

YAMAHA

Marine

Outboards

Enduro model —

**E9.9C
E15C**

Kerosene model —

E15NK

SERVICE MANUAL

E

PEDOMAN SERVIS

IN

290264

NOTICE

This manual has been prepared by the Yamaha Motor Company Ltd. primarily for use by Yamaha dealers and their trained mechanics when performing maintenance procedures and repairs to Yamaha equipment. It has been written to suit the needs of persons who have a basic understanding of the mechanical and electrical concepts and procedures inherent in the work, for without such knowledge attempted repairs or service to the equipment could render it unsafe or unfit for use.

Because the Yamaha Motor Company Ltd. has a policy of continuously improving its products, models may differ in detail from the descriptions and illustrations given in this publication. Use only the latest edition of this manual. Authorized Yamaha dealers are notified periodically of modifications and significant changes in specifications and procedures, and these are incorporated in successive editions of this manual.

**E9.9C/E15C, E15NK
SERVICE MANUAL**

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1st Edition, December 1996

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PERHATIAN

Buku petunjuk yang disusun oleh Yamaha Motor Company ini terutama dimaksudkan untuk digunakan oleh para dealer Yamaha dan mekanik-mekaniknya sebagai pedoman dalam melakukan perawatan dan reparasi peralatan buatan Yamaha. Buku ini disusun untuk mekanik yang memiliki pengetahuan dasar tentang konsep dan prosedur mekanik dan elektrikal yang berlaku untuk produk kami, karena tanpa bekal pengetahuan tadi usaha mereparasi atau perawatan atas produk kami tidak akan memberikan hasil sebagaimana mestinya.

Yamaha Motor Company Ltd. secara terus-menerus melakukan perbaikan pada produk-produknya, karena itu mungkin saja model tertentu berbeda dengan spesifikasi dan ilustrasi yang terdapat dalam buku petunjuk ini. Sedapat mungkin gunakan edisi terakhir buku petunjuk ini.

Dealer Yamaha yang ditunjuk mendapat pemberitahuan secara berkala mengenai modifikasi serta perubahan spesifikasi dan prosedur, dan semua perubahan ini akan dicantumkan di dalam edisi-edisi buku petunjuk berikutnya.

E9.9C/E15C, E15NK
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HOW TO USE THIS MANUAL

MANUAL FORMAT

All of the procedures in this manual are organized in a sequential, step-by-step format. The information has been compiled to provide the mechanic with an easy to read, handy reference that contains comprehensive explanations of all disassembly, repair, assembly, and inspection operations.

In this revised format, the condition of a faulty component will precede an arrow symbol and the course of action required will follow the symbol, e.g.,

- Bearings
Damage/pitting → Replace.

To assist you in finding your way through this manual the section title and major heading is given at the top of every page.

ILLUSTRATIONS

The illustrations within this service manual represent all of the designated models.

CROSS REFERENCES

The cross references have been kept to a minimum. Cross references will direct you to the appropriate section or chapter.

CARA MEMPERGUNAKAN BUKU PETUNJUK INI

SUSUNAN BUKU PETUNJUK

Semua prosedur di dalam buku petunjuk ini disusun secara langkah demi langkah yang berurutan. Petunjuk-petunjuk yang meliputi bongkar pasang, reparasi, dan pemeriksaan mudah dimengerti oleh mekanik. Di dalam petunjuk yang sudah diperbaiki ini, penjelasan mengenai keadaan suatu komponen yang rusak, diberi tanda panah serta tindakan yang harus dilakukan, misalnya:

- Bantalan
Rusak → Ganti.

Section Title (Judul Bagian) dan Major Heading (Judul Utama) tercantum pada bagian atas setiap halaman untuk mempermudah mencari petunjuk yang diperlukan. Pada halaman pertama dari setiap bagian tercantum indeks daftar isi bagian yang bersangkutan.

URAIAN

Uraian-uraian yang ada di dalam buku petunjuk perawatan berlaku untuk semua model yang di sebutkan.

RUJUKAN SILANG

Rujukan silang dibuat seminimum mungkin. Rujukan silang akan membimbing anda untuk membaca bagian atau bab yang tepat.

WARNINGS, CAUTIONS AND NOTES

In this Service Manual particularly important information is distinguished 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.

PERINGATAN, PERHATIAN DAN CATATAN

Perhatikan berbagai Peringatan, Perhatian dan Catatan yang diberikan di dalam buku petunjuk ini.



Tanda waspada ini berarti PERHATIAN ! WASPADA ! KESELAMATAN ANDA TERANCAM !

PERINGATAN :

Pengabaian tanda PERINGATAN ini dapat mengakibatkan cedera berat atau kematian bagi operator mesin, orang yang dekat, atau orang yang sedang memeriksa atau mereparasi motor tempel.

PERHATIAN :

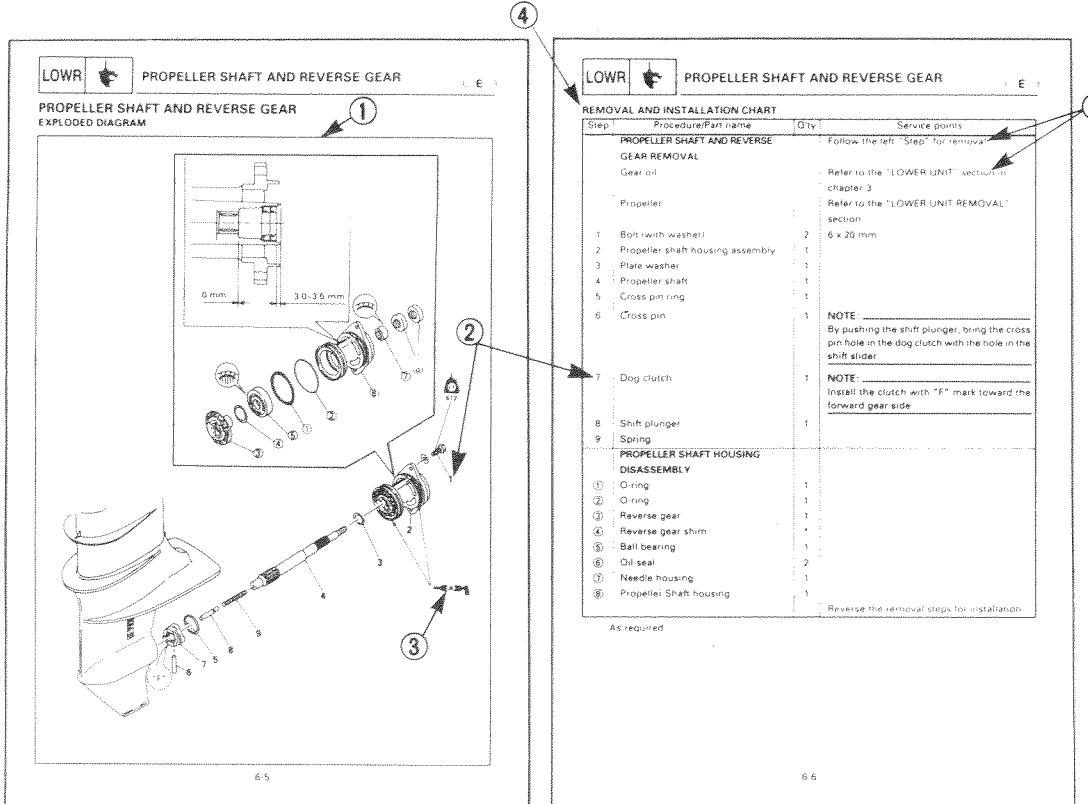
Tanda PERHATIAN menunjukkan bahwa tindakan pencegahan harus diambil untuk mencegah terjadinya kerusakan pada motor tempel.

CATATAN :

Tanda CATATAN memberikan informasi penting untuk memudahkan atau membuat prosedur menjadi lebih jelas.

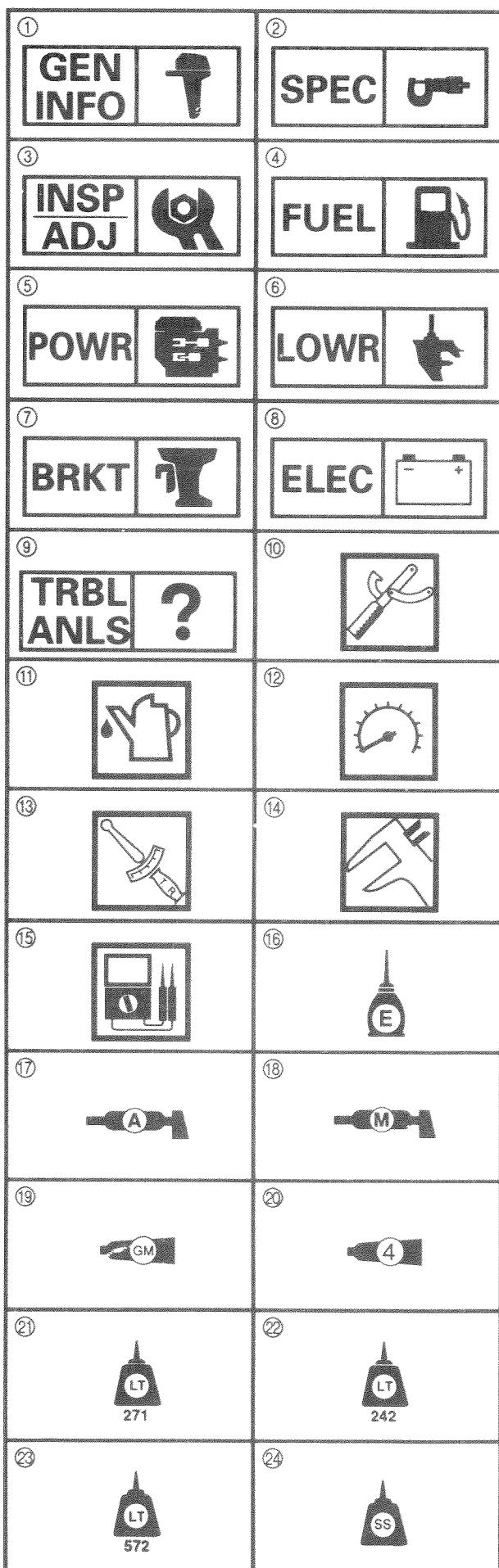
HOW TO READ DESCRIPTIONS

1. To help identify parts and clarify procedure steps, exploded diagrams ① are provided at the start of each section.
2. Numbers ② indicate the order of the job steps.
3. Symbols ③ indicate the contents and notes of the job.
For the meanings of the symbols, refer to the next page(s).
4. The "Removal and Installation Chart" ④ accompanies the exploded diagram and explains the job steps, part names, notes for the jobs, etc.
5. The "Service points" ⑤ give informative notes and discuss the appropriate sections to refer to.



CARA MEMBACA URAIAN

1. Untuk membantu mengenali bagian-bagian mesin dan menjelaskan langkah-langkah prosedur, diagram bagian-bagian mesin dalam keadaan terurai ① diberikan pada permulaan masing-masing bagian.
2. Nomor ② menunjukkan urutan-urutan langkah pekerjaan.
3. Tanda ③ menunjukkan isi dan catatan mengenai pekerjaan.
4. "BAGIAN PEMBONGKARAN DAN PEMASANGAN" ④ menyertai diagram bagian-bagian mesin dalam keadaan terurai dan menjelaskan langkah-langkah pekerjaan, nama-nama bagian mesin, catatan-catatan untuk pekerjaan dan sebagainya.
5. "TITIK-TITIK PERAWATAN" ⑤ memberikan catatan-catatan informasi dan membahas bagian-bagian yang tepat sebagai acuan.



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 adjustments
- ④ Fuel system
- ⑤ Power unit
- ⑥ Lower unit
- ⑦ Bracket unit
- ⑧ Electrical system
- ⑨ Trouble-analysis

Symbols ⑩ to ⑯ indicate specific data:

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

Symbol ⑯ to ⑰ in an exploded diagram indicate grade of lubricant and location of the lubrication point:

- ⑯ Apply Yamaha 2-stroke outboard motor oil
- ⑰ Apply water resistant grease (Yamaha grease A, Yamaha marine grease)
- ⑱ Apply molybdenum disulfide grease

Symbols ⑲ to ㉔ in an exploded diagram indicate the grade of the sealing or locking agent and the location of the application point:

- ⑲ Apply Gasket Maker®
- ⑳ Apply Yamabond #4 (Yamaha bond No. 4)
- ㉑ Apply LOCTITE® No. 271 (Red LOCTITE)
- ㉒ Apply LOCTITE® No. 242 (Blue LOCTITE)
- ㉓ Apply LOCTITE® No. 572
- ㉔ Apply silicon sealant

TANDA-TANDA

Tanda ① sampai ⑨ merupakan penanda halaman yang menunjukkan isi suatu bab.

- ① Keterangan umum
- ② Spesifikasi
- ③ Pemeriksaan dan penyetelan berkala
- ④ Sistem bahan bakar
- ⑤ Bagian mesin
- ⑥ Bagian bawah
- ⑦ Bagian siku-siku (bracket)
- ⑧ Sistem elektrik
- ⑨ Analisis gangguan

Tanda ⑩ sampai ⑯ menunjukkan data khusus :

- ⑩ Perkakas khusus
- ⑪ Cairan yang ditentukan
- ⑫ Putaran mesin yang ditentukan
- ⑬ Momen putar yang ditentukan
- ⑭ Ukuran yang ditentukan
- ⑯ Spesifikasi elektrik yang ditentukan
[Tahanan (Ω), Voltase (V), Ampere (A)]

Tanda ⑯ sampai ⑰ pada diagram bagian-bagian mesin yang terurai menunjukkan jenis pelumas dan lokasi titik pelumasan :

- ⑯ Pakai pelumas motor tempel Yamaha 2-tak
- ⑰ Pakai gemuk anti air (gemuk A dan gemuk kapal laut buatan Yamaha)
- ⑰ Pakai gemuk molybdenum disulfide

Tanda ⑲ sampai ㉓ pada diagram bagian-bagian mesin yang terurai menunjukkan jenis lem pelapis dan titik-titik pemakaian :

- ⑲ Pakai Gasket Maker®
- ⑳ Pakai Yamabond #4 (Yamaha bon No.4)
- ㉑ Pakai LOCTITE® No. 271 (Red LOCTITE)
- ㉒ Pakai LOCTITE® No. 242 (Blue LOCTITE)
- ㉓ Pakai LOCTITE® No. 572
- ㉔ Pakai seal silikon

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UNIT BRACKET (SIKU)

SISTEM ELEKTRIK

ANALISIS GANGGUAN



CHAPTER 1

GENERAL INFORMATION

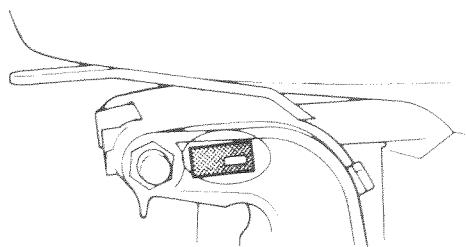
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BAB 1

KETERANGAN UMUM

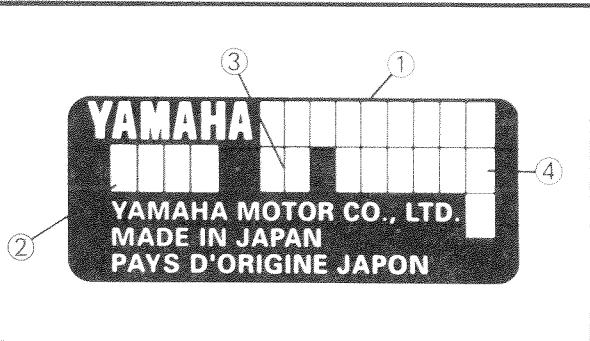
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IDENTIFICATION SERIAL NUMBER

The outboard motor's serial number is stamped on the label attached to the port side of the bracket clamp.

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



STARTING SERIAL NUMBERS

The starting serial number blocks are as follows:

Model	Starting serial No.
E9.9CMH	S: 100101~ L: 410101~ SUL: 950101~
E15CMH	S: 140101~ L: 500101~ SUL: 700101~
E15NMHK	S: 200101~ L: 600101~

**IDENTIFIKASI****NOMOR SERI**

Nomor seri motor tempel tertera pada pelat yang terlekat pada sisi kiri klem siku.

- ① Nama model
- ② Nomor model yang disetujui
- ③ Ketinggian palang buritan (transom height)
- ④ Nomor seri

NOMOR SERI AWAL

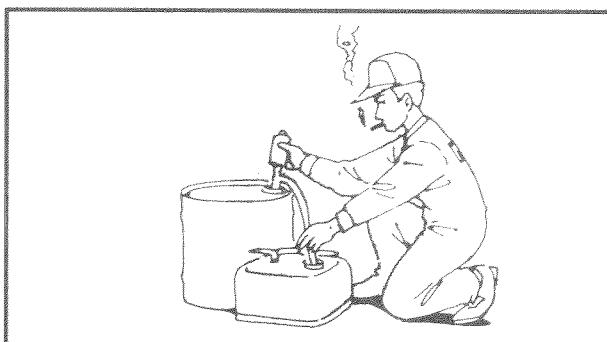
Blok nomor seri awal adalah sebagai berikut :

Model	Nomor seri awal
E9.9CMH	S: 100101 ~ L: 410101 ~ SUL: 950101 ~
E15CMH	S: 140101 ~ L: 500101 ~ SUL: 700101 ~
E15NMHK	S: 200101 ~ L: 600101 ~



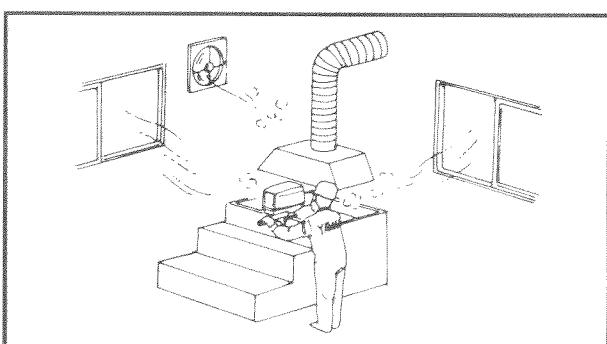
SAFETY WHILE WORKING

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



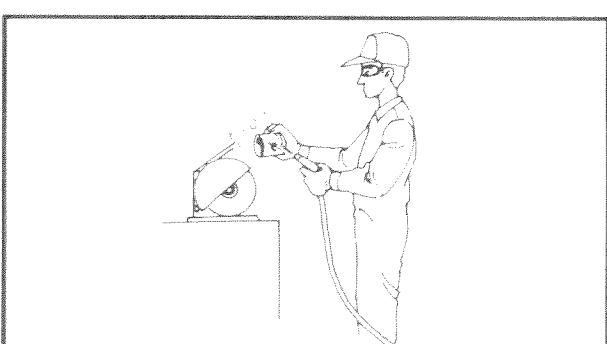
FIRE PREVENTION

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



VENTILATION

Petroleum vapors are heavier than air and if inhaled in large quantities can be deadly. Engine exhaust gases are harmful to breathe. When test-running an engine indoors, maintain good ventilation.



SELF-PROTECTION

Protect your eyes with suitable safety spectacles 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.



KEAMANAN KERJA

Prosedur keamanan yang diberikan di dalam buku petunjuk ini dianjurkan oleh Yamaha untuk dilaksanakan oleh semua dealer Yamaha dan para mekaniknya.

PENCEGAHAN KEBAKARAN

Bensin adalah bahan yang mudah terbakar. Uap bensin mudah terbakar jika terkena api. Dilarang merokok sewaktu bekerja, dan jauhkan segala sumber panas, api dan percikan api.

VENTILASI

Uap bensin lebih berat dari udara dan akan mematikan jika memasuki pernapasan dalam jumlah besar. Gas buang mesin berbahaya bagi pernapasan. Sewaktu mengetes mesin di dalam ruangan tertutup, usahakan ventilasi yang cukup.

PERLINDUNGAN DIRI

Lindungi mata anda dengan kacamata pengaman sewaktu menggunakan kompresor, sewaktu menggerinda/menggosok atau kegiatan lain dimana partikel-partikel halus berterbang. Lindungi tangan dan kaki dengan memakai sarung tangan atau sepatu pengaman sesuai dengan pekerjaan yang dilakukan.

MINYAK, GEMUK DAN CAIRAN PELAPIS

Jangan gunakan minyak lain kecuali minyak pelumas, gemuk dan cairan pelapis Yamaha atau lainnya yang dianjurkan oleh 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 one's pocket.
4. Hands and any other part of the body which have been in contact with lubricants or lubricant-contaminated clothing, should be thoroughly washed with hot water and soap as soon as practicable.
5. To protect the skin, the application of a suitable barrier cream to the hands before working is recommended.
6. A supply of clean lint-free cloths should be available for wiping purposes.



GOOD WORKING PRACTICES

1. The right tools

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

2. Tightening torque

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



Dalam kondisi pemakaian yang normal, penggunaan pelumas yang ditentukan tidak akan menimbulkan bahaya, namun keamanan kerja berada di atas segala-galanya, karena itu peraturan keamanan kerja harus diterapkan untuk meminimalkan resiko terjadinya bahaya.

Berikut ini ringkasan langkah-langkah pencegahan :

1. Sewaktu bekerja, pelihara kesehatan diri dan kesehatan industrial.
2. Segera mengganti pakaian yang terkena minyak pelumas secepat mungkin, lalu dicuci sebelum digunakan kembali.
3. Jaga agar kulit tidak terkena pelumas, misalnya jangan memasukkan lap yang penuh dengan pelumas ke dalam kantung pakaian.
4. Tangan serta anggota tubuh lain yang terkena pelumas atau terkena lap yang penuh pelumas harus dicuci bersih dengan air panas dan sabun secepat mungkin.
5. Dianjurkan menggunakan cream pelindung pada tangan sebelum mulai bekerja.
6. Selalu sediakan lap bersih yang tidak berbulu untuk keperluan membersihkan tangan dan lain-lain.

KEBIASAAN KERJA YANG BAIK

1. Perkakas yang tepat

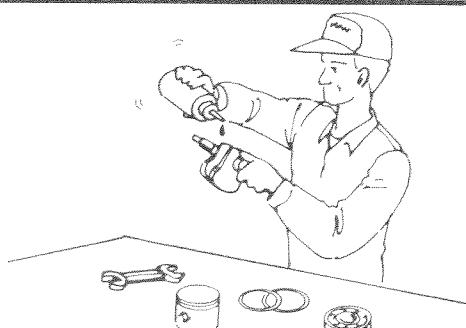
Gunakan perkakas khusus yang ditentukan agar bagian-bagian mesin tidak menjadi rusak. Gunakan perkakas yang tepat dengan cara yang benar — jangan sembarangan.

2. Mengencangkan momen putar

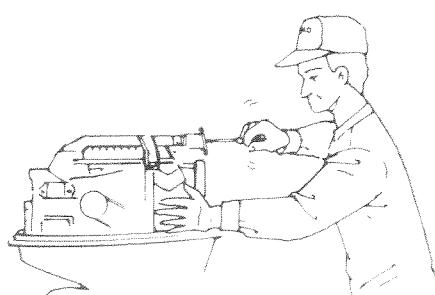
Ikuti ketentuan pengencangan momen putar. Sewaktu mengencangkan baut, mur dan sekrup, terlebih dahulu kencangkan yang berukuran besar, dan kencangkan dulu pengikat di bagian dalam sebelum mengencangkan pengikat di bagian luar.

**3. Nonreusable items**

Always use new gaskets, packings, O-rings, oil seals, split-pins and circlips etc. on reassembly.

**DISASSEMBLY AND ASSEMBLY**

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

CAUTION:

Do not use compressed air to spin the bearings dry. This causes damage to the bearing surfaces.

5. When installing oil seals, apply a light coating of water-resistant grease to the outside diameter.

**3. Barang yang tidak dapat dipakai kembali**

Selalu gunakan gasket, paking, O-ring, penjepit belah dan circlip yang baru sewaktu memasang kembali.

PEMBONGKARAN DAN PEMASANGAN

1. Bersihkan bagian-bagian yang dilepas dengan memakai kompresor.
2. Lumasi bagian-bagian yang bergerak sebelum dipasang kembali.

3. Setelah dipasang kembali, periksa bahwa bagian-bagian yang bergerak bekerja normal.

4. Pasang bantalan dengan sisi di mana tertera merek pabrik menghadap ke atas.

PERHATIAN:

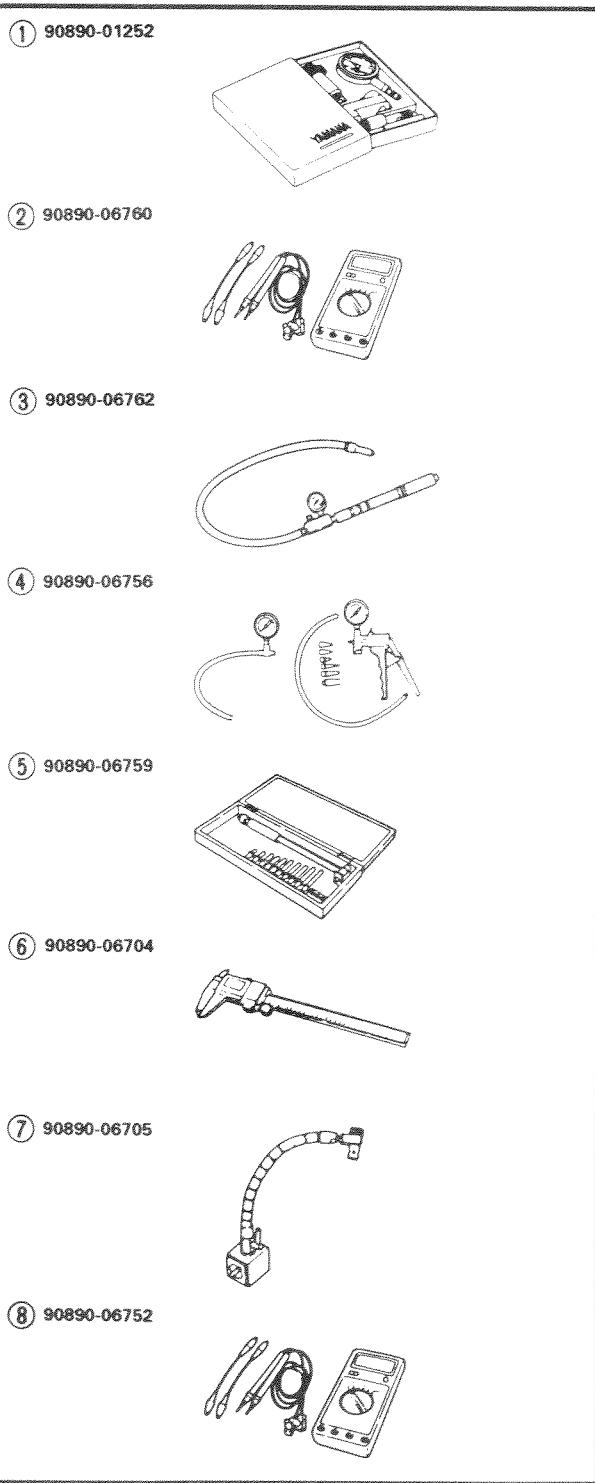
Jangan menggunakan udara kompresi untuk memutar bantalan supaya kering. Ini bisa menyebabkan kerusakan pada permukaan bantalan.

5. Sewaktu memasang paking oli, oleskan lapisan tipis gemuk anti air pada diameter luamya.



SPECIAL TOOLS

Using the correct special tools, recommended by Yamaha, will aid the work and enable accurate assembly and tune-up. Improvising and using improper tools can damage the equipment.



MEASURING

1. Dial gauge
P/N. 90890-01252
2. Tachometer
P/N. 90890-06760
3. Pressure tester
P/N. 90890-06762
4. Mity vac
P/N. 90890-06756
5. Cylinder gauge set
P/N. 90890-06759
6. Digital caliper
P/N. 90890-06704
7. Magnet base
P/N. 90890-06705
8. Digital multimeter
P/N. 90890-06752



PERKAKAS KHUSUS

Memakai perkakas khusus yang dianjurkan Yamaha akan membantu pekerjaan serta menjamin pemasangan kembali dan tune-up yang akurat.

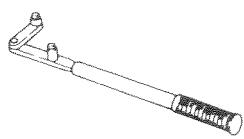
Kerja sembarang dan pemakaian perkakas yang tidak tepat dapat merusak peralatan.

PENGUKURAN

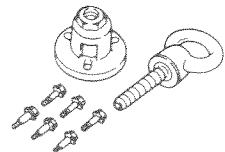
1. Dial gauge (Pengukuran berskala)
P/N. 90890-01252
2. Tachometer (Pengukur putaran mesin)
P/N. 90890-06760
3. Pengukur tekanan
P/N. 90890-06762
4. Mity vac
P/N. 90890-06756
5. Cylinder gauge set
P/N. 90890-06759
6. Digital caliper
P/N. 90890-06704
7. Magnet base (Dasar magnit)
P/N. 90890-06705
8. Digital multimeter
P/N. 90890-06752



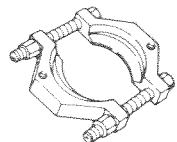
(1) 90890-06522



(2) 90890-06521



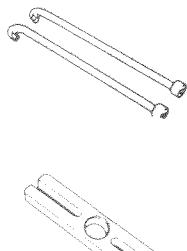
(3) 90890-06534



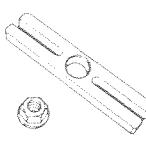
(4) 90890-06543



(5) 90890-06503



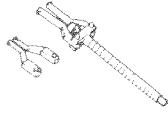
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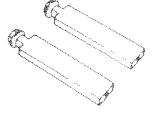
(7) 90890-06504



(8) 90890-06535



(9) 90890-06538

(10) 90890-06602
90890-06604
90890-06605
90890-06652

REMOVAL AND INSTALLATION

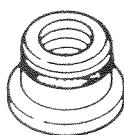
1. Flywheel holder
P/N. 90890-06522
2. Flywheel puller
P/N. 90890-06521
3. Bearing separator
P/N. 90890-06534
4. Small end needle bearing installer
P/N. 90890-06543
5. Bearing housing puller
P/N. 90890-06503
6. Stopper guide plate
(propeller shaft housing)
P/N. 90890-06501
7. Center bolt (propeller shaft housing)
P/N. 90890-06504
8. Bearing puller (reverse gear bearing)
P/N. 90890-06535
9. Stopper guide stand
(reverse gear bearing)
P/N. 90890-06538
10. Driver rod
P/N. 90890-06602, 90890-06604,
90890-06605, 90890-06652

**MELEPASKAN DAN MEMASANG KEMBALI**

1. Penahan roda gaya
P/N. 90890-06522
2. Penarik roda gaya
P/N. 90890-06521
3. Pemisah bantalan
P/N. 90890-06534
4. Pemasang bantalan jarum ujung kecil
P/N. 90890-06543
5. Penarik rumah bearing
P/N. 90890-06503
6. Pelat antar penahan
P/N. 90890-06501
7. Baut tengah (rumah poros baling-baling)
P/N. 90890-06504
8. Penarik bantalan (bantalan roda gigi mundur)
P/N. 90890-06535
9. Dudukan antar penahan
(bantalan roda gigi mundur)
P/N. 90890-06538
10. Bantalan penggerak
P/N. 90890-06602, 90890-06604,
90890-06605, 90890-06652.



(11) 90890-06616



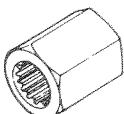
(12) 90890-06613



(13) 90890-06625



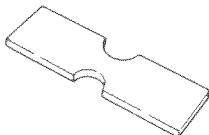
(14) 90890-06515

(15) 90890-06649
90890-06650

(16) 90890-06617



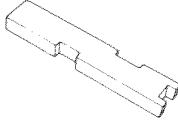
(17) 90890-06603



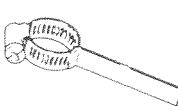
(18) 90890-06644



(19) 90890-06701



(20) 90890-06706



11. Needle bearing attachment (propeller shaft)
P/N. 90890-06616
12. Oil seal installer (propeller shaft)
P/N. 90890-06613
13. Bearing installer
P/N. 90890-06625 (forward gear)
14. Drive shaft holder
P/N. 90890-06515
15. Bushing attachment (drive shaft housing)
P/N. 90890-06649
90890-06650
16. Needle bearing attachment (drive shaft)
P/N. 90890-06617
17. Bearing depth plate
P/N. 90890-06603
18. Bearing installer
P/N. 90890-06644 (forward gear)
19. Shimming plate
P/N. 90890-06701
20. Backlash indicator
P/N. 90890-06706



11. Pelengkap bantalan jarum
(poros baling-baling)
P/N. 90890-06616
12. Pemasang seal oli (poros baling-baling)
P/N. 90890-06613
13. Pemasangan bantalan
P/N. 90890-06625 (roda gigi maju)
14. Penahan poros penggerak
P/N. 90890-06515
15. Pelengkap bushing (rumah poros penggerak)
P/N. 90890-06649
90890-06650
16. Pelengkap bantalan jarum (poros penggerak)
P/N. 90890-06617
17. Pelat kedalaman bantalan
P/N. 90890-06603
18. Pemasang bantalan
P/N. 90890-06644 (roda gigi maju)
19. Pelat shimming
P/N. 90890-06701
20. Indikator selip balik
P/N. 90890-06706



CHAPTER 2 SPECIFICATIONS

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BAB 2 SPESIFIKASI

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SPEC**GENERAL SPECIFICATIONS**

E

GENERAL SPECIFICATIONS

Item	Unit	Model				
		E9.9CMH	E15CMH	E15NMHK		
Approved model No.		682C	684C	6M7		
DIMENSION:						
Overall length	mm (in)		873 (34.4)			
Overall width	mm (in)		332 (13.1)			
Overall height	S L SUL	mm (in) mm (in) mm (in)	1,040 (40.9) 1,167 (45.9) 1,309 (51.5)	1,040 (40.9) — —		
Boat transom height	S L SUL	mm (in) mm (in) mm (in)	381 (15.0) 508 (20.0) 686 (27.0)	381 (15.0) — —		
O/M transom height	S L SUL	mm (in) mm (in) mm (in)	440 (17.3) 567 (22.3) 709 (27.9)	— — —		
WEIGHT: (with aluminum propeller)						
	S L SUL	kg (lb) kg (lb) kg (lb)	36 (79.4) 37.5 (82.7) 39 (86.0)	36.5 (80.5) 38 (83.8) —		
PERFORMANCE:						
Output (ISO)	kW (hp) @ r/min	7.4 (9.9) @ 5,000	11.2 (15) @ 5,000	11.2 (15) @ 5,000		
Full throttle operating range	r/min	4,500 ~ 5,500				
Maximum fuel consumption	L (US gal, Imp gal)/h @ r/min	6.1 (1.61, 1.34) @ 5,500	7.3 (1.93, 1.61) @ 5,500			
ENGINE:						
Type		2 stroke - L				
Number of cylinder		2				
Total displacement	cm ³ (cu. in)	246 (15.01)				
Bore x Stroke	mm (in)	56.0 x 50.0 (2.20 x 1.97)				
Compression ratio		6.80	6.10			
Number of carburetors		1				
Intake system		Reed valve				
Scavenging system		Loop charge				
Starting system		Manual				
Ignition system		CDI				
Alternator output		12-OP 80W (option)				
Enrichment system		Choke valve				
Advance type		Mechanical				
Spark plug (NGK) (CHAMPION)		B7HS-10				
Exhaust system		L82C (1.0 mm)				
Cooling system		Through propeller boss				
Lubrication system		Water				
		Pre-mixed fuel & oil				



SPESIFIKASI UMUM

Hal	Satuan	Model							
		E9.9CMH	E15CMH	E15NMHK					
		682C	684C	6M7					
UKURAN :									
Panjang seluruhnya	mm (in)	873 (34.4)							
Lebar seluruhnya	mm (in)	332 (13.1)							
Tinggi seluruhnya	S	mm (in)	1.040 (40.9)	1.040 (40.9)					
	L	mm (in)	1.167 (45.9)						
	SUL	mm (in)	1.309 (51.5)	—					
Tinggi palang buritan perahu	S	mm (in)	381 (15.0)	381 (15.0)					
	L	mm (in)	508 (20.0)						
	SUL	mm (in)	686 (27.0)	—					
Tinggi palang buritan O/M	S	mm (in)	440 (17.3)	—					
	L	mm (in)	567 (22.3)						
	SUL	mm (in)	709 (27.9)	—					
BERAT :									
(dengan baling-baling aluminium)	S	kg (lb)	36 (79.4)	36.5 (80.5)					
	L	kg (lb)	37.5 (82.7)	38 (83.8)					
	SUL	kg (lb)	39 (86.0)	—					
UNJUK KERJA :									
Output (ISO)	kW (hp) @ r/min	7.4 (9.9) @ 5.000	11.2 (15) @ 5.000	11.2 (15) @ 5.000					
Batas operasi gas penuh	r/min	4.500 ~ 5.500							
Konsumsi bahan bakar maksimum	L (US gal, Imp gal)/h @ r/min	6.1 (1.61, 1.34) @ 5.500	7.3 (1.93, 1.61) @ 5.500						
MESIN :									
Type	2 tak - L								
Jumlah silinder	2								
Pemindahan total	246 (15.01)								
Diameter x panjang langkah	56.0 x 50.0 (2.20 x 1.97)								
Perbandingan kompresi	6.80								
Jumlah karburator	1								
Sistem pemasukan	Katup buluh								
Sistem bilas	Pengisian melengkung								
Sistem starter	Manual								
Sistem penyalaan	CDI								
Output dinamo	12-OP 80W (pilihan)								
Sistem pengayaan	Katup erat (choke valve)								
Penyalaan awal	Mekanikal								
Busi (NGK)	B7HS-10								
(CHAMPION)	L82C (1.0 mm)								
Sistem pembuangan gas	Melalui poros baling-baling								
Sistem pendinginan	Air								
Sistem pelumasan	Campuran bahan bakar dan minyak								

SPEC**GENERAL SPECIFICATIONS**

E

Item	Unit	Model			
		E9.9CMH	E15CMH	E15NMHK	
FUEL AND LUBRICATION:	cm ³ (US oz, Imp oz)				
		Regular gasoline		Regular gasoline & Kerosene	
		2-stroke outboard motor oil/TC-W3			
		50:1	30:1		
		Hypoid gear oil-SAE#90			
Gear oil quantity		250 (8.45, 8.80)			
BRACKET:					
Trim/tilt system	Degrees	Manual tilt			
Tilt angle		8, 12, 16, 20			
Tilt-up angle		67			
Shallow water cruising angle		Tilt angle + 30/36			
Steering angle	Degrees (left + right)	45 + 45			
DRIVE UNIT:					
Gear shift position		F-N-R			
Gear ratio		2.08 (27/13)			
Gear type		Spiral bevel gear			
Clutch type		Dog clutch			
Propeller direction		Clockwise			
Propeller drive system		Spline			
Propeller series mark		J			



Hal	Satuan	Model		
		E9.9CMH	E15CMH	E15NMHK
		682C	684C	6M7
BAHAN BAKAR DAN PELUMASAN :	cm ³ (US oz, Imp oz)	Bensin		Bensin & Minyak tanah
		Minyak motor tempel 2-tak/TC-W3		
		50 : 1		30 : 1
		Minyak hypoid SAE #90		
		250 (8.45, 8.80)		
SIKU (BRACKET) :				
Cara penyetelan		Manual tilt		
Sudut kemiringan	Derajat	8, 12, 16, 20		
Sudut kemiringan ke atas	Derajat	67		
Sudut jelajah air dangkal	Derajat	Sudut kemiringan + 30/36		
Sudut kemudi	(kiri + kanan)	45 + 45		
PENGERAK (DRIVE UNIT) :				
Posisi gigi transmisi		F - N - R		
Perbandingan roda gigi		2.08 (27/13)		
Jenis roda gigi		Gigi konis ulir		
Jenis Kopeling		Kopeling genggam		
Arah baling-baling		Searah jarum jam		
Sistem penggerak baling-baling		Pasok		
Tanda seri baling-baling		J		

SPEC

MAINTENANCE SPECIFICATIONS

E

MAINTENANCE SPECIFICATIONS ENGINE

Item	Unit	Model		
		E9.9CMH	E15CMH	E15NMHK
CYLINDER HEAD: Warpage limit	mm (in)		0.1 (0.004)	
CYLINDER: Bore size	mm (in)	56.00 ~ 56.02 (2.205 ~ 2.206)		
Wear limit	mm (in)	56.10 (2.21)		
Taper limit	mm (in)	0.08 (0.003)		
Out of round limit	mm (in)	0.05 (0.002)		
PISTON: Identification mark	mm (in)	A		
Piston clearance	mm (in)	0.035 ~ 0.040 (0.0014 ~ 0.0016)		
Limit	mm (in)	0.090 (0.0035)		
Diameter D	mm (in)	55.940 ~ 55.965 (2.2024 ~ 2.2041)		
Measuring point H	mm (in)	10 (0.4)		
Pin boss inside diameter	mm (in)	14.004 ~ 14.015 (0.5513 ~ 0.5518)		
Ring groove clearance (installed)	mm (in)			
top	mm (in)	0.02 ~ 0.06 (0.001 ~ 0.002)		
2nd	mm (in)	0.04 ~ 0.08 (0.002 ~ 0.003)		
Oversized piston	mm (in)			
Diameter	1st mm (in)	56.25 (2.215)		
	2nd mm (in)	56.50 (2.224)		
PISTON PIN: Diameter	mm (in)	13.996 ~ 14.000 (0.5510 ~ 0.5512)		
PISTON RING (1st):				
Type	mm (in)	Keystone		
Dimensions (B × T)	mm (in)	2.0 × 2.5 (0.08 × 0.10)		
End gap (installed)	mm (in)	0.15 ~ 0.35 (0.006 ~ 0.014)		
Limit	mm (in)	0.55 (0.022)		
PISTON RING (2nd):				
Type	mm (in)	Barrel		
Dimensions (B × T)	mm (in)	2.0 × 2.5 (0.08 × 0.10)		
End gap (installed)	mm (in)	0.15 ~ 0.35 (0.006 ~ 0.014)		
Limit	mm (in)	0.55 (0.022)		
CONNECTING ROD: Small end diameter	mm (in)	18.000 ~ 18.011 (0.7087 ~ 0.7091)		
CRANKSHAFT ASSEMBLY:				
Crank width A	mm (in)	46.90 ~ 46.95 (1.846 ~ 1.848)		
Crank width B	mm (in)	25.90 ~ 26.10 (1.020 ~ 1.028)		
Runout limit D	mm (in)	0.03 (0.001)		
Big end side clearance E	mm (in)	0.30 ~ 0.80 (0.012 ~ 0.031)		
Small end axial play limit F	mm (in)	2.0 (0.08)		



SPESIFIKASI PEMELIHARAAN MESIN

Hal	Satuan	Model		
		E9.9CMH	E15CMH	E15NMHK
		682C	684C	6M7
KEPALA SILINDER :				
Batas toleransi pelengkungan/distorsi	mm (in)	0.1 (0.004)		
SILINDER :				
Diameter	mm (in)	56.00 ~ 56.02 (2.205 ~ 2.206)		
Batas keausan	mm (in)	56.10 (2.21)		
Batas tirus	mm (in)	0.08 (0.003)		
Batas out of round	mm (in)	0.05 (0.002)		
PISTON :				
Tanda identifikasi	mm (in)	A		
Jarak bebas piston	mm (in)	0.035 ~ 0.040 (0.0014 ~ 0.0016)		
Batas	mm (in)	0.090 (0.0035)		
Diameter D	mm (in)	55.940 ~ 55.965 (2.2024 ~ 2.2041)		
Titik pengukuran H	mm (in)	10 (0.4)		
Diameter dalam pin boss	mm (in)	14.004 ~ 14.015 (0.5513 ~ 0.5518)		
Jarak bebas alur ring (terpasang)	mm (in)			
atas	mm (in)	0.02 ~ 0.06 (0.001 ~ 0.002)		
kedua	mm (in)	0.04 ~ 0.08 (0.002 ~ 0.003)		
Piston oversize	mm (in)			
Diameter	Pertama	56.25 (2.215)		
	kedua	56.50 (2.224)		
PEN PISTON :				
Diameter	mm (in)	13.996 ~ 14.000 (0.5510 ~ 0.5512)		
RING PISTON (pertama) :				
Jenis	mm (in)	Keystone		
Ukuran (B x T)	mm (in)	2.0 x 2.5 (0.08 x 0.10)		
Jarak ujung (terpasang)	mm (in)	0.15 ~ 0.35 (0.006 ~ 0.014)		
Batas	mm (in)	0.55 (0.022)		
RING PISTON (kedua) :				
Jenis	mm (in)	Barrel		
Ukuran (B x T)	mm (in)	2.0 x 2.5 (0.08 x 0.10)		
Jarak ujung (terpasang)	mm (in)	0.15 ~ 0.35 (0.006 ~ 0.014)		
Batas	mm (in)	0.55 (0.022)		
BATAS PENGHUBUNG :				
Diameter ujung kecil	mm (in)	18.000 ~ 18.011 (0.7087 ~ 0.7091)		
MONTASE POROS ENGKOL :				
Lebar A	mm (in)	46.90 ~ 46.95 (1.846 ~ 1.848)		
Lebar B	mm (in)	25.90 ~ 26.10 (1.020 ~ 1.028)		
Batas runout D	mm (in)	0.03 (0.001)		
Jarak big end side E	mm (in)	0.30 ~ 0.80 (0.012 ~ 0.031)		
Batas small end axial play F	mm (in)	2.0 (0.08)		

SPEC**MAINTENANCE SPECIFICATIONS**

E

Item	Unit	Model		
		E9.9CMH	E15CMH	E15NMHK
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)		
REED VALVE:				
Valve stopper height ①	mm (in)	1.3 ± 0.1 (0.05 ± 0.00)	6.0 ± 0.1 (0.24 ± 0.00)	4.0 ± 0.2 (0.16 ± 0.01)
Valve bending limit	mm (in)	0.2 (0.01)		
CARBURETOR:				
Identification mark		63V00	65G00	
Float height	mm (in)	14.0 ± 1.5 (0.55 ± 0.06)	—	
Float arm height	mm (in)	—	5.0 ± 0.5 (0.20 ± 0.02)	
Float arm height (kerosene)		—	3.0 ± 0.5 (0.12 ± 0.02)	
Valve seat size	mm (in)	1.2 (0.05)	1.0 (0.04)	
Valve seat size (kerosene)		—	1.2 (0.05)	
Main jet (M.J.)	#	110	—	
Main jet (kerosene) (M.J.)	#	—	102	
Main nozzle (M.N.)	mm (in)	3.0 (0.12)	—	
Main nozzle (kerosene) (M.N.)	mm (in)	—	2.8 (0.11)	
Pilot jet (P.J.)	#	48	68	
Pilot jet (kerosene) (P.J.)	#	—	46	
Pilot screw (P.S.)	Turns out	1-1/2 ± 1/4	3/4 ± 1/4	
Pilot screw (kerosene) (P.S.)	Turns out	—	—	
Starter jet (S.J.)	mm (in)	—	70.0 (2.76)	
Starter jet (kerosene) (S.J.)	#	—	50	
ENGINE SPEED:				
Carb. Mark 1 idle speed		750 ± 50	1,450 ± 50	
Carb. Mark 1 trolling speed		650 ± 50	—	
RECOIL STARTER:				
Starter rope length	mm (in)	1,800 (70.9)		

SPEC**SPESIFIKASI PEMELIHARAAN**

(IN)

Hal	Satuan	Model		
		E9.9CMH	E15CMH	E15NMHK
		682C	684C	6M7
THERMOSTAT :				
Suhu keadaan terbuka	°C (°F)	48 ~ 52 (118.4 ~ 125.6)		
Suhu keadaan terbuka penuh	°C (°F)	60 (140)		
Kenaikan katup	mm (in)	3 (0.12)		
KATUP BULUH :				
Ketinggian penghenti katup @	mm (in)	1.3 ± 0.1 (0.05 ± 0.00)	6.0 ± 0.1 (0.24 ± 0.00)	4.0 ± 0.2 (0.16 ± 0.01)
Batas toleransi pembengkokan katup	mm (in)	0.2 (0.01)		
KARBURATOR :				
Tanda identifikasi	mm (in)	63V00		
Tinggi pelampung	mm (in)	14.0 ± 1.5 (0.55 ± 0.06)		
Tinggi lengan pelampung	mm (in)	—		
Tinggi lengan pelampung (minyak tanah)	mm (in)	—		
Ukuran dudukan katup	mm (in)	1.2 (0.05)		
Ukuran dudukan katup (minyak tanah)	mm (in)	—		
Jet utama (J.U)	#	110		
Jet utama (minyak tanah) (J.U)	#	—		
Nosel utama (N.U)	mm (in)	3.0 (0.12)		
Nosel utama (minyak tanah) (N.U)	mm (in)	—		
Pilot jet (P.J)	#	48		
Pilot jet (minyak tanah) (P.J)	#	—		
Sekrup pilot (S.P)	turns out	1-1/2 ± 1/4		
Sekrup pilot (minyak tanah) (S.P)	turns out	—		
Starter jet (S.J)	mm (in)	—		
Starter jet (minyak tanah) (S.J)	#	—		
KECEPATAN MESIN :				
Kecepatan putaran tanpa beban Carb. Mark 1		750 ± 50		
Kecepatan trolling Carb. Mark 1		650 ± 50		
STARTER TARIK :				
Panjang tali starter	mm (in)	1.800 (70.9)		

SPEC**MAINTENANCE SPECIFICATIONS**

E

LOWER

Item	Unit	Model		
		E9.9CMH	E15CMH	E15NMHK
GEAR BACKLASH:				
Pinion - forward	mm (in)		0.08 ~ 0.37 (0.003 ~ 0.015)	
Pinion - forward (SST)	mm (in)		0.19 ~ 0.86 (0.007 ~ 0.034)	
Pinion - reverse	mm (in)		0.41 ~ 0.71 (0.016 ~ 0.028)	
Pinion - reverse (SST)	mm (in)		0.95 ~ 1.65 (0.037 ~ 0.065)	
Pinion shims	mm		1.13, 1.2	
Forward shims	mm		0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50	
Reverse shims	mm		0.1, 0.2, 0.3, 0.4, 0.5	
PROPELLER (aluminum):				
No. of blades × diameter × pitch	in		3 × 9-1/4 × 8 - J 3 × 9-1/4 × 9 - J 3 × 9-1/4 × 9-3/4 - J 3 × 9-1/4 × 10-1/2 - J 3 × 9-1/4 × 12 - J 3 × 9-1/2 × 6-1/2 - J	
PROPELLER (dual thrust):				
No. of blades × diameter × pitch	in		3 × 9-1/4 × 8 - J 3 × 9-1/2 × 6-1/2 - J	
Test propeller 1	r/min		90890-01619	
rpm		5,000 ~ 5,200	5,200 ~ 5,400	
Test propeller 2	r/min		YB-1619	
rpm		5,000 ~ 5,200	5,200 ~ 5,400	



BAGIAN BAWAH

Hal	Satuan	Model		
		E9.9CMH	E15CMH	E15NMHK
		682C	684C	6M7
SELIP BALIK RODA GIGI :				
Pinion - maju	mm (in)		0.08 ~ 0.37 (0.003 ~ 0.015)	
Pinion - maju (SST)	mm (in)		0.19 ~ 0.86 (0.007 ~ 0.034)	
Pinion - mundur	mm (in)		0.41 ~ 0.71 (0.016 ~ 0.028)	
Pinion mundur (SST)	mm (in)		0.95 ~ 1.65 (0.037 ~ 0.065)	
Pelat pinion	mm		1.13, 1.2	
Pelat maju	mm		0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50	
Pelat mundur	mm		0.1, 0.2, 0.3, 0.4, 0.5	
BALING-BALING (aluminium) :				
Jumlah bilah x diameter x jarak	in		3 x 9-1/4 x 8 - J 3 x 9-1/4 x 9 - J 3 x 9-1/4 x 9-3/4 - J 3 x 9-1/4 x 10-1/2 - J 3 x 9-1/4 x 12 - J 3 x 9-1/2 x 6-1/2 - J	
BALING-BALING (daya tolak ganda)				
Jumlah bilah x diameter x jarak	in		3 x 9-1/4 x 8 - J 3 x 9-1/2 x 6-1/2 - J	
Uji baling-baling 1 rpm	r/min		90890-01619	
Uji baling-baling 2 rpm	r/min	5.000 ~ 5.200	5.200 ~ 5.400	YB-1619
		5.000 ~ 5.200	5.200 ~ 5.400	

SPEC**MAINTENANCE SPECIFICATIONS**

E

ELECTRICAL

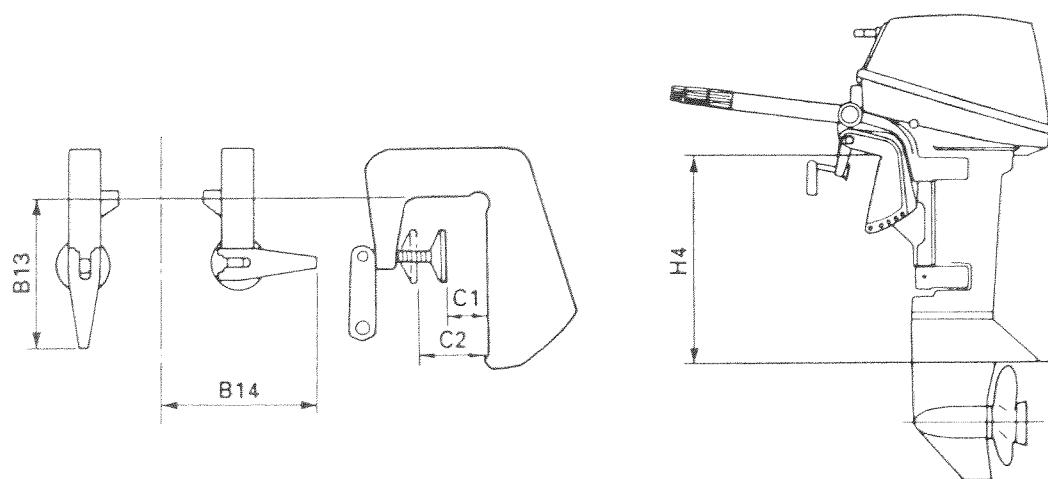
Item	Unit	Model		
		E9.9CMH	E15CMH	E15NMHK
IGNITION SYSTEM:				
Ignition timing (full retard)	Degrees	A.T.D.C. 5 ± 1	B.T.D.C. 5 ± 1	
(full advance)	Degrees	B.T.D.C. 30 ± 1	B.T.D.C. 24 ± 1	
Piston position (full retard)	mm (in)	A.T.D.C. 0.12 ± 0.04 (0.005 ± 0.002)	B.T.D.C. 0.12 ± 0.04 (0.005 ± 0.002)	
(full advance)	mm (in)	B.T.D.C. $4.22^{+0.28}_{-0.27}$ (0.166 ± 0.011)	B.T.D.C. 2.74 ± 0.22 (0.108 ± 0.22)	
Ignition coil type (single/twin)		Single		
Ignition coil resistance				
Primary coil	Ω (color)	0.05 ~ 0.07 (B/W - B)		
Secondary coil	k Ω (color)	1.68 ~ 2.52 (B/W - High tension cord)		
Spark plug cap		Standard		
Spark plug gap	mm (in)	0.9 ~ 1.0 (0.035 ~ 0.039)		
ENGINE STOP SWITCH:				
Continuity terminal with lock plate (color - color)		No continuity		
Continuity terminal without lock plate (color - color)		W — B		
Continuity terminal push button (color - color)		W — B		
STATOR ASSEMBLY:				
Pulser coil resistance 1	Ω (color)	352 ~ 528 (W/R - B)		
Charge coil resistance 1	Ω (color)	248 ~ 372 (Br - L)		
Pole number		4		
OPTIONS:				
Charging current (minimum/rpm)	A/rpm	1.9 ~ 4.9/3,000		
Charging current (maximum/rpm)	A/rpm	4.7 ~ 7.7/5,500		
Lighting voltage (minimum/rpm)	V/rpm	11.5/3,000		
Lighting voltage (maximum/rpm)	V/rpm	14 ~ 17/5,500		
Lighting coil resistance 1	k Ω (color)	0.16 ~ 0.24 (G - G)		
Pole number		4		

ELEKTRIK

Hal	Satuan	Model		
		E9.9CMH	E15CMH	E15NMHK
		682C	684C	6M7
SISTEM PENYALAAAN :				
Waktu penyalaan (perlambatan penuh) (pemajuan penuh)	Derajat	A.T.D.C. 5 ± 1	B.T.D.C. 5 ± 1	
Posisi Piston (perlambatan penuh) (pemajuan penuh)	Derajat mm (in)	B.T.D.C. 30 ± 1 A.T.D.C. 0.12 ± 0.04 (0.005 ± 0.002) B.T.D.C. $4.22^{+0.28}_{-0.27}$ (0.166 ± 0.011)	B.T.D.C. 24 ± 1 B.T.D.C. 0.12 ± 0.04 (0.005 ± 0.002) B.T.D.C. 2.74 ± 0.22 (0.108 ± 0.022)	
Jenis koil penyalaan (tunggal/ganda)		Tunggal		
Tahanan koil penyalaan				
Koil primer	Ω (warna)	0.05 ~ 0.07 (B/W - B)		
Koil sekunder	$k\Omega$ (warna)	1.68 ~ 2.52 (B/W - tali tegangan tinggi)		
Kap busi		Standar		
Celah busi	mm (in)	0.9 ~ 1.0 (0.035 ~ 0.039)		
SAKELAR PENGHENTI MESIN :				
Terminal kontinuitas dengan pelat (warna-warna)		Tanpa kontinuitas		
Terminal kontinuitas tanpa pelat pengunci (warna-warna)		W — B		
Tombol penekan terminal				
Kontinuitas (warna-warna)		W — B		
MONTASE STATOR :				
Tahanan koil pulser 1	Ω (warna)	352 ~ 528 (W/R - B)		
Tahanan koil pengisian 1	Ω (warna)	248 ~ 372 (Br - L)		
Jumlah kutub		4		
PILIHAN :				
Arus pengisian (minimum/rpm)	A/rpm	1.9 ~ 4.9/3.000		
Arus pengisian (maksimum/rpm)	A/rpm	4.7 ~ 7.7/5.500		
Voltase penerangan (minimum/rpm)	V/rpm	11.5/3.000		
Voltase penerangan (maksimum/rpm)	V/rpm	14 ~ 17/5.500		
Tahanan koil penerangan 1	$k\Omega$ (warna)	0.16 ~ 0.24 (G - G)		
Jumlah kutub		4		

SPEC**MAINTENANCE SPECIFICATIONS**

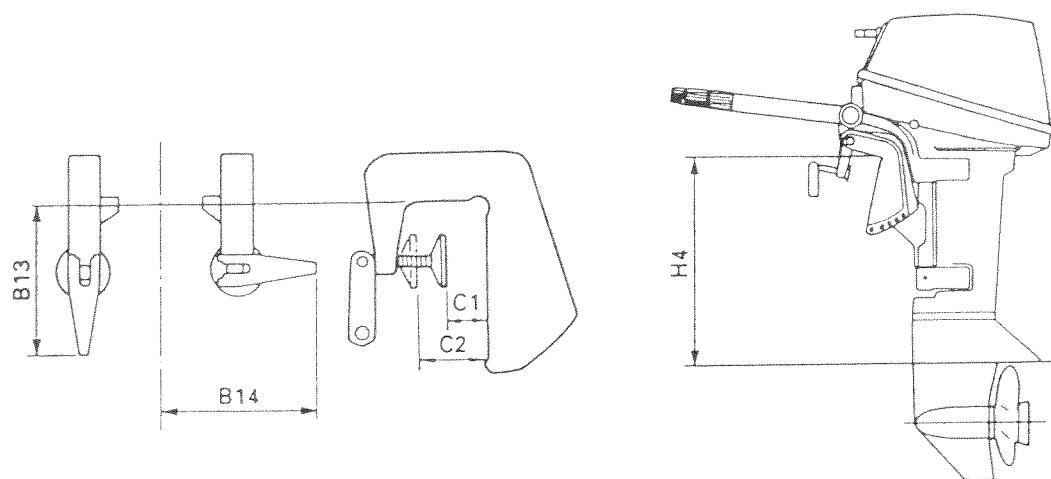
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DIMENSION

Symbol	Unit	9.9	15
H4 :S	mm (in)		440 (17.3)
	:L	mm (in)	567 (22.3)
B13 :SUL	mm (in)		709 (27.9)
B13	mm (in)		134 (5.3)
B14	mm (in)		133.5 (5.3)
C1	mm (in)		31 (1.2)
C2	mm (in)		64 (2.5)



UKURAN :



Tanda	Satuan	9.9	15
H4 : S	mm (in)	440 (17.3)	
: L	mm (in)	567 (22.3)	
: SUL	mm (in)	709 (27.9)	
B13	mm (in)	134 (5.3)	
B14	mm (in)	133.5 (5.3)	
C1	mm (in)	31 (1.2)	
C2	mm (in)	64 (2.5)	

SPEC**TIGHTENING TORQUE**

E

TIGHTENING TORQUE
SPECIFIED TORQUE

Part to tightened	Part name	Thread size	Q'ty	Tightening torque			Remarks
				Nm	m•kg	ft•lb	
ENGINE:							
Flywheel	Nut	M12	1	105	10.5	75	
Spark plug	Bolt	M14	2	25	2.5	18	
Cylinder head	1st	Bolt	M7	11	8.0	0.8	5.8
	2nd				17	1.7	12
Exhaust cover	1st	Bolt	M6	13	6.0	0.6	4.3
	2nd				12	1.2	8.7
Crankcase	1st	Bolt	M8	6.0	15	1.5	11
	2nd				30	3.0	22
LOWER:							
Propeller	Nut	M10	1	17	1.7	12	
Pinion	Nut	M8	1	26	2.6	19	
BRACKET:							
Bracket clamp	Nut	7/8 UNF	2	13	1.3	9.4	
Rubber mount (upper)	Nut	M8	2	21	2.1	15	
Rubber housing (lower)	Nut	M6	4	13	1.3	9.4	

SPEC**MENGENCANGKAN MOMEN PUTAR**

IN

MENGENCANGKAN MOMEN PUTAR
MOMEN PUTAR YANG DITENTUKAN

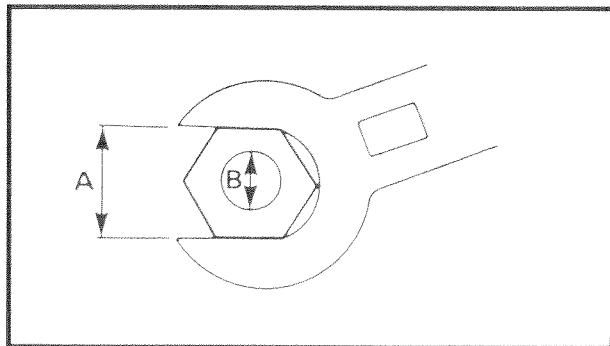
Bagian yang harus dikencangkan	Nama bagian	Ukuran ulir	Jumlah	Mengencangkan momen Putar			Catatan
				Nm	m•kg	ft•lb	
MESIN :							
Roda gaya	Mur	M12	1	105	10.5	75	→ E
Busi	Baut	M14	2	25	2.5	18	
Kepala silinder	Pertama	Baut	M7	11	8.0	0.8	5.8
	Kedua				17	1.7	12
Penutup pipa gas buang	Pertama	Baut	M6	13	6.0	0.6	4.3
	Kedua				12	1.2	8.7
Karter	Pertama	Baut	M8	6.0	15	1.5	11
	Kedua				30	3.0	22
BAGIAN BAWAH :							
Baling-baling	Mur	M10	1	17	1.7	12	
Pinion	Mur	M8	1	26	2.6	19	
SIKU (BRACKET) :							
Klem siku	Mur	7/8UNF	2	13	1.3	9.4	
Montase karet (atas)	Mur	M8	2	21	2.1	15	
Montase karet (bawah)	Mur	M6	4	13	1.3	9.4	



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

GENERAL TORQUE

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.





Mur (A)	Baut (B)	Spesifikasi momen putar umum		
		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

MOMEN PUTAR UMUM

Bagian ini memberi momen putar secara rinci untuk mengencangkan alat pengikat standar dengan ulir 150 kering bersih yang standar pada suhu ruangan.

Spesifikasi momen putar untuk komponen atau rakitan komponen (assemblies) diberikan pada bagian-bagian yang bersangkutan di dalam buku petunjuk ini.

Untuk mencegah terjadinya pelengkungan sesuatu bagian, kencangkan assemblies yang baut pengencangnya lebih dari satu secara berseberangan, dengan momen putar yang ditentukan.



CHAPTER 3

PERIODIC INSPECTION AND ADJUSTMENT

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BAB 3

PEMERIKSAAN DAN PENYETELAN BERKALA

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MAINTENANCE INTERVAL CHART

(E)

MAINTENANCE INTERVAL CHART

The following chart should be considered strictly as a guide to general maintenance intervals.

Depending on operating conditions, the intervals of maintenance should be changed.

Item	Remarks	Initial		Every		Page #
		10 hours (Break-in)	50 hours (3 months)	100 hours (6 months)	200 hours (1 year)	
COWLING:						
Cowling clamp	Inspect				○	—
FUEL SYSTEM:						
Fuel lines	Inspect	○		○	○	3-2
Fuel filter(s)	Clean	○	○	○		4-5
Carburetor	Clean	○	○	○		4-16
POWER UNIT:						
Water leakage	Inspect	○	○	○		—
Motor exterior	Inspect	○	○	○		—
Exhaust leakage	Inspect	○	○	○		—
Cooling water passage	Clean	○	○			—
CONTROL SYSTEM:						
Ignition timing	Inspect/adjust	○		○		3-2
Throttle link	Inspect/adjust				○	3-4
Throttle cable	Inspect/adjust				○	3-4
Idle speed	Inspect/adjust	○		○		3-5
LOWER UNIT:						
Gear oil	Replace	○		○		3-6
Lower unit leakage	Inspect				○	3-7
Propeller	Inspect	○	○	○		6-2
GENERAL:						
Anode	Inspect		○	○		3-8
Spark plugs	Clean/adjust/replace	○	○	○		3-8
Wires and connectors	Adjust/reconnect	○	○	○		—
Bolts and nuts	Retighten	○	○	○		—
Lubrication points	Grease			○		3-9


BAGAN PEMELIHARAAN

Bagian berikut ini merupakan pedoman pemeliharaan umum secara berkala. Jangka waktu pemeliharaan harus diubah, tergantung pada keadaan pengoperasian.

Hal	Catatan	Pemakaian awal		Setiap		Halaman #
		10 jam (permulaan)	50 jam (3 bulan)	100 jam (6 bulan)	200 jam (1 tahun)	
COWLING :						
Cowling clamp	Periksa				○	—
SISTEM BAHAN BAKAR :						
Saluran bahan bakar	Periksa	○		○	○	3-2
Filter bahan bakar	Bersihkan	○	○	○		4-5
Karburator	Bersihkan	○	○	○		4-16
UNIT DAYA :						
Kebocoran air	Periksa	○	○	○		—
Bagian luar mesin	Periksa	○	○	○		—
Kebocoran pipa gas buang	Periksa	○	○	○		—
Saluran air pendingin	Bersihkan		○	○		—
SISTEM PENGATUR :						
Waktu penyalakan	Periksa/setel	○		○		3-2
Penghubung gas	Periksa/setel				○	3-4
Kabel gas	Periksa/setel				○	3-4
Putaran tanpa beban	Periksa/setel	○		○		3-5
BAGIAN BAWAH :						
Minyak pelumas roda gigi	Ganti	○		○		3-6
Kebocoran bagian bawah	Periksa				○	3-7
Baling-baling	Periksa	○	○	○		6-2
UMUM :						
Anoda	Periksa		○	○		3-8
Busi	Bersihkan/setel/ganti	○	○	○		3-8
Sirkuit kabel dan konektor	Setel/hubungkan kembali	○	○	○		—
Baut dan mur	Kencangkan kembali	○	○	○		—
Titik-titik pemberian gemuk	Beri gemuk			○		3-9



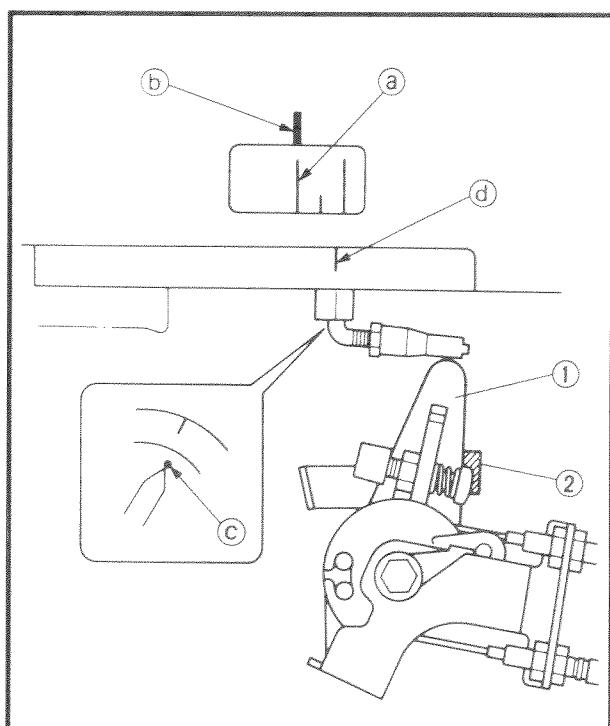
PERIODIC SERVICE FUEL SYSTEM

Fuel lines

1. Inspect:

- Fuel lines

Breaks/damage/leaks → Replace.



CONTROL SYSTEM

Adjusting the ignition timing

1. Check:

- Fully advanced ignition timing
Incorrect → Adjust.

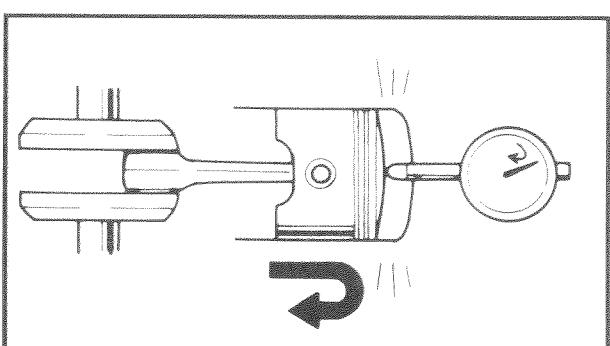
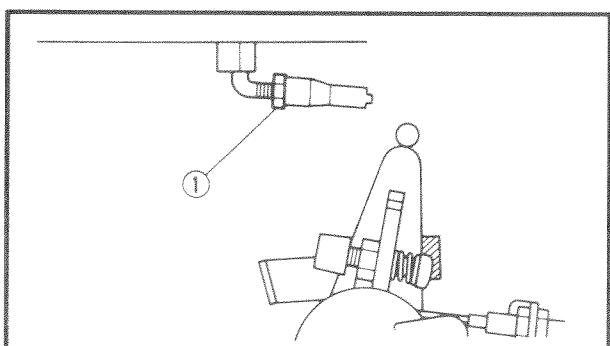
Checking steps:

- Turn the flywheel clockwise so that the mark ④ aligns with the mark ⑤ on the starter cover.



Fully advanced position:
E9.9C/E15C: 30° BTDC
E15NK: 24° BTDC

- Turn the magneto control lever ① so that it contacts the fully advanced stopper ②.
- Check the timing indicator ③ so that it aligns with the mark ④ on the flywheel.



2. Adjust:

- Link joint

Adjustment steps:

- Loosen the locknut ①.
- Disconnect the link joint from the magneto control lever.
- Remove the spark plug from cylinder #1.
- Insert the dial gauge into the spark plug hole.



Dial gauge:
90890-01252

- Slowly turn the flywheel clockwise until the piston reaches Top Dead Center (TDC).



PERAWATAN BERKALA SISTEM BAHAN BAKAR

Saluran bahan bakar

1. Periksa :

- Saluran bahan bakar
Retak/rusak/bocor → Ganti.

SISTEM PENGATUR

Menyetel waktu penyalaan

1. Periksa :

- Waktu penyalaan dengan pemajuan penuh.
Jika tidak tepat → Setel.

Langkah-langkah pemeriksaan :

- Putar roda gaya searah jarum jam sehingga tanda ① bertemu dengan tanda ⑤ pada penutup starter.



Posisi dengan pemajuan penuh :
E9.9C/E15C : 30° BTDC
E15NK : 24° BTDC

- Putar magneto control lever ① sehingga menyentuh penahan pemajuan penuh ②.
- Pastikan indikator waktu ③ menyatu dengan tanda ④ pada roda gaya.

2. Setel :

- Sambungan penghubung.

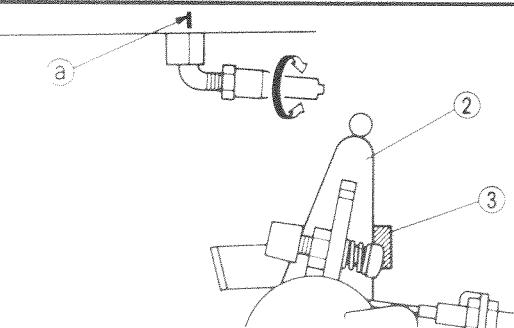
Langkah-langkah penyetelan :

- Kendorkan mur pengunci ①
- Lepaskan sambungan penghubung dari magneto control lever.
- Lepaskan busi dari silinder #1
- Masukkan dial gauge ke dalam lubang busi.



Dial gauge :
90890-01252

- Putar roda gaya perlahan-lahan searah jarum jam sampai piston mencapai Top Dead Center (TDC).



- Set the dial gauge to zero at TDC.
- Turn the flywheel counterclockwise until the dial gauge indicates that the position of the piston is at the specified distance from TDC.

**Piston position:**

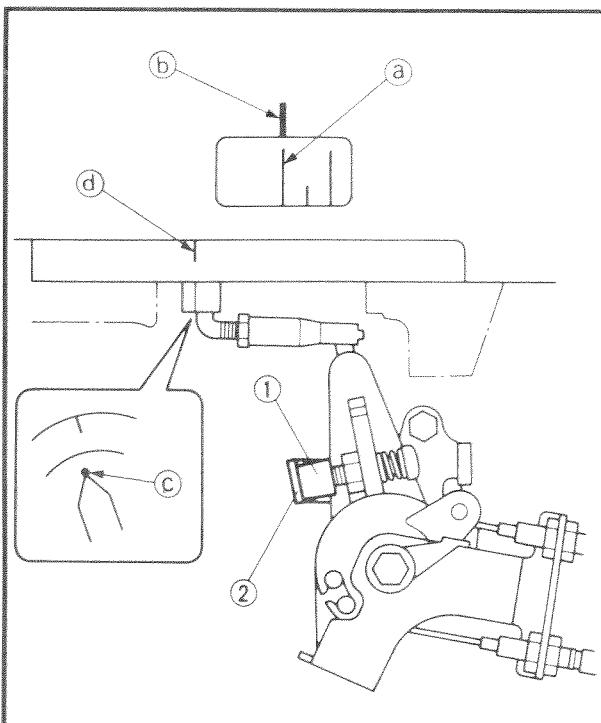
E9.9C/E15C:

4.22 mm (0.166 in) BTDC

E15NK:

2.74 mm (0.108 in) BTDC

- Turn the magneto control lever (2) so that it contacts the fully advanced stopper (3).
- Adjust the length of the link joint so that the timing indicator aligns with the mark (a) on the flywheel.
- Tighten the locknut.

**3. Check:**

- Fully retarded ignition timing
Incorrect → Adjust.

Checking steps:

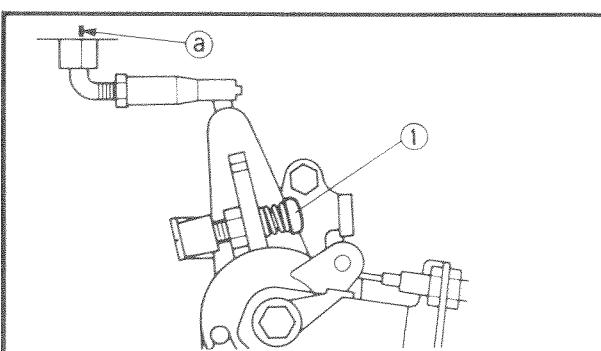
- Turn the flywheel clockwise so that the mark (a) aligns with the mark (b) on the starter cover.

**Fully retarded position:**

E9.9C/E15C: 5° ATDC

E15NK: 5° BTDC

- Turn the magneto control lever so that the full retard screw (1) contacts the full retard stopper (2).
- Check the timing indicator (c) so that it aligns with the mark (d) on the flywheel.

**4. Adjust:**

- Full retard screw

Adjustment steps:

- Turn the flywheel clockwise until the dial gauge indicates that the position of the piston is at the specified distance from TDC.



- Setel dial gauge pada angka nol di TDC.
- Putar roda gaya berlawanan arah jarum jam sampai dial gauge menunjukkan bahwa posisi piston berada pada jarak yang ditentukan dari TDC.



Posisi piston :

E9.9C/E15C :

4.22 mm (0.166 in) BTDC

E15NK :

2.74 mm (0.108 in) BTDC

- Putar magneto control lever ② sampai menyentuh penahan pemajuan penuh ③.
- Setel panjang sambungan penghubung sehingga indikator waktu menyatu dengan tanda ④ pada roda gaya.
- Kencangkan mur pengunci.

3. Periksa :

- Waktu penyalaan dengan perlambatan penuh.
Jika tidak tepat → Ganti.

Langkah-langkah pemeriksaan :

- Putar roda gaya searah jarum jam sehingga tanda ④ menyatu dengan tanda ⑤ pada penutup starter.



Posisi perlambatan penuh :

E9.9C/E15C : 5° ATDC

E15NK : 5° BTDC

- Putar magneto control lever sampai sekrup perlambatan penuh ① menyentuh penahan perlambatan penuh ②.
- Periksa indikator waktu ⑥ sehingga menyatu dengan tanda ⑦ pada roda gaya.

4. Setel :

- Sekrup perlambatan penuh.

Langkah-langkah penyetelan :

- Putar roda gaya searah jarum jam sampai dial gauge menunjukkan posisi piston berada pada jarak yang ditentukan dari TDC.

INSP
ADJ



CONTROL SYSTEM

E



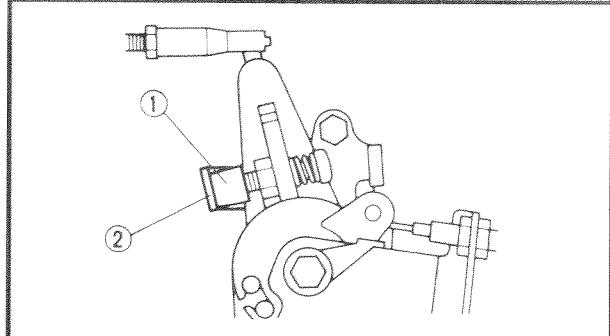
Piston position:
E9.9C/E15C:
0.12 mm (0.005 in) ATDC
E15NK:
0.12 mm (0.005 in) BTDC

- Turn the magneto control lever so that the full retard screw contacts the full retard stopper.
- Adjust the full retard screw ① so that the timing indicator aligns with the mark @ on the flywheel.

Adjusting the throttle link

NOTE:

Before adjusting the throttle link, the ignition timing should be properly adjusted.

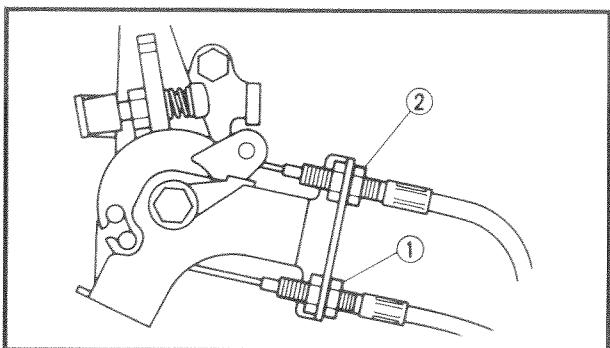


1. Check:

- Fully closed position
Incorrect → Adjust.

Checking steps:

- Close the throttle grip fully.
- Check that the full retard screw ① contacts the full retard stopper ②.



2. Adjust:

- Throttle cable adjuster

Adjustment steps:

- Loosen locknuts ① and ②.
- Turn the magneto control lever until the full retard screw contacts the full retard stopper.



Posisi piston :
E9.9C/E15C :
0.12 mm (0.005 in) ATDC
E15NK :
0.12 mm (0.005 in) BTDC

- Putar magneto control lever sampai sekrup perlambatan penuh menyentuh penahan perlambatan penuh.
- Setel sekrup perlambatan penuh ① sampai indikator waktu menyatu dengan tanda ② pada roda gaya.

Menyetel penghubung gas :

CATATAN : _____

Sebelum menyetel penghubung gas, waktu penyalaan harus disetel dengan benar.

1. Periksa :

- Posisi tertutup penuh.
Jika tidak tepat → Setel.

Langkah-langkah pemeriksaan :

- Tutup throttle grip sepenuhnya.
- Pastikan bahwa sekrup perlambatan penuh ① menyentuh penahan perlambatan penuh ②.

2. Setel :

- Penyetel kabel gas.

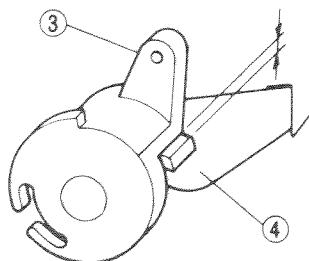
Langkah-langkah penyetelan :

- Longgarkan mur pengunci ① dan ②.
- Putarkan magneto control lever sampai sekrup perlambatan penuh menyentuh penahan perlambatan penuh.

INSP
ADJ

CONTROL SYSTEM

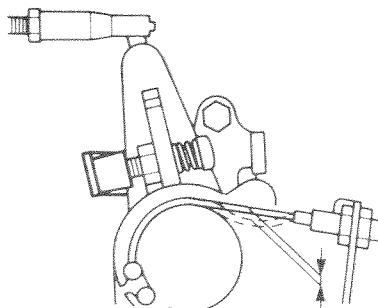
E



- Adjust the throttle cable adjuster until there is specified free play between the stoppers of the pulley (3) and the free acceleration lever (4).



Free play:
1 mm (0.04 in)



- Tighten the locknut (1).
- Adjust the throttle cable adjuster until there is specified free play on the throttle cable.



Free play:
1 mm (0.04 in)

- Tighten the locknut (2).

3. Check:

- Throttle operation
Unsmooth → Repair.

Adjusting the idle speed

NOTE:

Before adjusting the idle speed, the throttle link should be properly adjusted.

1. Measure:

- Idle speed
Out of specification → Adjust.



Idle speed:
E9.9C/E15C: 750 ± 50 rpm
E15NK: $1,450 \pm 50$ rpm

Measuring steps:

- Start the engine and allow it to warm up for a few minutes.
- Attach the tachometer to the high tension lead of cylinder #1.



Tachometer:
90890-06760



- Setel penyetel kabel gas sampai terdapat kelonggaran yang ditentukan antara penahan puli ③ dan tuas akselerasi bebas ④.



Kelonggaran :
1 mm (0.04 in)

- Kencangkan mur pengunci ①
- Setel penyetel kabel gas sampai terdapat kelonggaran yang ditentukan pada kabel gas.



Kelonggaran :
1 mm (0.04 in)

- Kencangkan mur pengunci ②.

3. Periksa :

- Operasi gas
Jika tidak mulus → Perbaiki.

Menyetel kecepatan tanpa beban

CATATAN :

Sebelum menyetel kecepatan tanpa beban, penghubung gas harus disetel dengan benar.

1. Ukur :

- Kecepatan tanpa beban
Jika tidak sesuai spesifikasi → Setel.



Kecepatan tanpa beban :
E9.9C/E15C : 750 ± 50 rpm
E15NK : 1.450 ± 50 rpm

Langkah-langkah pengukuran :

- Start mesin dan panaskan selama beberapa menit.
- Pasang tachometer pada timbel tegangan tinggi silinder #1.

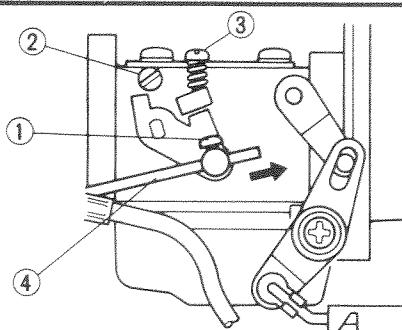


Tachometer :
90890-06760

**INSP
ADJ**

CONTROL SYSTEM/LOWER UNIT

E



2. Adjust:

- Idle speed

Adjustment steps:

- Loosen the screw ①.
- Turn in the pilot screw ② until it is lightly seated.
- Turn out the pilot screw for the specified number of turns.



Pilot screw:

E9.9C/E15C:

$1\frac{1}{2} \pm \frac{1}{4}$ turns out

E15NK:

$\frac{3}{4} \pm \frac{1}{4}$ turns out

- Turn the throttle stop screw ③ in or out until the specified idle speed is obtained.

Turning in → Idle speed increases.
Turning out → Idle speed decreases.

- Pull the acceleration rod ④ until the full retard screw contacts the full retard stopper.
- Tighten the screw ①.



Screw:

1 Nm (0.1 m · kg, 0.7 ft · lb)

LOWER UNIT

Gear oil

1. Check:

- Gear oil

Milky oil → Replace the oil seal.

Slag oil → Check the gear, bearing and clutch dog.

2. Check:

- Gear oil level

Oil level is low → Add oil to the proper level.



2. Setel :

- Kecepatan tanpa beban.

Langkah-langkah penyetelan :

- Kendorkan sekrup ①
- Putar sekrup pilot ② sampai agak rapat.
- Putar sekrup pilot sejumlah putaran yang ditentukan.

**Sekrup pilot :**

E9.9C/E15C :

1-1/2 ± 1/4 putar keluar

E15NK :

3/4 ± 1/4 putar keluar

- Putar sekrup penghenti gas ③ ke dalam atau ke luar sampai diperoleh kecepatan tanpa beban yang ditentukan.

Putaran ke dalam → Kecepatan tanpa beban bertambah.**Putaran ke luar → Kecepatan tanpa beban berkurang.**

- Tarik batang akselerasi ④ sampai sekrup perlambatan penuh menyentuh penahan perlambatan penuh.
- Kencangkan sekrup ①.

**Sekrup :**

1 Nm (0.1 m · kg, 0.7 ft · lb)

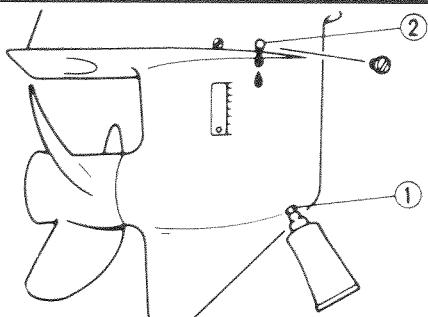
BAGIAN BAWAH MESIN**Minyak pelumas roda gigi**

1. Periksa :

- Minyak pelumas roda gigi
Jika terlihat seperti susu → Ganti seal oli.
Jika terdapat kerak minyak → Periksa roda gigi, bantalan dan clutch dog (alat penggenggam kopeling).

2. Periksa :

- Ketinggian minyak pelumas roda gigi.
Jika terlalu rendah → Tambahkan minyak pelumas sampai pada ketinggian yang semestinya.

**3. Replace:**

- Gear oil

Replacement steps:

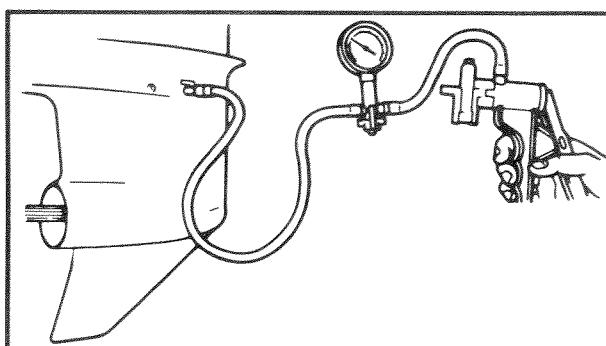
- Tilt up the motor.
- Place a pan under the drain plug ①.
- Remove the drain plug, the oil level plug ② and then drain the oil thoroughly.
- Place the outboard motor in an upright position.
- Fill the gear oil through the drain hole until it overflows at the level hole.



Recommended oil:
Hypoid gear oil, SAE 90

Oil capacity:
250 cm³
(8.45 US oz, 8.80 Imp oz)

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

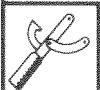
**Checking the lower unit leakage****1. Check:**

- Pressure

Pressure drops → Inspect the seals and components.

Checking steps:

- Attach the tester to the oil level hole.



Pressure tester:
90890-06762

- Apply the specified pressure.



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

- Check that the specified pressure holds for ten seconds.

NOTE: _____

Do not overpressurize. Excess pressure may cause the air to leak out.



3. Ganti :

- Minyak pelumas roda gigi.

Langkah-langkah penggantian :

- Miringkan mesin ke atas.
- Taruh panci di bawah sumbat pembuangan ①.
- Lepaskan sumbat pembuangan, sumbat ketinggian minyak ② dan kemudian buang minyak habis-habis.
- Taruh motor tempel dalam posisi tegak lurus.
- Isi minyak pelumas roda gigi melalui lubang pembuangan sampai meluap pada lubang ketinggian.

**Minyak yang dianjurkan :**

Minyak pelumas roda gigi hypoid,
SAE 90

Kapasitas minyak pelumas :

250 cm³

(8.45 US oz, 8.80 Imp oz)

- Pasang sumbat ketinggian minyak pelumas, kemudian sumbat pembuangan minyak.

Pemeriksaan kebocoran bagian bawah mesin

1. Periksa :

- Tekanan

Tekanan turun → Periksa seal-seal dan komponen-komponen.

Langkah-langkah pemeriksaan :

- Pasang alat pengukur (tester) pada lubang ketinggian minyak.

**Alat pengukur tekanan :**

90890-06762

- Pakai tekanan yang ditentukan.

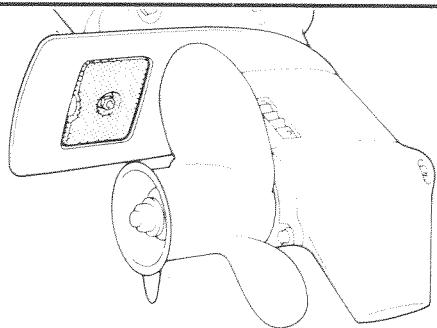
**Tekanan :**

100 kPa (1.0 kg/cm², 14.2 psi)

- Pastikan bahwa tekanan yang ditentukan bertahan selama 10 detik.

CATATAN :

Jangan memberi tekanan berlebihan. Tekanan yang berlebihan bisa menyebabkan udara bocor.



GENERAL

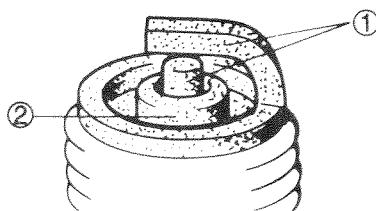
Anode

1. Inspect:

- Anode
 - Scales → Clean.
 - Grease/oil → Clean.
 - Excessive wear → Replace.

CAUTION:

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



Spark plugs

1. Inspect:

- Electrodes ①
 - Damage/wear → Replace the spark plug.
- Insulator color ②
 - Distinctly different color → Check the engine condition.



Color guide:

Medium to light tan color:

Normal

Whitish color:

Lean fuel mixture

- Plugged fuel mixture
- Air leak
- Wrong settings

Blackish color:

Overly rich mixture

- Electrical malfunction
- Excess oil used
- Defective spark plug

2. Clean:

- Spark plugs

Clean the spark plugs with a spark plug cleaner or wire brush.

**UMUM****Anoda**

1. Periksa :

- Anoda
Bersisik → Bersihkan.
Gemuk/oli → Bersihkan.
Aus berlebihan → Ganti.

PERHATIAN:

Jangan memberi minyak pelumas, gemuk atau cat pada anoda karena fungsinya bisa terganggu.

Busi

1. Periksa :

- Elektroda ①
Rusak/aus → Ganti busi.
- Warna isolator ②
Warna yang jelas berbeda → Periksa kondisi mesin.

**Petunjuk warna :**

Warna coklat sedang sampai muda :
Normal

Warna keputih-putihan :

- Campuran bahan bakar encer
- Campuran bahan bakar tersumbat
 - Kebocoran udara
 - Kesalahan tata-tetap

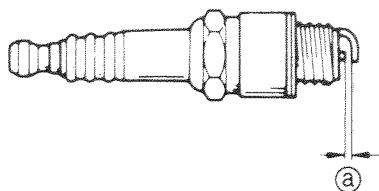
Warna kehitam-hitaman :

- Campuran terlalu pekat
- Gangguan elektrik
 - Pemakaian minyak pelumas berlebihan
 - Busi rusak

2. Bersihkan :

- Busi

Bersihkan busi dengan pembersih busi atau sikat kawat.

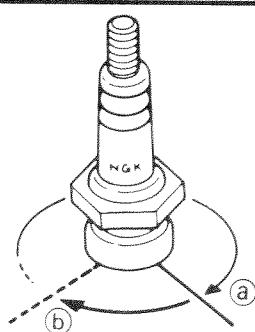


3. Measure:

- Electrode gap ①
Out of specification → Regap.
Use a wire gauge.



Electrode gap:
0.9 ~ 1.0 mm (0.035 ~ 0.039 in)



377-004

4. Tighten:

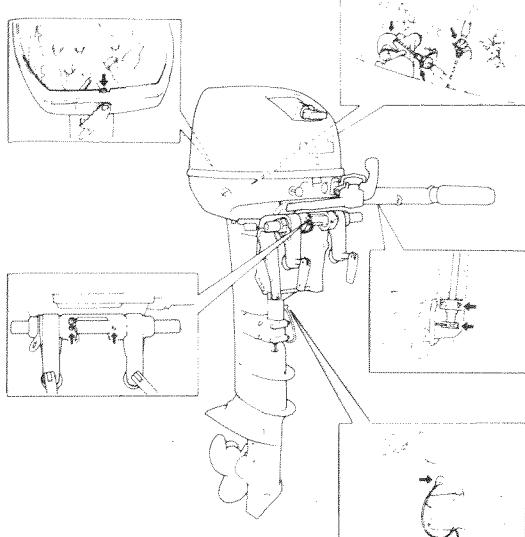
- Spark plugs



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

NOTE: _____

- Before installing a spark plug, clean the gasket surface and plug surface. Also it is suggested to apply a thin film of Anti Seize Compound to the spark plug threads to prevent thread seizure.
- If a torque wrench is not available, a good estimate of the correct torque is a further 1/4 to 1/2 turns ② on finger tightened ① spark plug.



Lubrication points

1. Apply:
 - Water resistant grease



3. Ukur :

- Celah elektroda @
Jika tidak sesuai spesifikasi → Atur kembali celahnya.
Gunakan alat pengukur kawat.



Celah elektroda :
0.9 ~ 1.0 mm (0.035 ~ 0.039 in)

4. Kencangkan :

- Busi



Busi :
25 Nm (2.5 m • kg, 18 ft • lb)

CATATAN :

- Sebelum memasang busi, bersihkan permukaan gasket dan permukaan busi. Juga disarankan memakai satu lapisan tipis Bahan Anti Macet pada ulir-ulir busi untuk mencegah kemacetan ulir.
- Jika tidak ada torque wrench (kunci momen putar), cara memperkirakan momen putar yang benar adalah dengan menambah 1/4 sampai 1/2 putaran ⑥ pada busi yang dikencangkan dengan jari @.

Titik-titik pelumasan

1. Gunakan
 - Gunakan anti air



CHAPTER 4

FUEL SYSTEM

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BAB 4

SISTEM BAHAN BAKAR

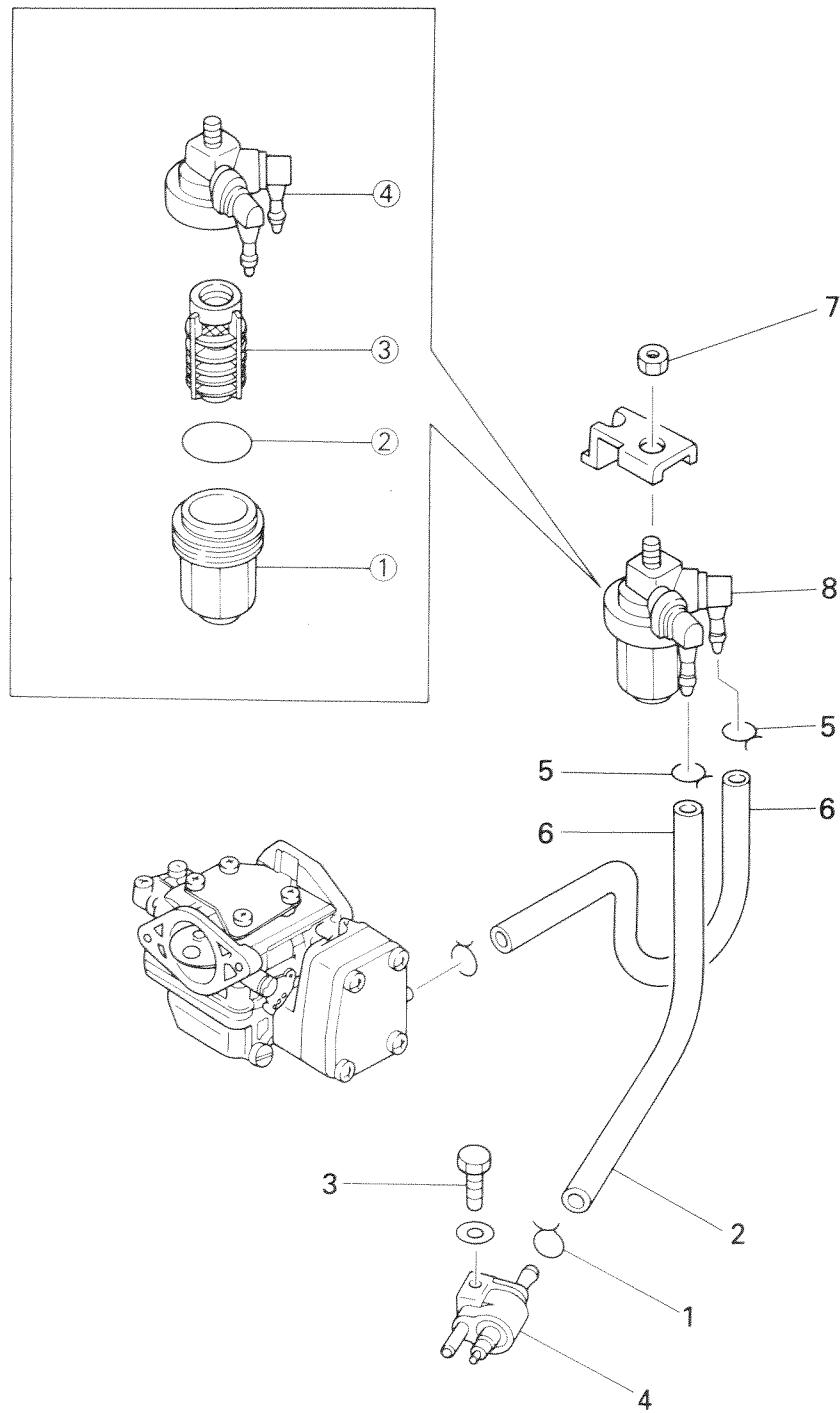
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FUEL JOINT AND FUEL FILTER

5

FUEL JOINT AND FUEL FILTER EXPLODED DIAGRAM (E9.9C/E15C)

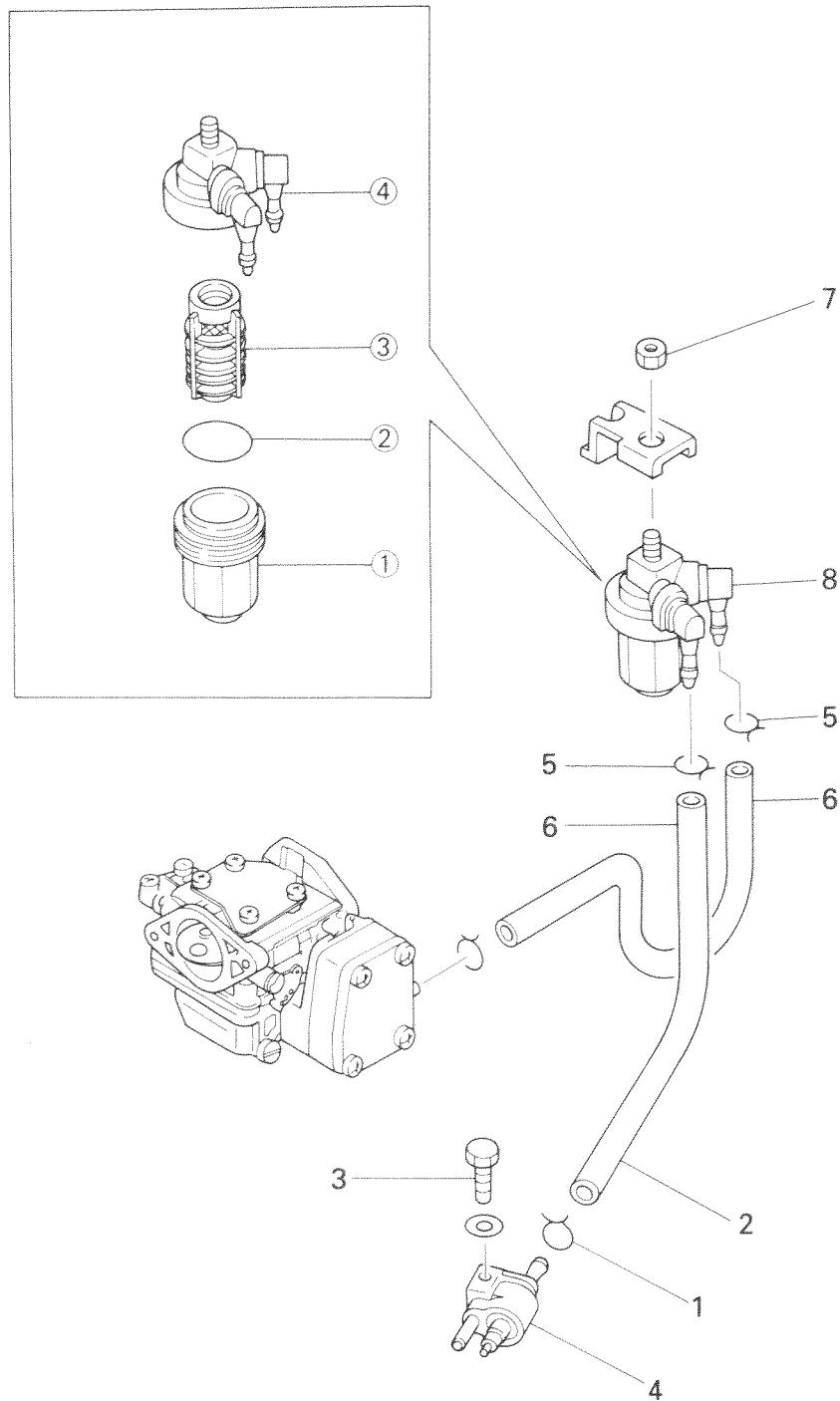




SAMBUNGAN BAHAN BAKAR DAN FILTER BAHAN BAKAR

IN

SAMBUNGAN BAHAN BAKAR DAN FILTER BAHAN BAKAR DIAGRAM BAGIAN-BAGIAN SECARA TERURAI (E9.9C/E15C)



FUEL**FUEL JOINT AND FUEL FILTER**

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the fuel joint and fuel filter		Remove the parts in the order below.
1	Clip	1	
2	Fuel hose (fuel joint side)	1	
3	Bolt/washer (fuel joint)	1/1	
4	Fuel joint	1	
5	Clips	2	
6	Fuel hoses (fuel filter side)	2	
7	Nut (fuel filter)	1	
8	Fuel filter	1	
①	Disassembling the fuel filter		
②	Filter cup	1	
③	O-ring	1	
④	Filter element	1	
⑤	Filter cup cover	1	For installation, reverse the removal procedures.

FUEL

SAMBUNGAN BAHAN BAKAR DAN FILTER BAHAN BAKAR

IN

BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

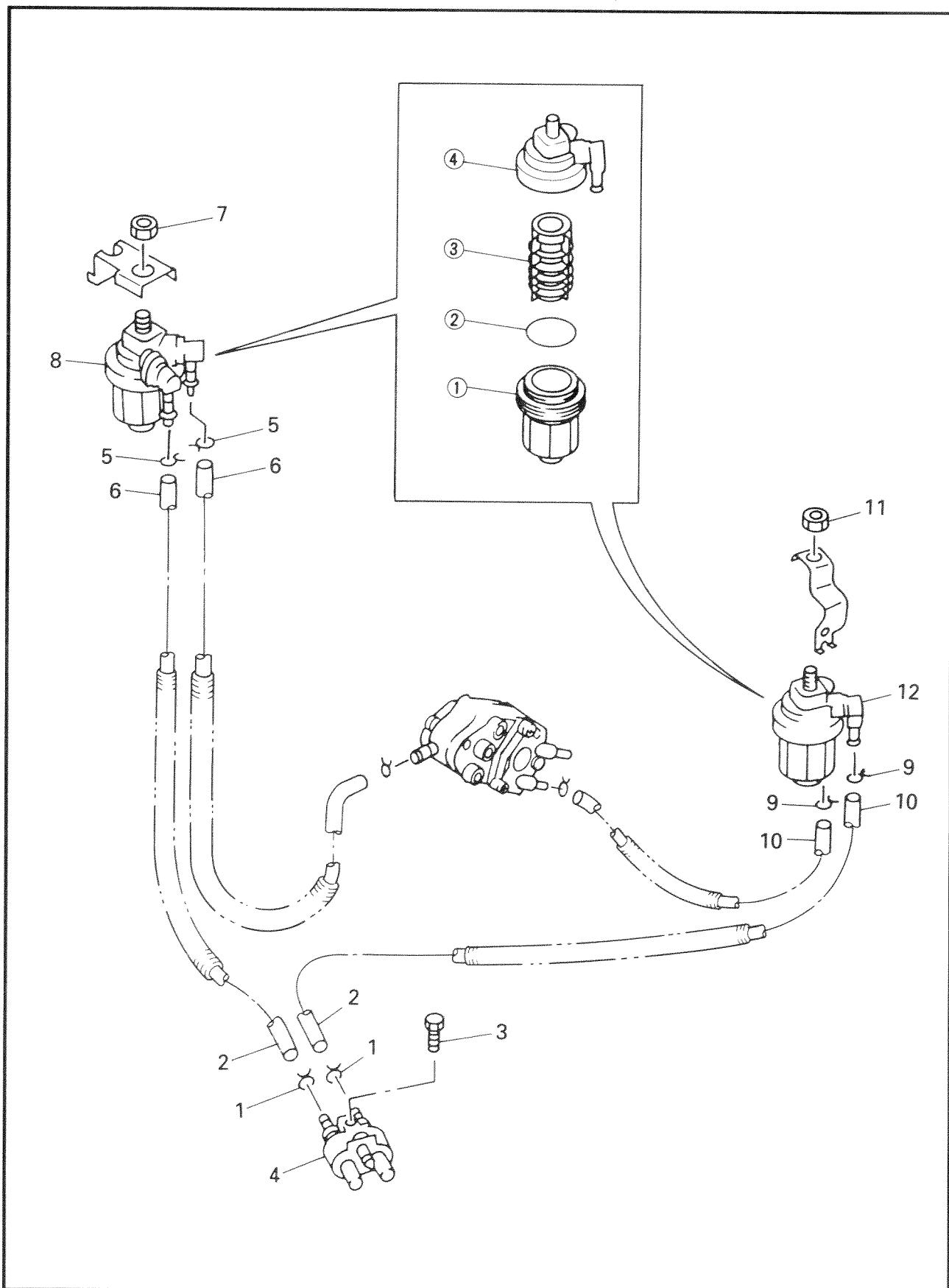
Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan sambungan bahan bakar dan filter bahan bakar		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Klip	1	
2	Selang bahan bakar (sebelah sambungan bahan bakar)	1	
3	Baut / washer (sambungan bahan bakar)	1/1	
4	Sambungan bahan bakar	1	
5	Klip	2	
6	Selang bahan bakar (sebelah filter bahan bakar)	2	
7	Mur (filter bahan bakar)	1	
8	Filter bahan bakar	1	
①	Membongkar filter bahan bakar		
②	Mangkuk filter	1	
③	O-ring	1	
④	Elemen filter	1	
	Penutup mangkuk filter	1	Untuk memasang kembali, balik langkah-langkah pelepasan.

FUEL

FUEL JOINT, DUAL LINE FUEL JOINT AND FUEL FILTERS

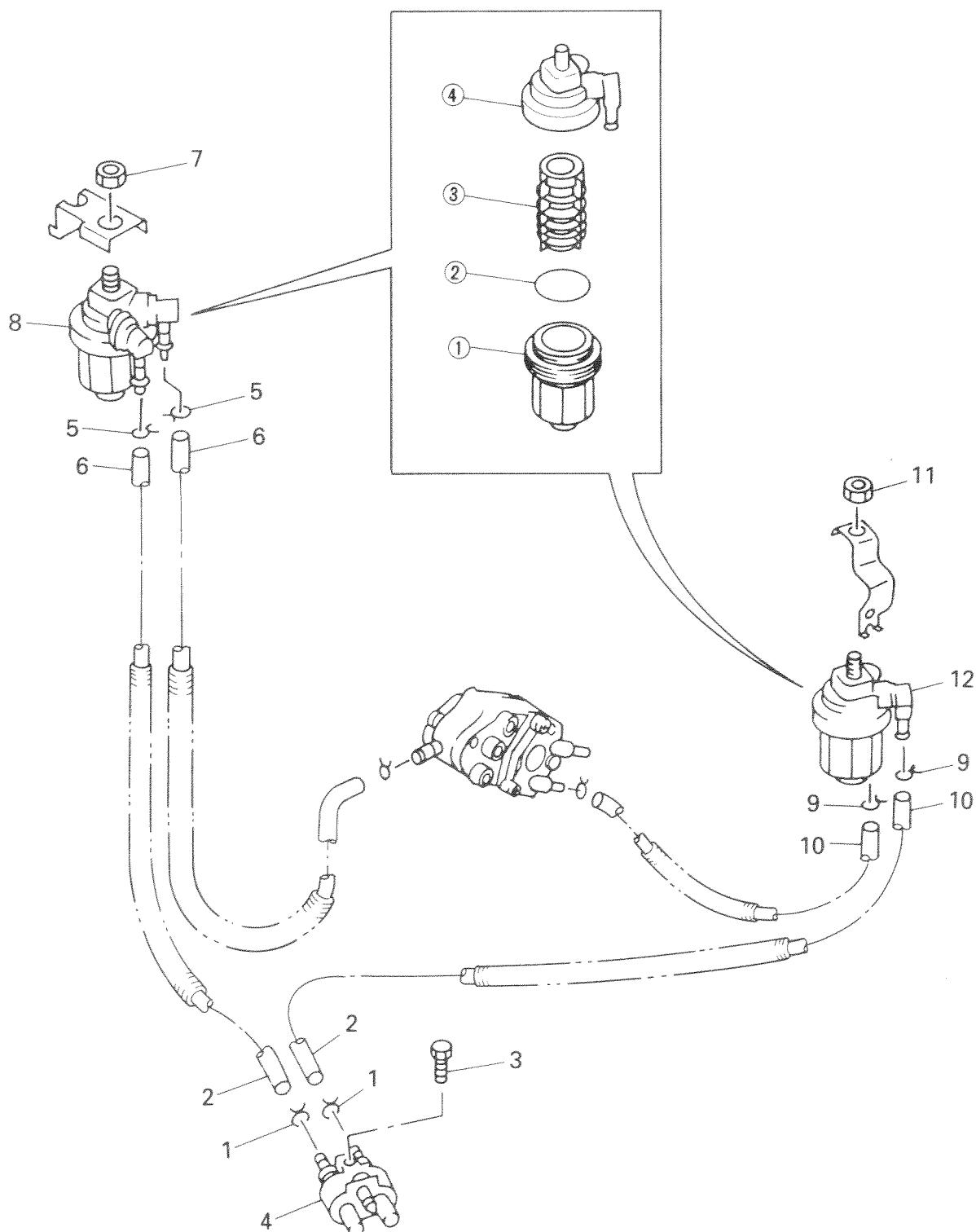
E

FUEL JOINT, DUAL LINE FUEL JOINT AND FUEL FILTERS EXPLODED DIAGRAM (E15NK)



FUEL**SAMBUNGAN BAHAN BAKAR, SAMBUNGAN BAHAN BAKAR
SALURAN GANDA DAN FILTER BAHAN BAKAR**

IN

**SAMBUNGAN BAHAN BAKAR, SAMBUNGAN BAHAN BAKAR
SALURAN GANDA DAN FILTER BAHAN BAKAR
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI (E15NK)**

FUEL**FUEL JOINT, DUAL LINE FUEL JOINT AND
FUEL FILTERS**

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the dual line fuel joint and fuel filters		Remove the parts in the order below.
1	Clips	2	
2	Fuel hoses (dual line fuel joint side)	2	
3	Bolt (dual line fuel joint)	1	
4	Dual line fuel joint	1	
5	Clips	2	
6	Fuel hoses (fuel filter side)	2	
7	Nut (fuel filter)	1	
8	Fuel filter	1	
9	Clips	2	
10	Fuel hoses (fuel filter side)	2	
11	Nut (fuel filter)	1	
12	Fuel filter	1	
	Disassembling the fuel filter The following steps are for each fuel filter		
①	Filter cup	1	
②	O-ring	1	
③	Filter element	1	
④	Filter cup cover	1	
			For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

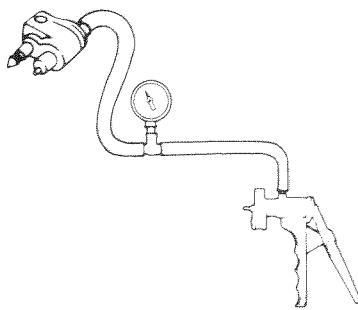
Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan sambungan bahan bakar saluran ganda dan filter bahan bakar		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Klip	2	
2	Selang bahan bakar (sebelah sambungan bahan bakar saluran ganda)	2	
3	Baut (sambungan bahan bakar saluran ganda)	1	
4	Sambungan bahan bakar saluran ganda	1	
5	Klip	2	
6	Selang bahan bakar (sebelah filter bahan bakar)	2	
7	Mur (filter bahan bakar)	1	
8	Filter bahan bakar	1	
9	Klip	2	
10	Selang bahan bakar (sebelah filter bahan bakar)	2	
11	Mur (filter bahan bakar)	1	
12	Filter bahan bakar	1	
	Membongkar filter bahan bakar Langkah-langkah berikut ini adalah untuk masing-masing filter bahan bakar		
①	Mangkuk filter	1	
②	O-ring	1	
③	Elemen filter	1	
④	Penutup mangkuk filter	1	
			Untuk memasang kembali, balik langkah-langkah pelepasan.

**SERVICE POINTS****Inspecting the fuel joint and dual line fuel joint**

1. Inspect:

- Fuel joint
- Dual line fuel joint

Cracks/damage/leaks → Replace.



2. Measure:

● Fuel joint operation

Specified pressure does not hold for ten seconds → Replace.

Measuring steps:

- Attach the Mity vac.

	Mity vac: 90890-06756
--	---------------------------------

- Apply the specified pressure.

	Specified pressure: 50 kPa (0.5 kg/cm ² , 7.1 psi)
--	---

Inspecting the fuel filter(s)

1. Inspect:

- Fuel filter element(s)
- Fuel filter cup(s)

Clogs/cracks/leaks → Replace.

Contamination → Clean.

FUEL

SAMBUNGAN BAHAN BAKAR, SAMBUNGAN BAHAN BAKAR SALURAN GANDA DAN FILTER BAHAN BAKAR

IN

TITIK-TITIK PERAWATAN

Memeriksa sambungan bahan bakar dan sambungan bahan bakar saluran ganda

1. Periksa :

- Sambungan bahan bakar
- Sambungan bahan bakar saluran ganda
Retak/rusak/bocor → Ganti.

2. Ukur :

- Operasi sambungan bahan bakar
Tekanan yang ditentukan tidak bertahan selama 10 detik → Ganti.

Langkah-langkah pengukuran :	
<ul style="list-style-type: none">● Pasang Mity vac	
	Mity vac : 90890-06756
<ul style="list-style-type: none">● Gunakan tekanan yang ditentukan.	
	Tekanan yang ditentukan : 50 kPa (0.5 kg/cm ² , 7.1 psi)

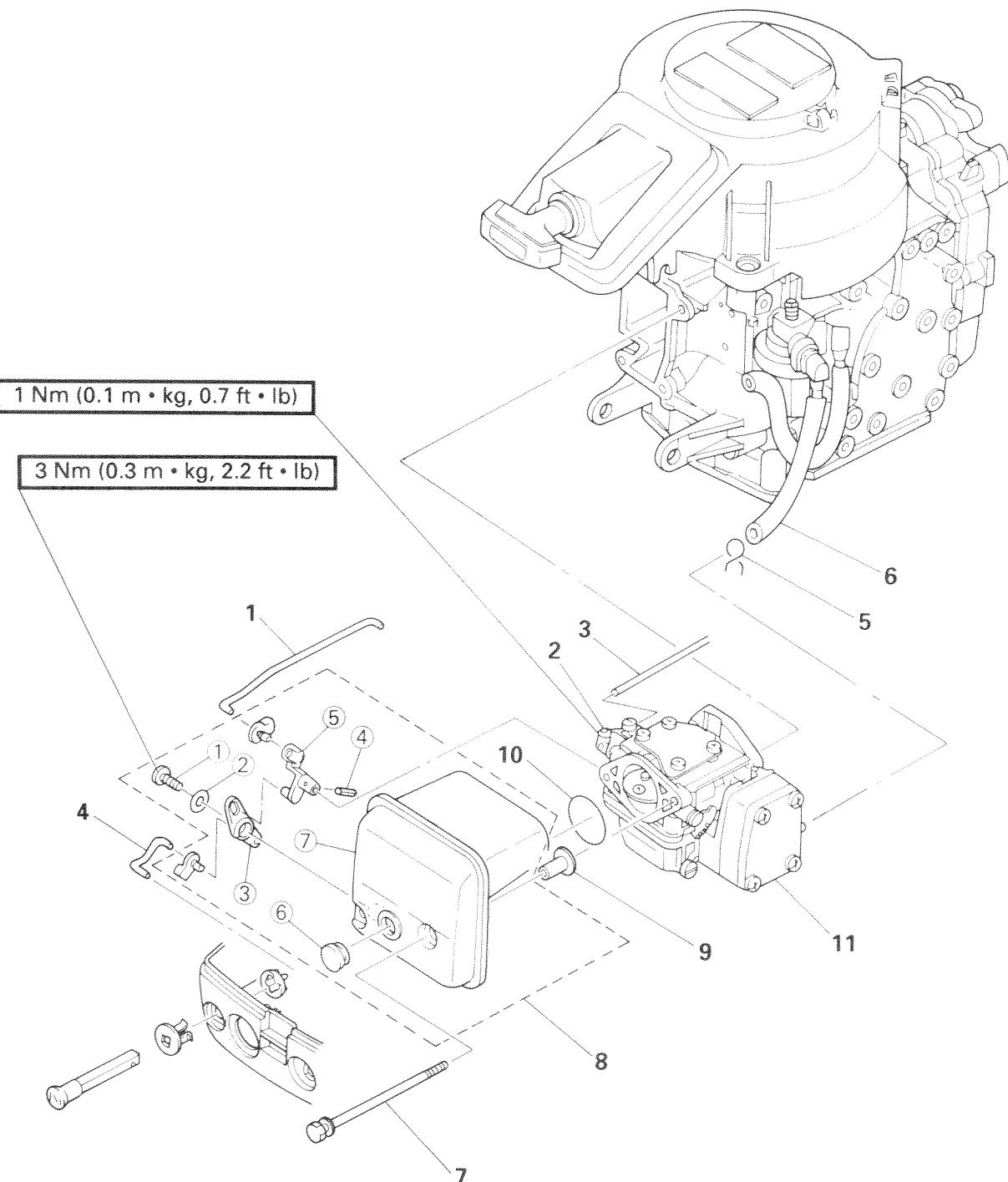
Memeriksa filter bahan bakar

1. Periksa :

- Elemen-elemen filter bahan bakar
- Mangkuk-mangkuk filter bahan bakar
Tersumbat/retak/bocor → Ganti.
Kotor → Bersihkan.

FUEL**CARBURETOR REMOVAL**

E

**CARBURETOR REMOVAL
EXPLODED DIAGRAM (E9.9C/E15C)**

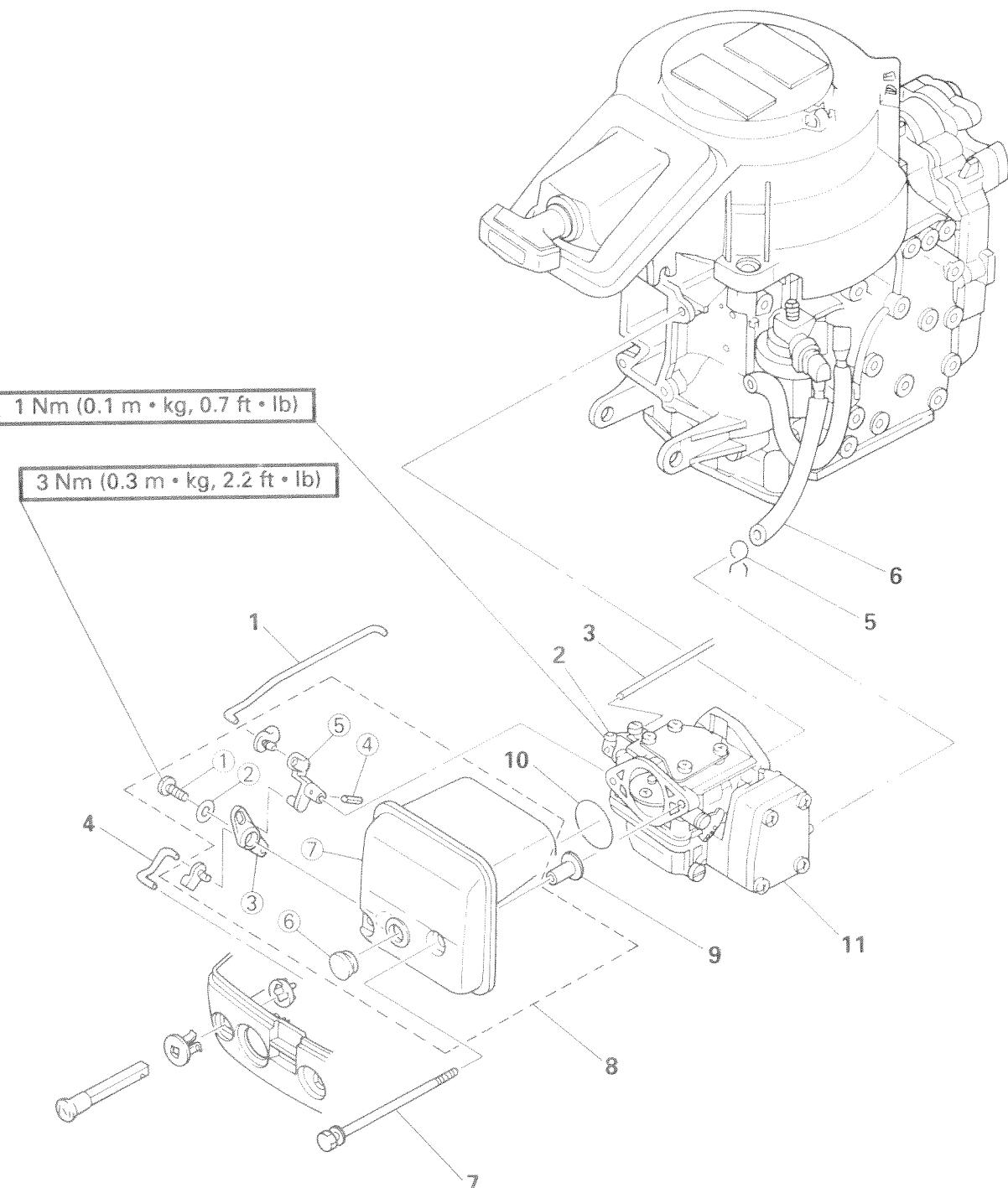
FUEL



MELEPASKAN KARBURATOR

IN

MELEPASKAN KARBURATOR DIAGRAM BAGIAN-BAGIAN SECARA TERURAI (E9.9C/E15C)





CARBURETOR REMOVAL

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the carburetor		
1	Choke rod	1	
2	Screw	1	
3	Acceleration rod	1	
4	Choke knob rod	1	
5	Clip	1	
6	Fuel hose	1	
7	Bolts/washers (silencer)	2/2	
8	Silencer	1	
9	Collars	2	
10	O-ring	1	
11	Carburetor	1	
	Disassembling the silencer		
①	Tapping screw	1	
②	Plain washer	1	
③	Choke lever joint	1	
④	Spring pin	1	
⑤	Choke lever	1	
⑥	Rubber plug	1	
⑦	Silencer	1	
			For installation, reverse the removal procedures.

FUEL



MELEPASKAN KARBURATOR

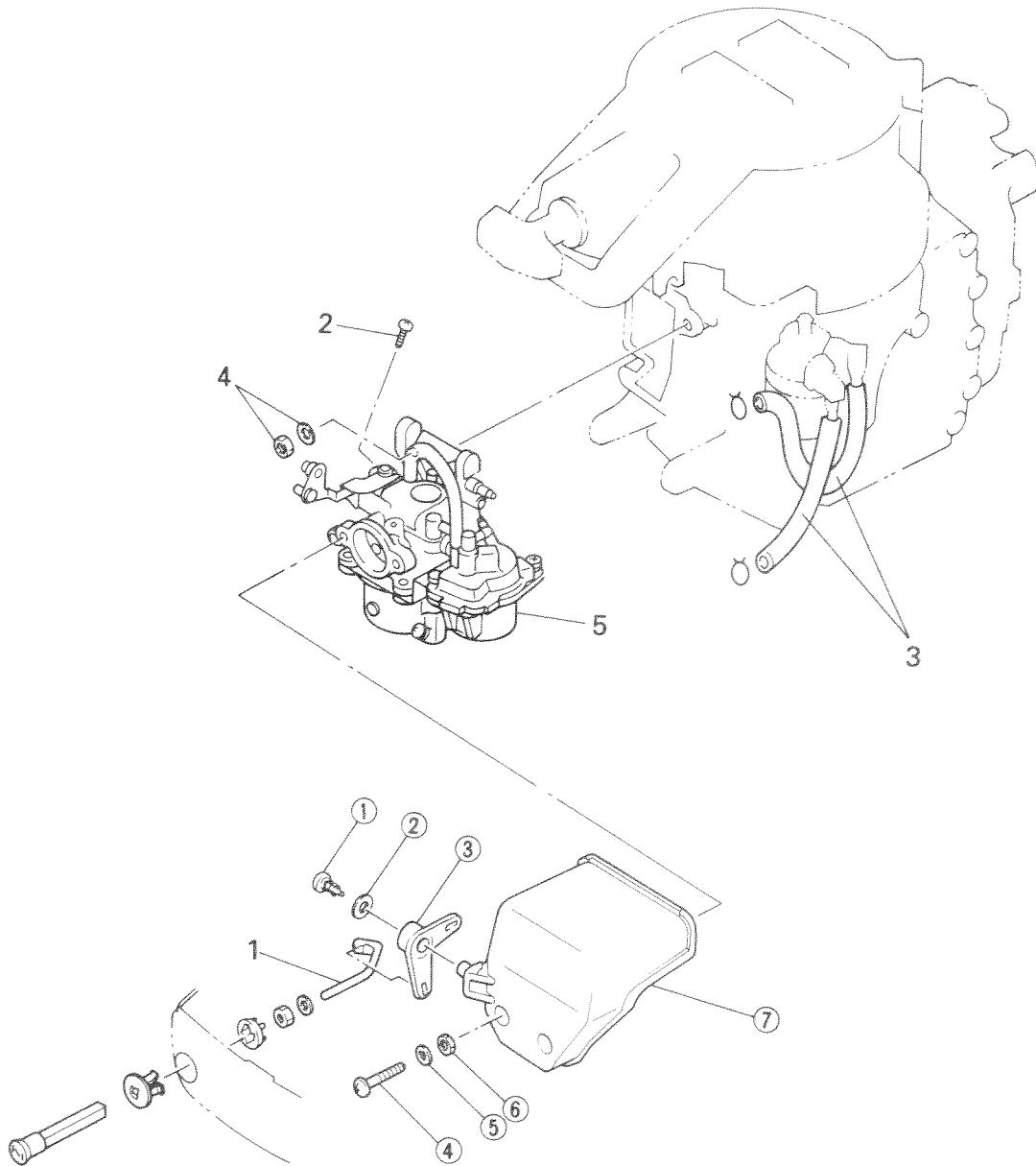
IN

BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan karburator		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Choke rod	1	
2	Sekrup	1	
3	Batang akselerasi	1	
4	Batang choke rod	1	
5	Klip	1	
6	Selang bahan bakar	1	
7	Baut / washer (peredam suara)	2/2	
8	Peredam suara	1	
9	Collars	2	
10	O-ring	1	
11	Karburator	1	
	Membongkar peredam suara		
①	Tapping screw	1	
②	Plain washer	1	
③	Choke lever joint	1	
④	Pen pegas	1	
⑤	Choke lever	1	
⑥	Sumbat karet	1	
⑦	Peredam suara	1	Untuk memasang kembali, balik langkah-langkah pelepasan.

FUEL**CARBURETOR REMOVAL**

E

EXPLODED DIAGRAM (E15NK)

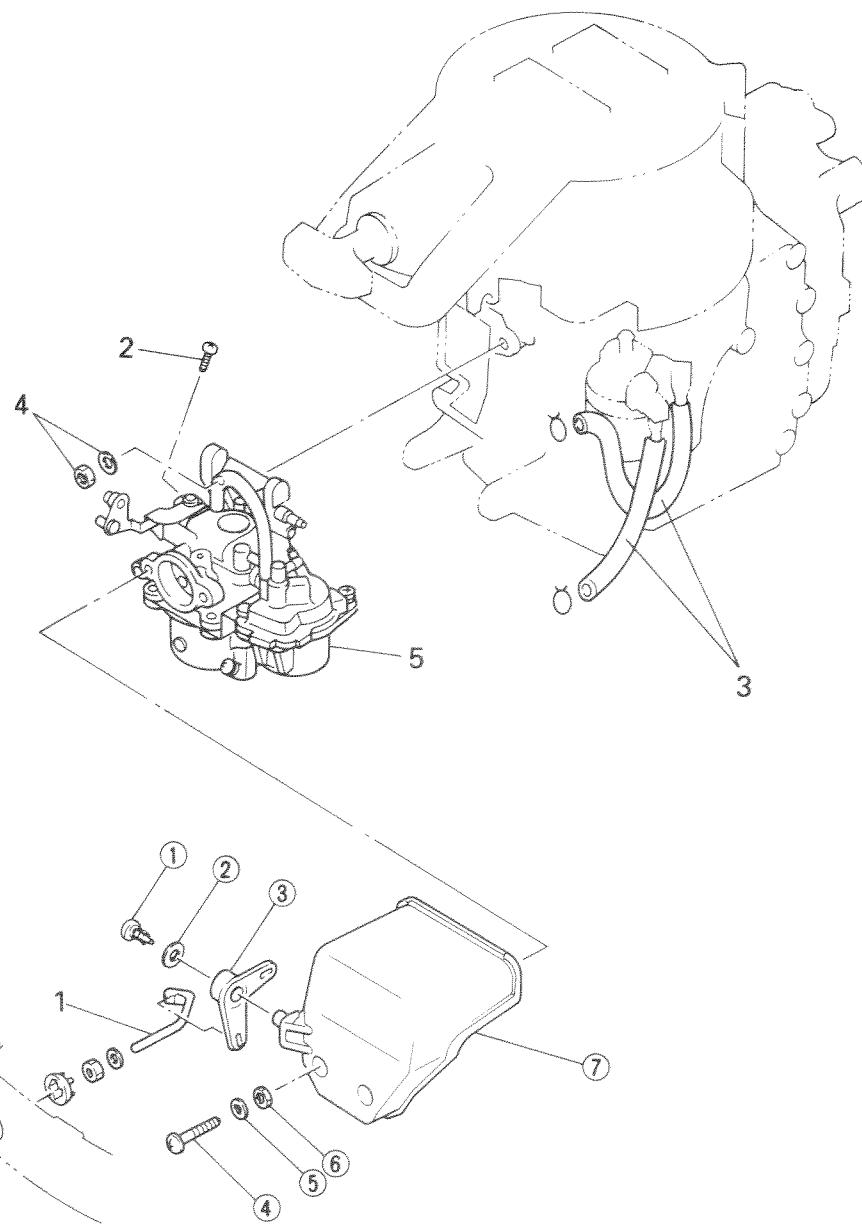
FUEL



MELEPASKAN KARBURATOR

(IN)

DIAGRAM BAGIAN-BAGIAN SECARA TERURAI (E15NK)



FUEL**CARBURETOR REMOVAL**

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the carburetor		Remove the parts in the order below.
1	Choke rod	1	
2	Screw (acceleration rod)	1	
3	Fuel hoses	2	
4	Nuts/washers	2/2	
5	Carburetor	1	
	Disassembling the silencer		
①	Screw (choke lever)	1	
②	Plain washer	1	
③	Choke lever	1	
④	Screws	2	
⑤	Plain washers	2	
⑥	Star washers	2	
⑦	Silencer	1	
			For installation, reverse the removal procedures.

FUEL**MELEPASKAN KARBURATOR**

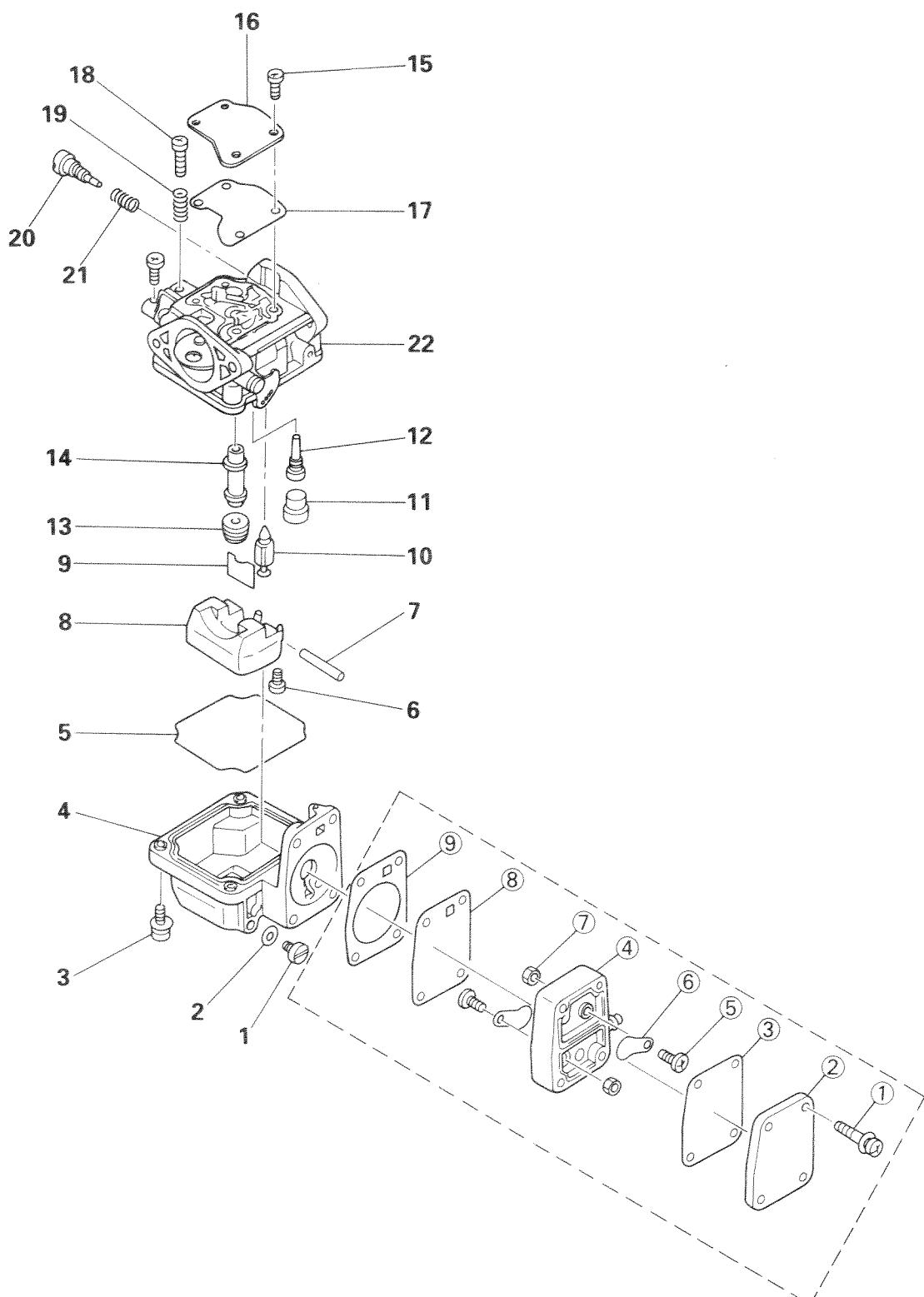
IN

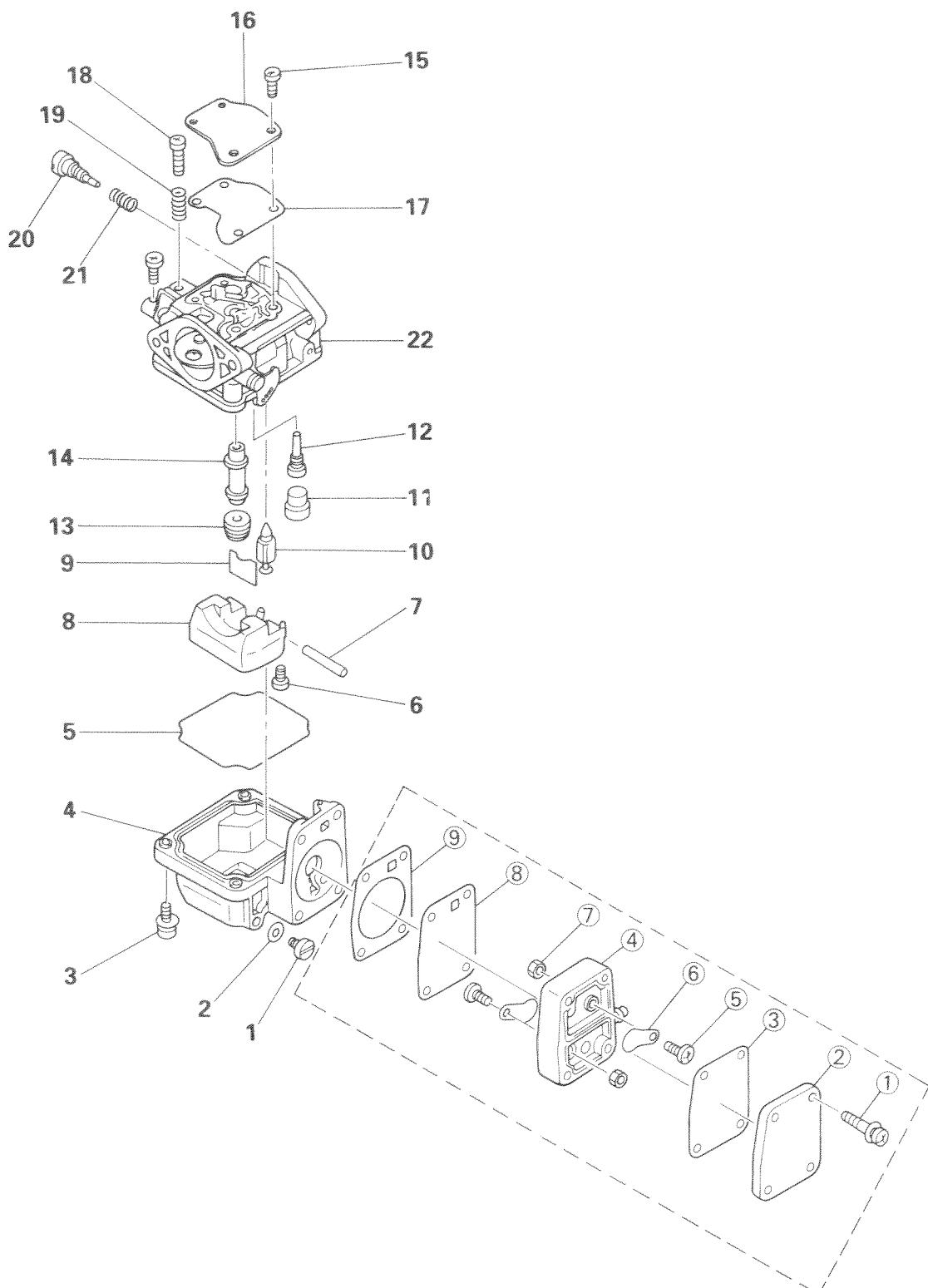
BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan karburator		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Choke rod	1	
2	Sekrup (batang akselerasi)	1	
3	Selang bahan bakar	2	
4	Mur / washer	2/2	
5	Karburator	1	
①	Membongkar peredam suara		
②	Sekrup (choke lever)	1	
③	Plain washer	1	
④	Choke lever	1	
⑤	Sekrup	2	
⑥	Plain washer	2	
⑦	Star washer	2	
	Peredam suara	1	Untuk memasang, balik langkah-langkah pelepasan.

FUEL**CARBURETOR**

E

**CARBURETOR
EXPLODED DIAGRAM (E9.9C/E15C)**

**KARBURATOR**
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI (E9.9C/E15C)

FUEL



CARBURETOR

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Disassembling the carburetor		Remove the parts in the order below. Refer to "CARBURETOR" in chapter 4.
1	Carburetor		
1	Drain screw	1	
2	Washer	1	
3	Screws/washers (float chamber)	4/4	4 × 14 mm
4	Float chamber	1	
5	Float chamber packing	1	
6	Screw	1	
7	Arm pin	1	
8	Float	1	
9	Clip	1	
10	Needle valve	1	
11	Cap	1	
12	Pilot jet	1	
13	Main jet	1	
14	Main nozzle	1	
15	Screws/washers (plate)	4/4	4 × 10 mm
16	Plate	1	
17	Packing	1	
18	Stopping screw	1	
19	Spring	1	
20	Pilot adjusting screw	1	
21	Spring	1	
22	Carburetor body	1	
	Disassembling the fuel pump		
①	Screws/washers (pump cover)	4/4	
②	Pump cover	1	
③	Diaphragm	1	
④	Pump body	1	
⑤	Screws	2	
⑥	Seat valves	2	
⑦	Nuts	2	
⑧	Diaphragm	1	
⑨	Diaphragm gasket	1	
			For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Membongkar karburator		Lepaskan bagian-bagian sesuai urutan di bawah ini. Lihat "KARBURATOR" pada bab. 4.
1	Karburator	1	
2	Sekrup pembuangan	1	
2	Washer	1	
3	Sekrup/washer (ruang pelampung)	4/4	4 x 14 mm
4	Ruang pelampung	1	
5	Paking ruang pelampung	1	
6	Sekrup	1	
7	Pen lengan	1	
8	Pelampung	1	
9	Klip	1	
10	Katup	1	
11	Kap	1	
12	Jet pilot	1	
13	Jet utama	1	
14	Nosel utama	1	
15	Sekrup/washer (pelat)	4/4	4 x 10 mm
16	Pelat	1	
17	Paking	1	
18	Sekrup penghentin	1	
19	Pegas	1	
20	Sekrup penyetel	1	
21	Pegas	1	
22	Badan karburator	1	
①	Membongkar pompa bahan bakar		
②	Sekrup/washer (penutup pompa)	4/4	
③	Penutup pompa	1	
④	Diafragma	1	
④	Badan pompa	1	
⑤	Sekrup	2	
⑥	Katup dudukan	2	
⑦	Mur	2	
⑧	Diafragma	1	
⑨	Gasket diafragma	1	
			Untuk memasang kembali, balik langkah-langkah pembongkaran.

FUEL**CARBURETOR**

E

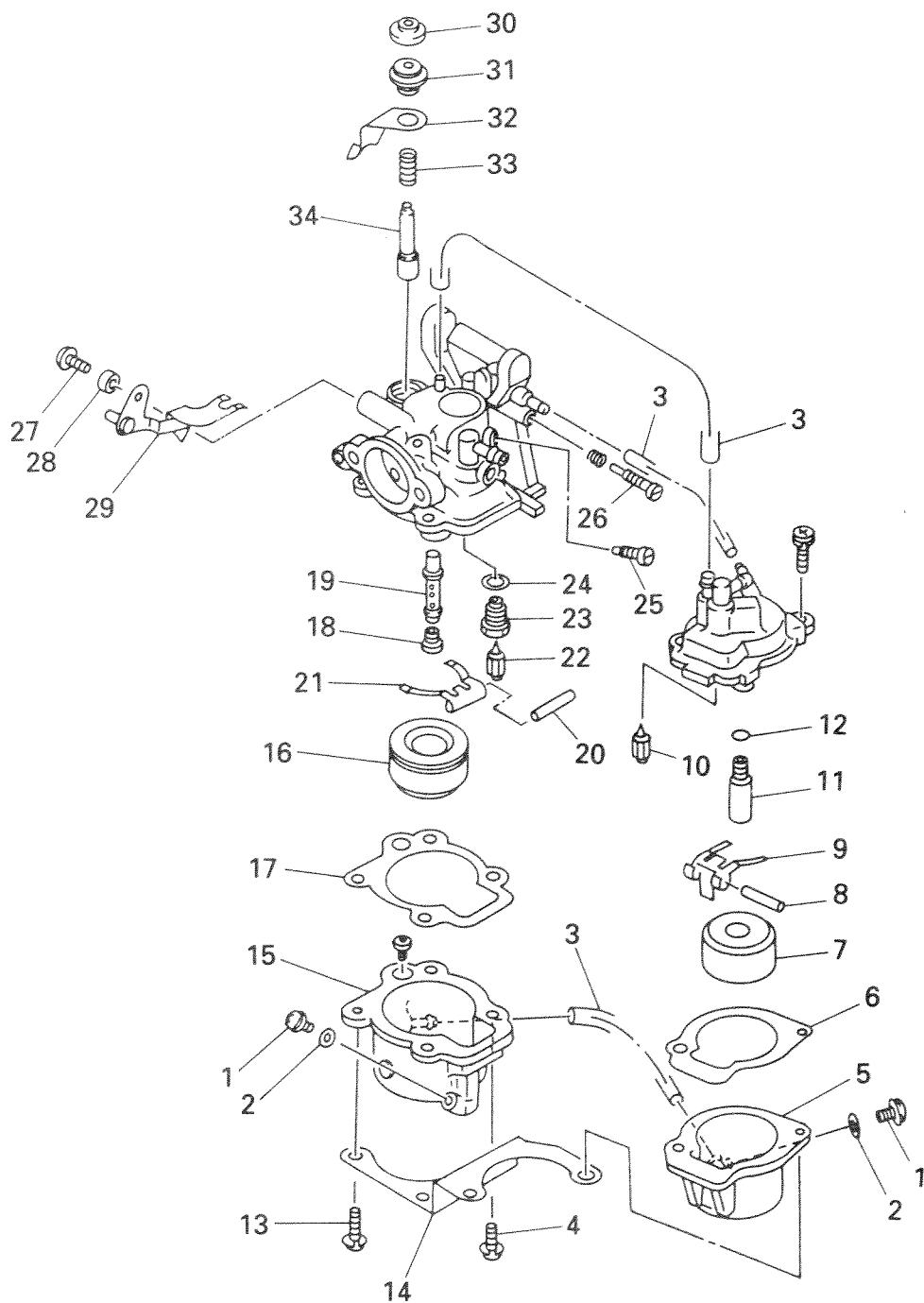
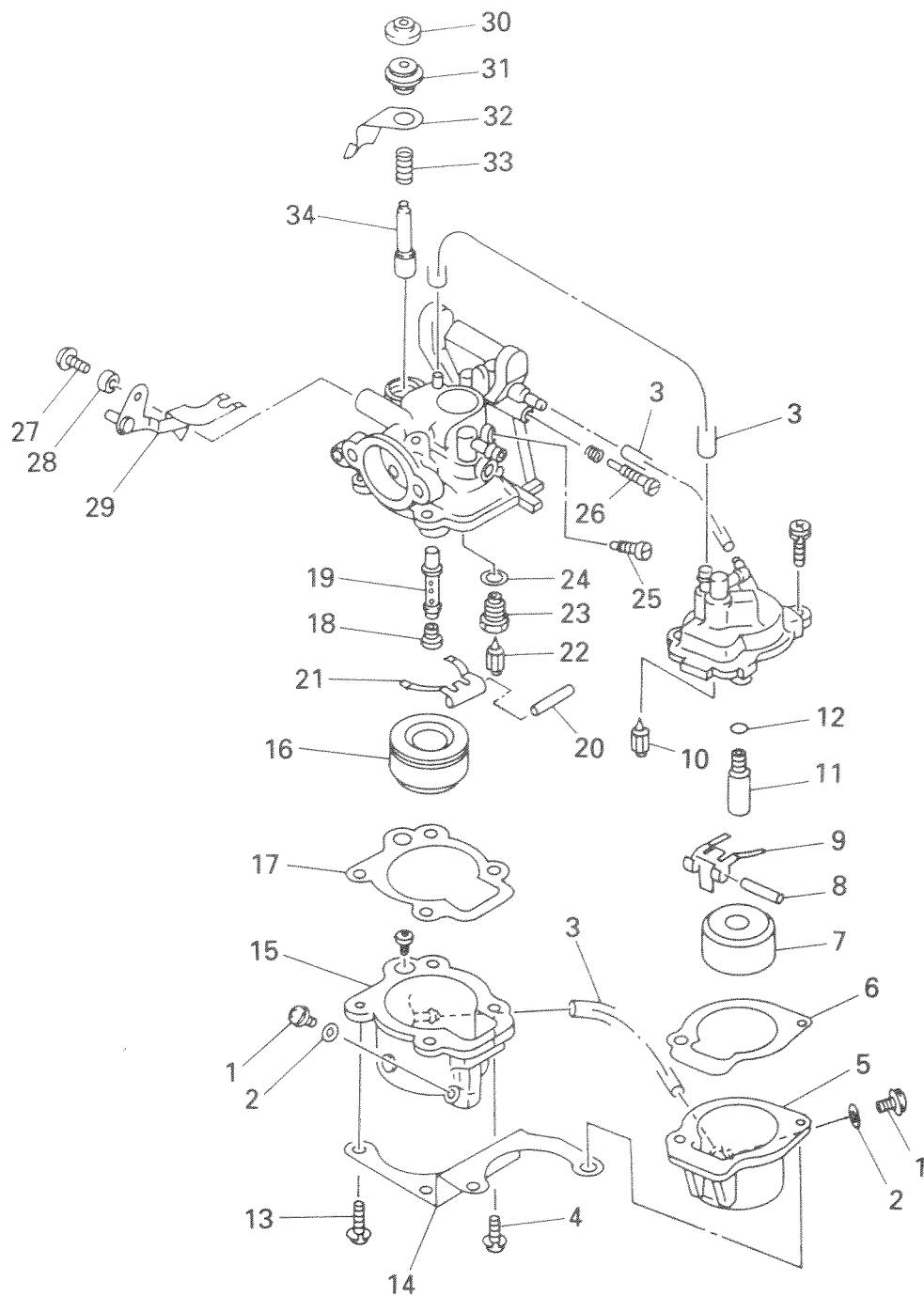
EXPLODED DIAGRAM (E15NK)



DIAGRAM BAGIAN-BAGIAN SECARA TERURAI (E15NK)



FUEL



CARBURETOR

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Disassembling the carburetor		Remove the parts in the order below.
1	Drain screws	2	
2	Washers	2	
3	Fuel hoses	3	
4	Screws/washers (connecting plate)	2/2	
5	Float chamber (gas)	1	
6	Gasket	1	
7	Float	1	
8	Float pin	1	
9	Diaphragm arm	1	
10	Needle valve	1	
11	Pilot jet (#68)	1	
12	O-ring	1	
13	Screws/washers (connecting plate)	4/4	
14	Connecting plate	1	
15	Float chamber (kerosene)	1	
16	Float	1	
17	Gasket	1	
18	Main jet (#102)	1	
19	Main nozzle	1	
20	Float pin	1	
21	Diaphragm arm	1	
22	Needle valve	1	
23	Valve seat (#12)	1	
24	Washer	1	
25	Pilot jet (#46)	1	
26	Pilot screw (with spring)	1	
27	Screw (starter lever)	1	
28	Spacer	1	
29	Starter lever	1	
30	Plunger cap	1	
31	Bolt (starter plunger)	1	
32	Starter lever plate	1	
33	Starter plunger spring	1	
34	Starter plunger	1	
			For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Membongkar karburator		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Sekrup pembuangan	2	
2	Washer	2	
3	Selang bahan bakar	3	
4	Sekrup/washer (pelat penghubung)	2/2	
5	Ruang pelampung (gas)	1	
6	Gasket	1	
7	Pelampung	1	
8	Pen pelampung	1	
9	Lengan diafragma	1	
10	Katup jarum	1	
11	Jet pilot (# 68)	1	
12	O-ring	1	
13	Sekrup/washer (pelat penghubung)	4/4	
14	Pelat penghubung	1	
15	Ruang pelampung (minyak tanah)	1	
16	Pelampung	1	
17	Gasket	1	
18	Jet utama (# 102)	1	
19	Nosel utama	1	
20	Pen pelampung	1	
21	Lengan diafragma	1	
22	Katup jarum	1	
23	Dudukan katup (# 12)	1	
24	Washer	1	
25	Jet pilot (# 46)	1	
26	Sekrup pilot (dengan pegas)	1	
27	Sekrup (starter lever)	1	
28	Spacer	1	
29	Starter lever (tuas starter)	1	
30	Kap plunyer	1	
31	Baut (plunyer starter)	1	
32	Pelat tuas starter	1	
33	Pegas plunyer starter	1	
34	Plunyer starter	1	
			Untuk memasang kembali, balik langkah-langkah pembongkaran.



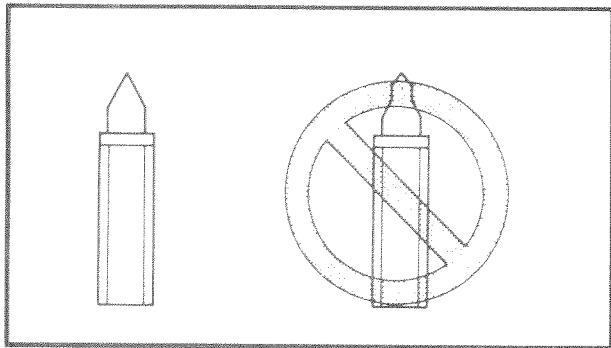
SERVICE POINTS

NOTE:

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

Inspecting the carburetor

1. Inspect:
 - Carburetor body
Cracks/damage → Replace.
Contamination → Clean.
2. Inspect:
 - Pilot screw
Bends/wear → Replace.
3. Inspect:
 - Main jet
 - Pilot jet
 - Main nozzle
Contamination → Replace.
4. Inspect:
 - Needle valve
Wear → Replace.
5. Inspect:
 - Float
Cracks/damage → Replace.
6. Inspect:
 - Valve seat
Cracks/distortion → Replace.



Inspecting the fuel pump

1. Inspect:
 - Diaphragm bodies
Cracks/damage/leaks → Replace.
2. Inspect:
 - Diaphragms
Damage → Replace.
3. Inspect:
 - Check valves
Damage → Replace.



TITIK-TITIK PERAWATAN

CATATAN :

Jangan menggunakan kawat baja untuk membersihkan jet karena hal itu bisa memperbesar diameter jet dan sangat mempengaruhi unjuk kerja.

Memeriksa karburator

1. Periksa :

- Badan karburator
Retak/rusak → Ganti.
Kotor → Bersihkan.

2. Periksa :

- Sekrup pilot
Bengkok/aus → Ganti.

3. Periksa :

- Jet utama
- Jet pilot
- Nosel utama
Kotor → Ganti.

4. Periksa :

- Katup jarum
Aus → Ganti.

5. Periksa :

- Pelampung
Retak/rusak → Ganti.

6. Periksa :

- Dudukan katup
Retak/distorsi → Ganti.

Memeriksa pompa bahan bakar

1. Periksa :

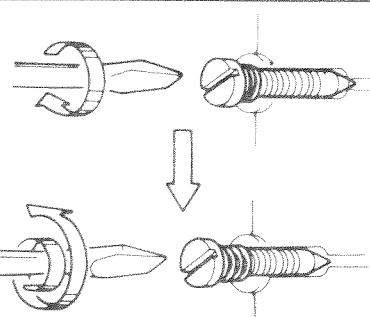
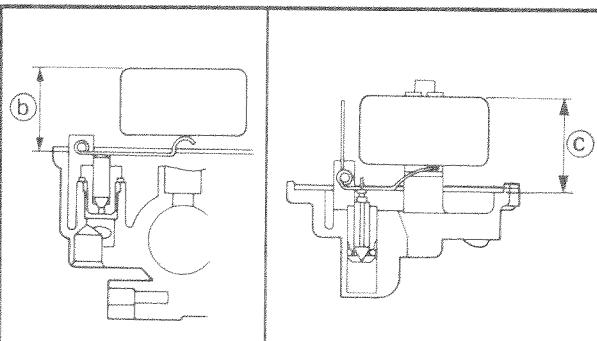
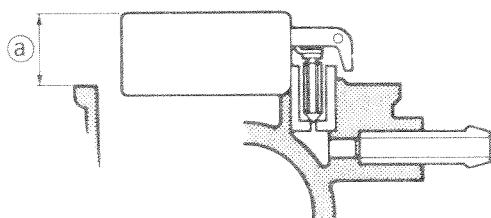
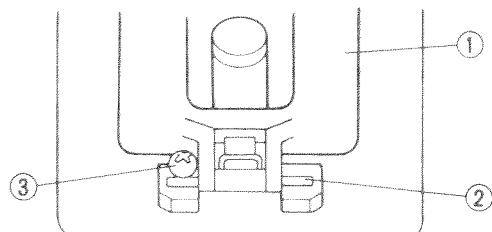
- Badan diafragma
Retak/rusak/bocor → Ganti.

2. Periksa :

- Diafragma
Rusak → Ganti.

3. Periksa :

- Katup periksa
Rusak → Ganti.



Assembling the carburetor

1. Install:

- Needle valve
- Float ①
- Float pin ②
- Screw ③

NOTE: _____

- The float pin should fit in the slit in the carburetor and be locked with the screw.
- After installing, check that the float operates smoothly.

2. Measure:

- Float height

Out of specification →

Adjust or replace.



Float height (E9.9C/E15C) ④:

$14.0 \pm 1.5 \text{ mm} (0.55 \pm 0.06 \text{ in})$

Float height (E15NK):

Kerosene ⑤:

$24.0 \pm 0.5 \text{ mm} (0.98 \pm 0.02 \text{ in})$

Gasoline ⑥:

$22.5 \pm 0.5 \text{ mm} (0.89 \pm 0.02 \text{ in})$

NOTE: _____

- The float should rest on the needle valve, but should not compress it.
- Measure the float height at the end which is opposite the side that pivots.

3. Adjust:

- Pilot screw

Adjustment steps:

- Turn the pilot screw until it is lightly seated.
- Turn the pilot screw out by the specified number of turns.



Pilot screw:

E9.9C/E15C:

$1\frac{1}{2} \pm \frac{1}{4} \text{ turns out}$

E15NK:

$\frac{3}{4} \pm \frac{1}{4} \text{ turns out}$



Memasang karburator

1. Pasang :

- Katup jarum
- Pelampung ①
- Pen pelampung ②
- Sekrup ③

CATATAN : _____

- Pen pelampung harus pas pada celah di dalam karburator dan dikunci dengan sekrup.
- Setelah memasang, pastikan bahwa pelampung beroperasi dengan mulus.

2. Ukur :

- Ketinggian pelampung

Jika tidak sesuai dengan spesifikasi →
Setel atau ganti.



Ketinggian pelampung (E9.9C/ E15C) ④

$14.0 \pm 1.5 \text{ mm (} 0.55 \pm 0.06 \text{ in)}$

Ketinggian pelampung (E15NK)

Minyak tanah ⑤:

$24.0 \pm 0.5 \text{ mm (} 0.98 \pm 0.02 \text{ in)}$

Bensin ⑥:

$22.5 \pm 0.5 \text{ mm (} 0.89 \pm 0.02 \text{ in)}$

CATATAN : _____

- Pelampung harus bertumpu pada katup jarum, tetapi tidak boleh menekannya.
- Ukur ketinggian pelampung pada ujung yang berseberangan dengan sisi yang berputar.

3. Setel :

- Sekrup pilot

Langkah-langkah penyetelan :

- Putar sekrup pilot sampai agak rapat.
- Putar sekrup pilot keluar sesuai dengan jumlah putaran yang ditentukan.



E9.9C/E15C :

$1\frac{1}{2} \pm \frac{1}{4} \text{ mm putaran keluar}$

E15NK :

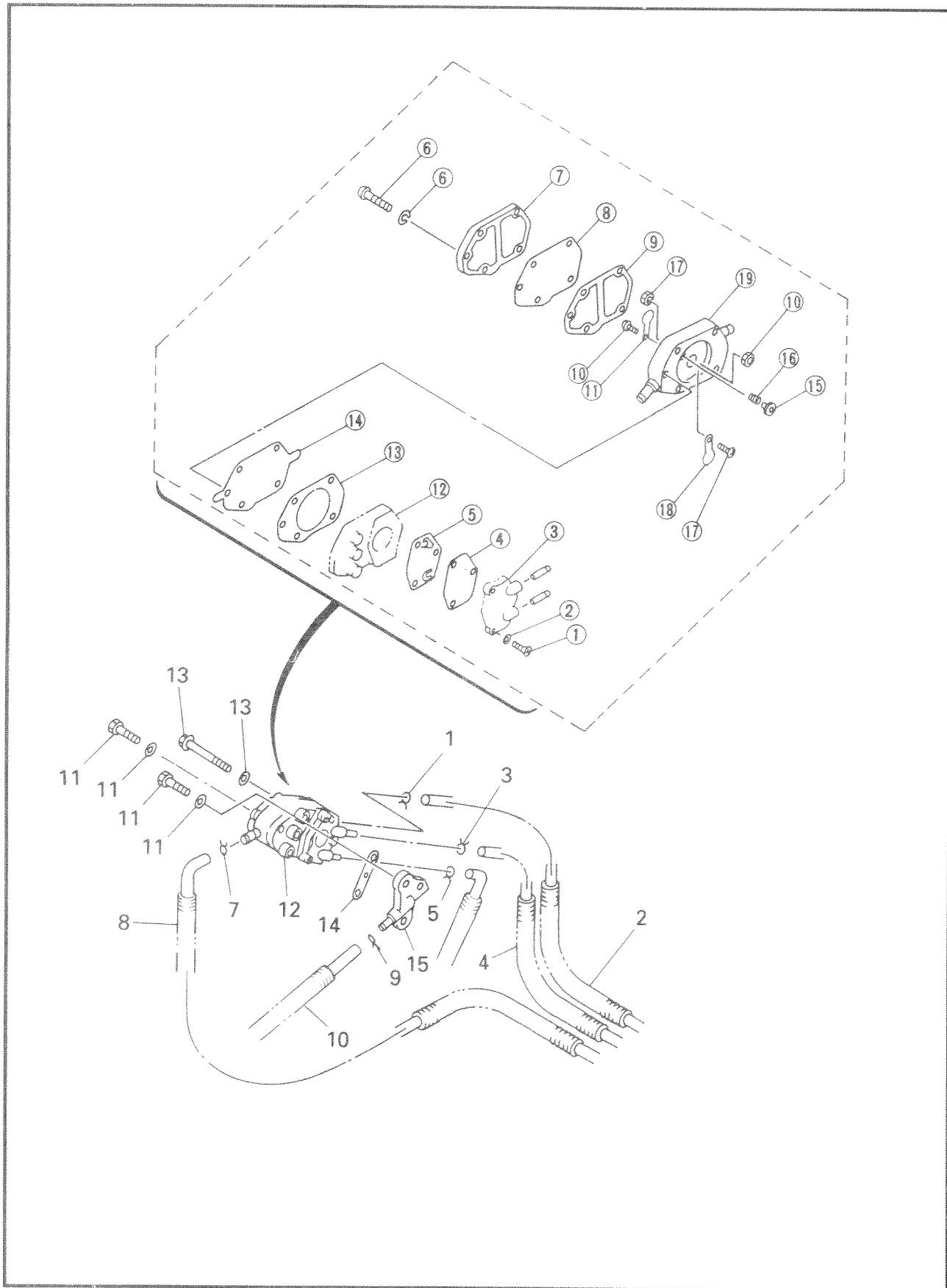
$\frac{3}{4} \pm \frac{1}{4} \text{ mm putaran keluar}$



FUEL PUMP

E

FUEL PUMP EXPLODED DIAGRAM (E15NK)



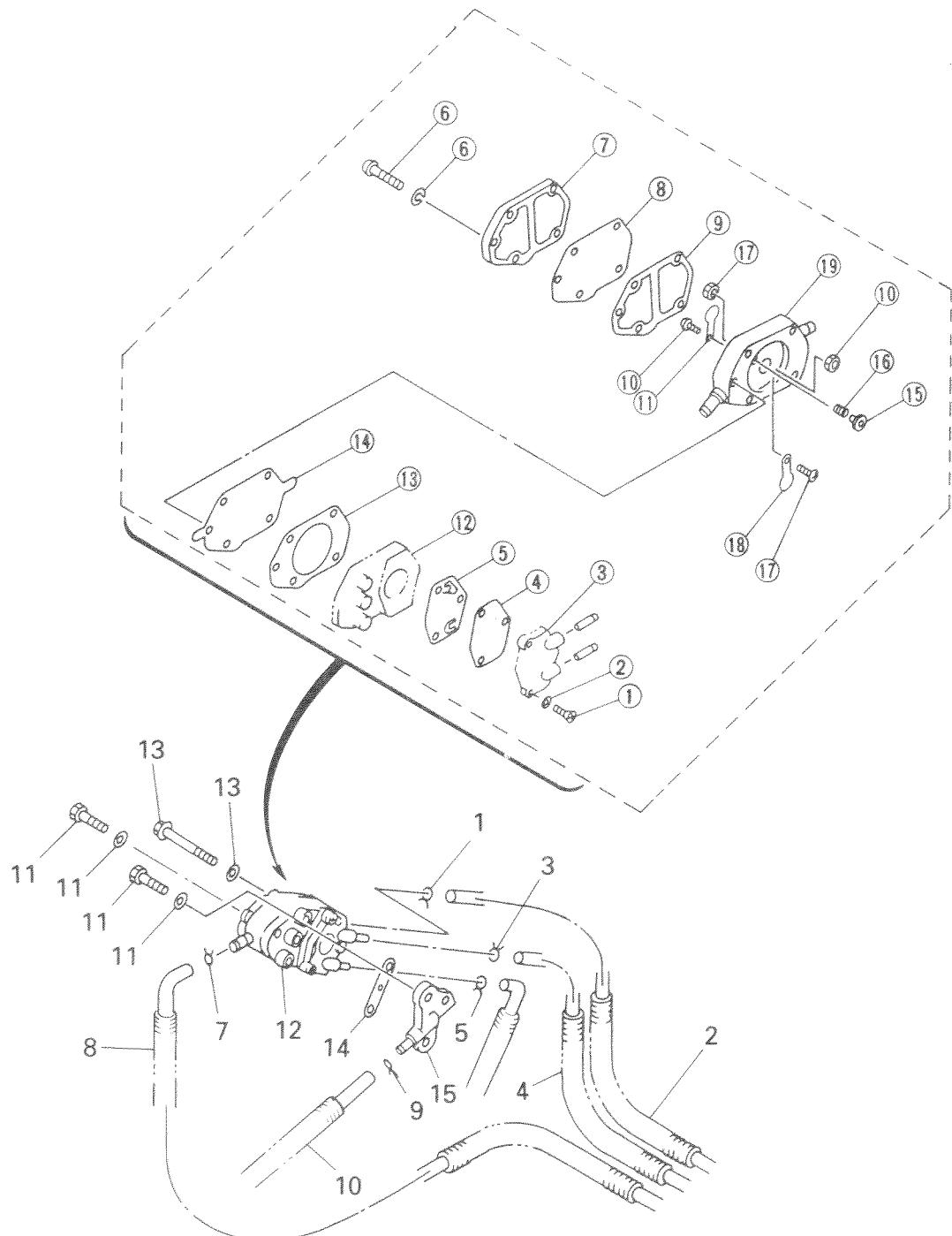
FUEL



POMPA BAHAN BAKAR

IN

**POMPA BAHAN BAKAR
DIAGRAM BAGIAN-BAGIAN SECARA LEPAS (E15NK)**



FUEL**FUEL PUMP**

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the fuel pump		Remove the parts in the order below.
1	Clip	1	
2	Kerosene hose (fuel pump to carburetor)	1	
3	Clip	1	
4	Gasoline hose (fuel pump to carburetor)	1	
5	Clip	1	
6	Gasoline hose (fuel pump to fuel filter)	1	
7	Clip	1	
8	Kerosene hose (fuel pump to fuel filter)	1	
9	Clip	1	
10	Pulser hose	1	
11	Bolts/washers (fuel pump bracket)	2/2	
12	Fuel pump (with the fuel pump bracket)	1	
13	Bolt/washer	1	
14	Gasket (fuel pump bracket)	1	
15	Fuel pump bracket	1	
	Disassembling the fuel pump		
①	Screws	3	
②	Star washers	3	
③	Diaphragm cover	1	
④	Diaphragm	1	
⑤	Diaphragm gasket	1	
⑥	Screws/washers	3/3	
⑦	Diaphragm body	1	
⑧	Diaphragm	1	
⑨	Diaphragm gasket	1	
⑩	Screw/nut (check valve)	1/1	
⑪	Check valve	1	
⑫	Diaphragm body	1	
⑬	Diaphragm gasket	1	
⑭	Diaphragm	1	
⑮	Spring seat	1	
⑯	Spring	1	
⑰	Screw/nut (check valve)	1	
⑱	Check valve	1	
⑲	Fuel pump body	1	
			For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan pompa bahan bakar		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Klip	1	
2	Selang minyak tanah (pompa bahan bakar ke karburator)	1	
3	Klip	1	
4	Selang bensin (pompa bahan bakar ke karburator)	1	
5	Klip	1	
6	Selang bensin (pompa bahan bakar ke filter bahan bakar)	1	
7	Klip	1	
8	Selang minyak tanah (pompa bahan bakar ke filter bahan bakar)	1	
9	Klip	1	
10	Selang pulser	1	
11	Baut/washer (bracket pompa bahan bakar)	2/2	
12	Pompa bahan bakar (dengan bracket pompa bahan bakar)	1	
13	Baut/washer	1	
14	Gasket (bracket pompa bahan bakar)	1	
15	Bracket pompa bahan bakar	1	
	Membongkar pompa bahan bakar		
①	Sekrup	3	
②	Star washer	3	
③	Penutup diafragma	1	
④	Diafragma	1	
⑤	Gasket diafragma	1	
⑥	Sekrup/washer	3/3	
⑦	Badan diafragma	1	
⑧	Diafragma	1	
⑨	Gasket diafragma	1	
⑩	Sekrup/mur (katup periksa)	1/1	
⑪	Katup periksa	1	
⑫	Badan diafragma	1	
⑬	Gasket diafragma	1	
⑭	Diafragma	1	
⑮	Dudukan pegas	1	
⑯	Pegas	1	
⑰	Sekrup/mur (katup periksa)	1	
⑱	Katup periksa	1	
⑲	Badan pompa bahan bakar	1	
			Untuk memasang kembali, balik langkah-langkah pelepasan.



CHAPTER 5 POWER UNIT

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BAB 5

UNIT DAYA

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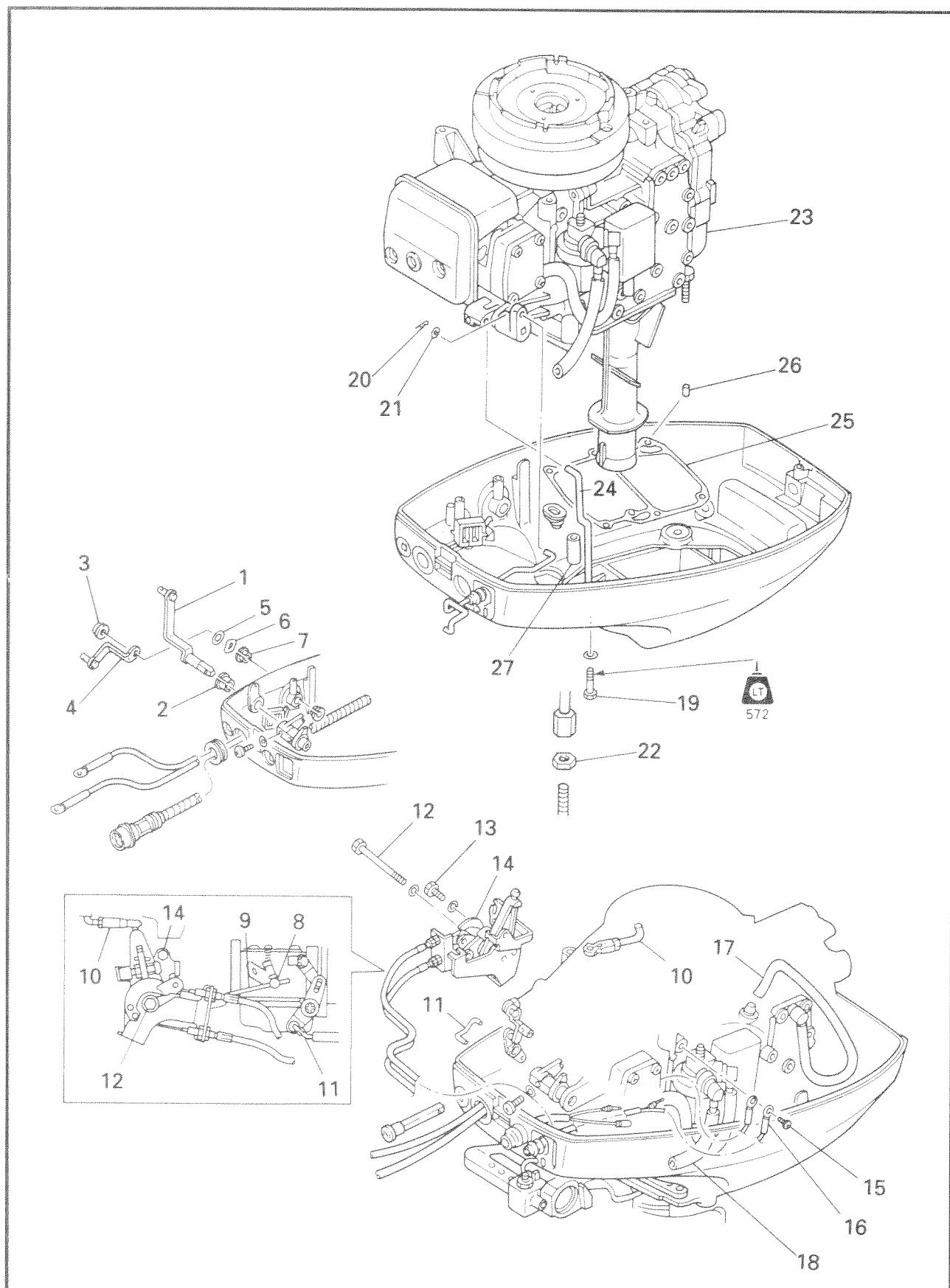
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POWER UNIT

E

POWER UNIT EXPLODED DIAGRAM (E9.9C/E15C)

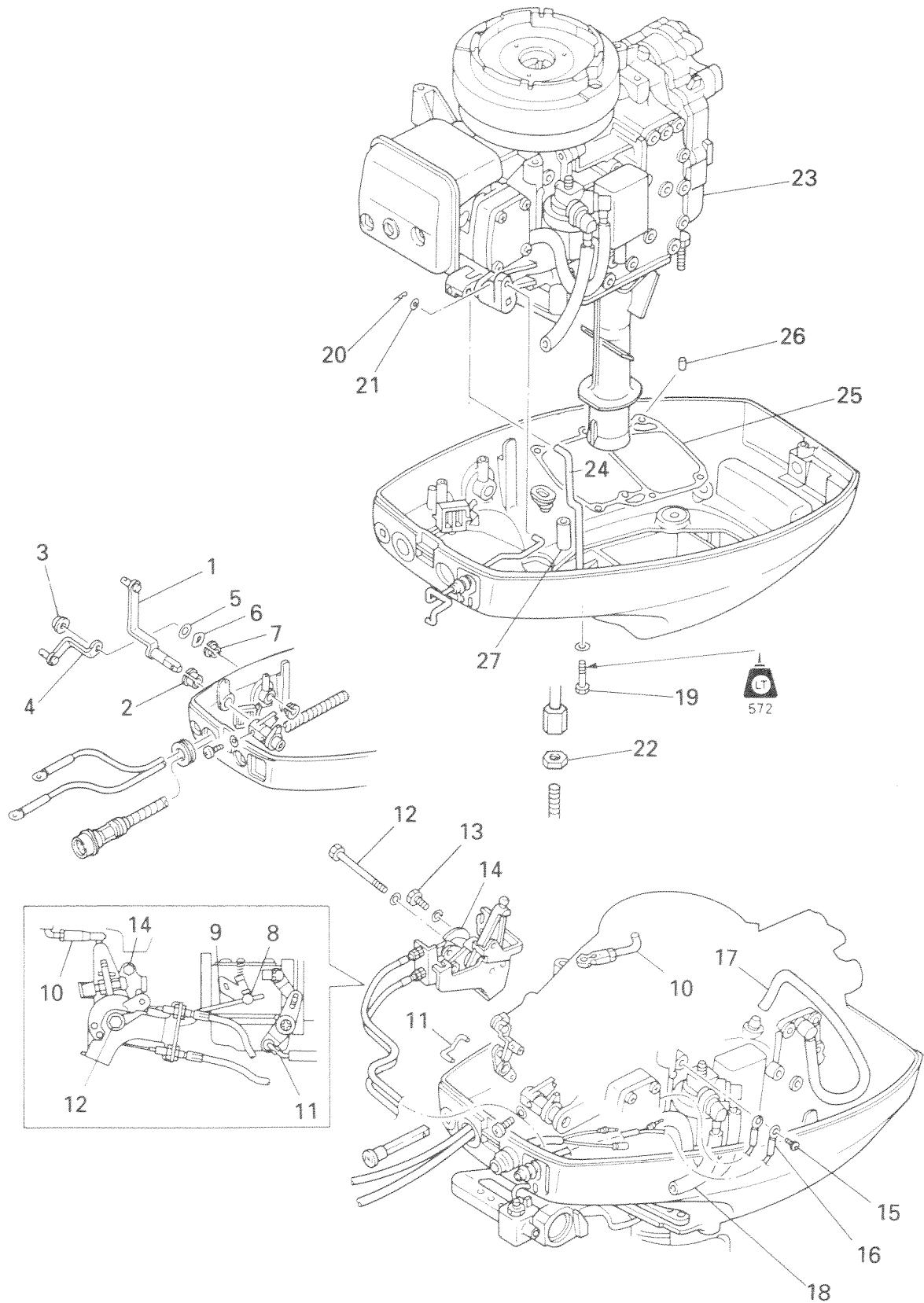


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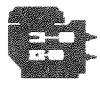


UNIT DAYA

IN

UNIT DAYA**DIAGRAM BAGIAN-BAGIAN SECARA TERURAI (E9.9C/E15C)**

POWR



POWER UNIT

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the power unit		Remove the parts in the order below.
1	Shift lever link	1	
2	Bushing	1	
3	Nut	1	
4	Throttle lever link	1	
5	Plain washer	1	
6	Wave washer	1	
7	Bushings	2	
8	Screw	1	
9	Acceleration rod	1	
10	Link joint	1	
11	Choke knob rod	1	
12	Bolt/washer	1/1	
13	Bolt/washer	1/1	
14	Control pulley bracket assembly	1	
15	Bolt/washer	1/1	
16	Engine stop switch leads	2	Except for remote model
17	Pilot water hose	1	
18	Fuel hose	1	
19	Bolts/washers	6/6	8 × 30 mm
20	Clip	1	
21	Plain washer	1	
22	Nut (shift rod joint)	1	
23	Engine unit	1	
24	Shift lever rod	1	
25	Gasket (upper case)	1	
26	Dowel pins	2	
27	Collar	1	For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan unit daya		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Shift lever link	1	
2	Bushing	1	
3	Mur	1	
4	Throttle lever link	1	
5	Plain washer	1	
6	Wave washer	1	
7	Bushing	2	
8	Sekrup	1	
9	Batang akselerasi	1	
10	Sambungan penghubung	1	
11	Choke knob rod	1	
12	Baut / washer	1/1	
13	Baut / washer	1/1	
14	Montase bracket puli pengatur	1	
15	Baut / washer	1/1	
16	Timbel sakelar penghenti mesin	2	Kecuali untuk model remote
17	Selang air pilot	1	
18	Selang bahan bakar	1	
19	Baut / washer	6/6	8 x 30 mm
20	Klip	1	
21	Plain washer	1	
22	Mur (shift rod joint)	1	
23	Unit mesin	1	
24	Shift lever rod	1	
25	Gasket (bak atas)	1	
26	Dowel pins	2	
27	Collar	1	
			Untuk memasang, balik langkah-langkah pelepasan.

POWR



POWER UNIT

E

EXPLODED DIAGRAM (E15NK)

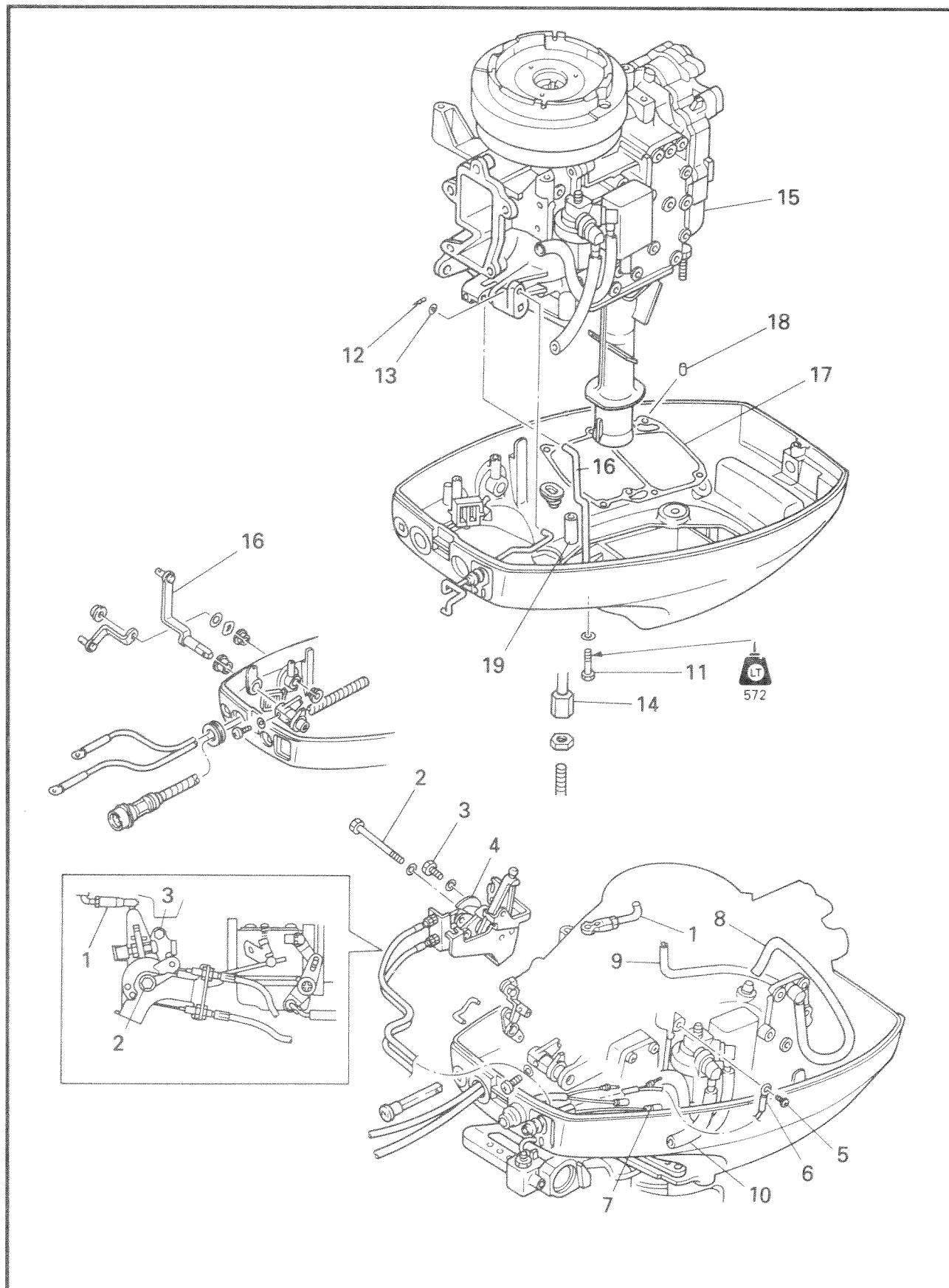
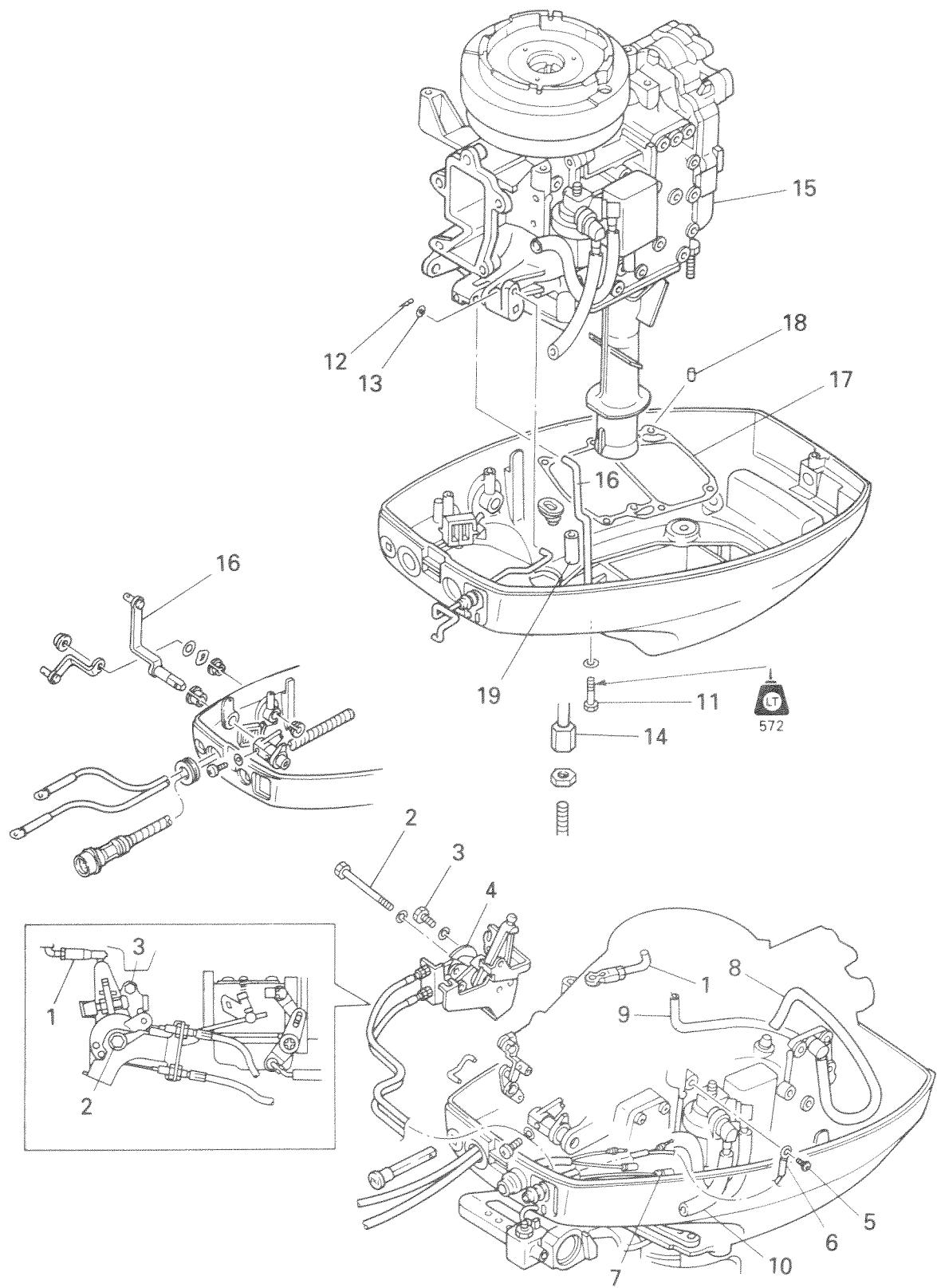




DIAGRAM BAGIAN-BAGIAN SECARA TERURAI (E15NK)



POWR



POWER UNIT

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the power unit		Remove the parts in the order below. Refer to "CARBURETOR REMOVAL" in chapter 4.
1	Carburetor		
1	Link joint	1	
2	Bolt	1	NOTE: _____ Do not remove the bolt from the control pulley bracket assembly.
3	Bolt/washer	1/1	
4	Control pulley bracket assembly	1	
5	Bolt/washer	1/1	
6	Ground lead	1	
7	Engine stop switch lead	1	Disconnect.
8	Breather hose	1	
9	Fuel hose (gasoline)	1	
10	Fuel hose (kerosene)	1	
11	Bolts/washers	6/6	
12	Clip	1	
13	Plain washer (plastic)	1	
14	Nut (shift rod joint)	1	NOTE: _____ Loosen the nut so the shift rods separate.
15	Engine unit	1	
16	Shift lever rod	1	
17	Gasket (upper case)	1	
18	Dowel pins	1	
19	Collars	2	
			For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

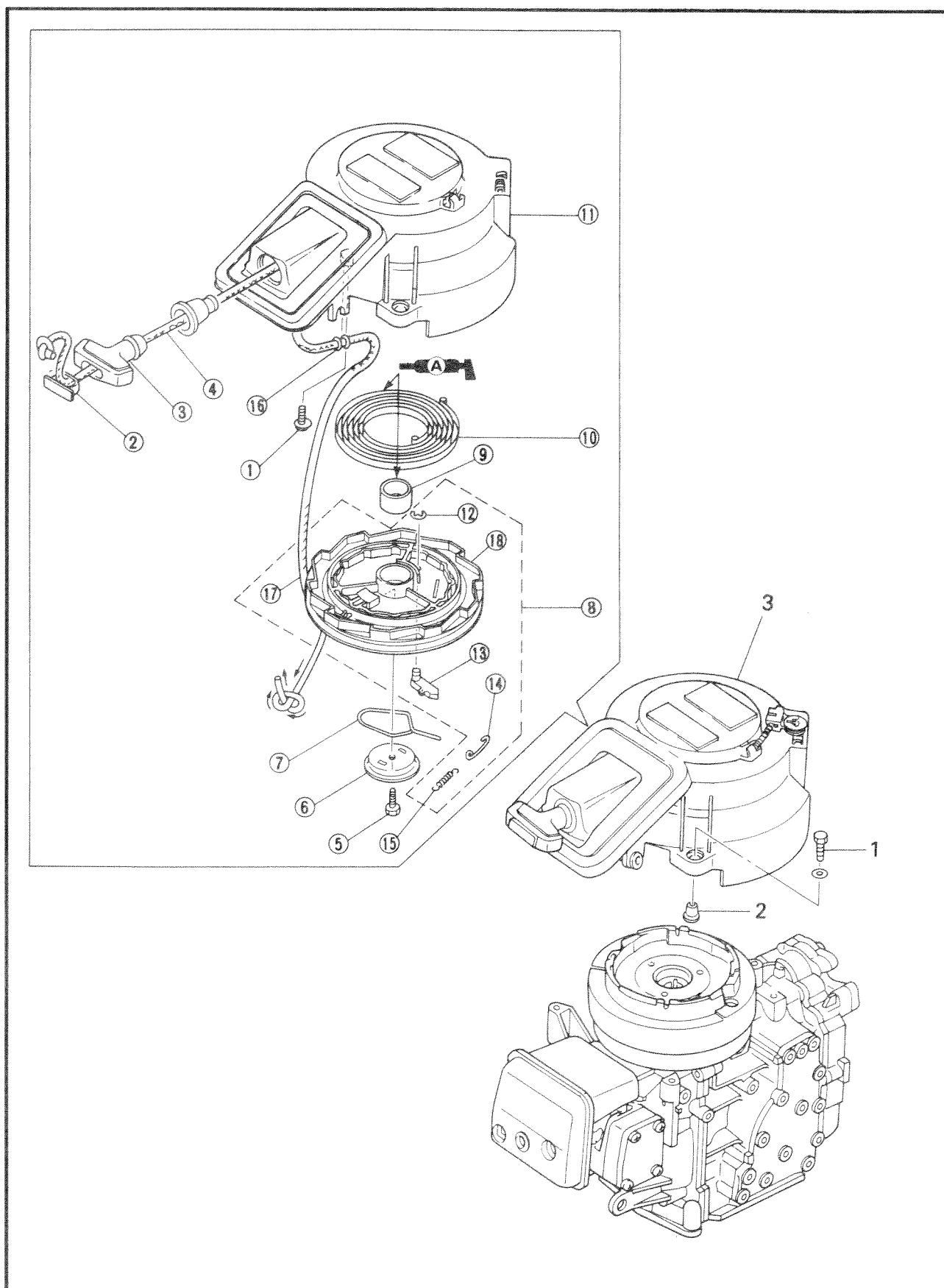
Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan unit daya		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini. Lihat "PELEPASAN KARBURATOR" pada bab 4.
1	Karburator		
2	Sambungan penghubung	1	
2	Baut	1	CATATAN : Jangan melepaskan baut dari montase bracket puli pengatur.
3	Baut / washer	1/1	
4	Montase bracket puli pengatur	1	
5	Baut / washer	1/1	
6	Timbel bumi	1	
7	Timbel sakelar penghenti mesin	1	Lepaskan hubungannya.
8	Selang breather	1	
9	Selang bahan bakar (bensin)	1	
10	Selang bahan bakar (minyak tanah)	1	
11	Baut / washer	6/6	
12	Klip	1	
13	Plain washer (plastik)	1	
14	Mur (shift rod joint)	1	CATATAN : Kendorkan mur sehingga shift rods terpisah.
15	Unit mesin	1	
16	Shift lever rod	1	
17	Gasket (bak atas)	1	
18	Dowel pins	1	
19	Collars	2	Untuk memasang kembali, balik langkah-langkah pelepasan.



RECOIL STARTER

E

RECOIL STARTER EXPLODED DIAGRAM

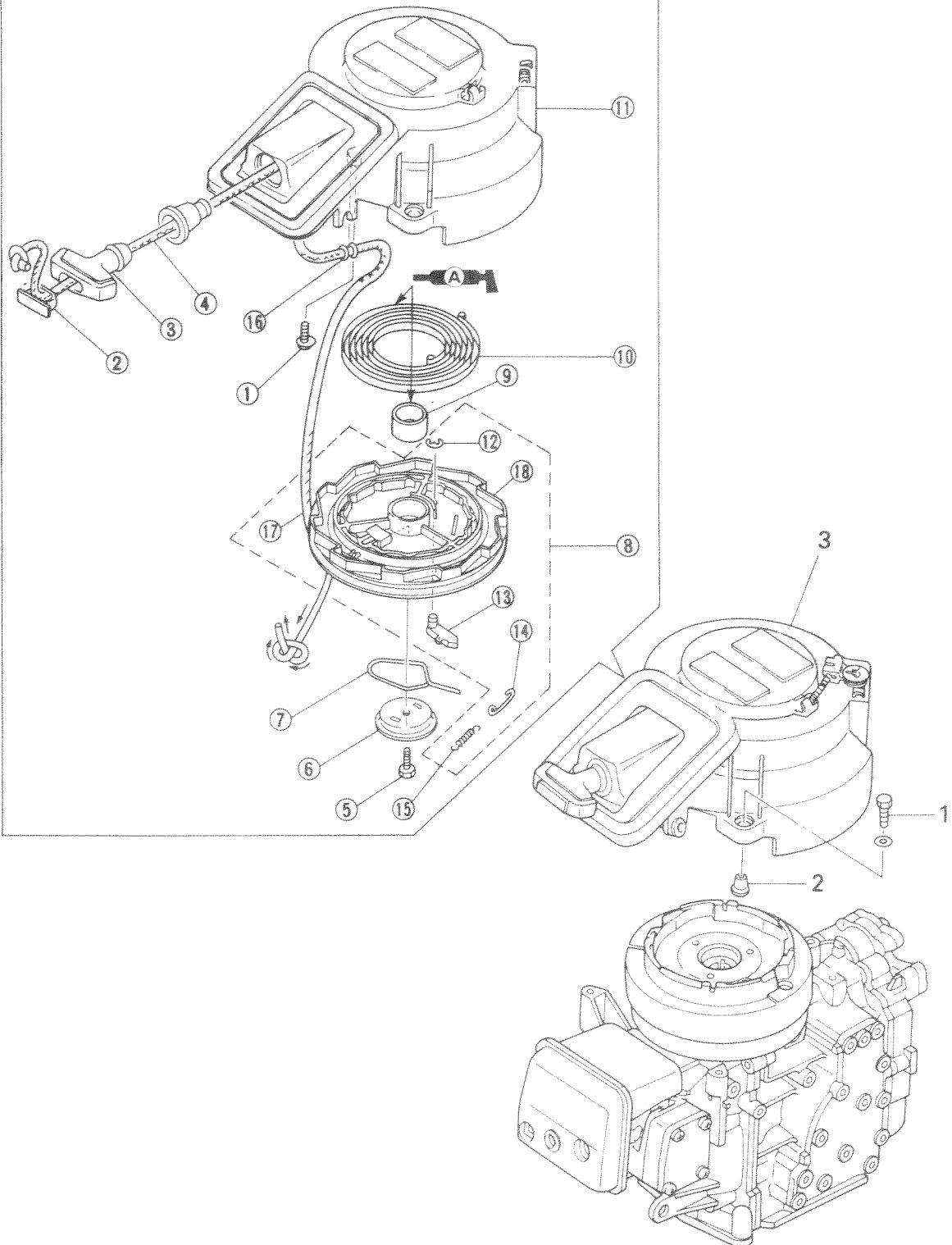




RECOIL STARTER

(IN)

RECOIL STARTER
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI





RECOIL STARTER

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
1	Removing the recoil starter		Remove the parts in the order below. 6 × 20 mm
2	Bolts/washers (recoil starter)	3/3	
3	Collars	3	
4	Recoil starter	1	
5	Disassembling the recoil starter		
①	Screw	1	
②	Cover	1	
③	Starter handle	1	
④	Starter rope	1	
⑤	Bolt/washer (drive plate)	1/1	
⑥	Drive plate	1	
⑦	Drive pawl spring	1	
⑧	Sheave drum assembly	1	NOTE: _____ ● Position the inner end of the spiral spring on the retainer post of the sheave drum. ● Use the starter rope to wind the spring 2-1/2 turns counterclockwise.
⑨	Bushing	1	
⑩	Spiral spring	1	
⑪	Starter case	1	
12	Disassembling the sheave drum		
13	Circlip	1	
14	Drive pawl	1	
15	Spring	1	
16	Return spring	1	
17	Rope guide	1	
18	Starter rope	1	NOTE: _____ Wind the rope two turns around the sheave drum.
19	Sheave drum	1	For installation, reverse the removal procedures.

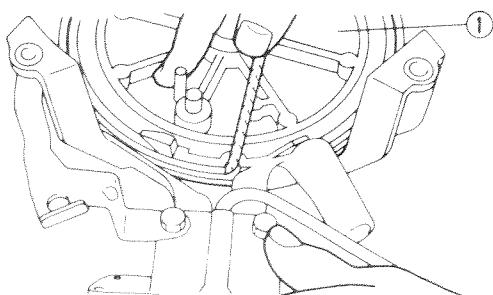


BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan recoil starter		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini. 6 x 20 mm
1	Baut / washer (recoil starter)	3/3	
2	Collars	3	
3	Recoil starter	1	
	Membongkar recoil starter		
①	Sekrup	1	
②	Penutup	1	
③	Gagang starter	1	
④	Tali starter	1	
⑤	Baut / washer (pelat penggerak)	1/1	
⑥	Pelat penggerak	1	
⑦	Drive pawl spring	1	
⑧	Montase sheave drum	1	
			CATATAN :
			● Taruh ujung bagian dalam pegas spiral pada retainer post (tiang penahan) sheave drum.
			● Gunakan tali starter untuk melilit pegas 2-1/2 putaran berlawanan arah jarum jam.
⑨	Bushing	1	
⑩	Pegas spiral	1	
⑪	Bak starter	1	
	Membongkar sheave drum		
⑫	Circlip	1	
⑬	Drive pawl	1	
⑭	Pegas	1	
⑮	Return spring	1	
⑯	Rope guide	1	
⑰	Tali starter	1	
			CATATAN :
			Lilit tali dua putaran di sekeliling sheave drum.
⑱	Sheave drum	1	Untuk memasang kembali, balik langkah-langkah pelepasan.

POWR**RECOIL STARTER**

E



SERVICE POINTS

Removing the sheave drum

1. Turn:

- Sheave drum ①

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

NOTE: _____

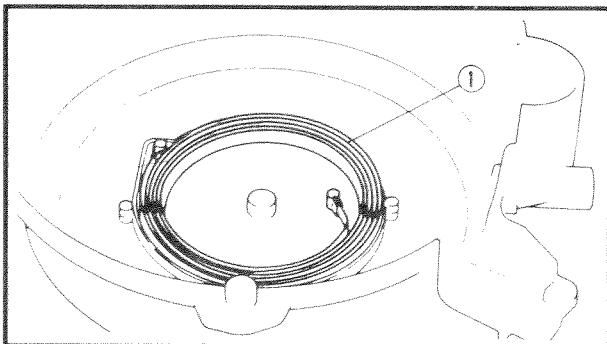
- Turn the sheave drum so that the cutaway on the outer surface of the sheave drum faces toward the starter handle.
- Pass the starter rope through the cut-away.

2. Remove:

- Sheave drum

⚠ WARNING

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



Removing the spiral spring

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.

Inspecting the drive pawl and spring

1. Inspect:

- Drive pawl
Cracks/damage/wear → Replace.
- Drive pawl spring
Bends/damage → Replace.

**TITIK-TITIK PERAWATAN****Melepaskan sheave drum**

1. Putar :

- Sheave drum ①
- Putar sheave drum searah jarum jam sampai pegas spiral bebas.

CATATAN :

- Putar sheave drum sehingga potongan pada permukaan luar sheave drum menghadap ke arah gagang starter.
- Masukkan tali starter melalui potongan tersebut.

2. Lepaskan :

- Sheave drum

PERINGATAN

Sewaktu melepaskan sheave drum, jangan lupa meletakkan sheave drum terbalik untuk mencegah jangan sampai pegas spiral terlontar ke atas.

Melepaskan pegas spiral

1. Lepaskan :

- Pegas spiral ①

PERINGATAN

Hati-hati jangan sampai pegas spiral terlontar ke atas sewaktu melepaskannya. Lepaskan pegas spiral dengan membuka lilitannya satu putaran demi satu putaran.

Memeriksa drive pawl dan pegas

1. Periksa :

- Drive pawl
Jika retak/rusak/aus → Ganti.
- Drive pawl spring (pegas drive pawl)
jika bengkok/rusak → Ganti.

POWR**RECOIL STARTER**

E

Inspecting the bushing

1. Inspect:

- Bushing

Cracks/damage → Replace.

Inspecting the sheave drum

1. Inspect:

- Sheave drum

Cracks/damage → Replace.

Inspecting the spiral spring

1. Inspect:

- Spiral spring

Bends/damage → Replace.

Inspecting the starter rope

1. Inspect:

- Starter rope

Fray/damage/wear → Replace.

NOTE:

When replacing the starter rope, cut it to the specified length and burn the end so that it will not fray.

**Starter rope length:
1,800 mm (70.9 in)****Checking the recoil starter**

1. Check:

- Starter operation

Abnormal noise/unsMOOTH → Repair.

POWR



RECOIL STARTER

(IN)

Memeriksa bushing

1. Periksa :
 - Bushing
Jika retak/rusak → Ganti.

Memeriksa sheave drum

1. Periksa :
 - Sheave drum
Jika retak/rusak → Ganti.

Memeriksa pegas spiral

1. Periksa :
 - Pegas spiral
Jika bengkok/rusak → Ganti.

Memeriksa tali starter

1. Periksa :
 - Tali starter
Jika terurai/rusak/aus → Ganti.

CATATAN :

Sewaktu mengganti tali starter, potong sesuai dengan panjang yang ditentukan dan bakar ujungnya supaya tidak terurai.



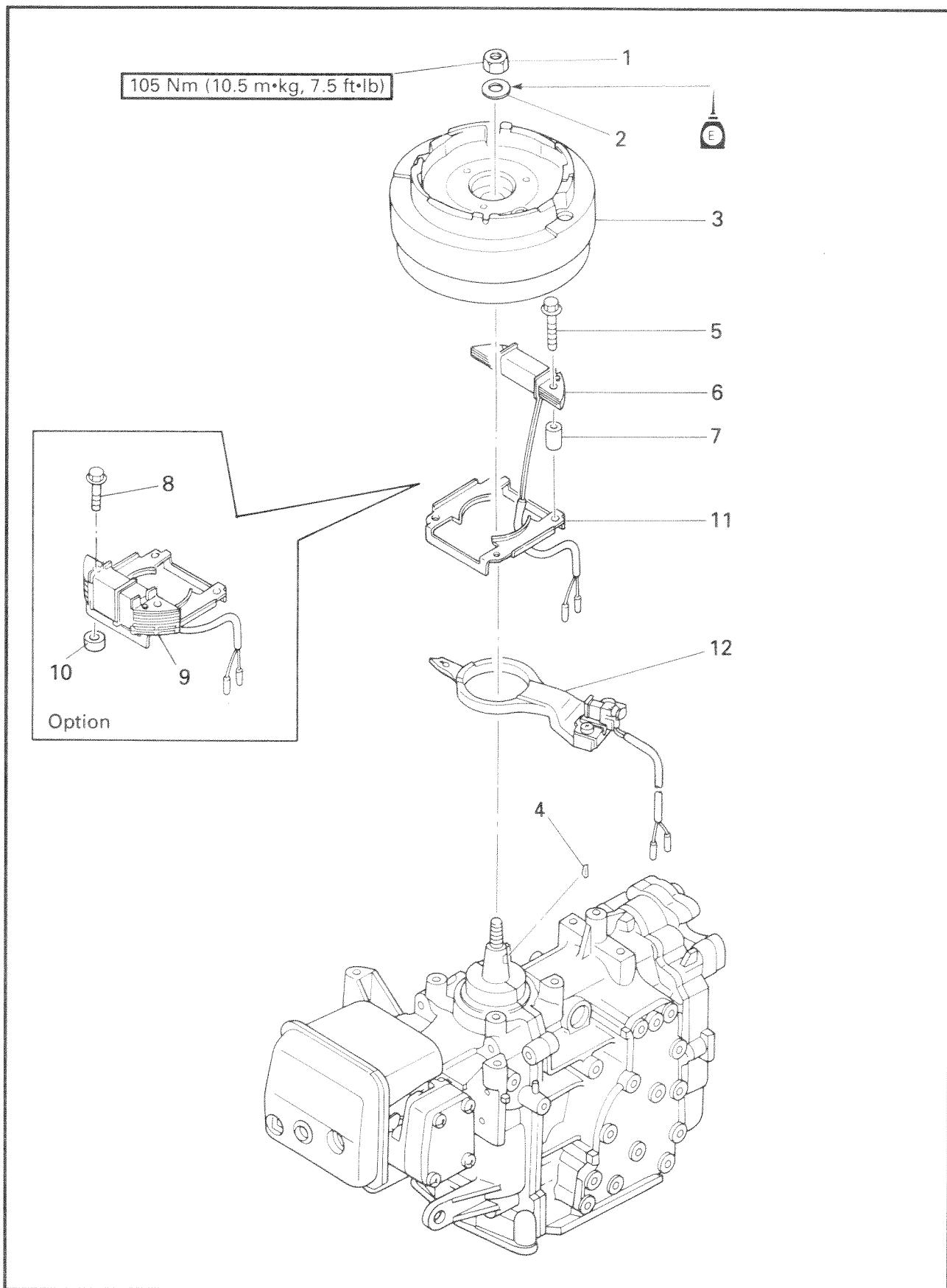
Panjang tali starter :
1.800 mm (70.9 in)

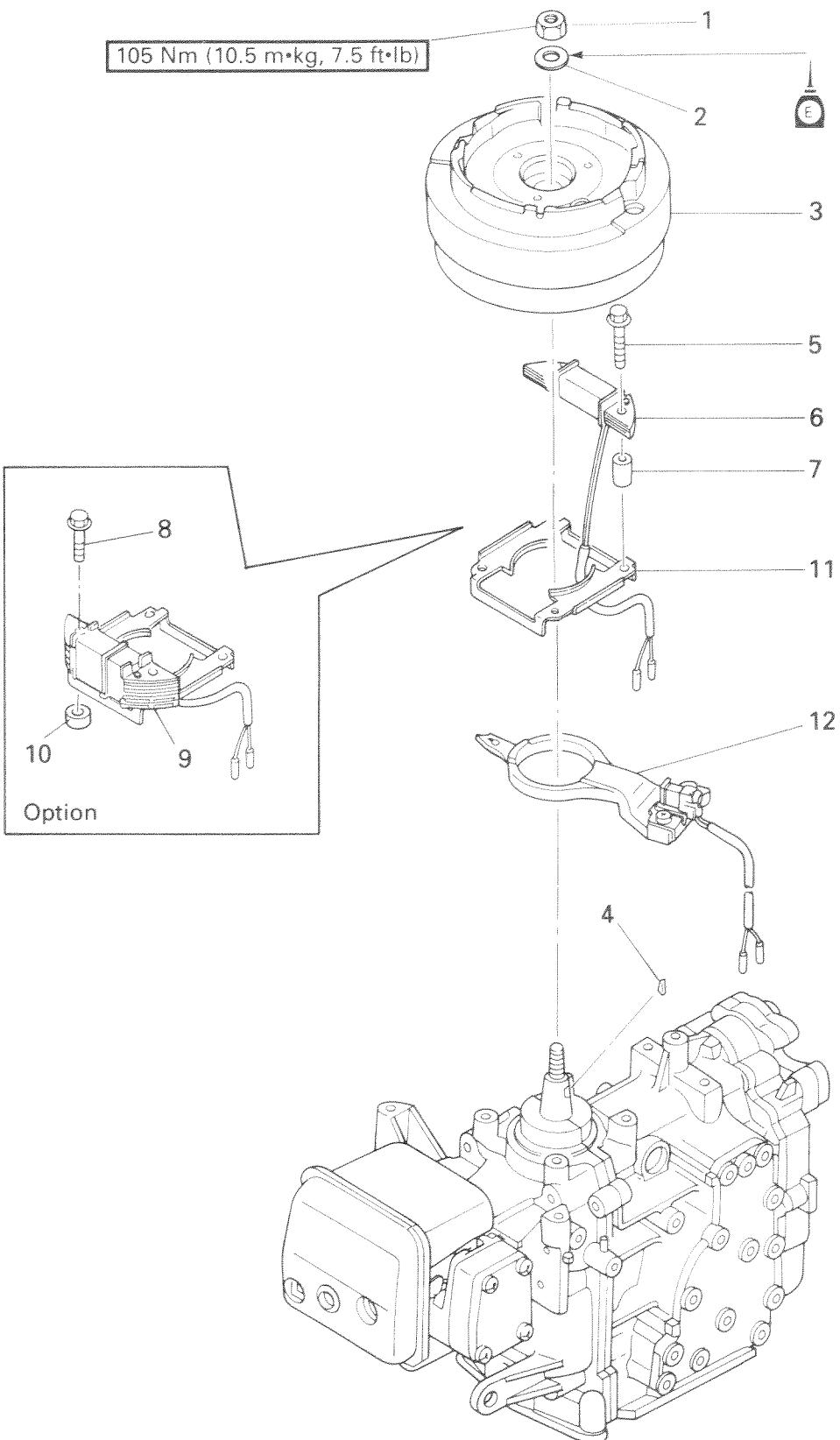
Memeriksa recoil starter

1. Periksa :
 - Operasi starter
Jika bunyinya abnormal/tidak mulus → Perbaiki.

POWR**FLYWHEEL MAGNETO AND MAGNETO BASE**

E

**FLYWHEEL MAGNETO AND MAGNETO BASE
EXPLODED DIAGRAM**

**MAGNIT RODA GAYA DAN DASAR MAGNIT
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI**

POWR

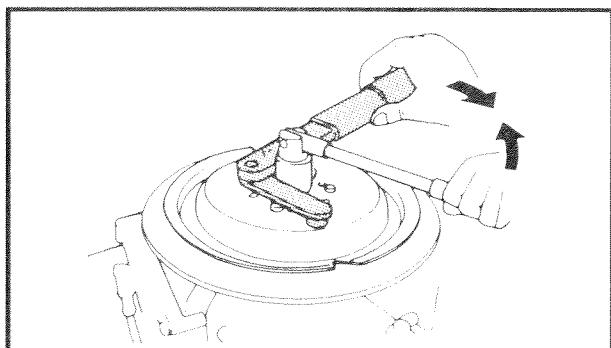


FLYWHEEL MAGNETO AND MAGNETO BASE

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the flywheel magneto and magneto base		Remove the parts in the order below.
1	Recoil starter		Refer to "RECOIL STARTER".
1	Nut	1	
2	Plain washer	1	
3	Flywheel	1	
4	Woodruff key	1	
5	Bolts/washers	2/2	
6	Charge coil	1	
7	Collars	2	
8	Bolts/washers	2/2	
9	Lighting coil	1	
10	Collars	2	
11	Magneto base plate	1	
12	Pulser coil assembly	1	
			For installation, reverse the removal procedures.



SERVICE POINTS

Removing the flywheel magneto

1. Remove:
 - Flywheel nut



Flywheel holder:
90890-06522

CAUTION:

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



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan magnit roda gaya dan dasar magnit		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini. Lihat "RECOIL STARTER"
1	Mur	1	
2	Plain washer	1	
3	Roda gaya	1	
4	Kunci woodruff	1	
5	Baut / washer	2/2	
6	Koil pengisian (charge coil)	1	
7	Collars	2	
8	Baut / washer	2/2	
9	Koil penerangan	1	
10	Collars	2	
11	Pelat dasar magnit	1	
12	Montase koil pulser	1	
			Untuk memasang, balik langkah-langkah pelepasan.

TITIK-TITIK PERAWATAN

Melepaskan magnit roda gaya

1. Lepaskan :

- Mur roda gaya



Penahan roda gaya :
90890-06522

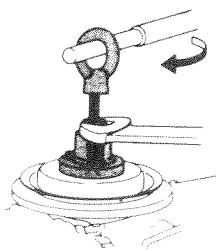
PERHATIAN:

Beban utama harus dibawa dalam arah tanda-tanda panah. Jika tidak, penahan bisa mudah selip.

POWR

FLYWHEEL MAGNETO AND MAGNETO BASE

E



2. Remove:

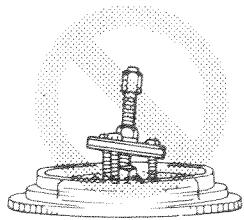
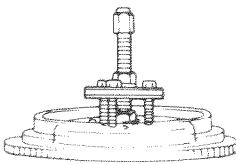
- Flywheel magneto



Flywheel puller:
90890-06521

CAUTION:

- Keep the nut side flush with the end of the crankshaft until the flywheel comes off of the tapered portion of the crank-shaft.
- 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 fly-wheel.





2. Lepaskan :

- Magnit roda gaya



Penarik roda gaya :
90890-06521

PERHATIAN:

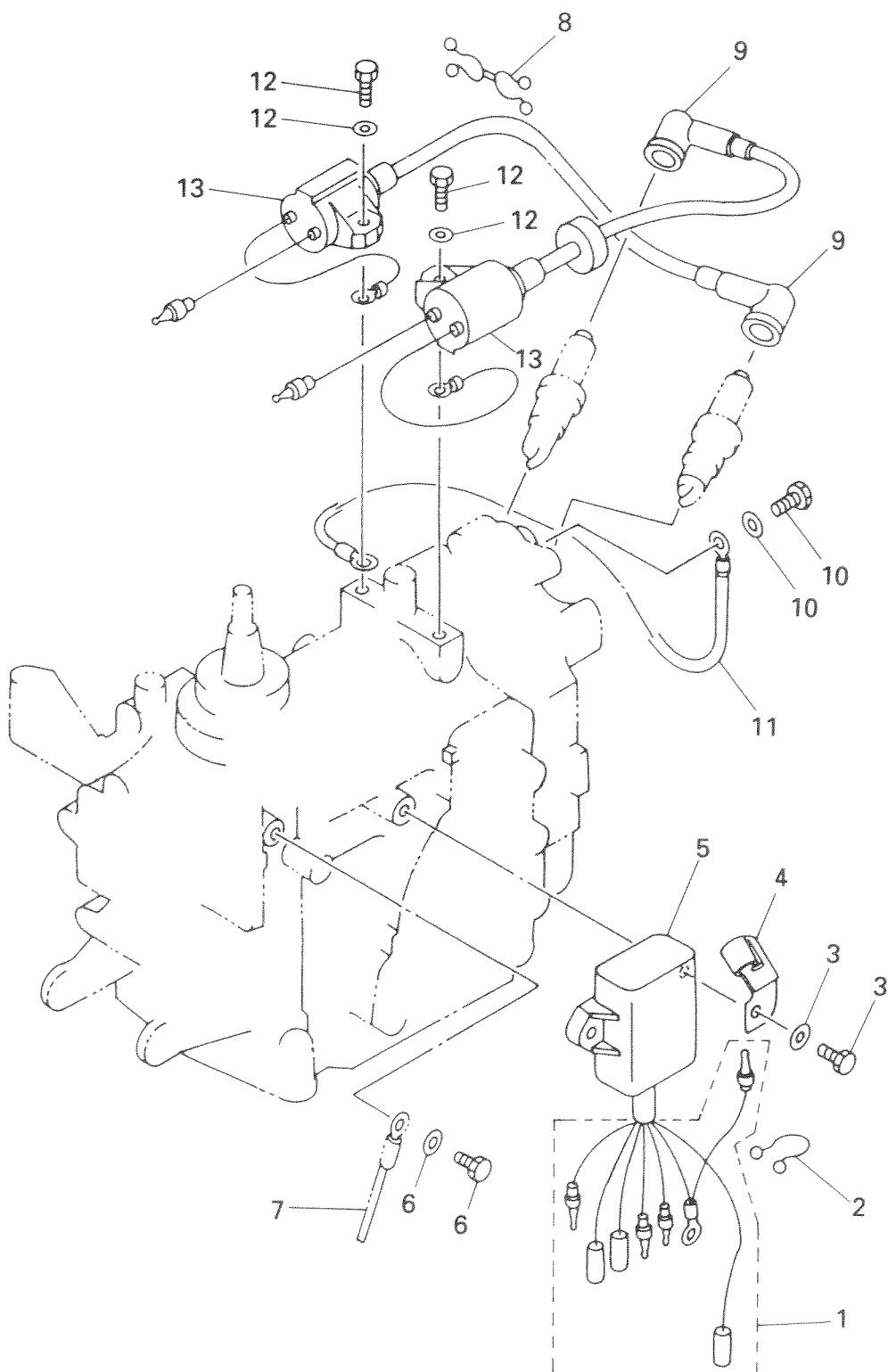
- Usahakan supaya sisi mur sama rata dengan ujung poros engkol sampai roda gaya lepas dari bagian tirus poros engkol.
- Untuk mencegah kerusakan pada mesin atau perkakas, putarlah baut-baut pengatur puller magnit roda gaya ke dalam dengan rata dan sempurna sehingga pelat puller sejajar dengan roda gaya.

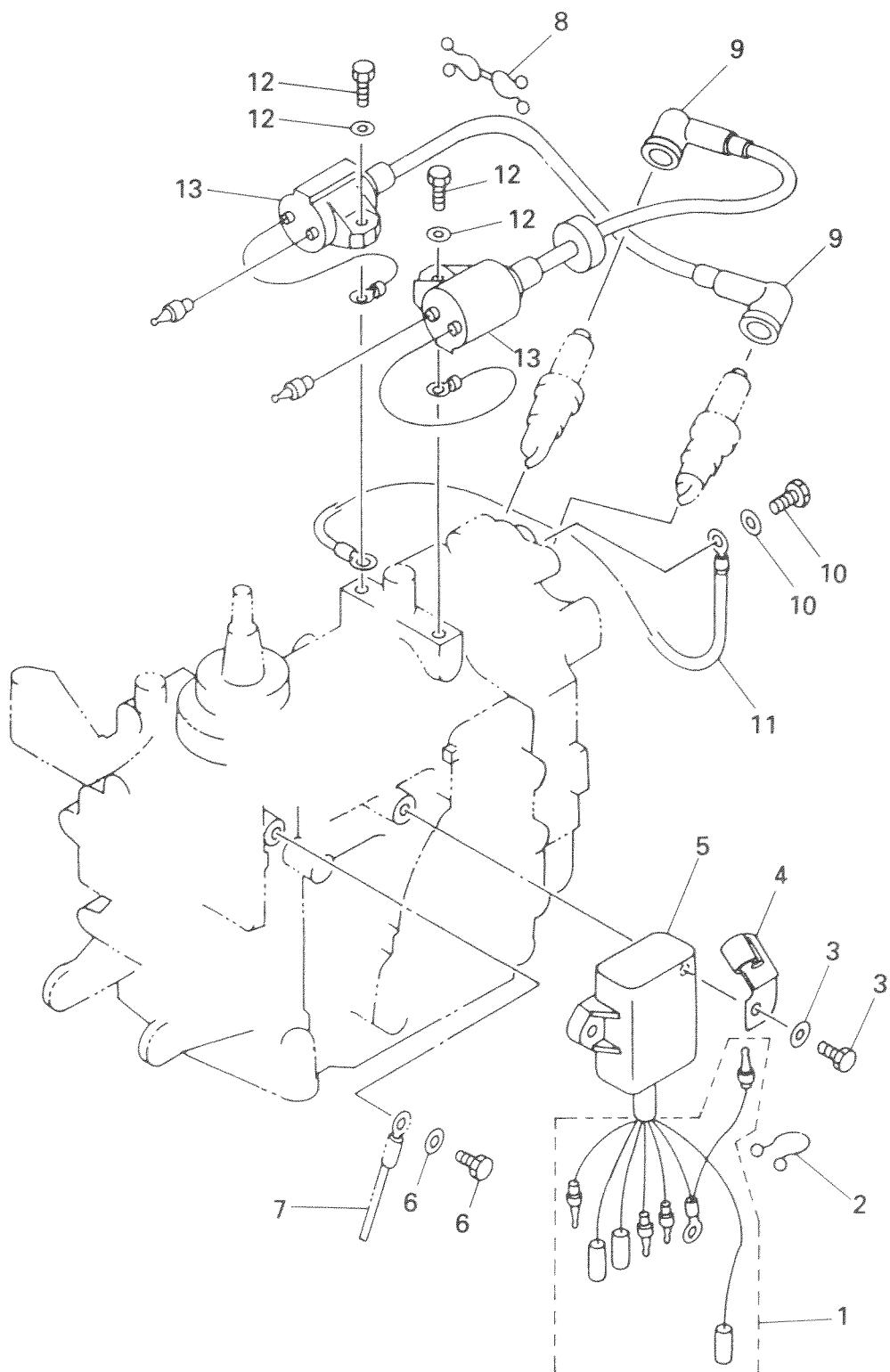


ELECTRICAL UNIT

(E)

ELECTRICAL UNIT EXPLODED DIAGRAM



**UNIT ELEKTRIK**
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI

POWR



ELECTRICAL UNIT

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the electrical unit		Remove the parts in the order below. Disconnect.
1	CDI leads	7	
2	Plastic clamp	1	
3	Bolts/washers (CDI unit)	2/2	
4	Metal bracket	1	
5	CDI unit	1	
6	Bolt/washer (ground lead)	1/1	
7	Ground lead	1	
8	Plastic clamp	1	
9	Spark plug leads	2	
10	Bolt/washer (ground lead)	1/1	
11	Ground lead	1	
12	Bolts/washers (ignition coils)	2/2	
13	Ignition coils	2	
			For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

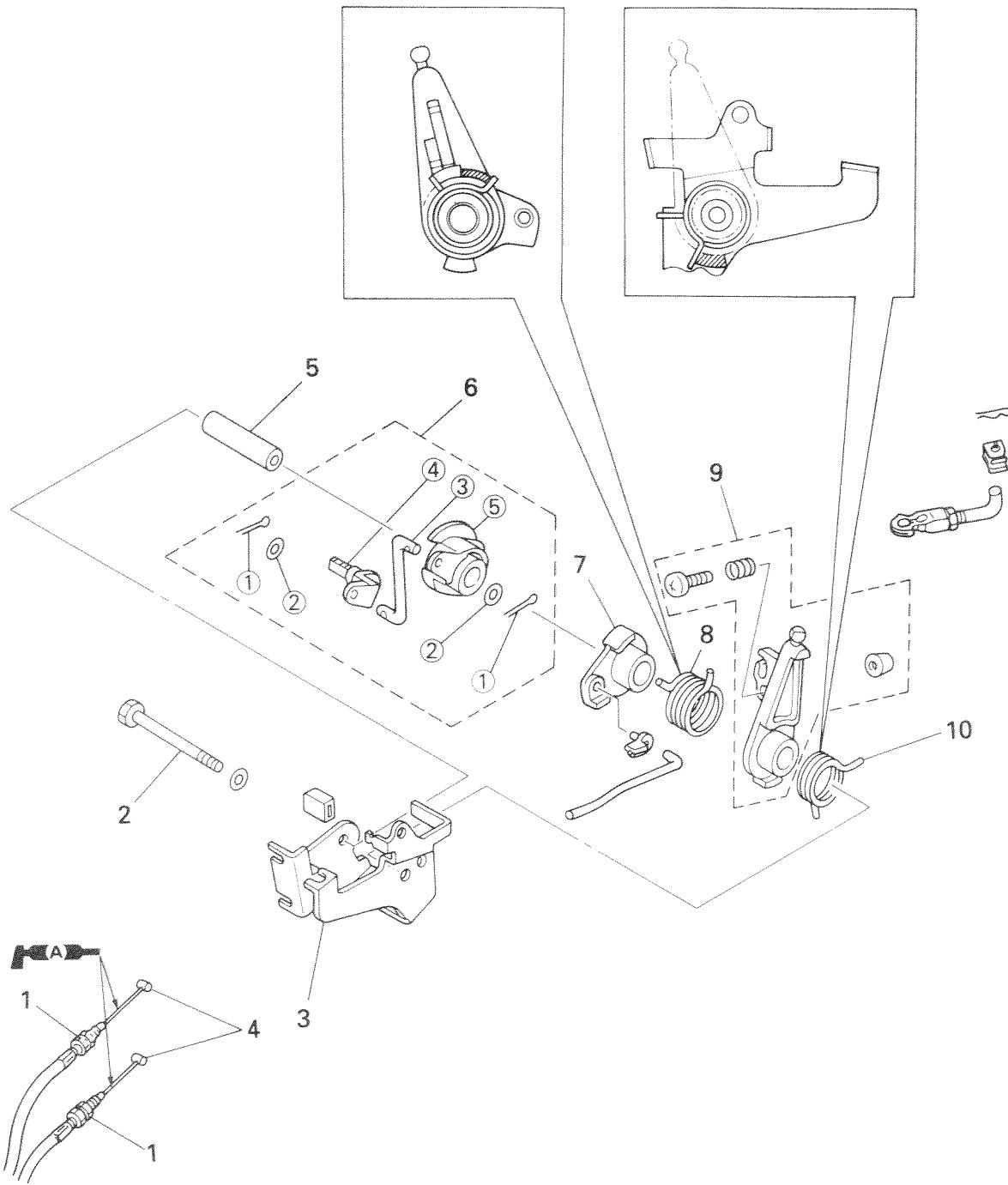
Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan unit elektrik		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Timbel CDI	7	
2	Klem plastik	1	
3	Baut / Washer (unit CDI)	2/2	
4	Bracket logam	1	
5	Unit CDI	1	
6	Baut / washer (timbel bumi)	1/1	
7	Timbel bumi	1	
8	Klem plastik	1	
9	Timbel busi	2	
10	Baut / washer (timbel bumi)	1/1	
11	Timbel bumi	1	
12	Baut / washer (koil penyalaan)	2/2	
13	Koil penyalaan	2	
			Untuk memasang, balik langkah-langkah pelepasan.

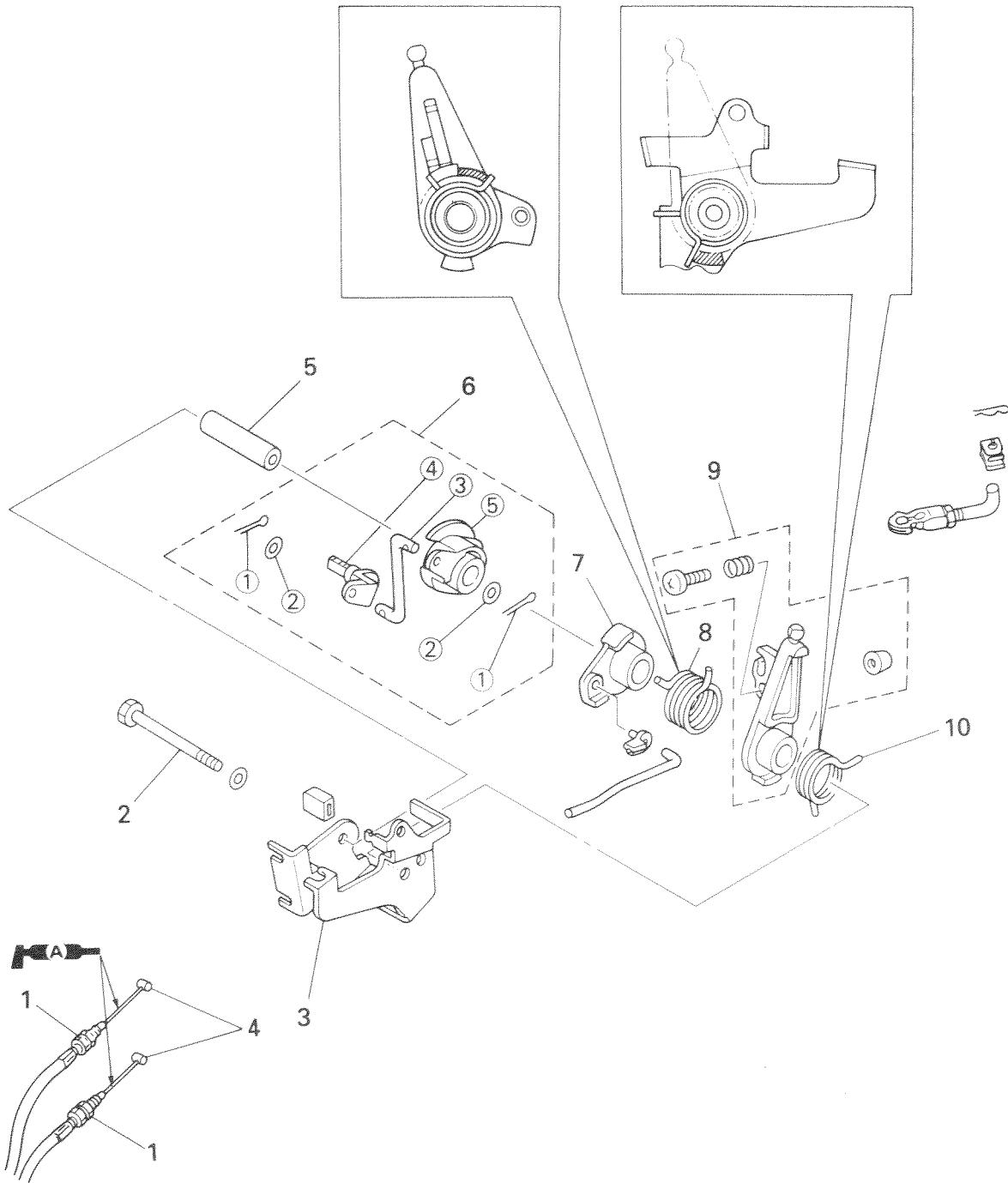


CONTROL UNIT

E

CONTROL UNIT EXPLODED DIAGRAM



**UNIT PENGATUR**
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI

POWR



CONTROL UNIT

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Disassembling the control unit		Remove the parts in the order below. Refer to "POWER UNIT".
1	Control pulley bracket assembly	2	
2	Locknuts (throttle cables)	2	
2	Bolt/washer (control pulley bracket)	1/1	
3	Control pulley bracket	1	
4	Throttle cables	2	
5	Collar	1	
6	Control pulley assembly	1	
7	Accelerator lever	1	
8	Accelerator lever spring	1	
9	Magneto control lever	1	
10	Magneto control lever spring	1	
	Disassembling the control pulley		
①	Cotter pins	2	
②	Plain washers	2	
③	Control pulley rod	1	
④	Control pulley lever	1	
⑤	Control pulley	1	
			For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

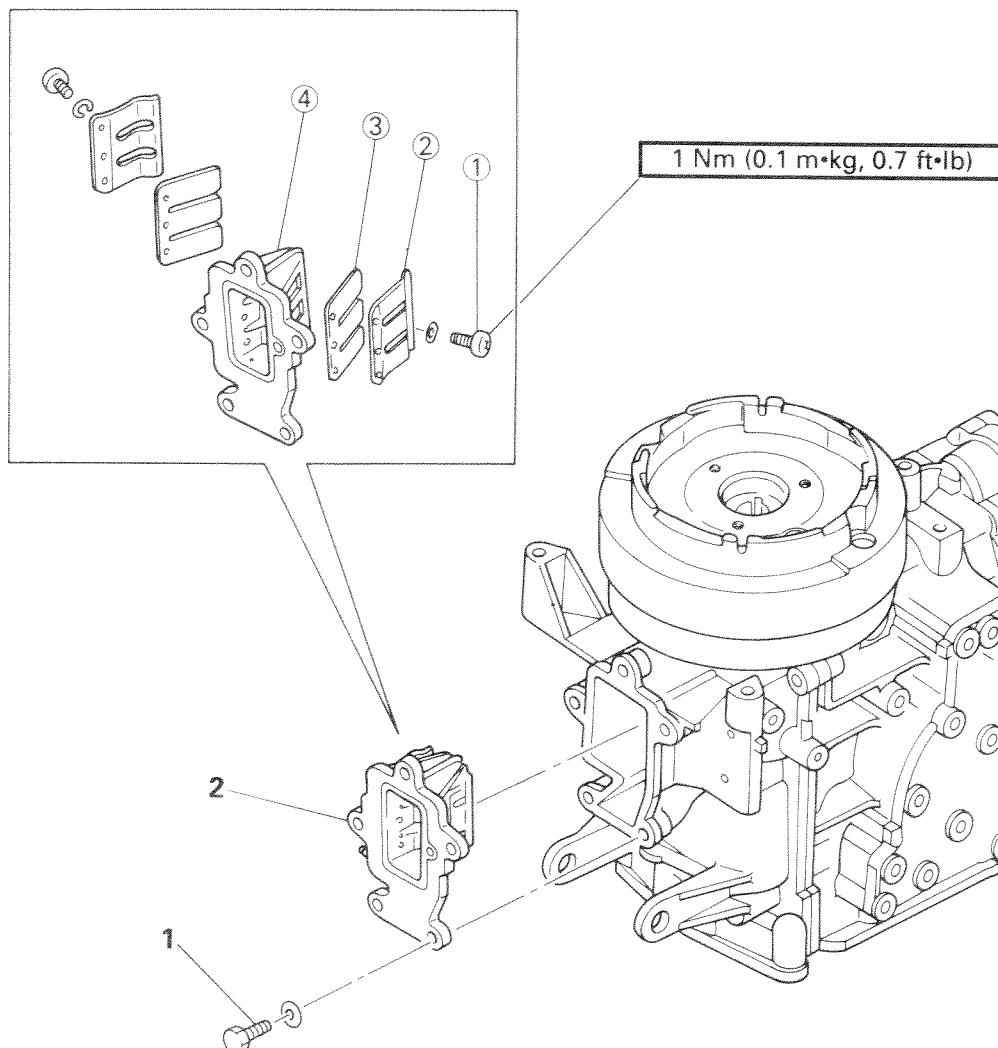
Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Membongkar unit pengatur		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini. Lihat "UNIT PEMBANGKIT DAYA (MESIN)".
1	Montase bracket puli pengatur	2	
2	Mur pengunci (kabel gas)	1/1	
3	Baut / washer (bracket puli pengatur)	1	
4	Bracket puli pengatur	1	
5	Kabel gas	2	
6	Collar	1	
7	Montase puli pengatur	1	
8	Tuas akselerator	1	
9	Pegas tuas akselerator	1	
10	Tuas pengatur magnit	1	
10	Pegas tuas pengatur magnit	1	
①	Membongkar puli pengatur		
②	Cotter pins	2	
③	Plain washer	2	
④	Batang puli pengatur	1	
⑤	Tuas puli pengatur	1	
⑤	Puli pengatur	1	Untuk memasang, balik langkah-langkah pelepasan.



REED VALVE

E

REED VALVE EXPLODED DIAGRAM



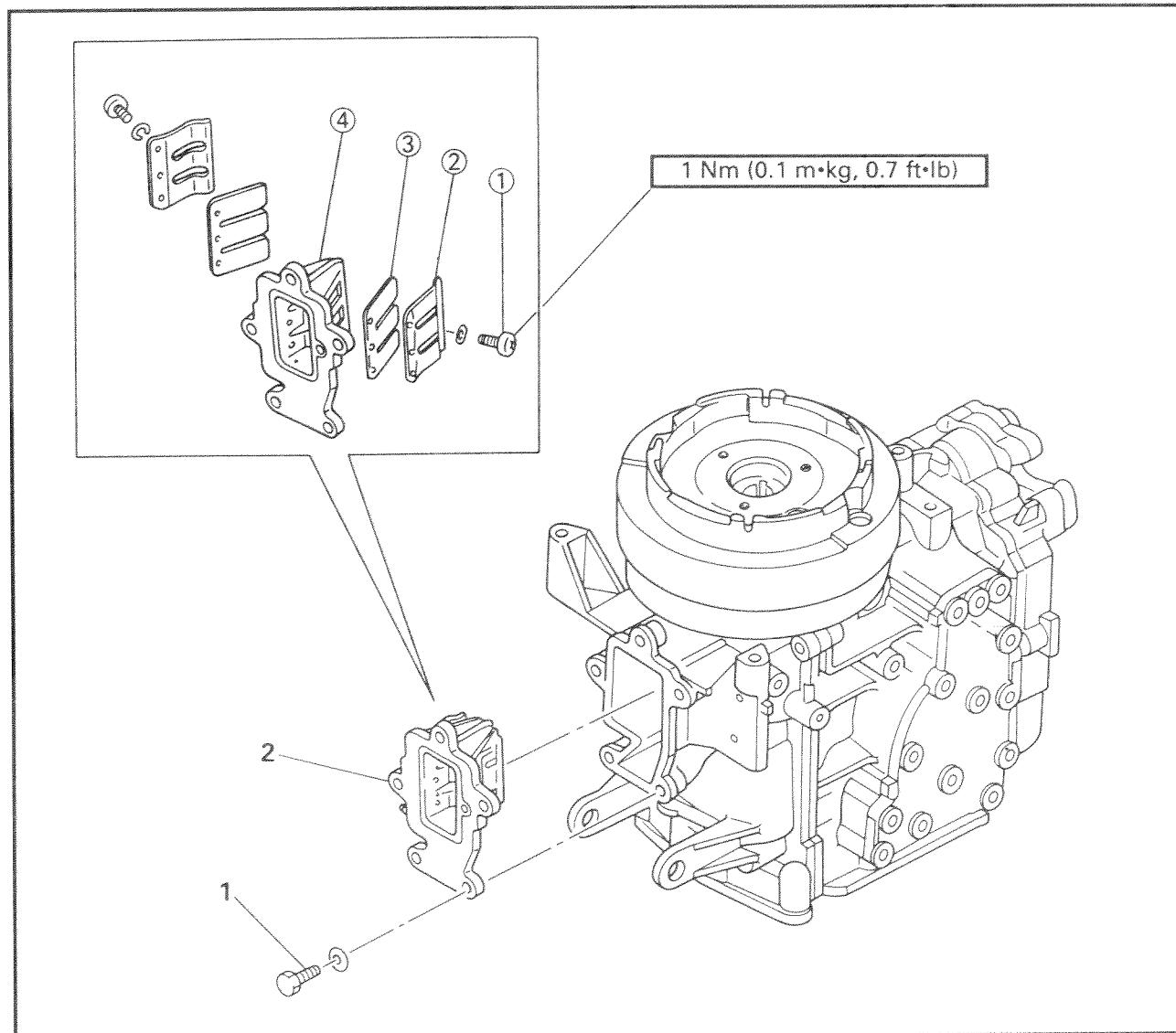
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
1	Removing the reed valve Carburetor Bolts/washers (reed valve assembly)	3/3	Remove the parts in the order below. Refer to "CARBURETOR" in chapter 4. 6 × 20 mm
2	Reed valve assembly	1	
①	Disassembling the reed valve Screws/washers (reed valves)	6/6	
②	Valve stoppers	2	
③	Reed valves	2	
④	Reed valve body	1	For installation, reverse the removal pro- cedures.



KATUP BULUH

DIAGRAM BAGIAN-BAGIAN SECARA TERURAI

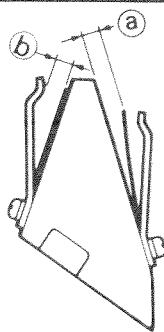


BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan katup buluh Karburator		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini. Lihat "PELEPASAN KARBURATOR" pada bab. 4.
1	Baut / washer (montase katup buluh)	3/3	
2	Montase katup buluh	1	6 x 20 mm
①	Membongkar katup buluh	6/6	
②	Sekrup / washer (katup buluh)	2	
③	Penahan katup	2	
④	Katup buluh	1	
	Badan katup buluh	1	Untuk memasang, balik langkah-langkah pelepasan.

POWR**REED VALVE**

E

**SERVICE POINTS****Inspecting the reed valve**

1. Inspect:

- Reed valve
Cracks/damage → Replace.

2. Measure:

- Valve bending @
Out of specification → Replace.

**Valve bending limit:
0.2 mm (0.01 in)**

3. Measure:

- Valve stopper height b
Out of specification → Replace.

**Valve stopper height:
9.9:
except for Europe
 0.7 ± 0.1 mm (0.03 ± 0.004 in)
for Europe:
 1.3 ± 0.1 mm (0.05 ± 0.004 in)
15:
 6.0 ± 0.1 mm (0.24 ± 0.004 in)**

**TITIK-TITIK PERAWATAN****Memeriksa katup buluh**

1. Periksa :

- Katup buluh
Retak/rusak → Ganti.

2. Ukur :

- Kebengkokan katup @
Jika tidak sesuai dengan spesifikasi
→ Ganti.



Batas kebengkokan katup :
0.2 mm (0.01 in)

3. Ukur :

- Ketinggian penahan katup Ⓟ
Jika tidak sesuai dengan spesifikasi
→ Ganti.



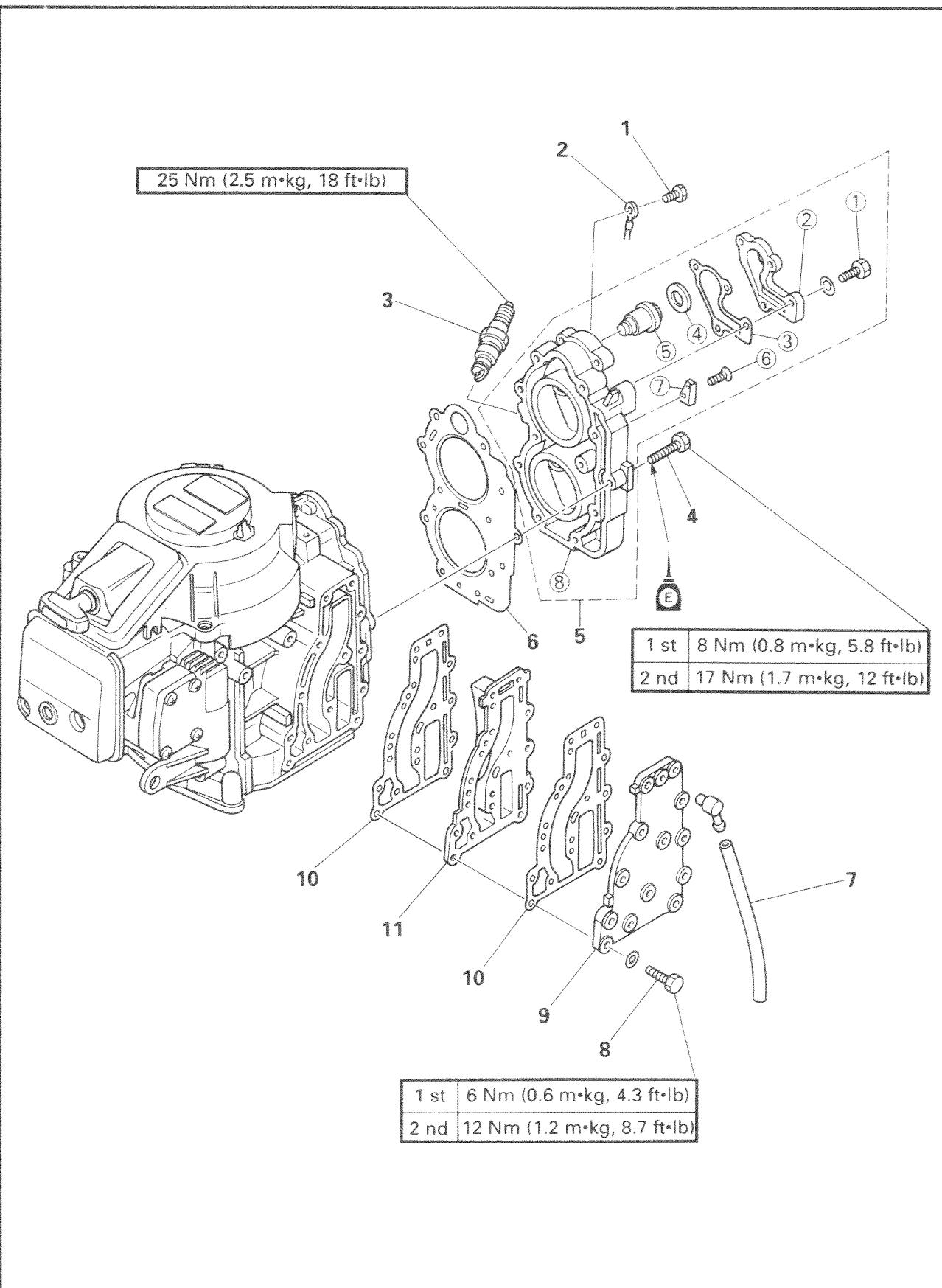
Ketinggian penahan katup :
9.9:
Kecuali untuk Eropah
 $0.7 \pm 0.1 \text{ mm (} 0.03 \pm 0.004 \text{ in)}$
Untuk Eropah :
 $1.3 \pm 0.1 \text{ mm (} 0.05 \pm 0.004 \text{ in)}$
15:
 $6.0 \pm 0.1 \text{ mm (} 0.24 \pm 0.004 \text{ in)}$



CYLINDER HEAD, THERMOSTAT AND EXHAUST COVER

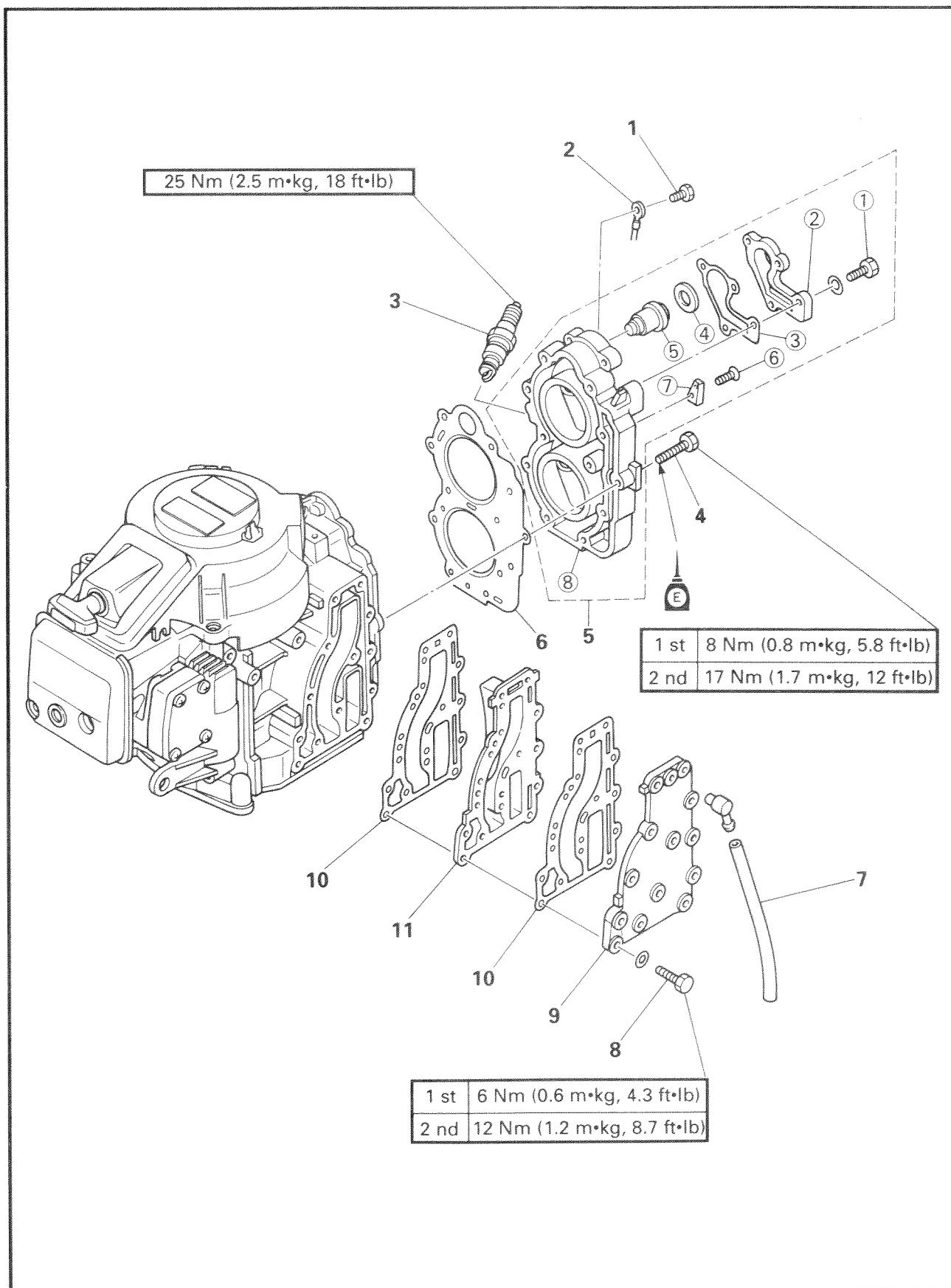
E

CYLINDER HEAD, THERMOSTAT AND EXHAUST COVER EXPLODED DIAGRAM





KEPALA SILINDER, THERMOSTAT DAN PENUTUP PIPA GAS BUANG DIAGRAM BAGIAN-BAGIAN SECARA TERURAI





CYLINDER HEAD, THERMOSTAT AND EXHAUST COVER

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the cylinder head, thermostat and exhaust cover		Remove the parts in the order below.
1	Bolt/washer (cylinder head ground lead)	1/1	6 × 12 mm
2	Cylinder head ground lead	1	
3	Spark plugs	2	
4	Flange bolts (cylinder head)	11	
5	Cylinder head	1	
6	Cylinder head gasket	1	
7	Pilot water hose	1	
8	Bolts/washers (exhaust outer cover)	13/13	
9	Exhaust outer cover	1	
10	Exhaust cover gaskets	2	
11	Exhaust inner cover	1	
①	Disassembling the cylinder head		
①	Bolts/washers (thermostat cover)	4/4	6 × 20 mm
②	Thermostat cover	1	
③	Thermostat cover gasket	1	
④	Plain washer	1	
⑤	Thermostat	1	
⑥	Screw	1	
⑦	Anode	1	
⑧	Cylinder head	1	
			For installation, reverse the removal procedures.

SERVICE POINTS

Inspecting the cylinder head

1. Inspect:

- Water jacket
Corrosion/mineral deposits → Clean.
- Cylinder inner surface
Score marks → Remove.
Use #600 ~ 800 grit wet sandpaper.

CAUTION:

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

POWR



KEPALA SILINDER, THERMOSTAT DAN PENUTUP PIPA GAS BUANG

(IN)

BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan kepala silinder, thermostat dan penutup pipa gas buang		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Baut / washer (timbel bumi kepala silinder)	1/1	6 x 12 mm
2	Timbel bumi kepala silinder	1	
3	Busi	2	
4	Baut flens (kepala silinder)	11	
5	Kepala silinder	1	
6	Gasket kepala silinder	1	
7	Selang air pilot	1	
8	Baut / washer (penutup luar pipa gas buang)	13/13	
9	Penutup luar pipa gas buang	1	
10	Gasket penutup pipa gas buang	2	
11	Penutup dalam pipa gas buang	1	
①	Membongkar kepala silinder	4/4	
②	Baut / washer (penutup thermostat)	1	6 x 20 mm
③	Penutup thermostat	1	
④	Gasket penutup thermostat	1	
⑤	Plain washer	1	
⑥	Thermostat	1	
⑦	Sekrup	1	
⑧	Anoda	1	
	Kepala silinder	1	Untuk memasang, balik langkah-langkah pelepasan.

TITIK-TITIK PERAWATAN

Memeriksa kepala silinder

1. Periksa :

- Jaket air
Korosi/endapan mineral → Bersihkan.
- Permukaan bagian dalam silinder
Banyak bintik-bintik → Hilangkan.
Gunakan ampelas basah # 600~800.

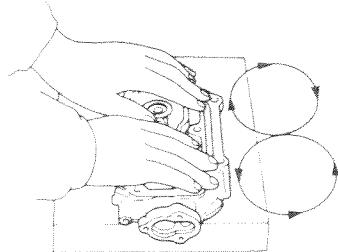
PERHATIAN:

Jangan menggores permukaan fitting silinder dan penutup silinder.

POWR

CYLINDER HEAD, THERMOSTAT AND EXHAUST COVER

E



2. Measure:

- Cylinder head warpage

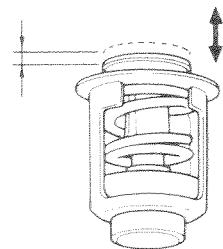
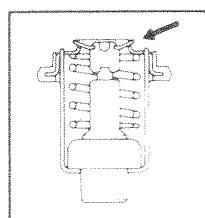
Use a straightedge and feeler gauge.
Out of specification → Resurface or replace.



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.



Inspecting the thermostat

1. Inspect:

- Thermostat

Damage/sticks → Replace.

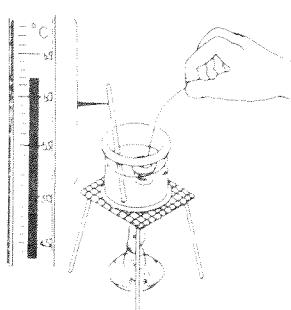
2. Measure:

- 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 the thermostat in the water.
- Slowly heat the water.
- Observe the thermometer's indicated temperature while stirring the water.



2. Ukur :

- Warpage kepala silinder
Gunakan straightedge and feeler gauge
Jika tidak sesuai dengan spesifikasi
→ Ampelas lagi atau ganti.



Batas warpage :
0.1 mm (0.04 in)

Langkah-langkah pengampelasan :

- Taruh ampelas basah 400 ~ 600 pada pelat permukaan.
- Ampelas lagi kepala dengan menggunakan pola mengampelasan angka delapan.

Memeriksa thermostat

1. Periksa :

- Thermostat
Jika rusak/menempel → Ganti.

2. Ukur :

- Suhu pembukaan katup
- Kenaikan katup
Jika tidak sesuai dengan spesifikasi
→ Ganti.

	Suhu air	Kenaikan katup
	Di bawah 48 ~ 52 °C (118 ~ 126 °F)	0 mm (0 in)
	Di atas 60 °C (140 °F)	Min. 3 mm (0.12 in)

Langkah-langkah pengukuran :

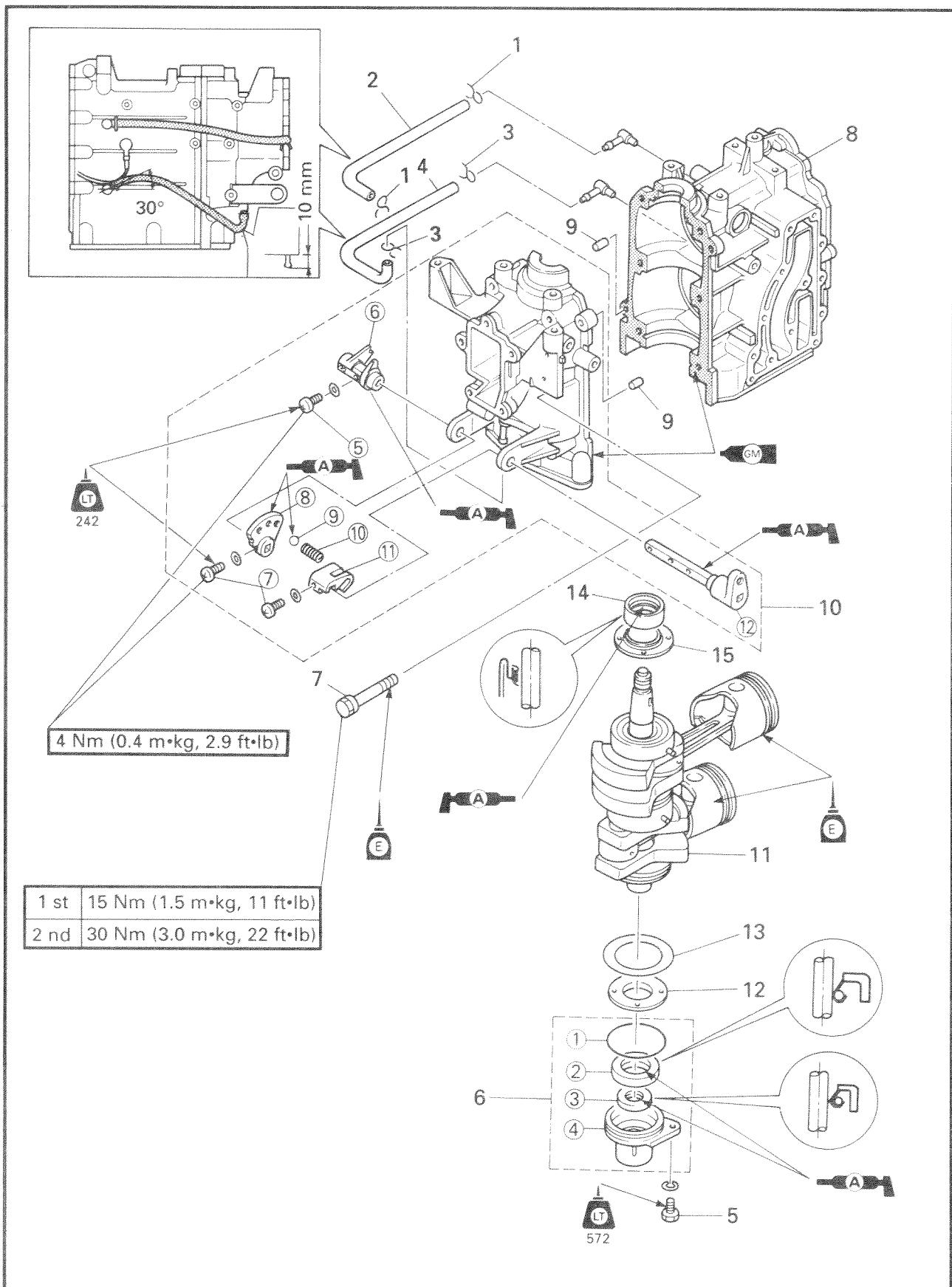
- Masukkan thermostat di dalam air
- Panaskan air secara perlahan-lahan
- Amati suhu pada thermometer sambil mengaduk air.

POWR



CRANKCASE AND CYLINDER BODY

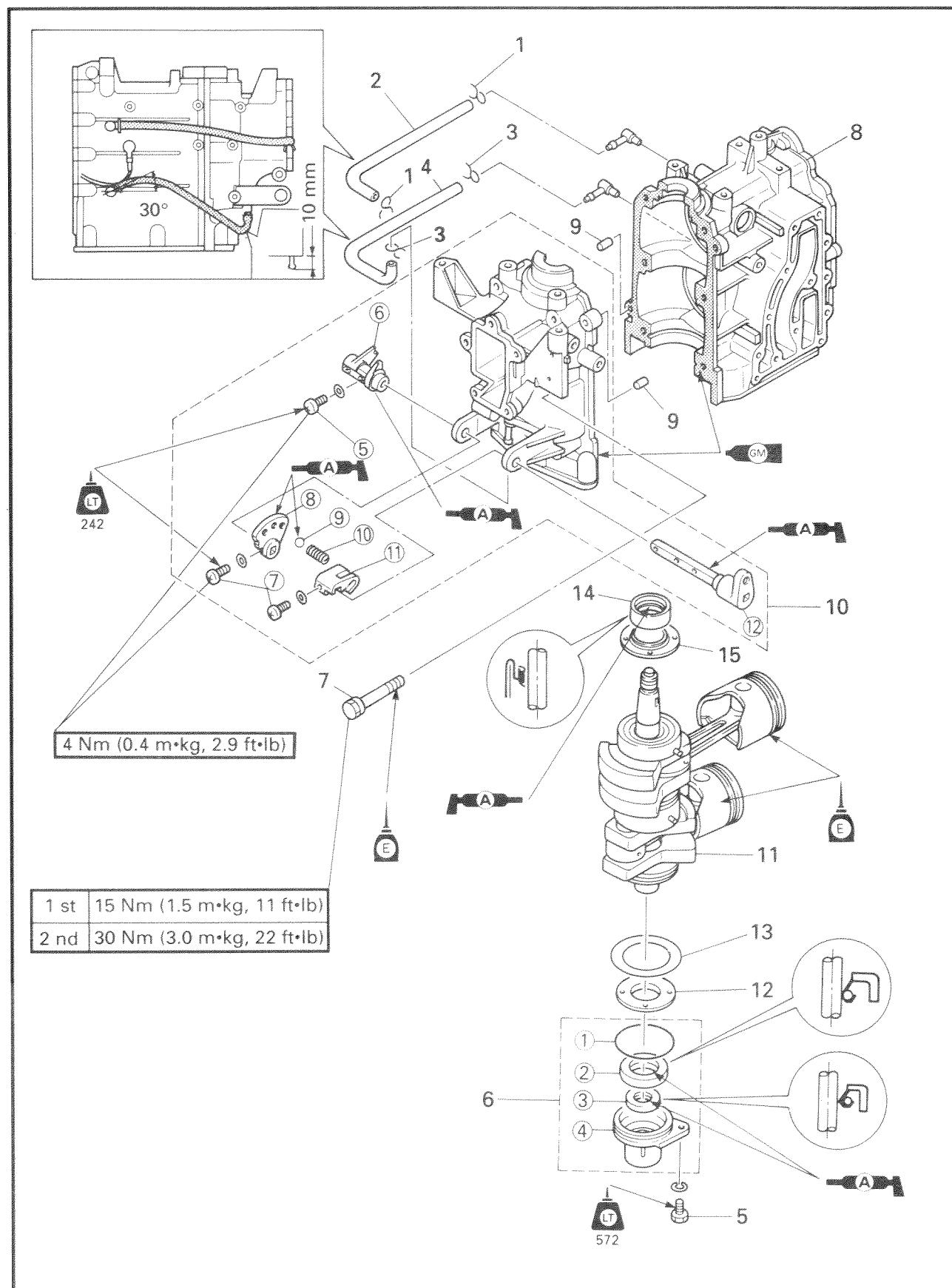
E

CRANKCASE AND CYLINDER BODY
EXPLODED DIAGRAM



KARTER DAN BADAN SILINDER

DIAGRAM BAGIAN-BAGIAN SECARA TERURAI





CRANKCASE AND CYLINDER BODY

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the crankcase and cylinder body		Remove the parts in the order below.
1	Clips	2	
2	Hose	1	
3	Clips	2	
4	Hose	1	
5	Bolt/washer (oil seal housing)	1/1	6 × 16 mm
6	Oil seal housing	1	
7	Bolts/washers	6/6	
8	Cylinder body	1	
9	Dowel pins	2	
10	Crankcase assembly	1	
11	Crankshaft assembly	1	
12	Plate	1	
13	Plain washer	1	
14	Oil seal	1	
15	Plate	1	
	Disassembling the oil seal housing		
①	O-ring	1	
②	Oil seal	1	
③	Oil seal	1	
④	Oil seal housing	1	
	Disassembling the crankcase		
⑤	Bolt/washer (shift lever)	1/1	5 × 12 mm
⑥	Shift lever bushing	1	
⑦	Screws/washers	2/2	5 × 12 mm
⑧	Cam plate	1	
⑨	Ball	1	
⑩	Spring	1	
⑪	Shaft rod lever	1	
⑫	Shift arm shaft	1	
			For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan karter dan badan silinder		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Klip	2	
2	Selang	1	
3	Klip	2	
4	Selang	1	
5	Baut / washer (rumah seal oli)	1/1	6 x 16 mm
6	Rumah seal oli	1	
7	Baut / washer	6/6	
8	Badan silinder	1	
9	Dowel pins	2	
10	Montase karter	1	
11	Montase poros engkol	1	
12	Pelat	1	
13	Plain washer	1	
14	Seal oli	1	
15	Pelat	1	
	Membongkar rumah seal oli		
①	O-ring	1	
②	Seal oli	1	
③	Seal oli	1	
④	Rumah seal oli	1	
	Membongkar karter		
⑤	Baut / washer (shift lever)	1/1	5 x 12 mm
⑥	Shift lever bushing	1	
⑦	Sekrup / washer	2/2	5 x 12 mm
⑧	Cam plate	1	
⑨	Bola (ball)	1	
⑩	Pegas	1	
⑪	Shaft rod lever	1	
⑫	Shift arm shaft	1	
			Untuk memasang kembali, balik langkah-langkah pelepasan.

**SERVICE POINTS****Inspecting the cylinder body**

1. Inspect:

- Water jackets
Corrosion/mineral deposits → Clean.
- Cylinder inner surface
Score marks → Remove.
Use #600 ~ 800 grit wet sandpaper.

NOTE:

Do not scratch the fitting surfaces of the crankcase and cylinder head.

2. Inspect:

- Exhaust wall
Cracks/damage → Replace.
Carbon deposits → Clean.
Use a round scraper.

NOTE:

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

3. Measure:

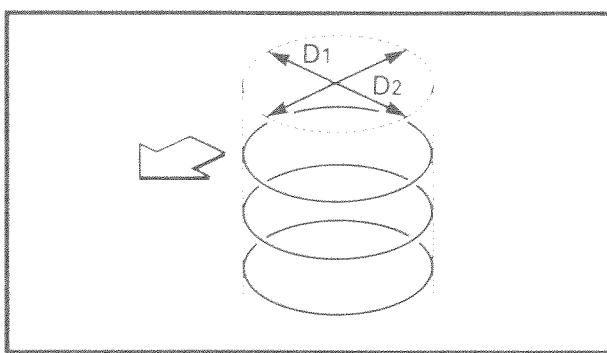
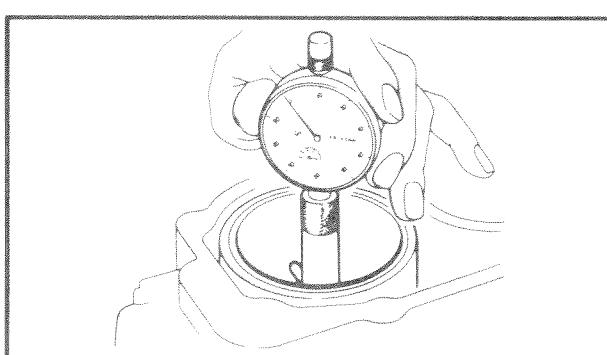
- Cylinder bore "D"
Use a cylinder gauge.
Out of specification → Rebore or replace.



Cylinder gauge set:
90890-06759

NOTE:

Take side to side and front to back measurements at each of the three locations (total of six measurements). Then, find the average of the measurements.



	Standard	Wear limit
Cylinder bore "D"	56.00 ~ 56.02 mm (2.205 ~ 2.206 in)	56.1 mm (2.21 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)

**TITIK-TITIK PERAWATAN****Memeriksa badan silinder**

1. Periksa :

- Jaket air
Korosi/endapan mineral → Bersihkan.
- Permukaan bagian dalam silinder
Banyak bintik-bintik → Hilangkan.
Gunakan ampelas basah # 600 ~ 800.

CATATAN :

Jangan menggores permukaan fitting karter dan kepala silinder.

2. Periksa :

- Dinding pipa gas buang
Jika retak/rusak → Ganti.
Jika ada endapan karbon → Bersihkan.
Gunakan alat pengikir bulat.

CATATAN :

Jangan menggores permukaan fitting silinder dan penutup pipa gas buang.

3. Ukur :

- Diameter silinder "D"
Gunakan alat ukur silinder (cylinder gauge).
Jika tidak sesuai dengan spesifikasi
→ Bor lagi atau ganti.

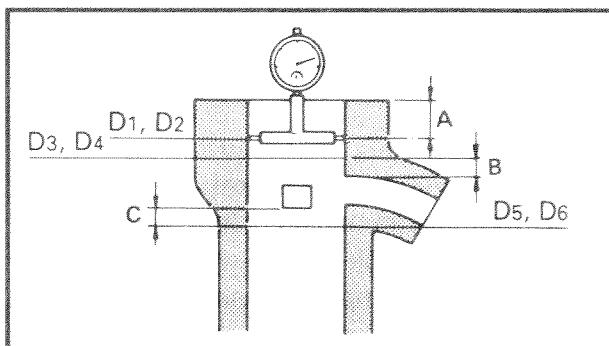


Alat ukur silinder :
90890-06759

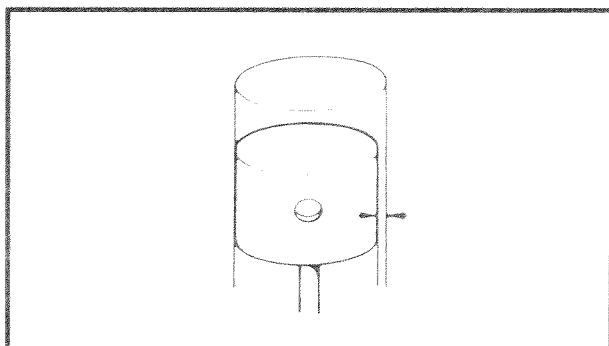
CATATAN :

Lakukan pengukuran dari samping ke samping dan dari depan ke belakang pada ketiga lokasi (seluruhnya enam pengukuran). Lalu, cari ukuran rata-rata.

	Standar	Batas keausan
Diameter Silinder "D"	56.00 ~ 56.02 mm (2.205 ~ 2.206 in)	56.1 mm (2.21 in)
Batas tirus T :	—	0.08 mm (0.003 in)
Batas out of round :	—	0.05 mm (0.002 in)
$D = \text{Diameter Maksimum } (D_1 - D_6)$ $T = (\text{Maksimum } D_1 \text{ atau } D_2) - (\text{Minimum } D_5 \text{ atau } D_6)$		



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



Measuring the piston to cylinder clearance

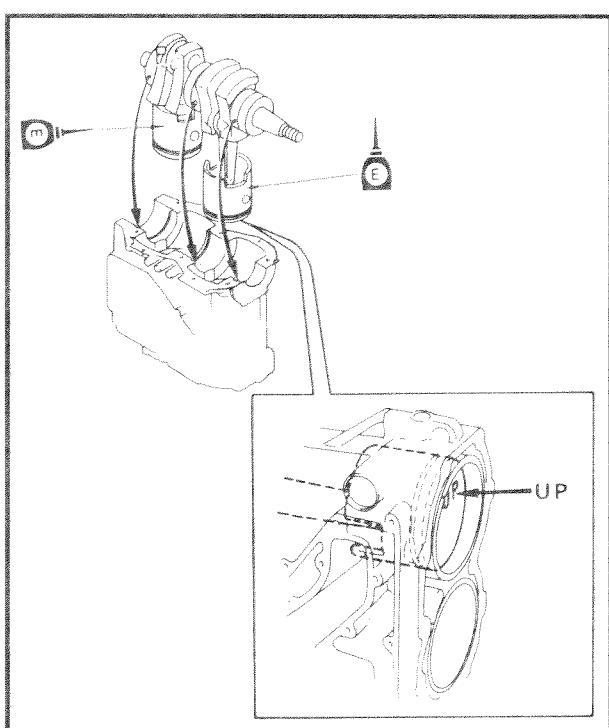
1. Calculate:

- Piston clearance

Out of specification → Replace the piston and piston rings or the cylinder or the piston, piston rings and cylinder.

$$\text{Piston clearance} = \text{Cylinder bore} - \text{Piston diameter}$$

	Piston clearance: 0.035 ~ 0.040 mm (0.0014 ~ 0.0016 in)
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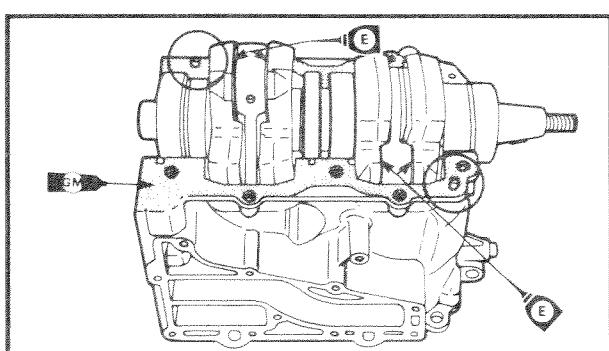
Installing the cylinder body and crankcase

1. Install:

- Cylinder body
- Crankshaft and pistons

NOTE:

- Align the piston ring end gaps with their respective locating pins.
- Fit the bearing locating pins into the cylinder body.



2. Apply:

- Gasket Maker
(onto the connecting surfaces of the crankcase and cylinder body)

NOTE:

- Before applying the gasket maker clean the connecting surfaces of the crankcase and cylinder body.
- Gasket maker should not overflow the contacting surface.



A : 10 mm (0.4 in) di bawah puncak silinder

B : 5 mm (0.2 in) di atas pipa gas buang

C : 5 mm (0.2 in) di bawah scavenging port

Mengukur jarak ruangan antara piston dan silinder

1. Hitung :

- Jarak ruangan piston

Jika tidak sesuai dengan spesifikasi →
Ganti piston dan ring piston atau silinder
atau piston, ring piston dan silinder.

Jarak ruangan piston	=	Diameter silinder	-	Diameter piston
	Jarak ruangan piston : 0.035 ~ 0.040 mm (0.0014 ~ 0.0016 in)			

Memasang badan silinder dan karter

1. Pasang :

- Badan silinder
- Poros engkol dan piston

CATATAN :

- Pertemukan celah-celah ujung ring piston dengan pen pasangannya masing-masing.
- Pasang pen pengatur tempat bearing ke dalam badan silinder.

2. Gunakan :

- Gasket Maker
(pada permukaan penghubung karter dan badan silinder)

CATATAN :

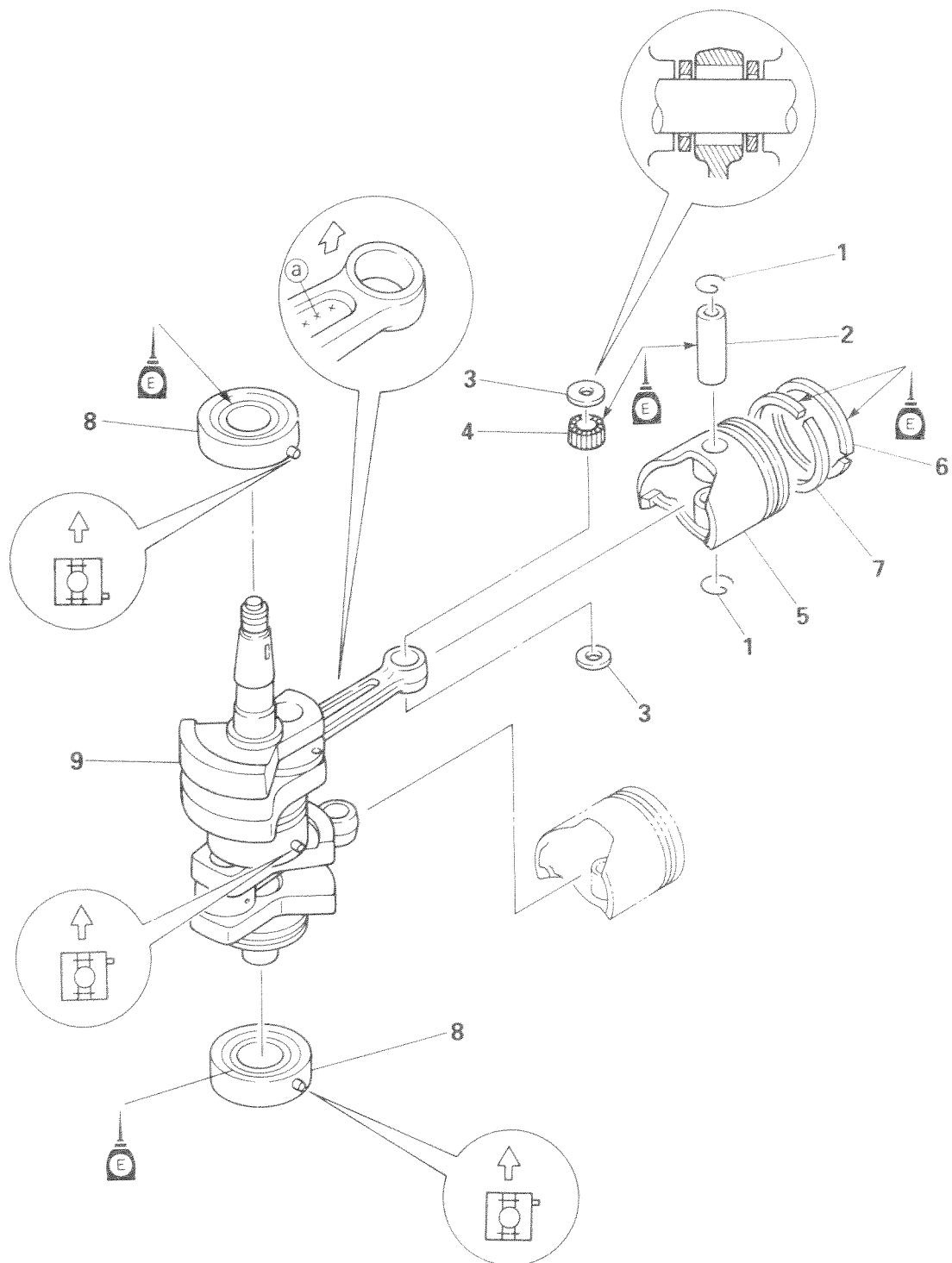
- Sebelum menggunakan gasket maker, bersihkan permukaan penghubung karter dan badan silinder.
- Gasket maker tidak boleh luber pada permukaan yang berhubungan tersebut.

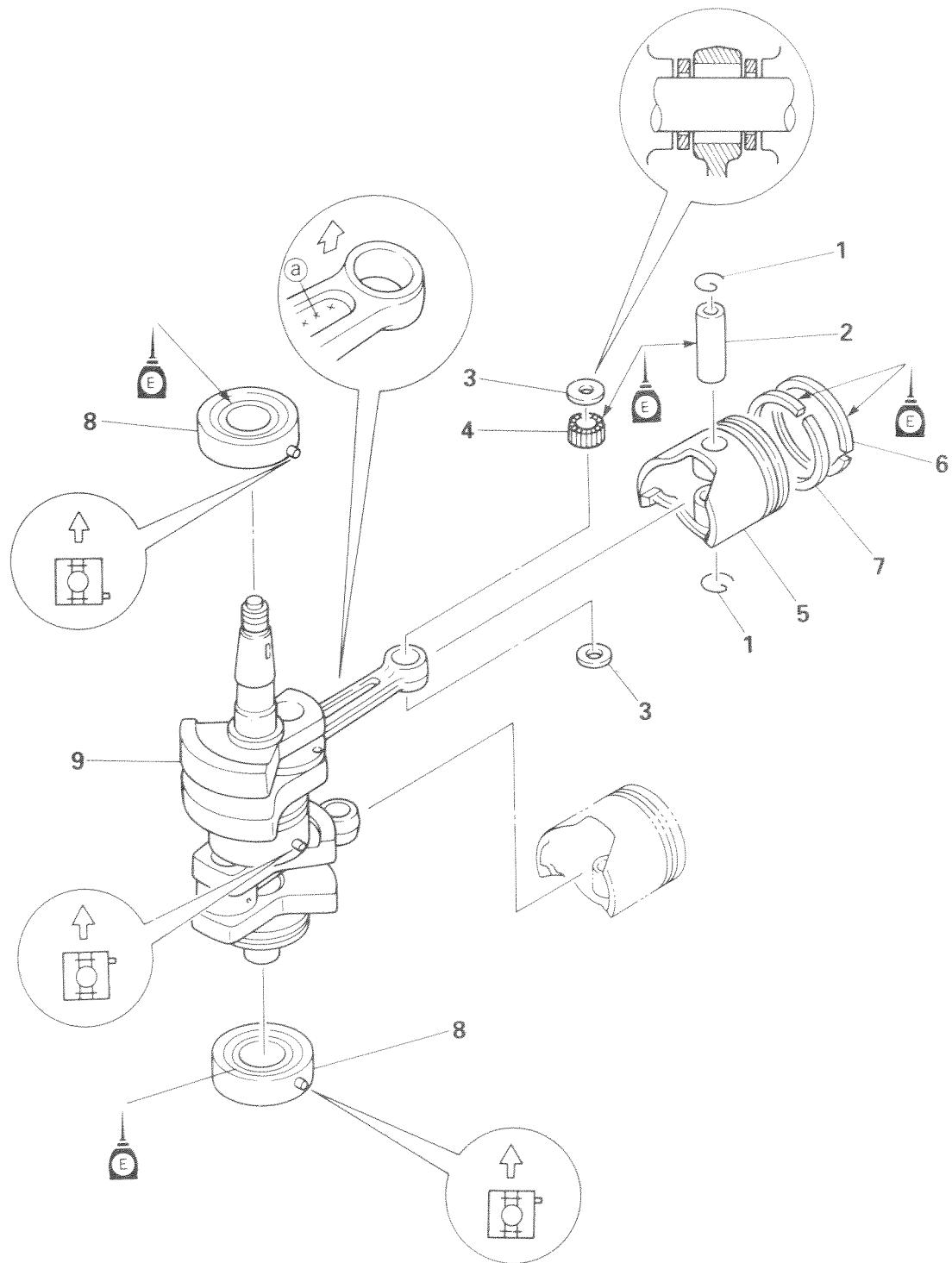


CRANKSHAFT AND PISTONS

E

CRANKSHAFT AND PISTONS EXPLODED DIAGRAM



**POROS ENGKOL DAN PISTON**
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI

POWR



CRANKSHAFT AND PISTONS

E

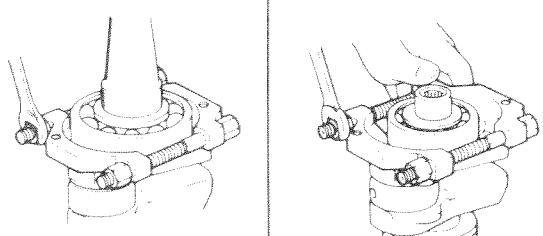
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Disassembling the crankshaft and pistons		Remove the parts in the order below.
	Crankshaft assembly		Refer to "CRANKCASE AND CYLINDER BODY".
1	Piston pin circlips	4	CAUTION: _____ Always use new circlips.
2	Piston pins	2	NOTE: _____ For reference during reinstallation, put identification marks on the piston pins, pistons and small end bearings.
3	Piston pin washers	4	CAUTION: _____ The rounded side of the washers should face towards the piston.
4	Small end needle bearings	50	CAUTION: _____ Do not use a combination of new and used needle bearings in the same small end.
5	Pistons	2	
6	Top piston rings	2	
7	2nd piston rings	2	
8	Crankshaft bearings	2	
9	Crankshaft	1	For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Membongkar poros engkol dan piston		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Montase poros engkol Piston pin circlips	4	Lihat "KARTER DAN BADAN SILINDER". PERHATIAN: _____ Gunakan selalu circlip baru.
2	Pen piston	2	CATATAN : _____ Supaya mudah waktu memasang kembali, beri tanda-tanda pengenal pada pen piston, piston dan bantalan ujung kecil.
3	Piston pin washers	4	PERHATIAN: _____ Sisi bulat washer harus menghadap ke arah piston.
4	Bantalan jarum ujung kecil	50	PERHATIAN: _____ Jangan menggunakan bantalan jarum baru dan bekas bersama-sama pada ujung kecil yang sama.
5	Piston	2	
6	Ring piston atas	2	
7	Ring piston kedua	2	
8	Bantalan poros engkol	2	
9	Poros engkol	1	Untuk memasang kembali, balik langkah-langkah pelepasan.



SERVICE POINTS

Removing the bearings

1. Remove:

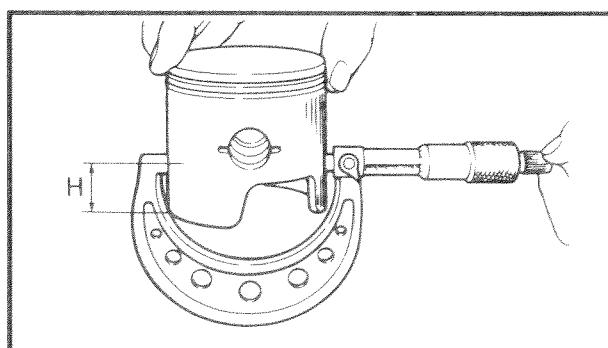
- Crankshaft bearings

NOTE: _____

Use a bearing separator to hold the bearing and then use a press to force out the crank-shaft.



Bearing separator:
90890-06534



Inspecting the pistons

1. Measure:

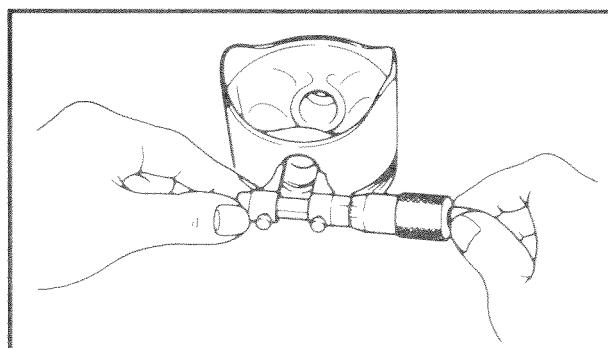
- Piston diameter

Use a micrometer.

Out of specification → Replace.

	Measuring point "H"	Piston diameter
Standard	10 mm (0.4 in)	55.940 ~ 55.985 mm (2.2024 ~ 2.2041 in)

	Oversized piston diameter: 1: 56.25 mm (2.215 in) 2: 56.50 mm (2.224 in)
--	---



2. Measure:

- Piston pin boss inside diameter

Use a micrometer.

Out of specification → Replace.

	Piston pin boss inside diameter: 14.004 ~ 14.015 mm (0.5513 ~ 0.5518 in)
--	---

Inspecting the piston pins and small end needle bearings

1. Inspect:

- Piston pins

- Small end needle bearings

Heat discoloration → Replace.

Damage/scratches → Replace.

**TITIK-TITIK PERAWATAN****Melepaskan bantalan (bearing)**

1. Lepaskan :

- Bantalan poros engkol.

CATATAN :

Gunakan bearing separator untuk menahan bearing dan kemudian gunakan tekanan untuk mengeluarkan poros engkol.

**Bearing separator :**

90890-06534

Memeriksa piston

1. Ukur :

- Diameter piston

Gunakan mikrometer

Jika tidak sesuai dengan spesifikasi

→ Ganti.

	Titik pengukuran "H"	Diameter piston
Standar	10 mm (0.4 in)	55.940 ~ 55.985 mm (2.2024 ~ 2.2041 in)

**Diameter piston oversize :**

1 : 56.25 mm (2.215 in)

2 : 56.60 mm (2.224 in)

2. Ukur :

- Diameter bagian dalam piston pin boss

Gunakan mikrometer.

Jika tidak sesuai dengan spesifikasi

→ Ganti.

	Diameter bagian dalam piston pin boss :
	14.004 ~ 14.015 mm (0.5513 ~ 0.5518 in)

Memeriksa pen piston dan bantalan jarum ujung kecil

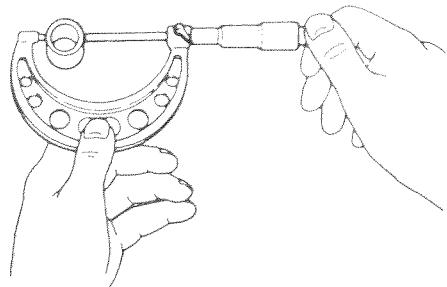
1. Periksa :

- Pen piston

- Bantalan jarum ujung kecil

Jika warna luntur akibat panas → Ganti.

Jika rusak/tergores → Ganti.



2. Measure:

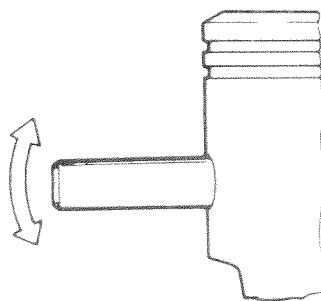
- Piston pin diameter

Use a micrometer.

Out of specification → Replace.



Piston pin diameter:
13.996 ~ 14.000 mm
(0.5510 ~ 0.5512 in)



3. Check:

- Free play

With the piston pin inserted in the piston.

Free play exists → Replace the piston pin or the piston or both.

Inspecting the piston rings

1. Inspect:

- Piston rings

Breaks/damage → Replace.

2. Measure:

- End gaps

Use a feeler gauge.

Out of specification → Replace.



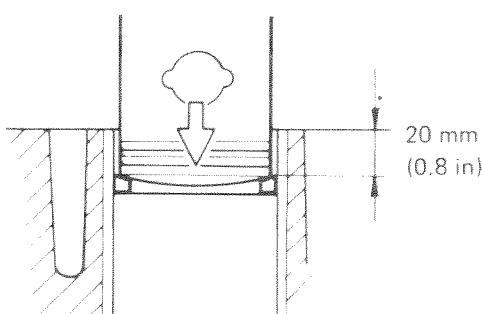
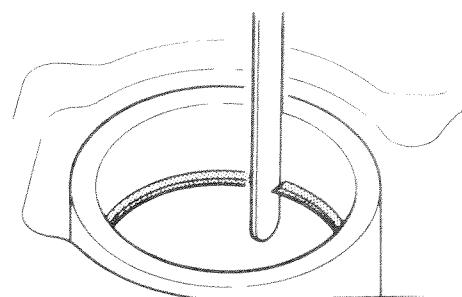
End gap:
Top: 0.15 ~ 0.35 mm
(0.006 ~ 0.014 in)
2nd: 0.15 ~ 0.35 mm
(0.006 ~ 0.014 in)

End gap limit:

Top: 0.55 mm (0.022 in)
2nd: 0.55 mm (0.022 in)

Measuring point:

20 mm (0.8 in)



NOTE: _____

Use the piston crown to push the piston ring into the cylinder.

3. Measure:

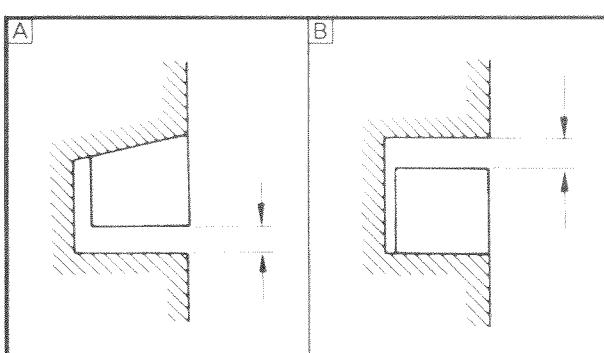
- Side clearances

Use a feeler gauge.

Out of specification → Replace the piston or the piston ring or both.



Side clearance:
Top A: 0.02 ~ 0.06 mm
(0.001 ~ 0.002 in)
2nd B: 0.04 ~ 0.08 mm
(0.002 ~ 0.003 in)





2. Ukur :

- Diameter pen piston
Gunakan mikrometer.
Jika tidak sesuai dengan spesifikasi → Ganti.



Diameter pen piston :
13.996 ~ 14.000 mm
(0.5510 ~ 0.5512 in)

3. Periksa :

- Kelonggaran
Dengan pen piston dimasukkan ke dalam piston.
Jika ada kelonggaran → Ganti pen piston atau piston atau keduanya.

Memeriksa ring piston

1. Periksa :

- Ring piston
Jika retak/rusak → Ganti.

2. Ukur :

- Celah ujung
Gunakan feeler gauge
Jika tidak sesuai dengan spesifikasi → Ganti.



Celah ujung :
Atas : 0.15 ~ 0.35 mm
(0.006 ~ 0.014 in)
Kedua : 0.15 ~ 0.35 mm
(0.006 ~ 0.014 in)

Batas celah ujung :
Atas : 0.55 mm (0.022 in)
Kedua : 0.55 mm (0.022 in)
Titik pengukuran :
20 mm (0.8 in)

CATATAN :

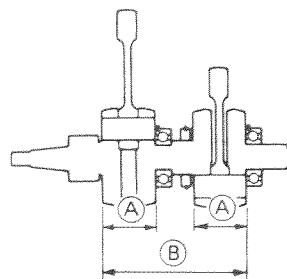
Gunakan piston crown untuk mendorong ring piston ke dalam silinder.

3. Ukur :

- Jarak ruangan samping
Gunakan feeler gauge
Jika tidak sesuai dengan spesifikasi → Ganti piston atau ring piston atau keduanya.



Jarak ruangan samping :
Atas A : 0.02 ~ 0.06 mm
(0.001 ~ 0.002 in)
Kedua B : 0.04 ~ 0.08 mm
(0.002 ~ 0.003 in)

**Inspecting the crankshaft****1. Measure:**

- Crankshaft width Ⓐ
- Crankshaft width Ⓑ

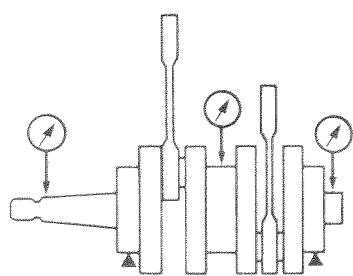
Out of specification → Replace.

**Crankshaft width Ⓐ:**

46.90 ~ 46.95 mm
(1.846 ~ 1.848 in)

Crankshaft width Ⓑ:

25.90 ~ 26.10 mm
(1.020 ~ 1.028 in)

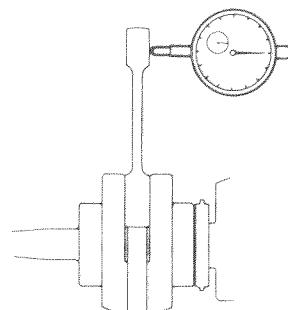
**2. Measure:**

- Runout

Use V-blocks and a dial gauge.
Out of specification → Replace.

**Runout limit:**

0.03 mm (0.001 in)

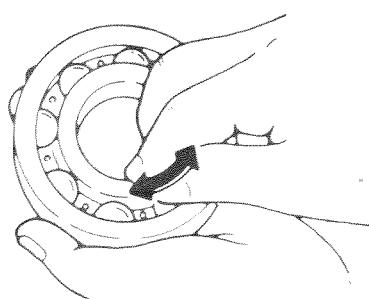
**3. Measure:**

- Axial play

Out of specification → Replace.

**Axial play limit:**

2.0 mm (0.08 in)

**4. Inspect:**

- Crankshaft bearings

Excessive noise/pitting → Replace.

CAUTION:

- To avoid damage, do not dry the bearings with compressed air.
- Do not scratch the balls when cleaning the bearings.

**Memeriksa poros engkol**

1. Ukur :

- Lebar poros engkol Ⓐ
- Lebar poros engkol Ⓑ

Jika tidak sesuai dengan spesifikasi
→ Ganti.



Lebar poros engkol Ⓐ:

46.90 ~ 46.95 mm
(1.846 ~ 1.848 in)

Lebar poros engkol Ⓑ:

25.90 ~ 26.10 mm
(1.020 ~ 1.028 in)

2. Ukur :

- Runout

Gunakan V-blocks dial gauge

Jika tidak sesuai dengan spesifikasi
→ Ganti.



Batas runout :

0.03 mm (0.001 in)

3. Ukur :

- Axial play

Jika tidak sesuai dengan spesifikasi
→ Ganti.



Batas axial play :

2.0 mm (0.08 in)

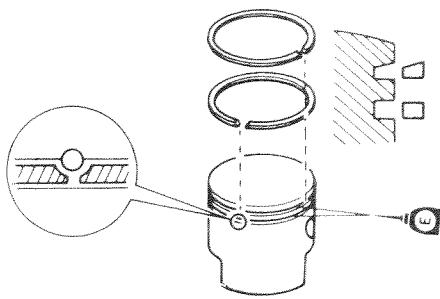
4. Periksa :

- Bearing poros engkol

Jika suaranya berlebihan/ada bintik-bintik → Ganti.

PERHATIAN:

- Untuk menghindari kerusakan, jangan mengeringkan bearing dengan udara kempaan.
- Jangan menggores bola (ball) sewaktu membersihkan bearing.

**Installing the pistons and piston rings**

1. Install:

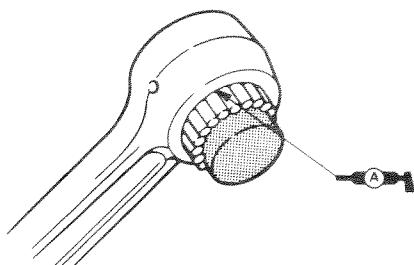
- Piston ring (2nd)
- Piston ring (top)

CAUTION:

- Do not scratch the piston or break the piston rings.
- Align the piston ring end gaps with their respective locating pin.
- After installing the piston rings, check that they move smoothly.

NOTE:

Piston rings should be replaced as a set.

**Installing the small end needle bearings**

1. Install:

- Small end needle bearings



Needle bearings per small end:
25 pieces



Small end needle bearing installer:
90890-06543

**Memasang piston dan ring piston**

1. Pasang :

- Ring piston (ke-2)
- Ring piston (atas)

PERHATIAN:

- Usahakan jangan sampai piston tergores atau ring piston retak.
- Pertemukan celah-celah ujung ring piston dengan masing-masing pen pasangannya.
- Setelah memasang ring piston, pastikan bahwa gerakannya mulus.

CATATAN :

Ring piston harus diganti per set.

Memasang bearing jarum ujung kecil

1. Pasang :

- Bearing jarum ujung kecil.



Bearing jarum per ujung kecil :
25 buah



Pemasangan bearing jarum ujung kecil :
90890-06543



CHAPTER 6 LOWER UNIT

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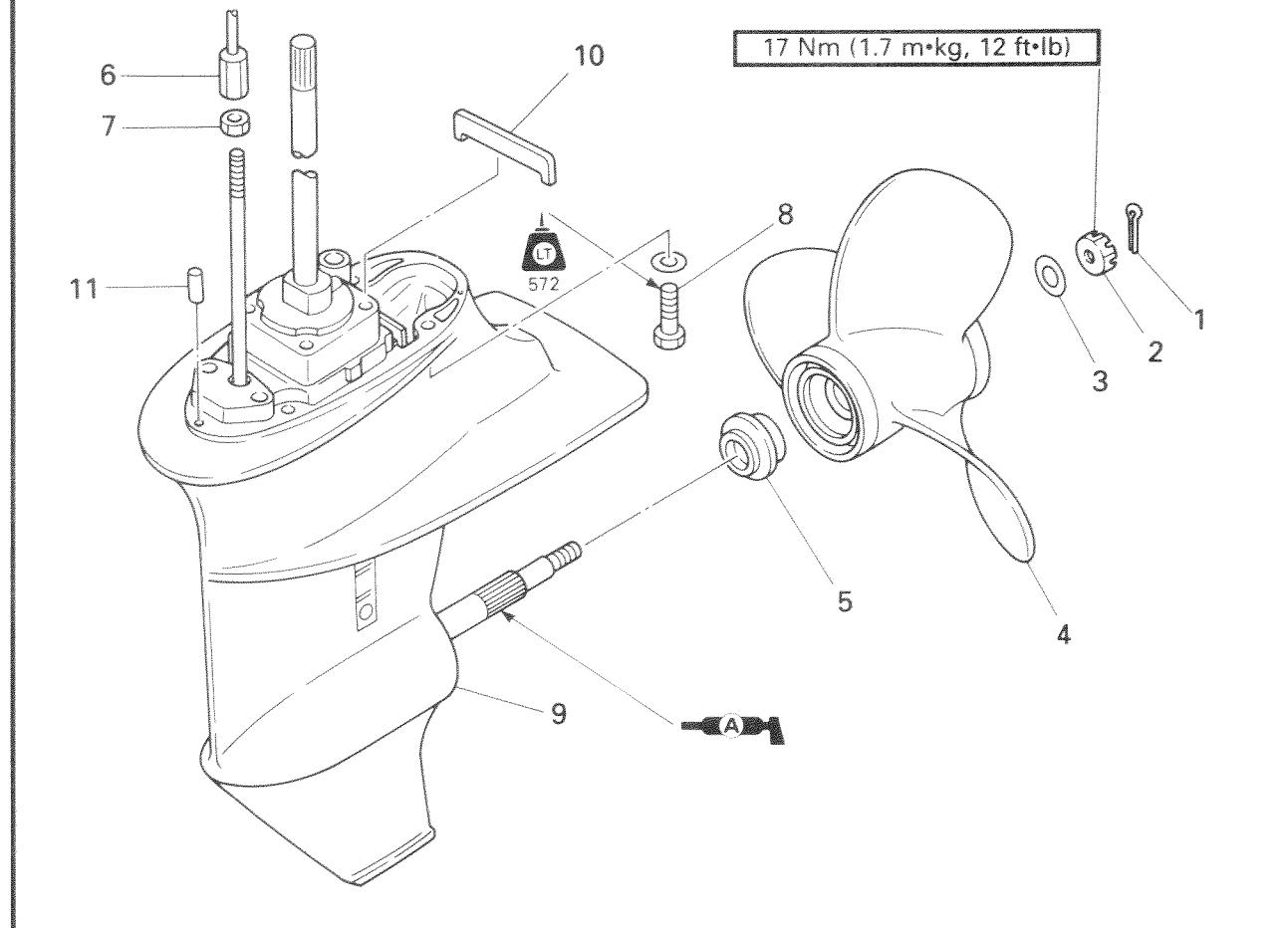
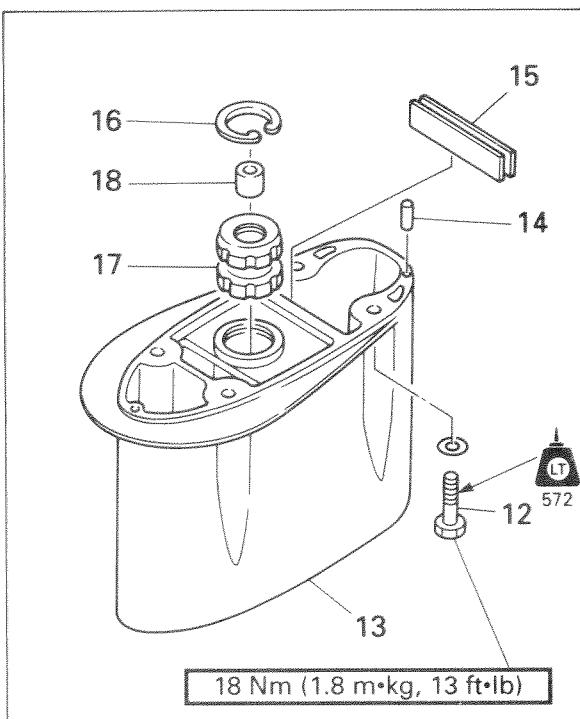
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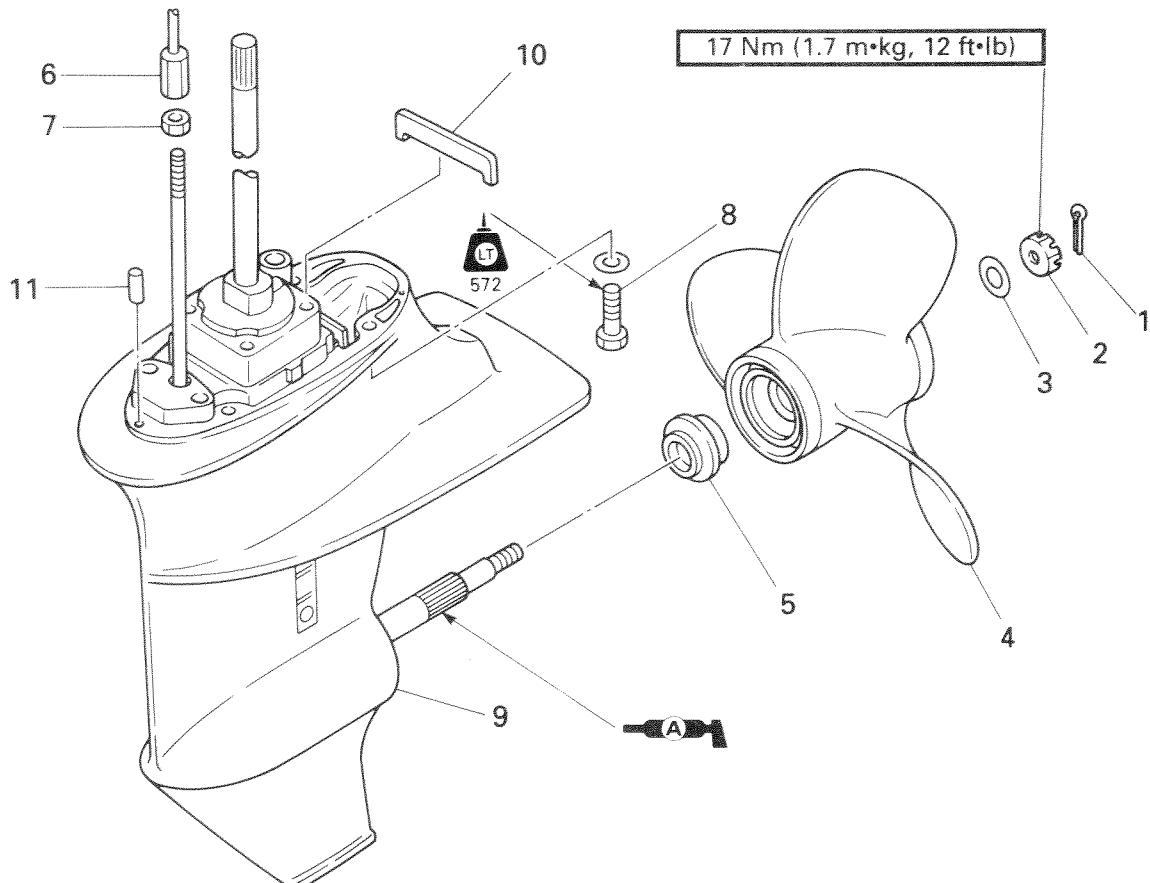
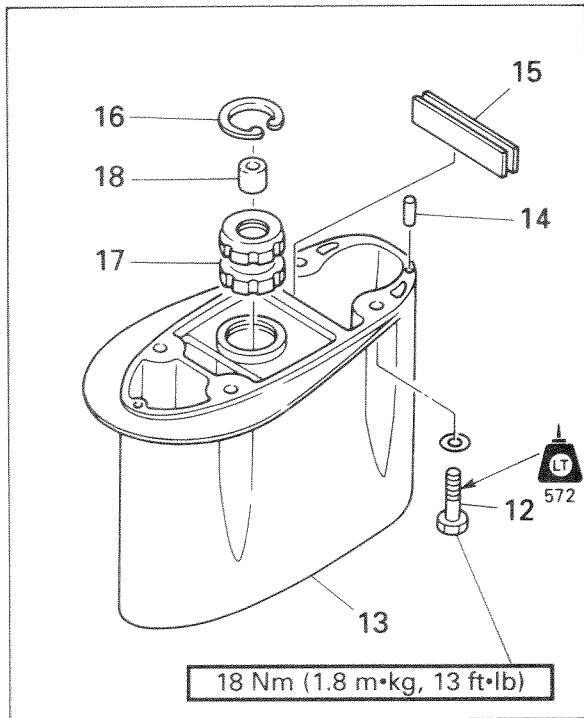


LOWER UNIT

6

LOWER UNIT EXPLODED DIAGRAM



LOWR**BAGIAN BAWAH****(IN)****BAGIAN BAWAH
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI**

LOWR**LOWER UNIT**

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the lower unit		Remove the parts in the order below.
1	Cotter pin	1	
2	Propeller nut	1	
3	Plain washer	1	
4	Propeller	1	
5	Spacer	1	
6	Nut	1	
7	Nut	1	
8	Bolts/washers	4/4	8 × 30 mm
9	Lower unit	1	
10	Rubber seal	1	
11	Pins	2	
12	Bolts/washers	4/4	For SUL model: 8 × 30 mm
13	Extension	1	
14	Pins	2	
15	Rubber seal	1	
16	Circlip	1	
17	Damper	1	
18	Bushing	1	
			For installation, reverse the removal procedures.

SERVICE POINTS**Inspecting the propeller**

1. Inspect:

- Blades
- Splines

Cracks/damage/wear → Replace.

LOWR



BAGIAN BAWAH

IN

BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan bagian bawah		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Cotter pin	1	
2	Mur baling-baling	1	
3	Plain washer	1	
4	Baling-baling	1	
5	Spacer	1	
6	Mur	1	
7	Mur	1	
8	Baut / washer	4/4	8 x 30 mm
9	Bagian bawah	1	
10	Seal karet	1	
11	Pen	2	
12	Baut / washer	4/4	Untuk model SUL : 8 x 30 mm
13	Perpanjangan	1	
14	Pen	2	
15	Seal karet	1	
16	Circlip	1	
17	Damper	1	
18	Bushing	1	
			Untuk memasang kembali, balik langkah-langkah pelepasan.

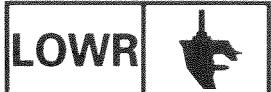
TITIK-TITIK PERAWATAN

Memeriksa baling-baling

1. Periksa :

- Bilah baling-baling
- Spline

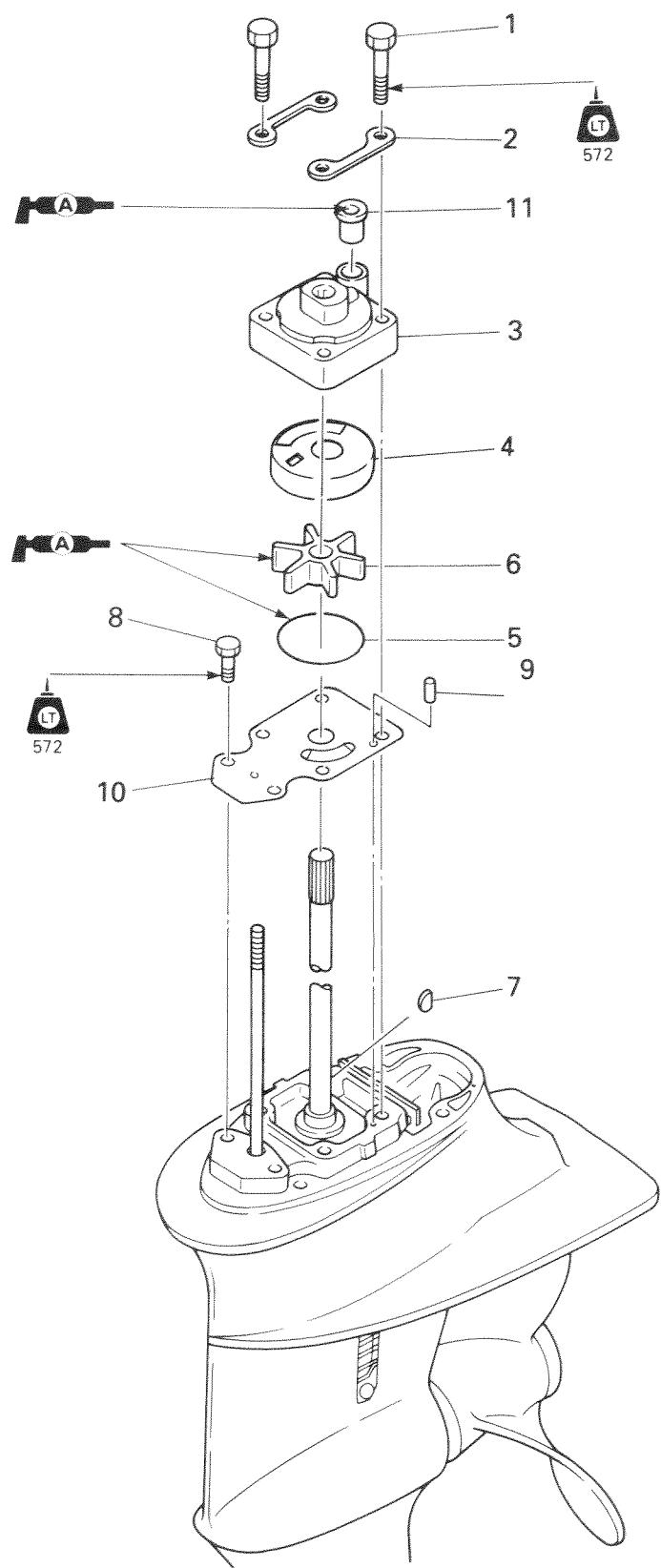
Jika retak/rusak/aus → Ganti.



WATER PUMP

(E)

WATER PUMP EXPLODED DIAGRAM



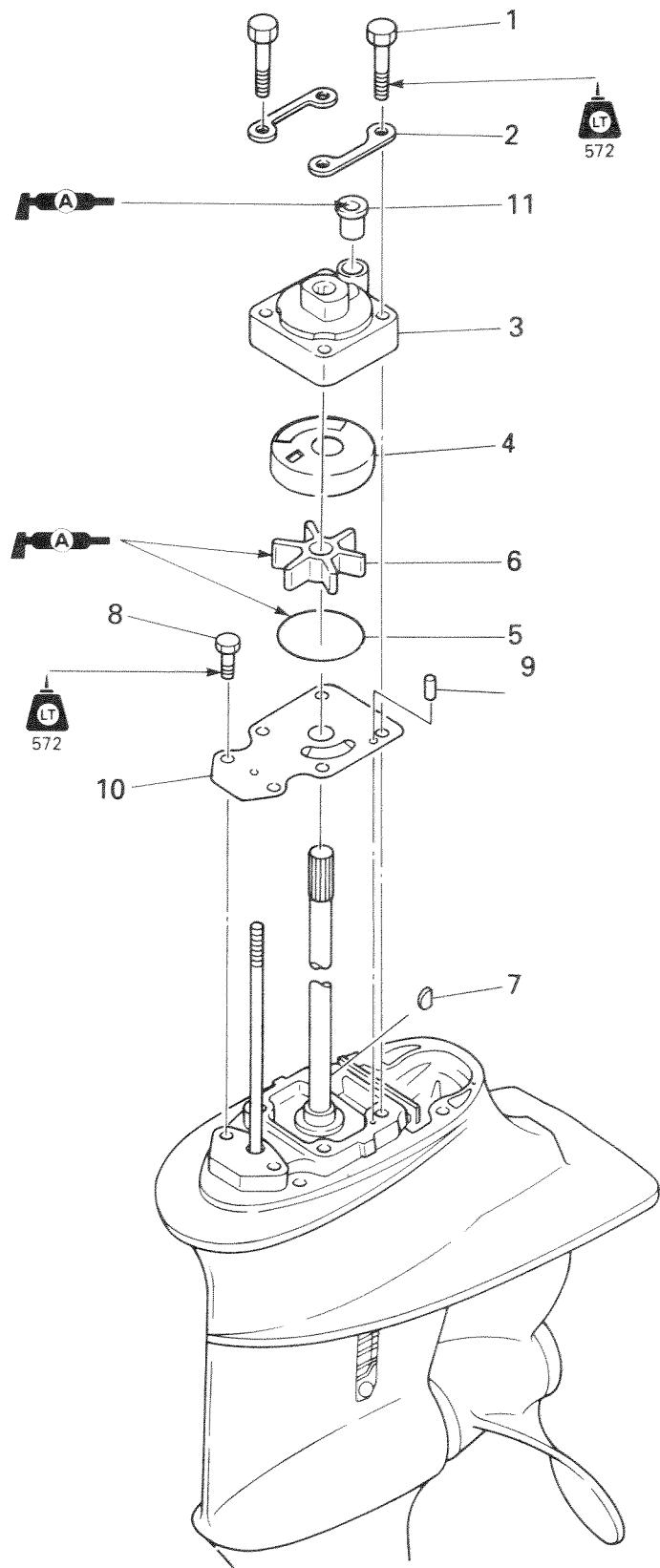
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POMPA AIR

IN

POMPA AIR
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI



LOWR



WATER PUMP

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the water pump Lower unit assembly		Remove the parts in the order below. Refer to "LOWER UNIT".
1	Bolts	4	
2	Plates	2	
3	Water pump housing	1	
4	Water pump cartridge	1	NOTE: _____ During installation, align the notch in the water pump cartridge with the slot on the water pump housing.
5	O-ring	1	
6	Impeller	1	NOTE: _____ During installation, align the notch in the impeller with the woodruff key.
7	Woodruff key	1	
8	Bolts	2	8 × 25 mm
9	Pins	2	
10	Water pump cartridge plate	1	
11	Rubber water seal	1	For installation, reverse the removal procedures.

SERVICE POINTS

Inspecting the water pump housing

1. Inspect:

- Water pump housing
Cracks/damage → Replace.

Inspecting the impeller, water pump cartridge and water pump cartridge plate

1. Inspect:

- Impeller
- Water pump cartridge
- Water pump cartridge plate
Cracks/damage → Replace.

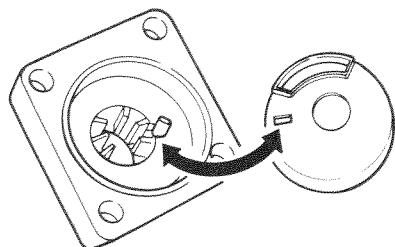
Installing the water pump cartridge

1. Install:

- Water pump cartridge

NOTE: _____

Align the notch in the water pump cartridge with the slot on the water pump housing.



LOWR



POMPA AIR

IN

BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan pompa air		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini. Lihat "BAGIAN BAWAH"
1	Baut	4	
2	Pelat	2	
3	Rumah pompa air	1	
4	Cartridge pompa air	1	CATATAN : Sewaktu memasang, pertemukan takik pada cartridge pompa air dengan celah pada rumah pompa air.
5	O-ring	1	
6	Impeller	1	CATATAN : Sewaktu memasang, pertemukan takik pada impeller dengan woodruff key.
7	Woodruff key	1	8 x 25 mm
8	Baut	2	
9	Pen	2	
10	Pelat cartridge pompa air	1	
11	Seal air karet	1	Untuk memasang kembali, balik langkah-langkah pelepasan.

TITIK-TITIK PERAWATAN

Memeriksa rumah pompa air

1. Periksa :

- Rumah pompa air
Jika retak/rusak → Ganti.

Memeriksa impeller, cartridge pompa air dan pelat cartridge pompa air

1. Periksa :

- Impeller
- Cartridge pompa air
- Pelat cartridge pompa air
Jika retak/rusak → Ganti.

Memasang cartridge pompa air

1. Pasang :

- Cartridge pompa air

CATATAN :

Pertemukan takik pada cartridge pompa air dengan celah pada rumah pompa air.

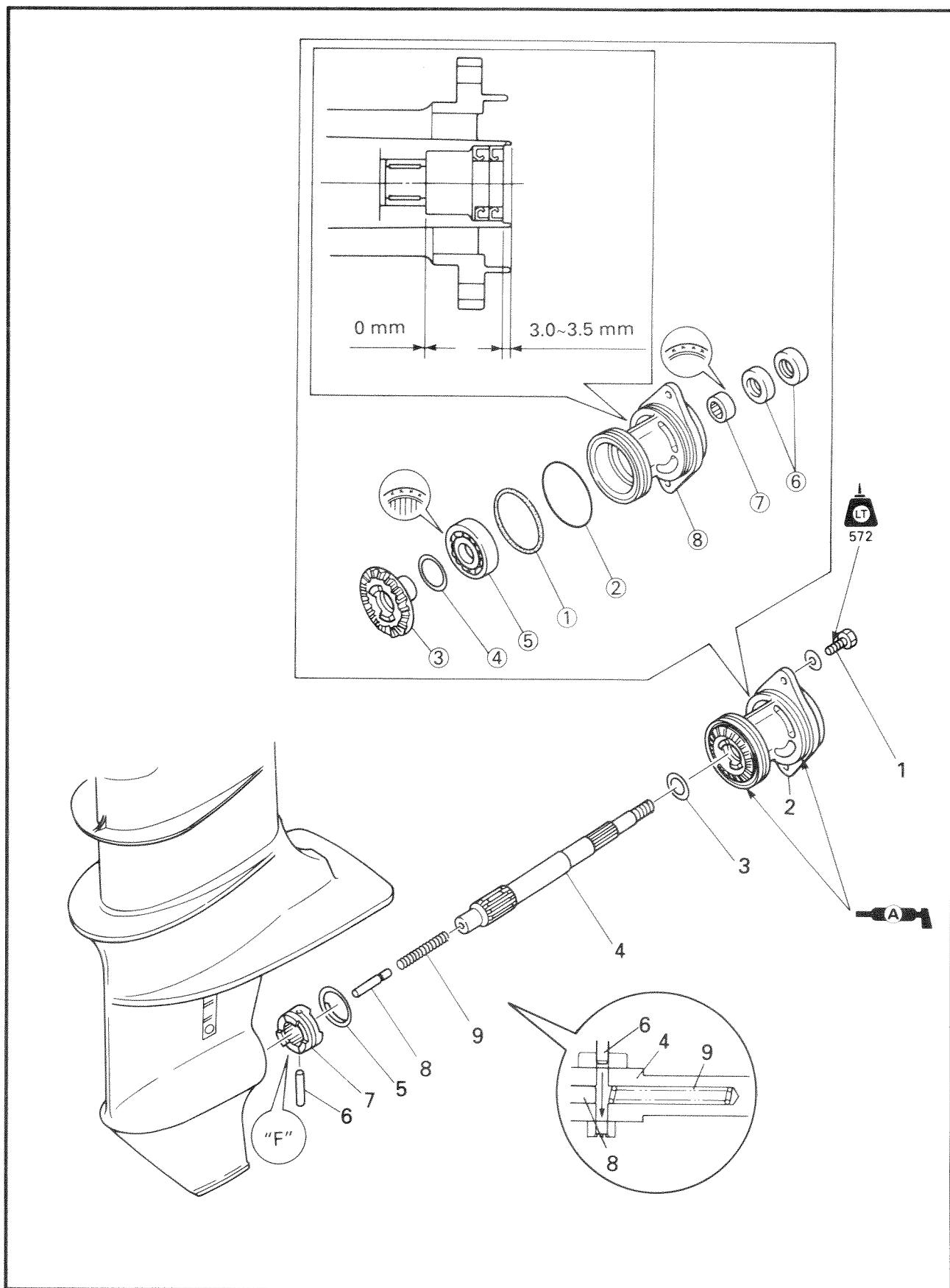
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PROPELLER SHAFT AND REVERSE GEAR

B

PROPELLER SHAFT AND REVERSE GEAR EXPLODED DIAGRAM



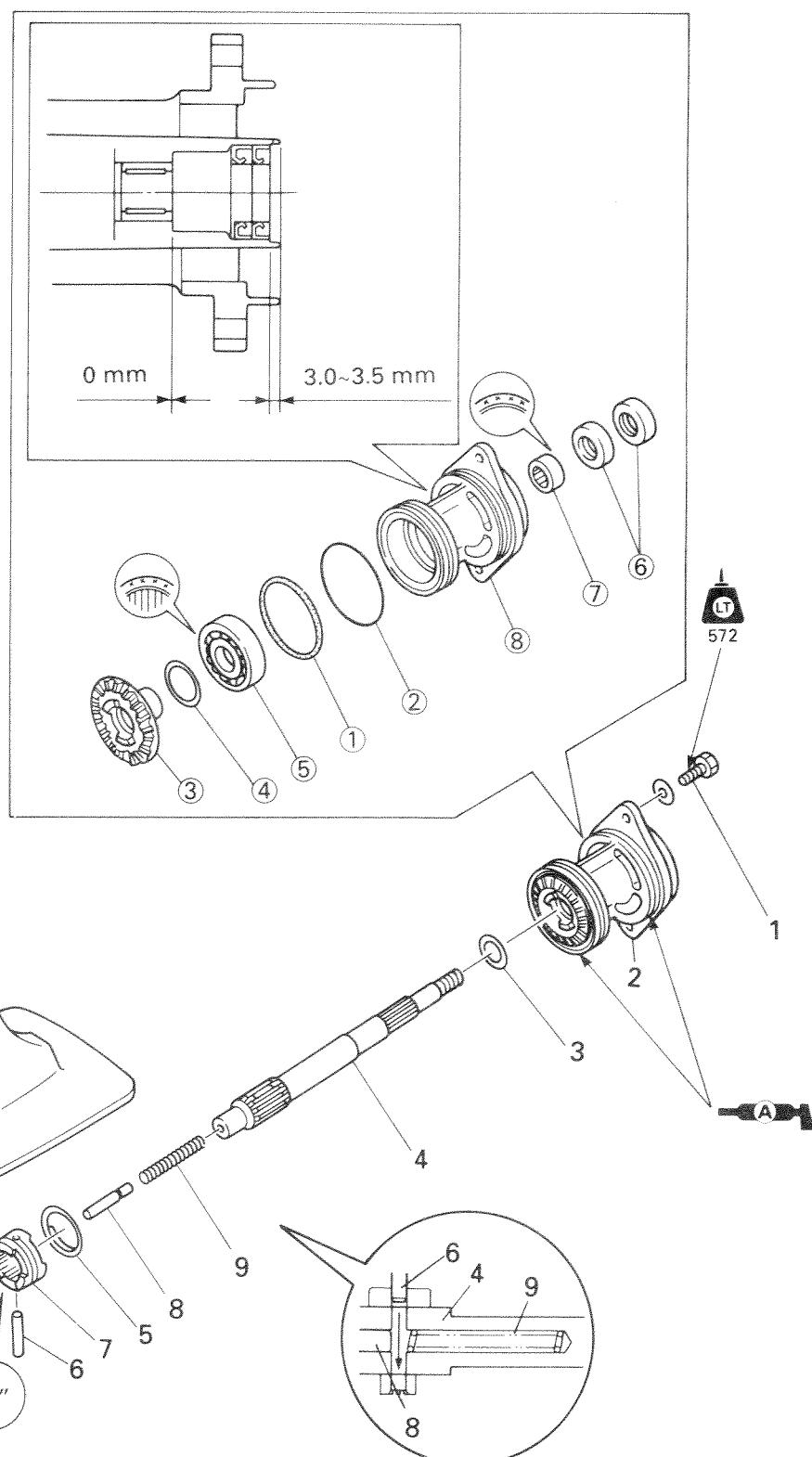
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POROS BALING-BALING DAN RODA GIGI MUNDUR

IN

POROS BALING-BALING DAN RODA GIGI MUNDUR DIAGRAM BAGIAN-BAGIAN SECARA TERURAI



LOWR



PROPELLER SHAFT AND REVERSE GEAR

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the propeller shaft and reverse gear		Remove the parts in the order below.
	Gear oil		Refer to "LOWER UNIT" in chapter 3.
	Propeller		Refer to "LOWER UNIT".
1	Bolts/washers (propeller shaft housing)	2/2	6 × 20 mm
2	Propeller shaft housing	1	
3	Plate washer	1	
4	Propeller shaft	1	
5	Cross pin ring	1	
6	Cross pin	1	
7	Dog clutch	1	NOTE: _____ Install the dog clutch with the "F" mark facing towards the forward gear side. _____
8	Shift plunger	1	
9	Spring	1	
	Disassembling the propeller shaft housing		
①	O-ring	1	
②	O-ring	1	
③	Reverse gear	1	
④	Reverse gear shim	*	
⑤	Ball bearing	1	
⑥	Oil seals	2	
⑦	Needle bearing	1	
⑧	Propeller shaft housing	1	For installation, reverse the removal procedures.

*: As required



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

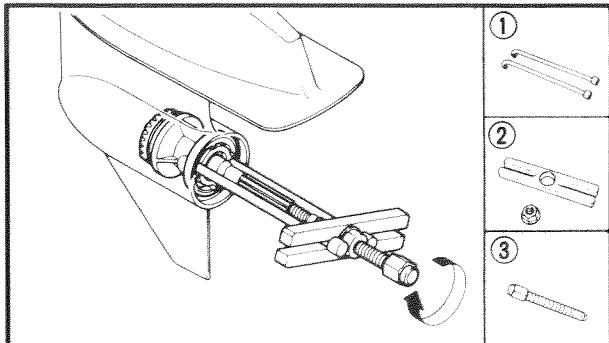
Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan poros baling-baling dan roda gigi mundur		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini. Lihat "BAGIAN BAWAH" pada bab. 3.
1	Minyak pelumas roda gigi		Lihat "BAGIAN BAWAH"
1	Baling-baling		6 x 20 mm
1	Baut / washer (rumah poros baling-baling)	2/2	
2	Rumah poros baling-baling	1	
3	Washer pelat	1	
4	Poros baling-baling	1	
5	Cross pin ring	1	
6	Cross pin	1	
7	Dog clutch	1	CATATAN : Pasang dog clutch dengan tanda "F" menghadap ke arah sisi roda gigi maju.
8	Shift plunger	1	
9	Pegas	1	
	Membongkar rumah poros		
	Baling-baling		
①	O-ring	1	
②	O-ring	1	
③	Roda gigi mundur	1	
④	Shim roda gigi mundur	*	
⑤	Bantalan bola	1	
⑥	Seal oli	2	
⑦	Bantalan jarum	1	
⑧	Rumah poros baling-baling	1	Untuk memasang kembali, balik langkah-langkah pelepasan.

*: Sesuai kebutuhan

LOWR

PROPELLER SHAFT AND REVERSE GEAR

E



SERVICE POINTS

Removing the propeller shaft housing

1. Remove:

- Propeller shaft housing

**Bearing housing puller:**

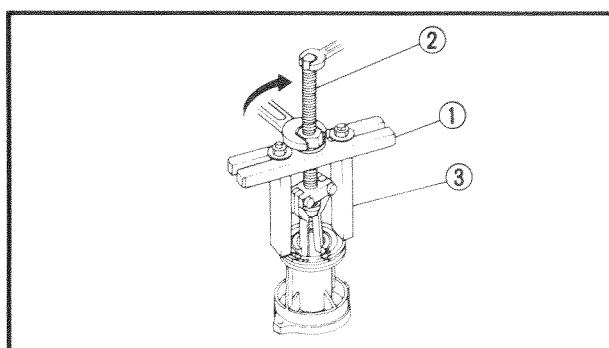
90890-06503 ①

Stopper guide plate:

90890-06501 ②

Center bolt:

90890-06504 ③



Disassembling the propeller shaft housing

1. Remove:

- Ball bearing

**Stopper guide plate:**

90890-06501 ①

Bearing puller:

90890-06535 ②

Stopper guide stand:

90890-06538 ③

2. Remove:

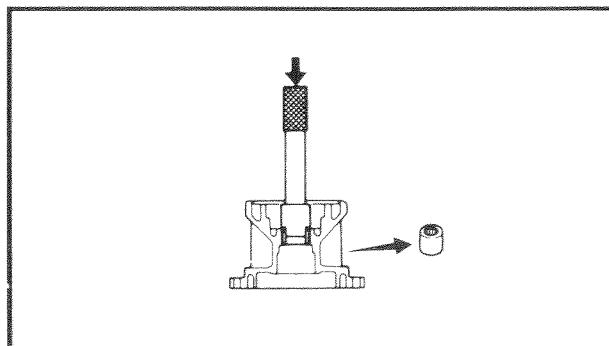
- Needle bearing

**Driver rod:**

90890-06604 ①

Needle bearing attachment:

90890-06616 ②



Inspecting the reverse gear

1. Inspect:

- Teeth
- Slots

Damage/wear → Replace.

**TITIK-TITIK PERAWATAN****Melepaskan rumah poros baling-baling**

1. Lepaskan :

- Rumah poros baling-baling

	Penarik rumah bearing :
	90890-06503 ①
	Stopper guide plate :
	90890-06501 ②
	Baut tengah :
	90890-06504 ③

Membongkar rumah poros baling-baling

1. Lepaskan :

- Ball bearing

	Stopper guide plate :
	90890-06501 ①
	Penarik bearing :
	90890-06535 ②
	Stopper guide stand :
	90890-06538 ③

2. Lepaskan :

- Bearing jarum

	Batang penggerak :
	90890-06604
	Pelengkap bantalan jarum :
	90890-06616

Memeriksa roda gigi mundur

1. Periksa :

- Gigi
 - Celah
- Jika rusak/aus → Ganti.

LOWR

PROPELLER SHAFT AND REVERSE GEAR

E

Inspecting the ball bearing and needle bearing

1. Inspect:

- Ball bearing
- Needle bearing

Excessive noise/pitting → Replace.

Inspecting the propeller shaft housing

1. Clean:

- Propeller shaft housing
Use a soft brush and solvent.

2. Inspect:

- Propeller shaft housing
Cracks/damage → Replace.

Inspecting the clutch dog

1. Inspect:

- Clutch dog
Damage/wear → Replace.

Inspecting the propeller shaft

1. Inspect:

- Propeller shaft
Damage/wear → Replace.

Assembling the propeller shaft housing

1. Install:

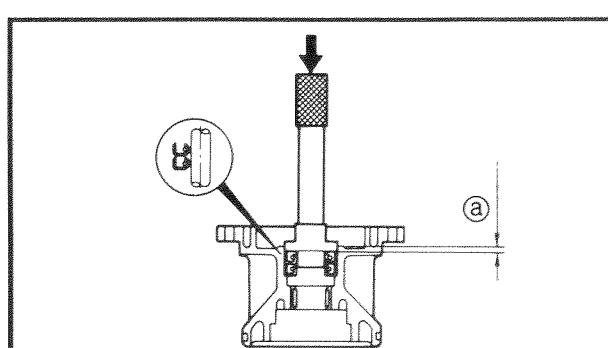
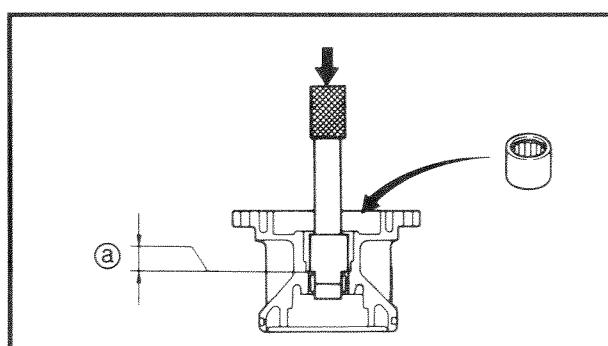
- Needle bearing



Depth ①:
0 mm (0 in)



Driver rod:
90890-06604
Needle bearing attachment:
90890-06616



2. Install:

- Oil seal



Depth ①:
3.0 ~ 3.5 mm (0.12 ~ 0.14 in)



Oil seal installer:
90890-06613
Driver rod:
90890-06652

**Memeriksa bantalan bola dan bantalan jarum**

1. Periksa :

- Bantalan bola
- Bantalan jarum

Jika ada suara berlebihan/ada bintik-bintik → Ganti.

Memeriksa rumah poros baling-baling

1. Bersihkan :

- Rumah poros baling-baling
Gunakan sikat lembut dan zat pelarut.

2. Periksa :

- Rumah poros baling-baling
Jika retak/rusak → Ganti.

Memeriksa clutch dog

1. Periksa :

- Clutch dog
Jika rusak/aus → Ganti.

Memeriksa poros baling-baling

1. Periksa :

- Poros baling-baling
Jika rusak/aus → Ganti.

Memasang rumah poros baling-baling

1. Pasang :

- Bantalan jarum



Kedalaman @:
0 mm (0 in)



Batang penggerak :
90890-06604
Perlengkapan bantalan jarum :
90890-06616

2. Pasang :

- Seal oli



Kedalaman @:
3.0 ~ 3.5 mm (0.12 ~ 0.14 in)



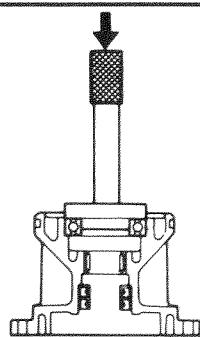
Pemasangan seal oli :
90890-06613
Batang penggerak :
90890-06652

LOWR



PROPELLER SHAFT AND REVERSE GEAR

(E)



3. Install:

- Ball bearing



Bearing installer:
90890-06640

LOWR



POROS BALING-BALING DAN RODA GIGI MUNDUR

(IN)

3. Pasang :

- Ball bearing (bantalan bearing)



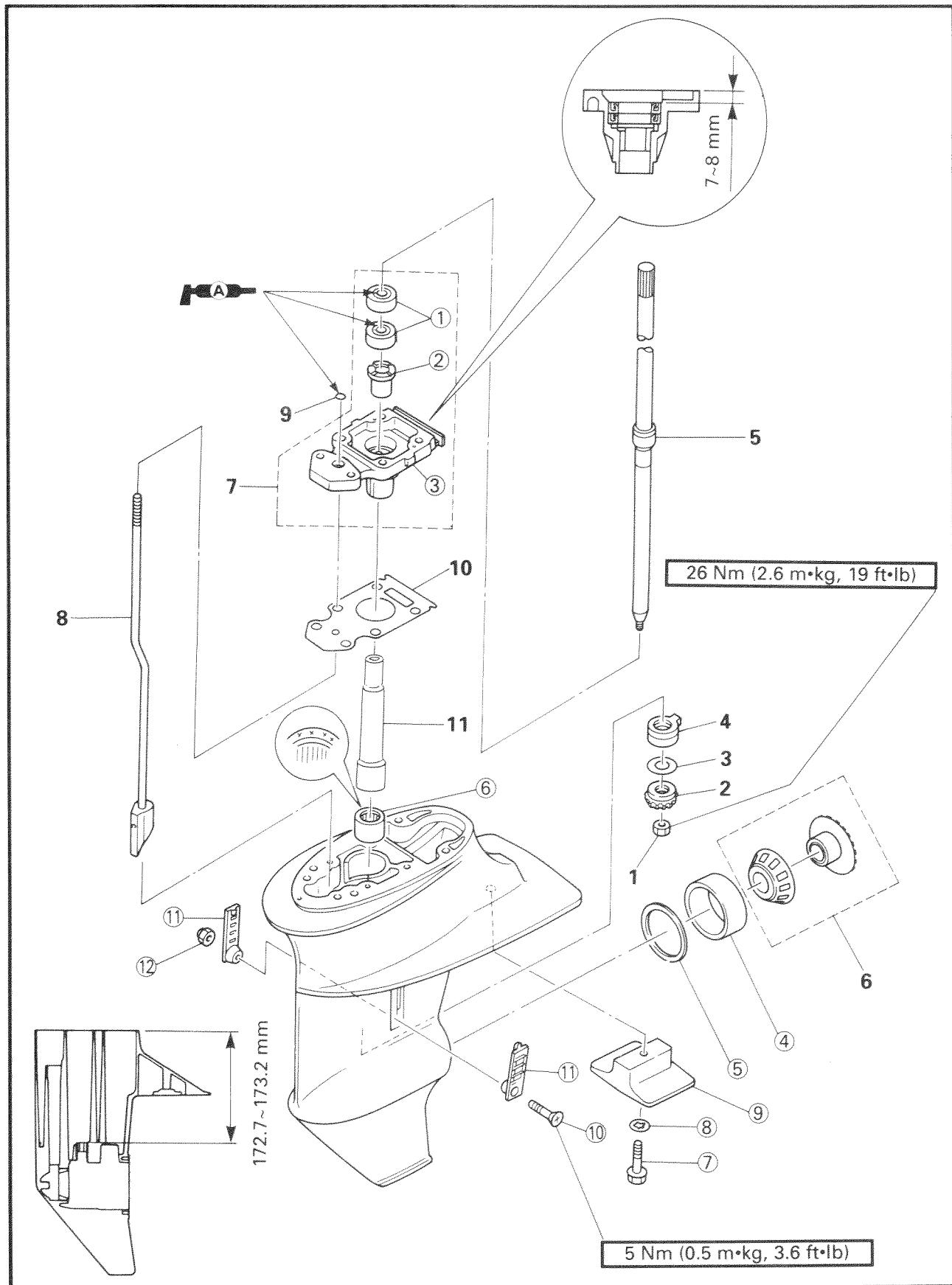
Pemasangan bearing :
90890-06640



DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD

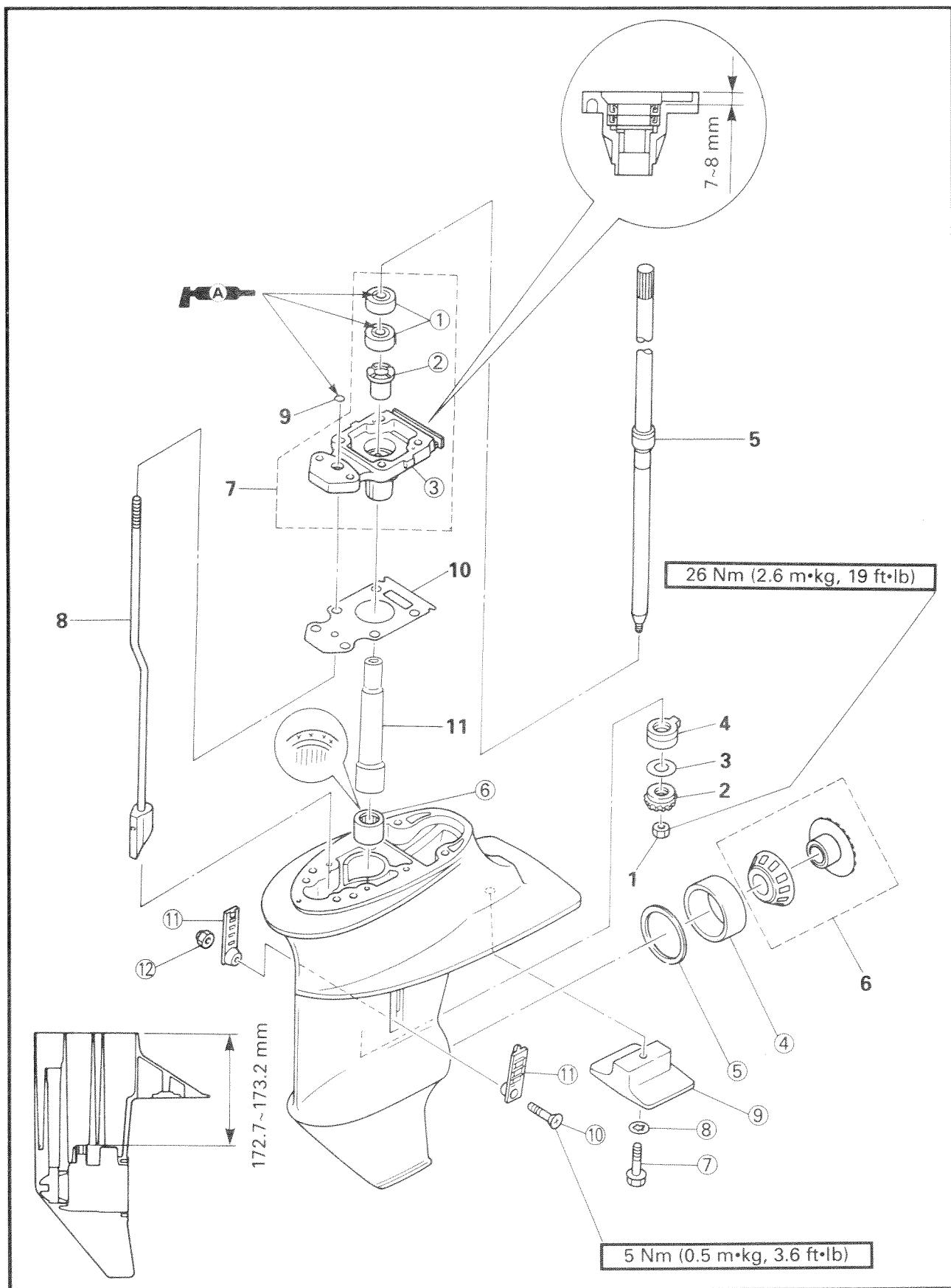
(E)

DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD EXPLODED DIAGRAM





POROS PENGGERAK, RODA GIGI MAJU DAN SHIFT ROD DIAGRAM BAGIAN-BAGIAN SECARA TERURAI





DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD

(E)

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the drive shaft, forward gear and shift rod		Remove the parts in the order below.
1	Propeller shaft		Refer to "PROPELLER SHAFT AND REVERSE GEAR".
2	Impeller		Refer to "WATER PUMP".
1	Pinion nut	1	
2	Pinion gear	1	
3	Shim	1	
4	Thrust bearing	1	
5	Drive shaft	1	
6	Forward gear assembly	1	
7	Bearing housing	1	
8	Shift rod	1	
9	O-ring	1	
10	Bearing housing gasket	1	
11	Collar	1	
	Disassembling the bearing housing		
①	Oil seals	2	
②	Bushing	1	
③	Bearing housing	1	
	Disassembling the lower case		
④	Forward gear bearing outer race	1	
⑤	Forward gear shim	*	
⑥	Needle bearing	1	
⑦	Bolt	1	8 × 30 mm
⑧	Toothed washer	1	
⑨	Anode	1	
⑩	Screw	1	
⑪	Water inlet covers	2	
⑫	Nut	1	
			For installation, reverse the removal procedures.

*: As required

LOWR



POROS PENGGERAK, RODA GIGI MAJU DAN SHIFT ROD

IN

BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

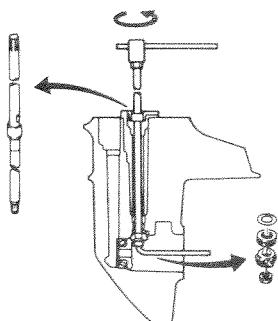
Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan poros penggerak, roda gigi maju dan shift rod		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Poros baling-baling		Lihat "POROS BALING-BALING DAN RODA GIGI MUNDUR".
2	Impeller		Lihat "POMPA AIR".
3	Mur pinion	1	
4	Roda gigi pinion	1	
5	Shim	1	
6	Thrust bearing	1	
7	Poros penggerak	1	
8	Montase roda gigi maju	1	
9	Rumah bearing	1	
10	Shift rod	1	
11	O-ring	1	
12	Gasket rumah bearing	1	
	Collar	1	
Membongkar rumah bearing			
①	Seal oli	2	
②	Bushing	1	
③	Rumah bearing	1	
Membongkar bak bawah			
④	Outer race bantalan roda gigi maju (forward gear bearing outer race)	1	
⑤	Shim roda gigi maju	*	
⑥	Bantalan jarum	1	
⑦	Baut	1	8 x 30 mm
⑧	Washer bergigi	1	
⑨	Anoda	1	
⑩	Sekrup	1	
⑪	Penutup jalan masuk air	2	
⑫	Mur	1	
			Untuk memasang kembali, balik langkah-langkah pelepasan.

*: Sesuai kebutuhan

LOWR

DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD

E



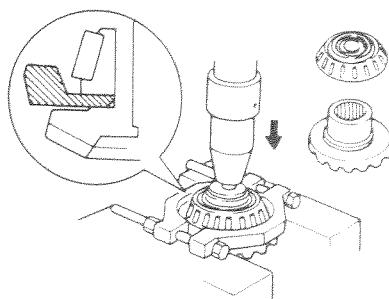
SERVICE POINTS

Removing and installing the pinion nut

1. Remove and install:
 - Pinion nut



Drive shaft holder:
90890-06515

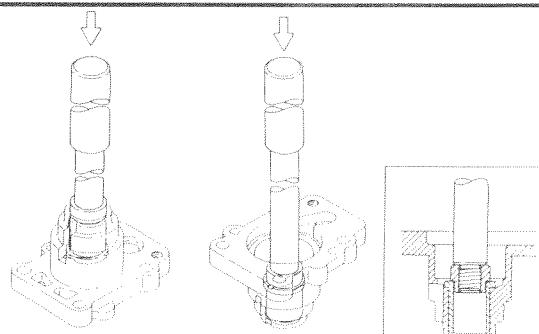


Disassembling the forward gear

1. Remove:
 - Tapered roller bearing
 - Forward gear



Bearing separator:
90890-06534

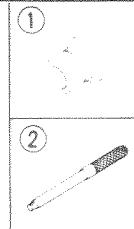
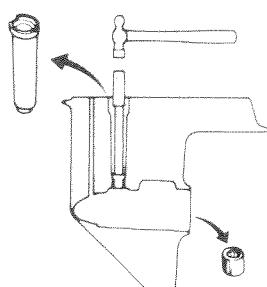


Disassembling and assembling the bearing housing

1. Remove and install:
 - Bushing



Bushing attachment:
90890-06649
Driver rod:
90890-06652

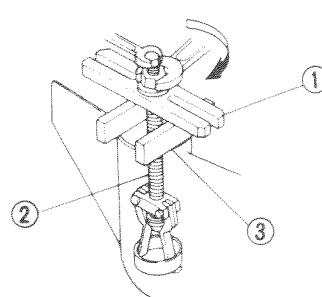


Disassembling the lower case

1. Remove:
 - Drive shaft needle bearing



Needle bearing attachment:
90890-06617 ①
Driver rod:
90890-06602 ②



2. Remove:

- Forward gear bearing outer race



Stopper guide plate:
90890-06501 ①
Bearing puller:
90890-06535 ②
Stopper guide stand:
90890-06538 ③

LOWR**POROS PENGGERAK, RODA GIGI MAJU DAN SHIFT ROD****IN****TITIK-TITIK PERAWATAN****Melepaskan dan memasang mur pinion**

1. Melepaskan dan memasang :
 - Mur pinion

**Penahan poros penggerak :**
90890-06515**Membongkar roda gigi maju**

1. Lepaskan :
 - Roller bearing tirus
 - Roda gigi maju

**Pemisah bearing :**
90890-06534**Membongkar dan memasang rumah bearing**

1. Lepaskan dan pasang :
 - Bushing

**Perlengkapan bushing :**
90890-06649
Batang penggerak :
90890-06652**Membongkar bak bawah**

1. Lepaskan :
 - Bantalan jarum poros penggerak

**Perlengkapan bantalan jarum :**
90890-06617 ①
Batang penggerak :
90890-06602 ②

2. Lepaskan :
 - Forward gear bearing outer race
(outer race bantalan roda gigi)

**Pelat stopper guider :**
90890-06501 ①
Penarik bearing :
90890-06535 ②
Dudukan stopper guide :
90890-06538 ③

LOWR

DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD

E

Inspecting the pinion and forward gear

1. Inspect:
 - Teeth
 - DogsDamage/wear → Replace.

Inspecting the drive shaft

1. Inspect:
 - Drive shaftDamage/wear → Replace.

Inspecting the shift cam

1. Inspect:
 - Shift camDamage/wear → Replace.

Inspecting the thrust bearing and needle bearing

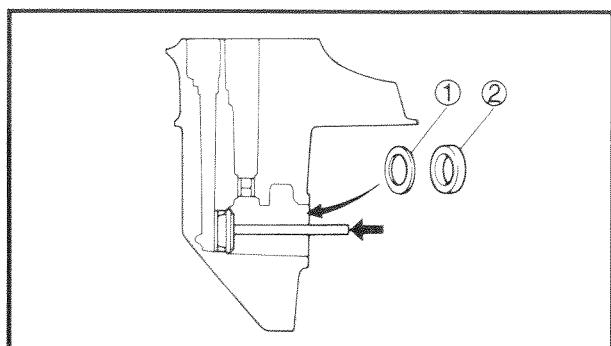
1. Inspect:
 - Thrust bearing
 - Needle bearingExcessive noise/pitting → Replace.

Inspecting the sleeve

1. Inspect:
 - SleeveDamage/wear → Replace.

Inspecting the lower case

1. Clean:
 - Gear caseUse a soft brush and solvent.
2. Inspect:
 - Water passageCorrosion/mineral deposits → Clean.
3. Inspect:
 - Lower caseCracks/damage → Replace.



Assembling the lower case

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

**Bearing installer:**

90890-06625

Driver rod:

90890-06605

**Memeriksa pinion dan roda gigi maju**

1. Periksa :

- Gigi
- Dog

Jika rusak/aus → Ganti.

Memeriksa poros penggerak

1. Periksa :

- Poros penggerak

Jika rusak/aus → Ganti.

Memeriksa shift cam

1. Periksa :

- Shift cam

Jika rusak/aus → Ganti.

Memeriksa thrust bearing dan bantalan jarum

1. Periksa :

- Thrust bearing
- Bantalan jarum

Jika suara berlebihan/ada bintik-bintik →
Ganti.

Memeriksa lengan (sleeve)

1. Periksa :

- Lengan

Jika rusak/aus → Ganti.

Memeriksa bak bawah

1. Bersihkan :

- Bak roda gigi

Gunakan sikat lembut dan zat pelarut.

2. Periksa :

- Saluran air

Jika korosi/ada endapan mineral →
Bersihkan.

3. Periksa :

- Bak bawah

Jika retak/rusak → Ganti.

Memasang bak bawah

1. Pasang :

- Shim roda gigi maju ①
- Outer race bantalan roda gigi maju ②



Pemasang bearing :

90890-066625

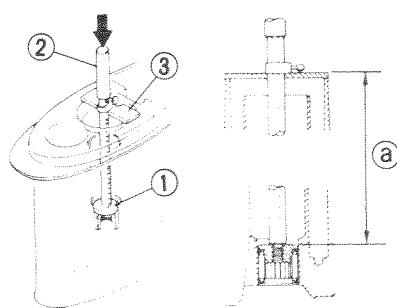
Bantalan penggerak :

90890-06605

LOWR

DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD

E

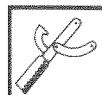


2. Install:

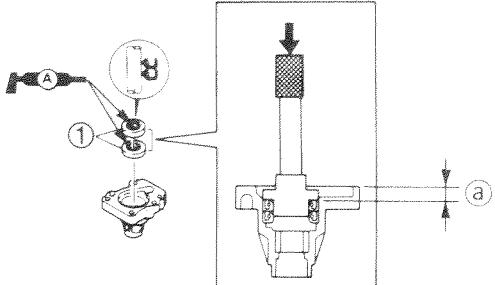
- Drive shaft needle bearing



Depth **a**:
172.7 ~ 173.2 mm (6.80 ~ 6.82 in)



Needle bearing attachment:
90890-06617 ①
Driver rod:
90890-06602 ②
Bearing depth plate:
90890-06603 ③



Assembling the drive shaft oil seal housing

1. Install:

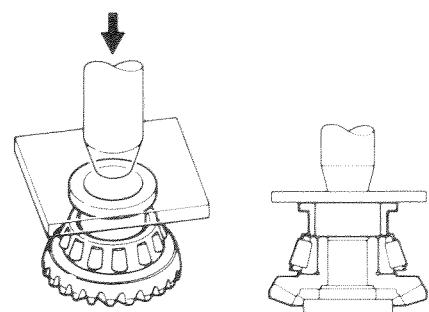
- Oil seal ①



Depth **a**:
7.0 ~ 8.0 mm (0.28 ~ 0.31 in)



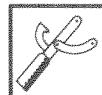
Bearing installer:
90890-06615
Driver rod:
90890-06652



Assembling the forward gear

1. Install:

- Forward gear
- Tapered roller bearing



Bearing installer:
90890-06644

LOWR



POROS PENGGERAK, RODA GIGI MAJU DAN SHIFT ROD

IN

2. Pasang :

- Bantalan jarum poros penggerak.



Kedalaman ②:
172.7 ~ 173.2 mm (6.80 ~ 6.82 in)



Perlengkapan bantalan jarum :
90890-06617 ①
Batang penggerak :
90890-06602 ②
Pelat kedalaman bearing :
90890-06603 ③

Memasang rumah seal oli poros penggerak

1. Pasang :

- Seal oli ①



Kedalaman ②:
7.0 ~ 8.0 mm (0.28 ~ 0.31 in)



Pemasang bearing :
90890-06615
Batang penggerak :
90890-06652

Memasang roda gigi maju

1. Pasang :

- Roda gigi maju
- Roller bearing tirus



Pemasang bearing :
90890-06644

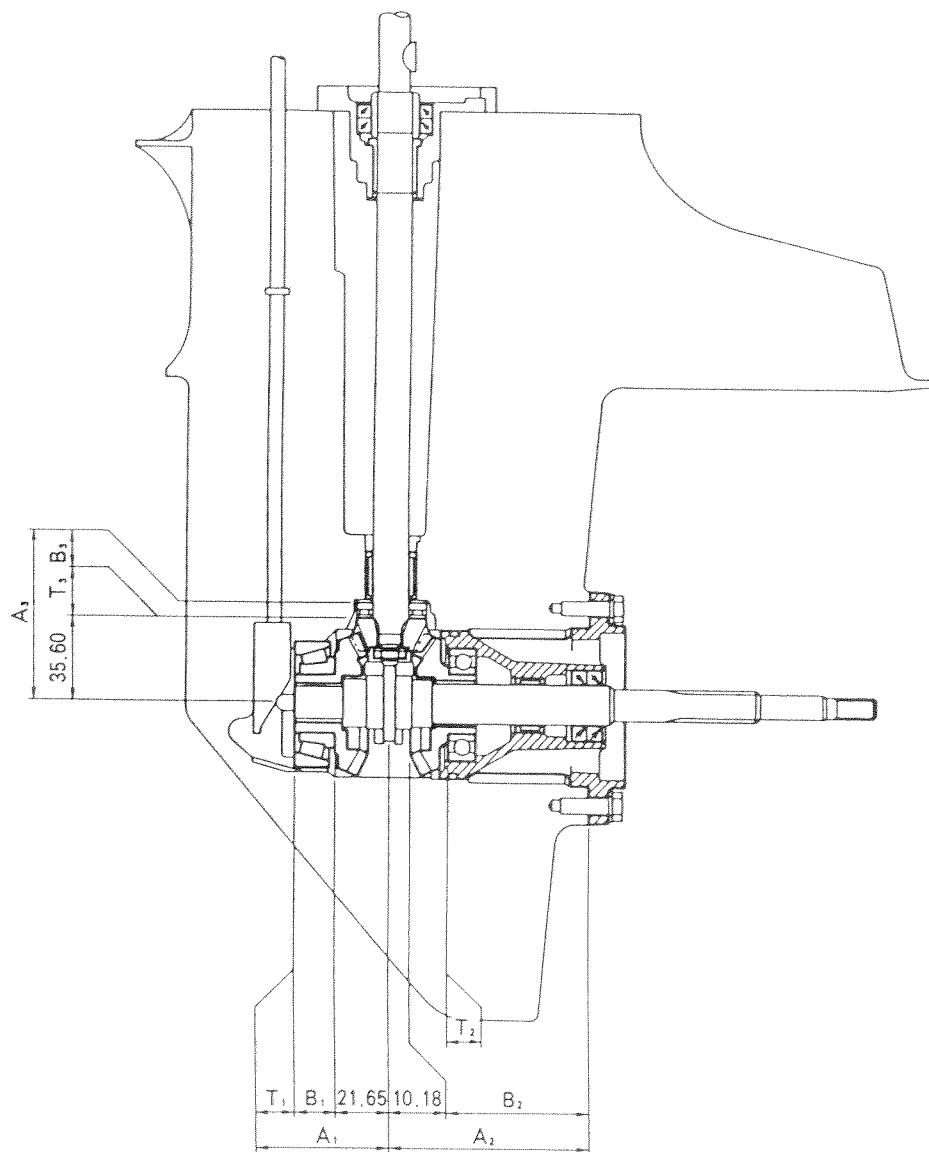
LOWR



SHIMMING

(E)

**SHIMMING
EXPLODED DIAGRAM**



unit : mm

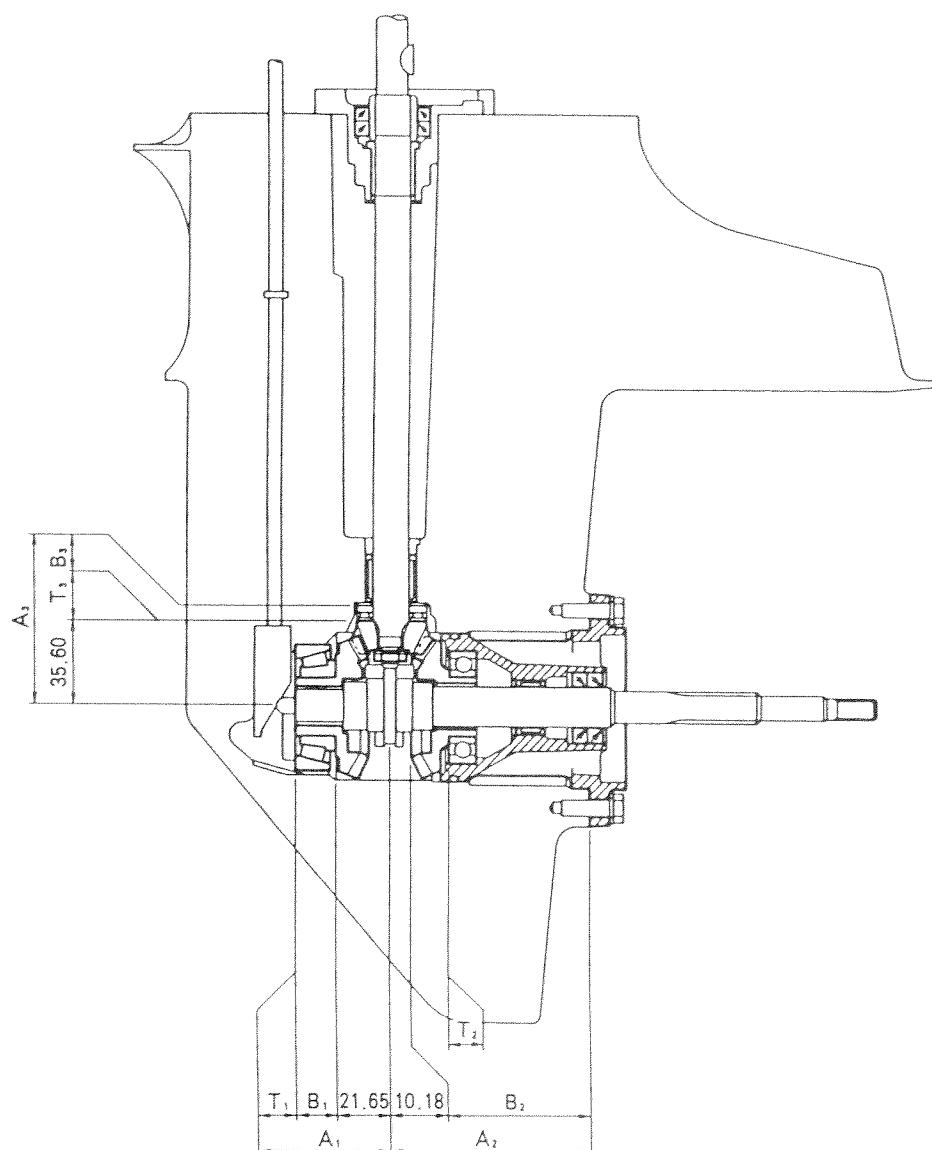
LOWR



SHIMMING

(IN)

**SHIMMING
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI**



unit : mm

LOWR**SHIMMING**

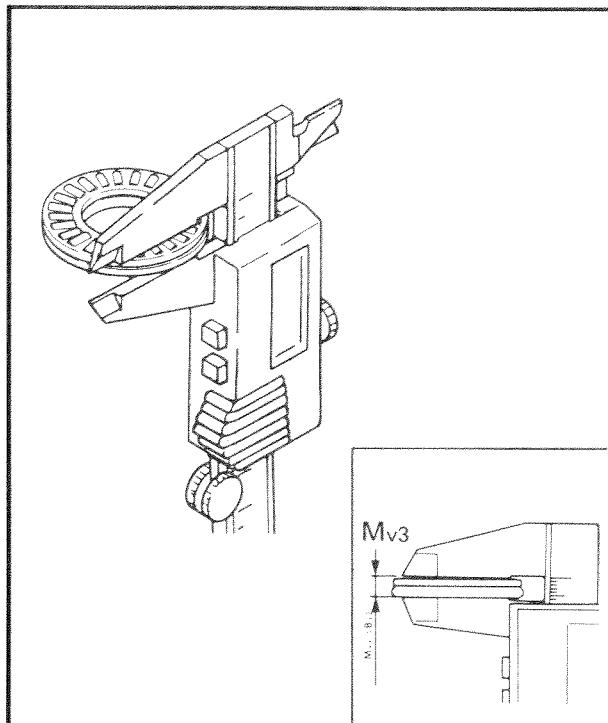
E

NOTE:

- There is no need to select shims when reassembling with the original case and inner parts.
- Shim calculations are required when reassembling with the original inner parts and a new case (the difference between the original inner parts and the new case).
- Measurements and adjustments are required when replacing the inner part(s).

SHIM SELECTION**Pinion gear shim****NOTE:**

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

**1. Measure:**

- Bearing and washer

**Digital caliper:**
90890-06704**NOTE:**

Measure the thickness (Mv3) of the bearing and washer.

2. Calculate:

- Pinion gear shim thickness (T3)

**Pinion gear shim thickness**
$$(T3) = 6.05 - Mv3 \text{ mm}$$
3. Select:

- Pinion gear shim

Calculated numeral		Shim size to use
more than	or less	
1.13	1.20	1.13
1.20	1.30	1.20
		Available shim thickness: 1.13 and 1.20 mm

LOWR**SHIMMING**

IN

CATATAN :

- Tidak perlu memilih shim sewaktu memasang kembali dengan bak dan bagian-bagian dalam orisinil.
- Penghitungan shim diperlukan sewaktu memasang kembali dengan bagian-bagian dalam orisinil dan bak baru (perbedaan antara bagian-bagian dalam orisinil dan bak baru).
- Pengukuran dan penyetelan diperlukan sewaktu mengganti bagian-bagian dalam.

PEMILIHAN SHIM**Shim roda gigi pinion****CATATAN :**

Cari ketebalan shim roda gigi pinion (T3) dengan memilih shim sampai ukuran yang ditentukan ditemukan.

1. Ukur :

- Bearing dan washer.

**Digital caliper :**
90890-06704**CATATAN :**

Ukur ketebalan (Mv3) bearing dan washer.

2. Hitung :

- Ketebalan shim roda gigi pinion (T3)

**Ketebalan shim roda gigi pinion
(T3) = 6.05 - Mv3 mm****3. Pilih :**

- Shim roda gigi pinion.

Angka yang dihitung	Ukuran shim yang digunakan
Lebih dari atau kurang	
1.13	1.20
1.20	1.30

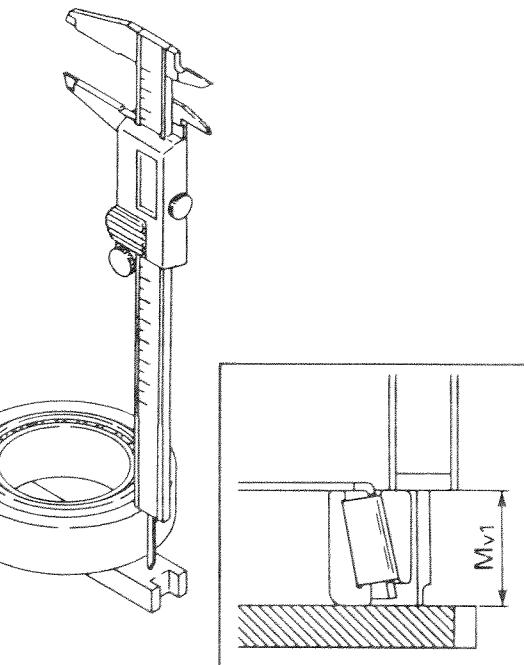
**Ketebalan shim yang ada :
1.13 dan 1.20 mm**

LOWR



SHIMMING

E



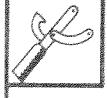
Forward gear shim

NOTE:

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

1. Measure:

- Shimming plate and bearing outer race

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

NOTE:

Measure the length between the shimming plate and the bearing outer race (Mv1) after turning the outer race two to three times.

2. Calculate:

- Forward gear shim thickness (T1)

 Forward gear shim thickness
(T1) = 16.60 - Mv1

3. Select:

- Forward gear shim

Calculated numeral at 1/100th place		Shim size to use
more than	or less	
0.00	0.02	0.00
0.02	0.05	0.02
0.05	0.08	0.05
0.08	0.10	0.08

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

Example:

If T1 is "0.44 mm",
then the forward gear shim = 0.42 mm

If T1 is "0.45 mm",
then the forward gear shim = 0.45 mm

LOWR**SHIMMING**

IN

Shim roda gigi maju**CATATAN :**

Cari ketebalan shim roda gigi maju (T1) dengan memilih shim sampai ukuran yang ditentukan ditemukan.

1. Ukur :

- Pelat shimming dan bearing outer race.

**Pelat shimming :**

90890-06701

Digital caliper :

90890-06704

CATATAN :

Ukur panjang antara pelat shimming dan bearing outer race (Mv1) setelah memutar outer race dua atau tiga kali.

2. Hitung :

- Ketebalan shim roda gigi maju (T1).

**Ketebalan shim roda gigi maju
(T1) = 16.60 - Mv1****3. Pilih :**

- Shim roda gigi maju.

Angka yang dihitung pada tempat ke-1/100		Angka yang dibulatkan
Lebih dari	atau kurang	
0.00	0.02	0.00
0.02	0.05	0.02
0.05	0.08	0.05
0.08	0.10	0.08

**Ketebalan shim yang ada :**
0.10, 0.12, 0.15, 0.18, 0.30, 0.40
dan 0.50 mm**Contoh :**

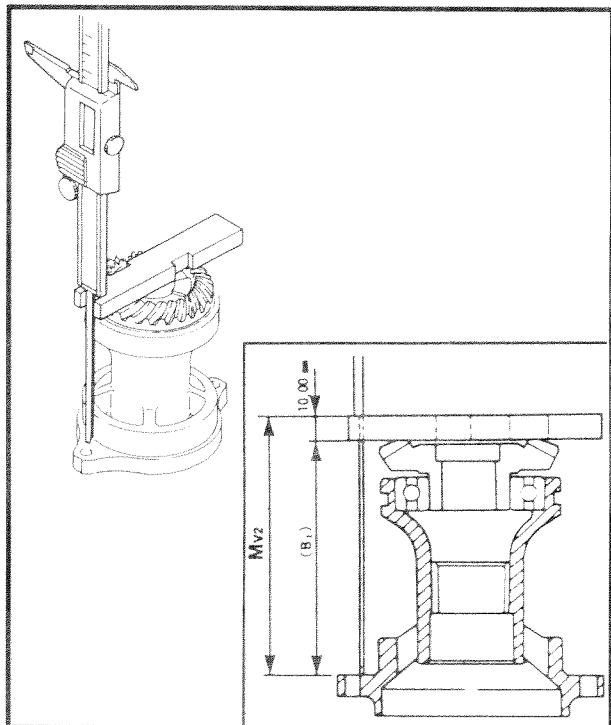
Jika T1 = "0.44 mm",
maka shim roda gigi maju = 0.42 mm
Jika T1 = "0.45 mm",
maka shim roda gigi maju = 0.45 mm

LOWR**SHIMMING**

E

Reverse gear shim**NOTE:**

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

**1. Measure:**

- Reverse gear



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

NOTE:

Before measuring the reverse gear (Mv2), remove the shim(s).

2. Calculate:

- Reverse gear shim thickness (T2)



Reverse gear shim thickness
(T2) = 80.57 – Mv2

3. Select:

- Reverse gear shim

Calculated numeral at 1/100th place		Shim size to use
more than	or less	
0.30	0.40	0.30
0.40	0.50	0.40
0.50	0.60	0.50
0.60	0.70	0.60

Available shim thickness:
0.10, 0.20, 0.30, 0.40 and 0.50 mm

LOWR**SHIMMING**

IN

Shim roda gigi mundur**CATATAN :**

Cari ketebalan shim roda gigi mundur (T2) dengan memilih shim sampai ukuran yang ditentukan (M) ditemukan.

1. Ukur :

- Roda gigi mundur.

**Pelat shimming :**

90890-06701

Digital caliper :

90890-06704

CATATAN :

Sebelum mengukur roda gigi mundur (Mv2), lepaskan shim-shim.

2. Hitung :

- Ketebalan shim roda gigi mundur (T2).

**Ketebalan shim roda gigi mundur
(T2) = 80.57 - Mv2****3. Pilih :**

- Shim roda gigi mundur.

Angka yang dihitung pada tempat ke-1/100		Angka yang dibulatkan
Lebih dari	atau kurang	
0.30	0.40	0.30
0.40	0.50	0.40
0.50	0.60	0.50
0.60	0.70	0.60

**Ketebalan shim yang ada :
0.10, 0.20, 0.30, 0.40 dan 0.50 mm**

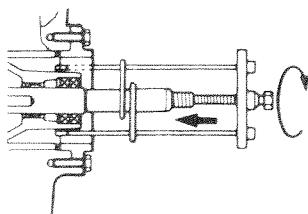
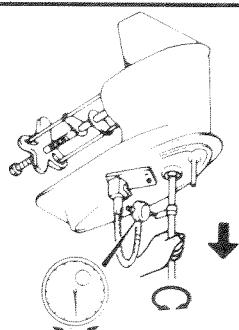
LOWR**SHIMMING**

E

BACKLASH MEASUREMENT

NOTE:

- Do not install the water pump components when measuring the backlash.
- Measure both the forward and reverse gear backlashes.
- If both the forward and reverse gear backlashes are larger than specified, the pinion gear may be too high.
- If both the forward and reverse gear backlashes are smaller than specified, the pinion gear may be too low.
- If either of these conditions exist, then check the pinion shim selection.



Forward gear

1. Measure:

- Forward gear backlash
Out of specification → Adjust.



Forward gear backlash:
0.08 ~ 0.37 mm (0.003 ~ 0.015 in)
SST:
0.19 ~ 0.86 mm (0.007 ~ 0.034 in)

Measuring steps:

- Set the shift shaft in the forward position.
- Position the bearing housing puller to push the propeller shaft.



Bearing housing puller:
90890-06503
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 onto the drive shaft (12.8 mm in diameter).



Backlash indicator:
90890-06706

LOWR**SHIMMING**

IN

PENGUKURAN SELIP BALIK (BACKLASH)**CATATAN :**

- Jangan memasang komponen-komponen pompa air sewaktu mengukur selip balik.
- Ukur kedua selip balik roda gigi maju maupun mundur.
- Jika kedua selip balik roda gigi maju dan mundur lebih besar daripada yang ditentukan, roda gigi pinion mungkin terlalu tinggi.
- Jika kedua selip balik roda gigi maju dan mundur lebih kecil daripada yang ditentukan, roda gigi pinion mungkin terlalu rendah.
- Jika ada salah satu kondisi ini, periksalah pemilihan pinion shim.

Roda gigi maju1. **Ukur :**

- Selip balik roda gigi maju.
Jika tidak sesuai spesifikasi → Setel.



Selip balik roda gigi maju :
0.80 ~ 0.37 mm (0.003 ~ 0.015 in)

SST :

0.19 ~ 0.86 mm (0.007 ~ 0.034 in)

Langkah-langkah pengukuran :

- Setel shift shaft dalam posisi maju.
- Taruh penarik rumah bearing untuk mendorong poros baling-baling.



Penarik rumah bearing :
90890-06503

Pelat stopper guide :
90890-06501

Baut tengah :
90890-06504



Baut tengah :
5 Nm (0.5 m • kg, 3.6 ft • lb)

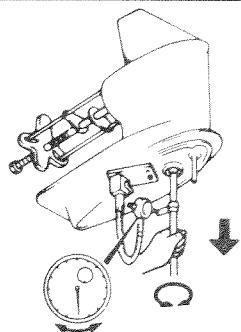
- Setel bagian bawah dengan posisi terbalik.
- Pasang indikator selip balik pada poros penggerak (dengan diameter 12.8 mm).



Indikator selip balik :
90890-06706

LOWR**SHIMMING**

E



- Attach the dial gauge onto the gear case and have the dial gauge stem contact the mark on the indicator.

**Dial gauge:**

90890-01252

Magnet base:

90890-06705

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

2. Adjust:

- Forward gear shim(s)

NOTE: _____

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

	Forward gear backlash	Shim thickness
	Less than 0.19 mm	To be decreased by $(0.38 - \text{measurement})/2.3$
	More than 0.56 mm	To be increased by $(\text{measurement} - 0.38)/2.3$
Available shim thickness: 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm		

Reverse gear

1. Measure:

- Reverse gear backlash

Out of specification → Adjust.

**Reverse gear backlash:**

0.41 ~ 0.71 mm (0.016 ~ 0.028 in)

SST:

0.95 ~ 1.65 mm (0.037 ~ 0.065 in)

LOWR**SHIMMING**

IN

- Pasang dial gauge pada bak roda gigi dan usahakan pangkal dial gauge menyentuh tanda pada indikator.

**Dial gauge :**

90890-01252

Dasar magnit :

90890-06705

- Sambil menarik poros penggerak, putar poros penggerak secara perlahan-lahan searah jarum jam dan berlawanan arah jarum jam. Sewaktu poros penggerak berhenti pada masing-masing arah, ukur selip balik.

2. Setel :

- Shim-shim roda gigi maju.

CATATAN :

Setel shim untuk ditambahkan atau dikurangi sesuai dengan spesifikasinya.

	Selip balik roda gigi maju	Ketebalan shim
	Kurang dari 0.19 mm	Untuk dikurangi dengan (0.38 - ukur- an)/2.3
	Lebih dari 0.56 mm	Untuk ditambahkan dengan (ukuran - 0.38)/ 2.3
Ketebalan shim yang ada : 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 dan 0.50 mm		

Roda gigi mundur

1. Ukur :

- Selip balik roda gigi mundur.

Jika tidak sesuai dengan spesifikasi → Setel.

**Selip balik roda gigi mundur :**

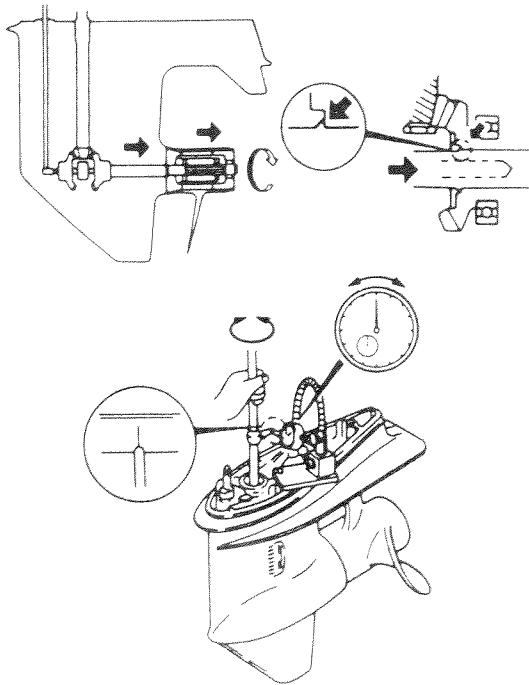
0.41 ~ 0.71 mm (0.016 ~ 0.028 in)

SST :

0.95 ~ 1.65 mm (0.037 ~ 0.065 in)

LOWR**SHIMMING**

E

**Measuring steps:**

- Set the shift shaft in the reverse position.
- Load the reverse gear by installing the propeller with the front side facing backward and tighten the propeller nut.



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

- Attach the backlash indicator onto the drive shaft (12.8 mm in diameter).



Backlash indicator:
90890-06706

- Attach the dial gauge onto the gear case and have the dial gauge stem contact the mark on the indicator.



Dial gauge:
90890-01252
Magnet base:
90890-06705

- While pulling the drive shaft, slowly turn the drive shaft clockwise and counter-clockwise. When the drive shaft stops in each direction, measure the backlash.

2. Adjust:

- Reverse gear shim(s)

NOTE:

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

	Reverse gear backlash	Shim thickness
	Less than 0.66 mm	To be decreased by (0.80 – measurement)/2.3
	More than 0.94 mm	To be increased by (measurement – 0.80)/2.3
Available shim thickness: 0.10, 0.20, 0.30, 0.40 and 0.50 mm		

LOWR**SHIMMING**

IN

Langkah-langkah pengukuran :

- Setel shift shaft dalam posisi mundur.
- Bebani roda gigi mundur dengan memasang baling-baling dengan sisi depan menghadap ke arah belakang dan kencangkan mur baling-baling.

**Mur (baling-baling):**

5 Nm (0.5 m • kg, 3.6 ft • lb)

- Pasang indikator selip balik pada poros penggerak (dengan diameter 12.8 mm).

**Indikator selip balik :**

90890-06706

- Pasang dial gauge pada bak roda gigi dan usahakan pangkal dial gauge menyentuh tanda pada indikator.

**Dial gauge:**

90890-01252

Dasar magnit :

90890-06705

- Sambil menarik poros penggerak, putar poros penggerak perlahan-lahan searah jarum jam dan berlawanan arah jarum jam. Sewaktu poros penggerak berhenti pada masing-masing arah, ukur selip balik.

2. Setel :

- Shim-shim roda gigi mundur.

CATATAN :

Setel shim-shim untuk ditambahkan atau dikurangi sesuai dengan spesifikasinya.

	Selip balik roda gigi mundur	Ketebalan shim
	Kurang dari 0.66 mm	Untuk dikurangi dengan (0.80 - ukuran)/2.3
	Lebih dari 0.94 mm	Untuk ditambahkan dengan (ukuran - 0.80)/ 2.3
Ketebalan shim yang ada :		0.10, 0.20, 0.30, 0.40 dan 0.50 mm



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BAB 7

UNIT BRACKET (SIKU)

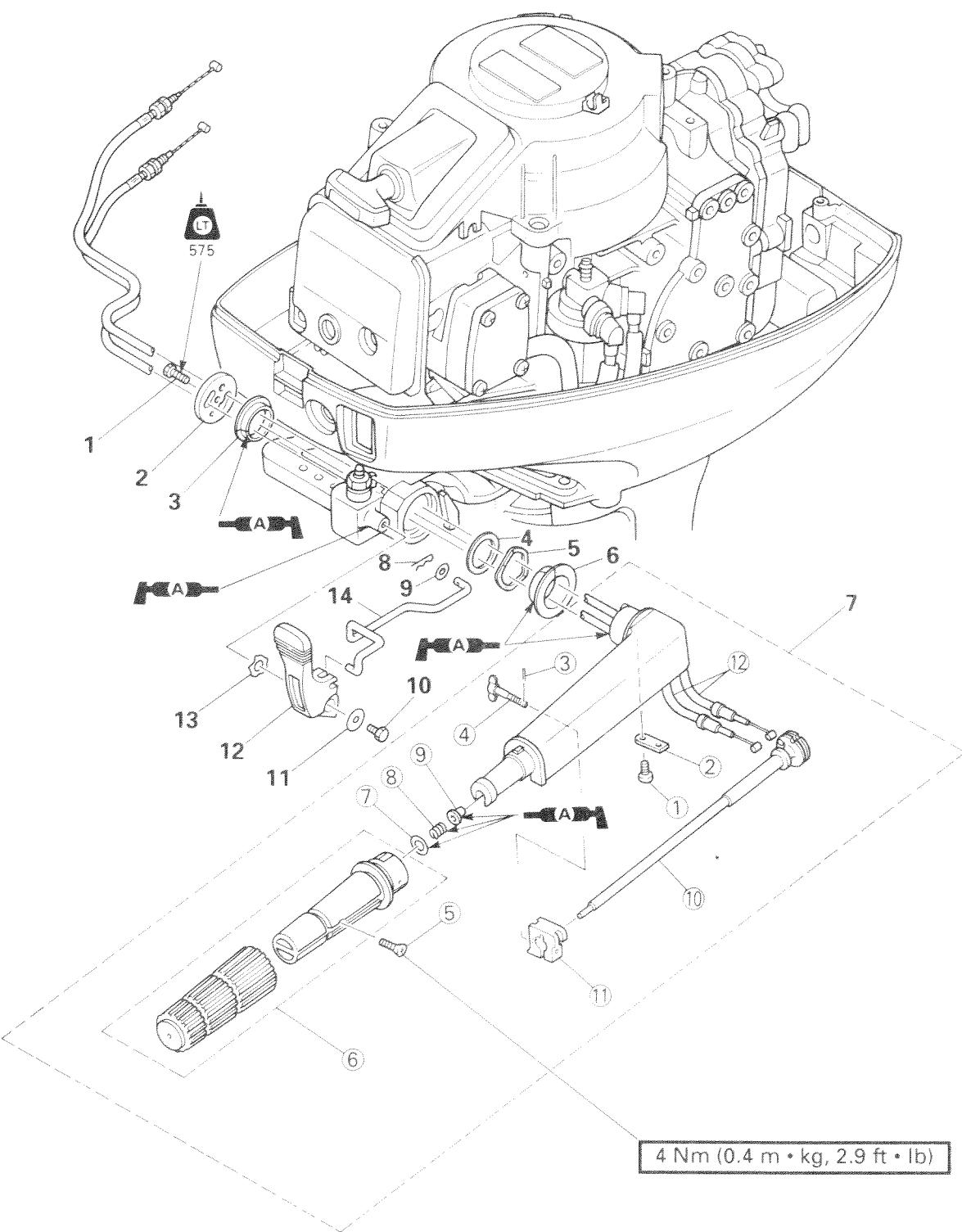
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BRKT



STEERING HANDLE AND SHIFT LEVER

E

STEERING HANDLE AND SHIFT LEVER
EXPLODED DIAGRAM

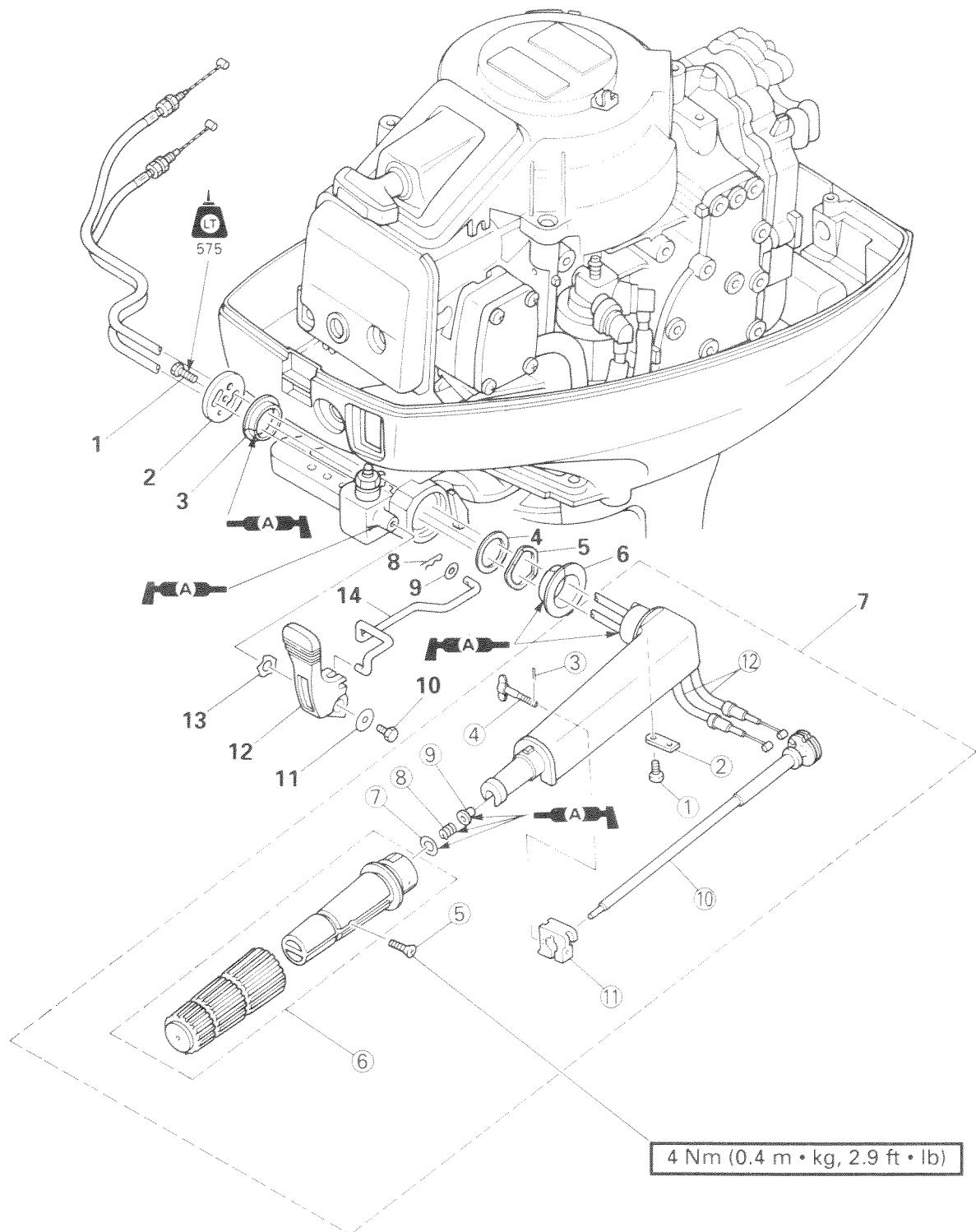
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GAGANG KEMUDI (STEERING HANDLE) DAN SHIFT LEVER

IN

GAGANG KEMUDI (STEERING HANDLE) DAN SHIFT LEVER DIAGRAM BAGIAN-BAGIAN SECARA TERURAI



BRKT



STEERING HANDLE AND SHIFT LEVER

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the steering handle Control pulley bracket assembly		Remove the parts in the order below. Refer to "POWER UNIT REMOVAL" in chapter 5.
1	Bolt	1	6 × 16 mm
2	Plate	1	
3	Bushing	1	
4	Plain washer	1	
5	Wave washer	1	
6	Bushing	1	
7	Steering handle assembly	1	
	Removing the shift lever		
8	Clip	1	
9	Plain washer	1	
10	Bolt	1	6 × 12 mm
11	Plain washer	1	
12	Shift lever	1	
13	Wave washer	1	
14	Shift link rod	1	
	Disassembling the steering handle		
①	Screws	2	
②	Plate	1	
③	Clip	1	
④	Friction adjusting screw	1	
⑤	Screw	1	
⑥	Steering grip	1	
⑦	Plain washer	1	
⑧	Spring	1	
⑨	Bushing	1	
⑩	Throttle shaft	1	
⑪	Friction piece	1	
⑫	Throttle cables	2	
			For installation, reverse the removal procedures.

BRKT



GAGANG KEMUDI (STEERING HANDLE) DAN SHIFT LEVER

IN

BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan gagang kemudi		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini. Lihat "PELEPASAN UNIT PEMBANGKIT DAYA (MESIN)" pada bab 5.
1	Baut	1	6 x 16 mm
2	Pelat	1	
3	Bushing	1	
4	Plain washer	1	
5	Wave washer	1	
6	Bushing	1	
7	Montase gagang kemudi	1	
	Melepaskan shift lever		
8	Klip	1	
9	Plain washer	1	
10	Baut	1	6 x 12 mm
11	Plain washer	1	
12	Shift lever	1	
13	wave washer	1	
14	Shift link rod	1	
	Membongkar gagang kemudi		
①	Sekrup	2	
②	Pelat	1	
③	Klip	1	
④	Sekrup penyetel friction	1	
⑤	Sekrup	1	
⑥	Steering grip	1	
⑦	Plain washer	1	
⑧	Pegas	1	
⑨	Bushing	1	
⑩	Poros gas	1	
⑪	Friction piece	1	
⑫	Kabel gas	2	
			Untuk memasang kembali, balik langkah-langkah pelepasan.

**SERVICE POINTS****Inspecting the control cable**

1. Inspect:
 - Throttle cable
Frays/kinks/sticks → Replace.

Inspecting the bushings

1. Inspect:
 - Bushings
Cracks/damage/wear → Replace.

Inspecting the friction piece

1. Inspect:
 - Friction piece
Cracks/damage/wear → Replace.

Inspecting the steering handle

1. Inspect:
 - Steering handle
Cracks/damage/wear → Replace.

Inspecting the throttle shaft

1. Inspect:
 - Throttle shaft
Bends/damage/wear → Replace.

**TITIK-TITIK PERAWATAN****Memeriksa kabel pengatur**

1. Periksa :

- Kabel gas

Jika terurai/kusut/melekat → Ganti.

Memeriksa bushing

1. Periksa :

- Bushing

Jika retak/rusak/aus → Ganti.

Memeriksa friction piece

1. Periksa :

- Friction piece

Jika retak/rusak/aus → Ganti.

Memeriksa gagang kemudi

1. Periksa :

- Gagang kemudi

Jika retak/rusak/aus → Ganti.

Memeriksa poros gas

1. Periksa :

- Poros gas

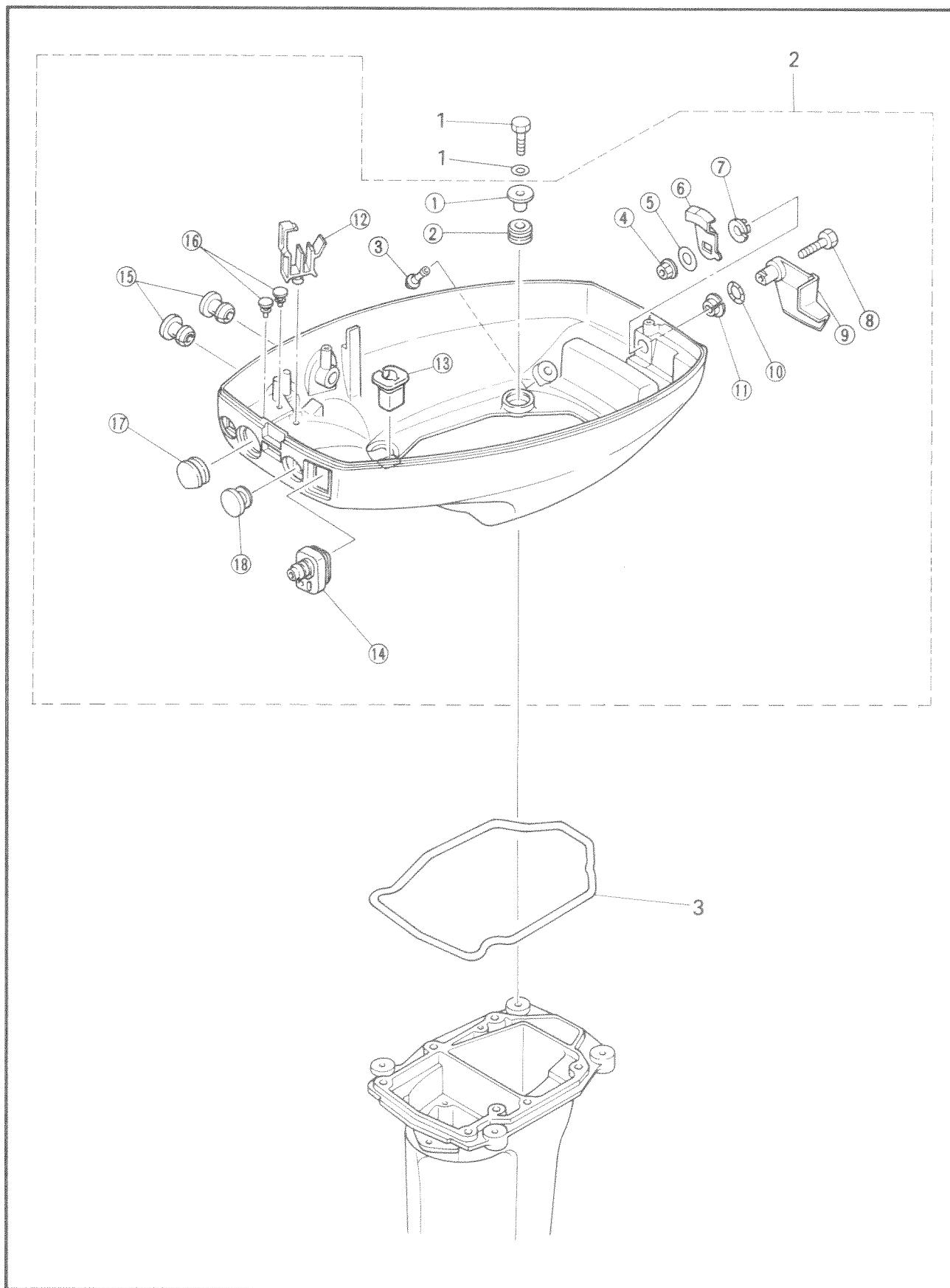
Jika bengkok/rusak/aus → Ganti.



BOTTOM COWLING

E

BOTTOM COWLING EXPLODED DIAGRAM



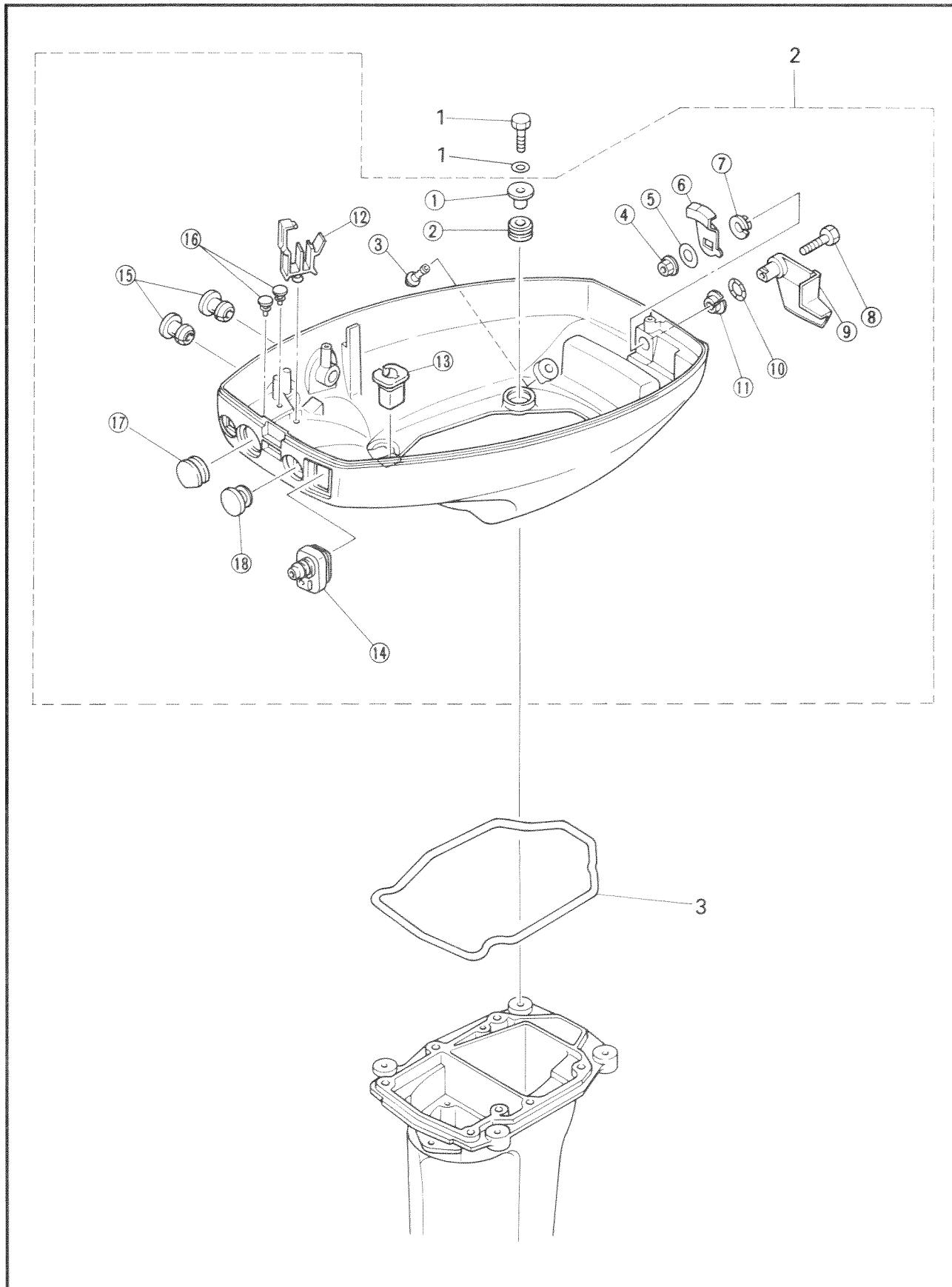
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COWLING DASAR

IN

COWLING DASAR DIAGRAM BAGIAN-BAGIAN SECARA TERURAI



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BOTTOM COWLING

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the bottom cowling		Remove the parts in the order below. Refer to "POWER UNIT" in chapter 5.
1	Power unit Bolts/washers (bottom cowling assembly)	4/4	6 × 25 mm
2	Bottom cowling assembly	1	
3	Rubber seal	1	
	Disassembling the bottom cowling		
①	Collars	4	
②	Grommets	4	
③	Hose nipple	1	
④	Nut	1	
⑤	Plain washer	1	
⑥	Hook clamp	1	
⑦	Bushing	1	
⑧	Bolt (clamp lever)	1	6 × 25 mm
⑨	Clamp lever	1	
⑩	Wave washer	1	
⑪	Bushing	1	
⑫	Fitting plate	1	
⑬	Grommet	1	
⑭	Grommet	1	
⑮	Grommets	2	
⑯	Grommets	2	
⑰	Grommet	1	
⑱	Grommet	1	
			For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

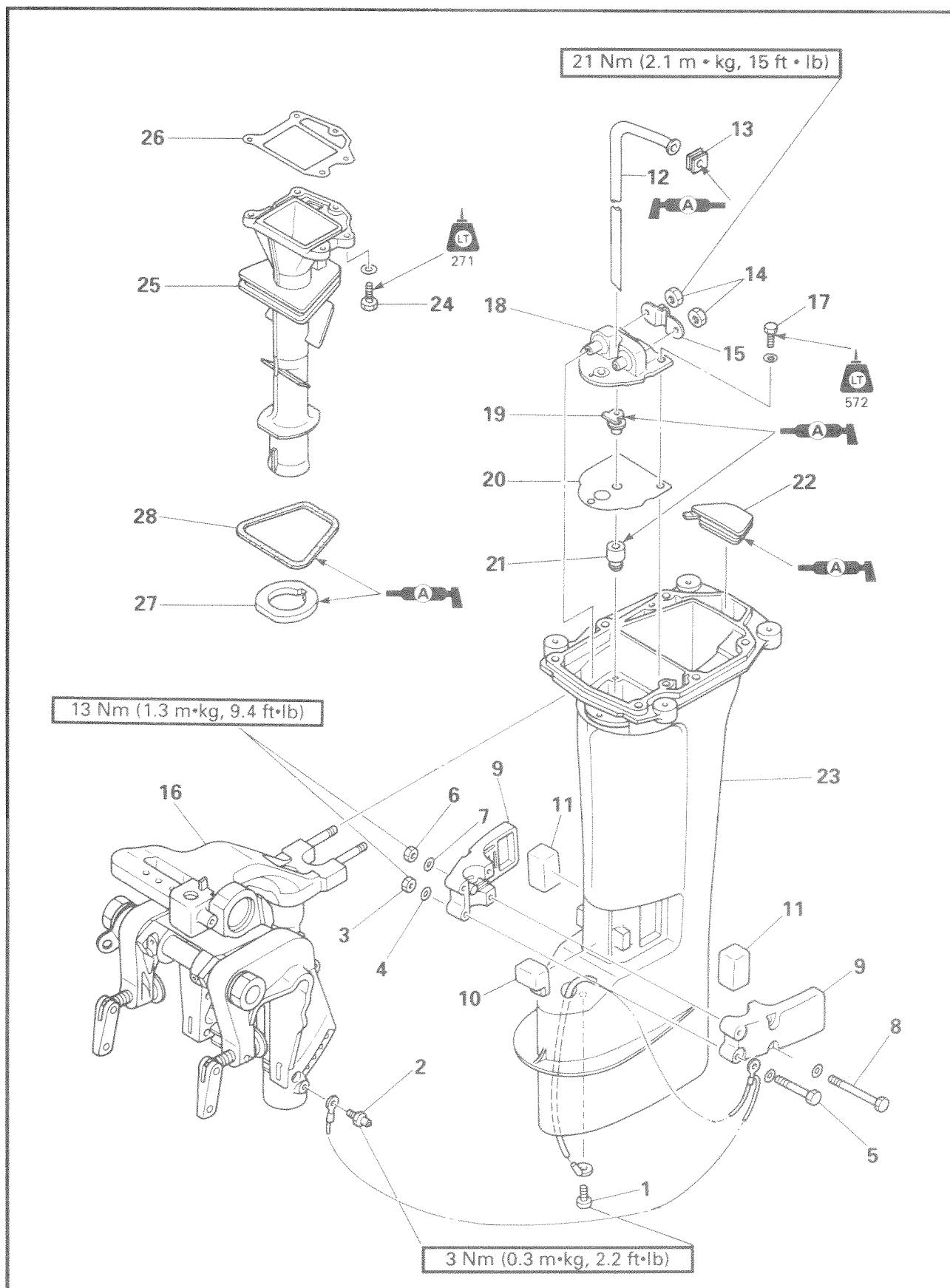
Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan cowling dasar		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini. Lihat "UNIT PEMBANGKIT DAYA (MESIN)" pada bab 5.
1	Unit pembangkit daya (mesin)	4/4	6 x 25 mm
2	Baut / washer (montase cowling dasar)	1	
3	Montase cowling dasar	1	
	Seal karet	1	
	Membongkar cowling dasar		
①	Collars	4	
②	Grommets	4	
③	Pentil selang	1	
④	Mur	1	
⑤	Plain washer	1	
⑥	Klem kait	1	
⑦	Bushing	1	
⑧	Baut (tuas klem)	1	6 x 25 mm
⑨	Tuas klem	1	
⑩	Wave washer	1	
⑪	Bushing	1	
⑫	Pelat fitting	1	
⑬	Grommet	1	
⑭	Grommet	1	
⑮	Grommets	2	
⑯	Grommets	2	
⑰	Grommet	1	
⑱	Grommet	1	
			Untuk memasang kembali, balik langkah-langkah pelepasan.

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UPPER CASE AND EXHAUST MANIFOLD

E

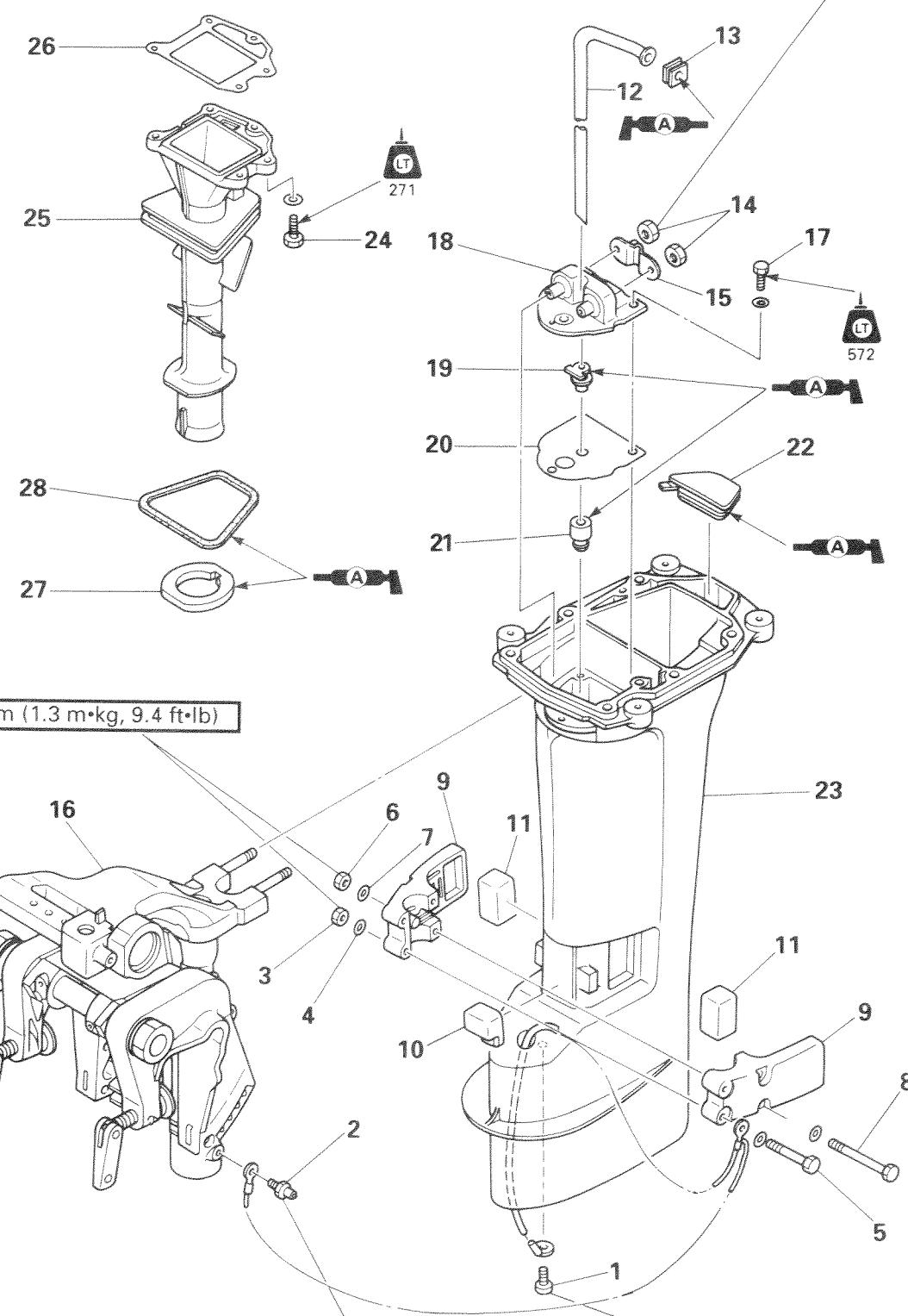
UPPER CASE AND EXHAUST MANIFOLD
EXPLODED DIAGRAM

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BAK ATAS DAN MANIPOL PIPA GAS BUANG

IN

BAK ATAS MANIPOL PIPA GAS BUANG
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI

BRKT



UPPER CASE AND EXHAUST MANIFOLD

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the upper case		Remove the parts in the order below. Refer to "BOTTOM COWLING". Refer to "LOWER UNIT" in chapter 6.
1	Screw	1	
2	Nipple	1	
3	Nuts	2	
4	Washers	2	
5	Bolts/washers	2/2	6 × 55 mm
6	Nuts	2	
7	Washers	2	
8	Bolts/washers	2/2	6 × 75 mm
9	Mount rubber housings (lower)	2	
10	Mount rubber (front)	1	
11	Mount rubber (side)	2	
12	Water tube	1	
13	Seal rubber	1	
14	Nuts	2	
15	Plate	1	
16	Bracket unit assembly	1	
17	Bolts/washers	3/3	6 × 18 mm
18	Mount rubber (upper)	1	
19	Water seal rubber	1	
20	Gasket (upper casing)	1	
21	Water seal rubber	1	
22	Rubber damper	1	
23	Upper case	1	
	Removing the exhaust manifold		
	Power unit		Refer to "POWER UNIT REMOVAL" in chapter 5.
24	Bolts/washers	5/5	6 × 20 mm
25	Exhaust manifold	1	
26	Gasket (exhaust manifold)	1	
27	Exhaust manifold packing	1	
28	O-ring	1	For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan bak atas		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini. Lihat "COWLING DASAR". Lihat "BAGIAN BAWAH" pada bab 5.
1	Montase cowling dasar	1	
2	Bagian bawah	1	
3	Sekrup	1	
4	Pentil	1	
5	Mur	2	
6	Washer	2	
7	Baut / washer	2/2	6 x 55 mm
8	Mur	2	
9	Washer	2	
10	Baut / washer	2/2	6 x 75 mm
11	Rumah karet montase (bawah)	2	
12	Karet montase (depan)	1	
13	Karet montase (samping)	2	
14	Pipa air	1	
15	Karet seal	1	
16	Mur	2	
17	Pelat	1	
18	Montase unit bracket	1	
19	Baut / washer	3/3	6 x 18 mm
20	Karet montase (atas)	1	
21	Karet seal air	1	
22	Gasket (bak atas)	1	
23	Karet seal air	1	
	Peredam karet	1	
	Bak atas	1	
	Melepaskan manipol pipa gas buang		
	Unit pembangkit daya (mesin)		Lihat "PELEPASAN UNIT PEMBANGKIT DAYA (MESIN)". Pada bab 5.
24	Baut / washer	5/5	6 x 20 mm
25	Manipol pipa gas buang	1	
26	Gasket (manipol pipa gas buang)	1	
27	Paking manipol pipa gas buang	1	
28	O-ring	1	
			Untuk memasang kembali, balik langkah-langkah pelepasan.

BRKT



UPPER CASE AND EXHAUST MANIFOLD

E

SERVICE POINTS

Inspecting the mount rubber

1. Inspect:
 - Mount rubber
Cracks/damage/wear → Replace.

Inspecting the mount bolts

1. Inspect:
 - Mount bolt
Wear/bent/damage → Replace.

**TITIK-TITIK PERAWATAN****Memeriksa karet montase**

1. Periksa :

- Karet montase
Jika retak/rusak/aus → Ganti.

Memeriksa baut montase

1. Periksa :

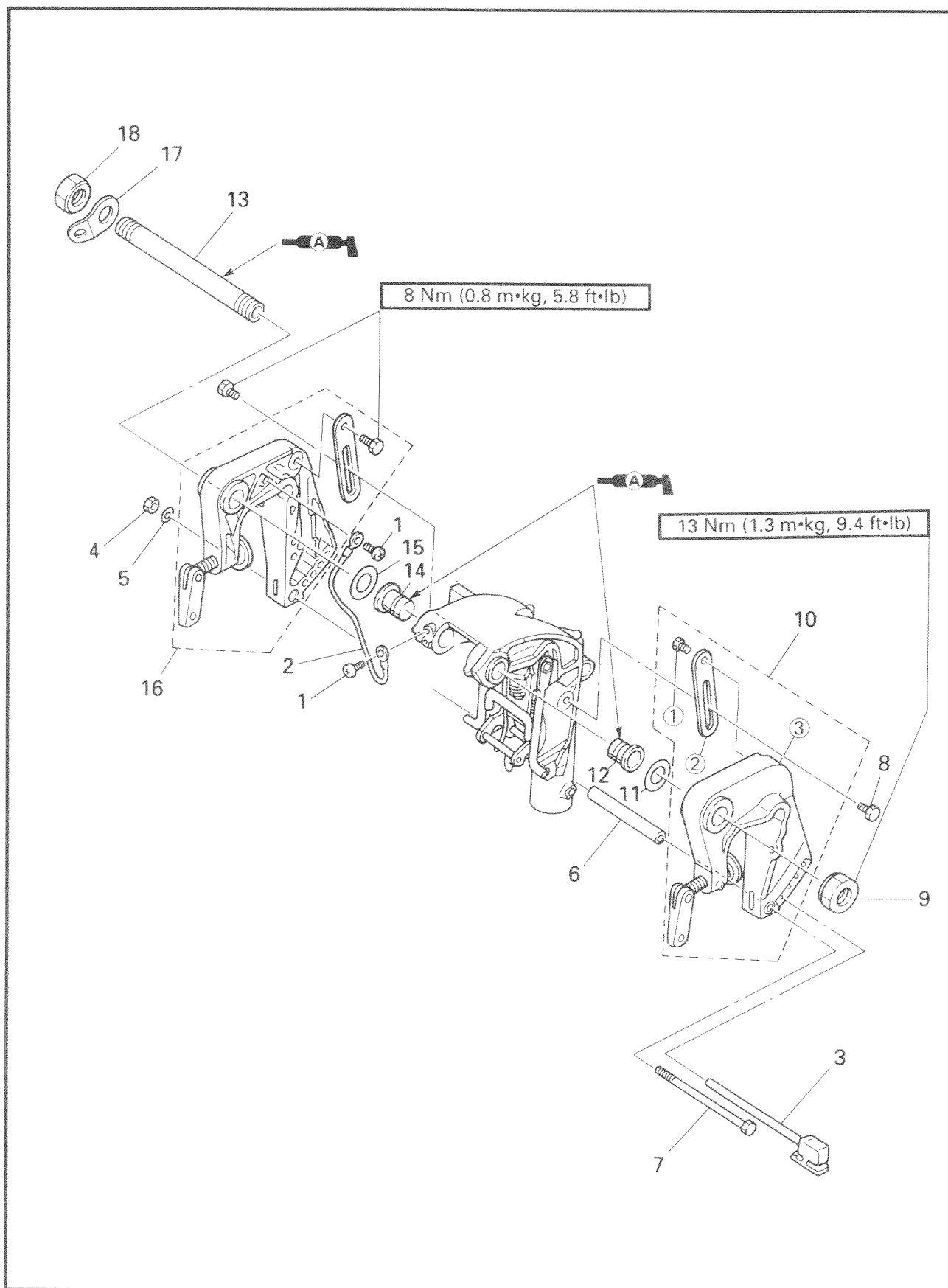
- Baut montase
Jika aus/bengkok/rusak → Ganti.

BRKT



CLAMP BRACKET

E

**CLAMP BRACKET
EXPLODED DIAGRAM**

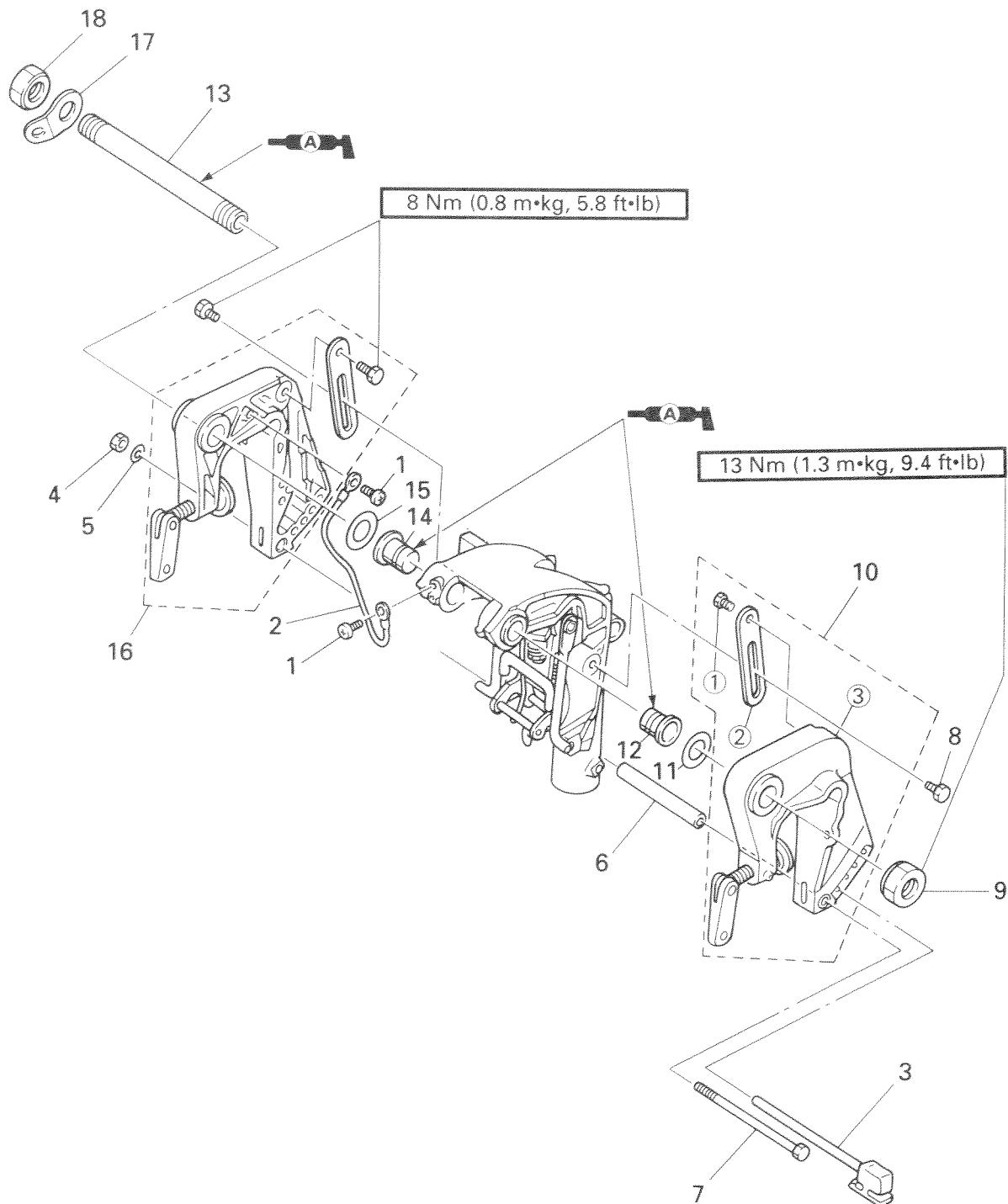
BRKT



CLAMP BRACKET (SIKU KLEM)

IN

CLAMP BRACKET DIAGRAM BAGIAN-BAGIAN SECARA TERURAI



BRKT



CLAMP BRACKET

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
Removing the clamp bracket			Remove the parts in the order below.
1	Screws	2	
2	Lead wire	1	
3	Tilt pin	1	
4	Nut	1	
5	Plain washer	1	
6	Collar	1	
7	Bolt	1	
8	Bolts	2	
9	Nut	1	
10	Clamp bracket assembly	1	
11	Plain washer	1	
12	Bushing	1	
13	Bolt (swivel bracket clamp)	1	
14	Bushing	1	
15	Plain washer	1	
16	Clamp bracket	1	
17	Clamp bracket plate	1	
18	Cap	1	
Disassembling the clamp bracket			
①	Bolts	2	
②	Tilt stop levers	2	
③	Clamps	2	
			For installation, reverse the removal procedures.

BRKT



CLAMP BRACKET (SIKU KLEM)

IN

BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

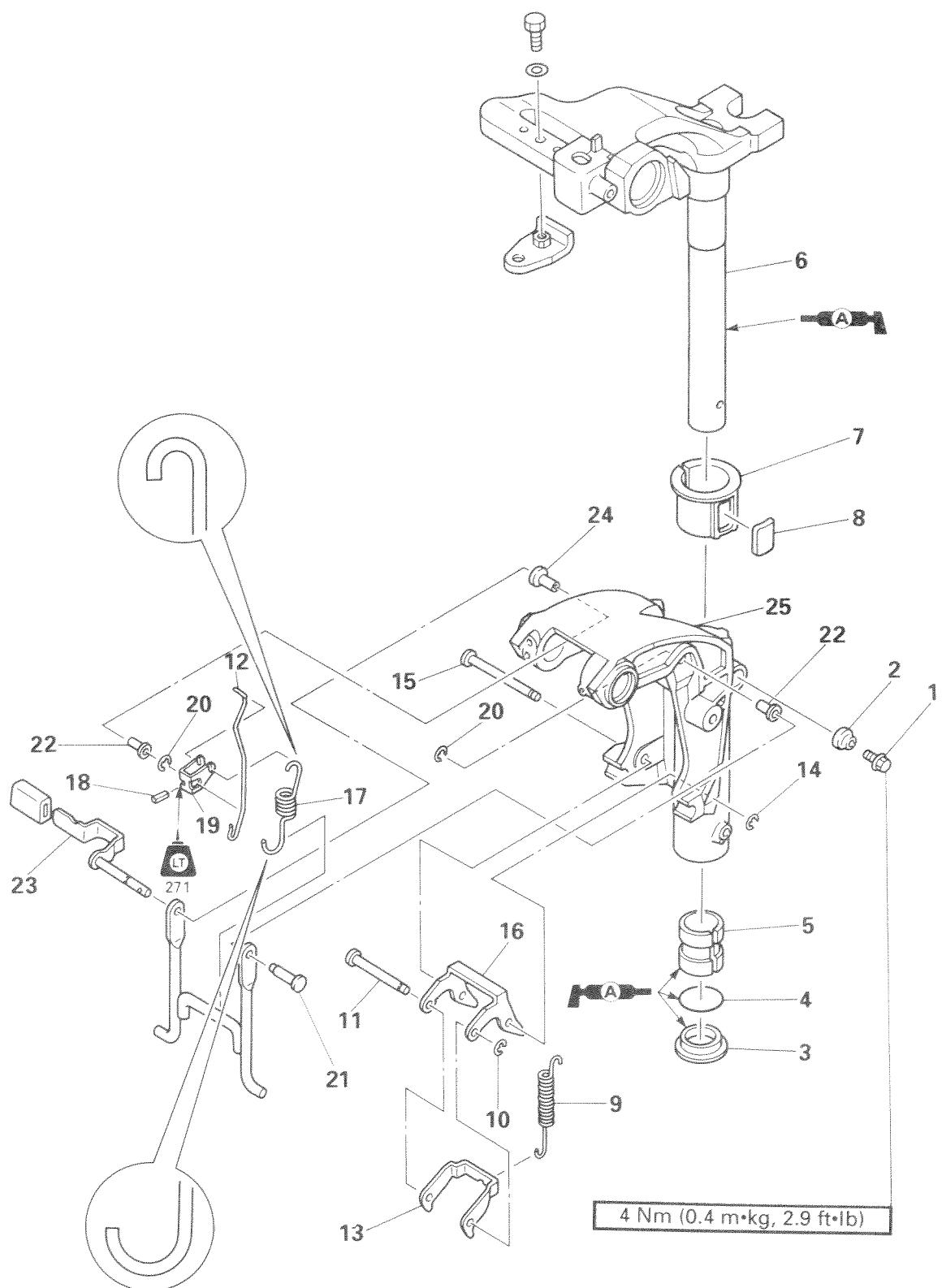
Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan clamp bracket		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini.
1	Sekrup	2	
2	Kawat timbel	1	
3	Pen kemiringan	1	
4	Mur	1	
5	Plain washer	1	
6	Collar	1	
7	Baut	1	
8	Baut	2	
9	Mur	1	
10	Montase clamp bracket	1	
11	Plain washer	1	
12	Bushing	1	
13	Baut (swivel clamp bracket)	1	
14	Bushing	1	
15	Plain washer	1	
16	Clamp bracket	1	
17	Pelat clamp bracket	1	
18	Kap	1	
①	Membongkar clamp bracket		
②	Baut	2	
③	Tuas penghenti kemiringan	2	
	Clamps (klem)	2	Untuk memasang kembali, balik langkah-langkah pelepasan.

BRKT



STEERING AND SWIVEL BRACKET

E

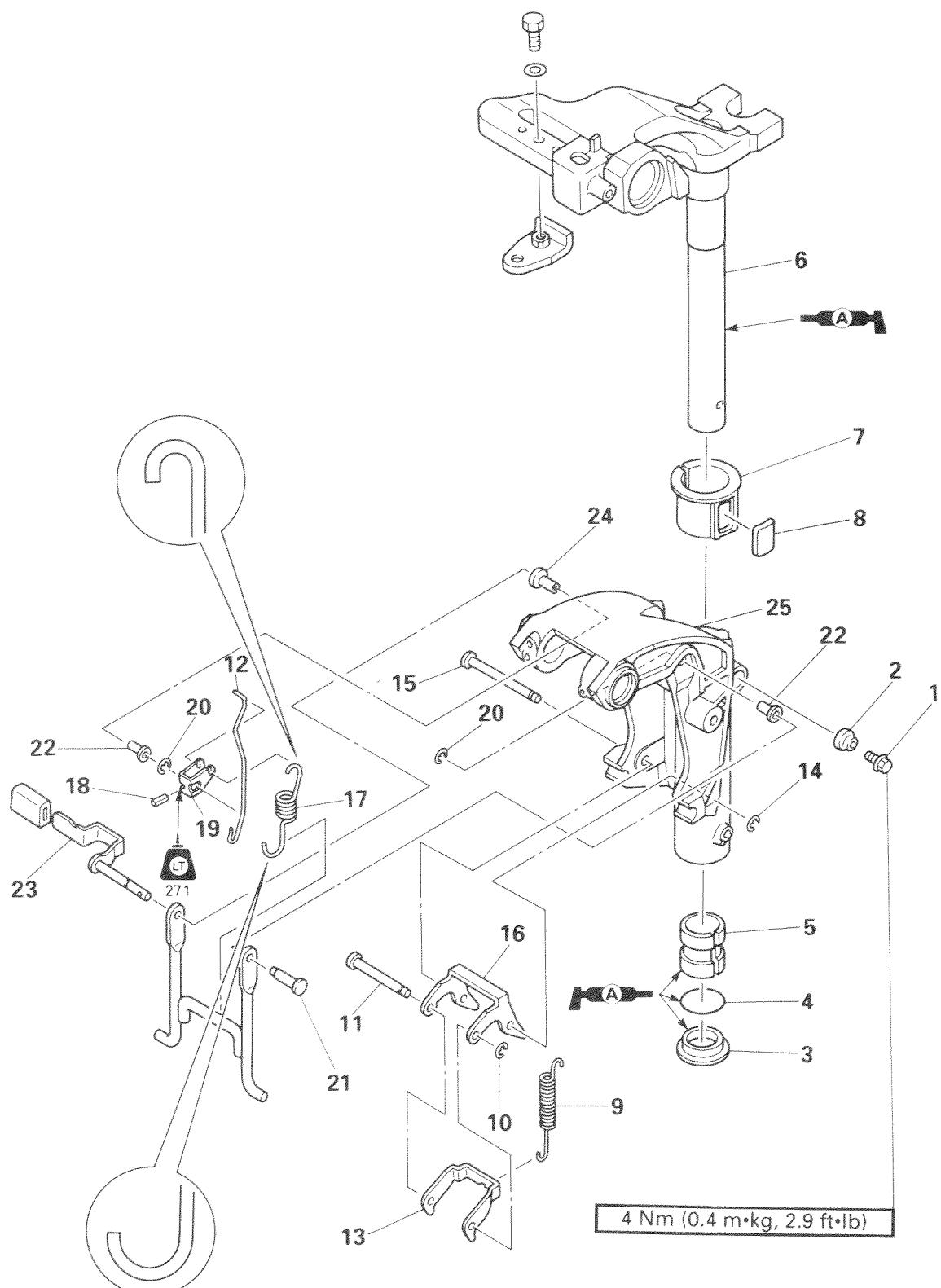
**STEERING AND SWIVEL BRACKET
EXPLODED DIAGRAM**

BRKT



STEERING AND SWIVEL BRACKET

IN

**STEERING AND SWIVEL BRACKET
DIAGRAM BAGIAN-BAGIAN SECARA TERURAI**

BRKT



STEERING AND SWIVEL BRACKET

E

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	Removing the steering bracket Swivel bracket clamp assembly		Remove the parts in the order below. Refer to "BOTTOM COWLING REMOVAL".
1	Flange bolt	1	
2	Rubber seal	1	
3	Bushing	1	
4	O-ring	1	
5	Bushing	1	
6	Steering bracket	1	
7	Bushing	1	
8	Friction piece	1	
	Disassembling the swivel bracket		
9	Spring	1	
10	Clip	1	
11	Tilt lock shaft	1	
12	Tilt lock rod	1	
13	Tilt lock arm	1	
14	Clip	1	
15	Tilt lock plate shaft	1	
16	Shallow water drive lever	1	
17	Spring	1	
18	Pin	1	
19	Tilt lever	1	
20	Clips	2	
21	Shaft pin	1	
22	Bushings	2	
23	Control lever	1	
24	Bushing	1	
25	Swivel bracket	1	For installation, reverse the removal procedures.



BAGAN PELEPASAN DAN PEMASANGAN KEMBALI

Langkah	Prosedur/Nama bagian	Jumlah	Titik-titik perawatan
	Melepaskan steering bracket		Lepaskan bagian-bagian sesuai dengan urutan di bawah ini. Lihat "COWLING DASAR".
1	Baut flens	1	
2	Seal karet	1	
3	Bushing	1	
4	O-ring	1	
5	Bushing	1	
6	Steering bracket	1	
7	Bushing	1	
8	Friction piece	1	
	Membongkar swivel bracket		
9	Pegas	1	
10	Klip	1	
11	Poros kunci kemiringan	1	
12	Batang kunci kemiringan	1	
13	Lengan kunci kemiringan	1	
14	Klip	1	
15	Poros pelat kunci kemiringan	1	
16	Tuas penggerak air dangkal	1	
17	Pegas	1	
18	Pen	1	
19	Tuas kemiringan	1	
20	Klip	2	
21	Pen poros	1	
22	Bushing	2	
23	Tuas pengatur	1	
24	Bushing	1	
25	Swivel bracket	1	
			Untuk memasang kembali, balik langkah-langkah pelepasan.



CHAPTER 8

ELECTRICAL SYSTEM

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BAB 8

SISTEM ELEKTRIK

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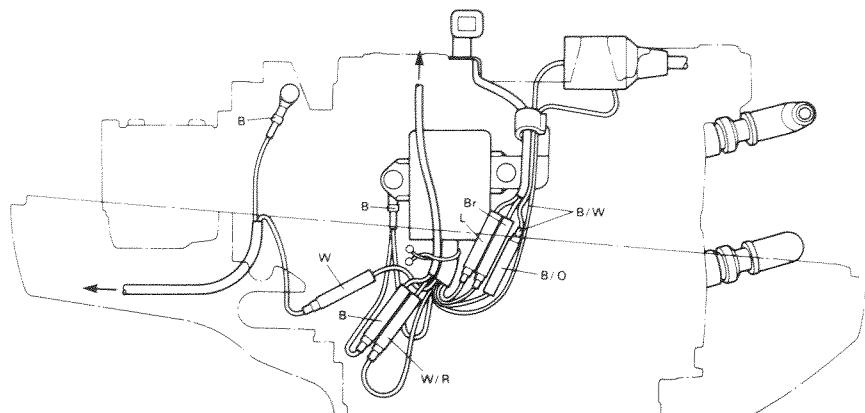
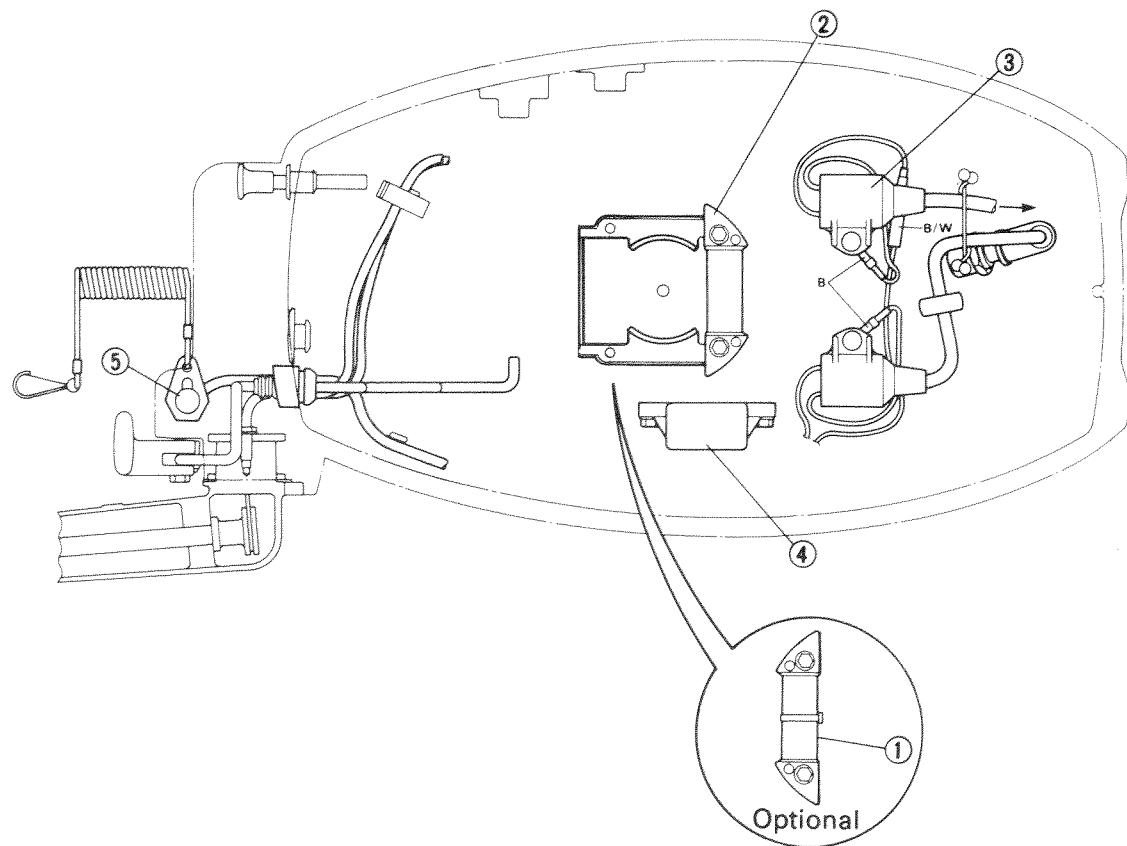


ELECTRICAL COMPONENTS MANUAL STARTER MODEL

- ① Lighting coil*
- ② Charge coil
- ③ Ignition coil
- ④ CDI unit
- ⑤ Engine stop switch

*: Optional

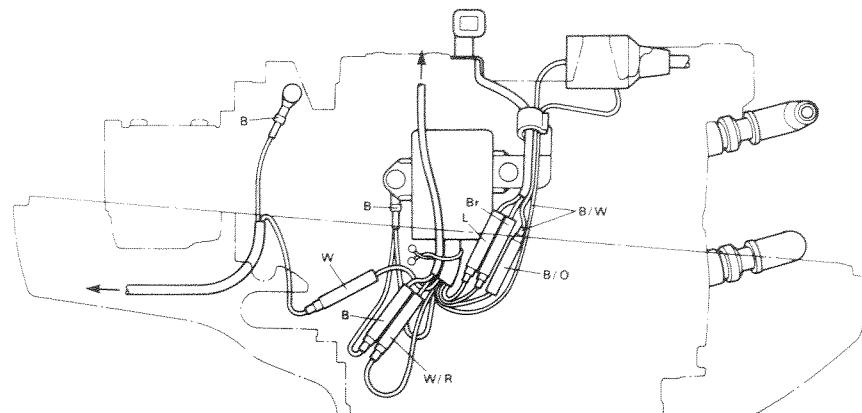
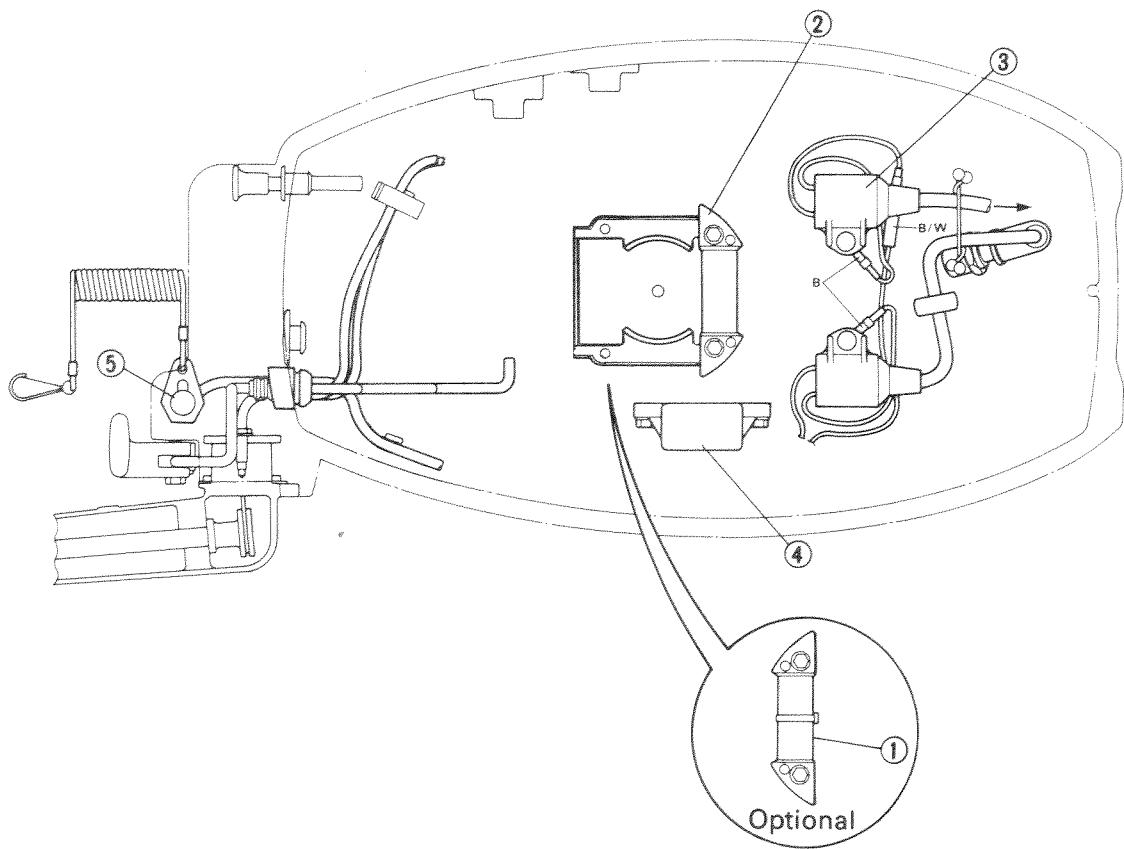
B : Black
Br : Brown
B/O : Black/Orange
B/W : Black/White
G : Green
G/W : Green/White
L : Blue
W : White
W/R : White/Red



KOMPONEN-KOMPONEN ELEKTRIK MODEL STARTER MANUAL

- ① Koil penerangan*
 - ② Koil pengisian
 - ③ Koil penyalaan
 - ④ Unit CDI
 - ⑤ Sakelar penghenti mesin
- * : Opsional

B : Hitam
Br : Coklat
B/O : Hitam/Orange
B/W : Hitam/Putih
G : Hijau
G/W : Hijau/Putih
L : Biru
W : Putih
W/R : Putih/Merah



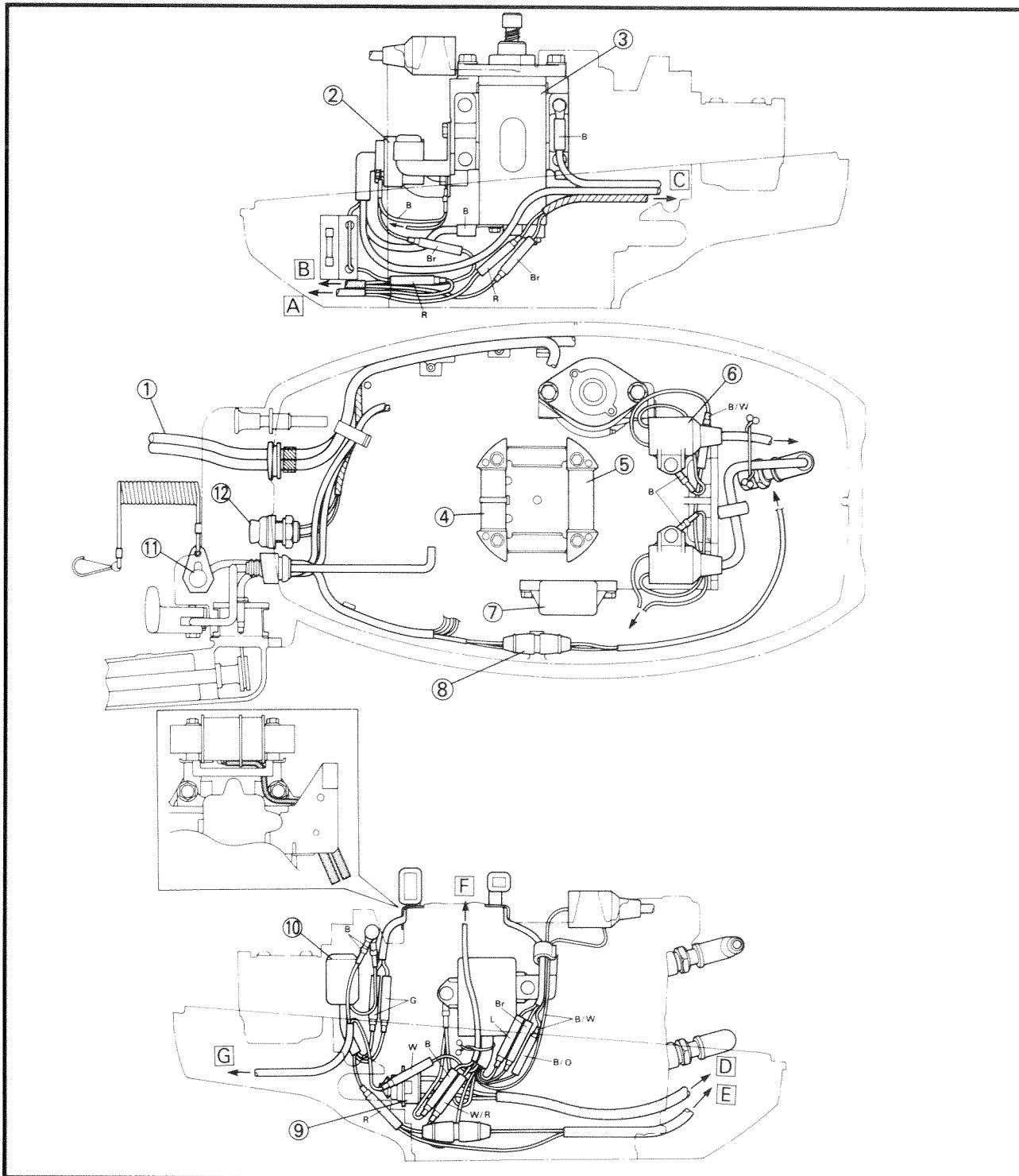


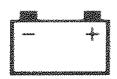
ELECTRICAL STARTER MODEL

- ① Battery cable
- ② Starter relay
- ③ Starter motor
- ④ Lighting coil
- ⑤ Charge coil
- ⑥ Ignition coil
- ⑦ CDI unit
- ⑧ Fuse
- ⑨ Neutral switch
- ⑩ Rectifier

- ⑪ Engine stop switch
- ⑫ Starter switch
- A To ⑩
- B To ⑨
- C To ⑫
- D To ②, ⑫
- E To ②, ⑫
- F To pulser coil
- G To ⑪

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



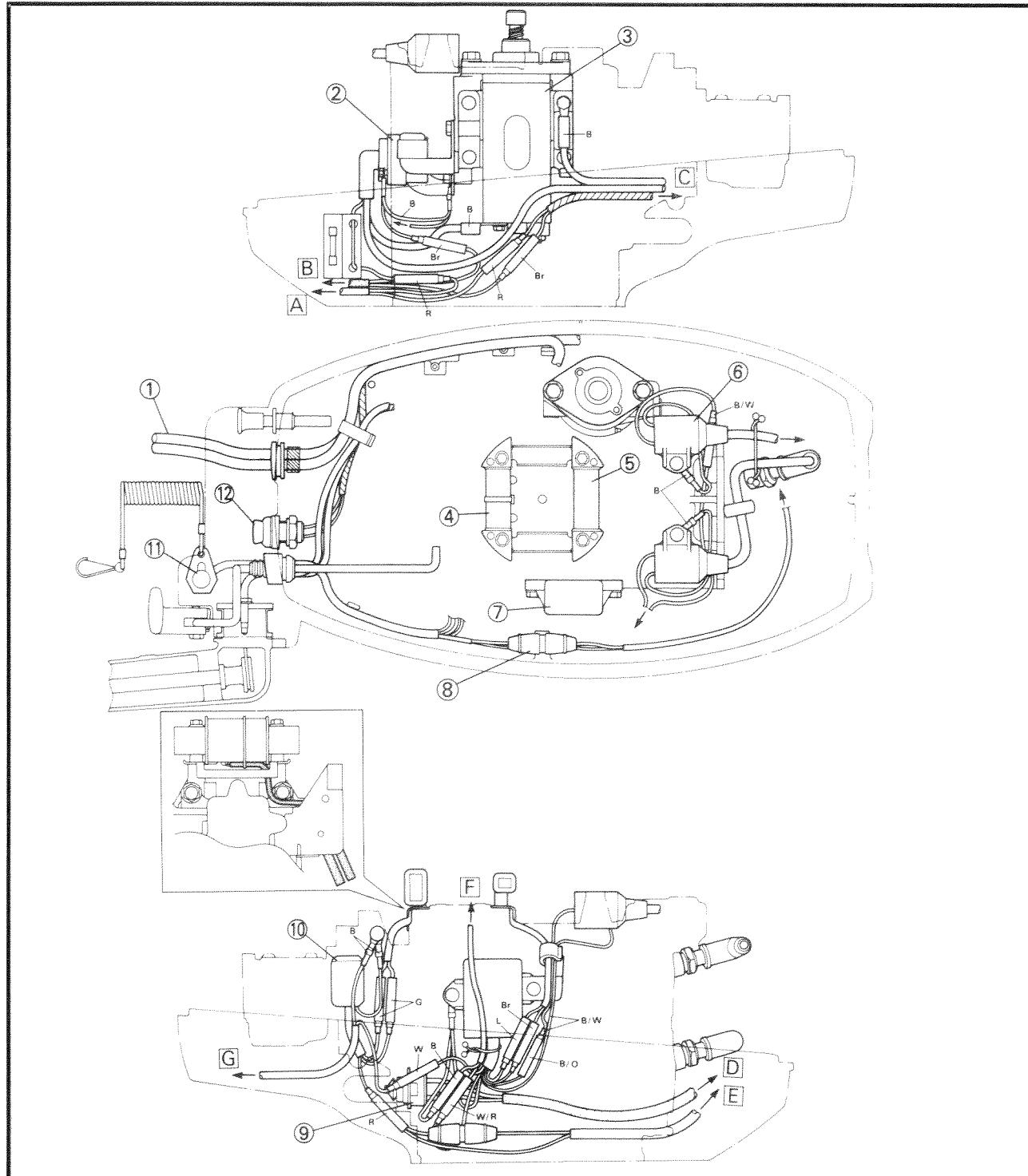


KOMPONEN-KOMPONEN ELEKTRIK

- ① Kabel aki
- ② Starter relay
- ③ Starter motor
- ④ Koil penerangan
- ⑤ Koil pengisian
- ⑥ Koil penyalaan
- ⑦ Unit CDI
- ⑧ Sekering
- ⑨ Sakelar netral
- ⑩ Rectifier

- ⑪ Sakelar penghenti mesin
- ⑫ Sakelar stater
- A Ke ⑩
- B Ke ⑨
- C Ke ⑫
- D Ke ②, ⑫
- E Ke ②, ⑫
- F Ke pulser coil
- G Ke ⑪

- | | |
|-----|----------------|
| B | : Hitam |
| Br | : Coklat |
| B/O | : Hitam/Orange |
| B/W | : Hitam/Putih |
| G | : Hijau |
| G/W | : Hijau/Putih |
| L | : Biru |
| R | : Merah |
| W | : Putih |
| W/R | : Putih/Merah |



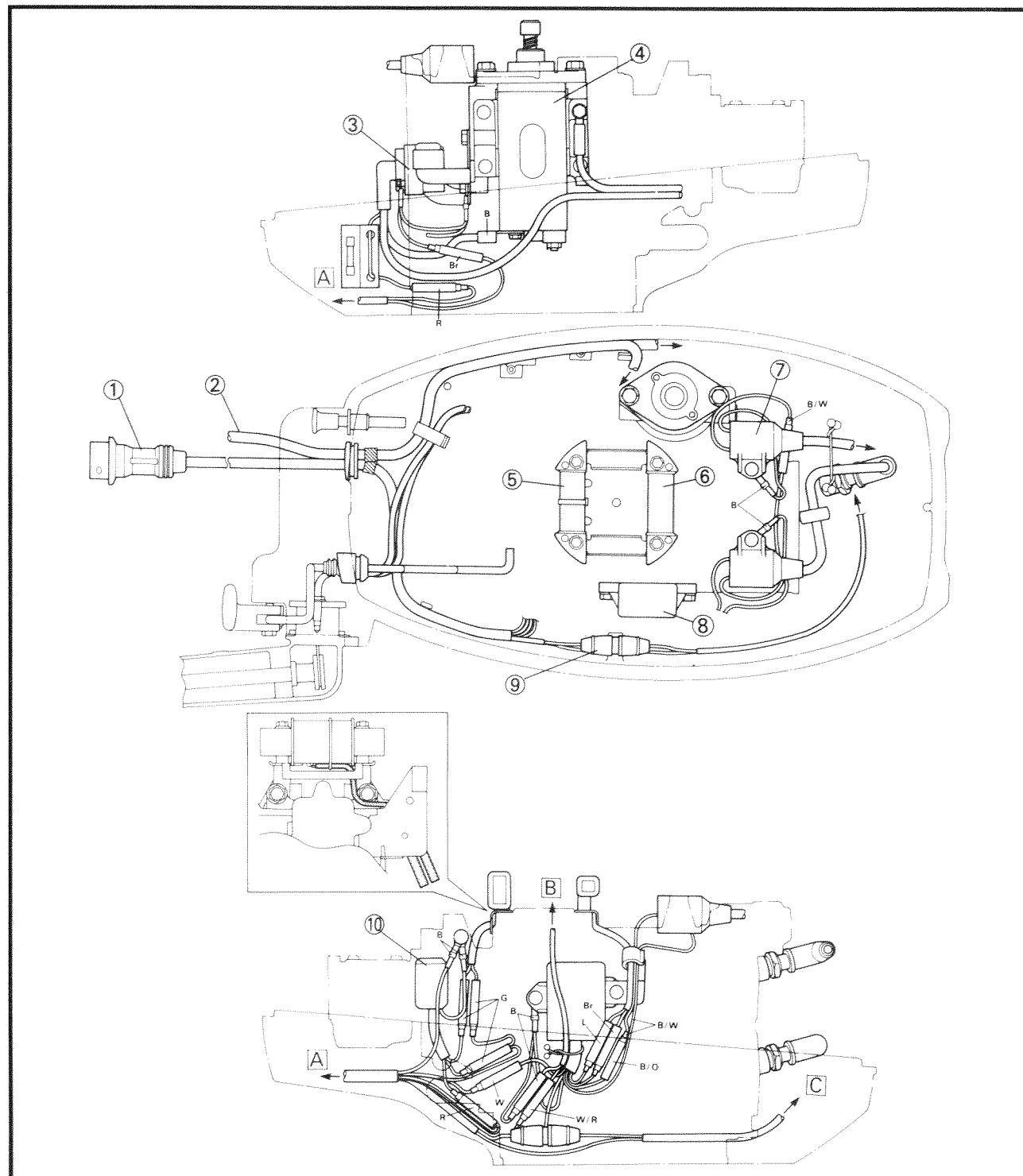


REMOTE CONTROL MODEL

- ① Wire harness
- ② Battery cable
- ③ Starter relay
- ④ Starter motor
- ⑤ Lighting coil
- ⑥ Charge coil
- ⑦ Ignition coil
- ⑧ CDI unit
- ⑨ Fuse
- ⑩ Rectifier

- [A] To ①
- [B] To pulser coil
- [C] To ③

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

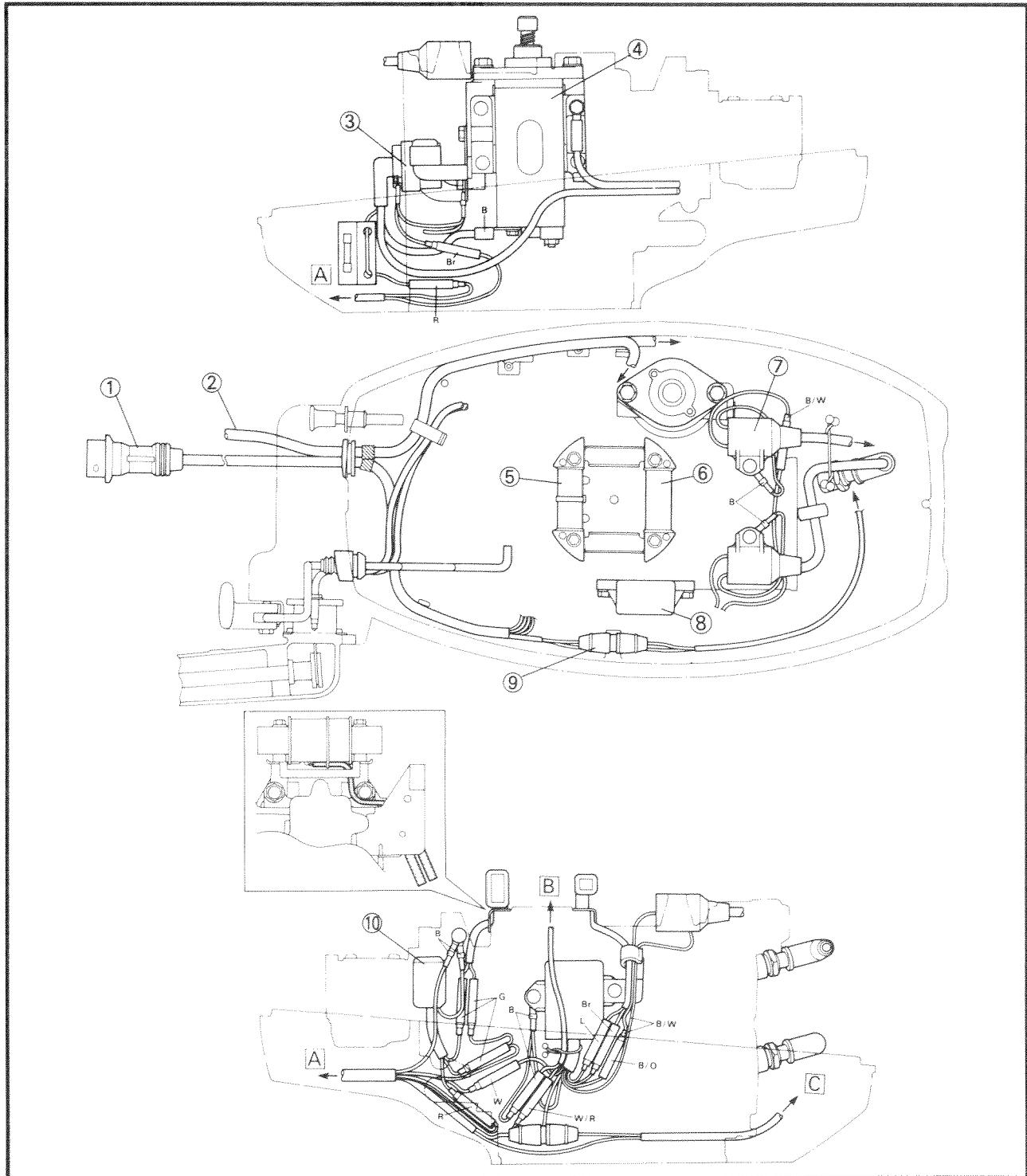


MODEL REMOTE CONTROL

- ① Wire harness
- ② Kabel aki
- ③ Starter relay
- ④ Starter motor
- ⑤ Koil penerangan
- ⑥ Koil pengisian
- ⑦ Koil penyalaan
- ⑧ Unit CDI
- ⑨ Sekering
- ⑩ Rectifier

- A Ke ①
 B Ke pulser coil
 C Ke ③

- B : Hitam
 Br : Coklat
 B/O : Hitam/Orange
 B/W : Hitam/Putih
 G : Hijau
 G/W : Hijau/Putih
 L : Biru
 R : Merah
 W : Putih
 W/R : Putih/Merah



ELEC

ELECTRICAL ANALYSIS

E

ELECTRICAL ANALYSIS INSPECTION

NOTE:

" indicates a continuity of electricity; i.e., a closed circuit at the respective switch position.

Measuring the peak voltage

NOTE:

- At cranking speed the coils output varies, greatly.
- Proper readings cannot be recorded when cranking a cold engine with fouled/weak spark plugs.

**Digital tester:**

J-39299

Peak volt adapter:

YU-39991



ANALISIS ELEKTRIK PEMERIKSA

CATATAN : _____

"○—○" menunjukkan kontinuitas listrik; yaitu sirkuit tertutup pada masing-masing posisi sakelar.

Mengukur voltase tertinggi

CATATAN : _____

- Pada kecepatan pengengkolan yang berbeda, output koil menjadi sangat bervariasi.
- Petunjuk ukuran yang tepat tidak dapat diperoleh bila mengengkol mesin dingin dengan busi yang soak/lemah.

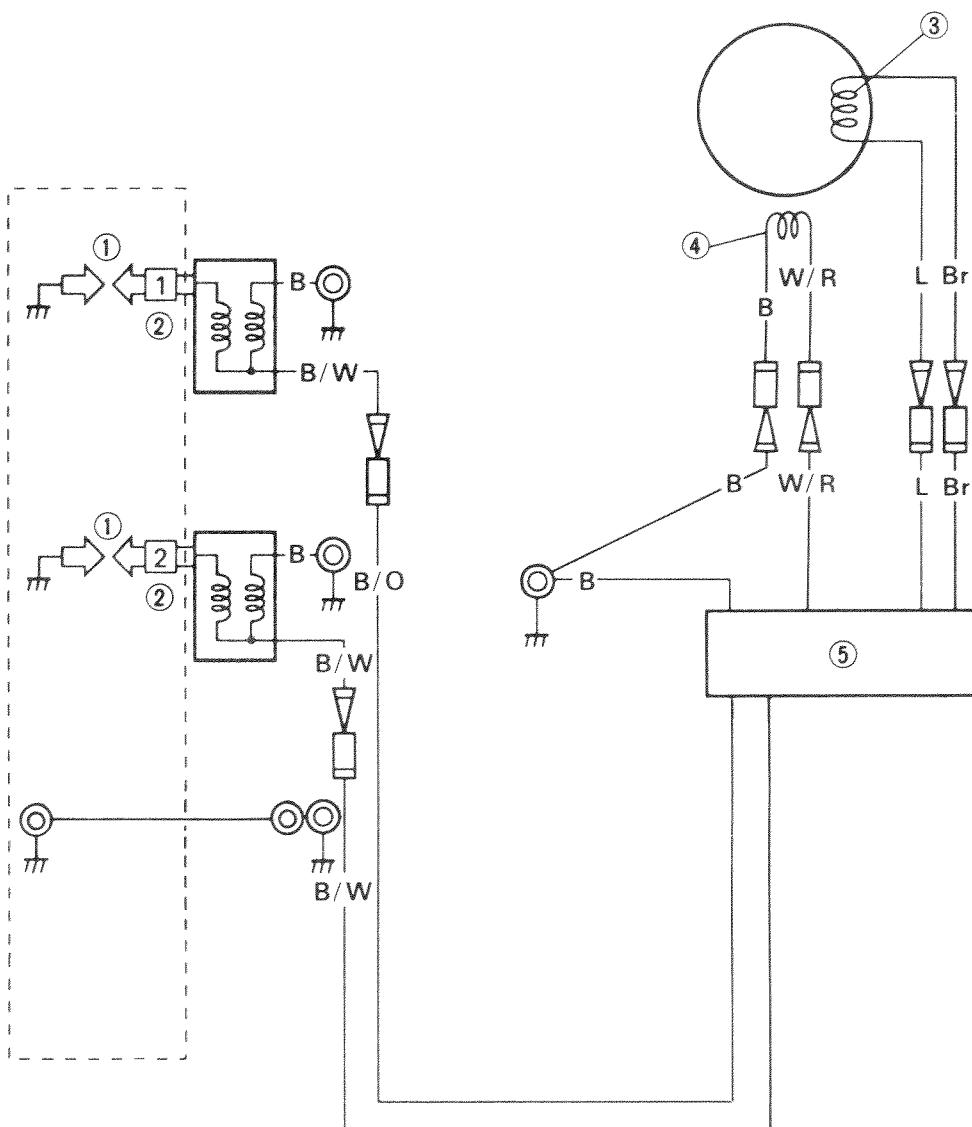


Digital tester :

J-39299

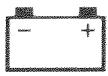
Adaptor volt tertinggi :

YU-39991


**IGNITION SYSTEM
WIRING DIAGRAM**


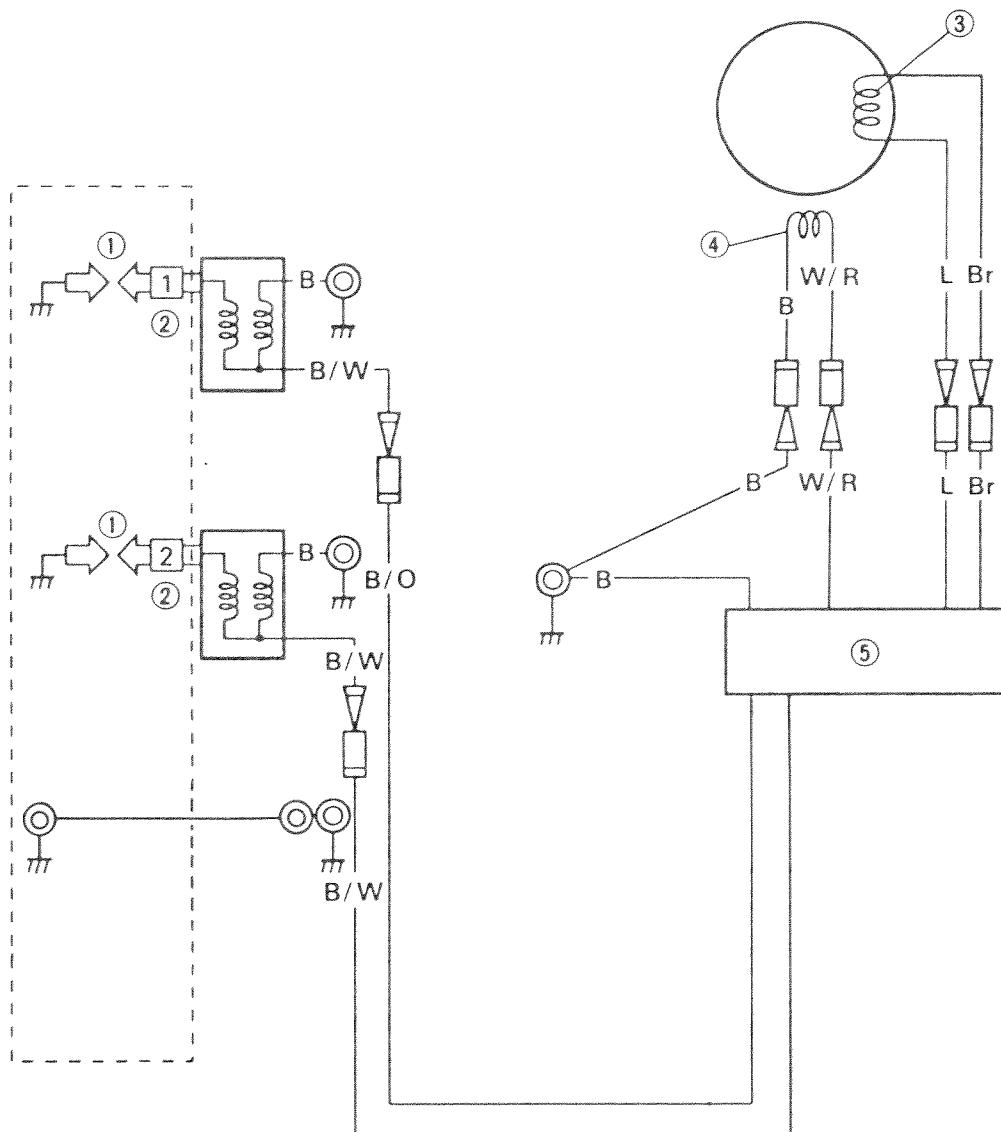
- ① Spark plug
- ② Ignition coil
- ③ Charge coil
- ④ Pulser coil
- ⑤ Main switch

Br	: Brown
L	: Blue
W/R	: White/Red
B/O	: Black/Orange
B/W	: Black/White
W	: White
B	: Black



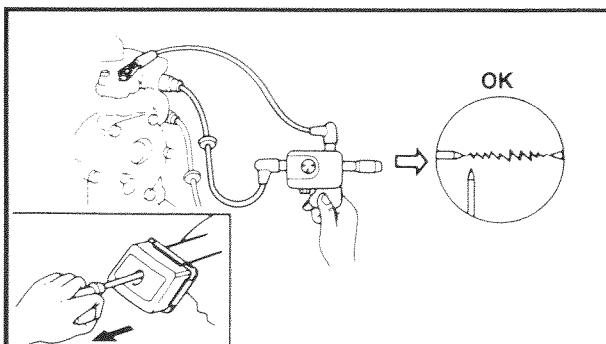
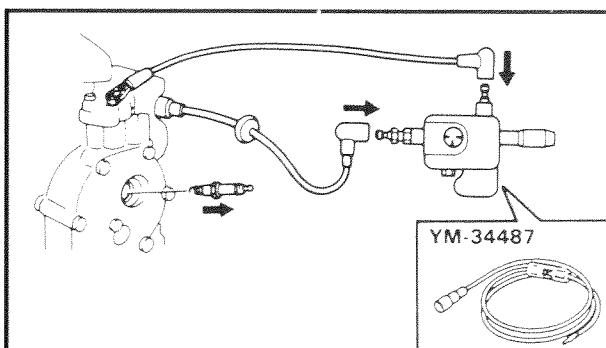
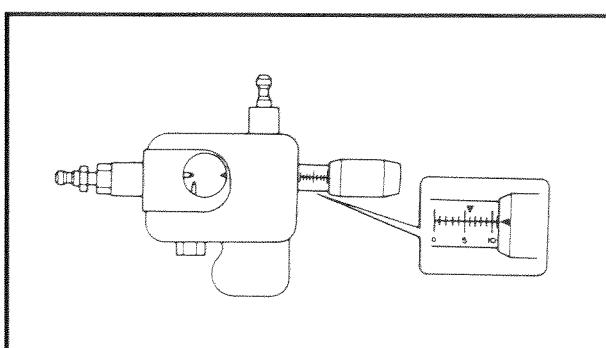
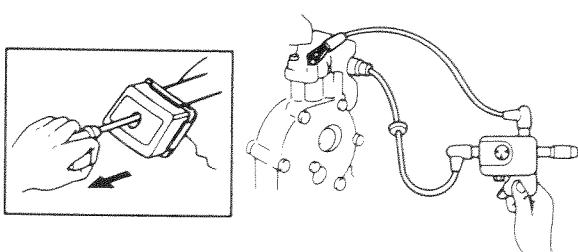
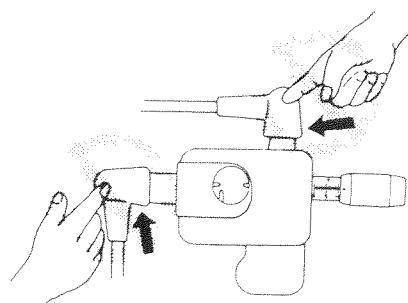
SISTEM PENYALAAAN

DIAGRAM SISTEM KAWAT



- ① Busi
- ② Koil penyalaan
- ③ Koil pengisian
- ④ Pulser coil
- ⑤ Sakelar utama

- Br : Coklat
- L : Biru
- W/R : Putih/Merah
- B/O : Hitam/Orange
- B/W : Hitam/Putih
- W : Putih
- B : Hitam



IGNITION SPARK GAP

⚠ WARNING

- While taking spark check 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 removed plug cap.
- This check is likely to produce sparks, so be sure that no flammable gas or fluid is in the vicinity.

1. Check:

- Ignition spark gap
Out of specification → Measure the peak voltage.



Spark gap:
9 mm (0.35 in)

Checking steps:

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



Spark gap tester:
90890-06754

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



CELAH PERCIKAN API PENYALAAAN

PERINGATAN

- Sewaktu memeriksa percikan api, hati-hati jangan sampai menyentuh setiap hubungan kawat timbel pada "alat penguji celah percikan api penyalaan".
- Sewaktu memeriksa percikan api, hati-hati jangan sampai terjadi kebocoran dari kap busi yang dilepas.
- Pemeriksaan ini mungkin menimbulkan percikan api, oleh karena itu usahakan jangan sampai ada gas atau cairan yang dapat terbakar di daerah sekeliling.

1. Periksa :

- Celah percikan api penyalaan
Jika tidak sesuai dengan spesifikasi →
Ukur voltase tertinggi.



Celah percikan :
9 mm (0.35 in)

Langkah-langkah pemeriksaan :

- Setel celah percikan api sesuai dengan spesifikasi dengan memutar tombol penyetel.



Alat pemeriksa :
90890-06754

- Hubungkan kap busi dengan alat pemeriksa celah percikan api.
- Lepaskan busi dari mesin.
- Engkol mesin dan amati percikan api sistem penyalaan melalui jendela pembuangan.



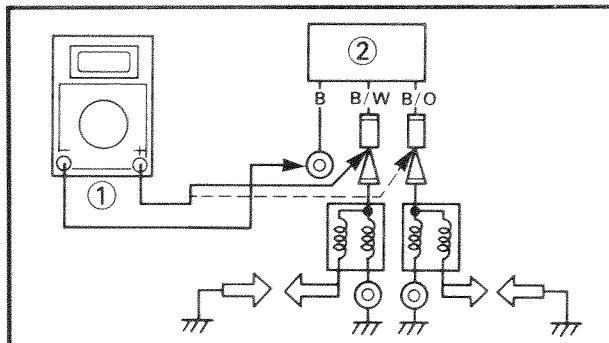
CDI SYSTEM PEAK VOLTAGE

⚠ WARNING

When checking the CDI unit do not touch any of the connections of the lead wires.

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 another component is defective.

**1. Measure:**

- CDI unit output (test #1)
Below specification → Replace the ignition coil.
Measure the output twice.



CDI output:
170 V at cranking
215 V at 1,500 r/min

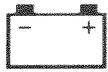
Measuring steps:

- Connect the tester (1) to the CDI unit (2), as shown.
- Set the tester dial to the proper range.



Range:
V

- Crank or start the engine.

**VOLTASE TERTINGGI SISTEM CDI****PERINGATAN**

Sewaktu memeriksa unit CDI, jangan menyentuh setiap hubungan kawat timbel.

CATATAN :

- Jika tidak ada percikan api atau jika percikan api lemah, lanjutkan dengan pemeriksaan CDI.
- Jika ada percikan api yang baik, permasalahananya bukan terletak pada sistem CDI, tetapi busi atau komponen lainnya mungkin rusak.

1. Ukur :

- Output unit CDI (tes # 1).
Jika di bawah spesifikasi → Ganti koil penyalaan.
Ukur output dua kali.

**Unit CDI :**

170 V pada pengengkolan
215 V pada 1.500 r/min

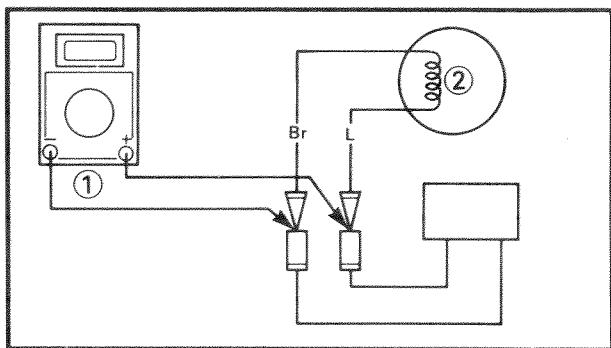
Langkah-langkah pengukuran :

- Hubungkan tester ① ke unit CDI ② seperti tampak dalam gambar.
- Setel tester dial pada batas yang benar.

**Batas :**

~V

- Engkol atau start mesin.



2. Measure:

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



Charge coil output:
200 V at cranking
250 V at 1,500 r/min

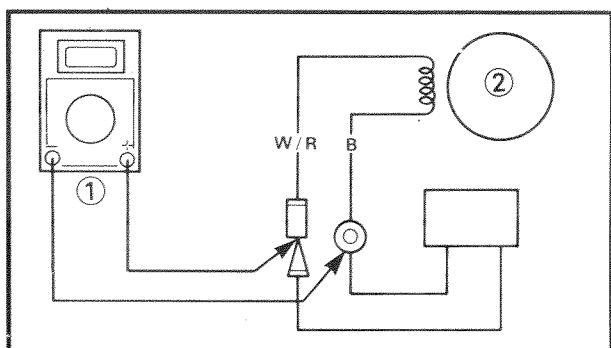
Measuring steps:

- Connect the digital tester (1) to the charge coil (2), as shown.
- Set the digital tester dial to the proper range.



Range:
V

- Crank or start the engine.



3. Measure:

- Pulser coil output (test #3)
- Above specification → Replace the CDI unit.
Below specification → Replace the pulser coil.



Pulser coil output:
5 V at cranking
5 V at 1,500 r/min

Measuring steps:

- Connect the digital tester (1) to the pulser coil (2) as shown.
- Set the digital tester dial to the proper range.



Range:
V

- Crank or start the engine.

SPARK PLUGS

Refer to "GENERAL" in chapter 3.



2. Ukur :

- Output koil pengisian (tes # 2)
Jika di bawah spesifikasi → Ganti koil pengisian.



Output koil pengisian :
200 V pada pengengkolan
250 V pada 1.500 r/min

Langkah-langkah pengukuran :

- Hubungkan digital tester ① dengan koil pengisian ② seperti tampak dalam gambar.
- Setel digital tester dial pada batas yang benar.



Batas :
V

- Engkol atau start mesin.

3. Ukur :

- Output koil pulser (tes # 3).
Jika diatas spesifikasi → Ganti unit CDI.
Jika di bawah spesifikasi → Ganti koil pulser.



Output koil pulser :
5 V pada pengengkolan
5 V pada 1.500 r/min

Langkah-langkah pengukuran :

- Hubungkan digital tester ① dengan koil pulser ② seperti tampak dalam gambar.
- Setel digital tester dial pada batas yang benar.

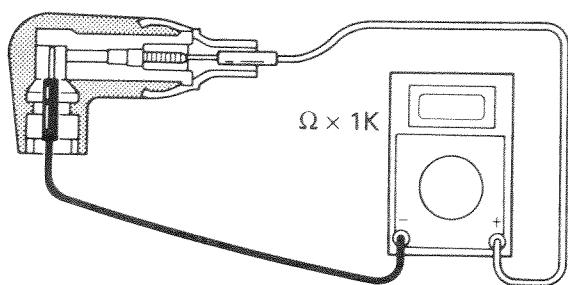


Batas :
V

- Engkol atau start mesin.

BUSI

Lihat "UMUM" pada bab 3.



SPARK PLUG CAPS

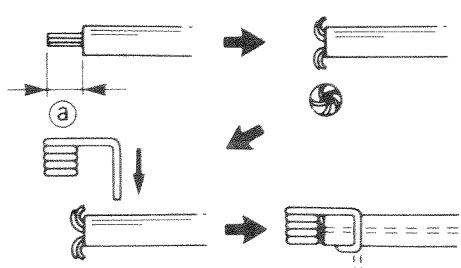
1. Inspect:

- Spark plug caps
Loose → Tighten.
Cracks/damage → Replace.

2. Measure: (For Canada and Europe)

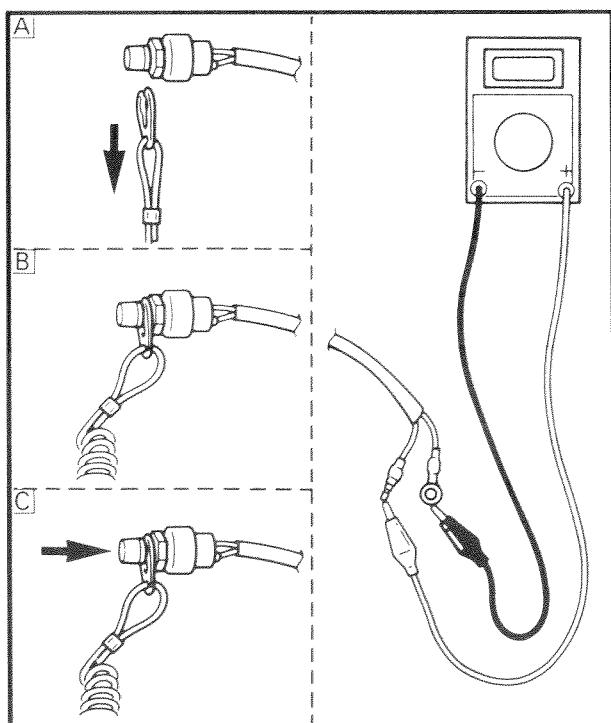
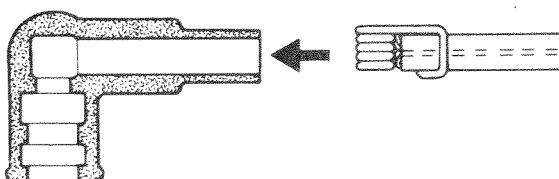
- Spark plug cap resistance
Out of specification → Replace.

Spark plug cap resistance:
4.0 ~ 6.0 kΩ



Replacement steps:

- Pull the spark plug cap off of the lead.
- Remove the spark plug cap spring.
- Strip the insulation cover 5 mm (0.2 in) (a) and spread the core wires outward.
- Fit the spark plug cap spring close to the spread core wires and bend the end of the spring around the lead.
- Install the spark plug cap spring into the spark plug cap.



ENGINE STOP SWITCH

1. Check:

- Continuity
Out of specification → Replace.

Lead colors	White	Black
Remove the lock-plate A		
Install the lock-plate B		
Push the button C		

KAP BUSI

1. Periksa :
 - Kap busi

Jika longgar → Kencangkan.
Jika retak/rusak → Ganti.
2. Ukur : (Untuk Canada dan Eropah)
 - Tahanan kap busi

Jika tidak sesuai dengan spesifikasi → Ganti.



Tahanan kap busi :
4.0 ~ 6.0 kΩ

Langkah-langkah penggantian :

- Tarik kap busi dari timbel
- Lepaskan pegas kap busi
- Kupas penutup isolasi 5 mm (0.2 in)@ dan rentangkan kawat inti keluar
- Pasang pegas kap busi dekat dengan kawat inti yang direntangkan dan tekuk ujung pegas di sekitar timbel.
- Pasang pegas kap busi ke dalam kap busi.

SAKELAR PENGHENTI MESIN

1. Periksa :
 - Kontinuitas

Jika tidak sesuai dengan spesifikasi → Ganti.

	Warna timbel	
	Putih	Merah
Lepaskan pelat pengunci A	<input type="radio"/>	<input type="radio"/>
Pasang pelat pengunci B		
Tekan tombol C	<input type="radio"/>	<input type="radio"/>

CHAPTER 9

TROUBLE-ANALYSIS

TROUBLE ANALYSIS	9-1
TROUBLE ANALYSIS CHART	9-1

BAB 9

ANALISIS GANGGUAN

ANALISIS GANGGUAN	9-1
BAGAN ANALISIS GANGGUAN	9-1

TROUBLE ANALYSIS

NOTE:

Check the following items before analyzing any problems.

1. All wiring connections are properly connected and free of rust.
2. The lanyard is installed on the engine stop switch.
3. The shift lever and engine are in neutral.
4. The carburetor is receiving fuel.
5. The proper rigging and engine settings are fixed.
6. The engine is free from any "hull problems".

TROUBLE ANALYSIS CHART

Trouble								Checks		Relative part	Reference Chapter	
ENGINE WILL NOT START	ROUGH IDLING	ENGINE STALLS	ENGINE WILL NOT STOP	POOR PERFORMANCE	OVERHEATING	LOSE STEERING	HARD SHIFTING					
								FUEL SYSTEM				
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					Fuel hose	4			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					Fuel joint	4			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					Fuel filter	4			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					Fuel pump	4			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					Carburetor	4			
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				Pilot screw setting	4			
	<input type="radio"/>	<input type="radio"/>						Idle speed	3			
								POWER UNIT				
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					Reed valve	5			
<input type="radio"/>	<input type="radio"/>							Cylinder head gasket	5			
<input type="radio"/>		<input type="radio"/>						Seal	5			
<input type="radio"/>		<input type="radio"/>						Cylinder body	5			
<input type="radio"/>		<input type="radio"/>						Piston ring	5			
<input type="radio"/>		<input type="radio"/>						Crankcase	5			
<input type="radio"/>		<input type="radio"/>						Piston	5			
<input type="radio"/>		<input type="radio"/>						Control unit adjustment	3			
	<input type="radio"/>	<input type="radio"/>						Bearing	5			
		<input type="radio"/>						Thermostat	5			
		<input type="radio"/>						Water passage	5			

ANALISIS GANGGUAN**CATATAN :**

Periksa hal-hal berikut ini sebelum melakukan analisis gangguan apa pun.

1. Semua hubungan kawat sudah benar dan tidak ada kawat.
2. Lanyard terpasang pada sakelar penghenti mesin.
3. Shift lever dan mesin ada dalam posisi netral.
4. Bahan bakar masuk ke dalam karburator.
5. Alat-alat dan perlengkapan mesin dalam keadaan terpasang.
6. Mesin bebas dari semua "masalah badan kapal".

BAGAN ANALISIS GANGGUAN

Gangguan								Pemeriksaan	
MESIN TIDAK MAU START	PUTARAN TANPA BEBAN KASAR	MESIN MOGOK	MESIN TIDAK MAU BERHENTI	UNJUK KERJA BURUK	PANAS BERLEBIHAN	KEMUDI LONGGAR	PERGANTIAN PERSNELING KERAS	Bagian yang berhubungan	
								Bab acuan	
SISTEM BAHAN BAKAR									
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				Selang bahan bakar	4
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				Sambungan bahan bakar	4
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				Filter bahan bakar	4
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				Pompa bahan bakar	4
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				Karburator	4
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			Perangkat sekrup pilot	4
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>						Putaran tanpa beban	3
UNIT DAYA									
<input type="radio"/>	<input type="radio"/>		<input type="radio"/>					Katup buluh	5
<input type="radio"/>	<input type="radio"/>							Gasket kepala silinder	5
<input type="radio"/>	<input type="radio"/>			<input type="radio"/>				Seal	5
<input type="radio"/>	<input type="radio"/>			<input type="radio"/>				Badan silinder	5
<input type="radio"/>	<input type="radio"/>			<input type="radio"/>				Ring piston	5
<input type="radio"/>	<input type="radio"/>			<input type="radio"/>				Karter	5
<input type="radio"/>	<input type="radio"/>			<input type="radio"/>				Piston	5
<input type="radio"/>		<input type="radio"/>		<input type="radio"/>				Penyetelan unit pengatur	3
		<input type="radio"/>		<input type="radio"/>				Bearing	5
			<input type="radio"/>					Thermostat	5
				<input type="radio"/>				Saluran air	5

Trouble								Checks			
ENGINE WILL NOT START	ROUGH IDLING	ENGINE STALLS	POOR PERFORMANCE	OVERHEATING	LOOSE STEERING	HARD SHIFTING				Relative 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 rod	6		
					○			Lower case	6		
BRACKET UNIT											
					○			Bracket	7		
					○			Rubber mount	7		
ELECTRICAL											
○	○	○	○	○	○			Ignition system	8		
○		○						Starting system	8		

TRBL
ANLS

ANALISIS GANGGUAN

IN

Gangguan										Pemeriksaan	
MESIN TIDAK MAU START	PUTARAN TANPA BEBAN KASAR	MESIN MOGOK	MESIN TIDAK MAU BERHENTI	UNJUK KERJA BURUK	PANAS BERLEBIHAN	KEMUDI LONGGAR	PERGANTIAN PERSNELING KERAS				
										Bagian yang berhubungan	Bab acuan
										BAGIAN BAWAH	
O						O				Posisi netral	6
O						O				Kopling	6
O						O				Roda gigi	6
				O	O					Saluran masuk air	6
				O	O					Pompa air	6
				O						Poros baling-baling	6
					O					Shifter/pen	6
						O				Shift cam	6
						O				Shift rod	6
						O				Bak bawah	6
										UNIT BRACKET (SIKU)	
						O				Bracket	7
						O				Karet mount	7
										ELEKTRIK	
O	O	O		O	O					Sistem penyalaan	8
O			O							Sistem permulaan jalan	8

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