CX210D
CX210D Long Reach
Crawler Excavator

SERVICE MANUAL

Part number 47891798
English
June 2015

CASE
CONSTRUCTION

Shoes

	Weight or quantity
500 grouser (shoe)	**1203 kg** (**2652.161 lb**)
Link	1 pair
Shoe	49
Bolt	196
Nut	196
600 grouser (shoe)	**1339 kg** (**2951.99 lb**)
Link	1 pair
Shoe	49
Bolt	196
Nut	196
700 grouser (shoe)	**1555 kg** (**3428.19 lb**)
Link	1 pair
Shoe	49
Bolt	196
Nut	196
800 grouser (shoe)	**1689 kg** (**3723.61 lb**)
Link	1 pair
Shoe	49
Bolt	196
Nut	196

Temperature

Fahrenheit to centigrade

°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
-60	-51.1	2	-18.9	56	13.3	114	45.6	172	77.8	230	110	288	142.2	346	174.4
-58	-50	0	-17.8	58	14.4	116	46.7	174	78.9	232	111.1	290	143.3	348	175.6
-56	-48.9	2	-16.7	60	15.6	118	47.8	176	80.0	234	112.2	292	144.4	350	176.7
-54	-47.8	4	-15.6	62	16.7	120	48.9	178	81.1	236	113.3	294	145.6	352	177.8
-52	-46.7	6	-14.4	64	17.8	122	50.0	180	82.2	238	114.4	296	146.7	354	178.9
-50	-45.6	8	-13.3	66	18.9	124	51.1	182	83.3	240	115.6	298	147.8	356	180
-48	-44.4	10	-12.2	68	20	126	52.2	184	84.4	242	116.7	300	148.9	358	181.1
-46	-43.3	12	-11.1	70	21.1	128	53.3	186	85.6	244	117.8	302	150	360	182.2
-44	-42.2	14	-10	72	22.2	130	54.4	188	86.7	246	118.9	304	151.1	362	183.3
-42	-41.1	16	-8.9	74	23.3	132	55.6	190	87.8	248	120	306	152.2	364	184.4
-40	-40.0	18	-7.8	76	24.4	134	56.7	192	88.9	250	121.1	308	153.3	366	185.6
-38	-38.9	20	-6.7	78	25.6	136	57.8	194	90.0	252	122.2	310	154.4	368	186.7
-36	-37.8	22	-5.6	80	26.7	138	58.9	196	91.1	254	123.3	312	155.6	370	187.8
-34	-36.7	24	-4.4	82	27.8	140	60	198	92.2	256	124.4	314	156.7	372	188.9
-32	-35.6	26	-3.3	84	28.9	142	61.1	200	93.3	258	125.6	316	157.8	374	190.0
-30	-34.4	28	-2.2	86	30.0	144	62.2	202	94.4	260	126.7	318	158.9	376	191.1
-28	-33.3	30	-1.1	88	31.1	146	63.3	204	95.6	262	127.8	320	160	378	192.2
-26	-32.2	32	0.0	90	32.2	148	64.4	206	96.7	264	128.9	322	161.1	380	193.3
-24	-31.1	34	1.1	92	33.3	150	65.6	208	97.8	266	130.0	324	162.2	382	194.4
-22	-30.0	36	2.2	94	34.4	152	66.7	210	98.9	268	131.1	326	163.3	384	195.6
-20	-28.9	38	3.3	96	35.6	154	67.8	212	100.0	270	132.2	328	164.4	386	196.7
-18	-27.8	40	4.4	98	36.7	156	68.9	214	101.1	272	133.3	330	165.6	388	197.8
-16	-26.7	42	5.6	100	37.8	158	70.0	216	102.2	274	134.4	332	166.7	390	198.9
-14	-25.6	44	6.7	102	38.9	160	71.1	218	103.3	276	135.6	334	167.8	392	200
-12	-24.4	46	7.8	104	40.0	162	72.2	220	104.4	278	136.7	336	168.9	400	204.4
-10	-23.3	48	8.9	106	41.1	164	73.3	222	105.6	280	137.8	338	170.0	410	210.0
-8	-22.2	50	10.0	108	42.2	166	74.4	224	106.7	282	138.9	340	171.1	420	215.6
-6	-21.1	52	11.1	110	43.3	168	75.6	226	107.8	284	140.0	342	172.2	430	221.1
-4	-20.0	54	12.2	112	44.4	170	76.7	228	108.9	286	141.1	344	173.3	440	226.7

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.

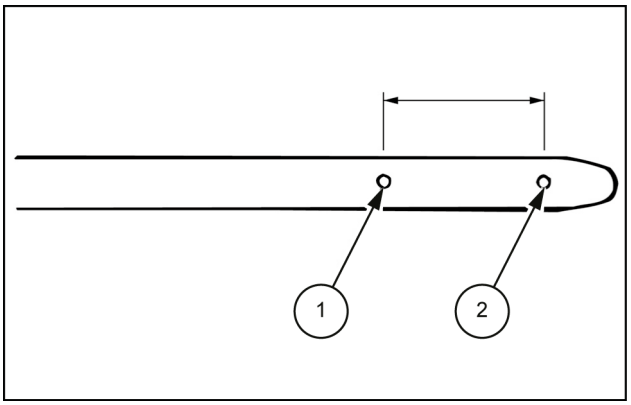
NOTE: *Wipe off the engine oil remaining on the oil level gauge.*

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.*



SMIL14CEX3221AB 1

Piston installation

1. Install the connecting rod bearing to the connecting rod.
2. Apply the engine oil to the connecting rod bearing.

   ⚠ CAUTION: Apply engine oil only to the internal diameter of the connecting rod bearing.

3. Apply the engine oil to the piston ring.
4. Apply the engine oil to the piston.
   - Thoroughly apply engine oil to the ring grooves and piston side surface.
5. Adjust the piston ring.

NOTE: *Shift each piston ring joint by the specified angle.*

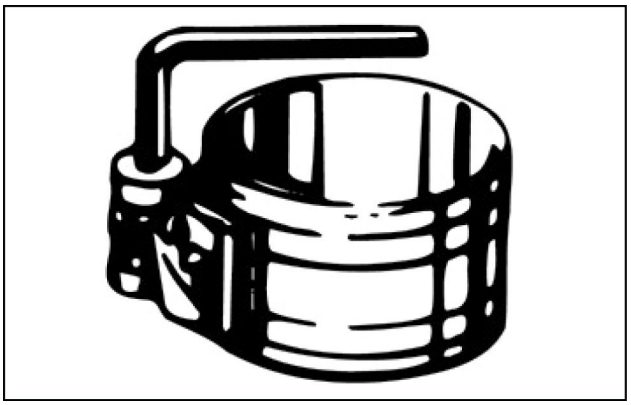
Specified angle: **90 °**

6. Apply the engine oil to the cylinder liner in the application area.
7. Install the special tool to the piston.

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

8. Align the piston to the cylinder block.

NOTE: *Turn the piston so that the front mark faces the engine front.*

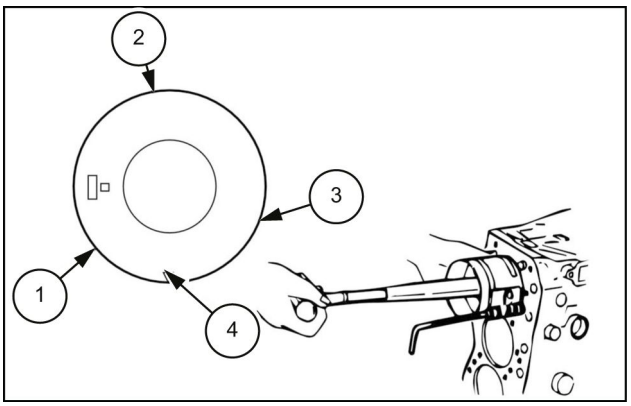


SMIL14CEX3167AA 16

9. Press the piston.

   ⚠ CAUTION:

   - To avoid damaging the oil jet, place the crank pin on the cylinder on which the piston will be installed at top dead center.
   - To avoid damaging the piston ring, firmly attach the piston installer to the cylinder block and push it.
   - Be careful not to damage the crank pin and cylinder liner.
   - Attach a stopper so that the liner does not protrude.



SMIL14CEX3168AB 17

1. No.1 compression ring joint
2. No.2 compression ring joint
3. Oil ring joint
4. Front mark

Cooling fan belt installation

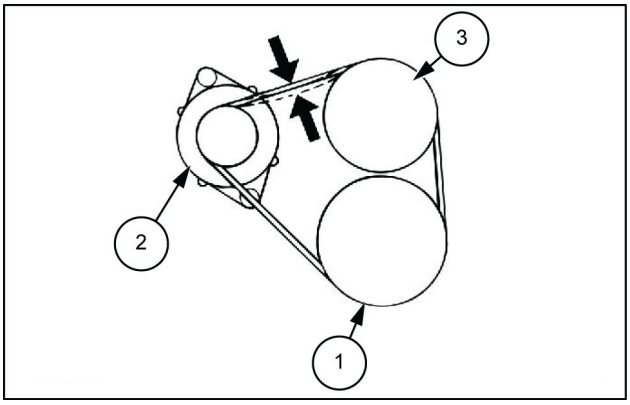
1. Install the cooling fan belt to the engine assembly.

Cooling fan belt adjustment

1. Press the cooling fan belt.

NOTE: *Measure the amount of cooling fan belt flex by pressing on the point indicated by the arrow in the diagram with the specified pressure.*
Standard: ***98.0 N*** *(****22 lb****)*
Specified value: **6.0 - 8.0 mm** (**0.2362 - 0.3150 in**) amount of flex

1. Crankshaft pulley
2. Generator
3. Fan pulley

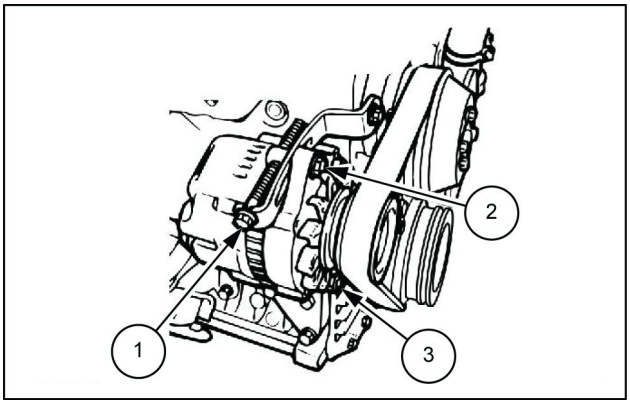


SMIL13CEX1822AB 99

2. Adjust the cooling fan belt to standard value using the adjust bolt.
   - Loosen the adjust plate side nut **(2)** and bracket side bolt **(3)**, shown in the diagram, and lightly tighten to the position for seating.
   - Adjust the belt deflection amount to the specified value using adjust bolt **(1)**.
   - After adjustment, tighten the adjust plate side nut **(2)** and bracket side bolt **(3)** to the specified torque.

     Tightening torque: **76 N·m** (**56 lb ft**) adjust plate side nut **(2)**

     Tightening torque: **127 N·m** (**94 lb ft**) bracket side bolt **(3)**



SMIL13CEX1823AB 100

Fan guide installation

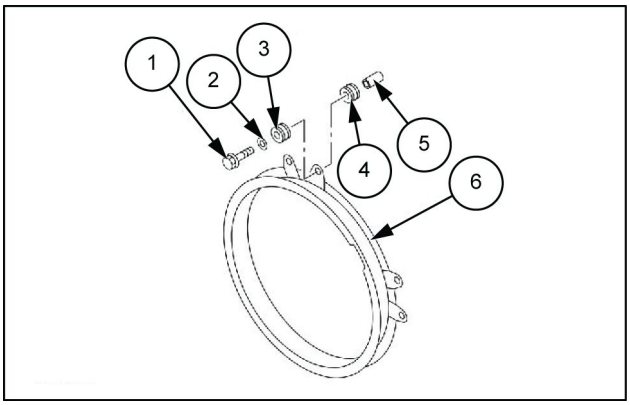
1. Install the fan guide bracket to the engine assembly.

   Tightening torque: **40 N·m** (**30 lb ft**)

2. Install the fan guide **(6)** to the fan guide bracket.

   Tightening torque: **30 N·m** (**22 lb ft**)

   1. Bolt
   2. Washer
   3. Rubber mount
   4. Rubber mount
   5. Guide tube



SMIL13CEX1824AB 101

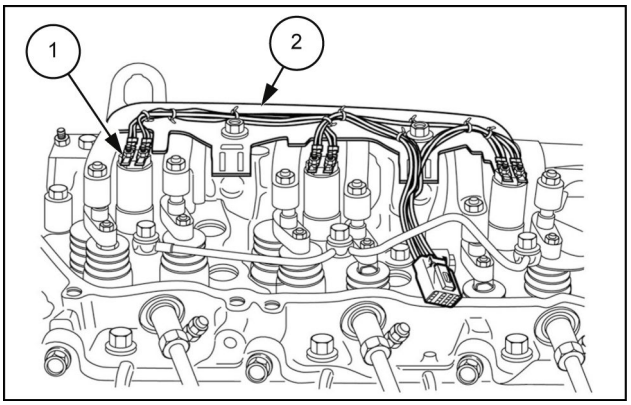
Injector harness installation

1. Install the injector harness to the cylinder head assembly.

NOTE: *Tighten the bolts on the bracket and install the injector harness together with the bracket.*

Tightening torque : **48 N·m** (**35 lb ft**)

1. Injector harness terminal
2. Injector harness bracket

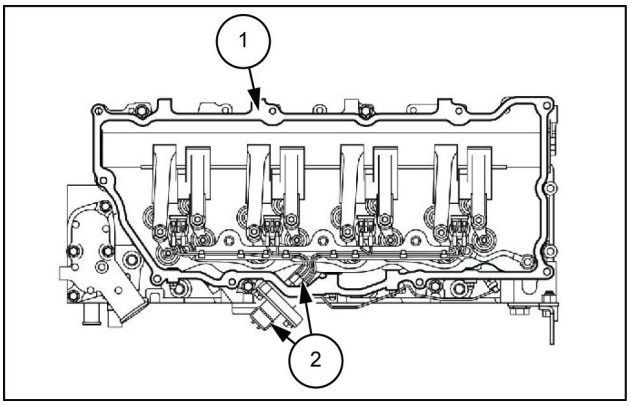


SMIL14CEX3094AB 8

2. Connect the injector harness to the injector.
Tightening torque: **2 N·m** (**18 lb in**)

> ⚠ CAUTION: Be careful not to damage the injector side stud bolts.

3. Install the connector **(2)** to the lower cover.



SMIL13CEX1700AB 9

Injector installation

> ⚠ CAUTION: When reusing an injector, do not change the installation position.

1. Apply the engine oil to the bolt **(2)**.
2. Temporarily tighten the injector **(1)** to the cylinder head assembly.

   > ⚠ CAUTION: Be extremely careful not to damage the injector nozzle.

3. Temporarily tighten the injection pipe to the injector.

   > ⚠ CAUTION: Use new injection pipes.

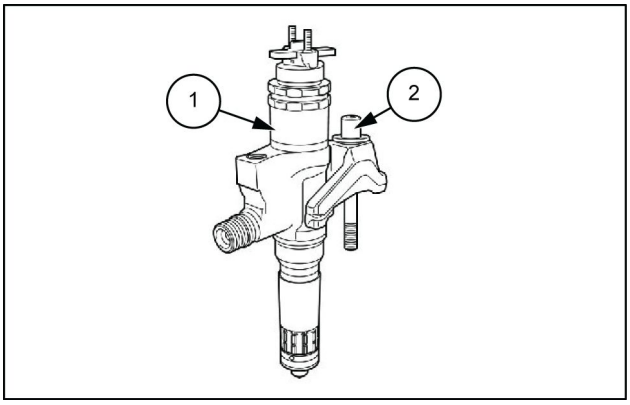
4. Temporarily tighten the injection pipe to the common rail assembly
5. Securely tighten the injector to the cylinder head assembly.

   Tightening torque: **30 N·m** (**22 lb ft**)

6. Install the injector leak-off pipe to the injector.

   > ⚠ CAUTION: Use new gaskets.

   Tightening torque: **14 N·m** (**10.33 lb ft**)



SMIL13CEX1696AB 38

Injection pipe installation

1. Securely tighten the injection pipe to the injector.

   Tightening torque: **30 N·m** (**22 lb ft**)

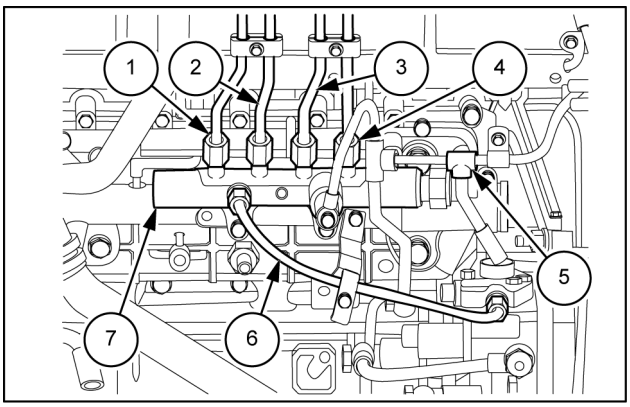
2. Securely tighten the injection pipe to the common rail assembly **(7)**.

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

3. Install the clip to the bracket.

   Tightening torque: **6 N·m** (**4.43 lb ft**)

   1. No.1 injection pipe
   2. No.2 injection pipe
   3. No.3 injection pipe
   4. No.4 injection pipe
   5. Fuel leak-off pipe
   6. Fuel pipe

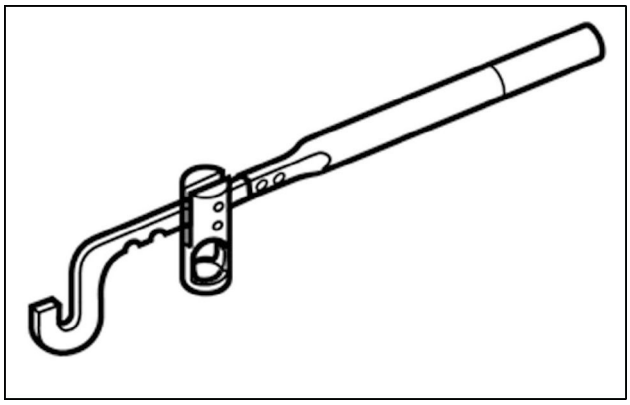


SMIL14CEX5653AB 39

Valves - Special tools

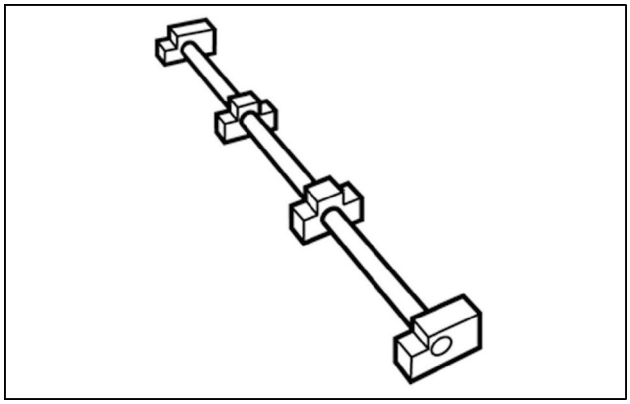
Valve spring

Isuzu reference	5-8840-2621-0
CASE CONSTRUCTION tool number	Common tool
Description	Valve spring replacer



SMIL14CEX2699AA 1

Isuzu reference	8-9439-6862-0
CASE CONSTRUCTION tool number	Not needed
Description	Pivot ASM



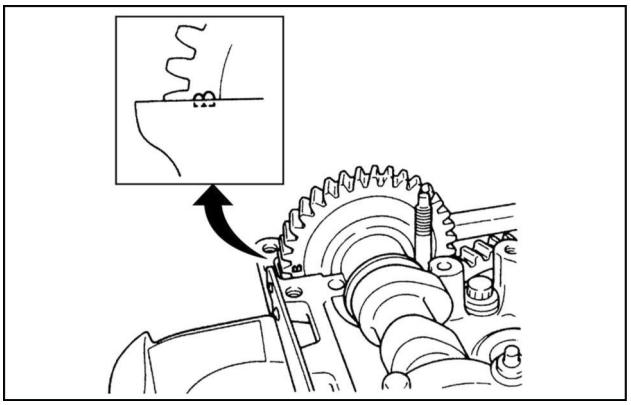
SMIL14CEX2700AA 2

4. Install the camshaft to the cylinder head assembly.

NOTE: *Mesh together the idle gear C and the camshaft gear so that the alignment mark on the camshaft gear matches the top surface of the cylinder head, and gently install the camshaft.*

5. Check alignment mark of the camshaft gear.

> ⚠ CAUTION:
>
> - Confirm that the alignment mark is not misaligned before installing the camshaft bearing cap.
> - If the alignment mark is not at the correct position, reinstall the camshaft.



SMIL14CEX3078AA 6

6. Apply the engine oil to the camshaft bearing.

NOTE: *Apply engine oil to the sliding surface of the bearing.*

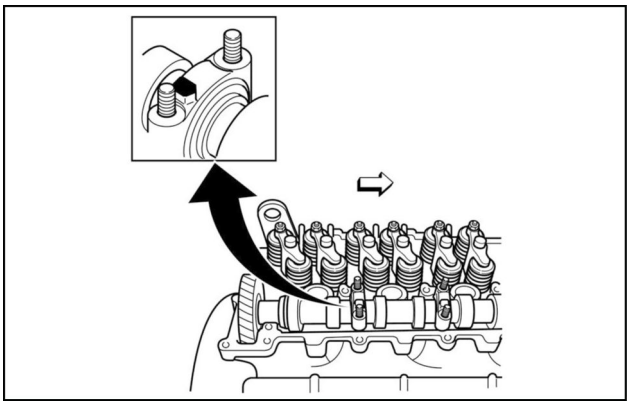
> ⚠ CAUTION: Apply engine oil after cleaning the bearing installation sections of the camshaft bearing and camshaft bearing cap.

7. Install the camshaft bearing to the camshaft bearing cap.
8. Install the camshaft bearing cap to the cylinder head assembly.

NOTE: *Turn the camshaft bearing cap so that the arrow mark on the top surface faces the engine front side, and assemble in numerical order.*

Tightening torque: **28 N·m** (**21 lb ft**)

Engine oil application

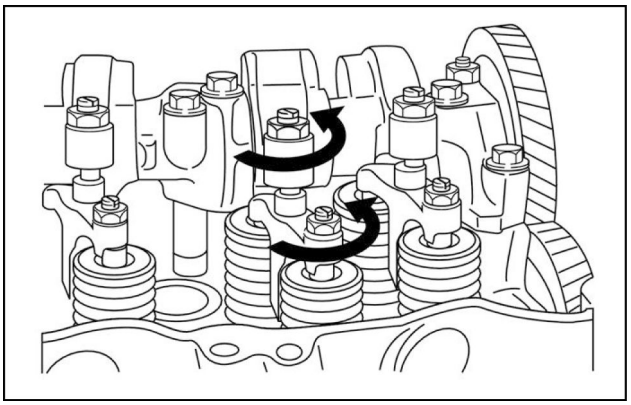


SMIL14CEX3079AA 7

Rocker arm shaft adjustment

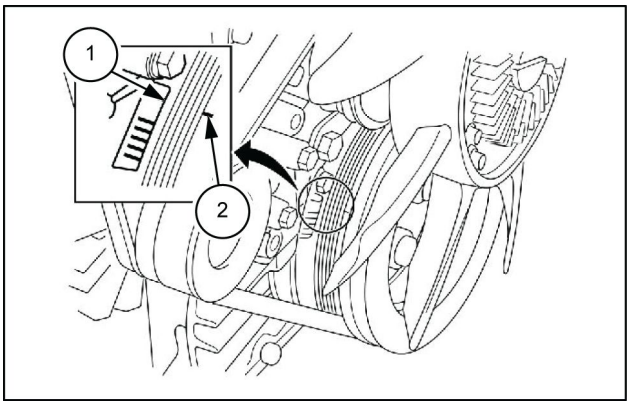
NOTE: *Valve clearance adjustment*

> ⚠ CAUTION:
>
> - Adjust the valve clearance while cool.
> - Loosen all adjust screws before adjustment.



SMIL14CEX3082AA 12

1. Align No.1 cylinder to the compression top dead center.
   1. Front cover marking
   2. 0° marking on the crankshaft damper



SMIL13CEX1690AB 13

2. Prepare the feeler gauge.

   Thickness : **0.4 mm** (**0.0157 in**)

NOTE: *Insert the thickness gauge between the rocker arm and bridge cap.*

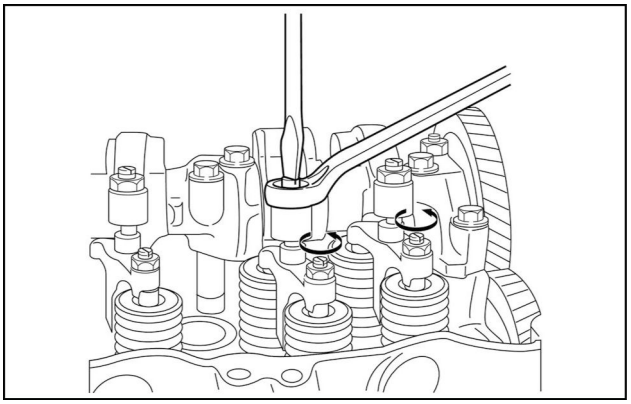
3. Turn the adjust screw.

NOTE: *When the movement of the thickness gauge becomes stiff, secure the adjust screw nut of the rocker arm.*

   Tightening torque: **22 N·m** (**16 lb ft**)

4. Turn the adjust screw.
5. With the thickness gauge inserted, lightly tighten the adjust screw of the bridge.
6. Confirm that the leading end of the adjust screw and valve shaft end have made contact and the movement of the thickness gauge has become stiff.
7. Check if the valve shaft end on the opposite side is floating or touching at an angle.
8. If it is floating or touching at an angle, slightly loosen the bridge adjust screw and adjust the valve shaft ends on both sides to touch properly.

   Clearance : Less than **0.1 mm** (**0.0039 in**) between valve and bridge

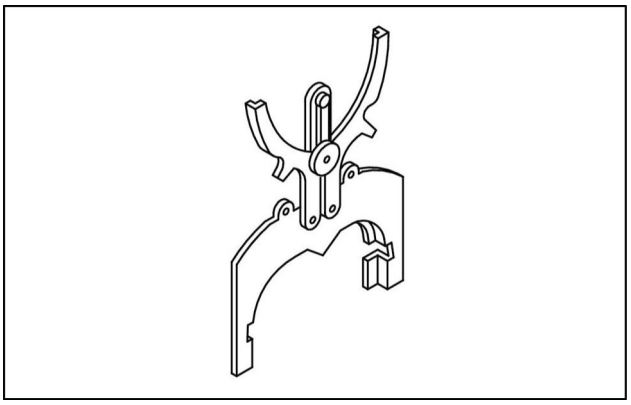


SMIL14CEX3083AA 14

Piston - Disassemble

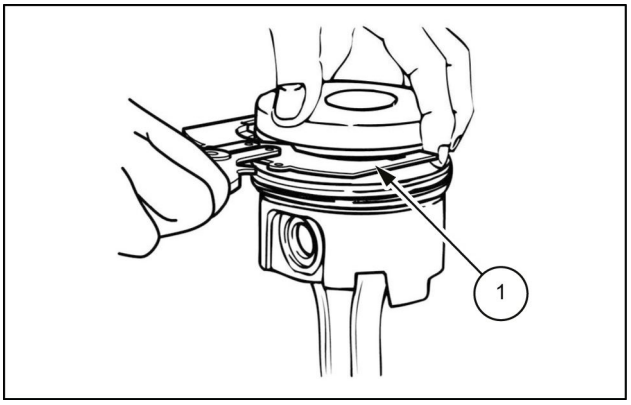
1. Remove the piston ring from the piston using the special tool **(1)**.

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



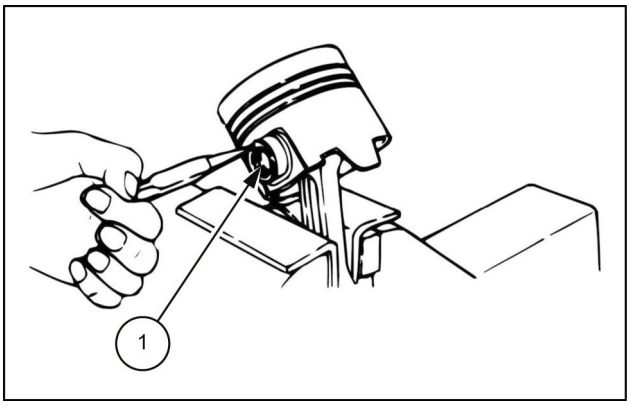
SMIL14CEX3362AA 1

NOTE: *Organize the removed piston rings according to the cylinders.*



SMIL14CEX3363AB 2

2. Remove the snap ring from the piston.
3. Remove the piston pin **(1)** from the piston.



SMIL14CEX3364AB 3

4. Remove the connecting rod from the piston.

NOTE: *Organize the removed piston rings according to the cylinders.*

5. Install the radiator cap to the radiator.

> ⚠ CAUTION: Securely attach the radiator cap.

6. Add coolant to the radiator reserve tank.

NOTE: *Add up to the MAX line of the radiator reserve tank. With the pressurized reserve tank specification, it is not necessary to bleed the air.*

> ⚠ CAUTION: Wipe off any excess coolant.

7. Start the engine.

NOTE: *Idle the engine for* ***5 min****.*

8. Stop the engine.

9. Remove the radiator cap from the radiator.

> ⚠ CAUTION:
>
> - Do not loosen the radiator cap or sub-tank cap when the coolant temperature is high.
> - Because steam and boiling water can burst out from the radiator and possibly cause burns, check that the engine has cooled.

10. Replenish the radiator with coolant.

NOTE: *Add an amount of coolant equal to the difference between the remaining coolant lever and the radiator cap mouth.*

> ⚠ CAUTION: If the coolant amount is excessively low, inspect for coolant leakage.

11. Install the radiator cap to the radiator.

> ⚠ CAUTION: Securely attach the radiator cap.

12. Start the engine.

NOTE: *For models with heaters, the set temperature and blower speed are set to the maximum, and warm up the engine approximately* ***1500 - 2000 RPM****.*
Touch the radiator upper hose, and confirm that is has become warm.

> ⚠ CAUTION: If the upper hose is not warm, perform step 12 again.

NOTE: *Idle the engine for* ***5 min****.*

13. Stop the engine.

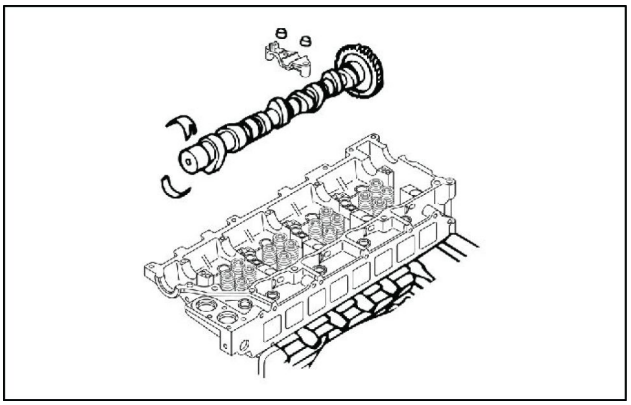
14. Remove the radiator cap from the radiator.

> ⚠ CAUTION: Confirm that the engine has cooled.

Camshaft removal

1. Remove the camshaft bearing cap from the cylinder head assembly.
2. Remove the camshaft bearing from the camshaft bearing cap.
3. Remove the camshaft from the cylinder head.
4. Remove the camshaft bearing from the cylinder head assembly.

NOTE: *Temporarily assemble the removed caps and bearings in the original position to avoid a mix-up after the bearings have been inspected.*



SMIL13CEX1497AA 40

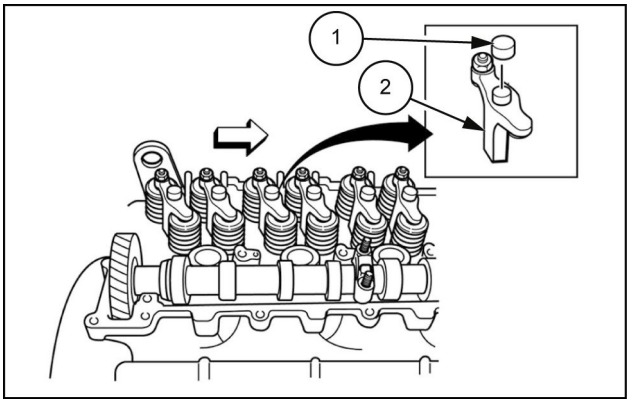
Bridge removal

1. Remove the bridge cap **(1)** from the bridge **(2)**.

   ⚠ CAUTION: Be careful not to drop the bridge cap **(1)** into the engine.

2. Remove the bridge **(2)** from the bridge guide.

NOTE: *After removing, organize to avoid a mix-up with other installation locations.*

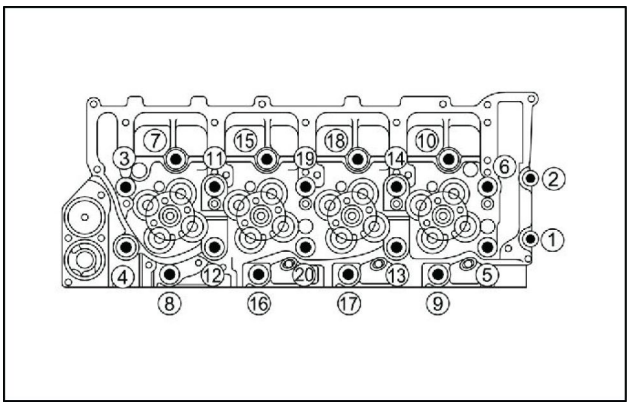


SMIL14CEX3012AB 41

Cylinder head assembly removal

1. Remove the cylinder head assembly from the cylinder block.

NOTE: *Loosening order of the head bolts.*



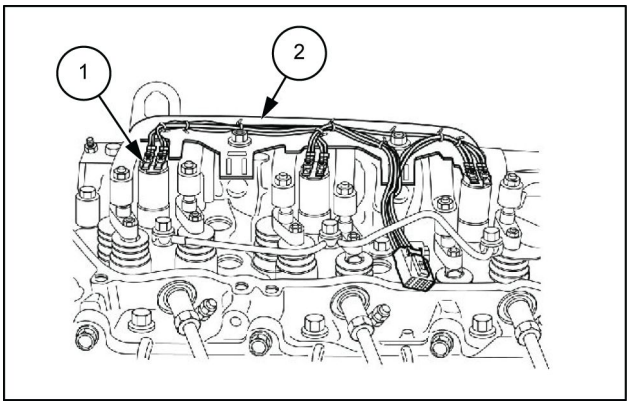
SMIL13CEX1499AA 42

6. Install the injector harness to the cylinder head assembly.

NOTE: *Tighten the bolts on the bracket and install the injector harness together with the bracket.*

Tightening torque: **48 N·m** (**35 lb ft**)

1. Injector harness terminal
2. Injector harness bracket



SMIL13CEX1699AB 70

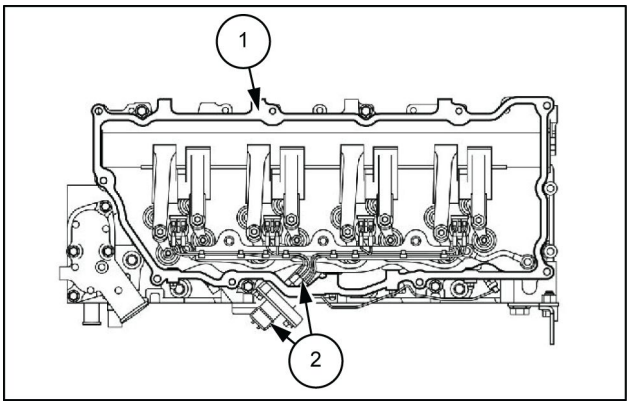
7. Connect the injector harness to the injector.

Tightening torque: **2 N·m** (**1.48 lb ft**)

⚠ CAUTION: Be careful not to damage the injector side stud bolts.

8. Install the connector **(2)** to the lower cover **(1)**.

Tightening torque: **2 N·m** (**1.48 lb ft**)



SMIL13CEX1700AB 71

Glow plug installation

1. Install the glow plug to the cylinder head assembly.

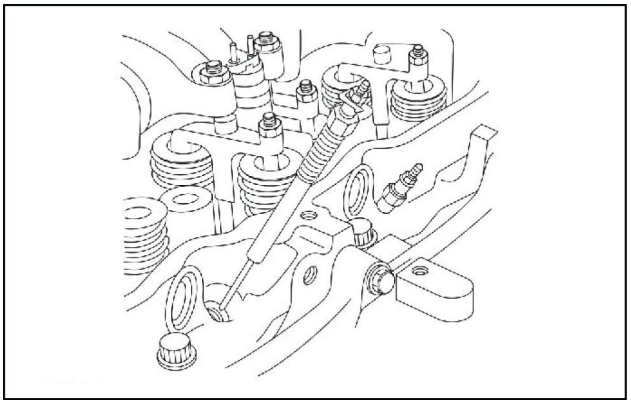
Tightening torque: **20 N·m** (**15 lb ft**)

⚠ CAUTION: Be careful not to exceed the specified torque when tightening.

2. Install the glow plug connector to the glow plug.

Tightening torque: **1 N·m** (**0.74 lb ft**)

⚠ CAUTION: Confirm that the glow plug connector does not interfere with the surrounding parts.

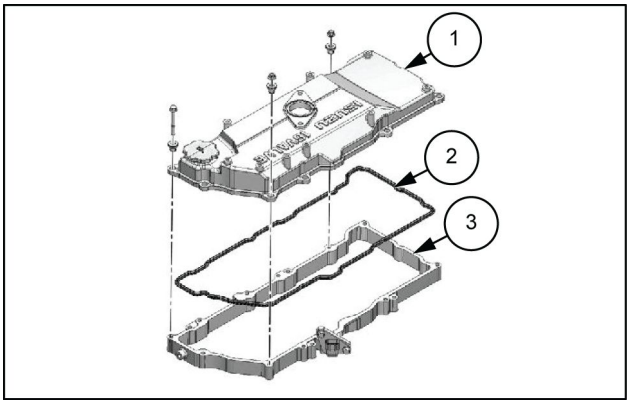


SMIL13CEX1801AB 72

Cylinder head cover installation

1. Align the head cover gasket **(2)** to the cylinder head cover **(1)**.
2. Install the cylinder head cover **(1)** to the lower cover **(3)**.

Tightening torque: **18 N·m** (**13 lb ft**).



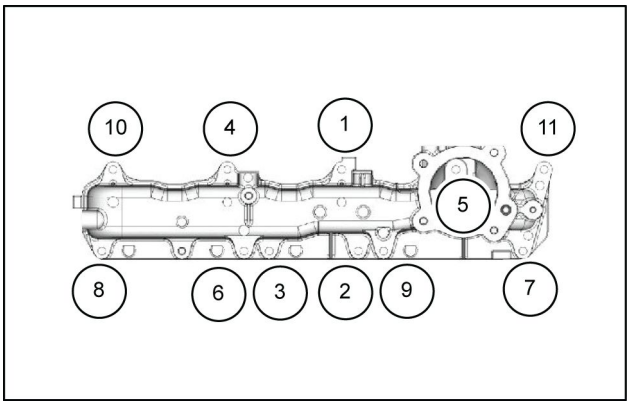
SMIL13CEX1803AB 73

Common rail - Install

1. Temporarily tighten the common rail bracket to the oil cooler assembly.

NOTE: *The installation bolt and common rail assembly are tightened together.*

2. Align the common rail assembly to the inlet cover.
3. Align the common rail assembly to the common rail bracket.



SMIL13CEX1392AB 1

4. Temporarily tighten the nut to the common rail assembly.

NOTE: *The stud bolts of the inlet cover are tightened together.*

5. Temporarily tighten the bolt to the common rail assembly.
6. Securely tighten the nut to the common rail assembly.

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

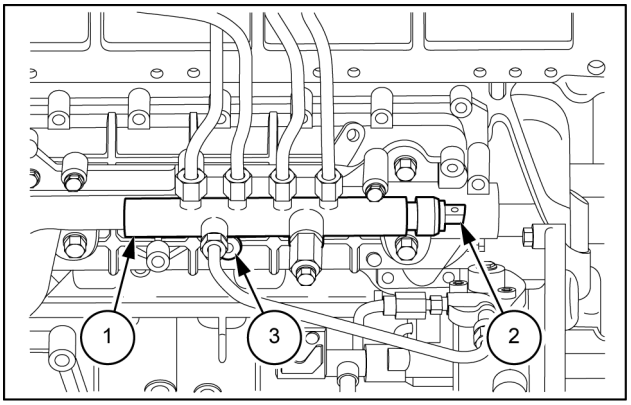
NOTE: *Refer to the tightening order in the diagram if the inlet cover is removed.*

7. Securely tighten the bolt to the common rail assembly **(1)**.

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

8. Connect the harness connector to the fuel pressure sensor **(2)**.

   3. Common rail bracket



SMIL14CEX5651AB 2

Contents

Engine - 10

Intake and exhaust manifolds and muffler - 254

SERVICE

5. Install the radiator cap to the radiator.

> ⚠ CAUTION: Securely attach the radiator cap.

6. Add coolant to the radiator reserve tank.

NOTE: *Add up to the MAX line of the radiator reserve tank. With the pressurized reserve tank specification, it is not necessary to bleed the air.*

> ⚠ CAUTION: Wipe off any excess coolant.

7. Start the engine.

NOTE: *Idle the engine for* ***5 min****.*

8. Stop the engine.

9. Remove the radiator cap from the radiator.

> ⚠ CAUTION:
>
> - Do not loosen the radiator cap or sub-tank cap when the coolant temperature is high.
> - Because steam and boiling water can burst out from the radiator and possibly cause burns, check that the engine has cooled.

10. Replenish the radiator with coolant.

NOTE: *Add an amount of coolant equal to the difference between the remaining coolant lever and the radiator cap mouth.*

> ⚠ CAUTION: If the coolant amount is excessively low, inspect for coolant leakage.

11. Install the radiator cap to the radiator.

> ⚠ CAUTION: Securely attach the radiator cap.

12. Start the engine.

NOTE: *For models with heaters, the set temperature and blower speed are set to the maximum, and warm up the engine approximately* ***1500 - 2000 RPM****.*
Touch the radiator upper hose, and confirm that is has become warm.

> ⚠ CAUTION: If the upper hose is not warm, perform step 12 again.

NOTE: *Idle the engine for* ***5 min****.*

EGR gas temperature sensor 2 installation

CAUTION:

- Check the EGR gas temperature sensor 2 connector color, and take care not to assemble incorrectly.
- Because the connector color cannot be identified using the outer surface if the exterior is painted, remove the connector and identify if using the connector interior color.
- 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

CAUTION:

- Do not subject the tip of the sensor to impact when installing the EGR gas temperature sensor.
- 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 B.

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

3. Install the harness bracket to EGR pipe B.

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

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

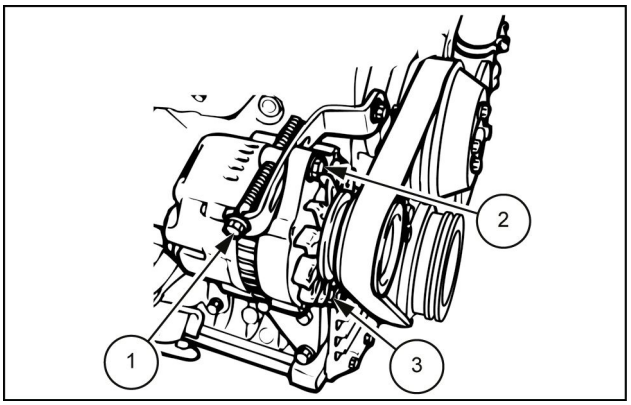
2. Adjust the cooling fan belt to the specified value using the adjust bolt **(1)** .

NOTE: *Loosen adjust-plate-side nut **(2)** and bracket-side bolt **(3)**, shown in the diagram, and lightly tighten to the position for seating.*
*Adjust the belt deflection amount to the specified value using adjust bolt **(1)**.*

NOTE: *After adjustment, tighten the adjust-plate-side nut **(2)** and bracket-side bolt **(3)** to the specified torque.*

Tightening torque: **76 N·m** (**56.1 lb ft**) Adjust-plate-side nut **(2)**

Tightening torque: **127 N·m** (**93.7 lb ft**) Bracket-side bolt **(3)**



SMIL14CEX3123AB 4

Fan guide installation

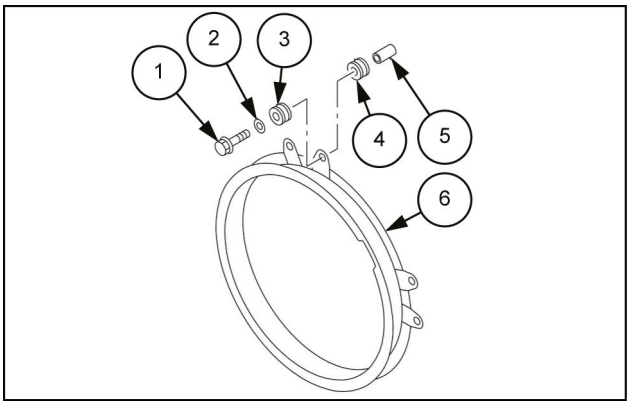
1. Install the fan guide bracket to the engine assembly.

   Tightening torque: **40 N·m** (**29.5 lb ft**)

2. Install the fan guide **(6)** to the fan guide bracket.

   Tightening torque: **30 N·m** (**22.1 lb ft**)

   1. Bolt
   2. Washer
   3. Rubber mount
   4. Rubber mount
   5. Guide tube

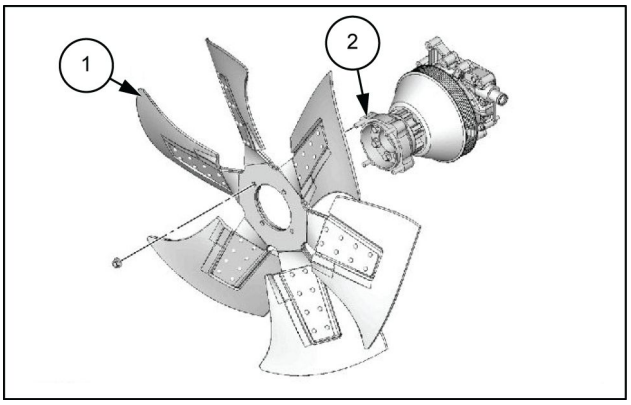


SMIL14CEX3122AB 5

Cooling fan installation

1. Install the cooling fan **(1)** to the adapter **(2)**.

   Tightening torque: **52 N·m** (**38.4 lb ft**)



SMIL13CEX1825AB 6

Battery ground cable connect

1. Connect the battery ground cable to the battery.

Fuel pipe removal

1. Remove the fuel pipe from the fuel supply pump and the common rail assembly.

NOTE: *Remove the clip.*

⚠ CAUTION: Do not reuse the removed gasket.

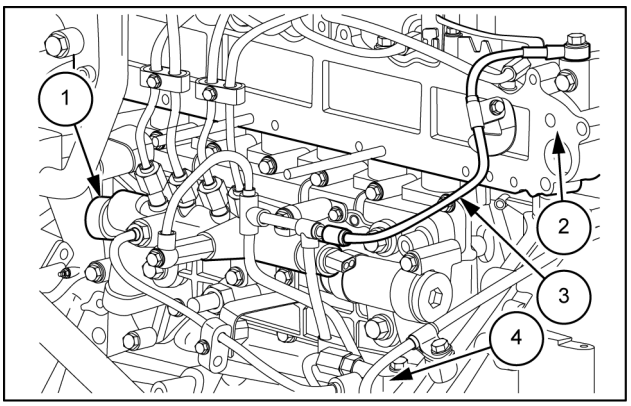
Fuel leak off pipe assembly removal

1. Disconnect the fuel leak-off pipe **(3)** from the cylinder head **(2)**.
2. Remove the fuel leak-off pipe **(3)** from the fuel supply pump **(4)**.

NOTE: *Remove the eyebolt tightened together with the fuel feed pipe.*

3. Disconnect the fuel leak-off pipe **(3)** from the common rail assembly **(1)**.
4. Remove the fuel leak-off pipe **(3)** from the inlet pipe.

NOTE: *Remove the clip.*



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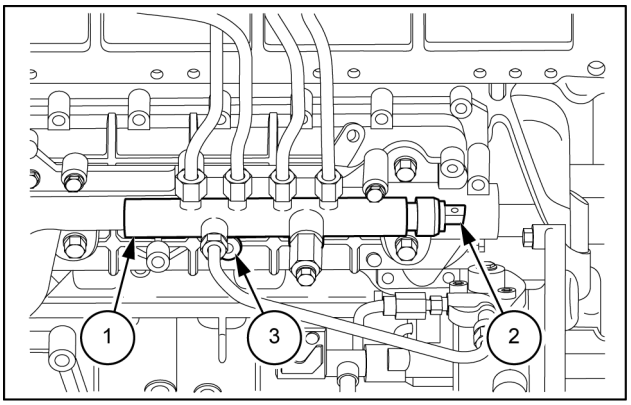
Common rail assembly removal

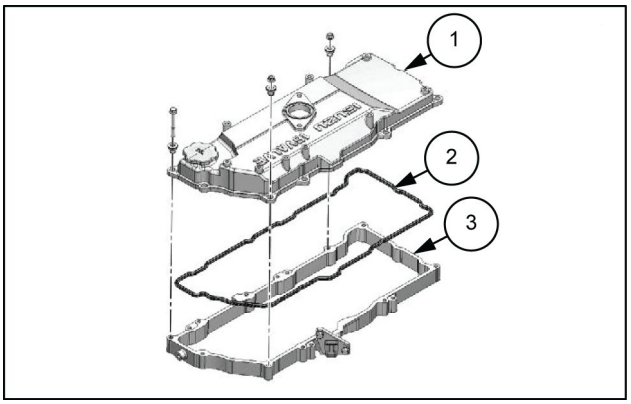
1. Disconnect the harness connector from the fuel pressure sensor **(2)** .
2. Remove the common rail assembly **(1)** from the inlet cover and the common rail bracket **(3)**.
3. Remove the common rail bracket **(3)** from the oil cooler assembly.



SMIL14CEX5651AB 24

Cylinder head cover removal

1. Disconnect the ventilation hose from the air breather.
2. Remove the cylinder head cover **(1)** from the lower cover **(3)**.
3. Remove the head cover gasket **(2)** from the cylinder head cover **(1)**.



SMIL13CEX1147AB 25

6. Final tighten the EGR pipe C to the EGR valve.

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

7. Final tighten the EGR pipe C to the engine hanger bracket.

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

8. Final tighten the EGR pipe B to the bracket.

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

9. Final tighten the EGR cooler B to the EGR pipe C.

   Tightening torque: **24 N·m** (**18 lb ft**) No.4 in the diagram

10. Final tighten the EGR pipe B to the EGR cooler B.

    Tightening torque: **24 N·m** (**18 lb ft**) No.5 in the diagram

11. Final tighten the EGR cooler A to the EGR pipe B.

    Tightening torque: **24 N·m** (**18 lb ft**) No.6 in the diagram

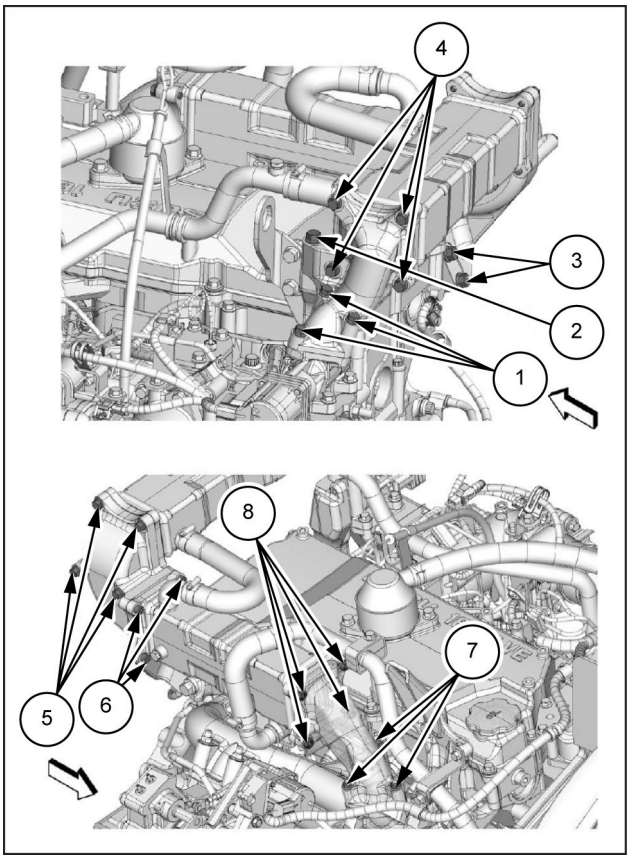
12. Final tighten the EGR pipe A to the exhaust manifold.

    Tightening torque: **28 N·m** (**21 lb ft**) No.7 in the diagram

13. Final tighten the EGR pipe A to the EGR cooler A.

    Tightening torque: **28 N·m** (**21 lb ft**) No.8 in the diagram

14. Install the EGR heat protector **(1)** to the EGR pipe A.



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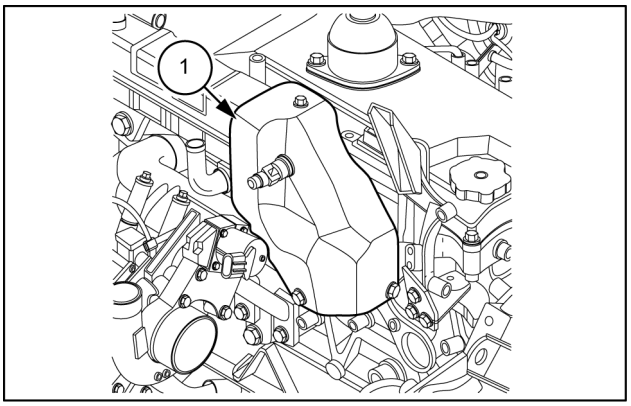

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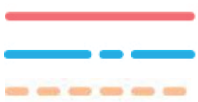
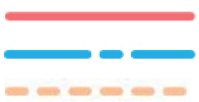


Pressure line
Tank line
Pilot pressure line

Pilot tank line
Electric line

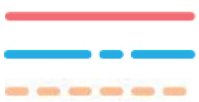
1. Swing motor
2. Swing
3. Cushion valve
4. Right swing
5. Left swing
6. Swing pilot pressure sensor
7. Remote control valve (arm, swing)
8. Control valve
9. Main computer
10. Lever lock
11. Swing brake
12. 5 stack solenoid valve
13. Console lever lock switch
14. P1 pressure sensor
15. P1 flow control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



Pressure line
Tank line
Pilot pressure line

Pilot tank line
Electric line

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



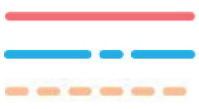
Pressure line
Tank line
Pilot pressure line

Pilot tank line
Electric line

1. Regeneration check valve
2. Oil cooler
3. Orifice
4. Cushion valve
5. Bucket (close)
6. Bucket (open)
7. Remote control valve (boom, bucket)
8. Lever lock
9. Boost pressure relief
10. 5 stack solenoid valve
11. Control valve
12. Bucket
13. Bucket cylinder
14. Bucket-close pilot pressure sensor
15. Console lever lock switch
16. Monitor display
17. Main computer
18. P1 pressure sensor
19. P2 pressure sensor
20. Hydraulic pump
21. Check valve
22. 6 stack proportional pressure reducing valve
23. Bucket spool stroke control

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

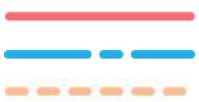
1. Control valve
2. Manifold
3. Relief valve
4. Breaker
5. Main computer
6. Monitor display
7. ATT select switch
8. Lever switch
9. 2 stack solenoid valve
10. Console lever lock switch
11. Lever lock
12. 5 stack solenoid valve
13. P1 pressure sensor
14. P2 pressure sensor
15. P2 flow control proportional valve
16. P1 flow control proportional valve
17. Hydraulic pump
18. Check valve
19. Oil cooler



Pressure line
Tank line
Pilot pressure line

Pilot tank line
Electric line

1. Travel motor
2. Travel high-speed select switch
3. Main computer
4. Control valve
5. Travel (left)
6. Travel (right)
7. Travel high speed
8. Lever lock
9. 5 stack solenoid valve
10. Console lever lock switch
11. Hydraulic pump
12. Travel remote control valve
13. Check valve
14. Oil cooler
15. Backward left
16. Forward left
17. Forward right
18. Backward right



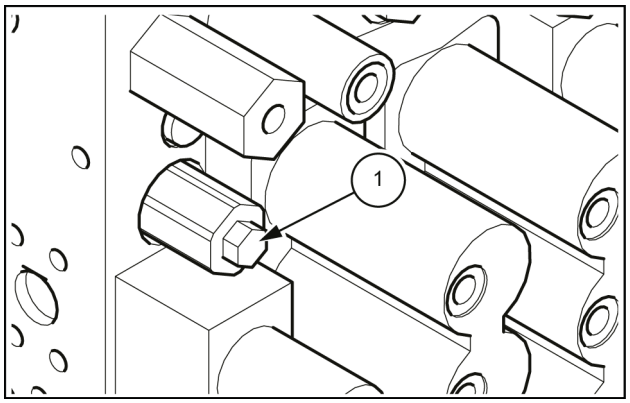
Pressure line
Tank line
Pilot pressure line

Pilot tank line
Electric line

1. Arm cylinder
2. Arm (in)
3. Arm (out)
4. Boom (up)
5. Boom (down)
6. Cushion valve
7. Remote control valve (boom, bucket)
8. Remote control valve (arm, swing)
9. Lever lock
10. Boost pressure relief
11. 5 stack solenoid valve
12. Arm **(1)**
13. Boom **(2)**
14. Arm load holding valve spool
15. Load holding valve check valve
16. Control valve
17. Swing priority variable orifice
18. Arm **(2)**
19. Boom load holding valve check valve
20. Boom cylinder
21. Attachment pilot pressure sensors
22. Console lever lock switch
23. Monitor display
24. Main computer
25. P1 pressure sensor
26. P2 pressure sensor
27. Hydraulic pump
28. Check valve
29. Oil cooler
30. HBCV check valve
31. 6 stack proportional pressure reducing valve
32. Boom spool stroke control

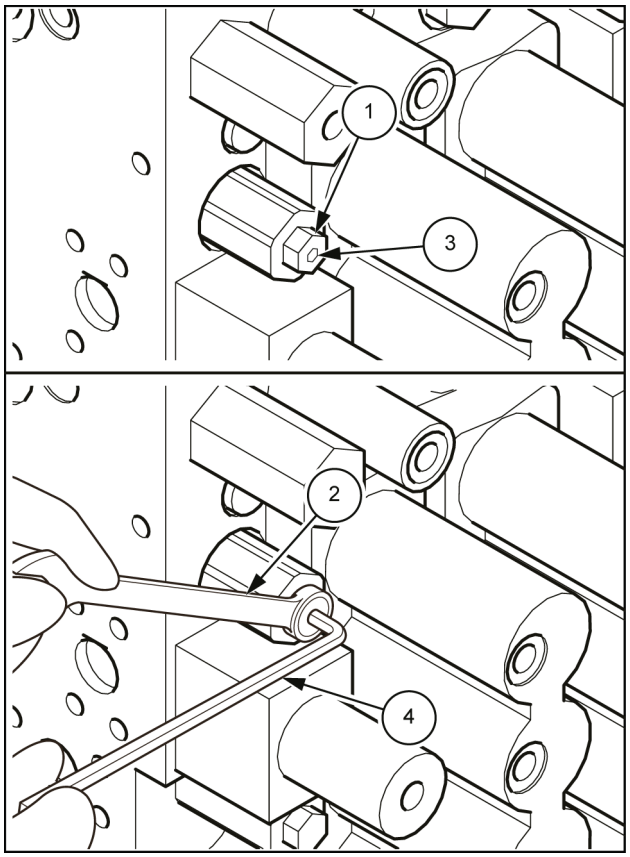
Pressure adjustment

Example: Boom up **(1)** overload relief adjustment



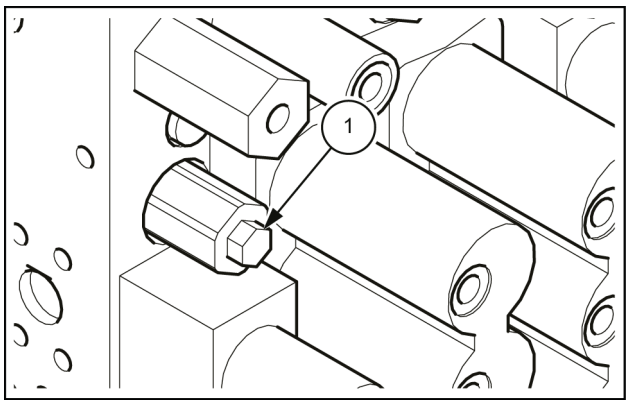
SMIL14CEX4128AB-01 12

1. Loosen the lock nut **(1)** with a wrench **(2)**, and turn the adjusting screw **(3)** with a hexagon wrench **(4)** to adjust it.
   - Tighten it if pressure is lower than the set pressure.
   - If pressure is higher than the set pressure, loosen the screw until it becomes below the set pressure, and then adjust it by tightening the screw.



SMIL14CEX4129BB-01 13

2. After the adjustment, lock the lock nut **(1)**.



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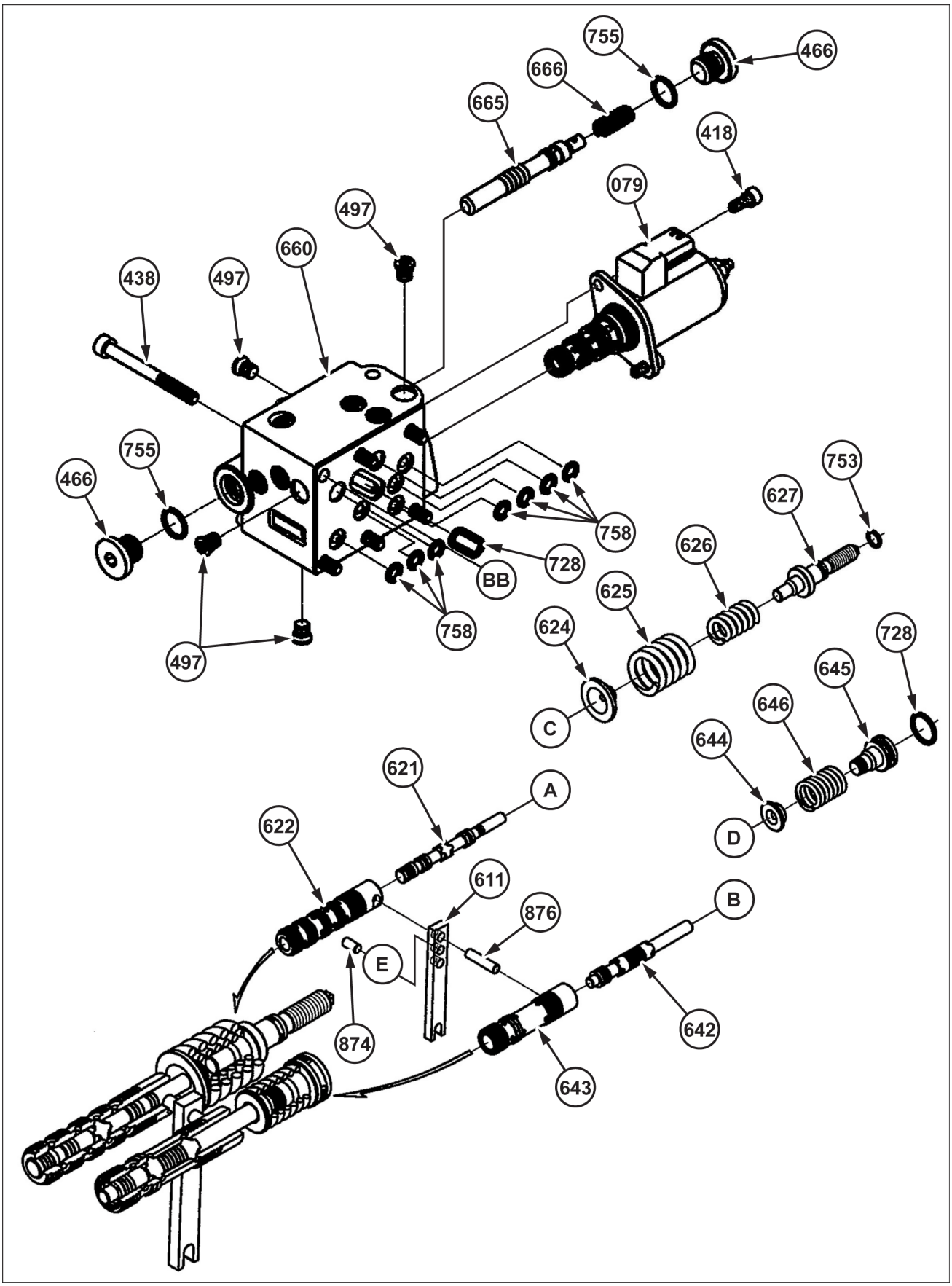
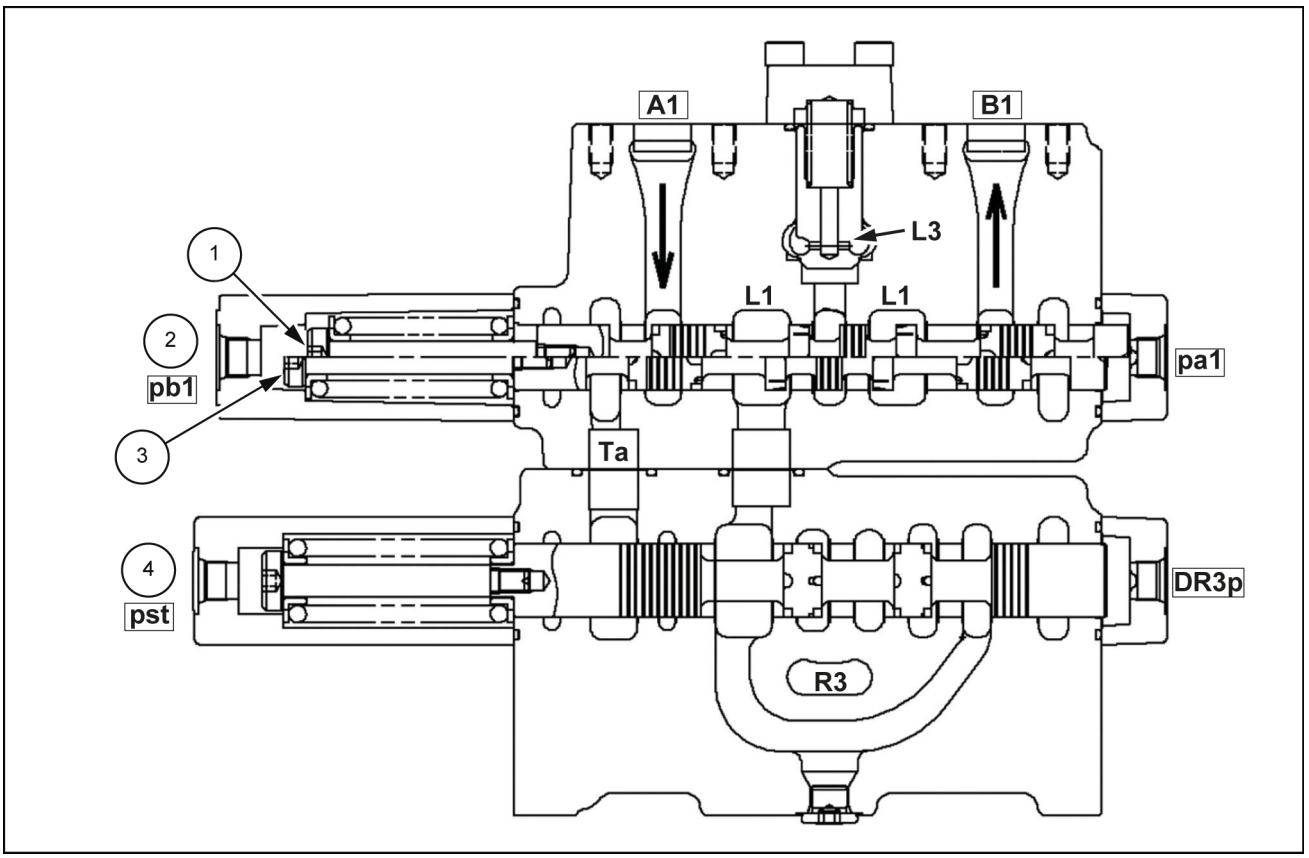


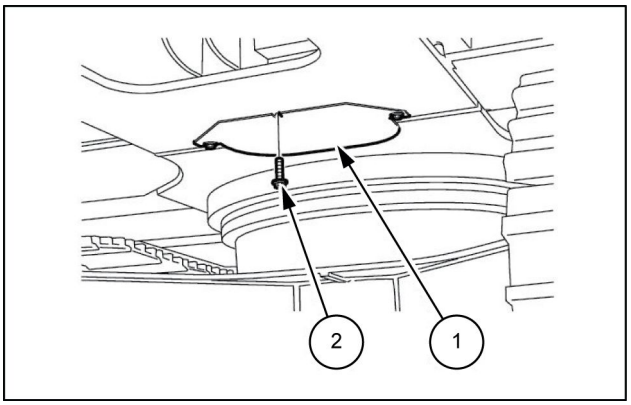
SMIL14CEX6588H 2



SMIL14CEX3808FB 6

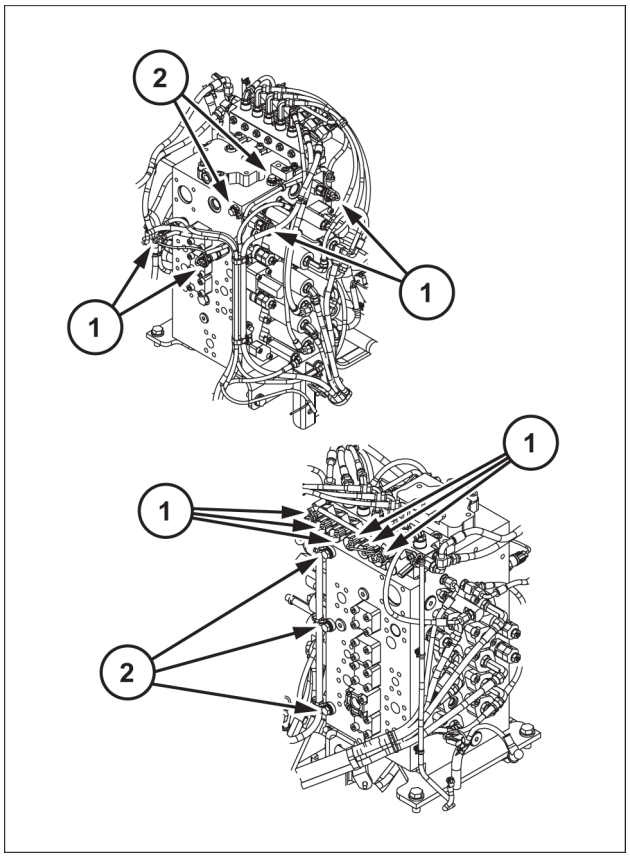
1, Switching state
2. Travel (section 1)
3. Neutral state
4. Travel straight (section ST)

4. Remove the 3 bolts **(2)** with a wrench [**19 mm**] to remove the under cover **(1)**.



SMIL13CEX0922AB 3

5. Remove the 10 connectors **(1)** of the pressure sensor. Remove the 5 clamps **(2)** with a wrench [**17 mm**].
   - Bolt tightening torque: **21.6 - 37.2 N·m** (**15.9 - 27.4 lb ft**)

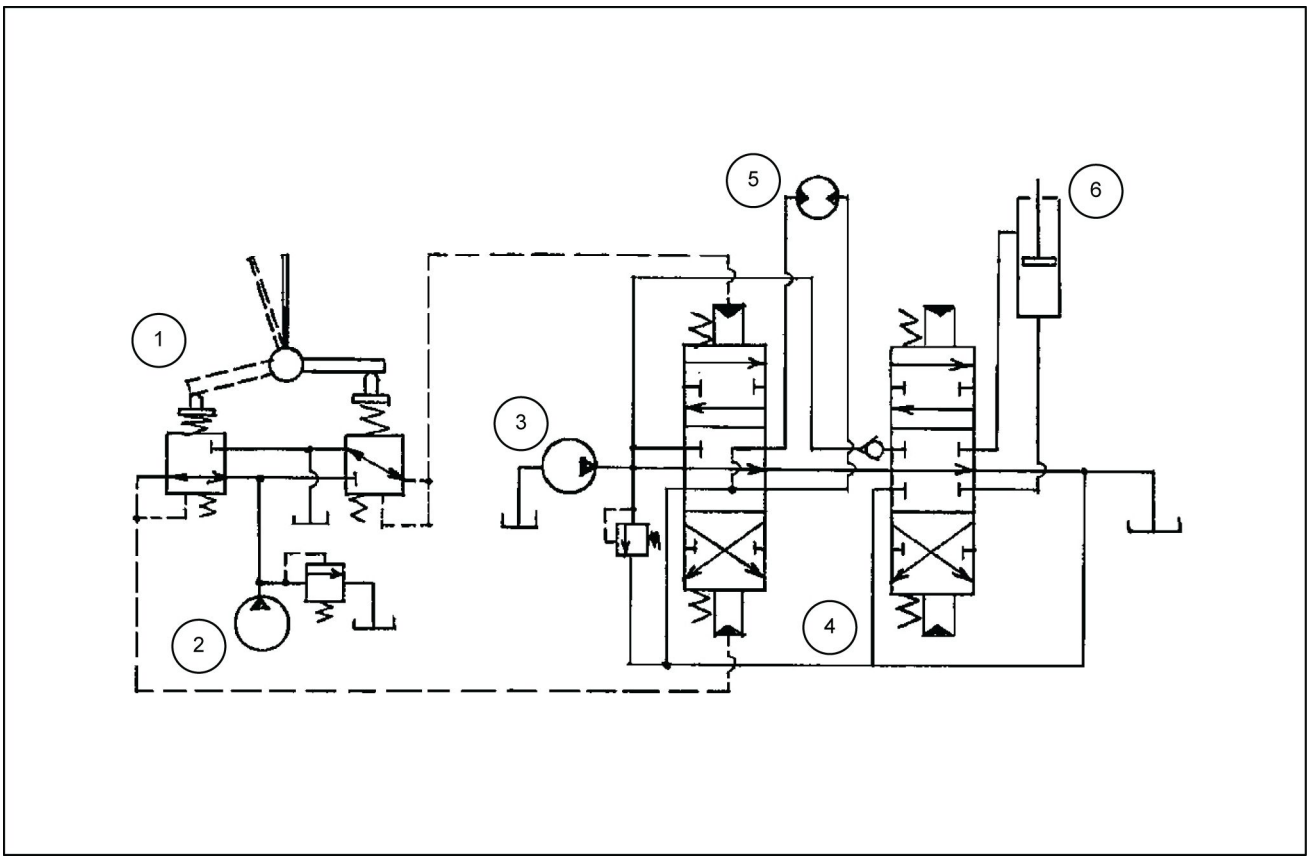


SMIL15CEX2155BB 4

Operation

Operation of the remote control valve is explained based on the hydraulic circuit diagram (Fig. **1**) and operation explanation diagrams (Fig. **2** - Fig. **4**).

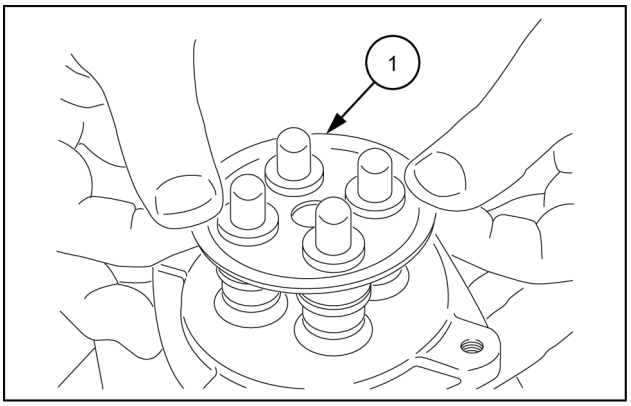
Fig. **1** is a typical usage example for the remote control valve.



LPIL12CX01993FB 1

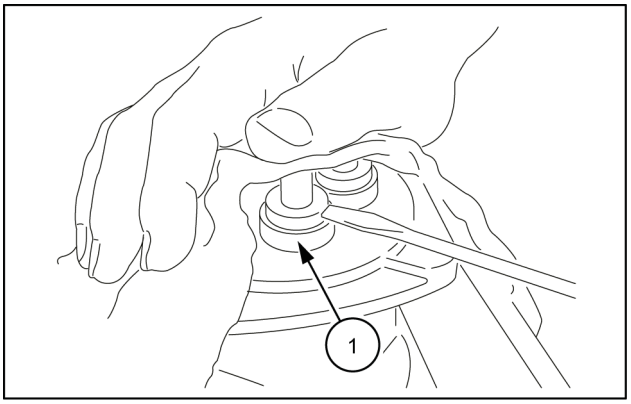
1. Pilot valve
2. Pilot pump
3. Main pump
4. Control valve
5. Hydraulic motor
6. Hydraulic cylinder

5. Remove the plate **(1)**.



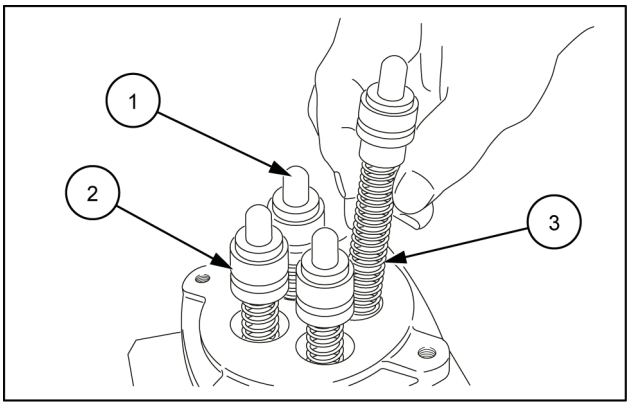
SMIL14CEX1576AB 5

6. If the return springs are weak, the plugs **(1)** will remain in the casing due to the sliding resistance of the O-rings, so use a flathead screwdriver to remove it.
   - Use the groove in the outer circumference of the plugs and remove them while making sure they are not damaged by an unbalanced load.
   - Use caution as plugs may fly off when they are being removed due to the return springs.



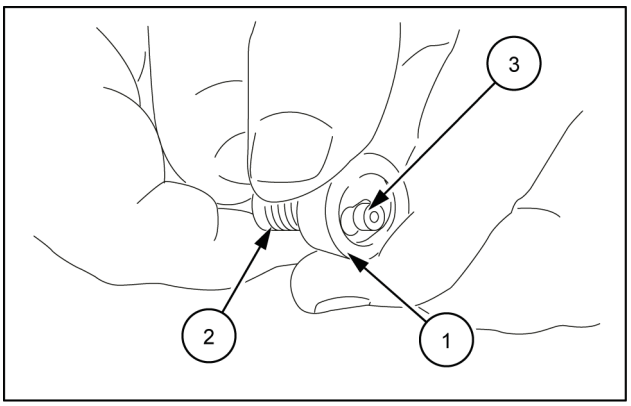
SMIL14CEX1577AB 6

7. Remove the push rods **(1)**, plugs **(2)**, pressure reducing valve assembly, and the return springs **(3)** from the casing.
   - Record the relation of parts to the casing hole positions through marking, etc.



SMIL14CEX1578AB 7

8. For disassembly of pressure reducing valve, press in the spring seating **(1)**, move the spring seating to the side while bending the secondary pressure spring **(2)**, and remove the spring from the spools **(3)** by passing through the larger hole.
   - Do not press in the spring seating by **6 mm** (**0.236 in**) or more.



SMIL14CEX1579AB 8

Pedal control - Prepare

⚠ CAUTION:

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

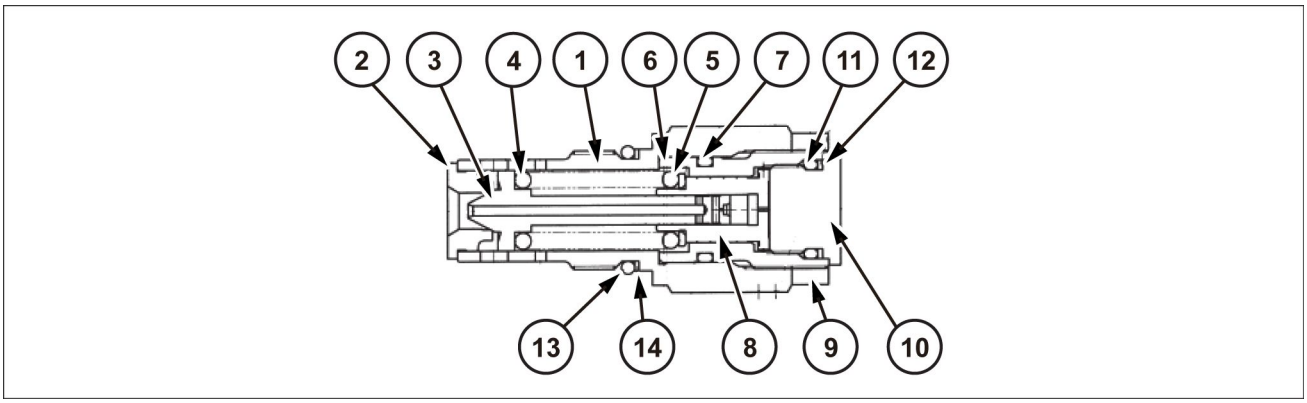
General cautions

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

Items to prepare:

- Wrench
- Screwdriver
- Specialty jigs
- Vise
- **LOCTITE® 262™**
- Special fiber cloth (Kimwipe)
- White kerosene

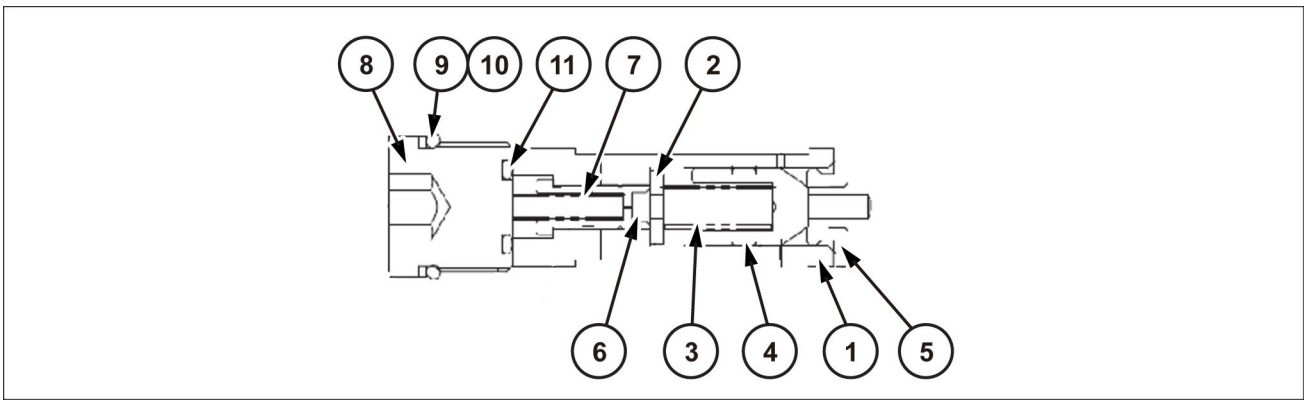
Relief valve assembly



SMIL15CEX2141EB 2

1. Body
2. Poppet seat
3. Poppet
4. Spring
5. Spring seat
6. Stopper
7. O-ring
8. Shockless spool
9. Nut
10. Stopper plug
11. O-ring
12. Backup ring
13. O-ring
14. Backup ring

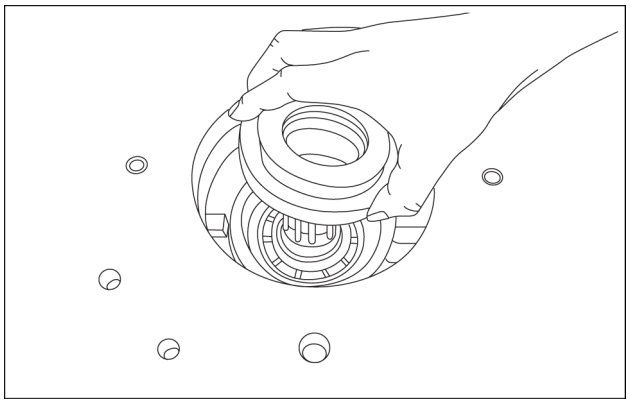
Reactionless valve assembly



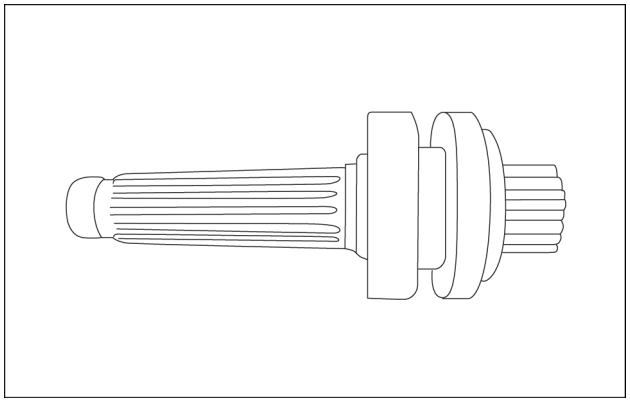
SMIL15CEX2142EB 3

1. Body
2. Spring seat
3. Spring
4. Poppet
5. Poppet seat
6. Stopper
7. Spring
8. Plug
9. O-ring
10. Backup ring
11. O-ring

20. Using plastic hammer; hit the bottom of shaft **(3)** softly, and then remove the shaft **(3)** from the casing **(1)**. Meanwhile this process cover oil seal **(31)** and bearing **(2)** which is shrinkage fit assembled are demounting with others.



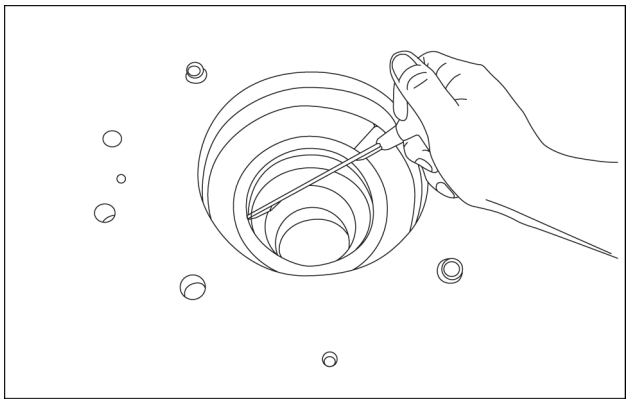
SMIL15CEX2089AA 28



SMIL15CEX2090AA 29

21. Remove the O-ring **(33)** from the casing **(1)**.

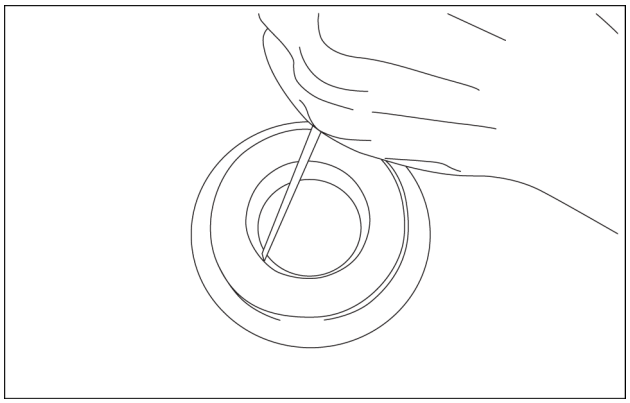
> ⚠ CAUTION: Beware the O-ring breakage. Re-use the O-ring is not recommended.



SMIL15CEX2091AA 30

22. Using the jig, remove the oil seal **(30)** from the cover oil seal **(31)**.

> ⚠ CAUTION: Re-use the oil seal **(30)** is not recommended.



SMIL15CEX2092AA 31

Code	Jig name
9	Thrust plate selection jig
10	Oil seal press-fit jig
11	Brake piston positioning jig
12	Snap ring removal and installation (removal) jig
13	Poppet seat removal jig

a	Base plate	g	M6x1.0 thread depth
b	Four guide pin	h	Surface knurling processing
c	Puller	i	Including the assembly diagram
d	Guide shaft	j	Notch
e	Hammer	k	C **1 mm** (**0.039 in**)
f	Stopper nuts [M8x1.25]	l	C **0.5 mm** (**0.0197 in**)

Travel motor - Torque

The below table indicates tightening torque for each fastening section.

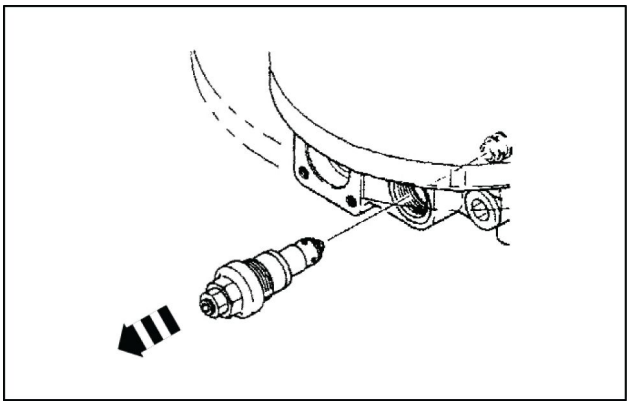
Reference number	Part name	Screw size	Bolt width	Tightening torque
1-2-2-4	Plug	**M24 x 1.5**	**14 mm** (**0.551 in**)	**127 - 147 N·m** (**93.67 - 108.42 lb ft**)
1-2-6-4	Hexagon socket head bolt	**M12 x 1.75** x **40 mm** (**1.575 in**) L	**10 mm** (**0.394 in**)	**98 - 118 N·m** (**72.28 - 87.03 lb ft**)
1-2-7	Relief valve assembly	**1-5/16 12UNF**	**27 mm** (**1.063 in**)	**353 - 393 N·m** (**260.36 - 289.86 lb ft**)
1-2-8	Plug	**NPTF 1/16**	**4 mm** (**0.157 in**)	**8.8 - 10.8 N·m** (**6.49 - 7.97 lb ft**)
1-2-11	Plug	G1/2	**10 mm** (**0.394 in**)	**112 - 124 N·m** (**82.61 - 91.46 lb ft**)
1-2-14	Plug	G1/2	**10 mm** (**0.394 in**)	**112 - 124 N·m** (**82.61 - 91.46 lb ft**)
1-2-19	Orifice	**M5 x 0.8** x **5 mm** (**0.197 in**) L	**2.5 mm** (**0.098 in**)	**1.96 - 2.94 N·m** (**1.45 - 2.17 lb ft**)
1-2-22	Orifice	**M5 x 0.8** x **5 mm** (**0.197 in**) L	**2.5 mm** (**0.098 in**)	**1.96 - 2.94 N·m** (**1.45 - 2.17 lb ft**)
1-2-23	Orifice	**M5 x 0.8** x **5 mm** (**0.197 in**) L	**2.5 mm** (**0.098 in**)	**1.96 - 2.94 N·m** (**1.45 - 2.17 lb ft**)
1-2-20	Plug	G1/4	**6 mm** (**0.236 in**)	**34.3 - 39.3 N·m** (**25.3 - 28.99 lb ft**)
1-11	Hexagon socket head bolt	**M14 x 2.0** x **35 mm** (**1.378 in**) L	**12 mm** (**0.472 in**)	**195 - 215 N·m** (**143.82 - 158.58 lb ft**)
8	Bolt	**M20 x 2.0** x **70 mm** (**2.756 in**) L	Torx T90	**512 - 566 N·m** (**377.63 - 417.46 lb ft**)
14	Bolt	**M20 x 2.0** x **130 mm** (**5.118 in**) L	Torx T90	**512 - 566 N·m** (**377.63 - 417.46 lb ft**)
24	Screw	**M10 x 1.5**	Torx T50	**53.9 - 63.7 N·m** (**39.75 - 46.98 lb ft**)
28	Hexagon socket head bolt	**M10 x 1.5** x **16 mm** (**0.630 in**) L	**8 mm** (**0.315 in**)	**69.77 - 77.03 N·m** (**51.46 - 56.81 lb ft**)
29	Plug	G3/4	**12 mm** (**0.472 in**)	**149 - 165 N·m** (**109.9 - 121.7 lb ft**)

Removal of relief valve assembly

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

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

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



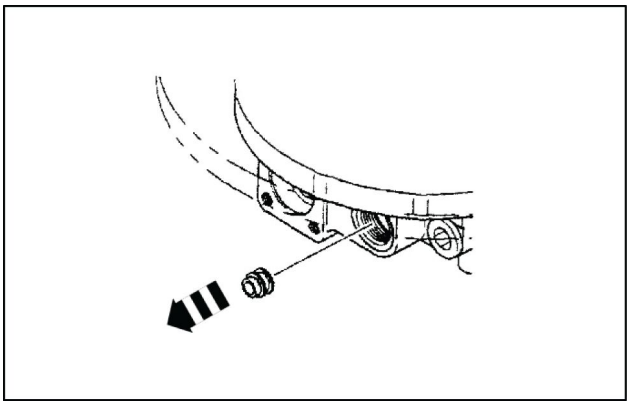
LPIL12CX01339AA 3

Poppet seat removal

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

⚠ CAUTION:

Do not perform disassembly if it is not necessary.



LPIL12CX01340AA 4

NOTICE:

- When tightening lines, etc. after confirming oil leaking, make sure to have operation of hydraulic devices stopped.
- Make sure that the pressure operating on the motor is low when checking for oil leaking. If the operating pressure is high and there is oil leaking, there is the danger of oil spraying out.

Contents

Hydraulic systems - 35

Boom hydraulic system - 736

(*) See content for specific models

Boom cylinder - Prepare – For disassemble

Preparations prepare the following before starting disassembly.

1. Work platform preparation

   Prepare a sufficiently spacious, solid and stable work surface so that parts will not fall or move during work.

2. Tool and materials preparation

   Prepare the tools and materials shown on the following pages.

General work precautions

1. Thoroughly clean any dirt or mud from the outside walls of the cylinder before starting disassembly.
2. Each part has been manufactured with a high degree of precision, so be careful to not let parts bump each other or fall when handling them.
3. If parts are struck or pried off with excessive force during work because they are tight, this may cause burrs or damage which causing reduction in performance or oil leaking. Perform work carefully and thoroughly.
4. If a cylinder is left disassembled, humidity and dirt can cause rust on parts. If a pause in the work is unavoidable, be careful to prevent rust and keep off dust.

Maintenance standards

Replace sliding parts and seal parts as follows.

1. Bushing

   When 1/4 of the circumference is worn brown over the entire length.

2. Seals and slide rings

   Replace with new parts when the cylinder is disassembled.

3. Pin bushing

   When there is severe seizing.

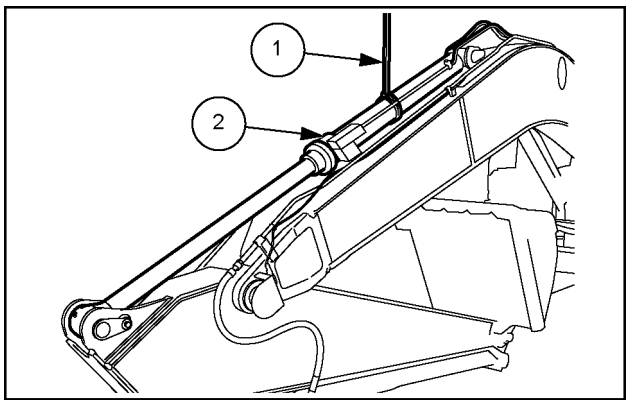
4. Piston rod

   When the piston rod is bent **0.5 mm** (**0.0197 in**) / **1 m** (**3.281 ft**) or more.

Dipper cylinder - Remove

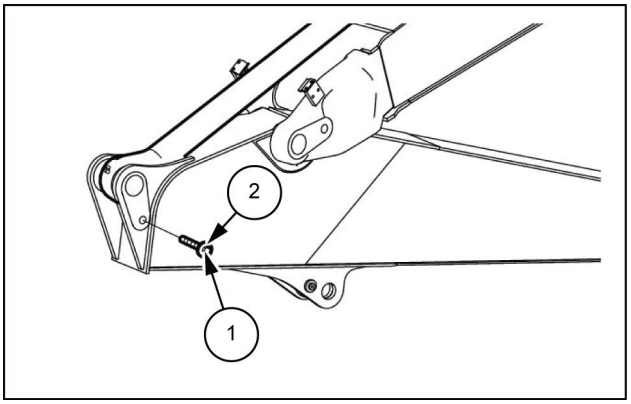
CX210D Crawler excavators LC version (TIER4 FINAL) - EU Market	WE

1. Secure the arm cylinder **(2)** with a lifting equipment and a nylon sling **(1)**.



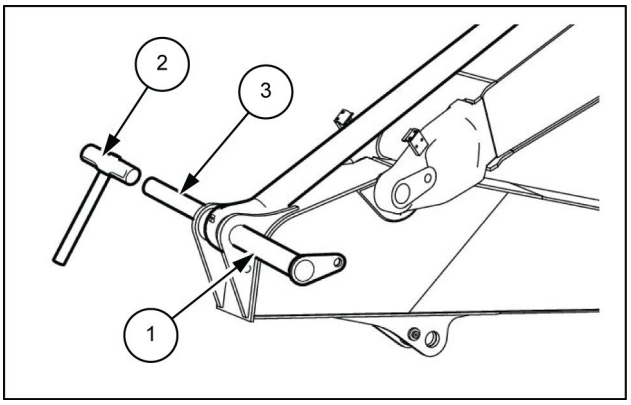
SMIL14CEX2156AB 1

2. Remove the bolt **(1)** and washer **(2)** with a wrench [**19 mm**].



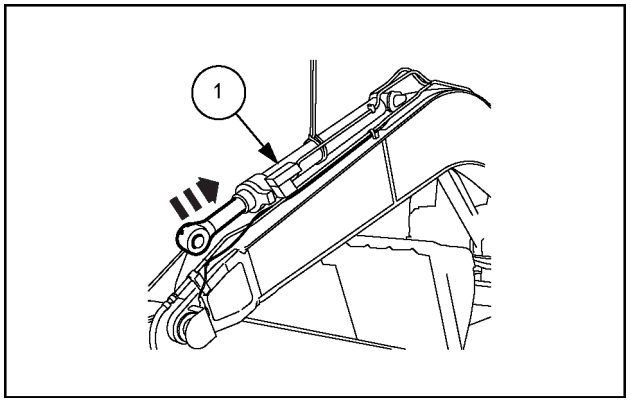
LPIL12CX01547AB 2

3. Pull out the pin **(1)** with a hammer **(2)** and a striking rod **(3)**.
   During this time, be aware that the arm and the arm cylinder rod may be displaced.



LPIL12CX01548AB 3

4. Start the engine, and perform arm-out operation at idling speed to retract the rod of the arm cylinder **(1)**.



SMIL14CEX2159AB 4

Contents

Hydraulic systems - 35

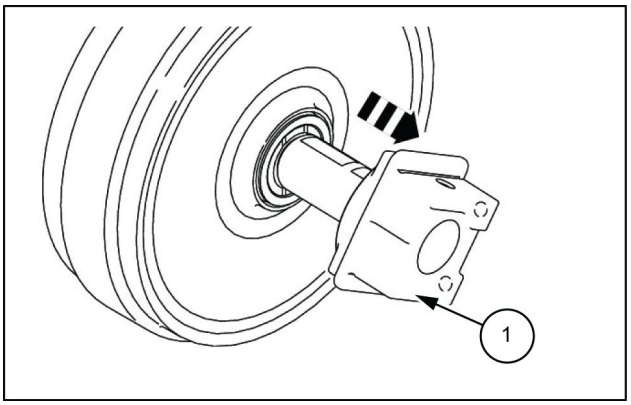
Hammer and rotating bucket hydraulic system - 360

Contents

Tracks and track suspension - 48

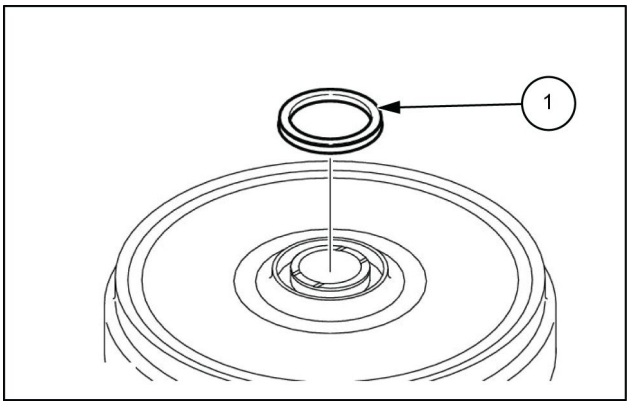
Tracks - 100

7. As described in Step **3**, remove the hub **(1)** on the opposite side and check that the sliding surface of the floating seal is not rusted and that the O-ring is not twisted.



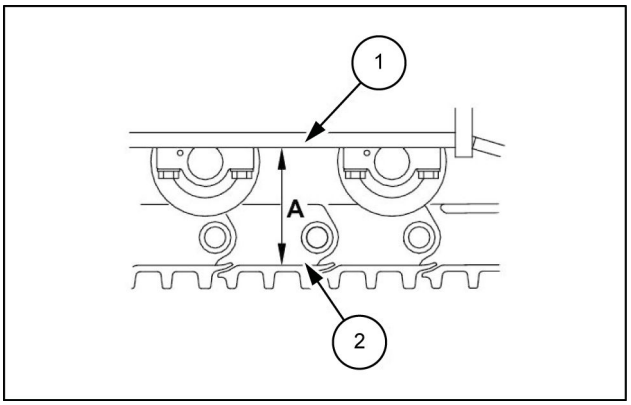
LPIL12CX01178AB 7

8. As described in Step **5**, remove the floating seal **(1)** on the opposite side.



LPIL12CX01179AB 8

5. Adjust the tension so that the distance indicated with A between the frame bottom **(1)** of the center area of the lower side frame and the lowest hanging part of the top of the shoe plate **(2)** is **290 - 310 mm** (**11.417 - 12.205 in**).



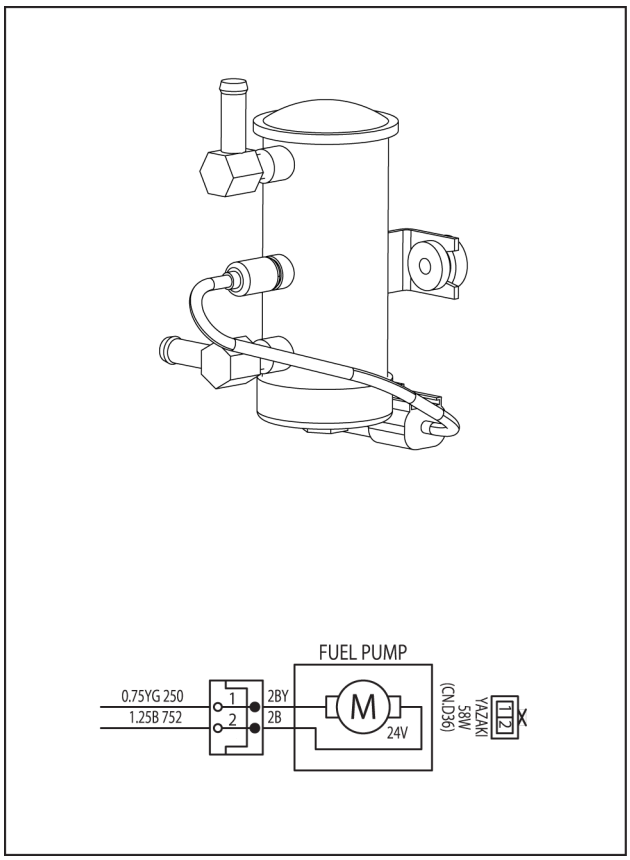
LPIL12CX01243AB 5

- Filling operation
  When cans are heated in order to fill them with refrigerant, make sure that the service can valve and gauge manifold low-pressure valve are open and heat with water at **40 °C** (**104.0 °F**) or below.
  Direct heating or heating to **40 °C** (**104.0 °F**) or higher may cause explosions, so use caution.
  If refrigerant filling is done after the engine is started, never open the gauge manifold high-pressure valve. This is very dangerous, as the high-pressure gas will flow in the opposite direction and may cause a can or charging hose explosion.
  Be careful not to allow the entry of dust or dirt into the air conditioner circuit.
  Air, moisture and dirt are very bad for the cooling cycle.
  Perform work quickly and accurately, and be especially careful to prevent the entry of foreign matter.
  Be careful not to overfill with gas.

Fuel feed pump

Rated voltage: **24 V** DC

Part No.: KHH11880



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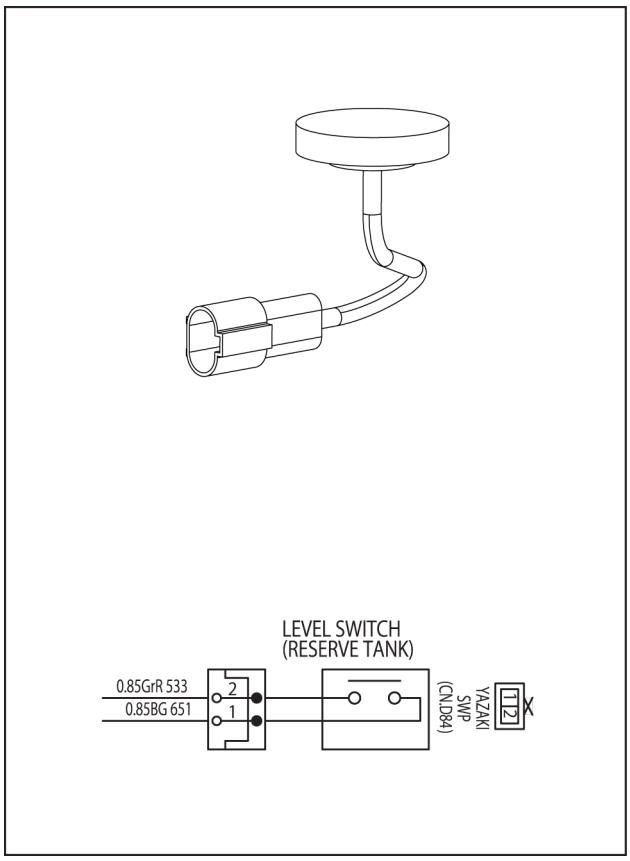
Reserve tank limit switch

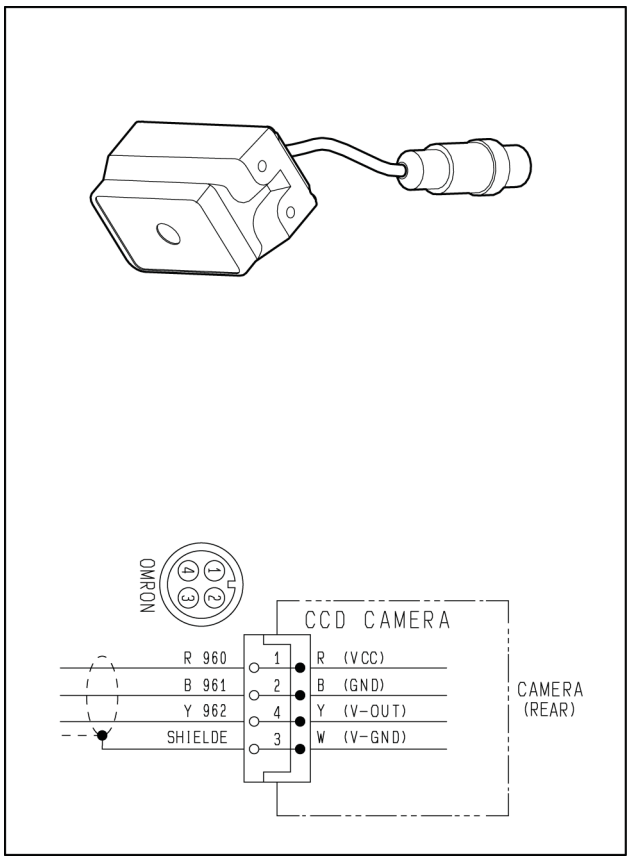
Part No.: KHH10850



SMIL14CEX6911BA 14

CCD camera

Part No.: KHR23830



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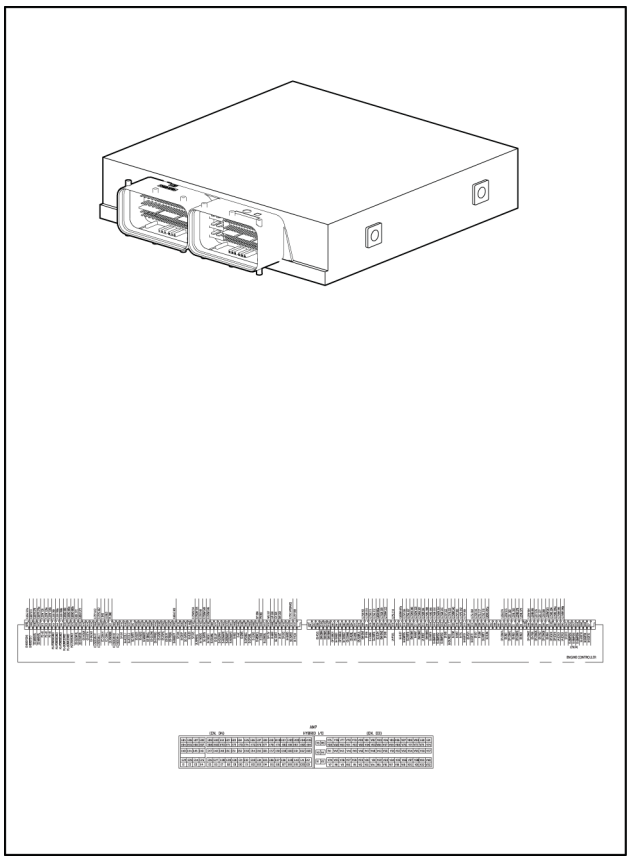
Engine control module

Part No.: KSH12511



SMIL14CEX4193BA 84

Electrical system - Electrical schema - Connector wiring diagram

Main frame

1. Install the fuse box and blade fuse on CN.D21F, D22F, and D23F.
2. Install the fuse holder, **60 A** fuse (KHR39840) and **100 A** fuse (KHR39850) on CN.D15 -D18, **50 A** fuse (KHR3850) on CN.D19 and D20.
3. For connectors marked with * (CN.D49F, D50F, D51F, D61F, D62F, D65F, D76F, D77F, D91F, D92F, D98F, D99F, D100F), install the suitable housing, waterproof plug, and rear holder assembly.
4. For connectors marked with # (CN.D10, D11, D27, D28), install the suitable rubber cap.
5. Install the joint connector on CN.D93 (CN JOINT GND).

a. The connector (CN.D61F) must be fastened with red tape.
b. The connector (CN.D60F) must be fastened with red tape.
c. The connector (CN.D54F) must be fastened with red tape.
d. The connector (CN.D77F) must be fastened with red tape.
e. The connector (CN.D65F) must be fastened with red tape.
f. The connector (CN.D50F) must be fastened with blue tape.
g. The connector (CN.D49F) must be fastened with red tape.
h. The connector (CN.D76F) must be fastened with white tape.
i. The connector (CN.D92F) must be fastened with red tape.
j. The connector (CN.D93) must be fastened with red tape.
k. The connector (CN.D37F) must be fastened with red tape.
l. The connector (CN.D51F) must be fastened with red tape.
m. The connector (CN.D32F) must be fastened with red tape.
n. The connector (CN.D62F) must be fastened with red tape.

*1. White adhesive tape
*2. Blue adhesive tape
*3. Red adhesive tape
*4. Yellow adhesive tape
*5. Green adhesive tape
*6. Plate
*7. Black adhesive tape
*8. Computer unit (ECM) details
*9. Computer unit (DCU) details

CN.A50F	Cab main harness: A	*CN.D51F	Travel alarm
CN.A51F	Cab main harness: B	CN.D52F	Boom lamp harness
CN.A52F	Cab main harness: C	CN.D53F	Housing lamp
CN.A53F	Cab main harness: D	*CN.D54F	Refueling pump harness
CN.A54F	Cab main harness: E	CN.D55F	Horn: L+
CN.A55F	Cab main harness: F	CN.D56F	Horn: L-
CN.A56F	Cab main harness: G	CN.D57F	Horn: H+
CN.D1F	DCU: 1	CN.D58F	Horn: H-
CN.D2F	DCU: 2	CN.D59F	Washer motor
CN.D3F	ECM: 1	CN.D60F	Washer motor diode
CN.D4F	ECM: 2	*CN.D61F	Beacon harness
CN.D5F	Engine harness: A	*CN.D62F	Signal lamp harness
CN.D6M	Engine harness: B	CN.D63F	P1 flow proportional solenoid valve
CN.D7M	Engine harness: C	CN.D64F	P2 flow proportional solenoid valve
CN.D8M	Engine harness: D	*CN.D65F	Option harness proportional solenoid valve
CN.D9M	Engine harness: H	CN.D66M	Control valve PWM
#CN.D10	Starter motor: S	CN.D67F	P1 pressure sensor
#CN.D11	Alternator: B	CN.D68F	P2 pressure sensor
CN.D12F	Alternator: L/R	CN.D69F	Swing pressure sensor
CN.D13	Alternator: E	CN.D70F	Boom-up pressure sensor
CN.D14	Alternator: GND	CN.D71F	Boom-down pressure sensor
CN.D15	Fuse **100 A**: 1	CN.D72F	Arm-put pressure sensor
CN.D16	Fuse **100 A**: 2	CN.D73F	Arm-in pressure sensor
CN.D17	Fuse **60 A**: 1	CN.D74F	Bucket-open pressure sensor
CN.D18	Fuse **60 A**: 2	CN.D75F	Bucket-close pressure sensor

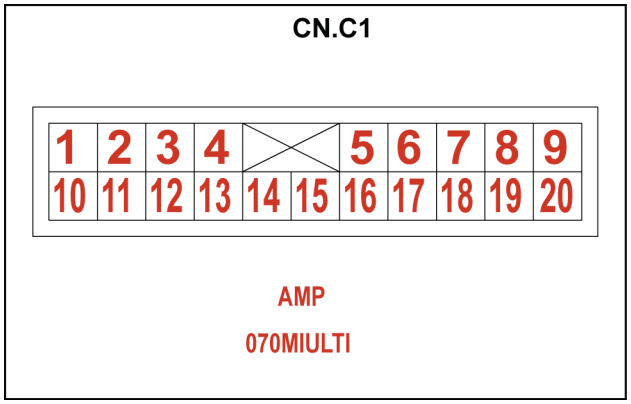
Harnesses and connectors - Electrical schematic sheet 18 - Sensors

Type	Component	Connector/Link	Description
Sensor	B21		Oil pressure sensor
Sensor	B40		Pressure sensor (N2)
Sensor	B42		Pressure sensor (P1) (red tape)
Sensor	B43		Pressure sensor (N1)
Sensor	B44		Pressure sensor (P2)
Sensor	B49		Crankshaft position sensor
Sensor	B52		Common rail pressure sensor
Sensor	B109		Pressure sensor (arm cylinder bottom)
Sensor	B133		Pressure sensor (arm cylinder rod)
Connector	CN.D5	**CN.D5**	-
Connector	CN.D65-1	**CN.D65-1**	Pressure sensor (N1)
Connector	CN.D65-2	**CN.D65-2**	Pressure sensor (N2)
Connector	CN.D65-3	**CN.D65-3**	Pressure sensor (arm cylinder rod)
Connector	CN.D65-4	**CN.D65-4**	Pressure sensor (arm cylinder bottom)
Connector	CN.D67	**CN.D67**	Pressure sensor (P1)
Connector	CN.D68	**CN.D68**	Pressure sensor (P2)
Connector	CN.E4	**CN.E4**	Crankshaft position sensor
Connector	CN.E5	**CN.E5**	Common rail pressure sensor
Connector	CN.E6	**CN.E6**	Oil pressure sensor

Harnesses and connectors - Electrical schematic sheet 36 - Wiper controller, wiper motor and sensor

Type	Component	Connector / Link	Description
Controller	A4		Wiper controller
Sensor	B61		Sunload sensor
Switch	M3		Wiper motor
Switch	S127		Horn select
Switch	S128		Crane switch
Switch	S129		Quick coupler
Connector	CN.C5	**CN.C5**	Sunload sensor
Connector	CN.C6	**CN.C6**	Wiper controller
Connector	CN.C7	**CN.C7**	Wiper motor
Connector	CN.C12	**CN.C12**	Horn select
Connector	CN.C13	**CN.C13**	Quick coupler
Connector	CN.C14	**CN.C14**	Crane switch
Connector	CN.C19	**CN.C19**	GND-118

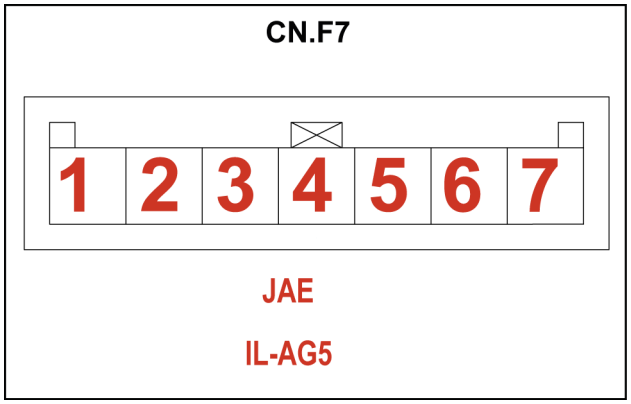
CONNECTOR CN.C1: Monitor display (Female)



SMIL15CEX1906AA 35

Pin	From	Wire	Description	Color-Size	Frame
1	CN.C3_M-P-1	130B		RL-0.85	**SHEET 35**
2	CN.C3_M-P-2	140B		W-1.25	
3	CN.C3_M-P-3	097A		V	
4	CN.C3_M-P-4	516		BrW-0.85	
5	CN.C3_M-P-5	CH2		P	
6	CN.C3_M-P-6	CL2		PG	
7	CN.C3_M-P-7	099A		G	
8	CN.C3_M-P-8	070A		WL	
9	CN.C3_M-P-9	071A		W	
10	CN.C3_M-P-10	960A		R	
11	CN.C3_M-P-11	961A		B	
12	CN.C3_M-P-12	098A		VG	
15	CN.C3_M-P-15	611		BG-1.25	
19	CN.C3_M-P-19	072A		BL	
20	CN.C3_M-P-20	610D		BG-1.25	

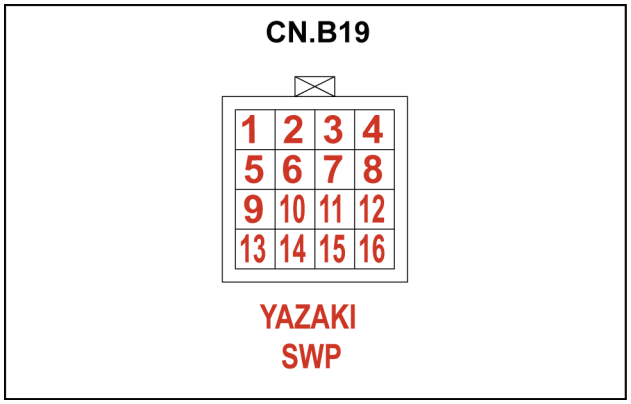
CONNECTOR CN.F7: Motor actuator (air mix) (Female)



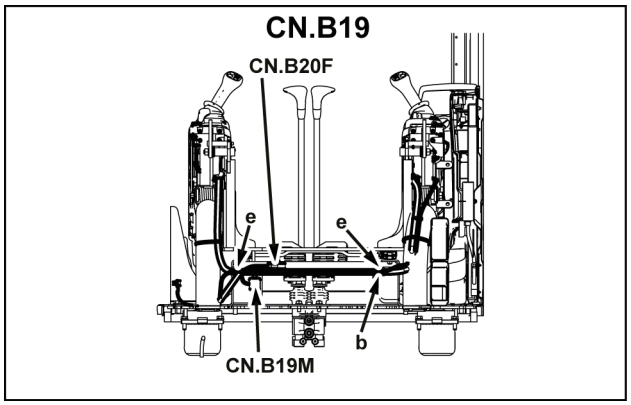
SMIL15CEX1357AA 76

Pin	From	Wire	Description	Color-Size	Frame
2	SP-926-P-X	926B		LY	**SHEET 28**
3	CN.B17-P-19	929A		GL	
4	SP-932-P-X	932B		BL	
6	CN.B17-P-12	921A		GW	
7	CN.B17-P-11	920A		GR	

CONNECTOR CN.B19 (Male)



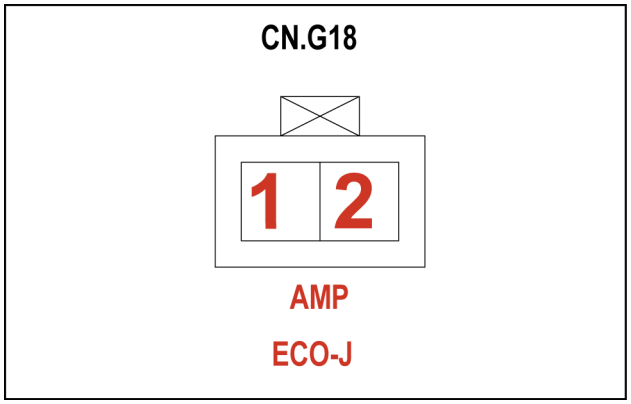
SMIL15CEX1929AA 40



SMIL15CEX1927AA 41

Pin	From	Wire	Description	Color-Size	Frame
1	SP-351-P-X	230A-4		W-0.85	**SHEET 23**
1	CN.G4-P-1	230H		W-0.85	
2	CN.G1_M-P-1	809B		V	
3	CN.G2_M-P-1	808A-2		GW-0.85	
4	SP-544-P-X	544B		LY-0.85	
5	CN.G5-P-1	850B		GR-0.85	
6	SP-852A-P-X	852B		OR-0.85	
7	CN.G4-P-5	854		G-0.85	
8	CN.G4-P-6	856B		O-0.85	
9	CN.G9_M-P-1	953		RL-0.85	
10	CN.G10_M-P-1	954		RY-0.85	
11	SP-955A-P-X	955		BW-0.85	
13	CN.G4-P-2	956		RG-0.85	
14	CN.G4-P-3	957		RW-0.85	
15	CN.G4-P-4	958		BY-0.85	
16	SP-730A-P-X	730A		B-0.85	

CONNECTOR CN.G18: Option 2 (lever up) solenoid valve (Male)



SMIL15CEX1094AA 68

Pin	From	Wire	Description	Color-Size	Frame
1	CN.G4_M-P-2	956A		RG-0.85	**SHEET 24**
2	SP-958A-P-X	958E		BY-0.85	

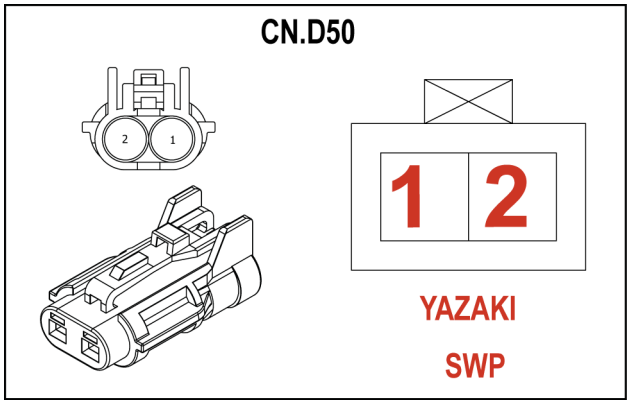
CONNECTOR CN.D23-1: Pressure sensor (pilot travel right) (Female)

Pin	From	Wire	Description	Color-Size	Frame
1	SP-435T-P-X				**SHEET 17**
2	CN.D82–P-2	445S		BW-0.85	
3	SP-445T-P-X	445S		OR-0.85	

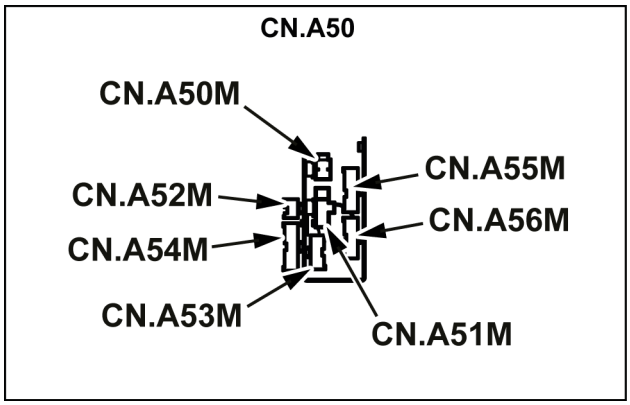
CONNECTOR CN.D34-1: Refuel pump (Female)

Pin	From	Wire	Description	Color-Size	Frame
1	SP-765-P-X	764		B-1.25	**SHEET 28**
2	CN.D34-3-P-5	892		LR-1.25	

CONNECTOR CN.A50 (Male)



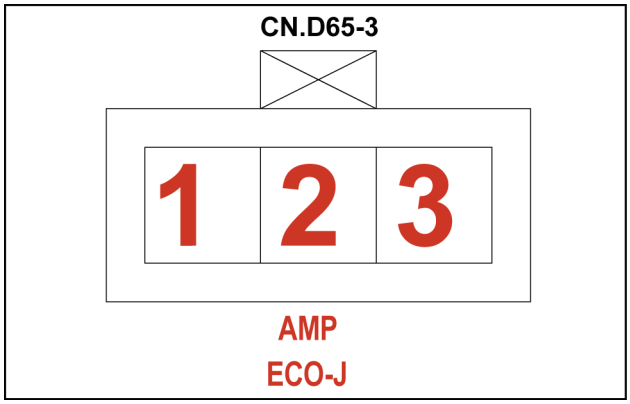
SMIL15CEX1455AA 5



SMIL15CEX2042AA 6

Pin	From	Wire	Description	Color-Size	Frame
1	SP-103A-P-X	103D		RW-5.0	
2	CN.D17-P-1	109		R-8.0	

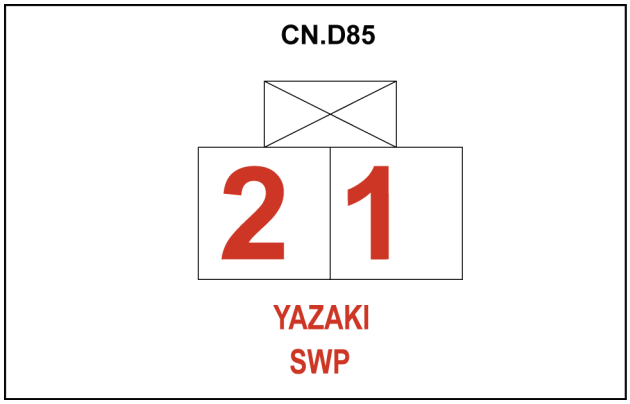
CONNECTOR CN.D65-3: Pressure sensor (arm cylinder rod) (Female)



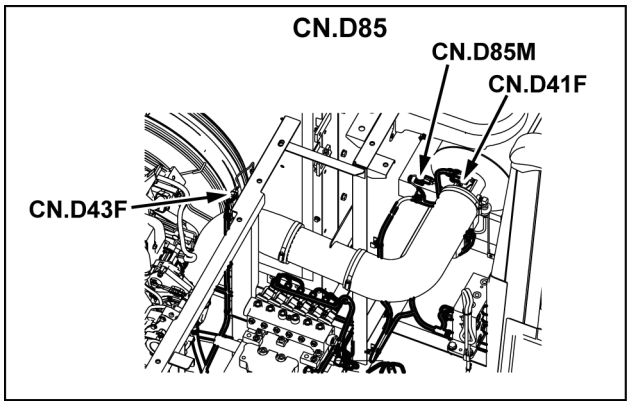
SMIL15CEX1964AA 14

Pin	From	Wire	Description	Color-Size	Frame
1	SP-435I-P-X	435Z		WL-0.85	**SHEET 18**
2	CN.D81_M-P-7	402B		BrW-0.85	
3	SP-445O-P-X	445-E		BW-0.85	

CONNECTOR CN.D85 : Pressure switch (Air cleaner) (Female)



SMIL15CEX2007AA 17



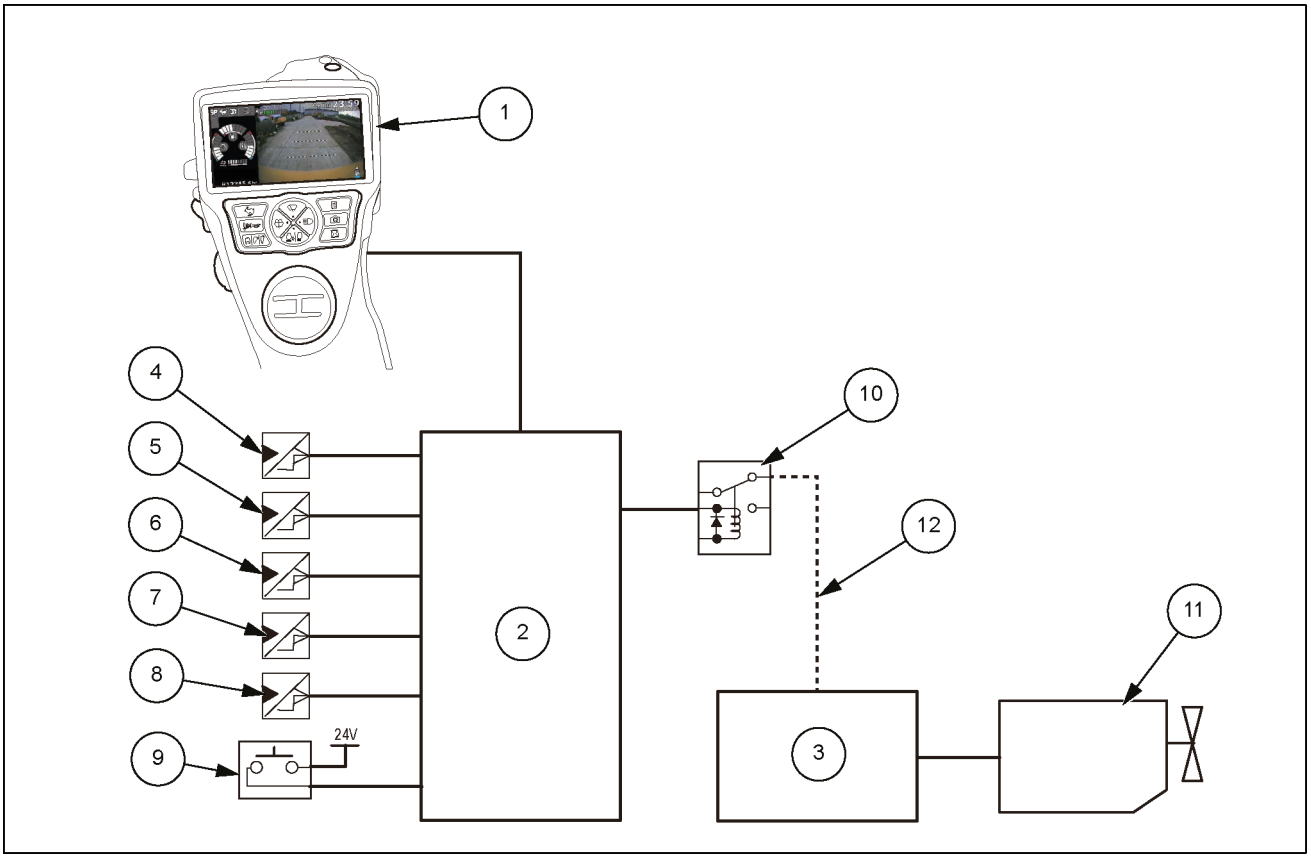
SMIL15CEX2006AA 18

Pin	From	Wire	Description	Color-Size	Frame
1	SP-651-P-X	650		BG-0.85	**SHEET 09**
2	CN.A56_M-P-11	534A		LW-0.85	

Cab engine controls - Dynamic description - Idle shutdown

Purpose/overview

The machine stops the engine automatically when idling condition continues for a certain time period.



SMIL14CEX3436FB 1

1. Monitor
2. Main controller
3. ECM
4. Pressure sensor (upper)
5. Pressure sensor (swing)
6. Pressure sensor (travel)
7. Pressure sensor (option 1)
8. Pressure sensor (option 2)
9. Gate lever limit switch
10. Battery relay
11. Engine
12. M line

Operation

1. The machine starts time count when the idle mode switch is pressed and idle shutdown mode is selected.
2. It displays "Stopping Engine" on the monitor and sounds alarm intermittently when the time count reaches idle shutdown time.
3. In further **10 s**, it activates idle shutdown control and sounds the alarm continuously at the same time.
4. If the idle shutdown control is activated, the controller turns ON (energizes) the key ON relay to cut the M line of the key switch.
5. The ECM judges as the Key OFF to stop the engine when the M line is cut.
6. It turns OFF the key ON relay to release the cut of the M line if the key is set to OFF.

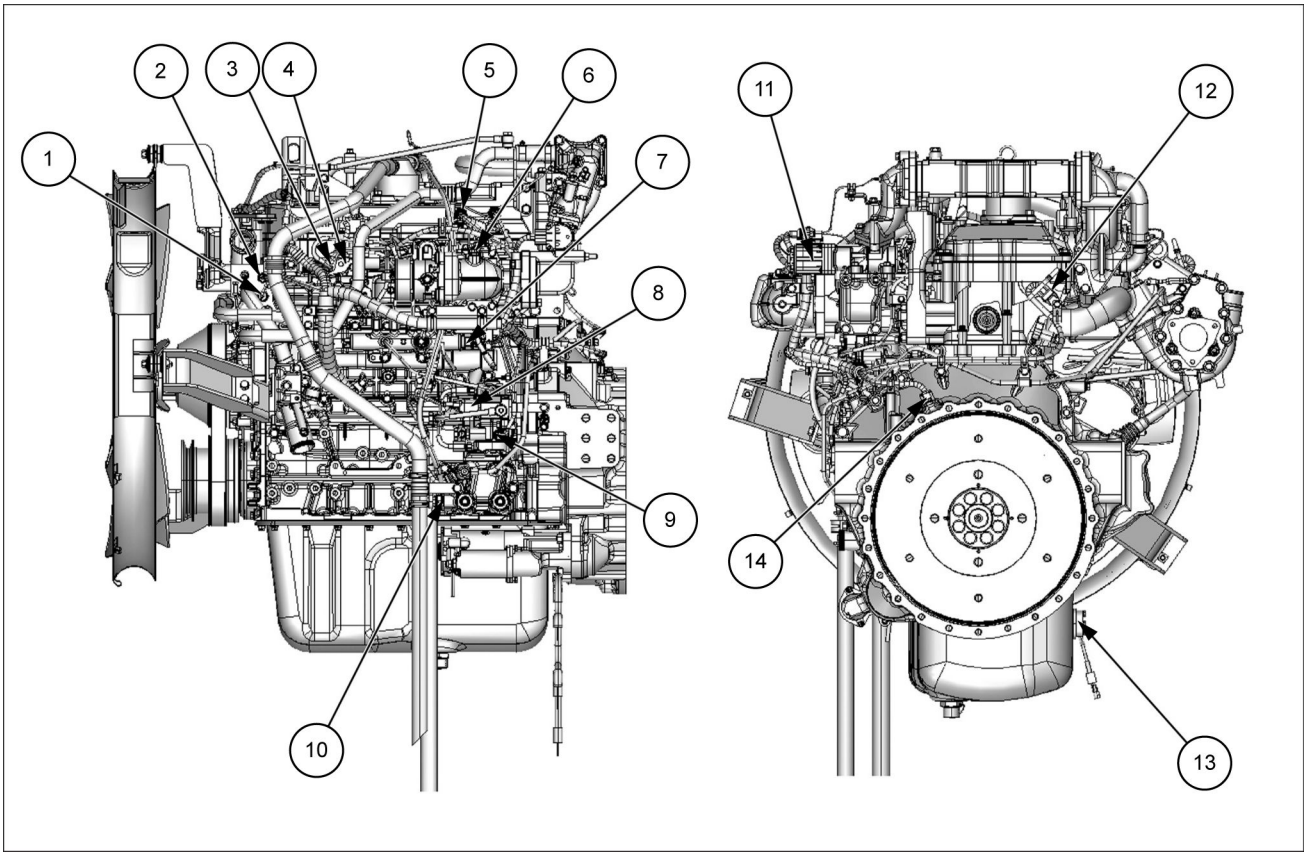
Stop condition

The idling stop function is not activated with the following conditions.

- The operation lever is operated. (Either one of the following pressure sensors is ON; upper, swing, travel, option 1, option 2)

Engine control system - Component localization

The locations, shapes, and existence or nonexistence of components vary depending on the specifications of the machine.



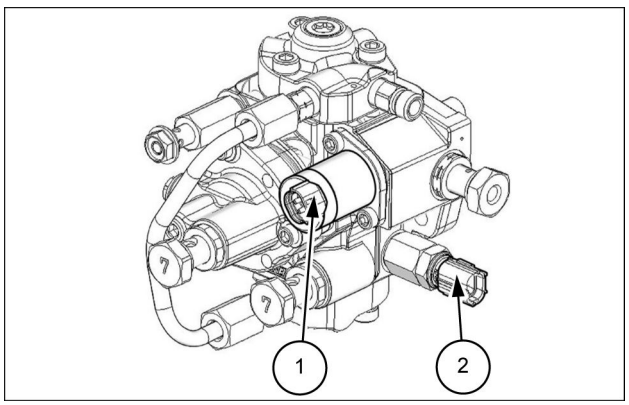
SMIL15CEX0347F 1

1. Overheat switch
2. Engine coolant temperature sensor
3. Glow plug
4. Injector
5. Boost sensor
6. IMT sensor
7. Boost temperature sensor
8. Fuel temperature sensor
9. Suction control valve
10. Oil pressure sensor
11. Fuel pressure sensor
12. EGR valve
13. CMP sensor
14. CKP sensor

Supply pump

The supply pump highly pressurizes the fuel using the engine torque, and force feeds the fuel to the common rail (fuel rail). The FRP regulator and fuel temperature sensor are also installed to the supply pump.

1. Suction control valve
2. Fuel temperature sensor



SMIL15CEX0348AB 2

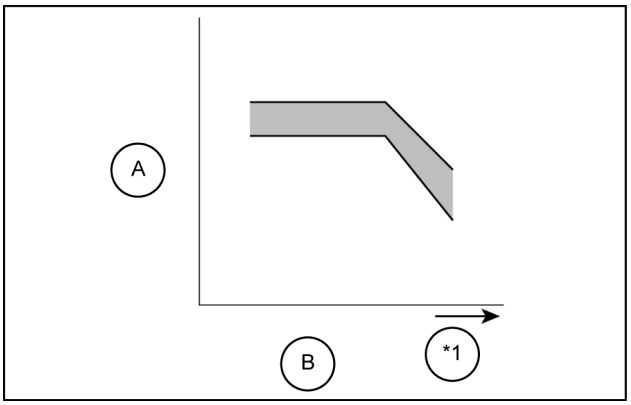
High altitude correction

The ECM calculates the current altitude from the barometric pressure sensor signals.
The SCV opening and closing interval and the injector electrified time are controlled according to the high altitude conditions at this time, and correction is made to achieve the optimum fuel flow.

A. Fuel flow limit (mm3/st)

B. Barometric pressure kPa

*1. High altitude



SMIL15CEX0644AB 10

Contents

Electrical systems - 55

Battery - 302

Intake air pressure and temperature sensor - Inspect

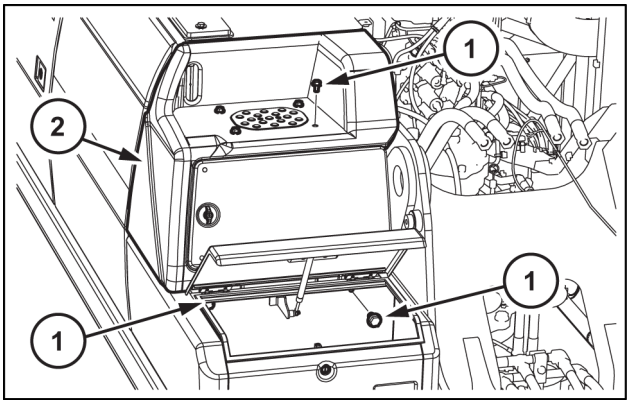
1. Inspect the boost pressure sensor/ boost temperature sensor.
   - Body fouling
   - Body damage
   - Terminal malfunction

NOTICE: *The sensor body must not be cleaned because doing so may damage the sensor internally.*

13	–
14	–
15	–
16	–
17	Urea fluid pressure sensor signal
18	Urea fluid pressure sensor GND
19	Urea fluid pressure sensor power supply
20	–
21	–
22	–
23	–
24	Urea fluid pump motor PWM
25	–
26	Urea fluid pump motor GND
27	–
28	–
29	–
30	–
31	–
32	Dosing module (High)
33	EGT sensor signal
34	EGT sensor GND
35	–
36	–
37	–
38	–
39	–
40	–
41	–
42	–
43	–
44	–
45	–
46	Urea fluid pump motor power supply
47	–
48	–
49	–
50	–
51	–
52	–
53	–
54	–
55	–
56	–
57	–
58	Urea fluid tank level sensor, urea fluid tank temperature sensor GND
59	Urea fluid tank level sensor signal
60	–
61	–
62	–
63	–
64	–
65	Reverting valve control
66	–
67	–
68	–
69	–
70	–

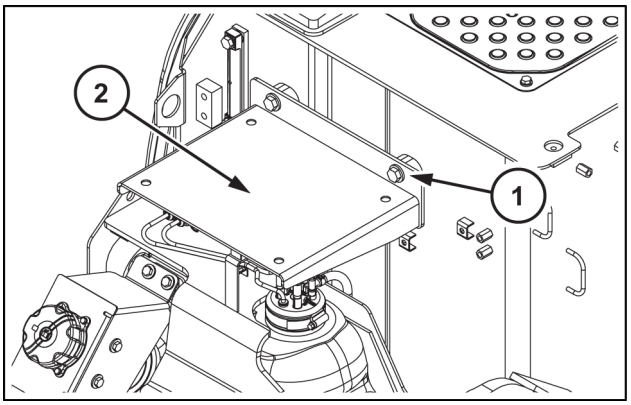
Diesel Exhaust Fluid (DEF)/AdBlue® supply module - Remove - Urea pump

1. Remove the 6 bolts **(1)** with a wrench [**19 mm**] to remove the cover **(2)**.



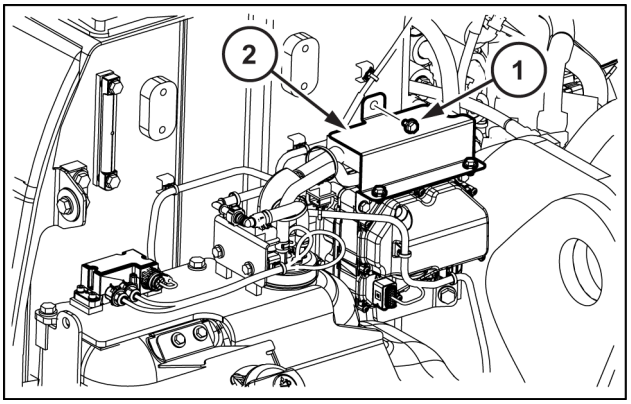
SMIL15CEX0640AB 1

2. Remove the 4 bolts **(1)** with a wrench [**19 mm**] to remove the step **(2)**.



SMIL15CEX0660AB 2

3. Remove the 3 bolts **(1)** with a wrench [**13 mm**] to remove the cover **(2)**.

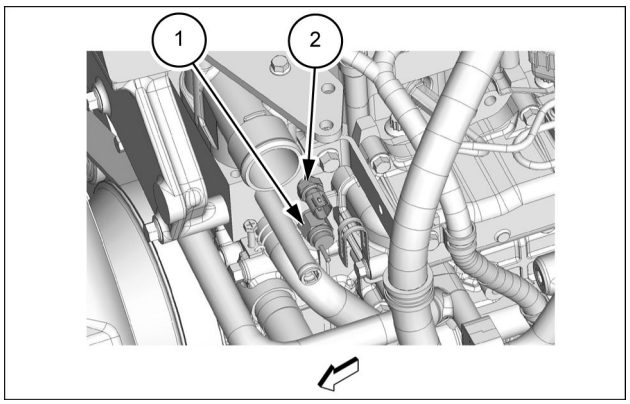


SMIL15CEX0642AB 3

Engine coolant temperature sensor - Remove

Overheat switch removal

1. Disengage the harness connector from the overheat switch **(1)**.
2. Remove the overheat switch **(1)** from the cylinder head assembly.



SMIL15CEX0366A 1

Engine coolant temperature sensor removal

1. Disengage the harness connector from the engine coolant temperature sensor **(2)**.
2. Remove the engine coolant temperature sensor **(2)** from the cylinder head assembly.

a. Hold down for **3 s**.
1. Travel speed select switch
2. Attachment selection switch
3. Menu switch
4. Light switch
5. Wiper switch
6. Auto idle switch

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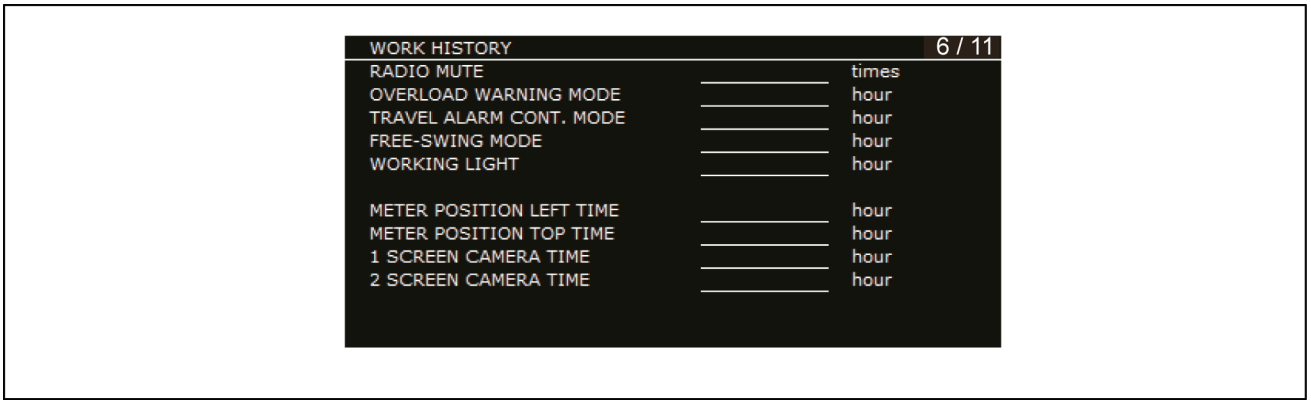

SMIL14CEX0948EA 35

Display	Explanation	Unit	Judgment condition	Judgment start condition
RADIO MUTE	Radio mute ON count	times	Radio mute SW OFF → ON	Key ON
OVERLOAD WARNING MODE	Overload warning mode ON time	hour	Overload SW = ON	Engine in operation
TRAVEL ALARM CONT. MODE	Time during which the travel alarm is in continuous mode	hour	Travel alarm mode SW = ON	Engine in operation
FREE-SWING MODE	Free swing mode ON time	hour	Free swing mode = ON	Engine in operation
WORKING LIGHT	Working light ON time	hour	Working light REL = ON	Key ON
METER POSITION. LEFT TIME	Time during which the gauge was set on the left	hour	When the camera layout on the meter screen is A, B, C, D, and E	Key ON
METER POSITION TOP TIME	Time during which the gauge was set at the top	hour	When the camera layout on the meter screen is F, G, H, I, and J	Key ON
1 SCREEN CAMERA TIME	Camera displaying time with 1 screens	hour	When the camera layout on the meter screen is A, B, C, H, I, and J	Key ON
2 SCREEN CAMERA TIME	Camera displaying time with 2 screens	hour	When the camera layout on the meter screen is D, E, F, and G	Key ON

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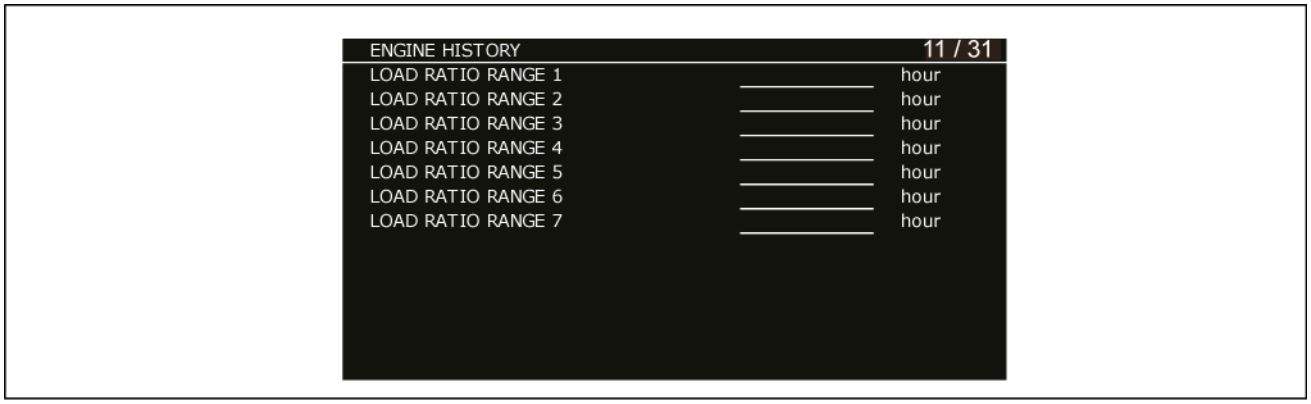

SMIL14CEX0983EA 71

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

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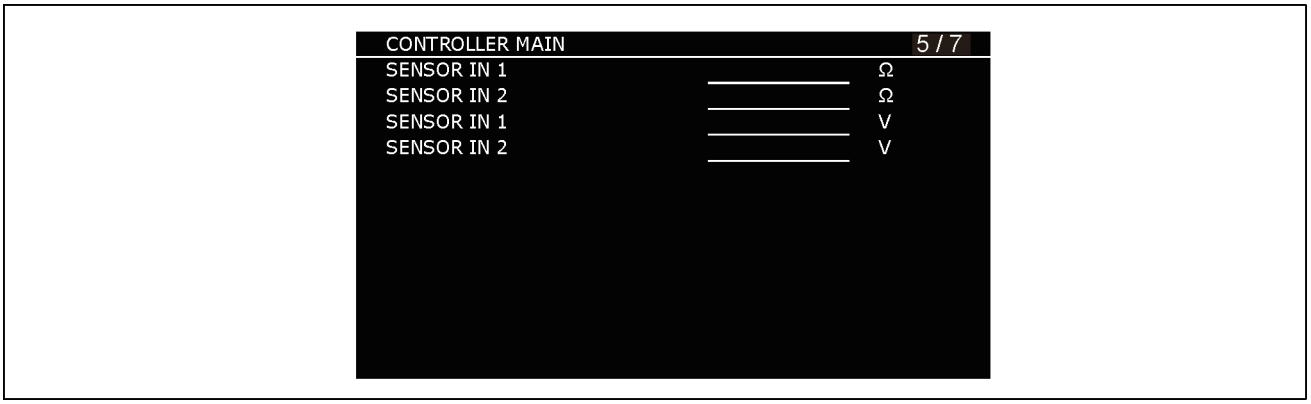
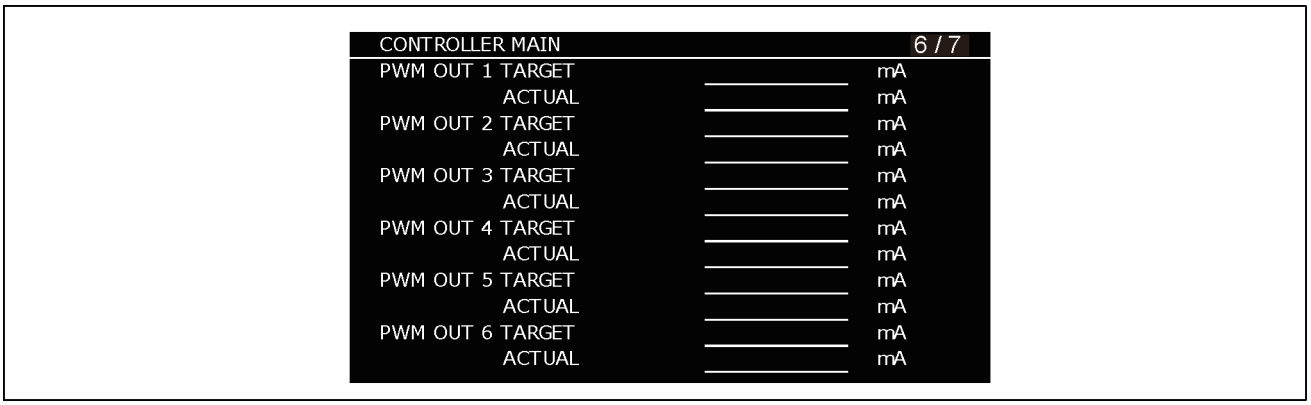


SMIL14CEX1114EA 107

Display	Explanation	Unit
SENSOR IN 1	Resistance of sensor input 1	Ω
SENSOR IN 2	Resistance of sensor input 2	Ω
SENSOR IN 1	Voltage of sensor 1	v
SENSOR IN 2	Voltage of sensor 2	v

6/7



SMIL14CEX1115EA 108

Display	Explanation	Unit
PWM OUT 1 TARGET	PWM target current	mA
ACTUAL	Actual current	mA
PWM OUT 2 TARGET	PWM target current	mA
ACTUAL	Actual current	mA
PWM OUT 3 TARGET	PWM target current	mA
ACTUAL	Actual current	mA
PWM OUT 4 TARGET	PWM target current	mA
ACTUAL	Actual current	mA
PWM OUT 5 TARGET	PWM target current	mA
ACTUAL	Actual current	mA
PWM OUT 6 TARGET	PWM target current	mA
ACTUAL	Actual current	mA

Operation

1. The ECM reads coolant temperature from the coolant temperature sensor and transmits it to the controller via CAN communication.
2. The controller transmits the obtained coolant temperature to the monitor via CAN communication by converting it to a gauge level.
3. The monitor displays the gauge level on screen once it receives the level.

Remarks

The table below shows threshold value of coolant temperature and gauge level.
It never reaches zero except for failure.

Coolant temperature	Gauge level
105 °C or more	8
102 °C or more	7
100 °C or more	6
97 °C or more	5
92 °C or more	4
77 °C or more	3
50 °C or more	2
Less than **50 °C**	1

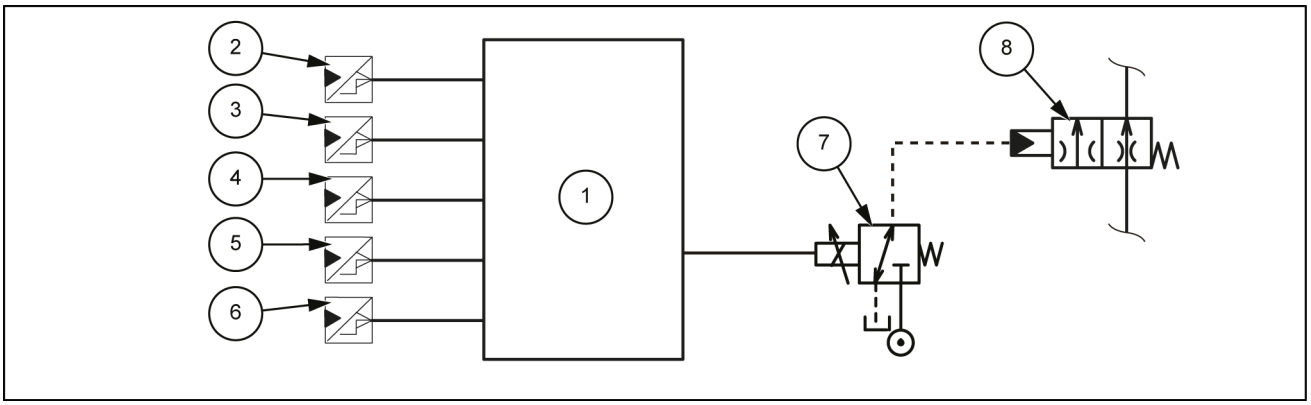
Functions

- Coolant temperature warning: Message of "OVER HEAT" is displayed on the monitor and alarm is sounded for **5 s** if the gauge level becomes 8.
- Preventing flickering: Coolant temperature is treated by filter (rolling average) and its result is used for judgment of displaying level.
  Filtering time = **32 s**
  Coolant temperature measurement cycle = **1 s**
- Pointer needle type: The system reads coolant temperature immediately after the key is turned ON, and then instantly judges display level to display it on the monitor.
  Therefore, this enables confirming remaining coolant temperature without waiting for filtering time due to preventing flickering.
- Operation at failure: The gauge level indicates zero at failure. It displays original monitor after resuming from failure status.

ARM 1 SEMI-PARALLEL CONTROL

Purpose/overview

The system improves workability by reducing pressure loss of operation of the arm (digging and dirt removal), prioritizing boom up (preventing trapping tab tip at initial leveling), prioritizing swing operation, and prioritizing option operation through controlling opening of the arm 1 semiparallel spool by the electromagnetic proportional valve.



SMIL14CEX0901EB 6

1. Main controller
2. Pressure sensor (boom)
3. Pressure sensor (arm)
4. Pressure sensor (swing) 7
5. Pressure sensor (travel)
6. Pressure sensor (option)
7. Arm 1 semi-parallel electromagnetic proportional valve
8. Arm 1 semi-parallel spool

Operation

The controller judges work state based on signal of the pressure sensors (boom, arm, bucket or travel) to control the electromagnetic proportional valve.

Operation condition

1. No lever operation
   The arm 1 semi-parallel spool opening is narrowed.
2. Operation 1 (boom, arm, bucket)
   The system divides the combination of boom up/down and arm out/in into the following seven types (including independent operation), and controls the state of the arm 1 semi-parallel spool opening through the supplemental use of bucket pilot pressure, boom cylinder pressure, and arm cylinder bottom pressure.
   - Boom up + Arm in: The arm 1 semi-parallel spool opening is changed according to the digging state.
   - Boom up + Arm out: The arm 1 semi-parallel spool opening is opened.
   - Boom down + Arm out: The arm 1 semi-parallel spool opening is opened.
   - Boom down + Arm in: The arm 1 semi-parallel spool opening is narrowed.
   - Independent boom operation (both up and down): The arm 1 semi-parallel spool opening is narrowed.
   - Independent arm-in operation: The arm 1 semi-parallel spool opening is narrowed.
   - Independent arm-out operation: The arm 1 semi-parallel spool opening is opened.
3. Operation 2 (travel, swing, option)
   During travel operation, swing operation, or option (crusher mode) full operation, the arm 1 semi-parallel spool opening is narrowed unconditionally.

3. Trouble in a sensor or its input circuit (disconnection or short)

Disconnection or short in the inside air sensor or its input circuit

A. Operator compartment temperature control end
   - The operator compartment temperature control (all control related to target blow temperature) is stopped and the air mix degree of opening is directly adjusted according to the temperature adjustment switch input.
   - Accompanying this, the operation panel set temperature display changes as in the diagram below.
   - HL.*
     * is a value between 0 - 9, and each time the DOWN switch is closed, this value decreases by 1; each time the UP switch is closed, this value increases by 1.

*value	Motor actuator degree of opening (°)
0	0°
1–8	* value x 10°
9	90°

B. Auto air flow control end
   - The air flow is temporarily fixed at the setting that was in effect when the inside air sensor abnormality was detected.
   - The AUTO display is set flashing.
   - After this, the air flow can be switched by the manual air flow switch.

C. AUTO blow mode control end
   - The air flow is temporarily fixed at the setting that was in effect when the inside air sensor abnormality was detected.
   - The AUTO display is set flashing.
   - After this, the air flow can be switched by the manual air flow switch.

D. Air mix damper degree of opening display priority
   - Even if the trouble shown by one of the items below occurs during inside air sensor trouble, E is not displayed in the * section below the decimal point and the air mix damper degree of opening display is given priority.
   - HL.E is only displayed for air mix motor actuator trouble.

E. Thermo operation control mode fixed
   - Switching of the control mode according to the blow mode and target blow temperature is stopped and the control mode is fixed at control mode 1.

Disconnection or short in the inside evaporator sensor or its input circuit

A. Compressor control is not executed and the compressor clutch is always OFF.

B. E is displayed in the first fraction position of the set temperature display LCD. See the diagram below. (The temperature setting is in **33.8 °F** steps.) However, E is not displayed for inside air sensor trouble.

C. The AC mark flashes.

Contents

Electrical systems - 55

Wiper and washer system - 518

Service support screen lock

The service support screen lock is a function that prevents the service support screen display unless the correct password is entered.

If a wrong password is entered, a buzzer sounds for **1 s** and the previous (meter) screen is redisplayed.

Customer-specific system information screen lock

The customer-specific system information screen has a function that allows the car-rental agency to lock this screen when renting the system to the customers so that they may view but not change the settings on the screen (2nd and 3rd pages).
For the setting procedure, refer to SERVICE SUPPORT SCREEN-SET UP-PERAMETERS.

- When it is locked, “LONG PUSH TO RESET ON THIS PAGE” will no longer appear on the message area. Cursor movement is not limited. (Choosing the customer-specific system information screen tab is allowed.)
- The customers are allowed to turn the pages to view information. However, they are no longer allowed to reset the total time or the total consumption.

Maintenance information screen lock

The maintenance information screen has a function that allows the car-rental agency to lock this screen when renting the system to the customers so that they may view but not change the settings on the screen (remaining time and replacement interval).
For the setting procedure, refer to SERVICE SUPPORT SCREEN-SET UP-PERAMETERS.

- When it is locked, a cursor movement is limited to the title line. (Choosing the maintenance information screen tab is allowed.)
- The customers are allowed to turn the pages to view the remaining time. However, they are no longer allowed to reset the remaining time or change the replacement interval.

Option line setting screen lock

The option line setting screen has a function that allows the car-rental agency to lock this screen when renting the system to the customers so that they may view but not change the settings on the screen (flow setting and pressure setting).
For the setting procedure, refer to SERVICE SUPPORT SCREEN-SET UP-PERAMETERS.

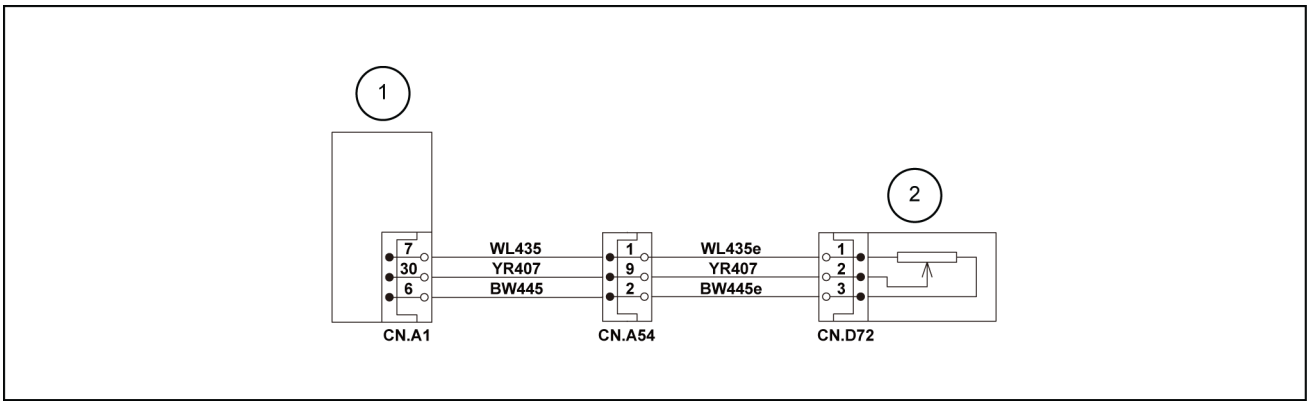
- When it is locked, a cursor movement is limited to the ATT number selection line. (Choosing the option line setting screen tab is allowed. Selecting an ATT type or selecting an ATT number is also allowed.)
- The customers are allowed to change the ATT type selection or the ATT number selection and view the current settings. However, they are not allowed to change them.

7069-Pressure sensor arm-out pilot abnormality

Control Module : MCM

Solution:

1. Use the below image for the fault code resolution process:



SMIL15CEX1882EB 1

1. Main controller
2. Pressure sensor (arm out pilot)

Turn the key switch ON.

A. If diagnostic trouble code 7069 is displayed, proceed to Step **2**.

2. Turn the key switch OFF.

Inspect the connectivity of each connector for poor insertion and wiring terminal disconnection

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

Turn the key switch ON.

A. If diagnostic trouble code 7069 is displayed, proceed to Step **3**.

3. Check the arm out pilot pressure sensor **(2)** voltage on the service support screen.

A. If the voltage is more than or equal to **4.75 V**, proceed to Step **4**.

B. If the voltage is less than or equal to **0.25 V**, proceed to Step **7**.

4. Turn the key switch OFF and disconnect the arm out pilot pressure sensor **(2)** connector **CN.D72**.

Turn the key switch ON.

Measure the voltage between the ground and terminal 1 of the arm out pilot pressure sensor **(2) CN.D72** (harness side).

A. If the voltage is not about **5 V**, find and replace the short circuit on the wire ID WL435e and WL435.

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

5. Measure the voltage between the ground and terminal 2 of the arm out pilot pressure sensor **(2) CN.D72** (harness side).

A. If the voltage is more than **4.75 V**, find and replace the short circuit on the wire ID YR407.

B. If the voltage is less than or equal to **4.75 V**, proceed to Step **6**.

B. If there is no continuity, replace the proportional valve **(2)**.

6. Remove the **CN.A3**.

   Inspect for continuity between the terminal 1 of the connector **CN.D66-3** harness side and terminal 2 of the connector **CN.A3** harness side.

   A. If there is continuity, proceed to Step **7**.

   B. If there is no continuity, repair or replace the G907a harness.

7. Inspect for continuity between the terminal 2 of the connector **CN.D66-3** harness side and terminal 4 of the connector **CN.A3** harness side.

   A. If there is continuity, replace the main controller **(1)**.

   B. If there is no continuity, repair or replace the GY907b harness.

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

5. Turn the key switch ON.

   A. If diagnostic trouble code 7613 is not displayed, replace defect monitor **(2)**.

   B. If diagnostic trouble code 7613 is displayed, replace the main controller **(1)**.

P0123-Throttle position sensor, high input

Control Module : ECM

Solution:

1. Check and diagnose the below fault codes before you proceed with the diagnostics code P0123.

   Diagnostic trouble code P06A8

2. Turn OFF the ignition switch.

   Disconnect the harness connector **CN.E3** from the intake throttle valve.

   Observe the intake throttle sensor display on the trouble diagnosis scan tool.

   If the reading is more than or equal to **0.1 V**, inspect the signal circuit between the ECM and the intake throttle position sensor.

   • There should be no short to the battery or ignition power supply.

   • There should be no short to the **5 V** power supply.

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

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

3. Inspect the intake throttle valve harness connector **CN.D4** for a poor connection.

   A. If a problem is found, repair the harness connector **CN.D4**.

   B. If the harness connector **CN.D4** is normal, replace the intake throttle valve. (Refer to " **Throttle Valve Actuator (TVA) - Remove (55.014)** and **Throttle Valve Actuator (TVA) - Install (55.014)**")

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

4. Inspect to see if there is an open circuit or high resistance in the GND circuit between the ECM and the intake throttle position sensor.

   A. If a problem is found, repair the GND circuit.

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

   NOTE:
   • The intake throttle position sensor shares the GND circuit with other sensors.
   • The diagnostic trouble code set on a sensor which shares this circuit may be detected.

5. Check the ECM harness connector **CN.D4** for a poor connection.

   A. If a problem is found, repair the harness connector **CN.D4**.

   B. If the harness connector **CN.D4** is normal, replace the ECM. (Refer to " **Engine Control Unit (ECU) - Remove (55.015)** and **Engine Control Unit (ECU) - Install (55.015)**")

6. Set the Injector ID Code, fuel delivery rate and engine number for the ECM.

7. Confirm resolution:

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

   2. Turn OFF the ignition switch for at least **30 s**.

   3. Start the engine.

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

P0409-EGR sensor circuit

Control Module : ECM

Solution:

1. Check and diagnose the below fault codes before you proceed with the diagnostics code P0409.

   Diagnostic trouble code P06A9

2. Turn OFF the ignition switch.

   Disconnect the harness connector **CN.E12** from the EGR valve.

   Turn ON the ignition switch.

   Use the trouble diagnosis scan tool to check if any of the EGR position 1, EGR position 2, and EGR position 3 shows ON.

   If there is a data display showing ON, inspect the signal circuit between the ECM and EGR valve of the EGR showing ON.

   • Make sure that there is no short to the battery or ignition power supply.

   • Make sure that there is no short to the **5 V** power supply circuit.

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

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

3. Measure the voltage between the EGR position sensor **5 V** power supply circuit and a normal GND.

   Inspect the GND circuit between the ECM and the CMP sensor for an open circuit and high resistance.

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

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

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

   NOTE:
   • *The EGR position sensor shares the **5 V** power supply circuit with other sensors.*
   • *The diagnostic trouble code set on a sensor which shares this circuit may be detected.*

4. Measure the voltage between the EGR position sensor **5 V** power supply circuit and the GND circuit.

   A. If the reading is less than or equal to the **4.5 V**, inspect to see if there is an open circuit or high resistance with the GND circuit between the ECM and EGR position sensor.

   B. If a problem is found, repair the GND circuit.

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

   NOTE:
   • *The EGR position sensor shares the GND circuit with other sensors.*
   • *The diagnostic trouble code set on a sensor which shares this circuit may be detected.*

5. While momentarily disconnecting the test cable with fuse from the EGR position sensor 1 signal circuit and **5 V** power supply circuit, check the EGR position 1 display with the trouble diagnosis scan tool.

   While momentarily disconnecting the test cable with fuse from the EGR position sensor 2 signal circuit and **5 V** power supply circuit, check the EGR position 2 display with the trouble diagnosis scan tool.

   While momentarily disconnecting the test cable with fuse from the EGR position sensor 3 signal circuit and **5 V** power supply circuit, check the EGR position 3 display with the trouble diagnosis scan tool.

P06D5-Sensor reference voltage 5 circuit

Control Module : ECM

Solution:

1. Turn ON the ignition switch.

   Measure the voltage of the ECM SP-5V5 terminal.

   If the reading is outside the specified range, replace the ECM. (Refer to " **Engine Control Unit (ECU) - Remove (55.015)** and **Engine Control Unit (ECU) - Install (55.015)**")

   Set the Injector ID Code, fuel delivery rate and engine No. for the ECM.
2. Confirm resolution:

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

   2. Turn OFF the ignition switch for at least **30 s**.

   3. Start the engine.

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

   NOTE:
   • Conditions for setting engine run time or coolant temperature vary depending on the diagnostic trouble codes.
   • For the conditions for setting the diagnostic trouble code, refer to the applicable code listed in 15E diagnostic trouble code information.

   5. Observe the diagnostic trouble code information with the trouble diagnosis scan tool. A diagnostic trouble code should not be set.

P2146-Fuel injector group 1 supply voltage circuit

Control Module : ECM

Solution:

1. Turn OFF the ignition switch.

   Disconnect the harness connector from the cylinder head injector harness intermediate connector **CN.E17**.

   Turn ON the ignition switch.

   Measure the voltage between the solenoid control circuit and GND.

   NOTE:
   • Solenoid control circuit and GND of the No.1 cylinder injector.
   • Solenoid control circuit and GND of the No.4 cylinder injector.

   A. If the reading is less than or equal to **12 V**, inspect to see if there is a short circuit to the GND with the control circuit between the ECM and injector harness intermediate connector **CN.E17**.

   B. If a problem is found, repair the control circuit.

   C. If there are no problems, proceed to Step **2**
2. Inspect the charge voltage circuit between the ECM and the injector harness intermediate connector **CN.E17**.

   NOTE:
   • No short circuit to the battery or ignition power is present.
   • No short circuit to GND is present.

   A. If a problem is found, repair the charge voltage circuit.

   B. If the charge voltage circuit between the ECM **CN.D4** and the injector harness intermediate connector **CN.E17** is normal, replace the ECM. (Refer to " **Engine Control Unit (ECU) - Remove (55.015)** and **Engine Control Unit (ECU) - Install (55.015)**")
3. Set the Injector ID Code, fuel delivery rate, and engine No. for the ECM.

   Inspect the injector harness intermediate connector **CN.E17** for a poor connection.

   A. If a problem is found, repair the injector harness intermediate connector **CN.E17**.

   B. If there are no problems, proceed to Step **4**
4. Disconnect the harness connector **CN.D4** from the ECM.

   Inspect the ECM harness connector **CN.D4** for a poor connection.

   A. If a problem is found, repair the harness connector **CN.D4**.

   B. If there are no problems, proceed to Step **5**
5. Inspect to see if there is an open circuit or high resistance with the charge voltage circuit between the ECM and the injector harness intermediate connector **CN.E17**.

   A. If a problem is found, repair the charge voltage circuit.

   B. If there are no problems, proceed to Step **6**
6. Remove the cylinder head cover.(Refer to " **Valve cover - Remove (10.101)**")

   Inspect the injector harness tightening nut for looseness.

   A. If the injector harness tightening nut is loose, tighten it.

4. Observe the diagnostic trouble code information with the trouble diagnosis scan tool. A diagnostic trouble code should not be set.

Harnesses and connectors - Electrical schematic sheet 21 (55.100) Harnesses and connectors - Electrical schematic sheet 15 (55.100)

NOTE:
• After clearing the DCU diagnostic trouble code, observe whether ECM diagnostic trouble code P20C9 is set.
• If diagnostic trouble code P20C9 is set, clear it.

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

3. Turn ON the ignition switch without starting the engine.

4. Observe the diagnostic trouble code information with the trouble diagnosis scan tool. A diagnostic trouble code should not be set.

Harnesses and connectors - Electrical schematic sheet 15 (55.100)

B. If there are no problems, proceed to Step **18**

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

    A. If a problem is found, repair the harness connector **CN.D4**.

    B. If there are no problems, proceed to Step **19**

19. Inspect each circuit for high resistance.

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

    B. If there are no problems, proceed to Step **15**

20. Inspect each circuit for high resistance.

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

    B. If the FRP regulator harness connector **CN.D36** and the ECM harness connector **CN.D4** are normal and there is no high resistance in each circuit, replace the fuel supply pump (Refer to " **High pressure pump - Remove (10.218)** and **High pressure pump - Install (10.218)**") and the fuel filter element. (Refer to " **Fuel filters - Remove (10.206)** and **Fuel filters - Install (10.206)**")

    C. If there are no problems, proceed to Step **21**

    NOTE: *When replacing the fuel supply pump, the fuel filter element must be replaced at the same time.*

21. If the vacuum is normal, turn OFF the ignition switch.

    Restore the fuel system.

    Start the engine.

    Perform the injector stop test with a trouble diagnosis scan tool.

    Check for any injectors that do not change the engine speed when commanded OFF.

    A. If there are any injectors that do no change the engine speed when commanded OFF, replace the applicable injectors. (Refer to " **Fuel injectors - Remove (10.218)** and **Fuel injectors - Install (10.218)**")

    B. If an injector has been replaced, set the Injector ID Code on the ECM.

    C. If the engine speed changes for all injectors when the OFF command is given, replace the pressure limiter valve. (Refer to " **Common rail - Remove (10.218)** and **Common rail - Install (10.218)**")

    NOTE:
    • The pressure limiter valve may be fixed open, or the operation pressure may decrease.
    • Do not replace the pressure limiter with a separate unit. If a problem is found, replace the common rail (fuel rail) assembly.

22. Confirm resolution:

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

    2. Turn OFF the ignition switch for at least **30 s**.

    3. Start the engine.

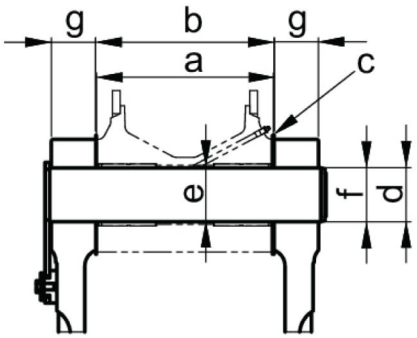
    4. Perform a test-run under the conditions for running the diagnostic trouble code.

    NOTE:
    • Conditions for setting engine run time or coolant temperature vary depending on the diagnostic trouble codes.
    • For the conditions for setting the diagnostic trouble code, refer to the applicable code listed in 15E diagnostic trouble code information.

    5. Observe the diagnostic trouble code information with a trouble diagnosis scan tool.

Harnesses and connectors - Electrical schematic sheet 18 (55.100) Harnesses and connectors - Electrical schematic sheet 22 (55.100) Harnesses and connectors - Electrical schematic sheet 14 (55.100)

5. Boom and arm installation section



LPIL12CX00023EA 6

Part name	Code	Standard value	Usage limits	Judgment	Solution
Boom	a	**310 mm** (**12.20 in**)	**313 mm** (**12.32 in**)	Acceptable/ Unacceptable	Replacement
Arm	b	**307.5 mm** (**12.11 in**)	**305.5 mm** (**12.03 in**)	Acceptable/ Unacceptable	Replacement
Clearance	c	**0.5 - 1.1 mm** (**0.02 - 0.04 in**)	Shim adjustment	Acceptable/ Unacceptable	Adjustment with shims
Pin	d	**Ø 90 mm** (**3.54 in**)	**Ø 89 mm** (**3.50 in**)	Acceptable/ Unacceptable	Replacement
Bushing (arm)	e	**Ø 90 mm** (**3.54 in**)	**Ø 91.5 mm** (**3.60 in**)	Acceptable/ Unacceptable	Replacement
Boom	f	**Ø 90 mm** (**3.54 in**)	**Ø 91.5 mm** (**3.60 in**)	Acceptable/ Unacceptable	Replacement
Boom	g	**68 mm** (**2.68 in**)	**66 mm** (**2.60 in**)	Acceptable/ Unacceptable	Replacement