821G
921G
Tier 4B (final)
Wheel Loader

SERVICE MANUAL

Part number 48083737
1st edition English
December 2016

CASE

Consumables - Biodiesel Fuel

Fatty Acid Methyl Ester Biodiesel (Biodiesel Fuel) consists of a family of fuels derived from vegetable oils treated with methyl esters.

NOTICE: *Biodiesel fuel blends are approved for your engine only if they comply with Specification Standards EN 14214 or ASTM D6751.*

NOTICE: *verify with your local dealer which blends are approved for your engine. Use of biodiesel fuel that do not comply with the Standards EN14214 or ASTM D6751 could lead to severe damage to engine and fuel system. Use of non-approved biodiesel fuels may void warranty coverage.*

Biodiesel Fuel Usage Conditions

Biodiesel fuels must be purchased from a trusted supplier that understands the product and maintains good fuel quality. Biodiesel fuels must be pre-blended by the supplier. Mixing biodiesel fuels on site can result in an incorrect mixture which can damage engine and fuel system.

Engine performance is effected by the use of biodiesel fuels. There may be up to 12 percent reduction in power or torque depending on the blend used.

NOTICE: *DO NOT modify the engine and/or fuel injection pump settings to recover reduced performance.*

The reduced power must be accepted if using any biodiesel fuel blends.

NOTICE: *the use of high biodiesel fuel blends is not recommended in cold weather conditions.*

Using biodiesel fuels may require changing engine oil, engine oil filters, and fuel filter elements more frequently. Biodiesel fuels can remove rust and other particles that adhere to the inside of the fuel tank. These particles are trapped by vehicle filters and may cause shortened filter life or filter blockages. Blockages are more common in cold weather conditions. Consult your dealer for information on cold weather operation and proper maintenance intervals when using any biodiesel fuel blend.

Biodiesel fuel may degrade natural rubber gaskets and hoses, as it is more solvent than petro-diesel. Frequently inspect hoses and other engine components when using biodiesel fuel.

DO NOT allow water to collect in the fuel or storage tanks. Biodiesel fuel attracts moisture from the atmosphere. Keep fuel tanks and storage tanks as full as possible to limit the amount of air and water vapors. It may be necessary to drain machine fuel filter more frequently. Potential oxidation and stability could create a problem with fuel stored in the machine.

Biodiesel Storage

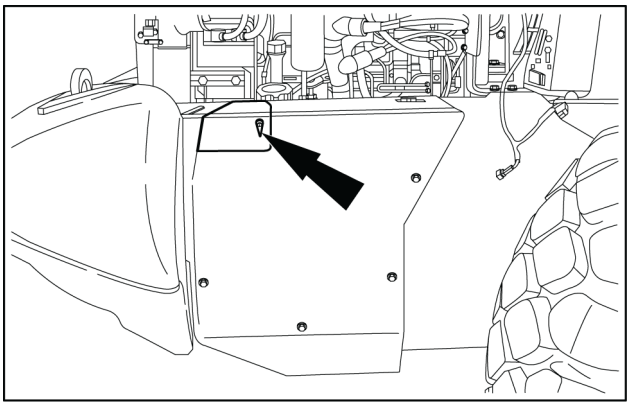
NOTICE: *DO NOT store machines for more than six months with biodiesel blends in the fuel system. DO NOT store biodiesel fuel in on-site storage tanks for more than six months.*

If long periods of storage are required, run the machine for 20 hours using regular diesel fuel to flush the biodiesel fuel from the engine fuel system.

NOTICE: *Biodiesel fuels must not be stored in on-site storage tanks for more than six months. Any spillage of biodiesel fuels must be cleaned up immediately before it can cause damage to the environment or the paint finish of the machine. Before using biodiesel fuel blends, you should consult with your dealer to receive full information about the approved blend for your machine and any detailed conditions of its usage. Failure to follow the requirements and conditions of biodiesel fuel usage will void your machine's warranty.*

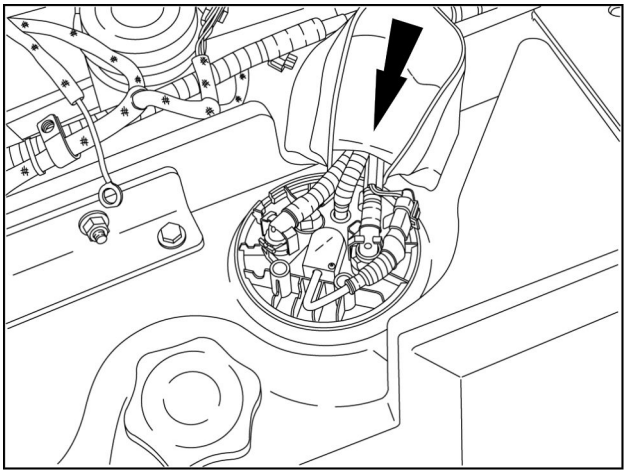
NOTE: *B7 is the highest biodiesel (7% blend) that should be used in this machine.*

59. Remove the **DEF/ADBLUE®** storage tank cover located on the right-hand side of the machine.



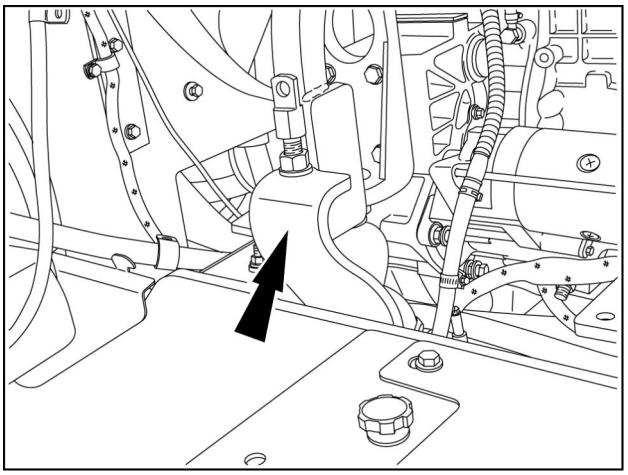
LEIL13WHL0170AB 59

60. Tag and disconnect the wire harness and **DEF/ADBLUE®** supply and return lines from the **DEF/ADBLUE®** storage tank. Install a protective cap in the supply lines.



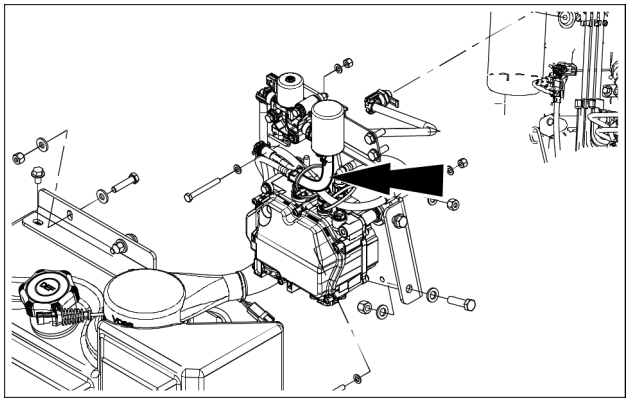
RAPH12WEL0070AA 60

61. Remove the support bracket of the hood lift cylinder.



RAPH12WEL0071AA 61

62. Remove the heater hose from the engine.



LEIL15WHL0009AB 62

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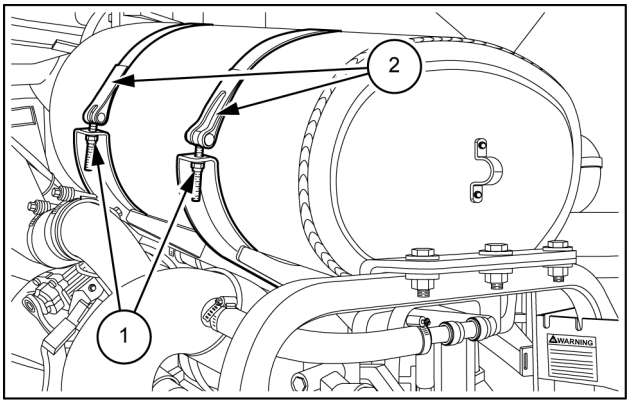
(*) See content for specific models

Selective Catalytic Reduction (SCR) muffler and catalyst - 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. Attach a suitable lifting device and a lift strap to the Selective Catalytic Reduction (SCR) muffler. Move the SCR muffler into position on the machine.
   Install the brackets **(2)** and fix the brackets with the nuts **(1)**.

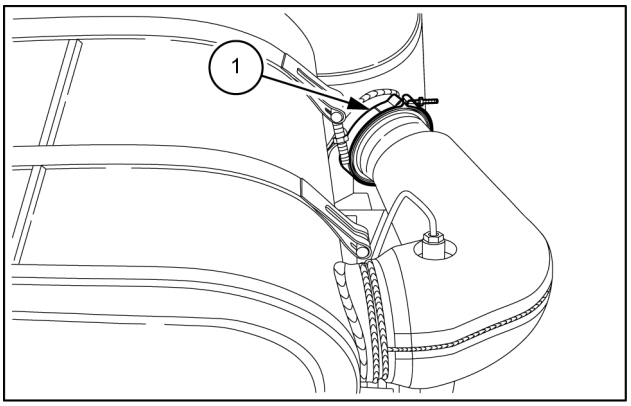
NOTE: *tighten the nuts **(1)** to **25 N·m** (**221.3 lb in**) only when the SCR is aligned with the DOC.*



LEIL13WHL0207AB 1

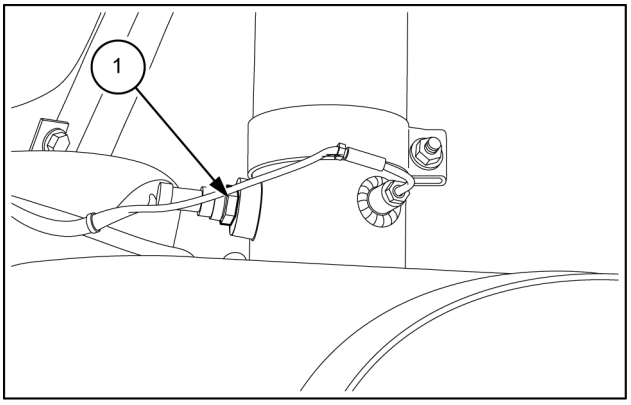
2. Install a new gasket and a new clamp **(1)** at connection between Diesel Oxidation Catalyst (DOC) and Selective Catalytic Reduction (SCR) pipe. Tighten the clamp to **11 - 13 N·m** (**97.4 - 115.1 lb in**) . Tighten all hexagonal nuts to secure catalyst to mounting support brackets.

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



LEIL13WHL0166AB 2

3. Install the NH_3 sensor **(1)** into the exhaust pipe on the Selective Catalytic Reduction (SCR).



LEIL13WHL0198AB 3

Radiator - Install

⚠ CAUTION

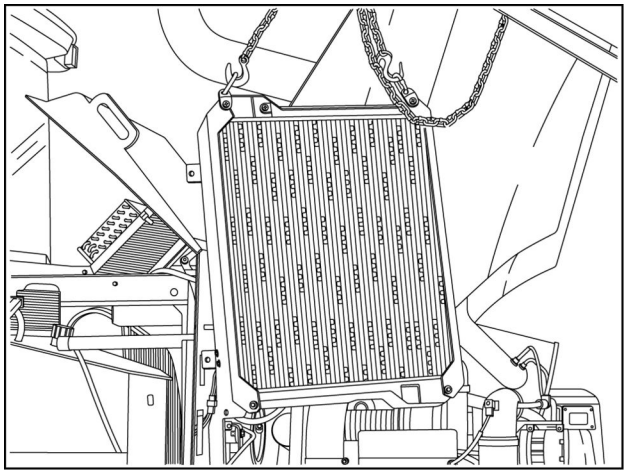
Burn hazard!
Hot coolant can spray out if you remove the filler cap while the system is hot. After the system has cooled, turn the filler cap to the first notch and wait for all pressure to release before proceeding. Failure to comply could result in minor or moderate injury.

C0043A

1. Using a suitable lifting device, position the radiator above the cooling box frame.

NOTE: *machine pictured includes the heavy duty/high debris cooling option. Your machine may differ slightly in appearance.*

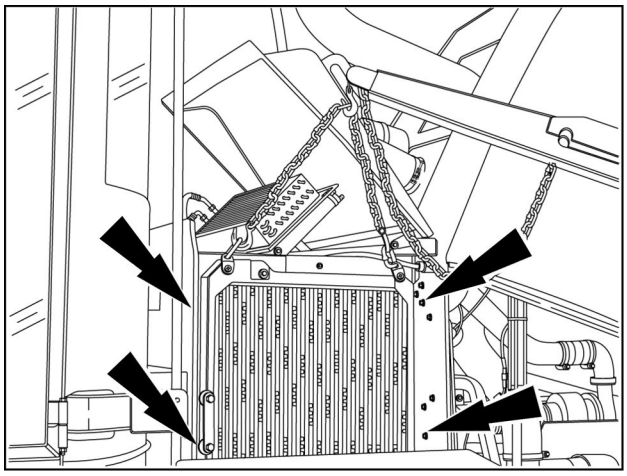
NOTE: *machines with the standard cooling option use a smaller radiator and a block-off plate attached to the radiator at the top bottom and sides. Install the radiator and block-off plate as one assembly. Attach the block-off plate to the radiator before the assembly is installed in the machine.*



RAIL12WEL0114AA 1

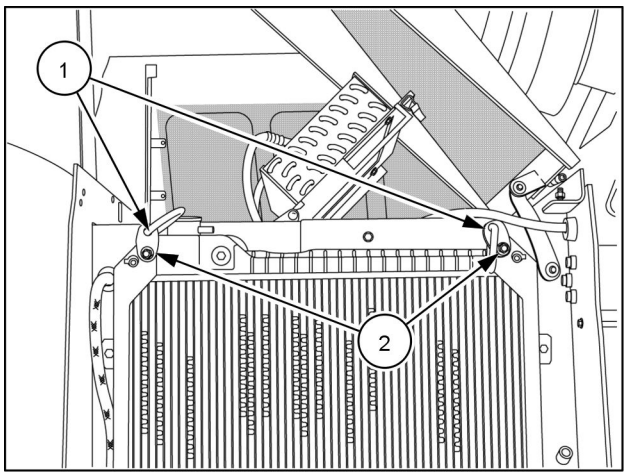
2. Carefully lower the radiator while guiding it into position on the cooling box frame. Install the lock washers and the bolts to secure the radiator.

NOTE: *machine pictured includes the heavy duty/high debris cooling option. Your machine may differ slightly in appearance.*



RAIL12WEL0113AA 2

3. Disconnect the lifting equipment from lifting eyes **(1)**. Remove lifting eyes and reinstall original bolts **(2)**.



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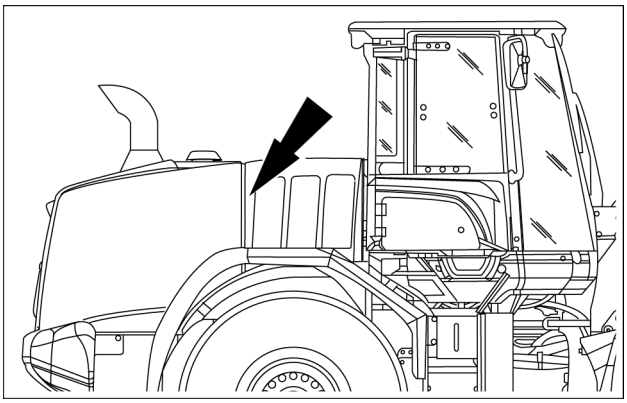
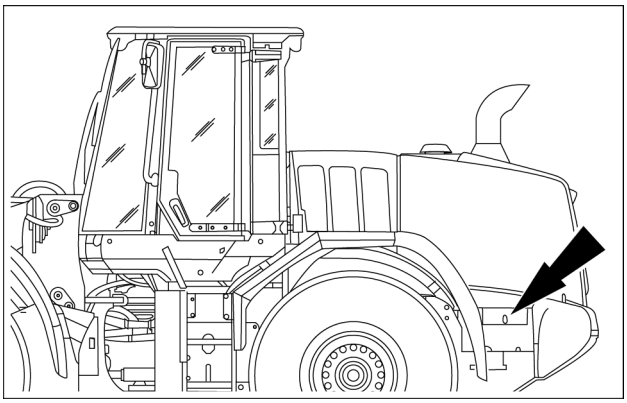
Crankcase ventilation system - Remove

1. Locate the blow-by recirculation system filter under the hood on the engine, in back of the cooling fan. It can be accessed from the right–hand side of the machine.



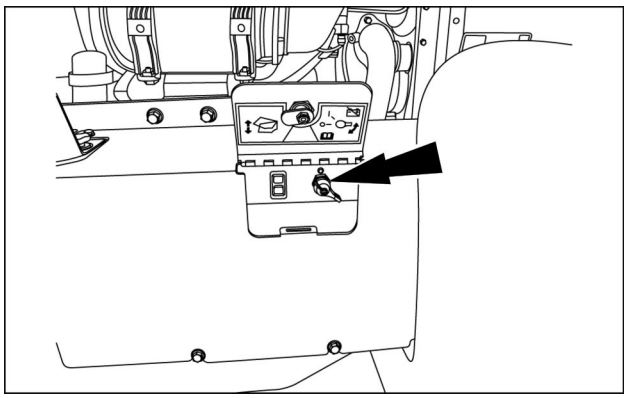
LEIL16WHL0577AA 1

2. Raise the hood using the controls located behind the access cover. Then remove the inner fender panel.



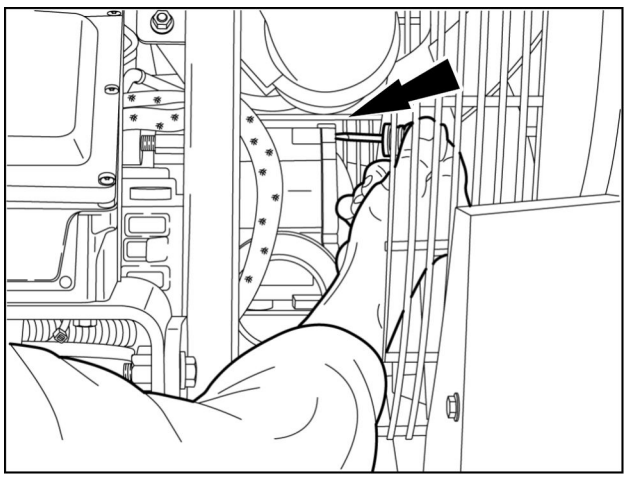
LEIL16WHL0578AA 2

3. Turn the timed disconnect switch to the OFF position.



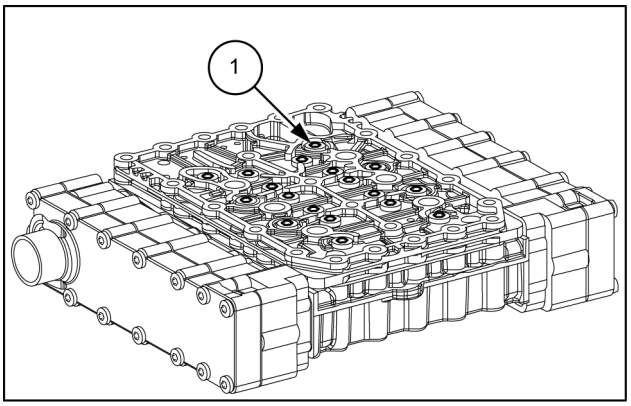
RCPH10WHL106AAH 3

4. Remove the screws on the filter housing cover plate. It may be necessary to use an off-set screwdriver.



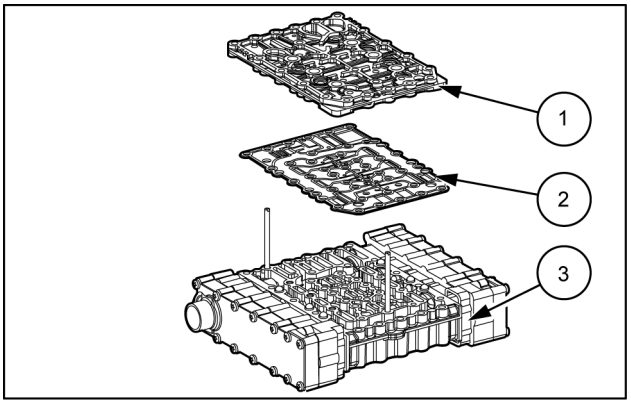
RAPH12WEL0089AA 4

7. Remove the Torx bolts **(1)**.



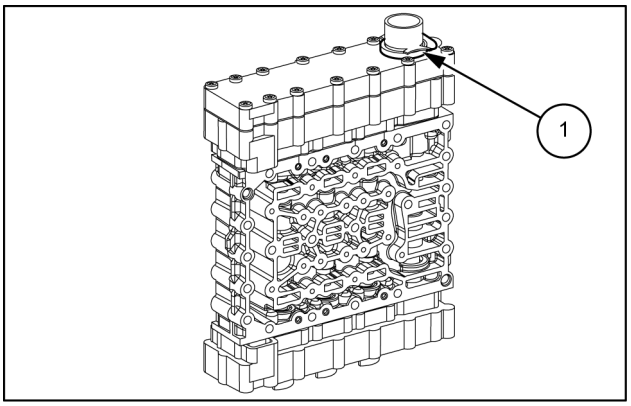
LEIL13WHL0780AB 10

8. Separate the duct plate **(1)** and the sealing plate **(2)** from the valve block **(3)**.



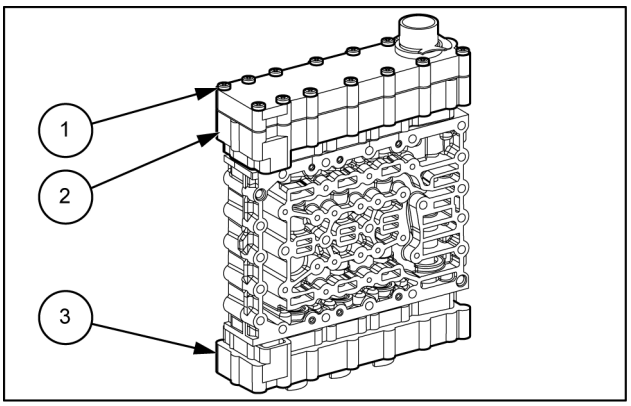
LEIL13WHL0781AB 11

9. Remove the retaining clamp **(1)**.



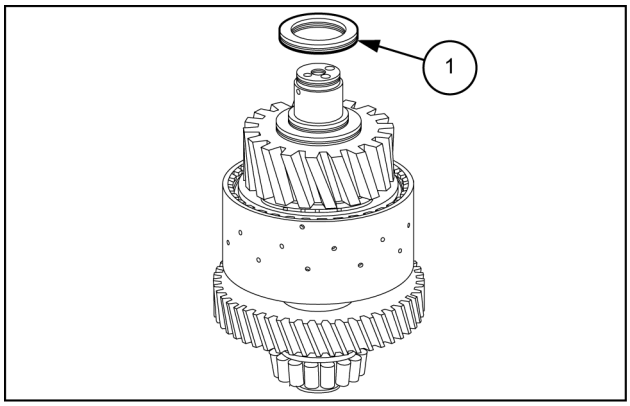
LEIL13WHL0782AB 12

10. Remove the Torx bolts **(1)** and the cover **(2)**. Repeat the procedure on the opposite end cover **(3)**.



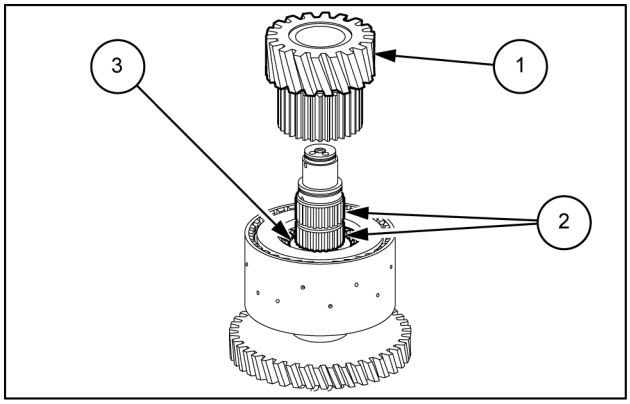
LEIL13WHL0783AB 13

4. Remove the axial bearing assembly **(1)**.



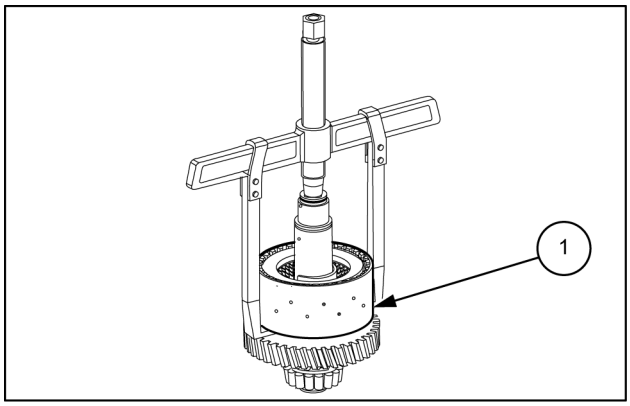
LEIL13WHL0862AB 113

5. Remove the idler gear **(1)**, the needle cage **(2)** and axial bearing assembly **(3)**.



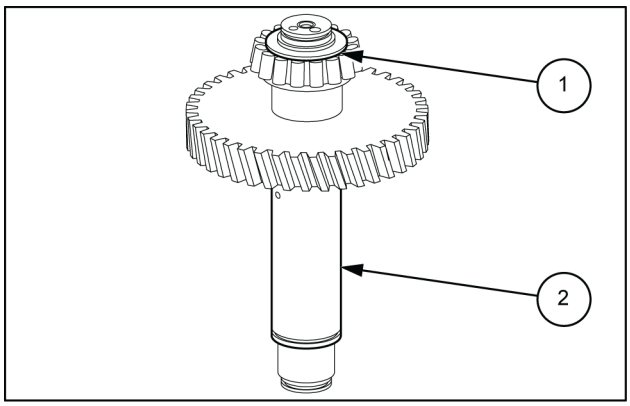
LEIL13WHL0863AB 114

6. Pull the clutch **(1)** off the shaft.



LEIL13WHL0864AB 115

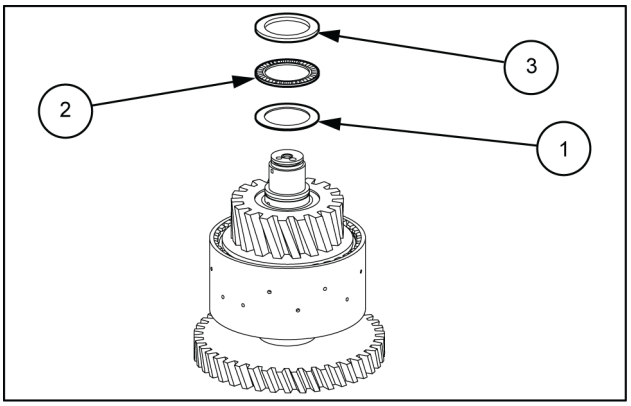
7. Turn the shaft **(2)**by **180 °** and snap out piston ring **(1)**.



LEIL13WHL0865AB 116

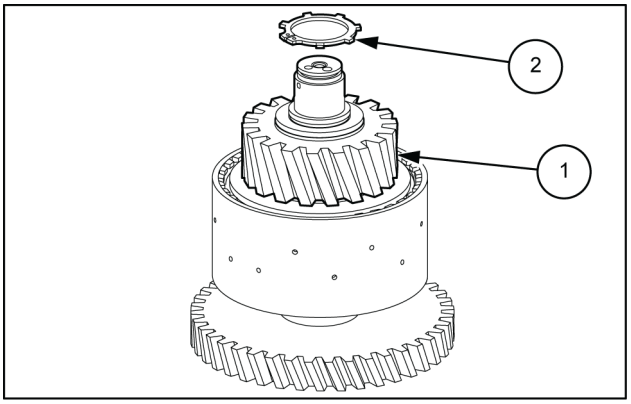
41. Mount and oil the axial washer **(1)**, the axial cage **(2)** and the running disc **(3)**.

NOTE: *install chamfer of the running disc **(3)** showing towards the axial cage.*



LEIL13WHL0918AB 64

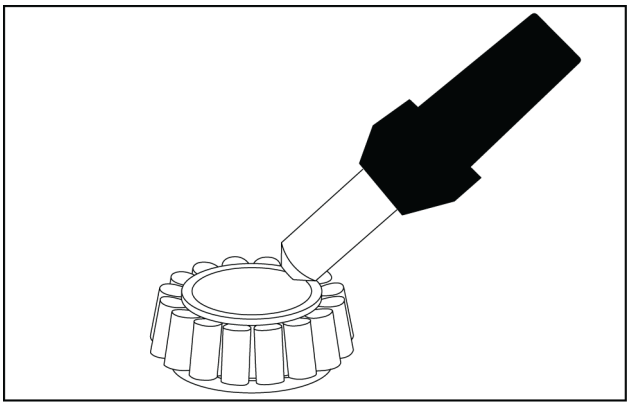
42. Secure the idler gear **(1)** and single parts with the retaining ring **(2)**.



LEIL13WHL0919AB 65

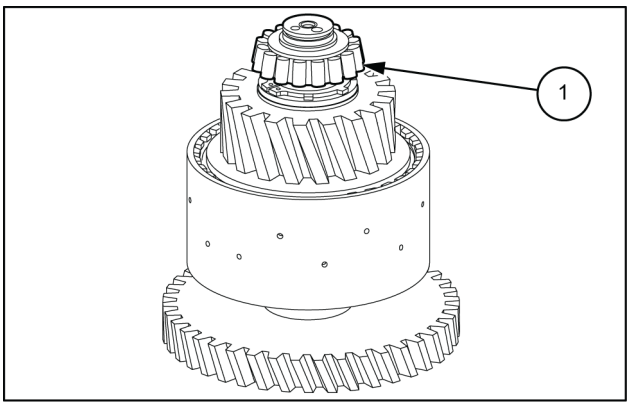
43. Heat bearing to approximately **120 °C** (**248 °F**).

NOTICE: *always wear protective gloves to prevent burning your hands when handling heated parts.*



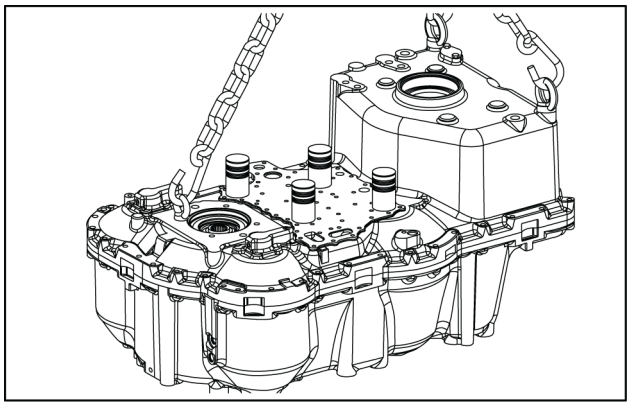
LEIL13WHL0887AA 66

44. Mount the bearing **(1)** until contact is made. Adjust bearing after it cools.



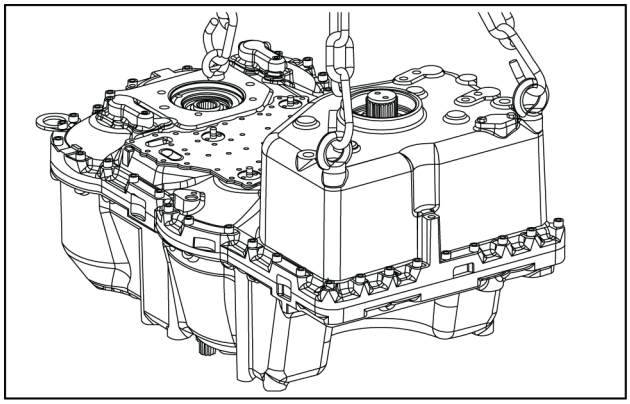
LEIL13WHL0920AB 67

15. Use the suitable lifting device to bring the rear housing into contact position with the front housing by cautiously assembling the clutches. Then remove handles.



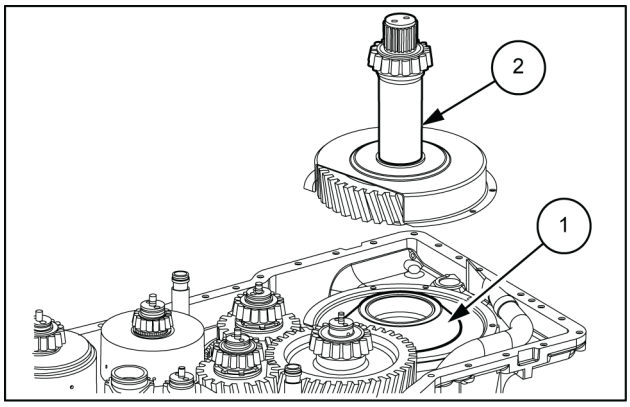
LEIL13WHL0981AA 171

16. Remove the rear housing again.



LEIL13WHL0982AA 172

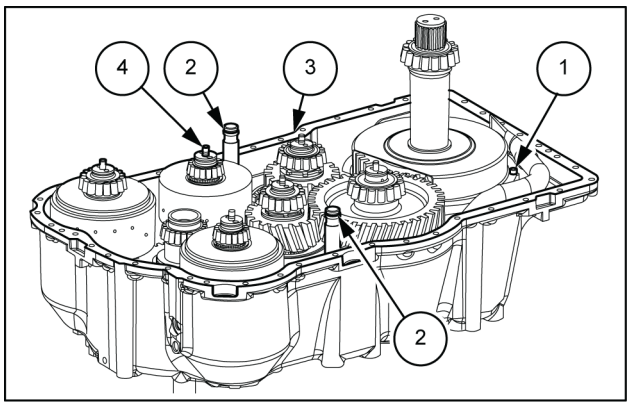
17. Position the screen sheet **(1)**. Install the pre-assembled output shaft **(2)**.



LEIL13WHL0983AB 173

18. Oil the cylindrical bolts **(1)** and use them to attach screen sheet **(1)**. Torque to **23 N·m** (**17 lb ft**). Mount O-rings **(2)** into the annular grooves of the oil tubes and oil them. Mount all rectangular rings **(4)**, grease and align them centrally. Wet mounting face **(3)** with sealing agent **LOCTITE® 574™**.

NOTE: *always use new cylindrical bolts.*



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FUNCTIONAL DATA

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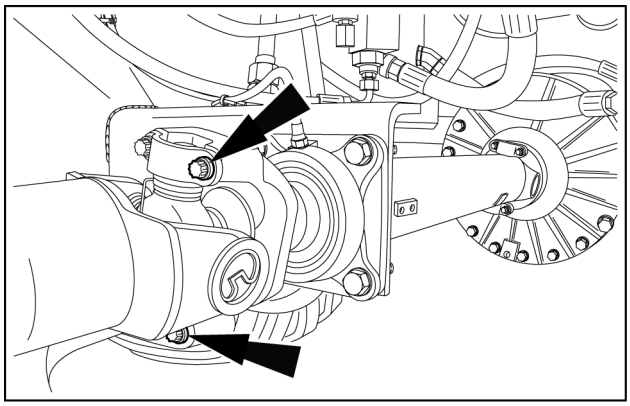
8. Install the straps and bolts that fasten the center drive shaft to the yoke on the front drive shaft.
   821G: Tighten the bolts to **75 - 81 N·m** (**55 - 60 lb ft**)
   921G: Tighten the bolts to **136 - 149 N·m** (**100 - 110 lb ft**)



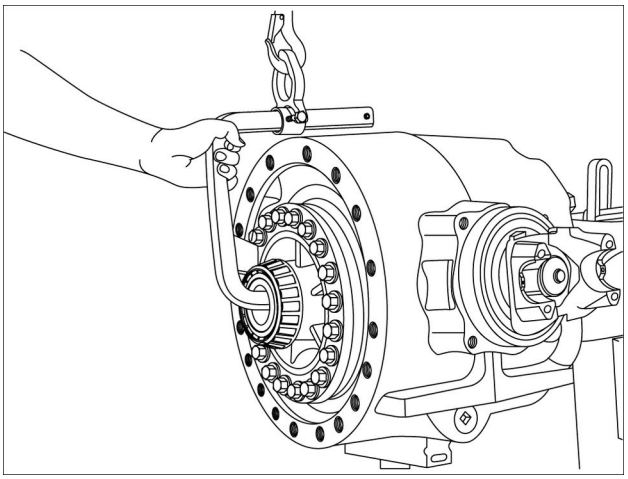
LEIL13WHL1069AB 4

9. Install the lubrication hose into the fitting on the bearing housing.
10. Lubricate the center bearing with the grease.

Differential - Install - Model MT-L 3095 II

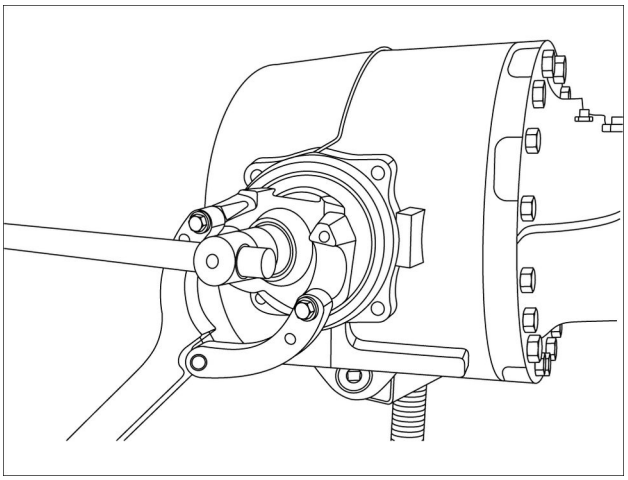
821G WHEEL LOADER XR-EH, NEW CAB TIER4B NA	NA
821G WHEEL LOADER ZBAR-EH, NEW CAB TIER4B NA	NA

1. After the contact pattern check, insert the differential into the axle drive housing again.



RAIL11WEL0371BA 1

2. Remove the slotted nut and pull the input flange from the input pinion. Use the **CAS2842** slotted nut wrench and **380001546** clamping device.

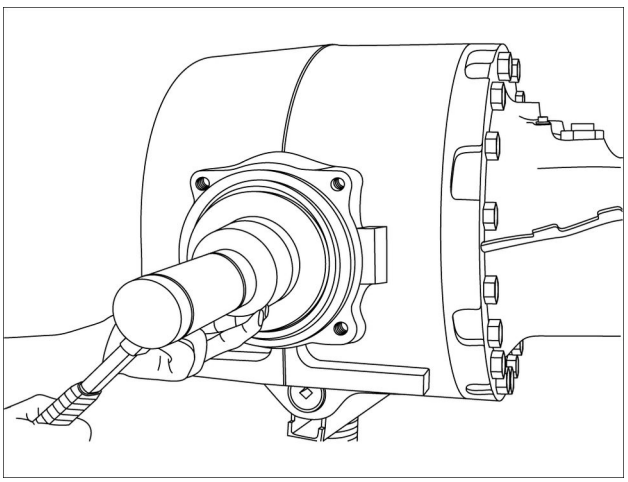


RAIL11WEL0372BA 2

3. By using the **CAS2841** driver tool, mount the shaft seal with the seal lip facing the oil chamber.

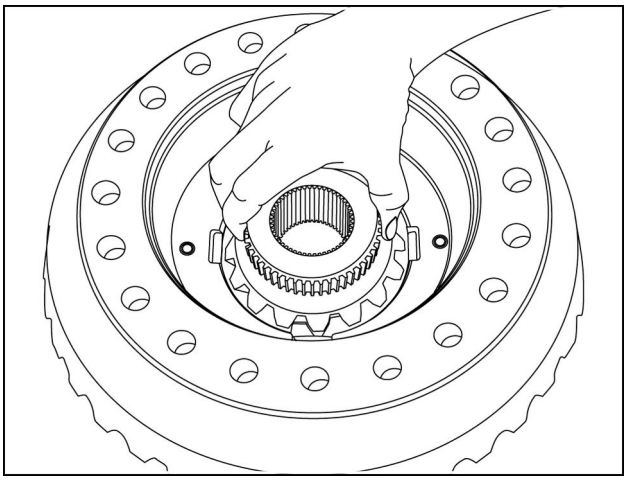
NOTE: *an exact installation position of the seal is obtained by using the specified driver tool.*

NOTE: *wet the outer diameter of the shaft seal with mineral spirits just before the installation. Fill the space between the seal and the dust lip with grease.*



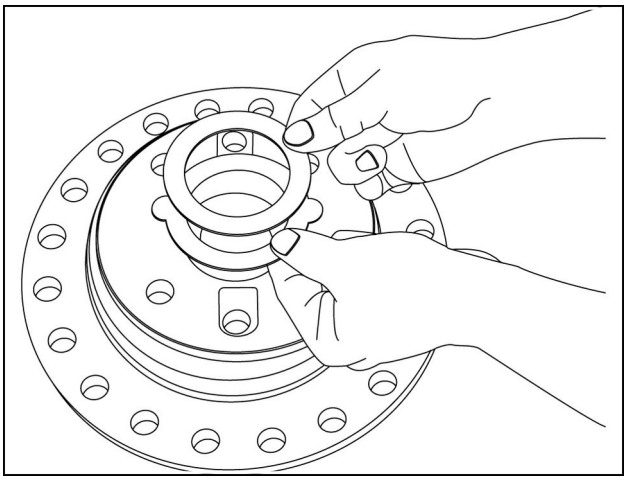
RAIL11WEL0373BA 3

7. Mount the second axle bevel gear.



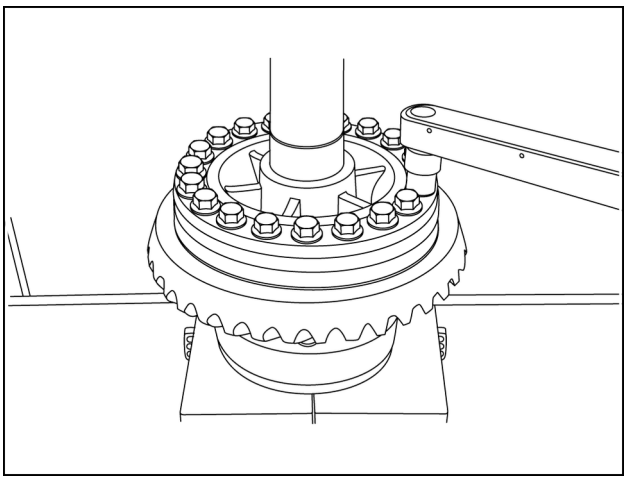
RCIL11WHL082BAF 7

8. Secure the thrust washers into the housing cover with grease.



RCIL11WHL083BAF 8

9. Mount two adjusting bolts and insert the housing cover until the contact with the differential housing is obtained. Preload the differential by using a press. Secure with new locking bolts. Torque to **400 N·m** (**295 lb ft**).



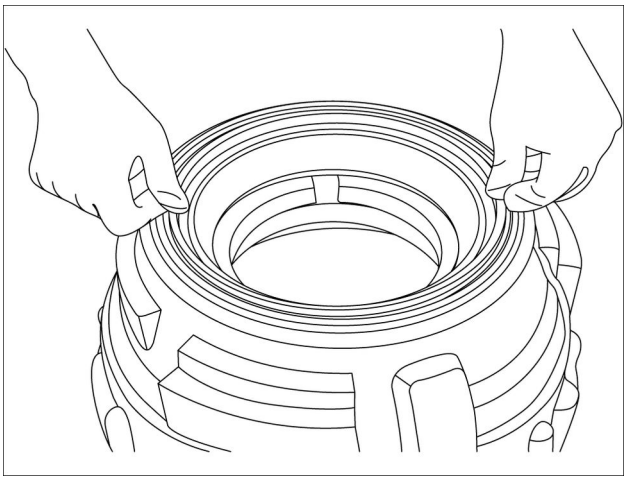
RCIL11WHL084BAF 9

4. Mount the new slide ring seal (part 2) into the brake housing.

NOTE: *the step shows the version with slide ring seal.*

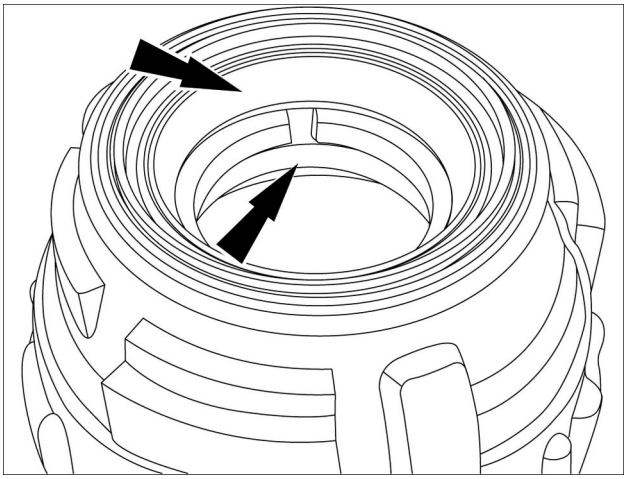
ATTENTION: *risk of injury - metal rings have extremely sharp edges. Wear protective gloves.*

NOTE: *the surface of the slide ring seal may not have any grooves, scratches or other damage. Make sure the sealing surface is parallel to the housing face. The O-rings must be mounted evenly into the locating hole and must not bulge out.*



RAIL11WEL0426BA 4

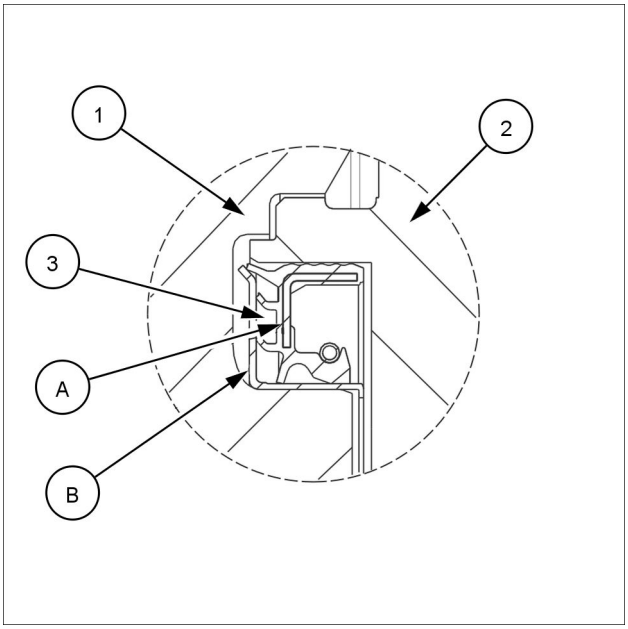
5. Insert both bearing outer rings (see arrows) into the brake housing until the contact is made.



RAIL11WEL0427BA 5

6. Refer to the illustration to see the installation position of the combi seal.
   1. Output shaft
   2. Brake housing
   3. Combi seal consisting of: a = Shaft seal, b = Screening plate.

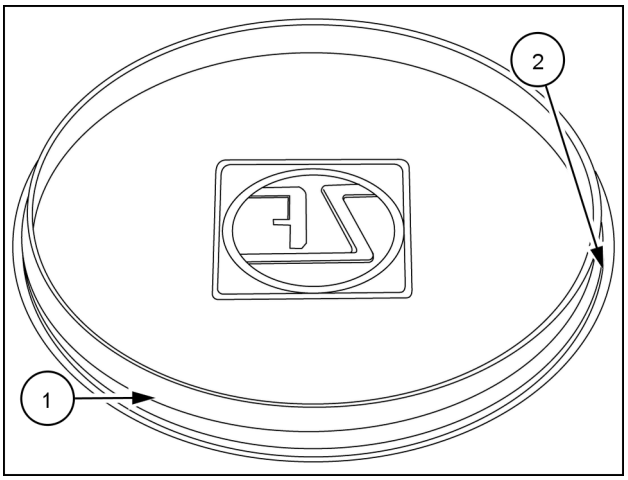
NOTE: *Steps 6 to 8 are for the version with combi seal. The illustration shows the installation position of the combi seal.*



RAIL11WEL0428BA 6

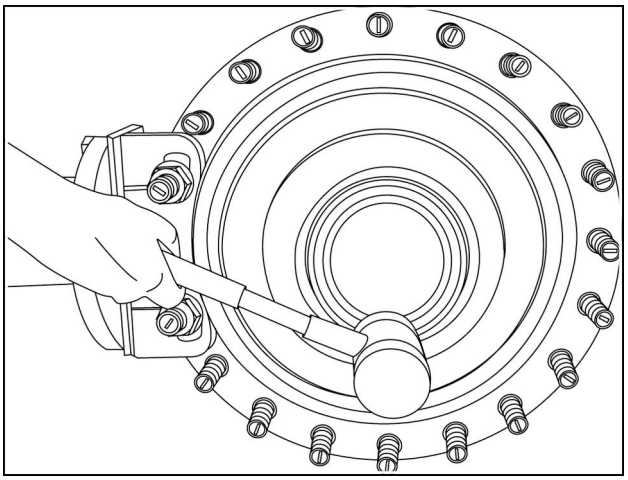
25. Install new O-ring **(1)** and cover. Wet the contact face **(2)** with **TEROSTAT® MS-9360**.

NOTE: *the curing period for* ***TEROSTAT® MS-9360*** *is greater than 24-hours.*



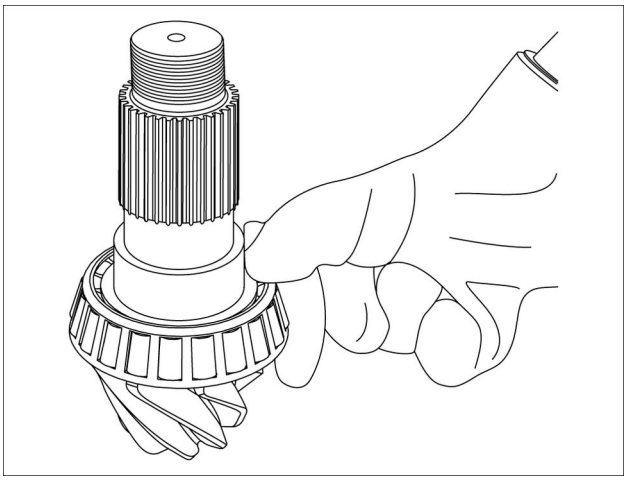
RCIL11WHL139BAF 27

26. Insert the cover into the output shaft until the contact is made.



RCIL11WHL140BAF 28

7. Heat the tapered roller bearing and insert it into the input pinion until the contact is made.

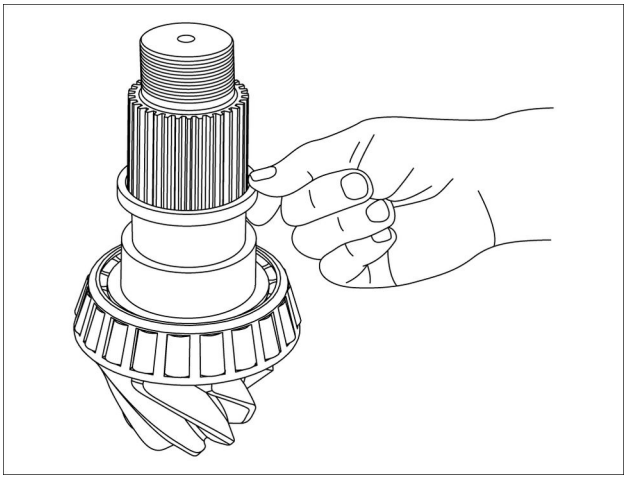


RAIL11WEL0355BA 7

8. Set the rolling torque of the input pinion bearing (without shaft seal) to **1.5 - 3.0 N·m** (**13 - 27 lb in**). Insert a spacer e.g. s = **8.18 mm** (**0.322 in**).

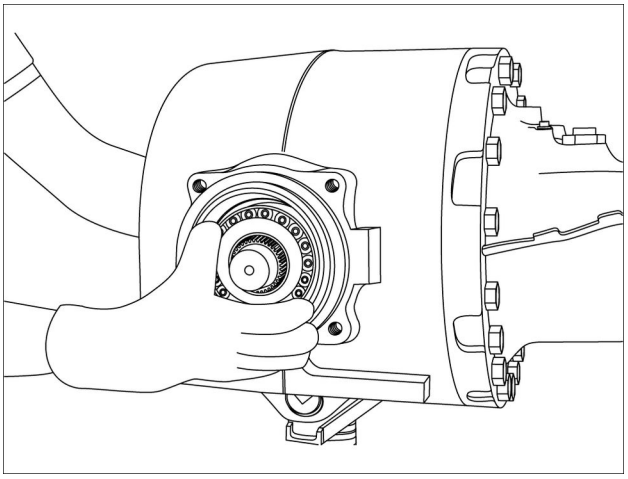
NOTE: *based on the experience, the needed rolling torque is obtained by reusing the spacer removed during the disassembly e.g. s =* ***8.18 mm*** *(****0.322 in****).*

NOTE: *a later check of the rolling torque is needed.*



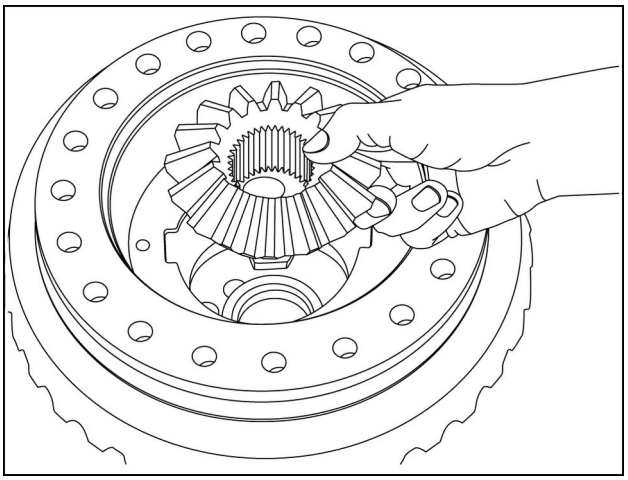
RAIL11WEL0356BA 8

9. Insert the pre-assembled input pinion into the axle drive housing. Insert the heated tapered roller bearing until the contact is made.



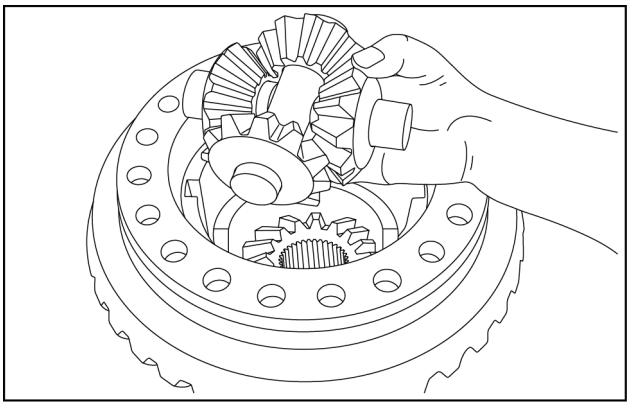
RAIL11WEL0357BA 9

5. Install the axle bevel gear until the contact is made. Then install the inner discs with teeth.



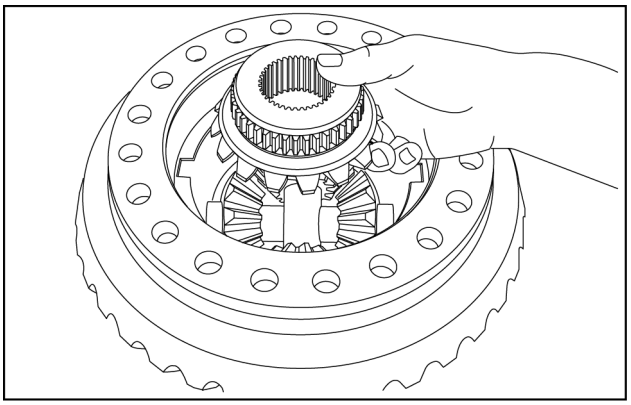
RCIL11WHL078BAF 5

6. Preassemble the differential spider and insert it into the differential housing/pressure ring.



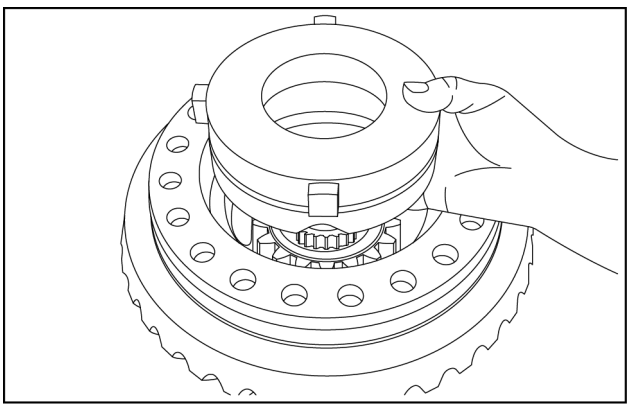
LEIL13WHL0599AA 6

7. Install the second axle bevel gear.



LEIL13WHL0600AA 7

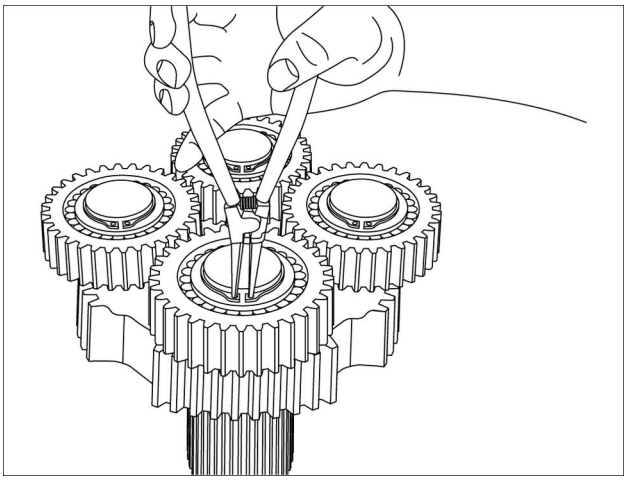
8. Install the second thrust ring into the differential housing



LEIL13WHL1201AA 8

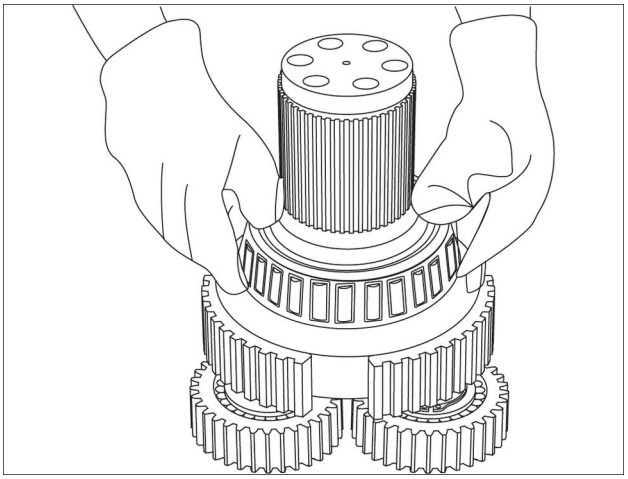
21. Heat the bearing inner rings. Insert the premounted planetary gears with the large radius facing the planetary carrier (downwards) until the contact is made. Secure the planetary gears by using retaining rings.

NOTE: *adjust the bearing inner rings after cooling.*



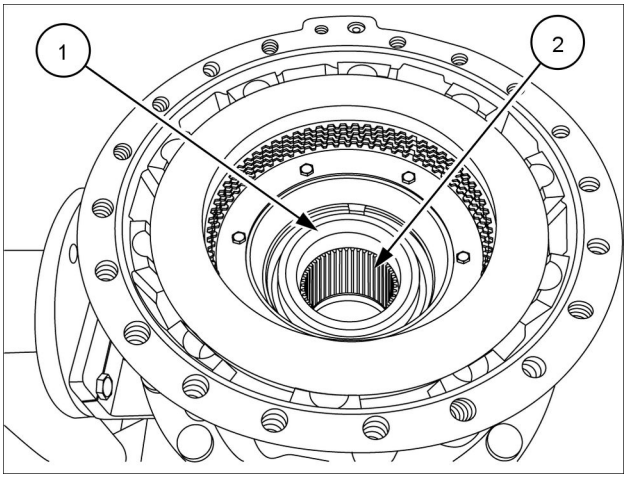
RAIL11WEL0442BA 21

22. Heat the tapered roller bearing and install it on the planetary carrier until the contact is made.



RAIL11WEL0443BA 22

23. Wet the contact face of the bearing inner ring **(1)** and profile teeth **(2)** in the output shaft with anti-corrosive agent.



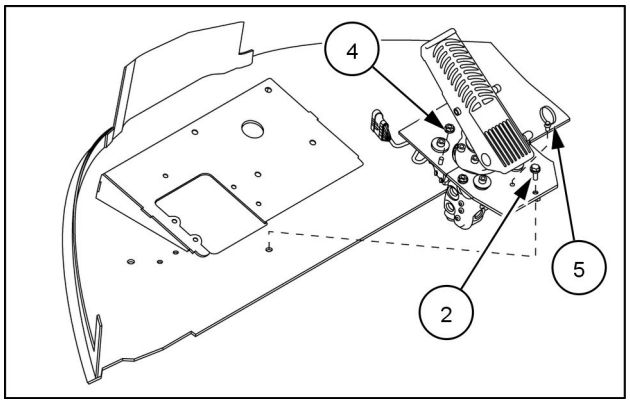
RAIL11WEL0444BA 23

Brake pedal control valve - Install

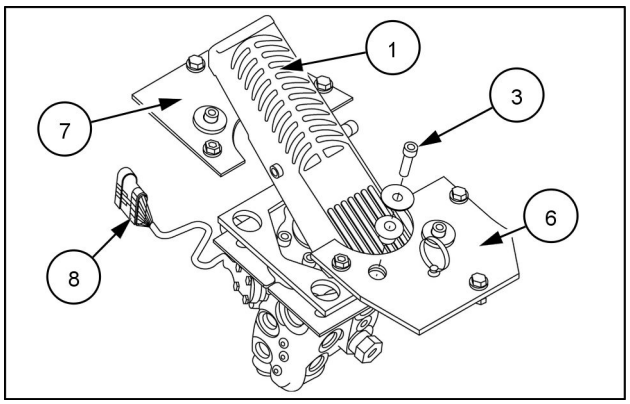
1. Position the brake pedal control valve **(1)** from under the cab floor. Connect the connector **(8)**. Position the plates **(6)** and **(7)**. Lock with the two nuts M8 **(4)**, the four screws M8x30 **(3)**, the four bolts M8x20 **(2)** and the strap **(5)**.

NOTE: *the connector **(8)** is only present on 5-speed valve brake.*

NOTE: *the strap **(5)** is only present if the differential lock option is installed.*

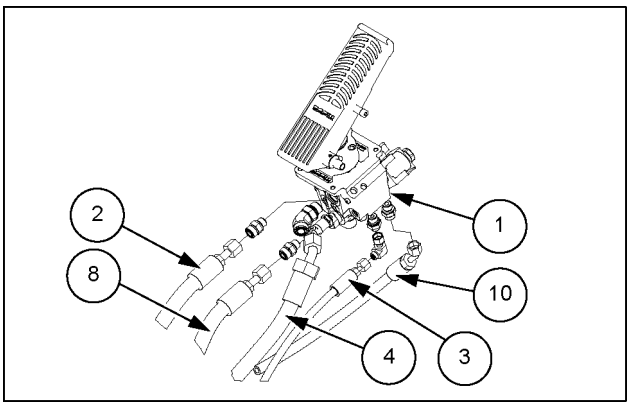


LEIL16WHL822AA 1

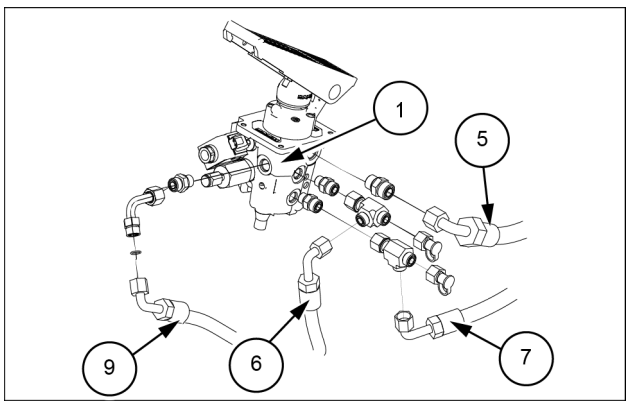


LEIL16WHL821AA 2

2. Remove the protective plugs from the hoses and connect the following hoses to the brake pedal control valve:
   - brake valve inlet hose **(4)**;
   - rear brake accumulator hose **(2)**;
   - front brake accumulator hose **(8)**;
   - parking brake accumulator hose **(10)**;
   - parking brake hose **(3)**;
   - brake valve discharge hose **(5)**;
   - front axle brake hose **(6)**;
   - rear axle brake hose **(7)**;
   - return brake valve to tank hose **(9)**.



LEIL16WHL1800AB 3

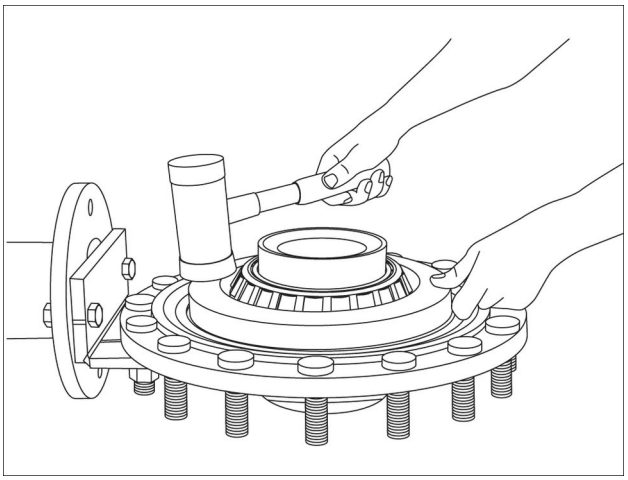


LEIL16WHL0676AB 4

3. Stop the vacuum pump and remove it.
4. Connect all the electrical connections.

7. Heat the slide bushing and position it at the output shaft collar. Position the slide bushing with pressure ring.

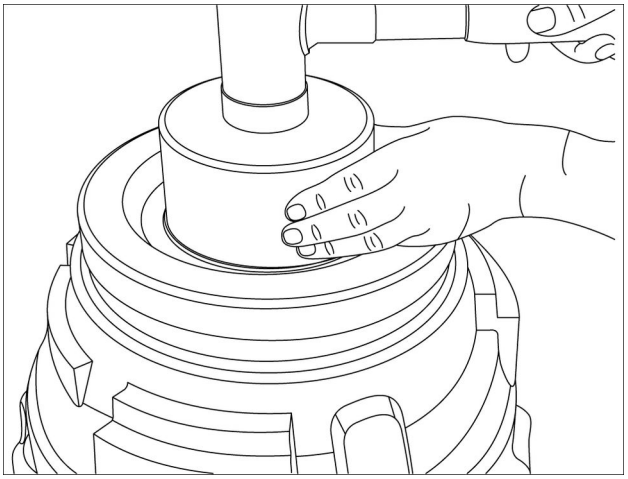
NOTE: *the exact installation position is obtained when using the specified pressure ring.*



RAIL11WEL0429BA 7

8. Insert the shaft seal into the brake housing by using the CAS2880 driver tool.

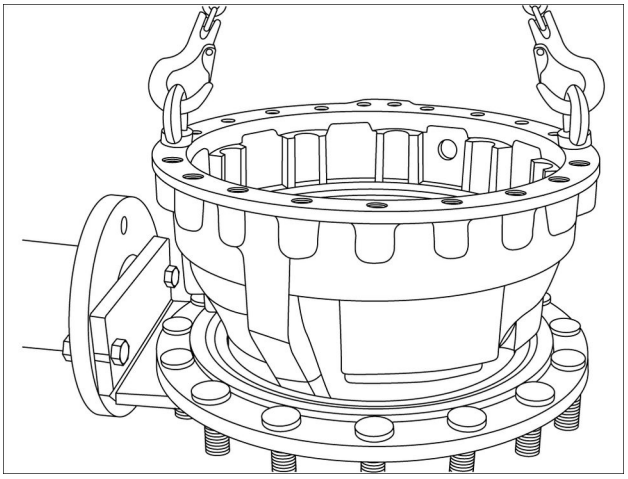
NOTE: *the exact installation position is obtained when using the specified driver tool. Make note of the installation position (step 6). Wet the outer diameter of the shaft seal with mineral spirits before the assembly.*



RAIL11WEL0430BA 8

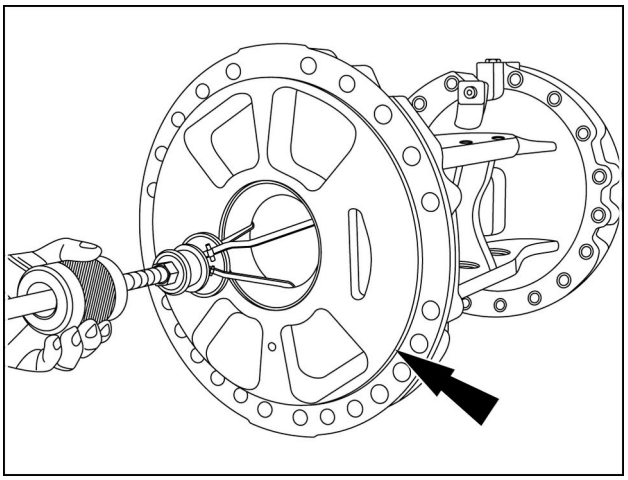
9. Use a suitable lifting device and insert the pre-mounted brake housing over the output shaft until contact is made.

NOTE: *before clamping the seal rings (slide ring seal) to the installation dimension, clean the sliding surfaces and apply an oil film. A leather cloth soaked in oil is recommended for this step.*



RAIL11WEL0431BA 9

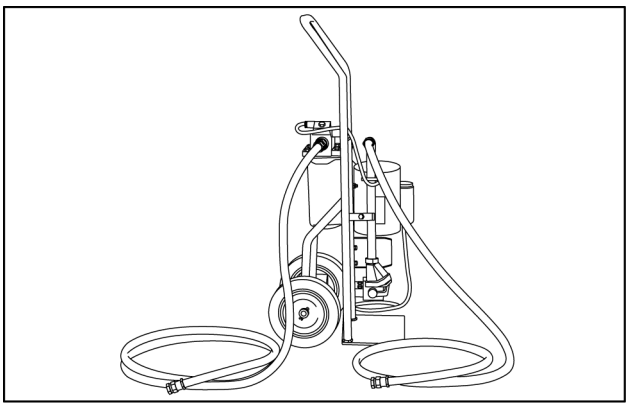
4. Pull the bearing outer ring and remove the shim behind. Remove the O-ring (see arrow).



RCIL11WHL027BAF 4

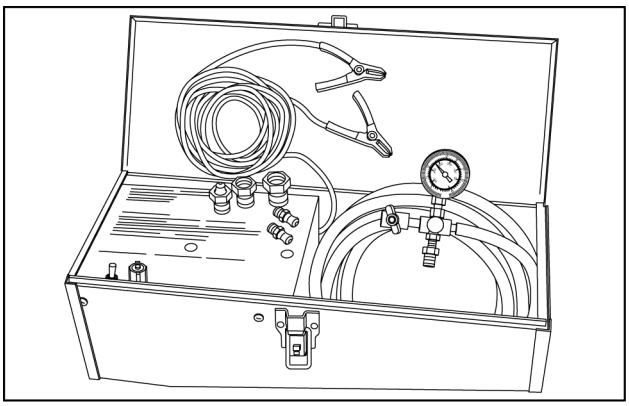
Hydraulic systems - Special tools

CAS10162A, Portable filter unit



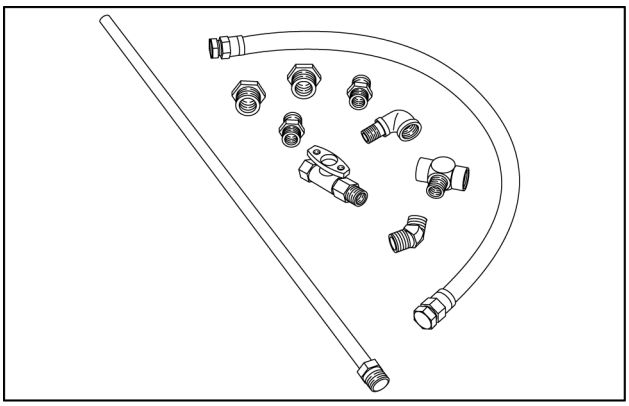
LEIL13WHL1194AA 1

CAS10192, Vacuum pump



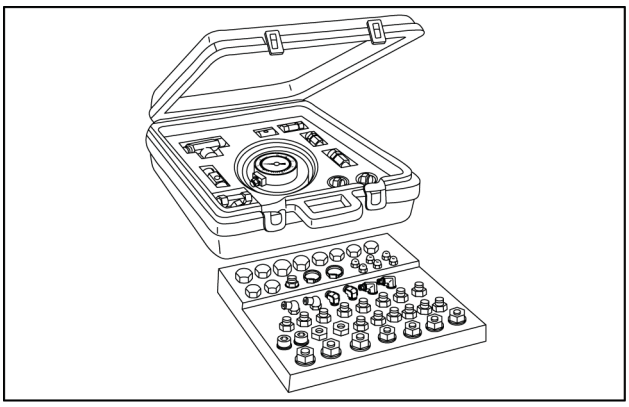
LEIL13WHL1195AA 2

CAS10508, Fitting kit



LEIL13WHL1196AA 3

CAS1904-1, Pressure fitting kit

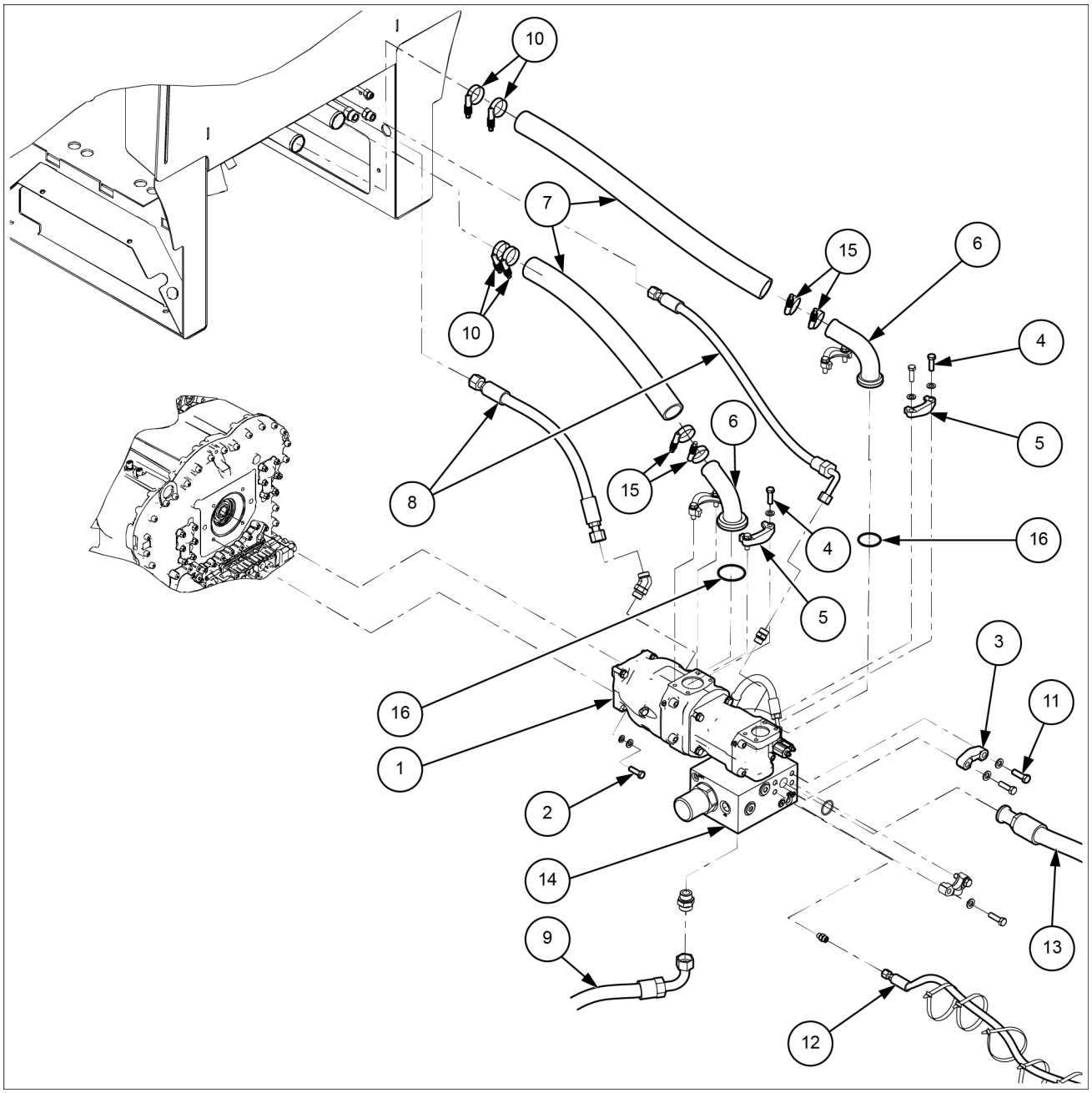


LEIL13WHL1197AA 4

11. Disconnect the vacuum pump from the hydraulic reservoir air breather hose. Remove the filler cap.
12. Install the outlet hose for the portable filter in the hydraulic reservoir filler neck.
13. Open the valve that is installed in the hole for the drain plug.
14. Move the switch for the portable filter to the ON position. Start and run the engine at **1500 RPM**.
15. Run the portable filter for 10 minutes.
16. Continue to run the portable filter. Increase the engine speed to full throttle. Heat the oil to operating temperature by doing the following steps:
    1. Hold the loader control in the bucket roll-back position for five seconds.
    2. Return the blade control lever in the NEUTRAL position for five seconds.
    3. Repeat steps 1 and 2 until the oil in the hydraulic system is at operating temperature.
17. Continue to run the engine at full throttle. Continue to run the portable filter.
18. Operate each hydraulic circuit to completely extend and retract the cylinders. Continue to operate each hydraulic circuit two times, one after the other for 45 minutes.
19. Decrease the engine speed to low idle.
20. Continue to run the portable filter for 10 minutes.

Variable displacement pump - Remove

921G WHEEL LOADER XR-EH, NEW CAB TIER4B NA	NA
921G WHEEL LOADER ZBAR-EH, NEW CAB TIER4B NA	NA

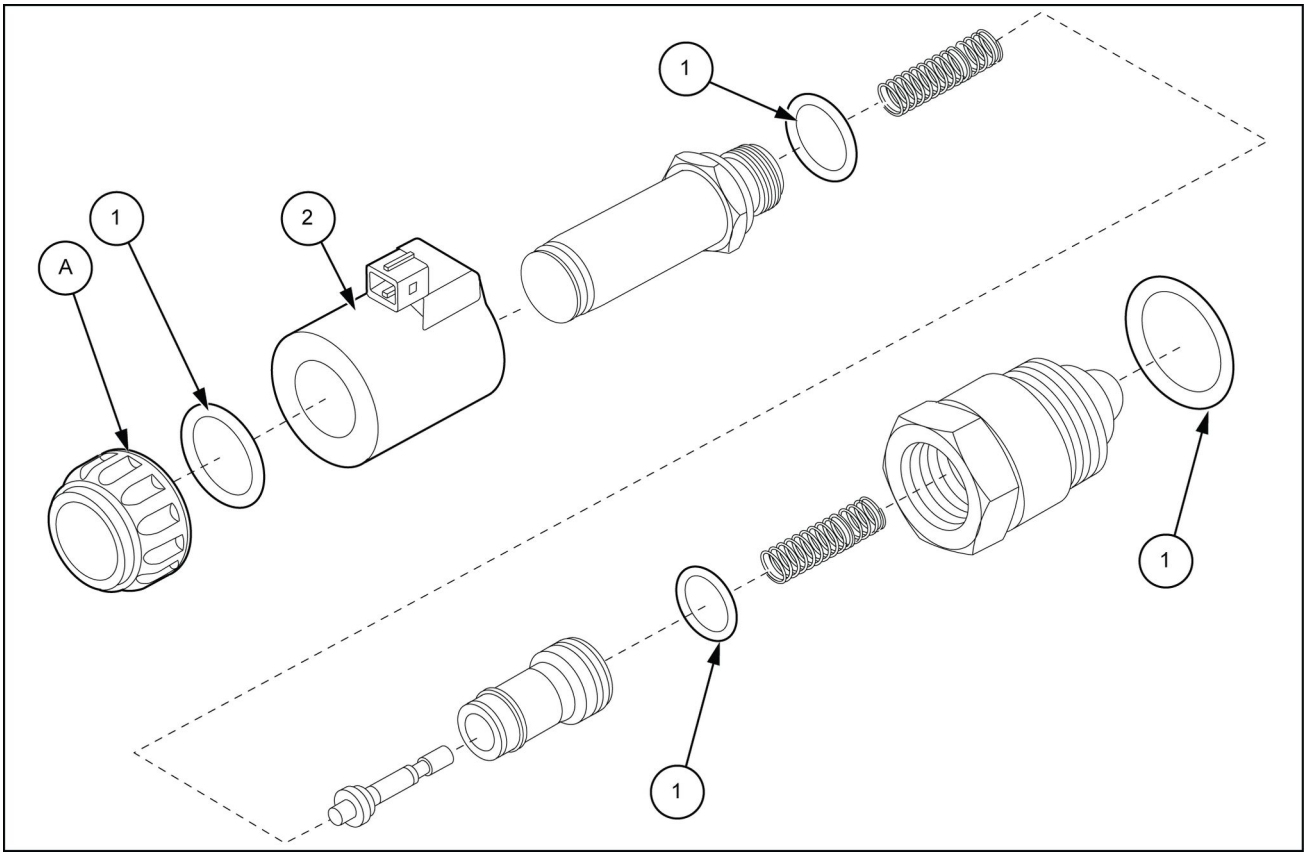


LEIL16WHL0540GB 1

1. Main hydraulic pump
2. Mount bolts
3. Split flange
4. Bolt
5. Split flange
6. Tube
7. Suction hose
8. Drain hose
9. Priority tank hose
10. Clamps
11. Bolt
12. Load sense hose
13. Pressure hose
14. Steering priority valve
15. Clamps
16. O-ring

NOTE: *when disconnecting the hydraulic fittings, plug the hoses and cap the fittings to prevent entry of foreign matter into the hydraulic system.*

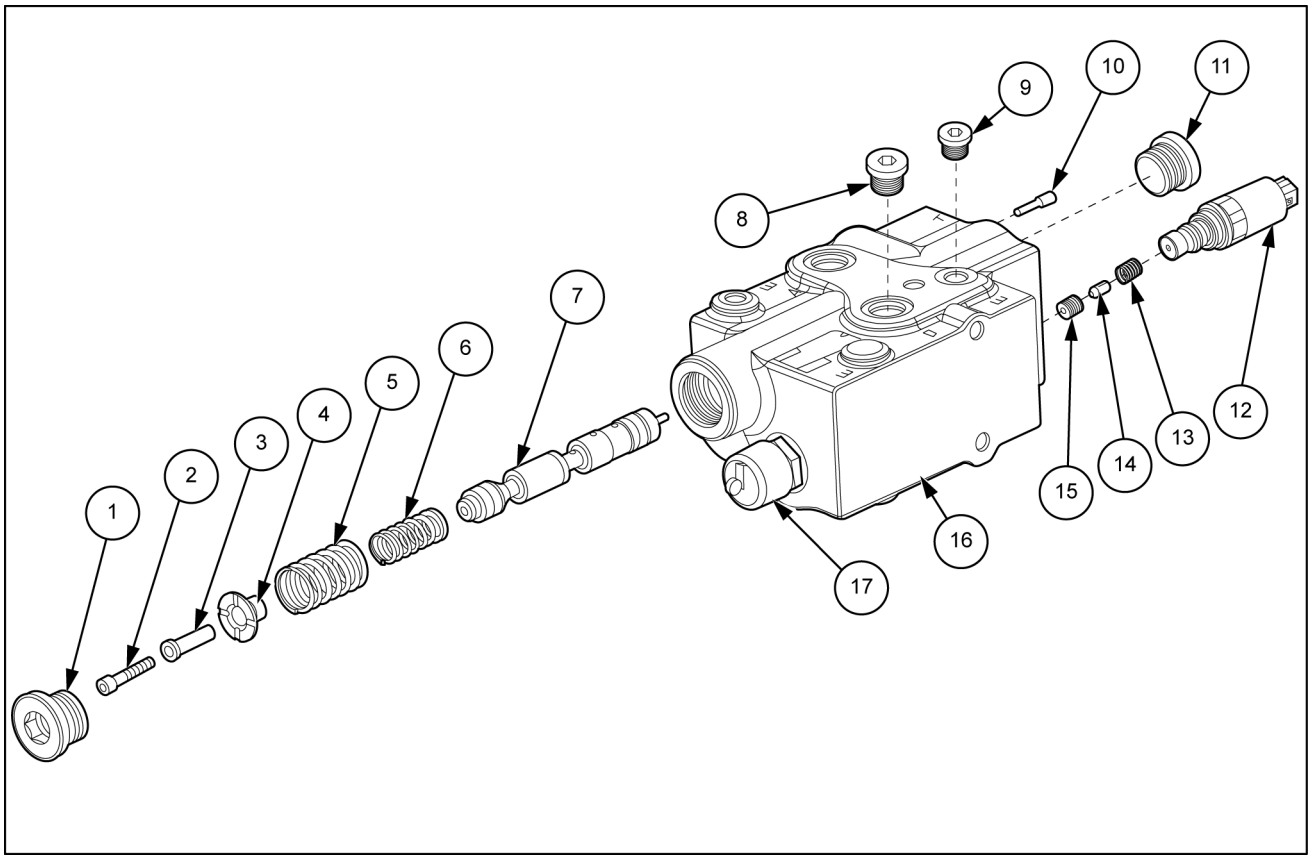
2. Install new O-rings and thrust rings on the anti-cavitation valve **(13)**. Hand tighten the coil nut **(A)**.



LEIL13WHL1348FB 2

1. O-rings
2. Coil

Ride control solenoid valve block - Exploded view



LEIL13WHL1362FB 1

1. Plug
2. Cap screw
3. Bushing
4. Spring carrier
5. Spring
6. Spring
7. Spool
8. Plug
9. Plug
10. Accumulator drain screw
11. Plug
12. Solenoid
13. Orifice
14. Poppet
15. Orifice
16. Valve block
17. Relief valve

9. Install the charging hose fitting onto the accumulator.
10. Tighten the needle valve by turning it clockwise. Slowly open the gauge valve **(D)** and observe the reading on the gauge. This reading is the nitrogen pressure level inside the accumulator.
11. Open the valve **(A)** on the nitrogen supply tank. While observing the pressure on the gauge, slightly open the needle valve on the accumulator charge hose. By regulating the needle valve, fill the accumulator to pressure according to temperature chart below. Close the needle valve. Close the valve **(A)** on the nitrogen supply tank.

Temperature	Accumulator pre-charge pressure
10 °C (**50 °F**)	**16.36 bar** (**237.22 psi**)
13 °C (**55 °F**)	**16.55 bar** (**239.98 psi**)
16 °C (**61 °F**)	**16.74 bar** (**242.73 psi**)
18 °C (**64 °F**)	**16.87 bar** (**244.62 psi**)
21 °C (**70 °F**)	**17.06 bar** (**247.37 psi**)
24 °C (**75 °F**)	**17.26 bar** (**250.27 psi**)
27 °C (**81 °F**)	**17.45 bar** (**253.02 psi**)
29 °C (**84 °F**)	**17.58 bar** (**254.91 psi**)
32 °C (**90 °F**)	**17.77 bar** (**257.66 psi**)
35 °C (**95 °F**)	**17.96 bar** (**260.42 psi**)
38 °C (**100 °F**)	**18.15 bar** (**263.17 psi**)

12. Close the valve **(B)** by turning to the right (clockwise). After a few minutes, check the accumulator for leakage.
13. Back off the needle valve on the accumulator end of the charging hose by turning it counterclockwise the maximum amount. This will prevent nitrogen from escaping from the accumulator as the hose is removed. Remove the charging hose from the accumulator.
14. Install the cap screws.
15. Remove the charging hose from the nitrogen supply tank.

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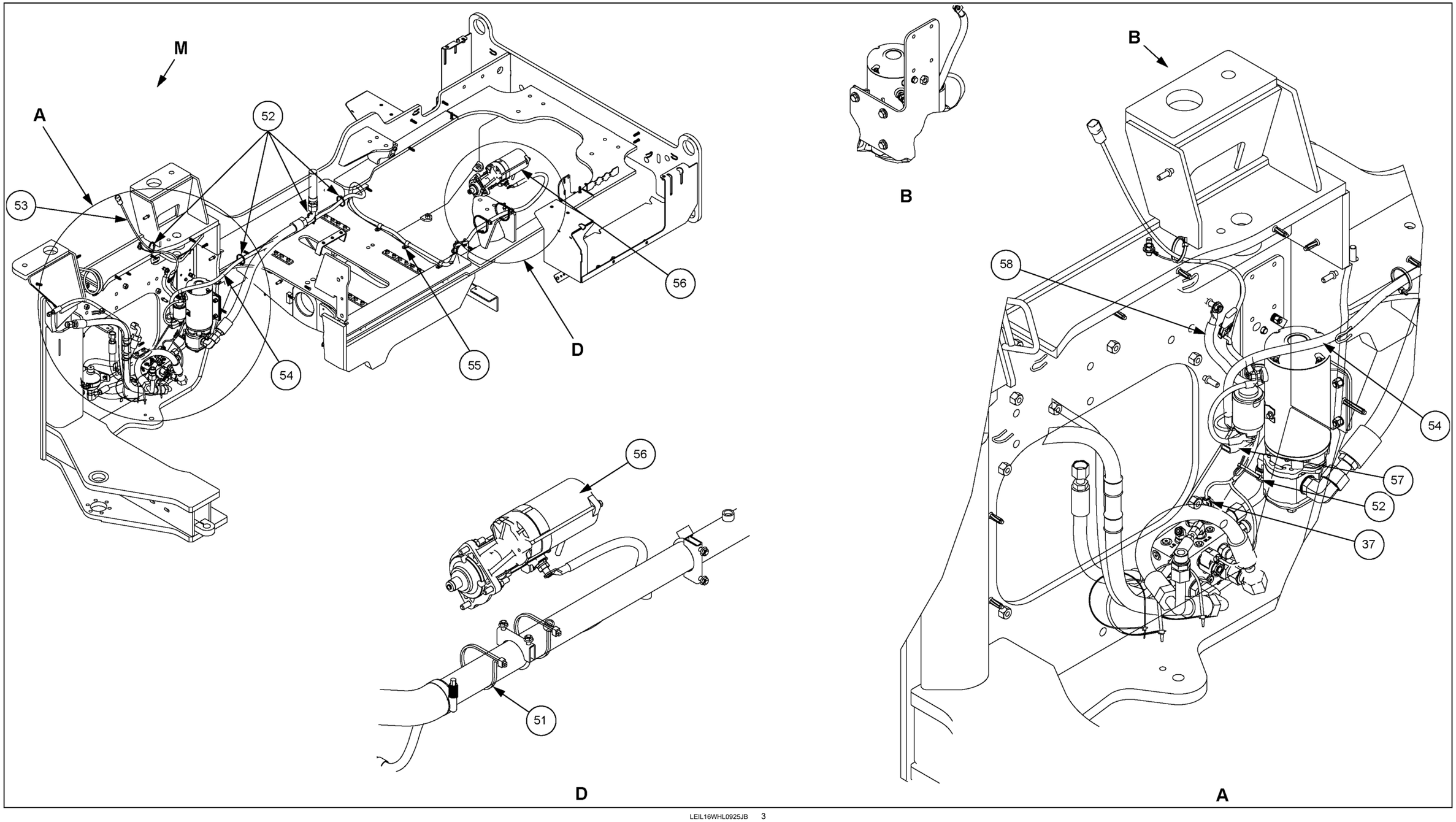
[41.216] Cylinders 41.3

[41.910] Auxiliary steering 41.4



LEIL16WHL0925JB 3

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

1. Steering EHPS valve
2. Bracket
3. Hydraulic connector
4. **90 °** elbow
5. **90 °** elbow
6. Tee
7. Hydraulic shuttle tee valve
8. Hydraulic connector
9. Hydraulic connector
10. Hydraulic connector
11. **90 °** elbow
12. Cut-off valve
13. Hydraulic connector
14. Washer, 9x21x2.5 mm
15. Bolt, M8x20 CL 8.8
16. Steering priority valve
17. Hose (to steering cylinder)
18. Hose (to steering cylinder)
19. Hydraulic connector
20. Right-hand base hose
21. Washer, 13.5x28x4 mm
22. Nut M12
23. Bolt, M12x50 CL 10.9
24. Right-hand rod hose
25. Steering LS hose
26. Steering LS hose
27. Tee
28. JSS pressure hose
29. Hose (to tank)
30. Steering pump isolator
31. Rubber mount bushing
32. **45 °** elbow
33. Right-hand steering cylinder tube head
34. Clamp
35. O-ring
36. Bracket
37. Bracket
38. Washer, 9x17x2 mm
39. Bolt, M8x20 CL 10.9
40. Bolt, M8x25 CL 10.9
41. Block clamp
42. Washer, 6.6x12x1.6 mm
43. Bolt, M6x70 CL 10.9
44. Nut M6
45. Steel mount bushing
46. Steering angle sensor
47. Belleville washer, M10x22
48. Bolt, M10x30 CL 10.9
49. Auxiliary steering valve
50. Orbitrol valve
51. JSS sensor mounting bracket
52. Bolt, M8x10 CL 8.8
53. Washer, 9x16x1.6 mm
54. Nut

Main priority valve - Test

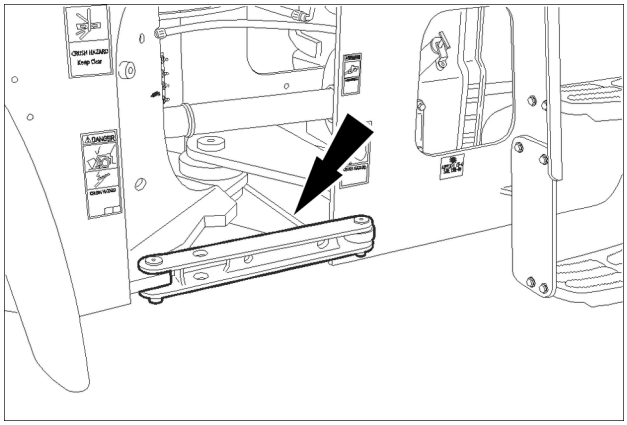
921G WHEEL LOADER XR-EH, NEW CAB TIER4B NA	NA
921G WHEEL LOADER ZBAR-EH, NEW CAB TIER4B NA	NA

NOTE: *the loader/steering pump differential pressure must be properly adjusted before doing this test.*

Pressure setting test

1. Install the articulation lock.

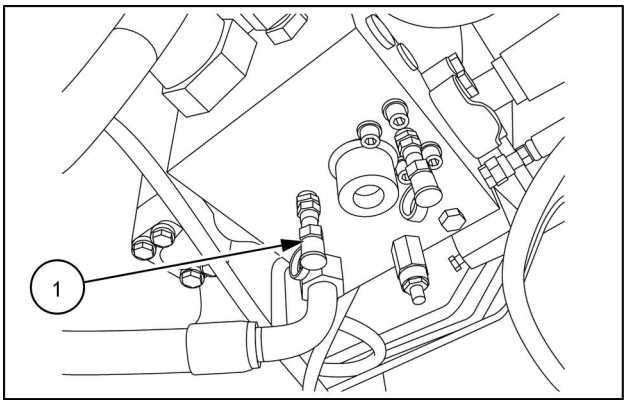
NOTICE: *when performing the following pressure check and adjustment, the articulation lock must be installed. Use caution when working in or near the articulation area.*



RCPH10WHL063BAL 1

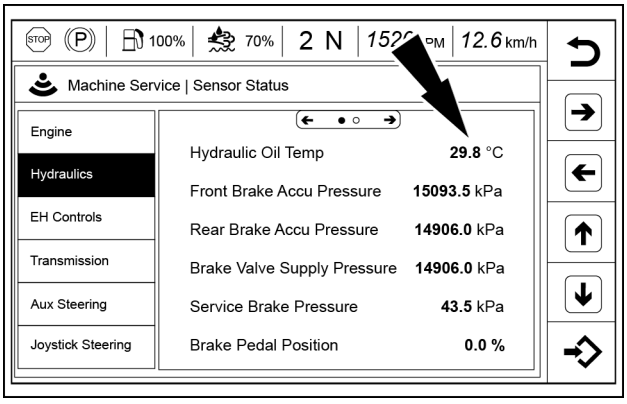
2. Remove the dust cap from the test port **(1)** located on the steering priority valve. Connect a **345 bar** (**5002 psi**) test gauge to the test port **(1)**.

NOTE: *make sure when you connect the pressure gauge that you do so in a manner that you can read the pressure gauge while sitting on the operator seat.*



LEIL16WHL0911AA 2

3. Make sure that the temperature of the hydraulic oil is **54 - 57 °C** (**129 - 135 °F**). The procedure to heat the hydraulic oil is the following.
   ● Check the oil temperature through the display in the cab (access to “Machine service – Sensor Status – Hydraulics” screens).
   ● Heat the hydraulic oil:
   A. Start the engine and run at full throttle.
   B. Hold the bucket control lever in the ROLLBACK position while raising and lowering the lift arms from ground level to full height.
   C. Continue this procedure until the hydraulic oil temperature is **54 - 57 °C** (**129 - 135 °F**). After heating oil to the operating temperature, lower the bucket to the ground.



LEIL16WHL0891AA 3

4. Run the engine at full throttle.
5. Steer hard in either direction over the relief pressure.
6. Record the reading on the test gauge.

1. Install the bearing **(5)** in the gland **(1)**.
2. Install the buffer seal **(4)** in the gland **(1)** so that the seal lips are toward the small end of the gland.
3. Install the rod seal **(3)** in the gland **(1)**. The rod seal must be installed so that the seal lips are toward the small end of the gland. The seal can be difficult to install. Use tools that will not damage the seal.
4. Install the rod wiper **(2)** in the gland **(1)** with the wiper lips toward the large end of the gland **(1)**.
5. Install the O-ring **(7)** on the gland **(1)**.
6. Install the backup ring **(6)** on the gland **(1)**. The backup ring must be toward the large end of the gland **(1)**. If the backup ring is not flat on both sides, the side that is not flat must be toward the O-ring **(7)**.
7. Fasten the piston rod **(14)** yoke in a vise.
8. Lubricate the piston rod **(15)** and bore in the gland **(1)** with clean hydraulic oil.

NOTE: *if a new gland **(1)** is being installed, write the cylinder part number on the gland.*

9. Push the gland **(1)** onto the piston rod **(14)** large end first. If necessary, use a soft hammer to drive the gland onto the piston rod.
10. Put a support below and near the end of the piston rod **(14)**. Put a cloth between the support and the piston rod to prevent damaging the piston rod.
11. Install a new cast iron ring **(10)** on the piston **(9)**.
12. Install a new wear ring **(11)** on the piston **(9)**.
13. Install a new loader ring **(12)** on the piston **(9)**.
14. Install a new seal **(13)** over the loader ring **(12)**.
15. Clean the threads on the end of the piston rod **(14)** and threads of the bolt **(8)** using Loctite cleaning solvent. Allow to dry. Apply **LOCTITE® 243™** to the piston rod threads **6.4 mm** (**0.3 in**) from the open end of the piston rod so that there is **12.7 mm** (**0.5 in**) of **LOCTITE® 243™** on the piston rod threads. DO NOT apply Loctite to the first **6.4 mm** (**0.3 in**) of the piston rod threads.
16. Install the bolt and hardened washer **(8)** in the piston **(9)**.
17. Install the piston **(9)** on the piston rod **(14)** and start bolt **(8)** into the piston rod.
18. Tighten the bolt **(8)** to a torque of **810 - 925 N·m** (**597 - 682 lb ft**).
19. Fasten the tube **(18)** in a vise. Be careful not to damage the tube.
20. Apply petroleum jelly to the O-rings **(7)** and backup ring **(6)** on the gland **(1)** and to the sealing surface in the tube **(18)**.
21. Lubricate the piston **(9)** and inside of the tube **(18)** with clean hydraulic oil.

Wheels - 44

Front wheels - 511

821G WHEEL LOADER XR-EH, NEW CAB TIER4B NA
821G WHEEL LOADER ZBAR-EH, NEW CAB TIER4B NA
921G WHEEL LOADER XR-EH, NEW CAB TIER4B NA
921G WHEEL LOADER ZBAR-EH, NEW CAB TIER4B NA

Expansion valve stuck open

Expansion Valve Stuck Open		1. Replace expansion valve.

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

Temperature of low pressure gauge: high
Temperature of high pressure gauge: high

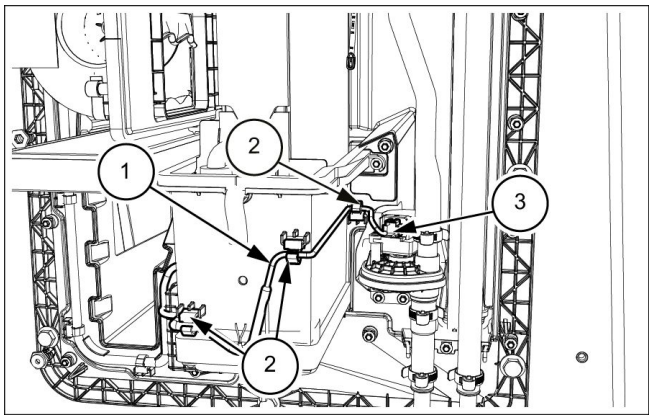
Condenser not operating - Indications:

A. Liquid line is very hot. B. Discharge air from evaporator is warm.		1. Check for loose or worn compressor belt and proper condenser fan operation. 2. Check to see that condenser is clean and that the fins are straight. 3. Check system for too much refrigerant. A. Remove refrigerant from system until gauge pressure is below normal. B. Add refrigerant until gauge pressures are normal. C. If problem persists, see step 4. 4. Remove and inspect condenser for restrictions caused by oil or reduced heat transfer. A. Discharge refrigerant from system. B. Use compressed air to remove oil from condenser. C. Replace receiver-drier. D. Charge system with new refrigerant.

Air in the system - Indications:

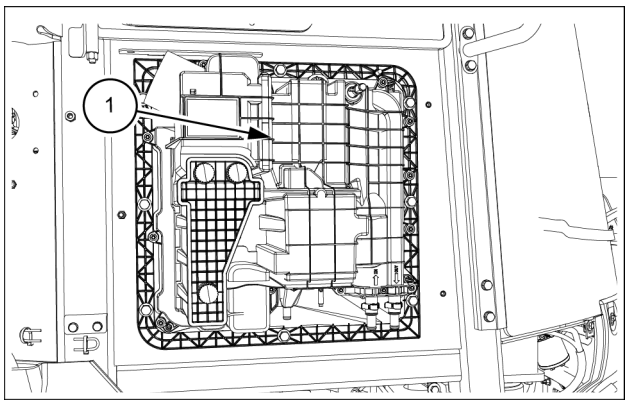
Discharge air from evaporator is warm.		1. Discharge refrigerant from system. 2. Replace receiver-drier. 3. Remove air and moisture from the system. 4. Charge system with new refrigerant.

5. Connect the electrical connector **(3)**.
   Install the three clamps **(2)** holding the air conditioning wire harness **(1)** on the water drain tank.



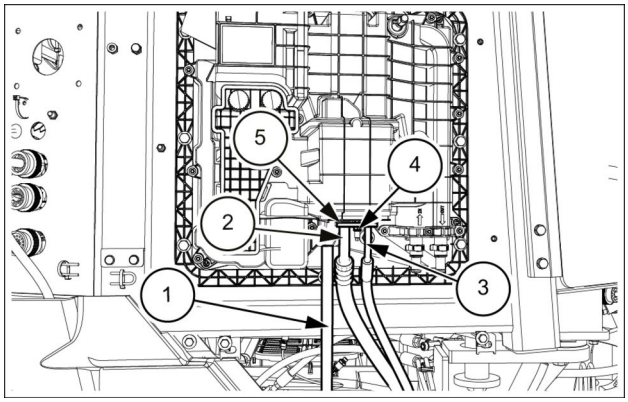
LEIL16WHL1244AB 5

6. Install the cover case **(1)**.



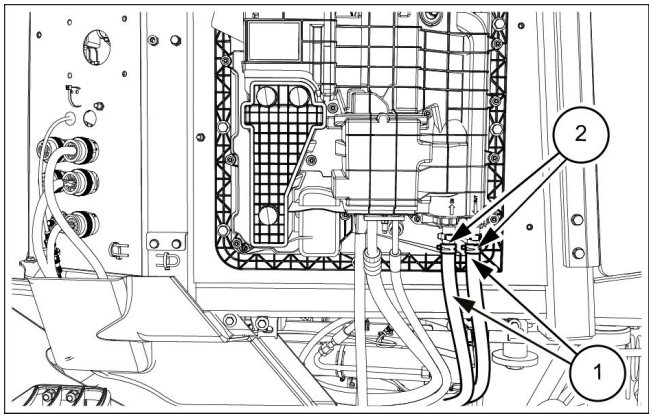
LEIL16WHL1243AB 6

7. Install the drain hose **(1)**.
   Remove the protective plugs from the air conditioning hoses **(2)** and **(3)**.Install the air conditioning hoses **(2)** and **(3)**
   Install the nut **(4)** and the clamp plate **(3)**.



LEIL16WHL1242AB 7

8. Remove the protective plugs from the heater hoses **(1)**.
   Install the heater hoses **(1)**and secure with the clamps **(2)**.



LEIL16WHL1241AB 8

Electrical components - Power outlet description

J-CNVRTR_24-12 - POWER CONVERTER (Power outlet)

Component Type	Power outlet
Wiring frames	**SHEET 35**
Connectors	**X-CNV (Receptacle)**

J-JS+ - JUMP START (Power outlet)

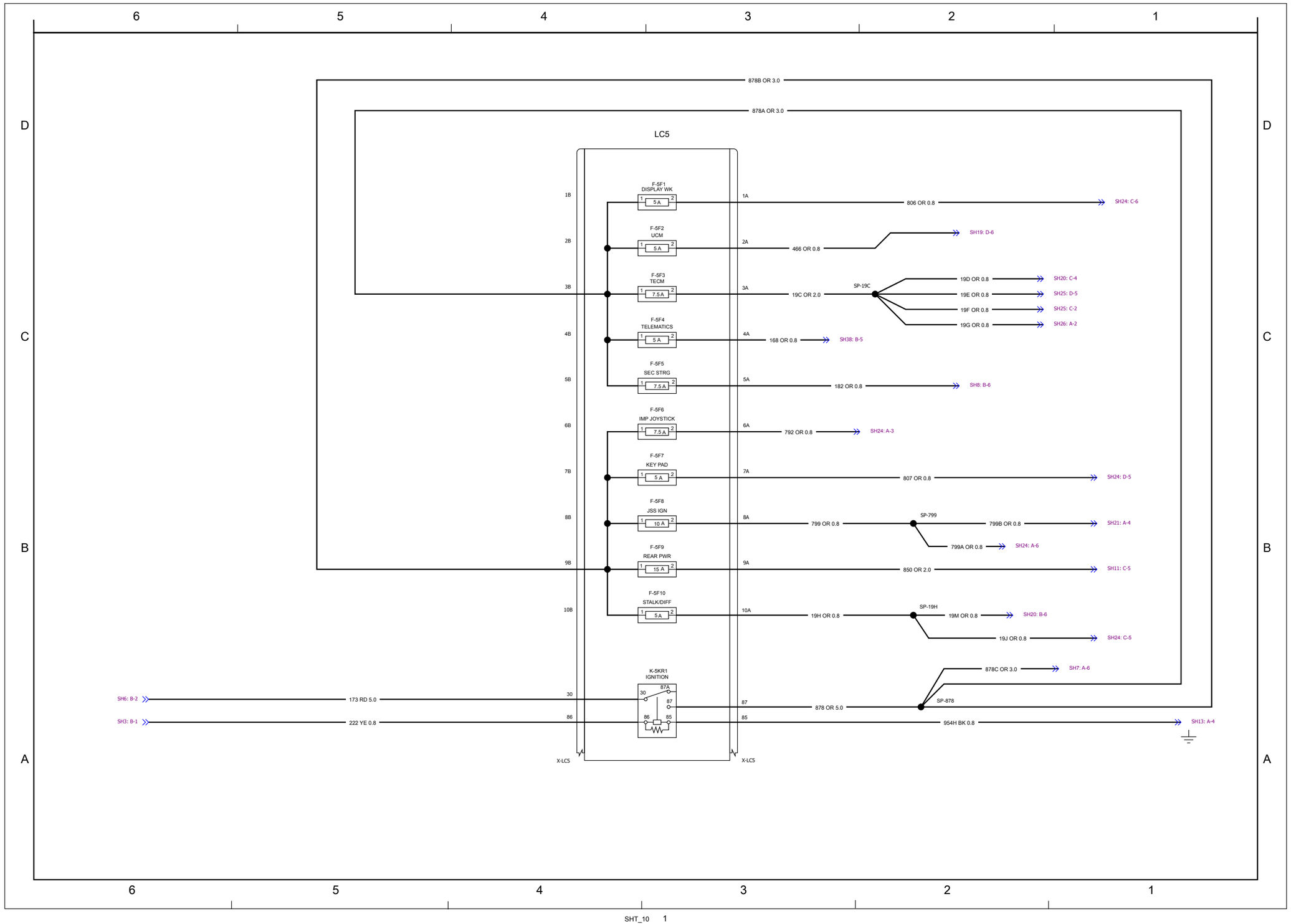
Component Type	Power outlet
Wiring frames	**SHEET 03**
Connectors	**X-JS+ (Plug)**

J-JS- - JUMP START STUD (Power outlet)

Component Type	Power outlet
Wiring frames	**SHEET 03**
Connectors	**X-JS- (Plug)**

J-PO1 - RH CONSOLE 12V POWER OUTLET (Power outlet)

Component Type	Power outlet
Wiring frames	**SHEET 35**
Connectors	**X-X-PO1 (Receptacle)**

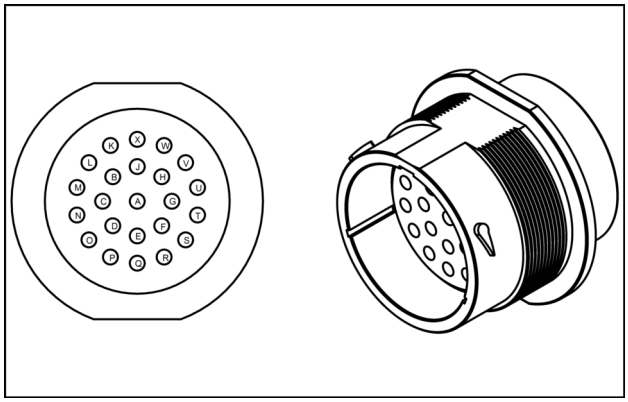

878B OR 3.0
878A OR 3.0
LC5
1B
F-5F1
DISPLAY WK
5 A
1A
806 OR 0.8
SH24: C-6
2B
F-5F2
UCM
5 A
2A
466 OR 0.8
SH19: D-6
3B
F-5F3
TECM
7.5 A
3A
19C OR 2.0
SP-19C
19D OR 0.8
SH20: C-4
19E OR 0.8
SH25: D-5
19F OR 0.8
SH25: C-2
19G OR 0.8
SH26: A-2
4B
F-5F4
TELEMATICS
5 A
4A
168 OR 0.8
SH38: B-5
5B
F-5F5
SEC STRG
7.5 A
5A
182 OR 0.8
SH8: B-6
6B
F-5F6
IMP JOYSTICK
7.5 A
6A
792 OR 0.8
SH24: A-3
7B
F-5F7
KEY PAD
5 A
7A
807 OR 0.8
SH24: D-5
8B
F-5F8
JSS IGN
10 A
8A
799 OR 0.8
SP-799
799B OR 0.8
SH21: A-4
799A OR 0.8
SH24: A-6
9B
F-5F9
REAR PWR
15 A
9A
850 OR 2.0
SH11: C-5
10B
F-5F10
STALK/DIFF
5 A
10A
19H OR 0.8
SP-19H
19M OR 0.8
SH20: B-6
19J OR 0.8
SH24: C-5
K-5KR1
IGNITION
30
87A
87
86
85
878C OR 3.0
SH7: A-6
SP-878
SH6: B-2
173 RD 5.0
SH3: B-1
222 YE 0.8
878 OR 5.0
954H BK 0.8
SH13: A-4
X-LC5
X-LC5
6
5
4
3
2
1
D
C
B
A
SHT_10 1

Wiring harnesses - Electrical schematic sheet 24 SH24 - CAN STRUCTURE

Type	Component	Connector / Link	Description
ECU	**A-DIA**	**X-DIA**	DIAGNOSTIC PLUG
ECU	**A-DSP**	**X-DSP**	DISPLAY
ECU	**A-SFB**	**X-X6**	SMART FUSE BOX
ECU	**A-TERM2**	**X-TERM2**	TERMINATOR
ECU	**A-TERM3**	**X-TERM3**	TERMINATOR
Sensor	**B-ST_MTN**	**X-STW**	STEERING WHEEL MOTION
Resistor	**R-022**	**X-TERM**	TERMINATOR
Switch	**SW-PD**	**X-SW_PD**	SWITCH/KEY PAD
Switch	**SW-RH_JS**		RIGH HAND JOYSTICK or 3 lever
Switch	**SW-STALK**		STALK SWITCH
Connector	X-A_RT	**X-A_RT**	ARM REST RIGHT
Connector	X-CAB_AR	**X-CAB_AR**	CAB TO RH ARM REST
Connector	X-CAB_E	**X-CAB_E**	CAB TO ENGINE
Connector	X-CAB_JSS	**X-CAB_JSS**	CAB TO JSS FRAME HARNESS
Connector	X-CAB_P	**X-CAB_P**	CAB TO PEDESTAL
Connector	X-DIA	**X-DIA**	DIAGNOSTIC PORT
Connector	X-DSP	**X-DSP**	DISPLAY
Connector	X-ENG	**X-ENG**	ENGINE TO CAB
Connector	X-JSS_CAN	**X-JSS_CAN**	CAN
Connector	X-JSS_COM	**X-JSS_COM**	JSS FRAME TO CAB CAN
Connector	X-JSS_FR	**X-JSS_FR**	JSS FRAME HARNESS TO CAB
Connector	X-JSV	**X-JSV**	JOYSTICK STEERING VALVE
Connector	X-PED	**X-PED**	PEDESTAL TO CAB
Connector	X-SFB_XCP	**X-SFB_XCP**	DIAG
Connector	X-STLK	**X-STLK**	STALK LEVER RH
Connector	X-STW	**X-STW**	STEERING WHEEL MOTION SENSOR
Connector	X-SW_PD	**X-SW_PD**	SWITCH PAD
Connector	X-TERM	**X-TERM**	TERMINATOR
Connector	X-TERM2	**X-TERM2**	TERMINATOR CAN
Connector	X-TERM3	**X-TERM3**	TERMINATOR CAN
Connector	X-X7	**X-X7**	SFB
Connector	X-X_TEL	**X-X_TEL**	TELEMATICS
Solenoid	**Y-JSS_STRG_VLV**	**X-JSV**	JOYSTICK STEERING VALVE

6
5
4
3
2
1
D
C
B
A
X-ENG
SH7: B-3
205 RD 2.0
2
2
X-CAB_E
HOOD LIFT
205A RD 2.0
209 WH 2.0
K-LC6R1
HOOD UP
208A BK 2.0
208B BK 1.0
SP-250A
205B RD 2.0
SW-HD_L_SW
HOOD LIFT SWITCH
OUT1
IN
OUT2
206 WH 1.0
SH3: A-4
533 RD 1.0
X-HD
M-HD_L_M
HOOD LIFT MOTOR
X-HDM
SP-208
208 BK 2.0
SH15: C-2
210 GY 2.0
205D RD 2.0
207 GY 1.0
K-LC6R2
HOOD DOWN
208C BK 2.0
208D BK 1.0
X-LC6
SHT_37 1

X-CAB_EH - CAB TO BOTTOM EH (87700159) (Plug)

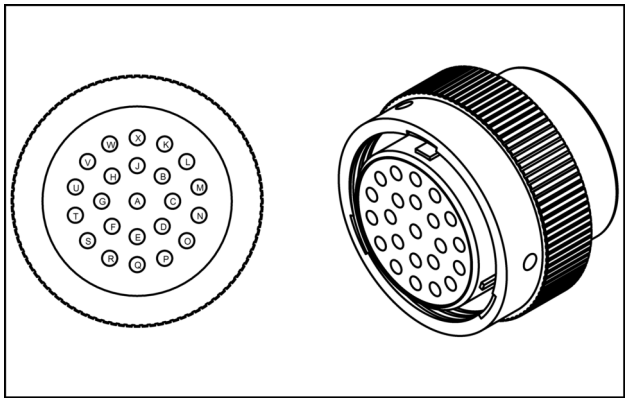


87700159 40

87700159

Pin	From	Wire	Description	Color-Size	Frame
A	**X-UCM3B (Receptacle) pin 18** UCM	344	PILOT ENABLE	WH - 0.8	**SHEET 22**
B	**X-UCM4A (Receptacle) pin 7** UCM	340	BOOM RAISE	WH - 0.8	
C	**X-UCM1B (Receptacle) pin 2** UCM	339	BOOM ENABLE	BR - 0.8	
D	**X-UCM4A (Receptacle) pin 6** UCM	341	BOOM LOWER	WH - 0.8	
E	**X-UCM3B (Receptacle) pin 17** UCM	346	BUCKET ROLL	WH - 0.8	
F	**X-UCM1B (Receptacle) pin 30** UCM	347	BUCKET ENABLE	BR - 0.8	
G	**X-UCM3B (Receptacle) pin 25** UCM	350	BUCKET DUMP	WH - 0.8	
H	**X-UCM3B (Receptacle) pin 32** UCM	351	AUX 1 LEFT	WH - 0.8	
J	**X-UCM1B (Receptacle) pin 10** UCM	352	AUX 1 ENABLE	BR - 0.8	
K	**X-UCM3B (Receptacle) pin 33** UCM	355	AUX 1 RIGHT	WH - 0.8	
L	**X-UCM4A (Receptacle) pin 19** UCM	356	AUX 2 LEFT	WH - 0.8	
M	**X-UCM1A (Receptacle) pin 21** UCM	357	AUX 2 ENABLE	BR - 0.8	
N	**X-UCM4A (Receptacle) pin 13** UCM	360	AUX 2 RIGHT	WH - 0.8	
S	**X-UCM1B (Receptacle) pin 19** UCM	647	BOOM ANGLE 1	YE - 0.8	
T	**X-UCM1B (Receptacle) pin 22** UCM	648	BOOM ANGLE 2	YE - 0.8	
W	**X-UCM1B (Receptacle) pin 21** UCM	653	BUCKET ANGLE 1	YE - 0.8	
X	**X-UCM1B (Receptacle) pin 23** UCM	654	BUCKET ANGLE 2	YE - 0.8	

X-FRNT_EH - FRONT TO BOTTOM EH (87700170) (Receptacle)

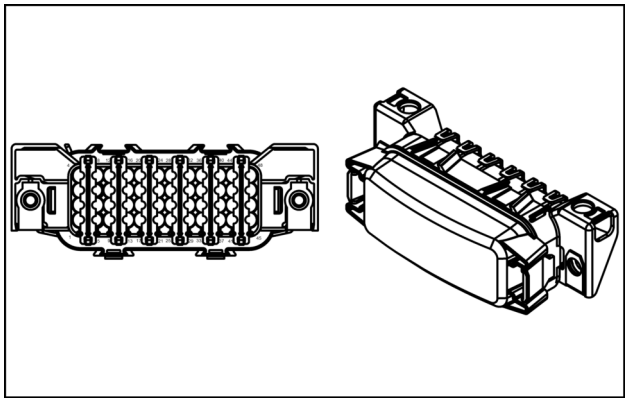


87700170 91

87700170

Pin	From	Wire	Description	Color-Size	Frame
A	**X-PILOT_ENABLE (Receptacle) pin 1** PILOT ENABLE SOLENOID	344B	PILOT ENABLE	WH - 0.8	**SHEET 22**
B	**X-BOOM_RAISE (Receptacle) pin 1** BOOM RAISE SOLENOID	340B	BOOM RAISE	WH - 0.8	
C	SP-339B-P-X	339B	BOOM ENABLE	BR - 0.8	
D	**X-BOOM_LOWER (Receptacle) pin 1** BOOM LOWER SOLENOID	341B	BOOM LOWER	WH - 0.8	
E	**X-BUCKET_ROLL (Receptacle) pin 1** BUCKET ROLL SOLENOID	346B	BUCKET ROLL	WH - 0.8	
F	SP-347B-P-X	347B	BUCKET ENABLE	BR - 0.8	
G	**X-BUCKET_DUMP (Receptacle) pin 1** BUCKET DUMP SOLENOID	350B	BUCKET DUMP	WH - 0.8	
H	**X-AUX_1_LEFT (Receptacle) pin 1** AUX 1 LEFT	351B	AUX 1 LEFT	WH - 0.8	
J	SP-352B-P-X	352B	AUX 1 ENABLE	BR - 0.8	
K	**X-AUX_1_RIGHT (Receptacle) pin 1** AUX 1 RIGHT	355B	AUX 1 RIGHT	WH - 0.8	
L	**X-AUX_2_LEFT (Receptacle) pin 1** AUX 2 LEFT	356B	AUX 2 LEFT	WH - 0.8	
M	SP-357B-P-X	357B	AUX 2 ENABLE	BR - 0.8	
N	**X-AUX_2_RIGHT (Receptacle) pin 1** AUX 2 RIGHT	360B	AUX 2 RIGHT	WH - 0.8	
P	SP-570E-P-X	482U	5V GND1	BL - 0.8	
Q	SP-486F-P-X	486H	5V REF1	PK - 0.8	
S	**X-BOA (Receptacle) pin C** BOOM ANGLE SENSOR	647B	BOOM ANGLE 1	YE - 0.8	
T	**X-BOA (Receptacle) pin D** BOOM ANGLE SENSOR	648B	BOOM ANGLE 2	YE - 0.8	
V	SP-471F-P-X	471F	5V REF2	PK - 0.8	
W	**X-BUA (Receptacle) pin C** BUCKET ANGLE SENSOR	653B	BUCKET ANGLE 1	YE - 0.8	
X	**X-BUA (Receptacle) pin D** BUCKET ANGLE SENSOR	654B	BUCKET ANGLE 2	YE - 0.8	

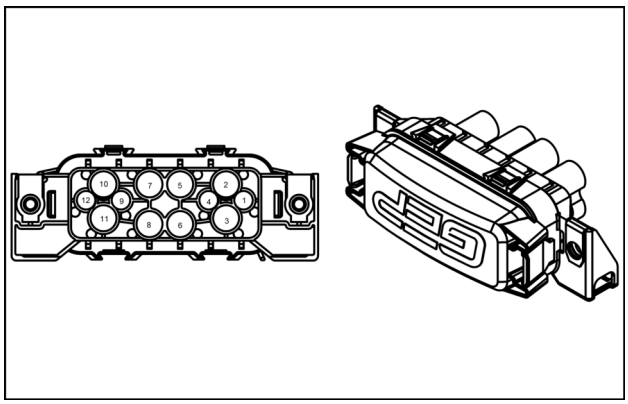
X-LC6 - LOADCENTER 6 [SH16: A-3] (84380518) (Receptacle)



84380518 147

84380518

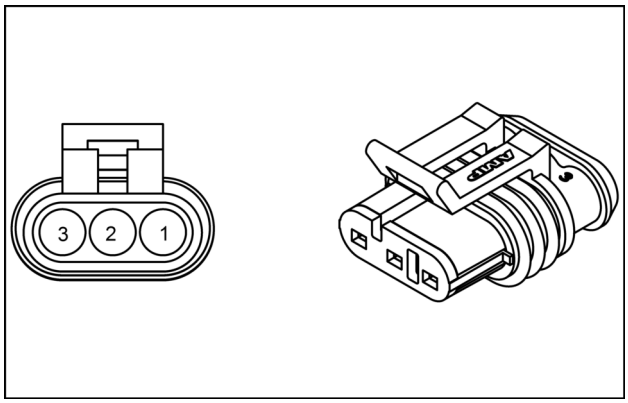
X-LC7 - LOAD CENTER 7 (84563565) (Receptacle)



84563565 148

84563565

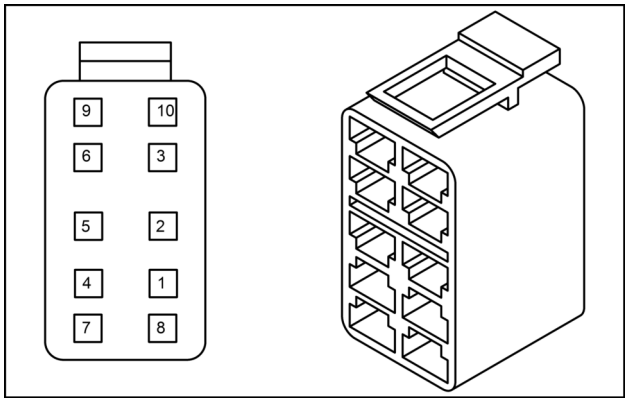
X-LEV1 - INLINE TO DEF LEVEL & TEMP (84062580) (Plug)



84062580 149

84062580

X-SRWP - SWITCH REAR WIPER [SW-WPR_SW] (87716755) (Receptacle)

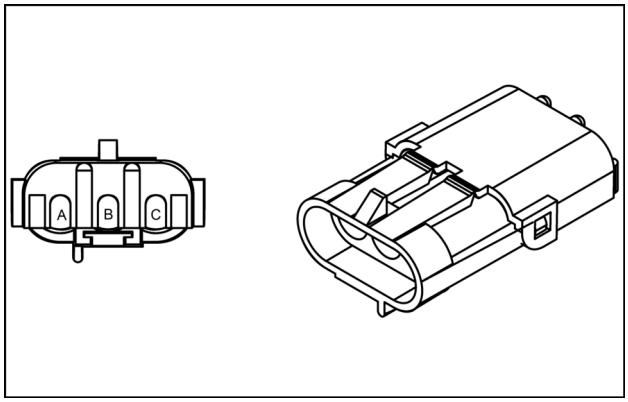


87716755 211

87716755

Pin	From	Wire	Description	Color-Size	Frame
2	**X-PG (Receptacle) pin L** PEDESTAL GROUND	955M	GROUND	BK - 0.8	**SHEET 28**
3	**X-PED_2 (Plug) pin 8** PEDESTAL TO CAB 2	728A	REAR WASHER SWITCH	YE - 0.8	
5	**X-PG (Receptacle) pin G** PEDESTAL GROUND	955W	PEDESTAL GROUND	BK - 0.8	
6	**X-PED_2 (Plug) pin 9** PEDESTAL TO CAB 2	727A	REAR WIPER SWITCH	YE - 0.8	
7	**X-PG (Receptacle) pin F** PEDESTAL GROUND	955D	REAR WIPER SW INDICATOR GND	BK - 0.8	
8	SP-981A-P-X	981C	SWITCH BACK LIGHTING	VT - 0.8	
9	**X-PG (Receptacle) pin C** PEDESTAL GROUND	955G	REAR WIPER SW GND	BK - 0.8	
10	**X-PED_2 (Plug) pin 11** PEDESTAL TO CAB 2	283A	REAR WIPER INDICATOR	VT - 0.8	

X-SSD - SS FLYBACK DIODE [D-SS DIODE] (87692858) (Plug)



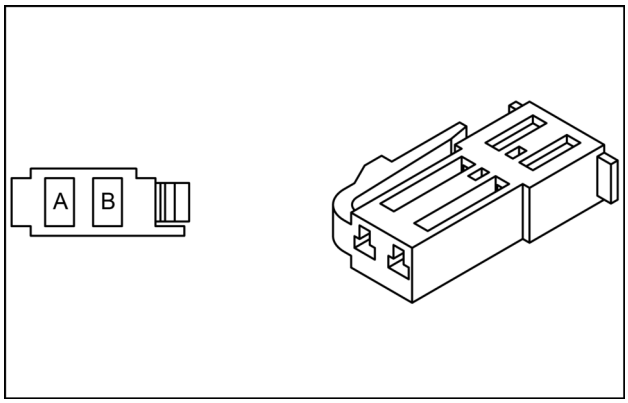
87692858 212

87692858

Pin	From	Wire	Description	Color-Size	Frame
A	**X-S245 (Plug) pin 1** GROUND	180A	SEC STRG FLYBACK GRND	BK - 1.0	**SHEET 21**
B	**X-S245 (Plug) pin 1** GROUND	180	SEC STRG FLYBACK GRND	BK - 1.0	
C	**X-SSS (Plug) pin 1** SECONDARY STEERING MOTOR	441E	SEC STRG FLY BACK PWR	OR - 1.0	

Pin	From	Wire	Description	Color-Size	Frame
30	**X-KEY (Receptacle) pin B** KEY SWITCH	220	SIG_IGNITION SWITCH_START	YE - 0.8	**SHEET 03**
31	**X-KEY (Receptacle) pin D** KEY SWITCH	221	SIG_IGNITION SWITCH_RUN	YE - 0.8	
32	**X-KEY (Receptacle) pin C** KEY SWITCH	225	SIG_IGNITION SWITCH_ACC	YE - 0.8	
36	SP-258-P-X	258D	AC ON SIGNAL	YE - 0.8	**SHEET 33**
48	**X-S_HMR (Receptacle) pin 3** SWITCH HEATED MIRRORS	116	MIRROR HEATER SW	YE - 0.8	**SHEET 34**
50	**X-S_BU (Receptacle) pin 3** CANCEL BACKUP ALARM	119	BACKUP ALARM CANCEL	YE - 0.8	**SHEET 36**
55	**X-CAB_P2 (Receptacle) pin 9** CAB TO PEDESTAL 2	727	REAR WIPER SWITCH	YE - 0.8	**SHEET 32**
56	**X-CAB_P2 (Receptacle) pin 8** CAB TO PEDESTAL 2	728	REAR WASHER SWITCH	YE - 0.8	
59	**X-FWM (Plug) pin D** FRONT WIPER MOTOR	102	FRONT WIPER MOTOR PARK	TN - 0.8	
67	**X-CAB_E (Receptacle) pin 17** CAB TO ENGINE	239A	ALT LAMP SIGNAL	YE - 0.8	**SHEET 03**
68	**X-S_RDF (Receptacle) pin 3** SWITCH REAR DEFROST	117	REAR DEFROST SWITCH	YE - 0.8	**SHEET 36**
80	**X-DS (Receptacle) pin 1** DOOR SWITCH	151	LH DOOR AJAR SW	YE - 0.8	**SHEET 27**

X-XLP1 - LOUDSPEAKER RT [H-LSP1] (84147089) (Receptacle)

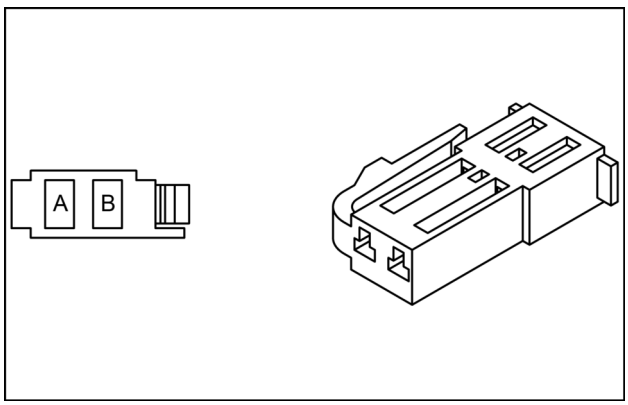


84147089 265

84147089

Pin	From	Wire	Description	Color-Size	Frame
1	**X-SPK (Receptacle) pin X** RADIO TO SPKRS	LP1-1	LOUDSPEAKER RIGHT -1	BL - 1.0	**SHEET 35**
2	**X-SPK (Receptacle) pin X** RADIO TO SPKRS	LP1-2	LOUDSPEAKER RIGHT -2	BK - 1.0	

X-XLP2 - LOUDSPEAKER LF [H-LSP2] (84147089) (Receptacle)



84147089 266

84147089

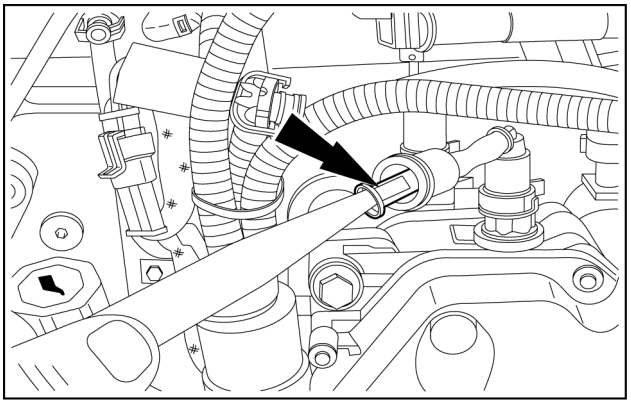
Electrical systems - 55

Battery - 302

821G WHEEL LOADER XR-EH, NEW CAB TIER4B NA
821G WHEEL LOADER ZBAR-EH, NEW CAB TIER4B NA
921G WHEEL LOADER XR-EH, NEW CAB TIER4B NA
921G WHEEL LOADER ZBAR-EH, NEW CAB TIER4B NA

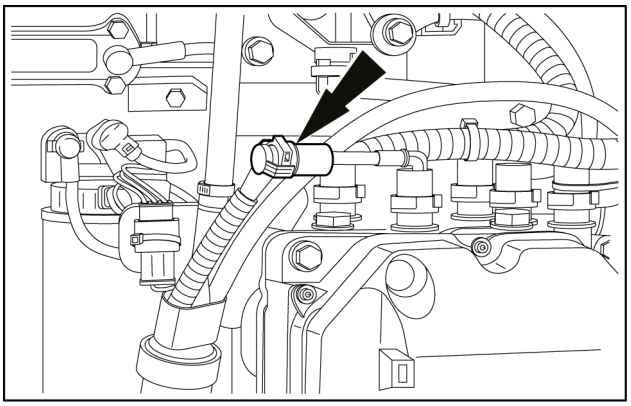
Diesel Exhaust Fluid (DEF)/AdBlue® supply module - Install - In-line supply filter screen

1. Install the filter screen into the supply line filter housing.



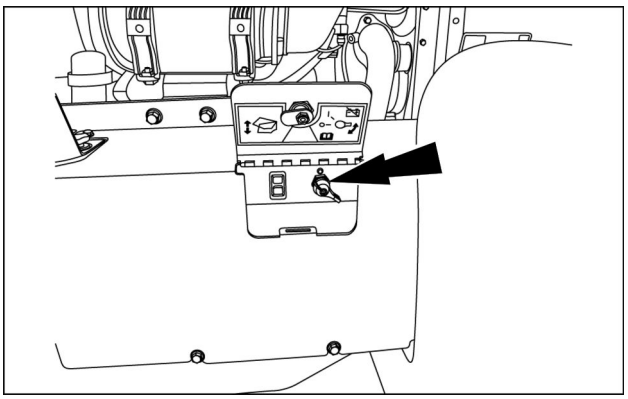
LEIL13WHL0221AB 1

2. Reconnect the supply line coupling.
   To connect, push the fitting ends together, until an audible strap is heard.



LEIL13WHL0220AB 2

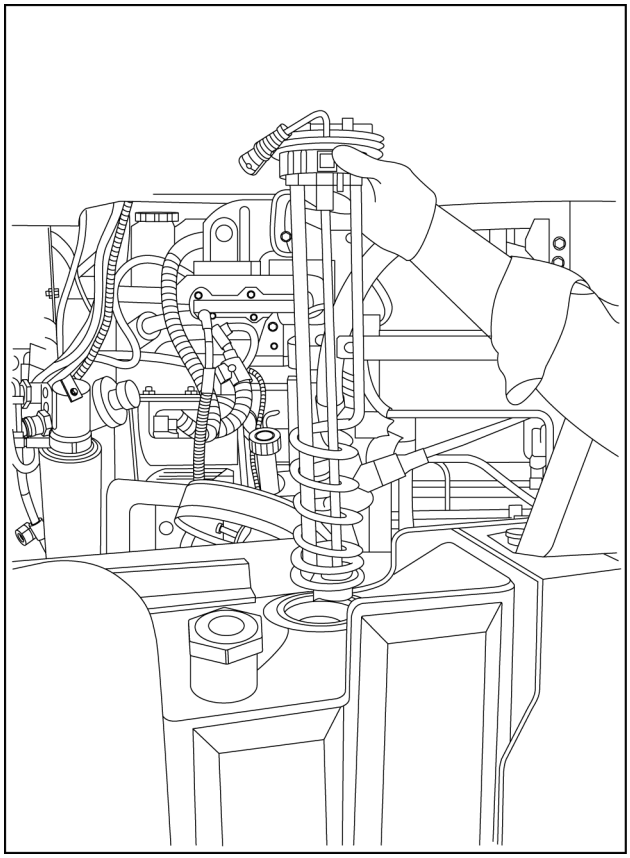
3. Turn the timed disconnect switch to the ON position.
   Clear any fault codes. Start the engine and check connections for leaks.
   Confirm problem has been corrected.



RCPH10WHL106AAH 3

Diesel Exhaust Fluid (DEF)/AdBlue® tank level and temperature sensor - Install

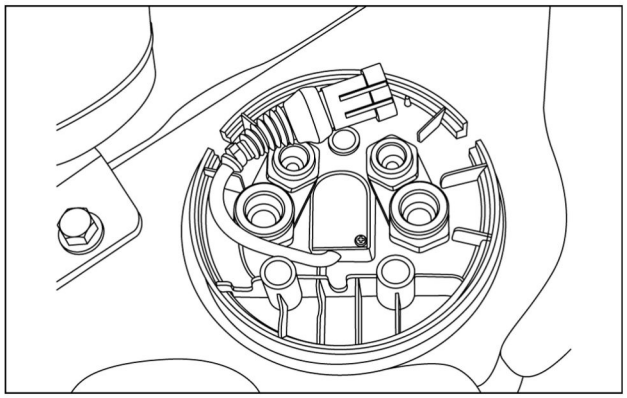
1. Insert the **DEF/ADBLUE®** tank level/temperature sensor pickup heater unit into the supply tank.



LEIL13WHL0235BA 1

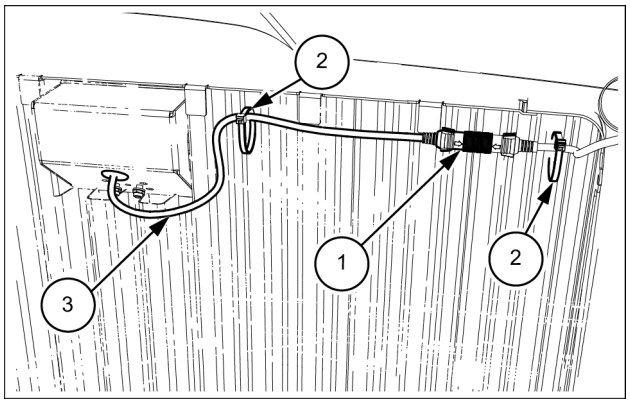
2. Twist the **DEF/ADBLUE®** tank level/temperature sensor pick up heater unit clockwise to secure it to the tank.

NOTE: *use markings made during disassembly to position the unit correctly in the tank.*



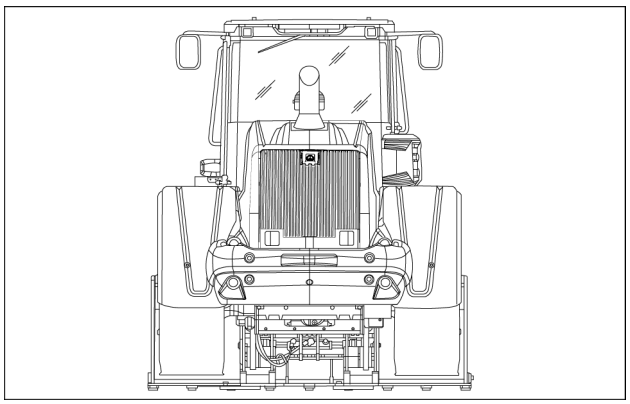
RCPH11WHL707BAU 2

5. Route the extension cable **(3)** of the rearview camera inside the engine hood. Connect the connector **(1)**. Use new cable ties **(2)** to secure the extension cable **(3)** of the rearview camera to the rear grill inner side.



LEIL16WHL0849AB 5

6. Lower the engine hood. Turn the timed disconnect switch to the ON position.



LEIL16WHL0848AB 6

Use a multimeter to perform the following voltage check:

From	To	Value
Connector **X-LC4** pin 86	Chassis ground	There should not be voltage

A. If there is a battery voltage value, replace the Electrical Accessory Power Relay.

B. If there is not a voltage value, 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_01_H	Chassis ground	There should not be voltage

A. If there is a battery voltage value, replace the Smart Fuse Box.

Wiring harnesses - Electrical schematic sheet 03 (55.100) Wiring harnesses - Electrical schematic sheet 09 (55.100)

Check the integrity of the connector **X-UCM2B** and visually check for any damage to the connector and to the pins 21 and 22.

A. If a problem is found, replace the connector **X-UCM2B**.

B. If there are no problems, connect the connector **X-UCM2B** to the Unit Control Module **A-UCM** and continue with Step **6**.

6. Check to see if the harness between the shift lever **A-PFNR** and the Unit Control Module **A-UCM** is defective.

A. If a problem is found, replace defective harness.

B. If there are no problems, continue with Step **7**.

7. Check if the shift lever **A-PFNR** is defective.

Check the signal combinations of the shift lever **A-PFNR** positions for gear range.

Disconnect the connector **X-UCM2B** from the Unit Control Module **A-UCM**.

Use a multimeter to check the signal combination.

The key must be in the ON position.

Put the shift lever **A-PFNR** in 1ST and 4TH position.

Perform the following check:

From	To	Value
Connector **X-UCM2B** pin 22	Chassis ground	There should be more then **0 V**
Connector **X-UCM2B** pin 21	Chassis ground	There should be **0 V**

A. If are detected both the signals, replace the shift lever **A-PFNR**.

B. If is detected only the signal on the connector **X-UCM2B** pin 22, continue with Step **8**.

8. Use a multimeter to check the signal combination.

The key must be in the ON position.

Put the shift lever **A-PFNR** in 3RD and 4TH position.

Perform the following check:

From	To	Value
Connector **X-UCM2B** pin 22	Chassis ground	There should be **0 V**
Connector **X-UCM2B** pin 21	Chassis ground	There should be more then **0 V**

A. If are detected both the signals, replace the shift lever **A-PFNR**.

B. If is detected only the signal on the connector **X-UCM2B** pin 21, replace the Unit Control Module **A-UCM**.

Wiring harnesses - Electrical schematic sheet 20 (55.100)

5150-12-Logical error at turbine speed input

Control Module : TCU

Context:
The Transmission Control Unit **A-TRANS** can not change the gears or the direction under the control of the normal clutch modulation. The Transmission Control Unit **A-TRANS** uses the substitute strategy for clutch control. All modulations are only time controlled.
If the failure is at the output speed, 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.

Cause:
There is a logical error at the supply circuit of the turbine speed sensor **B-TS_S**. The Transmission Control Unit **A-TRANS** measures a turbine speed over the threshold value and the next moment the measured speed is zero.

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 turbine speed sensor **B-TS_S** and the Transmission Control Unit **A-TRANS** is defective.
4. The turbine speed sensor **B-TS_S** gap has the wrong size.
5. The turbine speed sensor **B-TS_S** is defective.
6. 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-TSS** is connected to the turbine speed sensor **B-TS_S**.

   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-TSS** from the turbine speed sensor **B-TS_S**.

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

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

   B. If there are no problems, connect the connector **X-TSS** to the turbine speed sensor **B-TS_S** and continue with Step **4**.

Use a multimeter to perform the following resistance check:

From	To	Value
Connector **X-CAB_B** pin 4	Connector **X-UCM1A** pin 3	Short circuit
Connector **X-CAB_B** pin 3	Connector **X-UCM1B** pin 1	Short circuit

A. If one value is not correct, replace the harness between the connector and the **A-UCM**.

B. If the value is correct, replace **A-UCM**.

6. Check the BRAKE PEDAL ANGLE sensor integrity.

   The key must be in the OFF position.

   Remove the BRAKE PEDAL ANGLE sensor.

   Use a multimeter to perform the **B-BPP** check:

From	To	Value
Connector **X-BPP** pin 2	Connector **X-BPP** pin 1	Resistance

   A. If the resistance is an open circuit, replace the BRAKE PEDAL ANGLE.

   B. If resistance value is correct, continue as follows.

7. Move the cursor of the sensor and, by using a multimeter, perform the **B-BPP** check:

From	To	Value
Connector **X-BPP** pin 2	Connector **X-BPP** pin 3	Resistance changing

   A. If the resistance does not change, replace the BRAKE PEDAL ANGLE.

   B. If the resistance changes, continue with Step **8**.

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

   Disconnect **X-BTM** connector and visually check the integrity of the pins 15 on both connectors.

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

   B. If both pins are not damaged, continue with Step **9**.

9. Check the **B-BPP** to **X-BTM** hardness for a proper condition.

   The key must be in the OFF position.

   Use a multimeter to perform the following resistance check:

From	To	Value
Connector **X-BPP** pin 3	Connector **X-BTM** pin 15	Short circuit

   A. If the value is not correct, replace the harness between the connector and the **B-BPP**.

   B. If the value is correct, continue with Step **10**.

10. Check the **A-UCM** to **X-CAB_B** hardness for a proper condition.

    The key must be in the OFF position.

    Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM1A** pin 16	Connector **X-CAB_B** pin 15	Short circuit

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

    B. If the value is correct, replace the **A-UCM**.

B. If there are no problems, replace the Engine Control Unit **A-ECU**.

Wiring harnesses - Electrical schematic sheet 18 (55.100)

5510-03-Short circuit to battery voltage at clutch K4

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 a short circuit to battery voltage at clutch K4 of the transmission controller of tranny **A-TRC**. The measured resistance value of the valve is out of limit, the voltage at K4 valve is too high.

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**.

A. If a problem is found, replace the tbackup alarm device.

B. If there are no problems, replace the Smart Fuse Box **A-SFB**.

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 **6**.

6. Disconnect the connector **X-UCM3A** from the Unit Control Module **A-UCM**.

   Check the integrity of the connector **X-UCM3A** and visually check for any damage to the connector and to the pin 17.

   A. If a problem is found, replace the connector **X-UCM3A**.

   B. If there are no problems, continue with Step **7**.

7. Check the harness between the hydraulic filter pressure switch SW-PHF and the Unit Control Module **A-UCM** for short circuit to ground condition.

   The key must be in the OFF position.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM3A** pin 17	Chassis ground	There should be no continuity

   A. If there is continuity, find and replace the wire 636 and/or 636A.

   B. If there is no continuity, continue with Step **8**.

8. Check the harness between the hydraulic filter pressure switch SW-PHF and the Unit Control Module **A-UCM** 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-UCM3A** pin 17	Chassis ground	There should be no voltage

   A. If there is a voltage, find and replace the wire 636 and/or 636A.

   B. If there is no voltage, connect the connector **X-UCM3A** to the Unit Control Module **A-UCM** and continue with Step **9**.

9. Disconnect the connector **X-PHF** from the hydraulic filter pressure switch SW-PHF.

   Check if the hydraulic filter pressure switch SW-PHF is defective.

   A. If a problem is found, replace the hydraulic filter pressure switch SW-PHF.

   B. If there are no problems, replace the Unit Control Module **A-UCM**.

Wiring harnesses - Electrical schematic sheet 19 (55.100)

6115-(DTC 17E3)-Calculated soot in oil value has exceeded the allowable

Context:
The Electronic Control Unit (ECU) monitors for soot in engine oil. If the ECU determines that soot in oil exceeds a maximum quantity, this fault will occur.

Cause:
The ECU has detected a value greater than **10.00 g** of soot in the engine oil.

Possible failure modes:

1. Excessive soot in engine oil. (oil needs to be changed)
2. Reduced combustion efficiency, excessive idling or excessive pull load.
3. Faulty fuel injectors, leakage.
4. Faulty piston rings.
5. 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 **3**.
2. Change the engine lubrication oil.

   Reset the soot-in-oil calculation using the EST.
3. 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.

4. Check for related **DEF/AdBlue®** system faults.

   Use EST to determine if fault **6490 - (DTC 195A)-DEF/AdBlue supply module pump motor pressure sensor voltage is higher than expected** or **29242 - (DTC 723A)-DEF/AdBlue supply module pump motor short circuit to ground failure** is currently active.

   A. If either fault **6490 - (DTC 195A)-DEF/AdBlue supply module pump motor pressure sensor voltage is higher than expected** or fault **29242 - (DTC 723A)-DEF/AdBlue supply module pump motor short circuit to ground failure** is present, resolve fault **6490 - (DTC 195A)-DEF/AdBlue supply module pump motor pressure sensor voltage is higher than expected** and/or fault **29242 - (DTC 723A)-DEF/AdBlue supply module pump motor short circuit to ground failure**. Then determine if this fault is also resolved.

   B. If neither fault **6490 - (DTC 195A)-DEF/AdBlue supply module pump motor pressure sensor voltage is higher than expected** nor fault **29242 - (DTC 723A)-DEF/AdBlue supply module pump motor short circuit to ground failure** is present, continue with Step **5**.

5. Test the **DEF/AdBlue®** system.

   Use the EST to perform the Urea Dosing System Test (UDST) and follow the one screen instructions.

   Use the UDST Trouble Shooting Guideline, as required, to identify and resolve the problem.

   Then use EST to perform the Engine Restart Counter Reset / Unlock Inducement configuration. See **Selective Catalytic Reduction (SCR) exhaust treatment - Configure - Engine restart counter reset (10.500)**, if necessary.

   Then perform the SCR Fault Repair Verification Test. See **Selective Catalytic Reduction (SCR) exhaust treatment - Service instruction - SCR fault repair verification test (10.500)**, if necessary.

   Then verify that the fault has been resolved.

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

   B. If the fault is not resolved, continue with Step **6**.

6. As the components internal to the **DEF/AdBlue®** system supply module are not serviceable, replace the supply module.

   Then use EST to perform the Engine Restart Counter Reset / Unlock Inducement configuration. See **Selective Catalytic Reduction (SCR) exhaust treatment - Configure - Engine restart counter reset (10.500)**, if necessary.

   Then perform the SCR Fault Repair Verification Test. See **Selective Catalytic Reduction (SCR) exhaust treatment - Service instruction - SCR fault repair verification test (10.500)**, if necessary.

   Then check to see if this fault is resolved.

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

   B. If the fault is not 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.

8931-(DTC 22E3)-Oil temperature sensor voltage is lower than expected

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

Context:
The Engine Control Unit (ECU) monitors the oil temperature sensor B-9000 signal circuit. If the ECU determines that the voltage in the temperature signal circuit voltage is lower than expected, this fault will occur.

Cause:
The ECU has detected a voltage less than **235 mV** for a period greater than **500 ms** in the B-9000 temperature signal circuit.

Possible failure modes:

1. Faulty oil temperature sensor, internal failure.
2. Faulty signal circuit of the oil temperature sensor, short to ground condition.
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 **4**.
2. Check the signal circuit of the oil temperature sensor for a short to ground condition.

   Disconnect the connector **X-9004**.

   Disconnect the connector **X-9002** from the ECU.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

From	To	Value
X-9002 pin 13	Chassis ground	There should be no continuity.
X-9002 pin 13	**X-9002 pin 6**	There should be no continuity.
X-9002 pin 13	All other pins	There should be no continuity.

   A. If there is continuity, there is a short to ground in the signal circuit of the oil temperature sensor. Locate and repair the shorted conductor.

   B. If there is no continuity, continue to Step **3**.
3. Replace the oil temperature sensor.

   Use the EST to verify that this fault code has been resolved.

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

   B. If it has not been resolved, 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.

158-03-Short to Power at Key Switch Crank

Control Module : UCM

Context:
The **A-UCM** detects a voltage on the Key Switch Crank greater than the expected one; as a consequence is disabled the cracking request.

Cause:
The system detects, on 14 of connector **X-UCM2B**, a > **15 V**.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The connector **X-UCM2B** is damaged.
3. The **A-UCM** component 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-UCM2B** and **X-X3** 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-UCM2B**.

   Disconnect the connector **X-UCM2B** from the **A-UCM** and visually check the integrity of pin 14.

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

   B. If the pin is not damaged, continue with Step **4**.
4. Check the integrity of hardness between the **A-UCM** and the connector **X-X3**.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM2B** pin 14	Ground	≤ **15 V**

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

   B. If the measurement is not correct, check the correct functioning of the circuit relevant to the SMART FUSE BOX (see procedure **518150-03 - Electrical Crank Power Relay- Short Circuit to B+**).

Wiring harnesses - Electrical schematic sheet 03 (55.100) Wiring harnesses - Electrical schematic sheet 20 (55.100)

10649-(DTC 2999)-Upstream oxidation catalyst temperature sensor voltage is lower than expected

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:
The Engine Control Unit (ECU) monitors the DOC upstream temperature sensor circuit voltage. If the ECU detects a voltage less than **407.00 mV** in the DOC upstream temperature sensor signal circuit, this fault will occur. The temperature value is frozen at the last valid value or at **574.0 °C** (**1065.2 °F**) for a validated failure.

Cause:
The ECU has detected a voltage less than **407.00 mV** in the DOC upstream temperature sensor signal circuit.

Possible failure modes:

1. Faulty DOC upstream temperature sensor, wiring.
2. Faulty DOC upstream temperature sensor, internal failure.
3. Faulty the 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 **4**.
2. Check the DOC upstream temperature sensor signal circuit for a short to ground condition.

   Disconnect the connector **X-ECU**.

   Disconnect the connector **X-CTS**.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

From	To	Value
Connector **X-ECU** pin 16	Connector **X-ECU** pin 10	There should be no continuity
Connector **X-ECU** pin 10	Chassis ground	There should be no continuity

   A. If there is continuity, there is a short to ground condition. Locate and repair the shorted conductor.

   B. If there is no continuity, continue to Step **3**.
3. Replace the DOC upstream temperature sensor.

   Use the EST to verify the status of this fault.

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

11635-(DTC 2D73)-Low coolant pressure at inlet of main coolant pump

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

Context:
The Electronic Control Unit (ECU) monitors the primary cooling system pressure by monitoring the water pump inlet pressure sensor B–9011. If the ECU determines that the primary cooling system pressure is lower than expected based on engine speed and coolant temperature, this fault will occur.

Cause:
The ECU has determined that engine coolant pressure is too low.

Possible failure modes:

1. Faulty cooling system, leakage.
2. Faulty expansion tank cap, missing or loose.
3. Faulty coolant, level low.
4. Faulty water pump.
5. Faulty water pump inlet pressure sensor.

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**

B. If there is no continuity, leave both connectors disconnected and continue to Step **4**.

4. Check the signal circuit of the crankshaft speed sensor for a short circuit condition.

   The key must be in the ON position.

   Use a multimeter to perform the following voltage check:

From	To	Value
X-9002 pin 65	Chassis ground	There should be no voltage.

   A. If there is voltage, there is short circuit condition in the signal circuit of the crankshaft speed sensor. Locate and repair the shorted conductor.

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

5. Check the wiring of the crankshaft speed sensor for any electrical interferences in the wiring.

   Check if the correct camshaft sensor is installed and is properly secured, the sensor should not be loose or moving.

   Check phonic wheel timing on cursor engines and tone wheel timing on NEF engines. Refer to the appropriate service manual for specifications.

   A. If there is any electrical interference, an incorrect sensor is installed or any modification to the sensor/harness, or the sensor is not mounted correctly, repair as necessary.

   B. If there are no issues found, continue to Step **5**.

6. Replace the crankshaft speed 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, 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)

19332-(DTC 4B84)-Air filter clog or circuit failure

Context:
The Engine Control Unit (ECU) monitors the air filter restriction switch. If engine speed is greater than **1400 RPM** after **10 min** of engine running time and an air filter clog or circuit failure is detected, this fault will occur.

Cause:
An air filter clog or circuit failure has been detected.

Possible failure modes:

1. Faulty or clogged air filter.
2. Faulty air filter restriction switch or defective wiring of the air filter restriction switch.
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 **6**.
2. Inspect the engine air filter and air intake system for a clogged or obstructed condition.

   A. If the filter or air intake system is clogged or obstructed, repair or replace the air filter as necessary.

   B. If the air filter or air intake system is not clogged or obstructed, continue to Step **3**.
3. Check the circuit of the air filter restriction switch for a short circuit condition.

   Disconnect the connector **X-ECU**.

   Disconnect the connector **X-AFS**.

   They key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

From	To	Value
Connector **X-ECU** pin 37	Connector **X-ECU** pin 27	There should be no continuity

   A. If there is continuity, there is a short circuit condition in the circuit of the air filter restriction switch. Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connectors disconnected and continue to Step **4**.
4. Check the circuit of the air filter restriction switch 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 37	Chassis ground	There should be no voltage
Connector **X-ECU** pin 27	Chassis ground	There should be no voltage

   A. If there is voltage, there is a short circuit to key battery power in the circuit of the air filter restriction switch. Locate and repair the shorted conductor.

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

20826-(DTC 515A)-DEF/AdBlue supply module pump motor open load failure

Context:
The Engine Control Unit (ECU) monitors the circuit of the supply module pump motor. If the ECU detects an open load failure in the circuit of the supply module pump motor, this fault will occur.

Cause:
The ECU has detected an open load failure in the circuit of the supply module pump motor.

Possible failure modes:

1. Faulty wiring of the supply module pump motor, open circuit condition.
2. Faulty supply module pump motor, internal failure.
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 **4**.
2. Check the wiring of the supply module pump motor for an open circuit condition.

   Disconnect the connector **X-ECU**.

   Disconnect the connector **X-PUMP**.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

From	To	Value
Connector **X-ECU** pin 84	Connector **X-PUMP** pin 10	There should be continuity

   A. If there is no continuity, there is an open circuit condition in the wiring of the supply module pump motor. Locate and repair the broken conductor.

   B. If there is continuity, continue to Step **3**.
3. Replace the supply module.

   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.
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.

B. If there is continuity, there is a short circuit to ground condition in the vehicle (VE) harness. Use the appropriate service manual to locate and repair the shorted conductor.

4. Check the after run disconnection relay K-9106 low side wire for an open circuit condition.

   Use a multimeter to perform the following continuity check:

From	To	Value
X-9123 pin 2	**X-9001 pin 24**	There should be continuity.

   A. If there is continuity, check the ECU for the appropriate software and re-flash, if necessary.

   B. If there is no continuity, there is an open circuit condition in the vehicle (VE) harness. Use the appropriate service manual to locate and repair the broken conductor.

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, 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 02 (55.100)

25725-(DTC 647D)-Supply UB1 short to battery failure

Context:
The Engine Control Unit (ECU), monitors the supply UB1 circuit. If the ECU detects that the UB1 supply circuit has a short to battery power condition, this fault will occur.

Cause:
The ECU has detected a short to battery power in the supply UB1 circuit.

Possible failure modes:

1. Faulty supply UB1 circuit, short to battery power condition.
2. Faulty the 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 **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 **4**.
2. Check the supply UB1 circuit for a short to battery power condition.

   Disconnect the connector **X-ECU** from the ECU.

   The key must be in OFF position.

   Use a multimeter to perform the following continuity check:

From	To	Value
Connector **X-ECU** pin 50	All pins in connector **X-ECU**	There should be no continuity

   A. If there is continuity at any pin, there is a short to battery power condition in the supply UB1 circuit. Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and continue to Step **3**.
3. Check the supply UB1 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 test:

From	To	Value
Connector **X-ECU** pin 50	Chassis ground	There should be no voltage

   A. If there is voltage, there is a short to key battery power in the supply UB1 circuit. Locate and repair the shorted conductor.

   B. If there is no voltage, 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 16 (55.100)

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)

33570-(DTC 8322)-Auxiliary power relay low side ECU driver circuit over temperature failure

Context:
The Engine Control Unit (ECU) controls the voltage to the power relay engine auxiliary relay K-LC6KR3. The ECU monitors the engine auxiliary relay low side circuit for an over temperature/current condition. If the ECU detects an over temperature/current condition in the engine auxiliary relay low side circuit, this fault will occur.

Cause:
The ECU has detected an over temperature/current condition in the low side control circuit of the engine auxiliary relay.

Possible failure modes:

1. Faulty coil of the engine auxiliary relay.
2. Faulty low side control circuit of the engine auxiliary relay, wiring.
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 **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 **6**.
2. Check for the following related faults:

   25634 - (DTC 6422)-Auxiliary power relay low side driver circuit short to battery failure

   A. If the fault is active, diagnose it first and then return to this fault.

   B. If the fault is not active, continue to Step **3**.
3. Check the coil of the engine auxiliary relay for an internal failure.

   Remove the engine auxiliary relay.

   Use a multimeter to check the engine auxiliary relay coil resistance.

From	To	Value
Engine auxiliary relay, pin 85	Engine auxiliary relay, pin 86	There should be between **70 - 130 Ω**

   A. If the value is within the specified range, continue with Step **4**.

   B. If the value is not within the specified range, the engine auxiliary relay has failed internally. Replace the engine auxiliary relay.
4. Check the low side control circuit of the engine auxiliary relay for a short to high source condition.

   Disconnect the connector **X-ECU** from the ECU.

   The key must in the OFF position.

   Use a multimeter to perform the following continuity check:

From	To	Value
Connector **X-ECU** pin 45	Connector **X-ECU** pin 20	There should be no continuity
Connector **X-ECU** pin 45	All other pins	There should be no continuity

From	To	Value
Connector **X-ECU** pin 28	chassis ground	There should be continuity
Connector **X-ECU** pin 52	chassis ground	There should be continuity
Connector **X-ECU** pin 75	chassis ground	There should be continuity

A. If there is continuity on all of the checks, leave the connector **X-ECU** disconnected and continue with Step **5**.

B. If there is no continuity for one or more of the checks, refer to the appropriate vehicle service manual and electrical schematics to locate and restore the grounding circuit to the ECU.

5. Determine the condition of the ECU CAN circuit.

With the key switch in the “OFF” position, use a multimeter to measure the resistance of the CAN connection on the vehicle (VE) harness side:

From	To	Value
Connector **X-ECU** pin 46	Connector **X-ECU** pin 47	There should be **120 Ω**
Connector **X-ECU** pin 46	chassis ground	There should not be continuity
Connector **X-ECU** pin 47	chassis ground	There should not be continuity

Use a multimeter to measure the resistance of the CAN termination resistor, internal to the ECU:

From	To	Value
Connector **X-ECU** pin 46	Connector **X-ECU** pin 47	There should be **120 Ω**

A. If the measured resistances are correct and neither conductor is grounded, check the ECU for the appropriate software and re-flash, if necessary.

B. If the measured resistances are not correct or one or both of the conductors is grounded, refer to the appropriate vehicle service manual and electrical schematics to locate and restore the termination resistance to the CAN circuit.

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.

From	To	Value
Connector **X-ECU** pin 3	Chassis ground	There should be continuity
Connector **X-ECU** pin 5	Chassis ground	There should be continuity
Connector **X-ECU** pin 28	Chassis ground	There should be continuity
Connector **X-ECU** pin 52	Chassis ground	There should be continuity
Connector **X-ECU** pin 75	Chassis ground	There should be continuity

A. If there is continuity on all of the checks, leave the connector **X-ECU** disconnected and continue with Step **5**.

B. If there is no continuity for one or more of the checks, refer to the appropriate vehicle service manual and electrical schematics to locate and restore the grounding circuit to the ECU.

5. Determine the condition of the ECU CAN circuit.

   With the key switch in the “OFF” position, use a multimeter to measure the resistance of the CAN connection on the vehicle (VE) harness side:

From	To	Value
Connector **X-ECU** pin 46	Connector **X-ECU** pin 47	There should be **120 Ω**
Connector **X-ECU** pin 46	Chassis ground	There should not be continuity
Connector **X-ECU** pin 47	Chassis ground	There should not be continuity

   Use a multimeter to measure the resistance of the CAN termination resistor, internal to the ECU:

From	To	Value
Connector **X-ECU** pin 46	Connector **X-ECU** pin 47	There should be **120 Ω**

   A. If the measured resistances are correct and neither conductor is grounded, check the ECU for the appropriate software and re-flash, if necessary.

   B. If the measured resistances are not correct or one or both of the conductors is grounded, refer to the appropriate vehicle service manual and electrical schematics to locate and restore the termination resistance to the CAN circuit.

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, 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.

Wiring harnesses - Electrical schematic sheet 18 (55.100) Wiring harnesses - Electrical schematic sheet 16 (55.100)

57742-(DTC E18E)-Downstream NOx sensor internal failure (Open Circuit Error)

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 Selective Catalytic Reduction (SCR) downstream NO_x sensor see **Nitrogen Oxide (NOx) sensor - Dynamic description (55.988)**. The SCR downstream NO_x sensor has internal monitoring for open wire or short circuit and sends an error status in case of a detected failure. This failure is the result of an open circuit error in the sensor NO_x and/or Oxygen level circuit.

Cause:
The SCR downstream NO_x sensor has reported, via CAN, to the Engine Control Unit (ECU) that an open circuit condition exists in the NO_x and/or Oxygen level circuit.

Possible failure modes:

1. Faulty SCR downstream NO_x sensor, hardware or firmware.
2. Faulty software of the ECU.

Solution:

1. Verify that fault is present and active.

   Use the 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 **3**.
2. As there is no method for field testing or re-flashing the sensor controller, replace the SCR downstream NO_x sensor.

   Use the EST, see **Nitrogen Oxide (NOx) sensor - Configure - Reset ECU data (Downstream sensor) (55.988)**, if necessary, to perform the Replacement of the 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.
3. 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.

58669-(DTC E52D)-ECU internal: error sensor supplies voltage tracker

Context:
The Engine Control Unit (ECU) monitors the external voltage tracker for the ECU internal **5 V** supply. If the ECU determines that the voltage is too high or too low, this fault will occur.

Solution:

1. Check the ECU for the appropriate software and re-flash, if necessary.

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

   B. If the fault has not been resolved, escalate an ASIST concern.

59358-(DTC E7DE)-NH3 sensor open or short in ground circuit

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

Context:
For information regarding the NH3 electronic control unit and the NH3 sensor refer to **Ammonia (NH3) sensor - ECU description (55.988)**. The NH3 electronic control unit is required to report information at regular intervals to the Engine Control Unit (ECU) via Controller Area Network (CAN). If no current is sensed on the signal ground line, this fault will occur.

Cause:
The **NH3 electronic control unit** has reported a short to ground or open circuit error via CAN to the ECU.

Possible failure modes:

1. Faulty NH3 sensor wiring, signal ground line is open or grounded.
2. Faulty NH3 sensor, open or shorted or grounded internally.
3. Faulty NH3 electronic control unit, 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 **5**.
2. Check for short to ground circuit condition in the NH3 electronic control unit to NH3 sensor harness (cable).

   Disconnect the NH3 connector sensor from the NH3 electronic control unit.

   Use a multimeter to check for the continuity on the harness (cable) from the NH3 electronic control unit to NH3 sensor.

   A. If there is continuity on any of the checks, the harness or sensing head is damaged. Replace the NH3 sensor and its connecting cable.

   B. If there is no continuity, leave the NH3 connector sensor disconnected and continue with Step **3**.
3. As there is no method for field testing the temperature sensing portion of the sensor, replace the NH3 sensor.

   Then check to see that this fault is resolved.

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

   B. If the fault is not resolved, continue with Step **4**.
4. As there is no method of field testing or re-flashing the NH3 electronic control unit, replace the controller.

   Then check to see that this fault is resolved.

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

   B. If the fault is not resolved, check the ECU for the appropriate software and re-flash, if 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 the fault has been resolved, perform a parasitic draw test to measure excessive current draw from the battery. If an excessive draw is found, locate and repair as necessary and then return the machine to service.

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

6. Check the ECU for the appropriate software and re-flash, if necessary.

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

B. If the fault has not been resolved, escalate an ASIST concern.

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 16 (55.100)

Disconnect the connector **X-PED** from the connector **X-CAB_B** and visually check the integrity of pin 5 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 **6**.

6. Check the integrity of hardness between the connector **X-PED** and the connector **X-TT**.

   Disconnect the connector **X-TT** from the TELL TALE INDICATOR.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-PED** pin 5	Connector **X-TT** pin 4	Short circuit

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

   B. If the measurement is correct, continue with Step **7**.

7. Check the integrity of connector **X-UCM4B**.

   Disconnect the connector **X-UCM4B** from the **A-UCM** and visually check the integrity of pin 9.

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

   B. If the pin is not damaged, continue with Step **8**.

8. Check the integrity of hardness between the connectors **X-UCM4B** and **X-CAB_P**.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM4B** pin 9	Connector **X-CAB_P** pin 5	Short circuit

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

   B. If the measurement is correct, continue with Step **9**.

9. Replace the LED WARNING.

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

   B. If the functionality is not restored, replace the **A-UCM**.

Wiring harnesses - Electrical schematic sheet 20 (55.100) Wiring harnesses - Electrical schematic sheet 28 (55.100)

62755-(DTC F523)-Engine coolant temperature has exceeded the pre-warning threshold

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

Context:
The Engine Control Unit (ECU) monitors the engine coolant temperature. Two engine temperature thresholds are available to signal high engine temperature. A pre-warning is set if engine temperature coolant exceeds **106.0 °C** (**222.7 °F**) and a warning is set if engine coolant temperature exceeds **110.0 °C** (**229.9 °F**). If the pre-warning threshold is exceeded, this fault will occur.

Cause:
The engine coolant temperature pre-warning threshold has been exceeded.

Possible failure modes:

1. Engine temperature too high. (heavy use or high environmental temperature)
2. Faulty engine cooling system, coolant low, thermostat stuck closed, restricted cooling package etc.
3. Faulty B-9003 wiring or internal failure.
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 **6**.
2. Check for the following related faults:

   4371 - (DTC 1113)-Engine coolant temperature sensor voltage is higher than expected

   A. If the fault is active, diagnose it first and then return to this fault.

   B. Is the fault is not active, continue to Step **3**.
3. Check the engine cooling system for an over temperature condition.

   Check the cooling system for leakage, damage or blockage.

   Check the ambient air temperature using the EST to verify that the machine is not operating in extreme ambient temperatures.

   A. If any failures are found, repair the cooling system as necessary.

   B. If no failures are found, continue to Step **4**.
4. Check the B-9003 wiring.

   Disconnect the connector **X-9002**.

   Disconnect the connector **X-9006**.

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

   Use a multimeter to perform the following wiring checks:

64927-(DTC FD9F)-SCR Inducement: Level 1 (torque reduction), triggered by tampering 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 causing this fault to occur. Any one of many Selective Catalytic Reduction (SCR) **DEF/ADBLUE®** technical failure tampering detection faults that remains active for more than **36 h** will cause this fault to occur.

518093-03-Return ToTravel Key Fault

Control Module : Keypad and Joystick

Context:
Return ToTravel Key Fault

Cause:

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The Return ToTravel 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.

   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. Replace the Return ToTravel Key.

518113-04-Short to Ground at Brake Supply Line Pressure Sensor

Control Module : UCM

Context:
The **A-UCM** detects a value from BRAKE SUPPLY PRESS (**B-PBW**) out of lower limit.

Cause:
On pin 10 of connector **X-UCM1A** of **A-UCM**, the detected value is < **0.25 V**.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and **B-PBW** is damaged.
3. The BRAKE SUPPLY PRESS (**B-PBW**) is not correctly supplied
4. The BRAKE SUPPLY PRESS (**B-PBW**) is damaged.
5. The hardness between BRAKE SUPPLY PRESS (**B-PBW**) and **A-UCM** is damaged.

Solution:

1. Set Brake Supply Pressure to 0 bar
   No Brake Pressure Warning available

   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. Check the integrity of the harness between **A-UCM** and BRAKE SUPPLY PRESS (**B-PBW**).

   Visually check the integrity of the harness and check 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 output voltage of **A-UCM**.

   Disconnect the connector **X-CAB_B** from connector **X-BTM**.

   Use a multimeter to perform the following Voltage check:

From	To	Value
Connector **X-CAB_B** pin 8	Connector **X-CAB_B** pin 10	Voltage = **5 V**

   A. If the value is correct, reconnect the connectors and continue with Step **6**.

   B. If the value is not correct, continue with Step **4**.
4. Check the integrity of the **X-CAB_B** connector.

   The key must be in the OFF position.

   Visually check the integrity of pins 8 and 10.

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

   B. If both pins are not damaged, continue with Step **5**.
5. Check the hardness of connector **X-CAB_B** for a proper condition.

518122-16-Axle oil temperature high

Control Module : GHMI - Faults list

Context:
Axle oil temperature high.

Cause:

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The axle oil temperature is high.

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. Idle the machine and monitor the temperature. Wait until the oil temperature reach the proper temperature and restart the machine.

   A. If the oil temperature rises again, idle the machine and continue with Step **3**.

   B. If the oil temperature within the proper range continue to work monitoring the temperature.
3. Clean the cooler or operate the fan reverser. Wait until the oil temperature reach the proper temperature and restart the machine.

   A. If the oil temperature rises again, idle the machine and continue with Step **4**.

   B. If the oil temperature within the proper range continue to work monitoring the temperature.
4. Wait until the oil temperature reach the proper temperature and restart the machine and use a lower gear.

   A. If the oil temperature rises again, idle the machine and replace the axle oil temperature sensor.

   B. If the oil temperature within the proper range continue to work monitoring the temperature.

518133-03-Short to Power at Bucket Dump Valve High Side Driver

Control Module : UCM

Context:

The **A-UCM**, driving the boom lower, 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 25 of connector **X-UCM3B**, a short circuit to power 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_DUMP** is damaged.
3. The connectors **X-BUCKET_DUMP** 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 hardness between **A-UCM** and the connector **X-BUCKET_DUMP** is damaged.
5. The hardness between connectors **X-BTM_EH** and **X-BUCKET_DUMP** is damaged.
6. The hardness between connectors **X-FRNT_EH** and **X-BUCKET_DUMP** is damaged.
7. The BOOM_RAISE 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_DUMP** 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 25.

   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 hardness between the **A-UCM** and the connector **X-BUCKET_DUMP**.

B. If the functionality is not restored, replace the **A-UCM**.

Wiring harnesses - Electrical schematic sheet 22 (55.100)

518142-04-Short to Ground at AUX 2 Low Side Driver

Control Module : UCM

Context:

The **A-UCM** detects a grounding connection when drives an AUX 2 Solenoid; as a consequence:

- AUX II Function disabled
- Open AUX II LSD
- Command AUX II HSD PWMs to **0 %**

Cause:
The **A-UCM** detects, on pin 21 of connector **X-UCM1A**, a short circuit to ground risen by BSP.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between the **A-UCM** and the connectors **X-AUX_2_LEFT** and **X-AUX_2_RIGHT** is visually damaged.
3. The connector **X-UCM1A** is damaged.
4. The harness between **A-UCM** and the connectors **X-AUX_2_LEFT** and **X-AUX_2_RIGHT** 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**, **X-AUX_2_LEFT** and **X-AUX_2_RIGHT** 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 10.

   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 connectors **X-AUX_2_LEFT** and **X-AUX_2_RIGHT**.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM1A** pin 21	Ground	Open circuit

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

   B. If the measurement is not correct, check the correct functioning of the circuits relevant to:
   - the AUX 2 Left High Side Driver (see procedure **518140-04 - Short to Ground at AUX 2 Left High Side Driver**).
   - the AUX 2 Right High Side Driver (see procedure **518141-04 - Short to Ground at AUX 2 Right High Side Driver**).

Wiring harnesses - Electrical schematic sheet 22 (55.100)

518150-03-Electrical Ignition Power Relay- Short Circuit to B+

Control Module : SFB

Context:
Open circuit Electrical Ignition Power Relay.

Cause:
The Smart Fuse box measure a Short Circuit to B+ of Electrical Ignition Power Relay (X3-8) when the key is OFF.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between Smart Fuse Box and key switch Ignition is damaged.
3. The key switch Ignition connector is damaged.
4. The Smart Fuse Box connector is damaged.
5. The Electrical Ignition Power Relay is defective.
6. The Smart Fuse Box is defective.

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. Check the integrity of the harness between Smart Fuse Box and Ignition Power Relay (**X-LC5** pin 86).

   Visually check the integrity of the harness and check 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 the Ignition Power Relay connector (**X-LC5** pin 86).

   The key must be in the OFF position.

   Disconnect Ignition Power Relay connector and visually check the integrity of the pin.

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

   B. If the pin is not damaged, continue with following step.
4. Check the integrity of the Smart Fuse Box connector.

   The key must be in the OFF position.

   Disconnect **X-X3** connector and visually check the integrity of the pin 8.

   A. If the pin 8 is damaged, replace the **X-X3** connector.

   B. If the pin 8 is not damaged, continue with Step **5**.
5. Check the signal circuit for a Short Circuit to B+ condition on the harness between Electrical Ignition Power Relay pin (**X-LC5** pin 86) and Smart Fuse Box.

   Use a multimeter to perform the following voltage check:

5. Check the integrity of hardness between the connectors **X-FRNT_EH** and **X-PILOT_ENABLE**.

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

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-FRNT_EH** pin A	Connector **X-PILOT_ENABLE** pin 1	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 hardness between the connector **X-PILOT_ENABLE** and ground.

   Disconnect the connector **X-PILOT_ENABLE** from the ELECTROHYDRAULIC VALVE. Use a multimeter to perform the following check:

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-PILOT_ENABLE** pin 2	Ground	Short circuit

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

   B. If the measurement is correct, continue with Step **7**.

7. 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 pin A 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 **8**.

8. Check the integrity of hardness 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 A	Connector **X-BTM_EH** pin A	Short circuit

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

   B. If the measurement is correct, continue with Step **9**.

9. 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 **10**.

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

    Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM3B** pin 18	Connector **X-CAB_EH** pin A	Short circuit

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

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

518293-31-Error at 2.5V Ref1 Supply

Control Module : UCM

Context:

The **A-UCM** detects an error on the **2.5 V** Ref1; as a consequence:

- Loss of FIN_1, FIN_2, FIN_3, FIN_4;
- Command the FAN as open loop.

Cause:
IcVREF_2V5REF1_mV <= 2350 mV or IcVREF_2V5REF1_mV >= **2650 mV**

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The **A-UCM** is not functioning.

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. Replace the UCM.
3. Send the UCM to the manufacturer for its repairing (if possible).

520578-03-Battery Isolator SET - Short Circuit to B+

Control Module : SFB

Context:
Battery voltage on K Isolator set (short circuit to B+).

Cause:
The Smart Fuse box detects a battery voltage on K isolator signal (**X-X4** pin 17) when the key is ON.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between Smart Fuse Box and Battery Isolator is damaged.
3. The Battery Isolator connector is damaged.
4. The **X-ENG-2** connector is damaged.
5. The **X-CAB_E-2** connector is damaged.
6. The Smart Fuse Box connector is damaged. x
7. The Battery isolator is defective.
8. The harness between Battery Isolator and **X-ENG-2** connector is defective.
9. The harness between Smart Fuse Box and **X-CAB_E-2** connector is defective.
10. The Smart Fuse Box is defective.

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. Check the integrity of the harness between Smart Fuse Box and Battery Isolator.

   Visually check the integrity of the harness and check 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 the Battery Isolator connector.

   The key must be in the OFF position.

   Disconnect Battery Isolator connector **X-ISO** and visually check the integrity of the pin 2.

   A. If the pin 1 is damaged, replace the **X-ISO** connector.

   B. If the pin 1 is not damaged, continue with Step 4.
4. Check the integrity of the **X-ENG-2** connector.

   The key must be in the OFF position.

   Disconnect **X-ENG-2** connector and visually check the integrity of the pin F.

   A. If the pin F is damaged, replace the **X-ENG-2** connector.

   B. If the pin F is not damaged, continue with Step **5**.

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

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

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

6. Check the Electrical Ignition Power Relay pin (LMP-R-NA-TAIL pin 2) circuit for over current.

   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	GND	There should be an open circuit

A. If there is an short circuit to GND, 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 over current.

   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	GND	There should be an open circuit to GND

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

Wiring harnesses - Electrical schematic sheet 29 (55.100)

520598-04-VSUP C - Out of Range - Low

Control Module : SFB

Context:
VSUP C signal is out of range, too Low level.

Cause:
The Smart Fuse box measure a Low level of VSUP C signal (out of range), voltage <20 and not cranking.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between Smart Fuse Box and the Battery Isolator is damaged.
3. The Smart Fuse Box connector is damaged.
4. The Battery Isolator is defective.
5. The Smart Fuse Box is defective.

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. Check the integrity of the harness between Smart Fuse Box **X-X2** pin 2 and the Junction Block into the cab pin **X-P1031**.

   Visually check the integrity of the harness and check 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 the Smart Fuse Box **X-X2** connector pin 2.

   The key must be in the OFF position.

   Visually check the integrity of the pin.

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

   B. If the pin is not damaged, continue with following step.
4. Check the integrity of the Smart Fuse Box **X-LC1** connector pin 1.

   The key must be in the OFF position.

   Visually check the integrity of the pin.

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

   B. If the pin is not damaged, continue with following step.
5. Check the integrity of the fuse.

   The key must be in the OFF position.

   Visually check the integrity of the fuse **F-1F4** (**50 A**).

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Cab - Overview

Rollover Protective Structure (ROPS)

NOTICE: *the Rollover Protective Structure (ROPS) is a special safety component of your machine. DO NOT attach any device to the ROPS for pulling purposes. The ROPS is a certified structural support and any damage, fire, corrosion or modification will weaken the structure and reduce your protection. If this occurs, the ROPS MUST be replaced so that it will provide the same protection as a new ROPS.*

After an accident, fire or rollover, the following MUST be performed before returning the machine to field or job site operation:

- The ROPS structure MUST be replaced.
- The ROPS mounting or suspension, operator seat and suspension, seat belts and mounting components and wiring within the operator's protective system MUST be carefully inspected for damage.
- All damaged parts MUST be replaced.

DO NOT WELD, ATTEMPT TO STRAIGHTEN OR REPAIR THE ROPS.

Maintenance and inspection of the Rollover Protective Structure (ROPS)

After every 500 hours of operation or every six months, whichever comes first, do the following:

1. Check the torque on the ROPS mounting bolts; torque should be **561 - 758 N·m** (**413.8 - 559.1 lb ft**) for ROPS retaining bolts and **200 - 285 N·m** (**147.5 - 210.2 lb ft**) for viscous mount bolts. If necessary, tighten the bolts to the correct torque.
2. Check that seat belt mounting hardware is tight and seat belt is not cut or frayed. Check the torque on operators seat mounting bolts; torque should be **38 - 44 N·m** (**28 - 32 lb ft**). If necessary, tighten the bolts to the correct torque. Replace parts that are worn or damaged.

NOTICE: *class 10.9 hardware is used to mount and anchor the ROPS. Parts used for replacement must be those shown in the parts catalog.*

NOTICE: *do not install attachments that will make the total weight of the machine more than the weight shown in the maximum gross vehicle weight section of the ROPS serial number plate.*

NOTICE: *do not change the ROPS in any way. Changes made to the ROPS which are not authorized, such as welding, drilling or cutting will make the ROPS weaker and decrease your protection. Replace the ROPS if it becomes damaged in any way. DO NOT TRY TO MAKE REPAIRS TO THE ROPS.*