YAMAHA

Marine

Outboards

WORLD WIDE

20D, 25N

USA

20T, 25T

CANADA

20T2, 25T2

SERVICE MANUAL (E)

WARTUNGSHANDBUCH (D)

MANUEL D'ENTRETIEN (F)

MANUAL DE SERVICIO (ES)

290221

PREFACE

This service manual is intended to provide Yamaha dealers with information for maintaining or reconditioning models.
The information is limited for right & correct, prior to information weight and basic service skill.
Please read "NOTICE" and reinforce your knowledge to have best service with your updated service ability.

A10001-0*

20, 25
SERVICE MANUAL
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1st Edition, April 1995
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NOTICE

This manual has been compiled to Yamaha dealers and their trained service staff. The service staff should have a skill for basic outboard motor service and to read the manual for catching the information.

MANUAL FORMAT

Basically, each section is composed by 1)Exploded diagram 2)Disassembly/Assembly chart 3)Service point.

1) Exploded diagram:
   Torque indication, type of Oil/grease with symbols and requirement for parts directions are discribed. The unit for the diagram is devided depend on the service steps.
2) Disassembly/assembly chart:
   According to the exploded diagram and removal sequence, the chart is designed also for reassembling by reverse. Some important/identical informations such as bolt size and O-ring size, are described on the right side of the chart in "Service points".
3) Service point:
   Condensed for just service point. Therefore previous step-by-step description has been eliminated. Basic description is composed following step as the example.

1. Measure:	(Order number).(Service order):
● Length ⓐ	(Objective parts)
Out of specification → Replace.	(Specified condition) → (Recovery action order).

Chapter 8 "Electrical" is composed by viewing from trouble analysis, therfore each systems and all the relational parts is listed according to the system flow. Especially "Ignition system", Checking start from running condition (entire system check) then to each components.

Chapter 9 "Trouble analysis" is not trouble servey flow, its a relation chart between the trouble and the system. Regarding chapter is pointed and solvement priority as your experience and skill for your market.

MANUAL RELATION

Service manual is not mentioned about the model concept and its backup technical information, also described information will be changed for improvement, therefore catch the information from following publications and update your manual to latest version.

Model concept and backup technical information	: Refer to Service guide
Yearly update information	: Refer to Model guide
Update information in the year model	: Technical Service Information
Additional or modified serviceinformation	: Supplementary Service manual

MODEL IDENTIFICATION

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. When a procedure relates to more than one model, the main differences in specifications will be shown in a following table.

World wide	20DM	20DEM	20DMO	20DEO	20DERO	20DEMO
USA	20MH	–	–	–	–	–
Canada	20MH	20EH	20MH2	–	–	20EH2
Tiller handle	●	●	●	●	–	●
703 remote control	–	–	–	●	●	–
Recoil starter	●	●	●	●	●	●
Electric motor	–	●	–	●	●	●
Neutral switch	–	●	–	–	–	●
Oil injection	–	–	●	●	●	●
Overheat warning	–	–	–	–	–	–
Oil level warning	–	–	–	–	–	–

World wide	25NM	25NE	25NMO	25NEO	25NERO	25NEMO
USA	–	–	25MH	–	25ER	25EH
Canada	25MH	–	25MH2	–	25ER	25EH
Tiller handle	●	●	●	●	–	●
701 remote control	–	●	–	–	–	–
703 remote control	–	–	–	●	●	–
Recoil starter	●	●	●	●	●	●
Electric motor	–	●	–	●	●	●
Neutral switch	–	–	–	–	–	●
Oil injection	–	–	●	●	●	●
Overheat warning	●	●	●	●	●	●
Oil level warning	–	–	●	●	●	●

THE ILLUSTRATIONS

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

REFERENCES

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

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!

⚠ WARNING

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

CAUTION

A CAUTION indicates special precautions that must be taken to avoid damage to the outboard motor.

NOTE:

A NOTE provides key information to make procedures easier or clearer.

IMPORTANT:

This part has been subjected to change of specification during production.

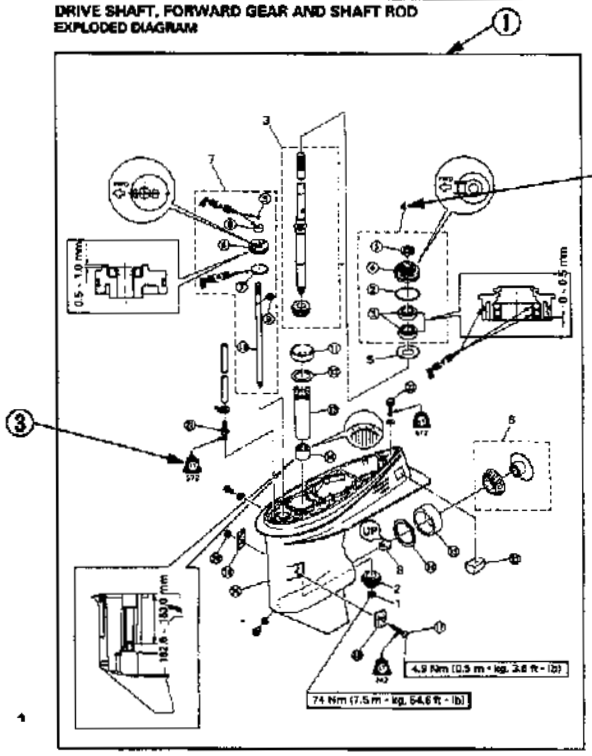
BASE INFORMATION
End of February 1995

HOW TO READ DESCRIPTIONS

1. A disassembly installation job mainly consists of the exploded diagram ①.
2. The numerical figures represented by the number ② indicates the order of the job steps.
3. The symbols represented by the number ③ indicates the contents and notes of the job. For the meanings of the symbols, refer to the "SYMBOLS".
4. The REMOVAL AND INSTALLATION CHART ④ is attached to the exploded diagram and explains the job steps, part names, notes for the jobs, etc.
5. The SERVICE POINTS, other than the exploded diagram, explains in detail the items difficult to explain in the exploded diagram or REMOVAL AND INSTALLATION CHART, the Service points requiring the detailed description ⑤, etc.

LOWR DRIVE SHAFT, FORWARD GEAR AND SHAFT ROD (E)

DRIVE SHAFT, FORWARD GEAR AND SHAFT ROD
EXPLODED DIAGRAM



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④

LOWR DRIVE SHAFT, FORWARD GEAR AND SHAFT ROD (E) ⑤

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD REMOVAL		Follow the left "Step" for removal.
	Gear oil		Refer to "LOWER UNIT" section in chapter 3.
	Lower unit assembly		Refer to "LOWER UNIT REMOVAL" section in chapter 6.
	Water pump		Refer to "WATER PUMP" section in chapter 5.
	Propeller shaft assembly		Refer to "PROPELLER SHAFT AND REVERSE GEAR" section in chapter 6.
1	Pinion nut	1	
2	Pinion gear	1	
3	Drive shaft	1	
4	Drive shaft oil seal housing assembly	1	
5	Plane washer	1	
6	Forward gear assembly	1	
7	Shift rod assembly	1	
8	Shift cam	1	NOTE: Set the "UP" mark upward.
	DRIVE SHAFT OIL SEAL HOUSING DISASSEMBLY		
①	Oil seal cover	1	
②	O-ring	1	
③	Oil seal	2	
④	Drive shaft oil seal housing	1	
	SHIFT ROD DISASSEMBLY		
④	O-ring	1	
⑤	Shift rod oil seal housing	1	
⑦	O-ring	1	
⑧	Oil seal	1	
⑨	Circlip	1	
⑩	Shift rod	1	
	LOWER CASE DISASSEMBLY		
⑪	Drive shaft bearing outer race	1	
⑫	Pinion gear shim	*	
⑬	Drive shaft sleeve	1	NOTE: Align the sleeve locating rib with the recess in the lower case.
⑭	Drive shaft needle bearing	1	NOTE: Install the bearing with its manufacture's marks or numbers facing outward.
⑮	Forward gear bearing outer race	1	

* As required

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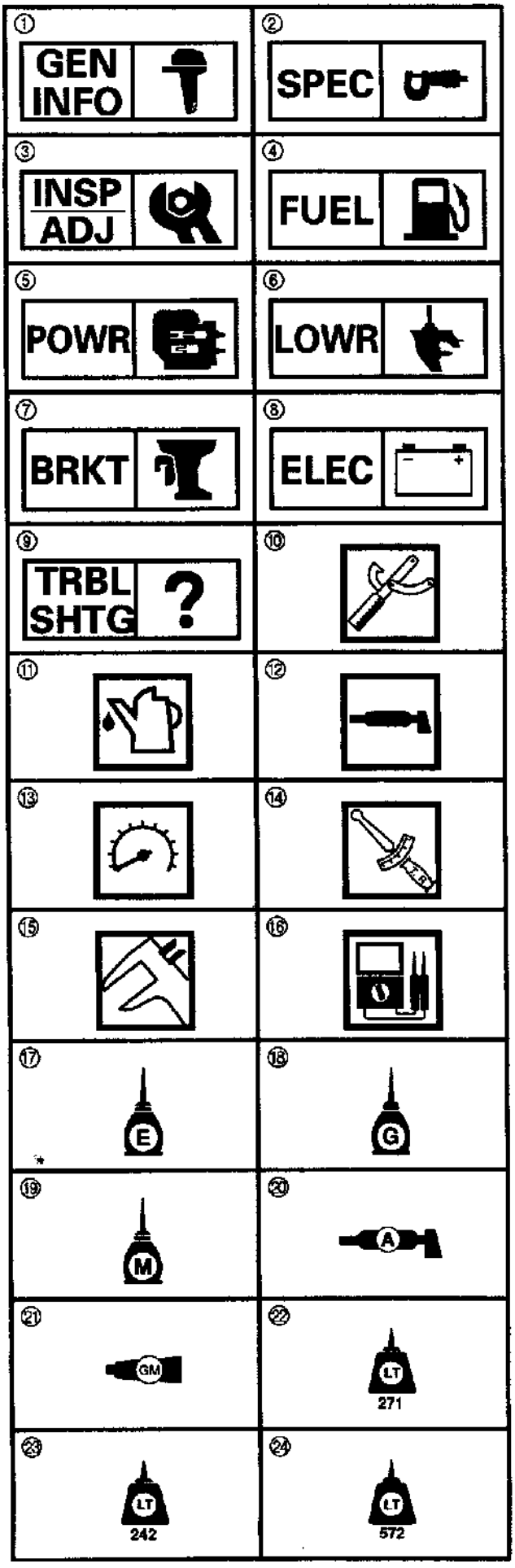

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SYMBOLS

Symbols ① to ⑨ are designed as thumb-tabs 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
⑧ Electrical System
⑨ Trouble-shooting

Symbols ⑩ to ⑯ indicate specific data:

⑩ Special tool
⑪ Specified liquid
⑫ Specified grease
⑬ Specified engine speed
⑭ Specified torque
⑮ Specified measurement
⑯ Specified electrical value
[Resistance (Ω), Voltage (V), Electric current (A)]

Symbol ⑰ to ⑳ in an exploded diagram indicate grade of lubricant and location of lubrication point:

⑰ Apply Yamaha 2-stroke outboard motor oil
⑱ Apply Yamaha gear-case lubricant
⑲ Apply molybdenum disulfide oil
⑳ Apply water resistant grease
(Yamaha grease A, Yamaha marine grease)

Symbols ㉑ to ㉔ in an exploded diagram indicate grade of sealing or locking agent, and location of application point:

㉑ Apply Gasket maker®
㉒ Apply LOCTITE® No. 271 (Red LOCTITE)
㉓ Apply LOCTITE® No. 242 (Blue LOCTITE)
㉔ Apply LOCTITE® No. 572 (White LOCTITE)

NOTE:

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

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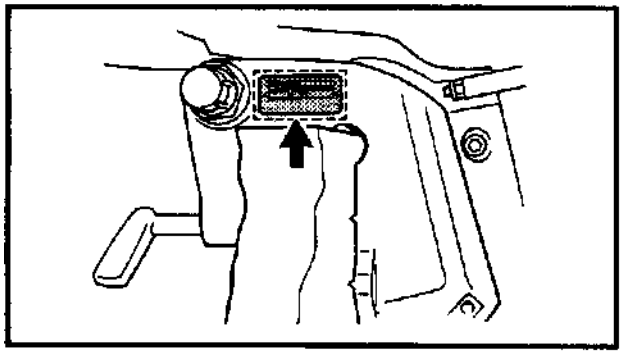
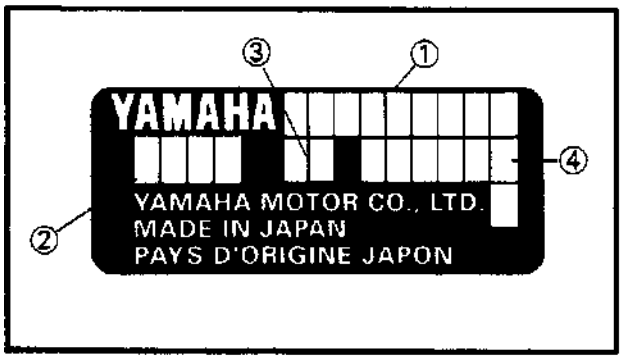
CHAPTER 1
GENERAL INFORMATION





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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.

NOTE:

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 code
③ Transom height
④ Serial number

STARTING SERIAL NUMBERS

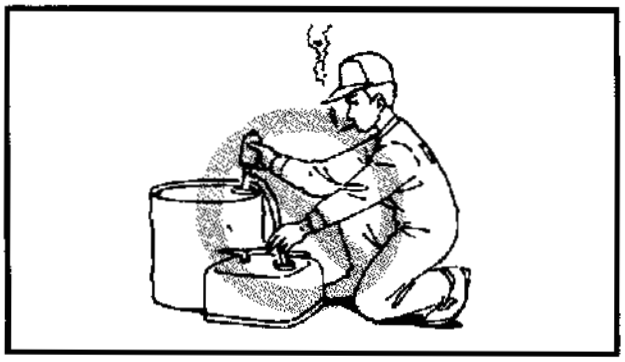
The starting serial number blocks are as follows:

Model ①			Approved model code ②	③	Starting serial No. ④
World wide	USA	Canada			
20DM	20MH	20MH	6L3	S	002760
				L	303329
				LL	600241
				UL	700216
20DMO		20MH2		S	105572
				L	402458
20DEM		20EH		S	230359
				L	532856
				LL	640381
				UL	740216
20DEMO		20EH2		S	250101
20DEO				S	154736
				L	451561
20DERO				S	180628
				L	480444

Model ①			Approved model code ②	③	Starting serial No. ④
World wide	USA	Canada			
25NM		25MH	6L2	S	003553
				L	304910
				LL	600236
25NMO	25MH	25MH2		S	110009
				L	404531
25NEMO	25EH	25EH		S	252858
				L	552241
25NE				S	050200
				L	351619
				LL	620116
25NEO				S	151087
				L	451730
25NERO	25ER	25ER		S	280246
				L	480666

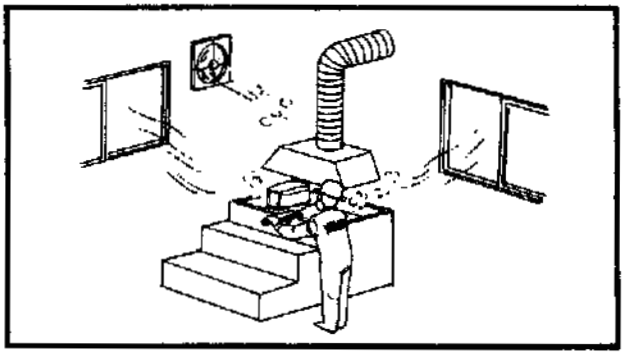
SAFETY WHILE WORKING

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



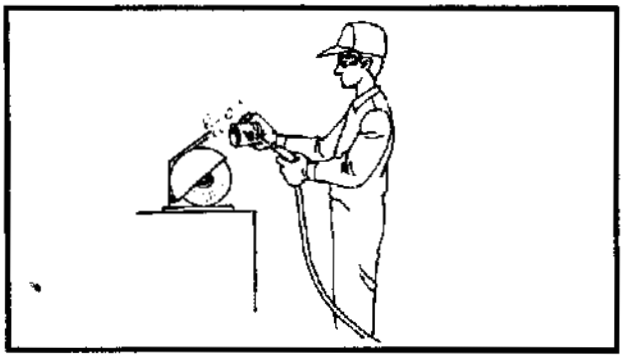
FIRE PREVENTION

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



VENTILATION

Petroleum vapor is heavier than air and is deadly if inhaled in large quantities. 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.

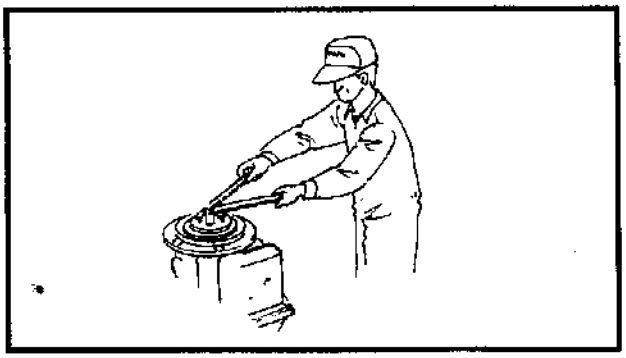
OILS, GREASES AND SEALING FLUIDS

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

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

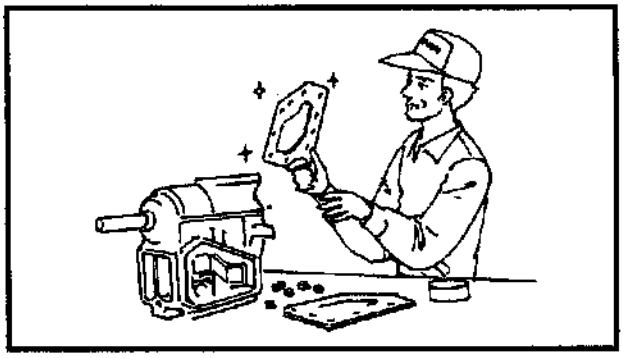
A summary of the most important precautions is as follows:

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 wiping-rag in your 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.

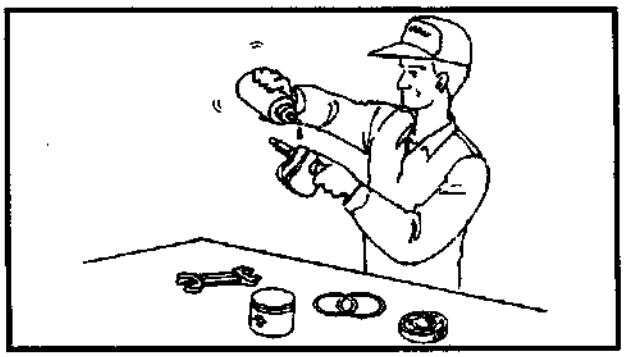


GOOD WORKING PRACTICES

1. **The right tools**
   Use the recommended special tools to protect parts from damage. Use the right tool in the right manner — do not improvise.
2. **Tightening torque**
   Follow the torque tightening instructions. When tightening bolts, nuts and screws, tighten the large sizes first, and tighten inner-positioned fixings before outer-positioned ones.

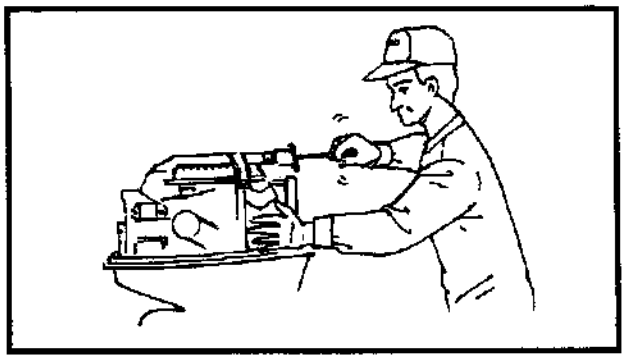


3. **Non-reusable items**
   Always use new gaskets, packings, O-rings, split-pins and circlips etc. on reassembly.



DISASSEMBLY AND ASSEMBLY

1. Clean parts with compressed air when disassembling.
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 diameter.

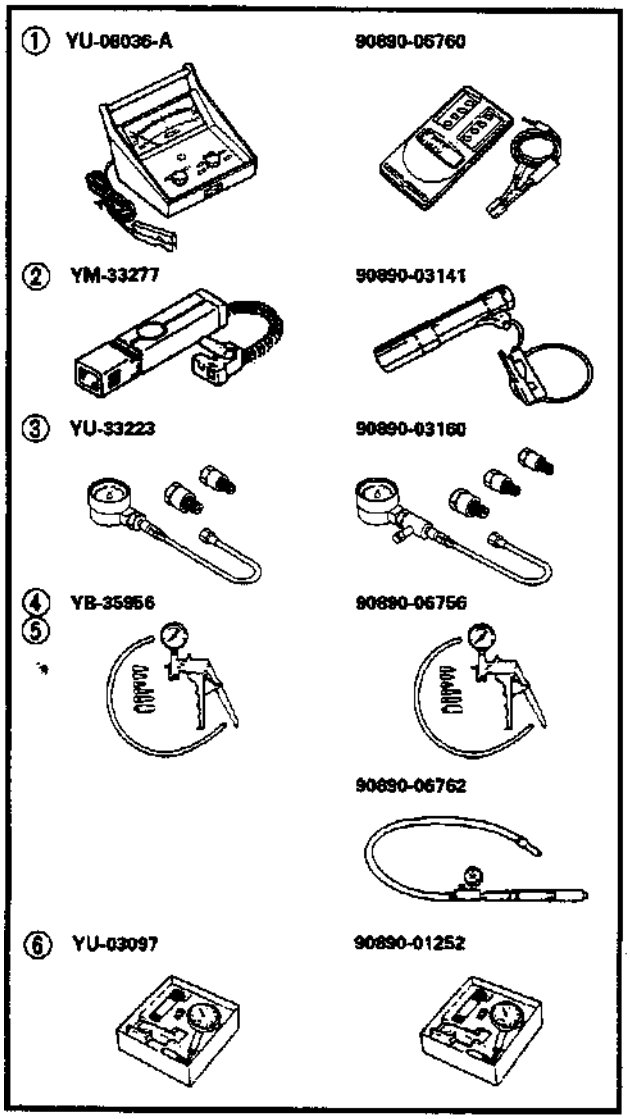
A80000-0*

SPECIAL TOOLS

The use of the 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 the U.S.A. and Canada, use part numbers starting with "YB-", "YU-", "YW-" or "J".
- For other countries, use part numbers starting with "90890-".

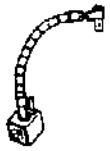


MEASURING

1. Tachometer
   P/N. YU-08036-A 90890-06760
2. Timing light
   P/N. YM-33277 90890-03141
3. Compression gauge
   P/N. YU-33223 90890-03160
4. Mity Vac
   P/N. YB-35956 90890-06756
5. Pressure tester
   P/N. YB-35956 90890-06762
6. Dial gauge set
   P/N. YU-03097 90890-01252

⑦ YB-06265 90890-06706

⑧ YU-34481 90890-06705



⑨ YB-07003 N.A.

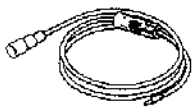
⑩ YU-26900-9 N.A.

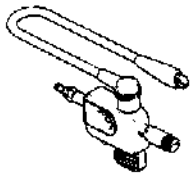
⑪ YU-03005 90890-06704

⑫ N.A. 90890-06701

⑬ YB-06344 N.A.

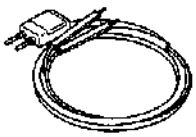
⑭ YM-34487 90890-06754



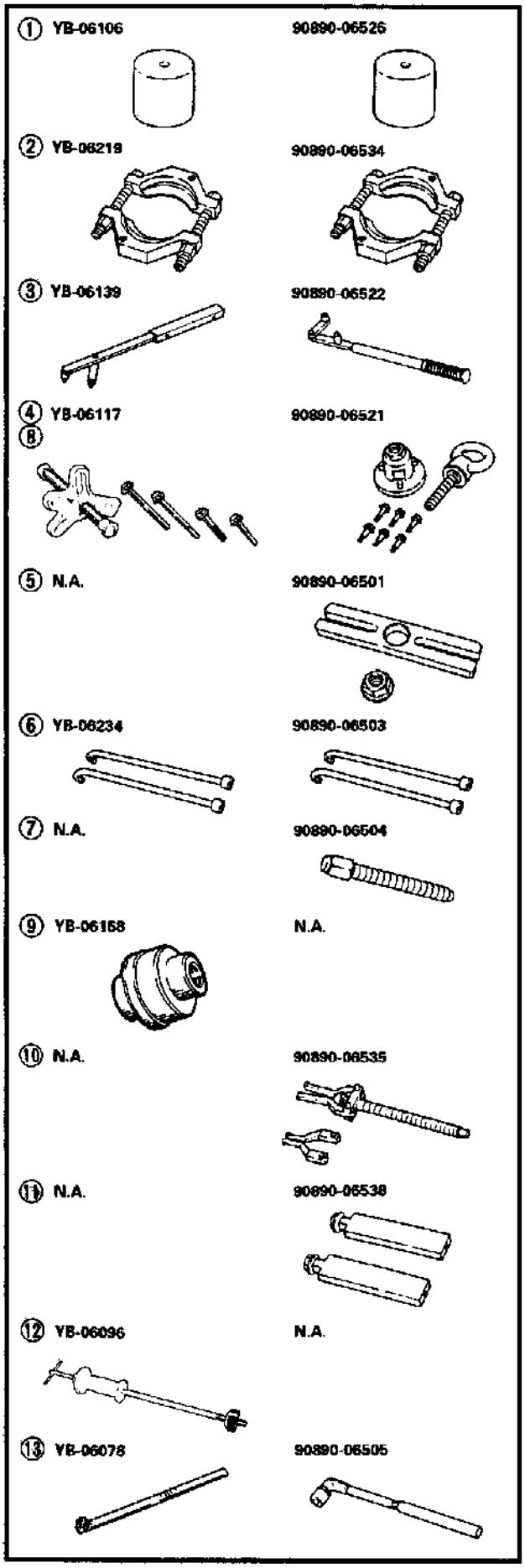


⑮ J-39299

⑯ YU-39991 N.A.

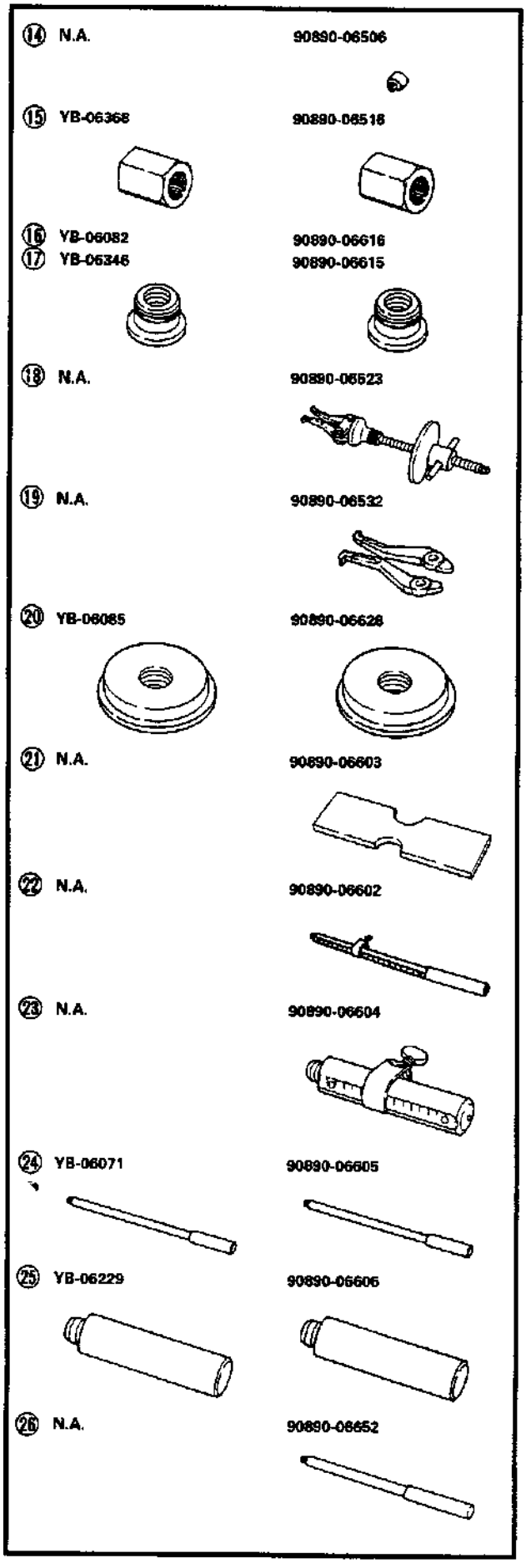


7. Backlash indicator
   P/N. YB-06265 90890-06706
8. Magnetic flexible stand
   P/N. YU-34481 90890-06705
9. Backlash adjusting plate
   P/N. YB-07003 N.A.
10. Feeler gauge
    P/N. YU-26900-9 N.A.
11. Calipers
    P/N. YU-03005 90890-06704
12. Shimming plate
    P/N. N.A. 90890-06701
13. Shimming gauge
    P/N. YB-06344 N.A.
14. Dynamic spark checker
    P/N. YM-34487 90890-06754
15. Digital multi meter
    P/N. J-39299 N.A.
16. Peak volt adapter
    P/N. YU-39991 N.A.



REMOVAL AND INSTALLATION

1. Small end bearing installer
   P/N. YB-06106 90890-06526
2. Bearing splitter plate
   P/N. YB-06219 90890-06534
3. Flywheel holder
   P/N. YB-06139 90890-06522
4. Flywheel puller
   P/N. YB-06117 90890-06521
5. Stopper guide plate
   P/N. N.A. 90890-06501
6. Puller claw
   P/N. YB-06234 90890-06503
7. Center bolt
   P/N. N.A. 90890-06504
8. Universal puller
   P/N. YB-06117 N.A.
9. Oil seal installer
   P/N. YB-06168 N.A.
10. Bearing puller
    P/N. N.A. 90890-06535
11. Stopper guide stand
    P/N. N.A. 90890-06538
12. Slide hammer set
    P/N. YB-06096 N.A.
13. Pinion nut wrench
    P/N. YB-06078 90890-06505



14. Socket adapter
    P/N. N.A. 90890-06506
15. Drive shaft holder
    P/N. YB-06368 90890-06516
16. Needle bearing attachment
    P/N. YB-06082 90890-06616
17. Needle bearing attachment
    P/N. YB-06346 90890-06615
18. Bearing outer race puller
    P/N. N.A. 90890-06523
19. Bearing outer race puller claw
    P/N. N.A. 90890-06532
20. Bearing installer
    P/N. YB-06085 90890-06628
21. Bearing depth plate
    P/N. N.A. 90890-06603
22. Driver rod - SL
    P/N. N.A. 90890-06602
23. Driver rod - SS
    P/N. N.A. 90890-06604
24. Driver rod - L
    P/N. YB-06071 90890-06605
25. Driver rod - S
    P/N. YB-06229 90890-06606
26. Driver rod - M10
    P/N. N.A. 90890-06652

CHAPTER 2
SPECIFICATIONS

GENERAL SPECIFICATIONS

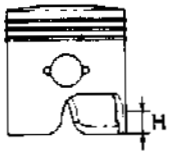
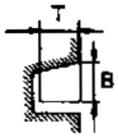
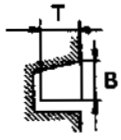
Item		Unit	Model												Note
			20 hp						25 hp						
			DM	DEM	DMO	DEMO	DEO	DERO	NM	NE	NMO	NEMO	NEO	NERO	World wide
			MH	—	—	—	—	—	—	—	MH	EH	—	ER	USA
			MH	EH	MH2	EH2	—	—	MH	—	MH2	EH	—	ER	Canada
DIMENSION:															
Over-all length		mm (in)	936 (36.9)												
			615 (24.2)												ERO
Over-all width		mm (in)	358 (14.1)												
			304 (12.0)												ERO
Over-all height	S	mm (in)	1,068 (42.0)												
	L	mm (in)	1,195 (47.0)												
	LL	mm (in)	1,246 (49.1)												
	UL	mm (in)	1,284 (50.6)												
Boat transom height															
	S	mm (in)	381 (15.0)												
	L	mm (in)	508 (20.0)												
	LL	mm (in)	559 (22.0)												
	UL	mm (in)	635 (25.0)												
WEIGHT:			20 hp												
			DM	DEM	DMO	DEMO	DEO	DERO							
With aluminium propeller	S	kg (lb)	48 (105.8)	50.5 (111.3)	49 (108.0)	50.5 (111.3)									
	L	kg (lb)	49.5 (109.1)	52 (114.6)		—	52 (114.6)								
	LL	kg (lb)	50 (110.2)	52.5 (115.7)	—										
	UL	kg (lb)	50.5 (111.3)	53 (116.8)	—										
			25 hp												
			NM	NE	NMO	NEMO	NEO	NERO							
	S	kg (lb)	48 (105.8)	49.5 (109.1)	49 (108.0)	51.5 (113.5)	50.5 (111.3)	49.5 (109.1)							
	L	kg (lb)	49.5 (109.1)	51 (112.4)	50.5 (111.3)	53 (116.8)	52 (114.6)	51 (112.4)							
	LL	kg (lb)	50 (110.2)	51.5 (113.5)	—										
	UL	kg (lb)	—												
PERFORMANCE:															
Speed range at W.O.T		r/min	5000 ~ 6000												
Output (ISO)		kW (hp)	14.9 (20)						18.7 (25)						at 5,500 r/min
Maximum fuel consumption		L (US gal, Imp gal)/h	11 (2.91, 2.42)						12 (3.17, 2.64)						at 5,500 r/min

Item	Unit	Model												Note
		20 hp						25 hp						
		DM	DEM	DMO	DEMO	DEO	DERO	NM	NE	NMO	NEMO	NEO	NERO	World wide
		MH	—	—	—	—	—	—	—	MH	EH	—	ER	USA
		MH	EH	MH2	EH2	—	—	MH	—	MH2	EH	—	ER	Canada
ENGINE:														
Type		2 stroke in-line												
Number of cylinder		2												
Total displacement	cm^3 (cu. in)	395 (24.11)												
Bore × Stroke	mm (in)	67.0 × 56.0 (2.64 × 2.20)												
Compression ratio		7.20												
Compression pressure	kPa (kg/cm^2, psi)	735 (7.35, 105)												
Number of carburetor		2												
Induction system		Loop Charge												
Starting device		R	R&E	R	R & E			R	R&E	R	R & E			R: Recoil starter E: Electric motor
Alternator output	V-W	12-80	—	12-80	—			12-80	—	12-80	—			Recoil start model
Charging current	V-A	—	12-06	—	12-06			—	12-06	—	12-06			Electric start model
Enrichment system		Choke Valve												
Advance type		Mechanical												
Spark plug		BR7HS-10 (B7HS-10)												NGK number
Exhaust		Through Prop Boss												
Lubrication system		Pre-mix fuel & oil		Oil injection				Pre-mix fuel & oil		Oil injection				
FUEL AND LUBRICATION:														
Fuel type		Regular Gasoline												
Fuel rating	P.O.N.	86												lower limit
	R.O.N.	91												lower limit
Engine oil type/Grade		TC-W3												
Gear oil type		Hypoid Gear Oil-SAE#90												
Gear oil quantity	cm^3 (US oz, Imp oz)	370 (12.51, 13.02)												
Engine oil tank capacity	L (US qt, Imp qt)	—		0.7 (0.74, 0.62)				—		0.7 (0.74, 0.62)				Oil injection model
BRACKET:														
Tilt angle	degree	8/12/15.5/19/23												
Tilt-up angle	degree	67												
Shallow water crushing angle	degree	30/36												
Steering angle	degree (left + right)	40+40												

Item	Unit	Model												Note
		20 hp						25 hp						
		DM	DEM	DMO	DEMO	DEO	DERO	NM	NE	NMO	NEMO	NEO	NERO	World wide
		MH	—	—	—	—	—	—	—	MH	EH	—	ER	USA
		MH	EH	MH2	EH2	—	—	MH	—	MH2	EH	—	ER	Canada
LOWER UNIT:														
Gear shift position		F-N-R												
Gear ratio		2.08 (27/13)												
Gear type		Spiral bevel fear												
Clutch type		Dog clutch												
Propeller direction		Clockwise												
Propeller drive system		Spline												
Propeller series mark		F												
ELECTRICAL:														
Battery capacity	Ah (kC)	40 (144)												Electric start model
Cold cranking	Amps	210												Electric start model

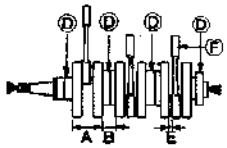
MAINTENANCE SPECIFICATIONS

ENGINE

Item	Unit	Model		Note
		20 hp	25 hp	
CYLINDER HEAD:				
Warpage limit	mm (in)	0.1 (0.004)		
CYLINDER:				
Bore size	mm (in)	67.00 ~ 67.02 (2.638 ~ 2.639)		
Wear limit	mm (in)	67.1 (2.642)		
Taper limit	mm (in)	0.08 (0.003)		
Out of round limit	mm (in)	0.05 (0.002)		
PISTON:				
Identification mark		6L2		
Piston clearance	mm (in)	0.040 ~ 0.045 (0.0016 ~ 0.0018)		
Limit	mm (in)	0.095 (0.004)		
Diameter	mm (in)	66.955 ~ 66.980 (2.636 ~ 2.637)		
Measuring point "H"	mm (in)	10 (0.394)		
				
Pin boss inside diameter	mm (in)	18.004 ~ 18.015 (0.7088 ~ 0.7093)		
Ring groove clearance Top	mm (in)	0.02 ~ 0.06 (0.001 ~ 0.002)		installed
Ring groove clearance 2nd	mm (in)	0.03 ~ 0.07 (0.001 ~ 0.003)		installed
Over size Diameter 1st	mm (in)	67.25 (2.648)		
Diameter 2nd	mm (in)	67.50 (2.657)		
PISTON PIN:				
Diameter	mm (in)	17.995 ~ 18.000 (0.7085 ~ 0.7087)		
PISTON RING (1st):				
Type		Keystone		
Dimensions 				
(B × T)	mm (in)	1.5 × 2.6 (0.06 × 0.10)		
End gap	mm (in)	0.40 ~ 0.60 (0.016 ~ 0.024)		installed
Limit	mm (in)	0.80 (0.031)		
PISTON RING (2nd):				
Type		Plain		
Dimensions 				
(B × T)	mm (in)	1.5 × 2.6 (0.06 × 0.10)		
End gap	mm (in)	0.40 ~ 0.60 (0.016 ~ 0.024)		installed
Limit	mm (in)	0.80 (0.031)		
CONNECTING ROD:				
Small end diameter	mm (in)	22.024 ~ 22.035 (0.8671 ~ 0.8675)		

MAINTENANCE SPECIFICATIONS

(E)

Item	Unit	Model		Note
		20hp	25hp	
CRANK SHAFT:				
Crank width A	mm (in)	49.90 ~ 49.95 (1.965 ~ 1.967)		
Crank width B	mm (in)	38.90 ~ 39.10 (1.531 ~ 1.539)		
Runout limit D	mm (in)	0.03 (0.001)		
Big end side clearance E	mm (in)	0.20 ~ 0.70 (0.008 ~ 0.028)		
Small end axial play limit F	mm (in)	2.0 (0.08)		
				
THERMOSTAT:				
Opening temperature	°C (°F)	48 ~ 52 (118.4 ~ 125.6)		
Full-opening temperature	°C (°F)	60 (140)		
Valve lift	mm (in)	3 (0.12)		
OIL INJECTION PUMP:				For; MO, EMO, EO, ERO
Identification mark		6L200		
Specified discharge	cm^3 (US oz, Imp oz)	0.80 ± 0.10 (0.031 ± 0.004)		
REED VALVE:				
Valve stopper height	mm (in)	6.0 ± 0.2 (0.236 ± 0.008)		
Valve warpage limit	mm (in)	0.2 (0.01)		
CARBURETOR:				
Identification mark		6L300	6L201	
Float height	mm (in)	14.5 ± 0.5 (0.57 ± 0.02)		
Main jet (M.J.)	#	125		
Pilot jet (P.J.)	#	60		
Pilot screw (P.S.)	turns out	2-1/2 ± 3/4	2 ± 3/4	
ENGINE SPEED:				
Idle speed	r/min	750 ± 50		
	r/min	–	780 ± 30	Canada
RECOIL STARTER:				
Starter rope length	mm (in)	1,950 (77)		

LOWER

Item	Unit	Model		Note
		20 hp	25 hp	
GEAR BACKLASH:				
Pinion - Forward	mm (in)	0.32 ~ 0.53 (0.013 ~ 0.021)		on the tool
Pinion - Reverse	mm (in)	0.85 ~ 1.17 (0.033 ~ 0.046)		on the tool
Pinion shim	mm	1.0, 1.1, 1.2, 1.3, 1.4		
Forward shim	mm	1.0, 1.1, 1.2, 1.3		
Reverse shim	mm	1.5, 1.6		
PROPELLER:				
I.D. mark		F		
Material		Aluminium	Stainless steel	
Blade × Diameter × Pitch	in	3 × 9-7/8 × 8	3 × 9-1/8 × 12	
		3 × 9-7/8 × 9	3 × 9-1/8 × 13	
		2 × 9-7/8 × 10-1/2		
		3 × 9-7/8 × 10-1/2		
		3 × 9-7/8 × 11-1/4	Dual thrust prop.	
		2 × 9-7/8 × 12	3 × 10-5/8 × 8-1/4	
		3 × 9-7/8 × 12		
		3 × 9-7/8 × 13		
		3 × 9-7/8 × 14		

ELECTRICAL

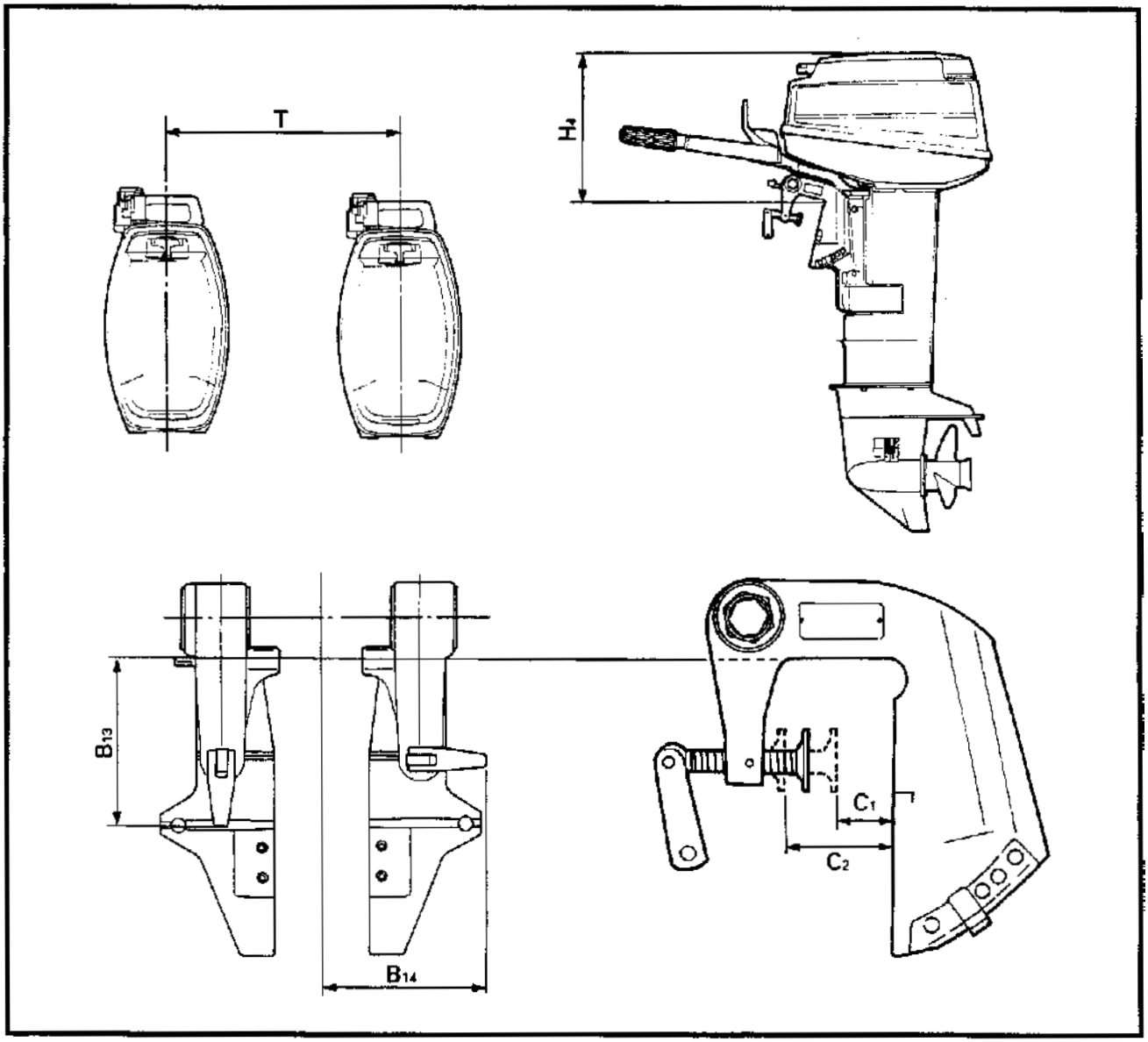
Item	Unit	Model		Note
		20 hp	25 hp	
IGNITION SYSTEM:				
Ignition timing	Degree	A.T.D.C. 5 ± 1		Fully retarded
Piston position	mm (in)	A.T.D.C. 0.14 ± 0.05 (0.0055 ± 0.002)		Fully retarded
Ignition timing	Degree	B.T.D.C. 25 ± 1		Fully advanced
Piston position	mm (in)	B.T.D.C. 3.34 $^{+0.27}_{-0.26}$ (0.132 $^{+0.010}_{-0.011}$)		Fully advanced
Ignition timing	Degree	T.D.C. 0		Cam roller pickup
Charge coil resistance	Ω	342 ~ 418		Br-L
Pulser coil resistance 1	Ω	311 ~ 381		W/R-B
Pulser coil resistance 2	Ω	311 ~ 381		W/B-B
Ignition coil resistance				
(primary)	Ω	0.18 ~ 0.24		B/W-B
(secondary)	kΩ	2.72 ~ 3.68		B/W-high tension cable
Spark plug gap	mm (in)	0.9 ~ 1.0 (0.035 ~ 0.039)		
Charge coil output peak voltage	V			Br-L
Pulser coil output peak voltage 1	V			W/R-B
Pulser coil resistance 2	V			W/B-B
CDI output peak voltage 1	V			B/O-B
CDI output peak voltage 2	V			B/W-B
Engine speed limiter	r/min	6300 ~ 6700		
Over heat speed control	r/min	1600 ~ 2400		

Item	Unit	Model		Note
		20 hp	25 hp	
STARTING SYSTEM:				For; E, EM, EMO, EO, ERO
Fuse	V-A	12-10		
Neutral switch	mm (in)	18.5 ~ 19.5 (0.73 ~ 0.76)		Turn ON
	mm (in)	19.5 ~ 20.5 (0.76 ~ 0.80)		Turn OFF For, E, EM, EMO
STARTING MOTOR:				For; E, EM, EMO, EO, ERO
Type		Bendix		
Rating	Sec.	30		
Output	kW	0.4		
Brush length	mm (in)	7.5 (0.295)		
Wear limit	mm (in)	4.5 (0.177)		
Commutator diameter	mm (in)	20.0 (0.787)		
Limit	mm (in)	19.4 (0.764)		
CHARGING SYSTEM:				
Charging current	A	3		at 3,000 r/min
	A	5 ~ 7		at 5,000 r/min
Lighting voltage	V	11.5		at 3,000 r/min
	V	13.5 ~ 16.5		at 5,500 r/min
Lighting coil resistance	Ω	0.30 ~ 0.36		G-G
Pole number		6		
WARNING SYSTEM:				For; 25 MO, EMO, EO, ERO
Thermo switch	°C (°F)	93 (199.4)		Turn ON
	°C (°F)	83 (181.4)		Turn OFF
Oil level sensor	mm (in)	56.3 ~ 59.3 (2.22 ~ 2.33)		Turn ON
Warning lamp	V-mA	1.7 ~ 20		

World wide	USA	Canada
20DM	20MH	20MH
20DEM		20MH2
20DMO		20EH
20DEMO		20EH2
20DEO		
20DERO		

World wide	USA	Canada
25NM		25MH
25NMO	25MH	25MH2
25NEMO	25EH	25EH
25NE		
25NEO		
25NERO	25ER	25ER

DIMENSION

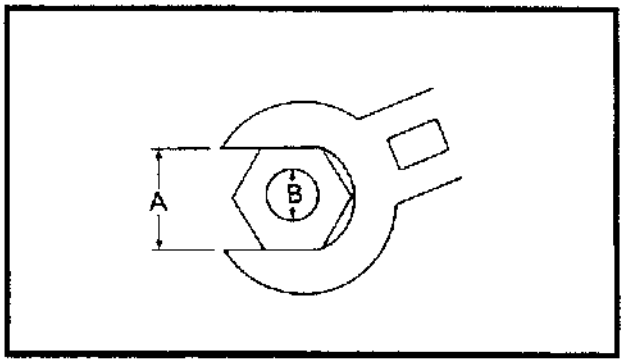


Symbol (used in diagram)		Unit	Model	
			20 hp	25 hp
HEIGHT				
H4	S	mm (in)	419 (16.5)	
	L	mm (in)	546 (21.5)	
	LL	mm (in)	597 (23.5)	
	UL	mm (in)	635 (25.0)	
TWIN ENGINE DISTANCE				
T		mm (in)	570 (22.4)	
BRACKET				
B13		mm (in)	125 (4.9)	
B14		mm (in)	153 (6.0)	
CLAMP				
C1		mm (in)	25 (1.0)	
C2		mm (in)	70 (2.8)	

TIGHTENING TORQUE

Part to be tightened		Part name	Thread size	Q'ty	Tightening torque Nm	m•kg	ft•lb	Remarks
ENGINE:								
Crank cylinder	1st	Bolt	M8	6	15	1.5	11	
	2nd	Nut			28	2.8	20	
	1st	Bolt	M6	4	5	0.5	3.6	
	2nd				11	1.1	8.0	
Cylinder head	1st	Bolt	M8	10	15	1.5	11	
	2nd				28	2.8	20	
Exhaust cover	1st	Bolt	M6	10	3	0.3	2.2	
	2nd				7	0.7	5.1	
Flywheel		Nut	M12	1	100	10.0	72	
Spark plug		Bolt	M14	2	25	2.5	18	
Reed valve		Screw	M5	4	4	0.4	2.9	
Power unit mounting		Bolt	M8	6	21	2.1	15	
UPPER CASE AND GEAR CASE:								
Lower case mounting		Bolt	M10	4	40	4.0	2.9	
Pinion nut		Nut	M10	1	50	5.0	36	
Propeller		Nut	M14	1	35	3.5	2.5	

Nut	Bolt	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

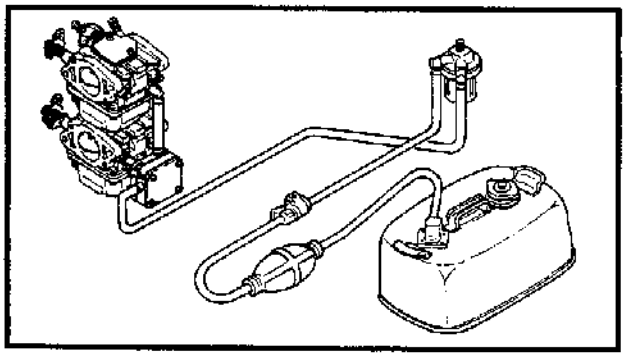
This chart specifies the torques for tightening standard fasteners with standard clean dry ISO threads at room temperature. Torque specifications for special components or assemblies are given in applicable sections of this manual. To avoid causing warpage, tighten multifastener assemblies in crisscross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

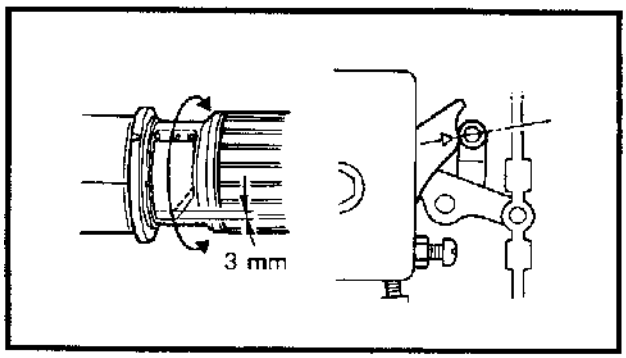
CHAPTER 3
PERIODIC INSPECTION AND ADJUSTMENT

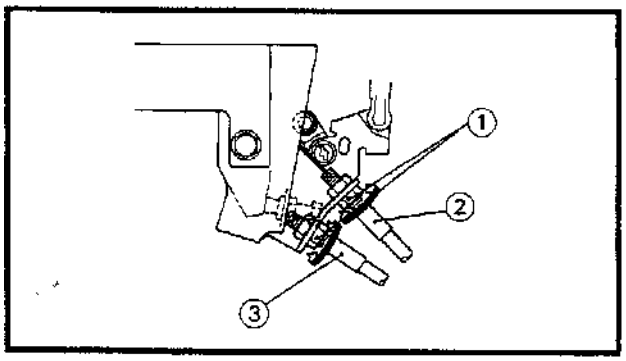
MAINTENANCE INTERVAL CHART

The following chart should be considered strictly as a guide to general maintenance intervals.
Depending on operating conditions, the intervals may have to be changed.

Item	Remarks	Initial		Every		Refer to page
		10 hours (Break in)	50 hours (3 months)	100 hours (6 months)	200 hours (1 year)	
COWLING:						
Cowling clamp	Inspection				○	—
FUEL SYSTEM:						
Fuel line	Inspection	○		○	○	3-2
Fuel filter	Inspection/Cleaning	○	○	○		4-3
Carburetor	Inspection/Adjustment	○	○	○		4-8
POWER UNIT:						
Thermostat	Inspection/Replacement			○		5-22
Water leak	Inspection	○	○	○		—
Motor exterior	Inspection	○	○	○		—
Exhaust leak	Inspection	○	○	○		—
Cooling water passage	Inspection		○	○		—
CONTROL SYSTEM:						
Ignition timing	Inspection/Adjustment	○		○		—
Throttle cable	Inspection/Adjustment				○	3-3
Start-in-gear protection	Inspection/Adjustment	○		○		3-5
Idle speed	Inspection/Adjustment	○		○		3-5
OIL INJECTION SYSTEM:						
Oil tank water drain	Cleaning	○	○	○		—
Oil pump link	Inspection/Adjustment	○		○		3-5
LOWER UNIT:						
Gear oil	Replacement	○		○		3-6
Oil leak	Inspection				○	3-6
Propeller	Inspection	○	○	○		—
GENERAL:						
Anode	Inspection		○	○		3-7
Battery	Inspection	○ every month				3-7
Spark plug	Inspection/Cleaning/ Adjustment/ Replacement	○	○	○		3-8
Wiring and connector	Inspection/Reconnection	○	○	○		—
Bolts and nuts	Retightening	○	○	○		—
Grease points	Refilling			○		3-9







PERIODIC SERVICE

FUEL SYSTEM

Fuel line

1. Inspect:
   - Fuel line
     Break/Leak/Damage → Replace.

CONTROL SYSTEM

Throttle cable adjustment

1. Check:
   - Indicator position (at W.O.T.)
     Incorrect → Adjust.

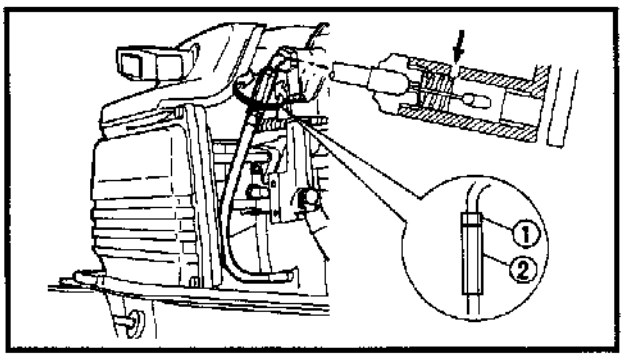
Checking steps:
- Turn the acceleratior cam to fully open.
- Check that the indicator mark and throttle roller are aligned in line.
- Loosen the lock nut ①.
- Adjust the nut ② to the indicator-roller alignment is obtained.
- Adjust the nut ③ to 3 mm (0.12 in) free play is obtained.
- Tighten the lock nut ①.

Start-in-gear protection adjustment

1. Check:
   - Device position
     Incorrect → Adjust.

Checking steps:
- Pull the recoil starter and check that the specified condition is obtained.

Shift position	Recoil starter
Neutral	Can be pulled
Forward	Blocked
Reverse	Blocked



2. Adjust:
   - Start-in-gear protection plunger

Adjustment steps:
- Shift into neutral.
- Loosen the lock nut ①.
- Adjust the nut ② to the starter stop plunger line is align with the center of the sight hole.
- Tighten the lock nut ①.

Idle speed adjustment

NOTE:
- The carburetor link should be adjusted before carry this adjustment.
- The engine should be warmed up.

1. Measure:
   - Idle speed

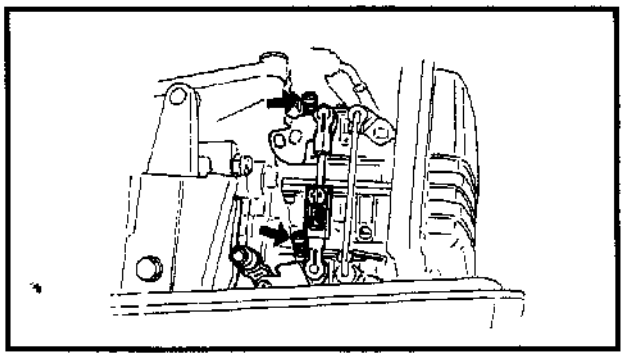
   Out of specification → Adjust.

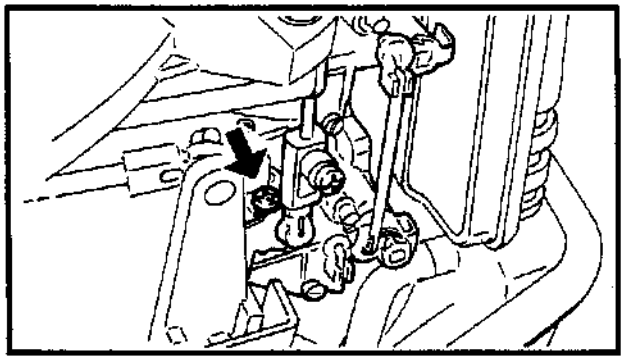
	Idle speed: **750 ± 50 r/min**
	Tachometer: **YU-08036, 90890-06760**

2. Adjust:
   - Pilot screw ①

Adjustment steps:
- Screw in the pilot screw until it is lightly seated.
- Back it out to specified number of turns.

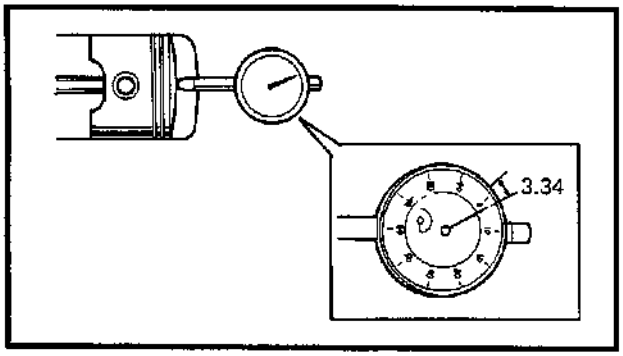
	Pilot screw turns out: **20hp: 2-1/2 ± 3/4** **25hp: 2 ± 3/4**

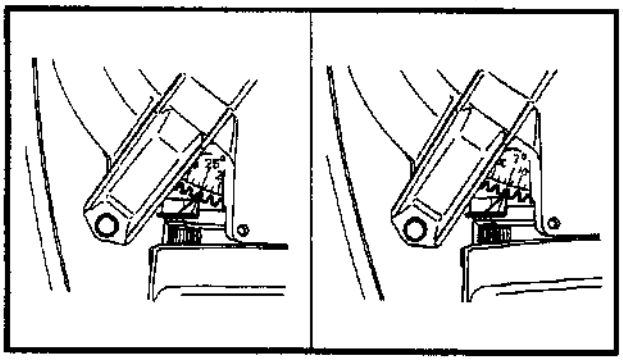


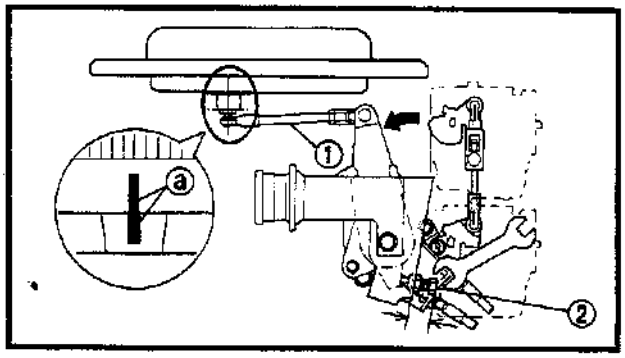


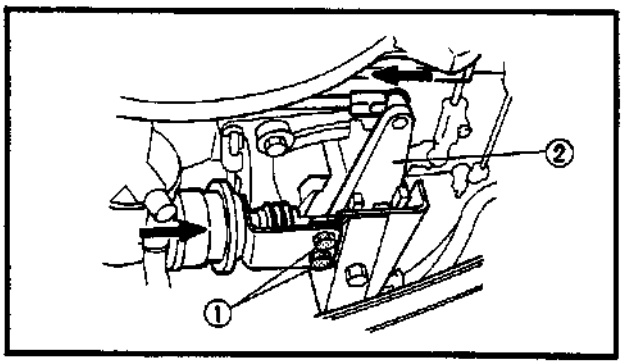
3. Adjust:
   - Throttle stop screw ①

	Idle speed to be increased
	Idle speed to be decreased









Ignition timing adjustment

1. Check:
   - Ignition timing
     Incorrect → Adjust.

Ignition timing:
W.O.T.: BTDC 25 degrees
Idling: ATDC 7 degrees

Timing light:
YM-33277, 90890-03141

2. Adjust:
   - Ignition timing

Adjustment steps:
- Set the piston in specified position.

3.34 mm (0.13 in) BTDC

Dial indicator:
YU-03097, 90890-01252

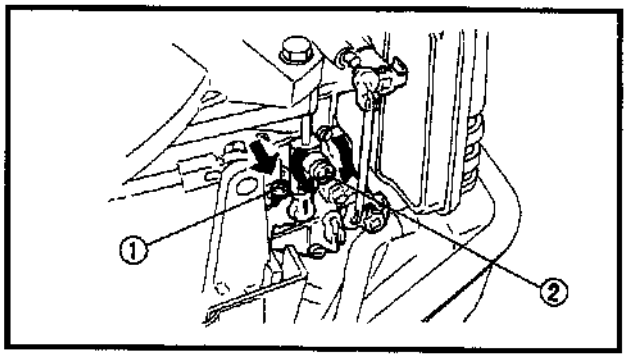
- Set the timing plate to specified degrees.

25 degrees BTDC

- Place the magneto control lever to full advanced position.
- Align the marks ⓐ on the magneto base and the flywheel.
- Adjust the length of the link rod ① with the length for both connections.
- Turn the flywheel to ATDC 7 degrees with the indicator.
- Adjust full retard screw ② to the marks on the magneto base and the flywheel are aligned.

3. Adjust:
   - Diaphragm assembly

Adjustment steps:
- Loosen the bolts ①.
- Place the lever ② to full retard.
- Secure the bolts ① with the condition that the diaphragm plunger is fully retracted.

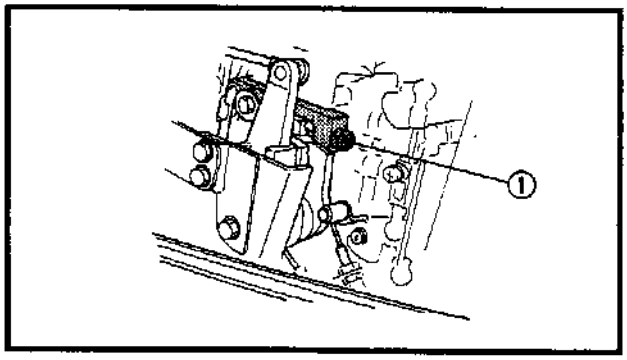


Carburetor link adjustment

1. Check:
   - Throttle valves closing
     Not evenly → Adjust.
2. Adjust:
   - Link rod

Adjustment steps:
- Loosen the throttle stop screw ① to fully close the throttle valve.
- Loosen the link rod screw ②.
- Tighten the screw ② in condition for both of the throttle valves are fully closed.
- Reset the screw ① and adjust the idle speed if necessory.

NOTE:
Note the throttle stop screw turns value for reset the screw.



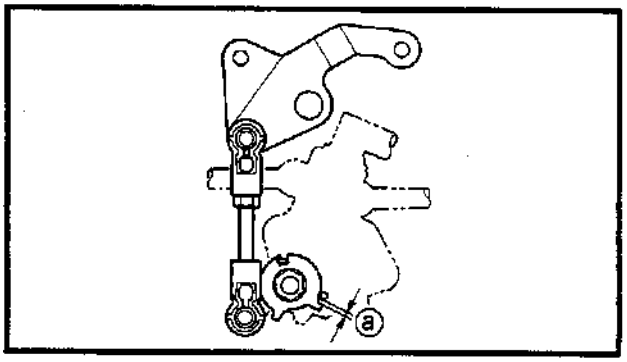
Neutral opening adjustment

1. Measure:
   - Upper limit engine speed in neutral
     Out of specification → Adjust.

	Controlled engine speed: 3800 ± 300 r/min

2. Adjust:
   - Neutral speed control screw ①

	Speed limit to be decreased
	Speed limit to be increased



OIL INJECTION SYSTEM

Oil pump link adjustment

1. Measure:
   - Oil pump control lever gap ⓐ
     Out of specification → Adjust.

	Lever gap at W.O.T.: 0.5 mm (0.02 in)

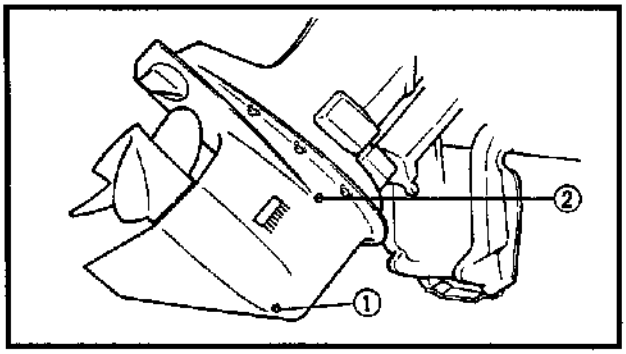
2. Adjust:
   - Link rod length

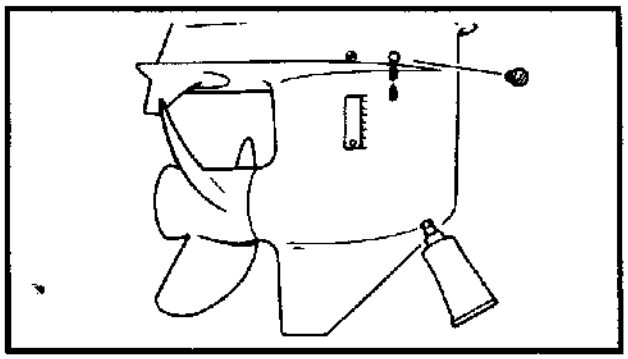
LOWER UNIT

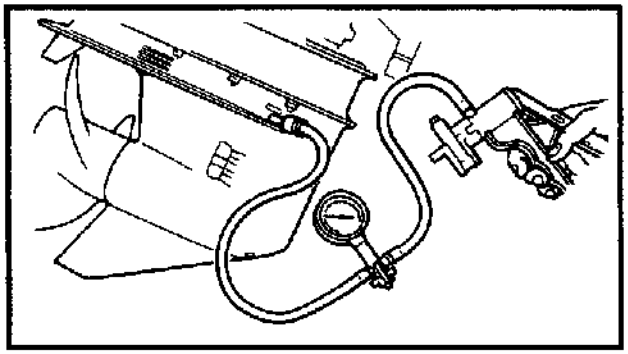
Gear oil

1. Check:
   - Gear oil
     Milky oil → Replace the oil seal.
     Slag oil → Check the gear, bearing and dog.

2. Check:
   - Gear oil level
     Oil level is low → Add oil to proper level.







3. Replace:
   - Gear oil

Replacement steps:
- Tilt up the motor.
- Place a pan under the drain plug ①.
- Remove the drain plug, then the oil level plug ② and drain the oil thoroughly.
- Place the outboard motor in an upright position.
- Fill the gear oil through the drain hole until it overflows at the level hole.

Recommended oil:
GEAR CASE LUBE (USA) or Hypoid gear oil, SAE #90
Oil capacity:
370 cm³ (12.5 US oz, 13.0 Imp oz)

- Refit the oil level plug and then the oil drain plug.

Lower unit leakage check

1. Check:
   - Pressure holding
     Pressure falls → Inspect seals and component parts.

Checking steps:
- Attach the tester to the oil-level hole.

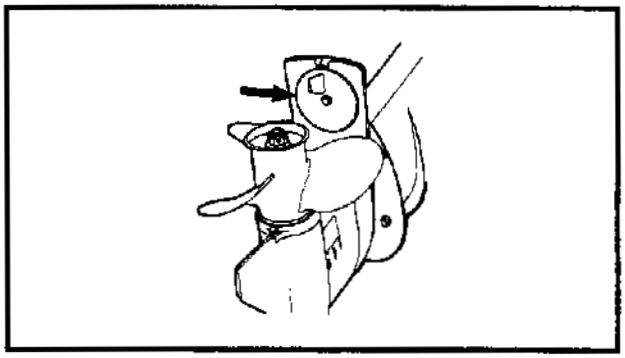
Pressure tester:
YB-03595/90890-06762

- Apply the specified pressure.

Pressure:
100 kPa (1.0 kg/cm², 14.2 psi)

- Check that the pressure is held at the specified level for 10 seconds.

NOTE:
Do not over-pressurize. Excess pressure may cause the air to leak out.



GENERAL

Anode

1. Inspect:
   - Anode
     Scale → Clean.
     Oil/grease → Clean.
     Wear/Excessively consumed → Replace.

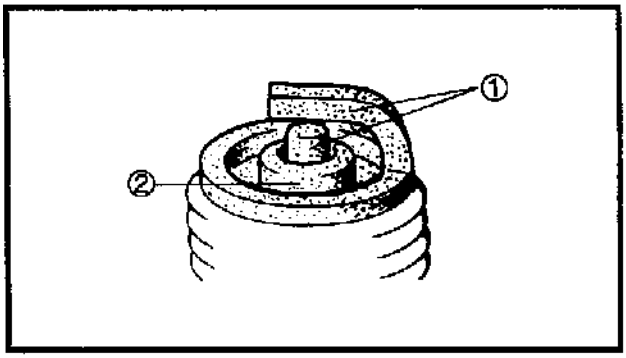
CAUTION:
Do not oil, grease or paint the sacrificial anode, or it will not function properly.

Battery

⚠ WARNING
Battery electrolyte is poisonous and dangerous, causing severe burns, etc. It contains sulfuric acid. Avoid contact with skin, eyes, or clothing.
Antidote:
EXTERNAL; Flush with water.
INTERNAL; Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.

EYES; Flush with water for 15 minutes and get prompt medical attention.
Batteries produce explosive gases: Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in a closed space. Always wear eye protection when working near batteries.
KEEP OUT OF REACH OF CHILDREN.

NOTE:
Batteries vary among manufacturers. Therefore the following procedures may not always apply. Consult your battery manufacturer's instructions.



Spark plug

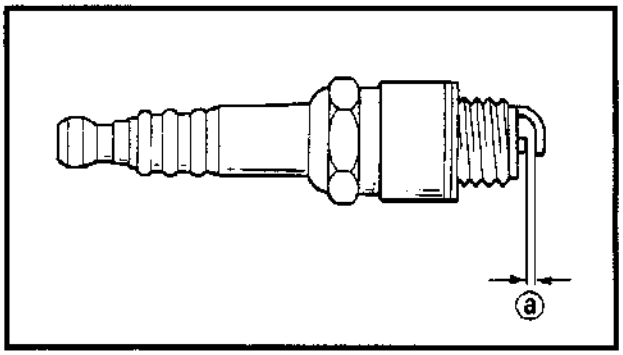
1. Inspect:
   - Electrode ①
     Worn/Damaged → Replace.
   - Insulator color ②
     Distinctly different color → Check the engine condition.

Color guide:
Normal: Medium to light tan color
Whitish color: Lean fuel mixture
- **Plugged fuel mixture**
- **Air leak**
- **Incorrect setting**

Blackish color: Electrical malfunction
- **Defective spark plug**
- **Defective ignition system**
- **Rich mixture**
- **Excessive idling**

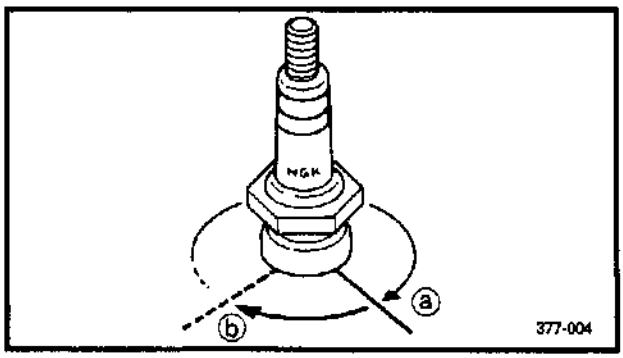
2. Clean:
   - Spark plug
     Clean the spark plug with a plug cleaner or wire brush.
3. Inspect:
   - Spark plug type

Standard spark plug:
BR7HS-10 (B7HS-10)



4. Measure:
   - Electrode gap ⓐ
     Out of specification → Regap.

	Gap: **0.9 ~ 1.0 mm (0.035 ~ 0.039 in)**

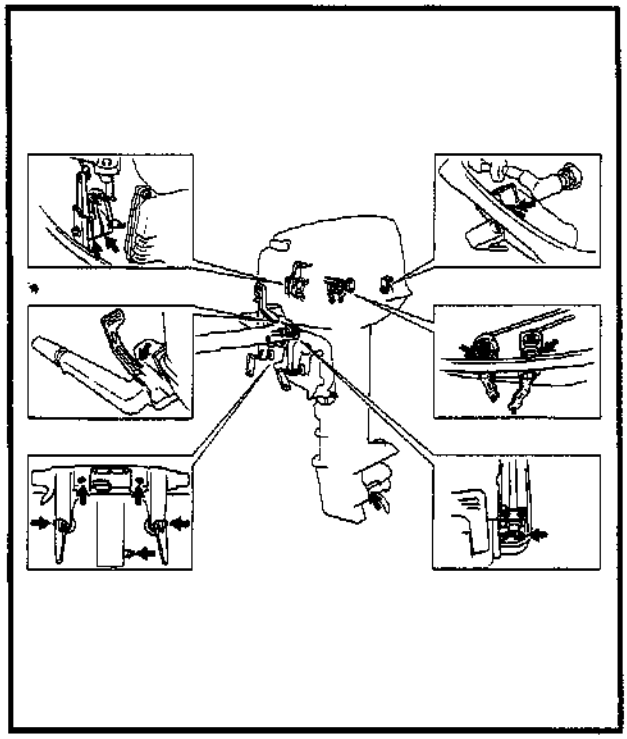


5. Tighten:
   - Spark plug

NOTE:
Before installing the spark plug, clean the gasket surface and the plug surface.

	Spark plug: **25 Nm (2.5 m • kg, 18 ft • lb)**

NOTE:
If a torque wrench is not available, a good estimate of the correct torque for the spark plug ⓐ is a further 1/4 to 1/2 a turn ⓑ more than finger-tight ⓐ.

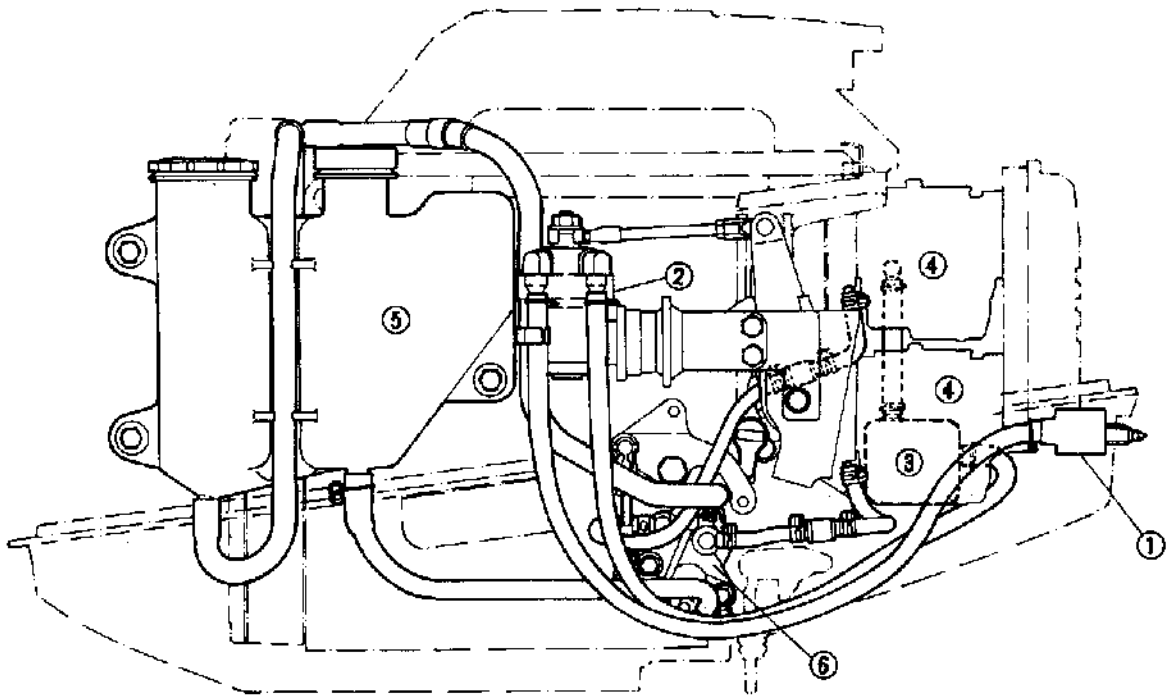


Grease points

1. Apply:
   - Water resistant grease

CHAPTER 4
FUEL SYSTEM

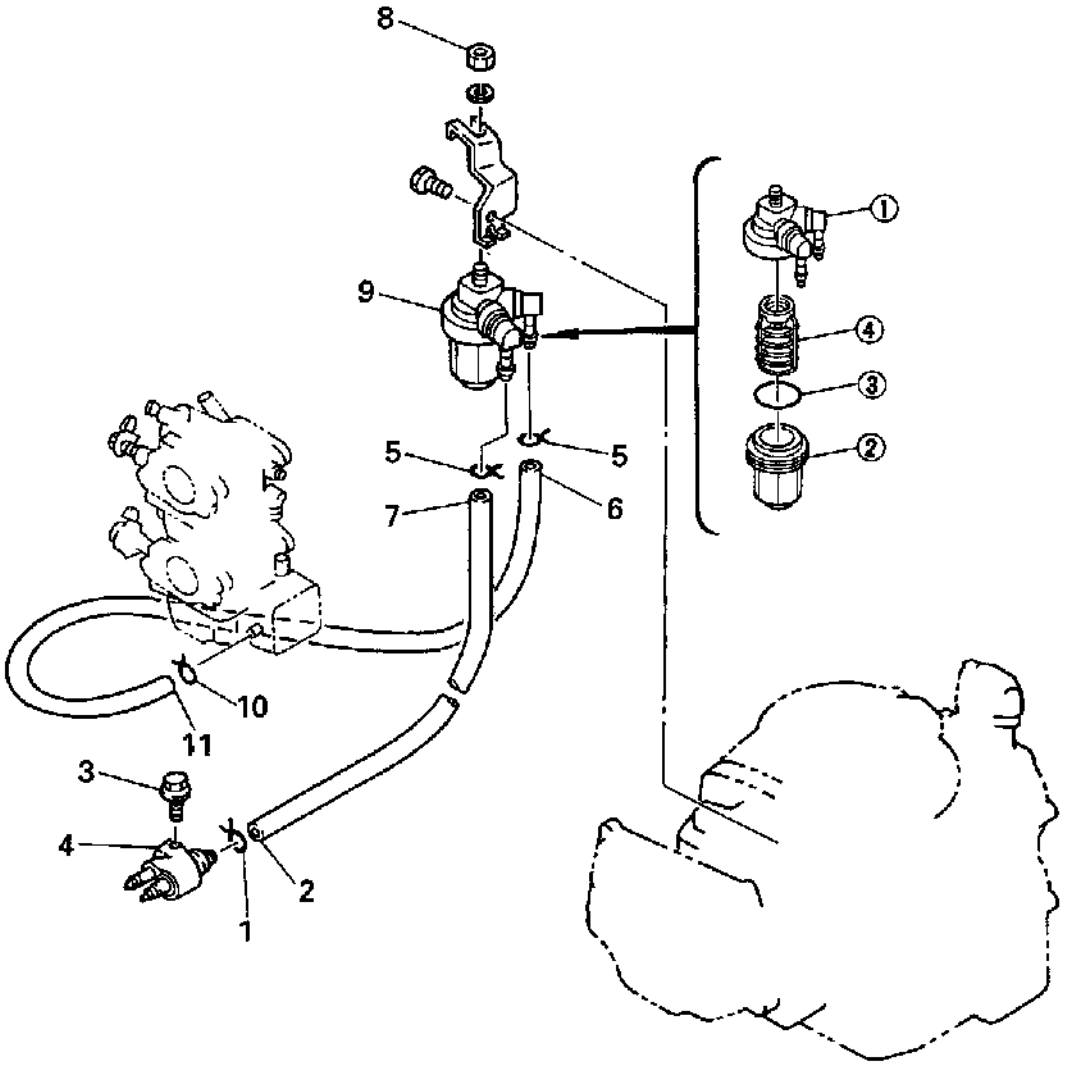
FUEL AND LUBRICATION SYSTEM
COMPONENTS



World wide	USA	Canada	①	②	③	④	⑤	⑥
20DM	20MH	20MH	●	●	●	●	–	–
20DMO	–	20MH2	●	●	●	●	●	●
20DEM	–	20EH	●	●	●	●	–	–
20DEMO	–	20EH2	●	●	●	●	●	●
20DEO	–	–	●	●	●	●	●	●
20DERO	–	–	●	●	●	●	●	●
25NM	–	25MH	●	●	●	●	–	–
25NMO	25MH	25MH2	●	●	●	●	●	●
25NEMO	25EH	25EH	●	●	●	●	●	●
25NE	–	–	●	●	●	●	–	–
25NEO	–	–	●	●	●	●	●	●
25NERO	25ER	25ER	●	●	●	●	●	●

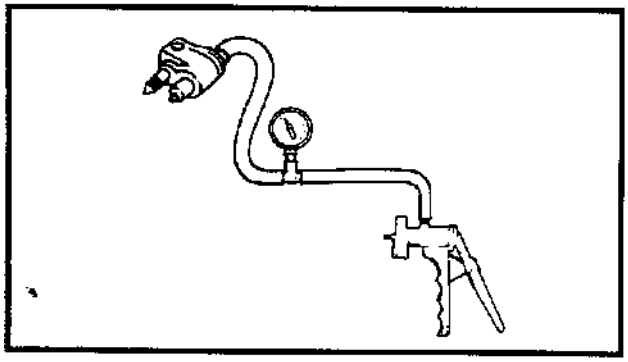
① Fuel joint
② Fuel filter
③ Fuel pump
④ Carburetor
⑤ Oil tank
⑥ Oil pump

FUEL FILTER
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	FUEL JOINT AND FUEL FILTER REMOVAL		Follow the left "Step" for removal.
1	Clip	1	
2	Fuel hose (joint-filter)	1	
3	Bolt (with washer)	1	6 × 20 mm
4	Fuel joint	1	
5	Clip	2	
6	Fuel hose (joint-filter)	1	
7	Fuel hose (filter-pump)	1	
8	Nut	1	
9	Fuel filter	1	
10	Clip	1	
11	Fuel hose (filter-pump)	1	
	FUEL FILTER DISASSEMBLY		
①	Filter body	1	
②	Filter cup	1	
③	O-ring	1	
④	Filter element	1	
			Reverse the removal steps for installation.



SERVICE POINTS

Fuel joint inspection

1. Check:
   - Fuel joint function
     Leak down within 10 seconds → Replace.

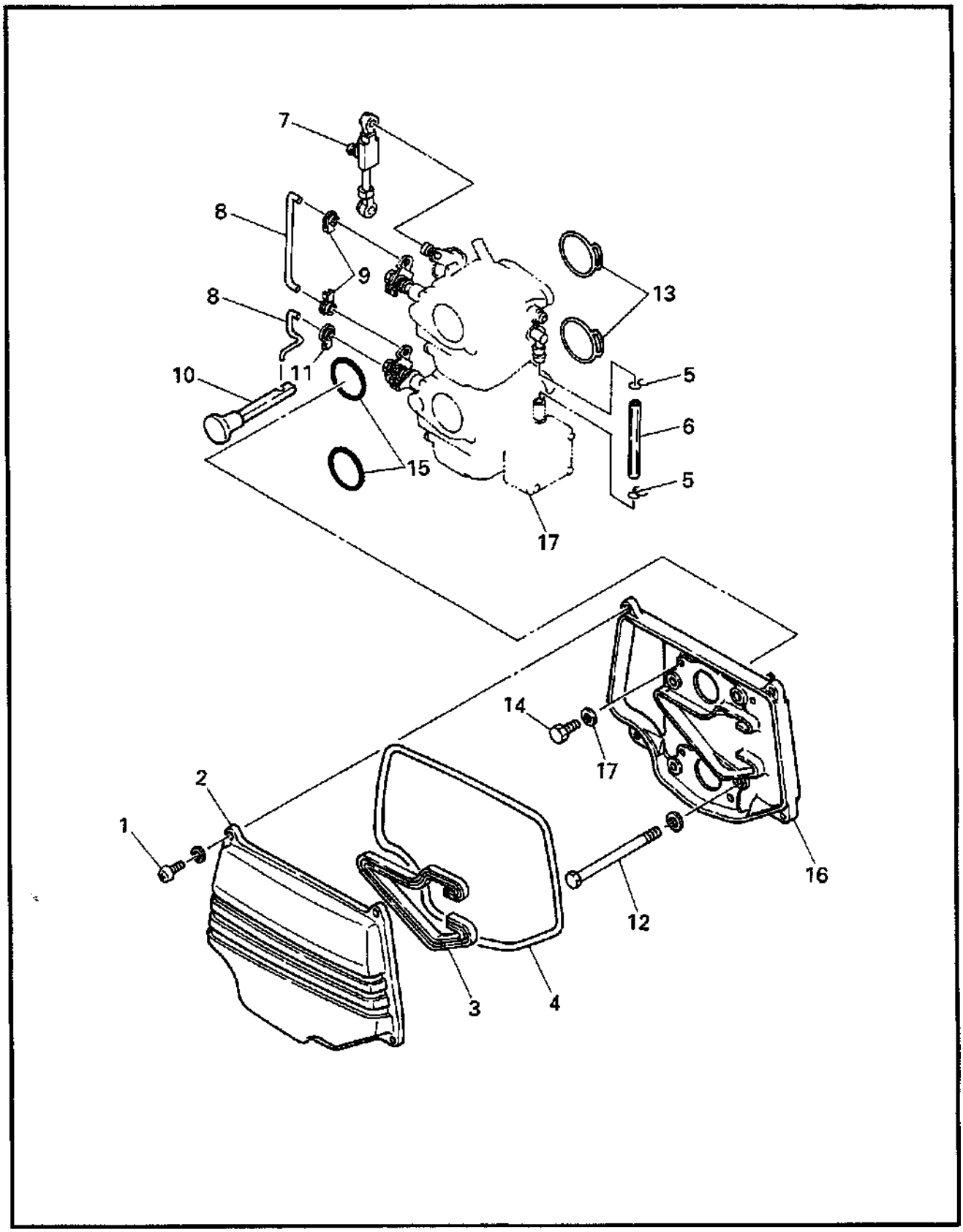
Measuring steps:
- Connect the Mity vac.

Mity vac:
YB-35956/90890-06756

- Apply specified pressure.

Pressure:
50 kPa (0.5 kg/cm², 7.1 psi)

CARBURETOR REMOVAL
EXPLODED DIAGRAM
AUSBAU DES VERGASERS
EXPLOSIONSZEICHNUNG



REMOVAL AND INSTALLATION CHART

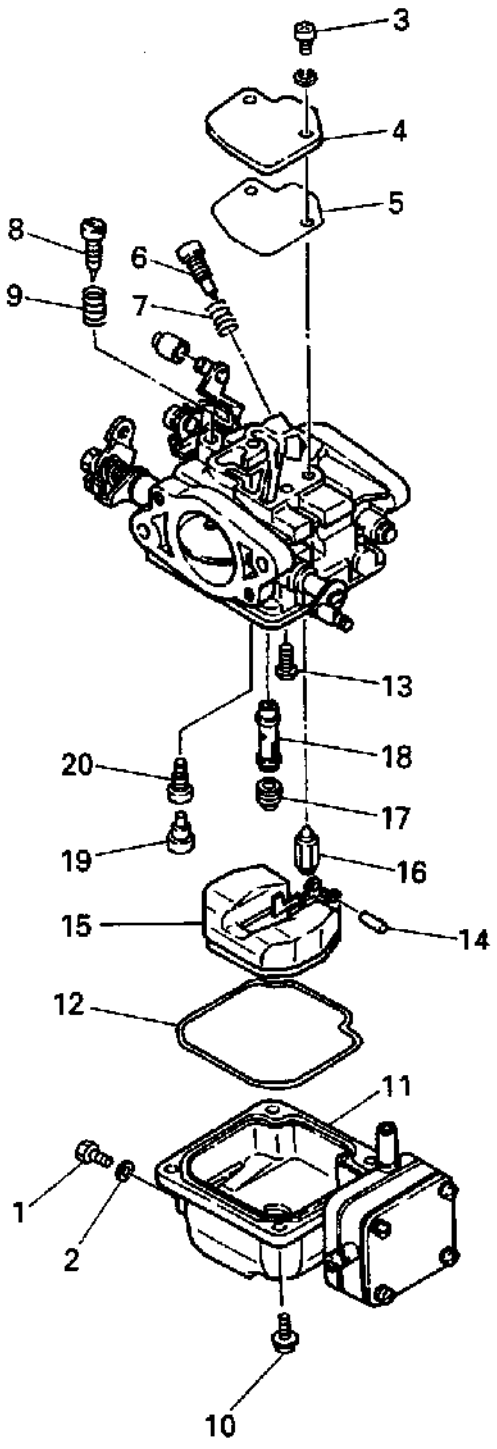
Step	Procedure/Part name	Q'ty	Service points
	CARBURETOR REMOVAL		Follow the left "Step" for removal.
1	Screw	4	
2	Cover	1	
3	Seal	1	
4	Packing	1	
5	Clip	2	
6	Hose	1	
7	Throttle link	1	
8	Choke link	1	
9	Retainer	2	
10	Choke rod	1	
11	Retainer	1	
12	Bolt	4	6 × 85 mm
13	Packing	2	
14	Bolt	4	5 × 12 mm
15	O-ring	2	
16	Silencer	1	
17	Carburetor	2	
			Reverse the removal steps for installation.

AUSBAU- UND EINBAUTABELLE

Schritt	Verfahren/Teilebezeichnung	Anzahl	Wartungspunkte
	AUSBAU DES VERGASERS		Den Punkten der Spalte "Schritt" links zum Ausbau folgen.
1	Schraube	4	
2	Deckel	1	
3	Dichtung	1	
4	Membran	1	
5	Clip	2	
6	Schlauch	1	
7	Drosselgestänge	1	
8	Choke-Gestänge	1	
9	Rückhalter	2	
10	Chokestange	1	
11	Rückhalter	1	
12	Schraube	4	6 × 85 mm
13	Membran	2	
14	Schraube	4	5 × 12 mm
15	O-Ring	2	
16	Schalldämpfer	1	
17	Vergaser	2	
			Zum Einbauen die Ausbauschritte in umgekehrter Reihenfolge ausführen.

CARBURETOR DISASSEMBLY

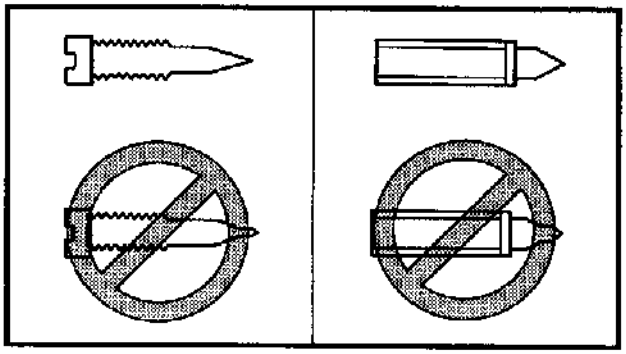
EXPLODED DIAGRAM



CARBURETOR DISASSEMBLY

REMOVAL AND INSTALLATION CHART

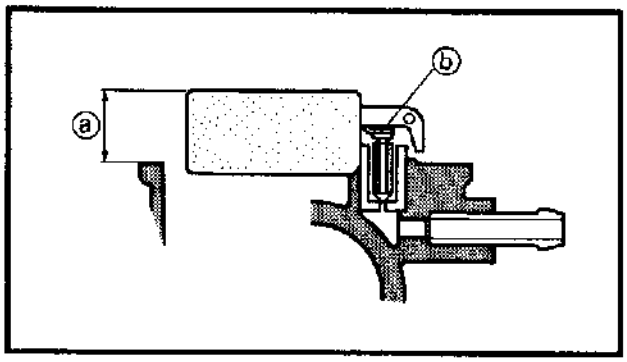
Step	Procedure/Part name	Q'ty	Service points
	CARBURETOR DISASSEMBLY		Follow the left "Step" for removal.
	Carburetor assembly		Refer to "CARBURETOR REMOVAL" section in chapter 4.
1	Drain screw	1	
2	Gasket	1	
3	Screw	2	4 × 10 mm
4	Cover plate	1	
5	Packing	1	
6	Pilot screw	1	
7	Spring	1	
8	Throttle stop screw	1	
9	Spring	1	
10	Screw	4	4 × 12 mm
11	Float chamber	1	
12	Packing	1	
13	Screw	1	4 × 6 mm
14	Arm pin	1	
15	Float	1	
16	Needle valve	1	
17	Main jet	1	
18	Main nozzle	1	
19	Plug	1	
20	Pilot jet	1	
			Reverse the removal steps for installation.



SERVICE POINTS

Carburetor inspection

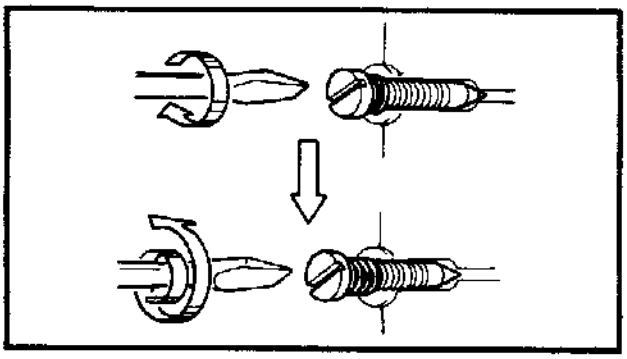
1. Inspect:
   - Pilot screw
     Grooved wear → Replace.
2. Inspect:
   - Needle valve
     Grooved wear → Replace.



Carburetor assembly

1. Measure:
   - Float height ⓐ
     Out of specification → Adjust the tab height ⓑ.

Float height ⓐ:
14.5 ± 0.5 mm (0.57 ± 0.02 in)

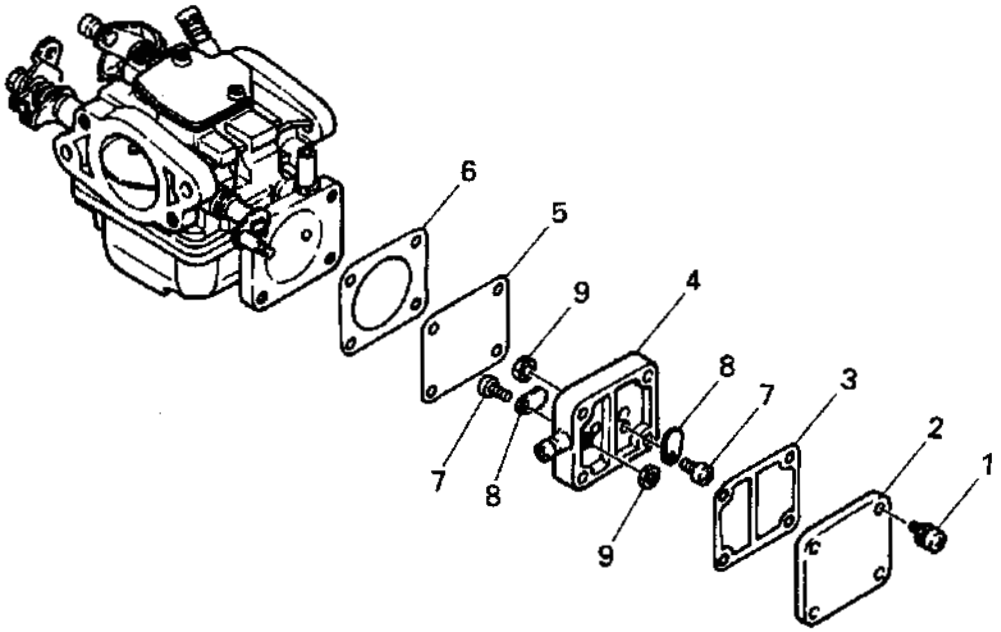


2. Adjust:
   - Pilot screw

Adjustment steps:
- Screw in the pilot screw until it is lightly seated.
- Back out the screw to the specification.

Pilot screw turns out:
20hp: 2-1/2 ± 3/4 turns out
25hp: 2 ± 3/4 turns out

FUEL PUMP
EXPLODED DIAGRAM
KRAFTSTOFFPUMPE
EXPLOSIONSZEICHNUNG



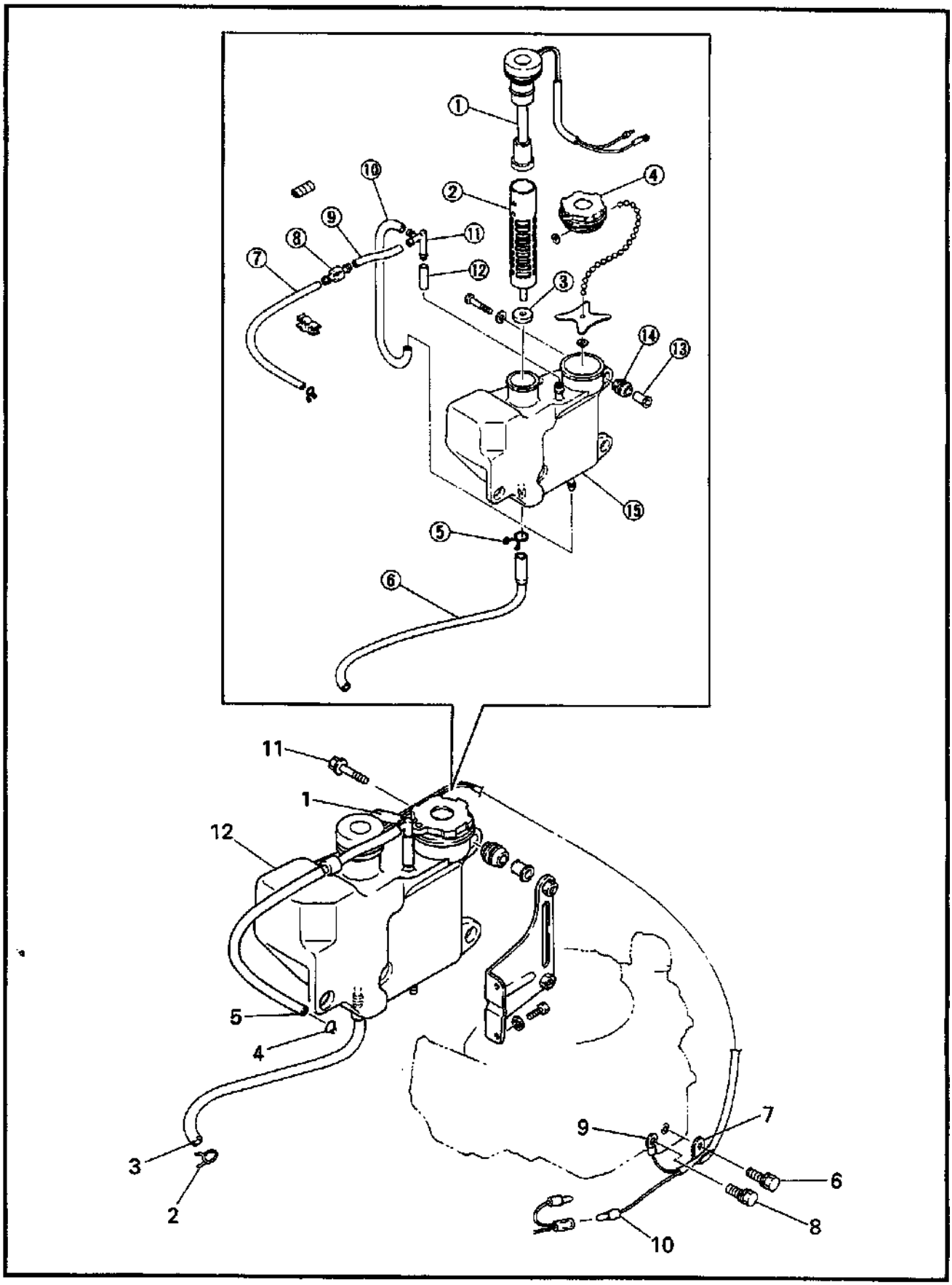
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	FUEL PUMP DISASSEMBLY		Follow the left "Step" for removal.
	Carburetor assembly		Refer to "CARBURETOR REMOVAL" section in chapter 4.
1	Screw	4	
2	Cover	1	
3	Gasket	1	
4	Pump body	1	
5	Diaphragm	1	
6	Packing	1	
7	Screw	2	
8	Valve	2	
9	Nut	2	
			Reverse the removal steps for installation.

AUSBAU- UND EINBAUTABELLE

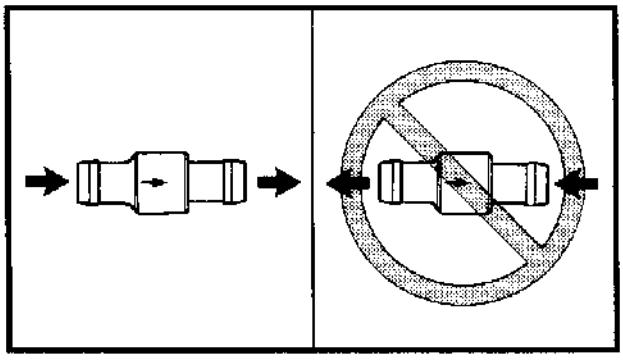
Schritt	Verfahren/Teilebezeichnung	Anzahl	Wartungspunkte
	ZERLEGEN DER KRAFTSTOFFPUMPE		Den Punkten der Spalte "Schritt" links zum Ausbau folgen.
	Vergaser-Baugruppe		Siehe Abschnitte "AUSBAU DES VERGASERS" in Kapitel 4.
1	Schraube	4	
2	Abdeckung	1	
3	Dichtung	1	
4	Pumpengehäuse	1	
5	Membran	1	
6	Packung	1	
7	Schraube	2	
8	Ventil	2	
9	Mutter	2	
			Zum Einbauen die Ausbauschritte in umgekehrter Reihenfolge ausführen.

OIL TANK
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

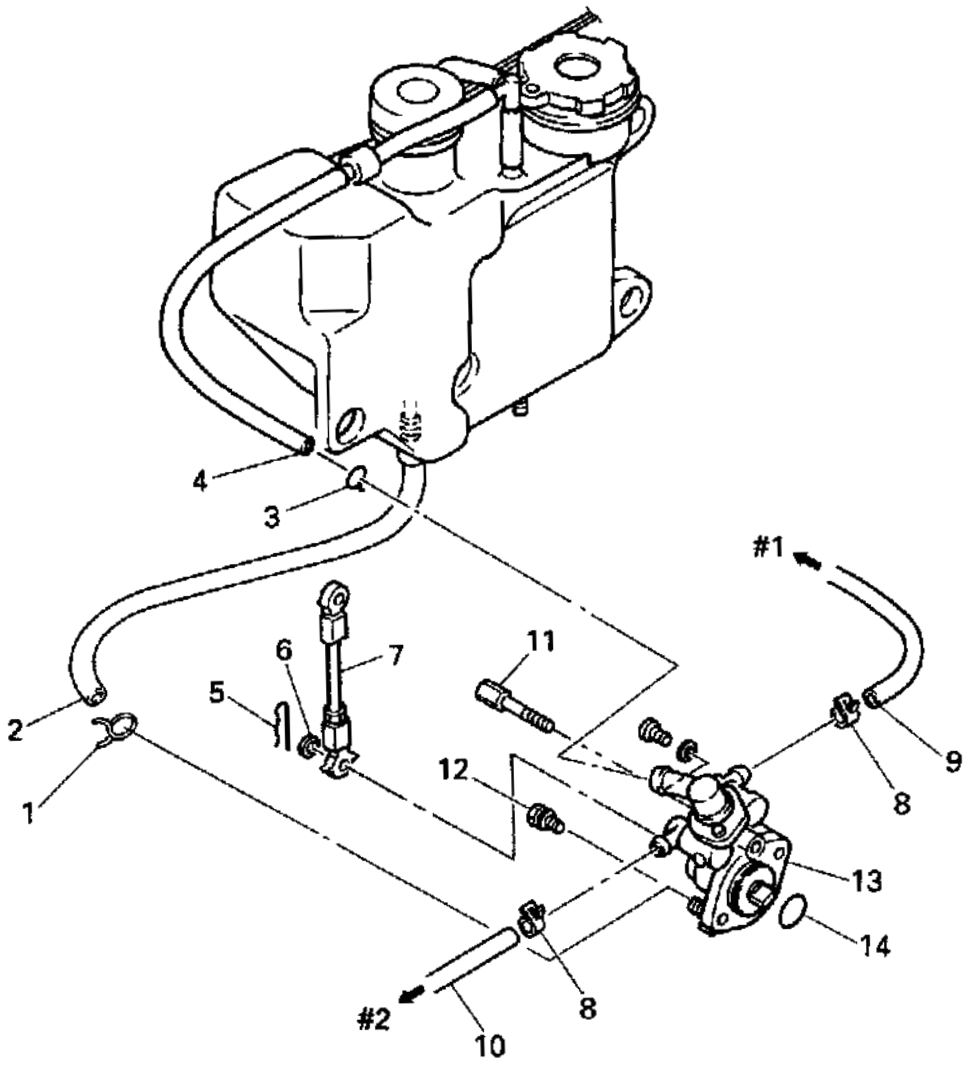
Step	Procedure/Part name	Q'ty	Service points
	OIL TANK REMOVAL		Follow the left "Step" for removal.
1	Oil drain hose	1	Drain the oil from the tank. 330 mm
2	Clip	1	
3	Inlet hose	1	240 mm
4	Clip	1	
5	Breather hose	1	610 mm
6	Bolt	1	
7	Clamp	1	
8	Bolt	1	
9	Ground terminal	1	
10	Connector	1	
11	Bolt	3	
12	Oil tank assembly	1	
	OIL TANK DISASSEMBLY		
①	Oil level sensor	1	
②	Oil strainer	1	
③	Gasket	1	
④	Filler cap	1	
⑤	Clip	1	
⑥	Inlet hose	1	
⑦	Breather hose	1	610 mm
⑧	Check valve	1	
⑨	Hose	1	30 mm
⑩	Drain hose	1	330 mm
⑪	Connector	1	
⑫	Hose	1	30 mm
⑬	Collar	3	
⑭	Grommet	3	
⑮	Oil tank	1	
			Reverse the removal steps for installation.



Check valve inspection

1. Check:
   - Check valve (flow one way)
     Back flow → Replace.

OIL PUMP
EXPLODED DIAGRAM
ÖLPUMPE
EXPLOSIONSZEICHNUNG



REMOVAL AND INSTALLATION CHART

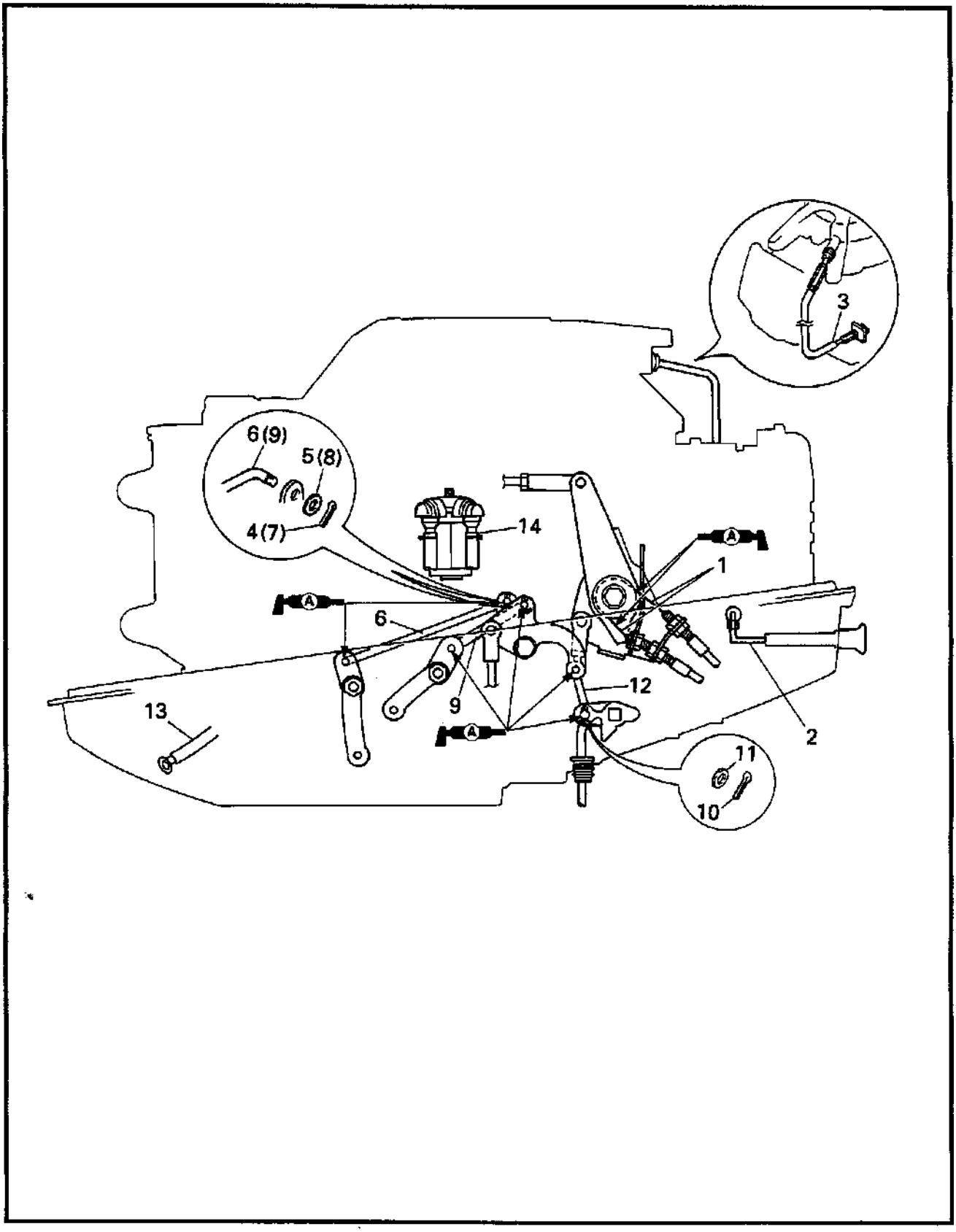
Step	Procedure/Part name	Q'ty	Service points
	OIL PUMP REMOVAL		Follow the left "Step" for removal.
	Engine oil		Refer to "OIL TANK" section in chapter 4.
1	Clip	1	
2	Inlet hose	1	240 mm
3	Clip	1	
4	Breather hose	1	610 mm
5	Clip	1	
6	Washer	1	
7	Link	1	
8	Clip	2	
9	Delivery hose #1	1	85 mm
10	Delivery hose #2	1	50 mm
11	Bolt	1	
12	Bolt	1	
13	Oil pump	1	
14	O-ring	1	
			Reverse the removal steps for installation.

AUSBAU- UND EINBAUTABELLE

Schritt	Verfahren/Teilebezeichnung	Anzahl	Wartungspunkte
	AUSBAU DER ÖLPUMPE		Den Punkten der Spalte "Schritt" links zum Ausbau folgen.
	Motoröl		Siehe Abschnitt "ÖLTANK" in Kapitel 4.
1	Clip	1	
2	Einlaßschlauch	1	240 mm
3	Clip	1	
4	Lüftungsschlauch	1	610 mm
5	Clip	1	
6	Unterlegscheibe	1	
7	Gestänge	1	
8	Clip	2	
9	Zuführschlauch Nr. 1	1	85 mm
10	Zuführschlauch Nr. 2	1	50 mm
11	Schraube	1	
12	Schraube	1	
13	Ölpumpe	1	
14	O-Ring	1	
			Zum Einbauen die Ausbauschritte in umgekehrter Reihenfolge ausführen.

CHAPTER 5
POWER UNIT

CONTROL CABLE, LINK AND HOSE
EXPLODED DIAGRAM
STEUERKABEL, GESTÄNGE UND SCHLAUCH
EXPLOSIONSZEICHNUNG



REMOVAL AND INSTALLATION CHART

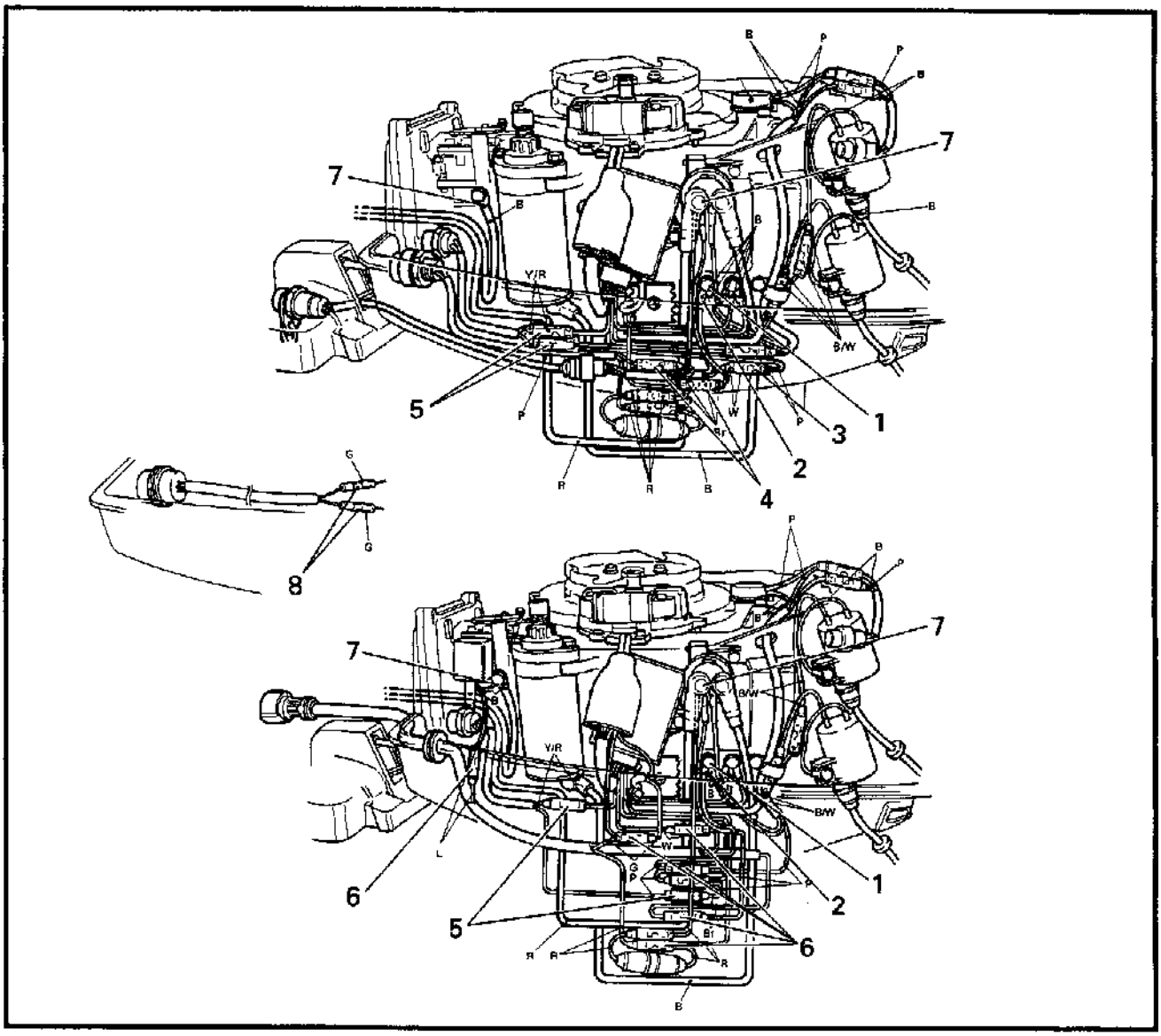
Step	Procedure/Part name	Q'ty	Service points
	CONTROL CABLE, LINK AND HOSE REMOVAL		Follow the left "Step" for removal.
1	Throttle cable	2	Tiller handle
2	Choke lever rod	1	Tiller handle model
3	Start-in-gear protection wire	1	with recoil starter model
4	Cotter pin	1	Remote control model
5	Washer	1	
6	Shift link	1	
7	Cotter pin	1	
8	Washer	1	
9	Throttle link	1	
10	Cotter pin	1	
11	Washer	1	
12	Shift actuator link	1	
13	Pilot water hose	1	
14	Fuel hose	1	
			Reverse the removal steps for installation.

AUSBAU- UND EINBAUTABELLE

Schritt	Verfahren/Teilebezeichnung	Anzahl	Wartungspunkte
	AUSBAU VON STEUERKABEL, GESTÄNGE UND SCHLAUCH		Den Punkten der Spalte "Schritt" links zum Ausbau folgen.
1	Gaszug	2	Ruderpinnengriff
2	Chokehebelstange	1	Ruderpinnengriff-Modell
3	Draht-Startsperre	1	mit Handrücklaufstarter
4	Splintstift	1	Modell mit Fernsteuerung
5	Unterlegscheibe	1	
6	Schaltgestänge	1	
7	Splintstift	1	
8	Unterlegscheibe	1	
9	Gasgestänge	1	
10	Splintstift	1	
11	Unterlegscheibe	1	
12	Schaltstellglied-Gestänge	1	
13	Leerlaufwasserschlauch	1	
14	Kraftstoffschlauch	1	
			Zum Einbauen die Ausbauschritte in umgekehrter Reihenfolge ausführen.

LEAD WIRE

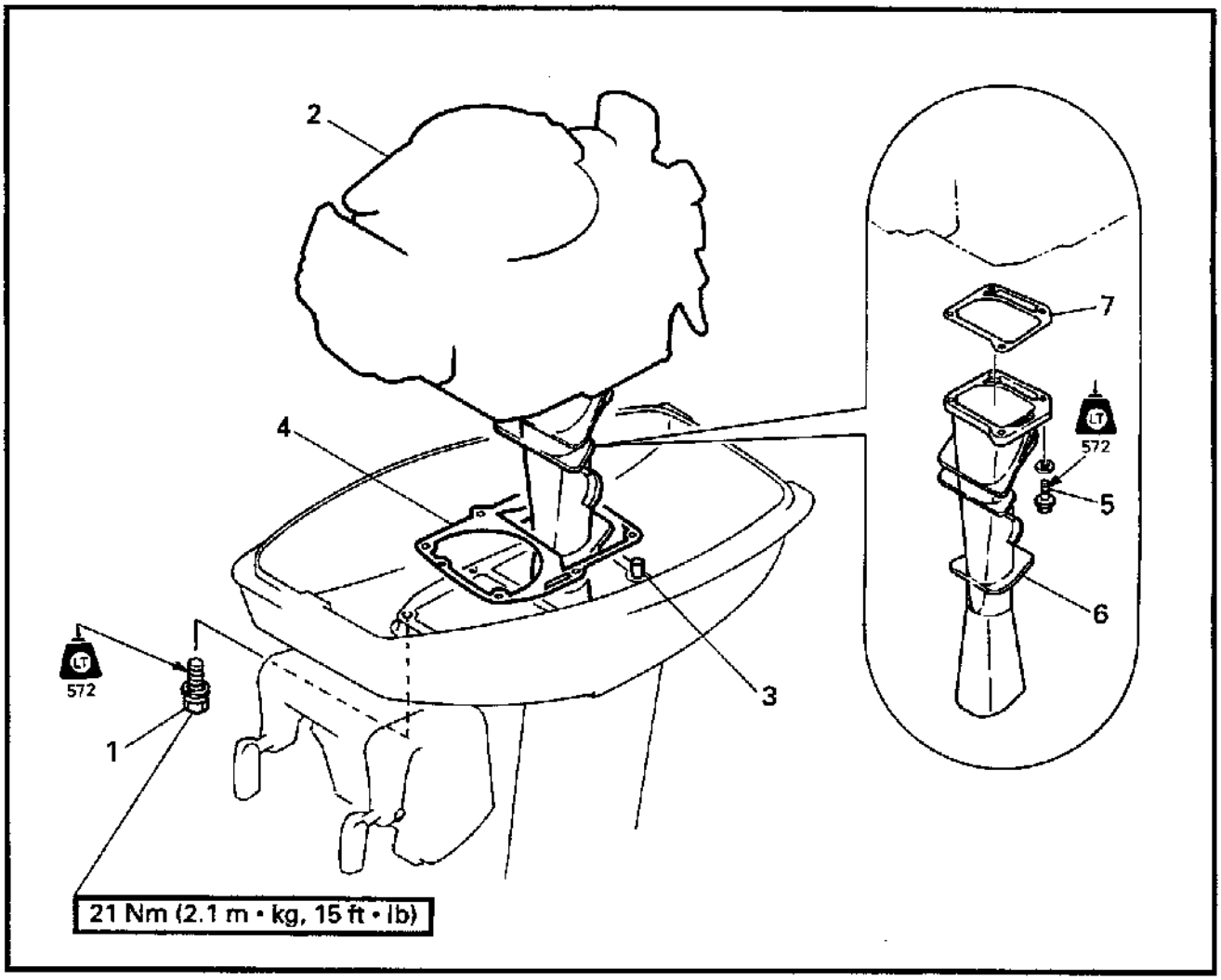
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
*	**LEAD WIRE REMOVAL**		Follow the left "Step" for removal.
1	Bolt	1	Tiller handle model 6 × 12 mm
2	Engine stop switch terminal	1	
3	Engine stop switch connector	1	
4	Starter switch connector	2	EH model (red, brown)
5	Warning lamp connector	2	Oil injection model (pink, yellow/red)
6	Remote control harness coupler	6	Remote control model
7	Battery cable	2	Electric start model (ground and positive)
8	2P connector	2	Europe model (green, green)
			Reverse the removal steps for installation.

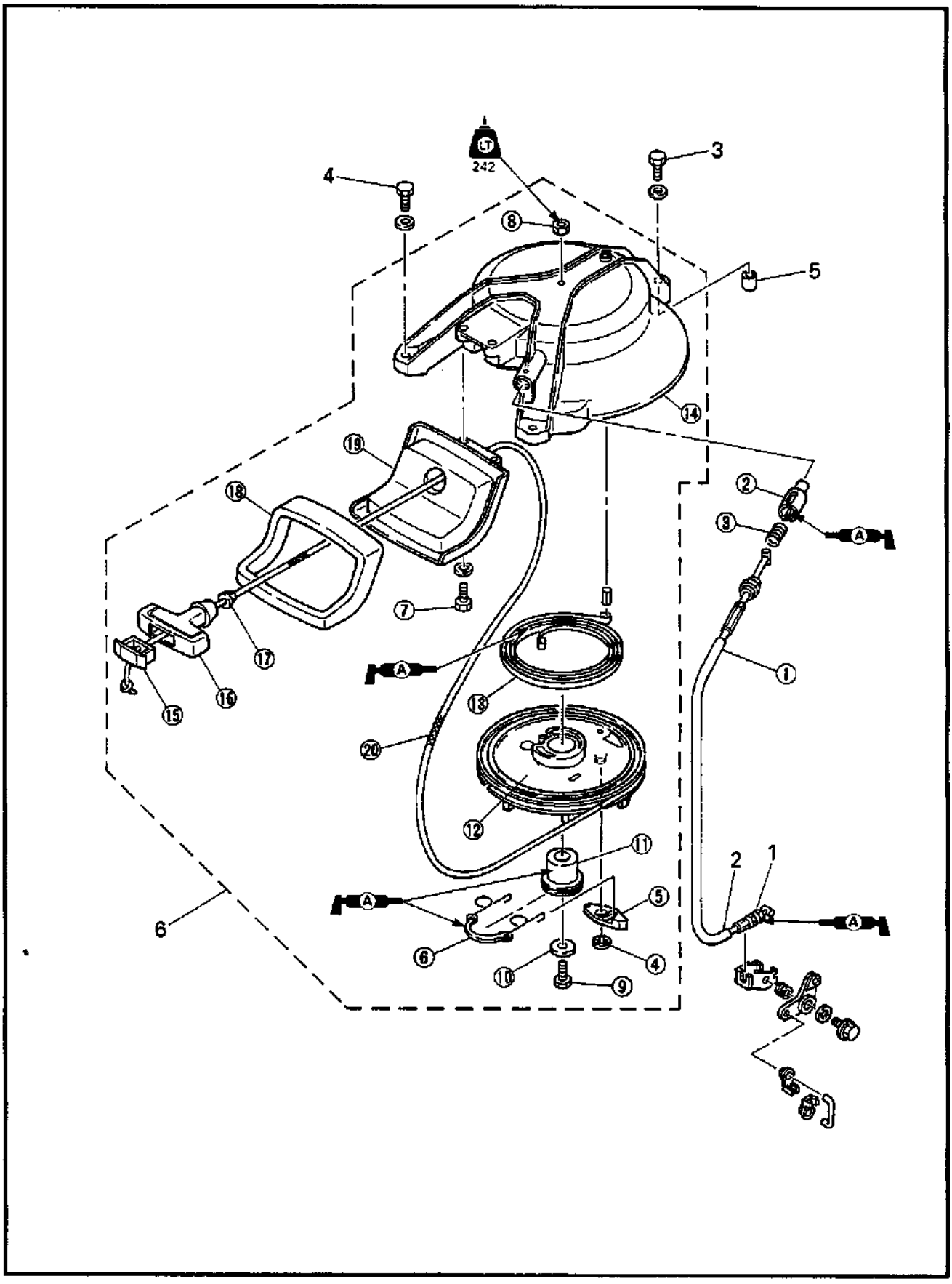
POWER UNIT
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

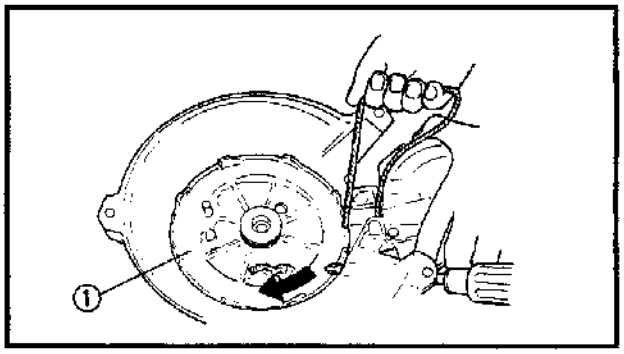
Step	Procedure/Part name	Q'ty	Service points
	POWER UNIT REMOVAL		Follow the left "Step" for removal.
	Control cable, link and hose		Refer to "CONTROL LINK, CABLE AND HOSE REMOVAL" section in chapter 5.
	Lead wire		Refer to "READ WIRE REMOVAL" section in chapter 5.
1	Bolt	6	8 × 30 mm
2	Power unit assembly	1	
3	Dowel pin	2	
4	Upper casing gasket	1	
5	Bolt	4	6 × 20 mm
6	Exhaust manifold	1	
7	Exhaust manifold gasket	1	
			Reverse the removal steps for installation.

RECOIL STARTER
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	RECOIL STARTER REMOVAL		Follow the left "Step" for removal.
1	Lock nut	1	
2	Start-in-gear protection wire	1	
3	Bolt	1	6 × 35 mm
4	Bolt	2	6 × 25 mm
5	Collar	1	10 × 14 mm
6	Recoil starter assembly	1	
	RECOIL STARTER DISASSEMBLY		
①	Start-in-gear protection wire	1	
②	Plunger	1	
③	Spring	1	
④	Circlip	1	
⑤	Drive pawl	1	
⑥	Drive paul spring	1	
⑦	Bolt	2	6 × 16 mm
⑧	Nut	1	
⑨	Bolt	1	6 × 25 mm
⑩	Washer	1	
⑪	Bushing	1	
⑫	Sheave drum	1	
⑬	Spiral spring	1	**NOTE:** ● When installing the new spiral spring, do not cut the wire holding the spring. ● When reusing the spiral spring, set the leading end first in the case and then fit one turn each time.
⑭	Starter case	1	
⑮	Cover	1	
⑯	Starter handle	1	
⑰	Damper	1	
⑱	Seal	1	
⑲	Rope guide	1	
⑳	Rope	1	1,950 mm Reverse the removal steps for installation.



SERVICE POINTS

Sheave drum removal

1. Turn:
   - Sheave drum ①

   Turn the sheave drum clockwise until the spiral spring is free.

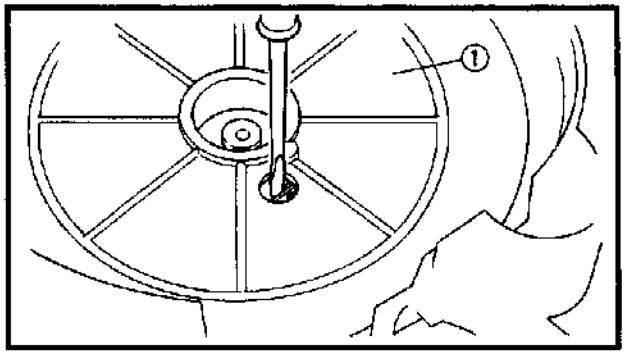
NOTE:

- Turn the sheave drum so that the cutaway on the outer surface of the sheave drum faces toward the starter handle.
- Pass the starter rope through the cut.

2. Remove:
   - Sheave drum ①

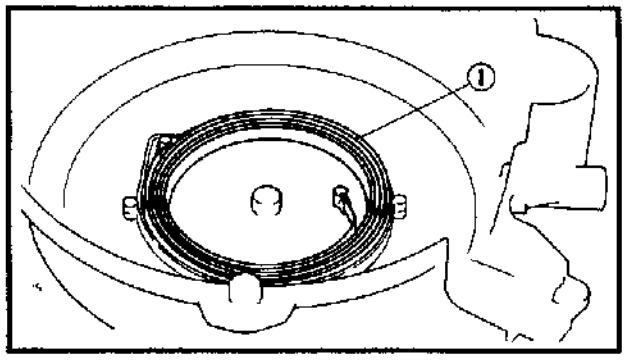
⚠ WARNING

When removing the sheave drum, be sure to turn the sheave drum upside down to prevent the spiral spring from popping up at you.



NOTE:

Insert a slotted-head screwdriver into the hole in the sheave drum, and remove the spiral spring from the sheave drum by pushing the spring.

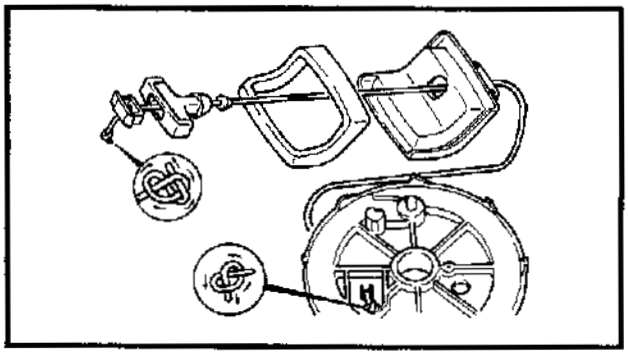


Spiral spring removal

1. Remove:
   - Spiral spring ①

⚠ WARNING

Be careful so that the spiral spring does not pop out when removing it. Remove it by allowing it out one turn of the winding each time.



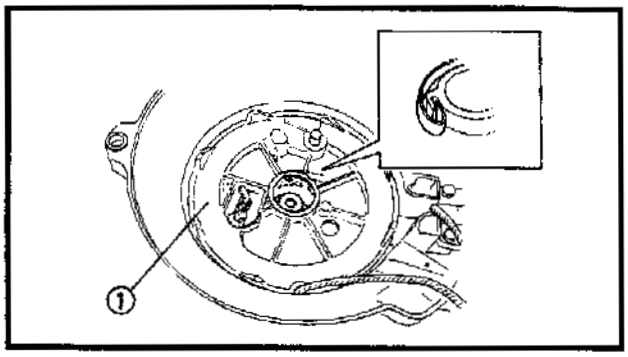
Starter rope installation

1. Install:
   - Starter rope

Starter rope length:
1,950 mm (76.8 in)

NOTE:

- Insert the rope through the rope holes and knot the end.
- Wind the rope 1-9/10 turns around the sheave drum.
- Place the rope at the cutaway.

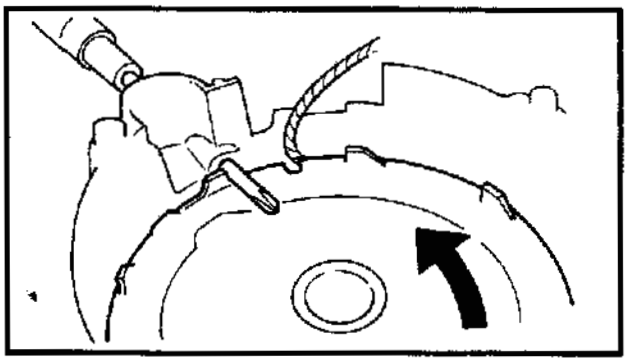


Sheave drum installation

1. Install:
   - Sheave drum ①

NOTE:

Position the inner end of the spiral spring on the retainer post of the sheave drum.

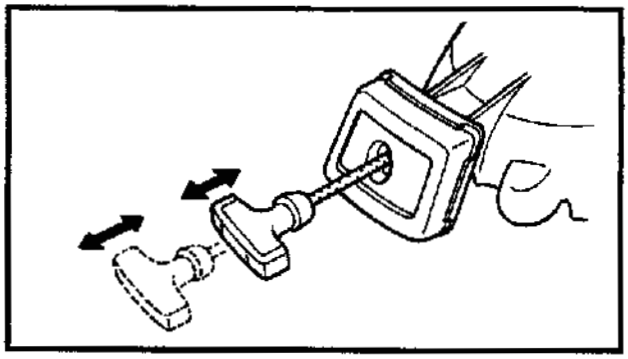


Spiral spring setting

1. Set:
   - Spiral spring

NOTE:

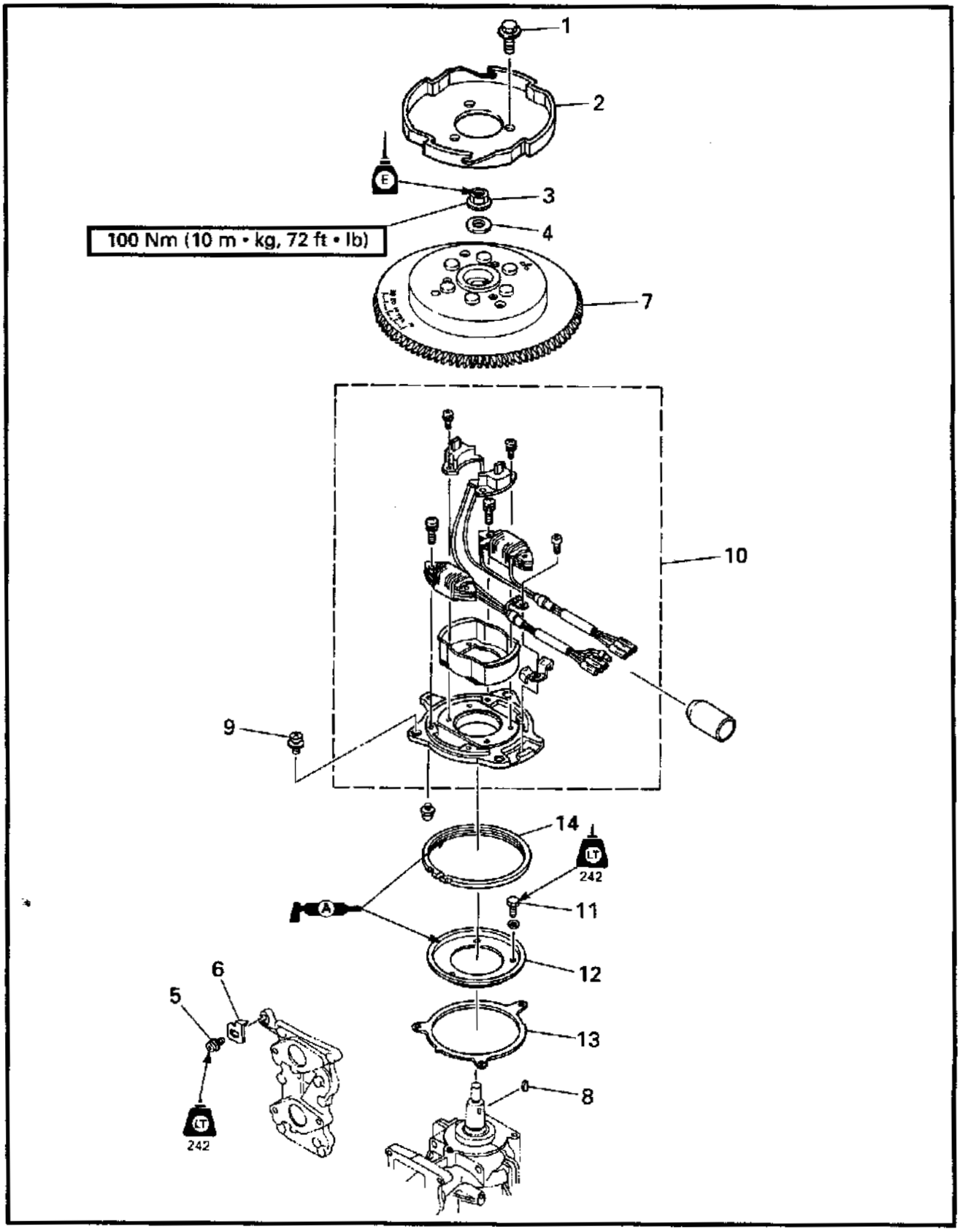
Wind up the spring 2-1/2 turns counterclockwise with the starter rope.



Recoil starter checking

1. Check:
   - Starter operation
     Unsmooth operation → Repair.

STATOR
EXPLODED DIAGRAM
STATOR
EXPLOSIONSZEICHNUNG

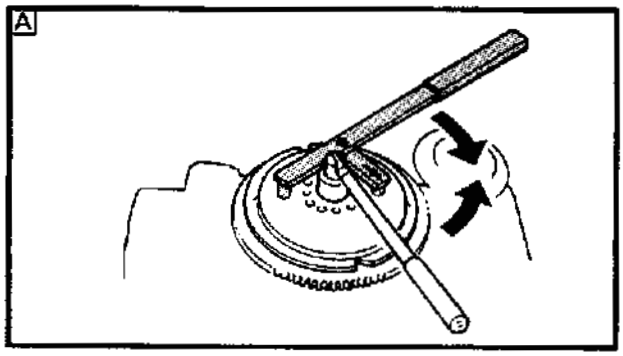


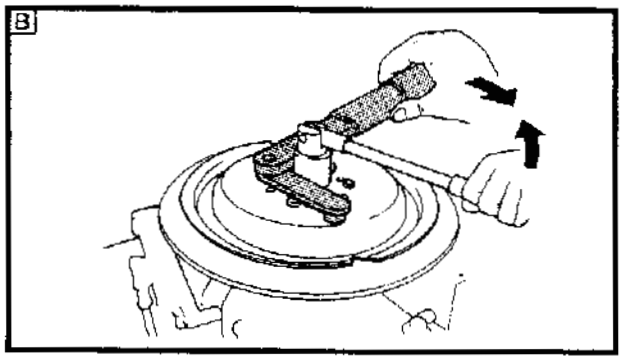
REMOVAL AND INSTALLATION CHART

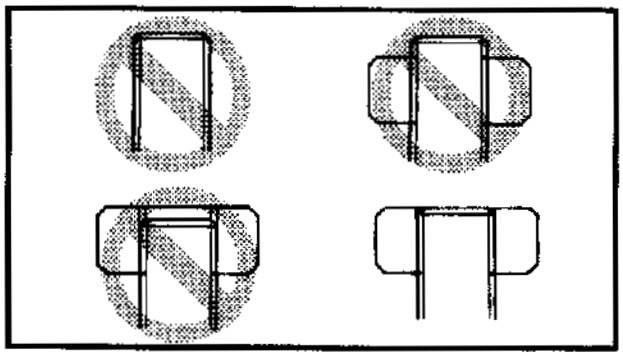
Step	Procedure/Part name	Q'ty	Service points
	STATOR REMOVAL		Follow the left "Step" for removal.
	Recoil starter assembly		Refer to "RECOIL STARTER REMOVAL" section in chapter 5.
1	Flange bolt	3	8 × 14 mm
2	Starter pulley	1	
3	Flywheel nut	1	
4	Washer	1	
5	Screw	1	5 × 10 mm
6	Timing plate	1	
7	Flywheel	1	
8	Woodruff key	1	
9	Screw	3	5 × 10 mm
10	Stator	1	
11	Bolt	3	6 × 12 mm
12	Friction ring	1	
13	Retainer plate	1	
14	Retainer ring	1	
			Reverse the removal steps for installation.

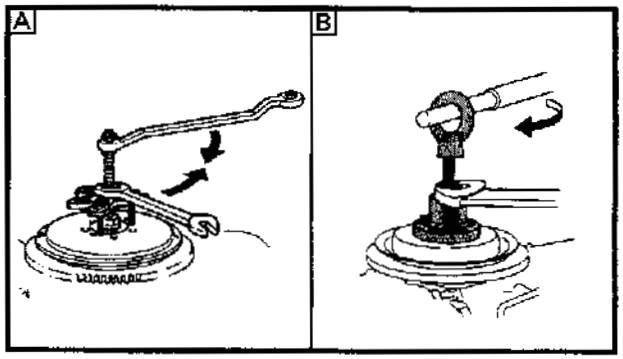
AUSBAU- UND EINBAUTABELLE

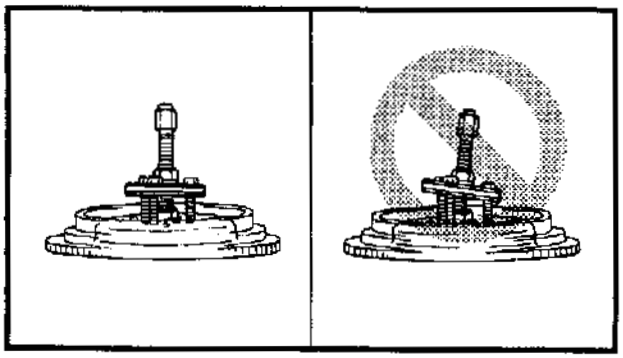
Schritt	Verfahren/Teilebezeichnung	Anzahl	Wartungspunkte
	AUSBAU DES STATOR		Den Punkten der Spalte "Schritt" links zum Ausbau folgen.
	Draht-Starrperren-Baugruppe		Siehe Abschnitt "AUSBAU DES HANDRÜCKLAUF-STARTERS" in Kapitel 5.
1	Flanschschraube	3	8 × 14 mm
2	Starterriemenscheibe	1	
3	Schwungradmutter	1	
4	Unterlegscheibe	1	
5	Schraube	1	5 × 10 mm
6	Steuerplatte	1	
7	Schwungrad	1	
8	Woodruffkeil	1	
9	Schraube	3	5 × 10 mm
*10	Stator	1	
11	Schraube	3	6 × 12 mm
12	Reibungsring	1	
13	Rückhalteplatte	1	
14	Rückhaltering	1	
			Zum Einbauen die Ausbauschritte in umgekehrter Reihenfolge ausführen.











SERVICE POINTS

Flywheel magneto removal

1. Remove:
   - Flywheel nut

	Flywheel holder: YB-06139/90890-06522

A For USA and CANADA
B Except for USA and CANADA

CAUTION:

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

2. Remove:
   - Flywheel magneto

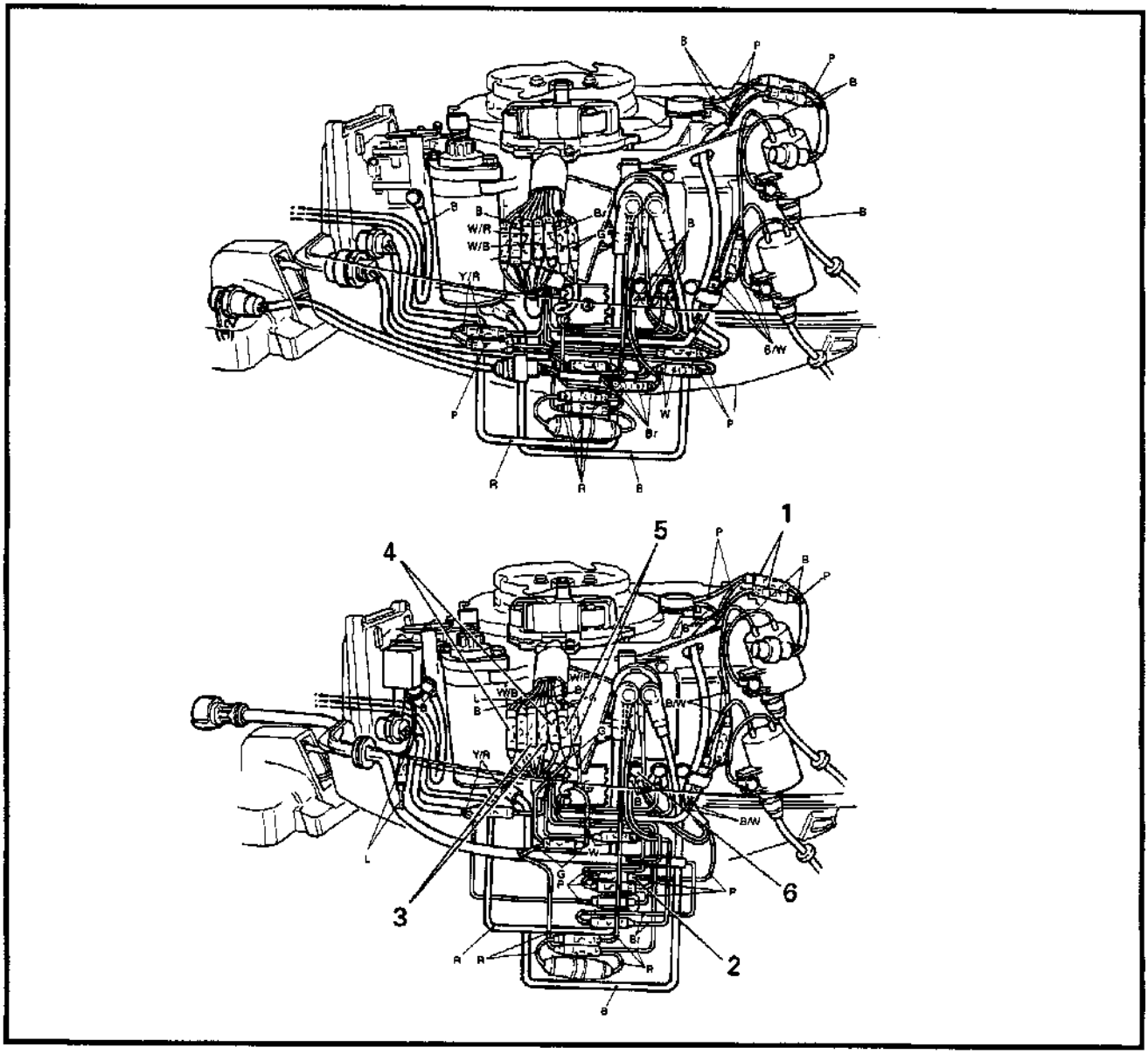
	Universal puller: YB-06117/90890-06521

A For USA and CANADA
B Except for USA and CANADA

CAUTION:

- **Keep the nut side flush with the crankshaft end until the flywheel comes off the tapered portion of the crankshaft.**
- **To prevent damage to the engine or tools, screw in the flywheel magneto-puller set-bolts evenly and completely so that the puller plate is parallel to the flywheel.**

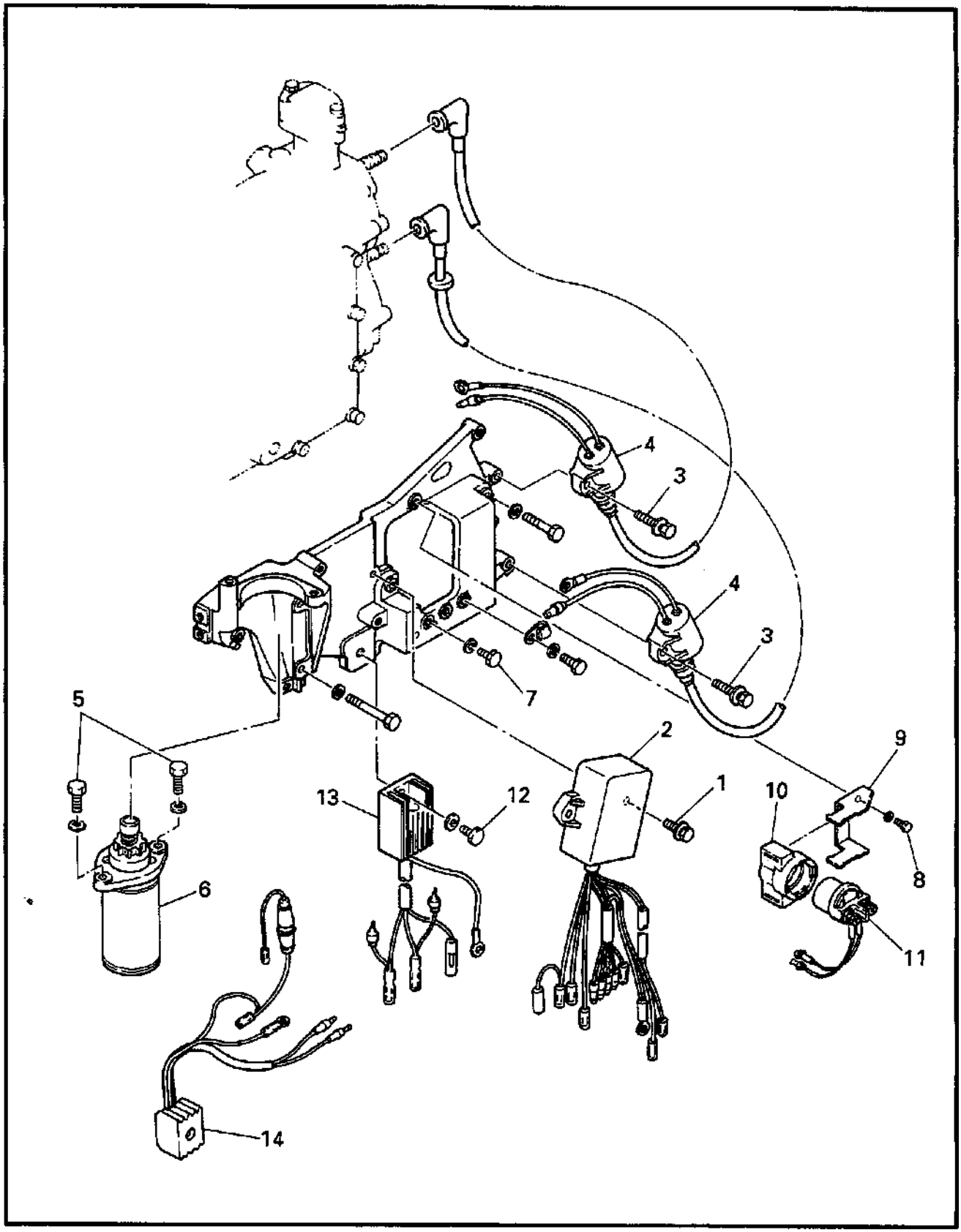
ELECTRICAL UNIT
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	ELECTRICAL UNIT REMOVAL		Follow the left "Step" for removal.
1	Thermo switch connector		25 HP
2	Oil level gauge connector		Oil injection model
3	Pulser coil connector		
4	Charge coil connector		
5	Lighting coil connector		
6	Bolt	3	6 × 30 mm
7	Bolt	2	6 × 45 mm
			Reverse the removal steps for installation.

ELECTRICAL UNIT DISASSEMBLY
EXPLODED DIAGRAM
ELEKTRISCHE EINHEIT
EXPLOSIONSZEICHNUNG



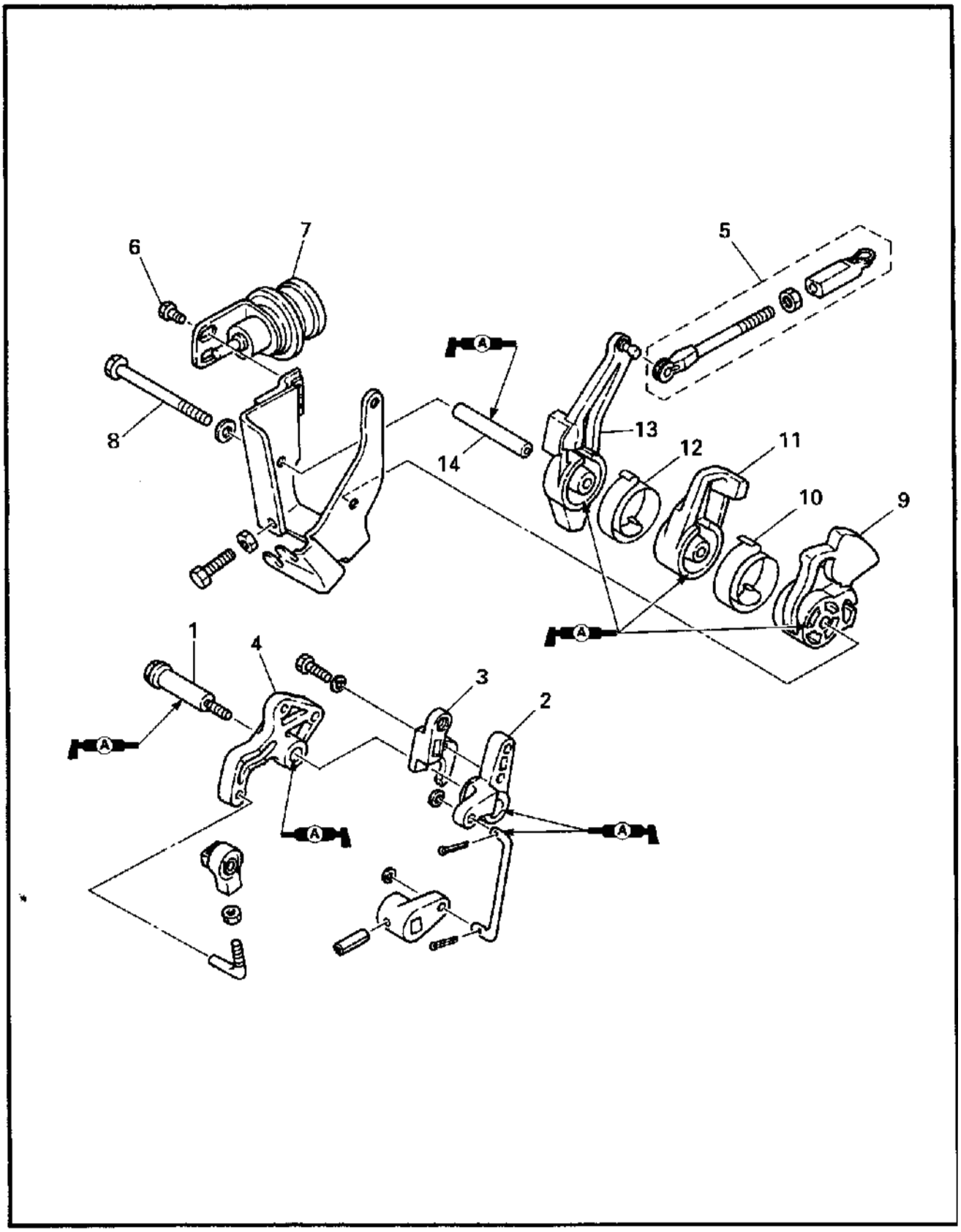
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	ELECTRICAL UNIT DISASSEMBLY		Follow the left "Step" for removal.
	Electrical unit		Refer to "ELECTRICAL UNIT REMOVAL" section in chapter 5.
1	Bolt	2	6 × 20 mm
2	CDI unit	1	
3	Bolt	2	6 × 20 mm
4	Ignition coil	2	
5	Bolt	2	8 × 25 mm
6	Starting motor	1	
7	Bolt	2	6 × 12 mm
8	Bolt	3	6 × 12 mm
9	Bracket	1	
10	Holder	1	
11	Starter relay	1	
12	Bolt	1	5 × 25 mm
13	Rectifier-regulator	1	Europe model
14	Rectifier	1	Except for Europe
15	Neutral switch	1	
			Reverse the removal steps for installation.

AUSBAU- UND EINBAUTABELLE

Schritt	Verfahren/Teilebezeichnung	Anzahl	Wartungspunkte
	ZERLEGEN DER ELEKTRISCHEN EINHEIT		Den Punkten der Spalte "Schritt" links zum Ausbau folgen.
	Elektrische Einheit		Siehe Abschnitt "AUSBAU DER ELEKTRISCHEN EINHEIT" in Kapitel 5.
1	Schraube	2	6 × 20 mm
2	CDI-Einheit	1	
3	Schraube	2	6 × 20 mm
4	Zündspule	2	
5	Schraube	2	8 × 25 mm
6	Startermotor	1	
7	Schraube	2	6 × 12 mm
8	Schraube	3	6 × 12 mm
9	Halterung	1	
10	Halter	1	
11	Starterrelais	1	
12	Schraube	1	5 × 25 mm
13	Gleichrichter-Regulator	1	Europa-Modell
14	Gleichrichter	1	Außer Europa
15	Leerlaufschalter	1	
			Zum Einbauen die Ausbauschritte in umgekehrter Reihenfolge ausführen.

CONTROL UNIT
EXPLODED DIAGRAM
STEUEREINHET
EXPLOSIONSZEICHNUNG



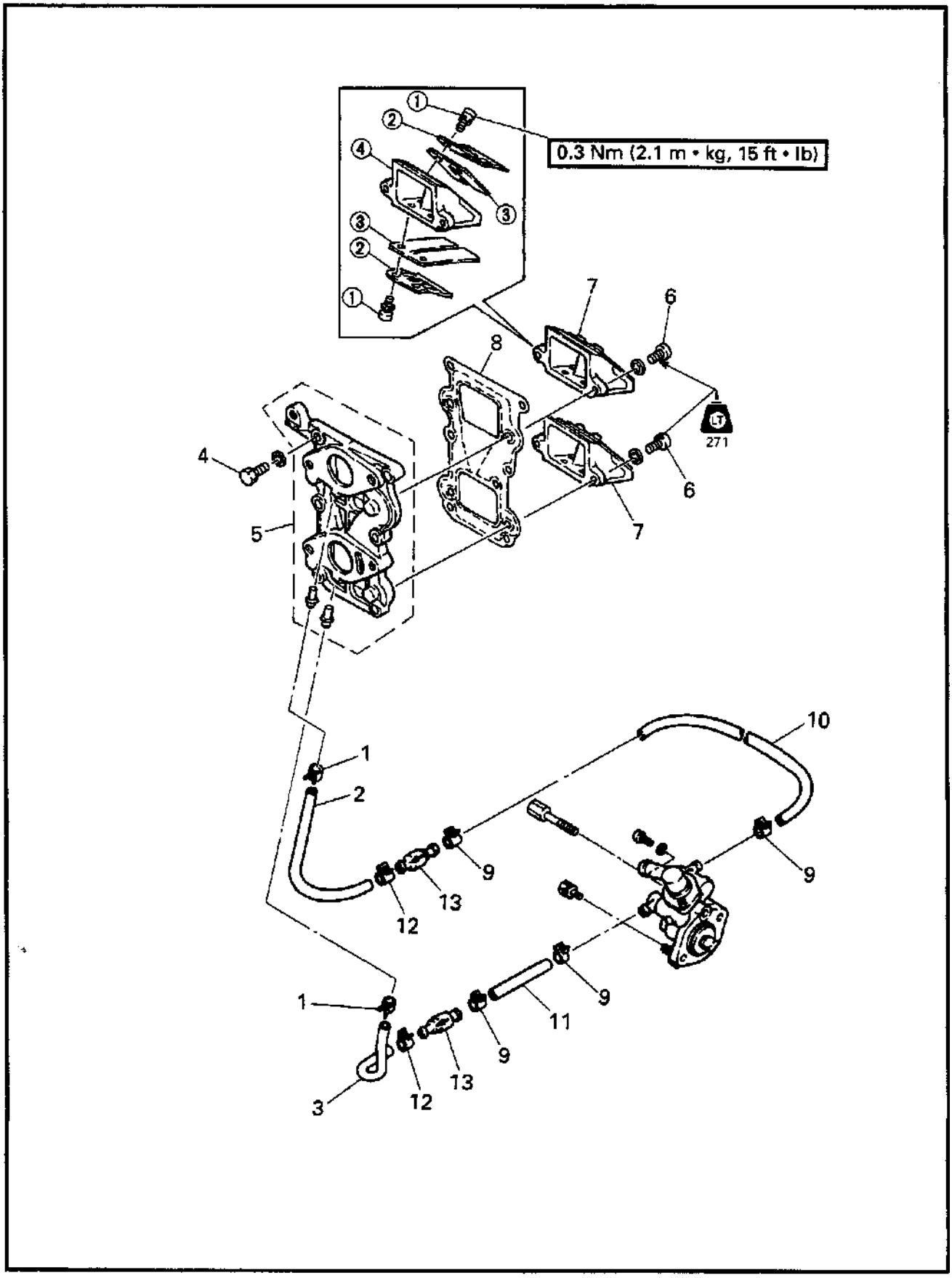
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CONTROL UNIT REMOVAL		Follow the left "Step" for removal.
	Power unit		Refer to "POWER UNIT REMOVAL" section in chapter 5.
1	Bolt	1	6 × 49 mm
2	Shift rod arm	1	
3	Shift rod link	1	
4	Accelerator cam	1	
5	Control rod	1	
6	Bolt	1	6 × 8 mm
7	Diaphragm unit	1	
8	Bolt	1	6 × 75 mm
9	Accelerator cam	1	
10	Spring	1	
11	Accelerator lever	1	
12	Spring	1	
13	Control lever	1	
14	Collar	1	
			Reverse the removal steps for installation.

AUSBAU- UND EINBAUTABELLE

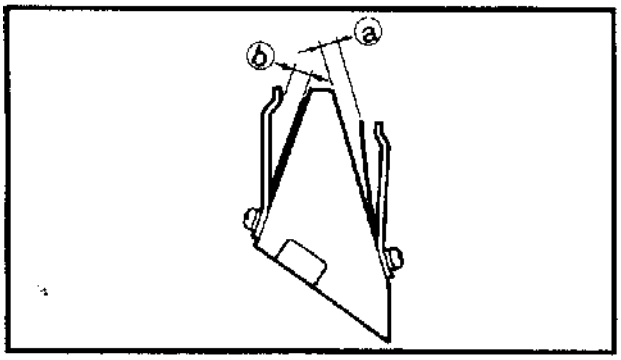
Schritt	Verfahren/Teilebezeichnung	Anzahl	Wartungspunkte
	AUSBAU DER STEUEREINHET		Den Punkten der Spalte "Schritt" links zum Ausbau folgen.
	Motorblock		Siehe Abschnitt "AUSBAU DER ANTRIEBSEINHEIT" in Kapitel 5.
1	Schraube	1	6 × 49 mm
2	Schaltstangenarm	1	
3	Schaltstangengestänge	1	
4	Beschleunigungsnocke	1	
5	Steuerstange	1	
6	Schraube	1	6 × 8 mm
7	Membraneinheit	1	
8	Schraube	1	6 × 75 mm
9	Beschleunigungsnocke	1	
*10	Feder	1	
11	Gashebel	1	
12	Feder	1	
13	Steuerhebel	1	
14	Muffe	1	
			Zum Einbauen die Ausbauschritte in umgekehrter Reihenfolge ausführen.

REEDVALVE
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	REED VALVE		Follow the left "Step" for removal.
	Oil tank assembly		Refer to "OIL TANK" section in chapter 4.
	Carburetor assembly		Refer to "CARBUTETOR REMOVAL" section in chapter 4.
1	Clip	2	Oil injection model
2	Delivery hose	1	85 mm
3	Delivery hose	1	50 mm
4	Bolt	6	6 × 25 mm
5	Intake manifold assembly	1	
6	Screw	4	5 × 16 mm
7	Reed valve assembly	2	
8	Gasket	1	
9	Clip	2	Oil injection model
10	Delivery hose	1	120 mm
11	Delivery hose	1	120 mm
12	Clip	2	
13	Check valve	2	
	REED VALVE DISASSEMBLY		
①	Screw	4	
②	Valve stopper	2	
③	Reed valve	2	
④	Reed valve body	1	
			Reverse the removal steps for installation.



SERVICE POINTS

Reed valve inspection

1. Inspect:
   - Reed valve
     Crack/Damage → Replace.
2. Measure:
   - Valve bending ⓐ
     Out of specification → Replace.

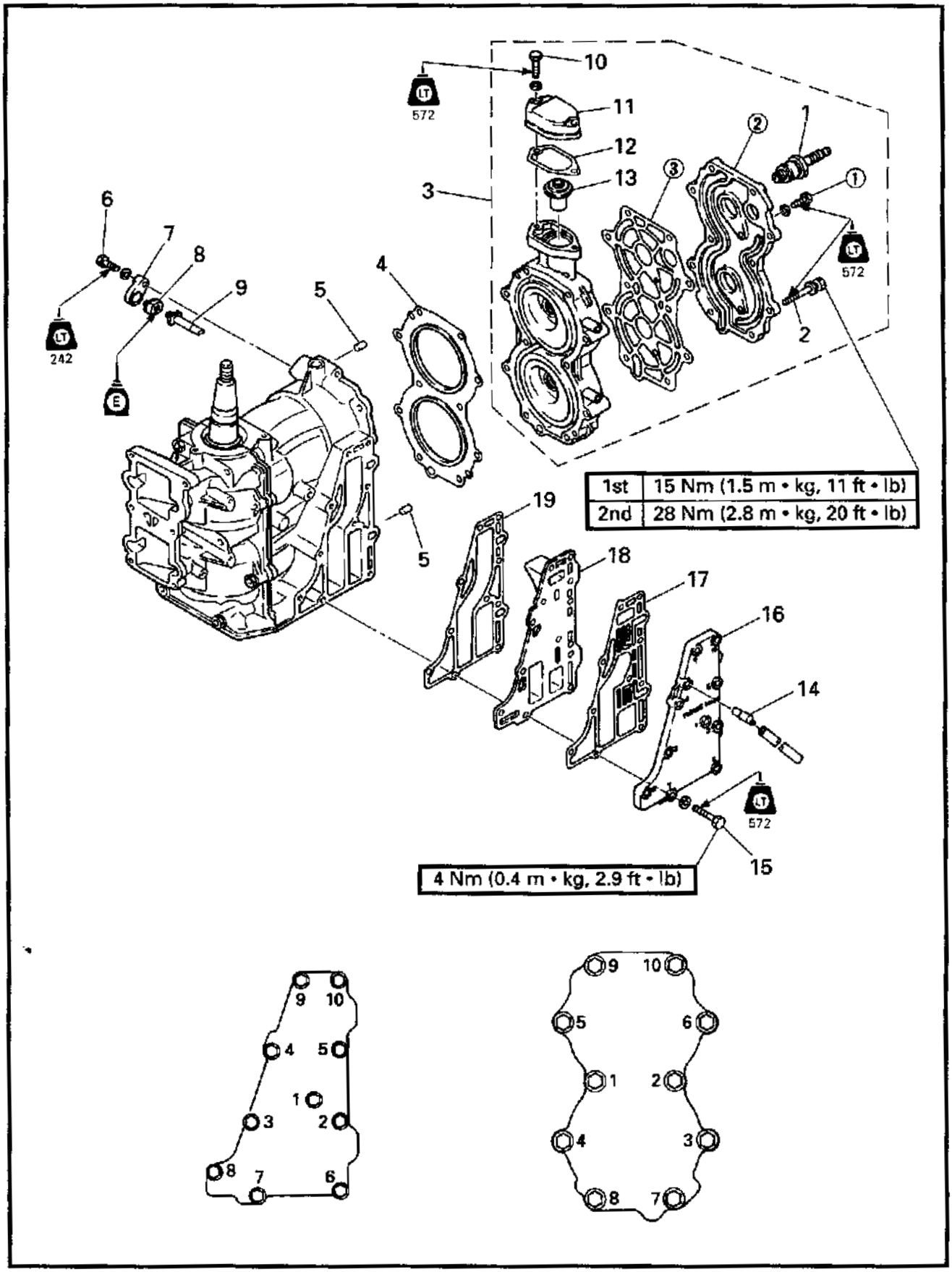
Valve bending limit:
0.2 mm (0.01 in)

3. Measure:
   - Valve stopper height ⓑ
     Out of specification → Replace.

Valve stopper height:
6.0 ± 0.2 mm (0.24 ± 0.01 in)

CYLINDER HEAD, THERMOSTAT AND EXHAUST COVER

EXPLODED DIAGRAM



CYLINDER HEAD, THERMOSTAT AND EXHAUST COVER

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CYLINDER HEAD REMOVAL		Follow the left "Step" for removal.
	Thermoswitch		
	Spark plug cap		
1	Spark plug	2	
2	Bolt (with washer)	10	8 × 55 mm **NOTE:** Tighten the bolts in sequence and in two steps of torque.
3	Cylinder head assembly	1	
4	Cylinder head gasket	1	
5	Dowel pin	2	
	ANODE REMOVAL		
6	Bolt	1	6 × 16 mm
7	Cover	1	
8	Anode	1	
9	Grommet	1	
	THERMOSTAT REMOVAL		
10	Bolt	2	6 × 25 mm
11	Thermostat cover	1	
12	Gasket	1	
13	Thermostat	1	
	EXHAUST COVER REMOVAL		
14	Pilot water hose	1	
15	Bolt	10	6 × 30 mm **NOTE:** Tighten the bolts in sequence and in two steps of torque.
16	Exhaust outer cover	1	
17	Outer cover gasket	1	
18	Exhaust inner cover	1	
19	Outer inner gasket	1	
	CYLINDER HEAD DISASSEMBLY		
①	Bolt (with washer)	2	6 × 16 mm
②	Cylinder head cover	1	
③	Head cover gasket	1	
			Reverse the removal steps for installation.

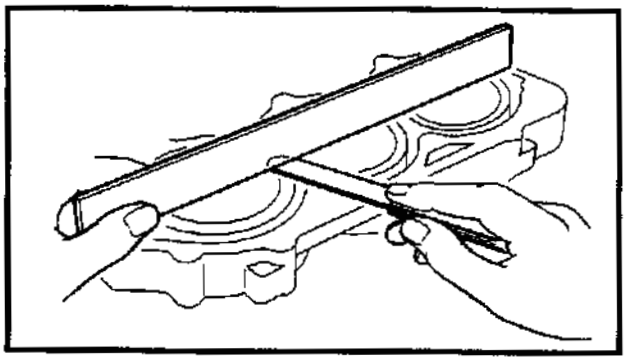
SERVICE POINTS

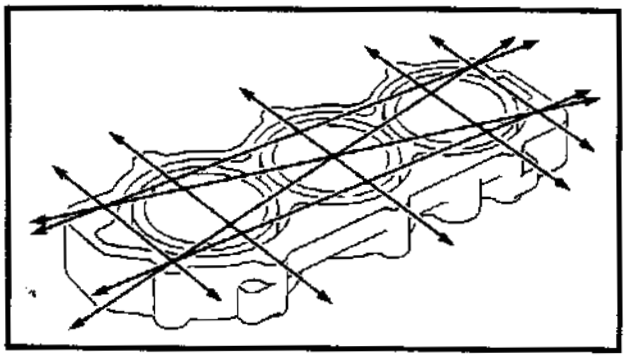
Cylinder head inspection

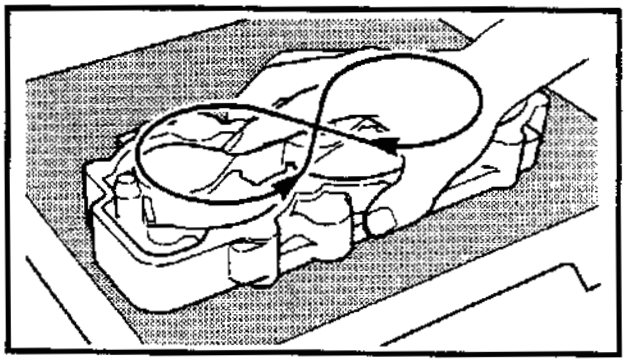
1. Inspect:
   - Water jacket
     Material deposit/Corrosion → Clean.
   - Cylinder inner surface
     Score marks → Clean.
     Use #600 ~ 800 grit wet sandpaper.

CAUTION:

Do not scratch the fitting surfaces of the cylinder and cylinder cover.







2. Measure:
   - Cylinder head warpage
     Use a straightedge and thickness gauge.
     Out of specification → Resurface or replace.

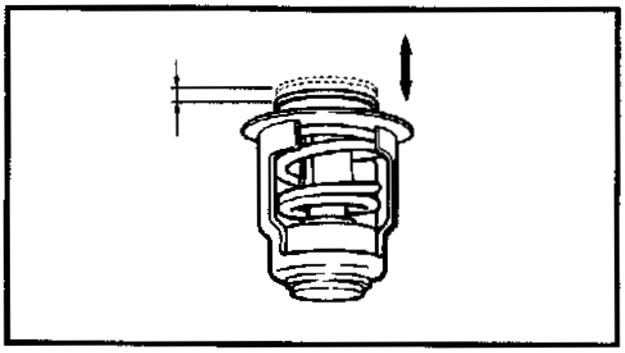
Warpage limit:
0.1 mm (0.004 in)

Resurfacing steps:

- Place a 400 ~ 600 grit wet sandpaper on the surface plate.
- Resurface the head using a figure-eight sanding pattern.

NOTE:

Rotate the head several times to avoid removing too much material from one side.



Thermostat inspection

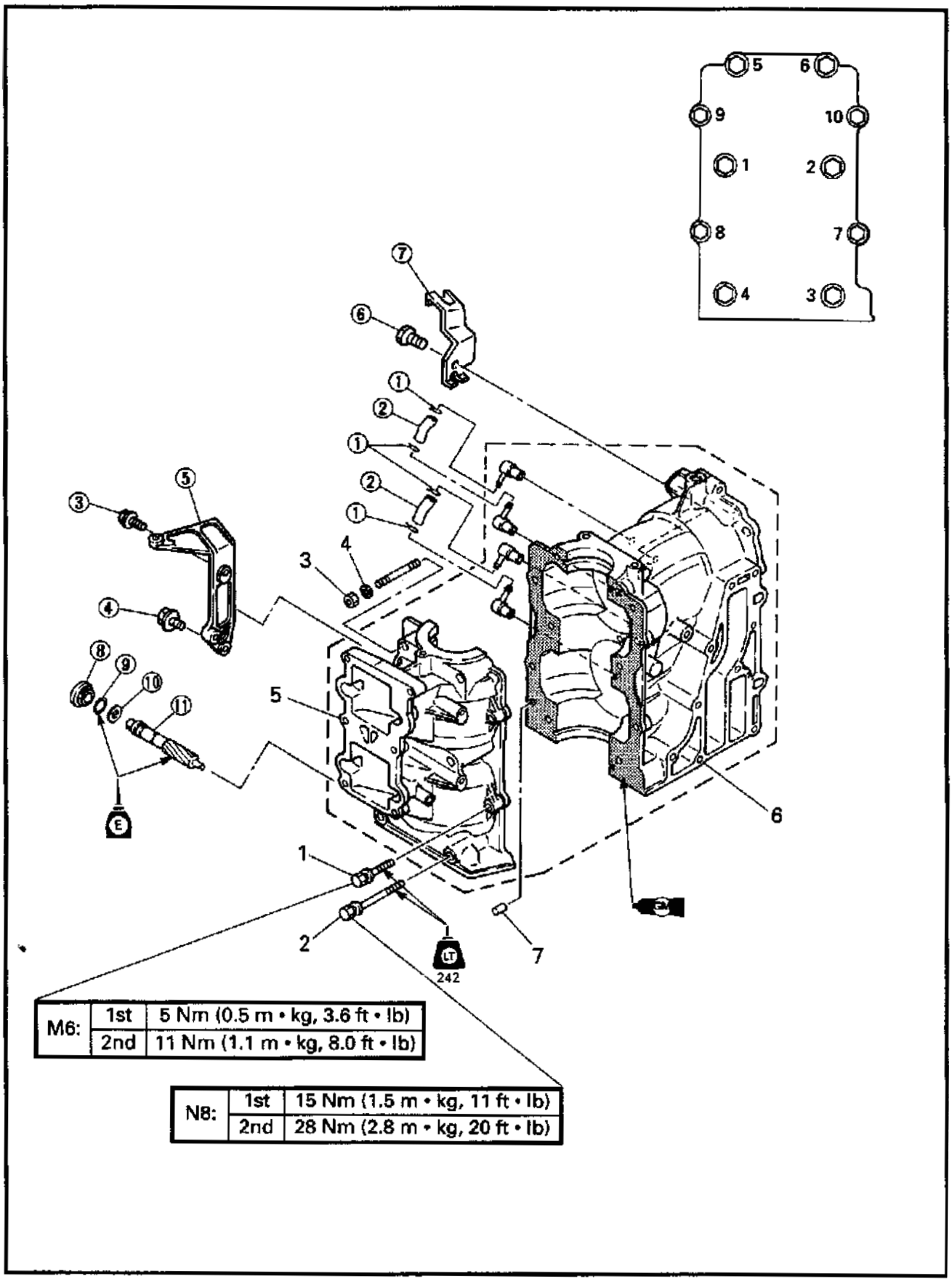
1. Inspect:
   - Thermostat
     Stick/Damage → Replace.
2. Measure:
   - Valve opening temperature
   - Valve lift
     Out of specification → Replace.

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

Measuring steps:

- Suspend thermostat in a vessel.
- Place reliable thermometer in a water.
- Heat water slowly.
- Observe thermometer, while stirring water continually.

CYLINDER BODY
EXPLODED DIAGRAM

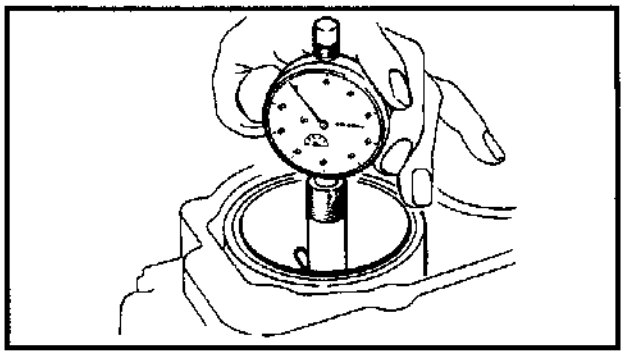


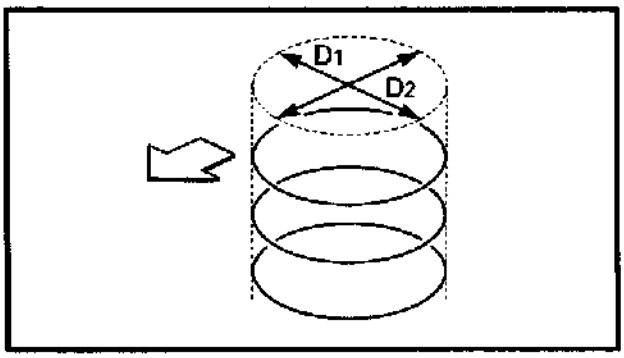
M6:	1st	5 Nm (0.5 m • kg, 3.6 ft • lb)
	2nd	11 Nm (1.1 m • kg, 8.0 ft • lb)

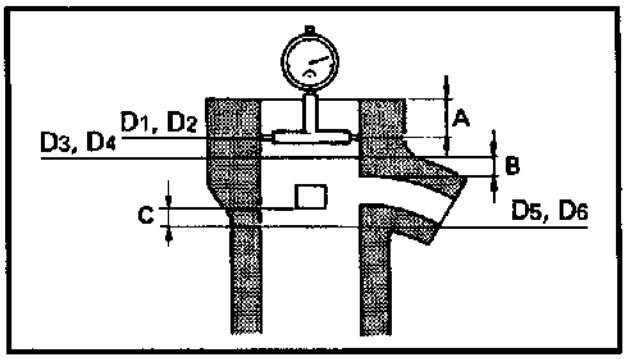
N8:	1st	15 Nm (1.5 m • kg, 11 ft • lb)
	2nd	28 Nm (2.8 m • kg, 20 ft • lb)

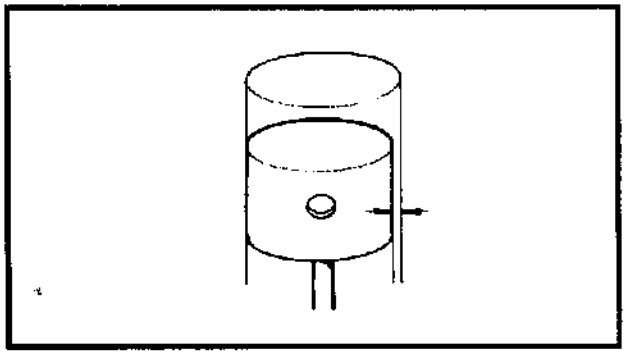
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CYLINDER BODY		Follow the left "Step" for removal.
	Power unit		Refer to "POWER UNIT REMOVAL" section in chapter 5.
	Oil tank assembly		Refer to "OIL TANK" section in chapter 4
	Oil pump		Refer to "OIL PUMP" section in chapter 4.
	Carburetor assembly		Refer to "CARBURETOR REMOVAL" section in chapter 4.
	Recoil starter assembly		Refer to "RECOIL STARTER REMOVAL" section in chapter 5.
	Flywheel and stator		Refer to "STATOR REMOVAL" section in chapter 5.
	Electrical unit assembly		Refer to "ELECTRICAL UNIT REMOVAL" section in chapter 5.
1	Bolt (with washer)	4	6 × 35 mm
2	Bolt (with washer)	4	8 × 60 mm
			NOTE: Tighten the bolts in sequence and in two steps of torque.
3	Nut	2	
4	Washer	2	
5	Crank case	1	
6	Cylinder body	1	**NOTE:** Film coat the crank case matching surface with Gasket Maker or equivalent.
7	Dowel pin	2	
	CRANK CASE DISASSEMBLY		
①	Clip	4	
②	Drainless hose	2	
③	Bolt	1	6 × 20 mm
④	Bolt (with washer)	1	6 × 20 mm
⑤	Recoil starter stay	1	
⑥	Bolt	1	6 × 14 mm
⑦	Fuel filter bracket	1	
⑧	Collar	1	Oil injection model
⑨	O-ring	1	
⑩	Washer	1	
⑪	Driven gear	1	
			Reverse the removal steps for installation.









SERVICE POINTS

1. Measure:
   - Cylinder bore "D"
     Out of specification → Rebore or replace.

NOTE:
Measure the cylinder bore "D" in parallel. Then, find the average of the measurement.

	Standard	Wear limit
Cylinder bore "D"	67.00 ~ 67.02 mm (2.638 ~ 2.639 in)	67.10 mm (2.642 in)
Taper limit "T"	—	0.08 mm (0.003 in)
Out of round limit	—	0.05 mm (0.002 in)

D = Maximum Dia. (D_1 – D_6)
T = (maximum D_1 or D_2) – (minimum D_5 or D_6)

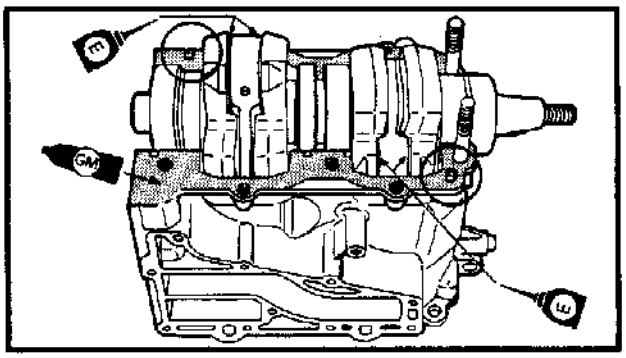
A: 10 mm (0.4 in) below the cylinder top
B: 5 mm (0.2 in) below the exhaust port
C: 5 mm (0.2 in) below the scavenging port

Piston to cylinder clearance

1. Calculate:
   - Piston clearance
     Out of specification → Replace piston and piston ring and/or cylinder.

Piston clearance	=	Cylinder bore	–	Piston diameter

Piston clearance:
0.040 ~ 0.045 mm
(0.0016 ~ 0.0018 in)



Cylinder body and crankcase installation

1. Install:
   - Cylinder body
   - Crankshaft and piston

NOTE:

- Align the piston ring end gaps with the respective locating pins.
- Fit the bearing and the labyrinth seal locating pins in the cylinder body.

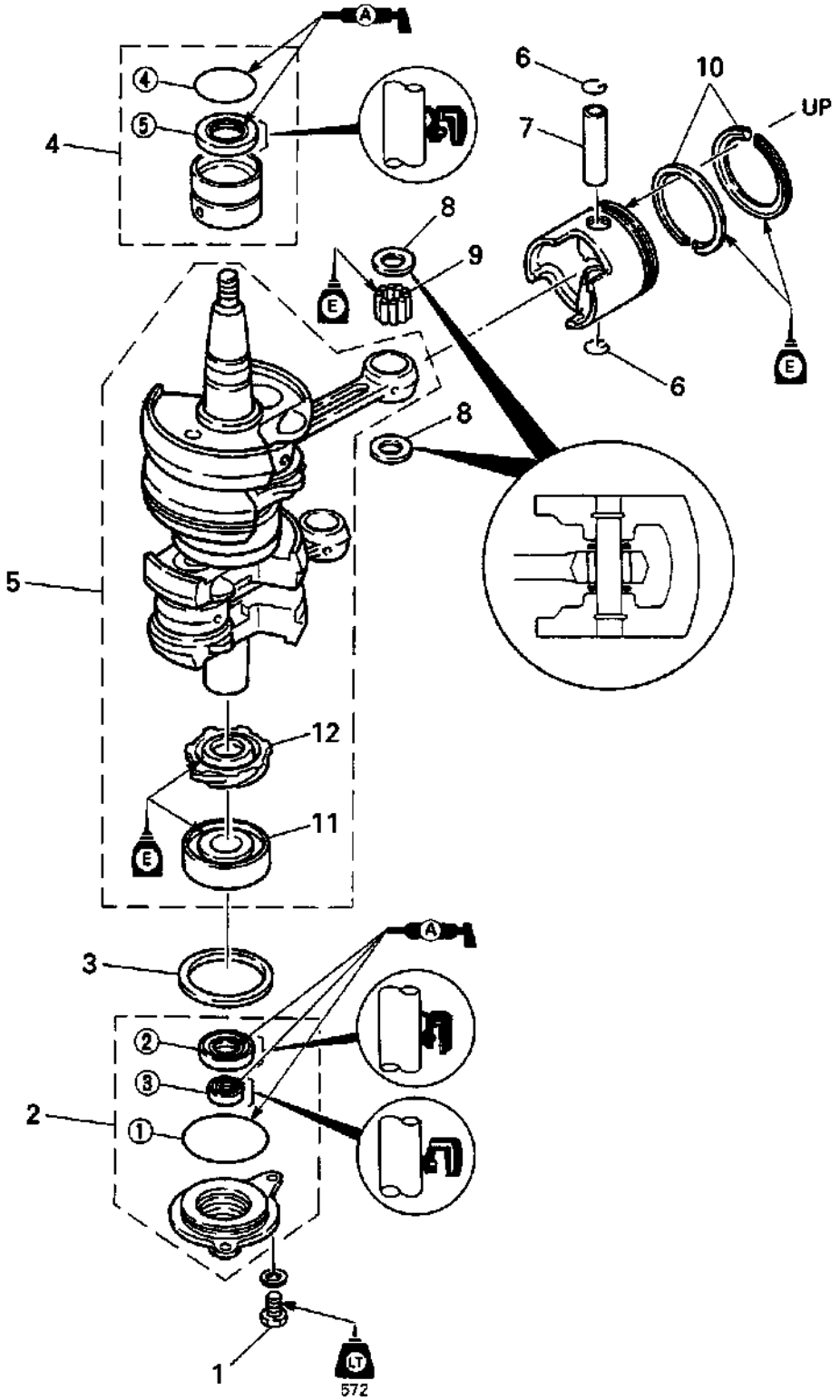
2. Apply:
   - Gasket maker

   Onto the connecting surfaces of the crankcase and cylinder body.

NOTE:

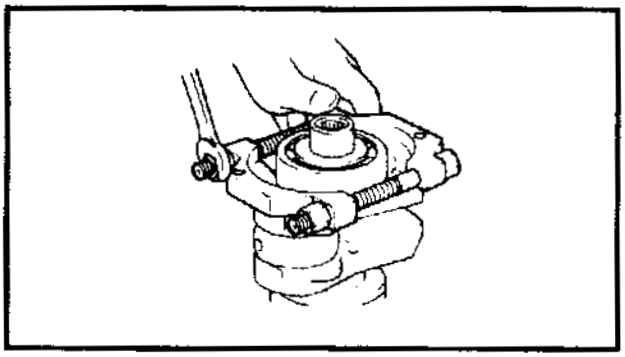
- Clean the connecting surfaces of the crankcase and cylinder body before applying the Gasket maker.
- Gasket maker should be so applied that it does not overflow the contacting surface.

CRANK SHAFT
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CRANK SHAFT		Follow the left "Step" for removal.
	Crank case		Refer to "CYLINDER BODY" section in chapter 5.
1	Bolt	1	6 × 16 mm
2	Oil seal housing	1	
3	Plane washer	1	
4	Upper bearing	1	
5	Crank shaft assembly	1	
6	Piston pin clip	4	Not reusable
7	Piston pin	2	
8	Piston pin washer	4	CAUTION: **The washer should be their convex side facing the piston.**
9	Small end bearing needle	62	CAUTION: **Do not mixture of new and used bearing needles in the same small end.**
10	Piston ring	4	
11	Bearing	1	
12	Oil pump drive gear	1	
	OIL SEAL HOUSING DISASSEMBLY		
①	O-ring	1	
②	Oil seal	1	
③	Oil seal	1	
	UPPER BEARING DISASSEMBLY		
④	O-ring	1	
⑤	Oil seal	1	
			Reverse the removal steps for installation.



SERVICE POINTS

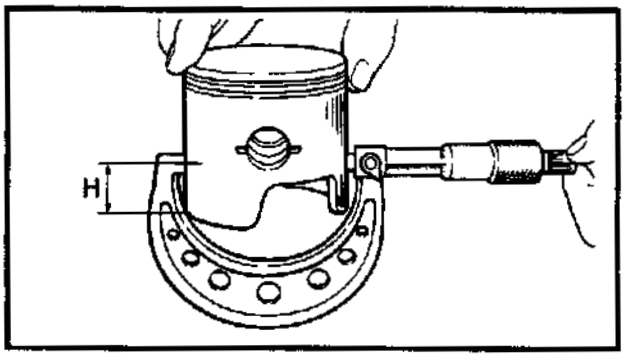
Bearing removal

1. Remove:
   - Bearing

NOTE:

Hold the bearing with the bearing separator, and forth out the crankshaft with a press.

	Bearing separator: YB-06219/90890-06534



Piston inspection

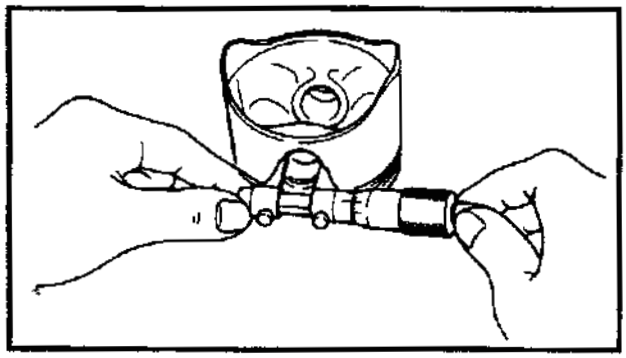
1. Measure:
   - Piston diameter

   Out of specification → Replace.

	Measuring point "H"	Piston diameter
Standard	10 mm (0.4 in)	66.96 ~ 66.98 mm (2.636 ~ 2.637 in)

Over size piston diameter:
1*: 67.25 mm (2.648 in)
2: 67.50 mm (2.657 in)

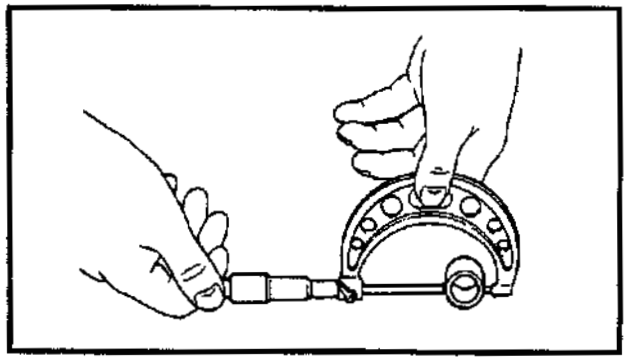
*: Except for U.S.A.



2. Measure:
   - Piston pin boss inside diameter

   Out of specification → Replace.

Piston pin boss inside diameter:
18.008 ~ 18.015 mm
(0.7090 ~ 0.7093 in)

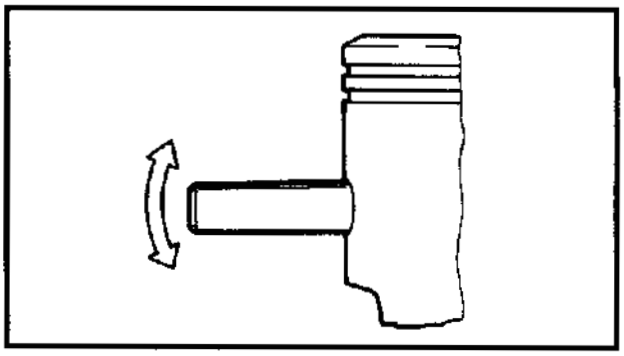


Piston pin inspection

1. Measure:
   - Piston pin diameter

   Out of specification → Replace.

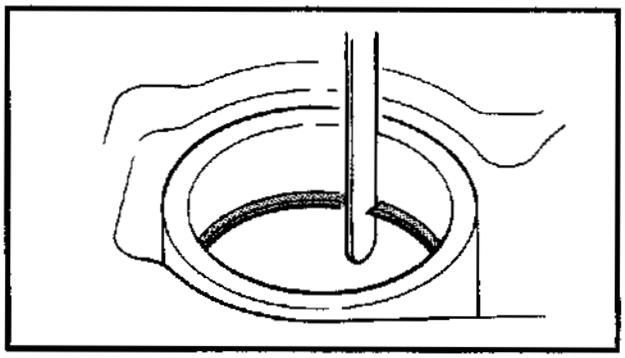
Piston pin diameter:
17.995 ~ 18.000 mm
(0.7085 ~ 0.7087 in)



2. Check:
   - Free play (when the piston pin is inserted in the piston.)
     There should be no noticeable for the play.
     Free play exists → Replace the pin and/or piston.

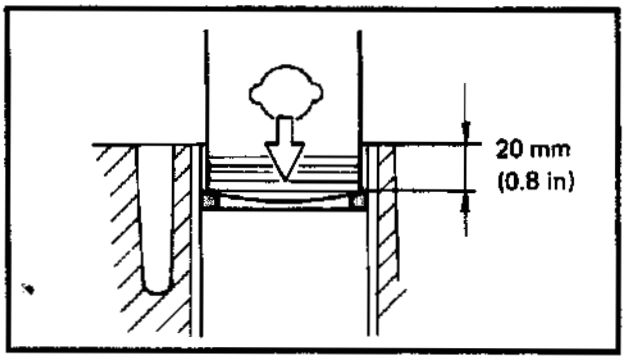
Piston ring inspection

1. Inspect:
   - Piston ring
     Breakage/Damage → Replace.

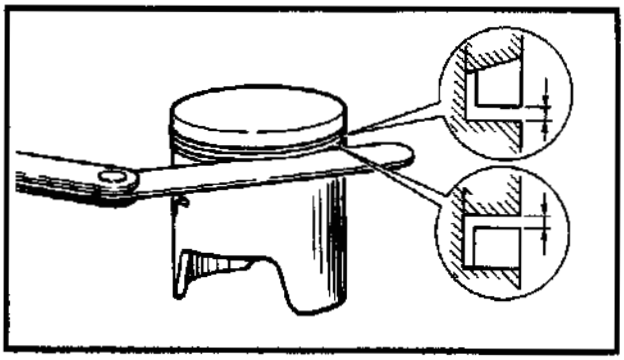


2. Measure:
   - End gap
     Out of specification → Replace.

End gap:
Top: 0.40 ~ 0.60 mm
(0.016 ~ 0.024 in)
2nd: 0.40 ~ 0.60 mm
(0.016 ~ 0.024 in)
End gap limit:
Top: 0.80 mm (0.031 in)
2nd: 0.80 mm (0.031 in)
Measuring point
20 mm (0.8 in)

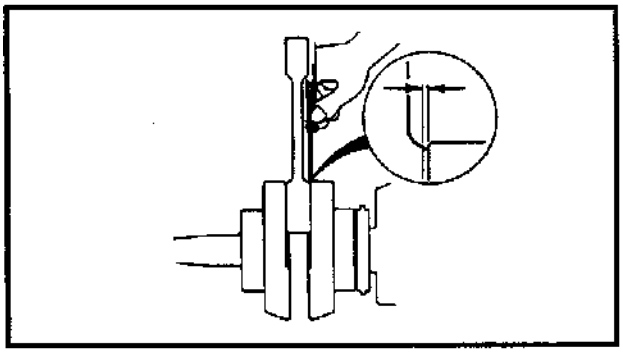


NOTE:
Install the piston ring into the cylinder. Push the ring with the piston crown.



3. Measure:
   - Side clearance
     Out of specification → Replace piston and/or ring.

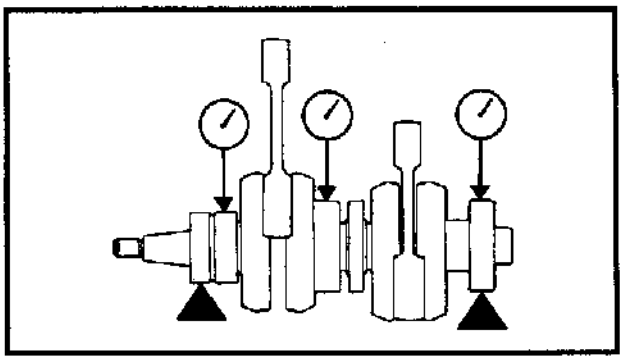
Side clearance:
Top: 0.02 ~ 0.06 mm
(0.008 ~ 0.024 in)
2nd: 0.03 ~ 0.07 mm
(0.001 ~ 0.003 in)



Crankshaft inspection

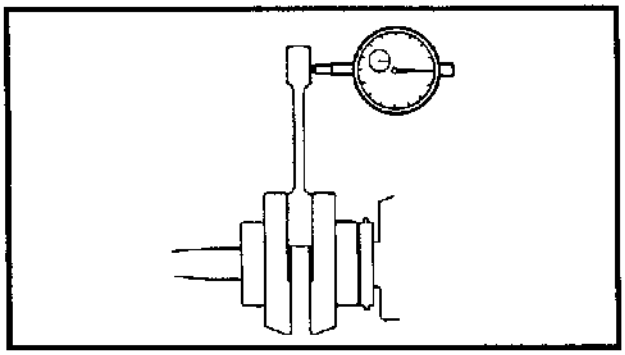
1. Measure:
   - Connecting-rod side clearance
     Out of specification → Replace.

	Connecting-rod side clearance: **0.20 ~ 0.70 mm (0.008 ~ 0.028 in)**



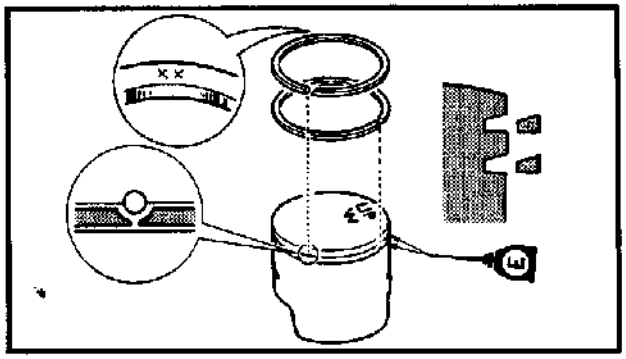
2. Measure:
   - Runout
     Out of specification → Replace.

	Runout limit: **0.03 mm (0.001 in)**



3. Measure:
   - Axial play
     Out of specification → Replace.

	Axial play limit: **2.0 mm (0.08 in)**



Piston and piston ring installation

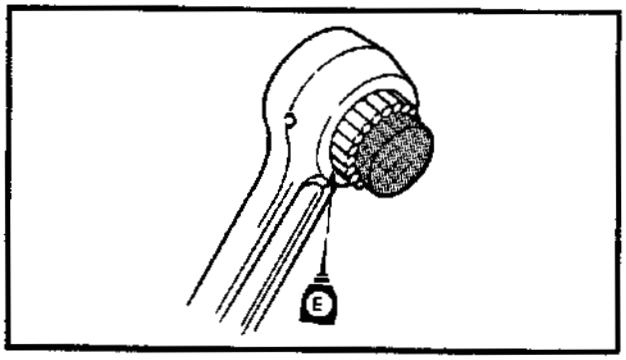
1. Install:
   - Piston ring (2nd)
   - Piston ring (top)

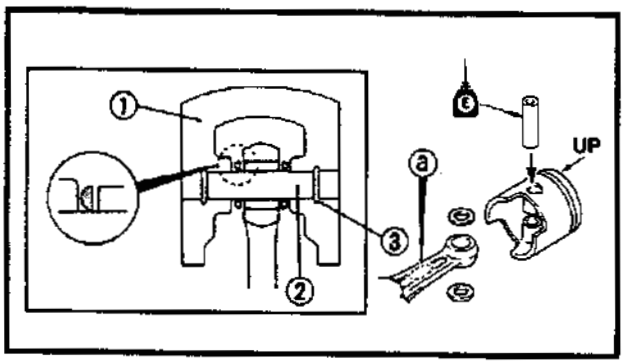
CAUTION:

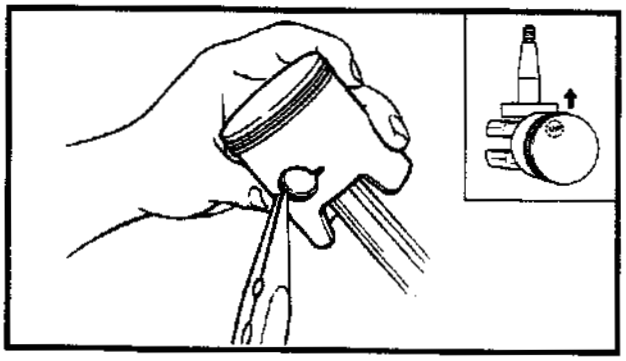
- **Take care not to scratch the piston or break piston rings.**
- **Align the each ring end gap with their locating pins.**
- **After fitting the rings, check that they move smoothly.**

NOTE:

Piston rings should be replaced as a set.







Crankshaft and piston installation

1. Install:
   - Small end bearing needle

	Needles per piston: 31 pieces
	Small end bearing needle installer: YB-06107/90890-06526

2. Install:
   - Piston ①
   - Piston pin ②
   - Piston pin clip ③

CAUTION:

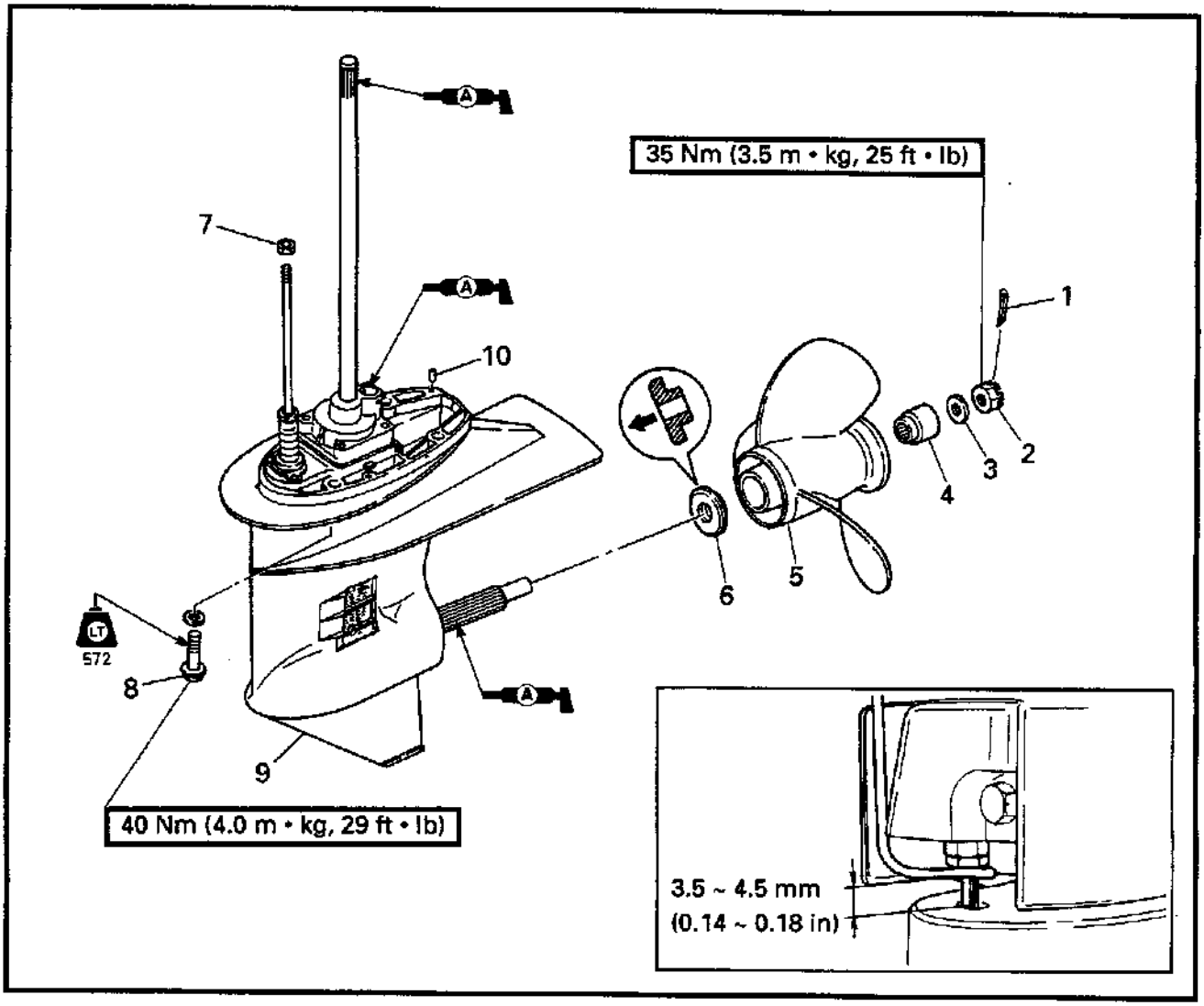
Do not allow the clip open ends to meet the piston pin slot.

NOTE:

- Mold mark ⓐ faces in the same direction as the "UP" mark on the piston.
- When no piston is replaced, be sure to re-install the pistons in their original cylinder.

CHAPTER 6
LOWER UNIT

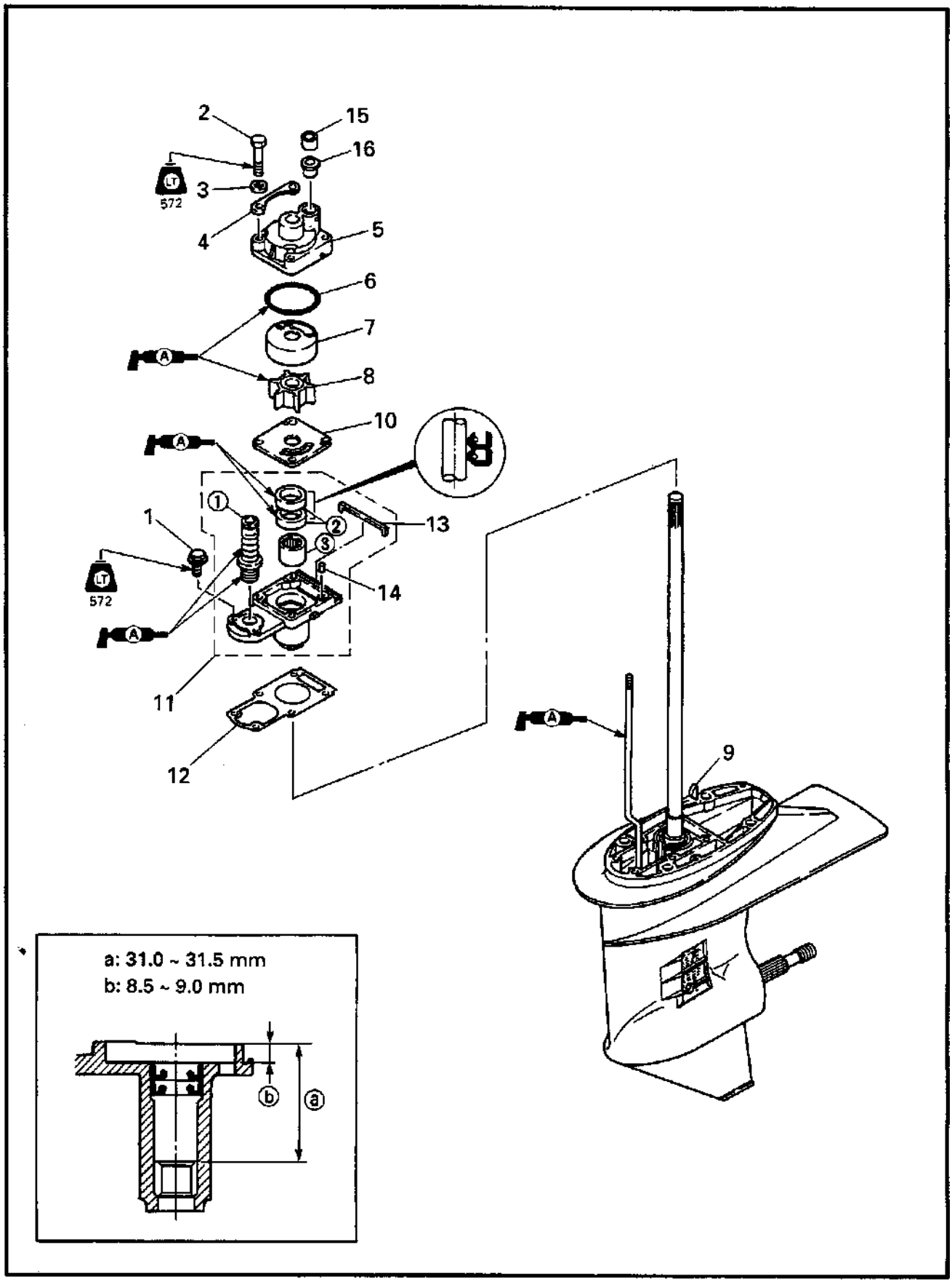
LOWER UNIT
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

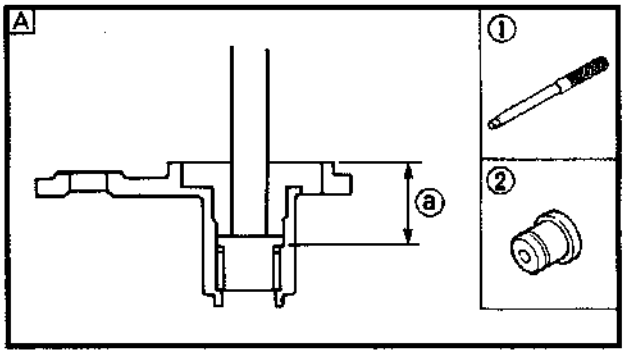
Step	Procedure/Part name	Q'ty	Service points
	LOWER UNIT REMOVAL		Follow the left "Step" for removal.
1	Cotter pin	1	
2	Propeller nut	1	
3	Plane washer	1	
4	Spacer	1	
5	Propeller	1	
6	Spacer	1	
7	Shift actuator nut	1	
8	Bolt (with washer)	4	10 × 35 mm
9	Lower unit	1	
10	Dowel pin	2	
			Reverse the removal steps for installation.

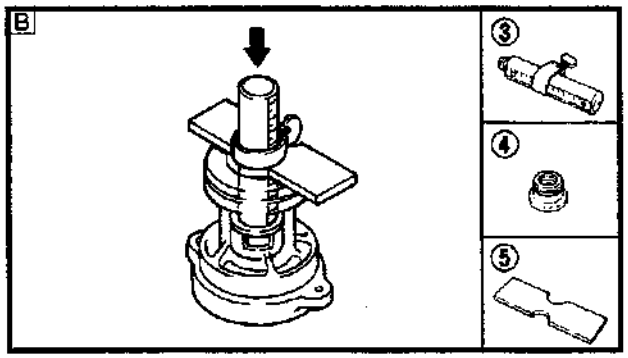
WATER PUMP
EXPLODED DIAGRAM

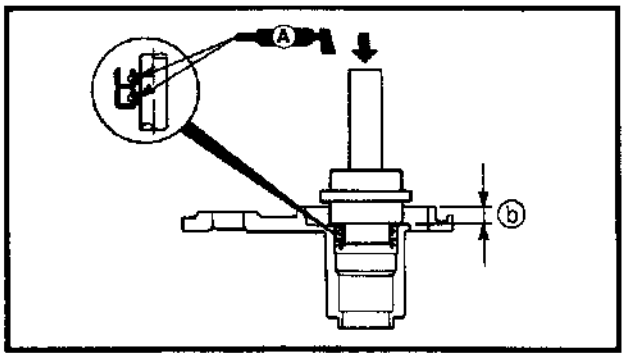


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	WATER PUMP REMOVAL Lower unit assembly		Follow the left "Step" for removal. Refer to "LOWER UNIT REMOVAL" section in chapter 6.
1	Bolt	2	6 × 20 mm
2	Bolt	4	6 × 40 mm
3	Washer	4	
4	Plate	2	
5	Water pump housing	1	**NOTE:** When installing the water pump housing, align the hole in it with the projection in the insert cartridge.
6	O-ring	1	
7	Insert cartridge	1	**NOTE:** When installing the cartridge, turn the drive shaft clockwise.
8	Impeller	1	
9	Woodruff key	1	
10	Cartridge plate	1	
11	Bearing housing assembly	1	
12	Housing gasket	1	
13	Seal	1	
14	Pin	2	
15	Water seal cover	1	
16	Water seal rubber	1	
	BEARING HOUSING DISASSEMBLY		
①	Shift rod boot	1	
②	Oil seal	2	
③	Bearing	1	
			Reverse the removal steps for installation.







Propeller shaft housing assembly

1. Install:
   - Needle bearing

Depth ⓐ:
31.0 ~ 31.5 mm (1.22 ~ 1.24 in)

Driver rod:
YB-06229 ..... ①
90890-06604 ..... ③
Needle bearing attachment:
YB-06346 ..... ②
90890-06615 ..... ④
Bearing depth plate:
90890-06603 ..... ⑤

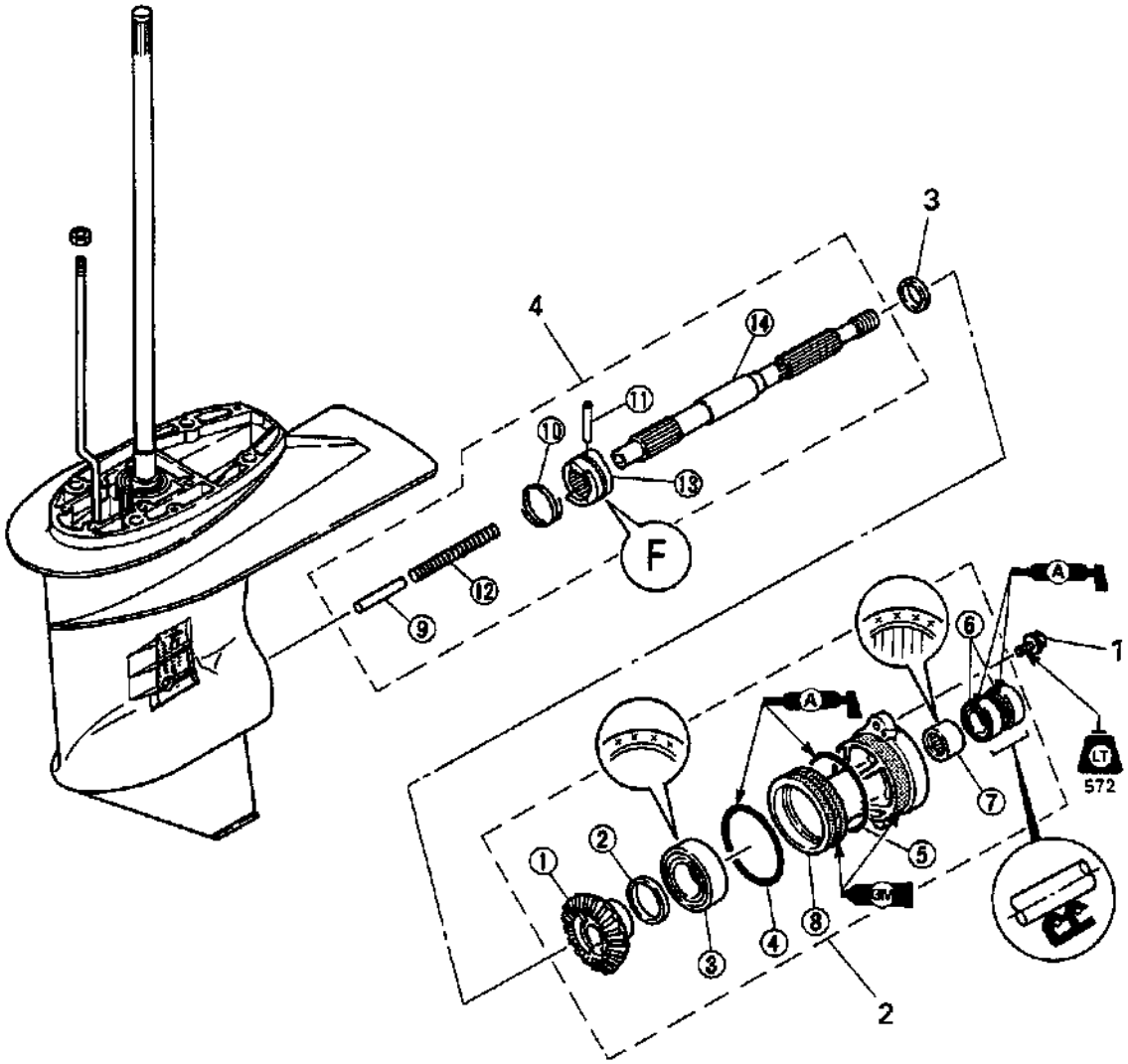
A For USA and CANADA
B Except for USA and CANADA

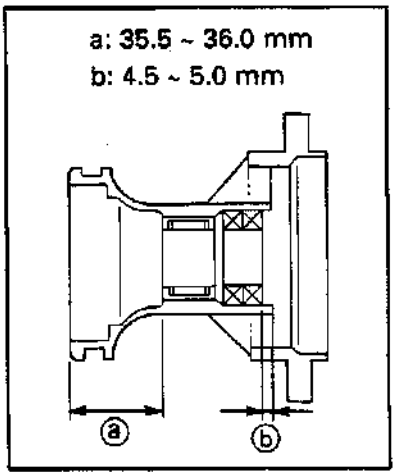
2. Install:
   - Oil seal

Depth ⓑ:
4.0 ~ 4.5 mm (0.16 ~ 0.18 in)

Oil seal installer:
YB-06168
Driver rod:
YB-06071

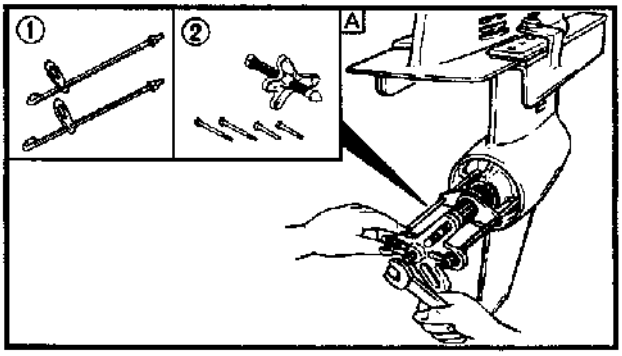
REVERSE GEAR
EXPLODED DIAGRAM

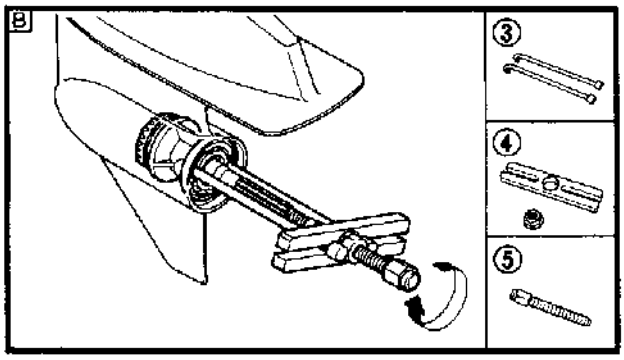


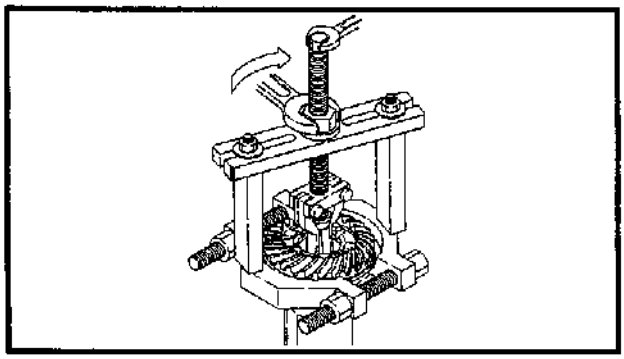


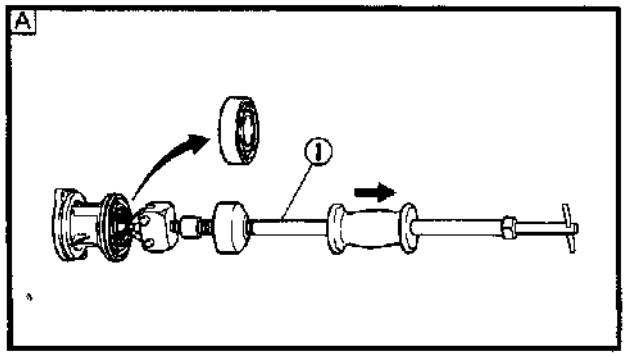
REMOVAL AND INSTALLATION CHART

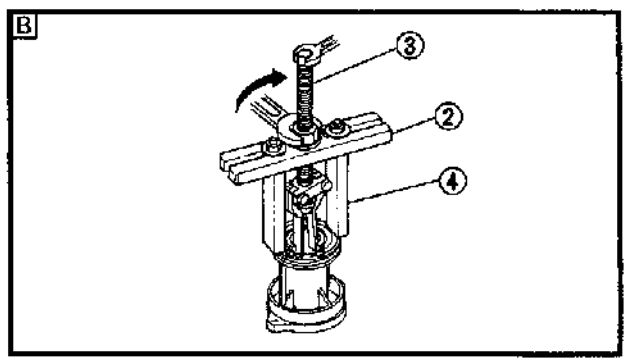
Step	Procedure/Part name	Q'ty	Service points
	REVERSE GEAR REMOVAL		Follow the left "Step" for removal.
	Gear oil		Refer to "LOWER UNIT" section in chapter 3.
	Propeller		Refer to "LOWER UNIT REMOVAL" section in chapter 6.
	Water pump assembly		Refer to "WATER PUMP REMOVAL" section in chapter 6.
1	Flange bolt	2	
2	Propeller shaft housing assembly	1	
3	Thrust washer	1	
4	Propeller shaft assembly	1	
	PROPELLER SHAFT HOUSING DISASSEMBLY		
①	Reverse gear	1	
②	Reverse gear shim	1 set	
③	Ball bearing	1	**NOTE:** Install the bearing with its manufacture's marks or numbers facing outward.
④	O-ring	1	
⑤	O-ring	1	
⑥	Oil seal	2	
⑦	Needle bearing	1	**NOTE:** Install the bearing with its manufacture's marks or numbers facing outward.
⑧	Propeller shaft housing	1	
	PROPELLER SHAFT DISASSEMBLY		
⑨	Shift plunger	1	
⑩	Cross pin ring	1	
⑪	Cross pin	1	
⑫	Spring	1	
⑬	Dog clutch	1	**NOTE:** Install the clutch with "F" mark toward the forward gear side.
⑭	Propeller shaft	1	
			Reverse the removal steps for installation.











SERVICE POINTS

Propeller shaft housing removal

1. Remove:
   - Propeller shaft housing assembly

Bearing housing puller:
YB-06234 ..... ①
90890-06503 ..... ③
Universal puller:
YB-06117 ..... ②
Stopper guide plate:
90890-06501 ..... ④
Center bolt:
90890-06504 ..... ⑤

A For USA and CANADA
B Except for USA and CANADA

Propeller shaft housing disassembly

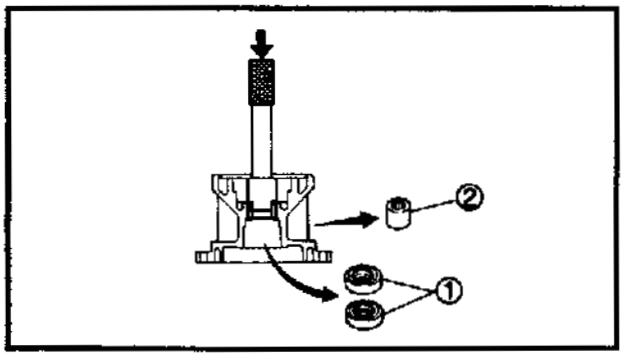
1. Remove:
   - Reverse gear

Bearing separator:
YB-06219/90890-06534
Stopper guide plate:
90890-06501
Bearing puller:
90890-06535
Stopper guide stand:
90890-06538

2. Remove:
   - Ball bearing

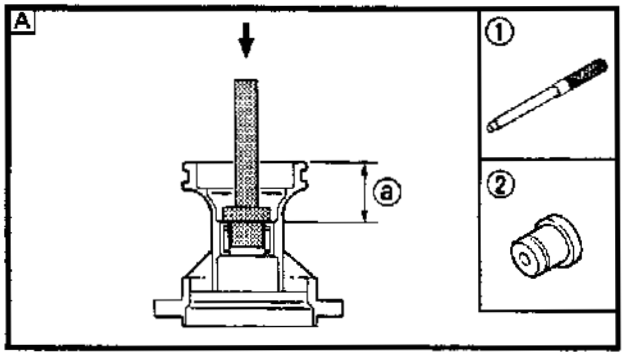
Slide hammer set:
YB-06096 ..... ①
Stopper guide plate:
90890-06501 ..... ②
Bearing puller:
90890-06535 ..... ③
Stopper guide stand:
90890-06538 ..... ④

A For USA and CANADA
B Except for USA and CANADA



3. Remove:
- Oil seal ①
- Needle bearing ②

Driver rod:
YB-06071/90890-06652
Needle bearing attachment:
YB-06082/90890-06615

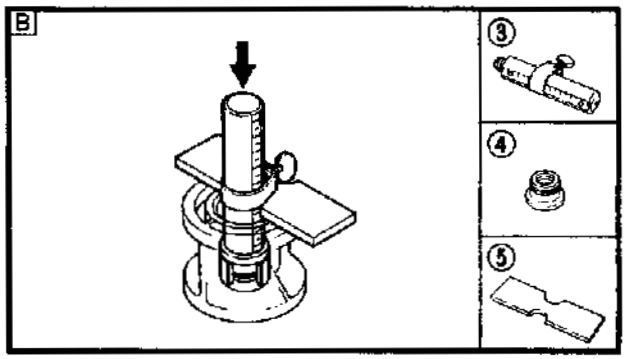


Propeller shaft housing assembly

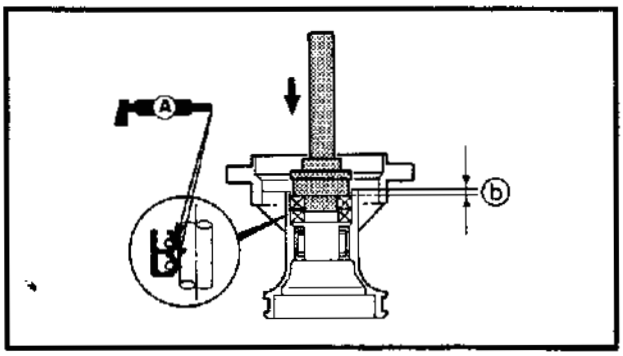
1. Install:
- Needle bearing

Depth ⓐ:
35.5 ~ 36.0 mm (1.40 ~ 1.42 in)

Driver rod:
YB-06229 ..... ①
90890-06604 ..... ③
Needle bearing attachment:
YB-06082 ..... ②
90890-06615 ..... ④
Bearing depth plate:
90890-06603 ..... ⑤



A For USA and CANADA
B Except for USA and CANADA

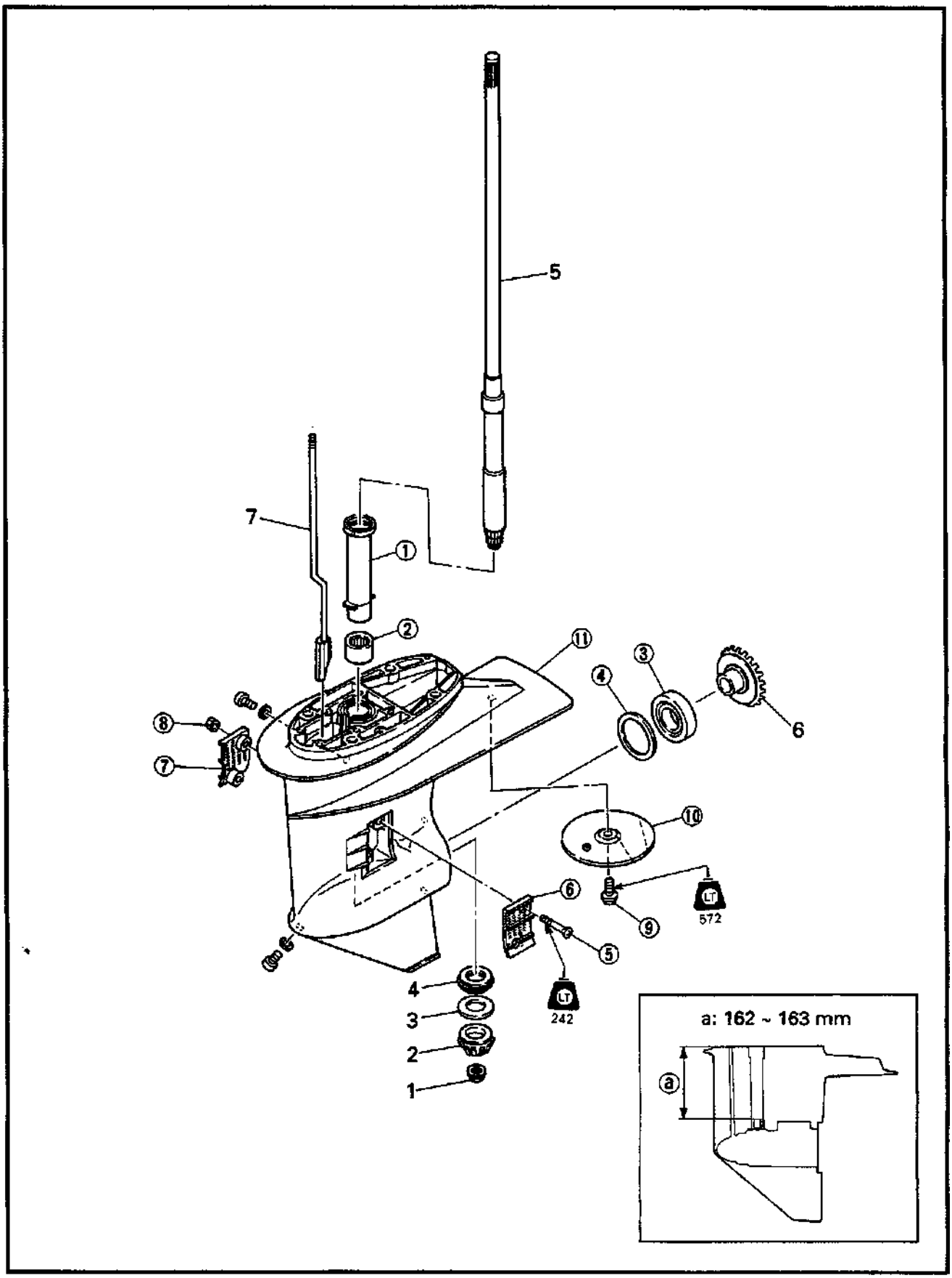


2. Install:
- Oil seal

Depth ⓑ:
4.0 ~ 4.5 mm (0.16 ~ 0.18 in)

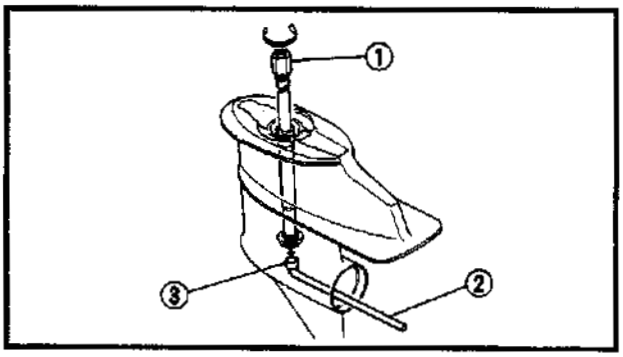
Oil seal installer:
YB-06168
Driver rod:
YB-06071

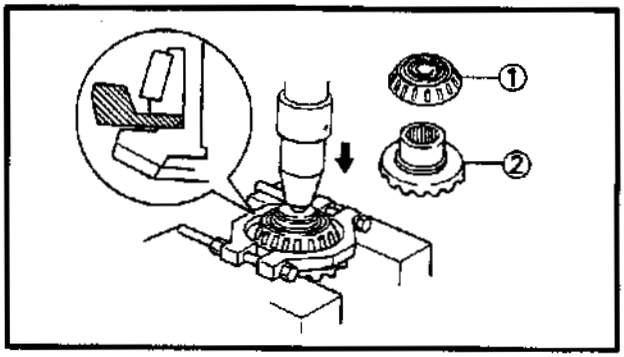
FORWARD GEAR
EXPLODED DIAGRAM



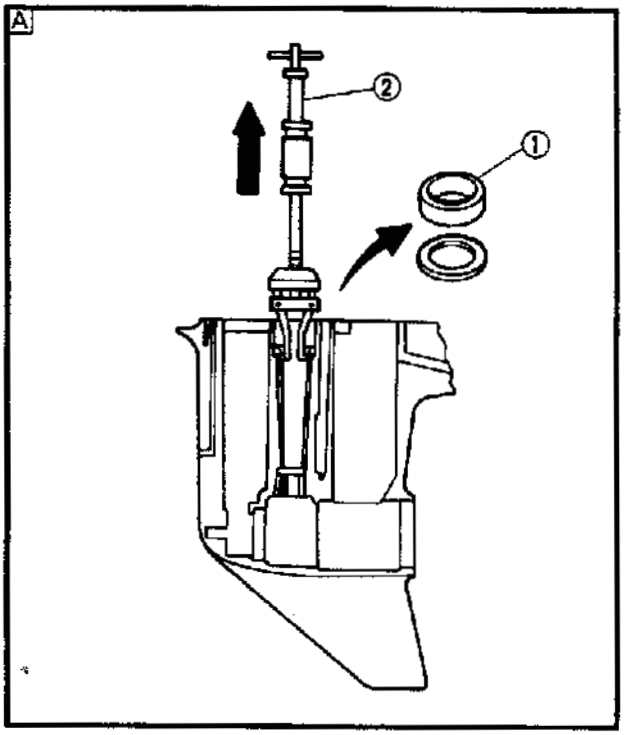
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	FORWARD GEAR REMOVAL		Follow the left "Step" for removal.
	Gear oil		Refer to the "LOWER UNIT" section in chapter 3.
	Lower unit assembly		Refer to the "LOWER UNIT REMOVAL" section in chapter 6.
	Water pump		Refer to the "WATER PUMP REMOVAL" section in chapter 6.
	Propeller shaft assembly		
1	Pinion nut	1	
2	Pinion gear	1	
3	Pinion shim	1	
4	Thrust bearing	1	
5	Drive shaft	1	
6	Forward gear	1	
7	Shift rod	1	
	LOWER CASE DISASSEMBLY		
①	Drive shaft sleeve	1	**NOTE:** Align the sleeve locating-rib with the recess in the lower case.
②	Drive shaft needle bearing	1	**NOTE:** Install the bearing with its manufacture's marks or numbers facing outward.
③	Forward bearing outer race	1	
④	Forward gear shim	1	
⑤	Screw	2	
⑥	Water inlet grill	1	
⑦	Water inlet grill	1	
⑧	Nut	2	
⑨	Bolt	1	
⑩	Anode	1	
⑪	Lower case	1	
			Reverse the removal steps for installation.





A



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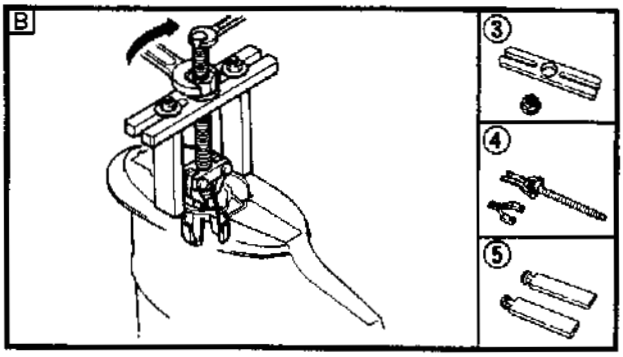


SERVICE POINTS

Pinion nut removal

1. Remove:
   - Pinion nut

	Drive shaft holder:
	YB-06368/90890-06516 ..... ①
	Pinion nut wrench:
	YB-06078 ..... ② ③
	90890-06505 ..... ②
	Socket adapter:
	90890-06506 ..... ③

Forward gear disassembly

1. Remove:
   - Taper roller bearing ①
   - Forward gear ②

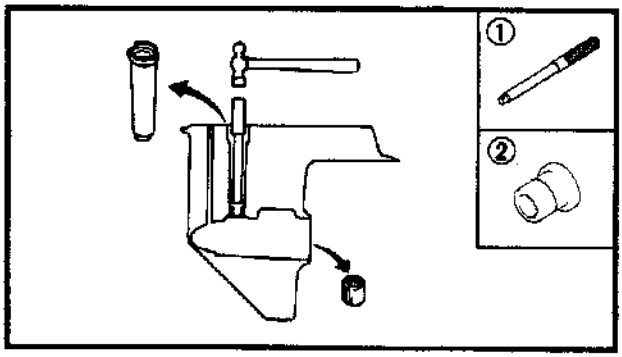
	Bearing separator:
	YB-06219/90890-06534

Lower case disassembly

1. Remove:
   - Drive shaft bearing outer race ①

	Slide hammer set:
	YB-06096 ..... ②
	Stopper guide plate:
	90890-06501 ..... ③
	Bearing puller:
	90890-06535 ..... ④
	Stopper guide stand:
	90890-06538 ..... ⑤

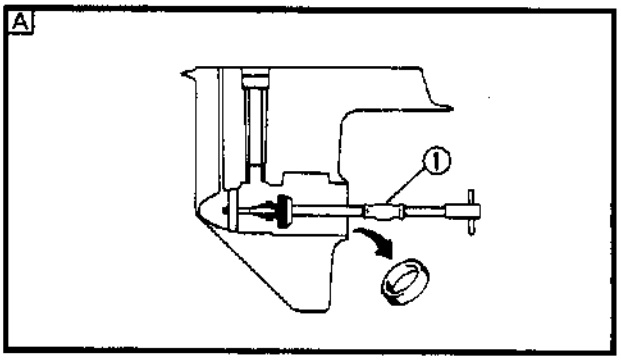
A For USA and CANADA
B Except for USA and CANADA



2. Remove:
- Drive shaft needle bearing

Needle bearing attachment:
YB-06082/90890-06615 ..... ①
Driver rod:
YB-06229/90890-06652 ..... ②

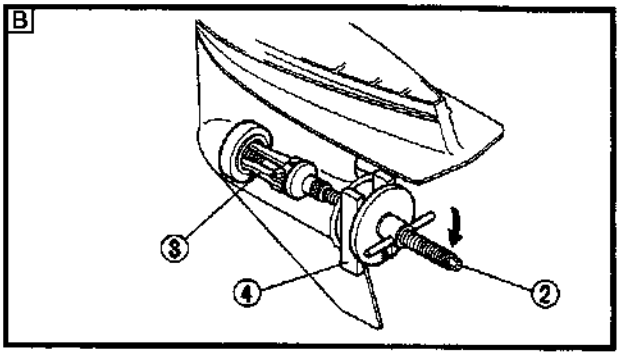
A



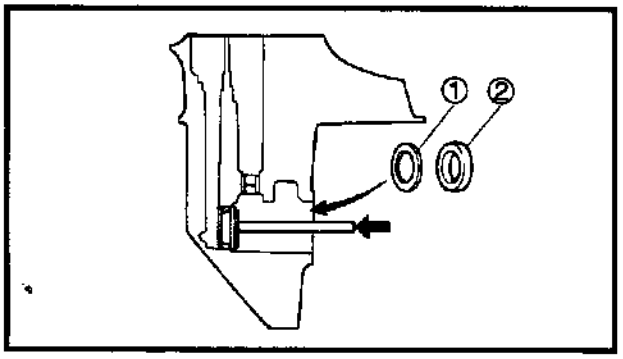
3. Remove:
- Forward gear bearing outer race

Slide hammer set:
YB-06096 ..... ①
Bearing outer race puller:
90890-06523 ..... ②
Bearing outer race puller claw:
90890-06532 ..... ③
Stopper guide stand:
90890-06538 ..... ④

B



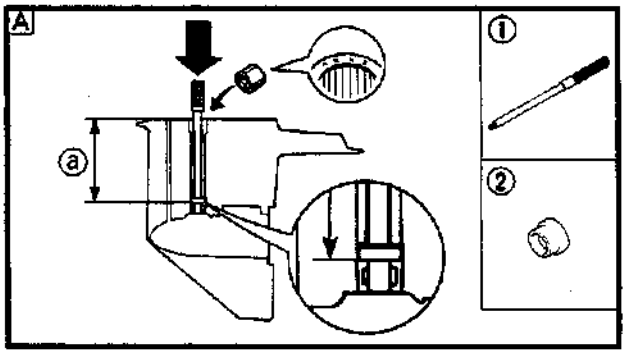
A For USA and CANADA
B Except for USA and CANADA

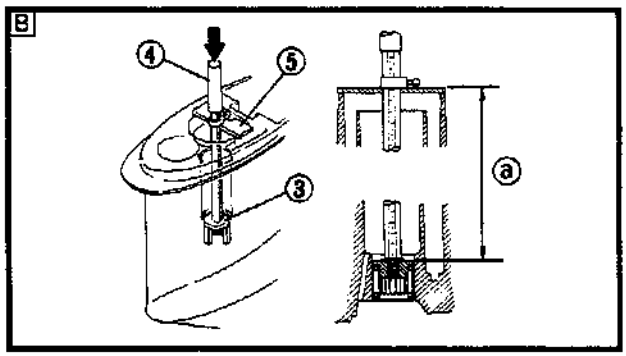


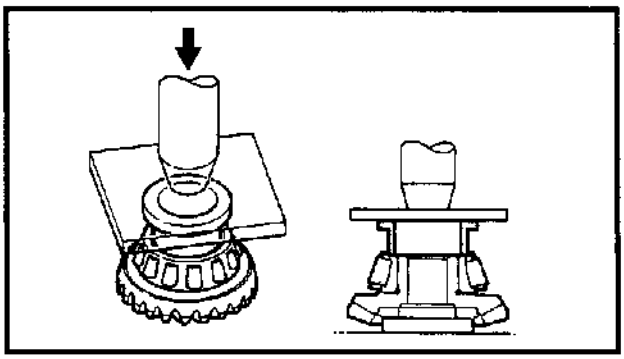
Lower case assembly

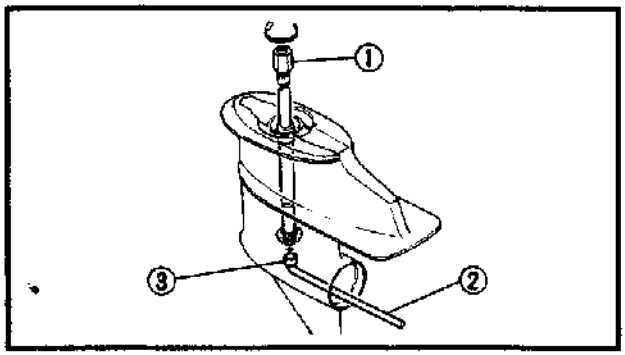
1. Install:
- Forward gear shim ①
- Forward gear bearing outer race ②

Bearing installer:
YB-06085/90890-06625
Driver rod:
YB-06071/90890-06605









2. Install:
   - Drive shaft needle bearing

	Depth ⓐ: **182.5 ~ 183 mm (7.19 ~ 7.20 in)**

	Bearing installer: **YB-06082** ..... ① **90890-06615** ..... ③ **Driver rod:** **YB-06229** ..... ② **90890-06602** ..... ④ **Bearing depth plate:** **90890-06603** ..... ⑤

A For USA and CANADA
B Except for USA and CANADA

Forward gear assembly

1. Install:
   - Forward gear
   - Taper roller bearing

	Bearing installer: **90890-06644**

Pinion nut installation

1. Install:
   - Pinion nut

	Drive shaft holder: **YB-06368/90890-06516** ..... ① **Pinion nut wrench:** **YB-06078** ..... ② ③ **90890-06505** ..... ② **Socket adapter:** **90890-06506** ..... ③

2. Adjust:
   - Shim(s)

   Remove or add.

Calculated numeral at 1/100th place		Use shim
more than	or less	
- - -	1.60	1.5
1.61	- - -	1.6

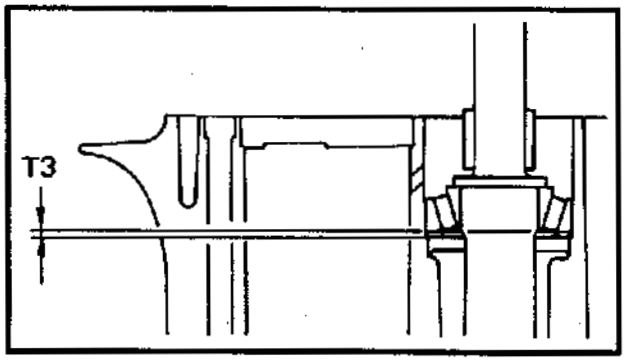
	Available shim thickness: **1.5 and 1.6 mm**

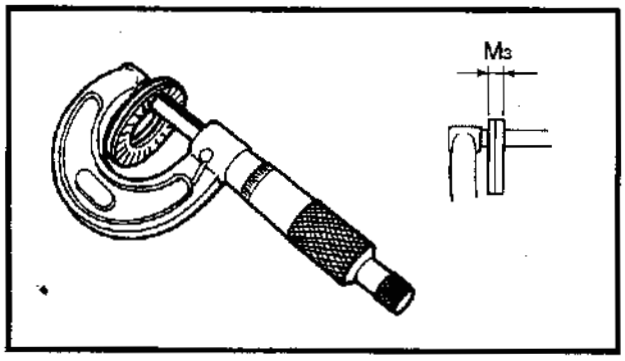
SHIMMING

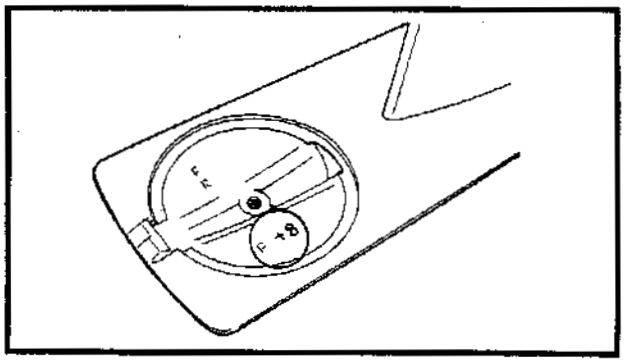
NOTE:

Shim selection requirement guide:

- Not required when;
  reassembling with original case and inner parts.
- Numeric calculation is required when;
  reassembling with original inner parts and the new case. (Difference between original and new case)
- Measurement and adjustment is required when;
  replacing the inner part(s).







SHIM SELECTION (FOR USA AND CANADA)

Pinion gear shim

1. Measure:
   - M3

Select shim (T3) =
6.5 + P/100 – M3

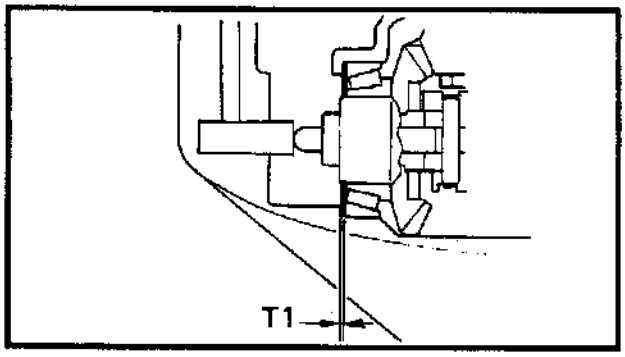
NOTE:

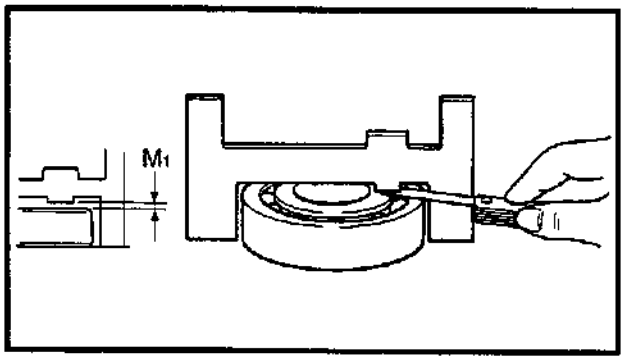
- P is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the P mark is missing or unreadable, assume a P mark of "0", and check the backlash when the unit is assembled.
- If the P value is negative (–), then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

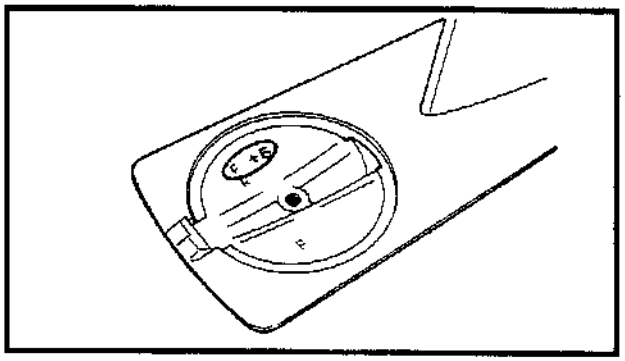
Example:

If P mark is "+5" and measurement M3 is "5.015 mm", then

T3 = 6.5 + (+5)/100 – (5.015) mm
= 6.5 + 5/100 – 5.015 mm
= 1.535 mm







Forward gear shim

NOTE:

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

1. Calculate:
   - Specified measurement (M)

Select shim (T1) =
1.0 + F/100 + M1

NOTE:

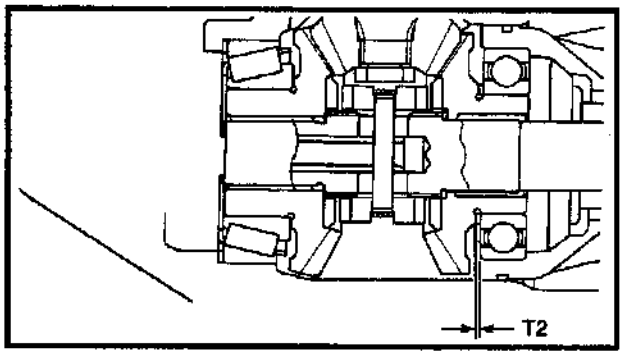
- F is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the F mark is missing or unreadable, assume an F mark of "0", and check the backlash when the unit is assembled.
- If the F value is negative (–), then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

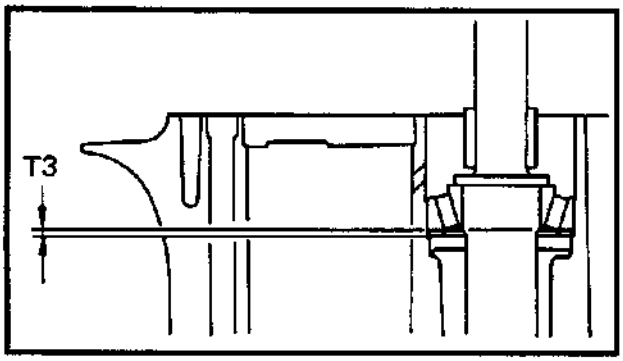
Example:
If F mark is "+5" and measure gap M1 is "0.05 mm", then T1 = 1.0 + (+5)/100 + (0.05)
= 1.0 + 5/100 + 0.05
= 1.10 mm
If F mark is "–5" and measure gap M1 is "0.45 mm", then T1 = 1.0 + (–5)/100 + (0.45)
= 1.0 – 5/100 + 0.45
= 1.40 mm

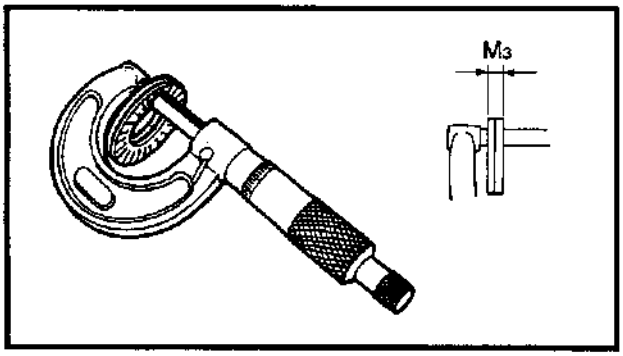
2. Adjust:
   - Shim(s)
     Remove or add.

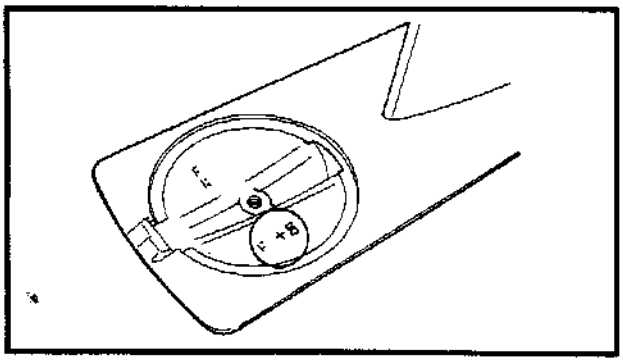
Calculated numeral at 1/100th place		Use shim
more than	or less	
1.00	1.10	1.0
1.10	1.20	1.1
1.20	1.30	1.2
1.30	1.40	1.3
1.40	1.50	1.4

Available shim thickness:
1.0, 1.1, 1.2, 1.3 and 1.4 mm









Reverse gear shim

NOTE:

- Find reverse gear shim thickness (T2) by backlash measurement.
- Measure the backlash with the original shim(s).
- If the original shim(s) is unavailable, start with a 1.0 mm shim.

Available shim thickness:
1.0, 1.1, 1.2 and 1.3 mm

SHIM SELECTION (EXCEPT FOR USA AND CANADA)

Pinion gear shim

1. Measure:
   - M3

Select shim (T3) =
6.5 + P/100 – M3

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.
- If the P value is negative (–), then subtract the P value from the measurement.

Example:
If P mark is "+5" and measurement M3 is "5.015 mm", then

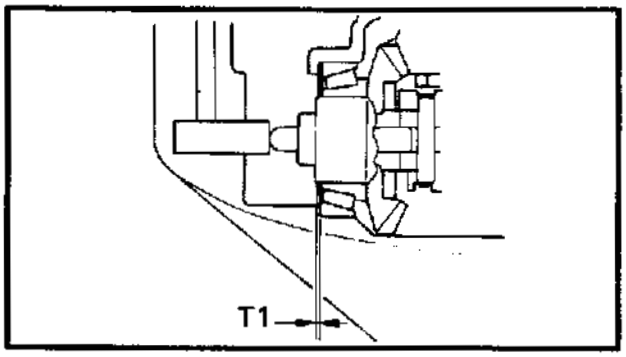
T3 = 6.5 + (+5)/100 – (5.015) mm
= 6.5 + 5/100 – 5.015 mm
= 1.535 mm

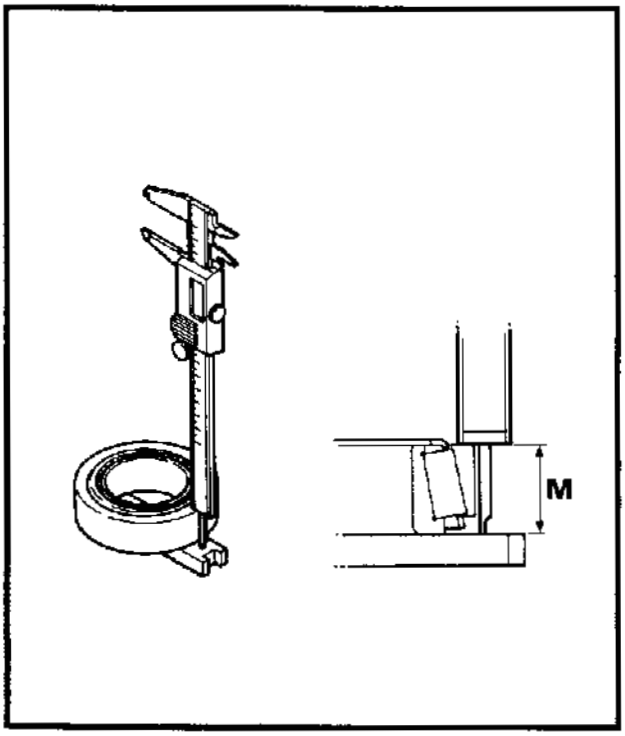
2. Adjust:
   - Shim(s)

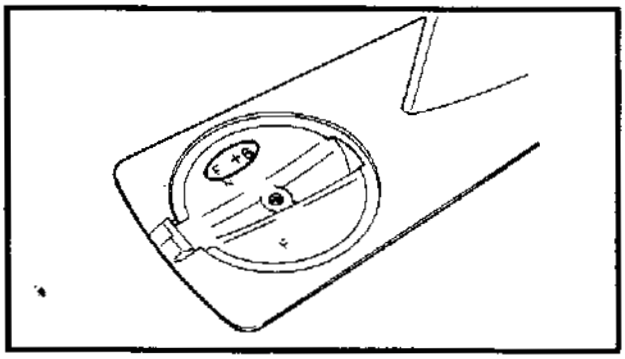
   Remove or add.

Calculated numeral at 1/100th place		Use shim
more than	or less	
– – –	1.60	1.5
1.61	– – –	1.6

Available shim thickness:
1.5 and 1.6 mm







Forward gear shim

NOTE:

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

1. Measure:
   - Measurement (M)

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

NOTE:

Measure the length between the shimming plate and the bearing outer race after turning the outer race 2 to 3 times.

2. Calculate:
   - Forward gear shim thickness (T1)

Forward gear shim thickness
(T1) = 17.50 + F/100 – M

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.
- If the F value is negative (–), then subtract the F value from the measurement.

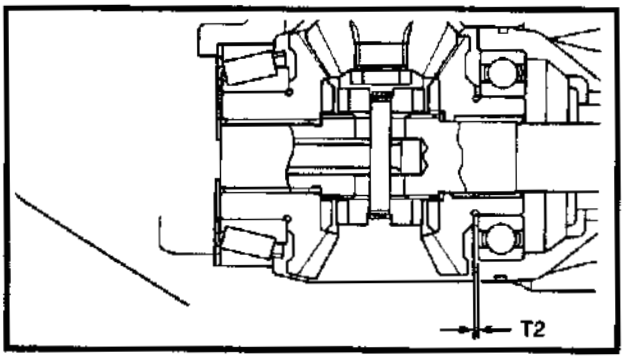
Example:
If M is "17.05 mm" and F mark is "+5",
then T1 = 17.50 mm + (+5)/100 – 17.05
= 0.45 + 0.05 mm
= 0.50 mm
If M is "17.05 mm" and F mark is "–5",
then T1 = 17.50 mm + (–5)/100 – 17.05
= 0.45 – 0.05 mm
= 0.40 mm

3. Select:
   - Forward gear shim

Calculated numeral at 1/100th place		Use shim
more than	or less	
1.00	1.10	1.0
1.10	1.20	1.1
1.20	1.30	1.2
1.30	1.40	1.3
1.40	1.50	1.4

Available shim thickness:
1.0, 1.1, 1.2, 1.3 and 1.4 mm

Example:
If T1 is "0.45 mm",
then pinion gear shim = 0.42 mm
If T1 is "0.50 mm",
then pinion gear shim = 0.48 mm



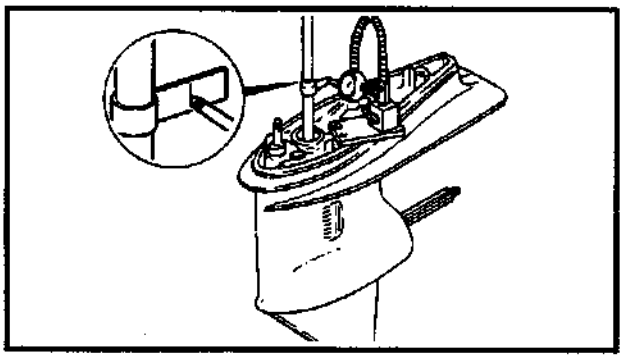
Reverse gear shim

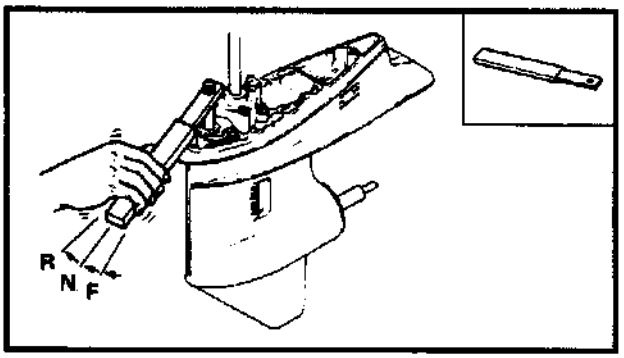
NOTE:
- Find reverse gear shim thickness (T2) by backlash measurement.
- Measure the backlash with the original shim(s).
- If the original shim(s) is unavailable, start with a 1.0 mm shim.

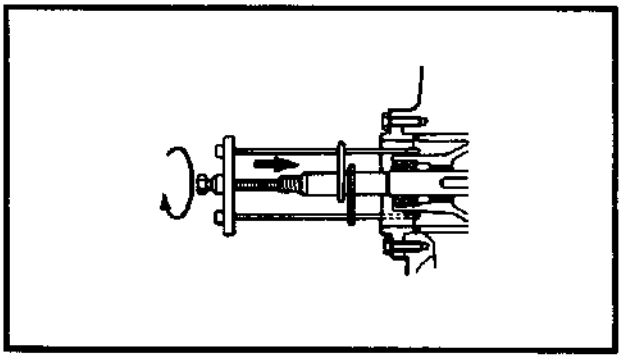
Available shim thickness:
1.0, 1.1, 1.2 and 1.3 mm

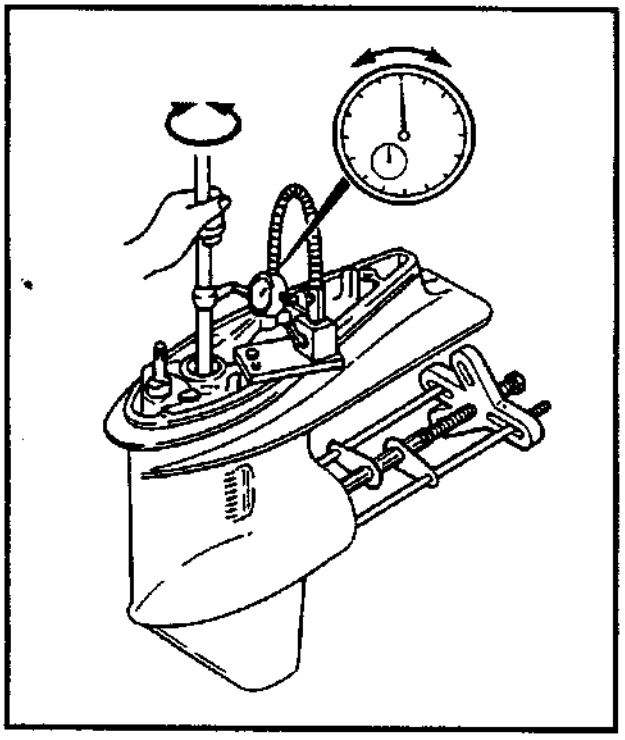
BACKLASH MEASUREMENT

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 large 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.









Forward gear

1. Measure:
   - Forward gear backlash
     Out of specification → Adjust.

Standard backlash (forward gear):
0.32 ~ 0.53 mm (0.013 ~ 0.021 in)

Measuring steps:
- Set the shift shaft in the forward position.

Shift rod wrench:
YB-06052

- Set the bearing housing puller for pushing the propeller shaft.

Bearing housing puller:
YB-06234/90890-06503
Universal puller:
YB-06117
Stopper guide plate:
90890-06501
Center bolt:
90890-06504

Center bolt:
5 Nm (0.5 m • kg, 3.6 ft • lb)

- Set the lower unit upside down.
- Attach the backlash indicator on the drive shaft (18 mm in diameter).

Backlash indicator:
YB-06265/90890-06706

- Attach the dial gauge on the gear case, and make the dial gauge stem contact the mark on the indicator.

Backlash adjusting plate:
YB-07003
Dial gauge:
YU-03097/90890-01252
Magnet base:
YU-34481/90890-06705

- While pulling the drive shaft, slowly turn the drive shaft clockwise and counterclockwise; then, measure the backlash when the drive shaft stops in each direction.

2. Adjust:
   - Forward gear shim(s)

NOTE:
Adjust the shim(s) to be added or removed according to specification.

Forward gear backlash	Shim thickness
Less than 0.32 mm	To be decreased by (0.44 – measurement) × 0.47
More than 0.53 mm	To be increased by (measurement – 0.44) × 0.47
Available shim thickness: 0.05, 0.08, 0.12, 0.30 and 0.50 mm	

Reverse gear

1. Measure:
   - Reverse gear backlash
     Out of specification → Adjust.

Standard backlash (reverse gear): 0.85 ~ 1.17 mm (0.034 ~ 0.046 in)

Measuring steps:
- Set the shift shaft in the forward position.

Shift rod wrench: YB-06052

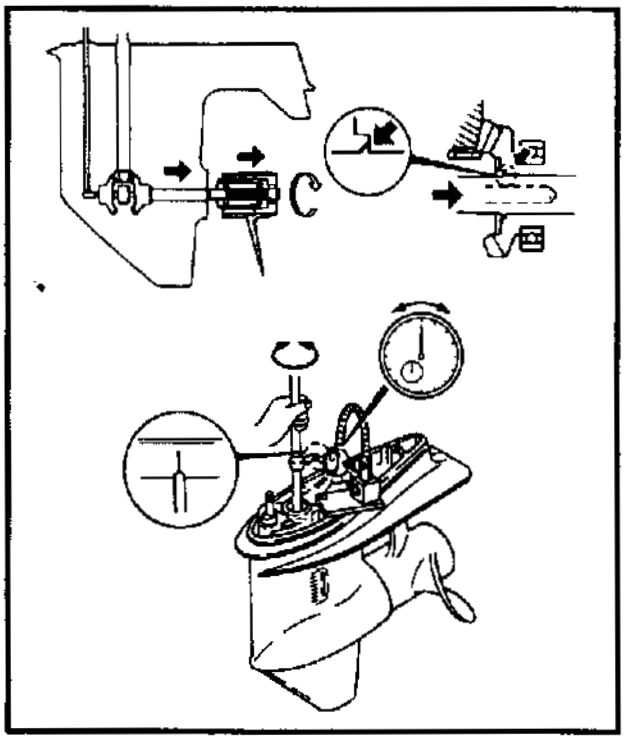
- Load the reverse gear by installing the propeller without its spacer and tighten the propeller nut.

Propeller nut: 5 Nm (0.5 m • kg, 3.6 ft • lb)

- Attach the backlash indicator on the drive shaft (18 mm in diameter).

Backlash indicator: YB-6265/90890-06706

- Attach the dial gauge on the gear case, and make the dial gauge stem contact the mark on the indicator.



Backlash adjusting plate:
YB-07003
Dial gauge:
YU-03097/90890-01252
Magnet base:
YU-34481/90890-06705

- While pulling the drive shaft, slowly turn the drive shaft clockwise and counterclockwise; then, measure the backlash when the drive shaft stops at each direction.

2. Adjust:
   - Reverse gear shim(s)

NOTE:
Adjust the shim(s) to be added or removed according to specification.

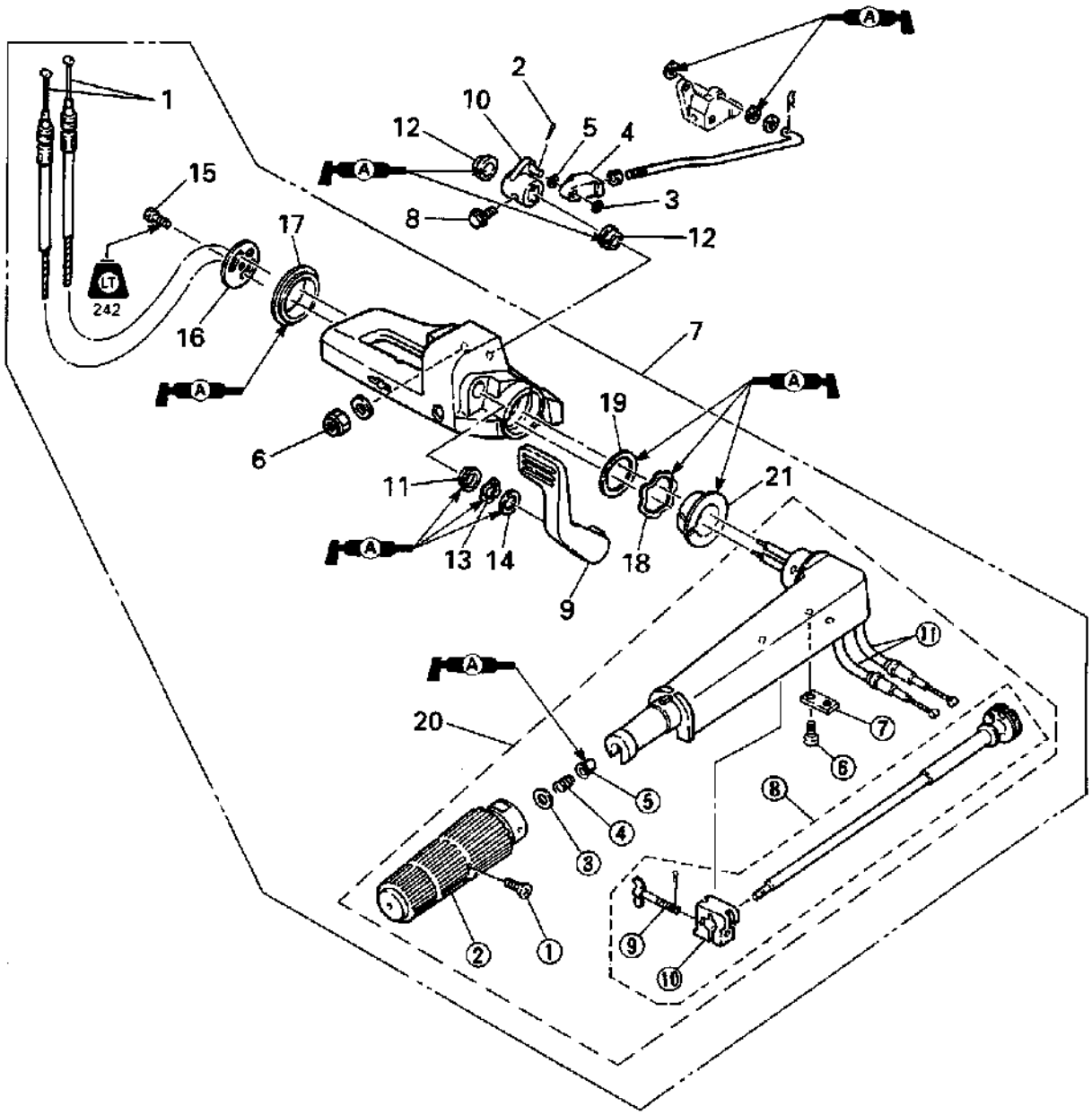
Reverse gear backlash	Shim thickness
Less than 0.85 mm	To be decreased by (1.01 – measurement) × 0.47
More than 1.17 mm	To be increased by (measurement – 1.01) × 0.47

Available shim thickness:
0.05, 0.08, 0.12, 0.30 and 0.50 mm

CHAPTER 7
BRACKET UNIT

STEERING BRACKET, SHIFT LEVER AND TILLER HANDLE

EXPLODED DIAGRAM



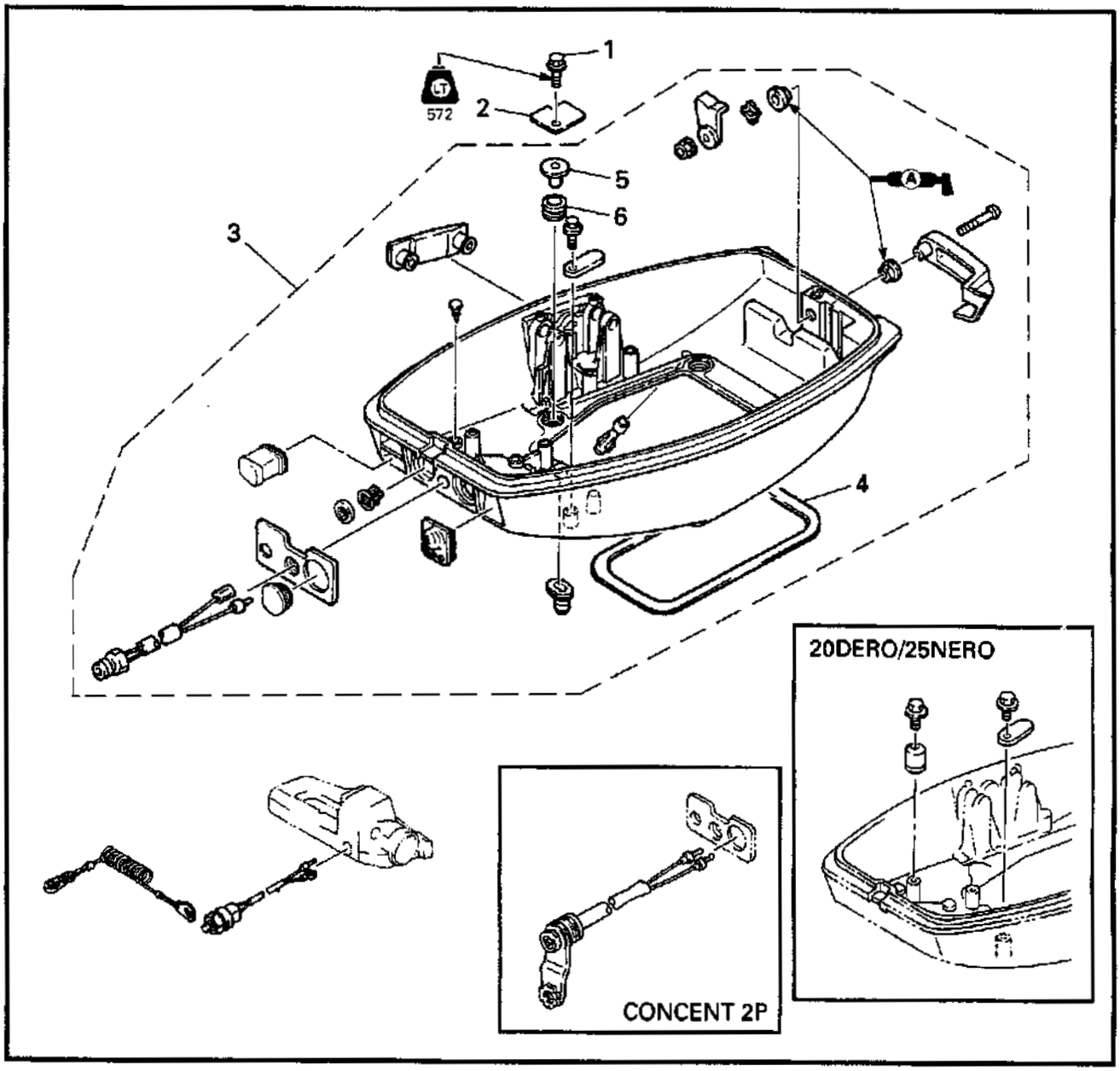
BRKT STEERING BRACKET, SHIFT LEVER AND TILLER HANDLE

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	STEERING BRACKET REMOVAL		Follow the left "Step" for removal.
1	Throttle cable	2	
2	Cotter pin	1	
3	Washer	1	
4	Cable end	1	
5	Washer	1	
6	Nut	2	
7	Steering bracket assembly	1	
	SHIFT LEVER REMOVAL		
8	Bolt	1	6 × 20 mm
9	Shift lever	1	
10	Shift rod lever	1	
11	Bushing	1	Smaller
12	Bushing	2	Larger
13	Wave washer	1	
14	Plane washer	1	
	TILLER HANDLE REMOVAL		
15	Bolt	1	6 × 16 mm
16	Retaining plate	1	
17	Bushing	1	
18	Wave washer	1	
19	Plane washer	1	
20	Tiller handle assembly	1	
21	Bushing	1	
	TILLER HANDLE DISASSEMBLY		
①	Screw	1	
②	Handle grip assembly	1	
③	Washer	1	
④	Spring	1	
⑤	Bushing	1	
⑥	Screw	2	5 × 12 mm
⑦	Retainer	1	
⑧	Throttle control shaft	1	
⑨	Friction adjust screw	1	
⑩	Friction adjuster	1	
⑪	Throttle cable	2	
			Reverse the removal steps for installation.

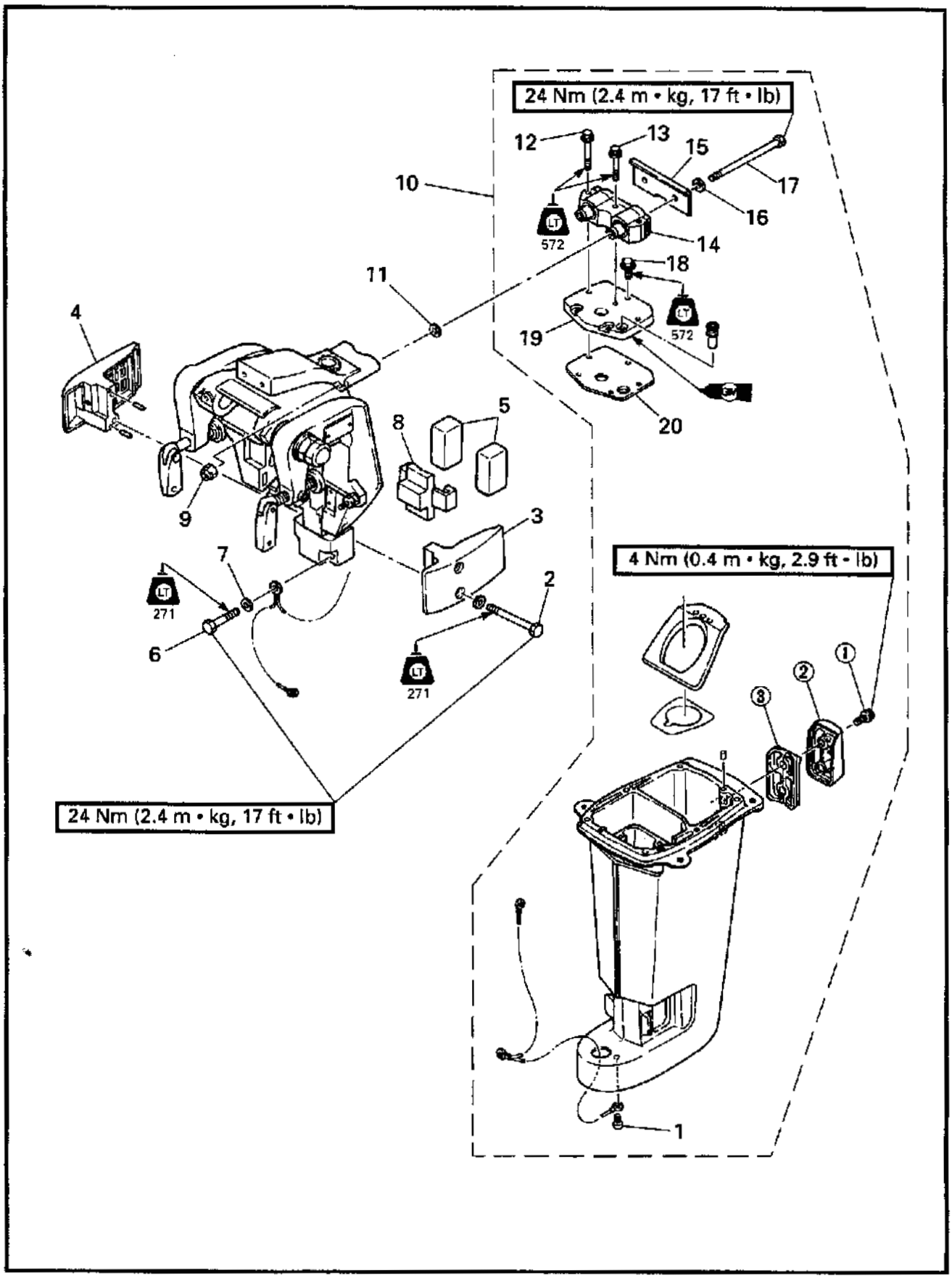
BOTTOM COWLING
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	BOTTOM COWLING REMOVAL		Follow the left "Step" for removal.
	Power unit assembly		
1	Bolt	4	6 × 20 mm
2	Fitting plate	2	
3	Bottom cowling assembly	1	
4	Seal rubber	1	
5	Collar	4	
6	Grommet	4	
			Reverse the removal steps for installation.

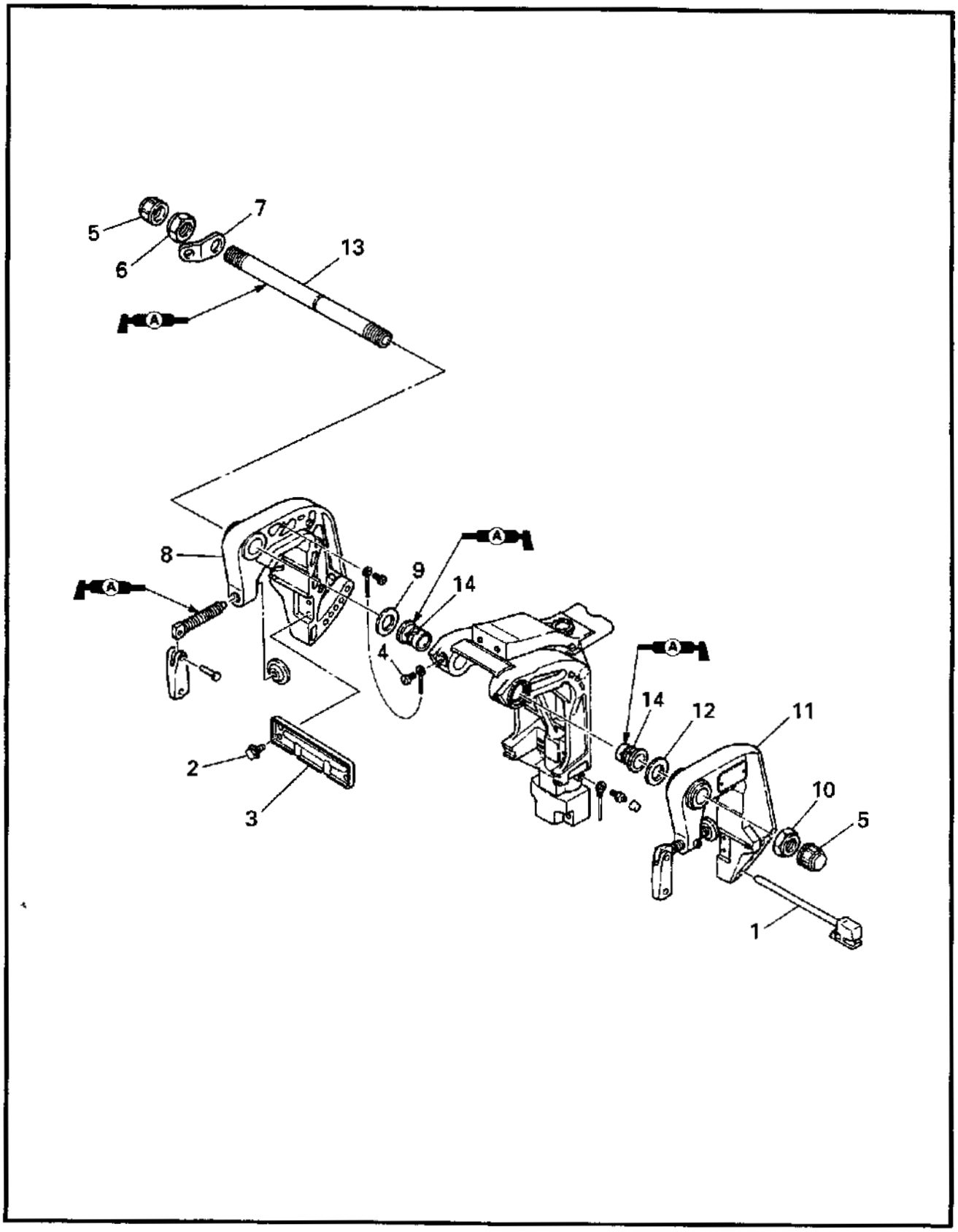
UPPER CASE
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	UPPER CASE REMOVAL		Follow the left "Step" for removal.
	Power unit		
	Lower unit assembly		
	Bottom cowling		
1	Bolt	1	6 × 19 mm
2	Bolt	2	8 × 85 mm
3	Lower mount housing	1	Left
4	Lower mount housing	1	Right
5	Lower side mount	2	
6	Bolt	2	8 × 45 mm
7	Washer	2	
8	Lower front mount	1	
9	Nut	2	
10	Upper case assembly	1	
11	Washer	2	
12	Bolt (with washer)	2	6 × 50 mm
13	Bolt (with washer)	1	6 × 40 mm
14	Upper rubber mount	1	
15	Plate	1	
16	Washer	2	
17	Bolt	2	8 × 120 mm
18	Bolt (with washer)	3	6 × 20 mm
19	Upper mount base	1	
20	Gasket	1	
	UPPER CASE DISASSEMBLY		
①	Screw	2	6 mm
②	Cover	1	
③	Gasket	1	
			Reverse the removal steps for installation.

CLAMP BRACKET
EXPLODED DIAGRAM
KLEMMHALTERUNG
EXPLOSIONSZEICHNUNG



CLAMP BRACKET
KLEMMHALTERUNG

E
D

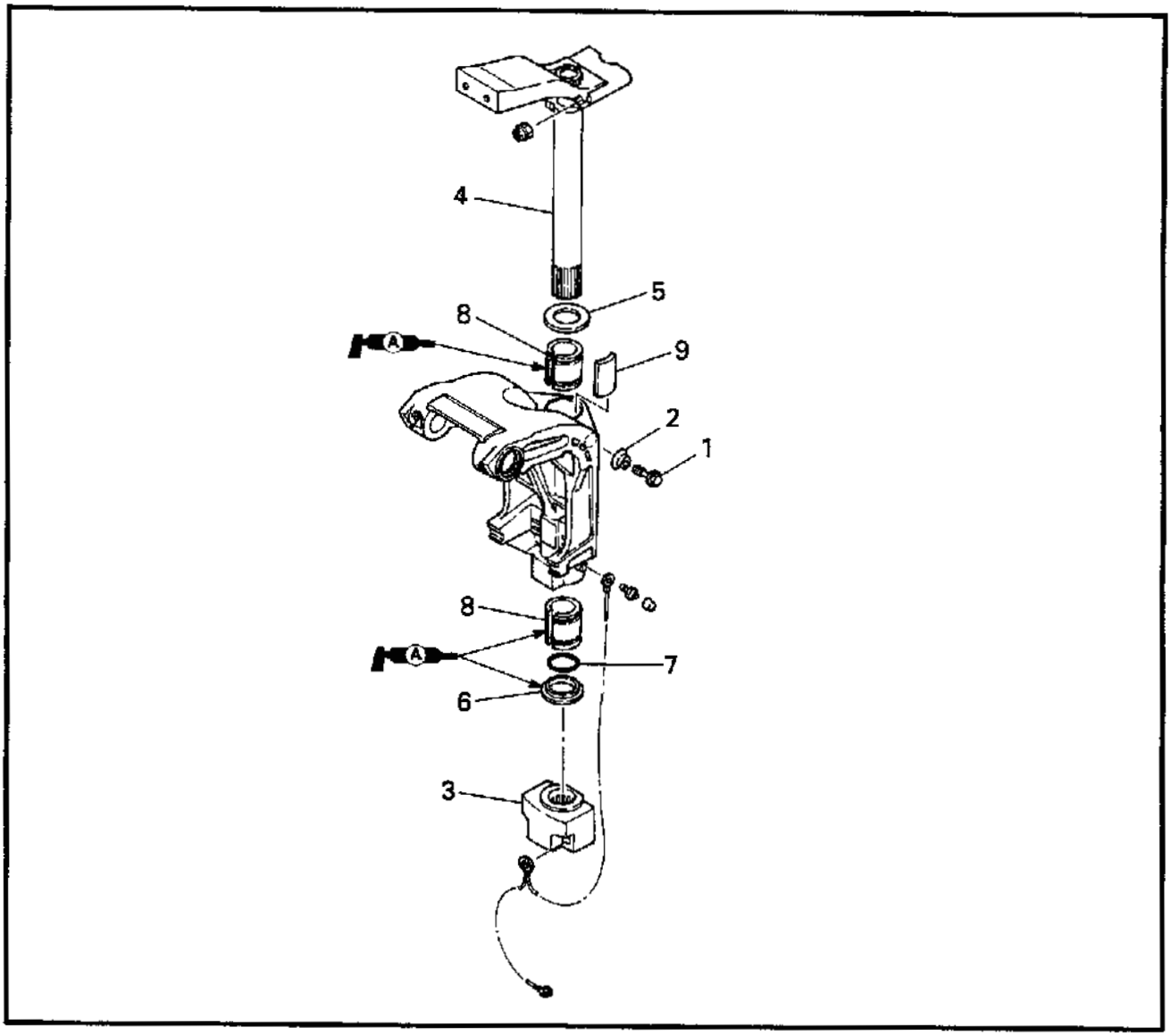
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CLAMP BRACKET REMOVAL		Follow the left "Step" for removal.
1	Tilt rod	1	
2	Bolt (with washer)	4	6 × 10 mm
3	Tilt lock plate	1	
4	Screw	1	
5	Cap	2	
6	Nut	1	
7	Eye plate	1	
8	Clamp bracket	1	Right
9	Washer	1	
10	Nut	1	
11	Clamp bracket	1	Left
12	Washer	1	
13	Steering tube	1	
14	Bushing	2	
			Reverse the removal steps for installation.

AUSBAU- UND EINBAUTABELLE

Schritt	Verfahren/Teilebezeichnung	Anzahl	Wartungspunkte
	KLEMMHALTERUNG-AUSBAU		Den Punkten der Spalte "Schritt" links zum Ausbau folgen.
1	Kippstangen	1	
2	Schraube (mit Unterlegscheibe)	4	6 × 10 mm
3	Kippsperrplatte	1	
4	Schraube	1	
5	Kappe	2	
6	Mutter	1	
7	Ösenplatte	1	
8	Klemmhalterung	1	Rechts
9	Unterlegscheibe	1	
10	Mutter	1	
11	Klemmhalterung	1	Links
*12	Unterlegscheibe	1	
13	Lenkröhre	1	
14	Büchse	2	
			Zum Einbauen die Ausbauschritte in umgekehrter Reihenfolge ausführen.

SWIVEL BRACKET
EXPLODED DIAGRAM

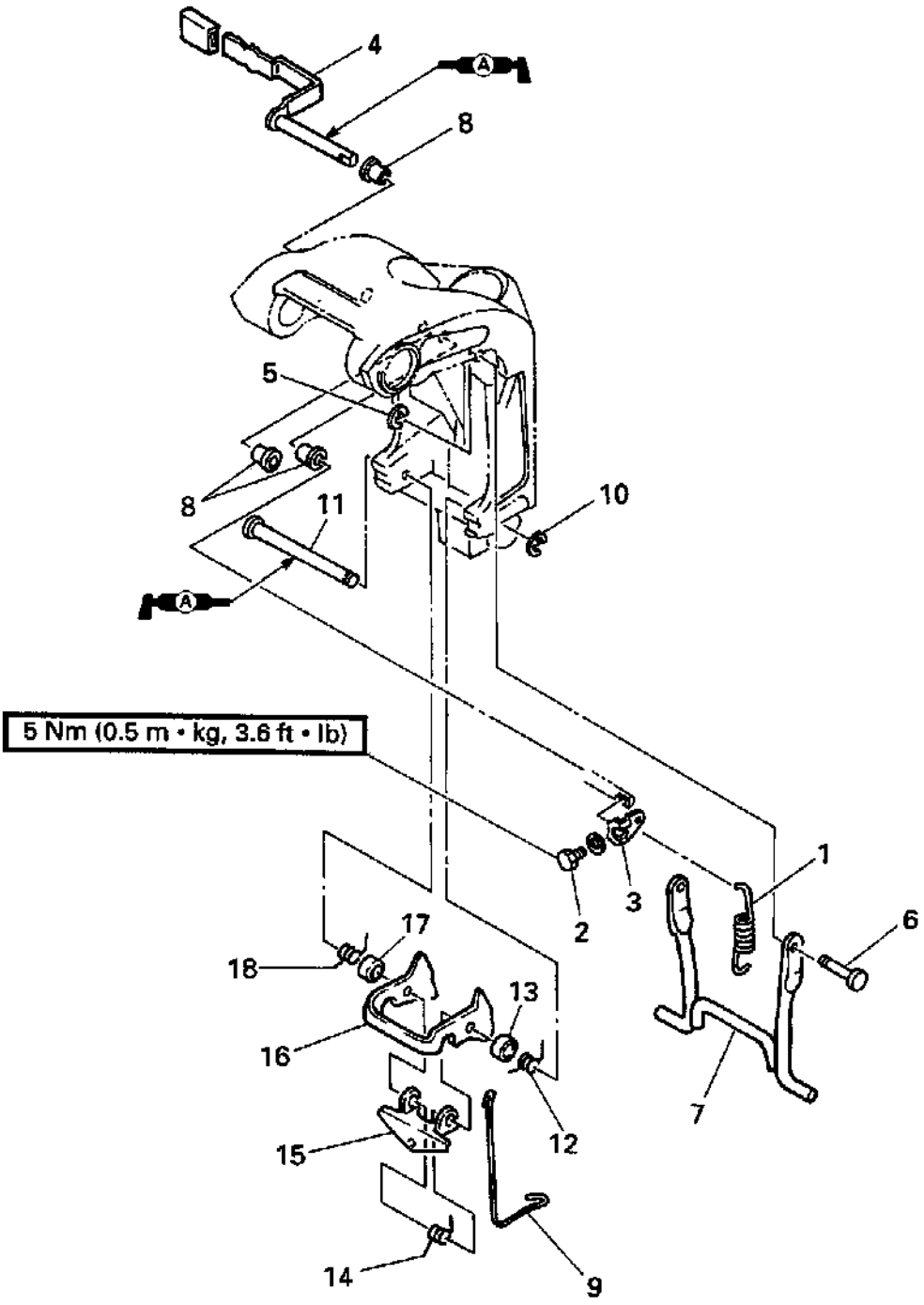


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
*	**SWIVEL BRACKET REMOVAL**		Follow the left "Step" for removal.
1	Flange bolt	1	6 × 22 mm
2	Seal rubber	1	
3	Lower mount housing	1	
4	Steering bracket	1	
5	Washer	1	
6	Bushing	1	
7	O-ring	1	
8	Bushing	2	
9	Friction plate	1	
			Reverse the removal steps for installation.

STEERING BRACKET DISASSEMBLY

EXPLODED DIAGRAM



STEERING BRACKET DISASSEMBLY

E

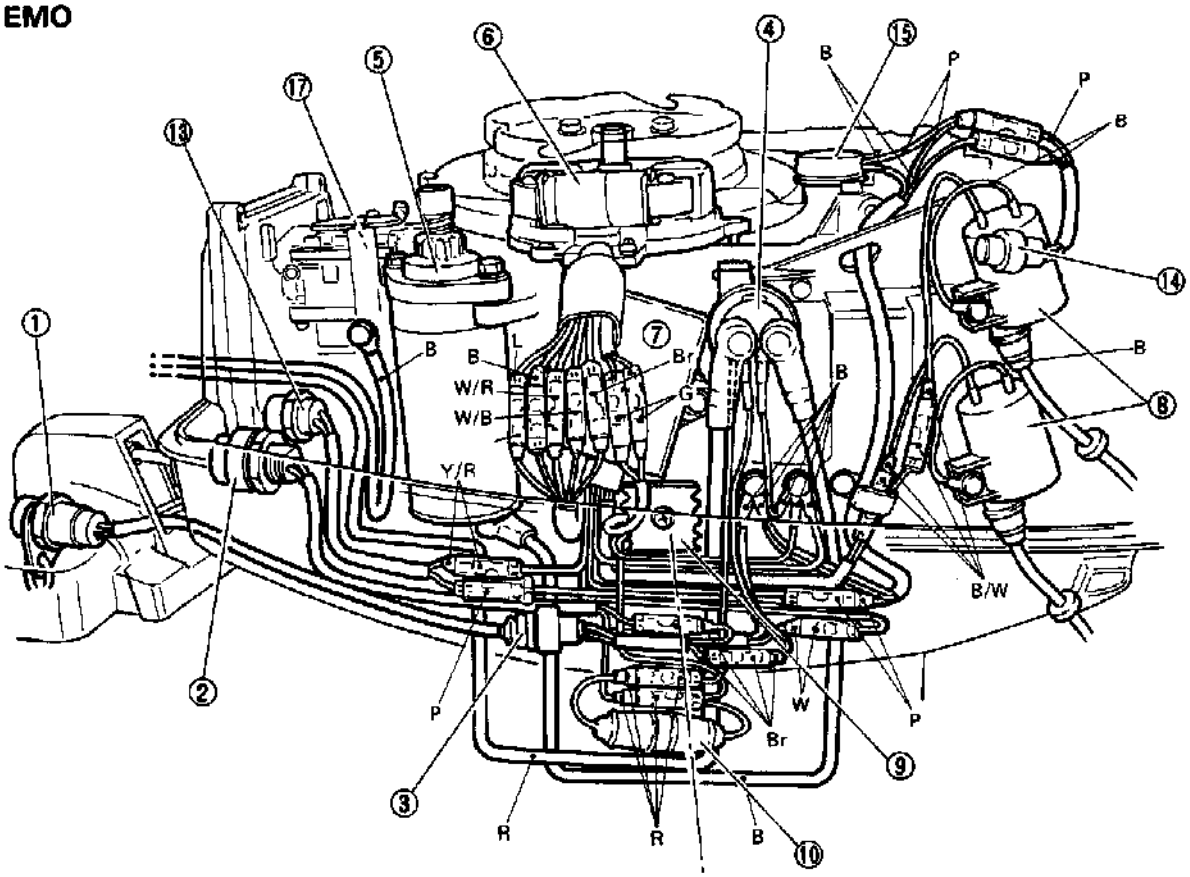
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	STEERING BRACKET DISASSEMBLY		Follow the left "Step" for removal.
1	Tension spring	1	
2	Bolt	1	5 × 10 mm
3	Tilt lever arm	1	
4	Tilt lever	1	
5	Circlip	1	
6	Shaft	1	
7	Tilt lock arm	1	
8	Bushing	3	
9	Reverse hook	1	
10	Circlip	1	
11	Reverse lock shaft	1	
12	Spring	1	
13	Seal rubber	1	
14	Spring	1	
15	Reverse lock plate	1	
16	Reverse lock jaw	1	
17	Seal rubber	1	
18	Spring	1	
			Reverse the removal steps for installation.

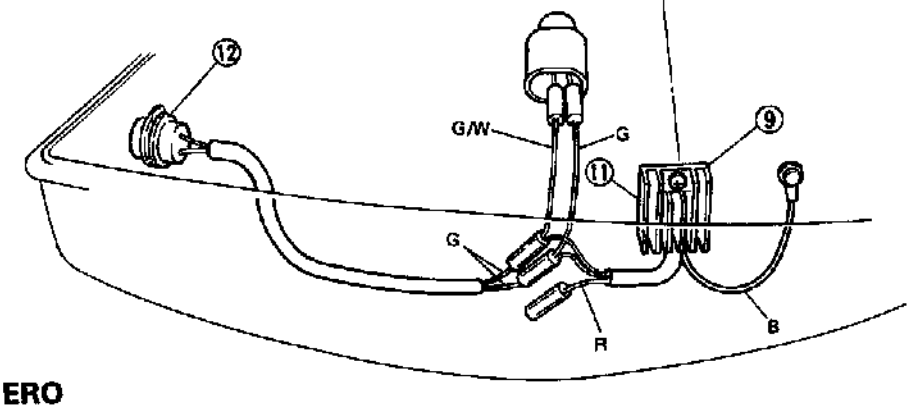
CHAPTER 8
ELECTRICAL SYSTEM

ELECTRICAL COMPONENTS

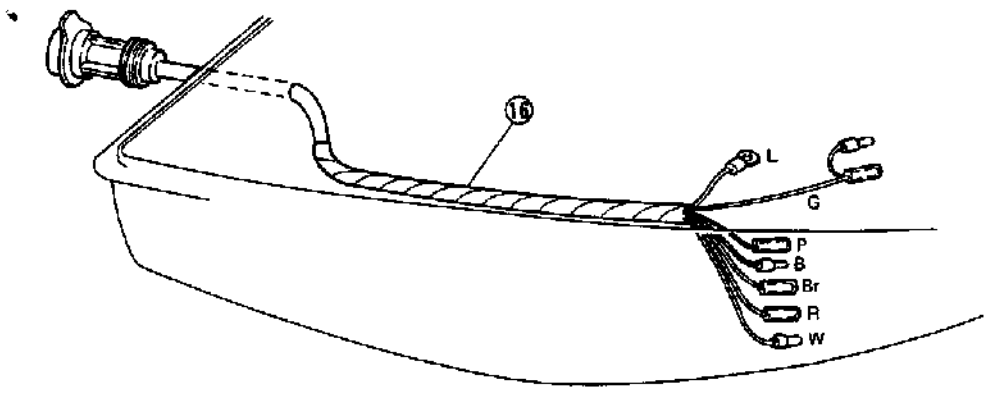
EM, EMO



M, MO



E, EO, ERO



① Engine stop switch
② Starter switch
③ Neutral switch
④ Starter relay
⑤ Starting motor
⑥ Stator
⑦ CDI unit
⑧ Ignition coil
⑨ Rectifier
⑩ Fuse
⑪ Regulator (Europe model)
⑫ 2P connector (Europe model)
⑬ Warning lamp
⑭ Thermo switch
⑮ Oil level sensor
⑯ 7P (10P) harness
⑰ Choke solenoid

ELECTRICAL ANALYSIS
INSPECTION

CAUTION:

All measuring instruments should be handled with special care, or the correct measurement is impossible.
On an instrument powered by dry batteries, they 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 position.

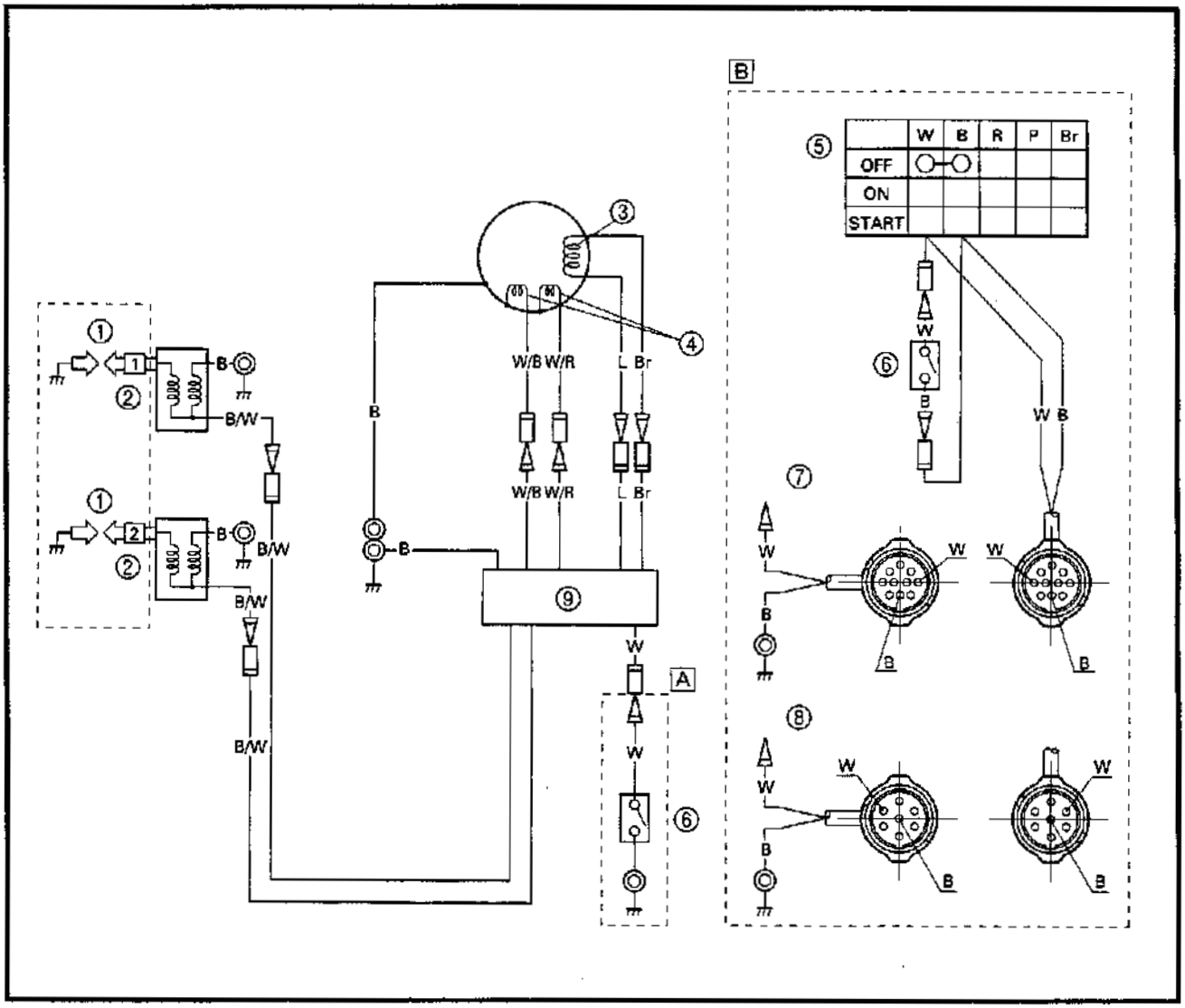
Peak voltage measurement

NOTE:

- The coil output varies greatly cranking speed.
- Cranking the cold engine with the plus in and a week battery cannot be found proper readings.

Digital tester:
J-39299
Peak volt adapter:
YU-39991

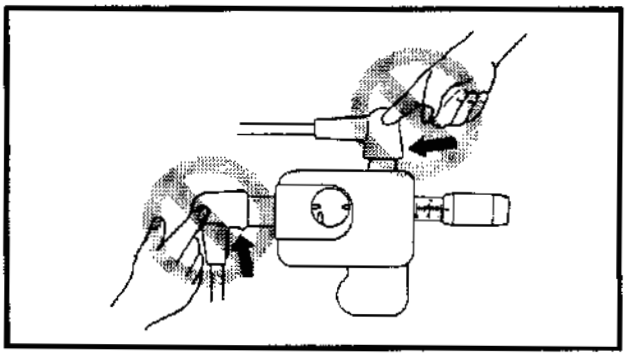
IGNITION SYSTEM

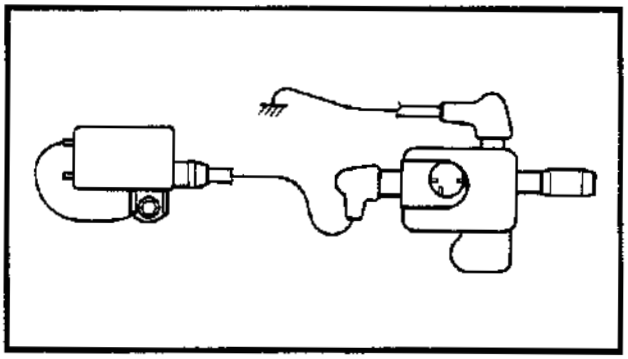


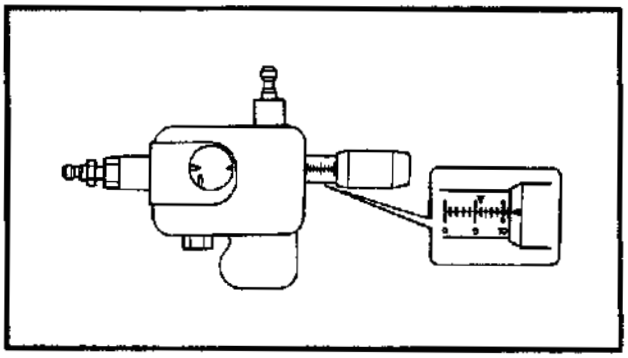
① Spark plug
② Ignition coil
③ Charge coil
④ Pulser coil
⑤ Main switch
⑥ Engine stop switch
⑦ 10P coupler
⑧ 7P coupler
⑨ CDI unit

A Manual starter model
B Electrical starter model

Br : Brown
L : Blue
W/R : White/Red
W/B : White/Black
W/G : White/Green
B/O : Black/Orange
B/W : Black/White
B/Y : Black/Yellow
W : White
B : Black







IGNITION SPARK GAP

⚠ 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. Check:
   - Ignition spark gap
     Out of specification → Replace.

Spark gap:
9 mm (0.35 in)

Checking steps:
- Adjust the spark gap to specification by turning the adjusting knob.

Spark gap tester:
YM-34487/90890-06754

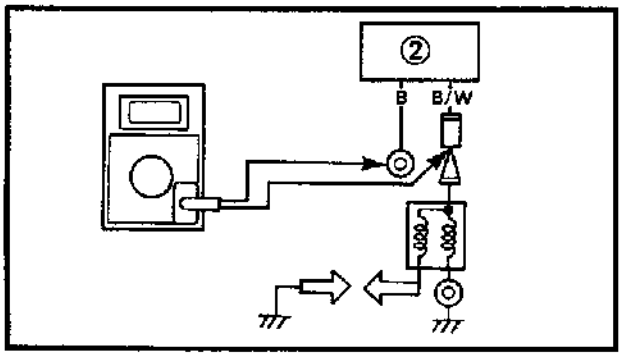
- Connect the spark plug cap to the spark gap tester.
- Remove the spark plugs from the engine.
- Crank the engine and check the sparks from the ignition system through the discharge window.

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.



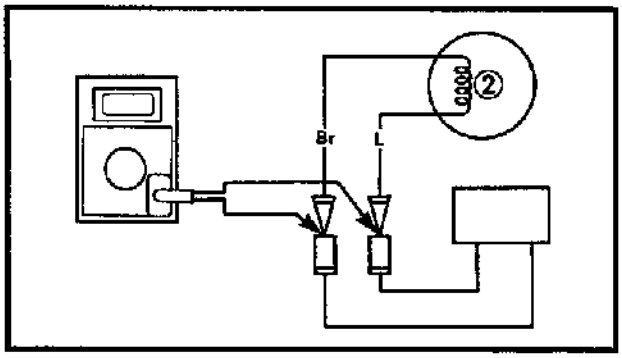
1. Measure:
   - CDI unit output (test #1)
     Below specification → Replace ignition coil.
     Repeat checking two times

CDI output:
125 V at cranking
135 V at 1,500 r/min

Measuring steps:
- Connect the tester ① to the CDI unit ② as shown.
- Set the tester dial to specification.

Range:
V

- Cranking or starting the engine.



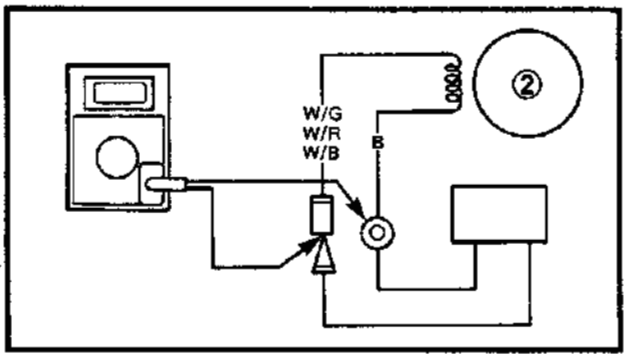
2. Measure:
   - Charge coil output (test #2)
     Below specification → Replace charge coil.

Charge coil output:
145 V at cranking
150 V at 1,500 r/min

Measuring steps:
- Connect the tester ① to the charge coil ② as shown.
- Set the tester dial to specification.

Range:
V

- Cranking or starting the engine.



3. Measure:
   - Pulser coil output (test #3)
     Beyond specification → Replace CDI unit.
     Below specification → Replace pulser coil.

Charge coil output:
6 V at cranking
13 V at 1,500 r/min

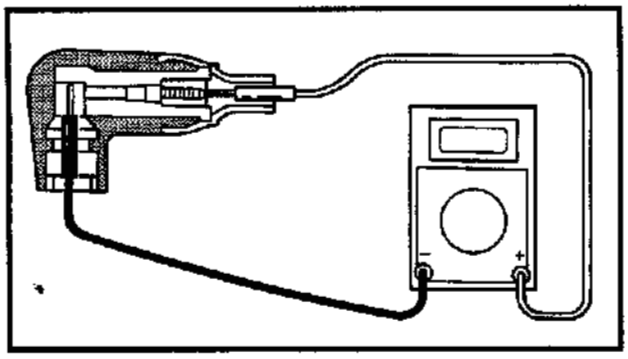
Measuring steps:
- Connect the tester ① to the pulser coil ② as shown.
- Set the tester dial to specification.

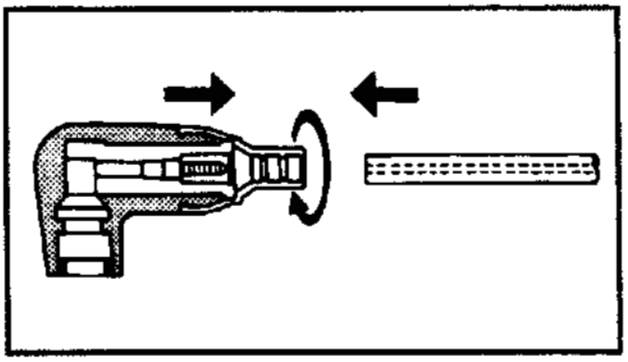
Range:
V

- Cranking or starting the engine.

SPARK PLUG

Refer to the "GENERAL" section in chapter 3.



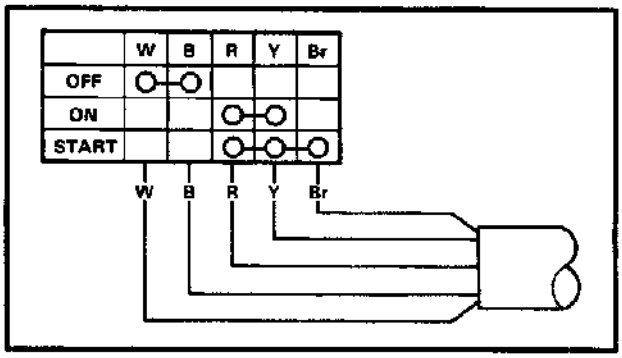


SPARK PLUG CAP

1. Inspect:
   - Spark plug cap
     Loosen → Tighten.
     Cracks/Damage → Replace.
2. Measure: (For Canada and Europe)
   - Spark plug cap resistance
     Out of specification → Replace.

Spark plug cap resistance:
4.0 ~ 6.0 kΩ

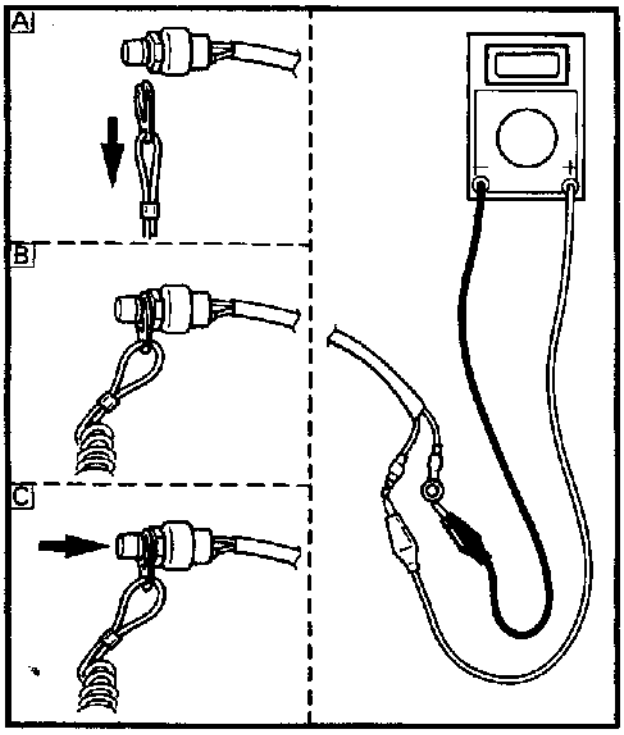
Replacement steps: (For Canada and Europe)
- Remove the spark plug cap by turning the cap counterclockwise.
- Install the spark plug cap by turning the cap clockwise until it is tight.



MAIN SWITCH

1. Check:
   - Continuity
     Out of specification → Replace.

Switch position	Checking lead color				
	White	Black	Red	Yellow	Brown
OFF	○—○				
ON			○—○		
START			○—○—○		

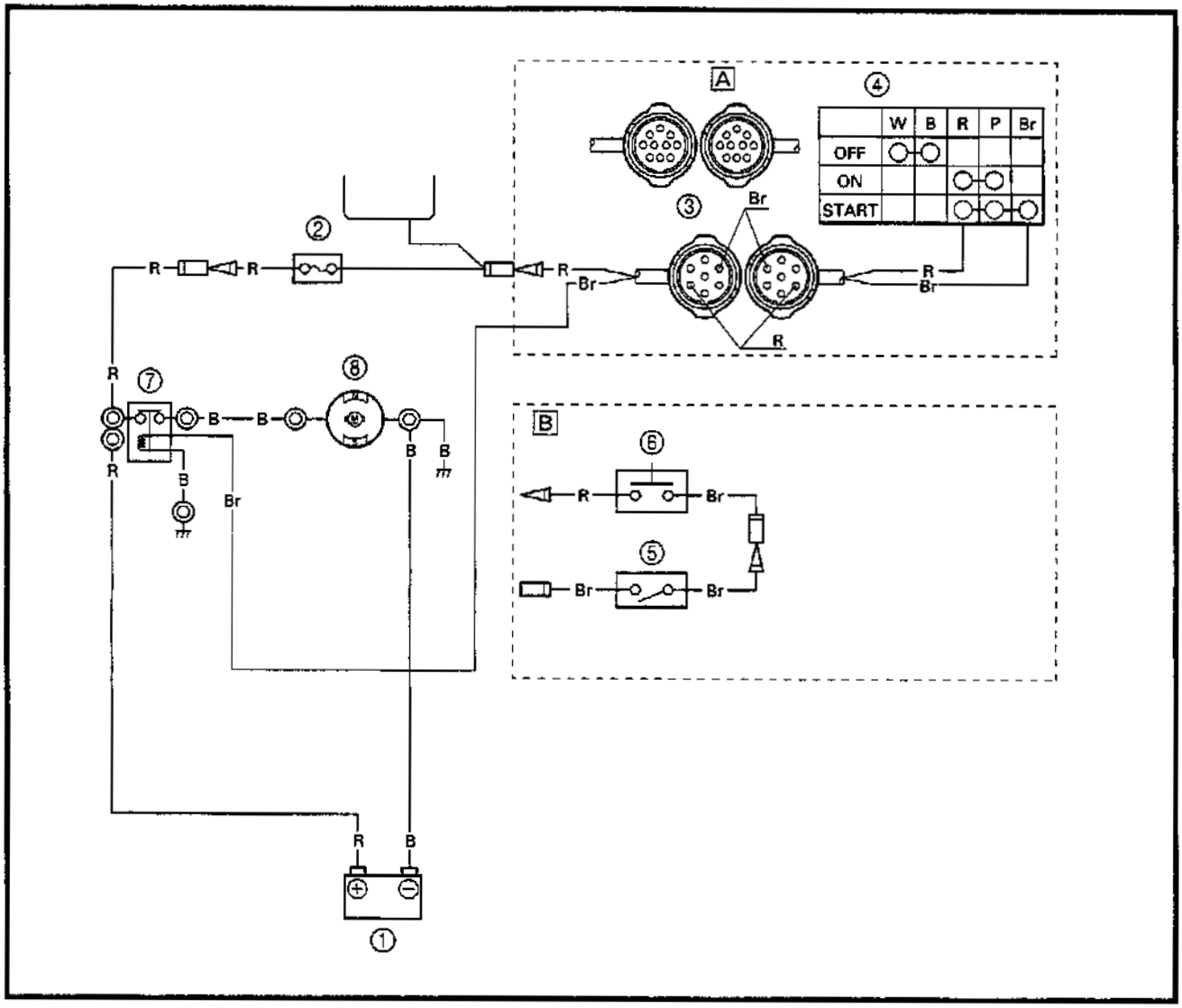


ENGINE STOP SWITCH

1. Check:
   - Continuity
     Out of specification → Replace.

	Checking lead color	
	White	Black
Remove the lock-plate [A]	○—○	
Install the lock-plate [B]		
Push the button [C]	○—○	

STARTING SYSTEM



① Battery
② Fuse
③ 7P (10P) coupler
④ Main switch
⑤ Neutral switch
⑥ Starter switch
⑦ Starter relay
⑧ Starting motor

B : Black
Br : Brown
R : Red

World wide	USA	Canada	Type
20DM	20MH	20MH	—
20DEM	—	20EH	B
20DMO	—	20MH2	—
20DEO	—	—	A
20DERO	—	—	A
20DEMO	—	20EH2	B
25NM	—	25MH	—
25NE	—	—	A
25NMO	25MH	25MH2	—
25NEO	—	—	A
25NERO	25ER	25ER	A
25NEMO	25EH	25EH	B

BATTERY

Refer to the "GENERAL" section in chapter 3.

FUSE

1. Check:
   - Fuse

   Blown → Replace.

	Fuse rating: **12 V - 20 A**

WIRING HARNESS

1. Check:
   - Continuity

   Discontinuity → Replace.

WIRING CONNECTION

1. Check:
   - Wiring connection

   Poor connection → Correct.

ENGINE STOP SWITCH

Refer to the "IGNITION SYSTEM" section.

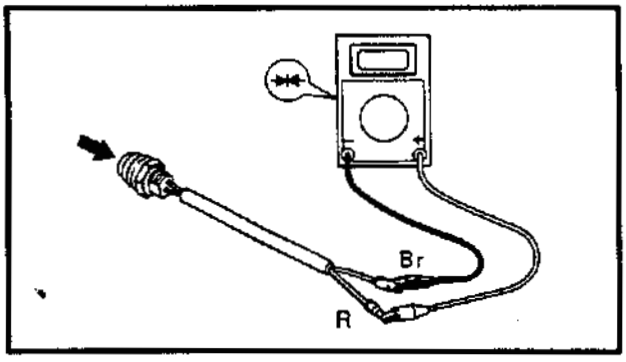
MAIN SWITCH

Refer to the "IGNITION SYSTEM" section.

STARTER SWITCH

1. Check:
   - Continuity

   Out of specification → Replace.

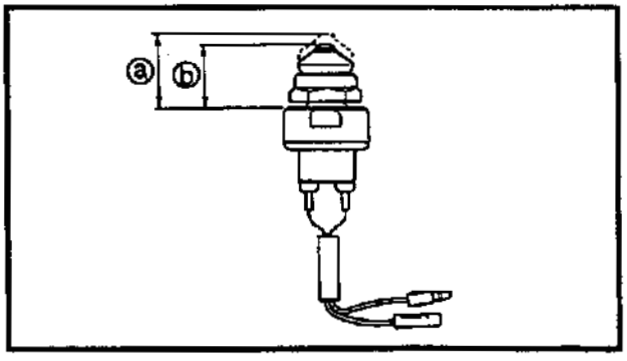


	Length	Leads color	
		Red	Brown
Free			
Push		○	○

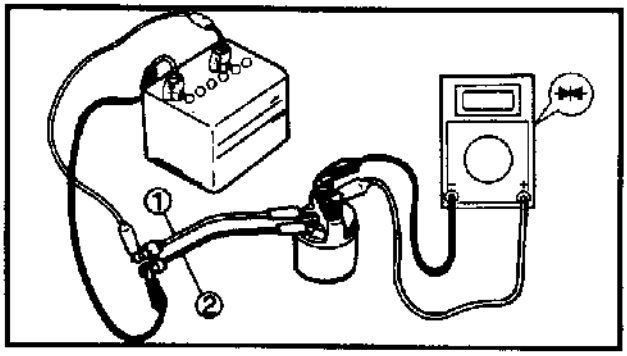
NEUTRAL SWITCH

1. Check:
   - Continuity

   Out of specification → Replace.



	Length	Leads color	
		Brown	Brown
Free ⓐ	19.5 ~ 20.5 mm (0.73 ~ 0.77 in)		
Push ⓑ	18.5 ~ 19.5 mm (0.73 ~ 0.77 in)	○	○



STARTER RELAY

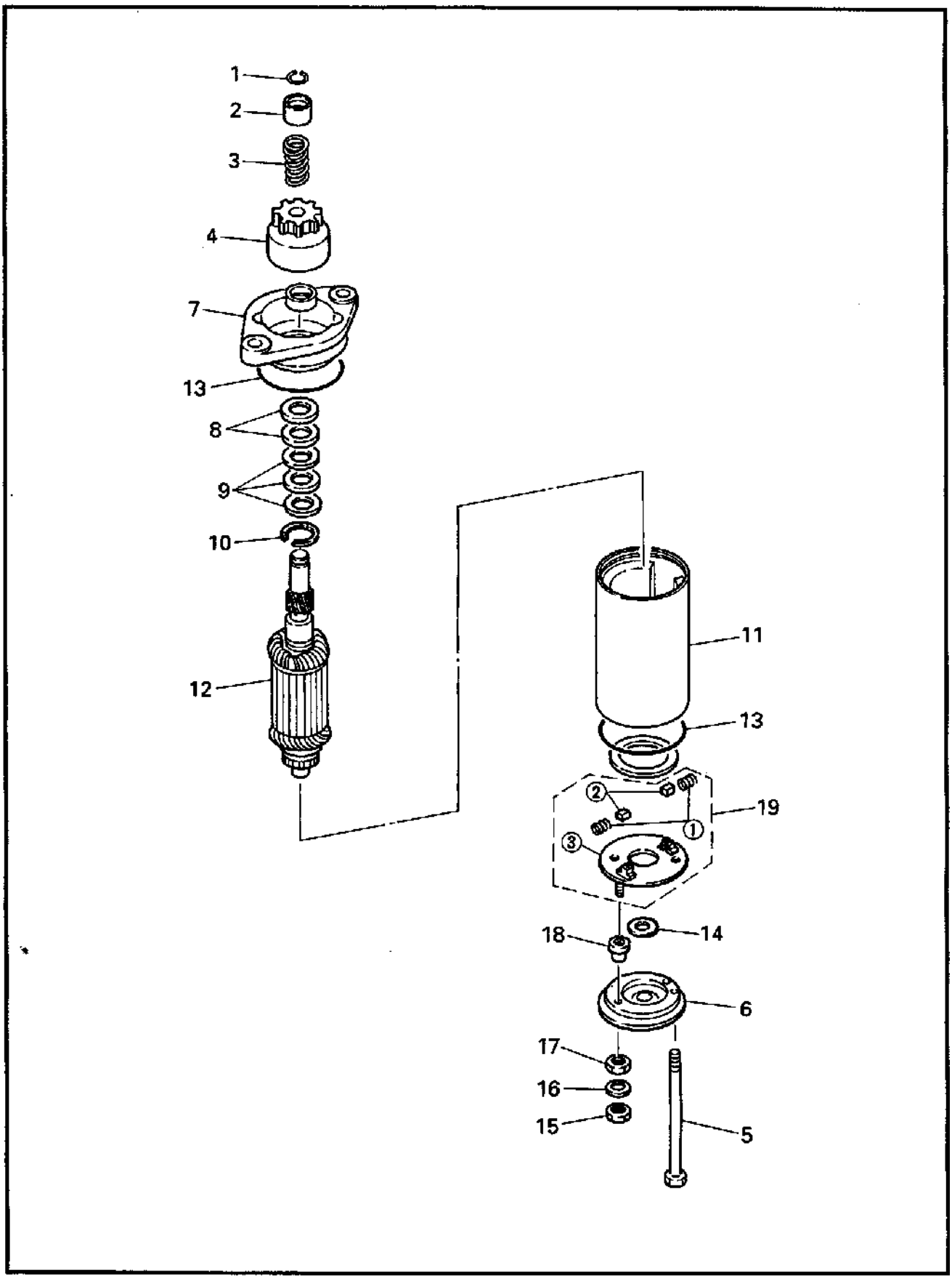
1. Check:
   - Relay operation
     Does not function → Replace.

Checking steps:
- Connect the tester between the terminals of the starter relay as shown.
- Connect a 12 V battery.

Brown lead ① → Positive terminal
Black lead ② → Negative terminal

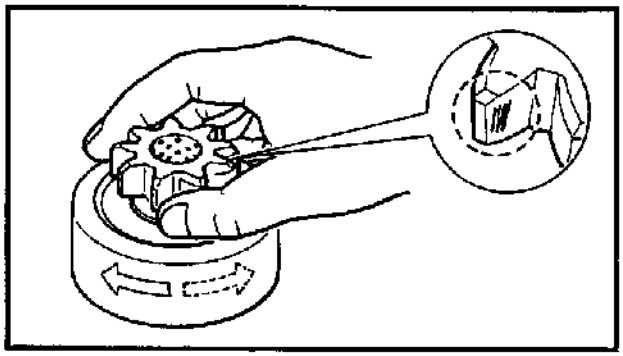
- Check that there is continuity between the starter relay terminals.

STARTING MOTOR
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	STARTING MOTOR DISASSEMBLY		Follow the left "Step" for removal.
	Starting motor assembly		Refer to the "ELECTRICAL UNIT" section in chapter 5.
1	Clip	1	
2	Pinion stopper	1	
3	Spring	1	
4	Pinion	1	
5	Through bolt	2	
6	Cover plate	1	
7	Front bracket	1	
8	Washer	2	0.5 mm
9	Washer	3	0.25 mm
10	Ring	1	1.5 mm
11	Stator	1	
12	Armature	1	
13	O-ring	2	
14	Washer	1	1.0 mm
15	Nut	1	
16	Washer	1	
17	Nut	1	
18	Insulation cover	1	
19	Brush holder assembly	1	
	BRUSH HOLDER DISASSEMBLY		
①	Brush spring	2	
②	Brush	2	
③	Brush holder	1	
			Reverse the removal steps for installation.

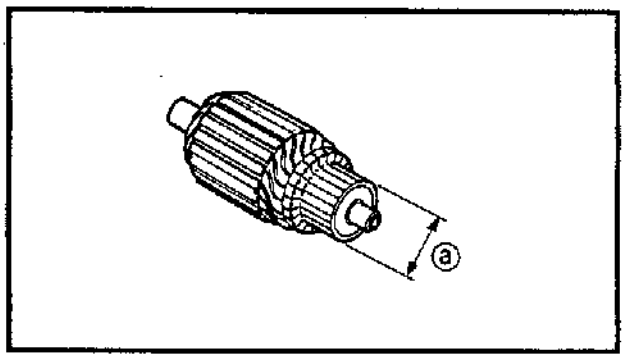


Pinion inspection

1. Inspect:
   - Pinion teeth
     Wear/Damage → Replace.
2. Check:
   - Clutch movement
     Damage → Replace.

NOTE:

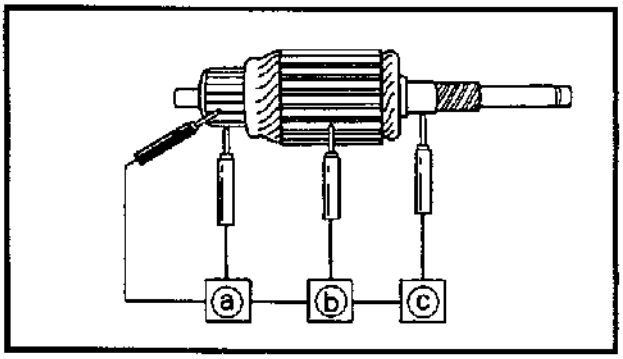
- Rotate clockwise: free
- Rotate counterclockwise: stiff



Armature inspection

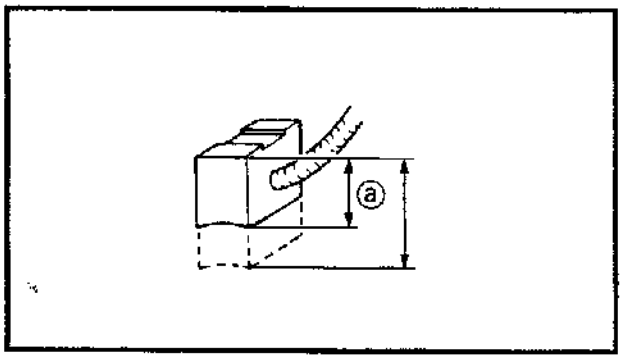
1. Measure:
   - Commutator diameter ⓐ
     Out of specification → Replace.

	Commutator diameter ⓐ: **Limit: 19.4 mm (0.76 in)**



2. Inspect:
   - Armature coil continuity
     Out of specification → Replace.

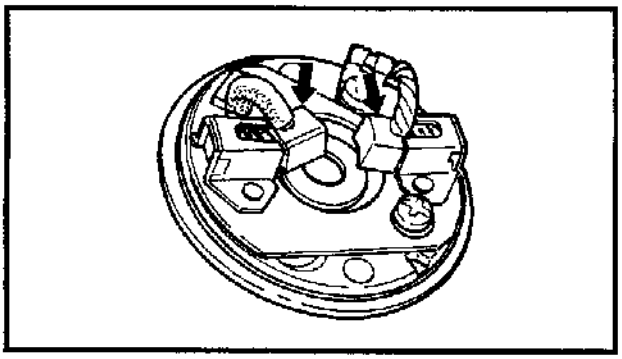
	Armature coil continuity:
Commutator segments ⓐ	**Continuity**
Segment - Armature core ⓑ	**Discontinuity**
Segment - Armature shaft ⓒ	**Discontinuity**



Brush holder inspection

1. Measure:
   - Brush length ⓐ
     Out of specification → Replace.

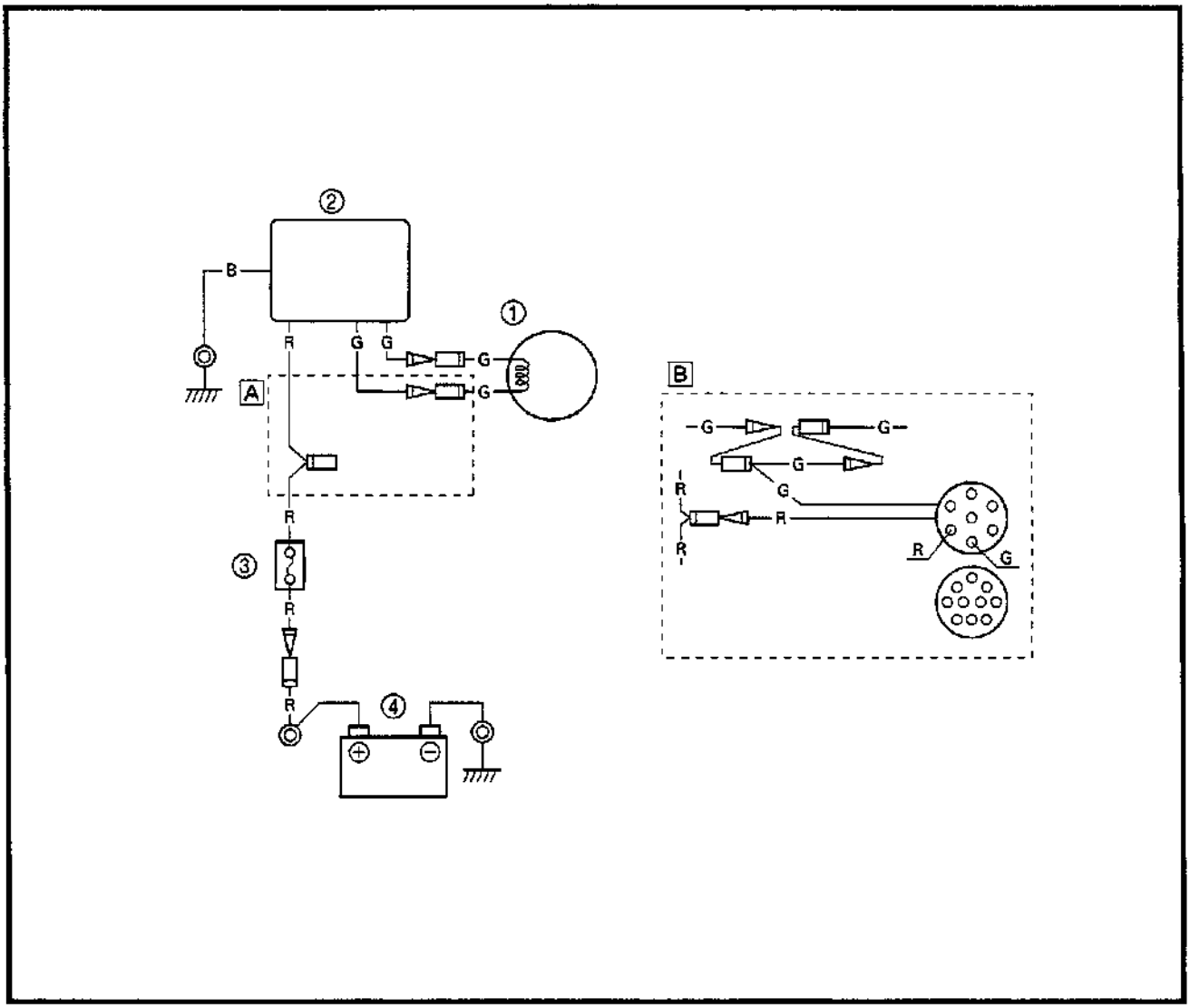
	Brush length ⓐ: **Limit: 4.5 mm (0.18 in)**



2. Check:
   - Brush holder continuity
     Out of specification → Replace.

	Brush holder continuity:
Brush - Brush	**Discontinuity**

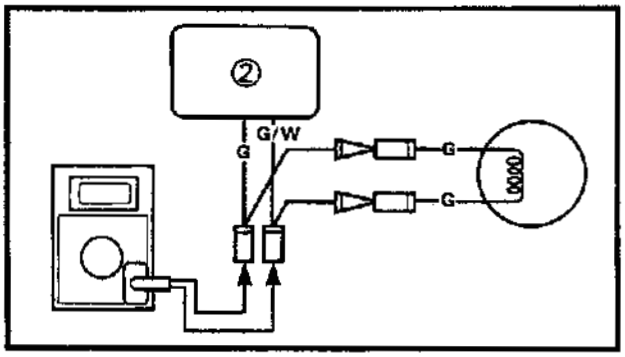
CHARGING SYSTEM

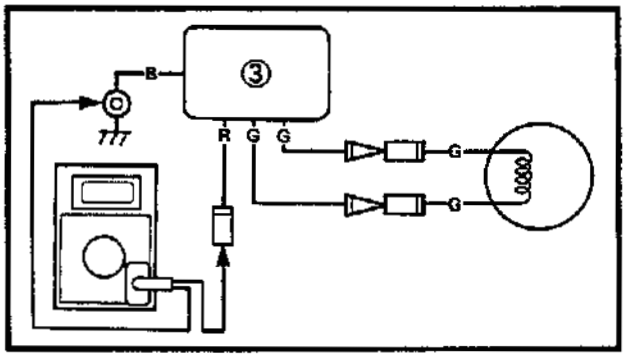


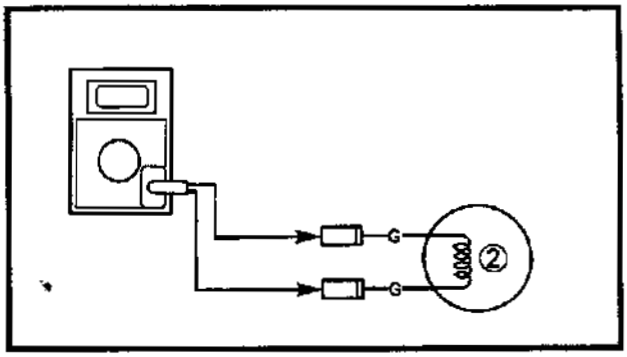
① Lighting coil
② Rectifier-Regulator
③ Fuse
④ Battery

R : Red
B : Black
G : Green

World wide	USA	Canada	Type
20DM	20MH	20MH	—
20DEM	—	20EH	A
20DMO	—	20MH2	—
20DEO	—	—	B
20DERO	—	—	B
20DEMO	—	20EH2	A
25NM	—	25MH	—
25NE	—	—	B
25NMO	25MH	25MH2	—
25NEO	—	—	B
25NERO	25ER	25ER	B
25NEMO	25EH	25EH	A







CHARGING SYSTEM PEAK VOLTAGE

1. Measure:
   - Rectifier output

   Below specification → Lighting measurement.

Regulator output ②:
(2P connector model)
11 V at cranking
13 V at 1,500 r/min
Rectifier output ③:
(electrical model)
11 V at cranking
13 V at 1,500 r/min

Measuring steps:
- Connect the tester ① to the rectifier ② regulator ③ as shown.
- Set the tester dial to specification.

Range:
②: $\tilde{V}$ ③: $\overline{V}$

- Cranking or starting the engine.

2. Measure:
   - Lighting coil output

   Beyond specification → Replace rectifier regulator/rectifier.
   Below specification → Replace lighting coil.

Lighting coil output:
12 V at 1,500 r/min

Measuring steps:
- Connect the tester ① to the lighting coil ② as shown.
- Set the tester dial to specification.

Range:
$\tilde{V}$

- Starting the engine.

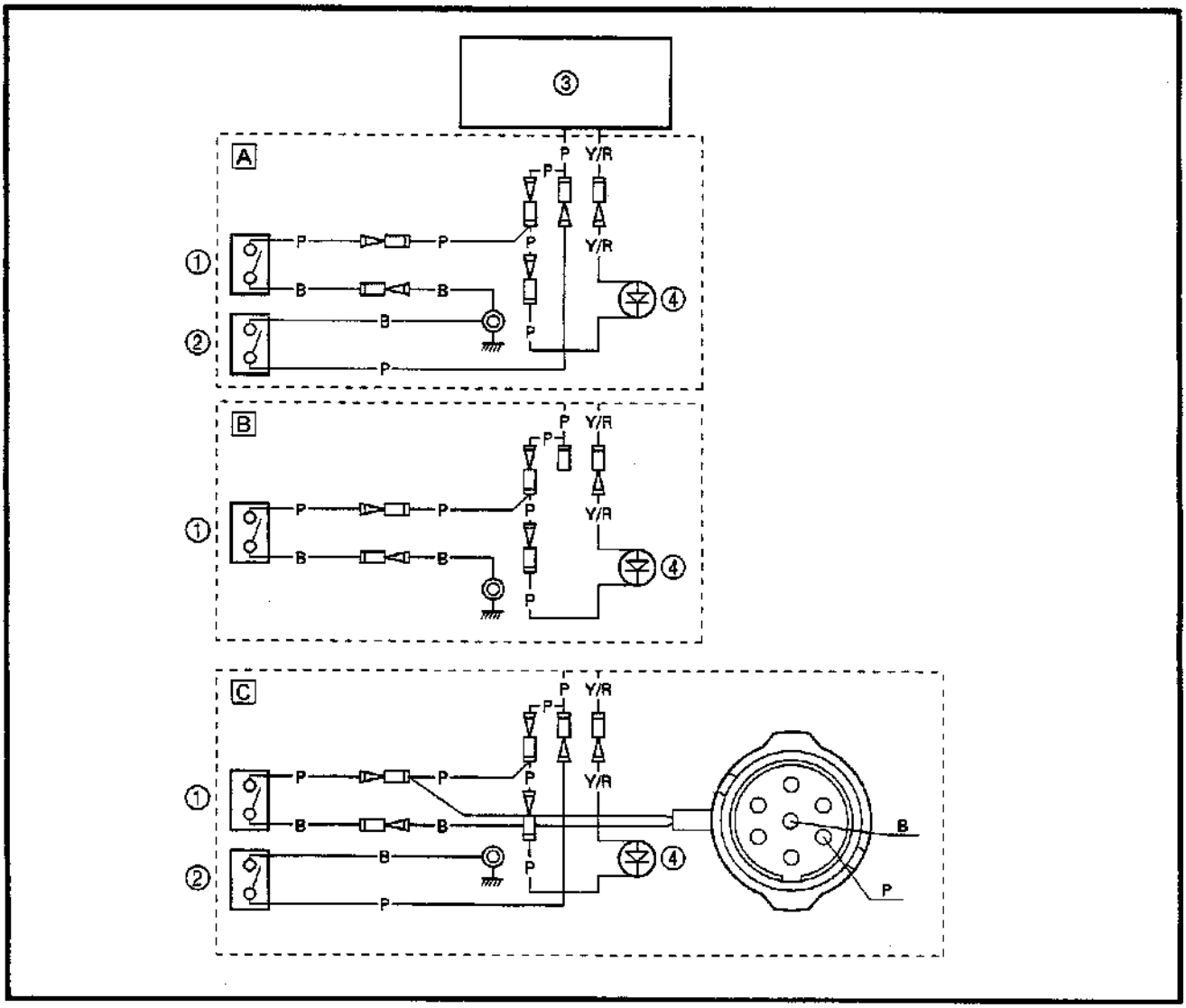
FUSE

Refer to the "STARTING SYSTEM" section.

BATTERY

Refer to the "GENERAL" section in chapter 3.

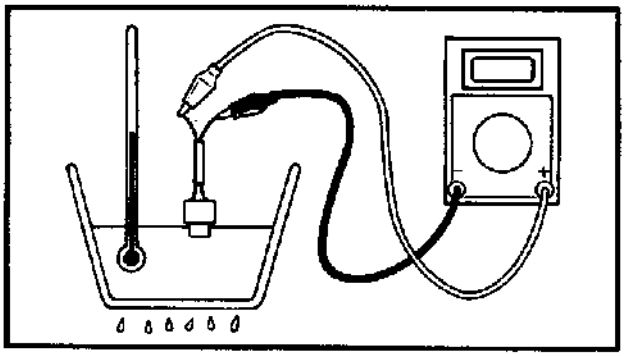
WARNING SYSTEM



① Thermo switch
② Oil level sensor
③ CDI unit
④ Warning lamp

P : Pink
B : Black
Y/R : Yellow/Red

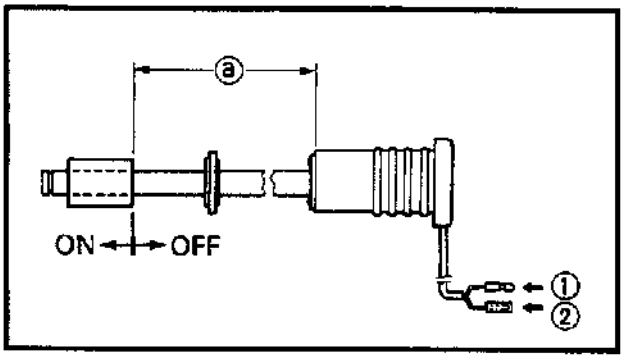
World wide	USA	Canada	Type
20DM	20MH	20MH	—
20DEM	—	20EH	—
20DMO	—	20MH2	—
20DEO	—	—	—
20DERO	—	—	—
20DEMO	—	20EH2	—
25NM	—	25MH	B
25NE	—	—	C
25NMO	25MH	25MH2	A
25NEO	—	—	C
25NERO	25ER	25ER	C
25NEMO	25EH	25EH	A



THERMO SWITCH

1. Measure:
   - Thermo switch continuity
     Out of specification → Replace.

Thermo switch continuity temperature:
Pink (P) — Black (B)
OFF → ON 76 ~ 84°C (169 ~ 183 °F)
ON → OFF 77 ~ 63°C (170 ~ 145 °F)

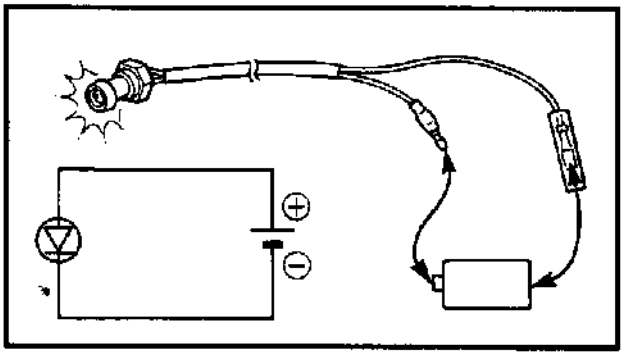


OIL LEVEL SENSOR

1. Measure:
   - Oil level sensor continuity
     Out of specification → Replace.

Float position	Checking leads color	
	① P	② B
ⓐ OFF		
ⓐ ON	○	○

Float length:
ⓐ 56.8 ~ 58.8 mm (2.24 ~ 2.31 in)



WARNING LAMP

1. Check:
   - LED (Light emitting diode) lighting
     No lighting → Replace.

Battery voltage:
1.5 V

Yellow/Red lead → Positive terminal.
Pink lead → Negative terminal.

CAUTION:

Use only originally pen light battery (1.5 V), other than batteries such as alkaline battery /higher voltage one will be burnt the diode.

NOTE:

LED has an direction for electrical current. Therefore try reverse connection if there is no lighting.

CHAPTER 9
TROUBLE-SHOOTING

TROUBLE ANALYSIS

NOTE:

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 comming to the carburetor.
7. Correct rigging and engine setting are obtained.
8. Engine is free from any "Hull problem".

TROUBLE ANALYSIS CHART

Trouble mode													Check elements	
ENGINE WILL NOT START	ROUGH IDLING	ENGINE STALLS	POOR DECELERATION	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	Rerative part	Reference chapter
													FUEL SYSTEM	
○		○			○								Fuel hose	4
○		○			○								Fuel joint	4
○	○	○			○								Fuel filter	4
○		○			○								Fuel pump	4
○	○	○			○								Carburetor	4
	○	○			○								● Idle speed	3
	○	○			○	○							● Pilot screw	4
													POWER UNIT	
○	○	○		○		○							Spark plug	3
○	○				○								Compression	3
○	○				○								Reed valve	5
○	○												Cylinder head gasket	5
○					○								Seal	5
○					○								Cylinder brock	5
○					○								Crank case	5
○					○								Piston ring	5
○					○								Piston	5
	○				○								Link adjustment	5
					○								Bearing	5
						○							Thermostat	5
						○							Water passage	5

TROUBLE ANALYSIS

Trouble mode													Check elements	
ENGINE WILL NOT START	ROUGH IDLING	ENGINE STALLS	POOR DECELERATION	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	Rerative part	Reference chapter
													LOWER UNIT	
○	○									○			Neutral position	6
○	○									○			Clutch	6
○										○			Gear	6
					○	○							Water inlet	6
					○	○							Water pump	6
					○								Propeller shaft	6
										○			Shifter/Pin	6
										○			Shift cam	6
										○			Shift shaft	6
										○			Lower case	6
													BRACKET UNIT	
							○						Bracket	7
							○						Mount rubber	7
										○			Shift actuator	7
													ELECTRICAL	
○	○	○			○								Ignition system	8
○				○									Starting system	8
	○	○			○								Enrichment control system	8
		○			○	○					○		Ignition control system	8
												○	Charging system	8