

521G
Stage IV
Wheel Loader

SERVICE MANUAL

Part number 51428203
English
November 2017
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CASE
CONSTRUCTION

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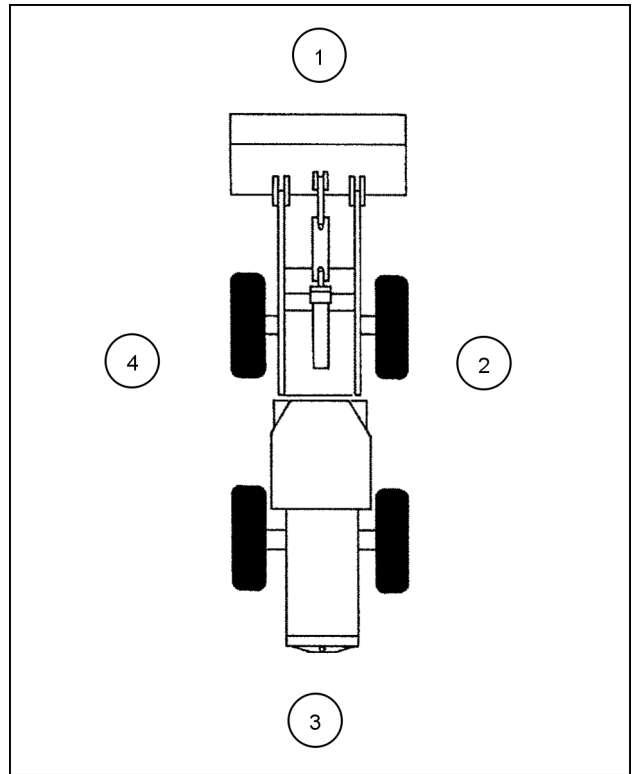
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Product identification

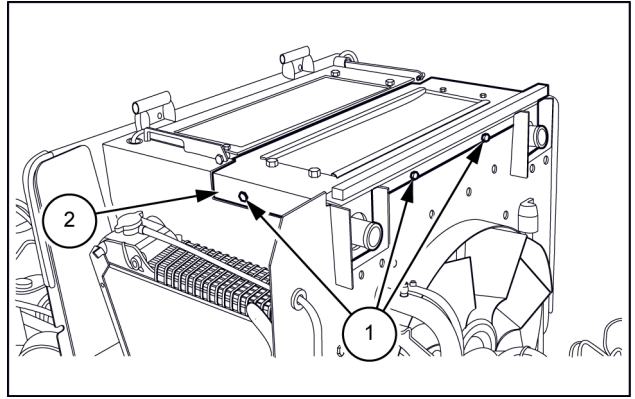
The terms right-hand, left-hand, front, and rear are used in this manual to indicate the sides as they are seen from the operator's seat.

1. Front
2. Right-hand
3. Rear
4. Left-hand



RCPH10WHL003BAH 1

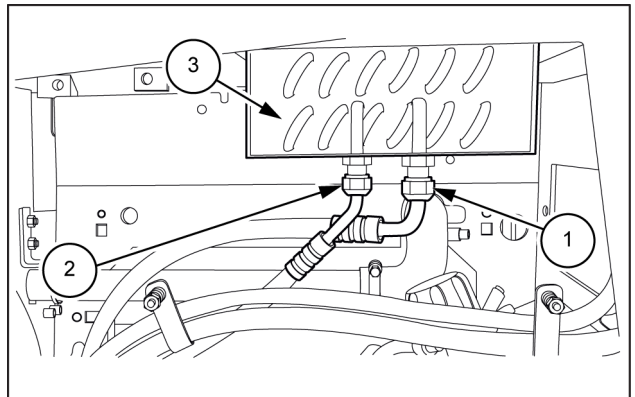
75. Remove the bolts (1), the washers, and the nuts. Remove the bracket (2) and the intercooler from the rear plate of the cooling system frame as an assembly.



LEIL15WHL0294AB 69

76. Disconnect and plug the hoses (1) and (2) from the air conditioning condenser (3).

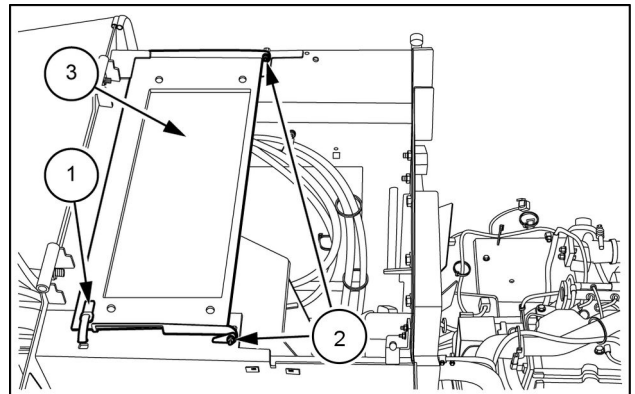
NOTE: pay attention to drain the refrigerant **R134A**.



LEIL15WHL0296AB 70

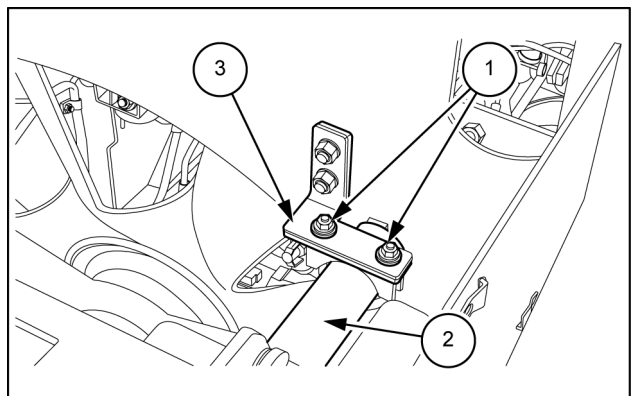
77. Unlatch the air conditioning condenser clamp (1).

78. Rotate the air conditioning condenser up. Remove the two retaining bolts (2), the washers, and the nuts located on each side. Move the air conditioning condenser (3) back from the cooling system frame.



LEIL15WHL0295AB 71

79. Loosen the flange nuts (1) to remove the upper radiator hose (2). Remove the bracket (3) that hold the upper radiator hose (2).



LEIL15WHL0293AB 72

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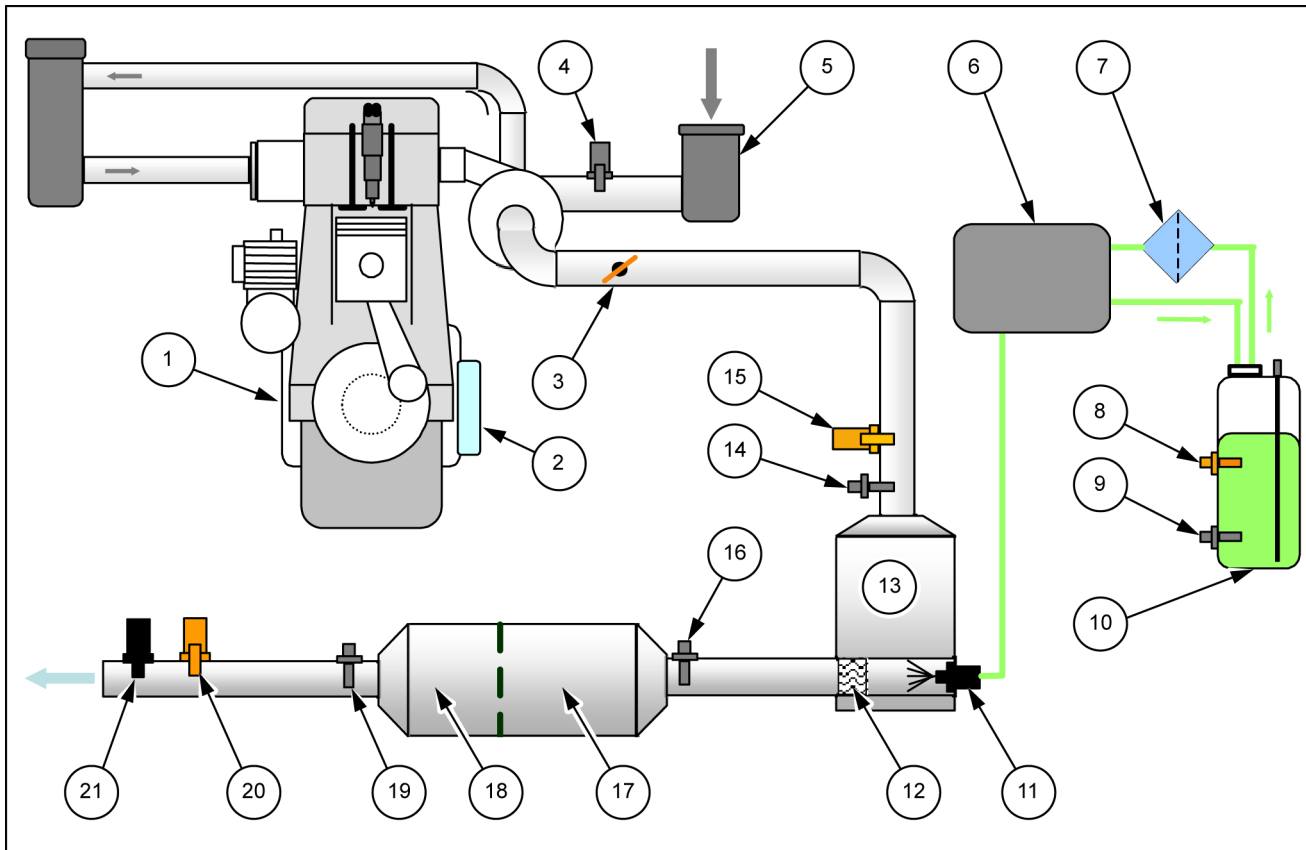
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Engine and crankcase - 001

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Control System Sensors

NOTE: emissions sensors in the exhaust system and on the vehicle may be damaged by vibrations from use of impact wrenches or hammers during service work. Avoid using these tools when servicing components close to the sensors. Remove the sensors with care if use of these tools cannot be avoided.

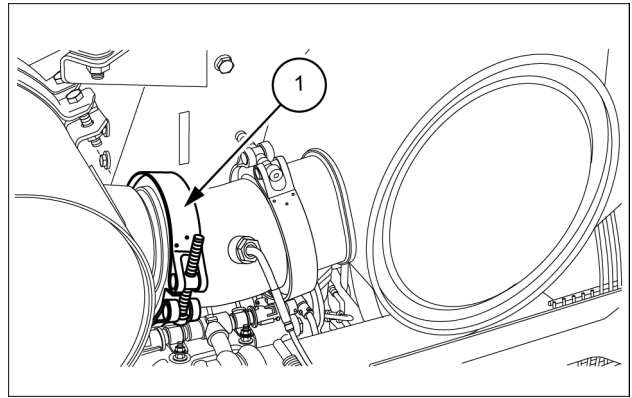


LEIL13WHL0189FB 10

- Humidity and Ambient Air Temperature sensor at engine intake. Ambient air humidity impacts the amount of NO_x generated. This humidity level is reported directly to the Engine Control Unit (ECU).
- **DEF/AdBLUE®** tank level and temperature sensor (9)
- The temperature of the **DEF/AdBLUE®** is important to the SCR control system. **DEF/AdBLUE®** freezes at **-11 °C (12 °F)**. It also degrades at elevated temperatures.
- If **DEF/AdBLUE®** is not injected or if it has been contaminated reduced engine power results. A **DEF/AdBLUE®** level sensor is installed in the tank and the AIC display shows that level.

4. Remove the clamp **(1)** and the gasket from Diesel Oxidation Catalyst (DOC) and Selective Catalytic Reduction (SCR) pipe connection. Discard the clamp and the gasket.

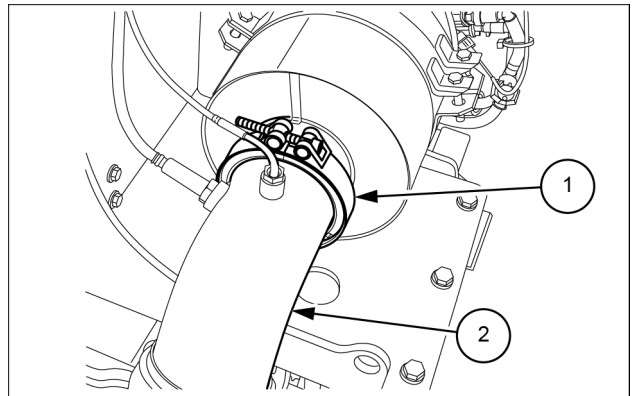
NOTE: gasket and clamp should be replaced every time the connection is disassembled.



LEIL15WHL0321AB 4

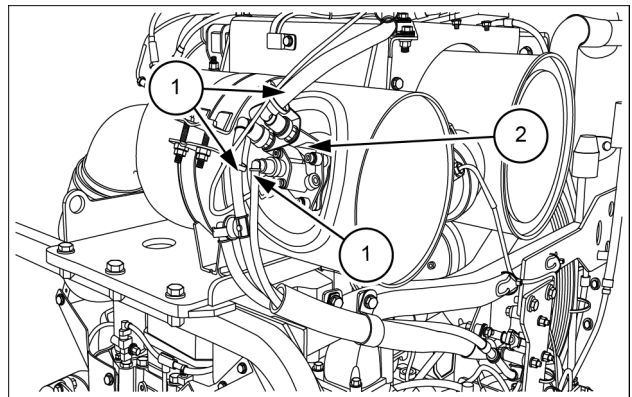
5. Loosen the clamp **(1)** on the Diesel Oxidation Catalyst (DOC) and disconnect the exhaust pipe **(2)** from the Diesel Oxidation Catalyst (DOC). Discard the clamp and the gasket.

NOTE: gasket and clamp should be replaced every time the connection is disassembled.



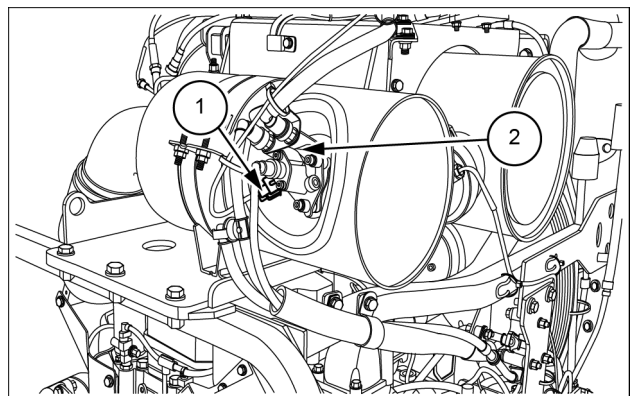
LEIL15WHL0322AB 5

6. Drain the engine coolant. Disconnect the hoses **(1)** from the Dosing Module **(2)**.



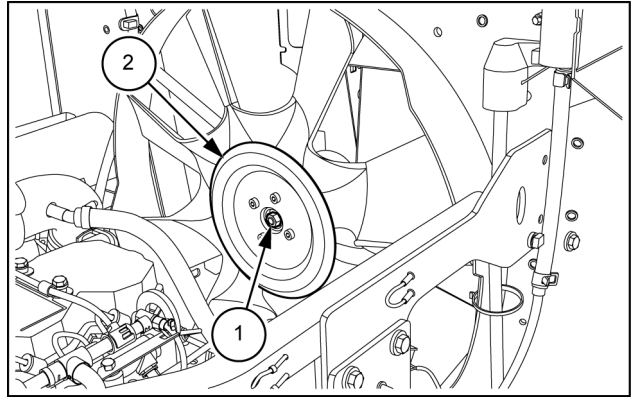
LEIL15WHL0323AB 6

7. Disconnect the electrical connector **(1)** from the Dosing Module **(2)**.



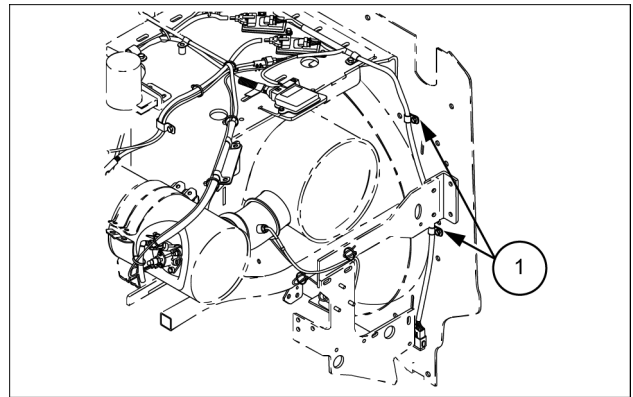
LEIL15WHL0176AB 7

10. Mark the fan hub (1) and fan blade (2).



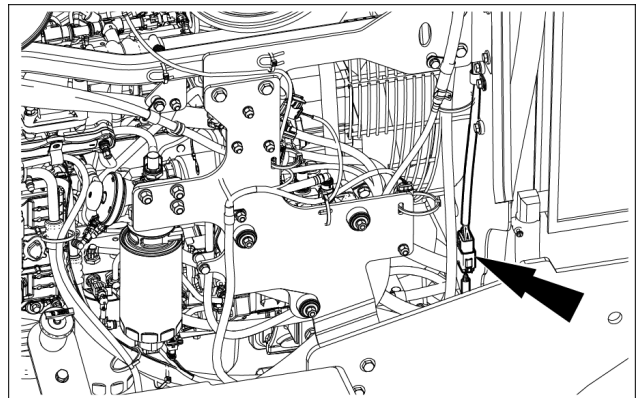
LEIL15WHL1424AB 8

11. Loosen the bolts (1) and remove the two clamps to separate the wiring harness from the rear chassis.



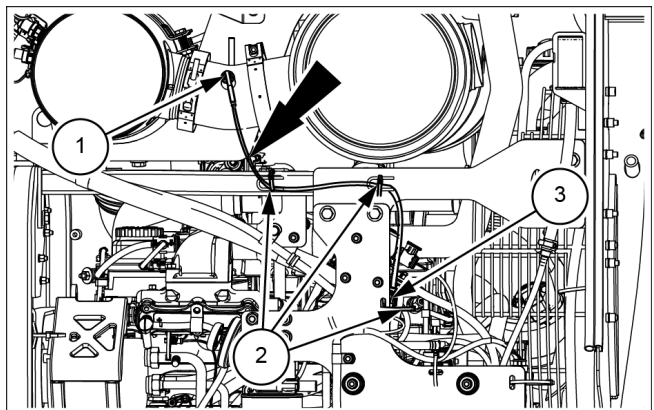
LEIL15WHL0272AB 9

12. Tag and disconnect the SCR sensor connector from the engine. Tag and disconnect the rear chassis harness connector.



LEIL16WHL1347AB 10

13. Loosen the hexagonal nut of the temperature sensor (1). Disconnect the temperature sensor (1) on the exhaust pipe (DOC to SCR). Tag and disconnect the wire harness (3) of the rear chassis wiring harness of the temperature sensor (1). Cut the straps (2) that hold the sensor lead.



LEIL16WHL1348AB 11

Aftercooler - Install

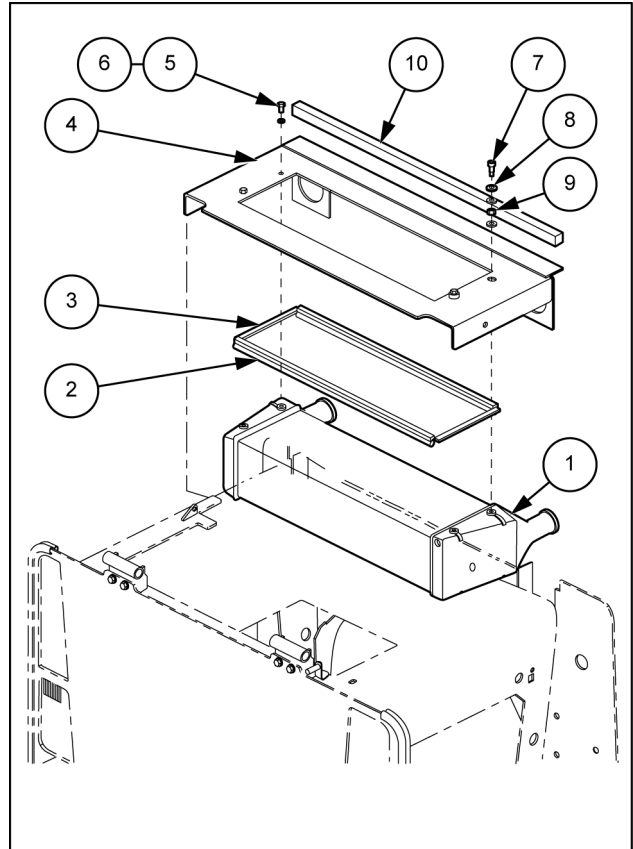
⚠ WARNING

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.

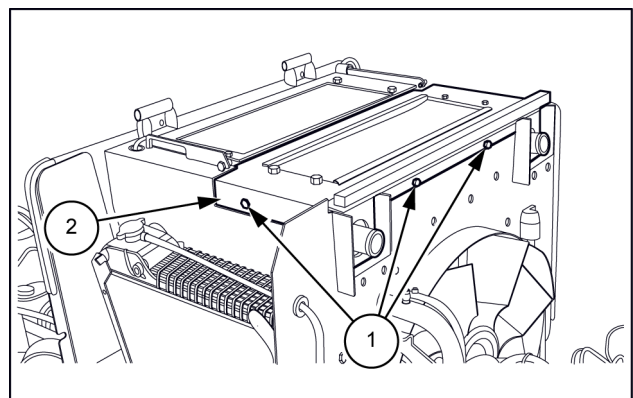
W0398A

1. Seal the aftercooler (1) to the bracket (4) with bulb and foam seals (2) and (3).
Install the two bolts (5) and the two spring lock washers (6).
Install the two hexagonal screws (7), with related washers (8) and springs poppet return (9).
Apply the foam seal (10) to the bracket (4).



LEIL15WHL1426BB 1

2. Place the aftercooler and its bracket in the correct position on the machine.
Install the bolts (1) to secure the bracket (2) on the rear plate of the cooling system frame.



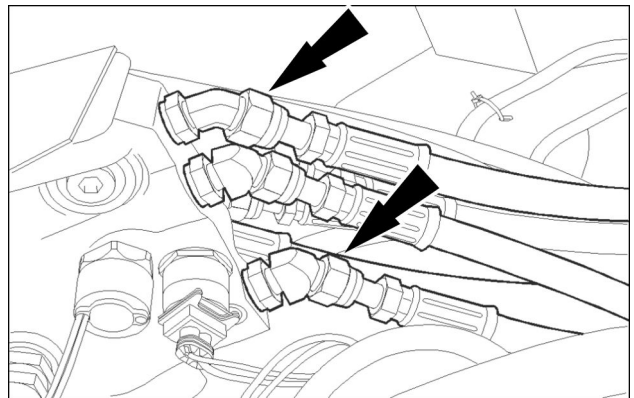
LEIL15WHL0294AB 2

Powershift transmission - Remove

1. Park the machine on a level surface and lower the bucket to the ground. Stop the engine and apply the parking brake.
2. Place the timed disconnect switch in the OFF position.
3. Apply articulation locking block to prevent accidental articulation of the machine.
4. Remove the cab.
5. Remove the hydraulic pump.
6. Put a suitable container under transmission drain plug. Remove drain plug and drain transmission oil. Install drain plug after oil has drained.

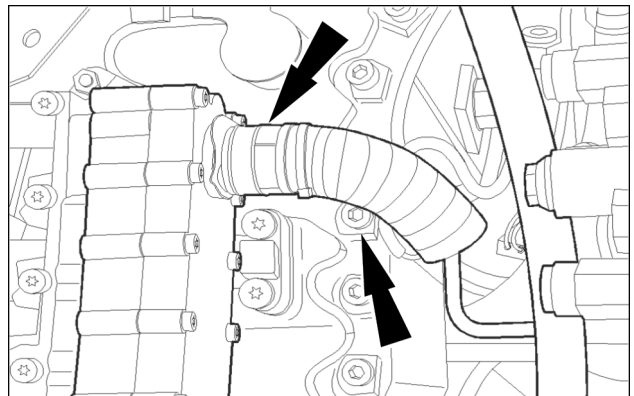
NOTE: follow local regulations when handling transmission oil.

7. Identify, tag, and disconnect the brake pump pressure hose and brake to hydraulic reservoir hose. Position hoses away from transmission. Remove and discard O-ring face seals from fittings and . Plug hoses and cap fittings to prevent entry of foreign matter into hydraulic system.



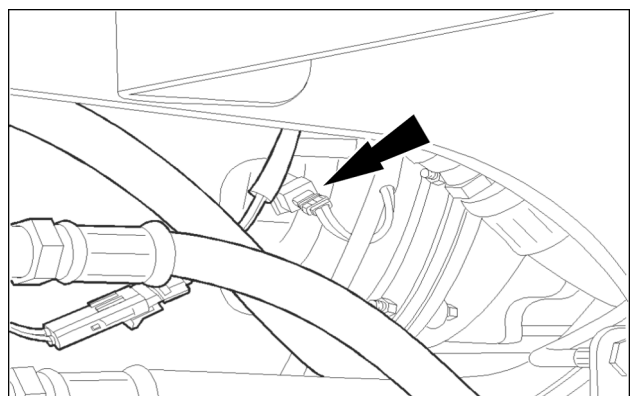
RAPH12WEL1948AA 1

8. Disconnect transmission wiring harness connector from control valve connector. Remove the socket head bolt securing the wiring harness clamp. Move wiring harness away from the transmission.



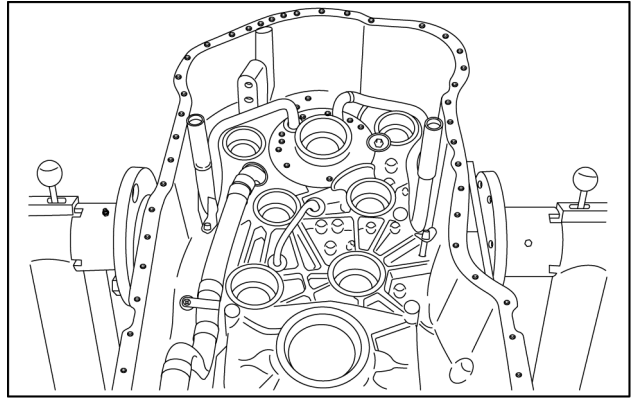
RAPH12WEL1952AA 2

9. Just above where clamp was installed, tag and disconnect transmission wiring harness connector from temperature sensor. Move wiring harness away from transmission.



RAPH12WEL1954AA 3

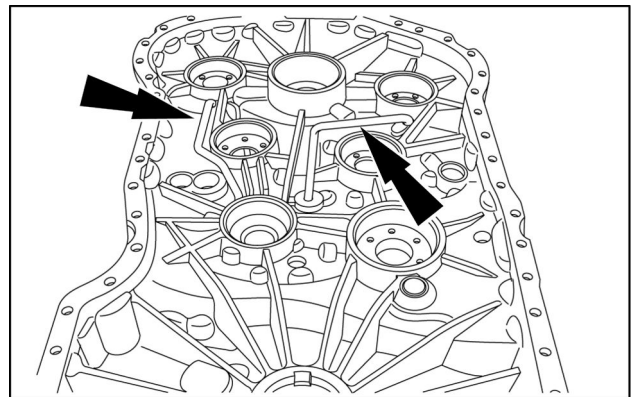
5. Install all the bearing outer races in the housing bores.



RAPH12WEL2026AA 4

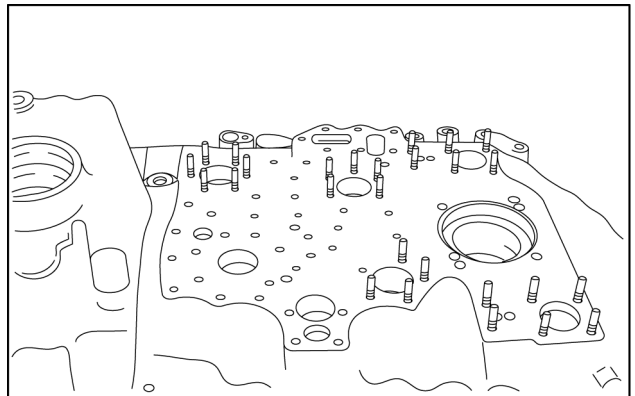
6. Install both of the oil pipes into the housing cover. Tilt the cover **180°**. Use a rolling tool to install the pipes into the housing bores.

NOTE: the pipe end of the pressure pipes must be slightly below the housing plane face.



RAPH12WEL2027AA 5

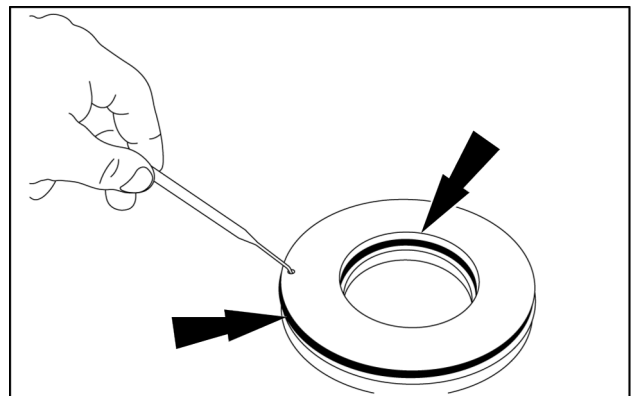
7. Install the studs. Torque the studs to **9 N·m (80 lb in)**.



RAPH12WEL2028AA 6

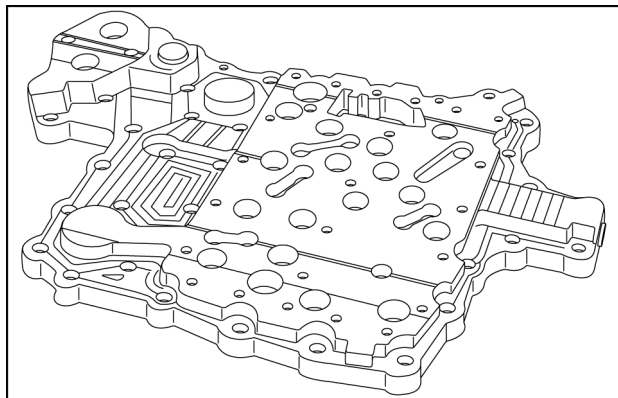
NOTE: the following steps are for the assembly of clutches KV and KR, beginning with the assembly of the clutch disc carrier.

8. Ensure that the drain hole is free and clear of debris. Install the O-rings into the piston grooves and apply oil.



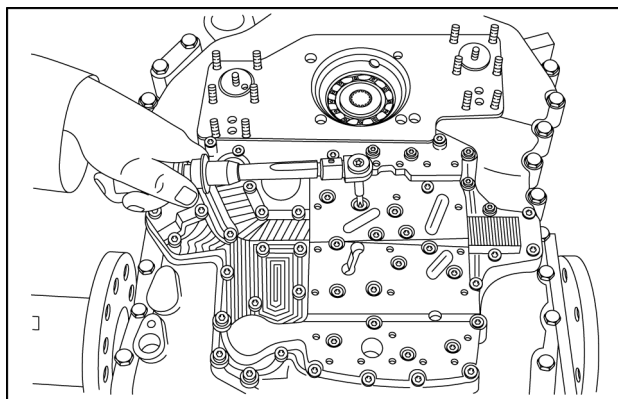
RAPH12WEL2029AA 7

116. Install new sealing rings and both of the plugs into the duct plate.



RAPH12WEL2104AA 108

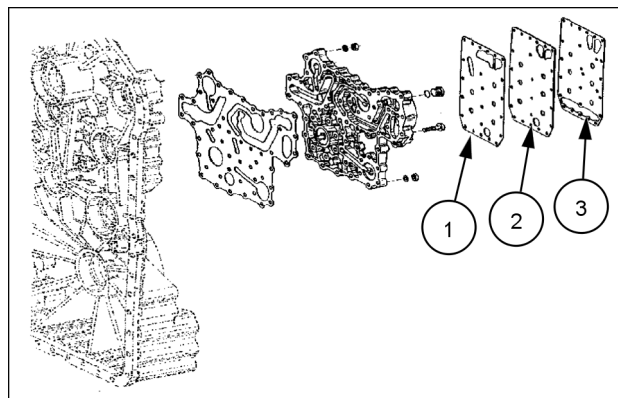
117. Install the gasket. Place the duct plate against the shoulder. Install the socket head screws and hex nuts. Torque the screws to **25 N·m (18 lb ft)**.



RAPH12WEL2105AA 109

NOTE: the following procedures are for the installation of the transmission control valve.

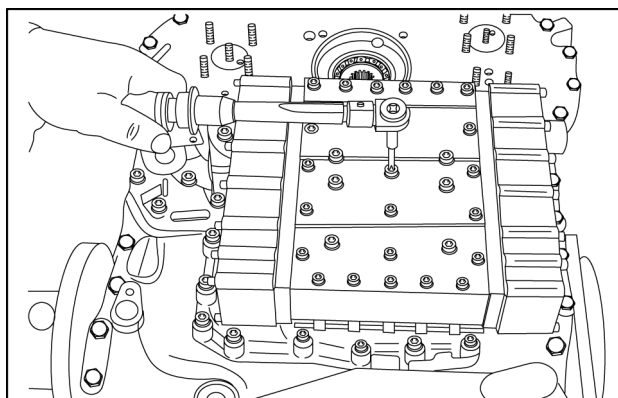
118. Install **380001577** transmission valve adjustment tool set. Be sure the hex rods (tool set component) are not installed on the studs. Mount the gasket (1), intermediate plate (2), and gasket (3).



RAPH12WEL1999AA 110

119. Install the screw plug with the new O-ring. Torque to **30 N·m (22 lb ft)**.

120. Install the control valve on the duct plate and **380001577** transmission valve adjustment tool set studs. Install the hex rods on the studs and tighten against the control valve. Install the 21 socket head screws. Torque the screws to **9.5 N·m (84 lb in)**. Remove the **380001577** transmission valve adjustment tool set. Install the remaining two socket head screws. Torque the screws to **9.5 N·m (84 lb in)**.



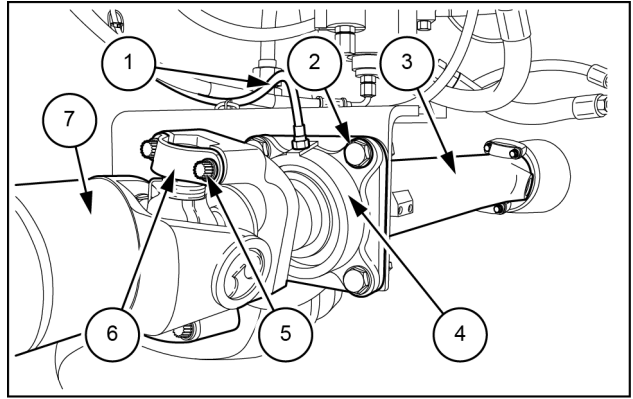
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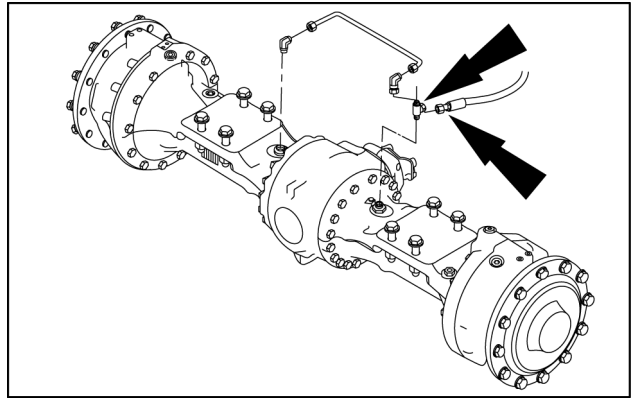
[23.314] Drive shaft.....	23.1
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5. Remove the clamp securing the lubrication hose (1) to the machine and the nut securing the opposite end of the hose (1). Remove the four bolts (5) and two straps (6) securing the center drive shaft (7) to the front drive shaft (3). Use a pry bar to separate the drive shafts. Support the center bearing (4) and the front drive shaft (3) and remove the four nuts, the bolts (2) and eight washers. Lower the carrier bearing and front drive shaft from mounting plate and remove from the machine.



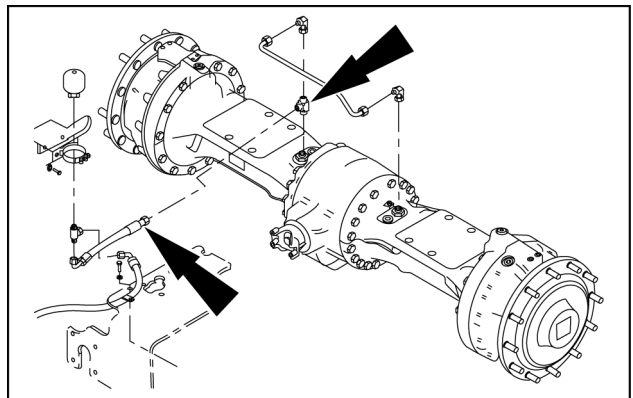
LEIL13WHL0572AB 4

6. For machines equipped with LSD axles (MT-3065-II without brake damping accumulators). From the front axle, disconnect the brake hose from the elbow. Remove and discard the O-ring face seal from the elbow.



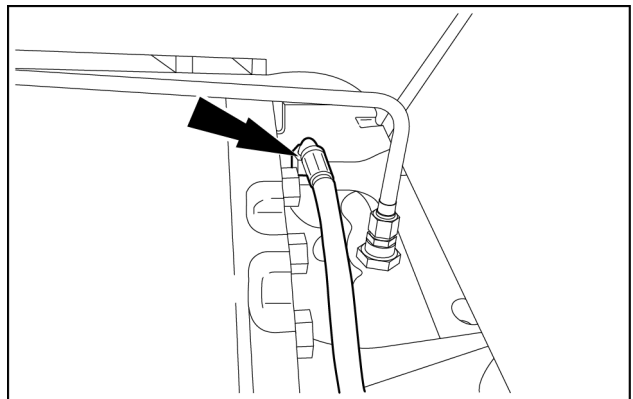
LEIL15WHL1232AA 5

7. For machines equipped with differential lock axles (MT-3075-II with brake damping accumulators), disconnect the brake line from the elbow at axle connection. Remove and discard O-ring face seal from elbow. To remove accumulator, also disconnect brake line and hose from the accumulator. Unbolt accumulator from the machine frame.



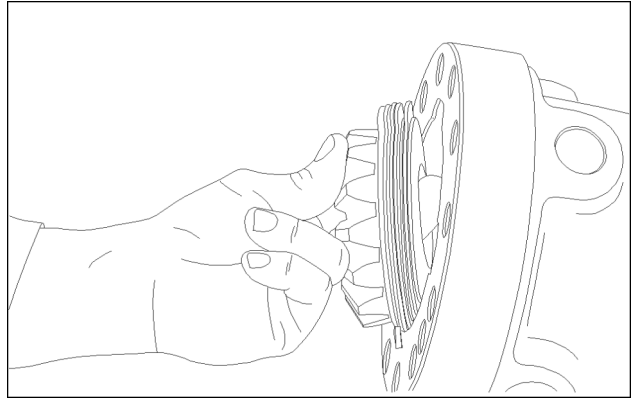
LEIL15WHL1233AA 6

8. For machines equipped with differential lock axles (MT-3075-II), disconnect the differential lock hose.

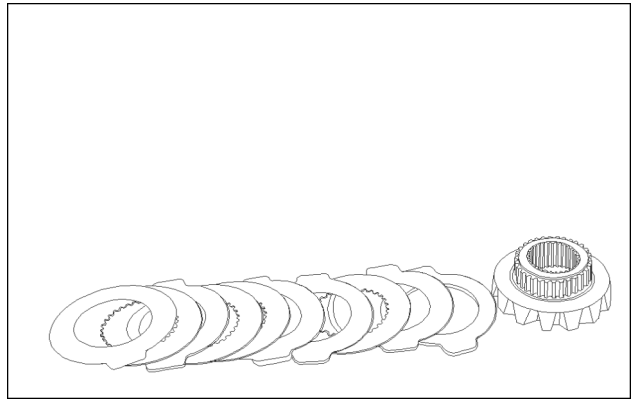


LEIL13WHL0570AB 7

10. Remove the inner set of clutch plates, thrust washer, and bevel gear from the differential housing.

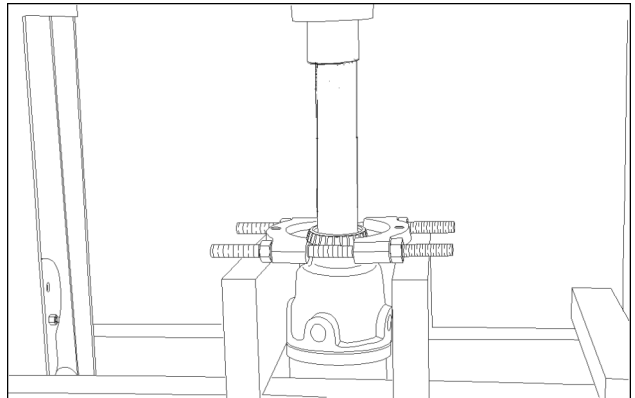


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RAPH12WEL2277AA 14

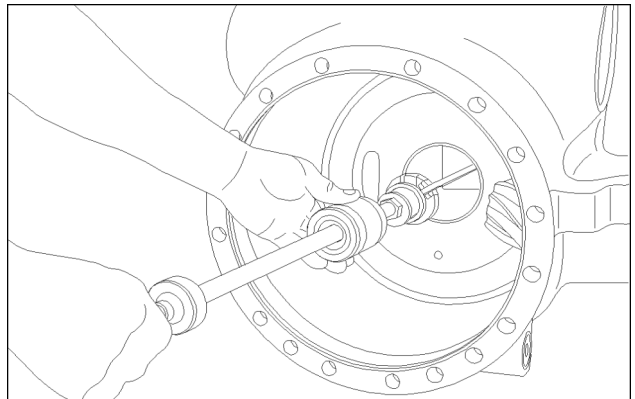
11. If required, use a suitable pliers and press to remove the bearing from the differential housing.



RAPH12WEL2269AA 15

12. Remove the bearing cups and shims from both axle housings.

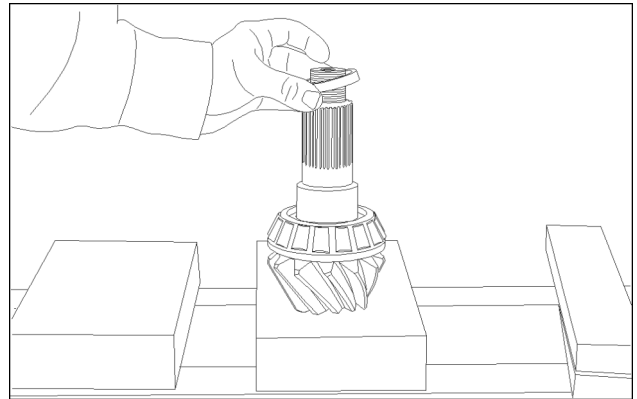
NOTE: Ensure shims are identified and remain associated with the axle housing they were removed from.



RAPH12WEL2193AA 16

Differential - Adjust - Bearing Rolling Torque

1. Install a **9.03 mm (0.356 in)** thick space on the pinion shaft.



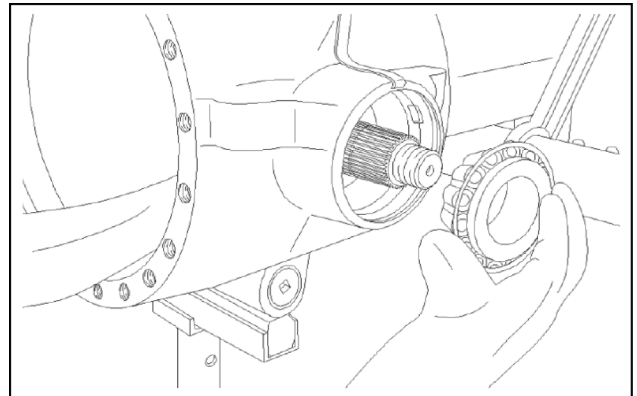
2. **⚠ CAUTION**

Burn hazard!
Always wear heat-resistant protective gloves when handling heated parts.
Failure to comply could result in minor or moderate injury.

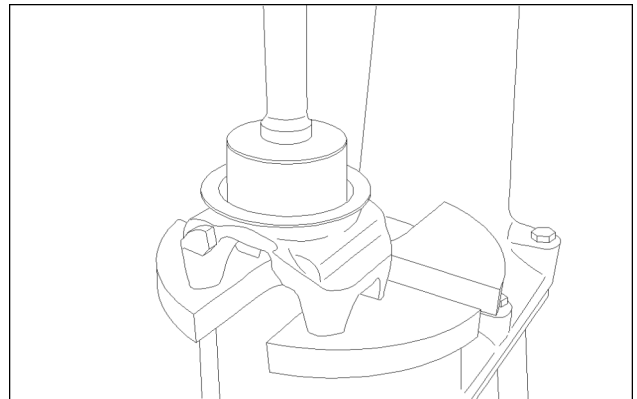
C0047A

Heat the pinion shaft outer bearing to **120 °C (248 °F)** in a bearing oven. Install the bearing on the pinion shaft until contact is made.

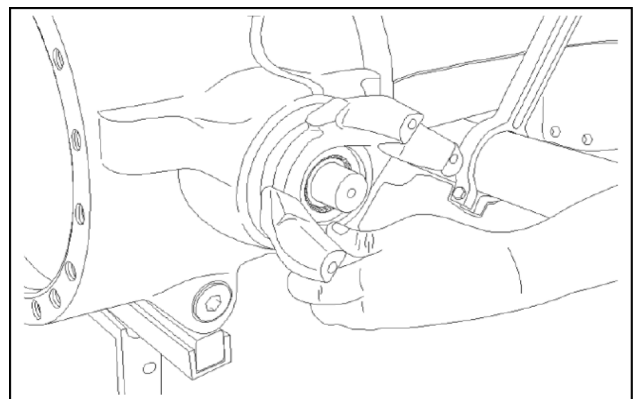
NOTE: allow the bearing to cool to ambient temperature before mounting the input flange and tightening the nut.



3. Press the dust shield on the input flange.



4. Install the input flange on the pinion shaft.

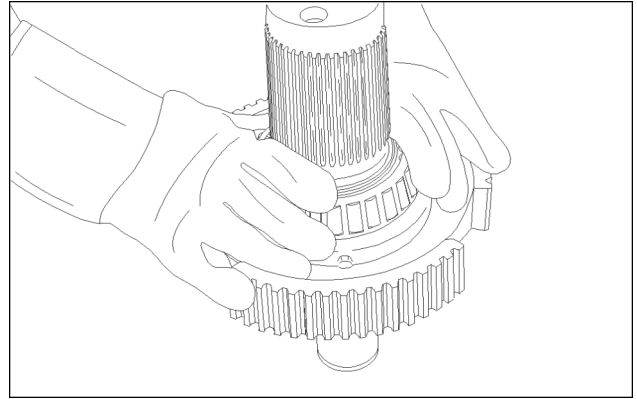


22. **CAUTION**

Burn hazard!
Always wear heat-resistant protective gloves when handling heated parts.
Failure to comply could result in minor or moderate injury.

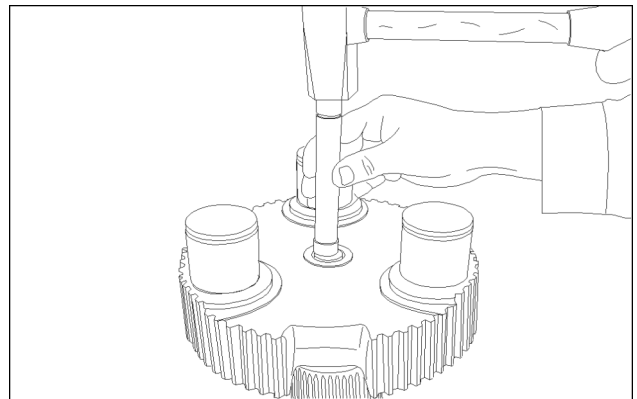
C0047A

Heat the carrier output shaft to **120 °C (248 °F)** in a bearing oven. Use heat resistant protective gloves to install the bearing on the wheel end shaft until the bearing is against the carrier gear.



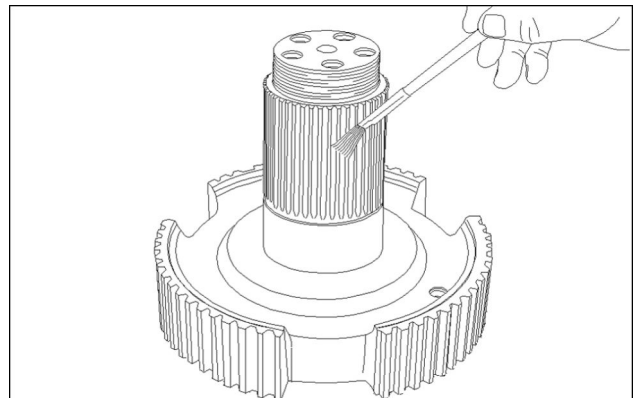
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23. Install a new stop pin if damaged or worn.



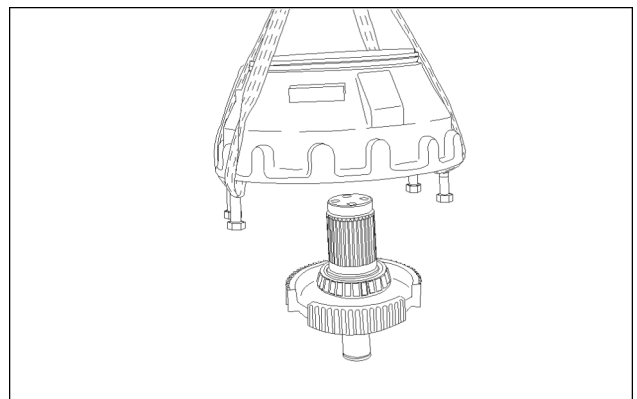
RAPH12WEL2183AA 26

24. Coat the spline of the carrier output shaft with **LOCTITE® SILVER GRADE ANTI-SEIZE** lubricant.



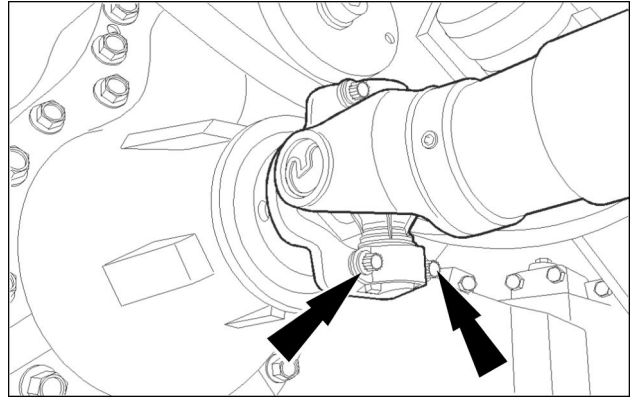
RAPH12WEL2336AA 27

25. Attach an acceptable lifting device to the brake housing. Insert the brake housing onto the carrier output shaft.



RAPH12WEL2260AA 28

16. Connect the rear drive shaft to the rear axle. Install two straps and four bolts. Torque the bolts to **61 – 81 N·m (45 – 60 lb ft)**.

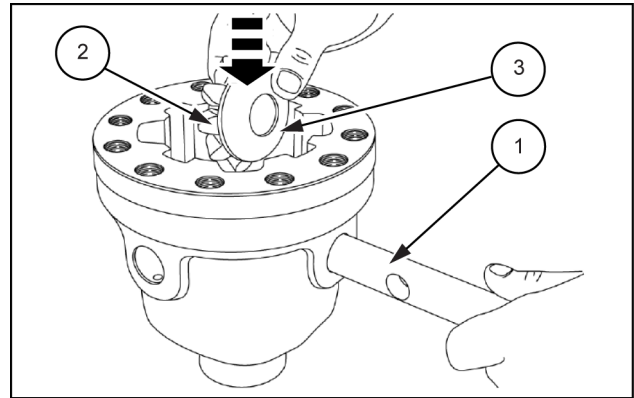


RAPH12WEL1973AA 13

17. Ensure the axle is filled to the proper level with gear lubricant. If required, fill axle to correct level following specifications.
18. Bleed the brakes following the correct procedures.
19. Put the articulation lock into the OPERATING position.

5. Insert the spider shaft (1) into the differential to mount the two spider gears (2) with thrust washers (3).

NOTE: insert the thrust washers with the tabs facing upwards and located in recess.

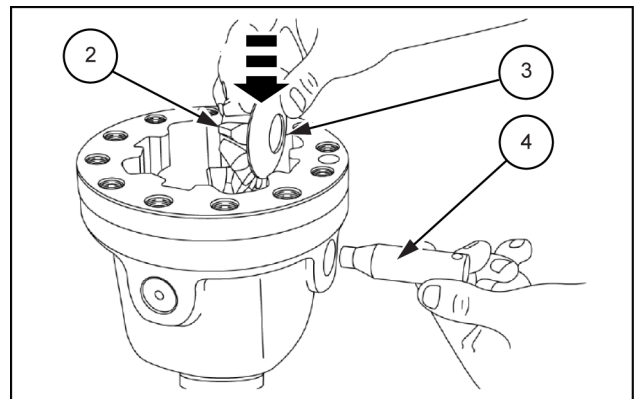


LEIL15WHL1269AB 5

6. Install the split spider shaft (4) with the spider gears (2) and the thrust washers (3).

NOTE: insert the thrust washers with the tabs facing upwards and located in recess.

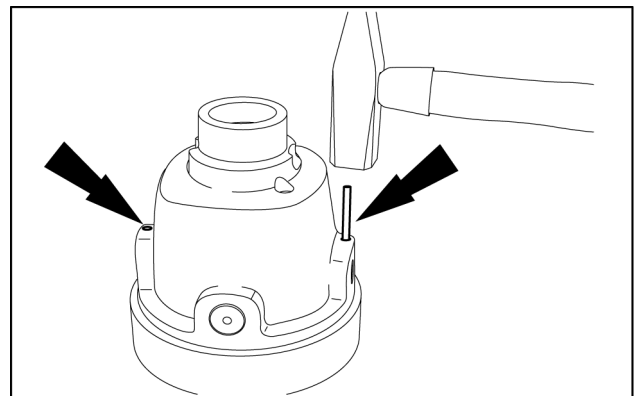
NOTE: refer to illustration for the correct installation position of the spider shaft/halves, specifically the slotted pin/location holes of the spider shaft towards the differential carrier.



LEIL15WHL1270AB 6

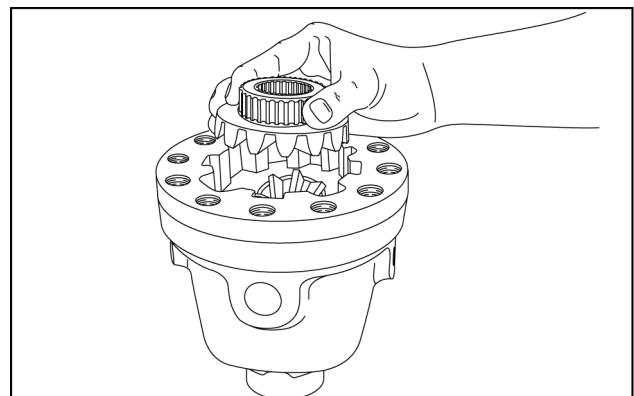
7. Secure the spider shaft half using the double-slotted pins as illustrated.

NOTE: ensure the double-slotted pins are installed with the slots 180° offset from each other.



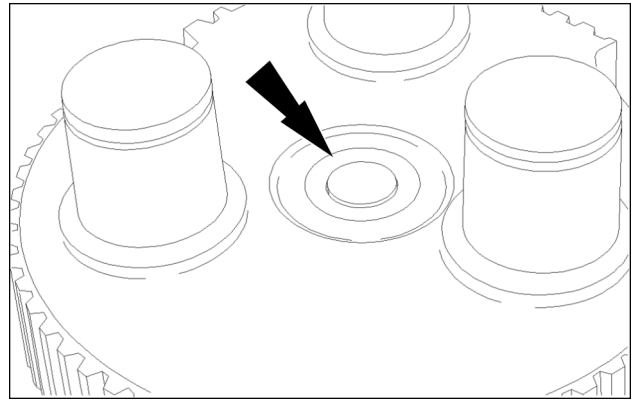
RAPH12WEL2371AA 7

8. Insert the second axle bevel gear into the differential carrier.

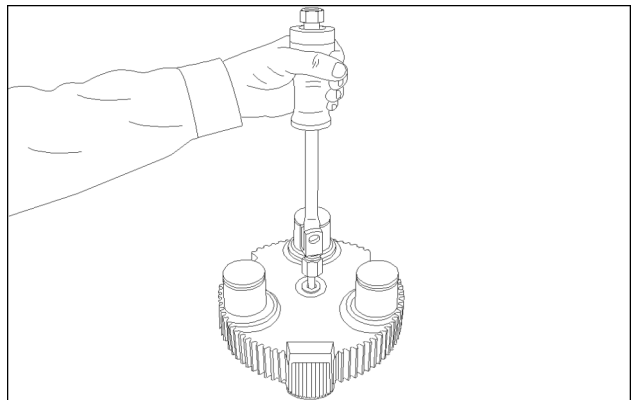


RAPH12WEL2372AA 8

18. Inspect the stop pin for excessive wear or damage. Remove the stop pin using a suitable adapter and a suitable striker. If necessary, drill a hole in the stop pin to aid in removal.

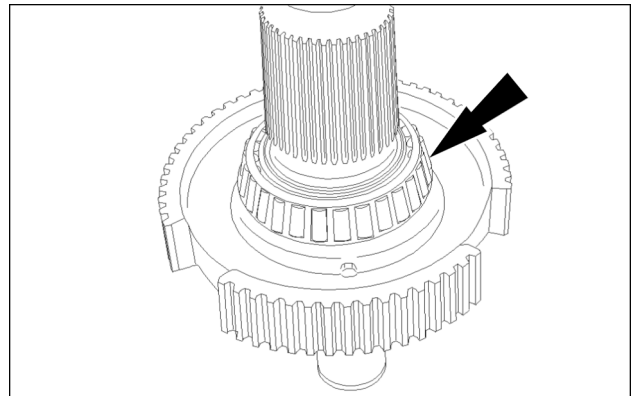


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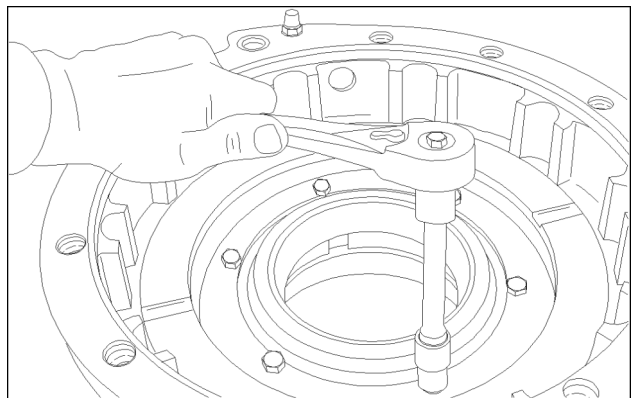
RAPH12WEL2806AA 21

19. Inspect the wheel bearing for excessive wear or damage. If damaged, use a die grinder to score and remove the bearing cage. Use a die grinder to score the bearing. Break the bearing free from the planetary carrier using a hammer and chisel.



RAPH12WEL2231AA 22

20. Loosen and remove the six bolts securing the return spring retainer to the brake housing.



RAPH12WEL2233AA 23



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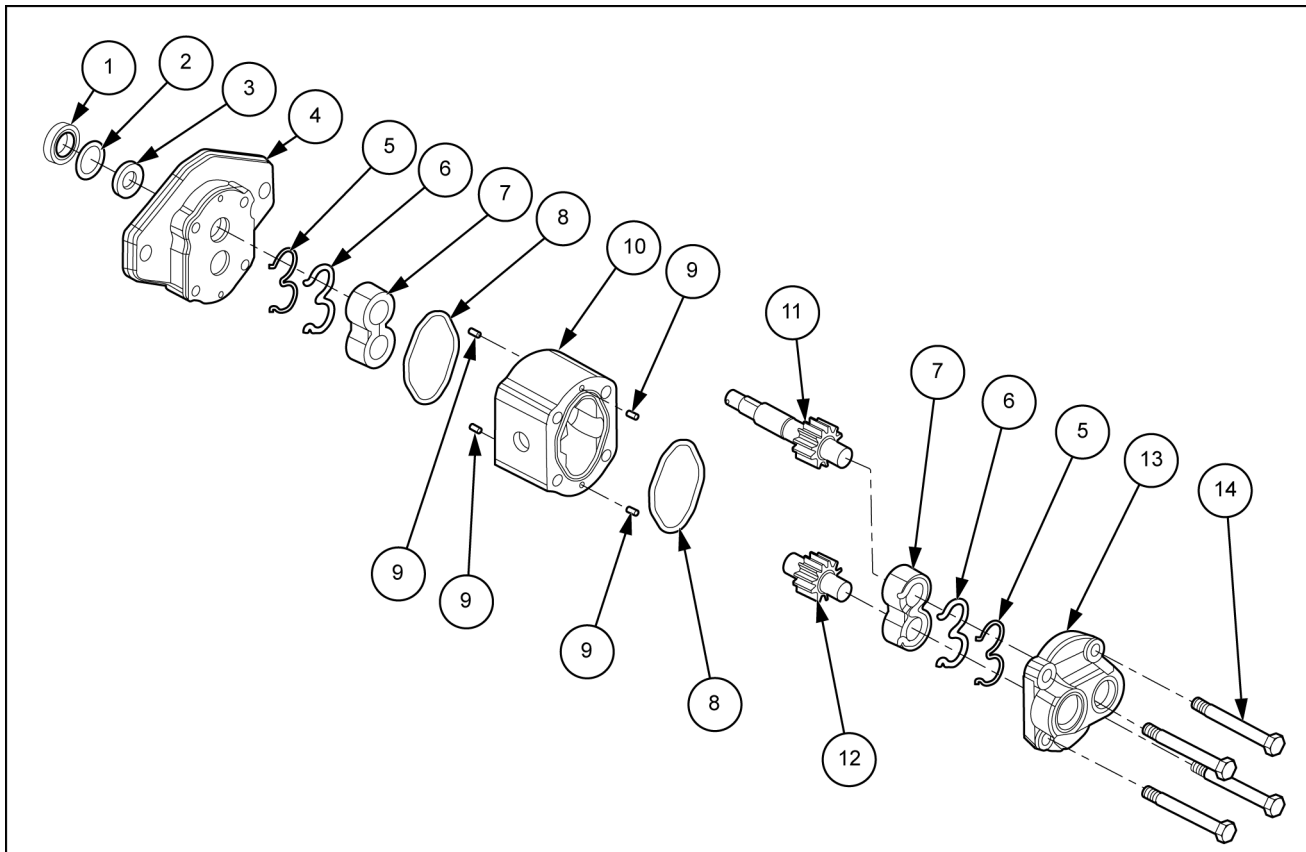
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Brake pump - Disassemble



LEIL15WHL1560FB 1

- | | | |
|----------------------------|---------------------|----------------------------|
| 1. Outer shaft seal | 6. Channel seal | 11. Drive gear |
| 2. Retaining ring | 7. Thrust plate | 12. Driven gear |
| 3. Shaft seal | 8. Quad ring (seal) | 13. Port end cover housing |
| 4. Shaft end cover housing | 9. Dowel pin | 14. Bolt |
| 5. Backup ring | 10. Gear housing | |

1. Carefully secure the pump by the port end cover (**13**) in a vise.
2. Loosen and remove the bolts (**14**).
3. Loosen the shaft end cover housing (**4**) by tapping with a soft hammer. Remove the shaft end cover housing.
4. Remove the backup ring (**5**), channel seal (**6**), and thrust plate (**7**).
5. Remove the drive gear (**11**) from the gear housing.
6. Remove the driven gear (**12**) from the gear housing (**10**).
7. Loosen the gear housing (**10**) from the port end housing cover (**13**) by tapping with a soft hammer. Remove the gear housing.
8. Remove the backup ring (**5**), channel seal (**6**), and the thrust plate (**7**).
9. Remove the outer shaft seal (**1**) from the shaft end cover housing (**4**).
10. Remove the retaining ring (**2**) from the shaft end cover housing (**4**).

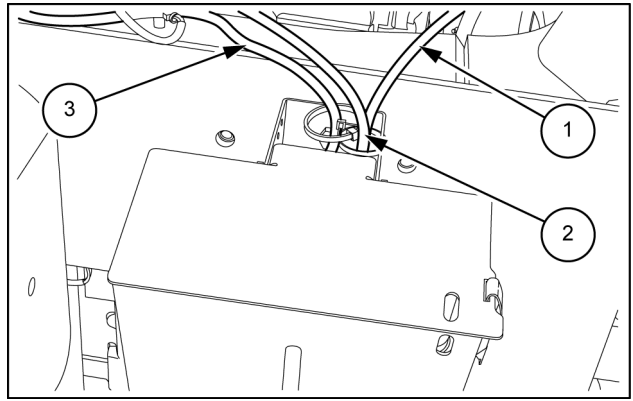
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Hydraulic service brakes - 202

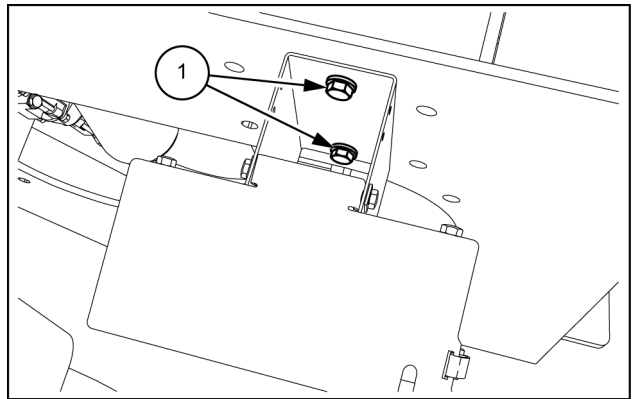
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7. Disconnect the front wiper hose (1), the rear wiper hose (2) and the harness (3) from the windshield washer tank.



LEIL15WHL1414AB 4

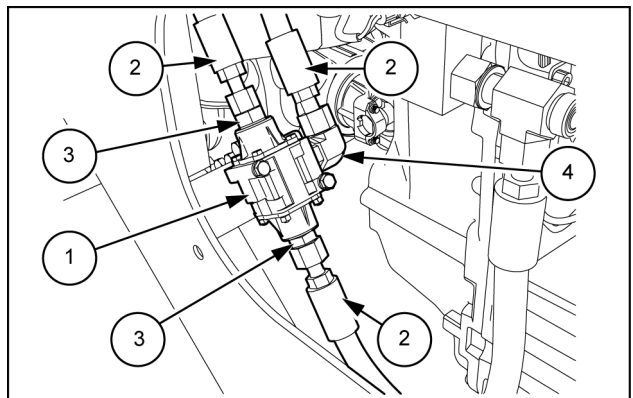
8. Remove the two bolts (1) with the related washers. Remove the windshield washer tank assembly from the machine.



LEIL15WHL1415AB 5

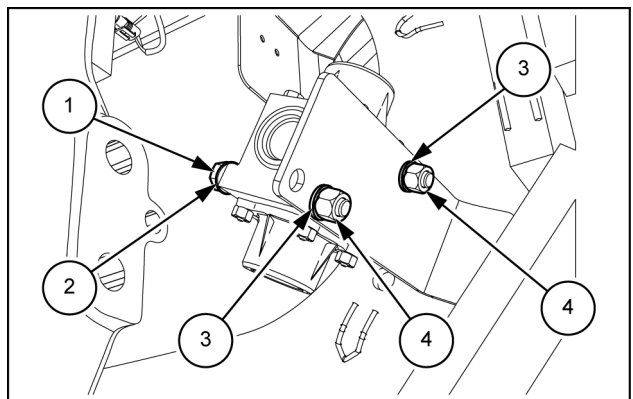
9. Tag and disconnect the hoses (2) from the thermal bypass valve (1). Remove the hydraulic fittings (3) and the 90° elbow (4) from the thermal bypass valve (1). Install a plug in the hoses. Install a cap on all fittings.

NOTE: for clarity, the hydraulic oil filter has been hidden in the figure beside.



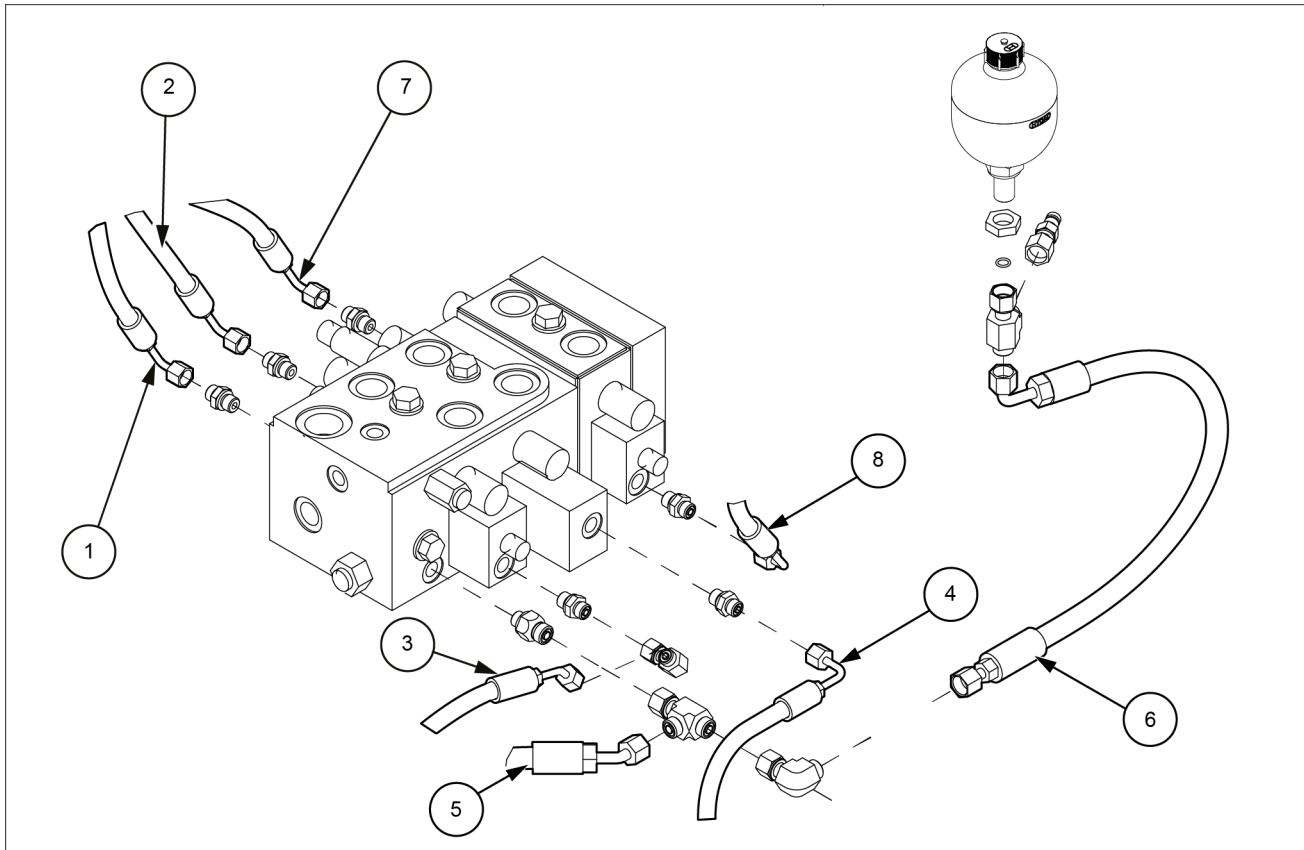
LEIL15WHL1416AB 6

10. Remove the two bolts (1), the washers (2), the washers (3) and the nuts (4). Remove the thermal bypass valve from the machine.



LEIL15WHL1417AB 7

3 spool main control valve



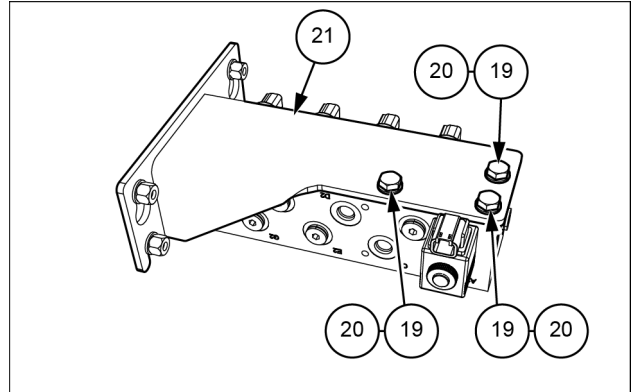
LEIL16WHL1787FB 6

- | | |
|-----------------------------------|---|
| 1. Pilot tilt left hose (Green) | 5. Pilot pressure hose |
| 2. Pilot lift left hose (Red) | 6. Pilot accumulator hose |
| 3. Pilot tilt right hose (Orange) | 7. Pilot 3 spool left hose (Yellow white) |
| 4. Pilot lift right hose (Yellow) | 8. Pilot 3 spool right hose (Red white) |

Electro-hydraulic control valve - Install

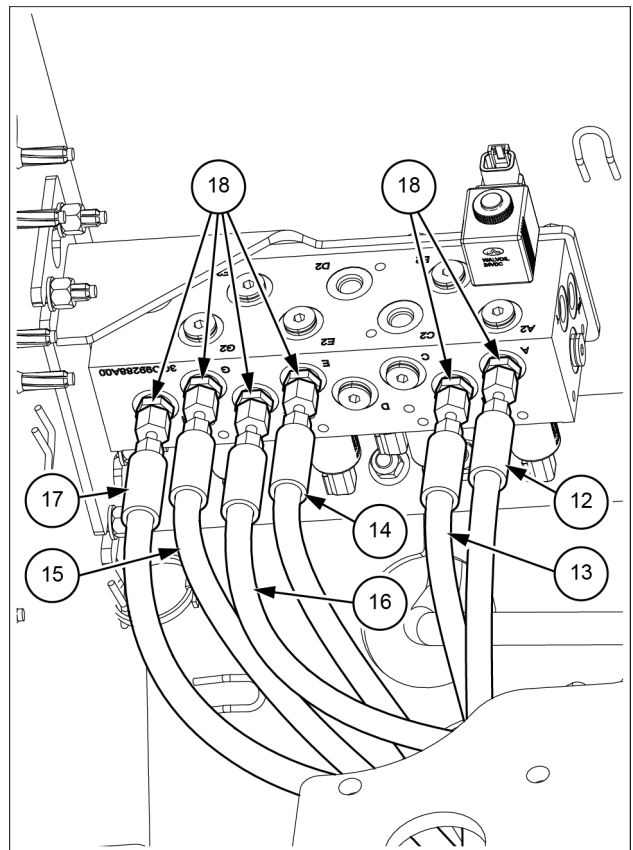
NOTE: the procedure showed from step 1 to step 16 refers to a machine equipped with a 4th function electro-hydraulic control valve, but it is similar also to the 3th function electro-hydraulic control valve.

1. Install the electro-hydraulic control valve to the bracket (21). Install the three bolts (19) with the relevant washers (20) to secure the electro-hydraulic control valve to the bracket (21).



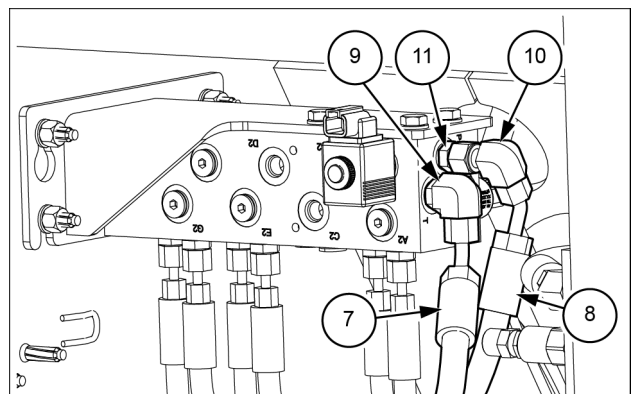
LEIL16WHL2730AB 1

2. Install the six fittings (18) on the ports A, B, E, F, G and H on the electro-hydraulic control valve.
3. Connect the pilot 4th spool right-hand hose (17) to the fitting (18) on the port H of the electro-hydraulic control valve.
4. Connect the pilot 3rd spool right-hand hose (16) to the fitting (18) on the port F of the electro-hydraulic control valve.
5. Connect the pilot 4th spool left-hand hose (15) to the fitting (18) on the port G of the electro-hydraulic control valve.
6. Connect the pilot 3rd spool left-hand hose (14) to the fitting (18) on the port E of the electro-hydraulic control valve.
7. Connect the pilot lift left-hand hose (13) to the fitting (18) on the port B of the electro-hydraulic control valve.
8. Connect the pilot tilt left-hand hose (12) to the fitting (18) on the port A of the electro-hydraulic control valve.



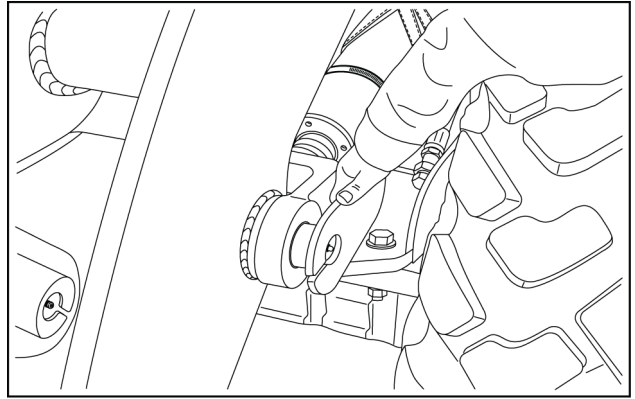
LEIL16WHL2729BB 2

9. Install the fitting (11) and the 90° elbow (10) on the port "Pst" of the electro-hydraulic control valve. Install the 90° elbow (9) on the port T of the electro-hydraulic control valve.
10. Connect the pilot pressure hose (8) to the 90° elbow (10) and the pilot tank hose (7) to the 90° elbow (9) on the electro-hydraulic control valve.



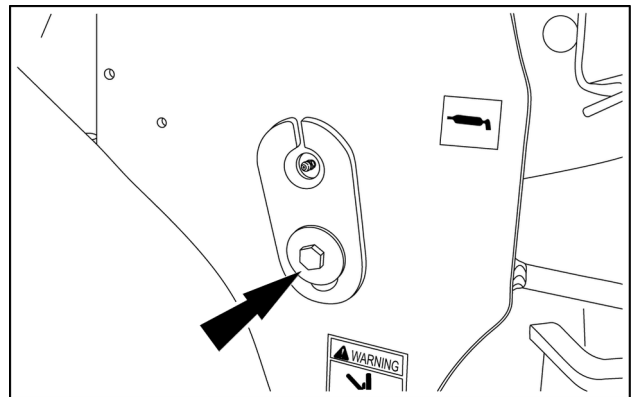
LEIL16WHL2728AB 3

7. Remove the pivot pin from the yoke end of the lift cylinder.



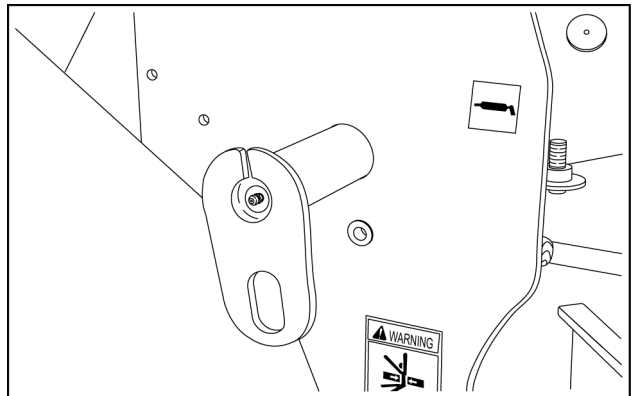
LEIL13WHL1261AA 4

8. Loosen and remove the bolt, washer and spacer that hold the pivot pin at the closed end of the lift cylinder.



LEIL13WHL1262AA 5

9. Remove the pivot pin from the closed end of the lift cylinder.



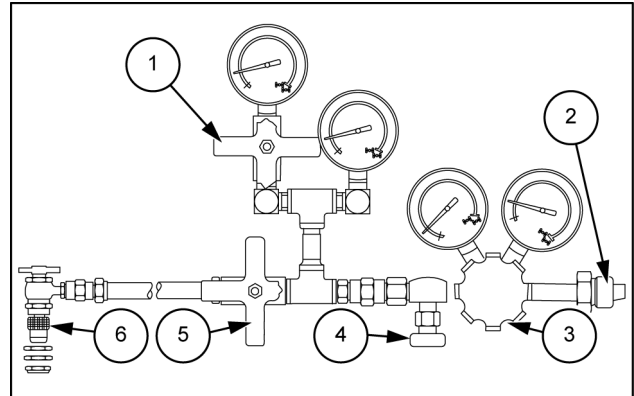
LEIL13WHL1263AA 6

10. Remove the lift cylinder from the machine.

Accumulator - Charging - Ride control

Charging the accumulator with nitrogen

1. Valve (C)
2. To nitrogen tank
3. Valve (A)
4. Valve (B)
5. Valve (D)
6. To accumulator



LEIL13WHL1361AB 1

NOTICE: use only nitrogen when charging the accumulator. Do not use air or oxygen that will cause an explosion.

NOTICE: do not drop the accumulator. A charged accumulator contains nitrogen compressed to **31 bar (450 psi)**. If the charging valve breaks away from the accumulator, the escaping nitrogen will propel the accumulator at a dangerous rate of speed.

NOTICE: do not expose the accumulator to temperatures above **49 °C (120 °F)**. A charged accumulator contains nitrogen compressed to **31 bar (450 psi)**. High heat will cause the safety plug to blow out of the accumulator and the escaping nitrogen will propel the accumulator at a dangerous rate of speed.

NOTICE: the four valves must be in the positions noted in the procedure before connecting the Nitrogen Accumulator Charging Kit to the machine or nitrogen.

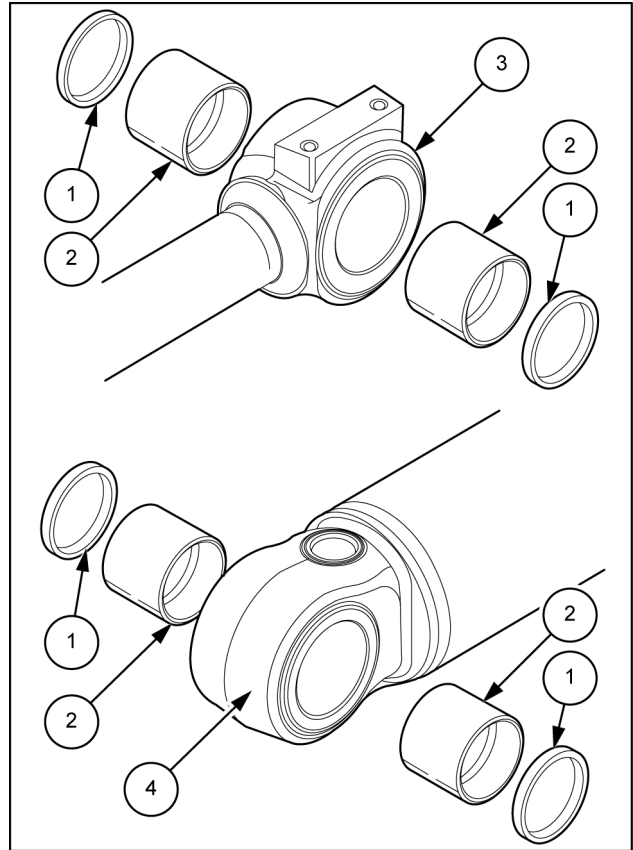
NOTICE: to help prevent equipment damage, the low pressure gauge valve (C) **MUST BE SHUT OFF** during high pressure (**10 bar (145 psi)** and above) applications.

1. Close the shutoff valve (A) by turning it all the way to the left (counterclockwise).
2. Open valve (B) by turning it out all the way to the left (counterclockwise).
3. Close valve (C) by turning it all the way to the right (clockwise).
4. Close the gauge valve (D) by turning it all the way to the right (clockwise).
5. Connect the charging hose to the nitrogen supply tank.

Loader bucket control cylinder - Install - Bushing

521G WHEEL LOADER XR-EH, NEW CAB TIER4B	WE
521G ZBAR-EH, NEW CAB TIER4B	WE

1. Use an acceptable driver to press new bushings (2) into piston rod eye (3) until recessed **8 mm (0.315 in)**.
2. Use an acceptable driver to install wipers (1) until flush with piston rod eye (3). The lips of the wipers (1) must be towards outside of bore.
3. Use an acceptable driver to press new bushings (2) into tube (4) eye until recessed **8 mm (0.315 in)**.
4. Use an acceptable driver to install wipers (1) until flush with tube (4) eye. The lips of wipers (1) must be towards outside of bore.

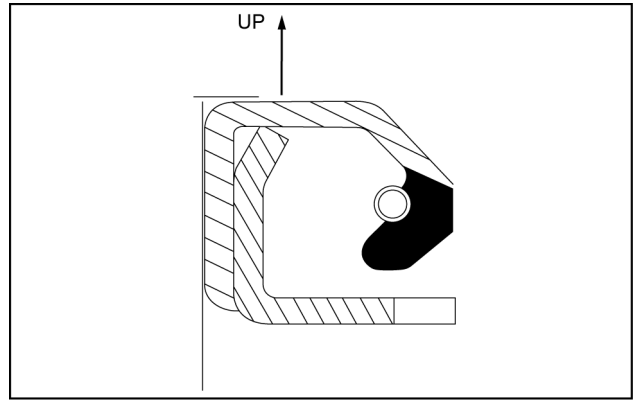


LEIL13WHL1356BB 1

9. Install the seal (11) in the bearing retainer plate (12).
The bottom of the seal (11) must be even with the bottom of the bearing retainer plate (12).

NOTE: with both seal cavities (S) toward the bearing cavity, the seals are forced out when the lubricant is applied. Do not press the seals after the installation. The seals could be damaged by bearings.

10. Grease the outer diameter of the upper pivot pin (15) and install it.
11. Lubricate the bearings until lubricant is forced out the lower seal (11).
12. Check the installation rotating the upper pivot pin by hand (pin must rotate smooth but hard). Remove the upper pivot pin (15) just before front frame and rear frame are assembled together.



LEIL13WHL1081AA 3

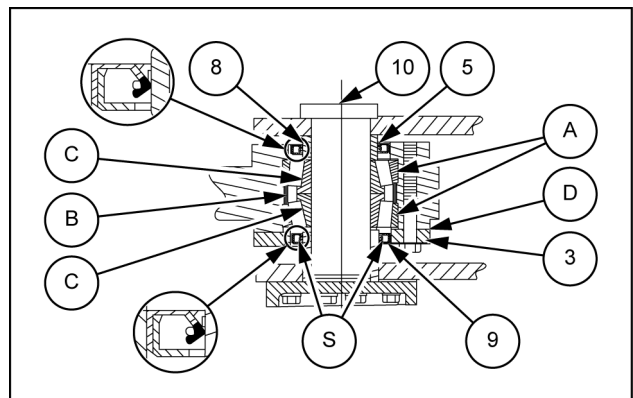
Lower bearing assemble

NOTE: for the numbering, refer to **Articulation frame pivot - Exploded view (39.100)**.

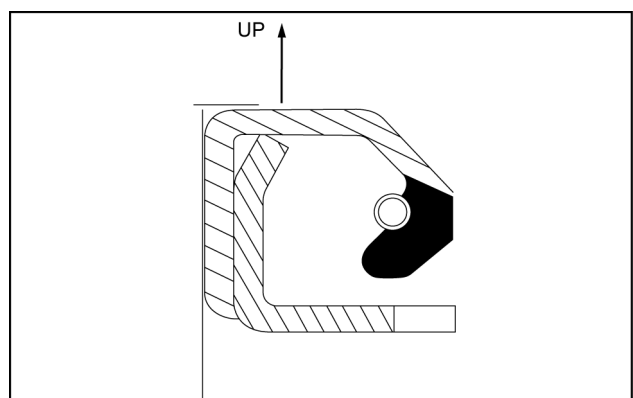
1. Lubricate the bore in the lower pivot with grease.
2. Press one cup (A) into the bore (wide edge of cup first).
3. Install the spacer (B) and the two bearing cones (C) packed with grease.
Be careful not to mix the bearing cones.
4. Press the remaining bearing cup (A) into the bore (thin edge of cup first), until seated in the spacer (B).

NOTE: the spacer is matched with each two bearing sets. Do not switch the spacers.

5. Install the bearing retainer plate (3), pulling the retainer plate tight against the bearings.
6. Measure the gap (D) between the bearing retainer plate (3) and the upper pivot plate.
Make a record of the measurement.
Subtract **0.076 – 0.102 mm (0.003 – 0.004 in)** from the measurement.
Select shims (27), (28), or (29) equal to that value.
7. Install the shims, the bearing retainer plate (6), the washers (6) and the bolts (7).
Apply one drop of 15W40 engine oil to each bolts.
Tighten the bolts (7) to **124 – 132 N·m (91 – 97 lb ft)**.
8. Install the seal (9) in the bearing retainer plate (3). The bottom of the seal (9) must be even with the bottom of the bearing retainer plate (3).



LEIL15WHL1352AB 4

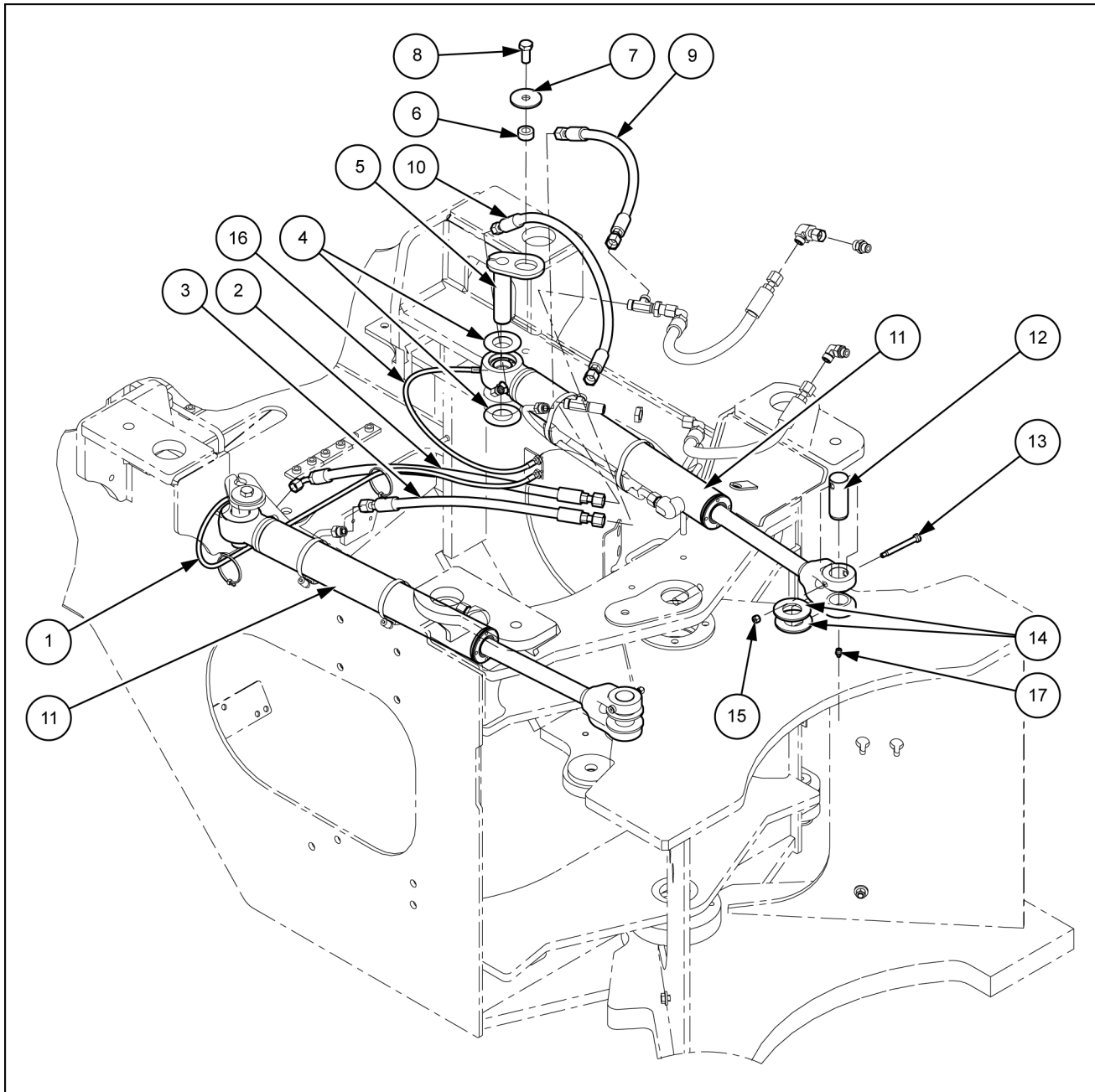


LEIL13WHL1081AA 5

**HYDRAULIC COMPONENTS OF THE STEERING SYSTEM WITH AUXILIARY STEERING AND JSS - Sheet
2 of 3**

- | | |
|---------------------------------|---------------------------------------|
| 1. Steering EHPS valve | 25. Sleeve hose 60x1200 |
| 2. Bracket | 26. Hose (to JSS pressure valve) |
| 3. Hydraulic connector | 27. Hose (to steering right rod) |
| 4. Hydraulic shuttle tee valve | 28. Hose (to steering right base) |
| 5. 45° elbow | 29. Bracket |
| 6. 90° elbow | 30. Washer, 9x16x1.6 mm |
| 7. 45° elbow | 31. Bolt, M8x10 CL 8.8 |
| 8. Hydraulic connector | 32. Steering angle sensor |
| 9. Hydraulic connector | 33. Nut |
| 10. 90° elbow | 34. Bracket |
| 11. Cut-off valve | 35. Bracket |
| 12. 90° elbow | 36. Washer, 9x17x2 mm |
| 13. T-joint | 37. Bolt, M8x20 CL 10.9 |
| 14. Hose (to tank) | 38. Bolt, M8x25 CL 10.9 |
| 15. T-joint | 39. Washer, 6.6x12.5x2 mm |
| 16. Hose (to steering cylinder) | 40. Washer, 6.6x12.5x1.6 mm |
| 17. Hose (to steering cylinder) | 41. Bolt, M6x70 CL 10.9 |
| 18. T-joint | 42. Nut |
| 19. Hose (to JSS load sense) | 43. Jump union |
| 20. Washer, 13.5x28x4 mm | 44. Hose (to steering load sensing) |
| 21. Bolt, M12x30 CL 10.9 | 45. Orbitrol valve |
| 22. Washer, 9x21x2.5 mm | 46. Loader valve |
| 23. Bolt, M8x20 CL 8.8 | 47. Rear chassis |
| 24. Hose (to return valve) | 48. Auxiliary steering solenoid valve |

Steering cylinder - Remove



LEIL16WHL1047GB 1

- | | | |
|------------------|-----------------------|---------------------|
| 1. Grease hose | 7. Washer | 13. Hexagonal screw |
| 2. Hose assembly | 8. Bolt M16x35 | 14. Washer |
| 3. Hose assembly | 9. Hose assembly | 15. Nut |
| 4. Washer | 10. Hose assembly | 16. Grease hose |
| 5. Pivot pin | 11. Steering cylinder | 17. Grease fitting |
| 6. Spacer | 12. Pin | |

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Auxiliary steering - 910

Auxiliary steering - Assemble - Pump and motor	13
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Air conditioning - Service instruction

Problem: no cooling

See pressure - temperature chart on **Air conditioning - General specification (50.200)**.

Temperature of low pressure gauge: very low

Temperature of high pressure gauge: very low

Indication of no refrigerant or low refrigerant charge:

<p>A. Discharge air from evaporator is warm. B. Compressor does not run, or cycles off rapidly after start-up. (Air conditioning warning light in cab should illuminate).</p>	<p>Yes</p>	<ol style="list-style-type: none"> 1. Leak test the system. It may be necessary to add refrigerant. 2. Evacuate and reclaim remaining refrigerant from system. 3. Repair system leaks as needed. Follow the given repair procedure. 4. Check level of oil in compressor - possible for compressor to have an oil loss. 5. Remove air and moisture from the system. 6. Charge system with new refrigerant. 7. Continue performance test for other possible problems.
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See pressure - temperature chart on **Air conditioning - General specification (50.200)**.

Temperature of low pressure gauge: high

Temperature of high pressure gauge: high

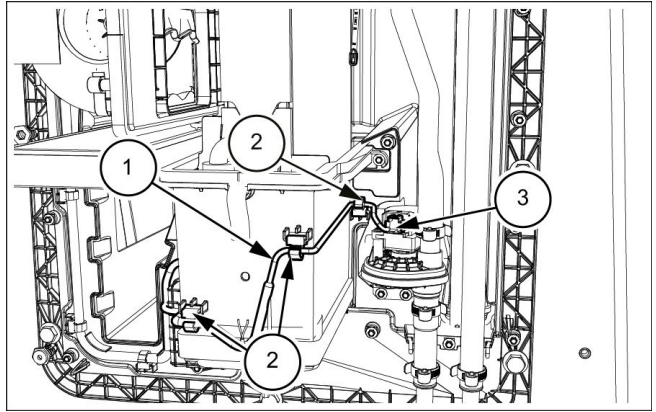
Indication of large quantity of air in the system:

<p>Discharge air from evaporator is warm</p>	<p>Yes</p>	<ol style="list-style-type: none"> 1. Evacuate and reclaim refrigerant from system. 2. Remove air and moisture from the system. 3. Charge system with new refrigerant.
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Condenser malfunctioning - Indications:

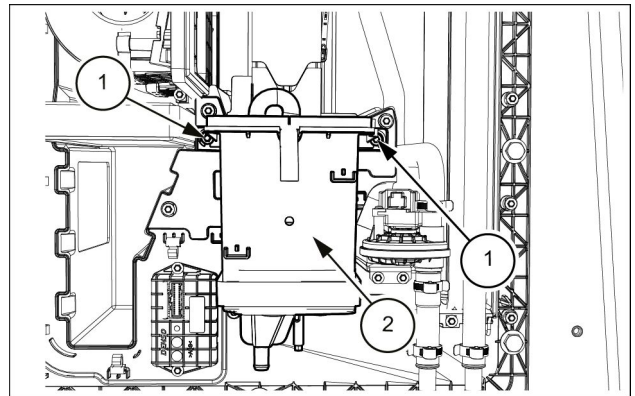
<p>A. Liquid line (between evaporator and condenser) is very hot. B. Discharge air from evaporator is warm.</p>		<ol style="list-style-type: none"> 1. Check for loose or worn compressor or engine fan belt and proper condenser fan operation. 2. Check to see that condenser is clean and unobstructed and that the fins are straight. 3. Check system for too much refrigerant. Evacuate, reclaim and recharge refrigerant until gauge pressure is normal. 4. Remove and check condenser for restrictions caused by oil or reduced heat transfer. <ol style="list-style-type: none"> A. Remove refrigerant from the system. B. Use compressed air to remove oil from condenser. C. Replace receiver-drier. D. Remove moisture and charge the system. 5. Continue the performance test for other possible problems.
---	--	---

13. Disconnect the electrical connector **(3)**.
Remove the three clamps **(2)** that hold the air conditioning wire harness **(1)** on the water drain tank.



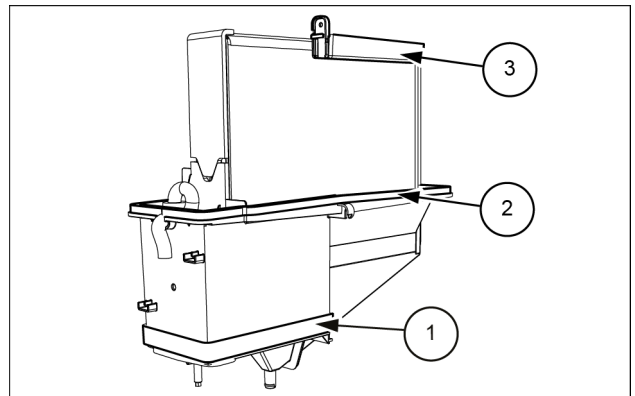
LEIL16WHL1244AB 8

14. Loosen the screws **(1)** and extract the water drain tank from the cab heater assembly.



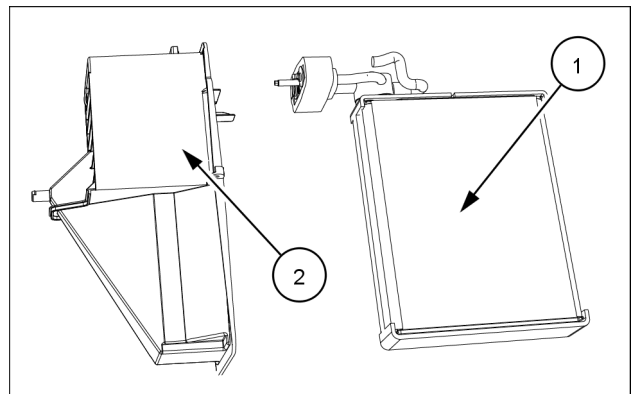
LEIL16WHL1245AB 9

15. Remove the case gasket **(1)** and the water drain tank gasket **(2)**. Remove the evaporator sensor bracket **(3)**.



LEIL16WHL1246AB 10

16. Separate the air conditioning evaporator **(1)** from the water drain tank **(2)**.



LEIL16WHL1249AB 11

F-2F2 - UCM VF2/3 (Fuse)

Component Type	Fuse
Wiring frames	SHEET 07

F-2F3 - UCM VF4/6 (Fuse)

Component Type	Fuse
Wiring frames	SHEET 07

F-2F4 - UCM VS1/VLP (Fuse)

Component Type	Fuse
Wiring frames	SHEET 07

F-2F5 - SPARE (Fuse)

Component Type	Fuse
Wiring frames	SHEET 07

F-2F6 - TECM (Fuse)

Component Type	Fuse
Wiring frames	SHEET 07

F-2F7 - DISPLAY (Fuse)

Component Type	Fuse
Wiring frames	SHEET 07

F-2F8 - DIAGNOSTIC (Fuse)

Component Type	Fuse
Wiring frames	SHEET 07

F-2F9 - HOOD LIFT (Fuse)

Component Type	Fuse
Wiring frames	SHEET 07

F-3F1 - 12V PWR1 (Fuse)

Component Type	Fuse
Wiring frames	SHEET 08

F-3F2 - 12V SPARE (Fuse)

Component Type	Fuse
Wiring frames	SHEET 08

F-3F3 - 12V RADIO (Fuse)

Component Type	Fuse
Wiring frames	SHEET 08

F-3F4 - 12V SPARE (Fuse)

Component Type	Fuse
Wiring frames	SHEET 08

Wiring harnesses - Electrical schematic sheet 07 SH07 - BATTERY PWR DISTR (FUSE BLOCK LC2)

Type	Component	Connector / Link	Description
ECU	A-MAIN JB CAB		JUNCTION BLOCK INTO CAB
Fuse	F-2F1		UCM-VP
Fuse	F-2F10		SPARE
Fuse	F-2F11		CAMERA
Fuse	F-2F12		SPARE
Fuse	F-2F13		SPARE
Fuse	F-2F14		SPARE
Fuse	F-2F2		UCM VF2/3
Fuse	F-2F3		UCM VF4/6
Fuse	F-2F4		UCM VS1/VLP
Fuse	F-2F5		SPARE
Fuse	F-2F6		TECM
Fuse	F-2F7		DISPLAY
Fuse	F-2F8		DIAGNOSTIC
Fuse	F-2F9		HOOD LIFT
Connector	X-LC2	X-LC2	LOADCENTER 2
Connector	X-P1002	X-P1002	B+ POWER STUD
Connector	X-P1196	X-P1196	B+ POWER STUD

Wiring harnesses - Electrical schematic sheet 21 SH21 - UCM-STEERING AUX JSS

Type	Component	Connector / Link	Description
ECU	A-UCM	X-UCM3B X-UCM4B X-UCM2B	47749442 WAS 84328725
Sensor	B-JSS	X-JSS_JOY	LH JOYSTICK STEERING
Sensor	B-JSS_CO 2	X-JSS_CO 2	JSS CUT OFF SENSOR 2
Sensor	B-PSS	X-PSS	AUX STEERING PRESSURE
Diode	D-SS DIODE	X-SSD	SEC STRG FLYBACK DIODE
Relay	K-JSS_CO 1	X-JSS_CO 1	JSS CUT OFF SENSOR 1
Motor	M-SEC_STRG	X-S244 X-SSS X-S242	SECONDARY STEERING MOTOR/PUMP
Switch	SW-ARM_POS_DWN	X-LH_ARM_DWN	LH ARMREST POSITION
Switch	SW-ARM_POS_UP	X-LH_ARM_UP	LH ARMREST POSITION
Switch	SW-SW_JSS	X-SW_JSS	SWITCH JSS ACTIVATION
Connector	X-BTM	X-BTM	BOTTOM TO CAB STD
Connector	X-BTS	X-BTS	BOTTOM TO SEC STRG
Connector	X-CAB_B	X-CAB_B	CAB TO BOTTOM
Connector	X-CAB_JSS	X-CAB_JSS	CAB TO JSS FRAME HARNESS
Connector	X-CAB_L	X-CAB_L	CAB TO JSS L ARMREST
Connector	X-CAB_L2	X-CAB_L2	CAB TO LEFT JSS
Connector	X-COV1	X-COV1	CUT OFF VALVE SOL
Connector	X-COV2	X-COV2	CUT OFF VALVE SOL
Connector	X-JSS_CO 1	X-JSS_CO 1	CUT OFF SENSOR
Connector	X-JSS_CO 2	X-JSS_CO 2	CUT OFF SENSOR
Connector	X-JSS_FR	X-JSS_FR	JSS FRAME HARNESS TO CAB
Connector	X-JSS_JOY	X-JSS_JOY	JSS LEFT HAND JOYSTICK
Connector	X-JSV	X-JSV	JOYSTICK STEERING VALVE
Connector	X-LFT 2	X-LFT 2	LEFT JS TO CAB
Connector	X-LFT_A	X-LFT_A	JSS TO CAB L ARMREST
Connector	X-LH_ARM_DWN	X-LH_ARM_DWN	LH JSS ARM REST DOWN
Connector	X-LH_ARM_UP	X-LH_ARM_UP	LH JSS ARM REST DOWN
Connector	X-PSS	X-PSS	STEERING PRESSURE SENSOR
Connector	X-S242	X-S242	GROUND
Connector	X-S244	X-S244	20157 AUX STRG PWR RT ANGLE CONNCTR
Connector	X-S245	X-S245	GROUND
Connector	X-SSD	X-SSD	SS FLYBACK DIODE
Connector	X-SSS	X-SSS	SECONDARY STEERING MOTOR
Connector	X-SST	X-SST	SEC STRG TO TRANS
Connector	X-SW_JSS	X-SW_JSS	JOYSTICK STEERING SWITCH
Connector	X-UCM1A	X-UCM1A	UCM
Connector	X-UCM2A	X-UCM2A	UCM
Connector	X-UCM2B	X-UCM2B	UCM
Connector	X-UCM3A	X-UCM3A	UCM
Connector	X-UCM3B	X-UCM3B	UCM
Connector	X-UCM4B	X-UCM4B	UCM
Connector	X-YSS	X-YSS	SEC STEERING VALVE SOL
Solenoid	Y-COV_1	X-COV1	JSS CUT OFF VALVE 1
Solenoid	Y-COV_2	X-COV2	JSS CUT OFF VALVE 2
Solenoid	Y-Y_SS	X-YSS	SEC STEERING SOL.

Wiring harnesses - Electrical schematic sheet 35 SH35 - CABIN RADIO LOUDSPEAKER/12V CNVRTR

Type	Component	Connector / Link	Description
Speaker	H-LSP1	X-XLP1	LOUDSPEAKER RT
Speaker	H-LSP2	X-XLP2	LOUDSPEAKER LF
Speaker	H-RADIO	X-SPK X-RAD	12V RADIO
Power outlet	J-CNVRTR 24-12	X-CNV	POWER CONVERTER
Power outlet	J-PO1	X-X-PO1	RH CONSOLE 12V POWER OUTLET
Lamp	LMP-CIG_LTR	X-CL	24V CIGAR LIGHTER
Connector	X-CL	X-CL	CIGAR LIGHTER
Connector	X-CNV	X-CNV	24 TO 12 POWER CONVERTER
Connector	X-LC3	X-LC3	LOADCENTER 3
Connector	X-RAD	X-RAD	RADIO
Connector	X-SC	X-SC	SEAT COMPRESSOR
Connector	X-SPK	X-SPK	RADIO TO SPKRS
Connector	X-X-PO1	X-X-PO1	POWER OUTLET
Connector	X-XLP1	X-XLP1	LOUDSPEAKER RT
Connector	X-XLP2	X-XLP2	LOUDSPEAKER LF
Solenoid	Y-SC	X-SC	SEAT COMPRESSOR

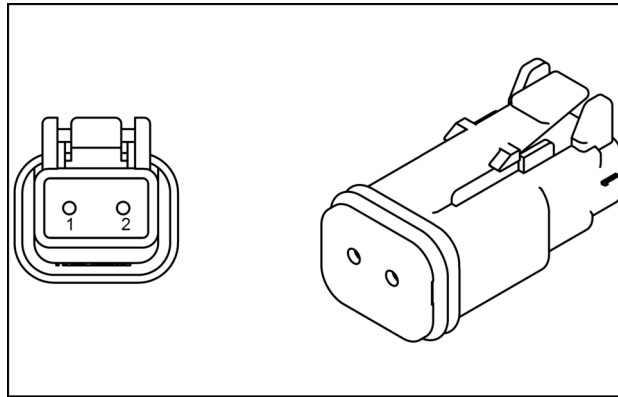
Wire fan harness

Connector	Description
X-FAN2	Fan speed sensor jumper
X-FSS	Fan speed sensor

Grid heater cables

Connector	Description
X-GH1	Grid heater
X-GH2	Grid heater
X-GH3	Grid heater
X-GH4	Grid heater
X-GH5	Grid heater
X-GH6	Grid heater
X-GH7	Grid heater
X-GND-R17	Grid heater

X-AUX_2_RIGHT - AUX 2 RIGHT [A-EH_VLV] (87695582) (Receptacle)

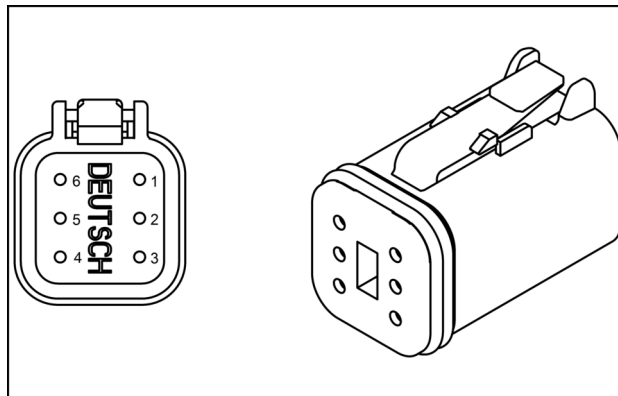


87695582 13

87695582

Pin	From	Wire	Description	Color-Size	Frame
1	X-FRNT_EH (Receptacle) pin N FRONT TO BOTTOM EH	360B	AUX 2 RIGHT	WH - 0.8	SHEET 22
2	SP-357B-P-X	357D	AUX 2 RIGHT ENABLE	BR - 0.8	

X-A_RT - ARM REST RIGHT (87694112) (Receptacle)

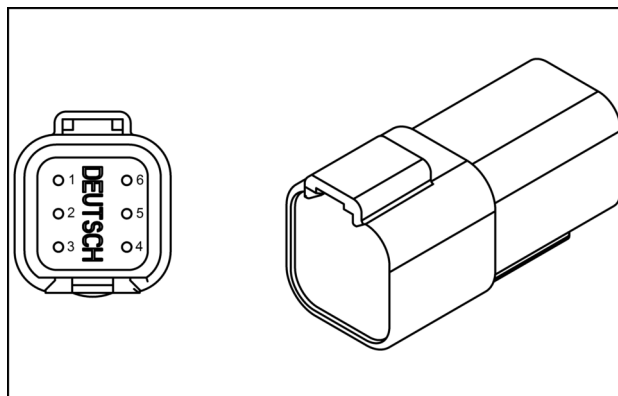


87694112 14

87694112

Pin	From	Wire	Description	Color-Size	Frame
5	SW-HN_RH_ARM-P-1	113D	RH ARMREST HORN SWITCH	BR - 0.8	SHEET 34

X-A_RT3 - RIGHT ARM PILOT (87694152) (Plug)

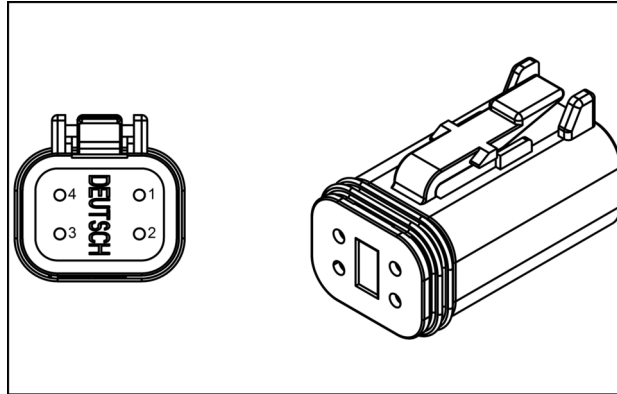


87694152 15

87694152

Pin	From	Wire	Description	Color-Size	Frame
A	X-SP_PK_CLN (Receptacle) pin X SPLICE PACK CLEAN GRND	945	CAB CLEAN GROUND DIAG	BK - 0.8	SHEET 16
B	X-LC2 (Receptacle) pin 8A LOADCENTER 2	798	DIAGNOSTIC B+	RD - 0.8	
C	SP-HH-P-X	CAN_HI	CAN	YE - 0.8	
D	SP-LH-P-X	CAN_LI	CAN	GN - 0.8	
E	X-CAB_E (Receptacle) pin 20 CAB TO ENGINE	303	ISO K LINE	WH - 0.8	
H	SP-B_HE-P-X	CANB_HD	CAN	WH - 0.8	
J	SP-B_LE-P-X	CANB_LD	CAN	BL - 0.8	

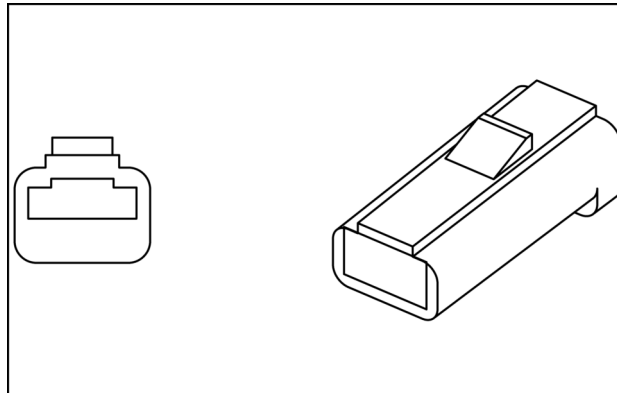
X-DIAG_T - TELEMATICS DIAGNOSTIC [SH38: B-1] (87694101) (Receptacle)



87694101 67
87694101

Pin	From	Wire	Description	Color-Size	Frame
2	X-X_TEL (Receptacle) pin 7 TELEMATICS	CAN_TH	CAN	TN - 0.8	SHEET 38
3	X-X_TEL (Receptacle) pin 6 TELEMATICS	CAN_TL	CAN	LB - 0.8	
4	X-SP_PK_CLN (Receptacle) pin X SPLICE PACK CLEAN GRND	912	CAB GROUND CLN	BK - 0.8	SHEET 12

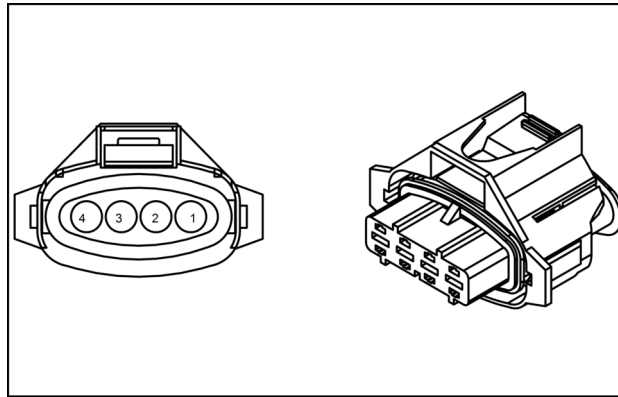
X-DM_G - DOME LIGHT GROUND [LMP-DM] (87688695) (Receptacle)



87688695 68
87688695

Pin	From	Wire	Description	Color-Size	Frame
1	X-CG3 (Receptacle) pin H CAB GROUND RH HEADLINER	955N	MAP LIGHT GND	BK - 0.8	SHEET 27

X-HTS - HUMIDITY AND TEMP SENSOR [B-HT] (87709809) (Receptacle)

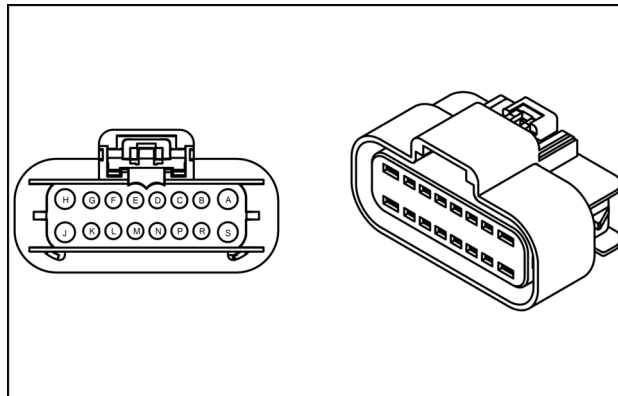


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Pin	From	Wire	Description	Color-Size	Frame
1	X-ECU (Receptacle) pin 90 ECU CONNECTOR	690	HUMIDITY TEMP SENSOR	OR - 0.8	SHEET 17
2	X-ECU (Receptacle) pin 15 ECU CONNECTOR	615	HUMIDITY TEMP SENSOR	YE - 0.8	
3	SP-643-P-X	643A	HUMIDITY TEMP SENSOR	BK - 0.8	
4	X-ECU (Receptacle) pin 40 ECU CONNECTOR	642	HUMIDITY TEMP SENSOR	YE - 0.8	

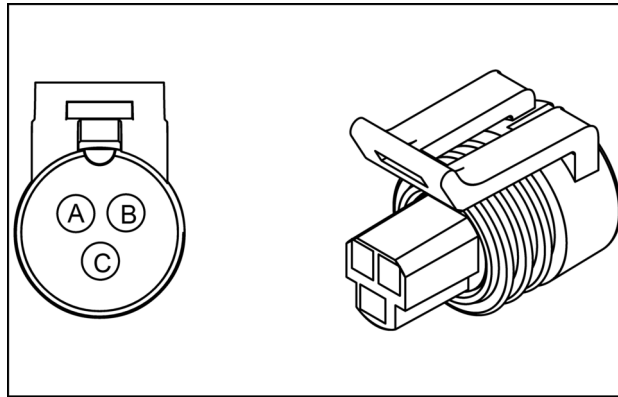
X-HVAC - INTRCECT TO HVAC SYSTEM BY HVAC [SH33: D-4] (87696573) (Receptacle)



87696573 125

87696573

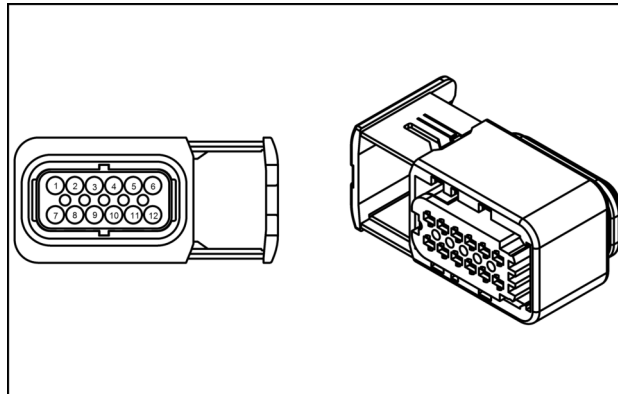
X-PSS - STEERING PRESSURE SENSOR [B-PSS] (84078681) (Receptacle)



84078681 182
84078681

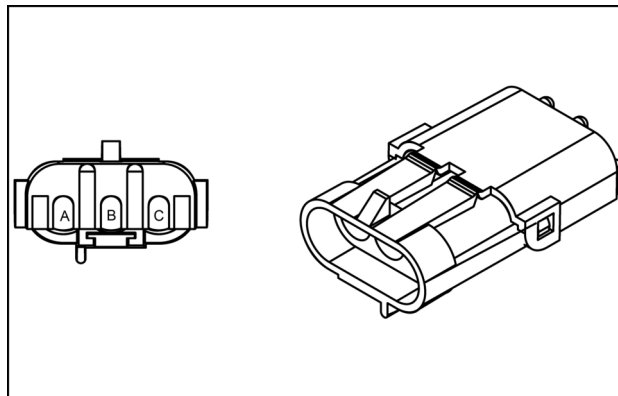
Pin	From	Wire	Description	Color-Size	Frame
A	X-SST (Plug) pin 3 SEC STRG TO TRANS	482P	5V GRND1	BL - 0.8	SHEET 21
B	X-SST (Plug) pin 2 SEC STRG TO TRANS	486W	5V PWR REF 1	PK - 0.8	
C	X-SST (Plug) pin 4 SEC STRG TO TRANS	176B	AUX STRG PRESS SIGNAL	YE - 0.8	

X-PUMP - DENOX CONTROL UNIT [A-PMP] (47421681) (Receptacle)



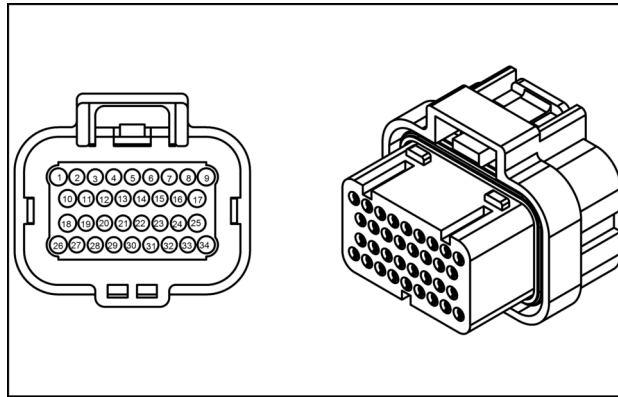
47421681 183
47421681

X-PXF - RETURN TO DIG PROX [B-PXF] (87692858) (Plug)



87692858 184
87692858

X-UCM1B - UCM [SH22: A-6] (87410946) (Receptacle)

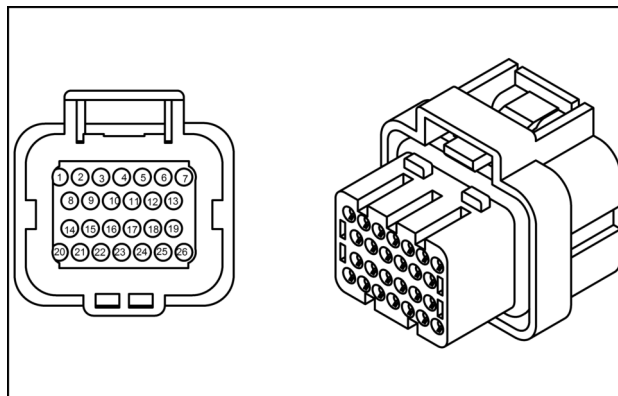


87410946 243

87410946

Pin	From	Wire	Description	Color-Size	Frame
1	SP-651-P-X	651	5V GND2	BL - 0.8	SHEET 22
2	X-CAB_EH (Plug) pin C CAB TO BOTTOM EH	339	BOOM ENABLE	BR - 0.8	
9	X-SP_PK1 (Receptacle) pin X SPLICE PACK	938	UCM CLEAN GROUND	BK - 0.8	SHEET 19
10	X-CAB_EH (Plug) pin J CAB TO BOTTOM EH	352	AUX 1 ENABLE	BR - 0.8	SHEET 22
19	X-CAB_EH (Plug) pin S CAB TO BOTTOM EH	647	BOOM ANGLE 1	YE - 0.8	
20	X-CAB_B (Plug) pin 7 CAB TO BOTTOM	641	BRAKE PRESSURE	YE - 0.8	SHEET 19
21	X-CAB_EH (Plug) pin W CAB TO BOTTOM EH	653	BUCKET ANGLE 1	YE - 0.8	SHEET 22
22	X-CAB_EH (Plug) pin T CAB TO BOTTOM EH	648	BOOM ANGLE 2	YE - 0.8	
23	X-CAB_EH (Plug) pin X CAB TO BOTTOM EH	654	BUCKET ANGLE 2	YE - 0.8	
25	SP-LA-P-X	CAN LT	CAN	GN - 0.8	
30	X-CAB_EH (Plug) pin F CAB TO BOTTOM EH	347	BUCKET ENABLE	BR - 0.8	
34	SP-HA-P-X	CAN HT	CAN	YE - 0.8	

X-UCM2A - UCM (82028493) (Receptacle)



82028493 244

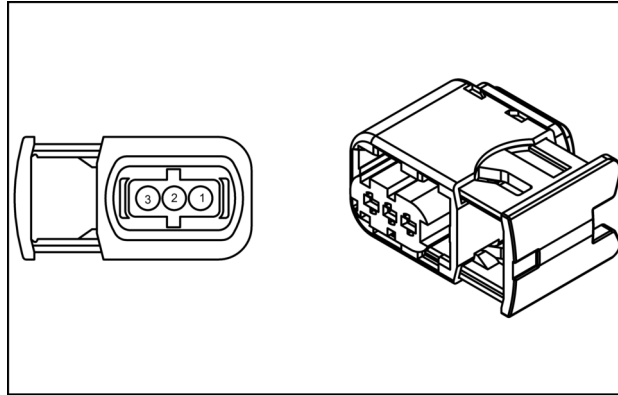
82028493

Pin	From	Wire	Description	Color-Size	Frame
7	SP-448-P-X	448A	CAB ISOLATED B+	RD - 1.0	SHEET 19
10	X-CAB_P2 (Receptacle) pin 3 CAB TO PEDESTAL 2	686	STALK FNR F	YE - 0.8	SHEET 20
11	X-CAB_P2 (Receptacle) pin 1 CAB TO PEDESTAL 2	679	STALK FNR R	YE - 0.8	
12	X-CAB_L (Receptacle) pin 5 CAB TO JSS L ARMREST	630	JSS JOYSTICK 2	YE - 0.8	SHEET 21
13	SP-448-P-X	448B	CAB ISOLATED B+	RD - 1.0	SHEET 19

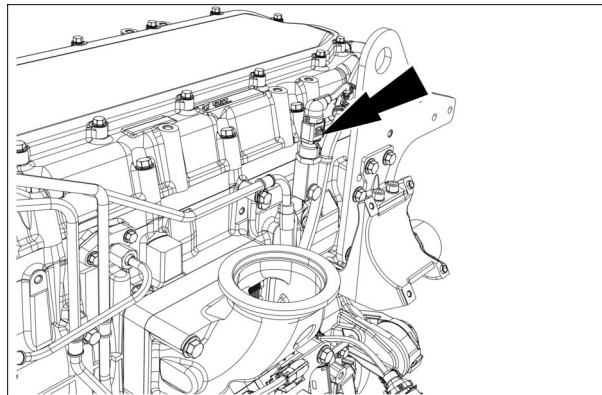
CONNECTOR X-9001 - Engine Control Unit (ECU)			
PIN NUMBER	WIRE NUMBER	CIRCUIT REFERENCE	ELECTRICAL SCHEMATIC FRAME
31	VE-117	Level signal, SCR tank level and temperature sensor B-9101	SHEET 03
32	VE-108	Signal, SCR upstream exhaust gas temperature sensor B-9107	
33	VE-237	Signal, Fuel pre-filter pressure sensor B-9112	SHEET 02
34	-	-	
35	-	-	
36	-	-	
37	VE-203	Signal, Air filter clogging switch S-9101	SHEET 02
38	-		
39	VE-118	Ground	SHEET 03
40	VE-103	Temperature signal, Humidity sensor with ambient temperature sensor B-9102	SHEET 02
41	-	-	
42	-	-	
43	VE-142	Sensor ground, Water in fuel switch S-9102, Low idle switch and acceleration pedal position sensor B-9111 and Humidity sensor with ambient temperature sensor B-9105	SHEET 02
44	-	-	
45	VE-180	Low side driver, Auxiliary power relay K-9107	SHEET 02
46	VE-222	CAN high	
47	VE-224	CAN low	
48	-	-	
49	VE-156D	Battery voltage, from Main relay K-9102	SHEET 02
50	VE-123	Supply UB1 (SCR tank heating valve Y-9102, SCR reverting valve Y-9100, SCR pump motor M-9100 and SCR heater relay K-9108)	SHEET 03
51	-	-	
52	VE-164E	Battery ground	SHEET 02
53	-	-	
54	-	-	
55	-	-	
56	VE-236	Reference ground, Fuel pre-filter pressure sensor B-9112	SHEET 02
57	-	-	
58	-	-	
59	-	-	
60	VE-143	Supply, Low idle switch B-9111	SHEET 02
61	VE-121	Reference ground, Fuel filter heater relay K-9100	
62	-		

Connector X-9023 - Crankcase pressure sensor

CONNECTOR X-9023 - Crankcase pressure sensor			
PIN NUMBER	WIRE NUMBER	CIRCUIT REFERENCE	ELECTRICAL SCHEMATIC FRAME
1	EN-043	Supply	SHEET 05
2	EN-044	Ground	
3	EN-045	Signal	



84146685 4



NHIL17ENG0309FA 5

Wire connectors - Component diagram 12 - Connectors X-9120 to X-9129

Connector X-9120 - Starter control relay

CONNECTOR X-9120 - Starter control relay			
PIN NUMBER	WIRE NUMBER	CIRCUIT REFERENCE	ELECTRICAL SCHEMATIC FRAME
30	VE-211	Supply, to Starter control relay K-9105 (control side)	SHEET 01
85	VE-210	Supply	
86	VE-209	Reference ground	
87	VE-206		
87A	-	-	

Connector X-9189 - Injector, cylinder 2

CONNECTOR X-9189 - Injector, cylinder 2			
PIN NUMBER	WIRE NUMBER	CIRCUIT REFERENCE	ELECTRICAL SCHEMATIC FRAME
1	EN-251	High side driver	SHEET 06
2	EN-252	Low side driver	

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Selective Catalytic Reduction (SCR) electrical system - 988

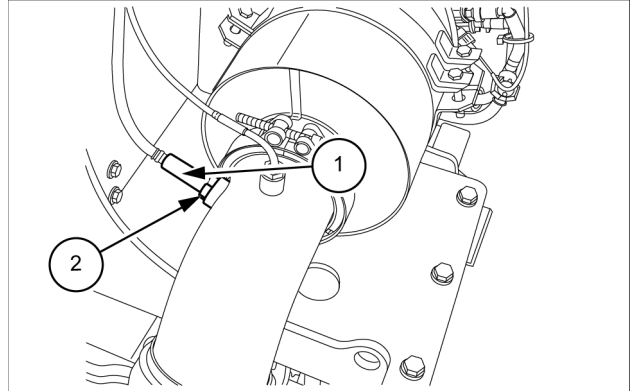
SERVICE

Diesel Exhaust Fluid (DEF)/AdBlue®/ARLA supply module	
Remove - Supply Tank Filler Neck Screen	3
Install - Supply Tank Filler Neck Screen	5
Filter - Remove	6
Filter - Install	9
Remove	11
Install	13
Diesel Exhaust Fluid (DEF)/AdBlue®/ARLA dosing module	
Remove	14
Install	16
Selective Catalytic Reduction (SCR) humidity sensor	
Remove	17
Install	19
Selective Catalytic Reduction (SCR) temperature sensors	
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Install - Catalyst inlet temperature sensor	23
Remove - Catalyst outlet temperature sensor	24
Install - Catalyst outlet temperature sensor	26
Nitrogen Oxide (NOx) sensor	
Remove	28
Install	30
Remove - Catalyst outlet Nitrogen Oxides (NOx) sensor	32
Install - Catalyst outlet Nitrogen Oxides (NOx) sensor	34
Diesel Exhaust Fluid (DEF)/AdBlue®/ARLA tank level and temperature sensor	
Remove	36
Install	39
Ammonia (NH3) sensor	
Remove - Catalyst outlet ammonia (NH3) sensor	41
Install - Catalyst outlet ammonia (NH3) sensor	43
Remove - NH3 Electronic Control Unit	45
Install - NH3 Electronic Control Unit	47

Nitrogen Oxide (NOx) sensor - Install

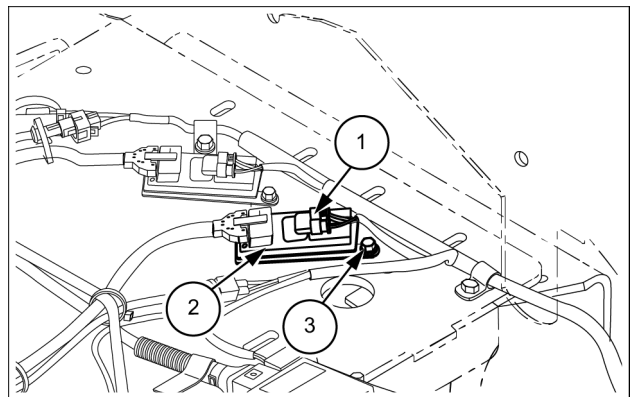
NOTICE: emissions sensors in the exhaust system and on the vehicle may be damaged by vibrations from use of impact wrenches or hammers during service work. Avoid using these tools when servicing components close to the sensors. Remove the sensors with care if use of these tools cannot be avoided.

1. Install the NOx sensor **(1)** into the inlet of the Diesel Oxidation Catalyst (DOC). Secure the NOx sensor with the hexagonal nut. Torque to. **40 – 60 N·m (30 – 44 lb ft)**.



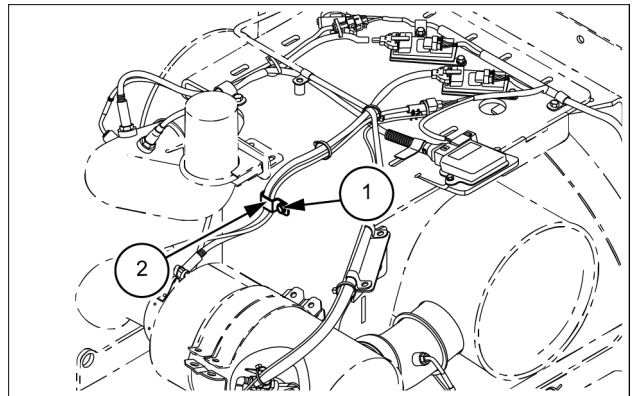
LEIL15WHL0223AB 1

2. Install the NOx sensor module **(2)** and secure it to the mounting support bracket using the two hexagonal bolts **(3)**. Reconnect the SCR sensors wiring harness **(1)** to the NOx sensor module.



LEIL15WHL0225AB 2

3. Install the clamp **(2)** that secure the sensor wiring harness to the catalyst mounting support bracket using the bolt **(1)**. Use new straps to hold the wiring harness to the others.



LEIL15WHL0226AB 3

Contents

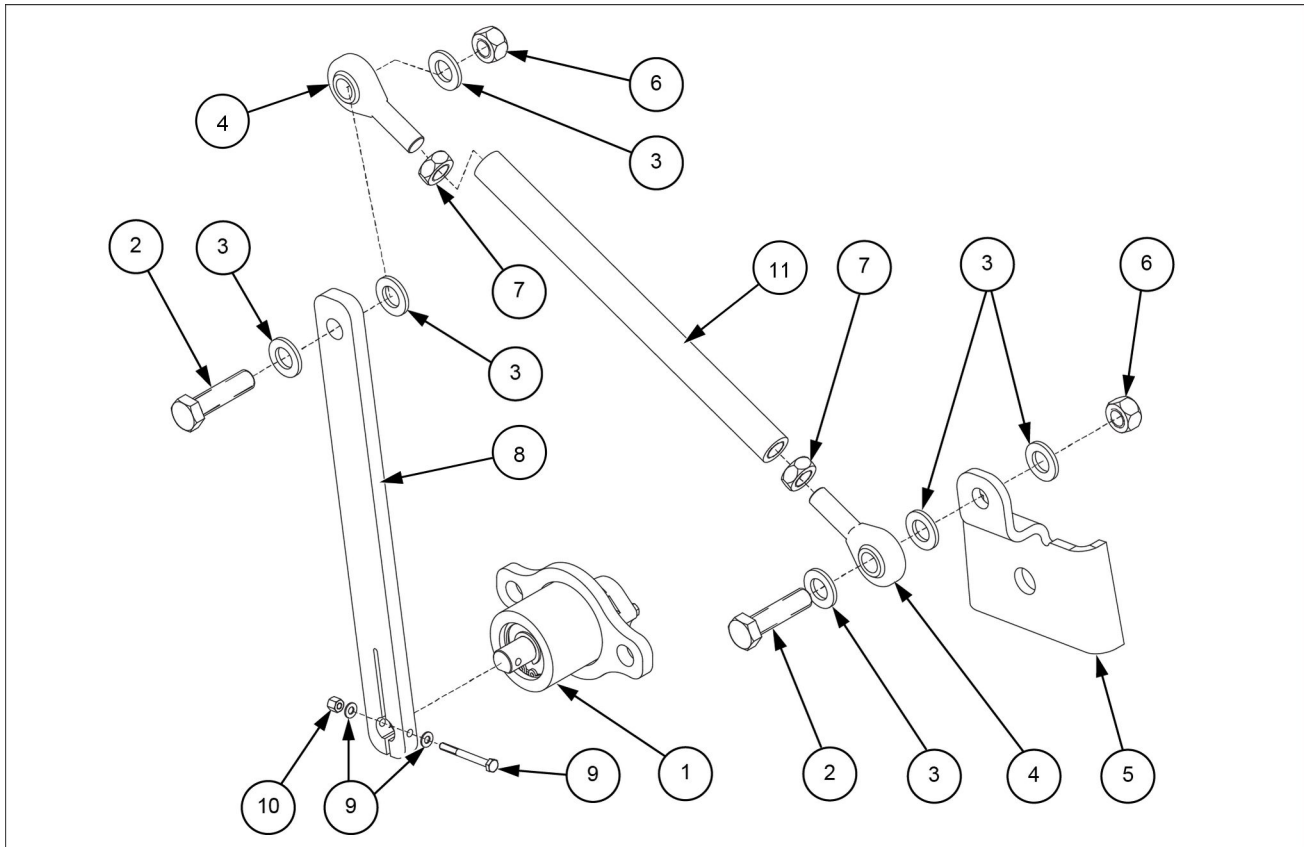
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Cab controls - 512

SERVICE

Joystick and Electric Hydraulic (EH) control	
Remove	3
Install	5
Remove (Two/three control levers)	7
Install (Two/three control levers)	10

XT models



LEIL17WHL2169FB 2

1. Loosen and remove the bolt (2), three washers (3), and nut (6) to separate the rod end (4) from the arm mounting bracket (5).
2. Loosen and remove the bolt (2), three washers (3), and nut (6) to separate the rod end (4) from the arm (8).
3. Loosen the two nuts (7) to separate the rod (11) from the two rod ends (4).
4. Loosen and remove the bolt (9), two washers (9), and nut (10) to unfix the EH tilt sensor (1) from the arm (8).

26197 - (DTC 6655)-Fuel metering unit is shorted to battery voltage at the low side	572
26237 - (DTC 667D)-Supply UB2 short to battery failure	574
26355 - (DTC 66F3)-Engine compression brake low side driver circuit short to battery failure	576
26402 - (DTC 6722)-Starter relay high side driver circuit short to battery failure	578
26419 - (DTC 6733)-Fan clutch solenoid short circuit to battery failure	580
26481 - (DTC 6771)-After run relay low side driver circuit short to battery failure	582
26702 - (DTC 684E)-DEF/AdBlue quality sensor internal failure (Temperature sensor circuit short to battery)	584
26749 - (DTC 687D)-Supply UB3 short to battery failure	585
27156 - (DTC 6A14)-Intake air heater actuator is shorted to battery voltage	587
27261 - (DTC 6A7D)-Actuator relay 3 circuit short to battery failure	589
27426 - (DTC 6B22)-Starter relay low side driver circuit short to battery failure	591
27738 - (DTC 6C5A)-DEF/AdBlue reverting valve driver circuit short to battery failure	593
28950 - (DTC 7116)-Injection bank 1 short circuit failure (all injectors of the same bank can be affected)	595
29050 - (DTC 717A)-DEF/AdBlue dosing valve actuator short circuit to ground in high side failure	596
29206 - (DTC 7216)-Injection bank 2 short circuit failure (all injectors of the same bank can be affected)	598
29242 - (DTC 723A)-DEF/AdBlue supply module pump motor short circuit to ground failure	599
29518 - (DTC 734E)-DEF/AdBlue quality sensor internal failure (Short circuit to ground error)	601
29683 - (DTC 73F3)-Engine compression brake high side driver circuit short to ground failure	602
29877 - (DTC 74B5)-Fuel filter heater actuator is shorted to ground	604
29986 - (DTC 7522)-Auxiliary power relay low side driver circuit short to ground failure	606
30037 - (DTC 7555)-Fuel metering unit is shorted to ground at the high side	608
30077 - (DTC 757D)-Supply UB1 circuit short to ground failure	610
30106 - (DTC 759A)-DEF/AdBlue tank heater actuator short circuit to ground failure	612
30549 - (DTC 7755)-Fuel metering unit is shorted to ground at the low side	614
30589 - (DTC 777D)-Supply UB2 short to ground failure	616
30707 - (DTC 77F3)-Engine compression brake low side driver circuit short to ground failure	618
30754 - (DTC 7822)-Starter relay high side driver circuit short to ground failure	620
30771 - (DTC 7833)-Fan clutch solenoid short circuit to ground failure	622
31054 - (DTC 794E)-DEF/AdBlue quality sensor internal failure (Temperature sensor circuit short to ground)	624
31101 - (DTC 797D)-Supply UB3 short to ground failure	625
31329 - (DTC 7A61)-Auxiliary power relay high side driver circuit short to ground failure	627
31764 - (DTC 7C14)-Intake air heater actuator is shorted to ground	629
31764 - (DTC 5614)-Intake air heater actuator has an open load error	631
31778 - (DTC 7C22)-Starter relay low side driver circuit short to ground failure	633
32090 - (DTC 7D5A)-DEF/AdBlue reverting valve driver circuit short to ground failure	634
33393 - (DTC 8271)-After run relay high side ECU driver circuit over temperature failure	636
33461 - (DTC 82B5)-Fuel filter heater ECU driver has an over temperature error	638
33570 - (DTC 8322)-Auxiliary power relay low side ECU driver circuit over temperature failure	640
33594 - (DTC 833A)-DEF/AdBlue supply module pump motor over temperature failure	642
33621 - (DTC 8355)-Fuel metering unit has an over-temperature error	644

4645 - (DTC 1225)-Rail pressure sensor value is above maximum offset

Context:

The Engine Control Unit (ECU) monitors fuel rail pressure against offset drift at engine stand still after a waiting period. This allows rail pressure to drop to ambient pressure, which is approximately **1.00 bar**. If the ECU determines that the rail pressure sensor is above maximum offset, this fault will occur.

Cause:

The ECU has determined that the rail pressure sensor is above maximum offset.

Possible failure modes:

1. Faulty wiring of the rail pressure sensor.
2. Faulty internal failure of the rail pressure sensor. (possibly due to overpressure)
3. Faulty software of the ECU.

Solution:

1. Verify fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with Step 2.

B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step 5.

2. Check for the following related faults:

5157 – (DTC 1425) - Fuel rail pressure sensor voltage is higher than expected

16677 – (DTC 4125) - Rail pressure sensor value is intermittent

A. If any of the listed faults are active, diagnose them first and then return to this fault.

B. If none of the listed faults are active, continue to Step 3.

3. Check that the rail pressure sensor is properly mounted and secured.

A. If the sensor is loose or incorrectly mounted, repair as necessary.

B. If the rail pressure sensor is properly mounted and secured, continue to Step 4.

4. Replace the rail pressure sensor.

Use the EST to verify the status of this fault.

A. If the fault has been resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU for the appropriate software and re-flash, as necessary.

5. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Flex the harnesses involved to reveal intermittent breaks or shorts in the wiring concerned. Operate the machine while you monitor the display.

A. If you find damage or the display indicates other than normal display readings, then repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, then erase the fault code and continue operation.

Check the integrity of the connector **X-TECM** and visually check for any damage to the connector and to the pins 3 and 19.

A. If a problem is found, replace the connector **X-TECM**.

B. If there are no problems, continue with Step 6.

6. Check the harness between the engine speed sensor **B-ES_S** and the Transmission Control Unit **A-TRANS** for a short circuit to battery voltage condition.

The key must be in the OFF position.

Use a multimeter to perform the following check:

From	To	Value
Connector X-TECM pin 19	Chassis ground	There should be no voltage

A. If there is a voltage, find and replace the wire 699 and/or 699A.

B. If there is no voltage, continue with Step 7.

7. Check the harness between the engine speed sensor **B-ES_S** and the Transmission Control Unit **A-TRANS** for an open circuit condition.

Disconnect the connector **X-ESS** from the engine speed sensor **B-ES_S**.

The key must be in the OFF position.

Use a multimeter to perform the following check:

From	To	Value
Connector X-TECM pin 19	Connector X-ESS pin 1	There should be continuity

A. If there is no continuity, find and repair or replace the wire 699 and/or 699A.

B. If there is continuity, continue with Step 8.

8. Check if the engine speed sensor **B-ES_S** is defective.

A. If a problem is found, replace the engine speed sensor **B-ES_S**.

B. If there are no problems, replace the Transmission Control Unit **A-TRANS**.

Wiring harnesses - Electrical schematic sheet 26 (55.100)

The key must be in the OFF position for continuity and ON position for voltage.

Use a multimeter to perform the following wiring checks:

From	To	Value
X-9002 pin 86	X-9003 pin 4	There should be continuity.
X-9002 pin 86	X-9002 pin 7	There should be no continuity.
X-9002 pin 86	X-9002 pin 90	There should be no continuity.
X-9002 pin 86	All other pins	There should be no continuity.
X-9002 pin 86	Chassis ground	There should be no continuity.
X-9002 pin 86	Chassis ground	There should be no voltage.

A. If the specified values are measured, continue to Step 5.

B. If the specified values are not measured, Locate and repair the faulty conductor.

5. Replace the B-9001.

Use the EST to verify the status of this fault.

A. If the fault has been resolved, return the machine to service.

B. If the fault has not been resolved, continue to Step 6.

6. Replace turbocharger wastegate (if equipped) or replace EVGT (if equipped).

Use the EST to verify the status of this fault.

A. If the fault has been resolved, return the machine to service.

B. If the fault has not been resolved, check the ECU for the appropriate software and re-flash, if necessary.

7. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Flex the harnesses involved to reveal intermittent breaks or shorts in the wiring concerned. Operate the machine while you monitor the display.

A. If you find damage or the display indicates other than normal display readings, repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, erase the fault code and continue operation.

Wiring harnesses - Electrical schematic sheet 05 (55.100)

5267 - (DTC 1493)-High pressure intercooler outlet temperature sensor voltage is higher than expected

NOTE: refer to the Engine Service Manual for more details.

Context:

The High Pressure Intercooler (HPI) downstream coolant temperature sensor B-9012 voltage is monitored by the Electronic Control Unit (ECU). If the voltage is greater than **4.90 V** for a period greater than **500 mV**, this fault will occur.

Cause:

The ECU has detected a value greater than **4.90 V** for a period greater than **500 mV** in the temperature signal circuit.

Possible failure modes:

1. Faulty temperature signal wire, shorted to a high source or open circuit.
2. Faulty coil of the temperature sensor.
3. Faulty software of the ECU.

Solution:

1. Verify that fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with Step 2.

B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step 5.

2. Check the temperature signal wire for an open circuit.

Disconnect connector **X-9028**.

Disconnect connector **X-9002**.

The key must be in the OFF position.

Use a multimeter to perform the following voltage test:

From	To	Value
X-9002 pin 38	X-9028 pin 2	There should be continuity.

A. If there is continuity, leave both connectors disconnected and continue to Step 3.

B. If there is no continuity, there an open circuit in the temperature sensor signal circuit. Locate and repair the broken conductor.

3. Check the temperature signal wire for a short to high source condition.

The key must be in the OFF position.

Use a multimeter to perform the following continuity check:

From	To	Value
X-9002 pin 38	X-9002 pin 34	There should be no continuity.
X-9002 pin 38	All other pins	There should be no continuity.

A. If there is continuity, there is a short to high source circuit in the temperature signal wire circuit. Locate and replace the shorted conductor.

B. If there is no continuity, continue to Step 4.

5480-05 - Open circuit at clutch K1

Control Module: TCU

Context:

The detected failure in the system has strong limitations to transmission control. The Transmission Control Unit **A-TRANS** can engage only one gear in each direction. In some cases only one direction will be possible.

The Transmission Control Unit **A-TRANS** will shift the transmission into neutral at the first occurrence of the failure. First, the operator must shift the gear selector into neutral position.

If output speed is less than a threshold for neutral to gear and the operator shifts the gear selector into forward or reverse, the Transmission Control Unit **A-TRANS** will select the limp-home gear.

If output speed is less than a threshold for reversal speed and the Transmission Control Unit **A-TRANS** has changed into the limp-home gear and the operator selects a shuttle shift, the Transmission Control Unit **A-TRANS** will shift immediately into the limp-home gear of the selected direction.

If output speed is greater than the threshold, the Transmission Control Unit **A-TRANS** will shift the transmission into neutral. The operator has to slow down the vehicle and must shift the gear selector into neutral position.

If a failure at another clutch is pending, the Transmission Control Unit **A-TRANS** detects a severe failure that disables control of system.

The Transmission Control Unit **A-TRANS** shuts off all solenoid valves and also both common power supplies (VPS1, VPS2). The park brake is operating, also all functions which use ADM 1 to ADM 8 are disabled.

The Transmission Control Unit **A-TRANS** shifts the transmission to neutral position.

Cause:

There is an open circuit at clutch K1 of the transmission controller of tranny **A-TRC**. The measured resistance value of the valve is out of limit.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harnesses or the connectors are damaged or the connectors are not installed.
3. The harness between the transmission controller of tranny **A-TRC** and the Transmission Control Unit **A-TRANS** is defective.
4. The transmission controller of tranny **A-TRC** is defective.
5. The Transmission Control Unit **A-TRANS** is defective.

Solution:

1. Verify that fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with Step 2.

B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.

2. Check if the connector **X-TRC** is connected to the transmission controller of tranny **A-TRC**.

Check if the connector **X-TRANS** is connected to the connector **X-CAB_TR**.

Check if the connector **X-TECM** is connected to the Transmission Control Unit **A-TRANS**.

A. If a problem is found, restore the connection.

B. If there are no problems, continue with Step 3.

3. Disconnect the connector **X-TRC** from the transmission controller of tranny **A-TRC**.

Check the integrity of the connector **X-TRC** and visually check for any damage to the connector and to the pins.

A. If a problem is found, replace the connector **X-TRC**.

5540-04 - Short circuit to ground at converter clutch (regulator valve)

Control Module: TCU

Context:

There is no failure detected in the transmission system or the failure has no or slight effects on the transmission control.

The Transmission Control Unit **A-TRANS** works without or, in special cases, with little limitations.

Cause:

There is a short circuit to ground at the converter clutch.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harnesses or the connectors are damaged or the connectors are not installed.
3. The harness between the transmission controller of tranny **A-TRC** and the Transmission Control Unit **A-TRANS** is defective.
4. The transmission controller of tranny **A-TRC** is defective.
5. The Transmission Control Unit **A-TRANS** is defective.

Solution:

1. Verify that fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with Step 2.

B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.

2. Check if the connector **X-TRC** is connected to the transmission controller of tranny **A-TRC**.

Check if the connector **X-TRANS** is connected to the connector **X-CAB_TR**.

Check if the connector **X-TECM** is connected to the Transmission Control Unit **A-TRANS**.

A. If a problem is found, restore the connection.

B. If there are no problems, continue with Step 3.

3. Disconnect the connector **X-TRC** from the transmission controller of tranny **A-TRC**.

Check the integrity of the connector **X-TRC** and visually check for any damage to the connector and to the pins.

A. If a problem is found, replace the connector **X-TRC**.

B. If there are no problems, connect the connector **X-TRC** to the transmission controller of tranny **A-TRC** and continue with Step 4.

4. Disconnect the connector **X-TRANS** from the connector **X-CAB_TR**.

Check the integrity of the connector **X-TRANS** and **X-CAB_TR**, visually check for any damage to the connectors and to the pin 5.

A. If a problem is found, replace the damaged connector.

B. If there are no problems, connect the connector **X-CAB_TR** to the connector **X-TRANS** and continue with Step 5.

5. Disconnect the connector **X-TECM** from the Transmission Control Unit **A-TRANS**.

5700-00 - Overtemp Sump

Control Module: TCU

Context:

There is no failure detected in the transmission system or the failure has no or slight effects on the transmission control.

The Transmission Control Unit **A-TRANS** works without or, in special cases, with little limitations.

Cause:

The Transmission Control Unit **A-TRANS** measures a temperature in the oil sump that is over the allowed threshold.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. Incorrect level of oil into the transmission.
3. The hydraulic oil temperature sensor **B-HOT** is defective.

Solution:

1. Verify that fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with Step 2.

B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.

2. Cool down the machine.

Check the oil level of the transmission.

A. If a problem is found, restore the oil level of the transmission.

B. If there are no problems, continue with Step 3.

3. Check if the hydraulic oil temperature sensor **B-HOT** is defective and replace if necessary.

Wiring harnesses - Electrical schematic sheet 19 (55.100)

2. Check for leakage, clogging or damage that would allow air to enter the low pressure side of the fuel system. Visually and tactually inspect the low pressure side of the fuel system for leaks, clogs or air entry damage. Inspect gear pump for appropriate pressure.

A. If leakage, clogging, air entry, damage or low gear pump pressure is found, repair or replace fittings, filters, lines, etc., as needed.

B. If no leakage, clogging, air entry, damage or low gear pump pressure is found, continue with Step 3.

3. Replace the fuel metering unit.

Use the EST to verify the status of this fault code.

A. If the fault has been resolved, see **Pressure regulating valve - Configure - Reset ECU data (10.218)** for the Replacement of the Rail Pressure Metering Unit - Reset ECU Data. Then use EST and see **Selective Catalytic Reduction (SCR) exhaust treatment - Configure - Engine restart counter reset (10.500)** if necessary, to perform the Engine Restart Counter Reset / Unlock Inducement configuration then return the machine to service.

B. If the fault has not been resolved, continue to Step 4.

4. Replace the PRV.

Use the EST to verify the status of this fault code.

A. If the fault has been resolved, see **Common rail - Configure - Reset ECU data (10.218)** for the Replacement of the Rail Pressure Relief Valve (PRV) - Reset ECU Data. Then use EST and see **Selective Catalytic Reduction (SCR) exhaust treatment - Configure - Engine restart counter reset (10.500)** if necessary, to perform the Engine Restart Counter Reset / Unlock Inducement configuration then return the machine to service.

B. If the fault has not been resolved, continue to Step 5.

5. Replace the rail pressure sensor.

Use the EST to verify the status of this fault code.

A. If the fault has been resolved, return the machine to service.

B. If fault has not been resolved, Check the ECU for the appropriate software and re-flash, if necessary.

From	To	Value
Connector X-ECU pin 32	All other pins	There should be no continuity

A. If there is continuity, there is a short circuit condition in the SCR upstream temperature sensor, signal circuit. Locate and repair the shorted conductor.

B. If there is no continuity, continue to Step 4.

4. Check the SCR upstream temperature sensor signal circuit for a short to key battery power condition.

The key must be in the ON position.

Use a multimeter to perform the following voltage check:

From	To	Value
Connector X-ECU pin 32	Chassis ground	There should be no voltage

A. If there is voltage, there is a short to key battery power condition in the SCR upstream temperature sensor signal circuit. Locate and repair the shorted conductor.

B. If there is no voltage, continue to Step 5.

5. Replace the SCR upstream temperature sensor.

Use the EST to verify the status of this fault code.

A. If the fault has been resolved, use EST, see **Selective Catalytic Reduction (SCR) exhaust treatment - Configuration - Engine restart counter reset (10.500)** if necessary, to perform the Engine Restart Counter Reset / Unlock Inducement configuration then return the machine to service.

B. If the fault has not been resolved, check the ECU for the appropriate software and re-flash, if necessary.

6. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Flex the harnesses involved to reveal intermittent breaks or shorts in the wiring concerned. Operate the machine while you monitor the display.

A. If you find damage or the display indicates other than normal display readings, repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, erase the fault code and continue operation.

Wiring harnesses - Electrical schematic sheet 17 (55.100)

- A. If there is continuity, there is a short to ground condition in the vehicle (VE) harness between the connector **X-ECU** pin 31 and the connector **X-LEV1** pin 1 and/or between the connector **X-LEV2** pin 1 and the connector **X-DTLTS** pin 1. Locate and repair the grounded conductor.
- B. If there is no continuity, check the ECU for the appropriate software and re-flash, if necessary.
- 4. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Flex the harnesses involved to reveal intermittent breaks or shorts in the wiring concerned. Operate the machine while you monitor the display.
 - A. If you find damage or the display indicates other than normal display readings, repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.
 - B. If you do not find damage and the display indicates only normal readings, erase the fault code and continue operation.

Wiring harnesses - Electrical schematic sheet 17 (55.100)

96-01 - Fuel Level Sensor Under Resistance

Control Module: UCM

Context:

The **A-UCM** detects a value of resistance of the FUEL LEVEL SENSOR (**B-RFLG**) lower than the low limit; as a consequence the fuel level is not available.

Cause:

The **A-UCM** detects on pin 11 of connector **X-UCM4A** a resistance value $< 20 \Omega$ 20Ω (last index is $27.5 \Omega \pm 2.5 \Omega$).

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and the FUEL LEVEL SENSOR is damaged.
3. The FUEL LEVEL SENSOR is damaged.
4. The connectors **X-CAB_E** or **X-ENG** or **X-FL** or **X-UCM4A** are damaged.
5. The harness of FUEL LEVEL SENSOR is damaged.
6. The harness between connectors **X-ENG** and **X-FL** is damaged.
7. The harness between connectors **X-CAB_E** and **X-UCM4A** is damaged.

Solution:

1. Verify that the fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

- A. If the fault is present and active, continue with Step 2.
- B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Visually check the integrity of the harness between the connector **X-UCM4A** and the connector **X-FL** for any damage.
 - A. If the harness is damaged, replace the harness.
 - B. If the harness is not damaged, continue with Step 3.
3. Replace the FUEL LEVEL SENSOR.
 - A. If the functionality is restored, the procedure ends.
 - B. If the functionality is not restored, continue with Step 4.
4. Check the integrity of connector **X-FL**.

Disconnect the connector **X-FL** from the FUEL LEVEL SENSOR and visually check the integrity of pins 1 and 2.

- A. If one pin is damaged, replace the harness relevant to the damaged connector.
- B. If the pins are not damaged, continue with Step 5.
5. Check the integrity of harness of the FUEL LEVEL SENSOR.

Disconnect the connector **X-FL** from the FUEL LEVEL SENSOR.

Use a multimeter to perform the following check:

From	To	Value
Connector X-FL pin 2	Connector X-FL pin 1	Open circuit

- A. If the measurement is not correct, replace the harness.

- B. If you do not find damage and the display indicates only normal readings, erase the fault code and continue operation.

- B. If you do not find damage and the display indicates only normal readings, erase the fault code and continue operation.

Wiring harnesses - Electrical schematic sheet 17 (55.100)

4. Replace the **DEF/AdBLUE®** supply module.

Check to see that this fault has been resolved.

A. If this fault is resolved, return the machine to service.

B. If this fault is not resolved, check the ECU for the appropriate software and re-flash, if necessary.

15322 - (DTC 3BDA)-NOx estimation model in ECU software is inaccurate due to other failures

Context:

The NOx estimation is essential for the calculation of the needed **DEF/AdBLUE®** dosing injection quantity in the Selective Catalytic Reduction (SCR) system for control of the NOx emissions. If the calculation is not reliable due to a defective sensor, the NOx control is no longer correct and this fault will occur. This fault requires no action other than the determination and resolution of the fault causing this fault to occur.

Cause:

One of the faults listed below has caused this fault to occur.

Possible failure modes:

1. **4371 – (DTC 1113)-Engine coolant temperature sensor voltage is higher than expected**
2. **8723 – (DTC 2213)-Engine coolant temperature sensor voltage is lower than expected**
3. **6596 – (DTC 19C4)-Ambient temperature sensor voltage is higher than expected**
4. **10948 – (DTC 2AC4)-Ambient temperature sensor voltage is lower than expected**
5. **7524 – (DTC 1D64)-Intake manifold pressure sensor voltage is higher than expected**
6. **11876 – (DTC 2E64)-Intake manifold pressure sensor voltage is lower than expected**
7. **4980 – (DTC 1374)-Intake manifold temperature sensor voltage is higher than expected**
8. **9332 – (DTC 2474)-Intake manifold temperature sensor voltage is lower than expected**

17429 - (DTC 4415)-Water in fuel detected or water in fuel circuit failure

NOTE: this fault code is for the Water in Fuel sensor with black connector housing. If the connector housing of the sensor is white take care that the pins 2 and 3 are reversed.

Context:

The Engine Control Unit (ECU) monitors the voltage output from the water in fuel sensor to determine if water is present in the fuel supply. If water is detected in the fuel, warnings will be displayed to alert the operator of potential engine damage if operation continues. High voltage signal from the water in fuel sensor indicates water present.

Cause:

This fault code is displayed to warn the operator that the ECU has detected excess water in the fuel system or a fault in the water in fuel sensor circuit.

Possible failure modes:

1. Excess water in the fuel supply.
2. Faulty water in fuel sensor, wiring or internal (mechanical and/or electrical) failure.
3. Faulty software of the ECU.

Solution:

1. Verify that this fault code is still present and in an active state.

Use the Easy Engine software provided on the Electronic Service Tool (EST) to check the fault status.

A. If the fault is still present and active, continue with Step 2.

B. If the fault is no longer present or is in an inactive state, Continue with Step 8 .

2. Check fuel for water contamination.

A. If there is water contamination, continue with Step 3.

B. If there is no water contamination, Continue with Step 4.

3. Verify proper water in fuel sensor operation.

Purge fuel supply system, replace fuel filter(s) and refill with fuel that is free of water contamination.

Start and run engine for 5 minutes.

Check for code to return to active status.

A. If code returns in an active status, replace water in fuel sensor.

B. If code remains inactive, return the machine to service.

4. Check for open, short and grounded circuit conditions in the water in fuel sensor circuit.

Disconnect the water in fuel sensor at connector **X-WIF**.

Disconnect the vehicle (VE) harness from the ECU at connector **X-ECU**.

Disconnect the connector **X-ENG** from the connector **X-CAB_E**.

With the key switch in the OFF position, use a multimeter to perform the following tests, on the vehicle (VE) harness:

From	To	Value
Connector X-WIF pin 1	Connector X-ECU pin 13	There should be continuity
Connector X-WIF pin 2	Connector X-ECU pin 43	There should be continuity

19338 - (DTC 4B8A)-DEF/AdBlue system unable to build sufficient pressure for dosing

NOTE: refer to the Engine Service Manual for more details.

NOTE: because this fault causes inducement, it is necessary to perform the SCR Fault Repair Verification Test once the fault has been resolved. See **Selective Catalytic Reduction (SCR) exhaust treatment - Service instruction - SCR fault repair verification test (10.500)** if necessary.

NOTE: because this fault causes inducement, it is necessary to perform the Engine Restart Counter Reset / Unlock Inducement configuration with the Electronic Service Tool (EST) before you return the machine to service. See **Selective Catalytic Reduction (SCR) exhaust treatment - Configure - Engine restart counter reset (10.500)** if necessary.

Context:

For information regarding the functional operation of the Diesel Exhaust Fluid **DEF/AdBLUE®** system see **Selective Catalytic Reduction (SCR) exhaust treatment - Dynamic description (10.500)**. If the **DEF/AdBLUE®** system pressure does not reach **6.50 bar (94.25 psi)** within **60.0 s** after ten pressure build up cycles, this fault will occur.

Cause:

The Engine Control Unit (ECU) has determined that a low pressure condition exists in the **DEF/AdBLUE®** system.

Possible failure modes:

1. Faulty **DEF/AdBLUE®** tank level, too low a fluid level (suction of air).
2. Faulty **DEF/AdBLUE®** system, leakage (external and/or internal).
3. Faulty **DEF/AdBLUE®** system filters or lines (tubes), restricted.
4. Faulty dosing module, blocked (stuck) open.
5. Faulty supply module pump motor not delivering enough, **DEF/AdBLUE®** reverting valve blocked (stuck) open, or pressure sensor supply module pressure sensor values too low.

Solution:

1. Verify that fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

- A. If the fault is present and active, continue with Step 2.
- B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step 8.

2. Check fluid level in **DEF/AdBLUE®** system supply tank.

As air in the **DEF/AdBLUE®** system will cause the pressure level to decrease, visually check the fluid level in the supply tank.

There should be an adequate level of fluid.

- A. If a less than adequate level is found, fill the **DEF/AdBLUE®** system supply tank to an acceptable level.
- B. If an adequate level is found, continue with Step 3.

3. Check for leakage or damage and/or blockage in **DEF/AdBLUE®** system.

Visually and tactually inspect the system filters and suction, pressure and back flow lines (tubes) for leakage and/or damage.

There should be no leakage or damage.

- A. If leakage or damage is found, repair or replace the filter and/or line (tube).

4. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Flex the harnesses involved to reveal intermittent breaks or shorts in the wiring concerned. Operate the machine while you monitor the display.
 - A. If you find damage or the display indicates other than normal display readings, repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.
 - B. If you do not find damage and the display indicates only normal readings, erase the fault code and continue operation.

Wiring harnesses - Electrical schematic sheet 01 (55.100)

Wiring harnesses - Electrical schematic sheet 18 (55.100)

- A. If there is continuity to chassis ground, leave connector **X-9184** disconnected and continue with step **5**.
- B. If there is no continuity, there is a short to ground condition in the engine harness between the valve cover connector **X-9184 pin 2** and the engine plug connector **X-9002 pin 26**. Locate and repair the grounded conductor.

5. Determine location of the short to ground condition.

Remove the injector (valve) cover and disconnect the injector harness from cylinder 2 injector at connector **X-9189-4CYL**.

Use a multimeter to check for continuity, on the injector:

From	To	Value
X-9189-4CYL pin 1	chassis ground	There should be no continuity

- A. If there is continuity, cylinder 2 injector Y-9002 solenoid coil has failed, replace the injector.
- B. If there is no continuity, there is a short to ground condition in cylinder 2 injector circuit, between connector **X-9189-4CYL pin 1** and connector **X-9184 pin 2**. Locate and repair the grounded conductor.

6. Disconnect the engine cylinder harness from the injector (valve) cover at connector **X-9184**.

Use a multimeter to measure the resistance on the injector cover side of the valve cover:

From	To	Value
X-9184 pin 2	X-9184 pin 1	There should be greater than 0.1 Ω

- A. If the resistance is greater than **0.1 Ω**, there is a short circuit condition in the engine injector harness between the valve cover connector **X-9184** and the engine plug connector **X-9002**. Locate and repair the short circuit.

- B. If the resistance is less than **0.1 Ω**, continue with step **7**.

7. Remove the injector (valve) cover and disconnect the injector harness from cylinder 2 injector at connector **X-9189-4CYL**.

Use a multimeter to check for continuity, on the injector:

From	To	Value
X-9189-4CYL pin 1	X-9189-4CYL pin 2	There should be greater than 0.1 Ω

- A. If there is greater than **0.1 Ω**, there is a short circuit condition in the injector harness, between connector **X-9184** and connectors **X-9189-4CYL pin 1** and **X-9189-4CYL pin 2**. Locate and repair the shorted conductors.

- B. If the resistance is less than **0.1 Ω**, the cylinder 2 injector Y-9002 solenoid coil has failed. Replace the injector.

8. Check the ECU supply voltage.

Disconnect the vehicle interface harness (VE) from the ECU at the vehicle plug connector **X-9001 X-90NN**.

Place the key switch S-9103 in the ON position.

Use a multimeter to check for voltage on the vehicle interface (VE) harness side of the vehicle plug:

From	To	Value
X-9001 pin 1	chassis ground	There should be 12.0 V
X-9001 pin 25	chassis ground	There should be 12.0 V
X-9001 pin 26	chassis ground	There should be 12.0 V
X-9001 pin 49	chassis ground	There should be 12.0 V
X-9001 pin 73	chassis ground	There should be 12.0 V

- A. If the **12.0 V** is present for all five checks, leave the vehicle plug connector **X-9001** disconnected and continue with Step **9**.

29206 - (DTC 7216)-Injection bank 2 short circuit failure (all injectors of the same bank can be affected)

Context:

Hardware errors in the injectors and their respective Engine Control Unit (ECU) power stages are investigated within the ECU. The injector control scheme also groups the individual injector control circuits into banks. The ECU diagnostic procedure uses pattern detection to identify specific injector as well as bank errors. When an expected combination of errors is detected, the associated fault occurs. If a short circuit failure condition exists in bank 2, this fault will occur.

Cause:

The ECU has determined that a short circuit condition exists in injector control bank 2.

Possible failure modes:

1. Faulty bank 2 injector circuit wiring, shorted.
2. Faulty bank 2 injector solenoid windings, shorted.
3. Faulty software of the ECU.

Solution:

1. Check for bank 2 injector fault code.

Use the Electronic Service Tool (EST) to check for the presence of **25382 - (DTC 6326) - Short circuit error of injector in cylinder 3 (55.640)** or **25894 - (DTC 6526) - Short circuit error of injector in cylinder 2 (55.640)**.

- A. If either **25382 - (DTC 6326) - Short circuit error of injector in cylinder 3 (55.640)** or **25894 - (DTC 6526) - Short circuit error of injector in cylinder 2 (55.640)** is present, resolve the relevant fault. Then check that this fault is also resolved.
- B. If neither **25382 - (DTC 6326) - Short circuit error of injector in cylinder 3 (55.640)** or **25894 - (DTC 6526) - Short circuit error of injector in cylinder 2 (55.640)** is present, check the ECU for the appropriate software and re-flash, if necessary.

- B. If you do not find damage and the display indicates only normal readings, erase the fault code and continue operation.

Wiring harnesses - Electrical schematic sheet 16 (55.100)

34716 - (DTC 879C)-Exhaust flap actuator is over temperature

NOTE: refer to the Engine Service Manual for more details.

Context:

For information regarding the functional operation of the exhaust flap A-9002 see **Exhaust flap actuator - Overview (55.014)**. The exhaust flap actuator controller sends and receives information at regular intervals to and from the Engine Control Unit (ECU) via Controller Area Network (CAN). If an over-current situation is sensed by the exhaust flap A-9001 actuator controller, this fault will occur.

Cause:

The ECU has reported, via the engine sensor CAN bus, that the exhaust flap actuator controller has reported that an over-current situation exists.

Possible failure modes:

1. Faulty supply voltage, out of required range.
2. Faulty CAN wiring, open or short circuit.
3. Faulty exhaust flap actuator controller, hardware or firmware.
4. Faulty software of the ECU.

Solution:

1. Verify that fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with Step 2.

B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step 7.

2. Check the exhaust flap actuator controller supply voltage.

Disconnect the engine (EN) harness from the exhaust flap actuator controller at connector **X-9025 NEF**.

With the key switch in the ON position, use a multimeter to check for voltage on the engine (EN) harness side:

From	To	Value
X-9025 NEF pin 1	X-9025 NEF pin 2	There should be 12.0 V .

A. If the voltage is present, leave connector **X-9025 NEF** disconnected and continue with Step 3.

B. If the voltage is not present, continue with Step 4.

3. Determine the condition of the exhaust flap actuator controller CAN circuit.

With the key switch in the OFF position, use a multimeter to measure the resistance of the CAN connection on the engine (EN) harness side:

From	To	Value
X-9025 NEF pin 4	X-9025 NEF pin 5	There should be 60 Ω .

A. If the measured resistance is correct, continue with Step 5.

B. If the measured resistance is not correct, continue with Step 4.

4. Check for other engine CAN faults.

Use EST to determine if other CAN faults exist.

A. If other faults do exist, use the appropriate vehicle service manual information to locate and repair the faulted CAN condition.

38091 - (DTC 94CB)-CAN communication failure between vehicle controller and ECU controller - TSC1_VR message (Engine brake)

Context:

The Engine Control Unit (ECU) is capable of connecting to and communicating on three separate Controller Area Networks (CAN). Proper configuration and monitoring of the three twisted pair configured networks is also a function of the ECU. CAN Node A Bus is the main vehicle interface bus. The ECU provides a CAN termination resistor for the CAN Node A Bus, internal to the ECU. The ECU receives and responds to Vehicle Retarder (VR) information at two different rates (active and passive) dependant upon change request status. If the ECU is not sensing the VR message at the passive rate, this fault will occur.

Cause:

The ECU is not properly sensing the VR message.

Possible failure modes:

1. Faulty vehicle system, related CAN fault.
2. Faulty supply voltage or ground, missing.
3. Faulty CAN circuit wiring, open circuit, short to ground, or short circuit.
4. Faulty ECU, termination resistor or software.

Solution:

1. Verify that fault is present and in active state.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with Step 2.

B. If the fault is no longer present or is in an inactive state, the fault may be intermittent and not currently active. Continue with Step 6.

2. Check for related vehicle CAN faults.

Use the EST to determine if vehicle CAN faults exist.

A. If related vehicle CAN faults do exist, resolve the vehicle CAN faults, then check that this fault is also resolved.

B. If related vehicle CAN faults do not exist, continue with Step 3.

3. Check the ECU supply voltage.

Disconnect the vehicle (VE) harness from the ECU at the connector **X-ECU**.

With the key switch in the "ON" position, use a multimeter to check for voltage on the vehicle (VE) harness side:

From	To	Value
Connector X-ECU pin 1	Chassis ground	There should be 12.0 V
Connector X-ECU pin 25	Chassis ground	There should be 12.0 V
Connector X-ECU pin 26	Chassis ground	There should be 12.0 V
Connector X-ECU pin 49	Chassis ground	There should be 12.0 V
Connector X-ECU pin 73	Chassis ground	There should be 12.0 V

A. If the voltage is present on all of the checks, leave the connector **X-ECU** disconnected and continue with Step 4.

B. If the voltage is not present for one or more of the checks, refer to the appropriate vehicle service manual and electrical schematics to locate and restore supply power to the ECU.

4. Check the ECU grounding.

With the key switch in the "OFF" position, use a multimeter to check for continuity on the vehicle (VE) harness side:

4. As there is no method for field testing or re-flashing the sensor controller, replace the SCR downstream NO_x sensor.

Then use the EST, see **Nitrogen Oxide (NO_x) sensor - Configure - Reset ECU data (Downstream sensor) (55.988)** if necessary, to perform the Replacement of Nox Downstream Sensor - Reset ECU Data configuration.

Then check to see that this fault is resolved.

A. If this fault is resolved, use the EST, see **Selective Catalytic Reduction (SCR) exhaust treatment - Configure - Engine restart counter reset (10.500)** if necessary, to perform the Engine Restart Counter Reset / Unlock Inducement configuration. Then return the machine to service.

B. If this fault is not resolved, check the ECU for the appropriate software and re-flash, if necessary.

5. Check for other engine ATS CAN faults.

Use EST to determine if other ATS CAN faults exist.

A. If other faults do exist, see **Controller Area Network (CAN) data bus - Test (55.640)** to locate and repair the faulted condition.

B. If no other faults exist, the ATS vehicle (VE) harness wiring is damaged between the network harness splice and the SCR downstream NO_x sensor connector **X-NOXS** pin 3 and/or **X-NOXS** pin 4. Locate and repair the damage to the ATS CAN circuit wiring.

6. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Flex the harnesses involved to reveal intermittent breaks or shorts in the wiring concerned. Operate the machine while you monitor the display.

A. If you find damage or the display indicates other than normal display readings, repair the damage discovered during the inspection or locate and repair the other than normal display condition and verify that the error has been resolved.

B. If you do not find damage and the display indicates only normal readings, erase the fault code and continue operation.

Wiring harnesses - Electrical schematic sheet 18 (55.100)

58333 - (DTC E3DD)-Post injection efficiency failure

Context:

Engine performance is assisted by the addition of pilot injections, main injections and post injections. The Engine Control Unit (ECU) monitors the post injection 3 efficiency. If injection is not commanded at an engine speed greater than **1200 RPM** and an engine speed greater than **1320 RPM** is then detected at least two times, this fault will occur.

Cause:

The ECU has detected an unwanted increase in engine speed. This failure may have been caused by unwanted leakage of fuel or engine oil into the engine or by unwanted post injections.

Possible failure modes:

1. Faulty fuel injectors, leakage.
2. Engine oil leakage into cylinders, faulty piston rings.
3. Faulty the software of the ECU.

5930-07 - Clutch failure

Control Module: TCU

Context:

The Transmission Control Unit **A-TRANS** detects a severe failure that disables control of system.

The Transmission Control Unit **A-TRANS** shuts off all solenoid valves and also both common power supplies (VPS1, VPS2). The park brake is operating, also all functions which use ADM 1 to ADM 8 are disabled.

The Transmission Control Unit **A-TRANS** shifts the transmission to neutral position.

Cause:

The Automatic Emergency Braking (AEB) was not able to adjust the clutch filling parameters. One of the AEB-Values is out of limit. The Transmission Control Unit **A-TRANS** shows also the affected clutch on the display.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The clutch is defective.

Solution:

1. Verify that fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with Step 2.

B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.

2. Check the clutch and repair or replace if necessary.

- B. If you do not find damage and the display indicates only normal readings, erase the fault code and continue operation.

62370 - (DTC F3A2)-Torque limitation due to excessive coolant temperature

Context:

This failure path is only for information. There was an active performance limitation due to high coolant temperature with a duration longer than **50.0 ms**. This failure does not require any other action except to check if other failures concerning the cooling system are present in the failure memory. If a failure is present, follow the troubleshooting procedure for that fault.

Cause:

One or more of the following failure modes may be the reason for the occurrence of this fault.

Possible failure modes:

1. Radiator plugged
2. Coolant leak
3. Water pump or coolant flow issue
4. Fan drive issue
5. Low coolant level
6. Air in coolant
7. Thermostat stuck closed
8. Head gasket leak
9. Extreme environmental conditions

5123-19 - Display Source Address Cyclic Timeout

Control Module: UCM

Context:

The **A-UCM** does not receive messages from the Display Source Address within the maximum interval time; as a consequence use last GHMI CAN message received, but consider PB_GHMI_CTRL_17.PBrakeTest = 0x0 (Test Not Required).

Cause:

Incoming cycle time message interval > 3 times of maximum defined cycle time.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness of busses CAN 1 or CAN 2 is damaged.
3. The connectors **X-UCM1B** or **X-UCM2B** are damaged.
4. The **A-UCM** is damaged.

Solution:

1. Verify that the fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with Step 2.

B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.

2. Visually check the integrity of the harness of busses CAN 1 (**X-UCM1B**).

A. If the harness is damaged, replace the harness.

B. If the harness is not damaged, continue with Step 3.

3. Visually check the integrity of the harness of busses CAN 2 (**X-UCM2B**).

A. If the harness is damaged, replace the harness.

B. If the harness is not damaged, continue with Step 4.

4. Check the integrity of connector **X-UCM1B**.

Disconnect the connector **X-UCM1B** from the **A-UCM** and visually check the integrity of pins 25 and 34.

A. If one pin is damaged, replace the harness.

B. If pins are not damaged, continue with Step 5.

5. Check the integrity of connector **X-UCM2B**.

Disconnect the connector **X-UCM2B** from the **A-UCM** and visually check the integrity of pins 1 and 10.

A. If one pin is damaged, replace the harness.

B. If pins are not damaged, replace the **A-UCM**.

Wiring harnesses - Electrical schematic sheet 22 (55.100)

Wiring harnesses - Electrical schematic sheet 24 (55.100)

64159 - (DTC FA9F)-SCR Inducement: Level 1 (torque reduction), triggered by DEF/AdBlue quality fault

NOTE: refer to the Engine Service Manual for more details.

NOTE: since this fault is part of the inducement strategy, it may be necessary to perform the Engine Restart Counter Reset / Unlock Inducement configuration with the Electronic Service Tool (EST) before you return the machine to service, unless this was accomplished as part of the resolution of the fault causing this fault. See **Selective Catalytic Reduction (SCR) exhaust treatment - Configure - Engine restart counter reset (10.500)**, if necessary.

Context:

This fault is only for informational purposes and requires no action other than the resolution of the active fault **19402 – (DTC 4BCA)-DEF/AdBlue concentration is out of range** and/or **19914 – (DTC 4DCA)-DEF/AdBlue quality sensor temperature failure (different from DEF/AdBlue level temperature)**, which after being active for more than **10 h** will cause this fault to occur.

518083-03 - Park Brake Key Fault

Control Module: Keypad and Joystick

Context:

Park Brake Key Fault.

Cause:

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The park brake sensor is damaged.
3. The park brake key is damaged.

Solution:

1. Verify that the fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

2. Replace the park brake sensor.
3. Replace the park brake key.

Wiring harnesses - Electrical schematic sheet 22 (55.100)

518122-00 - Front Axle Oil Temp Sensor Over Resistance

Control Module: UCM

Context:

The **A-UCM** detects a value of resistance of the FRONT AXLE OIL TEMP (**B-FAX**) higher than the upper limit; as a consequence FAX Temperature not available:

- FAX warning disabled;
- Set PV_VC_STS.FAxOilTempWarn = 0x3 (out of range).

Cause:

The **A-UCM** detects on pin 17 of connector **X-UCM4A** a resistance value > **400 Ω**.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and the FRONT AXLE OIL TEMP is damaged.
3. The connectors **X-CAB_B** or **X-BTM** or **X-BTM_F** or **X-FRNT** or **X-FAX** or **X-UCM4A** are damaged.
4. The harness between connectors **X-FAX** and ground is damaged.
5. The harness between connectors **X-FRNT** and FRONT AXLE OIL TEMP is damaged.
6. The harness between connectors **X-BTM** and **X-BTM_F** is damaged.
7. The harness between connectors **X-CAB_B** and **X-UCM4A** is damaged.
8. The FRONT AXLE OIL TEMP is damaged.

Solution:

1. Verify that the fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with Step 2.

B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.

2. Visually check the integrity of the harness between the connector **X-UCM4A** and the connector **X-FAX** for any damage.

A. If the harness is damaged, replace the harness.

B. If the harness is not damaged, continue with Step 3.

3. Check the integrity of connector **X-FAX**.

Disconnect the connector **X-FAX** from the FRONT AXLE OIL TEMP and visually check the integrity of pins 1 and 2 of the connector.

A. If one pin is damaged, replace the harness relevant to the connector.

B. If all pins are not damaged, continue with Step 4.

4. Check the integrity of harness between the connector **X-FAX** and ground.

Remove the FRONT AXLE OIL TEMP.

Use a multimeter to perform the following check:

From	To	Value
Connector X-FAX pin 2	Ground	Short circuit

518132-04 - Short to Ground at Bucket Roll Valve High Side Driver

Control Module: UCM

Context:

The **A-UCM**, driving the bucket roll valve, detects a grounding connection; as a consequence:

- Bucket Function disabled
- Open Bucket LSD
- Command Bucket HSD PWM to **0%**
- Disabled advanced EH features (RTD)

Cause:

The **A-UCM** detects, on pin 17 of connector **X-UCM3B**, a short circuit to ground risen by BSP.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and the connector **X-BUCKET_ROLL** is damaged.
3. The connectors **X-BUCKET_ROLL** or **X-FRNT_EH** or **X-BTM_FEH** or **X-BTM_EH** or **X-CAB_EH** or **X-UCM1B** or **X-UCM3B** are damaged.
4. The harness between **A-UCM** and the connector **X-BUCKET_ROLL** is damaged.
5. The harness between connectors **X-BTM_EH** and **X-BUCKET_ROLL** is damaged.
6. The harness between connectors **X-FRNT_EH** and **X-BUCKET_ROLL** is damaged.
7. The BUCKET ROLL SOLENOID is damaged.

Solution:

1. Verify that the fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.
 - A. If the fault is present and active, continue with Step 2.
 - B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Visually check the integrity of the harness between the connectors **X-UCM3B**, **X-UCM1B** and **X-BUCKET_ROLL** for any damage.
 - A. If the harness is damaged, replace the harness.
 - B. If the harness is not damaged, continue with Step 3.
3. Check the integrity of connector **X-UCM3B**.

Disconnect the connector **X-UCM3B** from the **A-UCM** and visually check the integrity of pin 17.
 - A. If the pin is damaged, replace the harness.
 - B. If the pin is not damaged, continue with Step 4.
4. Check the integrity of connector **X-UCM1B**.

Disconnect the connector **X-UCM1B** from the **A-UCM** and visually check the integrity of pin 30.
 - A. If the pin is damaged, replace the harness.
 - B. If the pin is not damaged, continue with Step 5.
5. Check the integrity of harness between the **A-UCM** and the connector **X-BUCKET_ROLL**.

518137-04 - Short to Ground at AUX 1 Left High Side Driver

Control Module: UCM

Context:

The **A-UCM**, driving the AUX 1 Left, detects a grounding connection; as a consequence:

- AUX I Function disabled;
- Open AUX 1 LSD ;
- Command AUX I HSD PWMs to **0%** Bucket Function disabled.

Cause:

The **A-UCM** detects, on pin 32 of connector **X-UCM3B**, a short circuit to ground risen by BSP.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and the connector **X-AUX_1_LEFT** is damaged.
3. The connectors **X-AUX_1_LEFT** or **X-FRNT_EH** or **X-BTM_FEH** or **X-BTM_EH** or **X-CAB_EH** or **X-UCM1B** or **X-UCM3B** are damaged.
4. The harness between **A-UCM** and the connector **X-AUX_1_LEFT** is damaged.
5. The harness between connectors **X-BTM_EH** and **X-AUX_1_LEFT** is damaged.
6. The harness between connectors **X-FRNT_EH** and **X-AUX_1_LEFT** is damaged.
7. The AUX 1 LEFT SOLENOID is damaged.

Solution:

1. Verify that the fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

- A. If the fault is present and active, continue with Step 2.
 - B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Visually check the integrity of the harness between the connectors **X-UCM3B**, **X-UCM1B** and **X-AUX_1_LEFT** for any damage.
 - A. If the harness is damaged, replace the harness.
 - B. If the harness is not damaged, continue with Step 3.
 3. Check the integrity of connector **X-UCM3B**.

Disconnect the connector **X-UCM3B** from the **A-UCM** and visually check the integrity of pin 32.

 - A. If the pin is damaged, replace the harness.
 - B. If the pin is not damaged, continue with Step 4.
 4. Check the integrity of connector **X-UCM1B**.

Disconnect the connector **X-UCM1B** from the **A-UCM** and visually check the integrity of pin 10.

 - A. If the pin is damaged, replace the harness.
 - B. If the pin is not damaged, continue with Step 5.
 5. Check the integrity of harness between the **A-UCM** and the connector **X-AUX_1_LEFT**.

5. Check the integrity of harness between the connectors **X-FRNT_EH** and **X-AUX_2_RIGHT**.

Disconnect the connector **X-AUX_2_RIGHT** from the ELECTROHYDRAULIC VALVE.

Use a multimeter to perform the following check:

From	To	Value
Connector X-FRNT_EH pin N	Connector X-AUX_2_RIGHT pin 1	Short circuit
Connector X-FRNT_EH pin M	Connector X-AUX_2_RIGHT pin 2	Short circuit

A. If the measurement is not correct, replace the harness.

B. If the measurement is correct, continue with Step 6.

6. Check the integrity of connectors **X-CAB_EH** and **X-BTM_EH**.

Disconnect the connector **X-CAB_EH** from the connector **X-BTM_EH** and visually check the integrity of pins N and M of both connectors.

A. If one pin is damaged, replace the harness relevant to the damaged connector.

B. If all pins are not damaged, continue with Step 7.

7. Check the integrity of harness between the connectors **X-BTM_FEH** and **X-BTM_EH**.

Disconnect the connector **X-FRNT_EH** from the connector **X-BTM_FEH**.

Use a multimeter to perform the following check:

From	To	Value
Connector X-BTM_FEH pin N	Connector X-BTM_EH pin N	Short circuit
Connector X-BTM_FEH pin M	Connector X-BTM_EH pin M	Short circuit

A. If the measurement is not correct, replace the harness.

B. If the measurement is correct, continue with Step 8.

8. Check the integrity of connector **X-UCM4A**.

Disconnect the connector **X-UCM4A** from the **A-UCM** and visually check the integrity of pin 13.

A. If the pin is damaged, replace the harness.

B. If the pin is not damaged, continue with Step 9.

9. Check the integrity of connector **X-UCM1A**.

Disconnect the connector **X-UCM1A** from the **A-UCM** and visually check the integrity of pin 21.

A. If the pin is damaged, replace the harness.

B. If the pin is not damaged, continue with Step 9.

10. Check the integrity of harness between the **A-UCM** and the connector **X-CAB_EH**.

Use a multimeter to perform the following check:

From	To	Value
Connector X-UCM4A pin 13	Connector X-CAB_EH pin N	Short circuit
Connector X-UCM1A pin 21	Connector X-CAB_EH pin M	Short circuit

A. If the measurement is not correct, replace the harness.

B. If the measurement is correct, continue with Step 11.

11. Replace the AUX 2 RIGHT SOLENOID.

A. If the functionality is restored, the procedure ends.

518147-04 - Short to Ground at FAN Reverser Low Side Driver

Control Module: UCM

Context:

The **A-UCM**, driving the FAN REVERSER (Y-Y_FR), detects a grounding connection; as a consequence the FAN Functions are disabled.

Cause:

The **A-UCM** detects, on pin 21 of connector **X-UCM2A**, a short circuit to ground risen by BSP.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and the connector **X-YFN** is damaged.
3. The connectors **X-CAB_E-2** or **X-ENG-2** or **X-YFR** or **X-UCM2A** are damaged.
4. The harness between **A-UCM** and ground is damaged.
5. The harness between the connector **X-ENG-2** and ground is damaged.
6. The FAN REVERSER is damaged.

Solution:

1. Verify that the fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

A. If the fault is present and active, continue with Step 2.

B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.

2. Visually check the integrity of the harness between the connectors **X-UCM2A** and **X-YFR** for any damage.

A. If the harness is damaged, replace the harness.

B. If the harness is not damaged, continue with Step 3.

3. Check the integrity of connector **X-UCM2A**.

Disconnect the connector **X-UCM2A** from the **A-UCM** and visually check the integrity of pin 21.

A. If the pin is damaged, replace the harness.

B. If the pin is not damaged, continue with Step 4.

4. Check the integrity of harness between the **A-UCM** and the ground.

Use a multimeter to perform the following check:

From	To	Value
Connector X-UCM2A pin 21	Ground	Open circuit

A. If the measurement is correct, replace the **A-UCM**.

B. If the measurement is not correct, continue with Step 5.

5. Check the integrity of connectors **X-CAB_E-2** and **X-ENG-2**.

Disconnect the connector **X-CAB_E-2** from the connector **X-ENG-2** and visually check the integrity of pin N of both connectors.

A. If one pin is damaged, replace the harness relevant to the damaged connector.

518177-04 - Short to Ground at Pilot Enable Valve High Side Driver

Control Module: UCM

Context:

The **A-UCM**, driving the Pilot Enable Valve, detects a grounding connection; as a consequence:

- Pilot Lock valve disabled;
- Command Pilot lock Valve HSD PWM to **0%** Bucket Function disabled.

Cause:

The **A-UCM** detects, on pin 18 of connector **X-UCM3B**, a short circuit to ground risen by BSP.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and the connector **X-PILOT_ENABLE** is damaged.
3. The connectors **X-PILOT_ENABLE** or **X-FRNT_EH** or **X-BTM_FEH** or **X-BTM_EH** or **X-CAB_EH** or **X-UCM3B** are damaged.
4. The harness between **A-UCM** and the connector **X-PILOT_ENABLE** is damaged.
5. The harness between connectors **X-BTM_EH** and **X-PILOT_ENABLE** is damaged.
6. The harness between connectors **X-FRNT_EH** and **X-PILOT_ENABLE** is damaged.
7. The PILOT ENABLE SOLENOID is damaged.

Solution:

1. Verify that the fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

- A. If the fault is present and active, continue with Step 2.
 - B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Visually check the integrity of the harness between the connectors **X-UCM3B** and **X-PILOT_ENABLE** for any damage.
 - A. If the harness is damaged, replace the harness.
 - B. If the harness is not damaged, continue with Step 3.
 3. Check the integrity of connector **X-UCM3B**.

Disconnect the connector **X-UCM3B** from the **A-UCM** and visually check the integrity of pin 18.

- A. If the pin is damaged, replace the harness.
 - B. If the pin is not damaged, continue with Step 4.
4. Check the integrity of harness between the **A-UCM** and the connector **X-PILOT_ENABLE**.

Use a multimeter to perform the following check:

From	To	Value
Connector X-UCM3B pin 18	Ground	Open circuit

- A. If the measurement is correct, replace the **A-UCM**.
 - B. If the measurement is not correct, continue with Step 5.
5. Check the integrity of connectors **X-CAB_EH** and **X-BTM_EH**.

518292-31 - Error at 24VP Supply Rail

Control Module: UCM

Context:

The **A-UCM** detects the absence of the 24VP power supply; as a consequence the UCM functions are all disabled.

Cause:

The **A-UCM** detects, on pin 20 of connector **X-UCM1A**, a voltage $< + 10 \text{ V}$.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and the LC2 is damaged.
3. The connectors **X-LC2** or **X-UCM1A** are damaged.
4. The harness between **A-UCM** and the connector **X-LC2** is damaged.
5. The UCM VP (**F-2F1**) is burnt.
6. The harness between the LC2 and the power supply is damaged.

Solution:

1. Verify that the fault is present and active.

Use the Electronic Service Tool (EST) to check the status of this fault.

- A. If the fault is present and active, continue with Step 2.
- B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Visually check the integrity of the harness between the connectors **X-UCM1A** and **X-LC2** for any damage.
 - A. If the harness is damaged, replace the harness.
 - B. If the harness is not damaged, continue with Step 3.
3. Check the integrity of connector **X-UCM1A**.

Disconnect the connector **X-UCM1A** from the **A-UCM** and visually check the integrity of pin 20.

- A. If the pin is damaged, replace the harness.
- B. If the pin is not damaged, continue with Step 4.
4. Check the integrity of harness between the **A-UCM** and the power supply.

Use a multimeter to perform the following check:

From	To	Value
Connector X-UCM1A pin 2	Ground	$\geq + 10 \text{ V}$

- A. If the measurement is correct, replace the **A-UCM**.
- B. If the measurement is not correct, continue with Step 5.
5. Check the integrity of connector **X-LC2**.

Disconnect the connector **X-LC2** from LC2 and visually check the integrity of pins 1A and 1B.

 - A. If one pin is damaged, replace the relevant harness.
 - B. If the pins are not damaged, continue with Step 6.
6. Check the integrity of harness between the connectors **X-LC2** and **X-UCM1A**.

Use a multimeter to perform the following voltage check:

From	To	Value
Connector K-3R1 pin 86	Chassis ground	There should be an open circuit

A. If there is a voltage, replace the **24 V** to **12 V** Converter.

B. If there is an open circuit, continue to Step **6**.

6. Check the Smart Fuse Box signal circuit.

The key must be in the OFF position.

Use a multimeter to perform the following voltage check:

From	To	Value
Connector A-SFB pin OUT_06_H	Chassis ground	There should be an open circuit

A. If there is an open circuit, replace the Smart Fuse Box.

Wiring harnesses - Electrical schematic sheet 03 (55.100)

Wiring harnesses - Electrical schematic sheet 08 (55.100)

From	To	Value
Connector X-X3 pin 12	+ 5 V	There should be an open circuit
Connector X-CAB_E pin 21	+ 5 V	There should be an open circuit
Connector X-ENG pin 7	+ 5 V	There should be an open circuit
Connector X-ENG_H pin 7	+ 5 V	There should be an open circuit

A. If there is an short circuit to B+, replace the harness.

B. If there is an open circuit, continue to Step 6.

6. Check the Electrical Ignition Power Relay pin (L-NA-TAIL pin 2) circuit for an short circuit to B+.

The key must be in the OFF position.

Use a multimeter to perform the following voltage check:

From	To	Value
Connector LMP-R-NA-TAIL pin 2	+ 5 V	There should be an open circuit

A. If there is an short circuit to B+, replace the Electrical Ignition Power Relay.

B. If there is an open circuit, continue to Step 7.

7. Check the Smart Fuse Box signal circuit for an short circuit to B+.

The key must be in the OFF position.

Use a multimeter to perform the following voltage check:

From	To	Value
Connector A-SFB pin OUT_20_H_CS	+ 5 V	There should be an open circuit to B+

A. If there is a short circuit, replace the Smart Fuse Box.

Wiring harnesses - Electrical schematic sheet 29 (55.100)

- A. If the fuse is damaged, replace the fuse.
- B. If the fuse is not damaged, continue with following step.

6. Check the Battery K Isolator.

The key must be in the OFF position.

Use a multimeter to perform the following voltage check:

From	To	Value
Connector X-ISO pin 1	Chassis ground	There should be an open circuit
Connector X-ISO pin 2	Chassis ground	There should be an open circuit
Connector X-ISO pin 3	Chassis ground	There should be a short

- A. Verify the Battery K Isolator Power supply (pin X-D)
- B. If Battery K Isolator is right functioning, replace the Smart Fuse Box.

Wiring harnesses - Electrical schematic sheet 03 (55.100)

Wiring harnesses - Electrical schematic sheet 04 (55.100)

Wiring harnesses - Electrical schematic sheet 06 (55.100)

520588-06 - Alternator Excitation Driver - Short Circuit to GND	1193
520591-00 - Backup Alarm - Too many loads or faulty load	1195
520591-03 - Backup Alarm - Short circuit to B+	1198
520591-05 - Backup Alarm - Open Circuit	1201
520591-06 - Backup Alarm - Short circuit to GND	1204
520596-03 - VSUP A - Out of Range - High	1207
520596-04 - VSUP A - Out of Range - Low	1209
520597-03 - VSUP B - Out of Range - High	1211
520597-04 - VSUP B - Out of Range - Low	1213
520598-03 - VSUP C - Out of Range - High	1215
520598-04 - VSUP C - Out of Range - Low	1217
520599-03 - VSUP D - Out of Range - High	1219
520599-04 - VSUP D - Out of Range - Low	1221
521-03 - Inch Pedal Position Sensor over voltage	102
521-04 - Inch Pedal Position Sensor under voltage	103
5211-09 - Speedlimit_Prop1 Can message timeout	98
5212-09 - Speedlimit_Prop2 Can message timeout	100
5220-09 - Brakes timeout	116
522809-02 - Memory Integrity EEPROM	1223
522810-09 - Joystick Steering Cut Off Valves not plausible	1224
5230-09 - Zftc1 Timeout	118
524262-13 - Primary EEPROM configuration CRC validation fault	1228
524263-13 - Redundant EEPROM configuration CRC validation fault	1229
524264-13 - Configuration parameter read error	1230
5260-09 - Dct1 Timeout = Vehicle_1 Timeout	120
5267 - (DTC 1493)-High pressure intercooler outlet temperature sensor voltage is higher than expected	122
5270-09 - Jss Timeout =Vehicle_2 Timeout	124
5271-09 - DISPID1 CAN message timeout	126
5280-09 - Engine Conf timeout	128
5290-09 - EEC1 Timeout	130
5300-09 - EEC3 Timeout	132
5310-09 - Engine speed limit function during gearshifts does not work properly	134
5370-02 - Shift lever signal defective	135
5390-02 - Aeb request signal defective	136
5420-02 - Starting gear signal defective	137
5430-02 - Enginge torque signal defective	138
5431-09 - Engine speed limit function does not work properly during stall or output speed limit function	139
5440-02 - Reference engine torque signal defective	140
5450-02 - Actual engine torque signal defective	141
5460-02 - Nom friction torque signal defective	142

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