

FOREWORD

This manual covers the service procedures of the TOYOTA FORKLIFT 50-4FD100~135, 50-4FDK150,160. Please use this manual for providing quick, correct servicing of the corresponding forklift models.

This manual deals with the above models as of August 2008. Please understand that disagreement can take place between the descriptions in the manual and actual vehicles due to change in design and specifications. Any change or modifications thereafter will be informed by Toyota Industrial Equipment Parts & Service News.

For the service procedures of the mounted engine, read the repair manuals listed below as reference together with this manual.

(Reference)

Repair manuals related to this manual are as follows:

TOYOTA INDUSTRIAL EQUIPMENT J08E-UM ENGINE
REPAIR MANUAL (No.)

TOYOTA Material Handling Company

A Division of TOYOTA INDUSTRIES CORPORATION

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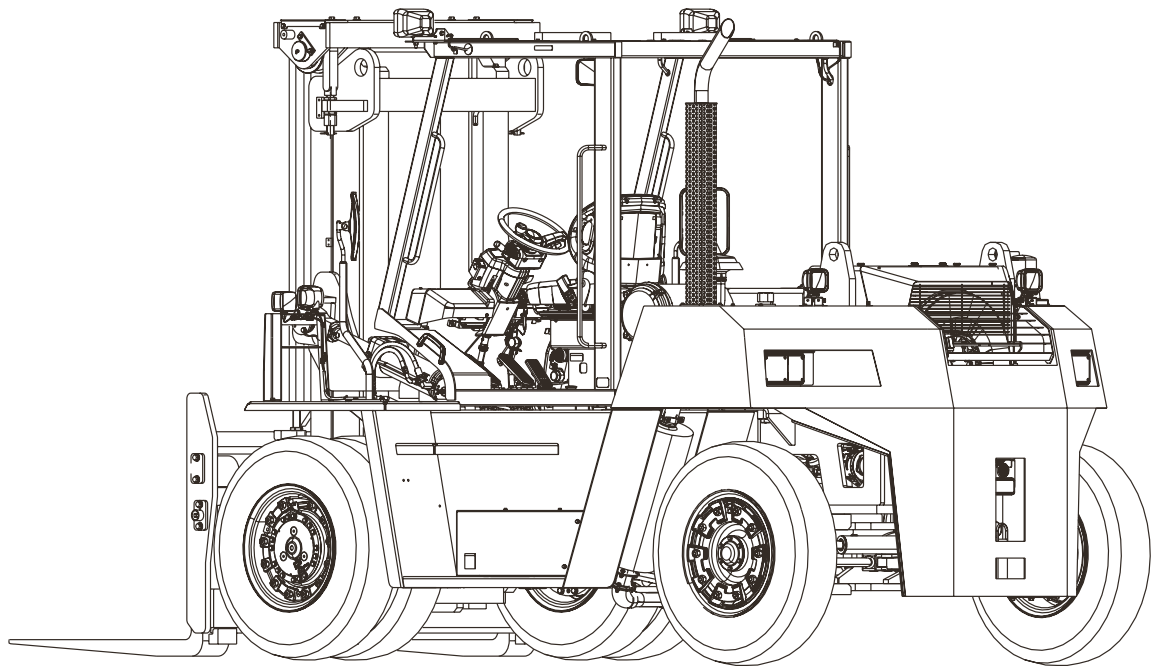
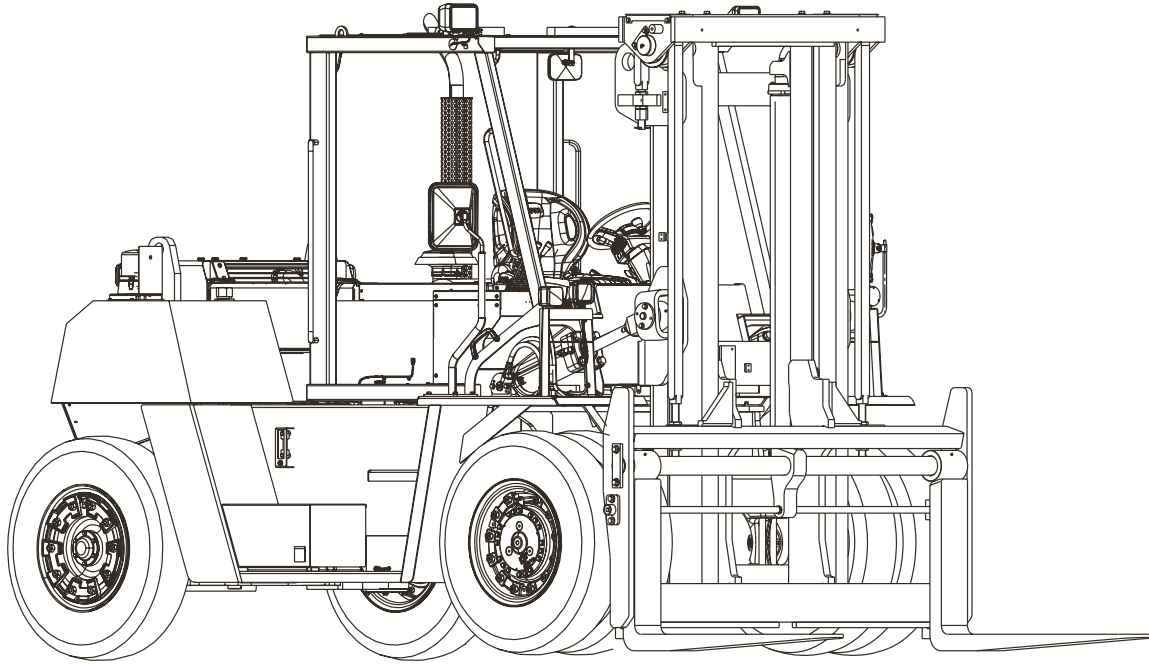
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GENERAL

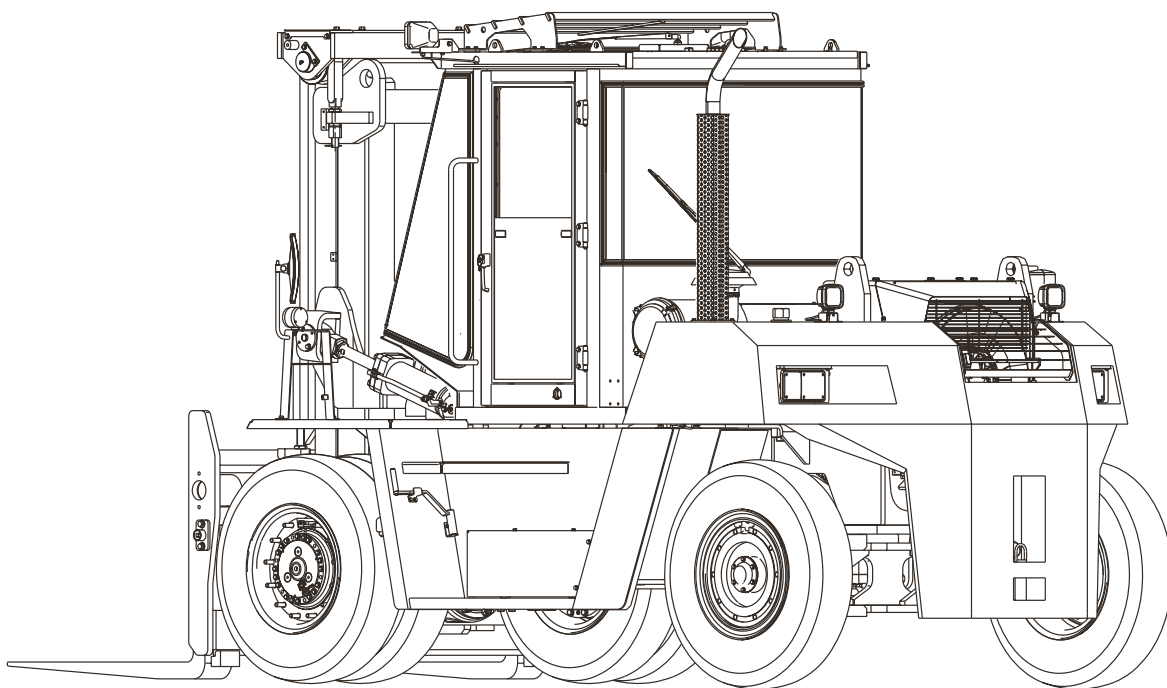
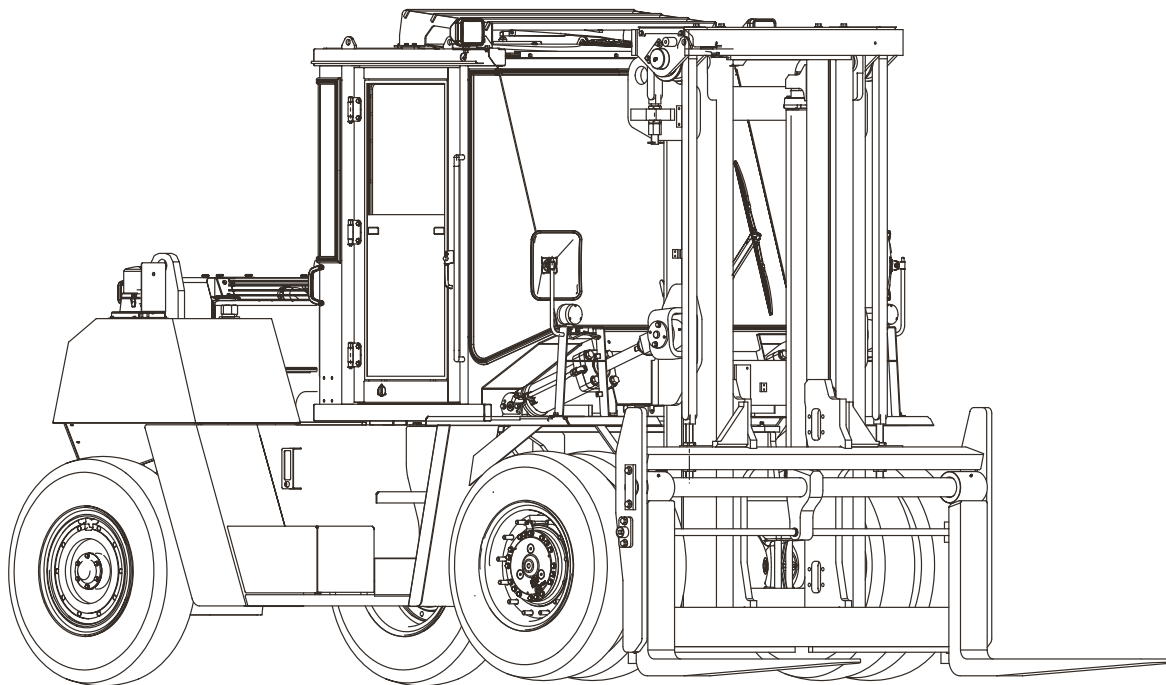
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VEHICLE EXTERIOR VIEWS

HEADGUARD MODEL



CABIN MODEL

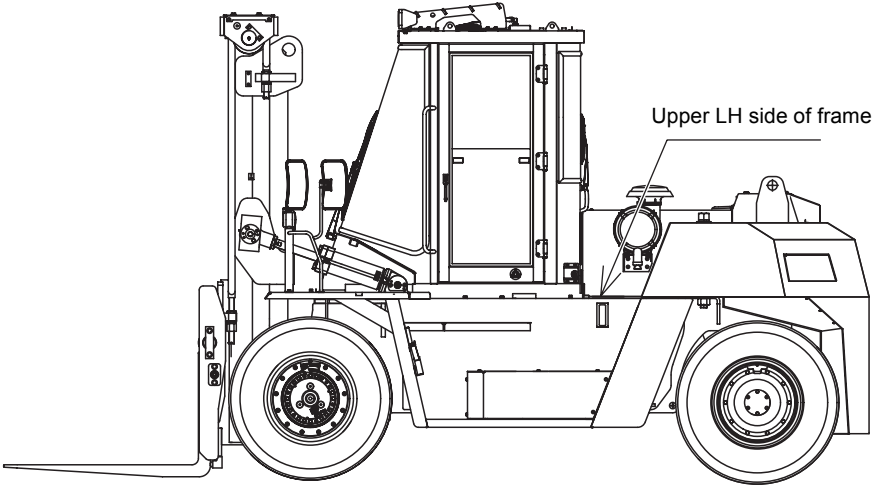


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VEHICLE MODEL

| Payload | Vehicle model | Standard load center | Engine model |
|----------|---------------|----------------------|--------------|
| 10 ton | 50-4FD100 | 600 mm (23.6 in) | J08E-UM |
| 11.5 ton | 50-4FD115 | | |
| 12 ton | 50-4FD120 | | |
| 13.5 ton | 50-4FD135 | | |
| 15 ton | 50-4FDK150 | | |
| 16 ton | 50-4FDK160 | | |

FRAME NUMBER

| Vehicle model | Punching format |
|-------------------|--|
| 50-4FD100 | 4FD120-50011 |
| 50-4FD115 | |
| 50-4FD120 | |
| 50-4FD135 | 4FDK160-50011 |
| 50-4FDK150 | |
| 50-4FDK160 | |
| Punching position |  |

HOW TO USE THIS MANUAL

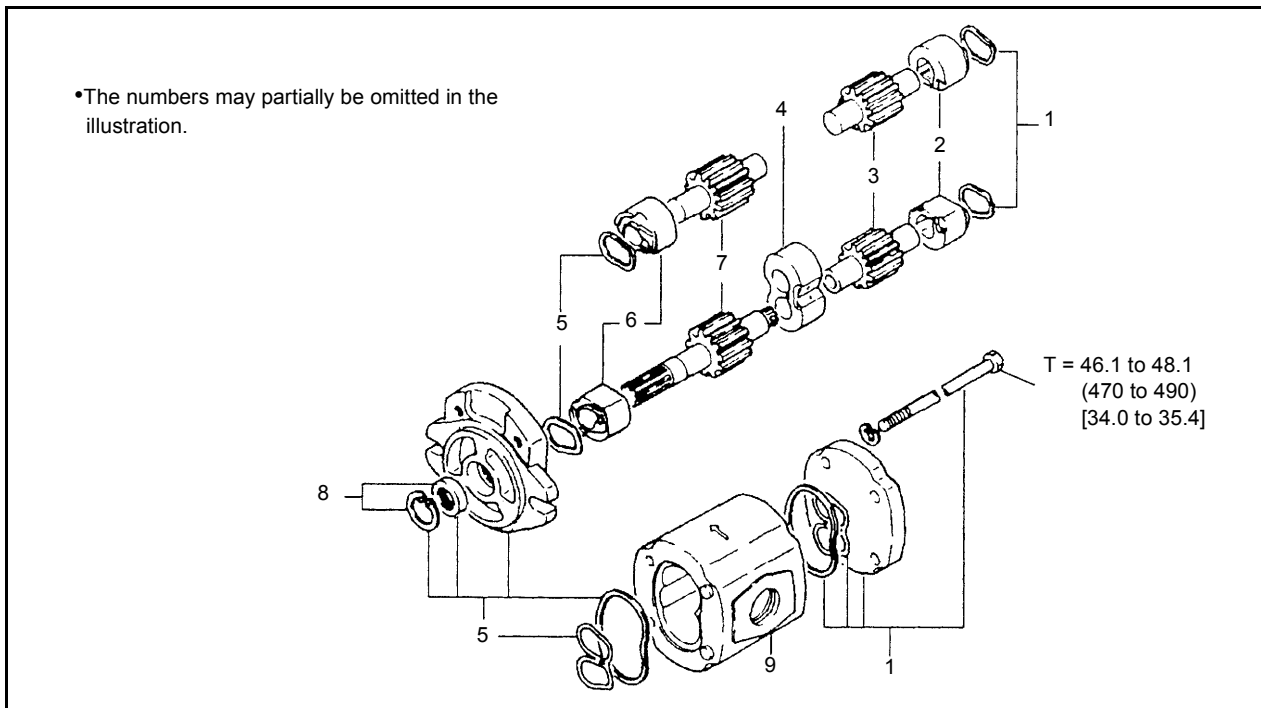
EXPLANATION METHOD

1. Operating procedure

Description example

DISASSEMBLY•INSPECTION•REASSEMBLY

Tightening torque unit → N·m (kgf·cm) [ft·lbf]



Disassembly Procedure

- 1 Remove the cover. **[Point 1]**
- 2 Remove the bushing. **[Point 2]**
- 3 Remove the gear.

← Operation to be explained

Point Operations

↙ Explanation of operation point with illustration

[POINT 1]

Disassembly:
Make match marks before removing the pump cover.

[POINT 2]

Inspection:
Measure the bushing inside diameter.
Limit: 19.12 mm

Explanation of abbreviations used for point operations

| | |
|--------------|------------|
| Removal | Reassembly |
| Installation | Adjustment |
| Disassembly | Inspection |

2. Matters omitted from this manual

This manual omits descriptions of the following jobs, but perform them in actual operation:

- (1) Cleaning and washing of removed parts as required
- (2) Visual inspection (partially described)

TERMINOLOGY

Caution:

Important matters, negligence of which may cause accidents. Be sure to observe them.

Note:

Important matters, negligence of which may cause failures, or matters in operation procedure requiring special attention.

Standard: Value showing the allowable range in inspection or adjustment.

Limit: The maximum or minimum value allowed in inspection or adjustment.

ABBREVIATIONS

| Abbreviation | Meaning | Abbreviation | Meaning |
|--------------|---------------------|--------------|---------------------------------------|
| ASSY | Assembly | SAE | Society of Automotive Engineers (USA) |
| LH | Lefthand | SAS | System of Active Stability |
| LLC | Long Life Coolant | SST | Special Service Tool |
| L/ | Less | STD | Standard |
| M/T | Manual Transmission | T/C | Torque Converter & Transmission |
| OPT | Option | T= | Tightening Torque |
| O/S | Oversize | 〇〇T | Number of teeth (〇〇T) |
| PS | Power Steering | U/S | Undersize |
| RH | Righthand | W/ | With |

OPERATING TIPS

GENERAL

1. Safe operation

- (1) After jacking up, always support the vehicle with wooden blocks and rigid stands.
- (2) When hoisting the vehicle, use wire ropes with sufficient reserve in load capacity.
- (3) Always disconnect the battery plug before the inspection or servicing of electrical parts.
- (4) The operator must always extract and carry the engine key when entering the area under the vehicle.
- (5) When 2 or more persons work as a group, always assign an instructor and operate according to his instructions.

2. Tactful operation

- (1) Prepare the tools, necessary measuring instruments (circuit tester, megohmmeter, oil pressure gauge, etc.) and SSTs before starting operation.
- (2) Check the cable color and wiring state before disconnecting any wiring.
- (3) When overhauling functional parts, complicated sections or related mechanisms, arrange the parts neatly to avoid confusion.
- (4) When disassembling and inspecting a precision part such as the control valve, use clean tools and operate in a clean location.
- (5) Always follow the specified operation steps for disassembly, inspection, reassembly and adjustment.
- (6) Always replace gaskets, packing, O-rings, self-locking nuts and cotterpins with new ones whenever they are disassembled.
- (7) Use genuine Toyota parts for replacement.
- (8) Use specified bolts and nuts and observe the specified tightening torque when reassembling. (Tighten to the medium value of the specified tightening torque range.) If no tightening torque is specified, use the value given in the "standard tightening torque table".

3. Defect status check

Do not start disassembly and/or replacement immediately, but first check that disassembly and/or replacement is necessary for the defect.

4. Waste fluid disposal

Always use a proper container to collect draining waste fluid from the vehicle.

Careless discharge of oil, fuel, coolant, oil filter, battery or other harmful substance may adversely affect human health and the environment. Always collect and sort them well, and ask specialized companies for appropriate disposal.

JACKING UP

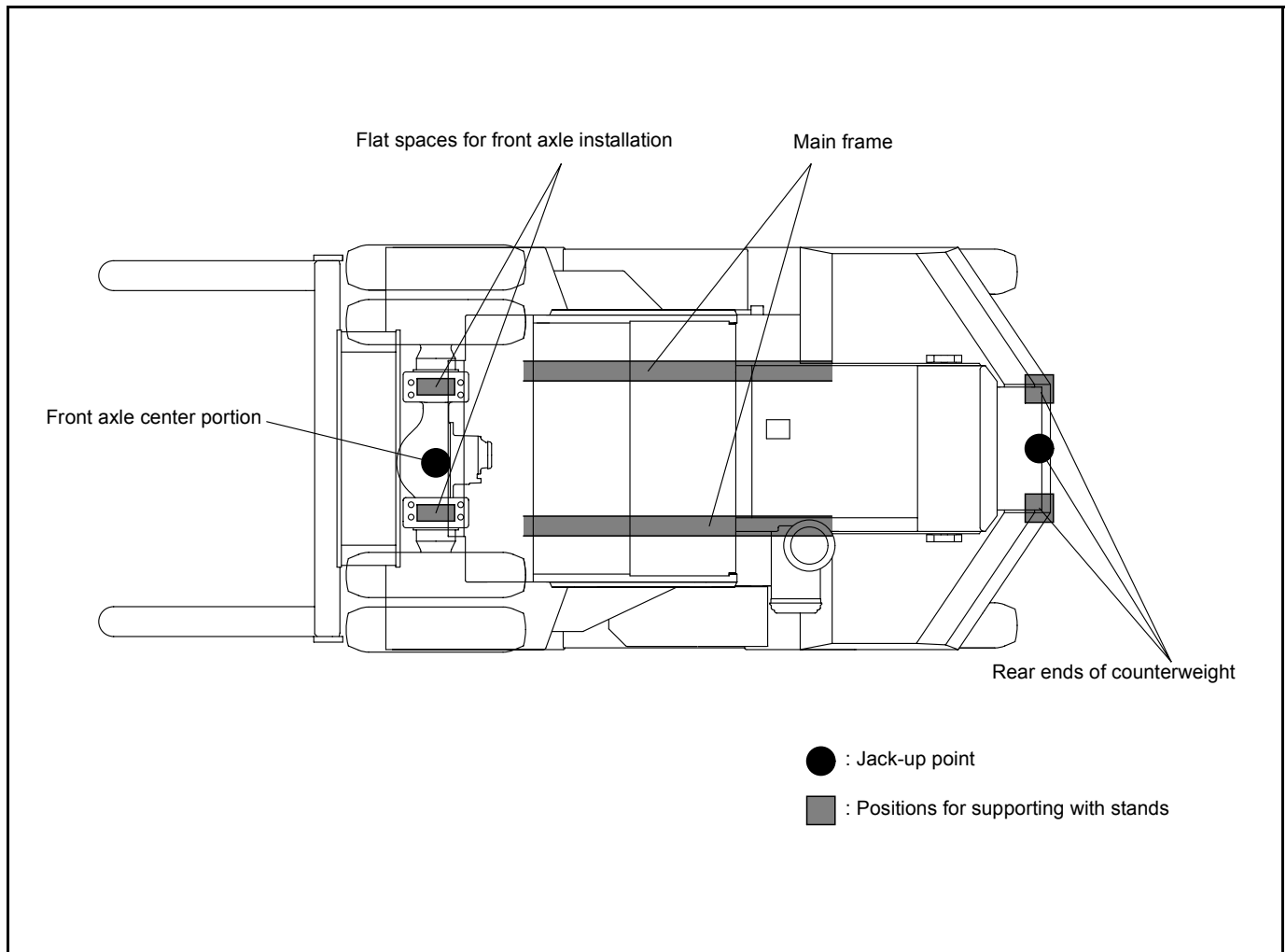
When jacking up the vehicle, always observe the following instructions.

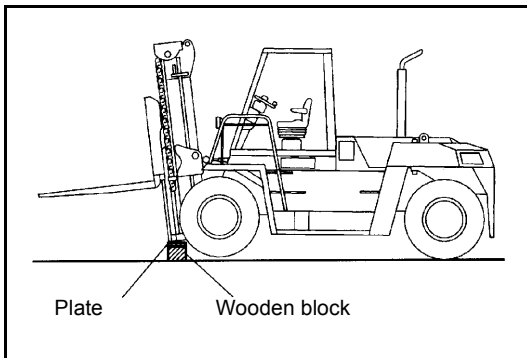
- When the fork is loaded, unload it and park the vehicle on a flat surface. Do not park on an inclined or rough ground.
- Use a jack with ample capacity and jack up the vehicle at the specified jack-up point. Jacking up at any other point is dangerous.
- Always support the load of jacked-up vehicle with wooden blocks at specified points. Supporting the vehicle only with the jack is very dangerous.
- Never, under any circumstances, put any part of the body (including hands and feet) under the jacked-up vehicle.

Reference weight

kg (lb)

| Vehicle model | | 50-4FD100 | 50-4FD115 | 50-4FD120 | 50-4FD135 | 50-4FDK150 | 50-4FDK160 |
|------------------------|-------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Vehicle overall weight | | 13570 (29916) | 14650 (32297) | 15120 (33334) | 16040 (35362) | 18070 (39837) | 18630 (41072) |
| Front axle load | W/mast ASSY | 6860 (15124) | 6970 (15366) | 6950 (15322) | 7750 (17086) | 8630 (19026) | 8580 (18915) |
| Rear wheel load | W/mast ASSY | 6710 (14793) | 7680 (16931) | 8170 (18012) | 8290 (18276) | 9440 (20811) | 10050 (22156) |



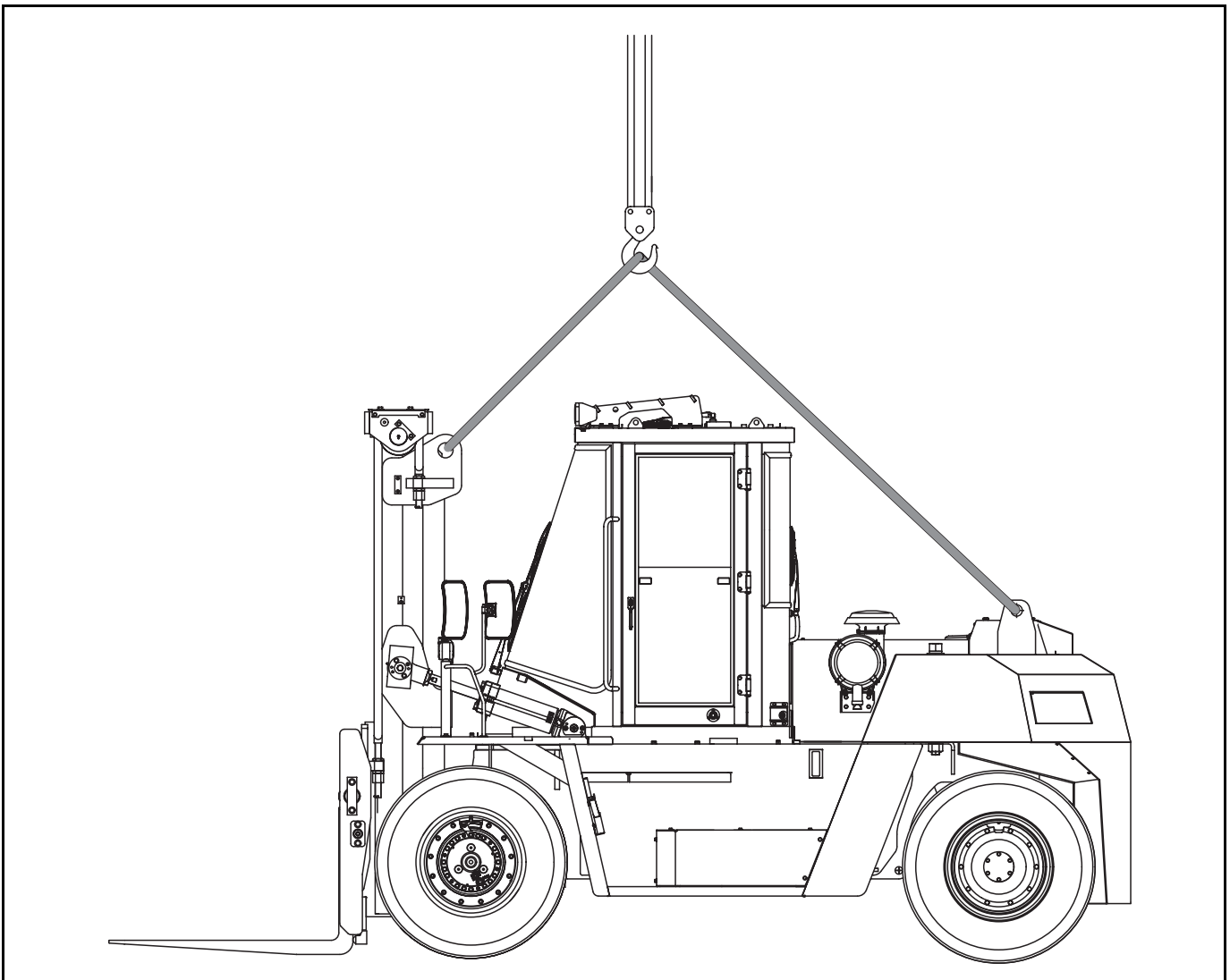


When the mast ASSY is installed on the vehicle, it is also possible to jack up the front side of the vehicle as follows:

1. Lift the lift bracket to a height not obstructing operation.
2. Place wooden blocks and a plate under the outer mast.
3. Tilt the mast forward to raise the front of the vehicle.
4. Support the flat spaces of the front axle mounting portion with stands.

HOISTING THE VEHICLE

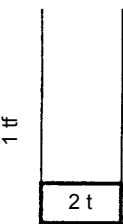
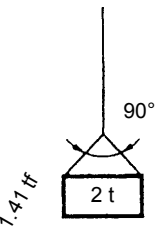
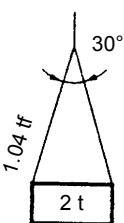
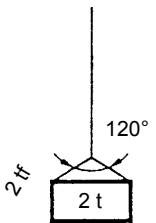
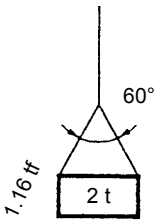
Always hoist the vehicle as specified in the specified position. Never hoist by any other attachment section as it is very dangerous.



Caution:

Hoist the vehicle only for loading/unloading at the time of vehicle shipment. Do not hoist the vehicle while ordinary servicing jobs.

WIRE ROPE SUSPENSION ANGLE LIST

| Lifting angle | Tension | Com-pression | Suspension method | Lifting angle | Tension | Com-pression | Suspension method |
|---------------|-----------|--------------|---|---------------|-----------|--------------|---|
| 0° | 1.00 time | 0 time |  | 90° | 1.41 time | 1.00 time |  |
| 30° | 1.04 time | 0.27 time |  | 120° | 2.00 time | 1.73 time |  |
| 60° | 1.16 time | 0.58 time |  | | | | |

SAFE LOAD FOR EACH WIRE ROPE SUSPENSION ANGLE

Unit: N (tf) [lbf]

| Rope diameter | Cutting load | Single-rope suspension | Two-rope suspension | | | | | Four-rope suspension | | | |
|---------------------|----------------------------|-----------------------------|---------------------------|---------------------------|--------------------------|--------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--|
| | | 0° | 0° | 30° | 60° | 90° | 0° | 30° | 60° | 90° | |
| 6 mm (0.24 in) | 21380 (2.18) [4807] | 3040 (0.31) [683.6] | 6080 (0.62) [1367] | 5880 (0.6) [1323] | 5200 (0.53) [1169] | 4310 (0.44) [970] | 12160 (1.24) [2734] | 11770 (1.2) [2646] | 10400 (1.06) [2337] | 8630 (0.88) [1940] | |
| 8 mm (0.32 in) | 31480 (3.21) [7078] | 4410 (0.45) [992.3] | 8830 (0.9) [1985] | 8530 (0.87) [1918] | 7650 (0.78) [1720] | 6280 (0.64) [1411] | 17650 (1.8) [3969] | 17060 (1.74) [3937] | 15300 (1.56) [3440] | 12550 (1.28) [2822] | |
| 10 mm (0.4 in) | 49230 (5.02) [11.69] | 6960 (0.71) [1565.6] | 14020 (1.43) [3153] | 13440 (1.37) [3021] | 11770 (1.2) [2646] | 9810 (1.0) [2205] | 27460 (2.8) [6174] | 26480 (2.7) [5954] | 23540 (2.4) [5292] | 19610 (2.0) [4410] | |
| 12.5 mm (0.5 in) | 76880 (7.84) [17387] | 10980 (1.12) [2469.5] | 21570 (2.2) [4851] | 21280 (2.1) [4631] | 18630 (1.9) [4190] | 14710 (1.5) [3308] | 43150 (4.4) [9702] | 41190 (4.2) [9261] | 37270 (3.8) [8379] | 29420 (3.0) [6615] | |
| 14 mm (0.56 in) | 96400 (9.83) [21675] | 13730 (1.4) [3087] | 27460 (2.8) [6174] | 26480 (2.7) [5954] | 23540 (2.4) [5292] | 18630 (1.9) [4190] | 54920 (5.6) [12348] | 52960 (5.4) [11907] | 47070 (4.8) [10584] | 37270 (3.8) [8379] | |

MEMBER WEIGHTS**Vehicle weight**

kg (lb)

| Specifications | Weight | | | | | |
|---|------------------|------------------|------------------|------------------|------------------|------------------|
| | 50-4FD100 | 50-4FD115 | 50-4FD120 | 50-4FD135 | 50-4FDK150 | 50-4FDK160 |
| Headguard Mast V mast, lifting height: 3000 Fork length: 1220 mm Attachment A31 | 13420 (29585) | 14500 (32000) | 14970 (33000) | 15890 (35030) | 17920 (39510) | 18480 (40740) |

Weight increase when the attachment is installed

kg (lb)

| Attachment type | Weight | | | | | |
|-----------------|------------|------------|------------|------------|------------|------------|
| | 50-4FD100 | 50-4FD115 | 50-4FD120 | 50-4FD135 | 50-4FDK150 | 50-4FDK160 |
| A35 | 110 (243) | 150 (331) | 150 (331) | 160 (353) | 100 (220) | 100 (220) |
| E3 | 490 (1080) | 530 (1168) | 530 (1168) | 590 (1300) | 450 (992) | 450 (992) |
| E3A35 | 530 (1168) | 560 (1235) | 560 (1235) | 620 (1367) | 480 (1058) | 480 (1058) |

Weight increase when the cabin air conditioner is installed: 230 kg

Mast weight (including lift bracket and excluding the fork)

kg (lb)

| Mast type | Lifting height mm (in) | Mast ASSY weight | | | | | |
|-----------|---------------------------|------------------|----------------|----------------|----------------|-----------------|-----------------|
| | | 50-4FD100 | 50-4FD115 | 50-4FD120 | 50-4FD135 | 50-4FDK150 | 50-4FDK160 |
| V | 3000 (118) | 2560 (5644) | 2650 (5842) | 2650 (5842) | 2920 (6437) | 3730 (8223) | 3730 (8223) |
| | 3300 (130) | 2620 (5776) | 2720 (5997) | 2720 (5997) | 3000 (6614) | 3830 (8444) | 3830 (8444) |
| | 3500 (138) | 2660 (5864) | 2770 (6107) | 2770 (6107) | 3060 (6746) | 3900 (8598) | 3900 (8598) |
| | 3700 (146) | 2700 (5952) | 2820 (6217) | 2820 (6217) | 3100 (6834) | 3940 (8686) | 3940 (8686) |
| | 4000 (157) | 2760 (6085) | 2890 (6371) | 2890 (6371) | 3200 (7055) | 4130 (9105) | 4130 (9105) |
| | 4500 (177) | 2930 (6459) | 3070 (6768) | 3070 (6768) | 3360 (7407) | 4280 (9436) | 4280 (9436) |
| | 5000 (197) | 3050 (6724) | 3240 (7143) | 3240 (7143) | 3570 (7870) | 4540 (10009) | 4540 (10009) |
| | 5500 (217) | 3160 (6967) | 3380 (7452) | 3380 (7452) | 3720 (8201) | 4690 (10340) | 4690 (10340) |
| | 6000 (236) | 3230 (7121) | 3500 (7716) | 3500 (7716) | 3850 (8488) | 4830 (10648) | 4830 (10648) |
| FV | 3000 (118) | 2610 (5754) | - | - | - | - | - |
| | 3500 (138) | 2730 (6019) | - | - | - | - | - |
| | 4000 (157) | 2850 (6283) | - | - | - | - | - |
| | 4500 (177) | 2990 (6592) | - | - | - | - | - |
| | 5000 (197) | 3180 (7011) | - | - | - | - | - |
| FSV | 4000 (157) | 3080 (6790) | 3550 (7826) | 3550 (7826) | 3810 (8400) | - | - |
| | 5000 (197) | 3310 (7297) | 3800 (8377) | 3800 (8377) | 4080 (8995) | - | - |
| | 6000 (236) | 3710 (8179) | 4220 (9303) | 4220 (9303) | 4520 (9965) | - | - |

Fork weight

kg (lb)

| Fork length mm (in) | Weight (for 2 forks) | | | | | |
|------------------------|----------------------|---------------|---------------|---------------|---------------|---------------|
| | 50-4FD100 | 50-4FD115 | 50-4FD120 | 50-4FD135 | 50-4FDK150 | 50-4FDK160 |
| 1220 (48.0) | 370 (816) | 410 (904) | 410 (904) | 470 (1036) | 470 (1036) | 520 (1146) |
| 1370 (53.9) | 390 (860) | 430 (948) | 430 (948) | 500 (1102) | 500 (1102) | 550 (1213) |
| 1520 (59.8) | 410 (904) | 450 (992) | 450 (992) | 520 (1146) | 520 (1146) | 580 (1279) |
| 1670 (65.7) | 430 (948) | 470 (1036) | 470 (1036) | 550 (1213) | 550 (1213) | 610 (1345) |
| 1820 (71.7) | 450 (992) | 500 (1102) | 500 (1102) | 570 (1257) | 570 (1257) | 630 (1389) |
| 2440 (96.1) | 600 (1323) | 670 (1477) | 670 (1477) | 730 (1609) | 730 (1609) | 810 (1786) |

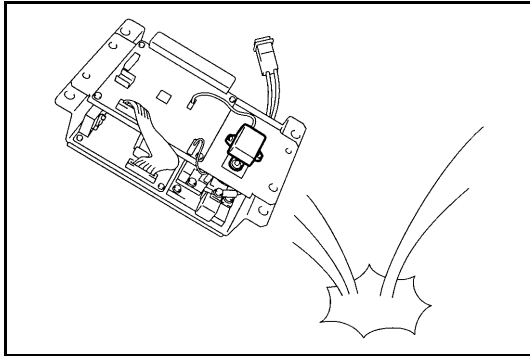
Member weights

kg (lb)

| Member name | Weight | | | | | |
|--------------------------------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | 50-4FD100 | 50-4FD115 | 50-4FD120 | 50-4FD135 | 50-4FDK150 | 50-4FDK160 |
| Engine ASSY | 520 (1146) | ← | ← | ← | ← | ← |
| Torque converter & transmission ASSY | 455 (1000) | ← | ← | ← | ← | ← |
| Front axle | 1075 (2370) | ← | ← | ← | ← | ← |
| Counterweight | 3860 (8510) | 4720 (10405) | 5180 (11420) | 5420 (11950) | 6640 (14640) | 7080 (15610) |
| Cabin ASSY | 550 (1212) | ← | ← | ← | ← | ← |
| Rear axle ASSY | 710 (1565) | ← | ← | ← | ← | ← |
| Tilt Cylinder | 40 (88) | ← | ← | ← | ← | ← |
| Lift Cylinder | 90 (198) | ← | ← | ← | ← | ← |
| Oil pump | 35 (77) | ← | ← | ← | ← | ← |
| Oil control valve | 75 (165) | ← | ← | ← | ← | ← |

ELECTRICAL PARTS INSPECTION

1. Always disconnect the battery plug before inspecting or servicing electrical parts.
2. Pay sufficient attention when handling electronic parts.



- (1) Never subject electronic parts, such as computers and relays, to impact.
- (2) Never expose electronic parts to high temperature or moisture.
- (3) Do not touch connector terminals, as they may be deformed or damaged due to static electricity.

3. Use a circuit tester that matches the object and purpose of measurement.

Analog type: This type is convenient for observing movement during operation and the operating condition. The measured value is only for reference or guideline.

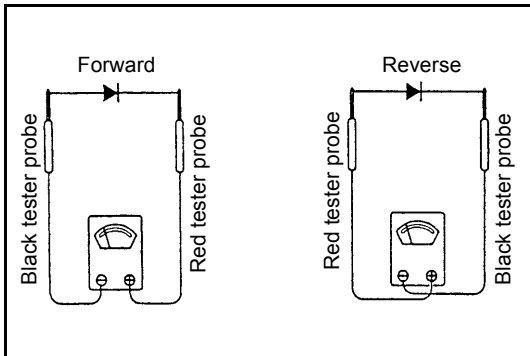
Digital type: A fairly accurate reading is possible. However, it is difficult to observe operation or movement.

- 1 Difference between results of measurement with analog and digital types

* The results of measurements using the analog type and the digital type may be different. Use the circuit tester according to its instruction manual.

Differences between the polarities of the analog type and the digital type are described below.

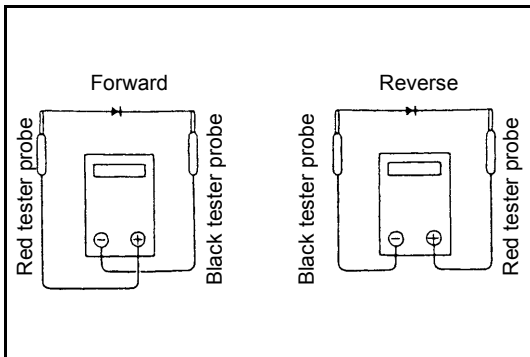
- (1) Analog circuit tester



Example of measurement result
Tester range: $k\Omega$ range

Forward direction: Continuity 11 $k\Omega$
Reverse direction: No continuity ∞

- (2) Digital circuit tester



Example of measurement result
Tester range: 2 $M\Omega$

Forward direction: Continuity 2 $M\Omega$
Reverse direction: No continuity

BOLT & NUT TIGHTENING TORQUE





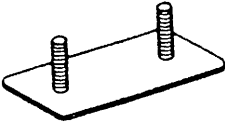
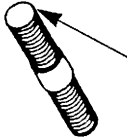
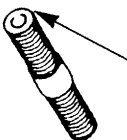
Standard bolt & nut tightening torque

Tightening torques of standard bolts and nuts are not indicated throughout the manual. Use the charts and table below to judge the standard tightening torque.

1. Judge the tightening torque for the hexagon head bolt, welded bolt or stud bolt having the standard bearing surface according to the tightening torque table by identifying the bolt strength class from the table below.
2. Judge the tightening torque for the hexagon flange bolt based on the threading diameter.
3. The nut tightening torque can be judged from its corresponding bolt type.

BOLT STRENGTH CLASS IDENTIFICATION METHOD AND TIGHTENING TORQUE

Identification by actual part

| Type | Shape and class | Class |
|---------------------------------|--|--|
| Hexagon head bolt (standard) |  Number in relief or hallmark on the head | 4 = 4T 5 = 5T 6 = 6T 7 = 7T 8 = 8T |
| |  No mark | 4T |
| |  Bolt with two raised lines on head | 5T |
| |  Bolt with three raised lines on head | 7T |
| |  Bolt with four raised lines on head | 8T |
| Welded bolt |  | 4T |
| Stud bolt |  No mark | 4T |
| |  2 mm groove(s) on one/both edge(s) | 6T |

Identification by part No.

| Type | Part No. | Shape |
|--------------|-----------------|-------|
| Hexagon bolt | 91611-40625 | |
| Stud bolt | 92132-40614 | |

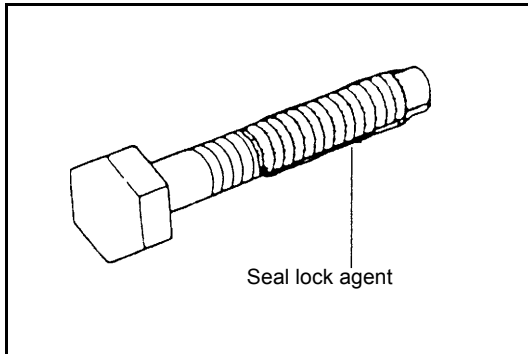
Tightening torque table

| Class | Nominal diameter mm | Pitch mm | Standard tightening torque | | |
|-------|------------------------|-------------|----------------------------|--------|-----------|
| | | | N•m | kgf•cm | ft•lbf |
| 4T | 6 | 1.0 | 5.4 | 55 | 48 in•lbf |
| | 8 | 1.25 | 13 | 130 | 9 |
| | 10 | 1.25 | 25 | 260 | 19 |
| | 12 | 1.25 | 47 | 480 | 35 |
| | 14 | 1.5 | 75 | 760 | 55 |
| | 16 | 1.5 | 113 | 1150 | 83 |
| 5T | 6 | 1.0 | 6.5 | 65 | 56 in•lbf |
| | 8 | 1.25 | 16 | 160 | 12 |
| | 10 | 1.25 | 32 | 330 | 24 |
| | 12 | 1.25 | 59 | 600 | 43 |
| | 14 | 1.5 | 91 | 930 | 67 |
| | 16 | 1.5 | 137 | 1400 | 101 |
| 6T | 6 | 1.0 | 7.8 | 80 | 69 in•lbf |
| | 8 | 1.25 | 19 | 195 | 14 |
| | 10 | 1.25 | 39 | 400 | 29 |
| | 12 | 1.25 | 72 | 730 | 53 |
| | 14 | 1.5 | 108 | 1100 | 80 |
| | 16 | 1.5 | 172 | 1750 | 127 |
| 7T | 6 | 1.0 | 11 | 110 | 8 |
| | 8 | 1.25 | 25 | 260 | 19 |
| | 10 | 1.25 | 52 | 530 | 38 |
| | 12 | 1.25 | 95 | 970 | 70 |
| | 14 | 1.5 | 147 | 1500 | 108 |
| | 16 | 1.5 | 226 | 2300 | 166 |
| 8T | 6 | 1.0 | 12 | 125 | 9 |
| | 8 | 1.25 | 29 | 300 | 22 |
| | 10 | 1.25 | 61 | 620 | 45 |
| | 12 | 1.25 | 108 | 1100 | 80 |
| | 14 | 1.5 | 172 | 1750 | 127 |
| | 16 | 1.5 | 265 | 2700 | 195 |

HEXAGON FLANGE BOLT TIGHTENING TORQUE

| Nominal diameter mm | Pitch mm | Standard tightening torque N•m (kgf•cm) [ft•lbf] | Remarks |
|------------------------|-------------|---|-----------------|
| 5 | 0.8 | 7.5 (76.5) [5.5] | |
| | | | Built-in washer |
| 6 | 1.0 | 12.5 (128) [9.2] | |
| | | 13 (133) [9.6] | Built-in washer |
| 8 | 1.25 | 31 (316) [22.9] | |
| | | 30 (306) [22.1] | Built-in washer |
| 10 | 1.25 | 64 (653) [47.2] | |
| | | 63 (643) [46.5] | Built-in washer |
| 12 | 1.25 | 115 (1173) [84.9] | |
| | | 115 (1173) [84.9] | Built-in washer |
| 14 | 1.5 | 180 (1837) [133] | |
| | | 180 (1837) [133] | Built-in washer |
| 16 | 1.5 | 280 (2857) [207] | |
| | | 275 (2806) [203] | Built-in washer |

PRECOATED BOLTS (BOLTS WITH SEAL LOCK AGENT COATING ON THREADS)



1. Do not use the precoat bolt as it is in either of the following cases:
 - (1) After it has been removed.
 - (2) When it has been moved by tightness check, etc. (Loosened or tightened.)

Note:

For torque check, tighten the bolt at the lower limit of the allowable tightening torque range; if the bolt moves, retighten it according to the steps below.

2. How to reuse precoated bolts
 - (1) Wash the bolt and threaded hole.
(The threaded hole must be washed even when replacing the bolt with a new one.)
 - (2) Completely dry the washed parts by blowing with air.
 - (3) Apply the specified seal lock agent on the bolt threaded portion.

HIGH PRESSURE HOSE FITTING TIGHTENING TORQUE

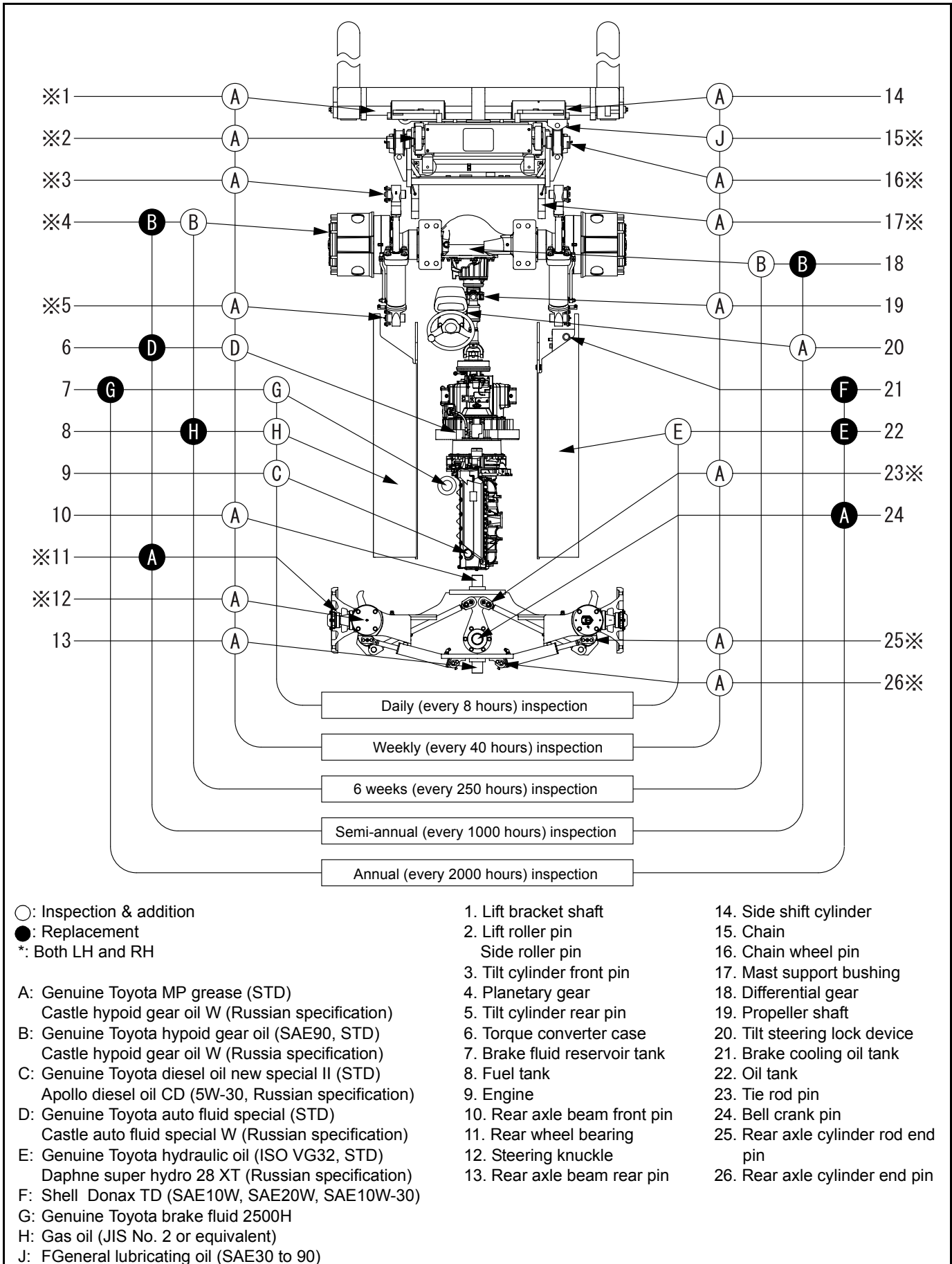
1. When connecting a high pressure hose, wipe the hose fitting and corresponding nipple contact surfaces with a clean cloth to remove foreign matter and dirt. Also check that there are no dents or other damage on the contact surfaces before installation.
2. When installing a high-pressure hose, align the hose metal joint with the nipple and tighten the bolt so as to maintain alignment.
3. The maximum tightening torque must not exceed twice the standard tightening torque.

| Nominal diameter of screw | Standard tightening torque N•m (kgf•cm) [ft•lbf] | | Hose inside diameter mm (in) |
|---------------------------|--|---|------------------------------|
| | Standard | Tightening range | |
| 7/16-20UNF | 25 (250) [18.1] | 24 to 26 (240 to 270) [17.4 to 19.5] | 6 (0.24) |
| 9/16-18UNF | 49 (500) [36.2] | 47 to 52 (480 to 530) [34.7 to 38.3] | 9 (0.35) |
| 3/4-16UNF | 59 (600) [43.4] | 56 to 62 (570 to 630) [41.2 to 45.6] | 12 (0.47) |
| 7/8-14UNF | 59 (600) [43.4] | 56 to 62 (570 to 630) [41.2 to 45.6] | 12 (0.47), 15 (0.59) |
| 1•1/16-12UNF | 118 (1200) [86.8] | 112 to 123 (1140 to 1250) [82.5 to 90.4] | 19 (0.75) |
| 1•5/16-12UNF | 137 (1400) [101.3] | 130 to 144 (1330 to 1470) [96.2 to 106.4] | 25 (0.98) |
| PF1/4 | 25 (250) [18.1] | 24 to 26 (240 to 270) [17.4 to 19.5] | 6 (0.24) |
| PF3/8 | 49 (500) [36.2] | 47 to 52 (480 to 530) [34.7 to 38.3] | 9 (0.35) |
| PF1/2 | 59 (600) [43.4] | 56 to 62 (570 to 630) [41.2 to 45.6] | 12 (0.47) |
| PF3/4 | 118 (1200) [86.8] | 112 to 123 (1140 to 1250) [82.5 to 90.4] | 19 (0.75) |
| PF1 | 137 (1400) [101.3] | 130 to 144 (1330 to 1470) [96.2 to 106.4] | 25 (0.98) |

RECOMMENDED LUBRICANT QUANTITY & TYPES

| Applicable portion | STD | Russian specification | Quantity I (US gal) |
|---|---|---|--|
| Engine | Genuine Toyota diesel oil New special II | Apollo diesel oil CD (5W-30) | 14.0 (3.7) |
| Engine coolant (excluding reservoir tank) | Genuine Toyota long life coolant (30% or 50%) | Genuine Toyota long life coolant (50%) | 25.0 (6.6) |
| Radiator reservoir tank (FULL mark position) | Genuine Toyota long life coolant (30% or 50%) | Genuine Toyota long life coolant (50%) | 1.5 (0.40) |
| Torque converter & transmission | Genuine Toyota auto fluid special | Castle auto fluid special W | 30.0 (7.9) |
| Differential | Genuine Toyota hypoid gear oil (SAE90) | Castle hypoid gear oil W | 18.0 (4.8) |
| Planetary gears (each of LH and RH) | Genuine Toyota hypoid gear oil (SAE90) | Castle hypoid gear oil W | 1.7 (0.45) |
| Each chassis part | Genuine Toyota MP grease Genuine Toyota chassis grease special | Castle hypoid gear oil W | 1.7 (0.45) |
| Brake fluid | Shell Donax TD (at factory shipment) Mobil fluid 424 Chevron 1000THF | Shell Donax TD (at factory shipment) Mobil fluid 424 Chevron 1000THF | 0.5 (0.13) |
| Brake cooling oil | Shell Donax TD (at factory shipment) Mobil fluid 424 Chevron 1000THF | Shell Donax TD (at factory shipment) Mobil fluid 424 Chevron 1000THF | 18 (4.8) |
| Hydraulic oil | Genuine Toyota hydraulic oil (ISOVG32) | Daphne super-hydro 28XT | 146.0 (38.6) (10 to 12 ton) 155.0 (40.9) (13.5 to 16 ton) |
| Fuel tank | Gas oil (JIS No.2 or supe- rior) | Gas oil (JIS No.2 or supe- rior) | 320.0 (84.5) |

LUBRICATION CHART



○: Inspection & addition
 ●: Replacement
 *: Both LH and RH

- A: Genuine Toyota MP grease (STD)
 Castle hypoid gear oil W (Russian specification)
- B: Genuine Toyota hypoid gear oil (SAE90, STD)
 Castle hypoid gear oil W (Russia specification)
- C: Genuine Toyota diesel oil new special II (STD)
 Apollo diesel oil CD (5W-30, Russian specification)
- D: Genuine Toyota auto fluid special (STD)
 Castle auto fluid special W (Russian specification)
- E: Genuine Toyota hydraulic oil (ISO VG32, STD)
 Daphne super hydro 28 XT (Russian specification)
- F: Shell Donax TD (SAE10W, SAE20W, SAE10W-30)
- G: Genuine Toyota brake fluid 2500H
- H: Gas oil (JIS No. 2 or equivalent)
- J: FGeneral lubricating oil (SAE30 to 90)

- 1. Lift bracket shaft
- 2. Lift roller pin
 Side roller pin
- 3. Tilt cylinder front pin
- 4. Planetary gear
- 5. Tilt cylinder rear pin
- 6. Torque converter case
- 7. Brake fluid reservoir tank
- 8. Fuel tank
- 9. Engine
- 10. Rear axle beam front pin
- 11. Rear wheel bearing
- 12. Steering knuckle
- 13. Rear axle beam rear pin
- 14. Side shift cylinder
- 15. Chain
- 16. Chain wheel pin
- 17. Mast support bushing
- 18. Differential gear
- 19. Propeller shaft
- 20. Tilt steering lock device
- 21. Brake cooling oil tank
- 22. Oil tank
- 23. Tie rod pin
- 24. Bell crank pin
- 25. Rear axle cylinder rod end pin
- 26. Rear axle cylinder end pin

PERIODIC MAINTENANCE

INSPECTION METHOD

- I: Inspection, repair or replacement if required
 M: Measurement, repair or adjustment if required
 T: Retightening C: Cleaning L: Lubrication
 *: For new vehicle *1: Flaw detector

| Item | | Inspection Period | Every 6 weeks | Every 3 months | Every 6 months | Every 12 months |
|--------------------------------|---|-------------------|-----------------|-----------------|------------------|------------------|
| | | | Every 250 hours | Every 500 hours | Every 1000 hours | Every 2000 hours |
| STEERING SYSTEM | | | | | | |
| Steering wheel | Play, loosening and looseness | I | | ← | ← | ← |
| | Function | I | | ← | ← | ← |
| Steering valve | Oil leak | I | | ← | ← | ← |
| | Loosened mounting | T | | ← | ← | ← |
| Tie rod and bell crank | Looseness, loosening and damage | T | | ← | ← | ← |
| Steering knuckle | Kingpin looseness | T | | ← | ← | ← |
| | Cracks and deformation | | | | | I |
| Power steering | Oil leak | I | | ← | ← | ← |
| | Loosened mounting | T | | ← | ← | ← |
| | Power steering hose replacement | | | | | I |
| | Power steering rubber parts replacement | | | | | I |
| Steering synchronizer | Function | I | | ← | ← | ← |
| | Loosened or damaged sensor mounting | I | | ← | ← | ← |
| | Functional parts damage and deformation | I | | ← | ← | ← |
| | Loosened of damaged wire harness | I | | ← | ← | ← |
| BRAKE SYSTEM | | | | | | |
| Brake valve | Brake valve function | I | | ← | ← | ← |
| | Braking performance | I | | ← | ← | ← |
| | Uneven braking | M | | ← | ← | ← |
| | Valve air leak | | | | | I |
| | Valve rubber parts replacement | | | | | I |
| Parking brake switch | Switch function | I | | ← | ← | ← |
| | Braking performance | I | | ← | ← | ← |
| Brake hose and pipe | Leak, crack and mounting state | I | | ← | ← | ← |
| | Loosened joint or clamp | I | | ← | ← | ← |
| | Brake fluid reservoir hose replacement | | | | | I |
| Air chamber and magnetic valve | Function, wear and damage | | | | | I |
| | Air chamber rubber parts replacement | | | | | I |

| Item | | Inspection Period | Every 6 weeks | Every 3 months | Every 6 months | Every 12 months |
|------------------------------|---|-------------------|-----------------|-----------------|------------------|------------------|
| | | | Every 250 hours | Every 500 hours | Every 1000 hours | Every 2000 hours |
| STEERING SYNCHRONIZER | | | | | | |
| Air compressor and air tank | Air cleaner clogging | | I | ← | ← | ← |
| | Water draining from air tank | | I | ← | ← | ← |
| | Compressor hose replacement | | | | | I |
| | Rubber parts replacement | | | | | I |
| | Check valve air tightness | | | | | I |
| | Air tank safety valve function | | | | | I |
| | Air compressor regulator function | | I | ← | ← | ← |
| | Air tank damage and deformation | | | | | I |
| Brake fluid reservoir tank | Leak and fluid level | | I | ← | ← | ← |
| Air master | Function, wear and damage | | | | | I |
| | Air leak and oil leak | | | | | I |
| | Air master rubber parts replacement | | | | | I |
| | Brake fluid replacement | | | | | I |
| Disc brake | Function, wear and damage | | | | | I |
| | Oil leak | | | | | I |
| | Disc wear | | | | | I |
| | Loosened mounting | | | | | T |
| Center brake drum and lining | Loosened drum mounting | | | T | ← | ← |
| | Clearance between drum and lining | | I | ← | ← | ← |
| | Lining wear | | | | | I |
| | Drum wear and damage | | | | | I |
| Brake cooler | Oil leak | | | | I | ← |
| | Damage and deformation | | | | I | ← |
| | Loosened mounting | | | | T | ← |
| DRIVE UNIT | | | | | | |
| Front axle | Damage and deformation | | | | | I |
| Rear axle | Damage and deformation | | | | | I |
| Wheel | Tire pressure | | I | ← | ← | ← |
| | Tire cracks and damage | | I | ← | ← | ← |
| | Abnormal tire wear | | I | ← | ← | ← |
| | Tire tread depth | | I | ← | ← | ← |
| | Metal piece, stone and other foreign matter on tire | | I | ← | ← | ← |
| | Rim side ring and disc wheel damage | | I | ← | ← | ← |
| | Rear wheel bearing looseness | | I | ← | ← | ← |
| | Abnormal sound from rear wheel bearing | | I | ← | ← | ← |
| | Rear wheel bearing grease replacement | | | | | I |

| Item | | Inspection Period | | | |
|----------------------------------|--|-------------------|-----------------|------------------|------------------|
| | | Every 6 weeks | Every 3 months | Every 6 months | Every 12 months |
| | | Every 250 hours | Every 500 hours | Every 1000 hours | Every 2000 hours |
| POWER TRANSMISSION SYSTEM | | | | | |
| Transmission & torque converter | Oil leak and oil level | | ← | ← | ← |
| | Control valve and clutch functions | | ← | ← | ← |
| | Inching valve function | | ← | ← | ← |
| | Torque converter stall inspection and hydraulic pressure measurement | | | T | ← |
| | Torque converter oil replacement | | | | |
| | Torque converter oil filter replacement | | | | |
| | Torque converter rubber hose replacement | | | | |
| Propeller shaft and drive shaft | Loosened joint | | T | ← | ← |
| | Looseness at spline portion | | | | |
| | Looseness at universal joint | | | | |
| | Propeller shaft runout | | | | |
| Differential | Axle shaft twist and crack | | | ← | ← |
| | Oil leak and oil level | | | ← | ← |
| | Differential oil replacement | | | | |
| Planetary gear | Bolts and nuts looseness | | | | |
| | Oil leak and oil level | | ← | ← | ← |
| Planetary gear | Planetary gear oil replacement | | | | |
| | | | | | |
| ELECTRICAL SYSTEM | | | | | |
| Battery | Fluid level | | ← | ← | ← |
| | Fluid specific gravity | | | ← | ← |
| | Terminal connection state | | | ← | ← |
| Electrical wiring | Loosened or damaged connection | | ← | ← | ← |
| | Wire harness damage and clamp loosening | | ← | ← | ← |
| | Fuses | | ← | ← | ← |
| Starting motor | Pinion gear meshing state | | ← | ← | ← |
| Charger | Charging function | | ← | ← | ← |
| Preheater | Glow plug function | | | | ← |
| MATERIAL HANDLING SYSTEM | | | | | |
| Fork | Fork deformation and wear | | ← | ← | ← |
| | Fork root and tooth weld crack and wear | | ← | ← | ← |
| | Fork shifter damage and wear | | ← | ← | ← |
| Mast and lift bracket | Deformed or damaged part and crack at welded portion | | ← | ← | ← |
| | Roller bearing looseness | | ← | ← | ← |
| | Mast and lift bracket looseness | | ← | ← | ← |
| | Mast support bushing wear and damage | | | | |
| | Roller and roller pin looseness and damage | | | | |
| | Chain greasing condition | | ← | ← | ← |
| | Chain deformation, damage and rusting | | ← | ← | ← |

| Item | | Inspection Period | | | |
|---|--|-------------------|-----------------|------------------|------------------|
| | | Every 6 weeks | Every 3 months | Every 6 months | Every 12 months |
| | | Every 250 hours | Every 500 hours | Every 1000 hours | Every 2000 hours |
| MATERIAL HANDLING SYSTEM | | | | | |
| Mast and lift bracket | Chain tension | I | ← | ← | ← |
| | Chain anchor bolt abnormality | I | ← | ← | ← |
| | Chain wheel deformation and damage | I | ← | ← | ← |
| | Chain wheel bearing looseness | T | ← | ← | ← |
| Various attachments | Abnormality and mounting condition of each part | I | ← | ← | ← |
| HYDRAULIC SYSTEM | | | | | |
| Cylinders (lift and tilt) | Rod, rod screw and rod end loosening, deformation and damage | T | ← | ← | ← |
| | Cylinder operation | I | ← | ← | ← |
| | Natural drop and natural forward tilt | I | ← | ← | ← |
| | Oil leak and damage | I | ← | ← | ← |
| | Pin and cylinder bearing wear and damage | I | ← | ← | ← |
| | Cylinder mounting loosening and damage | I | ← | ← | ← |
| | Lifting speed | M | ← | ← | ← |
| | Uneven movement | I | ← | ← | ← |
| Oil pump | Oil leak and abnormal sound | I | ← | ← | ← |
| | Drive gear wear | I | ← | ← | ← |
| Hydraulic tank | Oil level and contamination | I | ← | ← | ← |
| | Oil leak | I | ← | ← | ← |
| | Tank and oil strainer cleaning | | | C | ← |
| Control lever | Loose mounting | I | ← | ← | ← |
| | Operation | I | ← | ← | ← |
| Oil control valve | Oil leak | I | ← | ← | ← |
| | Lift lock valve and tilt lock valve functions | I | ← | ← | ← |
| | Relief pressure measurement | | | | M |
| Hydraulic hose and piping | Oil leak, looseness, loosening, deformation and damage | T | ← | ← | ← |
| | Hydraulic hose replacement | I | ← | ← | ← |
| SAFETY DEVICE, ETC. | | | | | |
| Cabin | Deformation, crack and damage | | | | I |
| | Crack at welded portion | | | | I |
| | Deteriorated or cracked weather-strip and silicone bond | | | | I |
| | Cabin mounting rubber deterioration and damage | | | | I |
| Lighting system and direction indicator | Action | I | ← | ← | ← |
| | Lighting or flashing status, fouling and damage | I | ← | ← | ← |

| Item | | Inspection Period | | | |
|--------------------------|--|-------------------|-----------------|------------------|------------------|
| | | Every 6 weeks | Every 3 months | Every 6 months | Every 12 months |
| | | Every 250 hours | Every 500 hours | Every 1000 hours | Every 2000 hours |
| SAFETY DEVICE, ETC. | | | | | |
| Horn | Sounding condition | I | ← | ← | ← |
| | Action | I | ← | ← | ← |
| Back-up buzzer | Sounding condition | I | ← | ← | ← |
| | Action | I | ← | ← | ← |
| Rearview mirror | Rear reflection on status | I | ← | ← | ← |
| | Dirt and damage | I | ← | ← | ← |
| Instruments | Action | I | ← | ← | ← |
| Exhaust pipe and muffler | Muffler rubber mount | I | ← | ← | ← |
| | Loosened or damaged mounting | I | ← | ← | ← |
| Seat | Seatbelt condition | I | ← | ← | ← |
| | Loosened or damaged mounting | I | ← | ← | ← |
| | Seatbelt damage and function | I | ← | ← | ← |
| Body | Damaged or cracked frame, and cross member, etc. | | | | I |
| | Bolts and nuts looseness | | | | T |
| Others | Chassis parts grease-up condition | L | ← | ← | ← |
| | Steering link system and universal joint grease-up | L | ← | ← | ← |

PERIODIC REPLACEMENT OF PARTS AND LUBRICANTS

: Replacement

| Item | Replacement cycle | Every 6 weeks | Every 3 months | Every 6 months | Every 12 months |
|---|-------------------|-----------------|-----------------|------------------|------------------|
| | | Every 250 hours | Every 500 hours | Every 1000 hours | Every 2000 hours |
| Engine oil | | ● | ← | ← | ← |
| Engine oil filter | | ●※ 1 | ● | ← | ← |
| Engine coolant | | | | ← | ← ●※ 4 |
| Air cleaner element | | | | | ● |
| Fuel filter | | | | ● | ← |
| Fuel hose | | | | | ●※ 5 |
| Torque converter & transmission oil | | | | ● | ← |
| Torque converter & transmission oil filter | | | | ● | ← |
| Torque converter & transmission rubber hoses | | | | | ●※ 5 |
| Differential oil | | | | ● | ← |
| Rear wheel bearing grease | | | | ● | ← |
| Planetary gear oil | | | | ● | ← |
| Power steering hose | | | | | ●※ 5 |
| Power steering rubber parts | | | | | ●※ 5 |
| Brake air circuit rubber parts (valve, air chamber, air master, etc.) | | | | | ● |
| Air dryer element | | | | | ● |
| Air compressor hose | | | | | ● |
| Air compressor rubber parts | | | | | ● |
| Brake cooling oil | | ●※ 2,3 | ●※ 2,3 | | ●※ 5 |
| Brake cooling oil filter | | ●※ 2 | | | |
| Brake fluid reservoir hose | | | | | ●※ 5 |
| Hydraulic oil | | | | ● | ← |
| Hydraulic oil filter | | ●※ 1 | | | ← |
| Hydraulic hose | | | | | ●※ 5 |
| Lift chain | | | | | ●※ 6 |

※ 1: For new vehicle

※ 3: For brand new vehicles, replace in sooner period between two hundred hours or three months.

※ 3: When replacing the brake cooling oil, check and clean the suction filter at the same time.

※ 4: LLC every 2 years

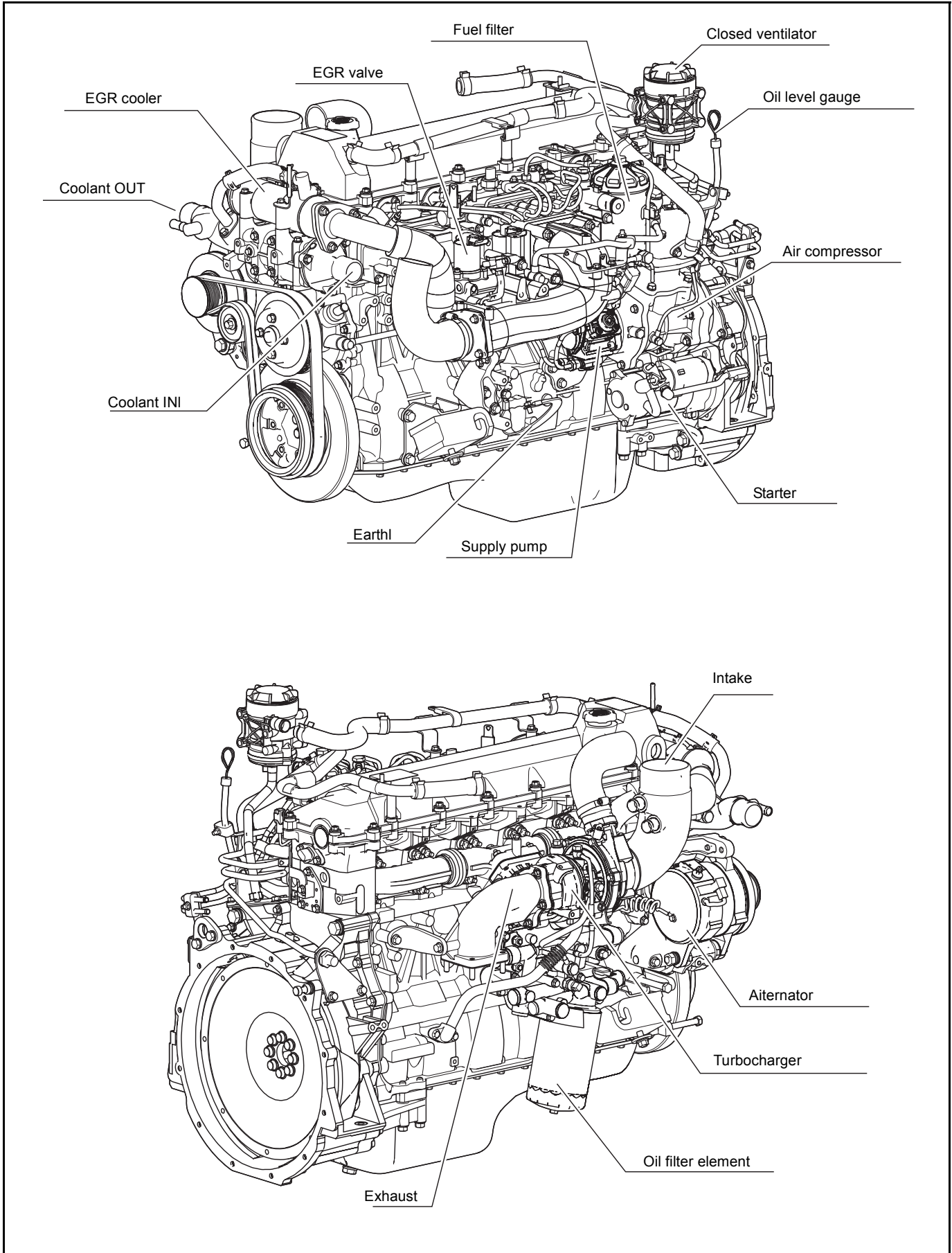
※ 5: Every 2 years

※ 6: Every 3 years

ENGINE

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GENERAL



FEATURES

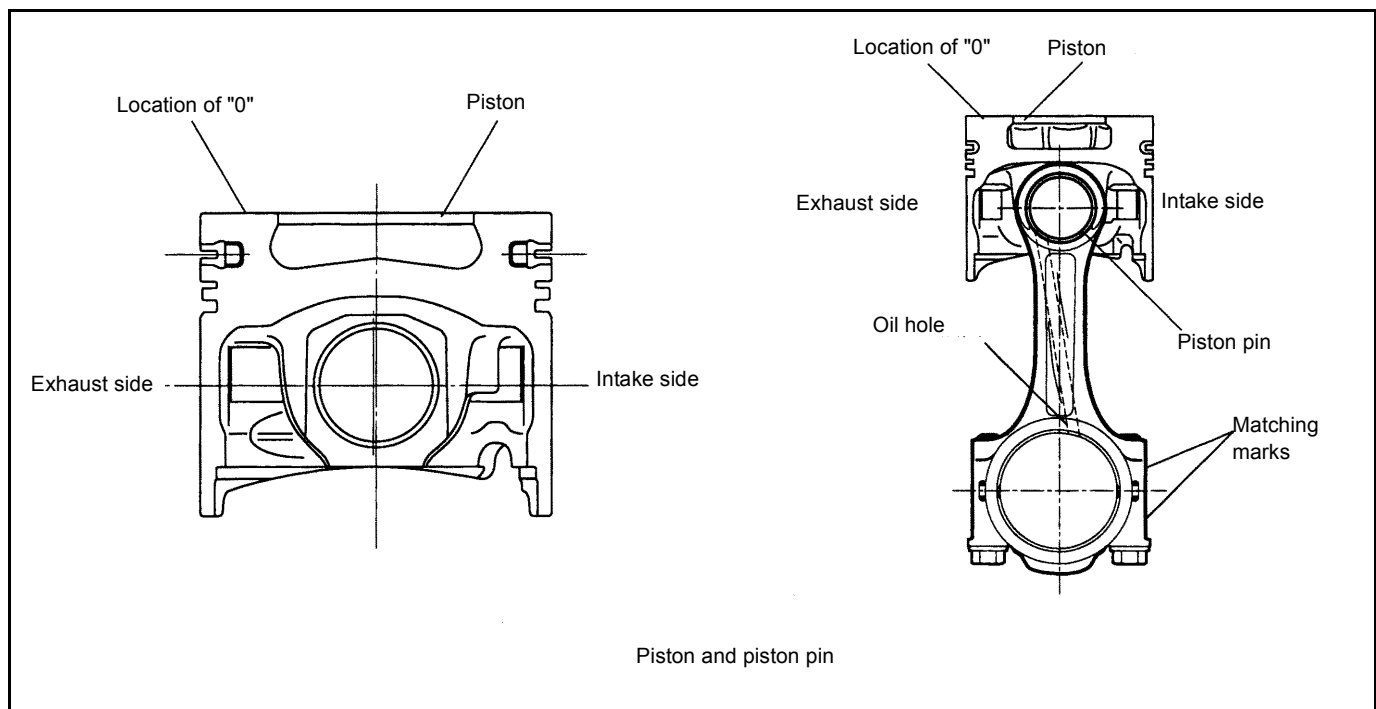
Engine mechanical (piston, piston pin and piston ring)

Structure

Piston and piston pin

- The heat-resistant aluminum alloy is used for the piston. The specially shaped combustion chamber is adopted in order to realize excellent combustion and fuel-efficiency.
- The outer shape of the piston is optimally profiled with taking a thermal expansion and piston oscillations into account.
- The skirt coating is adopted for the piston in order to reduce noises.
- Piston cooling jet system is used to cool down in order to maintain the appropriate temperature.
- The structure with a cooling cavity ensures reliability for high pressure.
- Insufficient jets due to deformed or improperly installed cooling jet cause defectiveness in cooling the piston, possibly ending up with malfunctions.
- The piston pin is made of case hardening steel, to which the full-floating type is applied, providing endurance for high-load.

1

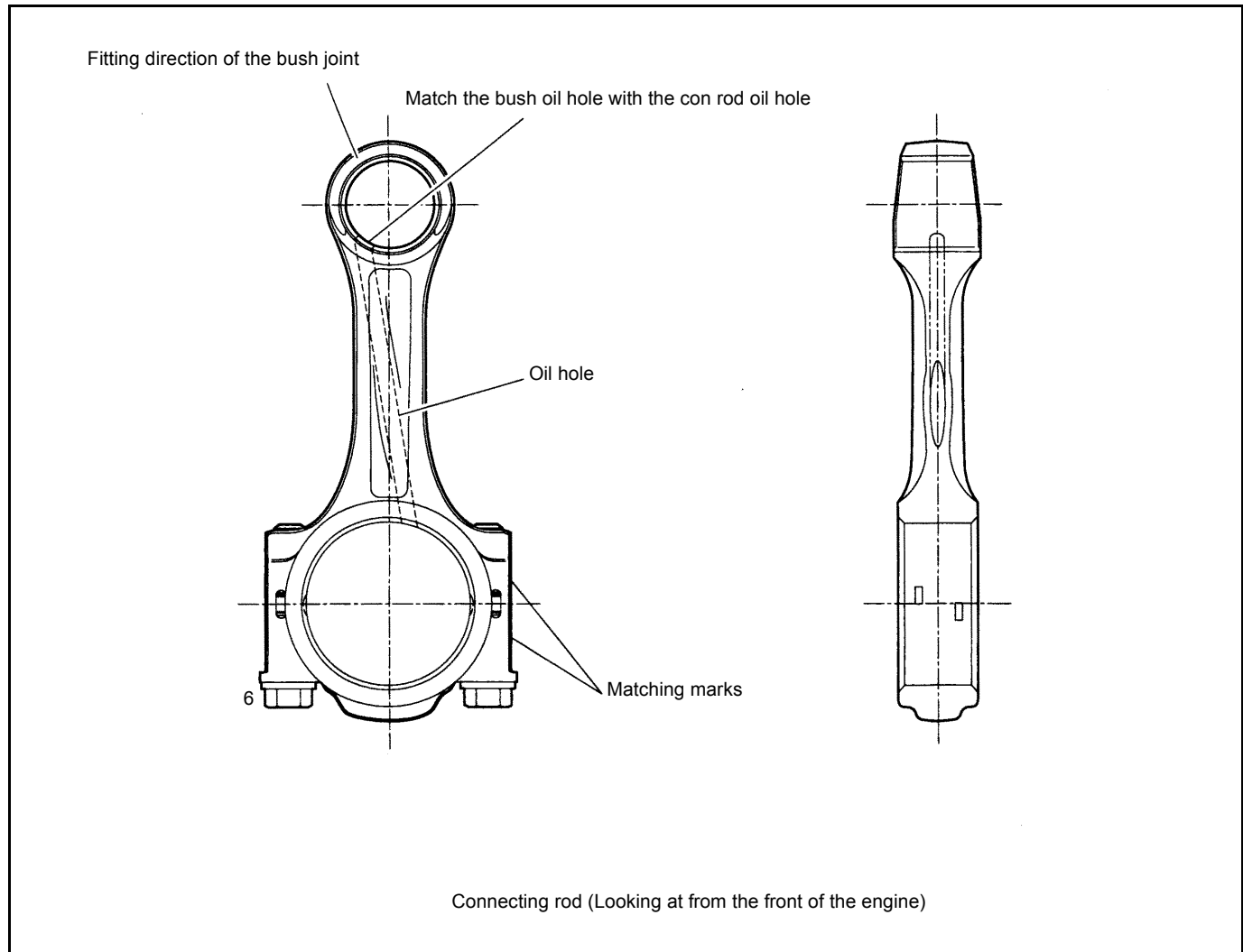


Engine mechanical (connecting rod and crank shaft)

Structure

Connecting rod

- The connecting rod is made of forged carbon steel. Its large end is horizontally split, which has advantages in rigidity. The bush made of lead bronze with the oil groove in the center is pressed in its small end.
- The connecting rod bolts are tightened by the plastic region tightening method.



- As shown in the illustration, the plastic region tightening method is the way of tightening the bolts in the plastic region where the change in the axial tension against the extension of the bolt is few. This method has following characteristics.

Stable axial tension can be obtained: Because fluctuation in the axial tension is small comparing to elastic region tightening, the axial tension can be stabilized.

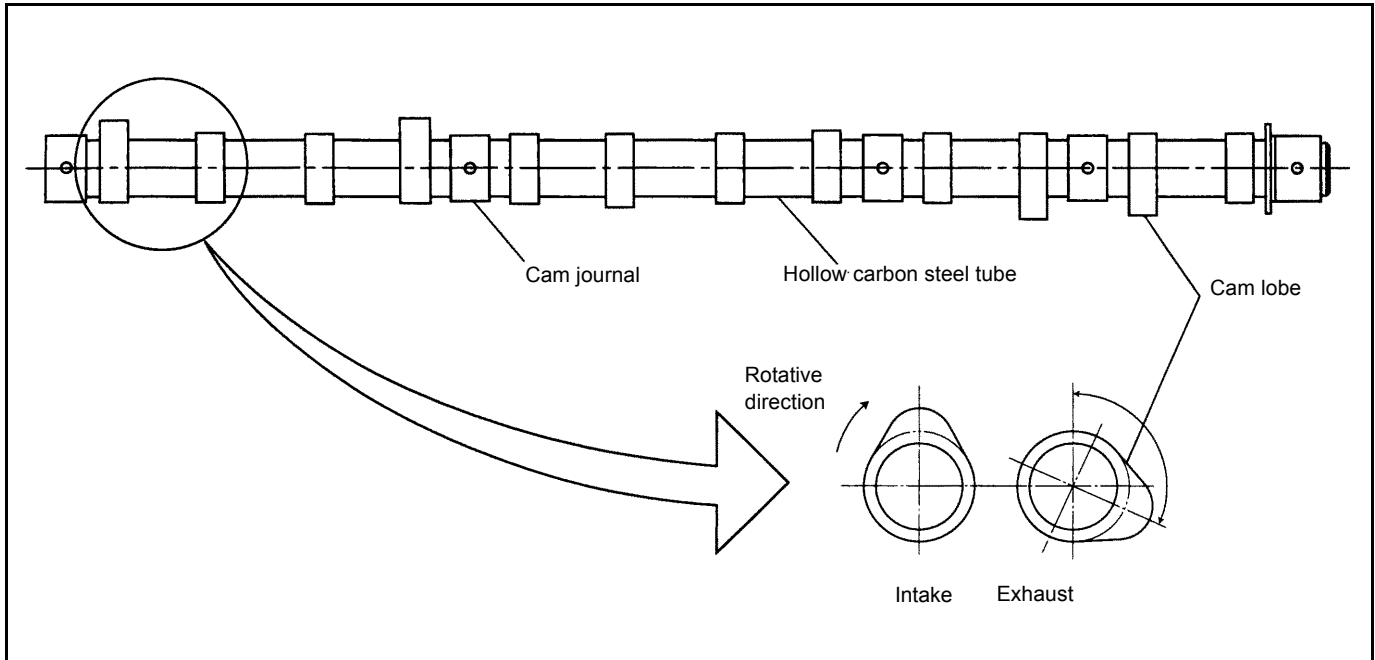
High axial tension can be obtained.

There is a limit in reuse: Because plastic elongation is added at every time of it is reused, the frequency of reuse is limited.

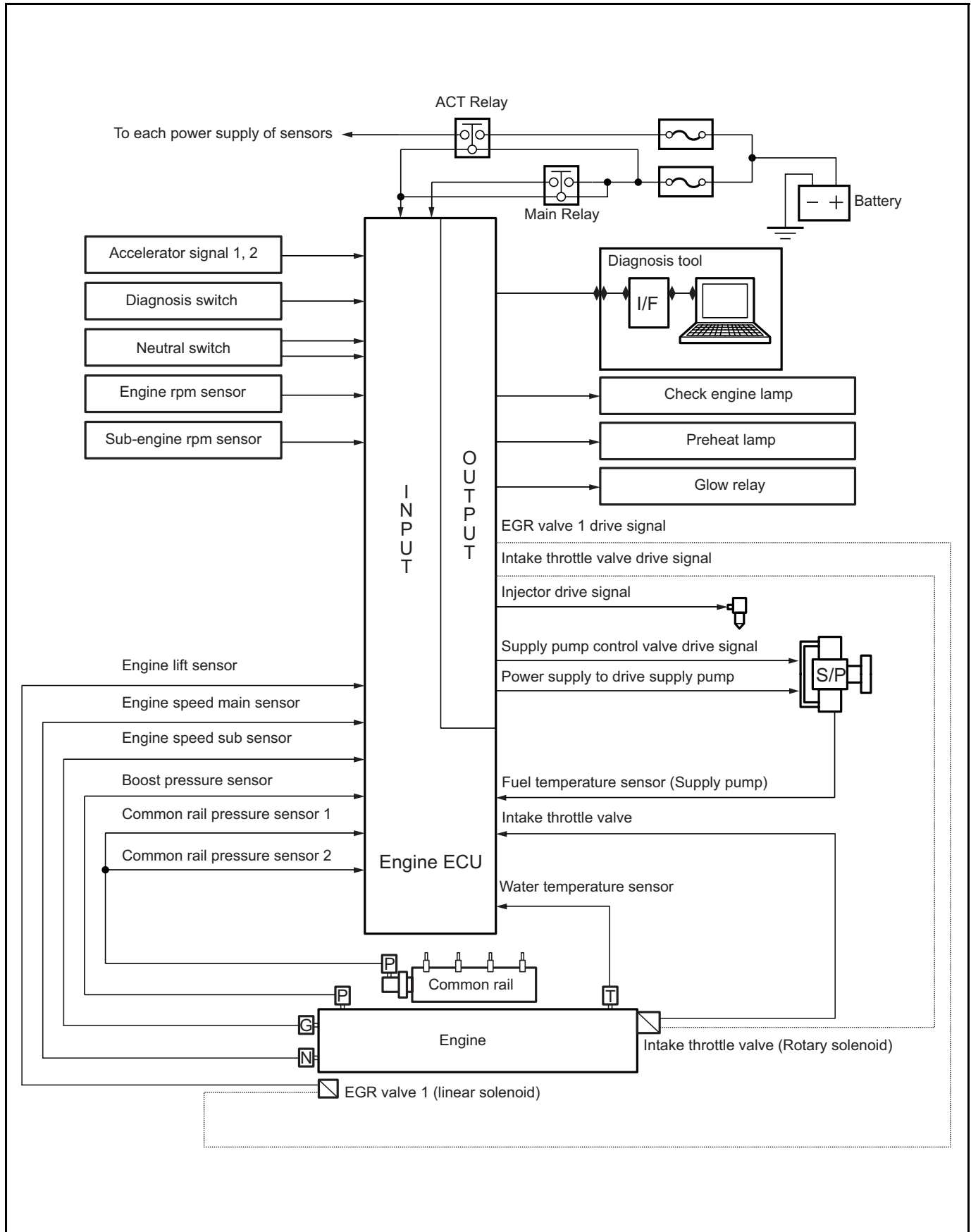
Refer to the J08E engine repair manual () when reusing.

Cam shaft

- The camshaft is manufactured by knockdown system. The cam lobe and the cam journal are pressed in a hollow carbon steel tube. The cam lobe is welded.
- By adopting a special profile for the cam, together with improving inhalation efficiency, quiet operation can be expected.
- The valve lift is optimized and the intake-air volume is heightened in order to improve combustion efficiency.



SYSTEM BLOCK DIAGRAM

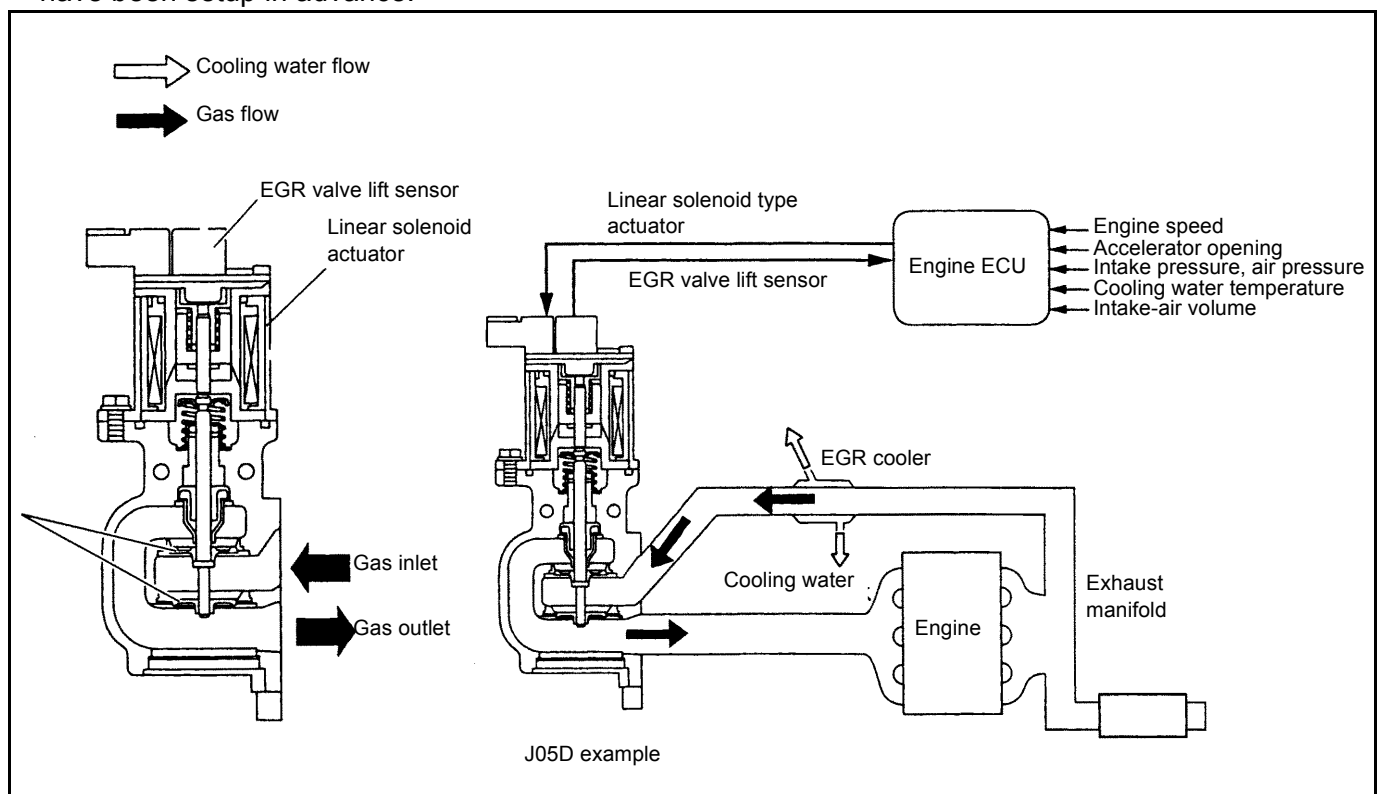


EGR valve

- To correspond to the automobile exhaust gas regulations of 2005, the computerized double-seated valve linear solenoid type of EGR valve was adopted.
- The computerized double-seated valve linear solenoid type of EGR valve was adopted in order to improve accuracy in adjustment and to reduce particulates and Nox altogether.
- By adopting the EGR valve lift sensor and giving feedback of the EGR valve opening degree to the engine ECU, EGR can be controlled optimally.

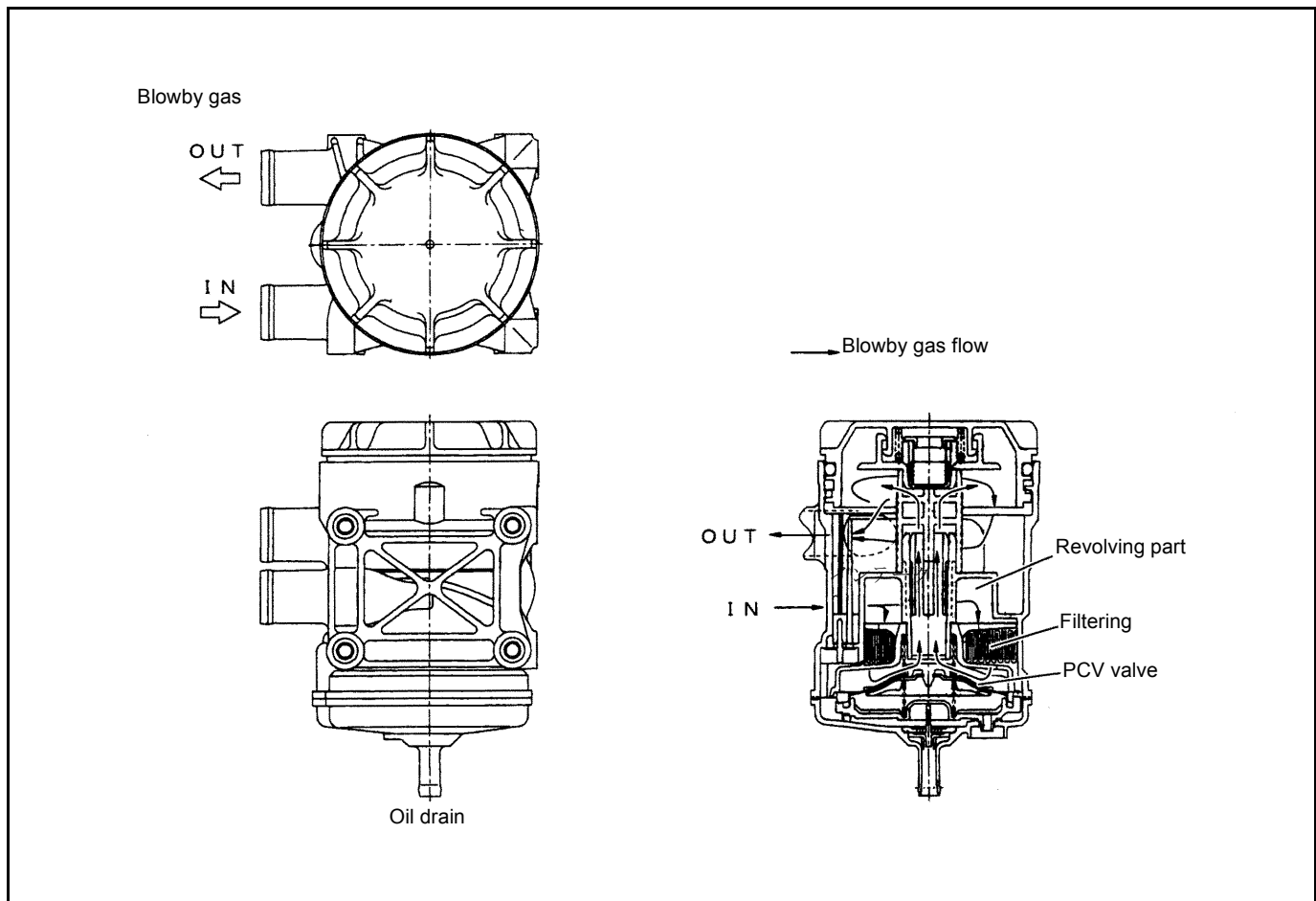
Operation of EGR valve

- In order to improve the performance of purifying the exhaust emission by EGR, feedback is controlled by the EGR valve opening degree to adjust the oxygen density in the intake-air that changes by EGR to the applicable target value for engine conditions (engine speed, supercharging pressure, temperatures of each section, load, intake-air volume).
- In order to expand the EGR area, the EGR volume is controlled by the valve opening degree with the lift sensor, based on the intake-air valve opening degree and the variable nozzle turbo opening degree that have been setup in advance.



Structure

- The flame-proof resin that is light and oil resistant is used for the main body of the closed ventilator. For the oil separate part, element-less type, which is maintenance-free, is adopted.
- To separate the oil mist in the blowby gas, there is a slewing part for the centrifugation and a filtering part for crash and separation inside. Also there is a PCV valve to adjust the inner pressure of the crankcase.
- On the body side, there are two ports. The upper port is for pumping out, linking to the intake-pipe, and the lower port is for intaking the blowby of the engine. Also on the under side of the body, there is a port to separate the oil mist included in the blowby gas and drain the liquefied oil.
- Concerning operation, when engine starts, negative pressure is generated in the intake-pipe, and the PCV valve sucks the blowby gas in the intake-pipe with adjusting the pressure inside the crankcase. At this time, the oil mist in the blowby gas is liquefied through centrifugation with slewing and crash and separation with filtering, and is returned to the oil pan.



LUBRICATION SYSTEM

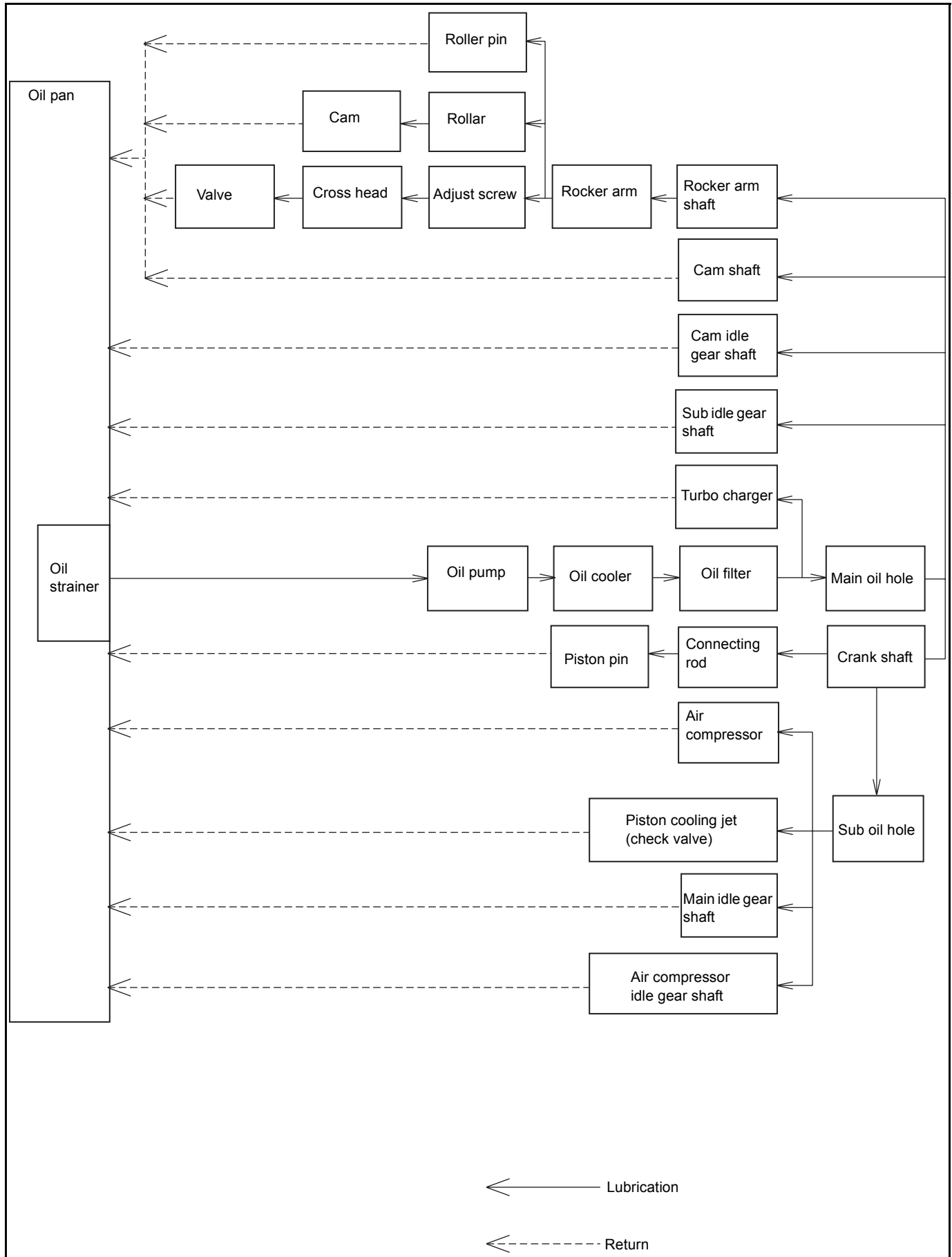
SPECIFICATION

| | |
|------------------------|---|
| Lubrication method | Pressure lubrication by gear pump |
| Oil filters | Paper filters for both full flow and bypass |
| Lubricating oil cooler | Water cooled multi plate type |

GENERAL DESCRIPTION

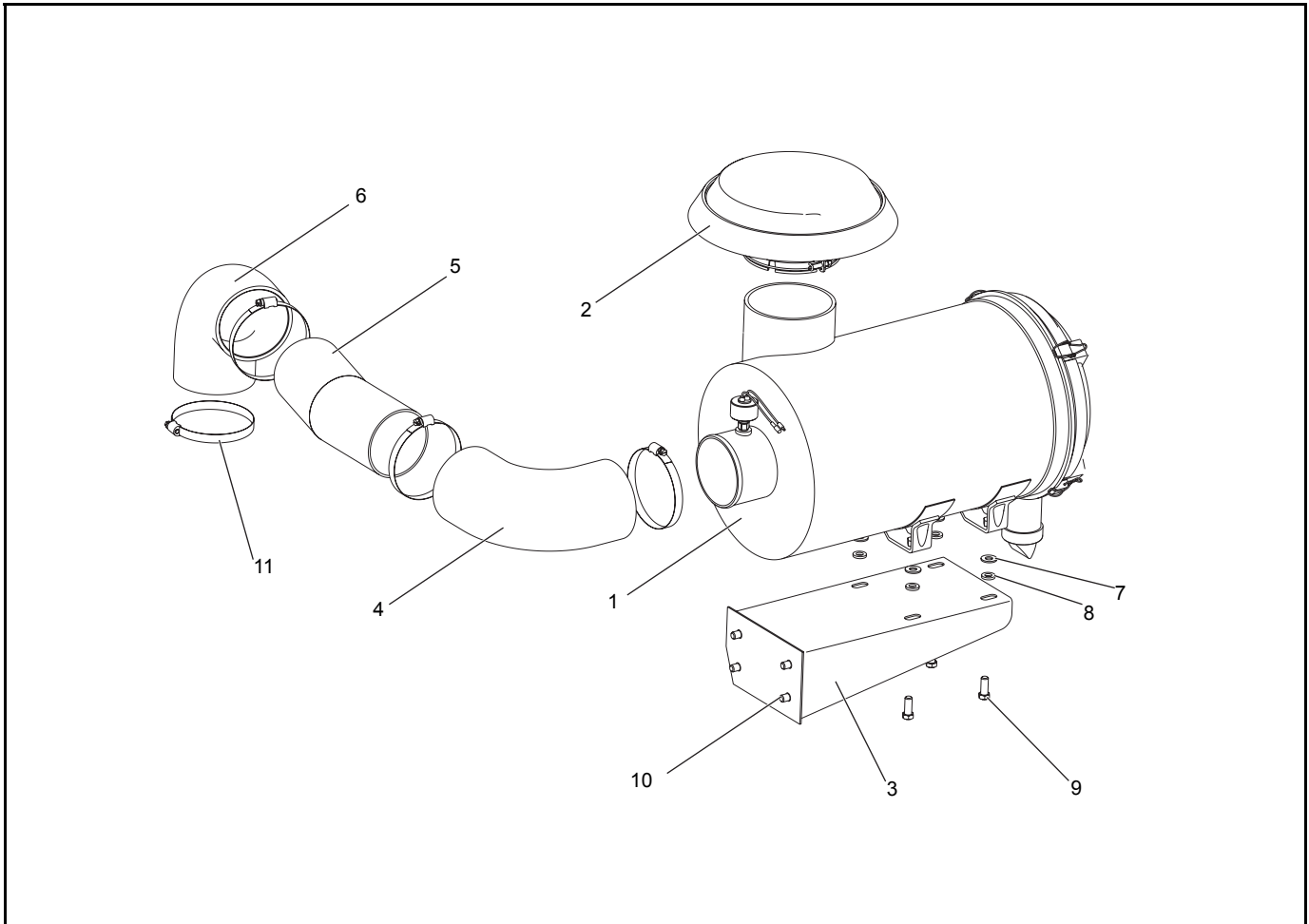
- Oil in the oil pan is drawn up through a strainer by the oil pump housed at the rear end of the cylinder block and then lead into the oil cooler where it exchanges heat with cooling water. Then it is lead through the oil filter and fed into the main oil hole in the cylinder block.
- From the main oil hole, oil is distributed to crankshaft journals, cam shaft and the rocker arm shaft for lubrication.
- After lubricating each journal position (main bearing) of the crankshaft, the oil then proceeds through the oil hole in the crankshaft and reaches the pin section to lubricate the large end of the connecting rod.
- Meanwhile, some oil from journal positions on the crankshaft goes into a sub-oil hole and is directed to the piston cooling jet at each cylinder to cool down each piston.
- Lubrication of the air compressor and supply pump drive gear is provided by oil coming through an oil passage branching off from the line that leads to the sub-oil hole.
- Oil supplied to the camshaft passes through the oil hole in the camshaft and is distributed to each journal for lubrication.
- Oil supplied to the rocker arm shaft is distributed through the oil hole in the rocker arm shaft to each rocker arm bushing for lubrication, and then goes through the oil hole in each locker arm to lubricate rollers and roller pins.
- Lubrication of each idle gear is provided by oil passing through either the main oil hole or sub-oil hole.
- Pressure of the oil in the system is controlled by a regulator valve so that the standard maximum pressure of 530 ± 40 kPa (5.4 ± 0.4 kgf/cm²) [76.8 ± 5.7 psi] is maintained. When the temperature is low and oil pressure is high, the safety valve on the oil pump opens [valve opening pressure: 1646 kPa (16.8 kgf/cm²) [239 psi]] and returns oil to the oil pan.
- Insufficient oil supply due to clogging in the oil cooler or oil filter is prevented by the safety valves [oil cooler side valve opening pressure: 392 ± 40 kPa (4.0 ± 0.4 kgf/cm²) [57 ± 5.7 psi], oil filter side valve opening presuure: 147 ± 10 kPa (1.5 ± 0.1 kgf/cm²) [21 ± 1.4 psi]].
- Pressure used by the oil pressure switch is taken from the secondary side of the oil filter, and each piston cooling jet is equipped with a check valve [injection pressure: 245 kPa (2.5 kgf/cm²) [36 psi]] for appropriate cooling.

LUBRICATION SYSTEM DIAGRAM



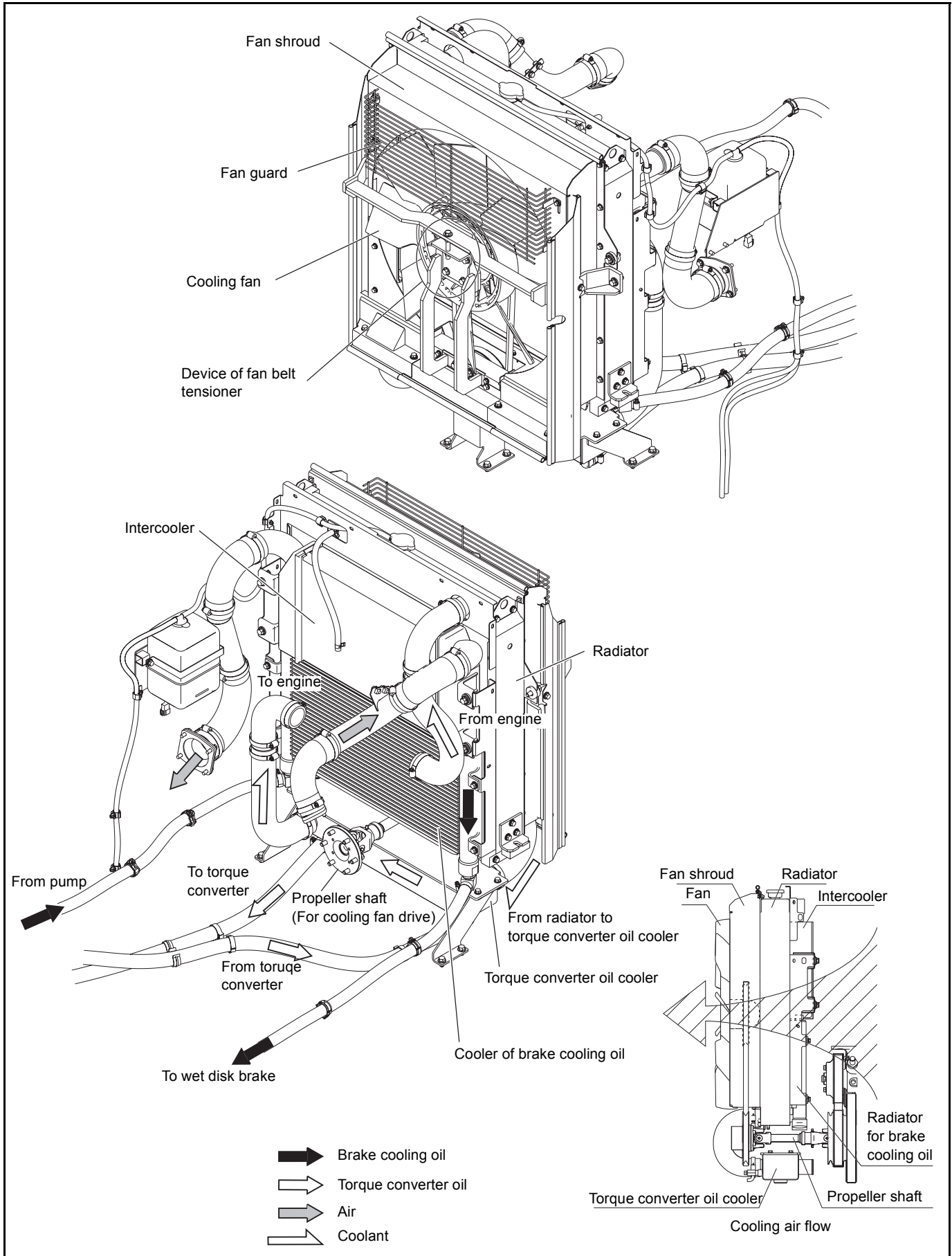
COMPONENTS

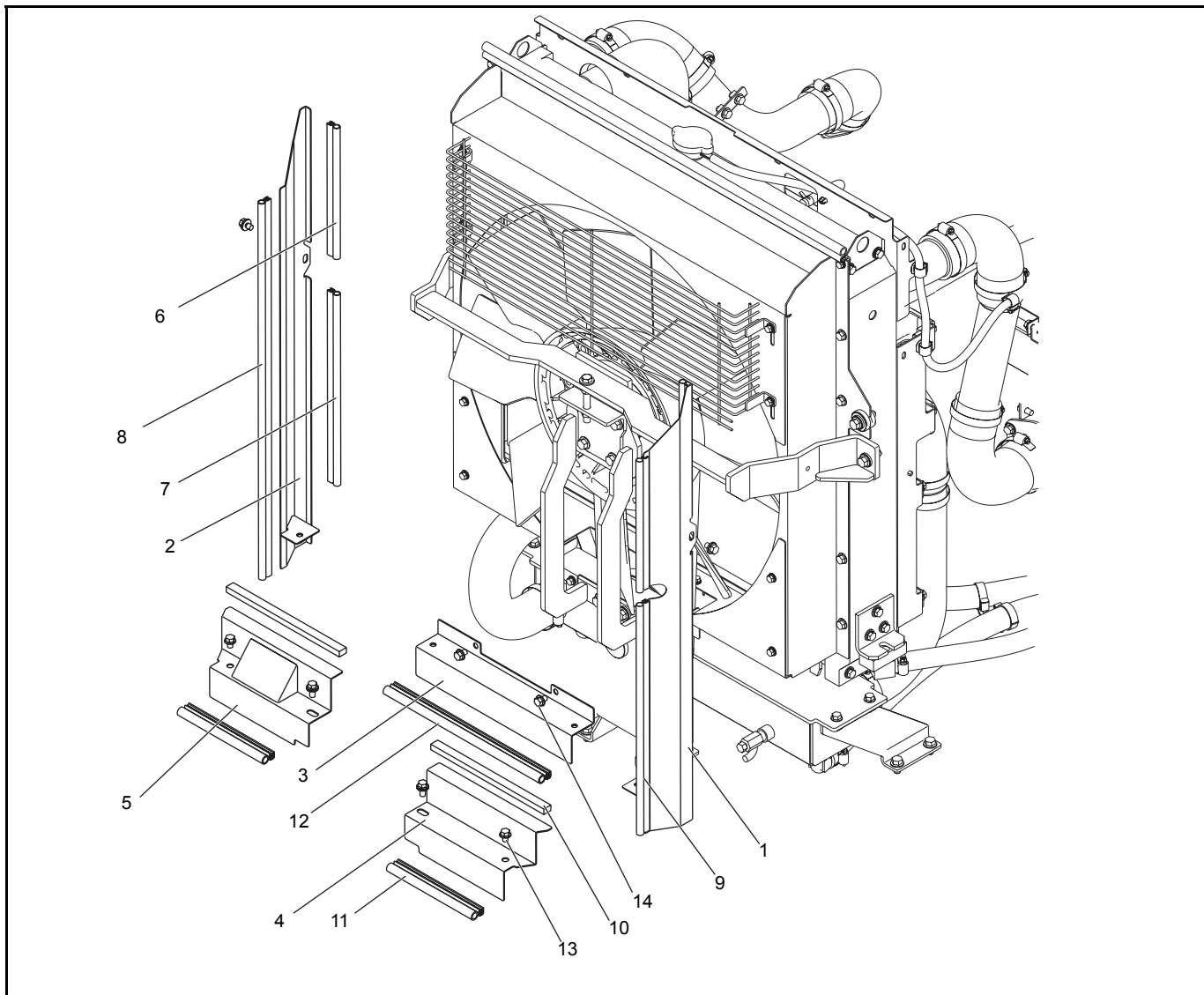
AIR CLEANER



| No. | Name | Quantity |
|-----|----------------|----------|
| 1 | AIR CLEANER | 1 |
| 2 | CAP | 1 |
| 3 | BRACKET | 1 |
| 4 | HOSE | 1 |
| 5 | PIPE, INTAKE | 1 |
| 6 | HOSE | 1 |
| 7 | WASHER, PLATE | 4 |
| 8 | WASHER, SPRING | 4 |
| 9 | BOLT | 4 |
| 10 | FLANGE BOLT | 4 |
| 11 | HOSE CLAMP | 4 |

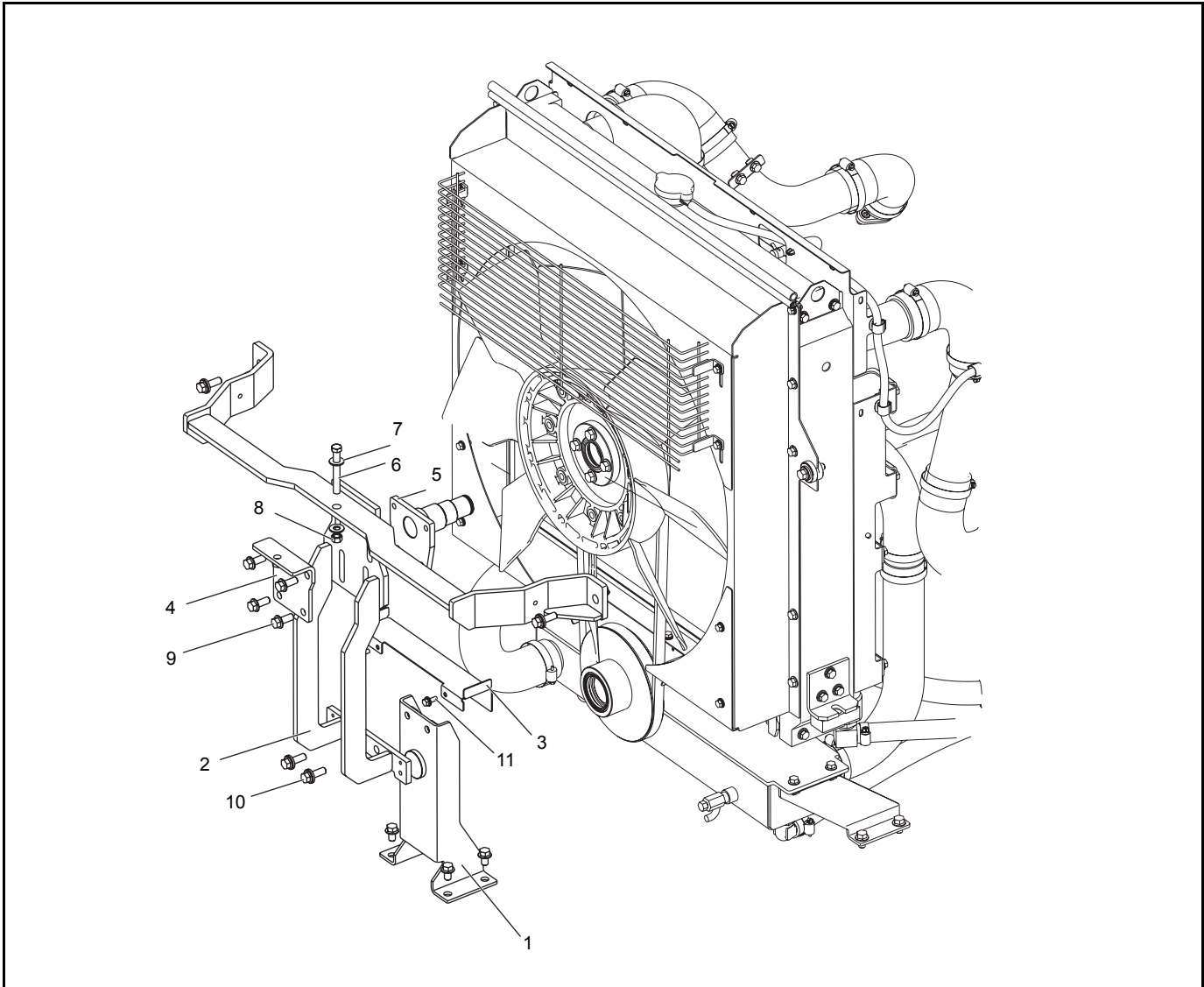
COOLING SYSTEM GENERAL



**COMPONENT
DUCT**


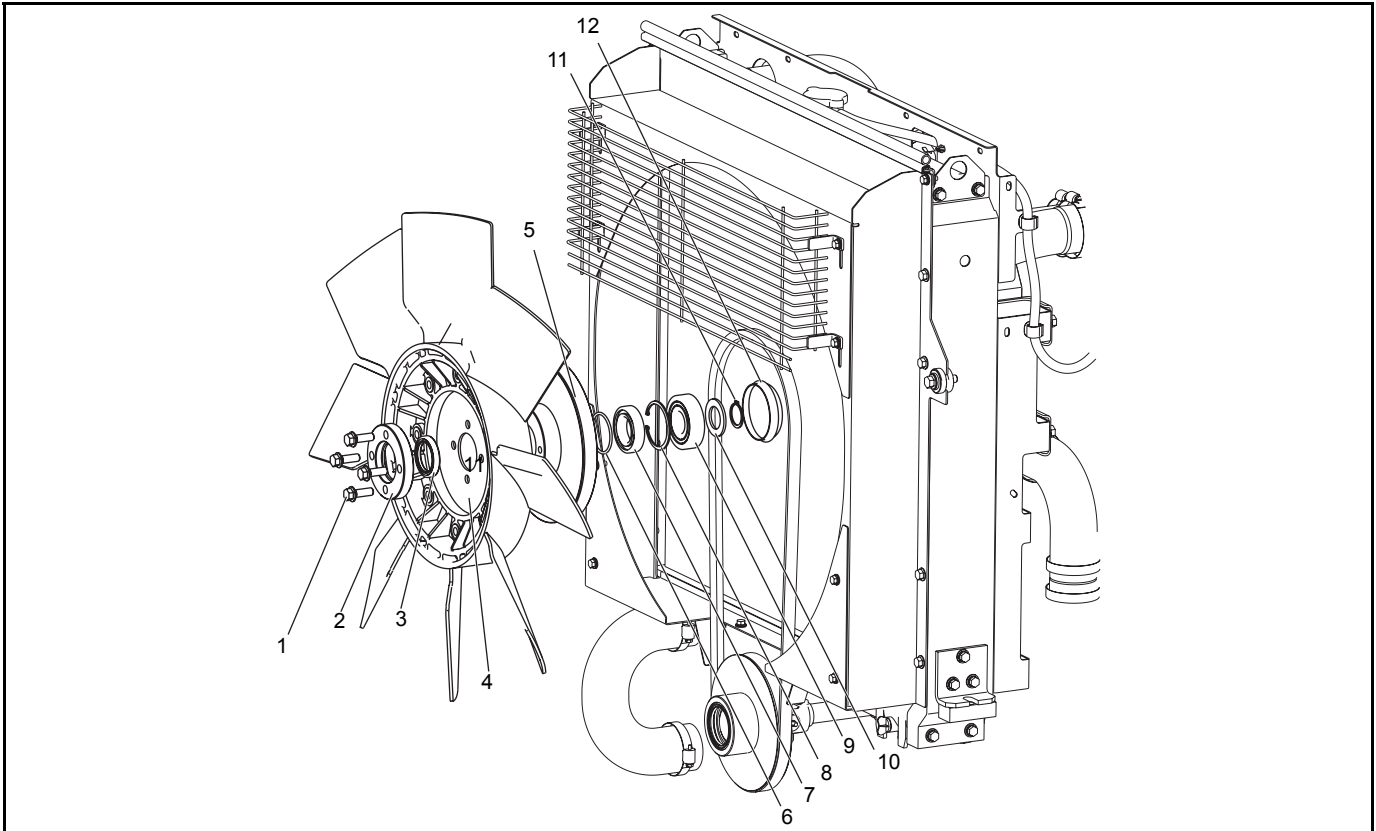
| No. | Name | Quantity |
|-----|-----------------|----------|
| 1 | DUCT, RH | 1 |
| 2 | DUCT, LH | 1 |
| 3 | DUCT, UNDER | 1 |
| 4 | DUCT, UNDER, RH | 1 |
| 5 | DUCT, UNDER, LH | 1 |
| 6 | SEAL | 3 |
| 7 | SEAL | 2 |
| 8 | SEAL | 1 |
| 9 | SEAL | 1 |
| 10 | SPONG | 2 |
| 11 | SEAL | 2 |
| 12 | SEAL | 1 |
| 13 | FRANGE BOLT | 4 |
| 14 | FRANGE BOLT | 4 |

FAN SUPPORT

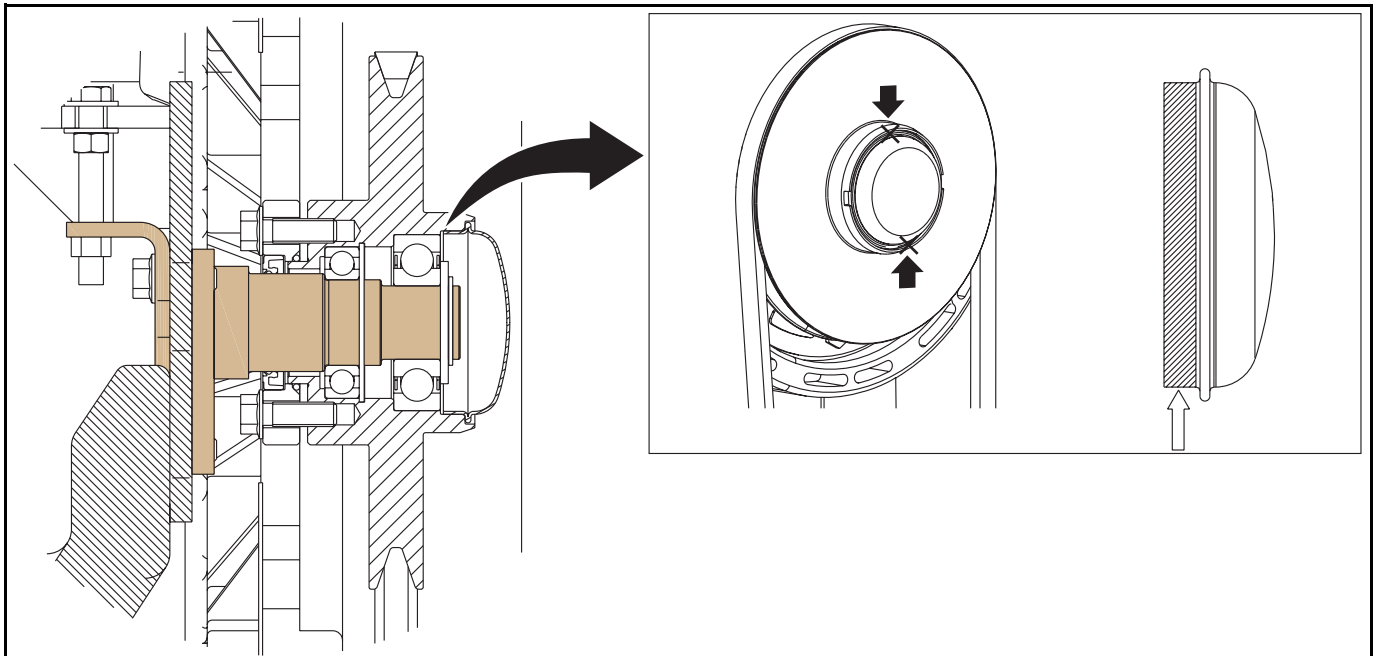


| No. | Name | Quantity |
|-----|----------------------|----------|
| 1 | PULLEY BRACKET, LWR | 1 |
| 2 | PLATE, FAN | 1 |
| 3 | PULLEY COVER | 1 |
| 4 | SUPPORT, FAN HOUSING | 1 |
| 5 | PULLEY BRACKET, UPR | 1 |
| 6 | ADJUST BOLT | 1 |
| 7 | WASHER, PLATE | 2 |
| 8 | LOCK NUT | 1 |
| 9 | FRANGE BOLT | 8 |
| 10 | FRANGE BOLT | 2 |
| 11 | FRANGE BOLT | 2 |

FAN DRIVEN

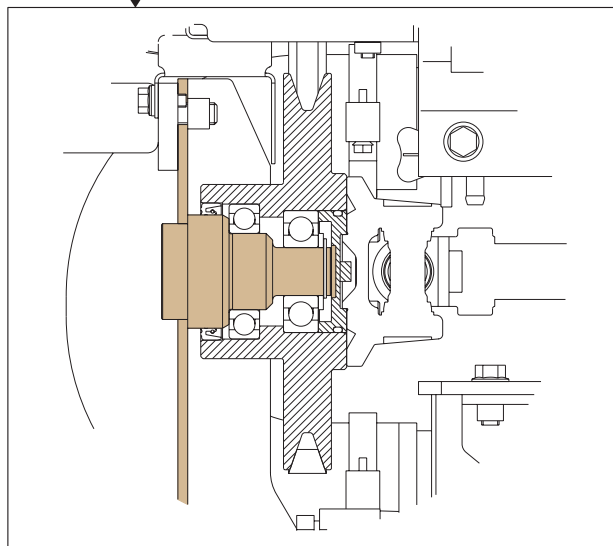
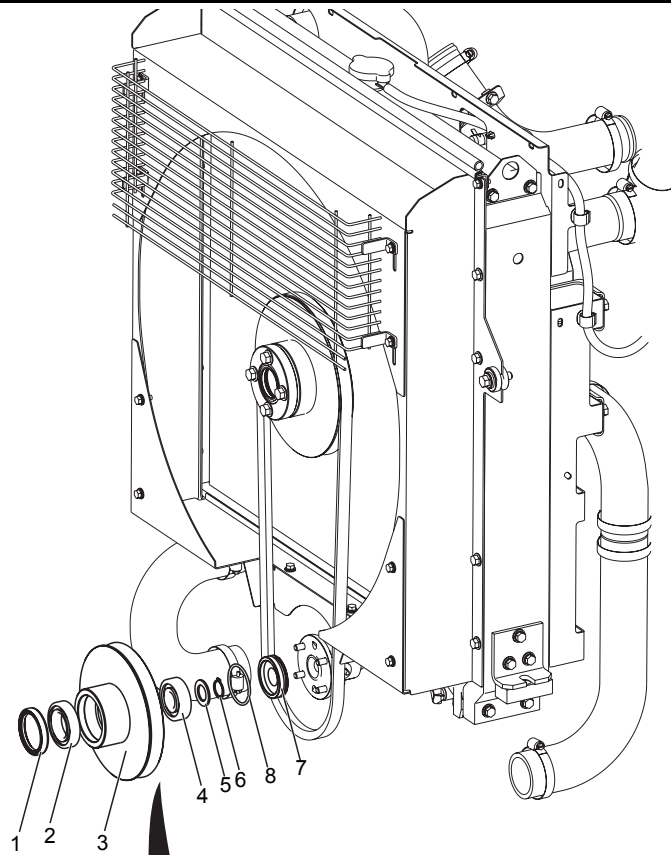


| No. | Name | Quantity | No. | Name | Quantity |
|-----|-------------|----------|-----|---------------|----------|
| 1 | FLANGE BOLT | 4 | 7 | BEARING | 1 |
| 2 | BOSS | 1 | 8 | SNAP RING | 1 |
| 3 | OIL SEAL | 1 | 9 | BEARING | 1 |
| 4 | FAN | 1 | 10 | WASHER, PLATE | 1 |
| 5 | FAN PULLEY | 1 | 11 | SNAP RING | 1 |
| 6 | O-RING | 1 | 12 | CAP | 1 |



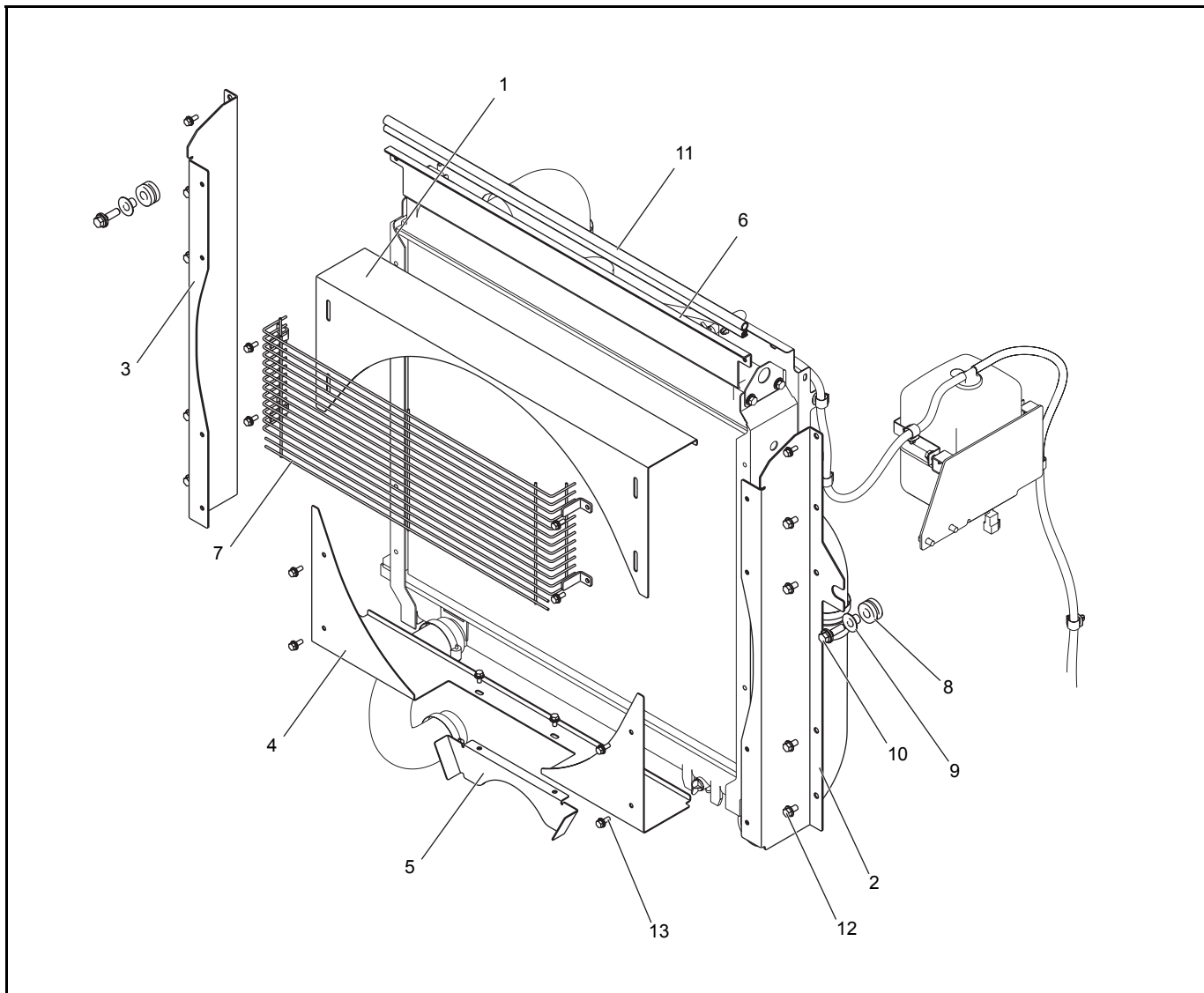
1. Apply sealing agent (08833-76002-71) to the entire periphery of the cap.
2. After fitting the cap, apply the caulking to two locations.

FAN DRIVE



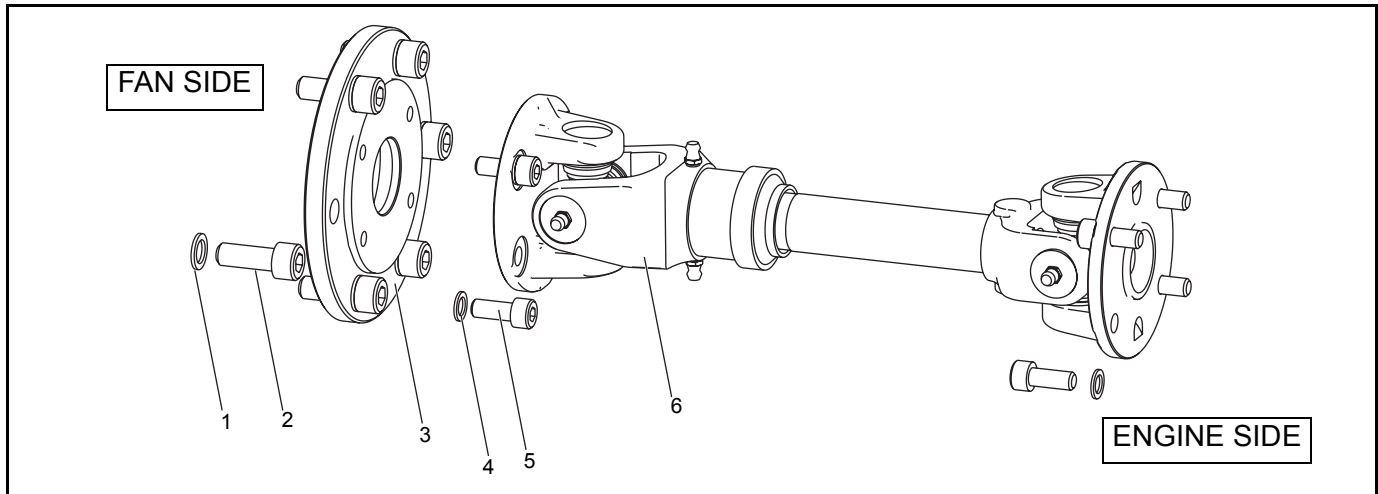
| No. | Name | Quantity |
|-----|---------------|----------|
| 1 | OIL SEAL | 1 |
| 2 | BEARING | 1 |
| 3 | FAN PULLEY | 1 |
| 4 | BEARING | 1 |
| 5 | WASHER, PLATE | 1 |
| 6 | SNAP RING | 1 |
| 7 | O-RING | 1 |
| 8 | PULLEY COVER | 1 |

FAN SHROUD

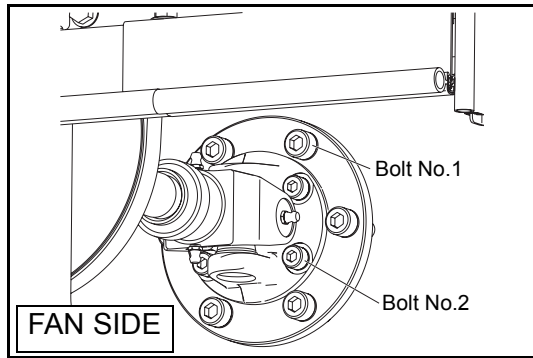


| No. | Name | Quantity |
|-----|-----------------|----------|
| 1 | FAN SHROUD, UPR | 1 |
| 2 | FAN SHROUD, RH | 1 |
| 3 | FAN SHROUD, LH | 1 |
| 4 | FAN SHROUD, LWR | 1 |
| 5 | PULLEY COVER | 1 |
| 6 | FAN SHROUD, UPR | 1 |
| 7 | FAN GUARD | 1 |
| 8 | INSULATOR | 2 |
| 9 | SPACER | 2 |
| 10 | BOLT | 2 |
| 11 | SEAL | 1 |
| 12 | FLANGE BOLT | 8 |
| 13 | FLANGE BOLT | 12 |

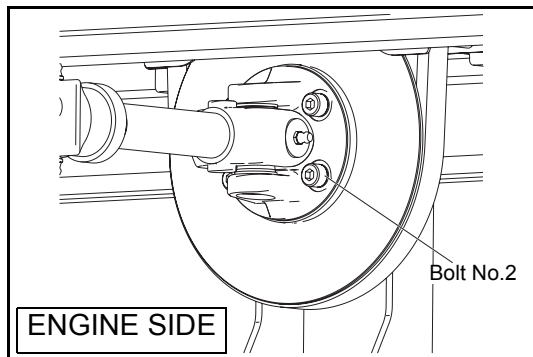
FAN DRIVE SHAFT



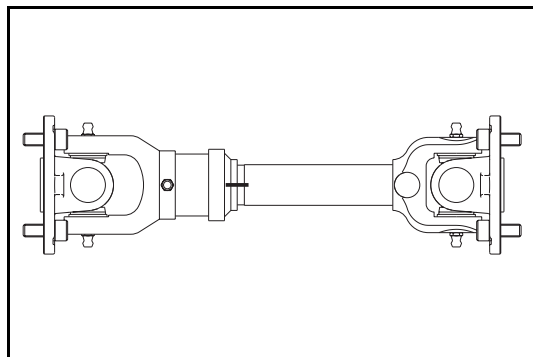
| No. | Name | Quantity | No. | Name | Quantity |
|-----|------------------------|----------|-----|-------------------|----------|
| 1 | WASHER, CD SPRING | 6 | 4 | WASHER, CD SPRING | 8 |
| 2 | BOLT, SOCKET | 6 | 5 | BOLT, SOCKET | 8 |
| 3 | PLATE, FLANGE YOKE SET | 1 | 6 | FAN DRIVE SHAFT | 1 |



1. Bolt No.1 tightening torque 33.6 to 78.4Nm
 Bolt No.2 tightening torque 30 to 40Nm
 Apply sealing agent (08833-76002-71) to the screw parts, to both No.1 and No.2.

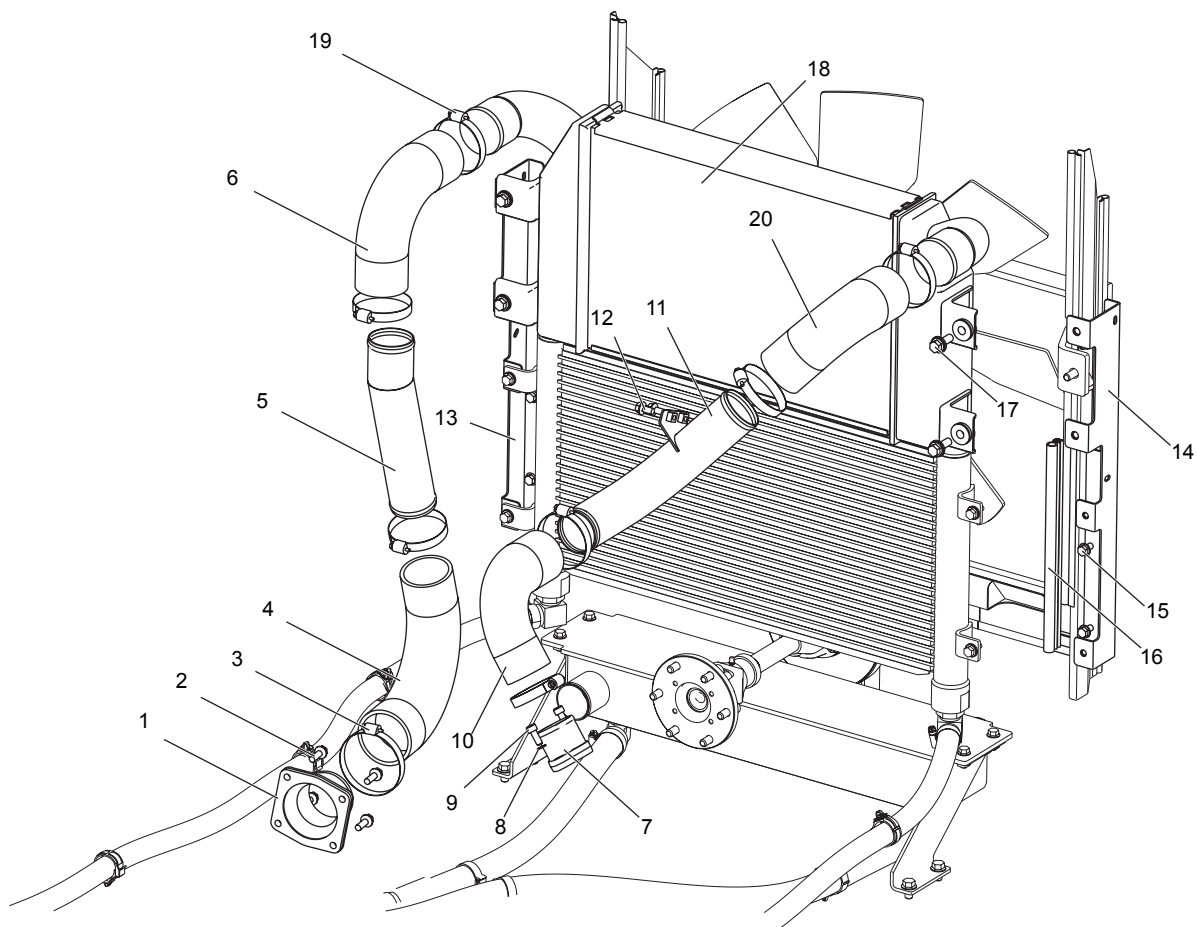


2. Bolt No.2 tightening torque 30 to 40Nm
 Apply sealing agent (08833-76002-71) on the set bolt threaded portion before reassembly.



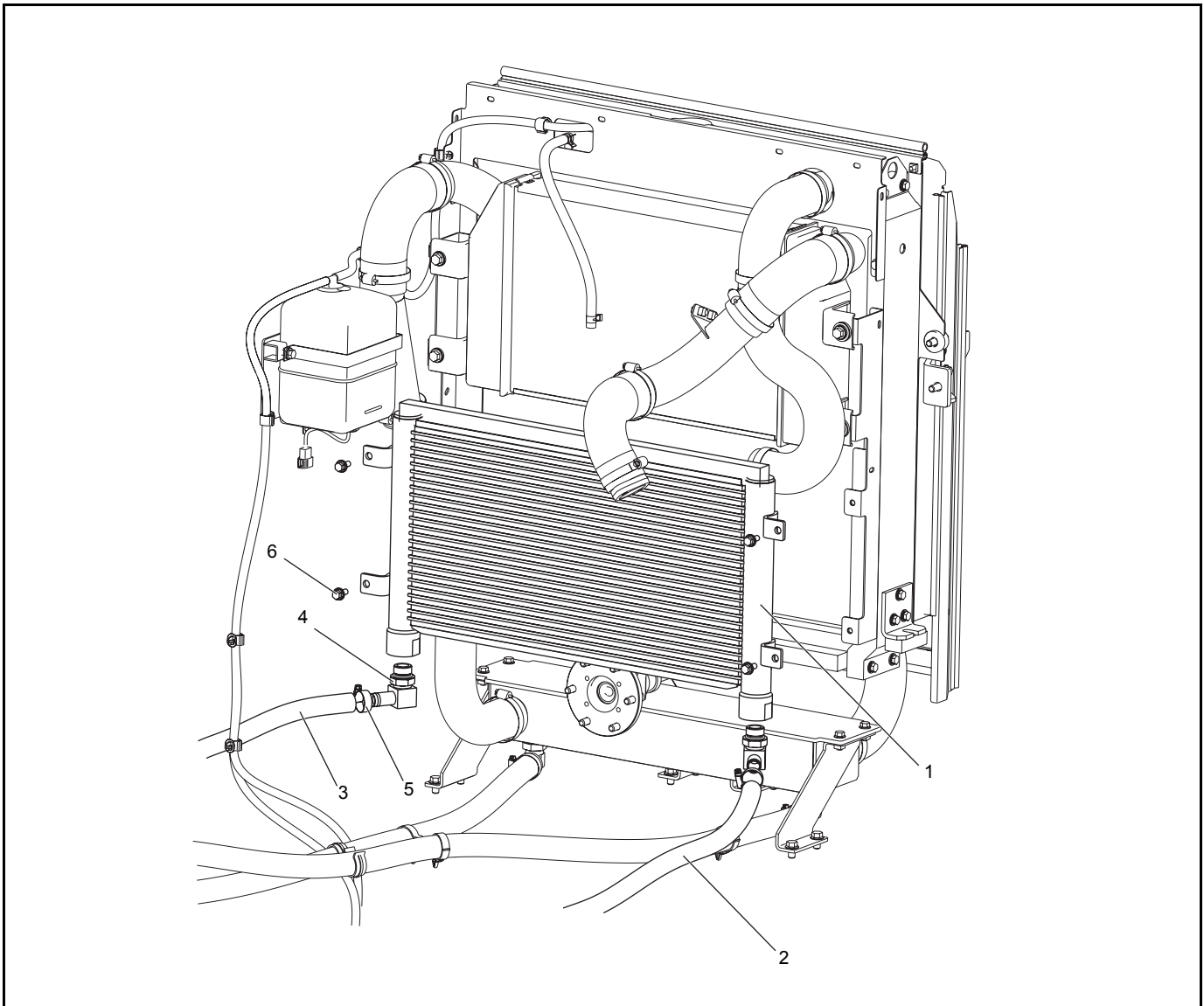
3. When breaking down the fan drive shaft, put matching marks on.
 When reassembling, match the matching marks.

INTER COOLER



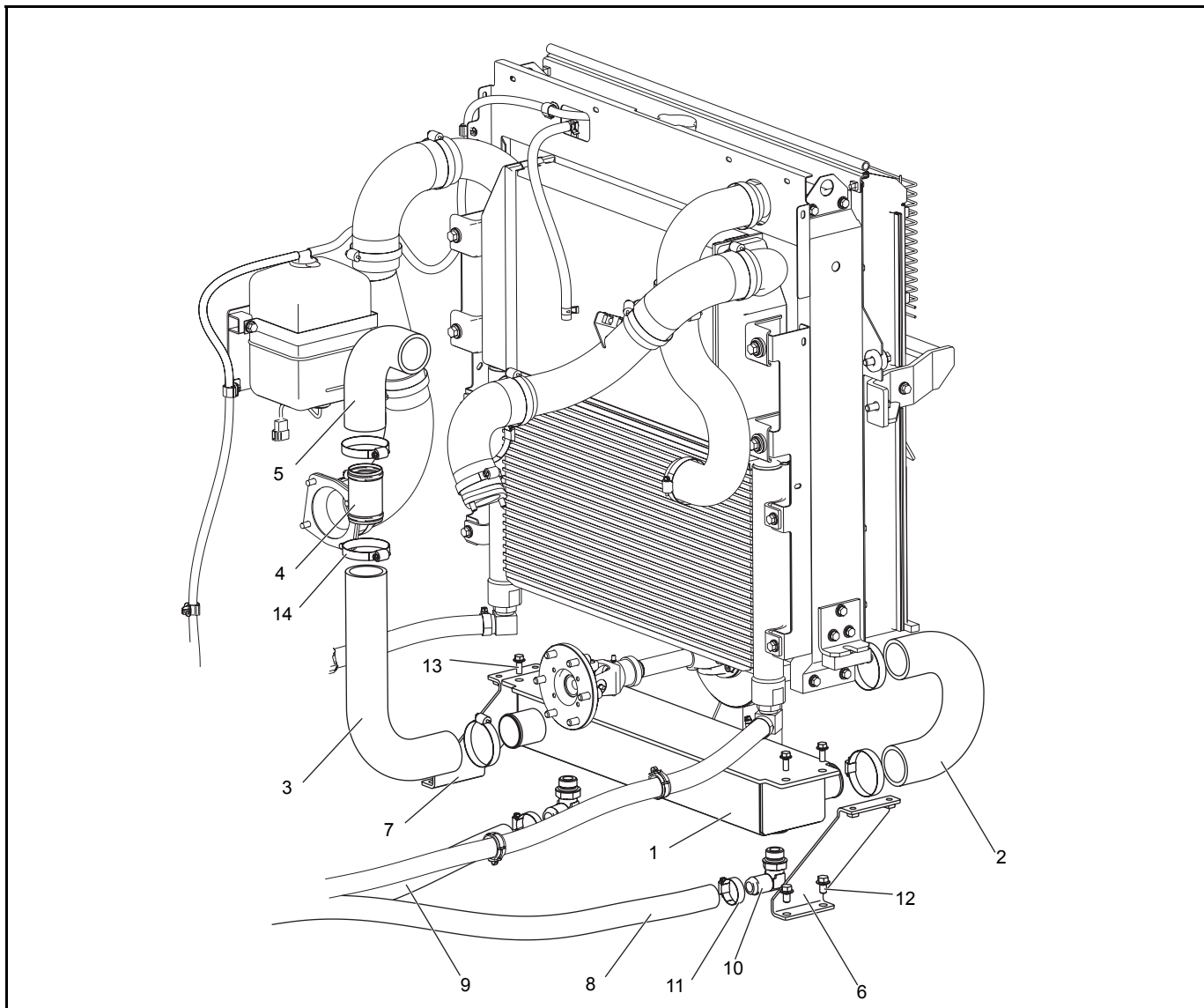
| No. | Name | Quantity |
|-----|--------------------------------|----------|
| 1 | FLANGE, AIR INTAKE | 1 |
| 2 | FLANGE BOLT | 4 |
| 3 | HOSE CLAMP | 1 |
| 4 | HOSE, INTERCOOLER OUTLET, No.2 | 1 |
| 5 | PIPE, INTERCOOLER OUTLET | 1 |
| 6 | HOSE, INTERCOOLER OUTLET, No.1 | 1 |
| 7 | FLANGE TURBO OUTLET | 1 |
| 8 | WASHER, CD SPRING | 2 |
| 9 | BOLT, SOCKET | 2 |
| 10 | HOSE, INTERCOOLER INLET, No.1 | 1 |
| 11 | PIPE | 1 |
| 12 | FLANGE BOLT | 2 |
| 13 | PLATE, RH | 1 |
| 14 | PLATE, LH | 1 |
| 15 | FLANGE BOLT | 6 |
| 16 | SEAL | 2 |
| 17 | FLANGE BOLT W/SPRING | 4 |
| 18 | INTERCOOLER | 1 |
| 19 | HOSE CLAMP | 7 |
| 20 | HOSE, INTERCOOLER INLET, No.2 | 1 |

BRAKE COOLING OIL COOLER



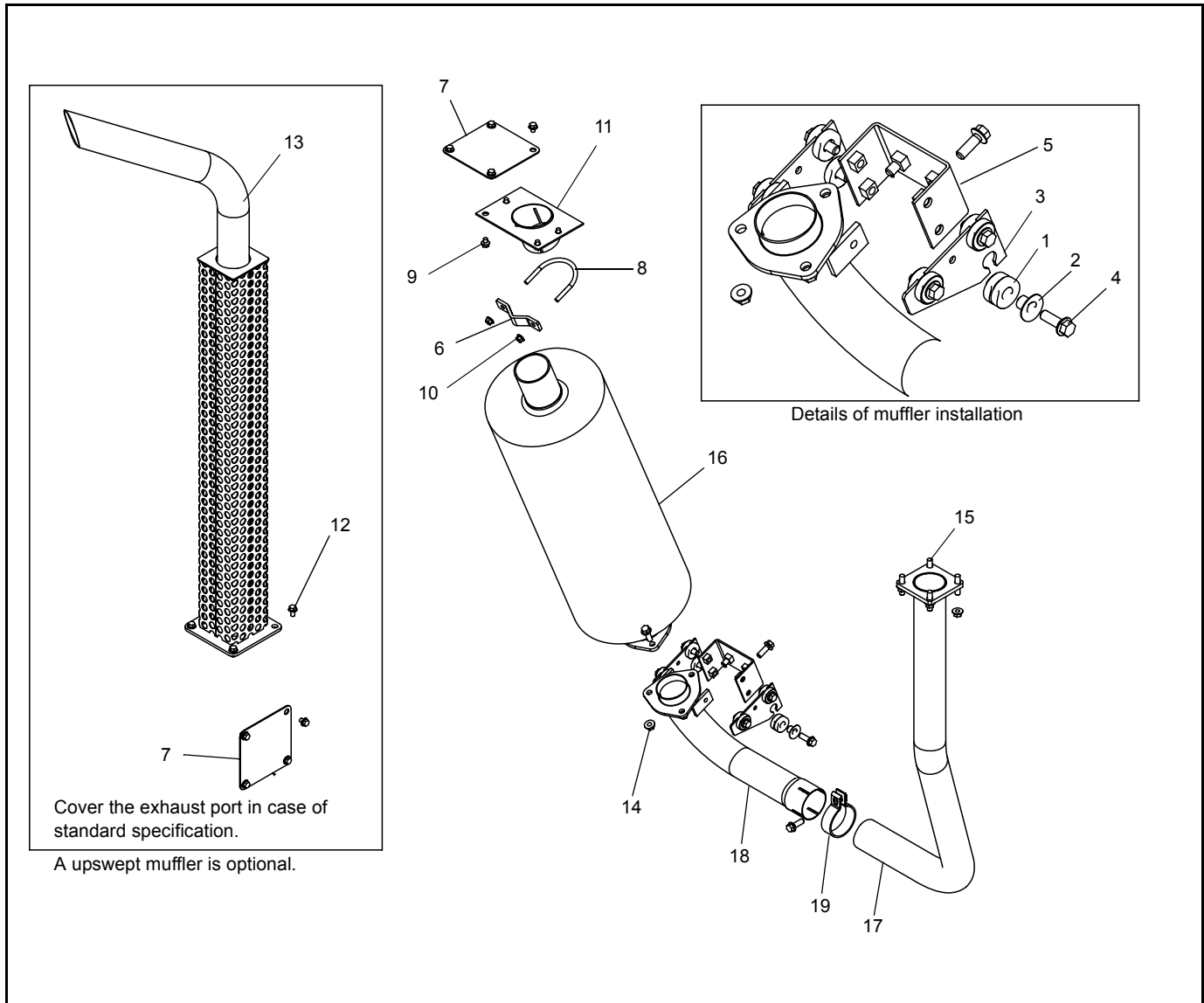
| No. | Name | Quantity |
|-----|--------------------------|----------|
| 1 | BRAKE COOLING OIL COOLER | 1 |
| 2 | HOSE | 1 |
| 3 | HOSE | 1 |
| 4 | FITTING | 2 |
| 5 | CLAMP | 2 |
| 6 | FLANGE BOLT | 4 |

TORQUE CONVERTER OIL COOLER



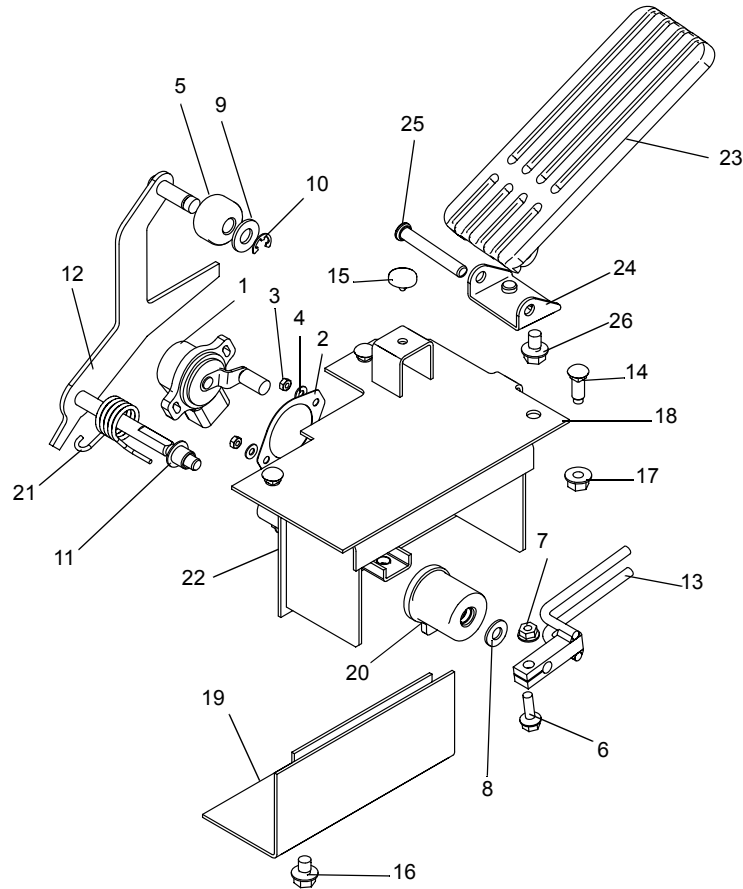
| No. | Name | Quantity |
|-----|-----------------------------|----------|
| 1 | TORQUE CONVERTER OIL COOLER | 1 |
| 2 | HOSE, RADIATOR OUTLET | 1 |
| 3 | HOSE, COOLER OUTLET | 1 |
| 4 | PIPE | 1 |
| 5 | HOSE | 1 |
| 6 | COOLER BRACKET, LH | 1 |
| 7 | COOLER BRACKET, RH | 1 |
| 8 | HOSE | 1 |
| 9 | HOSE | 1 |
| 10 | FITTING | 2 |
| 11 | CLAMP | 2 |
| 12 | FLANGE BOLT | 4 |
| 13 | FLANGE BOLT | 4 |
| 14 | CLAMP | 5 |

MUFFLER



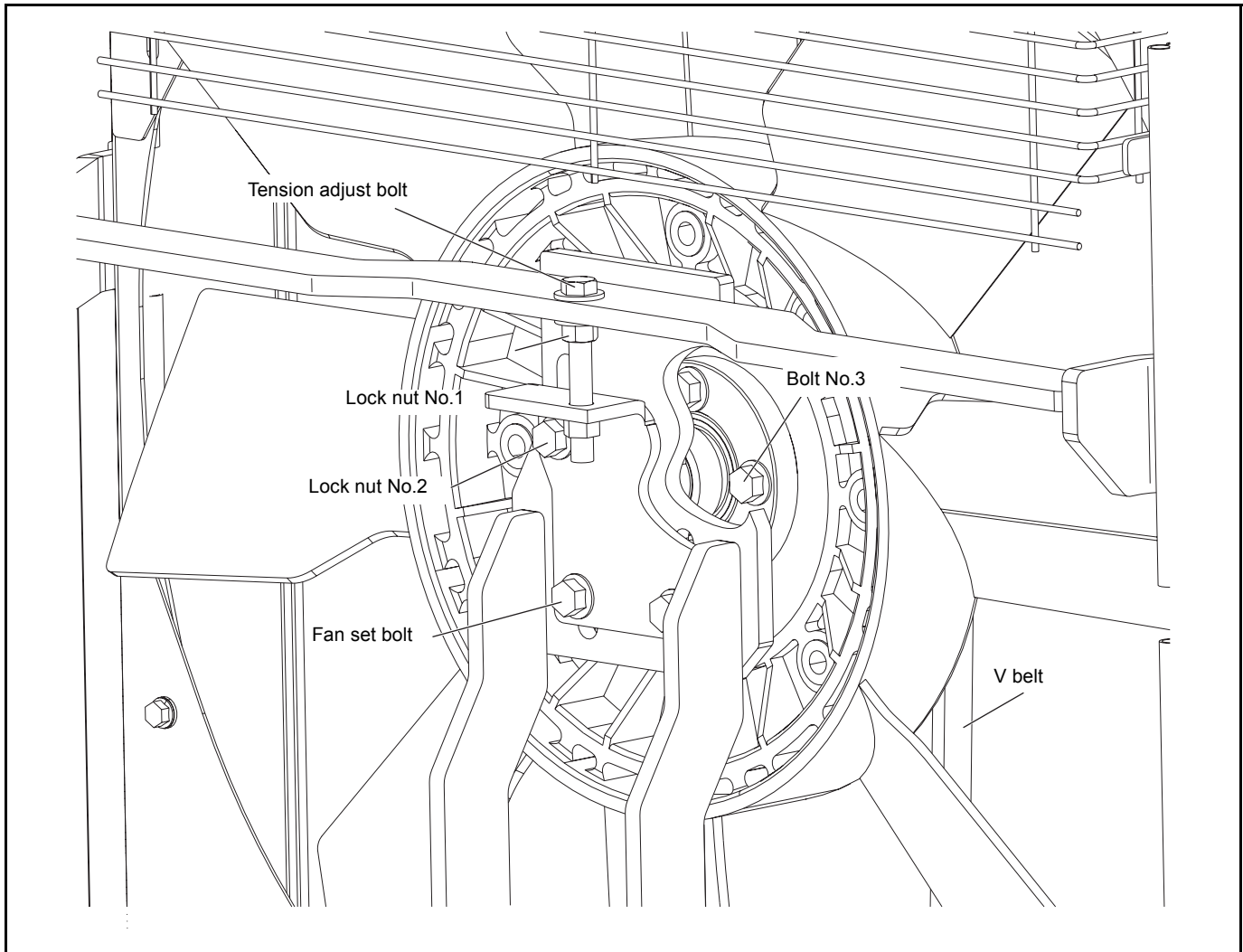
| No. | Name | Quantity |
|-----|--------------------------------|----------|
| 1 | INSULATOR | 6 |
| 2 | SPACER | 6 |
| 3 | PLATE | 2 |
| 4 | BOLT, FLANGE | 12 |
| 5 | BRACKET SUB-ASSY, EXHAUST | 1 |
| 6 | CLAMP, EXHAUST PIPE | 1 |
| 7 | FLANGE, EXHAUST | 2 |
| 8 | BOLT, U | 1 |
| 9 | BOLT, FLANGE | 12 |
| 10 | NUT, FLANGE | 2 |
| 11 | BRACKET SUB-ASSY, EXHAUST PIPE | 1 |
| 12 | BOLT, FLANGE | 4 |
| 13 | UPSWEPT, EXHAUST | 1 |
| 14 | NUT, FLANGE | 7 |
| 15 | STUD BOLT | 1 |
| 16 | MUFFLER SUB ASSY | 1 |
| 17 | PIPE SUB-ASSY, EXHAUST | 1 |
| 18 | PIPE SUB-ASSY, EXHAUST | 1 |
| 19 | CLAMP SUB-ASSY | 1 |

ACCELERATOR



| No. | Name | Quantity |
|-----|------------------------------|----------|
| 1 | SENSOR ASSY, ROTARY POSITION | 1 |
| 2 | GASKET, SENSOR | 1 |
| 3 | NUT | 2 |
| 4 | WASHER, PLATE | 2 |
| 5 | ROLLER, ACCEL LINK | 1 |
| 6 | BOLT, FLANGE | 1 |
| 7 | NUT, FLANGE | 1 |
| 8 | WASHER, PLATE | 1 |
| 9 | WASHER, PLATE | 1 |
| 10 | RING, E | 1 |
| 11 | BUSHING | 2 |
| 12 | ARM SUB-ASSY, ACCEL | 1 |
| 13 | ARM SUB-ASSY, SENSOR | 1 |
| 14 | BOLT, FLAT HEAD SQUARE NECK | 3 |
| 15 | CUSHION | 2 |
| 16 | BOLT, FLANGE | 1 |
| 17 | NUT, FLANGE | 3 |
| 18 | BRACKET SUB-ASSY, ACCEL ARM | 1 |
| 19 | COVER SUB-ASSY | 1 |
| 20 | SPRING ASSY, ACCELERATOR | 1 |
| 21 | SPRING, TORSION | 1 |
| 22 | BRACKET, ACCEL ARM | 1 |
| 23 | PEDAL, ACCEL | 1 |
| 24 | BRACKET, PEDAL | 1 |
| 25 | PIN, W/HEAD | 1 |
| 26 | BOLT, FLANGE | 2 |

FAN BELT ADJUSTMENT PROCEDURE



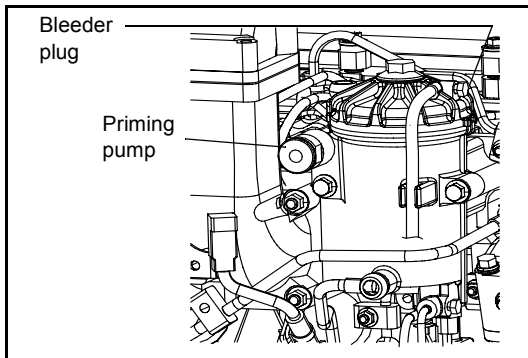
V-belt tension adjustment standard

Brand new parts: 520 ~ 760Nm

After using five minutes or longer: 300 ~ 560Nm

Adjustment procedure

1. Loosen the lock nuts No.1 and No.2.
2. Loosen the fan fixing bolts. (four)
3. Adjust the tension of the V-belt with a tension adjustment bolt.
4. Tighten the fan fixing bolts. (four)
5. Tighten the lock nut No.2.
6. Measure the tension of the V-belt.
Used SST: 09216-76002-71
7. Within the standard value: Tighten the lock nut No.1.
Value other than the standard: Readjust the tension of the V-belt with a tension adjustment bolt.

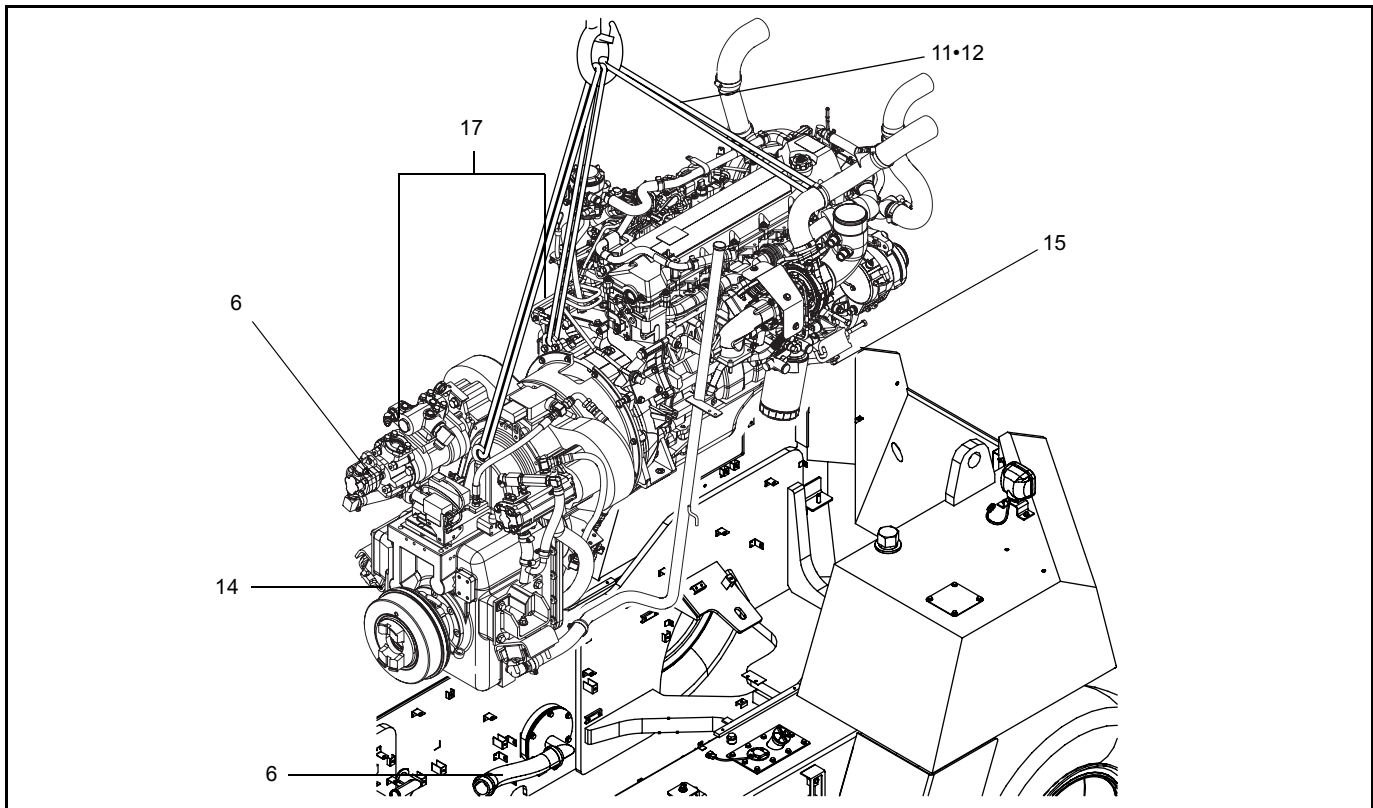


BLEEDING AIR FROM FUEL SYSTEM

1. Place a container to receive the discharged fuel under the tip end of the hose connected to the fuel filter.
2. Free the priming pump by rotating it counterclockwise.
3. Apply a pressure by operating the priming pump up and down, and bleed air by loosening the bleeder plug.
4. Tighten and fix the priming pump while holding it.
5. Wipe the fuel from the neighboring area.

ENGINE ASSY

REMOVAL•INSTALLATION



Removal Procedure

- 1 Park the vehicle on a flat ground and chock the wheels.
- 2 Remove the cabin or head guard. (See P.8-30.)
- 3 Disconnect the battery ⊖ terminal.
- 4 Disconnect the radiator hose. (See P.1-27.)
- 5 Remove the propeller shaft for cooling.
- 6 Disconnect the fuel piping and wiring from the engine.
- 7 Disconnect the piping from the hydraulic oil pump at the torque converter. **[Point 1]**
- 8 Disconnect the torque converter cooler hose.
- 9 Disconnect the exhaust pipe.
- 10 Disconnect the inching piping.
- 11 Disconnect the wiring from the torque converter.
- 12 Sling the engine and torque converter with hoisting wires. **[Point 2]**
- 13 Temporarily hoist the engine W/torque converter and transmission.
- 14 Remove the nut from the torque converter mounting rubber. **[Point 3]**
- 15 Remove nuts from the engine mounting rubber.
- 16 Remove the engine W/torque converter and transmission.
- 17 Place the engine and torque converter transmission on the work bench on the floor. **[Point 5]**
- 18 Remove the torque converter end plate cover.
- 19 Remove the flexible plate set bolts. **[Point 4]**
- 20 Remove the torque converter housing set bolts, and disconnect the torque converter and transmission ASSY from the engine ASSY.

Installation Procedure

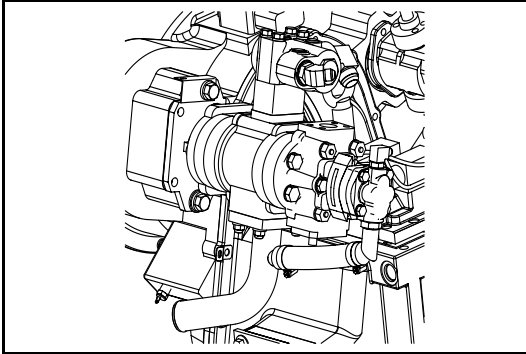
The installation procedure is the reverse of the removal procedure.

Note:

- After installation, bleed air from the fuel system.
- Prepare an oil receiver since the hydraulic oil will run out when the piping is disconnected.

Caution:

At the time of maintenance, inspection, adjustment or replacement of the torque converter ASSY, remove the parking brake air chamber before disconnecting the battery ⊖ terminal.

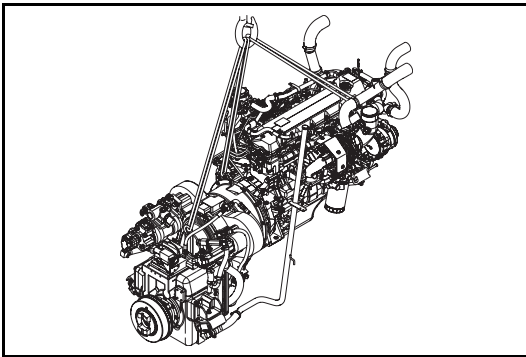


Point Operations

[Point 1]

Removal•Installation:

Disconnect the piping to make the material handling pump as illustrated at left.



[Point 2]

Removal•Installation:

Hoisting

| Position | Weight | Center of gravity |
|-----------------------------------|----------------------------------|---|
| Engine side :2 places | Approx. 1,200 kg (2645 lb) | Above the contact surface between the engine and torque converter |
| Torque converter side :1 place | | |

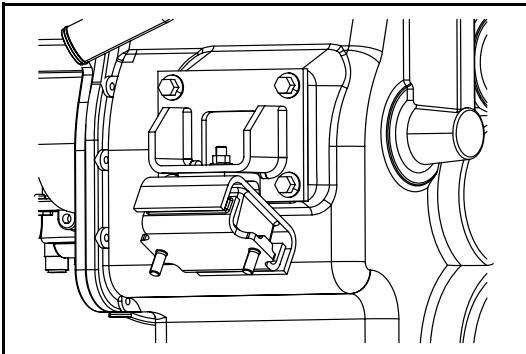
Caution:

Do not remove the torque converter level gage piping but fix it on the engine side.

[Point 3]

Removal•Installation:

Remove the lower nuts on both the engine and torque converter sides for easy positioning at the time of reinstallation on the vehicle.



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for your reading.**

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**Then Get More
Information.**