Technical Manual

EX27u, 35u (North America)

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SECTION 1
GENERAL

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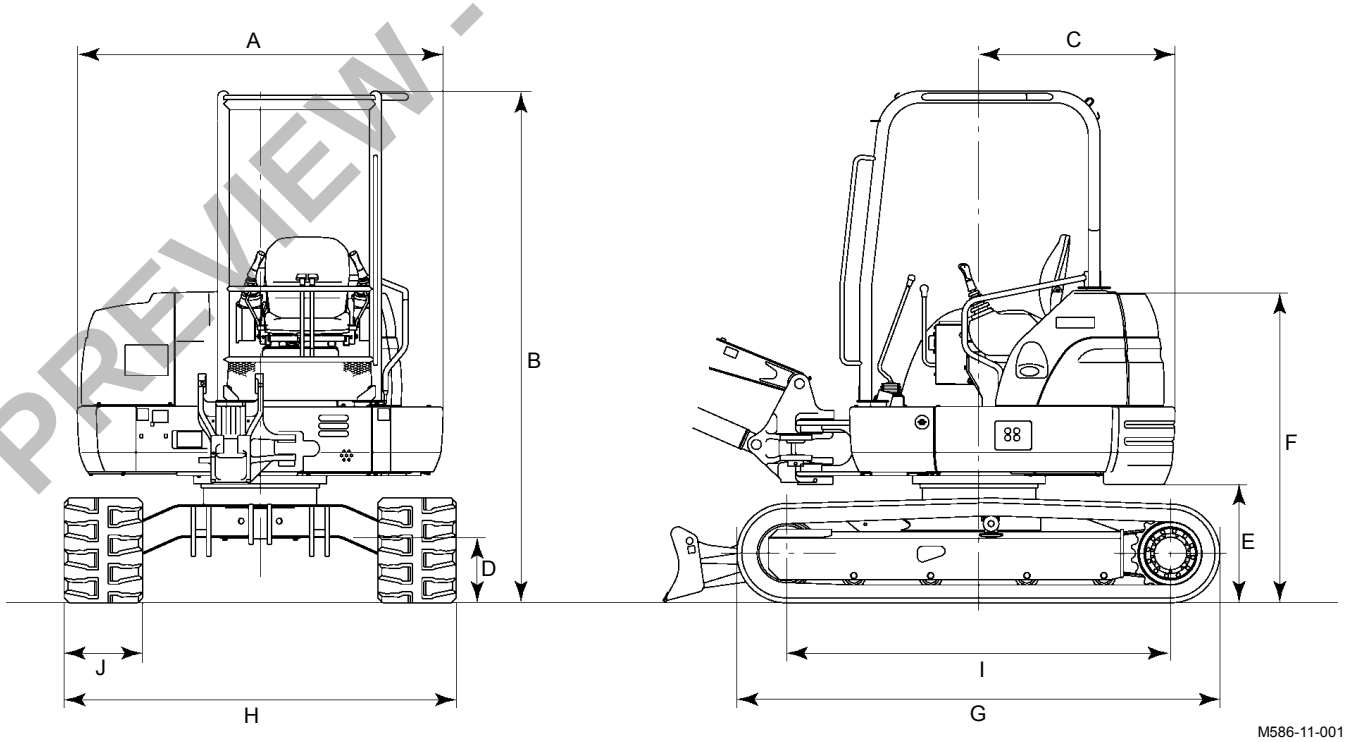
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SPECIFICATIONS

(27u)

Item	Unit	Canopy	Cab
Front Attachment	—	Boom swing type	
Bucket Capacity (Heaped)	m^3	0.08 (0.10 yd^3): PCSA (0.065: CECE)	
Operating Weight	kg (lb)	2930 (6460)	3050 (6720)
Base Machine Weight	kg (lb)	2200 (4850)	2320 (5110)
Engine	–	ISUZU 3LD1 16.9 kW/2450min^{-1} (23 PS/2450 rpm)	
A: Overall Width	mm (ft in)	1490 (4′ 11″)	
B: Cab Height	mm (ft in)	2550 (8′ 4″)	2660 (8′ 9″)
C: Rear End Swing Radius	mm (ft in)	775 (2′ 7″)	
D: Minimum Ground Clearance	mm (ft in)	325 (1′ 0.8″)	
E: Counterweight Clearance	mm (ft in)	540 (1′ 9″)	
F: Engine Cover Height	mm (ft in)	1510 (4′ 11″)	
G: Undercarriage Length	mm (ft in)	1920 (6′ 4″) (Rubber Crawler)	
H: Undercarriage Width	mm (ft in)	1550 (5′ 1″)	
I: Sprocket Center to Idler Center	mm (ft in)	1500 (4′ 11″)	
J: Track Shoe Width	mm (ft in)	300 (12″) (Rubber Crawler)	
Ground Pressure	kPa (kgf/cm^2, psi)	29.1 (0.30, 4.3)	30.3 (0.31, 4.4)
Swing Speed	min^{-1} (rpm)	8.1	
Travel Speed (Fast/Slow)	km/h (mph)	4.0/2.4 (2.5/1.5)	
Gradeability	% (deg.)	58 (30)	

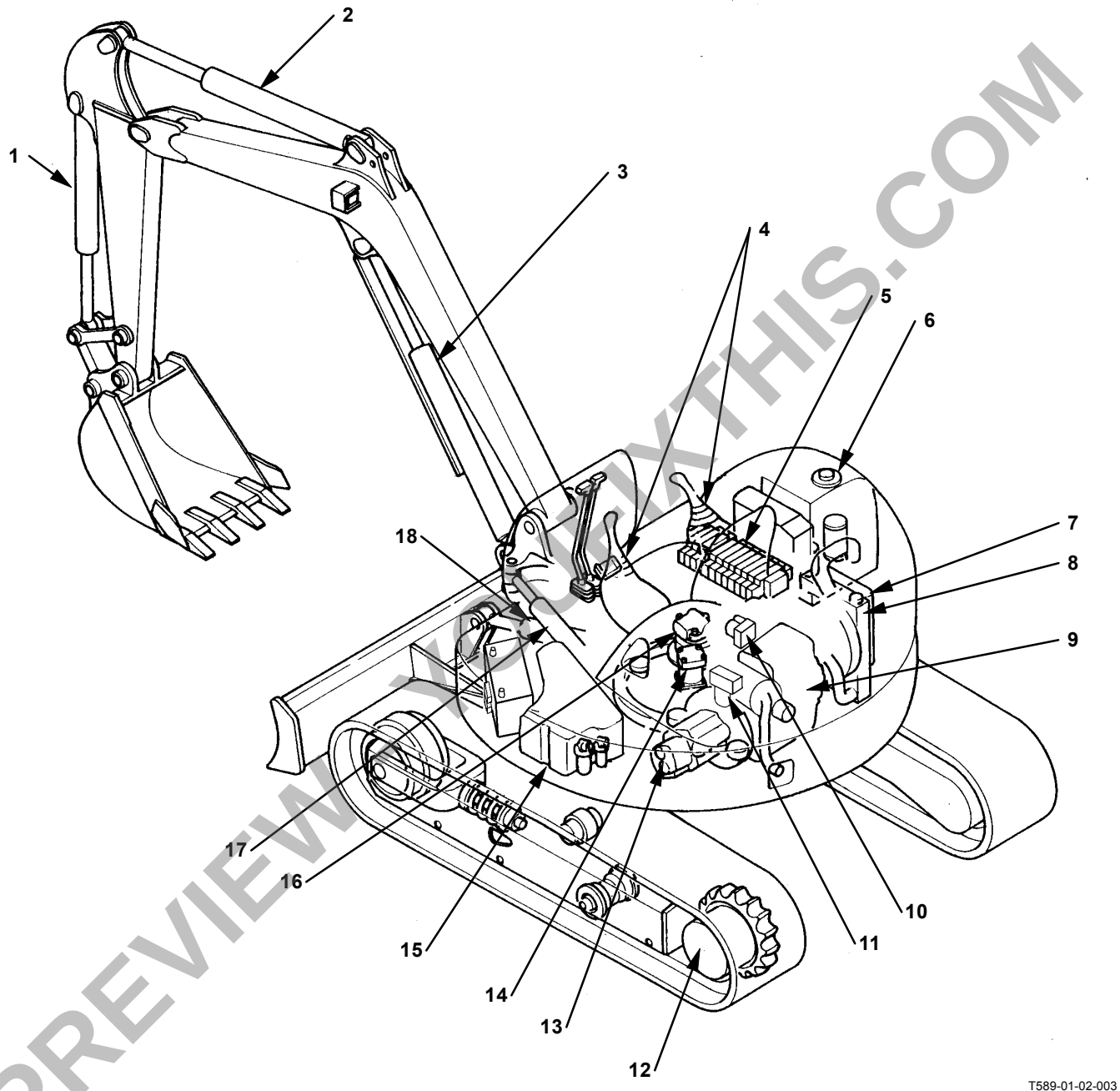


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MAIN COMPONENTS

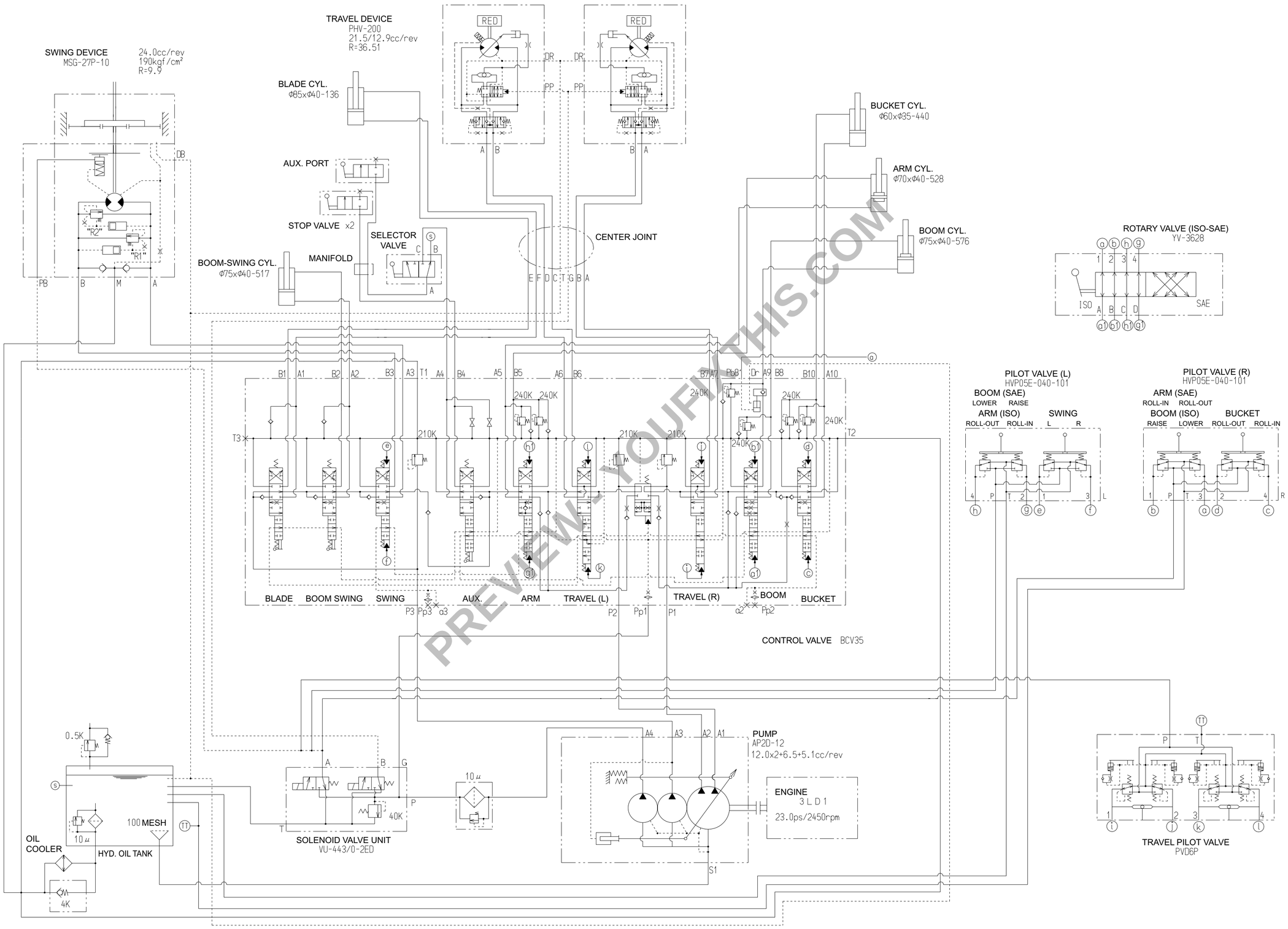
27u, 35u



1 - Bucket Cylinder
2 - Arm Cylinder
3 - Boom Cylinder
4 - Pilot Valve
5 - Control Valve
6 - Hydraulic Oil Tank
7 - Oil Cooler
8 - Radiator
9 - Engine
10 - Solenoid Valve
11 - Pilot Filter
12 - Travel Device
13 - Pump Device
14 - Center Joint
15 - Fuel Tank
16 - Swing Device
17 - Boom Swing Cylinder
18 - Blade Cylinder

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EX27u HYDRAULIC CIRCUIT DIAGRAM
(NORTH AMERICA SPEC.)



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TIGHTENING TORQUE SPECIFICATIONS

Bolts and Nuts of Machine: Standard Torque Chart

No.	Descriptions		Bolt Dia mm	Q'ty	Wrench Size mm	Torque		
						N¥m	(kgf¥m)	(lbf·ft)
1	Engine cushion rubber mounting bolt		12	4	19	88	(9)	(65)
2	Engine bracket mounting bolt (Front) *		10	8	17	49	(5)	(36)
	Engine bracket mounting bolt (Rear)*		10	6	17	49	(5)	(36)
3	Hydraulic oil tank mounting bolt		12	4	19	88	(9)	(65)
4	Fuel tank mounting nut		10	2	17	20	(2)	(15)
	Fuel tank mounting bolt		8	1	13	9.8	(1)	(7.2)
5	Hydraulic hoses and union joints				19	29.5	(3)	(22)
					22	39	(4)	(29)
					27	64	(6.5)	(47)
6	Pump mounting bolt		12	2	19	88	(9)	(65)
7	Pump cover mounting bolt		10	6	17	49	(5)	(36)
8	Control valve mounting bolt		10	4	17	49	(5)	(36)
	Control valve bracket mounting bolt		10	4	17	49	(5)	(36)
9	Swing device mounting bolt		14	6	22	137	(14)	(101)
10	Battery mounting nut		6	2	10	5	(0.5)	(3.7)
	Battery mounting bolt		10	3	17	49	(5)	(36)
11	Canopy mounting bolt		16	4	24	205	(21)	(151)
12	Cab mounting bolt		16	4	24	205	(21)	(151)
13	Swing bearing mounting bolt	Swing Device	12	24	19	108	(11)	(80)
		Track	12	20	19	108	(11)	(80)
14	Travel device mounting bolt *	27u	12	18	19	108	(11)	(80)
		35u	12	22	19	128	(13)	(94)
15	Sprocket mounting bolt*	27u	12	18	19	108	(11)	(80)
		35u	12	22	19	128	(13)	(94)
16	Upper roller mounting bolt		14	2	22	137	(14)	(101)
17	Lower roller mounting bolt*		14	16	22	137	(14)	(101)
18	Cover mounting bolt		8		13	9.8	(1)	(7.2)
			10		17	49	(5)	(36)
19	Counterweight mounting bolt		22	2	32	540	(55)	(400)

NOTE: (1) Apply lubricant (i.e. white zinc B dissolved into spindle oil) to reduce their friction coefficients.

(2) Remove rust, dirt, and dust before installing fasteners.

*(3) Apply LOCTITE to threads of fasteners indicated with * marks in the above chart.*

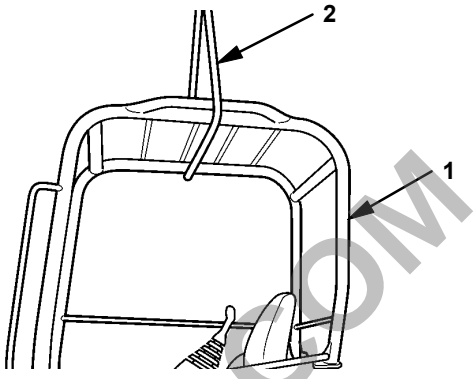
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REMOVE AND INSTALL CANOPY

Removal

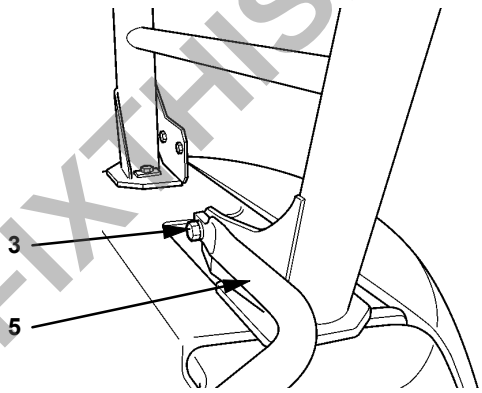
1. Attach sling belt (2) to canopy (1).



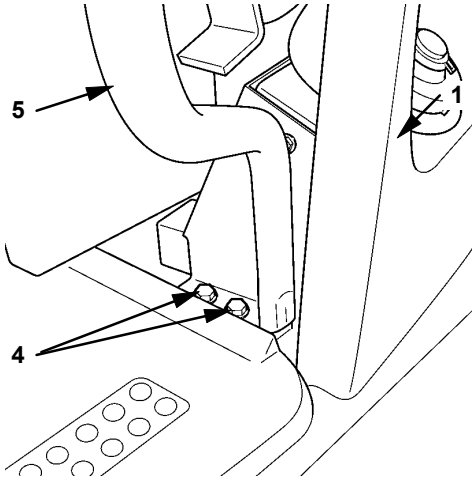
W571-02-01-001

2. Loosen bolts (3) and (4) (2 used) to remove handrail (5).

: 17 mm

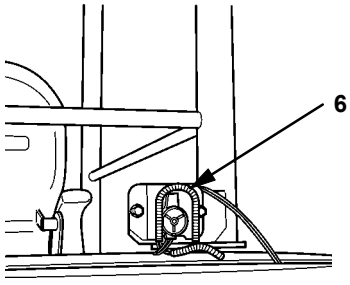


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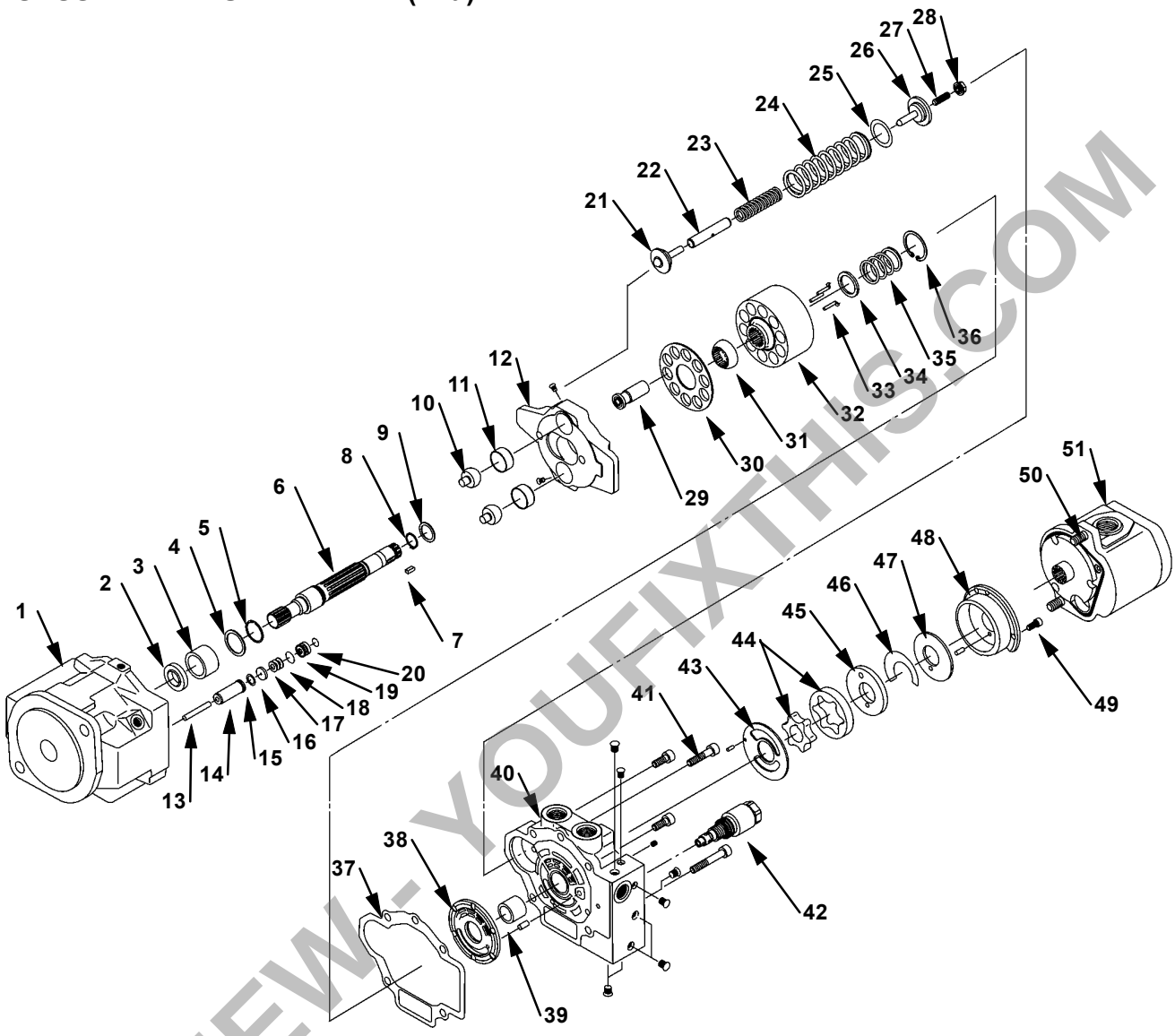
3. Disconnect connector from travel alarm (6).



W571-02-01-004

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DISASSEMBLE PUMP DEVICE (27u)



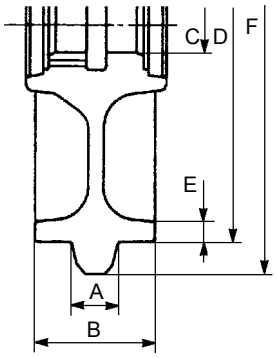
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1 - Housing
2 - Oil Seal
3 - Bearing
4 - Shim
5 - Ring
6 - Shaft
7 - Key
8 - Retaining Ring
9 - Shim
10 - Guide
11 - Bushing
12 - Swash Plate
13 - Pin
14 - Sleeve
15 - Shim
16 - Distance Peace
17 - Coned Disc Spring
18 - O-Ring
19 - Piston
20 - O-Ring
21 - Spring Seat
22 - Guide
23 - Spring
24 - Spring
25 - Shim
26 - Spring Seat
27 - Set Screw
28 - Nut
29 - Plunger
30 - Retainer
31 - Holder
32 - Cylinder Block
33 - Pin
34 - Retainer
35 - Spring
36 - Retaining Ring
37 - Packing
38 - Valve Plate
39 - Bearing
40 - Cover
41 - Socket Bolt
42 - Relief Valve
43 - Side Plate
44 - Gear
45 - Side Plate
46 - O-Ring
47 - Plate
48 - Housing
49 - Socket Bolt
50 - Socket Bolt
51 - Gear Pump

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MAINTENANCE STANDARDS



W503-03-05-001

Unit: mm

	Standard	Allowable Limit	Remedy
A	31	25	Cladding by welding and Hand Finishing
B	80	-	
C	39	-	
D	269	263	
E	10	-	
F	307	-	

NOTE: 1 mm = 0.03937 in

Unit: mm

Axle and Bushing

		Standard		Allowable Limit		Remedy
		27u	35u	27u	35u	
Axle	Outer Diameter	30.0	35.0	29.2	34.2	Replace
Bushing	Inner Diameter	30.0	35.0	30.5	35.5	
	Flange Thickness	2		1.5		

Lubrication Oil

Engine Oil Grade: API Class CD, SAE30

Oil Capacity: 60 cm^3 (0.63 US qt)

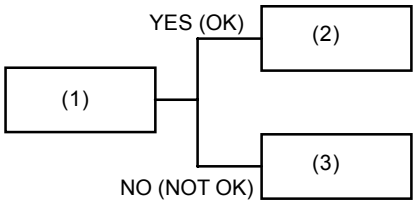
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TROUBLESHOOTING A PROCEDURE (DIAGNOSIS OF MACHINE BY SYMPTOM)

This procedure is used when operating the diagnosis by the symptom.

- How to Read the Troubleshooting Flow Charts



After checking or measuring item (1), select either YES (OK) or NO (NOT OK) and proceed to item (2) or (3) next.



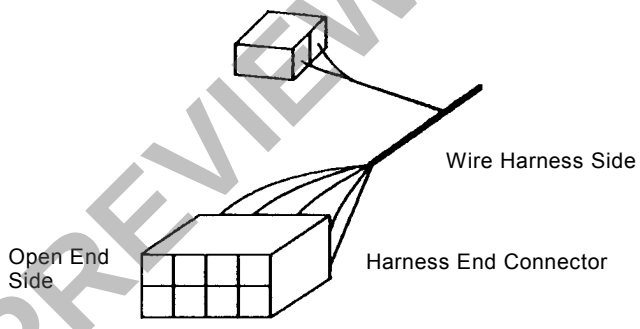
- Key switch: ON

As shown to the left, measuring methods or items to be referred to are indicated in the spaces under the box. Take care to measure or check correctly. Incorrect measuring or checking methods may result in making troubleshooting impossible, and may damage components.



The thick-line box indicates the causes. Scanning through thick-line boxes, possible causes can be focused.

NOTE: The connector drawings show the harness end connectors seen from the open end side.



T158-05-03-001

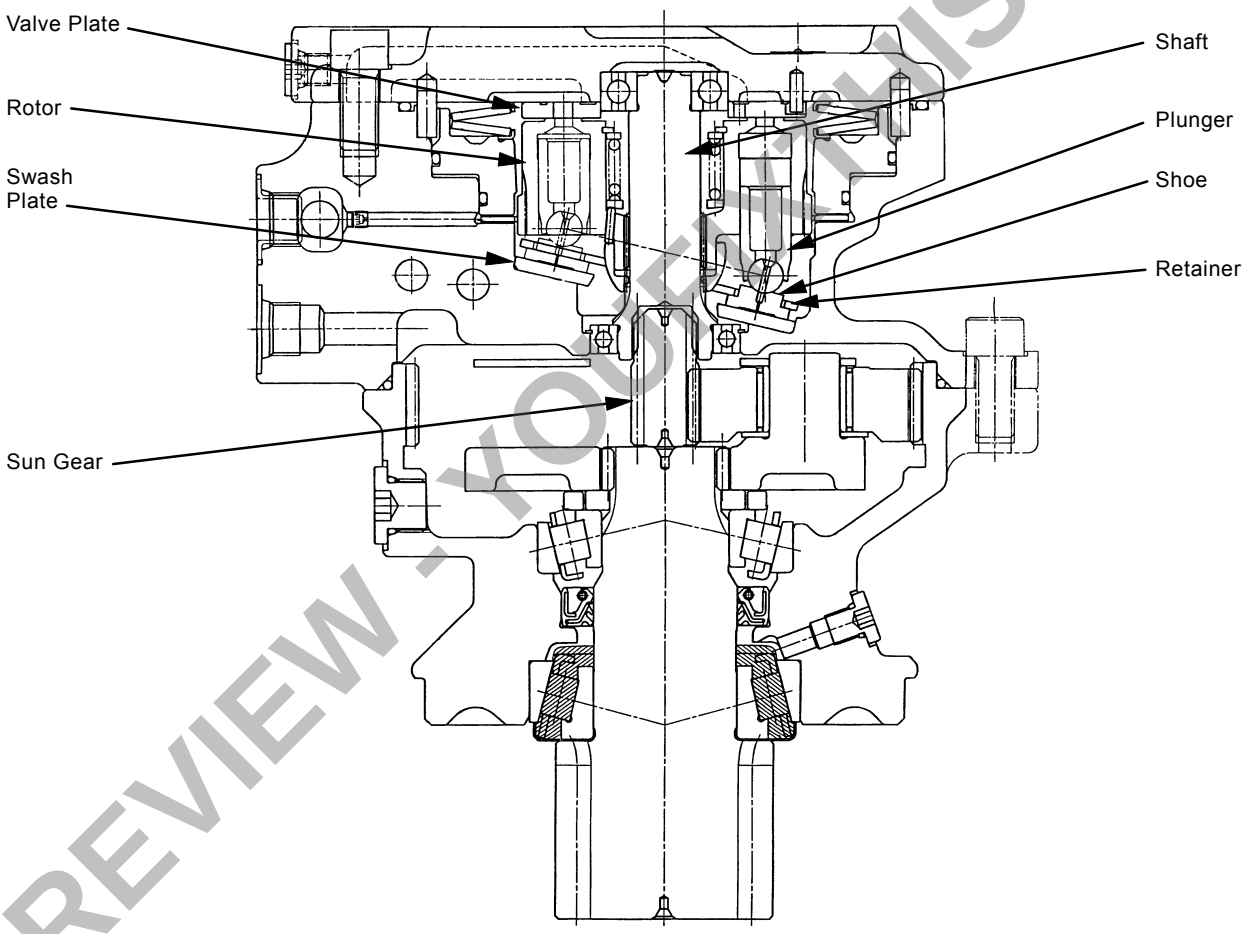
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SWING MOTOR

The inner rotor is splined to the shaft, and the plunger is inserted in the rotor.
When the pump supplies pressure oil to the swing motor, plungers are pushed down with pressure oil while sliding along the swash plate, developing turning force. As the shaft is splined to the sun gear in the swing reduction gear, the rotor torque is transmitted to the swing reduction gear unit.

NOTE: The drawing shows the swing motor installed on the 27u.

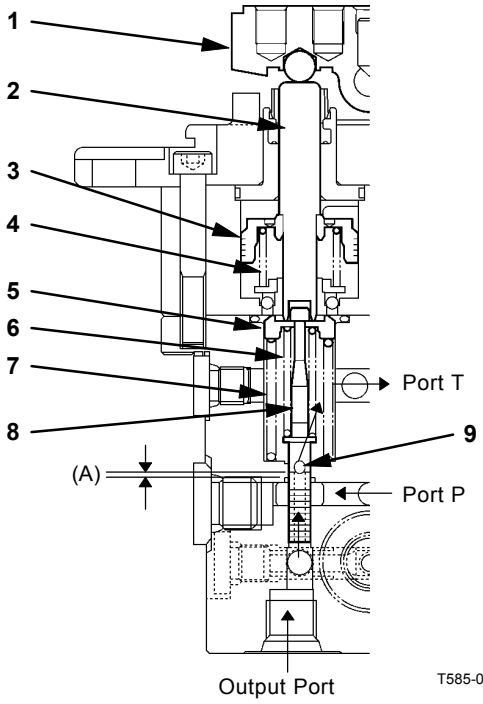


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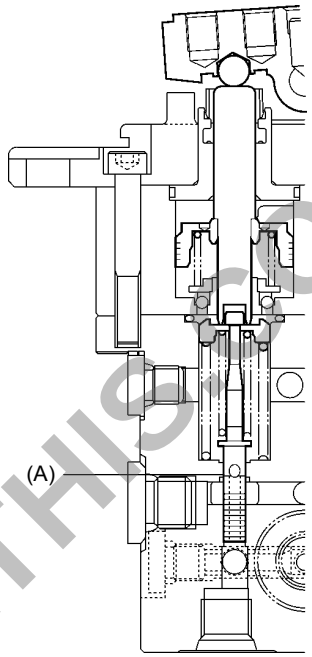
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Pusher Stroke: A to B

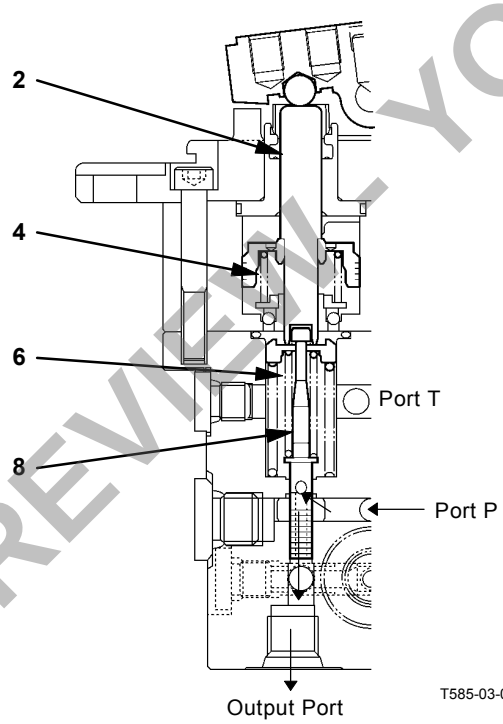


T585-03-04-001



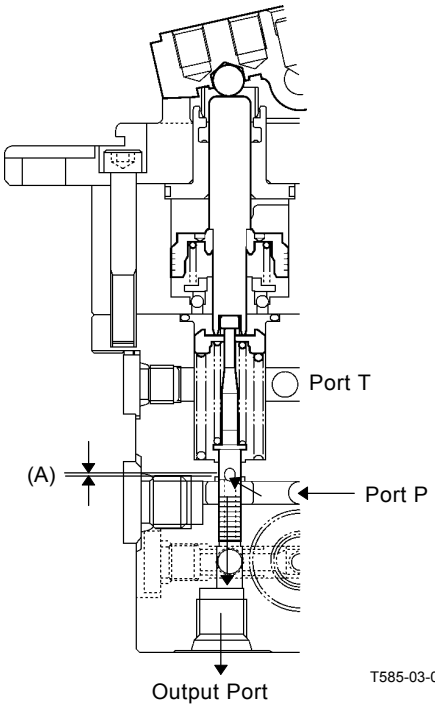
T585-03-04-002

Pusher Stroke: C to D



T585-03-04-003

Pusher Stroke: E to F



T585-03-04-004

1 - Cam
2 - Pusher
3 - Spring Guide
4 - Spring
5 - Spring Guide
6 - Balance Spring
7 - Return Spring
8 - Spool
9 - Hole

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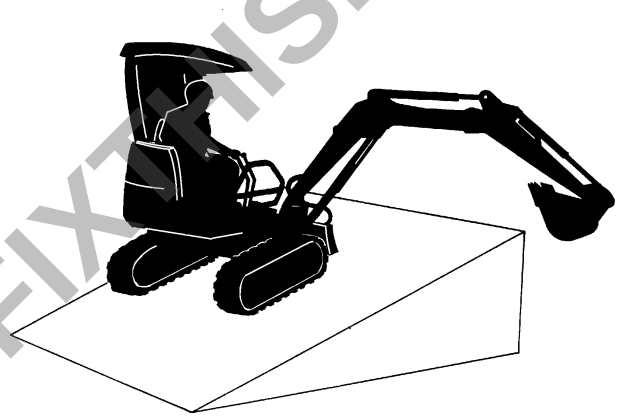
SWING MOTOR LEAKAGE

Summary:

To check swing parking brake performance, measure the upperstructure drift after parking the machine on a slope with the upperstructure positioned 90° to the slope.
(Mechanical brake for swing parking is installed on swing motor.)

Preparation:

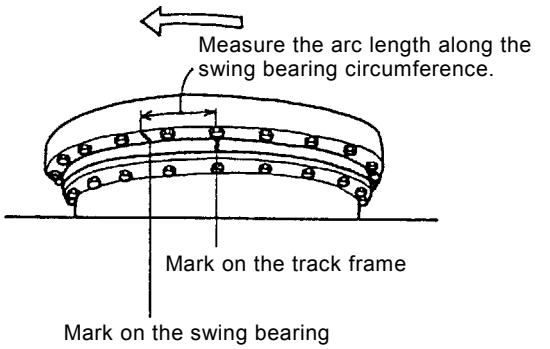
1. Check the lubrication of the swing gear and swing bearing.
2. Load the bucket with either soil or a weight equivalent to the weight standard.
   With: 27u : 92 kg (203 lb)
   35u : 134 kg (295 lb)
3. Roll the arm out, roll the bucket in, and position the arm top pin height flush with the boom foot pin.
4. Park the machine on a flat slope with a gradient of 15±1°.
5. Climb the slope, then swing the upperstructure 90° toward the slope. Make aligning marks on the swing bearing circumference and track frame.
6. Maintain the hydraulic oil temperature at 50±5 °C (122±9 °F).



T570-06-03-006

Measurement:

1. Start the engine and maintain engine speed at slow idle. After 5 minutes, measure the difference between the marks along the swing bearing circumference and the track frame.
2. Perform the measurement under the following two conditions:
   ·When the brake is applied(with the pilot control shut-off lever in the LOCK position).
   ·When the brake is released(with the pilot control shut-off lever in the UNLOCK position).
3. Perform the measurement on both right and left swing directions.
4. Perform the measurement three times in each direction and calculate the average values.



T105-06-03-010

Evaluation:

Refer to T4-5 Standard.

Remedy:

Refer to T5-2 "Troubleshooting A".

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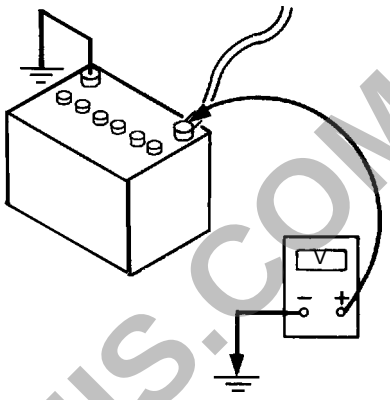
BATTERY VOLTAGE CHECK

1. Turn key switch OFF
2. Measure between battery plus terminal and the ground (vehicle) using a voltmeter.
   Correct Voltage Reading: 12 V

NOTE: If voltage is abnormal, re-charge or replace the battery.

3. Start the engine.
4. Measure the battery voltage again.
   Correct Voltage Reading: Approximately 14.5 V

NOTE: If voltage is abnormal, check the charging system.



T505-07-01-002

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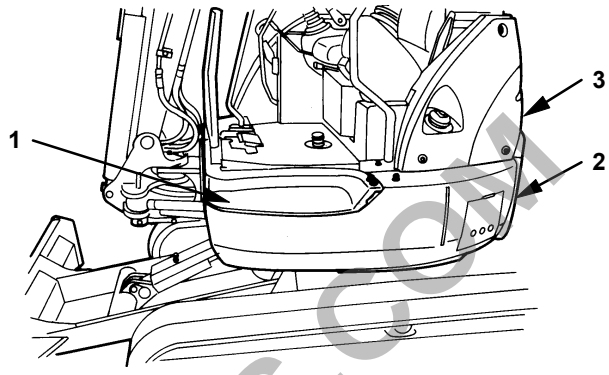
Removal

1. Remove covers (1), (2) and (3).

   : 13 mm

2. Disconnect all hoses from the pump.
   Plug each disconnected hose end.

   : 19 mm, 22 mm, 27 mm
   : 8 mm

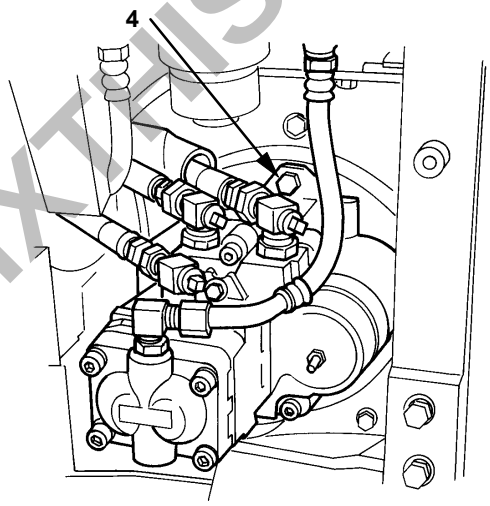


W574-02-03-001

CAUTION: Pump device weight: 20 kg (44 lb)

3. Attach sling belts to the pump. Slightly raise the pump using a crane and sling belts and remove bolts (4). Remove with a crane.

   : 19 mm



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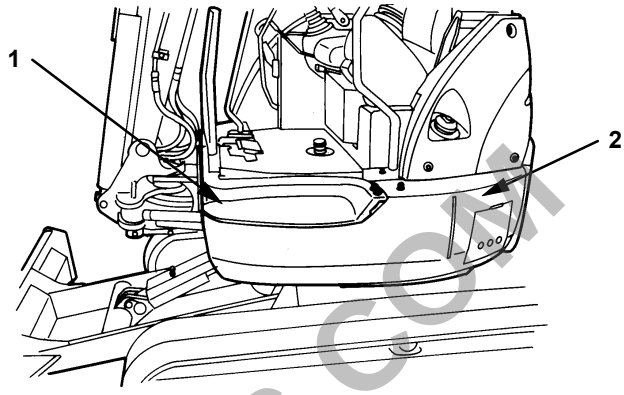
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Removal

1. Remove covers (1) and (2) by loosening bolts.

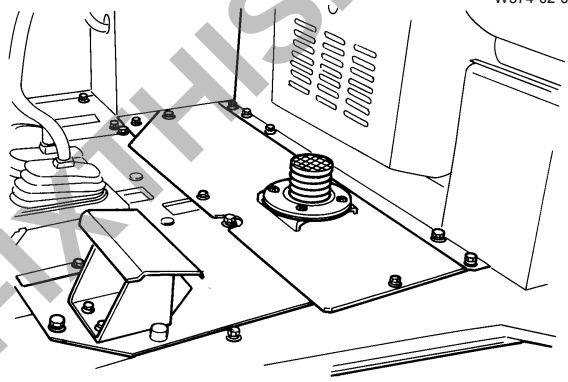
   : 13 mm



W574-02-03-001

2. Loosen bolts, then remove all floor plates.

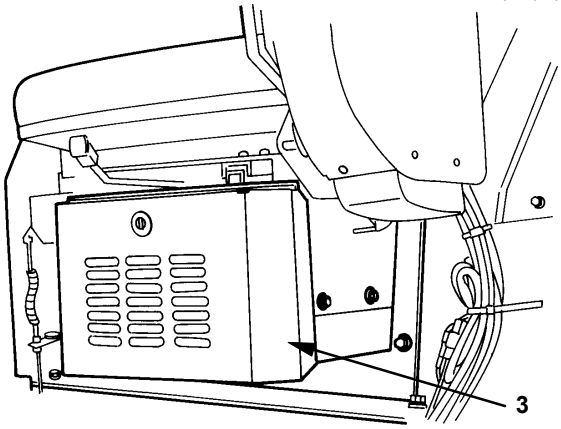
   : 13 mm, 17 mm



W574-02-05-001

3. Loosen bolts, then remove seat base (3).

   : 13 mm, 17 mm



W574-02-05-002

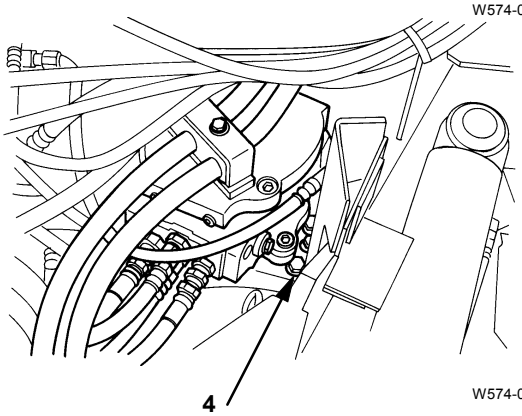
4. Disconnect all hoses from the swing device. Cap each disconnected hose end.

   : 19 mm, 22 mm

CAUTION: Swing device weight:
33 kg (73 lb) (27u)
38 kg (84 lb) (35u)

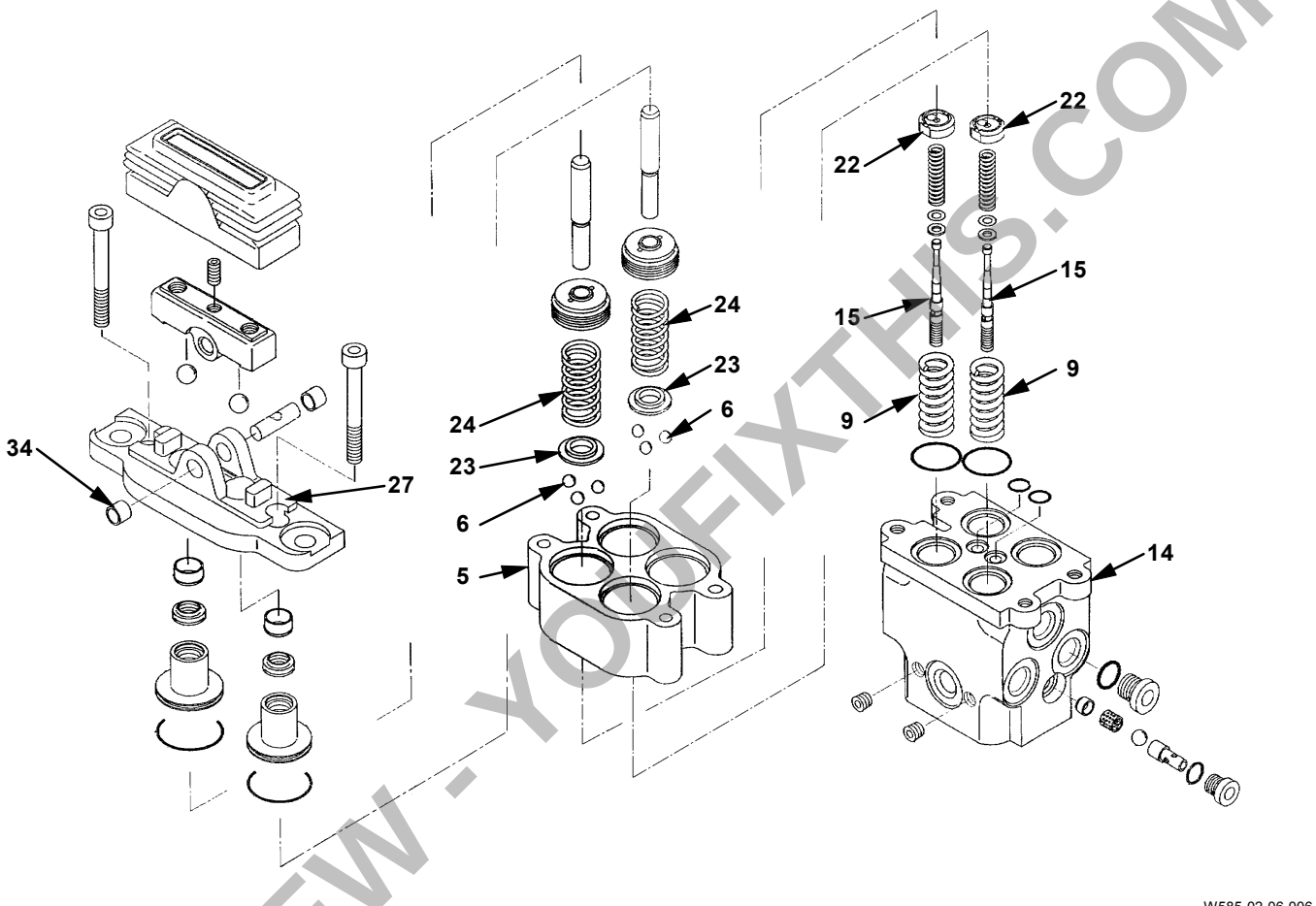
5. Remove swing device mounting bolt (4). Attach swing device to a crane with sling belts. Remove the swing device using the crane.

   : 22 mm



W574-02-05-003

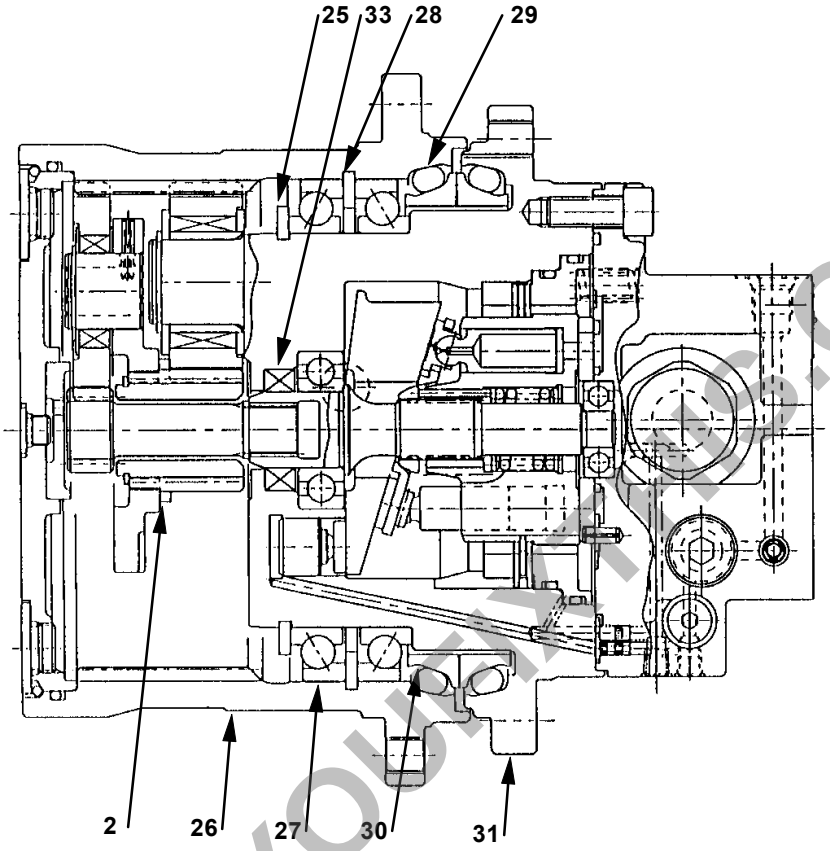
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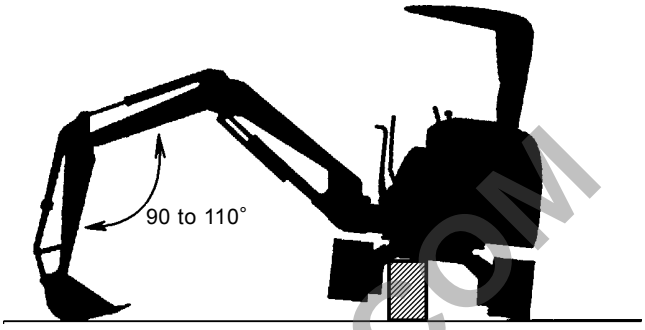
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REMOVE AND INSTALL LOWER ROLLER

Removal

CAUTION: Support the raised track securely using wooden blocks.

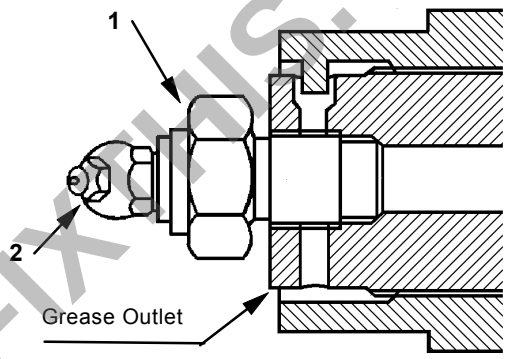
1. Raise the one side track off the ground using the front attachment.



M570-07-001

CAUTION: Grease pressure in the track adjuster is high. Do not loosen valve (1) quickly or loosen it too much. Valve (1) may fly out or high pressure grease in the track adjuster may spout. Loosen carefully, keeping body parts and face well away from valve (1). Never loosen grease fitting (2).

IMPORTANT: If gravel or mud is packed between sprockets and tracks, remove it before loosening.

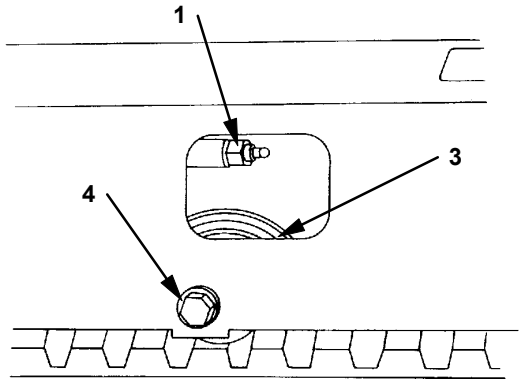


M104-07-119

2. Loosen track adjuster valve (1) slowly to let grease flow out until the clearance between the track frame and crawler is wide enough to remove lower roller (3).

3. Loosen bolt (4) and remove lower roller (3).

: 22 mm



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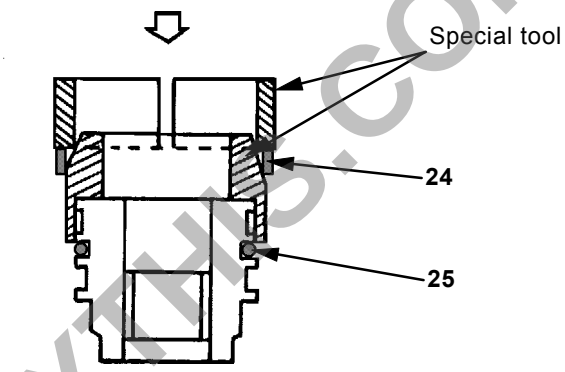
6. Install O-ring (14) and backup ring (13) onto the outer diameter of retainer (12).

7. Install retainer (12), connector (10) and stopper (11) into cylinder head (3).

IMPORTANT: Be sure that O-ring (25) is not twisted after installation.

8. Install O-ring (25) onto piton (21), then install seal ring (24) using a special tool.
   For boom cylinder ST2936 (27u)
   ST2937 (35u)
   For arm cylinder ST2935 (27u)
   ST2936 (35u)

9. Install a special tool onto piston (21), then correct the seating position of seal ring (24).

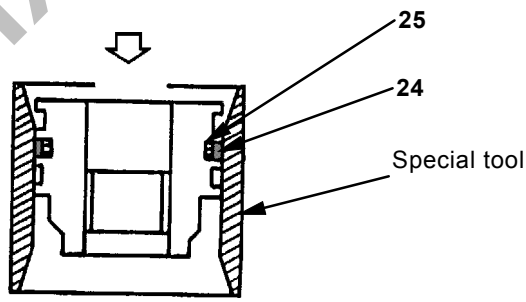


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IMPORTANT: Install the slide rings so that the slits are not aligned in the same position.

10. Install slide rings (26) and (20) onto piston (21).

11. Install cylinder head (3) onto piston rod (30).



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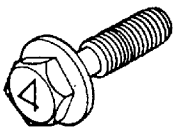
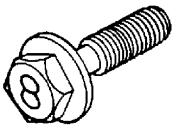
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TIGHTENING TORQUE SPECIFICATIONS

The tightening torque values given in the table below are applicable to the bolts unless otherwise specified.

FLANGED HEAD BOLT

kg·m (lb.ft/N·m)

Bolt head marking / Nominal size (dia. x pitch)			
M 6 × 1	0.5 ~ 0.9 (3.61 ~ 6.50/4.6 ~ 8.5)	0.6 ~ 1.2 (4.33 ~ 8.67/5.88 ~ 11.76)	—
M 8 × 1.25	1.1 ~ 2.0 (7.95 ~ 14.46/10.78 ~ 19.61)	1.4 ~ 2.9 (4.33 ~ 8.67/5.88 ~ 11.76)	1.9 ~ 3.4 (13.74 ~ 24.59/18.63 ~ 33.34)
M10 × 1.25	2.3 ~ 3.9 (17.35 ~ 28.20/23.53 ~ 38.24)	3.6 ~ 6.4 (26.03 ~ 44.12/35.30 ~ 59.82)	4.3 ~ 7.2 (31.10 ~ 52.07/42.16 ~ 70.60)
*M10 × 1.5	2.3 ~ 3.8 (16.63 ~ 27.48/22.55 ~ 37.26)	3.5 ~ 5.8 (25.31 ~ 41.95/34.32 ~ 56.87)	4.1 ~ 6.8 (29.65 ~ 49.18/40.20 ~ 66.68)
M12 × 1.25	5.6 ~ 8.4 (40.50 ~ 60.75/54.91 ~ 82.37)	7.9 ~ 11.9 (57.14 ~ 86.07/77.47 ~ 116.69)	8.7 ~ 13.0 (62.92 ~ 94.02/85.31 ~ 127.48)
*M12 × 1.75	3.5 ~ 9.5 (37.61 ~ 56.41/50.99 ~ 76.49)	7.3 ~ 10.9 (52.80 ~ 78.83/71.58 ~ 106.89)	8.1 ~ 12.2 (58.58 ~ 88.24/79.43 ~ 119.64)
M14 × 1.5	8.5 ~ 12.7 (61.48 ~ 91.85/83.35 ~ 124.54)	11.7 ~ 17.6 (84.62 ~ 127.30/114.73 ~ 172.59)	12.6 ~ 18.9 (91.13 ~ 136.70/123.56 ~ 185.34)
*M14 × 2	7.6 ~ 11.5 (57.14 ~ 85.34/77.47 ~ 115.71)	11.1 ~ 16.6 (80.28 ~ 120.06/108.85 ~ 162.79)	11.8 ~ 17.7 (85.34 ~ 128.02/115.71 ~ 173.57)
M16 × 1.5	11.8 ~ 17.7 (85.34 ~ 128.02/115.71 ~ 173.57)	17.1 ~ 26.5 (125.85 ~ 189.50/170.63 ~ 256.93)	18.0 ~ 27.1 (130.19 ~ 196.01/176.52 ~ 265.76)
*M16 × 2	11.2 ~ 16.7 (81.00 ~ 120.79/109.83 ~ 163.77)	16.6 ~ 24.9 (120.06 ~ 180.10/162.79 ~ 244.18)	17.2 ~ 25.7 (124.40 ~ 186.61/168.67 ~ 253.01)

A bolt with an asterisk (*) is used for female screws of soft material such as cast iron.

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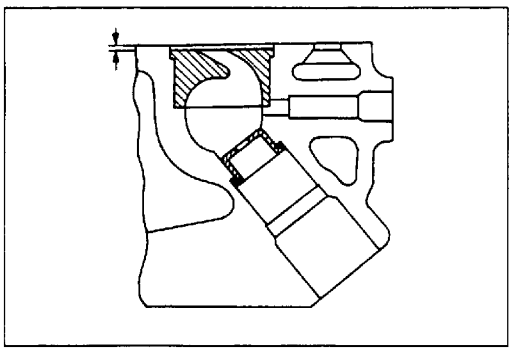


Fig. 67

HOT PLUG

Hot Plug Depression

1. Clean the cylinder head lower face, taking care not to damage the hot plug surfaces.
2. Use a straight edge and a feeler gauge to measure the hot plug depression in a straight line from the No. 1 hot plug to the No. 3 hot plug.

   If the measured value exceeds the specified limit, the hot plugs must be replaced.

Hot Plug Depression mm (in.)

Limit
0.05 (0.002)

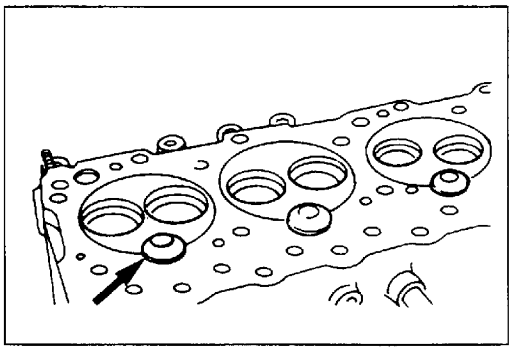


Fig. 68

Combustion Chamber Inspection

1. Remove the carbon adhering to the inside of the combustion chamber. Take care not to damage the hot plug fitting positions.
2. Inspect the combustion chamber, the hot plug hole, and the hot plug machined faces for cracking and other damage.

   If cracking or damage is present, the cylinder head must be replaced.

Note:

Be absolutely certain that there are no scratches or protuberances on the combustion chamber surfaces which will be in contact with the hot plug after it is installed. These flaws will prevent the hot plug from seating correctly.

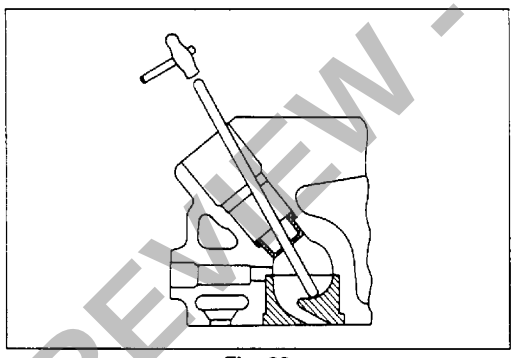


Fig. 69

Hot Plug Replacement

Hot Plug Removal

1. Insert a 3.0 – 5.0 mm (0.12 – 0.20 in) diameter brass bar into the nozzle holder fitting hole until it makes contact with the hot plug.
2. Lightly tap the bar with a hammer to drive the hot plug free.

Hot Plug Inspection

Inspect the hot plugs for excessive wear and other damage. Replace the hot plugs if either of these conditions are discovered.

Refer to "Hot Plug Installation".

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Adjustment of valve clearance

(Refer to Section "GENERAL INFORMATION – MAINTENANCE.")

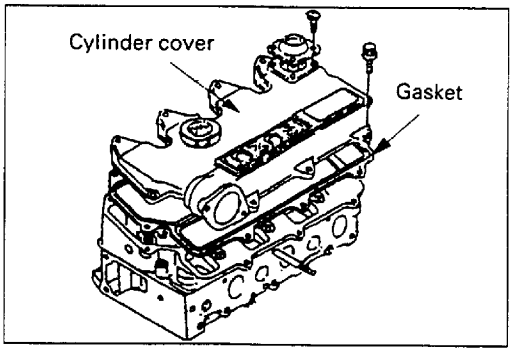


Fig. 170

Cylinder head cover

1. Install the gasket to the cylinder head cover.

Notes:

1. **Much care should be taken for the gasket not to get dislocated or twisted when installing the head cover.**
2. **Avoid the application of liquid gasket to the rubber gasket.**

2. Install the cylinder head cover to the rocker arm bracket, and tighten it to the specified torque.

kg·m (ft. lbs.)

Tightening torque	0.2 – 0.5 (1.4 – 3.6)

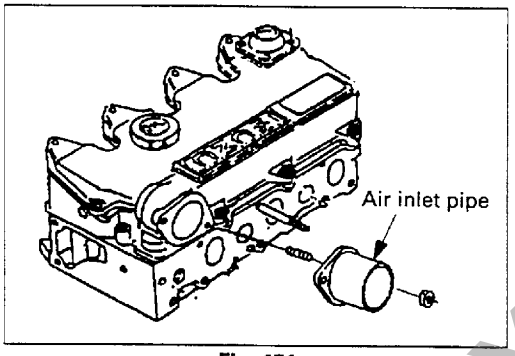


Fig. 171

Air inlet pipe

1. Apply liquid gasket (TB1207C) to the surface in which the air inlet pipe is installed.
2. Install the air inlet pipe to the cylinder head cover, and tighten it to the specified torque.

kg·m (ft. lbs.)

Tightening torque	0.8 – 1.2 (6.0 – 9.0)

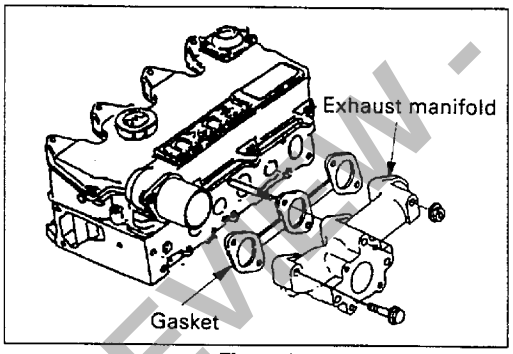


Fig. 172

Exhaust manifold

Assemble the gasket to the cylinder head, install the exhaust manifold along the stud bolts and tighten it to the specified torque.

kg·m (ft. lbs.)

Tightening torque	1.9 – 2.9 (14.0 – 21.0)

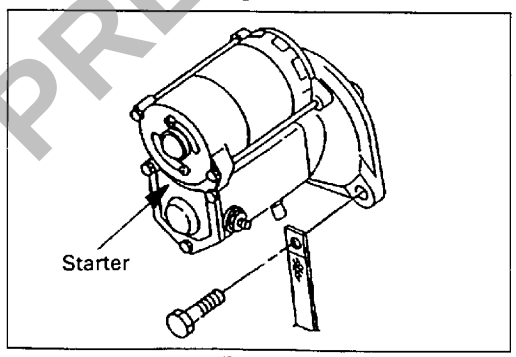


Fig. 173

Starter

Install the starter to the flywheel housing, and tighten it to the specified torque.

kg·m (ft. lbs.)

Tightening torque	8.7 – 10.5 (63.0 – 76.0)

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