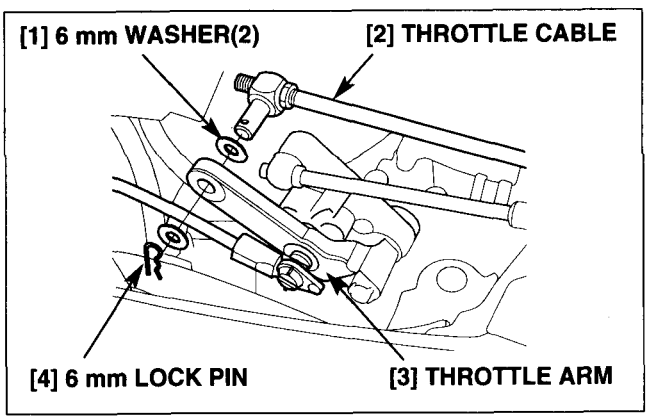
7) After adjustment, attach the throttle rod to the throttle cam.



4. THROTTLE ROD/THROTTLE CABLE

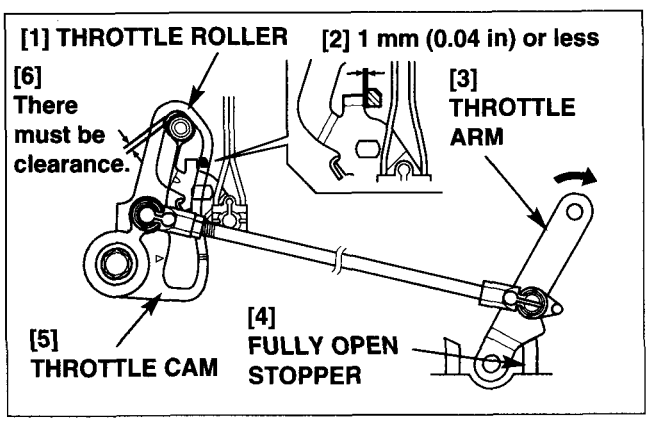
• Throttle Rod Length Adjustment

1) Remove the 6 mm lock pin and 6 mm washers, and disconnect the throttle cable from the throttle arm.

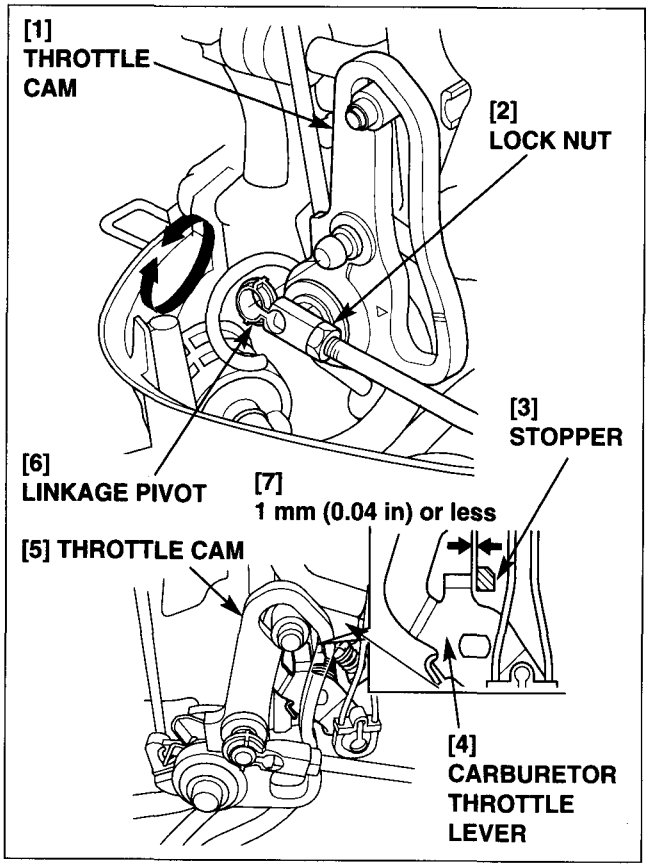


2) Move the throttle arm to the fully open position and be sure that the throttle arm contacts the fully open stopper.

3) Check that there is clearance between the throttle cam and throttle roller. Be sure there is clearance of 1 mm (0.04 in) or less between the carburetor throttle lever and stopper on the No.3 carburetor.



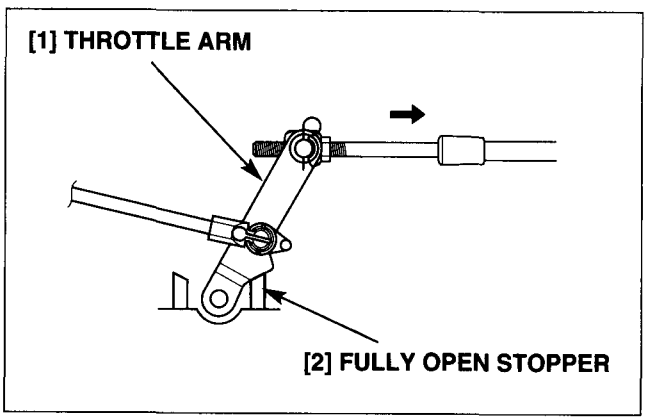
4) Loosen the linkage pivot lock nut, detach the linkage pivot from the throttle cam and adjust by turning the linkage pivot.
5) After adjustment, attach the linkage pivot to the throttle cam and tighten the lock nut securely.
6) After tightening the lock nut, move the throttle arm to the fully open position. Be sure there is clearance of 1 mm (0.04 in) or less between the carburetor throttle lever and stopper on the No.3 carburetor.
7) If the clearance is more than 1 mm (0.04 in), readjust by turning the linkage pivot.
8) Attach the throttle cable to the throttle arm and install the 6 mm washers and 6 mm lock pin.
9) Adjust the throttle cable length.



• Throttle Cable Length Adjustment

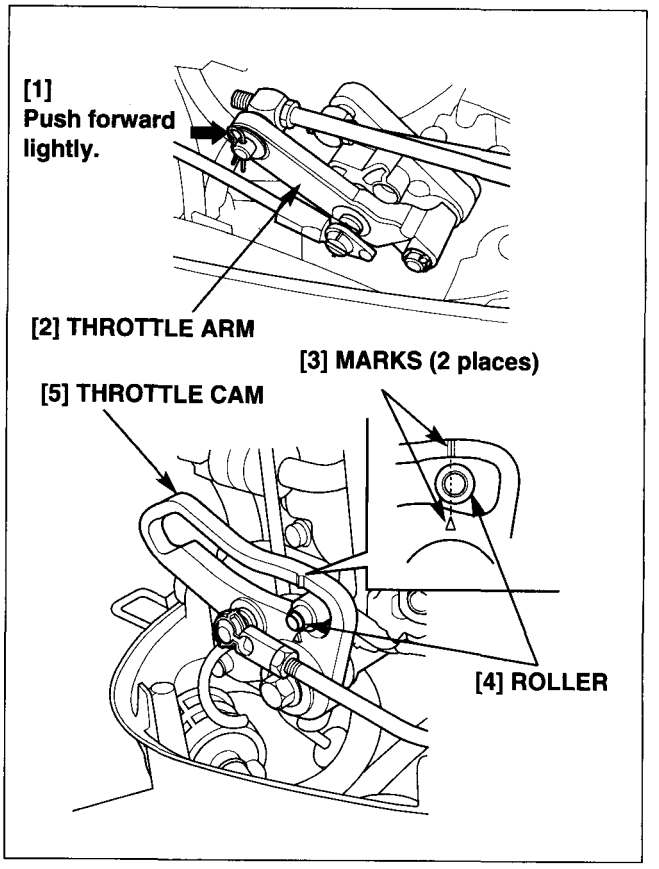
Adjust the throttle cable length after adjusting the throttle rod length.

1) Turn the throttle grip to the fully open position and check that the throttle arm contacts the fully open stopper.



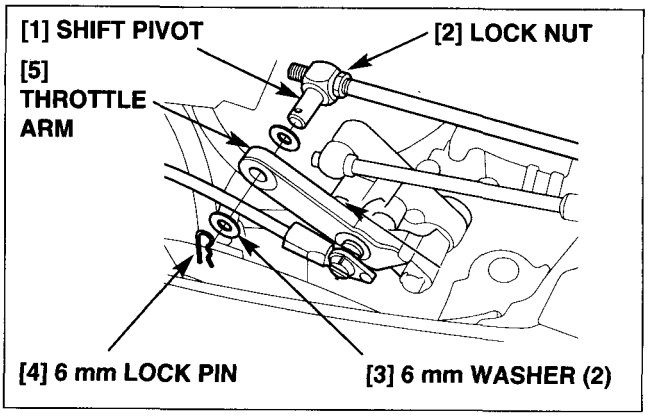
2) Return the throttle grip to the fully close position and hold it in the position with the friction grip.

3) Pushing the throttle arm lightly in the direction of arrow, check that the reference marks (2 places) on the throttle cam are at the left side to the center line of the roller when viewing the throttle cam from the front.



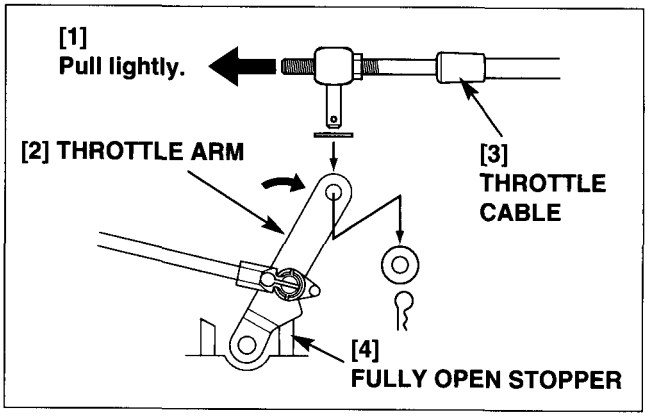
4) Adjust as follows, if necessary.

   a. Loosen the shift pivot lock nut, remove the 6 mm lock pin and 6 mm washers, and disconnect the shift cable from the throttle arm.



   b. Turn the throttle grip to the fully open position and hold it in the position using the friction grip.
   c. Pull the throttle cable lightly as shown.
   d. With the throttle arm lightly in contact with the fully open stopper, turn the shift pivot and adjust the throttle cable length so that the shift pivot can be set on the throttle arm smoothly.
   e. Tighten the lock nut securely.

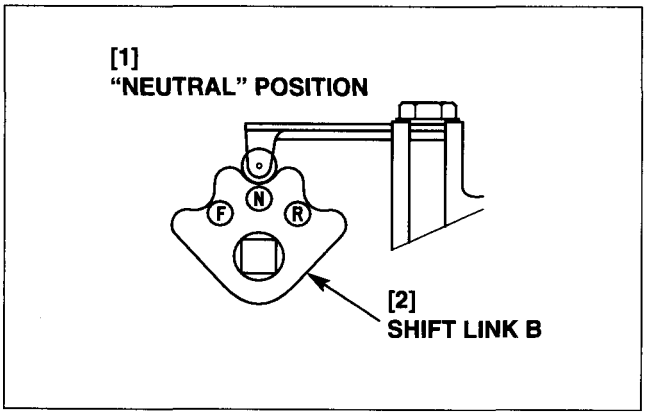
5) After adjustment, turn the throttle grip from the fully open position to the fully close position and check the procedure from step 1 to step 3 again.

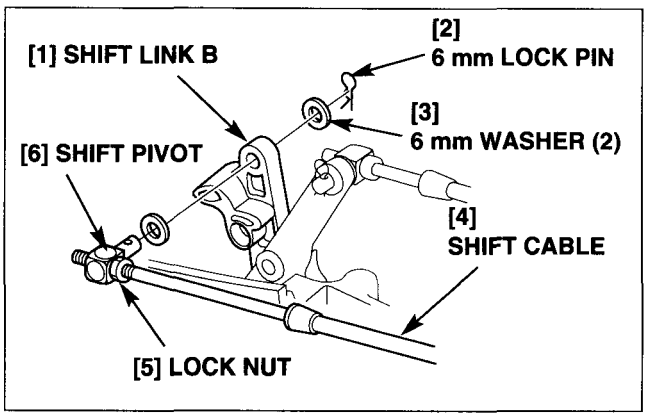


5. SHIFT CABLE (Long Tiller Handle Type)

• Adjustment

1) Adjust the shift rod (P. 3-13 of the base shop manual).
2) Set the shift lever in the "Neutral" position and disconnect the shift cable from the shift link B.
3) Set the shift lever in the "Neutral" position and move it a few times within the range of play.
4) Check again that the shift link B is in the "Neutral" position.
5) Loosen the shift pivot lock nut. Turn the shift pivot and adjust the shift cable length so that the shift pivot can be set on the shift link B smoothly.
6) After adjustment, tighten the lock nut securely.
7) Install the shift pivot on the shift link B.
8) Operate the shift lever and be sure that the shift link B sets in each position smoothly.

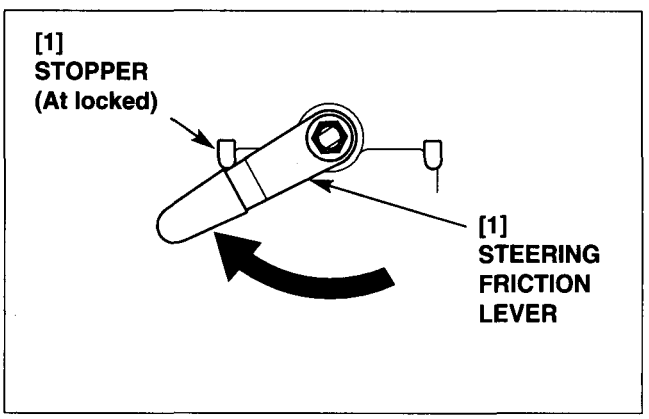




6. STEERING FRICTION (Long Tiller Handle Type Without Mechanical Tilt)

• Inspection/Adjustment

1) Set the steering friction lever in the lock position (i.e. fully to the left until the steering friction lever comes in contact with the stopper).

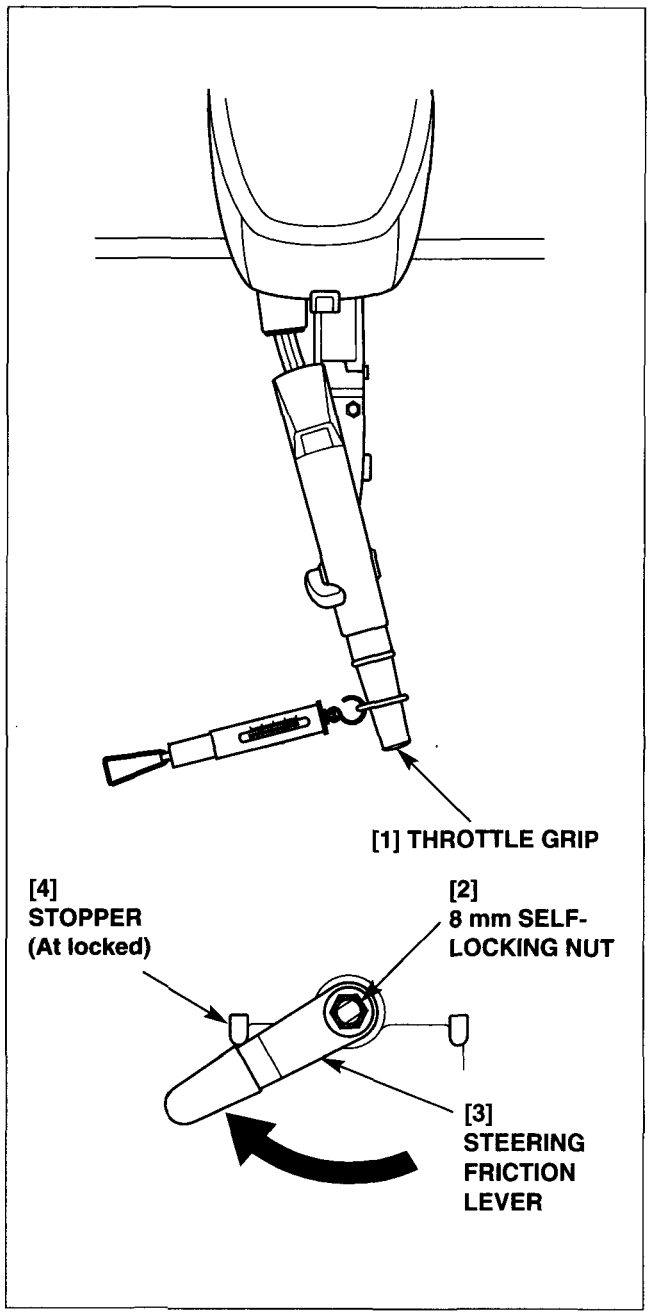


2) Check the starting torque by measuring the starting force using a spring scale at the center of the throttle grip. The motor should start to move at 100 N (10.0 kgf, 22.0 lbf) of force.

3) If the starting force is less than 100 N (10.0 kgf, 22.0 lbf), move the throttle friction lever fully to the left (i.e. in the lock position) and tighten the 8 mm self-locking nut to the specified torque.

   TORQUE: 8.5 N·m (0.85 kgf·m, 6.1 lbf·ft).

4) Recheck the starting force. If the starting force is less than 100 N (10.0 kgf, 22.0 lbf), check the friction block disc surface for contamination with grease (P. 13-1).



1. CARBURETOR ASSEMBLY REMOVAL

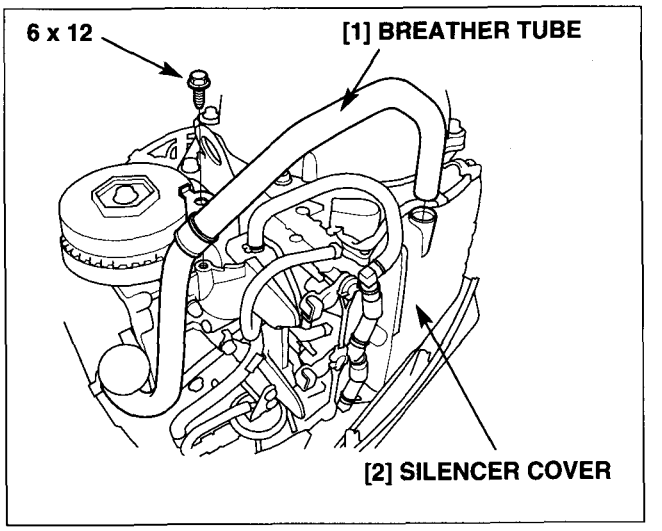
⚠WARNING

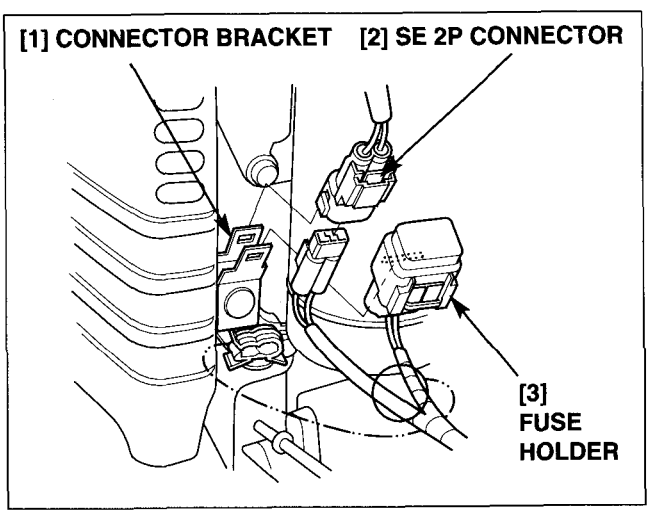
Gasoline is highly flammable and explosive.

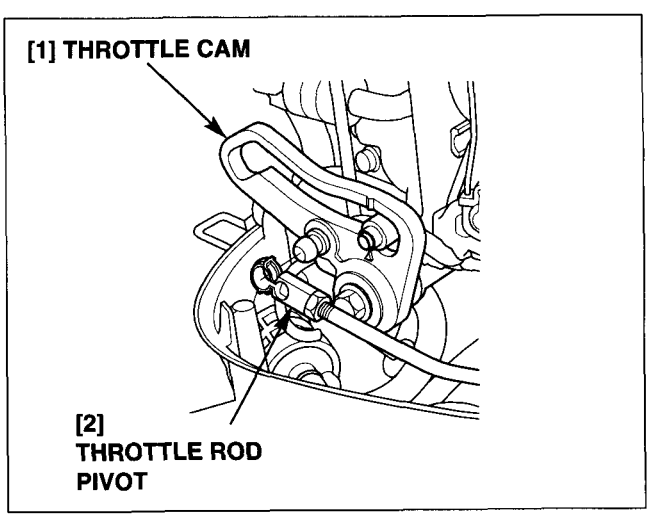
You can be burned or seriously injured when handling fuel.

- **Keep heat, sparks, and flame away.**
- **Handle fuel only outdoors.**
- **Wipe up spills immediately.**
- **Loosen the drain screw of each cylinder and drain the engine before removing the carburetor assembly.**

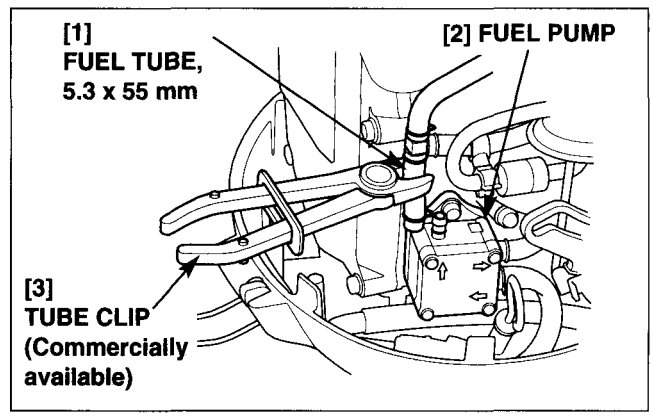
1) Remove the engine cover (P. 3-4 of the base shop manual).
2) Remove the 6 x 12 mm flange bolt and pull off the breather tube from the silencer cover.
3) Remove the fuse holder from the connector bracket.
4) Remove the SE 2P connector from the connector bracket and disconnect the 2P connector.
5) Detach the throttle rod pivot from the throttle cam.



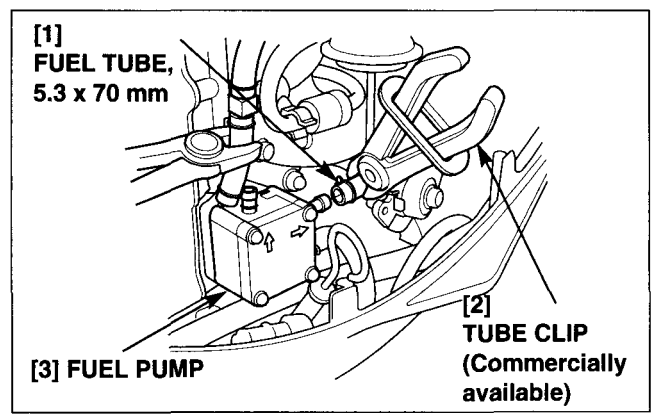




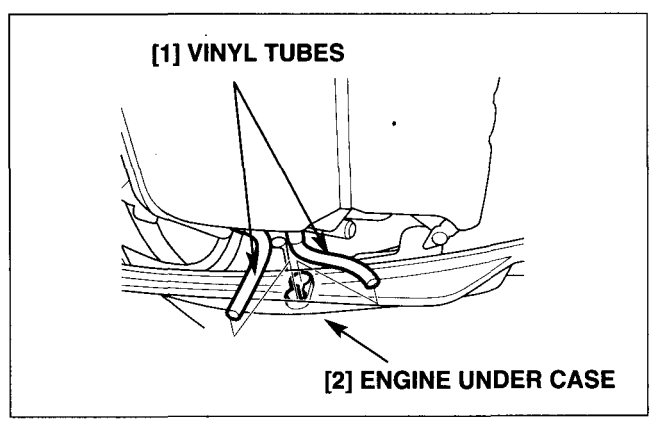
6) Pinch the 5.3 x 55 mm fuel tube with a commercially available tube clip and disconnect the 5.3 x 55 mm fuel tube from the fuel pump.



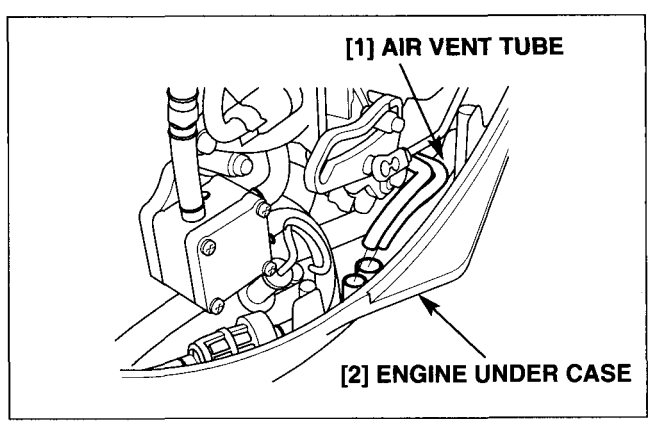
7) Pinch the 5.3 x 70 mm fuel tube with a commercially available tube clip and disconnect the 5.3 x 70 mm fuel tube from the fuel pump.



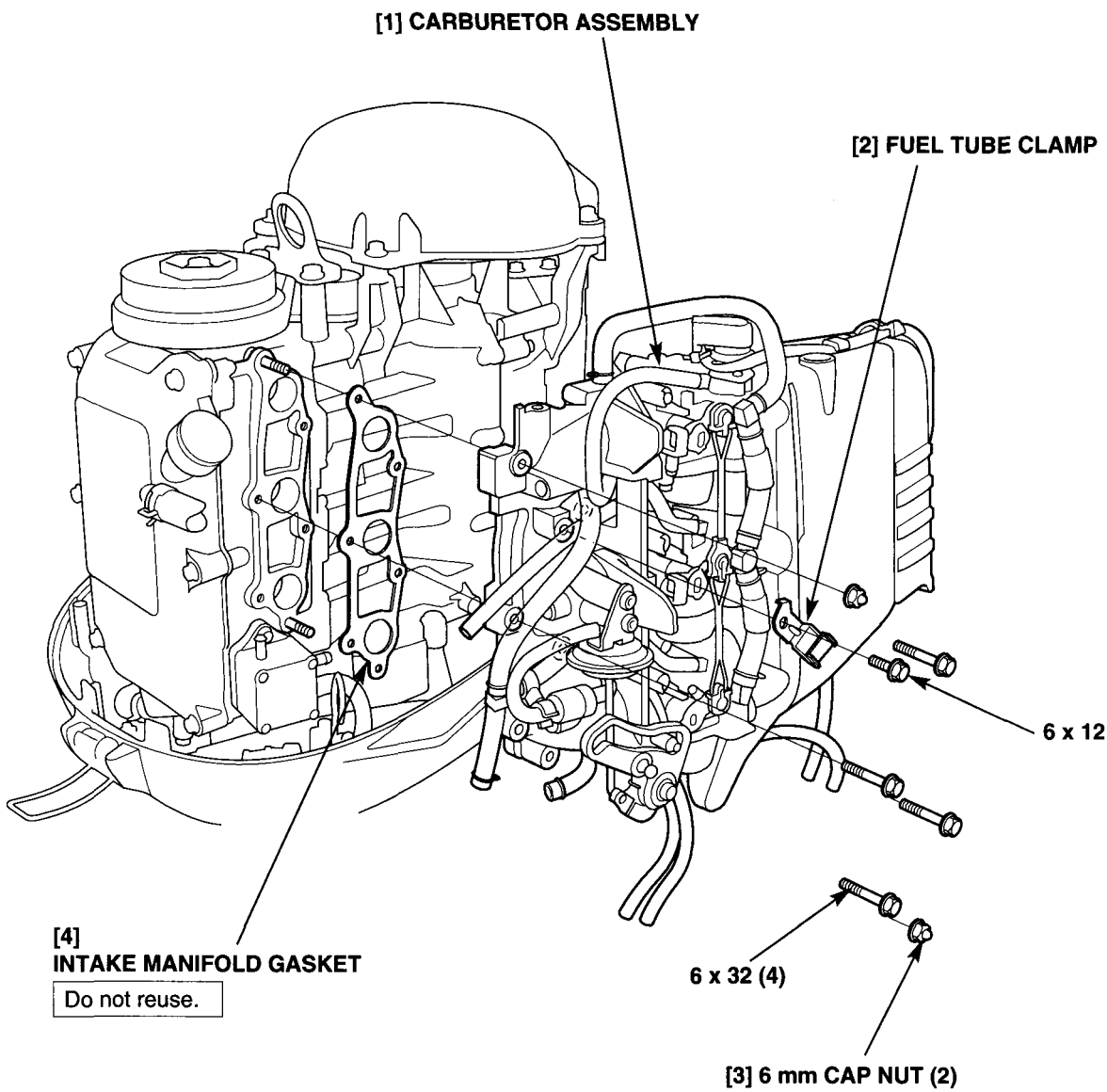
8) Pull off the two vinyl tubes from the engine under case.



9) Pull off the two air vent tubes from the engine under case.



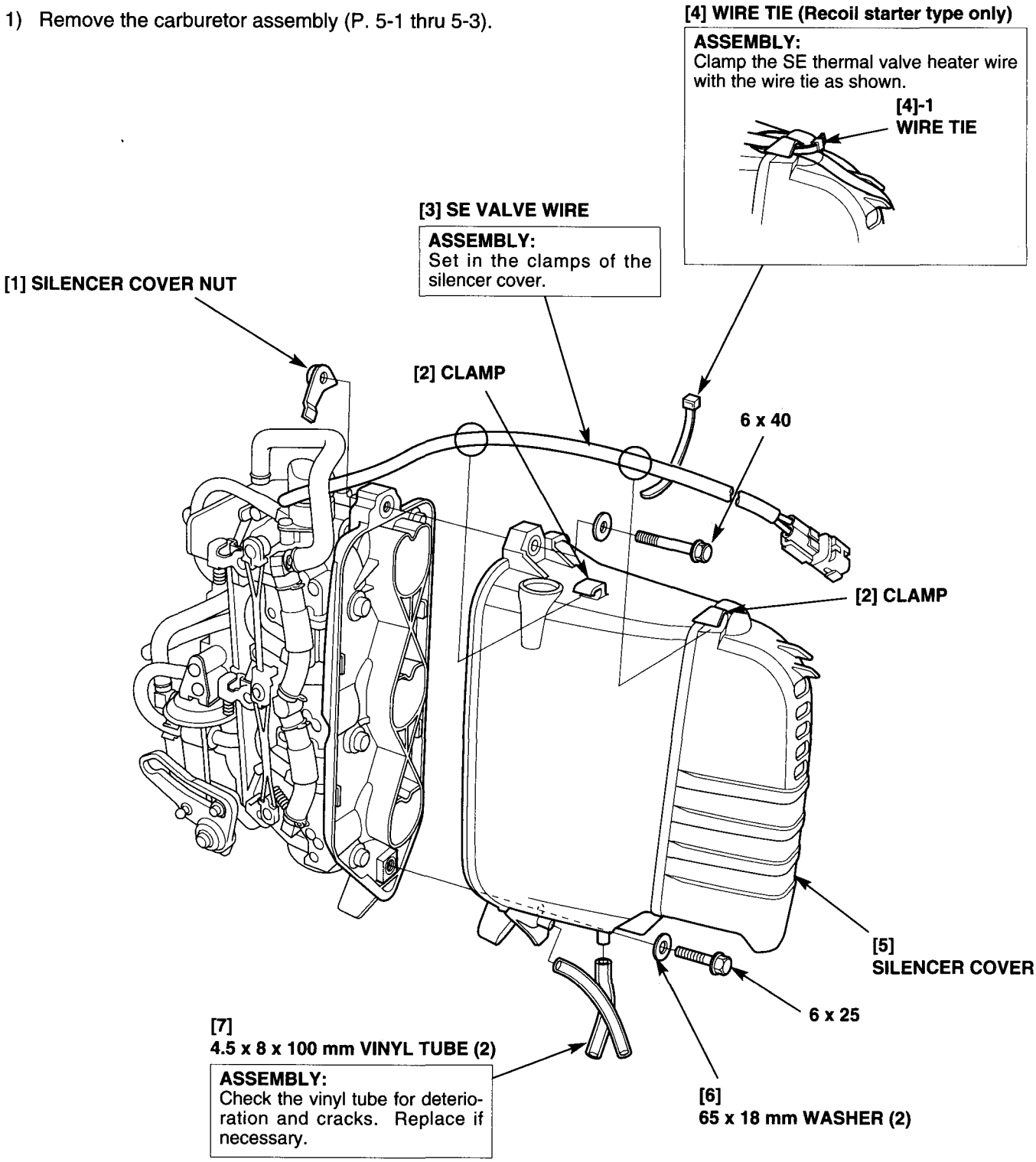
10) Remove the two 6 mm cap nuts from the intake manifold and remove the four 6 x 32 mm flange bolts. Remove the carburetor assembly and intake manifold gasket.



2. SILENCER COVER

a. REMOVAL/INSTALLATION

1) Remove the carburetor assembly (P. 5-1 thru 5-3).



3. MANIFOLD/CARBURETOR

a. DISASSEMBLY/REASSEMBLY

• Fuel Line (1/2)

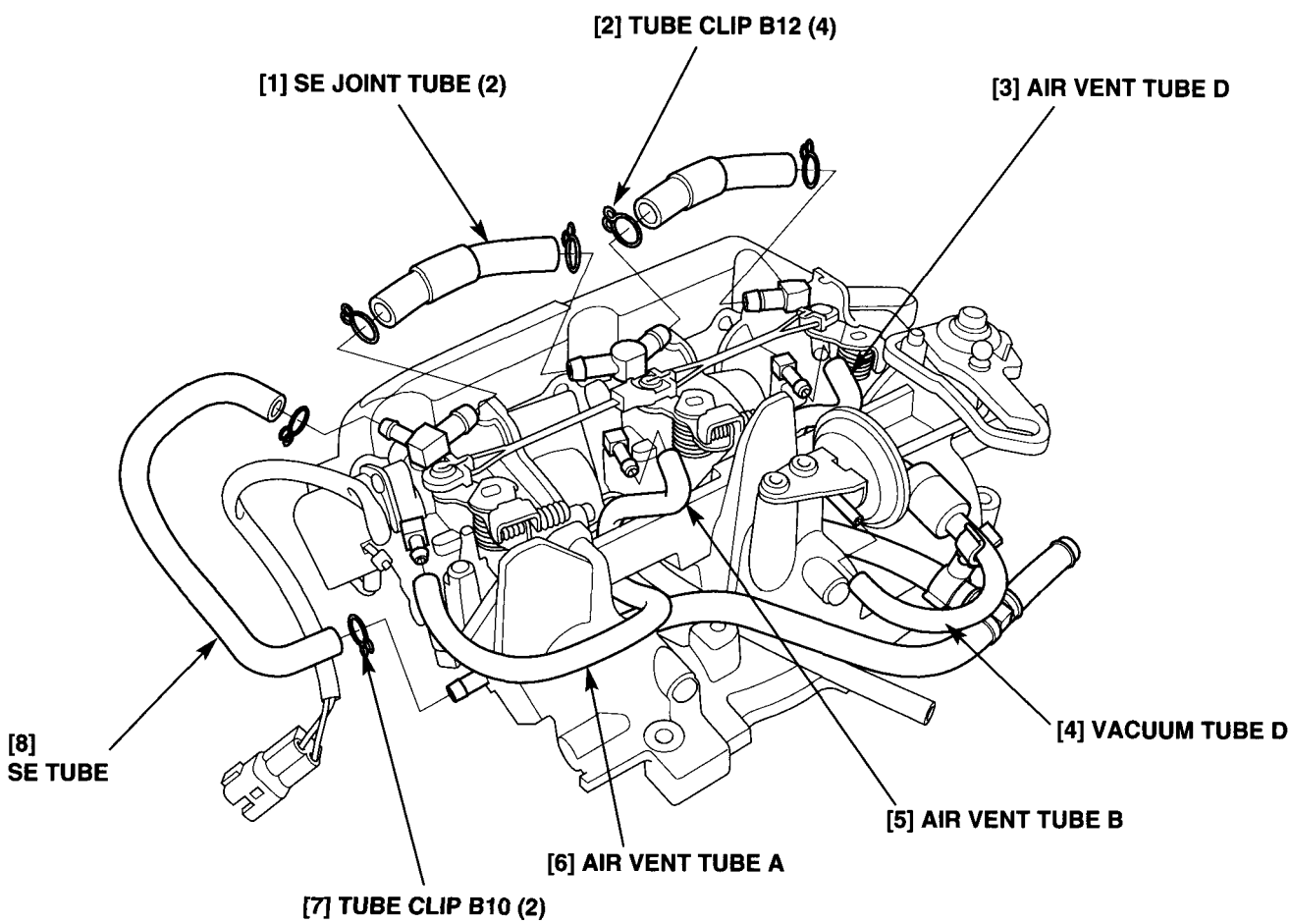
⚠WARNING

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.**

- Before disassembly, drain the fuel from the carburetor and fuel lines completely.
- Check each tube for deterioration and cracks before connecting the tubes. Replace the tubes if necessary.



• Fuel Line (2/2)

Tube routing (P. 2-30)

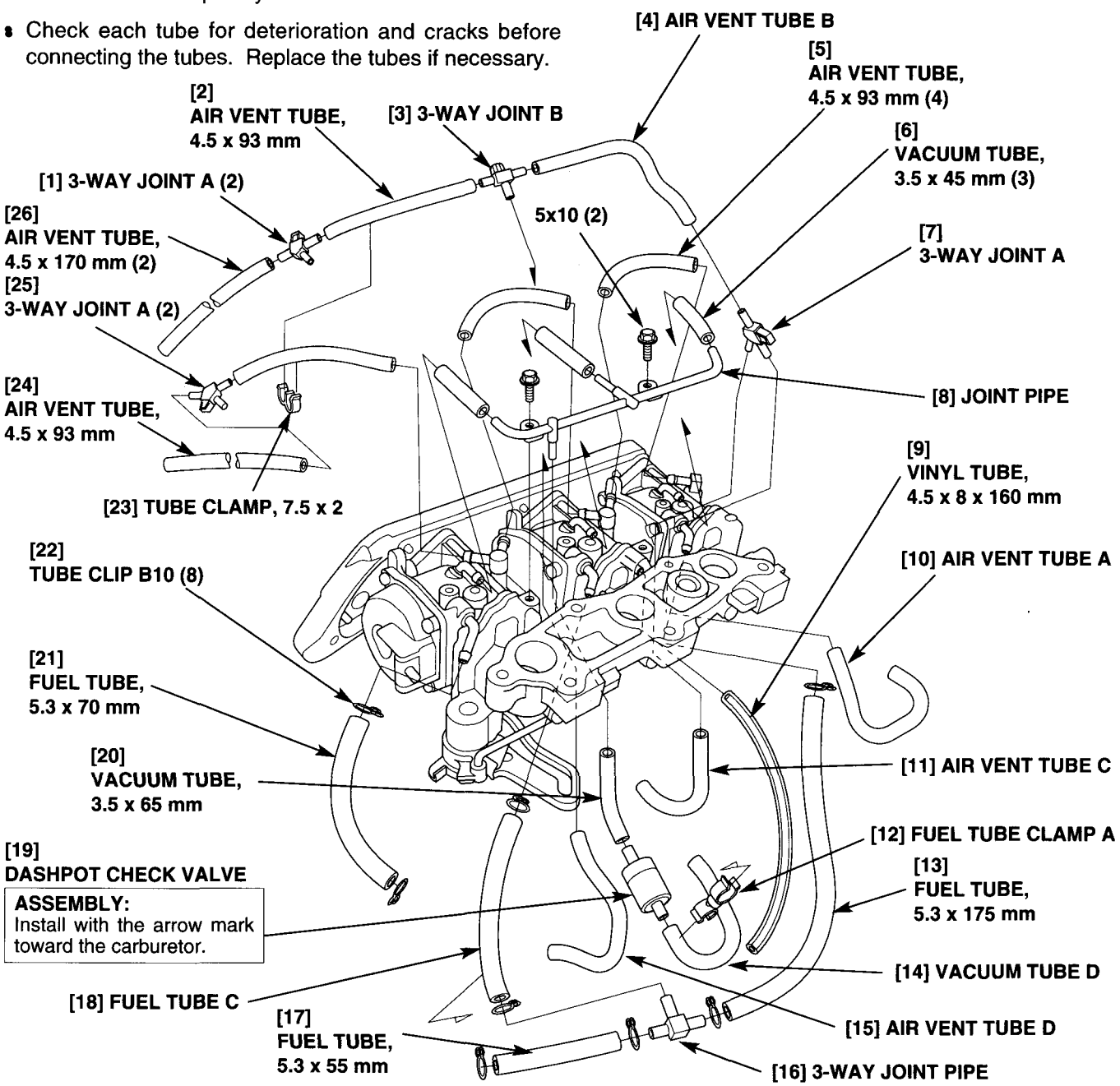
⚠WARNING

Gasoline is highly flammable and explosive.

You can be burned or seriously injured when handling fuel.

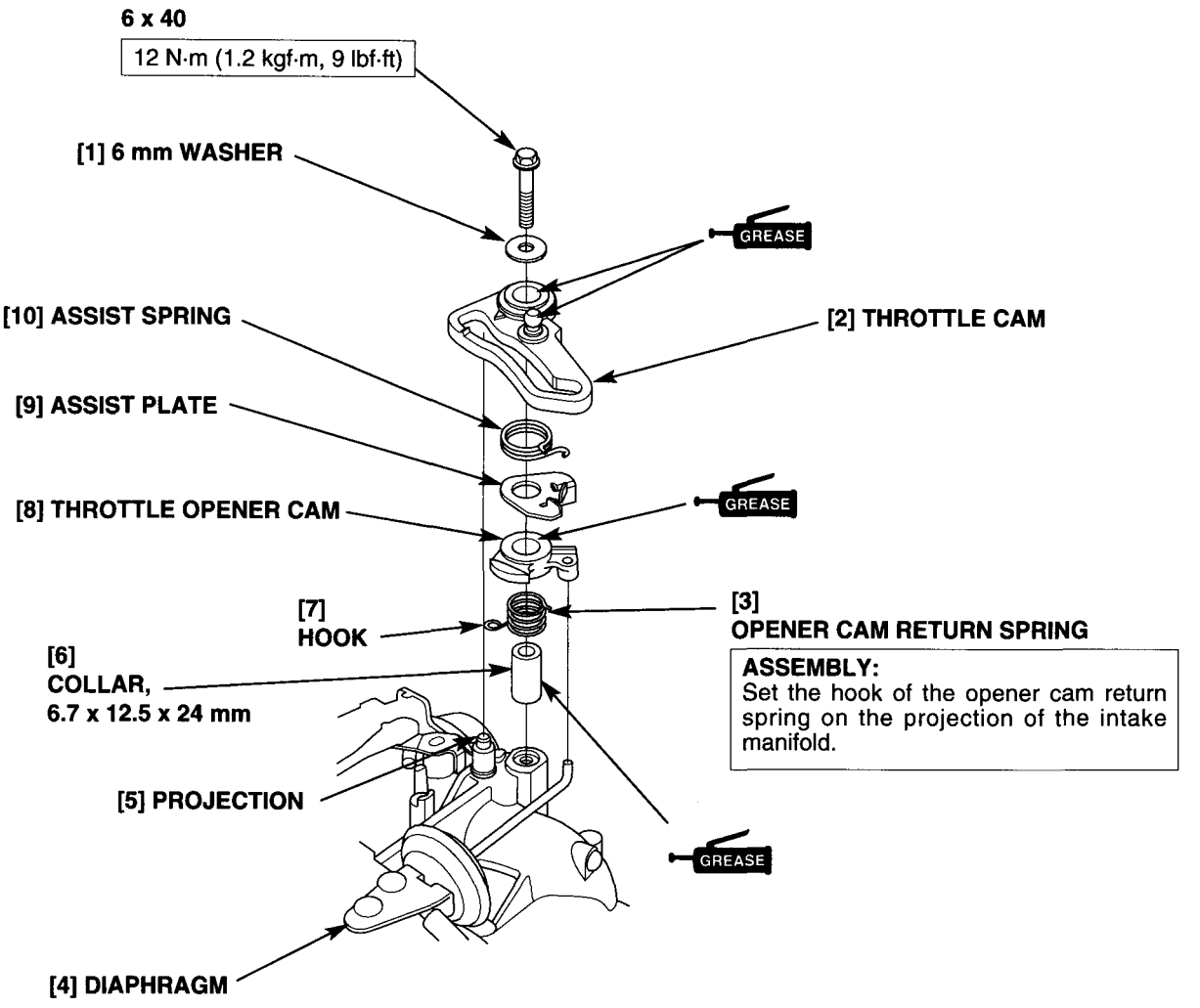
- **Keep heat, sparks, and flame away.**
- **Handle fuel only outdoors.**
- **Wipe up spills immediately.**

- Before disassembly, drain the fuel from the carburetor and fuel lines completely.
- Check each tube for deterioration and cracks before connecting the tubes. Replace the tubes if necessary.



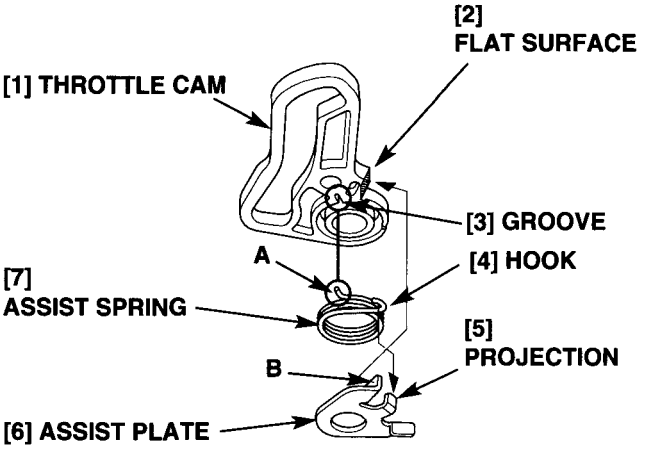
• Throttle Cam

Throttle cam disassembly/reassembly can be made with the carburetor assembly installed.



• ASSIST PLATE, ASSIST SPRING ASSEMBLY

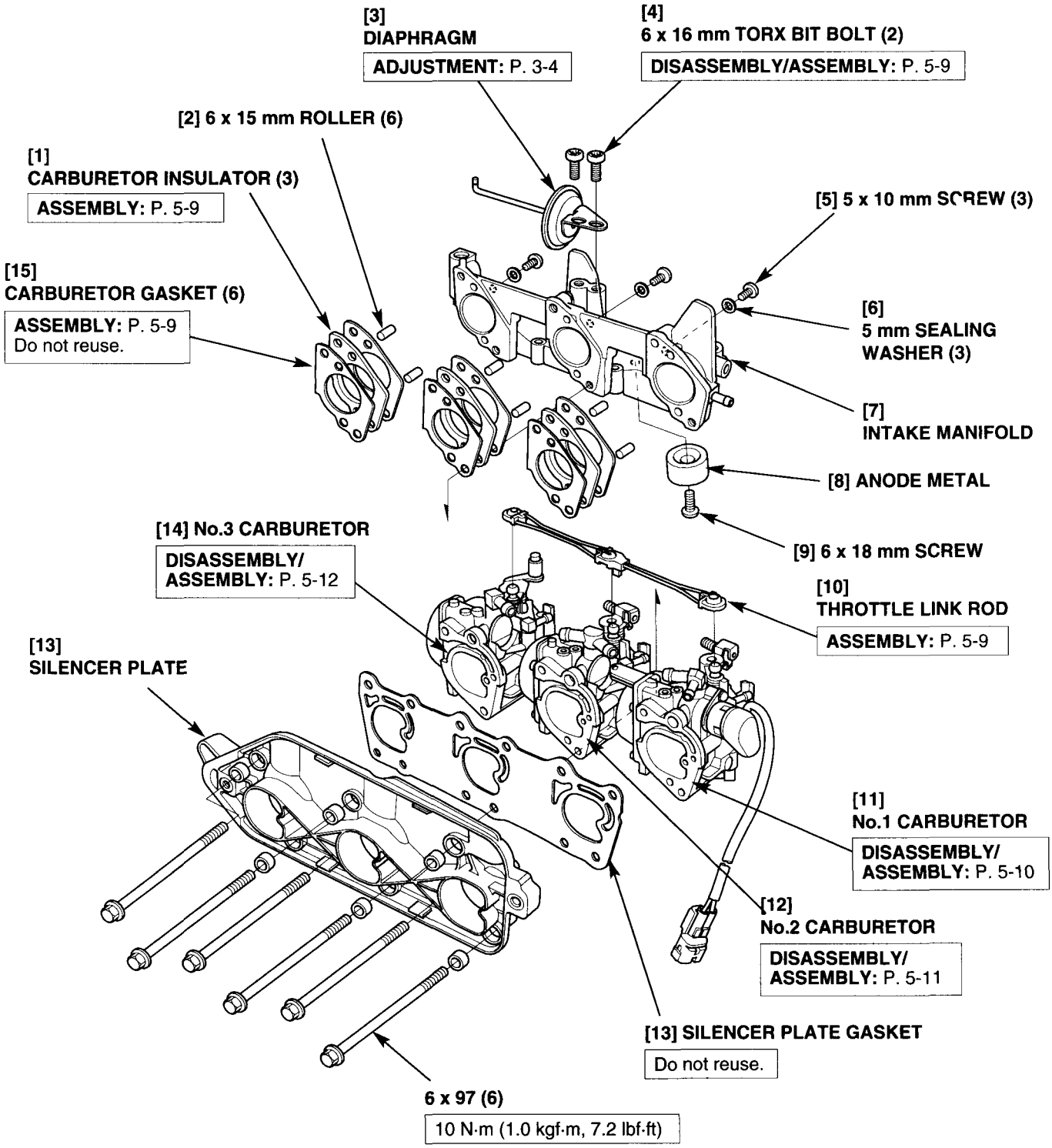
1) Install by aligning "A" of the assist spring with the groove in the throttle cam.
2) Set the projection of the assist plate on the hook of the assist spring.
3) Align "B" of the assist plate with the flat surface of the throttle cam.



• Manifold/Carburetor

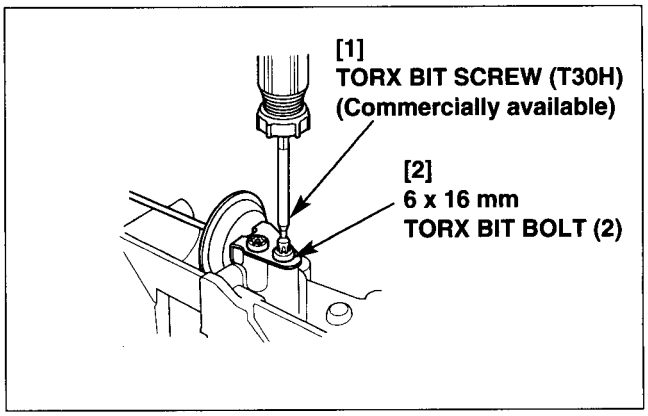
Remove the following parts.

- Engine cover (P. 3-4 of the base shop manual)
- Carburetor assembly (P. 5-1)
- Silencer cover (P. 5-4)
- Fuel line (P. 5-5)
- Throttle cam (P. 5-7)



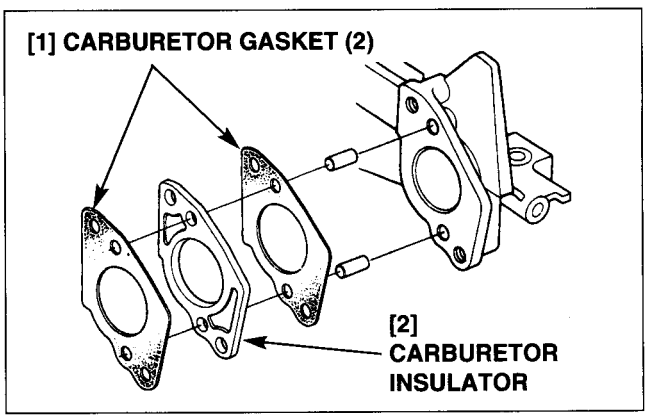
• 6 x 16 mm Torx Bit Bolt

Remove and install the 6 x 16 mm torx bit bolts with a commercially available torx bit screw (T30H).



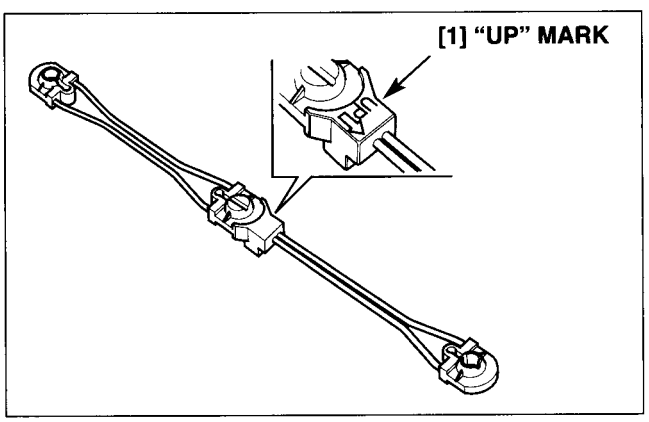
• Carburetor Gasket/Insulator

Install the carburetor gaskets and insulator as shown. Note the installation direction.



• Throttle Link Rod

Install with the "UP⬆" mark at the center of the rod facing up (i.e. toward the No.1 carburetor).



• No.1 Carburetor

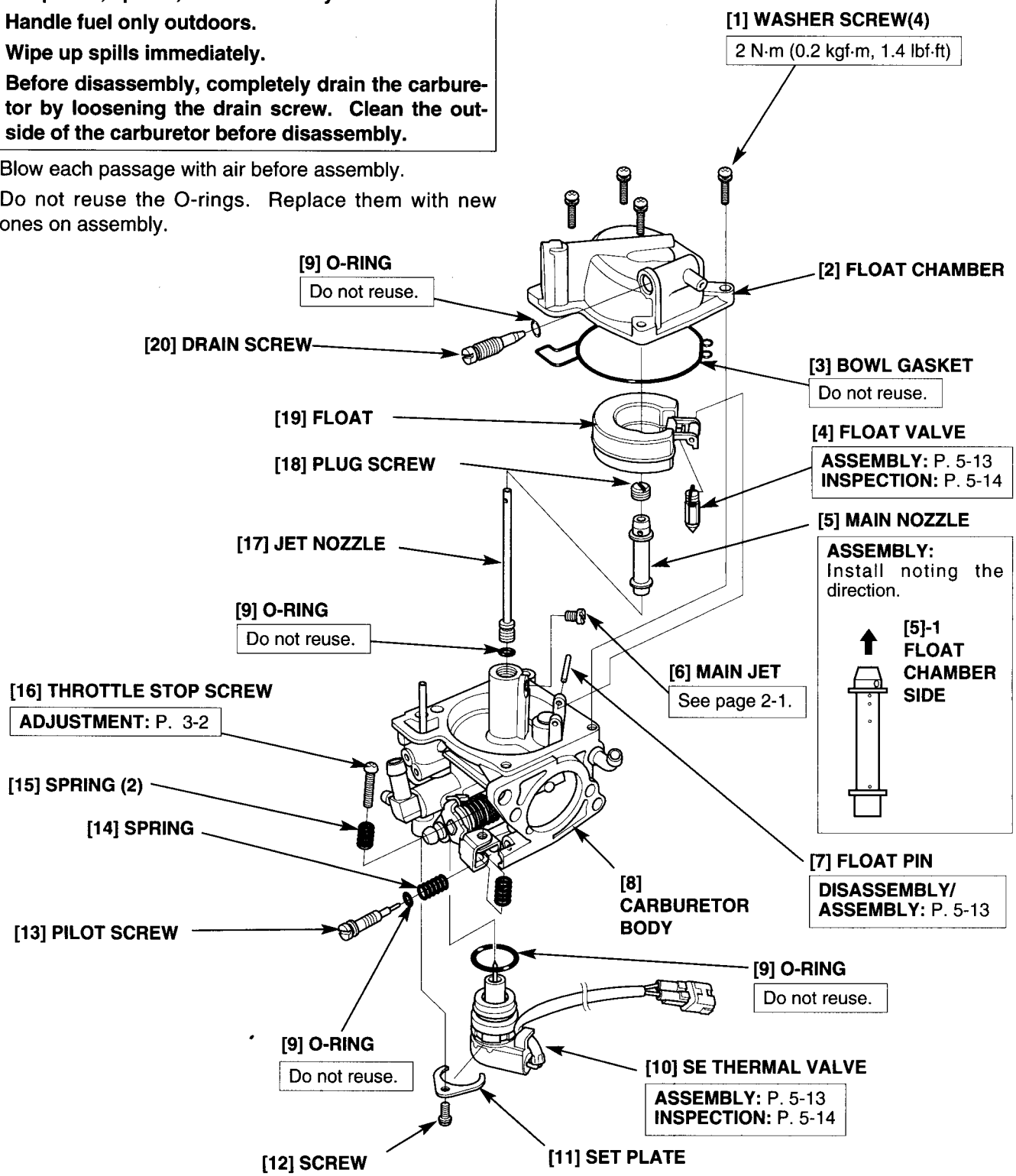
⚠WARNING

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.**
- **Before disassembly, completely drain the carburetor by loosening the drain screw. Clean the outside of the carburetor before disassembly.**

- Blow each passage with air before assembly.
- Do not reuse the O-rings. Replace them with new ones on assembly.



• No.2 Carburetor

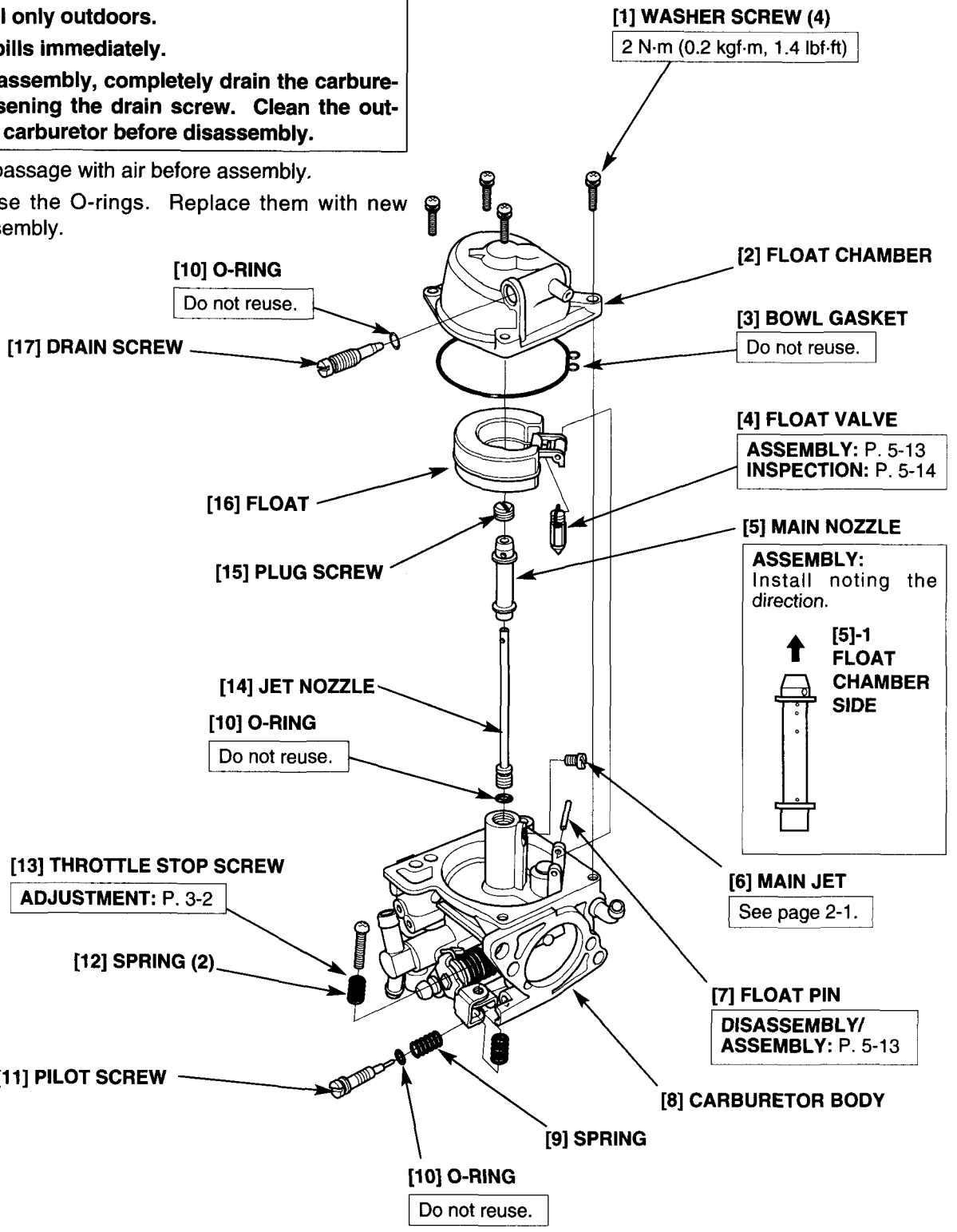
⚠WARNING

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.**
- **Before disassembly, completely drain the carburetor by loosening the drain screw. Clean the outside of the carburetor before disassembly.**

- Blow each passage with air before assembly.
- Do not reuse the O-rings. Replace them with new ones on assembly.



• No.3 Carburetor

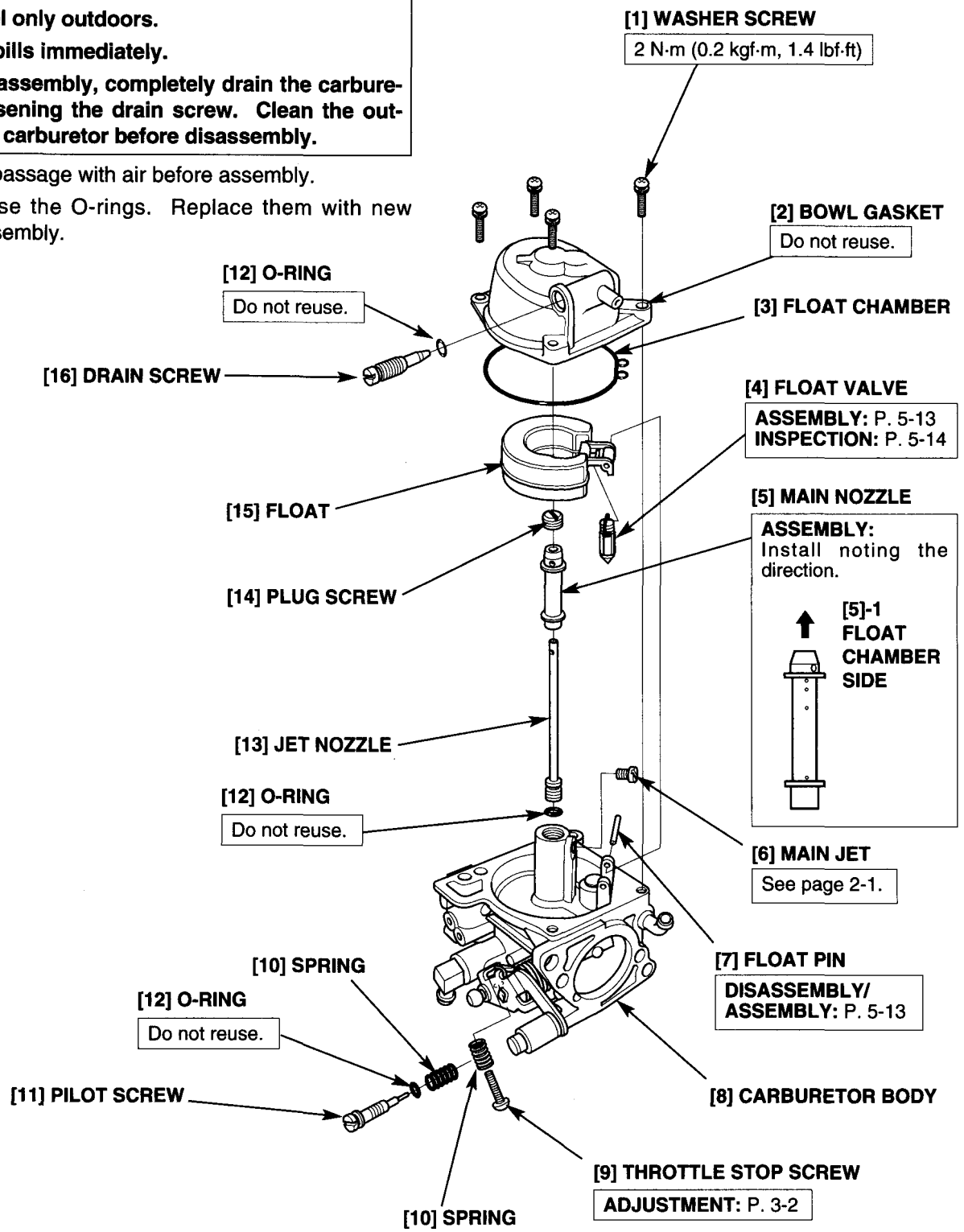
⚠WARNING

Gasoline is highly flammable and explosive.

You can be burned or seriously injured when handling fuel.

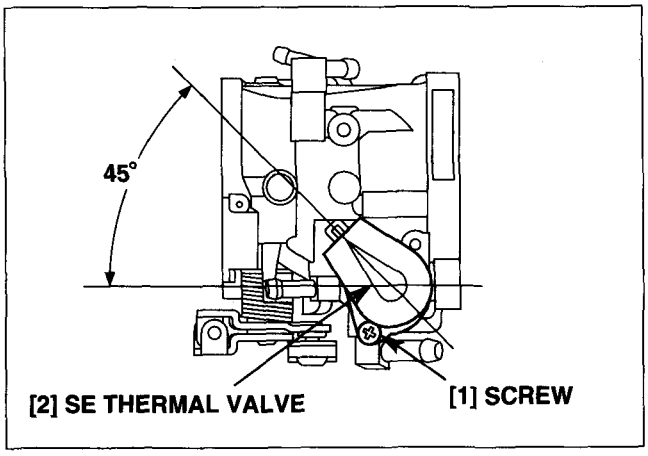
- **Keep heat, sparks, and flame away.**
- **Handle fuel only outdoors.**
- **Wipe up spills immediately.**
- **Before disassembly, completely drain the carburetor by loosening the drain screw. Clean the outside of the carburetor before disassembly.**

- Blow each passage with air before assembly.
- Do not reuse the O-rings. Replace them with new ones on assembly.



• SE (Starter Enrichment) Thermal Valve

- Take care not to damage the valve part of the SE thermal valve.
- Adjust the SE thermal valve installation angle as shown and tighten the screw securely.



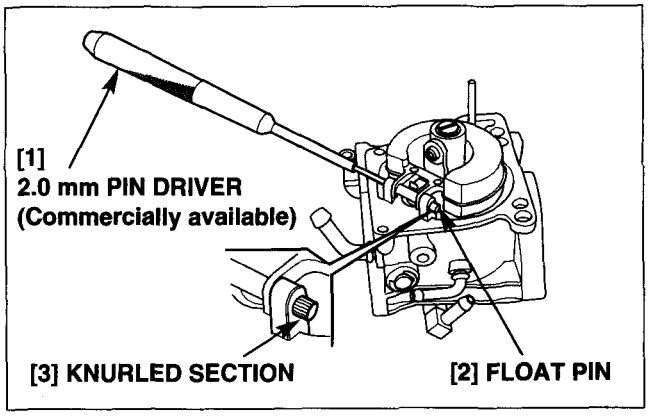
• Float/Float Valve

Removal:

1) Attach a commercially available 2.0 mm pin driver to the opposite side of the knurled section of the float pin as shown.
   Drive out the float pin by lightly tapping on the 2.0 mm pin driver.
2) Remove the float and float valve.

CAUTION

Do not damage the installation section of the float pin.

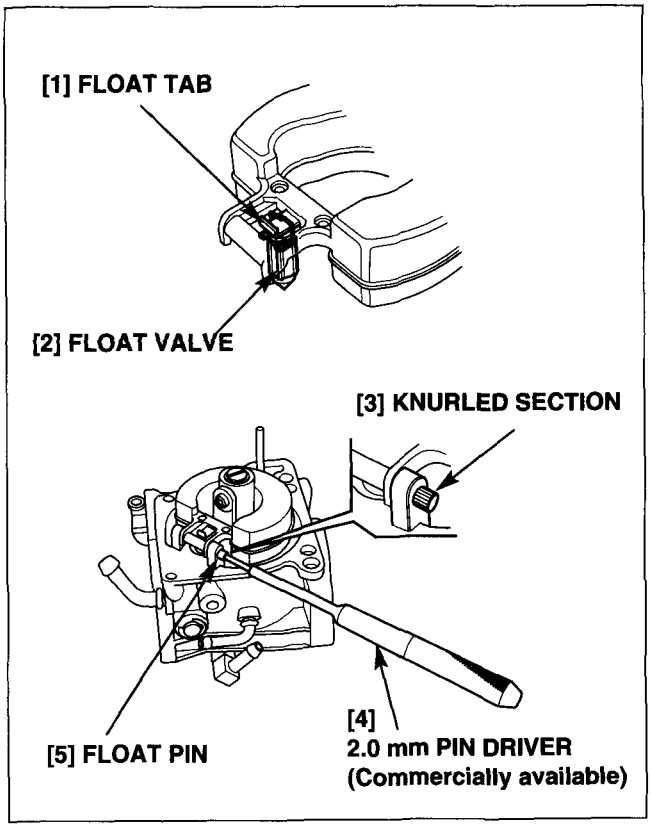


Installation:

1) Set the float valve on the float tab as shown and install them on the carburetor body.
2) Install the float pin in the direction shown.
3) Install the float pin by lightly tapping on the knurled section side of the float pin using a commercially available 2.0 mm pin driver.

CAUTION

- **Install the float pin with care not to damage the installation section of the float pin.**
- **When the float pin can be installed lightly with hand or when the float pin comes out of position easily, insert the float pin from the pin installation part of the opposite side and install it with a pin driver.**



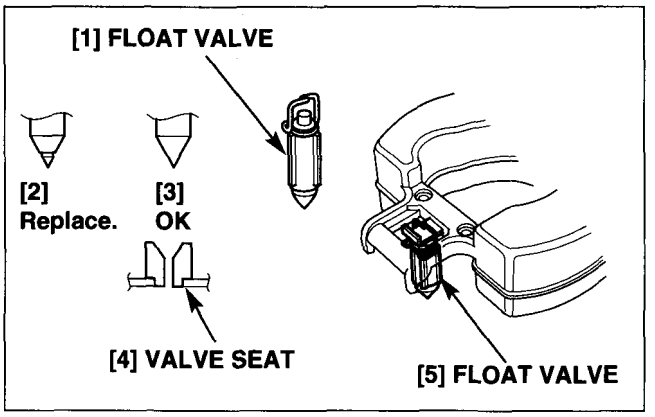
b. INSPECTION

• Float Valve/Valve Seat

Check the float valve and valve seat for cracks, wear or damage. Replace if necessary.

• Float

Check the float for damage, deformation or gasoline in the float. Replace if necessary.



• Carburetor Float Level Height

Measure the float level height with the float installed.

- Set the float level gauge at right angles to the float chamber mating surface and measure the float level height at the highest place of the float.

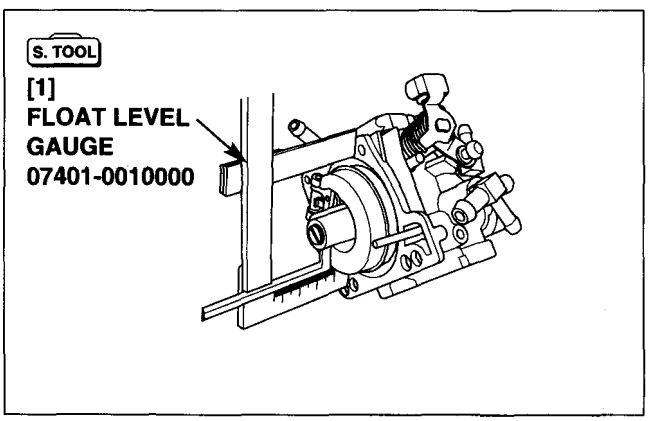
1) Place the carburetor as shown. Push the float lightly with a finger and measure the distance between the float top and carburetor body when the float valve just starts to operate.

Standard float height	BF25D: 14 mm (0.55 in) BF30D: 13 mm (0.51in)

2) If the height is out of specification, check the float valve and valve seat for wear or damage.
3) If the float valve and float are not worn and damaged, adjust the float height by bending the brass float tab carefully.

CAUTION

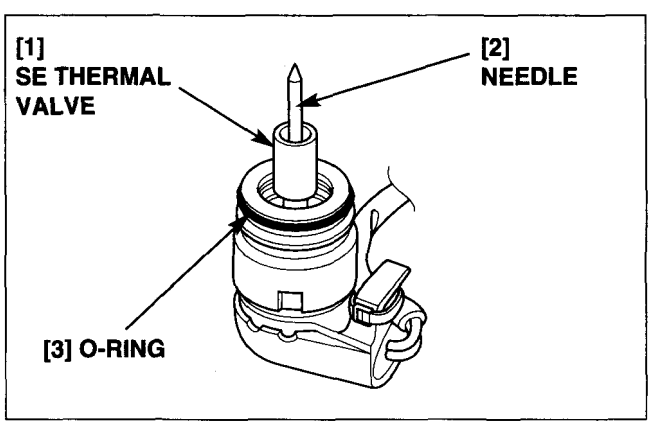
Take care not to damage the float when adjusting the float height by bending the float tab.



• SE (Starter Enrichment) Thermal Valve

Check the SE thermal valve and needle for wear or damage.

Check the O-ring for damage and deterioration. Replace the O-ring with a new one if necessary.

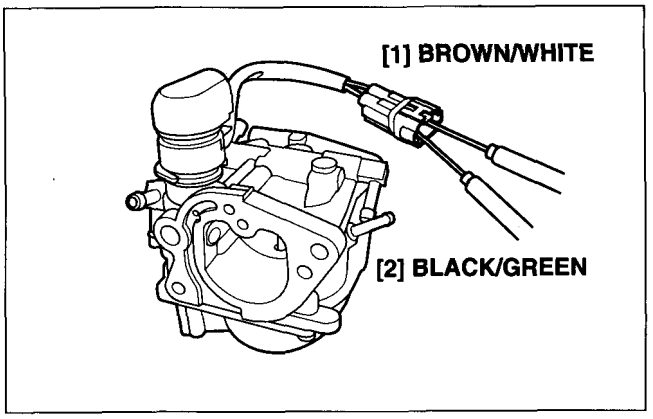


Resistance check:

Resistance can be checked with the carburetor mounted on the motor.

Measure the resistance between the 2P connector terminals.

Resistance	15.8 – 24.2 Ω



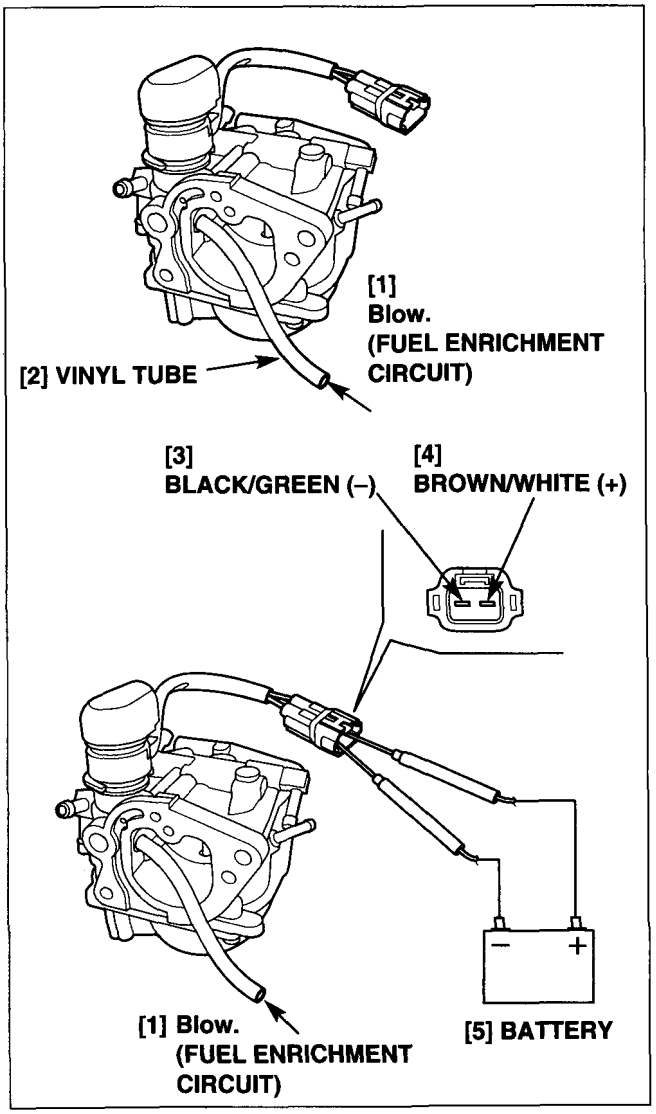
Operation check:

Operation check must be made on the assembled carburetor.

1) Install a vinyl tube or equivalent in the hole in the position of the carburetor shown (silencer plate side).
2) At room temperature, gently blow into the tube and verify air passes through the passage (fuel enrichment circuit is active).
3) Connect the 12V battery positive (+) terminal to the brown/white terminal and negative (–) to the black/green terminal for about five minutes. A gentle puff of air should not pass through (fuel enrichment circuit is fully closed).
   - Note that inspection with the battery connected must be made quickly.

CAUTION

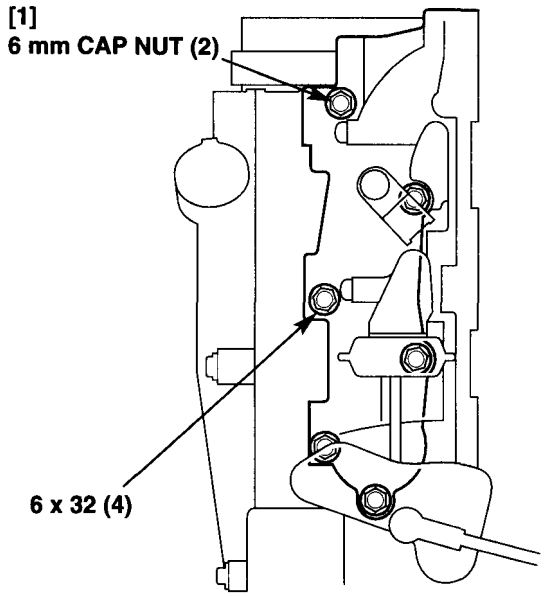
The SE thermal valve heater becomes very hot when the battery is connected. Take care not to touch it directly.

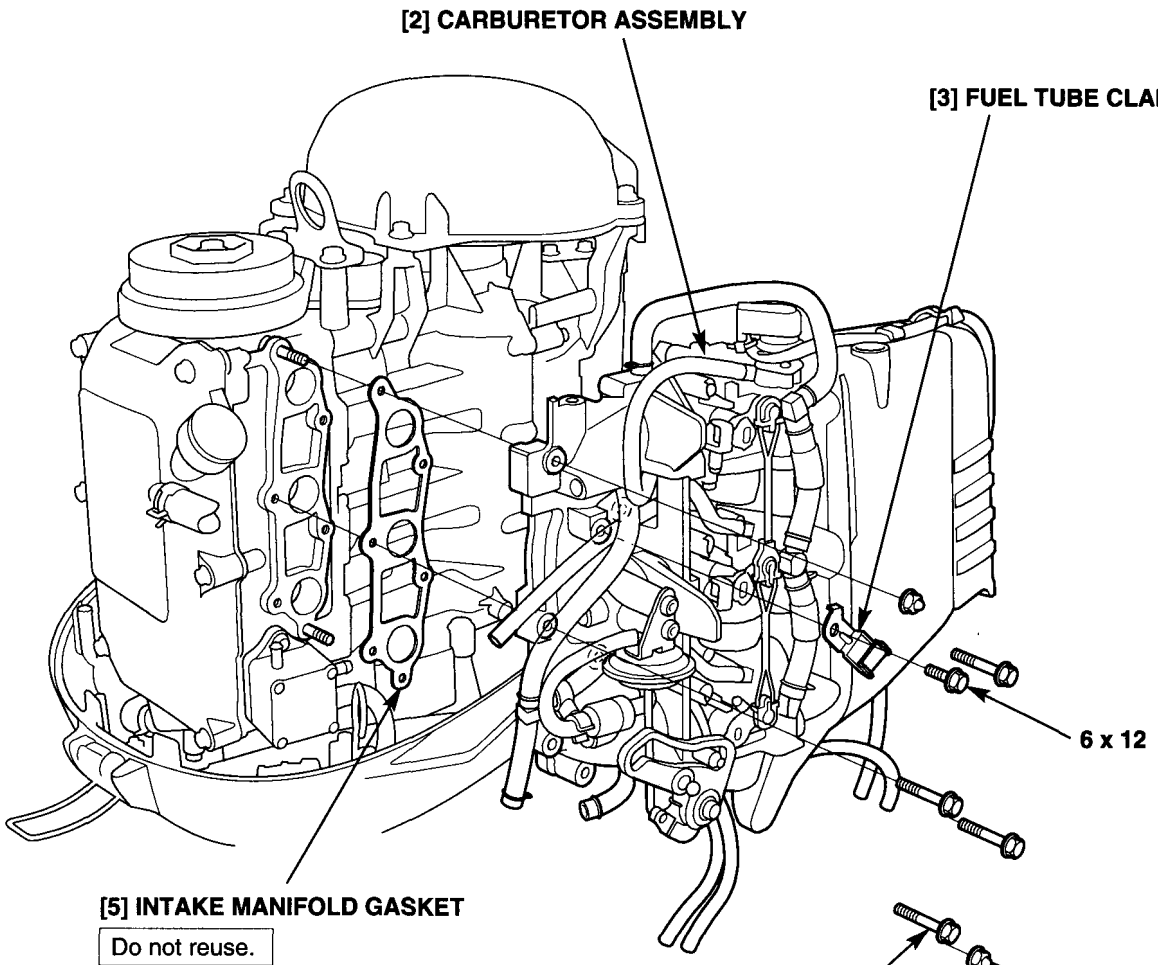


4. CARBURETOR ASSEMBLY INSTALLATION

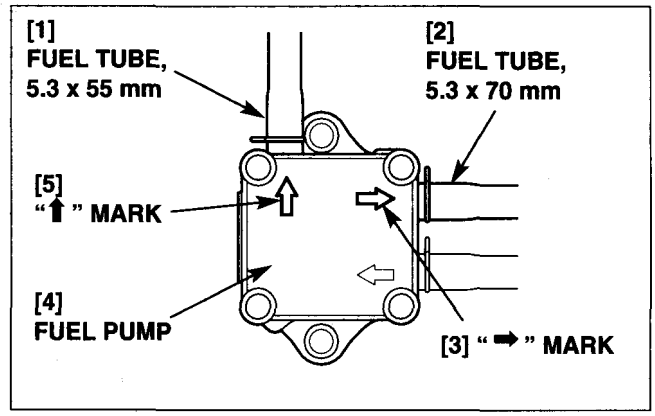
1) Install a new intake manifold gasket and carburetor assembly on the cylinder head.
2) Loosely tighten the two 6 mm cap nuts and four 6 x 32 mm flange bolts.
3) Tighten each bolt and nut in a criss-cross pattern in *two or three steps to the specified torque.*

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

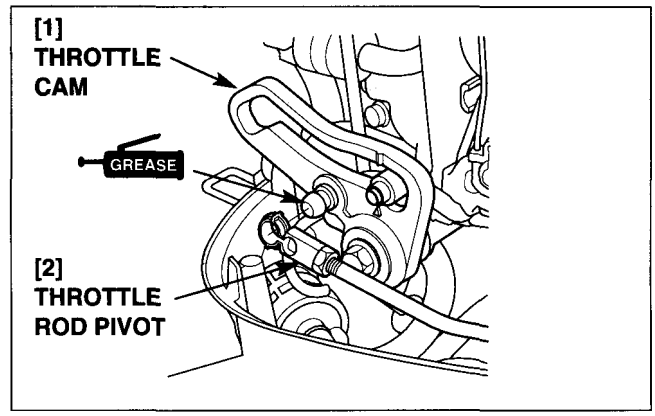




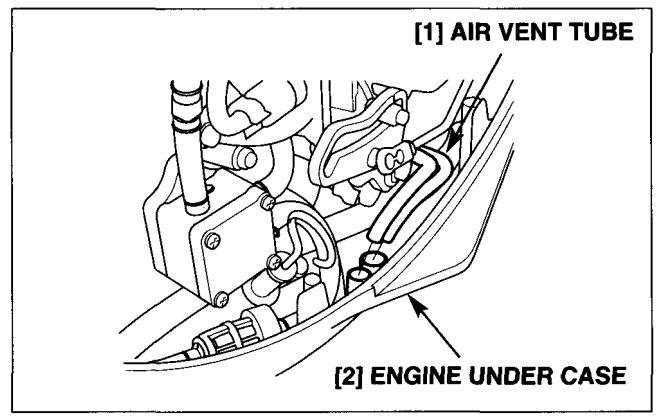
4) Connect the 5.3 x 70 mm fuel tube to the "➡" marked fitting of the fuel pump, and the 5.3 x 55 mm fuel tube to the "⬆" marked fitting of the fuel pump.



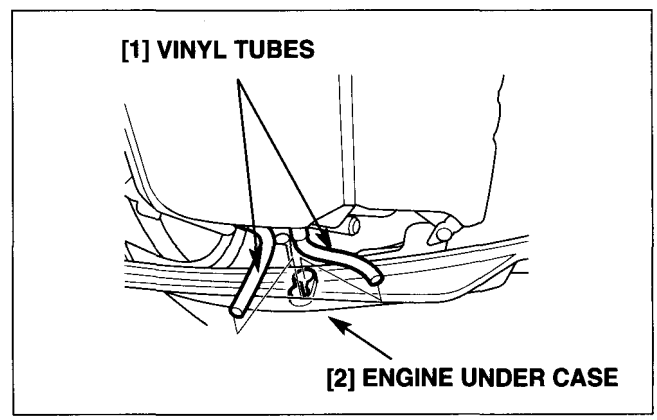
5) Attach the throttle rod pivot to the throttle cam.



6) Insert the two air vent tubes into the engine under case as shown.



7) Insert the two vinyl tubes into the engine under case as shown.

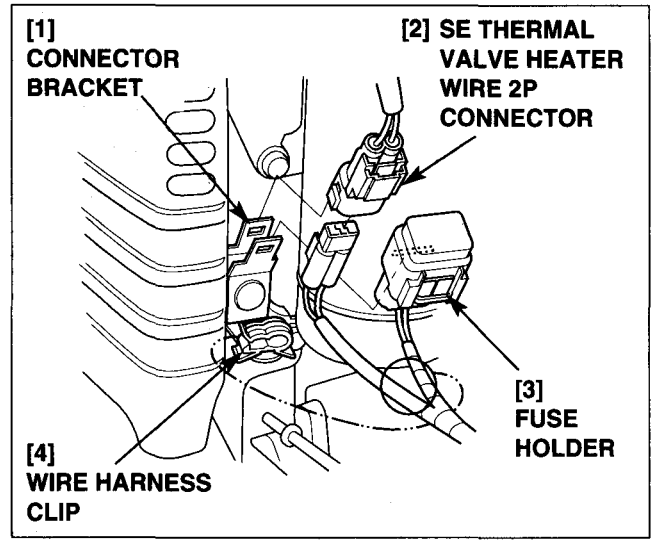


8) Connect the SE thermal valve heater wire 2P connector and set it on the connector bracket of the inner one.

   Set the SE thermal valve heater wire in the wire harness clip.

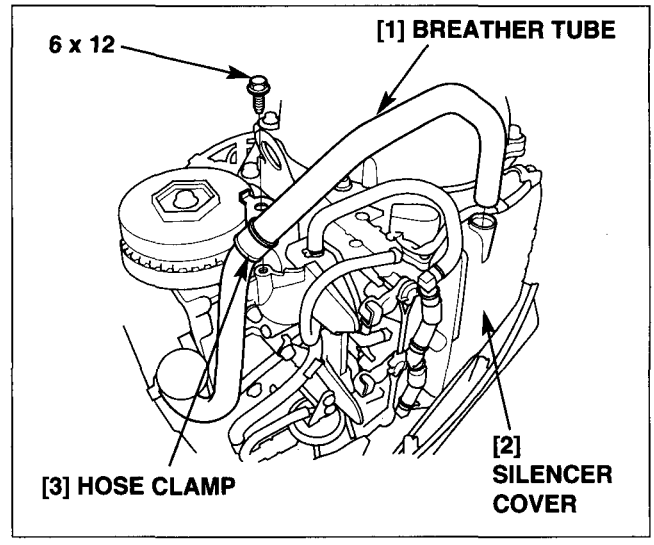
9) Set the fuse holder on the connector bracket of your side.

   Set the fuse holder wire in the wire harness clip.



10) Insert the breather tube into the silencer cover.

11) Secure the hose clamp with the 6 x 12 mm flange bolt.



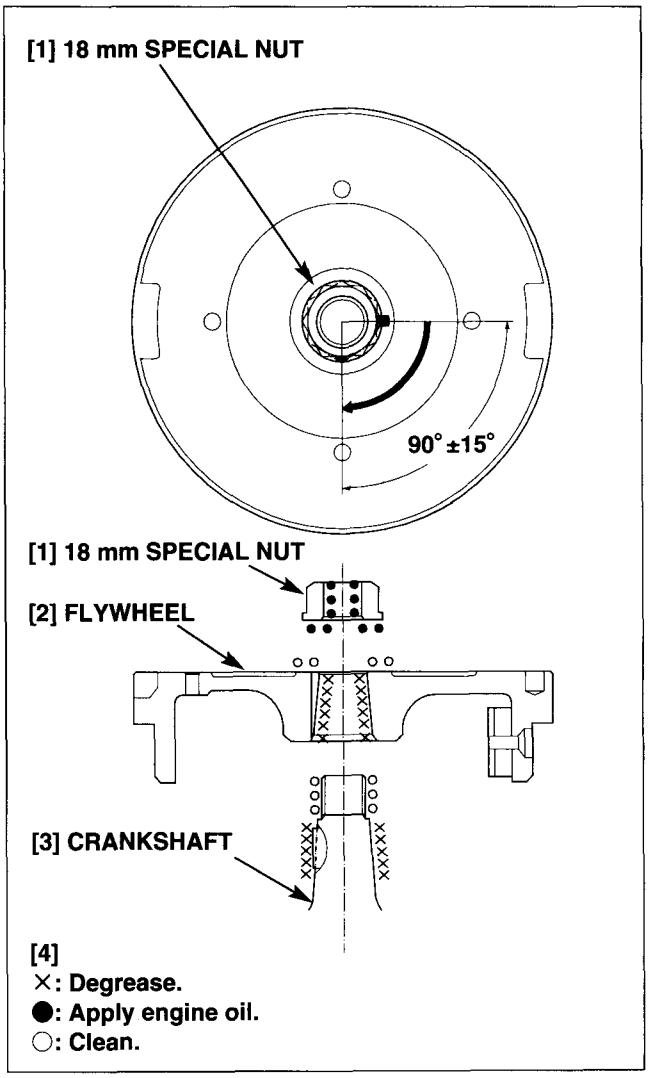
1. FLYWHEEL

1. FLYWHEEL

a. ASSEMBLY

1) Clean the flywheel and crankshaft mating surfaces and the tapered part of the crankshaft with a clean shop towel and degreasing agent.
2) Install the flywheel aligning the flywheel key way with the woodruff key.
3) Secure the flywheel with the holder. (P. 6-2 of the base shop manual).
4) Apply a thin coat of engine oil to the flanged part and threads of the 18 mm special nut, then tighten it to the specified torque.

   TORQUE: 39 N·m (4.0 kgf·m, 29 lbf·ft)
5) Tighten the 18 mm special nut to an additional 90° ±15°.



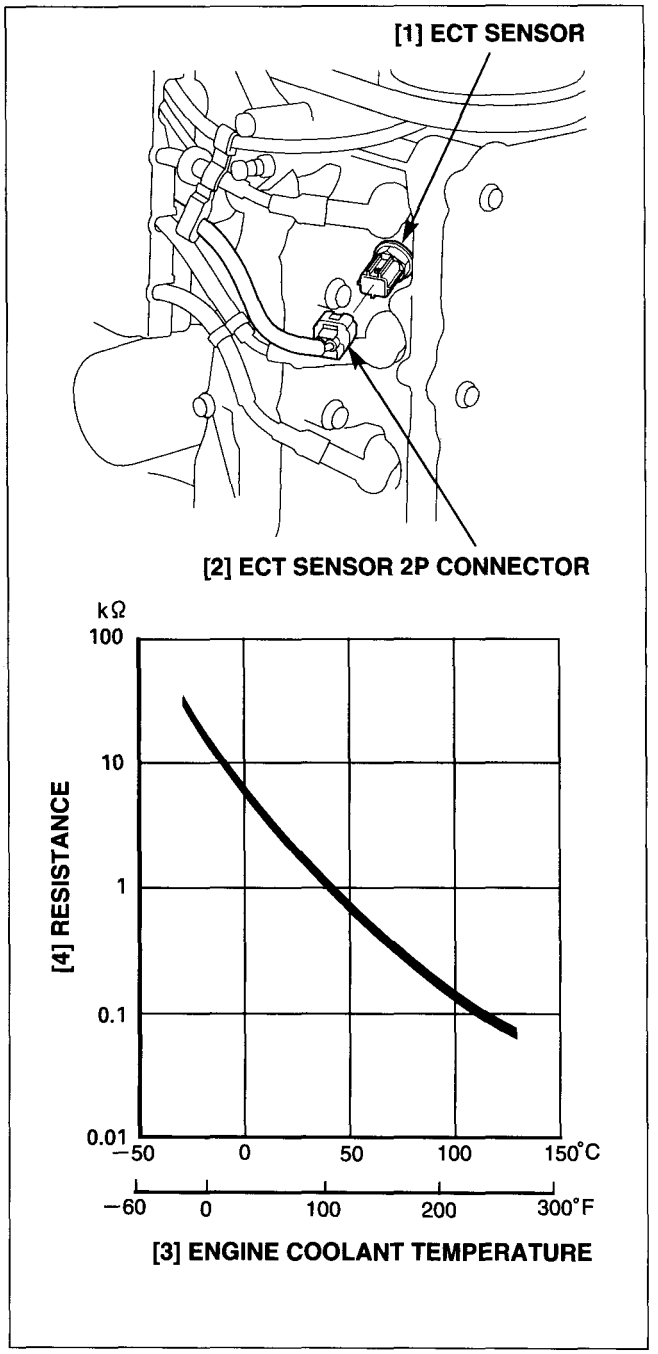
1. ECT SENSOR

a. INSPECTION

1) Disconnect the ECT sensor 2P connector from the ECT sensor.
2) Measure the resistance between the ECT sensor terminals (with the engine cold).
3) Connect the ECT sensor 2P connector. Start the engine and let it idle to warm up to normal operating temperature.
4) Disconnect the ECT sensor 2P connector from the ECT sensor and measure the resistance between the ECT sensor terminals (with the engine warmed up).

   The resistance should be in the table as shown right.

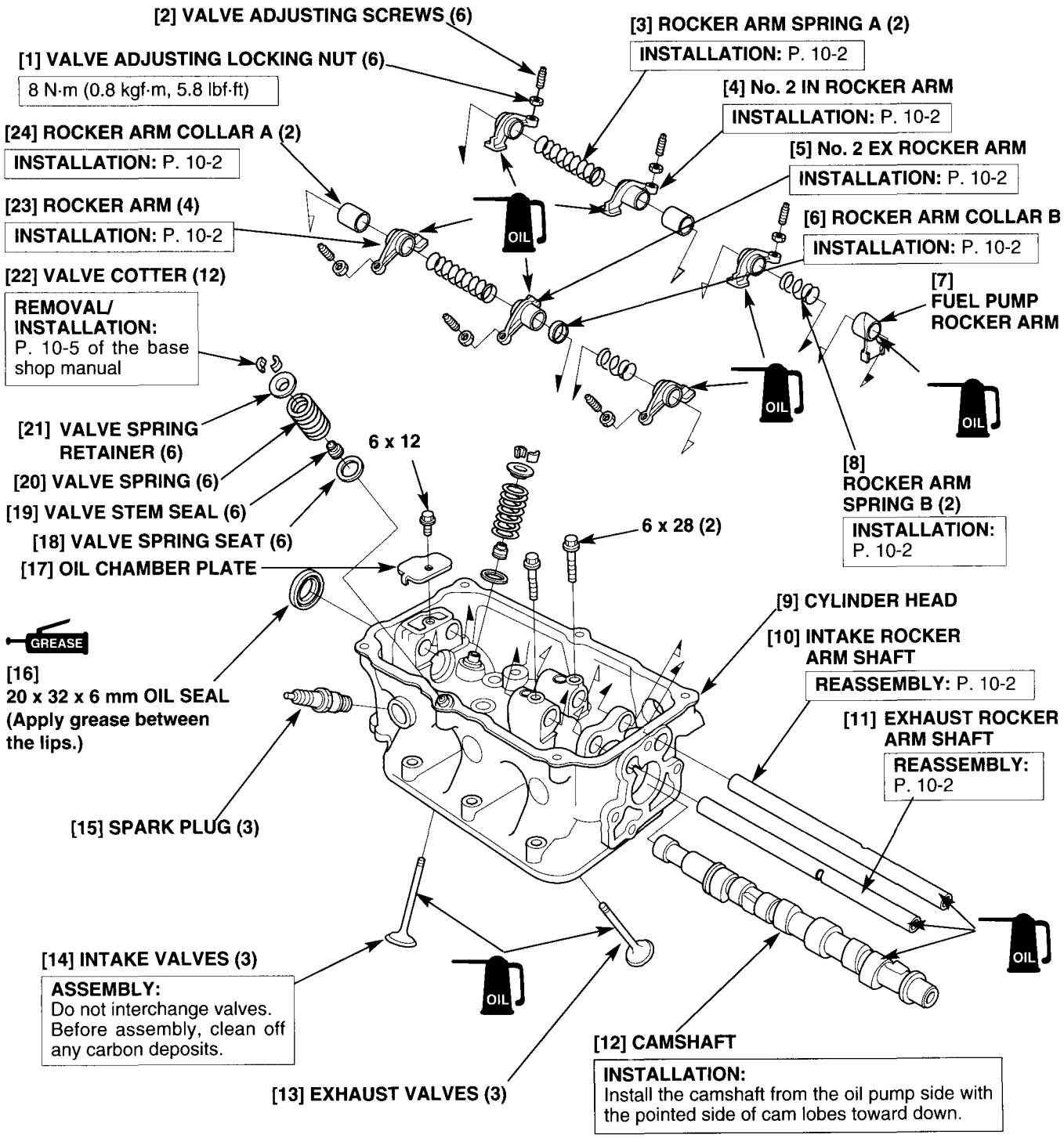
5) Replace the ECT sensor if necessary.
   - See P. 9-1 ECT SWITCH of the base shop manual.



1. CYLINDER HEAD (Recoil Starter Type)

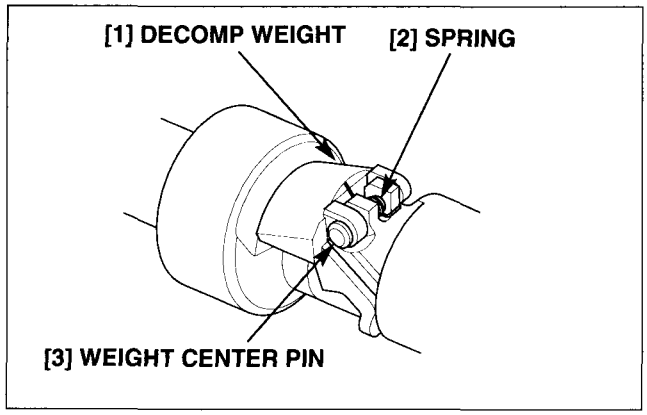
a. DISASSEMBLY/REASSEMBLY

Remove the cylinder head assembly (P. 10-1 of the base shop manual).



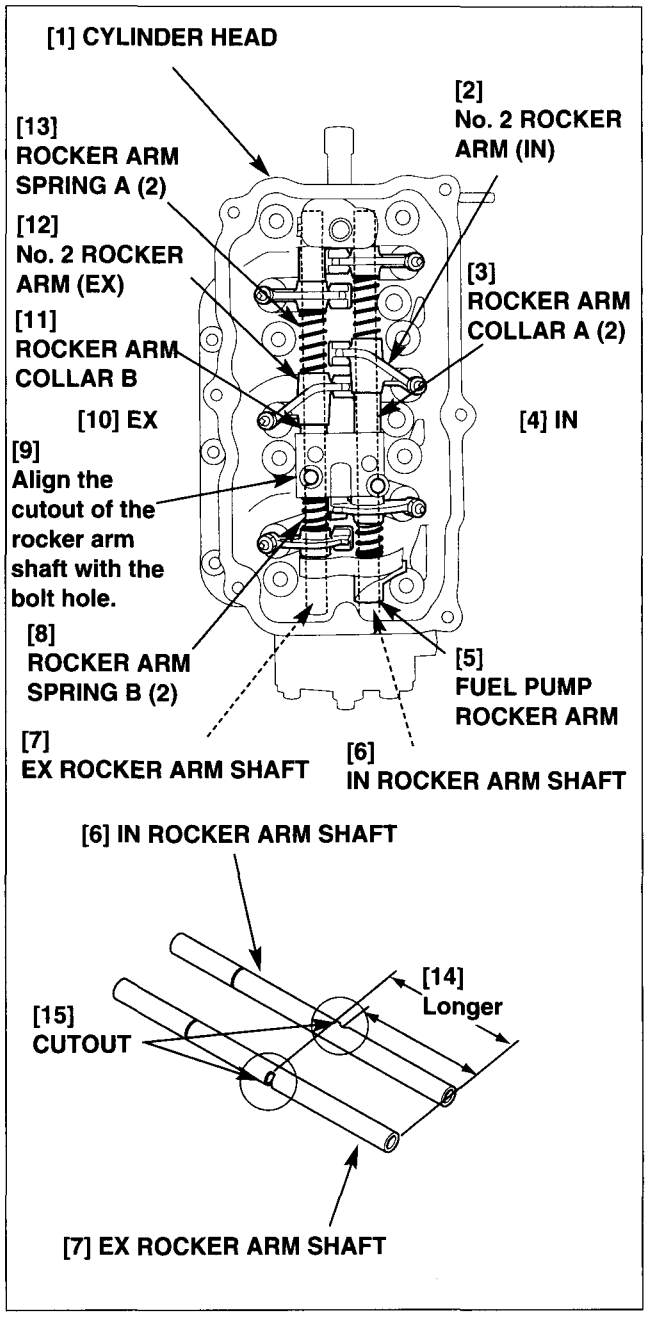
• MECHANICAL DECOMP INSPECTION

Inspect that the decompressor weight moves smoothly, and spring is not weak or worn.



• ROCKER ARM SHAFT INSTALLATION

- Loosen the valve adjusting screw of each locker arm fully.
- Place the rocker arms, rocker arm springs and rocker arm collars noting the installation direction.
- Install the rocker am shafts with cutout facing out side and align the cutout with the bolt hole of the cylinder head.



1. CYLINDER BLOCK/CRANKSHAFT

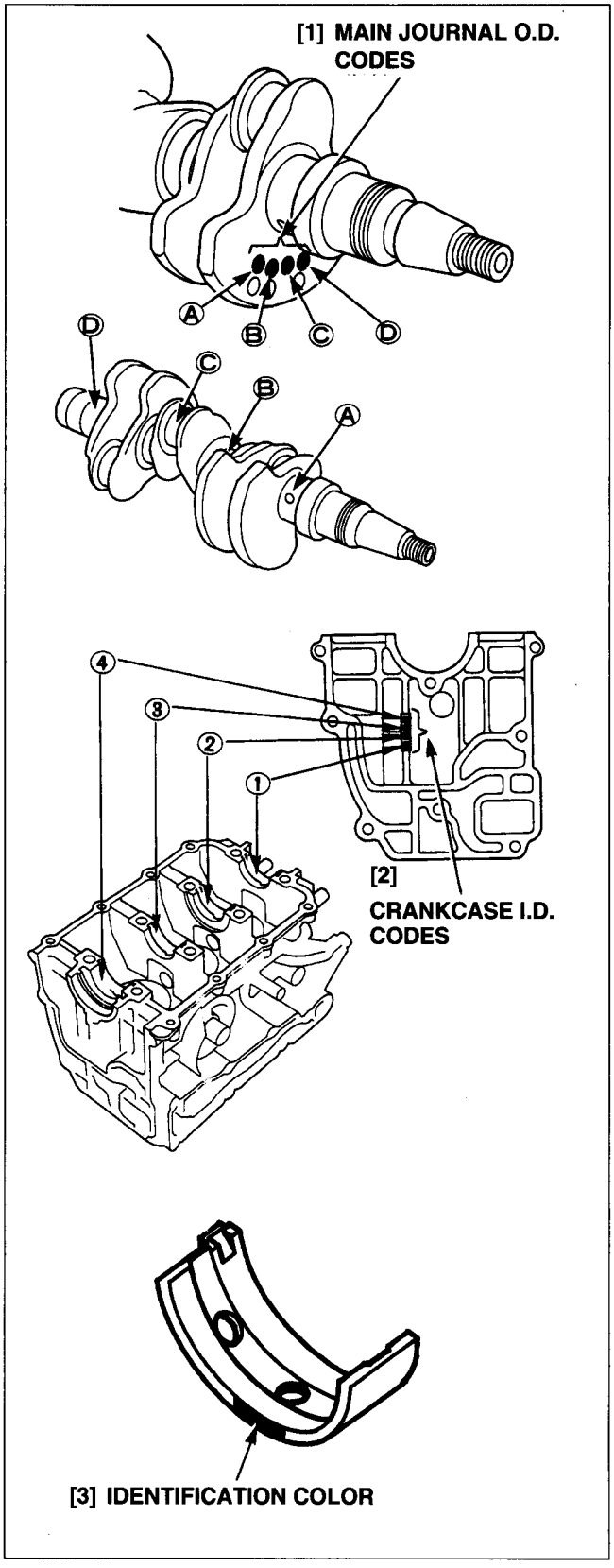
a. BEARING SELECTION

• Crankshaft Main Bearing

1) Record the crankshaft main journal O.D. code.
2) Record the crankcase I.D. code.
3) Cross-reference the main journal O.D. code and I.D. cord to determine the replacement bearing color from the table shown below.

Unit: mm (in)

Crankcase I.D. code / Main journal O.D. code		A	B	C
		39.000 – less than 39.008 (1.5354 – less than 1.5357)	39.008 – less than 39.016 (1.5357 – less than 1.5361)	39.016 – 39.024 (1.5361 – 1.5364)
1	35.994 – 36.002 (1.4171 – 1.4181)	RED	PINK	YELLOW
2	35.986 – less than 35.994 (1.4168 - less than 1.4171)	PINK	YELLOW	GREEN

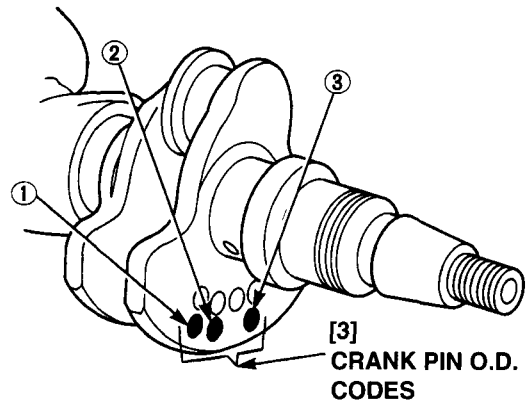


• Connecting Rod Bearing

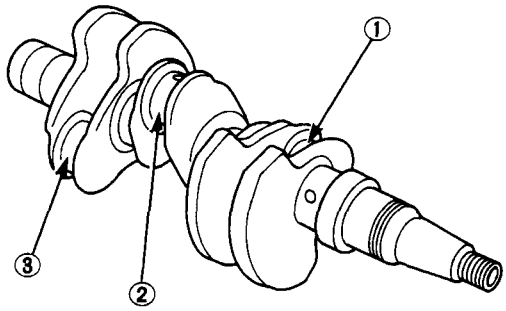
1) Record the crank pin O.D. code.
2) Record the connecting rod I.D. code.
3) Cross-reference the crank pin O.D. code and connecting rod I.D. code to determine the replacement bearing from the table shown below.

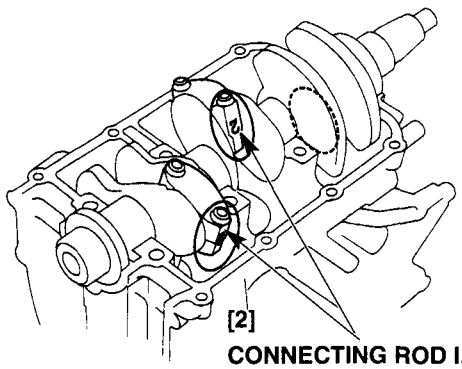
Unit: mm (in)

Connecting rod I.D. code / Crank pin O.D. code		1	2	3
		35.000 – less than 35.008 (1.3780 – less than 1.3783)	35.008 – less than 35.016 (1.3783 – less than 1.3786)	35.016 – 35.024 (1.3786 – 1.3789)
A	32.003 – 32.011 (1.2600 – 1.2603)	RED	PINK	YELLOW
B	31.995 – less than 32.003 (1.2596 – less than 1.2600)	PINK	YELLOW	GREEN
C	31.987 – less than 31.995 (1.2593 – less than 1.2596)	YELLOW	GREEN	BROWN

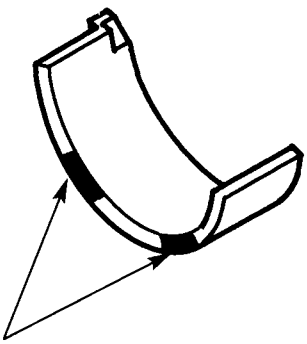


[3]
CRANK PIN O.D. CODES





[2]
CONNECTING ROD I.D. CODES



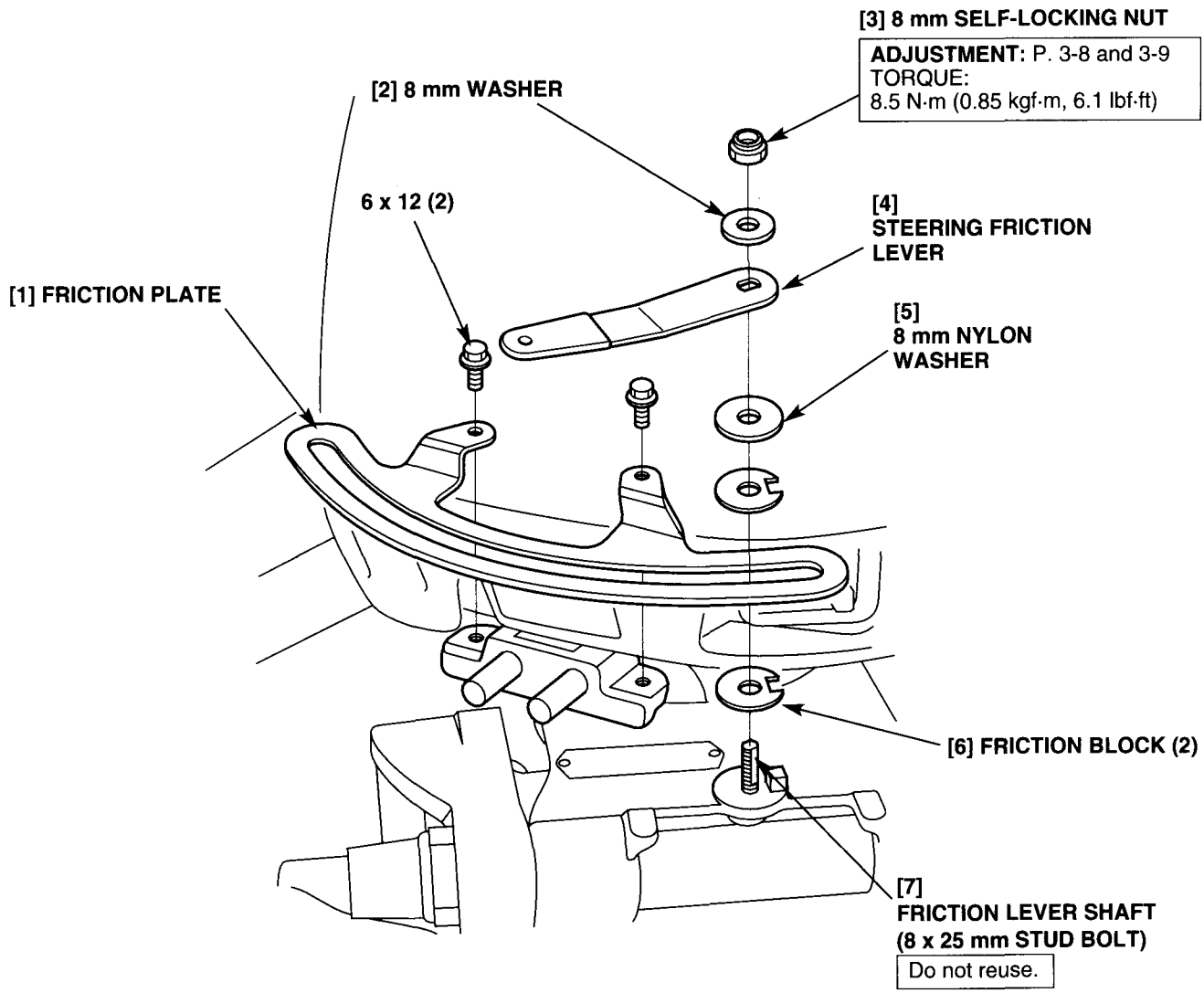
[3]
IDENTIFICATION COLOR

1. STEERING FRICTION LEVER (Long Tiller Handle Type Without Mechanical Tilt)
2. GAS ASSISTED TILT
3. POWER TRIM/TILT
4. TILT STOPPER

1. STEERING FRICTION LEVER (Long Tiller Handle Type Without Mechanical Tilt)

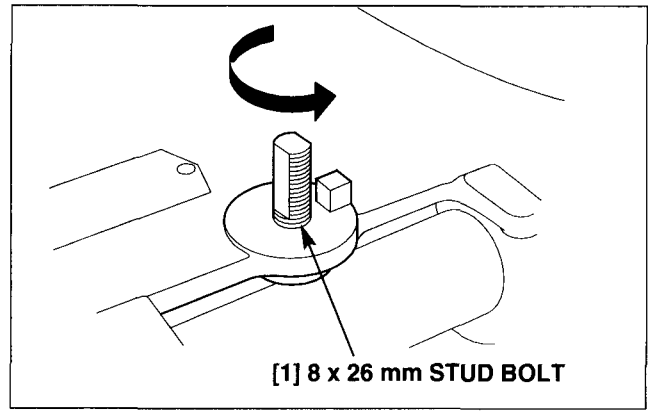
a. DISASSEMBLY

Remove the long tiller handle assembly (P. 15-1).



b. ASSEMBLY

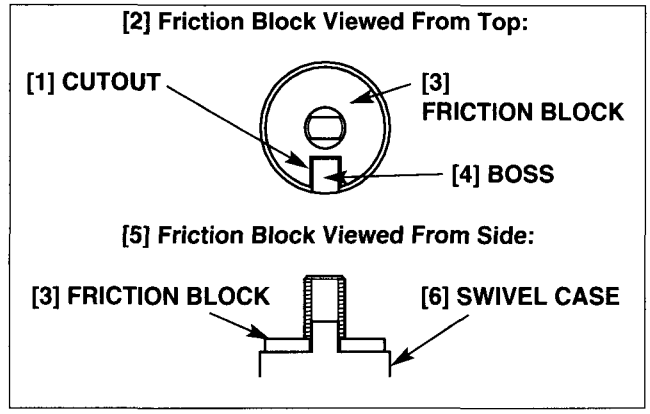
1) Tighten a new 8 x 26 mm stud bolt fully, then back it off 1/4 to 3/4 turns out.



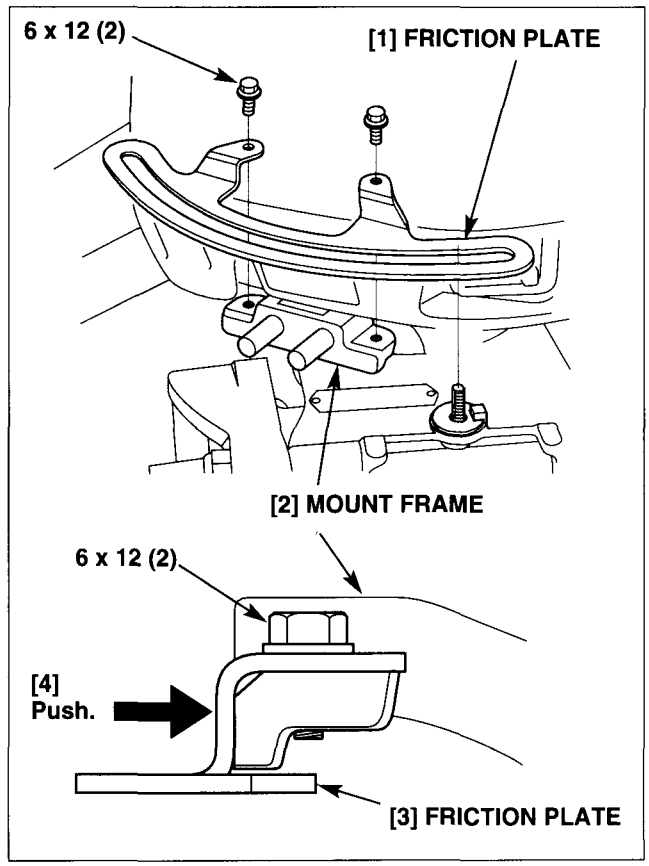
2) With the friction block disc surface facing up (i.e. engine under case side), install one of the friction blocks onto the friction lever shaft by aligning the cutout in the friction block with the boss on the swivel case.

CAUTION

- **Check the two friction block disc surfaces for wear. If both or either one is worn, replace with new ones as a set.**
- **Check the friction block disc surface for contamination with grease. Degrease if necessary.**



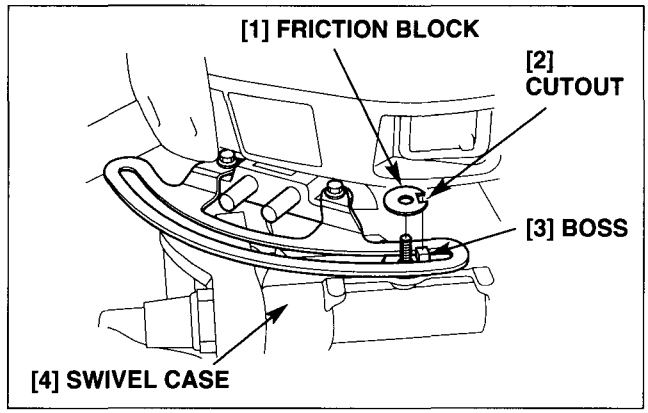
3) Install the friction plate on the mount frame and loosely tighten the two 6 x 12 mm flange bolts.
Pushing the friction plate toward the mount frame in the direction shown by arrow, tighten the 6 x 12 mm flange bolts securely.



4) With the friction block disc surface facing down (i.e. friction plate side), install the other friction block by aligning the cutout in the friction block with the boss on the swivel case.

CAUTION

Check the friction block disc surface for contamination with grease. Degrease if necessary.



5) Check the 8 mm nylon washer, steering friction lever and the 8 mm washer for contamination with grease.

CAUTION

If the 8 mm nylon washer, steering friction lever and/or the 8 mm washer is contaminated with grease, degrease the part securely.

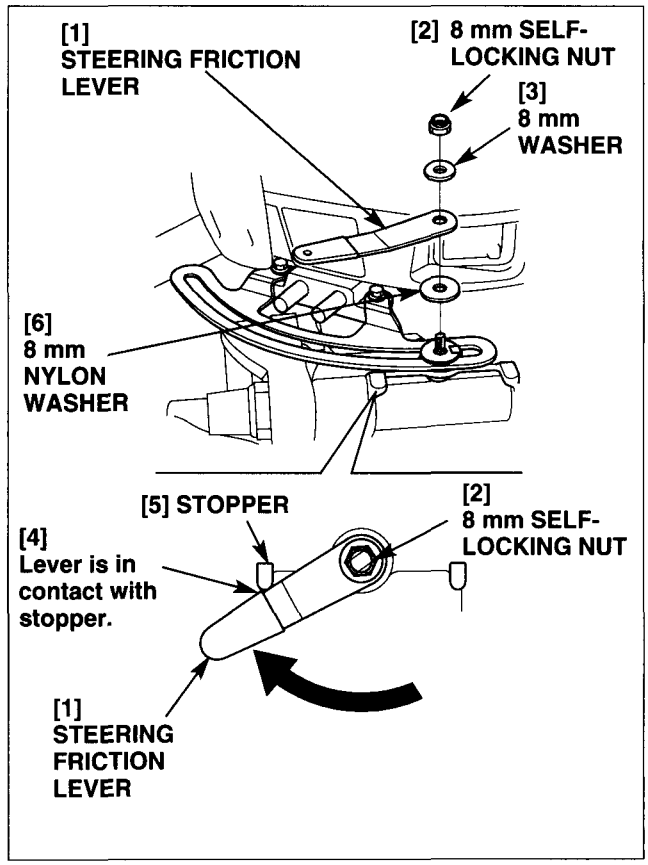
6) Install the 8 mm nylon washer, steering friction lever, 8 mm washer and the 8 mm self-locking nut.

7) Turn the steering friction lever to the lock position (i.e. fully to the left until it contacts the stopper), and tighten the 8 mm self-locking nut to the specified torque.

TORQUE: 8.5 N·m (0.85 kgf·m, 6.1 lbf·ft)

8) Install the long tiller handle assembly (P. 15-13).

9) After assembly, check the starting torque by measuring the starting force at the center of the throttle grip using a spring scale (P. 3-8).



2. GAS ASSISTED TILT

a. DISASSEMBLY/ASSEMBLY

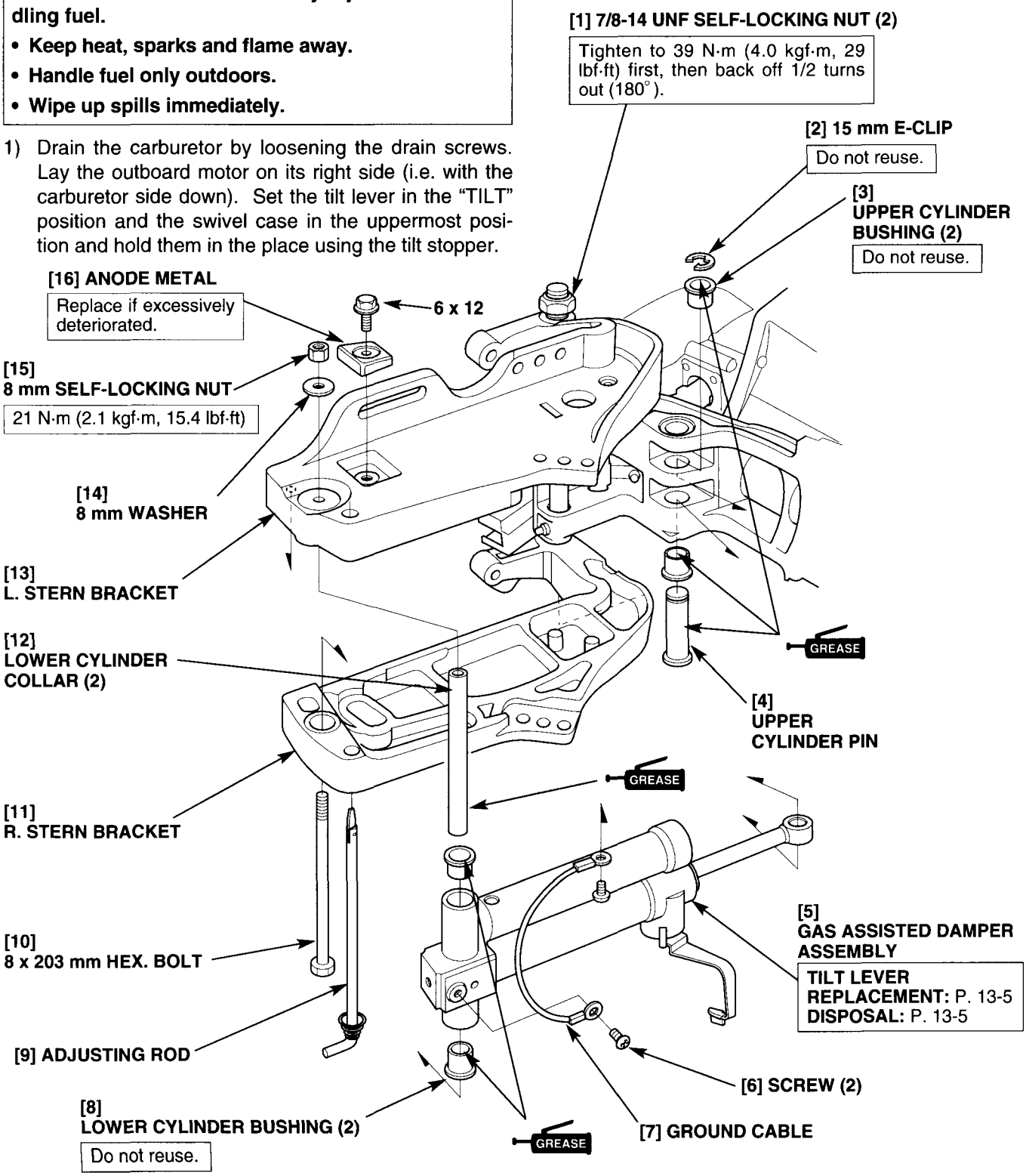
⚠WARNING

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.**

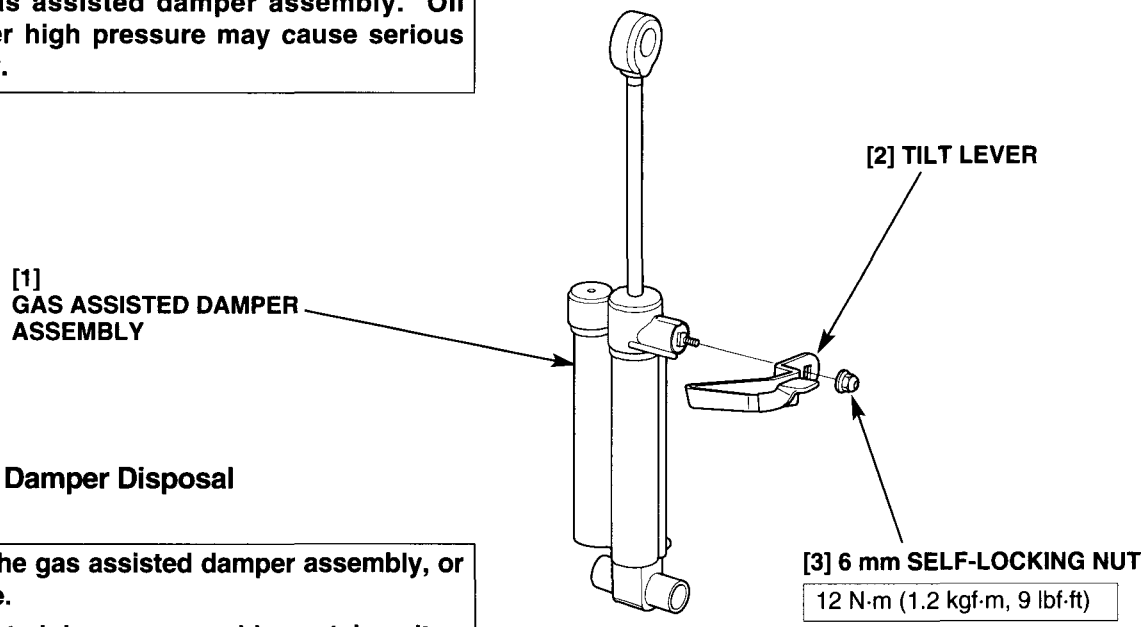
1) Drain the carburetor by loosening the drain screws. Lay the outboard motor on its right side (i.e. with the carburetor side down). Set the tilt lever in the "TILT" position and the swivel case in the uppermost position and hold them in the place using the tilt stopper.



• Tilt Lever Replacement

CAUTION

The gas assisted damper assembly contains nitrogen gas and oil under high pressure. Do not disassemble the gas assisted damper assembly. Oil escaping under high pressure may cause serious personal injury.



• Gas Assisted Damper Disposal

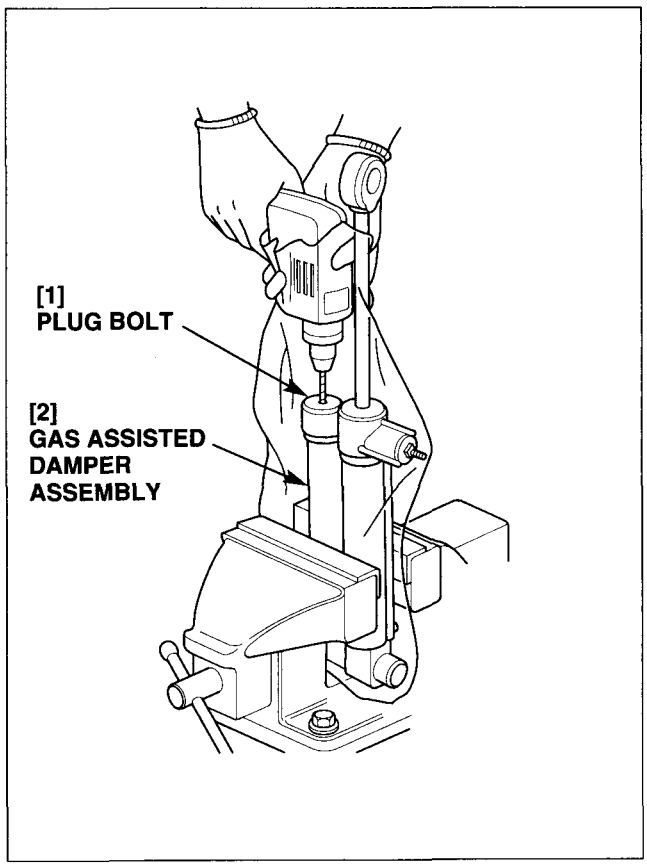
CAUTION

- **Do not heat the gas assisted damper assembly, or it will explode.**
- **The gas assisted damper assembly contains nitrogen gas and oil under high pressure. Do not disassemble the gas assisted damper assembly. Oil escaping under high pressure may cause serious personal injury.**
- **Dispose of the gas assisted damper assembly after releasing gas from it in the following procedure.**

1) Set the tilt lever in the "TILT" position with the piston rod of the gas assisted damper assembly fully extended.
2) Wrap the gas assisted damper assembly inside a plastic bag and hold it upright in a vice as shown.
3) Through the open end of the plastic bag, insert a drill motor with a sharp 2 - 3 mm (5/64 – 1/8 in) drill bit.
   Hold the bag around the drill motor and briefly run the drill motor inside the bag; this will inflate the bag with air from the drill motor and keep the bag from getting caught in the bit when you start.
   Drill the plug bolt on the reservoir top to release the gas pressure.

   CAUTION

   - **Drill only at the specified point.**
   - **Always wear eye protection to avoid getting metal shaving in your eyes when the gas pressure is released. The plastic bag is only intended to shield you from the escaping gas.**



3. POWER TRIM/TILT

a. REMOVAL

• Drain the carburetor by loosening the drain screws and remove the motor from the engine.

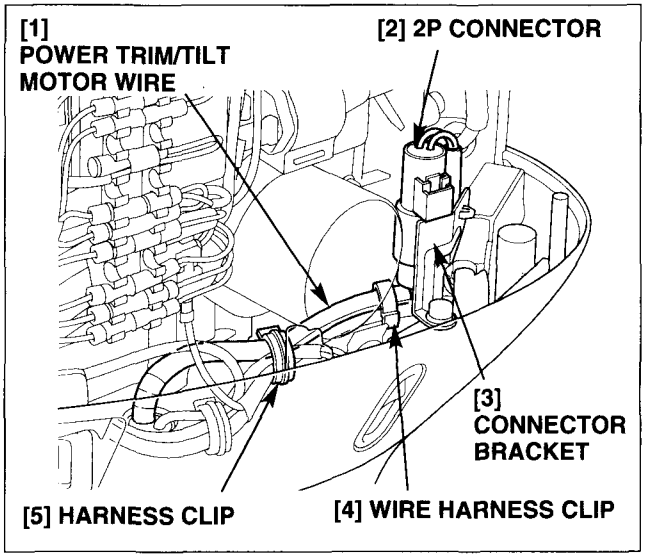
⚠WARNING

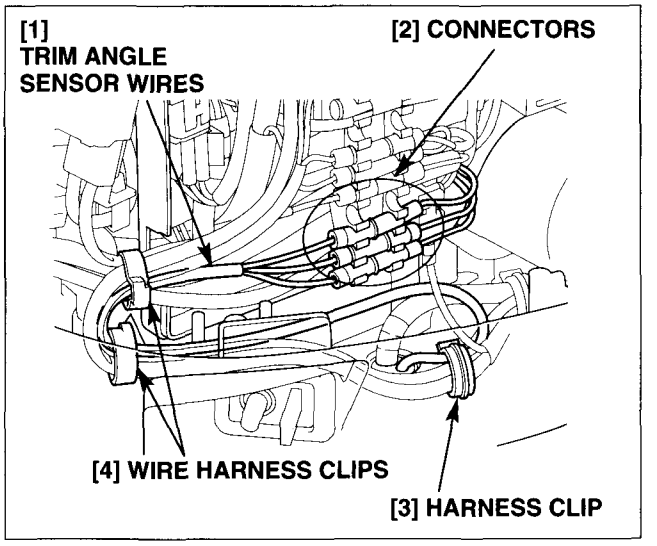
Gasoline is highly flammable and explosive.

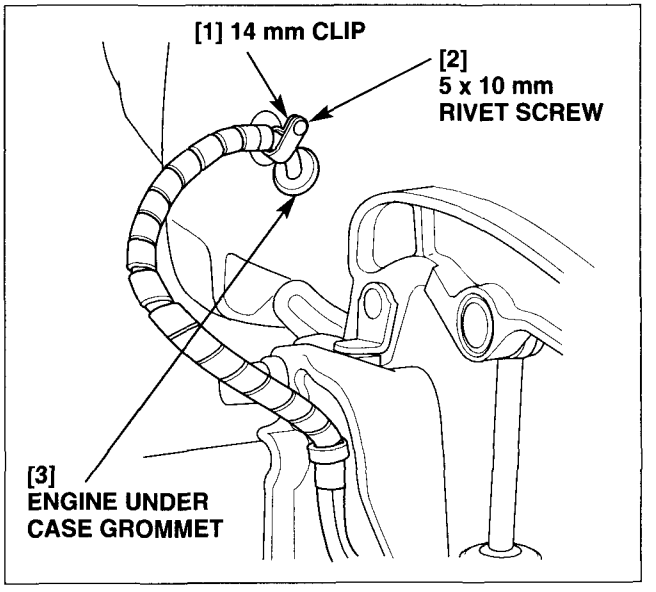
You can be burned or seriously injured when handling fuel.

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

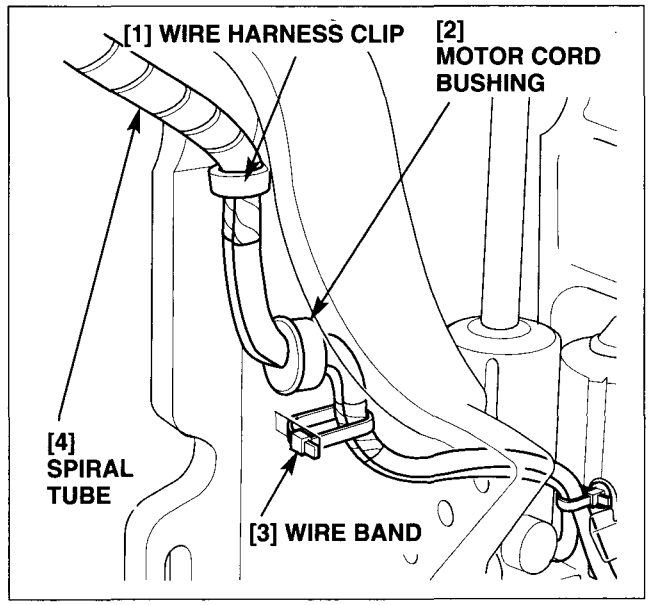
1) Remove the engine cover and CDI unit cover (P. 8-3 of the base shop manual).
2) Lay the outboard motor on its right side (i.e. with the carburetor side down).
3) With the right stern bracket raised off, operate the power trim/tilt switch and set the swivel case in the uppermost position.
   After setting the outboard motor in the uppermost position, hold it in the position with the tilt stopper.
4) Remove the power trim/tilt motor wire.
   —Open the wire harness clip.
   —Release the wires from the two harness clips.
   —Remove the power trim/tilt motor 2P connector from the connector bracket and disconnect the connector.
5) Disconnect the trim angle sensor wire from the engine side.
   —Open the two wire harness clips.
   —Release the wires from the harness clip.
   —Remove the trim angle sensor wire connector from the connector bracket and disconnect the connector.
6) Remove the 5 x 10 mm rivet screw and remove the 14 mm clip.
7) Remove the engine under case grommet and pull off the wire from the engine under case.



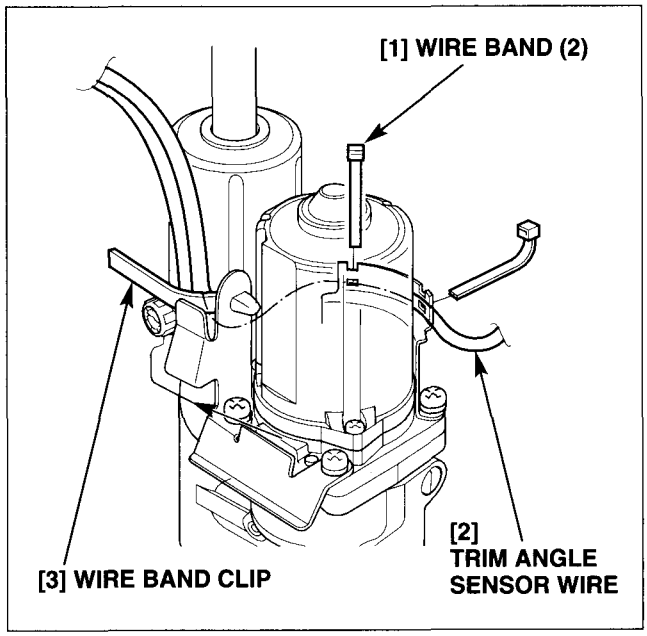




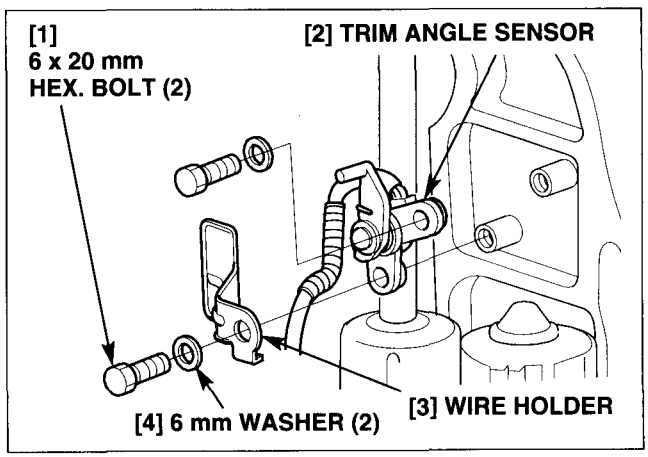
8) Remove the power trim/tilt motor wire and trim angle sensor wire from the left stern bracket.
   - Remove the spiral tube.
   - Open the wire harness clip.
   - Remove the harness band.
   - Remove the motor cord bushing and pull off the wires.



9) Remove the wire bands and remove the trim angle sensor wire from the power trim/tilt assembly.



10) Remove the 6 x 20 mm hex bolts and 6 mm washers, then remove the wire holder and trim angle sensor.

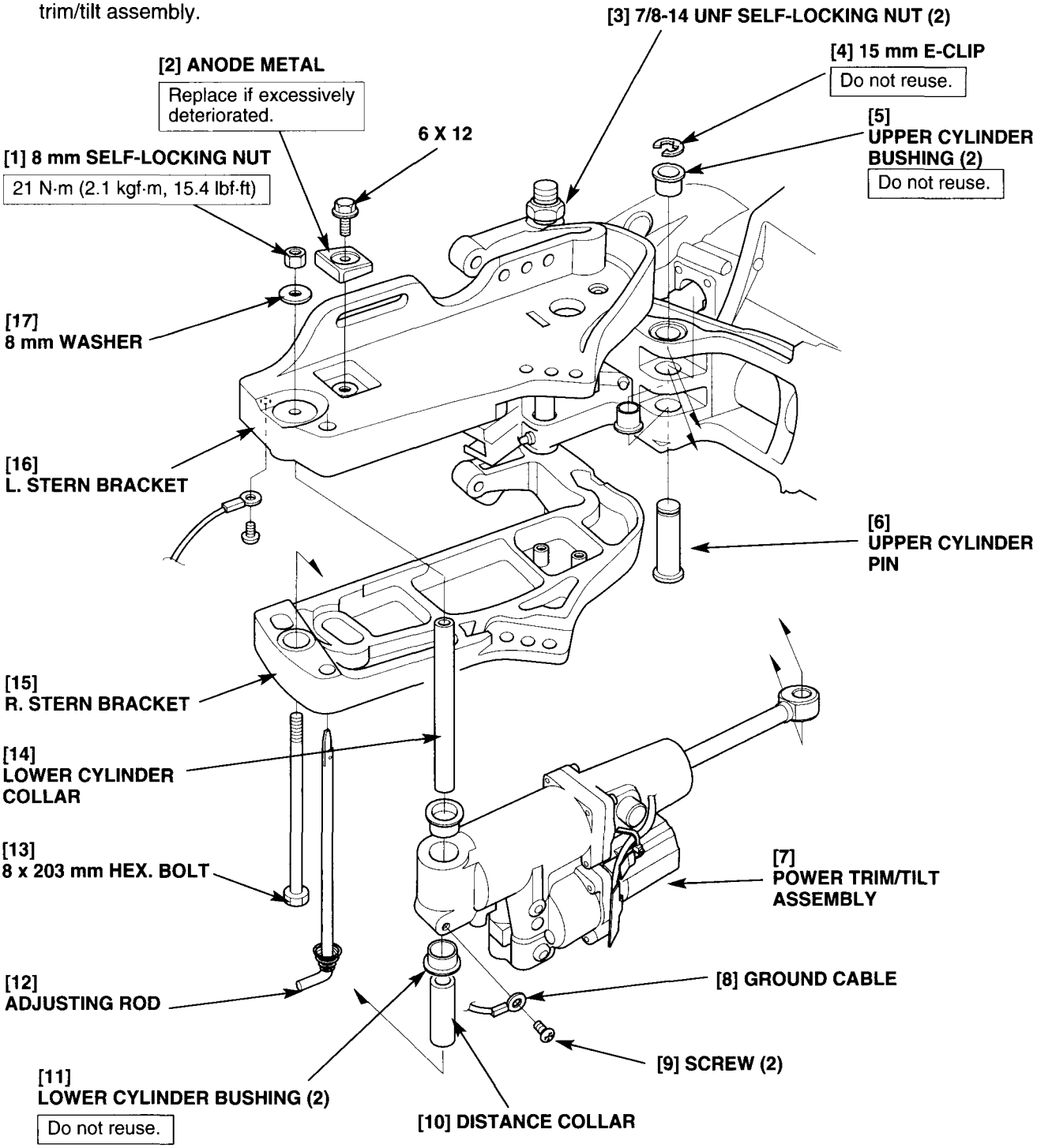


11) Remove the 15 mm E-clip and remove the upper cylinder pin.

12) Remove the 8 mm self-locking nut, 8 mm washer and the 8 x 203 mm hex. bolt.

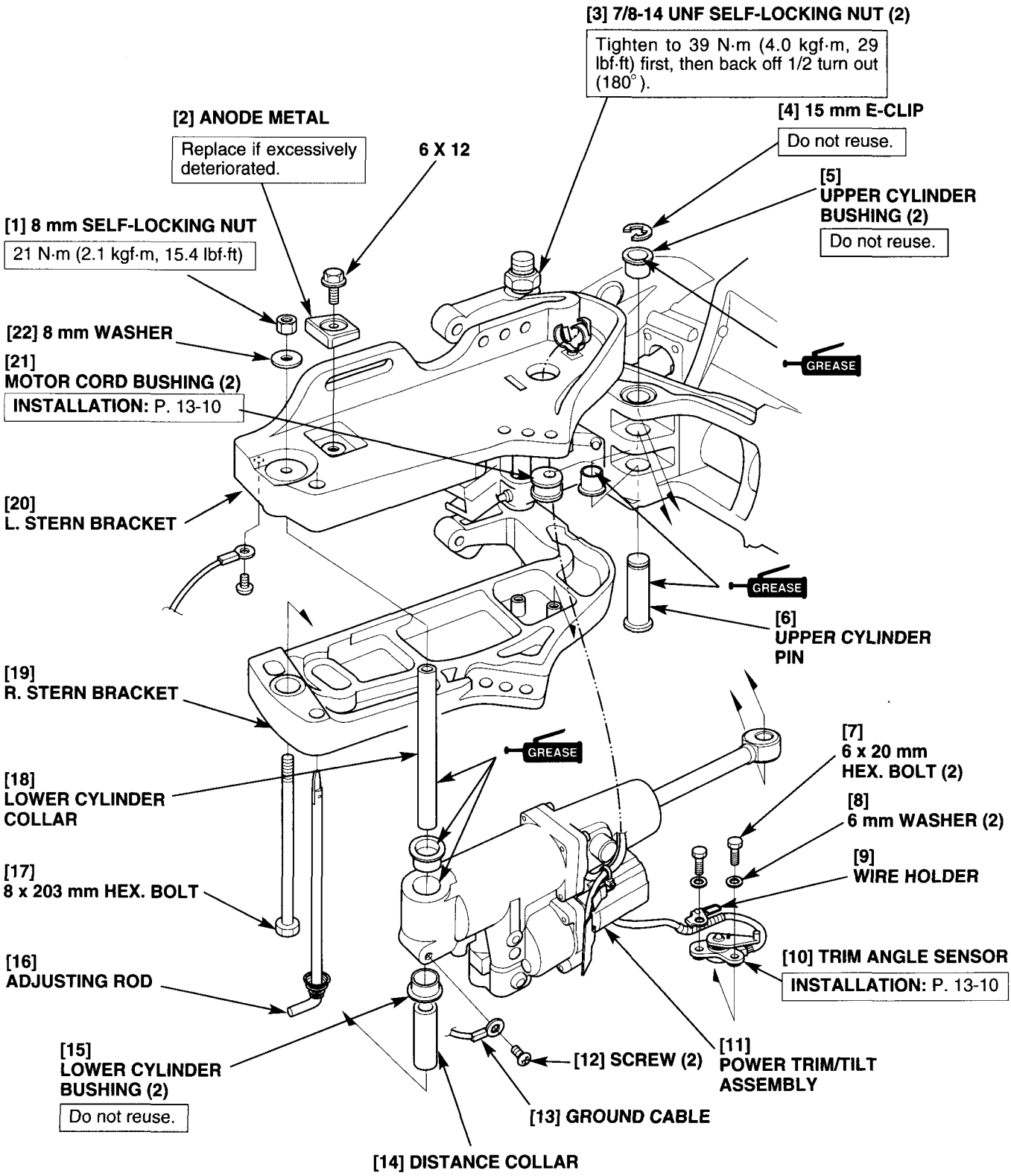
13) Loosen the 7/8-14 UNF self-locking nuts and raise the left stern bracket off.

14) Disconnect the ground cable and remove the power trim/tilt assembly.



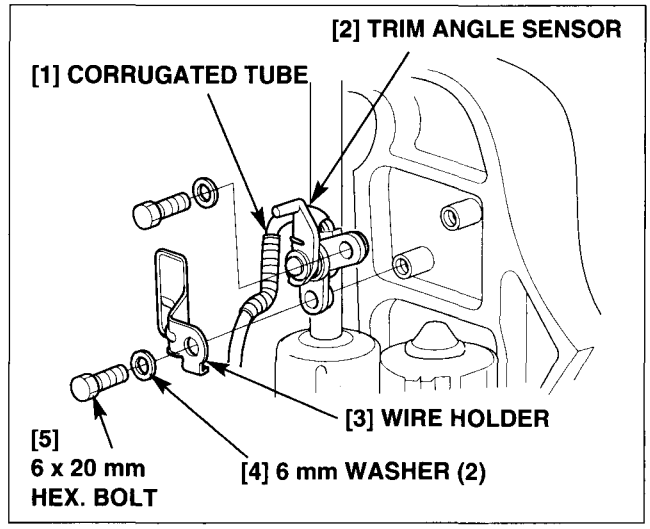
b. INSTALLATION

Install the power trim/tilt motor in the reverse order of removal.



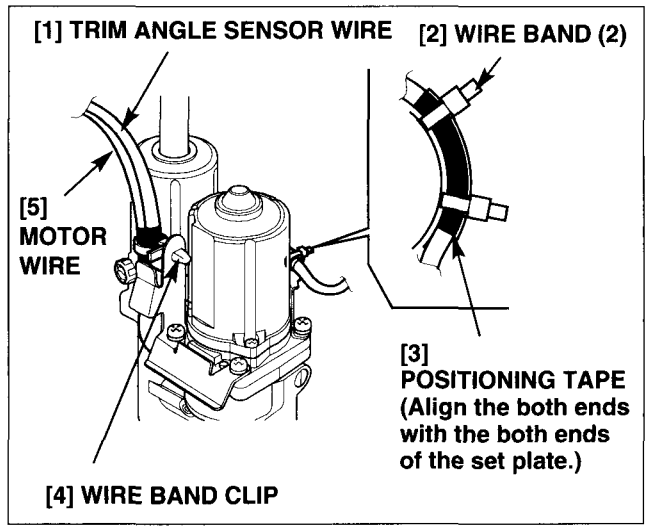
• Trim Angle Sensor Installation

- Set the corrugated tube at the wire holder with the slit facing to the wire holder.



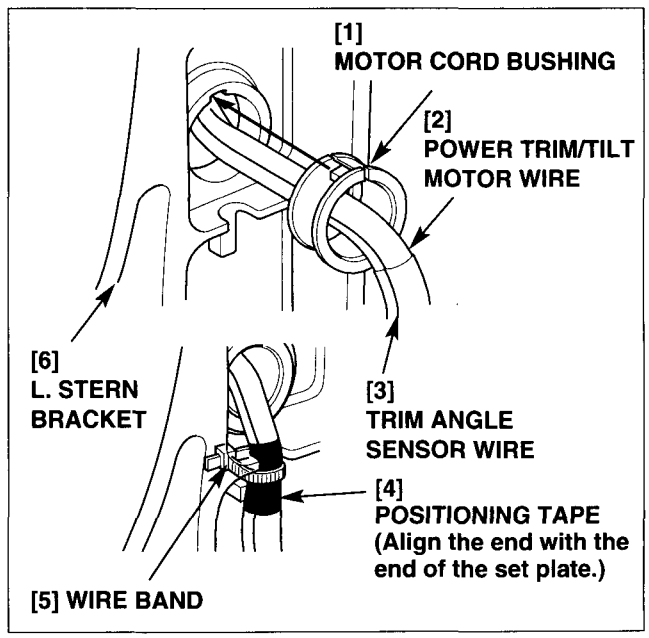
• Trim Angle Sensor Wire Installation

- Set the trim angle sensor side positioning tape (White) on the trim angle sensor wire by aligning its end with the end of the set plate, and secure with the wire band.
- Secure the power trim/tilt motor wire and trim angle sensor wire by securing with the wire band clip in the center of the positioning tape (White).



• Trim Angle Sensor Wire & Power Trim/Tilt Motor Wire Installation

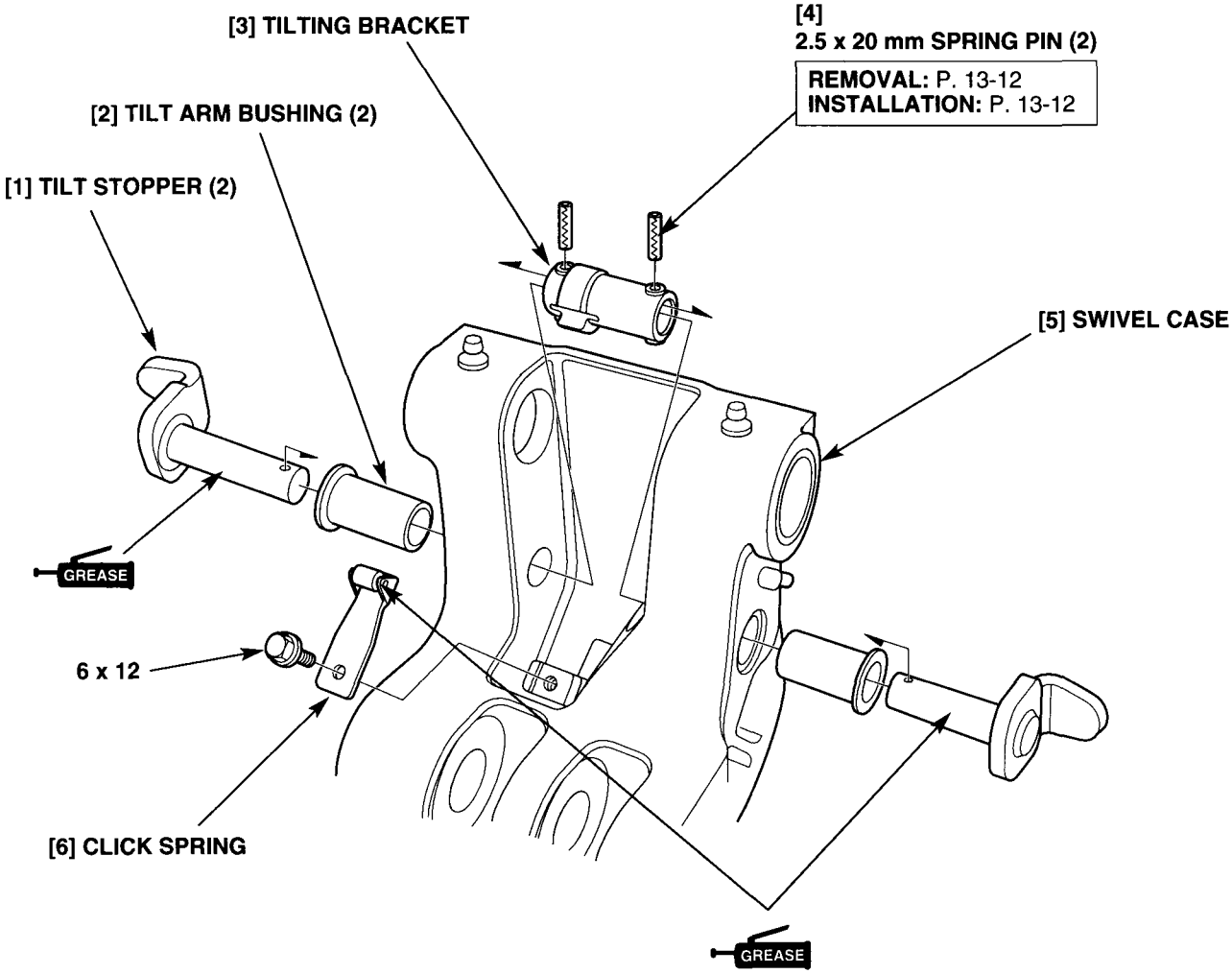
- Set the motor cord bushing aligning the boss of the motor cord bushing with the groove in the left stern bracket.
- Secure the power trim/tilt motor wire and trim angle sensor wire against the left stern bracket using the wire band in the center of the positioning tape.



4. TILT STOPPER

a. DISASSEMBLY/ASSEMBLY

1) Remove the stern brackets (P. 13-8 of the base shop manual.)

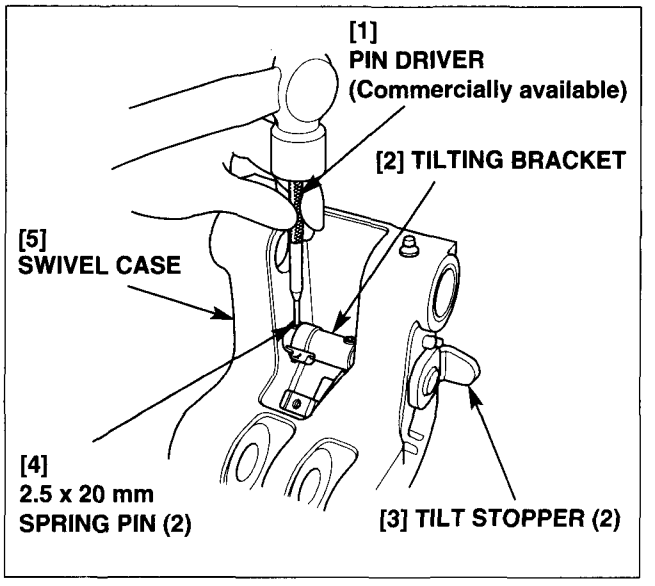


• Spring Pin Removal

- Drive out the 2.5 x 20 mm spring pins from the tilting bracket using a commercially available pin driver as shown.

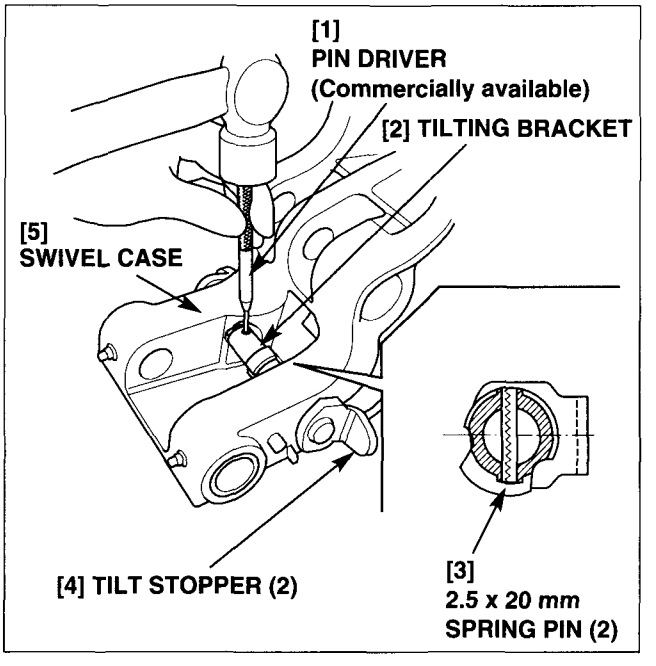
CAUTION

Drive out the 2.5 x 20 mm spring pins with care not to let it contact the swivel case.



• Spring Pin Installation

1) Install the tilt stoppers and tilting bracket on both sides of the swivel case.
2) Set the tilt stoppers and tilting bracket in the position shown.
3) Using a commercially available pin driver, install the 2.5 x 20 mm spring pins by aligning the spring pin installation hole in the tilt stopper with the spring pin installation hole in the tilting bracket.
4) After installation, be sure that the spring pin is not protruding from the tilting bracket.



1. REMOTE CONTROL BOX

a. DISASSEMBLY/REASSEMBLY

• REMOTE CONTROL LEVER

REMOVAL:

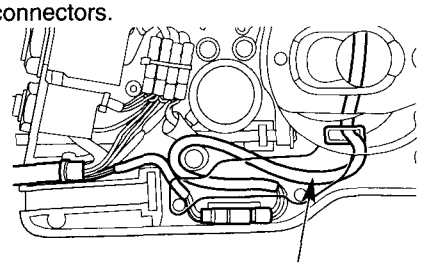
1) Remove the remote control box housings B and C (P. 14-3 of the base shop manual).
2) Disconnect the remote control cables (P. 14-3 of the base shop manual).
3) Remove the 5 x 8 mm self-tapping screw and power tilt cord clamp.
4) Disconnect the power trim/tilt switch wire connectors.
5) Remove the remote control lever (P. 14-6 of the base shop manual).

INSTALLATION:

Installation is the reverse order of removal.

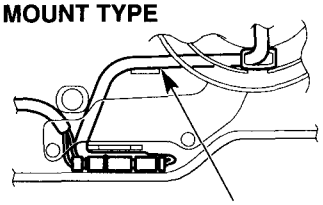
[1] POWER TRIM/TILT SWITCH WIRE

INSTALLATION:
Route the switch wire as shown and connect the connectors.

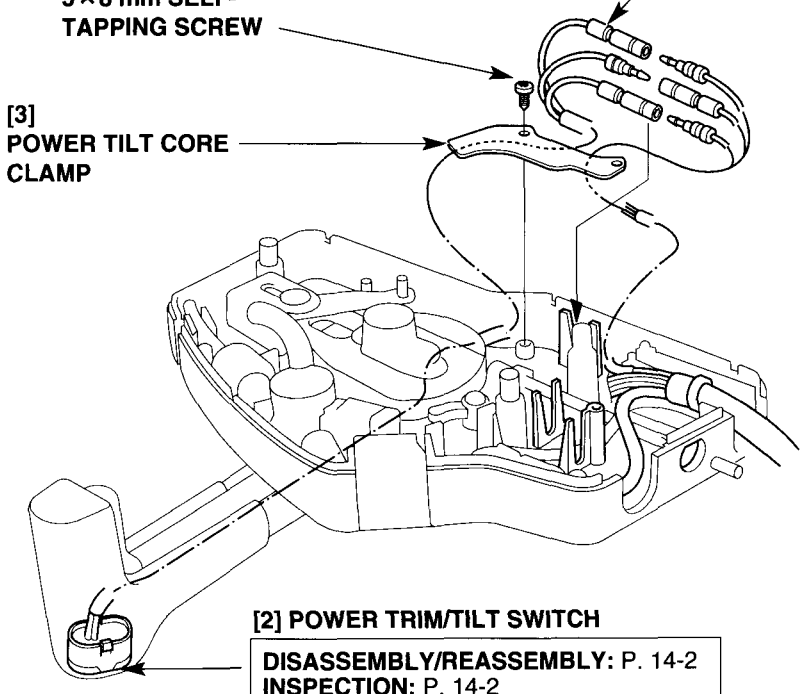


[1]-1 POWER TRIM/TILT SWITCH WIRE

[1]-2 PORT MOUNT TYPE



[1]-1 POWER TRIM/TILT SWITCH WIRE

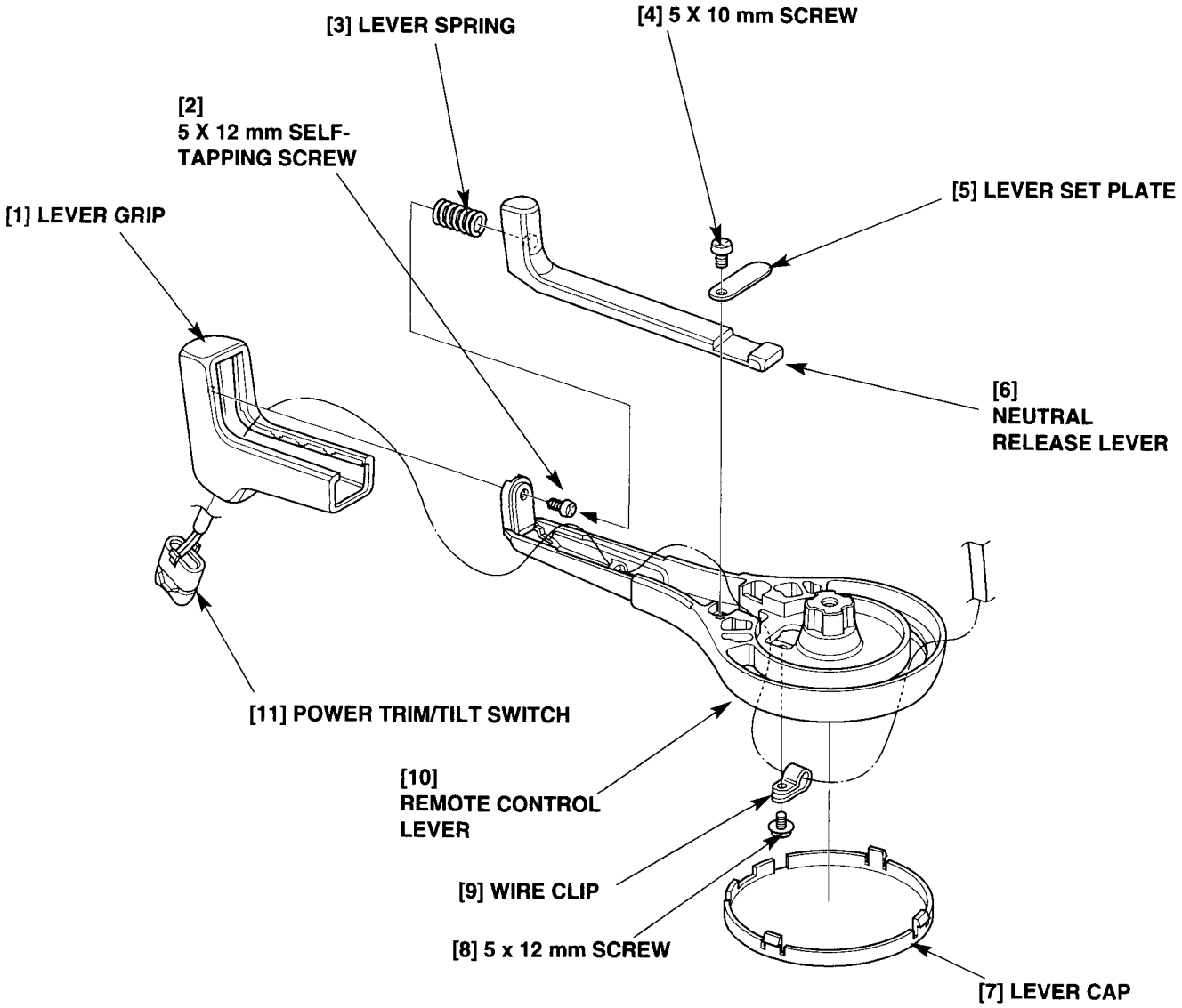


[2] POWER TRIM/TILT SWITCH

DISASSEMBLY/REASSEMBLY: P. 14-2
INSPECTION: P. 14-2

• **DISASSEMBLY/REASSEMBLY**

1) Remove the remote control lever (P. 14-1).



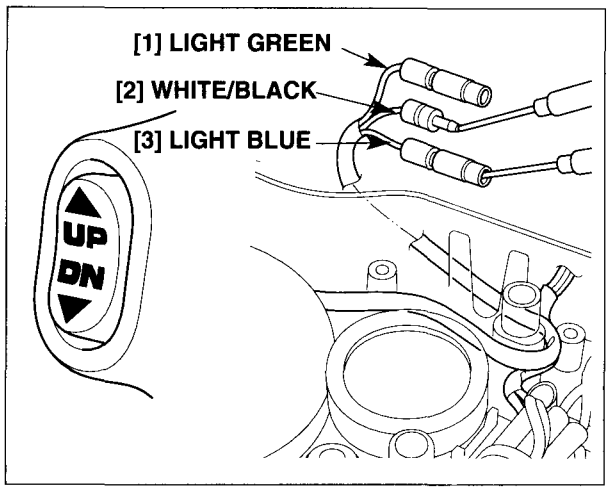
b. INSPECTION

• **POWER TRIM/TILT SWITCH**
• **POWER TILT SWITCH**

Check for continuity between the terminals according to the table below.

There should be continuity between O—O.

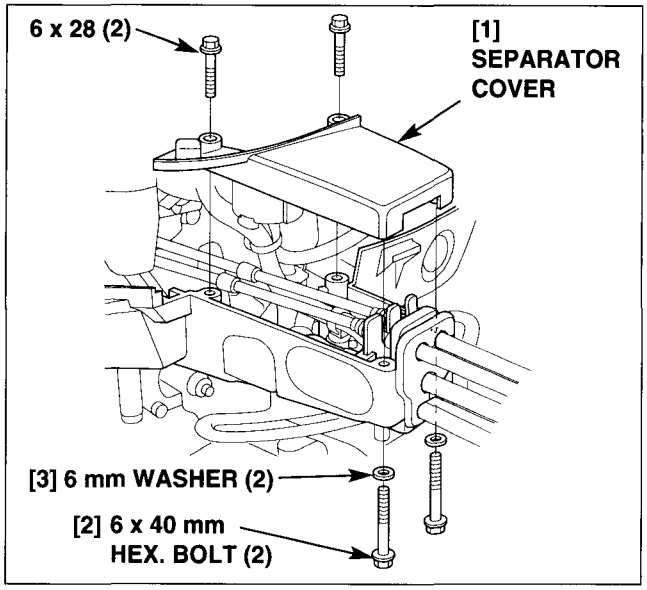
Collar / Position	Light blue	White/black	Light green
UP		O	O
Normal			
DOWN	O	O	



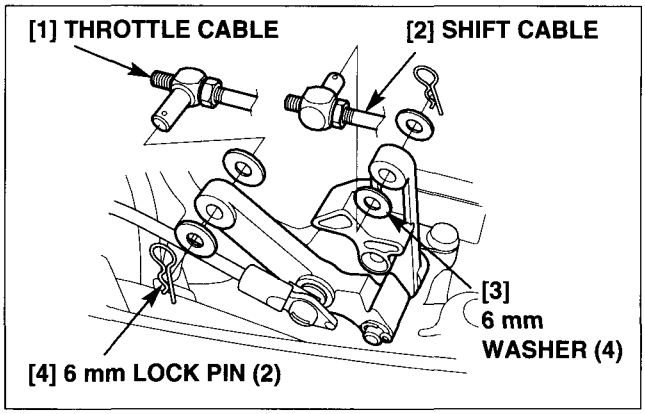
1. LONG TILLER HANDLE

a. REMOVAL

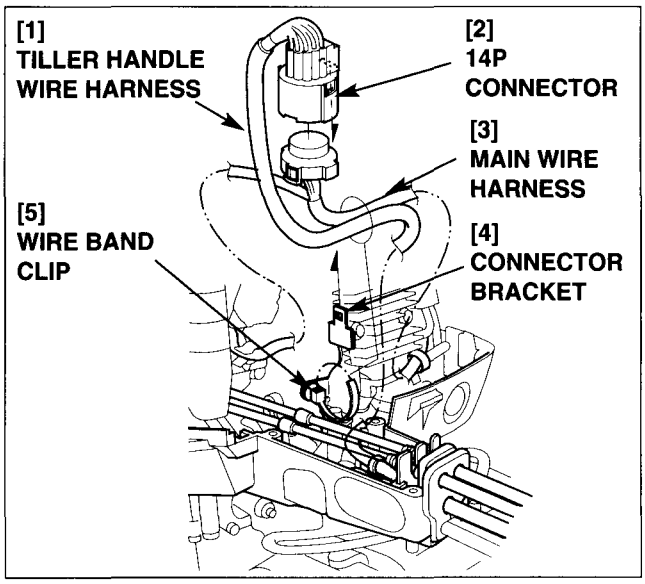
1) Remove the engine cover (P. 4-1 of the base shop manual).
2) Set the shift lever in the "N" (Neutral) position.
3) Remove the two 6 x 28 mm flange bolts, two 6 x 40 mm hex. bolts and two 6 mm washers, and remove the separator cover.



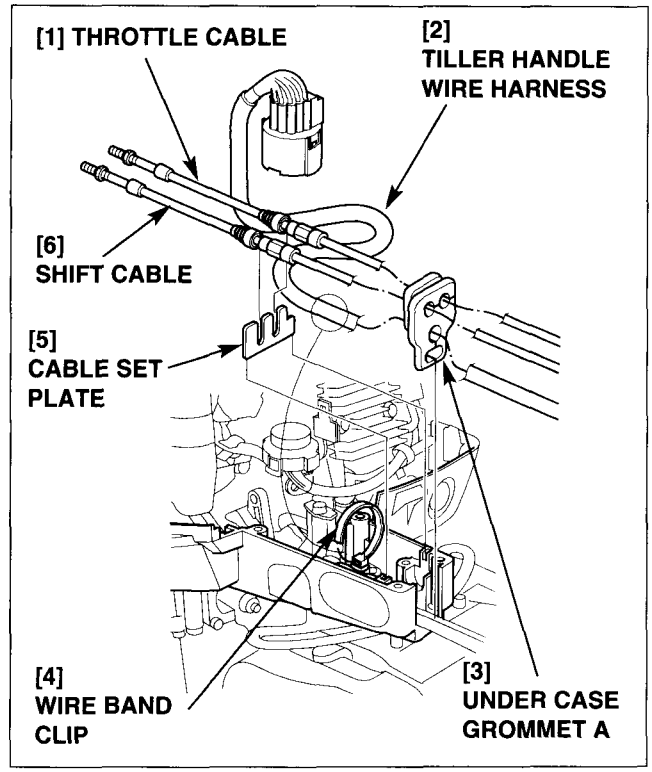
4) Remove the 6 mm lock pins and 6 mm washers, then disconnect the shift cable and throttle cable.



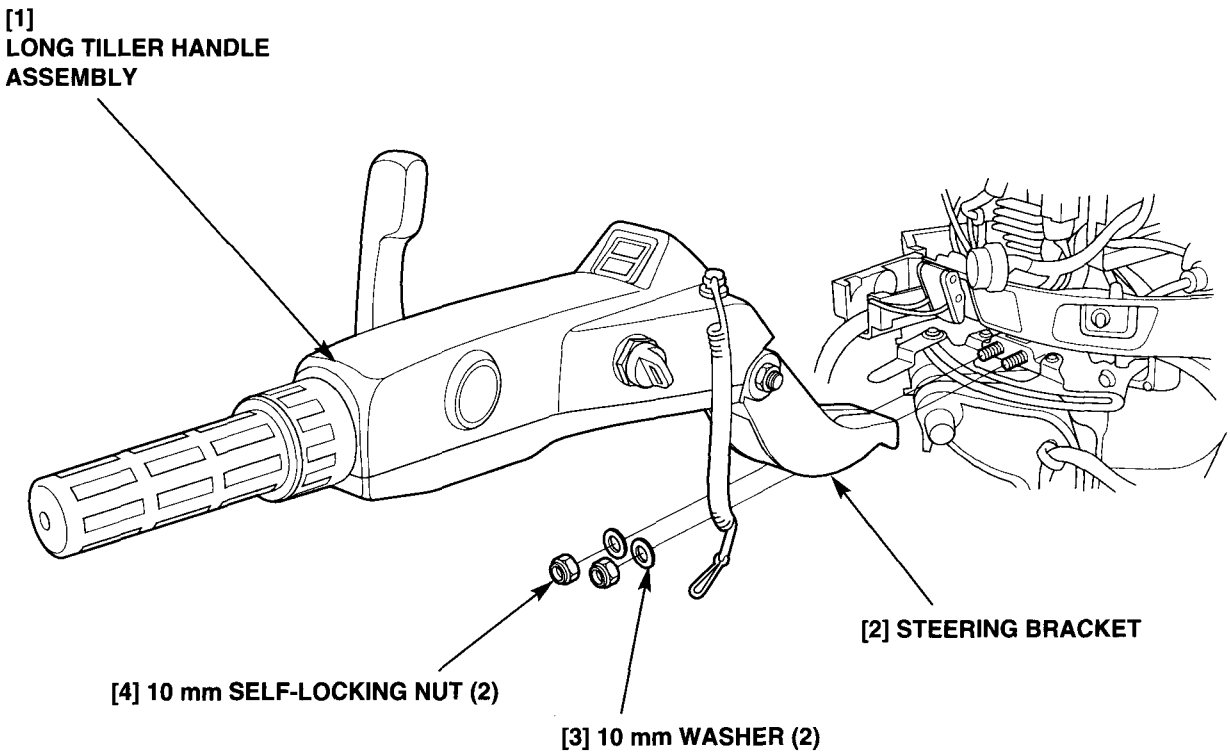
5) Open the wire band clip and release the tiller handle wire harness and main wire harness.
6) Remove the tiller handle wire harness 14P connector from the connector bracket, and disconnect the connector.



7) Remove the two remote control cables from the under case grommet A and remote control cable set plate.
8) Remove the remote control cable set plate
9) Open the wire band clip and release the tiller handle wire harness.
10) Remove the under case grommet A from the engine under case and remove the tiller handle wire harness from the under case grommet A.



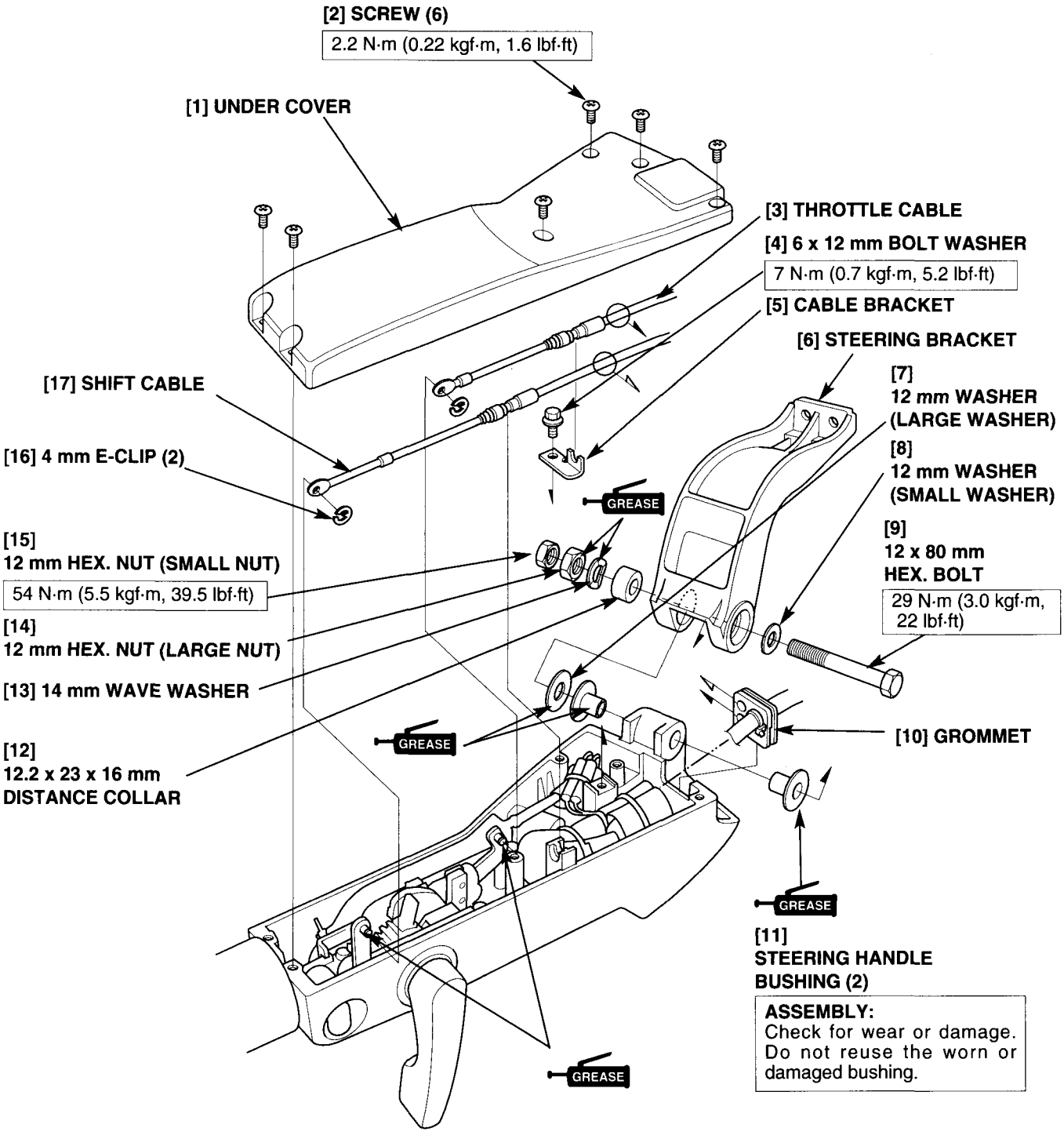
11) Remove the two self-locking nuts that tighten the steering bracket, then remove the two 10 mm washers and long tiller handle assembly.



b. DISASSEMBLY/ASSEMBLY

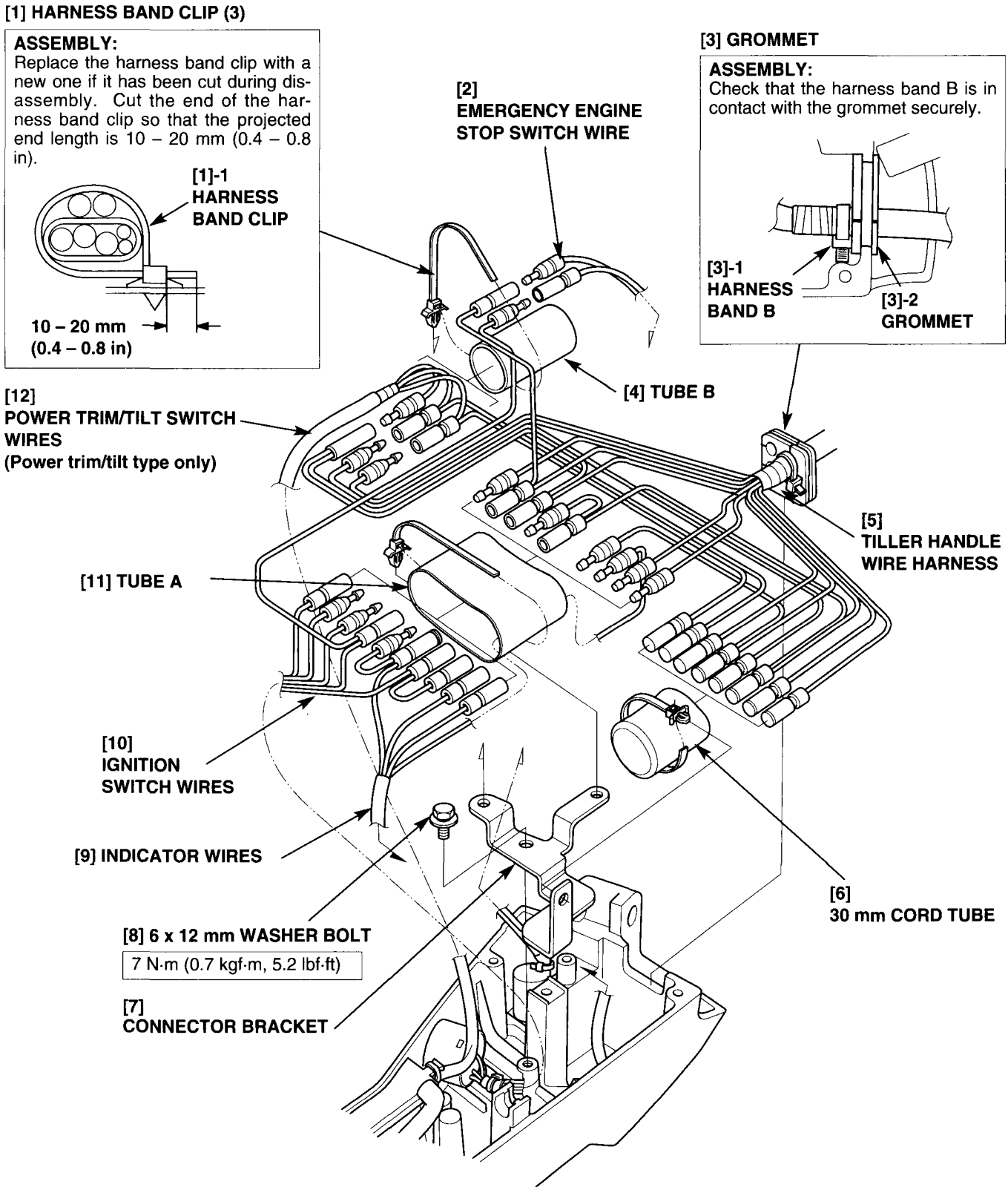
• Cover/Cable/Steering Bracket

1) Remove the tiller handle (P. 15-1 and 2).

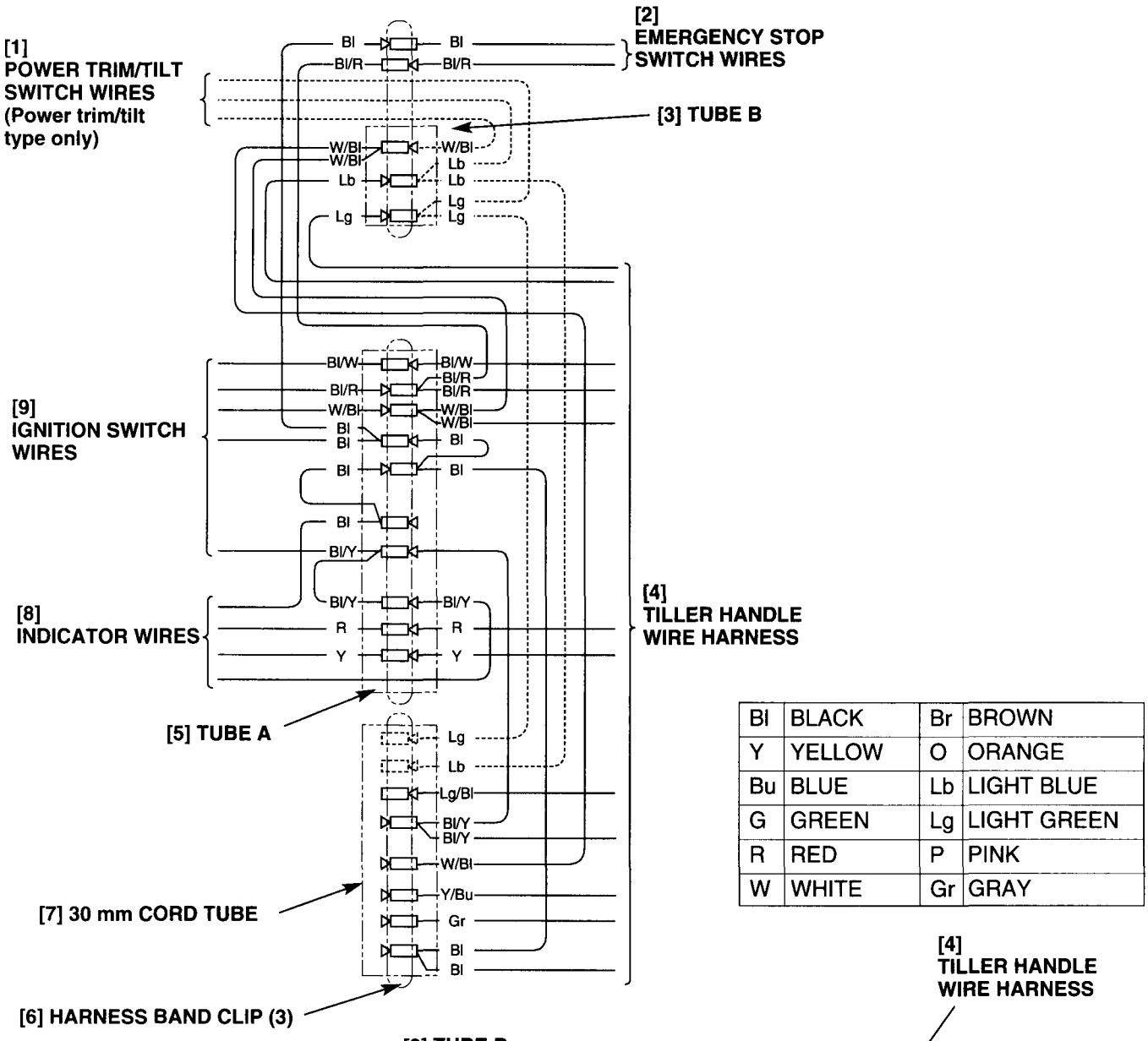


• Wire Harness (Except mechanical tilt type)

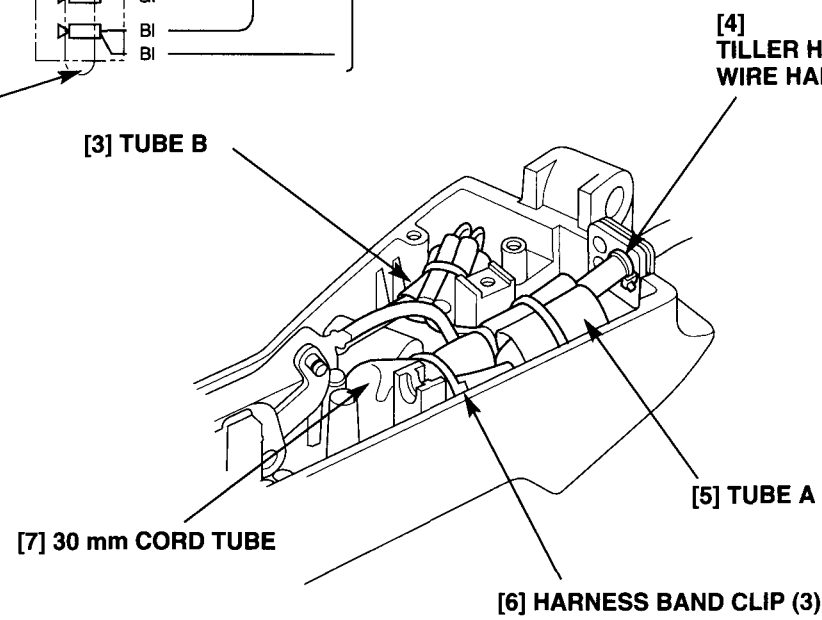
1) Remove the under cover and remove the throttle cable and shift cable (P. 15-3).
   • Wire harness connection: P15-5



• Wire Harness Connection (Except mechanical tilt type)



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



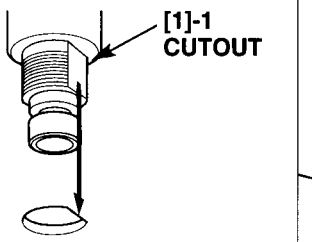
• Ignition Switch/Emergency Stop Switch/Indicator

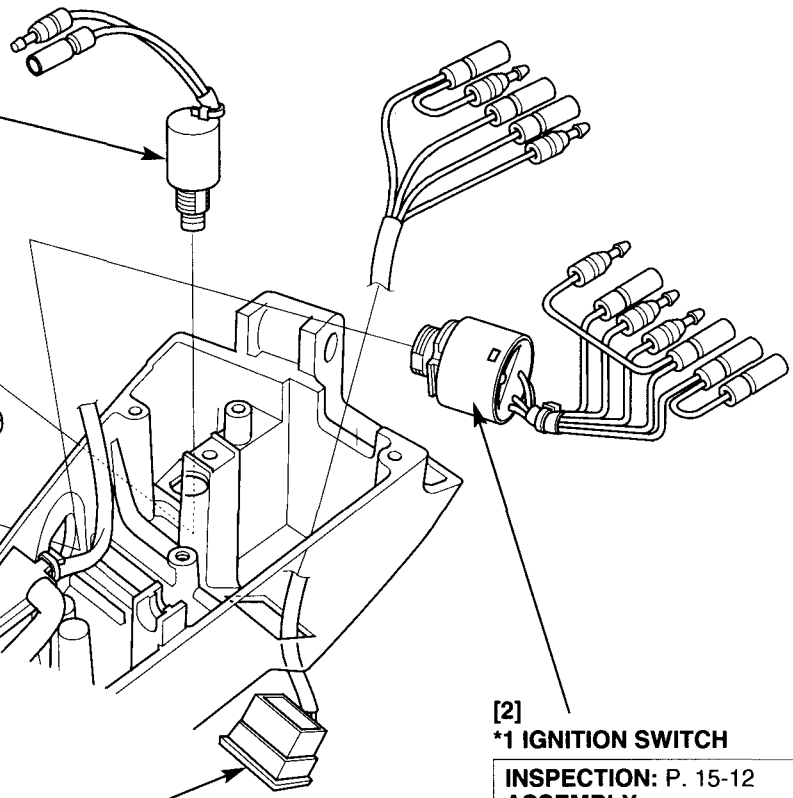
1) Remove the under cover, then remove the throttle cable and shift cable (P. 15-3).
2) Disconnect the tiller handle wire harness (P. 15-4).

*1: Except mechanical tilt type

[1] EMERGENCY STOP SWITCH

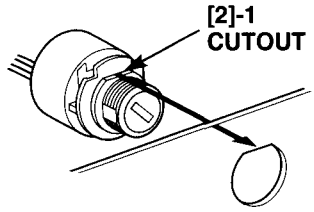
INSPECTION: P. 15-12
ASSEMBLY:
Install the emergency stop switch by aligning the cutout in the switch with the flat part of the handle installation section.





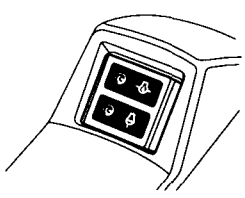
[2]
***1 IGNITION SWITCH**

INSPECTION: P. 15-12
ASSEMBLY:
Install the ignition switch by aligning the cutout in the switch with the flat part of the handle installation section.



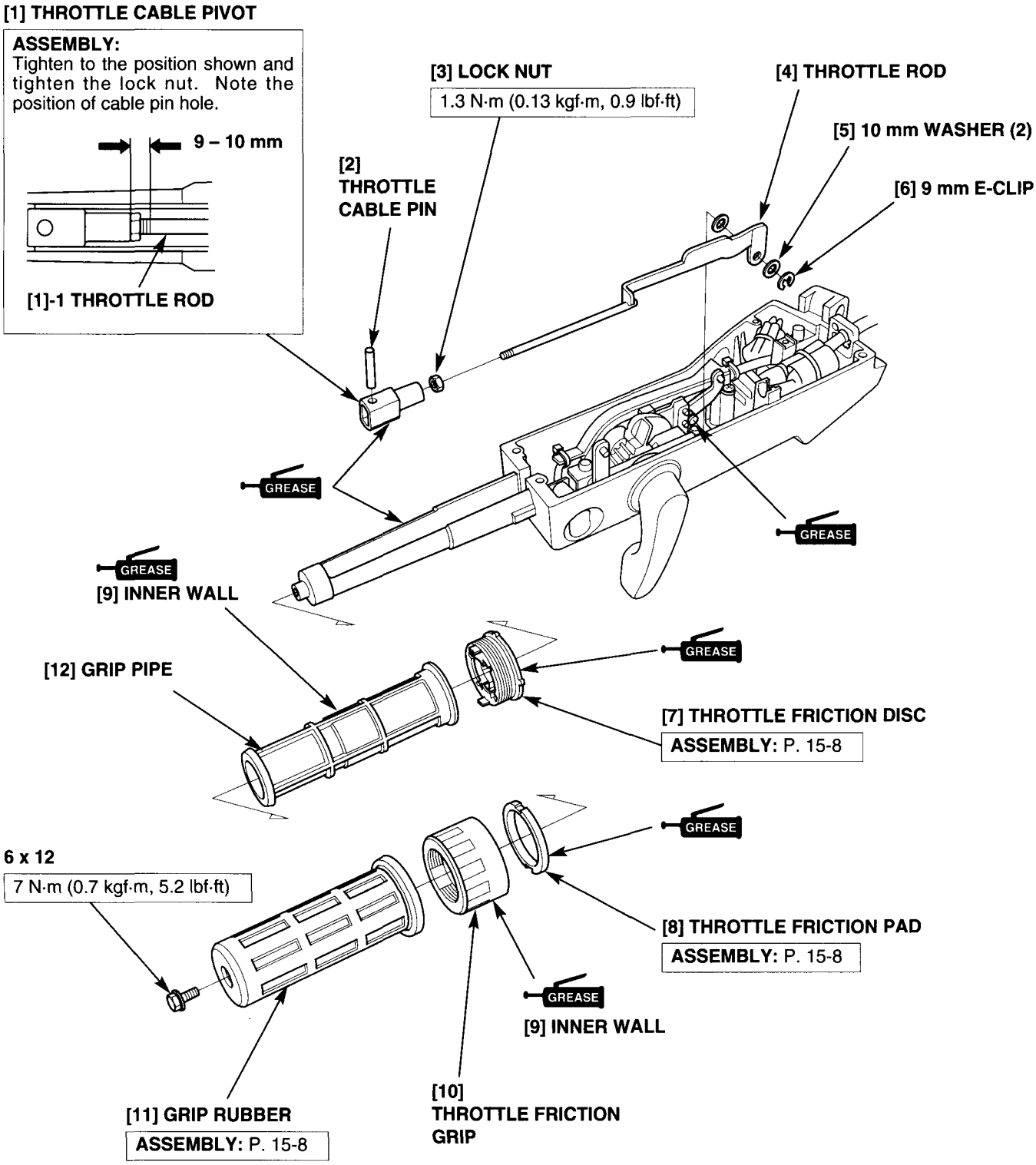
[3]
***1 INDICATOR**

INSPECTION: P. 15-12
ASSEMBLY:
Install in the direction shown.



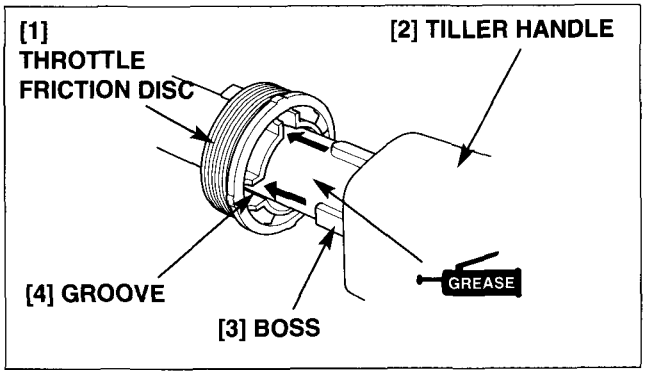
• Throttle Grip/Throttle Rod

1) Remove the following:
   —Under cover (P. 15-3)
   —Throttle cable, shift cable (P. 15-3)



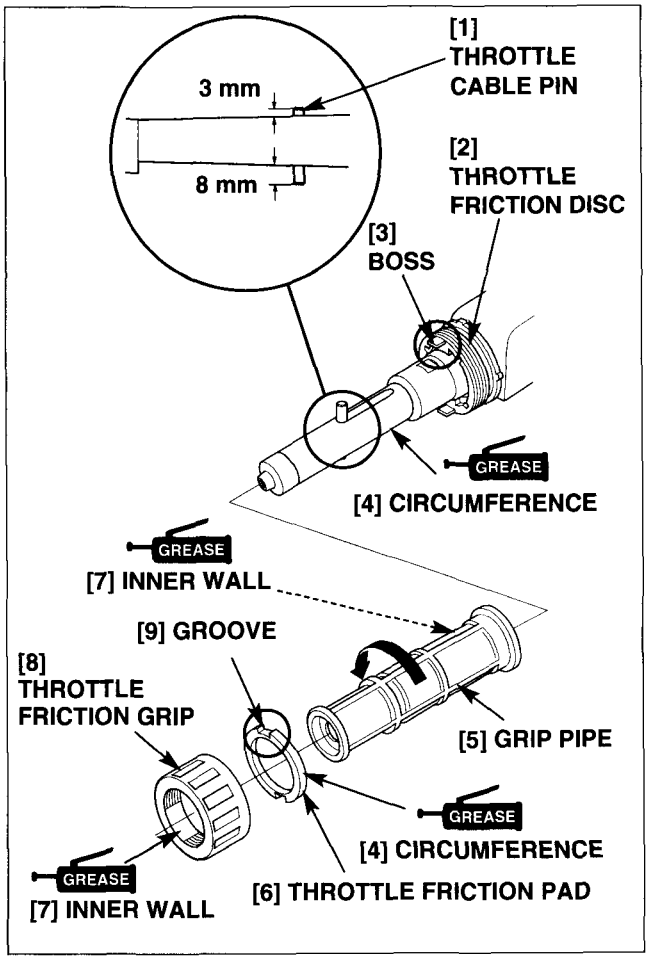
• Friction disc Installation

• Install the friction disc by aligning the grooves of the throttle friction disc with the bosses of the tiller handle as shown.



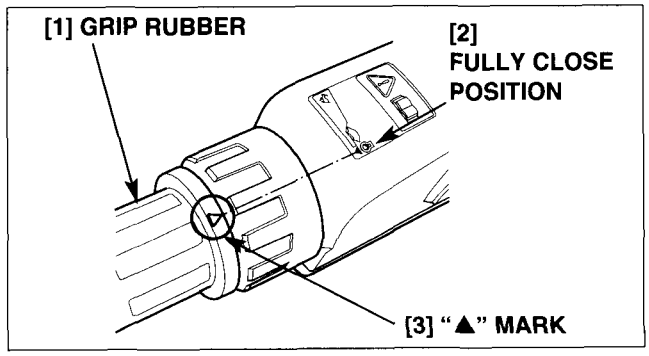
• Grip Pipe Installation

1) Install the throttle cable pin on the cable pivot with the dimensions of the projected length at both ends of the pin as shown.
2) Install the grip pipe on the tiller handle by turning it counterclockwise slowly.
3) Install the throttle friction pad by aligning its groove with the boss on the throttle friction disc.
4) Install the throttle friction grip onto the throttle friction pad.



• Grip Rubber Installation

1) Turn the throttle grip pipe clockwise fully (to the fully close position) and tighten the throttle friction grip to hold the grip pipe.
2) Install the grip rubber by aligning the "▲" mark on the grip rubber with the fully close position mark ("▲" mark) of the throttle and tighten the 6 x 12 mm flange bolt securely.

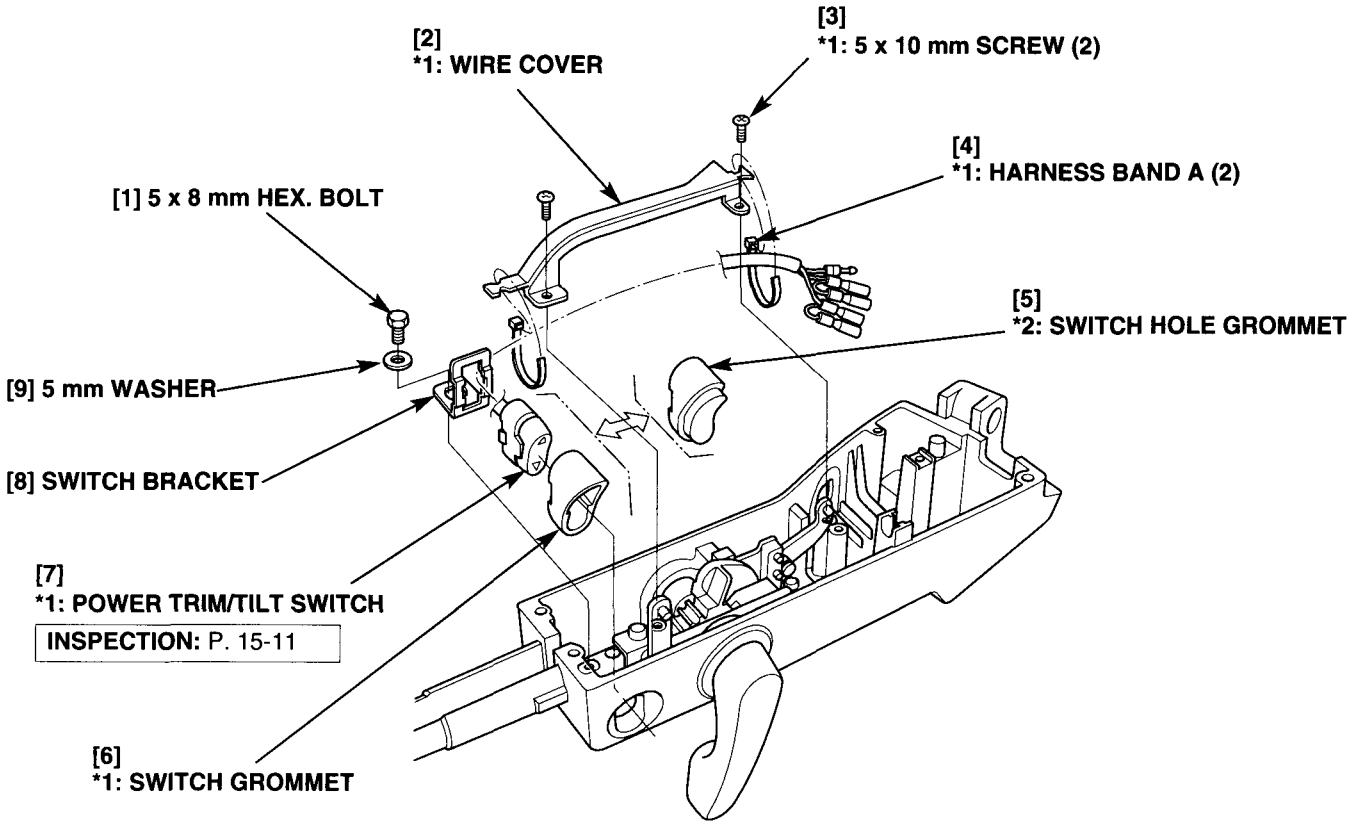


• Power Trim/Tilt Switch

1) Remove the following.
   —Under cover (P. 15-3)
   —Throttle cable, shift cable (P. 15-3)
   —Throttle grip (P. 15-7)
   —Throttle rod (P. 15-7)

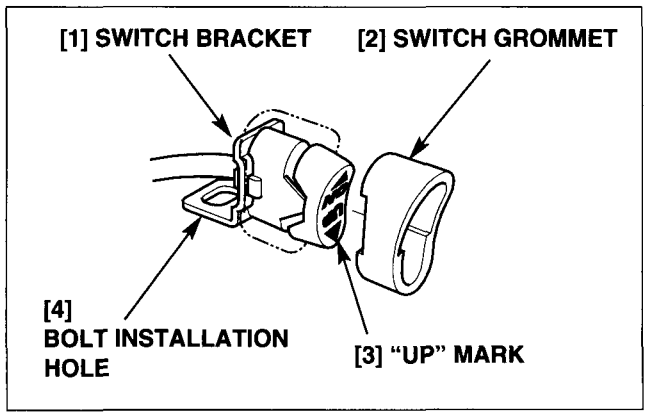
- After connecting the throttle rod (P. 15-7), operate the throttle grip and check that the power trim/tilt switch wire does not interfere with the throttle rod.

*1: Power trim/tilt type only
*2: Except power trim/tilt type



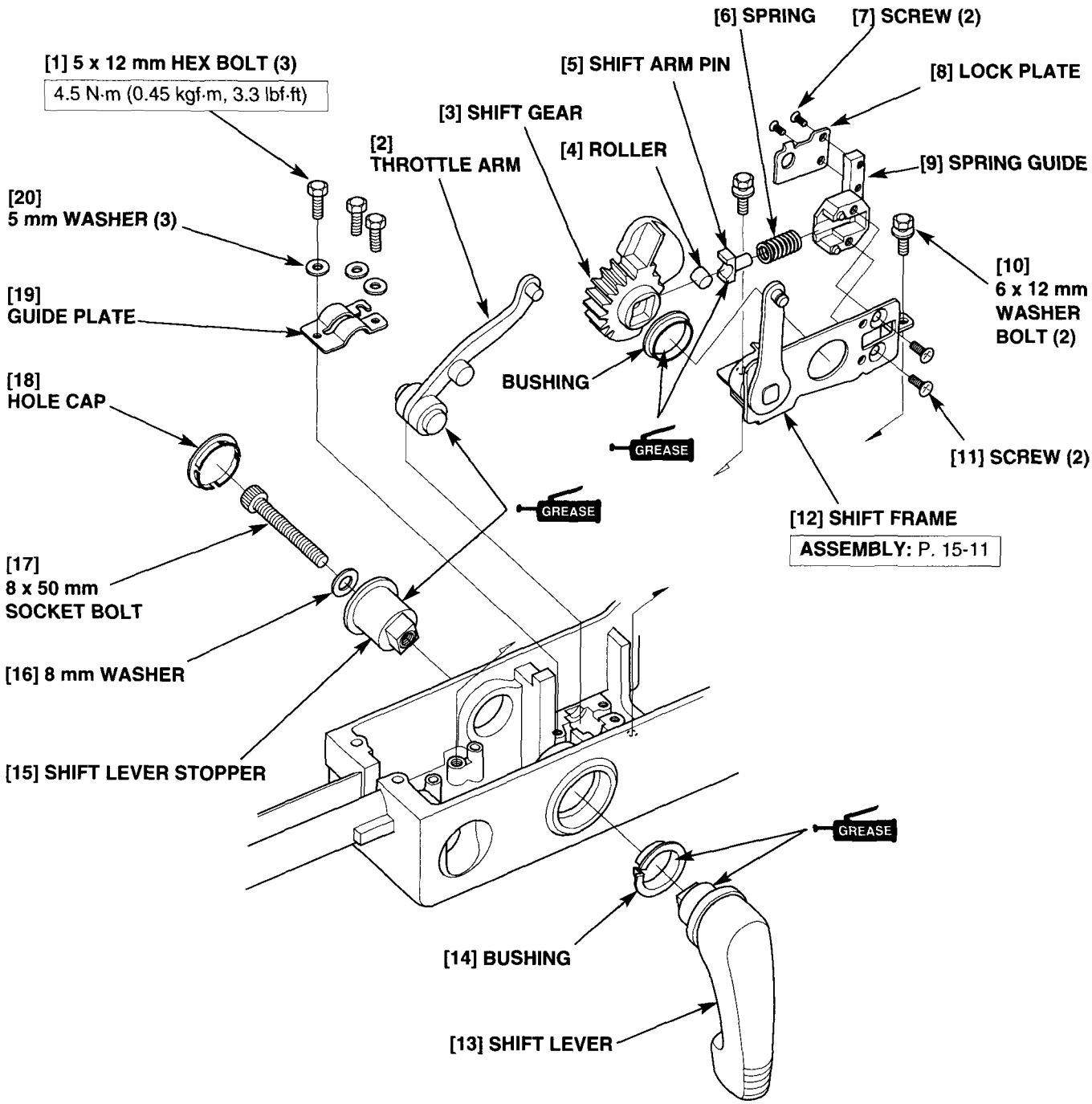
• Power Trim/Tilt Switch Installation

- Install the power trim/tilt switch with the "UP" mark in the same side as the bolt installation hole side of the bracket.



• Shift Lever/Shift Unit/Throttle Arm

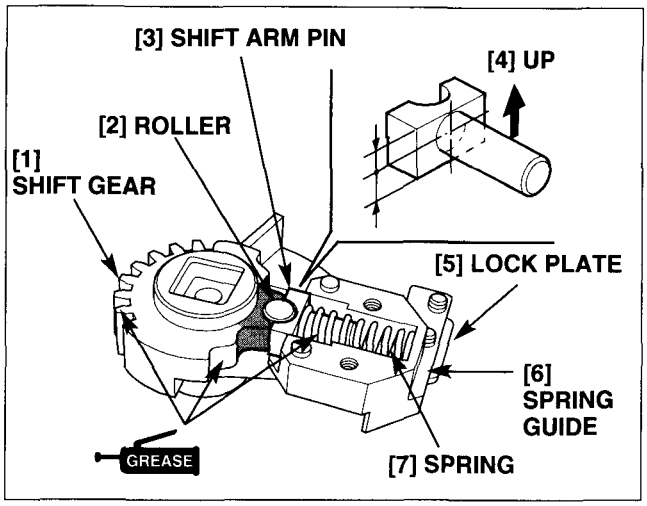
1) Remove the following:
   —Engine under cover (P. 15-3)
   —Throttle cable, shift cable (P. 15-3)
   —Throttle grip (P. 15-7)
   —Throttle rod (P. 15-7)
   —Power trim/tilt switch (P. 15-9)



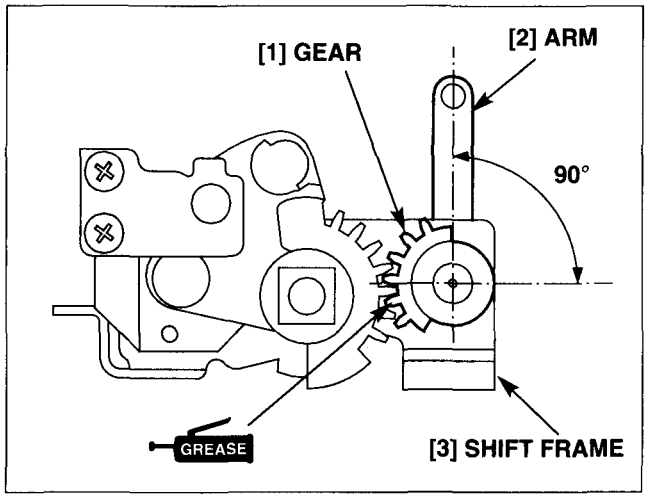
• Shift Unit Assembly

d. Assembly

1) Install the lock plate on the spring guide.
2) Apply grease to the spring, shift arm pin and roller. Install the shift arm pin on the spring guide. Note the installation direction of the shift arm pin.
3) Apply grease to the bushing and set it in the shift frame.
4) Apply grease to the shift gear teeth and roller mounting section, and install the spring guide roller on the roller mounting section of the shift gear as shown.



5) Apply grease to the shift gear of the shift frame. Set the arm of the shift frame in the vertical position as shown.
6) Install the shift gear and spring guide on the shift frame as a set. Take care not to move the arm of the shift frame.
7) Tighten the two screws against the shift frame.

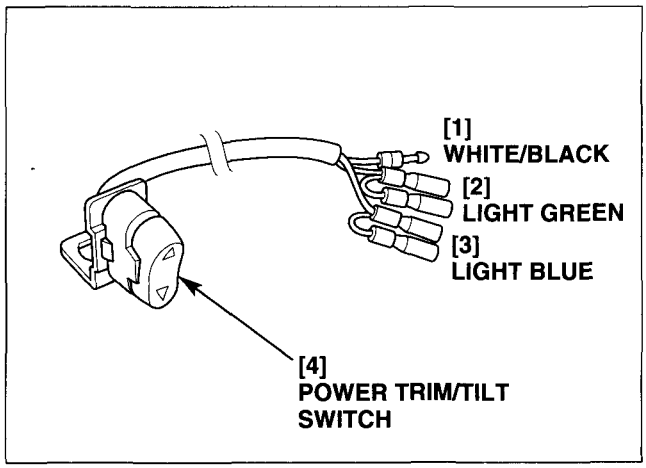


b. INSPECTION

• Power Trim/Tilt Switch

Check for continuity between the terminals. There must be continuity between the terminals marked with circle in the table below.

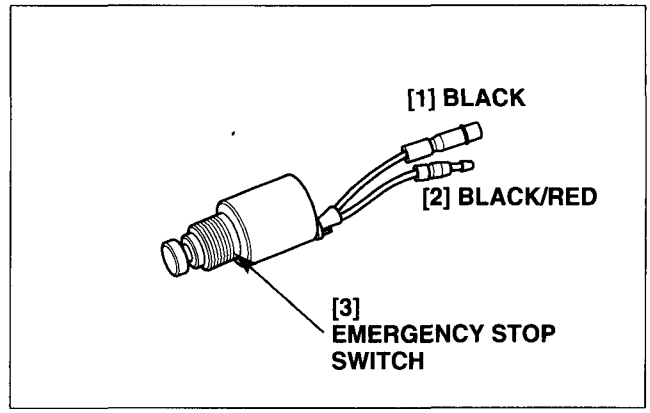
	Light green	White/Black	Light blue
UP	○	○	
Normal			
DOWN		○	○



• Emergency Stop Switch

Check for continuity between the terminals. There must be continuity between the terminals marked with circle in the table below.

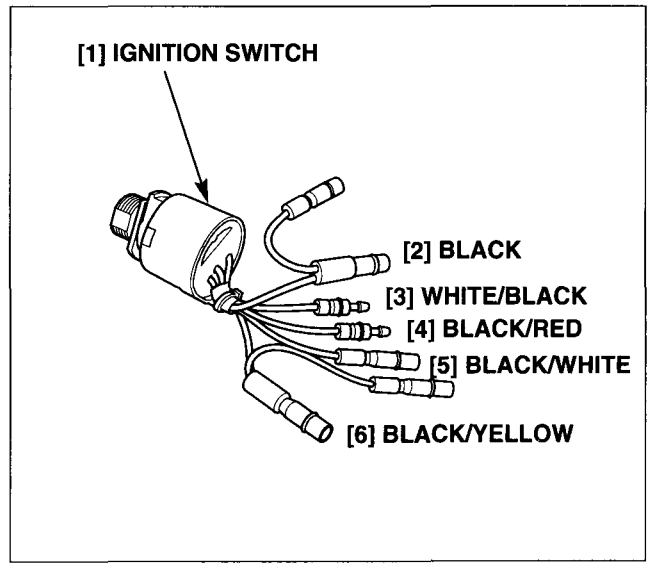
	Black/Red	Black
Normal		
Push or remove clip	○———	———○



• Ignition Switch

Check for continuity between the terminals. There must be continuity between the terminals marked with circle in the table below.

	Black	Black/ Red	White/ Black	Black/ Yellow	Black/ White
OFF	○	○			
ON			○	○	
START			○	○	○

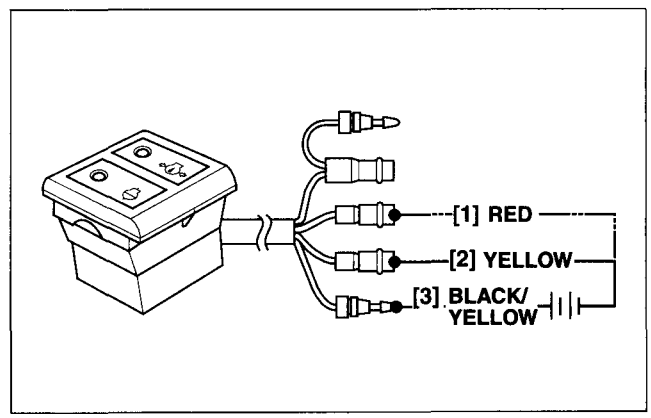


• Indicator

NOTE

Be sure the battery is in good condition before performing this test.

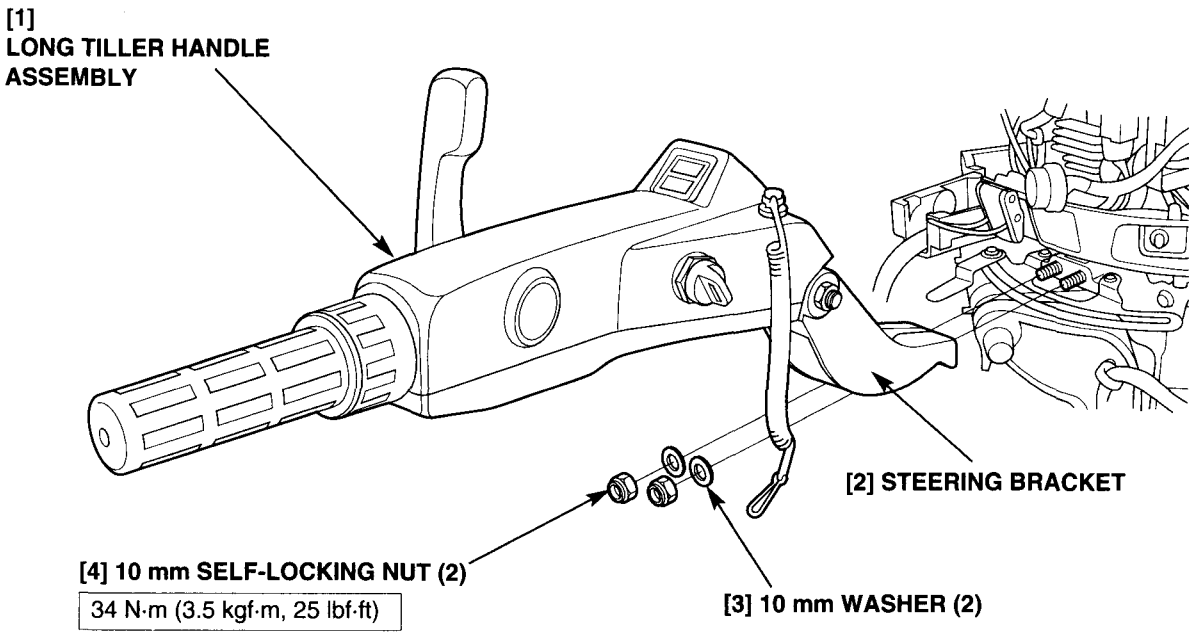
1) Connect the 12V battery between the black/yellow (+) terminal and the red (–) terminal of the indicator. Be sure that the red light (LED) comes on.
2) Connect the 12V battery between the black/yellow (+) terminal and the yellow (–) terminal of the indicator. Be sure that the green light (LED) comes on.



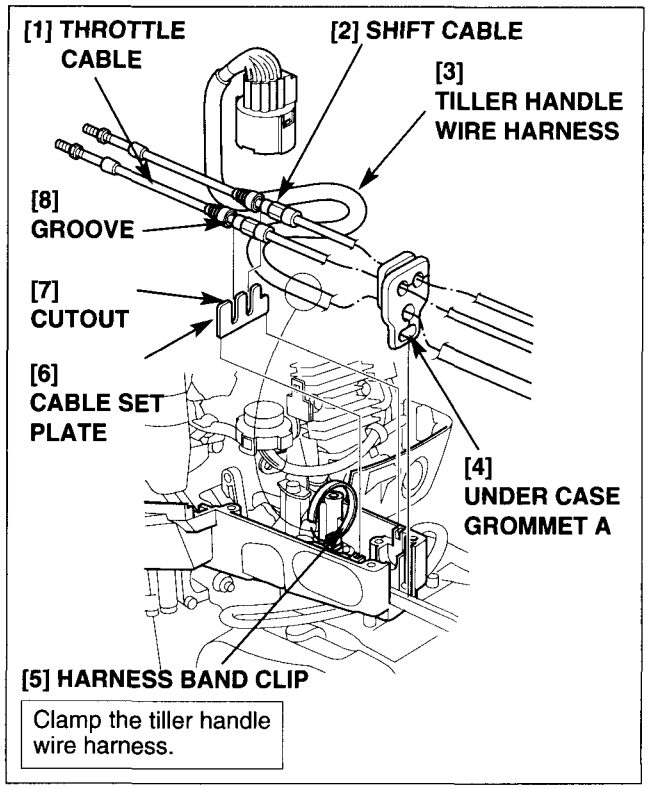
c. LONG TILLER HANDLE INSTALLATION

1) Set the long tiller handle assembly on the mount frame and tighten the two 10 mm washers and two 10 mm self-locking nuts.
2) Tighten the two 10 mm self-locking nuts to the specified torque.

   TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)



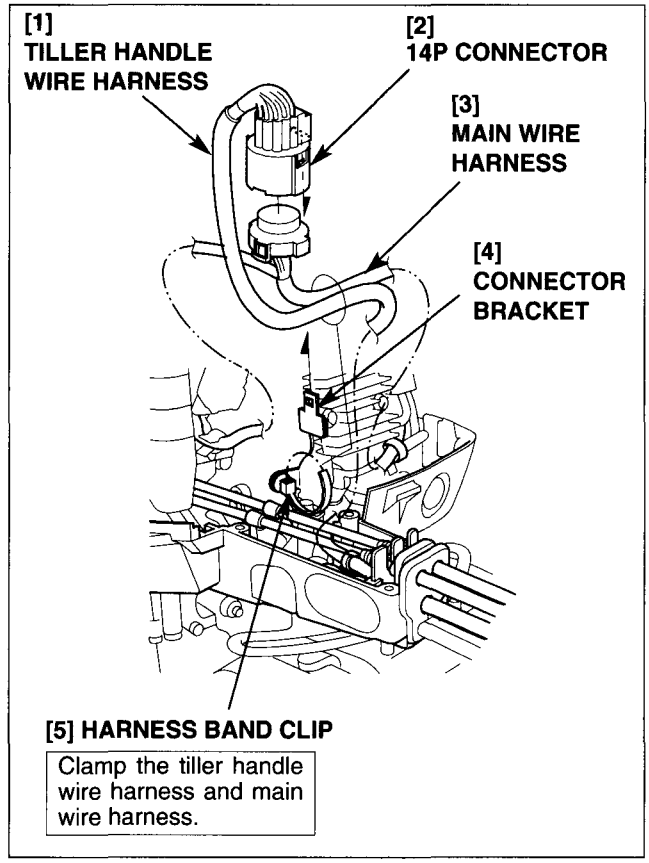
3) Pass the tiller handle wire harness through the under case grommet A.
4) Pass the throttle cable and shift cable through the under case grommet A.
   - Pass the throttle cable through the inner side of the under case grommet A and the shift cable through the side close to the opening.
5) Set the throttle cable and shift cable in the cable plate by aligning the groove in each cable with the cutout in the cable set plate.
6) Set the under case grommet A, tiller handle wire harness, throttle cable and shift cable as a set in the engine under case.
7) Secure the tiller handle wire harness with the wire band clip.



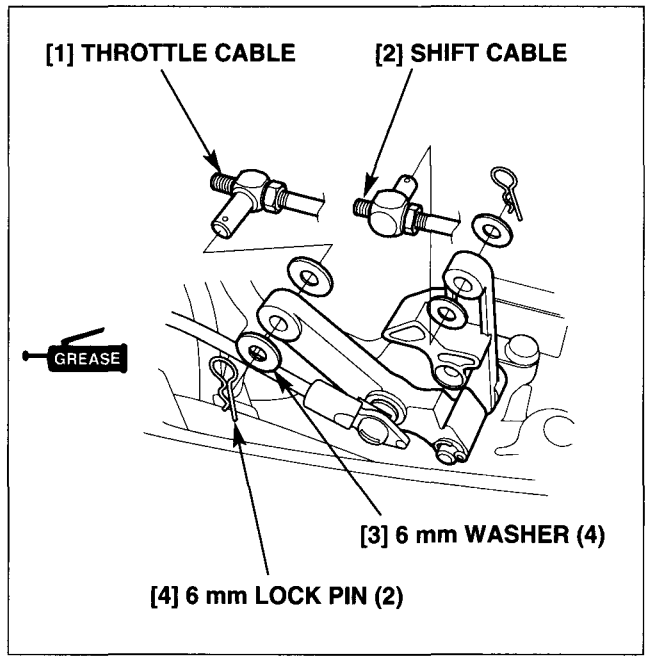
8) Connect the tiller handle wire harness 14P connector and set it on the connector bracket (Except mechanical tilt type)

   Connect the emergency stop switch wire 2P connector to the ICM wire 2P connector (Mecanical tilt type).

9) Clamp the tiller handle wire harness and main wire harness with the harness band clip.

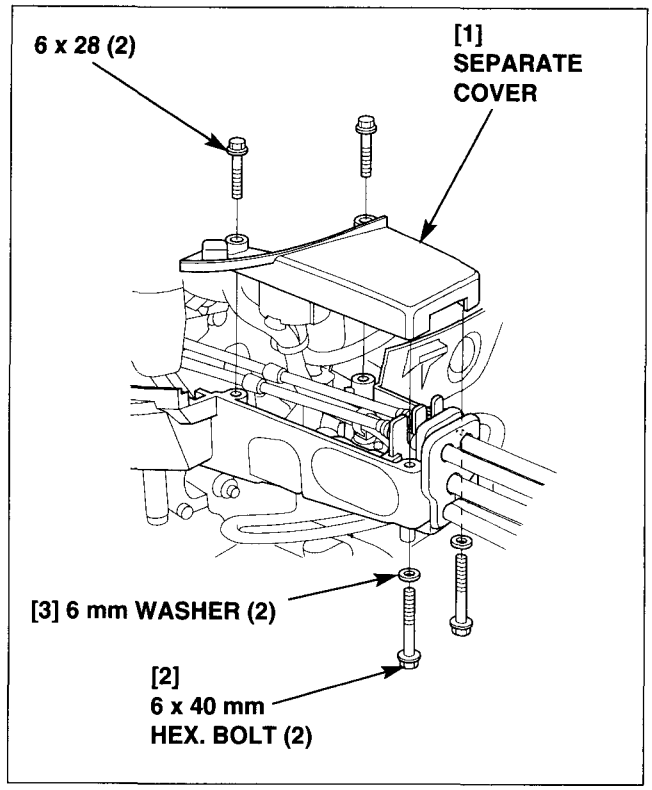


10) Set the 6 mm washers on the control cable shift pivot. Set the shift pivot on the throttle arm and shift link B, and install the 6 mm washers and 6 mm lock pins. After assembly, adjust the throttle cable and shift cable (P. 3-6 thru 3-8).



11) Install the separate cover.

12) Install the engine cover.



1. CDI UNIT
2. POWER COIL
3. SE THERMAL VALVE HEATER COIL

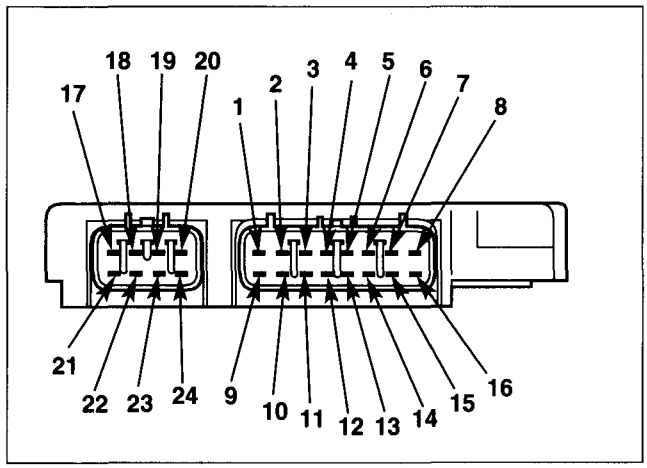
1. CDI UNIT

a. INSPECTION

Measure the resistance between the CDI unit terminals.

CAUTION

- **Be careful not to touch the metallic part of the tester probe with your body, otherwise correct resistance value cannot be obtained.**
- **Use only the specified tester shown below to obtain correct resistance value.**
  — Hioki tester: Model 3030
- **Read the tester manufacturer's operation instructions carefully before operation with the tester. Be sure the tester's battery is fully charged and check the meter before using the tester.**
- **The tester needle can sway large and it returns slowly effected by the internal condenser. Wait until the needle stabilizes before measurement.**

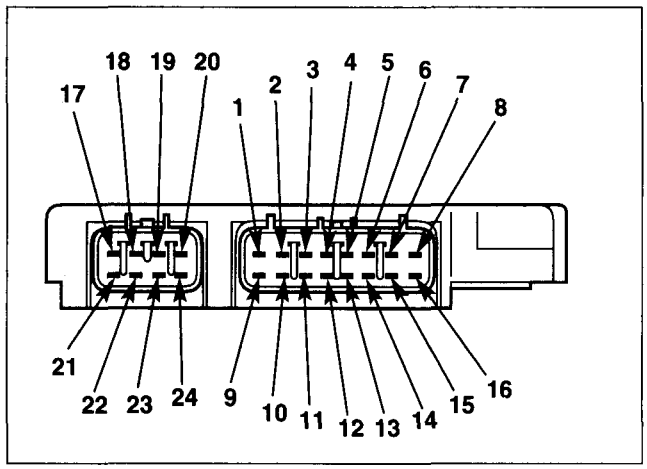


unit: kΩ

[2] Tester probe (−) \ [1] Tester probe (+)	1	2	3	*4	*5	6	*7	8	9	10	11	12
1		∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
2	∞		∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
3	500~∞	500~∞		500~∞	∞	∞	∞	500~∞	500~∞	∞	500~∞	500~∞
*4	60~300	100~400	11~45		∞	19~80	∞	13~60	6.5~28	∞	6~26	7~30
*5	∞	∞	100~400	34~150		100~500	∞	100~400	60~300	∞	60~300	70~300
6	∞	∞	∞	∞	∞		∞	∞	∞	∞	∞	∞
*7	∞	∞	∞	∞	∞	∞		∞	∞	∞	∞	∞
8	60~300	90~400	15~60	60~300	∞	22~60	∞		9.5~40	∞	9~36	18~80
9	17~70	16~70	2~8.5	12~50	∞	5~20	∞	2.6~11		∞	0.4~1.8	0.8~3.6
10	36~150	70~300	14~60	50~200	∞	20~90	∞	16~70	8.5~34		8.5~34	10~40
11	17~70	15~60	1.4~6	11~50	∞	4.6~19	∞	2~8.5	0.4~1.8	∞		0.8~3.4
12	18~80	30~150	5.5~24	24~100	∞	4~16	∞	7~28	3~13	∞	2.4~10	
13	16~70	30~150	5.5~24	24~100	∞	3.6~15	∞	7~28	3~13	∞	2.4~10	7~28
*14	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
15	60~300	90~400	15~60	60~300	∞	22~100	∞	17~70	9.5~38	∞	9~36	14~60
16	60~300	90~400	15~60	60~300	∞	22~100	∞	17~70	9.5~38	∞	9~36	14~60
17	20~150	30~150	7~28	22~90	∞	11~45	∞	8~32	4.8~20	∞	4.4~17	5~20
18	24~150	26~150	7~28	22~90	∞	11~45	∞	8~32	4.8~20	∞	4.4~17	5~20
19	20~90	19~80	3.8~16	16~70	∞	7~28	∞	4.6~18	2.2~9.5	∞	1.8~8	2.4~10
20	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
21	24~150	26~150	7~28	22~100	∞	11~45	∞	8~32	4.8~20	∞	4.4~18	5~20
22	16~70	15~60	1.4~6	11~50	∞	4.2~17	∞	2~8.5	0.4~1.8	∞	0	0.4~1.6
23	16~70	15~60	1.4~6	11~50	∞	4.2~17	∞	2~8.5	0.4~1.8	∞	0	0.4~1.6
24	22~90	22~90	5~20	18~60	∞	8.5~34	∞	6~24	2.8~12	∞	2.6~11	3.2~13

CAUTION

- **Be careful not to touch the metallic part of the tester probe with your body, otherwise correct resistance value cannot be obtained.**
- **Use only the specified tester shown below to obtain correct resistance value.**
  — Hioki tester: Model 3030
- **Read the tester manufacturer's operation instructions carefully before operation with the tester. Be sure the tester's battery is fully charged and check the meter before using the tester.**
- **The tester needle can sway large and it returns slowly effected by the internal condenser. Wait until the needle stabilizes before measurement.**



unit: kΩ

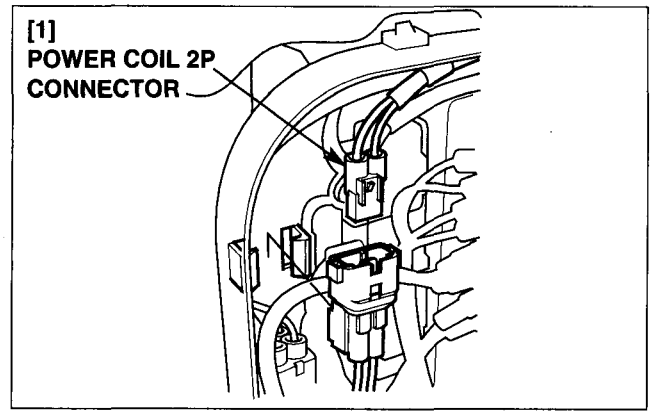
[2] Tester probe (−) \ [1] Tester probe (+)	13	*14	15	16	17	18	19	20	21	22	23	24
1	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
2	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
3	500~∞	∞	500~∞	500~∞	500~∞	∞	500~∞	500~∞	500~∞	500~∞	500~∞	500~∞
*4	7~30	∞	13~60	13~60	12~50	12~50	9~36	24~100	12~60	6~24	6~24	10~45
*5	60~300	∞	100~400	90~100	70~300	70~300	60~300	500~∞	70~300	60~300	60~300	60~300
6	∞	∞	∞	∞	∞		∞	∞	∞	∞	∞	∞
*7	∞	∞	∞	∞	∞	∞		∞	∞	∞	∞	∞
8	11~15	∞	17~70	17~70	15~60	15~60	12~50	100~500	15~50	9~36	9~38	13~60
9	0.8~3.6	∞	2.6~11	2.6~11	4.2~18	4.2~18	2.2~9	8~32	4.2~18	0.4~2	0.4~2	3~14
10	10~40	∞	15~70	15~70	14~60	14~60	11~45	22~90	14~60	8.5~36	8.5~36	12~50
11	0.4~1.6	∞	2~8	2~8	3.0~15	3.8~16	1.8~7	5~34	3.6~15	0	0	2.4~10
12	3.2~13	∞	8~34	7~28	7.5~32	7.5~32	5~20	6~32	7.5~32	2.6~11	2.6~11	6.5~26
13		∞	10~40	6.5~28	7.5~32	7.5~32	5~22	8~32	7.5~32	2.6~11	2.6~11	6.5~26
*14	∞		∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
15	10~45	∞		12~50	15~60	15~60	12~50	28~150	15~60	9~38	9~38	13~60
16	10~45	∞	17~70		15~60	15~60	12~50	28~150	15~60	9~38	9~38	13~60
17	5.5~22	∞	7.5~32	8~32		3.5~34	6~26	10~45	8.5~34	4.4~18	4.4~18	7~30
18	5.5~22	∞	7.5~32	8~32	8~34		6~26	10~45	8.5~34	4.4~18	4.4~18	7~30
19	2.4~10	∞	4.4~18	4.4~18	5.5~24	5.5~24		6.5~28	5.5~24	1.8~8	1.8~8	4.6~19
20	∞	∞	∞	∞	∞	∞	∞		∞	∞	∞	∞
21	5~20	∞	7.5~32	8~32	8~34	8.6~34	6~28	10~45		4.4~18	4.4~18	7~20
22	0.4~1.6	∞	2~8	2~8	3.6~15	3.8~16	1.6~7	4~16	3.8~16		0	2.4~10
23	0.4~1.6	∞	2~8	2~8	3.6~15	3.8~18	1.6~7	4~16	3.8~16	0		2.4~10
24	3.2~13	∞	5.5~24	6~24	6.5~23	7~28	4.6~19	8~34	7~30	2.6~11	2.6~11	

2. POWER COIL

a. INSPECTION

Measure the resistance between the terminals.

Resistance	6.12 – 7.48 Ω

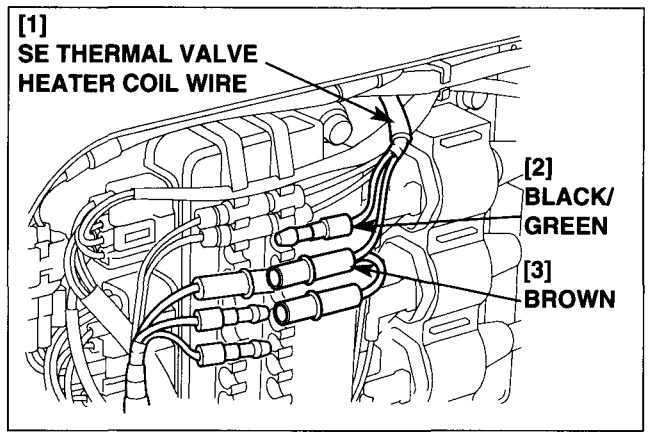


3. SE THERMAL VALVE HEATER COIL

a. INSPECTION

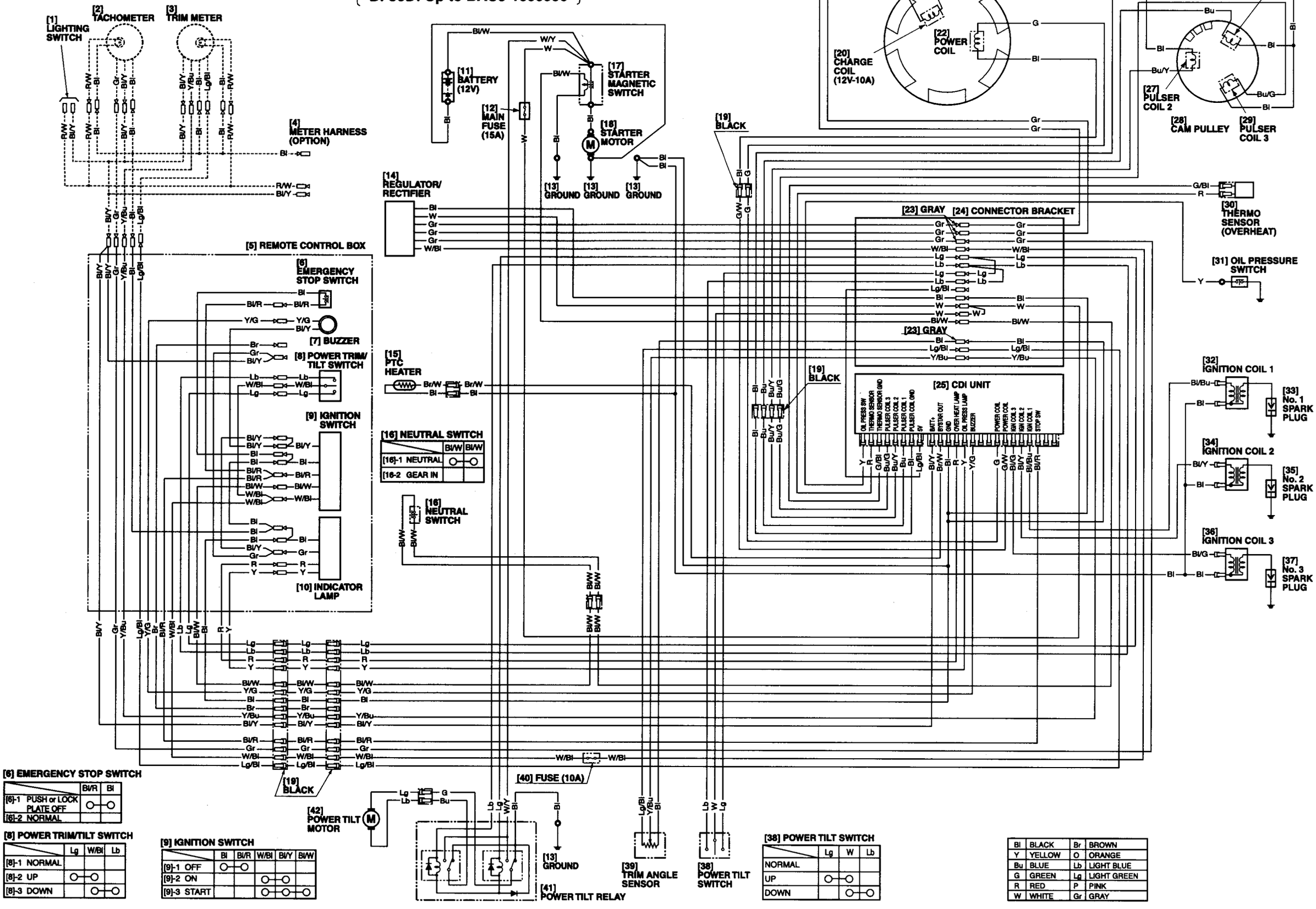
Measure the resistance between the brown and black/ green wire terminals of the SE thermal valve heater coil wire.

Resistance	1.7 – 2.1 Ω



Remote control type with power trim/tilt

Frame serial number:
BF25D: Up to BATJ-1000362
BF30D: Up to BAUJ-1000536



[6] EMERGENCY STOP SWITCH

	Bl/R	Bl
[6]-1 PUSH or LOCK PLATE OFF	○	○
[6]-2 NORMAL		

[8] POWER TRIM/TILT SWITCH

	Lg	W/Bl	Lb
[8]-1 NORMAL			
[8]-2 UP	○	○	
[8]-3 DOWN		○	○

[9] IGNITION SWITCH

	Bl	Bl/R	W/Bl	Bl/Y	Bl/W
[9]-1 OFF	○	○			
[9]-2 ON			○	○	
[9]-3 START			○	○	○

[16] NEUTRAL SWITCH

	Bl/W	Bl/W
[16]-1 NEUTRAL	○	○
[16]-2 GEAR IN		

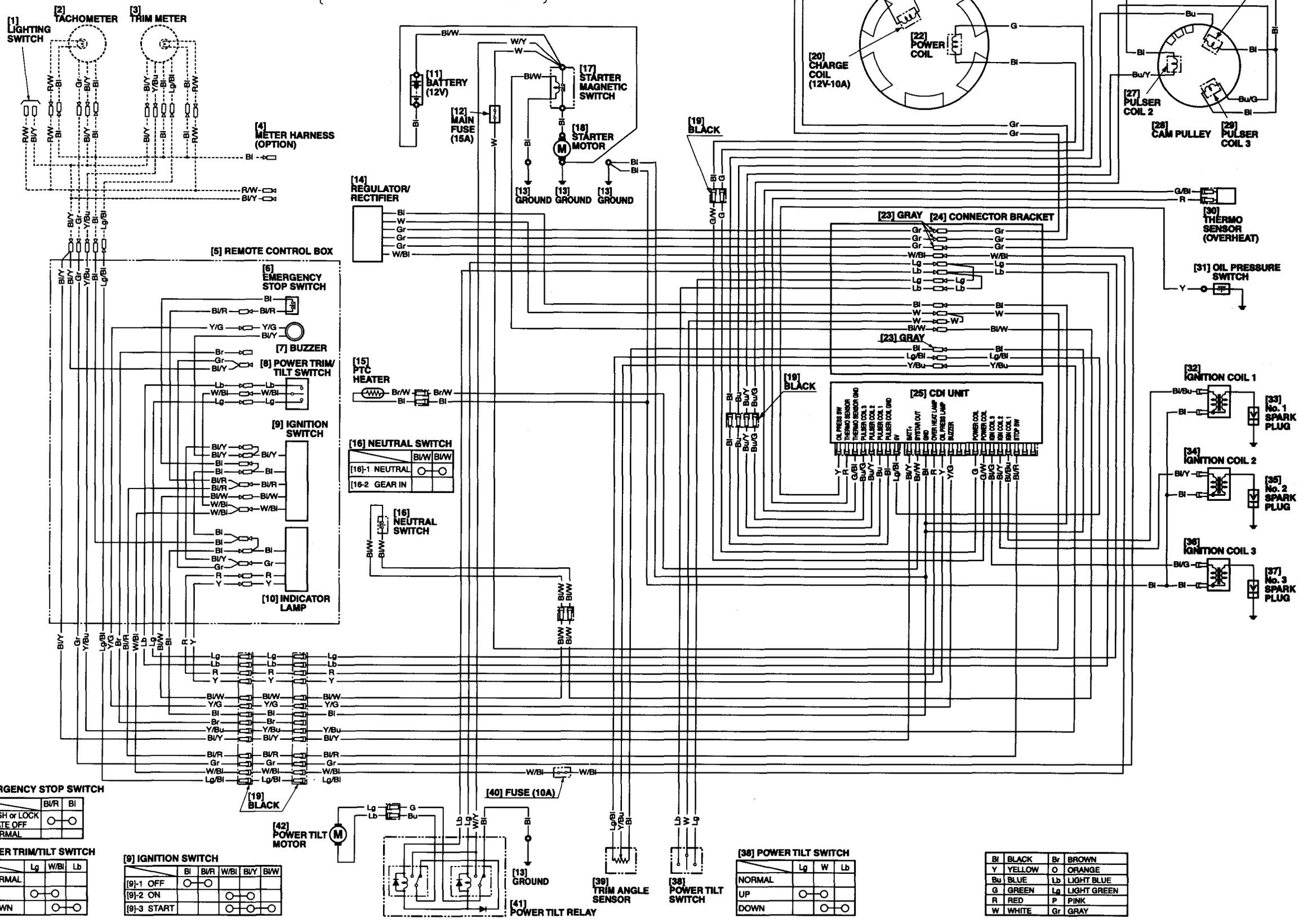
[38] POWER TILT SWITCH

	Lg	W	Lb
NORMAL			
UP	○	○	
DOWN		○	○

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

Remote control type with power trim/tilt

Frame serial number:
BF25D: After BATJ-1000363
BF30D: After BAUJ-1000537



[6] EMERGENCY STOP SWITCH

	Bl/R	Bl
[6]-1 PUSH or LOCK PLATE OFF	○	○
[6]-2 NORMAL		

[8] POWER TRIM/TILT SWITCH

	Lg	W/Bl	Lb
[8]-1 NORMAL			
[8]-2 UP	○	○	
[8]-3 DOWN		○	○

[9] IGNITION SWITCH

	Bl	Bl/R	W/Bl	Bl/Y	Bl/W
[9]-1 OFF	○	○			
[9]-2 ON			○	○	
[9]-3 START			○	○	○

[16] NEUTRAL SWITCH

	Bl/W	Bl/W
[16]-1 NEUTRAL	○	○
[16-2 GEAR IN		

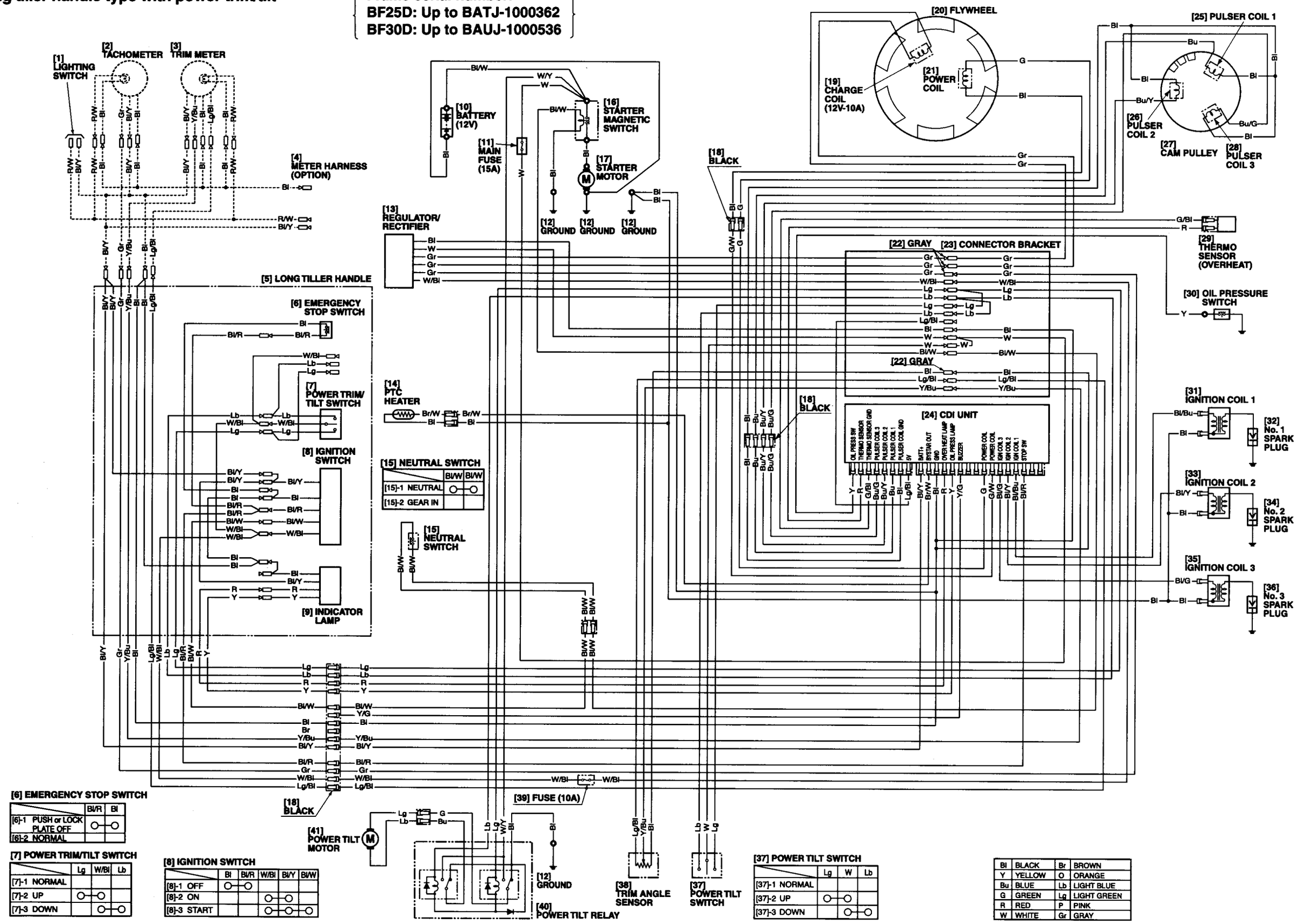
[38] POWER TILT SWITCH

	Lg	W	Lb
NORMAL			
UP	○	○	
DOWN		○	○

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

Long tiller handle type with power trim/tilt

Frame serial number:
BF25D: Up to BATJ-1000362
BF30D: Up to BAUJ-1000536



[6] EMERGENCY STOP SWITCH

	Bl/R	Bl
[6]-1 PUSH or LOCK PLATE OFF	○	○
[6]-2 NORMAL		

[7] POWER TRIM/TILT SWITCH

	Lg	W/Bl	Lb
[7]-1 NORMAL			
[7]-2 UP	○	○	
[7]-3 DOWN		○	○

[8] IGNITION SWITCH

	Bl	Bl/R	W/Bl	Bl/Y	Bl/W
[8]-1 OFF	○	○			
[8]-2 ON			○	○	
[8]-3 START			○	○	○

[15] NEUTRAL SWITCH

	Bl/W	Bl/W
[15]-1 NEUTRAL	○	○
[15]-2 GEAR IN		

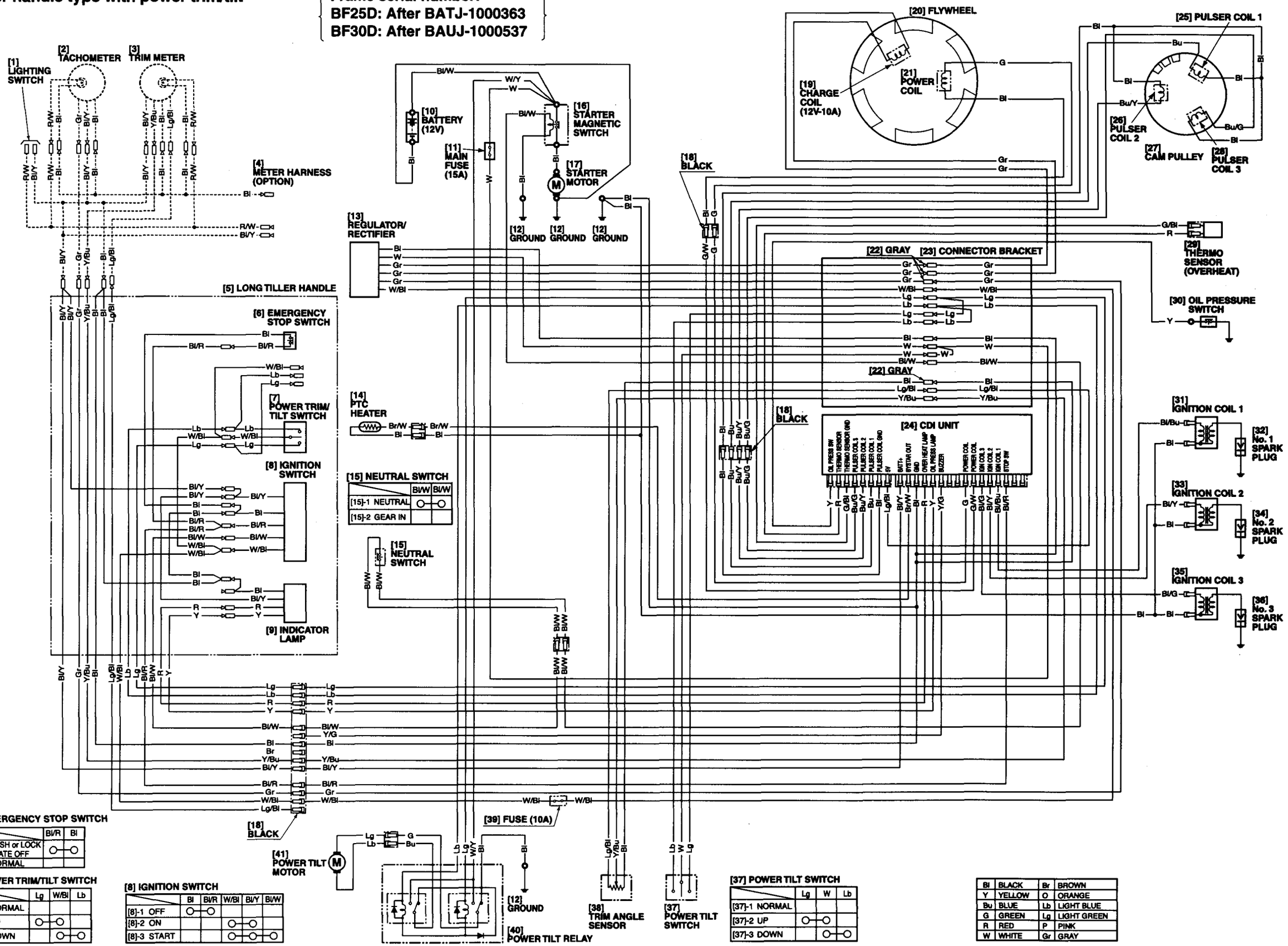
[37] POWER TILT SWITCH

	Lg	W	Lb
[37]-1 NORMAL			
[37]-2 UP	○	○	
[37]-3 DOWN		○	○

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

Long tiller handle type with power trim/tilt

Frame serial number:
BF25D: After BATJ-1000363
BF30D: After BAUJ-1000537



[6] EMERGENCY STOP SWITCH

	Bl/R	Bl
[6]-1 PUSH or LOCK PLATE OFF	○	○
[6]-2 NORMAL		

[7] POWER TRIM/TILT SWITCH

	Lg	W/Bl	Lb
[7]-1 NORMAL			
[7]-2 UP	○	○	
[7]-3 DOWN		○	○

[8] IGNITION SWITCH

	Bl	Bl/R	W/Bl	Bl/Y	Bl/W
[8]-1 OFF	○	○			
[8]-2 ON			○	○	
[8]-3 START			○	○	○

[15] NEUTRAL SWITCH

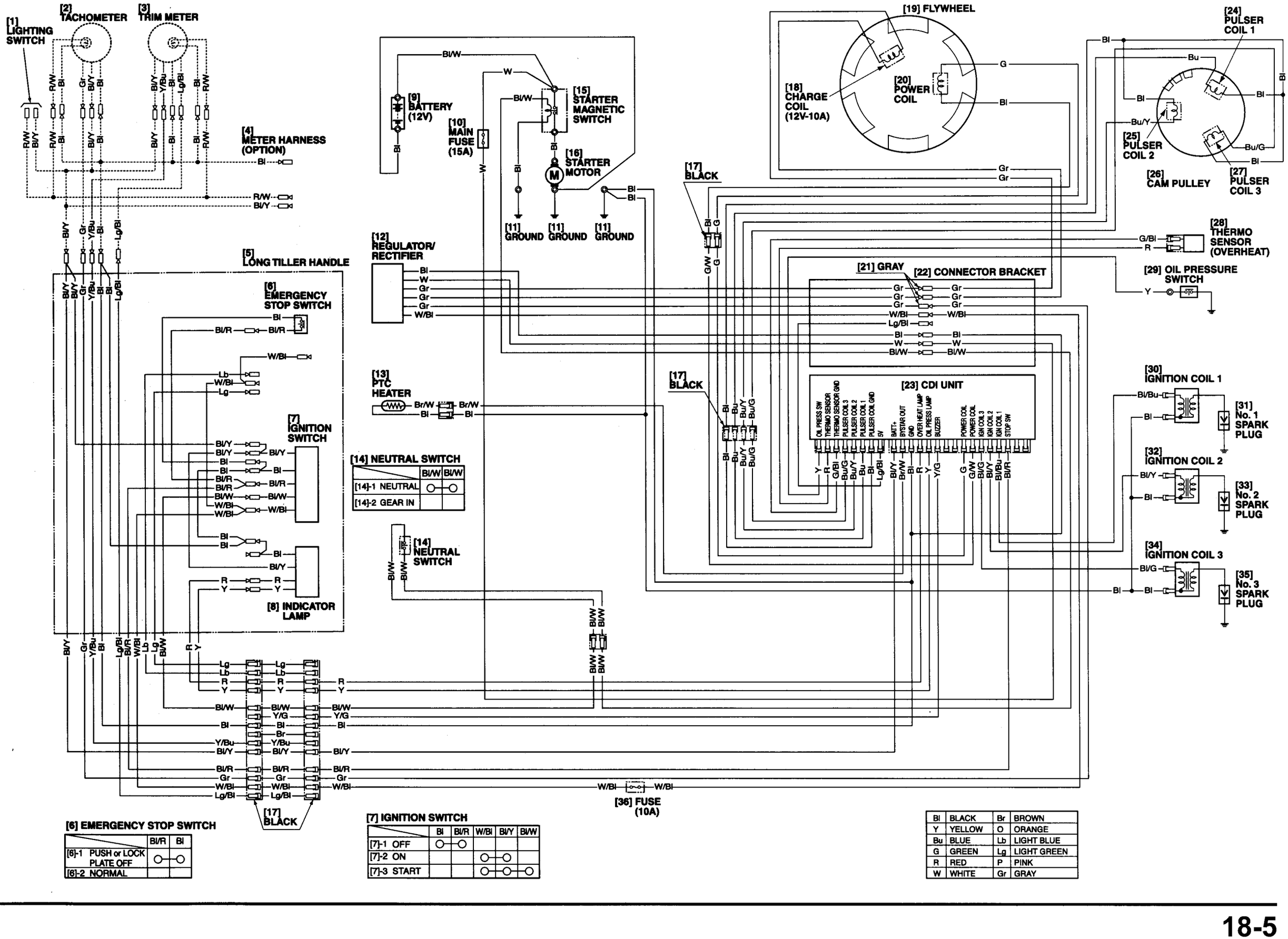
	Bl/W	Bl/W
[15]-1 NEUTRAL	○	○
[15]-2 GEAR IN		

[37] POWER TILT SWITCH

	Lg	W	Lb
[37]-1 NORMAL			
[37]-2 UP	○	○	
[37]-3 DOWN		○	○

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

Long tiller handle type with gas assisted tilt



[6] EMERGENCY STOP SWITCH

	Bl/R	Bl
[6]-1 PUSH or LOCK PLATE OFF	○	○
[6]-2 NORMAL		

[7] IGNITION SWITCH

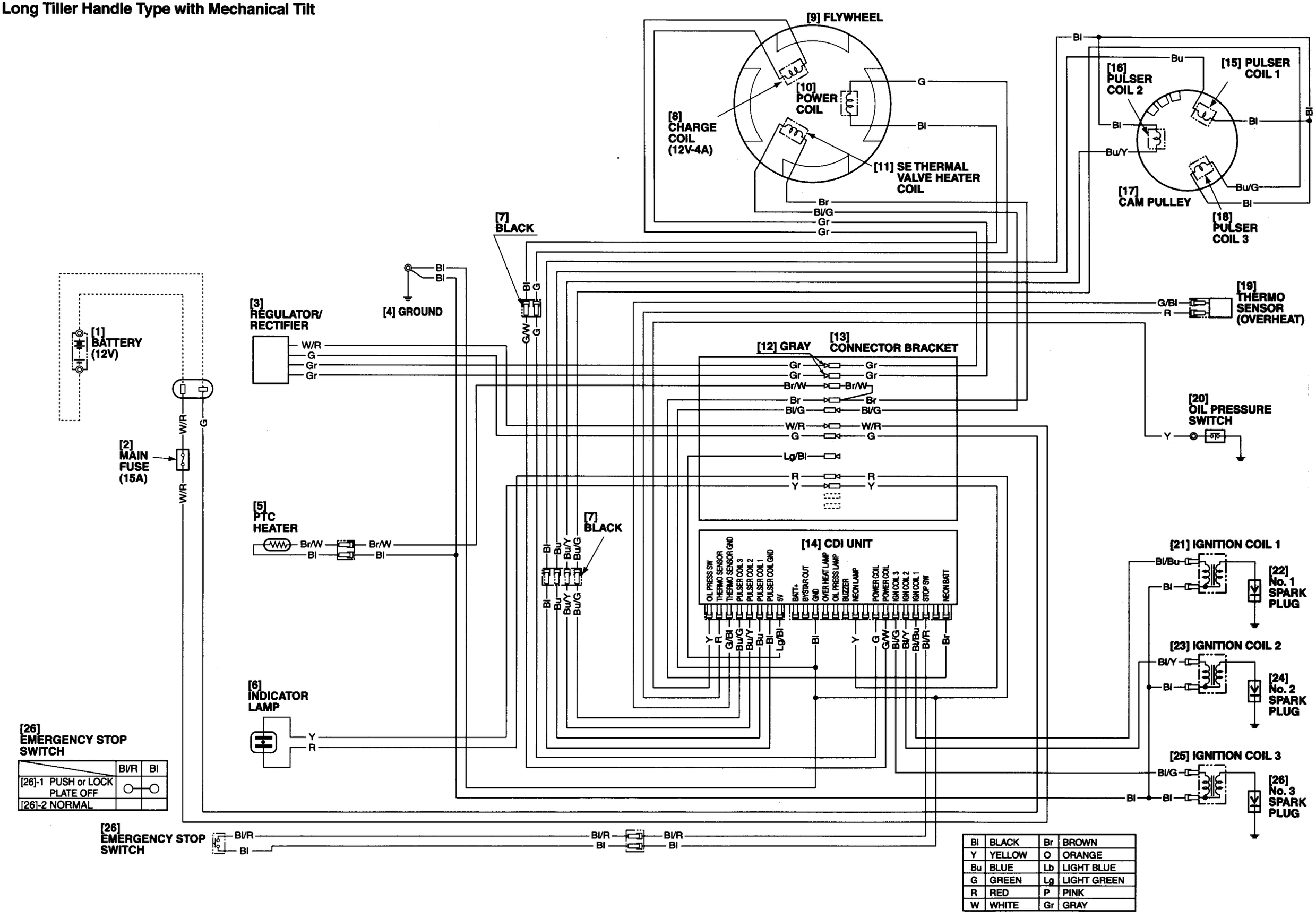
	Bl	Bl/R	W/Bl	Bl/Y	Bl/W
[7]-1 OFF	○	○			
[7]-2 ON			○	○	
[7]-3 START			○	○	○

[14] NEUTRAL SWITCH

	Bl/W	Bl/W
[14]-1 NEUTRAL	○	○
[14]-2 GEAR IN		

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

Long Tiller Handle Type with Mechanical Tilt



	BI/R	BI
[26]-1 PUSH or LOCK PLATE OFF	○	○
[26]-2 NORMAL		

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

HONDA
OUTBOARD
MOTOR

Shop Manual News

Power Equipment

News No.	Issue Date
P/P-087	Nov. 2000

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
INSTALLATION: • Do not reuse. • Apply grease to the mating surface and lips of the seals. • Apply soapy water to the circumference of the seals.	**INSTALLATION:** • Do not reuse. • Apply grease to the mating surface, circumference and lips of the seals.

HONDA MOTOR CO., LTD.
SERVICE PUBLICATION OFFICE

HONDA

OUTBOARD MOTOR

Shop Manual News

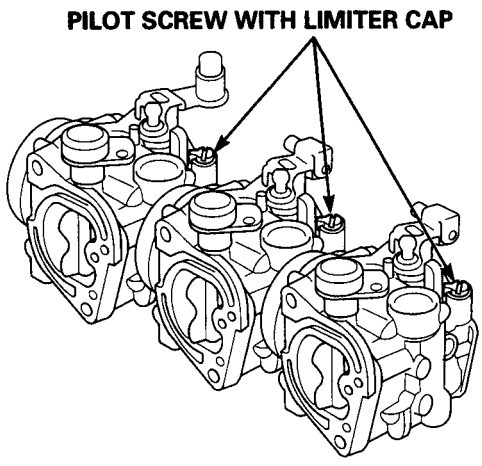
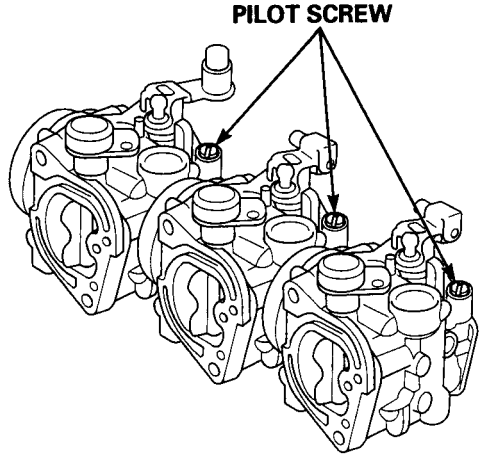
Power Equipment

News No.	Issue Date
P/P-093	MAY., 01

SOME PARTS OF CHANGES

Model	Publication No.	Applicable Pages
BF30A	66ZV700Z	2-1
BF40A/50A	66ZV300X	2-1

CHANGE LOCATIONS

Item	After Modification	Before Modification
Engine Serial No.	BF30A/BF30AX: BAWE-1011107 and subsequent	BF30A/BF30AX: Up to BAWE-1011106
	BF30A1: BAWE-2000001 and subsequent	———
	BF40A/BF40AX: BAYE-1016440 and subsequent	BF40A/BF40AX: Up to BAYE-1016439
	BF40A1: BAYE-2007400 and subsequent	BF40A1: Up to BAYE-2007399
	BF50A/BF50AX: BAZE-1033504 and subsequent	BF50A/BF50AX: Up to BAZE-1033503
	BF50A1: BAZE-2000001 and subsequent	———
Carburetor BF30A1/BF40A1/BF50A1 Canadian models only		
Pilot Screw Opening	BF30A/BF30AX, BF30A1: 2 turns out	BF30A, BF30AX: 3 turns out
	BF40A/BF40AX, BF40A1: 1-5/8 turns out	BF40A/BF40AX, BF40A1: 2-1/4 turns out
	BF50A/BF50AX, BF50A1: 2 turns out	BF50A, BF50AX: 1 turn out

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Service Publication Office

PILOT SCREW REPLACEMENT

Leave the pilot screw and limiter cap in place during carburetor cleaning. Remove only if necessary for carburetor repair. Removal of the limiter cap requires breaking the pilot screw. A new pilot screw and limiter cap must be installed.

1) When the limiter cap has been broken off, remove the broken pilot screw.

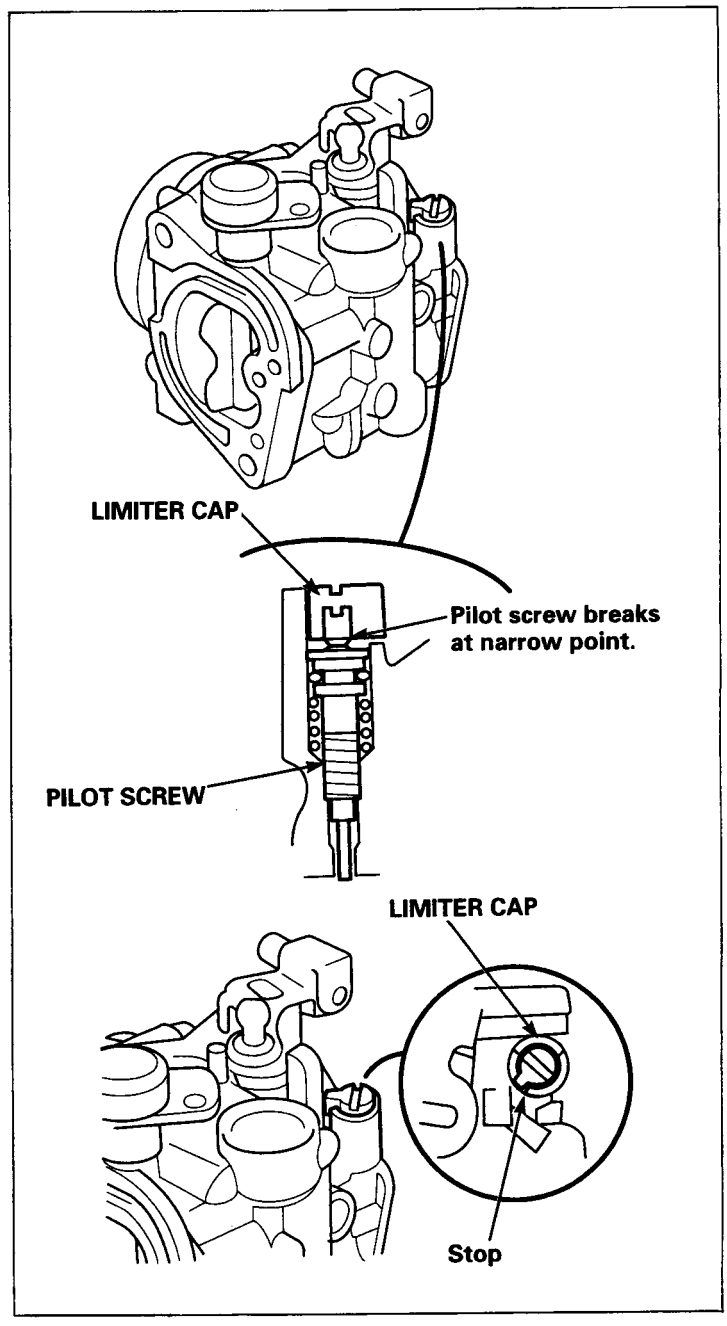
2) Place a new O-ring on the replacement pilot screw, and install it on the carburetor.

3) Turn the pilot screw in until it is fully seated, then turn the screw out the required number of turns.

Pilot screw opening	BF30A1	2 turns out
	BF40A1 (BAYE 2000001~2007399)	2-1/4 turns out
	BF40A1 (BAYE 2007400~)	1-5/8 turns out
	BF50A1	2 turns out

4) Apply Locktite®638 to the inside of the limiter cap, then install the cap so its stop prevents the pilot screw from being turned counterclockwise.

   Be careful to avoid turning the pilot screw while installing the limiter cap. The pilot screw must stay at its require setting.



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OUTBOARD MOTOR

Shop Manual News

Power Equipment

News No.	Issue Date
P/P-138	August 2002

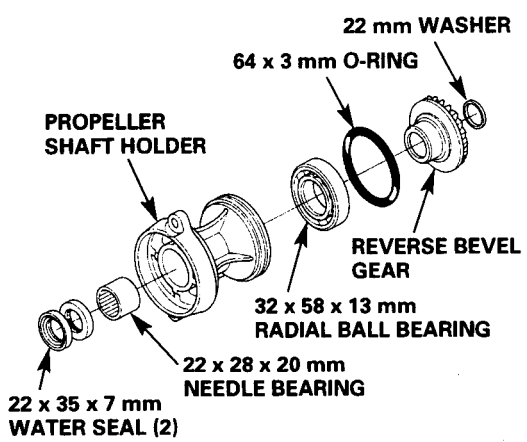
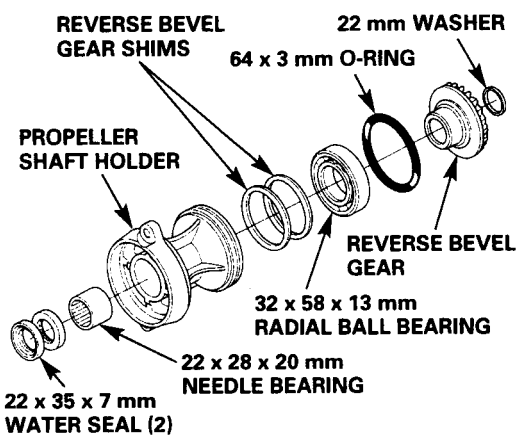
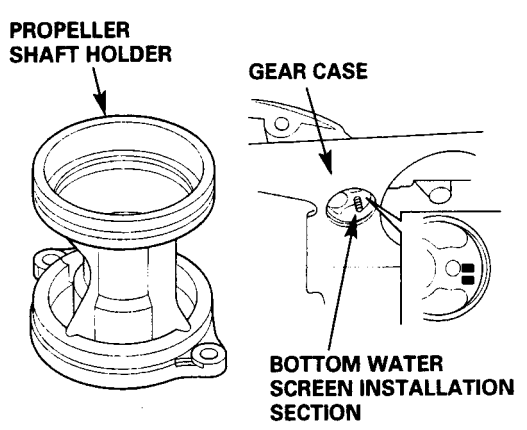
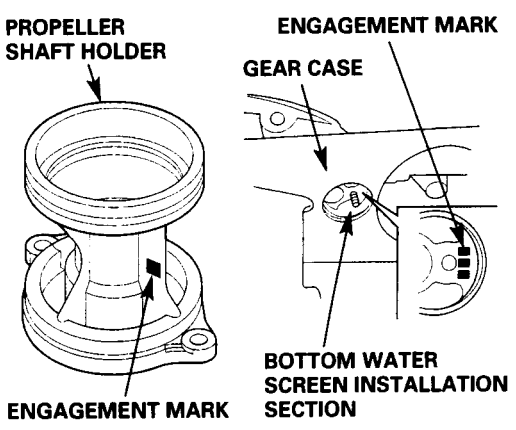
SOME PARTS OF CHANGES

Applicable Information	Publication No.	Applicable Pages
BF20A • BF25A • BF30A	66ZV700	12-2, 12-15, 12-19, 12-20

CHANGE LOCATIONS

The reverse bevel gear shims is not used from the following frame serial numbers.

<table>
<tr><td rowspan="3">Frame serial number

Item</td><td>BF20A</td><td>:BAHL-2100001 and subsequent
:BAHS-2100005 and subsequent</td><td>BF20A</td><td>:Up to BAHL-2099999
:Up to BAHS-2100004</td></tr>
<tr><td>BF25A</td><td>:BAJL-3100131 and subsequent
:BAJS-3220783 and subsequent
:BAJU-3100003 and subsequent</td><td>BF25A</td><td>:Up to BAJL-3100130
:Up to BAJS-3220782
:Up to BAJU-3100002</td></tr>
<tr><td>BF30A</td><td>:BAWL-3100103 and subsequent
:BAWS-3220595 and subsequent</td><td>BF30A</td><td>:Up to BAWL-3100102
:Up to BAWS-3220594</td></tr>
<tr><td>REVERSE BEVEL GEAR SHIM
The reverse gear shims are not used.</td><td colspan="2"> 
</td><td colspan="2"> 
</td></tr>
<tr><td>ENGAGEMENT MARK
The engagement mark for the reverse gear shims are not used.</td><td colspan="2"> 
</td><td colspan="2"> 
</td></tr>
<tr><td>REVERSE GEAR SHIM SELECTION TABLE</td><td colspan="2">Not applied</td><td colspan="2">Applied</td></tr>
</table>

Honda Motor Co., Ltd.
Service Publication Office

POWER PRODUCT

SERVICE NEWS

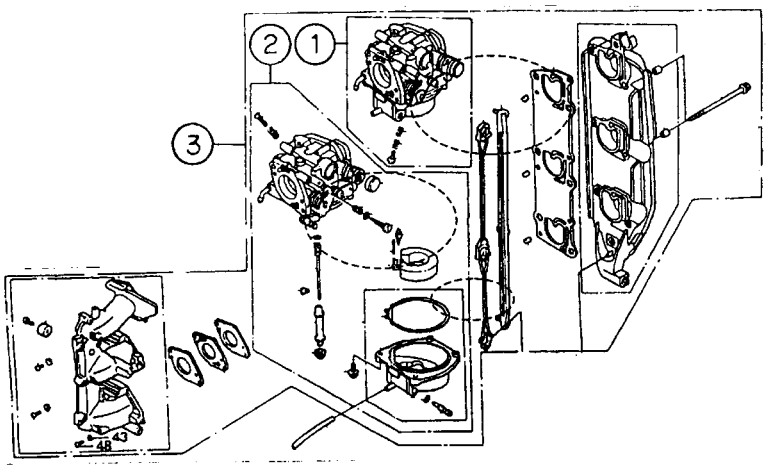
Issued: September 2000 (Outboard motors)

Model: BF50/30AY

Re: Carburetor assembly parts

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)	CARBURETOR ASSY.(#1 #2)	No	No
CARBURETOR ASSY.(#)	CARBURETOR ASSY.(#)	No	No
CARBURETOR ASSY.	CARBURETOR ASSY.	No	Yes
CARBURETOR ASSY.(#1 #2)	CARBURETOR ASSY.(#1 #2)	No	No
CARBURETOR ASSY.(#)	CARBURETOR ASSY.(#)	No	No
CARBURETOR ASSY.	CARBURETOR ASSY.	No	Yes



Change

Stabilization of the idle speed by change of the passage to the pilot screw part of the carburetor body

Applicable model numbers

	(From the production of June 2000 on.)
	(From the production of June 2000 on.)

In case of problems with the idle speed stability for old models, please take the following measures.

Confirmation of the phenomenon

Idle speed not stable, engine stalls occur.

Clean

Procedure

{1} Wipe the tip of the pilot screw removed from the carburetor with a rag and wash it with kerosene or similar.

{2} Return the pilot screw for the standard number of turns according to the service manual.

{3} Follow the service manual to perform tuning adjustment and adjustment to the specified idle speed again.

{4} If the problem occurs again with the passage of time after the above steps {1} to {3} have been performed, replace the old carburetor assembly by the countermeasure carburetor assembly.

Issued: HONDA MOTOR CO., LTD. POWER PRODUCT SERVICE DIVISION