CX130C
Crawler Excavator

SERVICE MANUAL

Part number 47795402
English
January 2016

CASE
CONSTRUCTION

Basic instructions - Shop and assembly

Shimming

For each adjustment operation, select adjusting shims and measure the adjusting shims individually using a micrometer, then add up the recorded values. Do not rely on measuring the entire shimming set, which may be incorrect, or the rated value shown on each shim.

Rotating shaft seals

For correct rotating shaft seal installation, proceed as follows:

1. Before assembly, allow the seal to soak in the oil it will be sealing for at least thirty minutes.
2. Thoroughly clean the shaft and check that the working surface on the shaft is not damaged.
3. Position the sealing lip facing the fluid.

   NOTE: *With hydrodynamic lips, take into consideration the shaft rotation direction and position the grooves so that they will move the fluid towards the inner side of the seal.*
4. Coat the sealing lip with a thin layer of lubricant (use oil rather than grease). Fill the gap between the sealing lip and the dust lip on double lip seals with grease.
5. Insert the seal in its seat and press down using a flat punch or seal installation tool. Do not tap the seal with a hammer or mallet.
6. While you insert the seal, check that the seal is perpendicular to the seat. When the seal settles, make sure that the seal makes contact with the thrust element, if required.
7. To prevent damage to the seal lip on the shaft, position a protective guard during installation operations.

O-ring seals

Lubricate the O-ring seals before you insert them in the seats. This will prevent the O-ring seals from overturning and twisting, which would jeopardize sealing efficiency.

Sealing compounds

Apply a sealing compound on the mating surfaces when specified by the procedure. Before you apply the sealing compound, prepare the surfaces as directed by the product container.

Spare parts

Only use CNH Original Parts or CASE CONSTRUCTION Original Parts.

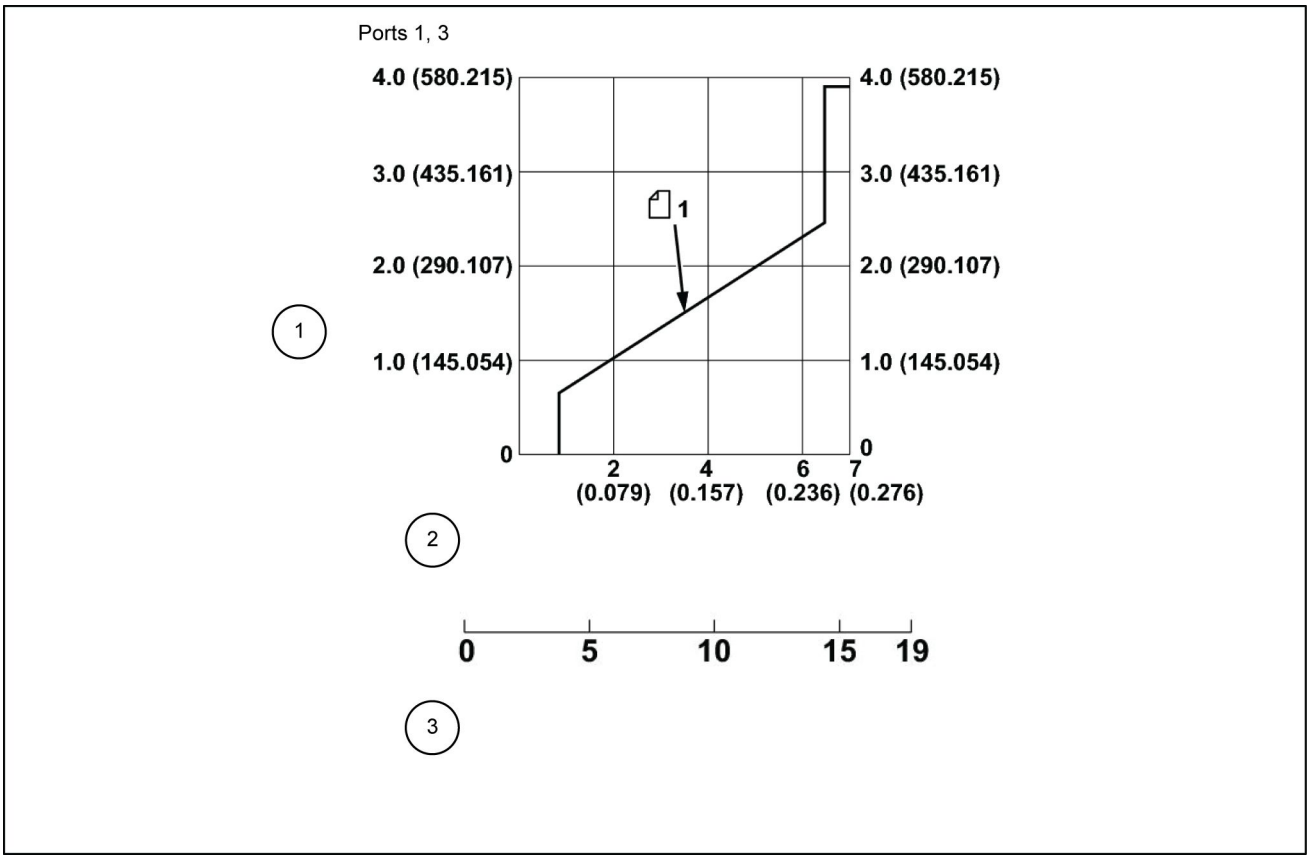
Only genuine spare parts guarantee the same quality, duration, and safety as original parts, as they are the same parts that are assembled during standard production. Only CNH Original Parts or CASE CONSTRUCTION Original Parts can offer this guarantee.

When ordering spare parts, always provide the following information:

- Machine model (commercial name) and Product Identification Number (PIN)
- Part number of the ordered part, which can be found in the parts catalog

Weight	**1.0 kg** (**2.2046 lb**)

Operation remote control valve control diagram



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1. Secondary pressure [MPa (psi)]
2. Push rod stroke [mm (in)]
3. Operating angle [deg.]
A. 1 Secondary pressure

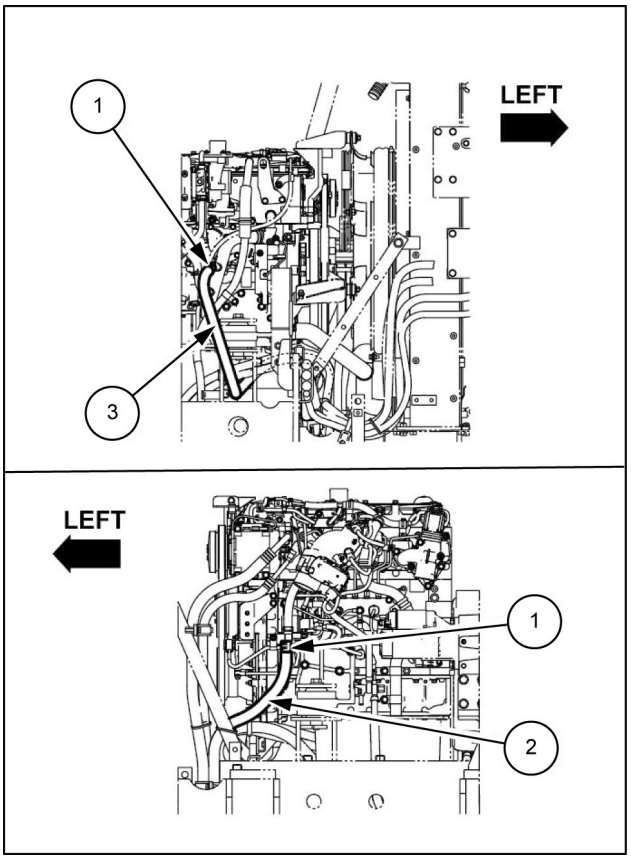
Weight kilogram meters to Newton meters

kgf·m	0	1	2	3	4	5	6	7	8	9	kgf·m
	N·m	N·m	N·m	N·m	N·m	N·m	N·m	N·m	N·m	N·m	
----		9.81	19.61	29.42	39.23	49.03	58.84	68.65	78.45	88.26	----
10	98.07	107.87	117.68	127.49	137.29	147.10	156.91	166.71	176.52	186.33	10
20	196.13	205.94	215.75	225.55	235.36	245.17	254.97	264.78	274.59	284.39	20
30	294.20	304.01	313.81	323.62	333.43	343.23	353.04	362.85	372.65	382.46	30
40	392.27	402.07	411.88	421.69	431.49	441.30	451.11	460.91	470.72	480.53	40
50	490.33	500.14	509.95	519.75	529.56	539.37	549.17	558.98	568.79	578.59	50
60	588.40	598.21	608.01	617.82	627.63	637.43	647.24	657.05	666.85	676.66	60
70	686.47	696.27	706.08	715.89	725.69	735.50	745.31	755.11	764.92	774.73	70
80	784.53	794.34	804.15	813.95	823.76	833.57	843.37	853.18	862.99	872.79	80
90	882.60	892.41	902.21	912.02	921.83	931.63	941.44	951.25	961.05	970.86	90
100	980.67	990.47	1000.28	1010.08	1019.89	1029.70	1039.5	1049.31	1059.12	1068.92	100

Newton meters to weight kilogram meters

N·m	0	10	20	30	40	50	60	70	80	90	N·m
	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	kgf·m	
----		1.020	2.039	3.059	4.079	5.099	6.118	7.138	8.158	9.177	----
100	10.197	11.217	12.237	13.256	14.276	15.296	16.315	17.335	18.355	19.375	10
200	20.394	21.414	22.434	23.453	24.473	25.493	26.513	27.532	28.552	29.572	20
300	30.591	31.611	32.631	33.651	34.670	35.690	36.710	37.729	38.749	39.769	30
400	40.789	41.808	42.828	43.848	44.868	45.887	46.907	47.927	48.946	49.966	40
500	50.986	52.006	53.025	54.045	55.065	56.084	57.104	58.124	59.144	60.163	50
600	61.183	62.203	63.222	64.242	65.262	66.282	67.301	68.321	69.341	70.360	60
700	71.380	72.400	73.420	74.439	75.459	76.479	77.498	78.518	79.538	80.558	70
800	81.577	82.597	83.617	84.636	85.656	86.676	87.696	88.715	89.735	90.755	80
900	91.774	92.794	93.814	94.834	95.853	96.873	97.893	98.912	99.932	100.952	90
1000	101.972	102.991	104.011	105.031	106.050	107.070	108.090	109.110	110.129	111.149	100

16. Loosen the 2 hose bands **(1)**, and then remove the heater hoses **(2)**, **(3)**.
    - Install caps or plugs to the engine and hoses to prevent any entry of water, dust or dirt.



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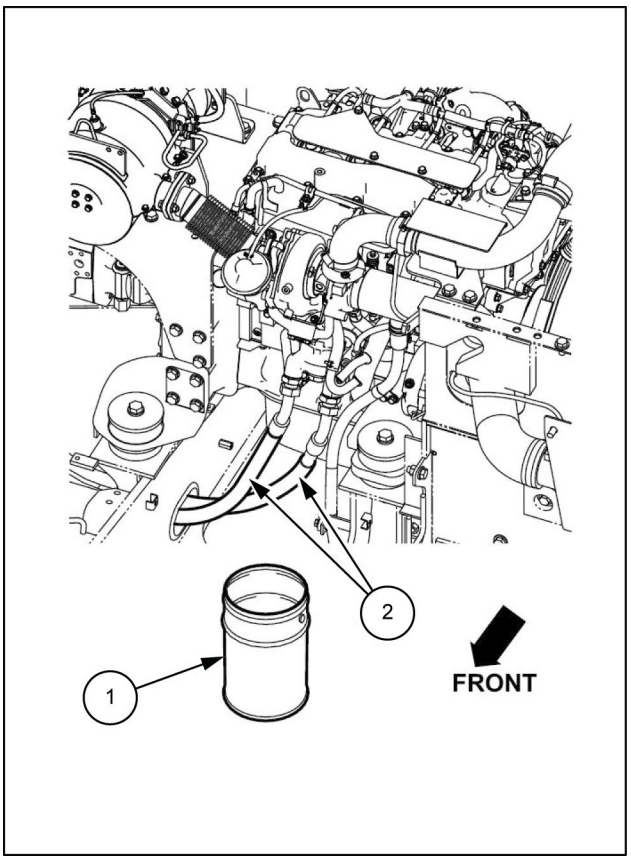
17. Prepare the waste oil can **(1)**.
    - Drain the engine oil before removing the engine oil hose.
      Use a wrench [**36 mm**] to remove the 2 engine oil remote hoses **(1)**.
    - Mark the engine and hoses so that the connectors match at the time of assembly.
    - Install caps or plugs to the engine and hoses to prevent any entry of water, dust or dirt.
    - Clean the engine and hoses by spraying them with a parts cleaner to prevent scratches and prevent dirt from accumulating on the connectors.

      Tightening torque for installation: **54.1 - 63.9 N·m** (**39.90 - 47.13 lb ft**)



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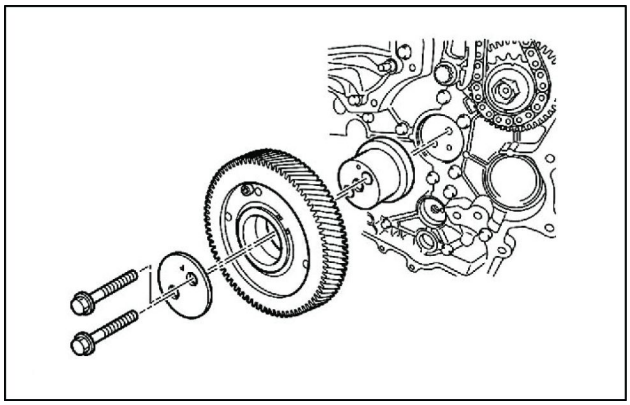
Idle gear A removal

1. Remove the idle gear A from the idle gear A shaft.
   - Remove idle gear A, idle gear A flange, and idle gear A shaft.



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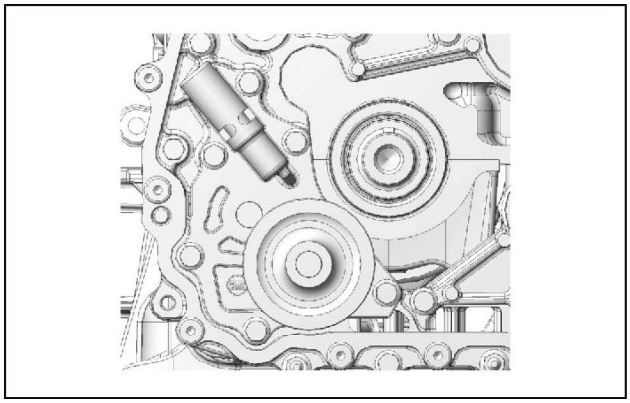
Oil pump assembly removal

1. Remove the oil pump assembly from the timing gear case.



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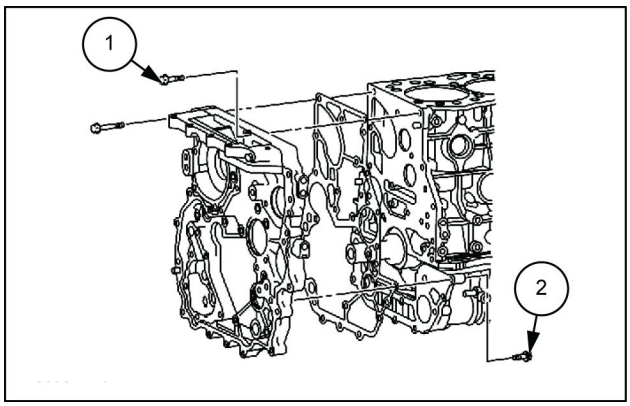
Timing gear case removal

1. Remove the timing gear case from the cylinder block.
   - Install bolt **(1)** in the diagram to the inside of timing gear case and bolt **(2)** from the crankcase side.

   ⚠ CAUTION: Do not forget to remove the bolt.

2. Remove the gasket from the cylinder block.



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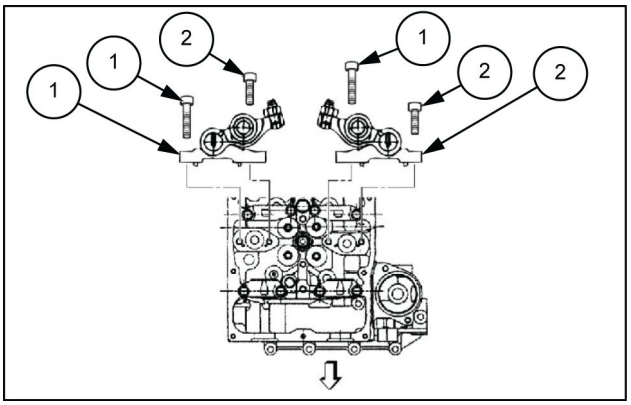
Rocker arm shaft assembly installation

1. Apply the engine oil to the bolt.
2. Install the rocker arm shaft assembly to the cylinder head.
   - Tighten to the specified torque in the order shown in the diagram.

     Tightening torque: **21 N·m** (**15 lb ft**)

   1. Exhaust rocker arm shaft assembly
   2. Inlet rocker arm shaft assembly



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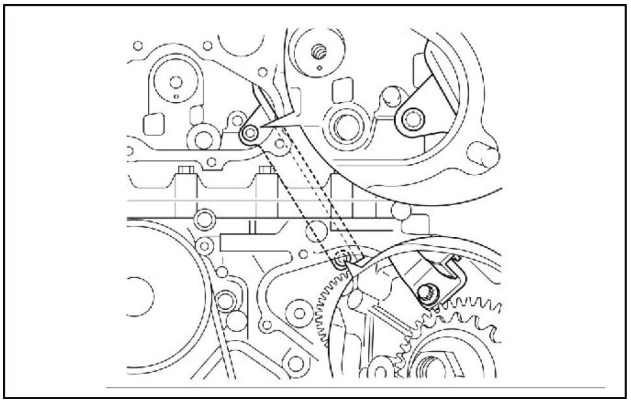
Timing chain guide installation

1. Install the timing chain guide to the cylinder head.

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

   - Install the timing chain tension lever.



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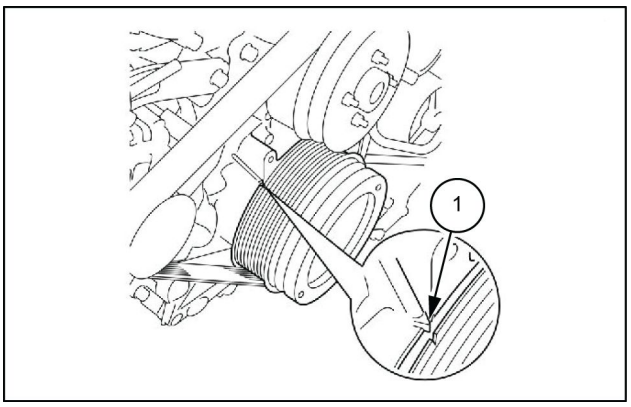
Timing chain installation

1. Align No.1 cylinder to the compression top dead center **(1)**.
   - Rotate the crankshaft in the forward direction to align the No.1 cylinder piston to compression top dead center **(1)**.
2. Install the timing chain to the sprocket.



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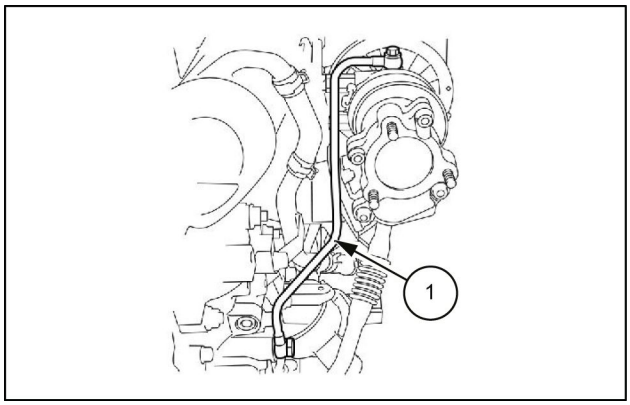
2. Remove the water feed pipe from the oil cooler assembly.
3. Disconnect the oil feed pipe **(1)** from the turbocharger assembly.
4. Remove the oil feed pipe **(1)** from the oil cooler assembly.



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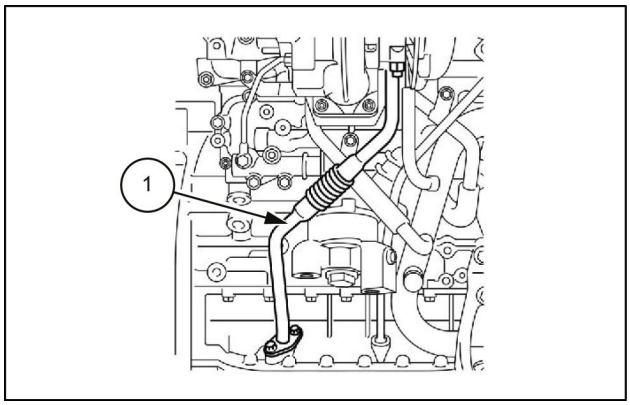
5. Disconnect the oil return pipe **(1)** from the turbocharger assembly.
6. Remove the oil return pipe **(1)** from the crankcase.



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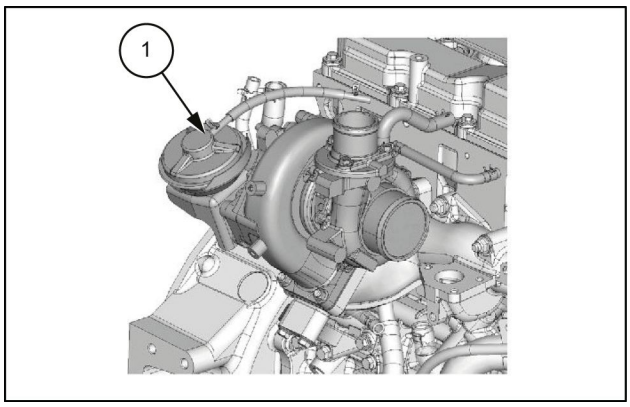
7. Remove the turbocharger assembly **(1)** from the exhaust manifold.
   - Remove both the water feed hose and the water drain hose.
   - Do not reuse the gasket.

   CAUTION: Do not hold the actuator rod.



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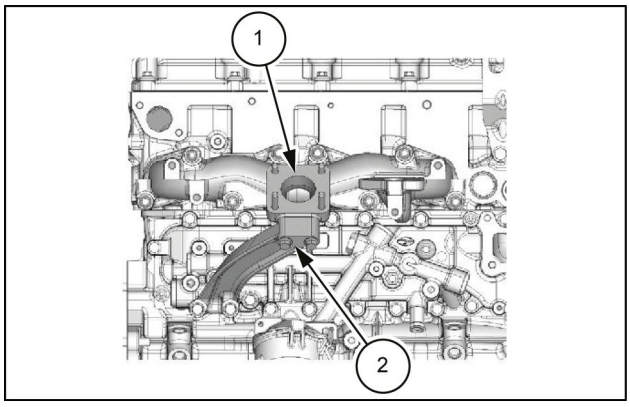
Exhaust manifold removal

1. Remove the exhaust manifold bracket **(2)** from the exhaust manifold **(1)** and the oil cooler assembly.
2. Remove the exhaust manifold **(1)** from the cylinder head.
   - Do not reuse the gasket.



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Vacuum pump assembly installation

1. Install the vacuum pump to the gear case cover.

> ⚠ CAUTION:
>
> - Apply engine oil to the O-ring.

2. Remove the brackets from the gear case and the vacuum pump.

NOTE: *Install the fan shroud bracket left and fan shroud stay **(2)**.*

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

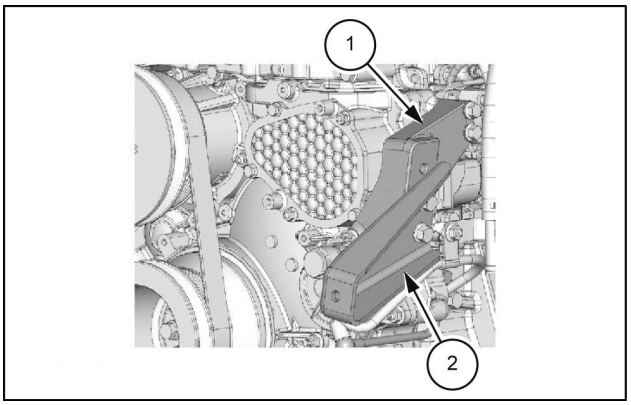
1. Fan shroud bracket (LH)

3. Install the oil feed pipe **(2)** to the vacuum pump **(4)** and cylinder block.

Tightening torque: **12 N·m** (**8.85 lb ft**)

4. Connect the vacuum hose **(1)** to the vacuum pump **(4)**.

3. Gear case cover



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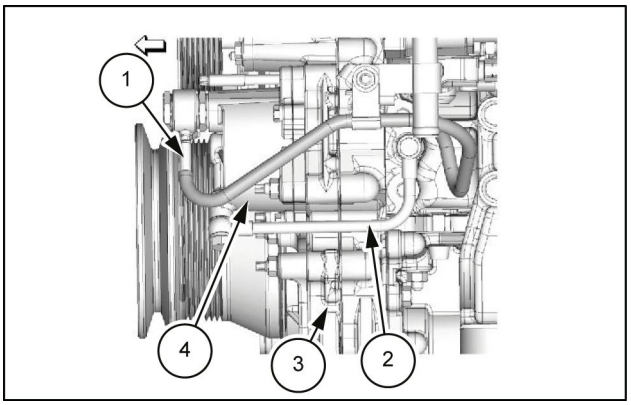

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Crankshaft pulley installation

> ⚠ CAUTION:
>
> - Do not reuse the crankshaft pulley bolt or washer.

1. Apply the engine oil to the bolt.

NOTE: *Apply engine oil to the threaded portion and seat surface of the bolt.*

2. Install the crankshaft pulley to the crankshaft.

NOTE: *Tighten at the specified torque in the order of the numbers in the diagram.*

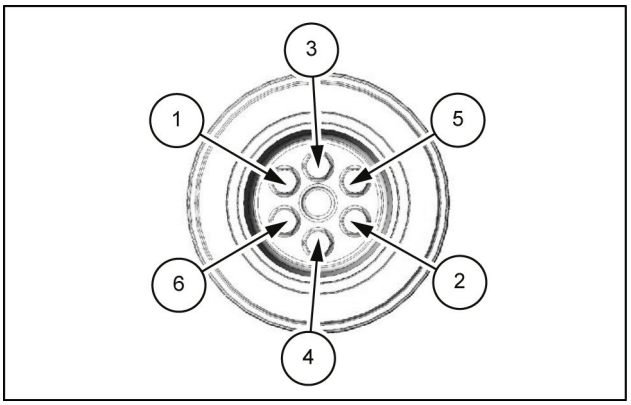
Tightening torque: **30 N·m** (**22 lb ft**)

3. Tighten the bolt using special tool.
   Specified angle: 180°

NOTE: *Tighten again at the specified angle in the order shown in the diagram.*

Specified angle: 60°

> ⚠ CAUTION:
>
> - The total rotational angle for the 2nd and 3rd times will be between 240˚ and 270˚.



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9. Start the engine and put it into an idling state.
   - Idle for **5 s**.

   CAUTION:

   - Do not rev the engine.

10. Adjust the engine speed.

NOTE: *Slowly increase the engine speed and maintain for **3 s**.*
After completion of the above operation, operate at maximum revolutions on the side of the machine and repeat the operation of revving to the maximum speed multiple times.

CAUTION:

- If air removal operations are insufficient, due to the possibility of engine trouble, make sure to follow all procedures.

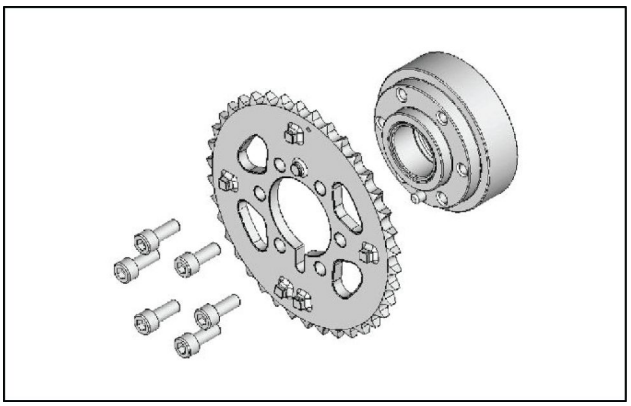
Battery ground cable connect

1. Connect the battery ground cable to the battery.

Cylinder head - Disassemble

Sprocket removal

1. Remove the sprocket from idle gear D.



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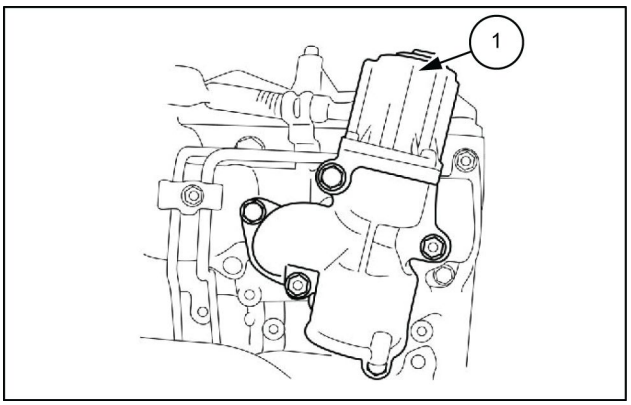
EGR valve removal

1. Remove the EGR valve **(1)** from the cylinder head.



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Inlet manifold removal

1. Remove the inlet manifold from the cylinder head.

Water outlet pipe removal

1. Remove the water outlet pipe from the cylinder head.

Valve stem end cap removal

1. Remove the valve stem end cap from the valve.

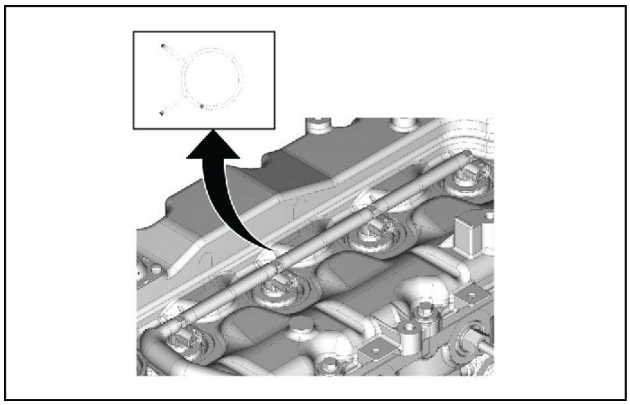
Split collar removal

1. Remove the split collar from the valve using special tool.

NOTE: *Using a replacer, compress the valve spring and remove the split collar.*

Fuel hose installation

1. Install the nozzle leak off pipe to the injector.
   - If the nozzle leak off hose has been removed, install with the clip knob facing the exhaust side as shown in the diagram.



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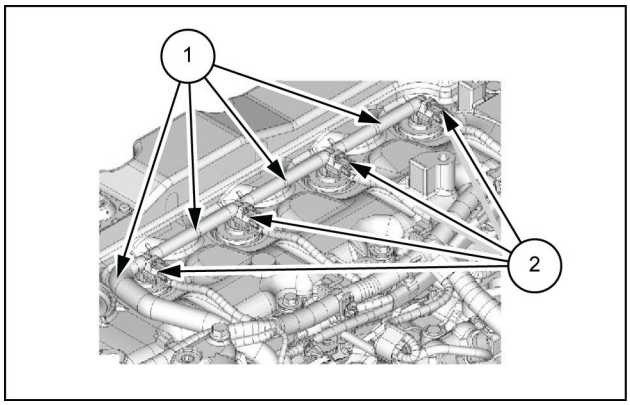
2. Connect the harness connector to the injector.
   1. Nozzle leak off pipe
   2. Injector harness



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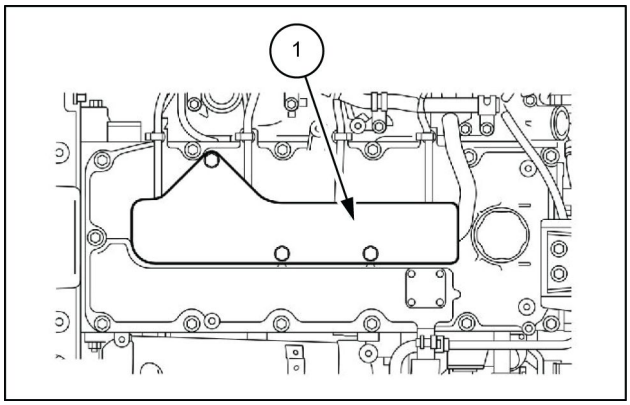
3. Install the cover **(1)** to the cylinder head cover.



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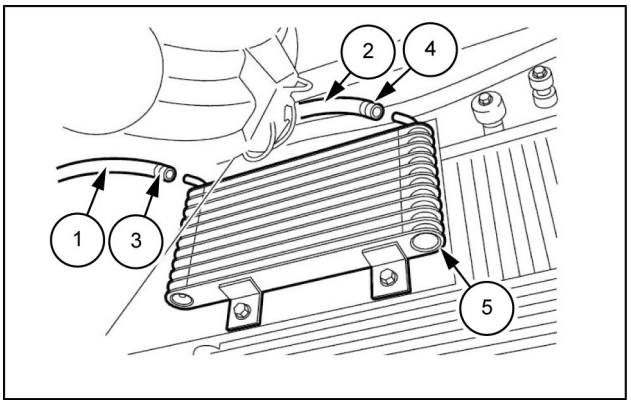
Cooling fan belt installation

1. Install the cooling fan belt to the pulley.

Fuel cooler - Remove

1. Mark the fuel cooler **(5)** and hoses **(1)** and **(2)** so that the connectors match at the time of assembly.
   - Use pliers to loosen the hose bands **(3)** and **(4)**, and then remove the hoses.
   - Fuel will spill out, so place a drip pan directly below the area.
   - Install caps or plugs to the fuel cooler and hoses to prevent any entry of water, dust or dirt.



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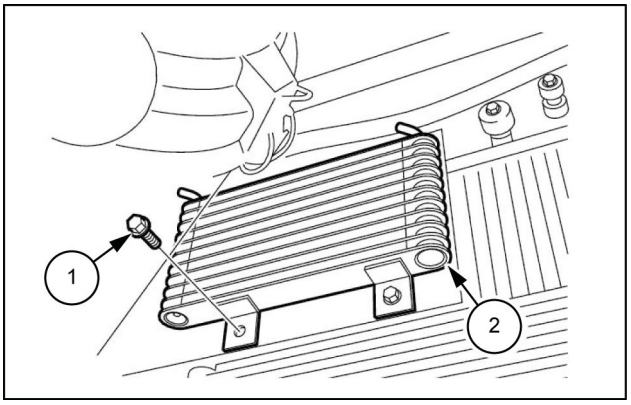
2. Use a wrench [**13 mm**] to remove the 4 bolts **(1)**, and then remove the fuel cooler **(2)**.



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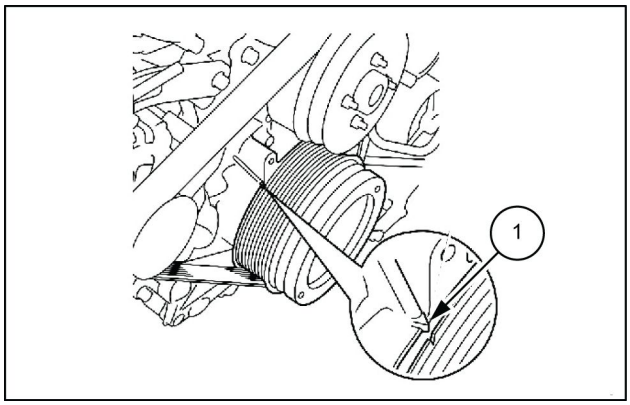
Timing chain installation

1. Align No. 1 cylinder to the compression top dead center **(1)**.
   - Rotate the crankshaft in the forward direction to align the No. 1 cylinder piston to compression top dead center.

   1. Compression top dead center alignment position

2. Install the timing chain to the sprocket.



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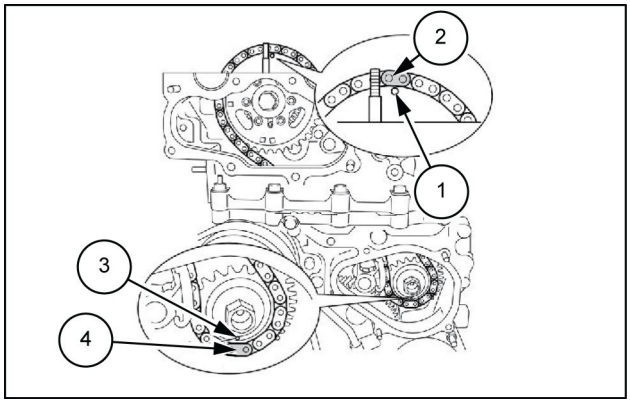
Sprocket installation

1. Install the sprocket to the supply pump gear.
   - Align the alignment mark of the supply pump sprocket and the yellow plate **(4)** of the timing chain.
   - Align the dowel pin of the supply pump gear and the notch of the supply pump sprocket and install the supply pump sprocket.
2. Turn the nut.
   - Tighten the supply pump shaft nut with your hand.

   1. Idle gear alignment mark
   2. Blue plate
   3. Sprocket alignment mark



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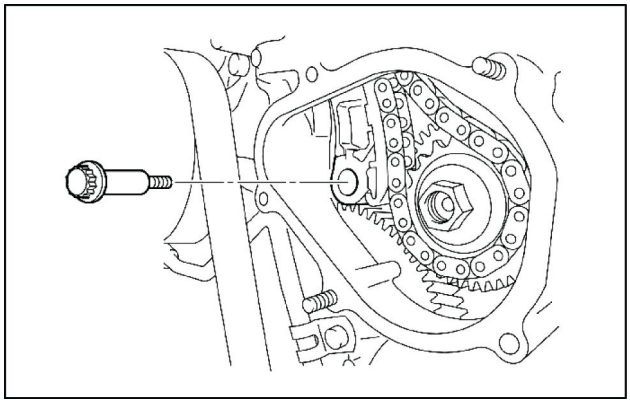
Timing chain lever pivot installation

1. Install the timing chain lever pivot to the timing chain tension lever.
   - Check that the timing chain lever moves smoothly. Tightening torque: **25 N·m** (**18.4 lb ft**)



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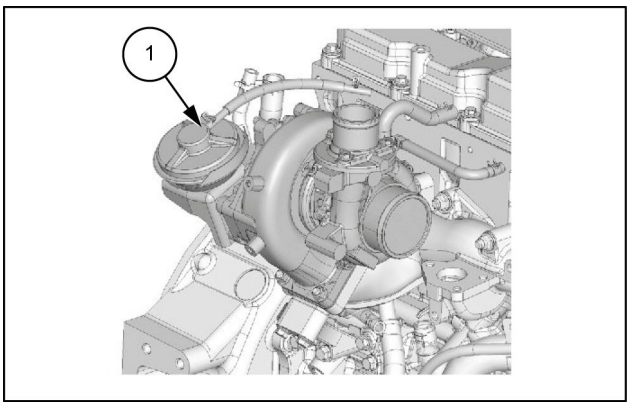
Turbocharger - Install

Turbocharger assembly installation

1. Install the turbocharger assembly **(1)** to the exhaust manifold.

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

   ⚠ CAUTION: Do not hold the actuator rod.



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NOTE: *Fill with **0.5 cm³** of engine oil from the fuel filler.*

2. Install the water feed pipe to the oil cooler.

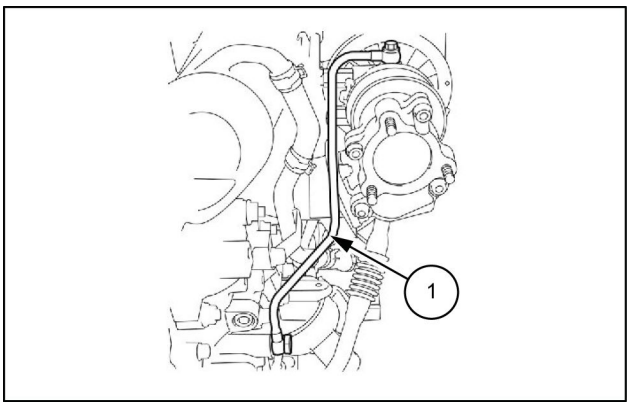
   Tightening torque: **41 N·m** (**30 lb ft**)

3. Connect the water feed pipe to the turbocharger assembly.

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

4. Install the oil feed pipe to the oil cooler assembly.
5. Connect the oil feed pipe **(1)** to the turbocharger assembly.

   Tightening torque: **23 N·m** (**17 lb ft**)



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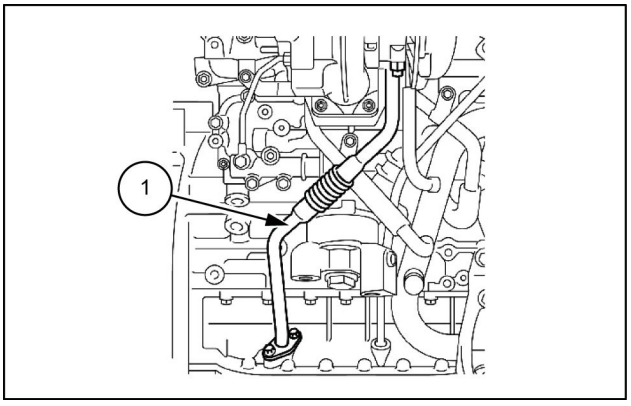
6. Install the oil return pipe **(1)** to the crankcase.

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

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

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

8. Connect the vacuum hose to the turbocharger assembly.



LPIL12CX00199AB 3

Engine oil filling

1. Replenish the engine with engine oil.

NOTE: *Recheck the tightening of the oil pan drain plug.*

Coolant filling

1. Replenish the radiator assembly with coolant.

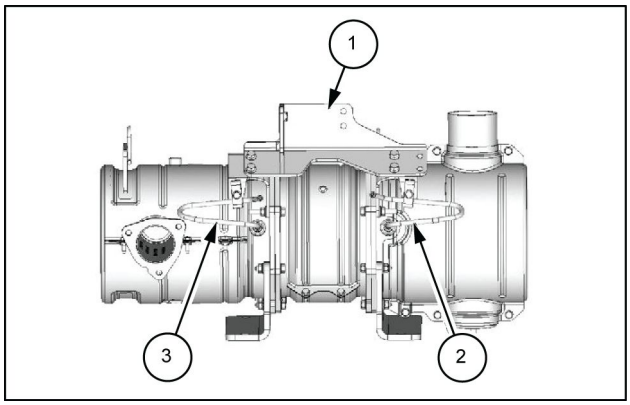
Battery ground cable connect

1. Connect the battery ground cable to the battery.

9. Install the bracket **(1)** to the DPD assembly.

   Tightening torque: **25 N·m** (**18.44 lb ft**)

   2. Differential pressure pipe on the filter rear side
   3. Differential pressure pipe on the filter front side



LPIL12CX00961AB 2

Exhaust gas temperature sensor installation

> ⚠ CAUTION:
>
> - Do not subject the tip of the exhaust gas temperature sensor to shock when installing.
> - Remove the old anti-seize lubricant on the sleeve nut.
> - Apply the anti-seize lubricant on the threaded portion of the sleeve nut.
> - Apply Never-Seez High Temperature Stainless Grade: 5-87411-039-0 anti-seize lubricant, manufactured by Bostik in the United States.
> - Replace the oxidation catalyst assembly if damage has been found in the sensor installation section of the oxidation catalyst assembly.

1. Temporarily tighten the exhaust gas temperature sensor to the DPD assembly.

> ⚠ CAUTION: To avoid damaging the sensor installation sections due to sensor incorrect assembly, tighten it by hand.

NOTE: *Exhaust gas temperature sensor identification*

Sensor type	Screw size	Connector color
Exhaust gas temperature sensor 2	**M12 x 1.75**	Dark gray
Exhaust gas temperature sensor 1	**M12 x 1.25**	Light gray

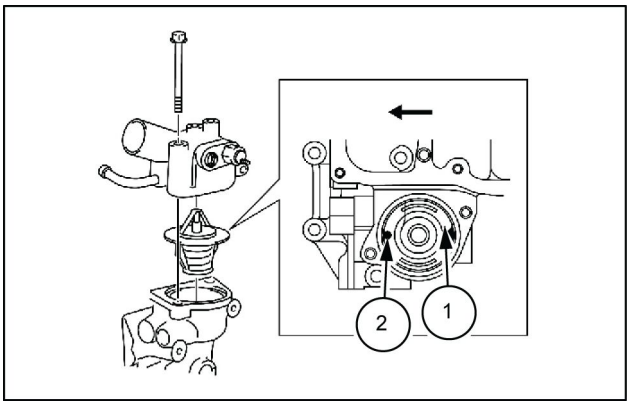
2. Securely tighten the exhaust gas temperature sensor to the DPD assembly.

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

Coolant thermostat - Install

1. Install the thermostat **(1)** to the cylinder head assembly.

NOTE: *Install the jiggle valve* ***(2)*** *to face the engine front side.*



LPIL12CX00954AB 1

Water outlet pipe installation

1. Install the water outlet pipe to the cylinder head assembly.

   Tightening torque: **25 N·m** (**18.44 lb ft**)

2. Connect the radiator upper hose to the water outlet pipe.

Coolant filling

1. Replenish the radiator assembly with coolant.

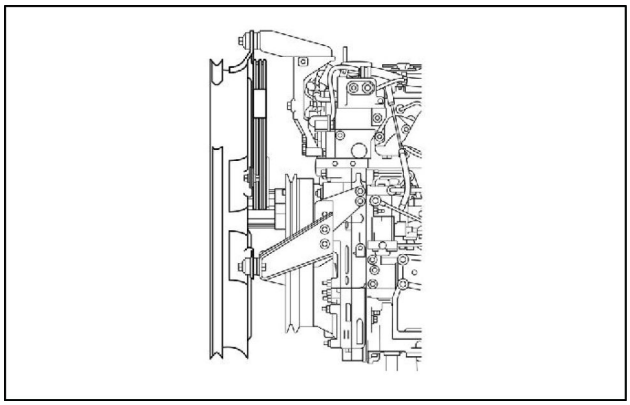
Battery ground cable connect

1. Connect the battery ground cable to the battery.

Fan shroud installation

1. Install the fan shroud to the bracket.
   - Install the fan shroud and fan guard.

     Tightening torque: **51 N·m** (**38 lb ft**)



LPIL12CX00203AA 10

Cooling fan belt adjustment

1. Adjust the cooling fan belt.

   NOTE:

   - Loosen the adjust plate lock bolt and the mounting bolt at the bottom side of the generator **(3)**.
   - Turn the adjust bolt **(4)** to adjust the belt.
   - Press the specified position on the belt with the specified load to inspect the amount of belt flex **(7)**.
     Load: **98 N** (**22 lb**)
   - Verify whether precise tension has been set using a sonic tension meter.

   Amount of deflection

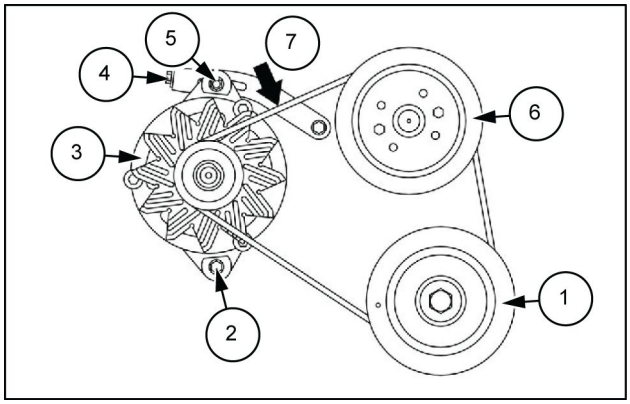
   New: **4.2 - 5.0 mm** (**0.1654 - 0.1969 in**)

   When adjusting the tension: **6.6 - 7.4 mm** (**0.2598 - 0.2913 in**)

   Frequency of vibrations

   New: **220 - 244 Hz**

   When adjusting the tension: **182 - 206 Hz**



LPIL12CX00946AB 11

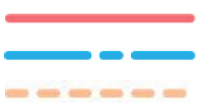
1. Crankshaft pulley
2. Installation bolt

5. Lock nut
6. Fan pulley

> ⚠ CAUTION: Always take care to set the correct tension as belt service life may be shortened or the belt squeaking may occur if tension is inadequate.

Hydraulic systems - Hydraulic schema - Travel circuit

TRAVEL LOW-SPEED CIRCUIT



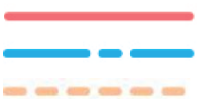
Pressure line
Tank line
Pilot pressure line

Pilot tank line
Electric line

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

As an example, this section explains the forward travel operation.
The travel motor 2-stage tilting angle is a large angle side. Even if the travel switch is set to the high-speed side, switching the key switch OFF and then ON again always returns the system to this state.
By operating the travel remote control valve to the forward side, the pilot pressure oil is fed to the control valve 5a1 port and switches the left travel spool to the forward side. At the same time, the oil is also fed to the 4a1 port to switch the right travel spool to the forward side.
The discharge oil from hydraulic pump A1 enters the control valve PR (P1) port and the discharge oil from hydraulic pump A2 enters the control valve PL (P2) port. Each flows to the respective travel motor and causes forward travel through the left and right travel spools being switched.
The return oil from the travel motor goes through the left and right travel spools and returns to the hydraulic oil tank.

SWING BRAKE CIRCUIT

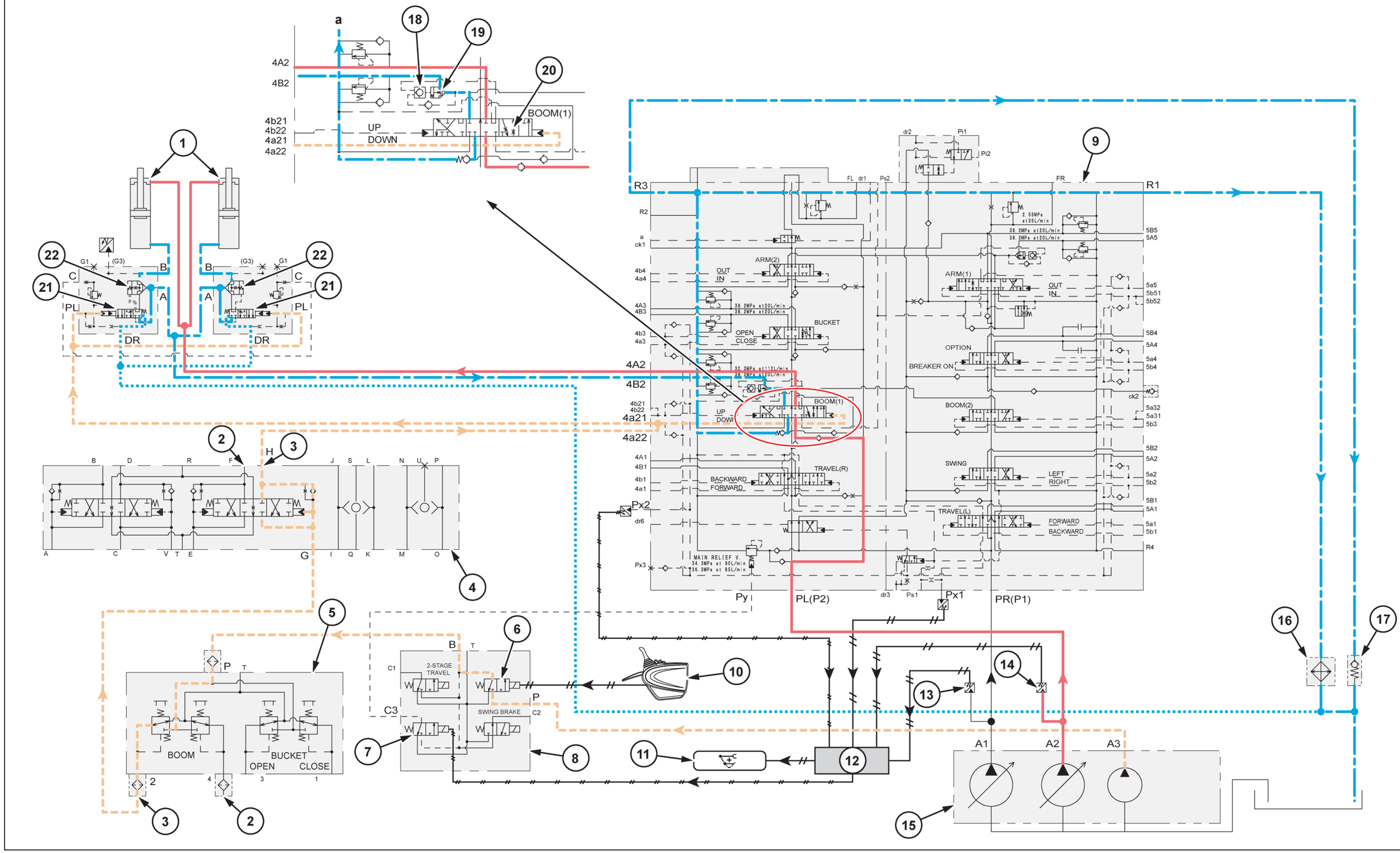


Pressure line
Tank line
Pilot pressure line

Pilot tank line
Electric line

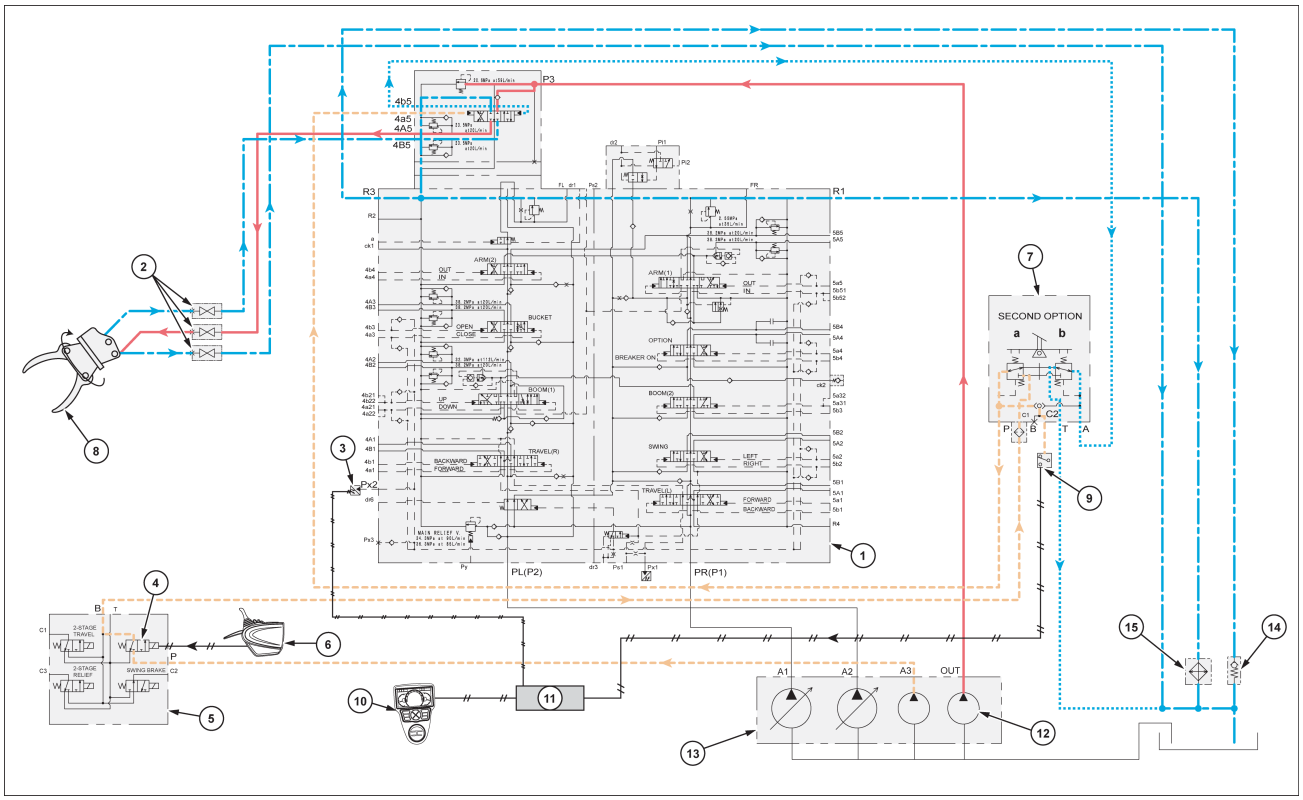
1. Swing motor
2. Cushion valve
3. Right swing
4. Left swing
5. Swing pilot pressure sensor
6. Remote control valve (arm, swing)
7. Hydraulic pump
8. Check valve
9. Lever lock
10. Swing brake
11. 4 stack solenoid valve
12. Console lever lock switch
13. Computer A
14. Control valve
15. Oil cooler
16.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

As an example, this section explains the brake circuit operation after the end of a right swing operation.
When the remote control valve is returned to neutral from a right swing operation, the pilot pressure oil is cut off and the control valve swing spool returns to neutral. The pressurized oil fed to the swing motor B port from the control valve 5B2 port is cut. At the same time, the destination location is eliminated for the pressurized oil flowing from the swing motor A port to the control valve 5A2 port, so the pressure rises to the swing motor relief valve set pressure. The pressure generated here becomes a brake force and stops the motor.
When the swing is stopped, the swing motor continues to rotate for a while due to inertial force. In order to make up the shortfall in the oil volume, oil is supplied from the make-up line connected to the swing motor Mu port from the control valve R2 port to open the make-up check valve and oil is suctioned in to prevent cavitation.


a
18
19
20
4A2
4B2
4b21
4b22
4a21
4a22
BOOM(1)
UP
DOWN
1
22
21
G1
(G3)
B
C
A
PL
DR
2
3
H
B D R F J S L N U P
A C V T E G I Q K M O
4
5
P T
BOOM
BUCKET
OPEN CLOSE
6
B T
C1
2-STAGE TRAVEL
C3
SWING BRAKE
C2
7
8
10
11
12
13
14
15
16
17
9
R3
R2
R1
FR
FL dr1 Ps2
dr2 Pi1 Pi2
ARM(2)
ARM(1)
OUT
IN
BUCKET
OPEN
CLOSE
OPTION
BREAKER ON
BOOM(2)
SWING
LEFT
RIGHT
TRAVEL(R)
TRAVEL(L)
BACKWARD
FORWARD
MAIN RELIEF V.
34.3MPa at 90L/min
36.3MPa at 85L/min
Px2
Px3
Py
Px1
PL(P2)
PR(P1)
dr6
dr3
Ps1
ck1
ck2
A1 A2 A3

9. Second option pilot pressure switch

As an example, this section explains the case in which the hydraulic rotation fork attachment is used.
By operating the second option remote control valve to the right swing side, the pilot pressure oil is fed to the control valve 4a5 port. The fourth hydraulic pump OUT discharge oil is fed to the control valve P3 port, goes through the second option spool and flows to the hydraulic rotation fork to operate to the right swing side. The return oil from the hydraulic rotation fork goes through the second option spool and returns to the hydraulic tank.
The oil in the second option drain line returns to the hydraulic tank without going through the control valve. second option spool port relief valve pressure becomes the hydraulic rotation fork set pressure.

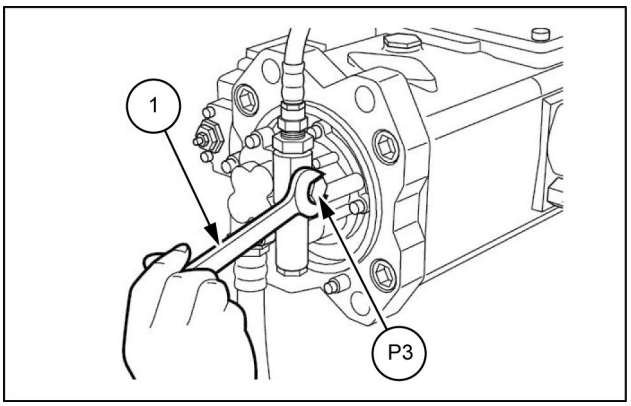


SMIL15CEX6904JB 5

Hydraulic systems - Pressure test – Pilot

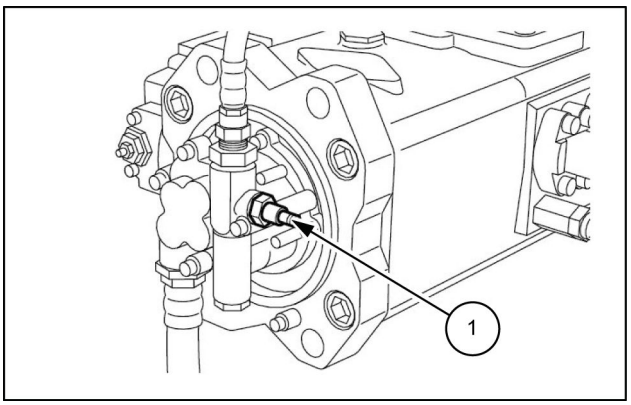
Pressure gauge installation

Remove the plug with the wrench **(1)** to install a pressure gauge at the pump pressure measuring port P3.



LPIL12CX04117AB 1

Install the adapter **(1)**.



LPIL12CX01632AB 2

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

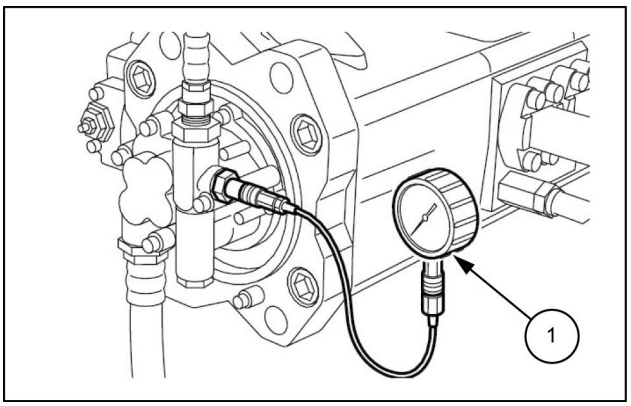
Engine speed: **2000 RPM**

Work mode: SP mode

Oil temperature: **45 - 55 °C** (**113 - 131 °F**)

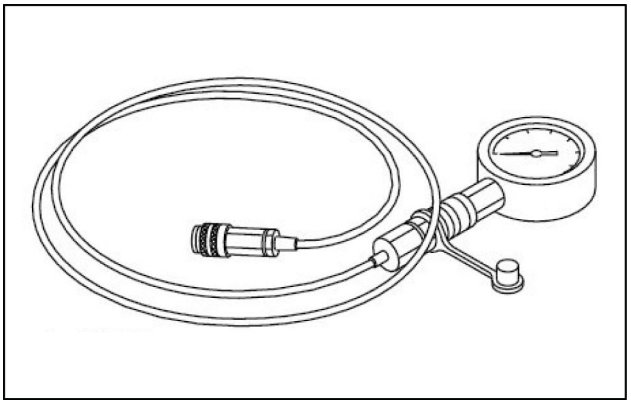
Measuring port: P3 port

Set pressure: **3.92 MPa** (**569 psi**)



LPIL12CX01634AB 3

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



LPIL12CX01633AA 4

Pump - Special tools

The table below shows the tools required for assembly and disassembly of the K7V pump. The bolts and plugs may vary by pump type.

Tool name	Tool dimensions
Hexagon wrench	**4 mm**, **5 mm**, **6 mm**, **8 mm**, **10 mm**, **14 mm**
Socket wrench, double-head (single-head) wrench	**19 mm**, **24 mm**
Monkey wrench	Medium-sized
Screwdriver	Flathead screwdriver (medium size) x 2
Plastic hammer	
Torque wrench	With adjustable specified torque tightening
Snap ring pliers	For stop ring, TSR-160
Steel rod	Diameter Ø **4 mm** (**0.157 in**) or less, L = **100 mm** (**3.937 in**)
Tweezers	

Pump - Prepare – Pump Coupling

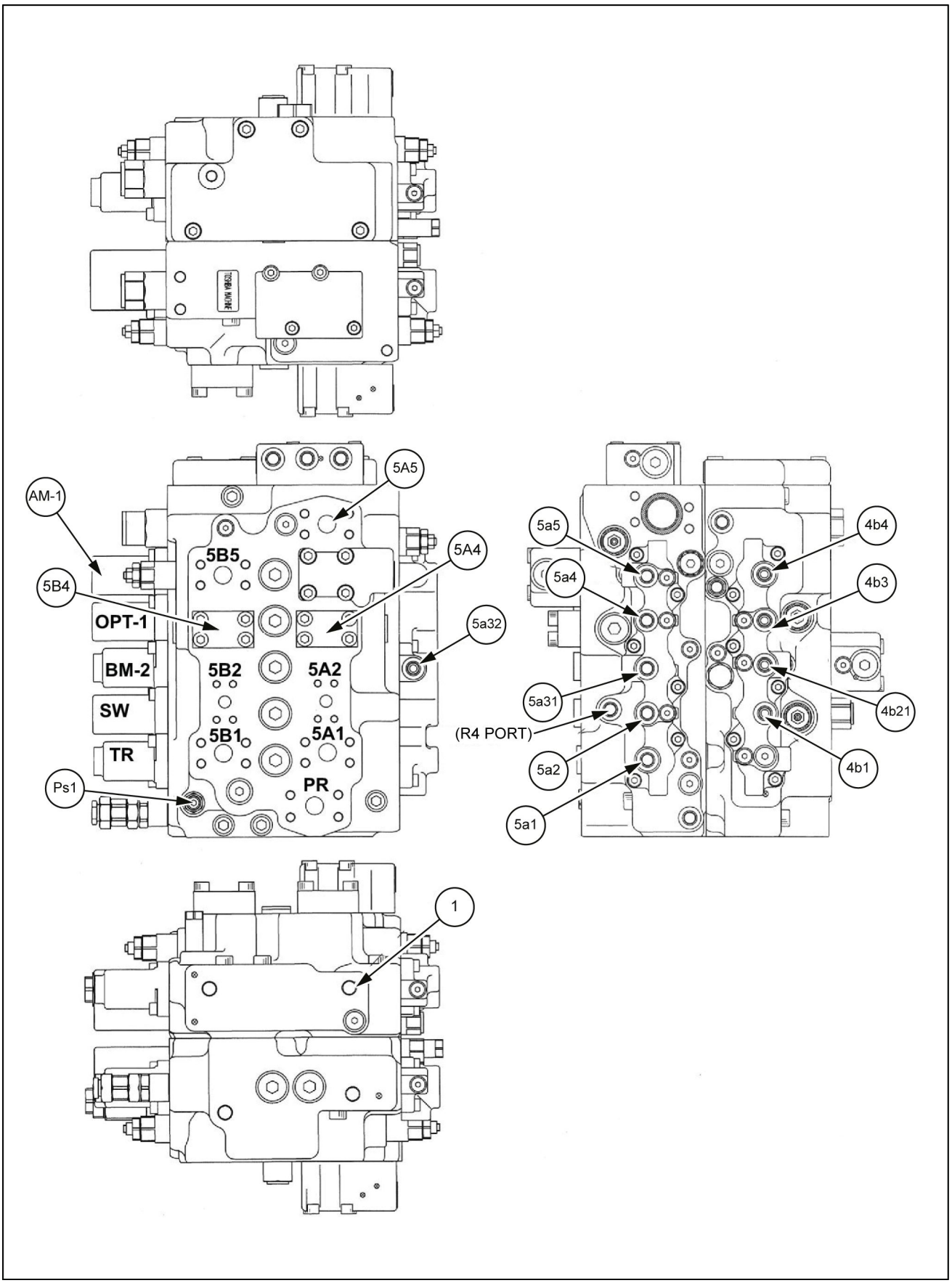
⚠ CAUTION:

- Stop the machine on a level location with good footing.
- Be sure to stop the engine before beginning work.
- When working together with others, always be sure to exchange signals and pay adequate attention to safety.
- Always wear protective gear (protective eyewear and safety shoes, etc.) when working with a hammer.

Items to prepare:

- Wrench [**17 mm**]
- Hexagon wrenches [**8 mm**, **14 mm**]
- Hammer
- Plastic hammer
- Nylon sling (with the required lifting capacity)
- Liftcrane (with the required lifting capacity)

- Regulator subassembly (Quantity 1 set)
412. Hexagon socket head bolt (Quantity 2)
413. Hexagon socket head bolt (Quantity 2)
437. Hexagon socket head bolt (Quantity 5)
438. Hexagon socket head bolt (Quantity 4)
439. Hexagon socket head bolt (Quantity 4)
466. ROH plug (Quantity 1)
496. Insert plug (Quantity 8)
497. MH plug (Quantity 3)
601. Casing B (Quantity 1)
611. Feedback lever (Quantity 1)
612. Lever (1) (Quantity 1)
613. Lever (2) (Quantity 1)
614. Fulcrum plug (Quantity 1)
615. Adjusting plug (Quantity 1)
616. Loosening prevention plug (Quantity 2)
621. Compensation piston (Quantity 1)
622. Piston case (Quantity 1)
623. Compensation rod (Quantity 1)
624. Spring seating C (Quantity 1)
625. Outer spring (Quantity 1)
626. Inner spring (Quantity 1)
627. Adjusting ring C (Quantity 1)
628. Adjusting screw C (Quantity 1)
629. Cover C (Quantity 1)
630. Lock nut (Quantity 1)
631. Pf sleeve (Quantity 1)
641. Pilot cover B (Quantity 1)
643. Pilot piston (Quantity 1)
644. Spring seating Q (Quantity 1)
645. Adjusting ring Q (Quantity 1)
646. Pilot spring (Quantity 1)
651. Sleeve (Quantity 1)
652. Spool (Quantity 1)
653. Spring seating (Quantity 1)
654. Return spring (Quantity 1)
655. Set spring (Quantity 1)
656. Valve casing (Quantity 1)
708. O-ring (Quantity 1)
724. O-ring (Quantity 7)
726. O-ring (Quantity 2)
728. O-ring (Quantity 1)
730. O-ring (Quantity 2)
734. O-ring (Quantity 1)
753. O-ring (Quantity 6)
755. O-ring (Quantity 2)
757. O-ring (Quantity 1)
801. Hexagon nut (Quantity 1)
802. Hexagon nut (Quantity 1)
814. Stop ring (Quantity 1)
836. Stop ring (Quantity 1)
874. Pin (Quantity 3)
875. Pin (Quantity 2)
887. Pin (Quantity 1)
897. Pin (Quantity 1)
898. Pin (Quantity 1)
924. Hexagon socket head stop screw (Quantity 1)

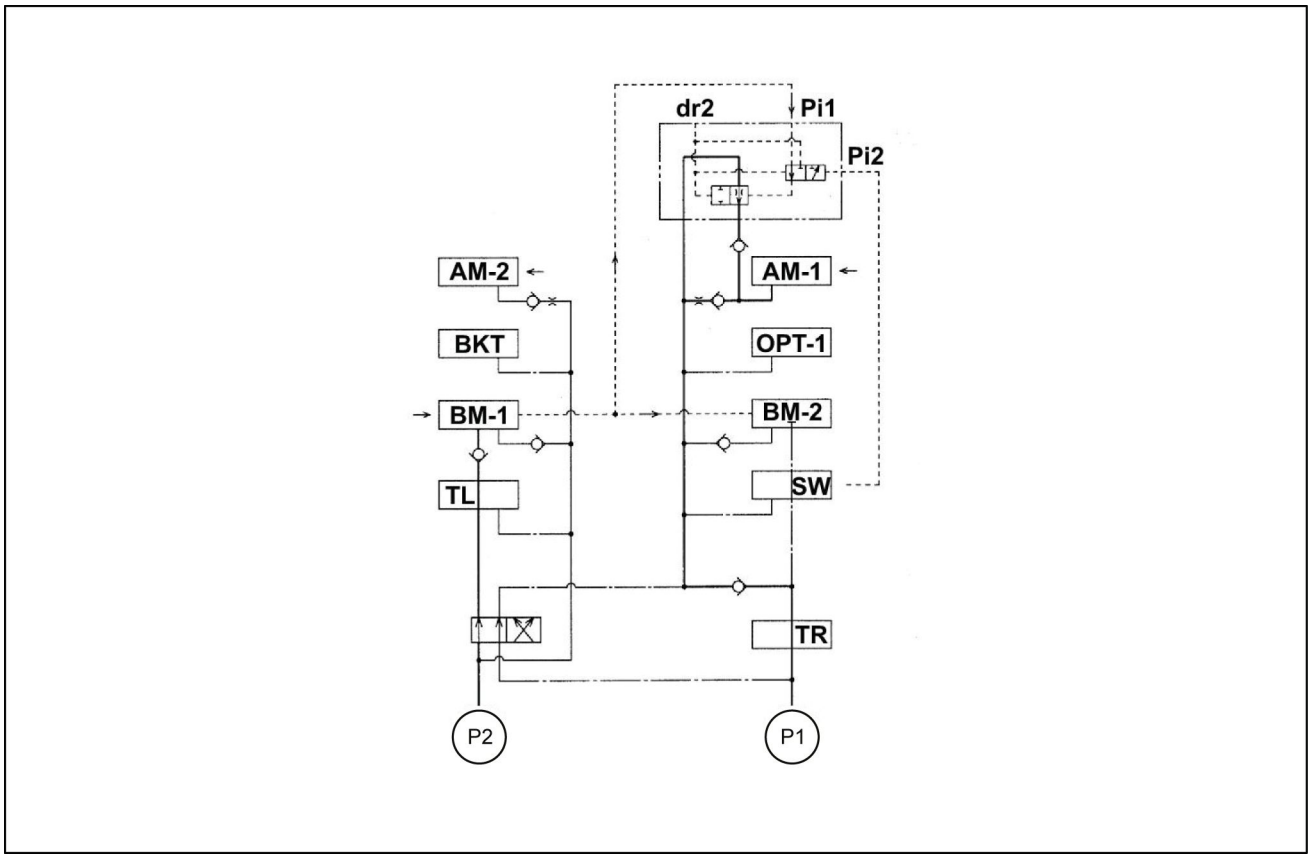


LPIL12CX01786HB 2

1. Valve installation tap

Swing priority circuit

1. Arm-in and boom (up) operation (See Fig. **9**.)
   Through boom-up operation, the plunger switchover pilot pressure operates on the swing priority valve Pi1 port, spool B is switched, and the degree of opening of the path is increased.
   Because the center bypass path is cut-off at upstream boom 2, the oil flowing in from the P1 pump is fed from the parallel oil path giving priority to arm 1, which has a lighter load.
   Because the parallel path is narrowed by orifice C, the oil flowing in from the P2 pump is fed giving priority to boom 1, and the excess oil flows into arm 2 to avoid a sudden change in the arm speed.

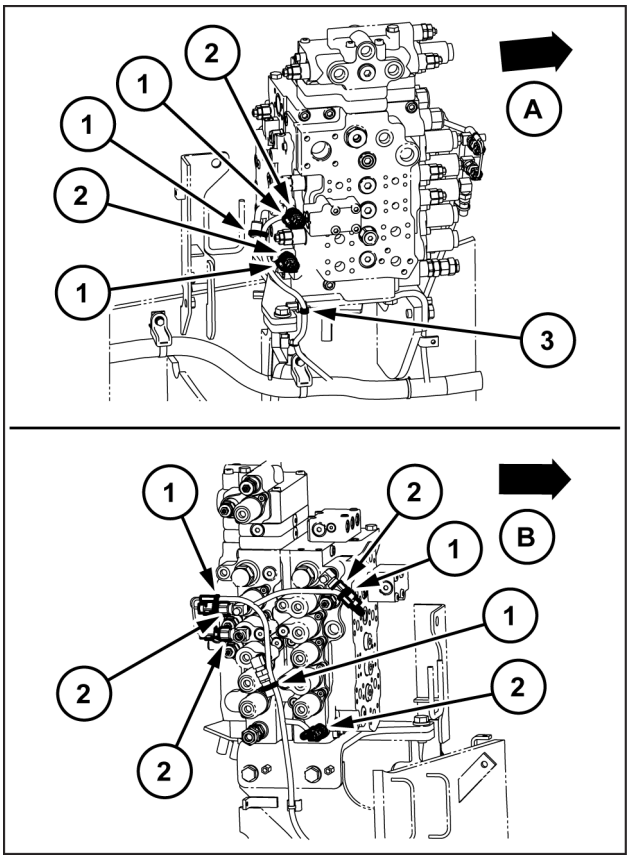


LPIL12CX02212FB 7

5. Cut the 6 wire bands **(1)** to remove the 6 pressure sensors **(2)** from the control valve.
   - Pressure sensor tightening torque: **16 - 20 N·m** (**11.80 - 14.75 lb ft**)
     Remove the bolts **(3)** with a wrench [**13 mm**].
   - Bolt tightening torque: **21.6 - 37.2 N·m** (**15.931 - 27.437 lb ft**)
     Remove the bolt **(4)** with a wrench [**13 mm**].
     Disconnect the 3 connectors **(5)**.

     (A): front

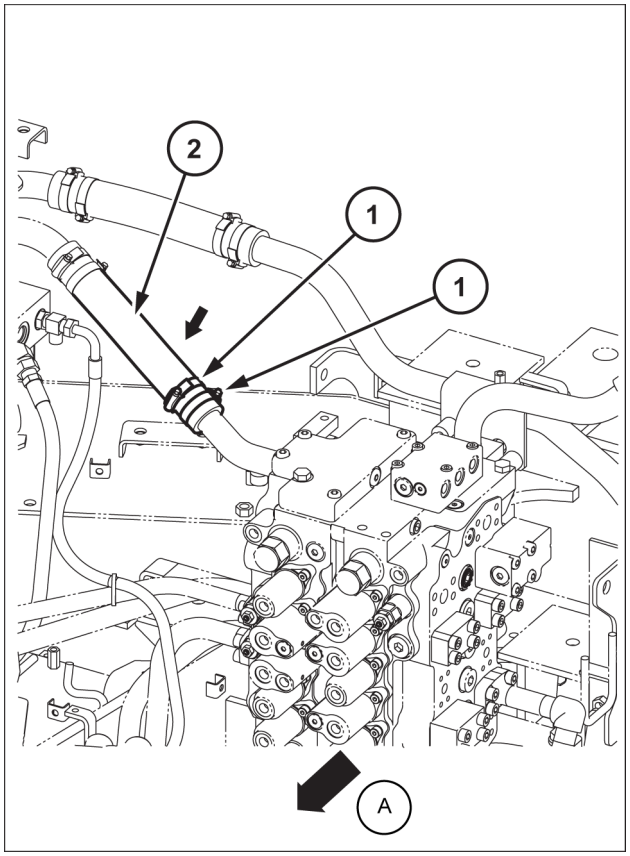
     (B): left



SMIL15CEX6647BB 4

6. Loosen the 2 hose bands **(1)** with a wrench [**7 mm**] to disconnect the hydraulic hose **(2)**.
   - When tightening the hose bands, access them in the direction of the arrow.

     (A): front



SMIL15CEX4396BB 5

Main pressure control valve - Prepare

WARNING:

- Be sure to release hydraulic pressure before beginning work.

CAUTION:

- Be sure to stop the engine before beginning work.

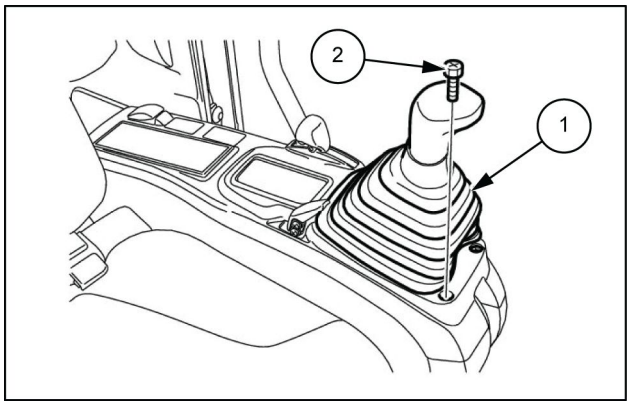
Items to prepare:

- Wrenches [**13 mm**, **17 mm**, **19 mm**, **22 mm**]
- Marking pen
- Cap
- Plug
- Rag
- Cleaning fluid

Code	Part name	Code	Part name
101	Casing (Quantity 1)	217	Washer (Quantity 4)
151	Plate (Quantity 1)	221-1	Return spring (port 1) (Quantity 1)
201	Spool (Quantity 4)	221-2	Return spring (port 3) (Quantity 1)
211	Plug (Quantity 4)	221-3	Return spring (ports 2, 4) (Quantity 2)
212-1	Push rod (ports 1, 3) (Quantity 2)	241-1	Secondary pressure spring (ports 1, 3) (Quantity 2)
212-2	Push rod (ports 2, 4) (Quantity 2)	241-2	Secondary pressure spring (ports 2, 4) (Quantity 2)
213	Seal (Quantity 4)	301	Joint (Quantity 1)
214	O-ring (Quantity 4)	302	Disk (Quantity 1)
216-1	Spring seating (ports 1, 3) (Quantity 2)	312	Adjusting nut (Quantity 1)
216-2	Spring seating (ports 2, 4) (Quantity 2)	501	Bellows (Quantity 1)

Code	Screw size	Tightening torque
301	**M14**	**44.2 - 50.0 N·m** (**32.600 - 36.878 lb ft**)
302 312	**M14**	**63.7 - 73.5 N·m** (**46.983 - 54.211 lb ft**)

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



LPIL12CX01905AB 13

Hand control valve - Troubleshooting

Problem	Possible Cause	Correction
Secondary pressure is not rising	Primary pressure is insufficient	Maintain primary pressure
	Secondary pressure spring **(241)** is broken or worn	Replace with new part
	The gap between spool **(201)** and the casing **(101)** is abnormally large	Replace with the remote control valve unit
	There is backlash in the handle section	Assemble/disassemble and replace the handle section
Secondary pressure is unstable	Sliding parts are sticking	Repair the sticking sections
	Tank line pressure is variable	Return directly to the oil tank
	Air is getting into lines	Perform operation several times and bleed out air
Secondary pressure is high	Tank line pressure is high	Return directly to the oil tank
	Sliding parts are sticking	Repair the sticking sections

24. Cleaning parts
    - Clean all parts by placing them in a rough cleaning container filled with white kerosene. (rough cleaning).
    - Scratching can easily occur if cleaning of parts is begun just after parts are immersed in white kerosene, so let each part sit in white kerosene until debris and grease sufficiently loosen off from the surface of parts and float to the surface.
    - If the white kerosene is dirty, this will encourage damage to parts and result in reduced performance after reassembly.
      Thoroughly manage the level of cleanliness of the white kerosene.
    - Clean each part by placing it in a finish cleaning container filled with white kerosene, and thoroughly clean each part, including the interior, while slowly rotating it. (finish cleaning)
      Use a clean rag to thoroughly remove any white kerosene stuck to parts.
    - Do not dry parts with compressed air, as this will damage parts and cause rust to form due to debris and moisture being dispersed into the atmosphere.
    - Preventing rust on parts
      Apply an anti-rust agent to each part.
      Rust will form on parts if they are left as is after cleaning, and this will cause reduced performance of functions after reassembly.

The g chamber pressure operates on pressurized areas A3 and A4 of the piston **(302)**.

When this hydraulic pressure becomes larger than the load on the spring **(321)**, the piston starts to move to the left.

At this time, the oil in the h chamber formed between the piston and the adjusting plug **(401)** is discharged into the g chamber via the orifice n set up on the piston **(302)** while the piston moves to the left, so the h chamber functions as a damping chamber.

Through this, the spring load gradually increases until the piston reaches the adjusting plug end section and the relief pressure P rises smoothly.

3. State shown in **(4)** (Fig. **4**)

   When the piston **(302)** reaches the adjusting plug **(401)** end section, it does not move farther to the left, so the constant relief state is reached and the relief pressure is held at P2.

   Through the processes **(1)** - **(4)** above, the relief pressure varies as in Fig. **5**.

Operation explanation for when the relief valve is depressurized

In the case where the P port pressure falls, the P port pressure and the g chamber pressure fall together to the tank pressure when the pressurization of the P port ends.

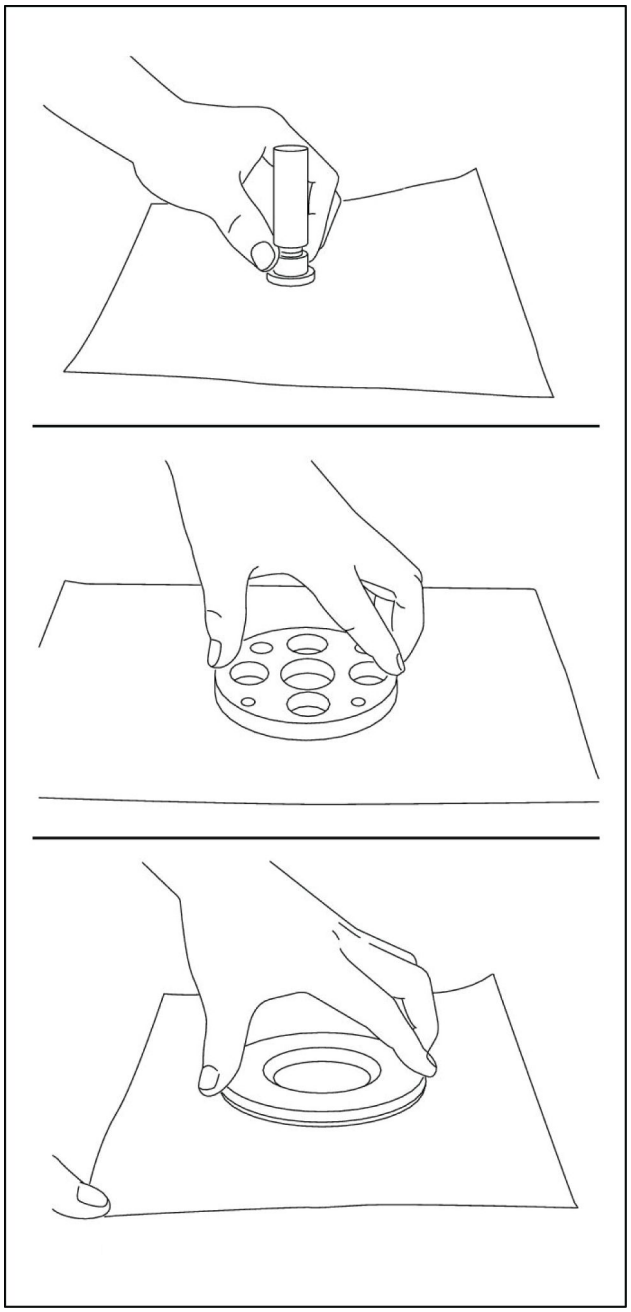
Through this process, the plunger **(301)** which was open moves to the left and is placed in the seat **(401)**.

At the same time, the piston **(302)** also is moved to the right by the spring **(321)** and returns to the state in **(1)** (Fig. **4**).

Swing reduction motor - Pre-assemble

Execute the following preparations before reassembly.

1. Check each part for scratches from use or from disassembly. If there are any scratches, remove them with a whetstone or sandpaper of the necessary grain, clean with cleaning oil, then dry off with an air blower.
   - Replace seal parts with new ones.
   - Lap the sliding surfaces of the piston assemblies **(8)**, balance plate **(22)**, and cam plate **(6)** on a surface plate with No. 2000 sandpaper.
   - When assembling sliding sections, apply clean hydraulic oil before assembling.
   - When installing piston assemblies **(8)** in the cylinder **(25)** piston holes, put the piston assemblies in the same holes they were in before disassembly.



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3. Self-travel prevention function

If the hydraulic motor is rotated by an external force during normal operation, self-travel will occur.

For example, this occurs when going down a sharp incline when using as the power shovel travel motor.

The following explains the mechanism for preventing this phenomenon.

The hydraulic motor is being rotated by an external force during normal operation. The pressure of the hydraulic oil (A port or B port) being fed is reduced.

If the pressure approaches a state where self-travel begins, the spool **(323)** begins to move to a central neutral position.

The area of the hydraulic oil path from the D port to the B port of the exit-side of the hydraulic motor is reduced, according to the amount of movement of the spool.

The flow amount of the hydraulic oil discharged from the D port to the B port is also restricted.

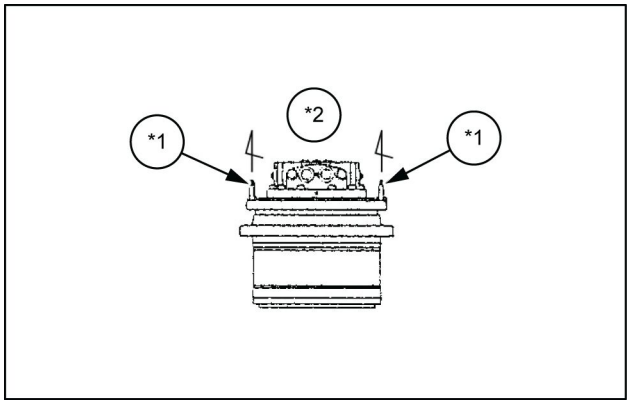
At the same time, the D port pressure (back pressure) is raised.

In this way, by controlling the hydraulic motor exit port flow amount and pressure, the self-travel phenomenon is prevented.

Travel motor - Service instruction - Precautions before motor disassembly

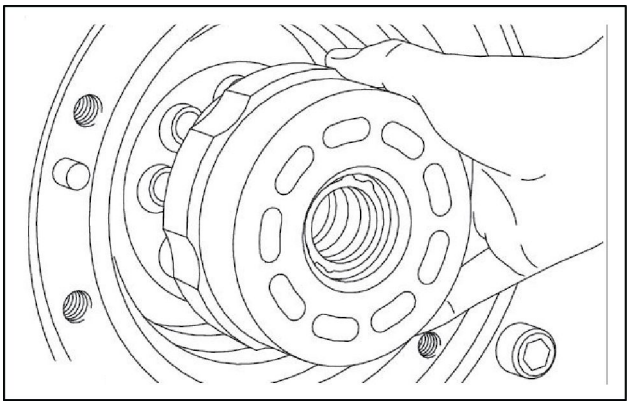
Begin motor disassembly only after thoroughly reading the precautions below:

1. When performing disassembly, always wear protective gear such as a helmet, goggles and safety shoes.
2. Use the specified tools when performing disassembly.
3. Remove all lines connected to the motor and remove the motor from the machine only after making sure that the machine is on a level surface and there are no external forces acting on rotating parts, so that the machine does not operate uncontrollably when the motor is removed.
4. To prevent foreign matter from entering the lines and motor when removing the motor from the machine, sufficiently clean off mud and dirt adhered around the motor before removing lines connected to the motor.
5. When removing lines connected to the motor, hydraulic oil from inside the lines will spray out. For this reason, remove these lines only after removing pressure from inside the lines and preparing an oil pan.
   To prevent injuries due to the motor falling when transporting it by lifting **(*2)** the motor with a liftcrane, lift the machine with the eyebolts **(*1)** mounted in the positions indicated in the Fig. **1**.
6. The motor is filled with hydraulic oil.
   Before disassembling the motor, prepare an oil pan and drain the hydraulic oil from the motor.
7. To prevent injuries during disassembly, prepare a waist-high, stable work platform to perform work on.
8. The motor comprises high-precision parts.
   For this reason, foreign matter adhering to parts can be damaging.
   Motor disassembly should be done in an inside space without dust, and mud and dirt should be prevented from adhering to parts.
9. The motor comprises high-precision parts.
   For this reason, dents and scratches on part surfaces can be damaging.
   Be very careful when handling parts during disassembly and do not create any dents or scratching.
10. To prevent personal injury and damage to parts during disassembly, do not force disassembly of parts which are especially tight to disassemble.



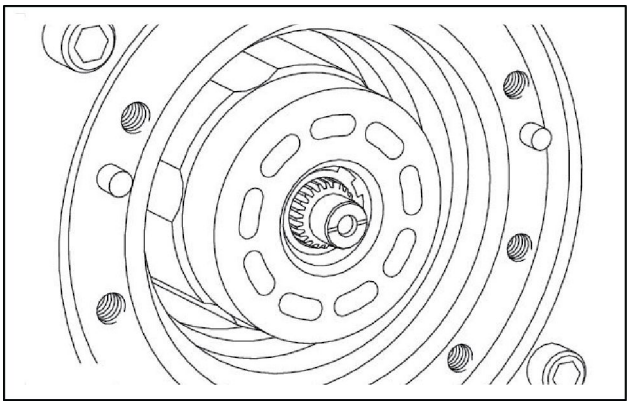
LPIL12CX01036AB 1

4. Insert the cylinder block **(104)** into the shaft **(102)**.
   - Align the spline hole with the spline shaft of the shaft and insert the cylinder block.



LPIL12CX02520AA 21

5. After attaching the cylinder block **(104)**, rotate the cylinder block by hand and check that there is no backlash. Inspect if there is backlash.
   - Do not lift the cylinder block up after attachment. Lifting will cause the thrust ball **(108)** to become misaligned and rotation will not be normal.

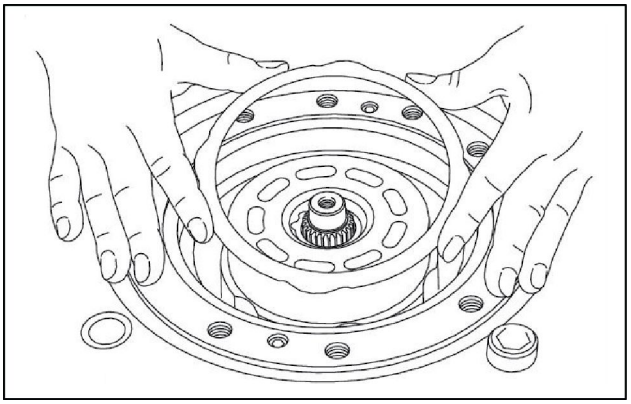


LPIL12CX02521AA 22

Assembly of parking brake section

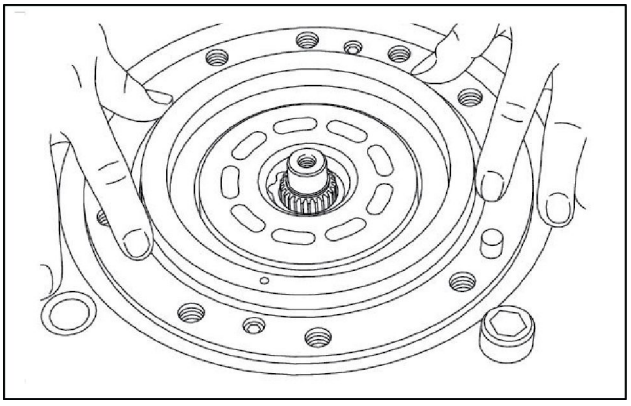
- Install the friction plates **(115)** after immersing them in hydraulic oil.

1. Tilt the work platform **90 °**.
2. Alternately install the 4 partner plates **(116)** and 3 friction plates **(115)** into the cylinder block **(104)**.
3. Install the O-rings **(135)** and **(139)** into the piston **(112)** O-ring groove. At this time, apply a thin layer of grease to the O-rings **(135)** and **(139)**.



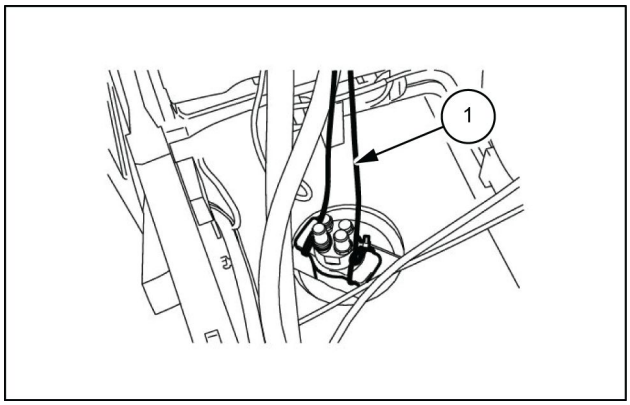
LPIL12CX02522AA 23

4. Install the piston **(112)** into the spindle **(2)**.
   - If it is difficult to insert the piston into the spindle due to resistance caused by the O-rings **(135)** and **(139)**, lightly strike the end surface of the piston with a plastic hammer to insert it. Be careful not to scratch the O-rings when installing the piston.



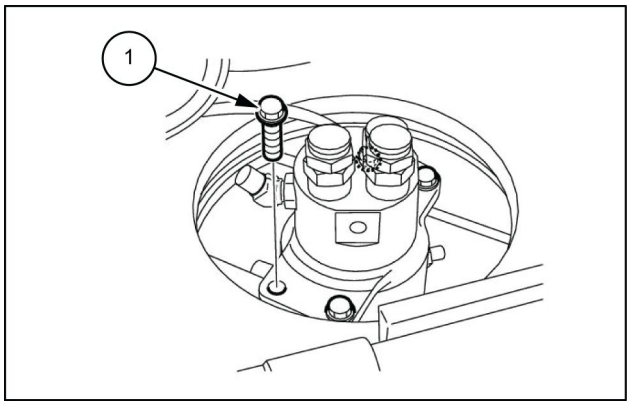
LPIL12CX02523AA 24

9. Wrap wire ropes **(1)** around the center joint and suspend it with a liftcrane so that the center joint does not fall during removal and installation operations.



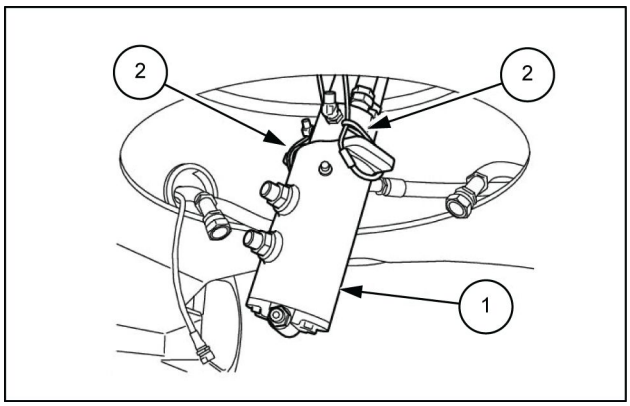
LPIL12CX01592AB 9

10. Use a wrench [**19 mm**] to remove the 4 bolts **(1)** from the center joint.



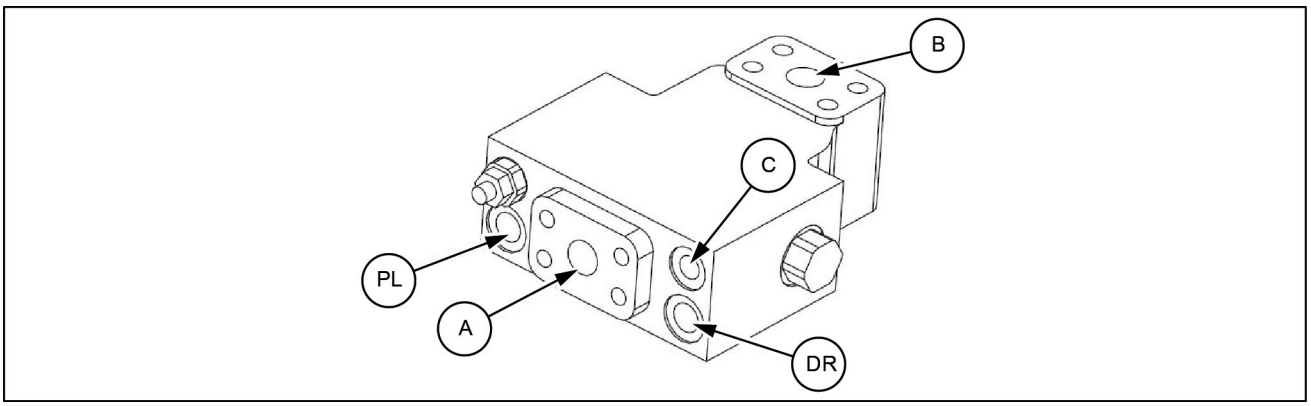
LPIL12CX01593AB 10

11. Use the wire ropes **(2)** and liftcrane to lift the center joint **(1)**.
Thoroughly check that the location is safe before lowering the center joint on wood planks.



LPIL12CX01594AB 11

Boom lifting cylinder holding valve - Overview



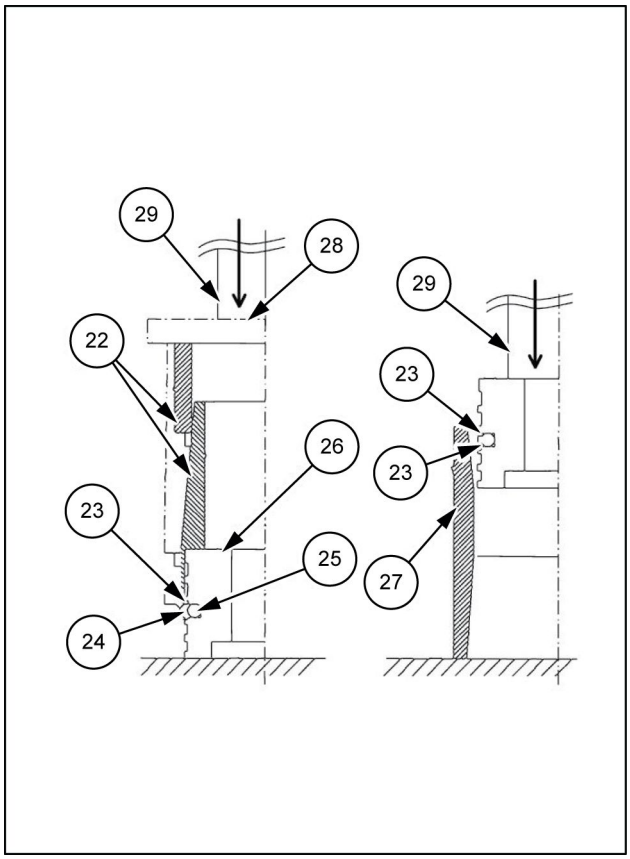
LPIL12CX02926EB 1

B port opening side

Port	Port size	Remarks
A	SAE 6000psi 3/4	
B	SAE 6000psi 3/4	
C	**G1/4**	
DR	**G3/8**	
PL	**G3/8**	Boom HBCV
	G1/4	Arm HBCV

Assembly of piston assembly

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



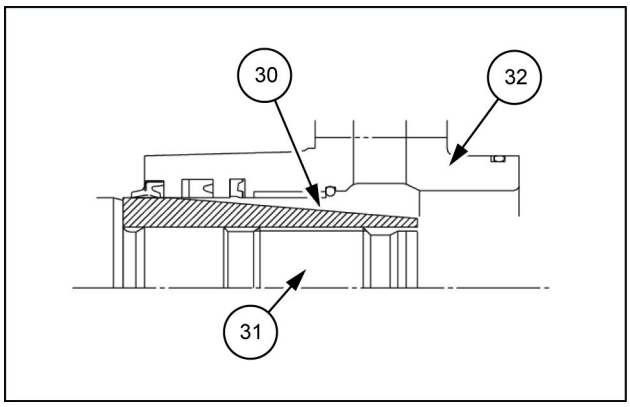
LPIL12CX02943BB 6

Assembly of piston rod assembly

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

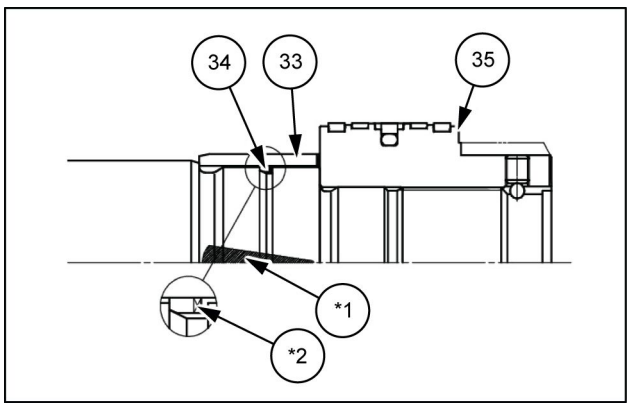
   28. Metal block

   29. Press



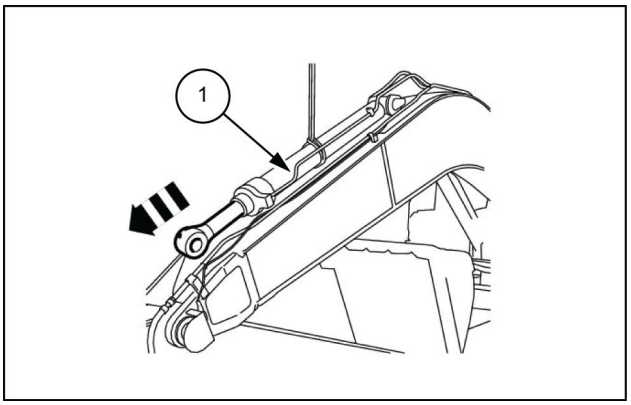
LPIL12CX02944AB 7

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



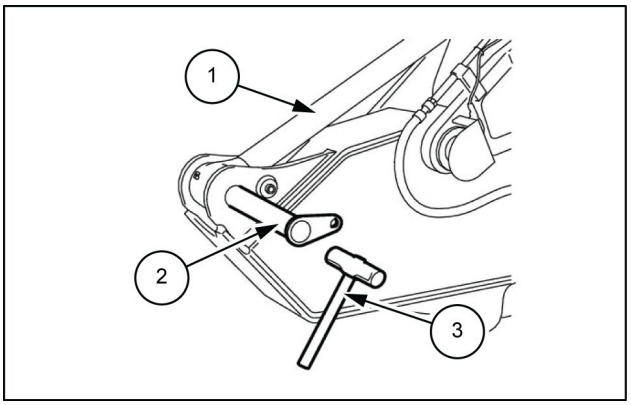
LPIL12CX02945AB 8

8. Start the engine, move the arm in at idle, and extend the arm cylinder **(1)** rod.



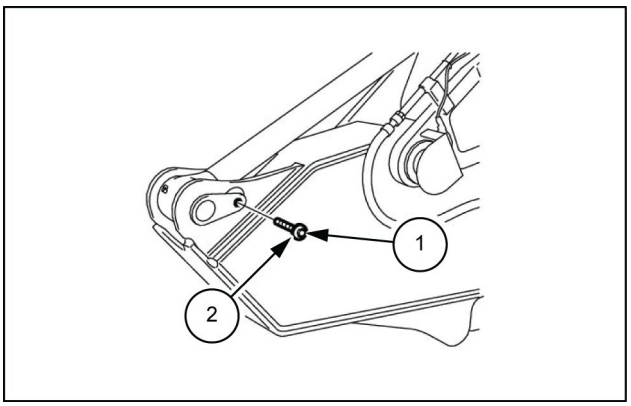
LPIL12CX01566AB 8

9. Align the arm cylinder **(1)** with the arm pin hole and use a hammer **(3)** to insert the pin **(2)**.
   Be careful. The arm and arm cylinder rod may come out of place at this time.



LPIL12CX01567AB 9

10. Use a wrench [**19 mm**] to tighten the bolt **(1)** and washer **(2)**.
    - Grease up



LPIL12CX01568AB 10

Index

Hydraulic systems - 35

Dozer blade cylinders - 741

Blade lifting cylinder - Sectional view 3

Contents

Tracks and track suspension - 48

Tracks - 100

TECHNICAL DATA

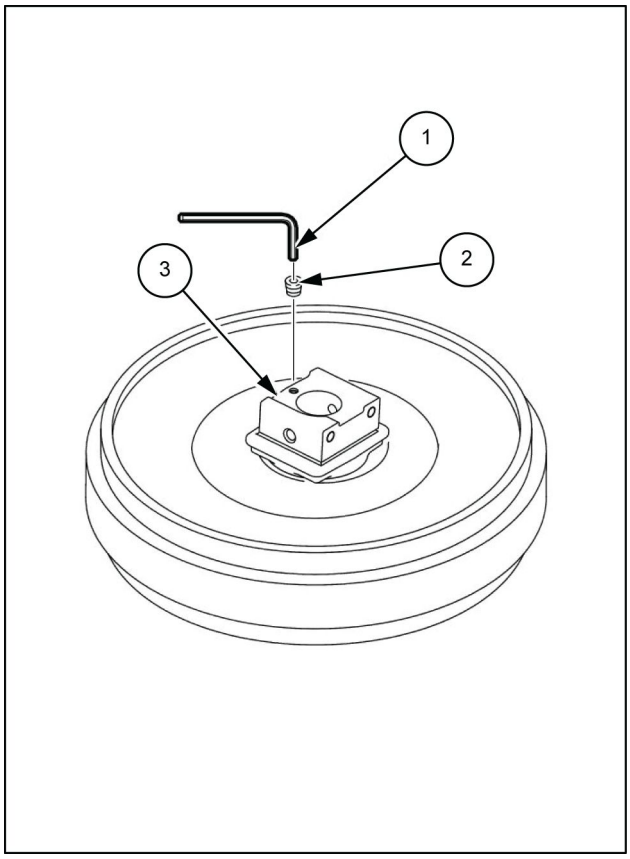
Track chain
Service limits 3

SERVICE

Track chain
Prepare 4
Remove 5
Install 7
Prepare – Shoe plate 9
Remove – Shoe plate 10
Install – Shoe plate 11

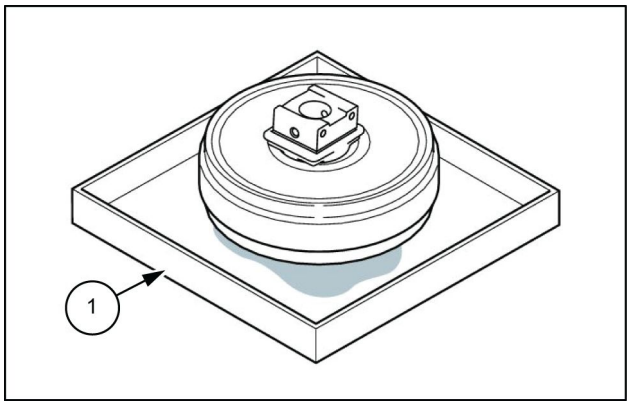
Idler wheel - Disassemble

1. After cleaning the roller with kerosene, use the hexagon wrench **(1)** to remove the plug **(2)** from the hub **(3)**.
   - The plug is coated with seal nylon, which comes off when the plug is removed. Seal tape is necessary for reusing.



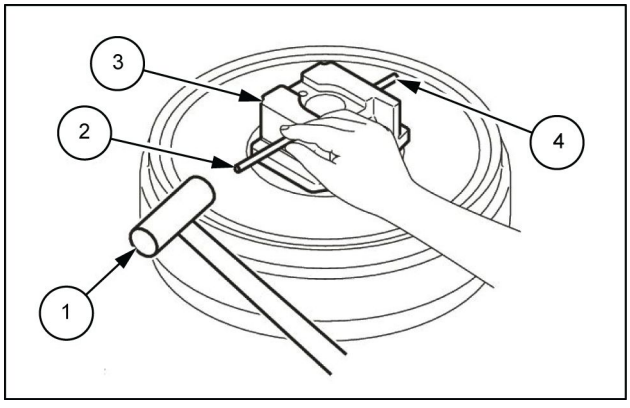
LPIL12CX01172BB 1

2. Face down the part of the roller from which the plug was removed and empty the oil from within the roller.
   - It may take a few hours to completely empty the oil.
   - Place an oil pan **(1)** underneath to catch the oil.



LPIL12CX01173AB 2

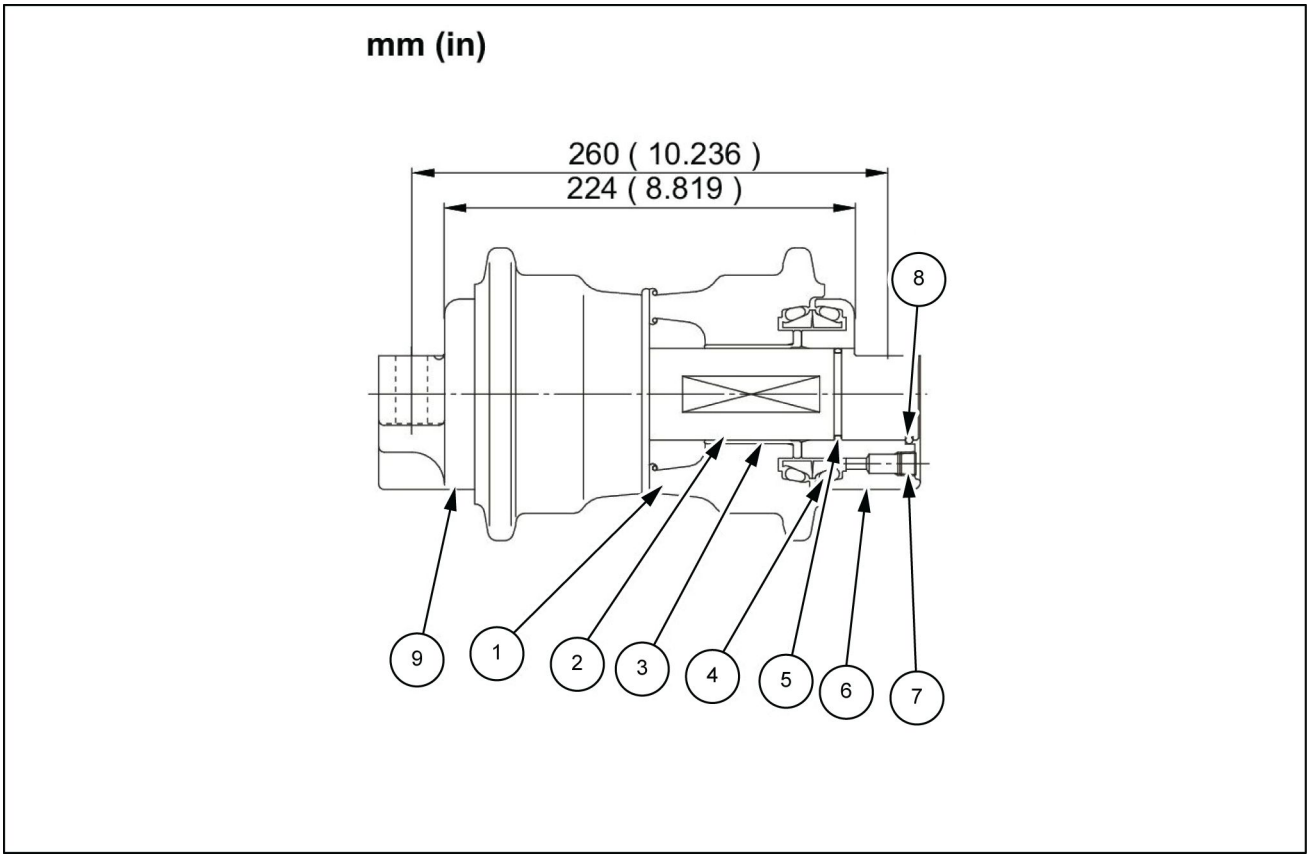
3. Use the hammer **(1)** and pin removal jig **(2)** to remove the hub pin **(4)** from the hub **(3)**.
   - Securely fasten the roller before doing this work.
   - As it is very securely fixed, apply lubricant before beginning work.



LPIL12CX02636AB 3

Track frame roller - Sectional view

Dimension diagram



LPIL12CX02627FB 1

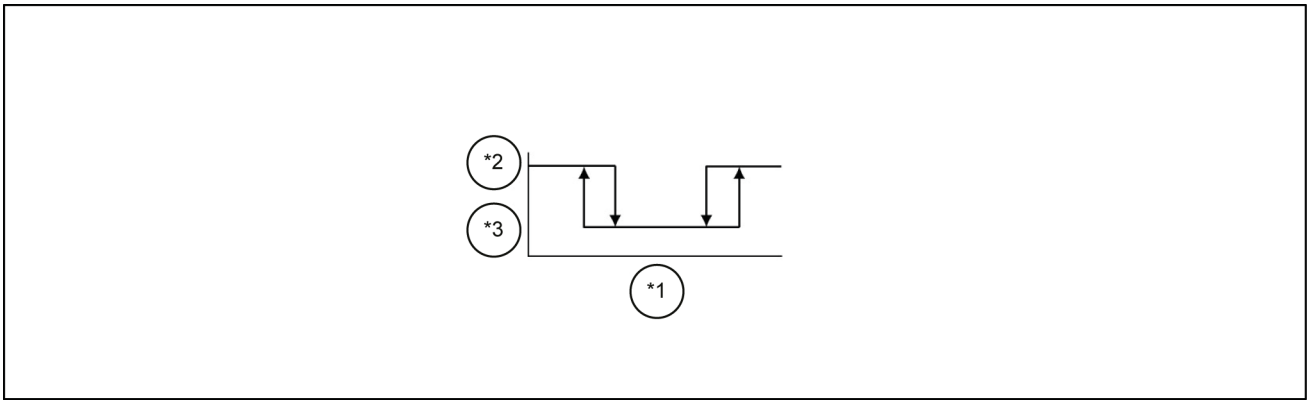
NOTE: *All the dimensions are in mm (in)*

Index

Tracks and track suspension - 48

Track rollers - 138

Track frame roller - Assemble 22
Track frame roller - Dimension 4
Track frame roller - Disassemble 18
Track frame roller - Exploded view 9
Track frame roller - Install 16
Track frame roller - Prepare 13
Track frame roller - Prepare – For disassembling 17
Track frame roller - Remove 14
Track frame roller - Sectional view 10
Track frame roller - Service limits 3
Track frame roller - Special tools 5
Track support roller - Assemble 33
Track support roller - Dimension 7
Track support roller - Disassemble 30
Track support roller - Exploded view 11
Track support roller - Install 27
Track support roller - Prepare 25
Track support roller - Prepare – For disassembling 29
Track support roller - Remove 26
Track support roller - Sectional view 12
Track support roller - Service limits 6
Track support roller - Special tools 8



LPIL12CX02288EB 3

*1. Target blow temperature
*2. Control mode 1
*3. Control mode 2

Fletching prevention function

1. Operation conditions
   After the end of initial operation, if **4 - 5 min**. continue with the air flow M3 or higher and the compressor clutch not coming “ON” even once, the compressor clutch is switched “ON” one time.
   This control is cleared by the vehicle main key power supply being switched “OFF” and this control starts again when this power supply is switched “ON” again.
2. This control takes priority over all other control.

AUTO switch link function

When operation of the AUTO switch is recognized, compressor clutch control comes “ON” and “AUTO” is displayed.

1. Compressor clutch control is the same control as for the AC switch being switched “ON”.
2. When it is recognized that the AC switch has been switched “OFF”, the “AUTO” display goes out.
   Even when it is recognized that the AC switch has been switched “ON” again, “AUTO” is not displayed.

However, at this time, if the main key power supply is switched “OFF”, then “ON” again, since the AC “ON”, air flow “AUTO”, and blow mode “AUTO” conditions are all met, “AUTO” is displayed.

COOLMAX control and HOTMAX control

When the set temperature is **18 °C** (**64.4 °F**) [COOLMAX] (or 18.E)

1. The air mix motor actuator is set to the 0° limiter position (fully closed).
2. For auto air flow control, the air flow is set to “Hi”.
3. For “AUTO” blow mode control, the blow mode is set to “VENT”.

When the set temperature is **32.0 °C** (**89.6 °F**) [HOTMAX] (or 32.E)

1. The air mix motor actuator is set to the 90° limiter position (fully open).
2. For auto air flow control, the air flow is set to M4.
3. For “AUTO” blow mode control, the blow mode is set to “FOOT”.

Abnormality detection and control after abnormality detected

Summary explanation

If there is an abnormality in a motor actuator drive line or sensor computer input circuit, the abnormality is detected and control after detection is performed as described below.

Air-conditioning condenser - Install

To install, perform the reverse of the removal procedure.

Tighten the lines and bolts to the specified torque.

If the torque is not specified for a bolt, see **Torque – Special torque settings ()**.

Make sure to resupply and check the compressor oil quantity.

The compressor contains **135 cm³** (**8.24 in³**) of oil.

The oil quantity being low will cause compressor seizing and a reduction in durability. The oil quantity being high will cause a reduction in cooling capabilities.

Make sure to check the oil quantity and adjust if needed.

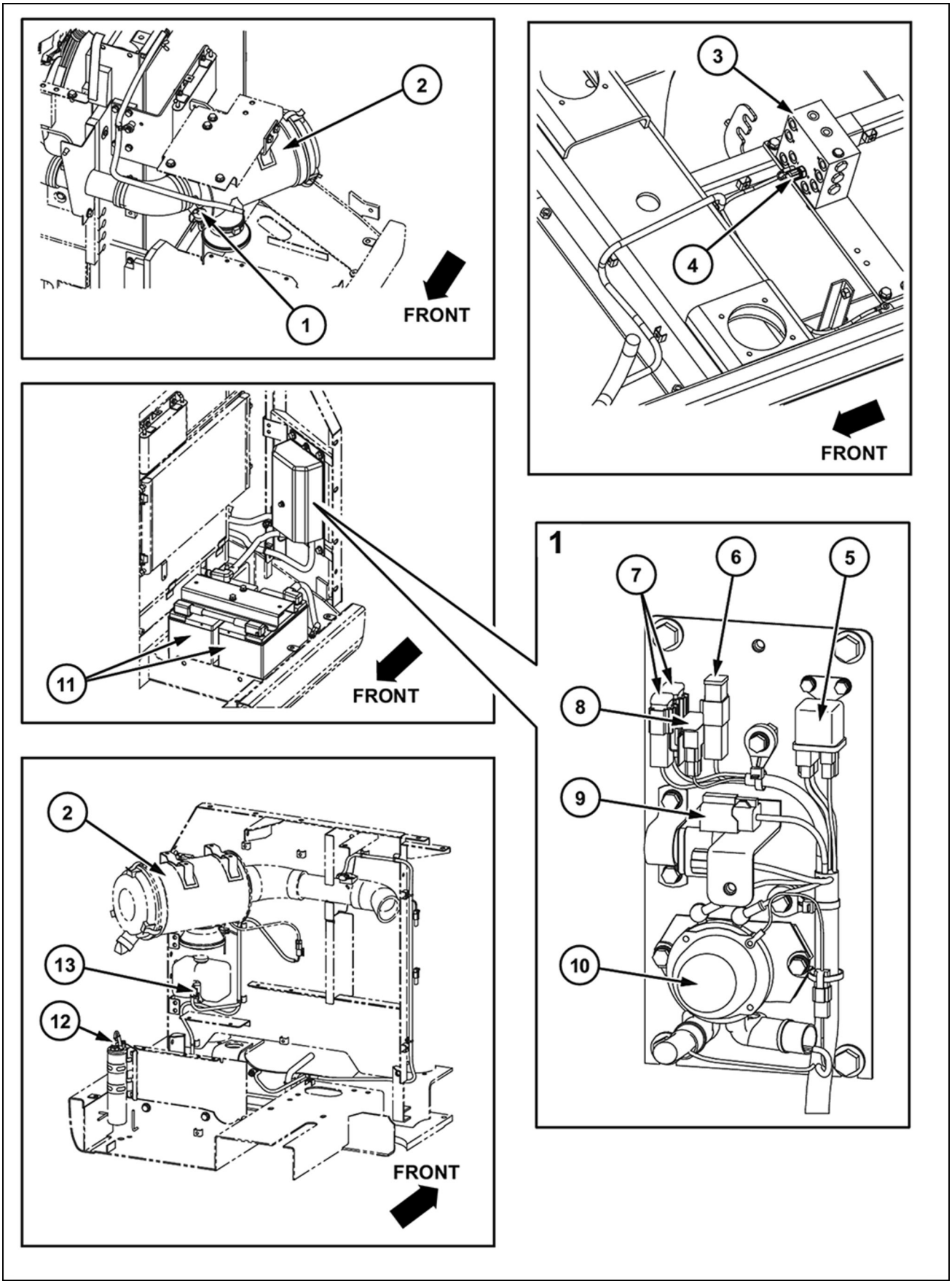
Resupply quantity: **40 cm³** (**2.44 in³**)

Resupply oil: **SANDEN SP-10 LUBRICANT** or **PAG SP20**

Perform air-conditioner gas charging. For details, see **Air conditioning - Filling (50.200)**.

Electrical system - Component localization

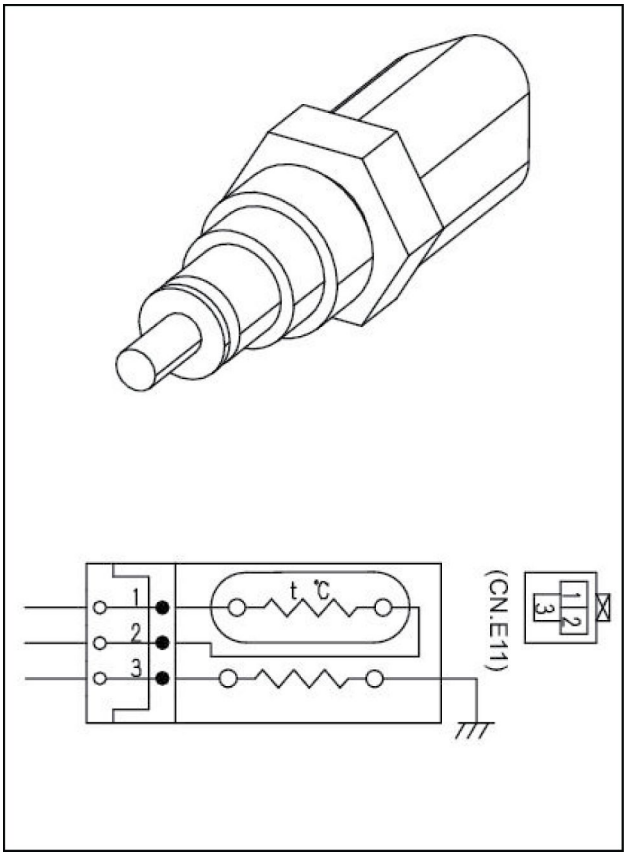
Main unit left side layout diagram (radiator chamber)



SMPH15CEX4870HB 1

Name: Engine coolant temperature sensor

Part No.: 898156-6480

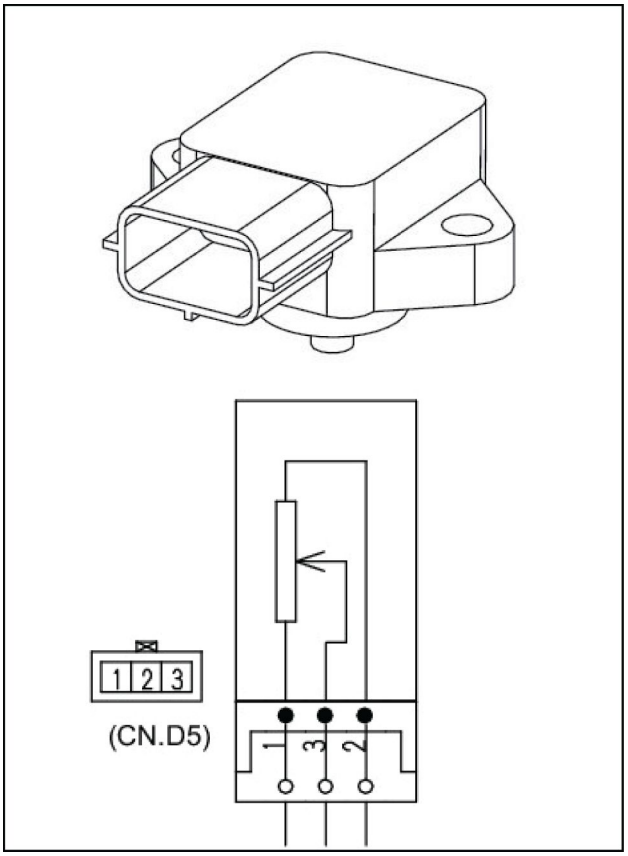


LPIL12CX03135BA 27

Name: Barometric pressure sensor

Isuzu Part No.: 897217-7780

Part No.: KHH0536

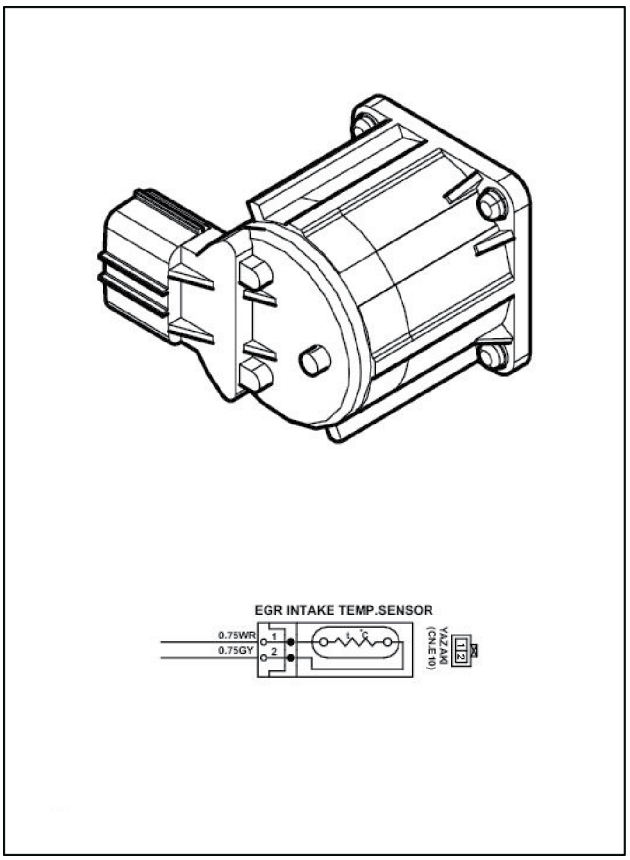


LPIL12CX03136BA 28

Name: EGR manifold temperature sensor (Isuzu)

Isuzu Part No.: -

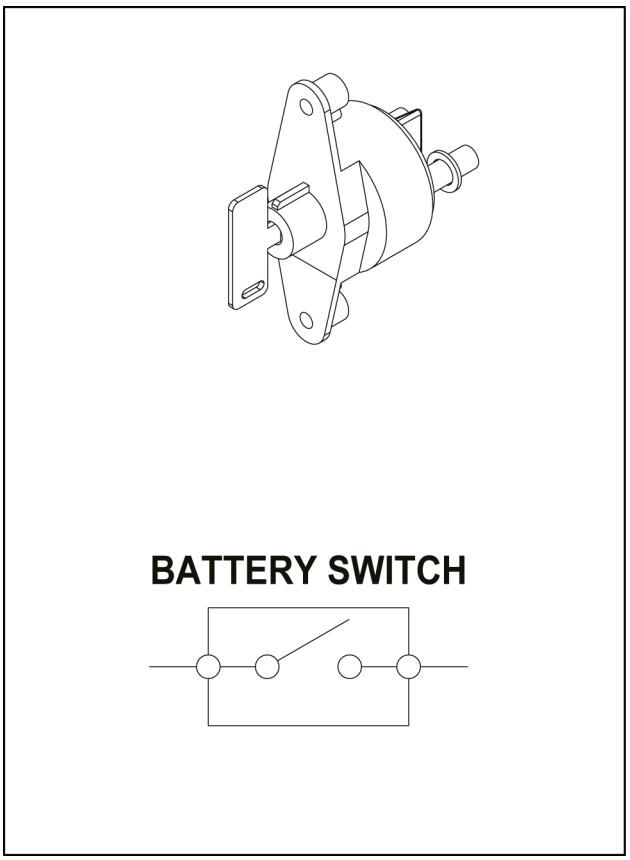
Part No.: -



LPIL12CX00826BA 81

Name: Battery switch

Part No.: KHR32760



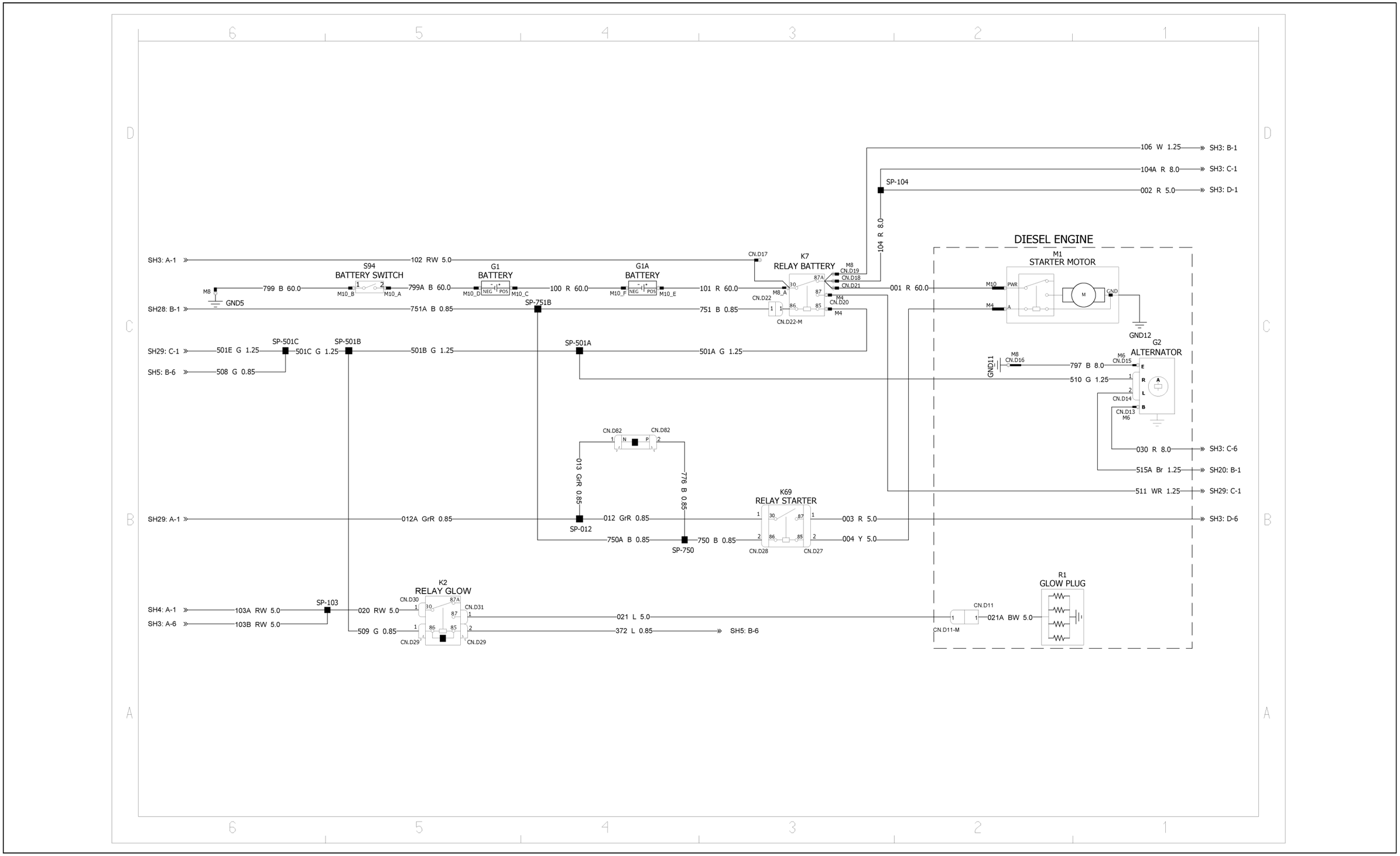
SMIL14CEX4810BA 82

Console

*1. White adhesive tape
*2. Red adhesive tape
*3. Blue adhesive tape
*4. Plate position

a. CN. B17F must be fastened with red tape.
b. CN. F7F must be fastened with red tape.
c. CN. B18F must be fastened with red tape.
d. CN. B28F must be fastened with red tape.
e. The terminals (CN. B13F, 14F, 15F) must be fastened with red tape.
f. CN. B26F must be fastened with red tape.
g. CN. B29F must be fastened with red tape.
h. CN. B6F must be fastened with red tape.
i. CN. B27F must be fastened with red tape.

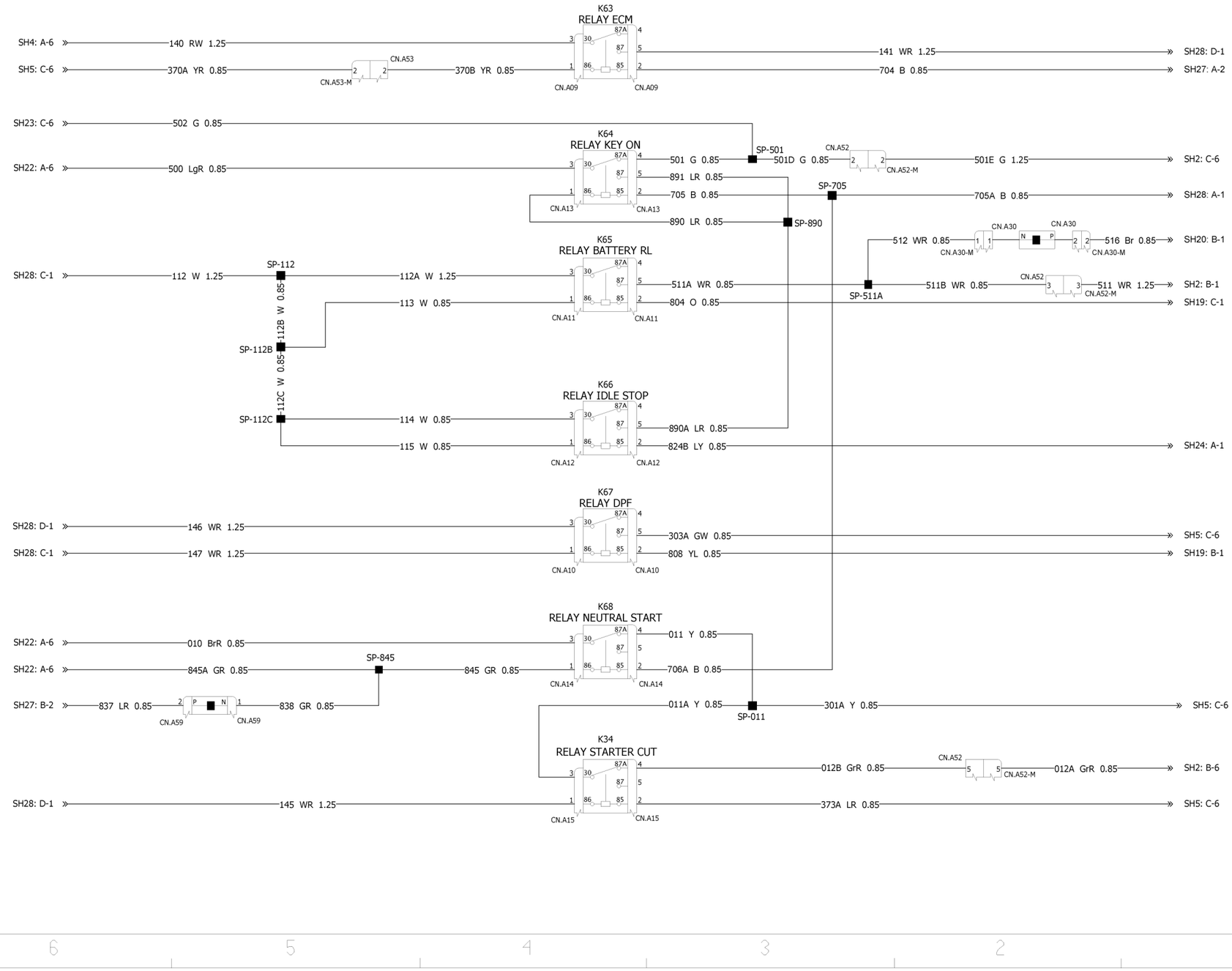
CN.A46F	Cab main harness: A	CN.B15F	12 V: IGN
CN.A47F	Cab main harness: B	CN.B16M	12 V: GND
CN.A48F	Cab main harness: C	CN.B17F	Suspension seat
CN.A49F	Cab main harness: D	CN.B18F	Diode: Seat
CN.B1F	Starter switch	CN.B19F	Air conditioner unit: A
CN.B2M	Engine throttle switch	CN.B20F	Air conditioner unit: B
CN.B4F	Knob (R1) switch	CN.B21F	Air conditioner panel: A
CN.B5F	Knob (L1) switch	CN.B22F	Air conditioner GND
CN.B7F	Engine stop switch	CN.B22F	Air conditioner panel: B
CN.B8F	Fan reverse switch	CN.B26F	Knob (R2) switch
CN.B9F	Free swing switch	CN.B27F	Knob (L2) switch
CN.B10F	Beacon switch	CN.B28F	Option (R) switch
CN.B11F	Overload/alarm switch	CN.B29F	Option (L) switch
CN.B12F	Lifting equipmentswitch	CN.D6F	Diode: Gate
CN.B13F	Radio	CN.F7F	Room lamp and radio fuse
CN.B14F	12 V: +B		



SMIL15CEXZ269JA 1

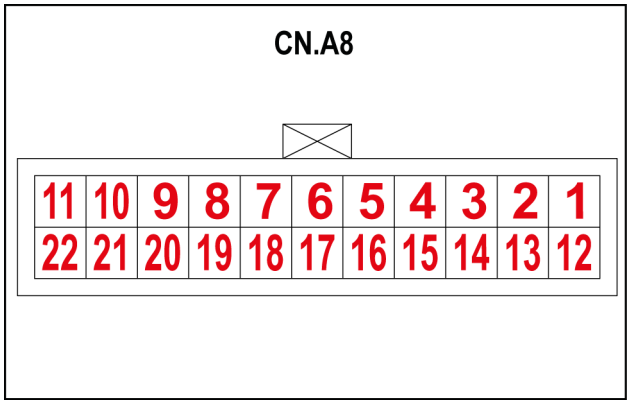
Wiring harnesses - Electrical schematic sheet 16 - Engine-refuel pump

Type	Components	Connectors / link	Description
Switch	B94		1st option pressure switch
Solenoid valve	Y9		Option 2 speed
Solenoid valve	Y25		Option 2 knob (L)-R
Solenoid valve	Y26		Option 2 knob (L)-L
Solenoid valve	Y27		Option Select
Connector	CN.57-1C	**CN.57-1C**	Option Select
Connector	CN.57-2C	**CN.57-2C**	Option 2 speed
Connector	CN.57-3A	**CN.57-3A**	1st option pressure switch
Connector	CN.57-7A	**CN.57-7A**	Option 2 knob (L)-R
Connector	CN.57-8A	**CN.57-8A**	Option 2 knob (L)-L
Connector	CN.57-11	**CN.57-11**	
Connector	CN.57-12	**CN.57-12**	

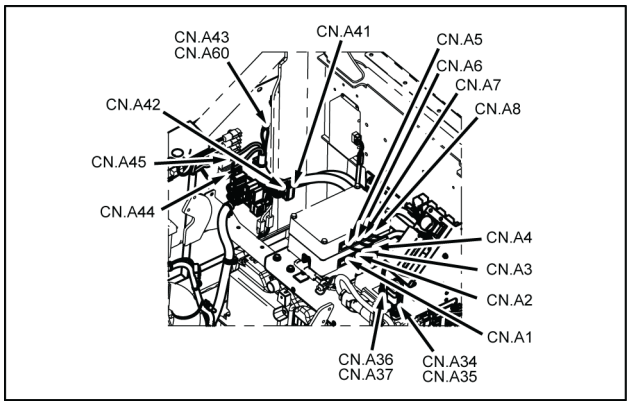


SMIL15CEXZ296JA 1

CONNECTOR CN.A8 – CONTROLLER B (Female)



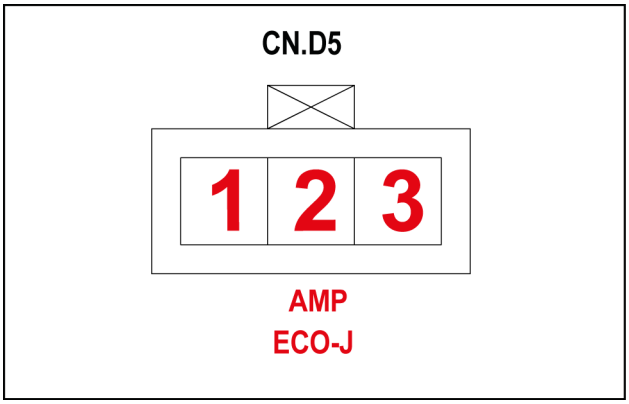
SMIL15CEX3860AA 15



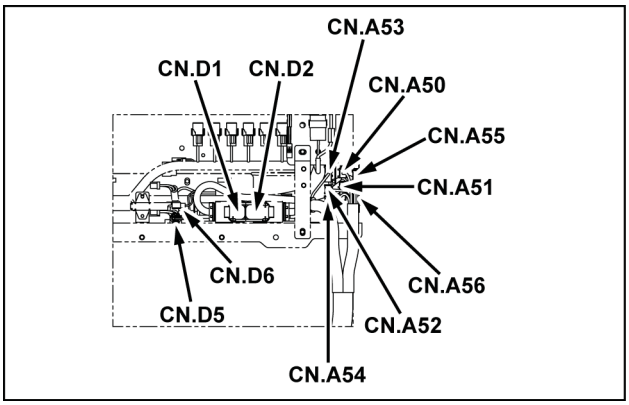
SMIL14CEX4436AA 16

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP-109-P-X	109		W-1.25	**SHEET 21**
2	SP-602-P-X	602		BG-1.25	
3	CN.A55-P-7	813		Lg	
5	SP-702-P-X	702		B-0.85	
7	CN.A55-P-6	812		G	
12	SP-109-P-X	109A		W-1.25	
13	SP-602-P-X	602A		BG-1.25	
16	SP-702-P-X	702A		B-0.85	
17	CN.A56-P-13	818		YL-0.85	
19	CN.A24-P-5	819		WL	

CONNECTOR CN.D5 – BAROMETRIC PRESSURE SENSOR (Female)



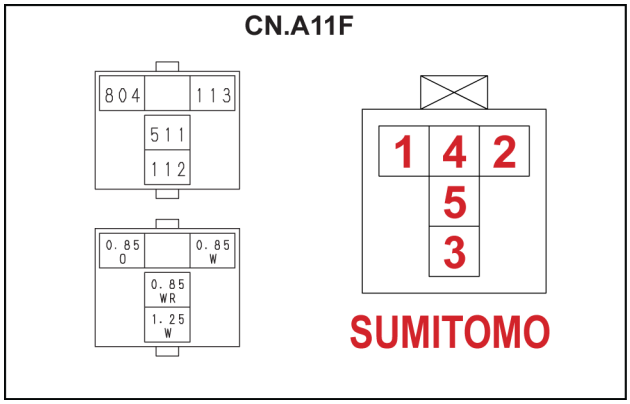
SMIL15CEX3892AA 51



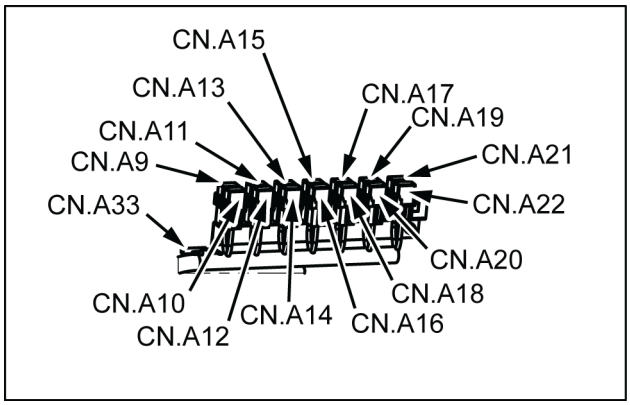
SMIL16CEX0001AA 52

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP-328-P-X	328		WB-0.85	**SHEET 05**
2	SP-330-P-X	330		BW-0.85	
3	CN.D1-P-87	329		YL-0.85	

CONNECTOR CN.A11 – BATTERY REAY (Female)



SMIL14CEX4407AA 3



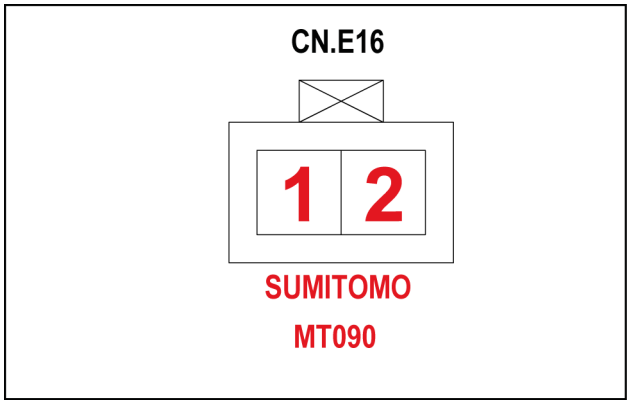
SMIL14CEX4434AA 4

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP-112B-P-X	113		W-0.85	**SHEET 29**
2	CN.A4-P-8	804		O-0.85	**SHEET 19**
3	SP-112-P-X	112A		W-1.25	**SHEET 29**
5	SP-511A-P-X	511A		WR-0.85	

CONNECTOR CN.C14 – CIGAR LIGHTER (Female)

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP-712-P-X	713		B-0.85	**SHEET 25**

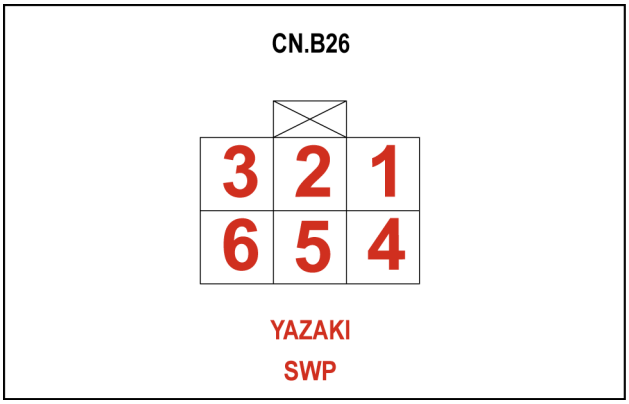
CONNECTOR CN.E16 – INJECTOR 2 (NO. 3) (Female)



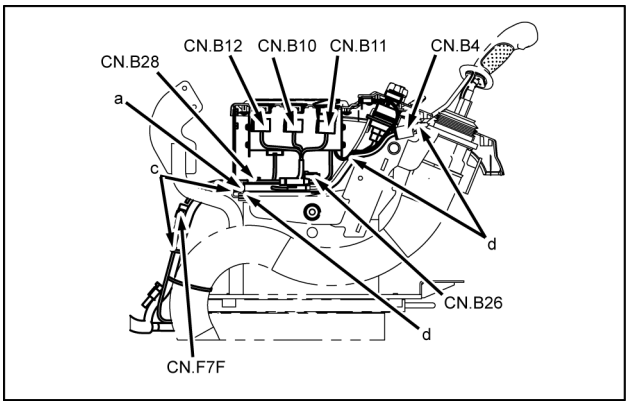
SMIL15CEX2278AA 73

Pin	From	Wire ID	Description	Color-Size	Frame
1	CN.D10-M-P-8	376A		B-1.25	**SHEET 08**
2	CN.D10-M-P-4	377A		WL-1.25	

CONNECTOR CN.B26 – FOR PROPORTIONAL LEVER (Female)



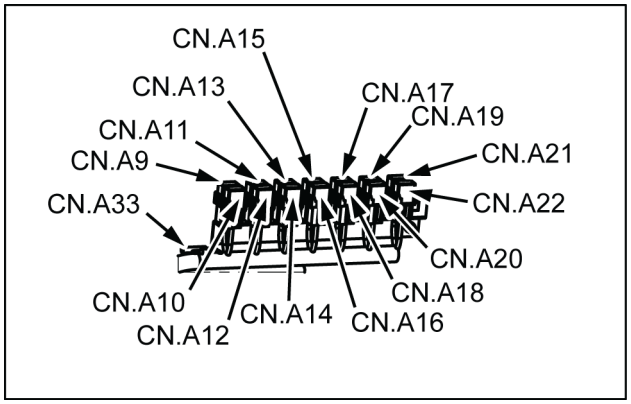
SMIL15CEX9438AA 31



SMIL14CEX4446AA 32

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP-268-P-X	268B		WL-0.85	**SHEET 31**
2	CN.A47-M-P-8	953A		RL-0.85	**SHEET 22**
3	CN.A47-M-P-9	954A		RY-0.85	
4	CN.A47-M-P-10	955A		BW-0.85	
5	CN.A47-M-P-6	554A		VY	
6	SP-625-P-X	732		B-0.85	**SHEET 31**

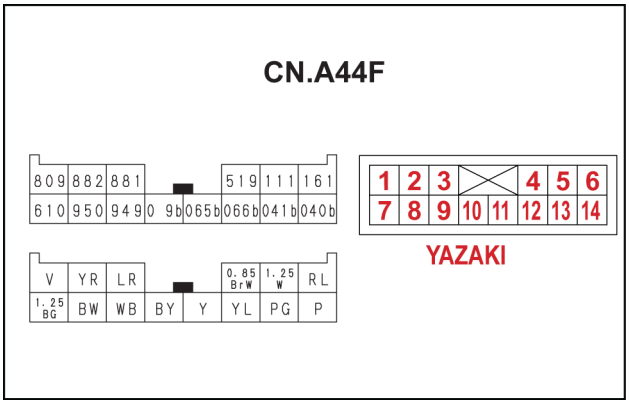
CONNECTOR CN.A33 – IMMOBILIZER (Male)



SMIL14CEX4434AA 4

Pin	From	Wire ID	Description	Color-Size	Frame
1	CN.A42-M-P-19	637		BG	**SHEET 23**

CONNECTOR CN.A44 – CAB HARNESS A (Male)



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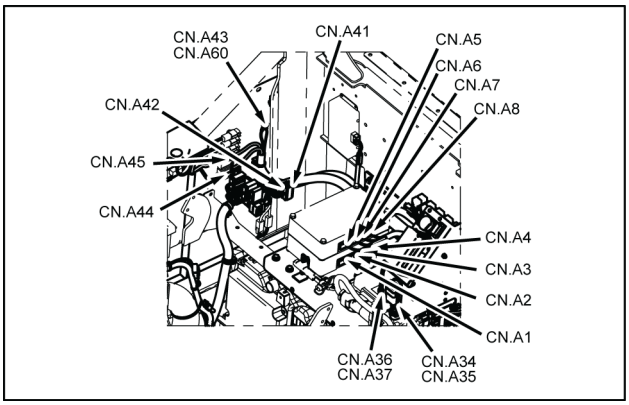
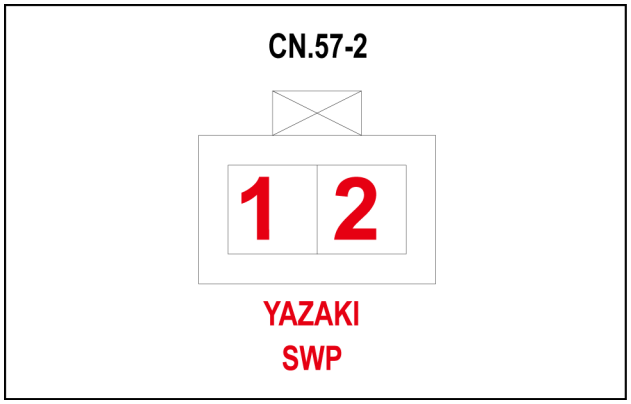


SMIL14CEX4436AA 9

Pin	From	Wire ID	Description	Color-Size	Frame
1	CN.A41-M-P-12	161B		RL	**SHEET 23**
2	CN.A39-M-P-5	111B		W-1.25	**SHEET 28**
3	SP-515A-P-X	519B		BrW-0.85	**SHEET 20**
4	SP-881-P-X	881C		LR-0.85	**SHEET 24**
5	SP-882-P-X	882B		YR-0.85	
6	CN.A4-P-19	809		V	**SHEET 19**
7	CN.A41-M-P-2	40N		P	**SHEET 23**
8	CN.A42-M-P-2	41P		PG	
9	CN.A25-P-3	066b		YL	**SHEET 21**
10	CN.A25-P-1	065b		Y	
11	CN.A25-P-8	069b		BY	
12	CN.A48-P-12	949B		WB	**SHEET 33**
13	CN.A48-P-13	950B		BW	
14	SP-610E-P-X	610E		BG-1.25	**SHEET 23**

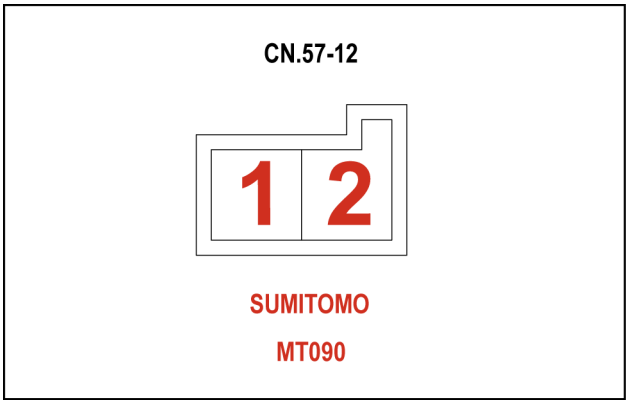
CONNECTOR CN.57-2A – OPTION 2 SPEED SOLENOID VALVE (Male)



SMIL16CEX0026AA 9

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP-260G-P-X	261C		WL-0.75	**SHEET 18**
2	CN.A57-M-P-3	805C		YR-0.75	**SHEET 17**

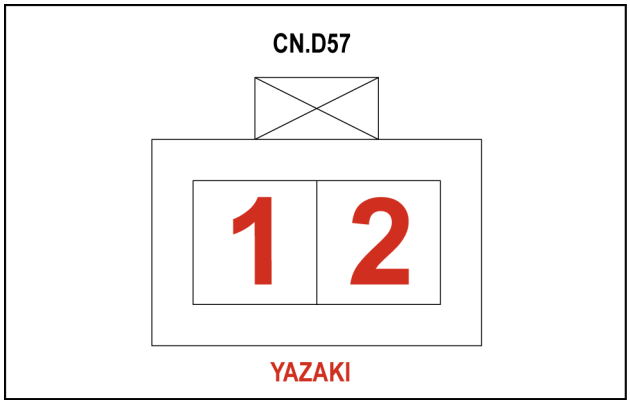
CONNECTOR CN.57-12 – CN.57-12 (Female)



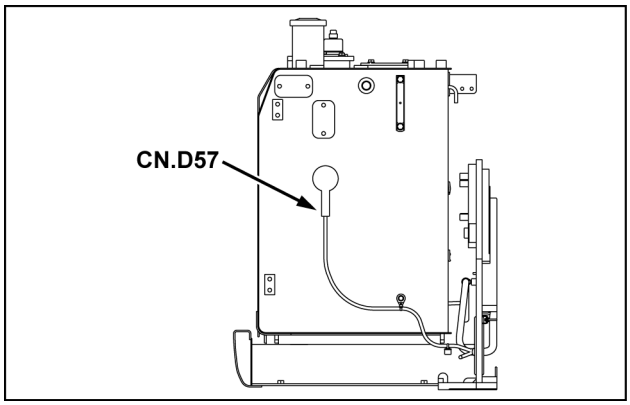
SMIL15CEX9456AA 36

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP-856A-P-X	861A		OL-0.75	**SHEET 16**
1	SP-856-P-X	861		OL-0.75	**SHEET 17**
2	SP-535-P-X	545A		GY-0.75	**SHEET 16**
2	SP-545-P-X	545		GY-0.75	**SHEET 17**

CONNECTOR CN.D57 – FUEL LEVEL SENSOR (Male)



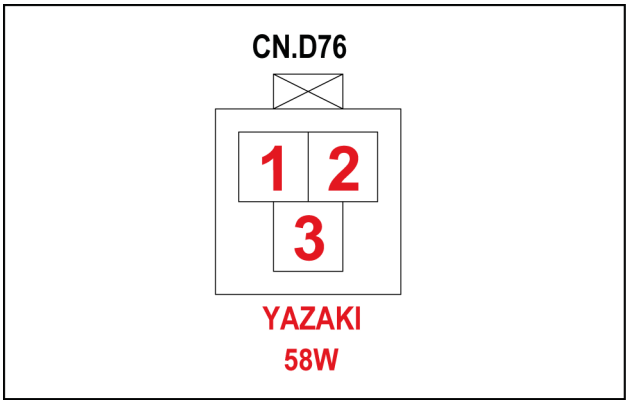
SMIL15CEX9357AA 87



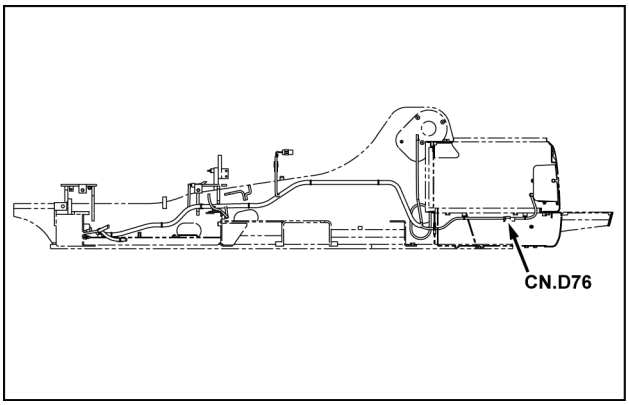
SMIL15CEX9356AA 88

Pin	From	Wire ID	Description	Color-Size	Frame
1	CN.A54-M-P-18	660A		BG-0.85	**SHEET 19**
2	CN.A54-M-P-17	492A		GL-0.85	**SHEET 20**

CONNECTOR CN.D76 – CN.D76 (Male)



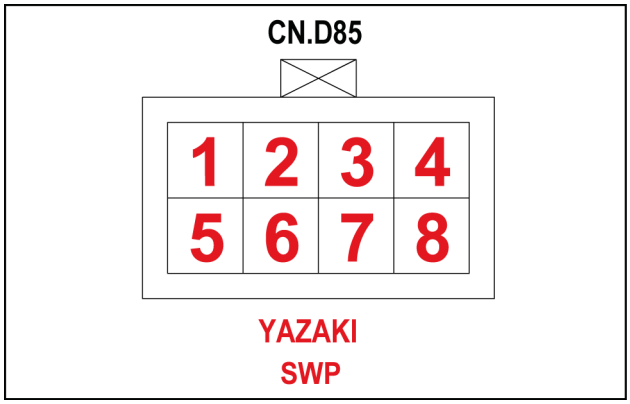
SMIL15CEX2926AA 9



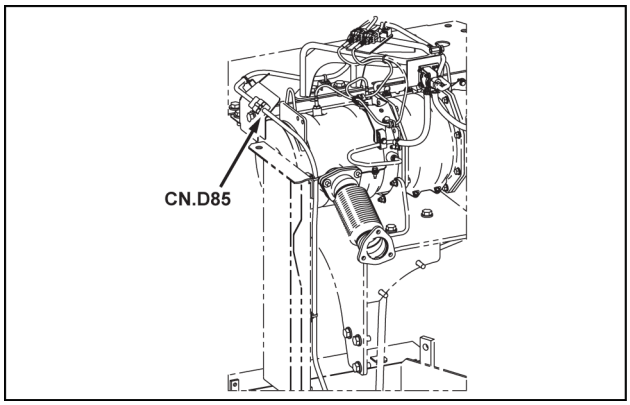
SMIL16CEX0020AA 10

Pin	From	Wire ID	Description	Color-Size	Frame
1	CN.A51-M-P-1	250A		W-2.0	**SHEET 04**
2	SP-700F-P-X	764		B-2.0	**SHEET 11**
3	CN.A55-M-P-9	822C		VG 0.85	**SHEET 24**

CONNECTOR CN.D85 – CN.D85 (Male)



SMIL15CEX2948AA 22



SMIL16CEX0024AA 23

Pin	From	Wire ID	Description	Color-Size	Frame
1	CN.D1-P-79	346		Y-0.75	**SHEET 05**
2	SP-349-P-X	347A		BW-0.75	**SHEET 06**
3	CN.D1-P-80	348		R-0.75	**SHEET 05**
4	SP-349-P-X	349		BW-0.75	**SHEET 06**
5	CN.D1-P-70	331B		WB-0.75	**SHEET 05**
6	CN.D1-P-84	332		P-0.75	
7	CN.D1-P-112	333		BW-0.75	
8	CN.D1-P-115	693b		BL-0.75	

Engine timing sensors Crankshaft sensor - Remove

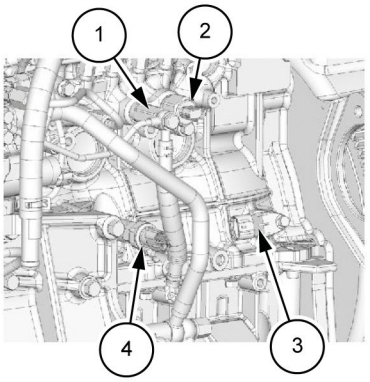
Battery ground cable disconnect

1. Disconnect the battery ground cable from the battery.

CKP sensor removal

1. Disconnect the harness connector from the CKP sensor **(3)**.
2. Remove the CKP sensor **(3)** from the cylinder block.
   1. Pressure limiter
   2. Fuel pressure sensor
   4. Oil pressure sensor

> ⚠ CAUTION: The CKP sensor **(3)** is sensitive to shock, so do not throw or drop it.

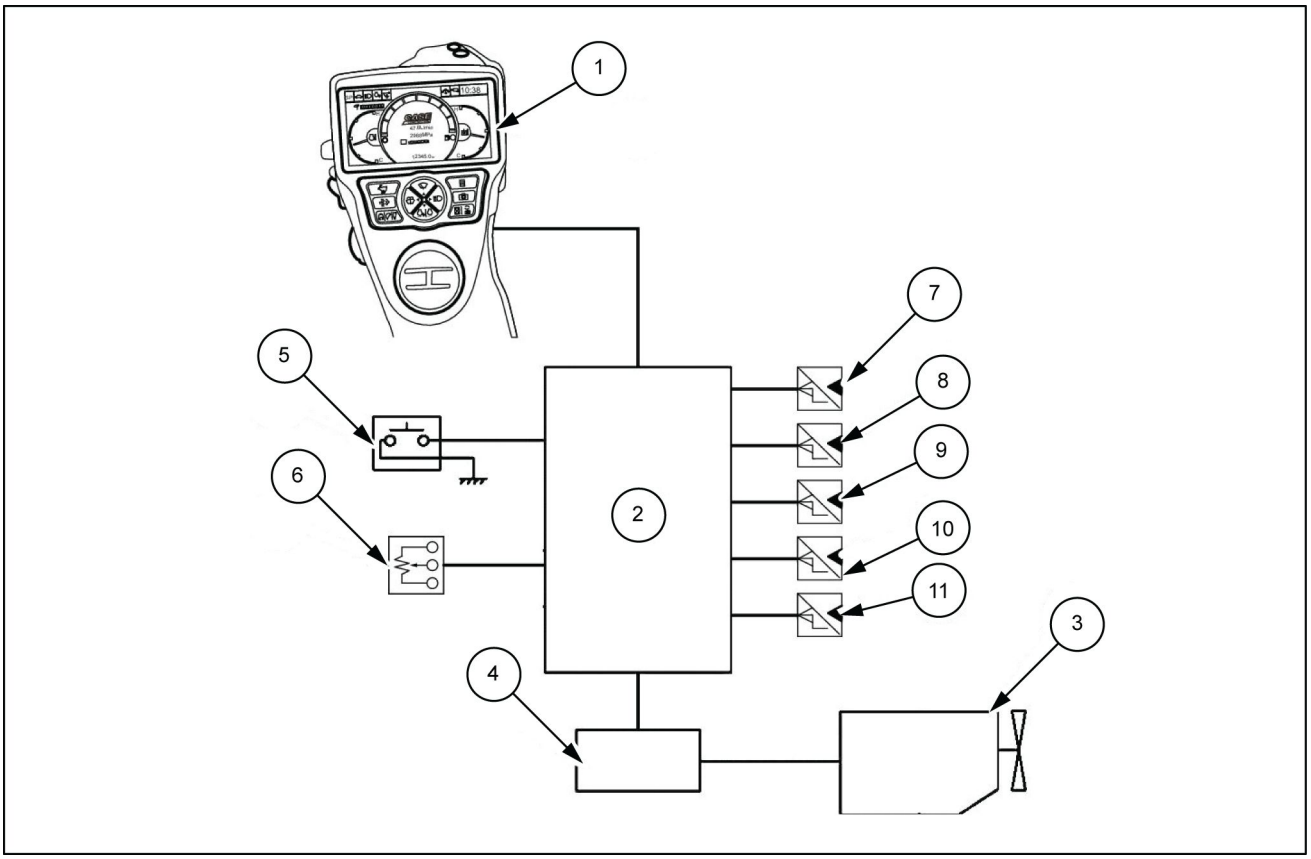


LPIL12CX00872AB 1

Engine starting system - Dynamic description – Auto idle

Purpose

Reduces the engine speed to idling state **1200 RPM** when machine operations are not being performed. (Energy saving)



LPIL12CX00394FB 1

1. Monitor display
2. Computer A
3. Engine
4. ECM
5. One-touch idle switch
6. Throttle volume
7. Pressure sensor (option 1)
8. Pressure sensor (option 2)
9. Pressure sensor (upper)
10. Pressure sensor (swing)
11. Pressure sensor (travel)

Operation explanation

1. Auto idle operation conditions
   The operation starts when all the conditions below are satisfied.
   A. The auto idle mode switch is pressed and auto idle mode is “ON”.
   B. When an operation lever has not been operated for a certain amount of time. (When the upper, swing, travel, option 1, or option 2 pressure sensors have been “OFF” for a certain amount of time.)
2. Auto idle end conditions
   The operation ends under the following conditions.
   A. When the operation lever is operated during auto idle. (When the upper, swing, travel, option 1, or option 2 pressure sensors are “ON”)
   B. When the throttle volume is operated.
   C. When the one-touch idle switch is pressed.

Engine unit abnormalities such as insufficient compression pressure, pistonrelated failure, turbocharger and raised oil.

Alternator - Install

To install, perform the reverse of the removal procedure.

Install according to the installation procedures and tension adjustment procedures in **Water pump - Install (10.400)**.

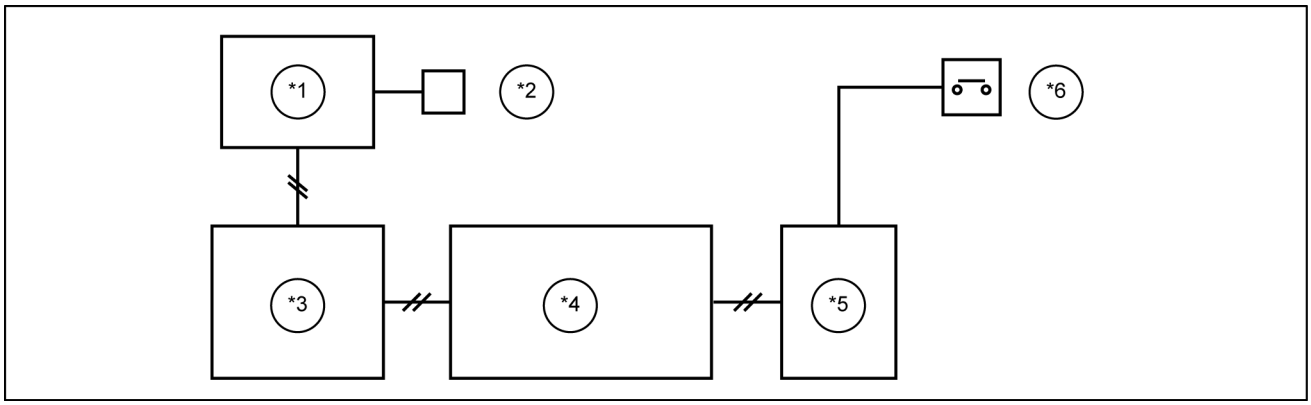
Fuel injection system - Dynamic description - Fuel filter clog

Summary

Issues a warning when the fuel filter is clogged.

There are 2 levels of clogs.

Configuration



SMIL14CEX0534EB 1

*1. Color monitor
*2. Buzzer
*3. Computer B
*4. Computer A
*5. ECM
*6. Fuel filter clog sensor

Operation explanation

1. When the below conditions are satisfied, the fuel filter clog judgment is started.
   - Fuel temperature **0 °C** (**32.0 °F**) or more
   - **3 s** passed after engine start
2. When the system detects the followings, a fuel filter clog abnormality warning is issued.
   - The fuel filter clog signal from the ECM has been ON for **5 s** or more.
   - The signal is sent in numbers 0 to 2.

Signal values	Meaning	Sensor pressure	Error code
0	No clog		
1	Clog level 1	**-30 kPa** (**-4 psi**) or less	7426
2	Clog level 2	**-38 kPa** (**-6 psi**) or less	7427

3. A message is displayed and a buzzer sounds.
   - Monitor warning message "FUEL FILTER" is displayed.
   - The buzzer sounds for **5 s**.
4. Engine protection
   - At the clog level 2 [**38 kPa** (**6 psi**) or less], the engine speed is fixed.
5. When the clog level 2 signal is received for **5 s** or more continuously, the buzzer sounds again for **5 s**.
6. When the filter negative pressure returns to **-5 kPa** (**-1 psi**) or more, the message disappears.

- Forced manual regeneration: During automatic regeneration, it is possible to interrupt automatic regeneration and switch to manual regeneration.
- Slow regeneration: When manual regeneration is interrupted for a prolonged period, it is necessary to combust the PM slower than normal.
  The diagnostic trouble code is displayed and service engineer operation is required. The machine cannot operate.

1. Switch the key “ON” and operate.
   The system displays the current amount of PM accumulated on the DPD bar graph.
   The PM accumulated on the filter continually self-combusts due to high-temperature exhaust gases during engine operation.
2. When the work was at low load, because the exhaust gas temperature is low, the PM does not self combust but accumulates.
   When the DPD differential pressure is high or every **8 h**, the ECM forces up the exhaust gas temperature to combust the accumulated PM. (See Automatic Regeneration.)
3. Normally, the above continuous regeneration and automatic regeneration keep the accumulated amount of PM from going above a certain amount, but if the operating conditions are such that the accumulated amount of PM becomes excessive, in order to avoid the risk of damage to the DPD assembly due to excessive temperature rise during regeneration, the ECM prohibits automatic regeneration and requests the operator to perform manual regeneration.
   The operator receives this request and starts regeneration. (See Manual Regeneration.)
4. While automatic regeneration is stopped, the operator can execute manual regeneration at any time with switch operation. (See Forced Manual Regeneration.)
5. If the operator ignores the manual regeneration request and continues to work, this causes (excess PM collection) and the ECM issues the diagnostic trouble code.
   When this point is reached, regeneration by the operator is no longer possible and special regeneration using service tools has become necessary. (See Slow Regeneration.)
6. If any of the following troubles occurs during regeneration, the hydraulic pressure load is stopped.

Excess PM collection

When the accumulated amount of PM exceeds the limit and the excess PM collected state is reached, the system behaves as follows.

- Ends the hydraulic pressure assist load.
- Lights the red lamp.
- Lights up the DPD gauge all red.
- Displays the "CHECK ENGINE" message.

Automatic regeneration

Summary

Regeneration is performed automatically during machine operation. The machine can operate normally.

The ECM judges the amount of PM accumulation and performs automatic regeneration once it reaches the specified amount.

Alternatively, automatic regeneration is performed when the machine has operated for a certain amount of time since the last regeneration.

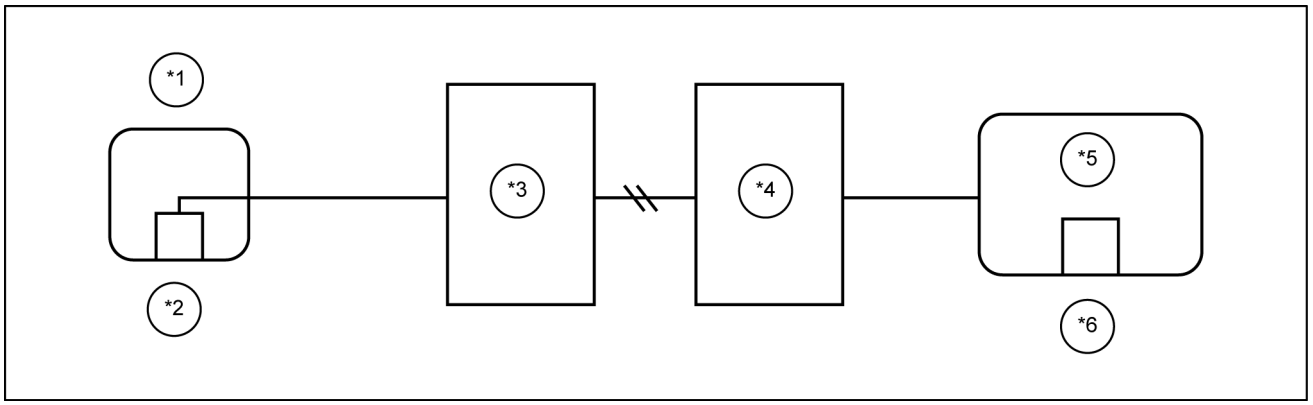
Engine cooling system - Dynamic description

Coolant level reduction

Summary

When the engine coolant level is low, the low coolant level warning is issued.

Configuration



SMIL14CEX0531EB 1

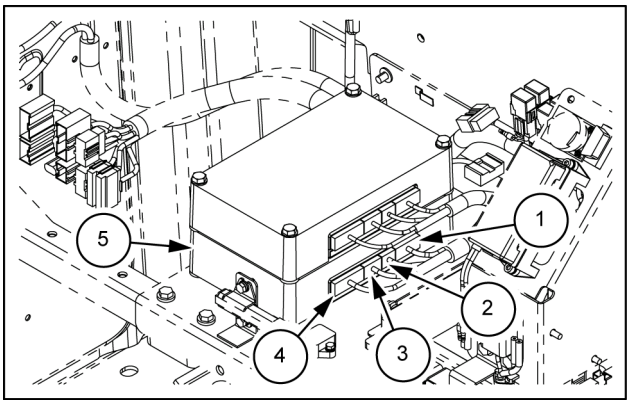
*1. Reserve tank
*2. Coolant level switch
*3. Computer A
*4. Computer B
*5. Monitor
*6. Buzzer

Operation

1. Detects the radiator reserve tank level switch and issues a warning.
2. The following operations are performed when the monitor receives the low level signal for **3 s** or more.
   - The message "LOW COOLANT" is displayed and the buzzer sounds for **5 s**.
3. After **3 s** have passed since the coolant level switch “OFF” is detected, the message "LOW COOLANT" disappears.

Electronic modules - Remove

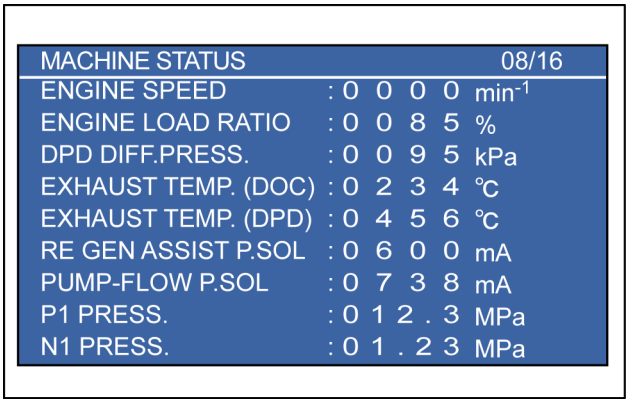
1. Detach the battery ground cable from the battery.
2. Remove the rear trim. See **Cab and platform - Remove (90.150)**.
3. Remove the computer B. See **Electronic modules - Remove (55.640)**.
4. Remove the connectors **(1)**, **(2)**, **(3)** and **(4)** and remove the computer A **(5)**.



SMIL14CEX0613AB 1

8. Engine

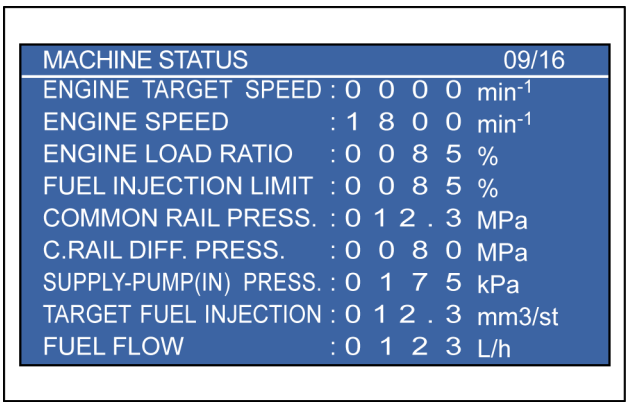
ENGINE SPEED	min^{-1} (rpm)	Engine speed
ENGINE LOAD RATIO	%	Engine load ratio
DPD DIFF. PRESS.	kPa (psi)	DPD exhaust gas differential pressure
EXHAUST TEMP. (DOC)	°C (°F)	Exhaust gas temperature (DOC)
EXHAUST TEMP. (DPD)	°C (°F)	Exhaust gas temperature (DPD filter front)
RE GEN ASSIST P.SOL.	mA	Actual milli-amp for regeneration assisting proportional valve
PUMP-FLOW P.SOL.	mA	Actual milli-amp for flow proportional valve
P1 PRESS.	MPa (psi)	P1 pressure
N1 PRESS.	MPa (psi)	N1 pressure



SMIL14CEX0457AA 9

9. Engine

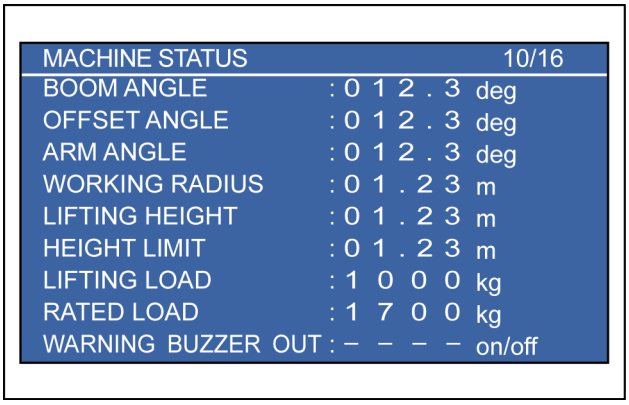
ENGINE TARGET SPEED	min^{-1} (rpm)	Engine target speed
ENGINE SPEED	min^{-1} (rpm)	Engine speed
ENGINE LOAD RATIO	%	Engine load ratio
FUEL INJECTION LIMIT	%	Fuel injection quantity limit level
COMMON RAIL PRESS.	MPa (psi)	Common rail pressure
C. RAIL DIFF. PRESS.	MPa (psi)	Common rail differential pressure
SUPPLY-PUMP (IN) PRESS.	kPa (psi)	Supply pump inlet pressure
TARGET FUEL INJECTION	mm^3 /st	Target fuel injection quantity
FUEL FLOW	L/h	Fuel flow



SMIL14CEX0458AA 10

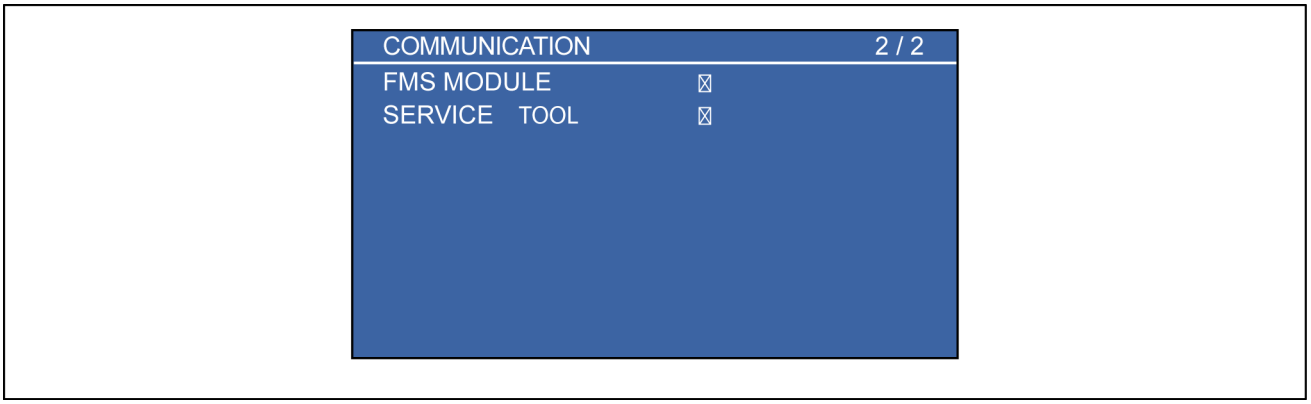
10. Work radius and height

BOOM ANGLE	deg	Boom angle
OFFSET ANGLE	deg	Offset angle
ARM ANGLE	deg	Arm angle
WORKING RADIUS	m (ft.)	Work radius
LIFTING HEIGHT	m (ft.)	Hanging work height
HEIGHT LIMIT	m (ft.)	Hanging height limit
LIFTING LOAD	kg (lb)	Actual load
RATED LOAD	kg (lb)	Rated load
WARNING BUZZER OUT	on/off	Warning buzzer output



SMIL14CEX0459AA 11

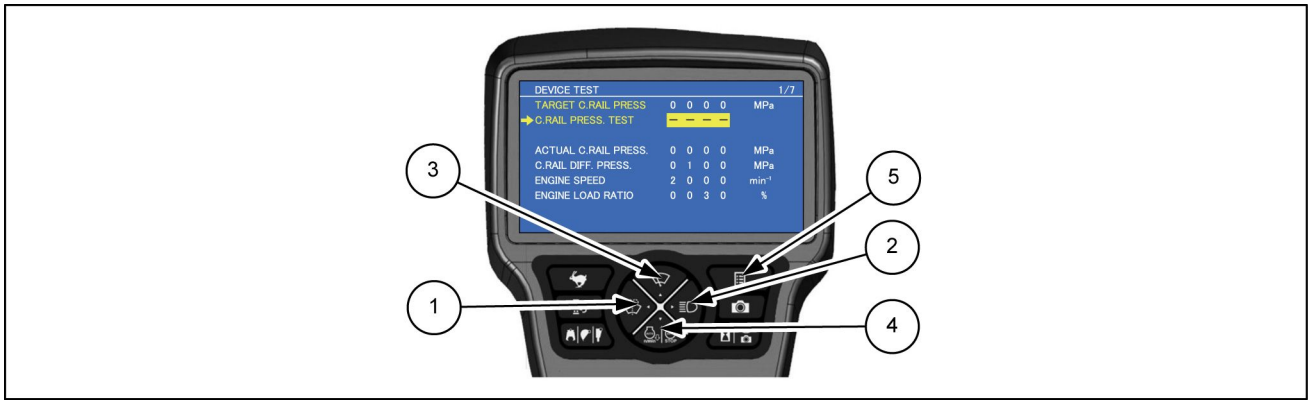
2. Communication between the computer B and each device



SMIL14CEX0546EA 15

●	ON
○	OFF

FMS MODULE	Communication with fuel density transducer	Japan only
SERVICE TOOL	Communication with TEPROS or EST	



SMIL14CEX0519EB 13

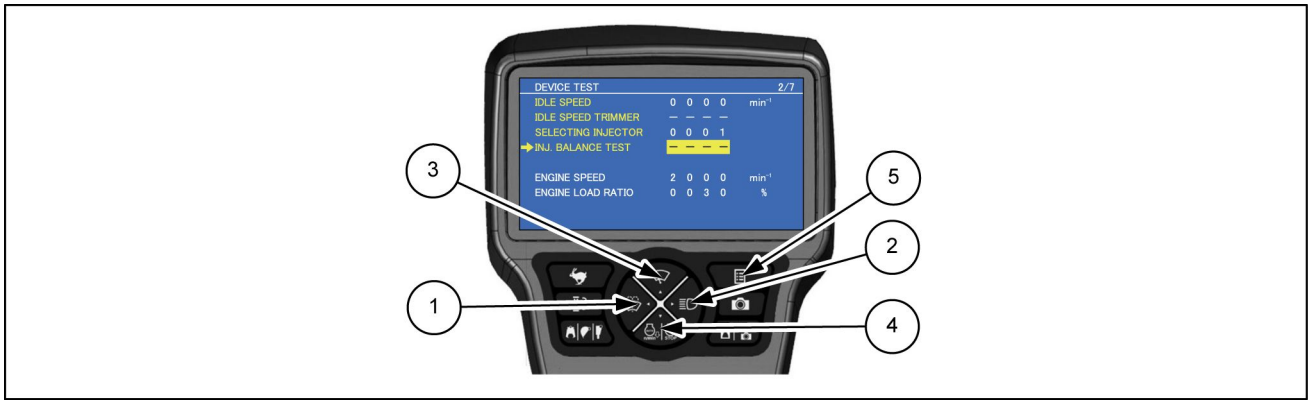
Procedure

Condition for the test
The engine is running.

1. Setting target common rail pressure
   Select “TARGET C.RAIL PRESS” (target common rail pressure) with switches **(3)** and **(4)**.
   Press switches **(1)** and **(2)** to set the target test pressure.
   Available set range: **30.0 - 80.0 MPa** (**4351.5 - 11604.0 psi**).
2. Test execution
   Select “C.RAIL PRESS. TEST” (common rail pressure test) with switches **(3)** and **(4)**.
   Hold down switch **(2)** for **2 s**., then “- - - -” changes to “+ + + +” and the test starts.
   The test will be continued for **10 s**.
3. Test finish
   After **10 s**, the engine automatically returns to normal state and start.

Injector balance test

Purpose: To check the injector status by stopping one injector when the engine speed is low.



SMIL14CEX0520EB 14

Procedure

Condition for the test
The engine is running.

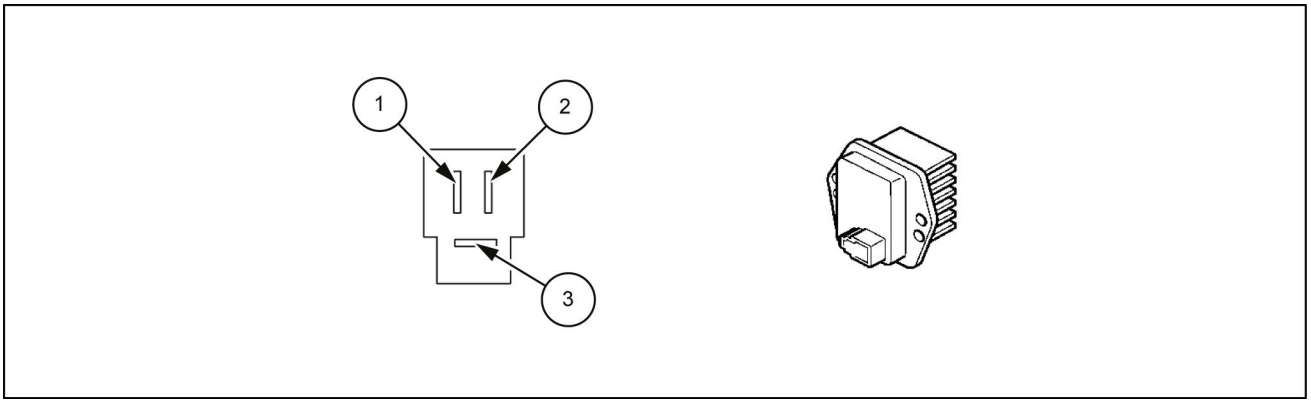
1. Setting the engine speed to low idle and stopping the injector
   Select “IDLE SPEED” (idling speed) with switches **(3)** and **(4)**.
   Press switches **(1)** and **(2)** to set the engine speed to low idle.
   Available set range: **-500 - +500 RPM**
   Select “SELECTING INGECTOR” (injector select) with switches **(3)** and **(4)**.
   Press switches **(1)** and **(2)** to set the injector number to stop.
2. Test execution

Cab Heating, Ventilation, and Air-Conditioning (HVAC) controls - Dynamic description - Blower amp

The power transistor receives the base current from the control unit and changes the speed of the fan motor.

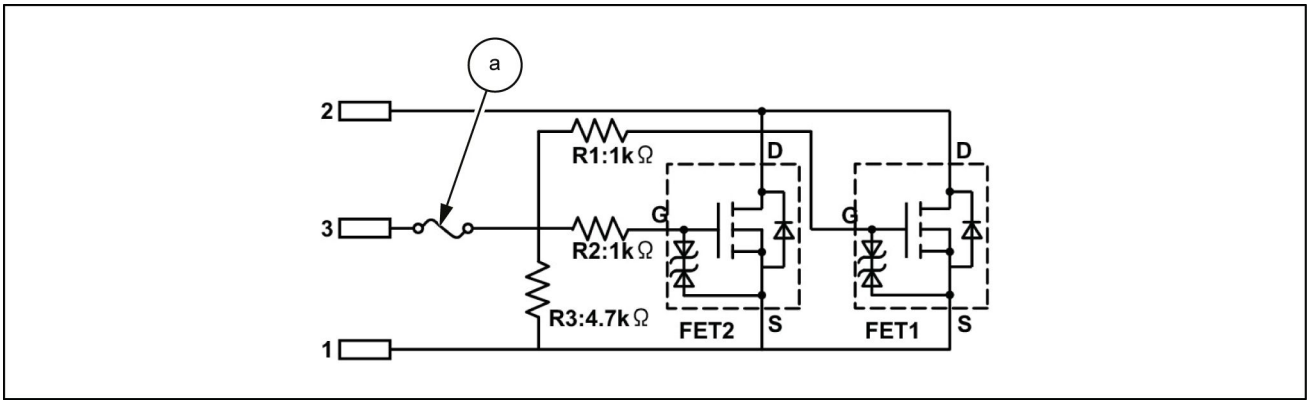
Blower amp inspection

The blower amp can be easily judged by removing the blower amp connector and checking for continuity across the blower amp terminals.



LPIL12CX02409EB 1

	Terminal No.			Continuity
	1	2	3	
Tester	+	- - -	-	Yes (**4.7 kΩ**)
	-	+	- - -	No
	+	-	- - -	Yes (diode parallel forward direction)

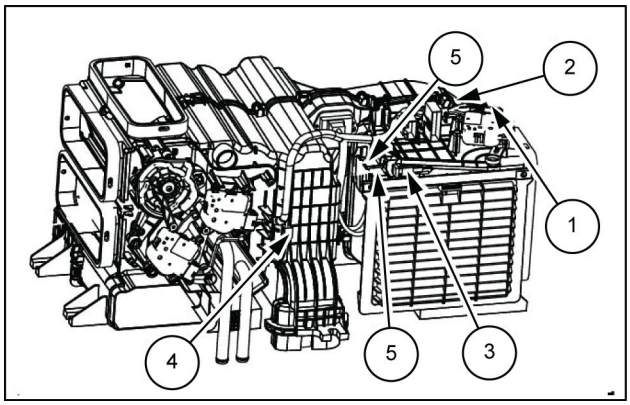


LPIL12CX02410EB 2

a. Temperature fuse: **132 - 138 °C** (**269.6 - 280.4 °F**)

Cab heater blower unit - Remove

1. Remove the connectors connected to the refresh/recirculate motor actuator connector **(1)**, blower motor connector **(2)**, inside air sensor connector **(3)**, evaporator sensor connector **(4)** and relay connector **(5)**.

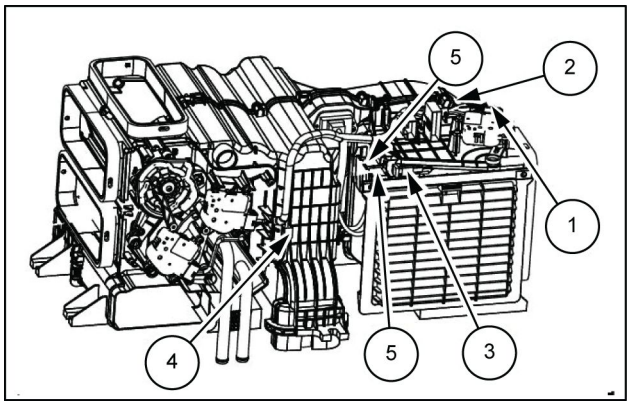


LPIL12CX02366AB 1

2. Remove the filter cover **(1)** and inside air filter **(2)**.
   - Remove the 4 Phillips screws **(3)** and remove the intake case **(4)**.

     Screw size

     Phillips screws **(3)**: **M5** x **16 mm** (**0.630 in**) (T1)



LPIL12CX02366AB 2

Hammer electric system - Dynamic description Crusher mode

Purpose

It is possible to set the maximum flow and the maximum pressure for each of the five crushers.

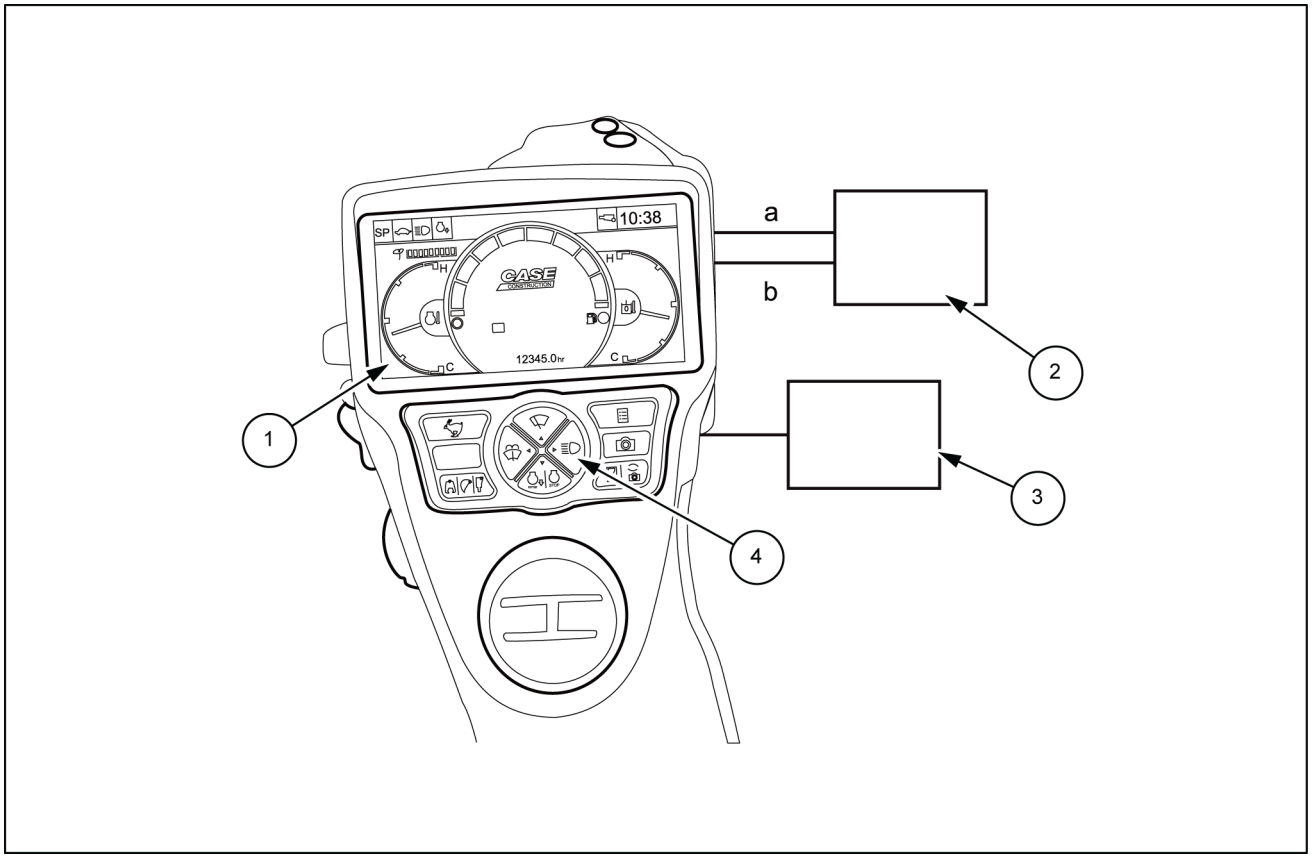
Operation explanation

1. Each time the attachment select switch is pressed, it switches between Normal Mode → Breaker Mode → Crusher Mode → Normal Mode.
   The maximum flow for the switched mode is displayed on the monitor for **3 s**.
   - The crusher mode only has Crusher Mode 1 in the initial state, but a mode can be added on the flow setting screen.
2. Crusher can be used by selecting crusher mode.
   - Set the maximum flow and maximum pressure first on the flow setting screen.
   - If the set flow rate requires 2 pumps flow, 2 pumps flow is performed.
3. When the key is turned “OFF” once, then “ON” again, the attachment mode selected previously is retained.

Work light - Dynamic description

Purpose

Press the working light switch to turn the working light “ON”. (To improve visibility during night work.)



SMIL13CEX4775FB 1

a. Dimming level automatic adjustment using the solar radiation sensor

b. Working light-linked dimming using the working light relay

1.	Monitor	3.	Working light relay
2.	Computer A	4.	Working light switch

Operation explanation

1. When the key is turned “ON”, the working light is “OFF”.
2. When the working light switch is pressed, the working light relay turns “ON”, and the working light icon on the monitor turns “ON”.
   The boom light and cab light turn “ON”.
3. When the working light switch is pressed again, the working light relay turns “OFF”, and the working light icon on the monitor turns “OFF”.
   The boom light and cab light turn “OFF”.

0110-Turbocharger control module communication abnormality

Control Module : ECU

Solution:

1. Check and diagnose the below fault codes before you proceed with the diagnostics code 0110.

   Diagnostic trouble code 0045
   Diagnostic trouble code 0001

2. Turn OFF the ignition switch.

   Remove the harness connector from the turbo control unit.

   Turn ON the ignition switch.

   Measure the voltage between the turbo control unit harness connector CAN-Low circuit and ground.

   Measure the voltage between the CAN-High circuit and ground of the turbo control unit harness connector.

   A. If the reading is outside **1.5 - 3.5 V**, Inspect to see if there is an open circuit or high resistance with the CAN-High circuit between the turbo control unit and the ECM.

   B. If a problem is found, repair the CAN-High circuit.

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

3. Inspect to see if there is an open circuit or high resistance with the CAN-Low circuit between the turbo control unit and the ECM.

   A. If a problem is found, repair the CAN-Low circuit.

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

4. Inspect the turbo control unit harness connector for a poor connection.

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

   B. If there are no problems, Replace the turbo control unit.

5. Confirm resolution:

   1. Use the trouble diagnosis scan tool to delete the diagnostic trouble code.

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

   3. Start the engine.

   4. Test the operation.

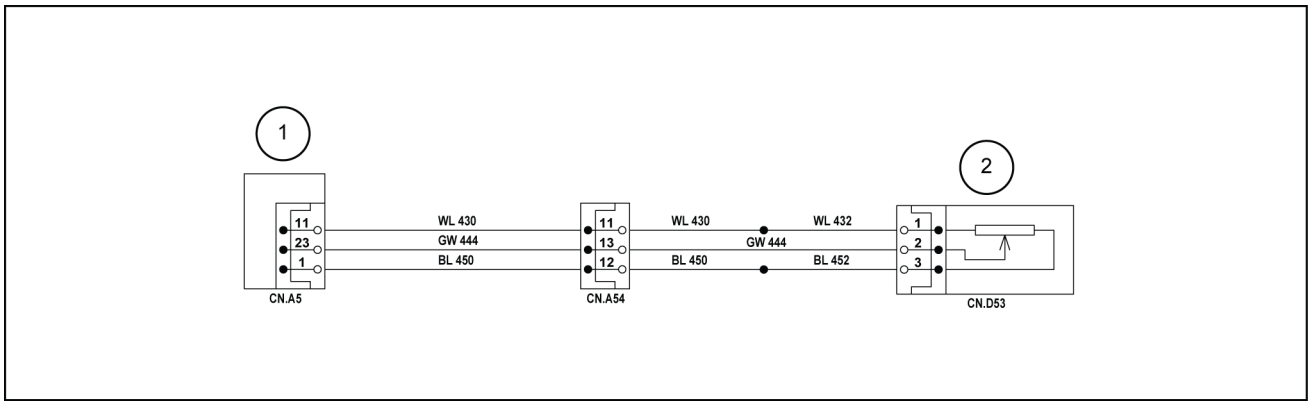
   5. Use the trouble diagnosis scan tool to confirm that a diagnostic trouble code has not been detected.

7065-Boom-up pilot pressure sensor signal abnormality

Control Module : MCM

Solution:

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



SMIL16CEX0052EB 1

1. Computer B
2. Boom-up pilot pressure sensor

Turn the key switch ON.

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

A. If diagnostic trouble code 7065 is displayed, proceed to Step **2**.

2. Check the boom up 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 **3**.

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

3. Turn the key switch OFF and disconnect the boom up pilot pressure sensor connector **CN.D53**.

Turn the key switch ON.

Measure the voltage between the ground and terminal 1 of the boom up pilot pressure sensor connector **CN.D53** harness side.

A. If the voltage is not about **5 V**, find and replace the short circuit on the wire ID WL432 or WL430.

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

4. Measure the voltage between the ground and terminal 2 of the boom up pilot pressure sensor connector **CN.D53** harness side.

A. If the voltage is more than **4.75 V**, find and replace the short circuit on the wire ID GW444.

B. If the voltage is less than or equal to **4.75 V**, proceed to Step **5**.

5. Measure the voltage between the ground and terminal 3 of the boom up pilot pressure sensor connector **CN.D53** harness side.

A. If the voltage is more than **0.25 V**, find and replace the short circuit on the wire ID BL452 or BL450.

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

6. Inspect the boom up pilot pressure sensor **(2)**.

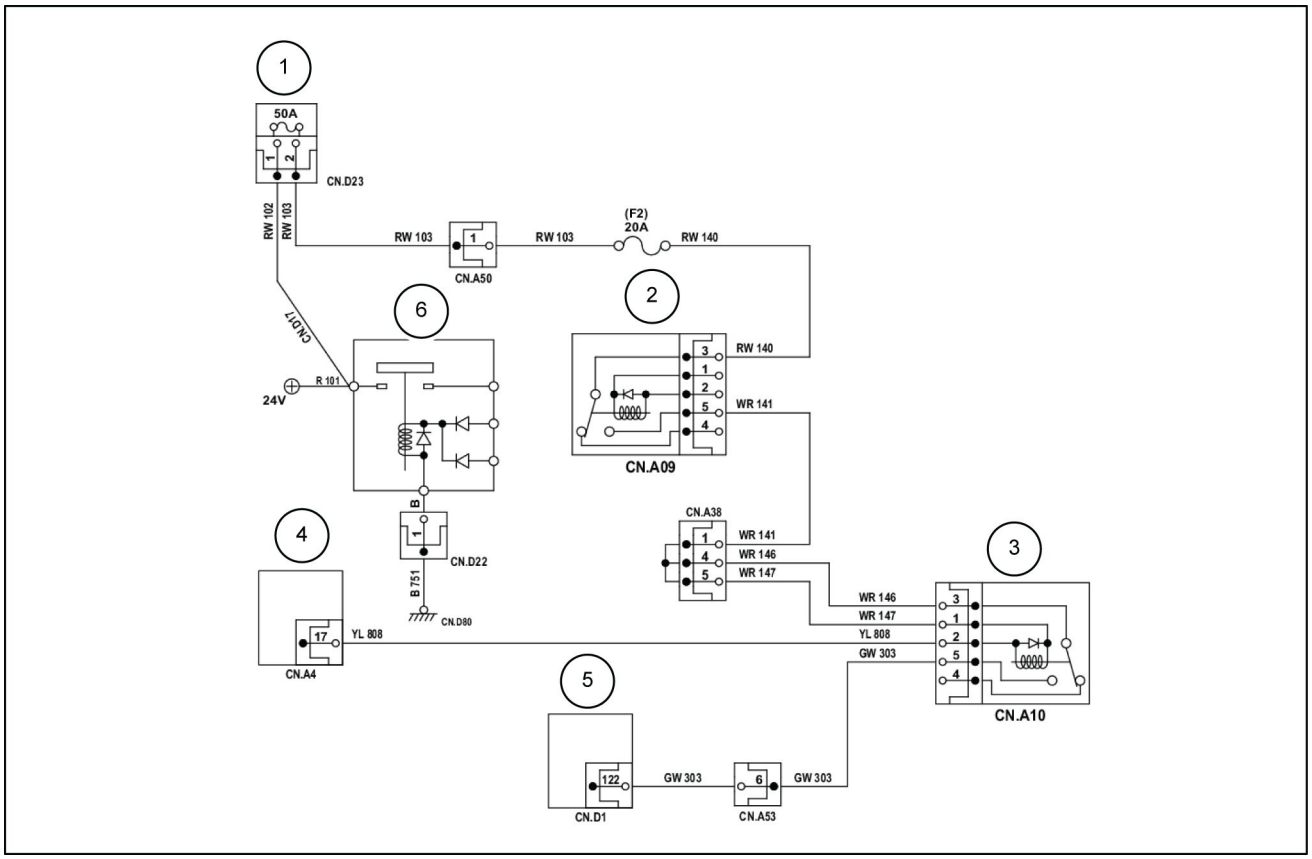
Turn the key switch OFF.

7253-DPD regeneration request output signal abnormality

Control Module : MCM

Solution:

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



LPIL12CX02655FB 1

1. Fusible link back up
2. ECM relay
3. DPF relay
4. Computer A
5. Engine computer
6. Relay battery

Turn the key switch ON.

A. If diagnostic trouble code 7253 is displayed, proceed to Step **2**.

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

Inspect the fusible link **50 A** fuse and fuse box F4 **10 A** fuse.

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

3. Turn the key switch OFF and disconnect the DPF relay connector **CN.A10**.

Inspect for continuity between the terminals 1 and 2 of the DPF relay connector **CN.A10** DPF relay side.

A. If there is no continuity, replace DPF relay.

B. If there is continuity, proceed to Step **4**.

4. Install connector the DPF relay connector **CN.A10**.

Inspect for continuity between the ground and terminal 1 of the the DPF relay connector **CN.A10** harness side.

A. If there is no continuity, find and replace the short circuit on the wire ID WR147, WR141 or WR140.

7609-EEPROM (B) data abnormality

Control Module : MCM

Solution:

1. Turn the key switch ON.

   A. If diagnostic trouble code 7609 is displayed, proceed to Step **2**.

2. Check whether rewriting was performed on computer B before the diagnostic trouble code was displayed.

   A. If there rewriting performed on computer B before the diagnostic trouble code was displayed, rewriting of the computer changed the used space of the EEPROM. Turn the key switch OFF, and then turn the key switch ON again.

   B. If there rewriting performed on computer B before the diagnostic trouble code was not displayed, replace computer B.

P0102-Mass air flow circuit low input

Control Module : ECM

Solution:

1. Check and diagnose the below fault codes before you proceed with the diagnostics code 0102

   Diagnostic trouble code 0560

2. Turn OFF the ignition switch.

   Disconnect the mass air flow sensor harness connector **CN.D35** from the mass air flow sensor.

   Inspect to see if there is an open circuit or high resistance in the **12 V** power supply circuit between the ECM and the mass air flow sensor.

   A. If a problem is found, repair the **12 V** power supply circuit.

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

3. Connect the test cable with fuse between the **12 V** power supply circuit and the signal circuit of the mass air flow sensor harness connector **CN.D35**.

   Check the mass air flow sensor display with the trouble diagnosis scan tool.

   If the reading is more than or equal to **4.9 V**, inspect to see if there is a poor connection with the mass air flow sensor harness connector **CN.D35**.

   A. If a problem is found, repair the mass air flow sensor harness connector **CN.D35**.

   B. If the mass air flow sensor harness connector **CN.D35** is normal, replace the mass air flow sensor. (Refer to “Mass air flow sensor - Remove" and “Mass air flow sensor - Install”)

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

4. Inspect the signal circuit between the ECM and the mass air flow sensor.

   Make sure that there is no open circuit or high resistance.

   Make sure that there is no short to ground.

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

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

5. Inspect the ECM harness connector for a poor connection.

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

   B. If the harness connector **CN.D1** 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 on the ECM.

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

7. Confirm resolution:

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

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

   3. Start the engine.

   4. Perform a test-run.

6. Disconnect the harness connector **CN.D2** from the ECM.

   Inspect the ECM harness connector **CN.D2** for poor connections.

   A. If a problem is found, repair the harness connector **CN.D2**.

   B. If the harness connector **CN.D2** is normal, replace the ECM. (Refer to " **Engine Control Unit (ECU) - Remove (55.015)**" and " **Engine Control Unit (ECU) - Install (55.015)**")

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

7. Set the injector ID code on the ECM.

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

8. 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.

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

Wiring harnesses - Electrical schematic sheet 09 (55.100)
Wiring harnesses - Electrical schematic sheet 08 - Engine controller (55.100.DP-C.20.E.08)

P0428-Catalyst temperature sensor circuit high sensor 1

Control Module : ECM

Solution:

1. Check and diagnose the below fault codes before you proceed with the diagnostics code 0428.

   Diagnostic trouble code 0697

2. Turn OFF the ignition switch.

   Disconnect the harness connector **CN.D33** from the exhaust gas temperature sensor 1.

   Turn ON the ignition switch.

   Measure the voltage between the exhaust gas temperature sensor 1 signal circuit and normal ground.

   If the reading is more than or equal to the **5.5 V**, inspect to see if there is a short circuit to the battery or ignition power supply with the signal circuit between the ECM and the exhaust gas temperature sensor 1.

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

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

3. Connect the test cable with fuse between the exhaust gas temperature sensor 1 signal circuit and ground circuit.

   Check the exhaust temperature sensor (before the filter) display with the trouble diagnosis scan tool.

   If the reading is less than or equal to the **0.1 V**, inspect to see if there is a short circuit to the **5.0 V** power supply circuit with the signal circuit between the ECM and the exhaust gas temperature sensor 1.

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

   B. If the harness connector **CN.D33** is normal, replace the exhaust gas temperature sensor 1. (Refer to " **Exhaust Gas Recirculation (EGR) temperature sensors - Remove (55.989)**" and " **Exhaust Gas Recirculation (EGR) temperature sensors - Install (55.989)**")

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

4. Inspect to see if there is a poor connection with the exhaust gas temperature sensor 1 harness connector **CN.D33**.

   A. If the harness connector **CN.D33** is normal, replace the exhaust gas temperature sensor 1. (Refer to " **Exhaust Gas Recirculation (EGR) temperature sensors - Remove (55.989)**" and " **Exhaust Gas Recirculation (EGR) temperature sensors - Install (55.989)**")

   B. If the harness connector **CN.D33** is not normal,proceed to Step **5**.

5. Connect the test cable with fuse between the exhaust gas temperature sensor 1 signal circuit and normal ground.

   Check the exhaust temperature sensor (before the filter) display with the trouble diagnosis scan tool.

   A. If the reading is more than or equal to the **0.1 V**, inspect to see if there is an open circuit or high resistance with the signal circuit between the ECM and the exhaust gas temperature sensor 1.

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

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

6. Inspect to see if there is an open circuit or high resistance in the ground circuit between the ECM and the exhaust gas temperature sensor 1.

   NOTE:
   • The exhaust gas temperature sensor 1 shares the ground circuit with other sensors.
   • The diagnostic trouble code may be detected on a sensor which shares this circuit.

Measure the voltage between the DPD differential pressure sensor **5 V** power supply circuit and ground of the DPD differential pressure sensor harness connector.

A. If the reading is more than or equal to **4.5 V**, replace the fuel filter pressure sensor (B88). (Refer to " **Fuel filter sensor - Remove (55.010)**" and " **Fuel filter sensor - Install (55.010)**")

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

7. If the reading is less than or equal to **4.5 V**, inspect to see if there is a short pressure sensor **5 V** power supply circuit between the ECM and the DPD differential pressure sensor.

   A. If a problem is found, repair the DPD differential pressure sensor **5 V** power supply circuit.

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

8. Inspect to see if there is a short circuit to the ground with the oil pressure sensor **5 V** power supply circuit between the ECM and oil pressure sensor.

   A. If a problem is found, repair the oil pressure sensor **5 V** power supply circuit.

   B. If there are no problems, proceed to Step **9**.

9. Inspect to see if there is a short circuit to the ground with the fuel filter pressure sensor **5 V** power supply circuit between the ECM and fuel filter pressure sensor.

   A. If a problem is found, repair the fuel filter pressure sensor **5 V** power supply circuit.

   B. If a problem is not found, replace the ECM. (Refer to " **Engine Control Unit (ECU) - Remove (55.015)**" and " **Engine Control Unit (ECU) - Install (55.015)**") **10**.

10. Set the injector ID code on the ECM.

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

    Confirm resolution:

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

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

    3. Start the engine.

    4. Perform a test-run.

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

Wiring harnesses - Electrical schematic sheet 09 (55.100) Wiring harnesses - Electrical schematic sheet 06 (55.100)

A. If a problem is found, repair the intermediate harness connector **CN.D10**.

B. If no problems are found, proceed to Step **7**.

7. Check if insulation resistance of the first cylinder and fourth cylinder injector is at or above **1 Ω**.

   A. If the reading is less than or equal to **1 Ω**, replace the relevant injector. (Refer to " **Fuel injectors - Remove (10.218)**" and " **Fuel injectors - Install (10.218)**")

8. Set the injector ID code on the ECM .

   A. If the reading is more than or equal to **1 Ω**,repair or replace the injector harness.

9. Confirm resolution:

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

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

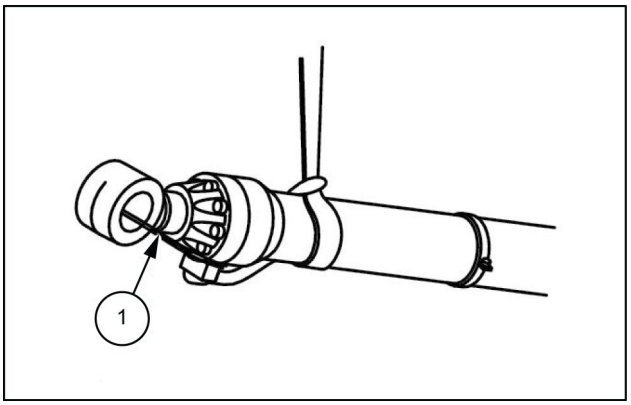
   3. Start the engine.

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

Wiring harnesses - Electrical schematic sheet 09 - Engine controller (55.100.DP-C.20.E.09)
Wiring harnesses - Electrical schematic sheet 08 - Engine controller (55.100.DP-C.20.E.08)

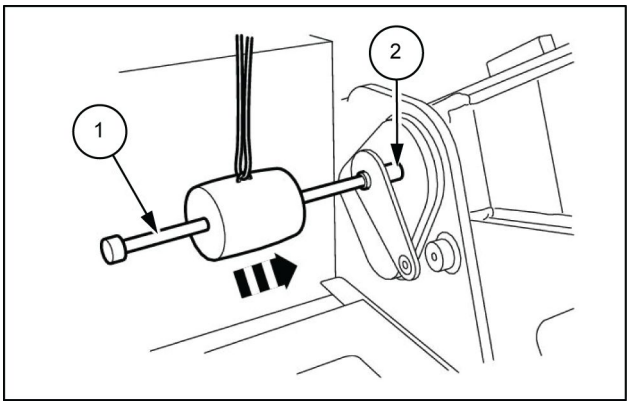
P0217-Engine coolant over temperature condition 142
P0219-Engine overspeed condition 143
P0234-Turbocharger overboost condition 144
P0237-Turbocharger boost sensor circuit low 147
P0238-Turbocharger boost sensor circuit high 149
P0299-Turbocharger low boost pressure abnormality 151
P0335-Crankshaft position sensor circuit 154
P0340-Camshaft position sensor circuit 156
P0380-Glow plug circuit 158
P0404-EGR control circuit range/performance 159
P0409-EGR sensor circuit 161
P041C-EGR cooler outlet 1 temperature sensor circuit low 163
P041D-EGR cooler outlet 1 temperature sensor circuit high 165
P0426-Catalyst temperature sensor circuit range/performance sensor 1 166
P0427-Catalyst temperature sensor circuit low sensor 1 167
P0428-Catalyst temperature sensor circuit high sensor 1 168
P042B-Catalyst temperature sensor circuit range/performance sensor 2 170
P042C-Catalyst temperature sensor circuit low sensor 2 171
P042D-Catalyst temperature sensor circuit high sensor 2 172
P0522-Oil pressure sensor circuit low 174
P0523-Oil pressure sensor circuit high 176
P0560-System voltage 178
P0563-System voltage high 180
P0601-ECU memory fault - Bad Intelligent device 181
P0602-Control module programming error 182
P0604-Internal control module random access memory (RAM) error 183
P0606-Internal control module CPU error 184
P060C-Internal control module A/D processing performance 185
P0638-Throttle actuator control range/performance 186
P0641-Sensor reference voltage 1 circuit 188
P0651-Sensor reference voltage 2 circuit 190
P0685-ECM power relay control circuit open 192
P0687-ECM power relay control circuit high 193
P0697-Sensor reference voltage 3 circuit 194
P1093-Fuel rail pressure (FRP) too low 196
P1112-Boost temperature sensor circuit low 200
P1113-Boost temperature sensor circuit high 201
P1261-Injector positive voltage control circuit group 1 203
P1262-Injector positive voltage control circuit group 2 204
P1293-Fuel filter pressure sensor circuit low 205
P1294-Fuel filter pressure sensor circuit high 207
P1404-Exhaust gas recirculation 1 closed position performance 209

4. Tie the left and right cylinder rods with wire **(1)** so that they cannot come out.



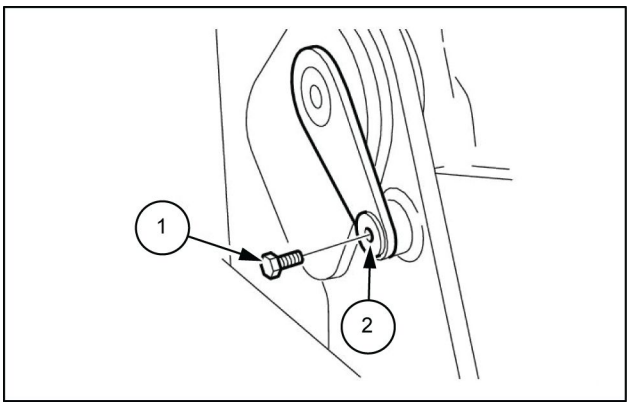
LPIL12CX02876AB 4

5. Align the boom with the swing frame pin hole and use a slide hammer **(1)** [**36 mm**] to tighten the pin **(2)**.
   - When inserting pins, be careful not to damage the dust seals.
   - If the insertion of a shim is possible according to the tolerance, adjust the shim.



SMIL13CEX1083AB 5

6. Use a wrench [**24 mm**] to tighten the bolt **(1)** and washer **(2)**.
   - Grease up.



SMIL13CEX1084AB 6

7. Use wrenches [**19 mm**, **36 mm**] to install the hoses **(1)**, **(2)**, **(3)**, **(4)**, **(5)** and **(6)**.

   (1) Bucket hose [use **36 mm** wrench]

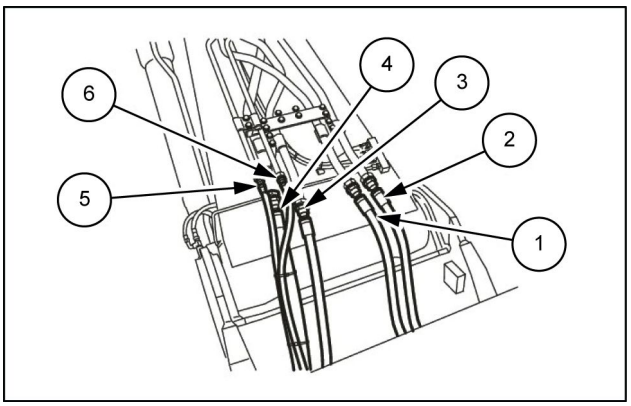
   (2) Bucket hose [use **36 mm** wrench]

   (3) Arm hose [use **36 mm** wrench]

   (4) Arm hose [use **36 mm** wrench]

   (5) 2nd option hose [use **19 mm** wrench]

   (6) 2nd option hose [use **19 mm** wrench]



SMIL13CEX0162AB 7