A50000-0

HOW TO USE THIS MANUAL

MANUAL FORMAT

This manual provides the mechanic with descriptions of the operations of disassembly, repair, assembly, adjustment and inspection, each of which is presented in a sequential, step-by-step procedure.

To assist you to find your way about this manual, the Section Title and Major Heading is given at the head of every page.

An Index to contents is provided on the first page of each section.

MODEL INDICATION

Multiple models are shown in this manual. These indications are noted as follows.

Model name	50GETO	60FEHTO	60FED	60FEDO	60FET	60FETO	70BEDO	70BETO
USA and Canada name	_	P60TH	C60ER	_	C60TR	_		70TR
Indication	50GETO	60FEHTO	60FED	60FEDO	60FET	60FETO	70BEDO	70BETO
Model name	75CET	75CETO	75CEHTO	80AETO	90AEHD	90AED	90AET	90AETO
USA and Canada name	C75TR	75TR	P75TH	_	_	_	C90TR	90TR B90TR
Indication	75CET	75CETO	75CEHTO	80AETO	90AEHD	90AED	90AET	90AETO

THE ILLUSTRATIONS

Some illustrations in this manual may differ from the model you have. This is because the procedure described may relate to several models, though only one may be illustrated. (The name of the model described will be mentioned in the description.)

To help you identify components and understand the correct procedures of disassembly and assembly, exploded diagrams are provided. Steps in the procedures are numbered thus: 1), 2), 3). Parts shown in the illustrations are identified thus: ①, ②, ③.

REFERENCES

These have been kept to a minimum, however, when you are referred to another section of the manual, you are told the page number to go to.

SPECIFICATIONS

These are given in bold type at each procedure. It is not necessary to leave the section dealing with the procedure in order to look up the specifications.

It is important to note the differences in specifications of models. Where a procedure relates to more than one model, the main differences in specifications will be shown in the following table.

Model name	50GETO	60FEHTO	60FED	60FEDO	60FET	60FETO	70BEDO	70BETO
USA and Canada name	_	P60TH	C60ER	_	C60TR	_	_	70TR
Control system	Remote control	Manual control			Remote	control		
Tilt system	Power trim and tilt		Manual tilt		Power trim and tilt		Manual tilt	Power trim and tilt
Lubrication system	Oil injection		Pre-mixed	Oil injection	Pre-mixed	d Oil inje		
Model name	75CET	75CETO	75CEHTO	80AETO	90AEHD	90AED	90AET	90AETO
USA and Canada name	C75TR	75TR	P75H	_	_	_	C90TR	90TR B90TR
Control system	Remote	control	Manual control	Remote control	Manual control	Remote control		ol
Tilt system		Power tri	m and tilt		Manual tilt		Power trim and tilt	
Lubrication system	Pre-mixed		Oil injection			Pre-mixed		Oil injection

WARNINGS, CAUTIONS AND NOTES

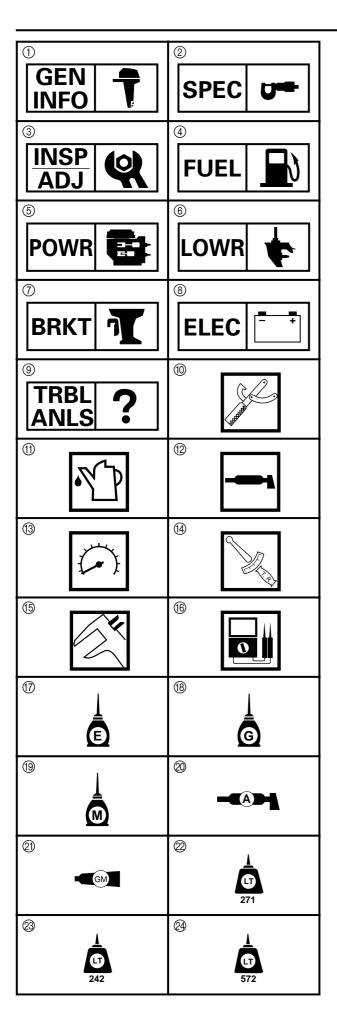
Attention is drawn to the various Warnings, Cautions and Notes which distinguish important information in this manual in the following ways.

The Safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

A WARNING

Failure to follow WARNING instructions <u>could result in severe injury or death</u> to the machine operator, a bystander, or a person inspecting or repairing the outboard motor.

CAUTION:	
A CAUTION inc	licates special precautions that must be taken to avoid damage to the out-
NOTE:	
	es key information to make procedures easier or clearer.



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SYMBOLS

Symbols 1) to 9 are designed as thumbtabs to indicate the content of a chapter.

- (1) General Information
- ② Specifications
- ③ Periodic Inspection and Adjustment
- (4) Fuel System
- ⑤ Power Unit
- 6 Lower Unit
- (7) Bracket Unit
- ® Electrical Systems
- Trouble Analysis

Symbols (1) to (6) indicates specific data:

- Special service tool
- (f) Specified liquid
- (12) Specified grease
- (3) Specified engine speed
- (14) Specified torque
- (5) Specified measurement
- (6) Specified electrical value [Resistance (Ω), Voltage (V), Electric current (A)]

Symbol (7) to (20) in an exploded diagram indicate grade of lubricant and location of **lubrication** point:

- (7) Apply engine oil
- (8) Apply gear oil
- Apply molybdenum disulfide oil
- Apply water resistant grease (Yamaha marine grease A, Yamaha marine grease)

Symbols 2) to 24 in an exploded diagram indicate grade of sealing or locking agent, and location of application point:

- ② Apply Gasket Maker®
- Apply LOCTITE[®] No. 271 (Red LOCTITE)
 Apply LOCTITE[®] No. 242 (Blue LOCTITE)
- 24 Apply LOCTITE® No. 572

NOTE:

In this manual, the above symbols may not be used in every case.

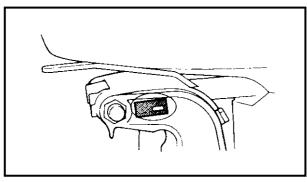


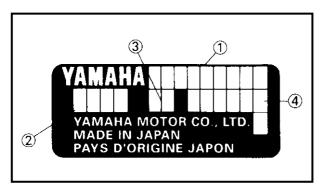
CHAPTER 1 GENERAL INFORMATION

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IDENTIFICATION SERIAL NUMBER

The serial number of the outboard motor is stamped on a plate attached to the port side of the clamp bracket.

① Serial number

NOTE: ___

For USA model:

As an anti-theft measure, a special label on which the outboard motor serial number is stamped is bonded to the port side of the clamp bracket. The label is specially treated so that peeling it off causes cracks across the serial number.

- ① Model name
- ② Approved model No.
- ③ Transom height
- 4 Serial number

STARTING SERIAL NUMBERS

The starting serial number blocks are as follows:

	Model		Annuouad	Serial		Model		Annuovad	Serial
World- wide	USA	Canada	Approved model No.	number	World- wide	USA	Canada	Approved model No.	number
50GETO	_	_	62F	L: 400805 ~	70BEDO	_	_		L: 402029 ~
60FEHTO	P60TH	P60TH		L: 551924 ~	70BETO	70TR	70TR	6H3	L: 491824 ~
BUFERTO	РООТП	POUIN		X: 750186 ~	/UBEIU	/UBEIO /UIK			X: 731262 ~
60FED		C60ER] [S: 001118 ~	75CET	C75TR	C75TR		L: 001251 ~
OUFED	_	COUEN		L: 305624 ~	75CETO	_	75TR	6H0	L: 951540 ~
60FEDO				S: 100850 ~	75CEHTO	P75TH	_		L: 900371 ~
BOLEDO	_	_	6H2	L: 407212 ~	80AETO	_			L: 457543 ~
			ОПΖ	S: 050474 ~			_		X: 851331 ~
60FET	C60TR	C60TR		L: 357665 ~	90AEHD	_	_		L: 320132 ~
				X: 710231 ~	90AED	_	_		L: 401108 ~
]	S: 150756 ~	90AET	C90TR	C90TR	6H1	L: 354053 ~
60FETO	60FETO — — —	_		L: 472180 ~	004570	90TR	0075	1	L: 498690 ~
				X: 732000 ~	90AETO	B90TR	90TR		X: 856313 ~

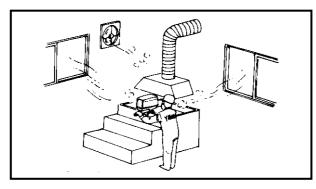


The procedures given in this manual are those recommended by Yamaha to be followed by Yamaha dealers and their mechanics.



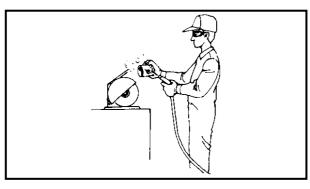
FIRE PREVENTION

Gasoline (petrol) is highly flammable. Petroleum vapor is explosive if ignited. Do not smoke while handling and keep it away from heat, sparks, and open flames.



VENTILATION

Petroleum vapor is heavier than air and if inhaled in large quantities will not support life. Engine exhaust gases are harmful to breathe. When test-running an engine indoors, maintain good ventilation.



SELF-PROTECTION

Protect your eyes with suitable safety glasses or safety goggles when using compressed air, when grinding or when doing any operation which may cause particles to fly off.

Protect hands and feet by wearing safety gloves or protective shoes if appropriate to the work you are doing.



OILS, GREASES AND SEALING FLUIDS

Use only genuine Yamaha oils, grease and sealing fluids or those recommended by Yamaha.



SAFETY WHILE WORKING

Under normal conditions of use, there should be no hazards from the use of the lubricants mentioned in this manual. However, safety is all-important and by adopting good safety practices, any risk is minimized.

A summary of the most important precautions is as follows:

- 1. While working, maintain good standards of personal and industrial hygiene.
- 2. Clothing which has become contaminated with lubricants should be changed as soon as practicable, and laundered before further use.
- 3. Avoid skin contact with lubricants; do not, for example, place a soiled wipingrag in one's pocket.
- 4. Hands, and any other part of the body which have been in contact with lubricants or lubricant-contaminated clothing, should be thoroughly washed with hot water and soap as soon as practicable.
- 5. To protect the skin, the application of a suitable barrier cream to the hands before working is recommended.
- 6. A supply of clean, lint-free cloths should be available for wiping purposes.

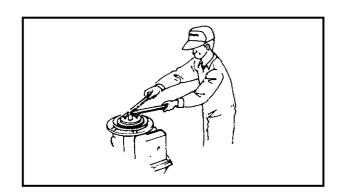


1. The right tools

Use the special tools that are advised to protect parts from damage. Use the right tool in the right manner - don't improvise.

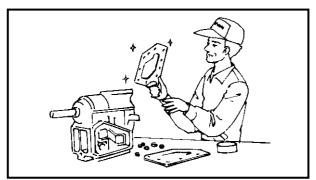
2. Tightening torque

Follow the torque tightening instructions. When tightening bolts, nuts and screws, tighten the larger sizes first, and tighten inner-positioned fixings before outer-positioned ones.



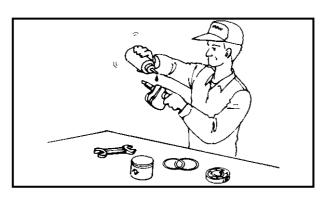


SAFETY WHILE WORKING



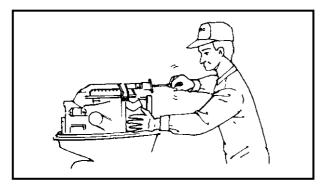
3. Non-reusable items

When reassembling, always use new gaskets, packing, O-rings, oil seals, split-pins and circlips, etc.



DISASSEMBLY AND ASSEMBLY

- 1. Clean parts with compressed-air when disassembling them.
- 2. Oil the contact surfaces of moving parts before assembly.



3. After assembly, check that moving parts operate normally.

- 4. Install bearings with the manufacturer's markings on the side exposed to view and liberally oil the bearings.
- 5. When installing oil seals, apply a light coating of water-resistant grease to the outside circumference.



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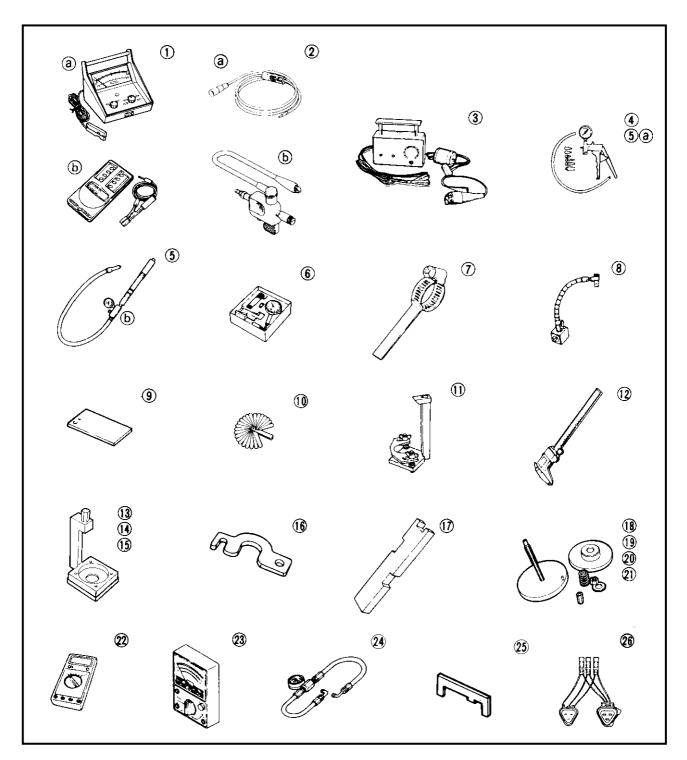
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SPECIAL TOOLS

The use of correct special tools recommended by Yamaha will aid the work and enable accurate assembly and tune-up. Improvisations and use of improper tools can cause damage to the equipment.

NOTE: .

- For USA and Canada, use part numbers starting with "YB-", "YM-", "YU-" or "YW-".
- For others, use part numbers starting with "90890-".





SPECIAL TOOLS

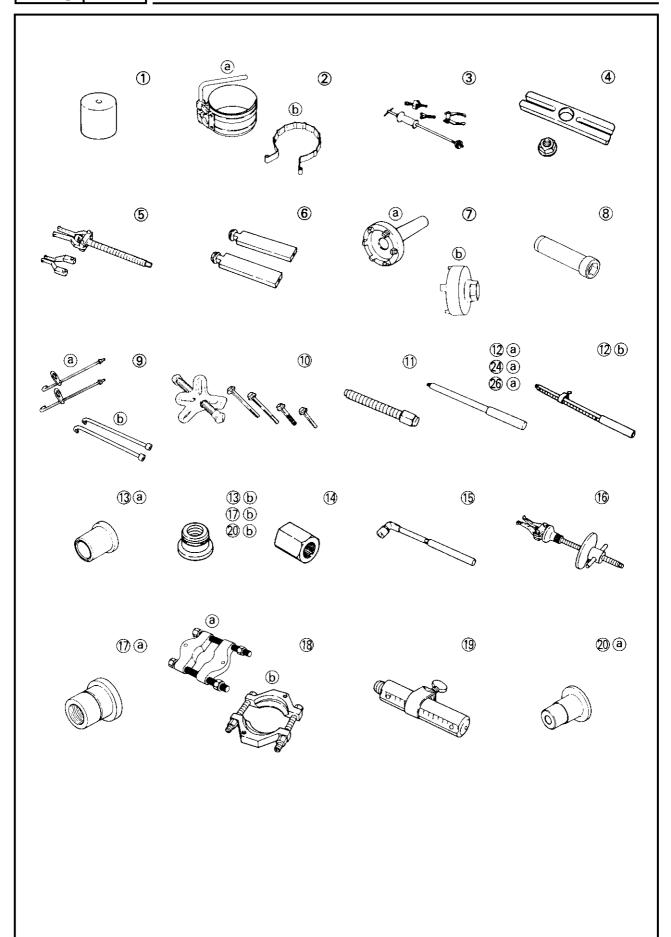
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MEASURING

		Too	No.		
	Tool name	USA and Canada @	Except for USA and Canada (b)	Use	for:
1	Tachometer	YU-08036-A	90890-06760	ldle s	peed
2	Dynamic spark tester	YM-34487	90890-06754	lgnition	system
3	CDI tester	YU-91022-B	N.A.	Ignition	system
4	Mity Vac	YB-35956	90890-06756	Fuel	joint
5	Pressure tester	YB-35956	90890-06762	Lowe	r case
6	Dial gauge	YU-03097	90890-01252	Back	dash
7	Backlash indicator	YB-06265	90890-06706	Back	dash
8	Magnet base	YU-34481	90890-06705	Back	dash
9	Backlash adjusting plate	YB-07003	N.A.	Back	dash
10	Thickness gauge	YU-26900-8	N.A.	Shim	ming
11	Pinion height gauge	N.A.	90890-06702	Pinion s	himming
12	Digital caliper	N.A.	90890-06704	Pinion shimming	Forward shimming
13	Gauge block	YB-34432-9	N.A.	Pinion s	nimming
14	Adapter plate	YB-34432-10	N.A.	Pinion s	himming
15	Gauge base	YB-34432-11	N.A.	Pinion s	himming
16	Clamp	YB-34432-17	N.A.	Pinion s	himming
17	Shimming plate	N.A.	90890-06701	Forward	shimming
18	Base plate	YB-34446-1	N.A.	Forward	shimming
19	Compression spring	YB-34446-3	N.A.	Forward	shimming
20	Press plate	YB-34446-5	N.A.	Forward	shimming
21	Gauge pin	YB-34446-7	N.A.	Forward	shimming
22	Digital multimeter	YU-34899-A	90890-06752	Elec	trical
23	Pocket tester	YU-03112	90890-03112	Electrical	
24	Pressure gauge	YB-06181	N.A.	PTT	unit
25	Shimming gauge	YB-34468-3 YB-34468-5	N.A.	Reverse s	shimming
26	3 pins test harness	YB-06443	90890-06757	Peak voltage	measurement









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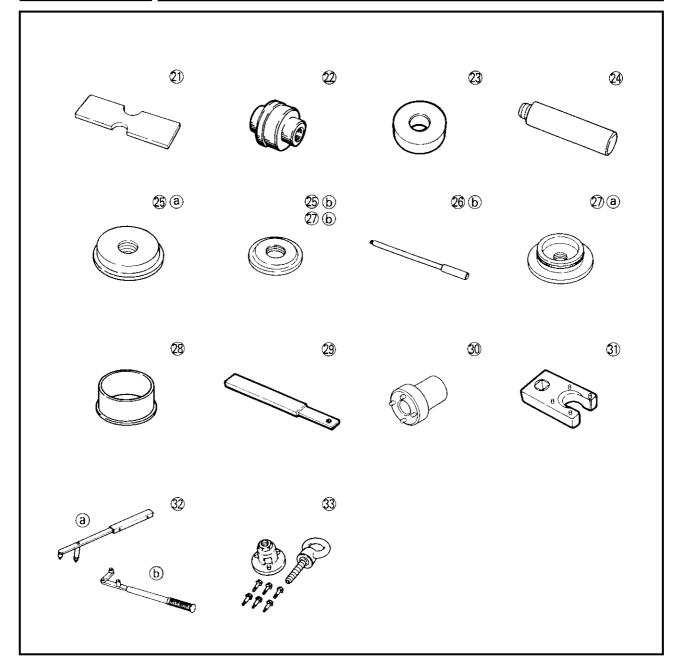
REMOVAL AND INSTALLATION

		Too	l No.	
	Tool name	USA and Canada ⓐ	Except for USA and Canada (b)	Use for:
1	Small end bearing installer	YB-06107 YB-06287	90890-06527	Connecting rod
2	Piston slider	YU-33294	90890-06530	Cylinder piston
3	Slide hammer set	YB-06096	N.A.	Water pump housing oil seal Reverse gear bearing Propeller shaft housing oil seal Drive shaft outer bearing Forward gear outer bearing
4	Stopper guide plate	N.A.	90890-06501	Water pump housing oil seal Bearing housing Reverse gear bearing Propeller shaft housing oil seal Drive shaft outer bearing
5	Bearing puller	N.A.	90890-06535	Water pump housing oil seal Reverse gear bearing Propeller shaft housing oil seal Drive shaft outer bearing
6	Stopper guide stand	N.A.	90890-06538	Water pump housing oil seal Reverse gear bearing Propeller shaft housing oil seal Drive shaft outer bearing
7	Ring nut wrench	YB-06048 YB-34447	90890-06510 90890-06511	Ring nut
8	Extension	N.A.	90890-06513	Ring nut
9	Claw	YB-06207	90890-06502 90890-06503	Propeller shaft housing
10	Universal puller	YB-06117	N.A.	Propeller shaft housing
11	Center bolt	N.A.	90890-06504	Propeller shaft housing
12	Drive rod	YB-06071	90890-06602	Propeller shaft housing oil seal Drive shaft needle bearing
13	Needle bearing attachment	YB-06153	90890-06612	Propeller shaft housing bearing
14	Drive shaft holder	YB-06049 YB-06151	90890-06518 90890-06519	Pinion nut
15	Pinion nut holder	N.A.	90890-06505	Pinion nut
16	Bearing outer race puller	N.A.	90890-06523	Forward gear outer bearing
17	Needle bearing attachment	YB-06155	90890-06611	Drive shaft needle bearing
18	Bearing separator	YB-06219	90890-06534	Crank shaft bearing Reverse gear bearing Forward gear bearing
19	Drive rod	YB-06071	90890-06604	Propeller shaft needle bearing
20	Needle bearing attachment	YB-06153	90890-06612 90890-06614	Propeller shaft needle bearing



SPECIAL TOOLS



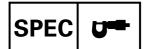




SPECIAL TOOLS

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		No.		
	Tool name	USA and Canada ⓐ	Except for USA and Canada (b)	Use for:
21	Bearing depth plate	N.A.	90890-06603	Propeller shaft needle bearing Drive shaft needle bearing
22	Oil seal attachment	YB-06269	N.A.	Propeller shaft oil seal
23	Needle bearing depth stop	YB-34473	N.A.	Drive shaft needle bearing
24	Driver rod	YB-06071	90890-06606	Drive shaft outer bearing
25	Bearing outer race attachment	YB-06156	90890-06626 90890-06627	Drive shaft outer bearing
26	Driver rod	YB-06071	90890-06605	Forward gear outer bearing
27	Bearing outer race attach- ment	YB-06276-B	90890-06621 90890-06622	Forward gear outer bearing
28	Bearing inner race attachment	N.A.	90890-06640 90890-06662	Forward gear inner bearing
29	Shift rod wrench	YB-06052	N.A.	Shift rod
30	Cylinder end screw wrench	YB-06175-1A	N.A.	PTT
31	Cylinder end screw wrench	YB-06175-2B	90890-06544 90890-06548	PTT
32	Flywheel holder	YB-06139	90890-06522	Flywheel
33	Flywheel puller	YB-06117	90890-06521	Flywheel



CHAPTER 2 SPECIFICATIONS

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GENERAL SPECIFICATION

				Model		
	_	Unit	50 hp	60 hp	70 hp	
Model			50GETO	*1: P60TH/	*3: 70BEDO	
				60FEHTO *2: C60ER/60FED	*5: 70TR/70BETO	
				*3: 60FEDO		
				*4: C60TR/60FET		
				*5: 60FETO		
Approved model No.			62F	6H2	6H3	
Overall Length		mm (in)	698 (27.5)	713 (28.1)	
			-	1,330 (52.4)*1	_	
Overall width	_	mm (in)		364 (14.3)		
Overall height	S	mm (in)	_	1,252 (49.3)*2,3,4	_	
	L	mm (in)	1,351 (53.2)		(54.1)	
	Х	mm (in)	_	, ,	9.1)*1,4,5	
Boat transom height	S	mm (in)	<u> </u>	381 (15.0)*2,3,4,5	_	
	L	mm (in)		508 (20.0)	*4.45	
	Χ	mm (in)	_		5.0) ^{*1,4,5}	
O/M transom height	S	mm (in)	_	400 (15.7)*2,3,4,5	_	
	L	mm (in)	520 (20.5)		20.5)	
	Χ	mm (in)	_	648 (25.5)*1,4,5		
Weight (Al.)	S	kg (lb)	_	94 (207)*2	_	
				95.5 (211)*3 104 (229)*4		
				103.5 (228)*5		
	L	kg (lb)	102 (225)		215) ^{*3}	
		3 ()	, ,,		(233) ^{*5}	
				112 (247)*1	_	
				96 (212)*2		
				106 (234)*4	×F	
	Х	kg (lb)	_	115 (254)*1 109 (240)*4	108.5 (239)*5	
Weight (SUS.)	S	kg (lb)	_	97.5 (215)*3		
Weight (000.)	J	kg (Ib)		105.5 (233)*5	_	
	L	kg (lb)	_		219) ^{*3}	
		3 ()	_		(237) ^{*5}	
	Χ	kg (lb)	_		(244) ^{*5}	
Full throttle speed range	ļ	r/min	4,500	~ 5,500	5,000 ~ 6,000	
Output (ISO)		kW (hp) @ r/min	36.8 (50) @ 5,000	44.1 (60) @ 5,000	51.5 (70) @ 5,500	
Maximum fuel consump	tion	L (US gal, Imp	22 (5.81, 4.84)	23 (6.08, 5.06)	26 (6.87, 5.72)	
		gal)/h @ r/min	@ 5,500	@ 5,500	@ 5,500	
Туре				2 stroke - L		
Cylinders				3		
Total displacement		cm ³ (cu in)		849 (51.8)		
Bore × Stroke		mm (in)		$2.0 \times 69.5 \ (2.83 \times 2.7)$		
Compression ratio			6.33		10	
Compression pressure		kPa (kg/cm²)		853 (8.53)		
Carburetor number				3		
Intake system				Reed valve		



GENERAL SPECIFICATION



				Model	
	_	Unit	75hp	80hp	90hp
Model			C75TR/75CET*1 75TR/75CETO*2 P75TH/75CEHTO*3	80AETO	90AEHD*1 90AED*2 C90TR/90AET*3 90TR/90AETO*4 B90TR/90AETO*4
Approved model No.			6H	10	6H1
Overall Length		mm (in)	726 (28.6)*1,2	726 (28.6)	726 (28.6)*2,3,4
			1,343 (52.9)*3	<u> </u>	1,343 (52.9)*1
Overall Width		mm (in)	374 (14.7)*1,2	374 (14.7)	374 (14.7)*2,3,4
			398 (15.7)*3	_	398 (15.7)*1
Overall Height	S	mm (in)		_	
	L	mm (in)		1,413 (55.6)	
	Χ	mm (in)	_	1,540 (60.6)	1,540 (60.6)* ⁴
Boat transom height	S	mm (in)		_	
	L	mm (in)		508 (20.0)	
	Χ	mm (in)	_	635 (25.0)	635 (25.0)*4
O/M transom height	S	mm (in)		_	
	L	mm (in)		520 (20.5)	
	Χ	mm (in)	_	647 (25.5)	647 (25.5)* ⁴
Weight (Al.)	S	kg (lb)			
	L	kg (lb)	119.5 (263)*1 120.5 (266)*2 124.5 (275)*3	120.5 (266)	115.5 (255)*1 111.5 (246)*2 119.5 (263)*3 120.5 (266)*4
	Χ	kg (lb)	_	123.5 (272)	123.5 (272) ^{*4}
Weight (SUS.)	S	kg (lb)		_	
	L	kg (lb)	121.5 (268)*1 122.5 (270)*2	122.5 (270)	113.5 (250)*2 121.5 (268)*3 122.5 (270)*4
	Χ	kg (lb)	_	125.5 (277)	125.5 (277) ^{*4}
Full throttle speed rang	е	r/min		4,500 ~ 5,500	
Output (ISO)		kW (hp) @ r/min	55.2 (75) @ 5,000		66.2 (90) @ 5,000
Maximum fuel consum	ption	L (US gal, Imp gal)/h @ r/min	32 (8.49 @ 5	,500	34.5 (9.11, 7.59) @ 5,500
Туре				2 stroke-L	
Cylinders		_		3	
Total Displacement		cm³ (cu in)		1,141 (69.6)	
Bore × Stroke		mm (in)		$0.0 \times 72.0 \ (3.23 \times 2.8)$	
Compression ratio			5.9		5.86
Compression pressure		kPa (kg/cm²)		922 (9.22)	
Carburetor number Intake system				3 Reed valve	



GENERAL SPECIFICATION



1114	Model						
Unit	50 hp	60 hp	70 hp	75 hp	80 hp	90 hp	
			Loop	harge	1	-	
			Elec	ctric			
			C	DI			
		6A			10A		
		Cho	oke valve	¹ /Prime s	start		
			Micro co	omputer			
	BR8HS-10			B8HS-10			
	Е	R8HS-10	/Register	plug-cap	(standard)	
			Through _I	prop boss	S		
			Wa	iter			
	P	re-mixed	gasoline	& oil*2/0	il injectio	n	
P.O.N.*3			Regular	gasoline			
			Mir	ո.86			
	TC-W3*4						
		Нур	ooid gear	oil-SAE#	90 ^{*5}		
cm ³ (US oz, Imp oz)	500 (16.91, 17.60)		610	(20.62, 2°	1.47)		
L (US qt, Imp qt)	2.8	3 (2.96, 2.4	46)	3.0	3 (3.49, 2.9	90)	
degree			8/12/16	5/20/24			
degree		63			_		
			6	7			
at 12 transom		−4 ~ 15			−4 ~ 16		
degree		35 + 35			30 + 30		
(left + right)							
				-R*6			
Gear type Clutch type							
Propeller direction Propeller drive system							
	•						
Δh (kC)							
1 1							
	Imp oz) L (US qt, Imp qt) degree degree at 12 transom	BR8HS-10 BR8HS-10 P.O.N.*3 cm³ (US oz, Imp oz) (16.91, 17.60) L (US qt, Imp qt) degree degree at 12 transom degree (left + right) 14:24 (1.714)	S0 hp 60 h	Onit 50 hp 60 hp 70 hp Loop of Elect	Through prop bose	Through prop boss Water Pre-mixed gasoline Min.86 TC-W3*4 Hypoid gear oil-SAE#90*5 Tog quere Gasoline Gas	

^{*1:} For C60ER, C60TR, C75TR

^{*2:} For C60ER/60FED, C60TR/60FET, C75TR, 90AEHD, 90AED, C90TR/90AET

^{*3:} Pump Octane Number; (Research octane + Motor octane)/2

^{*4:} YAMALUBE two-cycle outboard motor oil is recommended in USA YAMALUBE 1 is recommended in Canada

^{*5:} GEAR CASE LUBE is recommended in USA

^{*6:} Forward-Neutral-Reverse





ltem	Unit	Model
item	Offic	50 hp
Propeller		G type (aluminum)
No. of blades × diameter	in	3 × 11-3/8 × 12
× pitch		3 × 11-1/8 × 13

ltem	Unit	Model 60, 70 hp					
item	Offic						
Propeller		K type (aluminum)	K type (stainless)				
No. of blades × diameter	in	$3 \times 13 - 1/4 \times 17$	$3 \times 13 \times 17$				
× pitch		3 × 13 × 23	$3 \times 13 \times 19$				
		$3 \times 12-5/8 \times 21$	$3 \times 13 \times 21$				
		3 × 13 × 19	$3 \times 13 \times 23$				
		$3 \times 13 - 1/2 \times 15$	$3 \times 13 \times 25$				
		$3 \times 13-5/8 \times 13$	3 imes 13-1/2 $ imes$ 14				
			$3 \times 13 - 1/2 \times 16$				
P: High performance propeller		P type (s	tainless)				
	in	3 × 14	l × 20				
		3 × 14	1 × 24				
		3 × 14	1 × 28				

ltem	Unit	Mo	del				
item	Offic	75, 80, 90 hp					
Propeller		K type (aluminum)	K type (stainless)				
No. of blades × diameter	in	$3 \times 12-5/8 \times 21$	$3 \times 13 \times 17$				
× pitch		3 × 13 × 19	$3 \times 13 \times 19$				
·		3 × 13 × 23	$3 \times 13 \times 21$				
		$3 \times 13 - 1/4 \times 17$	$3 \times 13 \times 23$				
		3×13 -1/2 \times 15	$3 \times 13 \times 25$				
		3×13 -1/2 \times 17	3×13 -1/2 \times 14				
		$3 \times 13-5/8 \times 13$	3×13 -1/2 \times 16				
		3 × 14 × 11					
P: High performance propeller		P type (s	tainless)				
	in	3 × 14	l × 20				
		3 × 14	l × 22				
		3 × 14	l × 24				
		3 × 14	l × 26				
		3 × 14	l × 28				





C31000-0*

MAINTENANCE SPECIFICATIONS ENGINE

		Model							
ltem	Unit	50 hp	60 hp	70 hp	75 hp	80 hp	90 hp		
Cylinder head:									
Warpage limit	mm (in)			0.1 (0	0.004)				
(Lines indicate straight measurement)									
Cylinder:									
Bore size	mm (in)		2.00 ~ 72. 834 ~ 2.8			2.00 ~ 82.0 228 ~ 3.23			
Taper limit	mm (in)			0.08 (0.003)				
Out of round limit	mm (in)			0.05 (0.002)				
Piston:									
Piston to cylinder	mm (in)	0.	050 ~ 0.0	55	0.	060 ~ 0.00	65		
clearance		(0.0	020 ~ 0.0	022)	(0.0	024 ~ 0.00	026)		
<limit></limit>	mm (in)		105 (0.004	-	0.	115 (0.004	15)		
Piston size "D"	mm (in)	71.945 ~ 71.970 81.935 ~ 81.960							
		(2.8	325 ~ 2.8			258 ~ 3.2	268)		
Measuring point "H"	mm (in)			10 ((0.4)				
H									
Oversize 1st	mm (in)		2.25 (2.844	-		2.25 (3.238			
2nd	mm (in)		2.50 (2.85	•		2.50 (3.24	•		
Offset	mm (in)		0.5 (0.0197	-		1.0 (0.039			
[direction]		[E:	xhaust sid	de]	[E	xhaust sid	de]		
Piston ring:									
Sectional sketch									
Top ring & 2nd ring				Keys	stone				
Type									
B B	mm (in)	2.0 (0.08)							
T T	mm (in)		3.0 (0.12)	1		3.2 (0.13)			
End gap [installed]									
Top ring & 2nd ring	mm (in)	0.3 ~ 0.5 (0.012 ~ 0.020)					~ U.UZ4)		
Side clearance	mm /:\	_	102 00	7		1 02 0 04	2		
Top ring & 2nd ring	mm (in)		0.03 ~ 0.0 012 ~ 0.0			0.03 ~ 0.00 012 ~ 0.00			
		(0.0	0.0	0201	(0.0	0.00	J_T/		

^{*:} Except for USA





lto vo	l lmia			Mo	del			
ltem	Unit	50 hp	60 hp	70 hp	75 hp	80 hp	90 hp	
Crankshaft:								
Crank width "A"		57.90 ~ 57						
Crank width "B"	mm (in)			2 ~ 5.984)				
Crank width "C"	mm (in)		246.1 (9.6				9 ~ 11.21)	
Maximum deflection "D"	mm (in)	0.03 (0.0012)					20)	
Connecting rod side clearance "E"	mm (in)	0.20 ~ 0.70 (0.008 ~ 0.028) 0.12 ~ 0.26 (0.005 ~ 0.010						
Connecting rod maxi- mum axial play "F"	mm (in)	2.0 (0.08)						
Carburetor:								
Stamp mark		62F00	6H20A, 6H210*1	6H30A	6H007, 6H015*2	6H007	6H107	
Main jet (M.J.)	#	125	140, 145 (L)* ³	150		160		
Main air jet (M.A.J.)	#	170	175, 180*1	160	180		175	
Pilot jet (P.J.)	#	65	65, 70*1	75	78, 80* ²	78	78	
Pilot air jet (P.A.J.)	#	70	75, 80*1	70	80, 75* ²	80	70	
Pilot screw (P.S.)	Turns out	$1-3/8 \pm 1/4$	$1-1/2 \pm 1/4$, $1-3/8 \pm 1/4^{*1}$		-	± 1/4	1-1/4 ± 1/4	
Float height (F.H.)	mm (in)	15.0 ± 1.0			1.0 (0.55			
		(0.59 ± 0.04)			2.0 (0.55 ± 3.0 (0.77 ±			
Valve seat size	ø	1.2 (0.047)	1.6 (0.063), 1.4 (0.055)*1			1.6 (0.063	3)	
Idling speed	r/min			800	± 50			
Oil injection pump:								
Stamped mark		62F00 6H302 6H102						
Discharge	cm ³	$\begin{vmatrix} 1.90 \pm 0.50 \\ 2.20 \pm 0.50 \end{vmatrix}$ 3.10 ± 0.70						
	(US oz,	10.067 ± 0.0101						
Pood volvo	Imp oz)		U.U//±	0.018)	0.	109 ± 0.02	25)	
Reed valve:	mana /:\	2.0	0.2		0 0 0 /0	. 20 0.0	1)	
Stopper height	mm (in)	3.0 ± (0.12 ±	± 0.2 ± 0.01)		.9 ± 0.2 (0).39 ± 0.0	l) 	
Warpage limit	mm (in)			0.2 (0.01)			

^{*1:} For C60ER, C60TR *2: For C75TR *3: Lower cylinder





ltem	Linit	Unit Model							
item	Offic	50 hp	60 hp	70 hp	75 hp	80 hp	90 hp		
Thermostat:									
Valve opening temper- ature	°C (°F)	48 ~ 52 (118 ~ 126)							
Full-opening tempera- ture	°C (°F)	60 (140)							
Valve lift	mm (in)			3 (0).12)				

C32000-0*

ELECTRICAL

ltem	Unit			Mo	del			
ltem	Offic	50hp	60hp	70hp	75hp	80hp	90hp	
Ignition system:								
Ignition timing								
at full reversed	ATDC		7 ± 1			8 ± 1		
	degree			1				
at full advanced	BTDC	22	± 1		20 ± 1		22 ± 1	
	degree		7 . 4		I	0 4		
cam roller pick-up	ATDC		7 ± 1			8 ± 1		
Dieten position	degree							
Piston position at full advanced	BTDC	2 22	± 0.28	2.68 ±	2 02	± 0.27	3.41 ±	
at full advanced	mm (in)		± 0.28 ± 0.11)	0.26		± 0.27 ± 0.011)	0.29	
	111111 (1117	(0.127	± 0.11/	(0.106±	(0.111	± 0.011/	(0.134±	
				0.010)			0.011)	
Charging coil resistance	Ω	136 ~ 20	04 (Browi	n – Blue)	64 ~ 96 (Br – R)		- R)	
[20°C (68°F)]					191 ~ 288 (B – R)			
Charge coil output peak								
voltage (minimum)								
color			Br – L			- Br	R – L	
@ cranking (open)	V		120		_	55	90	
@ cranking (connect)	V		150		_	0	100	
@ 1,500 r/min	V		160			70	135	
@ 3,500 r/min	V		120			50	135	
Pulser coil resistance	Ω	240 ~ 3	360 (W/R	– W/B)	241 ~ 3	362 (W/R	– W/B)	
[20°C (68°F)]								
Pulser coil output peak voltage (minimum)								
color		\\//D \\//D		ļ ,	W/R – W/	, I		
@ cranking (open)	V	W/R – W/B 4.5		'	7.0			
@ cranking (open) @ cranking (connect)	V	4.5 2.5				7.0 5.0		
@ 1,500 r/min	V	2.5 6.5			14			
@ 1,500 1/11111 @ 3,500 r/min	V		10					
@ 3,300 I/IIIIII	٧		10			20		





		Model						
Item	Unit	50hp 60hp 70hp 75hp 80hp						
Ignition coil:								
Primary coil resistance [20°C (68°F)]	Ω	0.18 ~ 0.24 (Blac	k/White – Black)					
Secondary coil resistance [20°C (68°F)]	kΩ	3.26 ~ 4.88 (Black/White – High tension cord)						
Crank position sensor resistance [20°C (68°F)]	Ω	158 ~ 236 (Blue/White – Blue/Red)						
Crank position sensor								
peak voltage: (minimum)			L /D . L AA/					
color	.,	L/R – L/W	L/R – L/W					
@ cranking (open)	V	5.0	5.5					
@ cranking (connect)	V	5.0	5.5					
@ 1,500 r/min	V	20	25					
@ 3,500 r/min	V	16	20					
Spark plug:								
Spark plug gap	mm (in)	0.9 ~ 1.0 (0.	035 ~ 0.039)					
CDI unit output peak								
voltage: (minimum)								
color		B/W – B	B/W – B					
@ cranking (open)	V	-	_					
@ cranking (connect)	V	#1, 3: 105 #2: —	#1,3: 130 #2: —					
@ 1,500 r/min	V	145	155					
@ 3,500 r/min	V	105	130					
Lighting system:								
Lighting coil resistance	Ω	0.57 ~ 0.85 (G/W – G)	0.4 ~ 0.6 (G/W – G)					
STD (12V 80W)		0.07 0.00 (4,11 4,	0.1 0.0 (0,11 0,					
[20°C (68°F)]								
Lighting coil output								
peak voltage (minimum)								
color		G – G/W	G – G/W					
@ cranking (open)	V	8.5	10					
@ cranking (connect)	V	8.0	11					
@ 1,500 r/min	V	25	25					
@ 3,500 r/min	V	25	25					
Starter motor:								
Rating	Sec	30						
Output	kW	0.6 1.0						
Clutch type		Overru						
Brush length	mm (in)	12.5 (0.49)	16.0 (0.63)					
<wear limit=""></wear>	mm (in)	9.0 (0.35)	12.0 (0.47)					
Commutator undercut	mm (in)		0.03)					
<repair limit=""></repair>	mm (in)							
<nepaii iiiiil=""></nepaii>	111111 (1111)	0.2 (0.01)						

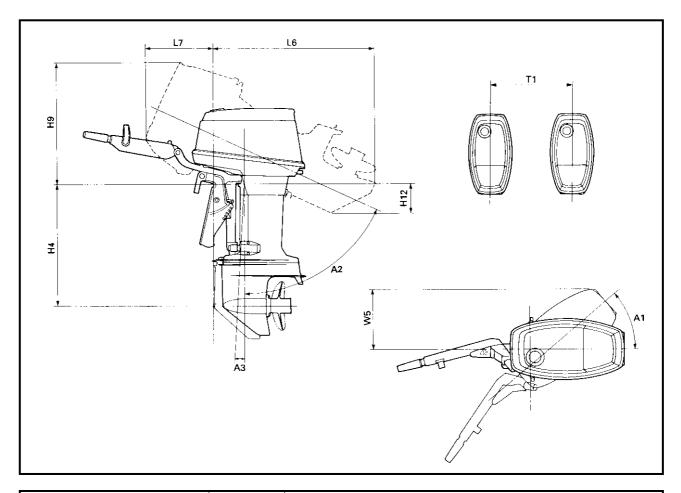




ltem	Unit			Mo	del		
item	Offic	50hp	60hp	70hp	75hp	80hp	90hp
Commutator outside diameter	mm (in)	30 (1.18)			33 (1.30)		
<repair limit=""></repair>	mm (in)		29 (1.14)			31 (1.22)	
Pinion/ring gear gap	mm (in)	3.0 ~ 5.0 (0.12 ~ 0.20)					
Others:							
Electrothermal valve resistance [20°C (68°F)]	Ω			2.3 ~ 3.	5 (L – B)		
Fuel enrichment valve resistance [20°C (68°F)]	Ω	3.4 ~ 4.0 (L – B)					
Trim sensor resistance	Ω	360 ~ 540 (P – B)					
		800 ~ 1,200 (B – O)					
Fuse	Α			2	0		



DIMENSION



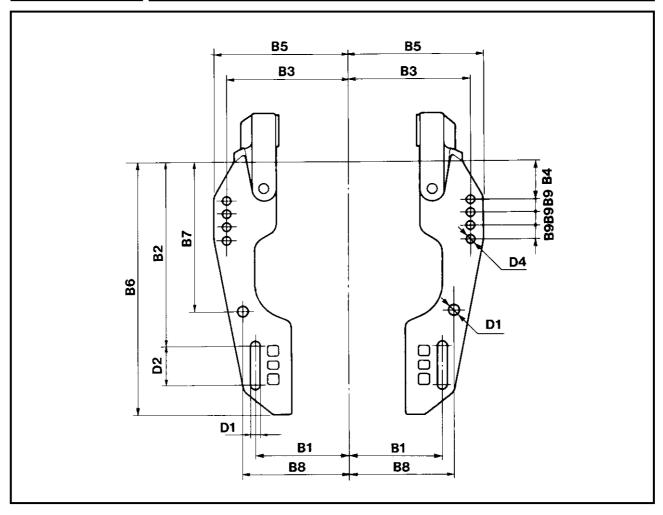
l+/	em	Unit		Model		
	5111	Onit	50 hp	60, 70 hp	75, 80, 90 hp	
L6	S	mm (in)	_	868 (34.2)	_	
	L		918 (36.1)	968 (38.1)	
	X		_	1,081	(42.6)	
L7	S	mm (in)	_	403 (15.9)	_	
	L, X		411	1 (16.2)	457 (18.0)	
H4	S	mm (in)	_	400 (15.7)	_	
	L			520 (20.5)		
	X		_	648 (25.5)	647 (25.5)	
H9	S	mm (in)	_	719 (28.3)	_	
	L, X		706	6 (27.8)	730 (28.7)	
H12	S	mm (in)	_	135 (5.3)	_	
	L		204 (8.0)	205 (8.1)	203 (8.0)	
	X		_	264 (10.4)	
W5		mm (in)	321	1 (12.6)	331 (13.0)	
A1		degree		35	30	
A2	S	degree	_	63	_	
	L, X			67, 62 ^{*1}		
A3	S	degree	_	0	_	
	L, X		4			
T1		mm (in)	— 600 (23.6) [*]			

^{*1:} For P60TH/60FEHTO, P75TH/75CEHTO

^{*2:} Except for P75TH/75CEHTO, 90AEHD







		Unit		Mo	del			
		Onit	50 hp	60 hp	70 hp	75, 80, 90 hp		
B1		mm (in)		125.4	(4.9)	•		
B2		mm (in)		254 (10.0)			
В3		mm (in)		163.5	6 (6.4)			
B4		mm (in)		50.8	(2.0)			
B5		mm (in)	180 (7.1)					
B6	S	mm (in)	_	329 (13.0)		_		
	L, X			351 (13.8)			
B7		mm (in)		138.1	(5.4)			
B8		mm (in)		203.2	(8.0)			
B9		mm (in)		18.5	(0.7)			
D1		mm (in)		13 (0.5)			
D2		mm (in)	55.5 (2.2)					
D4		mm (in)		12 (0.5)			



TIGHTENING TORQUE

		Part	Thread	O.	'ty	Tight	ening to	orque	
Parts to be tight	ened	name	size	50, 60, 70 hp	75, 80, 90 hp	Nm	m • kg	ft • lb	Remarks
ENGINE:		1		I			11		
	1st	Dolt	NAG		10	4	0.4	2.9	
	2nd	Bolt	M6	_	12	12	1.2	8.7	
Crank agas	1st	Dolt	NAO	6		10	1.0	7.2	
Crank case	2nd	Bolt	M8	6	_	20	2.0	14	
	1st	Pol+	N/10	8	0	20	2.0	14	
	2nd	Bolt	M10	0	8	40	4.0	29	
Connecting red	1st	Dolt	M8		6	12	1.2	8.7	
Connecting rod	2nd	Bolt	IVIO	_	6	35	3.5	25	
	1st			1.4	14	15	1.5	11	
Cylinder head	and	Bolt	M8	14	_	32	3.2	23	
	2nd			_	14	30	3.0	22	
	1st	Dala	N/C	10		3	0.3	2.2	
F	2nd	Bolt	M6	16	_	8	0.8	5.8	
Exhaust cover	1st	D - I4	MO		10	9	0.9	6.5	
	2nd	Bolt	M8		18	18	1.8	13	
	1st		M6	0	12	4	0.4	2.9	
Intake manifold	0	Bolt		8		8	0.8	5.8	
	2nd			_	12	12	1.2	8.7	
Spark plug		Bolt	M14	3	3	25	2.5	18	
Flywheel		Nut	M20	1	1	160	16.0	115	─
Power unit mount	ing	Bolt	M8	8	11	21	2.1	15	
Starter motor mou	ınting	Bolt	M8	2	2	20	2.0	14	242
Straight screw plu	g	Screw	M12	1	1	23	2.3	1.7	
UPPER CASE AND	GEAR (CASE:	1	•	-		-		
Upper mount rubb	er	Nut	M10	2	2	24	2.4	17	27.1
Bracket bolt		Nut	M22	1	1	15	1.5	11	
Upper case mount	ting	Bolt	M8	11	11	21	2.1	15	
Exhaust guide		Bolt	M8	4	4	21	2.1	15	
Exhaust manifold		Bolt	M8	4	4	21	2.1	15	572
Muffler		Bolt	M8	4	4	21	2.1	15	572
Ping put		NI+		1	_	130	13	94	50 hp
Ring nut		Nut	_	1	1	145	14.5	105	
Pinion nut		Nut	M12	1	_	75	7.5	54	— — — 50 hp
		Nut	M16	1	1	95	9.5	69	
Lower case mount	ting	Bolt	M10	5	5	40	4.0	29	
Propeller		Nut	M16	1	1	35	3.5	25	
Tiller handle mour	nting	Nut	M10	1	1	38	3.8	27	
Handle bracket mo	ounting	Nut	M10	2	2	38	3.8	27	

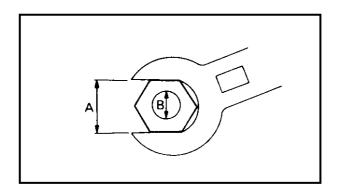


TIGHTENING TORQUE/ GENERAL TORQUE SPECIFICATIONS



Parts to be tightened	Part name	Thread size	Q'ty		Tightening torque			
			50, 60, 70 hp	75, 80, 90 hp	Nm	m • kg	ft • lb	Remarks
POWER TRIM AND TILT:								
Tilt cylinder end screw	Screw	_	1	_	80	8.0	58	6H308
				1	90	9.0	65	6H1-15, 62F-02
Trim cylinder end screw	Screw	_	2		70	7.0	50	6H308
				2	160	16.0	115	6H1-15, 62F-02
Fluid-level plug	Bolt	_	1	_	3	0.3	2.2	6H308
				1	7	0.7	5.1	6H1-15, 62F-02
Lock nut	Nut	_	6	_	10	1.0	7.2	6H308
				6	15	1.5	11	6H1-15, 62F-02
Valve spring mounting	Screw	_	2	2	4	0.4	2.9	6H1-15, 62F-02
Valve lock screw	Screw	_	1	_	13	1.3	9.4	6H308
				1	4	0.4	2.9	6H1-15, 62F-02
Gear pump mounting	Bolt	M6	3	_	5	0.5	3.6	6H308
				3	4	0.4	2.9	6H1-15, 62F-02
Manual valve	Screw	_	1	1	3	0.3	2.2	
Main valve	Screw	_	2	_	10	1.0	7.2	6H308
				2	11	1.1	8.0	6H1-15, 62F-02

Nut (A)	Bolt (B)	General torque specifications				
		Nm	m•kg	ft•lb		
8 mm	M5	5.0	0.5	3.6		
10 mm	M6	8.0	0.8	5.8		
12 mm	M8	18	1.8	13		
14 mm	M10	36	3.6	25		
17 mm	M12	43	4.3	31		



GENERAL TORQUE SPECIFICATIONS

This chart specifies the torque for tightening standard fastners with standard fastners with standard clean dry ISO threads at room temperature. Torque specifications for special components or assemblies are given in applicable sections of this manual. To avoid causing warpage, tighten multifastener assemblies in crisscross fashion and in progressive stages a until the specified torque is reached.



CHAPTER 3 PERIODIC INSPECTION AND ADJUSTMENT

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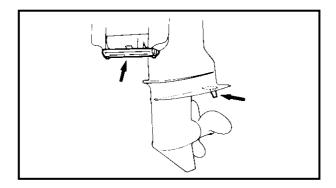


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PERIODIC SERVICE MAINTENANCE SCHEDULE

The following chart may be taken as a helpful guide to the intervals between maintenance procedures.

lustam rala	Init	ial	Eve	D-f	
Intervals	10 hours (Break-in)	50 hours (3 months)	100 hours (6 months)	200 hours (1 year)	Refer page
Anode		0	0		3-1
Battery	0	\circ	0		3-2
	(every month)				3-2
Carburetor	0	\circ	0		3-3
Carburetor link	0			0	3-3
Cylinder head bolts, engine mounting bolts, and flywheel nut	0		0		3-4
Fuel filter	0	0	0		3-4
Fuel tank and fuel line	0		0	0	3-4
Gear oil	0		0		2.5
Idle-speed	0		0		3-5
Ignition timing	0		0		3-6
Oil injection pump	0				3-10
Oil level warning system	0		0		3-11
Oil pump link	0				2.12
Power trim and tilt system	0	\circ	0	0	3-12
Propeller	0	0	0		2.12
Spark plug	0	\circ	0		3-13



D31000-0

ANODE

Inspect the anode. If it is worn out, replace it with a new one. If scaling of the surface is evident, remove the anode, clean it with a wire brush and remove all trace of oil or grease. After cleaning, polish the contact surfaces of the anode mount and re-install.

CAUTION:

Never paint the anode. To ensure good electrical contact, keep the anode contact surface clean of oil or grease.

D31305-0*

BATTERY

▲ WARNING

Battery electrolyte is dangerous; it contains sulfuric acid which is poisonous and highly caustic.

Always follow these preventive measures:

- Avoid bodily contact with electrolyte as it can cause severe burns or permanent eye injury.
- Wear protective eye gear when handling or working near batteries.

Antidote (EXTERNAL):

- SKIN Wash with water.
- EYES Flush with water for 15 minutes and get immediate medical attention.

Antidote (INTERNAL):

 Drink large quantities of water or milk followed with milk of magnesia, beaten egg or vegetable oil. Get immediate medical attention.

Batteries generate explosive, hydrogen gas. Always follow these preventive measures:

- Charge batteries in a well-ventilated area.
- Keep batteries away from fire, sparks or open flames (e.g., welding equipment, lighted cigarettes).
- DO NOT SMOKE when charging or handling batteries.

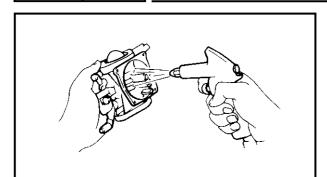
KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.

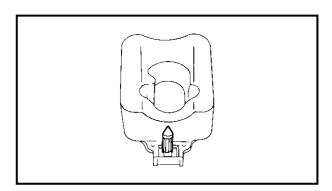


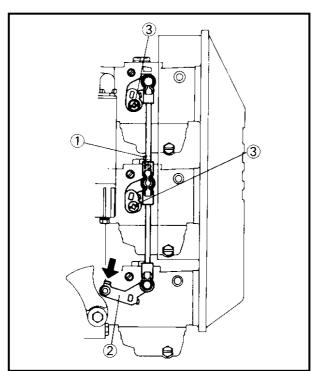
Recommended battery capacity:
Rating.......12V 70AH (252 kC)
Minimum cold crank performance
.......380 Amps at -17.8°C (0°F)
Minimum reserve capacity
.....124 minutes at 26.7°C (80°F)











D31600-1

CARBURETOR

Check the fuel passages and air passages for fouling or clogging. Clean fouled parts with suitable cleaning solvent and blow out clogged passages with compressed air.

A WARNING

Protect your eyes with suitable safety glasses or safety goggles when using compressed air.

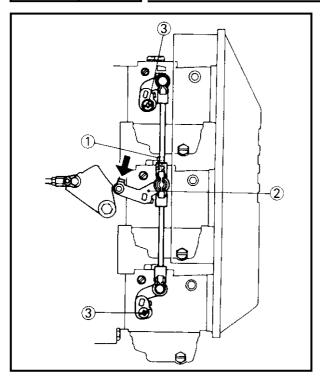
2. Check the needle-valve for wear and replace it if worn.

D31902-1*

CARBURETOR LINK ADJUSTMENT (50, 60, 70 hp)

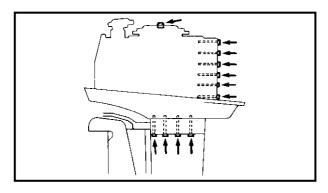
- 1. Loosen the idle adjust screw and fully close the throttle valve.
- 2. Loosen the throttle lever securing screws of upper and middle carburetors by turning clockwise.
- 3. While lightly pushing the throttle lever of the lower carburetor in the direction of the arrow (full-closed), tighten the throttle lever securing screw of the upper middle carburetors by turning counterclockwise.
- 1) Idle adjust screw
- ② Throttle lever
- ③ Throttle lever securing screw

PERIODIC SERVICE



(75, 80, 90 hp)

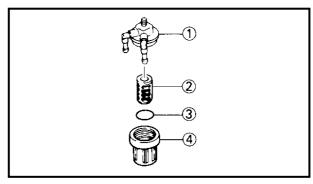
- 1. Loosen the idle adjust screw and fully close the throttle valve.
- 2. Loosen the throttle lever securing screws of upper and lower carburetors by turning clockwise.
- 3. While lightly pushing the throttle lever of the middle carburetor in the direction of the arrow (full-closed), tighten the throttle lever securing screw of the upper and lower carburetors by turning counterclockwise.
- 1) Idle adjust screw
- ② Throttle lever
- 3 Throttle lever securing screw



D32000-0

CYLINDER HEAD BOLTS, ENGINE MOUNTING BOLTS, AND FLYWHEEL NUT

- 1. Retighten to specifications.
- 2. Check other fixings and tighten if necessary.

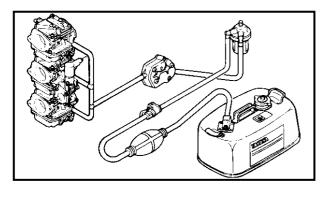


D32300-0

FUEL FILTER

Clean the strainer of dust and impurities.

- 1) Strainer body
- ② Strainer
- ③ O-ring
- (4) Strainer cup



D32600-0

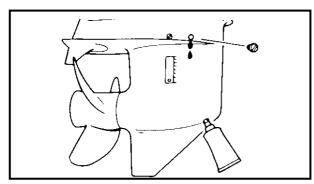
FUEL TANK AND FUEL LINE

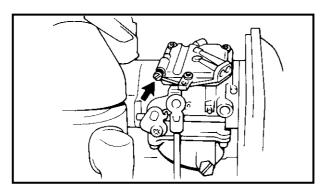
- 1. Check the fuel tank and fuel line for leaks.
- 2. Clean the fuel tank thoroughly.

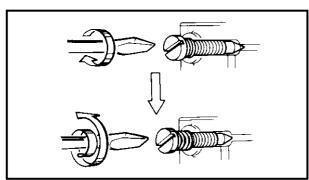


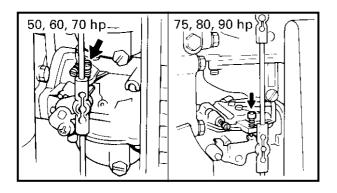
PERIODIC SERVICE











D32900-0

GEAR OIL

- 1. Drain the gear oil thoroughly and pour in new oil.
- 2. Check for water or metallic sediment in the drained oil.

NOTE: _

If the gear oil becomes "milky", check the gear case oil seals and shift boot for water entry.

D33000-0*

IDLE-SPEED

- 1. Turn the pilot screw until it is lightly seated.
- 2. Turn the pilot screw outward to the specified setting.



Pilot screw [stamped mark]: 62F00, 6H210, 6H007, 6H015: 1-3/8 \pm 1/4 turns out 6H20A: 1-1/2 \pm 1/4 turns out 6H30A, 6H107: 1-1/4 \pm 1/4 turns out

- 3. Start the motor and allow it to warm up for a few minutes.
- 4. Set the idle-speed to the specified level by setting the throttle stop-screw. Use a tachometer for checking the speed when adjusting the motor speed.

NOTF:

Turning the throttle stop-screw clockwise increases the motor speed; turning it counterclockwise decreases the motor speed.



Tachometer: YU-8036-A/90890-06760



 $\begin{array}{c} \text{Idle speed:} \\ \text{800} \pm \text{50 rpm} \end{array}$

D33304-0³

IGNITION TIMING ADJUSTMENT TIMING PLATE POSITION ADJUSTMENT

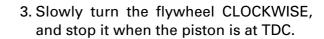
If the timing plate is moved even a little during inspection or repair operation, it should be set in the following way:

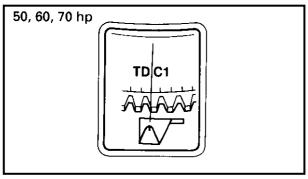
This adjustment must be made before adjusting the ignition timing.

- 1. Remove the spark plugs from the cylinders.
- 2. Install a dial-gauge in the spark-plug hole of No. 1 cylinder.



For easy timing-plate adjustment, it is advisable to remove the spark plugs from all the cylinders.

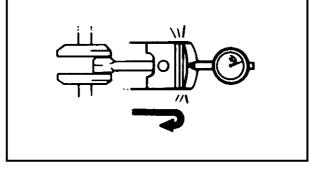


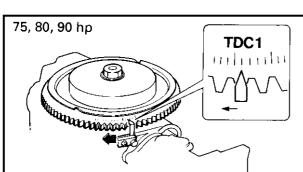


- 4. If the end of the timing plate is not aligned with the TDC mark on the CDI magneto rotor, loosen the timing plate set screw, align the timing plate end with the TDC mark, then tighten the screw.
 - 5. Remove the dial gauge from the No. 1 cylinder and install the spark plugs for each cylinder.

NOTE: _

After tightening the screw, paint over the screw-head to discourage tampering with the adjustment.

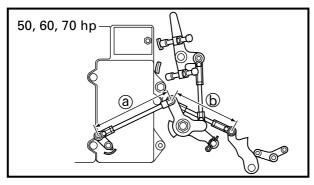


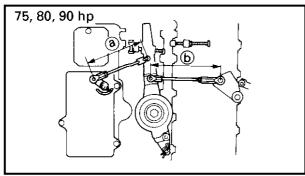


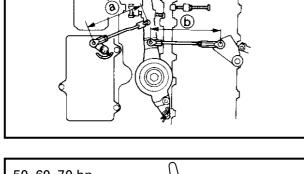


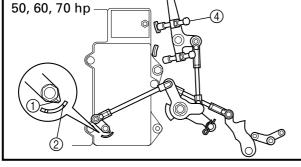
PERIODIC SERVICE

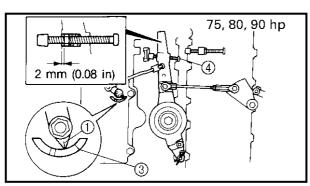


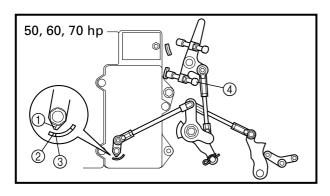












THROTTLE SENSOR CONTROL LINK **ADJUSTMENT**

1. Adjust the lengths of the throttle sensor control link and throttle cam control link to specifications.



Throttle sensor control link length @:

50, 60, 70 hp: 120 ± 0.5 mm

 $(4.72 \pm 0.02 in)$ 75, 80, 90 hp: 93.5 ± 0.5 mm

 $(3.68 \pm 0.02 in)$

Throttle cam link length (b): 50, 60, 70 hp: 95 mm (3.74 in) 75, 80, 90 hp: 120.5 mm (4.74 in)

- 2. Adjust the length of the full-retard adjusting screw so that when the fullretard adjusting screw contacts the stopper, the full-retard indication on the CDI unit aligns with the timing indicator.
- ① Timing indicator
- (2) Full-retard indication (50, 60, 70 hp)
- ③ Full-retard indication (75, 80, 90 hp)
- (4) Full-retard adjusting screw

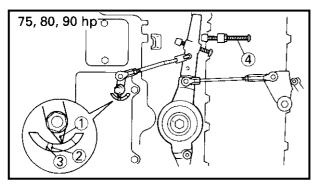
NOTE:

The nut in the magneto control lever should be 2 mm (0.08 in) off from the end of the magneto control lever.

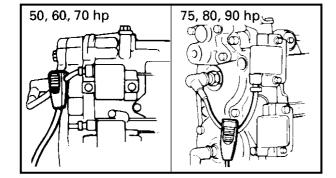
- 3. Adjust the length of the full-advance adjusting screw so that when the fulladvance adjusting screw contacts the stopper, the full-advance indication on the CDI unit aligns with the timing indicator.
- ① Timing indicator
- ② Full-advance indication (50, 60 hp)
- ③ Full-advance indication (70 hp)
- 4 Full-advance adjusting screw







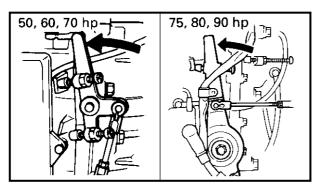
- 1 Timing indicator
- ② Full-advance indication (75, 80 hp)
- ③ Full-advance indication (90 hp)
- 4 Full-advance adjusting screw



IGNITION TIMING ADJUSTMENT

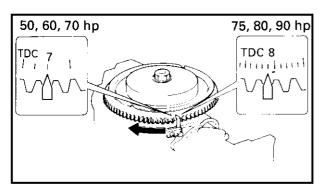
CAUTION:

When checking ignition timing using a timing light, be sure to replace the propeller with the specified test propeller, and make tests with the machine placed in a test tank.

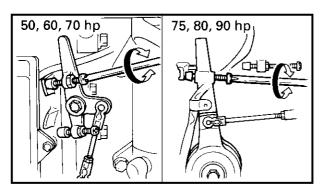


NOTE: _

Before adjusting, be sure to warm up the engine.



- 1. Attach the timing light and tachometer to the No. 1 cylinder high tension code.
- 2. While keeping the stopper in contact with the full-retard adjusting screw, measure the full-retard ignition timing with the timing light.
 - If the timing is out of specification, adjust it by turning the full-retard adjusting screw.



NOTE: _

When measuring the full-retard ignition timing, keep the specified engine speed.



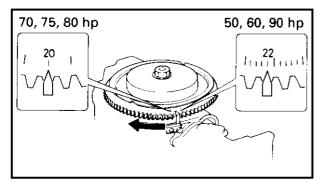
Full-retard side engine speed: $800 \pm 50 \text{ rpm}$

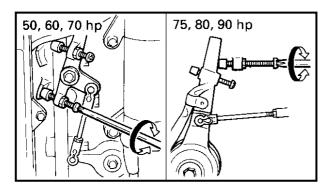


Full-retard side ignition timing: 50, 60, 70 hp: $7 \pm 1^{\circ}$ ATDC









3. While keeping the stopper in contact with the full-advance adjusting screw, measure the full-retard ignition timing with the timing light.

If the timing is out of specification, adjust it by turning the full-advance adjusting screw.

NOTE: _

When measuring the full-advance ignition timing, keep the specified engine speed.



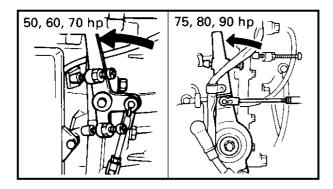
Full-advance side engine speed: 50, 60, 75, 80, 90 ph: 5,000 \pm 500 rpm 70 hp:

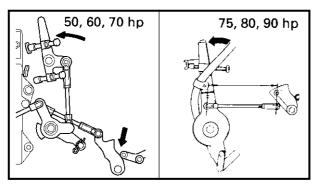
70 np: 5,500 ± 500 rpm



Full-advance side ignition timing: 50, 60, 90 hp: 22 \pm 1 $^{\circ}$ BTDC

70, 75, 80 hp: 20 ± 1° BTDC





PICK-UP TIMING ADJUSTMENT

NOTE

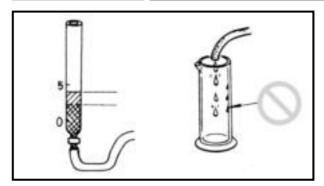
Engine idle speed should be adjusted properly before adjusting the pick-up timing.

- 1. Turn the magneto control lever to the full-retard position.
- 2. Bring the throttle cam to lightly contact the throttle lever roller. (The throttle valve should not open.)

Adjust the accelerator link length and connect magneto control lever to the accelerator cam.







D34000-0*

OIL INJECTION PUMP OPERATIONAL TEST

1. Start the engine and set the idling speed at 1,500 rpm by adjusting the throttle-stop lever.

CAUTION:

Use only oil-mixed fuel (50:1) as malfunction or engine seizure may otherwise result.

- 2. Remove the oil-pump link-rod and fix the oil-pump lever in the full-throttle position.
- Measure the oil discharge from each port for three minutes using a measuring cylinder graduated in steps of at least 0.1 cc to confirm that the specified amount is discharged.



Specified discharge: (3 min/1 cylinder) 50 hp: $1.90 \pm 0.50 \text{ cm}^3 \text{ } (0.064 \pm 0.017 \text{ US oz, } 0.067 \pm 0.018 \text{ Imp oz)} 60, 70 \text{ hp:} \\ 2.20 \pm 0.50 \text{ cm}^3 \text{ } (0.074 \pm 0.017 \text{ US oz, } 0.077 \pm 0.018 \text{ Imp oz)} 75, 80, 90 \text{ hp:} \\ 3.10 \pm 0.70 \text{ cm}^3 \text{ } (0.105 \pm 0.024 \text{ US oz, } 0.0109 \pm 0.025 \text{ Imp oz)}$

NOTE: _

Oil temperature: $10 \sim 30^{\circ}\text{C}$ ($50 \sim 86^{\circ}\text{F}$)

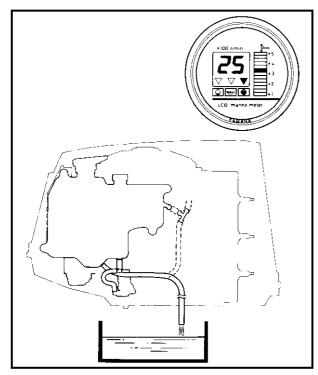
- Before measuring, bleed the pump completely and ensure no air-bubbles are present in the oil flowing out of the oil feed pipe.
- When measuring with the measuring cylinder, ensure that no oil clings to the cylinder wall, otherwise the measurement will be inaccurate.
- 3. Use only genuine Yamaha oil. If the viscosity is too high or too low, the measurement of the discharge will be inaccurate.
- 4. The longer the time over which measurement is made, the more accurate will be the measurement. Calculate the rate of discharge per minute.



D33900-0*

CHECKING THE OIL LEVEL WARNING SYSTEM

- 1. Fill the oil-tank with oil.
- 2. Start the engine.
- 3. By letting the oil little by little out of the drain-hose, check that the oil-level warning system operates correctly.

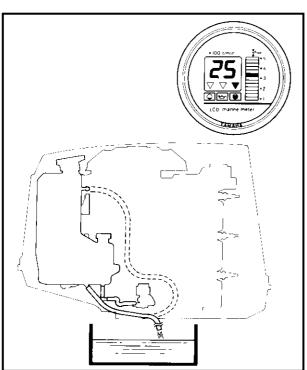


CAUTION:

Do not allow the engine to operate without oil even briefly for this will cause malfunction or engine seizure.

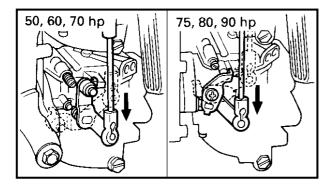
50, 60, 70 hp

Case	Oil level	Oil level warning lamp	Warning buzzer	Speed drop function
1	More than 770 cm ³ (0.81 US qt)	GREEN	OFF	OFF
2	770 cm ³ (0.31 Us qt) ~ 280 cm ³ (0.3 US qt)	YELLOW	OFF	OFF
3	280 cm ³ or less (0.3 US qt)	RED	ON	ON



75, 80, 90 hp

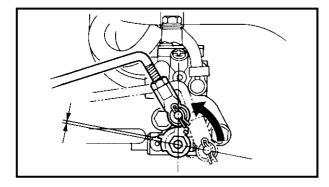
Case	Oil level	Oil level warning lamp	Warning buzzer	Speed drop function
1	More than 1,130 cm ³ (1.19 US qt)	GREEN	OFF	OFF
2	1,130 cm ³ (1.19 Us qt) ~ 310 cm ³ (0.33 US qt)	YELLOW	OFF	OFF
3	310 cm ³ or less (0.33 US qt)	RED	ON	ON



D34300-

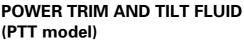
OIL PUMP LINK ADJUSTMENT

1. Fully-open the carburetor throttle valve.



- 2. Set the oil-pump lever 1 mm off fullopen side stopper. With the lever in this position, adjust the length of the rod connecting the oil-pump to the carburetor and tighten the locknut.
- 3. Install the connecting-rod.
- 4. By operating the carburetor, check that the throttle-valve opens fully.





- 1. Tilt-up the motor and lock it with the tilt-lock lever.
- Remove the fluid-level plug to check the fluid level. With the motor tilted-up, the fluid level should be immediately below the fluid-hole. If the fluid level is low, top up with the recommended fluid.



ATF (automatic transmission fluid)

CAUTION:

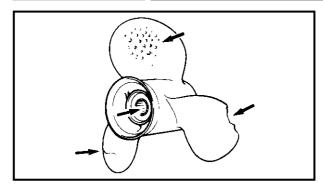
When checking the fluid level (with the unit removed from the engine), hold the unit in the vertical position and set the tilt-rod in the tilt-up position.

3. Re-fit the fluid-level plug and tighten it.



Fluid-level plug: Short transom [6H308]: 3 Nm (0.3 m • kg, 2.2 ft • lb) Long transom [6H1-15, 62F-02]: 7 Nm (0.7 m • kg, 5.1 ft • lb)

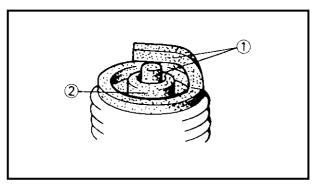




D34900-0

PROPELLER

- 1. Check the blades for wear, damage or cavitation erosion.
- 2. Check the spline for wear and damage.



D35000-0*

SPARK PLUG

1. Check the electrode ① condition and state of wear, note the insulator ② color and the electrode gap.

Normal condition is a medium to light tan color.

Distinctly different color \rightarrow Check the engine condition.

White color : Lean fuel mixture

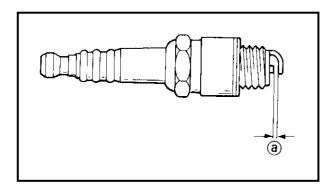
• Plugged filter, jet

Air leak

Wrong settings

Blackish color: Electrical malfunction

• Defective spark plug



2. Clean the spark plug with spark-plug cleaner or wire brush. Use a wire gauge to adjust the plug gap (a) to specification.



Spark plug gap:

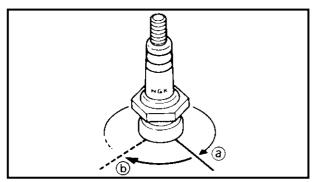
0.9 ~ 1.0 mm (0.035 ~ 0.039 in)

3. If the electrode becomes too worn, replace the spark plug.

S	Standard spark plugs:			
,	Except for Canada, Europe, China and South Africa	For Canada, Europe, China and South Africa		
50 hp	BR8HS-10	BR8HS-10		
60, 70, 75, 80, 90 hp	B8HS-10	BR8HS-10		







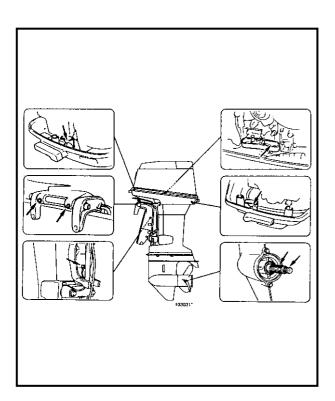
4. When installing the spark plug, clean the gasket surface, wipe off any grime that may be on the surface of the plug and screw in the spark plug to the correct torque.



Tightening torque: 25 Nm (2.5 m • kg, 18 ft • lb)

NOTE: _

If a torque wrench is not available, a good estimate of the correct torque is a further 1/4 to 1/2 turns (b) on finger-tightened (a) spark plug.



GREASING POINTS

- 1. Apply:
 - Water resistant grease



CHAPTER 4 FUEL SYSTEM

FUEL SYSTEM	4-1
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FUEL LINE	4-2
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CLEANING AND INSPECTION	4-3
FUEL TANK	4-3
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EXPLODED DIAGRAM (Except for C60ER, C60TR, C75TR)	
EXPLODED DIAGRAM (For C60ER, C60TR, C75TR)	
REMOVAL AND DISASSEMBLY	
INSPECTION	
CARBURETOR BODY	
NEEDLE VALVE	
PILOT SCREW	
COLLAR	
FLOAT	
ENRICHING FUEL PUMP	
ELECTROTHERMAL VALVE	
ASSEMBLY	
INSTALLATION	
OIL-INJECTION SYSTEM (Oil injection model)	
EXPLODED DIAGRAM	
REMOVAL	
CLEANING AND INSPECTION	
OIL-TANK	
OIL-LEVER SENSOR	
OIL-HOSES	
INSTALLATION	Д ₋16

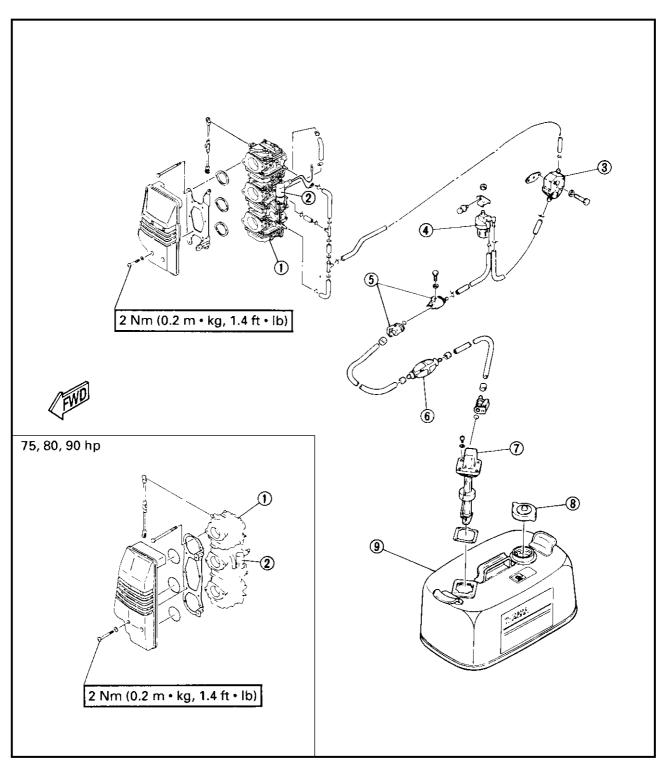
E

E20000-1

FUEL SYSTEM EXPLODED DIAGRAM

- ① Carburetor
- ② Electrothermal valve*
- 3 Fuel pump assembly
- 4 Fuel filter assembly
- ⑤ Fuel joint
- 6 Priming pump
- 7 Fuel meter assembly
- 8 Fuel tank cap
- 9 Fuel tank

* Except for C60ER, C60TR, C75TR



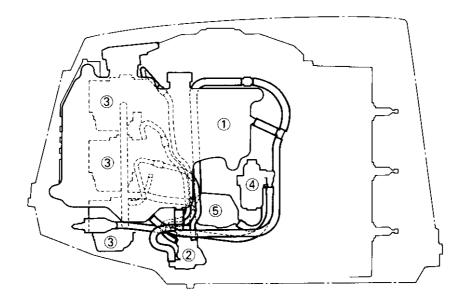


D22500-0

FUEL LINE

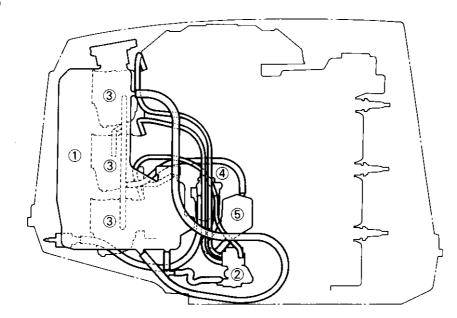
Check that the fuel line is correctly installed.

50, 60, 70 hp



- ① Oil tank*
- ② Oil injection pump*
- 3 Carburetor
- 4 Fuel filter
- 5 Fuel pump

75, 80, 90 hp



- ① Oil tank*
- ② Oil injection pump*
- ③ Carburetor
- 4 Fuel filter
- 5 Fuel pump

REMOVAL

A WARNING

1. Fire prevention

Gasoline (petrol) is highly flammable. Petroleum vapour is explosive if ignited. Do not smoke while handling and keep it away from heat, sparks and open flames.

2. Ventilation

Petroleum vapour is heavier than air and if inhaled in large quantities will not support life. Engine exhaust gases are harmful to breathe. When test-running an engine indoors, maintain good ventilation.

3. Spillage

Remember that fuel remains in the fuel hose between the fuel joint and the carburetor. Drain all remaining fuel out into a container, or soak it up with a cloth so that the fuel does not spill onto the bottom cowling.

4. Leaks

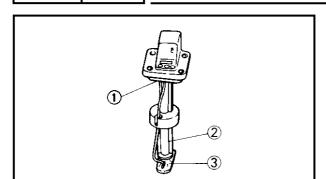
Failure to check for and correct fuel leaks may result in fire or explosion.

1. Referring to the exploded diagram, remove the fuel line.

E21010-0

CLEANING AND INSPECTION FUEL TANK

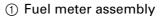
- Add a small quantity of a suitable cleaning solvent into the fuel tank and thoroughly clean the tank interior by shaking the tank.
- 2. Drain off the cleaning solvent completely.



E21020-0

FUEL METER COMPLETE

- Using a soft brush and solvent, clean the strainer on the end of the suction pipe and blow-dry it with compressed air.
- 2. Visually inspect the strainer for damage and replace the fuel meter complete if required.
- 3. Inspect the fuel meter components for cracks and replace the fuel meter complete if required.
- 4. Re-install the fuel meter complete with the rubber gasket to the fuel tank, ensuring that there are no leaks between the fuel meter and the fuel tank.

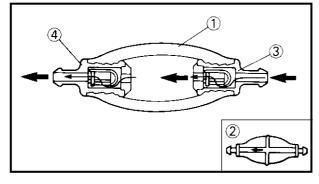


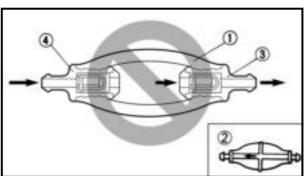
- ② Suction pipe
- ③ Fuel strainer

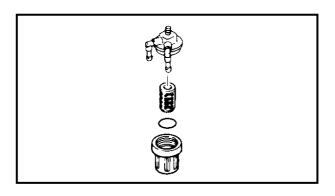
E21030-0

PRIMING PUMP

- 1. Visually inspect for cracks or breaks in the priming-pump and fuel-hoses and replace them if required.
- 2. Check the operation of the check-valve by blowing into the pump.
- 1) Priming valve
- ② Arrow mark
- 3 Check valve (inlet)
- (4) Check valve (outlet)



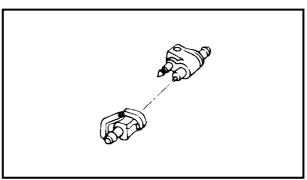


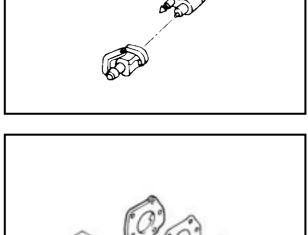


E21040-0

FUEL FILTER

- 1. After removing the nut and filter-cap, disassemble the fuel filter.
- 2. Visually inspect the filter body for cracks or damage to the thread and replace if required.





- 3. Using a soft brush and solvent, clean the filter element thoroughly. Inspect the filter element for breakage or distortion and replace if required.
- 4. Using a soft brush and solvent, clean the filter-cup thoroughly. Inspect the filter-cup for cracks or thread damage and replace if required.
- 5. Place the O-ring on the filter body, install the element and screw in the filter cup.

F21050-0

FUEL JOINTS

1. Inspect the fuel joints for leaks and cracks and replace as required.

E21060-0

FUEL PUMP

- 1. Using a screwdriver, disassemble the fuel pump.
- 2. Visually inspect the pump body for cracks and replace if required.
- 3. Inspect the valves for cracks or distortion and replace if required.
- 4. Inspect the diaphragm for sign of damage, perforation or stretching and replace if required.
- 5. Assemble the fuel pump with new gaskets.

E22000-0

INSTALLATION

Referring to the diagram, install the fuel system.

Note the following points:

When connecting the fuel hoses to the fuel pump and fuel filter, follow the direction of flow indicated by the embossed arrows.

Place the clips in position, connect the hoses, and tighten the clips. Check for leaks.

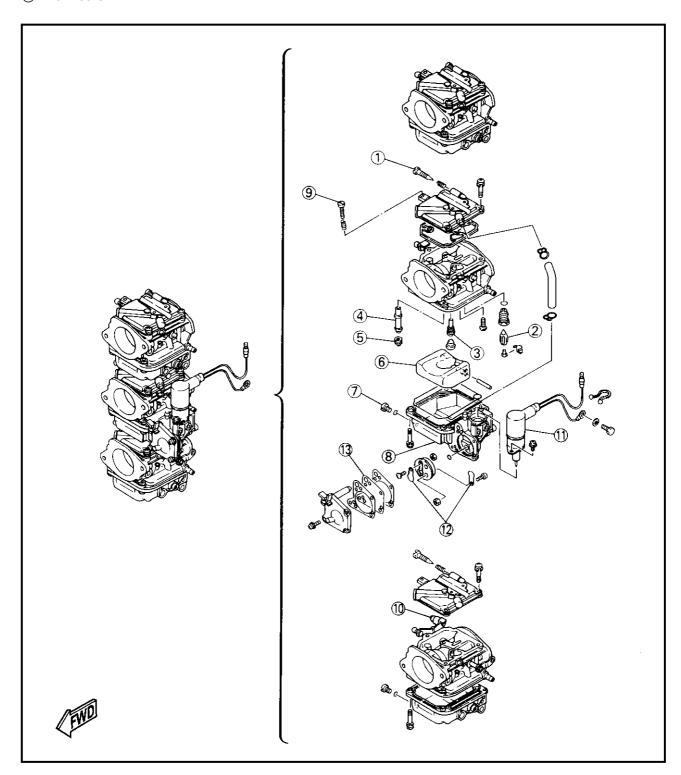
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E31001-1

CARBURETOR EXPLODED DIAGRAM (Except for C60ER, C60TR, C75TR)

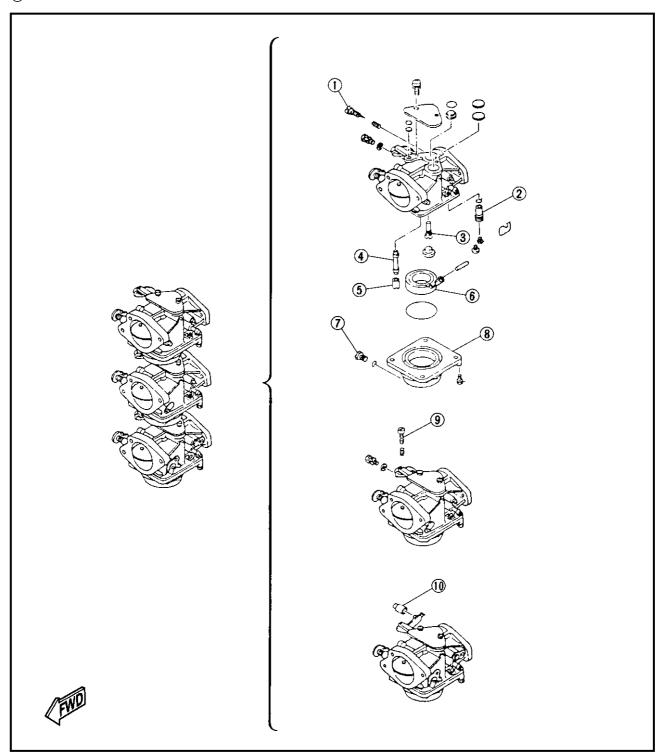
- ① Pilot screw
- ② Needle valve
- ③ Pilot jet
- 4 Main nozzle
- ⑤ Main jet
- 6 Float
- ⑦ Drain screw

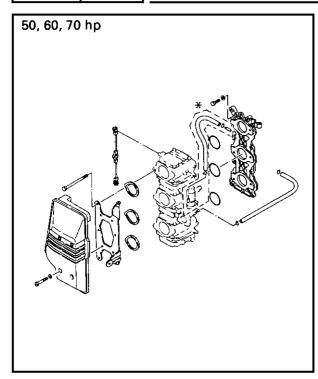
- 8 Float chamber
- Throttle stop screw
- 10 Collar
- (1) Electrothermal valve
- ② Valve
- (3) Diaphragm

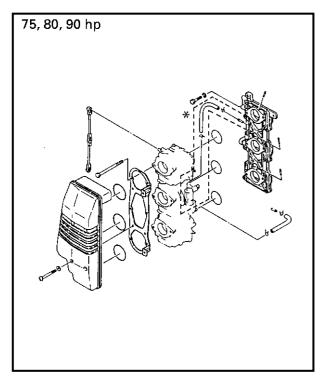


EXPLODED DIAGRAM (For C60ER, C60TR, C75TR)

- ① Pilot screw
- ② Needle valve
- ③ Pilot jet
- 4 Main nozzle
- ⑤ Main jet
- <a>⑥ Float
- 7 Drain screw
- Throttle stop screw
- 1 Collar







REMOVAL AND DISASSEMBLY

A WARNING

At this step, ensure there is no spillage of gasoline on removing the connections.

- 1. Remove the silencer cover, disconnect the fuel hose, then remove the carburetor.
- * Except for C60ER, C60TR, C75TR
 - 2. Referring to the diagram, use a screwdriver to disassemble the carburetor.
 - 3. Using solvent, clean the components thoroughly and blow-dry them with compressed air.

WARNING

Protect your eyes with suitable safety glasses or safety goggles when using compressed air. Protect your eyes and the eyes of others by directing the flow of compressed-air downward, noting that solvent and small parts may be blown off.

CAUTION:

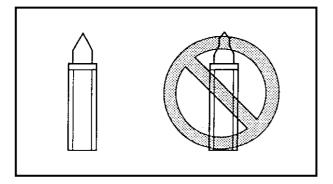
Do not use steel wire for cleaning the jets as this may enlarge the jet diameters and seriously affect performance.



E32000-1*

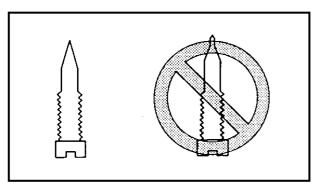
INSPECTION CARBURETOR BODY

1. Inspect the carburetor body for cracks or clogging of the passages.



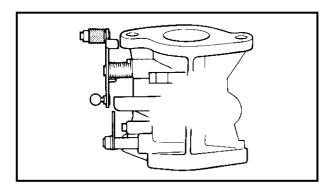
NEEDLE VALVE

1. Inspect the needle valve for free movement and wear and replace if required.



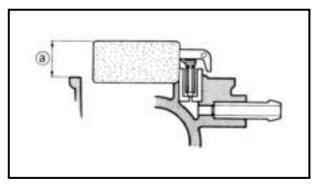
PILOT SCREW

1. Inspect the pilot screw for wear and replace if required.



COLLAR

1. Inspect the collar at the end of the accelerator-arm for wear and replace if required.



FLOAT

- 1. Visually inspect the float for damage or cracks and replace if required.
- 2. Measure the float height (a). If it is more than 2 mm (0.08 in) greater or less than the specified float height, recheck the valve seat and needle-valve.



Float height ⓐ [Stamped mark]: 62F00:

15.0 \pm 1.0 mm (0.59 \pm 0.04 in) 6H20A, 6H30A, 6H007, 6H107:

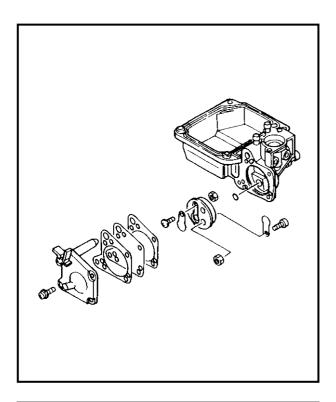
14.0 \pm 1.0 mm (0.55 \pm 0.04 in)

6H210:

 $14.0 \pm 2.0 \text{ mm } (0.55 \pm 0.08 \text{ in})$

6H015:

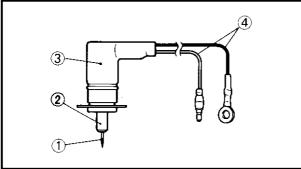
 $19.5 \pm 3.0 \text{ mm} (0.77 \pm 0.12 \text{ in})$

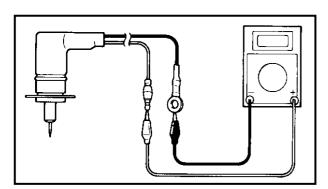


E21060-0

ENRICHING FUEL PUMP

- 1. Using a screwdriver, disassemble the fuel pump.
- 2. Visually inspect the pump body for cracks and replace if required.
- 3. Inspect the valves for cracks or distortion and replace if required.
- 4. Inspect the diaphragm for any sign of damage, perforation or stretching and replace if required.





ELECTROTHERMAL VALVE

 Inspect the needle valve for any bending and wear, and the piston valve for flow.

Inspect the body for cracks and the wire lead for defects.

- 1) Needle valve
- ② Piston valve
- ③ Body
- 4) Wire lead
 - 2. Measure the resistance of the electrothermal valve.

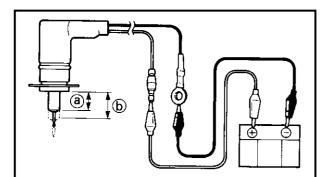


Electrothermal valve resistance: Blue – Black

2.3 ~ **3.5** Ω at **20**°C (68°F)

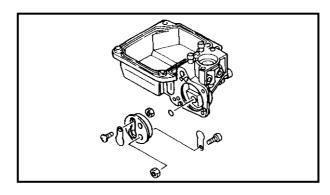
NOTE: _____

When measuring the resistance of 10 Ω or less using the digital tester, the correct measurement cannot be obtained. Refer to "Lower resistance measurement" (page 8-15).



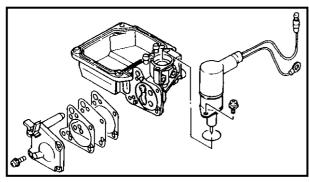
- 3. Check the piston valve height.

 If the piston valve height is not different from ⓐ to ⓑ, replace the electrothermal valve.
 - a) Measure the piston valve height @.
 - b) Connect the wire leads to a 12V battery.
 - c) Measure the piston valve height **b** after several minutes.
 - d) Compare the valve height (a) with (b).

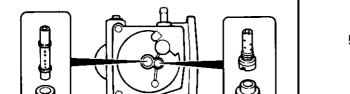


ASSEMBLY

1. Install a new O-ring, the valves on the body and secure with the screws.

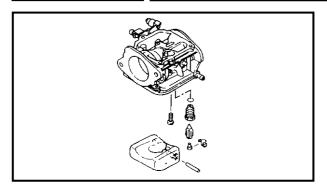


- Install the diaphragm on the carburetor with new gaskets, install the pump cover on the carburetor and secure with the screws.
- Install a new O-ring to the electrothermal valve, install it to the carburetor with the plate and secure with the screws.

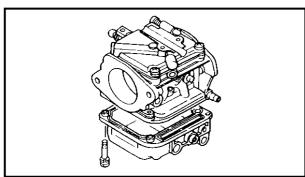


- 4. Insert the main nozzle fully and screw in the main jet until tight.
- 5. Screw in the pilot jet fully and install the cap.

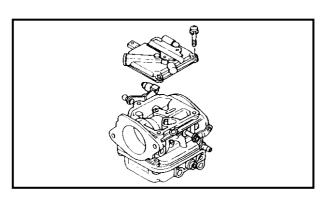




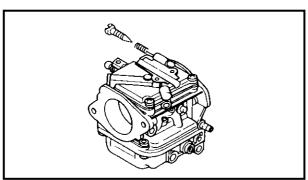
6. Install the needle-valve on the float, attach the float to the carburetor body with the float-pin and tighten the screw.



7. Install a new O-ring to the float-chamber, install it to the carburetor body and secure with the screws.



8. Install the plate with new packing and secure with the screws.



9. Install the pilot-screw with its spring, screw it in until seated then screw it out the specified number of turns.

CAUTION:

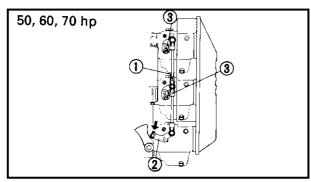
Do not cause damage to the tip of the pilot screw by over-tightening it.

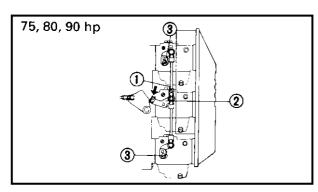


Pilot screw [stamped mark]: 62F00, 6H210, 6H007, 6H015: 1-3/8 \pm 1/4 turns out 6H20A: 1-1/2 \pm 1/4 turns out 6H30A, 6H107: 1-1/4 \pm 1/4 turns out



CARBURETOR





E34004-1

INSTALLATION

- 1. Install the carburetors and plate with new gaskets.
- 1 Idle adjust screw
- ② Throttle lever
- ③ Throttle lever securing screw
 - Connect the fuel hoses to the carburetors and fit the hose-clips over the recesses to ensure leak-proof connections.
 - 3. Connect the electrothermal valve leads.
 - 4. Connect the oil-pump link-rod to the carburetor and oil-injection pump.
 - 5. Install the silencer cover and tighten the bolt to the specified torque.

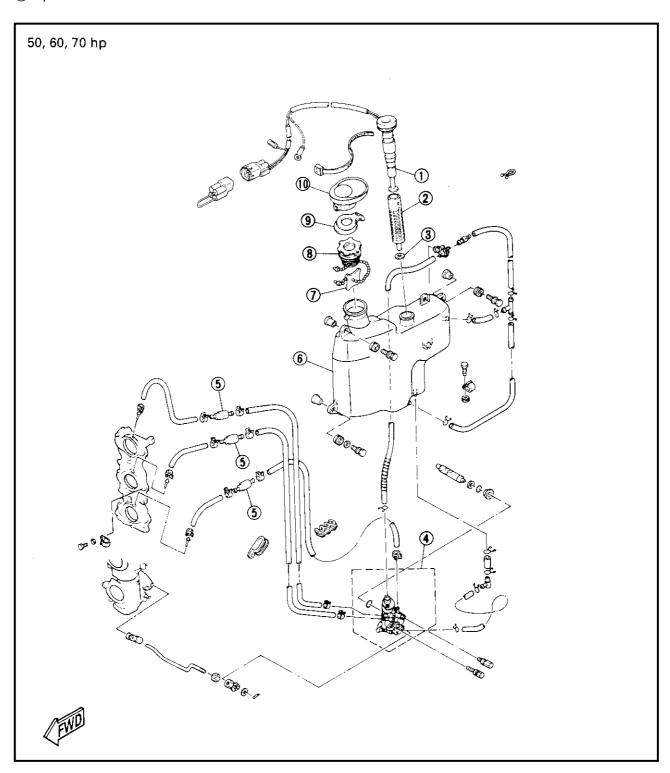


Bolt (silencer cover): 2 Nm (0.2 m • kg, 1.4 ft • lb)

OIL-INJECTION SYSTEM (Oil injection model) EXPLODED DIAGRAM

- 1 Oil level sensor
- ② Oil strainer
- ③ Strainer cover gasket
- ④ Oil injection pump assembly
- ⑤ Check valve
- ⑥ Oil tank
- Special washer

- ® Oil tank cap assembly
- Hook
- 10 Filler tube



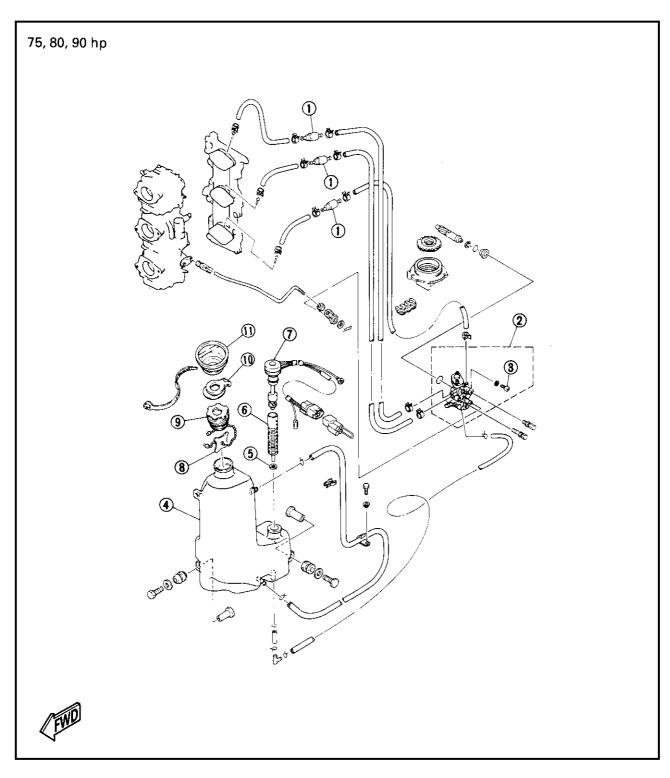


OIL-INJECTION SYSTEM

E

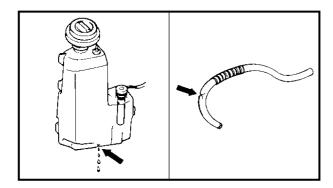
- ① Check valve
- ② Oil injection pump assembly
- 3 Drain screw
- ④ Oil tank
- ⑤ Strainer cover gasket
- 6 Oil strainer
- 7 Oil lever sensor

- Special washer
- Oil tank cap assembly
- 1 Hook
- 1 Filler tube



REMOVAL

- 1. Drain the oil from the oil-tank and remove the carburetor.
- 2. Disconnect the hoses and remove the oil-injection system.



E42001-0*

CLEANING AND INSPECTION OIL-TANK

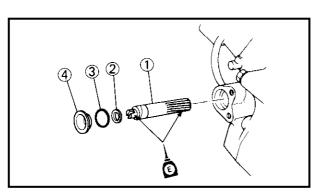
- 1. Using solvent, clean the oil-tank.
- 2. Drain the solvent and dry the tank.
- 3. Inspect the oil-tank for cracks and replace it if required.

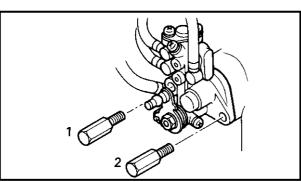
OIL-LEVER SENSOR

Refer to "OIL-LEVEL SENSOR" section in chapter 8.

OIL-HOSES

1. Inspect the oil-hoses for damage or cracks and replace them if required.





E43001-0*

INSTALLATION

- 1. Connect the oil-hoses to the oil-pump and tighten the clips on the hoses.
- 2. Install the driven gear.
- 1 Driven gear
- ② Washer
- ③ O-ring
- ④ Distance collar
 - 3. Install the oil-pump to the power-head.

NOTE: _

Tighten the bolts to the specified torque in sequence.



Oil injection pump mounting bolt: 7 Nm (0.7 m • kg, 5.1 ft • lb)





- 4. Assemble the oil-tank and install it.
- 5. Connect the oil delivery-hoses to the intake manifolds and tighten the clips on the hoses.
- 6. Lead the wire of the oil-level sensor to the port side of the engine and connect the cores.
- 7. Bleed the air from the lines.

CAUTION:	
After reinstalling	g the oil injection pump, be
sure to bleed the	e pump.



CHAPTER 5 POWER UNIT

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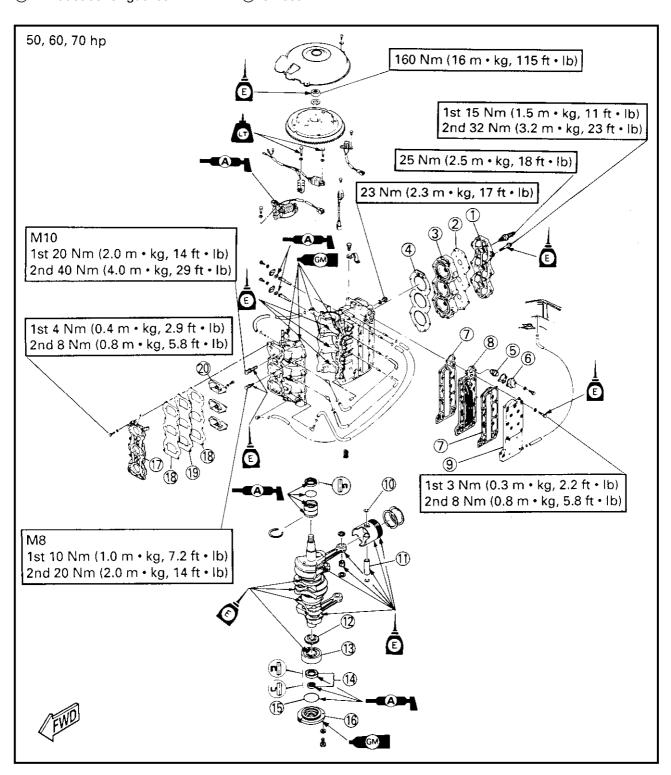
G20000-0

EXPLODED DIAGRAM

- ① Cylinder head cover
- ② Head cover gasket
- ③ Cylinder head
- ④ Cylinder head gasket
- ⑤ Thermostat
- ⑥ Thermostat cover
- ⑦ Exhaust cover gasket

- Piston pin clip
- 11) Piston pin
- 12 Drive gear
- (13) Bearing
- (4) Oil seal

- (5) O-ring
- (6) Oil seal housing
- ① Intake manifold
- ® Valve seat packing
- (9) Reed valve plate
- Reed valve assembly





EXPLODED DIAGRAM

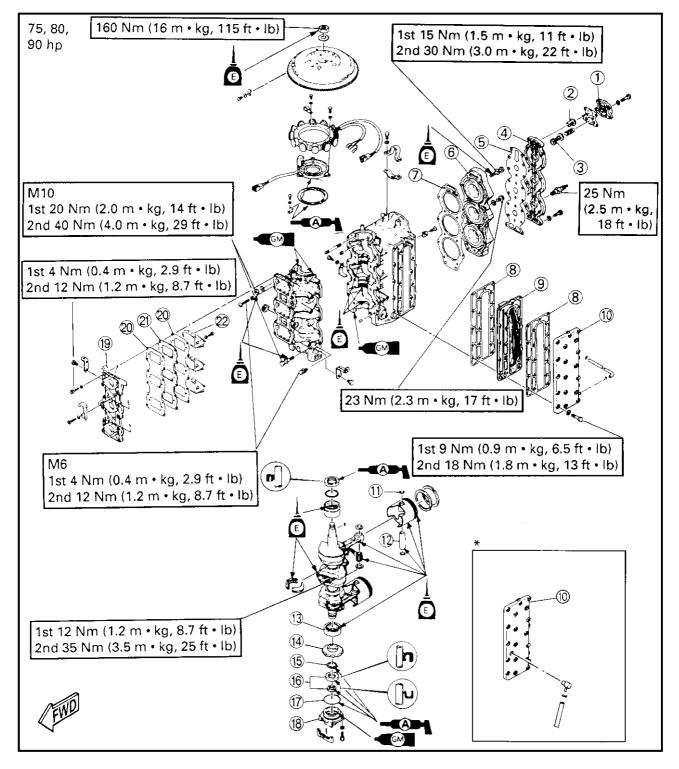


- 1 Thermostat cover
- ② Thermostat
- ③ Thermo sensor
- ④ Cylinder head cover
- ⑤ Head cover gasket
- 6 Cylinder head
- (7) Cylinder head gasket
- (9) Exhaust inner cover

- ① Exhaust outer cover
- 11) Piston pin clip
- Piston pin
- Bearing
- ① Drive gear
- (5) Circlip
- (6) Oil seal
- ① O-ring
- (8) Oil seal housing

- (9) Intake manifold
- Valve seat packing
- 21 Reed valve plate
- 22 Reed valve assembly

*B90TR/90AETO





PREPARATION FOR OVERHAUL/REMOVAL



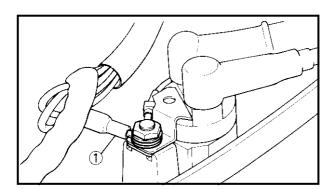
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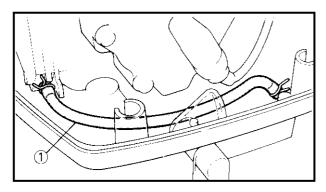
PREPARATION FOR OVERHAUL

- 1. Clean all dirt, mud, dust and foreign material from the engine before the engine is removed and disassembled.
- To ensure that you can perform the work cleanly and efficiently, check that you have the proper tools and cleaning equipment before commencing engine removal and disassembly.
- During engine disassembly, as parts are disassembled, clean them and place them in trays in their order of disassembly. This will speed up assembly and help ensure that all parts are correctly reinstalled.

NOTE: _

When disassembling the engine, keep mated parts together, e.g., cylinder and piston and other parts that have been 'mated' through normal wear. Mated sets should be re-used on reassembly or replaced completely.





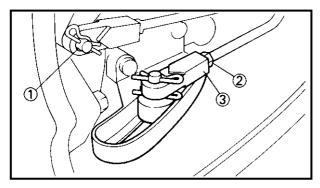
G40003-0*

REMOVAL

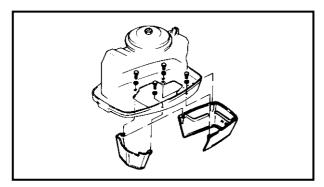
- Remove the electrical system parts.
 Refer to "ELECTRICAL COMPONENTS" section in chapter 8.
- Ground lead from the cylinder head cover Battery cable Power trim and tilt motor leads (PTT model) Power trim and tilt relay (PTT model) Oil level sensor lead (oil injection model)
 - Remove the fuel system parts and hose. Refer to "FUEL SYSTEM" section in chapter 4.
- ① Cooling water pilot hose Fuel hose on the strainer



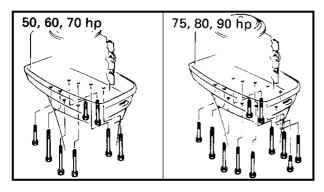




- 3. Remove the throttle cable and the shift mechanism.
- ① Throttle cable joint by removing the hair pin
- ② Shift rod bracket bolt
- 3 Shift cable joint and bushing by removing the hair pin



4. Remove the front and rear aprons.

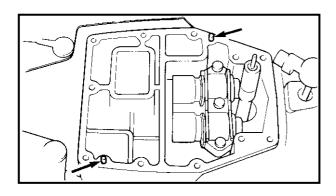


5. Remove the power head installation bolts, and then remove the power head from the upper casing.

50, 60,	70 hp	8	bolts
75, 80,	90 hp	11	bolts

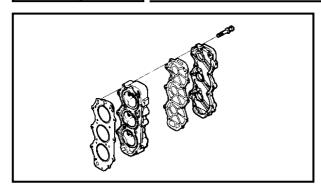
NOTE: ___

The power head may be difficult to separate from the bottom cowling because of a stuck gasket holding them together. If this is the case, lever it off the bottom cowling with a piece of wood. Use care not to damage the bottom cowling or power head with the wood.



Remove the dowel pins from the bottom cowling or power head. To protect the dowel pins against damage, cover them with rags.



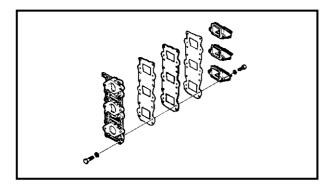


G50003-0

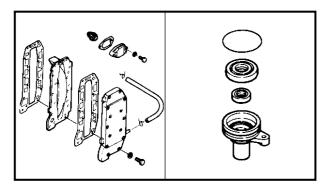
DISASSEMBLY

Referring to the exploded diagram, remove the following parts.

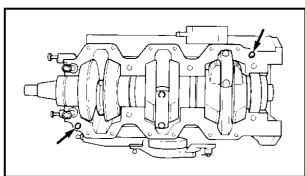
1. Cylinder head



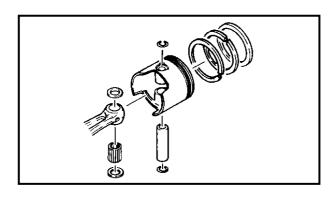
2. Intake manifold



- 3. Exhaust cover and thermostat cover.
- 4. Oil seal housing
 Using the oil seal remover, remove the oil seal one by one from the housing.



- 5. Crankcase Remove the two dowel pins.
- 6. Crankshaft and connecting rod. (50, 60, 70 hp)
- 7. Connecting rod caps, needle bearings and crankshaft. (75, 80, 90 hp)



- 8. Piston and piston pin
- 9. Piston rings

Note the following points:

- 1. When disassembling the piston and piston pin, place a tray under the connecting rod to catch the needle bearings.
- Only carry out exchange of the crankshaft bearing if the bearing is malfunctioning.

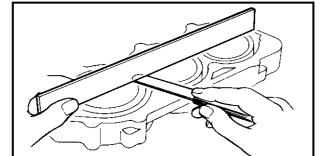


G61000-0*

INSPECTION CYLINDER HEAD

CLEANING

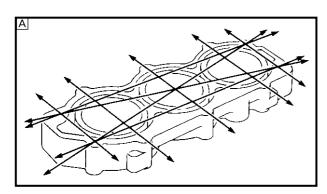
- Using a gasket scraper, remove all traces of gasket material from the cylinder head.
- 2. Using a round scraper, remove carbon deposits from the combustion chamber.



CAUTION:

Do not scratch the surfaces of the cylinder and combustion chamber.

3. Using a soft brush, clean the water jacket.



INSPECTION

 Using a precision straight-edge and thickness gauge, measure the surface contacting the cylinder block for warping.

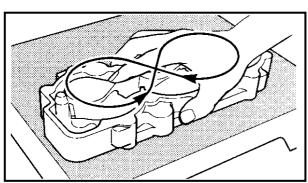


Warpage limit: 0.1 mm (0.004 in)

A Lines indicate straight-line measurement

If the degree of warping exceeds this specification, re-surface the cylinder-head as follows:

Place 400-600 grit wet-or-dry paper on the surface-plate, and resurface the cylinder-head using a figure-eight sanding pattern.

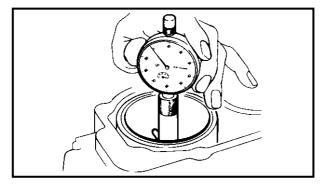




G61501-0*

CYLINDER BLOCK CLEANING

- 1. Using a gasket-scraper, remove all traces of gasket material from the cylinder-block surface.
- 2. Using a soft brush and solvent, clean the cylinder-block.

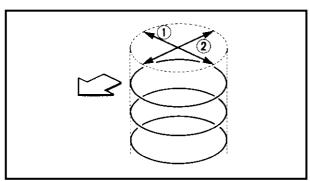


INSPECTION

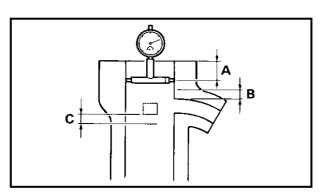
1. Visually inspect the cylinder sleeves for cracks and scratches.

If cracks are found, replace the cylinder block.

If scratches are found, check the degree of out-of-round, and then hone the cylinder or re-bore it if necessary.



- 2. Using a cylinder-gauge, measure the cylinder bore at three positions in the thrust and axial directions.
- 1) Axial direction
- ② Thrust direction



A: 10 mm (0.4 in) below the cylinder top

B: 5 mm (0.2 in) above the exhaust port

C: 5 mm (0.2 in) below the scavenging port

NOTE

Do not place the cylinder-gauge on the port hole.



Cylinder bore size;

50, 60, 70 hp: 72.00 ~ 72.02 mm

(2.834 ~ 2.835 in)

75, 80, 90 hp: 82.00 ~ 82.02 mm

(3.228 ~ 3.229 in)

Taper limit:

0.08 mm (0.003 in) Out of round limit: 0.05 mm (0.002 in)

If diameter is greater than the limit, hone or rebore the cylinder or, if necessary, replace the cylinder-block.

G62001-0*

PISTON CLEANING

- 1. Using a gasket-scraper, remove the carbon from the piston top.
- 2. Using a broken ring, clean the ring grooves.
- 3. Using a soft brush and solvent, thoroughly clean the piston. If necessary, use 600 ~ 800 grit wet-or-dry sandpaper to remove score marks or varnish.

INSPECTION

1. Using a micrometer, measure the piston diameter at right angles to the piston-pin center line, 10 mm (0.4 in) above the bottom edge.



Piston diameter:

Standard:

50, 60, 70 hp: 71.945 ~ 71.970 mm (2.8325 ~ 2.8335 in) 75, 80, 90 hp: 81.935 ~ 81.960 mm (3.2258 ~ 3.2268 in)

2. Using the measured cylinder bore diameter in thrust directions, subtract the piston diameter measurement from the cylinder bore diameter measurement.



Piston clearance:

50, 60, 70 hp: 0.050 ~ 0.055 mm (0.0020 ~ 0.0022 in)

75, 80, 90 hp: 0.060 ~ 0.065 mm $(0.0024 \sim 0.0026 in)$

If this clearance is not within the specifications, replace the piston with standard or oversize and/or rebore the cylinder.



Oversize piston:

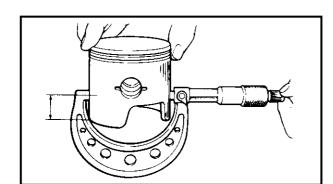
50, 60, 70 hp:

*1st 72.25 mm (2.844 in) 2nd 72.50 mm (2.854 in)

75, 80, 90 hp:

*1st 82.25 mm (3.238 in) 2nd 82.50 mm (3.248 in)

* Except for USA



G62501-0*

PISTON RING INSPECTION

1. Using a thickness gauge, measure the clearance between the piston ring and the groove land.



Side clearance:
50, 60, 70 hp:
Top/2nd ring:
0.03 ~ 0.07 mm
(0.0012 ~ 0.0028 in)
75, 80, 90 hp:
Top/2nd ring:
0.03 ~ 0.06 mm
(0.0012 ~ 0.0024 in)

If the clearance is not within the specifications, replace the piston.

- A Top/2nd: Keystone type
- B Piston marked with "W" (50, 60, 70 hp)
 - 2. Insert the piston ring into the cylinder.
 Using a piston, push the piston ring a little beyond the bottom of the ring travel to a depth of 20 mm (0.8 in) from the top of the cylinder block.

CAUTION:

Take care not to scratch the piston. Using a thickness gauge, measure the end-gap.

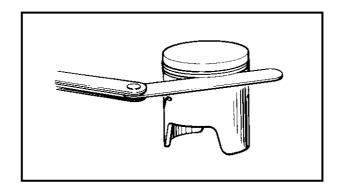


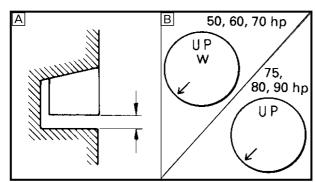
Ring end gap (installed): 50, 60, 70 hp: 0.3 ~ 0.5 mm (0.012 ~ 0.020 in) 75, 80, 90 hp: 0.4 ~ 0.6 mm (0.016 ~ 0.024 in)

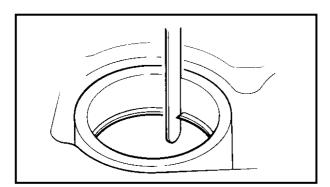
If the clearance is not within the specifications, replace the piston-ring.

NOTE: _

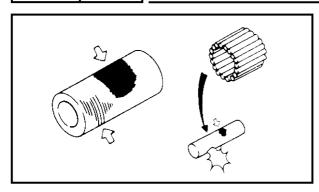
If the clearance is greater than maximum, even with a new piston ring, rebore the cylinder and use an over-size piston and piston-ring.

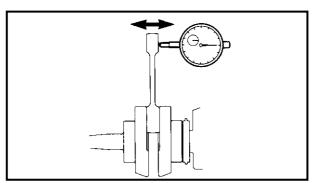












363000-0

PISTON PIN AND SMALL END BEARING CLEANING

1. Use a soft brush and solvent to clean the parts.

INSPECTION

1. Visually inspect for surface defects, breakage, scratches and pitting. If it is decided to replace the small end bearings, replace them all.

G63500-0*

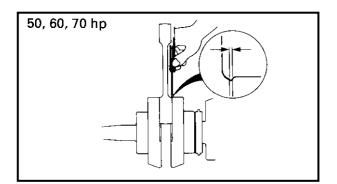
CRANKSHAFT INSPECTION

- 1. Place the crankshaft on a crankshaftaligner or on V-blocks.
- 2. Using a dial gauge, measure the connecting-rod axial play.



Maximum axial play: 2.0 mm (0.08 in)

If this axial play is greater than the maximum axial play, replace the crankshaft assembly.



Using feeler gauges, measure the connecting-rod side clearance.
 (50, 60, 70 hp)



Connecting-rod side clearance:

50, 60, 70 hp:

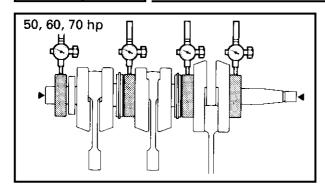
0.2 ~ 0.7 mm (0.008 ~ 0.028 in)

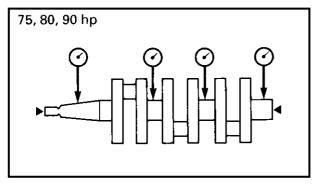
75, 80, 90 hp:

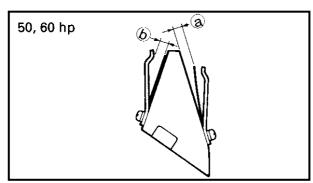
0.12 ~ 0.26 mm (0.005 ~ 0.010 in)

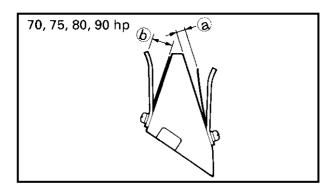
If this side clearance exceeds the specification, replace the crankshaft assembly.











4. Using dial gauges, measure the deflection.



Maximum deflection:

50, 60, 70 hp:

0.03 mm (0.0012 in)

75, 80, 90 hp:

0.05 mm (0.0020 in)

If the deflection is greater than the specified maximum, correct the alignment by use of a copper hammer and a wedge.

If the deflection is greater than the specified maximum, replace the crankshaft assembly.

G64000-0*

REED VALVE INSPECTION

1. Visually inspect for warping of the reed valve. If warped, measure the distortion with feeler gauges.



Warpage limit @: 0.2 mm (0.01 in)

If the amount of warping is greater than the specification, replace the reed valve.

2. Using a vernier caliper, measure the valve stopper height.



Valve stopper height **(b)**:

50, 60 hp:

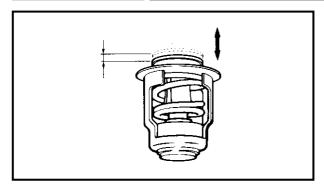
 3.0 ± 0.2 mm (0.12 \pm 0.01 in)

70, 75, 80, 90 hp:

 $9.9 \pm 0.2 \text{ mm} (0.39 \pm 0.01 \text{ in})$

If the valve stopper height is outside the specification, adjust it by bending it.

3. Visually inspect for cracks on the reed valve. If cracks are found, replace the reed valve.



G64500-0*

THERMOSTAT CLEANING

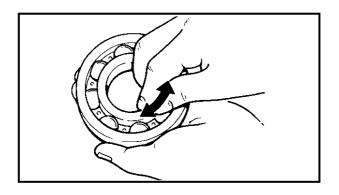
1. Using a soft brush and water, remove all traces of salt, dirt or corrosion.

INSPECTION

- 1. Visually inspect the thermostat for damage. If the thermostat is damaged or if it opens when cold, replace it.
- 2. Immerse the thermostat in water and heat the water gradually. Check the valve opening temperature and the valve lift.

Z.	Water temperature	Valve lift
	Below 48 ~ 52°C (118 ~ 126°F)	0 mm
	Above 60°C (140°F)	Minimum 3 mm (0.12 in)

If the valve opening and/or temperature and valve-lift are not within the specifications, replace the thermostat.



G65000-0*

CRANK MAIN BEARING CLEANING

 Using a soft brush and solvent, thoroughly clean the bearing. Dry it with air, and sparingly lubricate it with 2-stroke outboard motor oil.

NOTE: _

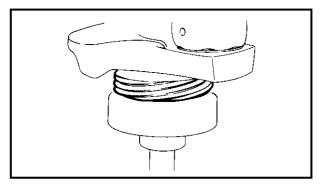
Do not spin bearing with air blower. This can damage the bearing. Also, take care not to scratch the bearing balls when cleaning.

INSPECTION

 Hold the bearing inner race and slowly turn the bearing outer race with your fingers. If any rough spots are felt, replace the bearing.



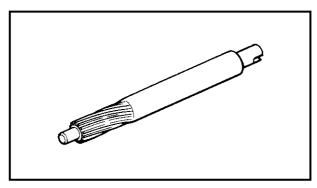




G65500-0

DRIVE GEAR (OIL INJECTION PUMP DRIVE) INSPECTION

1. Visually inspect drive gear teeth for cracks, pitting or wear and replace the gear if any are found.

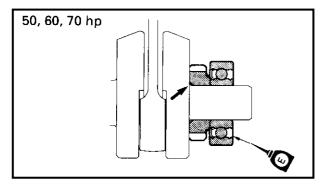


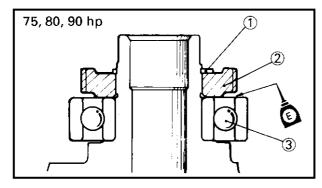
DRIVEN GEAR (OIL INJECTION PUMP DRIVE) INSPECTION

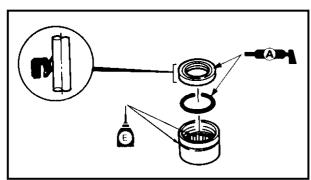
1. Visually inspect driven gear teeth for cracks, pitting or wear and replace the gear if any are found.











371000-1

ASSEMBLY AND ADJUSTMENT BEARING, OIL SEAL AND O-RING

1. Press in the new bearing.

CAUTION:

When reassembling the lower crank bearing and/or the oil-pump drive gear, the tapered side of the drive gear and the seal-cap side of the bearing should be installed towards the crank side as shown in the illustration.

75, 80, 90 hp:

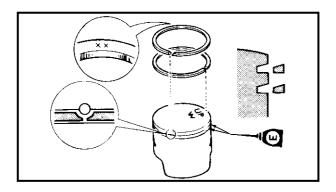
Install the circlip

- 1) Circlip
- (2) Oil injection pump drive gear
- ③ Crank lower bearing
 - 2. Install the new oil seal in the needle bearing.

CAUTION:

The direction of the oil seal must be as shown in the illustration, otherwise damage will be caused.

- 3. Install the new O-ring.
- 4. Lubricate the bearing with 2-stroke outboard motor oil. Apply water resistant grease or equivalent to the inside lip of the oil seal and to the O-ring.



G72001-0

PISTON AND PISTON RING

- Install the top and 2nd piston rings into their respective ring grooves with the markings facing upward.
- 2. Align each ring end-gap with their location pins.

373000-0*

SMALL END BEARINGS AND PISTON ASSEMBLY

1. Count the small-end bearing needles.

Number of needles per small end: 28-pcs.



Do not use a mixture of new and used bearing needles in the same small end.

2. Using the special service tool, install the bearings in the connecting-rod small end and place washers on both sides.

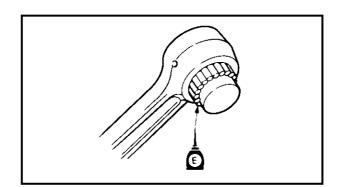


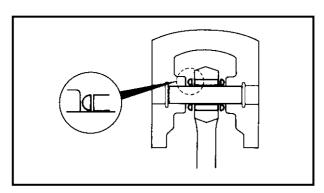
Small end bearing installer: 50, 60, 70 hp: YB-6287/90890-06527 75, 80, 90 hp: YB-6107/90890-06527

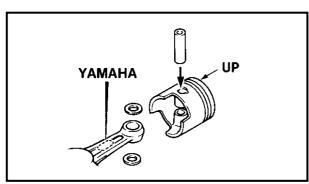
CAUTION:

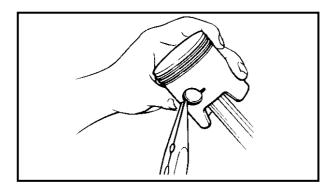
The washer should be placed with their convex sides facing the piston.

- 3. Insert the piston-pin into the piston.
- 4. Align the "UP" mark on the piston crown towards the crankshaft's tapered end. Install the piston in the connecting-rod small end, insert the piston-pin, then install new piston-pin clips.
- 5. Lubricate each bearing with 2-stroke outboard-motor oil.



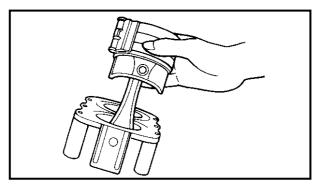












G78000-0³

CONNECTING ROD BIG END BEARING ASSEMBLY (75, 80, 90 hp)

1. Install the piston.

Align the ring ends with locating pins in the grooves and using the piston slider, push the piston into the cylinder.

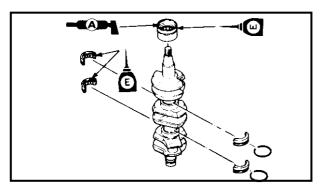


Piston slider:

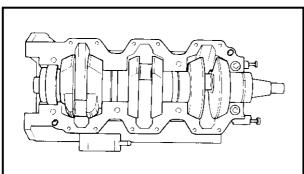
YU-33294/90890-06530

NOTE: _

The "UP" mark on the piston crown should be on the flywheel side. Be sure to apply oil to the piston and cylinder wall.



2. Place the crankshaft on the cylinder, and align the upper, upper middle and lower middle bearing pin holes with the pins on the cylinder, and fit the crankshaft correctly to the cylinder.



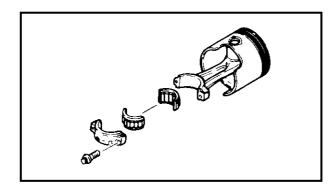
3. Install the bearing in the big end and install the cap.

The cap bolts should be tightened in the following manner.

a. Lightly screw in the bolts by hand while making sure the cap and rod ends are aligned completely. Then, tighten the bolts to the 1st specified torque.

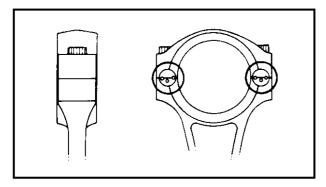
Next, tighten to the 2nd specified torque. Check to see that the cap and rod ends are aligned. If not aligned, do the above procedure all over again.

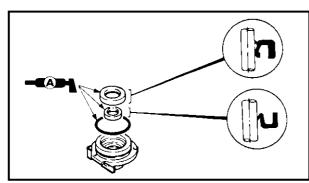
b. Loosen the bolts 1/2 turn and tighten them to the 1st specified torque. Then, tighten to the 2nd specified torque.











Replace the cap bolts each time the connecting rod is disassembled.



Connecting rod big end: (75, 80, 90 hp) 1st step: 12 Nm (1.2 m • kg, 8.7 ft • lb) 2nd step: 35 Nm (3.5 m • kg, 25 ft • lb)

G79000-1*

OIL SEAL HOUSING

1. Press-fit the oil seals one by one.

CAUTION:

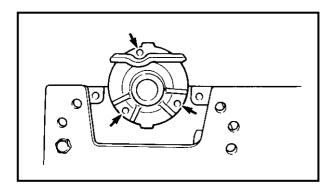
When press-fitting the oil seal, be sure that if faces in the correct direction.

- 2. Fit the new O-ring in the grooves in the oil seal housing outer surfaces.
- 3. After installing the oil seal and O-ring, pack the oil seal lip and outer surface of the O-ring with water resistant grease.

NOTE: ___

Avoid cutting or stretching the oil seal housing O-ring.

4. Install the oil seal housing onto the cylinder and align the bolt holes.



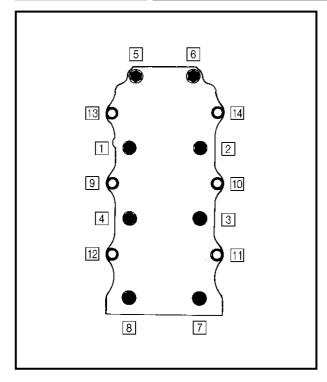
G74000-0*

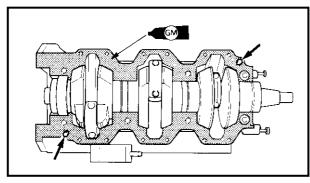
CRANK CYLINDER ASSEMBLY (50, 60, 70 hp)

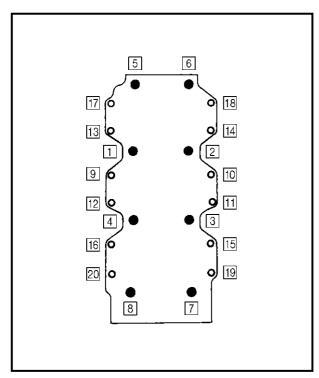
1. Lubricate the piston-rings and pistons with 2-stroke outboard-motor oil and install the crank assembly into the cylinder block.











- 2. Lift the crank assembly a little in order to install a washer on the lower crankcase and align each location-pin of the bearings and labyrinth-seals with each cut on the cylinder-block. Then, fit the crank assembly in place.
- 3. Film-coat the cylinder-block mating surface with Gasket Maker or equivalent.
- 4. Install the dowel-pins.
- 5. Match the cylinder-block and tighten the bolts to the specified torque in sequence and in two steps.



Crankcase bolt (50, 60, 70 hp) 1st step:

M8: 10 Nm (1.0 m • kg, 7.2 ft • lb) M10: 20 Nm (2.0 m • kg, 14 ft • lb) 2nd step:

M8: 20 Nm (2.0 m • kg, 14 ft • lb) M10: 40 Nm (4.0 m • kg, 29 ft • lb)

6. Check that the crankshaft turns smoothly.

G74002-0*

CRANK CYLINDER ASSEMBLY (75, 80, 90 hp)

- 1. Align each locating-pin of the bearings and labyrinth-seals with each cut on the cylinder-block. Then, fit the crank assembly in place.
- 2. Film-coat the cylinder-block mating surface with Gasket Maker or equivalent.
- 3. Install the dowel-pins.
- 4. Match the cylinder-block and tighten the bolts to the specified torque in sequence and in two steps.



Crankcase bolt (75, 80, 90 hp)

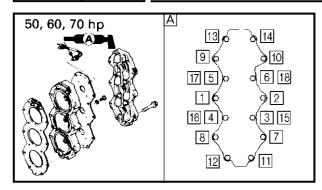
M6: 4 Nm (0.4 m • kg, 2.9 ft • lb) M10: 20 Nm (2.0 m • kg, 14 ft • lb) 2nd step:

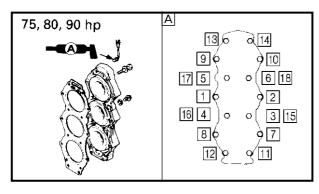
M6: 12 Nm (1.2 m • kg, 8.7 ft • lb) M10: 40 Nm (4.0 m • kg, 29 ft • lb)

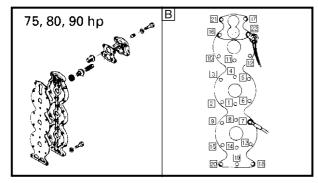
5. Check that the crankshaft turns smoothly.

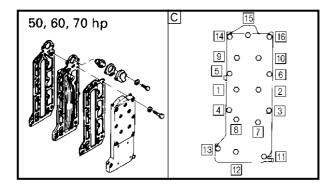


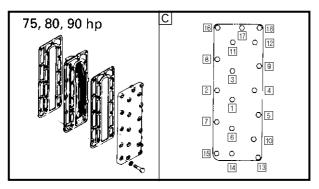












G75000-0

CYLINDER HEAD AND EXHAUST COVER

- 1. Install the gaskets cylinder-head cover and exhaust cover.
- 2. Tighten the bolts to the specified torque in sequence and in two steps.
- A Tightening sequence



Cylinder head (50, 60, 70 hp): 1st step:

15 Nm (1.5 m • kg, 11 ft • lb) 2nd step:

32 Nm (3.2 m • kg, 23 ft • lb) Cylinder-head (75, 80, 90 hp):

, 1st step:

15 Nm (1.5 m • kg, 11 ft • lb)

2nd step:

30 Nm (3.0 m • kg, 22 ft • lb)

B Tightening sequence

C Tightening sequence



Exhaust cover (50, 60, 70 hp):

1st step:

3 Nm (0.3 m • kg, 2.2 ft • lb)

2nd step:

8 Nm (0.8 m • kg, 5.8 ft • lb) Exhaust cover (75, 80, 90 hp):

1st step:

9 Nm (0.9 m • kg, 6.5 ft • lb)

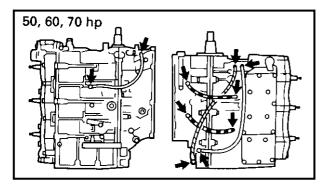
2nd step:

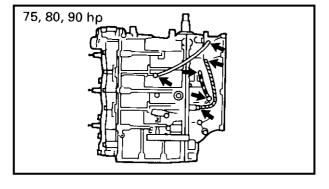
18 Nm (1.8 m • kg, 13 ft • lb)

3. Install the thermostat, gasket and cover.





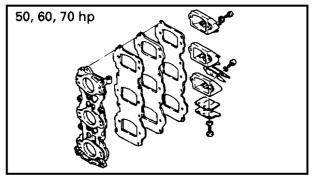


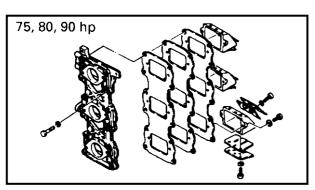


G75500-0

DRAINAGE HOSE

- 1. Fit two clips around the drainage hose.
- 2. Connect one end of the hose to the delivery side of the check valve and the other end to the joint on the intake side and lock with the clips.





G76000-0*

INTAKE MANIFOLD

- 1. Install the reed-valve assembly and the gasket reed-valve plate to the intake manifold.
- 2. Install the manifold assembly to the crankcase and tighten the bolts to the specified torque in sequence and in two steps.



Intake manifold (50, 60, 70 hp): 1st step:

4 Nm (0.4 m • kg, 2.9 ft • lb) 2nd step:

8 Nm (0.8 m • kg, 5.8 ft • lb) Intake manifold (75, 80, 90 hp): 1st step:

4 Nm (0.4 m • kg, 2.9 ft • lb) 2nd step:

12 Nm (1.2 m • kg, 8.7 ft • lb)

G77000-0*

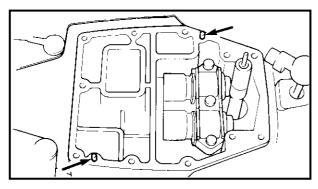
FUEL SYSTEM AND ELECTRICAL SYSTEM

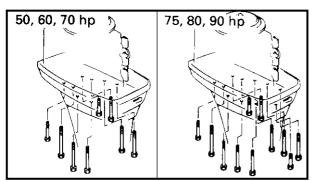
- Install the fuel system.
 Refer to "FUEL SYSTEM" section in chapter 4.
- 2. Install the electrical system.

 Refer to "ELECTRICAL COMPONENTS" section in chapter 8.









G8000-0*

INSTALLATION

- 1. Install locating pins in position on the exhaust guide.
- 2. Align the locating-pin holes on the gasket with dowel pins and place the gasket on the bottom cowling.
- 3. Install the power head onto the bottom cowling, tighten the mounting-bolts to the specified torque.



Mounting bolts: 21 Nm (2.1 m • kg, 15 ft • lb)

- 4. Connect the hoses, cables and wires.
- 5. Install the apron.
- 6. Check the fittings installation, cable connections and functions before starting the engine to check operation and to check for leaks.



CHAPTER 6 LOWER UNIT

(FOR 50GETO, C60ER, C60TR/60FET (OCEANIA), C75TR, 90AEHD, 90AED, C90TR/90AET)				
EXPLODED DIAGRAM (EXCEPT FOR 50GETO, C60ER, C60TR/60FET (OCEANIA), C75TR, 90AEHD, 90AED, C90TR/90AET)				
PREPARATION FOR REMOVAL	6-3			
DISASSEMBLY	6-3			
INSPECTION GEAR CASE BEARING HOUSING CLAW-WASHER RING-NUT WATER PUMP HOUSING IMPELLER OIL-SEAL HOUSING (Water pump housing) GEAR. BEARING CLUTCH DOG AND COMPONENTS DRIVE AND PROPELLER SHAFT DRIVE SHAFT SLEEVE PROPELLER/TRIM TAB/ANODE	6-9 6-9 6-9 6-10 . 6-10 . 6-10 . 6-11 . 6-11			
ASSEMBLY AND ADJUSTMENTPROPELLER-SHAFT HOUSINGGEAR CASE	. 6-12			
SHIM SELECTION	. 6-17 . 6-22 . 6-25 . 6-28			
LOWER UNIT LEAKAGE CHECK	. 6-31			



EXPLODED DIAGRAM

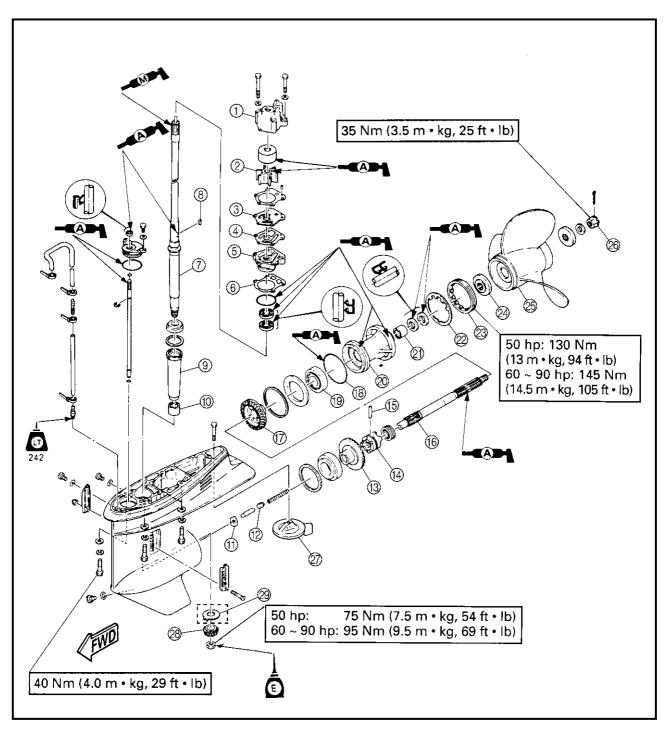


EXPLODED DIAGRAM (FOR 50GETO, C60ER, C60TR/60FET (OCEANIA), C75TR, 90AEHD, 90AED, C90TR/90AET)

- ① Water pump housing
- 2 Impeller
- ③ Cartridge outer plate
- 4 Cartridge outer plate gasket
- (5) Oil-seal housing
- ⑥ Water pump gasket
- ⑦ Drive shaft
- Woodruff key
- 9 Drive shaft sleeve
- Needle bearing

- (1) Shifter
- 12) Shift slide
- (13) Forward gear
- (4) Clutch dog
- (5) Cross pin
- (6) Propeller shaft
- Reverse gear
- ® O-ring
- (19) Bearing
- Bearing housing

- 2 Needle bearing
- 22 Claw washer
- 23 Ring nut
- 24 Spacer
- 25 Propeller
- 26 Castle nut
- ② Trim tab
- Pinion gear
- Spacer (50GETO)





EXPLODED DIAGRAM

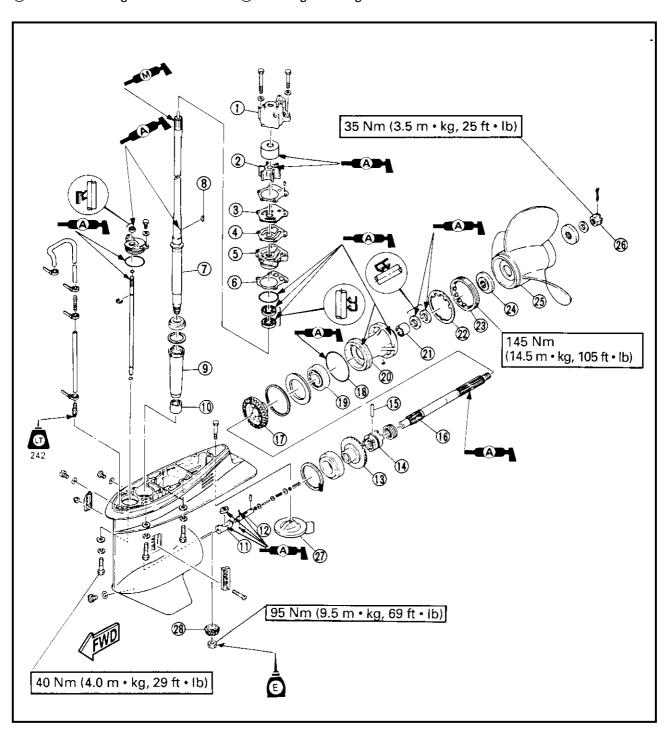
E

EXPLODED DIAGRAM (EXCEPT FOR 50GETO, C60ER, C60TR/60FET (OCEANIA), C75TR, 90AEHD, 90AED, C90TR/90AET)

- ① Water pump housing
- 2 Impeller
- ③ Cartridge outer plate
- (4) Cartridge outer plate gasket
- (5) Oil-seal housing
- ⑥ Water pump gasket
- ⑦ Drive shaft
- Woodruff key
- 9 Drive shaft sleeve
- Needle bearing

- 11) Shifter
- Shift slide
- (13) Forward gear
- (4) Clutch dog
- (5) Cross pin
- (6) Propeller shaft
- (7) Reverse gear
- ® O-ring
- (19) Bearing
- Bearing housing

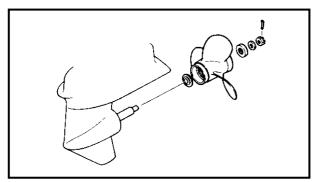
- 2 Needle bearing
- 22 Claw washer
- 23 Ring nut
- ② Spacer
- 25 Propeller
- 26 Castle nut
- ② Trim tab
- Pinion gear

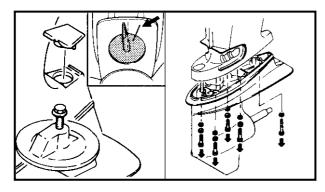


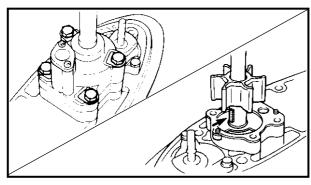


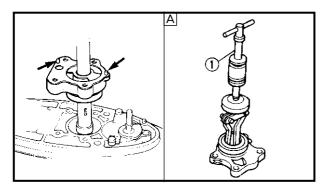
PREPARATION FOR REMOVAL/DISASSEMBLY

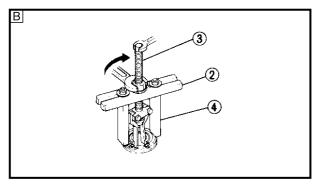












120001-0*

PREPARATION FOR REMOVAL

- 1. Remove the nut, washer, propeller and spacer from the propeller shaft.
- 2. Drain the gear oil by removing the plugs from the oil-filling hole and the oil-level hole. Be sure to remove the oil filling plug first.
- 3. Set the shift lever into neutral position.
- 4. Tilt up the lower unit and lock it with the tilt lock lever.
- 5. Remove the trim tab. Before removing it, put a mark indicating its position on the anticavitation plate.
- 6. Remove the bolts.

140007-0

DISASSEMBLY

- 1. Referring to the exploded diagram, remove the following parts.
 - Water pump housing and insert cartridge
 - 2) Impeller and woodruff key
 - 3) Oil-seal housing (Water pump housing)Remove the oil seals, if necessary



Slide hammer set:

YB-6096 (1)

Stopper guide plate:

90890-06501 (2)

Bearing puller:

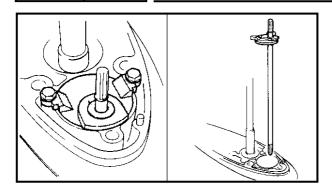
90890-06535 ③

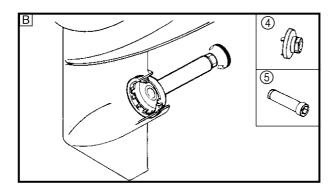
Stopper guide stand:

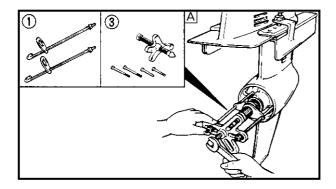
90890-06538 (4)

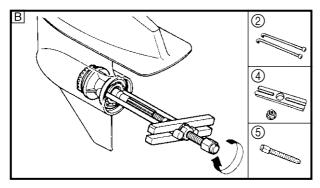
- A For USA and Canada
- **B** Except for USA and Canada











4) Shift-rod

5) Ring-nut ① and claw-washer ②

Ring nut wrench: YB-34447 ③
90890-06511
Extension (ring nut wrench):
90890-06513 ⑤

- A For USA and Canada
- **B** Except for USA and Canada

NOTE: ___

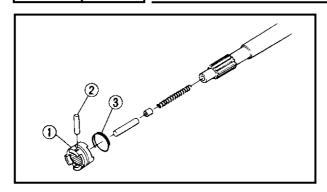
To remove the ring-nut: straighten the lobe of the claw-washer by using a screwdriver, then attach and turn it in the direction of the off mark using the special service tool.

6) Bearing-housing Using special service tool.

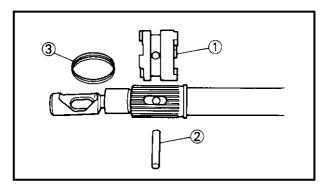
	Claw: YB-6207 ①
₩	50, 60, 70 hp: 90890-065032
	75, 80, 90 hp: 90890-06502 ② Flywheel puller:
	YB-6117 ③ Stopper guide plate:
	90890-06501 4
	90890-06504 ⑤

- A For USA and Canada
- **B** Except for USA and Canada

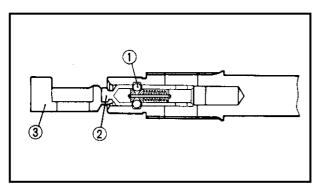




- 7) Propeller shaft (For 50GETO, C60ER, C60TR/60FET (Oceania), C75TR, 90AEHD, 90AED, C90TR/90AET)
- ① Clutch dog
- ② Cross pin
- ③ Cross pin ring



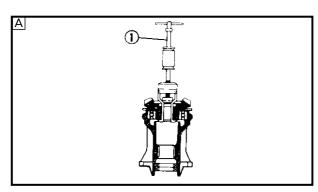
- 7) Propeller shaft (Except for 50GETO, C60ER, C60TR/ 60FET (Oceania), C75TR, 90AEHD, 90AED, C90TR/90AET)
- ① Clutch dog
- ② Cross pin
- 3 Cross pin ring



8) Shift slide (Except for 50GETO, C60ER, C60TR/

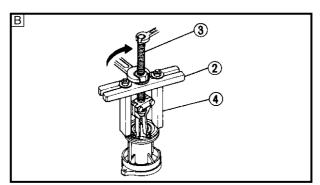
60FET (Oceania), C75TR, 90AEHD, 90AED, C90TR/90AET)
Using a slotted screwdriver, remove the shift slide balls (1) from the pau-

the shift slide balls ① from the neutral position and pull out the shift slide ② and shifter ③.



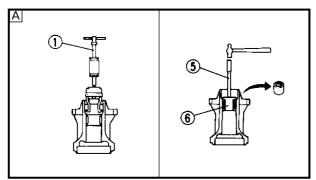
9) Reverse gear and bearing

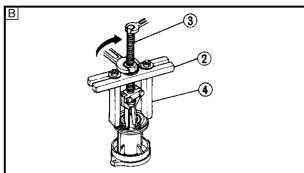
- A For USA and Canada
- **B** Except for USA and Canada

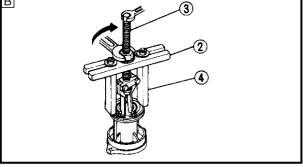


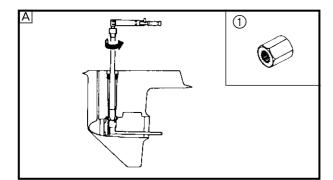


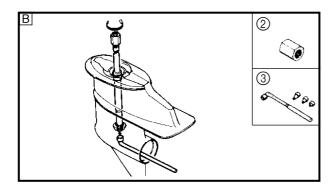
DISASSEMBLY



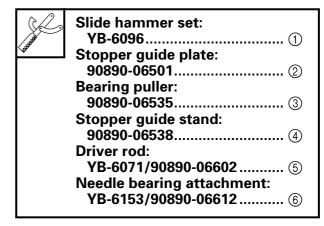






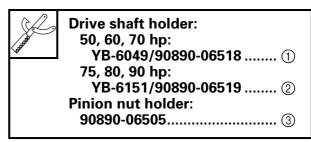


10) Oil seals and needle bearing



- A For USA and Canada
- **B** Except for USA and Canada

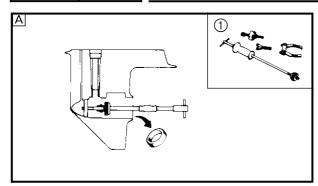
11) Pinion nut, pinion and drive shaft bearing inner race



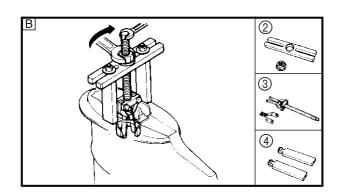
- A For USA and Canada
- **B** Except for USA and Canada

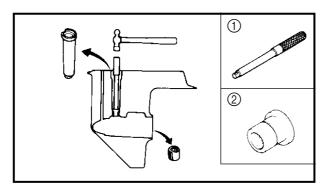
NOTE: __

For ease of reassembly and adjustment, keep shim packs in their groups as removed.



(2)





12) Forward gear bearing outer race

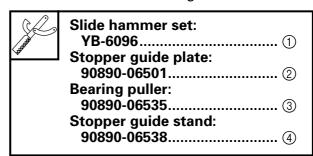
	Slide hammer set: YB-6096① Bearing outer race puller: 90890-06523②
--	--------------------------------------------------------------------

- A For USA and Canada
- **B** Except for USA and Canada

NOTE: ___

For ease of reassembly and adjustment, keep shim packs in their groups as removed.

13) Drive shaft bearing outer race



- A For USA and Canada
- **B** Except for USA and Canada

- 14) Drive shaft sleeve
- 15) Drive shaft needle bearing



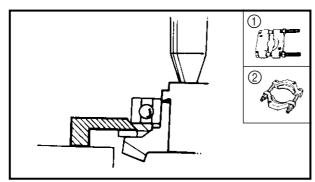
Driver rod:

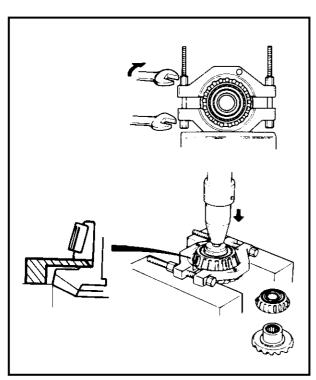
YB-6071/90890-06602..... ① **Needle bearing attachment**:

YB-6155/90890-06611..... ②



DISASSEMBLY



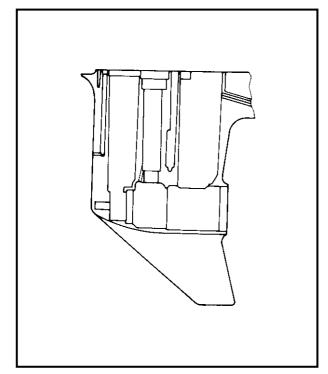


16) Reverse gear bearing and forward gear bearing

	Bearing separator: YB-6219 ①
₩	90890-06534 ②
	•

NOTE: ______Separate the bearing from the gear using special service tool and hydraulic press.

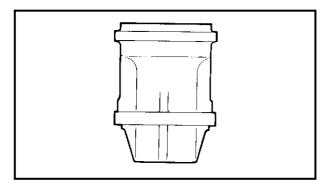




151001-0

INSPECTION GEAR CASE

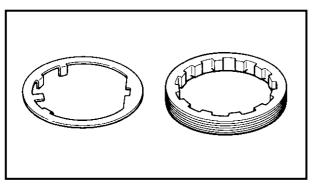
- 1. Using a soft brush and solvent, clean the case and water passage.
- 2. Visually inspect the gear case for cracks, corrosion or distortion. If any crack or excessive corrosion is found, replace the gear case.
- 3. Check the water inlet cover and water passage for clogging.



151500-0

BEARING HOUSING

- 1. Using a soft brush and solvent, clean the housing thoroughly.
- 2. Visually inspect the housing for cracks and corrosion. If any damage is found, replace the bearing housing.



152000-0

CLAW-WASHER

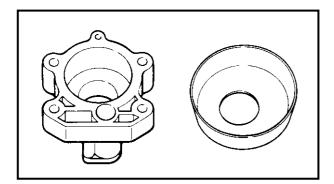
 Visually inspect the washer for cracks. If a crack is found, replace the clawwasher.

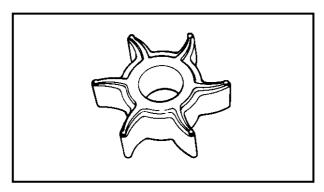
152500-0

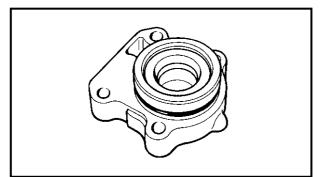
RING-NUT

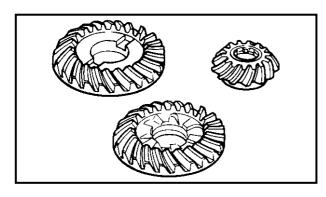
- 1. Using a soft brush and solvent, clean the thread of the ring-nut.
- 2. Visually inspect the ring-nut for cracks or damage to the thread. If cracked or damaged, replace the ring-nut.

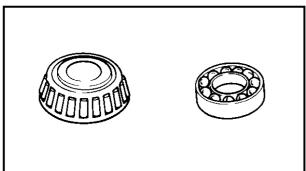












53000-0

WATER PUMP HOUSING

- 1. Inspect the water pump housing for signs of twisting or scratches of the inner cartridge. If twisted or scratched excessively, replace the housing.
- 2. During the above operation, inspect the impeller plate and replace this if damaged.

153500-0

IMPELLER

1. Visually inspect the impeller for cracks, distortion or burning. If any damage is found, replace the impeller.

154000-0

OIL-SEAL HOUSING (Water pump housing)

- 1. Using a soft brush and solvent, clean the oil-seal housing.
- 2. Visually inspect the housing for cracks or corrosion. If a crack and/or excessive corrosion is found, replace the oil-seal housing.

154500-0

GEAR

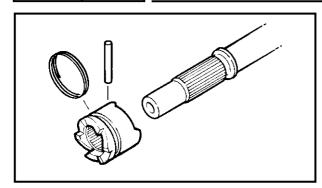
 Visually inspect the teeth and dogs on the gears for cracks, peeling or distortion due to gear-crashing. If damage is found on any of the gears, replace with a new one.

155000-0

BEARING

 Inspect the bearings for pitting, scratching or rumbling (which may be detected by turning the bearing by hand), and replace them if they are not in good condition.

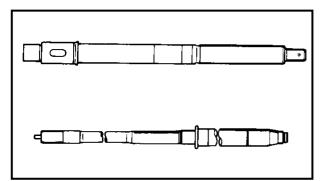
INSPECTION



15500-0

CLUTCH DOG AND COMPONENTS

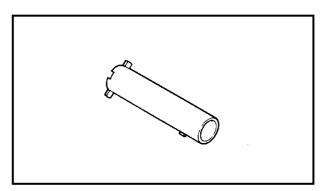
1. Visually inspect the clutch dog, looking particularly for rounding of the dog edge, cracks and other signs of damage or wear. If the dog is excessively rounded, inspect the mating gear, and replace both if necessary.



156000-0

DRIVE AND PROPELLER SHAFT

 Visually inspect the shafts, looking for grooved wear on the surface in contact with the bearings and oil-seals and checking for wear on the splines. Replace if worn or damaged.



156300-0

DRIVE SHAFT SLEEVE

1. Visually inspect the sleeve for wear and cracks. If any damage is found, replace the sleeve.

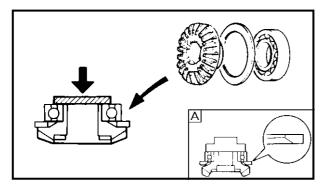
157000-0*

PROPELLER/TRIM TAB/ANODE

1. Refer to "PERIODIC SERVICE" section in chapter 3.



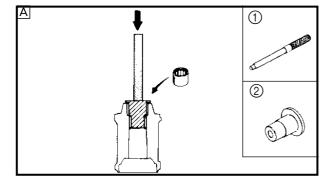




161009-0³

ASSEMBLY AND ADJUSTMENT PROPELLER-SHAFT HOUSING

- 1. Install the thrust washer and press-fit a ball-bearing to the reverse gear.
- A 50GETO



2. Install a needle-bearing and oil seals, and then press-fit the reverse gear complete into the bearing housing.

NOTE: _

Install the needle bearing with its manufacture's marks or numbers facing outward.



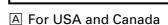
Depth @:

50 hp : 20.7 mm (1.06 in) 60 ~ 90 hp: 25.5 mm (1.00 in)



23

Drive rod:



B Except for USA and Canada



Depth (b): 5 mm (0.20 in)

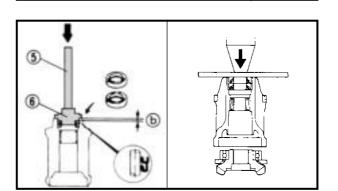


Driver rod:

YB-6071..... ⑤
Oil seal attachment:

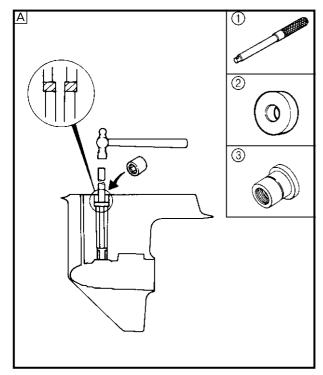
60 ~ 90 hp:

YB-6259 ⑥

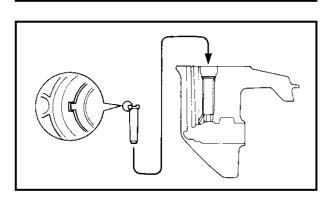


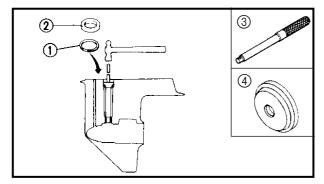
(a)





B a



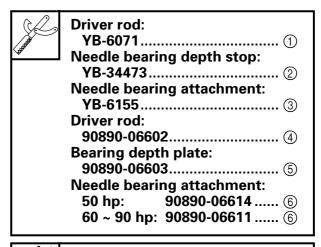


GEAR CASE

1. Install a new needle-bearing in position.

NOTE

The needle bearing should be installed with the mark facing the flange side of attachment.



X

Depth @:

50 hp : 198.3 ~ 198.8 mm

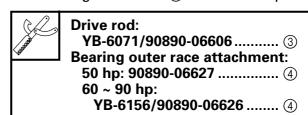
(7.81 ~ 7.83 in)

60 ~ 90 hp : 187.6 ~ 188.6 mm

(7.39 ~ 7.43 in)

- A For USA and Canada
- **B** Except for USA and Canada
 - 2. Align the drive-shaft sleeve locating-rib with the recess in the gear case and place the drive-shaft sleeve into the gear case.

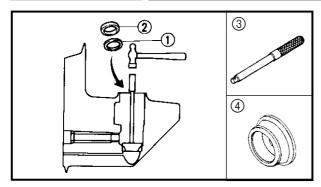
3. Place the pinion-gear shim-pack ① in position and install the taper-roller bearing outer race ② on the shim-pack.

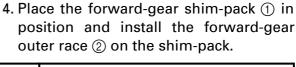


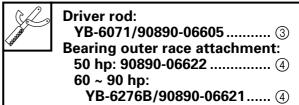


1





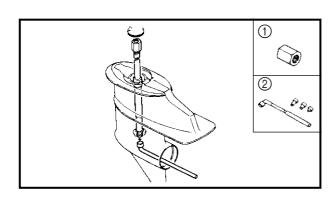




5. Install the bearing inner race to the forward-gear, then place the forward-gear complete onto the outer race.



Bearing inner race attachment: 50 hp: 90890-06640 ① 60 ~ 90 hp: 90890-06662 ①



 Place the drive-shaft in the gear case and insert it into the pinion.
 Tighten the pinion nut to the specified torque.

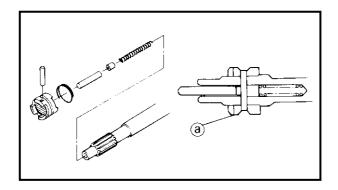
Pinion nut:



50 hp: 75 Nm (7.5 m • kg, 54 ft • lb) 60 ~ 90 hp: 95 Nm (9.5 m • kg, 69 ft • lb)



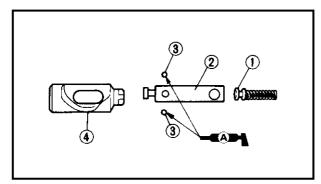
Drive shaft holder: 50, 60, 70 hp: YB-6049/90890-06518....... ① 75, 80, 90 hp: YB-6151/90890-06519...... ① Pinion nut holder: 90890-06505...... ②

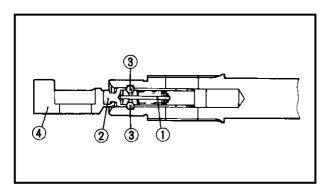


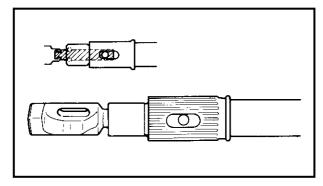
- 7. Assemble the propeller shaft. (For 50GETO, C60ER, C60TR/60FET (Oceania), C75TR, 90AEHD, 90AED, C90TR/90AET)
 - 1) Referring to the illustration.
- @ "F" mark side

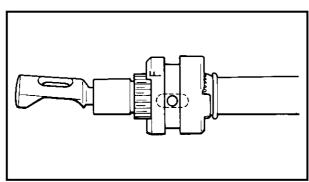


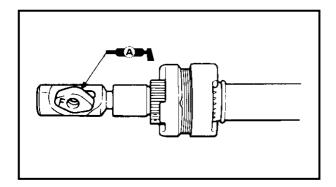












- 7. Assemble the propeller shaft. (Except for 50GETO, C60ER, C60TR/60FET (Oceania), C75TR, 90AEHD, 90AED, C90TR/90AET)
 - 1) Insert the free shaft ① into the shift slide ②.
 - 2) Insert the two balls ③ and shifter ④ on the shift slide.

NOTE: _

Grease the balls so that they will not come off easily from the shift slide, thus making your work easier.

- 3) Align the hole in the shift slide cross pin with the slot in the propeller shaft cross pin and insert the shift slide into the propeller shaft.
- 4) Push the shifter and stop pushing it when the balls move into the neutral groove in the propeller shaft making a slick.
 - If the balls move into the reverse groove passing the neutral, be sure to bring them back to neutral.
- 5) Install the clutch dog so that its cross pin hole is aligned with the slot in the splined portion of the propeller shaft.

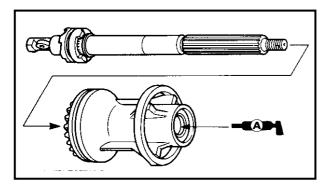
NOTE:

Install the clutch dog so that the "F" mark on the clutch dog is on the forward gear side.

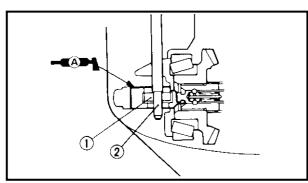
- 6) Bring the cross pin hole in the clutch dog with the hole in the shift slide and insert the cross pin into these holes. Then, install the cross pin ring.
- 7) Place the shift cam on the shifter (with the "F" mark on the shift cam facing forward) and insert the propeller shaft into the forward gear.



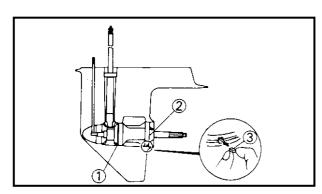




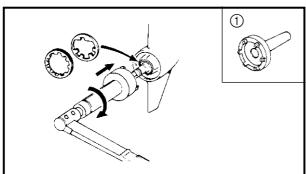
8. Grease the lips of the oil-seals and insert the propeller shaft complete into the bearing housing. Then, place the bearing housing complete to the gear case.



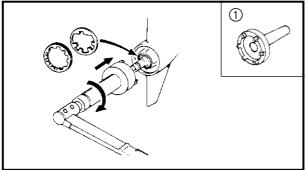
9. Look into the gear case through the hole and align the shift rod hole in the gear case with the splined hole in the shift cam (1) and install the shift rod (2). (Except for 50GETO, C60ER, C60TR/ (Oceania), C75TR, 90AEHD, 60FET 90AED, C90TR/90AET)



10. Place the reverse-gear shim (1) in place, then install the bearing housing 2 (aligning the key-way in the gear-case with that in the bearing housing) and insert the key (3).

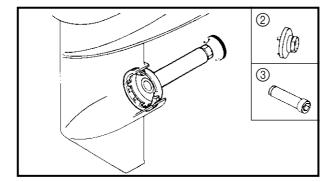


11. Place a claw-washer in place, install a ring-nut (with its embossed marks facing outward away from the bearing housing), tighten the ring-nut to the specified torque and bend the clawwasher over the ring-nut to lock it.





50 hp: 130 Nm (13.0 m • kg, 0.94 ft • lb) 60, 70, 75, 80, 90 hp: 145 Nm (14.5 m • kg, 105 ft • lb)



Ring nut wrench: 50 hp: YB-06048/90890-06510 60 ~ 90 hp: YB-34447 1 90890-06511..... ② Extension (ring nut wrench): 90890-06513..... ③

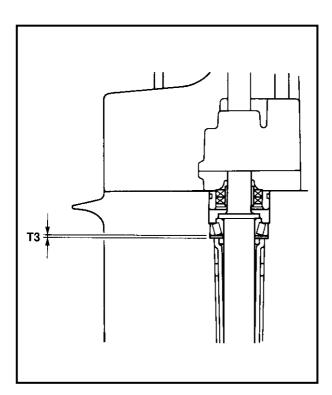


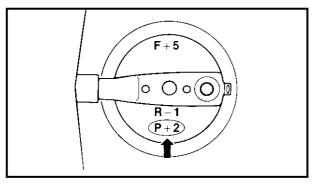


SHIM SELECTION

NOTE: ____

- 1. When reassembling the lower unit with the original gear case and inner parts, shim selection is not required.
- 2. When replacing the gear case only, read the numeral preceded by "F, R, P" and adjust the shims according to the difference between numerals of the original gear-case and the new gear-case.
- 3. If the bearing(s) and/or gear(s) are replaced, carry out the shim selection.





FOR USA AND CANADA Pinion gear shim

NOTE: ____

Find pinion gear shim thickness (T3) by selecting shims until the specified measurement (M) with the special tool is obtained.

1. Find the specified measurement (M).



Specified Measurement (M) = 0.20 mm + P/100 mm

NOTE: _

- P is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the P mark is missing or unreadable, assume a P mark of "0" and check the backlash when the unit is assembled.
- 2. If the **P** value is negative (-), then **subtract** the **P** value from the measurement.





Example:

If P mark is "+5", then

M = 0.20 + (+5)/100 mm

= 0.20 + 0.05 mm

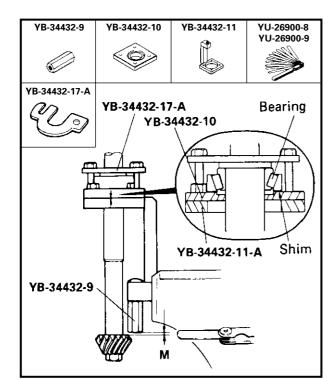
 $= 0.25 \, \text{mm}$

If **P** mark is "-3", then

M = 0.20 + (-3)/100 mm

= 0.20 - 0.03 mm

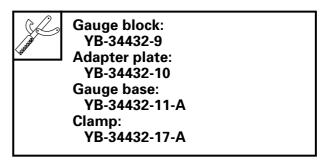
= 0.17 mm



2. Assemble the shimming gauge with the drive shaft, bearing and shim(s) as shown in the illustration.

NOTE:

- 1. Attach the adapter plate to the gauge base using 4 bolts with appropriate sizes.
- 2. If the original shim(s) is unavailable, start with a 0.50 mm shim.



- 3. Install the pinion on the drive shaft and tighten the nut to the specified torque.
- 4. Using a thickness gauge at the specified measurement (**M**) established above, check the fit between the shimming gauge and lower surface of the pinion as shown.



Thickness gauge: YU-26900-8 YU-26900-9

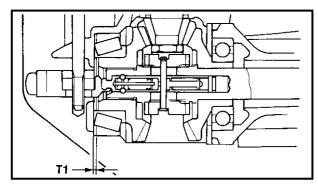
5. If the thickness gauge at the **M** specification will not fit, then remove or add the shim(s) until the thickness gauge just fits between the tool surfaces.

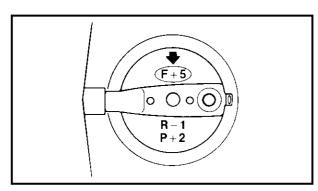


Available shim thickness: 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm









YB-34446-1 YB-34446-5 YB-34446-3 YB-34446-3 YB-34446-3 YB-34446-3 YB-34446-5 YB-34446-3 YB-34446-5 YB-34446-3 YB-34446-3 YB-5 SHIM

Forward gear shim

NOTE: __

Find forward gear shim thickness (**T1**) by selecting shims until the specified measurement (**M**) with the special tool is obtained.

1. Find the specified measurement (M).



Specified Measurement (M) = 1.69 mm + F/100 mm

NOTE: __

- F is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the F mark is missing or unreadable, assume an F mark of "0" and check the backlash when the unit is assembled.
- 2. If the **F** value is negative (–), then **subtract** the **F** value from the measurement.

Example:

If **F** mark is "+5", then

M = 1.69 + (+5)/100 mm

 $= 1.69 + 0.05 \, \text{mm}$

= 1.74 mm

If F mark is "-3", then

M = 1.69 + (-3)/100 mm

= 1.69 - 0.03 mm

 $= 1.66 \, \text{mm}$

 Assemble the shimming gauge with the forward bearing and original shim(s) as shown in the illustration. Tighten the nut four turns after contacting the spring.

NOTE: _

If the original shim(s) is unavailable, start with a 0.50 mm shim.



Base plate:

YB-34446-1

Compression spring:

YB-34446-3

Press plate:

YB-34446-5

Gauge pin:

YB-34446-7





3. Using a thickness gauge at the specified measurement (**M**) established above, check the fit between the shimming gauge and upper disc of the tool.

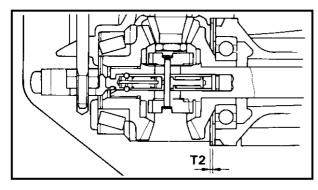


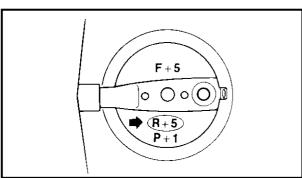
Thickness gauge: YU-26900-8 YU-26900-9

4. If the thickness gauge at the M specification will not fit, then remove or add the shim(s) until the thickness gauge just fits between the tool surfaces.



Available shim thicknesses: 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm





Reverse gear shim

NOTE: _

Find the reverse gear shim thickness (**T2**) by selecting shims until the specified measurement (**M**) with the special tool is obtained.

1. Find the specified measurement (**M**).



Specified Measurement (M) = 60, 70 hp: 1.00 mm - R/100 mm 75, 90 hp: 1.50 mm - R/100 mm

NOTE: __

- R is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the R mark is missing or unreadable, assume an R mark of "0" and check the backlash when the unit is assembled.
- 2. If the **R** value is negative(–), then **add** the **R** value to the measurement.





Example: (60, 70 hp) If R mark is "+5", then $\mathbf{M} = 1.00 - (+5)/100 \text{ mm}$ = 1.00 - 0.05 mm

 $= 0.95 \, \text{mm}$

If **R** mark is "-3", then

 $\mathbf{M} = 1.00 - (-3)/100 \text{ mm}$

= 1.00 + 0.03 mm

 $= 1.03 \, \text{mm}$

Example: (75, 90 hp) If **R** mark is "+5", then M = 1.50 - (+5)/100 mm=1.50 - 0.05 mm

 $=0.45 \, \text{mm}$

If **R** mark is "-3", then

M = 1.50 - (-3)/100 mm

=1.50 + 0.03 mm

=1.53 mm

2. Place the original shim(s) on the thrust washer mounted on the bearing housing and place the shimming gauge on top of the shim(s) as shown in the illustration.

NOTE: _

- 1. If the original shim(s) is unavailable, start with a 0.50 mm shim.
- 2. Be sure to remove the O-ring from under the thrust washer.



Shimming gauge: YB-34468-5 (60, 70 hp) YB-34468-3 (75, 90 hp)

3. Using a thickness gauge at the specified measurement (M) established above, check the fit between the shimming gauge and the reverse gear. Force the shimming gauge against the shims and thrust washer when checking the fit.

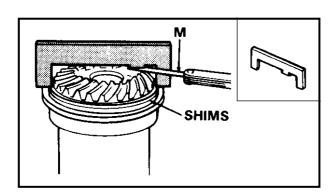


Thickness gauge: YU-26900-8 YU-26900-9

4. If the thickness gauge at the M specification will not fit, then remove or add the shim(s) until the thickness gauge just fits between the tool surfaces.



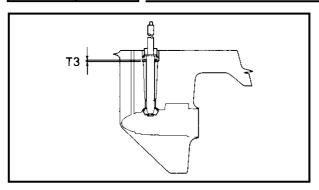
Available shim thickness: 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm





SHIM SELECTION (EXCEPT FOR USA AND CANADA)





EXCEPT FOR USA AND CANADA Pinion gear shim

- Find pinion gear shim thickness (T3) by selecting shims until the specified measurement (M) with the special tool is obtained.
- 2. Install the pinion on the drive shaft and tighten the nut to the specified torque.



Pinion nut:

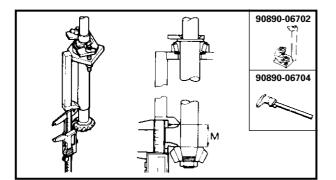
50 hp:

75 Nm (7.5 m • kg, 54 ft • lb)

60 ~ 90 hp:

95 Nm (9.5 m • kg, 69 ft • lb)

3. Assemble the pinion height gauge with the drive shaft and bearing as shown in the illustration. Bolt the bearing housing to the special tool with at least two bolts.





Pinion height gauge: 90890-06702 Digital caliper: 90890-06704

4. Using a digital caliper at the specified measurement (M) established above, measure the distance between the pinion height gauge and lower surface of the pinion as shown.



Shim thickness (T3)= 50 hp: M - 40.2 mm - P/100 mm 60 ~ 90 hp: M - 31.5 mm - P/100 mm

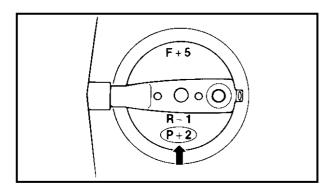
5. **P** is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the **P** mark is missing or unreadable, assume a **P** mark of "0" and check the backlash when the unit is assembled.

Example:

If **M** is "32.10 mm" **P** is "+2", then **T3** = 32.10 - 31.5 - 2/100 = 0.58

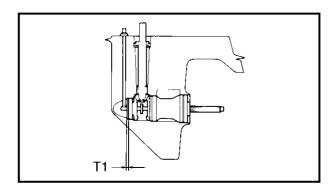


Available shim thickness: 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm



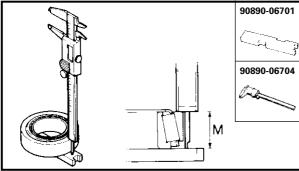
NOTE: _____

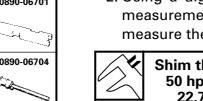
- Use a minimum number of shims to obtain the thickness equal or nearly equal to the calculation.
- Install the shims with the thicker one on the outer side.



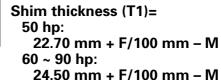
Forward gear shim

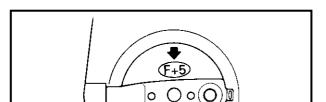
 Find forward gear shim thickness (T1) by selecting shims until the specified measurement (M) with the special tool is obtained.





2. Using a digital caliper at the specified measurement (**M**) established above, measure the bearing height.





R-1



3. **F** is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the **F** mark is missing or unreadable, assume an **F** mark of "0" and check the backlash when the unit is assembled.

Example:

If **M** is "23.90 mm" **F** is "+5", then **T1** = 24.50 + 5/100 - 23.90 = 0.65

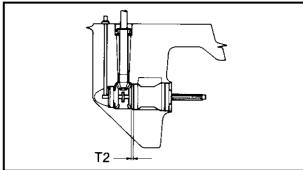


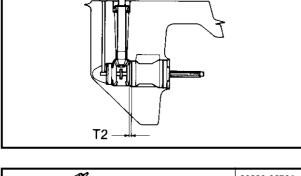
Available shim thickness: 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

SHIM SELECTION (EXCEPT FOR USA AND CANADA)

NOTE: _____

- Use a minimum number of shims to obtain the thickness equal or nearly equal to the calculation.
- Install the shims with the thicker one on the outer side.





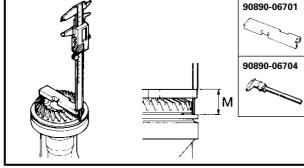
Reverse gear shim

1. Find reverse gear shim thickness (T2) by selecting shims until the specified measurement (M) with the special tool is obtained.

NOTE: __

Be sure to remove the O-ring from under the thrust washer.

2. Using a digital caliper at the specified measurement (M) established above, measure the distance between the washer top and special tool top as shown.

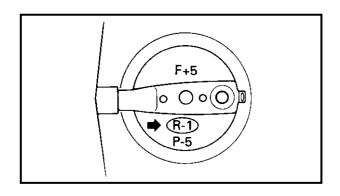




Shim thickness (T2)= 50 hp: M - 25.40 mm - R/100 mm 60, 70 hp M - 28.00 mm - R/100 mm 75 ~ 90 hp: M - 26.00 mm - R/100 mm



Shimming plate: 90890-06701 Digital caliper: 90890-06704



3. R is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the R mark is missing or unreadable, assume an R mark of "0" and check the backlash when the unit is assembled.

Example:

If **M** is "28.60 mm" **R** is "-1", then **T2** = 28.60 - 28.00 + 1/100 = 0.61



Available shim thickness: 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

NOTE: ___

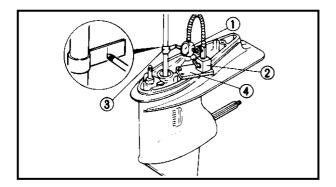
- Use a minimum number of shims to obtain the thickness equal or nearly equal to the calculation.
- Install the shims with the thicker one on the outer side.

163015-0*

MEASURING THE BACKLASH

NOTE: _

- Do not install the water pump components when measuring the backlash.
- Both forward and reverse gear backlashes should be measured.
- If both the forward and reverse gear backlashes are larger than specified, the pinion may be too high.
- If both forward and reverse gear backlashes are smaller than specified, the pinion may be too low.
- If either of these conditions exists, then check the pinion shim selection.
 - 1. Place the shift rod in neutral.
 - 2. Install a dial gauge on the gear case.
 - 3. Install a backlash indicator gauge (special service tool) on the drive shaft (50, 60, 70 hp: 18 mm in diameter, 75, 80, 90 hp: 20 mm in diameter) and make the dial gauge stem contact the mark on the indicator gauge.





Dial gauge: YU-3097/90890-01252..... ① Magnet base:

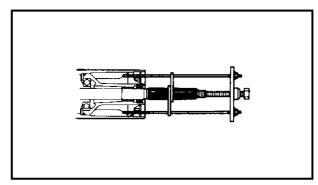
YU-34481/90890-06705...... ②

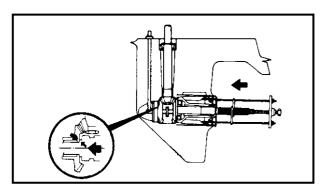
Backlash indicator: YB-6265/90890-06706............ ③ Backlash adjusting plate:

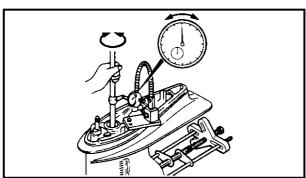


SHIM SELECTION









Forward gear

1. Install a bearing housing puller (special service tool) in the bearing housing so that it engages with the center bolt of the propeller shaft.

NOTE: _

Tighten the center bolt while turning the propeller shaft a few times clockwise.



Center bolt:

5 Nm (0.5 m • kg, 3.6 ft • lb)



Claw:

YB-6207/90890-06503 50, 60, 70 hp:

90890-06502

Universal puller: YB-6117

Stopper guide plate:

90890-06501

Center bolt:

90890-06504

- 2. Slowly turn the drive shaft in and out and read the dial gauge when the drive shaft stops in each direction.
- 3. Determine the shim size according to the chart.

50, 75, 80, 90 hp:

Forward gear backlash	Decrease or increase				
Less than 0.08 mm (0.003 in)	Thickness of shim to be decreased (mm) = (0.17 – measurement) × 0.60				
0.08 – 0.25 mm (0.003 – 0.009 in)	Decrease or increase will be unnecessary				
More than 0.25 mm (0.009 in)	Thickness of shim to be increased (mm) = (measurement – 0.17) \times 0.60				

60, 70 hp:

Forward gear backlash	Decrease or increase			
Less than 0.09 mm (0.004 in)	Thickness of shim to be decreased (mm) = (0.19 – measurement) × 0.53			
0.09 – 0.28 mm (0.004 – 0.011 in)	Decrease or increase will be unnecessary			
More than 0.28 mm (0.011 in)	Thickness of shim to be increased (mm) = (measurement - 0.19) × 0.53			

Reverse gear

1. Install a propeller on the propeller shaft, with the front facing backward, fit the nut and tighten.



Nut (propeller): 5 Nm (0.5 m • kg, 3.6 ft • lb)

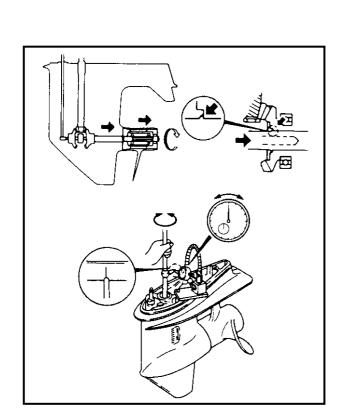
- 2. Slowly turn the drive shaft in and out and read the dial gauge when the drive shaft stops in each direction.
- 3. Determine the shim size according to the chart.

50 hp:

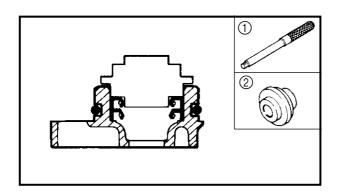
Reverse gear backlash	Decrease or increase				
Less than 0.84 mm (0.033 in)	Thickness of shim to be increased (mm) = $(1.01 - measurement) \times 0.60$				
0.84 – 1.17 mm (0.033 – 0.046 in)	Decrease or increase will be unnecessary				
More than 1.17 mm (0.046 in)	Thickness of shim to be decreased (mm) = (measurement – 1.01) \times 0.60				

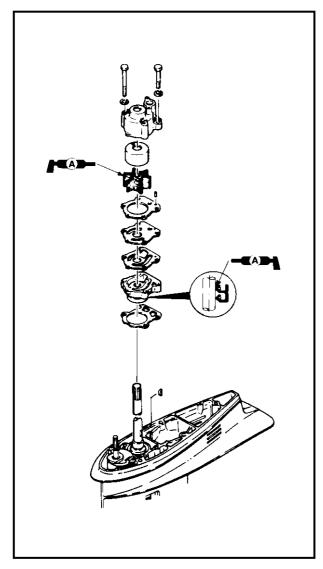
60, 70 hp:

Reverse gear backlash	Decrease or increase			
Less than 0.75 mm (0.033 in)	Thickness of shim to be increased (mm) = $(0.94 - measurement) \times 0.53$			
0.75 – 1.13 mm (0.033 – 0.044 in)	Decrease or increase will be unnecessary			
More than 1.13 mm (0.044 in)	Thickness of shim to be decreased (mm) = (measurement – 0.94) \times 0.53			









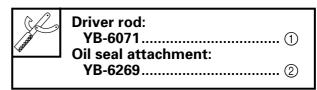
75, 80, 90 hp:

Reverse gear backlash	Decrease or increase			
Less than 0.67 mm (0.026 in)	Thickness of shim to be increased (mm) = $(0.84 - measurement) \times 0.60$			
0.67 – 1.00 mm (0.026 – 0.039 in)	Decrease or increase will be unnecessary			
More than 1.00 mm (0.039 in)	Thickness of shim to be decreased (mm) = (measurement – 0.84) \times 0.60			

164000-0

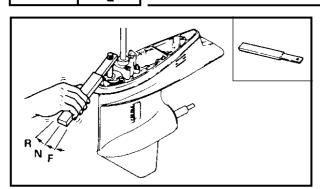
WATER PUMP INSTALLATION

1. Install a new oil seal in the oil-seal housing, and fit a new O-ring in the O-ring groove.



- 2. Grease the O-ring and the lip of the oilseal, then install the oilseal housing complete to the gear-case and fit the dowel-pins.
- 3. Aligning with the dowel-pins, install a new gasket, a plate and a new gasket on the oil-seal housing.
- 4. Install a key in the keyway on the driveshaft and insert a impeller.
- 5. Grease the impeller and install the water-pump housing, turning the drive shaft clockwise, then tighten the bolts.





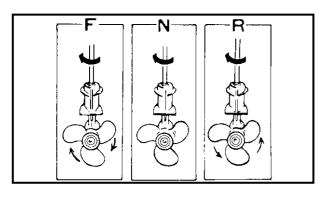
170003-0*

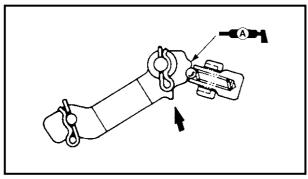
INSTALLATION

1. Check that the clutch dog shifts to "Forward", "Neutral" and "Reverse" correctly by turning the shift rod, and shift into "Neutral".

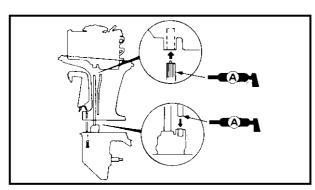


Shift rod wrench: YB-6052

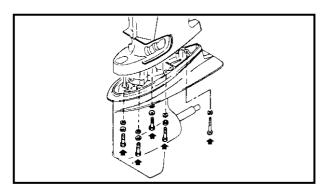




2. Align the mark on the shift lever with the arrow mark on the bottom cowling.



3. Grease the spline of the drive-shaft and the water-tube outer face, align the water-tube and drive-shaft, install the lower unit and tighten the bolts to the specified torque.





Lower unit mounting bolts: 40 Nm (4.0 m • kg, 29 ft • lb)

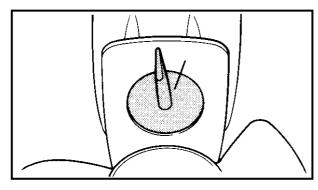


INSTALLATION

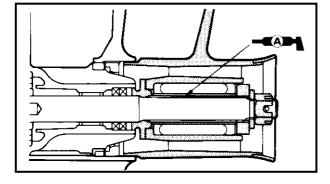


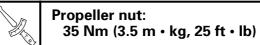


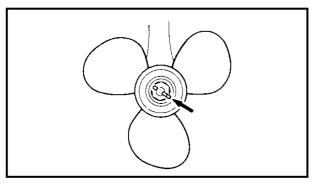
4. Install the trim tab on the gear case. Be sure to align the marks put on both of them when they were removed. Place the cap over the bolt hole.



5. Install the spacers, propeller, washer, and propeller nut over the propeller shaft.



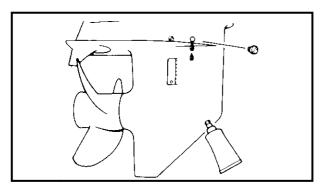




6. Align the recess in the propeller nut with the hole in the propeller shaft and insert the cotter pin into the hole. Be sure to bend the cotter pin ends.

NOTE: _

If the propeller nut does not align with the propeller shaft hole when the nut is tightened to specification, turn it in further so that they align.

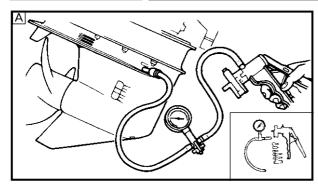


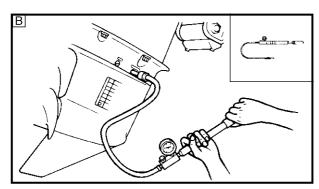
7. Fill with fresh gear oil through the oil plug-hole until oil flows out through the level-plug hole, then secure the plugs in these two holes. (Secure the check plug first.)



INSTALLATION





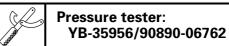


65000-0

LOWER UNIT LEAKAGE CHECK

- 1. Tighten the gear oil-drain screw and connect the tester to the oil-level hole.
- Pump the tester, and apply a pressure of 100 kPa (1.0 kg/cm², 14.2 psi).
 Then, place the gear case in the water tank.
- 3. Check that the pressure is held at 100 kPa (1.0 kg/cm², 14.2 psi) for 10 seconds.

CAUTION:						
Do not overpressurize.						
NOTE:						
If the pressure fa	alls, leakage from the lower					
unit is unaccepta	able, requiring re-inspection					
of its componen	t parts.					



A For USA and Canada

B Except for USA and Canada



CHAPTER 7 BRACKET UNIT

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BRACKET UNIT EXPLODED DIAGRAM

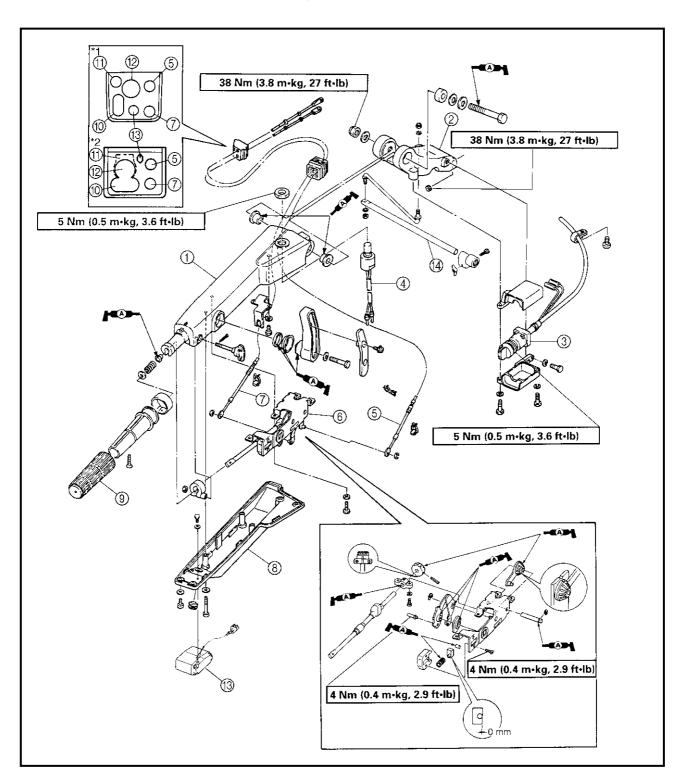
MANUAL HANDLE

P60TH/60FEHTO*1, P75TH/75CEHTO, 90AEHD*2

- 1) Steering handle
- ② Bracket
- 3 Main switch
- 4 Engine stop switch
- (5) Throttle cable

- 6 Link assembly
- ⑦ Shift cable
- ® Cover
- 9 Grip
- 10 Battery cable

- (1) Main switch lead
- ② Extension wire lead
- (3) PTT switch (PTT model)
- (PTT model)

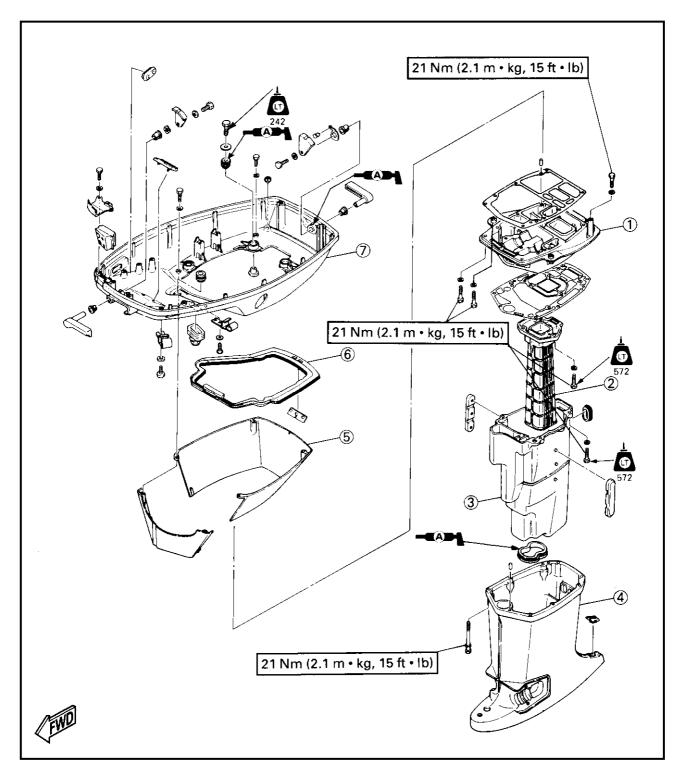




K15000-0

UPPER CASING 50, 60, 70 hp

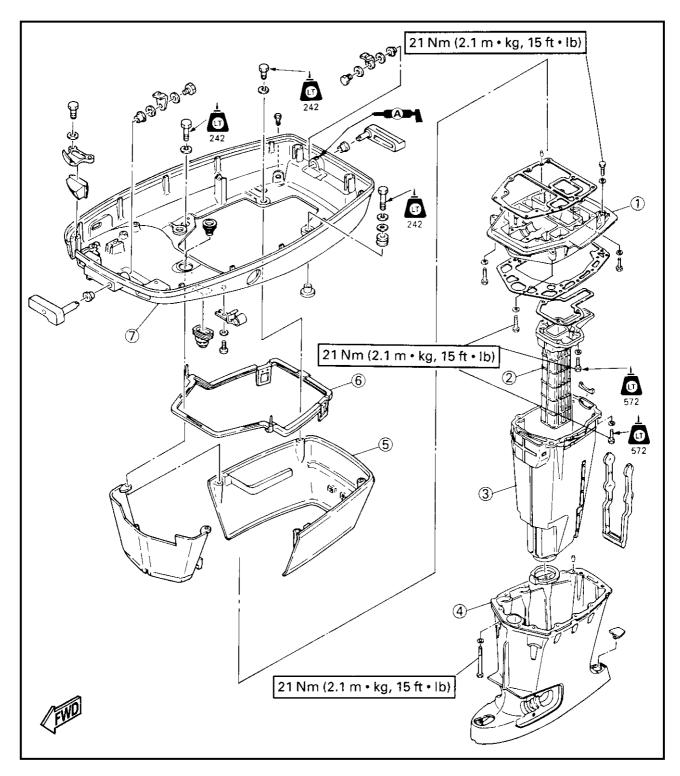
- ① Exhaust guide
- ② Exhaust manifold
- ③ Muffler
- 4 Upper case
- ⑤ Apron
- 6 Seal
- Bottom cowling





75, 80, 90 hp

- ① Exhaust guide
- ② Exhaust manifold
- ③ Muffler
- ④ Upper case
- ⑤ Apron
- 6 Seal
- ⑦ Bottom cowling

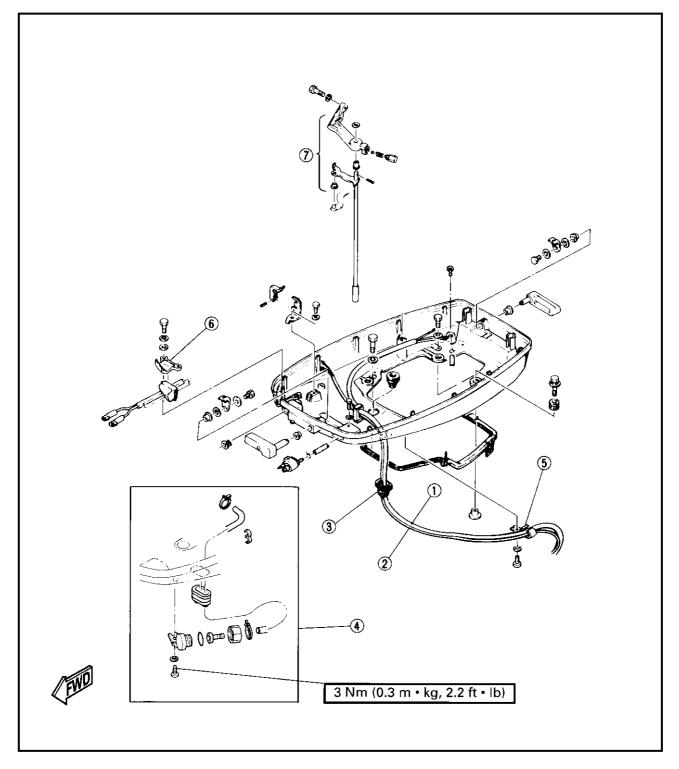




K-15300-0

BOTTOM COWLING

- ① Power trim and tilt motor lead (PTT model)
- ② Trim sender lead (PTT model)
- ③ Grommet
- 4 Flushing kit (B90TR/90AETO)
- ⑤ Clamp (PTT model)
- Bottom cowling fitting plate
- Shift actuator



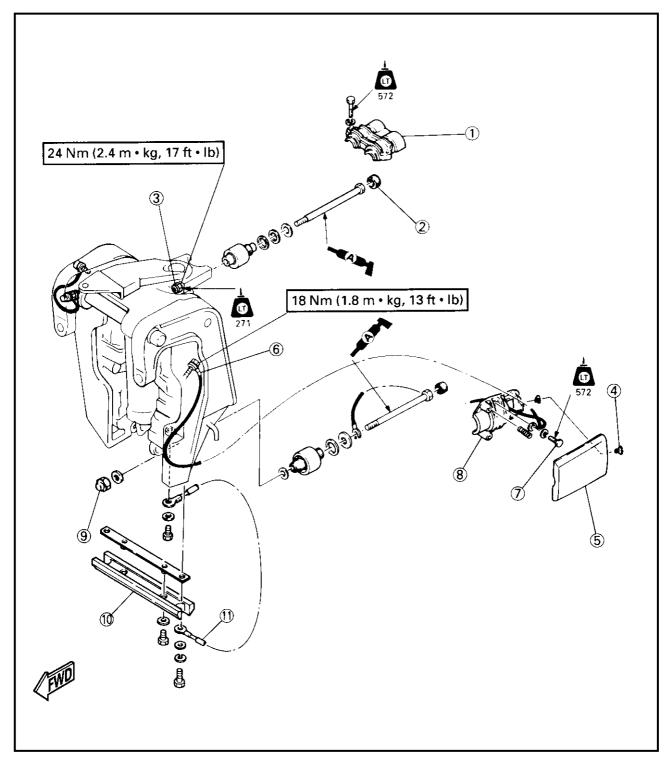


K-15600-0

BRACKET UNIT

- ① Upper mount rubber cover
- ② Cap
- ③ Upper mount rubber nut
- 4 Screw
- **5** Low mount rubber cover
- 6 Ground lead
- 7 Bolt
- ® Mount rubber housing

- (n) Anode (PTT model)
- (f) Read wire (PTT model)

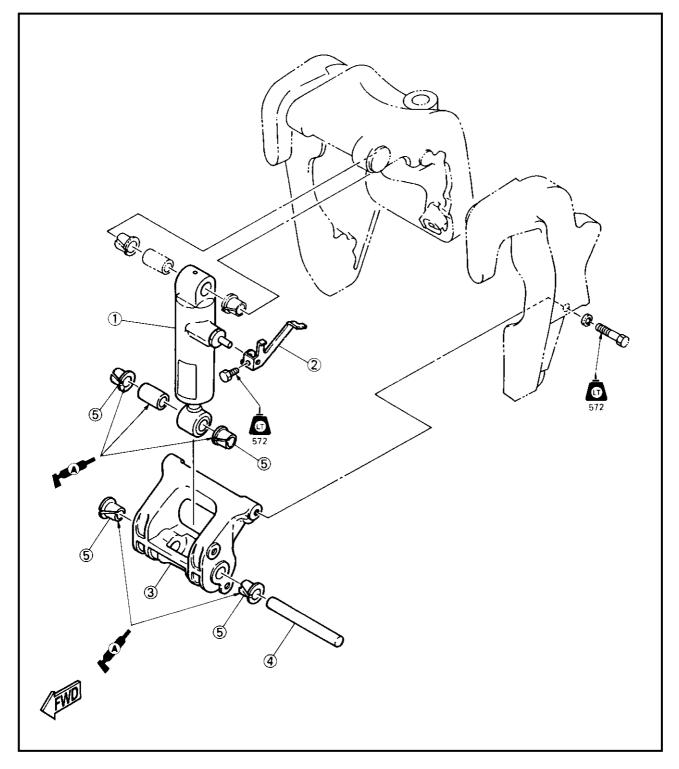




BRACKET UNIT (Manual tilt model)

- ① Tilt unit

- ② Tilt lever③ Clamp bracket spacer④ Lower shock mount pin
- ⑤ Bushing



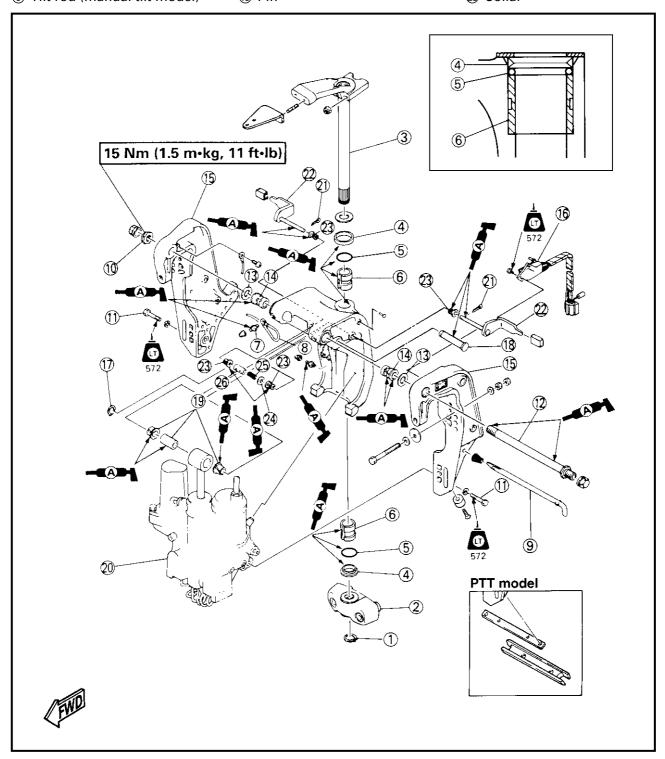
K15900-0

BRACKET (Short transom)

- ① Circlip
- 2 Lower mounting housing
- Steering pivot shaft
- 4 Bushing
- ⑤ O-ring
- 6 Bushing
- ⑦ Grease nipple
- ® Ground lead
- Tilt rod (manual tilt model)

- (1) Clamp bracket nut
- (1) Bolt (6 bolts)
- 12 Clamp bracket bolt
- Washer
- (4) Bushing
- (5) Clamp bracket
- (B) Trim sensor (PTT model)
- ① Circlip
- ® Pin

- Bushing
- ② Power trim and tilt unit (PTT model)
- ② Cotter pin
- 2 Tilt lock lever
- Bushing
- ② Washer
- Spring
- **%** Collar





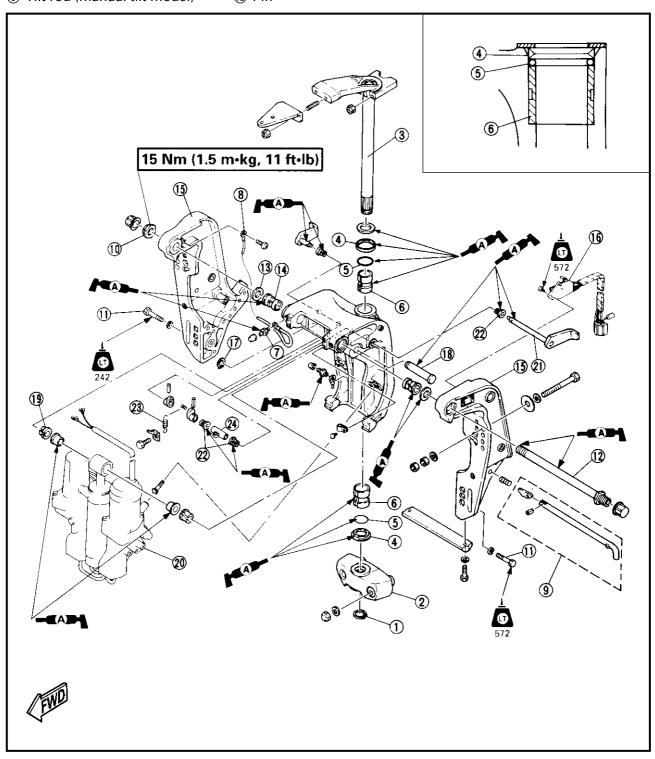
K15900-0

BRACKET (Long transom)

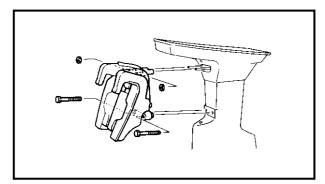
- ① Circlip
- 2 Lower mounting housing
- Steering pivot shaft
- 4 Bushing
- ⑤ O-ring
- 6 Bushing
- ⑦ Grease nipple
- ® Ground lead
- Tilt rod (manual tilt model)

- (1) Clamp bracket nut
- ① Bolt (6 bolts)
- Clamp bracket bolt
- Washer
- (4) Bushing
- (5) Clamp bracket
- (B) Trim sensor (PTT model)
- ① Circlip
- ® Pin

- Bushing
- ② Power trim and tilt unit (PTT model)
- ② Tilt lock lever
- 2 Bushing
- Spring
- 24 Collar







K20002-0

REMOVAL

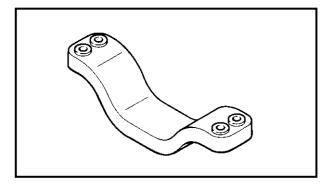
- 1. Remove the power-head.
- 2. Remove the swivel-bracket from the upper casing.

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Lay the outboard motor on the floor to carry out this removal.

DISASSEMBLY

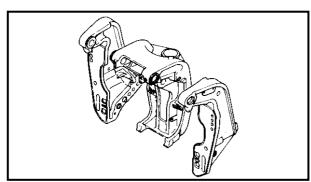
1. Referring to the exploded diagram, disassemble the bracket unit.



INSPECTION

ANODE

1. Check anode and replace with new one when the size is less than 1/3 of original length.



BRACKET

1. Inspect the bracket and replace them, if cracked.

TRIM SENSOR

1. Check resistance of the new trim sensor.



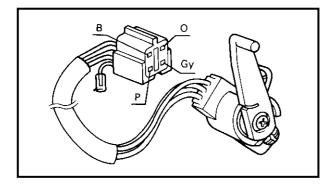
Trim sensor resistance:

Pink – Black

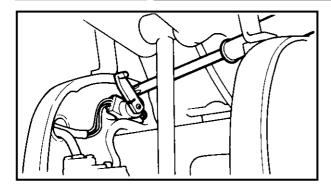
360 ~ 540 Ω

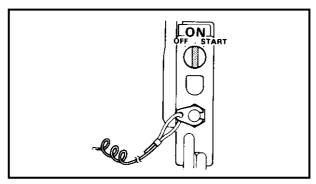
Black - Orange

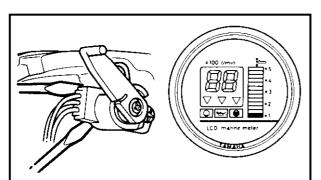
800 ~ **1200** Ω

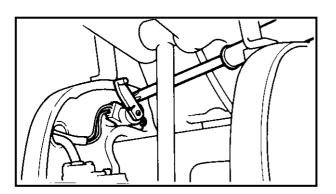


2. Measure resistance between black and pink leads to check that the value changes gradually in the whole trim and tilt range. If not, replace trim sensor with new one.









Trim sensor adjustment

Fully tilt up the outboard motor. Loosen the two bolts securing the trim sensor until it moves slightly.

A WARNING

Be sure to support the engine with the tilt support lever while loosening the bolts to prevent the engine from tilting down due to lack of oil pressure.

Fully tilt down the outboard motor.

Connect battery cables of the outboard motor to a battery and set the main switch to "ON".

Adjust the trim sensor position by pushing a screw driver so that one segment on the trim indicator on the digital meter goes on.

Tilt up the outboard motor and tighten both installation bolts.

A WARNING

Be sure to support the engine with the tilt support lever while tightening the bolts to prevent the engine from tilting down due to lack of oil pressure.

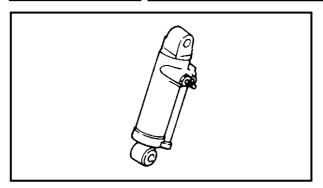
ASSEMBLY

1. Referring to the exploded diagram, assemble the bracket unit.



HYDRAULIC TILT UNIT/ POWER TRIM AND TILT UNIT





HYDRAULIC TILT UNIT

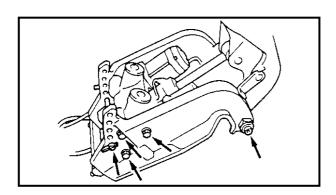
A WARNING

This cylinder is highly pressurized. Therefore, never overhaul or damage it.

INSPECTION

1. Inspect the tilt cylinder assembly for scratches or corrosion.

If any scratches are found, replace the tilt cylinder assembly.



POWER TRIM AND TILT UNIT REMOVAL

- 1. Disconnect the leads from the relay in the bottom cowling.
- 2. Remove the tilt-rod, bolts and nut, and the clamp-bracket.
- 3. Remove the circlip and the complete power trim and tilt unit.



E

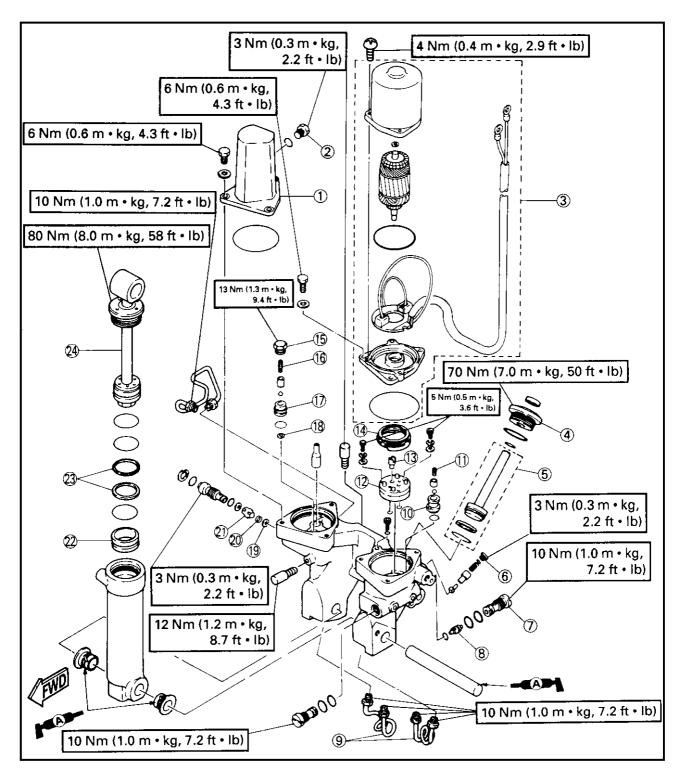
K51000-0

EXPLODED DIAGRAM (Short transom [6H308])

- ① Reservoir body
- ② Reservoir plug
- ③ Motor assembly
- 4 Trim cylinder end screw
- **5** Trim piston assembly
- (6) Valve seat screw
- Main valve assembly
- Shuttle piston

- 9 Pipe
- O Down relief valve seat
- (1) Down relief spring
- Gear pump assembly
- Shaft connector
- (4) Filter 2
- (5) Up relief valve lock screw
- (6) Up relief spring

- (7) Up relief valve seat
- ® Filter 1
- (19) Manual valve seat
- Manual release spring
- ② Adapter
- 22 Free piston
- Back-up ring 2
- ② Tilt cylinder assembly

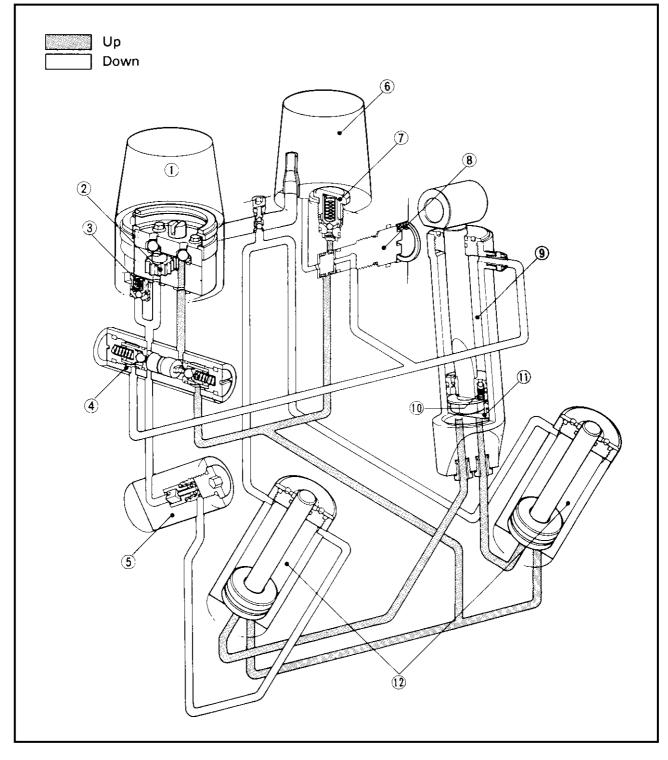




E

- ① Power trim and tilt motor
- ② Gear pump
- 3 Down-relief valve (48 kg/cm²)
- 4 Main valve
- ⑤ 2-way check valve
- 6 Reservoir
- 7 Up-relief valve (40 kg/cm²)
- ® Manual valve
- Tilt cylinder

- (10) Absorber valve (80 kg/cm²)
- 1 Free piston
- 12 Trim cylinder

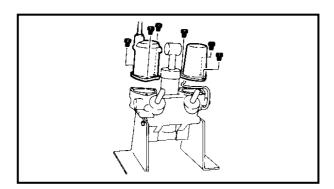


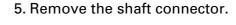
K52002-0

DISASSEMBLY

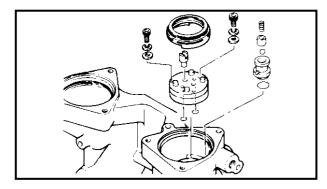
CAUTION:

- 1. Do not wipe components of the hydraulic system with rags or paper tissues, etc., as fibers entering the system will cause malfunction.
- 2. After removing the tilt-motor or oil-reservoir, do not depress the tilt-rod or trim-rod, since this may cause hydraulic fluid to be ejected from the port.
 - 1. Turn the manual valve fully towards the manual position.
 - 2. Remove the hydraulic-fluid level-plug and drain the hydraulic-fluid.
 - 3. Remove the delivery pipes and drain the hydraulic-fluid.
 - 4. Remove the hydraulic-fluid reservoir and the tilt-motor.



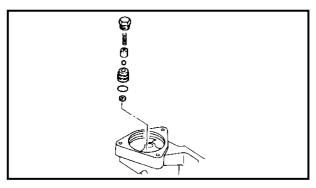


- 6. Remove the filter and the gear-pump.
- 7. Remove the O-rings and the complete down relief-valve.



CAUTION:

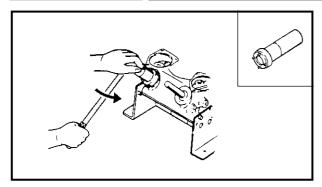
Do not disassemble the gear-pump unit which is factory-adjusted, but replace the complete gear-pump unit if necessary.



8. Loosen the bolt and remove the complete up-relief valve.



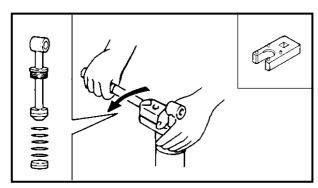




9. Using the special service tool, loosen the trim-cylinder end-screw and pull out the trim-piston and components.



Cylinder end screw wrench: YB-6175-1A/90890-06542



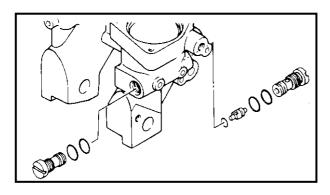
10. Using the special service tool, loosen the tilt-cylinder end-screw and pull out the tile-piston and the free-piston.

A WARNING

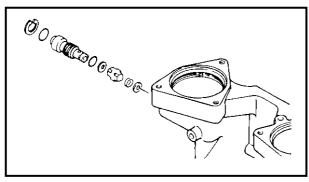
The free-piston can be removed easily by blowing compressed air into the drain-hole of the cylinder. Be sure to cover the open end of the cylinder with a rag to prevent the free-piston from being ejected, which could cause injury or piston damage.



Cylinder end screw wrench: YB-6175-2B/90890-06544



11. Remove the main valves and the shuttle-piston.



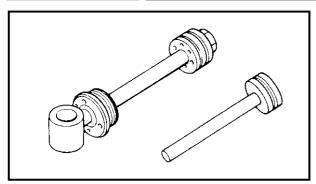
12. Remove the circlip, the manual-valve and components.

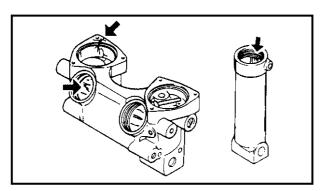
NOTE

The manual-valve screw is threaded left handed.









K53000-0

INSPECTION

TILT-ROD AND TRIM-ROD

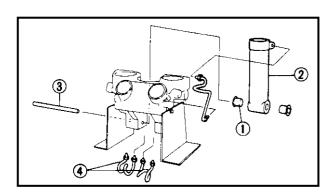
- 1. Clean these components using a soft brush and solvent and inspect them carefully. If there are light scratches on the surfaces, these may be polished off using fine wet-or-dry sandpaper (440 ~ 600 grit), but if there is excessive scratching, replace the components.
- 2. Clean all the parts thoroughly using a soft brush and solvent and dry them with compressed air.
- Inspect the tilt-cylinder and pump-unit and replace them if they are badly corroded.

K54000-0

ASSEMBLY

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The components in this assembly are to be lightly coated with hydraulic fluid before assembly.



- 1. Install the tilt-cylinder and the delivery pipes.
- ① Bushing
- ② Tilt-cylinder
- 3 Lower mount pin
- 4 Delivery pipe

NOTE: ____

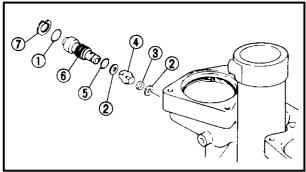
Feed oil into each pipe.



Lock nut (delivery pipe): 10 Nm (1.0 m • kg, 7.2 ft • lb)





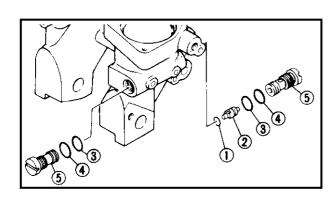


- 2. Install the manual-valve in the body with new O-rings.
- ① O-ring (fitted into the body)
- ② Manual valve seat
- ③ Manual release spring (L = 6.0 mm, D = 11.5 mm)
- 4 Adapter 1
- ⑤ O-ring
- ⑥ Manual valve (left-handed thread)
- (7) Circlip



Manual valve:

3 Nm (0.3 m • kg, 2.2 ft • lb)

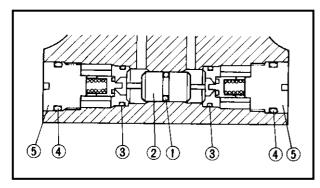


- 3. Install a new O-ring on the shuttle-piston, insert the piston into the body, then install the main valves with new O-rings.
- ① O-ring
- ② Shuttle-piston
- ③ O-ring
- 4 O-ring
- ⑤ Main valve



Main valve:

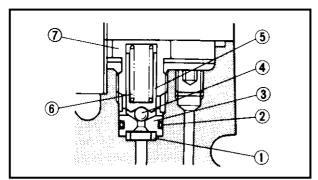
10 Nm (1.0 m • kg, 7.2 ft • lb)



- 4. Install the up-relief valve with a new Oring and tighten the locking-bolt to the specified torque.
- 1) Filter
- ② O-ring
- 3 Up relief valve seat
- 4 Ball
- (5) Valve support pin
- 6 Up relief spring (L = 19.7 mm, D = 5 mm)
- (7) Up relief valve lock screw

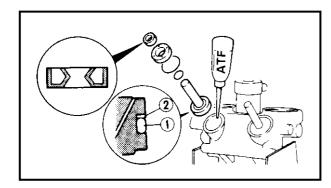








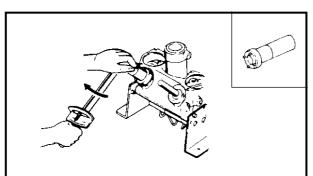
Locking bolt: 13 Nm (1.3 m • kg, 9.4 ft • lb)



5. Fit a new O-ring and the back-up ring to the trim-piston, fit new O-rings and a new oil-seal to the end-screw and install the complete trim-piston in the cylinder. Fill the cylinder with hydraulic fluid and install and tighten the end-screw to the specified torque.



ATF (automatic transmission fluid)

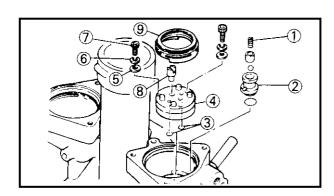


- O-ring
 Back-up ring

Trim cylinder end screw: 70 Nm (7.0 m • kg, 50 ft • lb)



Cylinder end screw wrench: YB-6175-1A/90890-6548



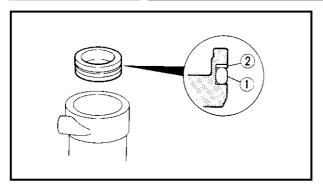
- Install the down relief-valve and the complete gear-pump with new O-rings, tighten the screws and fit the shaft connector and filter, then fill with hydraulic fluid.
- ① Down relief spring (L = 13 mm, D = 6.1 mm)
- 2 Down relief valve seat
- ③ O-rings
- 4 Gear pump
- ⑤ Washer
- Washer
- ⑦ Screw (Use hexagon wrench)
- (8) Shaft connector
- 9 Filter



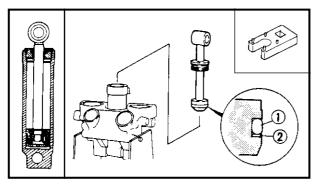
Gear pump mounting screw: 5 Nm (0.5 m • kg, 3.6 ft • lb)







- 7. Fit a new O-ring and the back-up ring on the free-piston and install it into the cylinder.
- ① O-ring
- ② Back-up ring



8. Fit a new O-ring and the back-up ring to the tilt-piston and install it into the cylinder.

Fill the cylinder with hydraulic fluid and tighten the end-screw to the specified torque.

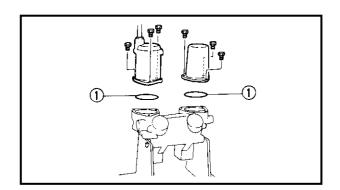
- ① O-ring
- ② Back-up ring



Cylinder end screw wrench: YB-6175-2B/90890-06544



Tilt cylinder end screw: 80 Nm (8.0 m • kg, 58 ft • lb)



9. Align the connector-shaft keyway with the motor-shaft projection and install the motor with new O-ring.



Bolt (tilt motor): 4 Nm (0.4 m • kg, 2.9 ft • lb)

10. Install the hydraulic-fluid reservoir with new O-ring.



Bolt (reservoir body): 6 Nm (0.6 m • kg, 4.3 ft • lb)

- ① O-ring
- 11. Air bleeding. Refer to page 7-28.



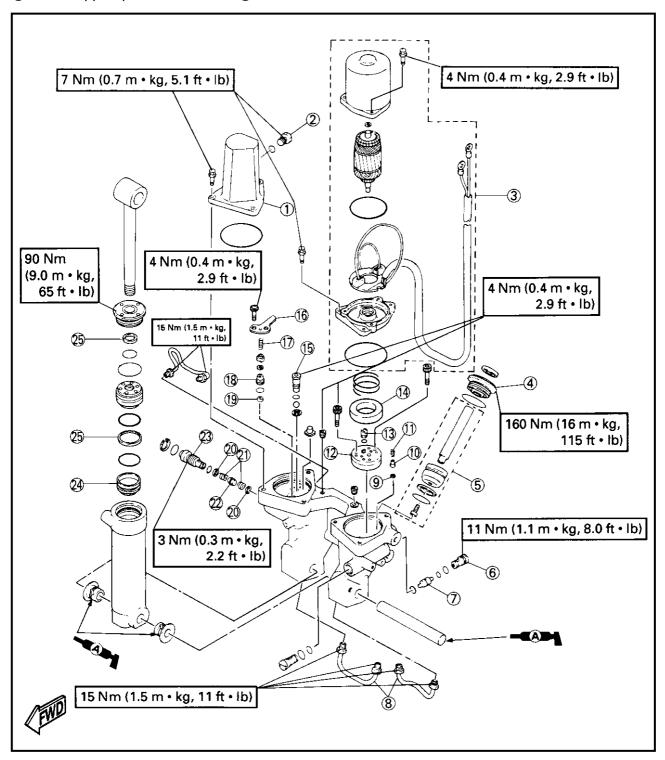
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EXPLODED DIAGRAM (Long transom [6H1-15], [62F-02])

- 1 Reservoir body
- ② Reservoir plug
- ③ Motor assembly
- (4) Trim cylinder end screw
- (5) Trim piston assembly
- (6) Main valve assembly
- (7) Shuttle piston
- 8 Pipe
- Main valve seal
- Walve support pin

- 1 Down relief spring
- (2) Gear pump assembly
- Shaft connector
- (4) Filter 1
- (5) Valve lock screw
- 16 Trim spring
- 17 Up relief spring
- ® Up relief valve seat
- (19) Filter 2
- Manual valve seat

- 2 Manual release spring
- 22 Adapter
- Manual release screw
- Free piston
- 25 Back up ring

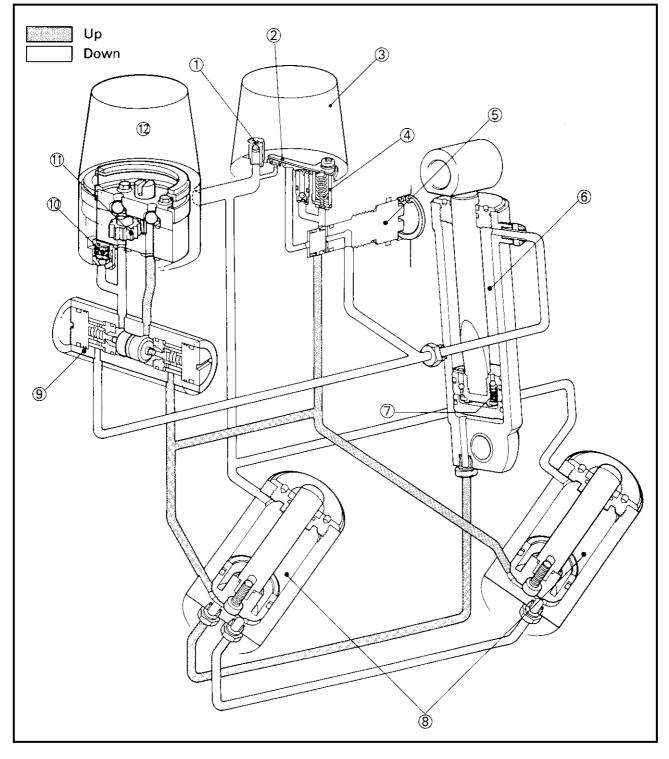


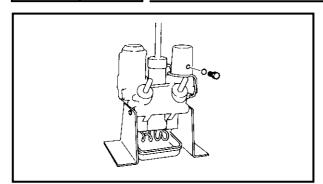




- ① Trim down valve (0.2 kg/cm²) ② Trim down valve (1 kg/cm²)
- ③ Reservoir
- (100 kg/cm²)
- ⑤ Manual valve
- 6 Tilt cylinder
- 7 Absorber valve (180 kg/cm²)
- Trim cylinder
- Main valve (0.5 kg/cm²)

- ① Down-relief valve (30 kg/cm²)
- 11) Gear pump
- Power trim and tilt motor



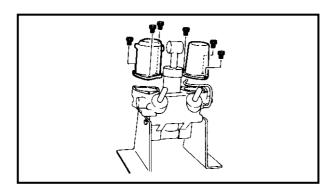


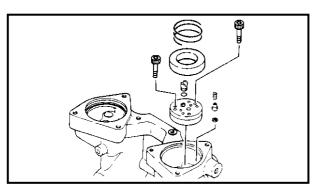
K52002-0

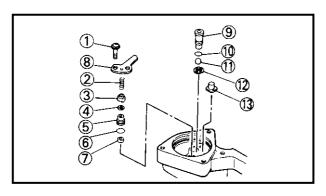
DISASSEMBLY

CAUTION:

- Do not wipe components of the hydraulic system with rags or paper tissues, etc., as fibers entering the system will cause malfunction.
- 2. After removing the tilt-motor or oil-reservoir, do not depress the tilt-rod or trim-rod which may cause hydraulic fluid to be ejected from the port.







- 1. Turn the manual valve fully towards the manual position.
- 2. Remove the delivery pipes and the hydraulic-fluid level-plug.
- 3. Remove the hydraulic-fluid reservoir and the tilt-motor.
- 4. Remove the shaft connector.
- 5. Remove the filter and the gear-pump.
- 6. Remove the O-rings and the complete down relief-valve.

CAUTION:

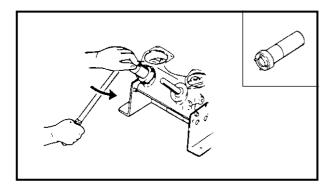
Do not disassemble the gear-pump unit which is factory-adjusted, but replace the complete gear-pump unit if necessary.

- 7. Loosen the screw and remove the complete up-relief valve.
- 1) Screw
- ② Up relief spring
- ③ Valve support pin
- (4) Relief valve seal
- (5) Relief valve seat
- 6 O-ring
- 7 Filter
- 8 Trim spring





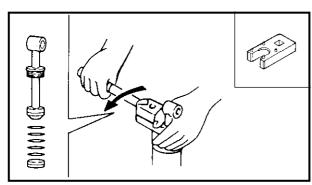
- 8. Remove the one-way valve and main valve seal.
- (9) Valve lock screw
- ① O-ring
- ① Ball
- 12 Washer
- (3) Main valve seal



9. Loosen the trim-cylinder end-screw and pull out the trim-piston and components.



Cylinder end screw wrench: YB-6175-1A/90890-6548



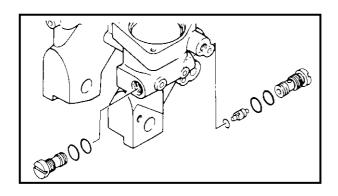
10. Loosen the tilt-cylinder end-screw and pull out the tilt-piston and the free-piston.

▲ WARNING

The free-piston can be removed easily by blowing compressed air into the drain-hole of the cylinder. Be sure to cover the open end of the cylinder with a rag to prevent the free-piston from being ejected, which could cause injury or piston damage.



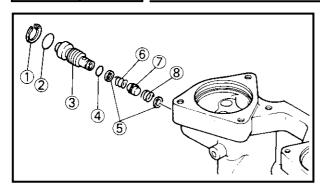
Cylinder end screw wrench: YB-6175-2B/90890-06544

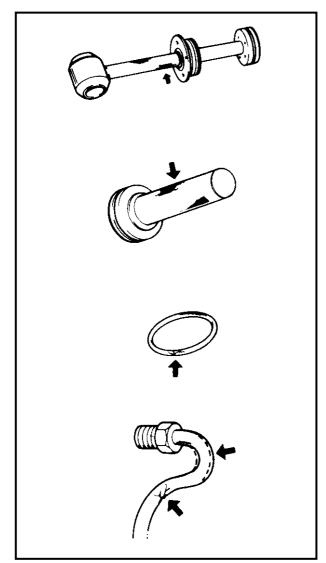


11. Remove the main valves and the shuttle-piston.









- 12. Remove the circlip and the manual valve and components.
- ① Snap ring
- ② O-ring
- (3) Manual release screw
- (4) O-ring
- (5) Manual valve seat
- ⑥ Manual release spring 1
- (7) Adapter 1
- ® Manual release spring 2

K53000-0

INSPECTION TILT-ROD AND TRIM-ROD

- 1. Clean these components using a soft brush and solvent and inspect them carefully. If there are light scratches on the surfaces, these may be polished off using fine wet-or-dry sandpaper (440 ~ 600 grit), but if there is excessive scratching, replace the components.
- 2. Clean all the parts thoroughly using a soft brush and solvent and dry them with compressed air.
- 3. Inspect the tilt-cylinder and pump-unit and replace them if they are badly corroded.

K54001-0*

ASSEMBLY

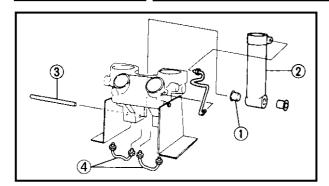
NOTE:

The components in this assembly are to be lightly coated with hydraulic fluid before assembly.

BRKT 1

POWER TRIM AND TILT UNIT

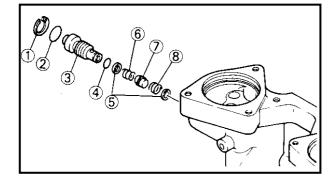




- 1. Install the tilt-cylinder and the delivery pipes.
- ① Bushing
- ② Tilt-cylinder
- 3 Lower mount pin
- 4 Delivery pipe

NOTE: _

Feed oil into each pipe.





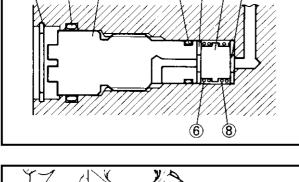
Lock nut (delivery pipe): 15 Nm (1.5 m • kg, 11 ft • lb)

- 2. Install the manual-valve in the body with new O-rings.
- ① Snap ring
- ② O-ring
- ③ Manual release screw
- 4 O-ring
- (5) Manual valve seat
- ⑥ Manual release spring (ø0.6 mm)
- 7 Adapter 1
- Manual release spring (ø1.2 mm)

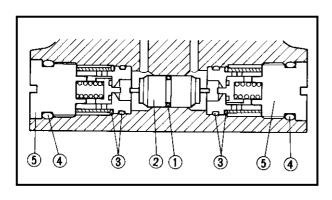


Manual valve:

3 Nm (0.3 m • kg, 2.2 ft • lb)



0034



- 3. Install a new O-ring on the shuttle-piston and insert the piston into the body, then install the main valves with new O-rings.
- ① O-ring
- ② Shuttle-piston
- ③ O-ring
- 4 O-ring
- ⑤ Main valve



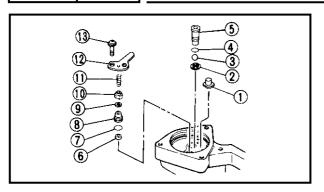
Main valve:

11 Nm (1.1 m • kg, 8.0 ft • lb)

BRKT 1

POWER TRIM AND TILT UNIT





- 4. Install the up-relief valve and the valve lock screw with new O-rings and tighten the screw to the specified torque.
- 1) Main valve seal
- ② Washer
- 3 Ball
- 4 O-ring
- (5) Valve lock screw
- 6 Filter
- ⑦ O-ring
- (8) Up relief valve seat
- (9) Up relief valve seal
- 10 Valve support pin
- 11 Up relief spring
- 12 Trim spring
- (3) Screw

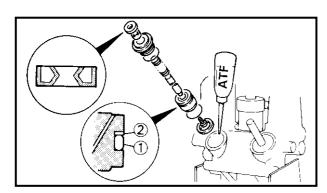


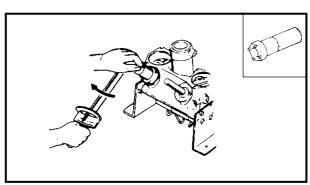
Valve lock screw:

4 Nm (0.4 m • kg, 2.9 ft • lb)

Screw:

4 Nm (0.4 m • kg, 2.9 ft • lb)





5. Fit a new O-ring and the back-up ring on the trim-piston, fit new O-rings and a new oil-seal on the end-screw and install the complete trim-piston in the cylinder. Fill the cylinder with hydraulic fluid and install and tighten the endscrew to the specified torque.



ATF (automatic transmission fluid)

- ① O-ring
- ② Back-up ring



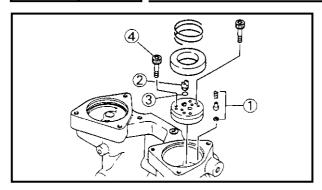
End-screw (trim cylinder): 160 Nm (16 m • kg, 115 ft • lb)

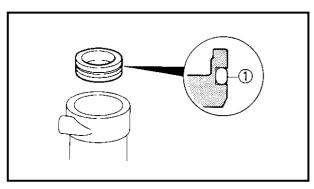


Cylinder end screw wrench: YB-6175-1A/90890-6548









- 6. Install the down relief-valve and the gear-pump complete with new O-rings, tighten the bolts, and fit the connector-shaft and filter, then fill with hydraulic fluid.
- ① Down relief-valve assembly
- ② Shaft-connector
- ③ O-ring
- 4 Bolt



Bolt:

4 Nm (0.4 m • kg, 2.9 ft • lb)

- 7. Fit a new O-ring on the free-piston and install it into the cylinder.
- ① O-ring
 - 8. Fit a new O-ring and the back-up ring to the tilt-piston and install the piston in the cylinder. Fill the cylinder with hydraulic fluid and tighten the endscrew to the specified torque.
- ① O-ring
- ② Back-up ring



End-screw (tilt cylinder): 90 Nm (9.0 m • kg, 65 ft • lb)



Cylinder end screw wrench: YB-6175-2B/90890-06544

9. Align the connector-shaft keyway with the motor-shaft projection and install the motor with a new O-ring.



Bolt (tilt motor):

4 Nm (0.4 m • kg, 2.9 ft • lb)

10. Install the hydraulic-fluid reservoir with a new O-ring.



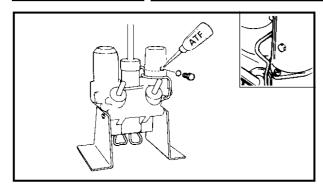
Bolt (reservoir body): 7 Nm (0.7 m • kg, 5.1 ft • lb)

① O-ring



POWER TRIM AND TILT UNIT





FILLING WITH HYDRAULIC FLUID AND AIR-BLEEDING

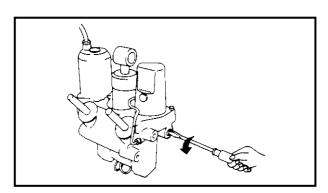
1. Pour in the fluid until it overflows from the fluid-level plug-hole and install the reservoir plug.

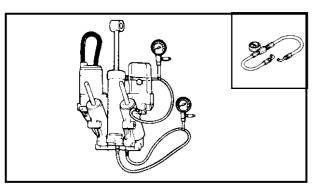


ATF (automatic transmission fluid)

- 2. Turn the manual-valve fully towards manual-tilt. Depress the tilt-rod fully, then close the manual valve. Use the motor to go fully up, check hydraulic and top if necessary. Open the manual valve and repeat these operations two or three times. Then, turn the manual-valve fully towards power-tilt.
- 3. Check the level of the hydraulic fluid at full tilt up, top up with fluid if necessary. Insert and tighten the fluid-level plug.
- 4. Connect the leads to a battery to check the function.

Trim and tilt up	. Blue (+)
	Green (-)
Trim and tilt down	. Green (+)
	Blue (-)





K55506-0*

HYDRAULIC FLUID PRESSURE TEST

Drive the motor to check trim and tilt up and down operation and fluid leakage.

- 1. Close the manual valve.
- 2. Connect the pressure gauge.

NOTE: _

- Feed hydraulic fluid into each pipe while taking care not to allow air to enter.
- Two set of hoses are required so that both of the trim and tilt pressures can be measured at the same time.

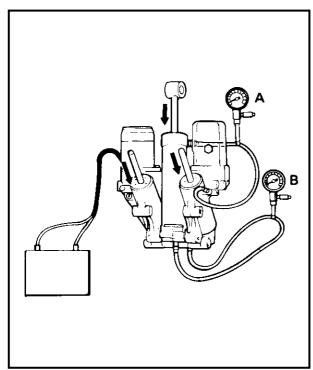


Pressure gauge: YB-6181



POWER TRIM AND TILT UNIT





3. Connect the leads to a battery to check the fluid discharge pressure during down-operation.

Trim and tilt down Green (+)
Blue (-)

CAUTION:

The motor should not be operated for more than three seconds after trim and tilt down is completed.

A: Tilt operating pressure

B: Trim operating pressure



At the end of down operation:

[Stamped mark]

[6H308]

A: 4,100 ~ 5,500 kPa

(41 ~ 55 kg/cm², 583 ~ 782 psi)

B: 600 ~ 1,100 kPa

(6 ~ 11 kg/cm², 85 ~ 157 psi)

[6H1-15]

A: 2,200 ~ 3,800 kPa

(22 ~ 38 kg/cm², 313 ~ 540 psi)

B: 600 ~ 1,100 kPa

 $(6 \sim 11 \text{ kg/cm}^2, 85 \sim 157 \text{ psi})$

[62F-02]

A: 2,100 ~ 3,700 kPa

(21 ~ 37 kg/cm², 299 ~ 526 psi)

B: 600 ~ 1,100 kPa

(6 ~ 11 kg/cm², 85 ~ 157 psi)

4. Connect the leads to a battery to check the fluid discharge pressure during upoperation.

Trim and tilt up...... Blue (+)
Green (-)

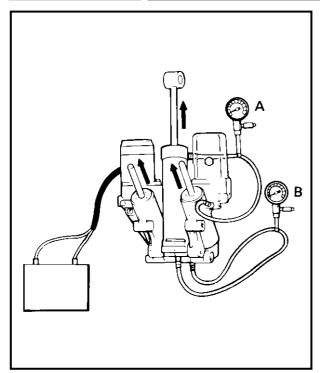
NOTE:

The motor should not be operated for more than fourteen seconds after full tilt up-operation.



POWER TRIM AND TILT UNIT





A: Tilt operating pressure

B: Trim operating pressure



During up operation pressure:

A: 0 ~ 500 kPa

 $(0 \sim 5 \text{ kg/cm}^2, 0 \sim 71 \text{ psi})$

B: 0 ~ 500 kPa

 $(0 \sim 5 \text{ kg/cm}^2, 0 \sim 71 \text{ psi})$

At the end of up-operation pressure:

A: 0 kPa (0 kg/cm², 0 psi) [6H308]

B: 3,500 ~ 4,500 kPa

(35 ~ 45 kg/cm², 500 ~ 640 psi)

[6H1-15]

B: 9,000 ~ 11,000 kPa

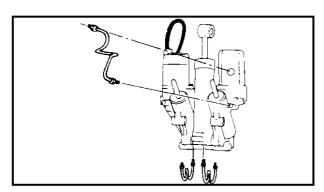
 $(90 \sim 110 \text{ kg/cm}^2)$

1,280 ~ 1,565 psi)

[62F-02]

B: 5,690 ~ 6,570 kPa

(57 ~ 66 kg/cm², 299 ~ 526 psi)



5. Remove the fluid pressure gauge and install the delivery pipes.

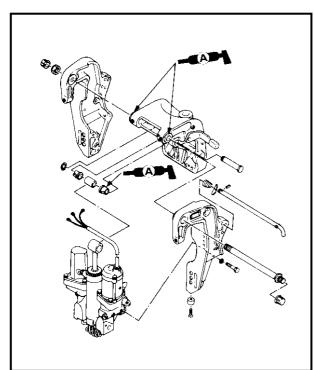
NOTE: __

When the fluid pressure gauge has been removed, be sure to bleed the air from the system.



INSTALLATION

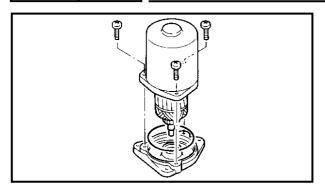
1. Referring to the illustration, install the power trim and tilt unit to the bracket.





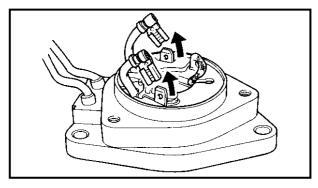
POWER TRIM AND TILT MOTOR



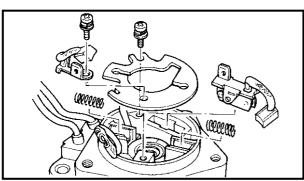


POWER TRIM AND TILT MOTOR DISASSEMBLY

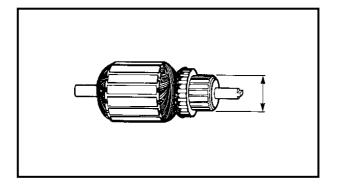
1. Loosen the screws and remove the stator, O-ring and the armature.



2. Disconnect the connector.



3. Loosen the screw and remove the brush, cover plate, circuit breaker and the spring.



K62001-0*

INSPECTION ARMATURE COIL

- 1. Visually inspect the commutator surface and if it shows signs of roughness, polish it with 600-grit wet-or-dry sandpaper.
- 2. Measure the outside diameter of the commutator by use of a vernier caliper. If the diameter is less than the specified minimum outside diameter, replace the whole armature.



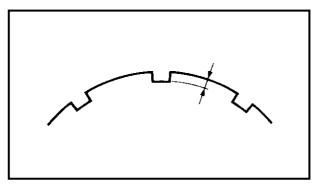
Armature minimum outside diameter:

Standard: 22 mm (0.87 in) Minimum: 21 mm (0.83 in)

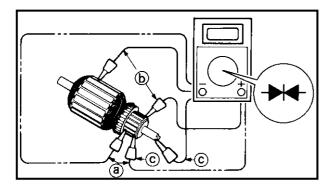


POWER TRIM AND TILT MOTOR

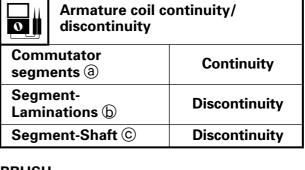


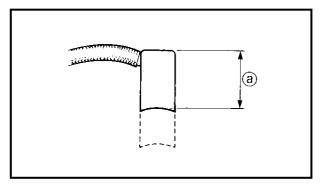


3. Scrape between the segments with a hack-saw blade and then carefully remove all particles of metal and mica with compressed air.



4. Check for continuity or discontinuity of the armature coil. If it is out of specification, replace the armature.





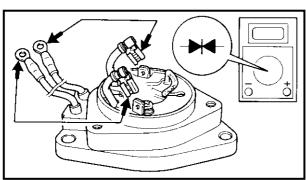
BRUSH

1. Measure the brushes for wear.



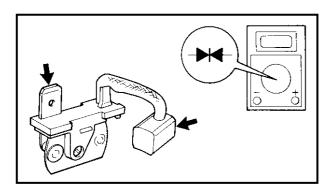
Brush, size @:

Standard: 9.8 mm (0.39 in) Minimum: 4.8 mm (0.19 in)



BASE ASSEMBLY

- Inspect the base assembly for cracks or burns and replace the base assembly if such are found.
- 2. Check for continuity between the connector and lead wire. If there is discontinuity, replace the base assembly.



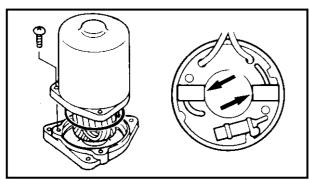
CIRCUIT BREAKER

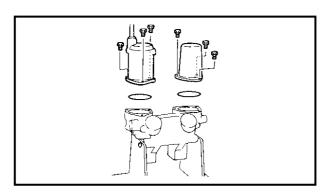
1. Check for continuity between the brush and the terminal. If there is discontinuity, replace the circuit breaker.



POWER TRIM AND TILT MOTOR







K63000-0*

ASSEMBLY

- 1. Install the armature into the frame-end.
- 2. Place the O-ring on the frame-end and install the yoke assembly, then install the screws.



Screw:

4 Nm (0.4 m • kg, 2.9 ft • lb)

 Place the O-ring on the motor assembly and align the grooves of the motor assembly and gear pump, then install the bolts.

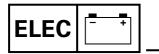


Power trim and tilt motor mounting bolt: [Stamped mark] [6H308] 6 Nm (0.6 m • kg, 4.3 ft • lb) [6H1-15], [62F-02] 7 Nm (0.7 m • kg, 5.1 ft • lb)



CHAPTER 8 ELECTRICAL SYSTEMS

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INSTALLATION (75, 80, 90 hp)	
•	



ELECTRICAL COMPONENTS



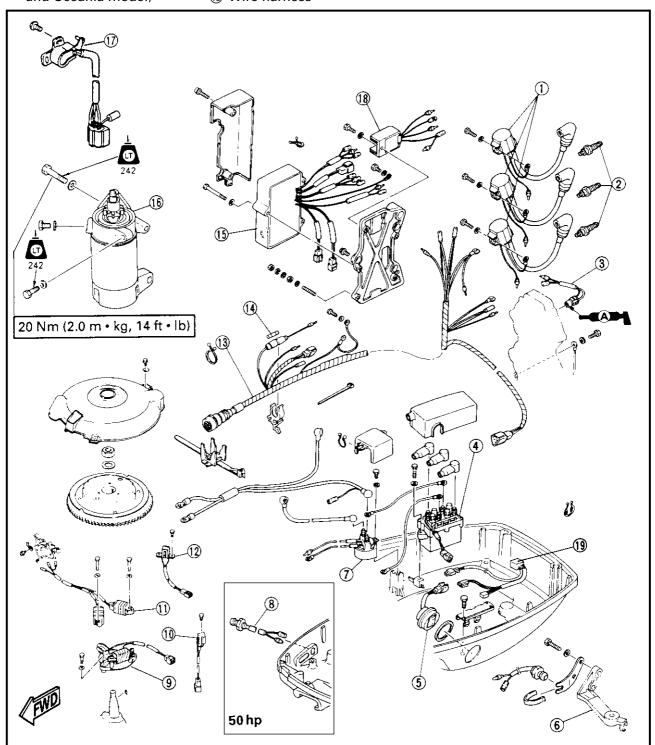
M20000-0

ELECTRICAL COMPONENTS

50, 60, 70 hp

- ① Ignition coil
- ② Spark-plug
- ③ Thermo switch
- 4 Power trim and tilt replay (PTT model)
- ⑤ Trailer switch (PTT model except for USA, Canada and Oceania model)
- ⑥ Neutral switch (P60TH/60FEHTO)
- Starter relay
- ® Oil warning lamp (50GETO)
- (1) Crank position sensor
- ① Lighting coil
- 12 Pulser coil
- (3) Wire harness

- (4) Fuse
- (5) CDI unit
- (6) Starter motor
- ① Trim sensor (PTT model)
- ® Rectifier/regulator
- (9) Power trim and tilt connector assy (P60TH/60FEHTO)





ELECTRICAL COMPONENTS

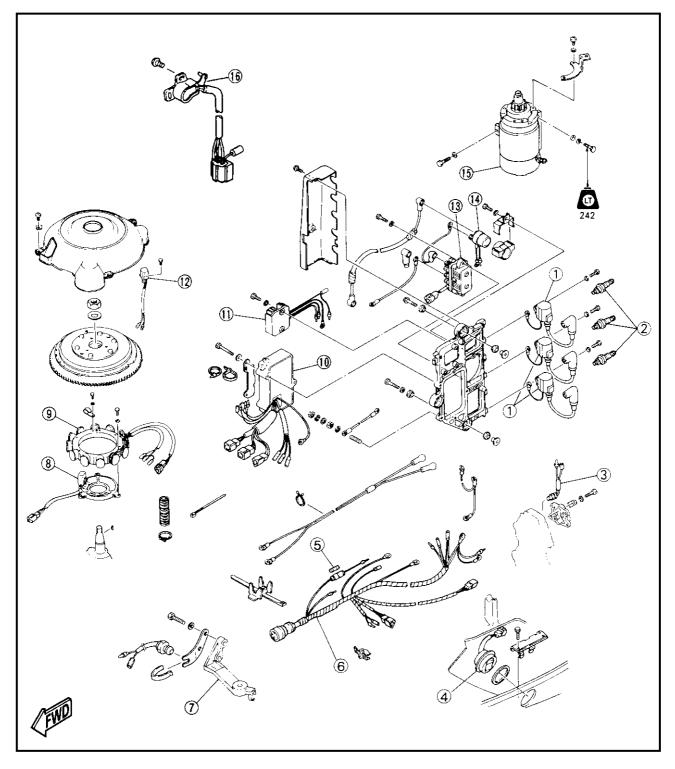


M20001-0

75, 80, 90 hp

- ① Ignition coil
- ② Spark-plug
- ③ Thermo switch
- ④ Trailer switch (PTT model except for C75TR/ 75CET, C90TR/90AET)
- ⑤ Fuse
- 6 Wire harness

- Neutral switch (P75TH/ 75CEHTO, 90AEHD, 90TR/ 90AETO, B90TR/90AETO)
- ® Pulser coil
- Stator assembly
- 1 CDI unit
- 11) Rectifier/regulator
- (12) Crank position sensor
- ③ Power trim and tilt relay (PTT model)
- (4) Starter relay
- (5) Starter motor
- (f) Trim sensor (PTT model)





D22000-0

ELECTRICAL WIRING

Check that all leads and connectors are properly connected.

50, 60, 70 hp

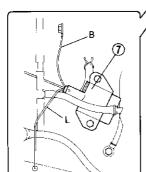
- ① Electrothermal valve*1
- ② Clamp
- 3 Power trim and tilt motor lead*2
- 4 Trim sensor lead*2
- 5 Trailer switch coupler*2
- 6 Trailer switch*3
- 7 Fuel enrichment valve*4
- A To wire harness

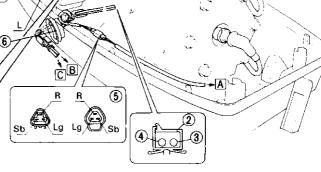
- □ To lighting coil
- *1: Except for C60ER, C60TR
- *2: For PTT model
- *3: For PTT model except for USA, Canada and Oceania model
- *4: For C60ER, C60TR

: Black В L : Blue

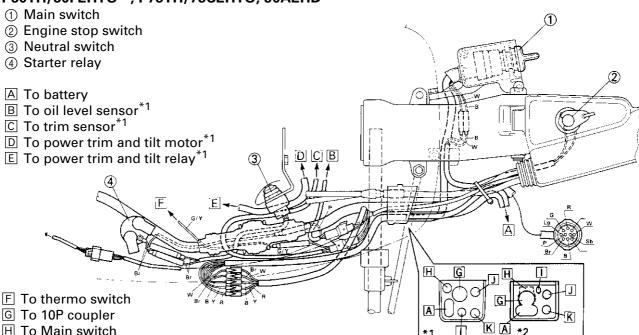
Lg : Light green

: Red R Sb: Sky blue





P60TH/60FEHTO*1, P75TH/75CEHTO, 90AEHD*2



■ To power trim and tilt switch*1

K Shift cable

*1: Except for 90AEHD

В : Black Br : Brown

: Green G/Y: Green/Yellow Ρ : Pink : Red R

: Yellow

: White



E

50, 60, 70 hp

- 1 Pulser coil coupler
- ② Trim sensor coupler*1
- 3 Oil level sensor coupler*2
- 4 Wire harness coupler (7P*3/10P*4)
- ⑤ Ground lead from rectifier/regulator
- 6 Ground lead from starter relay
- 7 Ground lead from wire harness
- Power trim and tilt relay coupler*1
- (1) Crank position sensor coupler
- A To CDI unit
- To power trim and tilt motor*1
- To trim sensor*1
- D To oil level sensor*2
- E To meter
- F To electrothermal valve*5
- © To fuel enrichment valve*6

В : Black Br : Brown G : Green Gy: Gray : Blue

Lg : Light green : Orange 0

Ρ : Pink R : Red

Sb: Sky blue W: White

: Yellow

*1: For PTT model

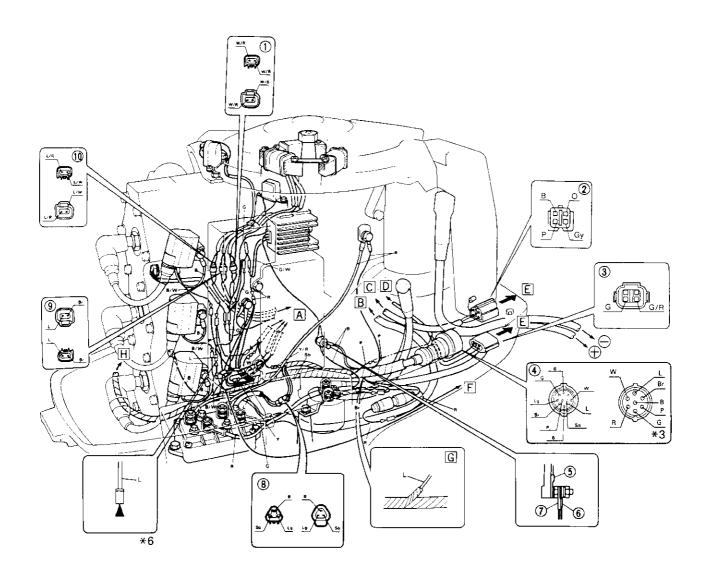
*2: For oil injection model

*3: For C60ER/60FED

*4: Except for C60ER/60FED

*5: Except for C60ER, C60TR

*6: For C60ER, C60TR





E

75, 80, 90 hp

① Trailer switch coupler*1

A To electrothermal valve*2

■ To battery

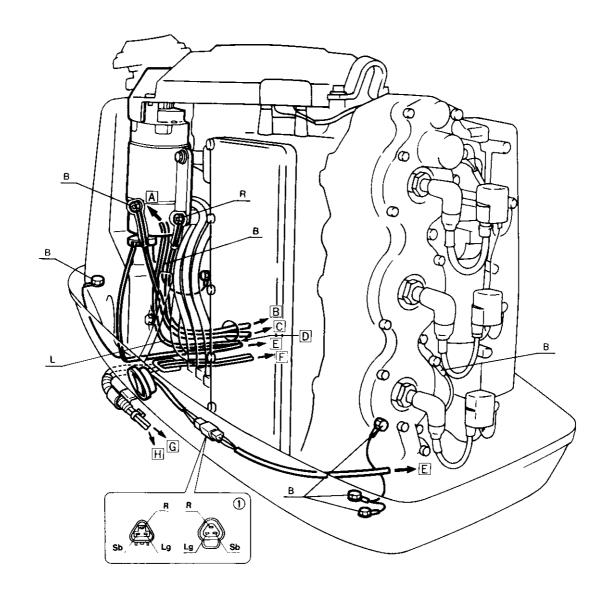
© To starter relay
D To lighting coil
To wire harness

F To meter

G To trim sensor*1

H To power trim and tilt motor*1
*1: For PTT model
*2: Except for C75TR

В : Black : Blue L Lg : Light green : Red Sb: Sky blue





 $\subset E$

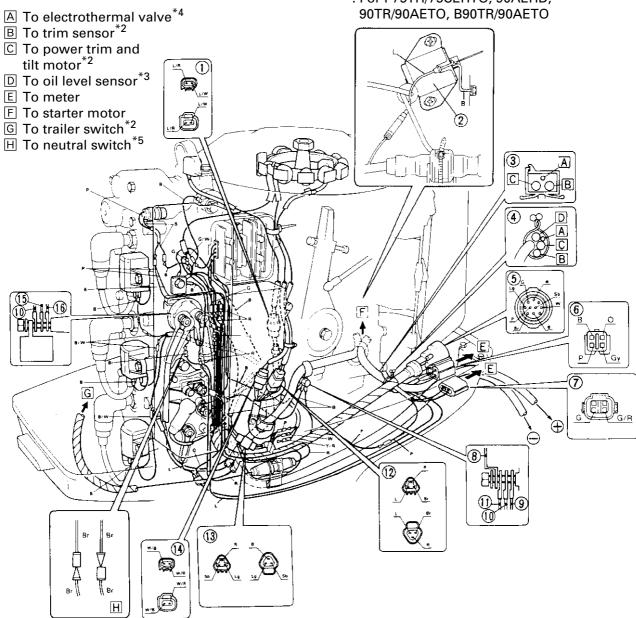
75, 80, 90 hp

- ① Crank position sensor coupler
- ② Fuel enrichment valve*1
- ③ Clamp
- 4 Clamp
- Wire harness coupler
 Trim sensor coupler*2
- ⑦ Oil level sensor coupler*3
- ® Clamp
- Ground lead from power trim and tilt relay*2
- (1) Ground lead from wire harness
- (1) Ground lead from rectifier/regulator
- Charge coil coupler
- Power trim and tilt relay coupler*2
- (4) Pulser coil coupler
- (5) Ground lead from starter relay
- (6) Ground lead from CDI unit

- В : Black Br : Brown : Green G Gy: Gray : Blue Lg : Light green : Orange
- : Red Sb: Sky blue W : White

: Pink

- : Yellow
- *1: For C75TR
- *2: For PTT model
- *3: For oil injection model
- *4: Except for C75TR
- *5: For P75TH/75CEHTO, 90AEHD,

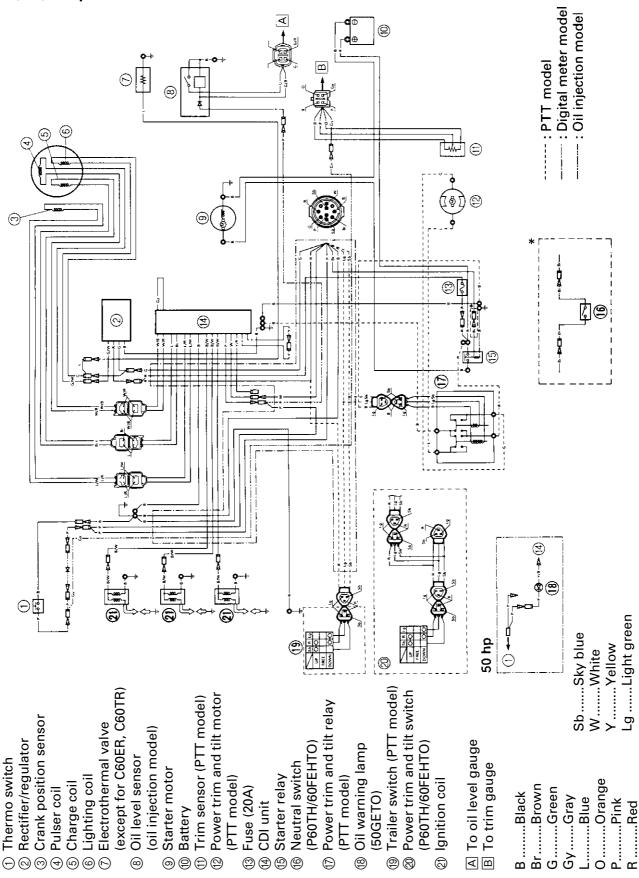


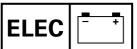
M30000-0

ELEC

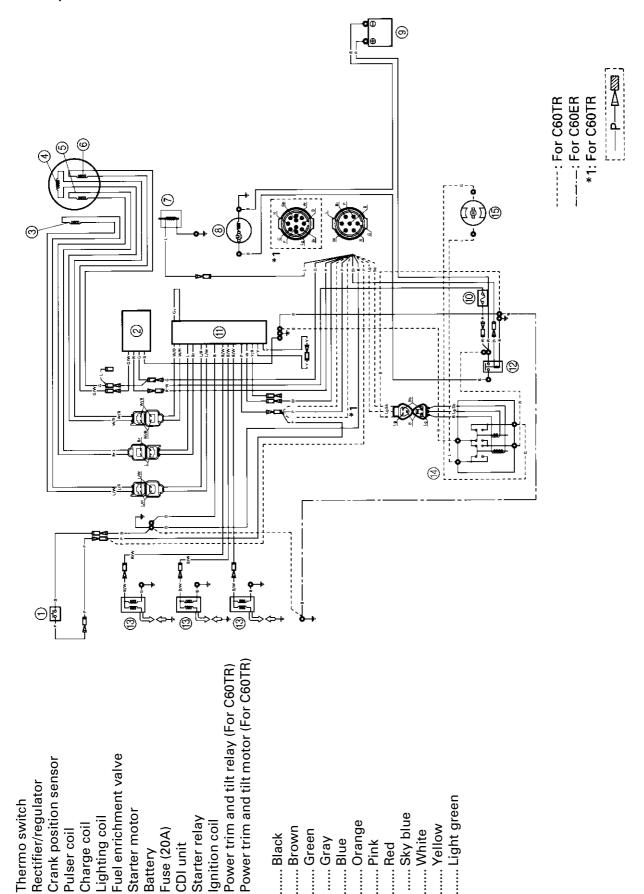
WIRING DIAGRAM

50, 60, 70 hp





C60ER, C60TR



Starter motor Battery

Fuel enrichment valve

Lighting coil

Charge coil Pulser coil

Crank position sensor Rectifier/regulator

Thermo switch

Fuse (20A) CDI unit

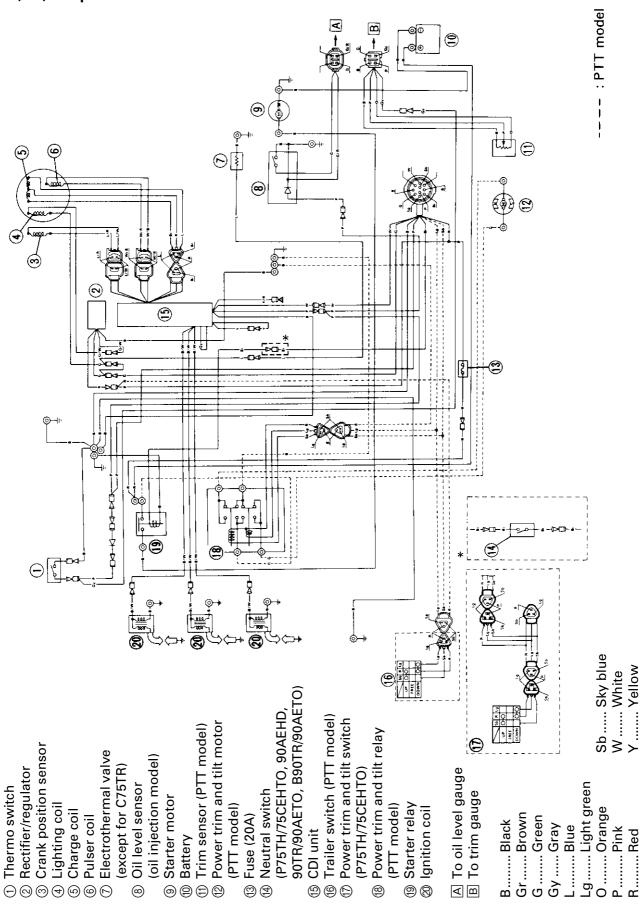
Starter relay Ignition coil

Power trim and tilt relay (For C60TR)

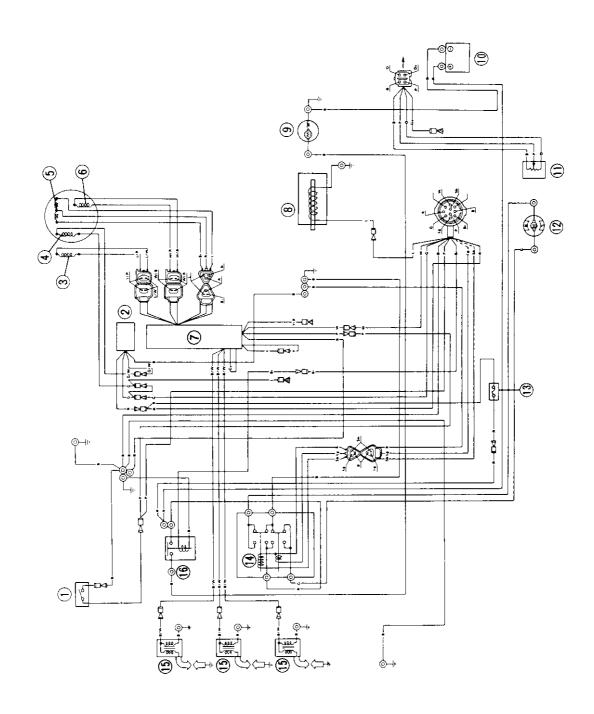
B...... Black
Br..... Brown
G..... Green
Gy.... Gray
L..... Blue
O..... Orange
P..... Pink
R..... Red
Sb.... Sky blue
W..... White

M30000-0

75, 80, 90 hp



C75TR



B....... Black Gr...... Brown G...... Green Gy..... Gray

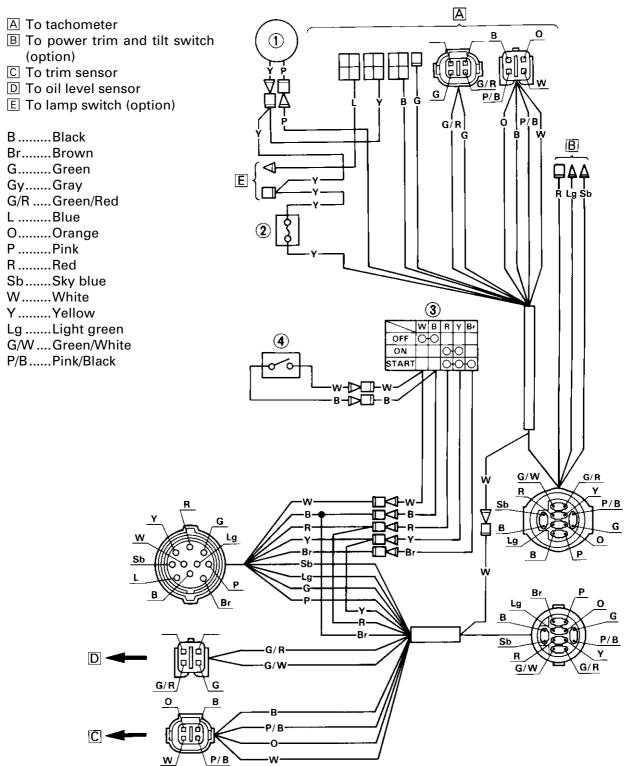
Lg...... Light green
O...... Orange
P...... Pink
R...... Red
Sb..... Sky blue
W...... White L...... Blue



WIRING DIAGRAM

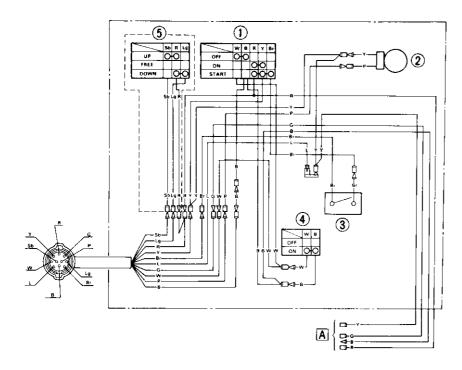
P60TH/60FEHTO

- ① Buzzer
- ② Fuse (10A)
- 3 Main switch
- 4 Engine stop switch



M31000-0

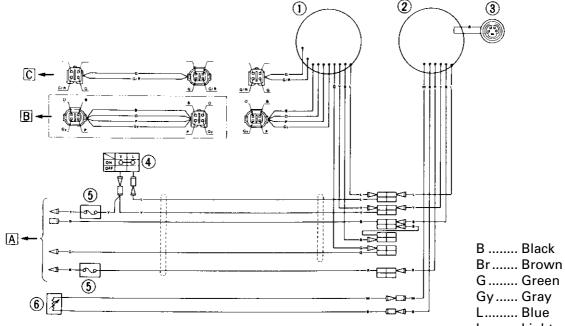
REMOTE CONTROL BOX



- ① Main switch
- ② Buzzer
- ③ Neutral switch
- 4 Engine stop switch
- ⑤ Power trim and tilt switch
- A To meter harness

3

DIGITAL METER



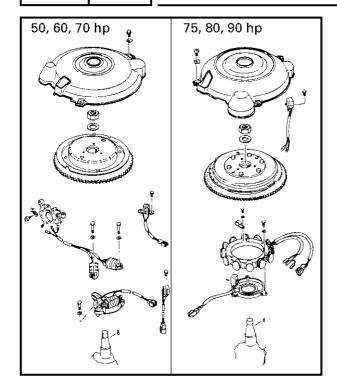
- ① Digital tachometer
- ② Digital speedometer (option)
- ③ To fuel management meter (option)
- 4 Lamp switch (option)
- ⑤ Fuse (10A)
- 6 Fuel sensor (option)

- A To remote control box
- **B** To trim sensor
- © To oil level gauge

G..... Green Gy Gray L..... Blue Lg...... Light green O..... Orange P..... Pink R Red Sb Sky blue W..... White

Y Yellow

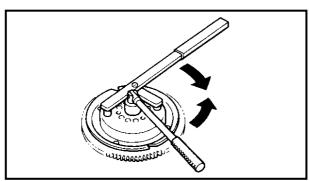
REMOVAL



M40003-0

REMOVAL MAGNETO BASE

- 1. Remove the flywheel cover.
- 2. Remove the starter-pulley.



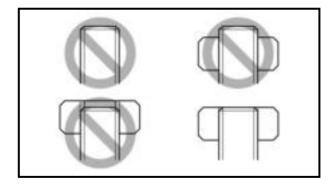
3. Loosen the flywheel nut until it is flush with the crankshaft.



Flywheel holder: YB-6139/90890-06522

CAUTION:

The major load must be carried in the direction of the arrows. If not, the holder may easily slip off.

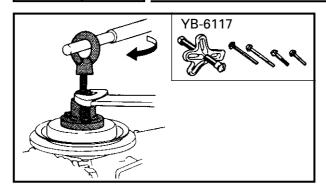


CAUTION:

Keep the nut side flush with the crankshaft end until the flywheel comes off the tapered portion of the crankshaft.



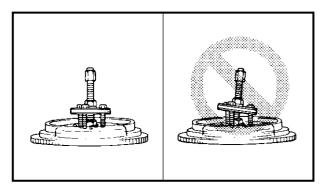




4. Remove the flywheel magneto.

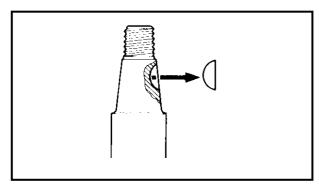


Flywheel puller: YB-6117/90890-06521

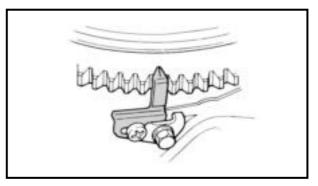


CAUTION:

To prevent damage to the engine or tools, screw in the flywheel magneto-puller setbolts evenly and completely so that the puller plate is parallel to the flywheel.



5. Remove the woodruff key from the crankshaft keyway using a screwdriver.



CAUTION:

Take special care not to damage the surface of the crankshaft. When removing the flywheel magneto, lift it up while tilting it slightly. Do not allow the magneto to contact the timing plate.

ELECTRICAL ANALYSIS INSPECTION

CAUTION: All measuring instruments should be handled with special care or the correct mea-
surement is impossible. On an instrument powered by dry batteries, the latter should be checked for voltage periodically and replaced, if necessary.
NOTE:
" O—O " indicates the terminals between
which there is a continuity of electricity; i.e.,
a closed circuit at the respective switch

Peak voltage measurement

NOTE:

position.

- The coil output varies greatly at cranking speed.
- Cranking a cold engine with the plugs in and a weak battery does not enable proper readings.



Digital multimeter: J-39299/90890-06752 Peak volt adapter: YU-39991/90890-03169

Low resistance measurement

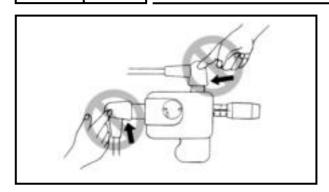
When measuring a resistance of 10 Ω or less using the digital tester, the correct measurement cannot be obtained because of the tester's internal resistance.

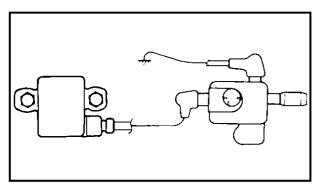
To obtain the correct value, subtract this internal resistance from the displayed measurement.

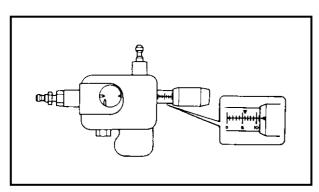


Correct value =
Displayed measurement –
Internal resistance

The internal resistance of the tester can be obtained by connecting both of its terminals.







IGNITION SPARK GAP

A WARNING

- While checking the spark be careful not to touch any connection of lead wires of the "Ignition spark gap tester".
- When doing the spark test, take special care not to allow leakage from the plug cap which has been removed.

This check is likely to produce sparks, so be sure that no flammable gas or fluid is present.

- 1. Ignition spark gap:
 - 1) Adjust the spark gap to specification by turning the adjusting knob.



Spark gap tester: YM-34487/90890-06754

- 2) Connect the spark plug cap to the spark gap tester.
- 3) Remove the spark plugs from the engine.
- 4) Crank the engine and check the sparks from the ignition system through the discharge window.
- 5) Measure the ignition spark gap.
- If the output is out of specification, measure the CDI SYSTEM PEAK VOLTAGE.



Spark gap: 9 mm (0.35 in)

CDI SYSTEM PEAK VOLTAGE

▲ WARNING

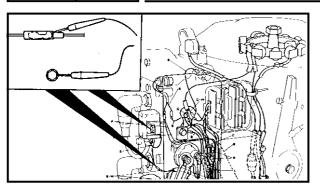
While taking CDI unit check be careful not to touch any connection of lead wires of the "Digital tester".

NOTE: _

- If there is no spark or the spark is weak, continue with the CDI test.
- If a good spark is obtained, the problem is not with the CDI system, but possibly the spark plug or other component is defective.



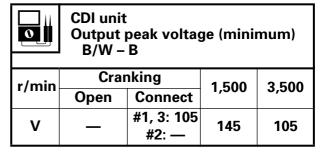




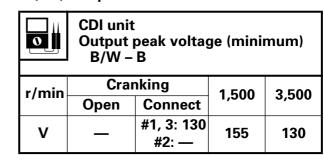
1. CDI unit output:

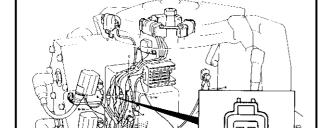
- 1) Connect the tester to the CDI unit as shown.
- 2) Set the tester dial to specification.
- 3) Crank or start the engine.
- 4) Measure all the CDI unit output.
- 5) If the output is beyond specification, replace the ignition coil.
- 6) If the output is below specification, measure the charge coil output.

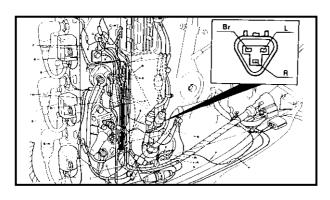
50, 60, 70 hp



75, 80, 90 hp







2. Charge coil output:

1) Disconnect the charge coil coupler. Connect the 2/3 pins test harness.



50, 60, 70 hp

2 pins test harness:

YB-38831/90890-06767

75, 80, 90 hp

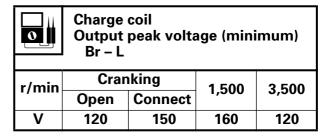
3 pins tester harness:

YB-06443/90890-06757

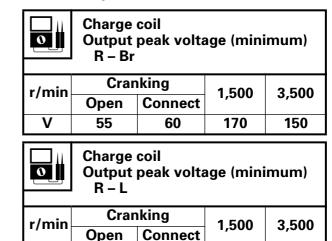
- 2) Connect the tester to the measurement terminal.
- 3) Set the tester dial to specification.
- 4) Crank or start the engine.
- 5) Measure the charge coil output.
- 6) If the output is below specification, replace the charge coil.
- If the output is beyond specification, measure pulser coil output.



50, 60, 70 hp



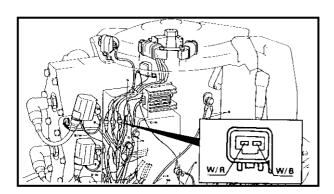
75, 80, 90 hp

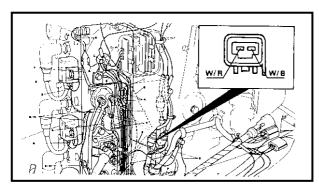


100

135

135





3. Pulser coil output:

90

1) Disconnect the pulse coil couple. Connect the 2 pins test harness.

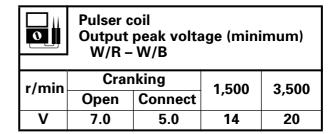


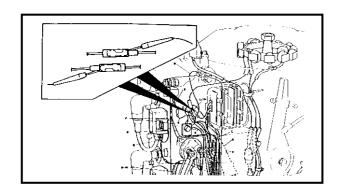
- 2) Connect the tester to the measurement terminal.
- 3) Set the tester dial to specification.
- 4) Crank or start the engine.
- 5) Measure the pulser coil output.
- 6) If the output is beyond specification, replace CDI unit.
- 7) If the output is below specification, replace pulser coil.

50, 60, 70 hp

Pulser coil Output peak voltage (minimum) W/R – W/B				
r/min	Cranking		1,500	3,500
','''	Open	Connect	1,300	3,300
V	4.5	2.5	6.5	10

75, 80, 90 hp





4. Lighting coil output:

- 1) Connect the tester to the lighting coil as shown.
- 2) Set the tester dial to specification.
- 3) Start the engine.
- 4) Measure the lighting coil output.
- 5) If the output is beyond specification, replace rectifier/regulator.
- 6) If the output is below specification, replace lighting coil.

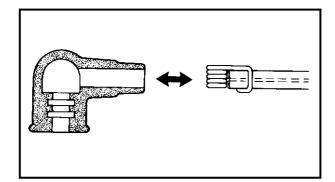
50, 60, 70 hp

Lighting coil Output peak voltage (minimum) G – G/W				
r/min	min Cranking		1,500	3,500
', ''''	Open	Connect	1,500	3,300
V	8.5	8.0	25	25

75, 80, 90 hp

Lighting coil Output peak voltage (minimum) G – G/W				
r/min	r/min Cranking		1,500	3,500
','''	Open	Connect	1,500	3,300
V	10	11	25	25

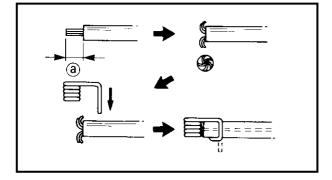




M53005-0

REPLACEMENT OF SPARK-PLUG CAP [Standard type]

1. Remove the spark-plug cap by pulling the cap and remove the plug-cap spring from the high-tension cable.

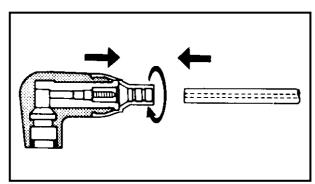


2. Cut an amount of about ⓐ off the end of the high-tension cable.



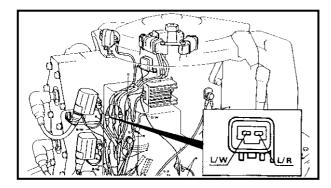
Distance @: 5 mm (0.2 in)

- 3. Fit onto the plug cap-spring.
- 4. Push the cap-spring into the plug-cap.



[Resistance specification type]

- 1. Remove the spark-plug cap by turning the cap.
- 2. Install the spark-plug cap onto the hightension cable.



CRANK POSITION SENSOR

Measure the peak voltage of the crank position sensor as shown.

50, 60, 70 hp



Crank position sensor Output peak voltage (minimum) L/R – L/W

r/min	Cran	king	1,500	3,500	
' / ' '	Open	Connect		3,300	
V	5.0	5.0	20	16	

75, 80, 90 hp

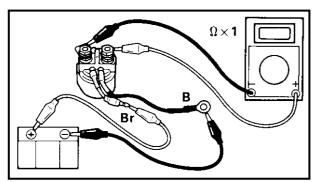


0

Crank position sensor
Output peak voltage (minimum)
L/R - L/W

r/min	Cran	ıking	1,500	3,500	
','''	Open	Connect		3,500	
٧	5.5	5.5	25	20	





M55000-0

STARTER RELAY

- 1. Check for continuity between the terminals and the ends of the black and brown leads.
- 2. Test to ensure there is no continuity between terminals.
- 3. Check the relay operation.
 - Connect a tester between the terminals of the starter relay. Connect the leads of the starter-relay to a 12-V battery.

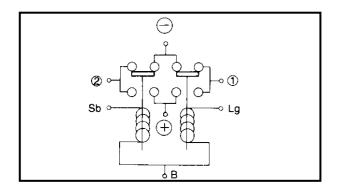
Brown lead	(+)
Black lead	. (–)



Battery voltage:

B: Black Br: Brown

> 4. Check that there is continuity between the starter relay terminals. If the operation is not as specified, replace the starter relay.



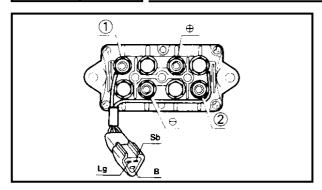
M51410-0

POWER TRIM AND TILT RELAY

- Check the relay for terminal looseness and for wiring rust and corrosion.
 Replace the relay if any of the three defects is found.
- 2. Connect the (+) terminal and ① terminal and the (+) terminal and ② terminal to the tester and check that the resistance becomes ∞ in each case.

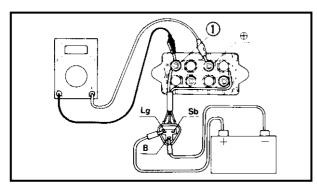




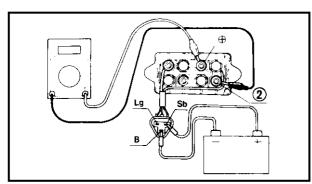


3. Connect the (-) terminal and ① terminal and the (-) terminal and ② terminal to the tester and check the continuity in each case.

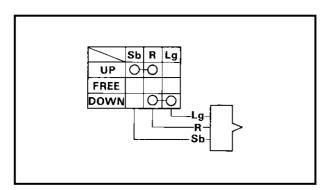
Sb: Sky blue Lg: Light green B: Black



4. Connect the black terminal to the (–) terminal of the battery and the light green terminal to the (+) terminal of the battery. Then, connect the (+) terminal and ① terminal to the tester and check the continuity.



5. Connect the black terminal to the (–) terminal of the battery and the sky-blue terminal to the (+) terminal of the battery. Then, connect the (+) terminal and ② terminal to the tester and check the continuity.



M56100-0

TRAILER SWITCH

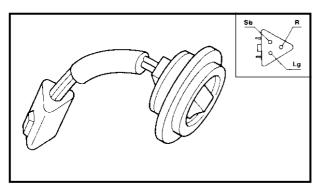
1. To see that there is continuity, push the switch.

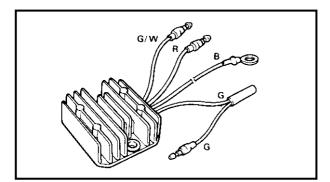
Unit: Ω

		Checking leads		
		Sky blue	Light green	
		l	I	
		Red	Red	
Switch Position	UP	Continuity	Discontinuity	
	FREE	Discontinuity	Discontinuity	
	DOWN	Discontinuity	Continuity	

2. Check rubber seal.

Replace the seal if it has any damage.





M56501-0

RECTIFIER/REGULATOR

1. Check the continuity of the rectifier/regulator.

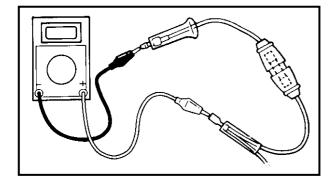
Red	Rectifier/regulator check				
Tester ⊕ Tester ⊝	Green	Green/ White	Red	Black	
Green		∞	Conti- nuity	8	
Green/ White	Conti- nuity		Conti- nuity	Conti- nuity	
Red	∞	∞		~	
Black	Conti- nuity	Conti- nuity	Conti- nuity		

 ∞ : Discontinuity

If continuity is not as specified, replace the rectifier/regulator.

NOTE: _

- The digital tester cannot be used for this inspection.
- Never connect the rectifier/regulator directly to the battery to check continuity.
- When testing, disconnect the battery terminals.
- ullet When resistance is measured at less than 100 Ω , it can be said that there is continuity.



M57001-0*

FUSE

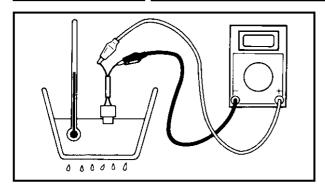
Referring to the diagram, check the continuity of the fuse. If the fuse is blown, replace with a fuse of correct rating.



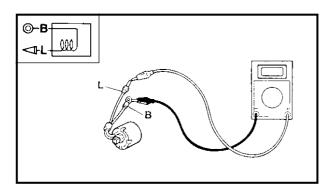
Fuse rating: 20A







(a) (b) (3) (B)



M57300-0

THERMO SWITCH

- 1. Immerse the thermo switch in water. While heating the water, check the continuity at the specified temperature.
- While cooling the water, check the continuity at the specified temperature.
 If continuity is not as specified, replace the thermo switch.



ON temperature ⓐ: 84 ~ 90°C (183 ~ 194°F) OFF temperature ⓑ: 60 ~ 74°C (140 ~ 165°F)

- 1 Discontinuity
- ② Continuity
- ③ Discontinuity
- A Temperature
- □ Time

FUEL ENRICHMENT VALVE

1. Measure the resistance of the fuel enrichment valve.



Fuel enrichment valve resistance: at 20°C (68°F)

L – B: **3.4 ~ 4.0** Ω

NOTE: _

Refer to "Low resistance measurement" for this inspection.

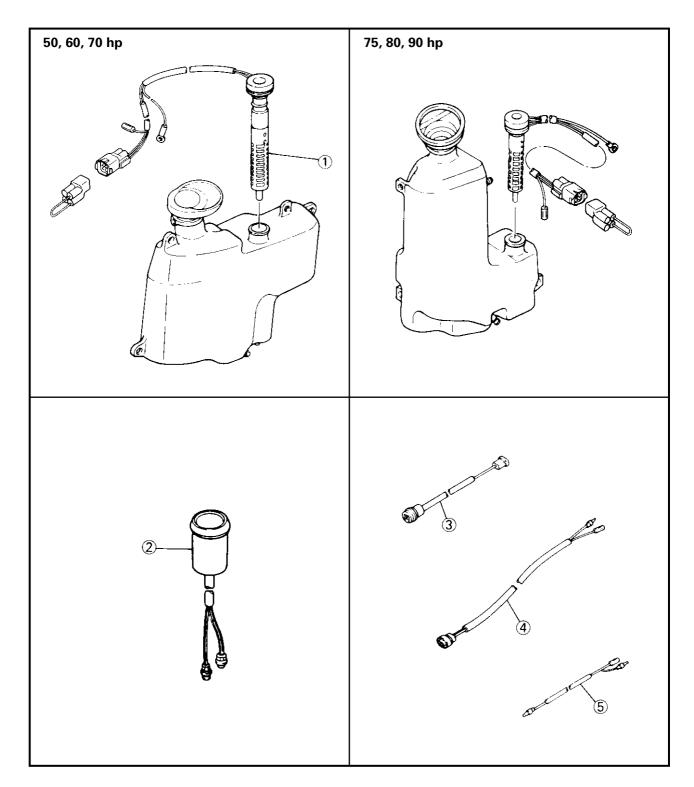


E

M57500-0

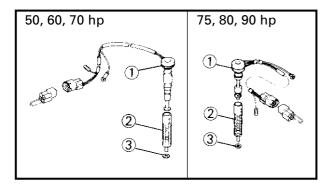
OIL INJECTION SYSTEM (Oil injection model)

- ① Oil level sensor
- Digital Meter(Oil level warning lamps/control unit)
- 3 Lead wire
- 4 Lead wire
- (5) Lead wire assembly





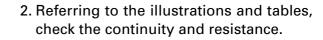


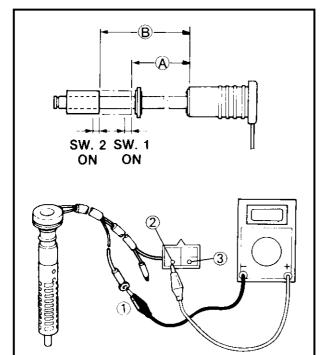


158004-0

OIL-LEVEL SENSOR

- 1. Remove the circlip and disassemble the oil-level sensor.
- 1 Oil-level sensor
- ② Strainer cover
- ③ Gasket





50, 60, 70 hp Marking: 6H3-16

 $Unit: \Omega$

	Oil level sensor resistance				
Float SW.1 ON (A) 79.5 ~ 82. 5 mm (3.13 ~ 3.25 in)			Float SW. 2 ON ® 114.5 ~ 117.3 mm (4.51 ~ 4.62 in)		
Tester O Tester	① Black	② Green	Tester G Tester	① Black	③ Green/ Red
① Black		0	① Black		*∞
② Green	0		③ Green/ Red	640	

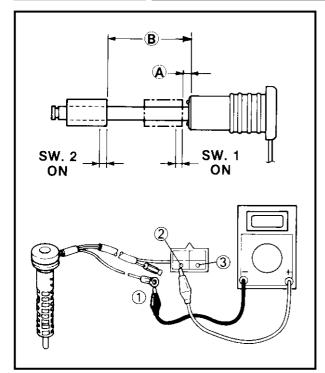
Oil	Oil level sensor resistance				
Float SW. 1, SW. 2, both OFF					
Tester ⊕ Tester ⊝	② Green	② Green	③ Green/ Red		
① Black		∞	*∞		
② Green	∞		~		
③ Green/Red	*∞	∞			

^{* &}quot; ∞ " indicates that the pointer deflects once and returns to " ∞ ".

 $[\]infty$: Discontinuity

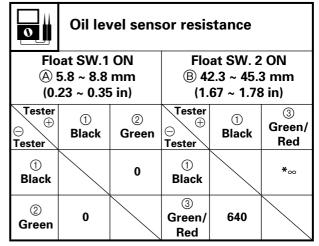






75, 80, 90 hp Marking: 6H1-15

Unit: Ω

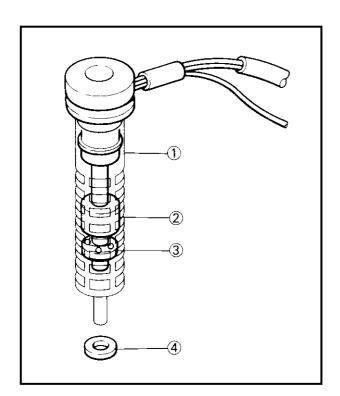


Oil	Oil level sensor resistance				
Flo	Float SW. 1, SW. 2, both OFF				
Tester (② Green	② Green	③ Green/ Red		
① Black		∞	*∞		
② Green	∞		∞		
③ Green/Red	*∞	∞			

- * " ∞ " indicates that the pointer deflects once and returns to " ∞ ".
- ∞: Discontinuity
 - 3. Assemble as shown in the diagram.
- ① Strainer cover
- ② Float (Magnet)
- ③ Plate
- ④ Gasket

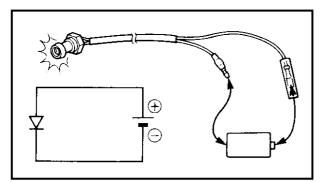
NOTE: ____

- Place the float with the magnet side upward.
- Assemble the plate which has a hole at the bottom.









M57602-0

OIL-LEVEL WARNING LAMP (L.E.D.) (50GETO)

Test the Light Emitting Diode (L.E.D.) using a 1.5-V dry-cell battery.

If no light is emitted, replace the warning lamp.

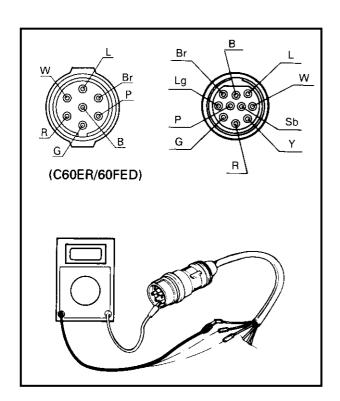


Battery voltage:

1.5V

CAUTION:

Do not use a 12-V battery or a larger capacity type, as this may damage the L.E.D. We recommend using a pen light battery.



M58300-0

WIRING HARNESS

- Check the continuity between the coupler side and each connector. Cores and pins of identical colors must be connected or a continuity test can not be made.
- 2. If any of the cores is open-circuit, replace the wiring harness.

Lg: Light green

P : Pink

Br : Brown

B: Black L: Blue

Sb : Sky blue

W : White

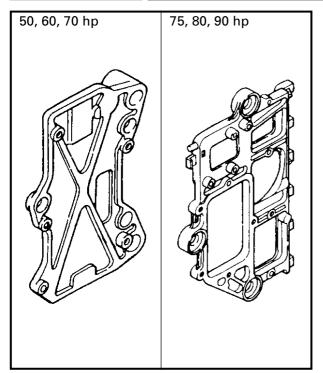
Y: Yellow

R : Red

G: Green



ELECTRICAL ANALYSIS



M58800-0

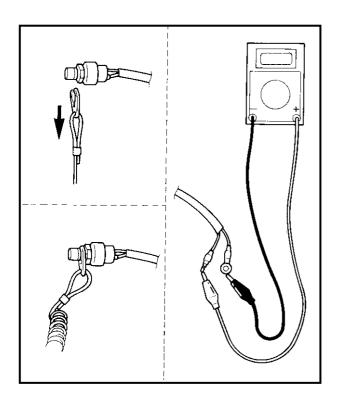
BRACKET

1. Inspect the bracket and replace it if it's cracked.

M58900-0*

BATTERY

Refer to "PERIODIC SERVICE" section in chapter 3.



M59000-0

ENGINE STOP SWITCH (P60TH/60FEHTO, P75TH/75CEHTO, 90AEHD)

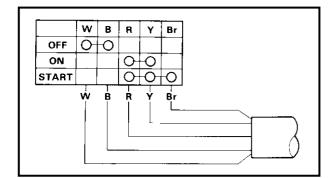
1. When removing and installing the lockplate, check for continuity according to the chart below.

	Lock plate	Wire color				
	Lock plate	W	В			
Remo	oved	0-	—O			
Insta	lled					



ELECTRICAL ANALYSIS/INSTALLATION





MAIN SWITCH (P60TH/60FEHTO, P75TH/75CEHTO, 90AEHD)

1. Check the continuity of the main switch. Replace if continuity is not as specified.

	lu l	CI	hecking lead	ds
0				Red
\vdash		White	Red	I
		l	I	Yellow
		Black	Yellow	I
				Brown
ition	OFF	Continuity	Disconti- nuity	Disconti- nuity
h Pos	ON	ON Discontinuity		Disconti- nuity
Switch Position	START	Disconti- nuity	Disconti- nuity	Continuity

NEUTRAL SWITCH (P60TH/60FEHTO, P75TH/75CEHTO, 90AEHD, 90TR/ 90AETO, B90TR/90AETO)

1. Check the continuity of the neutral switch.

Replace if continuity is not as specified.

0	Distance	Color: Brown – Brown		
Free a	19.6 ~ 20.5 mm (0.77 ~ 0.81 in)	Discontinuity		
Push	18.5 ~ 19.5 mm (0.73 ~ 0.77 in)	Continuity		

M61002-0*

INSTALLATION FLYWHEEL MAGNETO

- 1. Install the magneto base onto the retainer-plate.
- 2. Install so that the woodruff key in the keyways fits in the crankshaft.
- 3. Lock the flywheel rotor with the washer and nut. Tighten the nut to the specified torque.

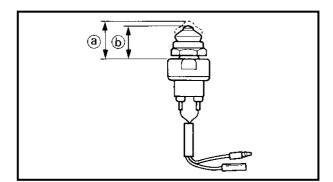


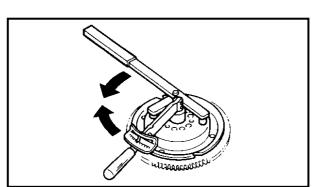
Flywheel nut: 160 Nm (16 m • kg, 115 ft • lb)



Flywheel holder: YB-6139/90890-06522

4. Install the flywheel cover.



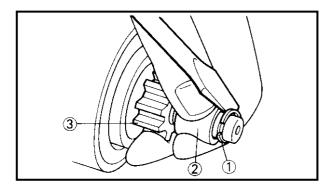


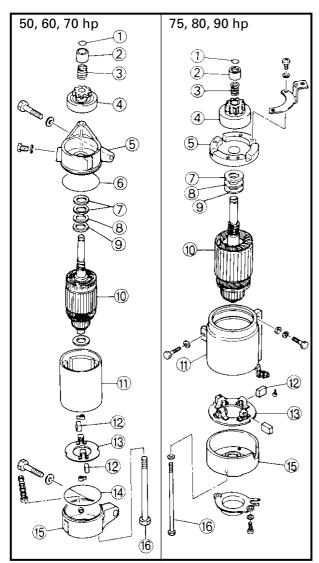


M71001-0*

STARTER MOTOR REMOVAL

1. Disconnect the cables and remove the starter-motor.





DISASSEMBLY

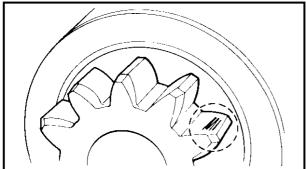
- 1. Remove the starter-clutch. Using a screw-driver, pry off the clip.
- ① Clip
- ② Pinion Stopper
- ③ Pinion (starter clutch)

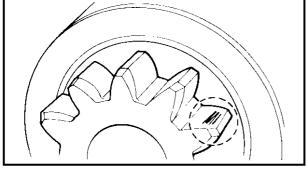
NOTE: ___

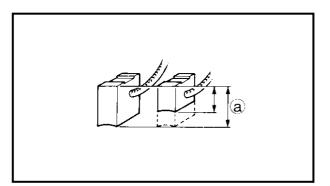
Push the pinion stopper by hand toward the pinion and remove the clip.

- 2. Remove the two through-bolts and pull out the front cover lightly tapping it with a plastic hammer, if necessary.
- 3. Using a piece of steel wire, separate the brush springs and remove the brushes from the brush-holders.
- 4. Remove the yoke assembly by lightly tapping it with a plastic hammer and remove the armature.
- ① Clip
- ② Pinion stopper
- ③ Spring
- (4) Pinion (starter clutch)
- (5) Front cover
- ⑥ O-ring
- Washer(50, 60, 70 hp: t = 1.0 mm,75, 80, 90 hp: t = 2.0 mm)
- (a) Washer
 (50, 60, 70 hp: t = 0.15 mm,
 75, 80, 90 hp: t = 0.3 mm)
- Washer(50, 60, 70 hp: t = 2.0 mm,75, 80, 90 hp: t = 1.0 mm)
- ① Armature
- (1) Yoke assembly
- 12) Brush
- Brush holder
- (4) O-ring (50, 60, 70 hp)
- ® Rear cover
- 16 Through-bolt









INSPECTION

PINION

- 1. Inspect the pinion and inner teeth for wear or damage and check ease of pinion sliding motion and replace, if damaged.
- 2. Inspect the flywheel gear and replace, if worn or damaged.

STARTER CLUTCH

1. Check the clutch movement. Rotate the pinion clockwise and check that it turns freely. Also, try to rotate the pinion counterclockwise and confirm that it locks.

BRUSH

1. Measure the brushes for wear.



Brush size (a):

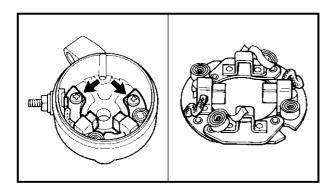
Standard:

50, 60, 70 hp: 12.5 mm (0.49 in) 75, 80, 90 hp: 16.0 mm (0.63 in)

Minimum:

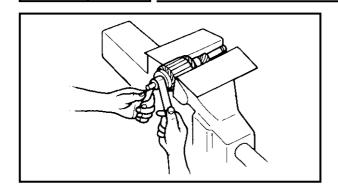
50, 60, 70 hp: 9.0 mm (0.35 in) 75, 80, 90 hp: 12.0 mm (0.47 in)

If the size is less than the minimum specification, replace the complete brush-holder assemblies.



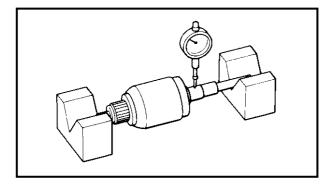
BRUSH-HOLDER

1. Check the insulation between the brushholder and ground. If there is any continuity, replace the brush-holder assembly.



ARMATURE

 Inspect the commutator surfaces and if these are dirty or burnt, clean with 400grit wet-or-dry sandpaper.



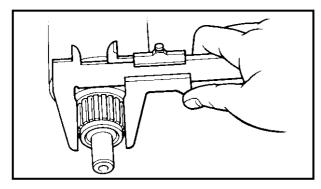
Inspect the commutator deflection with a dial gauge and block and replace the armature if the deflection is out of specification.



Maximum deflection: 0.05 mm (0.0020 in)

If the deflection is greater than the specified deflection, replace the armature.

3. Measure the diameter of the commutator.

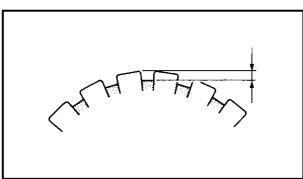




50, 60, 70 hp: 30 mm (1.18 in) 75, 80, 90 hp: 33 mm (1.30 in)

Minimum diameter:

50, 60, 70 hp: 29 mm (1.14 in) 75, 80, 90 hp: 31 mm (1.12 in)

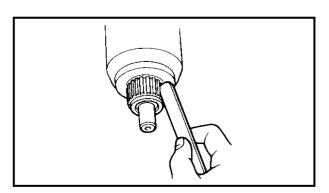


If the commutator diameter is out of specification, replace the armature.

4. Measure the commutator mica undercut depth.



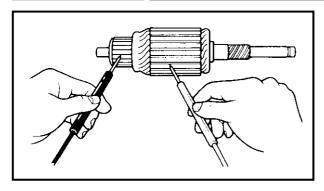
Standard mica undercut depth: 0.8 mm (0.03 in) Minimum undercut depth: 0.2 mm (0.01 in)



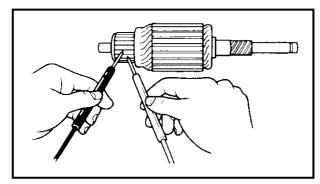
If the undercut depth is less than the specified minimum, scrape between the segments with a hacksaw blade, then remove all particles of mica and metal with compressed air.



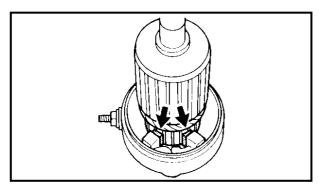




5. Check the insulation between the shaft or laminations and ground. If there is any continuity, replace the armature.



6. Inspect that the commutator is an open circuit by checking for continuity between segments. If any segment is not continuous, replace the armature.

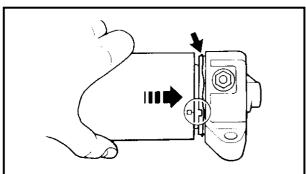


ASSEMBLY (50, 60, 70 hp)

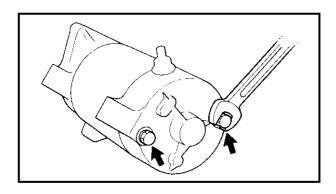
 Apply a thin coat of water resistant grease to the rear cover bushing and install the armature in the rear cover assembly.



Install by lifting the brushes, and inserting the armature straight into the bushing taking care not to scratch the brush or contaminate it with grease.



 Install the yoke assembly, aligning the recess on the rear cover with the projection on the stator and ensuring that the O-ring fits correctly in the rear cover groove.

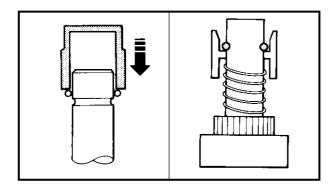


Mount the two washers on the armature shaft. Sparingly apply water resistant grease to the front cover bushing, ensure that the O-ring fits into the armature shaft and insert the shaft into the front cover.

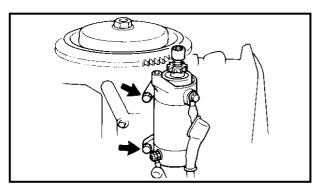




- 4. Insert the through-bolts into the rear cover and screw them into the front cover.
- 5. Mount the pinion, spring and pinionstopper on the armature shaft.



6. Hold down the pinion-stopper and fit the circlip into the groove in the shaft. Use a socket-wrench that fits properly over the armature shaft. Reform the circlip by using pliers. Lift up the pinionstopper until its bottom contacts the circlip.



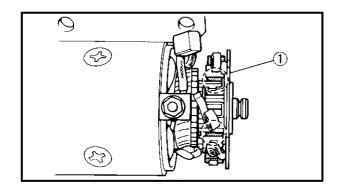
INSTALLATION (50, 60, 70 hp)

1. Place the starter-motor on the starter motor stay and tighten the bolts to the specified torque.



Starter motor mounting bolt: 20 Nm (2.0 m • kg, 14 ft • lb)

- 2. Secure the starter-motor to the engine with the four starter-motor mounting bolts.
- 3. Connect the positive and negative wires to the starter-motor.

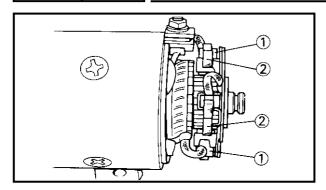


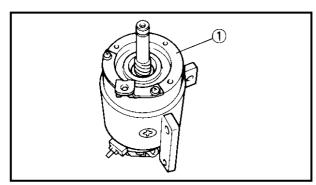
ASSEMBLY (75, 80, 90 hp)

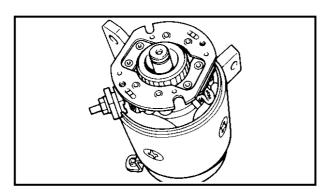
- 1. Insert the armature into the yoke assembly. Fit the brush attached to the negative side of the brush holder into the armature.
- 1) Brush holder

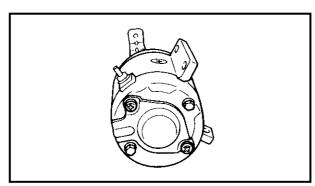












2. Install the positive brush (on the stator coil side) in the brush holder and hold it with the spring.

NOTE:

Use care not to scratch the brushes when installing.

- 1) Positive brush
- ② Spring
 - Mount the two steel washers and resin washer, in that order, on the armature shaft and install the front cover onto the yoke assembly.
- 1) Front cover
 - 4. Align the cut (for the through-bolt) in the brush holder with the gap in the brush holder so that the through-bolt can be inserted.
 - Install the rear cover onto the yoke assembly, insert the through-bolt into the rear cover and screw it into the front cover.

NOTE: ___

- Apply a thin coat of grease (anti-freeze grease) to the front and rear cover bearings.
- To seal out water, the mating surfaces are coated with sealing compound.

INSTALLATION (75, 80, 90 hp)

- 1. Place the starter-motor on the starter-motor stay and tighten the bolts.
- 2. Secure the starter-motor to the engine with the four starter-motor mounting-
- 3. Connect the positive and negative wires to the starter-motor.



CHAPTER 9 TROUBLE ANALYSIS

TROUBLE ANALYSIS	. 9	-1
TROUBLE ANALYSIS CHART	. 9	-1



TROUBLE ANALYSIS

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TROUBLE ANALYSIS

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The following items should be obtained before "trouble analysis".

- 1. Battery is charged and its specified gravity is in specification.
- 2. There is no incorrect wiring connection.
- 3. Wiring connections are surely engaged and without any rust.
- 4. Lanyard is installed to the engine stop switch.
- 5. Shift position is in neutral.
- 6. Fuel is coming to the carburetor.
- 7. Correct rigging and engine setting are obtained. 8. Engine is free from any "Hull problem".

TROUBLE ANALYSIS CHART

				Tro	ouble	e mo	ode					Check elements	
ENGINE WILL NOT START	ROUGH IDLING	ENGINE STALLS	ENGINE WILL NOT STOP	POOR PERFORMANCE	OVERHEATING	LOOSE STEERING	LOOSE TILT HOLDING	TILT MOTOR WILL NOT RUN	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference Chapter
				'							'	FUEL SYSTEM	
		0		0								ldle speed	3
0		0		0								Fuel hose	3
0		0		0								Fuel joint	4
0	0	0		0								Fuel filter	4
0		0		0								Fuel pump	4
0		0		0								Carburetor	4
		0		0	0							Pilot screw setting	4
										POWER UNIT			
	0			0	0							Link adjustment	3
\circ	0			0								Compression	5
0	0			0								Read valve	5
0	0											Cylinder head gasket	5
0				0								Cylinder block	5
0												Piston	5
0				0								Piston ring	5
0				0								Crank case	5
				0								Bearing	5
					0							Thermostat	5
					0							Water passage	5



TROUBLE ANALYSIS



Trouble mode										Check elements			
ENGINE WILL NOT START	ROUGH IDLING	ENGINE STALLS	ENGINE WILL NOT STOP	POOR PERFORMANCE	OVERHEATING	LOOSE STEERING	LOOSE TILT HOLDING	TILT MOTOR WILL NOT RUN	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference Chapter
										1		LOWER UNIT	
0									0			Neutral position	6
0									0			Clutch	6
0									0			Gear	6
				0	0							Water inlet	6
				0	0							Water pump	6
				0								Propeller shaft	6
									0			Shift rod	6
									0			Shift slider	6
									0			Shift cam	6
									0			Lower case	6
				0								Shim adjustment	6
						1			1			BRACKET UNIT	
						0						Bracket	7
						0						Mount rubber	7
<u> </u>									0			Shift actuator	7
							_					PTT UNIT	
<u> </u>							0					Fluid level	7
							0					Relief valve	7
<u> </u>							0	_				Fluid passage	3
<u> </u>								0				PTT motor	7
<u> </u>								0				PTT control system	7
						ı	ı	ı	ı	İ	ı	ELECTRICAL	
0				0								Pulser coil	8
0				0							_	Charge coil	8
<u> </u>	_			_							0	Lighting coil	8
0	0	0		0								Ignition coil	8
0	0		_	0	_					_		Spark plug cap	8
	0	0	0	0	0					0		CDI unit	8
<u></u>				0								Crank position sensor	8
0												Starter relay	8
<u> </u>							0					Power trim and tilt relay	8
							0					Trailer switch	8
<u> </u>											0	Rectifier/regulator	8



TROUBLE ANALYSIS



				Tro	oubl	e mo	ode					Check elements	
ENGINE WILL NOT START	ROUGH IDLING	ENGINE STALLS	ENGINE WILL NOT STOP	POOR PERFORMANCE	OVERHEATING	LOOSE STEERING	LOOSE TILT HOLDING	TILT MOTOR WILL NOT RUN	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference Chapter
\circ							0				0	Fuse	8
				0	0					0		Thermo switch	8
				0						0		Oil level sensor	8
										0		Oil level warning lamp	8
0								0		0	0	Wire harness	8
0								0			0	Battery	3
			0									Engine stop switch	8
0			0									Main switch	8
0												Neutral switch	8
												Starter motor	8



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