521G
Tier 2
Wheel Loader

SERVICE MANUAL

Part number 48083739
English
July 2018

CASE
CONSTRUCTION

Basic instructions - Precaution for disassembly and assembly

Preparations for disassembly

- Thoroughly wash the machine before bringing it into the shop. Bringing a dirty machine into the shop may cause machine components to be contaminated during disassembling/assembling, resulting in damage to machine components, as well as decreased efficiency in service work.
- Be sure to thoroughly understand all disassembling/assembling procedures beforehand, to help avoid incorrect disassembling of components as well as personal injury.
- Check and record the items listed below to prevent problems from occurring in the future.

1. The machine model, machine serial number, and hour meter reading.
2. Reason for disassembly (symptoms, failed parts, and causes).
3. Clogging of filters and oil, water or air leaks, if any.
4. Capacities and condition of lubricants.
5. Loose or damaged parts.

- Prepare the necessary tools to be used and the area for disassembling work.
- Wear appropriate clothing, safety shoes, safety helmet, goggles, and clothes with long sleeves.
- Confirm ready access to a first-aid kit and fire extinguisher, as well as appropriate emergency personnel contacts in the case of a medical accident or fire.
- Before performing any work on the machine, follow lockout/tagout procedures by attaching a “maintenance in progress tag”. This tag can be applied on the left-hand control lever, safety lever or cab door. Notify those with access to the machine that you will be performing the maintenance.

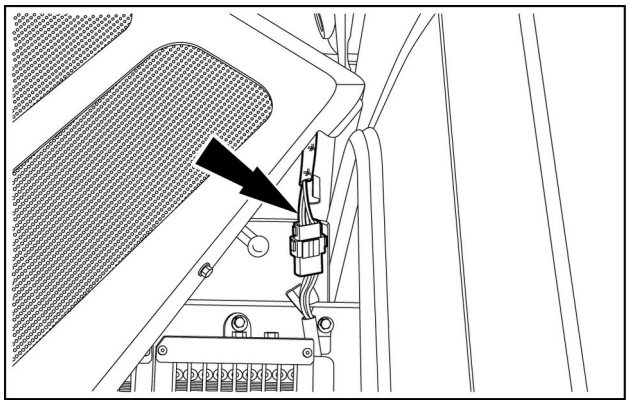
Disassembling and assembling hydraulic equipment

- Before removing lines, release the pressure of hydraulic oil tank, or open the cover on the return side to tank, and take out the filter.
- Drain the oil in removed lines into an appropriate container to prevent oil contamination.
- Protect open connections with plugs or caps to prevent oil from leaking and debris from contaminating the system.
- Thoroughly clean the outside of components before disassembling, and drain hydraulic oil and gear oil before disassembly.

Disassembling hydraulic equipment

- Impaired performance and function of hydraulic equipment after unauthorized service may not be covered under warranty by the manufacturer. Consult your local dealer for service.
- If it is unavoidably necessary to disassemble and modify, it should be carried out by experts or personnel qualified through service training.
- Make match mark on parts for reassembling.
- Before disassembling, read instructions in advance, and determine if the service is required to be performed by an authorized dealer.
- Use appropriate specialty tools and jigs if required.
- If parts can not be removed as specified by the procedure, never force removal. Check for other failures that may be causing binding or interference.
- Inspect parts for wear and clearance; record the measured values. Replace components if the values fall outside of the recommended range.
- If an abnormality is detected, repair or replace the parts.
- When removing parts, use appropriate markings or labels to ensure they can be reinstalled in the correct order and location without confusion.
- For common parts, pay attention to the quantity and locations of each group of components.

17. Disconnect the hood wiring harness connector from the rear chassis wiring harness connector. Identify and tag the connectors to aid in reassembly.



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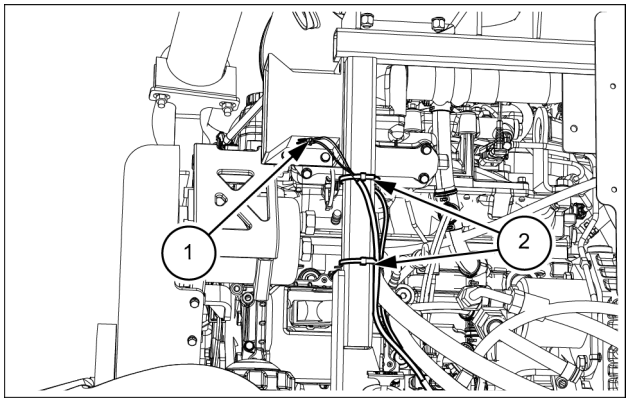
18. Tag and disconnect the backup alarm connector **(1)**. Remove the two straps cable tie **(2)**.



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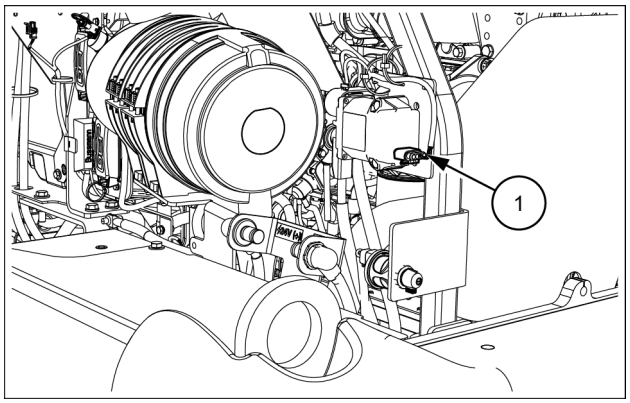
19. Remove the connector **(1)** from the battery isolator.



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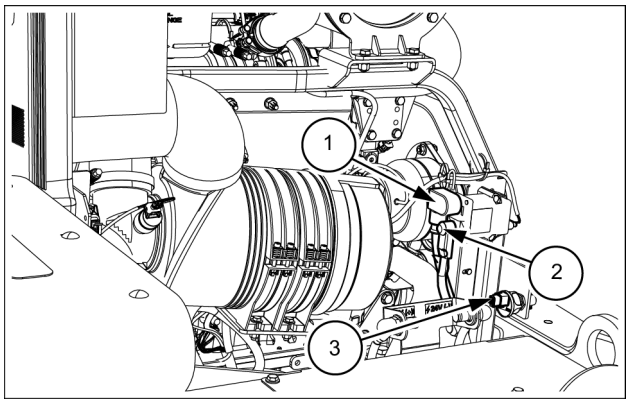
20. Tag and disconnect the battery to isolator cable **(1)** and the isolator to starter cable **(2)** from the battery isolator.
    Disconnect the connector **(3)** from the timed disconnect switch.



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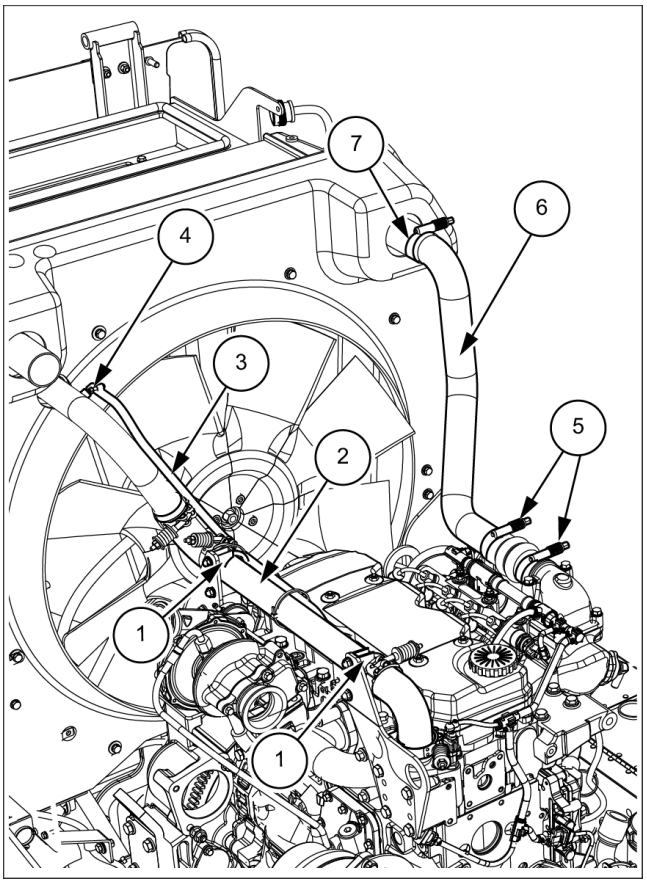
27. Connect the after cooler output hose to the intake manifold. Secure the clamps **(5)** and torque to **10.1 – 11.3 N·m** (**7.4 – 8.3 lb ft**).
28. Connect the after cooler output hose **(6)** to the inter-cooler. Secure the clamp **(7)** and torque to **10.1 – 11.3 N·m** (**7.4 – 8.3 lb ft**).
29. Connect the hose **(5)** to the engine.
    Torque the clamp **10.1 – 11.3 N·m** (**7.4 – 8.3 lb ft**).
30. Connect the radiator hose **(2)** to the upper radiator hose **(8)** tighten the clamp **(9)**.
    Torque the clamp to **10.1 – 11.3 N·m** (**7.4 – 8.3 lb ft**).



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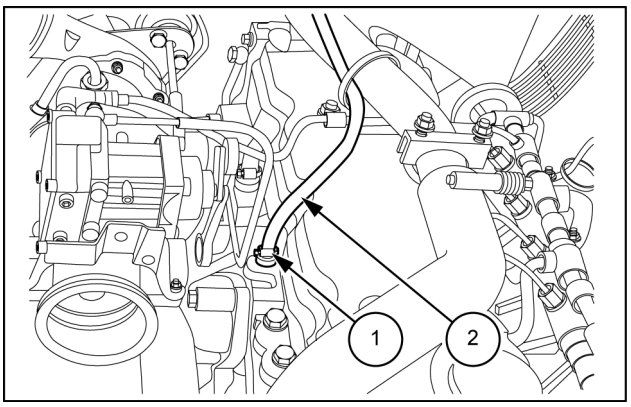
31. Secure the radiator hose **(2)** to the engine with the U-bolt clamps **(1)**.
32. Locate correctly the breather hose **(3)**.
33. Install the breather hose **(3)** on the upper radiator hose **(2)** tightening the clamp **(4)**. Torque the clamp **(4)** to **1.1 N·m** (**9.7 lb in**).
34. Use new tie straps to secure the radiator hose **(2)** to the breather hose **(3)**.
35. Install the breather hose **(2)** on the engine using the clamp **(1)**. Torque the clamp **(1)** to **1.1 N·m** (**9.7 lb in**).



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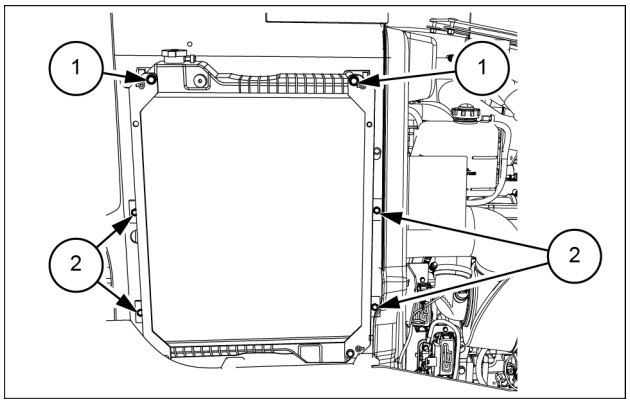
12. Remove the screws **(1)** and install in place of them two lifting eyes .
    Attach a suitable lifting equipment to lifting eyes.

NOTE: *for added lifting support, use bolts with a longer thread than the bolts removed from the radiator.*

13. Remove the mounting bolts **(2)** and the related spring lock washers. Carefully lift the radiator from the machine.

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. Remove the radiator and block-off plate as one assembly. Remove the block-off plate from the radiator after the assembly is out of the machine.*



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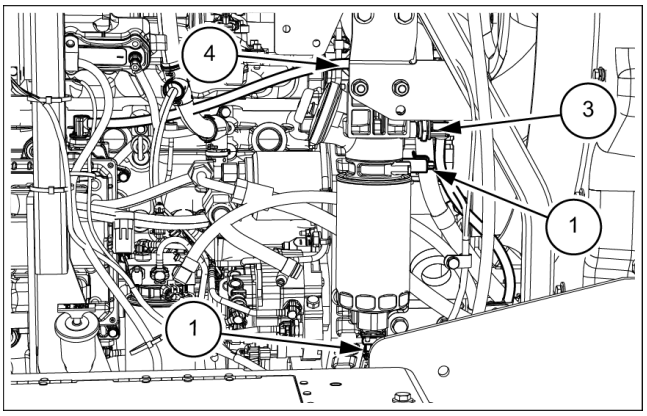
10. Tag and disconnect the fuel filter heater wire **(1)** and the water sensor **(2)**. Drain the fuel filter and disconnect the inlet fuel line **(3)** and outlet fuel line **(4)** from the fuel filter head. Plug the lines and cap the fittings.

NOTE: *the fuel filter bracket has been hidden for clarify.*



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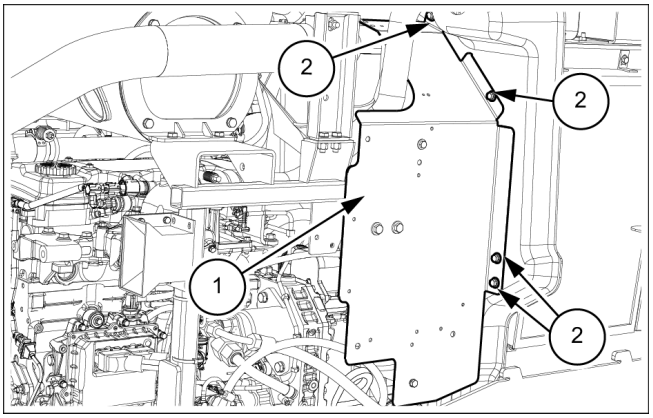
11. Remove the bolts **(2)** with related washers to separate the fuel filter bracket **(1)** from the cooling frame.



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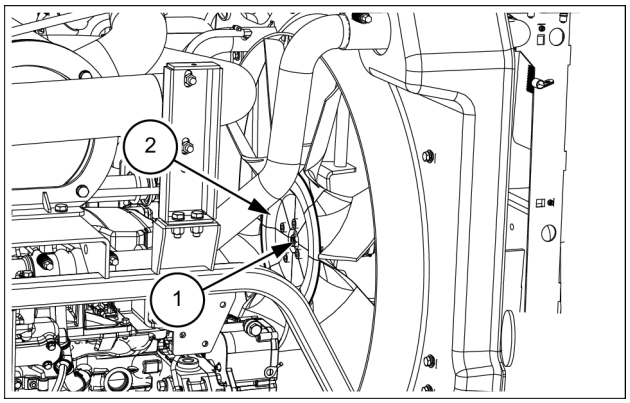
12. Mark the fan hub **(1)** and fan blade **(2)**.
13. Remove the bolts **(4)** and **(5)** with their related washers to separate the muffler support **(1)** from the support structures **(2)** and **(3)**.



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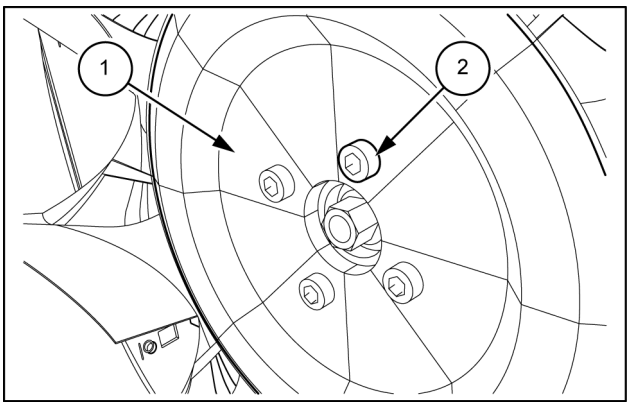
14. Loosen the four hexagonal bolts **(2)**. Remove the fan **(1)** from the machine.



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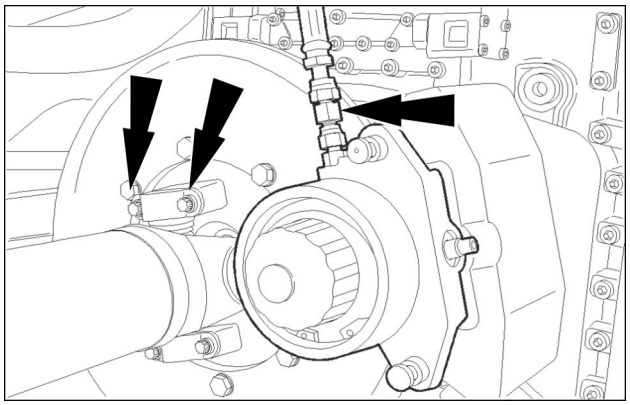
14. Identify, tag, and disconnect parking brake hose from parking brake. Plug hose and cap fitting to prevent entry of foreign matter into hydraulic system. Move hose away from transmission. Remove four bolts and two straps securing center drive shaft to transmission output flange. Disconnect center drive shaft from transmission.



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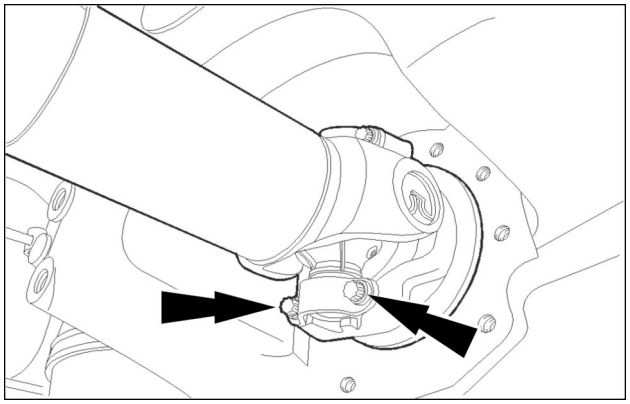
15. Remove four bolts and two straps securing rear drive shaft to transmission output flange. Disconnect rear drive shaft from transmission.



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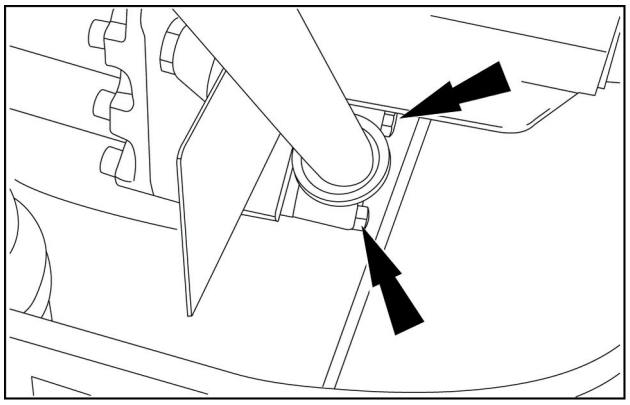
16. Remove two bolts. Remove fill tube with cap and oil gauge assembled, two seals, and metal strainer. Discard seals.



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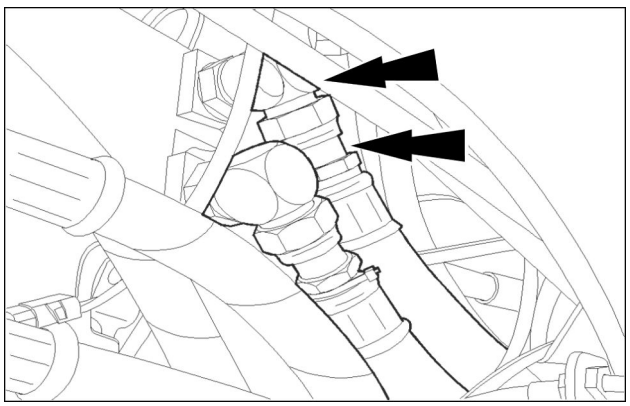
17. Identify, tag, and disconnect the cooler hose from the fitting located in the left-hand side of the transmission. Install a plug in the hose. Remove and discard the O-ring face seal from the fitting.



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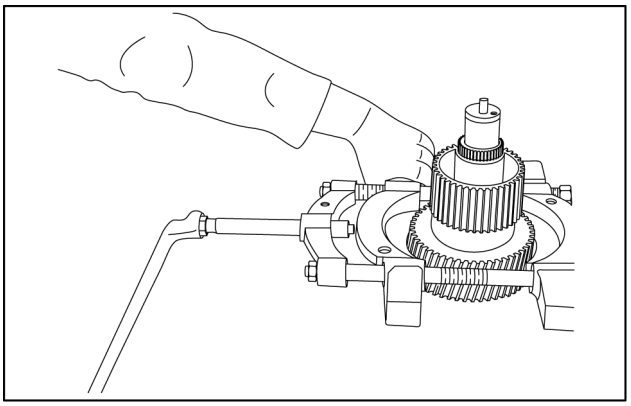
47. Press the idler gear from the shaft using a bearing separator. Remove the released needle bearing.



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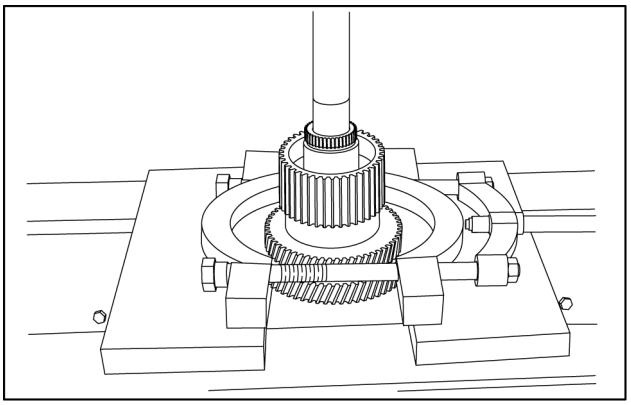

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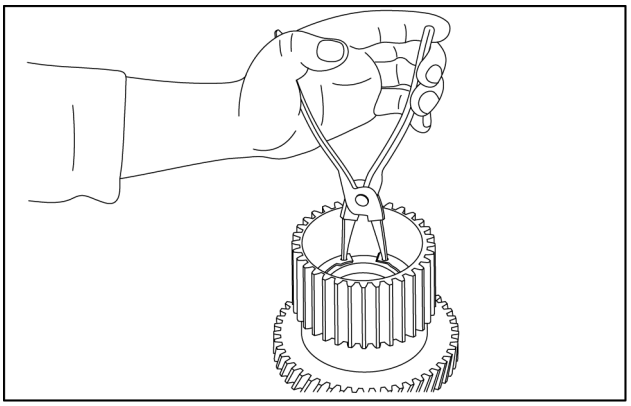
48. Remove the snap ring and remove the ball bearing.

NOTE: *the following steps are for the disassembly of clutch K3. The disassembly of clutches K1 and K2 are similar.*



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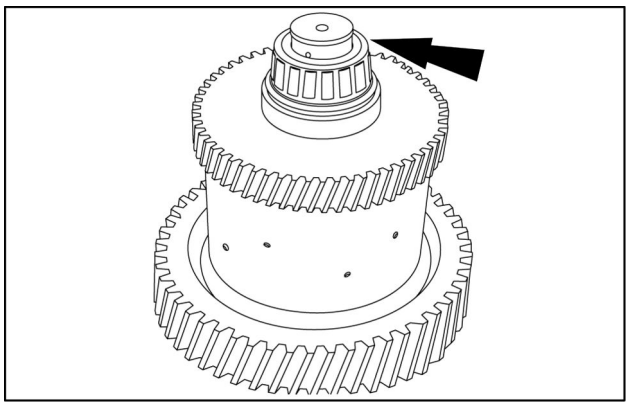
49. Remove the rectangular ring. Pull the tapered roller bearing from the shaft.



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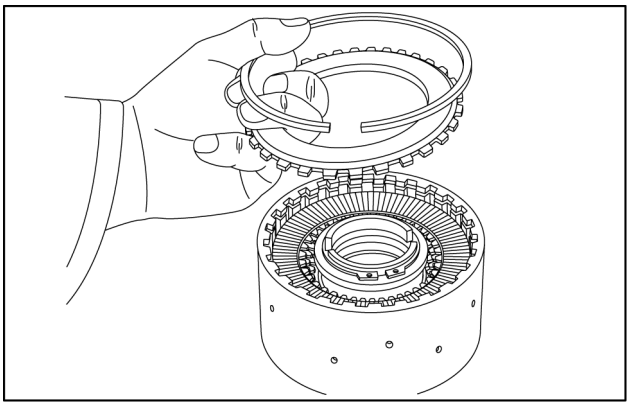
58. Install the end shim and snap ring.



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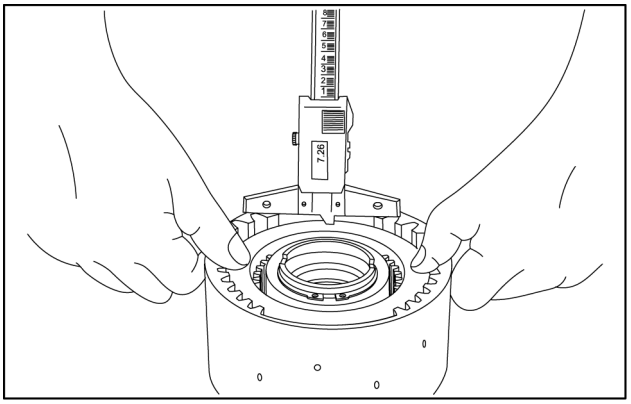
59. Adjust the running clearance to **1.2 – 1.4 mm** (**0.047 – 0.055 in**). Press down on the end shim with approximately **10 kg** (**22 lb**). Measure and record dimension **(A)** from the carrier face to the end shim. Use a depth gauge as illustrated.



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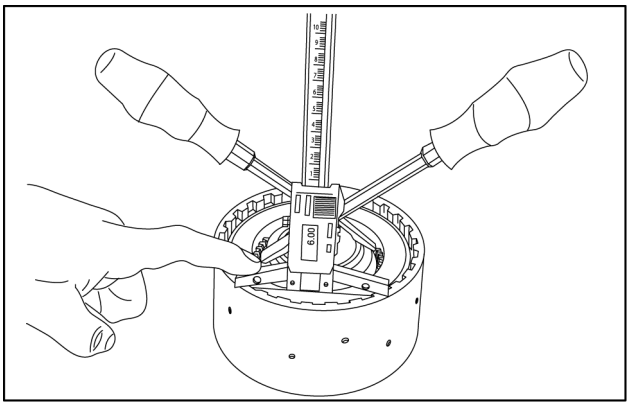
60. Use tools to lift the end shim upward against the snap ring until contact is obtained. Use a depth gauge to measure and record the dimension **(B)** from the carrier face to the end shim as illustrated. Subtract this measurement from recorded dimension **(A)**. The difference is the running clearance.

NOTE: *the required running clearance is **1.2 – 1.4 mm** (**0.047 – 0.055 in**). Use snap rings of different thicknesses to obtain correct running clearance.*



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Running Clearance Example

Dimension A	**7.2 mm** (**0.28 in**)
Dimension B	–**6.0 mm** (**0.24 in**)
Difference = Running clearance	**1.2 mm** (**0.05 in**)

Required running clearance is **1.2 – 1.4 mm** (**0.05 – 0.06 in**)

Use snap rings of different thickness as required to obtain correct running clearance.

61. Remove the clutch disc pack. Apply oil to the discs. Install the clutch disc pack, end shim, and snap ring as required to obtain correct running clearance.

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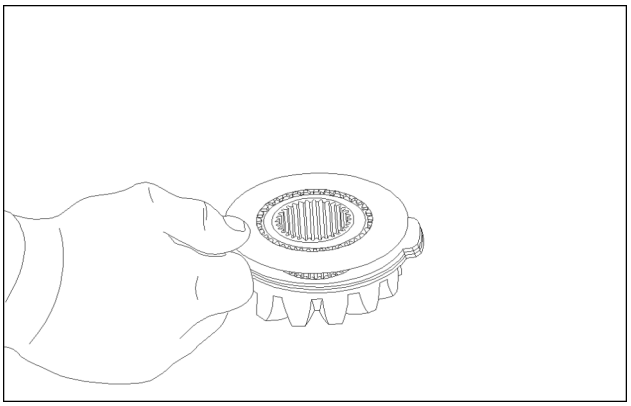
5. Install one friction plate on the inner bevel gear.



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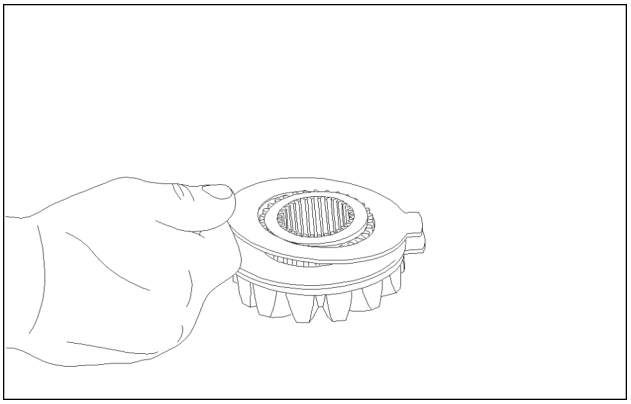
6. Install two reaction plates on the inner bevel gear.



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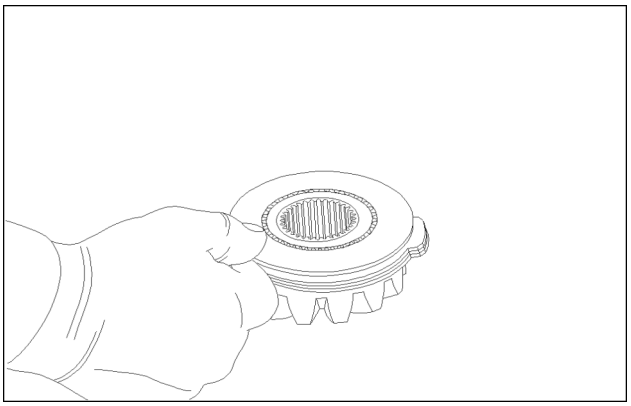
7. Install two friction plates on the inner bevel gear.



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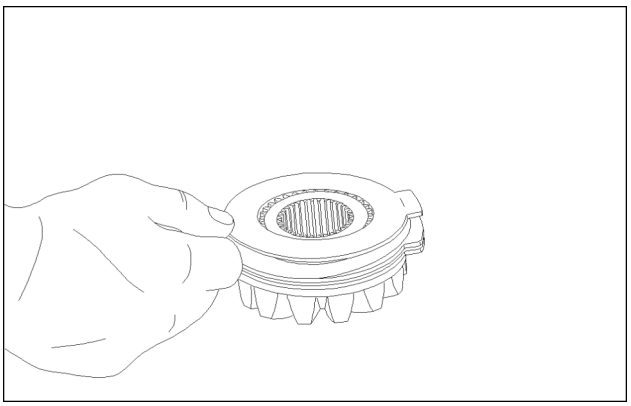
8. Install one reaction plate on the inner bevel gear.



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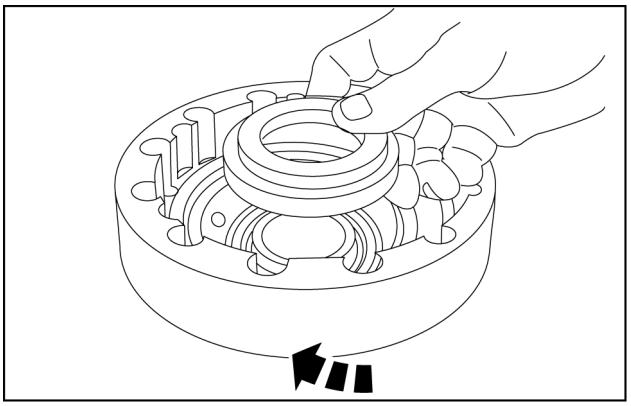
13. Place the lid on the pressure piece.

NOTE: *Ensure the lid is only supported on the pressure piece and not on the sliding sleeve.*



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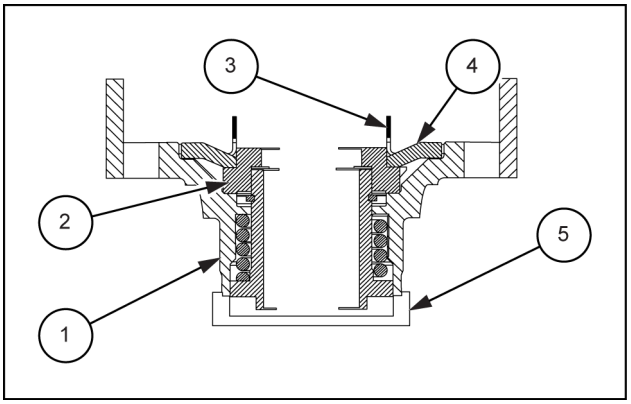
14. Premount the single parts as illustrated.
    1. Lid
    2. Pressure piece
    3. Cage
    4. Lever (12 components)
    5. Pressure piece

NOTE: *Be sure that the lid is supported only by the pressure piece* ***(5)****, but never on the sliding sleeve.*



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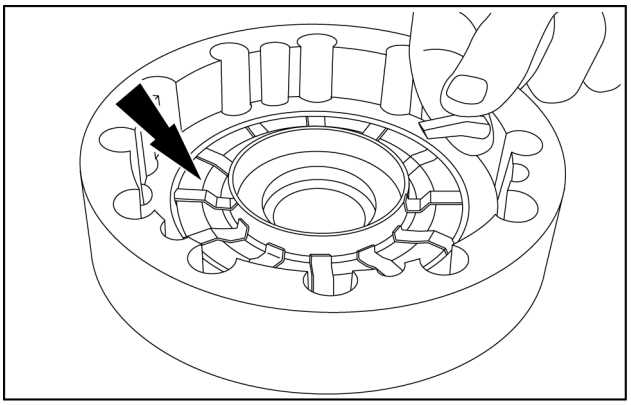
15. Insert the cage and position the lever in cage using grease to aid in assembly.

NOTE: *Ensure the installation position of levers is correct as illustrated.*



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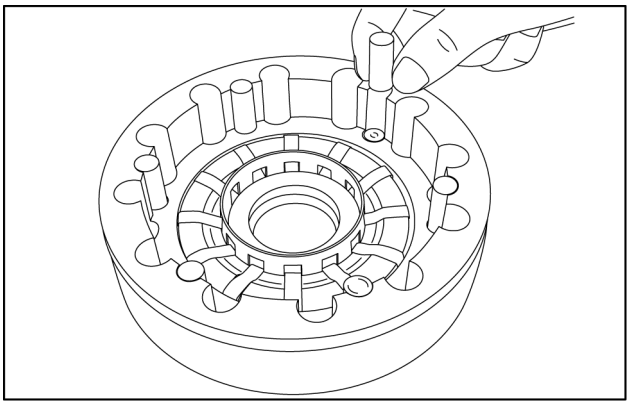
16. Place the cylindrical pins into the lid using grease to aid in assembly.



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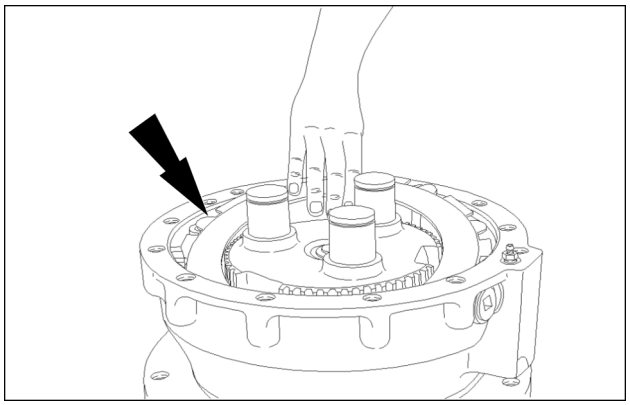
13. Remove the brake plate from the brake housing.



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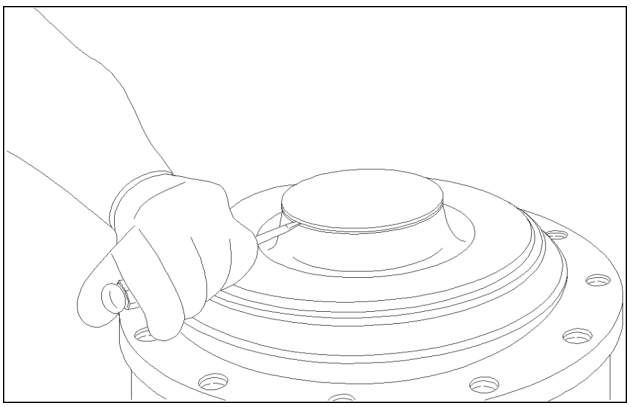
14. Repeat the preceding two steps to remove the remaining brake plates and friction plates.
15. Pry the cover off from the output shaft. Remove and discard the O-ring from the cover.



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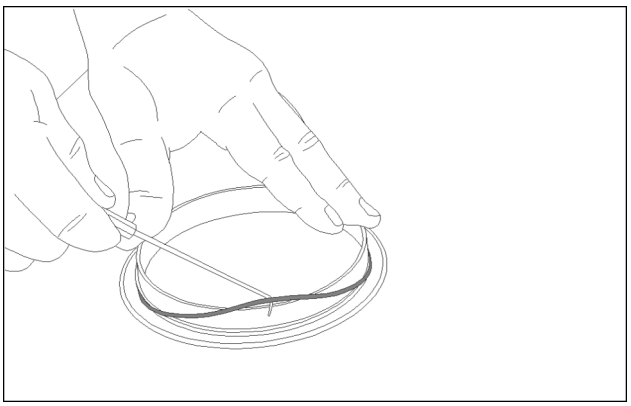

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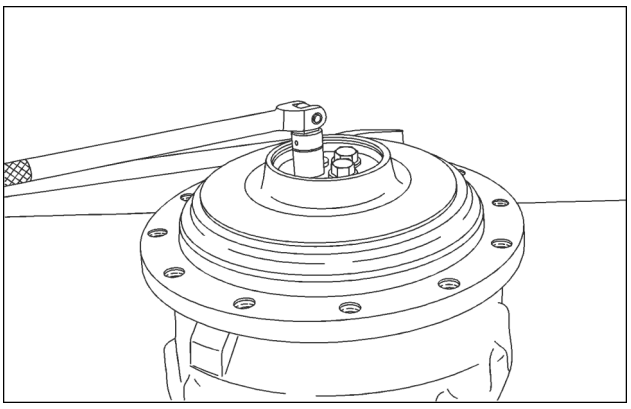
16. Remove the four bolts holding the wheel end to the output shaft of the carrier.



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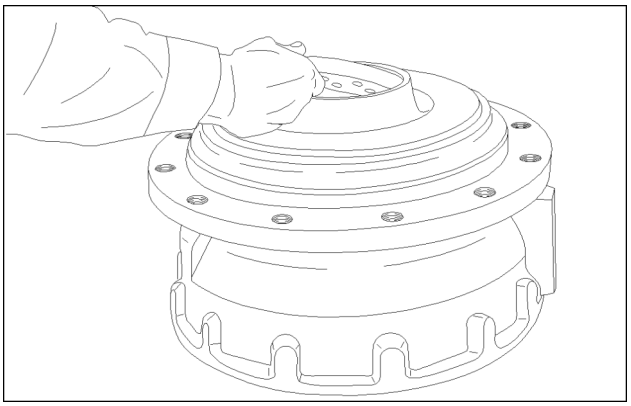
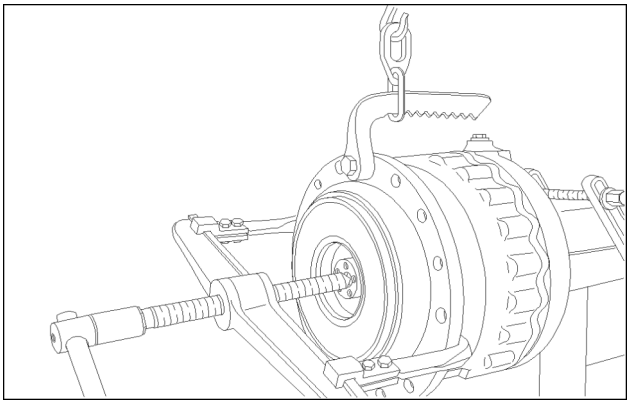
5. Remove the retainer from the wheel end.



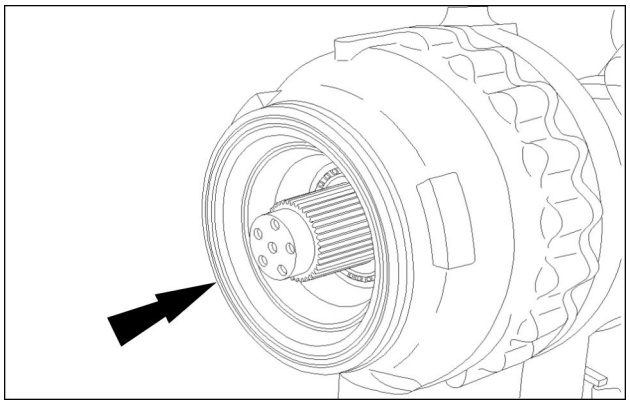
RAPH12WEL2262AA 5

6. Use an acceptable lifting bracket to hold the wheel end. Separate the output shaft using a puller.



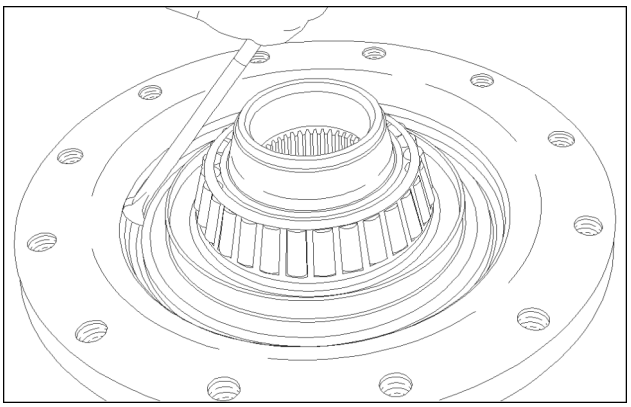
RAPH12WEL2186AA 6

7. Remove the seal from the brake housing using a pry bar.



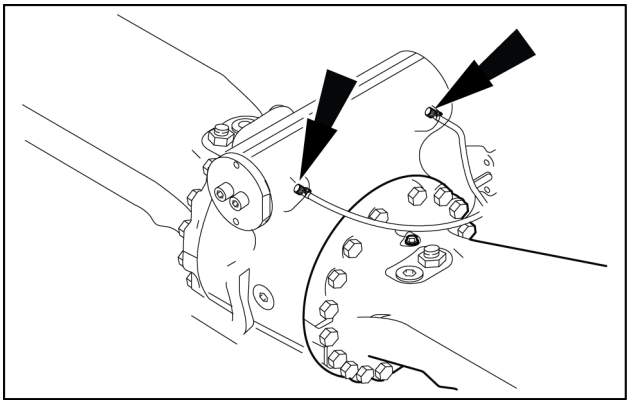
RAPH12WEL2187AA 7

8. Inspect the metal face seal ring for excessive wear or damage. If required, remove the bushing.



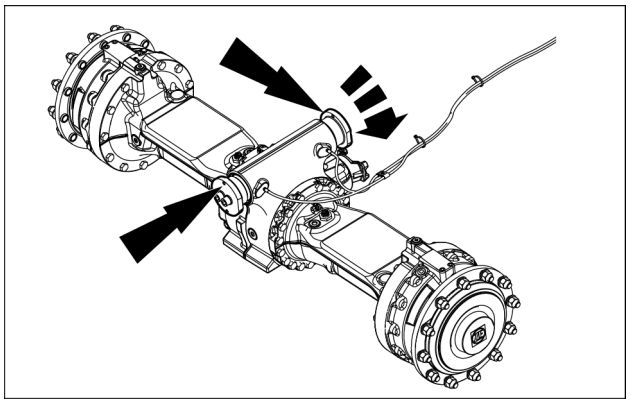
RAPH12WEL2224AA 8

10. Apply **LOCTITE® 7471™ PRIMER T™** to the female threads of the axle pivot pin and let dry for **70 s** . Then, apply **LOCTITE® 243™** to the female threads of the axle pin. Install the washers and bolts **(6)**). Tighten the bolts **(6)** to **575 – 600 N·m** (**424.1 – 442.5 lb ft**).
11. Connect the grease hoses to the rear axle.



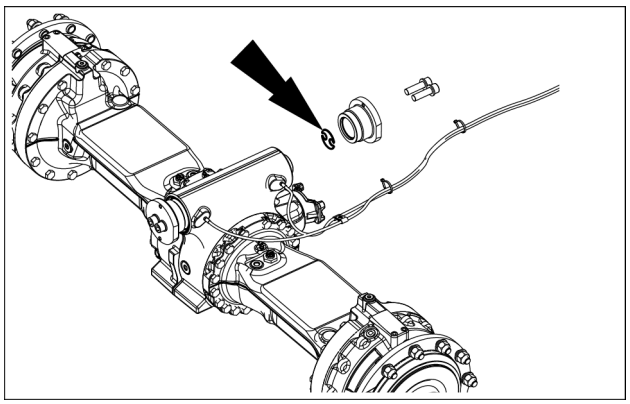
LEIL15WHL1261AB 6

12. Try spinning the end cap by hand. If the hand cap spins no shim is necessary.



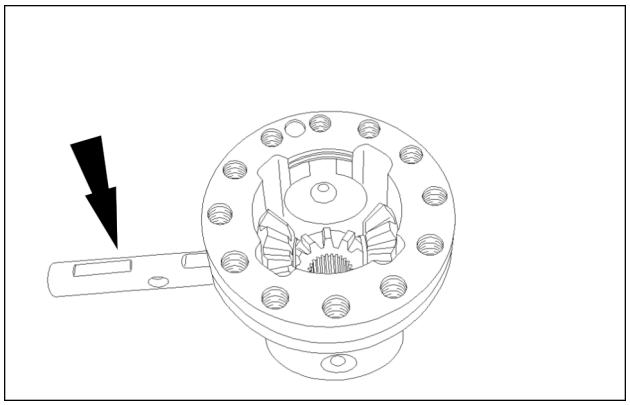
LEIL17WHL1621AB 7

If the hand cap does not spin, remove one of the end caps and add a shim (arrow). Re-assemble the end cap and bolts. Torque the bolts again to **575 – 600 N·m** (**424.1 – 442.5 lb ft**).
Try spinning the end cap by hand. If the hand cap spins, no further shim is required.

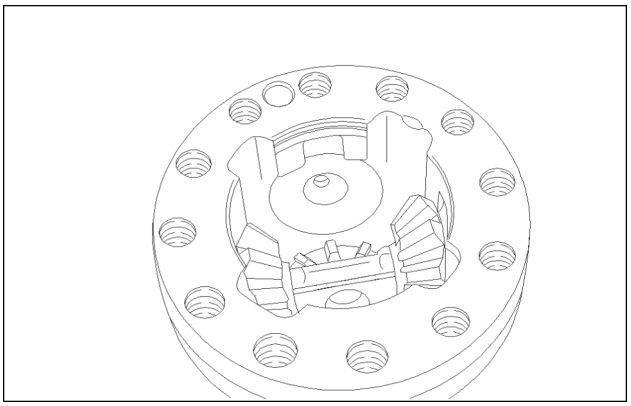


LEIL17WHL1622AB 8

14. Install the full differential shaft into the housing through both thrust washers and spider gears installed in the previous step. Ensure the position of the hole in the center of the differential shaft is horizontal to the differential housing.

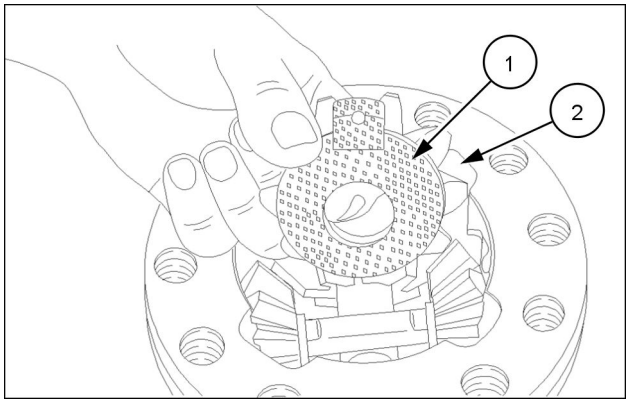


RAPH12WEL2290AA 14



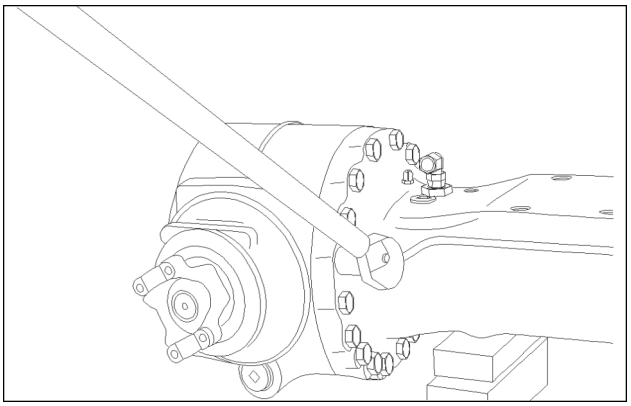
RAPH12WEL2291AA 15

15. Install a thrust washer **(1)** and spider gear **(2)** into the differential housing. Install another thrust washer and spider gear directly across from the other.



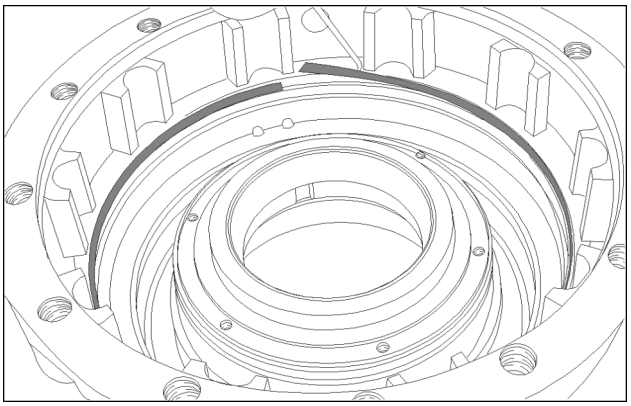
RAPH12WEL2293AA 16

5. Torque the bolts to **390 N·m** (**288 lb ft**).



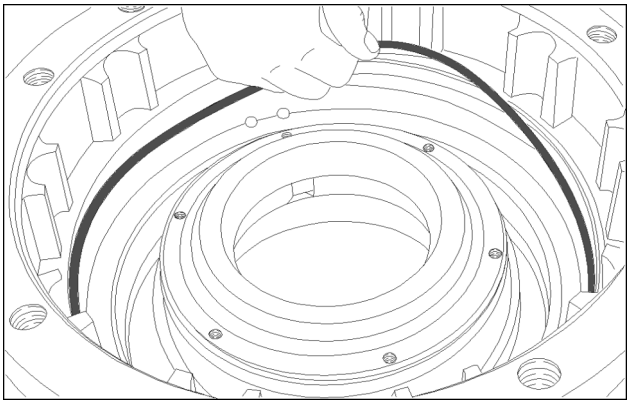
RAPH12WEL2440AA 5

25. Remove the wear ring from the brake housing.



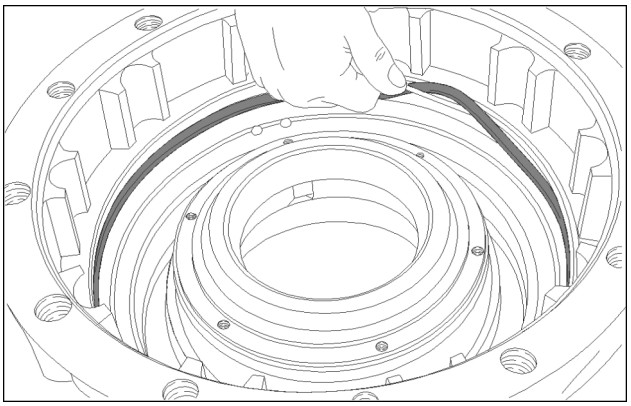
RAPH12WEL2247AA 28

26. Remove the upper backup ring from the brake housing, which is located in the same groove as the upper seal.



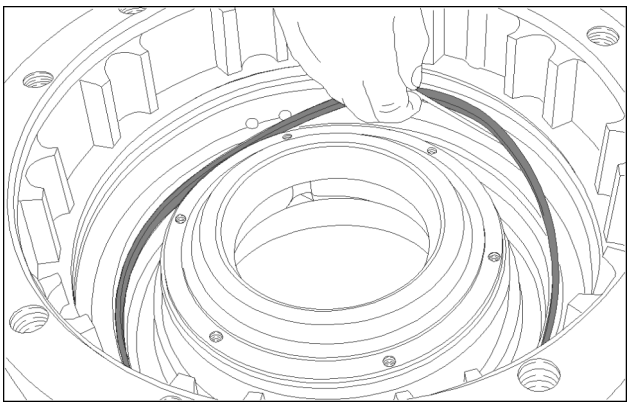
RAPH12WEL2244AA 29

27. Remove the upper seal from brake housing.



RAPH12WEL2243AA 30

28. Remove the lower seal from the brake housing, which is located in the same groove as the lower backup ring.



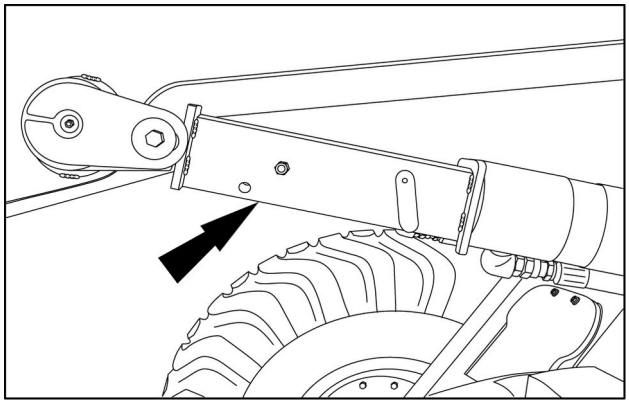
RAPH12WEL2245AA 31

Hydraulic service brakes - Bleed - Bleeding the Brake System

1. Check the level of the hydraulic fluid in the reservoir. Add fluid to the reservoir if necessary.

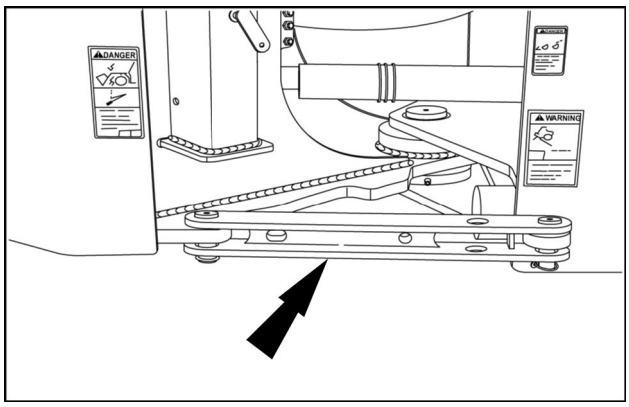
NOTE: *if the machine is equipped with quick-attached components, disconnect them from machine prior to proceeding.*

2. Raise the loader arms and install the safety link.



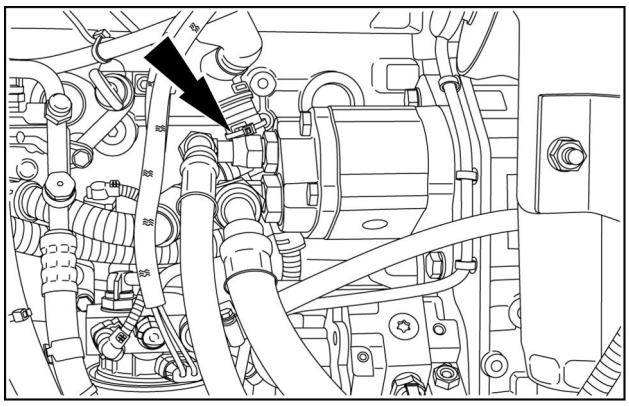
RAPH12WEL1853AA 1

3. Put the articulation lock in the LOCKED position.



RAPH12WEL1412AA 2

4. Apply the parking brake.
5. To prime the pump, do the following:
   A. Turn the ignition switch to the OFF position.
   B. Turn the timed disconnect switch to the OFF position.
6. Disconnect the connectors from the ECU to prevent the start of the engine.
7. Loosen the fitting on the brake pump section hose.



RAPH12WEL1480AA 3

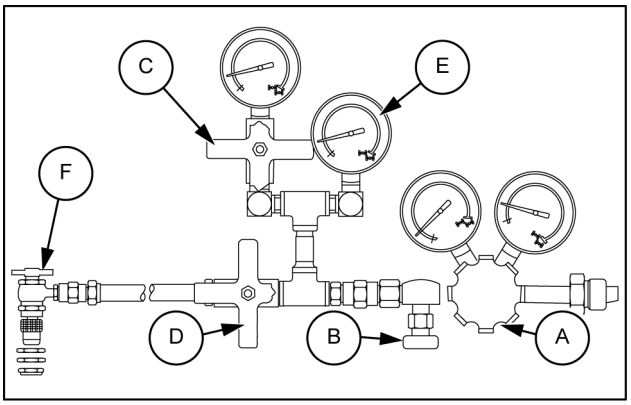
8. Turn the timed disconnect switch to the ON position.

Accumulator - Discharging

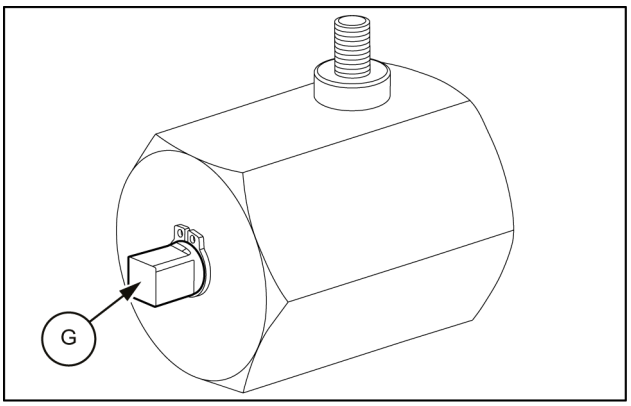
1. Remove cover from accumulator charge port. Loosen the Allen screw in the charge port.

NOTE: *do not turn the Allen screw more than 1/8 of a turn or gas will escape uncontrolled.*

2. Install adapter **380001168** on accumulator, use the **380001737** nitrogen charging kit to discharge the accumulator. The tool must be disconnected from the nitrogen tank.
3. Close valves **(B)**, **(C)** and **(D)**.
4. Adjust the regulator **(A)** to the minimum pressure setting by turning the knob counterclockwise.
5. Turn the T-handle on valve **(F)** fully out.
6. Connect valve **(F)** to the valve stem on the adapter.
7. Turn the T-handle inward on valve **(F)** to engage the pin in the valve stem, open valve **(G)**.
8. Open valve **(D)** and check the charge pressure on gauge **(E)**.
9. To discharge the accumulator, partially open valve **(B)**. The accumulator charge will bleed down through the regulator.
10. Once the accumulator is fully discharged, disconnect valve **(F)** from the valve stem and remove adapter.

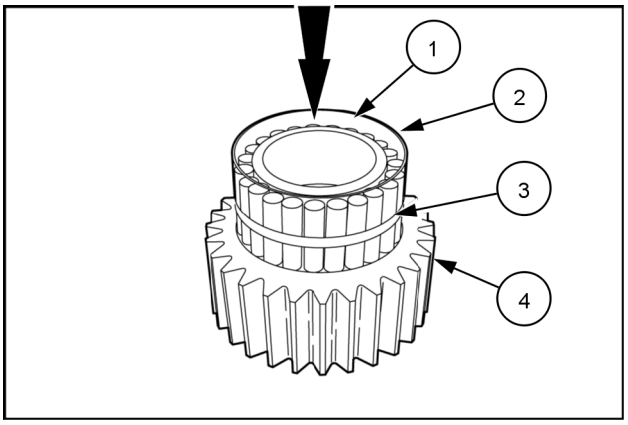


LEIL13WHL1358AB 1



LEIL13WHL1230AB 2

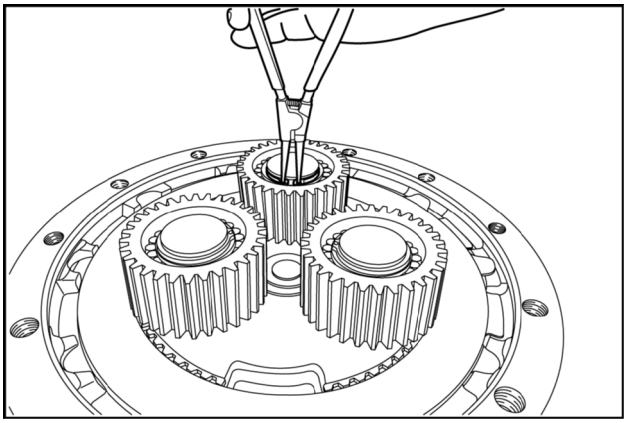
24. Insert the cylindrical roller bearing into the planetary gear. For this purpose, press the cylindrical roller bearing through the packaging sleeve until the snap ring engages into the annular groove of the planetary gear.
    1. Cylindrical roller bearing
    2. Packaging sleeve
    3. Snap ring
    4. Planetary gear



RAIL11WEL0555BA 24

25. Heat the bearing inner rings and insert the pre-mounted planetary gears with large radius facing the planetary carrier (downwards). Then fix the planetary gears using retaining rings.

NOTE: *adjust the bearing inner rings after they cool.*



RAIL11WEL0556BA 25

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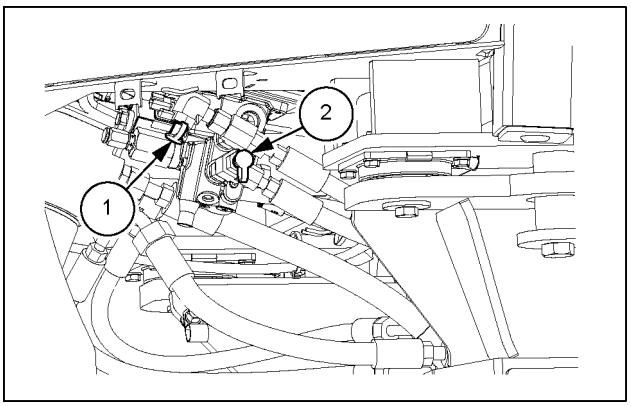
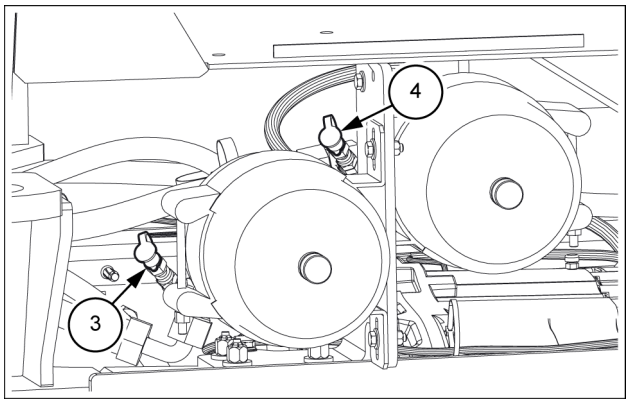
Hydraulic systems - Component localization - Test ports

1. Front axle test port
2. Rear axle test port



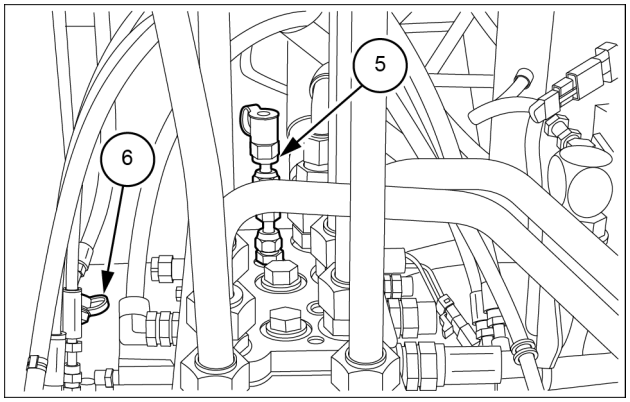
LEIL16WHL1494AB 1

3. Front brake accumulator test port
4. Rear brake accumulator test port



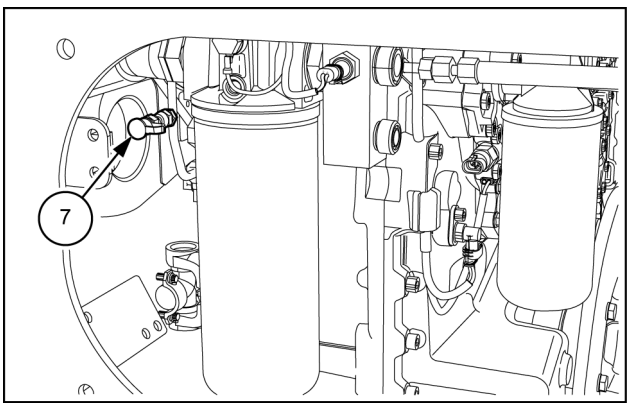
LEIL18WHL0897AB 2

5. Loader valve test port (load sense)
6. Loader valve test port (pilot pressure)



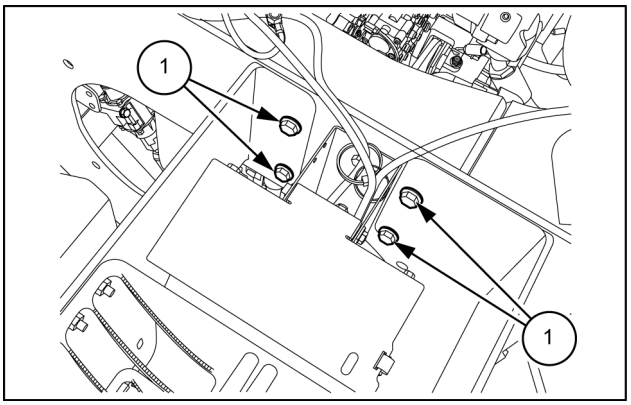
LEIL14WHL0530AB 3

7. Differential lock valve test port



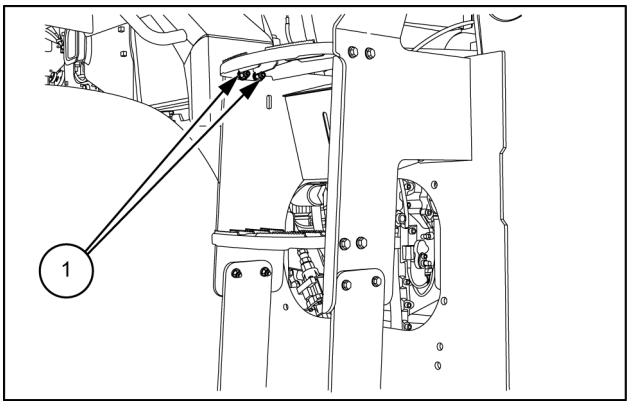
LEIL15WHL1401AB 4

6. Place the right-hand ladder and steps assembly in position on the machine. Install the four bolts **(1)** with the related washers to secure the right-hand ladder and steps assembly to the machine.



LEIL15WHL1413AB 5

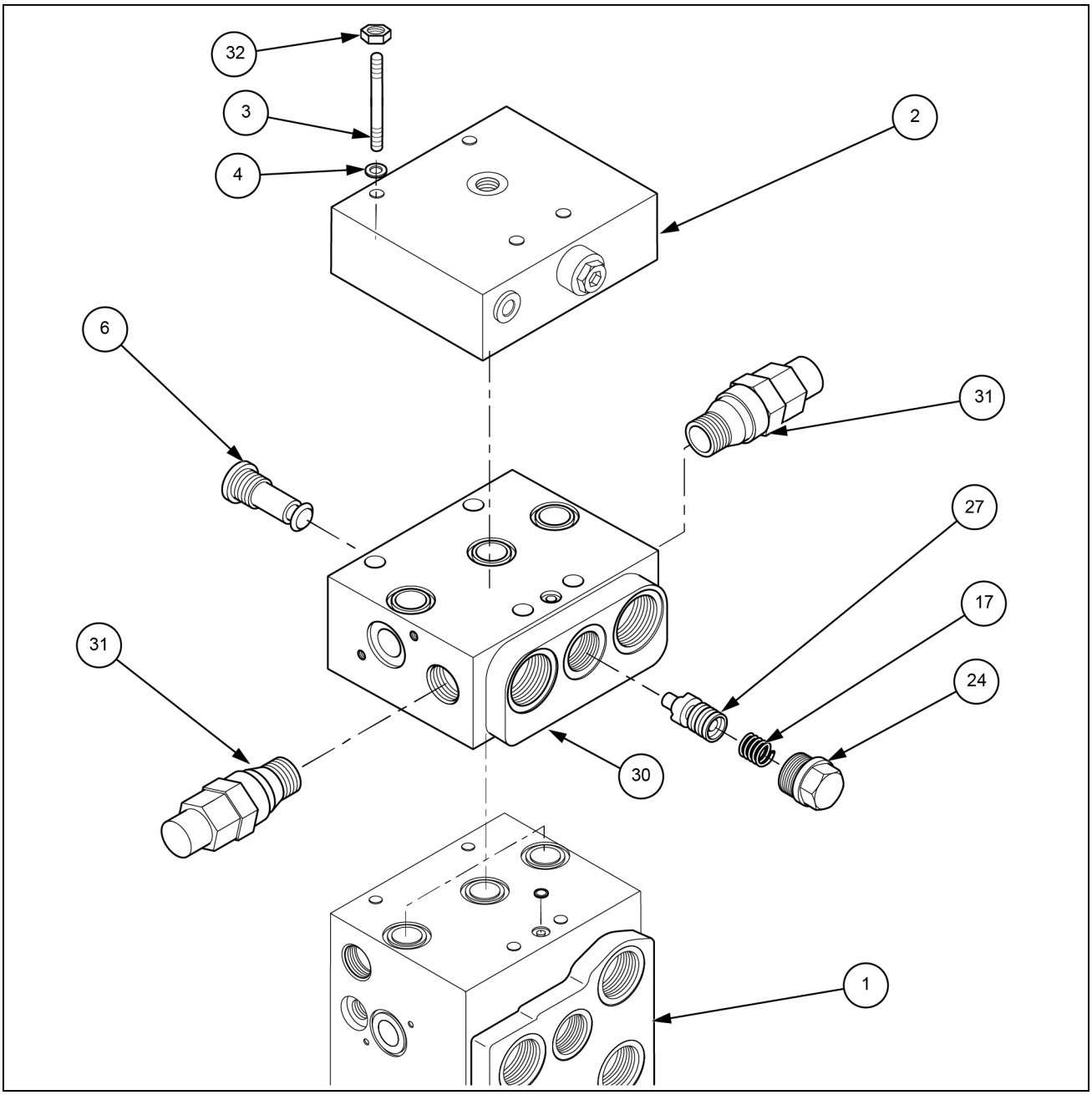
7. Install the bolts **(1)** with the related washers and nuts to secure the ladder to the right-hand fender.



LEIL15WHL1412AB 6

8. Turn the vacuum pump OFF. Disconnect the vacuum pump from the hydraulic reservoir.
9. Check the level of the hydraulic oil in the reservoir. Ensure the level is to specification. Add oil as required.
10. Start the engine. Run the engine at low idle for **2 min**.
11. Turn the engine OFF. Inspect for hydraulic oil leaks at the thermal bypass valve.
12. Ensure the level of the hydraulic oil is to specification. Add oil as required. Tighten the filler cap on the reservoir.

3 and 4 spool mounting configuration



LEIL16WHL1823GB 3

2. Plate
3. Screw
4. Washer
5. Load check valve
10. O-ring
17. Spring
24. Plug
27. Compensation spool
30. Housing
31. Anticavitation and circuit relief
32. Nut

Circuit relief pressure test

1. Connect the hand pump **5870 287 007** to the port for anti-cavitation and circuit relief valves **(7)**.

NOTE: *repeat steps for machines that are configured with a 3 spool valve.*

2. Make sure that the hand pump **5870 287 007** is full of hydraulic oil and that the temperature of the oil is approximately **21 °C** (**70 °F**).
3. Operate the handle of the hand pump **5870 287 007** and read the highest pressure. Repeat this step several times to be sure of the reading.
4. If the pressure is not correct, adjust the circuit relief valve.

Circuit relief adjustment

1. Loosen the lock nut. Turn the adjustment screw clockwise to increase the pressure or counterclockwise to decrease the pressure.
2. Check the pressure again. Repeat the adjustment as necessary.

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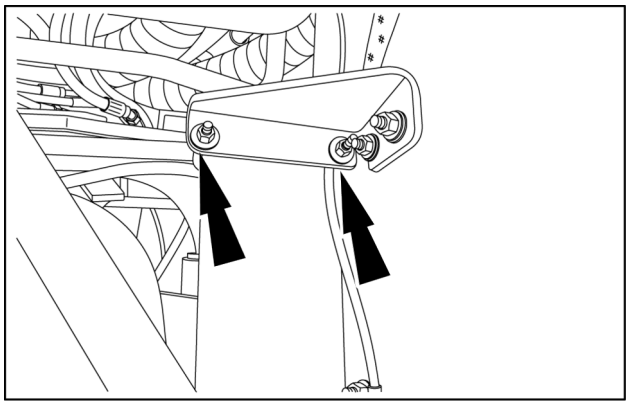
Lift arm cylinder - Inspect

NOTE: *for the numbering, refer to* ***Lift arm cylinder - Exploded view (35.701)****.*

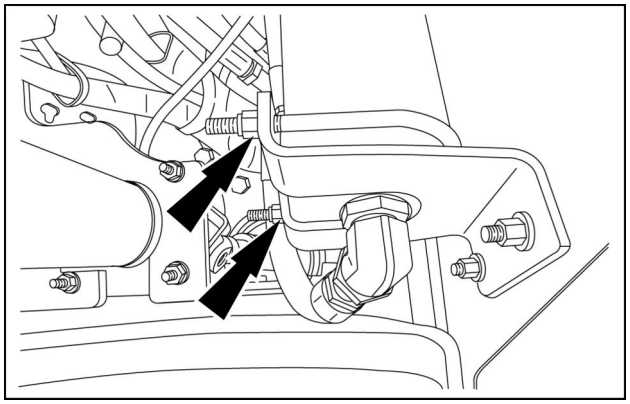
1. Clean all parts in cleaning solvent. Use only lint free cloths for cleaning and drying.
2. Check to be sure that piston rod **(13)** is straight. If piston rod is not straight, replace it with a new piston rod.
3. Shine a light inside tube **(1)** and check for deep grooves and other damage. If there is any damage to tube, replace with a new tube.
4. Remove any small scratches on piston rod **(13)** or inside tube **(1)** with emery cloth of medium grit. Use emery cloth with a rotary motion.
5. Inspect bushings **(2)** in tube eye. Replace as required.
6. Inspect gland **(4)** for rust. Clean and remove rust as necessary.
7. Inspect gland end of tube **(1)** for sharp edges that may cut gland O-ring **(11)** and remove as necessary.
8. Inspect piston **(15)** for damage and wear. If piston is damaged or worn, replace with a new piston.

6. Loosen and remove the nuts and washers from the top U-bolt. Remove the U-bolt.



RAPH12WEL2622AA 4

7. Loosen and remove the nuts and washers from the bottom U-bolt. Remove the bottom U-bolt.
8. Remove the Ride control accumulator from the machine.



RAPH12WEL2621AA 5

Loader bucket control cylinder - Assemble

521G ZBAR - EH, NEW CAB TIER2 [FNH0521GNGHE00001 -]	ANZ --- APAC --- LA --- MEA

NOTE: *for the numbering in this procedure, refer to* ***Loader bucket control cylinder - Exploded view (35.723)****.*

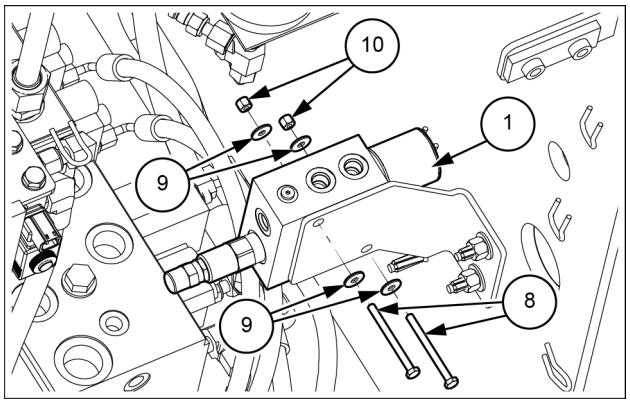
NOTE: *the XR loader bucket control cylinder differs from the Z-bar loader bucket cylinder only for the length of the piston rod* ***(12)****.*

1. Install the bushing **(8)** in the gland **(4)**.

NOTE: *if a new gland is being used, put the part number of the cylinder on the new gland.*

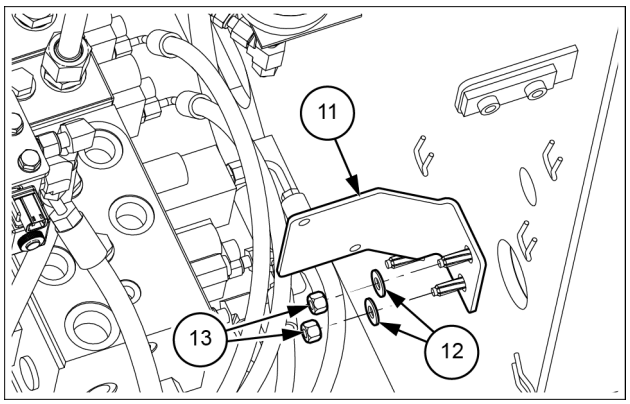
2. Install the seal **(6)** in the gland **(4)**. The seal **(6)** is to be installed so that the lips of the wide seal **(6)** are toward the bushing **(8)**. The wide seal **(6)** can be difficult to install.
3. Install the seal **(7)** in the gland **(4)**. The side of the seal **(7)** with the groove must be toward the bushing **(8)**.
4. Install a new wiper **(5)** in the gland **(4)**. The lips of the wiper **(5)** must be toward the outside end of the gland **(4)**.
5. Install a new O-ring **(9)** in the groove on the gland **(4)**.
6. Install a new backup ring **(10)** in the groove on the outside diameter of the gland **(4)**. If both sides of the backup ring **(10)** are not flat, the side that is not flat must be toward the small end of the gland **(4)**.
7. Install a new O-ring **(11)** next to the backup ring **(10)** in the groove on the outside of the gland **(4)**. The O-ring **(11)** must be toward the small end of the gland **(4)**.
8. Fasten the piston rod eye or yoke in the vise.
9. Remove any marks and sharp edges on the chamfer at the end of the piston rod **(12)**. Make sure that the piston rod **(12)** is clean.
10. Lubricate the bore of the gland **(4)** and the piston rod **(12)** with clean oil.
11. Push the gland **(4)** onto the piston rod **(12)**. If necessary, use a soft hammer to drive the gland **(4)** onto the piston rod **(12)**.
12. Put a support below and near the end of the piston rod **(12)**. Use a shop cloth between the support and the piston rod **(12)** to prevent damage to the piston rod **(12)**.
13. Start the piston **(16)** onto the piston rod **(12)**.
14. Clean the threads on the end of the piston rod and the threads of the piston bolt using Loctite cleaning solvent. Allow to dry. Apply **LOCTITE® 242®** to the piston rod threads 1/4 inch from the open end of the piston rod so that there is 1/2 inch of **LOCTITE® 242®** on the piston rod threads. DO NOT apply Loctite to the first 1/4 inch of the piston rod threads.

9. Remove the two bolts **(8)**, the four washers **(9)** and the nuts **(10)** to release and remove the solenoid valve **(1)** from the bracket fixed to the front chassis.



LEIL16WHL1440AB 4

10. Remove the washers **(12)** and the nuts **(13)**. Remove the bracket **(11)** from the studs welded on the front chassis.

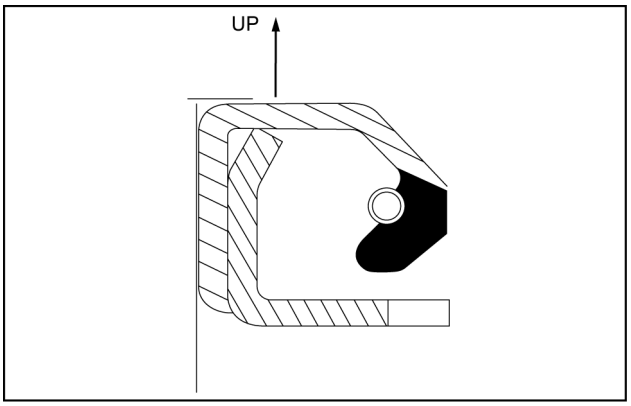


LEIL16WHL1441AB 5

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

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

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



LEIL13WHL1081AA 3

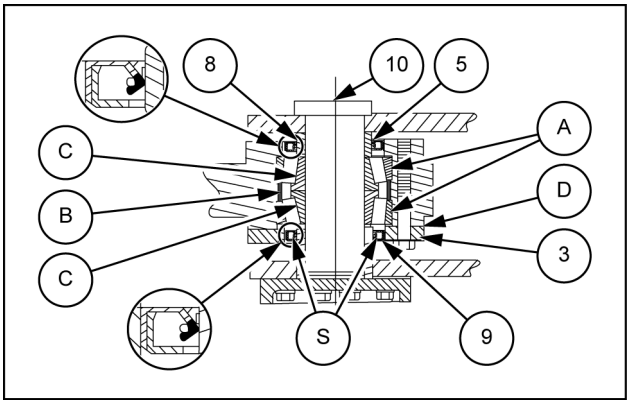
Lower bearing assemble

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

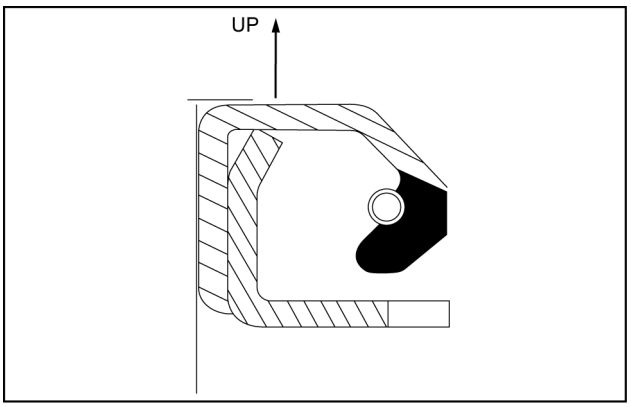
1. Lubricate the bore in the lower pivot with grease.
2. Press one cup **(A)** into the bore (wide edge of cup first).
3. Install the spacer **(B)** and the two bearing cones **(C)** packed with grease.
   Be careful not to mix the bearing cones.
4. Press the remaining bearing cup **(A)** into the bore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

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

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



LEIL15WHL1352AB 4



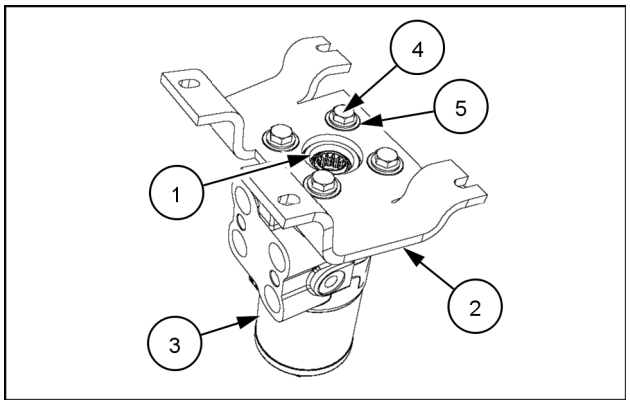
LEIL13WHL1081AA 5

HYDRAULIC COMPONENTS OF THE STANDARD STEERING SYSTEM WITH JOYSTICK STEERING (JSS) - Sheet 2 of 2

1. Steering EHPS valve
2. Bracket
3. Hydraulic connector
4. Hydraulic shuttle tee valve
5. Hydraulic connector
6. **90°** elbow
7. **45°** elbow
8. Hydraulic connector
9. Hydraulic connector
10. **90°** elbow
11. Cut-off valve
12. **90°** elbow
13. T-joint
14. Hose (to tank)
15. T-joint
16. Hose (to steering cylinder)
17. Hose (to steering cylinder)
18. T-joint
19. T-joint
20. Hose (JSS pressure)
21. Sleeve hose 60x554
22. Washer, 13.5x28x4 mm
23. Bolt, M12x30
24. Washer, 9x21x2.5 mm
25. Bolt, M8x20
26. Hose (return to loader valve)
27. Sleeve hose 60x1200
28. Hose (steering cylinder right base)
29. Hose (steering cylinder right rod)
30. Hose (JSS load sense)
31. Spacer swivel
32. Hose (to orbitrol load sense)
33. Wide strap tie 384 mm
34. Loader valve
35. Orbitrol valve
36. Rear chassis
37. Steering cylinder
38. Hose (steering cylinder left rod)
39. Hose (steering cylinder left base)
40. Bracket, valve mount
41. Bracket, valve mount adjust
42. Washer, 9x17x2 mm
43. Bolt, M8x20
44. Bolt, M8x25
45. Nut
46. Washer, 6.6x12.5x2 mm
47. Washer, 6.6x12x1.6 mm
48. Bolt, M6x70
49. Nut
50. Electrical connector

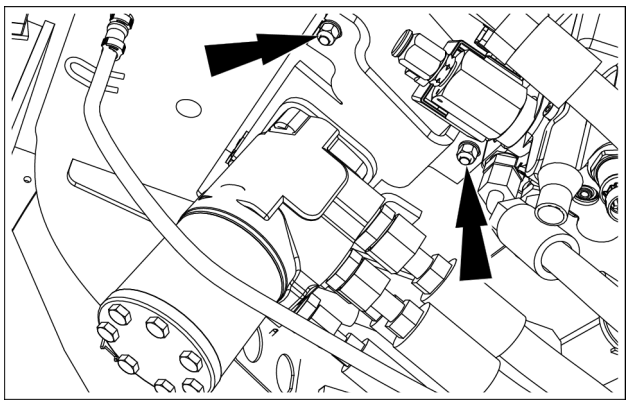
Steering valve - Install

1. Place the steering isolator **(1)** between the steering control valve **(3)** and the steering valve bracket **(2)**. Orient the steering isolator **(1)** with boss features towards cab. Install and tighten the four mounting bolts **(4)** with the washers **(5)**, steel bushings and rubber bushings (not visible in figure) to fix the steering control valve **(3)** to steering valve bracket **(2)**.



LEIL16WHL1171AA 1

2. Engage the steering control valve into the steering shaft.
3. Tighten the four nuts (see arrows) to fix the steering valve bracket to the cab frame.
4. Start the vacuum pump, remove the caps and plugs from the fittings and hoses. Connect the hoses to the steering control valve according to the tags installed during removal. Remove and discard the tags.



LEIL16WHL1122AA 2

Steering cylinder - Test - Leaks

NOTE: *make sure all persons are clear of the area of the center pivot. Make sure the center pivot is free of any obstructions.*

1. Park the machine on a level surface.
2. Turn the machine all the way to the right.
3. Stop the engine and apply the parking brake.
4. Find the tube that is connected to the rod end of the left-hand steering cylinder. Disconnect the tube from the left-hand cylinder.
5. Install a plug in the tube.
6. Start and run the engine at full throttle.
7. Turn the steering wheel to the right. Hold the steering wheel for a full right turn. Have another person check for leakage from the opening of the rod end of the left-hand steering cylinder.
8. If there is constant leakage from the rod end, the piston packing in the left-hand steering cylinder is damaged. Repairs must be made.
9. Connect the tube to the rod end of the left-hand steering cylinder.
10. Turn the machine all the way to the left.
11. Stop the engine.
12. Find the tube that is connected to the rod end of the right-hand steering cylinder. Disconnect the tube from the right-hand steering cylinder.
13. Install a plug in the tube.
14. Start and run the engine at full throttle.
15. Turn the steering wheel to the left. Hold the steering wheel for a full left turn. Have another person check for leakage at the opening of the rod end of the right-hand steering cylinder.
16. If there is constant leakage from the rod end, the piston packing in the right-hand steering cylinder is damaged. Repairs must be made.
17. Connect the tube to the rod end of the right-hand steering cylinder.

Auxiliary steering - Test - Pump

Test equipment

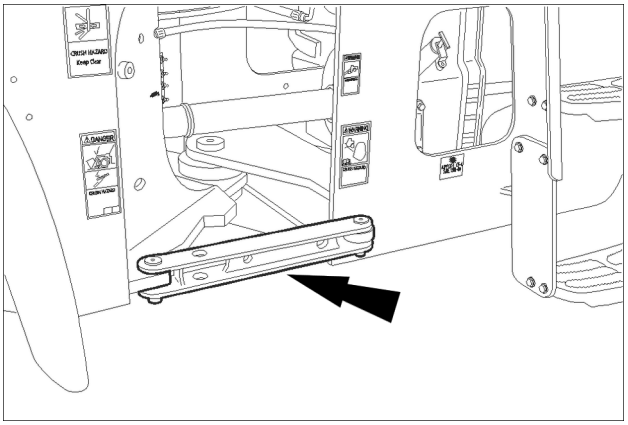
CAS10280 Flow meter

380001740 Flow meter fitting kit

Test procedure

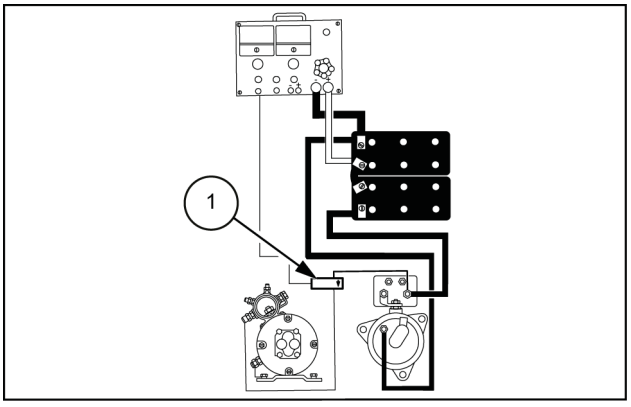
1. Install the articulation lock.

NOTE: *when performing this pressure check, always be sure the articulation lock is in place, especially when working in the articulation joint area.*



RCPH10WHL063BAL 1

2. Loosen and remove the outlet hose to the auxiliary steering pump from the auxiliary steering priority valve.
3. Install a plug into the auxiliary steering priority valve fitting.
4. Connect the inlet of the flow meter to the outlet line of the auxiliary steering pump.
5. Install the outlet hose of the flow meter in the hydraulic reservoir and hold in place with wire.
6. Connect the ammeter clamp **(1)** to the cable as shown in the illustration.



LEIL13WHL0658AB 2

7. Make sure that the parking brake is applied and the bucket is on the floor.
8. Make sure that the oil is at the operating temperature.
9. Make sure that the load valve for the flow meter is open (zero pressure).
10. Start and run the engine.
11. Stop the engine and turn the key back to the ON position.
12. Turn the steering wheel to activate the auxiliary steering pump.

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Air conditioning - Dynamic description

The refrigerant circuit of the air conditioning system contains five major components: compressor **(3)**, condenser **(4)**, receiver-drier **(5)**, expansion valve **(1)** and evaporator **(2)**. These components are connected by tubes and hoses and operate as a closed system. The air conditioner system is charged with **HFC R134A** refrigerant.

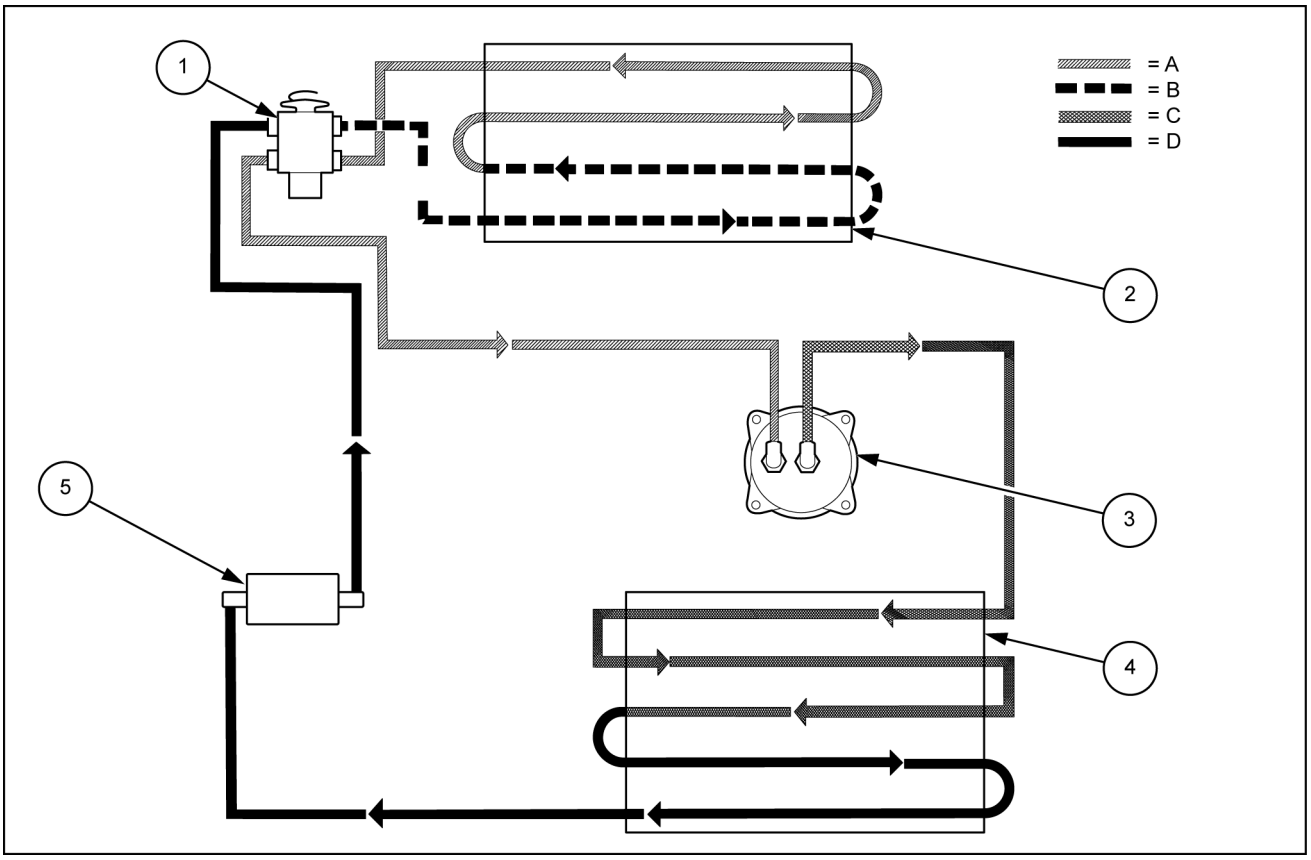
The compressor receives the refrigerant as a low pressure gas. The compressor then compresses the refrigerant and sends it in the form of a high pressure gas to the condenser. The air flow through the condenser then removes the heat from the refrigerant. As the heat is removed the refrigerant changes to a high pressure liquid.

The high pressure refrigerant liquid then flows from the condenser to the receiver-drier. The receiver-drier is a container filled with moisture removing material, which removes any moisture that may have entered the air conditioner system in order to prevent corrosion of the internal components of the air conditioner system.

The refrigerant, still in a high pressure liquid form, then flows from the receiver-drier to the expansion valve. The expansion valve then causes a restriction in flow of refrigerant to the evaporator core. The evaporator meters refrigerant flow based on evaporator heat load.

As the refrigerant flows through the evaporator core, the refrigerant is heated by the air around and flowing through the evaporator fins. The combination of increased heat and decreased pressure causes the air flow through the evaporator fins to become very cool and the liquid refrigerant to become a low pressure gas. The cooled air then passes from the evaporator to the cab for the operator's comfort.

The electrical circuit of the air conditioning system consists of a fan speed control, temperature control, one relay, a blower motor, blower resistor, Air Conditioning compressor clutch, Air Conditioning low pressure switch, Air Conditioning high pressure switch, and Air Conditioning warning light.



LEIL15WHL0770FB 1

1. Expansion valve
2. Evaporator
3. Compressor
4. Condenser
5. Dryer
A. Low pressure gas
B. Low pressure liquid
C. High pressure gas
D. High pressure liquid

Blower and Compressor Clutch Check

Component	Correction
Compressor Clutch	***NOTE:*** *check supply voltage with compressor lead plugged in and engaged. Voltage drops will not be apparent without current flow.* 1. If there is electrical system voltage to the clutch, check for excessive voltage drop in the ground circuit, and replace the compressor.
Low and High Pressure Switches	Check the high and low pressure switches.
Blower Fuse (**10 A**)	Check for damaged blower fuse.
Blower Fan Switch	1. Check switch operation. Switch must give four different blower speeds: OFF, Low, High, and Purge. 2. Check for loose connections or broken wires. Repair or replace as necessary. 3. Check resistor board.
Blower Motor	1. Check the wiring to the blower motor. Make repairs or replace items as necessary. 2. Check motor ground wire. Make sure motor ground wire is making good contact with mounting bracket.
Temperature Control Switch	1. With key in ON position, turn switch to maximum cold. Compressor clutch must engage. ***NOTE:*** *blower must be operating, since electrical power to temperature control switch is received from blower switch.* 2. Turn the blower off. Disconnect the wires from the temperature control. Using an ohmmeter, check the continuity between switch terminals. If continuity is not present when switch is on maximum cold, replace switch.

Cab Temperature Check

Component	Correction
Air Louvers	1. Make sure louvers and recirculation vents are fully open for most efficient air conditioning operation. Defrost louvers must be closed. 2. Check blower; blower must be running.
Air Conditioning	***NOTICE:*** *use caution when feeling hoses. Hoses become very hot. Check temperature by slowly reaching for hose and touching briefly several times with finger tips, increasing the duration with each touch.* 1. Feel the air conditioning hoses. The high pressure hoses (small line) must be warmer than the low pressure hose (large line). 2. If no temperature difference, the system is low on refrigerant, or compressor is not working correctly.
Duct Temperature	1. Put a thermometer in the air duct behind the seat and run the compressor for f i ve minutes to make temperature stable. 2. Duct temperature must be below **25 °C** (**77 °F**) if the system is operating at maximum efficiency. 3. If temperature is above **25 °C** (**77 °F**), system is low on refrigerant, there is a restr iction in the system, compressor is not working correctly, or air ducts are not sealed correctly. ***NOTE:*** *ambient temperature must be **27 – 43 °C (81 – 109 °F)**.*

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F-3F5 - SPARE (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 08 SH08 - POWER DISTRIBUTION (FUSE BLOCK LC3)**

F-3F6 - SPARE (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 08 SH08 - POWER DISTRIBUTION (FUSE BLOCK LC3)**

F-3F7 - SPARE (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 08 SH08 - POWER DISTRIBUTION (FUSE BLOCK LC3)**

F-3F8 - 12V CONVERTER (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 08 SH08 - POWER DISTRIBUTION (FUSE BLOCK LC3)**

F-4F1 - 24V CIGAR (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 09 SH09 - ACCESSORY PWR DIST (FUSE BLOCK LC4)**

F-4F10 - SPARE (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 09 SH09 - ACCESSORY PWR DIST (FUSE BLOCK LC4)**

F-4F2 - SPARE (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 09 SH09 - ACCESSORY PWR DIST (FUSE BLOCK LC4)**

F-4F3 - A/C CLUTCH (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 09 SH09 - ACCESSORY PWR DIST (FUSE BLOCK LC4)**

F-4F4 - SPARE (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 09 SH09 - ACCESSORY PWR DIST (FUSE BLOCK LC4)**

F-4F5 - SPARE (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 09 SH09 - ACCESSORY PWR DIST (FUSE BLOCK LC4)**

F-4F6 - BLOWER (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 09 SH09 - ACCESSORY PWR DIST (FUSE BLOCK LC4)**

F-4F7 - SEAT (Fuse)

Component Type	Fuse
Wiring frames	**SHEET 09 SH09 - ACCESSORY PWR DIST (FUSE BLOCK LC4)**

Y-Y_PL - PILOT LOCK (Solenoid)

Component Type	Solenoid
Wiring frames	**SHEET 23 SH23 - PILOT LOADER CONTROLS**
Connectors	**X-YPP (Plug)** - PILOT PRESSURE SOLENOID [Y-Y_PL] (87692855)

Y-Y_SS - SEC STEERING SOL. (Solenoid)

Component Type	Solenoid
Wiring frames	**SHEET 21 SH21 - UCM-STEERING AUX JSS**
Connectors	**X-YSS (Receptacle)** - SEC STEERING VALVE SOL [Y-Y_SS] (87695582)

Wiring harnesses - Electrical schematic sheet 12 SH12 - POWER DISTRIBUTION 1 CLEAN GROUND BLK

Type	Component	Connector / Link
Connector	X-CAB_E	**X-CAB_E** - CAB TO ENGINE [SH7: B-5] (84807216)
Connector	X-ENG	**X-ENG** - ENGINE TO CAB [SH18: C-6] (87696948)
Connector	X-GND_CENG1	**X-GND_CENG1** - GROUND CLEAN ENG BLOCK (84140737)
Connector	X-GND_CENG2	**X-GND_CENG2** - GROUND CLEAN ENG BLOCK [SH12: A-4] (84140737)
Connector	X-SP_PK_CLN	**X-SP_PK_CLN** - SPLICE PACK CLEAN GRND [SH25: C-1] (87352746)
Connector	X-TURBO_2	**X-TURBO_2** - ENGINE HARNESS INTERFACE T2 [SH18: B-5] (87694583)

Wiring harnesses - Electrical schematic sheet 22 SH22 - UCM-LOADER BOOM CONTROL

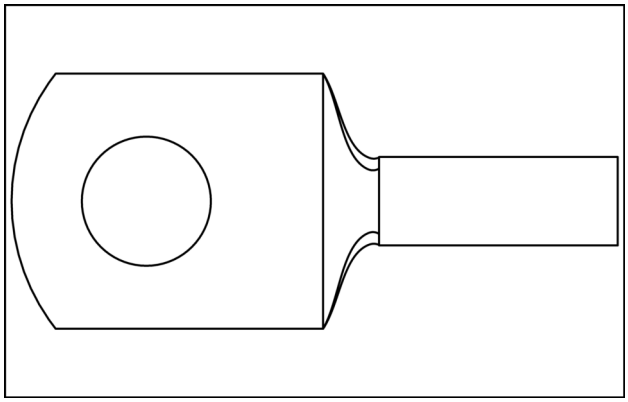
Type	Component	Connector / Link
ECU	**A-EH_VLV** - ELECTROHY-DRAULIC VALVE (ECU)	**X-PILOT_ENABLE** - PILOT ENABLE SOLENOID [SH28: A-1] (87695582) **X-BOOM_RAISE** - BOOM RAISE SOLENOID [A-EH_VLV] (87695582) **X-BOOM_LOWER** - BOOM LOWER SOLENOID [A-EH_VLV] (87695582) **X-BUCKET_ROLL** - BUCKET ROLL SOLENOID [A-EH_VLV] (87695582) **X-BUCKET_DUMP** - BUCKET DUMP SOLENOID [A-EH_VLV] (87695582) **X-AUX_1_LEFT** - AUX 1 LEFT [A-EH_VLV] (87695582) **X-AUX_1_RIGHT** - AUX 1 RIGHT [A-EH_VLV] (87695582) **X-AUX_2_LEFT** - AUX 2 LEFT [A-EH_VLV] (87695582) **X-AUX_2_RIGHT** - AUX 2 RIGHT [A-EH_VLV] (87695582)
ECU	**A-UCM** - 47749442 WAS 84328725 (ECU)	**X-UCM3B** - UCM [A-UCM] (84130760) **X-UCM4B** - UCM [A-UCM] (82028495) **X-UCM2B** - UCM [A-UCM] (82028495)
Sensor	**B-BKT_ANG** - BUCKET ANGLE (Sensor)	**X-BUA** - BUCKET ANGLE SENSOR [B-BKT_ANG] (84403598)
Sensor	**B-BM_ANG** - BOOM ANGLE (Sensor)	**X-BOA** - BOOM ANGLE SENSOR [B-BM_ANG] (84403598)
Switch	**SW-PRB** - ROLL BACK PR SW (Switch)	**X-PRB** - ROLL BACK PRESSURE SWITCH [SW-PRB] (87692877)
Connector	X-AUX_1_LEFT	**X-AUX_1_LEFT** - AUX 1 LEFT [A-EH_VLV] (87695582)
Connector	X-AUX_1_RIGHT	**X-AUX_1_RIGHT** - AUX 1 RIGHT [A-EH_VLV] (87695582)
Connector	X-AUX_2_LEFT	**X-AUX_2_LEFT** - AUX 2 LEFT [A-EH_VLV] (87695582)
Connector	X-AUX_2_RIGHT	**X-AUX_2_RIGHT** - AUX 2 RIGHT [A-EH_VLV] (87695582)
Connector	X-BOA	**X-BOA** - BOOM ANGLE SENSOR [B-BM_ANG] (84403598)
Connector	X-BOOM_LOWER	**X-BOOM_LOWER** - BOOM LOWER SOLENOID [A-EH_VLV] (87695582)
Connector	X-BOOM_RAISE	**X-BOOM_RAISE** - BOOM RAISE SOLENOID [A-EH_VLV] (87695582)

Type	Component	Connector / Link
Connector	X-BTM	**X-BTM** - BOTTOM TO CAB STD (87704523)
Connector	X-BTM_EH	**X-BTM_EH** - BOTTOM TO CAB EH (84281075)
Connector	X-BTM_F	**X-BTM_F** - BOTTOM TO FRONT STD (87696087)
Connector	X-BTM_FEH	**X-BTM_FEH** - BOTTOM TO FRONT EH (87700160)
Connector	X-BUA	**X-BUA** - BUCKET ANGLE SENSOR [B-BKT_ANG] (84403598)
Connector	X-BUCKET_DUMP	**X-BUCKET_DUMP** - BUCKET DUMP SOLENOID [A-EH_VLV] (87695582)
Connector	X-BUCKET_ROLL	**X-BUCKET_ROLL** - BUCKET ROLL SOLENOID [A-EH_VLV] (87695582)
Connector	X-CAB_B	**X-CAB_B** - CAB TO BOTTOM [SH21: B-3] (87696945)
Connector	X-CAB_EH	**X-CAB_EH** - CAB TO BOTTOM EH (87700159)
Connector	X-FAX	**X-FAX** - FRONT AXLE TEMP SENSOR [SH20: A-6] (87711966)
Connector	X-FRNT	**X-FRNT** - FRONT TO BOTTOM STD (87704426)
Connector	X-FRNT_EH	**X-FRNT_EH** - FRONT TO BOTTOM EH (87700170)
Connector	X-PILOT_ENABLE	**X-PILOT_ENABLE** - PILOT ENABLE SOLENOID [SH28: A-1] (87695582)
Connector	X-PRB	**X-PRB** - ROLL BACK PRESSURE SWITCH [SW-PRB] (87692877)
Connector	X-UCM1A	**X-UCM1A** - UCM (82016219)
Connector	X-UCM1B	**X-UCM1B** - UCM [SH22: A-6] (87410946)
Connector	X-UCM2B	**X-UCM2B** - UCM [A-UCM] (82028495)
Connector	X-UCM3B	**X-UCM3B** - UCM [A-UCM] (84130760)
Connector	X-UCM4A	**X-UCM4A** - UCM (82028493)
Connector	X-UCM4B	**X-UCM4B** - UCM [A-UCM] (82028495)
Connector	X-YPE	**X-YPE** - COUPLER VALVE [Y-YPE] (87695582)
Connector	X-YRC	**X-YRC** - RIDE CONTROL SOLENOID [Y-YRC] (84607243)
Solenoid	**Y-YPE** - COUPLER VALVE SOL. (Solenoid)	**X-YPE** - COUPLER VALVE [Y-YPE] (87695582)
Solenoid	**Y-YRC** - YRC RIDE CONTROL SOL (Solenoid)	**X-YRC** - RIDE CONTROL SOLENOID [Y-YRC] (84607243)

Wiring harnesses - Electrical schematic sheet 32 SH32 - CAB WIPER / WASHER

Type	Component	Connector / Link
ECU	**A-SFB** - SMART FUSE BOX (ECU)	**X-X6** - SFB [A-SFB] (47554341)
Motor	**M-FW_M** - FRONT WASHER MOTOR (Motor)	**X-FWW** - FRONT WASHER MOTOR [M-FW_M] (84015523)
Motor	**M-RW_M** - REAR WASHER MOTOR (Motor)	**X-RWW** - REAR WASHER MOTOR [M-RW_M] (84015523)
Motor	**M-R_WPR_M** - REAR WIPER MOTOR (Motor)	**X-RWM** - REAR WIPER MOTOR [M-R_WPR_M] (87692862) **X-RWM_G** - REAR WIPER MOTOR GRND [SH13: C-2] (87693744)
Switch	**SW-WPR_SW** - REAR WIPER SWITCH (Switch)	**X-SRWP** - SWITCH REAR WIPER [SW-WPR_SW] (87716755)
Connector	X-CAB_P2	**X-CAB_P2** - CAB TO PEDESTAL 2 [SH27: B-2] (87705101)
Connector	X-CAB_TR	**X-CAB_TR** - CAB TO TRANSMISSION [SH26: A-2] (87696944)
Connector	X-FWM	**X-FWM** - FRONT WIPER MOTOR (87692862)
Connector	X-FWM_G	**X-FWM_G** - FRONT WIPER GROUND [SH14: D-5] (87693744)
Connector	X-FWW	**X-FWW** - FRONT WASHER MOTOR [M-FW_M] (84015523)
Connector	X-PED_2	**X-PED_2** - PEDESTAL TO CAB 2 (87705114)
Connector	X-PG	**X-PG** - PEDESTAL GROUND [SH28: B-6] (87705607)
Connector	X-RWM	**X-RWM** - REAR WIPER MOTOR [M-R_WPR_M] (87692862)
Connector	X-RWM_G	**X-RWM_G** - REAR WIPER MOTOR GRND [SH13: C-2] (87693744)
Connector	X-RWW	**X-RWW** - REAR WASHER MOTOR [M-RW_M] (84015523)
Connector	X-SRWP	**X-SRWP** - SWITCH REAR WIPER [SW-WPR_SW] (87716755)
Connector	X-TRANS	**X-TRANS** - TRANSMISSION TO CAB (87696949)
Connector	X-X4	**X-X4** - SFB (47554343)
Connector	X-X6	**X-X6** - SFB [A-SFB] (47554341)
Connector	X-X7	**X-X7** - SFB [SH3: A-3] (84538791)

X-ALT_B - ALTERNATOR B+ (84399576) (Plug)

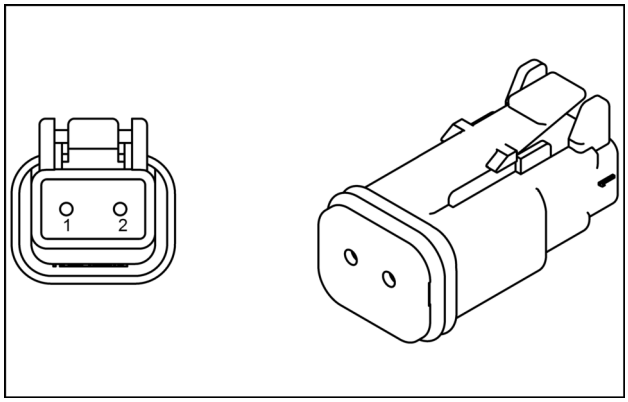


84399576 9

84399576

Pin	From	Wire	Description	Color-Size	Frame
1	**X-XM1C (Plug) pin 1** - STARTER (84401295)	301	ALTERNATOR B+	RD - 13.0	**SHEET 03 SH03 - PWR DISTR-BATTERY / STARTER / KEY**

X-AUX_1_LEFT - AUX 1 LEFT [A-EH_VLV] (87695582) (Receptacle)

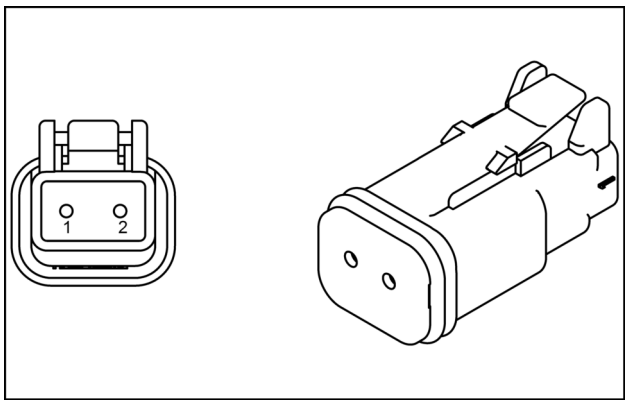


87695582 10

87695582

Pin	From	Wire	Description	Color-Size	Frame
1	**X-FRNT_EH (Receptacle) pin H** - FRONT TO BOTTOM EH (87700170)	351B	AUX 1 LEFT	WH - 0.8	**SHEET 22 SH22 - UCM-LOADER BOOM CONTROL**
2	SP-352B-P-X	352C	AUX 1 LEFT ENABLE	BR - 0.8	

X-AUX_1_RIGHT - AUX 1 RIGHT [A-EH_VLV] (87695582) (Receptacle)

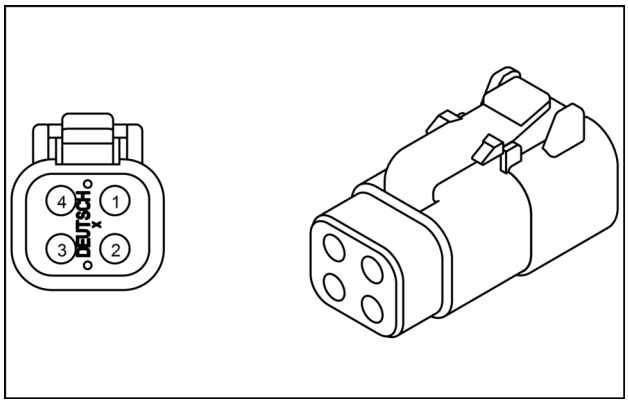


87695582 11

87695582

Pin	From	Wire	Description	Color-Size	Frame
1	SP-471-P-X	471J	5V REF2	PK - 0.8	**SHEET 21 SH21 - UCM-STEERING AUX JSS**
2	**X-UCM2A (Receptacle) pin 18** - UCM (82028493)	670	JSS JOYSTICK 1	YE - 0.8	
3	SP-651-P-X	651L	5V GND2	BL - 0.8	
4	**X-UCM2B (Receptacle) pin 12** - UCM [A-UCM] (82028495)	675	LH ARMREST POSITION UP	GY - 0.8	
5	**X-UCM2A (Receptacle) pin 12** - UCM (82028493)	630	JSS JOYSTICK 2	YE - 0.8	
6	SP-967-P-X	967C	5 V REF GRND3	BL - 0.8	
7	SP-677-P-X	677C	5V REF3 OUT	PK - 0.8	
8	**X-UCM2B (Receptacle) pin 20** - UCM [A-UCM] (82028495)	673	LH ARMREST POSITION DWN	TN - 0.8	
9	**X-UCM3B (Receptacle) pin 16** - UCM [A-UCM] (84130760)	678	JSS ACTIVATION	WH - 0.8	
10	SP-799-P-X	799B	JSS IGNITION POWER	OR - 0.8	
11	**X-CG4 (Receptacle) pin J** - CAB GROUND [SH24: B-6] (84149207)	954J	LH JSS GND	BK - 0.8	
12	**X-UCM3B (Receptacle) pin 23** - UCM [A-UCM] (84130760)	682	JSS ACTIVATION NC	YE - 0.8	

X-CAB_L2 - CAB TO LEFT JSS (87696138) (Receptacle)

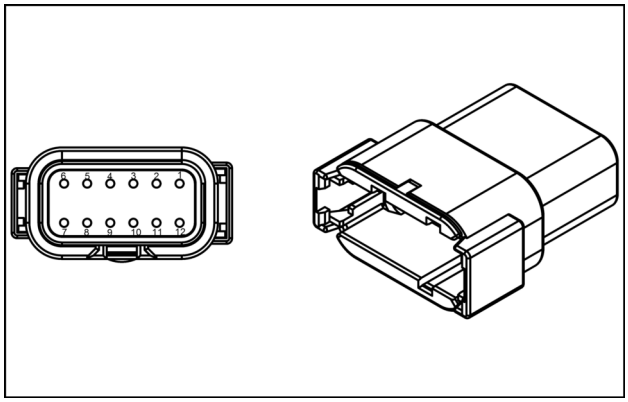


87696138 43

87696138

Pin	From	Wire	Description	Color-Size	Frame
1	**X-UCM4B (Receptacle) pin 16** - UCM [A-UCM] (82028495)	691	JSS INDICATOR	WH - 0.8	**SHEET 21 SH21 - UCM-STEERING AUX JSS**
2	SP-981-P-X	981J	BACKLIGHTING	VT - 0.8	

X-CAB_P - CAB TO PEDESTAL [SH20: D-2] (87700155) (Plug)



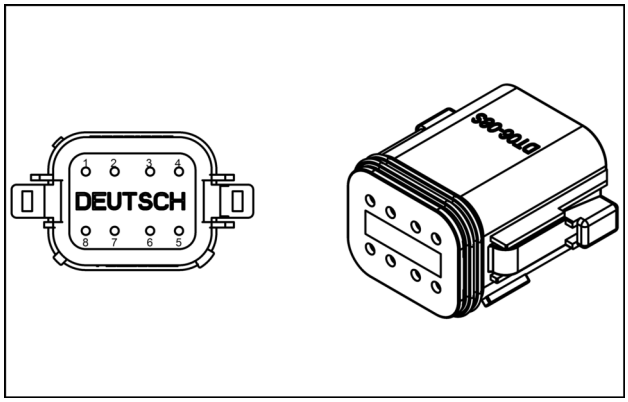
87700155 44

87700155

Pin	From	Wire	Description	Color-Size	Frame
2	**X-X5 (Receptacle) pin 16** - SFB [SH3: D-3] (47554342)	189	RH TURN INDICATOR	VT - 0.8	**SHEET 28 SH28 - LIGHTING HAZARD WARNING, BLINKERS, DRIVING**
3	SP-132-P-X	132C	LH HIGH BEAM LAMP	VT - 0.8	

Pin	From	Wire	Description	Color-Size	Frame
6	**X-RH-TAIL (Receptacle) pin 4** - RH REAR TAIL [LMP-R-NA-TAIL] (87694101)	131F	TURN RH EURO	VT - 0.8	**SHEET 29 SH29 - LIGHTING REAR TAILS**
6	**X-ENG_H (Plug) pin 4** - ENGINE TO HOOD (87700321)	131A	RH REAR TURN LAMP NA	VT - 0.8	
7	**X-BU2 (Plug) pin 1** - BACK UP ALARM [H-BU_ALRM] (84426117)	121A	BACKUP ALARM	OR - 0.8	**SHEET 36 SH36 - REAR DEFROST, BACKUP ALARM**
7	**X-EHD_23 (Plug) pin 1** - ENG TO PL23 HOOD (87694154)	121B	BACKUP ALARM PL23	OR - 0.8	
8	**X-FL pin 2** - FUEL LEVEL [B-RFLG] (82012083)	633A	FUEL LEVEL	YE - 0.8	**SHEET 19 SH19 - UCM PWR, GRND, INSTRUMENTATION**
9	SP-482R-P-X	482R	5V GRND REF1	BL - 0.8	
10	**X-ENG_H (Plug) pin 2** - ENGINE TO HOOD (87700321)	126A	LH BRAKE LAMP NA	VT - 0.8	**SHEET 29 SH29 - LIGHTING REAR TAILS**
10	**X-LH-TAIL (Receptacle) pin 2** - LH REAR TAIL LIGHT NA [L-NA-TAIL] (87694101)	126E	STOP LH EURO	VT - 0.8	
11	**X-ENG_H (Plug) pin 5** - ENGINE TO HOOD (87700321)	130B	RH TAIL LAMP NA	VT - 0.8	
11	**X-RH-TAIL (Receptacle) pin 3** - RH REAR TAIL [LMP-R-NA-TAIL] (87694101)	130J	TAIL RH EURO	VT - 0.8	
12	**X-LH-TAIL (Receptacle) pin 3** - LH REAR TAIL LIGHT NA [L-NA-TAIL] (87694101)	127J	TAIL EURO	VT - 0.8	
12	**X-ENG_H (Plug) pin 6** - ENGINE TO HOOD (87700321)	127E	LH TAIL LAMP NA	VT - 0.8	
13	**X-ECU (Receptacle) pin 47** - ECU CONNECTOR [A-ECU] (84300197)	CAN_L	CAN	GN - 0.8	**SHEET 18 SH18 - ENGINE CONTROL UNIT 3, AT**
13	**X-EDC7 (Plug) pin 34** - ENGINE CONTROLLER T2/3 [SH18: C-5] (84160698)	CAN_L7	CAN	GN - 0.8	
14	**X-ECU (Receptacle) pin 46** - ECU CONNECTOR [A-ECU] (84300197)	CAN_H	CAN	YE - 0.8	
14	**X-EDC7 (Plug) pin 35** - ENGINE CONTROLLER T2/3 [SH18: C-5] (84160698)	CAN_H7	CAN	YE - 0.8	
15	SP-663A-P-X	663A	OK TO START	YE - 0.8	**SHEET 20 SH20 - UCM VEHICLE DRIVELINE / FAN CONTROL**
16	**X-FAN (Receptacle) pin 4** - FAN SPEED SENSOR JUMPER [SH11: C-1] (87694112)	400A	FAN SPEED	YE - 0.8	
17	**X-ALT (Receptacle) pin 4** - ALTERNATOR [G-G1] (8602487)	239	ALT LAMP SIGNAL	YE - 0.8	**SHEET 03 SH03 - PWR DISTR-BATTERY / STARTER / KEY**
18	**X-AFS2 (Receptacle) pin 2** - AIR FILTER SWITCH T2/3 [SW-AFS2] (84607243)	319A	AIR FILTER REST SW T2	YE - 0.8	**SHEET 20 SH20 - UCM VEHICLE DRIVELINE / FAN CONTROL**
20	**X-EDC7 (Plug) pin 89** - ENGINE CONTROLLER T2/3 [SH18: C-5] (84160698)	303A	ISO K	WH - 0.8	**SHEET 16 SH16 - ENGINE CONTROL UNIT 1, GRID HEATER, FILTER HEATER**
21	**X-ENG_H (Plug) pin 7** - ENGINE TO HOOD (87700321)	129A	RH BRAKE LAMP NA	VT - 0.8	**SHEET 29 SH29 - LIGHTING REAR TAILS**
21	**X-RH-TAIL (Receptacle) pin 2** - RH REAR TAIL [LMP-R-NA-TAIL] (87694101)	129E	STOP RH EURO	VT - 0.8	
22	**X-ENG_H (Plug) pin 3** - ENGINE TO HOOD (87700321)	128A	LH REAR TURN LAMP NA	VT - 0.8	
22	**X-LH-TAIL (Receptacle) pin 4** - LH REAR TAIL LIGHT NA [L-NA-TAIL] (87694101)	128E	LH TURN EURO	VT - 0.8	

X-HD_N - HOOD TO ENG (87700325) (Receptacle)

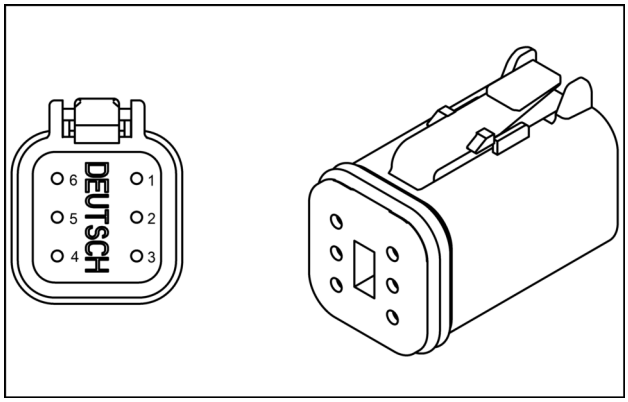


87700325 119

87700325

Pin	From	Wire	Description	Color-Size	Frame
1	SP-242H-P-X	242H	HOOD GRND PL23	BK - 0.8	**SHEET 29 SH29 - LIGHTING REAR TAILS**
1	SP-242A-P-X	242A	TAIL LIGHTS GRND NA	BK - 1.0	
2	**X-LH-TAIL (Receptacle) pin 2** - LH REAR TAIL LIGHT NA [L-NA-TAIL] (87694101)	126B	LH BRAKE LAMP NA	VT - 0.8	
2	**X-LH-REAR-TAIL-EURO (Receptacle) pin 1** - LH REAR TAIL LIGHT EURO [LMP-L-EURO-TAIL] (87694112)	126D	STOP PL23 EURO	VT - 0.8	
3	**X-LH-TAIL (Receptacle) pin 4** - LH REAR TAIL LIGHT NA [L-NA-TAIL] (87694101)	128B	LH REAR TURN LAMP NA	VT - 0.8	
3	**X-LH-REAR-TAIL-EURO (Receptacle) pin 2** - LH REAR TAIL LIGHT EURO [LMP-L-EURO-TAIL] (87694112)	128D	TURN PL23 EURO	VT - 0.8	
4	**X-RH-REAR-TAIL-EURO (Receptacle) pin 2** - RH-REAR-TAIL-EURO [LMP-R-EURO-TAIL] (87694112)	131E	TAIL EURO	VT - 0.8	
4	**X-RH-TAIL (Receptacle) pin 4** - RH REAR TAIL [LMP-R-NA-TAIL] (87694101)	131B	RH REAR TURN LAMP NA	VT - 0.8	
5	**X-RH-REAR-TAIL-EURO (Receptacle) pin 3** - RH-REAR-TAIL-EURO [LMP-R-EURO-TAIL] (87694112)	130H	TA	VT - 0.8	
5	**X-RH-TAIL (Receptacle) pin 3** - RH REAR TAIL [LMP-R-NA-TAIL] (87694101)	130C	RH TAIL LAMP NA	VT - 0.8	
6	**X-LH-REAR-TAIL-EURO (Receptacle) pin 3** - LH REAR TAIL LIGHT EURO [LMP-L-EURO-TAIL] (87694112)	127H	TAIL PL23 EURO	VT - 0.8	
6	**X-LH-TAIL (Receptacle) pin 3** - LH REAR TAIL LIGHT NA [L-NA-TAIL] (87694101)	127F	LH TAIL LAMP NA	VT - 0.8	
7	**X-RH-TAIL (Receptacle) pin 2** - RH REAR TAIL [LMP-R-NA-TAIL] (87694101)	129B	RH BRAKE LAMP NA	VT - 0.8	
7	**X-RH-REAR-TAIL-EURO (Receptacle) pin 1** - RH-REAR-TAIL-EURO [LMP-R-EURO-TAIL] (87694112)	129D	STOP PL23 EURO	VT - 0.8	

X-LH-REAR-TAIL-EURO - LH REAR TAIL LIGHT EURO [LMP-L-EURO-TAIL] (87694112) (Receptacle)

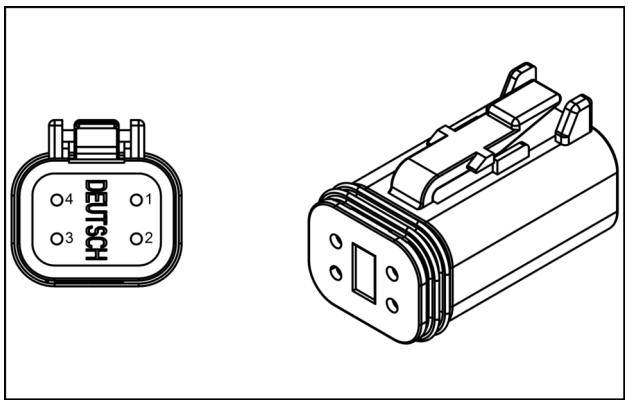


87694112 156

87694112

Pin	From	Wire	Description	Color-Size	Frame
1	**X-HD_N (Receptacle) pin 2** - HOOD TO ENG (87700325)	126D	STOP PL23 EURO	VT - 0.8	**SHEET 30 SH30 - OLD EURO LIGHTING**
2	**X-HD_N (Receptacle) pin 3** - HOOD TO ENG (87700325)	128D	TURN PL23 EURO	VT - 0.8	
3	**X-HD_N (Receptacle) pin 6** - HOOD TO ENG (87700325)	127H	TAIL PL23 EURO	VT - 0.8	
4	SP-124H-P-X	124K	REVERSE LIGHTS PL23	VT - 0.8	
5	SP-242H-P-X	242L	GRND	BK - 0.8	

X-LH-TAIL - LH REAR TAIL LIGHT NA [L-NA-TAIL] (87694101) (Receptacle)



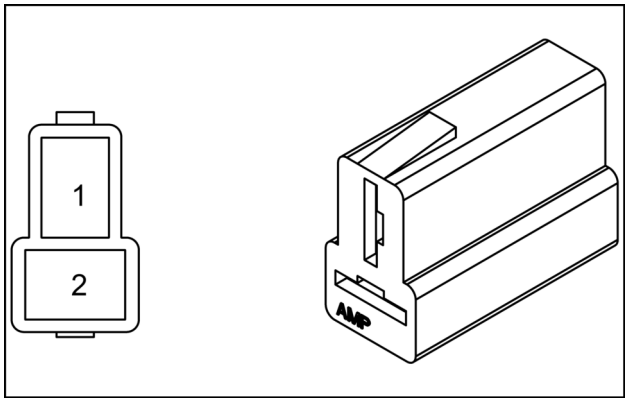
87694101 157

87694101

Pin	From	Wire	Description	Color-Size	Frame
1	SP-243-P-X	243A	TAIL LIGHTS GRND EURO	BK - 0.8	**SHEET 29 SH29 - LIGHTING REAR TAILS**
1	SP-242A-P-X	242C	TAIL LIGHTS GRND NA	BK - 1.0	
2	**X-ENG (Plug) pin 10** - ENGINE TO CAB [SH18: C-6] (87696948)	126E	STOP LH EURO	VT - 0.8	
2	**X-HD_N (Receptacle) pin 2** - HOOD TO ENG (87700325)	126B	LH BRAKE LAMP NA	VT - 0.8	
3	**X-HD_N (Receptacle) pin 6** - HOOD TO ENG (87700325)	127F	LH TAIL LAMP NA	VT - 0.8	
3	**X-ENG (Plug) pin 12** - ENGINE TO CAB [SH18: C-6] (87696948)	127J	TAIL EURO	VT - 0.8	
4	**X-ENG (Plug) pin 22** - ENGINE TO CAB [SH18: C-6] (87696948)	128E	LH TURN EURO	VT - 0.8	
4	**X-HD_N (Receptacle) pin 3** - HOOD TO ENG (87700325)	128B	LH REAR TURN LAMP NA	VT - 0.8	

Pin	From	Wire	Description	Color-Size	Frame
A	**X-CG3 (Receptacle) pin L** - CAB GROUND RH HEADLINER [SH13: D-5] (84149207)	955V	REAR WIPER MOTOR GND	BK - 1.0	**SHEET 32 SH32 - CAB WIPER / WASHER**

X-RWW - REAR WASHER MOTOR [M-RW_M] (84015523) (Receptacle)

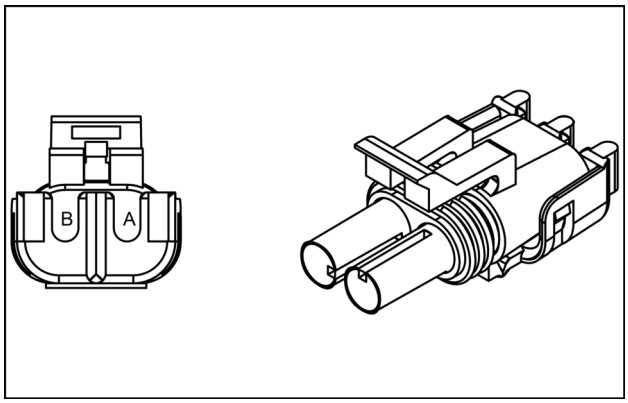


84015523 201

84015523

Pin	From	Wire	Description	Color-Size	Frame
1	**X-TRANS (Plug) pin 4** - TRANSMISSION TO CAB (87696949)	106A	REAR WASHER MOTOR	OR - 0.8	**SHEET 32 SH32 - CAB WIPER / WASHER**
2	SP-391A-P-X	391E	WIPER GROUND	BK - 0.8	**SHEET 20 SH20 - UCM VEHICLE DRIVELINE / FAN CONTROL**

X-SC - SEAT COMPRESSOR [Y-SC] (87692855) (Plug)

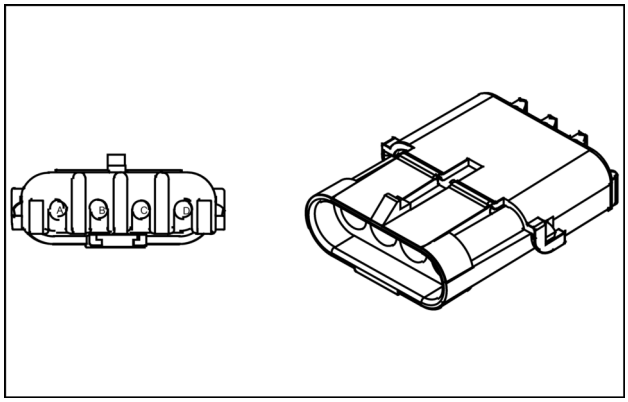


87692855 202

87692855

Pin	From	Wire	Description	Color-Size	Frame
A	**X-LC4 (Receptacle) pin 7A** - LOADCENTER 4 [SH35: C-6] (87733595)	742	12V FUSED ACC PWR FOR SEAT COMP	OR - 2.0	**SHEET 35 SH35 - CABIN RADIO LOUDSPEAKER/12V CNVRTR**
B	**X-CG4 (Receptacle) pin C** - CAB GROUND [SH24: B-6] (84149207)	955L	SEAT COMPRESSOR GND	BK - 2.0	

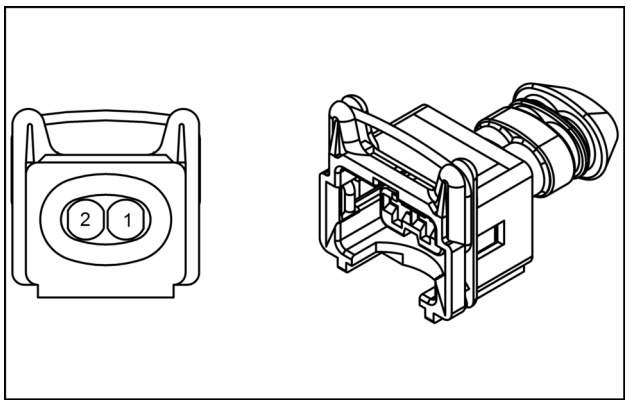
X-TS2 - TRANS SHIFTER 2 [A-PFNR] (47702209) (Receptacle)



47702209 237

47702209

X-TSS - SPEED SENSOR TURBINE [B-TS_S] (84364854) (Receptacle)

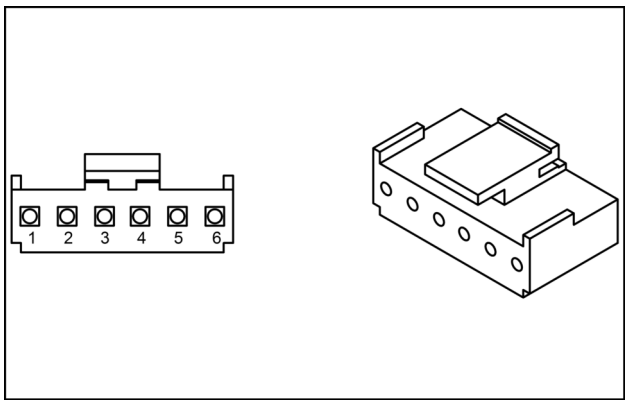


84364854 238

84364854

Pin	From	Wire	Description	Color-Size	Frame
1	**X-TRANS (Plug) pin 8** - TRANSMISSION TO CAB (87696949)	700A	TURBINE SPEED SENSOR	YE - 0.8	**SHEET 26 SH26 - GEAR CONTROL UNIT 2**
2	**X-TRANS (Plug) pin 14** - TRANSMISSION TO CAB (87696949)	702C	SPEED SENSOR GRND	BL - 0.8	

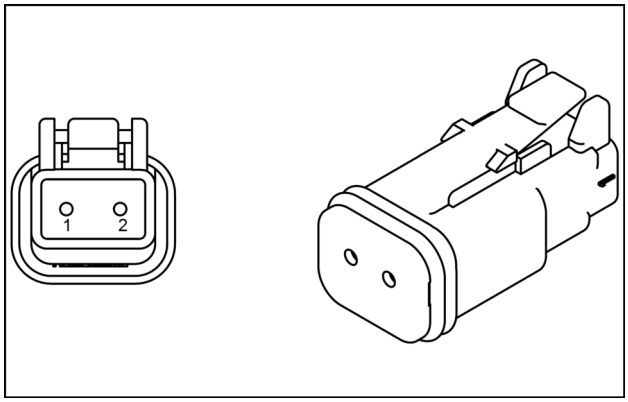
X-TT - TELL TALE INDICATOR [LMP-TTI] (87715979) (Receptacle)



87715979 239

87715979

X-YLV - HEAT LOAD VALVE [Y-YLV] (87695582) (Receptacle)

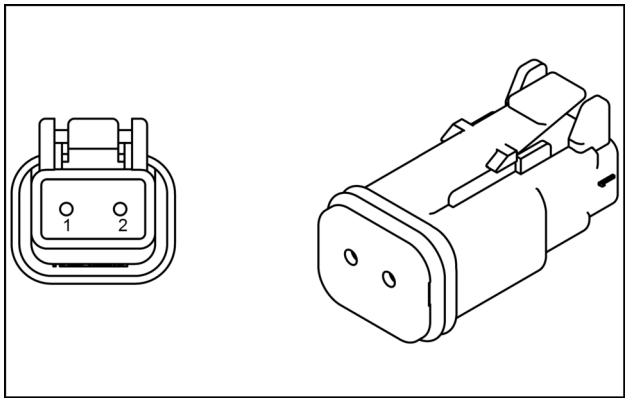


87695582 274

87695582

Pin	From	Wire	Description	Color-Size	Frame
1	**X-FAN2 (Plug) pin 2** - FAN SPEED SENSOR JUMPER (87694152)	852A	HEAT LOAD VALVE	OR - 0.8	**SHEET 20 SH20 - UCM VEHICLE DRIVELINE / FAN CONTROL**
2	**X-FAN2 (Plug) pin 1** - FAN SPEED SENSOR JUMPER (87694152)	582B	HEAT LOAD VALVE SIGNAL	BR - 0.8	

X-YPB - VALVE PARKING BRAKE [Y-Y_PB] (87695582) (Receptacle)

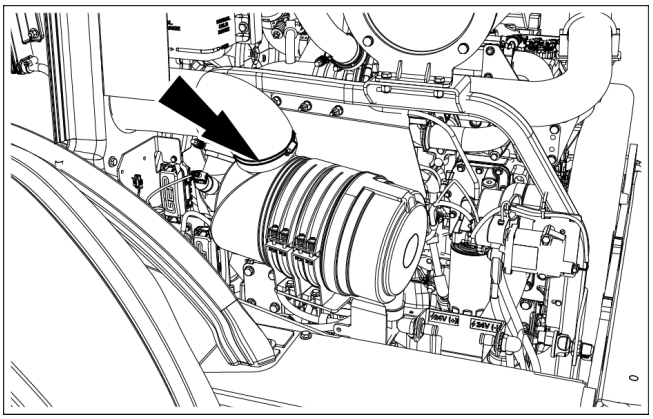


87695582 275

87695582

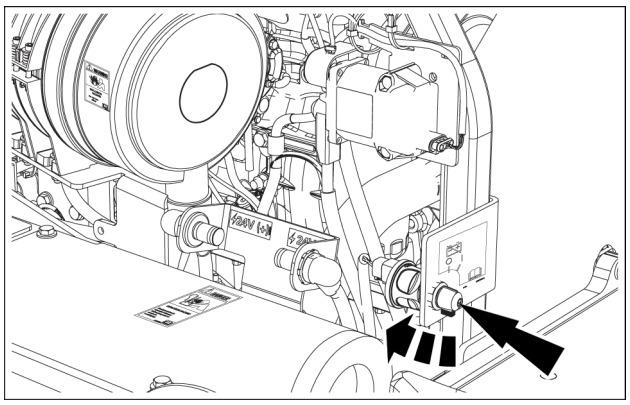
Pin	From	Wire	Description	Color-Size	Frame
1	**X-BTM (Receptacle) pin 18** - BOTTOM TO CAB STD (87704523)	388A	PARK BRAKE SOL	WH - 0.8	**SHEET 20 SH20 - UCM VEHICLE DRIVELINE / FAN CONTROL**
2	**X-BTM (Receptacle) pin 19** - BOTTOM TO CAB STD (87704523)	389A	PARK BRAKE SOL	BK - 0.8	

5. Install the clamp to secure the air cleaner intake hose to the air cleaner. Tighten the clamp to **3.7 – 4.5 N·m** (**32.4 – 39.6 lb in**).



LEIL17WHL0015AB 5

6. If removed, reinstall the negative battery cable. Turn the timed disconnect switch to the ON position. Lower the engine hood.



LEIL16WHL2685AA 6

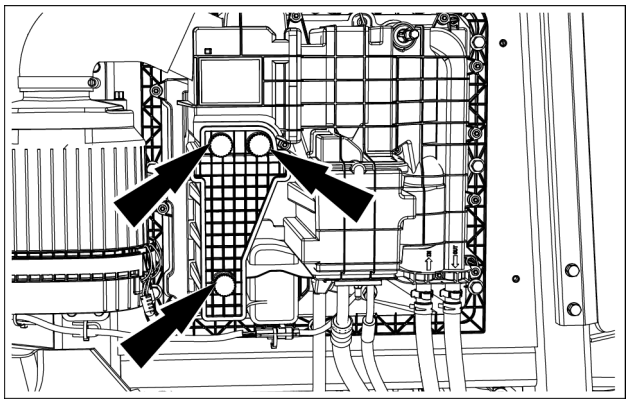
Charging Guide For Batteries Other Than Maintenance Free Batteries

Recommended Rate* and Time for Fully Discharged Battery		
Battery capacity – See Reserve Capacity under Specifications	**Slow Charge**	**Fast Charge**
80 min or Less	**10 h** at **5 A** **5 h** at **10 A**	**2.5 h** at **20 A** **1.5 h** at **30 A**
Above **80 min** to **125 min**	**15 h** at **5 A** **7.5 h** at **10 A**	**3.75 h** at **20 A** **1.5 h** at **50 A**
Above **125 min** to **170 min**	**20 h** at **5 A** **10 h** at **10 A**	**5 h** at **20 A** **2 h** at **50 A**
Above **170 min** to **250 min**	**30 h** at **5 A** **15 h** at **10 A**	**7.5 h** at **20 A** **3 h** at **50 A**
Above **250 min**	**24 h** at **10 A**	**6 h** at **40 A** **4 h** at **60 A**
*initial rate for standard taper charger.		

Preparing a dry charged battery for use

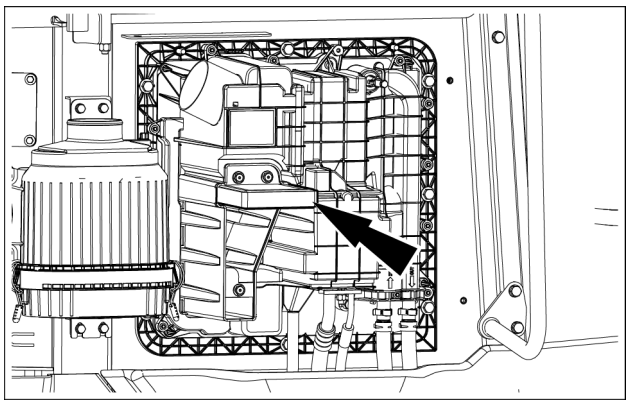
1. Remove the caps from the battery.
2. Fill each cell to the top of the separators with electrolyte. This will permit the volume of electrolyte to increase when heated by charging the battery.
3. Install the caps on the battery.
4. Connect a battery charger to the battery.
5. Charge the battery at 30 amperes until the specific gravity is 1.250 or more and the temperature of the electrolyte is at least **15.5 °C** (**59.9 °F**).
6. If necessary, fill each cell with electrolyte until the electrolyte is just below split ring at the bottom of the cell opening.

7. Remove the three retaining knobs that hold the cab air recirculation filter cover in place.



LEIL18WHL0453AB 4

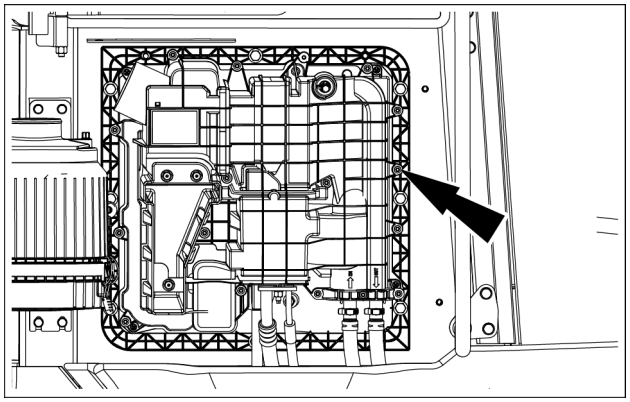
8. Extract the cab air recirculation filter.



LEIL18WHL0454AB 5

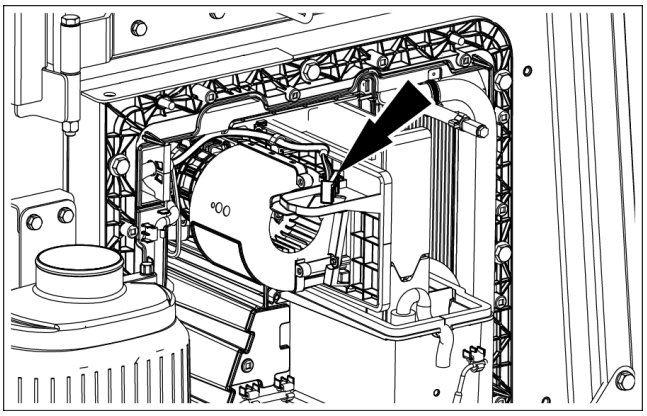
9. Remove the 16 screws holding the cover case. Remove the cover case from the machine.

NOTE: *for clarity, only one of the 16 screws is indicated in figure* ***6****.*



LEIL18WHL0459AB 6

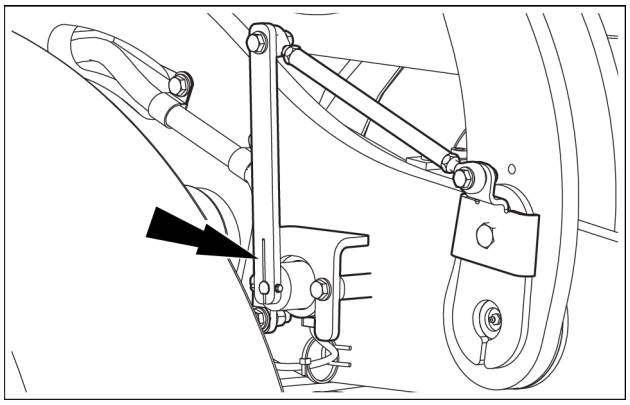
10. Disconnect the electrical connector from the blower.



LEIL18WHL0460AB 7

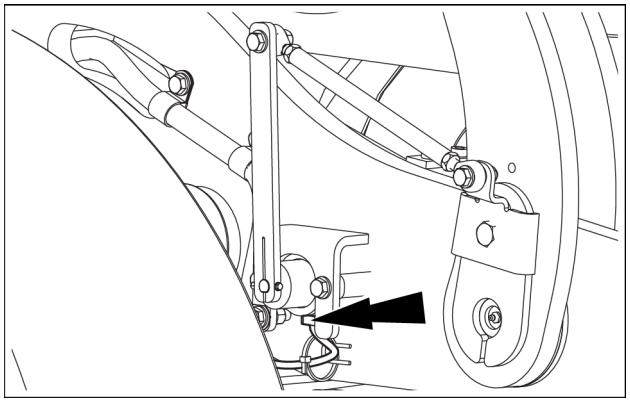
XT models

3. Locate the Electro-Hydraulic (EH) tilt sensor assembly on the right-hand of the front frame.



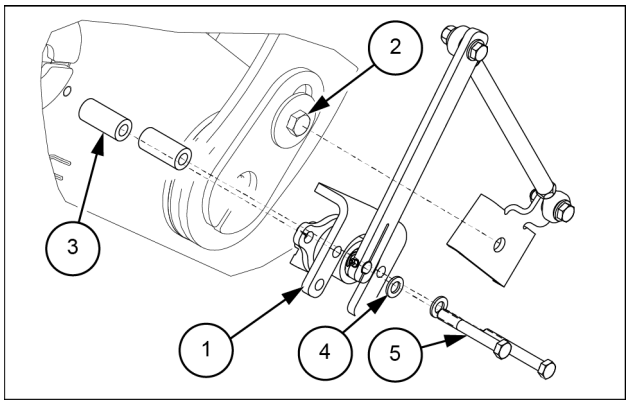
LEIL17WHL2165AB 4

4. Disconnect the electrical connector **X-BUA** from the Electro-Hydraulic (EH) tilt sensor.



LEIL17WHL2166AB 5

5. Loosen and remove the two bolts **(5)**, washers **(4)**, and spacers **(3)** that fix the EH tilt sensor assembly **(1)** to the front frame.
6. Remove the bolt **(2)** to unfix the EH tilt sensor assembly **(1)** from the machine.



LEIL17WHL2167FB 6

110-16 - Engine coolant temperature is high

Control Module: GHMI - Faults list

Context:
Engine coolant temperature is high.

Cause:

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The engine coolant temperature is between **105 – 110 °C**.

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 coolant temperature reach the proper temperature and restart the machine.

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

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

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

   B. If the coolant temperature within proper range continue to work monitoring the temperature.
4. Check the coolant level and add coolant if necessary. Wait until the coolant temperature reach the proper temperature and restart the machine.

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

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

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

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

   Check the integrity of the connector **X-TECM** and visually check for any damage to the connector and to the pins 46 and 49.

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

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

6. Check the harness between the gear oil temperature sensor **B-GOT** and the Transmission Control Unit **A-TRANS** for a short circuit to battery voltage condition.

   The key must be in the OFF position.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-TECM** pin 49	Chassis ground	There should be no voltage

   A. If there is a voltage, find and replace the wire 425 and/or 425A.

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

7. Check the harness between the gear oil temperature sensor **B-GOT** and the Transmission Control Unit **A-TRANS** for an open circuit condition.

   Disconnect the connector **X-TCOT** from the gear oil temperature sensor **B-GOT**.

   The key must be in the OFF position.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-TECM** pin 49	Connector **X-TCOT** pin 1	There should be continuity

   A. If there is no continuity, find and repair or replace the wire 425 and/or 425A.

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

8. Check if the gear oil temperature sensor **B-GOT** is defective.

   A. If a problem is found, replace the gear oil temperature sensor **B-GOT**.

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

Wiring harnesses - Electrical schematic sheet 26 (55.100)

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

   Check the integrity of the connector **X-TECM** and visually check for any damage to the connector and to the pins 3 and 42.

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

   B. If there are no problems, connect the connector **X-TECM** to the Transmission Control Unit **A-TRANS** and continue with Step **6**.

6. Check if the harness between the intermediate speed sensor **B-IS_S** and the Transmission Control Unit **A-TRANS** is defective.

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

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

7. Check the sensor gap at the intermediate speed sensor **B-IS_S**.

   A. If a problem is found, adjust the gap or replace the intermediate speed sensor **B-IS_S**.

   B. If there are no problems, continue with Step **8**.

8. Disconnect the **X-ISS** connector from the intermediate speed sensor **B-IS_S**.

   Check if the intermediate speed sensor **B-IS_S** is defective.

   A. If a problem is found, replace the intermediate speed sensor **B-IS_S**.

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

Wiring harnesses - Electrical schematic sheet 26 (55.100)

Remove the PARKING BRAKE SOLENOID sensor.

Use a multimeter to perform the following check:

From	To	Value
Connector **X-BTM** pin 18	Connector **X-YPB** pin 1	Short circuit
Connector **X-BTM** pin 19	Connector **X-YPB** pin 2	Short circuit

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

B. If the measurements are correct, continue with Step **6**.

6. Check the integrity of connector **X-UCM3B**.

Disconnect the connector **X-UCM3B** from the connector **A-UCM** and visually check the integrity of pin 27.

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

B. If the pin is not damaged, continue with Step **7**.

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

Disconnect the connector **X-UCM1A** from the connector **A-UCM** and visually check the integrity of pin 22.

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

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

8. Check the integrity of harness between the connector **X-CAB_B** and the **A-UCM**.

Use a multimeter to perform the following check:

From	To	Value
Connector **X-CAB_B** pin 18	Connector **X-UCM3B** pin 27	Short circuit
Connector **X-CAB_B** pin 19	Connector **X-UCM1A** pin 22	Short circuit

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

B. If the measurements are correct, continue with Step **9**.

9. Check the integrity of harness between connectors **X-UCM3B** and **X-UCM1A**.

Be sure the PARKING BRAKE SOLENOID sensor is installed and the connectors **X-BTM** and **X-CAB_B** are connected.

Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM3B** pin 27	Connector **X-UCM1A** pin 22	The PARKING BRAKE SOLENOID resistance

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

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

Wiring harnesses - Electrical schematic sheet 20 (55.100)

1052-01 - Rear Brake Accumulator Low Pressure

Control Module: UCM

Context:
The **A-UCM** detects a pressure value from Rear Brake Accumulator lower than the expected one.

Cause:
Rear Accumulator Pressure Mpa < **7.7 MPa**.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The Rear Brake Accumulator Pressure Sensor is not functioning.
3. The Rear Brake Accumulator 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. By performing the procedures **1052-03 – Short to Power at Rear Brake Accumulator Pressure Sensor** and **1052-04 – Short to Ground at Rear Brake Accumulator Pressure Sensor**, check the Rear Brake Accumulator Pressure Sensor is correctly functioning.

   A. If the sensor is not functioning, replace sensor.

   B. If the sensor is functioning, continue with Step **3**.
3. Replace the Rear Brake Accumulator.

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

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

Wiring harnesses - Electrical schematic sheet 19 (55.100)

2663-04 - Hall cell Y1/Y2 voltage abnormally low

Control Module: Keypad and Joystick

Context:
Hall cell Y1/Y2 voltage abnormally low

Cause:

Possible failure modes:

1. The fault is intermittent and not currently active.

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, make calibration.

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

B. If there are no problems, replace the display computer **A-DSP**.

Wiring harnesses - Electrical schematic sheet 24 (55.100)

5470-02 - EEC2 Timeout

Control Module: TCU

Context:
There is no failure detected in the transmission system or the failure has no or slight effects on the transmission control.
The Transmission Control Unit **A-TRANS** works without or, in special cases, with little limitations.
The Transmission Control Unit **A-TRANS** uses the default signal of the accelerator pedal in idle position.

Cause:
There is a timeout of the CAN-message EEC2 from the Engine Control Unit **A-ECU**.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The CAN connector or the harness are damaged or the connectors are not installed.
3. There are interference on the CAN-Bus.
4. The Engine Control Unit **A-ECU** is defective.

Solution:

1. Verify that fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Check the integrity of the CAN-Bus harnesses and connectors.

   Visually inspect the relevant harness and connectors for damage, bent or dislocated pins, corroded terminals or broken wires. Verify that the connectors are fully installed. Flex the harness involved to revel 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, continue with Step **3**.
3. Check the wires of CAN-Bus for a contact to vehicle ground condition.

   A. If a problem is found, find and replace the damaged wire.

   B. If there are no problems, continue with Step **4**.
4. Check the wires of CAN-Bus for a contact to battery voltage condition.

   A. If a problem is found, find and replace the damaged wire.

   B. If there are no problems, continue with Step **5**.
5. Check if there are interference on the CAN-Bus.

   A. If a problem is found, repair or replace the defective component.

   B. If there are no problems, continue with Step **6**.
6. Check the wire of the CAN harness connected to the Engine Control Unit **A-ECU**, connector **X-ECU** pin 46 and pin 47.

   A. If a problem is found, repair or replace the damaged wire.

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

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

   Check the integrity of the connector **X-TRANS** and **X-CAB_TR**, visually check for any damage to the connectors and to the pin 16.

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

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

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

   Check the integrity of the connector **X-TECM** and visually check for any damage to the connector and to the pin 56.

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

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

6. Check the harness between the transmission controller of tranny **A-TRC** and the Transmission Control Unit **A-TRANS** for an open circuit condition.

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

   The key must be in the OFF position.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-TECM** pin 56	Connector **X-TRC** pin 1	There should be continuity

   A. If there is no continuity, find and repair or replace the wire 834 and/or 834A.

   B. If there is continuity, continue with Step **7**.

7. Check if the transmission controller of tranny **A-TRC** is defective.

   Check the resistance of the transmission controller of tranny **A-TRC**.

   A. If a problem is found, replace the transmission controller of tranny **A-TRC**.

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

Wiring harnesses - Electrical schematic sheet 25 (55.100)

Check the integrity of the connector **X-TECM** and visually check for any damage to the connector and to the pin 39.

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

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

6. Check the harness between the transmission controller of tranny **A-TRC** and the Transmission Control Unit **A-TRANS** for an open circuit condition.

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

   The key must be in the OFF position.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-TECM** pin 39	Connector **X-TRC** pin 8	There should be continuity

   A. If there is no continuity, find and repair or replace the wire 842 and/or 842A.

   B. If there is continuity, continue with Step **7**.

7. Check if the transmission controller of tranny **A-TRC** is defective.

   Check the resistance of the transmission controller of tranny **A-TRC**.

   A. If a problem is found, replace the transmission controller of tranny **A-TRC**.

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

Wiring harnesses - Electrical schematic sheet 25 (55.100)

5710-00 - Overtemp Retarder

Control Module: TCU

Context:
There is no failure detected in the transmission system or the failure has no or slight effects on the transmission control.
The Transmission Control Unit **A-TRANS** works without or, in special cases, with little limitations.

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

Possible failure modes:

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

Solution:

1. Verify that fault is present and active.

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

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

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

   Check the oil level of the transmission.

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

   B. If there are no problems, continue with Step **3**.
3. Check if the hydraulic oil temperature sensor **B-HOT** is defective.

   A. If a problem is found, replace the connector **B-HOT**.

Wiring harnesses - Electrical schematic sheet 19 (55.100)

From	To	Value
Connector **X-DSP** pin 1	Connector **X-DSP** pin 14	There should be no continuity
Connector **X-DSP** pin 2	Connector **X-DSP** pin 14	There should be no continuity

A. If there is continuity, find and replace the damaged wire.

B. If there is no continuity, replace the display **A-DSP**.

Wiring harnesses - Electrical schematic sheet 24 (55.100)
Wiring harnesses - Electrical schematic sheet 25 (55.100)

65579-04 - Engine Controller Grid Heater relay circuit driver - Short circuit to Ground

Control Module: ECU

Context:
The Engine Control Unit (**A-ECU**) controls the grid heater relay activation on both high side and low side. If the **A-ECU** detects a short to ground condition in the high side supply of the grid heater relay, this fault will occur.

Cause:
The **A-ECU** has detected a short to ground condition in the grid heater relay high side control circuit.

Possible failure modes:

1. Faulty grid heater relay signal circuit, shorted to ground.
2. Faulty grid heater relay, internal failure.
3. Faulty **A-ECU**, software.

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 and the connectors.

   Visually inspect the relevant harness and connector for damage, bent or dislocated pins, corroded terminals or broken wires. Verify that the connectors are fully installed. Flex the harness 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 continue with Step **3**.
3. Check the integrity of the grid heater relay K-GH.

   The key must be in the OFF position.

   Remove the grid heater relay K-GH.

   Use a multimeter to perform the following continuity check on the grid heater relay:

From	To	Value
GH5 (pin 87)	Connector **X-GHC (Plug)** pin 2 (85)	There should be no continuity
GH4 (pin 30)	Connector **X-GHC (Plug)** pin 2 (85)	There should be no continuity

   A. If there is continuity, the grid heater relay is defective. Replace the component.

   B. If there is no continuity, leave the grid heater relay removed and continue with Step **4**.
4. Check the grid heater relay signal circuit for a short to ground condition.

   Put the key switch in the OFF position.

   Use a multimeter to perform the following continuity check on the engine harness side:

65683-04 - Turbine speed - Signal too low

Control Module: TCU

Context:
The Transmission Control Unit (TCU / **A-TRANS**) monitors the analog input value of the turbine speed sensor B-TS_S. If the turbine speed sensor **B-TS_S** input signal is too low, this fault will occur.

Cause:
The **A-TRANS** is sensing an analog input signal too low in the turbine speed sensor **B-TS_S** signal circuit.

Possible failure modes:

1. Faulty turbine speed sensor **B-TS_S** signal circuit, shorted to ground.
2. Faulty turbine speed sensor **B-TS_S**, internal failure.
3. Faulty **A-TRANS**, software.

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 and the connectors.

   Visually inspect the relevant harness and connector for damage, bent or dislocated pins, corroded terminals or broken wires. Verify that the connectors are fully installed. Flex the harness 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 continue with Step **3**.
3. Check the integrity of the turbine speed sensor **B-TS_S**.

   Turn the key switch in the OFF position.

   Disconnect the connector **X-TSS** and remove the turbine speed sensor.

   Use a multimeter to measure resistance between the following points on the component side:

From	To	Value
B-TS_S pin 1	**B-TS_S** pin 2	There should be measurable resistance

   A. If the resistance is about **0 Ω** or infinite, the turbine speed sensor **B-TS_S** is defective. Replace the component.

   B. If there is measurable resistance, leave the connector disconnected and continue with Step **4**.
4. Check the turbine speed sensor **B-TS_S** signal circuit for a short to ground condition.

   Turn the key switch in the OFF position.

   Disconnect the connector **X-TECM**.

   Use a multimeter to perform the following continuity check on the engine harness side:

65753-02 - ADC Monitoring – Test Impulse Error

Control Module: ECU

Context:
This function monitors the analog-digital converter (ADC) of the microcontroller. The test pulse for the signal error consists of cyclically setting the ADC channel of the accelerator pedal (APP2) to zero. Monitoring for no-load test pulse is switched off (only allowed for poti/switch accelerator pedal).

Cause:
The converted test pulse voltage exceeds **5.20 V** for longer than **10.92 min** more than 65535.00 consecutive times.

Possible failure modes:

1. Faulty ECU, software.
2. Faulty ECU, internal failure.

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

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

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

65768-04 - Sensor Supply Voltage 3 - Low

Control Module: ECU

Context:
For reasons of safety the ECU provides 3 independent **5 V** voltage supplies for the sensors. These sensor supply voltages are monitored to ensure they remain within a given range. This check for voltage limits is done autonomously by the hardware (thresholds not applicable). The error status is then reported via SPI-bus to the diagnostic system management (DSM) where the error status is time-debounced before setting/healing the fault path.

Cause:
The hardware has detected the sensor voltage supply 3 to be below a lower limit.

Possible failure modes:

1. Faulty battery, voltage too low.
2. Faulty ECU power supply, voltage too low.
3. Faulty ECU supply voltage 3 output wiring, defect in one of the connected components.
4. Faulty ECU, internal failure.

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 and the connectors.

   Visually inspect the relevant harness and connector for damage, bent or dislocated pins, corroded terminals or broken wires. Verify that the connectors are fully installed. Flex the harness 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 continue with Step **3**.
3. Check defects in one of the connected components.

   One at a time, disconnect each component connected to the sensor supply voltage 3 and use the EST to monitor the status of this fault.

   A. If the fault is eliminated after a component disconnection, the relevant component has failed. Replace the relevant component.

   B. If the fault has not been eliminated after components disconnection, continue with Step **4**.
4. Check the battery voltage.

   The engine must be running.

   Use a multimeter to perform the following voltage check:

From	To	Value
Connector **X-563**	Connector **X-566**	There should be about **24 V**

   A. If there is less than **24 V**, continue with Step **5**.

9. Check the ECU CAN 1 circuit for an open circuit condition.

   The key must be in the OFF position.

   Disconnect the diagnostic connector **X-DIA**.

   Disconnect the UCM connector **X-UCM1B**.

   Use a multimeter to perform the following continuity check on the engine harness:

From	To	Value
Connector **X-EDC7 (Plug) pin 35**	Connector **X-DIA (Plug) pin C**	There should be continuity
Connector **X-EDC7 (Plug) pin 34**	Connector **X-DIA (Plug) pin D**	There should be continuity
Connector **X-EDC7 (Plug) pin 35**	Connector **X-UCM1B (Receptacle) pin 34**	There should be continuity
Connector **X-EDC7 (Plug) pin 34**	Connector **X-UCM1B (Receptacle) pin 25**	There should be continuity

   A. If there is no continuity, there is an open circuit condition in the CAN 1 circuit. Locate and repair the shorted conductor.

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

Wiring harnesses - Electrical schematic sheet 03 (55.100)
Wiring harnesses - Electrical schematic sheet 16 (55.100)
Wiring harnesses - Electrical schematic sheet 18 (55.100)
Wiring harnesses - Electrical schematic sheet 22 (55.100)
Wiring harnesses - Electrical schematic sheet 24 (55.100)

9. Check the ECU CAN 1 circuit for an open circuit condition.

   The key must be in the OFF position.

   Disconnect the diagnostic connector **X-DIA**.

   Disconnect the UCM connector **X-UCM1B**.

   Use a multimeter to perform the following continuity check on the engine harness:

From	To	Value
Connector **X-EDC7 (Plug) pin 35**	Connector **X-DIA (Plug) pin C**	There should be continuity
Connector **X-EDC7 (Plug) pin 34**	Connector **X-DIA (Plug) pin D**	There should be continuity
Connector **X-EDC7 (Plug) pin 35**	Connector **X-UCM1B (Receptacle) pin 34**	There should be continuity
Connector **X-EDC7 (Plug) pin 34**	Connector **X-UCM1B (Receptacle) pin 25**	There should be continuity

   A. If there is no continuity, there is an open circuit condition in the CAN 1 circuit. Locate and repair the shorted conductor.

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

Wiring harnesses - Electrical schematic sheet 03 (55.100)
Wiring harnesses - Electrical schematic sheet 16 (55.100)
Wiring harnesses - Electrical schematic sheet 18 (55.100)
Wiring harnesses - Electrical schematic sheet 22 (55.100)
Wiring harnesses - Electrical schematic sheet 24 (55.100)

518074-03 - Key_18 Key Fault

Control Module: Keypad and Joystick

Context:
Key_18 Key Fault.

Cause:

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The Key_18 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, replace the Key_18 Key.

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

Visually check the integrity of pin 19.

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

B. If the pin is not damaged, continue with Step **6**.

6. Check the integrity of the harness between the connector **X-UCM1B** and the power supply.

   Mount the BOOM ANGLE sensor.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM1B** pin 19	Ground	< + **5 V**

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

   B. If the measurement is not correct, continue with Step **7**.

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

   Disconnect the connector **X-BTM_EH** from the connector **X-CAB_EH**.

   Visually check the integrity of pin S of both connectors.

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

   B. If both pins are not damaged, continue with Step **8**.

8. Check the harness between the connector **X-BTM_EH** and the power supply.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-BTM_EH** pin 5	Ground	< + **5 V**

   A. If the value is not correct, replace the harness between the connectors **X-CAB_EH** and **X-UCM1B**.

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

9. Check the integrity of the connectors **X-FRNT_EH** and **X-BTM_FEH**.

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

   Visually check the integrity of pins S and V of both connectors.

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

   B. If both pins are not damaged, continue with Step **10**.

10. Check the harness of the connector **X-FRNT_EH**.

    Use a multimeter to perform the following check:

From	To	Value
Connector **X-FRNT_EH** pin S	Connector **X-FRNT_EH** pin V	Open circuit

    A. If the value is not correct, replace the harness between the connectors **X-BOA** and **X-FRNT_EH**.

    B. If the value is correct, replace the harness between the connectors **X-BTM_FEH** and **X-BTM_EH**.

Wiring harnesses - Electrical schematic sheet 22 (55.100)

518114-03 - Short to Power at Brake Line (declutch) Pressure Sensor

Control Module: UCM

Context:
The **A-UCM** detects a value from PEDAL/DECLTCH (B-PBL) out of higher limit.

Cause:
On pin 20 of connector **X-UCM1B** of **A-UCM**, the detected value is > **4.75 V**.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The PEDAL/DECLTCH (B-PBL) is damaged.

Solution:

1. Set Brake Line Pressure to 0 bar
   CCO disabled (clutches will be immediately engaged if declutch was active)
   Brake Light disabled (set error to SFB) Default position sensor to minimum value (0%)

   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 PEDAL/DECLTCH (B-PBL) integrity.

   The key must be in the OFF position.

   Remove the PEDAL/DECLTCH (B-PBL).

   Use a multimeter to perform the PBL check:

From	To	Value
Connector **X-PLB-PBD** pin B	Connector **X-PLB-PBD** pin A	Resistance

   A. If the resistance is an open circuit, replace the PEDAL/DECLTCH.

   B. If resistance value is correct, continue with Step **3**.
3. Move the cursor of the sensor and, by using a multimeter, perform the PBL check:

From	To	Value
Connector **X-PLB-PBD** pin B	Connector **X-PLB-PBD** pin C	Resistance changing

   A. If the value is a short circuit, replace the PEDAL/DECLTCH.

   B. If the resistance changes, replace the **A-UCM**.

Wiring harnesses - Electrical schematic sheet 19 (55.100)

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

Wiring harnesses - Electrical schematic sheet 20 (55.100)

518131-03 - Short to Power/Open Circuit at Boom Valve Low Side Driver

Control Module: UCM

Context:

The **A-UCM** detects a short circuit to power or an open circuit or a low current when drives a Boom Valve; as a consequence:

- Boom Function disabled;
- Open Boom LSD;
- Command Boom HSD PWM to **0%**;
- Disabled advanced EH features (RTT/Float, HC).

Cause:
The **A-UCM** detects, on pin 2 of connector **X-UCM1B**, a short circuit to power or an open circuit or a low current 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-BOOM_RAISE** and **X-BOOM_LOWER** is visually damaged.
3. The connector **X-UCM1B** is damaged.
4. The harness between **A-UCM** and the connectors **X-BOOM_RAISE** and **X-BOOM_LOWER** 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-UCM1B**, **X-BOOM_RAISE** and **X-BOOM_LOWER** 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-UCM1B**.

   Disconnect the connector **X-UCM1B** from the **A-UCM** and visually check the integrity of pin 2.

   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-BOOM_RAISE** and **X-BOOM_LOWER**.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM1B** pin 2	Ground	**0 V**

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

518134-04 - Short to Ground at Bucket Valve Low Side Driver

Control Module: UCM

Context:

The **A-UCM** detects a grounding connection when drives a Bucket Valve; 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 30 of connector **X-UCM1B**, 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-BUCKET_ROLL** and **X-BUCKET_DUMP** is visually damaged.
3. The connector **X-UCM1B** is damaged.
4. The harness between **A-UCM** and the connectors X-BOOM_ROLL and X-BOOM_DUMP 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-UCM1B**, **X-BUCKET_ROLL** 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-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 **4**.
4. Check the integrity of harness between the **A-UCM** and the connectors **X-BUCKET_ROLL** and **X-BUCKET_DUMP**.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM1B** pin 30	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 Bucket Roll Valve High Side Driver (see procedure **518132-04 – Short to Ground at Bucket Roll Valve High Side Driver**).

Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM3B** pin 33	Connector **X-UCM1B** pin 10	< + **24 V**

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

B. If the measurement is not correct, continue with Step **6**.

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

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

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

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

7. Check the integrity of harness between the connectors **X-BTM_EH** and **X-AUX_1_RIGHT**.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-BTM_EH** pin K	Connector **X-BTM_EH** pin J	< + **24 V**

   A. If the measurement is correct, replace the harness between connector **X-CAB_EH** and the **A-UCM**.

   B. If the measurement is not correct, continue with Step **8**.

8. Check the integrity of connectors **X-BTM_FEH** and **X-FRNT_EH**.

   Disconnect the connector **X-BTM_FEH** from the connector **X-FRNT_EH** and visually check the integrity of pins K and J 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 **9**.

9. Check the integrity of harness between the connector **X-FRNT_EH** and the connector **X-AUX_1_RIGHT**.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-FRNT_EH** pin K	Connector **X-FRNT_EH** pin J	< + **24 V**

   A. If the measurement is correct, replace the harness between connectors **X-BTM_EH** and **X-BTM_FEH**.

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

10. Check the integrity of connector **X-AUX_1_RIGHT**.

    Disconnect the connector **X-AUX_1_RIGHT** from the ELECTROHYDRAULIC VALVE (**A-EH_VLV**) and visually check the integrity of pins 1 and 2 of the connector.

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

    B. If the pins are not damaged, replace the AUX 1 RIGHT SOLENOID.

Wiring harnesses - Electrical schematic sheet 22 (55.100)

Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM4A** pin 13	Ground	Open circuit
Connector **X-UCM1A** pin 21	Ground	Open circuit

A. If the measurements are correct, replace the **A-UCM**.

B. If one measurement is not correct, continue with Step **6**.

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

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

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

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

7. Check the integrity of harness between the connectors **X-BTM_EH** and **X-AUX_2_RIGHT**.

Use a multimeter to perform the following check:

From	To	Value
Connector **X-BTM_EH** pin N	Ground	Open circuit
Connector **X-BTM_EH** pin M	Ground	Open circuit

A. If the measurements are correct, replace the harness between connector **X-CAB_EH** and the **A-UCM**.

B. If the measurement is not correct, continue with Step **8**.

8. Check the integrity of connectors **X-BTM_FEH** and **X-FRNT_EH**.

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

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

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

9. Check the integrity of harness between the connector **X-FRNT_EH** and the connector **X-AUX_2_RIGHT**.

Use a multimeter to perform the following check:

From	To	Value
Connector **X-FRNT_EH** pin N	Ground	Open circuit
Connector **X-FRNT_EH** pin M	Ground	Open circuit

A. If the measurements are correct, replace the harness between connectors **X-BTM_EH** and **X-BTM_FEH**.

B. If one measurement is correct, continue with Step **10**.

10. Check the integrity of connector **X-AUX_2_RIGHT**.

Disconnect the connector **X-AUX_2_RIGHT** from the ELECTROHYDRAULIC VALVE (**A-EH_VLV**) and visually check the integrity of pins 1 and 2 of the connector.

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

B. If the pins are not damaged, replace the AUX 2 RIGHT SOLENOID.

Wiring harnesses - Electrical schematic sheet 22 (55.100)

518145-04 - Short to Ground at Park Brake Low Side Driver

Control Module: UCM

Context:
The **A-UCM** detects a grounding from PARKING BRAKE SOLENOID (Y-Y_BP).

Cause:
The **A-UCM** detects on pin 22 of connector **X-UCM1A** a short circuit to ground.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and the PARKING BRAKE SOLENOID is damaged.
3. The PARKING BRAKE SOLENOID is damaged.
4. The connectors **X-BTM** and **X-CAB_B** are damaged.
5. The harness of connector **X-BTM** is damaged.
6. The harness of connector **X-CAB_B** is damaged.

Solution:

1. Set the key in OFF position.

   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 the **A-UCM** and the PARKING BRAKE SOLENOID.

   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 PARKING BRAKE SOLENOID integrity.

   Remove the PARKING BRAKE SOLENOID sensor.

   Use a multimeter to perform the resistance measurement of the solenoid.

   A. If the resistance is a short circuit, replace the PARKING BRAKE SOLENOID.

   B. If the resistance is not short circuit, continue with Step **4**.
4. Check the integrity of connectors **X-BTM** and **X-CAB_B**.

   Disconnect the connector **X-BTM** from the connector **X-CAB_B** and visually check the integrity of pins 18 and 19 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 **5**.
5. Check the integrity of harness of connector **X-BTM**.

   Use a multimeter to perform the following check:

518150-05 - Electrical Ignition Power Relay- Open Circuit

Control Module: SFB

Context:
Open circuit Electrical Ignition Power Relay.

Cause:
The Smart Fuse box measure an open circuit 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 Step **4**.
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 an open circuit 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:

518177-05 - Open Circuit at Pilot Enable Valve High Side Driver

Control Module: UCM

Context:

The **A-UCM**, driving the Pilot Enable Valve, detects an open circuit or a low current; as a consequence:

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

Cause:
The **A-UCM** detects, on pin 18 of connector **X-UCM3B**, an open circuit or a low current risen by BSP.

Possible failure modes:

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

Solution:

1. Verify that the fault is present and active.

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

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

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

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

   B. If the harness is not damaged, continue with Step **3**.
3. Check the integrity of connector **X-PILOT_ENABLE**.

   Disconnect the connector **X-PILOT_ENABLE** from the ELECTROHYDRAULIC VALVE (**A-EH_VLV**) and visually check the integrity of pins 1 and 2 of the connector.

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

   B. If the pins are not damaged, continue with Step **4**.
4. Check the integrity of connectors **X-BTM_FEH** and **X-FRNT_EH**.

   Disconnect the connector **X-BTM_FEH** from the connector **X-FRNT_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 **5**.

518289-31 - Error at 24VA Supply Rail

Control Module: UCM

Context:
The **A-UCM** detects the absence of the 24VA power supply; as a consequence the UCM disable all functions.

Cause:
The **A-UCM** detects, on pin 14 of connector **X-UCM1A**, a voltage < **10 V**.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and the LC5 is damaged.
3. The connectors **X-LC5** or **X-UCM1A** are damaged.
4. The harness between **A-UCM** and the connector **X-LC5** is damaged.
5. The fuse UCM (**F-5F2**) is burnt.
6. The harness between the LC5 and the power supply is damaged.

Solution:

1. Verify that the fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Visually check the integrity of the harness between the connectors **X-UCM1A** and **X-LC5** 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 14.

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

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

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM1A** pin 14	Ground	+ **10 V**

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

   B. If the voltage is not correct, continue with Step **5**.
5. Check the integrity of connector **X-LC5**.

   Disconnect the connector **X-LC5** from LC5 and visually check the integrity of pins 2A and 3B.

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

   B. If the pin is not damaged, continue with Step **6**.
6. Check the integrity of harness between the connectors **X-LC5** and **X-UCM1A**.

520333-19 - Keypad Source Address Cyclic Timeout

Control Module: UCM

Context:
The **A-UCM** does not receive messages from the Keypad Source Address within the maximum interval time; as a consequence use last keypad CAN message received.

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

Possible failure modes:

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

Solution:

1. Verify that the fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Visually check the integrity of the harness of busses CAN 1 (**X-UCM1B**).

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

   B. If the harness is not damaged, continue with Step **3**.
3. Visually check the integrity of the harness of busses CAN 2 (**X-UCM2B**).

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

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

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

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

   B. If pins are not damaged, continue with Step **5**.
5. Check the integrity of connector **X-UCM2B**.

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

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

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

Wiring harnesses - Electrical schematic sheet 22 (55.100)
Wiring harnesses - Electrical schematic sheet 24 (55.100)

5. Check the integrity of the **X-CAB_E-2** connector.

   The key must be in the OFF position.

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

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

   B. If the pin F is not damaged, continue with Step **6**.

6. Check the integrity of the Smart Fuse Box connector.

   The key must be in the OFF position.

   Disconnect **X-X4** connector and visually check the integrity of the pin 17.

   A. If the pin 17 is damaged, replace the **X-X4** connector.

   B. If the pin 17 is not damaged, continue with Step **7**.

7. Check the Battery Isolator signal circuit for a short key battery power condition.

   The key must be in the OFF position.

   Use a multimeter to perform the following voltage check:

From	To	Value
Connector **X-ISO** pin 2	Chassis ground	There should be an open circuit

   A. If there is a short circuit to GND, replace the Battery Isolator relay.

   B. If there is an open circuit, continue to Step **8**.

8. Check the signal circuit for a short key battery power condition on the harness between Battery Isolator and **X-ENG-2** connector.

   The key must be in the OFF position.

   Use a multimeter to perform the following voltage check:

From	To	Value
Connector **X-ENG-2** pin F	Chassis ground	There should be an open circuit

   A. If there is a Short Circuit to GND, replace the harness.

   B. If there is an open circuit, continue to Step **9**.

9. Check the signal circuit for a short key battery power condition on the harness between Smart Fuse Box and **X-CAB_E-2** connector.

   The key must be in the OFF position.

   Use a multimeter to perform the following voltage check:

From	To	Value
Connector **X-X4** pin 17	Chassis ground	There should be an open circuit

   A. If there is a Short Circuit to GND, replace the harness.

   B. If there is not voltage, continue to Step **10**.

10. Check the Smart Fuse Box signal circuit for a short key battery power condition.

    The key must be in the OFF position.

    Use a multimeter to perform the following voltage check:

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)

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

B. If the fuse is not damaged, continue with Step **6**.

6. Check the Battery K Isolator.

   The key must be in the OFF position.

   Use a multimeter to perform the following voltage check:

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

   A. Verify the Battery K Isolator Power supply (pin X-D).

   B. If Battery K Isolator is right functioning, replace the Smart Fuse Box.

Wiring harnesses - Electrical schematic sheet 03 (55.100)
Wiring harnesses - Electrical schematic sheet 04 (55.100)
Wiring harnesses - Electrical schematic sheet 06 (55.100)

From	To	Value
X-CAB_AR (Plug) pin 3	Chassis ground	There should be no continuity
X-CAB_AR (Plug) pin 4	Chassis ground	There should be no continuity

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

B. If there is no continuity, continue with Step **10**.

10. Check the CAN2 bus for a short circuit condition.

    The key must be in the OFF position.

    Use a multimeter to perform the following continuity checks:

From	To	Value
X-UCM2B (Receptacle) pin 10	**X-CAB_AR (Plug) pin 3**	There should be no continuity
X-UCM2B (Receptacle) pin 1	**X-CAB_AR (Plug) pin 4**	There should be no continuity
X-UCM2B (Receptacle) pin 10	**X-CAB_AR (Plug) pin 2**	There should be no continuity
X-UCM2B (Receptacle) pin 1	**X-CAB_AR (Plug) pin 2**	There should be no continuity

A. If there is continuity, there is a short circuit condition. Locate the fault and repair the conductor.

B. If there is no continuity, continue with Step **11**.

11. Check the right hand joystick **SW-RH_JS** ground connection.

    The key must be in the OFF position.

    Use a multimeter to perform the following continuity check:

From	To	Value
X-CAB_AR (Plug) pin 2	Chassis ground	There should be continuity

A. If there is no continuity, there is an open circuit. Locate the fault and repair the conductor.

B. If there is continuity, continue with Step **12**.

12. Check the right hand joystick **SW-RH_JS** power supply connection.

    The key must be in the OFF position.

    Use a multimeter to perform the following continuity check:

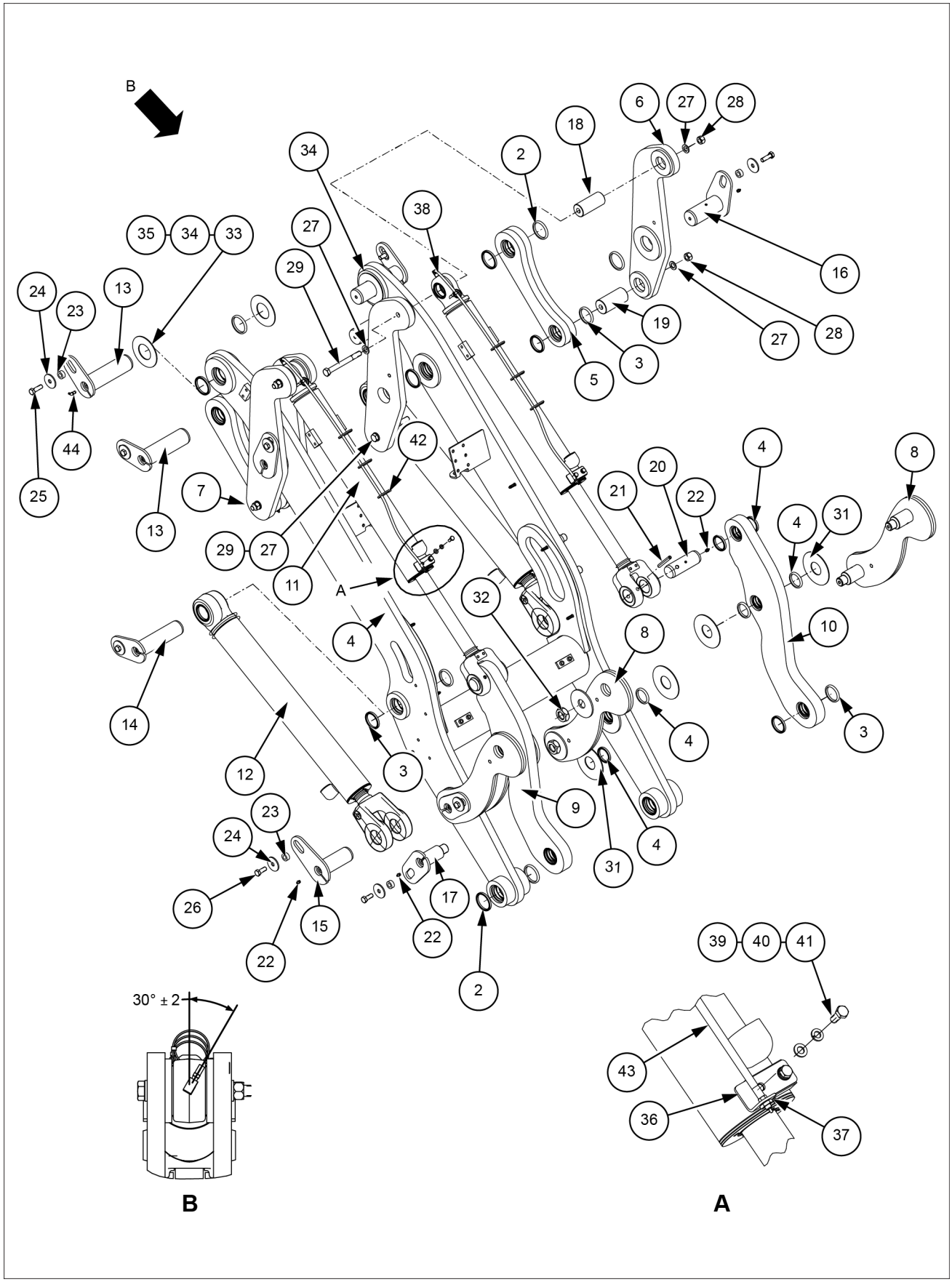
From	To	Value
X-CAB_AR (Plug) pin 1	**X-LC5** pin 6A	There should be continuity

A. If there is no continuity, there is an open circuit. Locate the fault and repair the conductor.

B. If there is continuity, check the UCM and replace if necessary. Then erase the fault and continue operation.

Wiring harnesses - Electrical schematic sheet 10 (55.100)
Wiring harnesses - Electrical schematic sheet 13 (55.100)
Wiring harnesses - Electrical schematic sheet 23 (55.100)
Wiring harnesses - Electrical schematic sheet 24 (55.100)

XT version



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