SERVICE MANUAL

W110D
Stage IV
Wheel Loader

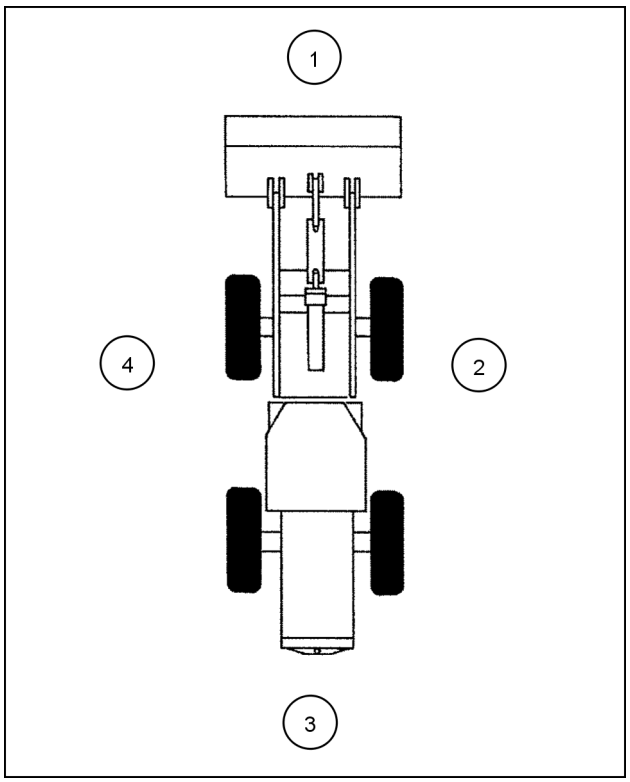
Part number 51428226
English
November 2017

NEW HOLLAND CONSTRUCTION

Product identification

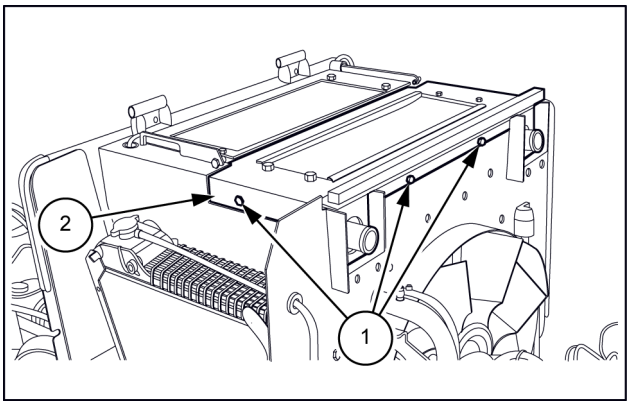
The terms right-hand, left-hand, front, and rear are used in this manual to indicate the sides as they are seen from the operator's seat.

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



RCPH10WHL003BAH 1

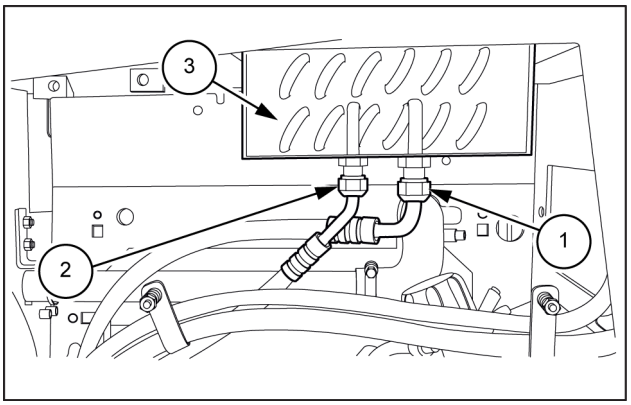
75. Remove the bolts **(1)**, the washers, and the nuts. Remove the bracket **(2)** and the intercooler from the rear plate of the cooling system frame as an assembly.



LEIL15WHL0294AB 69

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

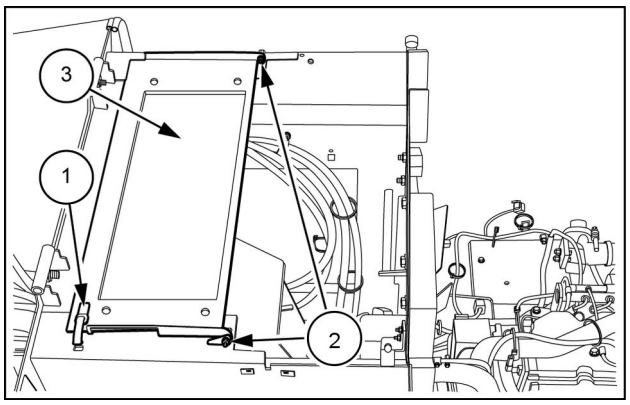
NOTE: *pay attention to drain the refrigerant* ***R134A****.*



LEIL15WHL0296AB 70

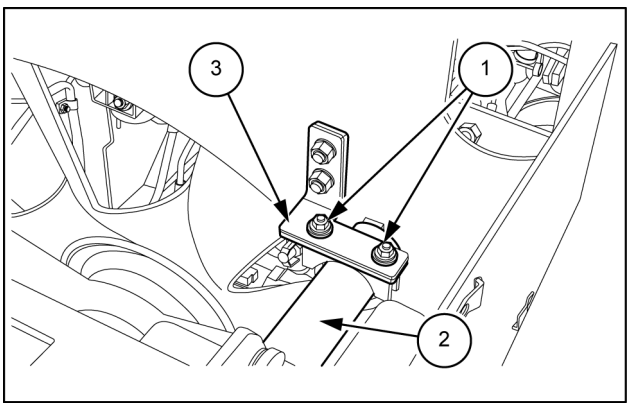
77. Unlatch the air conditioning condenser clamp **(1)**.

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



LEIL15WHL0295AB 71

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



LEIL15WHL0293AB 72

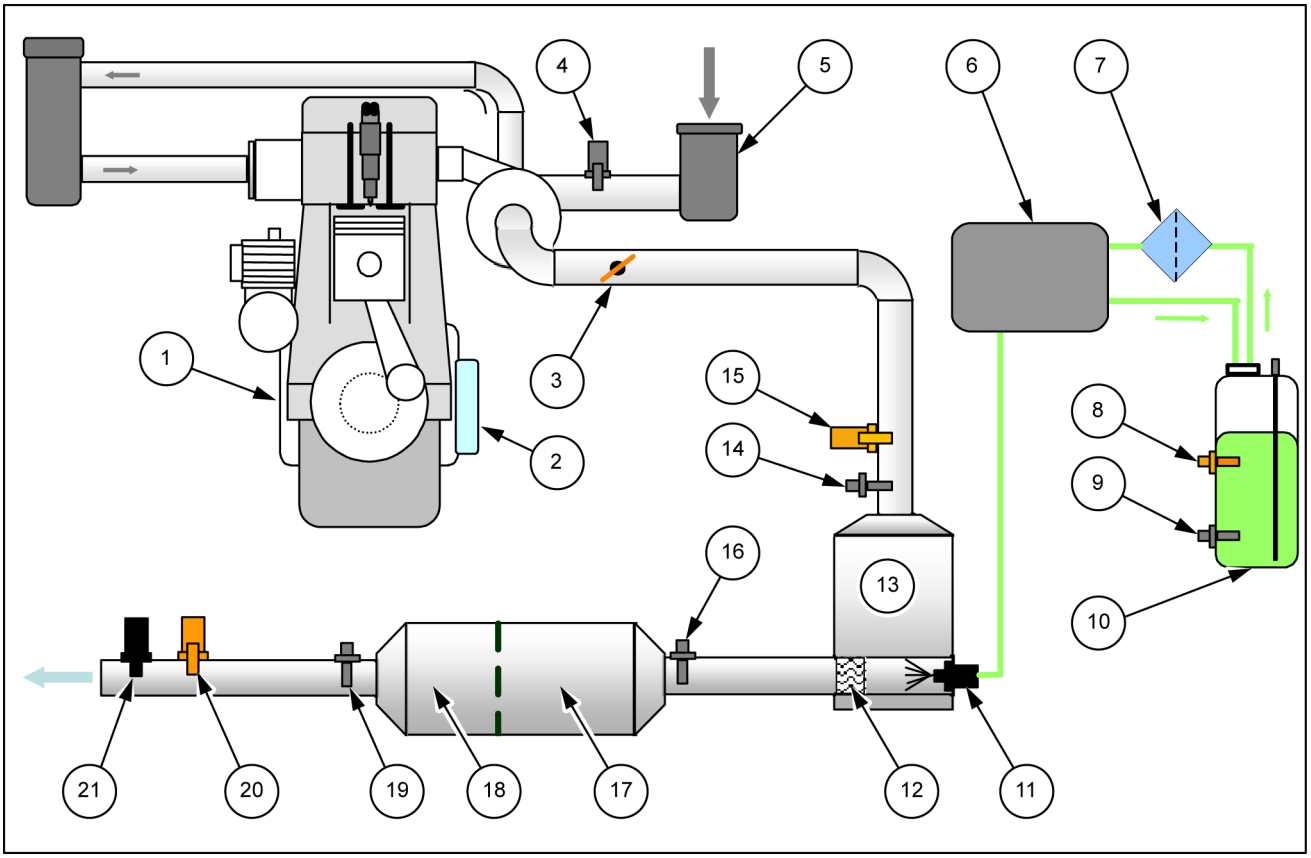
Index

Engine - 10

Engine and crankcase - 001

Control System Sensors

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

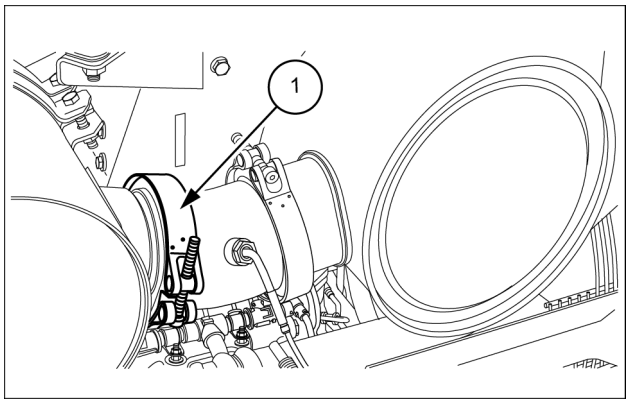


LEIL13WHL0189FB 10

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

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

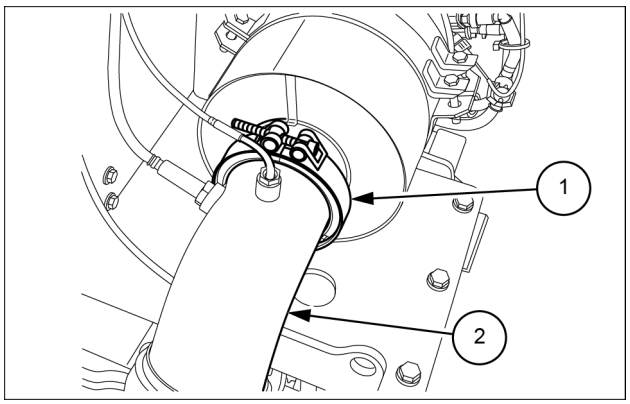
NOTE: *gasket and clamp should be replaced every time the connection is disassembled.*



LEIL15WHL0321AB 4

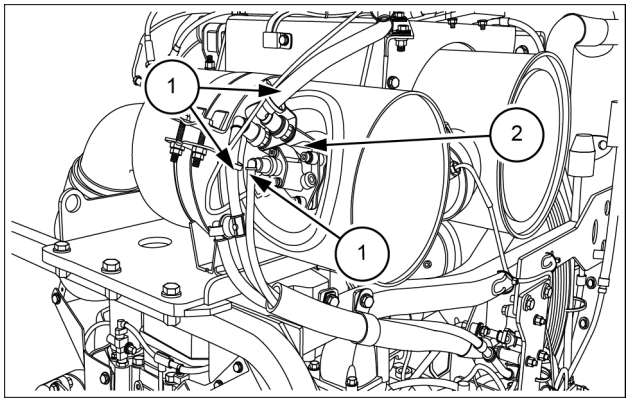
5. Loosen the clamp **(1)** on the Diesel Oxidation Catalyst (DOC) and disconnect the exhaust pipe **(2)** from the Diesel Oxidation Catalyst (DOC). Discard the clamp and the gasket.

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



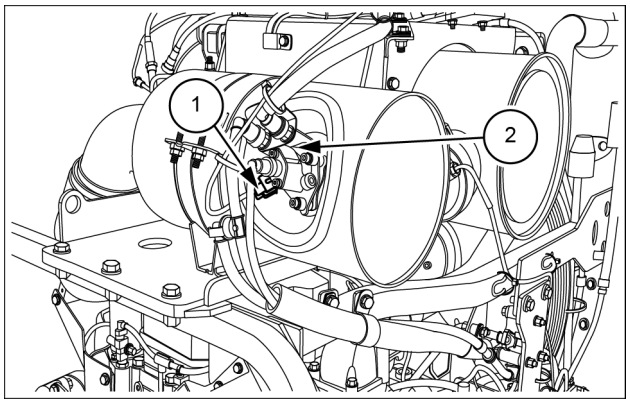
LEIL15WHL0322AB 5

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



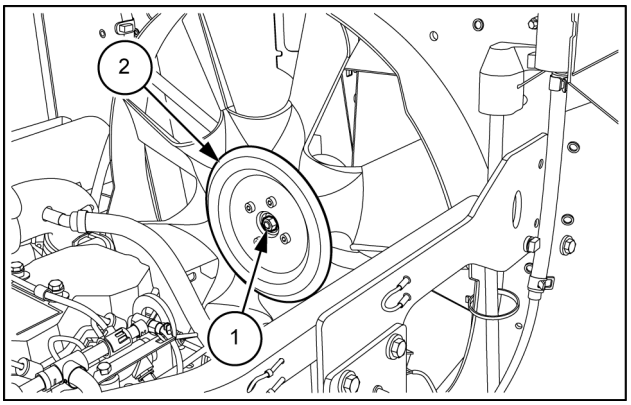
LEIL15WHL0323AB 6

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



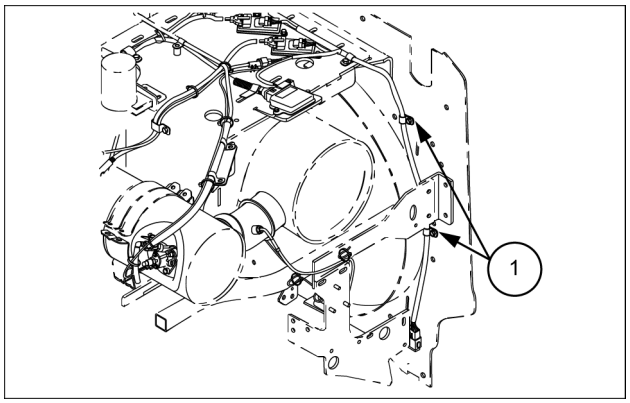
LEIL15WHL0176AB 7

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



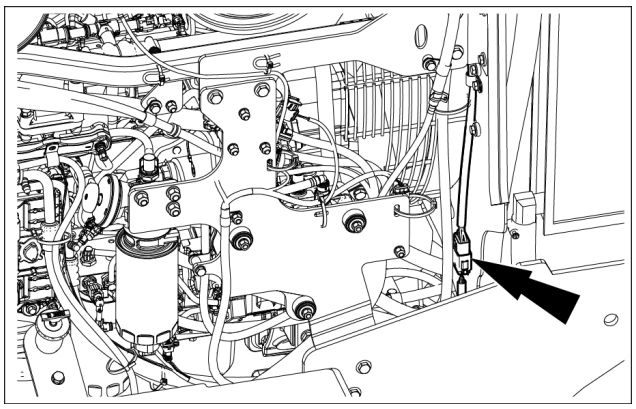
LEIL15WHL1424AB 8

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



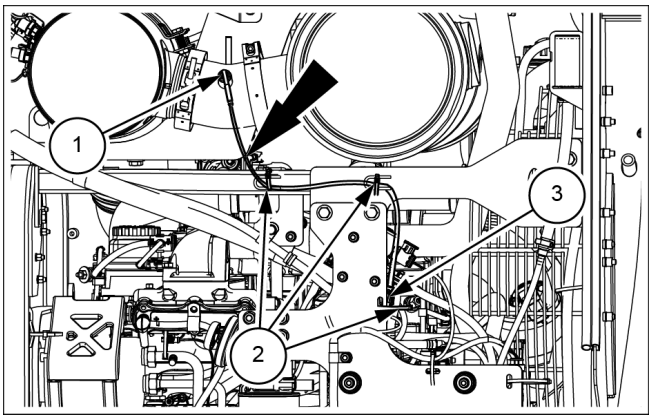
LEIL15WHL0272AB 9

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



LEIL16WHL1347AB 10

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



LEIL16WHL1348AB 11

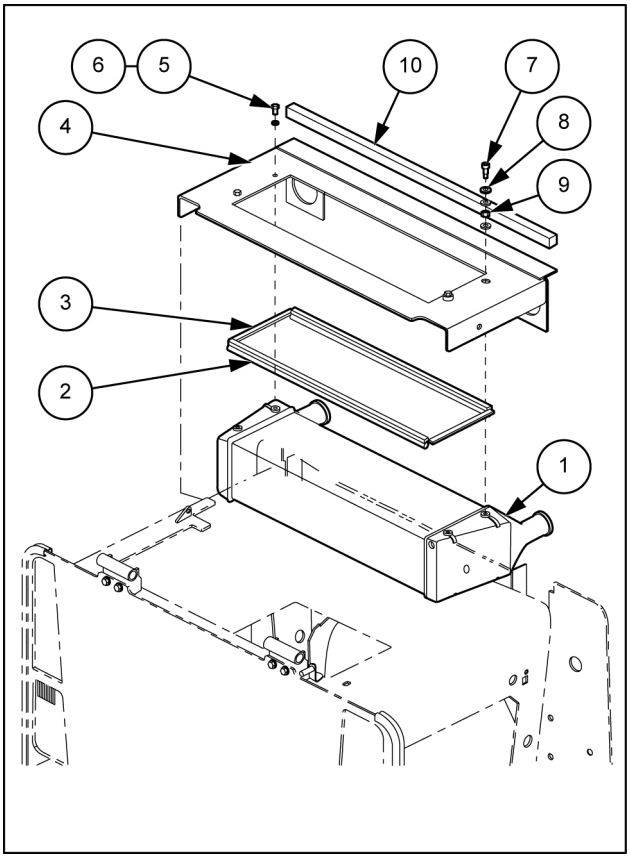
Aftercooler - Install

⚠ WARNING

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

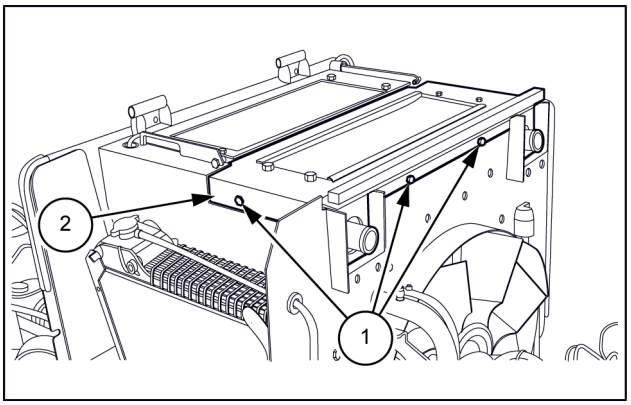
W0398A

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



LEIL15WHL1426BB 1

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



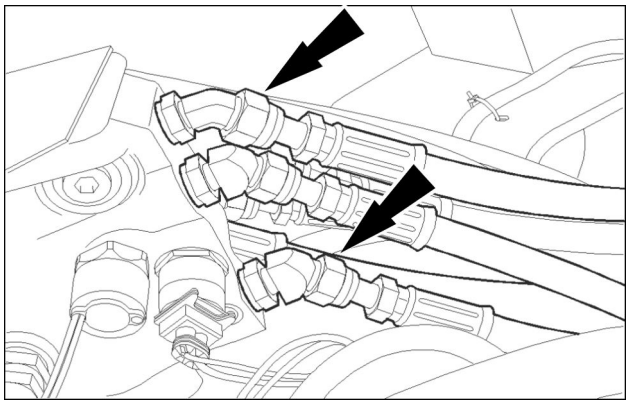
LEIL15WHL0294AB 2

Powershift transmission - Remove

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

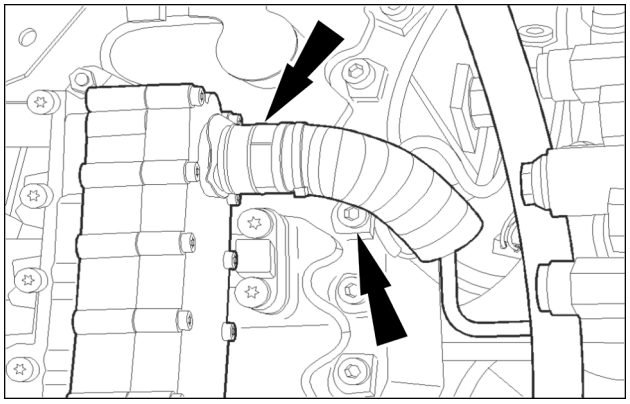
NOTE: *follow local regulations when handling transmission oil.*

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



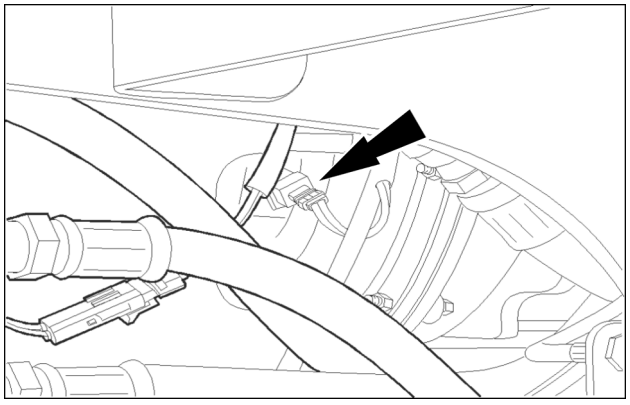
RAPH12WEL1948AA 1

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



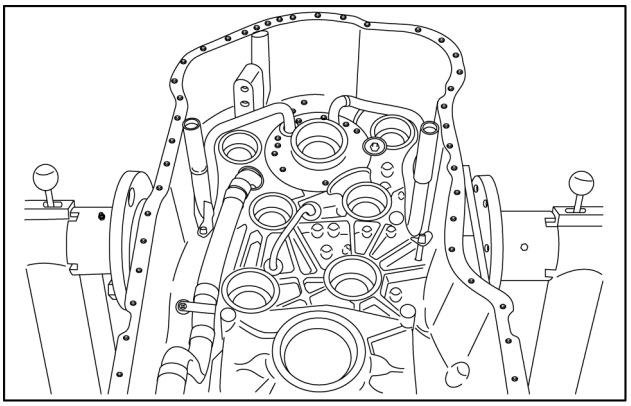
RAPH12WEL1952AA 2

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



RAPH12WEL1954AA 3

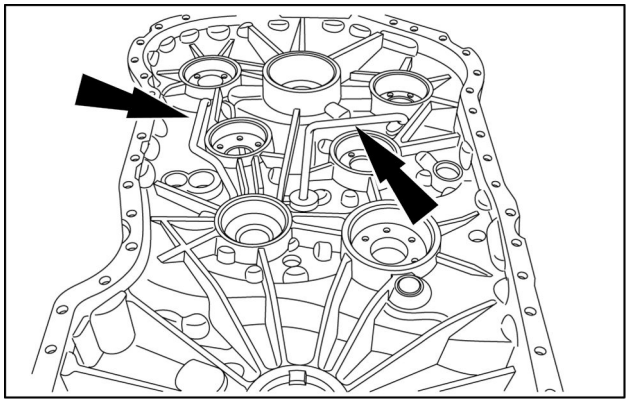
5. Install all the bearing outer races in the housing bores.



RAPH12WEL2026AA 4

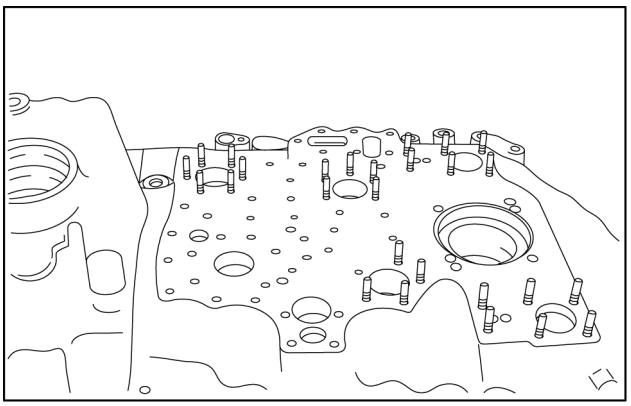
6. Install both of the oil pipes into the housing cover. Tilt the cover **180°**. Use a rolling tool to install the pipes into the housing bores.

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



RAPH12WEL2027AA 5

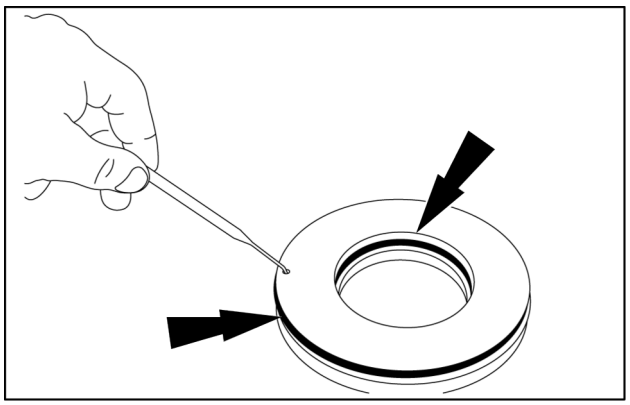
7. Install the studs. Torque the studs to **9 N·m** (**80 lb in**).



RAPH12WEL2028AA 6

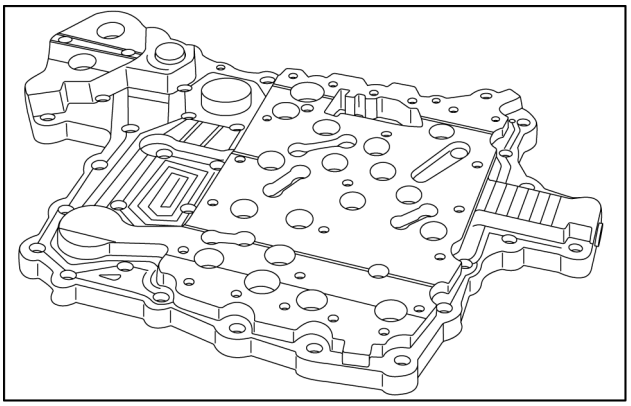
NOTE: *the following steps are for the assembly of clutches KV and KR, beginning with the assembly of the clutch disc carrier.*

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



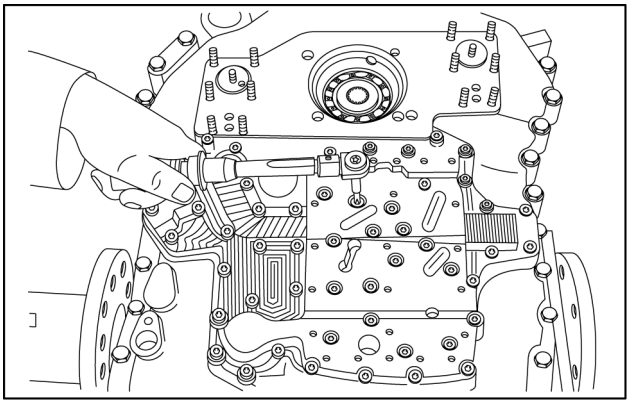
RAPH12WEL2029AA 7

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



RAPH12WEL2104AA 108

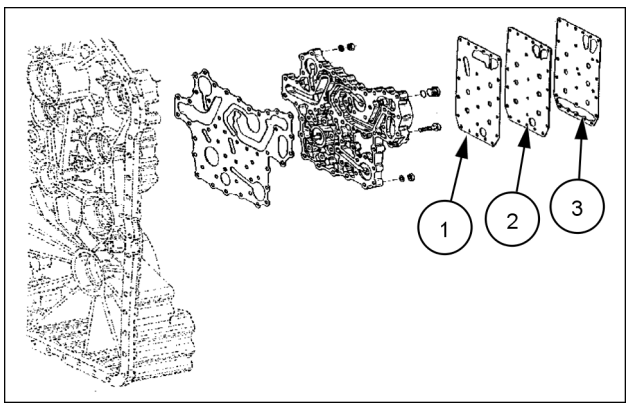
117. Install the gasket. Place the duct plate against the shoulder. Install the socket head screws and hex nuts. Torque the screws to **25 N·m** (**18 lb ft**).



RAPH12WEL2105AA 109

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

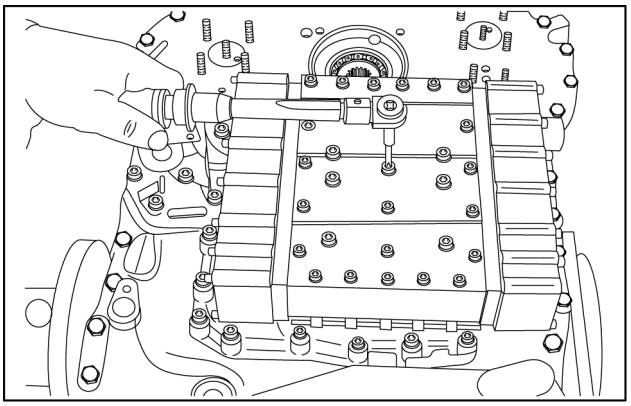
118. Install **380001577** transmission valve adjustment tool set. Be sure the hex rods (tool set component) are not installed on the studs. Mount the gasket **(1)**, intermediate plate **(2)**, and gasket **(3)**.



RAPH12WEL1999AA 110

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

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

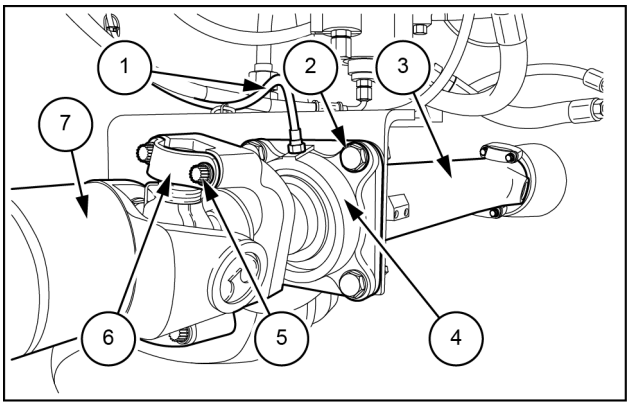


RAPH12WEL2106AA 111

Contents

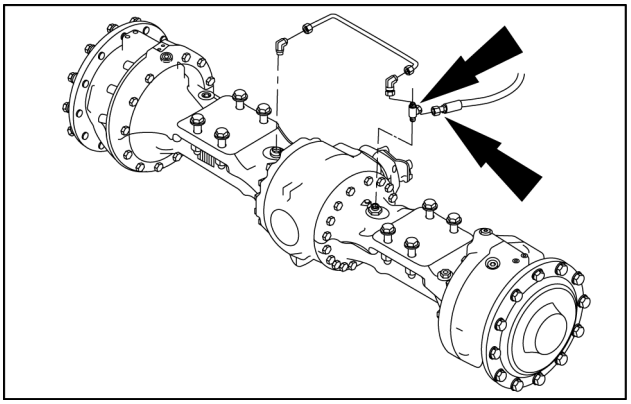
Four-Wheel Drive (4WD) system - 23

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



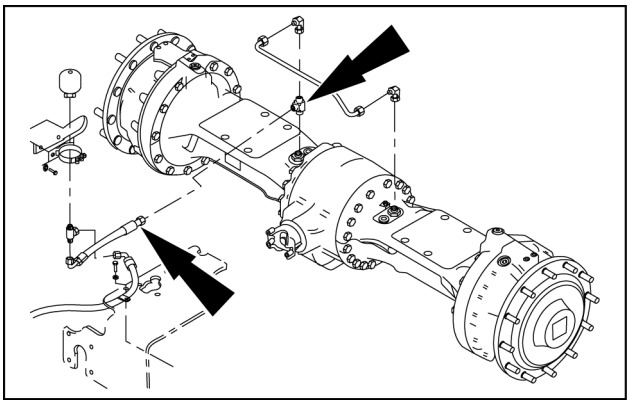
LEIL13WHL0572AB 4

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



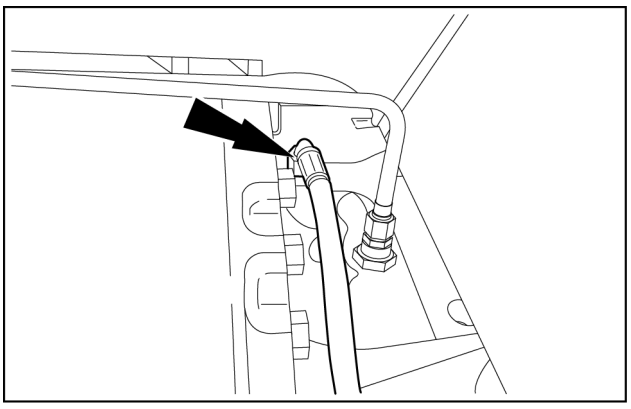
LEIL15WHL1232AA 5

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



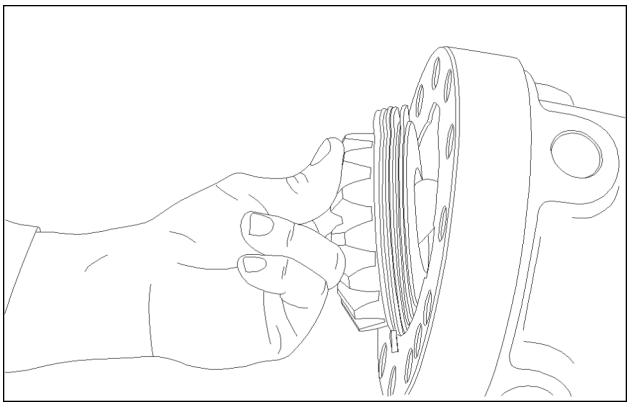
LEIL15WHL1233AA 6

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

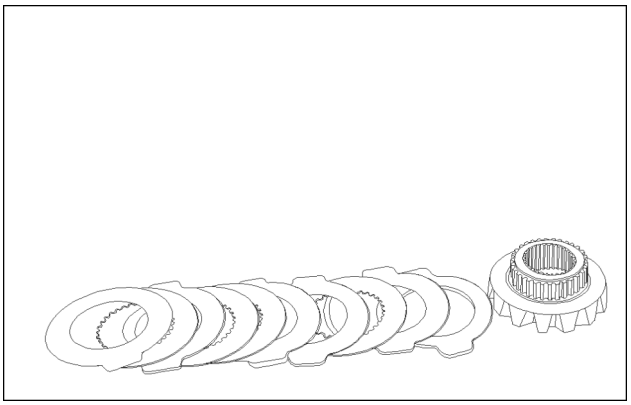


LEIL13WHL0570AB 7

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

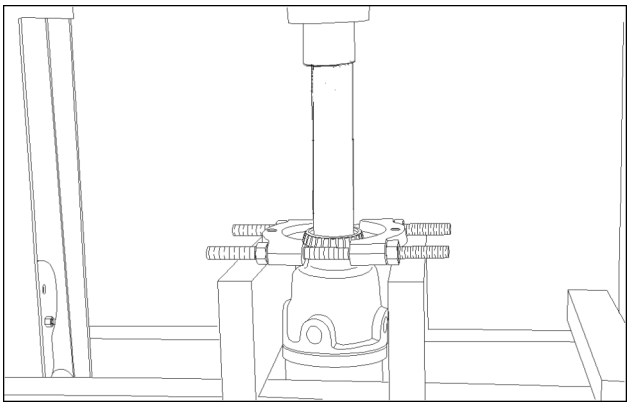


RAPH12WEL2287AA 13



RAPH12WEL2277AA 14

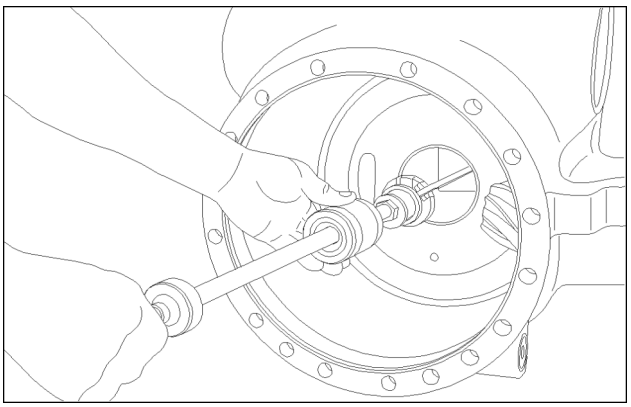
11. If required, use a suitable pliers and press to remove the bearing from the differential housing.



RAPH12WEL2269AA 15

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

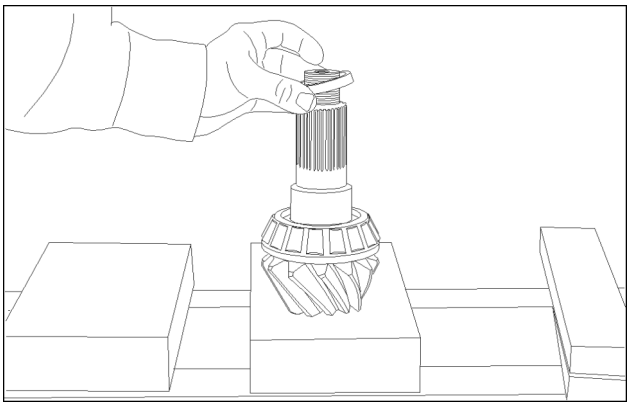
NOTE: *Ensure shims are identified and remain associated with the axle housing they were removed from.*



RAPH12WEL2193AA 16

Differential - Adjust - Bearing Rolling Torque

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



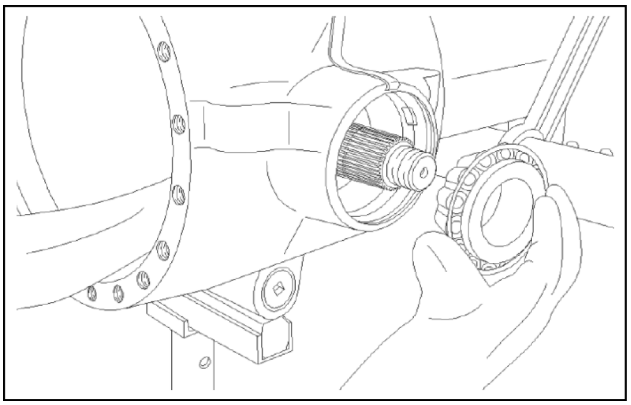
RAPH12WEL2320AA 1

2. **⚠ CAUTION**

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

   C0047A

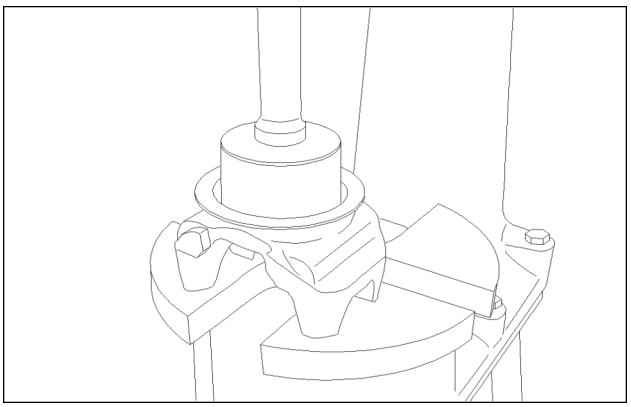
   Heat the pinion shaft outer bearing to **120 °C** (**248 °F**) in a bearing oven. Install the bearing on the pinion shaft until contact is made.



LEIL15WHL1266AA 2

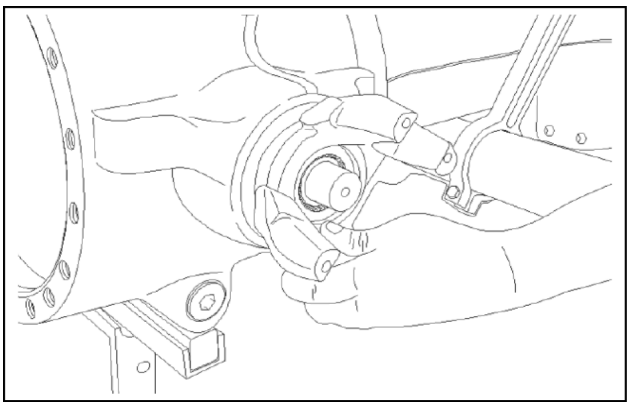
NOTE: *allow the bearing to cool to ambient temperature before mounting the input flange and tightening the nut.*

3. Press the dust shield on the input flange.



RAPH12WEL2200AA 3

4. Install the input flange on the pinion shaft.



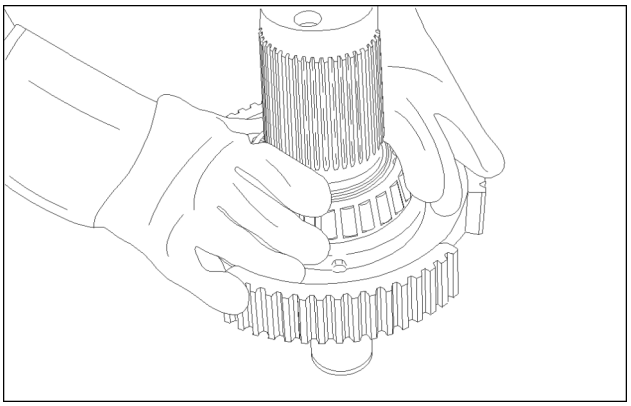
LEIL15WHL1267AA 4

22. **⚠ CAUTION**

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

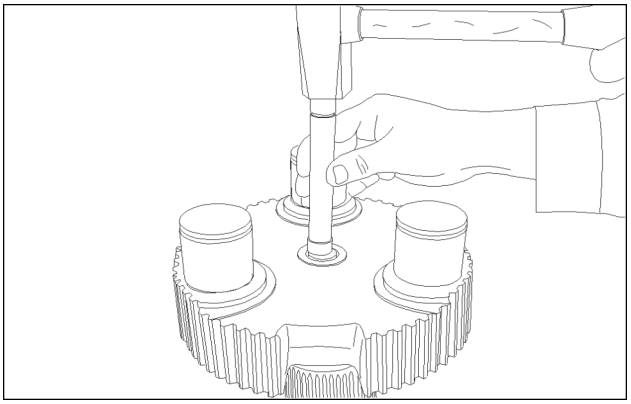
C0047A

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



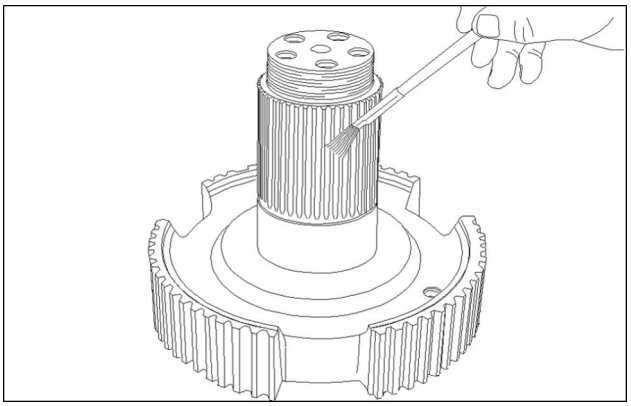
RAPH12WEL2232AA 25

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



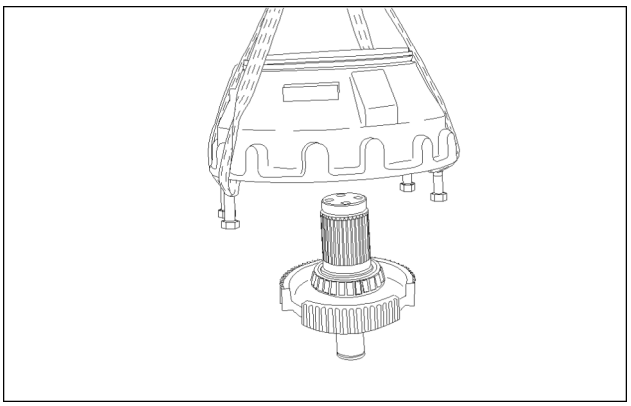
RAPH12WEL2183AA 26

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



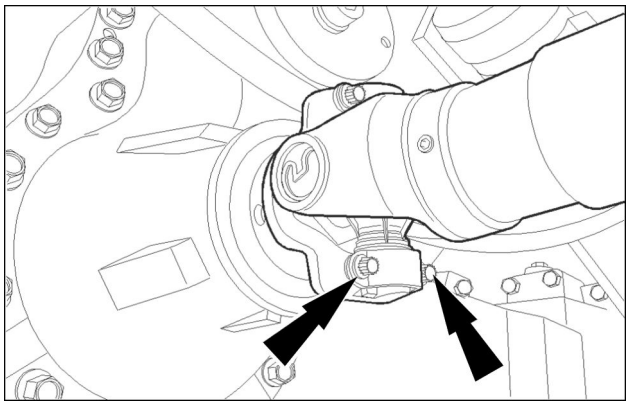
RAPH12WEL2336AA 27

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



RAPH12WEL2260AA 28

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

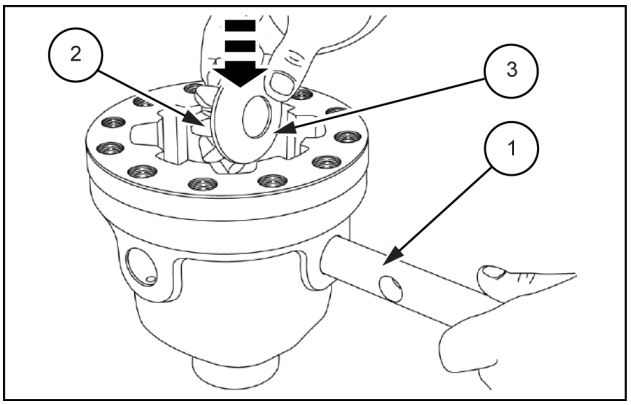


RAPH12WEL1973AA 13

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

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

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

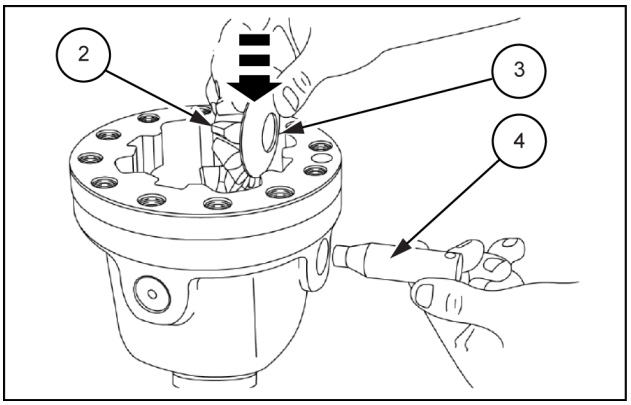


LEIL15WHL1269AB 5

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

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

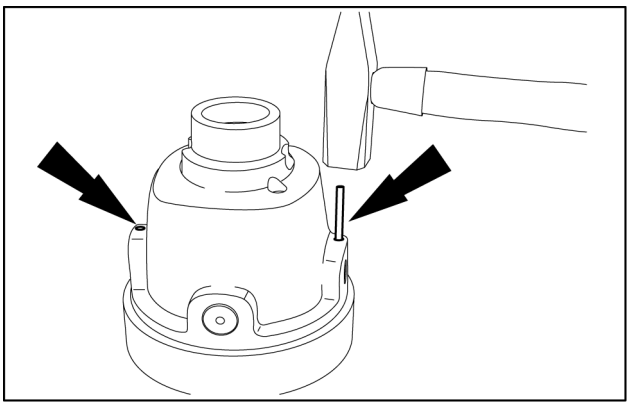
NOTE: *refer to illustration for the correct installation position of the spider shaft/halves, specifically the slotted pin/location holes of the spider shaft towards the differential carrier.*



LEIL15WHL1270AB 6

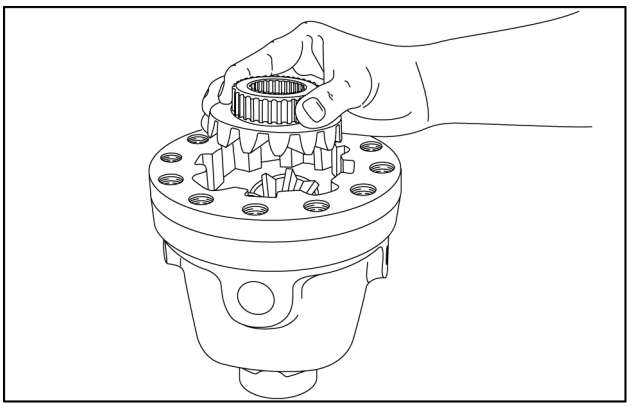
7. Secure the spider shaft half using the double-slotted pins as illustrated.

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



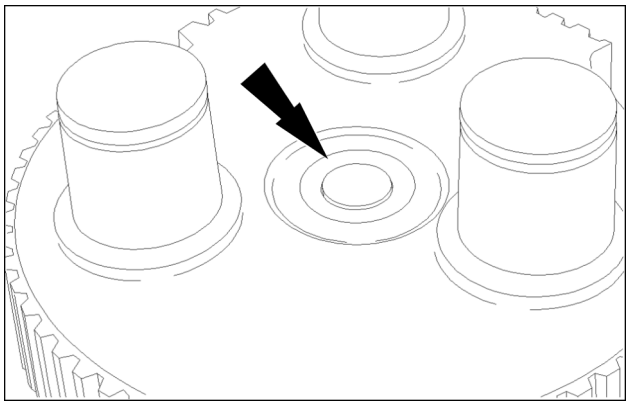
RAPH12WEL2371AA 7

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

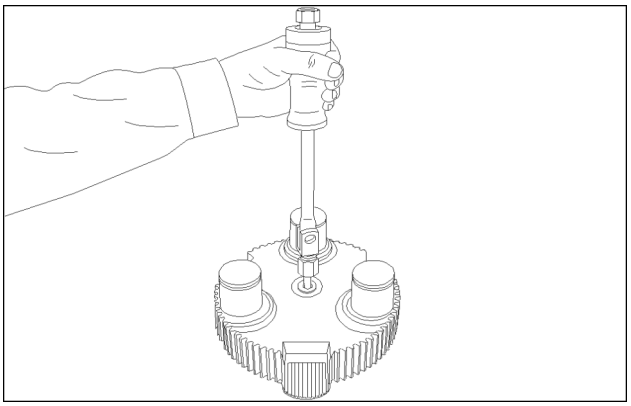


RAPH12WEL2372AA 8

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

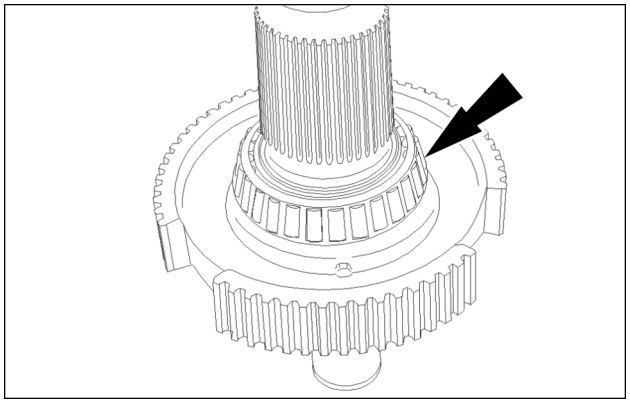


RAPH12WEL2230AA 20



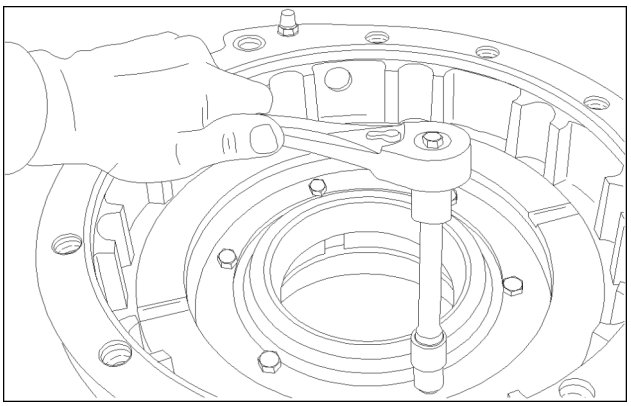
RAPH12WEL2806AA 21

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



RAPH12WEL2231AA 22

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



RAPH12WEL2233AA 23

CNH Industrial Italia S.p.A. viale delle Nazioni, 55 Modena Italy 41122

SERVICE - Technical Publications & Tools

PRINTED IN ITALY

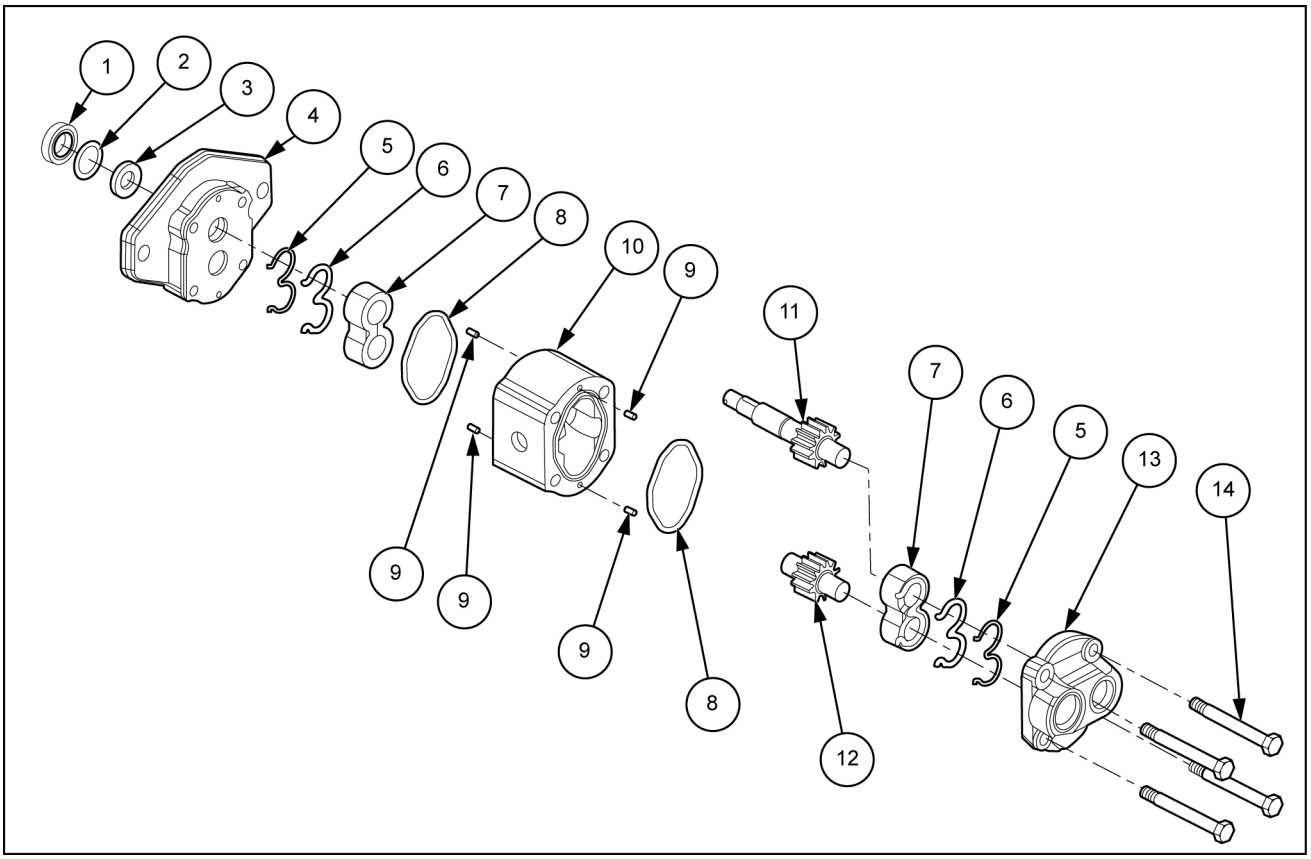
CNH Industrial Italia S.p.A reserves the right to make improvements in design and changes in specifications at any time without notice and without incurring any obligation to install them on units previously sold. Specifications, descriptions, and illustrative material herein are as accurate as known at the time of publication, but are subject to change without notice.

Availability of some models and equipment builds varies according to the country in which the equipment is being used. For exact information about any particular product, please consult your NEW HOLLAND CONSTRUCTION dealer.

NEW HOLLAND CONSTRUCTION is a trademark registered in the United States and many other countries, owned or licensed to CNH Industrial N.V., its subsidiaries or affiliates.

Any trademarks referred to herein, in association with goods and/or services of companies, other than owned by or licensed to CNH Industrial N.V., its subsidiaries or affiliates, are the property of those respective companies.

Brake pump - Disassemble



LEIL15WHL1560FB 1

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

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

Index

Brakes and controls - 33

Hydraulic service brakes - 202

Each of the hydraulic pumps are controlled by a compensator. Each of the compensators have two spools. The flow regulator spools (**(33A) (34A)**) control the output flow of each pump. The pressure regulator spools (**(33B) (34B)**) control the maximum pressure that the pumps are capable of delivering. In the wheel loader hydraulic system, these valves are adjusted higher than the maximum pressure in any of the circuits. Because of this higher adjustment, the pressure regulator spools do not function. If one or both of these pressure regulator spools are adjusted too low, the specified steering or loader relief valve pressures might not be able to be reached.

The priority flow divider **(35)** has many functions which require numerous components. The components of the steering priority flow divider consists of the following components:

- Steering priority spool **(35A)**
- Load sense shuttle check valve **(35B)**
- Second pump isolation check valve **(35C)**
- Differential pressure relief valve **(35D)**
- Steering relief valve **(35E)**

Steering is more critical to the operation of the machine so the steering priority spool **(35A)** is in the circuit to provide oil to the steering control valve **(24)** first. The priority spool **(35A)** is spring loaded to send all of the oil that the steering system requires. Between the steering priority valve **(35)** and the steering orbitrol control valve **(24)**, the oil flows through the steering isolation check valve **(24A)**. Once the steering circuit **(24)** is satisfied, all of the excess supply oil then becomes available to the loader hydraulic system.

Both PFC pumps (**(33) (34)**) require a load sense (LS) signal from the either the steering or loader systems, whichever requires a higher pressure. The PFC pumps do not deliver flow until a command LS signal is received, Once a load sense (LS) signal is received, the PFC pumps deliver as much flow as is required to satisfy the required LS pressure. The LS signals from both the steering control system and the loader system are connected to the steering priority valve. The LS signal shuttle check valve **(35B)** shifts away from the highest LS signal towards the lower LS signal. The higher LS signal is then sent to the flow regulator spools of both of the PFC pumps. The higher pressure adjustment of the first pump flow regulator **(34A)** causes that pump to begin to deliver flow first. The flow regulator pressure of the first pump **(34A)** must be adjusted to specification. The adjustment of the flow regulator pressure of second pump **(33A)** is lower than the first pump. If one compensator is adjusted, the opposite compensator must also be checked and adjusted. The first pump flow regulator pressure must **3 – 4 bar** (**44 – 58 psi**) higher than the adjustment of the second pump flow regulator. It is preferable to use the same gauge to make both of these adjustments.

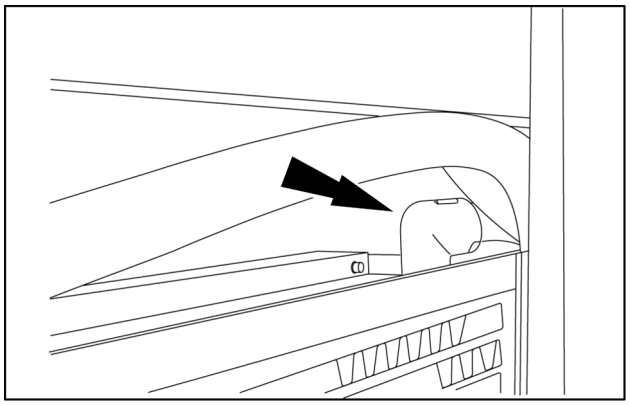
The second pump isolation check valve **(35C)** prevents pressurizing the second pump **(33)** from the outlet of the first pump **(34)**. Until the first pump **(34)** reaches full delivery, the second pump **(33)** is idling. The isolation valve **(35C)** protects the second pump **(33)**.

If the PFC pump control system malfunctions the pumps might deliver more flow than the hydraulic systems require, causing excessive pressure at the pump outlet. A differential pressure relief valve **(35D)** is installed in the steering priority valve limits this excessive pressure. The differential pressure relief **(35D)** provides a connection between the PFC pump outlet flow and tank. The differential pressure relief valve is spring biased to the closed position. Pump outlet pressure is ported to the non spring end of differential pressure relief valve spool. Load sense (LS) pressure is ported to the spring end of the spool. The differential pressure relief opens when the pump outlet pressure is about **40 bar** (**580 psi**) higher than load sense (LS) pressure.

The maximum steering pressure is lower than the maximum loader pressure. To limit this pressure in the steering system, a steering pressure relief valve **(35E)** is connected between the steering LS signal **(35B)** in the steering priority valve **(35)** and tank. This steering relief valve **(35E)** limits the maximum LS signal from the steering system and hence limits the maximum steering pressure. The maximum pressure in the loader circuit is regulated by the loader relief LS control valve located in the loader valve.

If only one of the complete steering or all of the loader circuits are malfunctioning, a quick check is to operate both steering and loader at the same time. If both systems then operate, the PFC pumps should be OK. If only one circuit of the loader valve malfunctions, the problem is in the loader valve only. If either the steering or all of the loader circuits malfunction and both systems function when operated at the same time. A possible problem is then the shuttle check valve **(35B)** in the steering priority valve **(35)**.

7. Raise the oil cooler and disconnect the hose from the bottom of the oil cooler. Install a plug in the hose. Install a cap on the fitting. Remove the oil cooler from the machine.



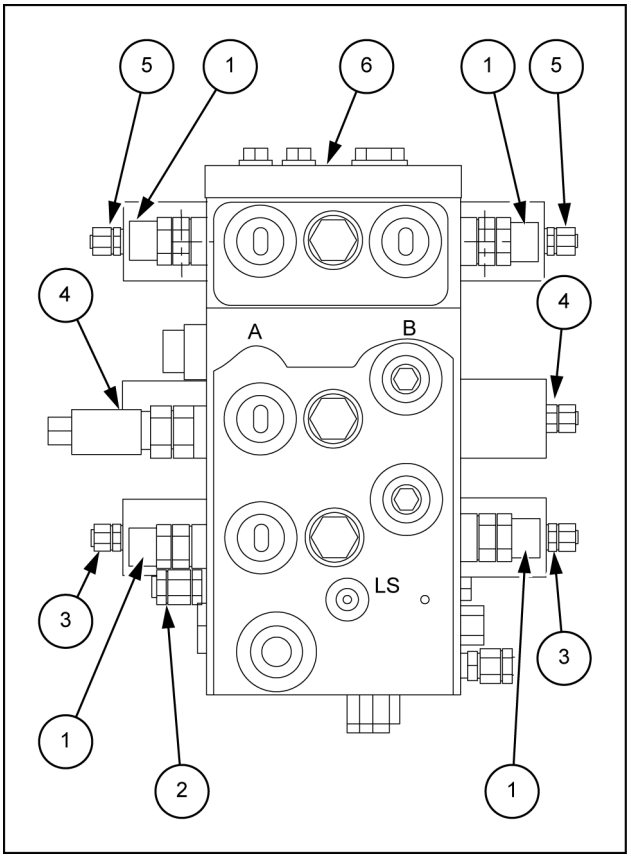
RAPH12WEL2599AA 4

Main control valve - Service instruction - Testing and adjusting the circuit relief valves

Pressure check

NOTE: *this procedure is related to 3 spool main control valve, but it is valid also for the 2 spool main control valve and for 4 spool main control valve.*

1. Circuit relief valves are located as shown beside.
    1. Circuit relief valves
    2. Main relief valve
    3. Bucket spool
    4. Lift spool
    5. Auxiliary spool
    6. Main control valve
2. Raise the lift arms and install the safety strut on the lift arm cylinder.
3. Loosen and remove the bolts and washers that fasten the access cover plate for the main control valve. Remove the cover plate.
4. Connect the hand pump **5870 287 007** to the disconnected line that goes to the main control valve.
5. 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**).
6. 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.
7. Compare the reading to the specifications.
8. If the pressure is not correct, adjust the circuit relief valve.
9. Install the access cover.
10. Remove the safety strut and lower the bucket to the ground. Shut off the engine. Find an easy place to disconnect the line for the circuit to be tested.



LEIL14WHL0435BB 1

Adjustment

1. Loosen the lock nut. Turn the adjustment screw clockwise to increase the pressure or counterclockwise to decrease the pressure.

NOTE: *one turn of the adjusting screw will change the pressure approximately* ***138 bar (2001 psi)****.*

2. Check the pressure again. Repeat the adjustment as necessary.

Contents

Hydraulic systems - 35

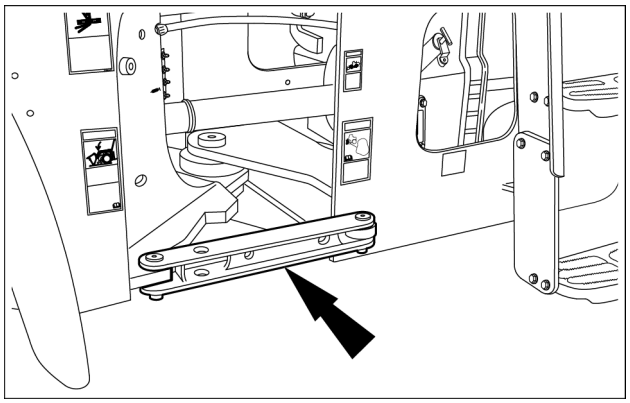
Remote control valves - 204

SERVICE

Front loader arm hydraulic system - Service instruction - Testing and adjusting the loader limit pressure

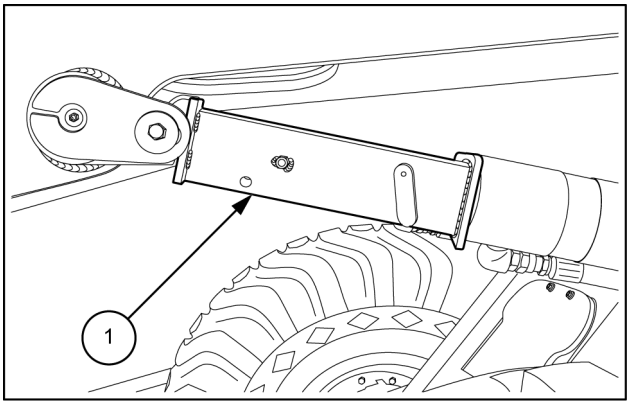
Pressure check

1. Install the articulation lock.



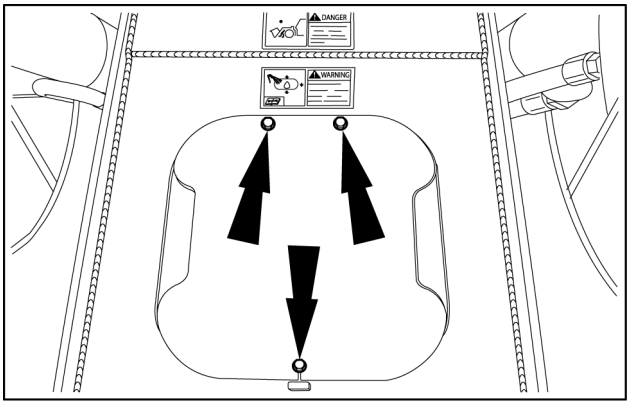
LEIL16WHL0048AB 1

2. Raise the loader arms and install the safety link **(1)**.



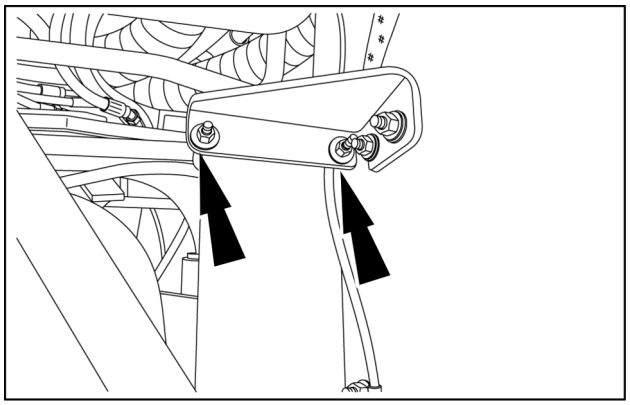
LEIL13WHL1231AB 2

3. Loosen and remove the bolts and washers that fasten the access cover plate for the main control valve. Remove the cover plate.



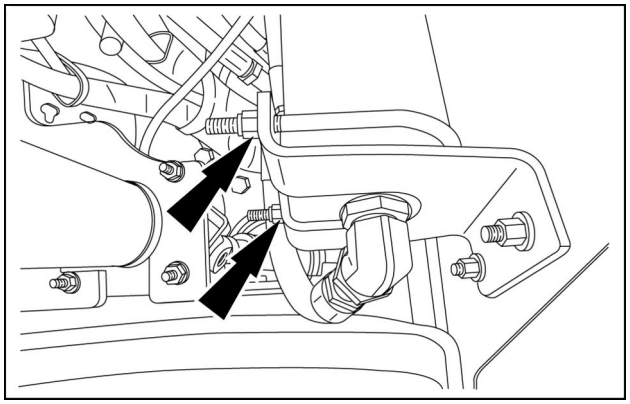
LEIL13WHL1246AB 3

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



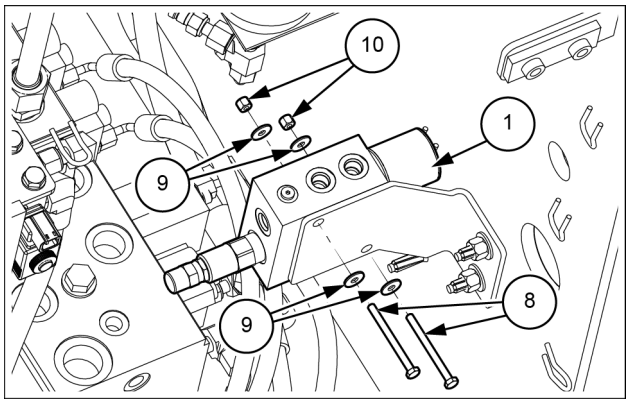
RAPH12WEL2622AA 4

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.



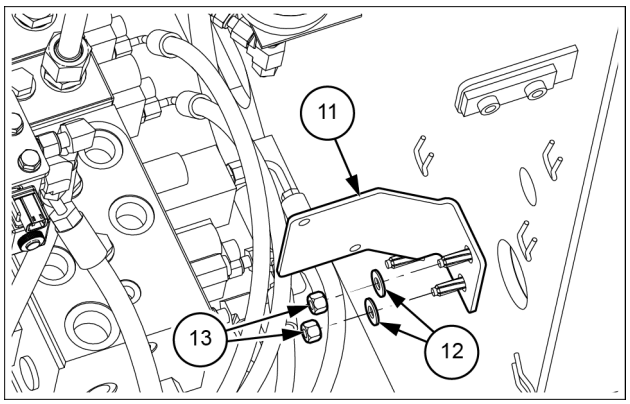
RAPH12WEL2621AA 5

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

Auxiliary steering priority valve - General specification

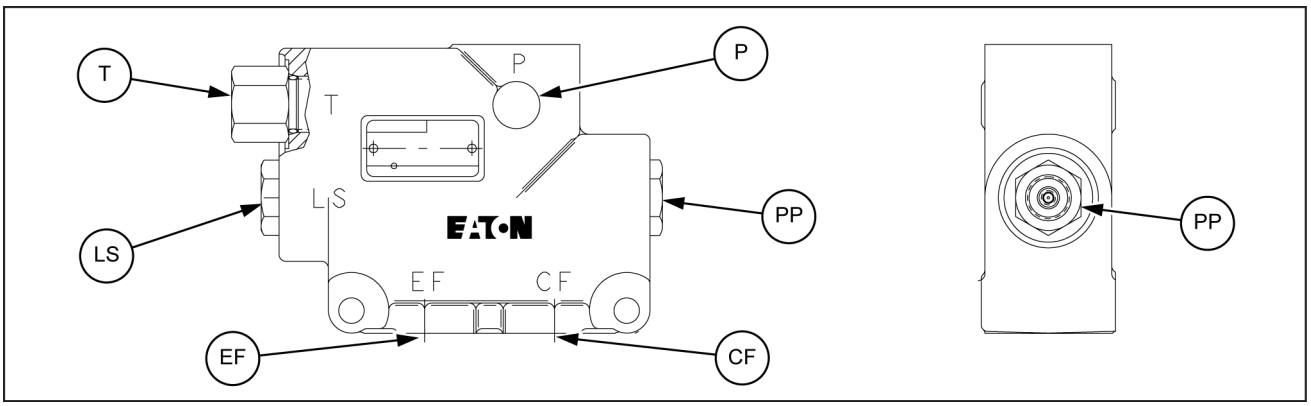
Inlet flow rating: **60.6 L/min** (**16.0 US gpm**).

Control pressure: **6.9 bar** (**100.1 psi**).

Relief valve pressure setting: **242 bar** (**3509 psi**).

Relief valve pressure limit: **276 bar** (**4002 psi**).

High flow spool



LEIL16WHL1051EB 1

Ports:

CF. Control flow (M18x1.5)

EF. Excess flow (M22x1.5)

LS. Load sensing (M12x1.5)

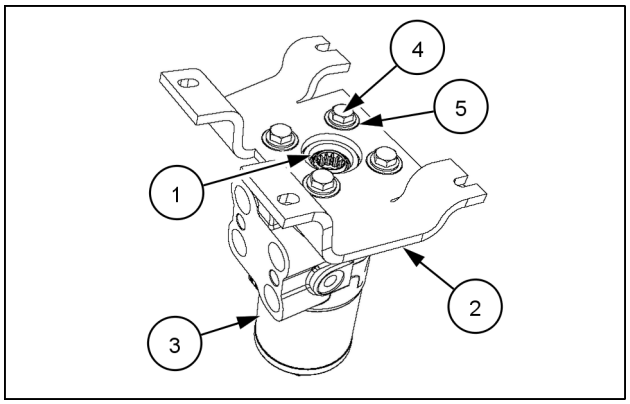
P. Pump inlet (M22x1.5)

PP. Pilot pressure (M12x1.5)

T. Relief valve drain (M12x1.5)

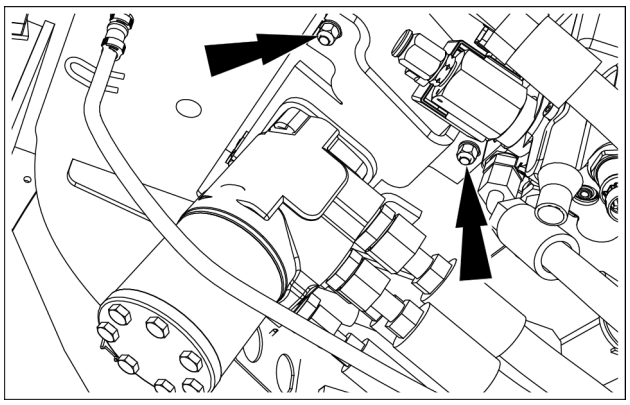
Steering valve - Install

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

Contents

Steering - 41

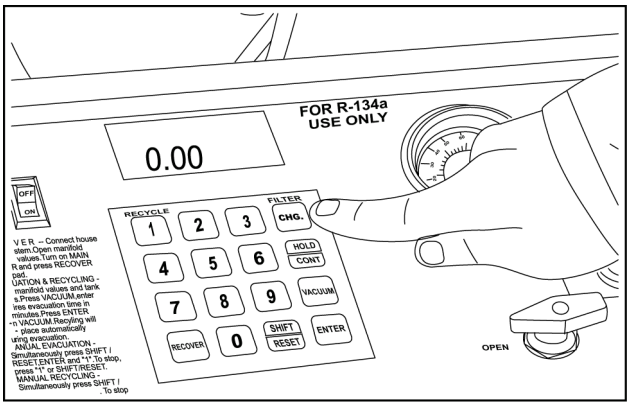
Auxiliary steering - 910

Contents

Wheels - 44

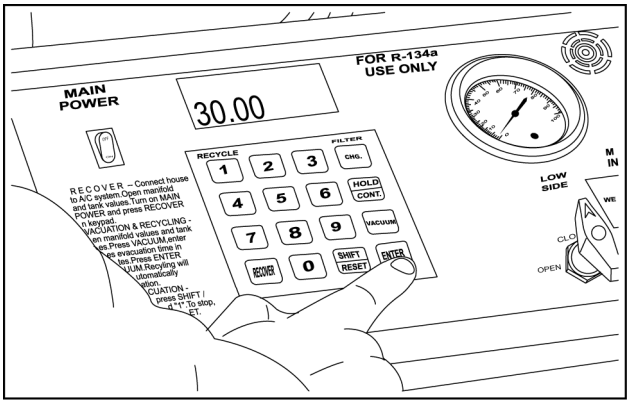
Rear wheels - 520

12. Press the Charge key. “Program” and “Charge” will appear on the display.



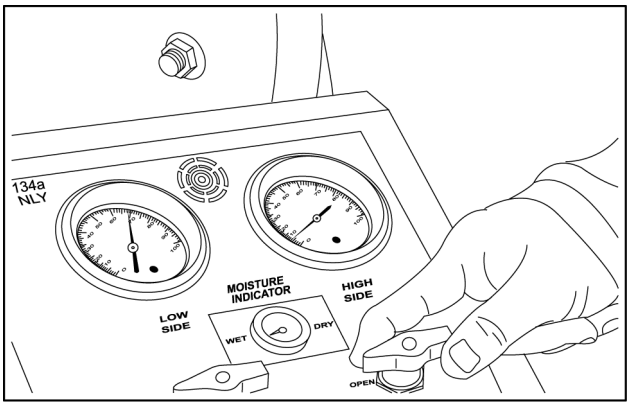
LEIL13WHL1101AA 9

13. Program **3.5 lbs** and press the enter key. The display will flash once indicating the programmed data has been accepted.



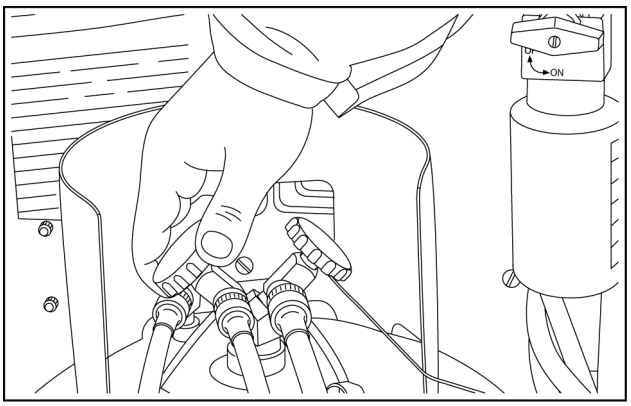
LEIL13WHL1100AA 10

14. Fully open the low and high pressure valves.



LEIL13WHL1102AA 11

15. Open the red (vapor) and blue (liquid) valves on the tank.



LEIL13WHL1093AA 12

Contents

Electrical systems - 55

Electrical system - 000

Connectors	**X-MH_R (Receptacle)**

LMP-MPL - MAP LIGHT (Lamp)

Component Type	Lamp
Wiring frames	**SHEET 27**
Connectors	**X-MAP (Receptacle)**

LMP-R-EURO-TAIL - RH REAR TAIL LT EURO (Lamp)

Component Type	Lamp
Wiring frames	**SHEET 30**
Connectors	**X-RH-REAR-TAIL-EURO (Receptacle)**

LMP-R-NA-TAIL - RH REAR TAIL LT NA (Lamp)

Component Type	Lamp
Wiring frames	**SHEET 29**
Connectors	**X-RH-TAIL (Receptacle)**

LMP-RFO - RIGHT FRONT OPT WL (Lamp)

Component Type	Lamp
Wiring frames	**SHEET 31**
Connectors	**X-RF2 (Receptacle)**

LMP-RF_LT - RH FRONT COMBO LIGHT (Lamp)

Component Type	Lamp
Wiring frames	**SHEET 28**
Connectors	**X-LRF (Plug)**

LMP-RF_WL - RIGHT FRONT WORK LIGHT (Lamp)

Component Type	Lamp
Wiring frames	**SHEET 31**
Connectors	**X-RFWL (Receptacle)**

LMP-RR_WL - RIGHT REAR WORK LIGHT (Lamp)

Component Type	Lamp
Wiring frames	**SHEET 31**
Connectors	**X-RRWL (Receptacle)**

LMP-TTI - TELL TALE INDICATOR (Lamp)

Component Type	Lamp
Wiring frames	**SHEET 28**
Connectors	**X-TT (Receptacle)**

Wiring harnesses - Electrical schematic sheet 13 SH13 - POWER DISTRIBUTION 2 CAB GROUND BLK

Type	Component	Connector / Link	Description
Connector	X-CG3	**X-CG3**	CAB GROUND RH HEADLINER
Connector	X-CG4	**X-CG4**	CAB GROUND
Connector	X-LC3	**X-LC3**	LOADCENTER 3

Wiring harnesses - Electrical schematic sheet 27 SH27 - LIGHTING DOME, MAP LIGHTS

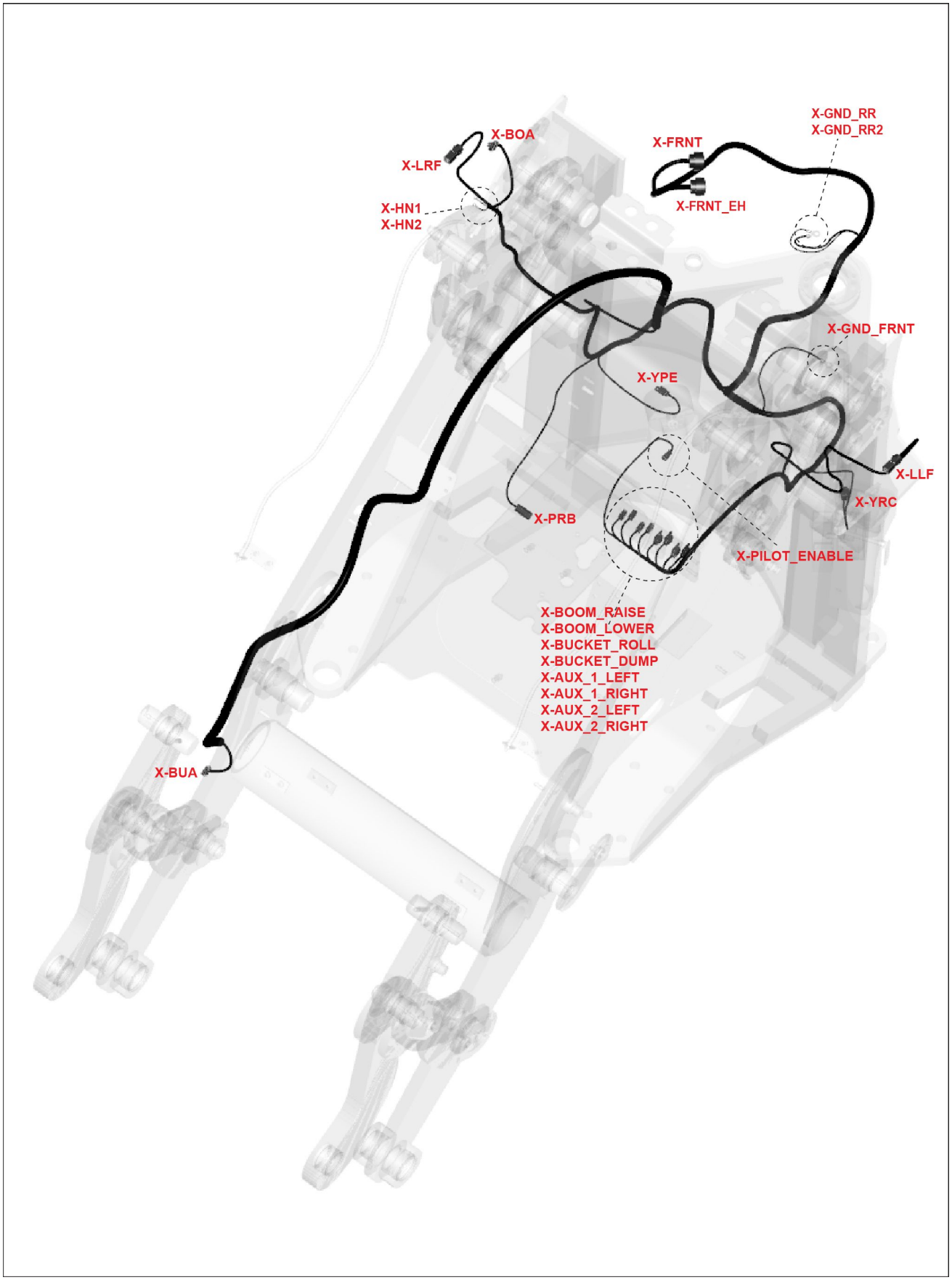
Type	Component	Connector / Link	Description
ECU	**A-SFB**	**X-X6**	SMART FUSE BOX
Lamp	**LMP-DM**	**X-DM_G X-DM_P**	EGRESS/DOME LAMP
Lamp	**LMP-LPL**	**X-LPL**	LICENSE PLATE LIGHT
Lamp	**LMP-MPL**	**X-MAP**	MAP LIGHT
Switch	**SW-DS**	**X-DS**	DOOR SWITCH
Connector	X-AIR	**X-AIR**	HVAC CONSOLE
Connector	X-CAB_E	**X-CAB_E**	CAB TO ENGINE
Connector	X-DM_G	**X-DM_G**	DOME LIGHT GROUND
Connector	X-DM_P	**X-DM_P**	DOME LIGHT POSITIVE
Connector	X-DS	**X-DS**	DOOR SWITCH
Connector	X-ENG	**X-ENG**	ENGINE TO CAB
Connector	X-ENG_H	**X-ENG_H**	ENGINE TO HOOD
Connector	X-E_HD	**X-E_HD**	ENGINE TO HOOD EURO
Connector	X-HD_E	**X-HD_E**	HOOD EURO TO EURO ENG HARN
Connector	X-HD_N	**X-HD_N**	HOOD TO ENG
Connector	X-LPL	**X-LPL**	LICENSE PLATE LIGHT
Connector	X-MAP	**X-MAP**	MAP LIGHT
Connector	X-X3	**X-X3**	SFB
Connector	X-X4	**X-X4**	SFB
Connector	X-X5	**X-X5**	SFB
Connector	X-X6	**X-X6**	SFB
Connector	X-X7	**X-X7**	SFB

Wiring harnesses - Electrical schematic sheet 01 - Power and starting (engine schematics)

Component ID	Description
F-9100	Fuse, 5A
F-9101	Fuse, 30A
F-9102	Fuse, 5A
F-9103	Fuse, 5A
F-9104	Fuse, 10A
F-9105	Fuse, 5A
GND-9101	Ground
GND-9103	Ground
GND-9104	Ground
K-9102[1] [2] [3]	Main relay or shunt
K-9103	Relay
K-9104[4]	Starter control relay
K-9105[4]	Starter relay
K-9106[3]	Afterrun disconnection relay
M-9101	Starter motor
S-9100	Battery disconnect switch
S-9103	Key switch
V-9100[3]	Diode

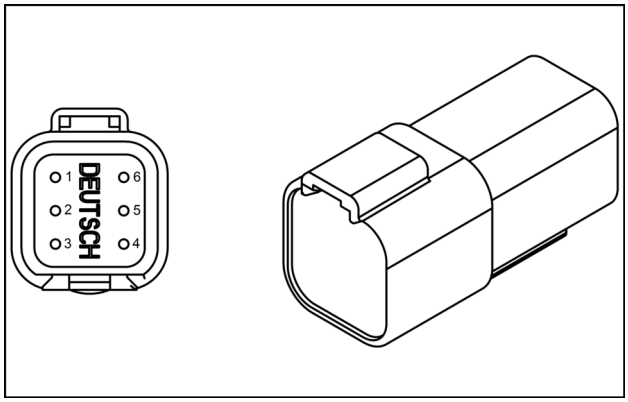
[1]Early machines will have relay K-9102.
[2]Re-configuration of the electrical supply wiring to the ECU replaced K-9102 with a shunt on some machines.
[3]Later machines will not have K-9102, K-9106 or V-9100. ECU supply will be wired directly from F-9101 to ECU.
[4] Used for ECU control of engine starting

XT models



LEIL17WHL1551HB 2

X-CAB_AR - CAB TO RH ARM REST (87694152) (Plug)

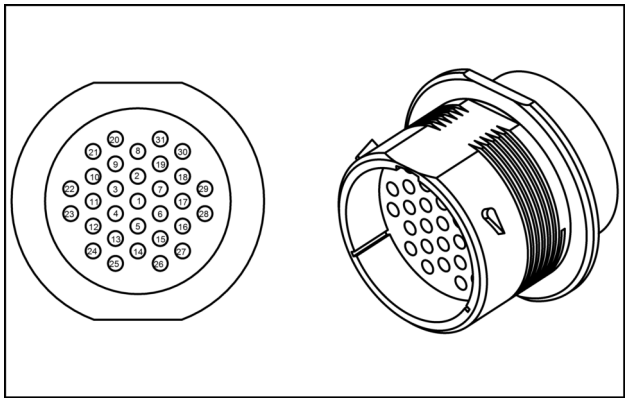


87694152 36

87694152

Pin	From	Wire	Description	Color-Size	Frame
1	**X-LC5 (Receptacle) pin 6A** LOADCENTER 5	792	IMP JOYSTICK PWR	OR - 0.8	**SHEET 24**
2	**X-CG4 (Receptacle) pin K** CAB GROUND	954K	RH ARMREST JOYSTICK GND	BK - 1.0	
3	SP-B_HJ-P-X	CANB_HI	CAN	WH - 0.8	
4	SP-B_LJ-P-X	CANB_LI	CAN	BL - 0.8	
5	SP-113-P-X	113C	RH ARMREST HORN SWITCH	BR - 0.8	**SHEET 34**

X-CAB_B - CAB TO BOTTOM [SH21: B-3] (87696945) (Plug)

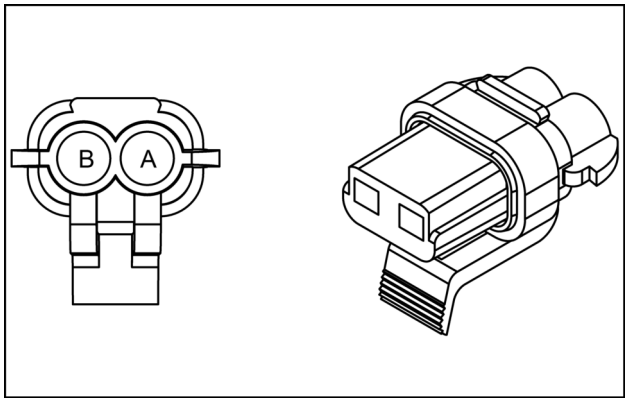


87696945 37

87696945

Pin	From	Wire	Description	Color-Size	Frame
3	SP-651-P-X	651J	5V GND2	BL - 0.8	**SHEET 22**
4	SP-471-P-X	471A	5V REF2	PK - 0.8	
5	**X-UCM3B (Receptacle) pin 6** UCM	366	RIDE CONTROL SIG	WH - 0.8	
6	**X-UCM1A (Receptacle) pin 10** UCM	640	BRAKE SUPPLY PRESS	YE - 0.8	**SHEET 19**
7	**X-UCM1B (Receptacle) pin 20** UCM	641	BRAKE PRESSURE	YE - 0.8	
8	SP-486-P-X	486A	5V PWR REF 1	PK - 0.8	
9	**X-UCM3B (Receptacle) pin 4** UCM	368	COUPLER VALVE RTRN	BR - 0.8	**SHEET 22**
10	SP-482-P-X	482C	5V GRND1	BL - 0.8	**SHEET 19**
11	**X-UCM1A (Receptacle) pin 8** UCM	176	AUX STRG PRESS SIGNAL	YE - 0.8	**SHEET 21**
12	**X-LC3 (Receptacle) pin R2_87** LOADCENTER 3	441	SEC STRG SOL PWR	OR - 0.8	**SHEET 08**
13	**X-UCM4B (Receptacle) pin 24** UCM	291	ROLL BACK PRESSURE SW	YE - 0.8	**SHEET 22**
14	**X-UCM3B (Receptacle) pin 7** UCM	367	COUPLER VALVE SIG	WH - 0.8	

X-FFH - FILTER HEATER [Y-F_F_H] (87679438) (Receptacle)

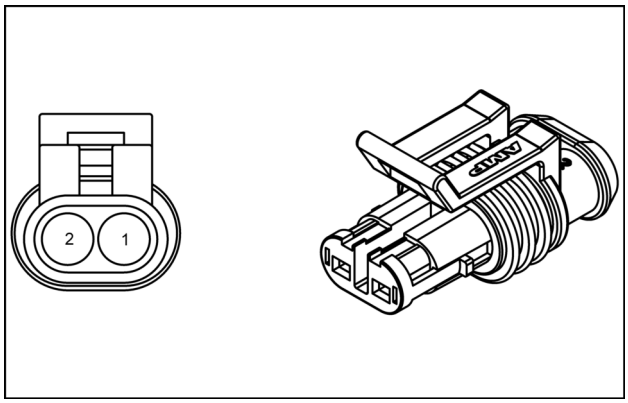


87679438 87

87679438

Pin	From	Wire	Description	Color-Size	Frame
A	SP-421-P-X	421A	FUEL FILTER HEATER	OR - 2.0	**SHEET 16**
B	**X-GND_ENG1 (Plug) pin 1** GROUND ENG BLOCK	196	FUEL FILTER HEATER GND	BK - 2.0	

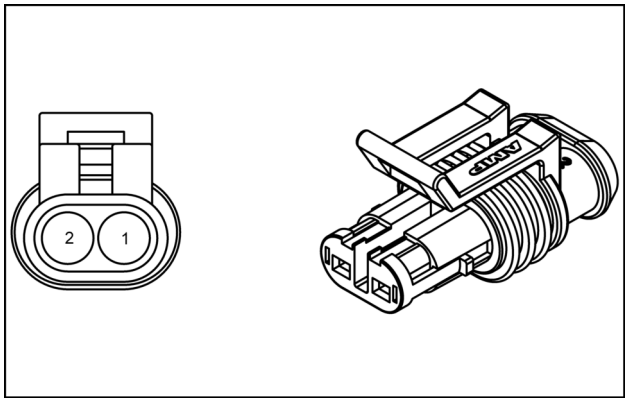
X-FL - FUEL LEVEL [B-RFLG] (82012083) (Plug)



82012083 88

82012083

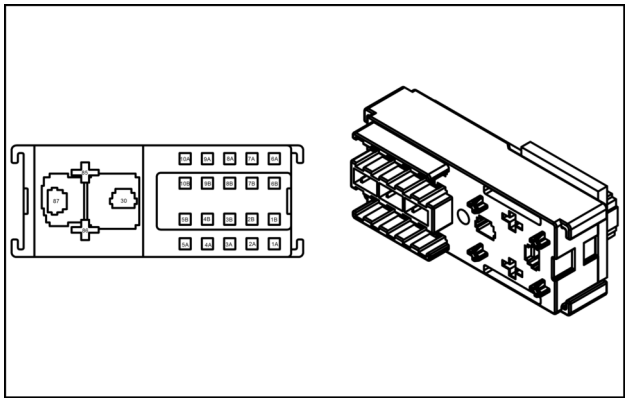
X-FM - PRESSURE SWITCH OIL FILTER [B-FM] (82012083) (Plug)



82012083 89

82012083

X-LC5 - LOADCENTER 5 [SH10: D-1] (87733595) (Receptacle)

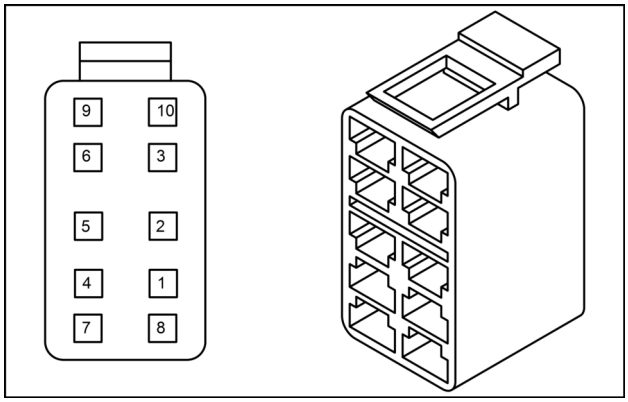


87733595 146

87733595

Pin	From	Wire	Description	Color-Size	Frame
30	**X-LC1 pin B1** LOADCENTER 1	173	ISOLATED_SFB_IGNITION SUPPLY	RD - 5.0	**SHEET 10**
30	K-5KR1-P-30	WIRE6302	WIRE6302		
85	**X-CG4 (Receptacle) pin H** CAB GROUND	954H	IGNITION RELAY COIL GND	BK - 0.8	
85	K-5KR1-P-85	WIRE6296	WIRE6296		
86	**X-X3 (Receptacle) pin 8** SFB	222	SIG_IGNITION RELAY_COIL	YE - 0.8	**SHEET 03**
86	K-5KR1-P-86	WIRE6308	WIRE6308		
87	K-5KR1-P-87	WIRE6307	WIRE6307		**SHEET 10**
87	SP-878-P-X	878	IGNITION POWER	OR - 5.0	
1A	**X-DSP (Receptacle) pin X** DISPLAY	806	DISPLAY WAKE-UP IGNITION POWER	OR - 0.8	
1A	F-5F1-P-2	WIRE6317	WIRE6317		
2A	SP-466-P-X	466	IGNITION POWR FOR UCM	OR - 0.8	
3A	F-5F3-P-2	WIRE6316	WIRE6316		
3A	SP-19C-P-X	19C	IGN PWR	OR - 2.0	
4A	**X-X_TEL (Receptacle) pin 2** TELEMATICS	168	TELEMATICS IGN POWER	OR - 0.8	
4A	F-5F4-P-2	WIRE6312	WIRE6312		
5A	F-5F5-P-2	WIRE6311	WIRE6311		
5A	**X-LC3 (Receptacle) pin R2_30** LOADCENTER 3	182	SEC STRG IGN PWR	OR - 0.8	
6A	F-5F6-P-2	WIRE6310	WIRE6310		
6A	**X-CAB_AR (Plug) pin 1** CAB TO RH ARM REST	792	IMP JOYSTICK PWR	OR - 0.8	
7A	**X-SW_PD (Receptacle) pin 1** SWITCH PAD	807	KEYPAD IGN POWER	OR - 0.8	
8A	SP-799-P-X	799	JSS IGNITION POWER	OR - 0.8	
9A	**X-CAB_E (Receptacle) pin 1** CAB TO ENGINE	850	IGN PWR FOR REAR	OR - 2.0	
10A	F-5F10-P-2	WIRE6309	WIRE6309		
10A	SP-19H-P-X	19H	STALK/DIFF FUSED PWR	OR - 0.8	
3B	SP-878-P-X	878A	IGNITION POWER	OR - 3.0	
9B	SP-878-P-X	878B	IGN PWR	OR - 3.0	

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

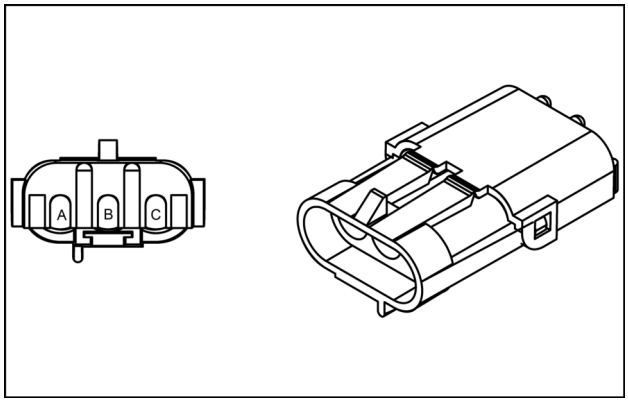


87716755 211

87716755

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

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



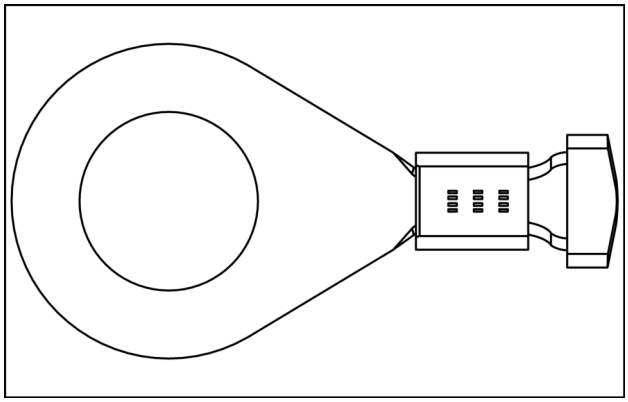
87692858 212

87692858

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

Pin	From	Wire	Description	Color-Size	Frame
1	**X-SPK (Receptacle) pin X** RADIO TO SPKRS	LP2-1	LOUDSPEAKER LEFT -1	WH - 1.0	**SHEET 35**
2	**X-SPK (Receptacle) pin X** RADIO TO SPKRS	LP2-2	LOUDSPEAKER LEFT -2	BR - 1.0	

X-XM1B - STARTER LUG FROM ISOLATOR (84596842) (Plug)

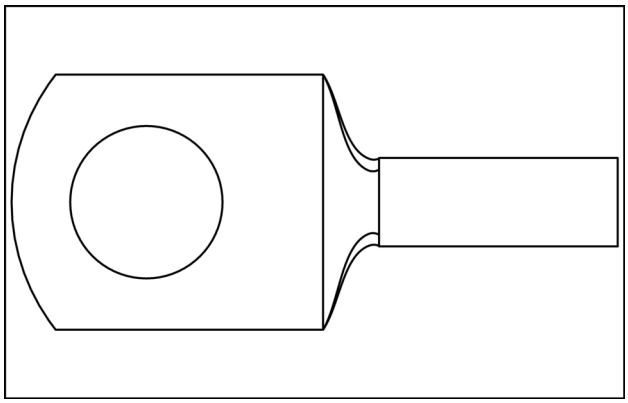


84596842 267

84596842

Pin	From	Wire	Description	Color-Size	Frame
1	**X-D(S) (Plug) pin 1** MASTER DISCONNECT SWITCHED	CABLE-004	BATTERY CABLE	RD - 62.0	**SHEET 03**

X-XM1C - STARTER (84401295) (Plug)



84401295 268

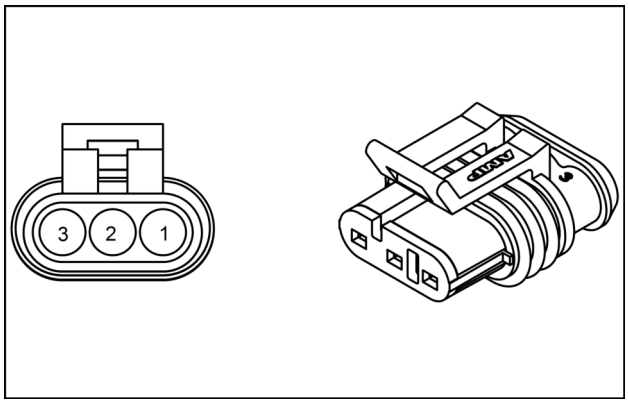
84401295

Pin	From	Wire	Description	Color-Size	Frame
1	**X-ALT_B (Plug) pin 1** ALTERNATOR B+	301	ALTERNATOR B+	RD - 13.0	**SHEET 03**

CONNECTOR X-9002 - Engine Control Unit (ECU)			
PIN NUMBER	**WIRE NUMBER**	**CIRCUIT REFERENCE**	**ELECTRICAL SCHEMATIC FRAME**
37	EN-005	Temperature signal, Boost pressure sensor with air temperature sensor B-9001	**SHEET 05**
38	EN-611	Temperature signal, Outlet intercooler pressure sensor with temperature sensor B-9012	
39	EN-014	Signal, Coolant temperature sensor B-9003	
40	EN-608	Reference ground, Outlet intercooler pressure sensor with temperature sensor B-9012	
41	-	-	
42	EN-044	Reference ground, Crankcase pressure sensor B-9009	**SHEET 05**
43	-	-	
44	-	-	
45	-	-	
46	-	-	
47	-	-	
48	-	-	
49	EN-017	High side driver, Cylinder 1 injector Y-9001	**SHEET 06**
50	EN-019	High side driver, Cylinder 2 injector Y-9002	
51	EN-020	High side driver, Cylinder 3 injector Y-9003	
52	-	-	
53	-	-	
54	-	-	
55	-	-	
56	-	-	
57	-	-	
58	EN-015	Supply, Fuel metering unit Y-9000	**SHEET 05**
59	EN-013A	Reference ground, Fuel temperature sensor B-9002 and Coolant temperature sensor B-9003	
60	EN-001	Reference ground, Rail pressure sensor B-9004	**SHEET 06**
61	EN-045	Signal, Crankcase pressure sensor B-9009	**SHEET 05**
62	EN-036	Signal, Fuel pre-filter clogging pressure sensor B-9006	
63	-	-	
64	-	-	
65	EN-040	Reference ground, Crankshaft speed sensor B-9007	**SHEET 05**
66	EN-039	Signal, Crankshaft speed sensor B-9007	
67	EN-041	Reference ground, Camshaft speed sensor B-9008	
68	EN-042	Signal, Camshaft speed sensor B-9008	
69	EN-046	Shielding, Camshaft speed sensor B-9008 and Crankshaft speed sensor B-9007	

Connector X-9101 - Selective Catalytic Reduction (SCR) tank level and temperature sensor

CONNECTOR X-9101 - Selective Catalytic Reduction (SCR) tank level and temperature sensor			
PIN NUMBER	**WIRE NUMBER**	**CIRCUIT REFERENCE**	**ELECTRICAL SCHEMATIC FRAME**
1	VE-117	SCR level sensor signal	**SHEET 03**
2	VE-118B	Reference ground	
3	VE-119	SCR temperature sensor signal	

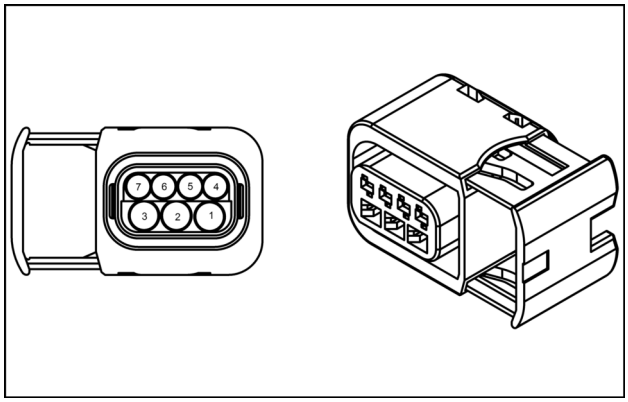


84062580 1

Wire connectors - Component diagram 14 - Connectors X-9140 to X-9149

Connector X-9140 - FPT interface connector

CONNECTOR X-9140 - FPT interface connector			
PIN NUMBER	**WIRE NUMBER**	**CIRCUIT REFERENCE**	**ELECTRICAL SCHEMATIC FRAME**
1	-	-	
2	VE-189B	Ground	**SHEET 04**
3	VE-218	Supply	
4	-	-	
5	VE-194B	CAN low	**SHEET 04**
6	VE-201F	CAN high	
7	-	-	



84152563 1

Connector X-9192 - Injector, cylinder 5

CONNECTOR X-9192 - Injector, cylinder 5			
PIN NUMBER	**WIRE NUMBER**	**CIRCUIT REFERENCE**	**ELECTRICAL SCHEMATIC FRAME**
1	EN-257	High side driver	**SHEET 06**
2	EN-258	Low side driver	

2. Check the level of the electrolyte more often during hot weather. The use of a large amount of water by the battery can be caused by high battery temperature or a voltage regulator setting that is too high. Keep the electrolyte level above the top of the plates in the battery at all times to prevent damage to the battery.

NOTE: *on maintenance free batteries it is necessary to remove the center part of the decal for access to the battery caps. Do not discard the center part of the decal. Install the center part of the decal after the battery caps have been installed.*

3. If the level of the electrolyte is low, add distilled water or other clean water until the electrolyte is **5 mm** (**0.2 in**) below the level of the ring. Do not add more water than is needed. Too much water can cause bad performance, a short service life, and corrosion around the battery.

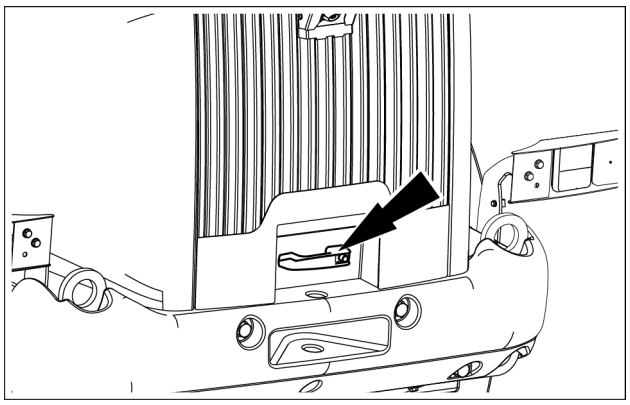
NOTE: *add water only. DO NOT add electrolyte.*

4. If damage causes an electrolyte leak, replace the battery.
5. Inspect the battery at regular intervals for dirt, corrosion, and damage. Electrolyte and dirt on the top of the battery can cause the battery to discharge by making a passage for the current to flow.
6. If the battery must be cleaned, remove the battery from the battery carrier and clean the battery, cable terminals, and the battery carrier. When available, use Battery Saver and Cleaner according to the instructions on the container. Battery Saver and Cleaner also helps prevent corrosion. If Battery Saver and Cleaner is not available, use baking soda and water as a cleaner. DO NOT permit any type of cleaner to enter the cells of the battery.
7. Install the battery in the machine and make sure the fasteners are tight. Apply Battery Saver and Cleaner or Urethane Seal Coat to the cable terminals to prevent corrosion. See the Parts Counter Catalog. Apply Urethane Seal Coat to the cable terminals to prevent corrosion. DO NOT apply grease.
8. Make sure the cable connections are clean and tight. Clean foreign material from the top of the battery.
9. Inspect the battery case, battery posts, and cables for damage.
10. Check the electrolyte level.
11. If you added water to the battery, the battery must be charged for **15 min** at **15 – 25 A** to mix the water with the electrolyte.

Diesel Exhaust Fluid (DEF)/AdBlue®/ARLA dosing module - Remove

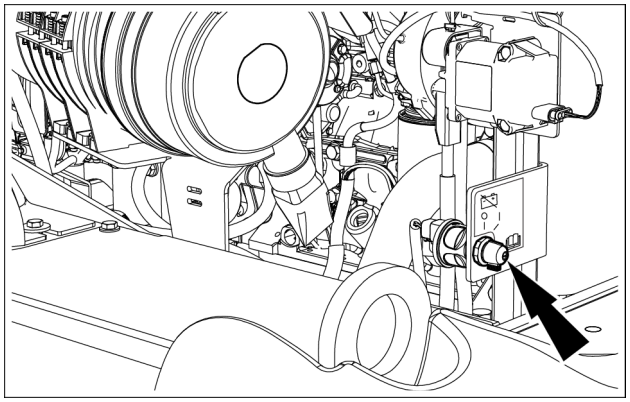
NOTE: *emissions sensors in the exhaust system and on the vehicle may be damaged by vibrations from use of impact wrenches or hammers during service work. Avoid using these tools when servicing components close to the sensors. Remove the sensors with care if use of these tools cannot be avoided.*

1. Raise the engine hood using the handle hood under the rear grill.



LEIL16WHL2016AB 1

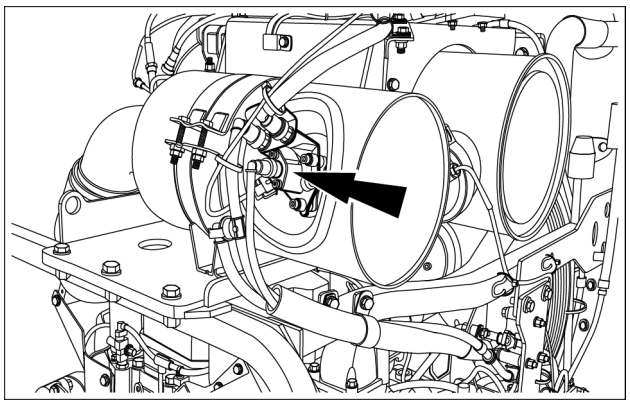
2. Locate the timed disconnect switch under the engine hood, on the left side of the machine. Turn the timed disconnect switch to the OFF position.



LEIL16WHL1382AB 2

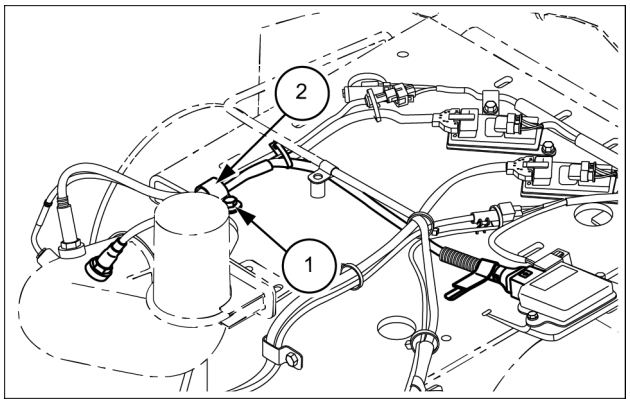
3. Clean dirt and debris from the Diesel Oxidation Catalyst (DOC) connections and **DEF/ADBLUE®** dosing valve.

NOTE: *the dosing valve is located in the Diesel Oxidation Catalyst (DOC).*



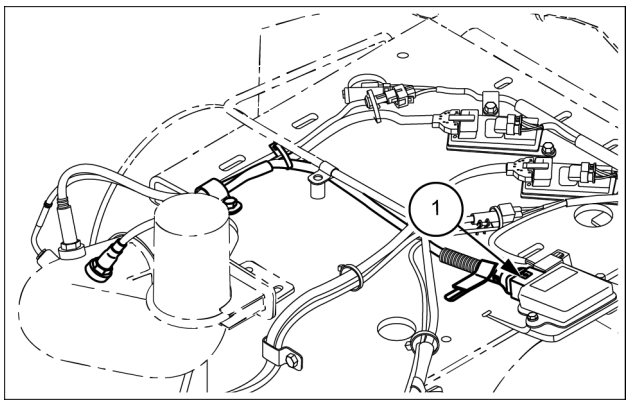
LEIL15WHL0330AB 3

4. Loosen the hexagonal bolt **(1)** and remove the clamp **(2)** that secure the sensor wiring harness to the catalyst mounting support bracket. Remove any straps holding the sensor wiring harness to the other wiring harness.



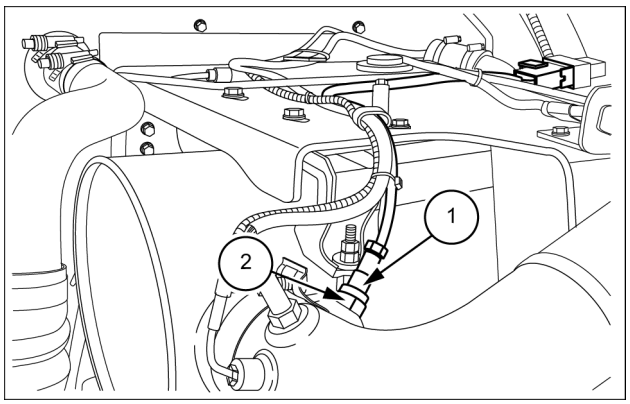
LEIL15WHL0341AB 4

5. Disconnect the sensor connector **(1)** from NH3 Electronic Control Unit.



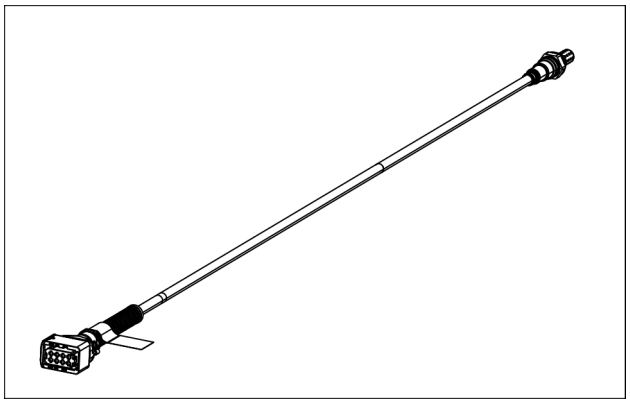
LEIL15WHL0342AB 5

6. Loosen the hexagonal nut **(2)** and remove the catalyst outlet ammonia (NH3) sensor **(1)**.



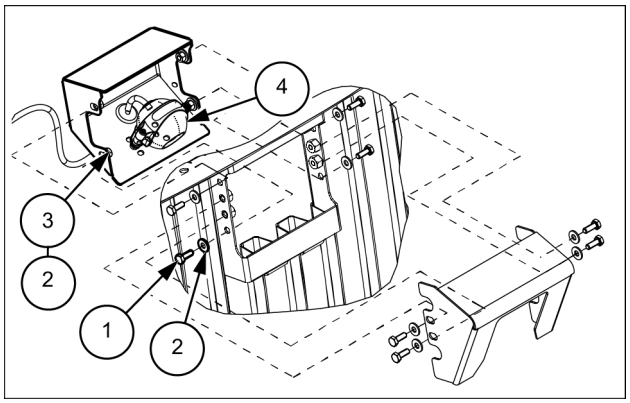
LEIL15WHL0335AB 6

7. Remove the sensor catalyst outlet ammonia (NH3) sensor and the wiring harness.



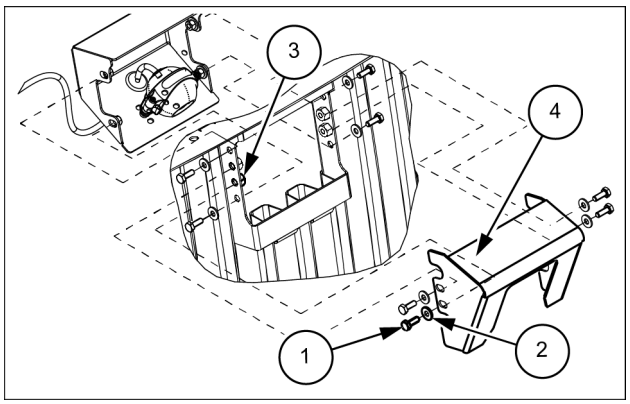
LEIL15WHL0220AA 7

5. Loosen the four bolts **(1)** , the eight washers **(2)** and the four nuts **(3)** to remove the mounting bracket **(4)** from the rear grill.



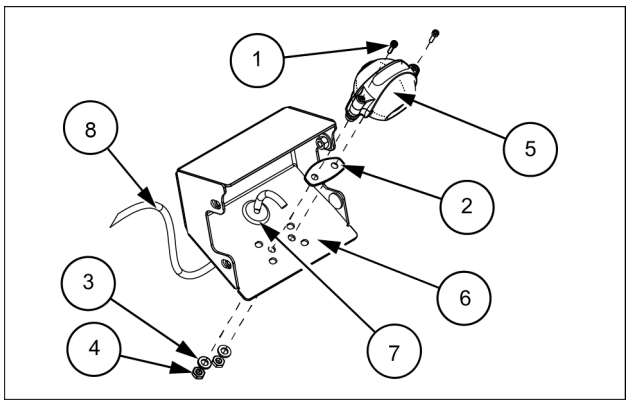
LEIL16WHL0844AB 5

6. Loosen the bolts **(1)**, the eight washers **(2)** and the four nuts **(3)** to remove the cover camera **(4)** from the rear grill.



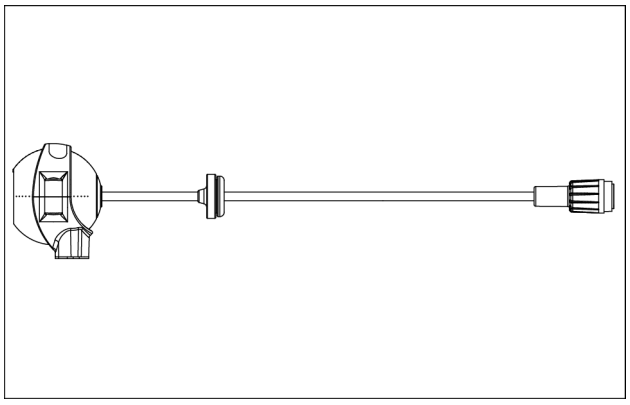
LEIL16WHL0845AB 6

7. Remove the two hexagonal socket screw **(1)**, the gasket **(2)**, the two washer **(3)** and the two nuts **(4)** to separate the rearview camera **(5)** from the mounting bracket **(6)**.
8. Remove the grommet **(7)**, installed on the cable **(8)**of the rearview camera **(5)**, from the mounting bracket **(6)**.



LEIL16WHL0843AB 7

9. Remove the rearview camera.



LEIL16WHL0959AA 8

3997-03 - Electrical Accessory Power Relay - Short Circuit to B+

Control Module: SFB

Context:
Electrical Accessory Power Relay - Short Circuit to B+.

Cause:
The Smart Fuse box detects a Short Circuit to B+ from the Electrical Accessory Power Relay (**X-X3** pin 11) 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 Electrical Accessory Power Relay is damaged.
3. The **X-LC4** connector (pin 86) is damaged.
4. The Smart Fuse Box connector (**X-X3** pin 11) is damaged.
5. The harness between Electrical Accessory Power Relay and Smart Fuse Box is defective.
6. The Electrical Accessory Power Relay is defective.
7. 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 Electrical Accessory Power Relay.

   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 Electrical Accessory Power Relay connector.

   The key must be in the OFF position.

   Disconnect Electrical Accessory Power Relay (**X-LC4** pin 86) and visually check the integrity of the pin.

   A. If the pin is damaged, replace the **X-LC4** 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 11.

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

   B. If the pin is not damaged, continue with Step **5**.
5. Check the Electrical Accessory Power Relay signal circuit.

   The key must be in the OFF position.

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

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

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

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

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

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

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

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

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

Use a multimeter to check the signal combination.

The key must be in the ON position.

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

Perform the following check:

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

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

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

8. Use a multimeter to check the signal combination.

The key must be in the ON position.

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

Perform the following check:

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

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

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

Wiring harnesses - Electrical schematic sheet 20 (55.100)

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 pins 8 and 14.

   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 pins 3 and 41.

   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 turbine speed sensor **B-TS_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 turbine speed sensor **B-TS_S**.

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

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

8. Disconnect the **X-TSS** connector from the turbine speed sensor **B-TS_S**.

   Check if the turbine speed sensor **B-TS_S** is defective.

   A. If a problem is found, replace the turbine speed sensor **B-TS_S**.

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

Wiring harnesses - Electrical schematic sheet 26 (55.100)

746-03 - Short to Power at Differential Lock Valve

Control Module: UCM

Context:
The **A-UCM** detects the supply voltage on pin 3 of connector **X-UCM3B**.

Cause:
The DIFF LOCK SOLENOID is not correctly working.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and the DIFF LOCK SOLENOID is damaged.
3. The DIFF LOCK SOLENOID is damaged.
4. The connector **X-TRANS** is damaged.
5. The harness between connector **X-TRANS** and component **A-UCM** is damaged.

Solution:

1. Disable Differential Lock function.
   ZFTC1DisengageDifflockRequest = On (TBC if 2 is possible).
   Icon and keypad LED blink (indicating always active) TBC.
   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 **A-UCM** and the DIFF LOCK 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 DIFF LOCK SOLENOID integrity.

   Remove the DIFF LOCK SOLENOID sensor.

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

   A. If the resistance is an open circuit, replace the DIFF LOCK SOLENOID.

   B. If the resistance is not an open circuit, continue with Step **4**.
4. Check the integrity of connector **X-TRANS**.

   Disconnect **X-TRANS** connector and visually check the integrity of pin 27.

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

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

   Use a multimeter to perform the following check:

5310-09 - Engine speed limit function during gearshifts does not work properly

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.
After the selection of the neutral position, only limited gears are available depending on applications.

Cause:
During gearshift, the engine speed limit function does not work properly.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. There are interference on the CAN-Bus.
3. 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 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 **4**.
4. 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, continue with Step **5**.
5. Check the efficiency of the Engine Control Unit **A-ECU**.

   The Engine Control Unit **A-ECU** may ignore torque or speed limit command the Transmission Control Unit **A-TRANS** via TSC1 message.

   A. If a problem is found, replace the Engine Control Unit **A-ECU**.

Wiring harnesses - Electrical schematic sheet 18 (55.100)

5510-05 - Open circuit at clutch K4

Control Module: TCU

Context:
The detected failure in the system has strong limitations to transmission control. The Transmission Control Unit **A-TRANS** can engage only one gear in each direction. In some cases only one direction will be possible.
The Transmission Control Unit **A-TRANS** will shift the transmission into neutral at the first occurrence of the failure. First, the operator must shift the gear selector into neutral position.
If output speed is less than a threshold for neutral to gear and the operator shifts the gear selector into forward or reverse, the Transmission Control Unit **A-TRANS** will select the limp-home gear.
If output speed is less than a threshold for reversal speed and the Transmission Control Unit **A-TRANS** has changed into the limp-home gear and the operator selects a shuttle shift, the Transmission Control Unit **A-TRANS** will shift immediately into the limp-home gear of the selected direction.
If output speed is greater than the threshold, the Transmission Control Unit **A-TRANS** will shift the transmission into neutral. The operator has to slow down the vehicle and must shift the gear selector into neutral position.
If a failure at another clutch is pending, the Transmission Control Unit **A-TRANS** detects a severe failure that disables control of system.
The Transmission Control Unit **A-TRANS** shuts off all solenoid valves and also both common power supplies (VPS1, VPS2). The park brake is operating, also all functions which use ADM 1 to ADM 8 are disabled.
The Transmission Control Unit **A-TRANS** shifts the transmission to neutral position.

Cause:
There is an open circuit at clutch K4 of the transmission controller of tranny **A-TRC**. The measured resistance value of the valve is out of limit.

Possible failure modes:

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

Solution:

1. Verify that fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Check if the connector **X-TRC** is connected to the transmission controller of tranny **A-TRC**.

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

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

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

   B. If there are no problems, continue with Step **3**.
3. Disconnect the connector **X-TRC** from the transmission controller of tranny **A-TRC**.

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

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

The key must be in the ON position.

Use a multimeter to perform the following continuity check:

From	To	Value
X-9002 pin 62	Chassis ground	There should be no voltage.

A. If there is voltage, there is a short to key power condition in the prefilter fuel pressure sensor B-9006 signal circuit. Locate and repair the shorted conductor.

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

5. Replace the prefilter fuel pressure sensor B-9006.

   Use the EST to verify the status of this fault.

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

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

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

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

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

Wiring harnesses - Electrical schematic sheet 05 (55.100)

5760-00 - Overtemp converter output

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 an oil temperature at the gear oil temperature sensor **B-GOT** output that is over the allowed threshold.

Possible failure modes:

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

Solution:

1. Verify that fault is present and active.

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

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

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

   Check the oil level of the transmission.

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

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

Wiring harnesses - Electrical schematic sheet 19 (55.100)
Wiring harnesses - Electrical schematic sheet 26 (55.100)

6297 - (DTC 1899)-Upstream oxidation catalyst temperature sensor voltage is higher than expected

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

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

Context:
The Engine Control Unit (ECU) monitors the circuit of the DOC upstream temperature sensor circuit. If the ECU determines that the signal circuit voltage of the DOC upstream temperature sensor is greater than **3.60 V**, this fault will occur. The temperature value is will be frozen at the last valid value for a preliminary failure and jumps to a fixed replacement value of **575.0 °C** (**1066.9 °F**) if the failure is validated.

Cause:
The ECU has detected a voltage greater than **3.30 V** in the signal circuit of the DOC upstream temperature sensor.

Possible failure modes:

1. Faulty DOC upstream temperature sensor, wiring.
2. Faulty DOC upstream temperature sensor, internal failure.
3. Faulty software of the ECU.

Solution:

1. Verify that fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step **6**.
2. Check the signal circuit of the DOC upstream temperature sensor for an open circuit condition.

   Disconnect the connector **X-ECU**.

   Disconnect the connector **X-CTS**.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

From	To	Value
Connector **X-ECU** pin 16	Connector **X-CTS** pin 1	There should be continuity

   A. If there is no continuity, there is an open circuit condition in the signal circuit of the DOC upstream temperature sensor. Locate and repair the broken conductor.

   B. If there is continuity, leave the connectors disconnected and continue to Step **3**.
3. Check the signal circuit of the DOC upstream temperature sensor for a short to high source condition.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

From	To	Value
Connector **X-ECU** pin 16	Connector **X-ECU** pin 9	There should be no continuity
Connector **X-ECU** pin 16	Connector **X-ECU** pin 32	There should be no continuity

7189 - (DTC 1C15)-Fuel temperature sensor voltage is higher than expected

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

Context:
The Engine Control Unit (ECU) monitors the fuel temperature sensor B-9002 signal circuit voltage. If the ECU determines that there is voltage higher than expected condition in the signal circuit of the fuel temperature sensor, this fault will occur.

Cause:
The ECU has detected a value greater than **4.93 V** in the B-9002 signal circuit.

Possible failure modes:

1. Faulty signal circuit of the fuel temperature sensor, short to high source condition.
2. Faulty fuel temperature sensor, internal failure.
3. Faulty software of the ECU.

Solution:

1. Verify that fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step **5**.
2. Check the signal circuit of the fuel temperature sensor for a short to high source condition.

   Disconnect connector **X-9005**.

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

   They key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

From	To	Value
X-9002 pin 12	All pins in connector **X-9002**	There should be no continuity.

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

   B. If there is no continuity, leave the connectors disconnected and continue to Step **3**.
3. Check the fuel temperature sensor for a short to key power condition.

   They key must be in the ON position.

   Use a multimeter to perform the following voltage check:

From	To	Value
X-9002 pin 12	Chassis ground	There should be no voltage.

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

   B. If there is no voltage, continue to Step **4**.
4. Replace the fuel temperature sensor.

9347 - (DTC 2483)-Water pump inlet pressure sensor voltage is lower than expected

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

Context:
The Electronic Control Unit (ECU) monitors the water pump inlet pressure sensor B-9011 signal circuit. If the ECU determines that the voltage in the signal circuit is lower than expected, this fault will occur.

Cause:
The ECU has detected a voltage less than **200 mV** for a period greater than **50 ms** in the water pump inlet pressure sensor signal circuit.

Possible failure modes:

1. Faulty water pump inlet pressure sensor signal circuit, short to ground condition.
2. Faulty water pump inlet pressure sensor, internal failure.
3. Faulty software of the ECU.

Solution:

1. Verify that fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step **4**.
2. Check the B-9011 signal circuit for a short to ground condition.

   Disconnect connector **X-9027**.

   Disconnect connector **X-9002**.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

From	To	Value
X-9002 pin 14	Chassis ground	There should be no continuity.
X-9002 pin 14	**X-9002 pin 19**	There should be no continuity.
X-9002 pin 14	All other pins	There should be no continuity.

   A. If there is continuity, there is a short to ground in the signal circuit of the water pump inlet pressure sensor. Locate and repair the shorted conductor.

   B. If there is no continuity, continue to Step **3**.
3. Replace the water pump inlet pressure sensor.

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

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

   B. If it has not been resolved, check the ECU for the appropriate software and re-flash, if necessary.
4. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Flex the harnesses involved to reveal intermittent breaks or shorts in the wiring concerned. Operate the machine while you monitor the display.

10410 - (DTC 28AA)-DEF/AdBlue tank temperature sensor plausibility min threshold

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

Context:
For information regarding the functional operation of the Selective Catalytic Reduction (SCR) system see **Selective Catalytic Reduction (SCR) exhaust treatment - Dynamic description (10.500)**. The Engine Control Unit (ECU) compares the temperature of the **DEF/ADBLUE®** fluid sensed by the **DEF/ADBLUE®** tank level and temperature sensor B-9101 to the ambient air temperature sensed by the humidity sensor with ambient temperature sensor B-9105. In cases where the vehicle has been exposed to extremely cold temperatures and then relocated to a warmer environment, this fault may occur. If the temperature of the fluid measures less than the ambient air temperature by more than **30.04 °C** (**86.07 °F**), this fault will occur.

Cause:
The ECU has determined that the temperature of the **DEF/ADBLUE®** tank level and temperature sensor B-9101 is more than **30.04 °C** (**86.07 °F**) lower than the temperature of the humidity sensor with ambient temp sensor B-9105.

Possible failure modes:

1. Faulty **DEF/ADBLUE®** tank level and temperature sensor, damaged internally.
2. Faulty software of the ECU.

Solution:

1. Verify the condition of the **DEF/ADBLUE®** tank level and temperature sensor.

   Disconnect the vehicle (VE) harness from the **DEF/ADBLUE®** tank level and temperature sensor at connector **X-9101**.

   With the key switch in the OFF position, use a multimeter to measure the resistance of the **DEF/ADBLUE®** tank level and temperature sensor B-9101. See **Diesel Exhaust Fluid (DEF)/AdBlue®/ARLA tank level and temperature sensor - General specification (55.988)** , if necessary, to determine resistance at temperature values:

From	To	Value
X-9101 pin 3	**X-9101 pin 2**	There should be less than **23342 Ω** .

   Use a device such as an Infra-red heat gun to acquire the **DEF/ADBLUE®** tank temperature and compare that relative value to the resistance temperature value which was measured.

   A. If the measured resistance temperature value and heat gun values are reasonably close, continue with Step **2**.

   B. If the measured resistance temperature value and heat gun values are not reasonably close, the **DEF/ADBLUE®** tank level and temperature sensor has failed internally. Replace the **DEF/ADBLUE®** tank level and temperature sensor unit.

2. Check electrical connection.

   Visually check the condition of the **DEF/ADBLUE®** tank level and temperature sensor connector **X-9101** for dirt and/or corrosion.

   Re-connect the **DEF/ADBLUE®** tank level and temperature sensor connector **X-9101** and check the mechanical integrity of the connection.

   Check to see if the fault is resolved.

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

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

Wiring harnesses - Electrical schematic sheet 03 (55.100)

B. If the fan operates, leave the connector disconnected and continue to Step **5**.

5. Check the fan speed sensor B-9103 wiring for a short circuit condition.

   Disconnect the connector **X-9001**.

   Disconnect the connector **X-9103**.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

From	To	Value
X-9001 pin 64	**X-9001 pin 65**	There should be no continuity.
X-9001 pin 64	All pins in connector **X-9001**	There should be no continuity.
X-9001 pin 64	Chassis ground	There should be no continuity.

   A. If the specified values are not measured, there is a short circuit condition in the fan speed sensor B-9103 wiring. Locate and repair the shorted conductor.

   B. If the specified values are measured, continue to Step **6**.

6. Replace the fan speed sensor B-9103.

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

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

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

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

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

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

Wiring harnesses - Electrical schematic sheet 02 (55.100)

12700 - (DTC 319C)-Exhaust flap sticking or internal failure

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

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

Cause:
The ECU has reported, via the engine sensor CAN bus, that the exhaust flap actuator controller has reported an internal failure.

Possible failure modes:

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

Solution:

1. Verify that fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step **6**.
2. Check the exhaust flap actuator controller supply voltage.

   Disconnect the engine (EN) harness from the exhaust flap A-9001 actuator controller at connector **X-9025 NEF**.

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

From	To	Value
X-9025 NEF pin 1	**X-9025 NEF pin 2**	There should be **24 V**.

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

   B. If the voltage is not present, continue with Step **4**.
3. Determine the condition of the exhaust flap actuator controller CAN circuit.

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

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

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

   B. If the measured resistance is not correct, continue with Step **4**.
4. Check for other engine CAN faults.

   Use EST to determine if other CAN faults exist.

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

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

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

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

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

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

16658 - (DTC 4112)-Camshaft speed sensor pattern is not plausible

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

Context:
The Engine Control Unit (ECU) is responsible for evaluating the signals received from the camshaft and crankshaft speed sensors. Angle and speed determination, signal plausibility and quality are all evaluated. If the ECU determines that the camshaft signal does not match the correct pattern (edge distance, level) or not all expected camshaft edges are detected during engine revolution more than six times, this fault will occur. Different monitoring strategies are used by the ECU during engine start and normal engine running. If the problem is detected at engine start, a redundant synchronization of the angular system is performed using only the crankshaft increment signal and test injections to determine engine phase. If this procedure fails, the injection is aborted and the system waits for a restart.

Cause:
The ECU has detected a camshaft signal implausibility more than six times.

Possible failure modes:

1. Faulty phonic wheel timing. (Cursor engines)
2. Faulty tone wheel timing. (NEF engines)
3. Faulty camshaft speed sensor B-9008.
4. Faulty camshaft speed sensor B-9008, wiring or electrical disturbances due to damaged isolation of wiring harness or special electrical features.
5. Faulty software of the ECU.

Solution:

1. Verify that fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step **7**.
2. Check the signal circuit of the camshaft speed sensor for an open circuit condition.

   Disconnect the connector **X-9002**.

   Disconnect the connector **X-9022**.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check while shaking the harness to promote an intermittent connection:

From	To	Value
X-9002 pin 68	**X-9022 pin 2**	There should be continuity.

   A. If there is no continuity when shaking the harness or without shaking the harness there is an open circuit condition in the B-9008 signal circuit, wire EN-042. Locate and repair the broken conductor.

   B. If there is continuity, leave both connectors disconnected and continue to Step **3**.
3. Check the signal circuit of the camshaft speed sensor for a short circuit condition.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity check:

A. If there is voltage there is a short circuit in the key switch wiring.Locate and repair the shorted conductor.

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

5. Replace the key switch.

   Use the EST to verify the status of this fault.

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

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

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

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

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

Wiring harnesses - Electrical schematic sheet 16 (55.100)

19678 - (DTC 4CDE)-NH3 sensor heater control failure

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

Context:
For information regarding the NH3 electronic control unit and the NH3 connector sensor refer to **Ammonia (NH3) sensor - ECU description (55.988)**. The NH3 electronic control unit is required to report information at regular intervals to the Engine Control Unit (ECU) via Controller Area Network (CAN). This fault is the result of a heater control failure.

Cause:
The NH3 electronic control unit has reported via CAN to the ECU that a heater control failure has occurred.

Possible failure modes:

1. Faulty NH3 sensor, open or shorted or grounded internally.
2. Faulty NH3 electronic control unit, hardware or firmware.
3. Faulty software of the ECU.

Solution:

1. Verify that fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step **4**.
2. As there is no method for field testing the temperature sensing portion of the sensor, replace the NH3 sensor.

   Then check to see that the fault is resolved.

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

   B. If the fault is not resolved, continue with Step **3**.
3. As there is no method of field testing or re-flashing the NH3 electronic control unit, replace the NH3 electronic control unit.

   Then check to see that the fault is resolved.

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

   B. If the fault is not resolved, check the ECU for the appropriate software and re-flash, if necessary.
4. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Flex the harnesses involved to reveal intermittent breaks or shorts in the wiring concerned. Operate the machine while you monitor the display.

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

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

From	To	Value
X-9185 pin 2	**X-9002 pin 74**	There should be continuity

A. If there is continuity, continue with step **5**.

B. If there is no continuity, there is an open circuit condition in the engine (EN) harness between the valve cover connector **X-9185 pin 2** and the engine plug connector **X-9002 pin 74**. Locate and repair the broken conductor.

5. Determine the location of the open circuit condition.

   Remove the injector (valve) cover and disconnect the injector harness from the cylinder 4 injector at connector **X-9191-4CYL pin 2** .

   Use a multimeter to check for continuity in the injector harness:

From	To	Value
X-9191-4CYL pin 2	**X-9185 pin 1**	There should be continuity

A. If there is continuity, leave the injector harness connector **X-9191-4CYL pin 2** disconnected from cylinder 4 continue with Step **6**.

B. If there is no continuity, there is an open circuit condition in the injector harness, between connector **X-9191-4CYL pin 2** and connector **X-9185 pin 1**. Locate and repair the broken conductor.

6. Determine the location of the open circuit condition.

   Use a multimeter to measure the resistance, on the injector:

From	To	Value
X-9191-4CYL pin 2	**X-9191-4CYL pin 1**	There should be between **0.2 – 0.5 Ω**

A. If there is between **0.2 – 0.5 Ω**, there is an open circuit condition in the injector harness between connector **X-9191-4CYL pin 1** and connector **X-9185 pin 2**. Locate and repair the broken conductor.

B. If the resistance is greater than **0.5 Ω**, the cylinder 4 injector Y-9004 solenoid coil has failed, replace the injector.

7. Check the ECU supply voltage.

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

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

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

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

A. If the **12.0 V** is present for all five checks, leave the vehicle plug connector **X-9001** disconnected and continue with Step **8**.

B. If the **12.0 V** is not present for one or more of the checks, use the appropriate vehicle electrical schematics to locate and repair the failure.

8. Check the ECU ground circuits.

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

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

From	To	Value
X-9001 pin 1	chassis ground	There should be continuity.
X-9001 pin 5	chassis ground	There should be continuity.

25525 - (DTC 63B5)-Fuel filter heater actuator is shorted to battery voltage

Context:
The Engine Control Unit (ECU) monitors the fuel filter heater relay signal circuit for a short to battery condition. If the ECU detects a short to battery condition for a period greater than **200 ms**, this fault will occur.

Cause:
The ECU has detected a short to battery condition in the fuel filter heater relay circuit for a period greater than **200 ms**.

Possible failure modes:

1. Faulty coil of the fuel filter heater relay.
2. Faulty signal circuit of the fuel filter heater relay, short to battery condition.
3. Faulty software of the ECU.

Solution:

1. Verify that the fault code 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 to Step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to Step **4**.

2. Check the coil of the fuel filter heater relay for an internal failure.

   Remove the fuel filter heater relay.

   Use a multimeter to perform the following resistance test:

From	To	Value
Fuel filter heater relay K-LC7R1, pin 9	Fuel filter heater relay K-LC7R1, pin 12	The coil resistance should be between **70.0 – 130.0 Ω** (**70.0 – 130.0 Ω**)

   A. If the value is within the specified range, leave the fuel filter heater relay removed and continue to Step **3**.

   B. If the value is not within the specified value, the fuel filter heater relay has failed internally. Replace the fuel filter heater relay.

3. Check the signal circuit of the fuel filter heater relay for a short to battery condition.

   Disconnect the connector **X-ECU**.

   Turn the key to the ON position.

   Use a multimeter to perform the following voltage test:

From	To	Value
Connector **X-ECU** pin 61	Chassis ground	There should be no voltage
Connector **X-ECU** pin 61	All other pins	There should be no voltage

   A. If there is voltage, there is a short to battery condition in the signal circuit of the fuel filter heater relay, wire 28F. Locate and repair the shorted conductor.

   B. If there is no voltage, check the ECU for the appropriate software and re-flash, if necessary.

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

26481 - (DTC 6771)-After run relay low side driver circuit short to battery failure

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

Context:
The Engine Control Unit (ECU) monitors the ignition switch. When the ECU determines that the ignition switch has been turned OFF, it will go into after run. The after run disconnection relay K-9106 controls the voltage to the main relay which allows the ECU to store failures into memory (and other relevant machine operating parameters) before being turned OFF.

Cause:
The ECU has detected a short to high source condition in the K-9106 circuit, low side.

Possible failure modes:

1. Faulty after run disconnection relay K-9106.
2. Short to high source condition in the after run disconnection relay K-9106 circuit, low side.
3. Faulty software of the ECU.

Solution:

1. Verify that fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step **5**.
2. Check the coil of the after run disconnection relay.

   Remove the after run disconnection relay.

   Use a multimeter to perform the following test:

From	To	Value
X-9123 pin 2	**X-9123 pin 1**	There should be between **70 – 130 Ω** (**70 – 130 Ω**).

   A. If there is between **70 – 130 Ω** (**70 – 130 Ω**), go to Step **3**.

   B. If the value is not within specification, the after run disconnection relay has failed internally. Replace the after run disconnection relay.
3. Check the after run disconnection relay low side circuit for an open circuit condition.

   Disconnect **X-9123**.

   Disconnect **X-9001**.

   Use a multimeter to perform the following continuity test.

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

   A. If there is continuity, leave **X-9123** and **X-9001** disconnected and go to Step **3**.

   B. If there is no continuity, there is an open circuit condition in the vehicle (VE) harness. Refer to the appropriate service manual to locate and repair the broken conductor.
4. Check the after run disconnection relay low circuit for a short to high source condition.

30077 - (DTC 757D)-Supply UB1 circuit short to ground failure

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

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

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

Possible failure modes:

1. Faulty supply UB1 circuit, short to ground condition.
2. Faulty the software of the ECU.

Solution:

1. Verify that fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step **4**.
2. Check the supply UB1 circuit for a short to ground condition.

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

   The key must be in OFF position.

   Use a multimeter to perform the following continuity check:

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

   A. If there is continuity, there is a short circuit condition in the supply UB1 circuit. Locate and repair the shorted conductor.

   B. If there is no continuity, leave the connector disconnected and continue to Step **3**.
3. Check the supply UB1 circuit for a short to ground condition.

   The key must be in the OFF position.

   Use a multimeter to perform the following continuity test:

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

   A. If there is continuity, there is a short to ground in the supply UB1 circuit. Locate and repair the shorted conductor.

   B. If there is no continuity, check the ECU for the appropriate software and re-flash, if necessary.
4. Visually inspect the relevant harnesses and connectors for damage, bent or dislocated pins, corroded terminals, or broken wires. Verify that the connectors are fully installed. Flex the harnesses involved to reveal intermittent breaks or shorts in the wiring concerned. Operate the machine while you monitor the display.

33461 - (DTC 82B5)-Fuel filter heater ECU driver has an over temperature error

Context:
The Engine Control Unit (ECU) monitors the fuel filter heater relay signal circuit for an over temperature condition. If the ECU detects an over temperature condition for a period greater than **200 ms**, this fault will occur.

Cause:
The ECU has detected an over temperature condition in the fuel filter heater relay circuit for a period greater than **200 ms**.

Possible failure modes:

1. Faulty coil of the fuel filter heater relay.
2. Faulty signal circuit of the fuel filter heater relay, short to battery condition.
3. Faulty software of the ECU.

Solution:

1. Verify that the fault code 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 to Step **2**.

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue to Step **4**.
2. Check the coil of the fuel filter heater relay for an internal failure.

   Remove the fuel filter heater relay.

   Use a multimeter to perform the following resistance test:

From	To	Value
Fuel filter heater relay K-LC7R1, pin 9	Fuel filter heater relay K-LC7R1, pin 12	The coil resistance should be between **70.0 – 130.0 Ω** (**70.0 – 130.0 Ω**)

   A. If the value is within the specified range, leave the fuel filter heater relay removed and continue to Step **3**.

   B. If the value is not within the specified value, the fuel filter heater relay has failed internally. Replace the fuel filter heater relay.
3. Check the signal circuit of the fuel filter heater relay for a short to battery condition.

   Disconnect the connector **X-ECU**.

   Turn the key to the ON position.

   Use a multimeter to perform the following voltage test:

From	To	Value
Connector **X-ECU** pin 61	Chassis ground	There should be no voltage
Connector **X-ECU** pin 61	Connector **X-ECU** pin 27	There should be no voltage
Connector **X-ECU** pin 61	All other pins	There should be no voltage

   A. If there is voltage, there is a short to battery condition in the signal circuit of the fuel filter heater relay. Locate and repair the shorted conductor.

   B. If there is no voltage, check the ECU for the appropriate software and re-flash, if necessary.

37147 - (DTC 911B)-CAN A Bus off passive failure

Context:
The Engine Control Unit (ECU) is capable of connecting to and communicating on three separate Controller Area Networks (CAN). Proper configuration and monitoring of the three twisted pair configured networks is also a function of the ECU. CAN Node A Bus is the main vehicle interface bus. The ECU provides a CAN termination resistor for the CAN Node A Bus, internal to the ECU. If the ECU senses that CAN Node A Bus is not functioning properly, this fault will occur.

Cause:
ECU has sensed a “Bus Off” state to be present at the CAN Node A.

Possible failure modes:

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

Solution:

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

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

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

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

2. Check for other vehicle CAN faults.

   Use the EST to determine if vehicle CAN faults exist.

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

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

3. Check the ECU supply voltage.

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

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

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

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

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

4. Check the ECU grounding.

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

From	To	Value
Connector **X-ECU** pin 3	chassis ground	There should be continuity
Connector **X-ECU** pin 5	chassis ground	There should be continuity

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

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

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

5. Determine the condition of the ECU CAN circuit.

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

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

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

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

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

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

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

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

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

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

57821 - (DTC E1DD)-ECU internal failure - Post injection quantity

Context:
Engine performance is assisted by the addition of pilot injections, main injections and three post injections. The Engine Control Unit (ECU) monitors the start angle and efficiency of post Injection 2. If the ECU determines that the post Injection 2 is not within a plausible value, a calibration error has occurred and this fault will occur.

Solution:

1. Check the ECU for the appropriate software and re-flash, if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, escalate an ASIST concern.

58685 - (DTC E53D)-ECU internal failure - Undervoltage monitoring error

Context:
The Engine Control Unit (ECU) performs shut off paths which deactivate all power stages relevant to fuel injection if certain internal ECU errors are detected. In order to test this function, every path is shortly activated during ECU initialization. Since the shut off is active, no fuel injection should occur during this test. If a voltage lower than expected condition is detected during this test, this fault will occur.

Solution:

1. Check the ECU for the appropriate software and re-flash, if necessary.
   A. If the fault has been resolved, return the machine to service.
   B. If the fault has not been resolved, escalate an ASIST concern.

59421 - (DTC E81D)-ECU internal failure - 'WDA active' reported due to errors in query/response communication

Context:
The Engine Control Unit (ECU) monitors the communication between the power stages and the power stage voltage supplier. If an unexpected communication (a wire is active when it should not be) is detected during this monitoring, this fault will occur.

Solution:

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

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

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

61839 - (DTC F18F)-DEF/AdBlue level too low warning is active - Stage 1

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

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

Context:
For information regarding the functional operation of the Selective Catalytic Reduction (SCR) system refer to **Selective Catalytic Reduction (SCR) exhaust treatment - Dynamic description (10.500)**. The Engine Control Unit (ECU) monitors the level and temperature of the **DEF/ADBLUE®** fluid. If the level of the fluid falls below **10%** of full, this fault will occur.

Cause:
The level signal of the **DEF/ADBLUE®** tank level and temperature sensor to the ECU is less than **10%** of full.

Possible failure modes:

1. **DEF/ADBLUE®** tank fluid level, too low.
2. Faulty **DEF/ADBLUE®** tank level and temperature sensor, failed internally.
3. Faulty software of the ECU.

Solution:

1. Fill the **DEF/ADBLUE®** tank to the appropriate level.

   Then check to see that this fault has been resolved.

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

   B. If this fault is not resolved, continue with Step **2**.
2. Verify the condition of the **DEF/ADBLUE®** tank level and temperature sensor.

   Disconnect the connector **X-DTLTS**.

   Use a multimeter to measure the resistance of the **DEF/ADBLUE®** tank level and temperature sensor:

From	To	Value
Connector **X-DTLTS** pin 1	Connector **X-DTLTS** pin 2	There should be greater than **12000 Ω**

   A. If the measured resistance is greater than **12000 Ω**, check the ECU for the appropriate software and re-flash, if necessary.

   B. If the measured resistance is less than **12000 Ω**, the **DEF/ADBLUE®** tank level and temperature sensor has failed internally. Replace the **DEF/ADBLUE®** tank level and temperature sensor unit.

   NOTE: *once the* ***DEF/ADBLUE®*** *tank level and temperature sensor has been removed, inspect the apparatus to determine if the filler spout magnet broke free of its mounting and became lodged causing a false reading.*

Wiring harnesses - Electrical schematic sheet 17 (55.100)

2662-04 - Hall cell X1/X2 voltage abnormally low

Control Module: Keypad and Joystick

Context:
Hall cell X1/X2 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.

62817 - (DTC F561)-ECU after run power interruption

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

Context:
The Engine Control Unit (ECU) monitors the ignition switch. When the ECU determines that the ignition switch has been turned OFF, it will go into after run. The after run disconnection relay K-9106 controls the voltage to the main relay which allows the ECU to store failures into memory (and other relevant machine operating parameters) before being turned OFF. If the ECU determines that the after run cycle was interrupted three consecutive times, this fault will occur.

Cause:
The ECU has detected an interruption in the after run process.

Possible failure modes:

1. Improper use of the Timed Disconnect Switch.
2. Faulty battery voltage.
3. Faulty K-9106, internal failure or loose connection.
4. Faulty K-9102, internal failure or loose connection.
5. Faulty fuse F-9105.
6. Faulty K-9106, wiring.
7. Faulty software of the ECU.

Solution:

1. Verify that fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active. Continue with Step **11**.

2. Check the battery voltage.

   Use a multimeter to perform the following voltage check:

From	To	Value
Battery post (+)	Battery post (–)	There should be approximately **12 V**.

   A. If there is approximately **12 V**, continue to Step **3**.

   B. If there is not approximately **12 V**, there is a battery or charging system fault. Repair as necessary.

3. Check for the following related faults:

   22897 – (DTC 5971)-After run relay low side driver circuit open or short to ground failure

   20849 – (DTC 5171)-After run relay high side driver circuit open failure

   26481 – (DTC 6771)-After run relay low side driver circuit short to battery failure

   34417 – (DTC 8671)-After run relay low side ECU drive circuit over temperature failure

   33393 – (DTC 8271)-After run relay high side ECU driver circuit over temperature failure

   25713 – (DTC 6471)-After run relay high side drive circuit short to ground failure

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

517755-19 - BJM Message Timeout (Boom, Bucket, Kick down)

Control Module: UCM

Context:

The **A-UCM** does not receive messages from the BJM within the maximum interval time; as a consequence:

- Default Joystick Signal to Neutral or **0%**;
- Default kick down to not pressed.

Cause:
After **5 s** from key on incoming cycle time message interval > 3 times of maximum defined cycle time.

Possible failure modes:

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

Solution:

1. Verify that the fault is present and active.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Disconnect the connector **X-RFWL** from the LMP-RF_WL (RIGHT FRONT WORK LIGHT) and visually check the integrity of pin 1 and 2.

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

B. If all pins are not damaged, continue with Step **12**.

12. Check the integrity of the harness between the connector **X-RFWL** and SP-949A.

Use a multimeter to perform the following check:

From	To	Value
Connector **X-RFWL** pin 2	Connector SP-949A	Short circuit

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

B. If the measurement is correct, continue with Step **13**.

13. Check the integrity of the harness between SP-949A and the connector **X-ROOF**.

Use a multimeter to perform the following check:

From	To	Value
Connector SP-949A	Connector **X-ROOF** pin 6	Short circuit

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

B. If the measurement is correct, continue with Step **14**.

14. Replace the LMP-RF_WL (RIGHT FRONT WORK LIGHT).

A. If the fault is present, continue with Step **15**.

15. Check the integrity of the harness between **X-CAB_R** and CG1.

Use a multimeter to perform the following check:

From	To	Value
Connector **X-CAB_R** pin 6	Connector CG1	Short circuit

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

B. If the measurement is correct, replace the **A-SFB** (SMART FUSE BOX).

Wiring harnesses - Electrical schematic sheet 13 (55.100)
Wiring harnesses - Electrical schematic sheet 31 (55.100)

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

5. Check the harness of connector **X-CAB_B** for a proper condition.

   The key must be in the OFF position.

   Use a multimeter to perform the following resistance check:

From	To	Value
Connector **X-CAB_B** pin 8	Connector **X-UCM1A** pin 2	Short circuit
Connector **X-CAB_B** pin 10	Connector **X-UCM1A** pin 1	Short circuit

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

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

6. Check the PEDAL/DECLTCH sensor integrity.

   The key must be in the OFF position.

   Remove the PEDAL/DECLTCH sensor.

   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 as follows.

7. 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 resistance does not change, replace the PEDAL/DECLTCH.

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

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

   Disconnect the connector **X-BTM** from the connector **X-CAB_B** and visually check the integrity of the pins 7 on both connectors.

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

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

9. Check the **B-PBL/PEDAL/DECLTCH** to **X-BTM** harness for a proper condition.

   The key must be in the OFF position.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-PLB-PBD** pin C	Connector **X-BTM** pin 7	Short circuit

   A. If the value is not correct, replace the harness between the connector and the PEDAL/DECLTCH.

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

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

    The key must be in the OFF position.

    Use a multimeter to perform the following check:

518129-05 - Open Circuit at Boom Raise Valve High Side Driver

Control Module: UCM

Context:

The **A-UCM**, driving the boom rise, detects an open circuit or a low current; 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 7 of connector **X-UCM4A**, 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-BOOM_RAISE** is damaged.
3. The connectors **X-BOOM_RAISE** or **X-FRNT_EH** or **X-BTM_FEH** or **X-BTM_EH** or **X-CAB_EH** or **X-UCM1B** or **X-UCM4A** are damaged.
4. The harness between connectors **X-FRNT_EH** and **X-BTM_FEH** is damaged.
5. The harness between connectors **X-BTM_EH** and **X-BTM_FEH** is damaged.
6. The harness between connectors **A-UCM** and the connector **X-CAB_EH** is damaged.
7. The BOOM_RAISE SOLENOID is damaged.

Solution:

1. Verify that the fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Visually check the integrity of the harness between the connectors **X-UCM4A**, **X-UCM1B** and **X-BOOM_RAISE** 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-BOOM_RAISE**.

   Disconnect the connector **X-BOOM_RAISE** 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 pins B and C of both connectors.

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

518134-03 - Short to Power/Open Circuit at Bucket 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 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 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-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	**0 V**

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

518139-03 - Short to Power/Open Circuit at AUX 1 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 an AUX 1 Solenoid; as a consequence:

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

Cause:
The **A-UCM** detects, on pin 10 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-AUX_1_LEFT** and **X-AUX_1_RIGHT** is visually damaged.
3. The connector **X-UCM1B** is damaged.
4. The harness between **A-UCM** and the connectors **X-AUX_1_LEFT** and **X-AUX_1_RIGHT** is damaged.

Solution:

1. Verify that the fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Visually check the integrity of the harness between the connectors **X-UCM1B**, **X-AUX_1_LEFT** and **X-AUX_1_RIGHT** for any damage.

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

   B. If the harness is not damaged, continue with Step **3**.
3. Check the integrity of connector **X-UCM1B**.

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

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

   B. If the pin is not damaged, continue with Step **4**.
4. Check the integrity of harness between the **A-UCM** and the connectors **X-AUX_1_LEFT** and **X-AUX_1_RIGHT**.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-UCM1B** pin 10	Ground	**0 V**

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

   B. If the measurement is not correct, check the correct functioning of the circuits relevant to:
   - the AUX 1 Left High Side Driver (see procedure **518137-03 – Short to Power at AUX 1 Left High Side Driver**).

518144-04 - Short to Ground at Aux Steering Enable High Side Driver

Control Module: UCM

Context:

The **A-UCM** detects a grounding from **X-LC3**, as a consequence:

- Disable Aux Steering function.

Cause:
The **A-UCM** detects, on pin 8 of connector **X-UCM4B**, a short circuit to power risen by BSP.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between the connector **X-UCM4B** and the connector **X-LC3** is damaged.
3. The relay SEC STEERING (K-3R2) of LC3 is damaged.
4. The harness relevant to 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 between the connector **X-UCM4B** and the connector **X-LC3** for any damage.

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

   B. If the harness is not damaged, continue with Step **3**.
3. Replace the relay SEC STEERING (K-3R2) of LC3.

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

   B. If the functionality is not restored, continue with Step **4**.
4. Check the integrity of the connector **X-LC3**.

   Disconnect the connector **X-LC3** from the LC3.

   Visually check the integrity of pins R2_30, R2_85, R2_86 and R2_87 of the connector.

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

   B. If all pins are not damaged, continue with Step **5**.
5. Check the integrity of the harness relevant to the connector **X-LC3**.

   Disconnect the connector **X-UCM4B** from **A-UCM**.

   Use a multimeter to perform the following check:

From	To	Value
Connector **X-LC3** pin R2_86	Connector **X-LC3** pin R2_85	Open circuit

518150-06 - Electrical Crank Power Relay- Short Circuit to GND

Control Module: SFB

Context:
Short Circuit to GND of the Electrical Crank Power Relay.

Cause:
The Smart Fuse box measure a Short Circuit to GND Electrical Crank Power Relay (X3-5) on SCG when ON.

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between Smart Fuse Box and UCM is damaged.
3. The key switch Crank connector is damaged.
4. The Smart Fuse Box connector is damaged.
5. The Crank 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 key switch Crank (**X-UCM2B** pin 14).

   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 key switch Crank connector (**X-UCM2B** pin 14).

   The key must be in the OFF position.

   Disconnect key switch Crank connector and visually check the integrity of the pin.

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

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

   The key must be in the OFF position.

   Disconnect **X-X3** connector and visually check the integrity of the pin 5.

   A. If the pin 5 is damaged, replace the **X-X3** connector.

   B. If the pin 5 is not damaged, continue with Step **5**.
5. Check the signal circuit for an open circuit condition on the harness between key switch Crank pin (**X-UCM2B** pin 14) and Smart Fuse Box.

   Use a multimeter to perform the following voltage check:

518283-31 - Error at 24VF2 Supply Rail

Control Module: UCM

Context:

The **A-UCM** detects the absence of the 24VF2 power supply; as a consequence:

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

Cause:
The **A-UCM** detects, on pins 1 and 8 of connector **X-UCM4A**, a voltage < **19.6 V** (Note: only one input is available in CCS).

Possible failure modes:

1. The fault is intermittent and not currently active.
2. The harness between **A-UCM** and the LC2 is damaged.
3. The connectors **X-LC2** or **X-UCM4A** are damaged.
4. The harness between **A-UCM** and the connector **X-LC2** is damaged.
5. The UCM VF2/3 (**F-2F2**) is burnt.
6. The harness between the LC2 and the power supply is damaged.

Solution:

1. Verify that the fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Visually check the integrity of the harness between the connectors **X-UCM4A** and **X-LC2** for any damage.

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

   B. If the harness is not damaged, continue with Step **3**.
3. Check the integrity of connector **X-UCM4A**.

   Disconnect the connector **X-UCM4A** from the **A-UCM** and visually check the integrity of pins 1 and 8.

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

   B. If the pins are 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-UCM4A** pin 1	Ground	≥ + **19.6 V**
Connector **X-UCM4A** pin 8	Ground	≥ + **19.6 V**

518500-16 - Hydrocarbon level is critical

Control Module: GHMI - Faults list

Context:
Hydrocarbon level is critical.

Cause:

Possible failure modes:

1. The fault is intermittent and not currently active.
2. Hydrocarbon level is critical.

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. Verify the proper operation of the Urea system.

   A. If the system is not faulty, continue with Step **3**.

   B. If the system is faulty, undertake the repair.
3. Verify the proper operation of the SCR system.

   A. If the system is not faulty, continue with Step **4**.

   B. If the system is faulty, undertake the repair.
4. Bring the machine to a safe stop, and turn the engine OFF immediately. Replace the hydrocarbon level sensor.

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:

520591-03 - Backup Alarm - Short circuit to B+

Control Module: SFB

Context:
Battery voltage on Backup Alarm (Short circuit to B+).

Cause:
The Smart Fuse box measure a battery voltage on Backup Alarm signal (X4 pin 21) 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 Backup Alarm is damaged.
3. The Backup Alarm connector is damaged.
4. The **X-ENG** connector is damaged.
5. The **X-CAB_E** connector is damaged.
6. The Smart Fuse Box connector is damaged.
7. The Backup Alarm is defective.
8. The harness between Backup Alarm and **X-ENG** connector is defective.
9. The harness between Smart Fuse Box and **X-CAB_E** connector is defective.
10. The Smart Fuse Box is defective.

Solution:

1. Verify that the fault is present and active.

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

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

   B. If the fault is no longer present or in an inactive state, the fault may be intermittent and not currently active.
2. Check the integrity of the harness between Smart Fuse Box and Backup Alarm.

   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 Backup Alarm connector.

   The key must be in the OFF position.

   Disconnect Backup Alarm connector **X-BU2** and visually check the integrity of the pin P.

   A. If the pin P is damaged, replace the **X-BU2** connector.

   B. If the pin P is not damaged, continue with following step.
4. Disconnect Backup Alarm connector **X-BU1** and visually check the integrity of the pin N.

   A. If the pin N is damaged, replace the **X-BU1** connector.

   B. If the pin N is not damaged, continue with Step **5**.
5. Check the integrity of the **X-ENG** connector.

   The key must be in the OFF position.

Use a multimeter to perform the following check:

From	To	Value
Connector **X-JSS_CO_1** pin 1	Connector **X-JSS_CO_1** pin 2	The sensor resistance

A. If the resistance is an open circuit, replace the JSS CUT OFF SENSOR 1.

B. If resistance value is correct, continue with the following step.

11. Use a multimeter to perform the following check:

From	To	Value
Connector **X-JSS_CO_1** pin 1	Connector **X-JSS_CO_1** pin 4	Resistance value between maximum and minimum

A. If the resistance value is not valid, replace the JSS CUT OFF SENSOR 1.

B. If the resistance is correct, continue with Step **12**.

12. Check the JSS CUT OFF SENSOR 2 integrity.

Install the JSS CUT OFF SENSOR 2.

Use a multimeter to perform the following check:

From	To	Value
Connector **X-JSS_CO_2** pin 1	Connector **X-JSS_CO_2** pin 2	The sensor resistance

A. If the resistance is an open circuit, replace the JSS CUT OFF SENSOR 2.

B. If resistance value is correct, continue with the following step.

13. Use a multimeter to perform the following check:

From	To	Value
Connector **X-JSS_CO_2** pin 1	Connector **X-JSS_CO_2** pin 4	Resistance value between maximum and minimum

A. If the resistance value is not valid, replace the JSS CUT OFF SENSOR 1.

B. If the resistance correct, continue with Step **14**.

14. Visually check the integrity of the harness between the PVED-CLS and the **A-UCM** (CAN 2) for any damage.

A. If the harness is damaged, replace the bus CAN 2.

B. If the harness is not damaged, continue with Step **15**.

15. Check the integrity of connector **X-UCM3A**.

Disconnect the connector **X-UCM3A** from the **A-UCM** and visually check the integrity of pin 12.

A. If the pin is damaged, replace the harness between the connectors **X-UCM3A** and **X-CAB_JSS**.

B. If the pin is not damaged, continue with Step **16**.

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

Disconnect the connector **X-UCM3B** from the **A-UCM** and visually check the integrity of pin 15.

A. If the pin is damaged, replace the harness between the connectors **X-UCM3B** and **X-CAB_JSS**.

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

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

Disconnect the connector **X-UCM2A** from the **A-UCM** and visually check the integrity of pin 20.

A. If the pin is damaged, replace the harness between the connectors **X-UCM2A** and **X-CAB_JSS**.

Contents

Front loader and bucket - 82

Arm - 100

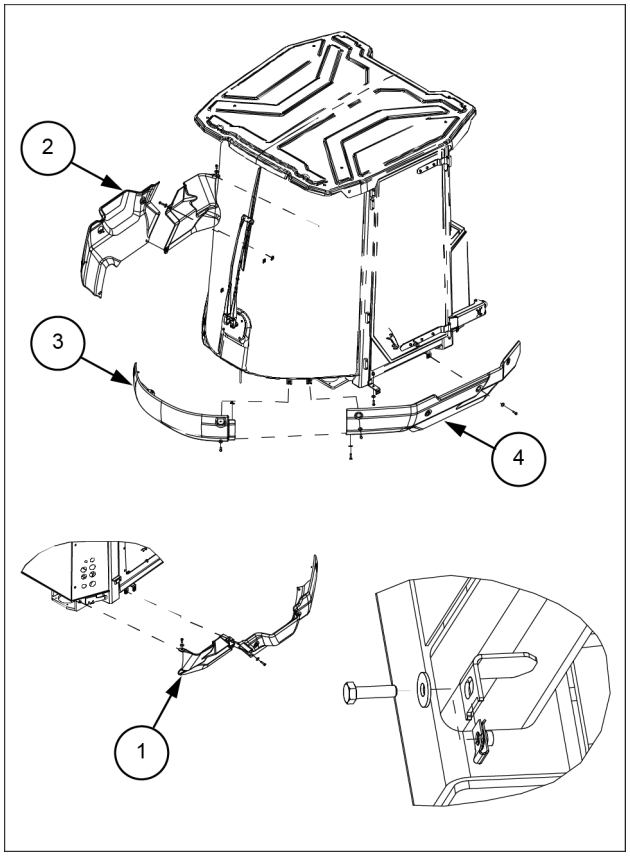
Cab - Remove

ROPS

NOTE: *procedures and pictures in following steps cover in detail removal and installation of ROPS.*

1. Park the machine on a level surface and lower the bucket to the ground.
   Stop the engine.
   Actuate the brake pedal several times to discharge the brake accumulators.
2. Put the key switch to ON position and move the joystick to the raise and to the lower position in order to release any hydraulic pressure in the hydraulic circuit.
3. Slowly loosen the filler cap on the hydraulic oil tank to release air pressure.
4. Put the key switch to OFF position.
5. Put the articulation lock in the locked position.
6. Put the timed disconnect switch in the OFF position.
7. Put a suitable container below the radiator drain. Remove cap and drain coolant into container. Install cap after coolant has drained.
8. Discharge and recover the air-conditioning refrigerant. Refer to **Air conditioning - Charging (50.200)**.
9. Remove the right-hand rear fender and steps (if equipped).
10. Remove the relevant bolts, washers, and nuts to disassemble:

    • the right-hand rear cab skirt **(1)**;
    • the right-hand cab skirt **(2)**;
    • the center cab skirt **(3)**;
    • the left-hand cab skirt **(4)**.



LEIL16WHL1189FB 1