CX180C
Crawler Excavator

SERVICE MANUAL

Part number 48139070
English
April 2017

CASE
CONSTRUCTION

	Weight or Quantity
Nut	176

Upper component

Swing unit

Swing motor assembly		
Swing motor		
	Manufacturer	Toshiba Machine Co., Ltd.
	Motor type	Fixed displacement piston motor
		With parking brake
	Intake amount	**151 cm³/rev** (**9.21 in³/rev**)
	Operating pressure	**27.9 MPa** (**4047 psi**)
	Operating flow	**143 l/min** (**143.0000 US gpm**)
	Mechanical brake torque	**821.5 N·m** (**605.907 lb ft**) min.
	Brake off pressure	**3.2 MPa** (**464 psi**) or less
	Relief valve set pressure	**27.9 MPa** (**4047 psi**) at **120 L/min** (**31.7 US gpm**) **26.0 MPa** (**3771 psi**) at **40 L/min** (**10.6 US gpm**)
Swing reduction gear		
	Reduction gear type	Planetary gear 2-stage reduction gear
	Reduction ratio	13.338
Dry weight		**235 kg** (**518.086 lb**)
Turntable bearing		
	No. of teeth	92
	Weight	**243.9 kg** (**537.707 lb**)
Counterweight		
	Weight	**3400 kg** (**7495.717 lb**)

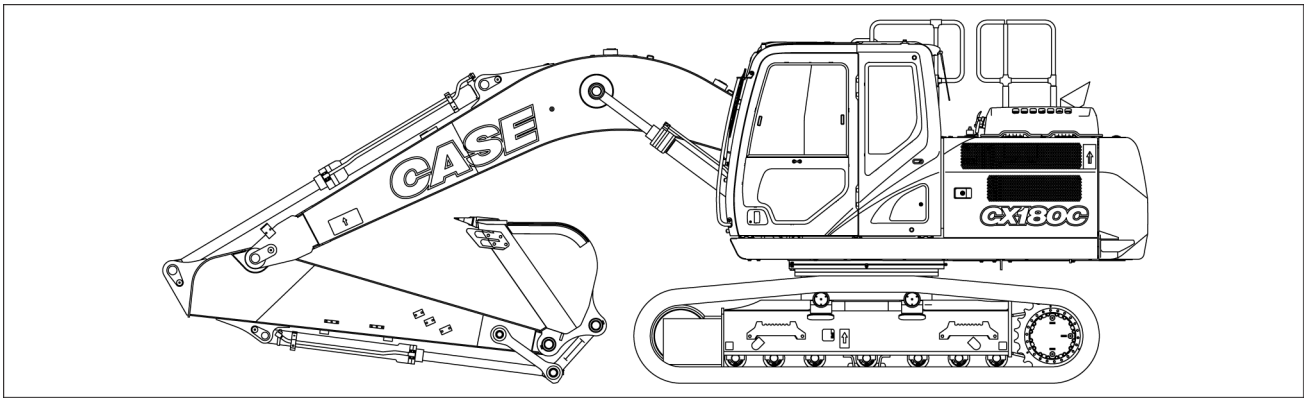
Engine-related

Engine

Engine model name	ISUZU AI-4JJ1X
Engine type	4-cycle, water-cooled, overhead camshaft type straight cylinder, direct fuel injection type (electronic control)
Number of cylinders-bore-stroke	4 -∅ **95.4 mm** (**3.76 in**) - **104.9 mm** (**4.13 in**)
Total displacement	**2.999 L** (**0.7923 US gal**)
Compression ratio	17.5
Rated output	**89.2 kW** (**121.28 Hp**) / **2000 RPM**
Maximum torque	**391.0 N·m** (**288.39 lb ft**) / about **1600 RPM**
Fuel consumption ratio	**230.6 g/kWh**
Engine dry weight	About **320 kg** (**705.479 lb**)
Engine dimension	L **928 mm** (**36.5354 in**) - W **760 mm** (**29.921 in**) - H **888 mm** (**34.9606 in**)
Cooling fan	∅ **550 mm** (**21.654 in**) - suction type - 8 vanes, plastic
	With bell mouth-type fan guide
Pulley ratio	0.95 (reduction)
Charging generator	**24 V 50 A**, AC type
Starter motor	**24 V 4 kW** (**5.4 Hp**) reduction type
Coolant capacity	**6.0 L** (**1.6 US gal**)
Oil pan capacity	Max: **15.0 L** (**4.0 US gal**) Min: **11.0 L** (**2.9 US gal**) (not including oil filter)
Direction of rotation	Right (viewed from fan side)
	Compliant with JISD 0006-2010

Product identification

The CX180C is a totally hydraulic excavator. It consists of an undercarriage fitted with tracks and a turntable bearing which supports the upperstructure frame. The upperstructure frame supports the attachment, at the front end of the machine, plus the engine, hydraulics and cab. When the operator works the controls, the engine-driven pump delivers hydraulic fluid to the control valves. The control valves distribute the hydraulic fluid to the various cylinders and hydraulic motors employed. A cooling system maintains the hydraulic fluid at normal operating temperature.



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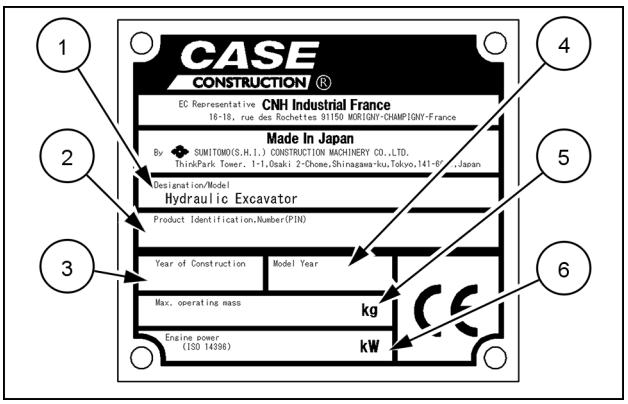
When ordering parts, obtaining information or assistance, always supply your CASE CONSTRUCTION Dealer with the type and serial number of your machine or accessories. Write the following in the spaces below: the type, serial number and year of manufacture of your machine, accessories and the serial numbers of the various hydraulic and mechanical components.

Machine



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(1) Designation/Model
Hydraulic Excavator CX180C

(2) Product Identification Number (PIN)

(3) Year of Construction

(4) Model Year

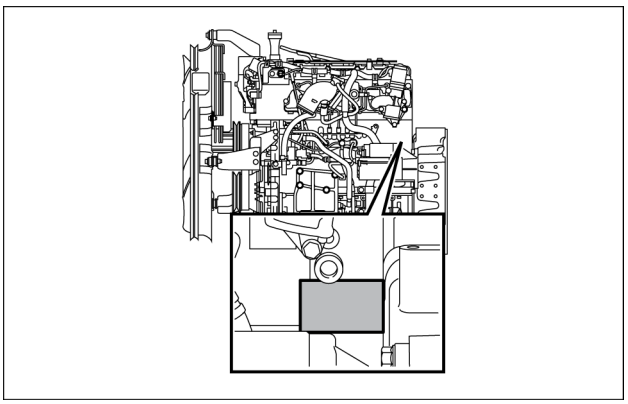
(5) Maximum operating mass
(the weight shown on the manufacturer's plate is the value using the heaviest configuration and that it does not always correspond to the transport configuration)

(6) Engine power **ISO 14396**

Engine

Manufacturer and model: ISUZU AI-4JJ1X

Serial number:



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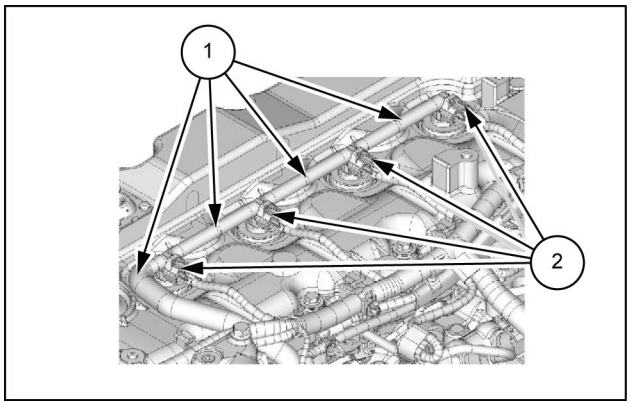
2. Remove the harness connector from the injector **(2)**.
3. Remove the nozzle leak off pipe **(1)** from the injector.

NOTICE: *Do not reuse the leak-off pipe clip **(1)**.*



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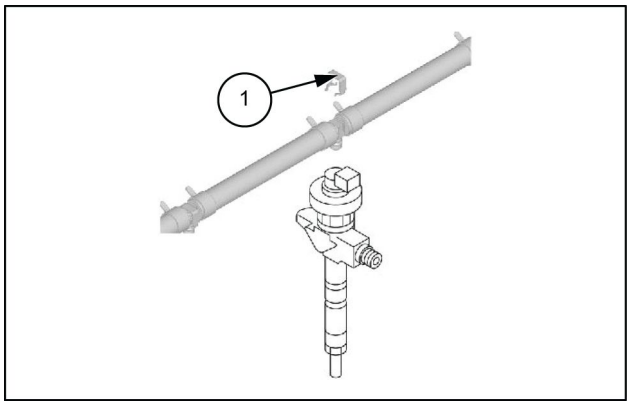

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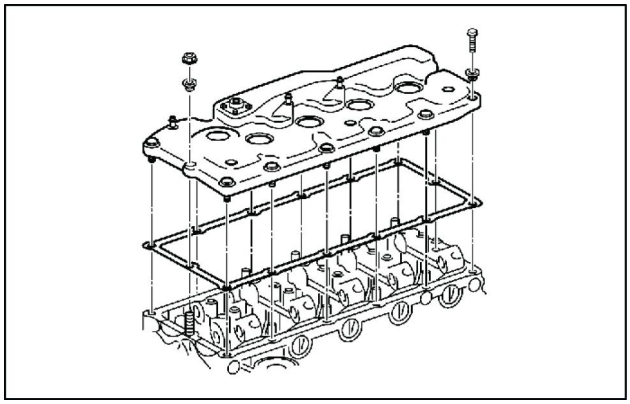
Cylinder head cover removal

NOTICE: *Do not damage the lip section of the oil seal with the connector of the injector.*

1. Remove the cylinder head cover from the cylinder head.
   - Shift the head cover to the left side of the engine and lift upwards to remove.



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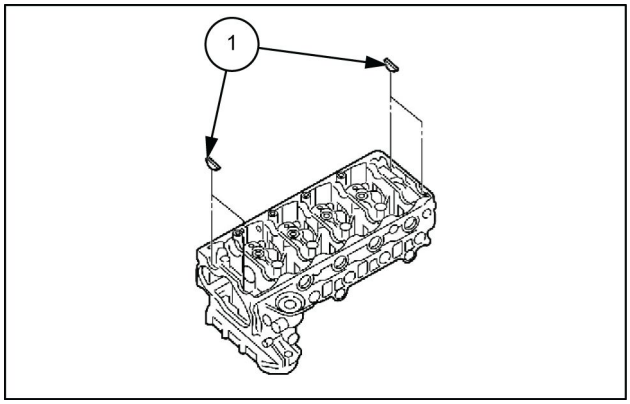
Cam end gasket removal

1. Remove the cam end gasket **(1)** from the cylinder head.
   - Clean any liquid gasket remaining on the cylinder head.



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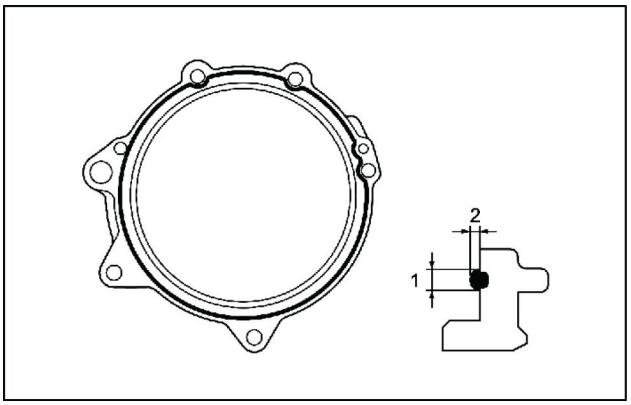
Oil seal retainer installation

1. Install the oil seal retainer to the crankcase.
   - As shown in the diagram, apply ThreeBond 1207B or equivalent liquid gasket, assemble within **5 min**, and tighten to the specified torque.

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

   1. **2 – 2.5 mm** (**0.08 – 0.10 in**)
   2. **2 – 2.5 mm** (**0.08 – 0.10 in**)



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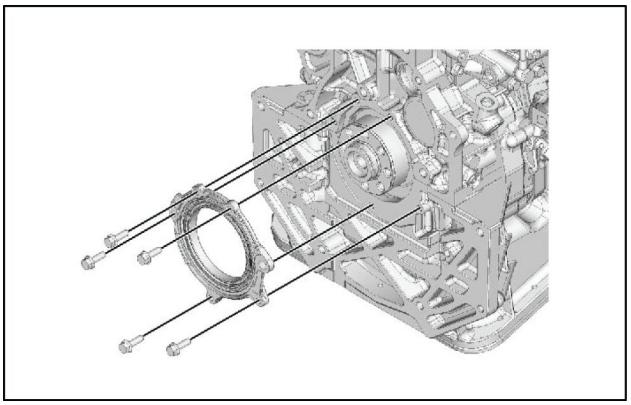

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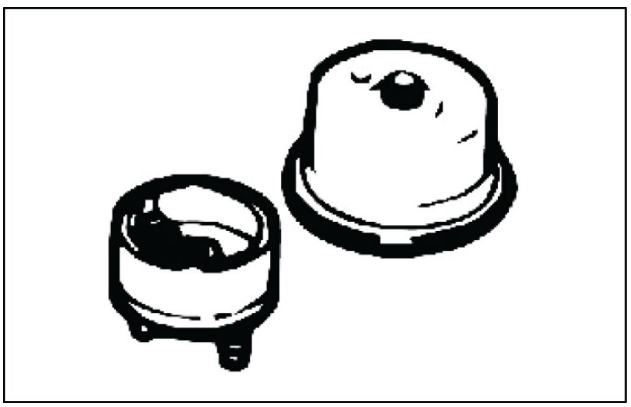
Crankshaft rear oil seal installation

1. Install the slinger to the oil seal.
   - Use a rear oil seal installer.

     Special tool: Oil seal installer kit (Refer to **Crankshaft - Special tools (10.103)**)

     Specified angle: **45°**



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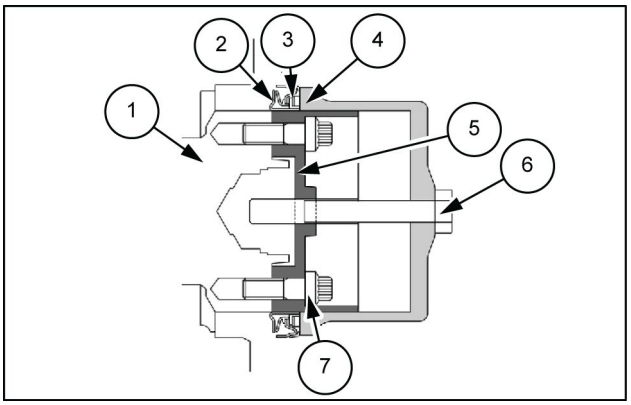
2. Install the crankshaft rear oil seal **(3)** to the adapter **(5)**.
   - Assemble and firmly fit the slinger **(2)** and rear oil seal.

NOTICE: *Do not reuse the crankshaft rear oil seal **(3)**.*

   7. Bolt

   - Insert the oil seal and slinger **(2)** to the outer periphery of the adapter **(5)**.

3. Install the adapter **(5)** to the crankshaft **(1)**.
   - Install the adapter **(5)** to the rear end section of the crankshaft **(1)**.



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Drive belt adjustment

1. Adjust the drive belt.
   - 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** (**22.031 lb**)

   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**)

   - Verify whether precise tension has been set using a sonic tension meter.

   Frequency of vibrations

     New: **220 – 244 Hz**

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

   1. Crankshaft pulley
   2. Installation bolt
   5. Lock nut
   6. Fan pulley

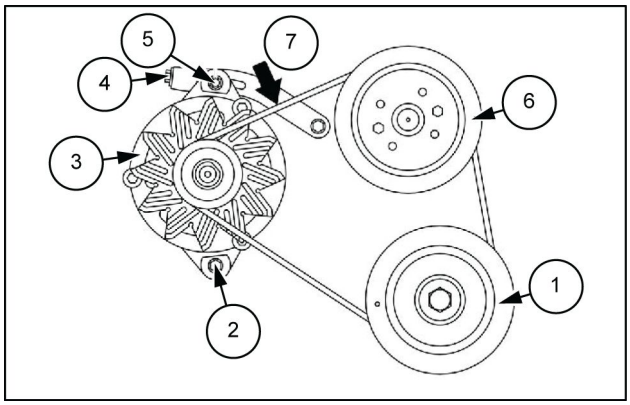
NOTICE: *When the tension is not appropriate, it can lead to a shorter service life and squeaking belt. Be sure to adjust the tension correctly.*

   - After adjustment, tighten the adjust plate lock bolt and mounting bolt at the bottom side of the generator to the specified torque.

     Tightening torque: **51 N·m** (**38 lb ft**) **M10** bolt, **M10** nut

     Tightening torque: **25 N·m** (**18 lb ft**) **M8** bolt, **M8** nut

   - When installing a new belt, initial elongation of the belt occurs.
   - Adjust the belt according to the adjustment method below in order to settle the belt in the pulley groove when installing a new belt or when readjusting the belt tension.
   - Follow the specified method to adjust the belt tension.
   - Start and idle the engine for **5 min** or more to settle the belt.
   - Stop the engine and readjust the belt tension to the specified value.



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Engine oil filling

1. Replenish the engine with engine oil.
   - Recheck the tightening of the oil pan drain plug.

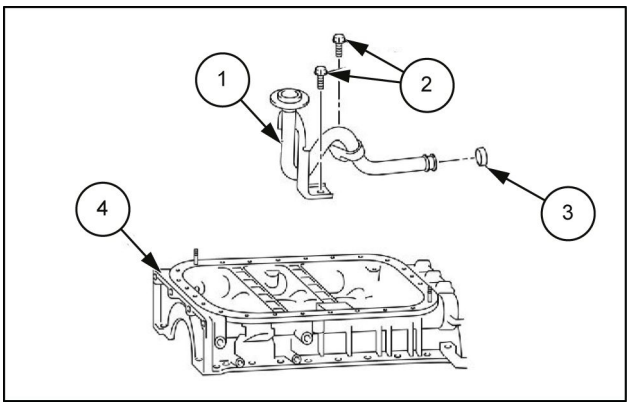
Pan and covers - Assemble

Assembly of oil pan and crankcase

1. Apply engine oil to the gasket **(3)**.
2. Install the gasket **(3)** to the oil strainer **(1)**.
3. Install the oil strainer **(1)** to the crankcase **(4)**.

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

   2. Bolt



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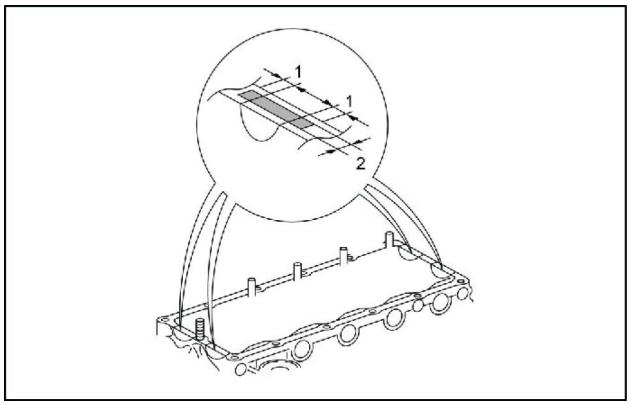
- Apply liquid gasket, ThreeBond 1207B as shown in the diagram.

1. **3.0 – 5.0 mm** (**0.1181 – 0.1969 in**)
2. **3.0 – 5.0 mm** (**0.1181 – 0.1969 in**)



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Cylinder head cover installation

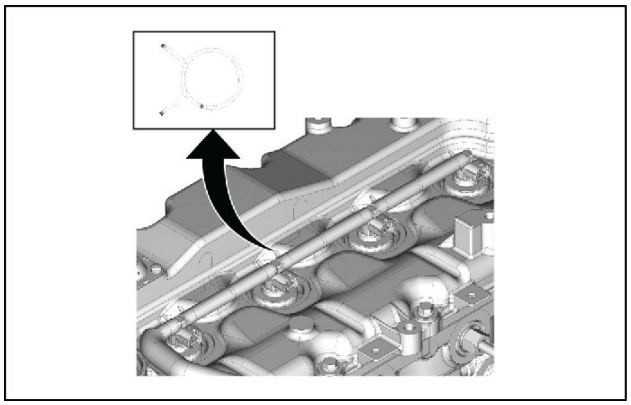
1. Install the cylinder head cover to the cylinder head.

   Tightening torque: **10 N·m** (**7 lb ft**)

2. Connect the PCV hose to the cylinder head cover.

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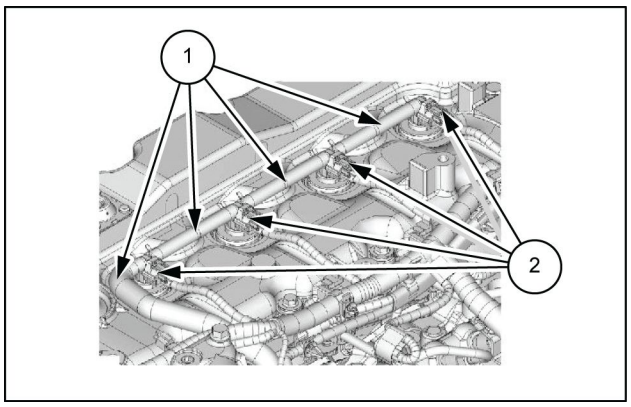
2. Connect the harness connector to the injector.
   1. Nozzle leak off pipe
   2. Injector harness



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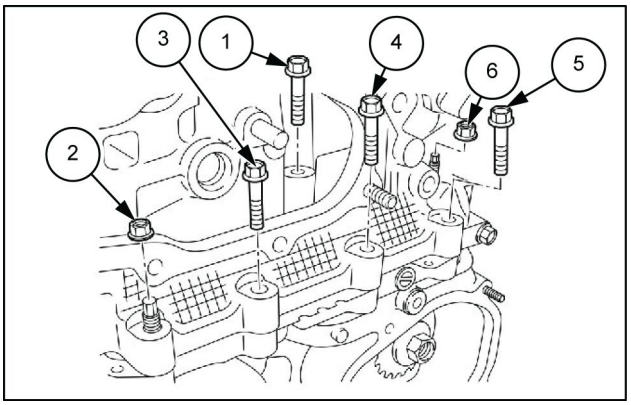
3. Install the bolt to the timing gear case.
4. Install the nut to the timing gear case.
   - Tighten at the specified torque in the order of the numbers in the diagram.

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



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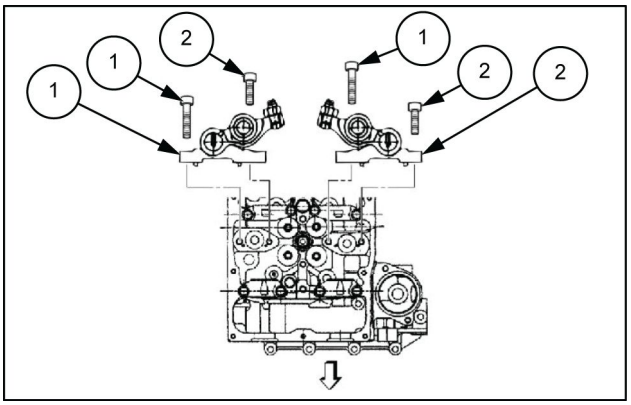
Rocker arm shaft assembly installation

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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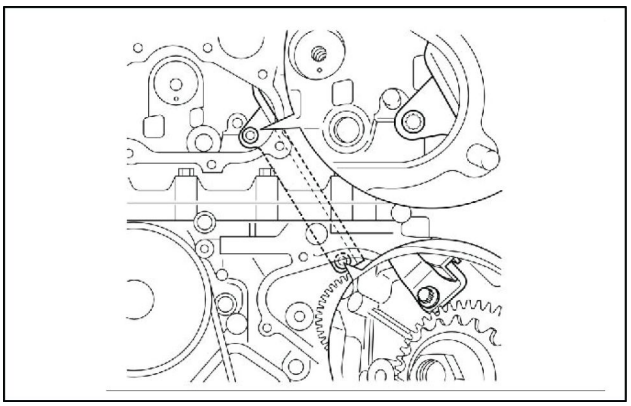
Timing chain guide installation

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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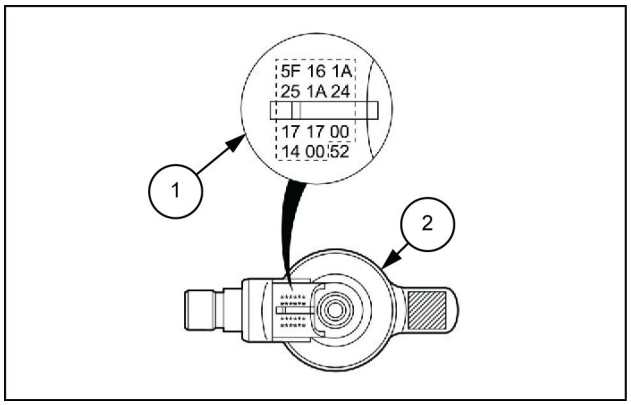
4. Temporarily tighten the injector **(1)** to the cylinder head.
   - Install and temporarily tighten the injector **(1)**, injector clamp, and clamp bolt to the cylinder head.
   - When installing the injector **(1)** to the cylinder head, confirm that the injector gasket is installed to the injector **(1)**.

NOTICE: *When replacing the injector, record the injector ID code* ***(2)*** *of the new injector.*
Record the 24 letters on the injector ID plate.



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Injection pipe installation

NOTICE: *When high-pressure lines in the fuel system are removed, always replace them with new lines.*
Reusing them causes damaged seal surfaces and fuel leaks.

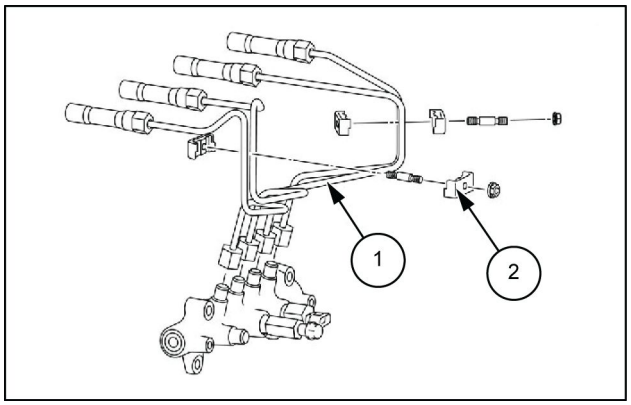
1. Temporarily tighten the injection pipe **(1)** to the injector and common rail assembly.
   - Apply engine oil to the threaded portion of the sleeve nut on the injector side of the injection pipe **(1)** and the O-ring of the injector.
   - When installing, do not damage the injector sleeve gasket.
   - Using an open-end wrench, lightly tighten the sleeve nut on the common rail side until it is firmly attached.
   - Tighten the sleeve nuts on the injector side until they can no longer be turned by hand.
2. Securely tighten the injector to the cylinder head.
   - Tighten the injector clamp **(2)** bolt to the specified torque.

     Tightening torque: **26 N·m** (**19 lb ft**)
3. Securely tighten the injection pipe **(1)** to the injector.
   - Tighten the sleeve nut on the injector side of the injection pipe **(1)** to the specified torque.

     Tightening torque: **30 N·m** (**22 lb ft**)
4. Securely tighten the injection pipe **(1)** to the common rail assembly.
   - Tighten the sleeve nut on the common rail side of the injection pipe **(1)** to the specified torque.

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

     Tightening torque: **7.8 N·m** (**5.753 lb ft**) clamp nut



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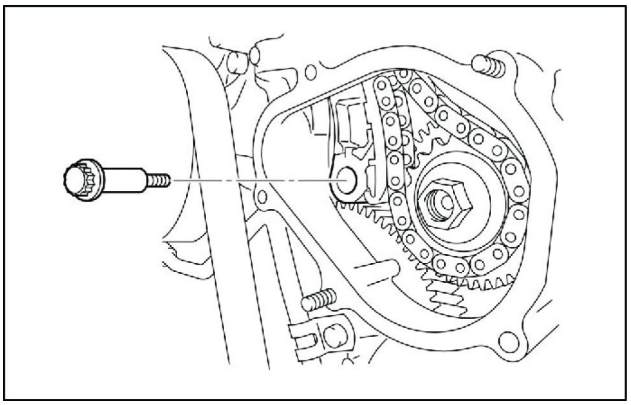
Timing chain lever pivot removal

1. Remove the timing chain lever pivot from the timing gear case.



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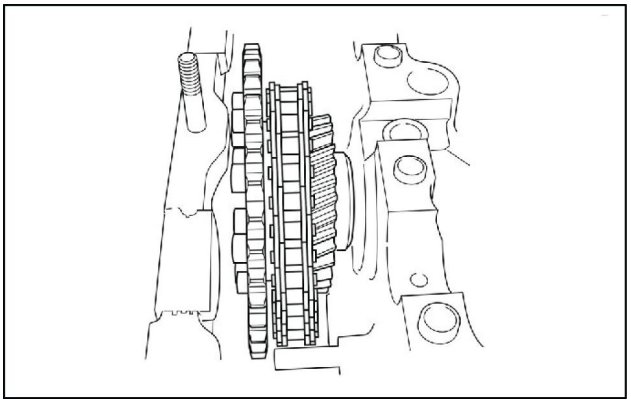
Idle gear D removal

1. Remove idle gear D **(3)** from the gear case cover.

NOTE: *Remove idle gear D **(3)** together with the sprocket.*

1. Bolt
2. washer
4. Idle gear shaft



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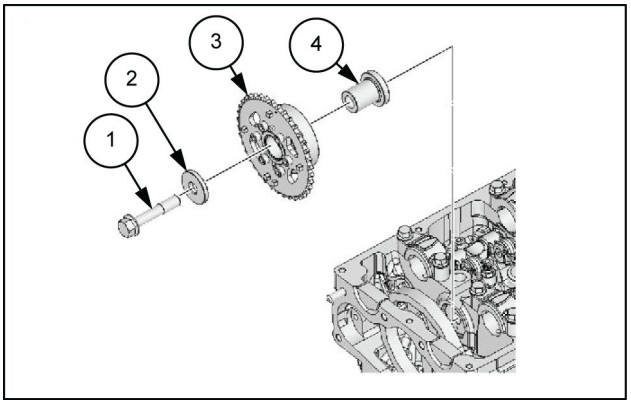

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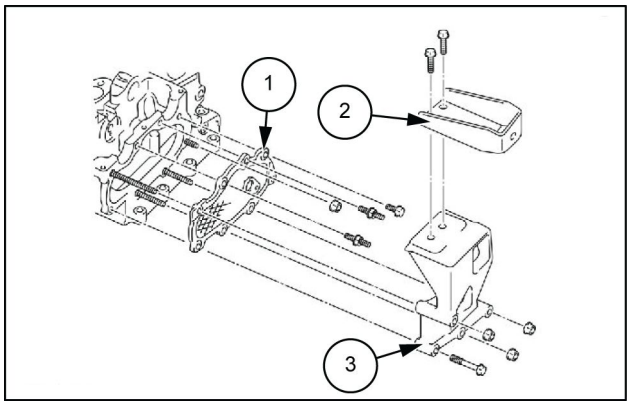
Timing chain removal

1. Remove the timing chain from the sprocket.

NOTE: *Remove from the supply pump sprocket.*

Timing chain upper cover removal

1. Remove the timing chain upper cover **(1)** from the cylinder head.
    2. Fan shroud bracket
    3. Fan shroud stay



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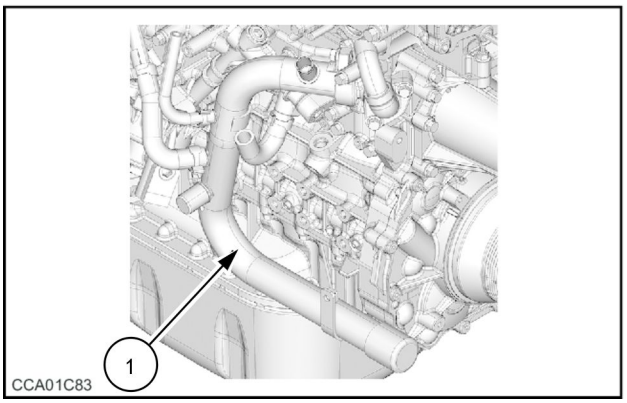
Water intake pipe removal

1. Disconnect the water intake pipe **(1)** from the oil cooler.

NOTICE: *Do not reuse the gasket or O-ring.*

2. Remove the water intake pipe **(1)** from the cylinder block.



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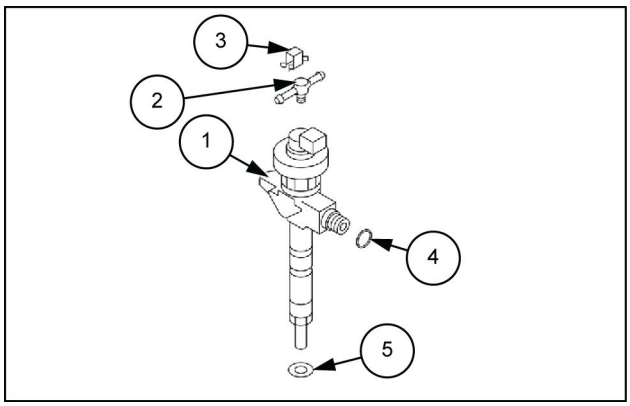
Injector removal

1. Remove the injector **(1)** from the cylinder head assembly.

NOTICE: *The injector ID code identifies the injector.*
Do not remove the injector ID code from the injector.
Never touch the electromagnetic section of the injector as doing so can reduce performance or cause damage.
Store the removed injectors with the cylinder number marked on them.
When replacing the injector, use a black marker to black out the ID code of the replaced cylinder number on the injector ID code label.

2. Remove the injector gasket **(5)** from the injector.



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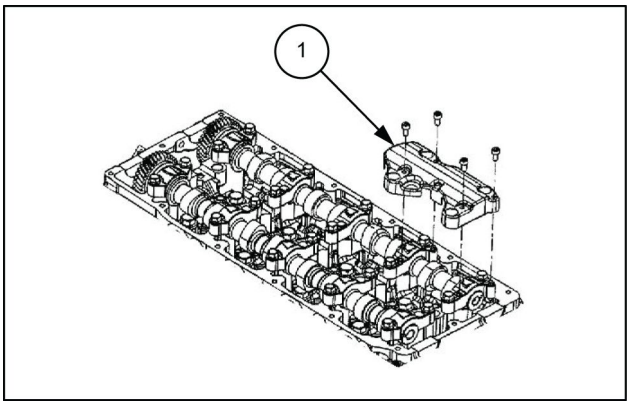
Baffle plate installation

1. Install the baffle plate **(1)** to the cylinder head.

   Tightening torque: **10 N·m** (**7 lb ft**)



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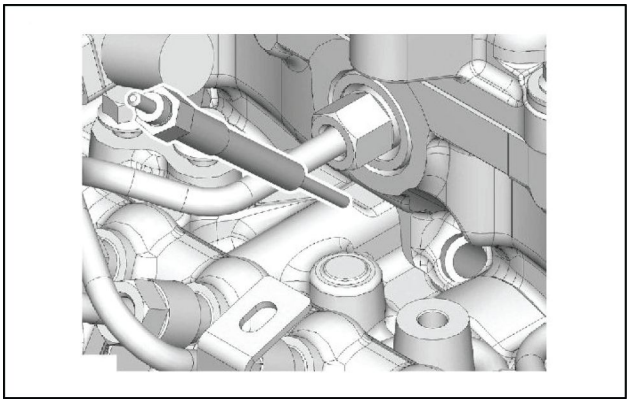
Glow plug installation

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

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

NOTICE: *Do not exceed specifications when tightening as over-tightening may result in breakage.*



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Glow plug connector installation

1. Install the glow plug connector to the glow plug.
   - Install the glow plug connector to the glow plugs of the No. 1, No. 3 and No. 4 cylinders.

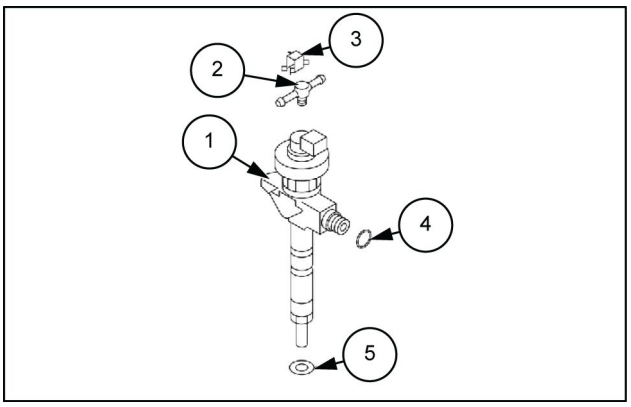
NOTICE: *When connecting the glow plug connectors, do not let them interfere with the cylinder head.*

Tightening torque: **1.8 N·m** (**1.328 lb ft**)

Injector installation

1. Install the injector gasket **(5)** to the injector **(1)**.
   - Push in until your hand stops.
   - Do not forcibly push the injector gasket **(5)** in as it will be pushed in to the end during clamp tightening.
2. Install the O-ring **(4)** to the injector **(1)**.
   - When installing the O-ring **(4)**, be careful not to cause damage by applying engine oil to it.

2. Leak-off pipe
3. Clip



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Piston pin inspection

1. Inspect the piston pin.

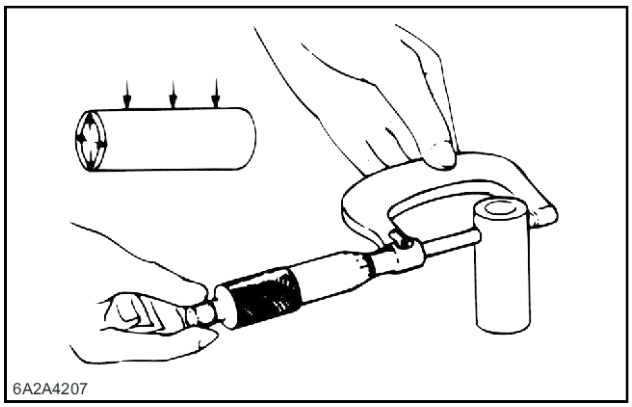
NOTE: *Visually inspect the piston pin for cracks, scratches, and other damage. Replace if necessary.*

2. Use a micrometer caliper to measure the outer diameter.

   Standard value: **33.995 – 34.000 mm** (**1.3384 – 1.3386 in**)

   Limit: **33.970 mm** (**1.3374 in**)

NOTE: *Measure the outer diameter of the piston pin and if the measurement value exceeds the limit, replace the piston pin.*



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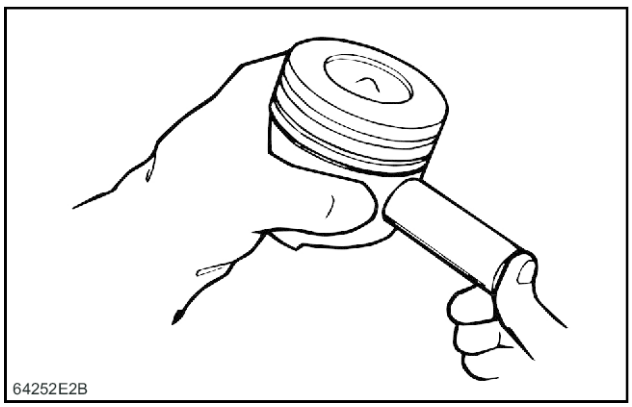
NOTE: *Check that the piston has resistance so that the piston pin can be easily pushed in when inserted at the normal temperature.*
If it is very loose or backlash is felt at the normal temperature, replace the piston or piston pin.

3. Use a dial gauge to measure the inner diameter.

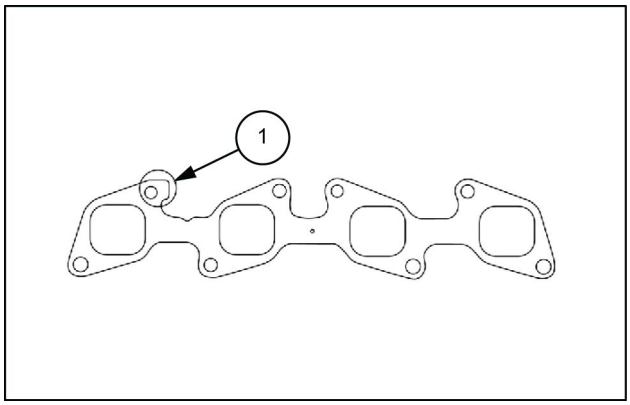
NOTE: *Measure the inner diameter of the connecting rod small end bushing.*



64252E2B 7

Exhaust manifold installation

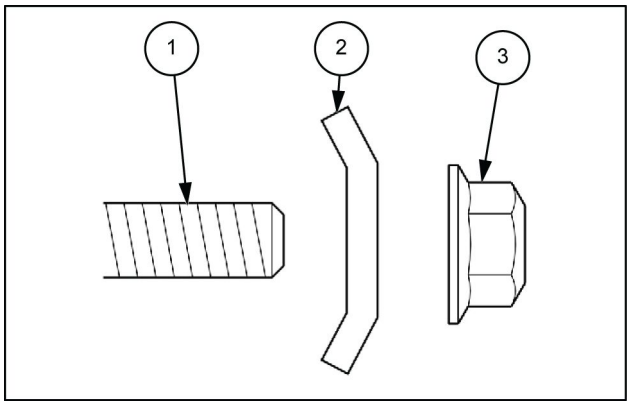
1. Install the exhaust manifold to the cylinder head.
   - Assemble so that the gasket ear portion **(1)** is on the engine rear side.



LPIL12CX00665AB 81

   - Assemble the washer **(2)** and nut **(3)** as indicated in the diagram and temporarily tighten.

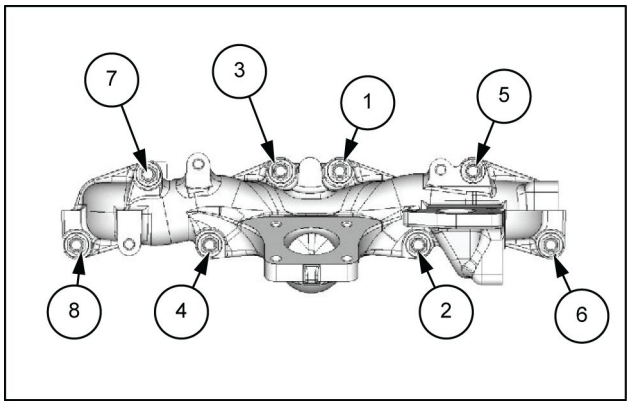
   1. Stud



LPIL12CX00666AB 82

   - Tighten to the specified torque in the order shown in the diagram.

     Tightening torque: **52 N·m** (**38 lb ft**)



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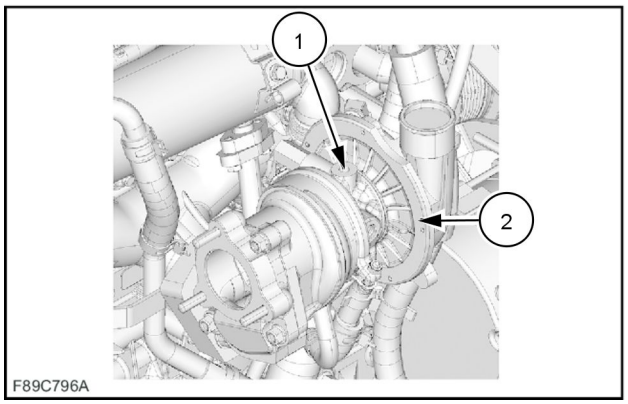
Turbocharger assembly installation

1. Install the turbocharger assembly **(2)** to the exhaust manifold.

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

   1. Oil feed port

   - Fill with **0.5 cm³** (**0.031 in³**) of engine oil from the fuel filler.



F89C796A 84

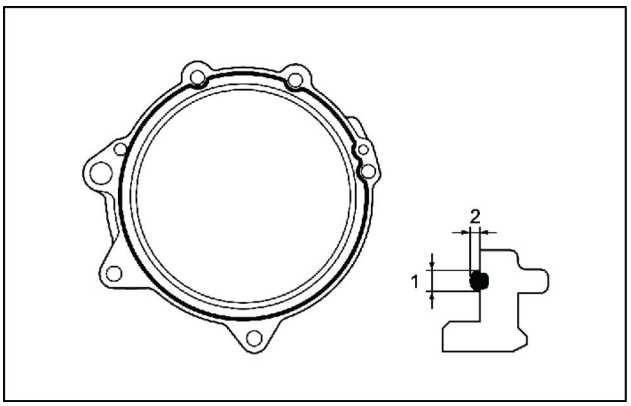
Crankshaft oil seal Rear seal - Install

Oil seal retainer installation

1. Install the oil seal retainer to the crankcase.
   - As shown in the diagram, apply ThreeBond 1207B or equivalent liquid gasket, assemble within **5 min**, and tighten to the specified torque.

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

   1. **2 – 2.5 mm** (**0.08 – 0.10 in**)
   2. **2 – 2.5 mm** (**0.08 – 0.10 in**)



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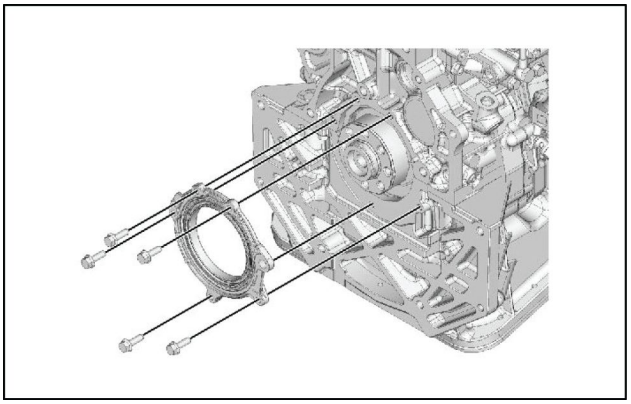


LPIL12CX00794AA 2

Flywheel housing installation

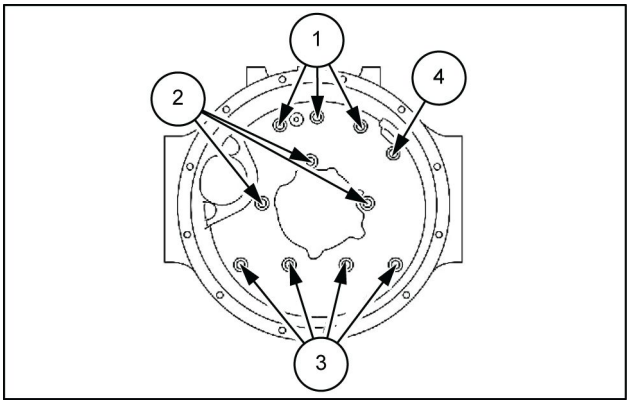
1. Install the flywheel housing to the crankcase.
   - Install the flywheel housing and tighten to the specified torque.
   - Loosen bolt **(4)** using a tool while holding down the nut on the opposite side.

     Tightening torque: **51 N·m** (**38 lb ft**) bolt **(1)**

     Tightening torque: **82 N·m** (**60 lb ft**) bolt **(2)**

     Tightening torque: **97 N·m** (**72 lb ft**) bolt **(3)**

     Tightening torque: **51 N·m** (**38 lb ft**) bolt **(4)**



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4. Standard value: **69.917 – 69.932 mm** (**2.7526 – 2.7532 in**) Journal section

   Standard value: **52.915 – 52.930 mm** (**2.0833 – 2.0839 in**) Pin section

NOTICE: *Do not polish the crankshaft surface as Tufftride soft-nitriding treatment is applied to increase the crankshaft strength.*

NOTE: *Inspect the Tufftride layer on the crankshaft.*

5. Use organic solvent to clean the crankshaft.

NOTE: *Thoroughly clean the crankshaft and completely remove oil from the location to be tested.*

6. Prepare a test solution.

NOTE: *Prepare a **5 – 10%** cupric chloride ammonium solution.*

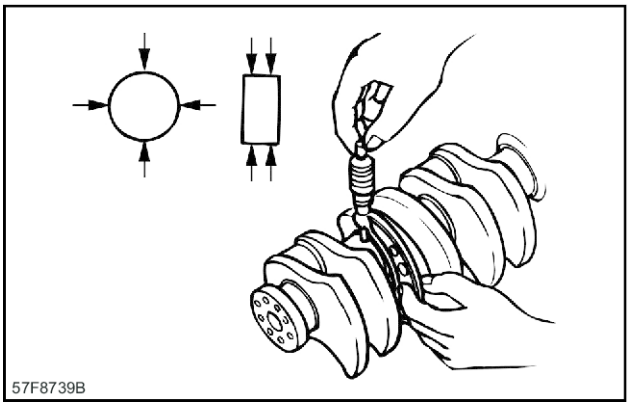
7. Apply the test solution to the crankshaft.
   1. Dropping prohibited area
   2. Test solution drop location
   3. Pin or journal sliding surface

NOTE: *Use an oil dropper to drop the solution on the location to be tested.*
Hold the surface to be inspected horizontal so that the solution does not run down.

NOTICE: *Do not let the solution touch the dropping prohibited area within **10 mm** (**0.3937 in**) from the oil port.*

NOTE: *Wait about **30 – 40 s**.*
*If the color does not change after **30 – 40 s** have passed, this means the crankshaft still has a Tufftride layer and can be used.*
If the test surface turns copper color, replace the crankshaft.

NOTICE: *Cupric chloride ammonium solution is highly corrosive. After the test is done, immediately clean the test surface.*



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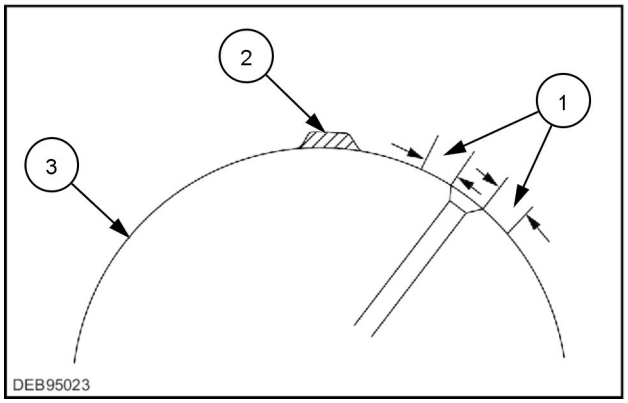
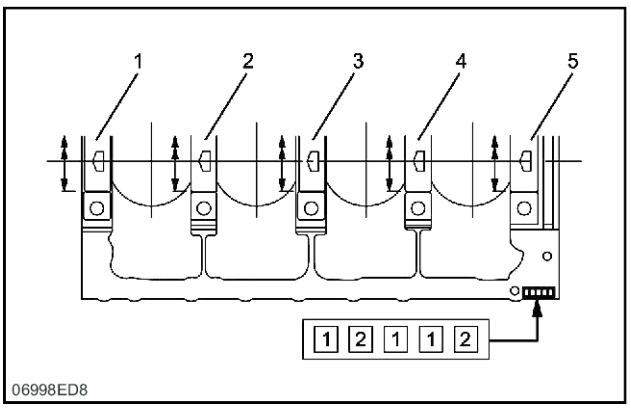


DEB95023 7

Crankshaft bearing preparation

1. Select the crankshaft bearing.
   1. No. 1
   2. No. 2
   3. No. 3
   4. No. 4
   5. No. 5

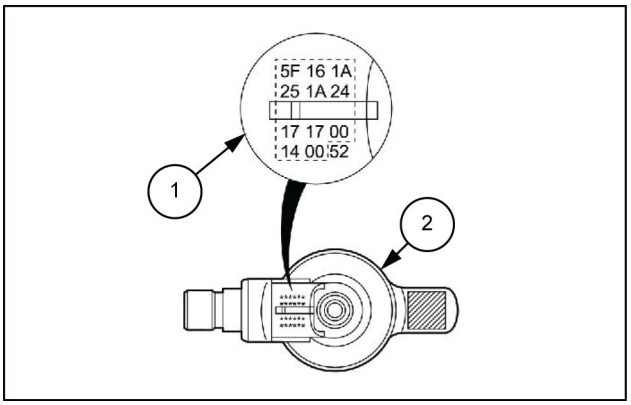
NOTE: *When installing a new crankshaft bearing or replacing the existing bearing, see the bearing selection table.*
Carefully check the cylinder block journal hole inner diameter grade and the crankshaft journal diameter grade and select new bearings and install.
The crankshaft bearing housing grade 1, 2, or 3 is stamped on the rear right of the cylinder block.



06998ED8 8

4. Temporarily tighten the injector **(1)** to the cylinder head.
   - Install and temporarily tighten the injector **(1)**, injector clamp, and clamp bolt to the cylinder head.
   - When installing the injector **(1)** to the cylinder head, confirm that the injector gasket is installed to the injector **(1)**.

NOTICE: *When replacing the injector, record the injector ID code **(2)** of the new injector.*
Record the 24 letters on the injector ID plate.



LPIL12CX00655AB 84

Injection pipe installation

NOTICE: *When high-pressure lines in the fuel system are removed, always replace them with new lines.*
Reusing them causes damaged seal surfaces and fuel leaks.

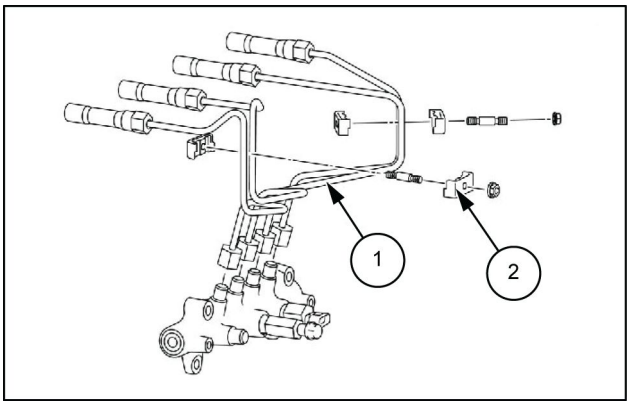
1. Temporarily tighten the injection pipe **(1)** to the injector and common rail assembly.
   - Apply engine oil to the threaded portion of the sleeve nut on the injector side of the injection pipe **(1)** and the O-ring of the injector.
   - When installing, do not damage the injector sleeve gasket.
   - Using an open-end wrench, lightly tighten the sleeve nut on the common rail side until it is firmly attached.
   - Tighten the sleeve nuts on the injector side until they can no longer be turned by hand.
2. Securely tighten the injector to the cylinder head.
   - Tighten the injector clamp **(2)** bolt to the specified torque.

     Tightening torque: **26 N·m** (**19 lb ft**)
3. Securely tighten the injection pipe **(1)** to the injector.
   - Tighten the sleeve nut on the injector side of the injection pipe **(1)** to the specified torque.

     Tightening torque: **30 N·m** (**22 lb ft**)
4. Securely tighten the injection pipe **(1)** to the common rail assembly.
   - Tighten the sleeve nut on the common rail side of the injection pipe **(1)** to the specified torque.

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

     Tightening torque: **7.8 N·m** (**5.753 lb ft**) clamp nut



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Fuel filters - Remove

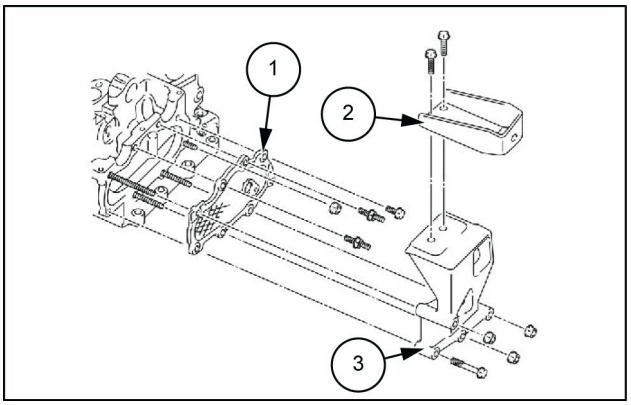
1. Disconnect the fuel hose from the fuel filter.
2. Remove the fuel filter from the machine.

NOTE: *Varies depending on the machine.*

2. Install the timing chain upper cover **(1)** to the cylinder head.
   - Apply **LOCTITE® 262™** to the threaded portion on the cylinder head side.

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

   1. Fan shroud bracket
   2. Fan shroud stay



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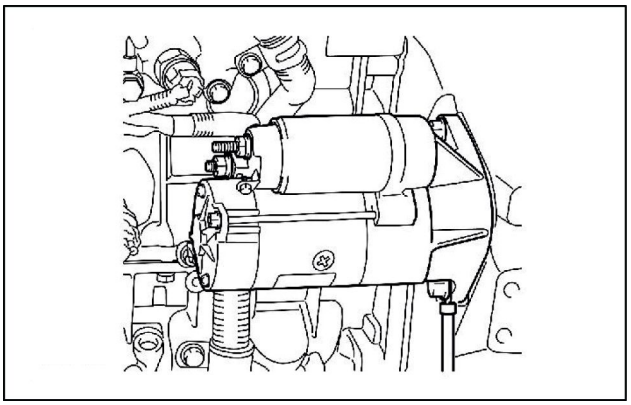
Starter motor installation

1. Install the starter motor to the flywheel housing.
   - Install the earth cable at the same time.

     Tightening torque: **97 N·m** (**72 lb ft**)
2. Connect the S-terminal to the starter motor.
3. Connect the B-terminal to the starter motor.

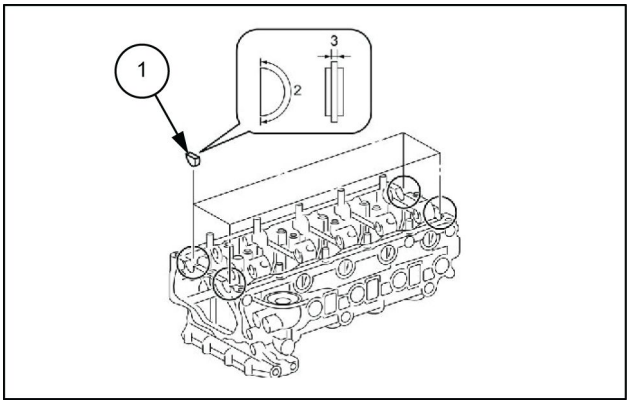


LPIL12CX01127AA 19

Cam end gasket installation

1. Install the cam end gasket **(1)** to the cylinder head.
   - Apply liquid gasket, ThreeBond 1207B to the area 2 indicated in the diagram with a width of **2.0 – 3.0 mm** (**0.0787 – 0.1181 in**) and install to the cylinder head.

   2. Liquid gasket application area
   3. Bead width



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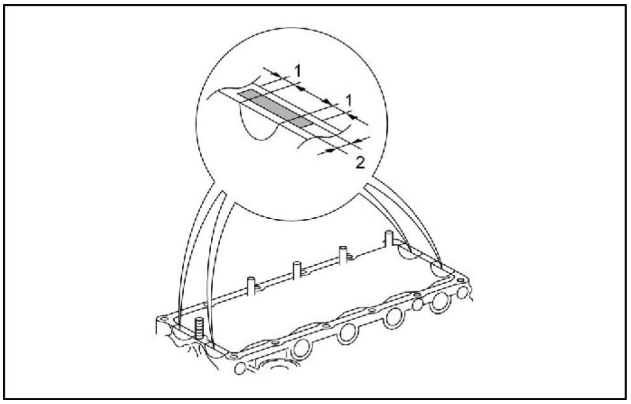
   - Apply liquid gasket, ThreeBond 1207B as shown in the diagram.

   1. **3.0 – 5.0 mm** (**0.1181 – 0.1969 in**)
   2. **3.0 – 5.0 mm** (**0.1181 – 0.1969 in**)



LPIL12CX00676AA 21

Turbocharger - Remove

Battery ground cable disconnect

1. Disengage the battery ground cable from the battery.

NOTICE: *Do not disconnect the battery cable for* ***1 min*** *after turning OFF the ignition switch.*

Coolant drain

⚠ WARNING

Burn hazard!
Hot coolant can spray and scald if you remove the radiator or deaeration tank cap while the system is hot. To remove the cap: allow the system to cool, turn the cap to the first notch, and wait for all pressure to release. Remove the cap only after all pressure has released.
Failure to comply could result in death or serious injury.

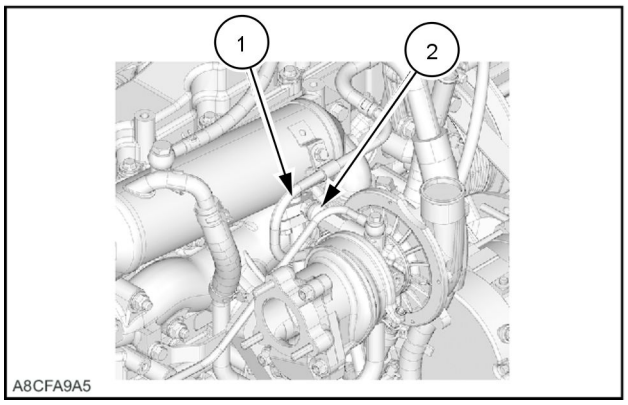
W0367A

1. Drain the coolant from the radiator.

NOTE: *Loosen the water drain plug and radiator drain plug on the rear right of the engine.*
Completely drain the coolant.
After draining the coolant completely, securely tighten the drain plug.

Turbocharger assembly removal

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



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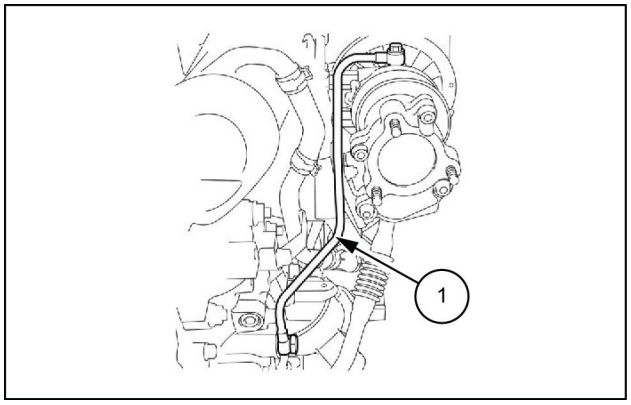
4. Remove the oil feed pipe **(1)** from the oil cooler assembly.



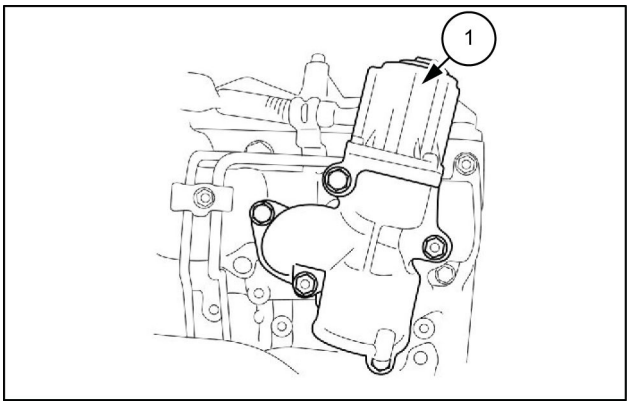
LPIL12CX00194AB 2

Exhaust Gas Recirculation (EGR) valve - Install

1. Install the EGR valve **(1)** to the inlet manifold.

   Tightening torque: **27 N·m** (**20 lb ft**)

2. Connect the harness connector to the EGR valve **(1)**.



LPIL12CX00505AB 1

Battery ground cable connect

1. Connect the battery ground cable to the battery.

Index

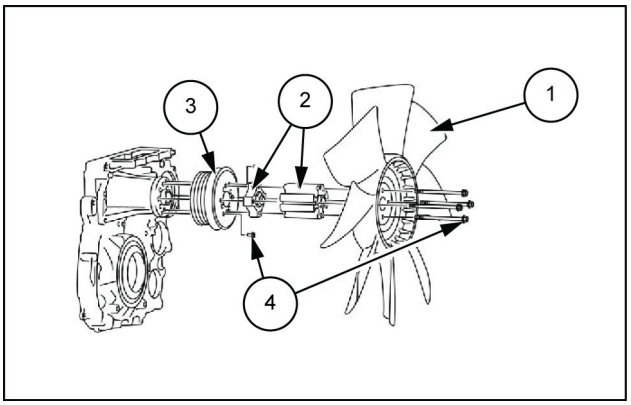
Engine - 10

Engine cooling system - 400

Cooling fan installation

1. Install the cooling fan **(1)** belt to the fan pulley **(3)**.
   - Install the spacer **(2)** at the same time.

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



LPIL12CX00680AB 7

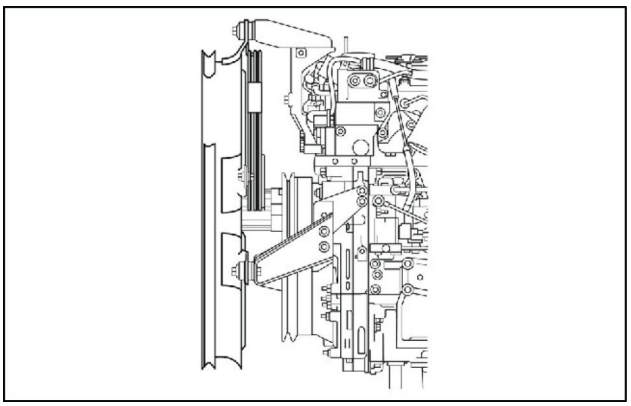
Drive belt installation

1. Install the drive belt on the fan pulley.

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**)



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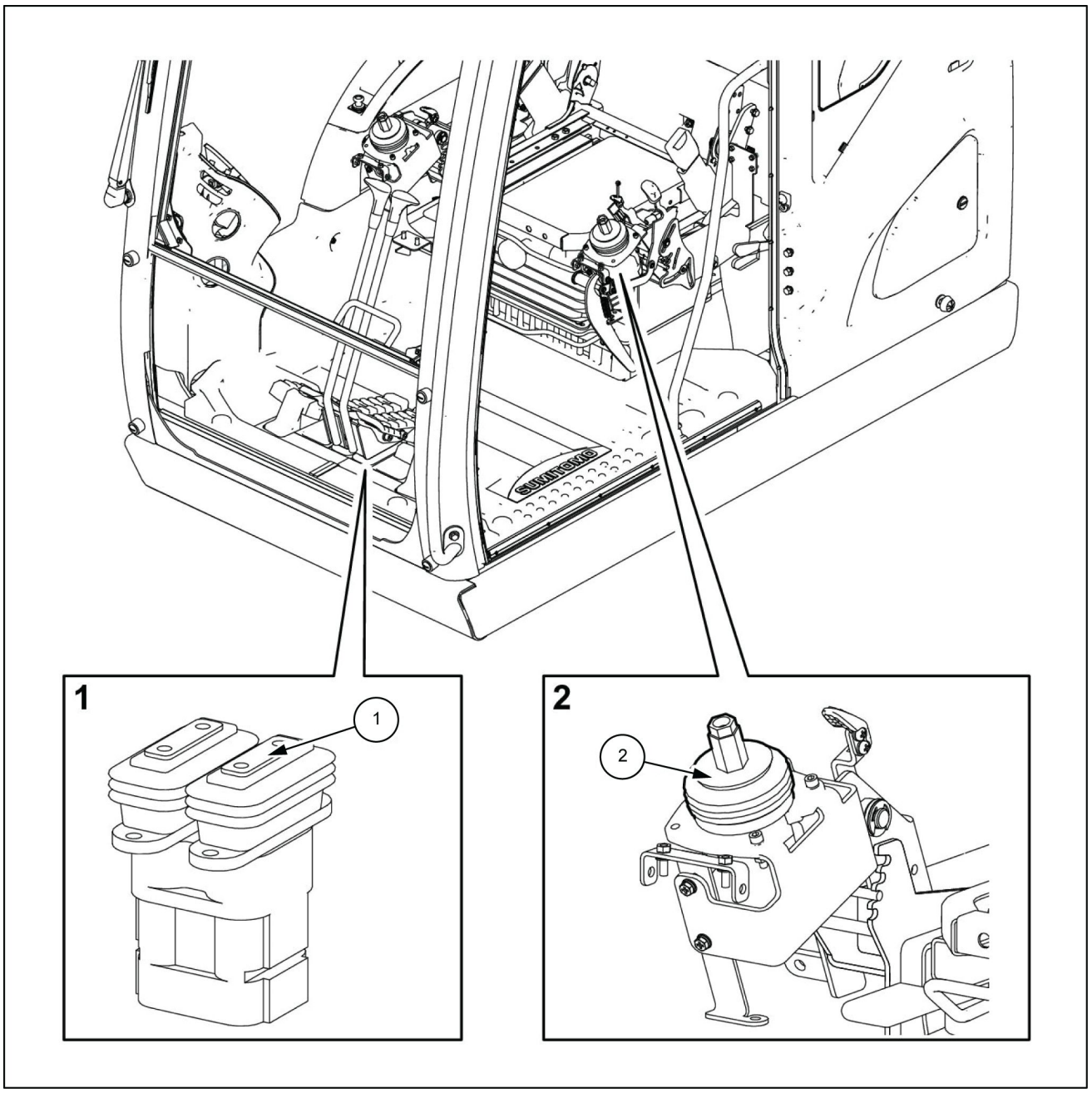
Hydraulic systems - Overview - Hydraulic equipment in cab



SMIL13CEX3499GB 1

1. Travel remote control valve
2. Upper operation remote control valve

Hydraulic systems - Hydraulic schema - Arm circuit

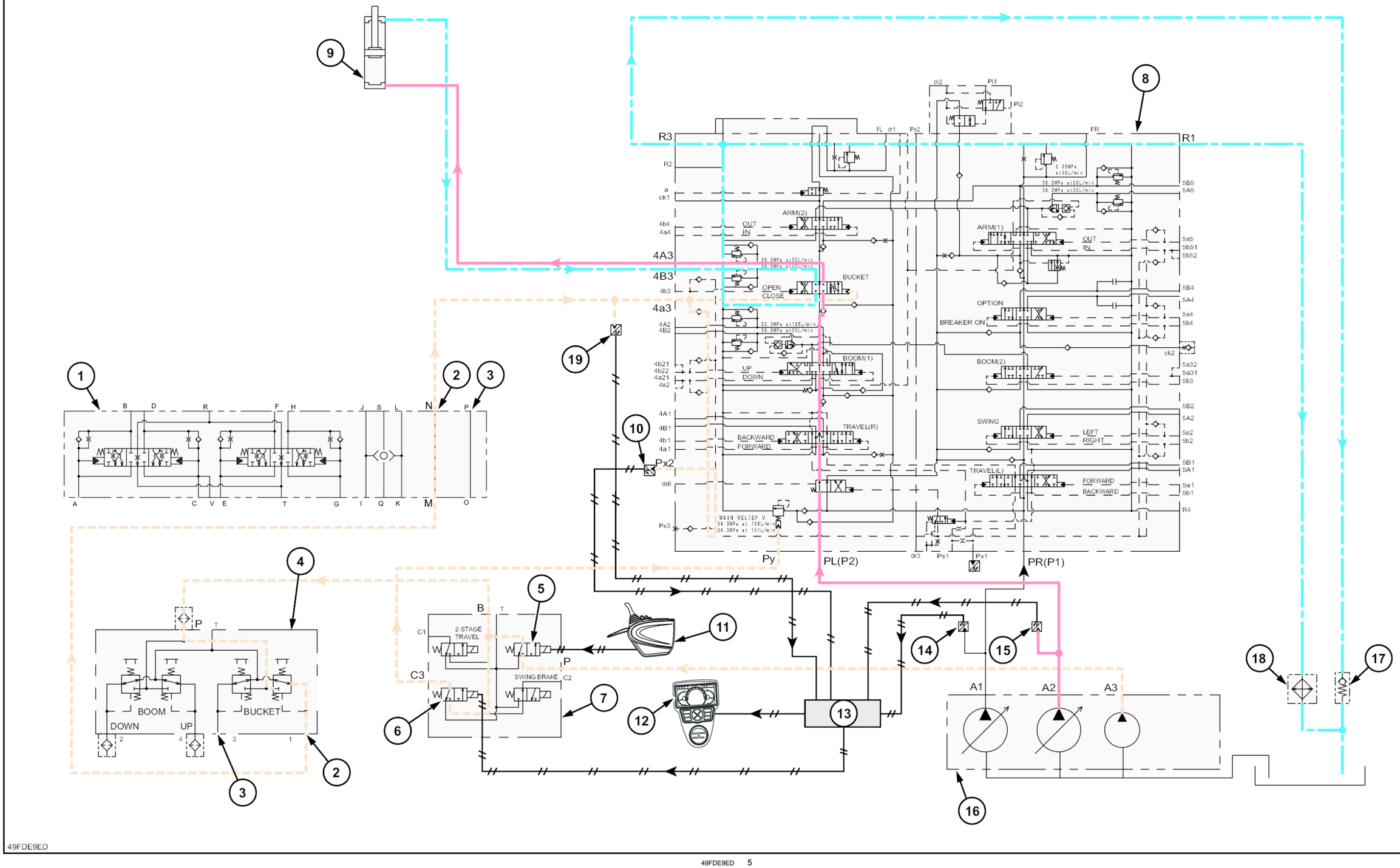
ARM-OUT CIRCUIT

When the remote control valve **(4)** is operated to the arm-out side, the pilot pressure oil is fed to the control valve **(8)** 4b4 port and 5a5 port via the cushion valve **(3)** and switches the arm [1] [2] spools to the out side.
The discharge oil from the hydraulic pump **(14)** A1 enters the control valve **(8)** PR (P1) port and is fed to the arm [1] spool via the center bypass oil path.
The discharge oil from the hydraulic pump **(14)** A2 enters the control valve **(8)** PL (P2) port, flows via the center bypass oil path and arm [2] spool and merges downstream of the arm [1] spool.
The merged pressure oil flows into the arm cylinder **(17)** rod side through the arm load holding valve check valve **(18)**, and the arm-out operation is carried out.
The return oil on the arm cylinder **(17)** bottom side returns to the hydraulic tank through the arm [1] [2] spools.

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

1. Arm (in)
2. Arm (out)
3. Cushion valve
4. Remote control valve (arm, swing)
5. Control valve
6. Upper pilot pressure sensor
7. Travel pilot pressure sensor
8. Computer A
9. Lever lock
10. Console lever lock switch
11. Pressure boost relief
12. 4 stack solenoid valve
13. Arm cylinder
14. P1 pressure sensor
15. P2 pressure sensor
16. Hydraulic pump
17. Horsepower control proportional valve
18. Oil cooler
19. Check valve
20. Arm pressure sensor

a. High flow


9
8
R3
R2
R1
FL
FR
dr1
Ps2
dr2
Pi1
Pi2
a
ck1
ARM(2)
OUT
IN
4b4
4a4
4A3
4B3
4b3
BUCKET
OPEN
CLOSE
4a3
4A2
4B2
ARM(1)
OUT
IN
5B5
5A5
5a5
5b51
5b52
OPTION
BREAKER ON
5B4
5A4
5a4
5b4
ck2
BOOM(1)
UP
DOWN
4b21
4b22
4a21
4a2
BOOM(2)
5a32
5a31
5b3
5B2
5A2
5a2
5b2
4A1
4B1
4b1
4a1
TRAVEL(R)
BACKWARD
FORWARD
SWING
LEFT
RIGHT
10
Px2
dr6
TRAVEL(L)
FORWARD
BACKWARD
5B1
5A1
5a1
5b1
R4
MAIN RELIEF V.
34.3MPa at 108L/min
36.3MPa at 101L/min
Px3
Py
dr3
Ps1
Px1
PL(P2)
PR(P1)
19
1
2
3
A
B
D
R
F
H
J
S
L
N
P
C
V
E
T
G
I
Q
K
M
O
4
P
T
BOOM
DOWN
UP
BUCKET
5
B
T
C1
2-STAGE
TRAVEL
P
C3
SWING BRAKE
C2
6
7
11
12
13
14
15
16
A1
A2
A3
18
17

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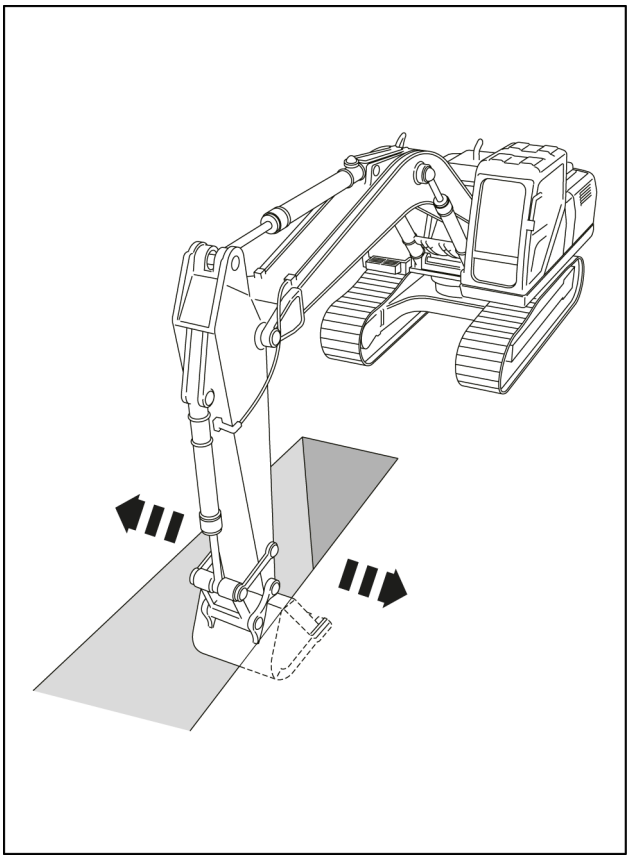
2. Measure with the following operations.

Engine speed	**2200 RPM**
Work mode	SP mode
Lever operation	Swing relief
Oil temperature	**45 – 55 °C** (**113.0 – 131.0 °F**)
Measuring port	P1 port
Set pressure	**27.9 MPa** (**4047 psi**)



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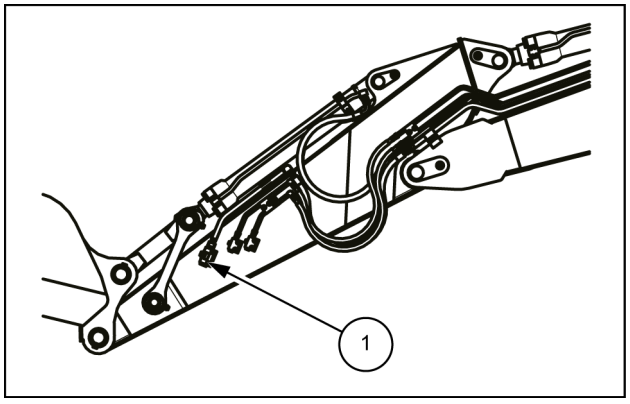
D. Option line pressure measurement

1. Close the option line stop valve **(1)**.
2. Switch the monitor attachment select switch to the option line to be measured. (Breaker/crusher)



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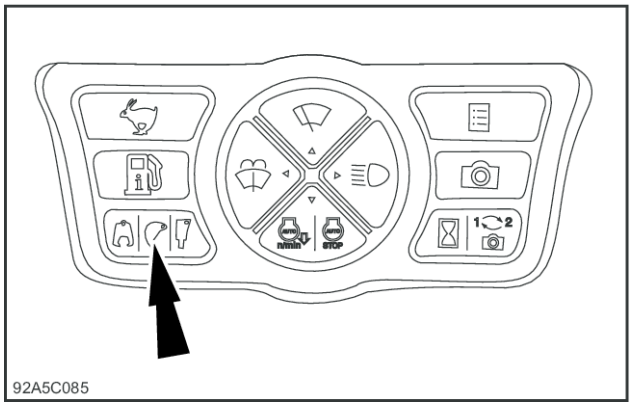
3. Measure with the following operations.

Engine speed	**2200 RPM**
Work mode	SP mode
Pedal operation	Option relief
Oil temperature	**45 – 55 °C** (**113.0 – 131.0 °F**)
Measuring port	1 pumps: P2 port
	2 pump: P1 port

* Adjust the set pressure to match the specifications of the attachment used.



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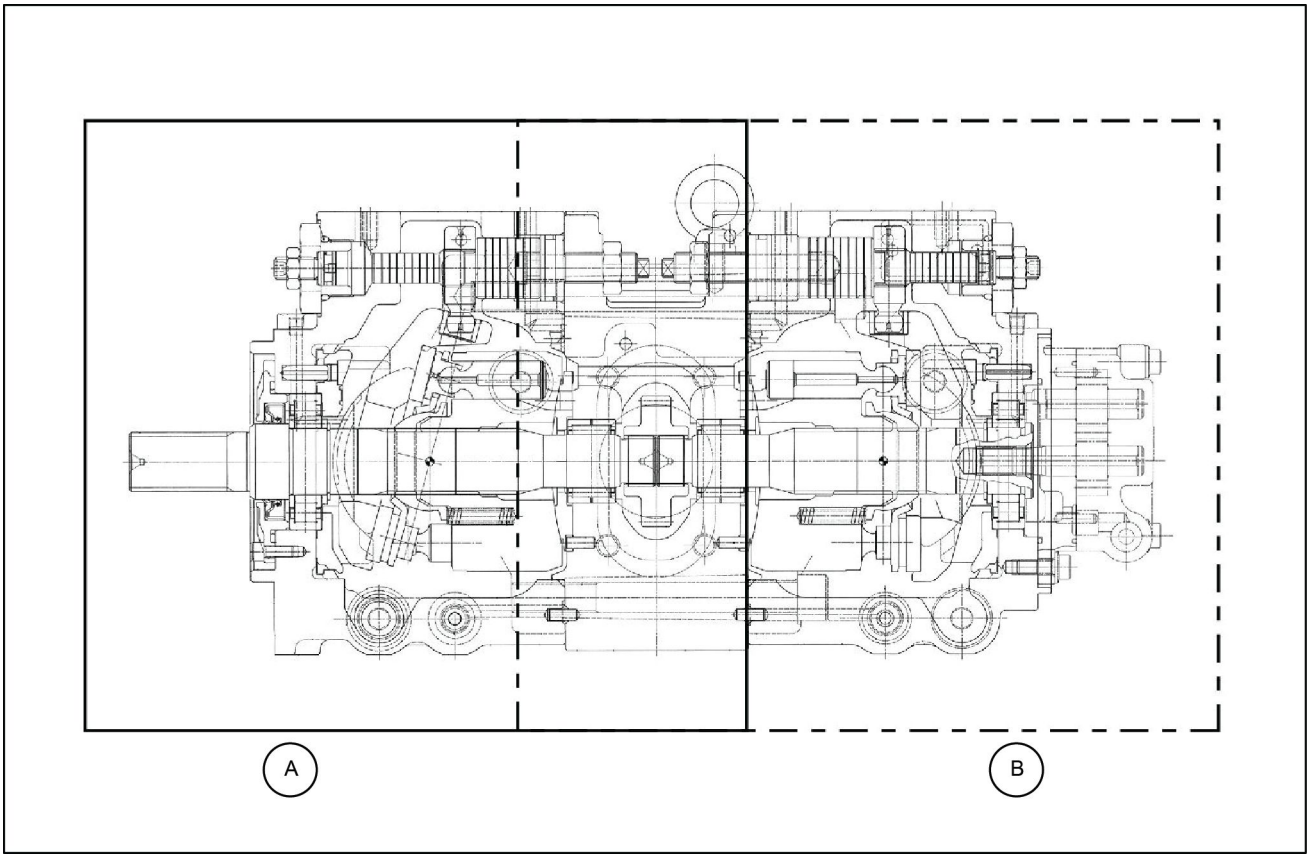
Hydraulic systems - 35

Reservoir, cooler, and filters - 300

CX180C Crawler excavator LC version (TIER 3)

Pump - Sectional view

Pump assembly cross-section diagram



LPIL12CX01969FB 1

A. Drive shaft front side

B. Drive shaft rear side

Hydraulic systems - 35

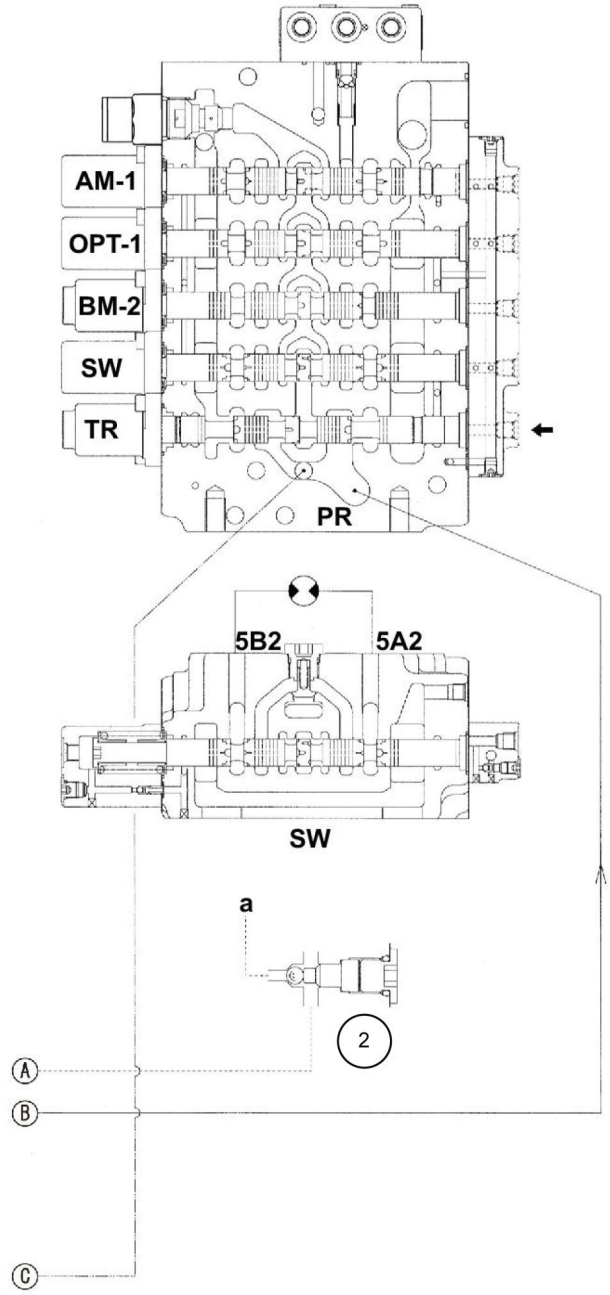
Pump control valves - 102

CX180C Crawler excavator LC version (TIER 3)

Contents

Hydraulic systems - 35

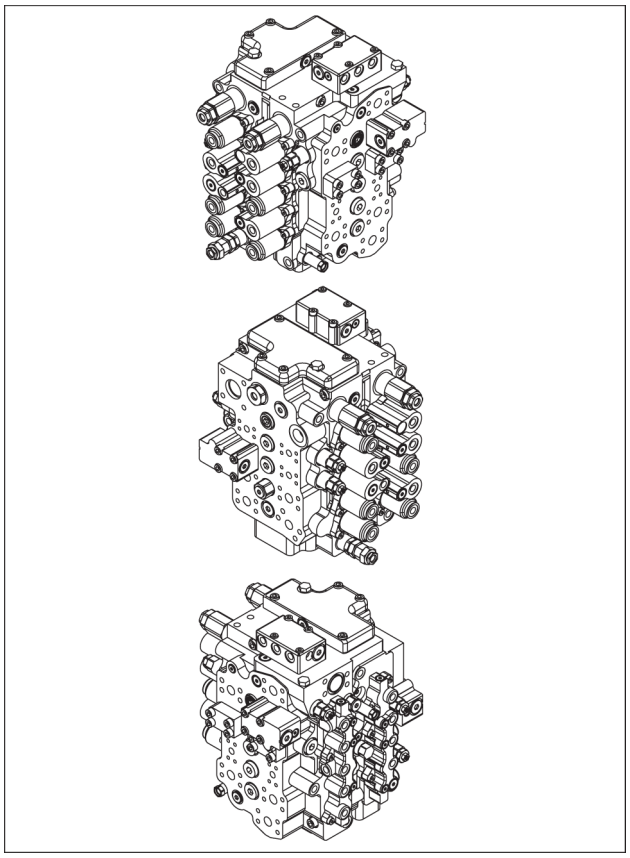
Main control valve - 359



LPIL12CX02209HB 4

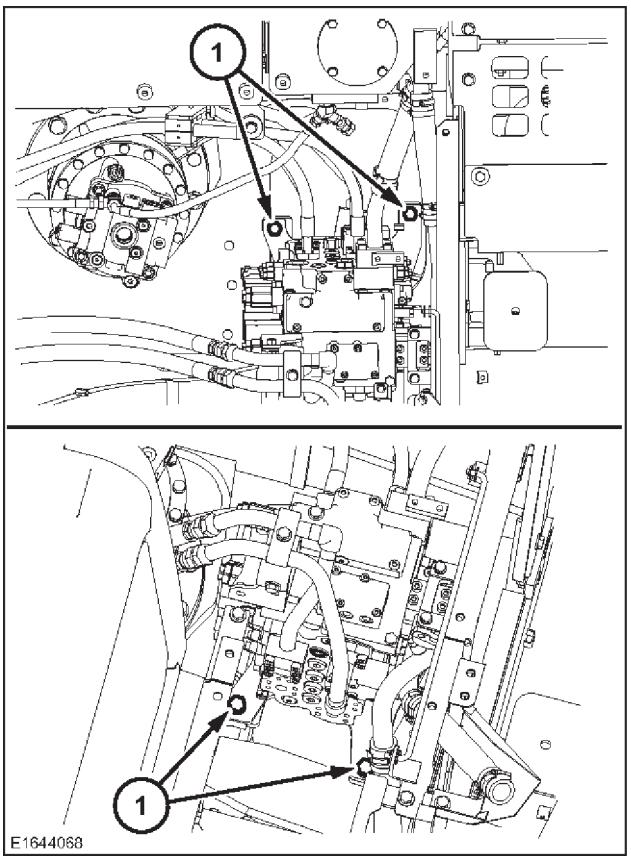
1. Parallel path
2. Ball check
3. Straight travel signal switchover spool
4. Straight travel switchover valve

10. Disconnect the lines and hoses of the control valve with wrenches [**19 mm**, **22 mm**, **36 mm**] and hexagon wrenches [**6 mm**, **8 mm**].
    - Apply marking to each location of the pipes and hoses so as to match connections at assembling.
    - Attach caps and plugs at the lines and hoses so as to prevent invasion of water, dust and dirt.
    - Spray parts cleaner to wash each section of piping in order to prevent adhering dirt to and damaging joints.



SMIL15CEX4399BB 9

11. Remove the 4 bolts **(1)** with a wrench [**24 mm**].
    - Bolt tightening torque: **267 – 312 N·m** (**196.93 – 230.12 lb ft**)

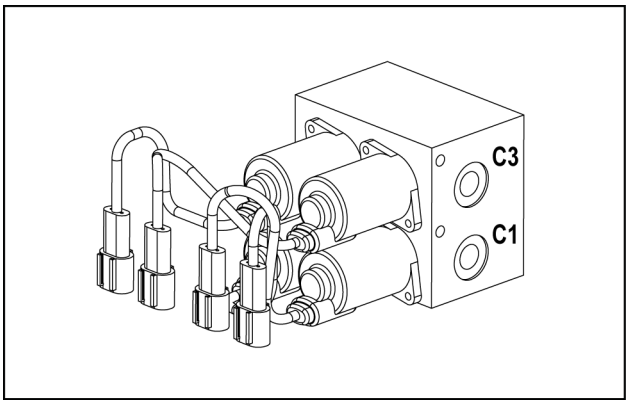


E1644068 10

Pilot solenoid valve block - Overview

4 Stack solenoid valve

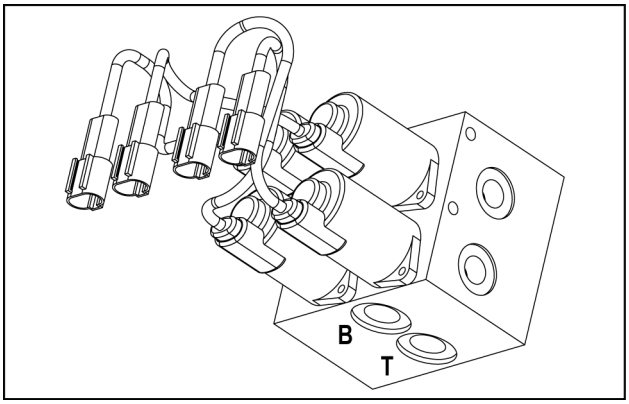
Port	Port size
C3	G1/4
C1	G1/4



SMIL15CEX3548AA 1

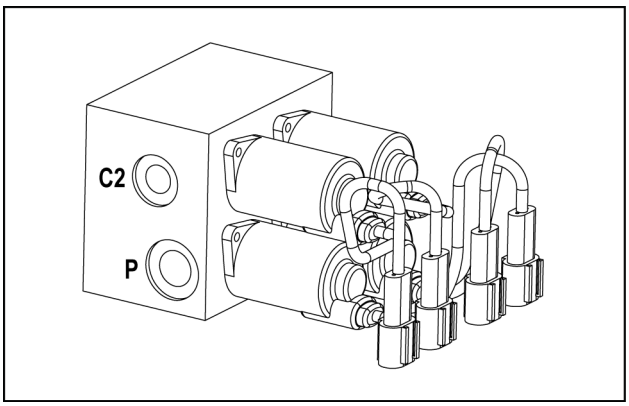
View from bottom

Port	Port size
B	G3/8
T	G3/8



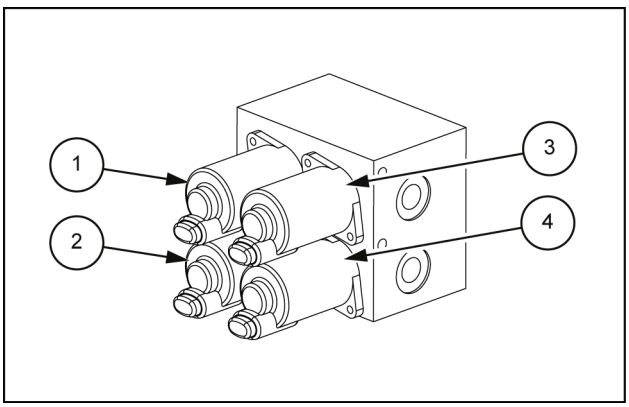
SMIL15CEX3549AA 2

Port	Port size
C2	G1/4
P	G3/8



SMIL15CEX3550AA 3

1. Swing brake
2. Lever lock
3. 2-stage relief
4. 2-stage travel



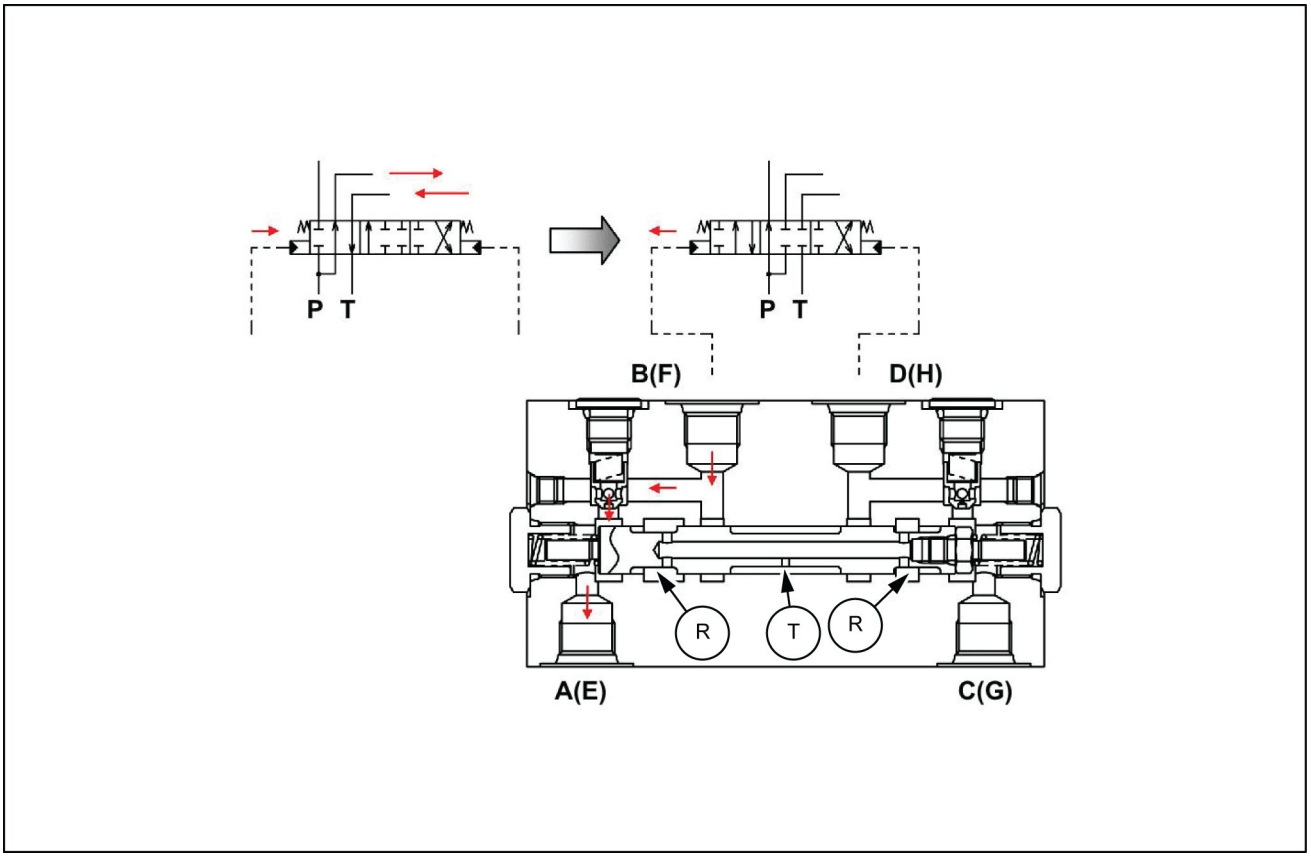
SMIL15CEX3551AB 4

Cushion operation

When the pressure oil fed from the pilot operation valve to the A port (or C, E, or G port) is closed by the pilot operation valve, the pressure oil that has operated on the control valve spool is pushed back to the B port (or the D, F, or H port) by the return spring on the spool.

The returned oil passes through the check plunger metering orifice, is sent to the A port (or the C, E, or G port), and is drained from the pilot operation valve.

At this time, by passing through the metering orifice, the pressurized oil holds down the control valve spool speed, which prevents the sudden stopping of the actuator and reduces shaking of the body. (Cushion function)



LPIL12CX02304FB 3

Cushion valve - Prepare

⚠ WARNING

Escaping fluid!
Hydraulic fluid or diesel fuel leaking under pressure can penetrate the skin and cause infection or other injury. To prevent personal injury: Relieve all pressure before disconnecting fluid lines or performing work on the hydraulic system. Before applying pressure, make sure all connections are tight and all components are in good condition. Never use your hand to check for suspected leaks under pressure. Use a piece of cardboard or wood for this purpose. If injured by leaking fluid, see your doctor immediately.
Failure to comply could result in death or serious injury.

W0178A

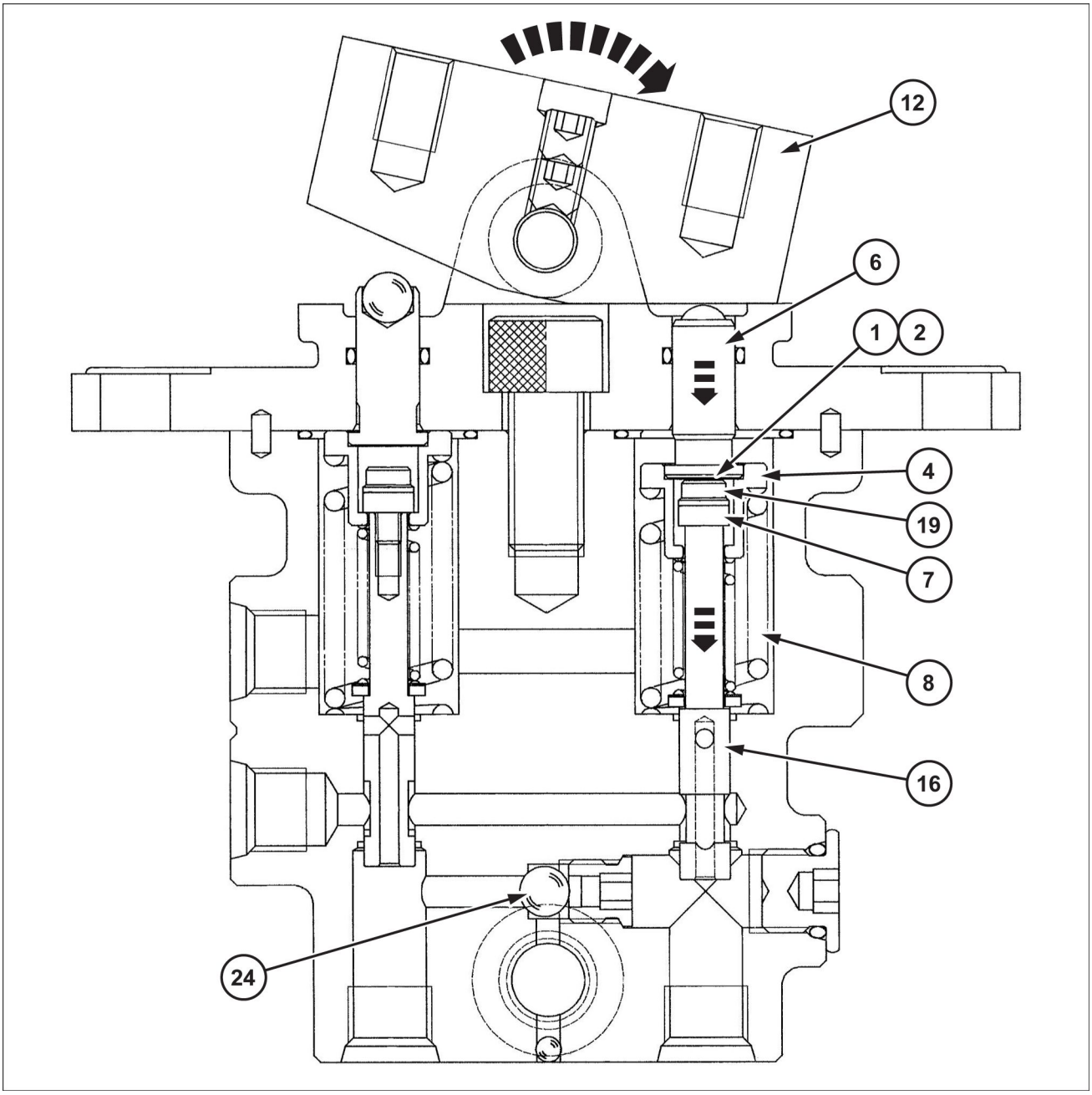
⚠ WARNING

Avoid injury!
Shut off the engine, remove the key, and make sure all motion is stopped before servicing the machine.
Failure to comply could result in death or serious injury.

W1128A

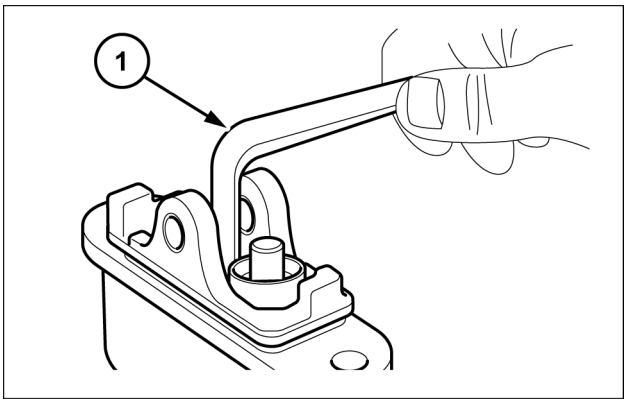
Items to prepare:

- Wrenches [**13 mm**, **17 mm**, **19 mm**, **22 mm**]
- Hexagon wrench [**5 mm**]
- Marking pen
- Cap
- Plug
- Waste oil can
- Rag
- Cleaning fluid



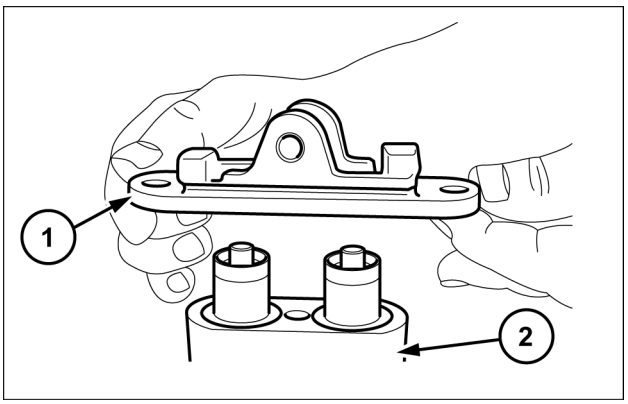
SMIL15CEX3791GB 2

5. Use a hexagon wrench **(1)** [**10 mm**] on the hexagon socket head bolts to loosen and remove it.



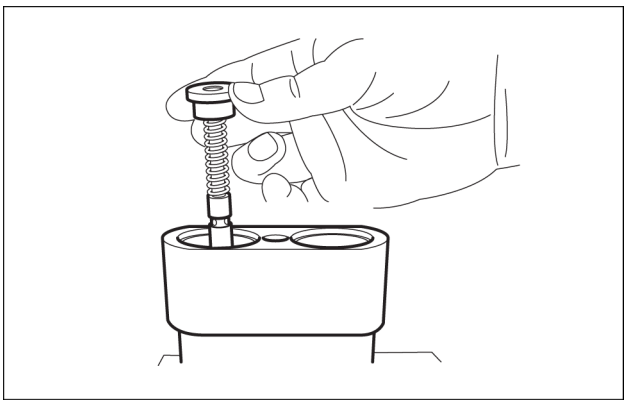
SMIL15CEX3768AB 5

6. Remove the cover **(1)** .
   1. Record the position of the cover **(1)** in relation to the casing **(2)** .

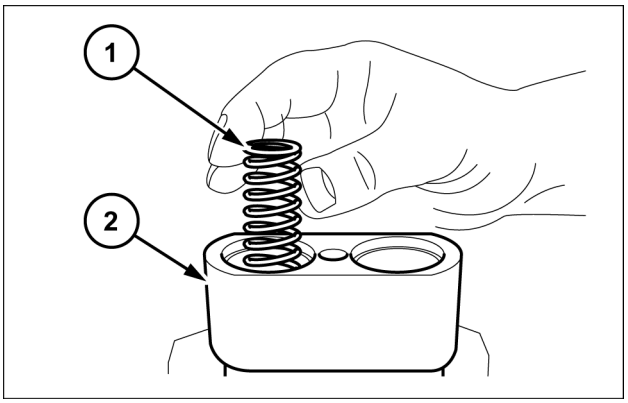


SMIL15CEX3769AB 6

7. Remove the pressure reducing valve assemblies and return springs **(1)** from the casing **(2)**.
   Record the positions of these parts in relation to the casing holes.



SMIL15CEX3770AB 7



SMIL15CEX3771AB 8

Hydraulic swing system - Drain fluid

Preparations

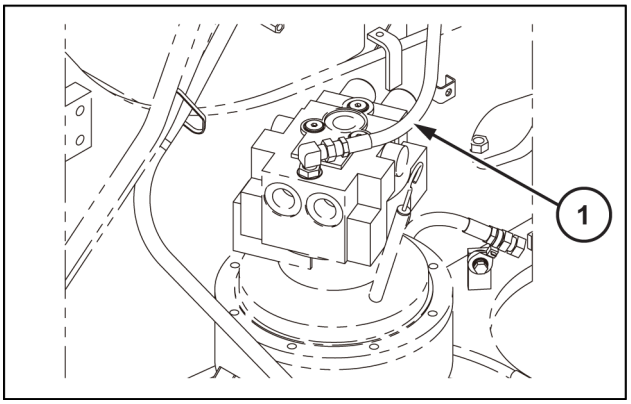
Measuring condition

Engine speed	**2000 RPM**
Mode	SP mode
Oil temperature	About **50 °C** (**122 °F**)

NOTE: *the drain volume varies greatly with the oil temperature.*

Swing motor drain volume measurement

1. Use a wrench [**22 mm**] to remove the drain hose and then install the extension hose for drain measurement **(1)** .



SMIL15CEX4549AB 1

3. Prepare a waste oil receiver and the measuring container **(1)**, and set them as in the diagram on the right.

   For the swing motor locking procedure, refer to **Hydraulic systems - Pressure setting (35.000)**.

4. In SP mode, relieve the swing operation, and move the extension hose to the measuring container **(1)** at the same time the motor starts (At starting, start measurement with a stop watch **(2)**).

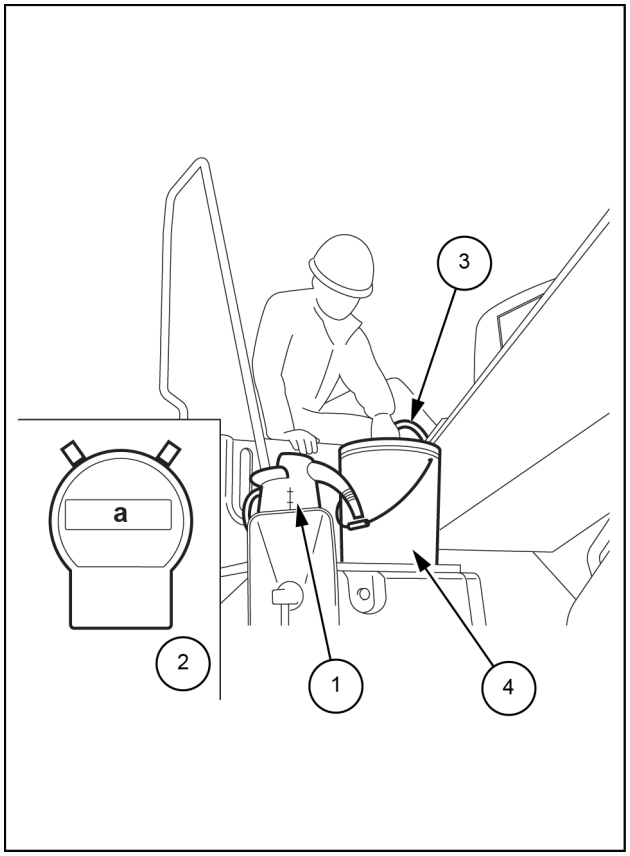
5. After **60 s**, move the extension hose **(3)** to the waste oil can **(4)**.

6. Measure the volume of oil in the measuring container **(1)** as the drain volume for **60 s**.

   (a). **60 s**

   Measure at least 3 times each for left and right.

Right	Left



SMIL14CEX2220BB 2

Swing reduction motor - Prepare - For disassemble and assemble

⚠ CAUTION

Avoid injury! Always do the following before lubricating, maintaining, or servicing the machine.
Wait for all movement to stop before you service or adjust the machine or equipment.
Failure to comply could result in minor or moderate injury.

C0154A

⚠ CAUTION

Burn hazard!
Wait for all components to cool before performing any operation.
Failure to comply could result in minor or moderate injury.

C0053A

NOTICE: *Check performance after reassembly. Do not resume use unless performance is fully recovered. Using this product at a sub-par performance level may result in product damage.*

⚠ CAUTION:

1. Read and understand the contents of this maintenance manual before performing disassembly, reassembly, inspection, repair, or other such work of this product.
2. Handle this product according to the separate “Usage Precautions”.
3. Use the specialty tools and measurement instruments for disassembly, reassembly, inspection, and repair, etc. of this product. Using an inappropriate tool may result in injury or product damage.
4. Be careful of parts falling when performing disassembly, reassembly, inspection or repair, etc. of this product. This may result in injury or parts damage.
5. Do not directly touch with bare hands the machined edges or threaded sections of parts during disassembly, reassembly, inspection, or repair etc. of this product. Doing so may result in injury.
6. The cautions (mark !) listed in this maintenance manual do not cover all possible dangers. Always think of safety first during disassembly, inspection, reassembly, repair, or other such work.

Reference number	Part name	Screw size	Bolt width	Tightening torque
8	Bolt	**M20 x 2.0** x **70 mm** (**2.756 in**) L	Torx T90	**512 – 566 N·m** (**377.63 – 417.46 lb ft**)
14	Bolt	**M20 x 2.0** x **130 mm** (**5.118 in**) L	Torx T90	**512 – 566 N·m** (**377.63 – 417.46 lb ft**)
24	Screw	**M10 x 1.5**	Torx T50	**53.9 – 63.7 N·m** (**39.75 – 46.98 lb ft**)
28	Hexagon socket head bolt	**M10 x 1.5** x **16 mm** (**0.630 in**) L	**8 mm** (**0.315 in**)	**69.77 – 77.03 N·m** (**51.46 – 56.81 lb ft**)
29	Plug	G3/4	**12 mm** (**0.472 in**)	**149 – 165 N·m** (**109.9 – 121.7 lb ft**)

Travel motor - Prepare

⚠ WARNING

Escaping fluid!
Hydraulic fluid or diesel fuel leaking under pressure can penetrate the skin and cause infection or other injury. To prevent personal injury: Relieve all pressure before disconnecting fluid lines or performing work on the hydraulic system. Before applying pressure, make sure all connections are tight and all components are in good condition. Never use your hand to check for suspected leaks under pressure. Use a piece of cardboard or wood for this purpose. If injured by leaking fluid, see your doctor immediately.
Failure to comply could result in death or serious injury.

W0178A

⚠ WARNING

Pressurized fluid can penetrate the skin and cause severe injuries.
The grease in the cylinder is under high pressure. Never loosen the grease fitting adaptor completely in order to speed up the flow of grease.
Failure to comply could result in death or serious injury.

W0261A

⚠ WARNING

Crushing hazard!
The lifting systems must be operated by qualified personnel who are aware of the correct procedures to follow. Make sure all lifting equipment is in good condition, and all hooks are equipped with safety latches.
Failure to comply could result in death or serious injury.

W0256A

⚠ WARNING

Heavy objects!
Lift and handle all heavy components using lifting equipment with adequate capacity. Always support units or parts with suitable slings or hooks. Make sure the work area is clear of all bystanders.
Failure to comply could result in death or serious injury.

W0398A

NOTICE: *Before removing the shoes, be sure to bleed off any air in the hydraulic circuits.*

NOTICE: *Be sure to adjust the shoe tension appropriately. If the shoe tension is insufficient, the shoe may come off when the machine enters on a bad road and it is very dangerous.*

NOTICE: *Before installing the shoe, always remove any dirt, gravel, etc. stuck to the travel unit.*

NOTICE: *The check valve adjustment procedure should not be done in front of the check valve.*

Items to prepare:

- Box wrenches [**19 mm**, **24 mm**]
- Wrenches [**19 mm**, **27 mm**, **41 mm**]
- Hammer (to remove the master pin)
- Striking jig (to remove the master pin)
- Lifting equipment (with the required lifting capacity)
- Wire rope (with the required breaking load)
- **LOCTITE® 262™**
- Wood planks, etc.
- Rag
- Cleaning fluid

Planetary gear attachment

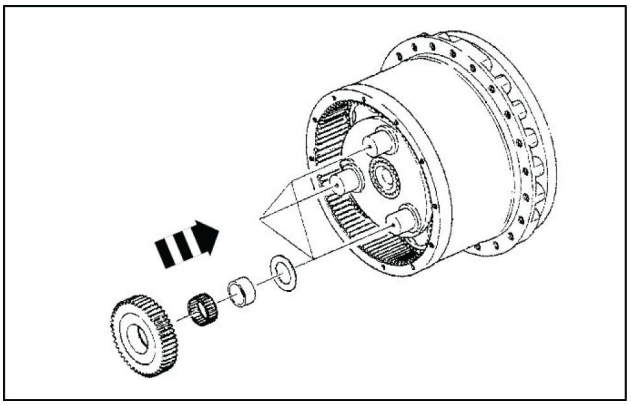
Attach the thrust plates **(18)** to the planetary gear B **(21)**. Next, attach the needle bearings **(20)** to the planetary gears.
Finally, after attaching the inner races **(19)**, join the holder B **(17)** trunnion sections (3 locations) with the internal diameter sections of the inner races to attach the planetary gears to the holder.

⚠ CAUTION:

1. When attaching the thrust plates to the planetary gears, make sure the shear droop on the thrust plates created by the press is facing the holder side.
2. When finally attaching the planetary gears to the holder, attach so that the internal teeth of the housing **(4)** engage with the planetary gear teeth.
3. Be careful with the attachment directions of the planetary gears.

   *1. Make the shear droop side face the holder B **(17)** side.

   *2. Thrust plate **(18)** attachment direction.



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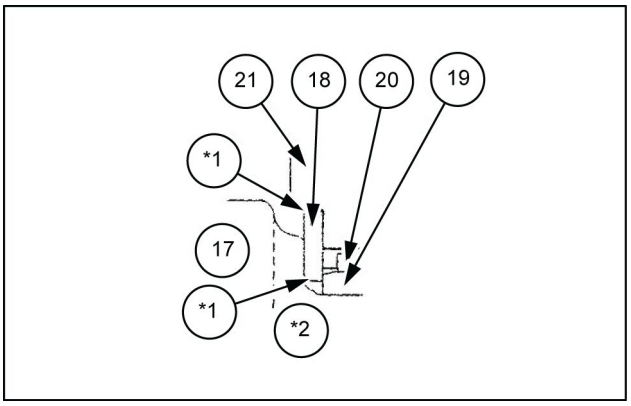


LPIL12CX01384AB 16

Drive gear attachment

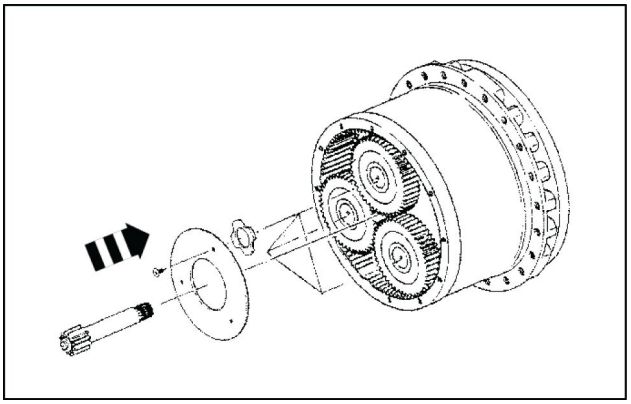
Attach the thrust plates **(22)** to the planetary gear B **(21)**, and attach the thrust plate **(23)**.
Insert the screws **(24)** with **LOCTITE®** applied in the threaded sections and tighten them to the specified torque.
Make the spline-side of the drive gear **(25)** face the motor section attachment side and attach the drive gear in the middle of the 3 planetary gears. Also engage the teeth of the planetary gears with the drive gear teeth.

⚠ CAUTION:

1. Be careful with the attachment direction of the thrust plates.
2. Thoroughly clean and degrease the screw holes and threaded sections of the holder B **(17)**.

   *1. Make the shear droop side face the planetary gear C **(12)** side.

   *2. Thrust plate **(13)** attachment direction



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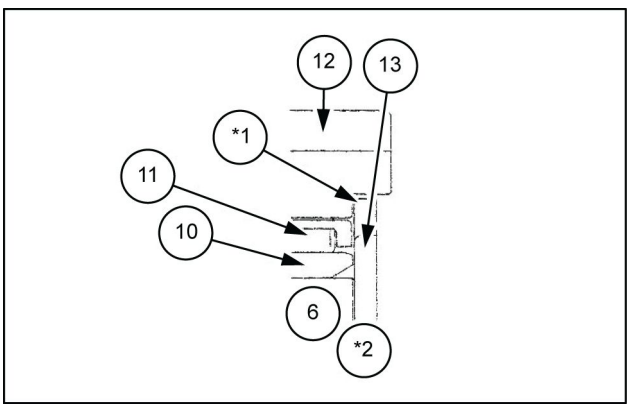

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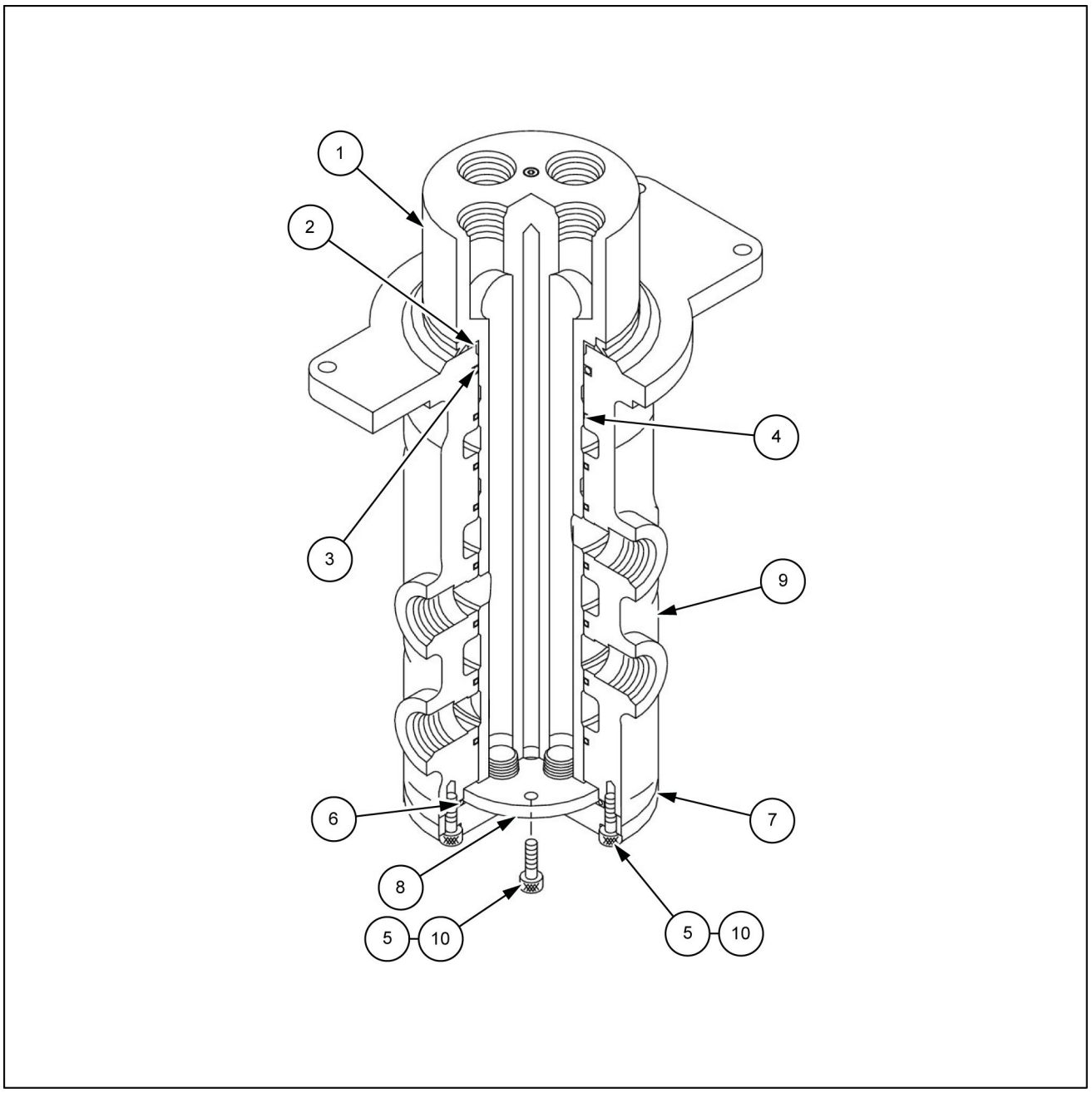
Hydraulic swivel - Exploded view



LPIL12CX02104GB 1

1. Axle
2. V-ring
3. O-ring
4. Packing ring
5. Hexagon socket head bolt
6. O-ring
7. Cover
8. Thrust plate
9. Rotor
10. **LOCTITE®**

Boom cylinder - Static description

Troubling diagnostics

Hydraulic cylinder trouble, countermeasure and solution

It is not easy to discover trouble locations.

The table below shows general symptoms, suggested causes and also solutions.

For repairs, see the suggested causes and solutions in **Boom cylinder - Troubleshooting (35.736)**.

The cause of machine problems are often not rooted in just a single part. Problems are often due to the relationship of one part with another.

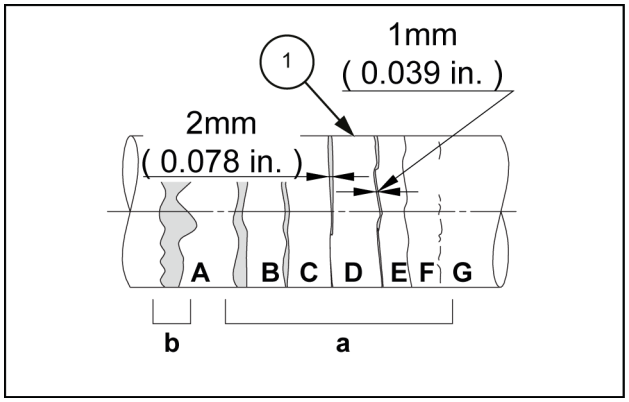
In some cases, solutions are required other than those given in **Boom cylinder - Troubleshooting (35.736)**.

In such a case, contact with our company to investigate the problem and its cause further and take appropriate measures.

Item	Symptom
1	Piston rod sliding section oil leak (For the judgment values, refer to “ **Boom cylinder - Inspect (35.736)**”)
2	Cylinder head matching section oil leak
3	Pipe and cylinder tube welding section oil leak
4	Operation defect

Inspection and maintenance locations	Inspection and service detail	Daily	Monthly	Yearly	Remarks
Cylinder tube section (including line sections)	Are there any loose bolts or nuts (screws)?	○			
	Retighten installation screws (bolts and nuts (screws))			○	
	Are there any welding section cracks or damage?	○			
	Are there large dents on the tube?	○			

Inspection after assembly

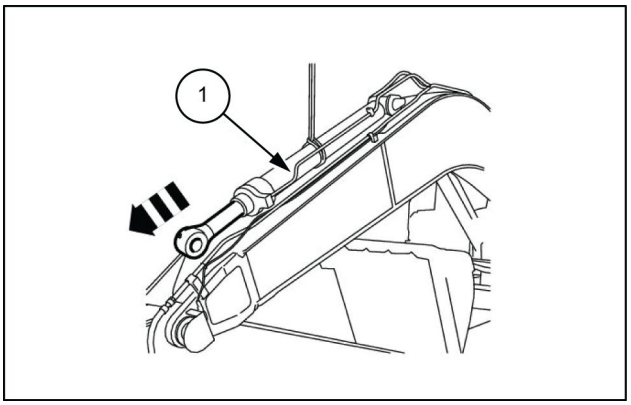
Dimension inspection	Check the maximum retracted length and stroke as instructed on the diagram.					
Pressure withstand inspection	Check for looseness, permanent deformation, and external leaks when the test pressure instructed on the diagram is applied to each stroke end for at least **3 min**.					
External leak inspection	Check the amount of oil leak at the rod section. • Judgment value for rod section oil leak amount Move the piston rod back and forth 20 times with the oil at a temperature from **20 – 104 °C** (**68 – 104 °F**) then judge by the state of the oil ring formed on the rod surface. If the oil ring is in a broken down A state, this is judged to be trouble. refer to " **Boom cylinder - Troubleshooting (35.736)**" for information on how to solve this.  SMIL14CEX3653AB 1					
Internal leak inspection	Oil leak amount unit: **10 min**.					
	Inner diameter	Oil leak amount	Inner diameter	Oil leak amount	Inner diameter	Oil leak amount
Internal leak inspection	**32 mm** (**1.26 in**)	0.4	**100 mm** (**3.94 in**)	4.0	**160 mm** (**6.30 in**)	10.0
	40 mm (**1.57 in**)	0.6	**125 mm** (**4.92 in**)	5.6	**180 mm** (**7.09 in**)	12.6
	50 mm (**1.97 in**)	1.0	**140 mm** (**5.51 in**)	6.0	**200 mm** (**7.87 in**)	15.6
	63 mm (**2.48 in**)	1.6			**220 mm** (**8.66 in**)	20.0
	80 mm (**3.15 in**)	2.3			**250 mm** (**9.84 in**)	22.0

1. Oil ring

A. Acceptable

B. Not acceptable

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



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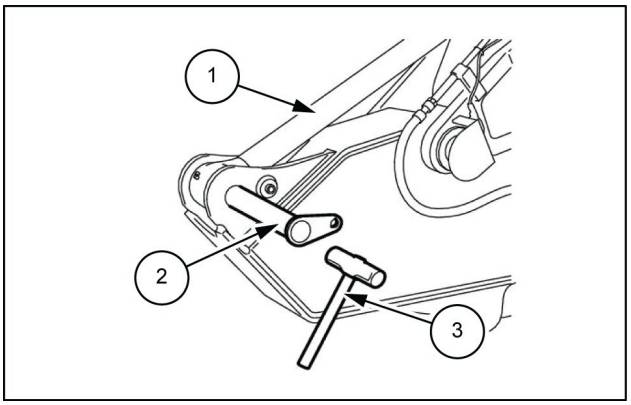
9. Align the arm cylinder **(1)** with the arm pin hole and use a hammer **(3)** to insert the pin **(2)**.
   Be careful. The arm and arm cylinder rod may come out of place at this time.



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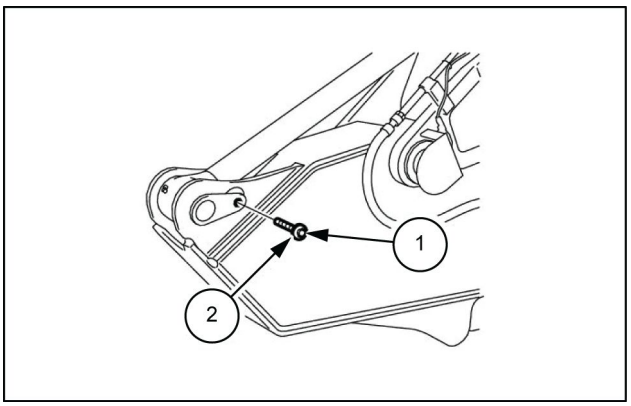
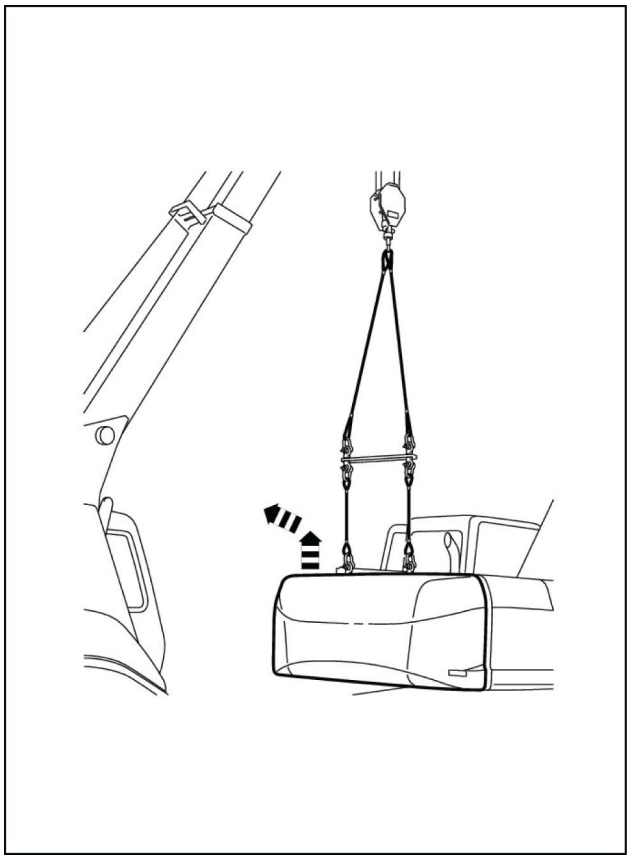
10. Use a wrench [**19 mm**] to tighten the bolt **(1)** and washer **(2)**.
    - Grease up



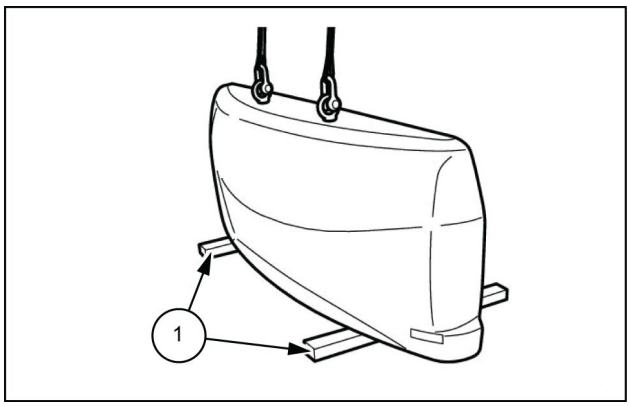
LPIL12CX01568AB 10

6. Use the wire ropes and lifting equipment to lift and remove the counterweight.
   - Move the counterweight about **50 cm** (**19.685 in**) to the rear while lifting it so that it does not interfere with the housing, engine components and pipes.



SMIL13CEX1071BA 5

7. Thoroughly check that the location is safe before lowering the counterweight on wood planks **(1)**.
   - Thoroughly fasten the counterweight with the wire ropes and lifting equipment so that it does not fall over.



SMIL13CEX1072AB 6

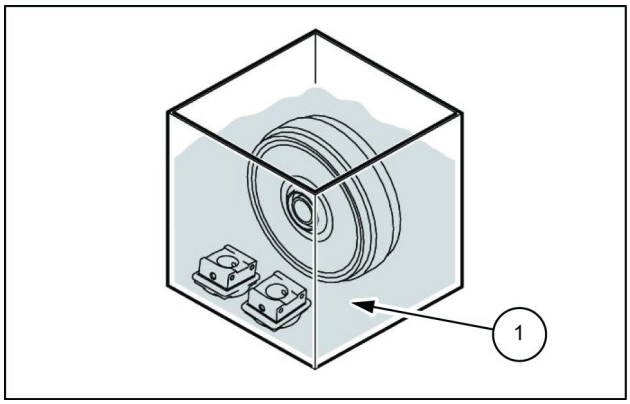
Index

Tracks and track suspension - 48

Tracks - 100

Idler wheel - Assemble

1. Clean all parts.
   - Find a clean location.
   - Place a rubber plate or cloth on the work platform so as not to damage the parts.
   - In order to clean off adhered matter that forms sharp points and causes scratches, immerse parts in cleaning fluid **(1)** until dirt and grease float to the top.



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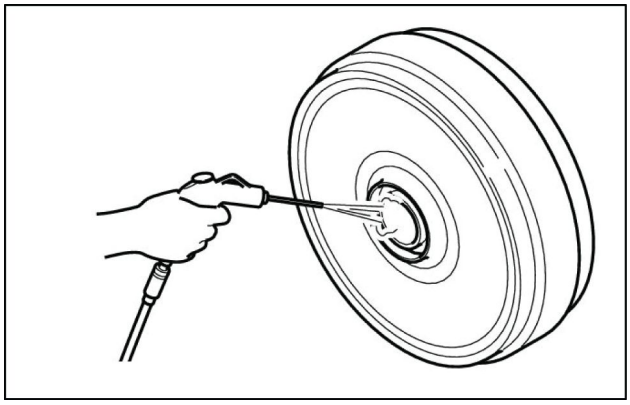
2. After cleaning the parts, air blow them to remove any remaining cleaning fluid or debris.
   - If the parts are to be left as is for a long time after drying them, apply engine oil.



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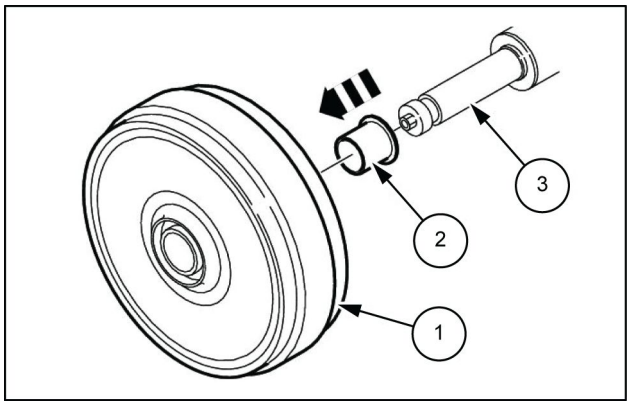
3. If the bushing **(2)** was removed during disassembly, put it into the roller **(1)**. Use a pressing machine **(3)** to press in both the left and right sides.



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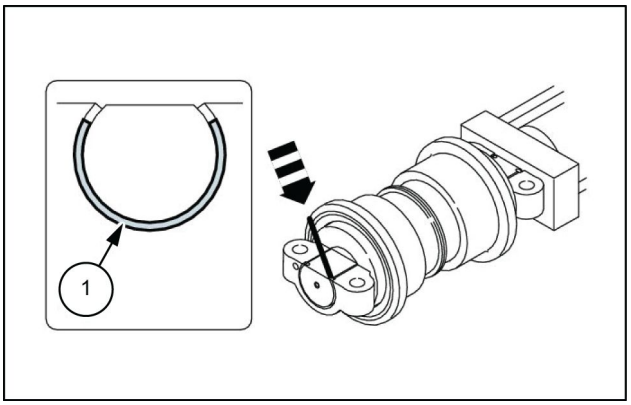
9. Attach the wire clip **(1)**.
   - When attaching the wire clip, secure the roller main unit so that it does not roll.



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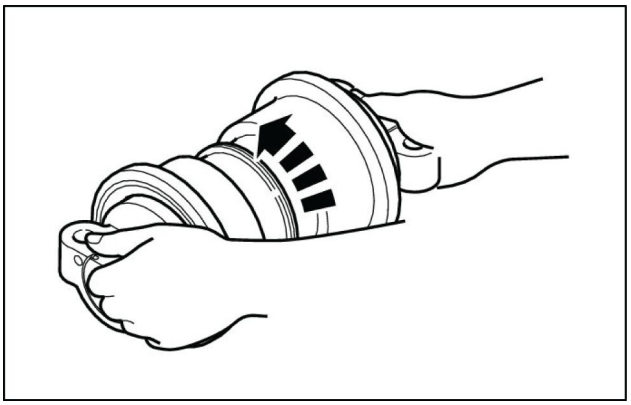
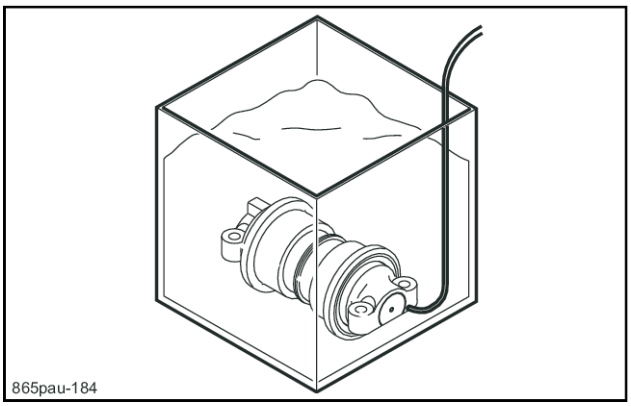
10. Turn the main unit and check that the roller rotates properly.



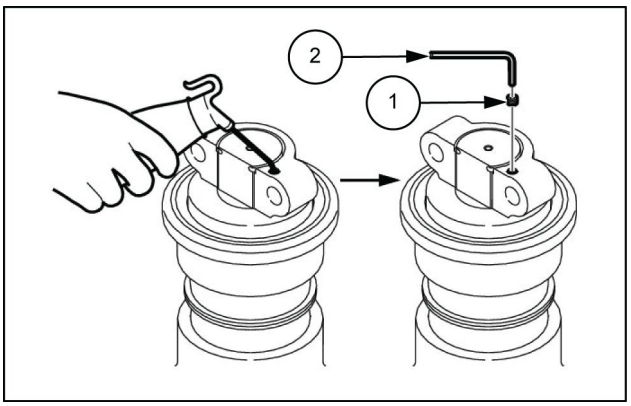
LPIL12CX01155AA 10

11. Inject compressed air [**0.2 MPa** (**29.01 psi**)] from the oil fill port and immerse in water to check that there are no leaks.



865PAU-184 11

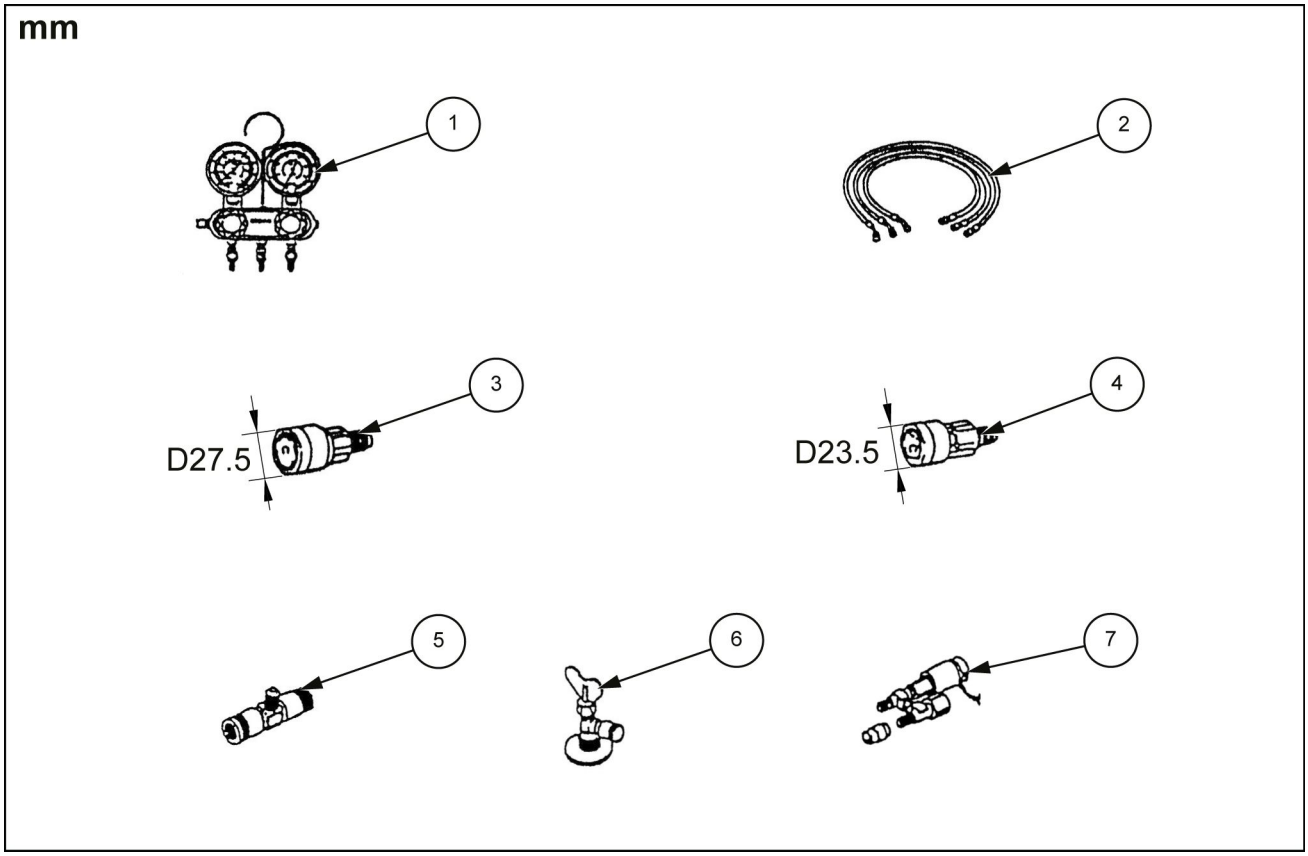
12. Fill gear oil (**125 cm³** (**7.628 in³**)) into the roller. Use a hexagon wrench [**6 mm**] **(2)** to tighten the plug **(1)** with the nylon seal applied.



LPIL12CX01157AB 12

Air conditioning - Special tools

Gas filling special tool



SMIL14CEX4136FB 1

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

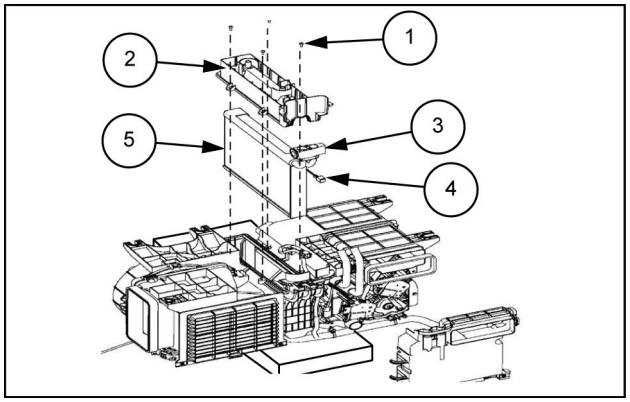
Code	Description
1	Gauge manifold
2	Charging hose
3	Quick joint **27.5 mm** (**1.1 in**)
4	Quick joint **23.5 mm** (**0.9 in**)
5	T joint
6	Service can valve
7	Vacuum pump adapter

Air-conditioning evaporator - Replace

NOTICE: *Be careful of the O-rings getting caught, etc., when installing the expansion valve.*

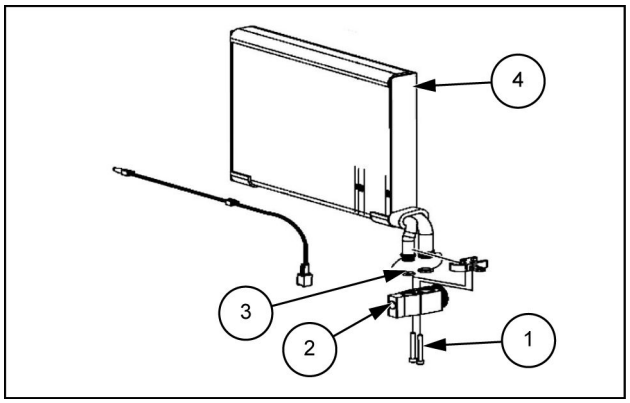
NOTICE: *The evaporator sensor cord is sandwiched in the groove of the HVAC unit, so carefully check it and remove it while making sure not to damage it.*

1. Turn the HVAC unit upside down and place it on a stand.
   - Remove the 4 Phillips screws **(1)** and remove the drain case **(2)**.
   - Remove the 1 Phillips screw **(1)** and remove the evaporator pipe stay **(3)**.
   - Remove the evaporator sensor connector **(4)** and remove the evaporator **(5)**.



SMIL14CEX1814AB 1

2. Use a hexagon wrench [**4 mm**] to remove the 2 hexagon socket head bolts **(1)**, and then remove the expansion valve **(2)**.
   - Install O-rings **(3)** on the new evaporator **(4)** (1 NF O-ring 5/8 and 1 NF O-ring 1/2).
     Bolt **(1)** tightening torque: **6.90 N·m** (**5.09 lb ft**).

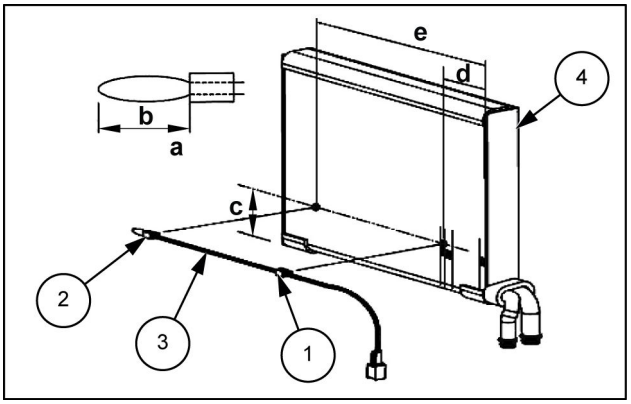


SMIL14CEX1815AB 2

Installation of evaporator sensor

NOTICE: *Be careful that the sensor cord does not get squeezed in the case when the case is assembled.*

1. Make sure to install the harness holder **(1)** and thermistor holder **(2)** in the original position of the evaporator **(4)** as shown in the diagram.
   - Install the evaporator sensor **(3)** end and thermistor holder **(2)** as shown in the diagram.
     a. Thermistor holder position
     b. **20 mm** (**0.79 in**)
     c. **73 mm** (**2.87 in**)
     d. 9th row
     e. 27th row

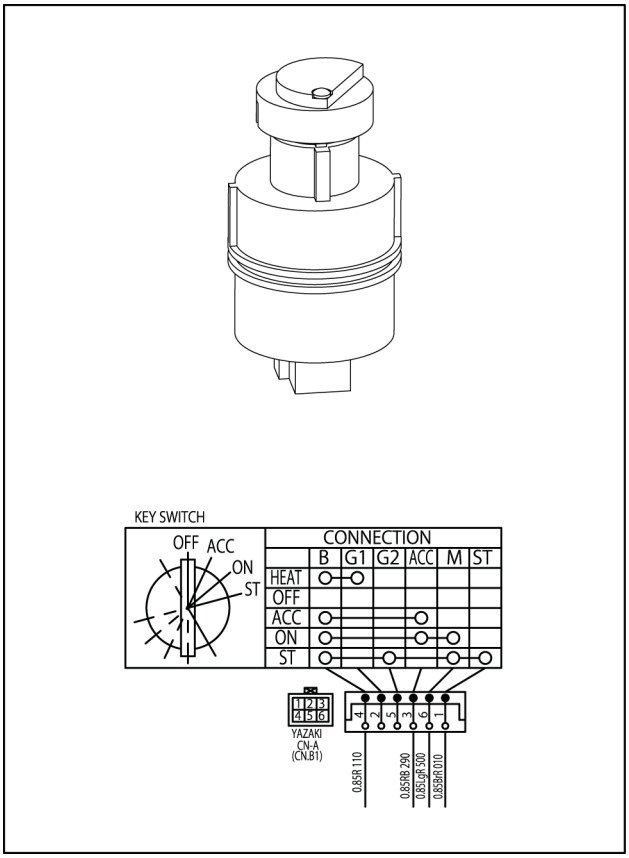


SMIL14CEX1816AB 3

Starter switch

Rated voltage: **24 V** DC

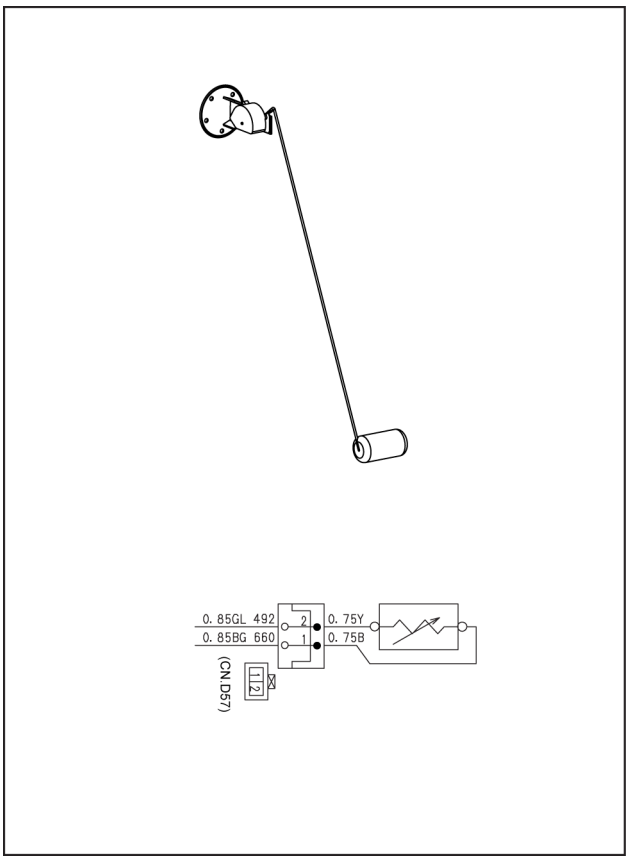
Part No.: KHR44930



SMIL14CEX4091BA 13

Fuel level sensor

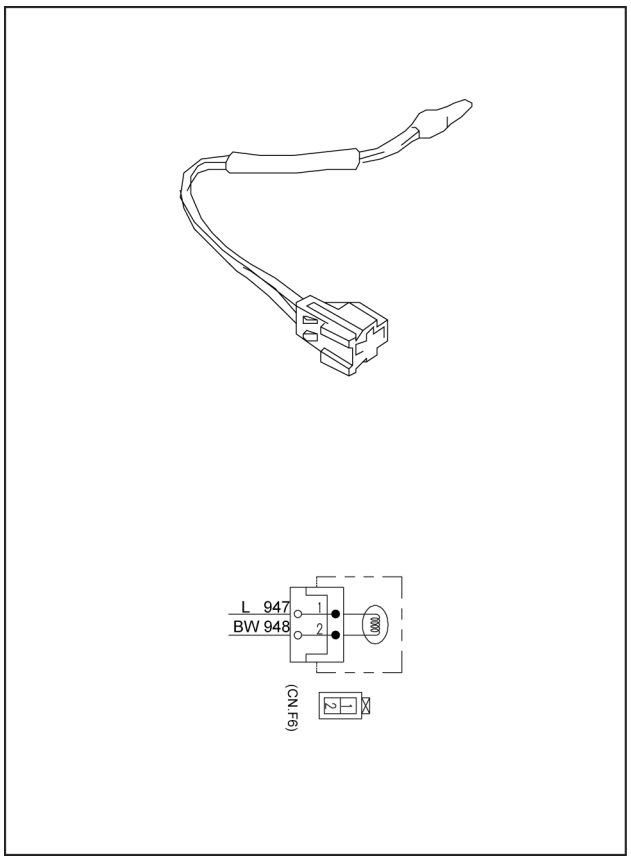
Part No.: KHR10670



SMIL15CEX7550BA 14

Evaporator sensor

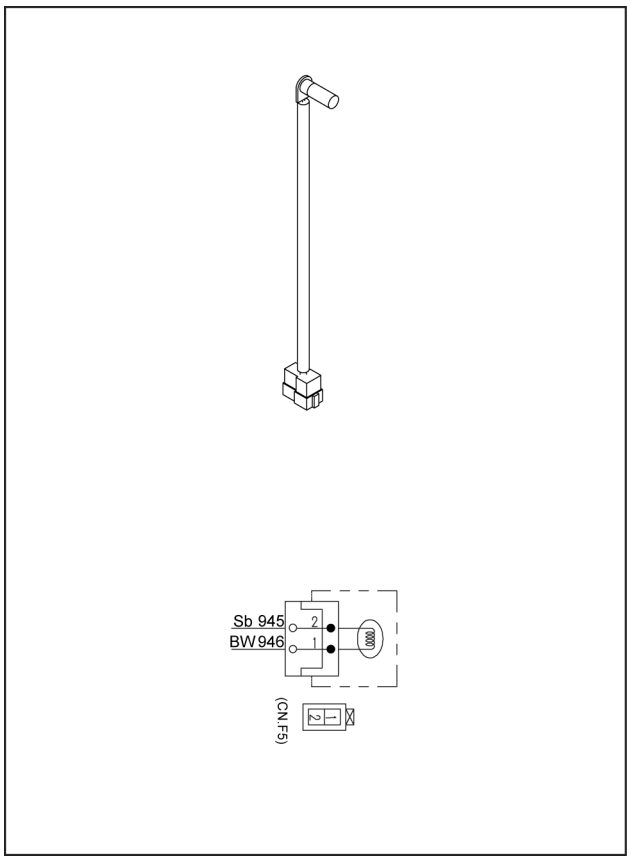
Part No.: KHR27650



SMIL15CEX7634BA 71

Refresh/recirculate temperature sensor

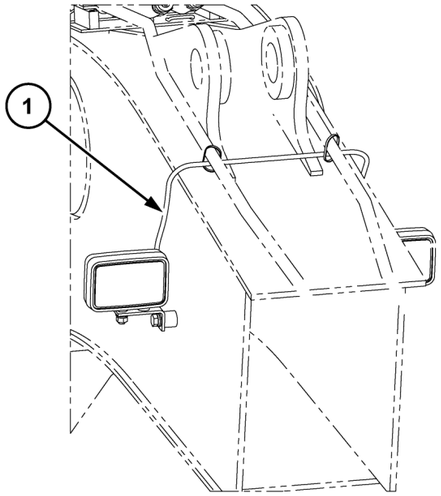
Part No.: KHR27490

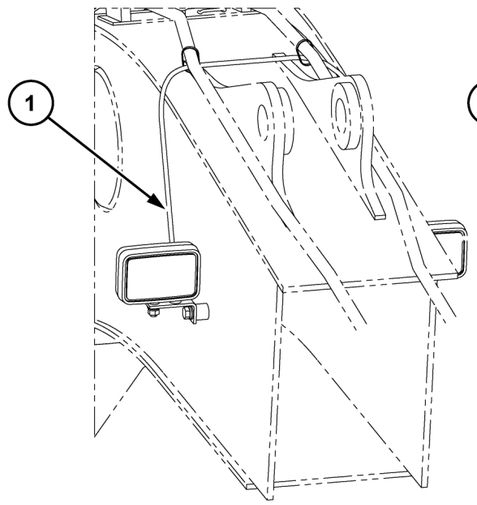


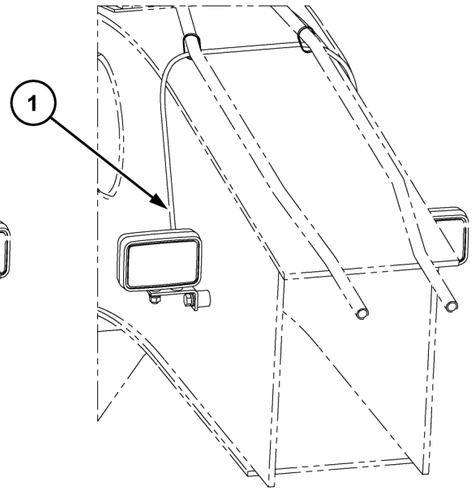
SMIL15CEX7635BA 72

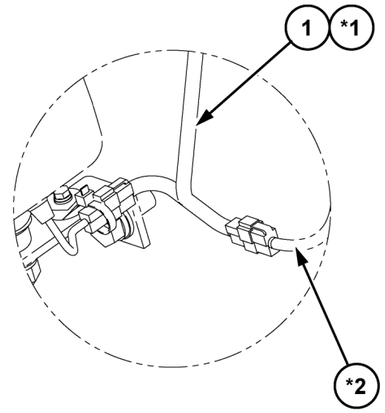
Engine harness

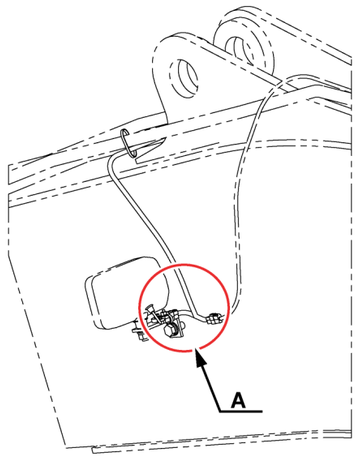
*1. Cam angle sensor (G)
*2. Water sensor
*3. Injector 1
*4. Injector 2
*5. Injector 3
*6. Injector 4
*7. Switch: O/H
*8. Boost pressure sensor
*9. MAT sensor (boost temperature)
*10. EGR valve
*11. Fuel temperature sensor
*12. SCV
*13. COM sensor (PC)
*14. Oil pressure sensor
*15. NE crank sensor
*16. Glow plug (#3)
*17. 20-pin H.CONN
*18. 12-pin H.CONN (injector)
*19. 8-pin H.CONN (EGR)
*20. 6-pin H.CONN
*21. 1-pin H.CONN (glow)



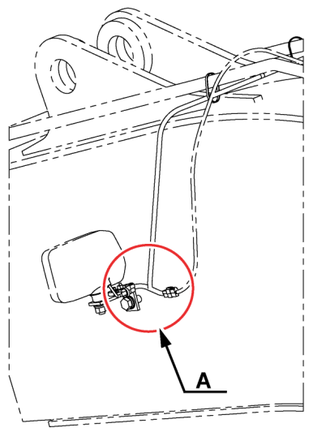




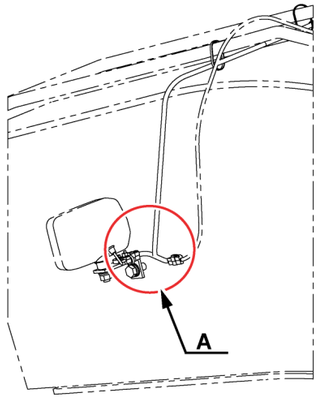




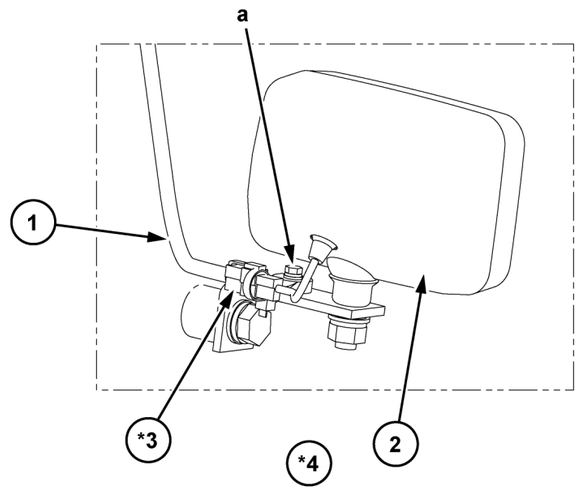
*5



*6



*7



Electrical system - Service instruction

Introduction to the trouble diagnosis

About trouble diagnosis

The following trouble diagnosis procedure is extremely important to resolve problems of all electric/electronic systems.

Neglecting to implement these steps may result in requiring unnecessary repairs.

Read and understand the procedure carefully and proceed with the trouble diagnosis.

Also, use available functions and the trouble diagnosis scan tool to perform the trouble diagnosis and system check.

Trouble diagnosis procedure

Checking complaints from customer

- Use the check sheet to organize the trouble situation.

Performing preliminary inspection

- Perform overall visual inspection.
- Check the past maintenance history.
- Detect any abnormality such as abnormal noise, smell, etc.
- Collect the failure trouble DTC information to provide effective repair.
- Inspect for an abnormality by comparing to the standard value.

Inspect the service information

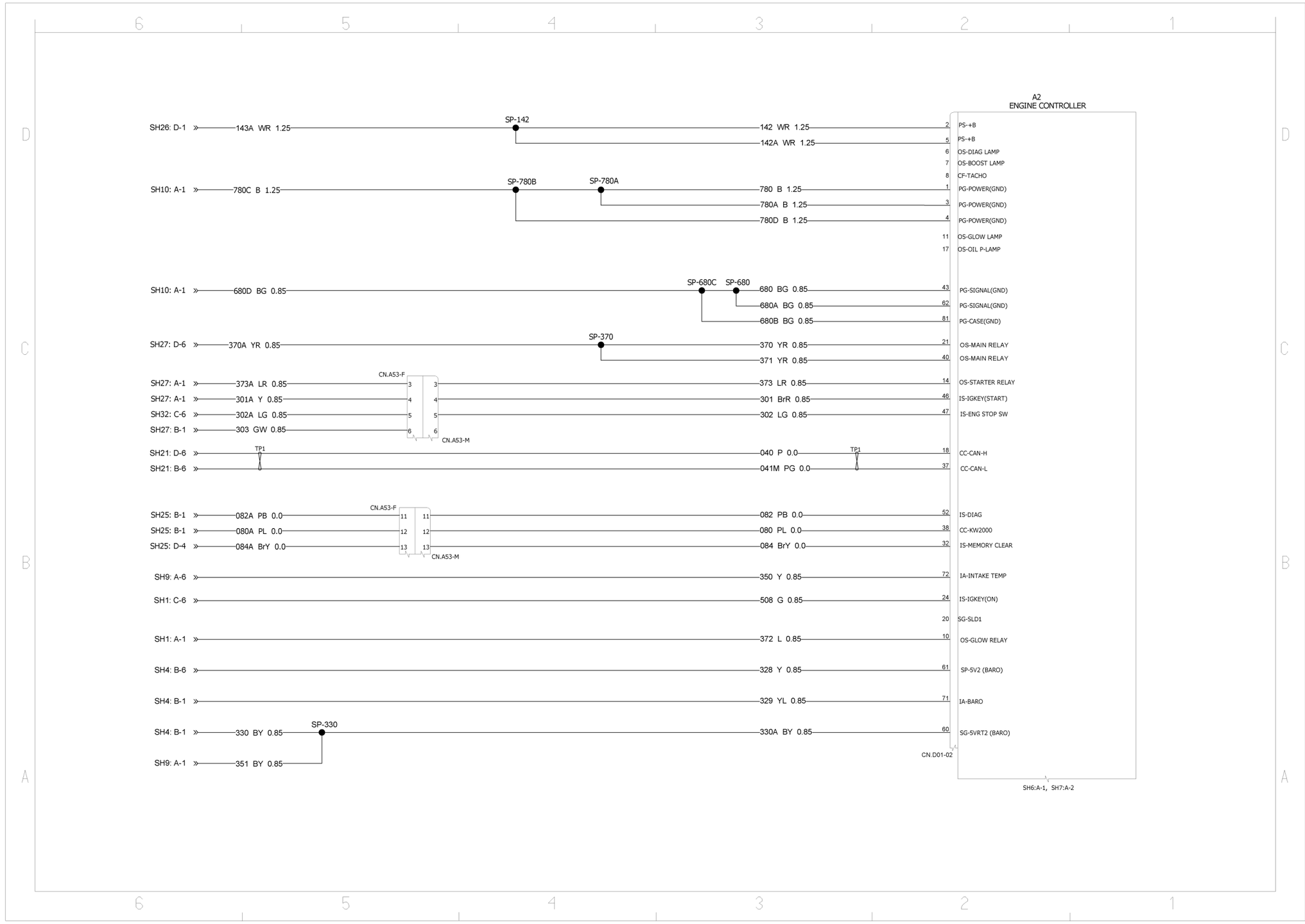
- Check the market Service Bulletin.

Perform inspection for the displayed code.

- Inspect the item shown by DTC.

Perform an inspection for problems according to symptoms.

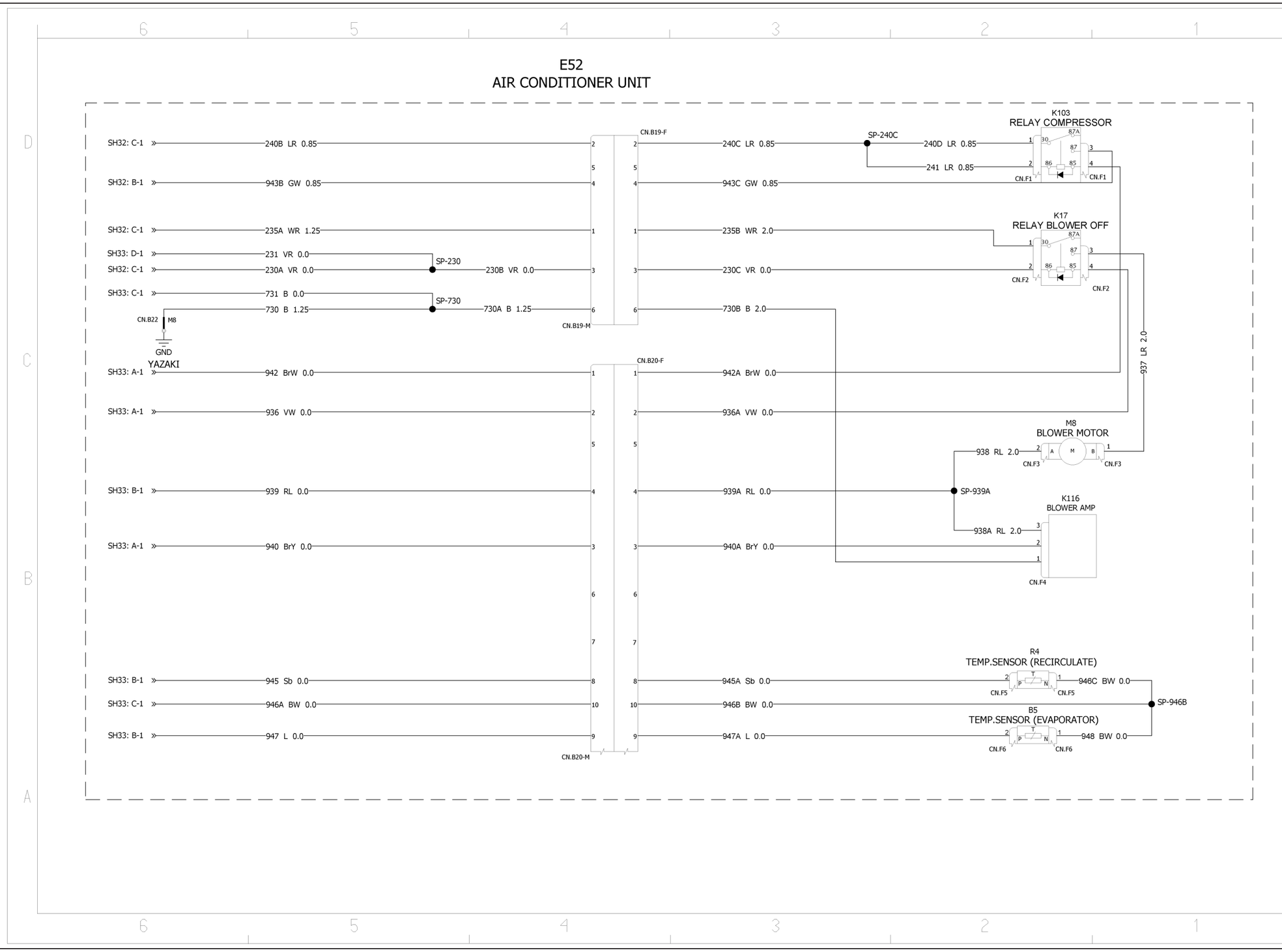
- Check the item that is not displayed in the DTC.



SMIL16CEX1223JA 1

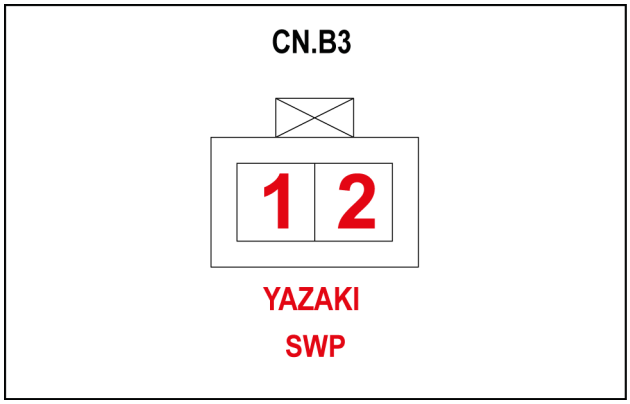
Wiring harnesses - Electrical schematic sheet 20 - Main cab-controller B

Type	Components	Connectors/link	Description
Controller	A13		Controller B
Connector	CN.A5	**CN.A5**	Controller B
Connector	CN.A54	**CN.A54**	

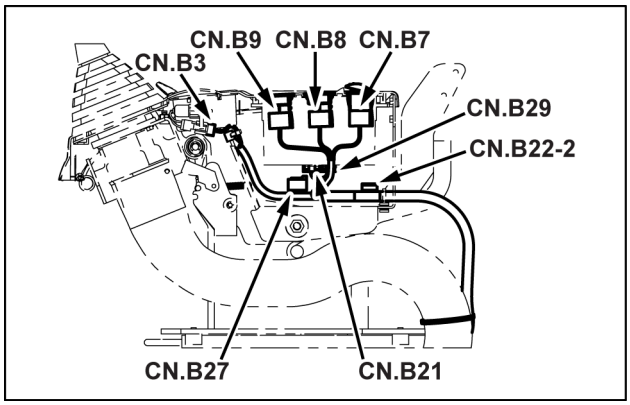


SMIL16CEX1243JA 1

CONNECTOR CN.B3 - LIMIT SWITCH (GATE) (Male)



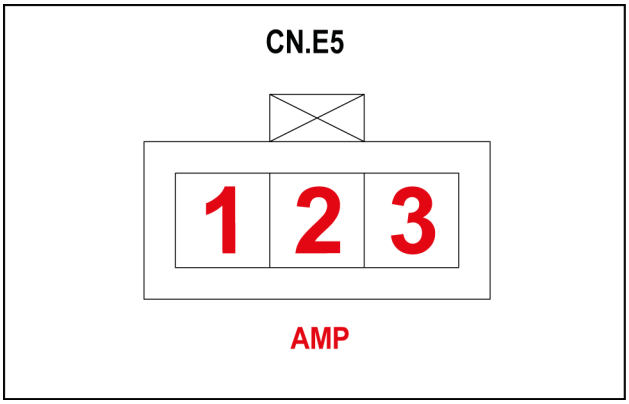
SMIL15CEX3927AA 23



SMIL16CEX1294AA 24

Pin	From	Wire	Description	Color-Size	Frame
1	CN.A46-M-P-3	170A		VW -0.85	**SHEET 29**
2	SP-840C-P-X	840D		RY -0.85	

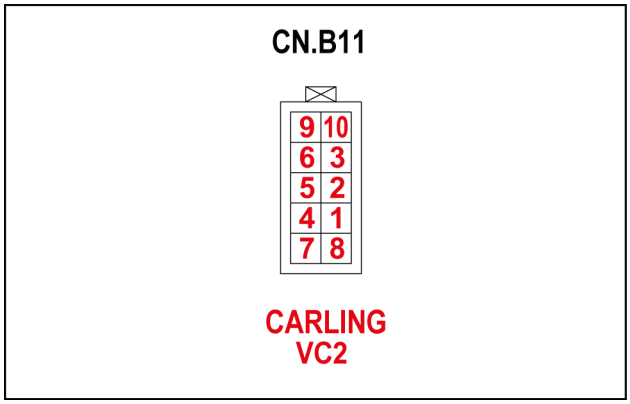
CONNECTOR CN.E5 - COMMON RAIL PRESSURE SENSOR (Male)



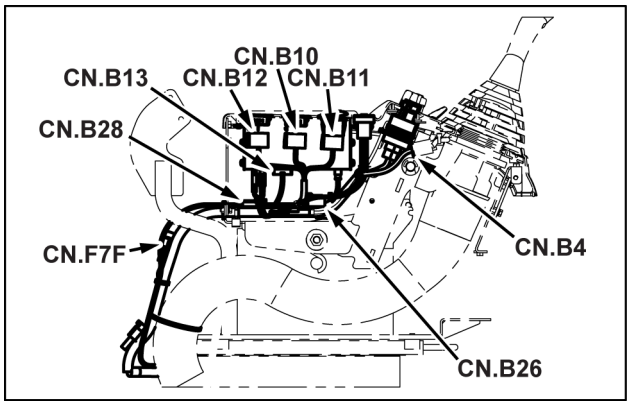
SMIL15CEX4029AA 60

Pin	From	Wire	Description	Color-Size	Frame
1	CN.D7-M-P-12	313A		L-0.5	**SHEET 06**
2	CN.D7-M-P-13	314C		Br-0.5	
3	CN.D7-M-P-14	315A		LW-0.5	

CONNECTOR CN.B11 - TRAVEL ALARM (OVER LOAD) (Male)



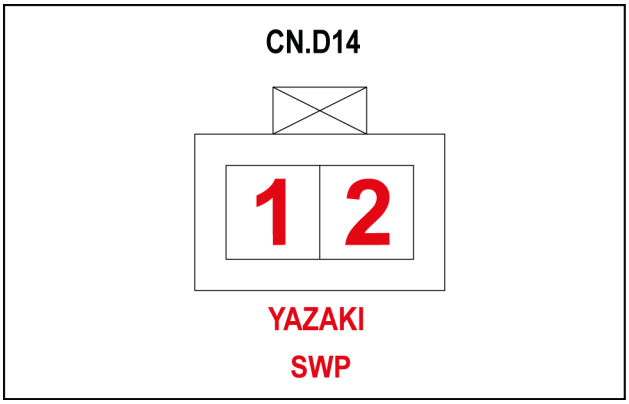
SMIL15CEX3937AA 23



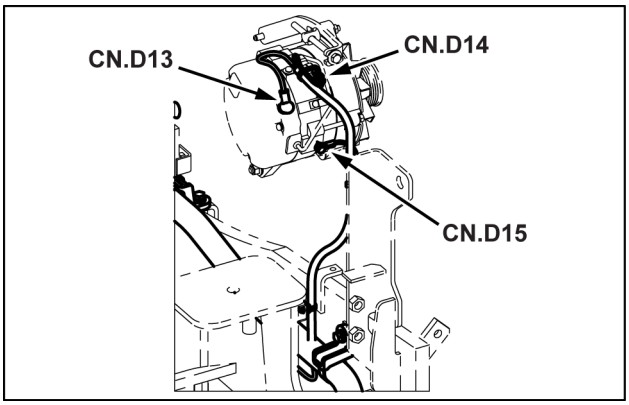
SMIL16CEX1292AA 24

Pin	From	Wire	Description	Color-Size	Frame
2	SP-622A-P-X	623		BG-0.85	**SHEET 29**
3	CN.A49-M-P-4	537A		WG-0.85	**SHEET 31**

CONNECTOR CN.D14 - ALTERNATOR (Male)



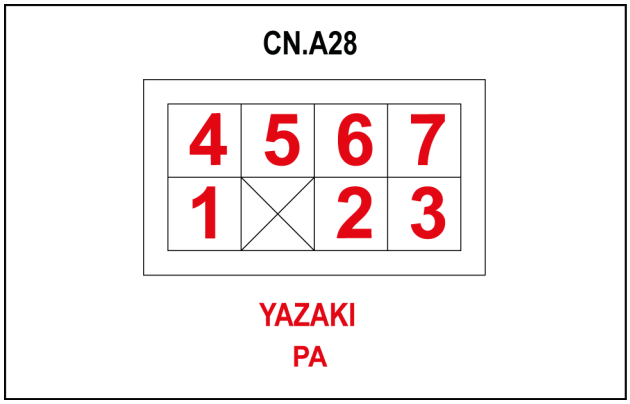
SMIL15CEX4020AA 55



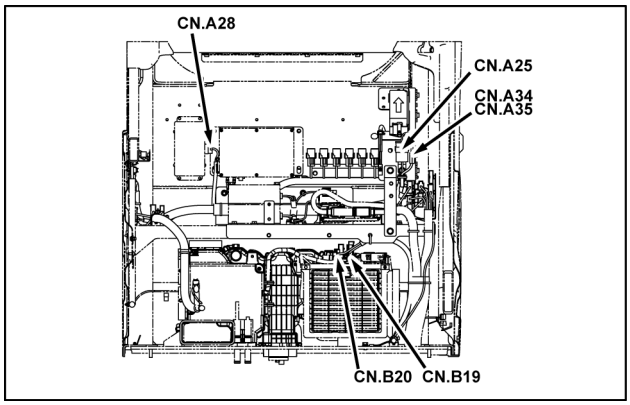
SMIL16CEX1286AA 56

Pin	From	Wire	Description	Color-Size	Frame
1	SP-501A-P-X	510		G-1.25	**SHEET 01**
2	CN.A52-M-P-4	515A		Br-1.25	**SHEET 18**

CONNECTOR CN.A28 - DC/DC (24V/12V) CONVERTER (Male)



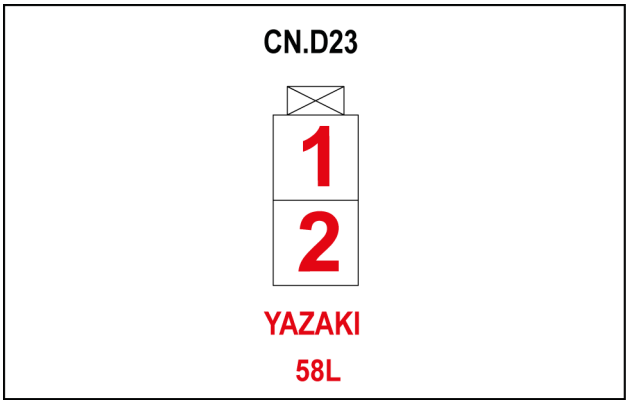
SMIL15CEX3895AA 24



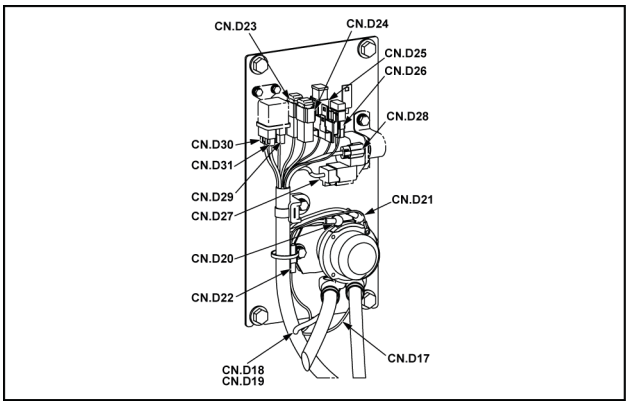
SMIL15CEX3886AA 25

Pin	From	Wire	Description	Color-Size	Frame
1	CN.A49-F-P-15	281		WR-0.85	**SHEET 31**
2	CN.A41-M-P-14	163		RL	**SHEET 21**
3	SP-281-P-X	280		RY-0.85	**SHEET 31**
4	CN.A49-F-P-16	709		BW-0.85	
5	SP-703-P-X	708		B-0.85	**SHEET 26**
6	F14-P-1	225		OR-0.85	**SHEET 03**

CONNECTOR CN.D23 - FUSIBLE LINK BACK UP (Male)



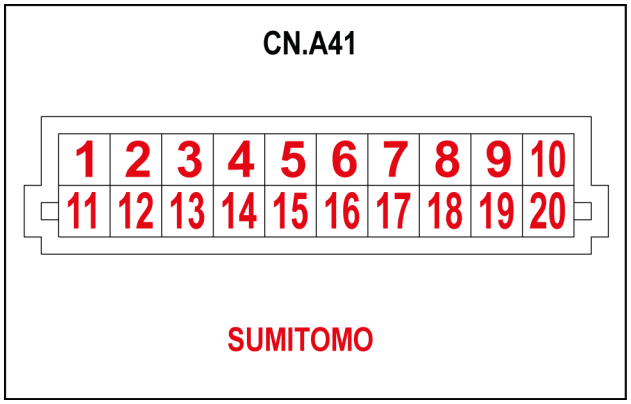
SMIL15CEX3950AA 54



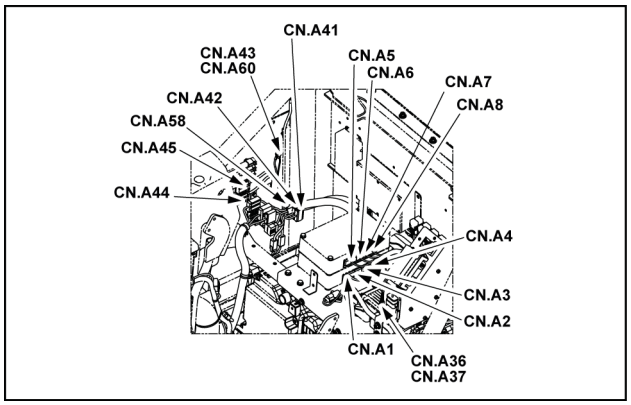
SMIL15CEX3949AA 55

Pin	From	Wire	Description	Color-Size	Frame
1	CN.D17-P-M8_A	102		RW-5	**SHEET 01**
2	SP-103-P-X	103B		RW-5	

CONNECTOR CN.A41 (Male)



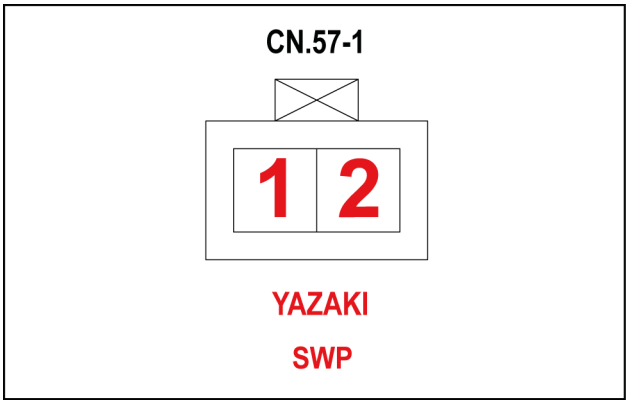
SMIL15CEX3893AA 3



SMIL15CEX3855AA 4

Pin	From	Wire	Description	Color-Size	Frame
1	CN.A53-F-P-7	040A		P	**SHEET 21**
2	CN.A44-M-P-7	040B		P	**SHEET 22**
3	CN.A2-P-6	040C		P	**SHEET 18**
4	CN.A6-P-6	040D		P	**SHEET 19**
5	CN.A23-P-7	040E		P	**SHEET 17**
6	CN.A24-M-P-7	040F		P	**SHEET 25**
7	CN.A48-F-P-10	040G		P	**SHEET 32**
8	CN.A26-M-P-3	040H		P	**SHEET 25**
9	CN.A27-M-P-3	040R		P	
10	CN.A34F-P-1	040J		P	
11	F4-P-IN	160		RL	**SHEET 03**
12	CN.A44-M-P-1	161B		RL	**SHEET 22**
13	CN.A49-F-P-1	162		RL	**SHEET 31**
14	CN.A28-P-2	163		RL	
15	SP-164-P-X	164		RL	**SHEET 21**
16	SP-501-P-X	502		G-0.85	**SHEET 25**
17	CN.A1-P-7	503		G-0.85	**SHEET 27**
18	CN.A5-P-7	504		G-0.85	**SHEET 18**
19	CN.A23-P-3	505		G-0.85	**SHEET 21**
20	SP-506-P-X	506		G-0.85	

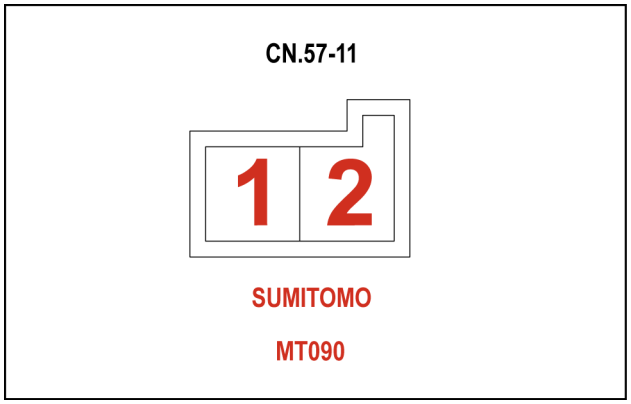
CONNECTOR CN.57-1C - OPTION SELECT SOLENOID VALVE (Male)



SMIL15CEX4164AA 6

Pin	From	Wire	Description	Color-Size	Frame
1	SP-260G-P-X	260Q		WL-0.75	**SHEET 42**
2	CN.A57C-M-P-2	806G		LY-0.75	

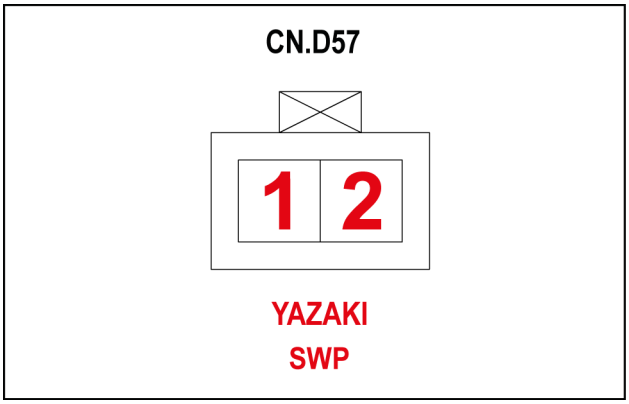
CONNECTOR CN.57-11A - PN DIODE (Male)



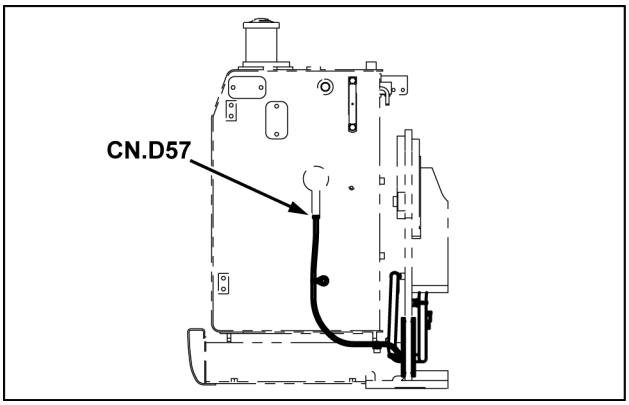
SMIL15CEX9455AA 35

Pin	From	Wire	Description	Color-Size	Frame
1	SP-854A-P-X	860A		GL	**SHEET 42**
2	SP-535A-P-X	535K		GY	

CONNECTOR CN.D57 - FUEL LEVEL SENSOR (Male)



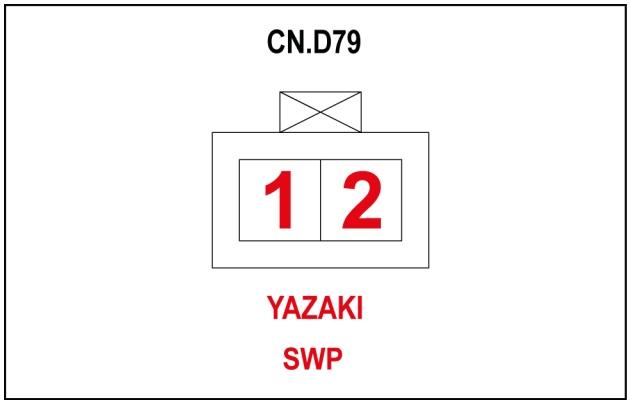
SMIL15CEX3970AA 80



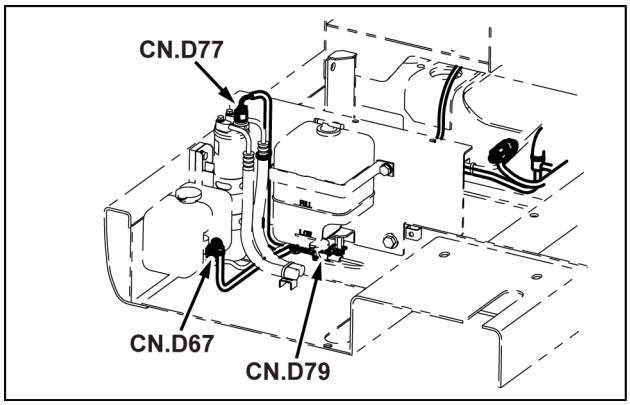
SMIL16CEX1272AA 81

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

CONNECTOR CN.D79 - LEVEL SWITCH (RESERVE TANK) (Female)



SMIL15CEX4015AA 16



SMIL16CEX1288AA 17

Pin	From	Wire	Description	Color-Size	Frame
1	SP-600A-P-X	651		BG-0.85	**SHEET 10**
2	CN.A54-P-19	532A		GrR-0.85	**SHEET 18**

Electrical systems - 55

Cab engine controls - 525

CX180C Crawler excavator LC version (TIER 3)

ECM

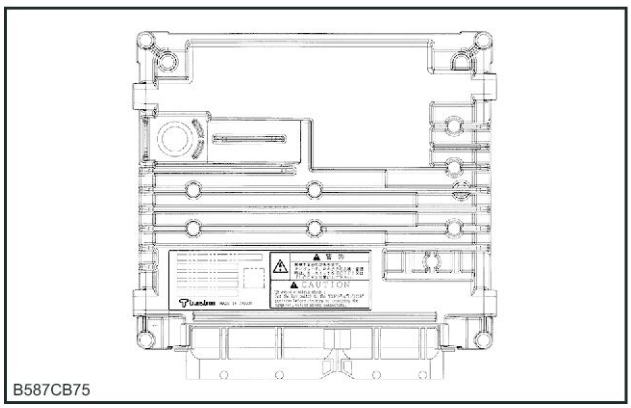
The ECM constantly monitors information sent from the various sensors and controls each system of the powertrain.

The ECM uses system diagnosis function to detect problems in system operation, issues warnings to the operator through the monitor, and stores any diagnostic trouble codes in memory.

The diagnostic trouble code identifies the area in which the problem occurred and supports repair work by the service engineer.

The ECM outputs voltages (e.g. **5 V**) to supply power to various sensors or switches. The ECM controls the output circuit by controlling the ground or power supply circuit via one of the devices.

NOTE: *As for the ECM installation position, refer to the manual of the machine.*



B587CB75 17

ECM and component parts

The ECM is designed to maintain regulation levels of exhaust gases while obtaining excellent performance and fuel efficiency. The ECM monitors various engine functions via sensors such as the CKP sensor.

ECM voltage

The ECM applies the specified voltage to various switches and sensors. The ECM is able to apply voltage in such a way because the ECM resistance is very high, and the voltage that is actually applied to the circuit is low. Therefore, the test lamp may not illuminate even if it is connected to the circuit. The voltmeter that is normally used at maintenance factories may not display a correct reading because its input impedance is too low. An accurate voltage reading can be obtained by using a digital multimeter (for example, 5-8840-2691-0) with an input impedance of **10 MΩ**.

Electrically Erasable Programmable Read Only Memory, EEPROM

EEPROM contains various programs and calibration information necessary for the ECM to control the powertrain operations. If a malfunction is found with the EEPROM, replace the ECM. The program and calibration information for the ECM powertrain control includes the engine type, engine number, ECM part number, diagnostic trouble code, learning value for correction of cylinder-to-cylinder variations, QR, Q resistance, EGR correction learning values, etc.

Cautions concerning ECM maintenance

The ECM has been designed to withstand the regular current consumption associated with the machine operation. Make sure that the circuit does not overload.

When testing for an open circuit or short circuit, do not ground or apply voltage to any of the ECM circuits unless instructed to do so. When performing these circuit tests, make sure to use digital multimeter 5-8840-2691-0.

NOTE: *Use the ECM with the part No. corresponding to the machine.*
When performing welding work on the machine, start the work after disconnecting the negative terminal of the battery.

Turning OFF the ECM power supply

In approximately **1 min** after turning the ignition switch OFF, the internal power supply of the ECM is not turned OFF. When it is necessary to turn OFF the ECM power supply, e.g., when clearing the memory, it is necessary to wait **1 min** or more after turning the ignition switch OFF.

Engine timing sensors - Inspect

1. Inspect the CMP sensor.
   - Inspect whether the CMP sensor is securely installed.
   - Inspect the sensor and connector sections for damage or debris.

Engine starter - Dynamic description

Starter

The starter is an outer gearing mesh method reduction starter adopting the magnetic shift type.

When the starter switch is turned ON, the plunger is drawn in, the contact point of the magnetic switch closes and the armature rotates. At the same time, the pinion is pushed to the front via the shift lever to mesh with the ring gear.

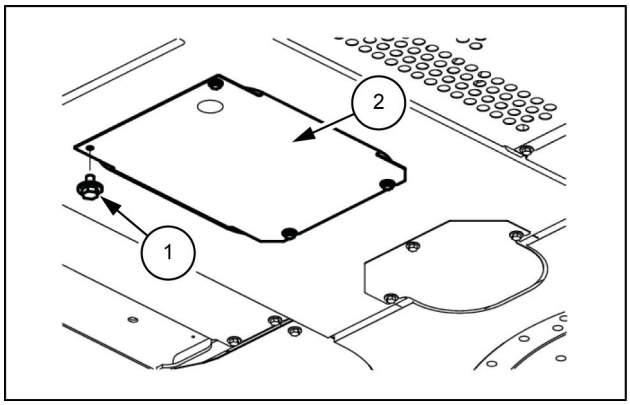
When the ring gear rotates, the crankshaft is turned to start the engine.

After the engine is started, the plunger returns, the pinion separates from the ring gear, and the armature stops rotating when the starter switch is turned OFF. When the engine revolution increases faster than the pinion, the pinion will be caused to turn in reverse, but because the pinion is idling by the one-way clutch operation, it does not work the armature.

Engine starter - Remove

1. Turn the battery disconnect switch to the "OFF" position or disconnect the negative terminal of the battery.
   - After removing terminals or harnesses, fasten them to the frame or a similar location so they do not interfere with the frame.
     Also, cover with a rubber cap to protect against sparks.
2. Use a wrench [**19 mm**] to remove the 4 bolts **(1)**, and then remove the under cover **(2)**.

   Tightening torque for bolt installation: **63.7 – 73.5 N·m** (**46.983 – 54.211 lb ft**)



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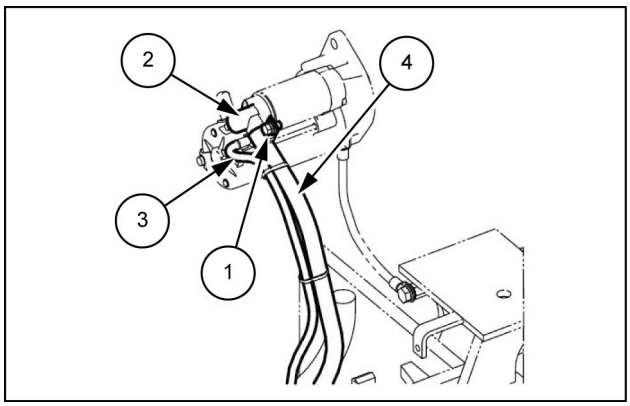
3. Use a wrench [**13 mm**] to remove the bolt **(1)**, and then remove the terminal cap **(2)**.
   Use a wrench to remove the wiring **(3)** and **(4)** from the starter.



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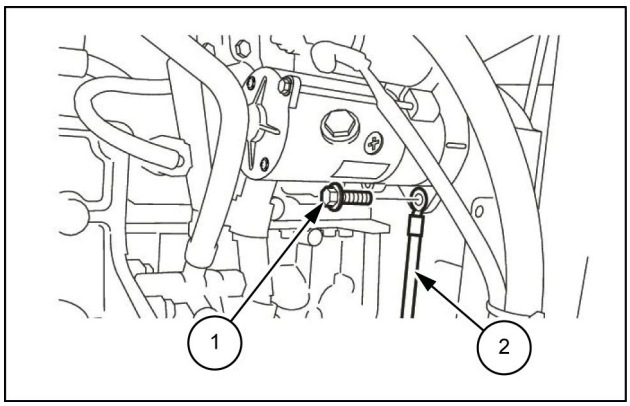
4. Use a wrench [**14 mm**] to remove the 2 bolts **(1)**, and then remove the starter motor **(3)** and battery cable **(2)** on the ground side.



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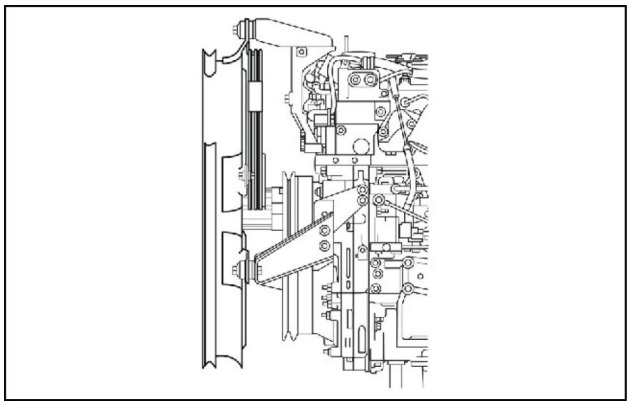
SERVICE

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**)



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Engine oil filling

1. Replenish the engine with engine oil.
   - Recheck the tightening of the oil pan drain plug.

Battery ground cable connect

1. Connect the battery ground cable to the battery.

Fuel air bleed

- Before starting the engine

1. Prepare the drain pan.
   - Place an appropriate pan under the fuel filter.
2. Turn the plug.
   - Sufficiently loosen the air removal plug.
3. Operate the priming pump.
   - Operate the priming pump twenty times or more until fuel spills out around the plug.
4. Close the plug.
5. Operate the priming pump.
   - Operate the priming pump ten times or more until it is completely filled with fuel.
   - Wait for approximately **1 min** after operating the priming pump.
6. Drain air from the fuel filter assembly.
   - Sufficiently loosen the air removal plug.
7. Close the plug.
   - Sufficiently tighten the air bleeding plug to the fuel filter.

NOTICE: *After tightening the air bleed plug, be sure to clean away the fuel from the surroundings.*

8. Operate the priming pump.
   - Push the priming pump ten times to fifteen times to feed fuel into the supply pump.
   - Or less, after starting the engine.

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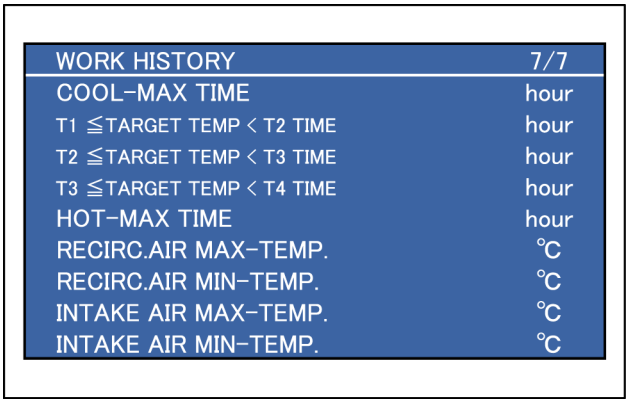
Electronic module - Fault code index

Main unit-side DTC list

Diagnostic trouble code	Trouble mode
7000	P1 pressure sensor signal abnormality
7001	P2 pressure sensor signal abnormality
7002	N1 pressure sensor signal abnormality
7003	N2 pressure sensor signal abnormality
7020	Upper pressure sensor signal abnormality
7021	Swing pressure sensor signal abnormality
7022	Travel pressure sensor signal abnormality
7023	Arm-in pressure sensor signal abnormality
7040	Fuel level sensor signal abnormality
7041	Oil temperature sensor signal abnormality
7063	Return filter clog switch abnormality
7065	Boom-up pilot pressure sensor signal abnormality
7067	Bucket-close pilot pressure sensor signal abnormality
7200	Swing brake solenoid signal abnormality
7201	Travel high-speed solenoid signal abnormality
7202	Pressure boost solenoid signal abnormality
7203	Travel alarm buzzer signal abnormality
7206	Option line switchover solenoid signal abnormality
7212	Shut-off solenoid signal abnormality
7240	Pump horsepower proportional valve signal abnormality
7241	P1 flow control proportional valve signal abnormality
7246	2 pumps flow solenoid signal abnormality
7254	Washer output abnormality
7400	Abnormally high coolant temperature [**105 °C** (**221.0 °F**) (or higher)]
7401	Abnormally high coolant temperature [**110 °C** (**230.0 °F**)(or higher)]
7404	Abnormally high oil temperature [**95 °C** (**203.0 °F**) (or higher)]
7405	Abnormally high boost temperature [**80 °C** (**176.0 °F**) (or higher)]
7406	Abnormally high boost temperature [**90 °C** (**194.0 °F**) (or higher)]
7420	Abnormally low alternator voltage
7421	Coolant level reduction
7422	Abnormally low engine oil pressure
7423	Air cleaner clogged
7428	Fuel filter water level
7601	Monitor communication abnormality
7602	ECM communication abnormality
7603	Computer S communication abnormality
7605	ECM mismatch
7606	EEPROM data abnormality
7608	Camera abnormality
7609	EEPROM (B) data abnormality
7611	Computer A communication abnormality
7612	Air conditioner communication abnormality
7613	Monitor communication CAN abnormality
7614	Air conditioner panel mismatch

7. Air-conditioner

COOL-MAX TIME	hour	Maximum cooling operation time
T1 ≤ TARGET TEMP < T2 TIME	hour	T1 ≤ Target temperature T < T2 time
T2 ≤ TARGET TEMP < T3 TIME	hour	T2 ≤ Target temperature T < T3 time
T3 ≤ TARGET TEMP < T4 TIME	hour	T3 ≤ Target temperature T < T4 time
HOT-MAX TIME	hour	Maximum heating operation time
RECIRC. AIR MAX-TEMP.	°C (°F)	Maximum inside air temperature
RECIRC. AIR MIN-TEMP.	°C (°F)	Minimum inside air temperature
INTAKE AIR MAX-TEMP.	°C (°F)	Maximum outside air temperature
INTAKE AIR MIN-TEMP.	°C (°F)	Minimum outside air temperature



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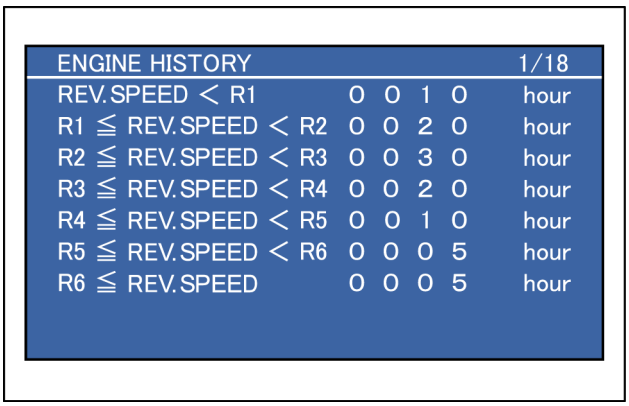
To switch to a page from 1 to 7, press the light switch  while the WORK HISTORY screen is displayed, and select the desired page.

Engine history

The engine speed, coolant temperature, fuel temperature, and suction air temperature distributions, etc. can be displayed.



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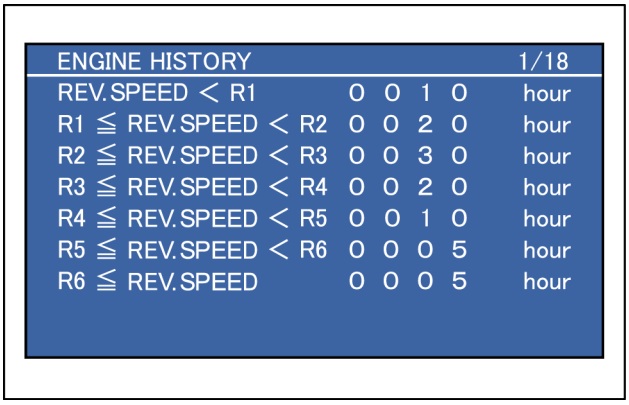
1. Actual speed distribution

REV. SPEED < R1	hour	S ≤ 1025
R1 ≤ REV. SPEED < R2	hour	1025 ≤ S < 1225
R2 ≤ REV. SPEED < R3	hour	1225 ≤ S < 1425
R3 ≤ REV. SPEED < R4	hour	1425 ≤ S < 1625
R4 ≤ REV. SPEED < R5	hour	1625 ≤ S < 1825
R5 ≤ REV. SPEED < R6	hour	1825 ≤ S < 2025
R6 ≤ REV. SPEED	hour	2025 ≤ S



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Instrument cluster - Static description - Password setting

Summary

Set the anti-theft password.

Configuration

- Monitor: Connected to Computer B
- Anti-theft setting knob: On the cab main harness

Operation explanation

1. With the key “OFF”, connect the anti-theft setting knob.
2. After connecting the knob, when you switch “ON” the key, the system displays the password setting screen.
3. After setting the 4-digit password, if you switch the key “ON→OFF→ON→OFF”, the system switches “ON” the anti-theft function.
   - All the key switching operations should be done within **2 s**.
4. When the anti-theft function comes “ON”, the monitor sets off the buzzer and the key icon is displayed.

* See anti-theft (password type).

Instrument cluster - Dynamic description - Clock

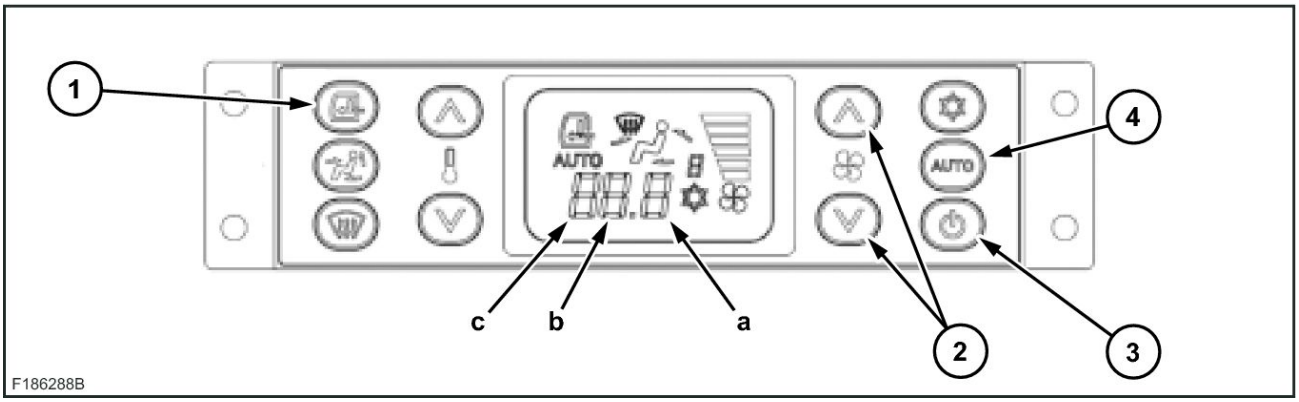
Purpose

Displays the time on the monitor.

Operation explanation

- The time is always displayed on the monitor.
- The clock continues to operate, without display, when the key is turned “OFF”. (Because it uses power from the battery)

Monitor mode display operating method



F186288B 8

a 1st digit
b 2nd digit
c 3rd digit

1 Refresh/recirculate select switch
2 Fan UP/DOWN switch
3 Panel ON/OFF switch
4 AUTO switch

1. Hold down the refresh/recirculate select switch and the panel ON/OFF switch at the same time for **1 s**. or longer to enter the monitor mode.
   Then, all symbols on the LCD light up for 1 min. (Broken symbols do not light up) When the system enters the monitor mode, the decimal display is selected. Press the AUTO switch to change to the hexadecimal display.
2. Numbers (0 - 9) or letters (A - F) are displayed on the 3rd and 2nd digits of the 3 digit segment display. Note that B is displayed as "b" and D is displayed as "d". "H" is always displayed on the 1st digit.
3. Use the fan UP/DOWN switches to change the number (0 - 2) for the monitor mode segment display. Select the sensor to check from the following monitor mode segment display table. Use the AUTO switch to select between the decimal and hexadecimal displays. Each time the AUTO switch is pressed, the display changes between decimal and hexadecimal.
   For trouble diagnosis, use the hexadecimal display because the 3 digit segment table is used to check for the diagnosis result. To display the values detected by each sensor, change to the decimal display.

In the hexadecimal display, when the value of a sensor changes in monitor mode, the hexadecimal display changes with it.
If the display before entering monitor mode was [HL. *], the error judgment value is displayed. (In other words, the detected value before the abnormality was detected) In the same way, if the display before entering monitor mode was [**. E], the display becomes **.E and the error judgment value is displayed.

B. Decimal display
From **-99.9 – 99.9 °C** (**-147.8 – 211.8 °F**) is displayed with decimals.
Also, the "-" minus display is displayed on the left side of the 3 digit segment.

5. Air-conditioner operation in monitor mode
When the system enters monitor mode, all output (operation) through control is stopped and until monitor mode is ended, operations and settings of basic control through all the switches are not possible.

6. Ending monitor mode
In monitor mode, if the operation panel ON/OFF switch closed path continues for **1 s** while the refresh/recirculate select switch closed path is ongoing, monitor mode is ended and the system returns to the basic control state.
The same also occurs if the vehicle main key power supply is switched OFF.

Table A

Exclusively for monitor mode 7-segment	Display contents			
0	Inside air sensor temperature data			
1	Evaporator sensor temperature data			
2	Solar radiation compensation data			
3	Outside air data			
4	–			
C	Coolant temperature signal status data			
	Abnormal	Lower than **30 °C** (**86 °F**)	**30 °C** (**86 °F**) or higher Lower than **45 °C** (**113 °F**)	**45 °C** (**113 °F**) or higher
	4	1	2	3
5 – F	Data (sensor diagnosis etc.)			

Table B

Sensor name	Short	Disconnection
Inside air sensor	F6H	0CH
Evaporator sensor	F6H	0CH

Table C

Sensor name	5 V short	Ground short
Solar radiation sensor	D5H	0CH

Door switch control

1. Summary explanation
This control adds a restriction to air-conditioner operation with the door switch or front window switch. Its purpose is to prevent overheating of the vehicle main unit.
Concretely, it suppresses condenser heating and controls in a way restricted in order to obtain a feeling of comfort.

2. Door switch/front window switch signal
Due to data sent from CAN communication.

Message ID: 0x18FF1028

Send node: Monitor Display

Send cycle: **10 ms**

Data: Open door signal and open window signal data

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CX180C Crawler excavator LC version (TIER 3)

Door link

When the room lamp switch is set to the DOOR position, the lamp lights when the door is open and goes out when the door is closed.

Auto lamp off

In 2, in order to prevent the battery from being run down, the room lamp goes out **30 s** after the door is opened.

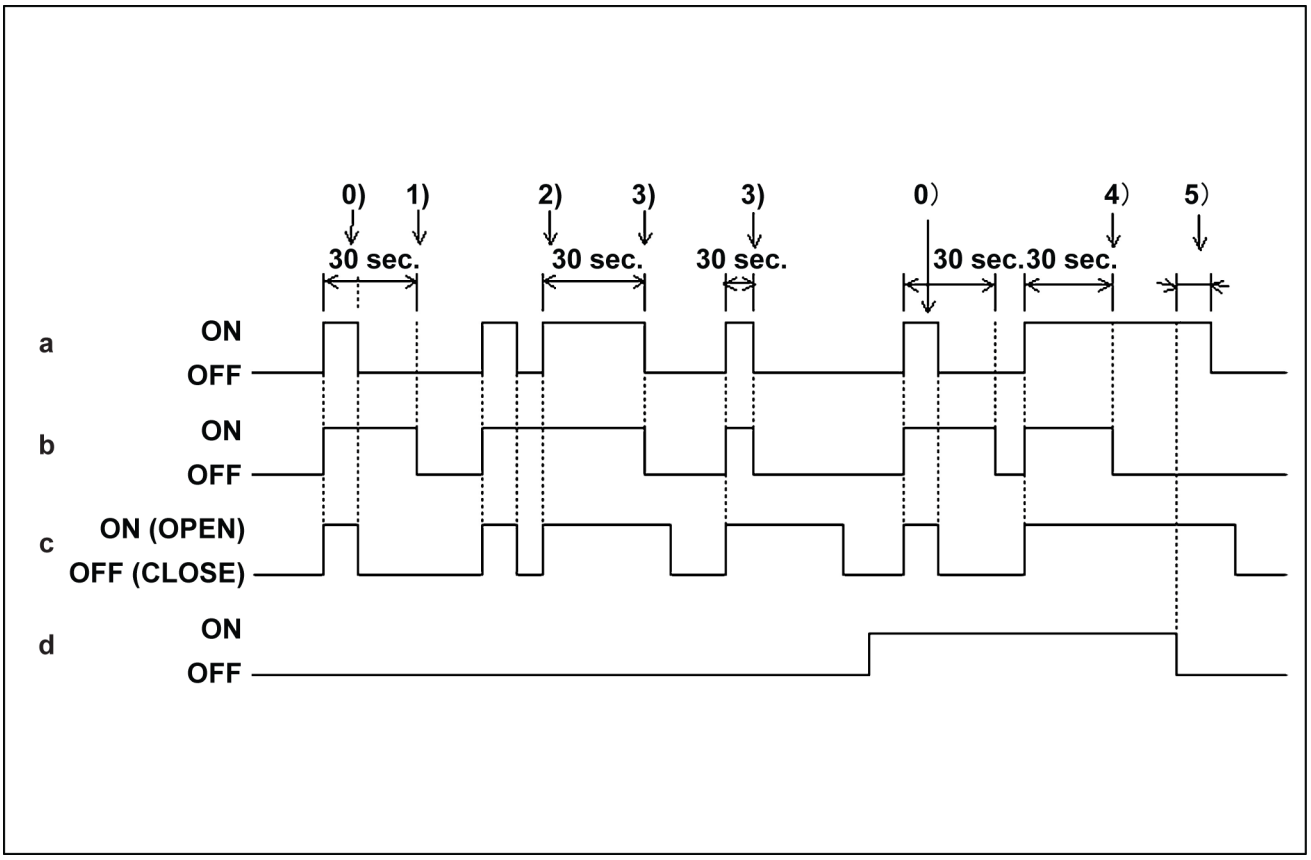
However, this function only works when the key switch is “OFF”. If it is ACC or “ON”, auto lamp off does not work. (Because even if the room lamp relay is “OFF”, power is supplied from ACC.)

The only purpose of this auto lamp off function is to prevent the battery from being run down if the door is left open with the key “OFF”.

Time chart

The time chart shows how the function in 3 works.

The room lamp switch is set to DOOR.



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a. Room lamp
b. Room lamp relay
c. Door limit switch
d. Key switch

0. Door linked room lamp.
1. Even after the door is closed, the room lamp relay is “ON” for **30 s**.
2. **30 s** is counted from the last time the door was opened.
3. After **30 s**, the lamp goes off automatically.
4. Auto lamp off does not work if the key switch is “ON” or ACC.
5. When the key is switched “OFF”, the lamp goes out. (after power-cut delay)

Check the terminal section of the connector **CN.D50** for rust, disconnection, or connection problems.

A. If the terminal section of the connector not normal, replace the defect upper pilot pressure sensor **(2)**.

B. If the terminal section of the connector normal, proceed to Step **7**.

7. Inspect for continuity between the ground and terminal 1 of the pilot upper pressure sensor connector **CN.D50** harness side.

   Inspect for continuity between the ground and terminal 2 of the pilot upper pressure sensor connector **CN.D50** harness side.

   A. If there is continuity, find and replace the wire ID W400, W405, or V415.

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

8. Inspect for continuity between the ground and terminal 3 of the pilot upper pressure sensor connector **CN.D50** harness side.

   A. If there is no continuity, find and repair or replace the open circuit on the wire ID BW420 or BW425.

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

9. Turn ON the key switch.

   Measure the voltage between the ground and terminal 1 of the pilot upper pressure sensor connector **CN.D50** harness side.

   A. If the voltage is not about **5 V**, find and repair or replace the open circuit on the wire ID W400 or W405.

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

10. Measure the voltage between the ground and terminal 2 of the pilot upper pressure sensor connector **CN.D50** harness side.

    A. If the voltage is less than **0.25 V**, find and repair or replace the open circuit on the wire ID V415.

    B. If the voltage is more than equal to **0.25 V**, proceed to Step **11**.

11. Connect pilot upper pressure sensor connector **CN.D50**.

    A. If the Diagnostic Trouble Code 7020 is displayed, replace computer A **(1)**.

Wiring harnesses - Electrical schematic sheet 13 (55.100)

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

4. Turn OFF the key switch.

   Inspect for continuity between the ground and terminal 1 of the shut-off solenoid connector **CN.D59** harness side.

   A. If there is continuity, find and replace the wire RY840 or VW170.

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

5. Inspect for continuity between the ground and terminal 2 of the shut-off solenoid connector **CN.D59** harness side.

   A. If there is no continuity, find and repair or replace the open circuit on the wire B752 harness.

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

6. Turn ON the key switch.

   Measure the voltage between the ground and terminal 1 of the shut-off solenoid connector **CN.D59** harness side.

   A. If the voltage is not about **24 V**, find and repair or replace the open circuit on the wire RY840 or VW170.

   B. If the voltage is about **24 V**, replace computer C **(5)**.

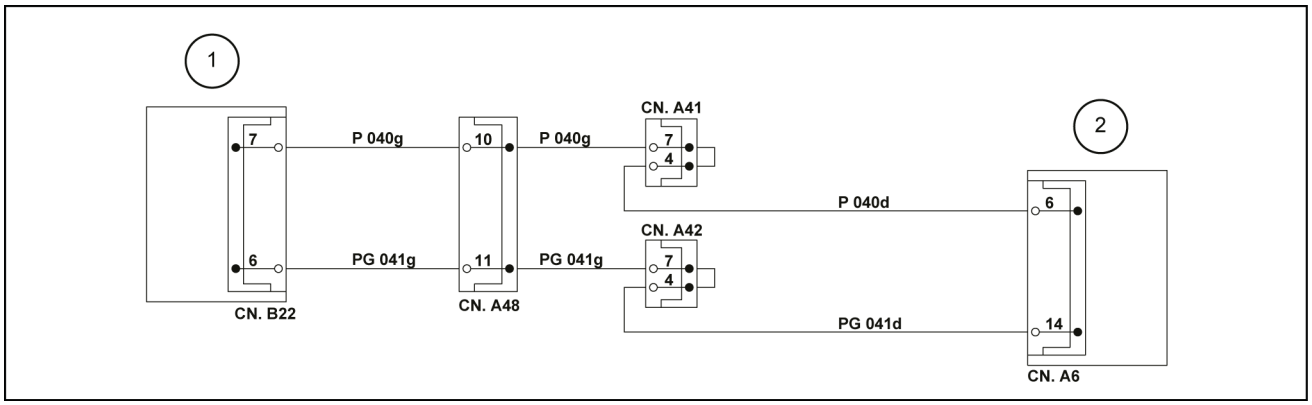
Wiring harnesses - Electrical schematic sheet 11 (55.100)

7612 - Air-conditioner communication abnormality

Control Module: MCM

Solution:

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



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1. Air-conditioner switch panel
2. Computer B

2. Turn ON the key switch.

   Inspect the connection status between computer B connector **CN.A6** and air-conditioner switch panel connector **CN.B22**. Make sure that all the connectors are secured.

   A. If Diagnostic Trouble Code 7612 is not displayed, Improper connection at computer B connector **CN.A6** or air-conditioner switch panel connector **CN.B22**.

   B. If Diagnostic Trouble Code 7612 is displayed, proceed to Step **3**.

3. Turn OFF the key switch.

   Disconnect the computer B connector **CN.A6** and air-conditioner switch panel **CN.B22**.

   Inspect for continuity between terminal 6 of the computer B connector **CN.A6** harness side and terminal 7 of the air-conditioner switch panel connector **CN.B22** harness side.

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

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

4. Inspect for continuity between terminal 14 of the computer B connector **CN.A6** harness side and terminal 6 of the air-conditioner switch panel connector **CN.B22** harness side.

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

   B. If there is continuity, proceed to Step**5**.

5. Turn ON the key switch.

   A. If Diagnostic Trouble Code 7612 is displayed, replace the air-conditioner switch panel **(2)**.

Wiring harnesses - Electrical schematic sheet 33 (55.100) Wiring harnesses - Electrical schematic sheet 19 (55.100)

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

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

7. Disconnect the harness connector **CN.D01-02** from the ECM.

   Inspect the ECM harness connector **CN.D01-02** for a poor connection.

   A. If a problem is found, repair the harness connector **CN.D01-02**.

   B. If the harness connector **CN.D01-02** is normal, replace the ECM. (Refer to " **Engine Control Unit (ECU) - Remove (55.015)**" and " **Engine Control Unit (ECU) - Install (55.015)**").
   Set the injector ID code and the engine serial number on the ECM.

8. Confirm resolution:

   1. Display RESET on the service support screen on the monitor and reset FAULTY HISTORY. See "Service Support - RESET Screen List".

   NOTE: *All the generated Diagnostic Trouble Codes will be cleared.*

   2. Turn OFF the starter switch and keep it OFF for **1 min** or longer.

   3. Start the engine.

   4. Perform a test-run under the conditions for running the Diagnostic Trouble Code.

   5. Display FAULTY HISTORY on the service support screen on the monitor and check that no Diagnostic Trouble Code has been detected. See "Service Support - FAULTY HISTORY".
   Conditions for setting the Diagnostic Trouble Codes such as engine run time or coolant temperature, etc., vary depending on the Diagnostic Trouble Codes.

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

P0409 - Exhaust gas recirculation 1 sensor circuit

Control Module: ECM

Solution:

1. Check the trouble code setting conditions before you proceed with the diagnostics code P0409.
   - Diagnostic trouble codes P060B and P0651 are not detected.
   - The ECM detects that the signal from the EGR valve position sensor is fixed to low or high status for **5 s** or longer.
2. Check and diagnose the below fault codes before you proceed with the diagnostics code P0409.

   Diagnostic trouble code P1655
3. Turn OFF the starter switch.

   Disconnect the harness connector **CN.E3** from the EGR valve.

   Turn ON the starter switch.

   Check if any of the EGR position 1, EGR position 2 and EGR position 3 data displays shows ON with the trouble diagnosis scan tool.

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

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

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

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

   B. If there are no problems, proceed to Step **4**.
4. Measure the voltage between the EGR position sensor **5 V** power supply circuit and a normal ground.

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

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

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

   B. If there are no problems, proceed to Step **5**.
5. Measure the voltage between the EGR position sensor **5 V** power supply circuit and the ground circuit.

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

   NOTE:
   • The EGR position sensor shares the ground circuit with other sensors.
   • The Diagnostic Trouble Code set on a sensor which shares this circuit may be detected.

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

   B. If there are no problems, proceed to Step **6**.
6. Use a test cable with fuse to short circuit the EGR position sensor 1 signal circuit and the **5 V** power supply circuit momentarily and check the indicated EGR position 1 with the trouble diagnosis scan tool.

7. Inspect for cuts and cracks in the fuel hose between the fuel tank and the fuel supply pump.

   A. If a problem is found, replace the fuel hose.

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

   NOTE:
   • The fuel hose from the fuel tank to the fuel supply pump has a weak vacuum when the engine is driving.
   • If the fuel hose connection is inadequate, air gets in.
   • With air in the fuel system, if the engine speed and load become high, the common rail pressure fluctuates and Diagnostic Trouble Code P1093 may be detected.

8. Check that an appropriate clamp is used between the fuel tank and the fuel supply pump.

   A. If a problem is found, replace the clamp.

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

9. Operate the priming pump until the handle becomes heavy.

   NOTE: *If there is a leak in the fuel system between the priming pump and the fuel supply pump, the pressing weight of the priming pump does not become heavy.*

   Start the engine.

   Inspect the high-pressure side of the fuel system and check for fuel leak between the fuel supply pump and common rail.

   NOTE:
   • The fuel may leak to the bottom section of the cylinder head cover from the high pressure hose inlet.
   • The engine oil level increases when the fuel leaks to the bottom portion of the cylinder head cover.
   • Inspect for fuel leaks into the engine oil.

   A. If a fuel leak is found, repair it.

   B. If there are no problems, proceed to Step **10**.

10. Turn OFF the starter switch.

    Remove the fuel hose on the fuel supply pump side from the fuel filter.

    NOTE:
    • Use a drain pan to catch any spilled fuel from the removed fuel hose.
    • Clean the pressure gauge and connecting hose before connecting them to the fuel pipe.
    • The fuel supply pump may be damaged by foreign matter that has entered into the connecting hose.

    Connect the pressure gauge between the fuel filter and the removed fuel hose.

    NOTE: *Check if the fuel system is securely connected.*

    Remove the air using the priming pump, and crank the engine for no longer than the **5 s**.

    NOTE: *Repeat cranking until the engine starts.*

    Leave the engine idling for **1 min** or longer.

    Check the pressure gauge while keeping the specified engine speed for the **1 min**.

    Check if the pressure gauge shows a negative pressure value is more than or equal to **17 kPa** (**2.5 psi**) during inspection.

    NOTE: *Fuel clogging is checked with the negative pressure amount in the fuel system.*

    If the negative pressure is more than or equal to **17 kPa** (**2.5 psi**), inspect to see if there is damage or twisting with the fuel system between the fuel supply pump and the fuel tank.

1. Display RESET on the service support screen on the monitor and reset FAULTY HISTORY. See "Service Support - RESET Screen List".

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

2. Turn OFF the starter switch for **1 min** or longer.

3. Start the engine and turn the engine throttle switch to the maximum, then to minimum while checking the indicated accelerator pedal position 2 (APP2) with the trouble diagnosis scan tool.

4. While turning the engine throttle switch to the maximum, then to the minimum, check that the trouble diagnosis scan tool does not indicate the value lower than **0.2 V**.

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

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