CX260C
Crawler Excavator

SERVICE MANUAL

Part number 47877014
English
July 2015

CASE
CONSTRUCTION

Air cleaner (double element)

Manufacturer	Nippon Donaldson, Ltd.
Element (outer)	
Element (inner)	
Weight	**7.5 kg** (**16.5347 lb**)

Radiator

Manufacturer		Zhejiang Yinlun Machinery Co., Ltd.
Oil cooler	Weight	**44.4 kg** (**97.8852 lb**)
	Oil volume	**10.84 L** (**2.8636 US gal**)
Radiator	Weight	**18.3 kg** (**40.3446 lb**)
	Coolant capacity	**10.2 L** (**2.6946 US gal**)
Air cooler	Weight	**10.3 kg** (**22.7076 lb**)
	Capacity	-
Fuel cooler	Weight	**1.2 kg** (**2.6455 lb**)
	Capacity	**0.34 L** (**0.0898 US gal**)

Hydraulic device

Hydraulic pump

Manufacturer			Kawasaki Heavy Industries, Ltd.
Main pump			
	Pump type		Double variable displacement piston pump
	Displacement capacity		**118.5 cm³/rev** (**7.231 in³/rev**) x 2
	Operating pressure	Rated	**34.3 MPa** (**4975 psi**)
		Maximum	**36.8 MPa** (**5337.84 psi**)
	Input revolution speed		**2000 RPM**
	Maximum discharge flow		**234 L/min** (**61.8163 US gpm**) x 2 (at **2000 RPM**)
Pilot pump			
	Pump type		Gear pump
	Displacement capacity		**10 cm³/rev** (**0.61 in³/rev**)
	Operating pressure		**3.92 MPa** (**569 psi**)
	Maximum discharge flow		**20 L/min** (**5.283 US gpm**) (at **2000 RPM**)
Control method			Hydraulic simultaneous constant output control
			Maximum flow adjustment control through external commands (negative control)
			Setting through external command milli-amp
			Horsepower adjustment control
Dry weight			**127 kg** (**279.9871 lb**)

Control-related

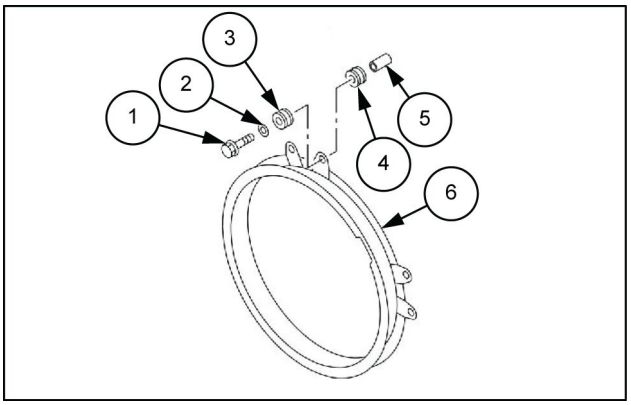
Control valve

Manufacturer		KYB Corporation
Maximum flow		**213 l/min** (**56.269 US gpm**) (at **1800 RPM**)
Overload set pressure		**29.4 MPa** (**4264 psi**) boom down
		38.7 MPa (**5613 psi**) other
Main relief set pressure		**34.3 MPa** (**4975 psi**)
	(at boosting)	**36.8 MPa** (**5338 psi**)
Foot relief set pressure		**2.55 MPa** (**370 psi**)
Function		Straight travel circuit
		Boom-up/arm 2 pumps internal flow
		Boom and arm load holding circuit
		Boom-down regenerative circuit
		Bucket-close regenerative circuit

Abbreviation	Explanation
FT	Fuel temperature
FWD	Forward
GEN	Generator
GND	Ground
HBCV	Hose burst check valve
HC	Hydrocarbons
HO2S	Heated O2 sensor
HR	Time
HRD	High reach demolition machine
IAC	Idle air control
IAT	Suction air temperature
IC	Integrated circuit
ID Plate	Nameplate, ID plate
IMT	Intake manifold temperature
INL	Suction air
INJ	Injection
ISO	International Organization for Standardization
ISP	Intake shutter position
ITP	Intake throttle position
J/C	Joint connector
JIS	Japanese Industrial Standards
KW	A type of communication technique (keyword)
LED	Light-emitting diode
LH	Left
LLC	Long-life coolant
LM	Lifting magnet
M/V	Magnet valve
MAF	Mass air flow
MAP	Manifold air pressure
Max	Maximum
MIL	Malfunction indicator lamp (diagnostic)
milli-amp	Current
Min	Minimum
MPU	Micro-processing unit
High-strength N	High-strength nut
NC	Normal closed
NO	Normal open
NOx	Nitrogen oxides
N-TDC	Number of top dead center
O2S	O2 sensor
OBD	On-board diagnostics
OEM	Original equipment manufacturer
OPT	Options
OT	Oil temperature
P/L	Indicator lamp
PCV	Pump control valve/positive crankcase ventilation
P-I	Proportional - integral
PM	Particulate matter
PTO	Power take-off
PWM	Pulse width modulation wave
QOS	Quick on start system
QWS	Quick warm up system
R/L	Relay
RAM	Random access memory
REF	Reference

Fan guide removal

1. Remove the fan guide **(6)** from the fan guide bracket.
2. Remove the fan guide bracket from the engine assembly.
    1. Bolt
    2. Washer
    3. Rubber mount
    4. Rubber mount assembly
    5. Guide tube



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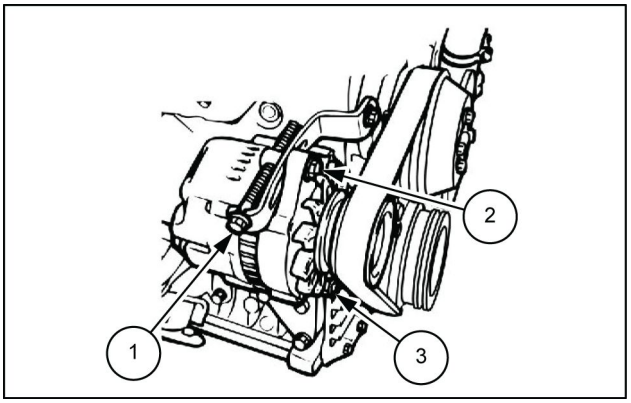
Cooling fan belt removal

1. Remove the cooling fan belt from the engine assembly.
    1. Adjust bolt
    2. Fixing bolt
    3. Fixing bolt



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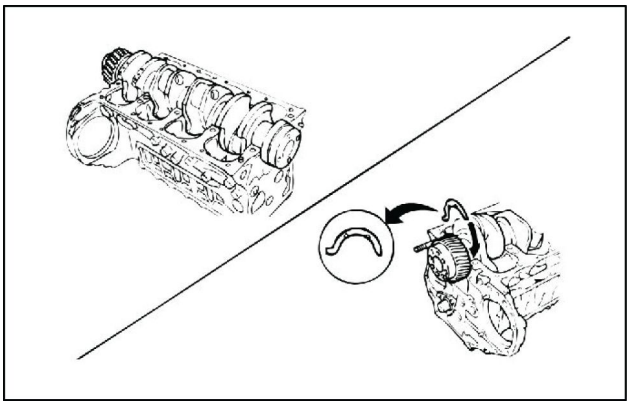
Crankshaft pulley removal

1. Remove the crankshaft pulley from the crankshaft.
2. Remove the crankshaft damper from the crankshaft pulley.

4. Apply the engine oil to the crankshaft bearing.
5. Apply the engine oil to the crankshaft.
6. Put the crankshaft on the cylinder block.
7. Install the thrust bearing to the cylinder block.
   - Install the thrust bearing on the No.5 journal so that the oil groove faces the engine rear.



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8. Install the crankshaft bearing to the crankcase.

   CAUTION:

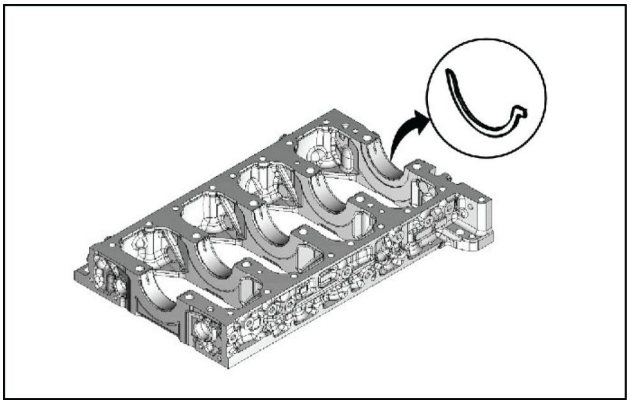
   Make sure there is no grime or oil on the crankcase contact surface for the crankshaft bearing.

9. Apply the grease to the thrust bearing.
   - Apply a small amount of grease to the thrust bearing to prevent falling.
10. Install the thrust bearing to the crankcase.
    - Install the thrust bearing on the No.5 journal so that the oil groove faces the engine rear.
11. Apply the engine oil to the crankshaft bearing.
12. Apply the liquid gasket to the crankcase.
    - Apply ThreeBond 1207B to the crankcase thoroughly so that there is no break in application of the bead.

    1. **2 - 3 mm** (**0.079 - 0.118 in**)
    2. **3 - 4 mm** (**0.118 - 0.157 in**)

    CAUTION:

    After applying the liquid gasket, install the crankcase within **5 min**.



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13. Put the crankcase on the cylinder block.

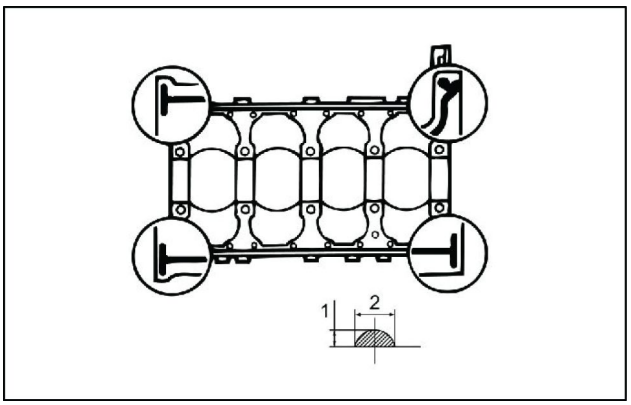
    CAUTION:

    Be careful not to let the thrust bearing fall.

14. Apply the disulfide molybdenum grease to the bolt.
    - Apply to the threaded portion and seat surface on the **M14** bolt for crankcase installation.
    - Tightening order

    CAUTION:

    Do not apply grease to the **M10** bolt.



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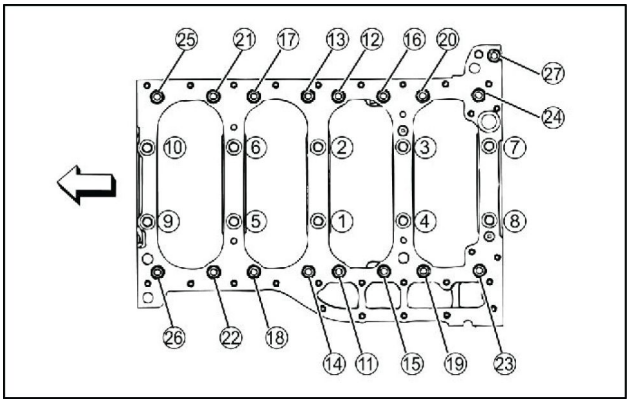
15. Tighten the bolt using the torque wrench.
    Tightening torque: **54 N·m** (**39.8 lb ft**) **M14** bolt
16. Tighten the bolt using the torque wrench.
    Tightening torque: **132 N·m** (**97.4 lb ft**) **M14** bolt



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EGR valve installation

1. Install the EGR valve to the EGR pipe D.

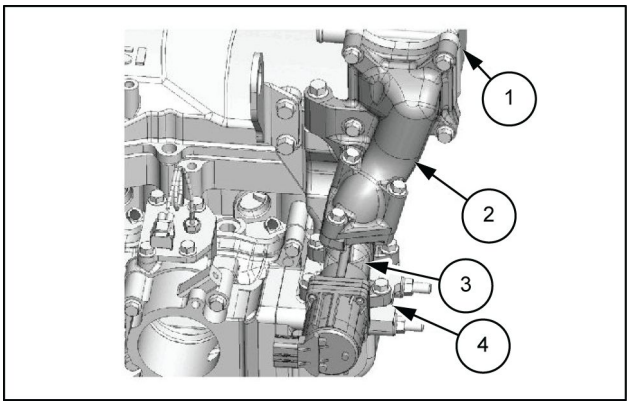
   Tightening torque: **24 N·m** (**18 lb ft**)

   1. EGR cooler C
   2. EGR pipe C
   3. EGR valve
   4. EGR pipe D

   ⚠ CAUTION:

   Use new gaskets.

2. Connect the harness connector to the EGR valve.



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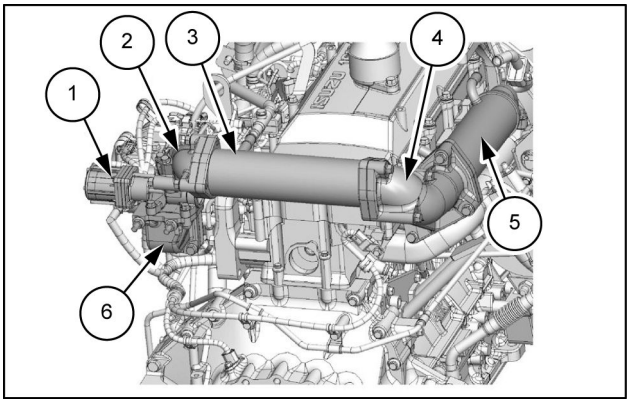
Cylindrical EGR cooler assembly installation

1. Temporarily tighten the EGR pipe B **(2)** to the EGR valve **(1)**.
2. Temporarily tighten the EGR cooler B **(3)** to the EGR pipe B **(2)**.
3. Temporarily tighten the EGR pipe A **(4)** to the EGR cooler B **(2)**.
4. Temporarily tighten the EGR cooler A **(5)** to the EGR pipe A **(4)** and the exhaust manifold.

   6. EGR pipe C

   - Temporarily tighten the all parts and then securely tighten them, using the tightening sequence shown in figure.



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Cylinder head - Remove

Battery ground cable disconnect

1. Disengage the battery ground cable from the battery.

Coolant Drain

1. Drain the coolant from the radiator.

   CAUTION:

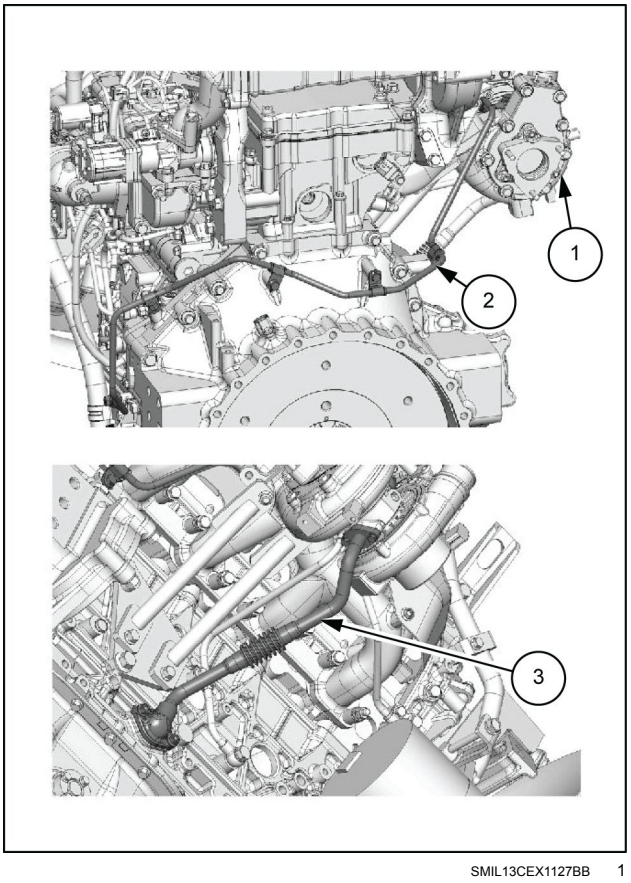
   After the coolant is discharged, make sure to tighten the drain plug.

Engine harness disconnect

1. Disengage the engine harness from the engine assembly.
   - Disconnect each connector.

Turbocharger assembly removal

1. Remove the air cleaner duct from the air cleaner assembly and the turbocharger assembly **(1)**.
2. Remove the air intake hose from the turbocharger assembly **(1)** and the intercooler.
3. Remove the exhaust pipe from the turbocharger assembly **(1)**.
4. Disengage the oil feed pipe **(2)** from the turbocharger assembly.
   - Remove the clip.
5. Remove the oil feed pipe **(2)** from the oil port cover.
   - Remove the clip.
6. Disengage the oil return pipe **(3)** from the turbocharger assembly.
7. Remove the oil return pipe **(3)** from the cylinder block.



SMIL13CEX1127BB 1

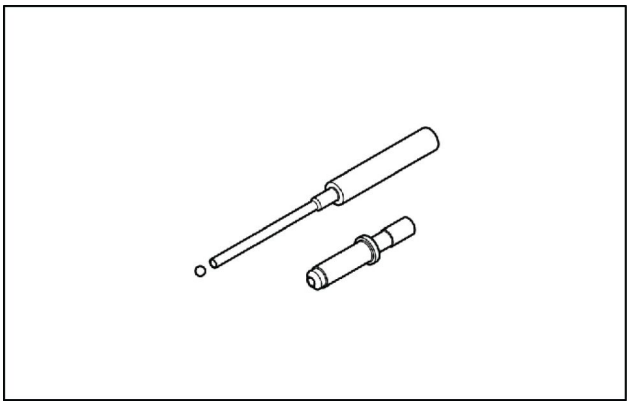
5. Install the injector sleeve **(4)** to the cylinder head assembly using the special tool.

   Special tool: nozzle sleeve setting tool (Refer to **Cylinder head - Special tools (10.101)**)

   CAUTION:

   Allow the cylinder head to float so that the ball **(2)** comes out from the bottom surface.

   1. Punch bar
   3. Guide sleeve
   5. Clamp
   6. Bolt



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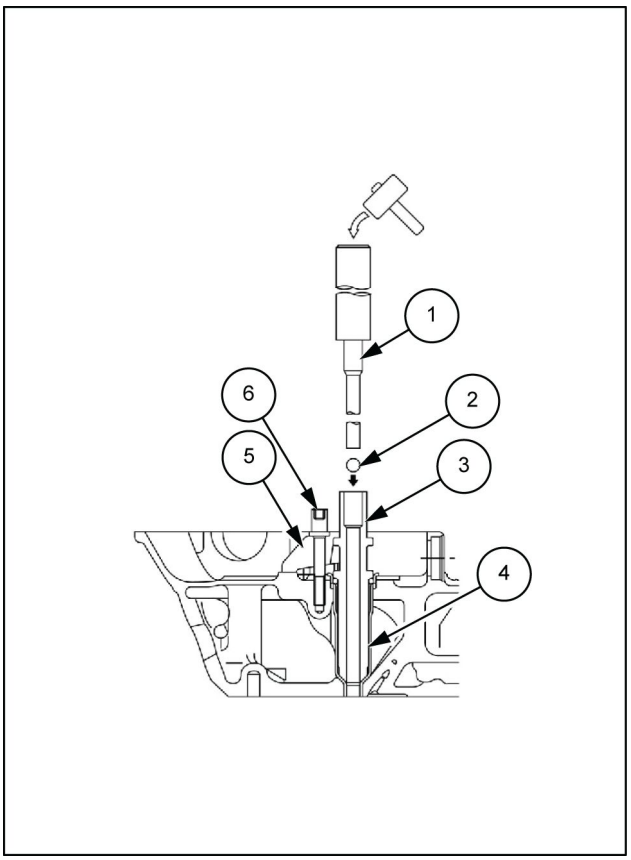

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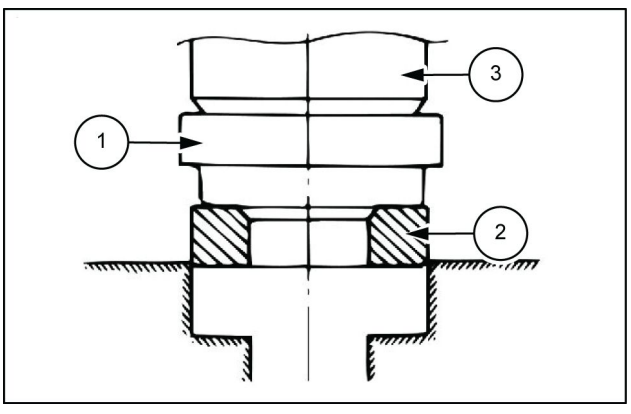
Valve seat insert installation

1. Prepare the dolly block **(1)**.
   - Prepare the one which has smaller outer diameter than the valve seat insert **(2)**.
2. Align the valve seat insert **(2)** to the cylinder head.
3. Align the dolly block **(1)** to the valve seat insert **(2)**.
4. Install the valve seat insert **(2)** to the cylinder head assembly using the press **(3)**.



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9. Operate the priming pump **(1)**.
   Number of times: 10 count (s) or more
   - Wait for **1 min** after operating the priming pump **(1)**.
10. Loosen the plug **(2)** using the wrench.
    - Remove the air in the fuel filter.
11. Tighten the plug **(2)** using the wrench.
12. Operate the priming pump **(1)**.
    Number of times: 10 count (s) or more
    - Wait for **1 min** after operating the priming pump **(1)**.
13. Loosen the plug **(2)** using the wrench.
    - Remove the air in the fuel filter.
14. Tighten the plug **(2)** using the wrench.

    Tightening torque: **10 N·m** (**7.38 lb ft**)

    CAUTION:

    Remove the fuel around the plug **(2)** thoroughly after tightening.
15. Operate the priming pump **(1)**.
    Number of times the operation is performed: 10 - 15 times
16. Start the engine.

    CAUTION:

    Do not accelerate the engine revolution right after staring.

    Idling: **5 s**
    - Accelerate the engine revolution gradually.

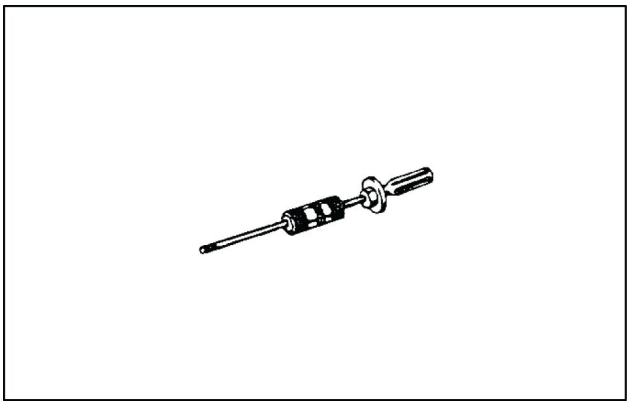
    Engine revolution hold: **3 min**
    - Accelerate the engine revolution to maximum.
    - Lower the rotation.

Contents

Engine - 10

Fuel filters - 206

Special tool: sliding hammer (refer to **Fuel injectors - Special tools (10.218)**)



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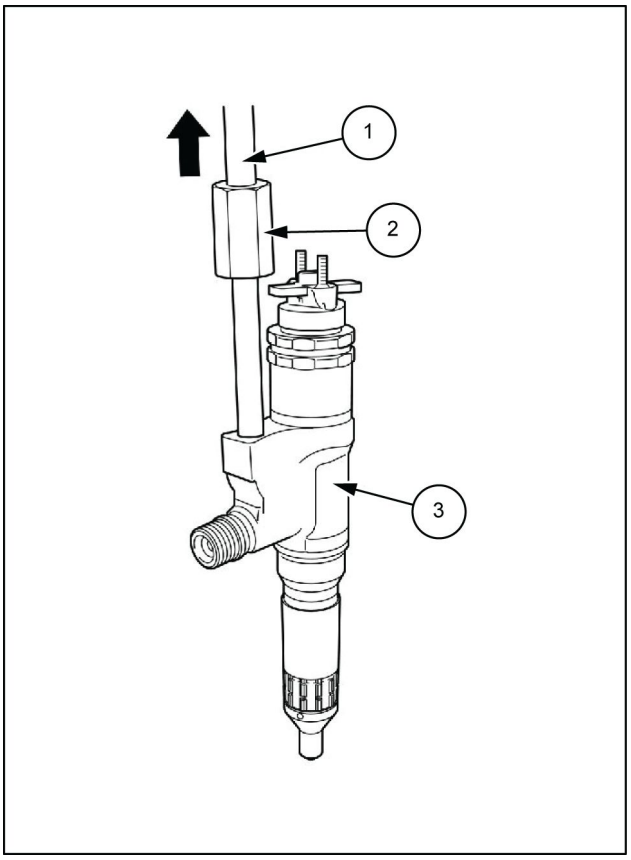
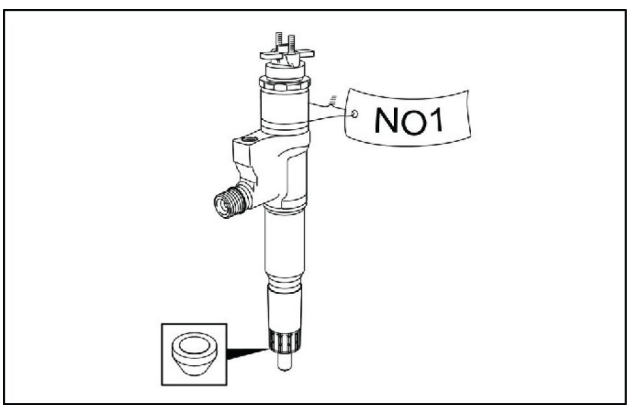
1. Sliding hammer
2. Fuel injector remover
3. Injector



SMIL13CEX1513BB 11

⚠ CAUTION:

- When using the special tool to remove an injector, check that the sleeve does not come off with it.
- Store the injectors with tags showing the cylinder number so that the ID code plates on the top section of the injector are not mixed up.
- Be careful not to damage the injector injection port.



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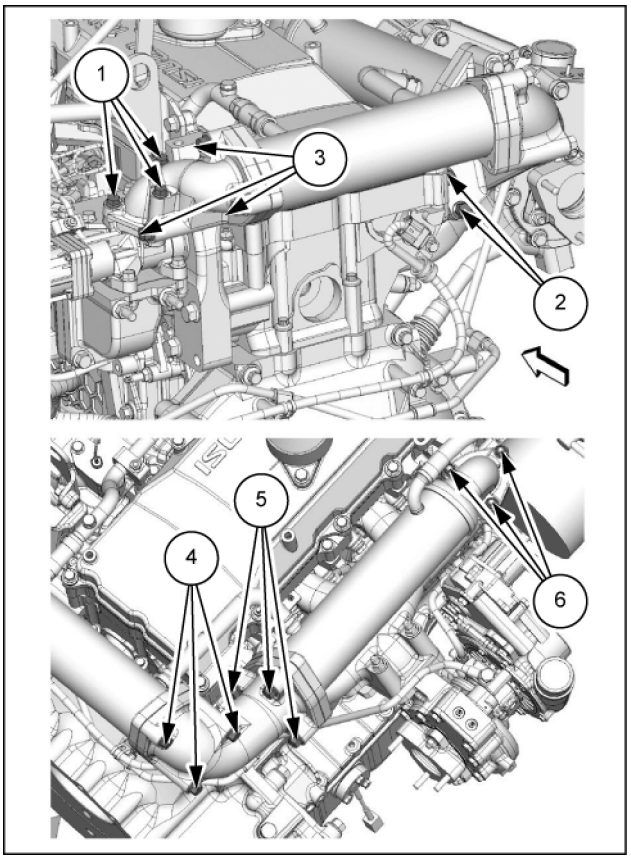
- Temporarily tighten the all parts and then securely tighten them, using the tightening sequence shown in figure **3**.



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5. Securely tighten the EGR pipe B to the EGR valve.

   Tightening torque: **24 N·m** (**18 lb ft**) No. 1 in the diagram

6. Securely tighten the EGR pipe A to the bracket.

   Tightening torque: **48 N·m** (**35 lb ft**) No. 2 in the diagram

7. Securely tighten the EGR pipe B to the EGR cooler B.

   Tightening torque: **48 N·m** (**35 lb ft**) No. 3 in the diagram

8. Securely tighten the EGR pipe A to the EGR cooler B.

   Tightening torque: **48 N·m** (**35 lb ft**) No. 4 in the diagram

9. Securely tighten the EGR pipe A to the EGR cooler A.

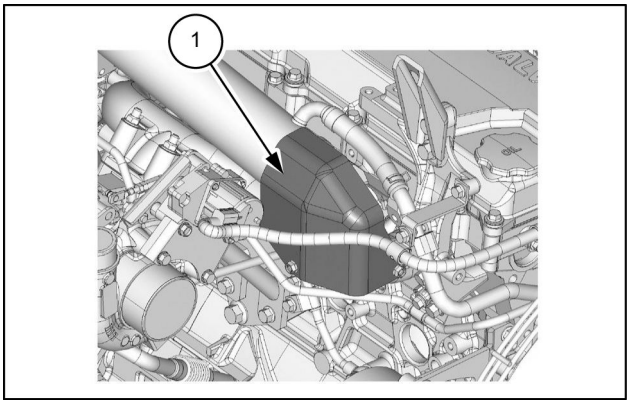
   Tightening torque: **48 N·m** (**35 lb ft**) No. 5 in the diagram

10. Securely tighten the EGR cooler A to the exhaust manifold.

    Tightening torque: **28 N·m** (**21 lb ft**) No. 6 in the diagram

11. Install the EGR heat protector **(1)** to the exhaust manifold.

    Tightening torque: **24 N·m** (**18 lb ft**)



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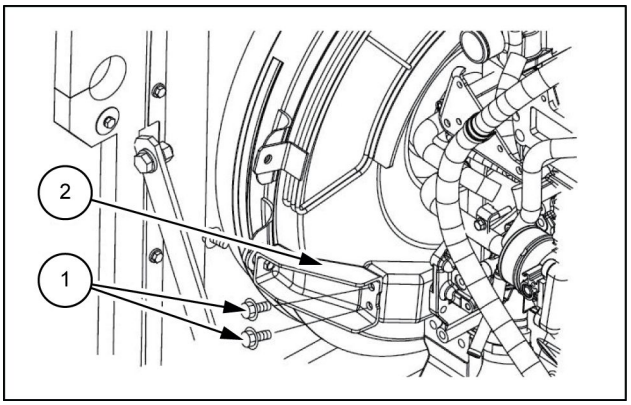
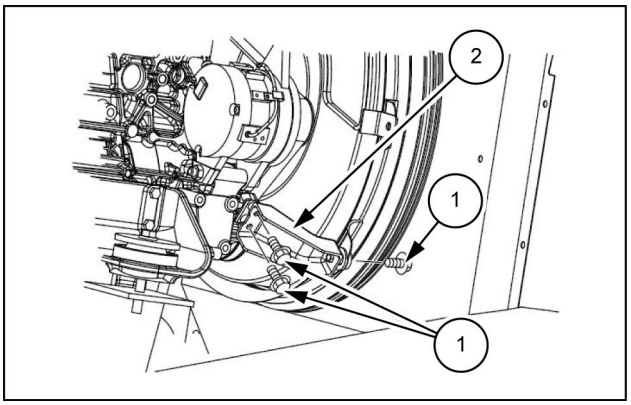
12. Use a wrench [**14 mm**] to remove the 3 bolts **(1)**, and then remove the brackets **(2)**.



SMIL13CEX1270AB 12

13. Use a wrench [**14 mm**] to remove the 3 bolts **(1)**, and then remove the brackets **(2)**.



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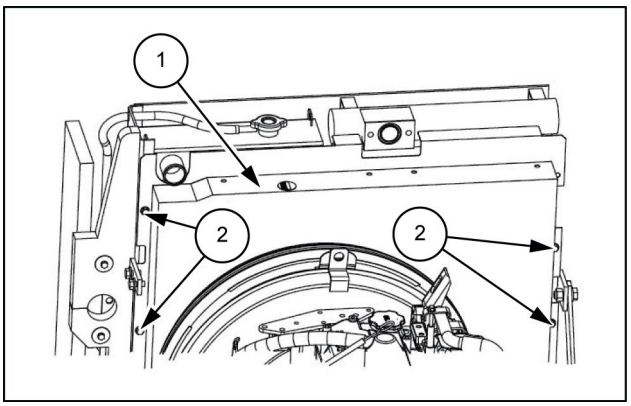
14. Use a box wrench [**13 mm**] to remove the 8 bolts **(2)** from the fan shroud **(1)**, and then move the fan shroud **(1)** towards the engine.



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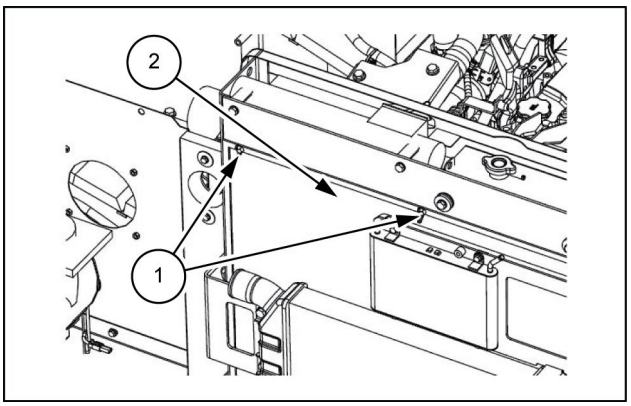
15. Remove the 2 one-touch clips **(1)**, and then remove the front anti-insect net **(2)**.



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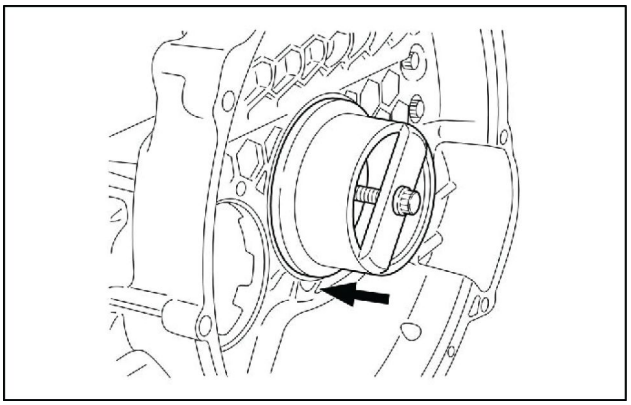
Engine lubrication system - 304

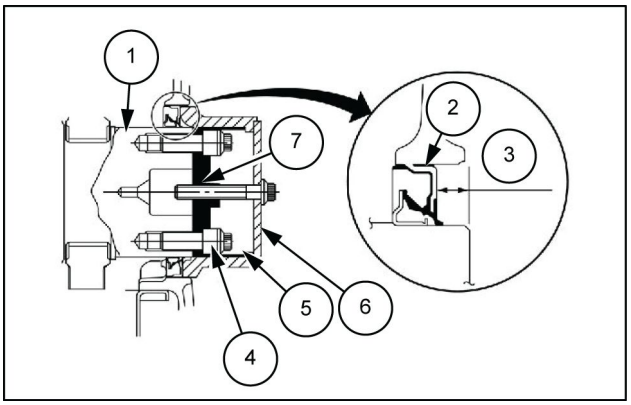
7. Install the center bolt to the sleeve.
8. Tighten the center bolt using the wrench.
   - Tighten the center bolt until the sleeve touches the adapter.



SMIL13CEX1888AA 10

9. Inspect the crankshaft rear oil seal **(2)**.
   - Measure the distance between the crankshaft head and the crankshaft rear oil seal **(2)**.
     Specified value: **7.2 - 7.8 mm** (**0.2835 - 0.3071 in**).

   1. Crankshaft
   3. Measurement location
   4. Collar
   5. Adapter ring
   6. Sleeve
   7. Adapter



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Flywheel installation

1. Apply the disulfide molybdenum grease to the bolt.
   - Apply to the seat surface and threaded portion on the flywheel installation bolts.
2. Install the flywheel to the crankshaft.
   - Tightening order

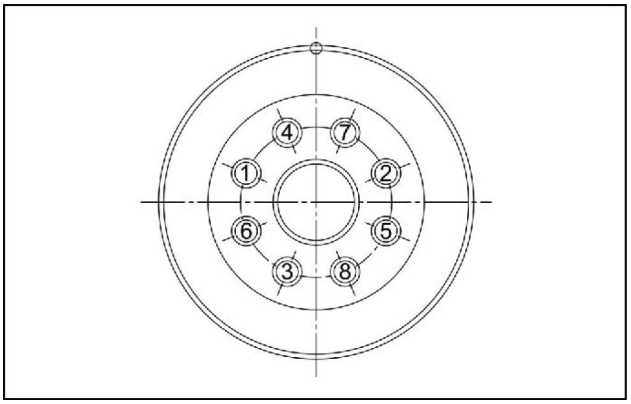
   ⚠ CAUTION:

   Pay attention to the knock pin position of the crankshaft.
3. Tighten the bolt using the torque wrench.

   Tightening torque: **78 N·m** (**57.53 lb ft**)
4. Tighten the bolt using the special tool.

   Special tool: angle gauge (refer to **Cylinder heads - Special tools (10.101)**)

   Tightening angle: 120°



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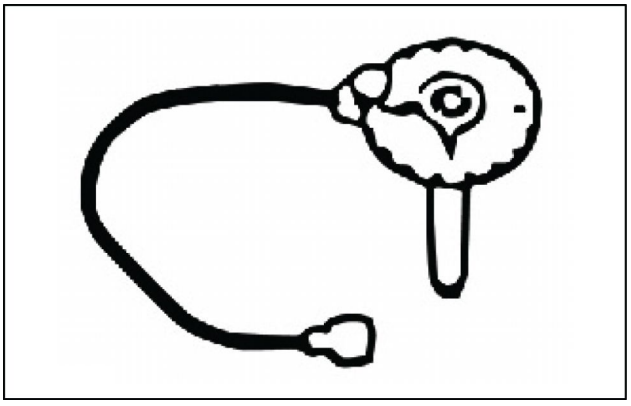

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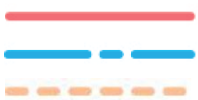
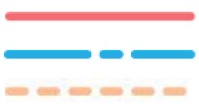


Pressure line
Tank line
Pilot pressure line

Pilot tank line
Electric line

1. Swing motor
2. Swing
3. Cushion valve
4. Right swing
5. Left swing
6. Swing pilot pressure sensor
7. Remote control valve (arm, swing)
8. Control valve
9. Travel pilot pressure sensor
10. Upper pilot pressure sensor
11. Computer A
12. Lever lock
13. Swing brake
14. 5 stack solenoid valve
15. Console lever lock switch
16. P1 pressure sensor
17. P1 flow control proportional valve
18. Hydraulic pump
19. Horsepower control proportional valve
20. P2 pressure sensor
21. Check valve
22. Oil cooler



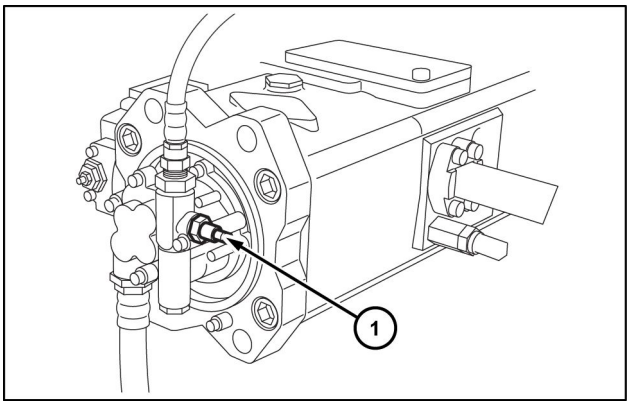
Pressure line
Tank line
Pilot pressure line

Pilot tank line
Electric line

1. Load holding valve check valve
2. Check valve
3. Oil cooler
4. Bleed-off
5. Cushion valve
6. Boom (up)
7. Boom (down)
8. Remote control valve (boom, bucket)
9. Lever lock
10. Boost pressure relief
11. 5 stack solenoid valve
12. Control valve
13. P2 pressure sensor
14. Hydraulic pump
15. Boom cylinder
16. Boom **(1)**
17. Travel pilot pressure sensor
18. Upper pilot pressure sensor
19. Console lever lock switch
20. Monitor display
21. Computer A
22. P1 pressure sensor
23. Check valve
24. Orifice

1. Travel motor
2. Travel remote control valve
3. Travel high speed
4. Lever lock
5. 5 stack solenoid valve
6. Console lever lock switch
7. Travel high-speed select switch
8. Computer A
9. Control valve
10. Travel (left)
11. Travel (right)
12. Travel pilot pressure sensor
13. P1 pressure sensor
14. P2 pressure sensor
15. N2 negative control pressure sensor
16. Hydraulic pump
17. Check valve
18. Oil cooler

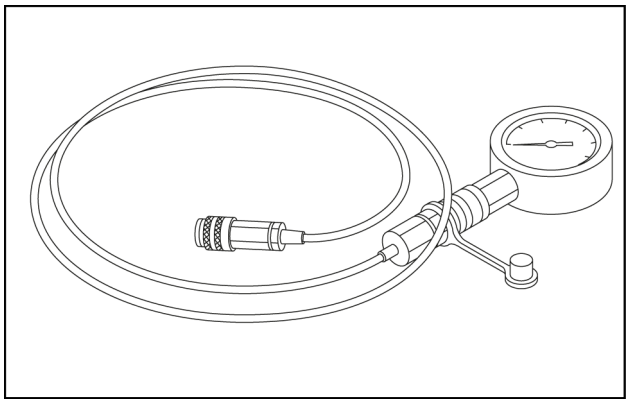
Install the adapter **(1)**.



SMIL15CEX5122AB 27

Install the pressure gauge **(1)** and measure the pressure.

Pressure gauge port size: G1/4 for **10 MPa** (**1450 psi**)



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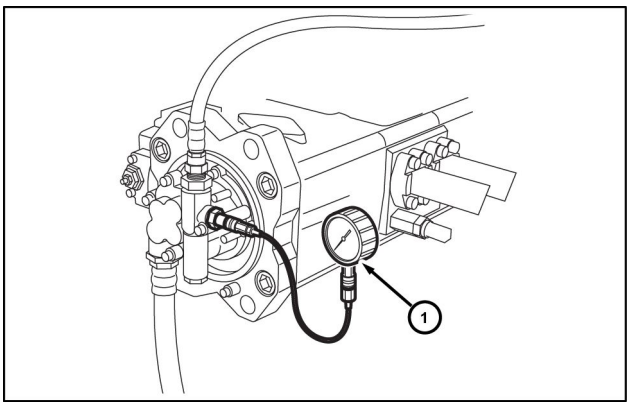
Engine speed	**2000 RPM**
Work mode	SP mode
Oil temperature	**45 - 55 °C** (**113.0 - 131.0 °F**)
Measuring port	P3 port
Set pressure	**3.92 MPa** (**568.60 psi**)



SMIL15CEX5123AB 29

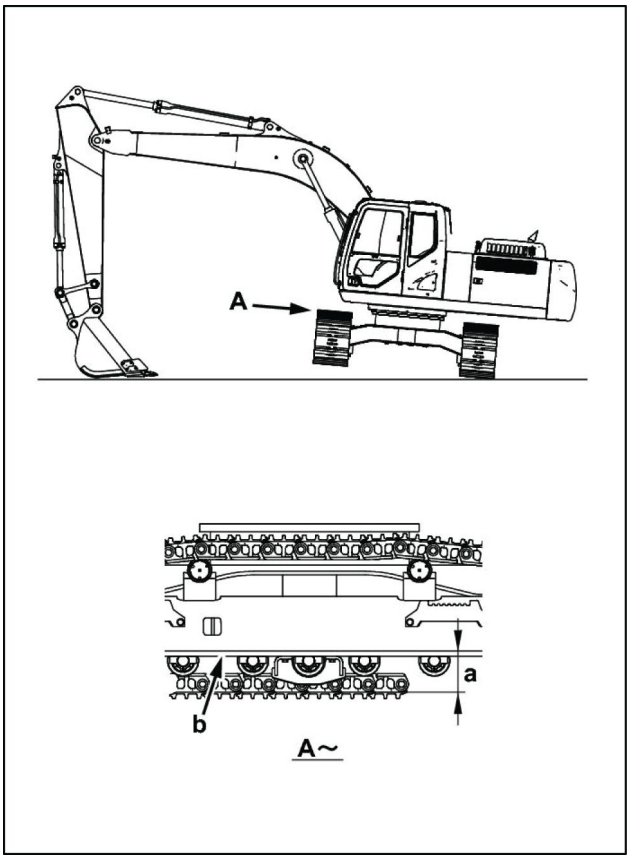
Shoe tension amount

Measurement method

1. Raise the shoe and, at the central position of the track, measure the gap between the underside of lower side frame and the topside of the shoe plate.
2. Measure for both the left and right sides.

Main unit posture

a. Topside of shoe plate
b. Underside of lower side frame



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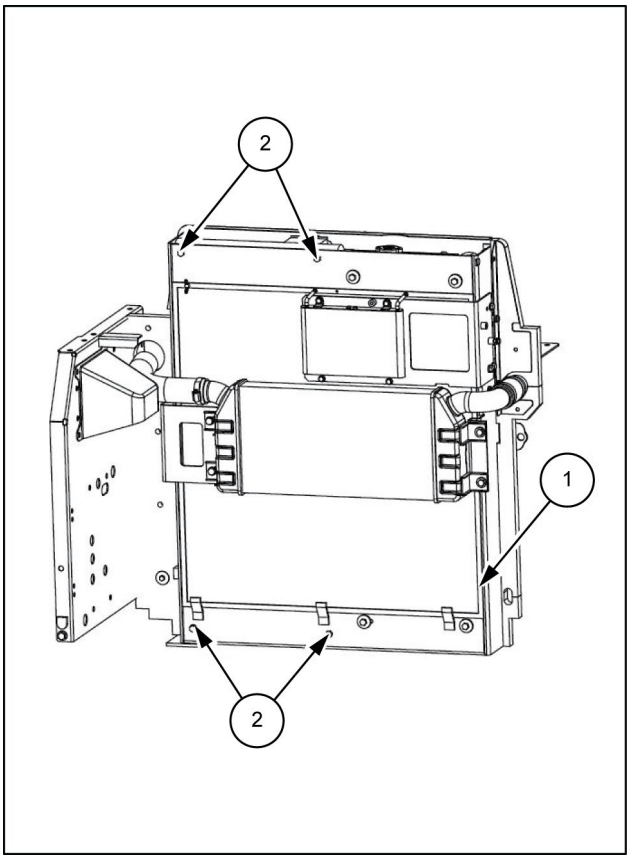
Swing ball race bearing movement amount and bucket tip movement amount

Measurement method

1. Up and down direction measurement
   A. Measure the up and down movement amount at two locations in front of and behind the ball race.
   B. Move the arm cylinder out and close the bucket cylinder, and move the bottom surface of the bucket **30 cm** (**11.81 in**) above the ground. Attach a dial gauge to the lowering section as shown in the figure below and do zero point adjustment.
   C. Jack up the main unit and measure the amount of movement with the dial gauge.
   * Jack up the main body until the swinging of the dial gauge becomes constant.

Main unit posture

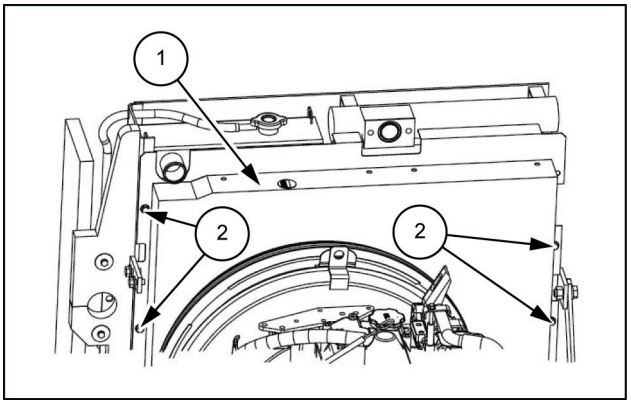
3. Use a wrench [**19 mm**] to secure the oil cooler **(1)** with the 4 bolts **(2)**.
   - Bolt **(2)** tightening torque: **88.0 N·m** (**64.905 lb ft**)



SMIL13CEX1282BB 3

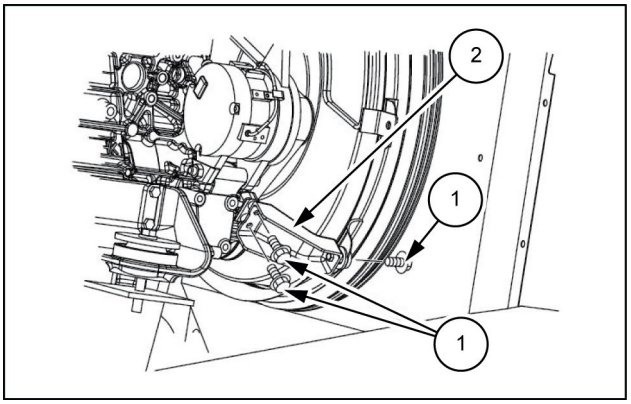
4. Use a box wrench [**13 mm**] to install the fan shroud **(1)** with the 8 bolts **(2)**.

   Bolt **(2)** tightening torque: **25.0 N·m** (**18.439 lb ft**)



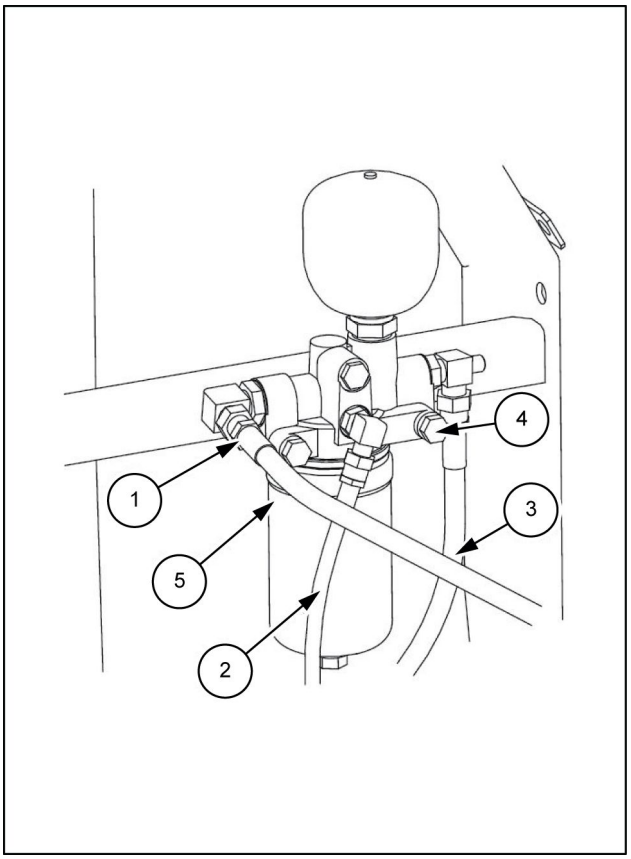
SMIL13CEX1272AB 4

5. Use a wrench [**13 mm**] to install the bracket **(2)** with the 3 bolts **(1)**.



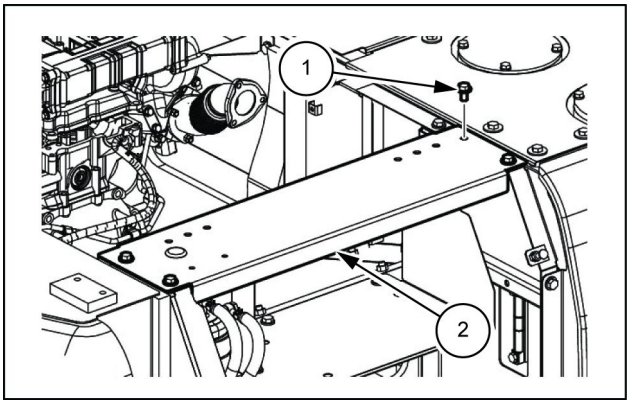
SMIL13CEX1271AB 5

4. Use a wrench [**27 mm**] to remove the hose **(1)**, use a wrench [**19 mm**] to remove the hose **(2)**, use a wrench [**22 mm**] to remove the hose **(3)**, use a wrench [**17 mm**] to remove the 2 bolts **(4)** and 2 washers, and then remove the pilot filter **(5)**.
   - Remove the 5 stack solenoid.
5. Remove the muffler.



SMIL13CEX0904BB 4

6. Use a wrench [**19 mm**] to remove the 8 bolts **(1)**, and then remove the duct cover **(2)**.



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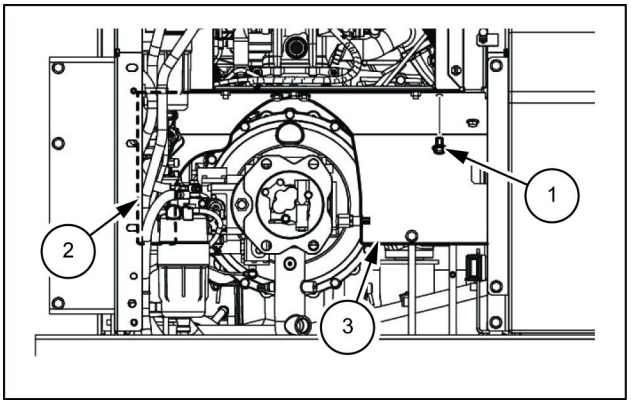
7. Use a wrench [**19 mm**] to remove the 6 bolts **(1)**, and then remove the cover **(2)** and **(3)**.



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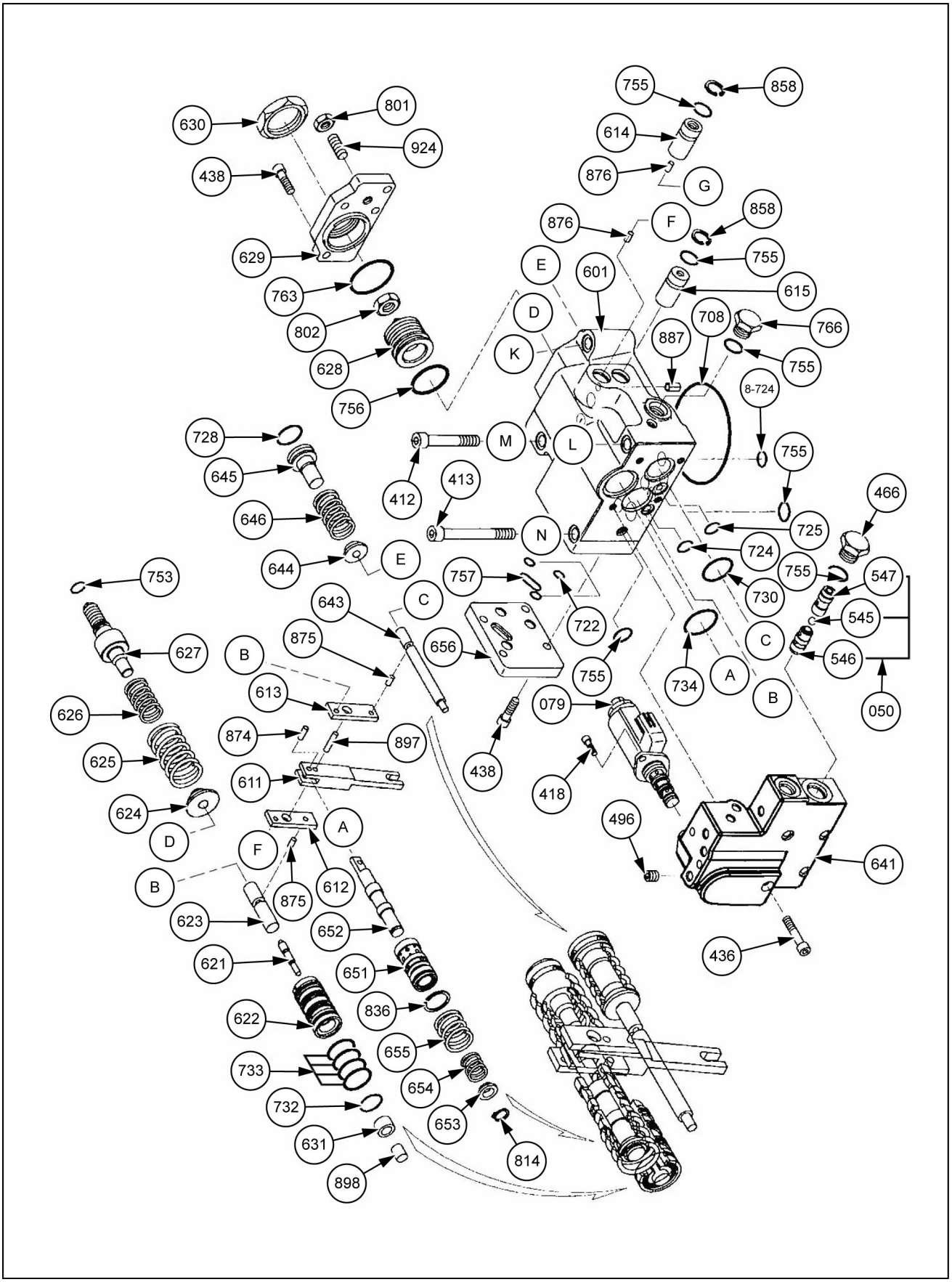
Pump control valve - Exploded view

Regulator breakdown (front side)

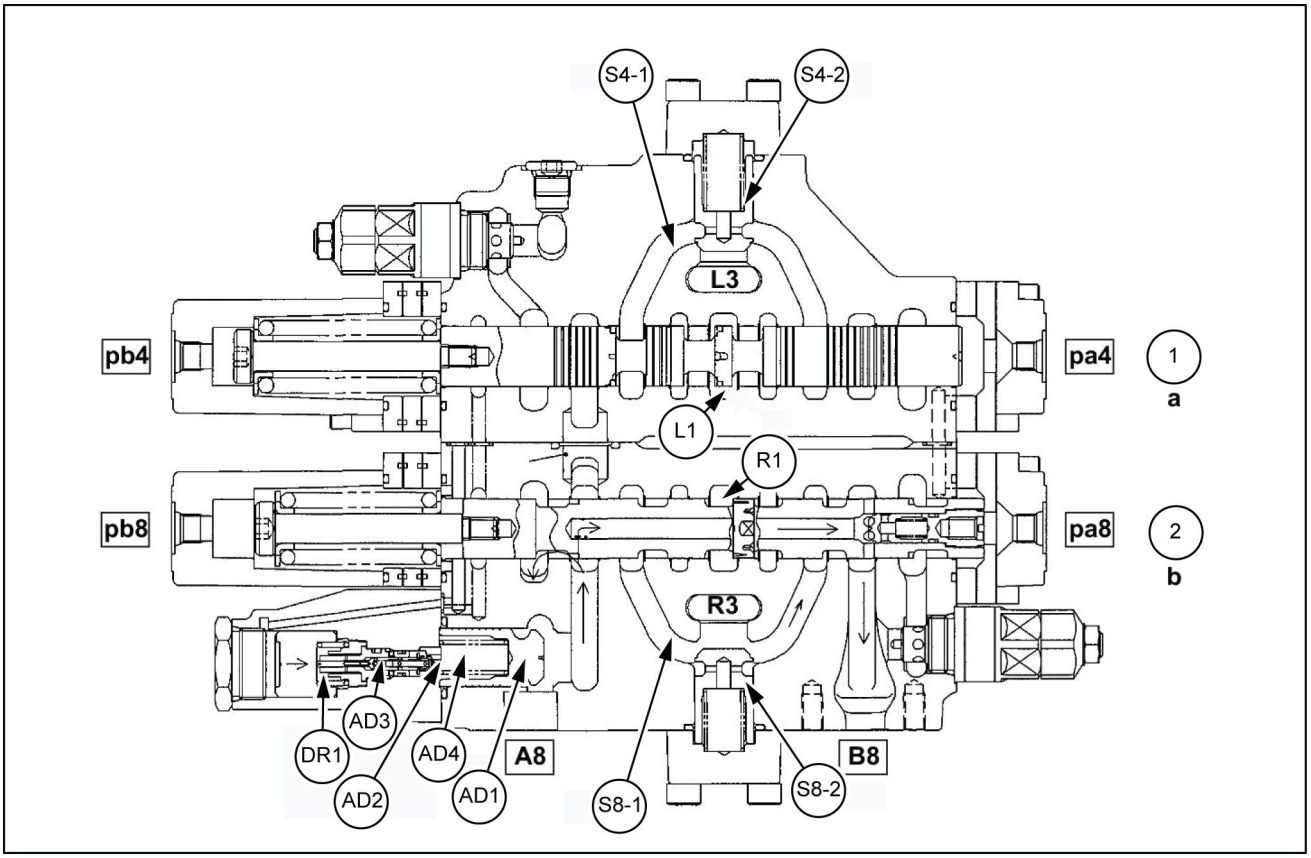


SMIL13CEX0980HB 1

Contents

Hydraulic systems - 35

Combination pump units - 304



SMIL13CEX1032FB 15

Down (regeneration)

1. Boom 2
2. Boom 1

6. Arm spool switchover [Fig. **16** - **19**]

   A. Neutral [Fig. **16**]
   This valve mounts an anti-drift valve on the arm 1 cylinder rod side.
   In neutral, the poppet (AD1) is led through path (AD2) and the spool (AD3) into the spring chamber (AD4). It is reliably seated by the pressure of the A5 port itself to cut off the return oil from the A5 port.

*1. Swing
*2. Open ↔ close
*3. Bucket
*4. Arm 1
*5. Out ↔ in
*6. Arm 2

Part list

1. Valve housing (Quantity 1)
2. Spool assembly (Quantity 1)
3. Spool assembly (Quantity 1)
4. Spool assembly (Quantity 1)
5. Spool assembly (Quantity 2)
6. Spool assembly (Quantity 1)
7. O-ring (Quantity 20)
8. Cap (Quantity 9)
9. Cap (Quantity 1)
10. Plate assembly (Quantity 1)
11. Plate assembly (Quantity 1)
13. Valve housing (Quantity 1)
14. Spool assembly (Quantity 1)
15. Spool assembly (Quantity 1)
16. Spool assembly (Quantity 1)
17. Spool assembly (Quantity 1)
18. Cap (Quantity 1)
19. Spool (Quantity 1)
20. Spring seat (Quantity 2)
21. Spring (Quantity 1)
22. Spool end (Quantity 1)
23. O-ring (Quantity 1)
24. Plug (Quantity 1)
25. O-ring (Quantity 1)
26. Spring (Quantity 1)
27. Spool assembly (Quantity 1)
28. Plate assembly (Quantity 1)
29. Plate assembly (Quantity 1)
30. O-ring (Quantity 1)
31. Backup ring (Quantity 2)
32. Poppet (Quantity 2)
33. Spring (Quantity 2)
34. Poppet (Quantity 7)
35. Spring (Quantity 8)
36. O-ring (Quantity 10)
37. Flange (Quantity 6)
38. Poppet (Quantity 2)
39. Spring (Quantity 2)
40. Orifice plug (Quantity 1)
41. O-ring (Quantity 17)
42. Body assembly (Quantity 1)
43. Flange (Quantity 1)
44. Poppet (Quantity 1)
45. Spring (Quantity 1)
46. Plug (Quantity 1)
47. O-ring (Quantity 1)
48. Spring (Quantity 1)
49. Poppet (Quantity 1)
51. Poppet (Quantity 1)
52. Flange (Quantity 2)
53. Spacer (Quantity 2)
54. O-ring (Quantity 2)
55. Backup ring (Quantity 2)
56. O-ring (Quantity 1)
57. Spacer (Quantity 1)
58. Sleeve (Quantity 1)
59. Poppet (Quantity 1)
60. Spring (Quantity 1)
61. Flange (Quantity 1)
64. O-ring (Quantity 3)
65. O-ring (Quantity 14)
66. O-ring (Quantity 12)
67. Antidrift valve assembly (Quantity 2)
68. Relief valve kit (Quantity 1)
69-1. Relief valve kit (Quantity 5)
69-2. Relief valve kit (Quantity 1)
70. Relief valve assembly (Quantity 2)
71. Plug assembly (Quantity 3)
72. Plug assembly (Quantity 10)
73. Plug assembly (Quantity 3)
74. Socket head bolt (Quantity 32)
75. Socket head bolt (Quantity 66)
77. Socket head bolt (Quantity 8)
78. Socket head bolt (Quantity 4)
79. Name plate (Quantity 1)
80. Drive screw (Quantity 2)
82. Metal plug (Quantity 4)
83. Socket head bolt (Quantity 4)
84. Spool assembly (Quantity 1)
86. Cap (Quantity 1)
88. Cap (Quantity 2)
89. O-ring (Quantity 2)
90. O-ring (Quantity 2)
91. Plug (Quantity 2)
92. Plug assembly (Quantity 2)
93. Plug assembly (Quantity 2)
94. Socket head bolt (Quantity 2)
95. Outlet housing (Quantity 1)
96. Tie rod (Quantity 4)
97. Nut (Quantity 4)
110. Plug assembly (Quantity 1)

3. Install the plate assemblies **(28)** and **(29)** and tighten the hexagon socket head bolts in the order **(75)**, **(94)**. Be careful not to apply excessive tightening torque to **(94)**.

   Tightening torque:

   (75) 39 - 44 N·m (**28.76 - 32.45 lb ft**)

   (94) 8.8 - 10.8 N·m (**6.49 - 7.97 lb ft**)

4. Install the plate assemblies **(10)** and **(11)**, and tighten with the hexagon socket head bolts **(75)**.

   Tightening torque: **39 - 44 N·m** (**28.76 - 32.45 lb ft**)

5. Install the caps **(8)** and **(9)**, and tighten with the hexagon socket head bolts **(74)**.

   Tightening torque: **39 - 44 N·m** (**28.76 - 32.45 lb ft**)

6. Screw in the plug assembly **(110)** with O-ring mounted into the option section (H-H cross section) short cap and tighten it.

   Tightening torque: **19 - 22 N·m** (**14.01 - 16.23 lb ft**)

7. Screw in the plugs **(91)** with O-rings **(90)** mounted into the option section (H-H cross section) and straight travel section (I-I cross section) long caps and tighten them.

   Tightening torque: **19 - 22 N·m** (**14.01 - 16.23 lb ft**)

   ⚠ CAUTION:

   - Be careful not to apply excessive torque when tightening a plug to a cap.
   - Applying excessive torque could crush the cap threads.

Straight travel signal control valve assembly

1. Screw the orifice plug (42-7) [**36 mm** (**1.417 in**) hexagon diameter] into the body (42-1) and tighten it.

   Tightening torque: **3.0 - 3.8 N·m** (**2.21 - 2.80 lb ft**)

2. Being careful about the insertion orientation, assemble the spools (42-2) and (42-3) and spring (42-4).

3. Tighten the plug assembly (42-5) [**5 mm** (**0.197 in**) hexagon socket diameter] with O-ring mounted to the body.

   Tightening torque: **13.5 - 16.5 N·m** (**9.96 - 12.17 lb ft**)

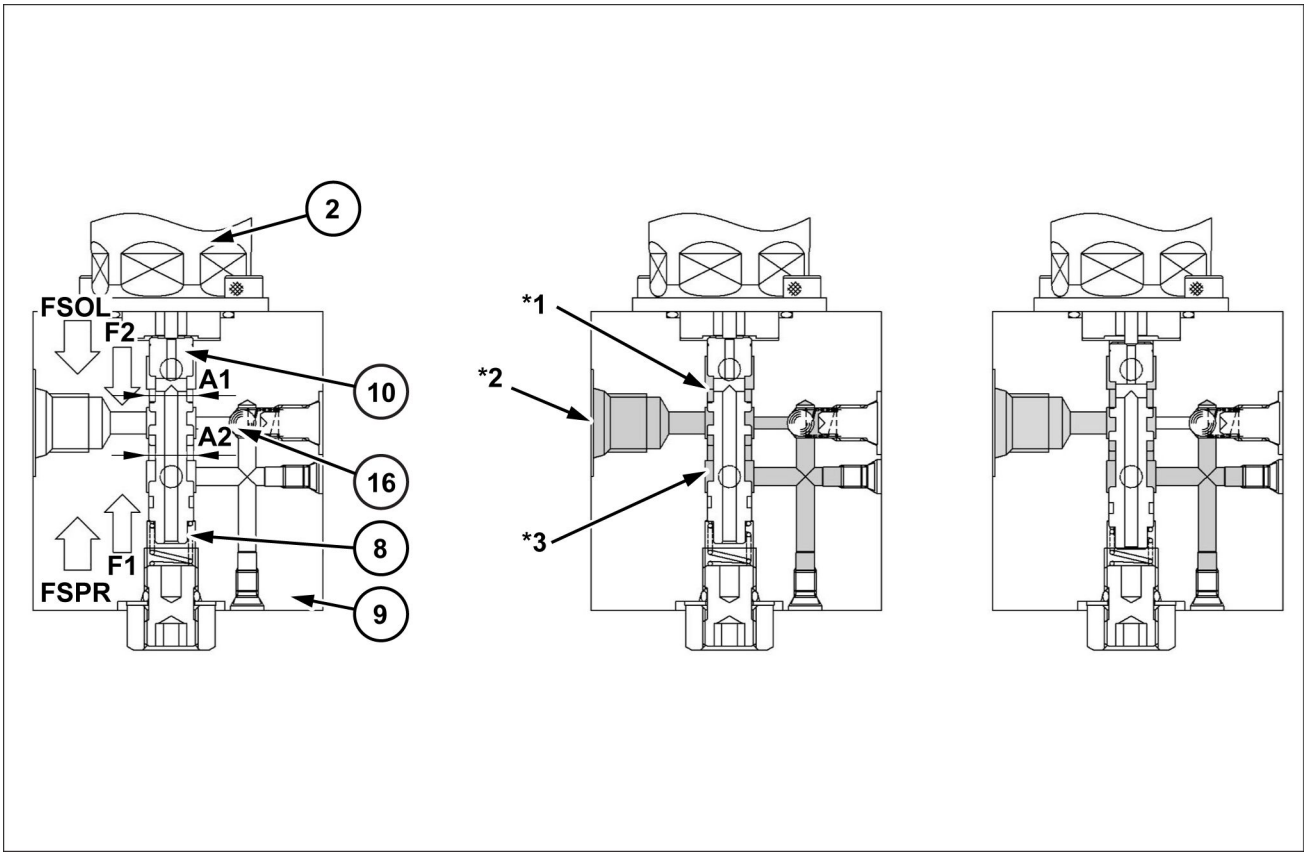
4. Install the body assembly **(42)** with the hexagon socket head bolts **(83)** [**5 mm** (**0.197 in**) hexagon socket diameter].

   Tightening torque: **8.8 - 10.8 N·m** (**6.49 - 7.97 lb ft**)

Add-on section assembly

1. Screw the tie rod **(96)** into the main unit valve housing **(1)**.

2. Install the main unit body matching surface O-rings **(56)** and **(64)**.



SMIL15CEX3795FB 1

A (B) port and P1 (P2) port circuit: Continuity established
A (B) port and P1 (P2) port circuit: Cut off

Na- To T port
N.

Na- A (B) port
N.

Na- To P1 (P2) port
N.

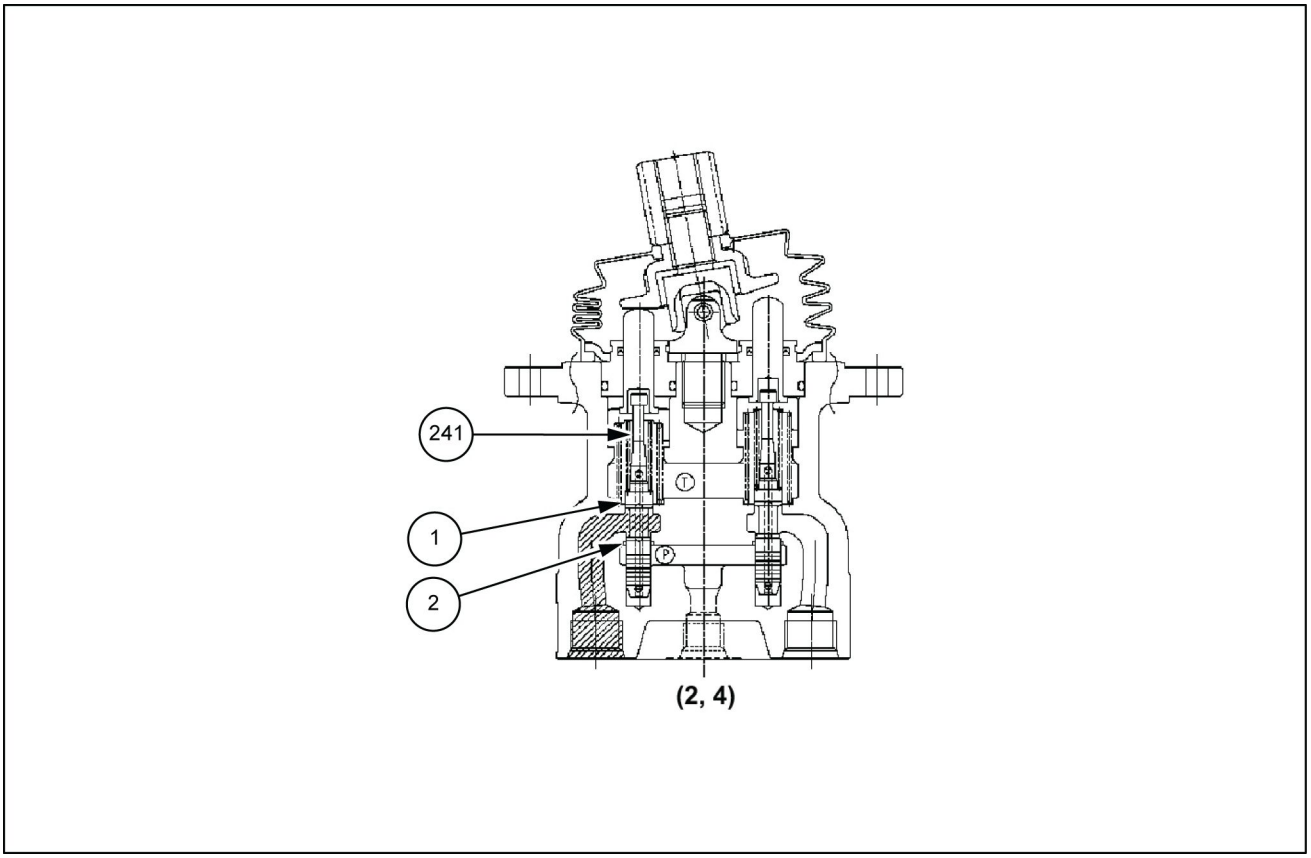
SOL3

Because of the C port pressure, pressures F3 and F4 are generated on the spool **(11)** in direction of the arrows.
F3 = PC x A3 + FSPR ··· equation **(3)**
F4 = PC x A4 + FSOL ··· equation **(4)**
[PC: C port pressure A3 : spool **(11)** cross-sectional area A4 : spool **(11)** cross-sectional area * A4 < A3 FSPR : spring **(1)** load FSOL : solenoid **(2)** attraction force]

1. Solenoid **(2)** current charge: OFF
   FSOL < FSPR causes F4 < F3 and the spool **(11)** is pressed upward. This means that the pressure oil that flows from the P3 port is cut off by the spool **(11)** and pressure is not generated on the C port.
2. Solenoid **(2)** current charge: ON
   When FSPR < FSOL, F3 < F4 occurs, spool **(11)** moves downward, spring **(1)** bends, and FSPR: spring **(1)** load rises.
   At this time, the C port is still cut off from the P3 port circuit.
   When the FSOL: solenoid attraction force rises further, the spool **(11)** moves further downward, which cuts off the C port and T port circuit and continuity is established with the C port and P port circuit.
   When the PC: C port pressure rises, F4 < F3, which causes the spool **(11)** to return upward, and continuity between the C port and T port circuit is established.
   As this is repeated, the spool **(11)** is balanced in the position where F3 = F4 .
   When equations **(3)** and **(4)** are converted with F3 = F4 (during balance control):
   PC x A3 + FSPR = PC x A4 + FSOL

When the handle is held (See Fig. 4)

When the handle is tilted and the pressure of the ports (2, 4) rises to a pressure equivalent to the set spring force **(241)**, the hydraulic pressure and the spring force are in balance. When the ports (2, 4) pressure becomes higher than the set pressure, the ports (2, 4) and the P port **(2)** close and the ports (2, 4) and the T port **(1)** open. When the ports (2, 4) pressure becomes lower than the set pressure, the ports (2, 4) and the P port **(2)** open and the ports (2, 4) and the T port **(1)** close, so the secondary pressure is held constant.



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When handle held (secondary pressure at or above set pressure)

1. T port	2. P port

Operation in area in which the handle tilt is large (depends on the model)

For certain models, when the handle is flipped down beyond a certain angle, the spool top end section touches the push rod bore bottom section and the output pressure goes into the state of still being connected with the P port pressure.

Furthermore, with the structure in which the spring seating and spring are installed inside the push rod, when the handle is flipped down beyond a certain angle, the push rod bore bottom section and the spring touch. That spring force changes the 2nd pressure gradient and after that the push rod bore bottom section and the spring seating top end section touch, and the output pressure remains connected to the P port.

Hand control - Prepare

⚠ CAUTION:

- To ensure safe operations, wear protective devices before beginning work and follow all precautions.
- Be sure to repair any parts damaged during disassembly, and prepare replacement parts in advance.
- If any parts are significantly rusted or dirty, clean them before disassembling.
- Any foreign matter entering the equipment during assembly can create a malfunction. Therefore, after thoroughly cleaning the equipment with cleaning oil, air blow the equipment, and assemble in a clean location.
- When assembling sliding parts, be sure to coat them with new hydraulic oil.
- As a rule, replace all O-rings and other seal parts with new parts.

General cautions

- Be careful not to drop precision parts or let bump them with other parts during work.
- Do not forcefully open or hit parts in an effort to speed up operations.
  Pay careful attention and proceed slowly so as not to damage any parts, create any oil leaks, or compromise the efficiency of the equipment, etc.
- Disassembled parts can easily rust or collect dust. Therefore, immediately after disassembling parts, take precautions to prevent the parts from rusting or collecting dust.

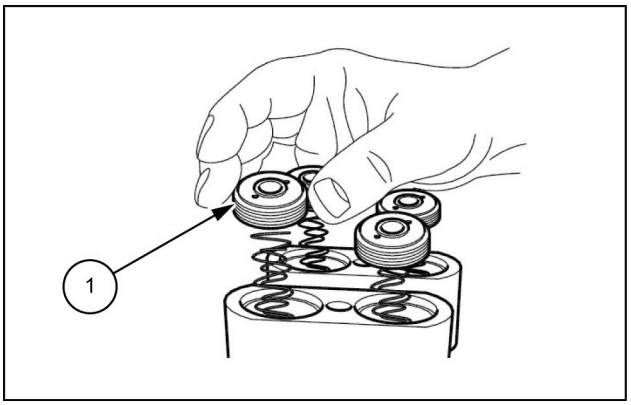
Required tools and tightening torque

Tools	Dimensions	Part No.	Part name	Screw size	Tightening torque
Wrench	**22 mm**	312	Adjusting nut	**M14**	**63.7 - 73.5 N·m** (**46.983 - 54.211 lb ft**)
	32 mm	302	Disk	**M14**	
Special jig	**24 mm**	301	Joint	**M14**	**44.2 - 50.0 N·m** (**32.600 - 36.878 lb ft**)

Other

- Vapor corrosion inhibitor
- White kerosene
- Heat-resistant grease
- Sandpaper (#1000, #2000)
- Whetstone
- Vise
- Screwdriver
- Torque wrench

9. Remove the pistons **(1)**. Record the positions of the pistons in relation to the casing holes.



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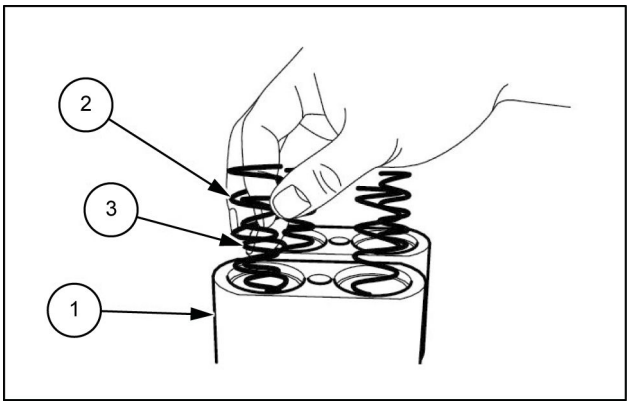
10. Remove the damping springs **(2)** and **(3)** from the casing **(1)**. Record the positions of the damping springs in relation to the casing holes.



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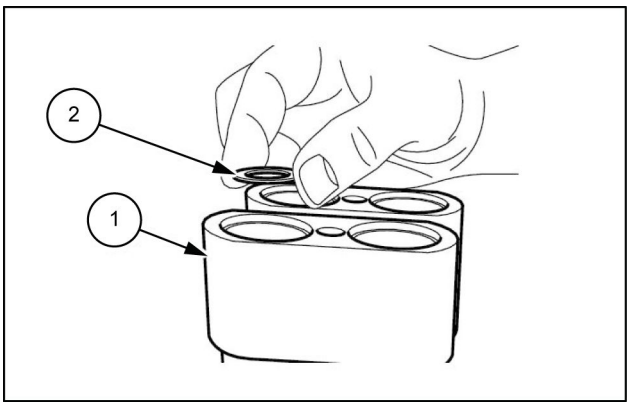
11. Remove the spring seating **(2)** from the casings **(1)**.
    - Record the positions of the spring seating in relation to the casing holes.



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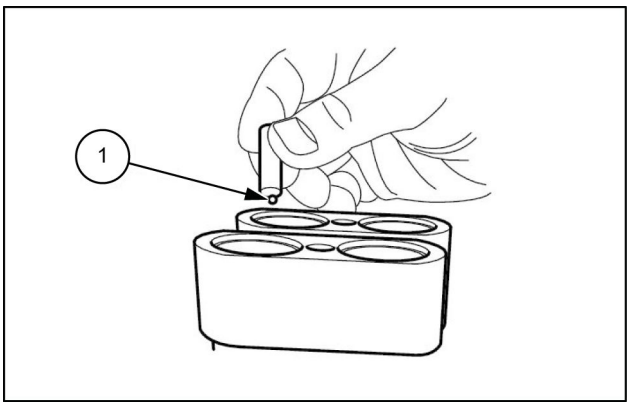
12. Use a magnet, etc. to remove steel balls **(1)**. Be careful not to lose the steel balls.



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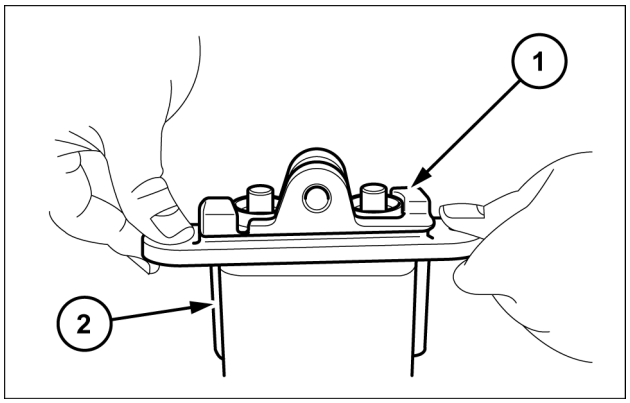
5. Install the cover **(1)** on the casing **(2)**. Install them in the positions they were in before disassembly.
   - Align the pin position.



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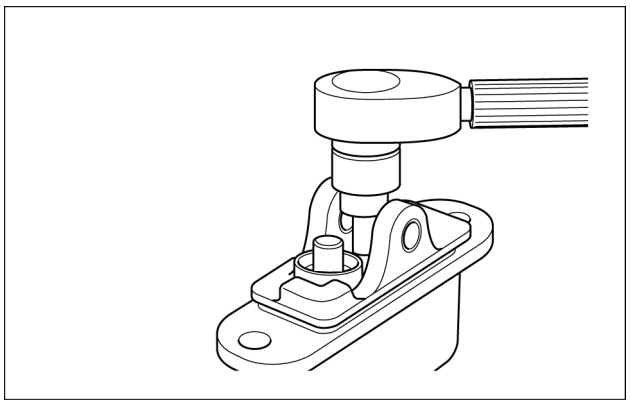
6. Tighten the hexagon socket head bolt to the specified torque.
   Tightening torque: **35.3 - 43.1 N·m** (**26.036 - 31.789 lb ft**)
   Make sure that the cover is horizontal.



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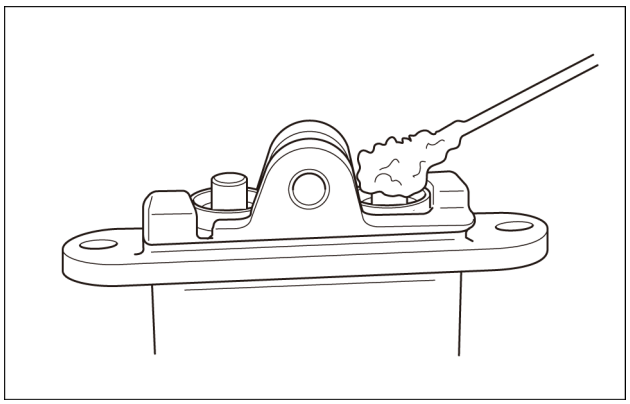
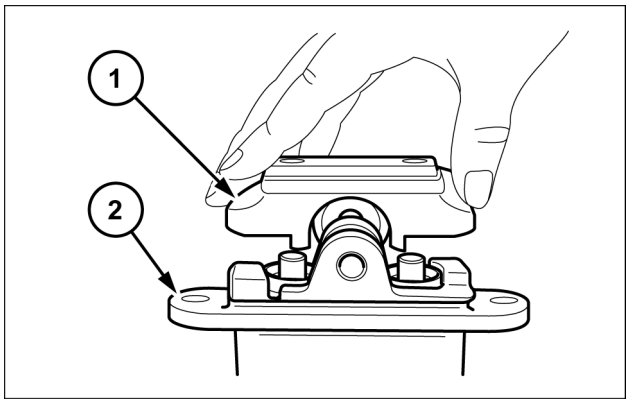
7. Apply grease to the top of the push rod. For grease application and filling, use a flat object made of soft material so as not to scratch the push rod.



SMIL15CEX3780AB 7

8. Install the cam **(1)** on the cover **(2)** . Install them in the positions they were in before disassembly.



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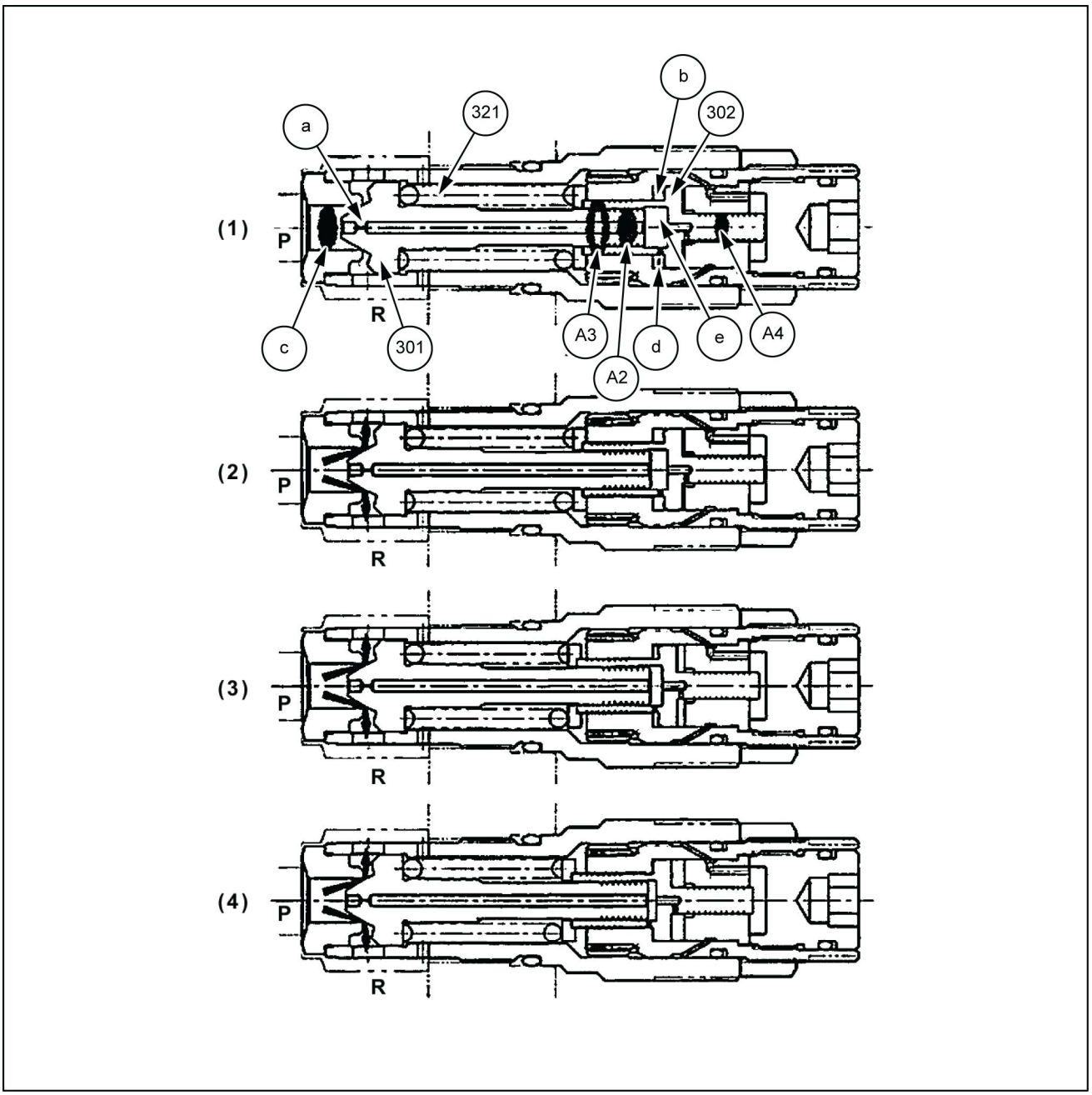
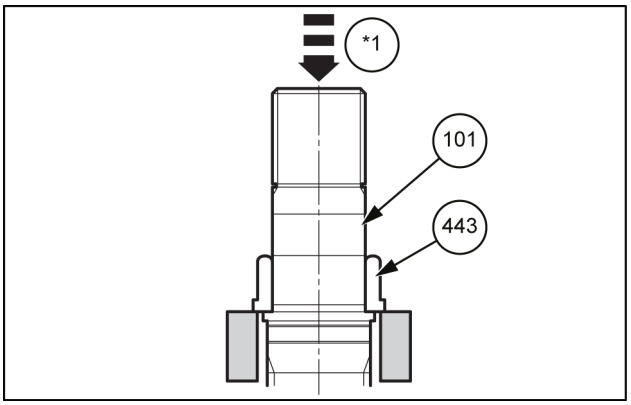


LPIL12CX02796GB 4

Relief valve operation explanation diagram

a. Orifice m
b. h chamber
c. A1 pressurized area
d. Orifice n
e. g chamber

13. Perform the following as necessary. Do not reuse a removed bearing.
    - Use a press to remove the inner race of the roller bearing **(443)** from the drive shaft **(101)**.
      When using a steel rod to hit the inner race of the roller bearing, hit the inner race evenly while being careful not to damage the bearing.
    - Using a steel rod, tap from the housing section side of the oil seal, and pull out the outer race of the roller bearing from the housing.
    - Use a slide hammer bearing puller **(*3)** to remove the roller bearing **(404)** from valve casing H0 **(303)**.



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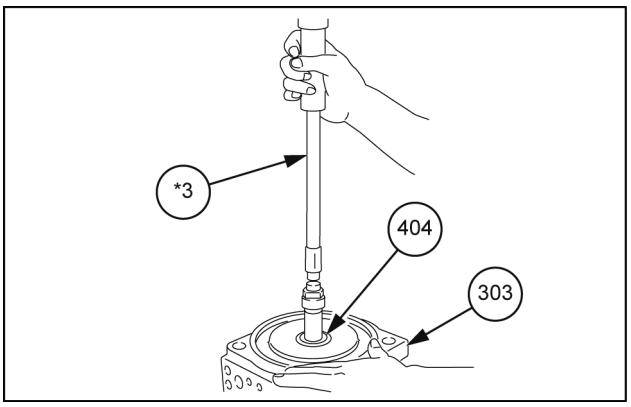

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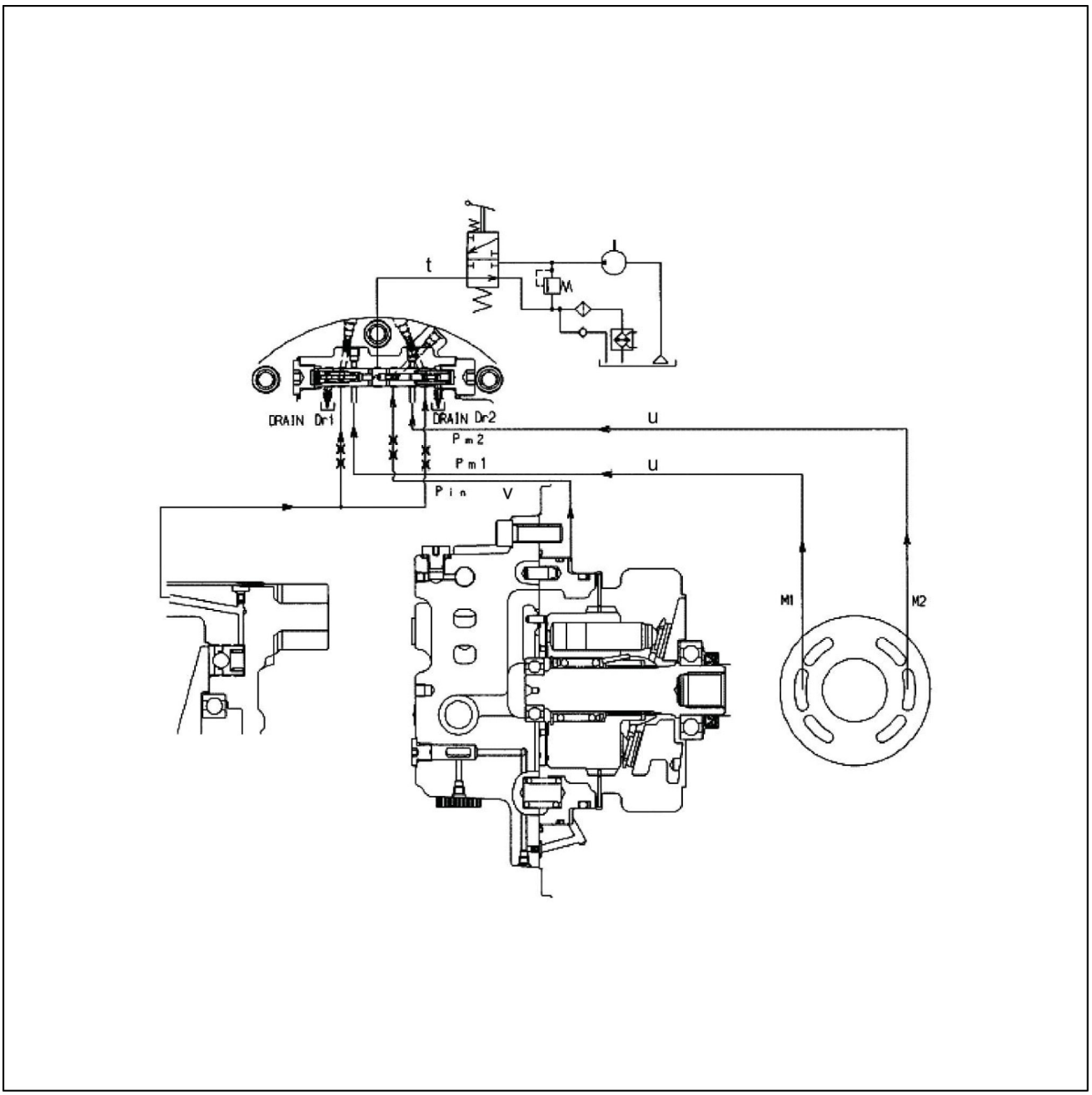
3. High-speed motor state for automatic 2-speed position
   Fig. **12** shows the high-speed motor state for the automatic 2-speed position.
   When the regulation pilot pressure is allowed to operate on the Ps port, the pilot pressure oil operates on the pilot hydraulic chamber on the motor capacity control valve front surface via oil path A and this pushes the motor capacity control valve to the right. Also, the load pressure Pin on the motor operates on the motor load pressure chamber via oil path B and pushes the motor capacity control valve to the left. When Pin is lower than the motor capacity control pressure P determined by the ratio of the pilot pressure pressurized area and the motor load pressure pressurized area, the motor capacity control valve is held in the state in Fig. **12** and the motor operates in high-speed (low-capacity) mode.
4. Low-speed motor state for automatic 2-speed position
   Fig. **13** shows the low-speed motor state for the automatic 2-speed position. When the load pressure pin on the motor rises and becomes higher than the motor capacity control pressure P discussed above, the motor capacity control valve moves to the left, switching the motor to low-speed (highcapacity) mode, so the motor operates at low speed.



LPIL12CX01774GA 10

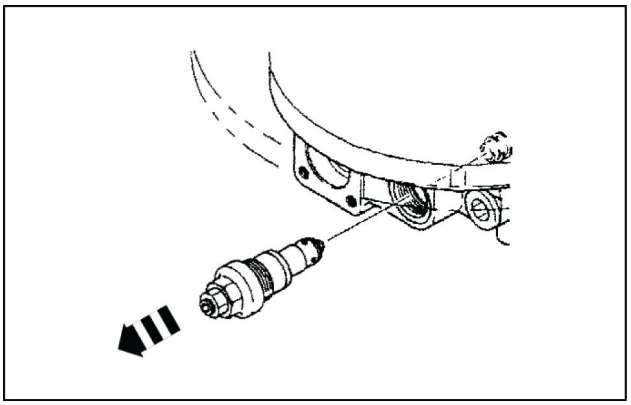
Motor high-speed (high-capacity) fixed mode

Removal of relief valve assembly

Loosen the plug (1-2-7-6) to remove the relief valve assemblies (1-2-7).
At this time, each poppet seat (1-2-7-3) remains in the base plate (1-2-1).

⚠ CAUTION:
The relief valve assemblies are at a set pressure. The motor driving force and braking force are both determined by this set pressure.
For this reason, do not perform the following actions.

1. Loosen the nut (1-2-7-16), and do not tamper with the set screw (1-2-7-15). If this part is tampered with, the set pressure of the relief valve will change and the machine will no longer display prescribed capabilities.
2. Do not perform disassembly of the relief valve assemblies. The set pressure will change and the machine will no longer display prescribed capabilities.



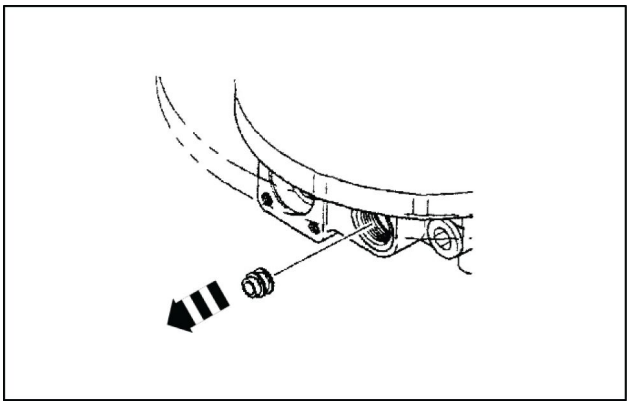
LPIL12CX01339AA 3

Poppet seat removal

Use the poppet seat removal jig to remove each poppet seat (1-2-7-3) from the base plate (1-2-1).

⚠ CAUTION:

Do not perform disassembly if it is not necessary.



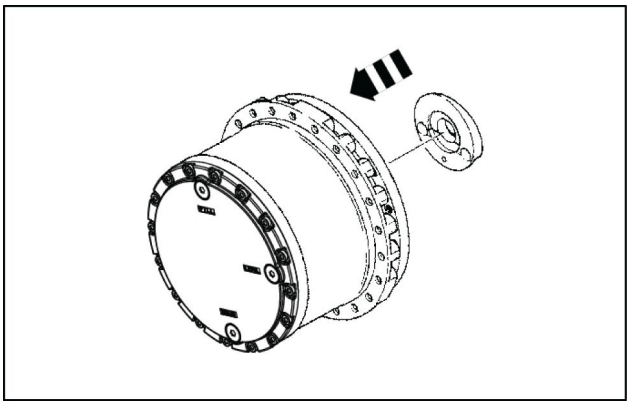
LPIL12CX01340AA 4

Swash plate attachment

Point the slanted surface of the swash plate **(1-5)** upwards and attach the swash plate to the flange **(1-1)**.

⚠ CAUTION:

1. Attach by matching the rear surface spherical holes of the swash plate with the steel balls **(1-6)**.
2. Attach the swash plate after applying hydraulic oil to the surface of the steel balls.
3. After attaching the swash plate, check that it moves smoothly.

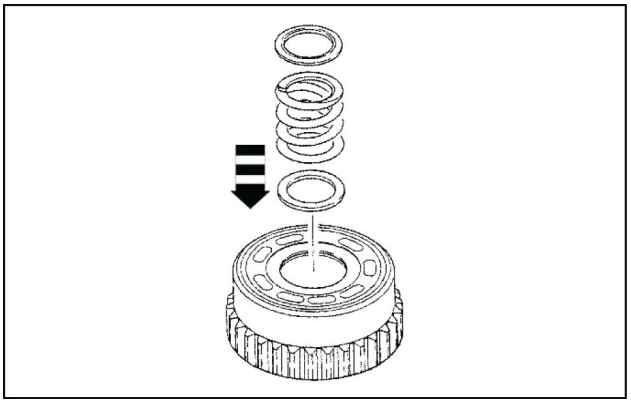


LPIL12CX01396AA 28

Assembly of cylinder block assembly

15. Point the surface of the cylinder block (1-4-1) that slides against the valve plate (1-21) upwards and place the cylinder block on the work platform of the hand press. Point the slanted surface of the spring seat (1-4-6) down and attach it to the cylinder block. Place both the spring (1-4-7) and collar (1-4-8) on top of spring seat with the collar on top.

    *1. Cylinder block attachment direction



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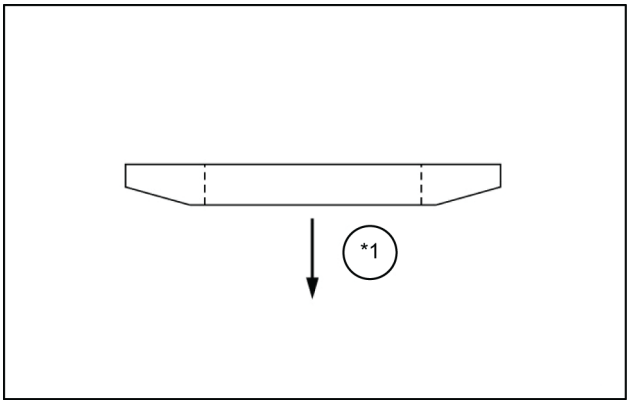
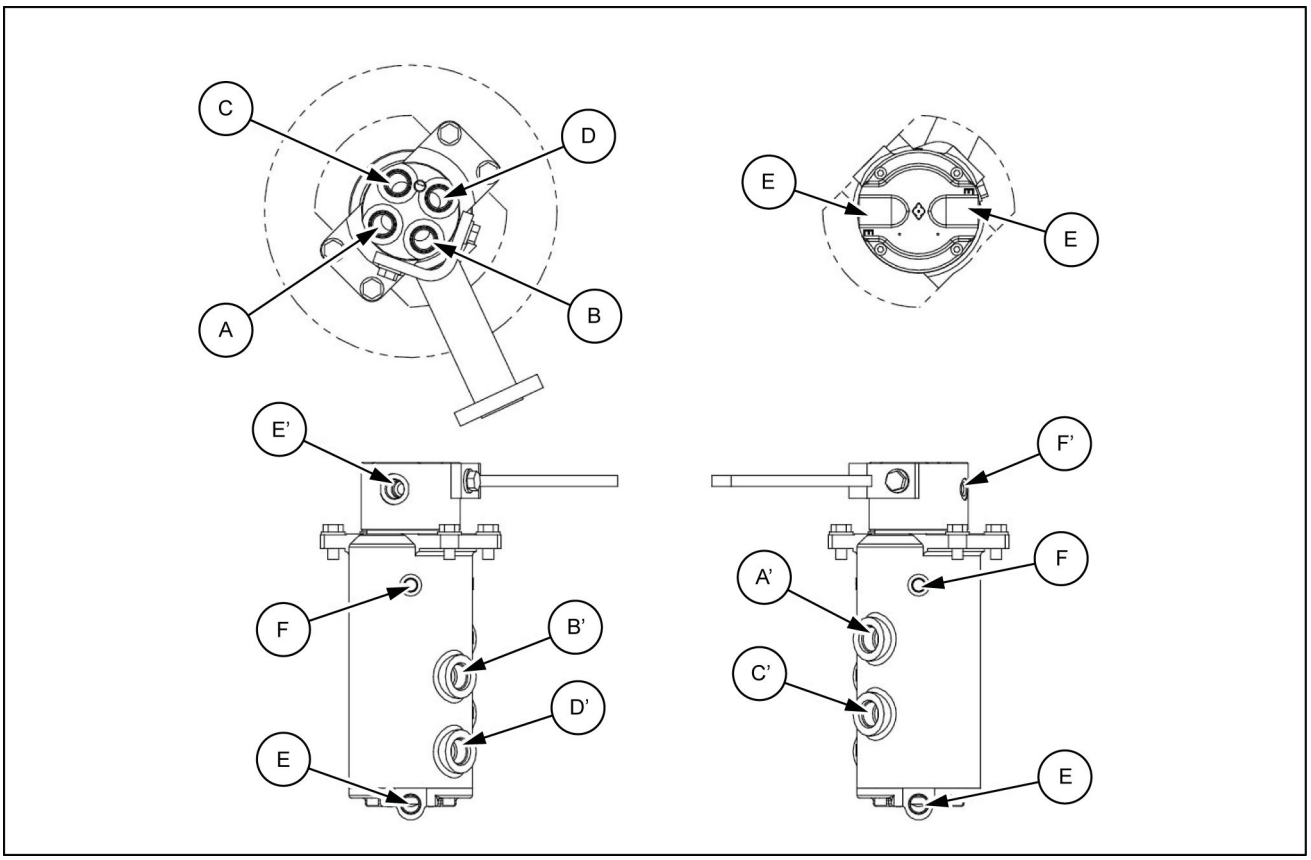


LPIL12CX01398AB 30

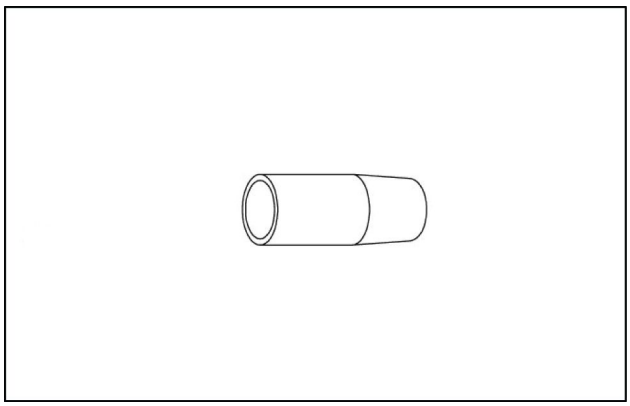
Hydraulic swivel - Overview



LPIL12CX01605FB 1

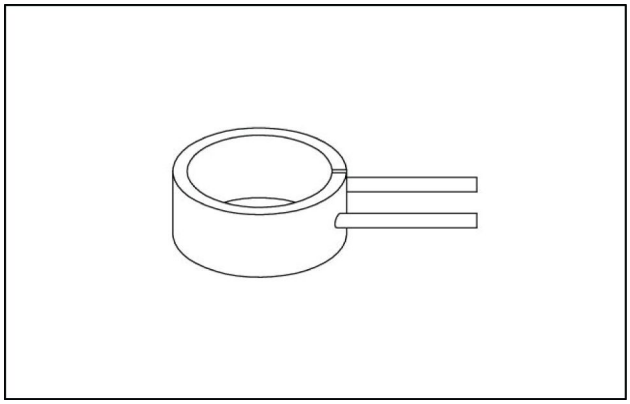
Port	Port name	Port size
A, A'	Main port (forward right)	G3/4
B, B'	Main port (forward left)	G3/4
C, C'	Main port (backward right)	G3/4
D, D'	Main port (backward left)	G3/4
E, E'	Drain port *E (2 locations), E' (1 location)	G1/2
F, F'	Pilot port *F (2 locations), F' (1 location)	G1/4

For cylinder head insertion



LPIL12CX02049AA 15

For piston insertion



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(The following table has a list of jig part numbers.)

Special jigs part number list

1. Select jigs for the cylinder head according to the rod diameter.
2. Select jigs for the piston according to the cylinder bore.

Cylinder head assembly and disassembly jig	
Applicable rod diameter	**Set part No.**
65 mm (2.559 in)	3006J-56001
70 mm (2.755 in)	3007J-06001
75 mm (2.952 in)	3007J-56001
80 mm (3.149 in)	3008J-06001
85 mm (3.346 in)	3008J-56001
90 mm (3.543 in)	3009J-06001
95 mm (3.74 in)	3009J-56001
100 mm (3.937 in)	3010J-06001
105 mm (4.133 in)	3010J-56001
110 mm (4.33 in)	3011J-06001
115 mm (4.527 in)	3011J-56001
120 mm (4.724 in)	3012J-06001

Seal ring insertion and calibration jig	
Applicable cylinder bore	**Set part No.**
95 mm (3.74 in)	3009J-51001
100 mm (3.937 in)	3010J-01001
105 mm (4.133 in)	3010J-51001
110 mm (4.33 in)	3011J-01001
115 mm (4.527 in)	3011J-51001
120 mm (4.724 in)	3012J-01001

Boom cylinder - Inspect

Dimension inspection

Check the maximum retracted length and stroke as instructed on the diagram.

Pressure withstand inspection

Check for looseness, permanent deformation, and external leaks when the test pressure instructed on the diagram is applied to each stroke end for at least **3 min**.

External leak inspection

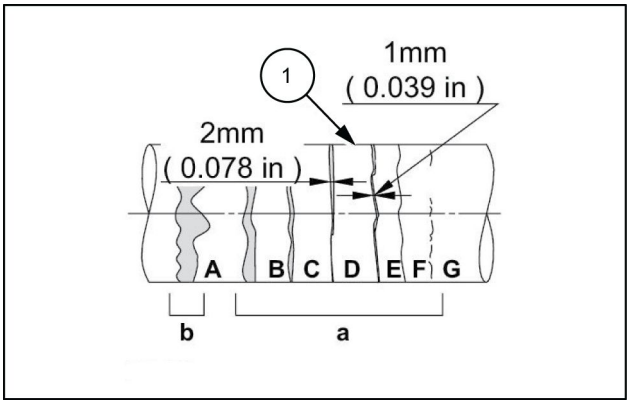
Check the amount of oil leak at the rod section.

- Judgment value for rod section oil leak amount. Move the piston rod back and forth 20 times with the oil at a temperature from **20 - 40 °C** (**68 - 104 °F**), then judge by the state of the oil ring formed on the rod surface. If the oil ring is in a broken down A state, this is judged to be trouble. See **Boom cylinder - Service instruction (35.736)** for information on how to solve this.

1. Oil ring

a. Acceptable

b. Not acceptable



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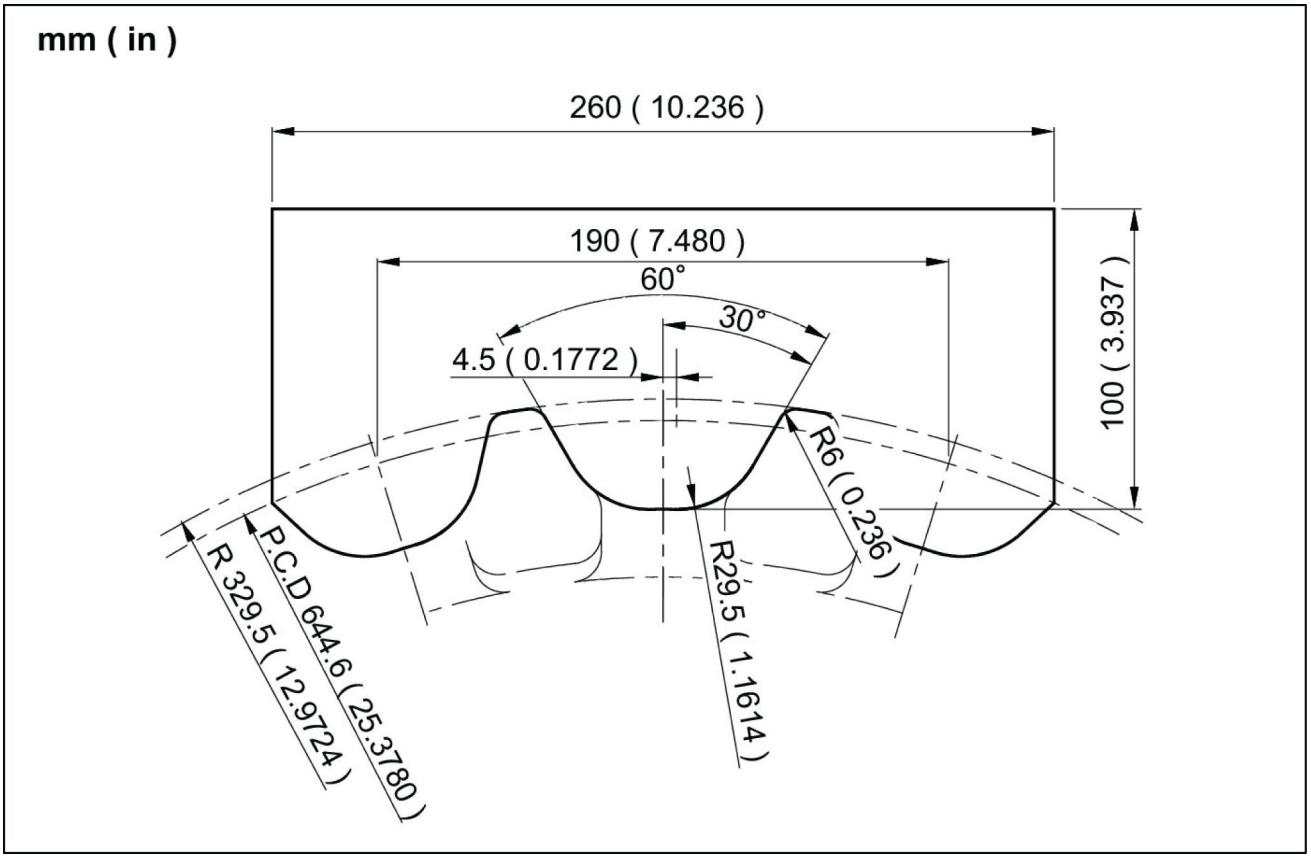
Internal leak inspection

Inner diameter	Oil leak amount
32 mm (**1.260 in**)	**0.4 ml** (**0.01 US fl oz**) / **10 min**
40 mm (**1.575 in**)	**0.6 ml** (**0.02 US fl oz**) / **10 min**
50 mm (**1.969 in**)	**1.0 ml** (**0.03 US fl oz**) / **10 min**
63 mm (**2.480 in**)	**1.6 ml** (**0.05 US fl oz**) / **10 min**
80 mm (**3.150 in**)	**2.3 ml** (**0.08 US fl oz**) / **10 min**
100 mm (**3.937 in**)	**4.0 ml** (**0.14 US fl oz**) / **10 min**
125 mm (**4.921 in**)	**5.6 ml** (**0.19 US fl oz**) / **10 min**
140 mm (**5.512 in**)	**6.0 ml** (**0.20 US fl oz**) / **10 min**
160 mm (**6.299 in**)	**10.0 ml** (**0.34 US fl oz**) / **10 min**
180 mm (**7.087 in**)	**12.6 ml** (**0.43 US fl oz**) / **10 min**
200 mm (**7.874 in**)	**15.6 ml** (**0.53 US fl oz**) / **10 min**
220 mm (**8.661 in**)	**20.0 ml** (**0.68 US fl oz**) / **10 min**
250 mm (**9.843 in**)	**22.0 ml** (**0.74 US fl oz**) / **10 min**

Driving wheel - Dimension

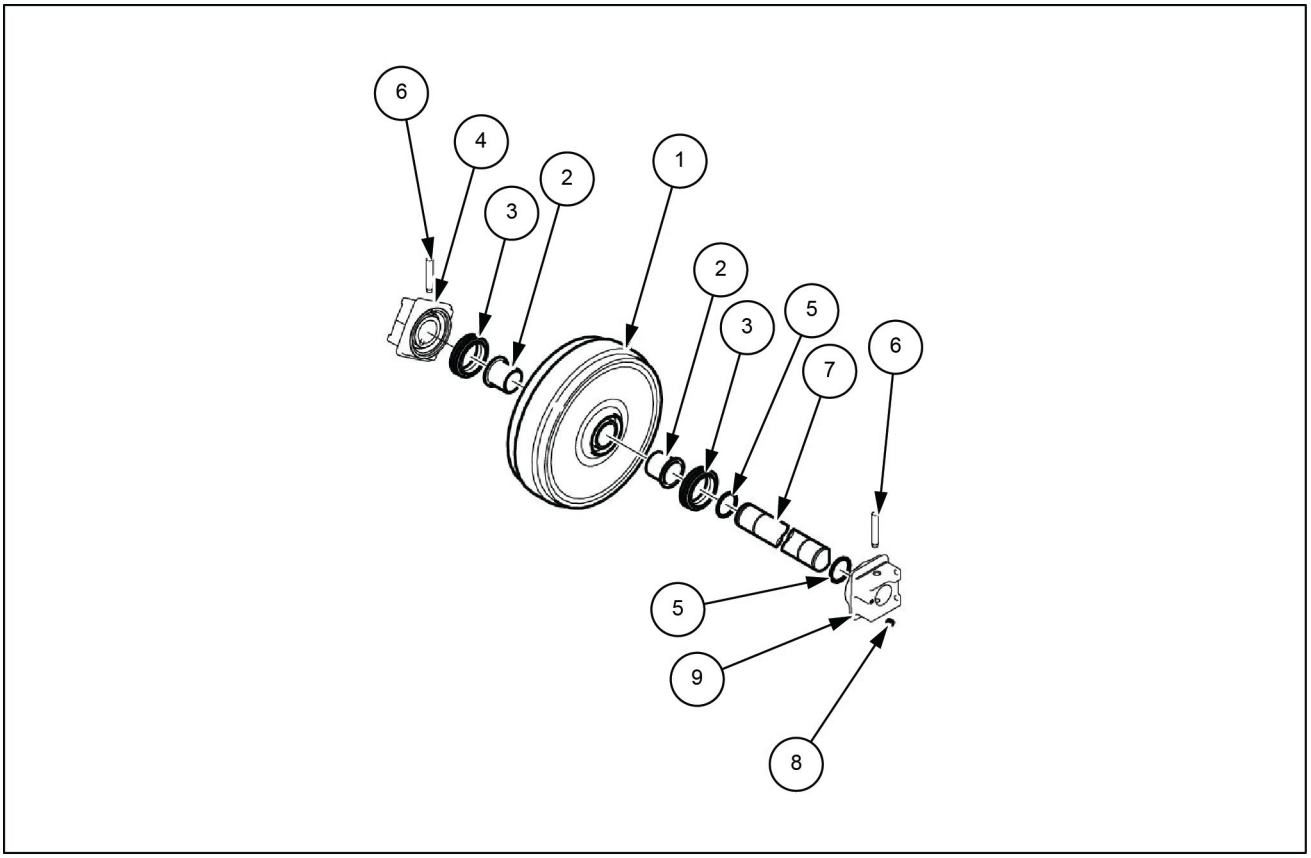
Inspection gauge for drive sprocket



SMIL13CEX1308FA 1

Idler wheel - Exploded view

Configuration diagram



LPIL12CX01169FB 1

	Part name	Part number
1	Roller (Qty. 1)	KRA1768
2	Bushing (Qty. 2)	KRA1201
3	Floating seal (Qty. 2)	BLA2371
4	Hub (without plug) (Qty. 1)	KRA14100
5	O-ring 1A-G50 (Qty. 2)	BHA0863
6	Hub pin (Qty. 2)	KRA14110
7	Shaft (Qty. 1)	KRA14120
8	Plug with seal nylon (Qty. 1)	KHJ0300
9	Hub (Qty. 1)	KRA14090

Contents

Tracks and track suspension - 48

Track rollers - 138

Track support roller - Prepare for disassemble and assemble

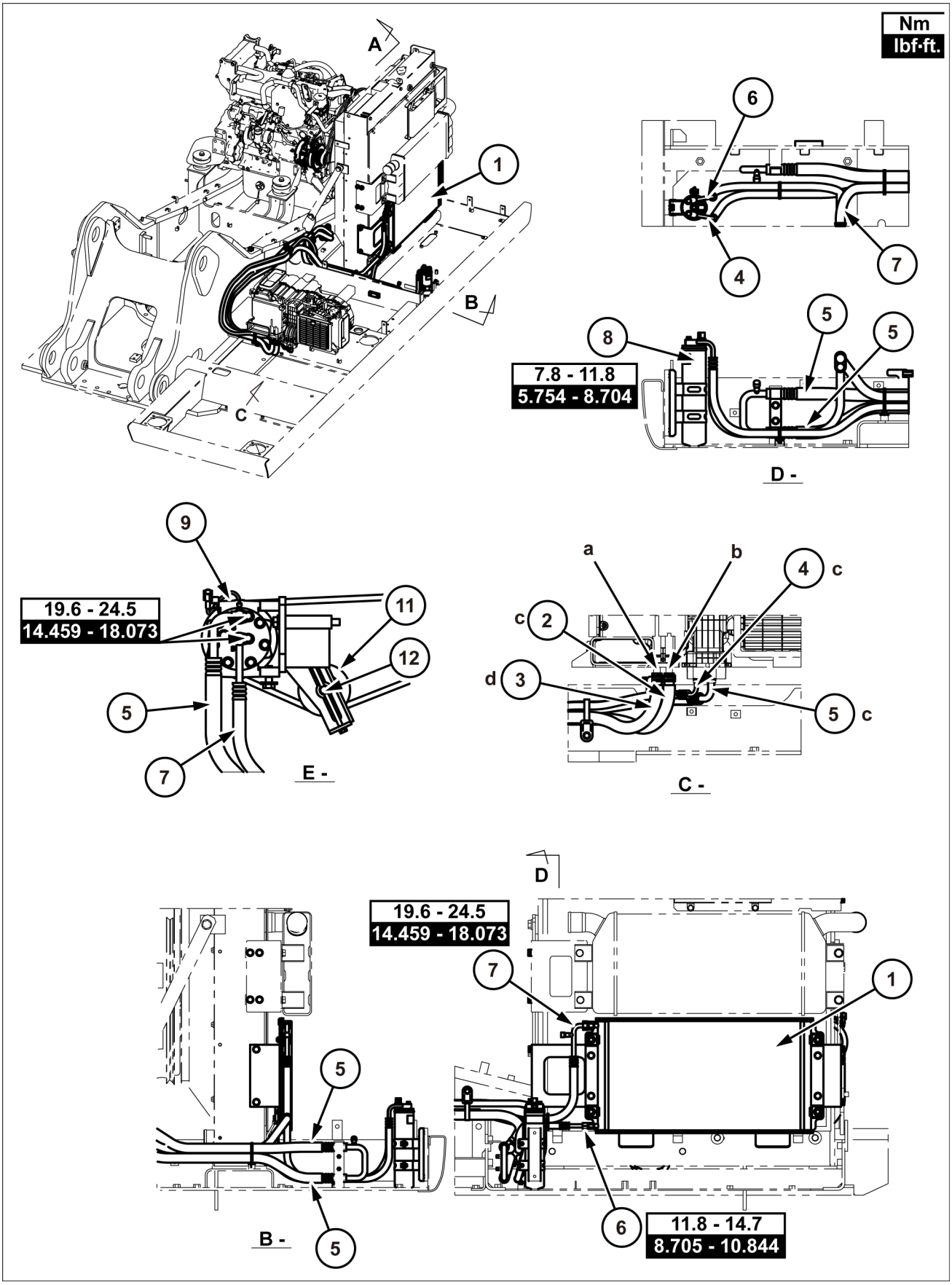
⚠ CAUTION:

- To ensure safe operations, wear protective devices before beginning work and follow all precautions.
- When removing devices or positioning devices at the time of installation, use a removal jig and a hammer or steel rod.
- Follow the precautions below when suspending the load.
- The lift crane must be operated by a qualified operator.
- Do not stand or pass under the suspended load.
- Check the weight of the roller to determine whether it can be carried by hand or whether a lift crane must be used.
- Fasten the roller to a level surface so it does not roll.
- Be sure to repair any parts damaged during disassembly, and prepare replacement parts in advance.
- If any parts are significantly rusted or dirty, clean them before disassembling.
- Any foreign matter entering the equipment during assembly can create a malfunction. Therefore, after thoroughly cleaning the equipment with cleaning oil, air blow the equipment, and assemble in a clean location.
- When assembling touching parts, be sure to coat them with new hydraulic oil.
- As a rule, replace all O-rings and other seal parts with new parts.

General cautions

- Be careful not to drop precision parts or let bump them with other parts during work.
- Do not forcefully open or hit parts in an effort to speed up operations. Pay careful attention and proceed slowly so as not to damage any parts, create any oil leaks, or compromise the efficiency of the equipment, etc.
- Disassembled parts can easily rust or collect dust. Therefore, immediately after disassembling parts, take precautions to prevent the parts from rusting or collecting dust.

Air conditioning - Overview – Frame



SMIL15CEX3191HB 1

Air conditioning - Service instruction - Work precautions

⚠ WARNING

Pressurized system!
Refrigerant under pressure. Service, repair, or recharging must be performed only by trained service technician.
Failure to comply could result in death or serious injury.

W1180A

⚠ WARNING

Escaping refrigerant may cause frostbite!
Always wear protective goggles when handling refrigerant. If you get refrigerant in your eye, immediately flush your eyes with water for 15 minutes. Seek medical assistance immediately.
Failure to comply could result in death or serious injury.

W0339A

⚠ WARNING

Explosion hazard!
Air-conditioning refrigerant boils at -12 °C (10 °F)!
-NEVER expose any part of the air-conditioning system to a direct flame or excessive heat.
-NEVER disconnect or disassemble any part of the air-conditioning system.
Discharging refrigerant gas into the atmosphere is illegal in many countries.
Failure to comply could result in death or serious injury.

W0340A

⚠ WARNING

Escaping refrigerant may cause frostbite!
If you get refrigerant on your skin:
-Warm the area with your hand or lukewarm water, 32 - 38 °C (90 - 100 °F).
-Cover the area loosely with a bandage to protect the area and the prevent infection.
-Seek medical assistance immediately.
Failure to comply could result in death or serious injury.

W0341A

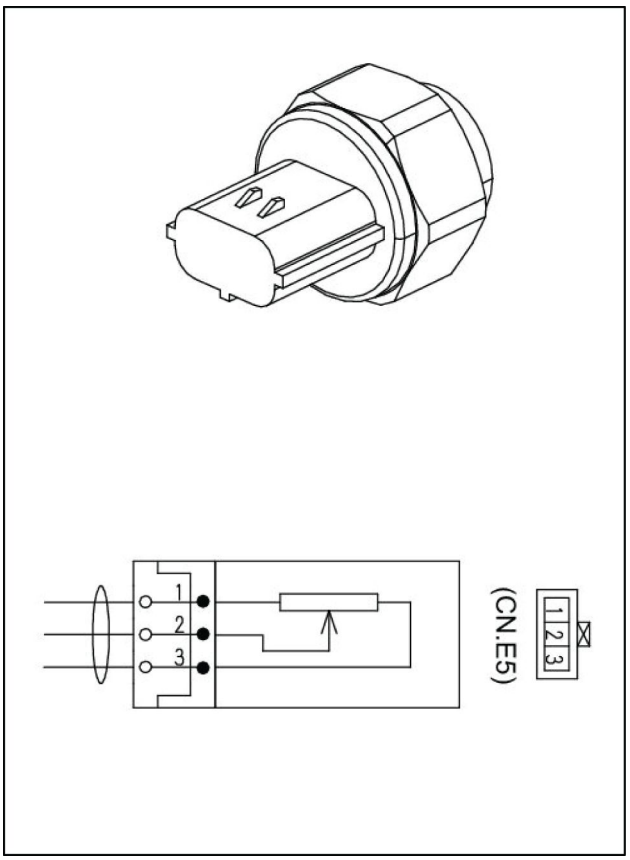
NOTICE: *Refrigerant in the liquid state is very cold [about **-26 °C** (**-14.8 °F**)], so be very careful during handling.*

Always use **R134A** refrigerant.

- Storage
  Keep service cans (hereinafter, cans) with refrigerant in them at **40 °C** (**104.0 °F**) or below.
  The insides of the cans are highly pressurized and filled with refrigerant, so if the temperature rises there is the danger of internal pressure rising sharply and an explosion occurring.
  Never store in direct sunlight, in a closed vehicle, or near open flames.
  Be careful not to drop cans or have them collide with other objects.

Name: Common rail pressure sensor

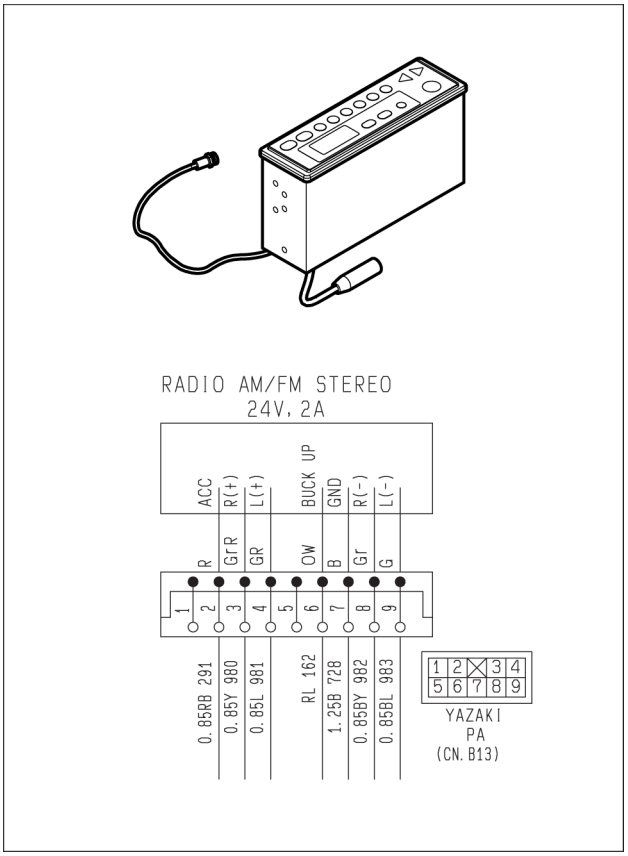
Common rail accessory
Common rail part No.: 898027-4560



LPIL12CX00561BA 17

Name: Vehicle radio

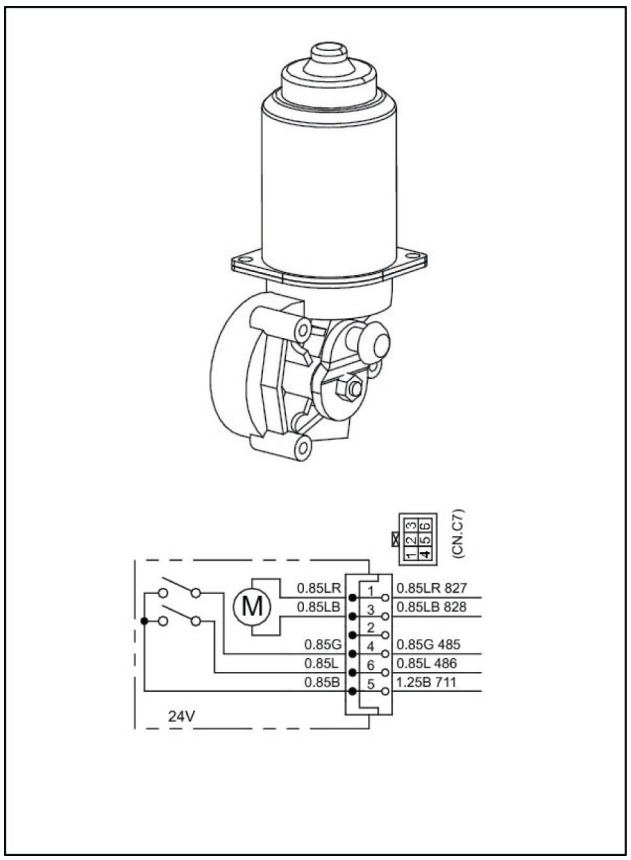
Part No.: KHR32850



SMIL15CEX1714BA 18

Name: Wiper motor

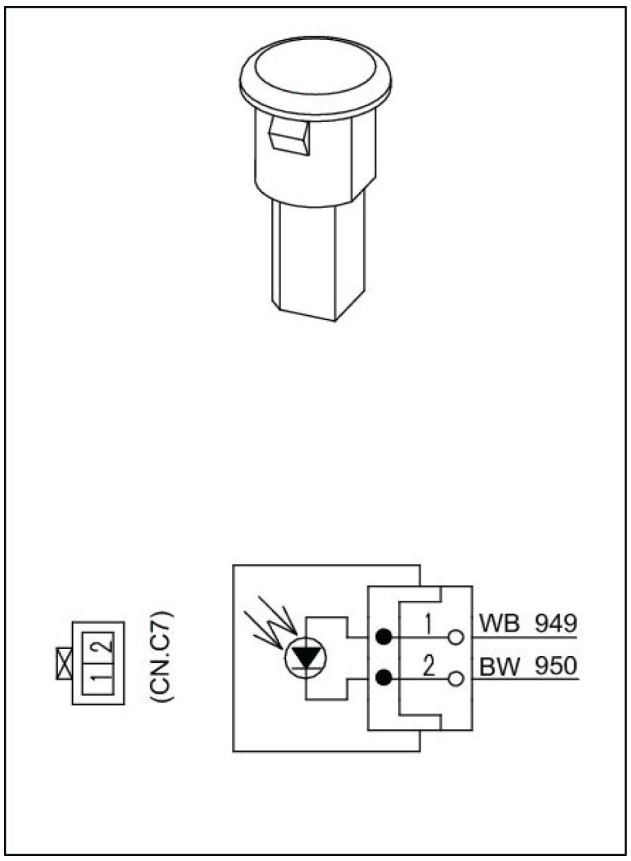
Part No.: KHN25780



LPIL12CX00807AA 69

Name: Solar radiation sensor

Part No.: KHR10540



LPIL12CX00808BA 70

Many OBD system checks go into the backup operation mode based on the instruction from the ECM which is given when the ECM detects a failure in the related systems or components.

When the backup operation mode is activated, the output is reduced to protect the actual unit.

Trouble diagnosis

Basic knowledge of tools required

- When performing the diagnostic procedure, lack of basic knowledge regarding this powertrain could result in an incorrect diagnosis or damage to the powertrain components.
  Do not attempt to diagnose a problem related to the powertrain without having the basic knowledge.
  A basic understanding of hand tools, such as the trouble diagnosis scan tools, is required to utilize the service manual effectively.

About the diagnostic test performed on the actual unit

Past failures

- The diagnostic tests of the previous ignition cycle have been completed.
- The diagnostic tests of the current ignition cycle have passed.
- Problems identified in the diagnostic tests currently do not exist.

Current failures

- The diagnostic tests of the previous ignition cycle have been completed.
- Problems identified in the diagnostic tests currently exist.
- Problems exist in the current ignition cycle.

Glossary

DTC

Every time the starter switch is turned “ON”, the ECM performs the self-test on most of the wiring and components, records any detected system failure in the memory of the ECM, and performs the backup control, depending on the DTC.

Also, abnormalities that affect travel will cause the monitor to show an abnormality display to inform the operator.

Ignition cycle

Because the actual unit activates with a method to satisfy a predetermined diagnosis standard, an ignition cycle is defined as turning the starter switch “ON”, running, then turning the starter switch “OFF”.

Wiring harnesses - Electrical schematic sheet 06 – Engine controller

Type	Components	Connectors/link	Description
	A2		Engine controller
Connector	CN.D01-02	**CN.D01-02**	Engine controller
Connector	CN.D7	**CN.D7**	
Connector	CN.D9	**CN.D9**	

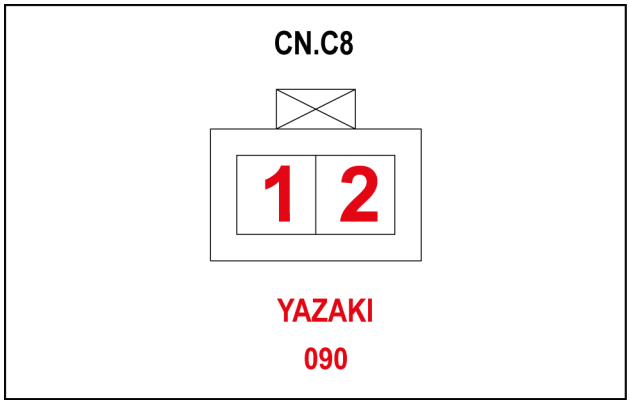
Wiring harnesses - Electrical schematic sheet 19 – Main cab-controller B

Type	Components	Connectors/link	Description
Controller	A13		Controller B
Connector	CN.A6	**CN.A6**	Controller B
Connector	CN.A7	**CN.A7**	Controller B
Connector	CN.A8	**CN.A8**	Controller B
Connector	CN.A24	**CN.A24**	
Connector	CN.A25	**CN.A25**	
Connector	CN.A55	**CN.A55**	
Connector	CN.A56	**CN.A56**	

Wiring harnesses - Electrical schematic sheet 27 – Main cab-relays

Type	Components	Connectors/link	Description
Relay	K34		Relay starter cut
Relay	K63		Relay ECM
Relay	K64		Relay key ON
Relay	K65		Relay battery RL
Relay	K66		Relay idle stop
Relay	K67		Relay DPF
Relay	K68		Relay neutral start
Connector	CN.A09	**CN.A09**	Relay ECM
Connector	CN.A10	**CN.A10**	Relay DPF
Connector	CN.A11	**CN.A11**	Relay battery RL
Connector	CN.A12	**CN.A12**	Relay idle stop
Connector	CN.A13	**CN.A13**	Relay key ON
Connector	CN.A14	**CN.A14**	Relay neutral start
Connector	CN.A15	**CN.A15**	Relay starter cut
Connector	CN.A30	**CN.A30**	PN diode
Connector	CN.A52	**CN.A52**	
Connector	CN.A53	**CN.A53**	
Connector	CN.A59	**CN.A59**	PN diode

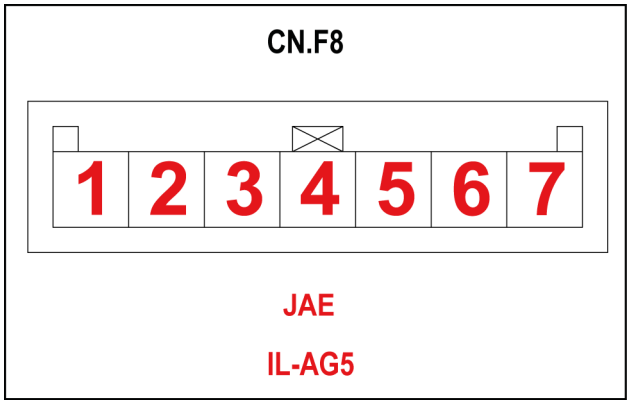
CONNECTOR CN.C8 - ROOM LAMP (Male)



SMIL15CEX3876AA 43

Pin	From	Wire	Description	Color-Size	Frame
1	CN.A45-F-P-11	888A		G	**SHEET 24**
2	CN.C9-M-P-4	843A		Y	

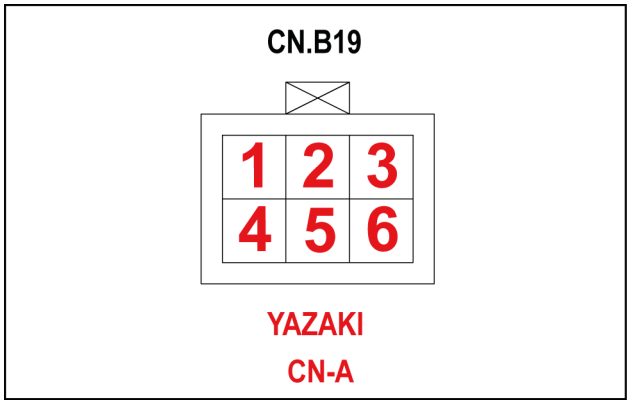
CONNECTOR CN.F8 - MOTOR ACTUATOR (MODE) (Male)



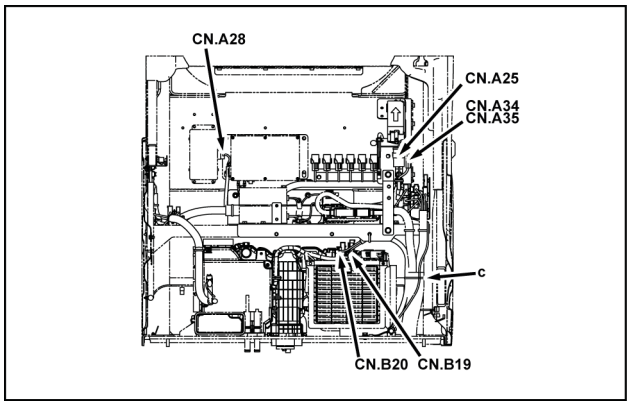
SMIL15CEX4053AA 69

Pin	From	Wire	Description	Color-Size	Frame
2	SP-928-P-X	927		LY	**SHEET 35**
3	CN.B20-F-P-20	930A		YL	
4	SP-934-P-X	933		BL	
6	CN.B20-F-P-14	923A		YW	
7	CN.B20-F-P-13	922A		YR	

CONNECTOR CN.B19 - (Female)



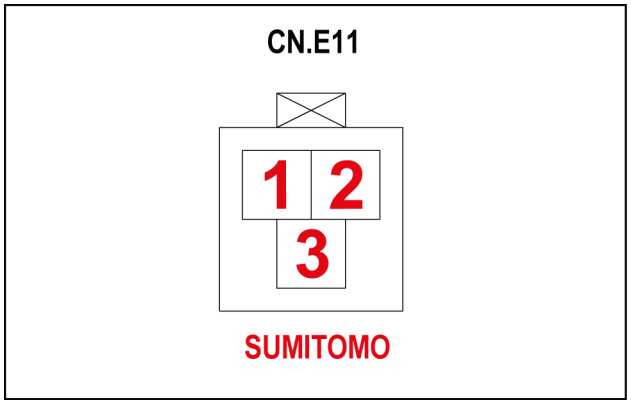
SMIL15CEX4044AA 37



SMIL15CEX3886AA 38

Pin	From	Wire	Description	Color-Size	Frame
1	CN.F2-P-1	235B		WR-2	**SHEET 34**
2	SP-240C-P-X	240C		LR-0.85	
3	CN.F2-P-2	230C		VR	
4	CN.F1-P-3	943C		GW-0.85	
6	CN.F4-P-1	730B		B-2	

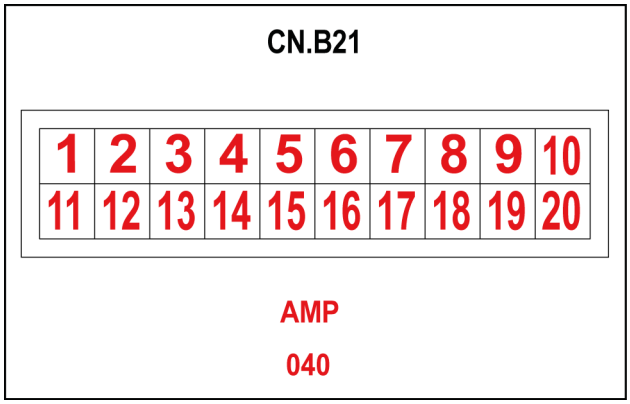
CONNECTOR CN.E11 - WATER TEMPERATURE SENSOR (Male)



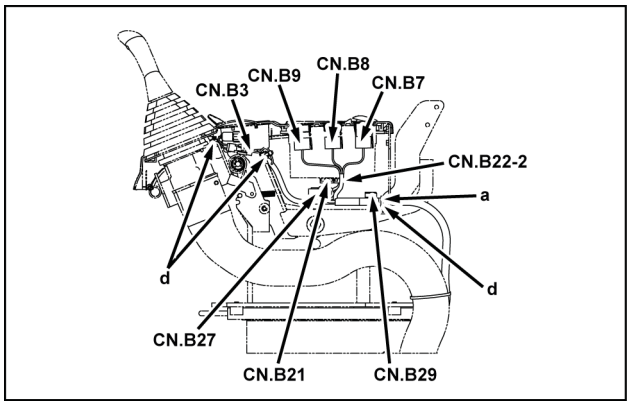
SMIL15CEX4033AA 63

Pin	From	Wire	Description	Color-Size	Frame
1	CN.D10-F-P-5	340A		BY-0.75	**SHEET 07**
2	SP-343-P-X	343C		RB-0.75	
3	SP-343-P-X	XXB		R-0.75	

CONNECTOR CN.B21 - AIR CONDITIONER SWITCH PANEL (Male)



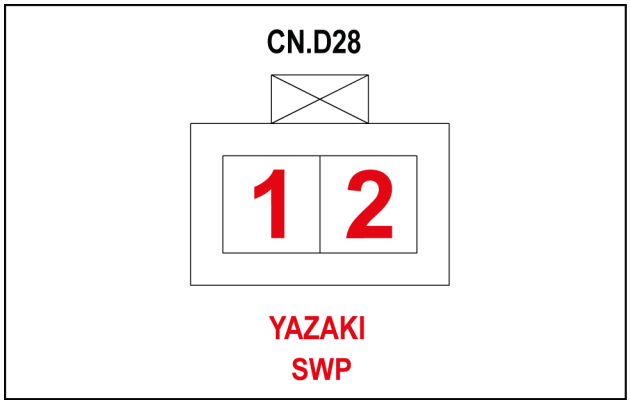
SMIL15CEX4043AA 30



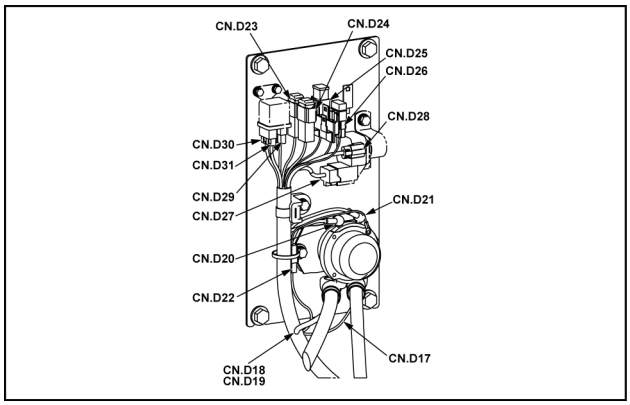
SMIL15CEX3926AA 31

Pin	From	Wire	Description	Color-Size	Frame
1	SP-230-P-X	231		VR	**SHEET 34**
2	CN.B20-M-P-16	925		LW	**SHEET 35**
3	CN.B20-M-P-15	924		LR	
4	CN.B20-M-P-14	923		YW	
5	CN.B20-M-P-13	922		YR	
6	CN.B20-M-P-12	921		GW	
7	CN.B20-M-P-11	920		GR	
11	SP-730-P-X	731		B	**SHEET 34**
12	SP-946-P-X	946		BW	**SHEET 33**
13	CN.B20-M-P-22	932		BL	**SHEET 35**
15	CN.B20-M-P-18	926		LY	
16	CN.A48-M-P-12	949C		WB	**SHEET 32**
18	CN.B20-M-P-9	947		L	**SHEET 34**
19	CN.B20-M-P-8	945		Sb	

CONNECTOR CN.D28 - RELAY STARTER (Male)



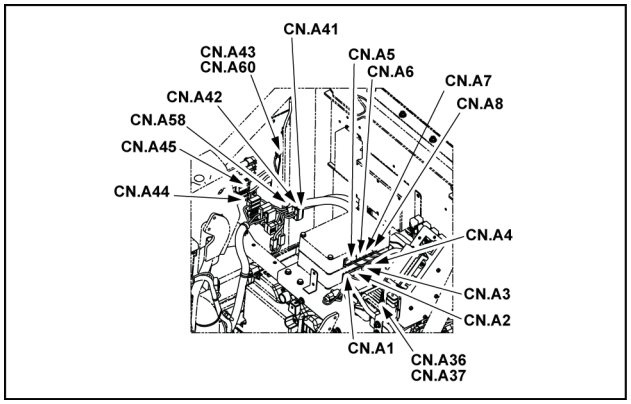
SMIL15CEX3989AA 61



SMIL15CEX3949AA 62

Pin	From	Wire	Description	Color-Size	Frame
1	SP-012-P-X	12		GrR-0.85	**SHEET 01**
2	SP-750-P-X	750		B-0.85	

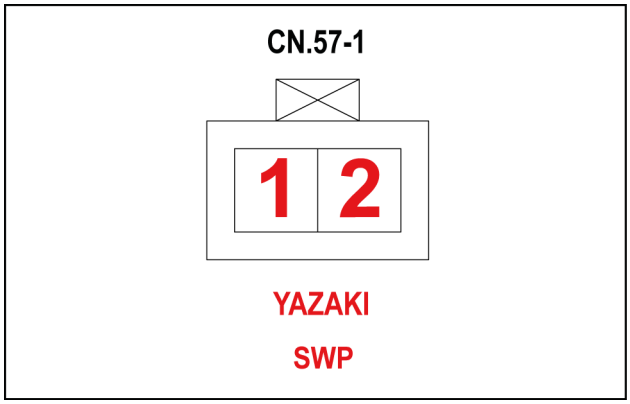
CONNECTOR CN.A43 - GROUND (Male)



SMIL15CEX3855AA 7

Pin	From	Wire	Description	Color-Size	Frame
M8	CN.A24-M-P-10	740		B-1.25	**SHEET 25**

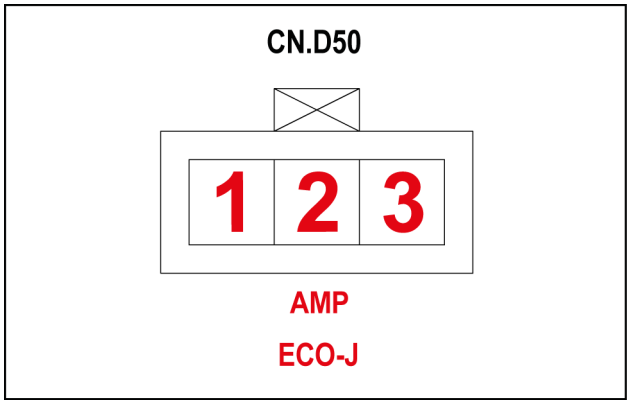
CONNECTOR CN.57-1 - OPTION SELECT SOLENOID VALVE (Male)



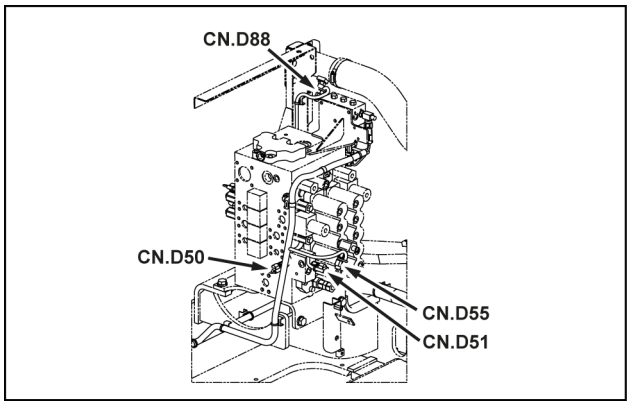
SMIL15CEX4164AA 2

Pin	From	Wire	Description	Color-Size	Frame
1	SP-260G-P-X	260F		WL	**SHEET 16**
2	CN.A57-P-2	806C		LY	**SHEET 15**

CONNECTOR CN.D50 - PRESSURE SENSOR (PILOT UPPER) (Male)



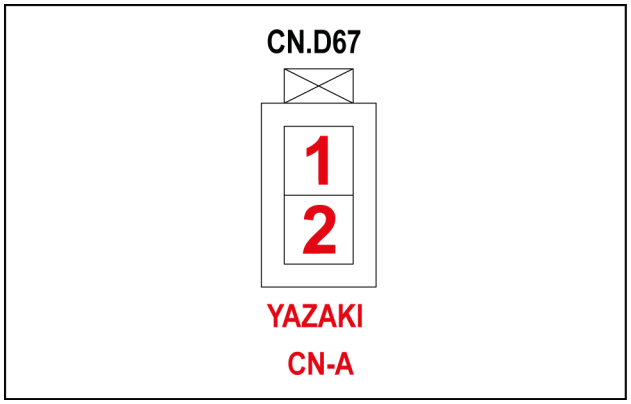
SMIL15CEX3980AA 38



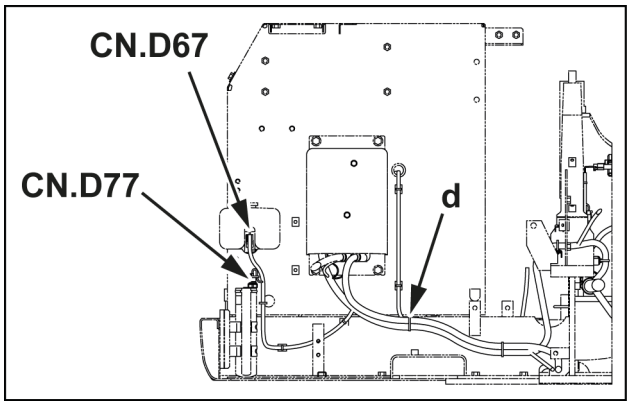
SMIL15CEX3979AA 39

Pin	From	Wire	Description	Color-Size	Frame
1	SP-409D-P-X	405		W-0.85	**SHEET 14**
2	CN.A54-M-P-8	415A		V-0.85	**SHEET 18**
3	SP-429D-P-X	425		BW-0.85	**SHEET 14**

CONNECTOR CN.D67 - WASHER MOTOR (Male)



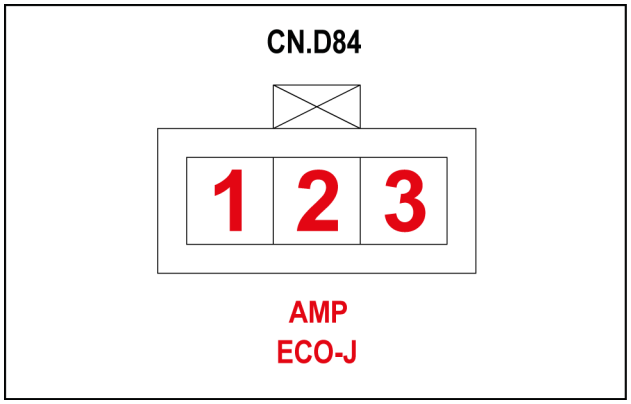
SMIL15CEX4001AA 28



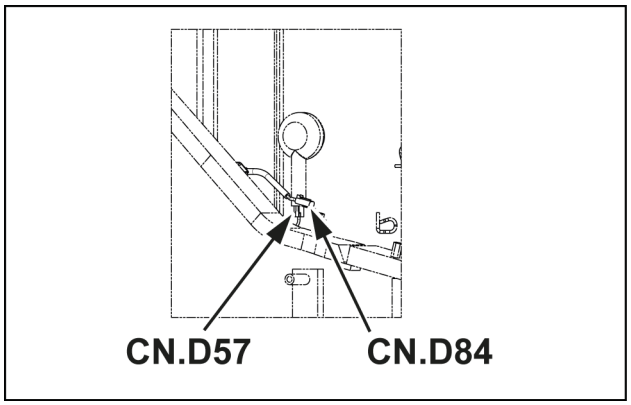
SMIL15CEX4000AA 29

Pin	From	Wire	Description	Color-Size	Frame
1	SP-830-P-X	829C		WV-0.85	**SHEET 10**
2	SP-755-P-X	755		B-0.85	

CONNECTOR CN.D84 - HYDRAULIC FILTER PRESSURE SENSOR (Male)



SMIL15CEX3971AA 9



SMIL15CEX3969AA 10

Pin	From	Wire	Description	Color-Size	Frame
1	SP-400A-P-X	407		W-0.85	**SHEET 13**
2	CN.A56-M-P-14	417A		LR-0.85	**SHEET 18**
3	SP-427-P-X	427		BW-0.75	**SHEET 13**

Engine timing sensors Crankshaft sensor - Install

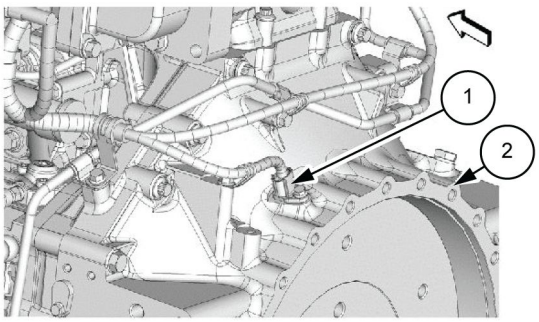
CKP sensor installation

1. Install the CKP sensor **(1)** to the flywheel housing **(2)**.

   CAUTION:

   Be careful not to subject the sensor to shock.

   - Tighten together with the clip.
   - Tightening torque: **6 N·m** (**53 lb in**)
2. Connect the harness connector to the CKP sensor **(1)**.



SMIL13CEX0857AB 1

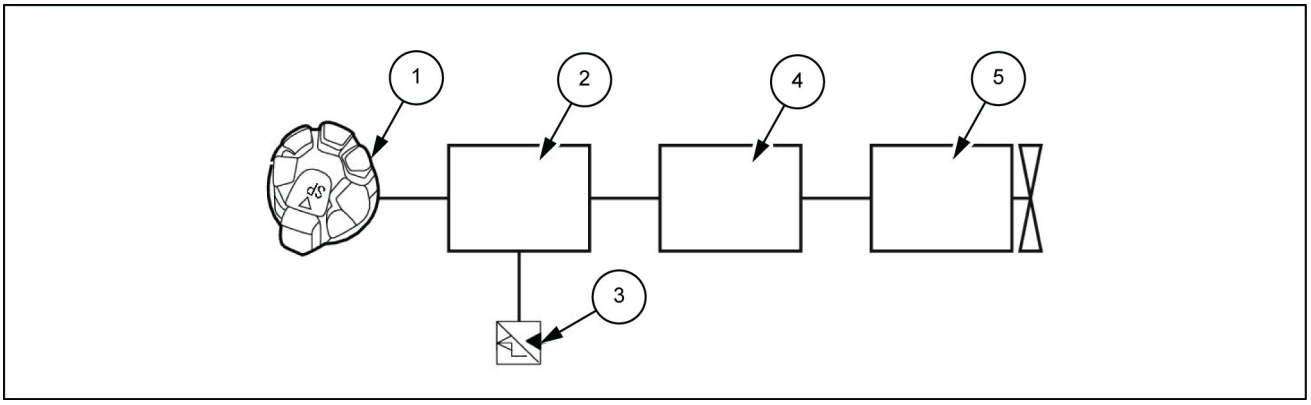
Battery ground cable connect

1. Connect the battery ground cable to the battery.

Engine starting system - Dynamic description – Idle up

Purpose

Raises the engine speed and maintains mechanical speed.



LPIL12CX00399EB 1

1. Throttle volume
2. Computer A
3. Pressure sensor (travel)
4. ECM
5. Engine
a. Engine speed

During SP mode travel

1. Idle up operation conditions
   The operation starts when all the conditions below are satisfied.
   A. When travel operation was performed. (Travel pressure sensor “ON”)
   B. When the work mode is SP mode.
2. Idle up end conditions
   Idle up is ended under the following conditions.
   A. The work mode is other than SP mode.
   B. When no travel operation is performed.

During low speed

1. Idle up operation conditions
   A. The target speed is lower than the idle up speed.
   B. When the lever is operated, it was judged that the system flow amount was insufficient.
   C. Must not be during swing, travel, or option (1 or 2) operation.

Thoroughly check for any leaking or clogging.

Check for fuel leaks and damage and denting on pipes in the fuel system.

Suction air system parts abnormality.

Exhaust system parts abnormality.

Diagnostic aids

Fuel cut-off, fuel freezing, air entering fuel line, filter abnormality, line abnormality, fuel quality, fuel tank and other fuel system abnormalities.

EGR valve abnormality and other suction air system abnormalities.

Excessive fuel injection and other injector abnormalities.

Engine abnormality caused by seizing, compression pressure deficiency and other mechanical troubles.

Troubles related to the hydraulic pump and other device on the machine.

ECM trouble.

Inspect for connector connection problems, abnormalities involving friction or breaking in harnesses, any wires inside harnesses separated and touching another circuit and causing a short.

Also, perform functional diagnosis inspection, check operations and control in each area, and repair any abnormalities.

Engine suction exhaust system inspection locations.

Inspect the suction air and exhaust systems for clogging, crushing, breaking, and any other abnormalities

In addition to the engine main unit inspection locations, perform inspection of the air cleaner, intercooler, and muffler.

2. Use a tester to measure the voltage.

   Supplement

   - If the test lamp does not illuminate when the switch 2 is closed, measure the voltage of the L terminal.
   - If the voltage is close to the battery voltage, inspect the alternator.
   - If the voltage is low, check the lamp or lamp circuit for a disconnection.

3. Use a tester to inspect the alternator.

   Supplement

   - Gradually increase the alternator rotation speed and check that the test lamp goes off before the rotation speed reaches about **1300 RPM**.
   - If the test lamp does not go off, inspect the alternator.

4. Use a tester to measure the voltage.

   Supplement

   - Measure the voltage when the alternator rotation speed is about 1300 rpm.
   - If the voltage exceeds **30 V**, inspect the regulator assembly.
   - If the voltage does not exceed the battery voltage, inspect the alternator.

5. Use a tester to inspect the regulator assembly.

   Supplement

   - Increase the alternator rotation speed and check the current when the rotation speed is about **5000 RPM**.
   - If the ammeter indicates more than **5 A**, continue charging for a while until it indicates less than **5 A** or replace with a fully charged battery.

6. Use a tester to measure the voltage.

   Supplement

   - If the current is less than **5 A** when the alternator rotation speed is about **5000 RPM**, measure the regulator adjustment voltage.
     Regulator adjustment voltage standard range: **28 - 29 V**.

NOTICE: *If the regulator adjustment voltage is outside the standard range, replace the regulator assembly.*

7. Stop the alternator.
8. Close the switch.

   Supplement

   - Close the switch 2.

NOTICE: *Check that the test lamp illuminates.*

9. Close the switch.

   Supplement

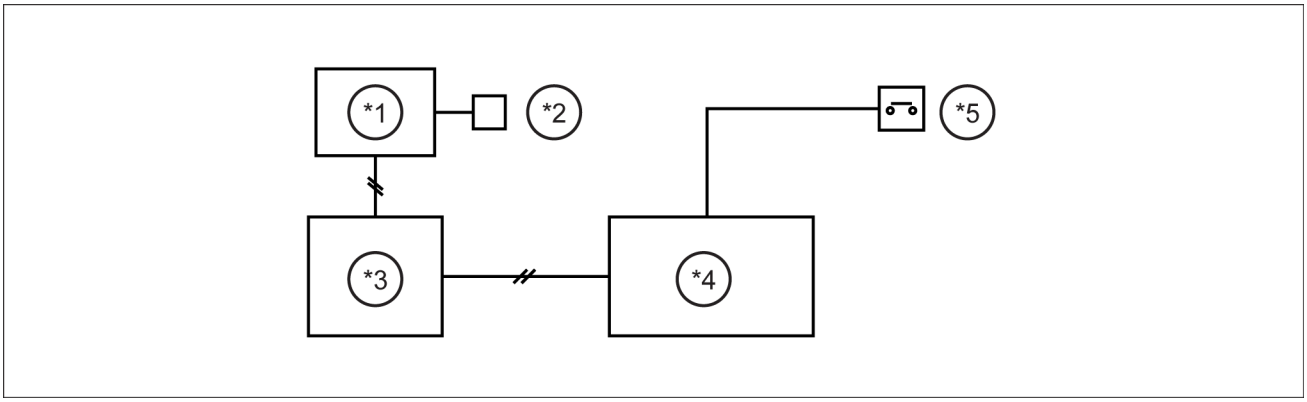
   - Set the no-load resistance to the maximum value and close the switch 3.

Fuel filter sensor - Dynamic description Fuel Filter Water Level Abnormality

Summary

Issues a warning when the fuel filter water level is abnormal.

Configuration



SMIL15CEX3197EB 1

1. Color monitor
2. Buzzer
3. Computer B
4. Computer A
5. Fuel filter water level sensor

Operation explanation

1. Turn the key ON .
   - The computer A controls the system and the result is displayed on the monitor via the computer B.
2. When the system detects the following, a fuel filter water level abnormality warning is issued.
   - The fuel filter water level switch has been ON for **5 s** or more.

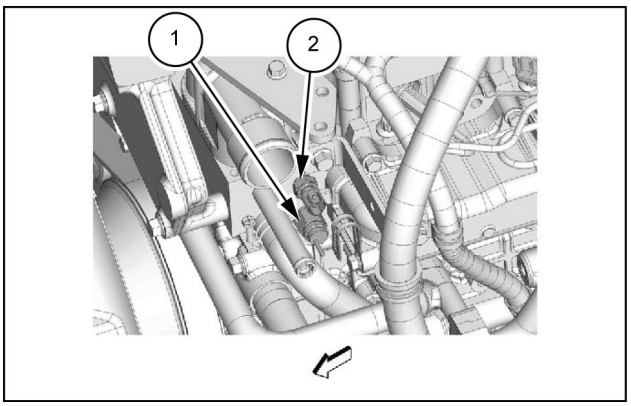
Error code	Type of trouble	Conditions to perform diagnosis	Conditions to determine failure	Time to determine failure
P7428	Water in the fuel filter has increased to **100 mL** (**3.38 US fl oz**) or more	■ When the machine is not moving. (Upper, swing, and travel pilot pressures are monitored.) ■ Fuel temperature **0 °C** (**32.0 °F**) or more	When determined with switch ON	**5000 ms**, continuous

3. A message is displayed and a buzzer sounds.
   - Monitor warning message "FUEL FILTER" is displayed.
   - The buzzer sounds.

Coolant high temperature sensor - Install

Overheat switch installation

1. Install the overheat switch **(1)** to the cylinder head assembly.
   - Apply **LOCTITE® 572™** to the threaded portion.
   - Tightening torque: **29 N·m** (**21 lb ft**)
2. Connect the harness connector to the overheat switch **(1)**.



SMIL13CEX1334AB 1

2. Water temperature sensor

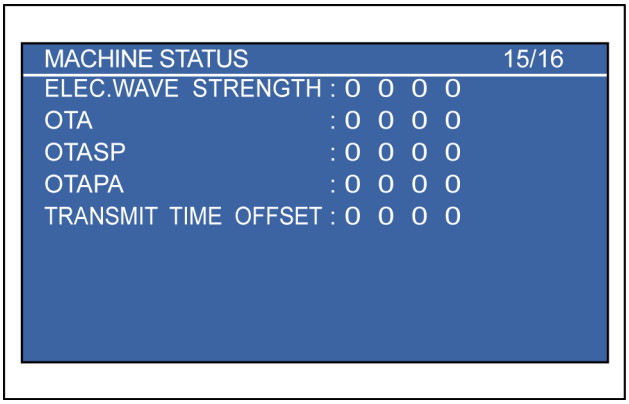
Electronic modules - Install

1. To install, perform the reverse of the removal procedure.

15. GPS information

Computer T provided

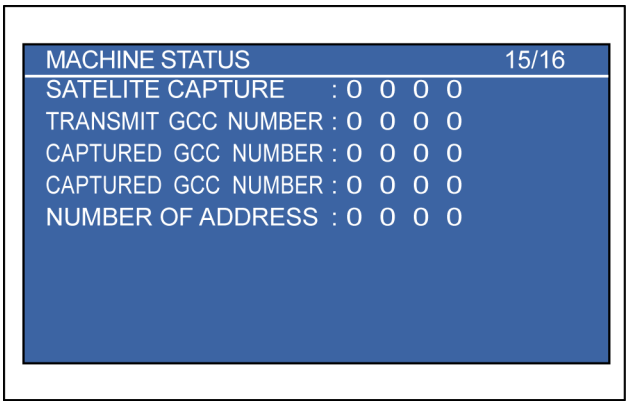
ELEC.WAVE STRENGTH	-	Wave strength
OTA	-	OTA execution result
OTASP	-	OTASP result code
OTAPA	-	OTAPA result code
TRANSMIT TIME OFFSET	sec	Offset time



SMIL14CEX0464AA 15

Computer S provided

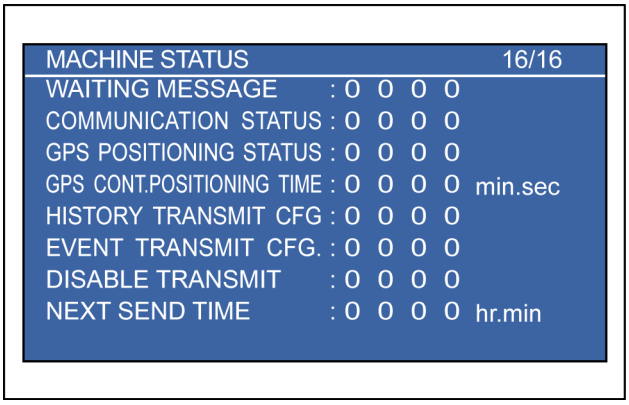
SATELITE CAPTURE	-	Satellite capture status
TRANSMIT GCC NUMBER	-	Transmit GCC
CAPTURED GCC NUMBER	-	Captured GCC
CAPTURED GCC NUMBER	-	Captured GCC
NUMBER OF ADDRESS	-	Send destination count



SMIL14CEX0465AA 16

16. GPS information

WAITING MESSAGE	-	Waiting message count
COMMUNICATION STATUS	-	Default setting status
GPS POSITIONING STATUS	-	GPS positioning status
GPS CONT.POSI-TIONING TIME	min.sec	GPS continuous positioning time
HISTORY TRANSMIT CFG.	-	Send distribution setting
EVENT TRANSMIT CFG.	-	Event send setting
DISABLE TRANSMIT	-	Send prohibition setting
NEXT SEND TIME	hr.min	Time until next regular transmission

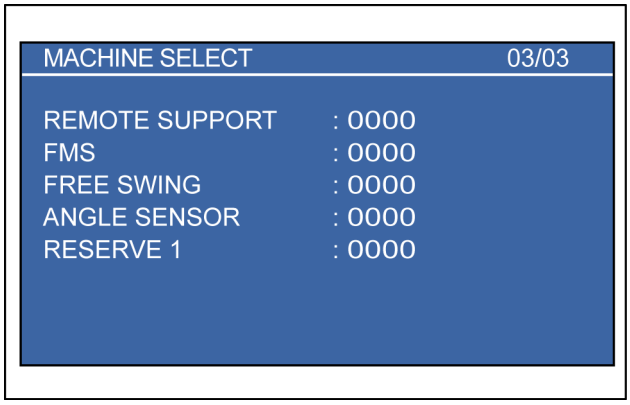


SMIL14CEX0466AA 17

To switch to a page from 1 to 16, press the light switch  while the MACHINE STATUS screen is displayed, and select the desired page.

3. Model select

REMOTE SUPPORT	Remote support
FMS	Fuel abnormality warning (FMS)
FREE SWING	Free swing
ANGLE SENSOR	Angle sensor
RESERVE 1	(Option)



SMIL14CEX0670AA 4

Remote support

Value	Contents	Remarks
0	No number	
1	No number	

FMS

Value	Contents	Remarks
0	No number	
1	No number	

Free swing

Value	Contents	Remarks
0	Not used	
1	Used	

Angle sensor

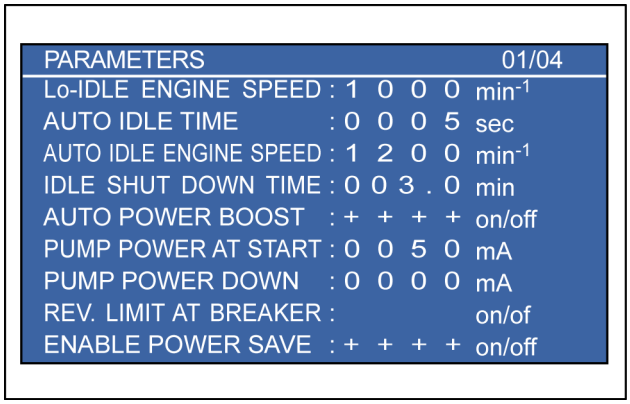
Value	Contents	Remarks
0	MONO or none	Supported from Ver. 2.00
1	OFFSET	Supported from Ver. 2.00
2	No number	

Parameters

The work mode speed and pump milli-amps can be set.

1. Engine

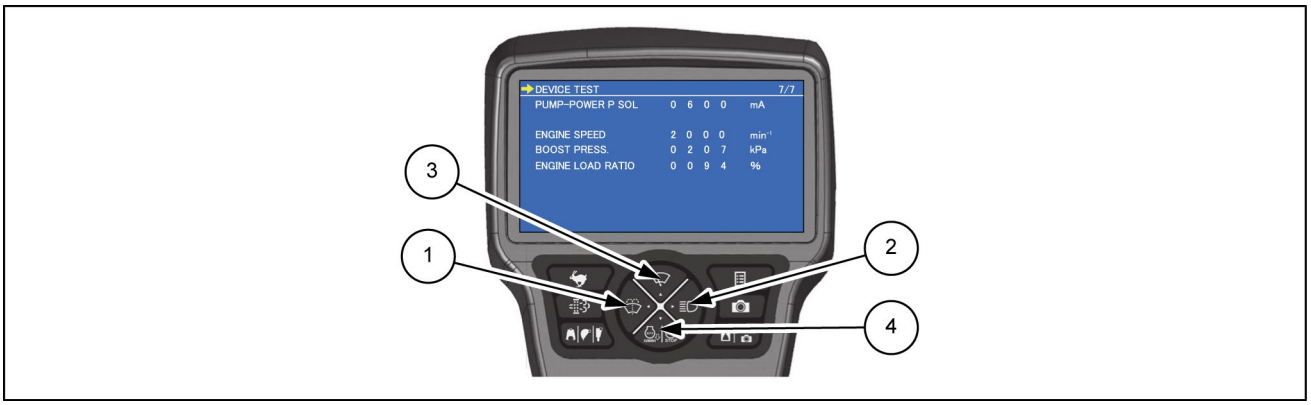
Lo-IDLE ENGINE SPEED	min-1 (rpm)	Low idle engine speed
AUTO IDLE TIME	sec	Auto idle time
AUTO IDLE ENGINE SPEED	min-1 (rpm)	Auto idle speed
IDLE SHUT DOWN TIME	min	Idle shutdown time
AUTO POWER BOOST	on/off	Auto pressure boost control
PUMP POWER AT START	mA	Milli-amp for pump horsepower control proportional valve: at start of ATT operation
PUMP POWER DOWN	mA	Milli-amp for pump horsepower control proportional valve: negative offset amount
REV. LIMIT AT BREAKER	on/off	Flow control by engine speed (in breaker mode)
ENABLE POWER SAVE	on/off	Power save function



SMIL14CEX0662AA 5

Turbo boost test

Purpose: To check the turbo boost pressure.



SMIL14CEX0529EB 18

Procedure

1. Setting for turbo boost test
   Select “ITEM-1” with switches **(3)** and **(4)**.
   Press switches **(1)** and **(2)** to set the maximum value of **740 mA**.
   Available set range: **50 - 740 mA**
2. Test execution
   Raise the engine speed to the SP mode.
   Slowly bring the 2 pump function to the stall condition.
   Maximum boost value, engine speed, and engine ratio are displayed.
3. Test finish
   Record the maximum turbo boost value.
   * The actual engine turbo boost pressure is calculated by subtracting the barometric pressure [BAROMETRIC PRESS. – MACHINE STATUS] value from the displayed turbo boost pressure.

Contents

Electrical systems - 55

Cab Heating, Ventilation, and Air-Conditioning (HVAC) controls - 051

FUNCTIONAL DATA

SERVICE

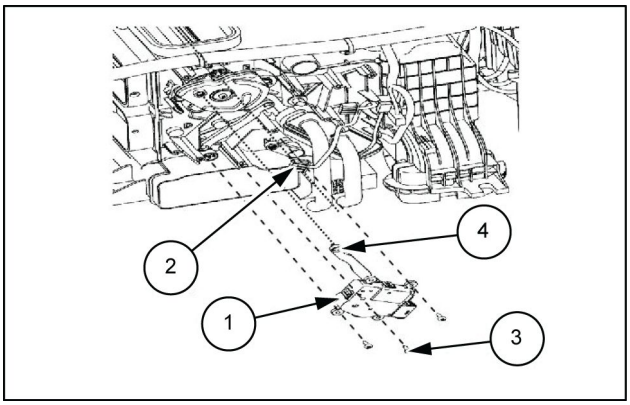
Heating, Ventilation, and Air-Conditioning (HVAC) control system - Replace

Replacement of mode motor actuator

Remove the link cover.
Remove the connector **(2)** from the motor actuator **(1)**.
Remove the 3 Phillips screws **(3)** securing the motor actuator **(1)**, remove the rod **(4)** attached to the motor actuator **(1)** from the rod hole on the mode cam, and then install the new motor actuator **(1)**.
The installation procedure is the reverse of the removal procedure.

Screw size

Phillips screws **(3)**: **M4** x **16 mm** (**0.630 in**) **(T1)**



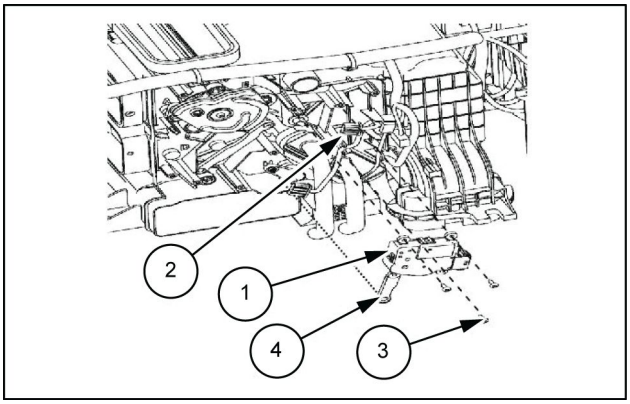
LPIL12CX00481AB 1

Replacement of air mix motor actuator

Remove the link cover.
Remove the connector **(2)** from the motor actuator **(1)**.
Remove the 3 Phillips screws **(3)** securing the motor actuator **(1)**, remove the rod **(4)** attached to the motor actuator **(1)** from the rod hole on the damper lever, and then install the new motor actuator **(1)**.
The installation procedure is the reverse of the removal procedure.

Screw size

Phillips screws **(3)**: **M4** x **16 mm** (**0.630 in**) **(T1)**



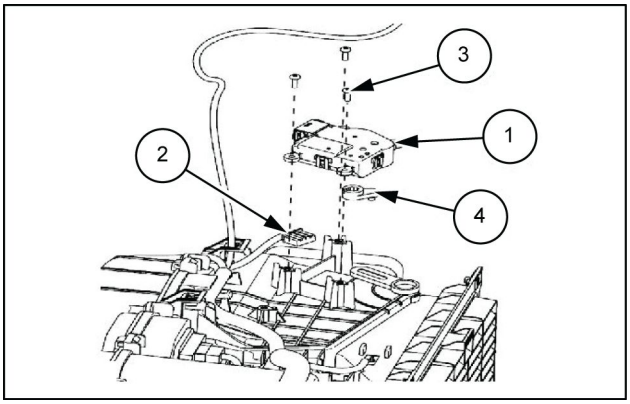
LPIL12CX00482AB 2

Replacement of refresh/recirculate motor actuator

Remove the link cover.
Remove the connector **(2)** from the motor actuator **(1)**.
Remove the 3 Phillips screws **(3)** securing the motor actuator **(1)**, remove the lever pin **(4)** attached to the motor actuator **(1)** from the slot hole, and then install the new motor actuator **(1)**. The installation procedure is the reverse of the removal procedure.

Screw size

Phillips screws **(3)**: **M4** x **16 mm** (**0.630 in**) **(T1)**



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Electrical systems - 55

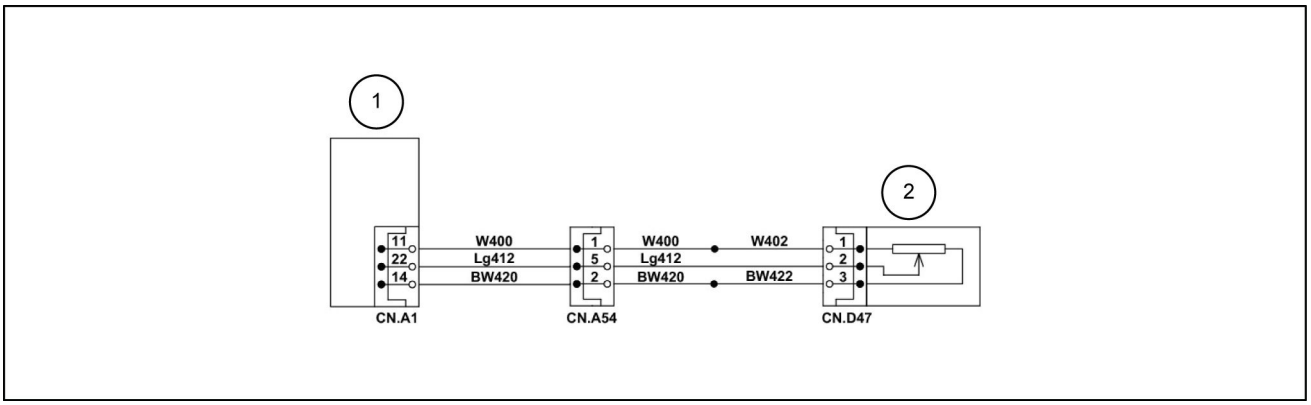
External lighting - 404

7002-N1 Pressure sensor signal abnormality

Control Module : MCM

Solution:

1. Use below image for the fault code process:



LPIL12CX00886EB 1

1. Computer A
2. N1 Pressure sensor

Turn the key switch ON.

Inspect the connection status of each connector. Make sure that all the connectors are secured.

A. If diagnostic trouble code 7002 is displayed, proceed to Step **2**.

2. Check the N1 pressure sensor connector **(2)** voltage on the service support screen.

A. If the voltage is more than or equal to **4.75 V**, proceed to Step **3**.

B. If the voltage is less than or equal to **0.25 V**, proceed to Step **6**.

3. Turn the key switch OFF and disconnect the N1 pressure sensor connector **(2) CN.D47** .

Turn the key switch ON.

Measure the voltage between the ground and terminal 1 of the N1 pressure sensor connector **(2) CN.D47** harness side.

A. If the voltage is not about **5 V**, find and repair the short circuit on the wire ID W400 or W402.

B. If the voltage is about **5 V**, proceed to Step **4**.

4. Measure the voltage between the ground and terminal 2 of the N1 pressure sensor connector **(2) CN.D47** harness side.

A. If the voltage is above **4.75 V**, find and repair the short circuit on the wire ID Lg412.

B. If the voltage is **4.75 V** or lower, proceed to Step **5**.

5. Measure the voltage between the ground and terminal 3 of the N1 pressure sensor connector **(2) CN.D47** harness side.

A. If the voltage is more than **0.25 V**, find and repair the short circuit on the wire ID BW420 or BW422.

B. If the voltage is less than or equal to **0.25 V**, replace computer A **(1)**.

6. Turn the key switch OFF.

Disconnect N1 pressure sensor connector **(2) CN.D47** .

Turn the key switch ON.

Inspect the connection status of each connector. Make sure that all the connectors are secured.

Inspect the fusible link **65 A** fuse **(11)** and fuse box F6 **10 A** fuse **(11)**.

A. If diagnostic trouble code 7201 is displayed, proceed to Step **2**.

2. Turn the key switch OFF and disconnect the connector **CN.D61** .

   Measure the resistance between the terminals 1 and 2 of the connector **CN.D61** solenoid side.

   A. If the resistance is not within **34 - 47 Ω**, replace travel high-speed solenoid **(6)**.

   B. If the resistance is within **34 - 47 Ω**, proceed to Step **3**.

3. Turn the key switch ON.

   Measure the voltage between the ground and terminal 2 of the connector **CN.D61** harness side.

   A. If the voltage is not **0 V**, find and repair the short circuit on the wire ID L801.

   B. If the voltage is **0 V**, proceed to Step **4**.

4. Turn the key switch OFF.

   Inspect for continuity between the ground and terminal 1 of the connector **CN.D61** harness side.

   A. If there is continuity, find and repair the short circuit on the wire ID R183, GR180, R105a, R104 or R105.

   B. If there is no continuity, proceed to Step **5**.

5. Inspect for continuity between the ground and terminal 2 of the connector **CN.D61** harness side.

   A. If there is no continuity, find and repair the open circuit on the wire ID L801.

   B. If there is continuity, proceed to Step **6**.

6. Turn the key switch ON.

   Measure the voltage between the ground and terminal 1 of the connector **CN.D61** harness side.

   A. If the voltage is not **24 V**, find and repair the open circuit on the wire ID R183, GR180, R105a, R104 or R105.

   B. If the voltage is **24 V**, replace computer A **(1)**.

Wiring harnesses - Electrical schematic sheet 11 (55.100)

Inspect the fuse box F11 **15 A** to see if either is blown.

Turn the key switch OFF.

Disconnect **CN.D67** .

A. If there is trouble with the motor, replace the motor **(3)**.

B. If there is no trouble with the motor, proceed to Step **4**.

4. Turn the key switch OFF.

   Inspect for continuity between the ground and terminal 1 of the connector **CN.D67** harness side.

   A. If there is continuity, replace the open circuit.

   B. If there is no continuity, proceed to Step **5**.

5. Inspect for continuity between terminal 1 of the connector **CN.D50** harness side and fuse box F11 **15 A**.

   A. If there is no continuity, replace the open circuit.

   B. If there is continuity, proceed to Step **6**.

6. Inspect for continuity between terminal 19 of the connector **CN.A4** harness side and terminal 13 of the connector **CN.A6** harness side.

   A. If there is no continuity, repair or replace the open circuit.

   B. If there is continuity, replace computer A **(4)**.

Wiring harnesses - Electrical schematic sheet 10 (55.100) Wiring harnesses - Electrical schematic sheet 13 (55.100) Wiring harnesses - Electrical schematic sheet 17 (55.100) Wiring harnesses - Electrical schematic sheet 19 (55.100)

A. If a problem is found, repair the harness connector.

B. If the harness connector is normal, replace the ECM.

8. Set the injector ID code on the ECM.
9. Confirm resolution:

   1. Clear the diagnostic trouble code using the trouble diagnosis scan tool.
   2. Turn the starter switch OFF for **30 s** or longer.
   3. Start the engine.
   4. Test the operation.

   NOTE: *Run the engine for at least **3 min**.*

   5. Use the trouble diagnosis scan tool to confirm that a diagnostic trouble code has not been detected.

A. If a problem is found, repair the harness connector **CN.D1-02**.

B. If the harness connector **CN.D1-02** is normal, replace the ECM.

8. Set the injector ID code on the ECM.

   Perform the unit difference learning of the fuel supply pump to the ECM.

9. Confirm resolution:

   1. Clear the diagnostic trouble code using the trouble diagnosis scan tool.

   2. Turn the starter switch OFF for **30 s** or longer.

   3. Start the engine.

   4. Perform a test-run.

   5. Use the trouble diagnosis scan tool to confirm that a diagnostic trouble code has not been detected.

Wiring harnesses - Electrical schematic sheet 07 (55.100) Wiring harnesses - Electrical schematic sheet 08 (55.100)

Wiring harnesses - Electrical schematic sheet 06 (55.100) Wiring harnesses - Electrical schematic sheet 08 (55.100)

C. If there are no problems, proceed to Step **7**.

7. Restore the actual unit.

   Turn ON the starter switch.

   Turn the starter switch OFF for **30 s** or longer.

   NOTE: *The starter switch must be once turned ON and then turned OFF before clearing the diagnostic trouble code.*

   Clear the diagnostic trouble code using the trouble diagnosis scan tool.

   Turn the starter switch OFF for **30 s** or longer.

   Start the engine.

   Use the trouble diagnosis scan tool to check if a diagnostic trouble code has been detected.

   A. If a diagnostic trouble code has been detected, replace the ECM.

8. Set the injector ID code on the ECM.

   Perform the unit difference learning of the fuel supply pump to the ECM.

9. Confirm resolution:

   1. Turn ON the starter switch.

   2 Turn the starter switch OFF for **30 s** or longer.

   NOTE: *The starter switch must be once turned ON and then turned OFF before clearing the diagnostic trouble code.*

   3. Clear the diagnostic trouble code using the trouble diagnosis scan tool.

   4. Turn the starter switch OFF for **30 s** or longer.

   5. Start the engine.

   6. Perform a test-run with the intake throttle solenoid drive duty of **20 %** or above.

   7. Use the trouble diagnosis scan tool to confirm that a diagnostic trouble code has not been detected.

Wiring harnesses - Electrical schematic sheet 18 (55.100)

P2228-Atmospheric pressure sensor - Shorted to low source

Control Module : ECM

Solution:

1. Check and diagnose the below fault code before you proceed with the diagnostics code 2228.

   Diagnostic trouble code 0651

2. Turn OFF the starter switch.

   Disconnect the harness connector **CN.D5** from the atmospheric pressure sensor.

   Turn ON the starter switch.

   Measure the voltage between the atmospheric pressure sensor **5 V** power supply circuit and GND.

   If it is less than or equal to **4.5 V** , inspect to see if there is an open circuit or high resistance with the **5 V** power supply circuit between the ECM and the atmospheric pressure sensor.

   A. If problem is found, repair the **5 V** power supply circuit.

   B. If there are no problems, proceed to Step **3**.

3. Connect the test cable with fuse between the atmospheric pressure sensor **5 V** power supply circuit and the signal circuit.

   Check the atmospheric pressure sensor display with the trouble diagnosis scan tool.

   If it is greater than or equal to **4.5 V**, inspect to see if there is poor connection with the atmospheric pressure sensor harness connector **CN.D5**.

   A. If problem is found, repair the harness connector **CN.D5**.

   B. If the harness connector **CN.D5** is normal, replace the atmospheric pressure sensor.

   C. If there are no problems, proceed to Step **4**.

4. If the atmospheric pressure sensor display is less than **4.5 V**, inspect the signal circuit between the ECM and the atmospheric pressure sensor.

   Make sure there should be no open circuit or high resistance.

   Make sure there should be no short to GND.

   A. If problem is found, repair the signal circuit.

   B. If there are no problems, proceed to Step **5**.

5. Inspect the ECM harness connector **CN.D1-02** for poor connection.

   A. If problem is found, repair the harness connector **CN.D1-02**.

   B. If the harness connector **CN.D1-02** is normal, replace the ECM.

6. Set the injector ID code on the ECM.

   Perform the unit difference learning of the fuel supply pump to the ECM.

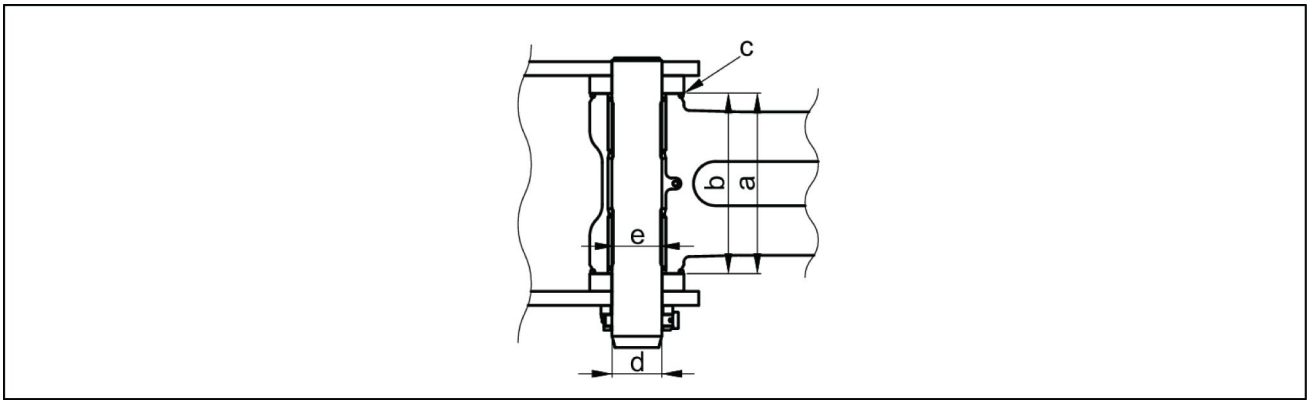
7. Confirm resolution:

   1. Clear the diagnostic trouble code using the trouble diagnosis scan tool.

   2. Turn the starter switch OFF for **30 s** or longer.

   3. Start the engine.

9. Bucket and bucket link installation section



SMIL13CEX2717EA 10

Part name	Code	Standard value	Usage limits	Judgment	Solution
Bucket	a	**326 mm** (**12.83 in**)	**332 mm** (**13.07 in**)	Acceptable/ Unacceptable	Replacement
Bucket link	b	**325 mm** (**12.80 in**)	**323 mm** (**12.72 in**)	Acceptable/ Unacceptable	Replacement
Clearance	c	**1.0 - 3.5 mm** (**0.04 - 0.14 in**)	Shim adjustment	Acceptable/ Unacceptable	Adjustment with shims
Pin	d	**Ø90 mm** (**3.54 in**)	**Ø89 mm** (**3.50 in**)	Acceptable/ Unacceptable	Replacement
Bushing (bucket link)	e	**Ø90 mm** (**3.54 in**)	**Ø91.5 mm** (**3.60 in**)	Acceptable/ Unacceptable	Replacement

Contents

Booms, dippers, and buckets - 84

Bucket - 100

SERVICE

Contents

Platform, cab, bodywork, and decals - 90

Cab glazing - 156