CX245D SR (Stage V)
Crawler Excavator

SERVICE MANUAL

Part number 90379709
English
May 2020

CASE CONSTRUCTION

Lights			
	Working light	Upper	**24 V 70 W** X 1
		Boom	**24 V 70 W** X 1
		Cab	**24 V 70 W** X 2
	Operator's cab room		**24 V 70 W** X 1

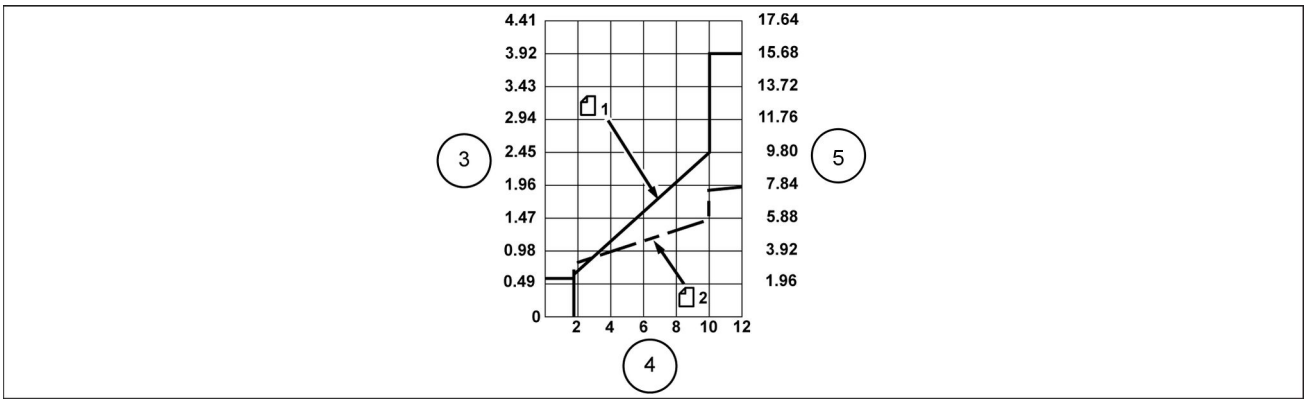
Operator environment

Operator's cab			
	Smooth and round shape design cab, fabricated by press work		
	Safety glass for all windows		
	Shock-less cab suspension by 4-point fluid mounting		
	Sliding front window with auto lock		
	Built-in type full-color LCD monitor display		
	Membrane switch on monitor display		
	Windshield wiper & washer		
	Floor mat		
	Polycarbonate roof hatch & Sun shade		
	Auto air-conditioner		
	Rain deflector		
	Sun visor		
	Roll-over protective structure (ROPS)		
	Top guard OPG level 1 (in CAB structure)		
	Top guard OPG level 2 (additional guard)		
Operator's seat			
	Low frequency air suspension with air springs and double acting hydraulic damper. (Achieves ISO7096 in category EM6)		
	With following features		
		Manual weight adjustment	Backrest angle adjustment
		Seat height adjustment	Adjustable pivoting armrests linked to consoles
		Adjustable headrest	Retractable seat belt
		Adjustable lumbar support	Control consoles adjust independently of seat
Others			
	Rear view mirror (Cab side & Right side)		
	Rear and right side view camera		

Undercarriage

Travel motor		Variable displacement axial piston motor
Brake		Mechanical disc brake
Hydraulic service brake		Brake valve
Final drive		Planetary gear reduction
Travel speeds	High	**5.0 km/h** (**3.1 mph**) (Automatic travel speed shifting)
	Low	**3.2 km/h** (**2.0 mph**)
Drawbar pull		**199 kN** (**44737 lb**)
Number of carrier rollers (each side)		2
Number of track rollers (each side)		8
Number of shoes (each side)		49
Type of shoe		Triple grouser shoe
Link pitch		**190 mm** (**7.480 in**)
Width of shoe		**600 mm** (**23.622 in**) (S.T.D)
Grade-ability		**70%** (**35°**)

Option remote control valve control diagram



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1	Secondary pressure	4	Pedal operating angle [deg.]
2	Independent operating torque	5	Operating torque [Nm]
3	Secondary pressure [MPa (psi)]		

Cushion valve (heat circuit, with shuttle valve)

Manufacturer	Yanagisawa Seiki MFG. Co., Ltd.
Port size	**G3/8** (A - P port)
	G1/4 (Q - V port)
Weight	**12.5 kg** (**27.5578 lb**)

Selector valve (option)

2WAY	
Manufacturer	Nishina Industrial Co., Ltd.
Rated flow rate	**25 l/min** (**6.604 US gpm**)
Operating method	ISO, S: Sumitomo (old)
Port size	**G3/8**
Weight	**4 kg** (**8.8185 lb**)

Center Joint

Operating pressure	High-pressure passage (ABCD)	**34.3 MPa** (**4975.34 psi**)
	High-pressure passage (EF)	**20.6 MPa** (**2988.11 psi**)
	Drain port (G)	**0.5 MPa** (**72.53 psi**)
	Pilot port (H)	**3.9 MPa** (**565.71 psi**)
Flow rate	High-pressure passage (ABCD)	**210 L/min** (**55.477 US gpm**)
	High-pressure passage (EF)	**80.5 L/min** (**21.266 US gpm**)
	Drain port (G)	**10 L/min** (**2.642 US gpm**)
	Pilot port (H)	**19.8 L/min** (**5.231 US gpm**)
Speed	**15 RPM** or less	
Rotational torque	At no load, **115 – 247 N·m** (**84.82 – 182.18 lb ft**)	
	29.4 MPa (**4264.470 psi**) applied to A and B or C and D ports **160 – 274 N·m** (**118.01 – 202.09 lb ft**)	
Hydraulic fluid used	ISO VG46	
Hydraulic fluid temperature range	**-20 – -95 °C** (**-3.9 – -203 °F**)	
Port A	Forward right	G3/4
Port B	Forward left	G3/4
Port C	Backward right	G3/4
Port D	Backward left	G3/4
Port E	Blade up	G1/2
Port F	Blade down	G1/2
Port G	Drain port	G1/2
Port H	Pilot port	G1/2

Square centimeters to square inches

cm^2	0	1	2	3	4	5	6	7	8	9	cm^2
	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	
----		0.155	0.310	0.465	0.620	0.775	0.930	1.085	1.240	1.395	----
10	1.550	1.705	1.860	2.015	2.170	2.325	2.480	2.635	2.790	2.945	10
20	3.100	3.255	3.410	3.565	3.720	3.875	4.030	4.185	4.340	4.495	20
30	4.650	4.805	4.960	5.115	5.270	5.425	5.580	5.735	5.890	6.045	30
40	6.200	6.355	6.510	6.665	6.820	6.975	7.130	7.285	7.440	7.595	40
50	7.750	7.905	8.060	8.215	8.370	8.525	8.680	8.835	8.990	9.145	50
60	9.300	9.455	9.610	9.765	9.920	10.075	10.230	10.385	10.540	10.695	60
70	10.850	11.005	11.160	11.315	11.470	11.625	11.780	11.935	12.090	12.245	70
80	12.400	12.555	12.710	12.865	13.020	13.175	13.330	13.485	13.640	13.795	80
90	13.950	14.105	14.260	14.415	14.570	14.725	14.880	15.035	15.190	15.345	90
100	15.500	15.655	15.810	15.965	16.120	16.275	16.430	16.585	16.740	16.895	100

Volume

Cubic inches to cubic centimeters

in^3	0	1	2	3	4	5	6	7	8	9	in^3
	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	cm^3 (cc)	
----		16.387	32.774	49.161	65.548	81.936	98.323	114.710	131.097	147.484	----
10	163.871	180.258	196.645	213.032	229.419	245.807	262.194	278.581	294.968	311.355	10
20	327.742	344.129	360.516	376.903	393.290	409.678	426.065	442.452	458.839	475.226	20
30	491.613	508.000	524.387	540.774	557.161	573.549	589.936	606.323	622.710	639.097	30
40	655.484	671.871	688.258	704.645	721.033	737.420	753.807	770.194	786.581	802.968	40
50	819.355	835.742	852.129	868.516	884.904	901.291	917.678	934.065	950.452	966.839	50
60	983.226	999.613	1016.000	1032.387	1048.775	1065.162	1081.549	1097.936	1114.323	1130.710	60
70	1147.097	1163.484	1179.871	1196.258	1212.646	1229.033	1245.420	1261.807	1278.194	1294.581	70
80	1310.968	1327.355	1343.742	1360.130	1376.517	1392.904	1409.291	1425.678	1442.065	1458.452	80
90	1474.839	1491.226	1507.613	1524.001	1540.388	1556.775	1573.162	1589.549	1605.936	1622.323	90
100	1638.710	1655.097	1671.484	1687.872	1704.259	1720.646	1737.033	1753.420	1769.807	1786.194	100

Cubic centimeters to cubic inches

cm^3 (cc)	0	1	2	3	4	5	6	7	8	9	cm^3 (cc)
	in^3	in^3	in^3	in^3	in^3	in^3	in^3	in^3	in^3	in^3	
----		0.0610	0.1220	0.1831	0.2441	0.3051	0.3661	0.4272	0.4882	0.5492	----
10	0.6102	0.6713	0.7323	0.7933	0.8543	0.9154	0.9764	1.0374	1.0984	1.1594	10
20	1.2205	1.2815	1.3425	1.4035	1.4646	1.5256	1.5866	1.6476	1.7087	1.7697	20
30	1.8307	1.8917	1.9528	2.0138	2.0748	2.1358	2.1968	2.2579	2.3189	2.3799	30
40	2.4409	2.5020	2.5630	2.6240	2.6850	2.7461	2.8071	2.8681	2.9291	2.9902	40
50	3.0512	3.1122	3.1732	3.2343	3.2953	3.3563	3.4173	3.4784	3.5394	3.6004	50
60	3.6614	3.7224	3.7835	3.8445	3.9055	3.9665	4.0276	4.0886	4.1496	4.2106	60
70	4.2717	4.3327	4.3937	4.4547	4.5157	4.5768	4.6378	4.6988	4.7598	4.8209	70
80	4.8819	4.9429	5.0039	5.0650	5.1260	5.1870	5.2480	5.3091	5.3701	5.4311	80
90	5.4921	5.5531	5.6142	5.6752	5.7362	5.7972	5.8583	5.9193	5.9803	6.0413	90
100	6.1024	6.1634	6.2244	6.2854	6.3465	6.4075	6.4685	6.5295	6.5905	6.6516	100

Engine - Check - Engine oil

⚠ WARNING

Burn hazard!
Do not handle any service fluid (engine coolant, engine oil, hydraulic oil, etc.) at temperatures that exceed 49 °C (120 °F). Allow fluids to cool before proceeding.
Failure to comply could result in death or serious injury.

W0330B

NOTICE: *The engine should be in a horizontal position.*

NOTICE: *Wait at least **5 min** before starting the engine and after stopping the engine.*

Engine oil inspection

1. Remove the oil level gauge from the oil level gauge guide tube.

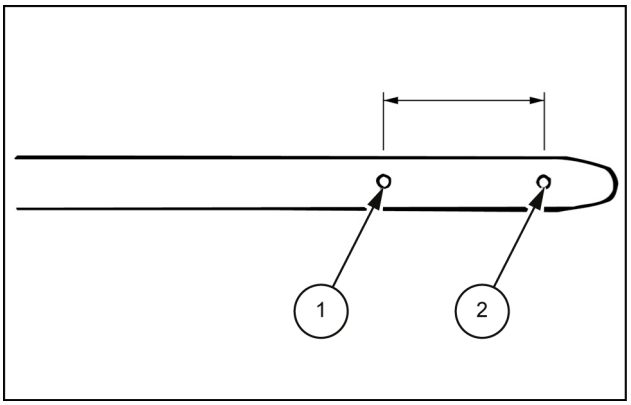
NOTE: *Wipe off the engine oil remaining on the oil level gauge.*

2. Install the oil level gauge to the oil level gauge guide tube.
3. Remove the oil level gauge from the oil level gauge guide tube.
4. Inspect the engine oil.

NOTE: *Check the engine oil remaining on the oil level gauge to inspect the engine oil level.*

1. Upper limit
2. Lower limit

NOTE: *If the oil level is under the lower limit, add engine oil. Replace the engine oil if engine oil is dirty.*



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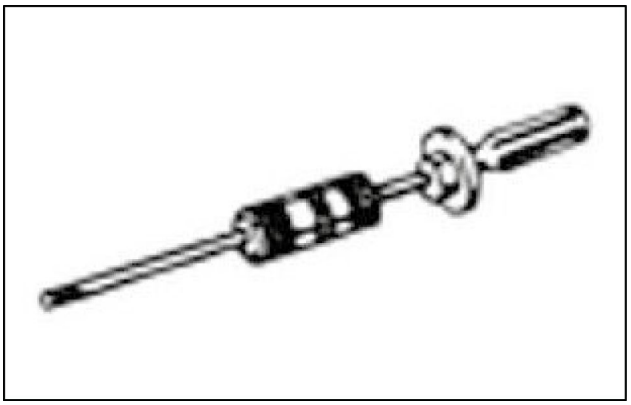
Special tool: Sliding hammer (Refer to " **Fuel injectors - Special tools (10.218)**")



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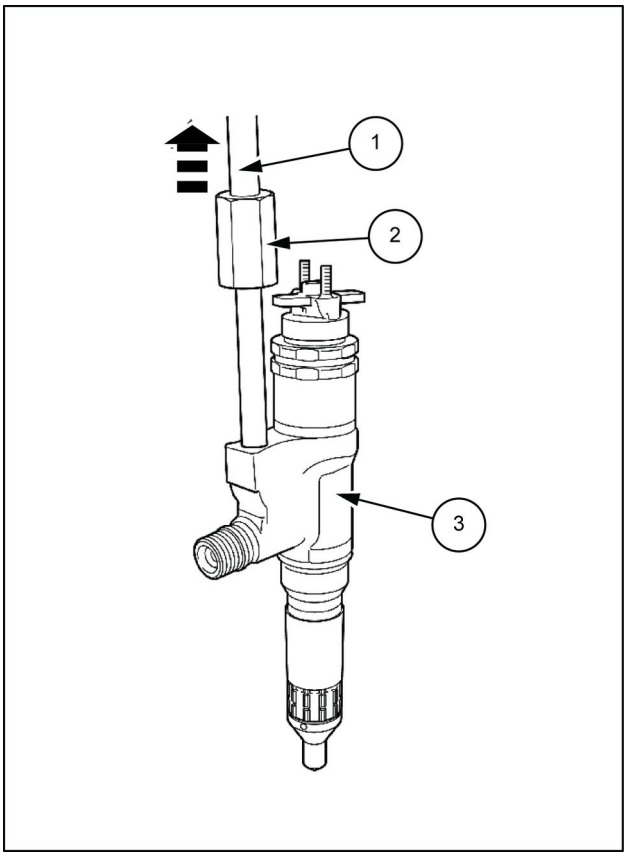
1. Sliding hammer
2. Fuel injector remover
3. Injector



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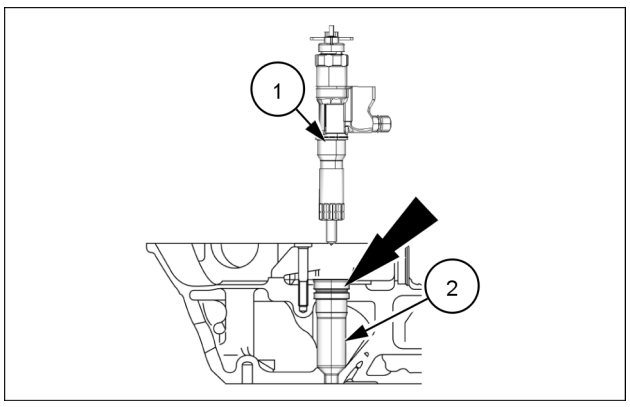
NOTICE: *When removing the injector* ***(1)*** *using the special tool, check that the injector sleeve* ***(2)*** *has not been removed as well.*



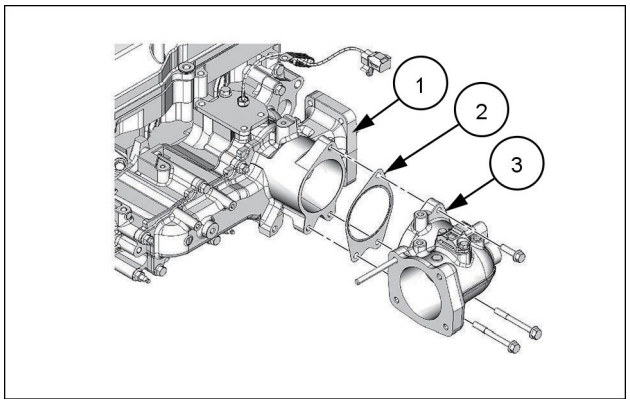
SMIL17CEX0322AA 37

Inlet pipe installation

1. Install the gasket **(2)** and the inlet pipe **(3)** to the outer inlet cover **(1)**.

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

NOTICE: *Use new gaskets.*

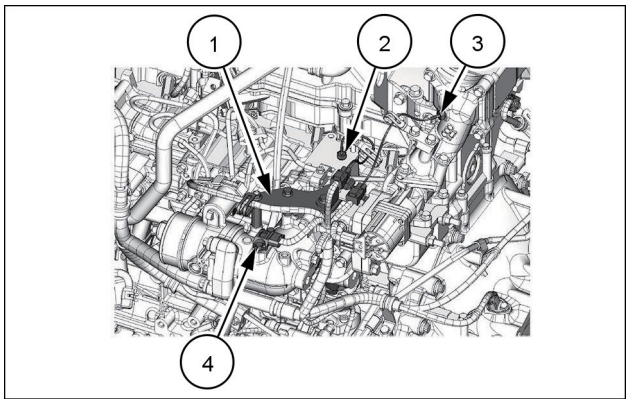


SMIL19CEX2991A 87

2. Connect the harness connector to the intake manifold temperature sensor **(2)**.
3. Connect the harness connector to the boost pressure sensor/boost temperature sensor **(4)**.
4. Install the harness bracket **(1)** to the inlet pipe.

   Tightening torque: **25 N·m** (**18 lb ft**)

   3. EGR gas temperature sensor 2



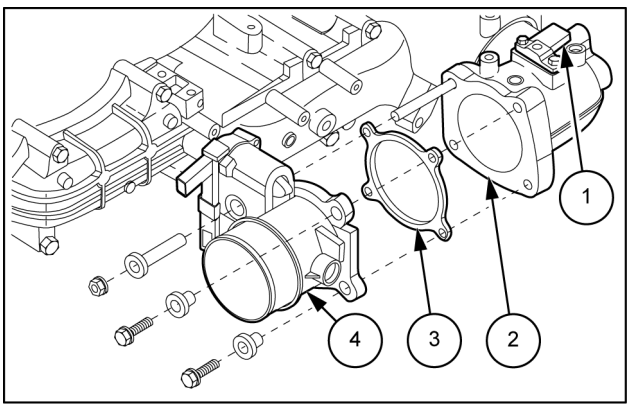
SMIL19CEX2990A 88

Intake throttle valve installation

1. Install the gasket **(3)** and the intake throttle valve **(4)** to the inlet pipe **(2)**.

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

   1. Boost pressure sensor/boost temperature sensor
2. Install the air duct to the intake throttle valve **(4)**.



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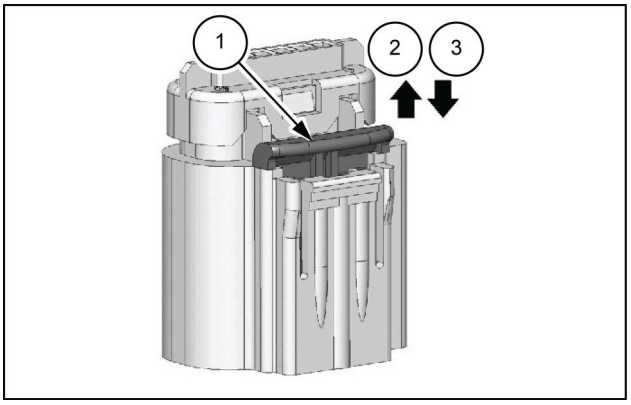
3. Connect the harness connector to the intake throttle valve.

NOTE: *After connecting the harness connector, press in the lock operation portion to lock.*

   1. Lock operation section
   2. Lock release
   3. Lock



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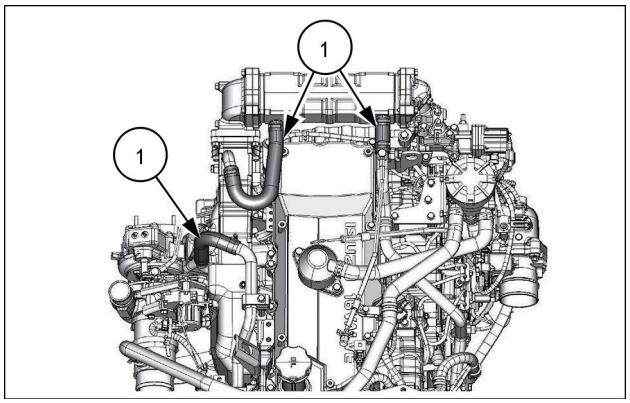
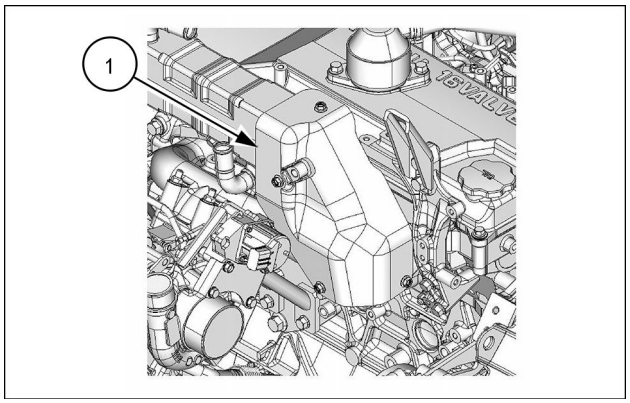
EGR removal

1. Disconnect the water rubber hose **(1)** from the EGR cooler assembly.



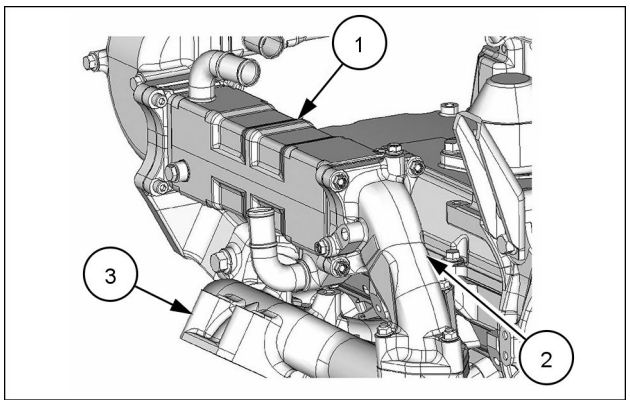
SMIL19CEX2985A 8

2. Remove the EGR heat protector **(1)** from the EGR pipe A.



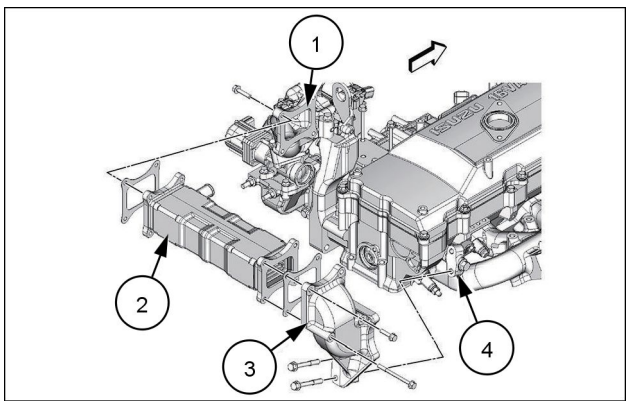
SMIL20CEX0212A 9

3. Remove EGR pipe A **(2)** from EGR cooler A **(1)** and the exhaust manifold **(3)**.



SMIL20CEX0213A 10

4. Remove the EGR cooler A from the EGR pipe B **(2)**.
5. Remove EGR pipe B **(3)** from EGR cooler B **(2)** and the EGR rear bracket **(4)**.
6. Remove the EGR cooler B **(2)** from the EGR pipe C **(1)**.
7. Remove EGR pipe C **(1)** from the rear engine hanger bracket and EGR valve.



SMIL19CEX2986A 11

Camshaft - Remove

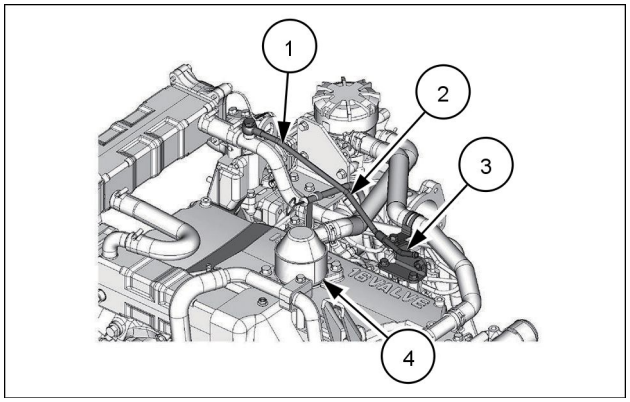
Battery ground cable disconnect

1. Disconnect the battery ground cable from the battery.

NOTICE: *While the indicator (LED) of the battery disconnect switch is lit, do not turn OFF the battery disconnect switch or disconnect its negative cable from the battery. (After key OFF, lit for a maximum duration of **3 min**)*

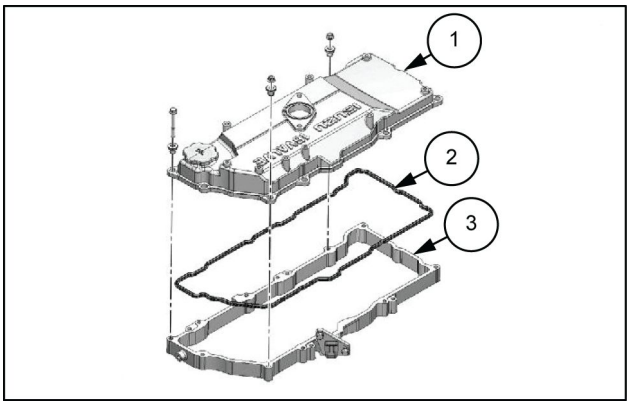
Cylinder head cover removal

1. Remove the air leak pipe **(1)** from the air leak pipe bracket **(3)** and EGR water pipe.
2. Disconnect the air leak pipe bracket **(3)** from the cylinder head cover.
3. Disconnect the oil level gauge guide tube **(2)** from the cylinder head cover.
4. Disconnect the oil separator hose from the air breather **(4)**.



SMIL20CEX0211A 1

5. Remove the cylinder head cover **(1)** from the lower cover **(3)**.
6. Remove the head cover gasket **(2)** from the cylinder head cover.



SMIL13CEX1147AB 2

Cylinder head - Inspect

Bridge cap inspection

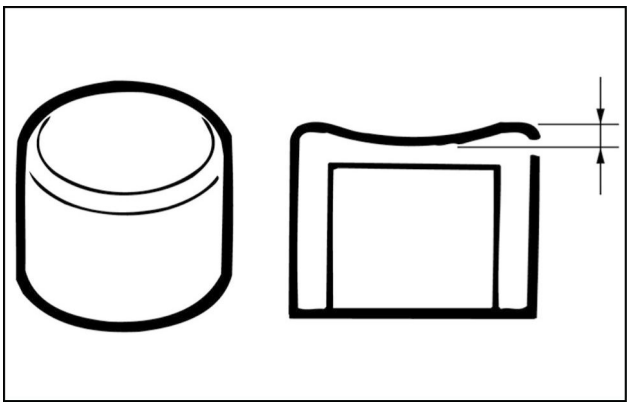
1. Measure the bridge cap using the dial gauge.

NOTE: *Measure the contact surface of the bridge cap and rocker arm.*

Limit: **0.1 mm** (**0.0039 in**) Amount of wear on the bridge cap

NOTICE: *Replace the bridge cap if the measured value exceeds the limit value.*

NOTICE: *Replace the bridge cap if it has an abnormal wear such as band-shaped wear.*



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Bridge inspection

1. Inspect the bridge **(1)**.

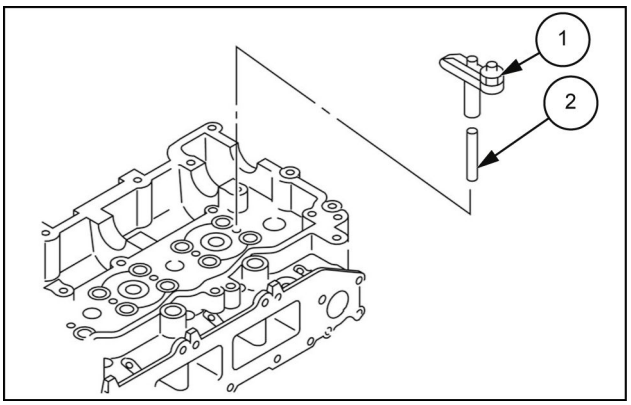
NOTE: *Confirm that the bridge moves smoothly on the bridge guide **(2)**.*

2. Check the clearance of the bridge cap.

Standard value: **0.020 – 0.057 mm** (**0.0008 – 0.0022 in**) Between the bridge **(1)** and bridge cap

Specified value: **0.1 mm** (**0.0039 in**)

Between the bridge **(1)** and bridge cap



SMIL14CEX3109AB 2

Idle gear C inspection

1. Measure the clearance using the feeler gauge.

NOTE: *Measure the clearance in the axis direction between the cylinder head and idle gear C **(1)**.*

Standard value: **0.090 – 0.145 mm** (**0.0035 – 0.0057 in**)

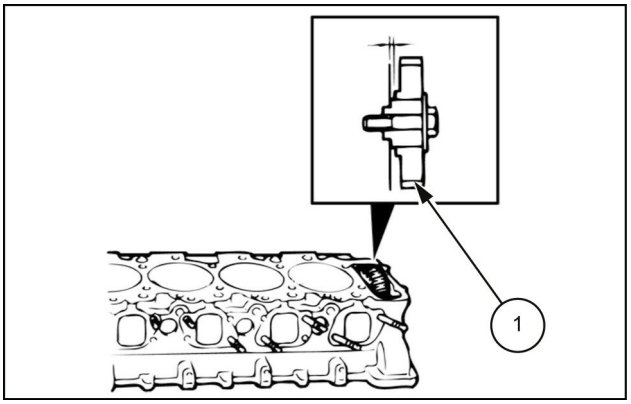
Limit: **0.2 mm** (**0.0079 in**)

2. Measure the idle gear shaft using the vernier caliper.

NOTE: *Outer diameter of the idle gear shaft.*

Specified value: **30 mm** (**1.1811 in**)

Limit: **29.85 mm** (**1.1752 in**)



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4. Apply engine oil to the bolts.

NOTE: *Apply to the threaded portion and seating surface of the bolts.*

5. Apply engine oil to the nuts.

NOTE: *Apply to the threaded portion of the nuts.*

6. Temporarily tighten the nuts to the camshaft brackets.
7. Temporarily tighten the bolts to the bracket and rocker arm.

NOTE: *Temporarily tighten the rocker arm shaft bolts and tightening nuts.*

8. Final tighten the rocker arm shaft to the cylinder head.
9. Securely tighten the rocker arm shaft to the cylinder head assembly.

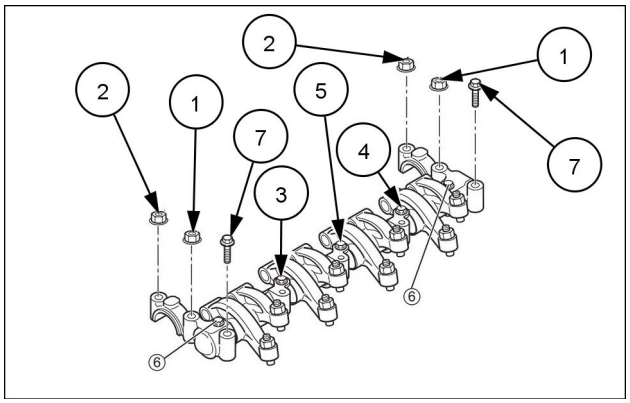
NOTE: *Hold the entire rocker arm shaft horizontally and gradually tighten it.*

Tightening torque: **20.6 N·m** (**15 lb ft**) **(1)**, **(2)**

Tightening torque: **56 N·m** (**41 lb ft**) **(3)**, **(4)**, **(5)**

Tightening torque: **27.4 N·m** (**20 lb ft**) **(6)**, **(7)**

NOTE: *The number after the tightening torque indicates the number in the diagram.*



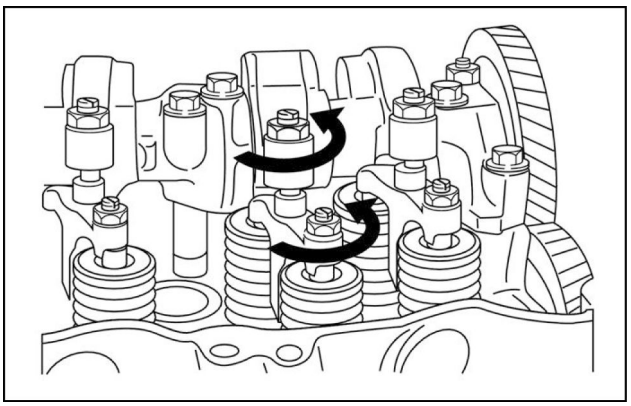
SMIL19CEX2999AA 12

Rocker arm shaft adjustment

1. Valve clearance adjustment

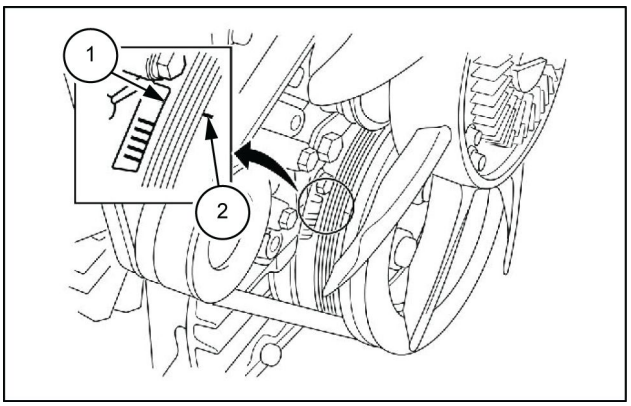
NOTICE: *Adjust the valve clearance while cool.*

NOTICE: *Loosen all adjust screws before adjustment.*



SMIL14CEX3082AA 13

2. Align the first cylinder to the compression top dead center.
    1. Front cover marking
    2. **0°** marking on the crankshaft damper



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Piston - Assemble

1. Install the snap ring to the piston using the snap ring pliers.

NOTE: *Install the snap ring on only one side.*

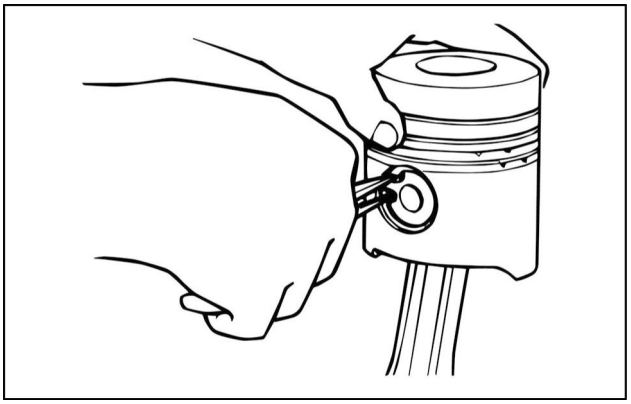
2. Align the connecting rod assembly to the piston.

NOTE: *Align the direction of the protrusion mark of the connecting rod and front mark of the piston.*

3. Apply the engine oil to the piston pin.
4. Install the piston pin to the piston.
5. Install the snap ring to the piston using the snap ring pliers.

NOTICE: *Confirm that the snap ring is securely installed in the ring groove.*

NOTICE: *Confirm that the connecting rod moves smoothly after installing the snap ring.*



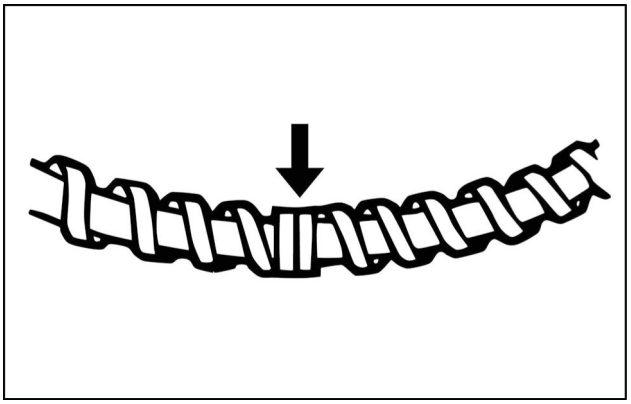
SMIL14CEX3366AA 1

6. Install the oil ring to the piston.

NOTE: *Assemble the coil expander ring on the piston, and then assemble the oil ring.*

NOTICE: *Assemble the oil ring joint so that the coil expander joint is on the direct opposite.*

NOTICE: *Check that there is no gap at the position of the arrow in the diagram when the oil ring coil expander is installed.*

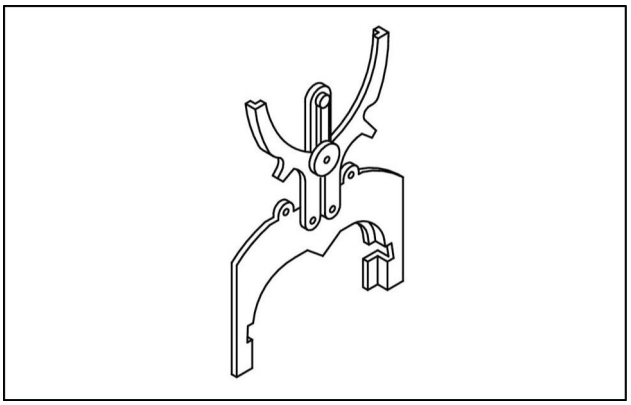


SMIL14CEX3367AA 2

7. Install the third ring to the piston using the special tool.

NOTE: *Make the N mark point upward.*

Special tool: Piston ring setting tool (Refer to " **Piston - Special tools (10.105)**")



SMIL14CEX3362AA 3

Crankshaft position sensor installation

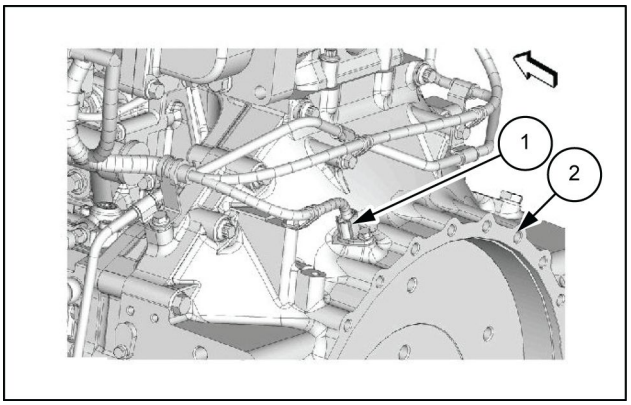
1. Install the crankshaft position sensor **(1)** to the flywheel housing **(2)**.

NOTICE: *Be careful not to subject the sensor to shock.*

NOTE: *Tighten together with the clip.*

Tightening torque: **6 N·m** (**53 lb in**)

2. Connect the harness connector to the crankshaft position sensor **(1)**.



SMIL13CEX1868AB 8

Starter assembly installation

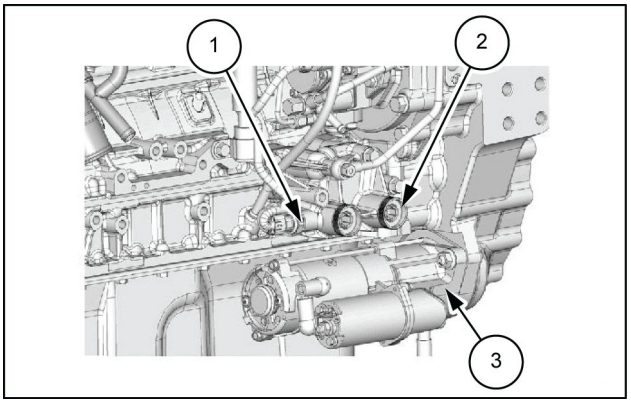
1. Install the starter assembly **(3)** to the flywheel housing.

Tightening torque: **106 N·m** (**78.2 lb ft**)

2. Connect the earth cable to the starter assembly **(3)**.

Tightening torque: **51 N·m** (**37.6 lb ft**)

1. Oil pressure sensor
2. Oil port cover

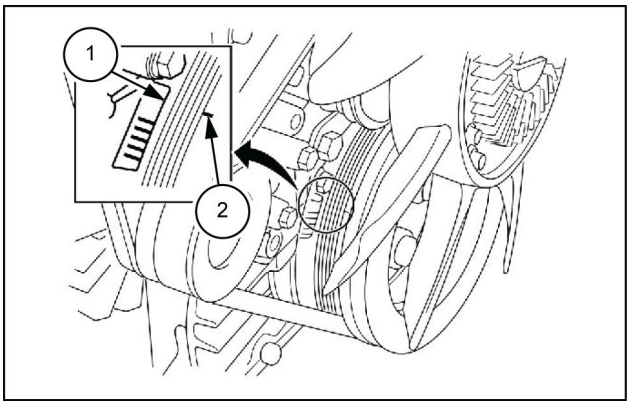


SMIL13CEX1867AB 9

Battery ground cable connect

1. Connect the battery ground cable to the battery.

5. Align the first cylinder to the compression top dead center.
    1. Front cover marking
    2. **0°** marking on the crankshaft damper
6. Install the O-ring to the fuel supply pump.



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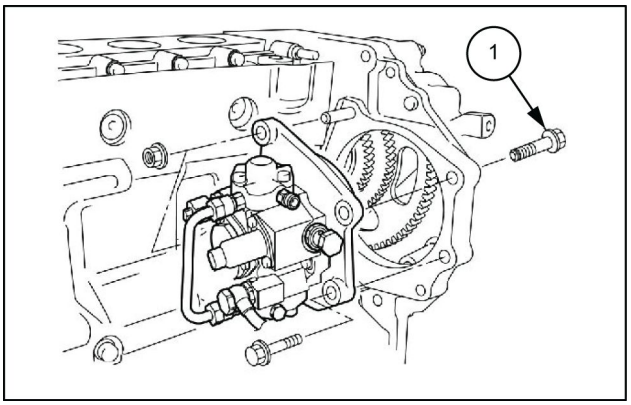
7. Temporarily tighten the fuel supply pump to the cylinder block by means of the bolt **(1)**.



SMIL13CEX1669AB 41

8. Check alignment mark of the supply pump gear.

NOTE: *Confirm that the alignment mark **(2)** can be seen through the plug hole **(1)** on the left side of the flywheel housing.*

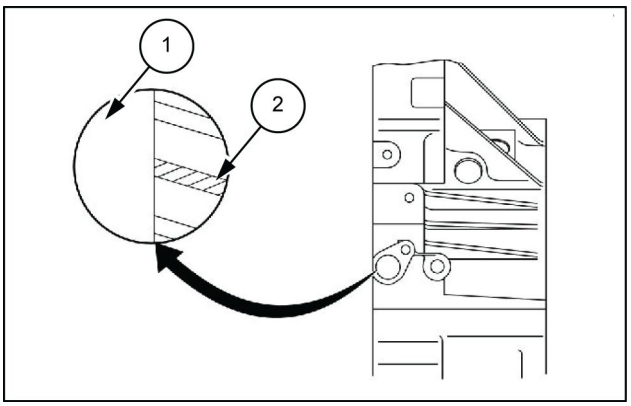
NOTICE: *If the alignment mark could not be confirmed, adjust the position of the supply pump gear.*

9. Securely tighten the fuel supply pump to the cylinder block.

    Tightening torque: **50 N·m** (**37 lb ft**) nut

    Tightening torque: **76 N·m** (**56 lb ft**) bolt

10. Connect the harness connector to the fuel supply pump.



SMIL13CEX1670AB 42

Fuel filters - Remove

Filter assembly

1. Disconnect the harness connector from the fuel filter pressure sensor.
2. Remove the fuel feed hose from the fuel filter.

NOTE: *To prevent the fuel leaking, attach a plug on the removed hose.*

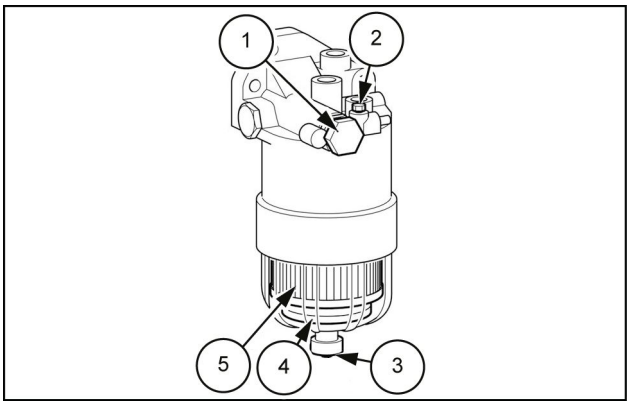
3. Remove the fuel return hose from the fuel filter.

NOTE: *To prevent the fuel leaking, attach a plug on the removed hose.*

4. Remove the fuel filter from the machine.

NOTE: *Element replaceable specification*

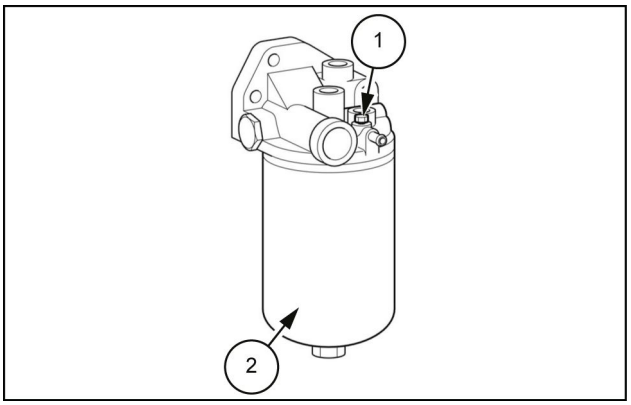
1. Priming pump
2. Air bleeding plug
3. Drain plug
4. Case
5. Fuel filter element



SMIL14CEX3106AB 1

NOTE: *Cartridge-type specification*

1. Air bleeding plug
2. Cartridge-type element



SMIL14CEX3107AB 2

Contents

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Air cleaners and lines - 202

SERVICE

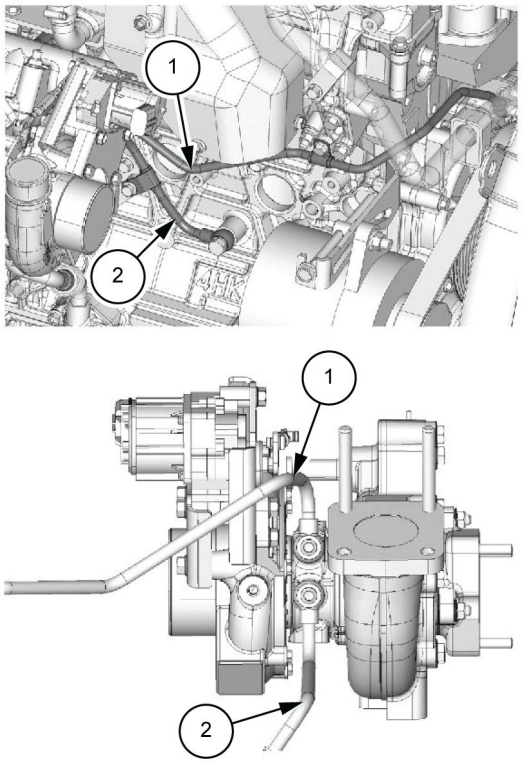
6. Connect the water feed pipe **(2)** to the turbocharger assembly.

NOTE: *Use new gaskets.*

Tightening torque: **14 N·m** (**10 lb ft**)

7. Connect the water return pipe **(1)** to the turbocharger assembly.

Tightening torque: **35 N·m** (**26 lb ft**) eyebolt



SMIL13CEX1820BB 13

8. Connect the oil return pipe **(3)** to the turbocharger assembly **(1)**.

NOTE: *Use new gaskets.*

Tightening torque: **9 N·m** (**6.64 lb ft**)

9. Replenish the turbocharger assembly with the engine oil.

10. Connect the oil feed pipe **(2)** to the turbocharger assembly **(1)**.

NOTE: *Use new gaskets.*

Tightening torque: **29 N·m** (**21 lb ft**) eyebolt

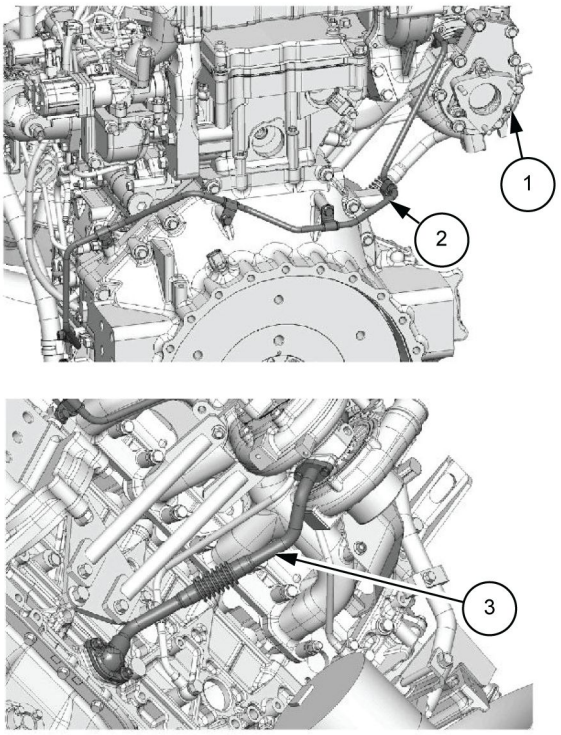
Tightening torque: **24 N·m** (**18 lb ft**) clip

11. Install the exhaust pipe to the turbocharger assembly **(1)**.

12. Install the air intake hose to the turbocharger assembly **(1)** and the intercooler.

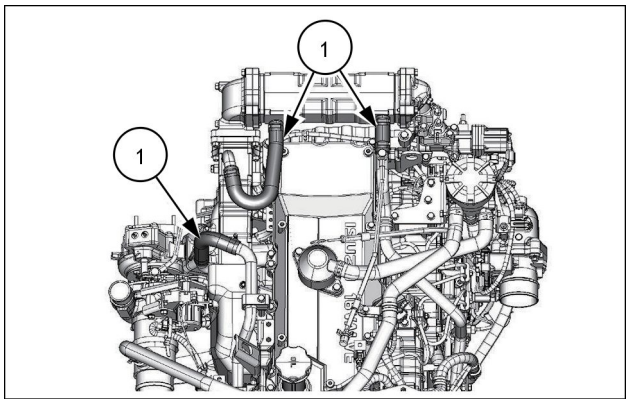
13. Install the air cleaner duct to the air cleaner assembly and the turbocharger assembly **(1)**.

14. Connect the harness connector to the turbocharger assembly **(1)**.



SMIL13CEX1821BB 14

22. Connect the water rubber hose **(1)** to the EGR cooler assembly.



SMIL19CEX2985A 7

EGR gas temperature sensor 2 installation

NOTICE: *Check the EGR gas temperature sensor 2 connector color, and take care not to assemble incorrectly.*

NOTICE: *Because the connector color cannot be identified using the outer surface if the exterior is painted, remove the connector and identify it using the connector interior color.*

NOTICE: *If it is difficult to determine the color, remove the connectors of EGR gas temperature sensor 2 and the IMT sensor, and determine the color using the connector interior color.*

Sensor name	Connector color
EGR gas temperature sensor 2	Light gray
IMT sensor	Gray

NOTICE: *Do not subject the tip of the sensor to impact when installing the EGR gas temperature sensor.*

NOTICE: *Do not reuse an EGR gas temperature sensor that has been subjected to impact due to being dropped, etc.*

1. Apply anti-seize lubricant EGR gas temperature sensor 2.

NOTE: *Apply High Temperature Stainless Never- Seez: 5-87411-039-0, manufactured by Bostik in the U.S., etc. to the threaded portion of EGR gas temperature sensor 2.*

2. Install EGR gas temperature sensor 2 to EGR pipe C.

   Tightening torque: **19.6 N·m** (**14 lb ft**)

3. Install the harness bracket to EGR pipe C.

   Tightening torque: **23.5 N·m** (**17 lb ft**)

4. Connect the harness connector to EGR gas temperature sensor 2.

Aftercooler - Inspect

1. Inspect the intercooler.
   - Inspect the fins for collapsing. Remove dust and other foreign materials.

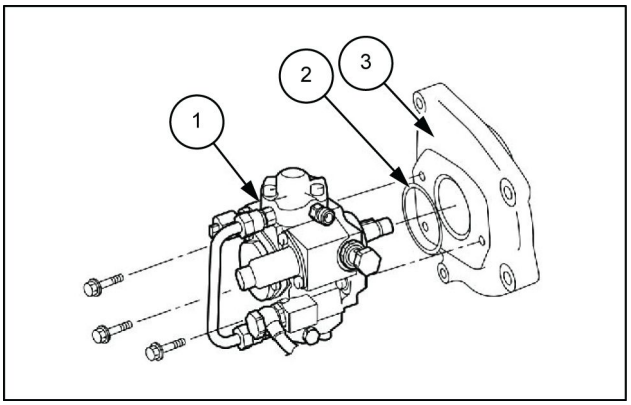
NOTICE: *When repairing the fins, take sufficient care not to damage the base of the fins. Inspect the inside of the intercooler, and if it is significantly dirty, clean it. When the fins are clogged, clean them.*

Fuel supply pump installation

1. Install the O-ring **(2)** to the fuel supply pump **(1)**.
2. Install the fuel supply pump **(1)** to the supply pump bracket **(3)**.

   Tightening torque: **19 N·m** (**14 lb ft**)

NOTE: *Be careful not to let the O-ring get twisted.*



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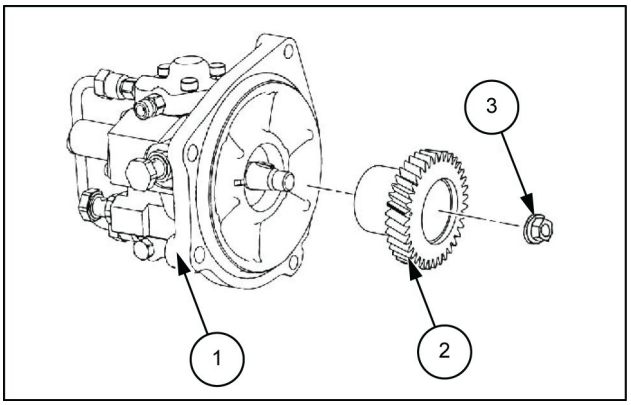
3. Install the supply pump gear **(2)** to the fuel supply pump **(1)**.

   Tightening torque: **98 N·m** (**72 lb ft**) Supply pump gear nut **(3)**

NOTE: *After installing the supply pump gear, refer to the diagram and make an alignment mark on it.*



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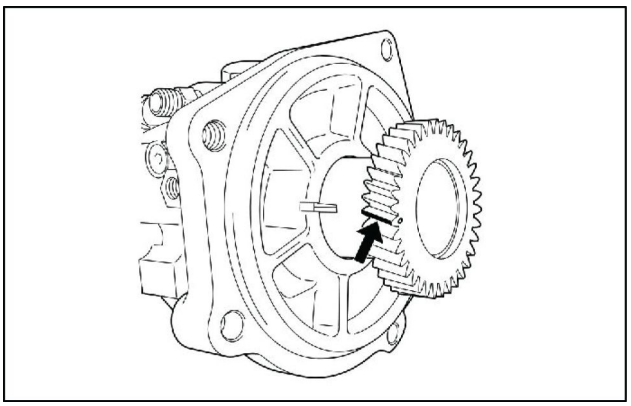

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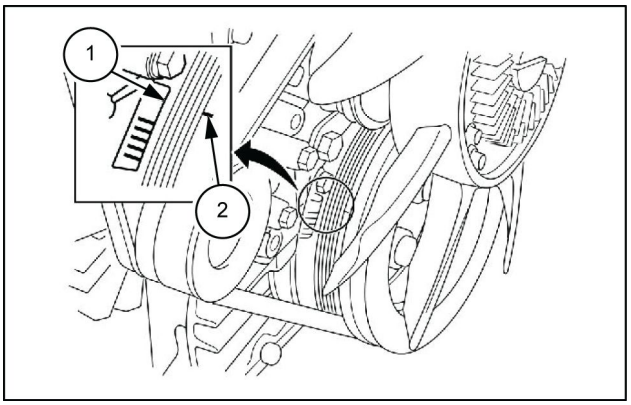
4. Align the first cylinder to the compression top dead center.
   1. Front cover marking
   2. **0°** marking on the crankshaft damper
5. Install the O-ring to the fuel supply pump.



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SWING PARKING CIRCUIT (MACHINE STOP)

When the machine is stopped (with the key switch OFF), the pressure oil from Port P of the swing motor **(1)** returns to the hydraulic tank through the swing brake solenoid **(10)**.
The swing parking brake stays applied.

Pressure line
Tank line
Pilot pressure line
Pilot tank line
Electric line

1. Swing motor
2. Cushion valve
3. Right swing
4. Left swing
5. Swing pilot pressure sensor
6. Remote control valve (arm, swing)
7. Check valve
8. Oil cooler
9. Lever lock
10. Swing brake
11. 5 stack solenoid valve
12. Console lever lock switch
13. Main computer
14. Control valve
15. Hydraulic pump

ARM-IN LOAD HOLDING VALVE CIRCUIT (WITH HBCV)

Load holding

When the remote control valve arm operation lever is in neutral, the oil on the arm cylinder **(12)** rod side is sealed by the load holding valve check valve **(2)**, reducing internal leakage from the main spool to reduce the hydraulic drift of the arm.

Load holding release

When the remote control valve **(7)** is operated to the arm-in side, the pilot pressure oil from Port Pb5 separated in the internal path moves the load holding valve spool **(1)** to the right. In this way, the oil in the spring chamber of the load holding valve check valve **(2)** goes to the tank line through the load holding valve spool **(1)**, the pressure in the spring chamber drops, and the load holding valve check valve **(2)** is opened.

Pressure line
Tank line
Pilot pressure line
Pilot tank line
Electric line

1. Load holding valve spool
2. Load holding valve check valve
3. Oil cooler
4. Arm (in)
5. Arm (out)
6. Cushion valve
7. Remote control valve (arm, swing)
8. Lever lock
9. Pressure boost relief
10. 5 stack solenoid valve
11. Control valve
12. Arm cylinder
13. Arm [1] spool
14. Arm [2] spool
15. Arm-in pilot pressure sensor
16. Console lever lock switch
17. Monitor display
18. Main computer
19. P1 pressure sensor
20. P2 pressure sensor
21. Hydraulic pump
22. Check valve
23. Arm HBCV check valve
24. Arm HBCV
25. 6 stack proportional valve
26. Arm regeneration proportional valve

AUTO PRESSURE BOOST CIRCUIT (ARM IN)

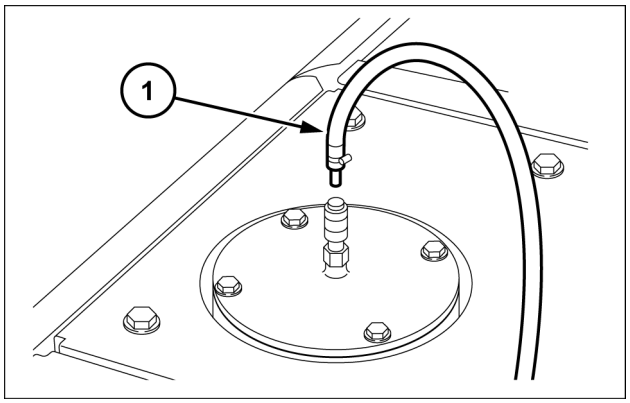
To increase the digging force during attachment operations, this circuit boosts the control valve **(8)** main relief set pressure according to the hydraulic load pressure.
This control is disabled after **8 s**.
As an example, this section explains the case in which the arm-in operation is carried out.
When the remote control valve **(4)** is operated to the arm-in side, the pilot pressure oil is fed to Port pb5 and Port pb9 of the control valve **(8)** via the cushion valve **(1)** and switches the arm [1] spool **(20)** and arm [2] spool **(21)** to the in side.
At the same time, the main computer **(14)** receives the electrical signal output from the arm-in pilot pressure sensor **(11)** and judges that an arm-in operation is being performed.
The main computer **(14)** receives electrical signals from the P1 pressure sensor **(15)** and P2 pressure sensor **(16)** and switches the pressure boost relief solenoid **(6)**.
As a result, the pilot pressure oil is fed to the main relief valve **(9)** through Port PH of the control valve **(8)** to boost the main relief set pressure for **8 s**.
This control is not actuated during travel operation or for the option circuit.

- Pressure line
- Tank line
- Pilot pressure line
- Pilot tank line
- Electric line

1. Cushion valve
2. Arm (in)
3. Arm (out)
4. Remote control valve (arm, swing)
5. Lever lock
6. Boost pressure relief
7. 5 stack solenoid valve
8. Control valve
9. Main relief valve
10. Arm cylinder
11. Arm-in pilot pressure sensor
12. Console lever lock switch
13. Monitor display
14. Main computer
15. P1 pressure sensor
16. P2 pressure sensor
17. Hydraulic pump
18. Check valve
19. Oil cooler
20. Arm [1] spool
21. Arm [2] spool

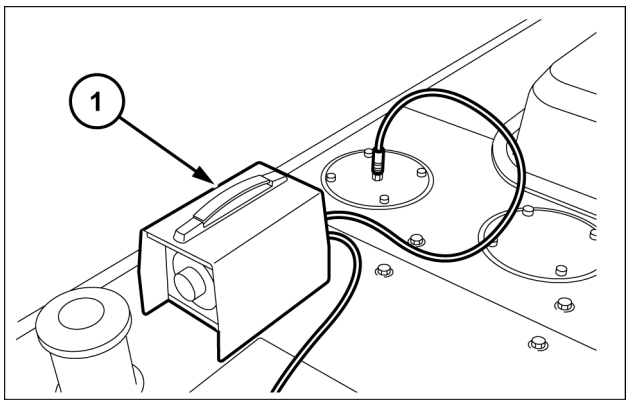
Item			Standard value
Ball race movement amount	Up/Down		**1.1 mm** (**0.043 in**) or less
	Right/Left		**3.8 mm** (**0.150 in**) or less
Bucket tip movement amount	Right/Left		**61 mm** (**2.402 in**) or less
Recoil spring	When compressed		**576 mm** (**22.677 in**)
	When freed		**647 mm** (**25.472 in**)
Solenoid	Coil resistance **20 °C** (**68 °F**)	Travel second speed	About **40 Ω**
		Pressure boost	About **40 Ω**
		Swing brake	About **40 Ω**
		Lever lock	About **40 Ω**

5. Install the vacuum pump **(1)** to the hydraulic tank lid.



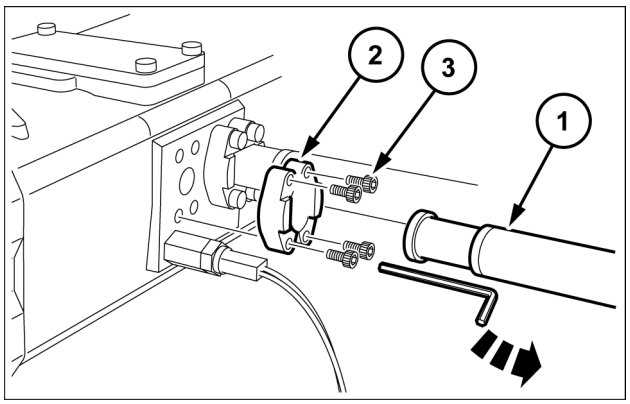
SMIL14CEX5093AB 5

6. After setting the vacuum pump **(1)** as in the diagram, switch on the power. (If the cable is too short, use an extension cable).



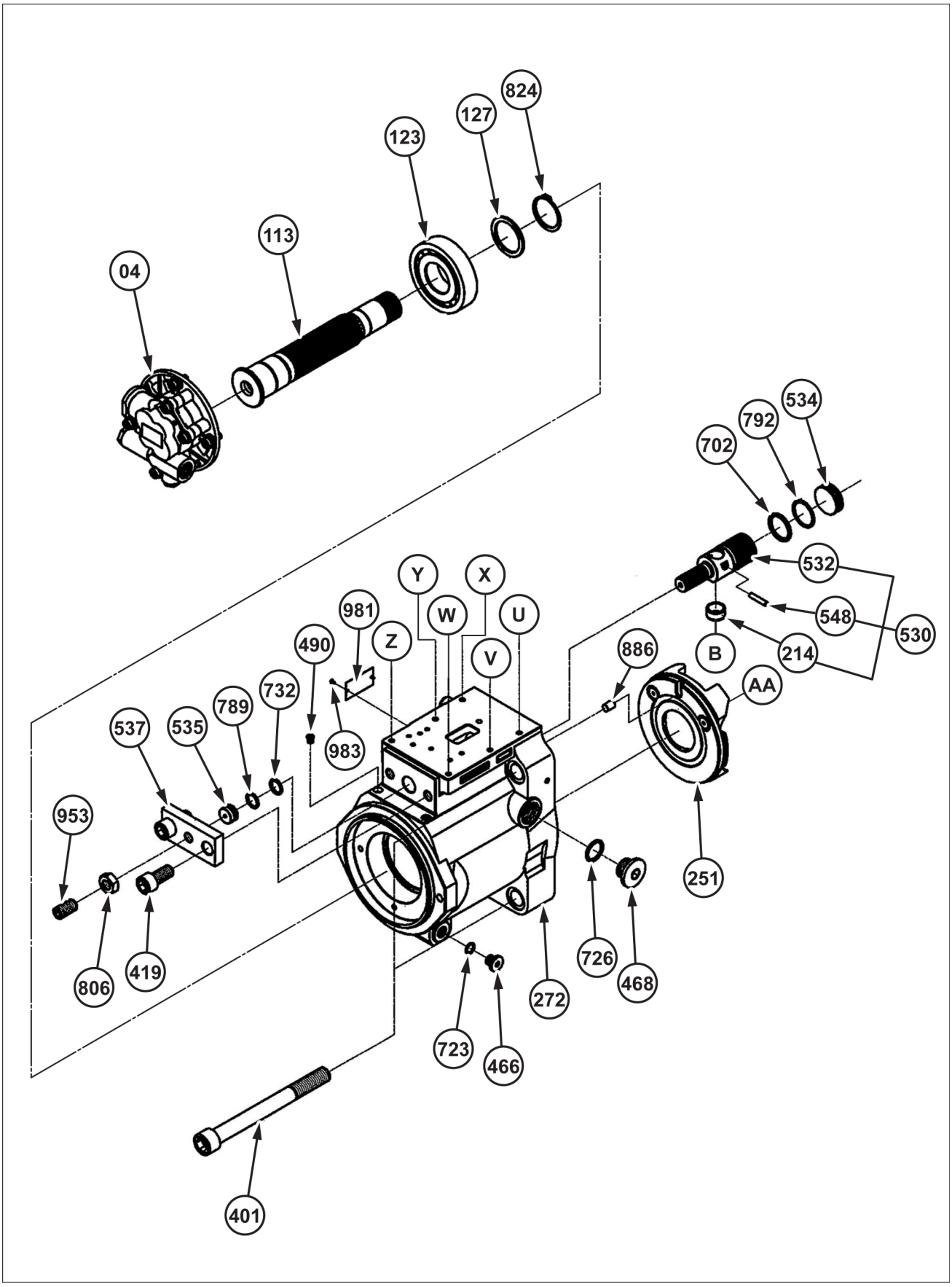
SMIL14CEX5094AB 6

7. Use a hexagon wrench [**8 mm**] to remove the hexagon socket head bolts **(3)** and split flanges **(2)**, and then remove the hydraulic hose **(3)**.
   The following explanations are given using the P2 pump side as an example.



SMIL19CEX2519AB 7

Pump - Exploded view



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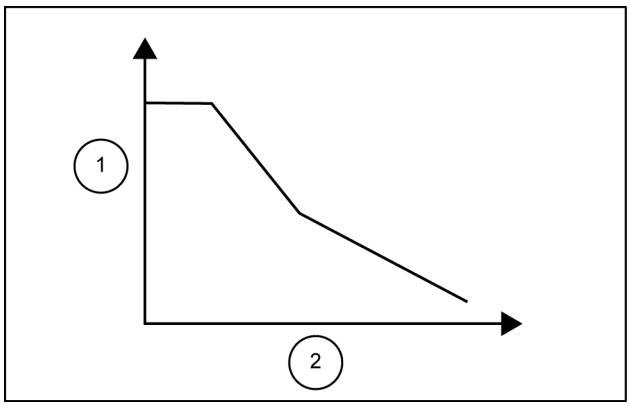


SMIL14CEX0597AA 2

1. Discharge flow Q
2. Discharge pressure Pd1 + Pd2

Overload prevention start-up

When the self pump discharge pressure Pd1 or the counterpart pump discharge pressure Pd2 increase, Pd1 and Pd2 work to the stepped section of the compensation spool **(621)** and pushes the compensation spool to right until a position, where the spring force of the outer spring **(625)** and the inner spring **(626)** and the hydraulic pressure balance out.
The compensation sleeve/spool pressure control section opens when the compensation spool moves, leading the discharge pressure Pd1 to the servo piston large-diameter section. The discharge pressure Pd1 is always led to the servo piston small-diameter section. However, the servo piston moves left due to the area difference and reduces the tilting angle. The feedback lever **(611)** is interlocked with the servo piston and the compensation sleeve **(622)**. When the servo piston moves left, the feedback lever rotates with the fulcrum pin **(874)** as a fulcrum, and the compensation sleeve moves right.
The opening section of the compensation sleeve spool starts closing gradually by this movement. The servo piston stops at a position, where the opening section totally closes.

Flow recovery start-up

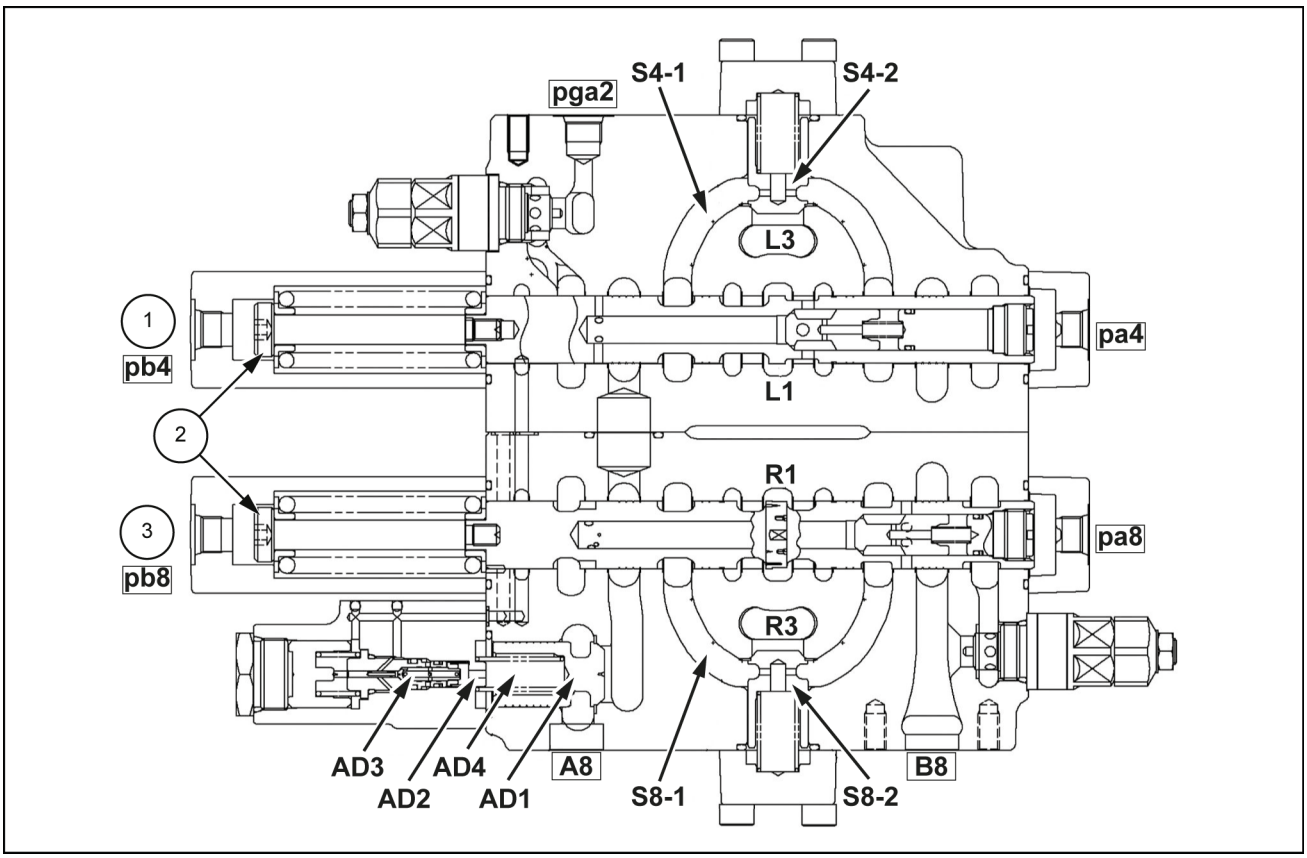
When the self pump discharge pressure Pd1 or the counterpart pump discharge pressure Pd2 decreases, the outer spring **(625)** and the inner spring **(626)** push back the compensation spool **(621)** to a position, where the spring force and the hydraulic pressure balance out.
When the compensation spool moves, the compensation sleeve/spool pressure control section opens, and the pressure of the servo piston large-diameter section is led to the tank line. Therefore, the servo piston **(532)** moves right by the discharge pressure Pd1 at the diameter section, increasing the tilting angle.
The feedback lever **(611)** is interlocked with the servo piston and the compensation sleeve **(622)**. When the servo piston moves right, the feedback lever rotates with the fulcrum pin **(874)** as a fulcrum, and the compensation sleeve moves left. The opening section of the compensation sleeve spool starts closing gradually by this movement. The servo piston stops at a position, where the opening section totally closes.

Low tilting (low flow) command override system

As explained, the tilting command of the flow control is output from the pilot spool side, and the tilting command of the horsepower control is output from the compensation spool side respectively. However, due to the hydraulic circuits, which are configured to lead the lower tilting command to the servo piston large-diameter room, the lower tilting command within commands of flow control and horse power control is always prioritized.

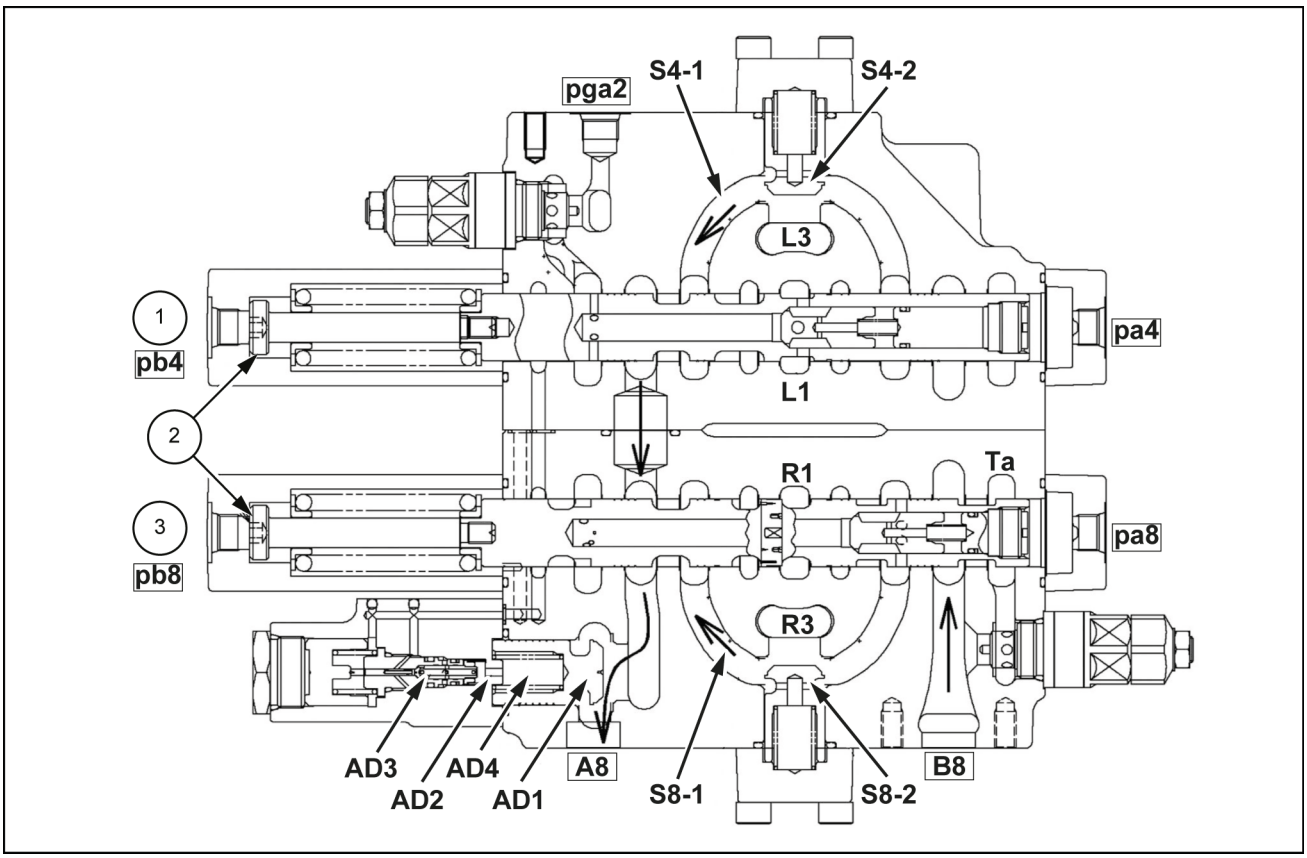
Power shift control (reducing horsepower control)

The power shift pressure Pf freely controls pump setting horsepower as shown in the following figure.
The compensation spool moves right via the Pf piston **(897)** when the power shift pressure **(Pf)** increases. Therefore, the pump tilting angle decreases, and the horsepower set decreases similarly as described in the overload prevention action of the horsepower control. On the contrary, the horsepower set increases when the power shift pressure **(Pf)** decreases.
When the command current of the electromagnetic proportional pressure reducing valve decreases to approx. **200 mA** or lower, the regulator judges as the electric system failure by the spool **(665)** integrated to the valve casing N2 **(660)**.



SMIL14CEX3812FB 10

1. Boom 2 (section 4)
2. Neutral state
3. Boom 1 (section 8)



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4. Hardening period of adhesive agent Opening to atmosphere for the following time period after tightening the spool end in order to ensure hardening of adhesive agent.

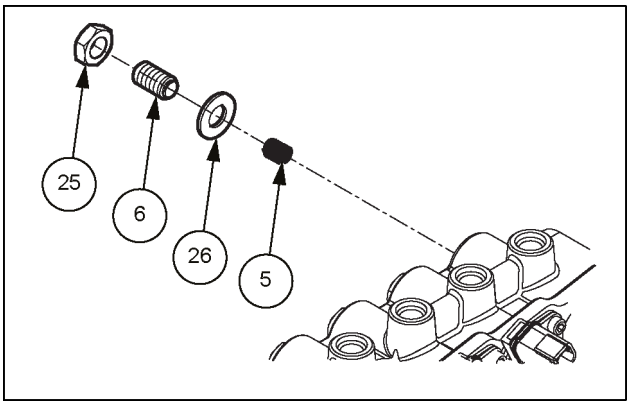
   Atmosphere temperature around **22 °C** (**71.6 °F**): For **8 h** or longer

   Atmosphere temperature around **40 °C** (**104.0 °F**): For **3 h** or longer

   Atmosphere temperature around **5 °C** (**41.0 °F**): For **24 h** or longer

NOTICE: *Exposure time not reaching the aforementioned time period may cause insufficient bonding strength.*

Remove the spring.
S1: Spring **(O) (4)**
S2 to S6: Spring **(C) (5)**



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2. Remove the spool.

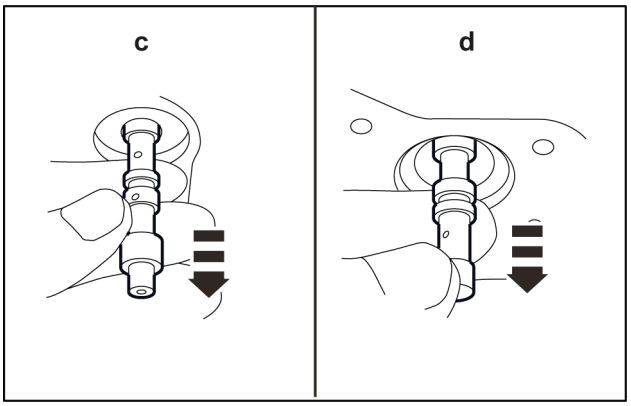
   • For normally open (S1)

     Pull out the spool **(O) (2)** from a hole for the adjusting screw of the body **(1)**.

   • For normally closed (S2 to S6)

     Pull out the spool **(C) (3)** from the sleeve **(C) (12)**.

     c. Normally open (S1)
     d. Normally closed (S2 to S6)



SMIL14CEX3720AA 5

3. Remove the sleeve.

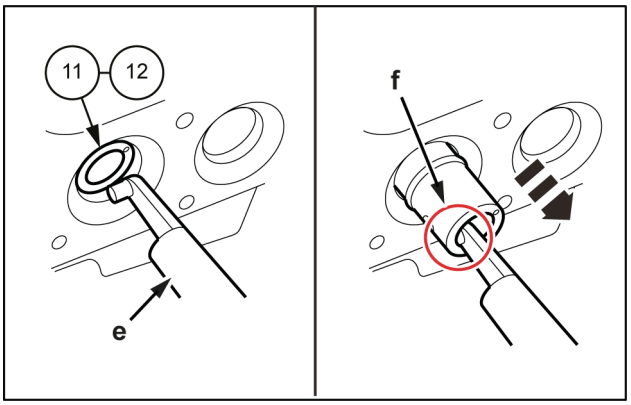
   Pull out the sleeve from the body **(1)** using a jig for removing sleeve.

NOTE: *Remove the sleeve **(O)**, **(C)** in the same manner.*

NOTICE: *Pay attention not to damage the body during removing the sleeve.*

NOTICE: *Remove the sleeve paying attention not to damage the inner surface of the sleeve by the jig.*

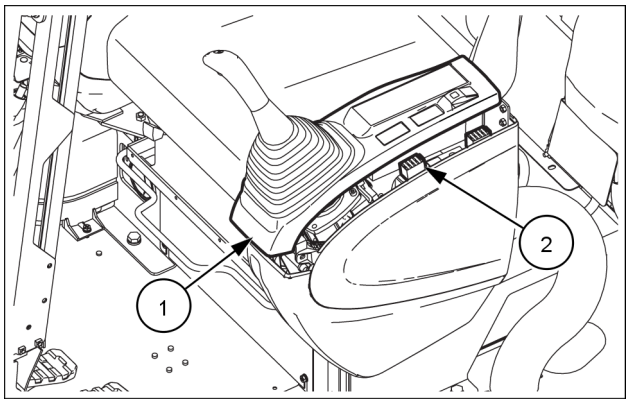
NOTICE: *Check for any harmful damage or crack inside and control edge when reusing the sleeve.*



SMIL14CEX3721AB 6

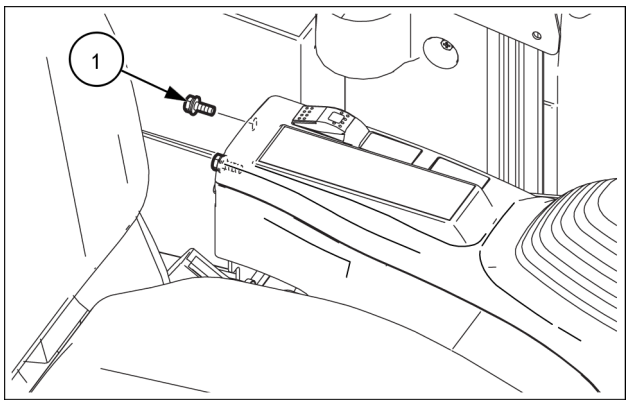
e. Jig
f. Pull out the sleeve by hooking on its port hole.

9. Install the connector **(2)** and install the console top cover **(1)**.



SMIL17CEX0975AB 9

10. Use the Phillips screwdriver to install the 2 screws **(1)** of the console top cover.



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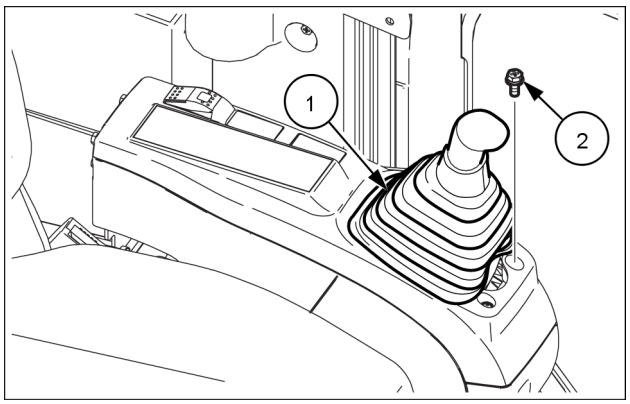
11. Use a Phillips screwdriver or box wrench [**10 mm**] to install the 2 bolts **(2)** for the console top cover and place the control lever boot **(1)** in place.



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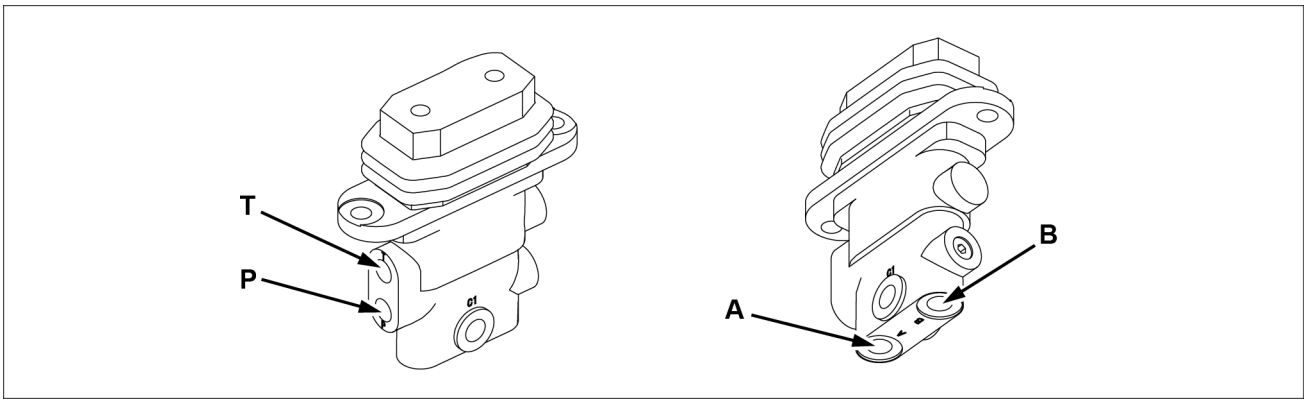
Options pedal - Overview - Remote control valve (second boom)

CX245D SR Crawler excavators LC triple articulation version (Stage V) - EU Market	WE
CX245D SR Crawler excavators LC with Blade triple articulation version (Stage V) - EU Market	WE

Port diagram



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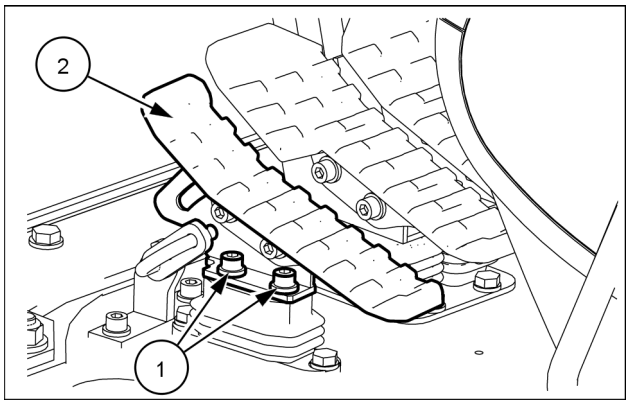
Port	Port name	Port size
A	Second boom up	**G1/4**
B	Second boom down	**G1/4**
P	Pressure	**G1/4**
T	Return	**G1/4**

7. Tighten the 2 bolts **(1)** with a hexagon wrench **8 mm**] to attach the option pedal **(2)**.



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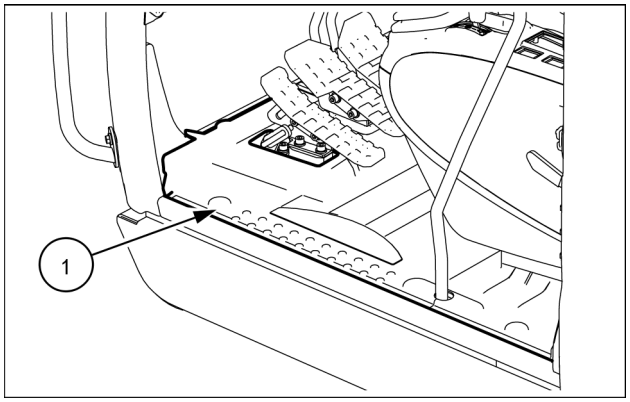
8. Mount the floor mat **(1)**.



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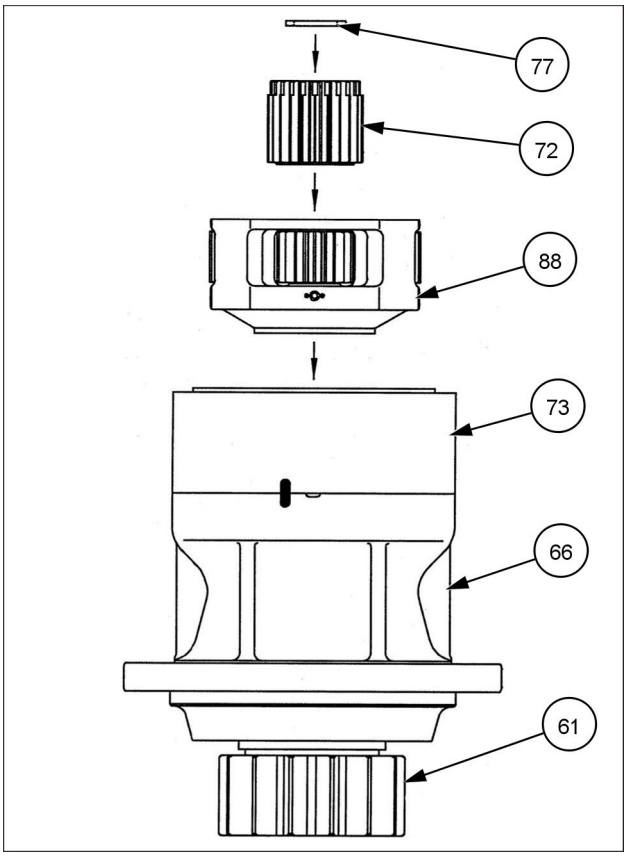
Installation of holder 2 assembly and spur tooth 4

1. Insert the holder 2 assembly **(88)** assembled in [10] while gently engaging the assembly with the inner teeth of the ring gear **(73)**.
   Additionally, insert the holder 2 assembly while turning it lightly so that spline of the pinion shaft **(61)** engages correctly.
   Gently engage the spur tooth 5 **(84)** with the spur teeth 4 **(72)** and insert.
   Make the groove on the thrust plate **(77)** face the spur teeth 4 side and insert it into the spur teeth 4.



SMIL17CEX0706BB 14

Installation of holder 1 assembly and sun gear

1. Insert the holder 1 assembly **(82)** while gently engaging the assembly with the inner teeth of the ring gear **(73)**.
   Additionally, insert the holder 1 assembly while turning it lightly so that teeth of the holder 1 assembly engage with the teeth of spur tooth 4 **(72)**.
   Make the groove on the sun gear **(76)** face the thrust plate **(77)** side and gently engage the groove with spur tooth 2 **(79)** to insert the sun gear.

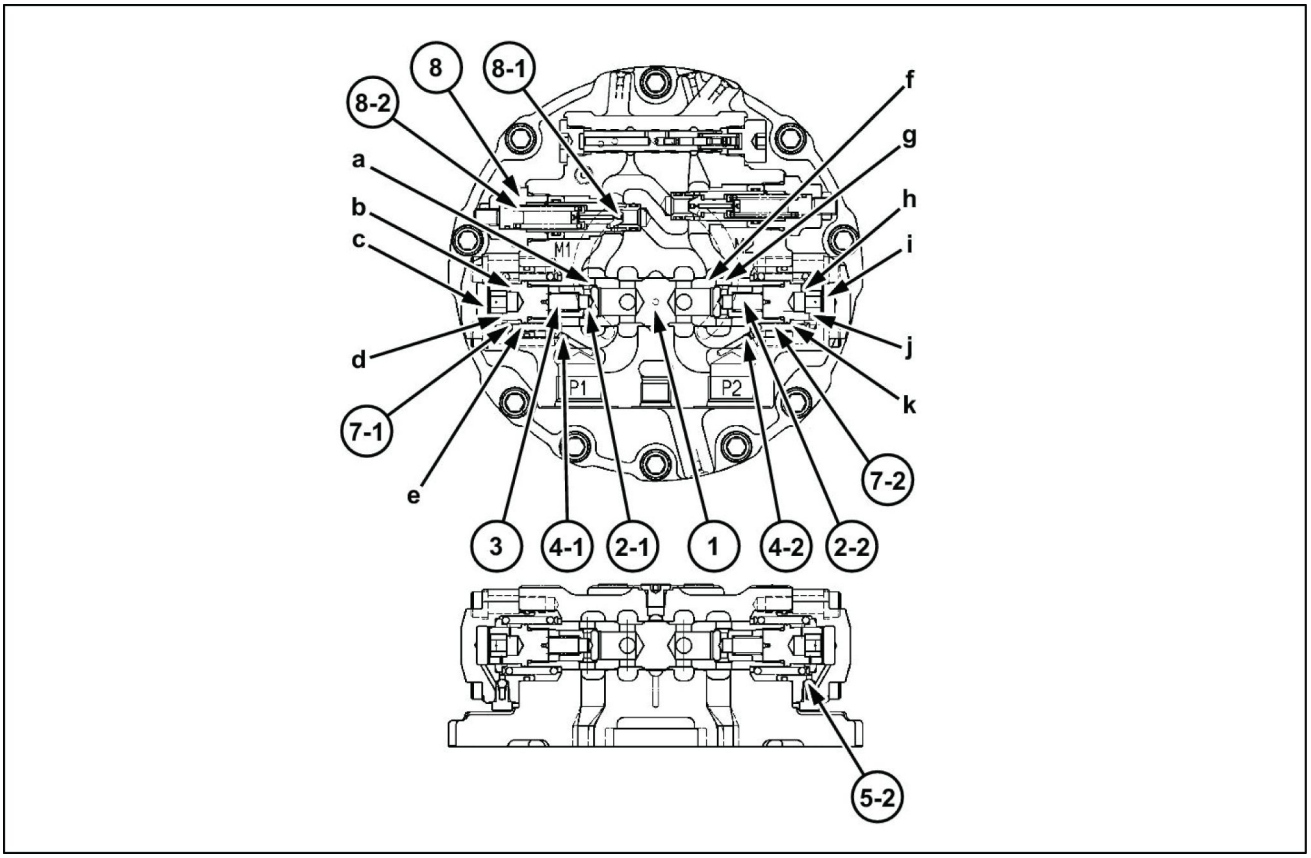
Piston motor braking (Fig. 3)

The double counter balance valve makes up the brake circuit together with the crossover relief valve. When the control valve is returned to neutral, the pressure oil from the hydraulic pump is cut-off and the P1 and P2 ports go to the same pressure.

Therefore, the plunger **(1)** moves to the neutral position, and the oil path B **(f)** opening surface area becomes small.

On the other hand, because the piston motor still attempts to rotate due to the inertial energy of the external load (piston motor pumping action), the M2 port pressure rises and acts as a braking force on the rotation of the piston motor.

At this time, when the M2 port side pressure reaches the set pressure for the relief valve **(8)**, the M1 port side poppet **(8-1)** moves to the left against the spring **(8-2)** and the pressure oil escapes to the M1 port side. In this way, the shock pressure due to the M2 port side inertial energy is controlled and at the same time the occurrence of a vacuum on the M1 port side is prevented.



LPIL12CX01767FA 3

Double counter balance valve and relief valve during piston motor braking

a. Oil path C1
b. Orifice D1
c. Damper chamber A1
d. Orifice D2
e. Spring chamber 1
g. Oil path C2
h. Orifice D3
i. Damper chamber A2
j. Orifice D4
k. Spring chamber 2

Reduction gear parts maintenance standards

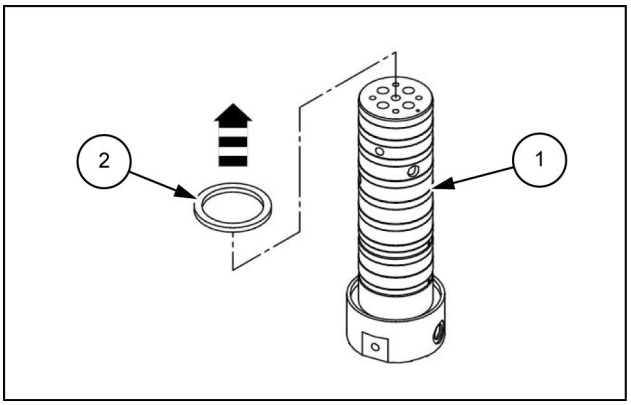
Table indicates maintenance standards for reduction gear parts.

Check each part according to the reduction gear parts maintenance standards in table.

When a permissible limit has been exceeded or is near being exceeded, perform part repair or replacement according to repair and solution procedures.

Applicable part	Inspection and measurement location	Permissible limit value	Repair, solution procedure
Planetary gear B **(21)**	Tooth thickness	Across 6 teeth **66.649 mm** (**2.623976 in**)	Replace planetary gear B
	Tooth surface	There is pitching on 10% or more of the tooth surface or breaking damage is occurring	
	Inner diameter	Flaking is occurring on the inner diameter surface	Replace the planetary gear, needle bearing and inner race
Needle bearing **(20)**	Roller rotation surfaces	Flaking is occurring on the surface	
Inner race **(19)**	Outer diameter surface	Flaking is occurring on the surface	
Drive gear **(25)**	Tooth thickness	Across 3 teeth **29.908 mm** (**1.177480 in**)	Replace the drive gear
	Tooth surface	There is pitching on 10% or more of the tooth surface or breaking damage is occurring	
	Spline section	Over-pin diameter **38.989 mm** (**1.535000 in**) Diameter of measurement pin **Ø3.00 mm** (**0.11811 in**) or breaking damage is occurring	If replacing the drive gear, inspect the shaft at the same time
Holder B **(17)**	Tooth thickness of internal tooth	Diameter between parts **66.742 mm** (**2.627637 in**) Diameter of measurement pin **Ø7.00 mm** (**0.27559 in**) or breaking damage is occurring	Replace holder B
Sun gear C **(15)**	Tooth thickness	Across 4 teeth **41.371 mm** (**1.628780 in**)	Replace sun gear C
	Tooth surface	There is pitching on 10% or more of the tooth surface or breaking damage is occurring	
Planetary gear C **(12)**	Tooth thickness	Across 6 teeth **65.662 mm** (**2.585118 in**)	Replace planetary gear C
	Tooth surface	There is pitching on 10% or more of the tooth surface or breaking damage is occurring	
	Inner diameter	Flaking is occurring on the inner diameter surface	Replace the planetary gear, needle bearing and inner race
Needle bearing **(11)**	Roller rotation surfaces	Flaking is occurring on the surface	
Inner race **(10)**	Outer diameter surface	Flaking is occurring on the surface	

5. Use V-ring removal jig or the like to remove the V-ring **(2)** from the axle **(1)**.



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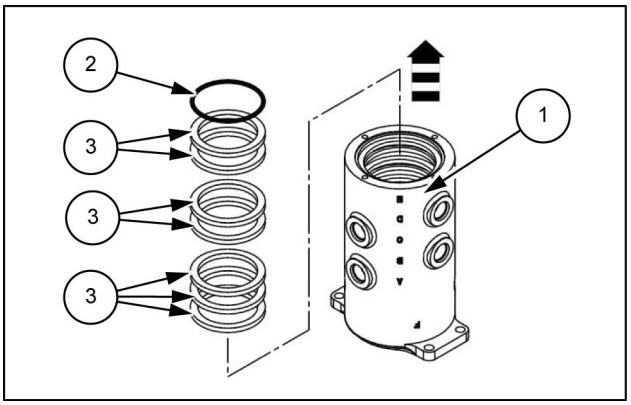
6. Use O-ring removal jig or the like to remove the O-ring **(2)** and packing ring **(3)** from the rotor **(1)**.



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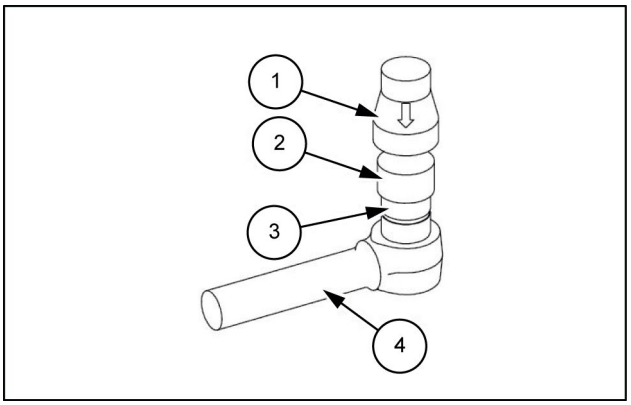
Boom cylinder - Assemble

CX245D SR Crawler excavators LC version (Stage V) - EU Market	WE
CX245D SR Crawler excavators LC with Blade version (Stage V) - EU Market	WE
CX245D SR Crawler excavators LC with Blade version (Stage V) - Israel Market	MEA

NOTICE: *If a part with peeling paint is assembled, the peeled off paint can get inside the cylinder. This causes oil leaks, so work being very careful to prevent this.*

Installation of pin bushing

1. Use the installation jig to press fit onto the piston rod **(4)** and into the tube.
   (apply hydraulic oil in advance)
2. Use the metal block **(5)** to install the wiper ring **(6)**.



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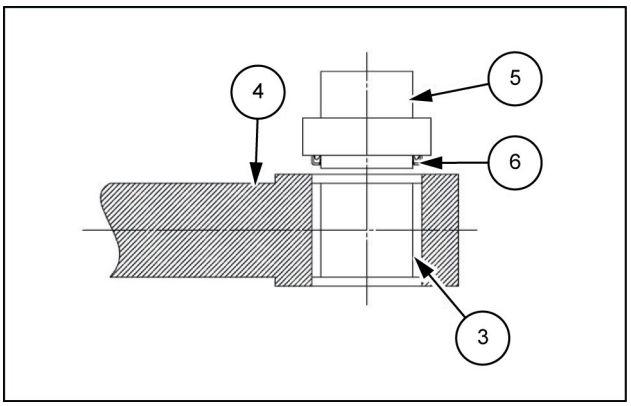
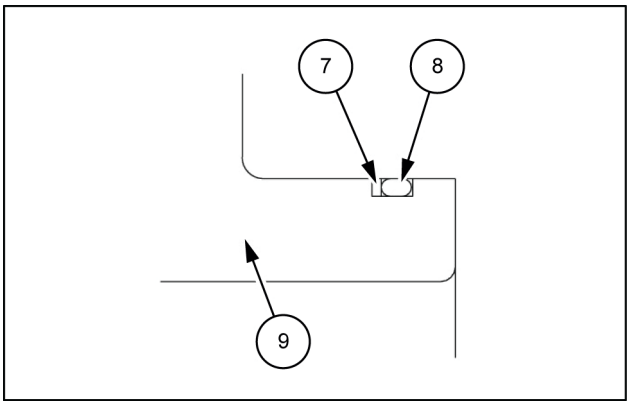


LPIL12CX02939AB 2

Replacement of seals

1. When disassembling the cylinder, replace all the seals.
2. O-rings
   - Clean the mounting groove well, and then mount the backup ring **(7)** and O-ring **(8)**.
     Foreign matter in the groove section would cause an oil leak.
   - Be careful about the location of the backup ring.
   - Apply grease or hydraulic oil to the backup ring and O-ring so that they slide easily, and then assemble them. If they are sliding poorly, O-ring may become twisted during assembly, which causes oil leaks.



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1. Press
2. Installation jig
3. Pin bushing
9. Cylinder head

Dipper cylinder - Sectional view

CX245D SR Crawler excavators LC version (Stage V) - EU Market	WE
CX245D SR Crawler excavators LC with Blade version (Stage V) - EU Market	WE
CX245D SR Crawler excavators LC with Blade version (Stage V) - Israel Market	MEA

6. Buffer ring
12. Installation bolt

Bushing

The bushing is press fit to the inside surface of the cylinder head **(3)** and touches the piston rod **(2)**. Together with the slide rings **(18)** and **(19)** on the outer circumference of the piston, the bushing divides the lateral load applied to the cylinder and moves linearly relative to the piston rod. Furthermore, it supports one end of the piston rod and has the function of minimizing eccentricity which has a negative impact on the sealing.

Buffer ring

The buffer ring **(6)** has the function of buffering the pressure and heat applied on the U-ring **(7)** by the hydraulic oil to improve durability.

U-ring and backup ring

The U-ring **(7)** seals the pressure oil within the cylinder. The U-ring also has the function of forming an appropriate oil film on the surface of the piston rod in order to prevent rust of the piston rod **(2)**. The backup ring **(8)** has the function of suppressing extrusion of the U-ring into the gap between the piston rod and the cylinder head **(3)** when the pressure operates and of improving durability.

Wiper ring

The wiper ring **(9)** is positioned in the opening where the piston rod **(2)** comes out from and goes into the cylinder. This wiper ring **(9)** prevents dust and water from getting into the cylinder from the outside. It also has the function of wiping off any mud sticking to the surface of the piston rod as the piston rod moves.

Piston assembly

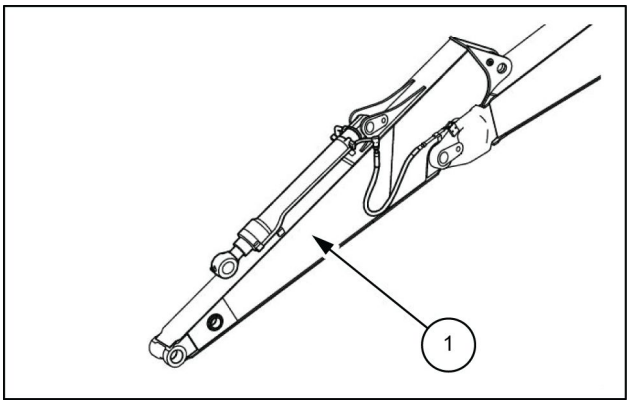
The piston assembly has the function of transmitting the propulsion of the cylinder. A seal ring **(16)** is mounted on the center of the piston **(15)** to prevent the flow of pressure oil from either the left or right chamber to the other chamber. There are slide rings **(18)** and **(19)** mounted at each end of the seal ring. They have the function of a bearing to receive the cylinder lateral load.

Bucket cylinder - Remove

CX245D SR Crawler excavators LC triple articulation version (Stage V) - EU Market	WE
CX245D SR Crawler excavators LC with Blade triple articulation version (Stage V) - EU Market	WE

- Remove the bucket. (Refer to " **Bucket - Remove (84.100)**")
- Remove the bucket link. (Refer to " **Link and rod - Remove (84.100)**")

1. Bring the arm **(1)** top in contact with the ground. Start the engine, open the bucket at idle, and retract the bucket cylinder rod.



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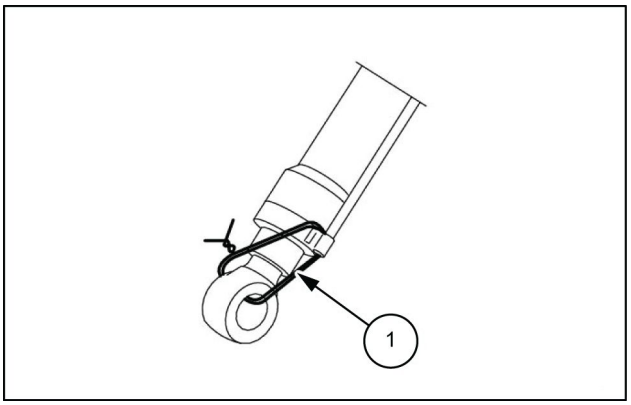
2. Tie the cylinder rod with wire **(1)** so that it cannot come out.



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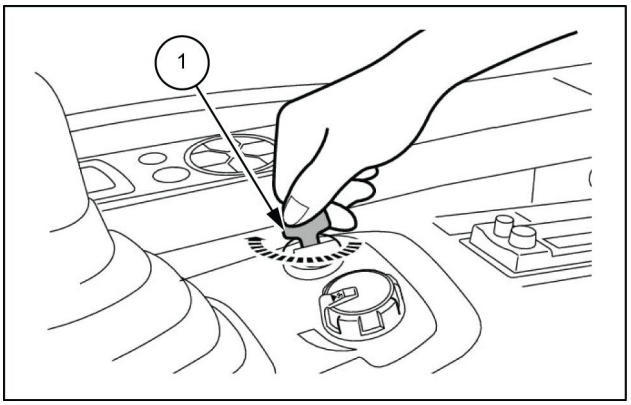
3. Turn the key switch **(1)** "OFF" and stop the engine.



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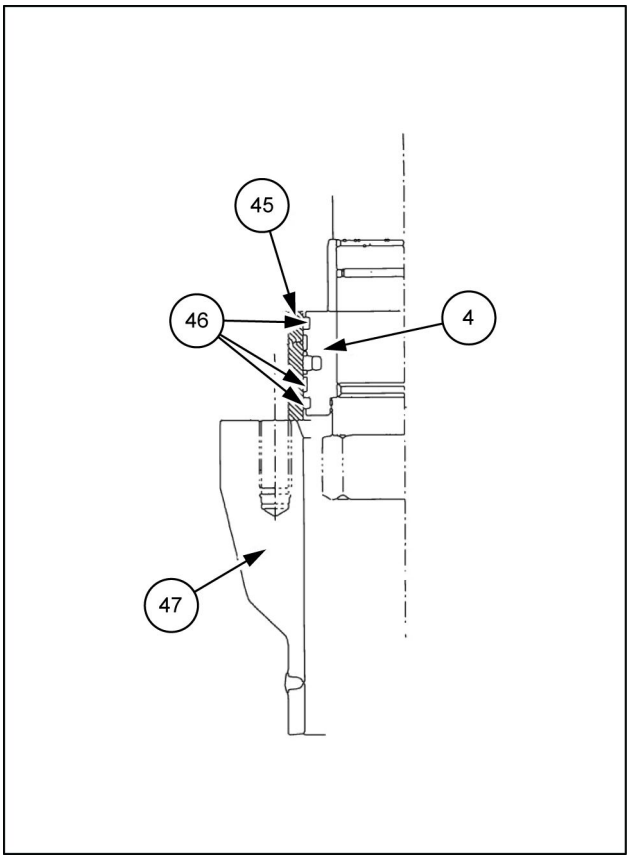
Problem	Possible Cause	Correction
	Rod packing (buffer ring and Uring): There is major extrusion of the packing heel section	1. Replace the part 2. Abnormally high pressure may be operating on the packing A. Check the pressure during operation B. There may be trouble with the buffer ring section Inspect the buffer ring section
Piston rod sliding section oil leak	Backup ring: The part is greatly deformed	1. As a rule, replace the rod packing too at the same time 2. Abnormally high pressure is often the cause. The check items for this are the same as those given above for packing heel section extrusion
	Wiper ring: There is foreign matter caught in the lip	Remove the foreign matter
	Wiper ring: The lip is damaged. There is other abnormal damage	Replace the part
	Bearing part (bushing): There is major wear of the bushing and the gap with the piston rod exceeds the limit on inner diameter wear in " **Bucket cylinder - Inspect (35.738)**"	Replace the part
	Bearing part (bushing): There are large scratches on a sliding surface	1. Replace the part 2. Inspect the piston rod sliding surfaces for scratches and rust
	Cylinder head: A seal mounting section has scratches and rust	1. Remove the scratches or rust with a whetstone 2. If the repair does not solve the problem, replace the cylinder head
Cylinder head matching section oil leak	O-ring: There is foreign matter caught in the inner or outer diameter. There is damage to the O-ring	1. Remove the foreign matter 2. If the O-ring is damaged, replace it 3. Tube interior surface inspection: If there are any scratches or rust, use a whetstone to make the surface smooth 4. Cylinder head O-ring groove inspection: Same as above 5. Backup ring inspection: If the backup ring is deformed or extruded, replace it Check the above and replace the Oring
	Backup ring: The part is deformed or extruded	Replace together with the O-ring
	Cylinder head: A part is loose	1. Disassemble the cylinder head and inspect the O-ring and backup ring. If there is damage, replace 2. Check the tube and cylinder head threads for damage and if there is any damage, replace 3. When the inspection is complete, tighten to the specified torque. (Refer to " **Bucket cylinder - Assemble (35.738)**") 4. Stop rotation
	Bolt: There is looseness, stretching, or breakage	Replace all the bolts and tighten to the specified torque

Insertion of piston rod into the tube

1. Secure the tube **(47)** vertically or horizontally.
2. Insert the piston rod **(4)** into the tube **(47)**.
   - If the tube is secured vertically, the piston rod enters the tube due to its own weight.
   - When the piston section is entering the tube, be careful that the slide rings **(46)** do not fall out.

   45. Jig, Nylon pipe (split in two)
   46. Slide ring (shift the abutment phase 180° from one ring to the next.)



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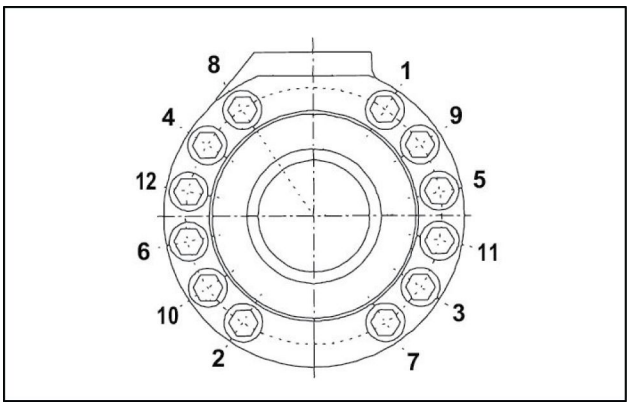
Cylinder head tightening

Align the cylinder head with the position on the assembly diagram, and then tighten the bolts to the specified torque given on the assembly diagram in the order shown in the diagram right.
Bolt tightening order



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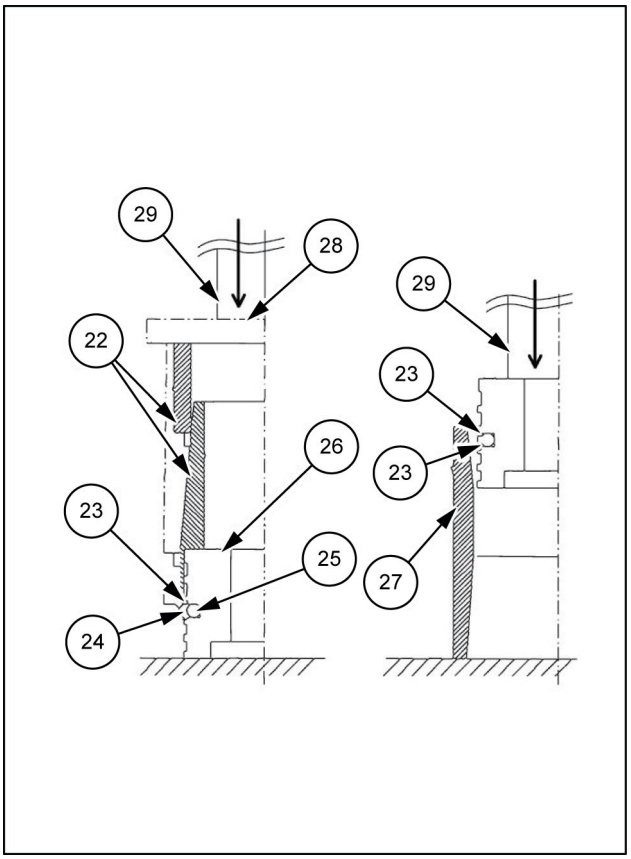
Assembly of piston assembly

1. Attach the seal ring **(24)**.
   - Attach the back-up ring **(23)** for one side and the O-ring **(25)** on the piston **(26)** in advance, place on the press platform, and use the seal ring insertion jig **(22)** as in the diagram to assemble the seal ring.
2. Calibrate the seal ring.
   - Mount the seal ring **(24)** and the other backup ring **(23)**, and then immediately calibrate with the seal ring calibration jig **(27)** so that the seal ring does not remain expanded. (Strictly observe this instruction.) Since the seal ring is stretched when it is mounted, if it is not calibrated, “Insertion of piston rod into the tube” is not possible.
3. Assemble the slide ring.
   - Spread the cut section of the slide ring the minimum with both hands and install from the axial direction. If it is spread too wide, it cannot be mounted.
     * Consult with our company about jigs.

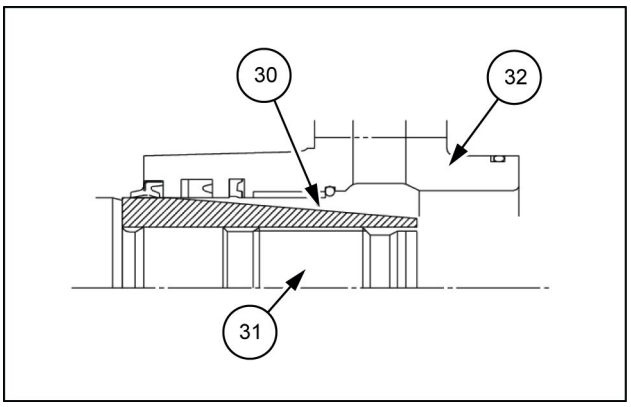
     28. Metal block
     29. Press



LPIL12CX02943BB 6

Assembly of piston rod assembly

1. Secure the piston rod **(31)**.
2. Assemble the cylinder head **(32)** on the piston rod **(31)**. Be careful that the wiper ring and U-ring lips do not catch on the stepped section. Use the cylinder head insertion jig **(30)** as in the diagram on the right to assemble the cylinder head on the piston rod.
   - Apply grease or oil and assemble being careful not to scratch the packing.



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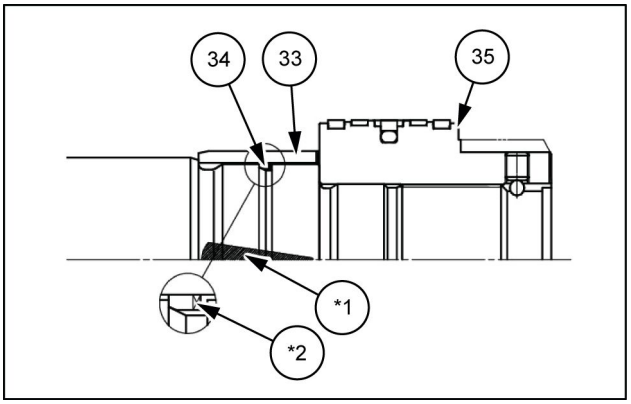
3. If there is a cushion on the extension side, assemble the cushion ring **(33)** and cushion seal **(34)** with the following procedure.
   1. Insert into the groove with the side of the cushion seal with the slit **(*2)** facing the piston side.
   2. Assemble with the part of the cushion ring processed to be flat facing as in the diagram.



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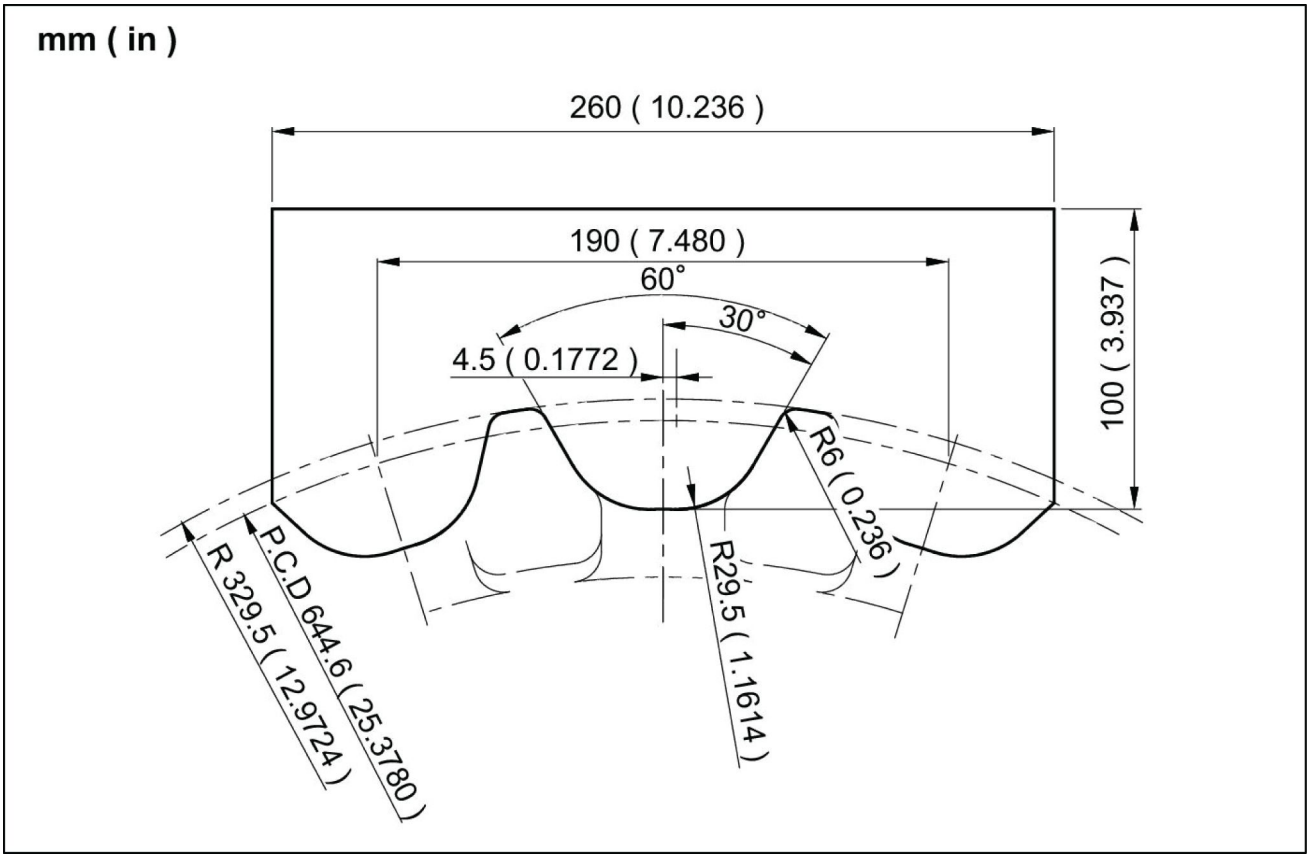
Driving wheel - Dimension

Inspection gauge for drive sprocket



SMIL13CEX1308FA 1

NOTE: *All the dimensions in figure are in mm (in).*

Track tensioner - Assemble

1. Place parts in a rough cleaning container filled with kerosene to clean off any adhered matter that can form sharp points and cause scratches.

NOTE: *Immerse in kerosene until dust, grease, and other adhered matter comes off and floats to the surface.*

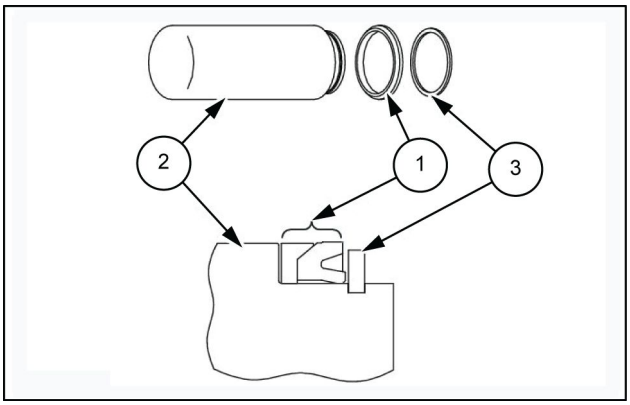
2. Place parts in a finish cleaning container filled with kerosene and clean while gently moving the parts. After cleaning, wipe away the kerosene with a clean rag.

NOTE: *Place the parts in a location free of dust and moisture and use compressed air to dry the parts. After drying, coat parts with engine oil.*

3. Install the U-packing **(1)** coated with grease onto the piston rod **(2)**, and then install the retaining ring **(3)**.

NOTE: *Use a new U-packing **(1)**.*

NOTE: *Make sure that the U-packing **(1)** faces correctly.*



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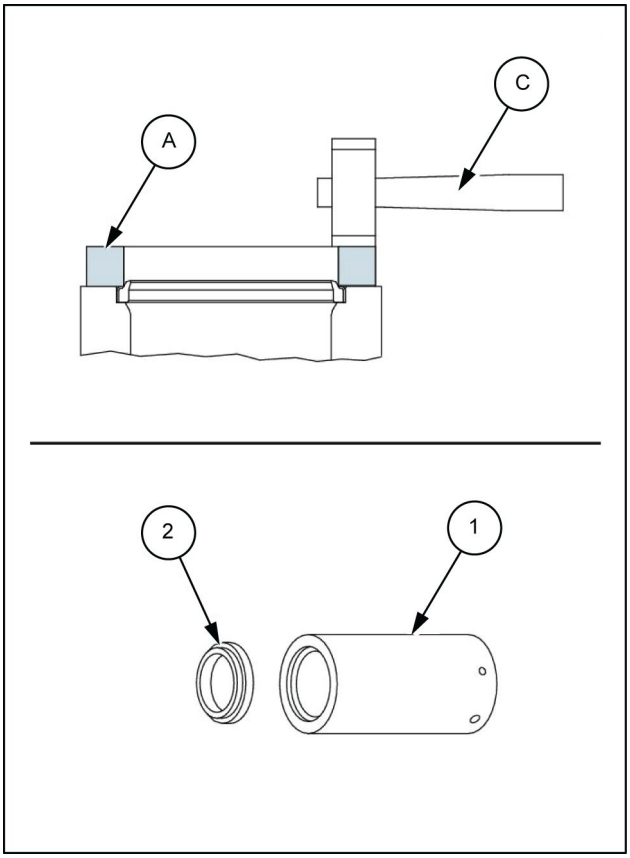
4. Use the jig **(A)** and hammer **(C)** to install the dust seal **(2)** on the grease cylinder **(1)**.
   Apply grease to the lip section of the dust seal **(2)**.

NOTE: *Use a new dust seal **(2)**.*



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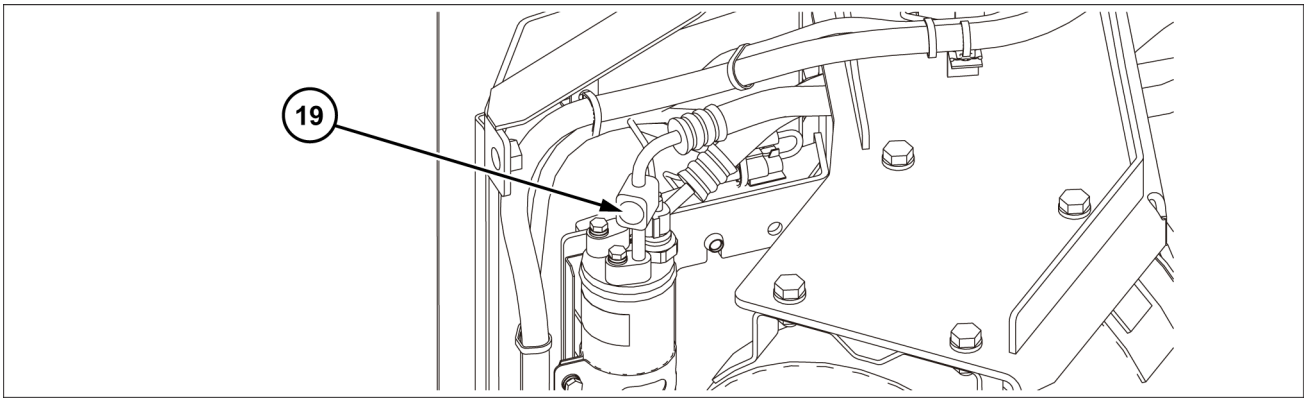
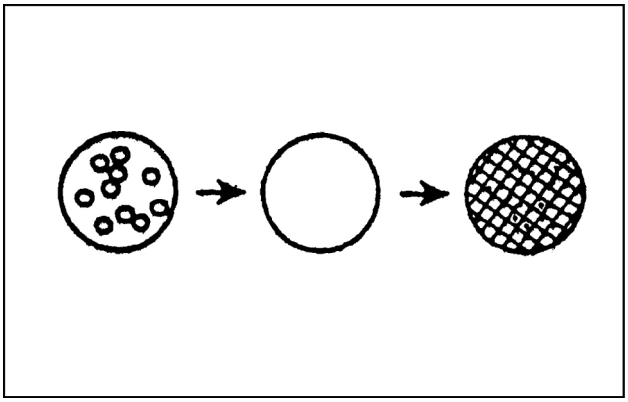
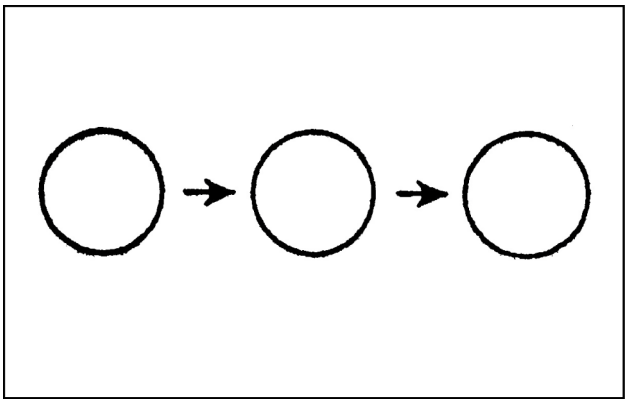
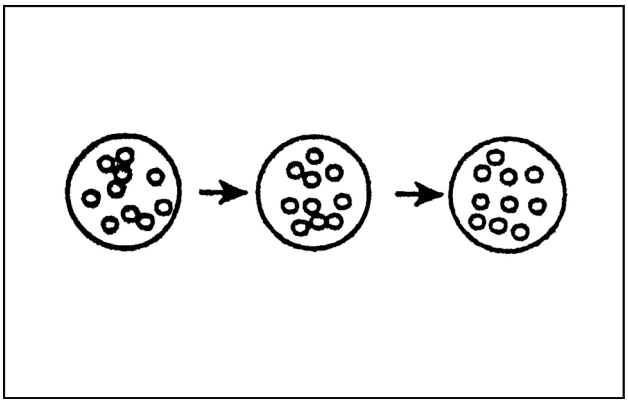
Items to prepare:

- Hexagon wrench [**6 mm**]
- Hammer
- Wrenches [**13 mm**], [**17 mm**]
- Box wrench [**17 mm**]
- Screwdriver
- Engine oil
- Specialty jigs
- Pressing machine
- **LOCTITE® 262™** or equivalent
- Special fiber cloth (Kimwipe)
- Marking pen
- Micrometer caliper
- Caliper

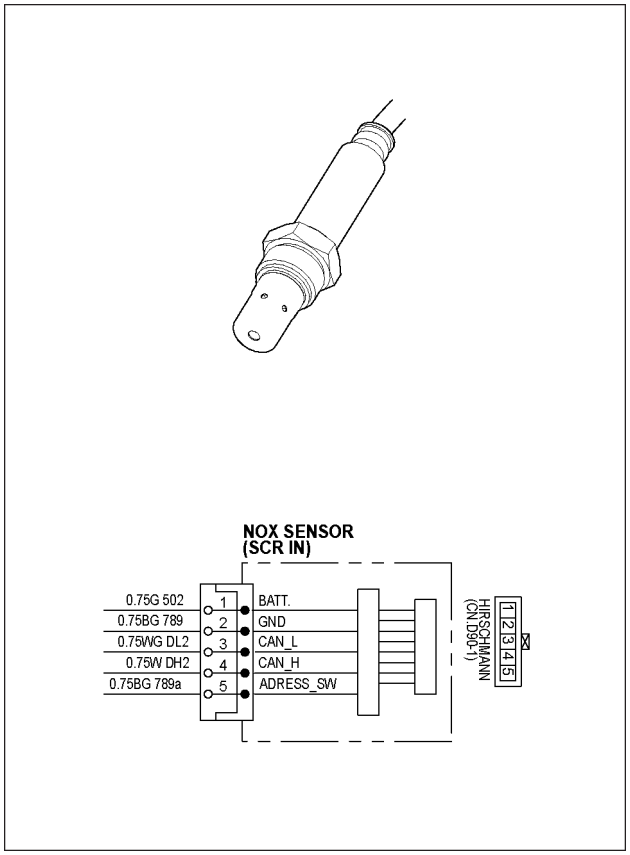


SMIL19CEX2593EB 6

Judgment of refrigerant volume seen from the sight glass of the receiver dryer		
Adequate	You can see a few bubbles after A/C-ON and then it turns to clear and show thin milky color	 SMIL14CEX1840AA 7
Excessive filling	No bubble is seen after A/C-ON	 SMIL14CEX1841AA 8
Insufficient filling volume	Continuous bubbles are seen after A/C-ON	 SMIL14CEX1842AA 9
Total gas filling volume: **950 – 1050 g** (**33.5 – 37.0 oz**)		

B115 - NOx sensor (SCR IN)

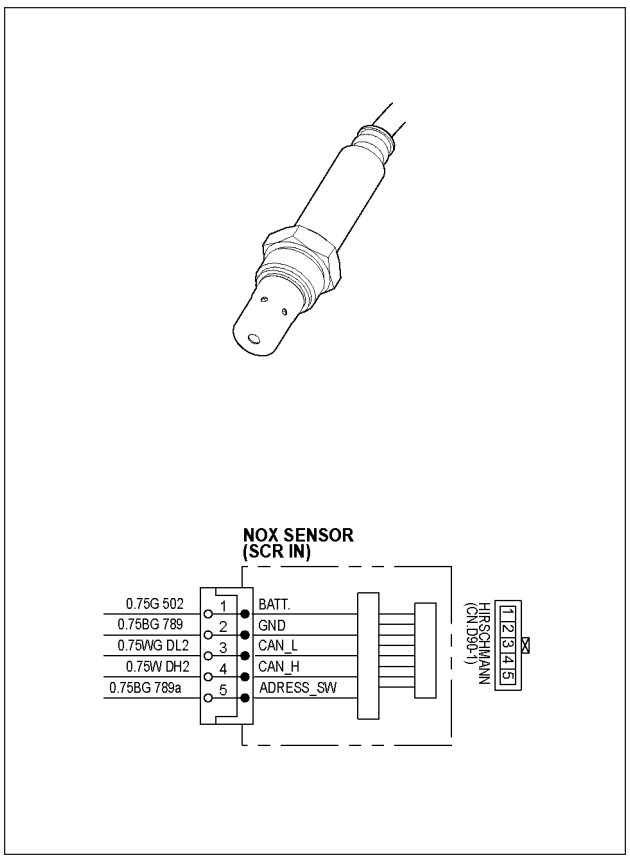
Part number: KHH15311



SMIL20CEX0334BA 44

B116 - NOx sensor (SCR OUT)

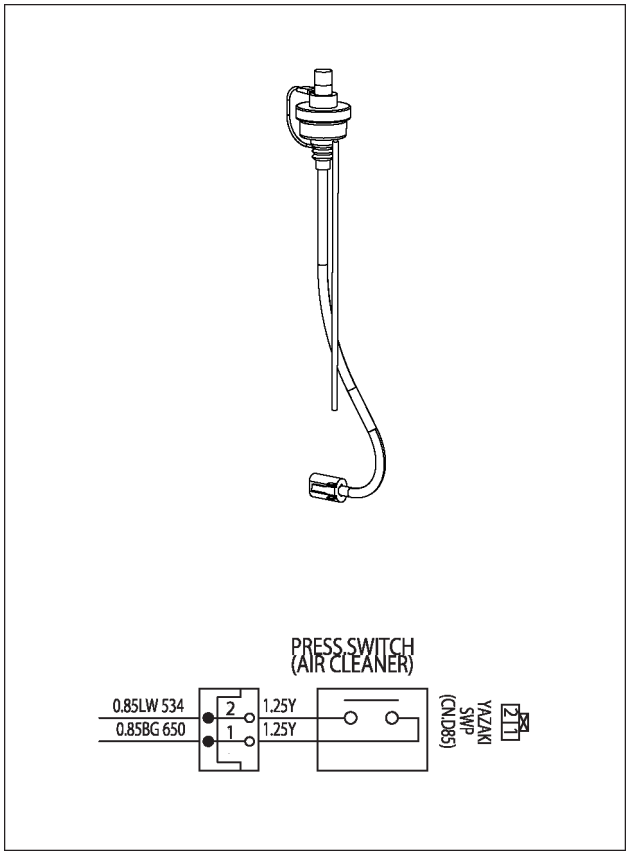
Part number: KHH15311



SMIL20CEX0334BA 45

S62 - Air cleaner pressure switch

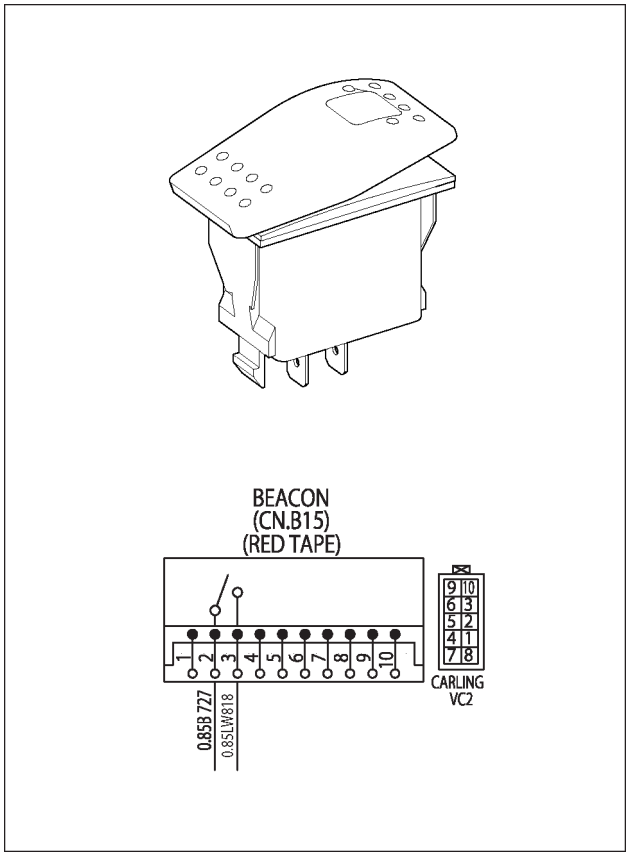
Part number: KHH10330



SMIL20CEX0362BA 130

S85 - Beacon switch (red tape)

Part number: KHR15480



SMIL20CEX0363BA 131

Light harness

*1. White adhesive tape
*2. Plate

Connector No.		Connect to	Manufacturer name	Part No.
	CN.D98-1F	LED light 1	DEUTSCH	DT06-2S-CE06: CONNECTOR 1062-16-0122: TERMINAL W2S-P012: WEDGE + DT04-2P-CE02: CONNECTOR W2P: WEDGE 114017: SEALING PLUG
	CN.D98-2F	LED light 2	DEUTSCH	DT06-2S-CE06: CONNECTOR 1062-16-0122: TERMINAL W2S-P012: WEDGE + DT04-2P-CE02: CONNECTOR W2P: WEDGE 114017: SEALING PLUG
	CN.D98-3F	LED light 3	DEUTSCH	DT06-2S-CE06: CONNECTOR 1062-16-0122: TERMINAL W2S-P012: WEDGE + DT04-2P-CE02: CONNECTOR W2P: WEDGE 114017: SEALING PLUG
	CN.D100M	Frame main harness	YAZAKI	7222-1424-30

Second option harness (proportional control)

*1. Red adhesive tape
*2. Blue adhesive tape
*3. Plate

Connector No.		Connect to	Manufacturer name	Part No.
	CN.B20F	Console harness	YAZAKI	7123-7484-40
	CN.B20-1F	Second option (up) pressure switch	YAZAKI	7123-1424-30
	CN.B20-2F	Second option (down) pressure switch	YAZAKI	7123-1424-30
	CN.B20-3F	Second option (up) proportional valve	TYCO ELEC AMP	174352-2
	CN.B20-4F	Second option (down) proportional valve	TYCO ELEC AMP	174352-2

FVM harness

NOTE: *For connectors marked with * (CN.A25-2F, A25-10F), install the suitable housing.*

a. CN.A25-2F and A25-10F must be fastened with red tape

*1. Red adhesive tape
*2. Blue adhesive tape
*3. Yellow adhesive tape
*4. Plate

Connector No.		Connect to	Manufacturer name	Part No.
	CN.A25M	Cab main harness	YAZAKI	7122-8345
	CN.A25-1F	FVM computer	TYCO ELEC AMP	917992-1
*	CN.A25-2F	Option power supply	YAZAKI	7123-8345 + 7122-8345
	CN.A25-3F	FVM setup	YAZAKI	7123-8386
	CN.A25-4M	CCD (rear)	YAZAKI	7222-7444-30
	CN.A25-5M	CCD (right)	YAZAKI	7222-7444-30
	CN.A25-6M	CCD (left)	YAZAKI	7222-7444-30
	CN.A25-7F	Cab harness (rear)	YAZAKI	7123-7444-30
	CN.A25-8F	Cab harness (right)	YAZAKI	7123-7444-30
	CN.A25-9F	Cab harness (FVM)	YAZAKI	7123-7444-30

EST-A harness

Connector No.		Connect to	Manufacturer name	Part No.
	CN.52F	Cab main harness	–	7122-8365
	CN.228M	EST connector; A	DEUTSCH	HD10-9-1939PE:HOUSING 1060-16-0622:TERMINAL 114017:SEALING PLUG + HDC16-9:CAP

Light harness (boom light)

*1. White adhesive tape
*2. Plate

Connector No.		Connect to	Manufacturer name	Part No.
	CN.D52-1	Boom lamp	DEUTSCH	DT06-2S-CE06: CONNECTOR 1062-16-0122: TERMINAL W2S-P012: WEDGE + DT04-2P-CE02:CONNECTOR W2P:WEDGE 114017:SEALING PLUG
	CN.D52M	Frame main harness	YAZAKI	7222-1424-30

Pressure sensor harness (overload warning)

*1. Plate

Connector No.		Connect to	Manufacturer name	Part No.
	CN.D77F-1	HBCV pressure sensor	TYCO ELEC AMP	174357-2
	CN.D77M	Frame main harness	YAZAKI	7222-7444-40

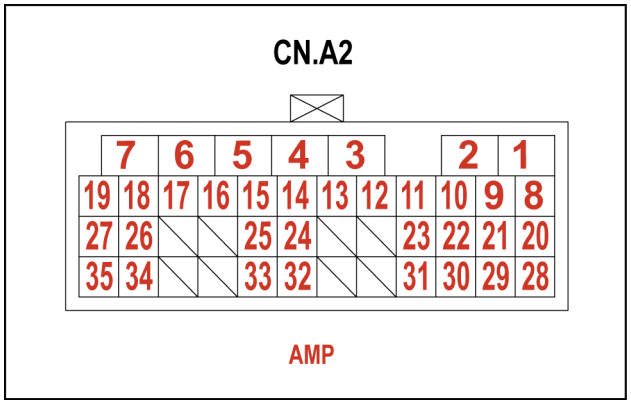
Wiring harnesses - Electrical schematic sheet 14 - Dosing control unit

Type	Component	Connector/Link
Controller	A17	
Connector	CN.D1-2	**CN.D1-2** CONNECTOR : DOSING CONTROL UNIT

Wiring harnesses - Electrical schematic sheet 36 - Quick coupler and around lamp

Type	Component	Connector/Link
Sensor	B61	
Switch	S129	
Lamp	S141	
	X33	
Connector	CN.A30	**CN.A30** CONNECTOR
Connector	CN.A30F	**CN.A30F (Female)** CONNECTOR
Connector	CN.A30M	**CN.A30M (Male)** CONNECTOR
Connector	CN.A36-M	**CN.A36 (Male)** CONNECTOR
Connector	CN.A60	**CN.A60** CONNECTOR
Connector	CN.C5	**CN.C5** CONNECTOR : SUNLOAD SENSOR
Connector	CN.C30	**CN.C30** CONNECTOR : QUICK COUPLER SWITCH
Connector	CN.C31	**CN.C31** CONNECTOR : AROUND LAMP
Connector	CN.C32	**CN.C32** CONNECTOR : FOR CRANE

CONNECTOR CN.A2: CONTROLLER (Male)

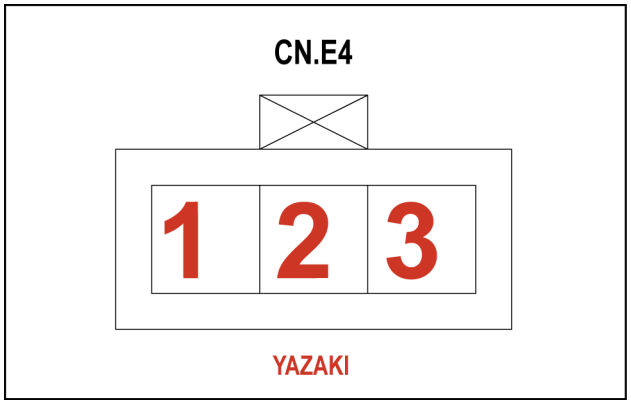


SMIL17CEX2894AA 2

Pin	From	Wire	Description	Color-Size	Frame
3	CN.A55-F-P-2	902A		OR-0.0	**SHEET 27 - Valves and fuel level sensor**
4	CN.A55-F-P-5	906A		BL/RD-0.0	
5	CN.A55-F-P-7	908A		RD-0.0	
6	CN.A55-F-P-14	905A		GN/RD-0.0	
7	CN.A55-F-P-16	906B		BL/BK-0.0	
11	CN.A55-F-P-11	902B		BK/OR-0.0	
16	CN.A54-F-P-22	550		GY/RD-0.0	**SHEET 26 - Valves**
19	CN.A55-F-P-18	908B		BK/RD-0.0	**SHEET 27 - Valves and fuel level sensor**
20	CN.A26-F-P-8	542		OR/RD-0.0	**SHEET 33 - Diagnostic connector**
24	SP51-P-X	501B		GN-0.0	**SHEET 08 - Controller**
25	CN.A48-P-4	515b		BR-0.0	**SHEET 40 - Interconnectors**
26	CN.A54-F-P-20	426		GN/BL-0.0	**SHEET 39 - Interconnectors**
27	CN.A55-F-P-15	905B		GN/WH-0.0	**SHEET 27 - Valves and fuel level sensor**
28	CN.A30-P-6	547		WH/RD-0.0	**SHEET 36 - Quick coupler and around lamp**
29	SP52-P-X	539C		GN/YE-0.0	**SHEET 08 - Controller**
31	CN.A26-F-P-7	541		YE/RD-0.0	**SHEET 33 - Diagnostic connector**
32	SP51-P-X	501C		GN-0.0	**SHEET 08 - Controller**
33	SP742-P-X	840A		RD/YE-0.0	**SHEET 39 - Interconnectors**
34	CN.A54-F-P-19	425		YE-0.0	
35	CN.A35-F-P-13	401		YE/GN-0.0	**SHEET 38 - Interconnectors**

To locate the connector refer to " **Electrical system - Electrical schema - Connector localization (55.000)**" or " **Electrical system - Electrical schema - Connector localization (55.000)**".

CONNECTOR CN.E4: CRANK ANGLE SENSOR (Male)

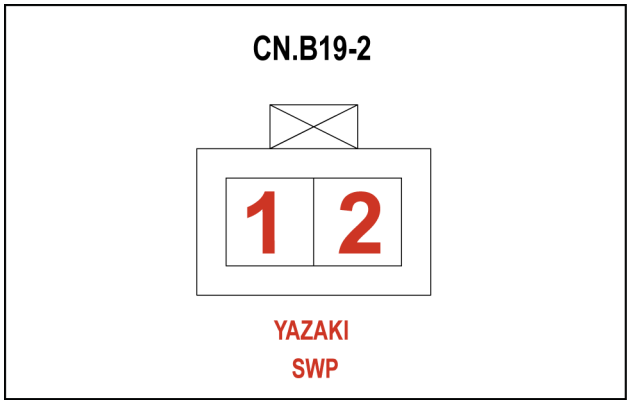


SMIL17CEX3118AA 42

Pin	From	Wire	Description	Color-Size	Frame
1	CN.D5-F-P-1	WIRE3133		VT/WH-0.0	**SHEET 17 - Engine sensors**
2	CN.D5-F-P-15	WIRE3716		WH/BK-0.0	
3	CN.D5-F-P-6	WIRE3713		GY/BK-0.0	

To locate the connector refer to " **Electrical system - Electrical schema - Connector localization (55.000)**" or " **Electrical system - Electrical schema - Connector localization (55.000)**".

CONNECTOR CN.B19-2A (Male)

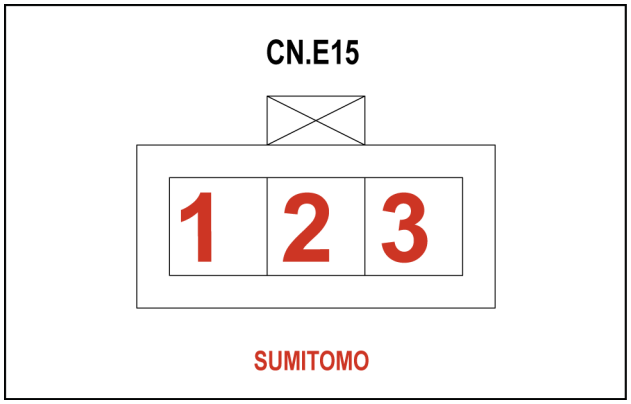


SMIL17CEX2980AA 30

Pin	From	Wire	Description	Color-Size	Frame
1	CN.B19A-P-3	808G		GN/WH-0.85	**SHEET 52 - Option_First option(pedal) and First option (proportional solenoid)**
2	SP29-P-X	730BC		BK-0.85	

To locate the connector refer to “ **Electrical system - Electrical schema - Connector localization (55.000)**” or “ **Electrical system - Electrical schema - Connector localization (55.000)**”.

CONNECTOR CN.E15: CAM ANGLE SENSOR (Male)

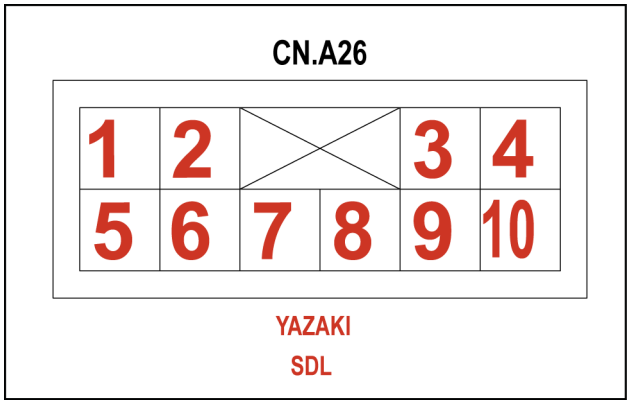


SMIL17CEX3128AA 61

Pin	From	Wire	Description	Color-Size	Frame
1	CN.D8-P-17	WIRE3241		YE-0.0	**SHEET 18 - Injectors**
2	CN.D8-P-19	WIRE3243		OR/BK-0.0	
3	CN.D8-P-18	WIRE3242		0.0	

To locate the connector refer to " **Electrical system - Electrical schema - Connector localization (55.000)**" or " **Electrical system - Electrical schema - Connector localization (55.000)**".

CONNECTOR CN.A26: TO SUB CONTROLLER (Female)



SMIL17CEX2927AA 30

Pin	From	Wire	Description	Color-Size	Frame
1	F92	270		WH/RD-0.0	**SHEET 04 - Power distribution**
2	F91	275		WH/BL-0.85	
3	F86	123		RD/GN-0.85	**SHEET 03 - Power distribution**
4	CN.A47-P-6	501f		GN-0.85	**SHEET 40 - Interconnectors**
5	CN.A45-F-P-4	818c		BL/GN-0.0	**SHEET 42 - Interconnectors**
7	CN.A2-P-31	541		YE/RD-0.0	**SHEET 08 - Controller**
8	CN.A2-P-20	542		OR/RD-0.0	
9	CN.A41-4	740		BK-1.25	**SHEET 43 - Interconnectors**
10	CN.A46-P-4	636		BK/GN-0.85	

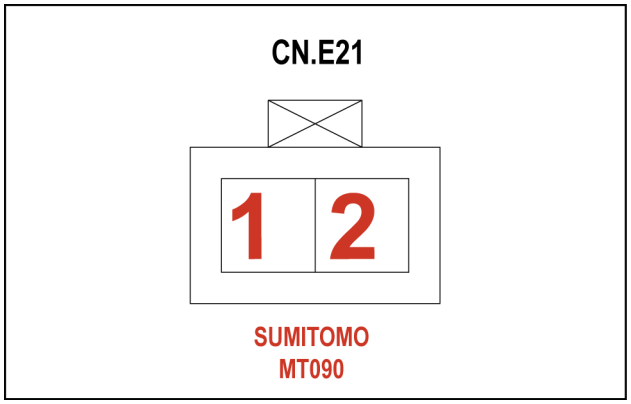
To locate the connector refer to " **Electrical system - Electrical schema - Connector localization (55.000)**" or " **Electrical system - Electrical schema - Connector localization (55.000)**".

CONNECTOR CN.A29C (Male)

Pin	From	Wire	Description	Color-Size	Frame
1	SP103-P-X	715B		BK-1.25	**SHEET 28 - Wiper and washer**

To locate the connector refer to " **Electrical system - Electrical schema - Connector localization (55.000)**" or " **Electrical system - Electrical schema - Connector localization (55.000)**".

CONNECTOR CN.E21: INJECTION 4 (#2) (Male)

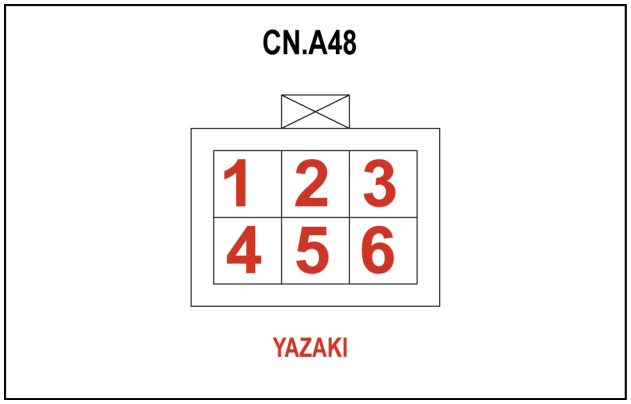


SMIL17CEX3134AA 59

Pin	From	Wire	Description	Color-Size	Frame
1	CN.E17-F-P-3	WIRE3724		BL/RD-1.25	**SHEET 18 - Injectors**
2	CN.E17-F-P-7	WIRE3725 A		BK/RD-1.25	

To locate the connector refer to “ **Electrical system - Electrical schema - Connector localization (55.000)**” or “ **Electrical system - Electrical schema - Connector localization (55.000)**”.

CONNECTOR CN.A48 (Male)

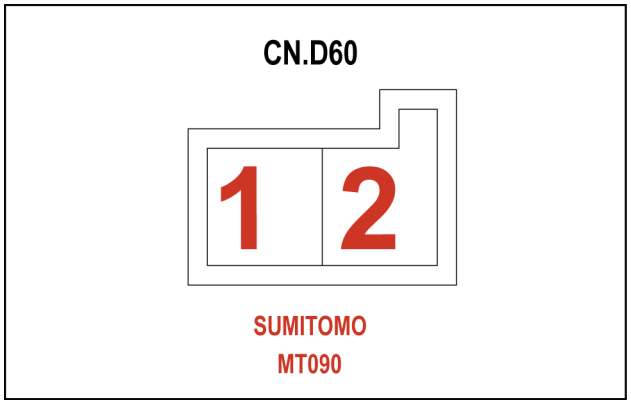


SMIL17CEX2948AA 9

Pin	From	Wire	Description	Color-Size	Frame
1	CN.A52-F-P-4	515		BR-0.85	**SHEET 39 - Interconnectors**
2	CN.A30F-P-1	515a		BR-0.85	**SHEET 36 - Quick coupler and around lamp**
3	CN.A2-P-26	515b		BR-0.0	**SHEET 08 - Controller**
4	CN.A22-P-8	515c		BR-0.85	**SHEET 32 - Est connectors**
5	CN.A38-P-2	515d		BR-0.0	**SHEET 40 - Interconnectors**

To locate the connector refer to “ **Electrical system - Electrical schema - Connector localization (55.000)**” or “ **Electrical system - Electrical schema - Connector localization (55.000)**”.

CONNECTOR CN.D60 (Male)



SMIL17CEX3058AA 3

Pin	From	Wire	Description	Color-Size	Frame
1	SP91-P-X	829a		WH/GN-0.85	**SHEET 28 - Wiper and washer**
2	SP92-P-X	776		BK-0.85	

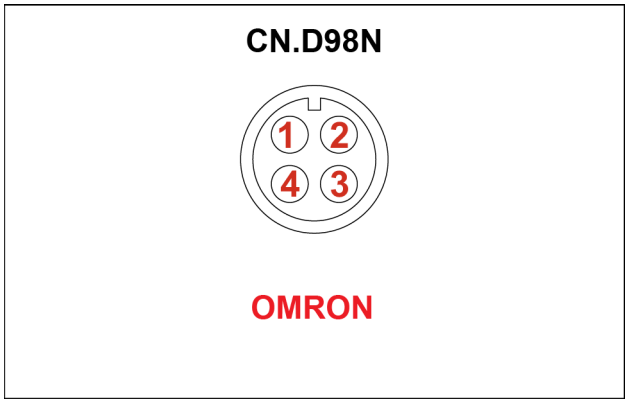
To locate the connector refer to “ **Electrical system - Electrical schema - Connector localization (55.000)**” or “ **Electrical system - Electrical schema - Connector localization (55.000)**”.

CONNECTOR CN.D81-7: ALARM (Male)

Pin	From	Wire	Description	Color-Size	Frame
1	SP42A-P-X	768A		BK-0.85	**SHEET 54 - Option_fuel feed pump, option_seat**

To locate the connector refer to " **Electrical system - Electrical schema - Connector localization (55.000)**" or " **Electrical system - Electrical schema - Connector localization (55.000)**".

CONNECTOR CN.D98N (Male)

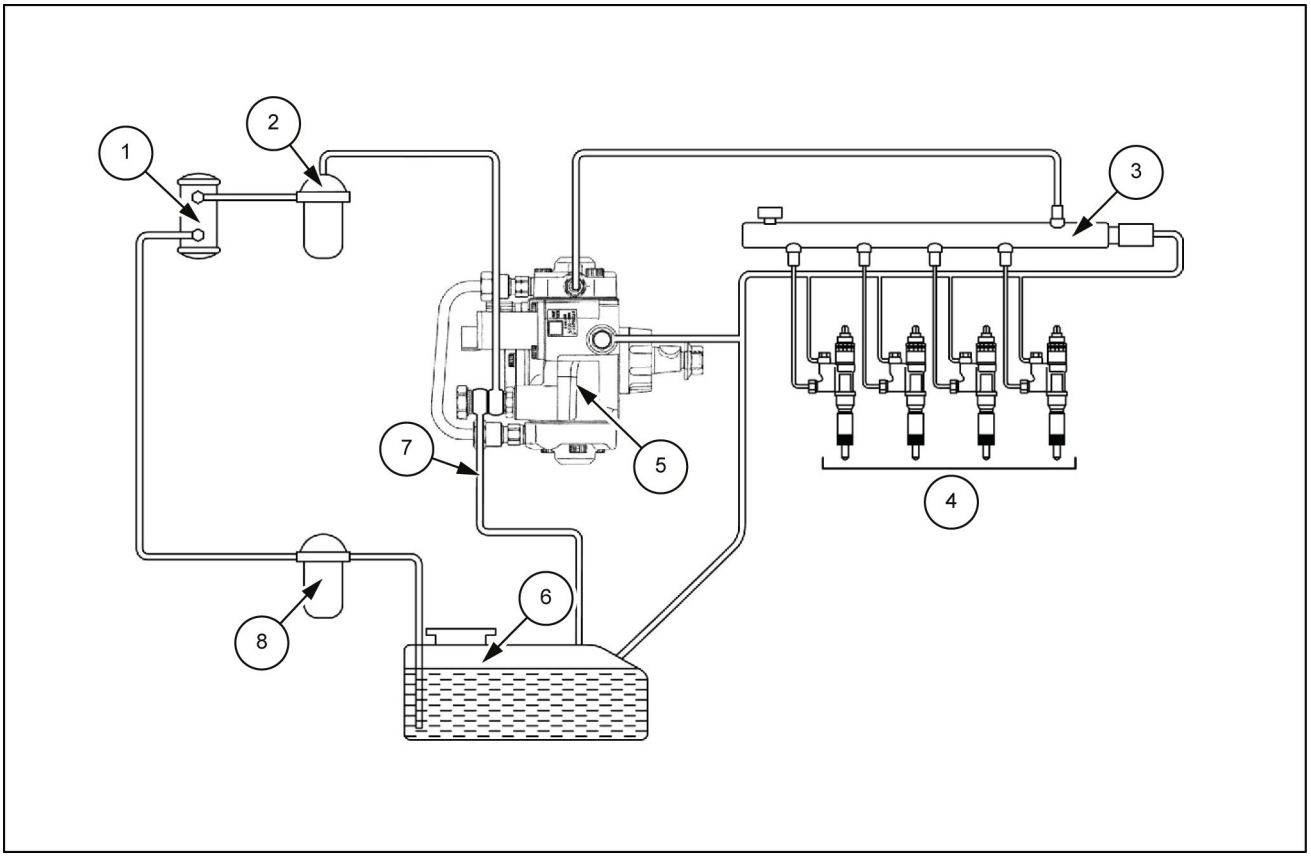


SMIL20CEX0313AA 21

Pin	From	Wire	Description	Color-Size	Frame
1	SP960G-P-X	960H		RD-0.0	**SHEET 45 - Field View Monitor (FVM)**
2	SP961G-P-X	961H		BK-0.0	
3	SP962G-P-X	962H		YE-0.0	
4	SP963G-P-X	963H		WH-0.0	

To locate the connector refer to " **Electrical system - Electrical schema - Connector localization (55.000)**" or " **Electrical system - Electrical schema - Connector localization (55.000)**".

At this time, the fuel amount to be supplied to the common rail (fuel rail) is controlled by regulating the Fuel Rail Pressure (FRP) regulator based on the signal from the ECM.



LPIL12CX00980FB 6

1. Electromagnetic pump
2. Fuel filter
3. Common rail
4. Fuel injector
5. Supply pump
6. Fuel tank
7. Fuel return pipe
8. Pre-fuel filter

Removing air from the fuel system

Place an appropriate pan under the air removal plug.

Turn the ignition switch ON, and activate the electromagnetic pump.

Loosen the air removal plug of the fuel filter sufficiently, and operate the priming pump 20 times or more until the fuel comes out from near the plug.

Tighten the plug, and operate the priming pump 10 times or more until the fuel permeates.

Wait for approximately **1 min**, and then loosen the plug to remove the air in the fuel filter. This should be repeated at least 3 times until no air comes out from the plug. Securely tighten each plug, and wipe up any fuel spilled in the vicinity. Operate the priming pump 10 - 15 times until the fuel permeates and is fed to the engine.

Contents

Electrical systems - 55

Engine starting system - 201

Alternator - Disassemble

NOTICE: *Before disassembling, make alignment marks on the front and rear bracket.*

1. Remove the rear cover from the rear bracket.
2. Remove the penetration bolt from the generator.
3. Disconnect the front bracket from the rear bracket.

NOTE: *Heat the bearing insertion section of the rear bracket.*

4. Remove the generator pulley from the rotor.

NOTE: *Remove the pulley tightening nut and then remove the pulley, fan, and collar.*

5. Remove the rotor from the front bracket using the press.
6. Remove the retainer from the front bracket.
7. Remove the bearing from the front bracket.

NOTICE: *Do not remove the bearing except when replacing.*
Do not reuse the removed bearing.

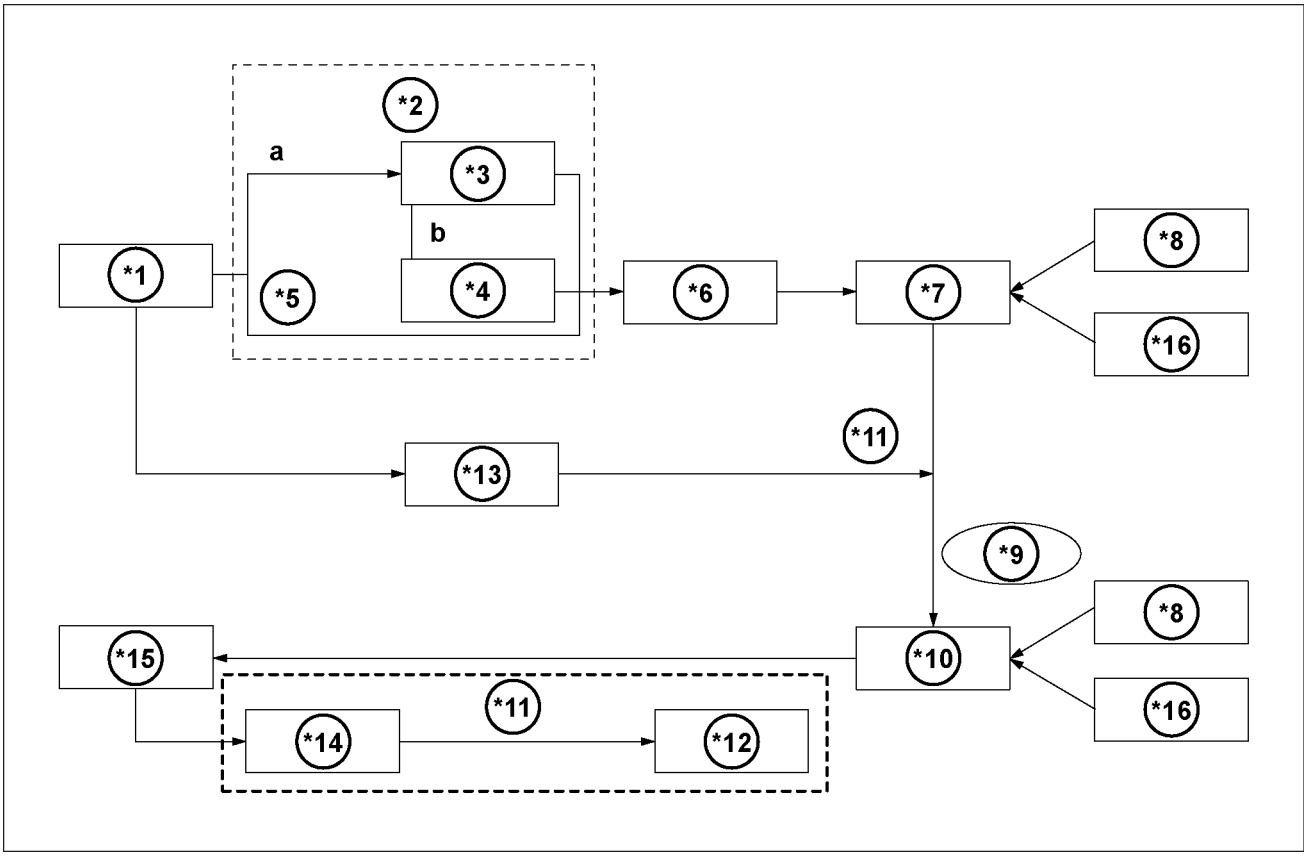
8. Remove the bearing from the rotor using the puller.

NOTICE: *Do not remove the bearing except when replacing.*
Do not reuse the removed bearing.

9. Remove the field coil from the rear bracket.

NOTICE: *Complete the solder removal of the field coil and regulator within five seconds.*

10. Remove the stator from the rectifier.
11. Remove the regulator assembly from the rear bracket.
12. Remove the B-terminal assembly from the rear bracket.
13. Remove the condenser from the rear bracket.
14. Remove the rectifier from the rear bracket.



SMIL19CEX2144FB 25

a. When the DEF (urea fluid) is frozen

b. When the outside air temperature is low

*1. Ignition switch is ON
*2. Heater control
*3. Defrosting control
*4. Thermal control
*5. At room temperature
*6. Startup control
*7. Dosing control through calculation
*8. NH3 storage control
*9. NOx sensor operation
*10. Dosing control based on NOx sensor information
*11. Control completion
*12. Urea SCR System Shut-Off
*13. NOx sensor control
*14. After-run control
*15. Ignition switch is OFF
*16. DPD cooperative control

Diesel Exhaust Fluid (DEF)/AdBlue®/ARLA dosing module - Assemble

1. Install the connector to the dosing module.

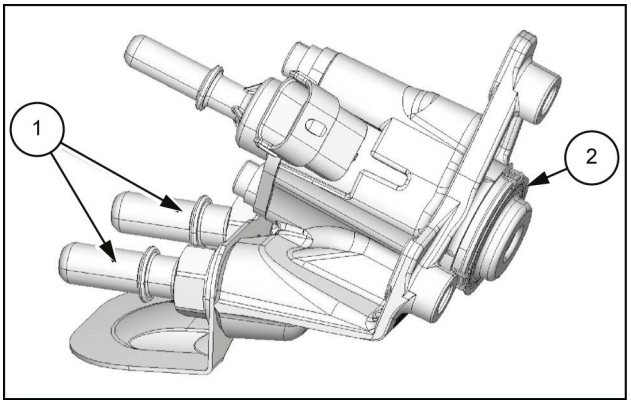
   Tightening torque: **5.5 N·m** (**48.7 lb in**)

NOTE: *Install the coolant piping connector **(1)** to the dosing module.*

NOTICE: *Do not pinch the O-ring.*

2. Install the gasket **(2)** to the dosing module.

NOTICE: *Do not reuse the removed gasket **(2)***



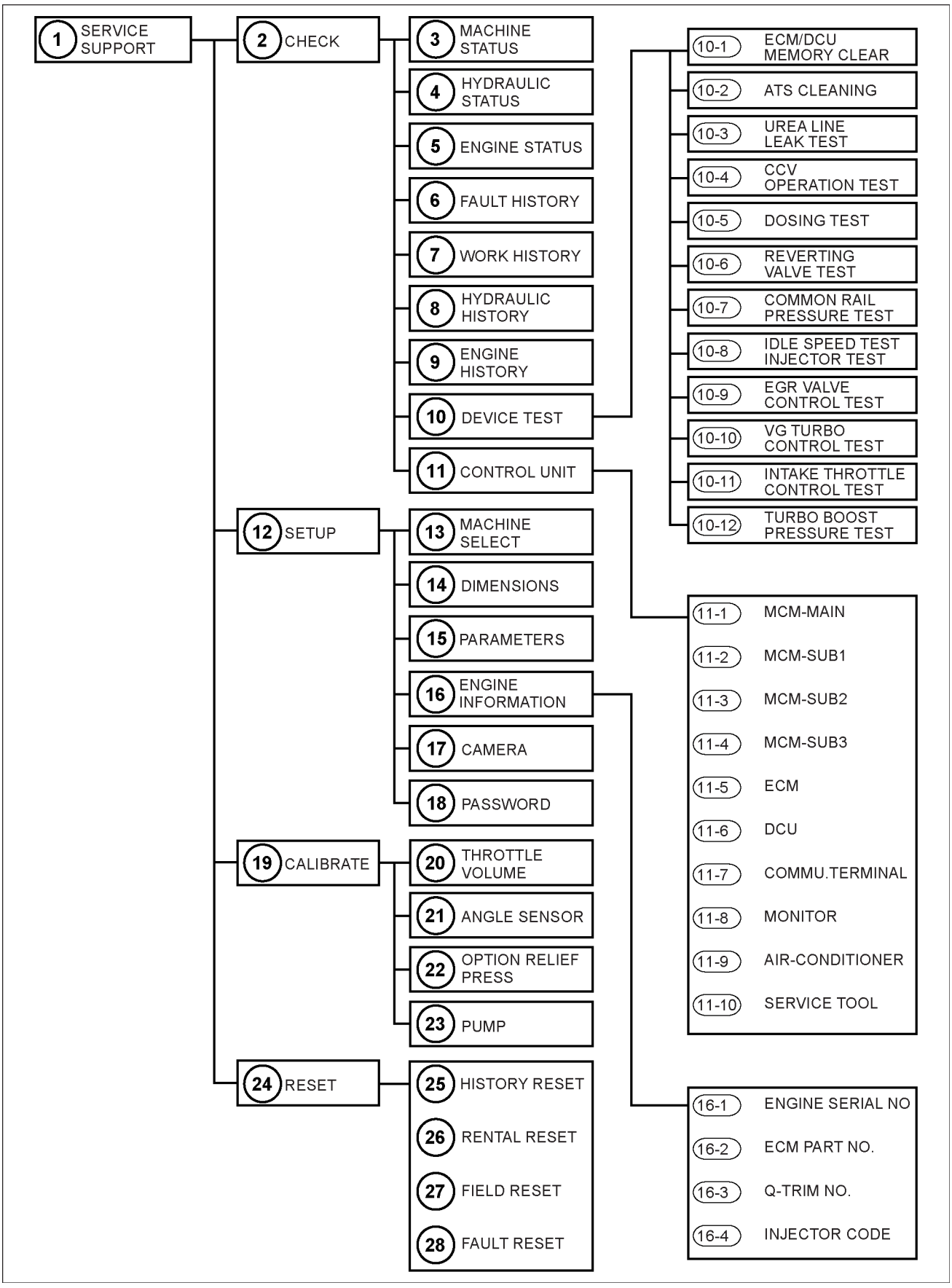
SMIL14CEX3234AB 1

Contents

Electrical systems - 55

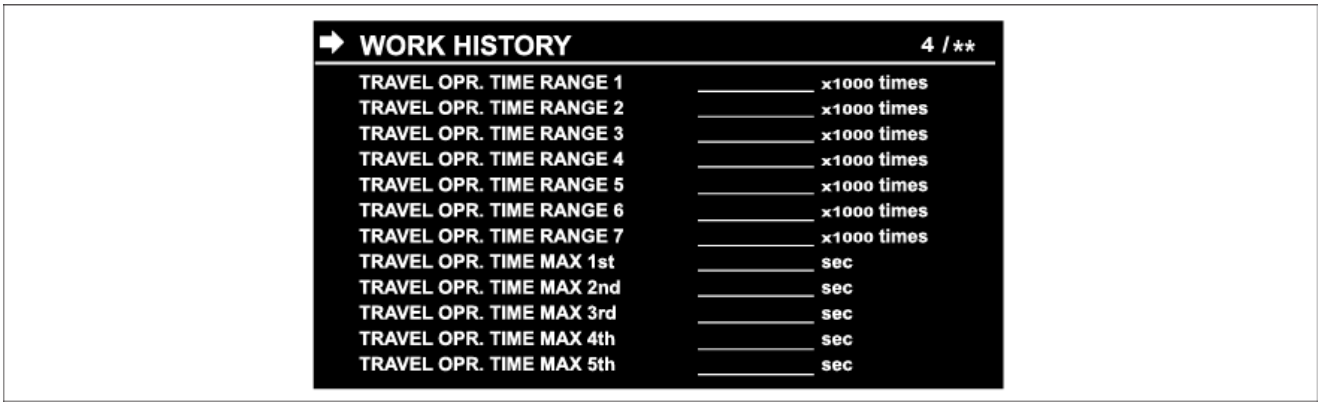
Engine cooling system - 012

Instrument cluster - Overview - Service monitor structure



SMIL20CEX0446HB 1

4/11



SMIL19CEX1279EA 38

Display	Explanation	Unit	Judgment condition	Judgment start condition
TRAVEL OPR. TIME RANGE 1	Frequency distribution of continuous travel time	times	Continuous travel time < **10 s**.	Engine in operation
TRAVEL OPR. TIME RANGE 2	Frequency distribution of continuous travel time	times	Continuous travel time < **30 s**.	Engine in operation
TRAVEL OPR. TIME RANGE 3	Frequency distribution of continuous travel time	times	Continuous travel time < **1 min**.	Engine in operation
TRAVEL OPR. TIME RANGE 4	Frequency distribution of continuous travel time	times	Continuous travel time < **3 min**.	Engine in operation
TRAVEL OPR. TIME RANGE 5	Frequency distribution of continuous travel time	times	Continuous travel time < **10 min**.	Engine in operation
TRAVEL OPR. TIME RANGE 6	Frequency distribution of continuous travel time	times	Continuous travel time < **30 min**.	Engine in operation
TRAVEL OPR. TIME RANGE 7	Frequency distribution of continuous travel time	times	Continuous travel time ≧ **30 min**.	Engine in operation
TRAVEL OPR. TIME MAX 1st	Continuous travel time ranking	sec	Continuous travel time: first rank	Engine in operation
TRAVEL OPR. TIME MAX 2nd	Continuous travel time ranking	sec	Continuous travel time: second rank	Engine in operation
TRAVEL OPR. TIME MAX 3rd	Continuous travel time ranking	sec	Continuous travel time: third rank	Engine in operation
TRAVEL OPR. TIME MAX 4th	Continuous travel time ranking	sec	Continuous travel time: fourth rank	Engine in operation
TRAVEL OPR. TIME MAX 5th	Continuous travel time ranking	sec	Continuous travel time: fifth rank	Engine in operation

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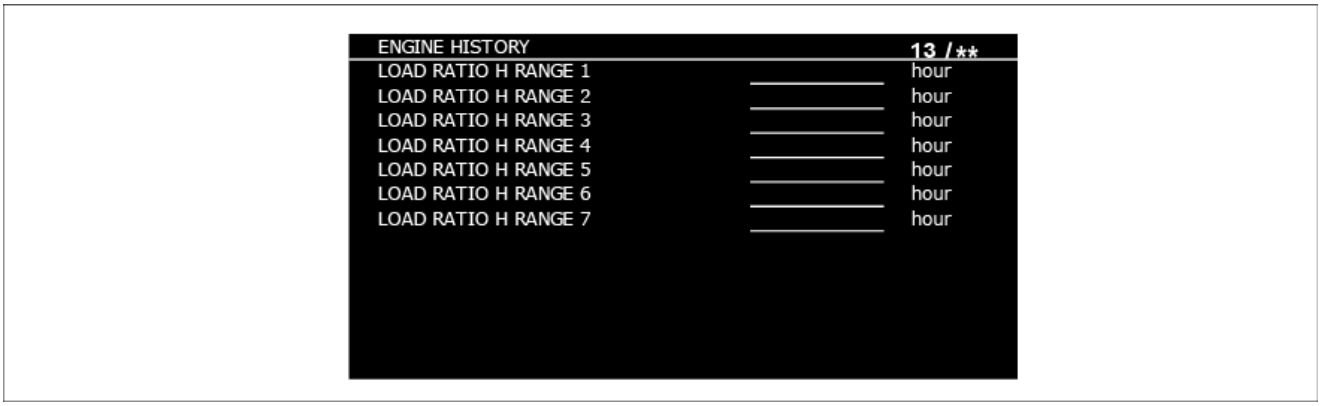

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Display	Explanation	Unit	Judgment condition	Judgment start condition
LOAD RATIO H RANGE 1	Engine load ratio (H); time distribution	hour	Less than **30%**	In **10 s** after the engine starts
LOAD RATIO H RANGE 2	Engine load ratio (H); time distribution	hour	Less than **40%**	In **10 s** after the engine starts
LOAD RATIO H RANGE 3	Engine load ratio (H); time distribution	hour	Less than **50%**	In **10 s** after the engine starts
LOAD RATIO H RANGE 4	Engine load ratio (H); time distribution	hour	Less than **60%**	In **10 s** after the engine starts
LOAD RATIO H RANGE 5	Engine load ratio (H); time distribution	hour	Less than **70%**	In **10 s** after the engine starts
LOAD RATIO H RANGE 6	Engine load ratio (H); time distribution	hour	Less than **80%**	In **10 s** after the engine starts
LOAD RATIO H RANGE 7	Engine load ratio (H); time distribution	hour	**80%** or more	In **10 s** after the engine starts

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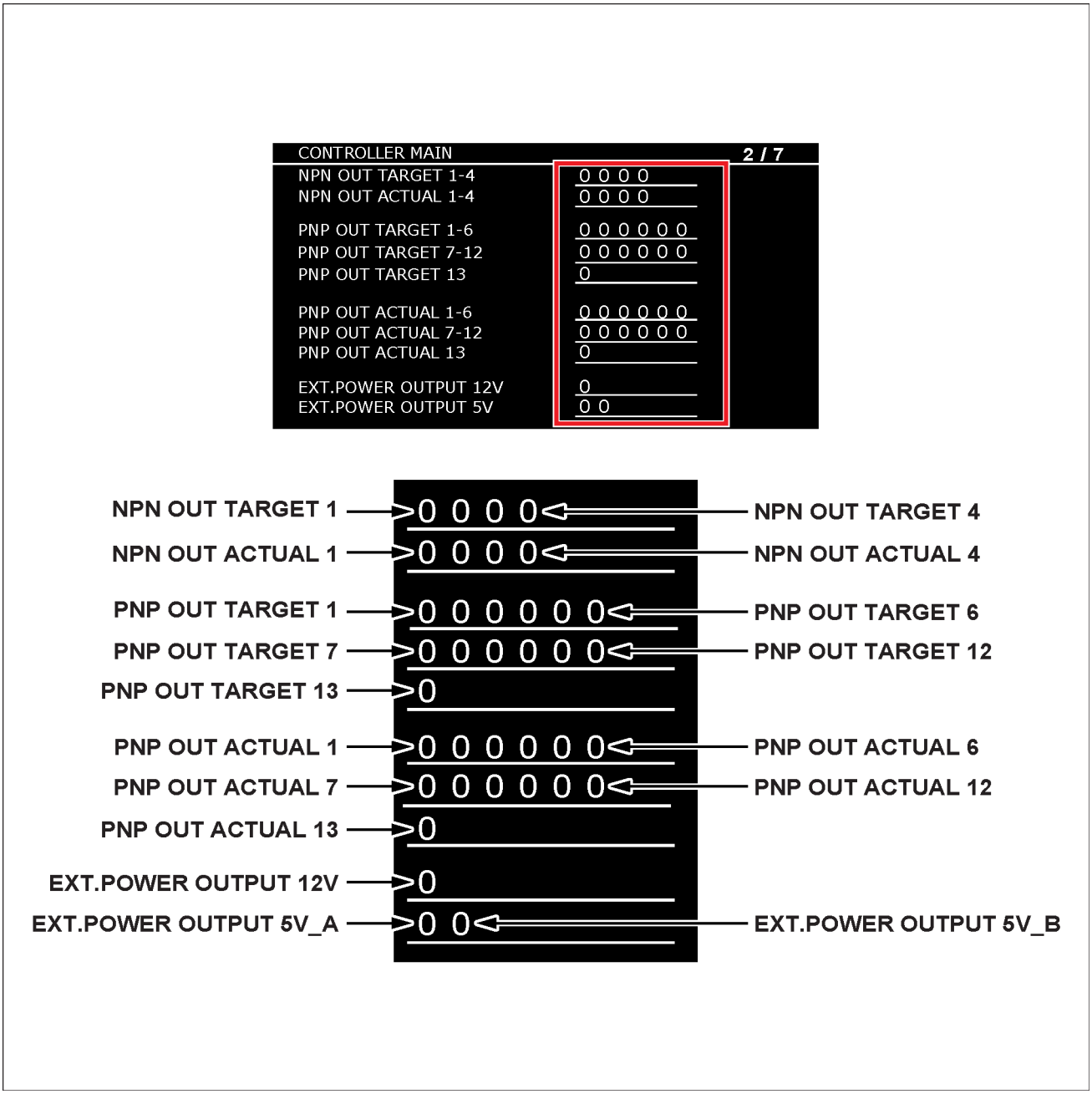

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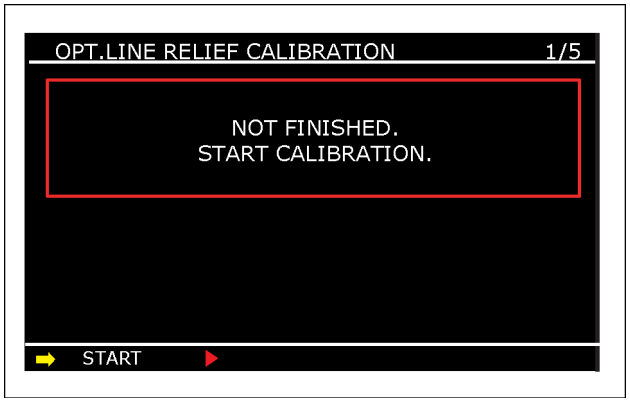
Display	Explanation	Unit	Input/output detail	
NPN OUT TARGET 1 - 4	NPN output specified value (0: OFF, 1: ON)	-	1	RL REFUEL PUMP *
			2	BZ QUICK COUPLER *
			3	SV QUICK COUPLER *
			4	CR LAMP and SV (125-7B, 225-7B) * RL LM MAGNET CUT (350-7B, 450-7B, 700-7B) *
NPN OUT ACTUAL 1 - 4	NPN output actual value (0: OFF, 1: ON)	-	1	RL REFUEL PUMP *
			2	BZ QUICK COUPLER *
			3	SV QUICK COUPLER *
			4	CR LAMP and SV (125-7B, 225-7B) * RL LM MAGNET CUT (350-7B, 450-7B, 700-7B) *

Option line relief

Adjust the option line relief pressure (only applicable for the models with electromagnetic relief valve).
The calibration setup is required when the option relief proportional valve is replaced or the pump is replaced.
This is disabled unless the calibration setup and adjustment for the hydraulic pump are completed in advance. (You cannot enter the screen.)

1. If the relief pressure adjustment is not finished, the (red) initial screen is displayed.



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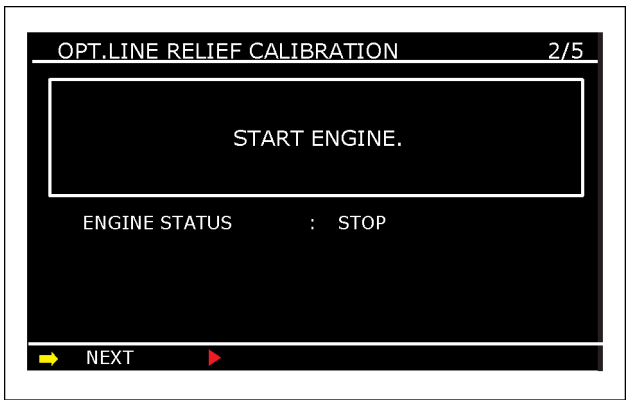
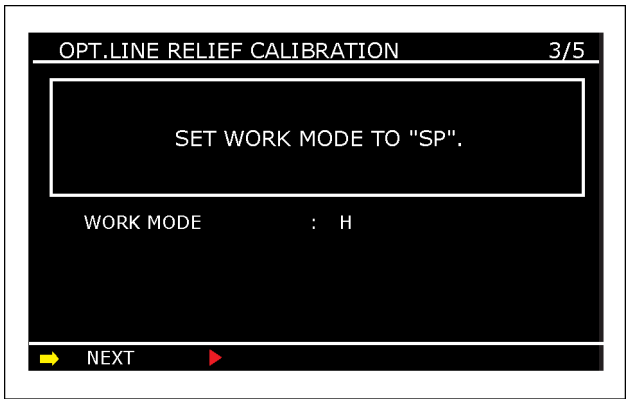
2. When  is pressed, the system displays the engine start screen.



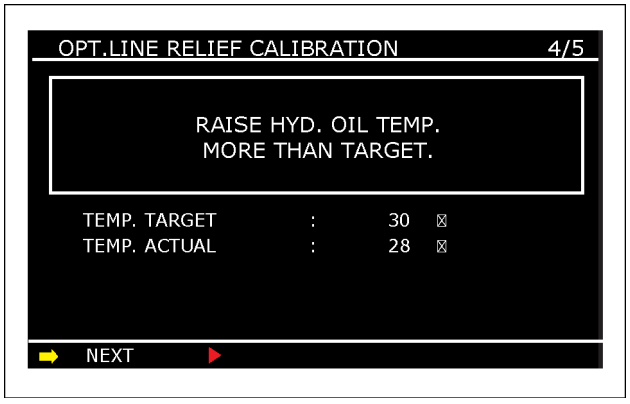
SMIL20CEX0508AA 9

3. When the engine is started and  is pressed, the system displays the SP mode screen.



SMIL20CEX0509AA 10

4. When the work mode is turned to the SP mode and  is pressed, the system displays the oil temperature raise screen.



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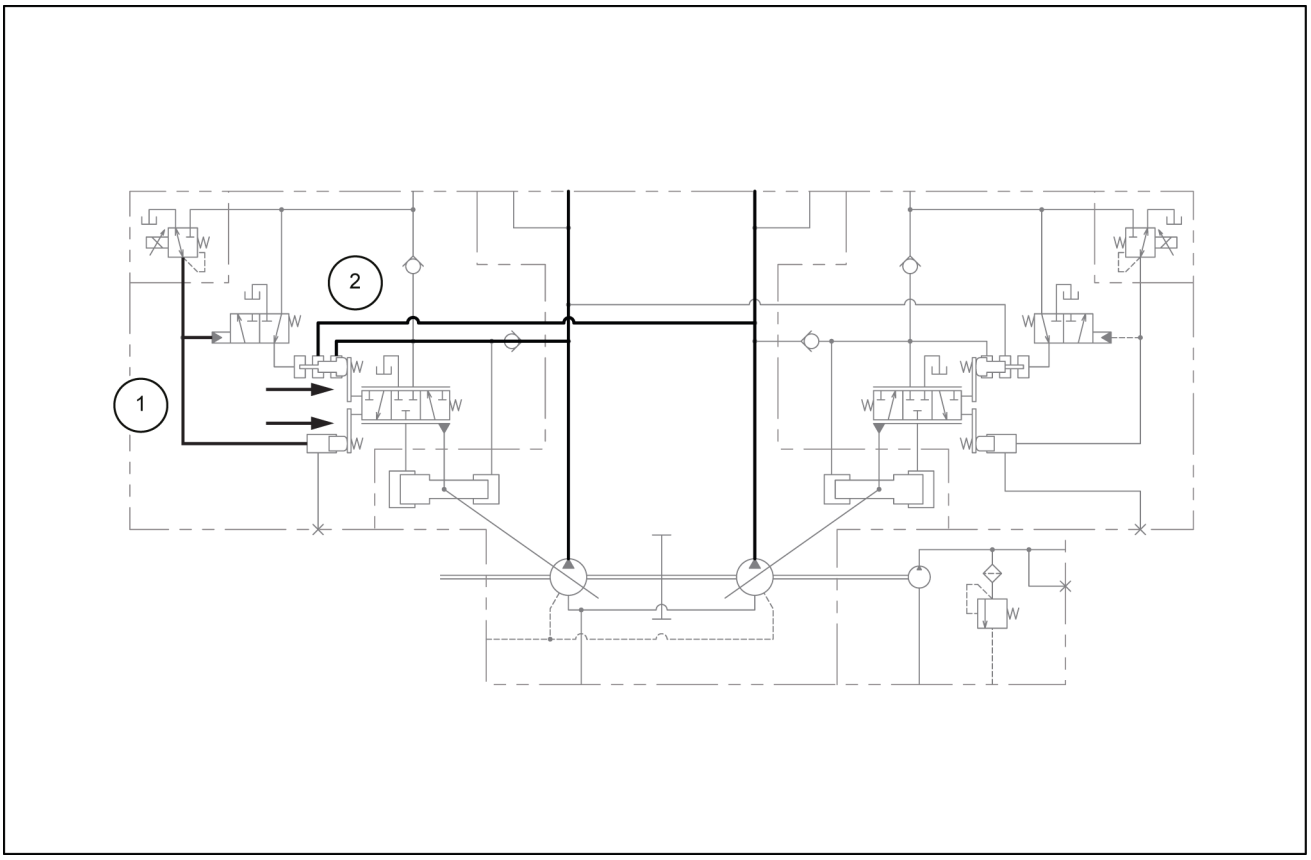
Specifications



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1. Secondary pressure of the electromagnetic proportional valve (normal control)
2. Main pressure (control at failure)

Control

Horsepower flow control (pump torque control)

The control is based on the secondary pressure of the electromagnetic proportional valve (normal control).

P1and P2 pressure sensor values are input to the main controller, flow is computed so that the design pump torque may be achieved at the secondary pressure of the pump proportional valve, and the flow is controlled.

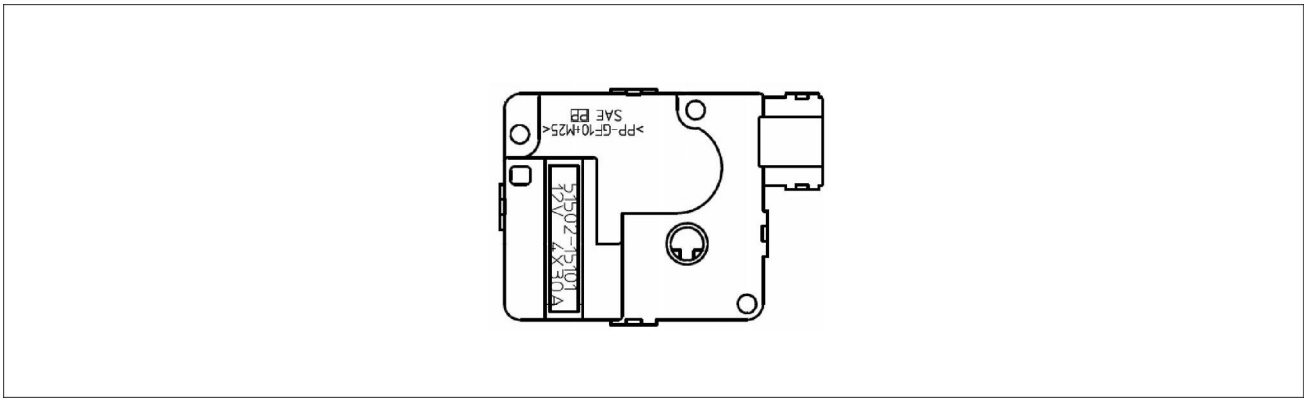
The pump torque flow is changed by changing the torque computed by the main controller (pump torque change).

Negative flow control

The control is based on the secondary pressure of the electromagnetic proportional valve (normal control).

N1 and N2 pressure sensor values are input to the main controller. Flow is controlled so that the design flow may be achieved at the secondary pressure of the proportional valve.

Refresh/recirculate actuator



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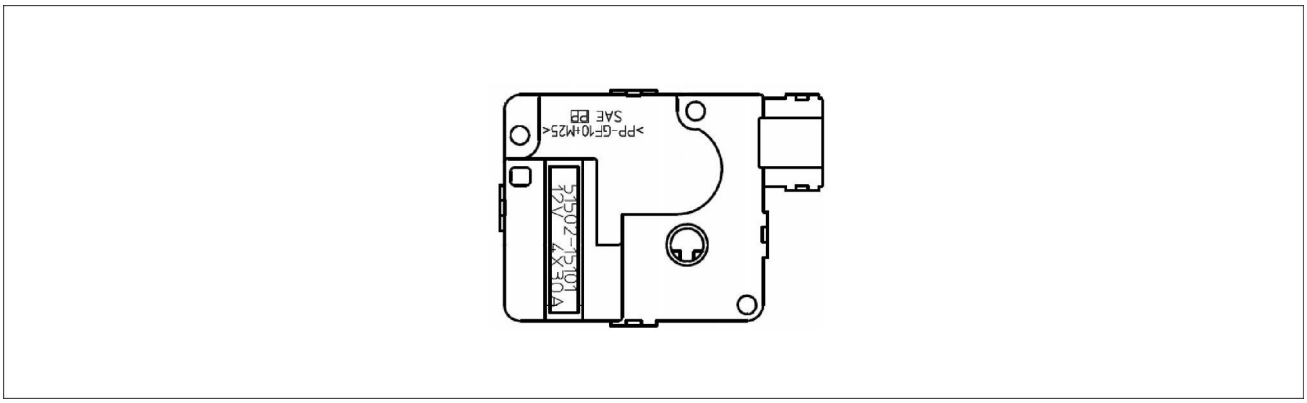
NOTICE: *The air conditioning system voltage specifications are* ***24 V****, but the motor actuator has* ***12 V*** *specifications.*

The refresh/recirculate switch actuator is installed on the blower intake unit. It opens and closes the refresh/recirculate door via the link.
Built into the refresh/recirculate switch actuator is the potentiometer that switches linked with the actuator shaft.
When the refresh/recirculate door position is determined by the refresh/recirculate switch on the control panel, the control unit reads in the signal of the potentiometer in the actuator and determines whether the motor turns forward or reverse.
The position detection switch also rotates linked with the motor and stops the refresh/recirculate door at the set position.

Mode switch actuator



SMIL17CEX1148EA 7

NOTICE: *The air conditioning system voltage specifications are* ***24 V****, but the motor actuator has* ***12 V*** *specifications.*

The mode switchover actuator is installed on the blow outlet of the air conditioner unit. It opens and closes the mode damper via the link.
The air mix actuator is the same part as the refresh/recirculate switch actuator.
When the blow mode is switched with the blow mode select switch, a signal that causes the motor to rotate in the opening and closing position direction of the target mode damper is output from the microcomputer in the control panel.
When the motor rotates, the potentiometer data that corresponds to the rotation angle is sent to the microcomputer. If potentiometer data for the target door is recognized, a motor OFF signal is sent and the motor is stopped.

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B. If the voltage is less than or equal to **0.25 V**, replace the main controller.

6. Inspect the arm in pressure sensor.

   Turn OFF the key switch.

   Disconnect arm in pressure sensor connector **CN.D73**.

   Measure the resistance between terminals 1 and 3 of the arm in pressure sensor connector **CN.D73** (arm in pressure sensor side).

   A. If the resistance is not about **10k Ω**, replace the arm in pressure sensor.

   B. If the resistance is about **10 Ω**, proceed to Step **7**.

7. Inspect for continuity between the ground and terminal 1 of the arm in pressure sensor connector **CN.D73** (harness side).

   Inspect for continuity between the ground and terminal 2 of the arm in pressure sensor connector **CN.D73** (harness side).

   A. If there is continuity, find and repair the short circuit on the wires ID WL435f, WL435, WB435b, WB435, and YG408.

   B. If there is no continuity, proceed to Step **8**.

8. Inspect for continuity between the ground and terminal 3 of the arm in pressure sensor connector **CN.D73** (harness side).

   A. If there is no continuity, find and repair the open circuit on the wires ID BW445b, BW445f, and BW445.

   B. If there is continuity, proceed to Step **9**.

9. Turn ON the key switch.

   Measure the voltage between the ground and terminal 1 of the arm in pressure sensor connector **CN.D73** (harness side).

   A. If the voltage is not about **5 V**, find and repair the open circuit on the wires ID WL435f, WL435, WB435b, and WB435.

   B. If the voltage is about **5 V**, proceed to Step **10**.

10. Measure the voltage between the ground and terminal 2 of the arm in pressure sensor connector **CN.D73** (harness side).

    A. If the voltage is less than **0.25 V**, find and repair the open circuit on the wire ID YG408.

    B. If the voltage is more than or equal to **0.25 V**, replace the main controller.

A. If there is no continuity, repair the open circuit on the wire ID GR905a.

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

6. Inspect for continuity between the terminal 2 of the connector **CN.D66-1** (harness side) and terminal 27 of the connector **CN.A2** (harness side).

A. If there is no continuity, repair the open circuit on the wire ID GW905b.

B. If there is continuity, replace the faulty main controller.

7605 - ECM mismatch

Control Module: MCM

Fault Description:
ECM mismatch.

Possible failure modes:

1. The ECM is defective.

Solution:

1. Turn OFF the key switch.

   Inspect the connectivity of the following connectors for poor insertion and wiring terminal disconnection.

   - **CN.A3** (Main controller)

   - **CN.A4** (Main controller)

   - **CN.A53**

   - **CN.A59**

   - **CN.D3** (Engine computer)

   Disconnect each connector and check for any wiring terminal abnormality. If there is no abnormality, reconnect the connectors.

   Turn ON the key switch.

   A. If diagnostic trouble code 7605 is displayed, proceed to Step **2**.
2. From the service support screen, display the model select screen and check that the correct model is selected.

   A. If the model selection screen is not correct, correctly set the model selection.

   B. B. If the model selection screen is correct, proceed to Step **3**.
3. Check that the ECM which matches the model is installed.

   A. If the ECM does not match the model, replace it with the ECM that matches with the model.

   B. If the ECM match the model, replace the ECM. (Refer to “ **Engine Control Unit (ECU) - Remove (55.015)**” and “ **Engine Control Unit (ECU) - Install (55.015)**”)

P0113 - Intake Air Temperature (IAT) sensor circuit high voltage

Control Module: ECM

Fault Description:
The Intake Air Temperature (IAT) sensor is installed between the air cleaner and the turbocharger and is integrated with the Mass Air Flow (MAF) sensor. The Intake Air Temperature (IAT) sensor is a variable resistor and measures the temperature of the air flowing into the engine. This sensor has a signal circuit and a ground circuit which are connected to the ECM. The sensor resistance is high when the intake air temperature is low, and the sensor resistance decreases as the intake air temperature increases. The ECM detects a high voltage when the sensor resistance is high, and a low voltage when the sensor resistance is low. If the ECM detects an excessively high signal voltage, the diagnostic trouble code is set.
Failure is indicated in the monitor on the machine, or the diagnostic light illuminates.
The ECM limits the fuel injection quantity.
The ECM stops the EGR control.
The ECM assumes a default Intake Air Temperature (IAT) value.
The ECM stops the VGS control.

Cause:
Preconditions:
- The key switch is ON
- The engine run time is **3 min** or more
- Diagnostic trouble codes P060C, P06A8, and P160B are not set
Setting conditions:
- The ECM detects that the Intake Air Temperature (IAT) sensor signal voltage is **4.9 V** or more for **5 s** or more.

Possible failure modes:

1. Short circuit to the battery power supply circuit.
2. Short circuit to the ignition power supply circuit.
3. Short circuit to the **12 V** or **5 V** power supply circuit.
4. The Mass Air Flow (MAF) and Intake Air Temperature (IAT) sensor harness connector **CN.D41** is defective.
5. The Mass Air Flow (MAF) and Intake Air Temperature (IAT) sensor is defective.
6. Open circuit or high resistance.
7. The ECM harness connector **CN.D3** is defective.
8. The ECM is defective.

Solution:

1. Check and diagnose the OBD system. (Refer to " **Engine control system - Check - OBD system (55.015)**")

   Connect a trouble diagnosis scan tool.

   Turn OFF the key switch and keep it OFF for **30 s** or more.

   Start the engine.

   Display FAULT HISTORY on the service support screen on the monitor, and check and diagnose the diagnostic trouble code P06A8.

   A. If the diagnostic trouble code is displayed, proceed to the applicable diagnostic trouble code diagnosis, and proceed to Step **11**.

   B. If the diagnostic trouble code is not displayed, proceed to Step **2**.
2. Observe "Intake air temperature sensor" display on the trouble diagnosis scan tool.

   A. If the value is more than or equal to **4.9 V**, proceed to Step **3**.

3. Turn OFF the key switch.

   Disconnect the boost pressure sensor harness connector **CN.E7**.

   Turn ON the key switch.

   Measure the voltage between the boost pressure sensor **5 V** power supply circuit and the frame ground.

   A. If the value is more than or equal to **4.5 V**, proceed to Step **4**.

   B. If the value is lower than **4.5 V**, proceed to Step **5**.

4. Connect a test cable with fuse between the sensor **5 V** power supply circuit, and the sensor signal circuit of the boost pressure sensor.

   Observe "Boost pressure sensor" display on the trouble diagnosis scan tool.

   A. If the value is more than or equal to **4.5 V**, proceed to Step **7**.

   B. If the value is lower than **4.5 V**, proceed to Step **6**.

5. Inspect the **5 V** power supply circuit between the ECM and the boost sensor for an open circuit or high resistance.

   NOTE: *The boost pressure sensor shares the **5 V** power supply circuit with other sensors. A malfunction in the **5 V** power supply circuit may set diagnostic trouble codes on sensors that share this circuit.*

   A. If there are problems, repair the circuit as necessary, and proceed to Step **9**.

   B. If there are no problems, proceed to Step **8**.

6. Inspect the signal circuit between the ECM and the boost pressure sensor for:
   - Open circuit
   - Short to ground
   - Short to the ground circuit
   - High resistance

   A. If there are problems, repair the circuit as necessary, and proceed to Step **9**.

   B. If there are no problems, proceed to Step **8**.

7. Inspect the boost sensor harness connector **CN.E7** for a poor connection.

   A. If there are problems, repair the connection as necessary, and proceed to Step **9**.

   B. If there are no problems, replace the boost pressure and temperature sensor (Refer to " **Boost pressure sensor - Remove (55.014)**" and " **Boost pressure sensor - Install (55.014)**"), and proceed to Step **9**.

8. Inspect the ECM harness connector **CN.D4** for poor connections.

   A. If there are no problems, replace the ECM (Refer to " **Engine Control Unit (ECU) - Remove (55.015)**" and " **Engine Control Unit (ECU) - Install (55.015)**"), and proceed to Step **9**.

   B. If there are no problems, repair the harness connector **CN.D4** and proceed to Step **9**.

   NOTICE: *Transfer engine information and injector information from the old ECM to the new ECM when the ECM is replaced. Refer to " **Instrument cluster - Dynamic description - Engine information (55.512)**".*

9. Confirm resolution:

   1. Execute DCU MEMORY CLEAR and ECM MEMORY CLEAR sequentially during the device test of the service monitor to reset the diagnostic trouble code. Refer to " **Instrument cluster - Overview - CHECK screen list (55.512)**".

   NOTE: *All the generated diagnostic trouble codes will be cleared.*

   2. Turn OFF the key switch and keep it OFF for **30 s** or more.

   3. Start the engine.

P0521 - Engine oil pressure sensor performance

Control Module: ECM

Fault Description:
The oil pressure sensor is installed near the starter motor, detects the engine oil pressure in the oil gallery, and converts the pressure to a voltage signal. The sensor has the following circuits.
- **5 V** power supply circuit
- Ground circuit
- Oil pressure sensor signal circuit

The ECM monitors the oil pressure sensor signal voltage. The signal voltage increases as the oil pressure rises, and it decreases as the oil pressure declines. If the ECM detects an excessively low engine oil pressure, the diagnostic trouble code is set.
Failure is indicated in the monitor on the machine, or the diagnostic light illuminates.
The ECM limits the engine speed.

Cause:
Preconditions:
- **25 s** or more have passed since the engine was started.
- The engine speed is **600 RPM** or more.
- Diagnostic trouble codes P0522 and P0523 are not set.

Setting conditions:
- The ECM detects that the engine oil pressure is **48 kPa** (**7.0 psi**) or less.

Possible failure modes:

1. Engine oil leakage.
2. The oil pressure sensor harness connector **CN.E6** is defective.
3. High resistance on oil pressure sensor circuit.

Solution:

1. Check and diagnose the OBD system. (Refer to " **Engine control system - Check - OBD system (55.015)**")

   Connect a trouble diagnosis scan tool.

   Turn OFF the key switch for **30 s** or more.

   Start the engine.

   Display FAULT HISTORY on the service support screen on the monitor, and check and diagnose the following diagnostic trouble code:

   Diagnostic trouble code P0522

   A. If the diagnostic trouble code is displayed, proceed to the applicable diagnostic trouble code diagnosis, and proceed to Step **5**.

   B. If the diagnostic trouble code is not displayed, proceed to Step **2**.
2. Inspect the oil pump, the oil pump pressure sensor, and the oil filter for leakage.

   A. If there is no leakage, proceed to Step **3**.

   B. If there is leakage, repair or replace as necessary, and proceed to Step **5**.
3. Inspect the oil pressure sensor harness connector **CN.E6** for poor connections.

   A. If the connection status is not normal, repair the oil pressure sensor harness connector **CN.E6**, and proceed to Step **5**.

   B. If the connection status is normal, proceed to Step **4**.

Turn ON the key switch.

Display FAULT HISTORY on the service support screen on the monitor, and check and diagnose the following diagnostic trouble code:

Diagnostic trouble code P0687

A. If the diagnostic trouble code is displayed, repair the short to the battery power supply in the control circuit between the ECM and the ECM main relay, and proceed to Step **4**.

B. If the diagnostic trouble code is not displayed, replace ECM main relay, and proceed to Step **4**.

4. Confirm resolution:

1. Execute DCU MEMORY CLEAR and ECM MEMORY CLEAR sequentially during the device test of the service monitor to reset the diagnostic trouble code. Refer to " **Instrument cluster - Overview - CHECK screen list (55.512)**".

NOTE: *All the generated diagnostic trouble codes will be cleared.*

2. Turn OFF the key switch and keep it OFF for **30 s** or more.

3. Start the engine.

4. Perform a test-run under the conditions set for running the diagnostic trouble code.

5. Display FAULT HISTORY on the service support screen on the monitor and check that no diagnostic trouble code has been detected. Refer to "Service Support - FAULT HISTORY".

P1468 - Urea Dosing Control Module (DCM) overtemperature

Control Module: DCU

Fault Description:
The DCU monitors the temperature inside itself by means of the DCU internal temperature rise monitor. If the DCU detects a DCU internal temperature that is more than or equal to a predetermined temperature, the diagnostic trouble code is set.
If the diagnosis conditions are met, it is stored in the failure history.

Cause:
Preconditions:
- The battery voltage is **19 – 32 V**.
- The DCU is ON.
Setting conditions:
- The DCU detects that the temperature in the DCU is excessively high for **5 s** or more.

Possible failure modes:

1. Abnormal high temperature.

Solution:

1. Check urea SCR control system. (Refer to " **Selective Catalytic Reduction (SCR) electrical system - Inspect (55.988)**")

   Connect a trouble diagnosis scan tool.

   Turn OFF the key switch until communication with the trouble diagnosis scan tool is discontinued.

   Turn ON the key switch.

   Display FAULT HISTORY on the service support screen on the monitor, and check and diagnose the following diagnostic trouble code:

   Diagnostic trouble code P1468

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

   B. If the diagnostic trouble code is not displayed, go to "Intermittent conditions of urea SCR system" (Refer to " **Selective Catalytic Reduction (SCR) electrical system - Inspect (55.988)**"), and proceed to Step **4**.
2. Display FAULT HISTORY on the service support screen on the monitor, and check and diagnose the following diagnostic trouble codes:

   Diagnostic trouble code P1468
   Diagnostic trouble code P1493

   A. If the diagnostic trouble codes are displayed, go to the applicable diagnostic trouble code diagnosis, and proceed to Step **4**.

   B. If the diagnostic trouble codes are not displayed, proceed to Step **3**.
3. Check whether any equipment which could cause abnormally high temperatures is installed in the area around the DCU.

   NOTE: *Ask the operator whether or not there were any external factors in the past which could have caused abnormally high temperature close to the DCU.*

   NOTE: *This diagnostic trouble code is set for the purpose of recording information. It is not a malfunction of the DCU. Replacement of the DCU is not necessary.*

   A. If a problem is found, take countermeasures to prevent abnormally high temperature, and proceed to Step **4**

P205B - Urea fluid tank temperature sensor performance

Control Module: DCU

Fault Description:
The urea fluid sensor is comprised of the urea fluid temperature sensor, urea fluid level sensor, and urea fluid quality sensor, and is installed to the urea fluid tank. If the DCU detects that the urea fluid temperature is excessively low or high compared to the intake air temperature, the diagnostic trouble code is set.
The abnormal urea fluid injection warning is displayed.

Cause:
Preconditions:
- The battery voltage is **19 – 32 V**.
- The key switch is ON.
- When the key switch is ON, the differences between the engine coolant temperature, intake air temperature, and fuel temperature are **5 °C** (**41 °F**) or less.
- Diagnostic trouble codes U0002 and U0100 are not set.
- ECM diagnostic trouble codes P0016, P0112, P0113, P0117, P0118, P0182, P0183, P0335, P0336, or P0340 is not set.

Setting conditions:
- The DCU detects that the difference between the urea fluid temperature and the intake air temperature is more than or equal to the predetermined range for several seconds or more.

Possible failure modes:

1. The urea sensor harness connector **CN.D39** is defective.
2. The urea sensor is defective.

Solution:

1. Check urea SCR control system. (Refer to " **Selective Catalytic Reduction (SCR) electrical system - Inspect (55.988)**")

   Connect a trouble diagnosis scan tool.

   Turn OFF the key switch until communication with the trouble diagnosis scan tool is discontinued.

   Turn ON the key switch.

   Display FAULT HISTORY on the service support screen on the monitor, and check and diagnose the following diagnostic trouble code:

   Diagnostic trouble code P205B

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

   B. If the diagnostic trouble code is not displayed, go to "Intermittent conditions of urea SCR system" (Refer to " **Selective Catalytic Reduction (SCR) electrical system - Inspect (55.988)**"), and proceed to Step **3**.
2. Inspect the urea fluid sensor harness connector **CN.D39** for poor connections, and for intrusion of water or foreign material into the connector.

   Inspect the DCU harness connector **CN.D1-2** for poor connections, and for intrusion of water or foreign material into the connector. Inspect the urea fluid temperature sensor between the DCU and the urea fluid sensor for high resistance.

   A. If all of the results are normal, replace the urea fluid sensor (Refer to " **Diesel Exhaust Fluid (DEF)/AdBlue®/ ARLA tank level and temperature sensor - Remove (55.988)**" and " **Diesel Exhaust Fluid (DEF)/AdBlue®/ ARLA tank level and temperature sensor - Install (55.988)**"), and proceed to Step **3**.

   B. If a problem is found, repair the circuit and connection as necessary, and proceed to Step **3**.

P20B4 - Urea fluid tank heater coolant control valve circuit high voltage

Control Module: DCU

Fault Description:
The coolant control valve is operated based on signals from the DCU. The coolant control valve has a power supply circuit and a control circuit which are connected to the DCU. If the DCU detects a short to the battery or a short to the ignition power supply in the control circuit, the diagnostic trouble code is set.
Failure is indicated in the monitor on the machine, or the diagnostic light illuminates.
The abnormal urea fluid injection warning is displayed.
Urea SCR control is disabled.
SCR purging is stopped.

Cause:
Preconditions:
- The battery voltage is **18 – 32 V**.
- The DCU is ON.
- The engine is not cranking.

Setting conditions:
- The DCU detects that there is a short to the battery power supply circuit or a short to the ignition power supply in the coolant control valve control circuit for **3 s** or more.

Possible failure modes:

1. The coolant control valve harness connector **CN.D40** is defective.
2. The coolant control valve is defective.
3. Short circuit between the DCU and the coolant control valve.
4. The DCU harness connector **CN.D1-2** is defective.
5. The DCU is defective.

Solution:

1. Check urea SCR control system. (Refer to " **Selective Catalytic Reduction (SCR) electrical system - Inspect (55.988)**")

   Connect a trouble diagnosis scan tool.

   Turn OFF the key switch until communication with the trouble diagnosis scan tool is discontinued.

   Turn ON the key switch.

   Display FAULT HISTORY on the service support screen on the monitor, and check and diagnose the following diagnostic trouble code:

   Diagnostic trouble code P20B4

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

   B. If the diagnostic trouble code is not displayed, go to "Intermittent conditions of urea SCR system" (Refer to " **Selective Catalytic Reduction (SCR) electrical system - Inspect (55.988)**"), and proceed to Step **7**.
2. Connect a trouble diagnosis scan tool.

   Perform "Urea fluid tank heater engine coolant control valve" under Actuator Test with the trouble diagnosis scan tool.

   Check the valve operation.

   A. If the valve switches ON/OFF, proceed to Step **7**.

3. Turn OFF the key switch until communication with the trouble diagnosis scan tool is discontinued.

4. Turn ON the key switch.

5. Display FAULT HISTORY on the service support screen on the monitor and check that no diagnostic trouble code has been detected. Refer to "Service Support - FAULT HISTORY”.

Display FAULT HISTORY on the service support screen on the monitor, and check and diagnose the following diagnostic trouble code:

Diagnostic trouble code U0002

A. If the diagnostic trouble code is displayed, proceed to Step **3**.

B. If the diagnostic trouble code is not displayed, replace ECM (Refer to " **Engine Control Unit (ECU) - Remove (55.015)**" and " **Engine Control Unit (ECU) - Install (55.015)**"), and proceed to Step **8**.

3. Turn OFF the key switch.

Connect the ECM harness connector **CN.D3**.

Disconnect the machine control unit harness connector **CN.A4**.

Turn ON the key switch

Display FAULT HISTORY on the service support screen on the monitor, and check and diagnose the following diagnostic trouble code:

Diagnostic trouble code U0002

A. If the diagnostic trouble code is displayed, proceed to Step **4**.

B. If the diagnostic trouble code is not displayed, replace ECM (Refer to " **Engine Control Unit (ECU) - Remove (55.015)**" and " **Engine Control Unit (ECU) - Install (55.015)**"), and proceed to Step **8**.

4. Inspect the termination resistor harness connector, for poor connections, and for intrusion of water or foreign material into the connector.

A. If the result is normal, proceed to Step **5**.

B. If a problem is found, repair the connection as necessary, and proceed to Step **8**.

5. Measure the resistance of the termination resistor.

A. If the value is within **115 – 125 Ω**, proceed to Step **6**.

B. If the value is not within **115 – 125 Ω**, replace the terminator resistor, and proceed to Step **6**.

6. Inspect the CAN circuit between DCU and each control unit for the conditions:
- Short to the battery power supply or short to the ignition power supply circuit.
- High resistance.
- Short together between CAN circuits.
- Short to the ground circuit.
- Short to metallic parts, such as the frame.

A. If the result is normal, proceed to Step **7**.

B. If a problem is found, repair the circuit as necessary, and proceed to Step **8**.

7. Inspect the DCU harness connector, for poor connections, and for intrusion of water or foreign material into the connector.

A. If the result is normal, replace DCU (Refer to " **Dosing control unit - Remove (55.988)**" and " **Dosing control unit - Install (55.988)**"), and proceed to Step **8**.

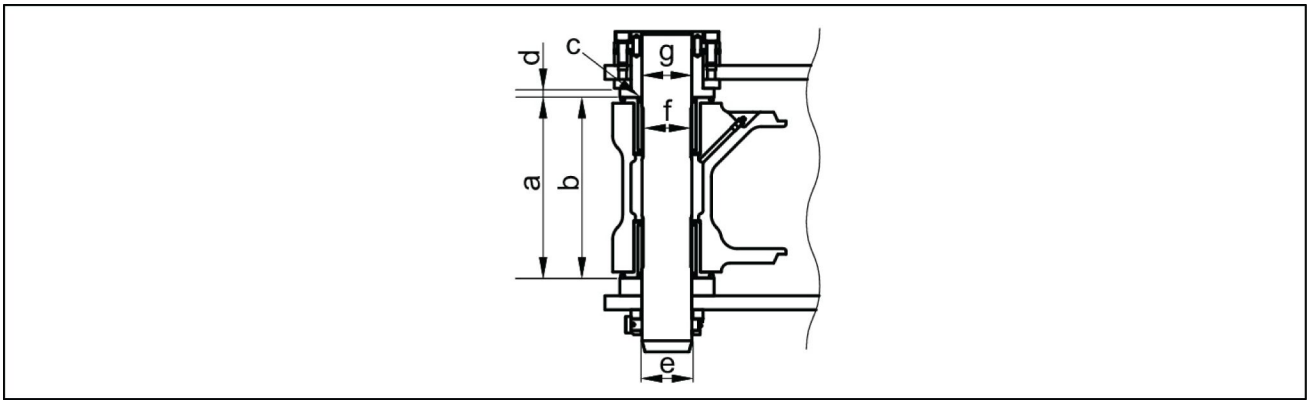
NOTE: *Perform programming after replacing the DCU.*

B. If a problem is found, repair the connection as necessary, and proceed to Step **8**.

8. Confirm resolution:

1. Execute DCU MEMORY CLEAR and ECM MEMORY CLEAR sequentially during the device test of the service monitor to reset the diagnostic trouble code. Refer to " **Instrument cluster - Overview - CHECK screen list (55.512)**".

11. Bucket and arm installation section



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Part name	Code	Standard value	Usage limits	Judgment	Solution
Bucket	a	**307 mm** (**12.09 in**)	**313 mm** (**12.32 in**)	Acceptable/ Unacceptable	Replacement
Arm	b	**306 mm** (**12.05 in**)	**304 mm** (**11.97 in**)	Acceptable/ Unacceptable	Replacement
Clearance	c	**0.7 – 3.8 mm** (**0.03 – 0.15 in**)	Shim adjustment	Acceptable/ Unacceptable	Adjustment with shims
Bushing (bucket)	d	**16 mm** (**0.63 in**)	**8 mm** (**0.31 in**)	Acceptable/ Unacceptable	Replacement
Pin	e	**Ø 80 mm** (**3.15 in**)	**Ø 79 mm** (**3.11 in**)	Acceptable/ Unacceptable	Replacement
Bushing (arm)	f	**Ø 80 mm** (**3.15 in**)	**Ø 81.5 mm** (**3.21 in**)	Acceptable/ Unacceptable	Replacement
Bushing (bucket)	g	**Ø 80 mm** (**3.15 in**)	**Ø 81.5 mm** (**3.21 in**)	Acceptable/ Unacceptable	Replacement