CX145D SR
Crawler Excavator

SERVICE MANUAL

Part number 51458821
English
March 2018

CASE

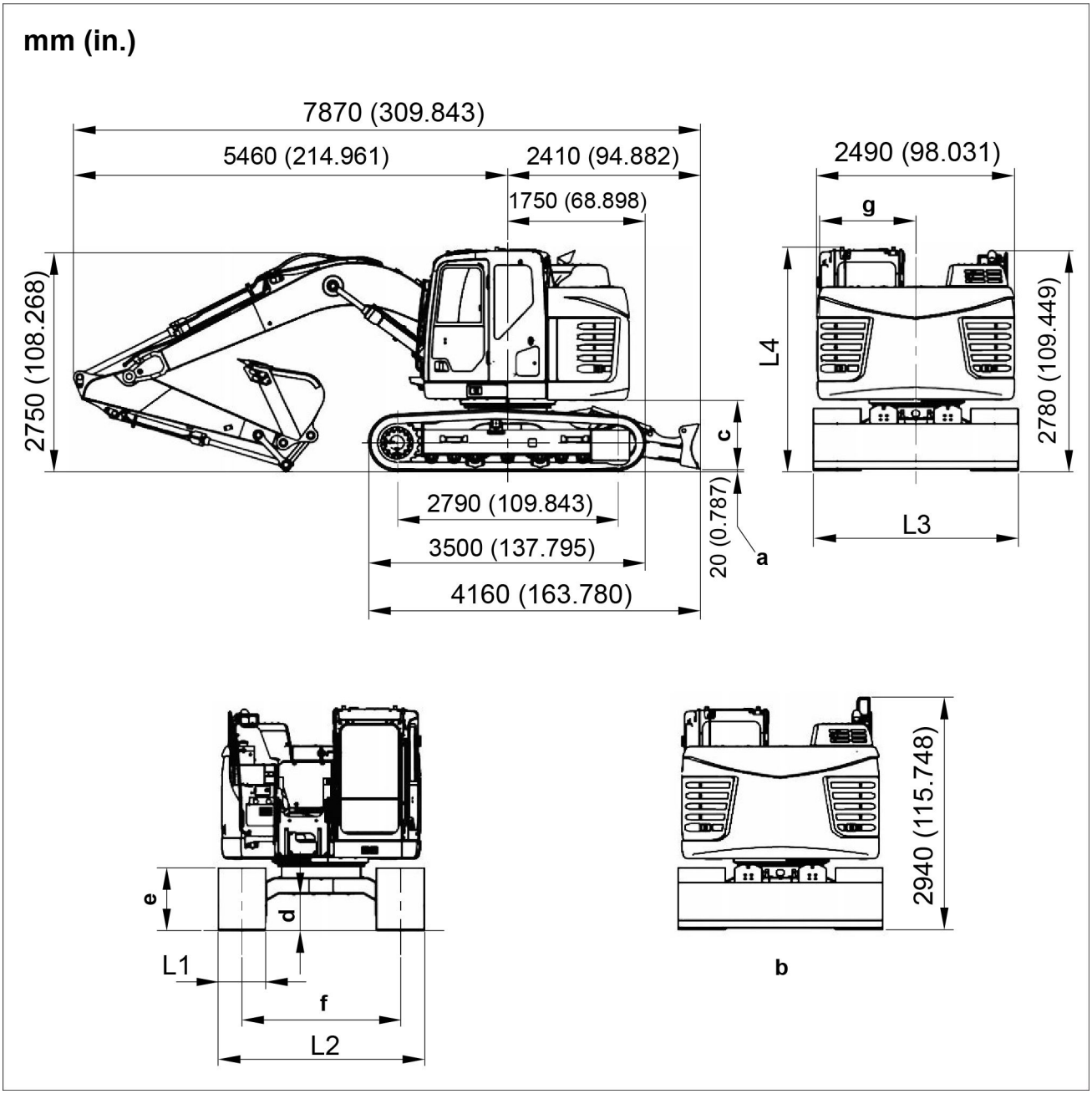
Upper component

Swing unit

Swing motor		
	Manufacturer	Hyest Corporation
	Motor type	Fixed displacement piston motor
		With parking brake
	Absorption amount	**64.3 cm³/rev** (**3.92 in³/rev**)
	Operating pressure	**27.9 MPa** (**4047 psi**)
	Operating flow	**130 l/min** (**34.3424 US gpm**)
	Mechanical brake torque	**336 N·m** (**247.821 lb ft**) min.
	Brake off pressure	**2.9 MPa** (**421 psi**) max.
	Relief valve set pressure	**27.9 MPa** (**4047 psi**) at **108 l/min** (**28.531 US gpm**) **27.3 MPa** (**3960 psi**) at **40 l/min** (**10.567 US gpm**)
Swing reduction gear		
	Reduction gear type	Planetary gear 2-stage reduction gear
	Reduction ratio	19.167
Dry weight		**100.0 kg** (**220.462 lb**)
Turntable bearing		
	Number of teeth	98
	Weight	**171.5 kg** (**378.0928 lb**)
Counterweight		
	Weight	**3550 kg** (**7826.410 lb**)

Short arm [2.11 m (6.92 ft)]

NOTE: *The values used in this document are subject to change without notice due to a design change or other reasons.*
The values indicated in the diagram exclude the shoe lug height ***(a) [20 mm*** *(****0.787 in****)].*



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b Dimension of upper guard rail
c **880 mm** (**34.646 in**)
d **425 mm** (**16.732 in**)
r **780 mm** (**30.709 in**)
f **1990 mm** (**78.346 in**)
g **1220 mm** (**48.031 in**)

Cooling system main specifications

Item	Specifications
Water pump	Centrifugal impeller method
Pulley ratio	1.03
Thermostat	Wax pellet type
Open valve temperature	**82.0 °C** (**180 °F**)
Full-open temperature	**95.0 °C** (**203 °F**)
Valve lift amount when fully opened	**10 mm** (**0.394 in**)

Electrical system main specifications

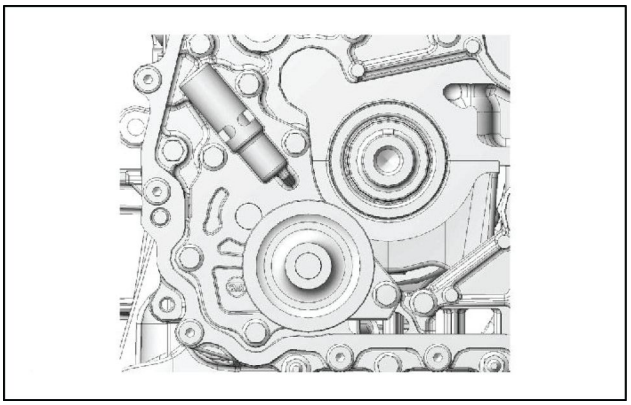
Generator	
Item	**Data**
Isuzu parts number	8980921122
Nominal output	**24 V**/ **50 A**
Rated rotation count	**5000 RPM**
Regulator type	IC type
Regulated voltage	**28 – 29 V**
Weight	**9.1 kg** (**20.1 lb**)

Starter		
Type (Manufacturer)		Hitachi
Rating	Voltage	**24 V**
	Output	**4 kW** (**5.4 Hp**)
	Time	**30 s**
Number of pinion teeth		11
Rotational direction (facing the pinion)		Clockwise
Weight (approx.)		**6.3 kg** (**13.9 lb**)
No-load characteristics	Current/voltage	Less than **120 A** / **23 V**
	Revolution speed	More than **3500 RPM**
Load characteristics	Current/voltage	Less than **250 A** / **18.6 V**
	Torque	More than **13.2 N·m** (**9.74 lb ft**)
	Revolution speed	More than **1590 RPM**
Locking characteristics	Current/voltage	Less than **1100 A** / **10 V**
	Torque	More than **47 N·m** (**34.67 lb ft**)

Glow plug	
Item	**Type**
Preheat device model	Glow plug
Glow plug rated voltage/current	**23 V** / **3.5 A**

Oil pump assembly removal

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



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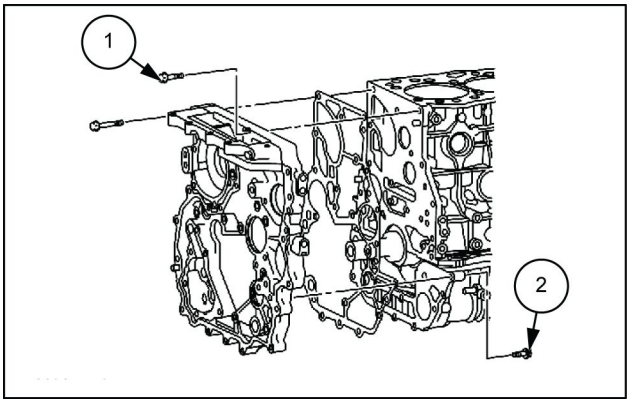
Timing gear case removal

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

NOTICE: *Do not forget to remove the bolt.*

2. Remove the gasket from the cylinder block.



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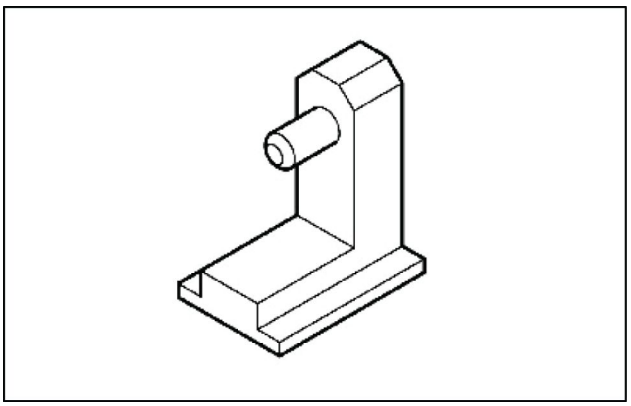
Flywheel removal

1. Fasten special tool to flywheel housing.
   - Install the crankshaft stopper to the flywheel housing starter installation section and ensure the crankshaft does not rotate.

NOTE: *Verify that the stopper is installed and securely bites into the ring gear.*

Special tool: Crankshaft stopper (Refer to **Crankshaft - Special tools (10.103)**)



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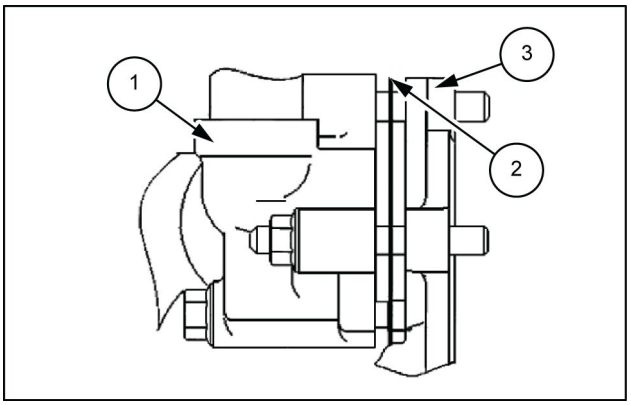
NOTICE: *Assembling the oil cooler* ***(3)*** *and water inlet pipe with their installation surfaces tilted will cause the coolant to leak.*

1. Water bypass pipe
2. Gasket



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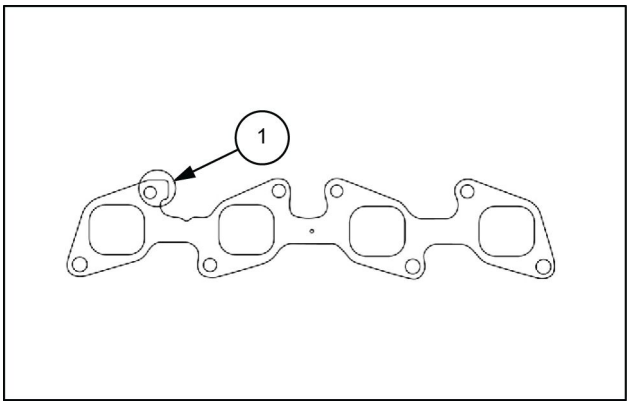
Exhaust manifold installation

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



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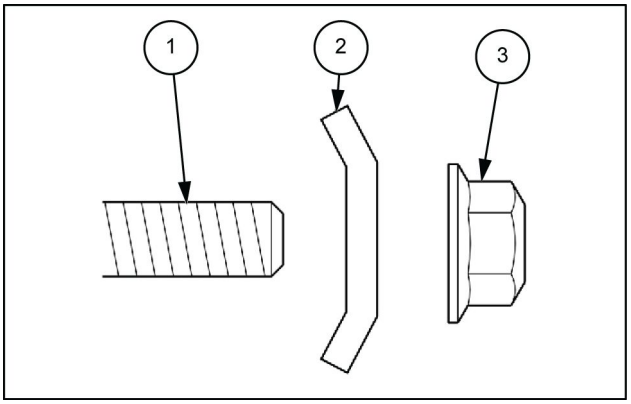
   - Assemble the washer **(2)** and nut **(3)** as indicated in the diagram and temporarily tighten.

     1. Stud



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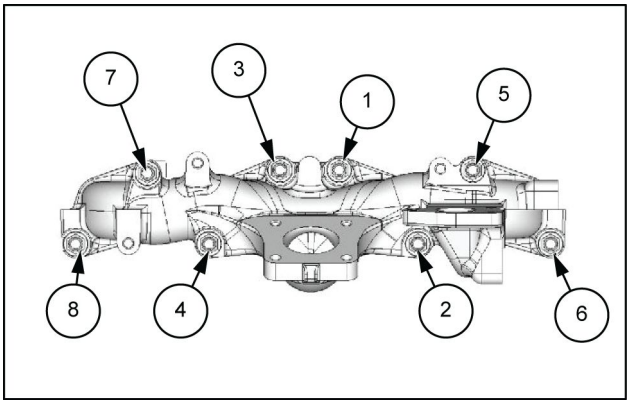
   - Tighten to the specified torque in the order shown in the diagram.

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



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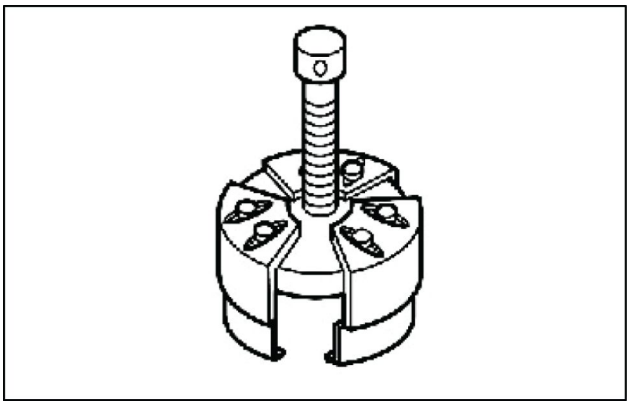
Crankshaft rear oil seal removal

1. Remove the crankshaft rear oil seal from the oil seal retainer.
2. Remove the slinger from the crankshaft using special tool.
   - Use a slinger puller to remove

     Special tool: Rear oil seal remover (Refer to **Crankshaft - Special tools (10.103)**)



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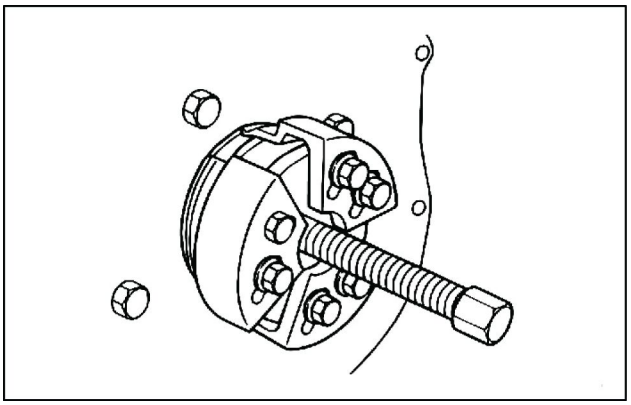

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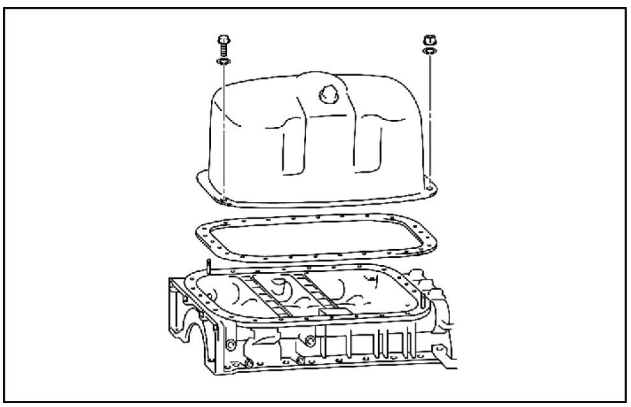
Oil pan removal

1. Remove the oil pan from the crankcase.



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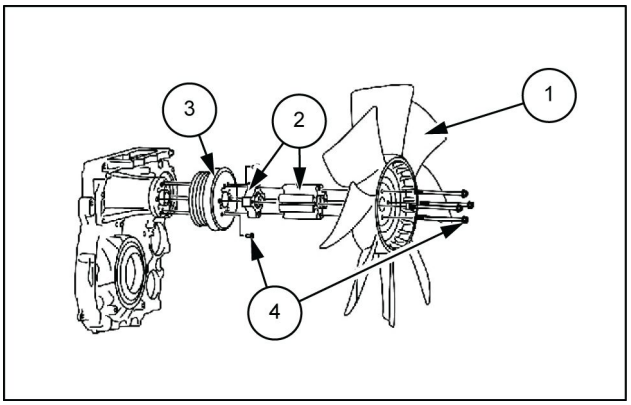
Cooling fan removal

1. Remove the cooling fan **(1)** from the fan pulley **(3)**.
   - Remove the spacer **(2)** at the same time.

     3. Fan pulley
     4. Bolt



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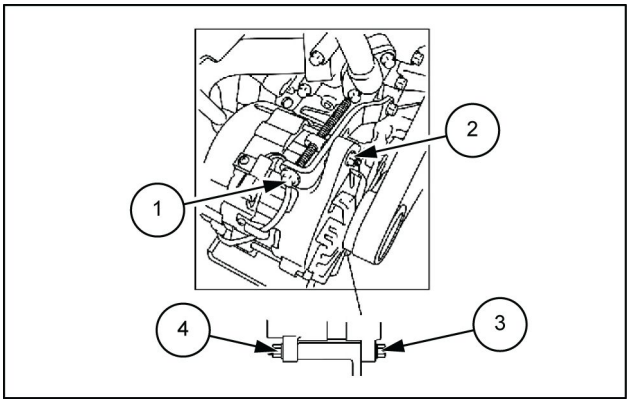
Cooling fan belt removal

1. Remove the cooling fan belt from the pulley.
   - Loosen the nuts **(4)** fastening the bolts **(3)**.
   - Loosen the generator adjust bolt **(1)** to remove the belt.

     2. Lock nut



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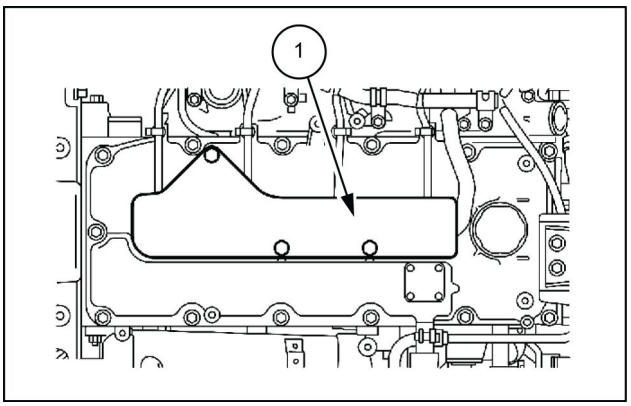
Fuel hose removal

1. Remove the cover **(1)** from the cylinder head cover.



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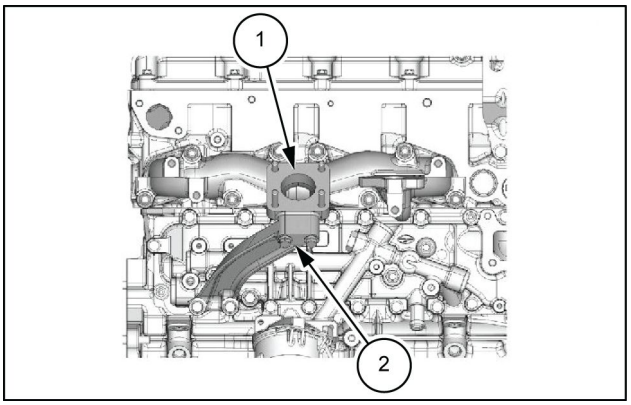
2. Install the exhaust manifold bracket **(2)** to the exhaust manifold **(1)** and the oil cooler assembly.

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



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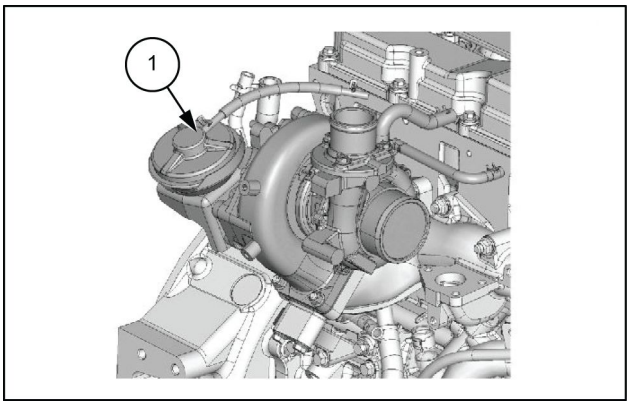
Turbocharger assembly installation

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

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

NOTE: *Do not hold the actuator rod.*

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



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

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

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

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

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

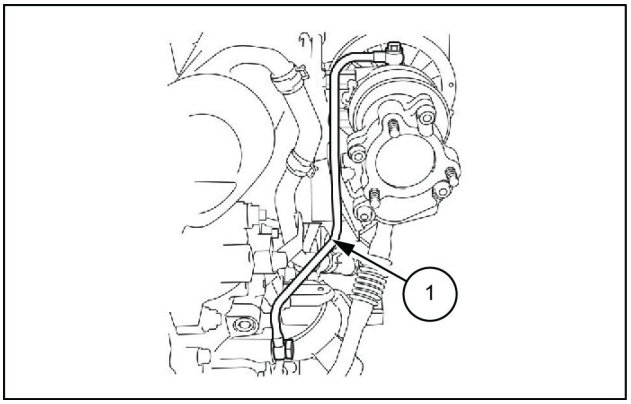
5. Connect the oil feed pipe **(1)** to the turbocharger assembly.

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

6. Install the oil feed pipe **(1)** to the oil cooler assembly.

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

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



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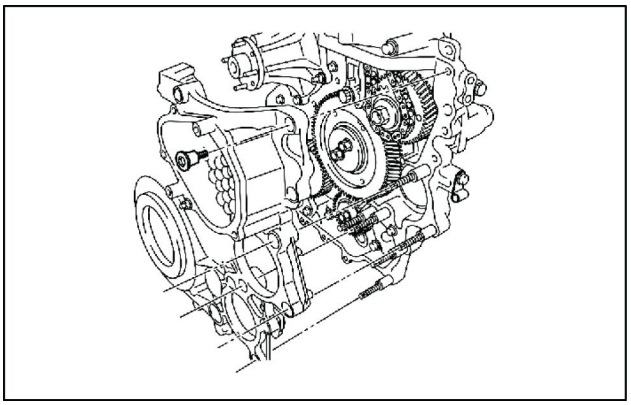
Gear case cover removal

1. Remove the gear case cover from the gear case.



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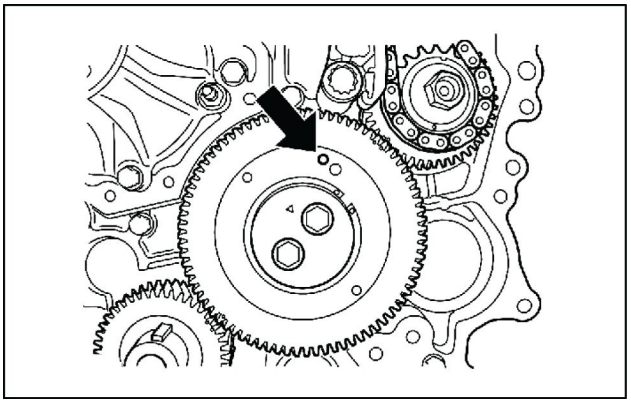
Crank gear removal

1. Remove the crank gear from the crankshaft.



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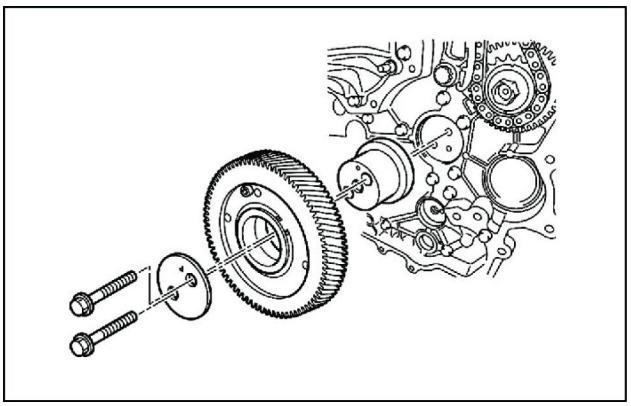
Idle gear A removal

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



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Coolant filling

1. Replenish the radiator assembly with coolant.

Battery ground cable connect

1. Connect the battery ground cable to the battery.

Cylinder head - Assemble

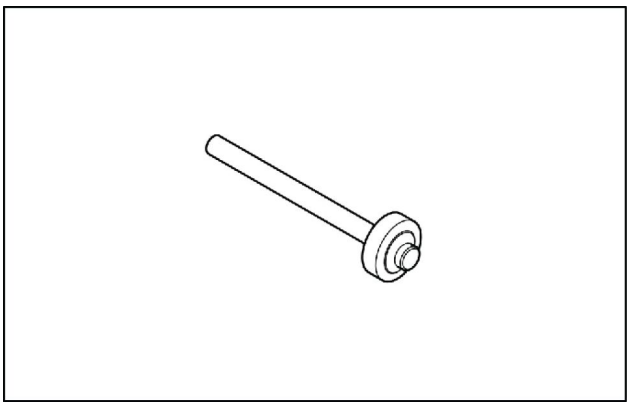
Oil seal installation

1. Install the oil seal to cylinder head **(1)** using special tool.

   Special tool: Oil seal installer (Refer to **Fuel injectors - Special tools (10.218)**)

NOTE: *Install to the injection pipe insertion surface using an oil seal installer **(2)**.*
Uniformly tap the seal so that it is not slanted.

NOTICE: *Be careful not to damage the lip section.*



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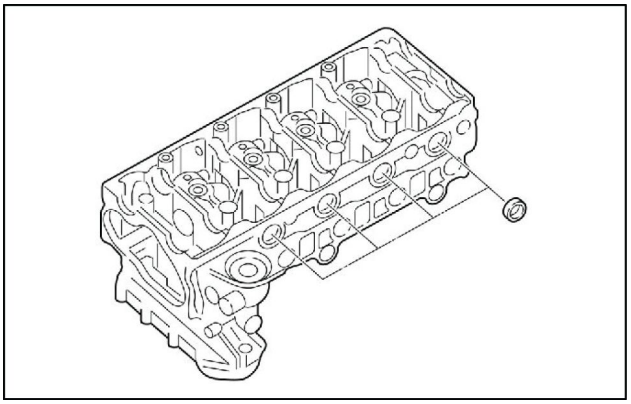

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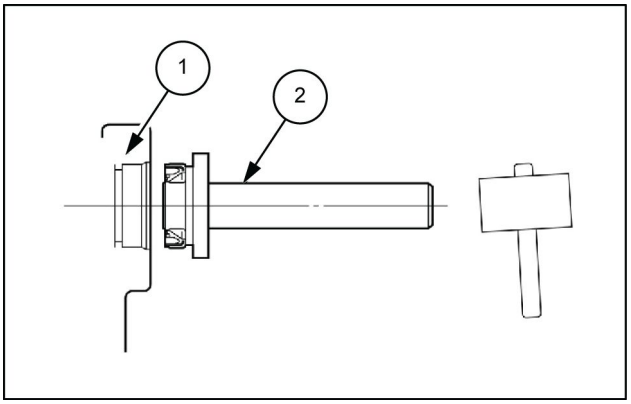

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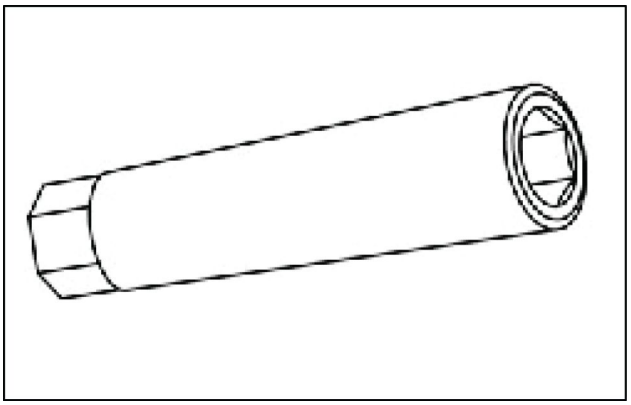
Rocker arm adjustment

1. Loosen the adjust screw using special tool.

   Special tool: Valve clearance adjust nut wrench (Refer to **Crankshaft - Special tools (10.103)**



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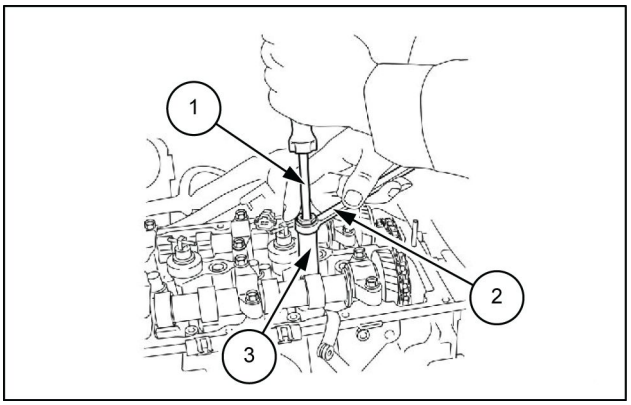
   - Use the adjust nut wrench **(3)** to loosen each adjust screw of the rocker arm.

     1. Driver
     2. Ring spanner



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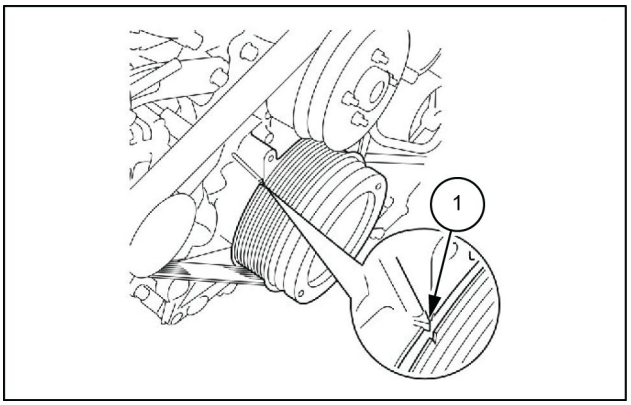
2. Align the first cylinder to the compression top dead center.
   - Turn the crankshaft in the forward direction (clockwise) to align the gear case cover and crank pulley alignment marks.

     1. Compression top dead center alignment position



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3. Adjust the valve clearance to specified value using a feeler gauge.
   - Insert a feeler gauge between the rocker arm roller and cam and tighten the rocker arm adjust screw.

     Specified value: **0.15 mm** (**0.0059 in**)

4. Align the fourth cylinder to compression top dead center.
   - Rotate the crankshaft **360°** from compression top dead center of the first cylinder and align the fourth cylinder to compression top dead center.
5. Adjust the valve clearance to specified value using a feeler gauge.
   - Insert a feeler gauge between the rocker arm roller and cam and tighten the rocker arm adjust screw.
   - Adjust the valve clearance if a circle is marked on the diagram when the first cylinder is at the compression top dead center, or when an X is marked on the diagram when the fourth cylinder is at the compression top dead center.

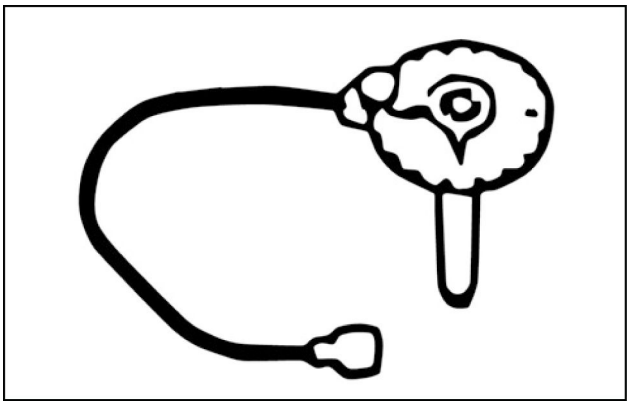
7. Use the special tool to tighten the bolts **(1)** and **(2)**.
   - Tighten to the specified angle in the order shown in the diagram.

     Special tool: Angle gauge (Refer to **Cylinder heads - Special tools (10.101)**)

     Specified angle: **45 – 60°** 45 - 60°
8. Remove the connecting rod bearing cap from the connecting rod.
   - Remove the connecting rod bearing cap from the connecting rod.
   - Measure the widest part of the plastigauge to find the oil clearance.
   - If the clearance exceeds the limit, replace the 2 bearings as a set.

     Standard value: **0.033 – 0.075 mm** (**0.0013 – 0.0030 in**)

     Limit: **0.10 mm** (**0.0039 in**)



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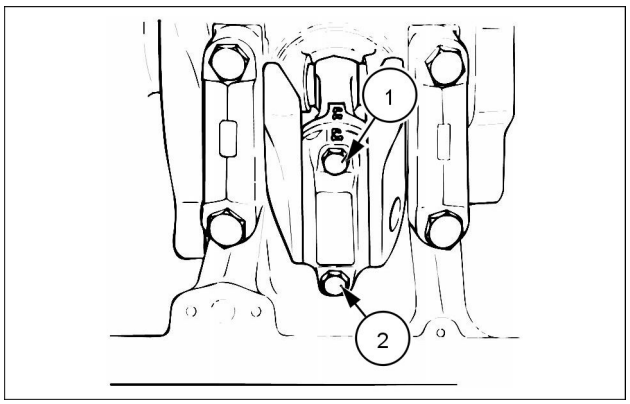

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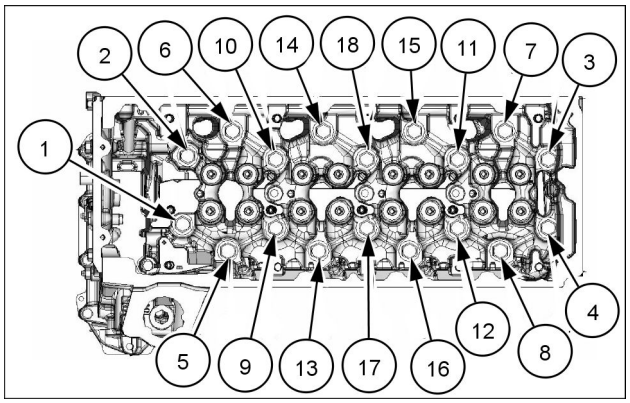
3. Remove the head bolts from the cylinder head.
   - Loosen and remove the cylinder head bolts in the order shown in the diagram.

NOTICE: *Do not reuse the head bolts.*

4. Remove the cylinder head from the cylinder block.
   - Remove with the inlet manifold.



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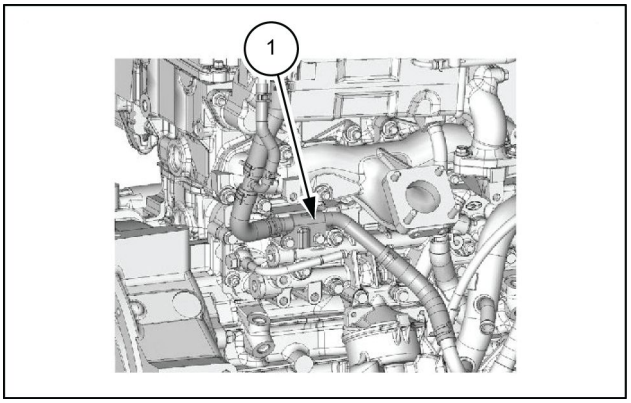
Cylinder head gasket removal

1. Remove the cylinder head gasket from the cylinder head.

NOTICE: *Do not reuse the gasket.*

EGR water pipe removal

1. Remove the EGR water pipe **(1)** from the oil cooler.
   - Remove the pipe clip installation bolt.



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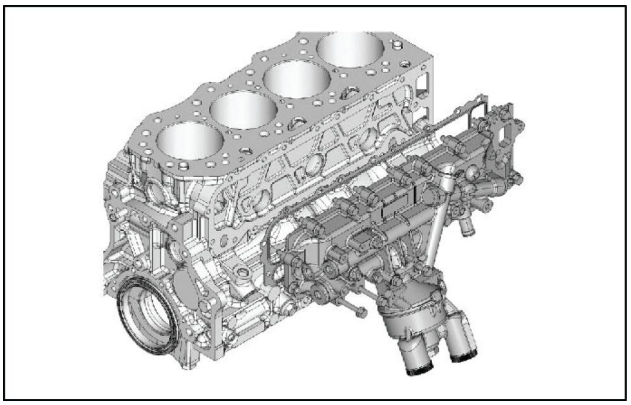
Oil cooler assembly removal

1. Remove the oil cooler from the cylinder block.



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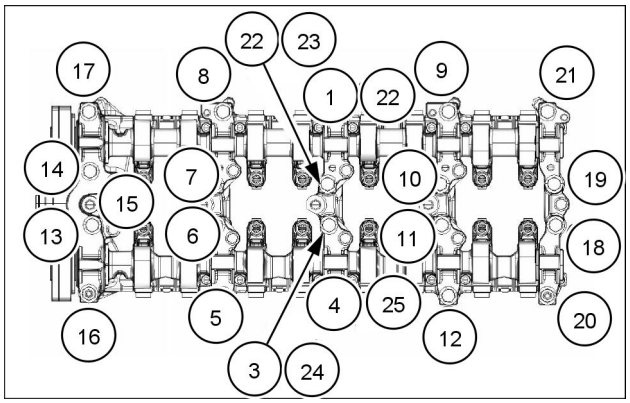
4. Apply engine oil to the bolt.
   - Apply to the threaded portion and seating surface of the M8 bolts.
5. Temporarily tighten the camshaft bracket to the cylinder head.
6. Final tighten the camshaft bracket to the cylinder head.
   - Tighten the M8 bolts in the order shown in the diagram.

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



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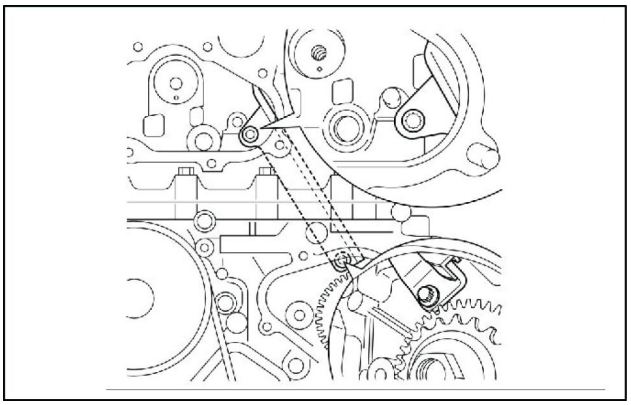
Timing chain guide installation

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

   Tightening torque: **25 N·m** (**18 lb ft**)
   - Install the timing chain tension lever.



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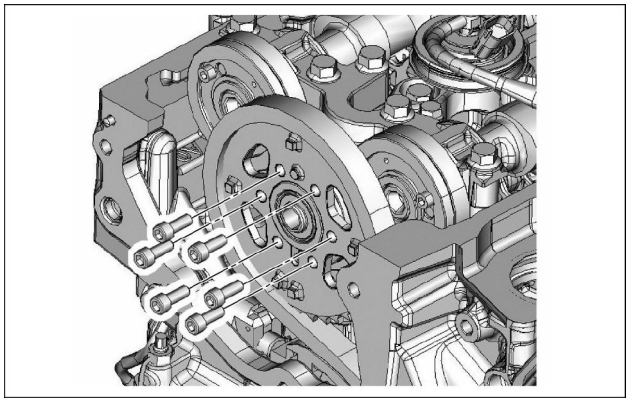
Timing chain installation

1. Align the timing chain to the sprocket.
   - Align to the supply pump side sprocket.
2. Install the sprocket to idle gear D.
   - Install as a set with the timing chain.

     Tightening torque: **8 N·m** (**71 lb in**)



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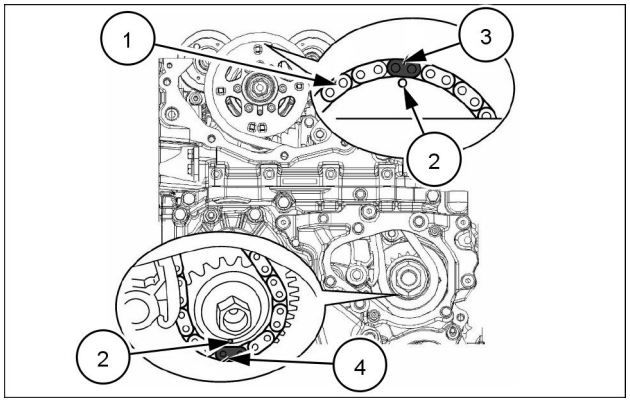
   - Align the 2 timing marks as shown in the diagram.
     1. Timing chain
     2. Timing mark
     3. Blue link
     4. Yellow link
3. Apply engine oil to the bolt.
   - Apply to the threaded portions and seating surfaces of the idle gear D fixing bolts.
4. Install the sleeve to the sprocket.

   Tightening torque: **59 N·m** (**44 lb ft**)

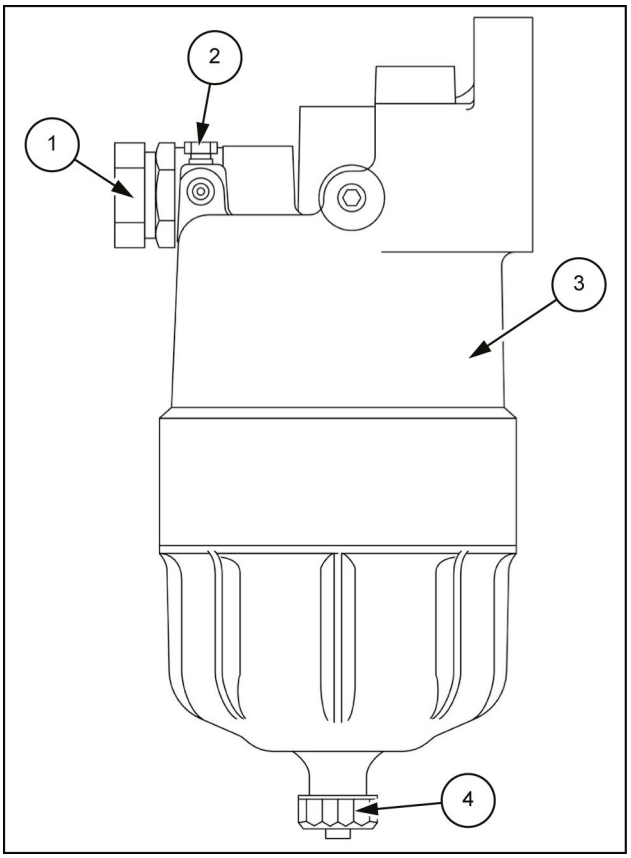


SMIL17CEX3329A 65

Fuel filters - Component identification

Element replacement type specification

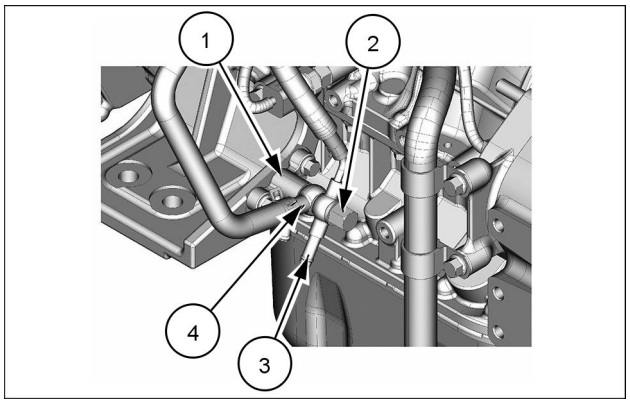
1. Priming pump
2. Air bleeding plug
3. Case
4. Drain plug



SMIL14CEX3970BB 1

Pressure regulating valve - Remove

1. Remove the relief valve **(2)** from the bracket **(1)**.
    3. Fuel return pipe
    4. Fuel suction pipe



SMIL17CEX3378A 1

Intake manifold - Install

Intake throttle valve installation

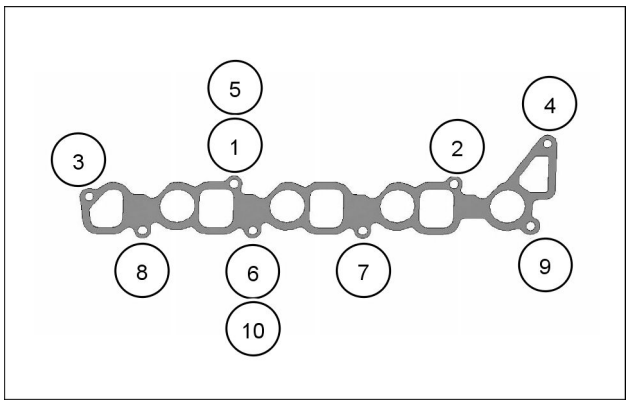
1. Install the gasket to the inlet manifold.
2. Install the intake throttle valve to the inlet manifold.
   - Install with the adapter pipe as a unit.

     Tightening torque: **10 N·m** (**89 lb in**)
3. Connect the harness connector to the intake throttle valve.
   - Press the red claw to lock.

Inlet manifold installation

1. Temporarily tighten the inlet manifold to the cylinder head.
   - Install the gasket and inlet manifold.
2. Final tighten the inlet manifold to the cylinder head.
   - Tighten to the specified torque in the order shown in the diagram.

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

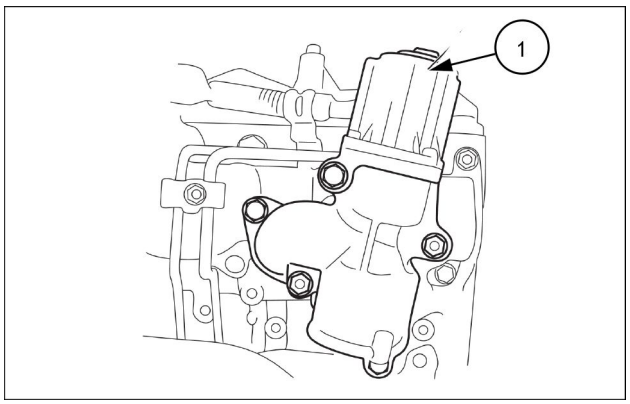


SMIL17CEX4112AA 1

EGR valve installation

1. Install the EGR valve **(1)** to the cylinder head.

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



SMIL17CEX4111AA 2

Exhaust gas temperature sensor 3 installation

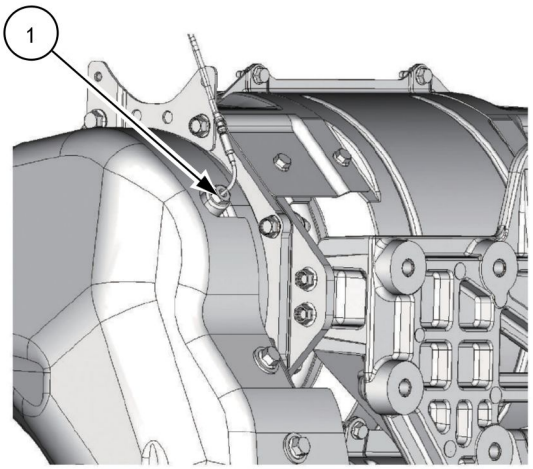
NOTICE: *Clean the old anti-seize lubricant on the sleeve nut, and apply new anti-seize lubricant to the threaded portion of the sleeve nut.*

NOTICE: *When assembling the tip of the sensor, do not bump it against the boss of the destination.*

NOTICE: *Do not use the sensor with flaws or dents due to dropping or bumping.*

NOTICE: *After assembling the sensor, do not bump the projection.*

NOTICE: *After starting the engine, check for gas leakage to see that it is sealed securely.*



SMIL17CEX3395B 12

1. Apply an anti-seize agent to the exhaust gas temperature sensor 3.

NOTE: *To the threads of the exhaust gas temperature sensor 3, apply such an agent as Never-Seez High Temperature Stainless grade 5-87411-039-0 manufactured by Bostik USA.*

2. Install the exhaust gas temperature sensor 3 **(1)** on the front chamber.

   Tightening torque: **32 N·m** (**24 lb ft**)

3. Connect the harness connector to exhaust gas temperature sensor 3 **(1)**.

Battery ground cable connect

1. Connect the harness connector to the exhaust gas temperature sensor 3.

SCR catalyst setting

NOTICE: *If the SCR catalyst is replaced, perform a data reset with a trouble diagnosis scan tool.*

1. Connect the trouble diagnosis scan tool to the DLC.
2. Turn ON the ignition switch.
3. Select Search.

NOTE: *Enter the engine number, and select Search.*

4. Select Diagnosis.

Contents

Engine - 10

Engine cooling system - 400

Aftercooler - Inspect

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

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

TRAVEL HIGH SPEED CIRCUIT

The machine travels at high speed when the angle of the travel motor **(1)** swash plate **(19)** is small.
The machine travels at low speed when the angle of the travel motor **(1)** swash plate **(19)** is large.
As an example, this section explains the case in which the forward travel operation is carried out.
When the travel remote control valve **(12)** is operated to the forward side, the pilot pressure oil is fed to Port pa1 of the control valve **(4)** and switches the right travel spool **(6)** to the forward side.
At the same time, the pressure oil is also fed to Port pb6 of the control valve **(4)** and switches the left travel spool **(5)** to the forward side.
The discharge oil from A1 of the hydraulic pump **(11)** flows into Port P1 of the control valve **(4)** and the discharge oil from A2 of the hydraulic pump **(11)** flows into Port P2 of the control valve **(4)**.
Switching the left travel spool **(5)** and right travel spool **(6)** lets each discharge oil flow to the travel motor **(1)** and causes forward travel.
When the travel high-speed select switch **(2)** is set to high-speed travel, the travel high-speed solenoid valve **(7)** is turned ON and the pilot pressure oil from Port C1 of the 4-stack solenoid valve **(9)** flows into Port P of the travel motor **(1)**.
As a result, the angle of the travel motor **(1)** swash plate **(19)** becomes smaller and the machine travels at high speed.
Even if the travel high-speed select switch **(2)** is set to high-speed travel, when the key switch is turned OFF and then ON again, the swash plate **(19)** angle becomes larger and the low-speed travel is resumed.
The return oil from the travel motor **(1)** returns to the hydraulic tank through the left and right travel spools.

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

Hydraulic systems - Hydraulic schema - Bucket circuit

BUCKET-OPEN CIRCUIT

When the remote control valve **(4)** is operated to the bucket-open side, the pilot pressure oil is fed to Port Pa7 of the control valve **(8)** via the manifold **(1)** and switches the bucket spool **(9)** to the open side.
The discharge oil from A2 of the hydraulic pump **(17)** flows into Port P2 of the control valve **(8)** and is fed to the bucket spool **(9)** via the parallel oil path.
Switching the bucket spool **(9)** lets the pressure oil flow into the bucket cylinder **(10)** rod side, and the bucket open operation is carried out.
The pressure oil on the bucket cylinder **(10)** bottom side returns to the hydraulic tank through the bucket spool **(9)**.

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

1. Manifold
2. Bucket (close)
3. Bucket (open)
4. Remote control valve (boom, bucket)
5. Lever lock
6. Pressure boost relief
7. 4-stack solenoid valve
8. Control valve
9. Bucket spool
10. Bucket cylinder
11. Bucket-open pilot pressure sensor
12. Console lever lock switch
13. Monitor display
14. Main computer
15. P1 pressure sensor
16. P2 pressure sensor
17. Hydraulic pump
18. Check valve
19. Oil cooler

Hydraulic systems - Service instruction - Table of standards

CX145D SR Crawler excavators STD W/Blade version (TIER 4 FINAL) - NA Markett	NA

Mode	SP mode, with bucket
Lower specifications	STD-BL
Boom specifications	Standard
Arm specifications	Standard
Arm length	Standard
Bucket size, specifications	0.5 standard

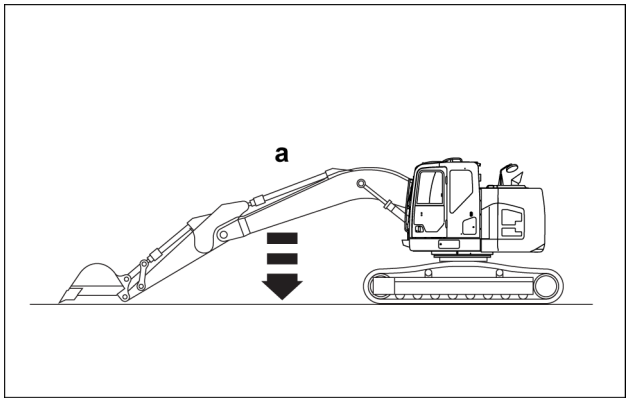
Item			Standard value
Pressure measurement	Main relief	Normal use	**32.3 – 36.3 MPa** (**4685.12 – 5265.32 psi**)
		Pressure boost	**34.3 – 38.3 MPa** (**4975.22 – 5555.42 psi**)
	Fourth pump relief	Second option	**18.6 – 22.6 MPa** (**2697.93 – 3278.13 psi**)
	Boom	Up	**36.5 – 42.5 MPa** (**5294.33 – 6164.63 psi**)
		Down	**36.5 – 42.5 MPa** (**5294.33 – 6164.63 psi**)
	Arm	Close	**36.5 – 42.5 MPa** (**5294.33 – 6164.63 psi**)
		Open	**36.5 – 42.5 MPa** (**5294.33 – 6164.63 psi**)
	Bucket	Open	**36.5 – 42.5 MPa** (**5294.33 – 6164.63 psi**)
		Close	**36.5 – 42.5 MPa** (**5294.33 – 6164.63 psi**)
	Swing	Both right and left	**27.0 – 31.0 MPa** (**3916.35 – 4496.55 psi**)
	Option	Breaker spec first speed	–
		Reciprocal spec Crusher mode second speed (P1, P2)	–
		Combined spec Breaker mode first speed (P1)	–
		Combined spec Crusher mode second speed (P1, P2)	–
		Combined (electromagnetic relief) spec Breaker mode first speed (P1)	–
		Combined (electromagnetic relief) spec Crusher mode second speed (P1, P2)	–
	Travel	Both right and left, and both forward and backward	**36.2 – 40.2 MPa** (**5250.81 – 5831.01 psi**)
	Quick coupler	ON	**32.3 – 36.3 MPa** (**4685.12 – 5265.32 psi**)
	Pilot pump	For pilot	**2.9 – 4.9 MPa** (**420.7 – 710.8 psi**)

During the attachment operation, the pressure resulting from the pressure boost setting can be checked for **8 s** due to operation of auto pressure boost.
After elapsing **8 s** or more, the standard set pressure can be checked.
Also during arm open/close, bucket open/close and boom up, measurement is executed by relief of each cylinder.

Lever operation	Arm out	Arm in	Bucket open	Bucket close	Boom up	Boom down
Engine speed	**2000 RPM**					
Work mode	SP mode					
Oil temperature	**45 – 55 °C** (**113 – 131 °F**)					
1 pump flow measuring port	P1	P1	P2	P2	P2	P2
2 pumps flow measuring port	P2	P2	None	None	P1	P1
Pressure boost	**36.3 MPa** (**5265 psi**)					**29.4 MPa** (**4264 psi**)
Standard pressure	**34.3 MPa** (**4975.2 psi**)					

Boom-down pressure measurement
For pressure measurement with the boom down, put the arm cylinder at its out stroke end, open the bucket, put the bucket tip on the ground, carry out the boom-down operation, and measure.

a. Boom-down relief



SMIL17CEX0931AB 22

Part table

Code	Part name	Component Part No. (Quantity) or type
04	Gear pump (Quantity 1 set)	ZX10L7RZ1-07A-V
05	PTO unit (option) (Quantity 1 set)	29PTN-T1OC
011	Piston subassembly (Quantity 2 sets)	151 (9PC), 152 (9PC)
013	Cylinder subassembly (R) (Quantity 1 set)	141 (1PC), 313 (1PC)
014	Cylinder subassembly (L) (Quantity 1 set)	141 (1PC), 314 (1PC)
030	Swash plate subassembly (Quantity 2 sets)	212 (1PC), 214 (1PC)
530	Tilting pin subassembly (Quantity 2 sets)	531 (1PC), 548 (1PC)

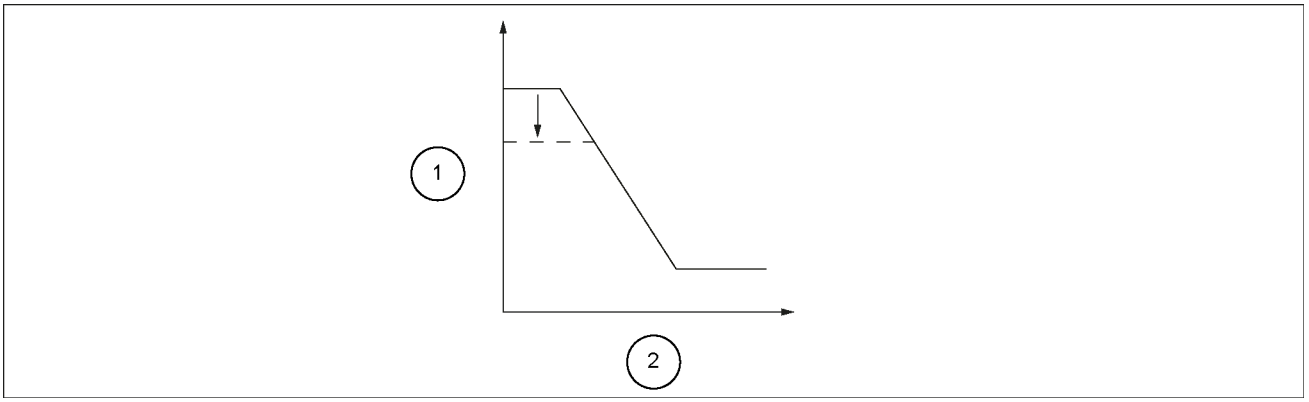
Code	Part name
1.	Right rotation valve plate
2.	Left rotation valve plate

Code	Part name	Code	Part name
111.	Drive shaft (front) (Quantity 1)	468.	ROH plug (Quantity 4)
113.	Drive shaft (rear) (Quantity 1)	497.	MH Plug (Quantity 9)
116.	First gear (Quantity 1)	531.	Tilting pin (Quantity 2)
123.	Cylinder roller bearing (Quantity 2)	532.	Servo piston (Quantity 2)
124.	Needle roller bearing (Quantity 2)	533.	Q min. plug (Quantity 2)
127.	Bearing spacer (Quantity 2)	534.	Stopper (L) (Quantity 2)
141.	Cylinder block (Quantity 2)	535.	Stopper (S) (Quantity 2)
151.	Piston (Quantity 18)	548.	Feedback pin (Quantity 2)
152.	Shoe (Quantity 18)	702.	O-ring (Quantity 2)
153.	Holder plate (Quantity 2)	710.	O-ring (Quantity 1)
156.	Spherical bushing (Quantity 2)	711.	O-ring (Quantity 1)
157.	Cylinder spring (Quantity 12)	717.	O-ring (Quantity 2)
211.	Shoe plate (Quantity 2)	723.	O-ring (Quantity 6)
212.	Swash plate (Quantity 2)	724.	O-ring (Quantity 12)
214.	Tilting bushing (Quantity 2)	727.	O-ring (Quantity 4)
251.	Swash plate support board (Quantity 2)	728.	O-ring (Quantity 2)
255.	Rotation lock pin (Quantity 2)	732.	O-ring (Quantity 4)
261.	Seal cover (F) (Quantity 1)	733.	O-ring (Quantity 2)
271.	Pump casing (F) (Quantity 1)	774.	Oil seal (Quantity 1)
272.	Pump casing (R) (Quantity 1)	789.	Backup ring (Quantity 2)
312.	Valve block (Quantity 1)	792.	Backup ring (Quantity 2)
313.	Valve plate (R) (Quantity 1)	806.	Hexagon nut (Quantity 2)
314.	Valve plate (L) (Quantity 1)	808.	Hexagon nut (Quantity 2)
326.	Cover (Quantity 1)	824.	Stop ring (Quantity 2)
401.	Hexagon socket head bolt (Quantity 2)	886.	Spring pin (Quantity 4)
402.	Hexagon socket head bolt (Quantity 2)	901.	Eyebolt (Quantity 2)
406.	Hexagon socket head bolt (Quantity 4)	953.	Hexagon socket head stop screw (Quantity 2)
414.	Hexagon socket head bolt (Quantity 4)	954.	Stop screw (Quantity 2)
466.	ROH plug (Quantity 2)	981.	Plate (Quantity 1)
467.	ROH plug (Quantity 2)	983.	Striking pin (Quantity 2)

Pump control valve - Adjust

The adjusting screws **(953)**, **(954)** at the pump main unit side adjust the maximum and the minimum flows. The adjusting screw **(C) (628)** of the regulator and the adjusting ring **(C) (627)** adjust the horsepower control feature, and the hexagon socket head bolt **(924)** adjusts the flow control feature. ("Appendix table 1. List of Regulator Adjustment Amounts" indicates adjustment amounts and variation amounts.)

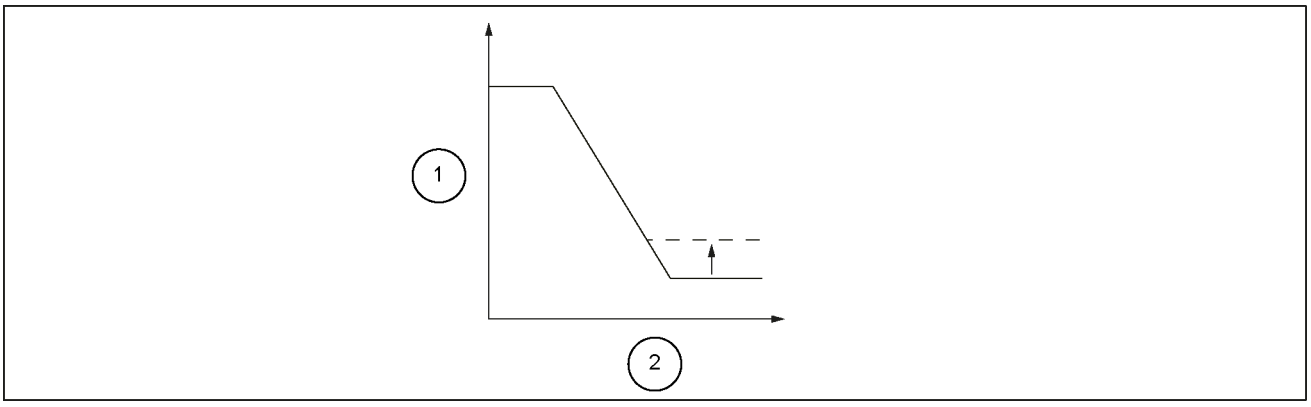
1. Maximum flow adjustment (pump main unit side)
    1. Discharge flow Q
    2. Command current I



SMIL14CEX2192EB 1

Loosen the hexagonal nut **(808)** and adjust by tightening (or loosing) the retaining screw **(954)**. Only the maximum flow changes, other control features do not change.

2. Minimum flow adjustment (pump main unit side)
    1. Discharge flow Q
    2. Command current I



SMIL14CEX2193EB 2

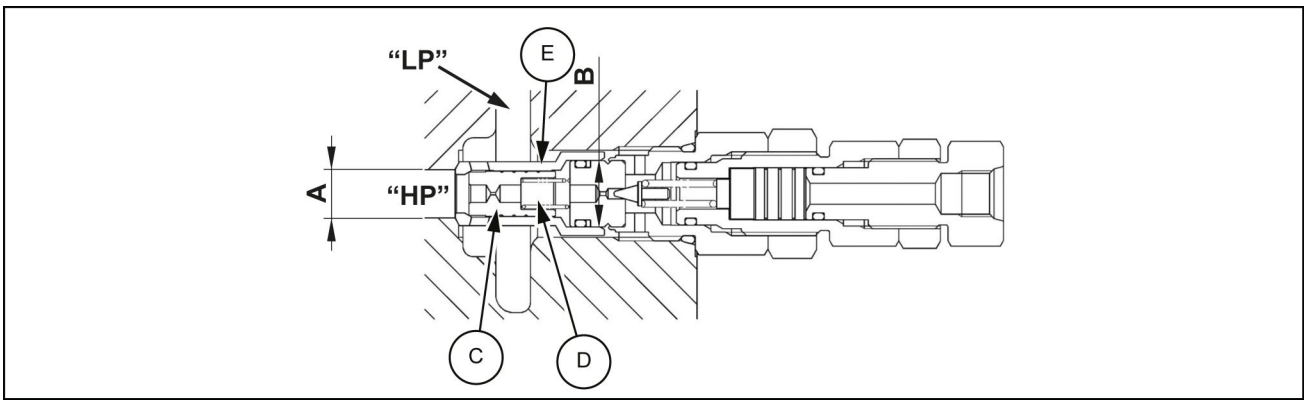
Loosen the hexagonal nut **(808)** and adjust by tightening (or loosing) the hexagon socket head retaining screw **(953)**.
As with adjustment of the maximum flow, other control features do not change. However, the required power at the time of the maximum discharge pressure may increase when the screw is tightened too much.

Activation of relief valve

Main relief valve

Main unit main relief valve activation

A. This relief valve is fit between the neutral path "HP" and the low-pressure path "LP" to allow oil to flow via the orifice hole in the main poppet **(C)** to fill the internal space **(D)**In addition, the sleeve **(E)** and the main poppet **(C)** are securely seated due to difference of areas between "A" and "B."



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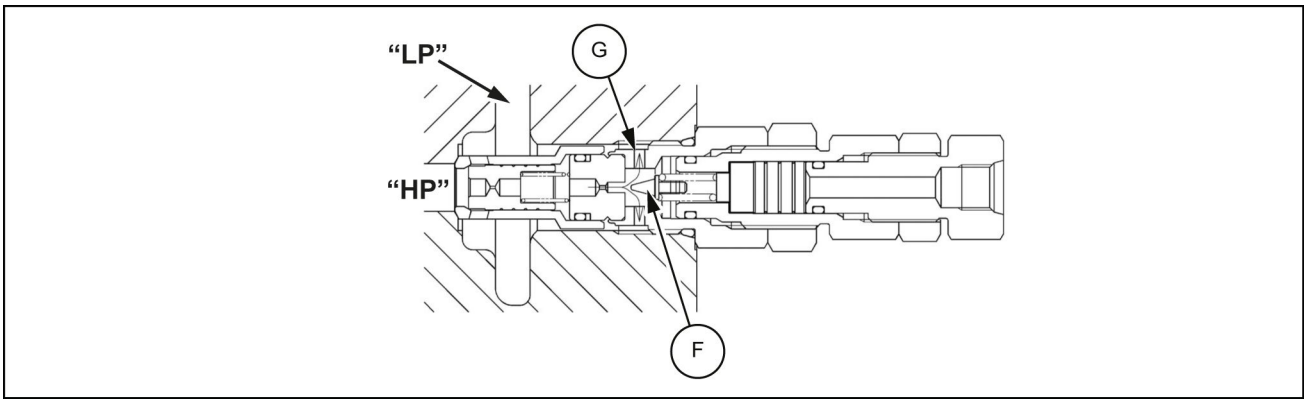
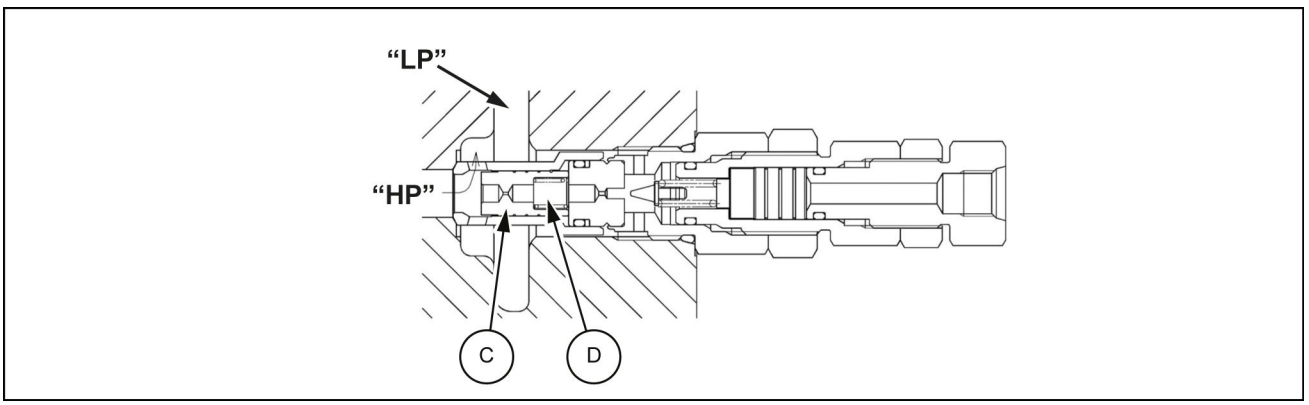
B. The pilot poppet **(F)** opens when pressure of the neutral path "HP" reaches set pilot spring force of the pilot poppet. Oil flows around the pilot poppet **(C)** to be led to the tank path "LP" via the drill hole **(G)**.



SMIL14CEX3832EB 16

C. Opening the pilot poppet reduces pressure of internal space **(D)** and opening the main poppet **(C)** allows oil of "HP" to directly flow to the path "LP".



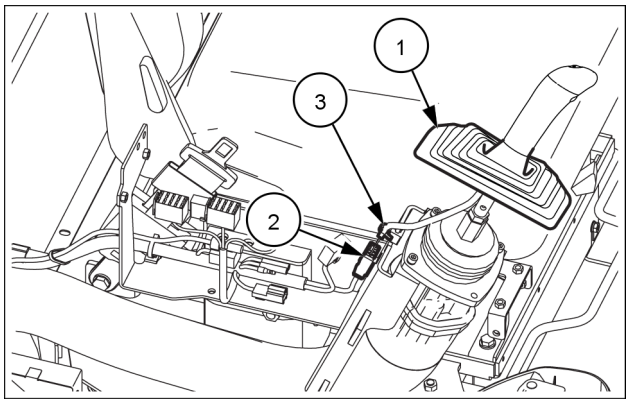
SMIL14CEX3833EB 17

Contents

Hydraulic systems - 35

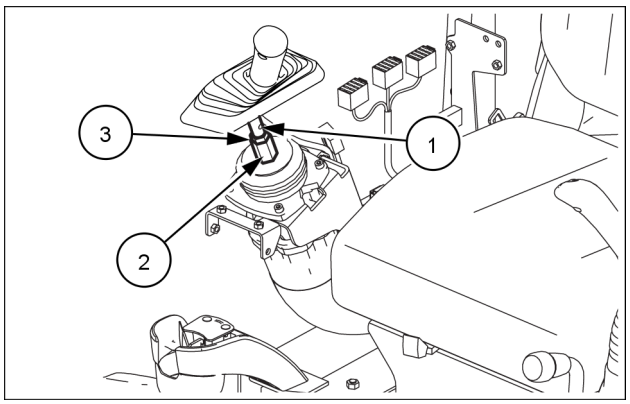
Hydraulic hand control - 355

5. Roll up the boot **(1)** of the control lever, remove the connector **(2)** of the horn switch, and cut the wire band **(3)**.



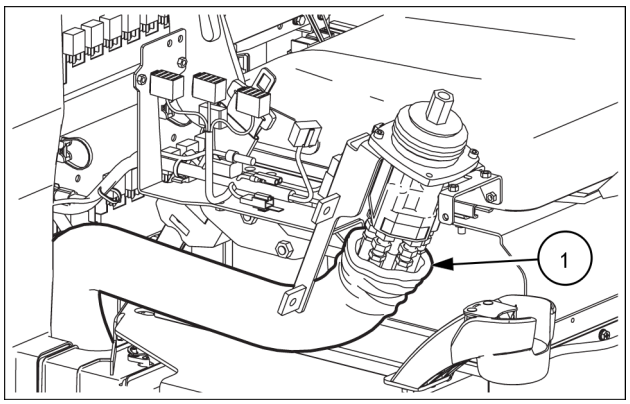
SMIL17CEX0987AB 5

6. While fastening the nut **(2)** with a wrench [**22 mm**], use a wrench [**19 mm**] to remove the lock nut **(3)** and remove the control lever **(1)**.



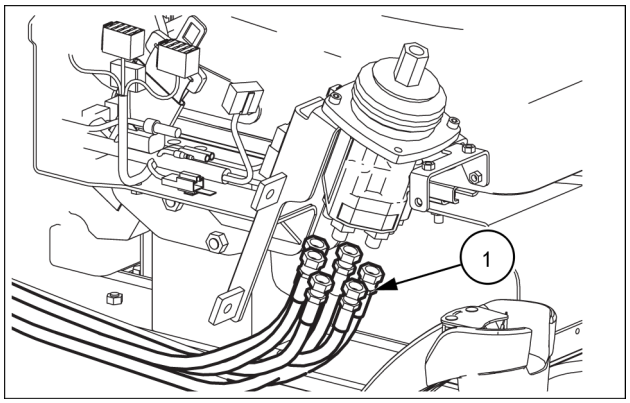
SMIL17CEX0988AB 6

7. Roll back the hose cover **(1)**.



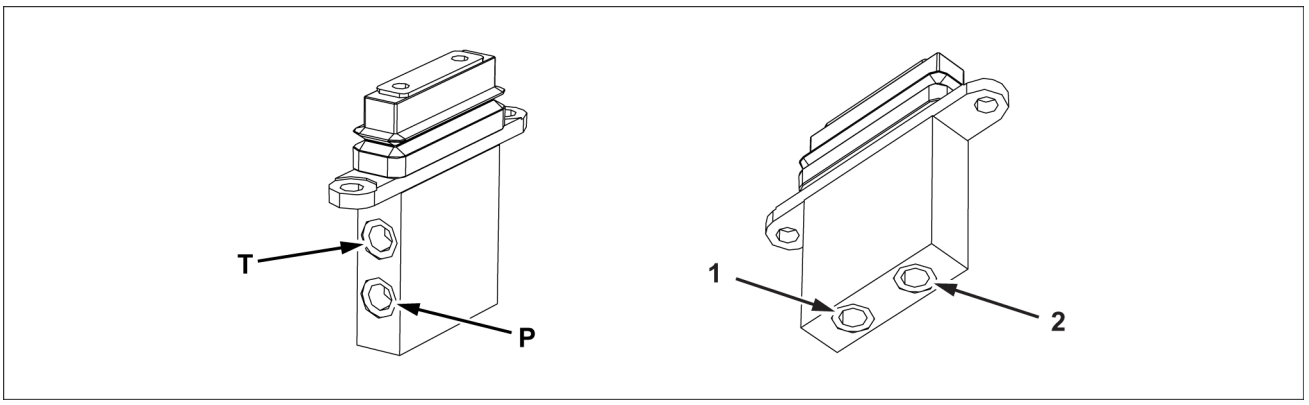
SMIL17CEX0989AB 7

8. Use a wrench [**19 mm**] to remove the 6 hoses **(1)**.
   - Mark the joystick remote control valve and hoses so that the connectors match at the time of assembly.
   - Use caps and plugs to cover the joystick remote control valve and hoses to prevent any entry of water, dust or dirt.
   - Clean the joystick remote control valve and hoses by spraying them with a parts cleaner to prevent scratches and prevent dirt from accumulating on the connectors.



SMIL17CEX0990AB 8

Options pedal - Overview - Remote control valve (Blade)



SMIL17CEX0924EB 1

Port	Port name	Port size
1	Down	**G1/4**
2	Up	**G1/4**
3	Pressure	**G1/4**
4	Return	**G1/4**

Swing reduction motor - Drain fluid

CX145D SR Crawler excavators LC version (TIER 4 FINAL) - NA Market	NA

Preparations

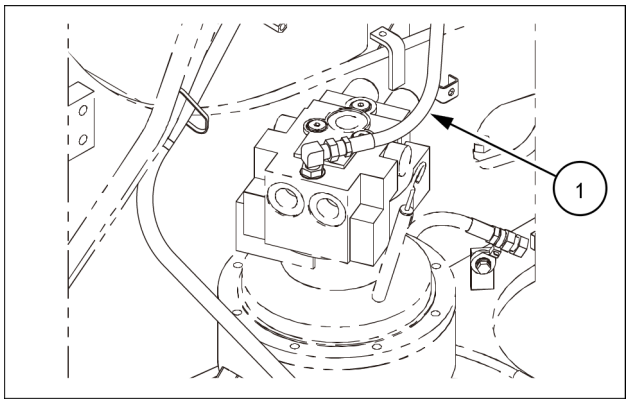
Measuring condition

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)**.



SMIL17CEX3877AA 1

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

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

3. 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)**).

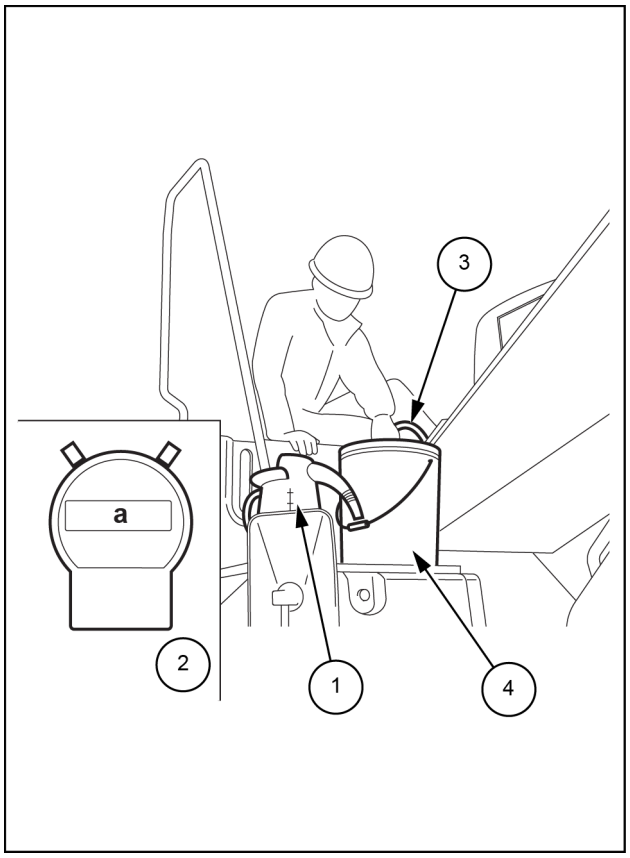
5. After **60 s**, move the extension hose **(3)** to the waste oil can **(4)**.

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

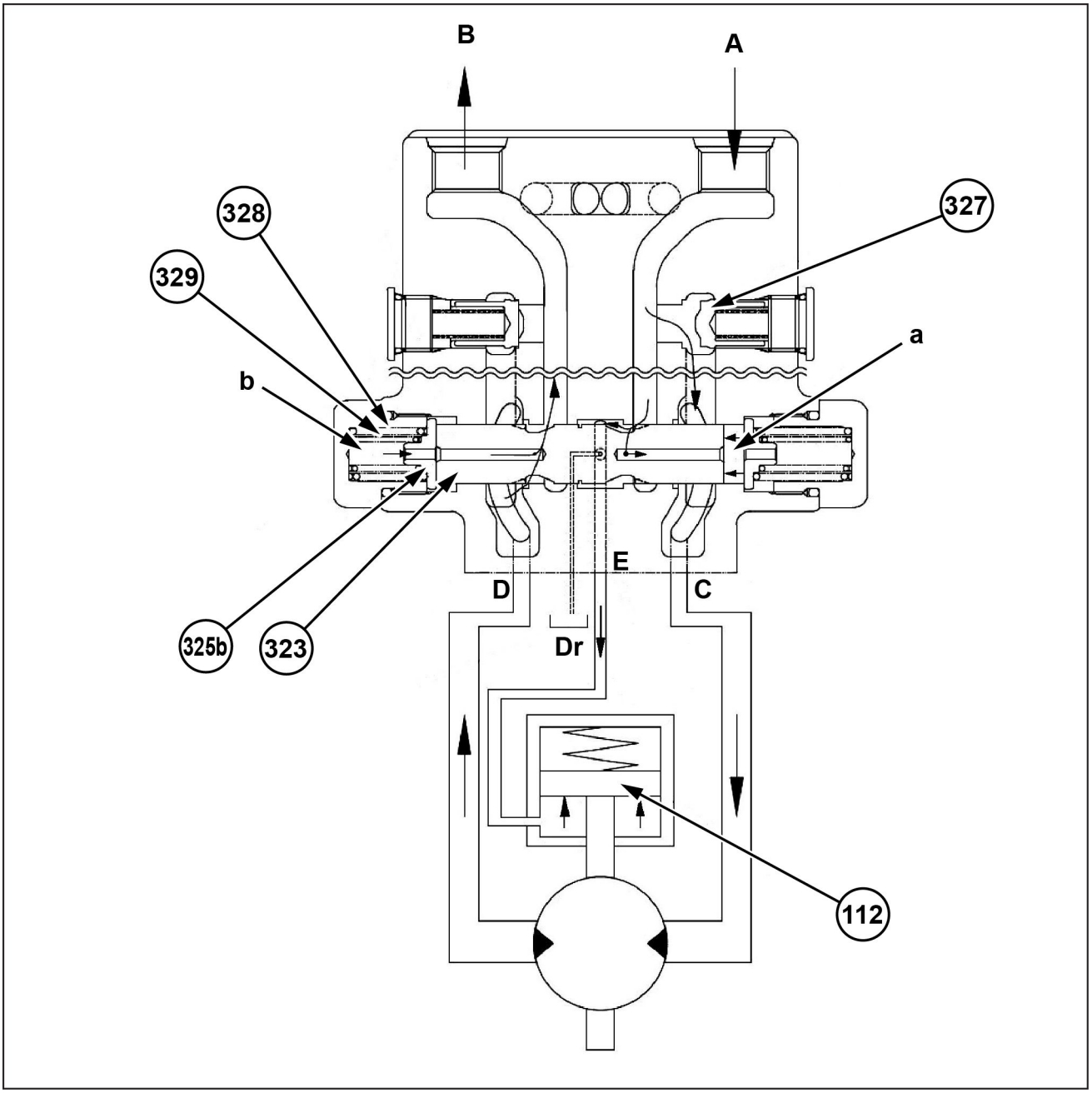
   (a). **60 s**

   Measure at least 3 times each for left and right.

Right	Left



SMIL14CEX2220BB 2



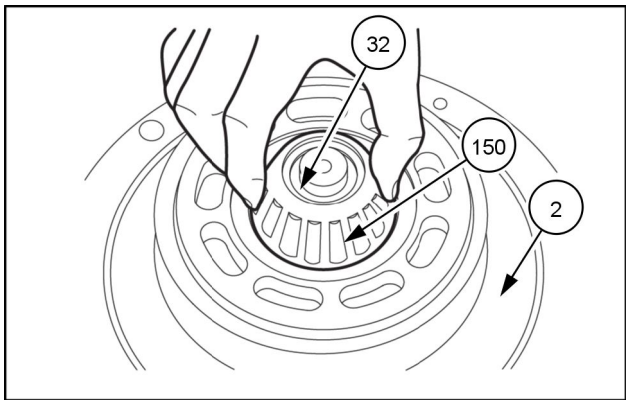
SMIL15CEX4751GB 3

112. Brake piston
323. Spool
327. Valve
325b. Spring retainer
328. Spring
329. Spring

Stop operation (Brake operation)
When the pressure oil supplied from the **(A)** port is stopped during traveling, the hydraulic pressure pushing the spool **(323)** will be lost, and the spool **(323)** slid to the right side will attempt to return to a neutral state via the spring retainer (325b) by force of the spring **(328)** and the spring **(329)**. At this time, the oil in **(a)** chamber attempts to go through the spool **(323)** out to the **(A)** port side; however, back pressure occurs by the orifice effect of spool **(323)** and spring retainer (325b) to control the return speed of spool **(323)**. Since, at the same time, the hydraulic motor attempts to rotate by inertial force even if the pressure oil is stopped, the return oil of hydraulic motor attempts to return from the **(D)** port through the clearance (path) between spool groove and rear flange to the **(B)** port side.
When the spool **(323)** has returned to a neutral state completely, the hydraulic motor return-side path will be completely interrupted by the spool **(323)**, and the hydraulic motor will stop. During work, this brake valve throttles the hydraulic motor return-side path by the sliding speed control of spool **(323)** and the groove shape of spool **(323)** to generate back pressure, thereby smoothly stopping the hydraulic motor that attempts to rotate by inertial force. On the other hand, when the brake is applied to attempt to stop the hydraulic motor, inertial force will work and it will

10. Remove the O-ring **(32)** from the spindle **(2)**.

NOTE: *do not reuse the removed O-ring* ***(32)****.*

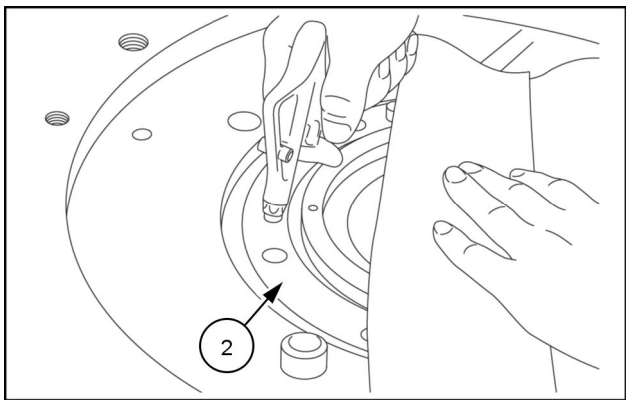


SMIL15CEX4131AA 36

Disassembly of parking brake section

NOTICE: *if you put in compressed air rapidly, the piston* ***(112)*** *may jump out of the spindle* ***(2)*** *to injure your body. Therefore, you must put a protective cover on the piston* ***(112)****.*

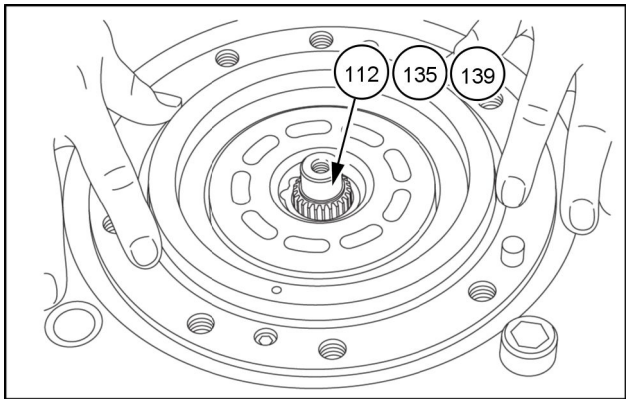
1. By putting compressed air in the parking brake path hole in spindle **(2)**, remove the piston **(112)** from the spindle **(2)**.



SMIL15CEX4132AA 37

2. Remove the O-rings **(135)** and **(139)** from the piston **(112)**.

NOTE: *do not reuse the removed O-rings* ***(135)*** *and* ***(139)****.*



SMIL15CEX4133AA 38

Travel motor - Change fluid

Replacement of hydraulic fluid

1. Hydraulic fluid replacement timing: Every 1000 hours or every year
2. If the hydraulic fluid is deteriorated significantly, replace it on the basis of the following standards even if its standard replacement time has not elapsed.

Test item		Replacement standard
Viscosity change (40[°C])	[%]	±10[%]
Total acid value	[mgKOH/g]	*
Moisture	[%]	0.1[%]
Impurity	[mg/100mL]	10 [mg/100 mL]
Insoluble content	[%]	0.05[%]
Color	-	Changed significantly

* Please consult us because it varies with the oil type and the manufacturer.

Special jig

Cylinder assembly requires the following special jigs.

No.	Cylinder	Part number	Quantity	Part name
1	Boom (KYB cylinder)	KHV0518	1	Cylinder bush removal/press-fit and wiper ring press-fit jig (1)
2	Bucket (KYB cylinder)	KHV0519	1	Cylinder bush removal/press-fit and wiper ring press-fit jig (1)
3	Arm (KYB cylinder)	KHV0522	1	
4	Boom (KYB cylinder)	KHV0535	1	Cylinder seal ring insertion and calibration jig
5	Bucket (KYB cylinder)	KHV0536	1	
6	Arm (KYB cylinder)	KHV0539	1	
7	Boom (KYB cylinder)	KHV0557	1	Cylinder head insertion jig
8	Bucket (KYB cylinder)	KHV0559	1	
9	Arm (KYB cylinder)	KHV0564	1	
1	Boom, Arm, Bucket (Zenoah cylinder)	KRV10620	1	Wrench assembly
2	Boom, Arm, Bucket (Zenoah cylinder)	KRV10630	1	Bushing tool kit
3	Boom, Arm, Bucket (Zenoah cylinder)	KRV10570	1	Expander
4	Boom, Bucket (Zenoah cylinder)	KSV21540	1	Compression ring
	Arm (Zenoah cylinder)	KSV21550	1	
5	Boom, Bucket (Zenoah cylinder)	KSV21560	1	Clamp
	Arm (Zenoah cylinder)	KSV21570	1	

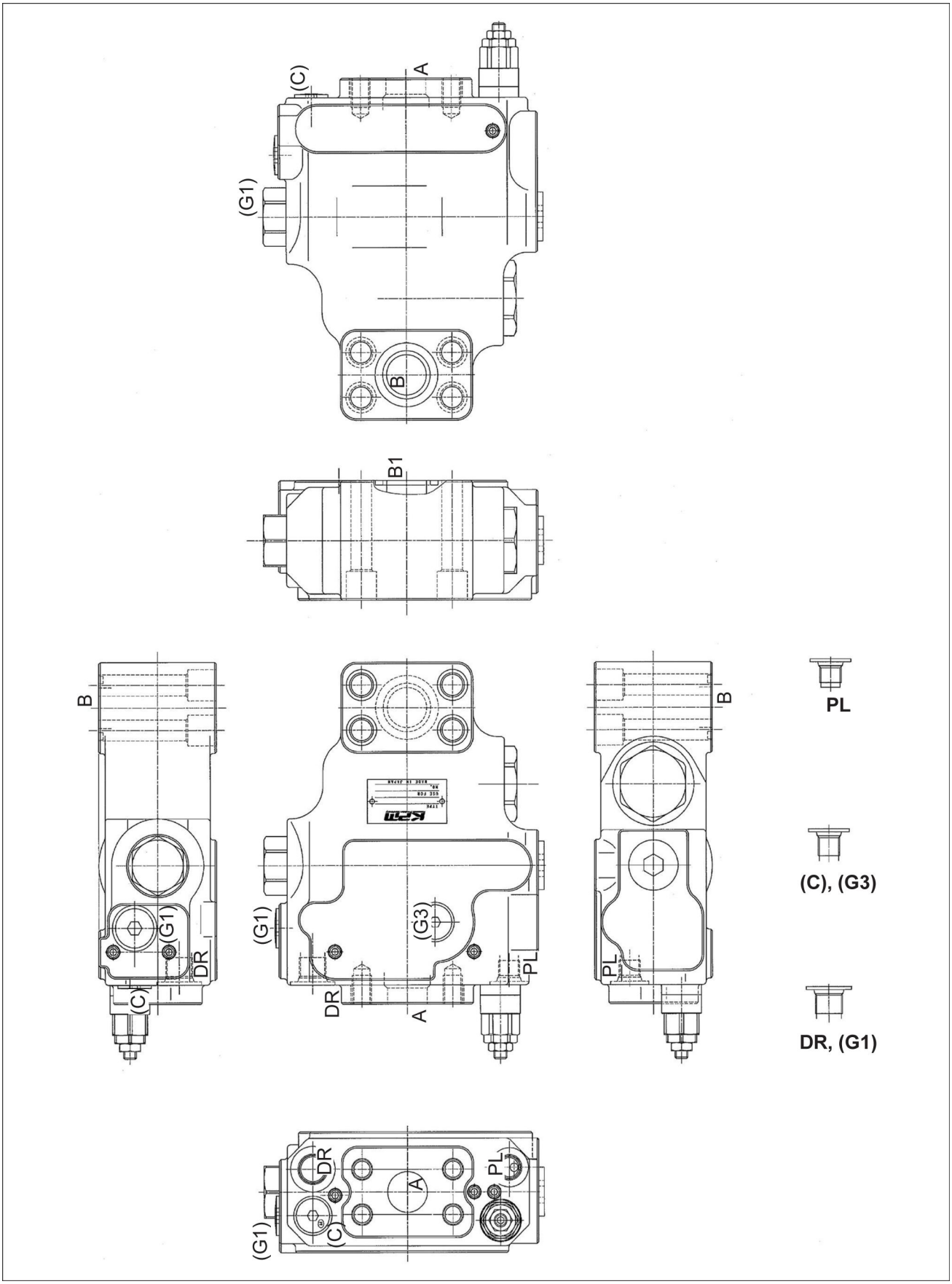
Boom cylinder - Inspect

Maintenance inspection and service

In order to ensure a hydraulic cylinder functions properly for a long time, periodically carry out maintenance inspection and service based on the "Autonomous inspection table". Repair any trouble locations quickly based on the Trouble Diagnostics.

NOTICE: *For periodic inspection and service, first work to prevent any hazard to operators. Strive to prevent hazards by working with an attitude based on good sense.*

Inspection and maintenance locations	Inspection and service detail	Daily	Monthly	Yearly	Remarks
Appearance	Is the cylinder clean (especially rod sliding sections)?	○			
	Is any oil leaking from line installation sections or other fixed sections?		○		
	Is there missing or peeling paint or rust?	○			
Operation	Is operation smooth and free of abnormal noise and any other abnormality?	○			
	Is the responsiveness good?	○			
	Is any oil leaking from sliding sections?	○			
	Are there internal leaks?			O	
	Is the operating pressure normal?		○		
	Is the overload relief valve set pressure normal?		○		
Hydraulic oil	Is hydraulic oil dirty or deteriorated?		○		
	Is hydraulic oil replaced periodically?		○	○	
	Are filters inspected periodically?		○		
Section for installation with main unit	Is the supply of grease to pins adequate?		○		
	Do pin sections have any abnormal noises or seizing?	○			
	Do pin sections have any backlash or wear?	○			
	Are pin seals normal?	○	O		
	Are any installation screws loose or fallen out?	○			
	Retighten installation screws			O	
Piston rod section	Are sliding sections worn?			O	When leaving piston rod sliding sections exposed for long periods, apply anti-rust oil to the piston rod.
	Are sliding sections scratched or dented?	○			
	Is sliding section plating peeling off?	○			
	Are sliding sections bent?		O		
	Are there any welding section cracks or damage?	○			

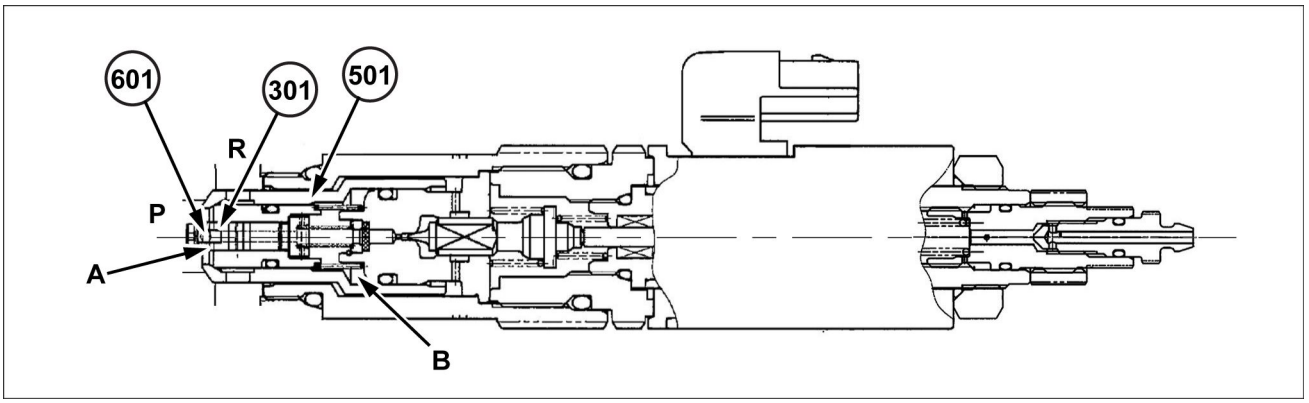


SMIL15CEX5784H 6

Ports details

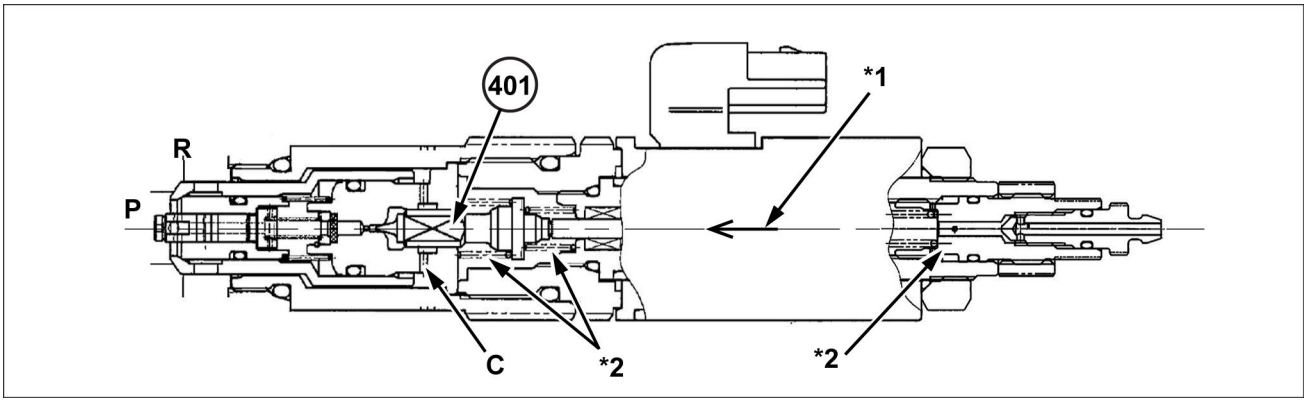
Operation of electromagnetic relief valve

1. The pressure oil from the P chamber flows through the B chamber via hole A on the piston **(601)**. The pressure from the surface area difference and the spring keeps the plunger **(301)** securely seated on the seat **(501)**.



SMIL15CEX4436EB 3

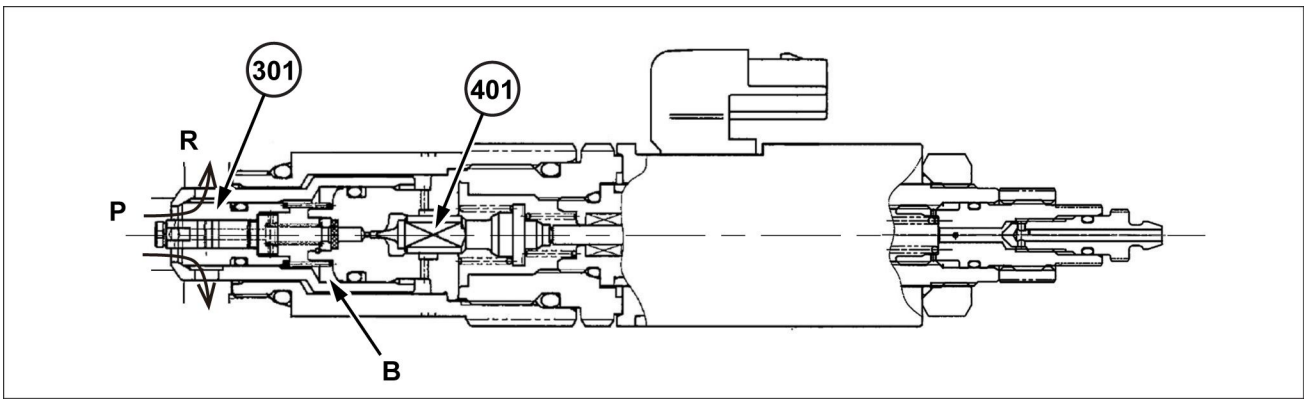
2. When the pressure in the P chamber reaches the pressure set with (spring force) + (solenoid force), the pressure oil pushes open the poppet **(401)** and flows to the T chamber via hole C.



SMIL15CEX4437EB 4

*1 Solenoid force *2 Spring

3. Because the poppet **(401)** has opened, the pressure in the B chamber drops and the plunger **(301)** opens, so the pressure oil in the P chamber flows to the T chamber.



SMIL15CEX4438EB 5

Contents

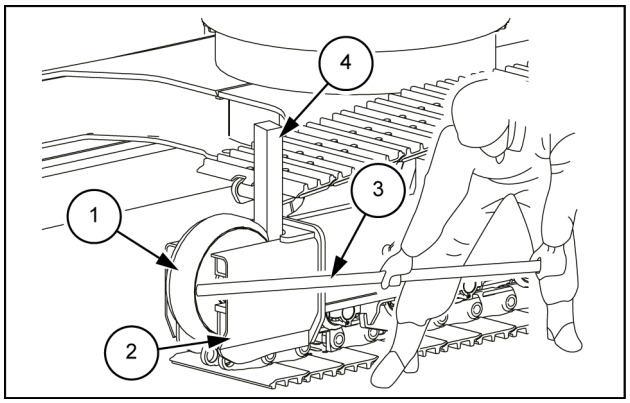
Tracks and track suspension - 48

Track frame and driving wheels - 130

Track tensioner - Remove

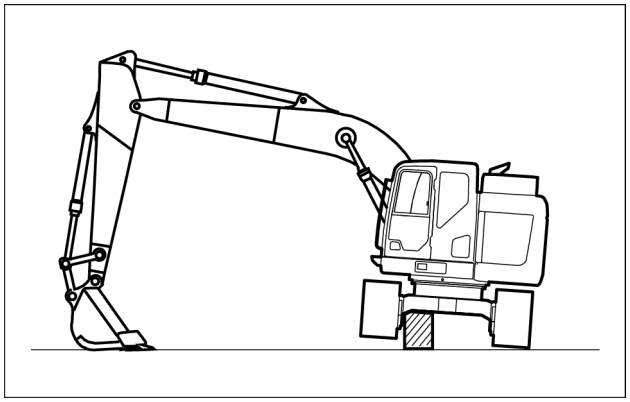
1. Remove the shoe assembly. See **Track chain - Remove (48.100)**.
2. Use a crowbar **(3)** to pull off the take-up roller **(1)** and recoil spring assembly about **100 mm** (**3.94 in**) from the side frame **(2)**.

   When removing the grease cylinder, use a wood plank **(4)** or the like to prevent the take-up roller **(1)** and recoil spring assembly from coming out.



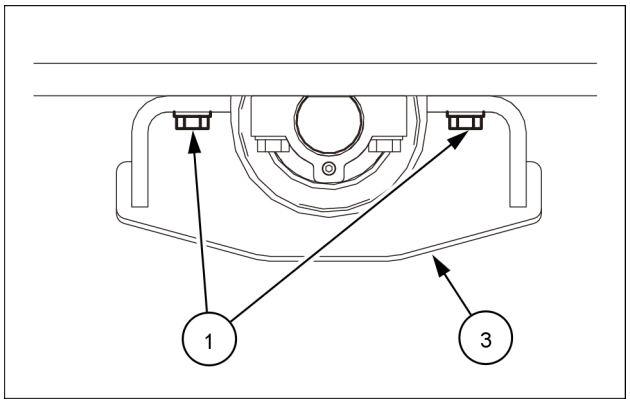
SMIL14CEX1153AB 1

3. As shown in the figure, when the shoe is jacked up by about **5 cm** (**1.969 in**), put wood planks under the lower frame to prevent falling.



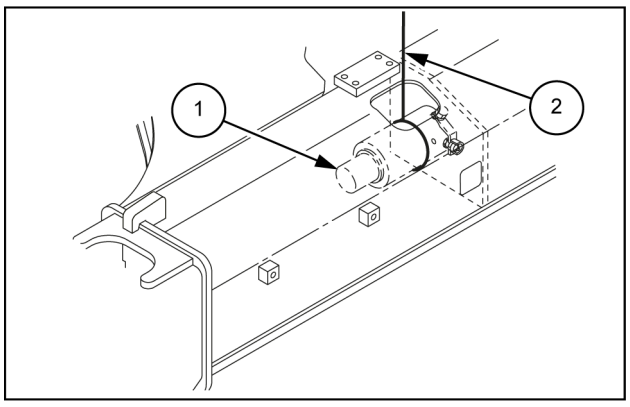
SMIL17CEX3695AA 2

4. Remove the bolt **(1)** with a wrench [**24 mm**] to remove the track guard **(3)**.



SMIL17CEX3697AA 3

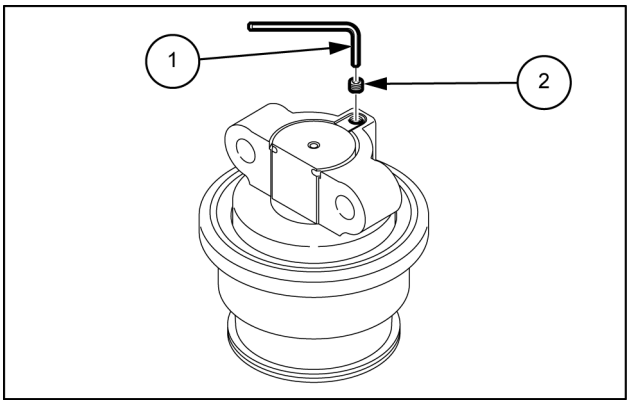
5. Attach a wire **(2)** to the grease cylinder assembly **(1)**, and stretch it taut a little with a lifting equipment.



SMIL14CEX1156AB 4

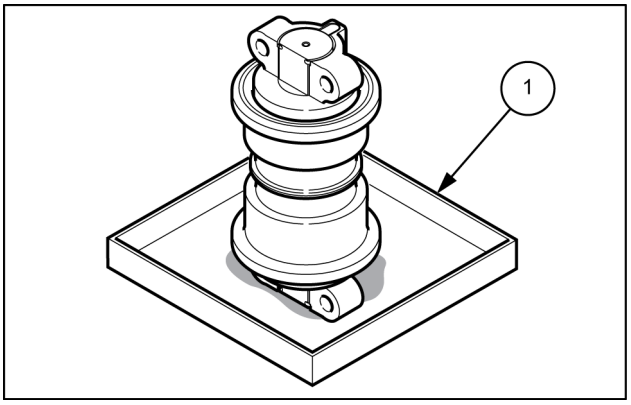
Track roller - Disassemble

1. Stand the roller vertically and use a hexagon wrench [**6 mm**] **(1)** to remove the plug **(2)**.
   - The plug is coated with seal nylon, which comes off when the plug is removed. To reuse the plug, using seal tape is necessary.



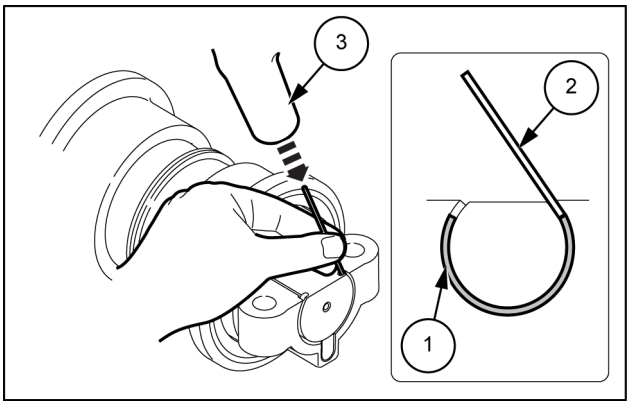
SMIL14CEX1286AB 1

2. Face down the part of the roller from which the plug was removed and empty the oil from within the roller.
   - It may take a few hours to completely empty the oil.
   - Place an oil pan **(1)** underneath to catch the oil.
   - Securely fasten so that the roller does not fall over.



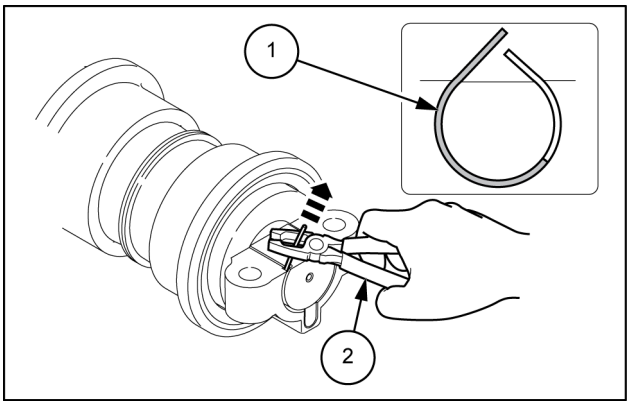
SMIL14CEX1287AB 2

3. Remove the wire clip **(1)**. Tap another wire **(2)** with the hammer **(3)** from the outside to push out the wire clip that is already in the roller.
   - Place the roller horizontally and secure it so it does not roll before doing this work.
   - The wire in the roller is very securely fixed, so prepare several wire clips. Also be sure to coat with lubricant.



SMIL14CEX1288AB 3

4. Use pliers **(2)** to remove the pushed out wire clip **(1)**.



SMIL14CEX1289AB 4

a. Air-conditioner unit
b. Engine
c. Heater (engine return)
d. White making
e. Heater (engine output)
f. Heater (unit outlet)
g. Heater (unit inlet)

1. Cooler hose (liquid 2) (Quantity 1)
2. Cooler hose (suction) (Quantity 1)
3. Heater hose (Quantity 1)
4. Heater hose (Quantity 1)
5. Cooler hose (discharge) (Quantity 1)
6. Compressor air conditioner (Quantity 1)
7. Air conditioner condenser (Quantity 1)
8. Receiver dryer (Quantity 1)
9. Cooler hose (liquid 1) (Quantity 1)

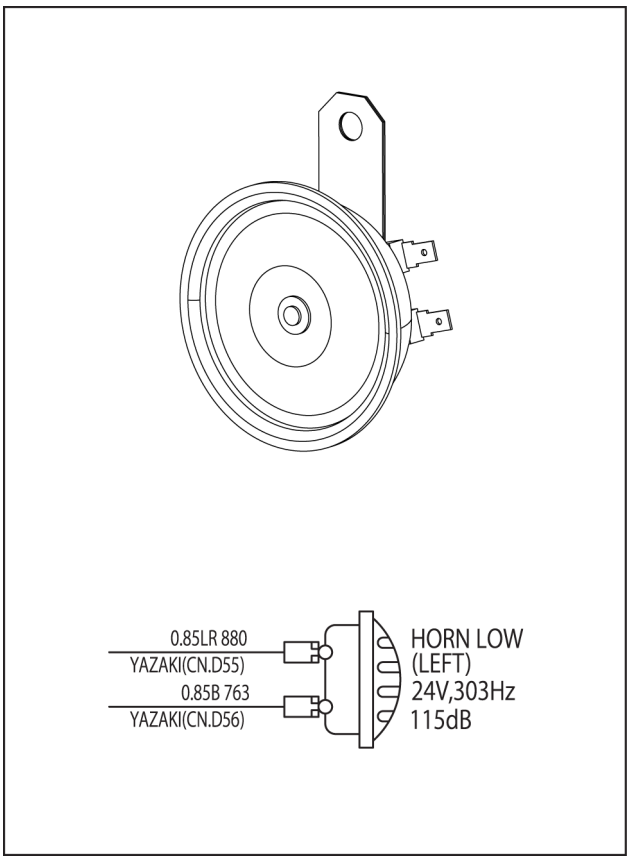
* ▨ in the hose connection table indicates clamping location and the numerical value indicates hose length.

NOTE: *All the torques in figures are in Nm.*

Horn (low)

Part No.: KHR21430

Basic frequency: **303 Hz**

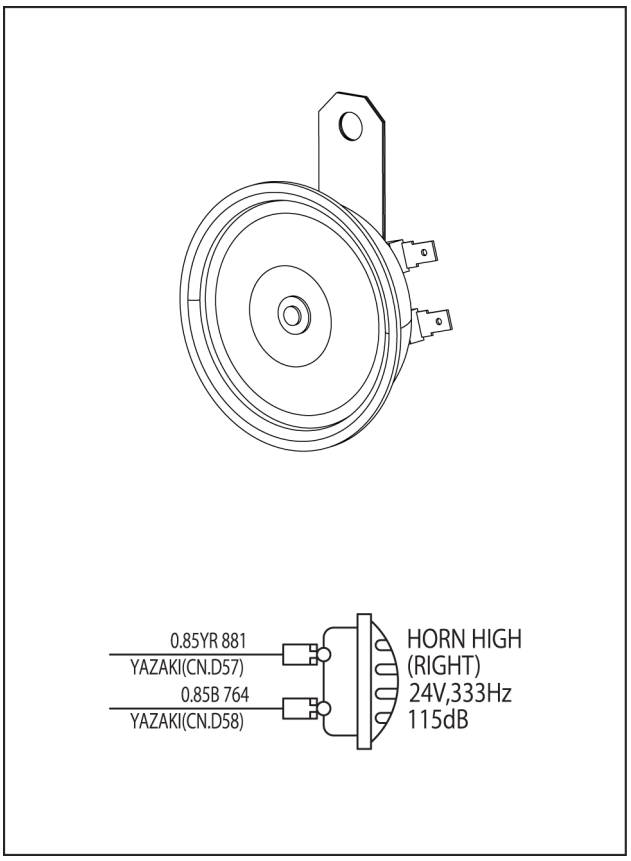


SMIL15CEX0585BA 63

Horn (high)

Part No.: KHR21440

Basic frequency: **333 Hz**



SMIL15CEX0586BA 64

Fuse box 1

Number	Name		Number	Name	
F1	Key switch	**10 A**	F9	Air conditioner blower motor	**15 A**
F2	Accessories	**10 A**	F10	Air conditioner compressor	**5 A**
F3	GPS controller	**10 A**	F11	Engine controller	**20 A**
F4	ICT controller	**15 A**	F12	Monitor (back-up)	**10 A**
F5	Monitor	**10 A**	F13	Back-up	**10 A**
F6	Controller	**10 A**	F14	Solenoid	**15 A**
F7	Gate Lock	**10 A**	F15	Proportional solenoid	**15 A**
F8	Air conditioner unit	**5 A**	F16	Horn	**10 A**

Fuse box 2

Number	Name		Number	Name	
F1	Seat suspension, heater	**10 A**	F8	Lamp (cab)	**15 A**
F2	Wiper, washer	**15 A**	F9	Lamp (boom, housing)	**15 A**
F3	Cigar lighter	**10 A**	F10	Option	**10 A**
F4	DC/DC converter	**10 A**	F11	Spare 2	**10 A**
F5	FVM	**10 A**	F12	Indicator	**10 A**
F6	Spare 1	**10 A**	F13	Option controller	**10 A**
F7	Beacon	**10 A**	F14	Option controller	**15 A**

Cab 1

NOTE: *When installing the ground terminals marked with *, check that the frame seating surface is not coated. If the surface is coated, remove the coating before installation.*

NOTE: *Adjust the clamp positions of the electrical wiring that comes out from connectors so that the wiring does not form sharp rounded shapes. [R = **10 mm** (**0.394 in**) or more]*

a. Marking position (Align white tape on harness)

b. Fasten the harness with the clip
The clip is a console accessory

Code	Part name	Code	Part name
1	Console harness (Quantity 1)	4	USB/AUX port (Quantity 1)
2	Rocker switch (emergency stop) (Quantity 1)	5	Rocker switch (travel alarm) (Quantity 1)
3	Ground wire: cab (Quantity 1)	6	Radio (Quantity 1)

CN.A32F	Cab main harness: A (10-pin)	CN.B14F	Overload: 10-pin
CN.A33F	Cab main harness: B (14-pin)	CN.B15F	Beacon switch: 10-pin (ID tape: Red)
CN.A34F	Cab main harness: C (18-pin)	CN.B16F	Travel alarm switch: 10-pin (ID tape: Blue)
CN.A35F	Cab main harness: D (20-pin)	CN.B17F	Fan reverse switch: 10-pin (ID tape: Red)
CN.B1F	Starter switch: 6-pin	CN.B18F	Free swing switch: 10-pin (ID tape: Blue)
CN.B2M	Engine throttle switch: 3-pin	CN.B19M	First option harness: 16-pin
CN.B3F	Limit gate switch: 2-pin	CN.B20M	Second option harness: 8-pin
CN.B5F	Knob (right 1) switch: 8-pin	CN.B21M	1-pedal harness: 3-pin
CN.B6F	Knob (right 2) switch: 6-pin	CN.B22F	Seat: 2-pin
CN.B7F	Knob (left 1) switch: 8-pin	CN.B24F	Radio: 9-pin
CN.B8F	Knob (left 2) switch: 6-pin	CN.B25F	**12 V**: +B
CN.B9F	Air conditioner unit: A (6-pin)	CN.B26F	**12 V**: IGN
CN.B10F	Air conditioner unit: B (22-pin)	CN.B27F	Computer: GND
CN.B11F	Air conditioner panel: A (20-pin)	CN.B27M	**12 V**: GND
CN.B12F	Air conditioner panel: B (16-pin)	CN.B28F	Air conditioner: GND
CN.B13F	Engine emergency stop switch: 10-pin		

Wiring harnesses - Electrical schematic sheet 14 - Engine controller

Type	Component	Connector/link	Description
ECM/DCU	A2		ECM/DCU and engine controller
Connector	CN.D4	**CN.D4** CONNECTOR : ECM/DCU AND ENGINE CONTROLLER	ECM/DCU and engine controller

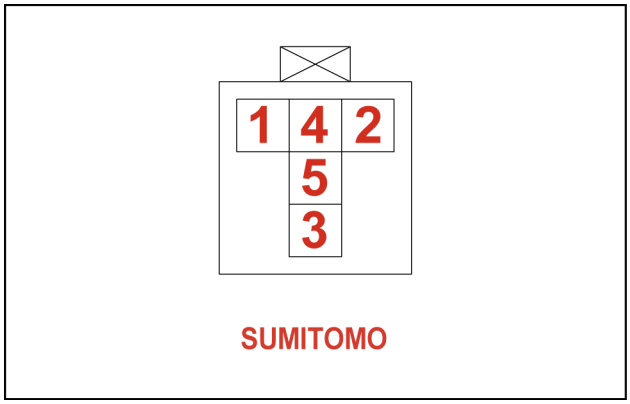
Wiring harnesses - Electrical schematic sheet 32 - Speakers, room lamp and limit switch (door)

Type	Component	Connector/link	Description
Lamp	E71		Room lamp
Speaker	H4		Right speaker
Speaker	H5		Left speaker
Switch	S53		Door limit switch
Switch	S54		Window limit switch
Switch	S141		Around light switch
Connector	CN.A26A	**CN.A26A** CONNECTOR :	
Connector	CN.A27A	**CN.A27A** CONNECTOR :	
Connector	CN.A28A	**CN.A28A** CONNECTOR :	
Connector	CN.A29A	**CN.A29A** CONNECTOR :	
Connector	CN.A30A	**CN.A30A** CONNECTOR : WINDOW LIMIT SWITCH	Window limit switch
Connector	CN.A31A	**CN.A31A** CONNECTOR : WINDOW LIMIT SWITCH	Window limit switch
Connector	CN.C3	**CN.C3** CONNECTOR :	
Connector	CN.C4	**CN.C4** CONNECTOR :	
Connector	CN.C22	**CN.C22** CONNECTOR : ROOM LAMP	Room lamp
Connector	CN.C23	**CN.C23** CONNECTOR : DOOR LIMIT SWITCH	Door limit switch
Connector	CN.C24	**CN.C24** CONNECTOR : RIGHT SPEAKER	Right speaker
Connector	CN.C25A	**CN.C25A** CONNECTOR : LEFT SPEAKER	Left speaker
Connector	CN.C31	**CN.C31** CONNECTOR : AROUND LIGHT SWITCH	Around light switch

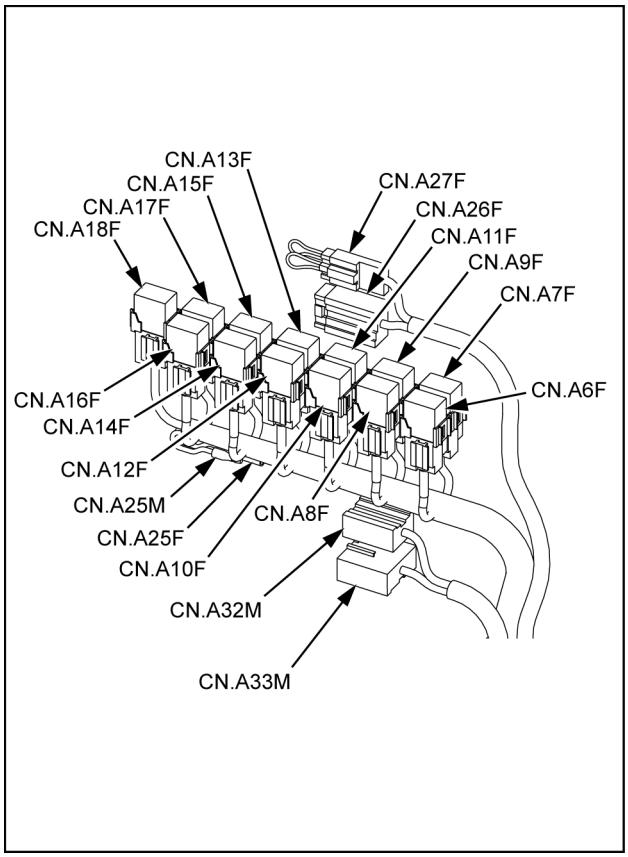
Wiring harnesses - Electrical schematic sheet 50 - Cab head lamp (with and without cab front guard)

Type	Component	Connector/link	Description
Lamp	E72		Halogen lamp
Lamp	E72A		Halogen lamp
Lamp	E72B		
Lamp	E74		Lamp
Lamp	E74E		Lamp
Lamp	E74F		Lamp
Connector	CN.A26F	**CN.A26F** CONNECTOR :	
Connector	CN.A26FA	**CN.A26FA** CONNECTOR :	
Connector	CN.A26-1M	**CN.A26-1M** CONNECTOR :	
Connector	CN.A26-1A	**CN.A26-1A** CONNECTOR :	
Connector	CN.A26-2M	**CN.A26-2M** CONNECTOR :	
Connector	CN.A27M	**CN.A27M** CONNECTOR :	
Connector	CN.A27MA	**CN.A27MA** CONNECTOR :	
Connector	CN.A27-1	**CN.A27-1** CONNECTOR :	
Connector	CN.A27-1A	**CN.A27-1A** CONNECTOR :	
Connector	CN.A27-2	**CN.A27-2** CONNECTOR :	
Connector	CN.A28F	**CN.A28F** CONNECTOR :	
Connector	CN.A28FA	**CN.A28FA** CONNECTOR :	
Connector	CN.A28-1	**CN.A28-1** CONNECTOR :	
Connector	CN.A28-1A	**CN.A28-1A** CONNECTOR :	
Connector	CN.A28-2	**CN.A28-2** CONNECTOR :	
Connector	CN.A29M	**CN.A29M** CONNECTOR :	
Connector	CN.A29MA	**CN.A29MA** CONNECTOR :	
Connector	CN.A29-1	**CN.A29-1** CONNECTOR :	
Connector	CN.A29-1A	**CN.A29-1A** CONNECTOR :	
Connector	CN.A29-2	**CN.A29-2** CONNECTOR :	
Connector	CN.D98-1A	**CN.D98-1A** CONNECTOR : LAMP	Lamp
Connector	CN.D98-1B	**CN.D98-1B** CONNECTOR : LAMP	Lamp
Connector	P1603		Lamp
Connector	P1604		Lamp

CONNECTOR CN.A6: STARTER CUT RELAY (Female)



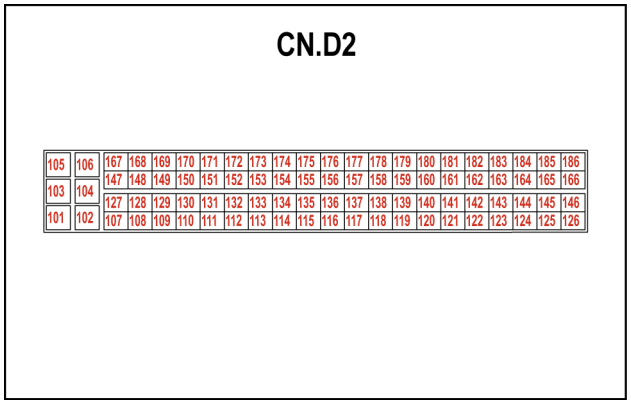
SMIL17CEX6774AA 11



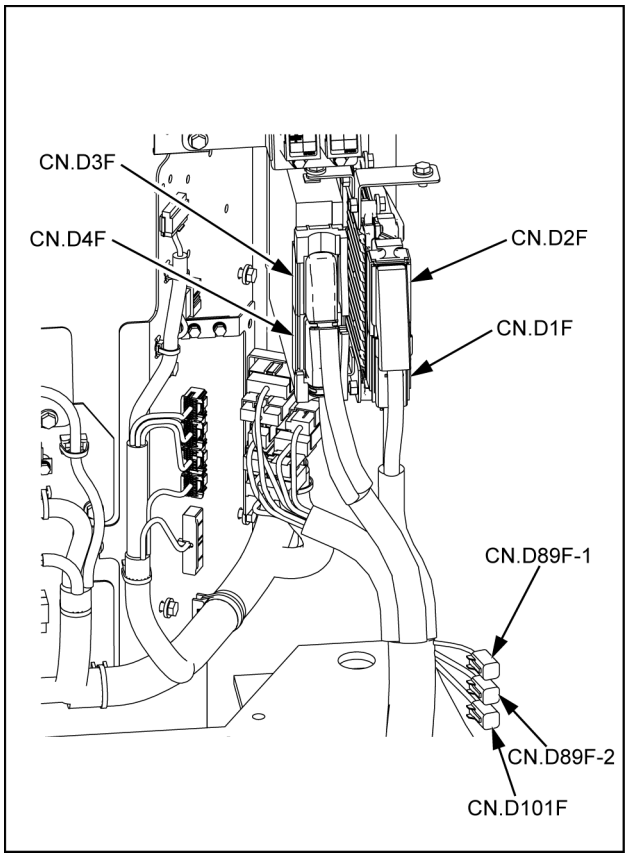
SMIL17CEX6514BA 12

Pin	From	Wire ID	Description	Color-Size	Frame
1	CN.A44M-P-3	126G		WH-1.25	**SHEET 45 - Interconnectors**
2	CN.A53F-P-4	373A		BL/RD-0.85	**SHEET 38 - Interconnectors**
3	SP135-P-X	011A		YE-0.85	**SHEET 05 - Power distribution**
4	CN.A52F-P-5	012		GY/RD-0.85	**SHEET 39 - Interconnectors**

CONNECTOR CN.D2: DOSING CONTROL (Female)

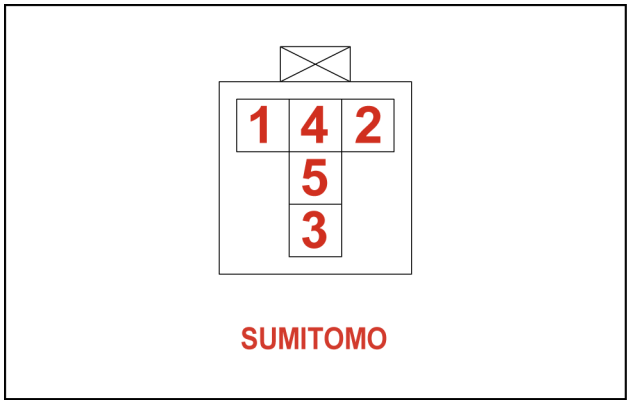


SMIL17CEX6687AA 69

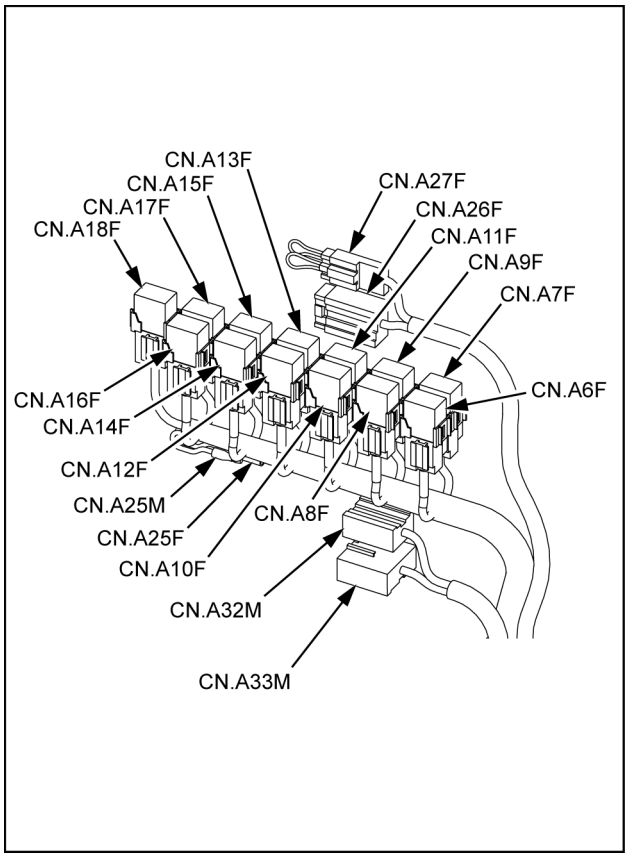


SMIL17CEX6531BA 70

CONNECTOR CN.A11: ACC:2 RELAY (Female)



SMIL17CEX6774AA 3



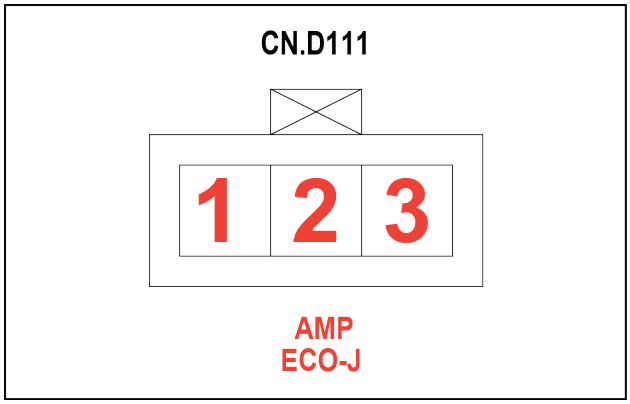
SMIL17CEX6514BA 4

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP793-P-X	811B		BL/YE-0.0	**SHEET 05 - Power distribution**
2	CN.A49M-P-5	707		BK-0.0	**SHEET 41 - Interconnectors**
3	CN.A8-P-5	116		RD/YE-0.0	**SHEET 05 - Power distribution**
4	CN.A43M-P-1	117		RD-0.0	**SHEET 45 - Interconnectors**

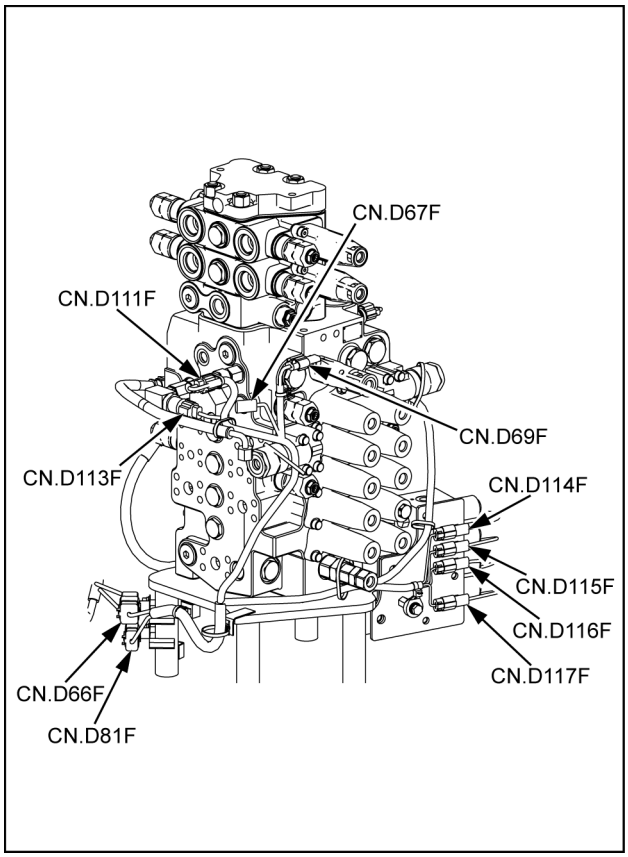
CONNECTOR CN.C18: ACC SOCKET (Male)

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP106-P-X	712		BK-0.85	**SHEET 28 - Wiper controller, wiper motor, washer**

CONNECTOR CN.D111: N2 PRESSURE SENSOR 5MPA (Female)



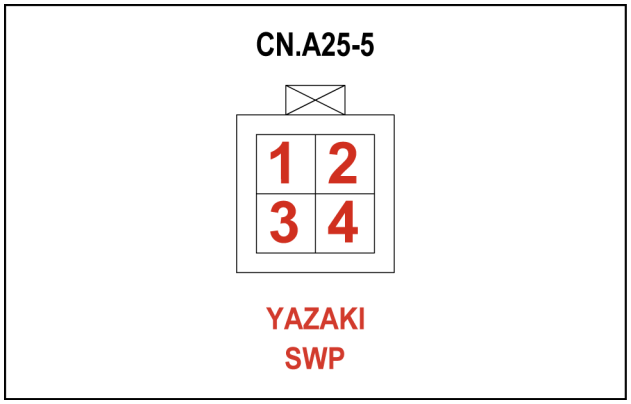
SMIL17CEX6620AA 92



SMIL17CEX6519BA 93

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP68-P-X	430C		WH-0.85	**SHEET 22 - Pressure sensors**
2	CN.D81M-P-4	420A		GN-0.85	**SHEET 44 - Interconnectors**
3	SP69-P-X	440C		BK/BL-0.85	**SHEET 22 - Pressure sensors**

CONNECTOR CN.A25-5: CN.A25-5 (Female)



SMIL17CEX6725AA 18

Pin	From	Wire ID	Description	Color-Size	Frame
1	CN.A25-8M-P-1	965A		RD/GN-0.0	**SHEET 49 - CCD camera**
2	CN.A25-8M-P-2	966A		BK/WH-0.0	
3	CN.A25-1-P-18	967A		YE/GN-0.0	**SHEET 62 - FVM controller**
4	CN.A25-1-P-16	968A		GY/WH-0.0	

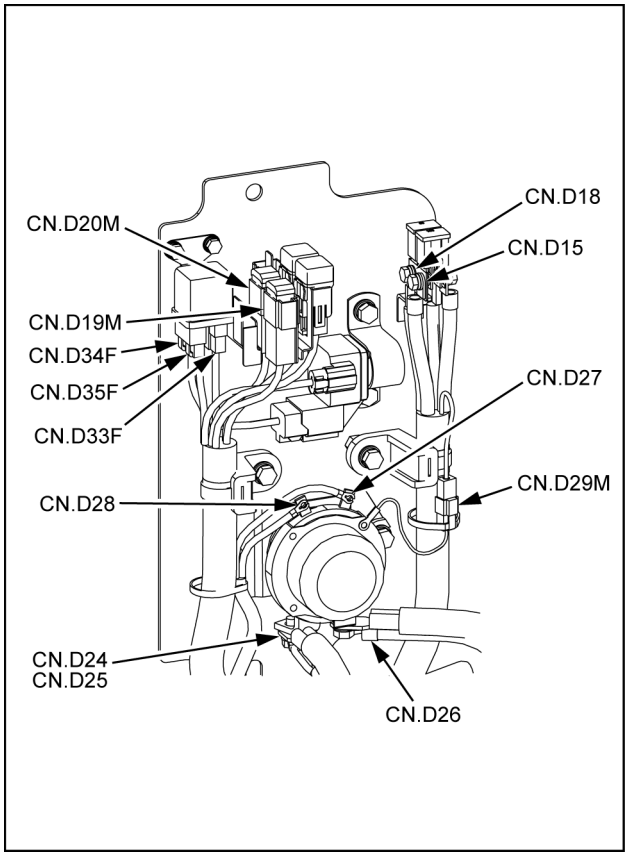
CONNECTOR CN.A26-12: CN.A26-12 (Female)

Pin	From	Wire	Description	Color-Size	Frame
1	CN.A26-13F-P-3	450AA		RD-1.25	**SHEET 63 - Sub controller**
2	CN.A26-13F-P-2	452A		BL-1.25	
3	CN.A26-13F-P-1	456AA		GN-1.25	
4	CN.A26-14M-P-3	450BB		RD-1.25	
5	CN.A26-14M-P-2	453A		OR-1.25	
6	CN.A26-14M-P-1	456BB		GN-1.25	

CONNECTOR CN.A29-1: CN.A29-1 (Female)

Pin	From	Wire ID	Description	Color-Size	Frame
1	CN.A29-1AM-P-1	WIRE3812		BK-1.25	**SHEET 50 - Cab head lamp (with and without cab front guard)**

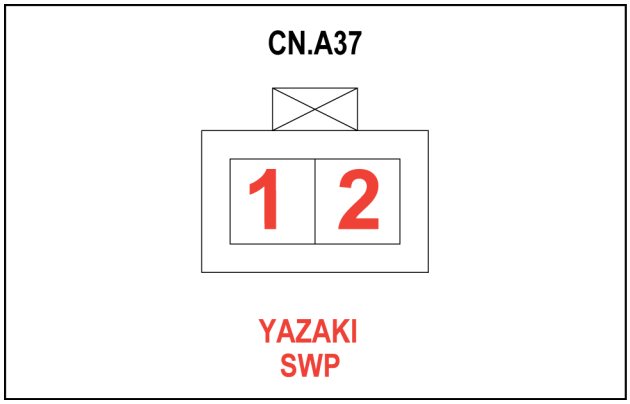
CONNECTOR CN.D26: BATTERY RELAY (Female)



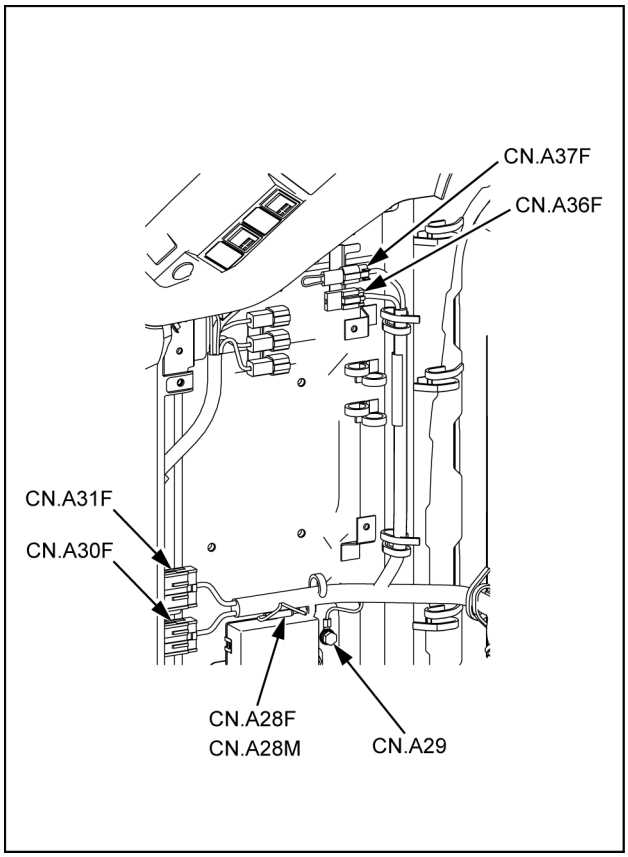
SMIL17CEX6495BA 59

Pin	From	Wire ID	Description	Color-Size	Frame
M8	CN.D16-P-1	031		RD-20.0	**SHEET 02 - Power distribution_starting and charging circuit**

CONNECTOR CN.A37: CN.A37 (Male)



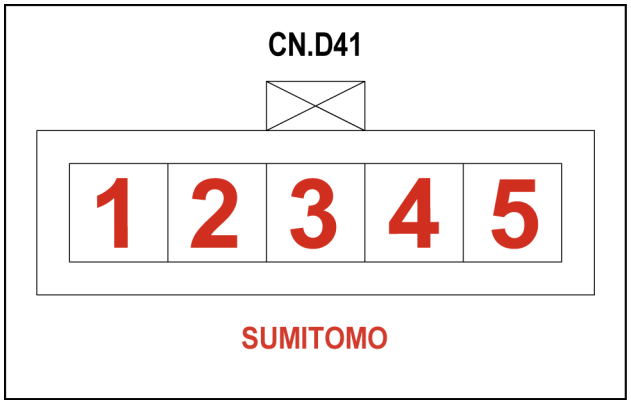
SMIL17CEX6838AA 26



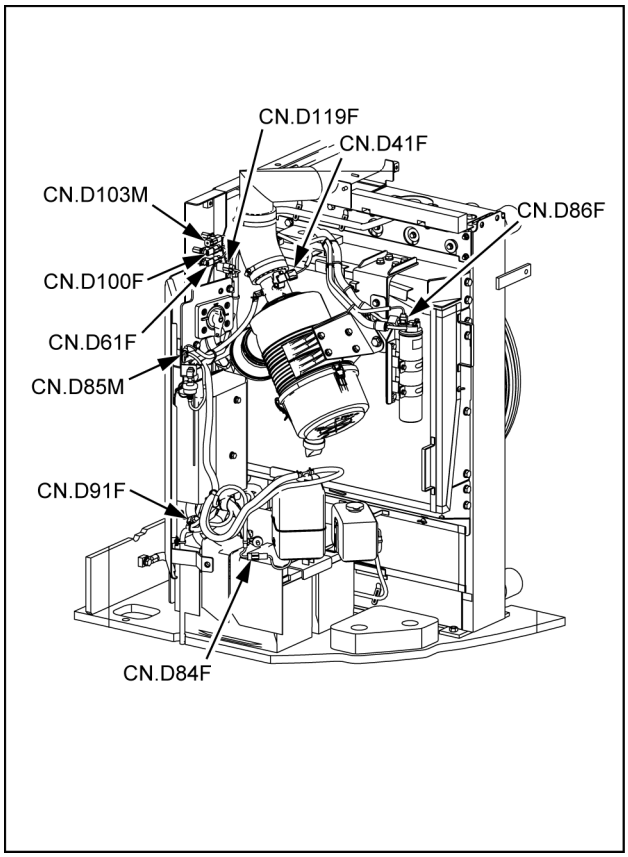
SMIL17CEX6507BA 27

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP60-P-X	880A		BL/RD-0.0	**SHEET 06 - Power distribution**
2	CN.A51F-3	881		YE/RD-0.0	**SHEET 39 - Interconnectors**

CONNECTOR CN.D41: AIR INTAKE SENSOR MASS AND TEMPERATURE SENSOR (Female)



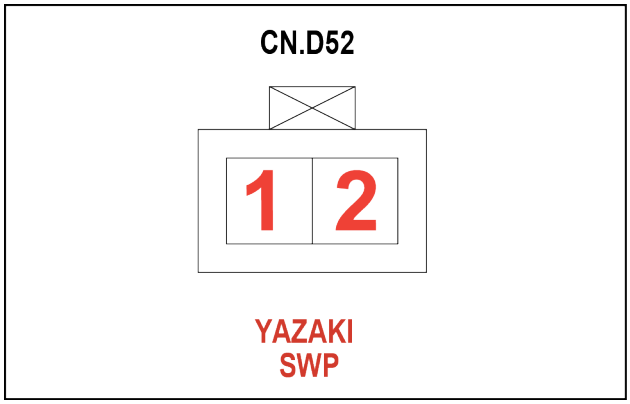
SMIL17CEX6697AA 23



SMIL17CEX6493BA 24

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP767-P-X	347AA		GN-0.0	**SHEET 21 - Air intake mass-temperature and urea sensor**
2	CN.D3-P-V29	350		BR/RD-0.0	**SHEET 13 - Engine controller**
3	CN.D3-P-V88	338		BL/WH-0.0	
4	CN.D3-P-V36	339		GN/YE-0.0	
5	CN.D3-P-V37	337		WH/GN-0.0	

CONNECTOR CN.D52: CN.D52 (Male)



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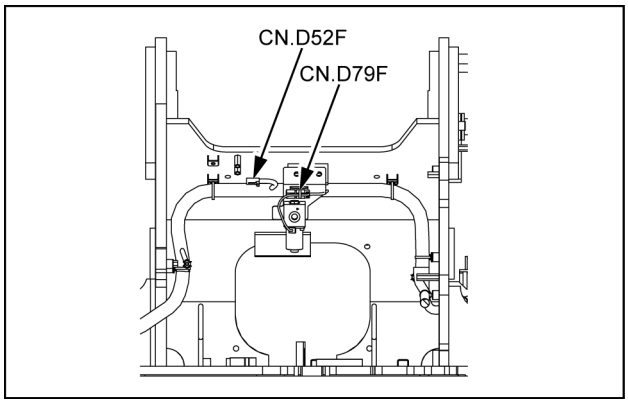
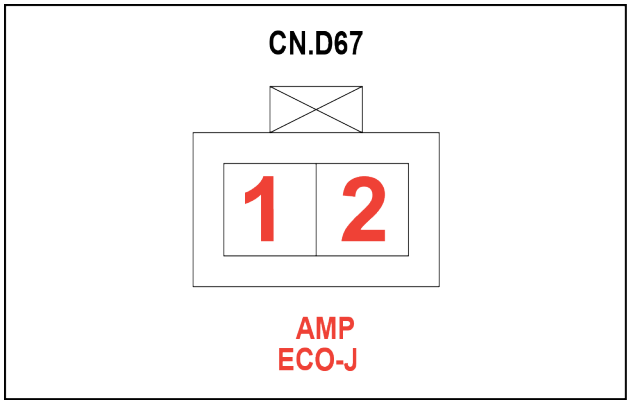


SMIL17CEX6521AA 44

Pin	From	Wire ID	Description	Color-Size	Frame
1	SP904-P-X	870E		YE-1.25	**SHEET 39 - Interconnectors**
2	CN.D93M-P-10	762E		BK-1.25	**SHEET 41 - Interconnectors**

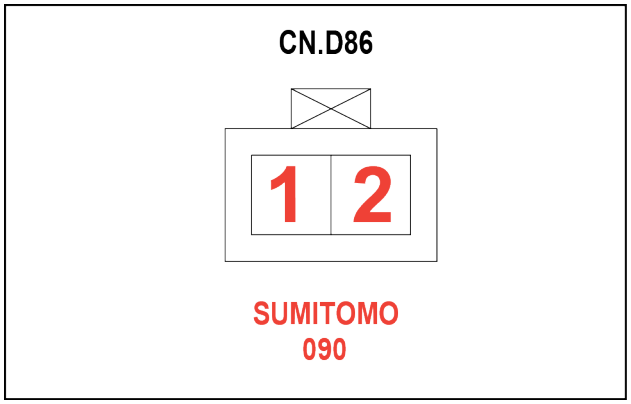
CONNECTOR CN.D67A: CN.D67A (Female)



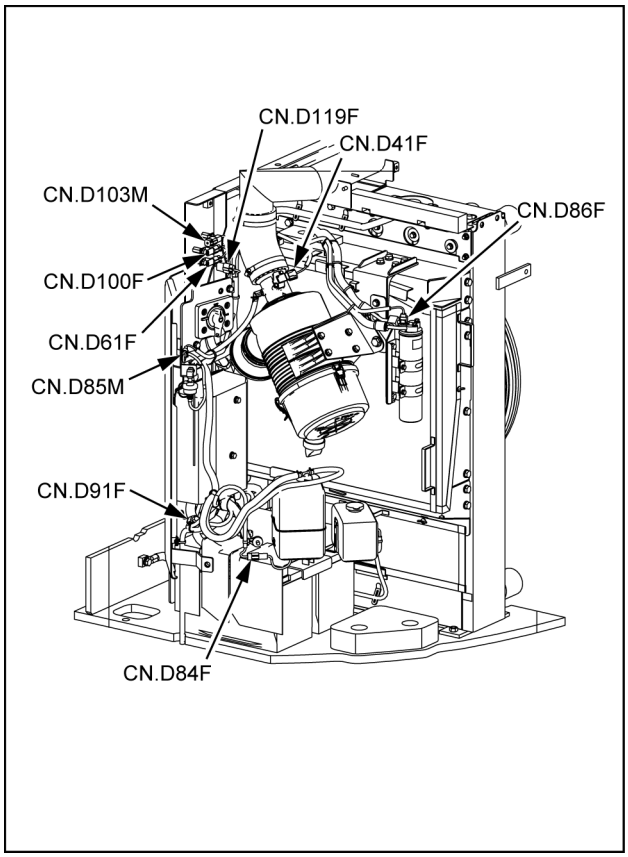
SMIL17CEX6658AA_2 19

Pin	From	Wire ID	Description	Color-Size	Frame
1	CN.D67MM-P-1	902AA		VT/RD-0.85	**SHEET 27 - Proportional and pressure switch**
2	CN.D67MM-P-2	902BA		VT/GN-0.85	

CONNECTOR CN.D86: RECEIVER DRYER DUAL SWITCH (Female)

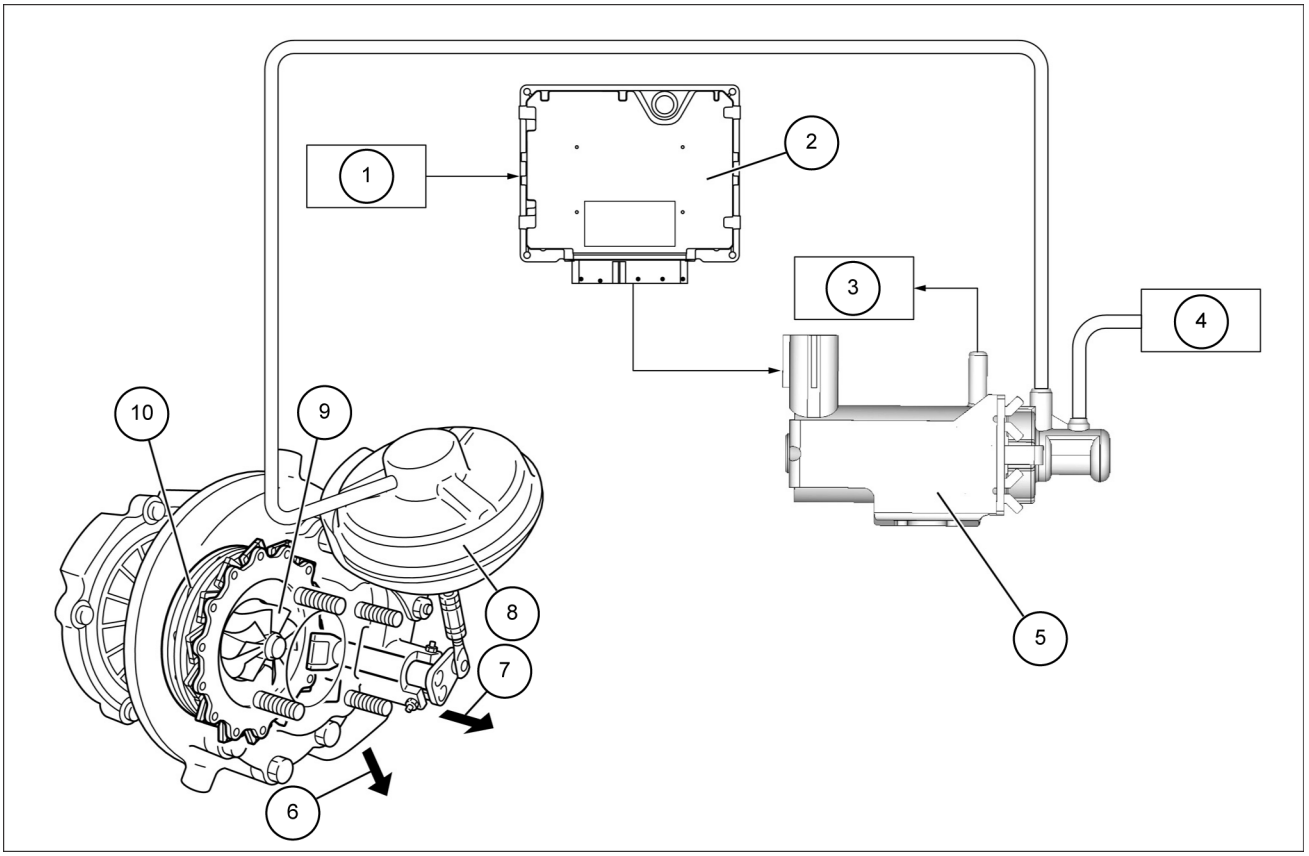


SMIL17CEX6674AA 20



SMIL17CEX6493BA 21

Pin	From	Wire ID	Description	Color-Size	Frame
1	CN.D87M-P-1	944		WH-1.25	**SHEET 26 - Dual switch, magnet clutch, fuel level sensor**
2	CN.A51M-P-1	943B		GN/WH-0.85	**SHEET 39 - Interconnectors**



SMIL15CEX9007FB 9

1. Boost sensor input, various sensor input
2. ECM
3. Open to atmosphere
4. Vacuum pump
5. Turbocharger control solenoid
6. Exhaust gas outlet
7. Exhaust gas inlet
8. Nozzle control actuator
9. Turbine wheel
10. Nozzle

Engine Control Unit (ECU) - Install

1. Mount the ECU in the reversed order of the procedure for removal.

NOTICE: *If the ECM is replaced, transfer the engine information and injector information from the old ECM to the new ECM. Refer to the "Service Support"-"SETUP Screen List"-"ENGINE INFORMATION".*

NOTICE: *Each bolt has to be tightened in the specified torque. Refer to "* ***Torque - Bolt and nut ()*** *" for the tightening torque of the unspecified bolts.*

Excessive black smoke in exhaust gas - symptoms

There is a great deal of black smoke during operation.

Excessive black smoke in exhaust gas - diagnosis

Preliminary inspection

Before using this section, perform a functional inspection and OBD system check to check all of the following items.

The ECM and monitor are operating correctly.

Check DTCs.

The scan tool data is within the normal operation range.

Check the condition of the actual machine and find applicable symptoms.

Confirm with the customer that the stipulated engine oil and fuel are being used.

Visual inspection

Some symptoms detection procedures require careful visual inspection.

This allows for problems to be repaired without performing further inspection, which saves valuable time.

The following items are included in this inspection.

Check whether the air filter element is dirty or clogged.

Check for correct wiring connections, tightness, and disconnections.

Check whether the power supply for commercially-available accessories is being diverged from the ECM power supply.

Check whether the ECM ground is dirty and check that it is securely installed in the correct location.

Check that pipes and hoses for fuel, air, and oil are not broken or twisted and that they are correctly connected.

Thoroughly check for any leaking or clogging.

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

Suction air system parts abnormality.

Exhaust system parts abnormality

Diagnostic aid

Fuel quality, for example non-regulation product being used and filter clogging, suction air line abnormality and other suction air system abnormalities.

EGR control system abnormality.

Exhaust pipe abnormality and other exhaust system abnormalities.

Coolant temperature sensor abnormality.

Boost sensor trouble.

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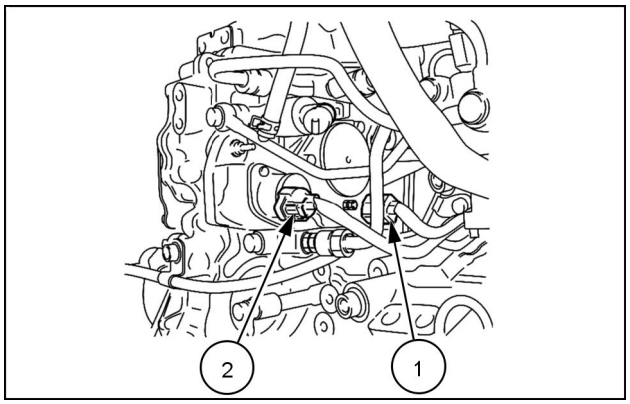
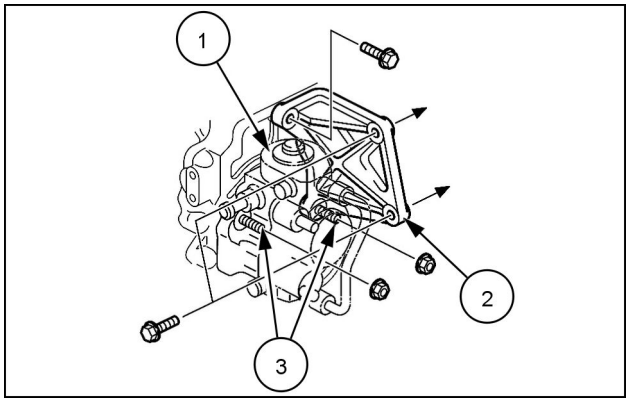
Fuel supply pump removal

1. Disconnect the harness connector from the fuel supply pump.
   - Disconnect the harness connector of the suction control valve and fuel temperature sensor.
     1. Fuel temperature sensor connector
     2. Suction control valve connector



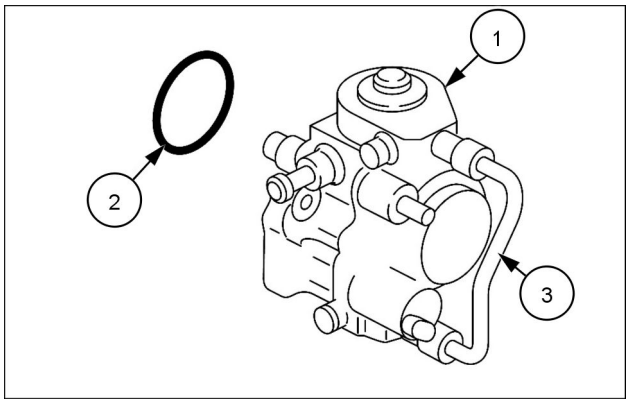
SMIL15CEX9773AB 20

2. Remove the supply pump bracket **(2)** from the cylinder block.
3. Remove the fuel supply pump **(1)** from the timing gear case.
   - When removing the fuel supply pump, do not hold the high pressure pipe of the pump instead of the handle.
     3. Stud bolt



SMIL15CEX9774AB 21

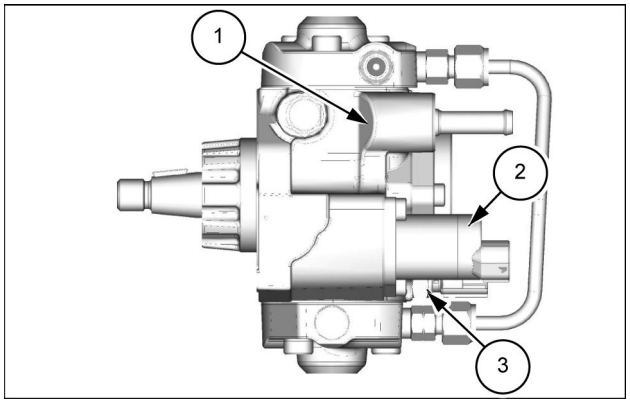
4. Remove the O-ring **(2)** from the fuel supply pump **(1)**.
     3. High pressure pipe



SMIL15CEX9707AB 22

Fuel temperature sensor removal

1. Remove the fuel temperature sensor **(3)** from the fuel supply pump **(1)**.
     2. Suction control valve



SMIL17CEX4081AB 23

Inlet air temperature sensor - Install

1. Install charge air cooler temperature sensor 1 to the intercooler.

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

2. Connect the connector to charge air cooler temperature sensor 1.

Battery ground cable connect

1. Connect the battery ground cable to the battery.

- The engine is running.
- The engine coolant temperature is **70 °C** (**158 °F**) or more and less than **90 °C** (**194 °F**).
- Urea solution is contained.
- The exhaust temperature (DOC outlet) is **680 °C** (**1256 °F**) or less.
- There is no sensor-related failure.
- The battery voltage is **21 V** or more.
- The device test is not in process.

2. AUTO SCR CLEANING standby conditions: If one of the following conditions is fulfilled, AUTO SCR CLEANING goes on standby without starting.
   - The engine coolant temperature is **65 °C** (**149 °F**) or more and less than **100 °C** (**212 °F**).
   - Urea solution has become low.
   - The exhaust temperature (DOC outlet) is **700 °C** (**1292 °F**) or more.
   - There is a sensor-related failure.
   - The battery voltage is **20 V** or less.
   - The device test is in process.

When, in the AUTO SCR CLEANING standby state, the conditions for starting AUTO SCR CLEANING in [1] are fulfilled, AUTO SCR CLEANING will be started.
Moreover, when these conditions are fulfilled during AUTO SCR CLEANING, it will be interrupted and go on standby.

3. Start of AUTO SCR CLEANING: The following controls will start when the conditions in [1] are fulfilled.
   - SCR CLEANING icon (green) turns on.
   - A warning buzzer sounds for 2 seconds.
   - The message "AUTO SCR CLEANING" appears.
4. Manual interruption of AUTO SCR CLEANING: The SCR CLEANING will be interrupted when the following operation is performed.
   During interruption, SCR CLEANING icon turns off.
   To resume the SCR CLEANING, eliminate the cause of interruption.
   - By pressing the SCR switch on the monitor during AUTO SCR CLEANING, the SCR CLEANING is interrupted. (The message "PUSH SCR CLEANING SWITCH" appears on the monitor. Pressing it again resumes AUTO SCR CLEANING.)
   - The SCR CLEANING is interrupted while the engine is stopped.
5. Manual resumption of AUTO SCR CLEANING: AUTO SCR CLEANING will resume when the following conditions are fulfilled.
   - The engine is started.
6. End of AUTO SCR CLEANING: The controls will be finished at the end of AUTO SCR CLEANING.
   - SCR CLEANING icon (green) turns off.
   - The message "AUTO SCR CLEANING" turns off.

MANUAL SCR CLEANING

MANUAL SCR CLEANING is requested if AUTO SCR CLEANING is incomplete (a failure in AUTO SCR CLEANING occurs twice continuously).

The machine cannot operate during MANUAL SCR CLEANING.

Assist load is controlled for the SCR CLEANING.

Operation explanation

1. Request for MANUAL SCR CLEANING: It will be displayed on the monitor when you are requested to perform MANUAL SCR CLEANING.

4. Apply anti-seize lubricant to NOx sensor 2 **(1)**.

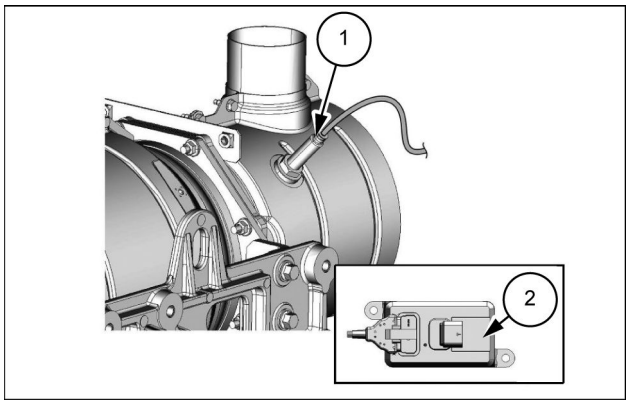
NOTE: *Apply High Temperature Stainless Never- Seez: 5-87411-039-0, manufactured by Bostik in the U.S., etc. to the threaded portion of NOx sensor 2* ***(1)****.*

5. Install NOx sensor 2 **(1)** to the silencer.

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

   Tightening torque: **8.5 N·m** (**6.3 lb ft**) Sensor controller

6. Connect the connector to the NOx sensor 2 controller **(2)**.



SMIL17CEX4061A 2

Battery ground cable connect

1. Connect the battery ground cable to the battery.

NOx sensor setting

NOTICE: *If the NOx sensor is replaced, perform a data reset with a trouble diagnosis scan tool.*

1. Connect the trouble diagnosis scan tool to the DLC.
2. Turn ON the ignition switch.
3. Select Search.

NOTE: *Enter the engine number, and select Search.*

4. Select diagnosis.
5. Select the engine.
6. Select urea SCR.
7. Select data reset.
8. Select NOx sensor data 1 reset.

NOTE: *Perform a data reset following the on-screen instructions.*

Engine oil level sensor - Remove

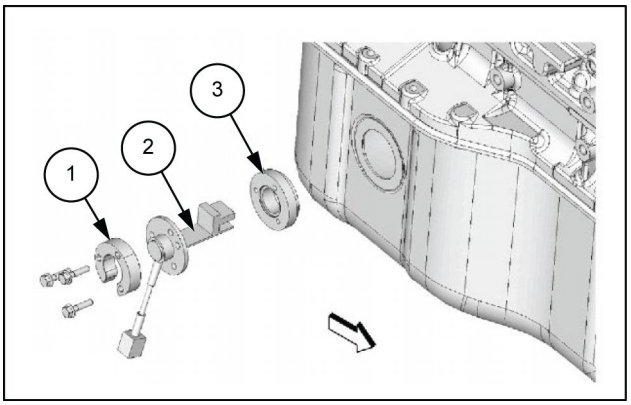
Engine oil drain

1. Remove the drain plug from the oil pan.
2. Drain the engine oil from the oil pan.
3. Install the drain plug to the oil pan.

   Tightening torque: **70 N·m** (**51.63 lb ft**)

Oil level sensor removal

1. Disengage the harness connector from the oil level sensor **(2)**.
2. Remove the oil level sensor **(2)** from the oil pan.
   1. Spacer
   3. Spacer



SMIL13CEX1832AB 1

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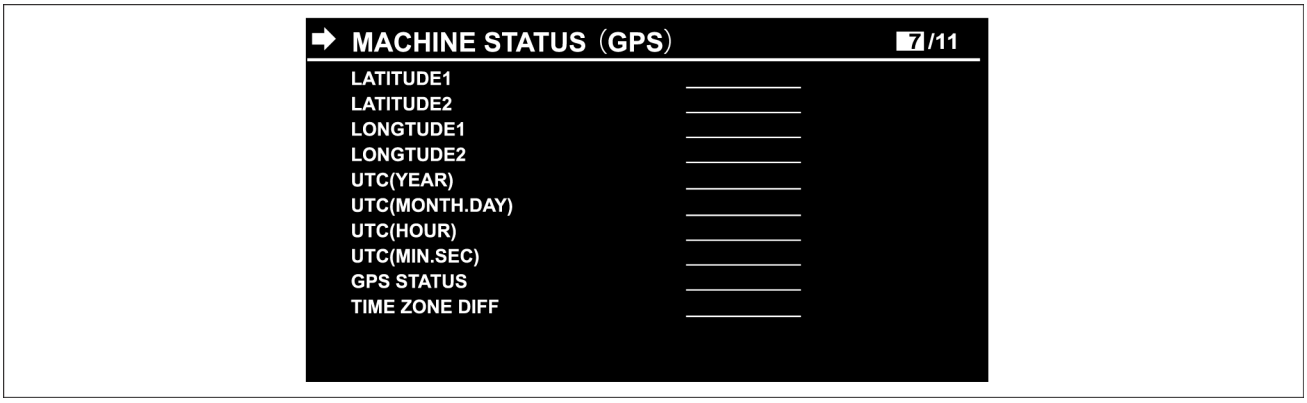

SMIL17CEX1057EA 8

Display	Explanation	Range
LATITUDE1	GPS latitude 1 (deg.)	**0 – 9999°**
LATITUDE2	GPS latitude 2 (min.)	**0 – 99.99‘**
LONGITUDE1	GPS longitude 1 (deg.)	**0 – 9999°**
LONGITUDE2	GPS longitude 2 (min.)	**0 – 99.99‘**
ALTITUDE	Altitude	**0 – 9999 m**
UTC(YEAR)	Universal Time (year)	0 - 9999
UTC(MONTH.DAY)	Universal Time (month, day)	0 - 12.31
UTC(HOUR)	Universal Time (hour)	0 - 23
UTC(MIN.SEC)	Universal Time (min., sec.)	0 - 59.59
GPS STATUS	GPS positioning status 0: GPS non-operating 1: GPS positioning 2: 2D positioning status 3: 3D positioning status	0 - 3
TIME ZONE DIFF	Time difference	-11.45 +12.00 hr.min

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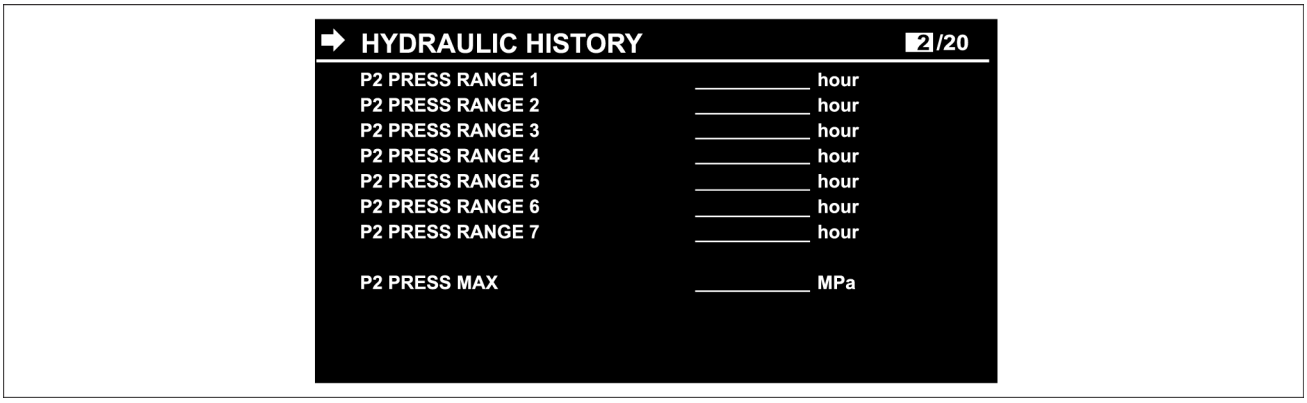

SMIL17CEX1740EA 44

Display	Explanation	Unit	Judgment condition	Judgment start condition
P2 PRESS RANGE 1	P2 pressure; time distribution 1	hour	Less than **10 MPa** (**1450 psi**)	Engine in operation
P2 PRESS RANGE 2	P2 pressure; time distribution 2	hour	Less than **15 MPa** (**2176 psi**)	Engine in operation
P2 PRESS RANGE 3	P2 pressure; time distribution 3	hour	Less than **20 MPa** (**2901 psi**)	Engine in operation
P2 PRESS RANGE 4	P2 pressure; time distribution 4	hour	Less than **25 MPa** (**3626 psi**)	Engine in operation
P2 PRESS RANGE 5	P2 pressure; time distribution 5	hour	Less than **30 MPa** (**4352 psi**)	Engine in operation
P2 PRESS RANGE 6	P2 pressure; time distribution 6	hour	Less than **35 MPa** (**5077 psi**)	Engine in operation
P2 PRESS RANGE 7	P2 pressure; time distribution 7	hour	**35 MPa** (**5077 psi**) or more	Engine in operation
P2 PRESS MAX	Maximum P2 pressure	MPa (psi)	–	Engine in operation

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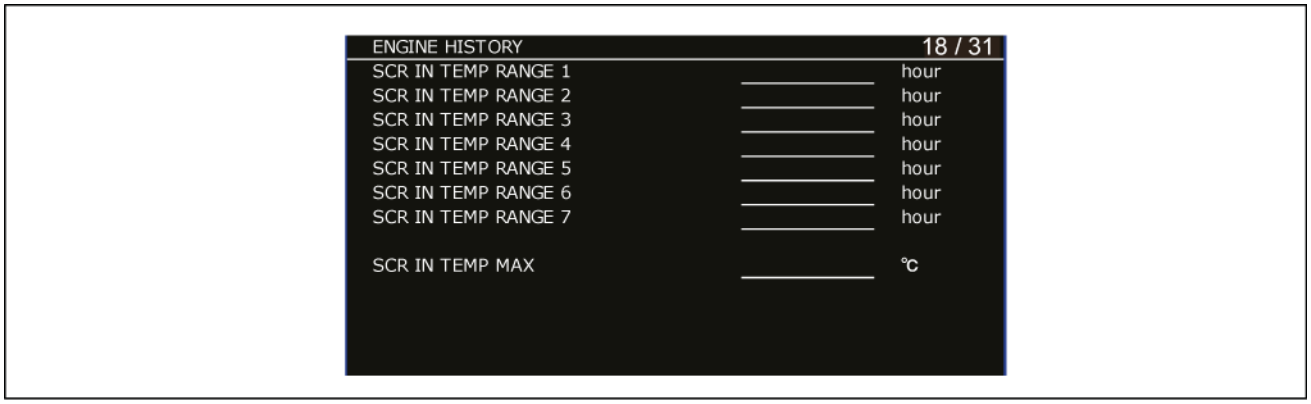

SMIL14CEX0990EA 80

Display	Explanation	Unit	Judgment condition	Judgment start condition
SCR IN TEMP RANGE 1	SCR inlet temperature; time distribution	hour	Less than **200 °C**	In **10 s** after the engine starts
SCR IN TEMP RANGE 2	SCR inlet temperature; time distribution	hour	Less than **300 °C**	In **10 s** after the engine starts
SCR IN TEMP RANGE 3	SCR inlet temperature; time distribution	hour	Less than **400 °C**	In **10 s** after the engine starts
SCR IN TEMP RANGE 4	SCR inlet temperature; time distribution	hour	Less than **500 °C**	In **10 s** after the engine starts
SCR IN TEMP RANGE 5	SCR inlet temperature; time distribution	hour	Less than **600 °C**	In **10 s** after the engine starts
SCR IN TEMP RANGE 6	SCR inlet temperature; time distribution	hour	Less than **700 °C**	In **10 s** after the engine starts
SCR IN TEMP RANGE 7	SCR inlet temperature; time distribution	hour	**700 °C** or more	In **10 s** after the engine starts
SCR IN TEMP MAX	Maximum value of SCR inlet temperature	°C (°F)	–	In **10 s** after the engine starts

COMMU. TERMINAL

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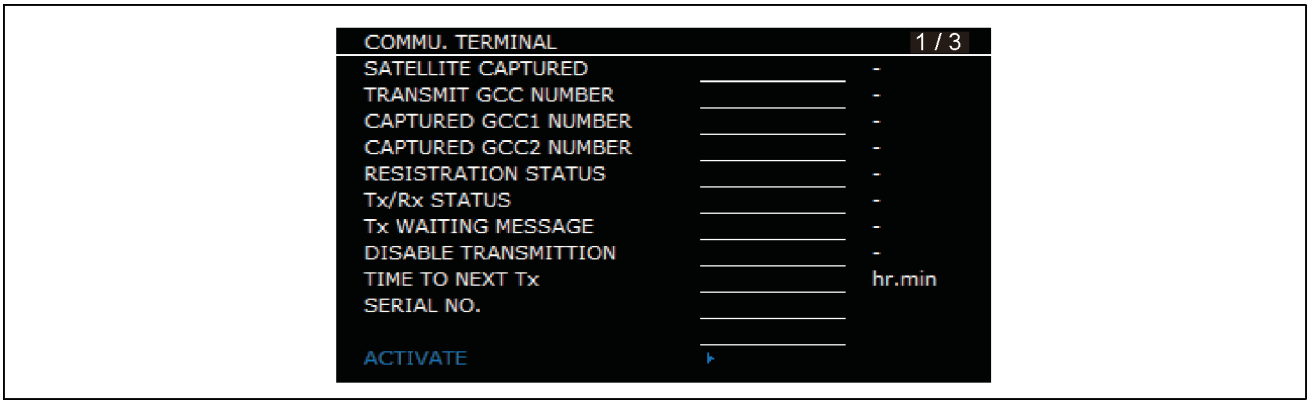


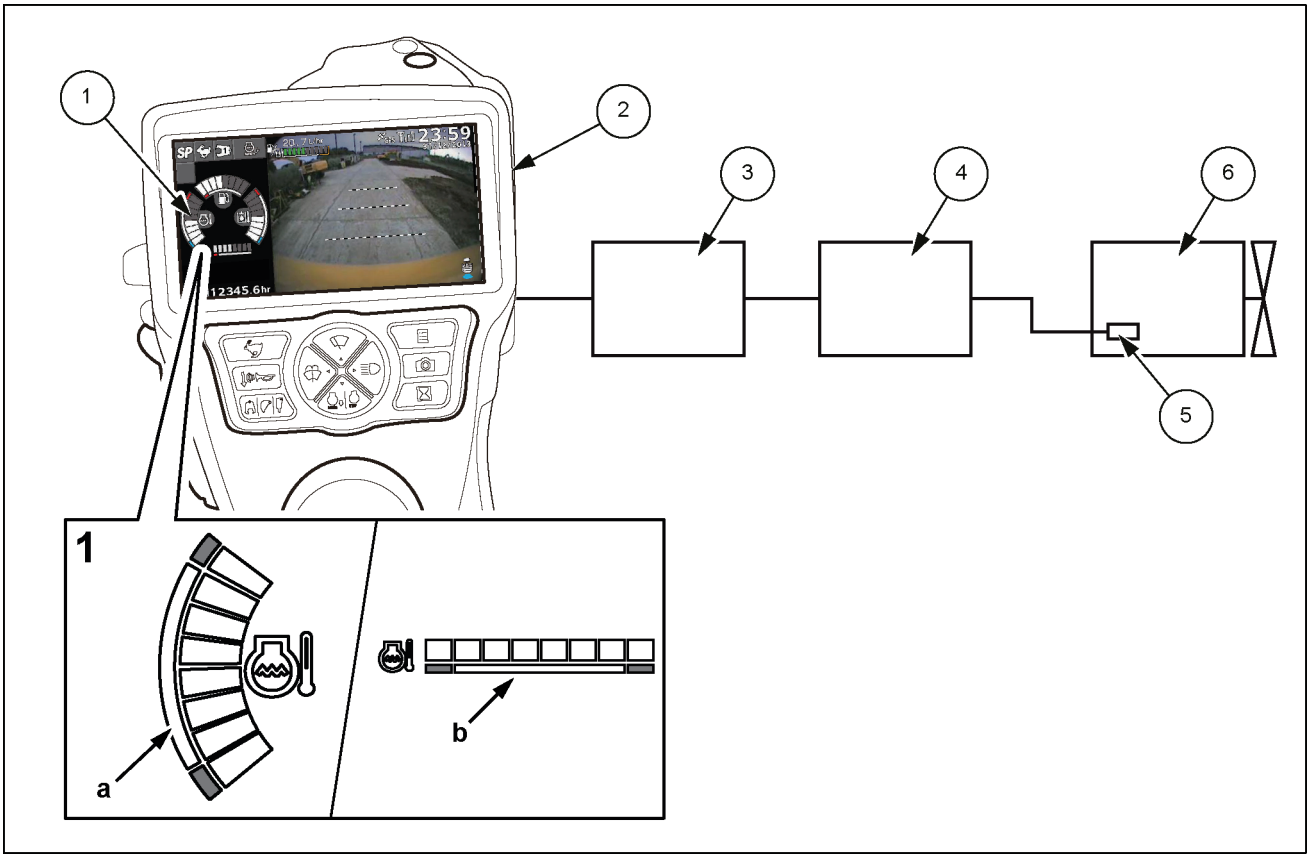
SMIL14CEX1120EA 116

Display	Explanation	Range
SATELLITE CAPTURED	Satellite communication capture status 0: GPS non-operating 1: GPS positioning 2: 2D positioning status 3: 3D positioning status	0 - 3
TRANSMIT GCC NUMBER	Transmitting GCC number	0 - 130
CAPTURED GCC1 NUMBER	Captured GCC1 number	0 - 130
CAPTURED GCC2 NUMBER	Captured GCC2 number	0 - 130
RESISTRATION STATUS	Registration (initial setting communication) status	–
Tx/Rx STATUS	Transmitting/receiving status (Transmitting/ receiving/idling)	–
Tx WAITING MESSAGE	Number of messages waiting to be transmitted	–
DISABLE TRANSMISSION	Setting to disable transmission	–
TIME TO NEXT Tx	Time to next transmission	hr.min
SERIAL NO.	Serial number of terminal	
ACTIVATE		

Instrument cluster - Dynamic description - Coolant temperature gauge

Purpose/overview

Coolant temperature is displayed as the number of illuminated segments (level).



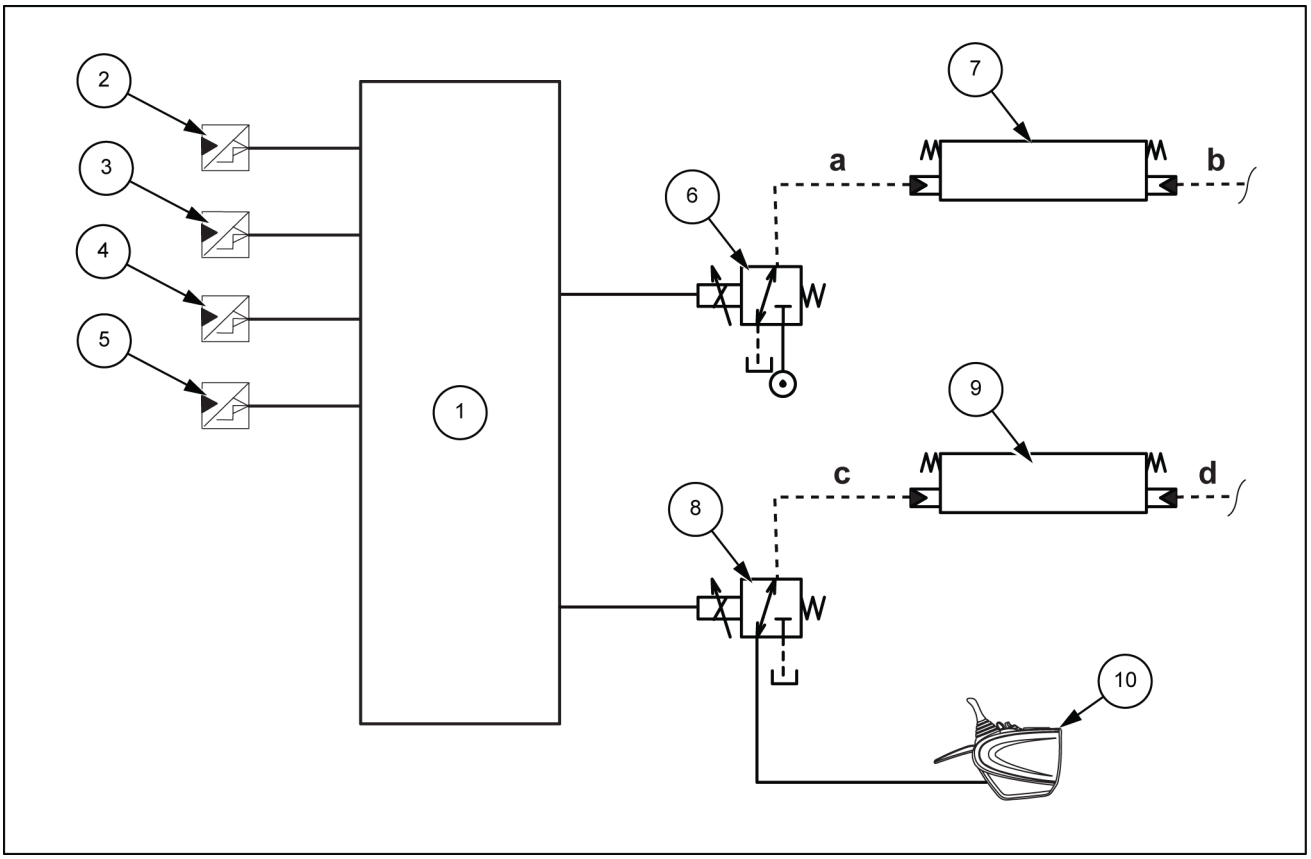
SMIL14CEX3416FB 1

1. Coolant temperature gauge
2. Monitor
3. Main controller
4. ECM
5. Coolant temperature sensor
6. Engine
a. Vehicle information; left side display
b. Vehicle information; upper side display

STROKE CONTROL

Purpose/overview

Strokes of the boom regeneration spool and the bucket spool are controlled in order to reduce pressure loss during digging and to improve operability.



SMIL14CEX1050FB 5

a. Boom 2 down
b. Boom 2 up
c. Bucket close
d. Bucket open

1. Main controller
2. Pressure sensor (boom up)
3. Pressure sensor (arm in)
4. Pressure sensor (bucket close)
5. Pressure sensor (travel)
6. Boom regeneration electromagnetic proportional value
7. Boom 2 spool
8. Bucket electromagnetic proportional valve
9. Bucket spool
10. Remote control valve

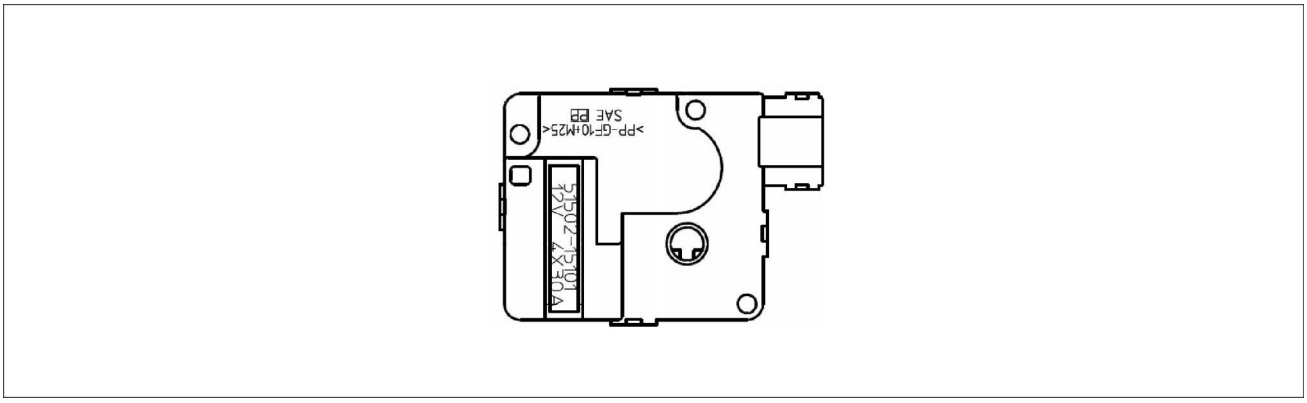
Operation:

The controller judges condition of digging work based on signal of the pressure sensors (boom, arm, bucket or travel) and controls the electromagnetic proportional valve to control stroke of the spool.

Boom up spool stroke control operation outline:

The boom 2 spool is pushed back at digging work (boom up).

Refresh/recirculate actuator

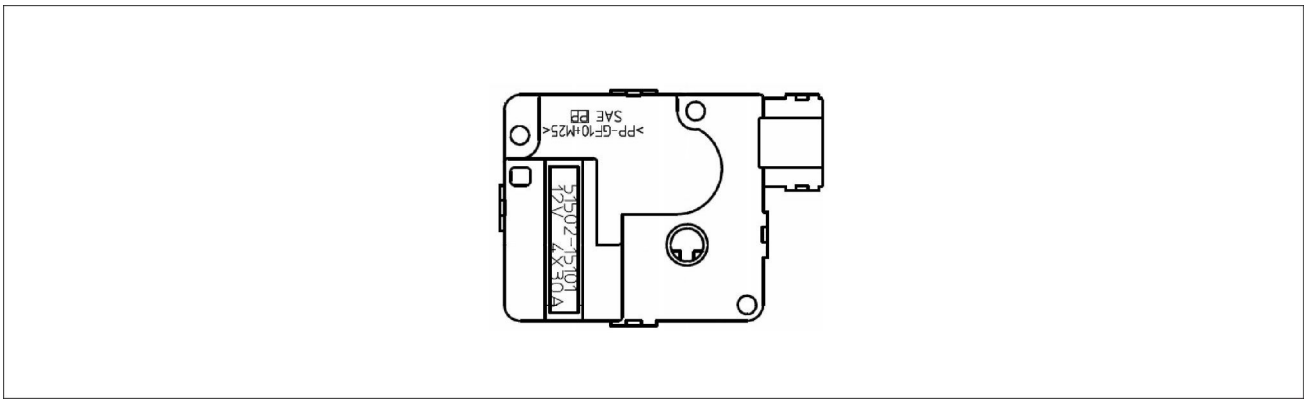


SMIL17CEX1148EA 6

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

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

Mode switch actuator



SMIL17CEX1148EA 7

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

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

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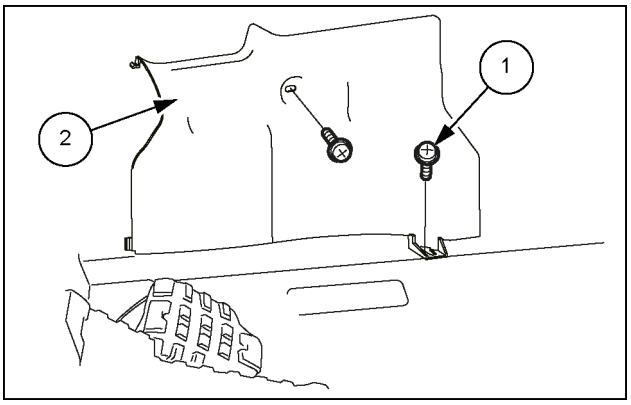
Electrical systems - 55

Swing control system - 416

Windshield wiper motor - Remove

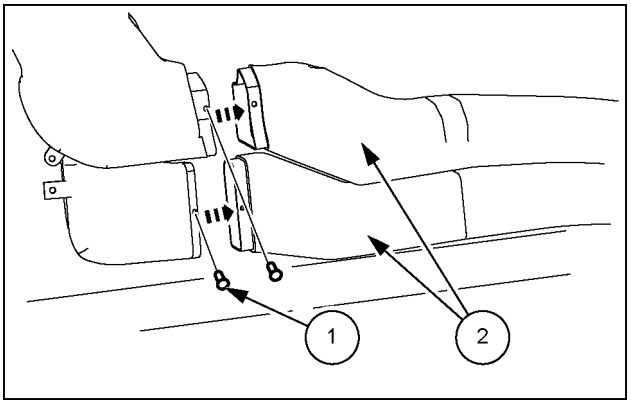
1. Use a Phillips screwdriver or box wrench [**10 mm**] to remove the 2 bolts **(1)**, and then remove the side front lower trim **(2)**.

   Tightening torque for bolt **(1)** installation: **5.9 – 7.8 N·m** (**4.4 – 5.8 lb ft**)



SMIL14CEX1921AB 1

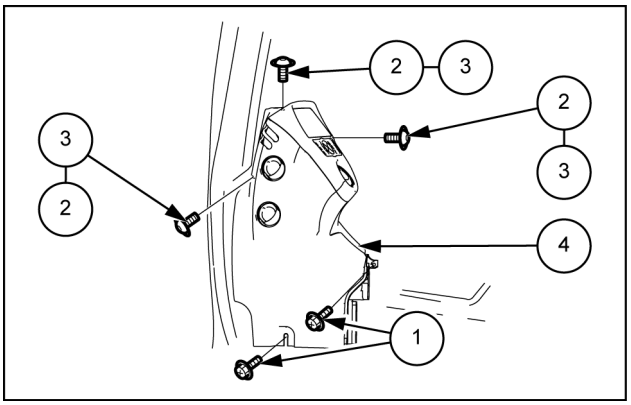
2. Use a flathead screwdriver or longnose pliers to remove the clip pins **(1)**, and then remove ducts B **(2)**.



SMIL14CEX1922AB 2

3. Use a Phillips screwdriver or box wrench [**10 mm**] to remove the 2 bolts **(1)**, use a hexagon wrench [**5 mm**] to remove the 3 bolts **(2)** and 3 washers **(3)**, and then remove the front upper trim assembly **(4)**.

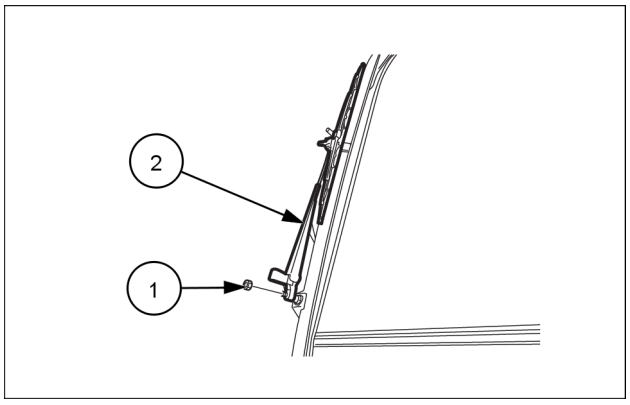
   Tightening torque for bolt **(1)** installation: **5.9 – 7.8 N·m** (**4.4 – 5.8 lb ft**)



SMIL14CEX1923AB 3

4. Use a wrench [**17 mm**] to remove the 1 nut **(1)**, and then remove the wiper arm **(2)**.

   Tightening torque for installation: **12 – 16 N·m** (**8.85 – 11.80 lb ft**)



SMIL17CEX1170AA 4

Contents

Electrical systems - 55

FAULT CODES - DTC

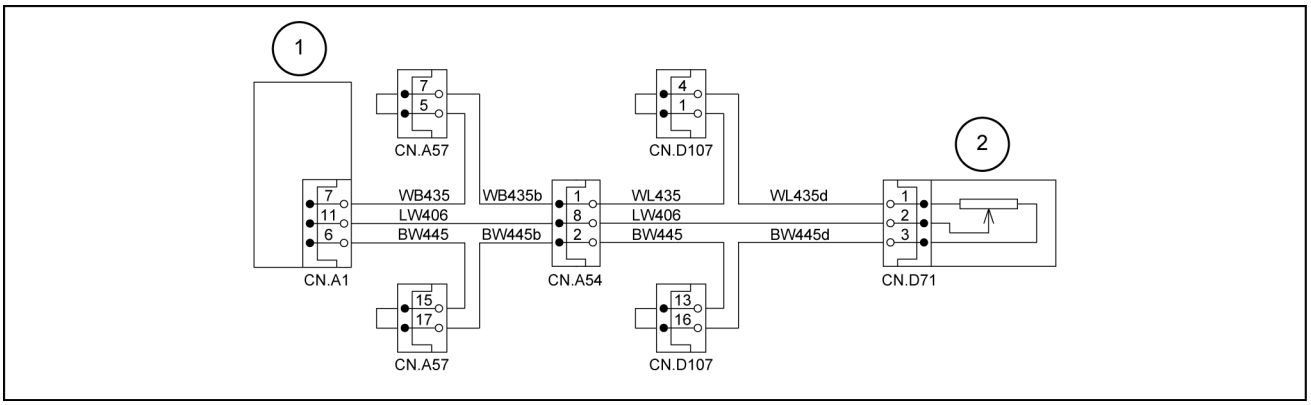
DIAGNOSTIC

7068 - Pressure sensor boom-down pilot abnormality

Control Module: MCM

Solution:

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



SMIL17CEX6451EA 1

1. Main controller
2. Pressure sensor (boom down)

Turn the key switch ON.

A. If diagnostic trouble code 7068 is displayed, proceed to Step **2**.

2. Turn the key switch OFF.

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

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

Turn the key switch ON.

A. If diagnostic trouble code 7068 is displayed, proceed to Step **3**.

3. Check the boom down pilot pressure **(2)** voltage on the service support screen.

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

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

4. Turn the key switch OFF and disconnect the pressure connector **CN.D71**.

Turn the key switch ON.

Measure the voltage between the ground and terminal 1 of the boom down pilot pressure sensor **(2)** connector **CN.D71** (harness side).

A. If the voltage is not about **5 V**, find and replace the short circuit on the wire ID WL435d, WL435, WB435b and WB435.

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

5. Measure the voltage between the ground and terminal 2 of the boom down pilot pressure sensor **(2)** connector **CN.D71** (harness side).

A. If the voltage is more than **4.75 V**, find and replace the short circuit on the wire ID LW406.

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

Inspect for continuity between the terminal 1 of the connector **CN.D114** harness side and terminal 6 of the connector **CN.A2** harness side.

A. If there is no continuity, repair or replace the GR905a harness.

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

7. Inspect for continuity between the terminal 2 of the connector **CN.D114** harness side and terminal 27 of the connector **CN.A2** harness side.

   A. If there is no continuity, repair or replace the GW905b harness.

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

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

5. Turn the key switch ON.

   A. If diagnostic trouble code 7621 is not displayed, replace the air conditioner panel **(2)**.

   B. If diagnostic trouble code 7621 is displayed, replace the main controller **(1)**.

P0123 - Throttle position sensor, high input

Control Module: ECM

Solution:

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

   Diagnostic trouble code P06A8

2. Turn OFF the starter switch.

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

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

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

      NOTE:
      • There should be no short to the battery or ignition power supply.
      • There should be no short to the 5 V power supply.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

   Use the device test on the service monitor to perform SCR purging. Refer to "Service Monitor - Device Test - SCR RE-GEN".

7. Confirm resolution:

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

   2. Turn OFF the starter switch for at least **60 s**.

   3. Start the engine.

Compare the EGR position 1 display with the desired EGR opening position display on the trouble diagnosis scan tool and observe whether the difference is within the specified range.

A. If the reading is outside the **0 – 5%**, replace the EGR valve. (Refer to " **Exhaust Gas Recirculation (EGR) valve - Remove (10.501)** and **Exhaust Gas Recirculation (EGR) valve - Install (10.501)**")

8. Confirm resolution:

1. Clear the diagnostic trouble code using the trouble diagnosis scan tool.
2. Turn OFF the ignition switch for at least **60 s** or more.
3. Start the engine.
4. Perform a test-run under the conditions for running the diagnostic trouble code.

NOTE: *Conditions for setting engine run time or coolant temperature vary depending on the diagnostic trouble codes.*

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

P0658 - Actuator supply voltage circuit

Control Module: DCU

Solution:

1. Turn OFF the starter switch.

   Disconnect the coolant control valve harness connector **CN.D40**.

   Inspect the coolant control valve harness connector **CN.D40**.

   NOTE:
   • Make sure that there should be no intermittent conditions, poor connections, or corrosion.
   • Make sure that there should be no water intrusion or adhering foreign material.

   A. If a problem is found, repair the connector **CN.D40**.

   B. If there are no problems, proceed to Step **2**.
2. Turn ON the starter switch without starting the engine.

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

   If diagnostic trouble code P20B1 is set but P0658 is not set, replace the coolant control valve. (Refer to " **Coolant control valve - Remove (10.500)**" and " **Coolant control valve - Install (10.500)**")

   Turn OFF the starter switch.

   Disconnect the urea fluid supply module harness connector **CN.D38**.

   NOTE: *The urea fluid pump, reverting valve, and urea fluid pressure sensor are built in.*

   Inspect the urea fluid supply module harness connector **CN.D38**.

   NOTE:
   • Make sure that there should be no intermittent conditions, poor connections, or corrosion.
   • Make sure that there should be no water intrusion or adhering foreign material.

   A. If a problem is found, repair the connector **CN.D38**.

   B. If there are no problems, proceed to Step **3**.
3. Turn ON the starter switch without starting the engine.

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

   If diagnostic trouble code P20A0 and P20B1 are set but P0658 is not set, replace the urea fluid supply module. (Refer to " **Diesel Exhaust Fluid (DEF)/AdBlue®/ARLA tank - Remove (10.500)**" and " **Diesel Exhaust Fluid (DEF)/AdBlue®/ARLA tank - Install (10.500)**")

   Inspect the battery voltage supply circuit between the DCU and the coolant control valve for a short to any metallic components, such as the frame.

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

   B. If there are no problems, proceed to Step **4**.
4. Inspect the battery voltage supply circuit between the DCU and the urea fluid supply module.

   NOTE:
   • Make sure that there should be no short to other GND circuits.
   • Make sure that there should be no short to other power supply circuits.

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

P1491 - Urea fluid overpressure

Control Module: DCU

Solution:

1. Check and diagnose the below fault code before you proceed with the diagnostic code P1491.

   Diagnostic trouble code P204B
   Diagnostic trouble code P204C
   Diagnostic trouble code P204D
   Diagnostic trouble code P208B

   NOTE: *If diagnostic trouble code P20E9 is set as a current failure or past failure at the same time, treat that first.*

2. Inspect the backflow piping between the urea fluid supply module and the urea fluid tank.

   NOTE:
   • Make sure that there should be no clogging caused by twisting or bending.
   • Make sure that there should be no clogging caused by foreign material.
   • Make sure that there should be no clogging caused by urea fluid freezing.
   • Make sure that there should be no layout changes in the urea fluid piping that differ from the specified layout.

   ⚠ CAUTION:
   Do not blow air onto the urea fluid connector on the urea fluid supply module.

   A. If a problem is found, repair or replace the backflow pipe.

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

3. Inspect the urea fluid sensor backflow line.

   NOTE:
   • Make sure that there should be no clogging caused by twisting or bending.
   • Make sure that there should be no clogging caused by urea fluid freezing.

   A. If a problem is found, replace the urea fluid supply module. (Refer to " **Diesel Exhaust Fluid (DEF)/AdBlue®/ ARLA tank - Remove (10.500)**" and " **Diesel Exhaust Fluid (DEF)/AdBlue®/ARLA tank - Install (10.500)**")

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

4. Inspect the backflow connector **CN.D38** of the urea fluid supply module.

   NOTE:
   • Make sure that check valve should not be clogged or stuck closed.
   • Make sure that there should be no clogging caused by deformation of the connector.

   A. If a problem is found, repair the backflow connector **CN.D38**. (Refer to " **Diesel Exhaust Fluid (DEF)/Ad-Blue®/ARLA tank - Remove (10.500)**" and " **Diesel Exhaust Fluid (DEF)/AdBlue®/ARLA tank - Install (10.500)**")

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

5. Turn OFF the starter switch.

   Disconnect the urea fluid supply module harness connector **CN.D38**.

   Inspect the urea fluid supply module harness connector **CN.D38**.

   NOTE:
   • Make sure that there should be no intermittent conditions, poor connections, or corrosion.
   • Make sure that there should be no water intrusion or adhering foreign material.

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

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

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

Wiring harnesses - Electrical schematic sheet 16 (55.100)

Wiring harnesses - Electrical schematic sheet 16 (55.100)

P242D - Exhaust gas temperature (EGT) sensor 3 circuit high voltage

Control Module: DCU

Solution:

1. Turn OFF the ignition switch.

   Disconnect the EGT sensor 3 harness connector **CN.D90-1**.

   Turn ON the ignition switch.

   Measure the voltage between the signal circuit and the DCU harness GND connection.

   If the reading is more than or equal to **5.2 V**, inspect the signal circuit between the DCU and EGT sensor 3 for a short to the battery or a short to the ignition power supply.

   NOTE: *EGT sensor 3 may be damaged if the sensor signal circuit is shorted to the power supply.*

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

   B. If there are no problems, proceed to Step **2**.
2. If the reading is less than **5.2 V**, inspect the signal circuit between the DCU and EGT sensor 3 for an open circuit or high resistance.

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

   B. If there are no problems, proceed to Step **3**.
3. Measure the voltage between the signal circuit and the GND circuit.

   If the reading is less than or equal to **4.6 V**, inspect the GND circuit between the DCU and EGT sensor 3 for an open circuit or high resistance.

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

   B. If there are no problems, proceed to Step **4**.
4. Inspect the EGT sensor 3 harness connector **CN.D90-1**.

   NOTE:
   • Make sure that there is no intermittent conditions, poor connections, or corrosion.
   • Make sure that there is no water intrusion or adhering foreign material.

   A. If a problem is found, repair the connector **CN.D90-1**.

   B. If there are no problems, proceed to Step **5**.
5. Replace EGT sensor 3. (Refer to " **Exhaust Gas Recirculation (EGR) temperature sensors - Remove - Temperature sensor 3 (55.989)** and **Exhaust Gas Recirculation (EGR) temperature sensors - Install - Temperature sensor 3 (55.989)**")

   NOTE: *If EGT sensor 3 is replaced, reset the EGT sensor 3 data with the trouble diagnosis scan tool.*

   Turn OFF the ignition switch.

   Disconnect the DCU harness connector **CN.D2**.

   Inspect the DCU harness connector **CN.D2**.

   NOTE:
   • Make sure that there is no intermittent conditions, poor connections, or corrosion.
   • Make sure that there is no water intrusion or adhering foreign material.

Contents

Booms, dippers, and buckets - 84

Dipper - Prepare

⚠ WARNING

Improper operation or service of this machine can result in an accident.
Raised equipment or machine movement without an operator can cause serious injury. Always do the following before performing any maintenance:
Park the machine on flat, level ground.
Lower the attachment to the ground.
Shut down the engine and remove the ignition key.
Lock the tracks.
Failure to comply could result in death or serious injury.

W0944D

⚠ WARNING

Improper operation or service of this machine can result in an accident.
Assign a supervisor to direct worksite operations. Agree on all safety measures, procedures, and suitable hand signals.
Failure to comply could result in death or serious injury.

W0287A

⚠ WARNING

Avoid injury!
Use Personal Protective Equipment (PPE), including protective goggles, gloves, and safety footwear.
Failure to comply could result in death or serious injury.

W1036A

⚠ 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

Items to prepare:

- Wrench [**19 mm**]
- Hammer
- Striking rod
- Nylon sling (with the required lifting capacity)
- Lifting equipment (with the required lifting capacity)
- Grease
- Rag
- Cleaning fluid
- Crosstie