Z55
550Z

Compact Excavator



Service Manual

Form No.
50940331
Revision A
Oct. 2015

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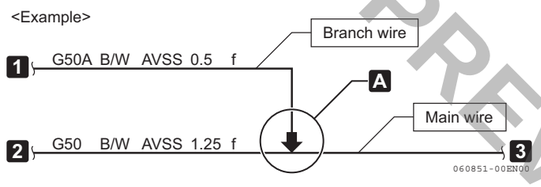
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2-9 Wiring Diagram

■ How to Read Wiring Diagrams

● Intersections and Wire Connections

<Example>



The point of arrow **A** on the main wire shown in the figure above represents an intersection of the branch wire and the main wire.
The direction of the arrow indicates which one is the branch wire (the arrowed line represents the branch wire) and also shows the division between the branch wire and the main wire.

In the example above, the wires are divided as follows.

1 to the point of arrow **A** : Branch wire G50A B/W AVSS 0.5 f
2 to **3** : Main wire G50 B/W AVSS 1.25 f

● How to Read Wiring Symbols

G50 B/W AVSS 1.25 f

- G50 — Circuit symbol
- B/W — Wire color (Ground color/stripe color)
- AVSS 1.25 f — Wire type and size

Wire color: B/W means:
Stripe color: White
Ground color: Black
Band symbol (No relation to the color)

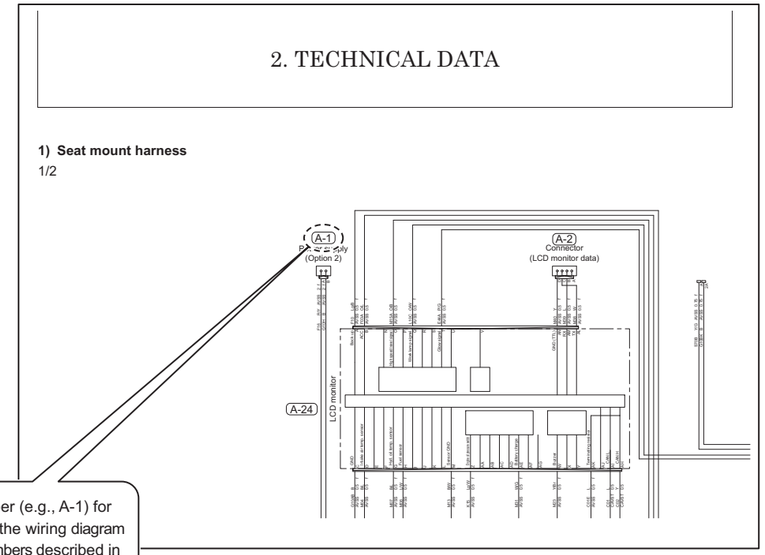
Wire color: B means:
Ground color: Black
Band symbol (No relation to the color)

Wire color codes			
W	White	P	Pink
R	Red	Br	Brown
B	Black	Lg	Light green
Y	Yellow	Sb	Sky blue
G	Green	Or	Orange
L	Blue	Gr	Gray
		V	Violet

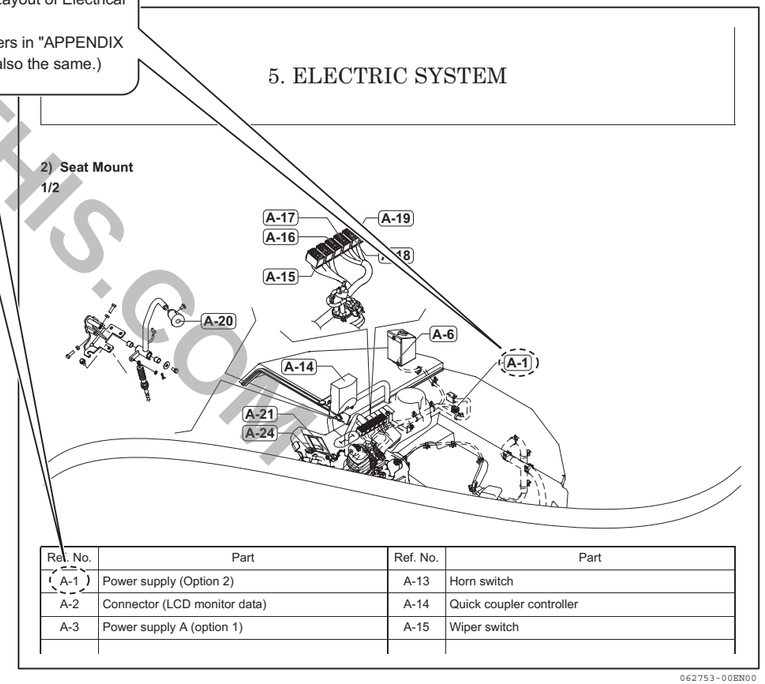
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● Reference numbers

<Example>



Each reference number (e.g., A-1) for electric equipment in the wiring diagram corresponds to the numbers described in Section "5-1-1 Parts Layout of Electrical Equipment".
(The reference numbers in "APPENDIX Wiring Diagram" are also the same.)



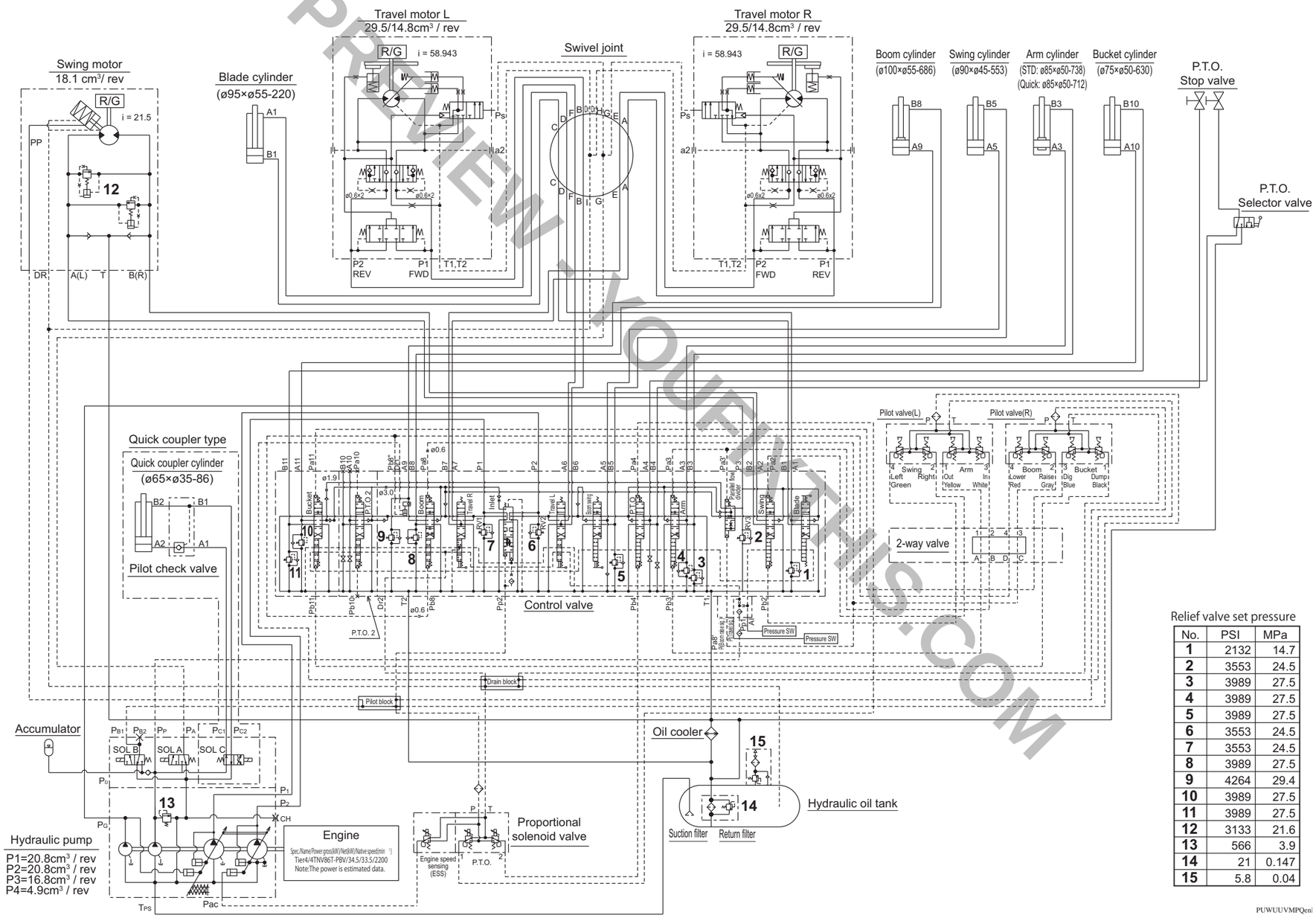
Ref. No.	Part	Ref. No.	Part
A-1	Power supply (Option 2)	A-13	Horn switch
A-2	Connector (LCD monitor data)	A-14	Quick coupler controller
A-3	Power supply A (option 1)	A-15	Wiper switch

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2-8 Hydraulic Circuit Schematic

Applicable model: Standard



Relief valve set pressure

No.	PSI	MPa
1	2132	14.7
2	3553	24.5
3	3989	27.5
4	3989	27.5
5	3989	27.5
6	3553	24.5
7	3553	24.5
8	3989	27.5
9	4264	29.4
10	3989	27.5
11	3989	27.5
12	3133	21.6
13	566	3.9
14	21	0.147
15	5.8	0.04

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4-2-5 Cylinder Head

Cylinder Head Components

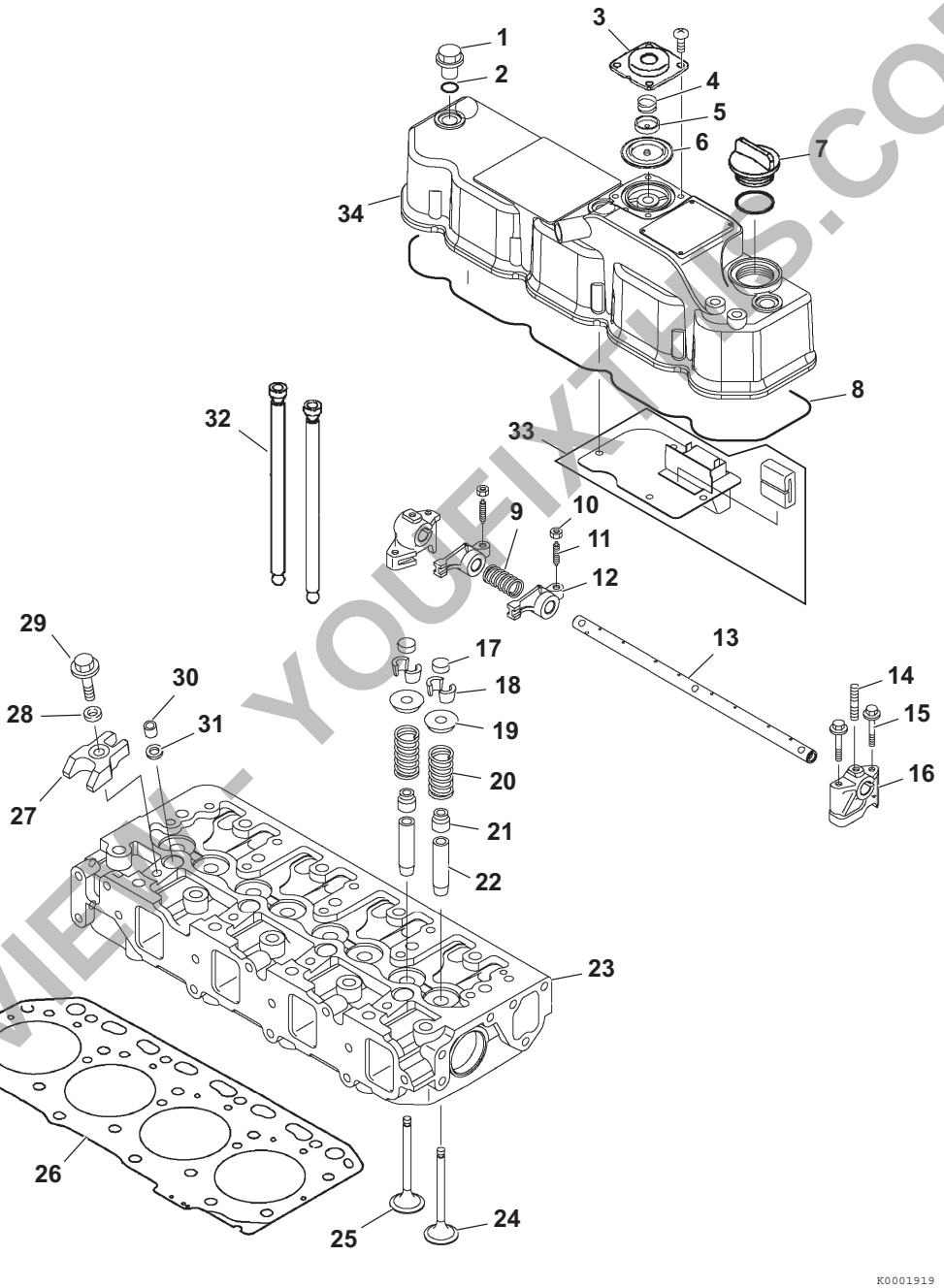


Figure 4-2-1

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3-7 List of Tightening Torque

3-7-1 Machine

Applicable model					
Equipment No		Tightening part	Thread size	Tightening torque ft•lbf (N•m)	Adhesive
Engine / Electrical equipment					
	1	Engine mount vibroisolating rubber	M16 × 150 (10.9T)	151.9 to 173.6 (205.8 to 235.2)	ThreeBond 1324
	2	Engine × Engine mount L <Fan side>	M10 × 40 (10.9T)	47.0 to 54.2 (63.4 to 73.5)	ThreeBond 1324
	3	Engine × Engine mount R <Flywheel side>	M10 × 30 (10.9T)	47.0 to 54.2 (63.4 to 73.5)	ThreeBond 1324
	4	Air cleaner intake hose	Hose clip 70	1.9 to 2.5 (2.5 to 3.4)	
	5	Cooling water hose	Hose clip 41	2.9 to 3.6 (3.9 to 4.9)	
	6	Cooling water hose	Hose clip 48	3.6 to 4.3 (4.9 to 5.9)	
	7	Fuel level gauge unit	M5 × 12 (Pan head screw)	0.87 to 1.08 (1.18 to 1.47)	
	8	Fuel tank holding band	Nut 10	1.81 to 2.17 (2.45 to 2.94) <Tank holding side>	18.1 to 23.8 (24.5 to 32.3) <Lock nut side>
	9	Bracket (SWP20-M)	M8 × 16	9.4 to 12.3 (12.8 to 16.7)	
	10	Fuel drain valve	R 3/8	14.5 to 21.7 (19.6 to 29.4)	Loctite 577
	11	Canopy mount CMP A ×Turning frame	M16 × 70 (10.9T)	123.0 to 151.9 (166.7 to 206.0)	ThreeBond 1324
	12	Canopy mount CMP A × Canopy mount CMP B	M10 × 30 (10.9T)	47.0 to 54.2 (63.7 to 73.5)	ThreeBond 1324
	13	Canopy mount CMP B ×Turning frame	M12 × 45 (10.9T)	79.6 to 94.0 (107.9 to 127.5)	ThreeBond 1324
	14	Air cleaner	M8 × 25	17.4 to 20.3 (23.5 to 27.5)	
	15	Fuel level gauge hose	Hose clip 13	0.72 to 1.08 (0.98 to 1.47)	
	16	LCD monitor × Panel cover	M5 × 20	1.88 to 2.43 (2.55 to 3.30)	
	17	Safety switch (High speed travel pedal)	Locknut M20×1.5	14.5 to 18.1 (19.6 to 24.5)	
	18	Safety switch (Cut-off lever)	Locknut M20×1.5	14.5 to 18.1 (19.6 to 24.5)	
	19	Accelerator dial (holding nut)	Nut (Fine thread) M9	0.98 to 1.08 (1.33 to 1.47)	
	20	Panel cover (lower) × Panel cover (upper)	M5 × 14 (Tapping screw)	1.88 to 2.43 (2.55 to 3.30)	
	21	Battery holding rod	Nut 8	1.45 to 2.17 (1.96 to 2.94) (Lower <holding>)	3.61 to 4.34 (4.90 to 5.88) (Upper <Locknut>)
	22	Harness × Starter motor terminal	Nut 8	5.5 to 7.2 (7.4 to 9.8)	
	23	Air conditioner hoses	Hose clip 22 - 41	2.9 to3.6 (3.9 to 4.9)	

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5-5 Error Code List

Error code	Classification	Error description	Detection condition	Causes	Corrective measures
00 000051.03	Caution	Intake throttle position sensor malfunction: High voltage	The sensor voltage is higher than 4.8 V when the engine is not cranking.	1. Improper connector engagement, 2. Faulty wire harness, 3. Intake throttle position sensor failure, 4. Engine ECU internal circuit failure	Check the connector, wire harness, intake throttle position sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000051.04	Caution	Intake throttle position sensor malfunction: Low voltage	The sensor voltage is lower than 0.2 V when the engine is not cranking.	1. Improper connector engagement, 2. Faulty wire harness, 3. Intake throttle position sensor failure, 4. Engine ECU internal circuit failure	Check the connector, wire harness, intake throttle position sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000091.03	Caution	Accelerator sensor malfunction: High voltage	The sensor voltage is higher than 4.6 V.	1. Improper connector engagement, 2. Faulty wire harness, 3. Accelerator sensor failure, 4. Engine ECU internal circuit failure	Check the connector, wire harness, accelerator sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000091.04	Caution	Accelerator sensor malfunction: Low voltage	The sensor voltage is lower than 0.2 V.	1. Improper connector engagement, 2. Faulty wire harness (Sensor 5V disconnection or short to ground), 3. Accelerator sensor failure, 4. Engine ECU internal circuit failure	Check the connector, wire harness, accelerator sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000100.01	Warning	Low engine oil pressure alarm	After the engine starts, the engine oil pressure switch stays on for a specific period of time at an engine speed of 600 min^{-1} or more and at a battery voltage of 9V or more.	1. Low engine oil pressure, 2. Engine lubrication system failure, 3. Faulty wire harness (Engine oil pressure switch wire short to ground), 4. Engine oil pressure switch failure (Short to ground on a wire inside the engine oil pressure switch), 5. Engine ECU internal circuit failure	Check the amount of engine oil, engine lubrication system, wire harness, engine oil pressure switch and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000100.04	Warning	Engine oil pressure switch disconnection	Before the engine starts with the starter switch in the "ON" position, the engine oil pressure switch stays off for one second at a battery voltage of 9 V or more.	1. Improper connector engagement, 2. Faulty wire harness (Engine oil pressure switch wire disconnection or short to power), 3. Engine oil pressure switch failure (Wire disconnection or short to power on a wire inside the engine oil pressure switch), 4. Engine ECU internal circuit failure	Check the connector, wire harness, engine oil pressure switch and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000102.03	Warning	EGR low pressure-side sensor malfunction: High voltage	The sensor voltage is higher than 4.8 V when the engine is not cranking.	1. Improper connector engagement, 2. Faulty wire harness (Sensor signal wire short to ground), 3. EGR pressure sensor failure (Improper sensor output due to short to ground on a wire inside the EGR pressure sensor), 4. Engine ECU internal circuit failure	Check the connector, wire harness, EGR pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000102.04	Warning	EGR low pressure-side sensor malfunction: Low voltage	The sensor voltage is lower than 0.2 V when the engine is not cranking.	1. Improper connector engagement, 2. Faulty wire harness, 3. EGR pressure sensor failure, 4. Engine ECU internal circuit failure	Check the connector, wire harness, EGR pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000102.13	Warning	EGR low pressure-side sensor malfunction: Abnormal learning value	The final offset value for the intake manifold pressure is lower than the threshold value or higher than the threshold value.	1. Improper connector engagement, 2. Faulty wire harness, 3. EGR pressure sensor failure, 4. Engine ECU internal circuit failure	Check the connector, wire harness, EGR pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000105.03	Warning	Intake manifold temperature sensor malfunction: High voltage	The sensor voltage is higher than 4.8 V when the engine is not cranking.	1. Improper connector engagement, 2. Faulty wire harness, 3. Intake manifold temperature sensor failure, 4. Engine ECU internal circuit failure	Check the connector, wire harness, intake manifold temperature sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000105.04	Warning	Intake manifold temperature sensor malfunction: Low voltage	The sensor voltage is lower than 0.2 V when the engine is not cranking.	1. Improper connector engagement, 2. Faulty wire harness, 3. Intake manifold temperature sensor failure, 4. Engine ECU internal circuit failure	Check the connector, wire harness, intake manifold temperature sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000108.03	Caution	Atmospheric pressure sensor malfunction: High voltage	The sensor voltage is higher than 4.8 V when the engine is not cranking.	1. Failure of atmospheric pressure sensor inside engine ECU, 2. Engine ECU internal circuit failure	Check the atmospheric pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000108.04	Caution	Atmospheric pressure sensor malfunction: Low voltage	The sensor voltage is lower than 0.2 V when the engine is not cranking.	1. Failure of atmospheric pressure sensor inside engine ECU, 2. Engine ECU internal circuit failure	Check the atmospheric pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000108.10	Caution	Abnormal atmospheric pressure sensor characteristics	The final offset values for both the intake manifold pressure and the exhaust manifold pressure remain at 5 kPa or higher for 600 ms.	1. Failure of atmospheric pressure sensor inside engine ECU, 2. Engine ECU internal circuit failure, 3. Abnormal characteristics of both EGR high pressure-side and low pressure-side sensors, 4. Obstruction due to foreign matter in the sensor area or frozen sensor	Check the atmospheric pressure sensor and engine ECU. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.
00 000110.00	Warning	Abnormally-high coolant temperature (Overheating)	60 seconds after the engine starts, the coolant temperature remains at 110°C or higher for 20 seconds.	1. Engine overheating, 2. Insufficient engine coolant, 3. Engine cooling system failure, 4. Coolant temperature sensor system failure	Check the amount of engine coolant, engine cooling system and coolant temperature sensor system. Turn the starter switch to the "OFF" position and then to the "ON" position to check if the error code is displayed again.

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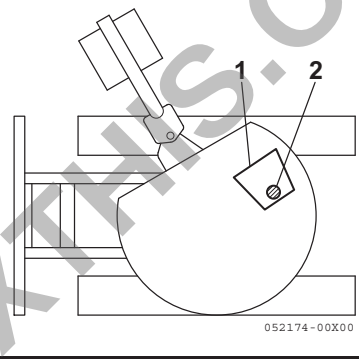
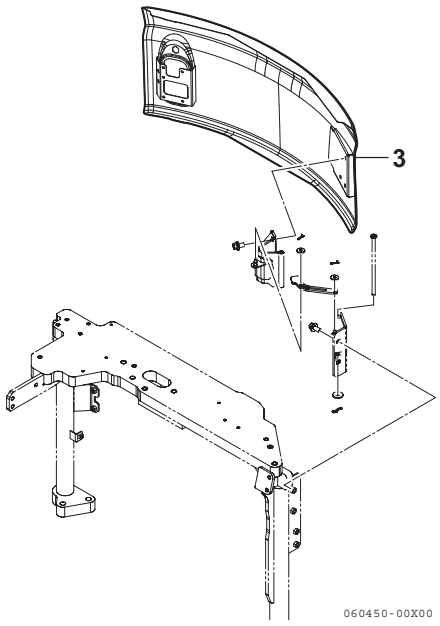
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7. Adjustment and Repair

7-1 Engine and Electric Equipment

7-1-1 Removal and Reinstallation of Engine

1) Removal

Procedure	
(1) Swing upperstructure so that drain plug **2** of hydraulic oil tank **1** is positioned halfway between right and left crawlers. Then lower bucket to ground and stop engine.	
(2) Remove engine hood rear cover **3**.	

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2. Technical Data

2-1 Specifications

Item				Unit	Quick coupler
Main specifications of machine					
Dimensions					
Overall length (Transportation position)				in. (mm)	219.7 (5580)
Cabin	Overall height	Transportation position		in. (mm)	100.0 (2540)
		Traveling position		in. (mm)	100.0 (2540)
	Overall width	Full machine width		in. (mm)	78.3 (1990)
Canopy	Overall height	Transportation position		in. (mm)	100.0 (2540)
		Traveling position		in. (mm)	100.0 (2540)
	Overall width	Full machine width		in. (mm)	78.3 (1990)
Tumbler center distance (rubber)				in. (mm)	81.5 (2070)
Track gauge				in. (mm)	62.6 (1590)
Minimum ground clearance				in. (mm)	13.6 (345)
Traveling performance					
Travel speed	Rubber crawler	Low speed (Forward/Reverse)		MPH (km/hr)	1.4 (2.2)
		High speed (Forward/Reverse)		MPH (km/hr)	2.6 (4.2)
Permissible water depth limit				in. (mm)	19.7 (500)
Work performance					
Bucket	Width (Standard) *including side cutter			in. (mm)	27.6 (700)
	[Standard. JIS heaped capacity]			cu.ft. (cu.m)	5.65 (0.16)
	Number of teeth / Installation method			pcs.	4 / rubber pin lock type
Maximum digging depth	With blade raised			in. (mm)	153.5 (3900)
	With blade on the ground			in. (mm)	162.2 (4120) <162.2 (4120)>
Maximum depth of vertically digging				in. (mm)	100.8 (2560)
Maximum dumping height				in. (mm)	159.4 (4050)
Minimum front swing radius (with boom in front)				in. (mm)	93.3 (2370)
Minimum front swing radius (at boom swing)			Cabin	in. (mm)	83.1 (2110)
			Canopy	in. (mm)	83.1 (2110)
Rear end swing radius				in. (mm)	39.2 (995)
Boom swing angle		Cabin	Left	degrees	68
			Right	degrees	68
		Canopy	Left	degrees	68
			Right	degrees	68
Maximum digging force		Bucket		lbs. (k•N)	7464 (33.2)
		Arm		lbs. (k•N)	5058 (22.5)

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CHAPTER 8

TROUBLESHOOTING

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2-7 Fuel, Lube Oil and Grease Recommended

Item	Recommended type	Capacity
Fuel oil	Diesel fuel oil (Ultra low sulfur)	17.4 Gals. (66L)
Engine oil	Engine oil SAE 10W30, CJ-4 class	7.8 Qts. (7.4 L)
Hydraulic oil	Hydraulic oil ISO VG46	In the tank: 10.0 Gals. (38 L) Other parts: 9.5 Gals (36 L)
Travel reduction gear oil	Gear oil SAE90 (GL-4)	1.3 Qts. (1.2 L) each
Idler	Engine oil SAE 30, CD class	0.074 Qts. (0.07 L)
Track roller	Gear oil SAE85W140(GL-5)	0.148 Qts. (0.14 L)
Carrier roller	Lithium soap group (extreme pressure type) multi-purpose grease NLGI No.2	0.063 Qts. (0.06 L)
Cooling water	Long-life coolant (LLC) 50 % added soft water	Radiator: 7.4 Qts. (7.0L) Subtank: 0.4 Qts. (0.4 L)
Grease	Lithium soap group (extreme pressure type) multi-purpose grease NLGI No.2	-

■ Mixture ratio of cooling water and antifreeze

Lowest temperature	°F (°C)	5 (-15)	-4 (-20)	-13 (-25)	-22 (-30)	-31 (-35)	-40 (-40)
Amount of anti-freeze	Qts. (L)	2.35 (2.2)	2.74 (2.6)	3.13 (3)	3.52 (3.3)	3.91 (3.7)	4.3 (4.1)
Amount of water	Qts. (L)	5.47 (5.2)	5.08 (4.8)	4.69 (4.4)	4.3 (4.1)	3.91 (3.7)	3.52 (3.3)

Note :

At the delivery from the factory, water and anti-freeze are mixed in the ratio shown above for the -31°F (-35°C) temperature.

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2-6 Periodic Inspection and Servicing

◇ : Check ○ : Supply ● : Replace □ : Adjust (clean) ■ : Oil & grease

Check & service items			Daily	Every 50 hrs	Every 100 hrs	Every 250 hrs	Every 500 hrs	Every 1000 hrs	Every 1500 hrs	Every 2000 hrs	Every 3000 hrs
General	Check falling off, breakage of parts		◇								
	Check loosened bolts & nuts, retighten		◇								
	Check engine condition		◇								
	Clean		□								
Fuel oil	Check & supply of oil to the tank		◇(○)								
	Drain the fuel tank			□							
	Water separator	Check, drain	◇								
		Replace					●				
	Replace the fuel filter element						●				
Lube oil	Engine oil	Check, resupply	◇								
		Replace		● 1st time		●					
	Replace the engine oil filter element			● 1st time		●					
	Travel reduction gear oil	Check, resupply				○					
		Replace			● 1st time			●			
Cooling water	Check & supply of cooling water		◇								
	Check cooling water leakage		◇								
	Check & clean radiator fins					□					
	Check & adjust the fan-belt tension		◇(□)								
	Clean & check the cooling water system, and replace the cooling water							●within one year			
Rubber hose	Check & replace fuel oil pipe, cooling water pipe		◇							●within two years	
Air cleaner	Clean air cleaner					□					
	Replace air cleaner element						●				
Hydraulic system	Hydraulic oil	Check, resupply	◇								
		Replace						●			
	Clean suction filter					□ 1st time		□			
	Replace return filter					● 1st time	●				
	Check for abnormality of hydraulic pump		◇								
	Check function of accumulator									◇	
Grease	Check grease-up positions, grease		■								
	Greasing the swing gears and the swing bearings			■							
Undercar-riage	Check, adjust track tension		◇								
Control equipment	Check performance, play of travel lever (pedal)		◇								
	Check performance, play of control levers		◇								
	Check performance, play of blade lever		◇								
	Check performance, play of boom swing pedal		◇								
	Check performance of engine control dial		◇								

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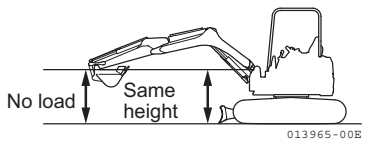
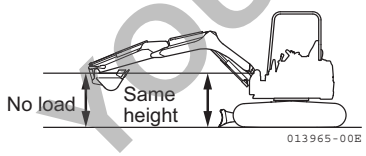
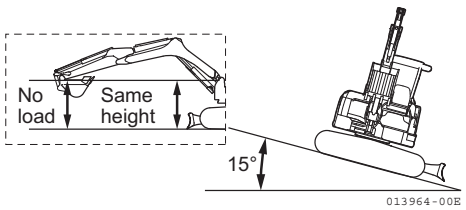
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ENGINE

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Applicable model				
Item	Measuring condition	Unit	Standard	Allowance
Machine performance				
Swing drift at stopping	Machine position  • Engine : Rated speed • Hydraulic oil temp. : 122 to 140 °F (50 to 60 °C) • Site : Firm, flat ground • Make the boom and bucket pins the same height. • Make match marks on the outer race and the inner race of the swing bearing (or the track frame). • Measure shifted distance between both marks after making one turn with no load.	in. (mm)	12.40 (315) or less, 45 degrees or less	19.29 (490) or less, 70 degrees or less
Swing time	Machine position  • Engine : Rated speed • Hydraulic oil temp. : 122 to 140 °F (50 to 60 °C) • Site : Firm, flat ground • Make one idling turn with no load, then measure the time necessary to make 5 turns.	sec.	30.0	34.0
Swing drift	Machine position  • Engine : stopped • Hydraulic oil temp. : 122 to 140 °F (50 to 60 °C) • Make the boom and bucket pins the same height. • Park the machine on a slope with an inclination of 15 degrees and turn the upperstructure 90 degrees to the crawler. • Make match marks on the outer race and the inner race of the swing bearing (or the track frame). • Measure shifted distance or angle between both marks after 5 min.	in. (mm)	Engine stop: 0 (0) Engine running: 2.17 (55) or less, 10 degrees or less	-

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■ Removal of rocker arm assembly

1. Remove the bolts **(Figure 4-2-7, (1))** that retain the rocker arm shaft supports.
2. Remove the rocker arm shaft assembly from the cylinder head.

   Note: Identify the push rods so they can be reinstalled in their original locations.

3. Remove the push rods and identify for installation.

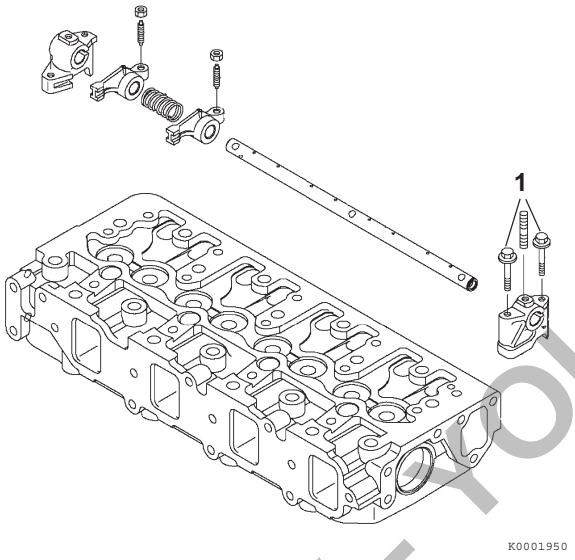


Figure 4-2-7

■ Disassembly of rocker arm assembly

1. Remove the rocker arm shaft alignment stud **(Figure 4-2-8, (4))** from support **(Figure 4-2-8, (5))**.

   Note: The rocker arm shaft fits tightly in the rocker arm supports. Clamp the support in a padded vise. Twist and pull out on the rocker arm shaft to remove. Reverse this process when you reinstall the rocker arm shaft into the supports.

2. Slide the rocker arm shaft **(Figure 4-2-8, (3))** out of the rocker arm supports **(Figure 4-2-8, (5))**, springs **(Figure 4-2-8, (1)),** and rocker arms **(Figure 4-2-8, (2))**.

   Note: Mark the rocker arms so they can be reinstalled with the original matching valve and pushrod.

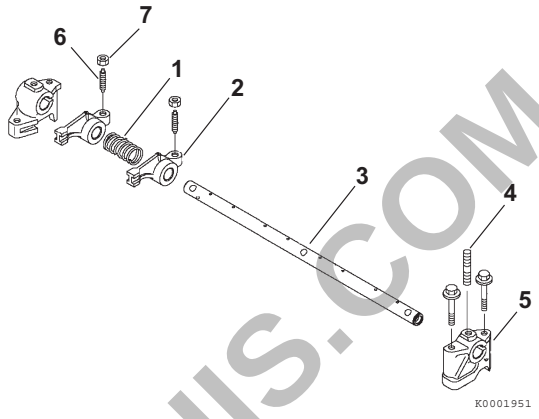
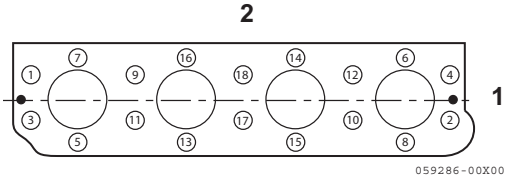


Figure 4-2-8

3. Remove the valve adjusting screw **(Figure 4-2-8, (6))** and the lock nut **(Figure 4-2-8, (7))** from the rocker arms.

■ Removal of cylinder head

1. Loosen the cylinder head bolts following the sequence shown in **(Figure 4-2-9)**.



1 – Cooling fan end
2 – Camshaft side

Figure 4-2-9

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Reassembly of Supply Pump

1. Reassembly of supply pump body
   Align the position of the supply pump drive shaft key (pin) to the drive gear position, and reinstall the supply pump to the gear case.
   Reinstall the supply pump with the 3 pieces of M8 nuts.

NOTICE

Be sure to apply oil to the O-ring at the time of installation so that is does not roll up.

Tightening torque for M8 nuts	16.7 - 20.9 ft·lb 22.6 - 28.4 N·m (2.3 - 2.9 kgf·m)

2. With the special M18 nuts, reinstall the supply pump drive gear to the supply pump drive shaft.

Tightening torque for M18 nut	55.3 - 62.7 ft·lb 75 - 85 N·m (7.7 - 8.7 kgf·m)

NOTICE

Make sure that the alignment mark with the idle gear is not misaligned.

NOTICE

Make sure that painting does not get into the coupler while reinstalling the coupler.

3. Reinstall the supply pump cover

Tightening torque for M8 bolts	16.7 - 20.9 ft·lb 22.6 - 28.4 N·m (2.3 - 2.9 kgf·m)

4. Reassembly of high-pressure pipe
   (Supply pump - common rail)

⚠ CAUTION

For high-pressure pipe, use a new one. If you reuse it, the displacement of the working face may occur, causing the fuel leaks.

1- Before reinstalling the high-pressure pipe, apply fuel to the cap nut thread portion.

2- Temporarily tighten the cap nuts (both the pump and rail sides) while pressing and fixing the seat portions.

3- Tighten the cap nuts to specification.

Tightening torque for cap nuts (rail side)	21.7 - 25.3 ft·lb (29.4 - 34.3 N·m; 3.0 - 3.5 kgf·m)
Tightening torque for cap nuts (pump side)	

5. Reinstall the fuel filter (M10 - 2 pieces).

Tightening torque for M10 bolts	25.8 - 31.7 ft·lb 35 - 43 N·m (3.6 - 4.4 kgf·m)

6. Reinstall the common rail and the return pipe from the injector.
7. Reinstall the return pipe from the supply pump.
8. Reinstall the fuel supply pipe (supply pump inlet) from the fuel filter.
9. Reinstall the wiring coupler of the fuel temperature sensor.
10. Reinstall the wiring coupler of the SCV.

NOTICE

Be sure to perform priming the engine before starting. If air is mixed to the fuel, seizure to the supply pump and the injector may result.

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■ Stationary regeneration

Although the DPF performs the regeneration control, if the operation conditions with idling at no load and low speed/low load operation are frequently repeated, the PM may not be regenerated.
If the ECU determines that performing the stationary regeneration is required at this time, the DPF regeneration request lamp comes on. If the DPF regeneration request lamp comes on, immediately perform the stationary regeneration by performing the following operation. If the operation is continued with the DPF regeneration request lamp being come on, an excessive amount of PM will accumulate. Abnormal combustion of PM may cause fire and damage to the DPF.

Operation procedures of stationary regeneration

1. Move to a well-ventilated and safe location.
2. Move the accelerator lever to the lowest position and operate the engine in idling.

   Note: If the DPF regeneration prohibition switch is installed, turn the DPF regeneration prohibition switch to "Regeneration Permitted".

3. Operate the interlock mechanism including the parking brake and activate the interlock function.

   Note: When the ECU verifies that the interlock mechanism is enabled with the regeneration interlock switch, the DPF regeneration approval lamp starts blinking.

4. Press the DPF regeneration request switch for 3 seconds (standard) or longer to start the stationary regeneration. (The time required to start the stationary regeneration can be changed. Refer to the operation manual for the detailed operation.)
   - When the stationary regeneration starts, the engine speed increases gradually to high idle speed. Then the reset regeneration is performed at that operation condition.
   - When the stationary regeneration starts, the DPF regeneration request lamp turns off, the DPF regeneration approval lamp switches from blinking to continuously lit, and the exhaust temperature warning lamp lights up.
   - The stationary regeneration is complete after approximately 25 to 30 minutes.
   - If you want to interrupt the stationary regeneration, perform one of the following operations.
     - Turn the interlock switch to "Regeneration Disabled".
     - Turn the DPF regeneration prohibition switch to "Regeneration Prohibited".
     - Raise the accelerator lever above the lowest position.
     - Turn off the power switch.
5. When the above-mentioned time has elapsed, the engine speed decreases to low idling, the regeneration approval lamp and the exhaust temperature warning lamp turn off, and the stationary regeneration is complete.

■ Precautions for stationary regeneration

- Do not disconnect SMARTASSIST DIRECT (SA-D) or the computer while performing the stationary regeneration. (Check the remaining battery level. Stationary regeneration takes approximately 1 hour to complete.)
- Be sure to check the remaining fuel level to avoid the engine from running out of fuel. (Stationary regeneration requires sufficient fuel that can run the engine for at least 1 hour.)
- Make sure that no other failure other than excessive deposits is observed.

■ Recovery regeneration (optional)

The DPF cannot be regenerated by the reset regeneration or the stationary regeneration when the excessive PM is accumulated. Therefore, optional recovery regeneration function is available. The recovery regeneration requires longer regeneration time and lower temperature than that of the reset regeneration and the stationary regeneration. However, the function varies depending on the driven machine. For details, refer to the operation manual provided by the driven machine manufacturer for these functions.

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(2) Accelerator Sensor Input

[1] The ECU calculates a target engine speed as a control standard based on the input voltage from the accelerator sensor. (Note that the actual engine speed is not always identical to the target engine speed because it is determined based on the relationship between the maximum engine torque and load torque.)
The accelerator sensor input voltage is converted into rotational speed and as shown in the figure below, it is preset so that the input voltage is converted into low idle speed at a voltage of 0.7V and into high idle speed at a voltage of 3.0V.
If the input voltage from the accelerator sensor becomes 0.2V or less or 4.6V or more, the ECU detects an accelerator sensor failure.

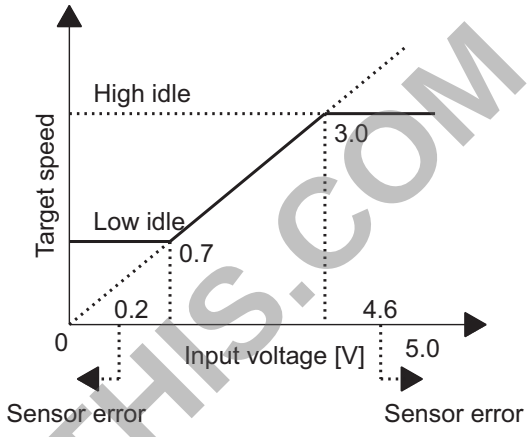


Figure: Accelerator Sensor Input

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[2] The ECU has a detection error in the electrical circuit and a hysteresis characteristic provided by software in regard to the input voltage from the accelerator sensor, and the sum of these values is ±0.125V.
Therefore, when the accelerator sensor is used within a preset voltage range between 0.7V and 3.0V, the accelerator sensor input voltage must be within the range shown in the figure below.

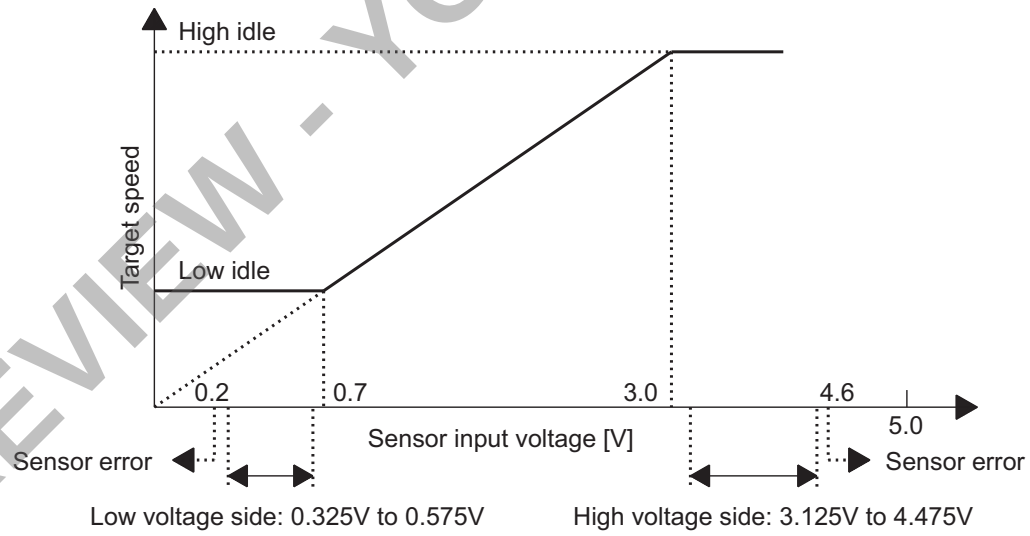


Figure: Accelerator Sensor Accuracy Requirements

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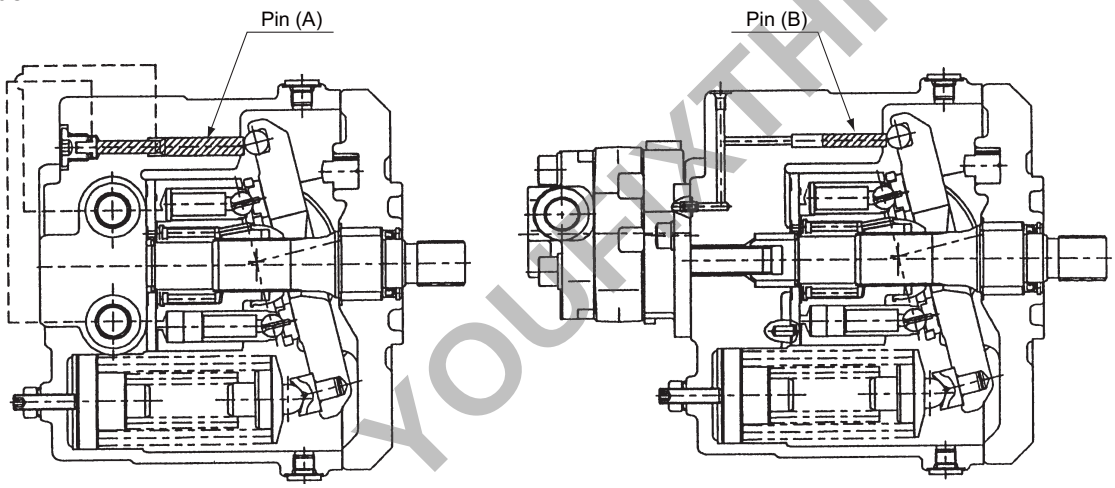
2) Horsepower Control for Standard spec. (without Air Conditioner)

Control the discharge volume of the piston pumps so that the amount of load in the piston pumps P1 and P2, the trochoid pump and the gear pump does not exceed the set torque.

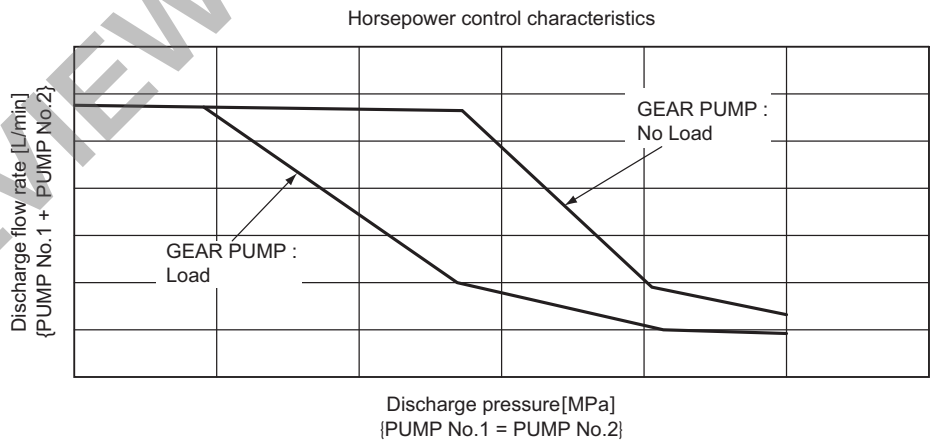
The oil pressure from the piston pumps P1 and P2 flows to the control pin (A) through the oil passage inside the port block. The discharge pressure of the gear pump flows to the control pin (B) through the inner passage of the piston pump body.

The oil pressure discharged from the piston pumps P1 and P2 and the gear pump rises and presses the respective control pins, causing the inclination angle of the swash plate to decrease and the discharge volume of the pumps to reduce.

The one side of the swash plate is held with springs. The spring force is adjusted according to the discharge pressure of each pump. The amount of horsepower (torque) of the pumps is controlled by the springs not to exceed the set torque.



Horsepower control explanation drawing



Horsepower control characteristics explanation diagram

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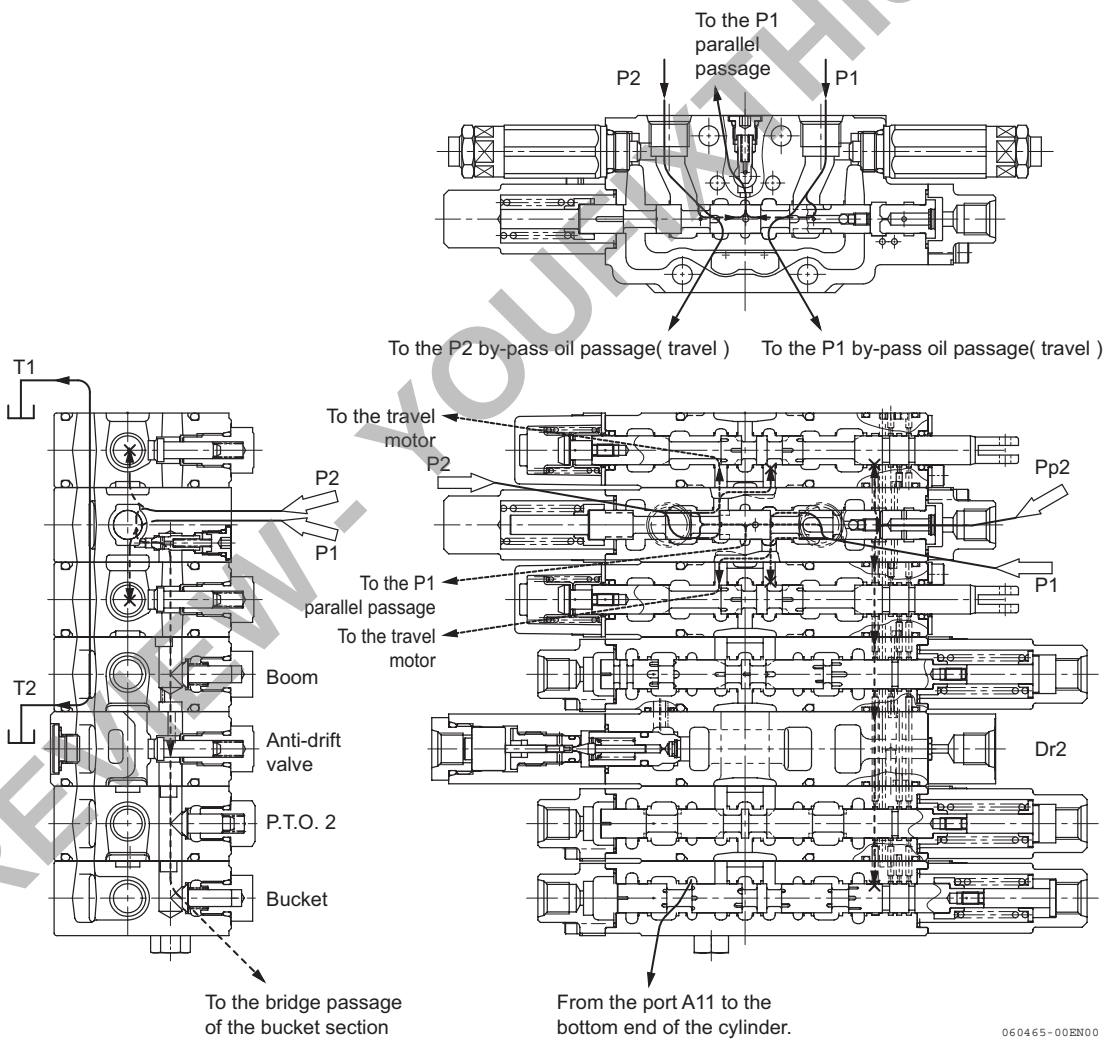
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(2) Traveling and bucket

When the bucket is operated while traveling, the oil from the port Pp2 flows into the TSP (traveling signal pilot) passage through the orifice in the piston but the spools of the right and left travel sections and the bucket section move to block their return oil passages. Therefore, the pressure in the TSP passage equals to that at the port Pp2, the spool of the P1, P2 inlet section is moved, the P1, P2 by-pass passages are narrowed and the P1 and P2 circuits are connected by another passage, and connected to the P1 parallel passage through the check valve.

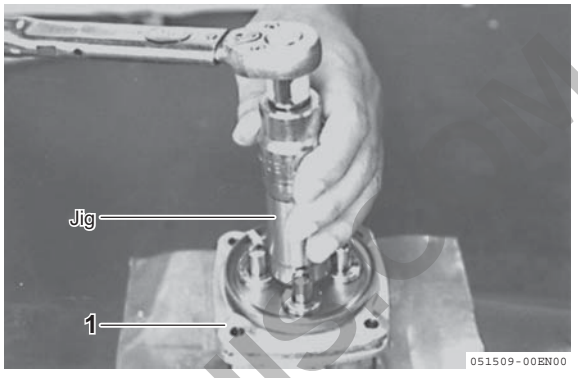
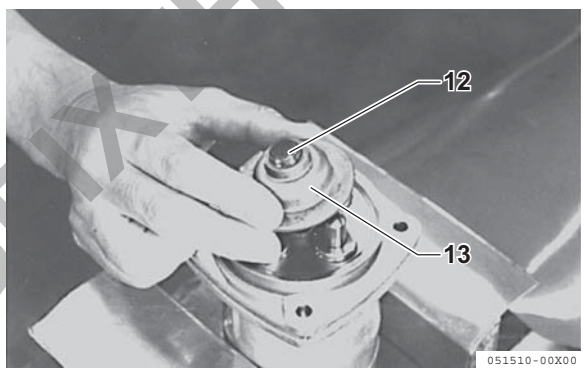
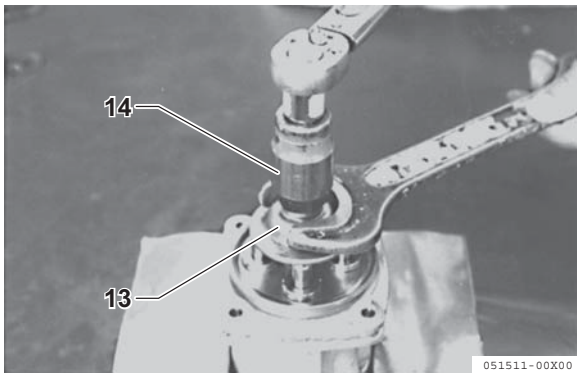
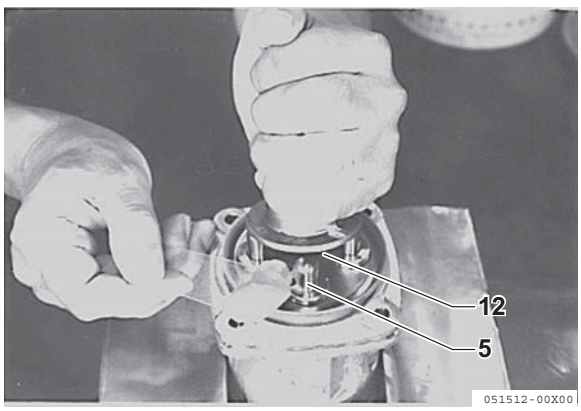
That is how the oil is supplied to the bucket section even while traveling, and simultaneous operation becomes possible.

In addition, as there are orifices in the passages to the right and left travel sections and bucket section, high pressure oil is supplied to each section even if pressure differences develop among those circuits, bucket operation while traveling is available.



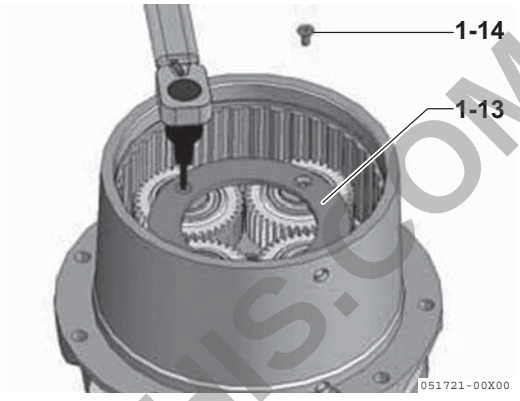
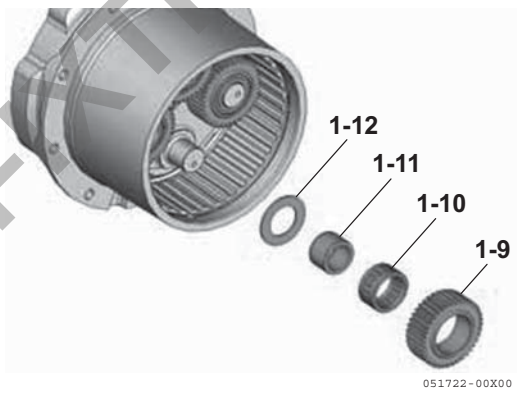
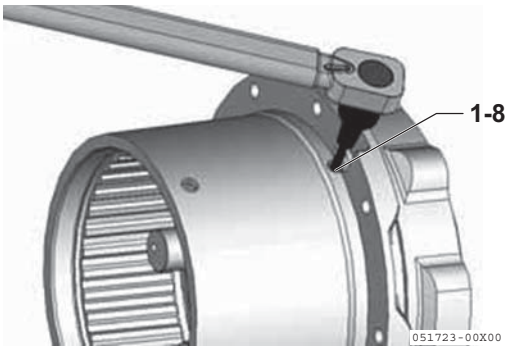
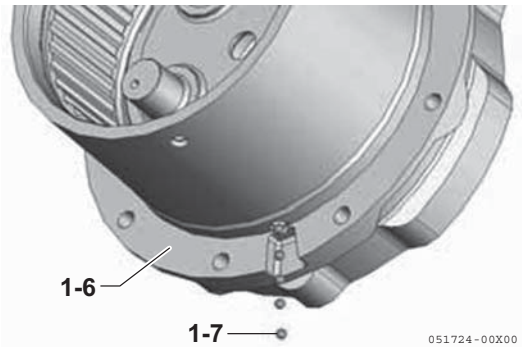
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Procedure	
(10) Using a jig, tighten joint **12** to casing **1** to the specified torque. **Tightening torque:** **32.6 to 36.9 ft•lbf (44.2 to 50.0 N•m)** **Adhesive: Loctite 262**	
(11) Install disc **13** onto joint **12**. ***Notes:*** • *Screw disc **13** onto joint **12** to the point it uniformly contacts four push rods **5**.* • *Screwing disc **13** too much may generate secondary pressure even when the control lever is in neutral, resulting in malfunctions of the machine. To avoid this, be careful not to screw disc **13** beyond the specified point.*	
(12) Install adjusting nut **14**, put a wrench on disc **13** to hold it and tighten adjusting nut **14** to the specified torque. **Tightening torque:** **47.0 to 54.2 ft•lbf (63.7 to 73.5 N•m)** **Adhesive: Loctite 262** ***Note:*** *Make sure that disc **13** is not moved during the tightening of the nut.*	
(13) Apply grease to the rotating portion of joint **12** and the top of push rod **5**.	

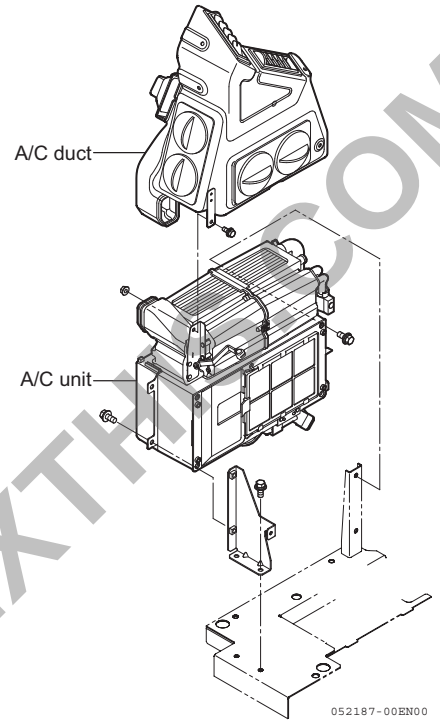
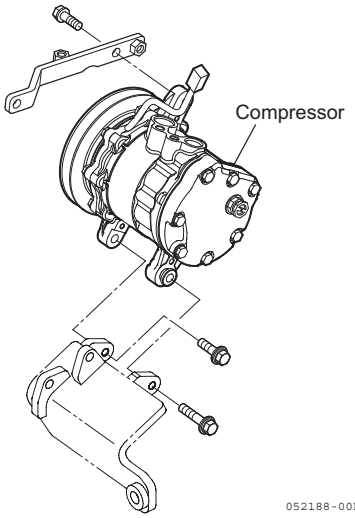
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Procedure	
(20) Remove screws **1-14** and thrust plate **1-13**. **Tools:** • Torque wrench 1 • Hexagon bit 5 for above ***Note:*** *Screws **1-14** may be hard to remove due to Loctite applied when installed. Warm the screw part up by a heat gun or the like, and the screws can be removed easily.*	
(21) Remove planetary gears B **1-9**, needle bearings **1-10**, inner races **1-11** and thrust washers **1-12**. Take care not to damage the gear tooth surfaces and the rolling surface of the collars.	
(22) Remove the other plug **1-8**. **Tools:** • Torque wrench 1 • Hexagon bit 6 for above	
(23) Take out steel balls **1-7** through the screw hole for plug **1-8**. Degrease the inside of the hole (with thinner or white gasoline), and take out the steel balls by blowing air into the screw hole. Insert a piano wire through the screw hole to check that all the steel balls have been taken out. **Tools:** • Hammer 13 • Piano wire S-4 ***Note:*** *When the steel balls are hard to take out, lightly tap around the outside surface of housing **1-6** with a hammer.*	

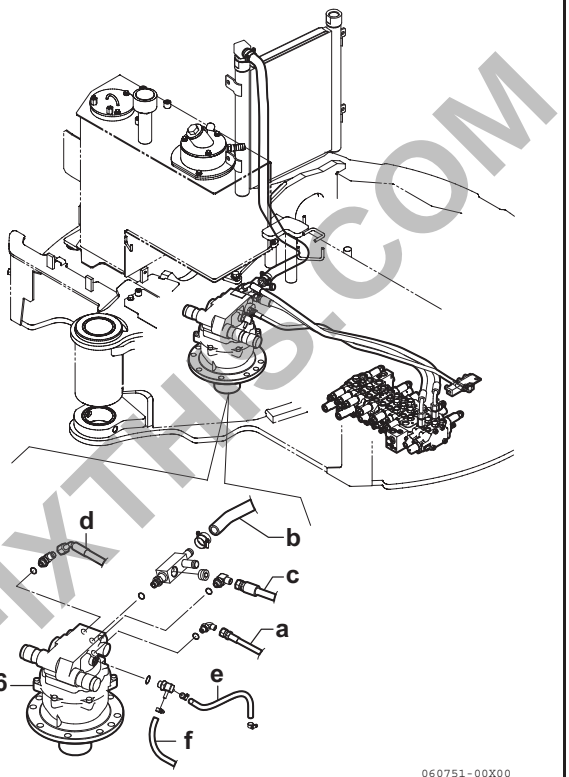
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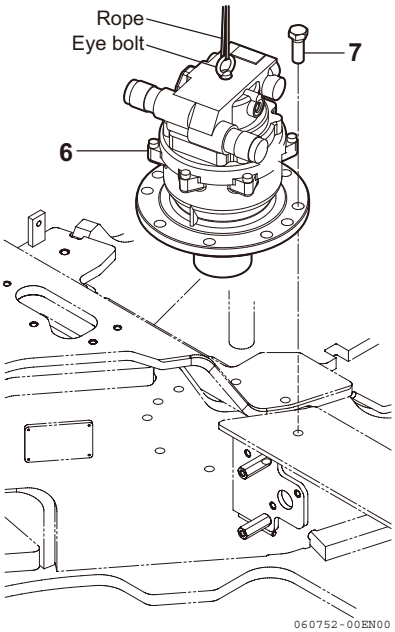
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Procedure	
***Step (21) is applicable for machine with air conditioner only.** (21) Remove air conditioner and its related parts. (Refer to Section "7-8-1 Removal and Reinstallation of Air Conditioner" for the removal procedure.)	 

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Procedure	
(4) Disconnect hydraulic hoses from swing motor **6**. a. Hose (Swing motor–Pilot block) b. Drain hose (Swing motor–Oil cooler) c. Hose (Control valve–Swing motor) d. Hose (Control valve–Swing motor) e. Drain hose (Swing motor–Swivel joint) f. Drain hose (Swing motor–Drain block)	

(5) Remove six mounting bolts (M14) **7** for swing motor and remove swing motor **6**. ***Note:*** *Install an eye bolt (M8) to swing motor, put rope through eye bolt and remove swing motor using lifting device.*	

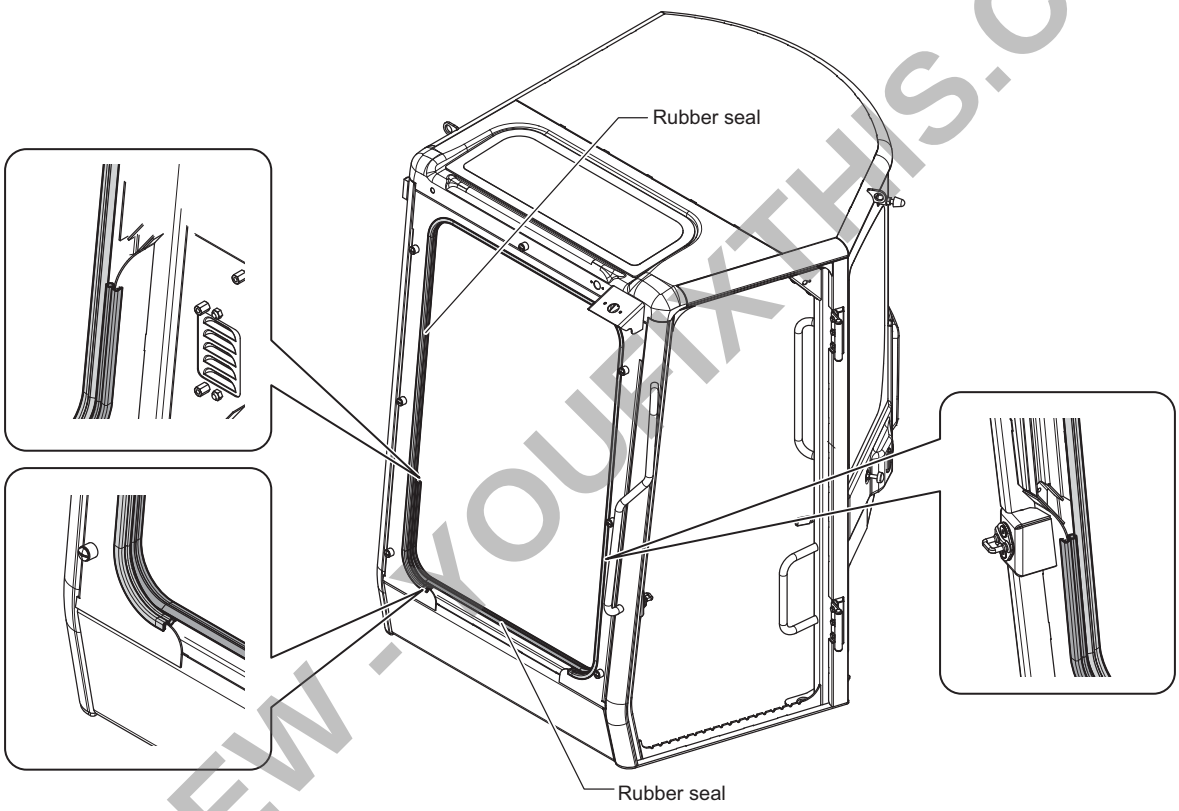
2) Reinstallation

Reinstall the swing motor in the reverse order to the removal procedure.

Hydraulic pump mounting bolt (M16)	
Adhesive	Three Bond 1324 or its equivalent
Tightening torque	195.3 to 224.2 ft·lbf (264.8 to 304.0 N·m)

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- Do not stretch rubber seals too much when installing them.
- Securely install rubber seals, especially in the corners.
- Make sure that there is no breakage or damage to rubber seals.
- Cut off the wires protruding from the cut surfaces of rubber seals.
- Install rubber seals by lightly tapping them with a soft-faced hammer.
- Be especially careful that rubber seals are not raised or deformed in the areas where the pieces of butyl tape are attached.



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