

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

SERVICE MANUAL

Part number 47673352

1st edition English

March 2014



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INTRODUCTION

Safety rules

Personal safety



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.

Throughout this manual you will find the signal words DANGER, WARNING, and CAUTION followed by special instructions. These precautions are intended for the personal safety of you and those working with you.

Read and understand all the safety messages in this manual before you operate or service the machine.

 DANGER indicates a hazardous situation that, if not avoided, will result in death or serious injury.

 WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury.

 CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION MESSAGES COULD RESULT IN DEATH OR SERIOUS INJURY.

Machine safety

NOTICE: Notice indicates a situation that, if not avoided, could result in machine or property damage.

Throughout this manual you will find the signal word Notice followed by special instructions to prevent machine or property damage. The word Notice is used to address practices not related to personal safety.

Information

NOTE: Note indicates additional information that clarifies steps, procedures, or other information in this manual.

Throughout this manual you will find the word Note followed by additional information about a step, procedure, or other information in the manual. The word Note is not intended to address personal safety or property damage.

Personal safety

Carefully read this Manual before proceeding with maintenance, repairs, refuelling or other machine operations.

Repairs have to be carried out only by authorized and instructed staff; specific precautions have to be taken when grinding, welding or when using mallets or heavy hammers.

Not authorized persons are not allowed to repair or carry out maintenance on this machine. Do not carry out any work on the equipment without prior authorization.

Ask your employer about the safety instructions in force and safety equipment.

Nobody is allowed to seat on the operator's place during machine maintenance unless he is a qualified operator helping with the maintenance work.

If it is necessary to move the equipment to carry out repairs or maintenance, do not lift or lower the equipment from any other position than the operator's seat.

Never carry out any operation on the machine when the engine is running, except when specifically indicated.

Stop the engine and ensure that all pressure is relieved from hydraulic circuits before removing caps, covers, valves, etc.

All repair and maintenance operations should be carried out with the greatest care and attention.

Service stairs and platforms used in a workshop or in the field should be built in compliance with the safety rules in force.

Any functional disorders, especially those affecting the safety of the machine, should therefore be rectified immediately.

⚠ DANGER

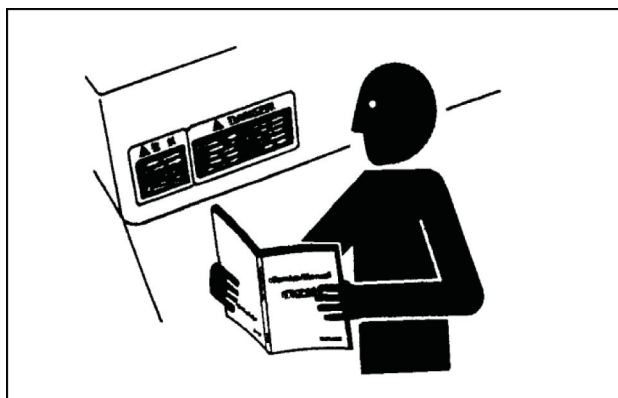
Unexpected movement!

Make sure parking brake is applied. Secure machine with wheel chocks.

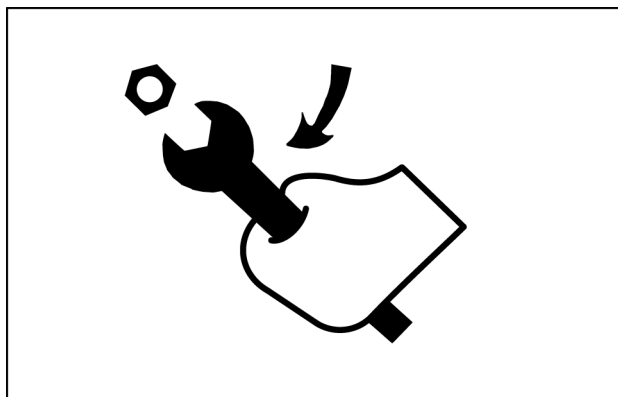
Failure to comply will result in death or serious injury.

D0013A

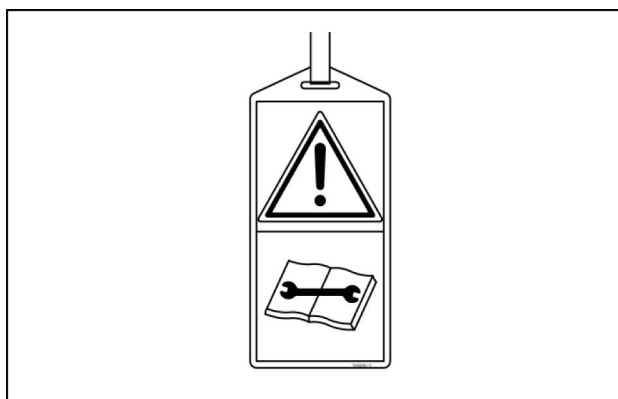
Before performing any work on the machine, attach a maintenance in progress tag. This tag can be applied on the left-hand control lever, safety lever or cab door.



TULI12WEX2004AA 1



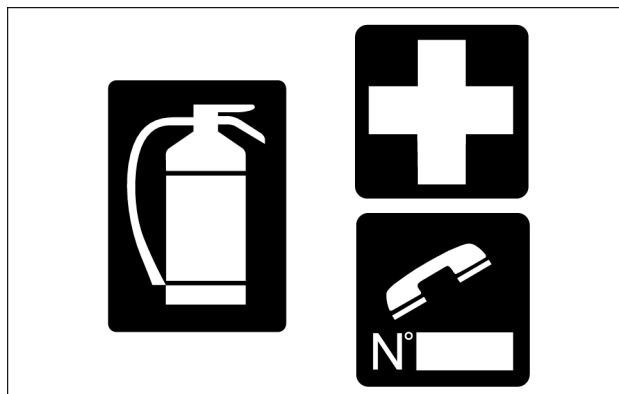
TULI12WEX2005AA 2



TULI12WEX2006AA 3

Emergency

Be prepared for emergencies. Always keep at disposal on the machine a first aid kit and a fire extinguisher. Make sure that the fire extinguisher is serviced in accordance with the manufacturer's instructions.



SMIL12WEX0174AA 4

Equipment

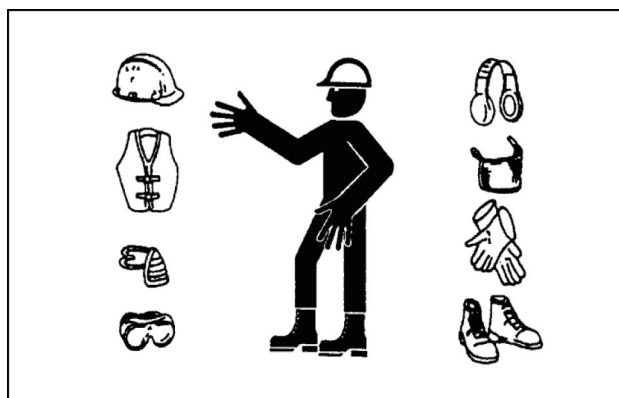
Wear close fitting clothing and safety equipment appropriate for the job:

- Safety helmet
- Safety shoes
- Heavy gloves
- Reflective clothing
- Wet weather clothing

If environment condition require it following personal safety equipment should be at hand:

- Respirators (or dust proof masks)
- Ear plugs or acoustic ears protections
- Goggles with lateral shield or masks for eyes protection

Do not wear rings, wristwatches, jewels, unbuttoned or flapping clothing such as ties, torn clothes, scarves, open jackets or shirts with open zips which could get caught into moving parts.



TULI12WEX2008AA 5

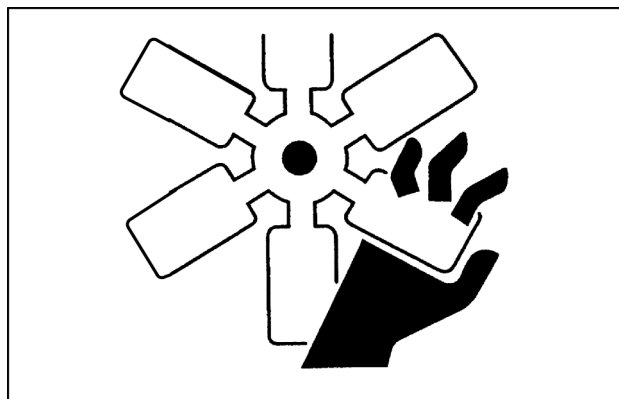
Engine - Radiator

Never leave the engine run in closed spaces without ventilation and not able to evacuate toxic exhaust gases. Keep the exhaust manifold and tube free from combustion materials.

Do not refuel with the engine running, especially if hot, as this increases fire hazard in case of fuel spillage.

Never attempt to check or adjust the belts when the engine is running.

Never lubricate the machine with the engine running.



TULI12WEX2009AA 6

Pay attention to rotary pieces and do not allow to anyone to approach to avoid becoming entangled.

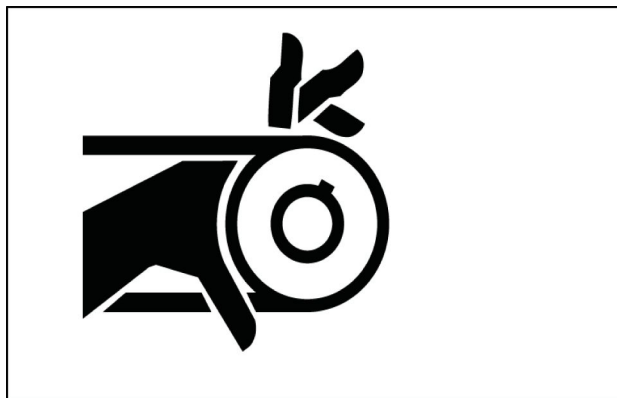
If hands, clothes or tools get caught in the fan blades or in the transmission belt, this can cause amputations, violent tears and generate condition of serious danger; for this reason avoid touching or to come close to all rotary or moving parts.

A violent jet of the coolant from the radiator can cause damages and scalds.

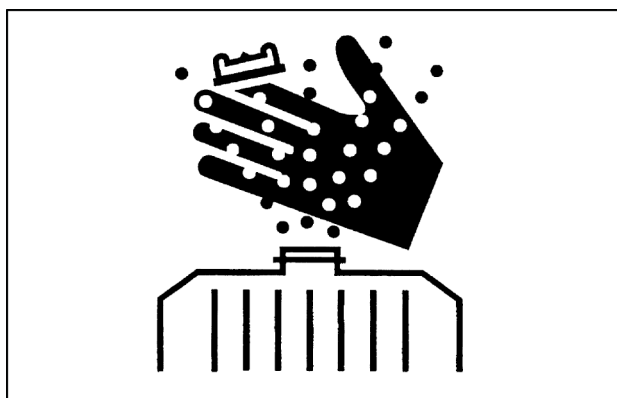
If you are to check the coolant level, you have to shut-off the engine previously and to let cool down the radiator and its pipes. Slowly unscrew the cap to release the inside pressure.

If necessary, remove the cap with hot engine, wear safety clothes and equipment, then loosen the cap slowly to relieve the pressure gradually.

When checking the fuel, oil and coolant levels, use exclusively explosion proof classified lamps. If this kind of lamps are not used fires or explosions may occur.



TULI12WEX2010AA 7



TULI12WEX2011AA 8

Hydraulic systems

Splashes of fluids under pressure can penetrate the skin causing serious injuries.

Avoid this hazard by relieving pressure before disconnecting hydraulic or other lines.

Relieve the residual pressure by moving the hydraulic control levers several times.

Tighten all connections before applying pressure.

To protect the eyes wear a facial shield or safety goggles.

Protect your hands and body from possible splashes of fluids under pressure.

Swallowing hydraulic oil is a severe health hazard.



TULI12WEX2012AA 9

When hydraulic oil has been swallowed, avoid vomiting, but consult a doctor or go to a hospital.

If an accident occurs, see a doctor familiar with this type of injury immediately.

Any fluid penetrating the skin must be removed within few hours to avoid serious infections.

Flammable splashes may originate because of the heat near pipes with fluids under pressure, with the result of serious scalds for the persons hit. Do not weld or use torches near pipes containing fluids or other flammable materials.

Pipes under pressure can accidentally be pierced when the heat expands beyond the area immediately heated.

Arrange for fire resistant temporary shields to protect hoses or other components during welding.

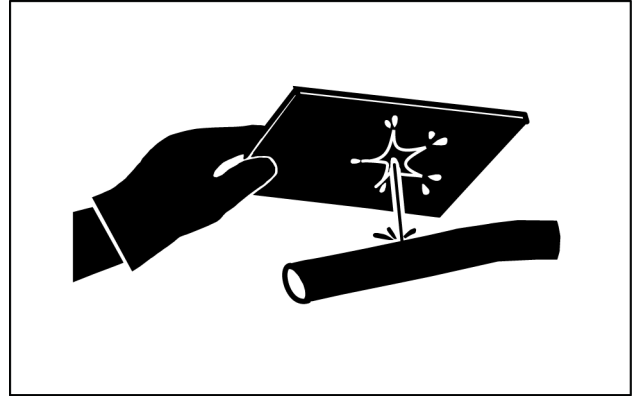
Have any visible leakage repaired immediately.

Escaping oil pollutes the environment. Soak up any oil that has escaped with a proper binding agent. Sweep up binding agent and dispose of it separately from other waste.

Never search for leakages with the fingers, but use a piece of cardboard and always wear goggles.

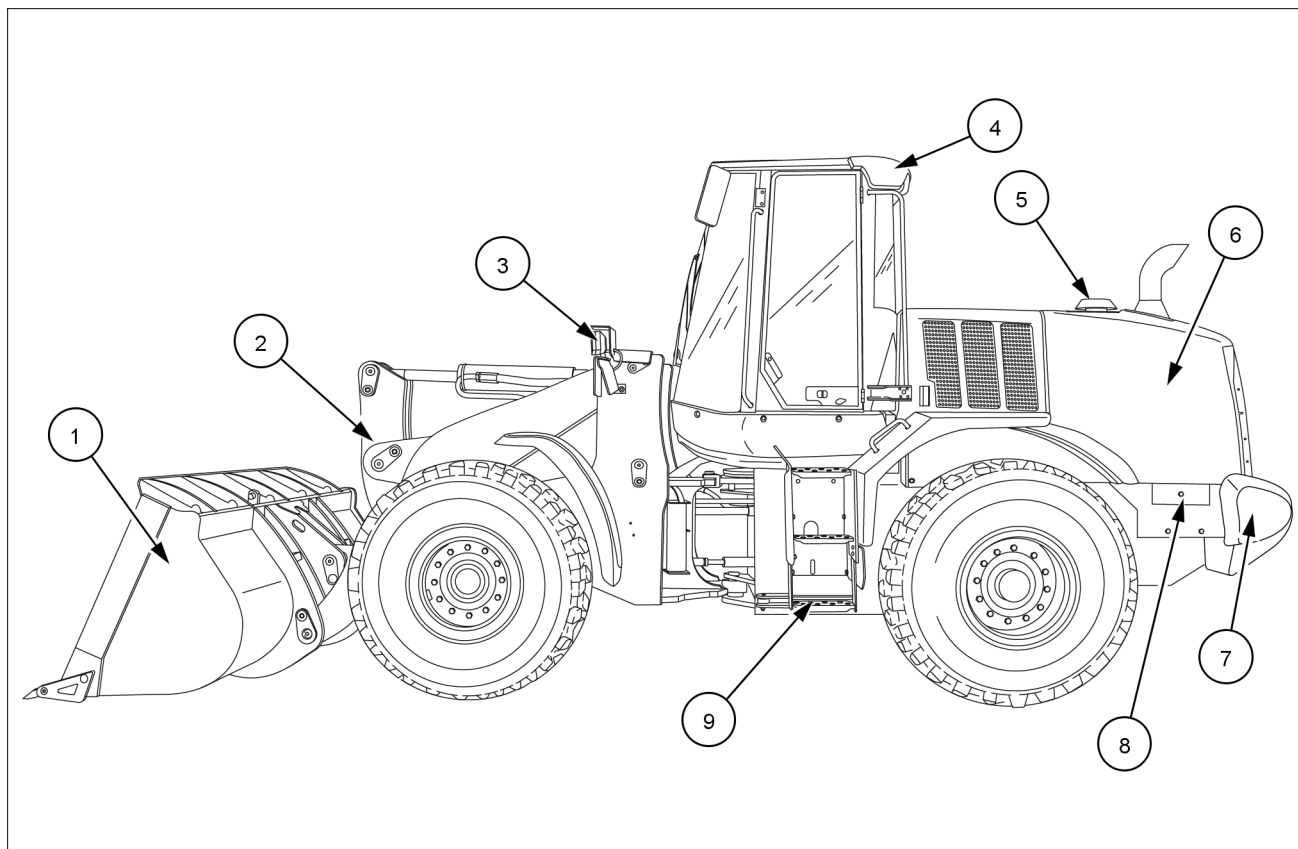
Never repair damaged piping; always replace it. Replace hydraulic hoses immediately on detecting any damage or moist areas.

Always store hydraulic oil in the original containers.



TULI12WEX2013AA 10

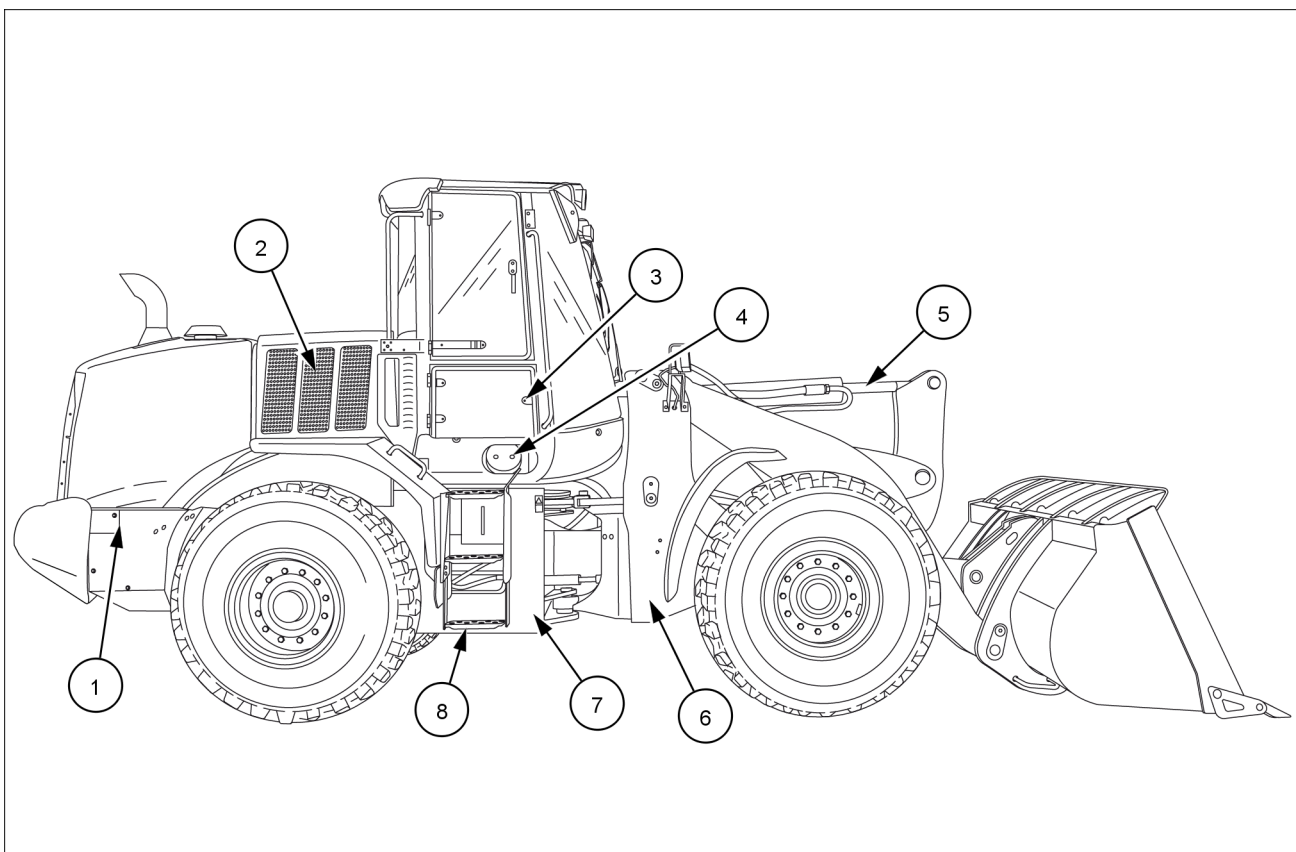
Product identification



LEIL13WHL0320FA 1

- | | |
|---|--|
| 1. Bucket | 6. Engine and Selective Catalyst Reduction (SCR) system |
| 2. Loader lift arms (Z-bar version) | 7. Counterweight |
| 3. Driving lights | 8. Electric master switch and battery jump post (optional) |
| 4. Roll Over Protection System (ROPS) cab | 9. Steps |
| 5. Precleaner | |

INTRODUCTION



LEIL13WHL0321FA 2

- | | |
|---|--------------------|
| 1. Diesel Exhaust Fluid (DEF) fill tank | 5. Bucket cylinder |
| 2. Sliding access panel | 6. Front frame |
| 3. Fuses access door | 7. Rear frame |
| 4. Cab air filter | 8. Steps |



SERVICE MANUAL

Engine

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Engine - General specification

821F	
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Engine with 4 Speed Transmission	
A. Low idle	870 RPM to 930 RPM
Alternate low idle	570 RPM to 630 RPM
Alternate Accelerated Idle	1170 RPM to 1230 RPM
B. Maximum No Load RPM	2100 RPM to 2155 RPM
C. Converter Stall	1883 RPM to 1963 RPM
D. Hydraulic Stall	1883 RPM to 1963 RPM
E. Converter & Hydraulic Stall	1497 RPM to 1577 RPM
Temperature of the torque converter oil	82 - 104 °C (180 - 219 °F)
Temperature of the hydraulic oil	54 - 57 °C (129 - 135 °F)

Engine with 5 Speed Transmission	
A. Low idle	870 RPM to 930 RPM
Alternate low idle	570 RPM to 630 RPM
Alternate Accelerated Idle	1170 RPM to 1230 RPM
B. Maximum No Load RPM	2100 RPM to 2155 RPM
C. Converter Stall	1860 RPM to 1900 RPM
D. Hydraulic Stall	1923 RPM to 2003 RPM
E. Converter & Hydraulic Stall	1524 RPM to 1604 RPM
Temperature of the torque converter oil	82 - 104 °C (180 - 219 °F)
Temperature of the hydraulic oil	54 - 57 °C (129 - 135 °F)

NOTE: Hydraulic Stall and Converter & Hydraulic Stall RPM values are read while the lift arms are rising with the bucket held rolled back and the engine at WOT in max power mode with transmission in manual mode and in 3rd gear.

Engine - General specification

921F	
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Engine with 4 Speed Transmission	
A. Low idle	870 RPM to 930 RPM
Alternate low idle	570 RPM to 630 RPM
Alternate Accelerated Idle	1170 RPM to 1230 RPM
B. Maximum No Load RPM	2100 RPM to 2155 RPM
C. Converter Stall	1900 RPM to 1940 RPM
D. Hydraulic Stall	1860 RPM to 1940 RPM
E. Converter & Hydraulic Stall	1525 RPM to 1605 RPM
Temperature of the torque converter oil	82 - 104 °C (180 - 219 °F)
Temperature of the hydraulic oil	54 - 57 °C (129 - 135 °F)

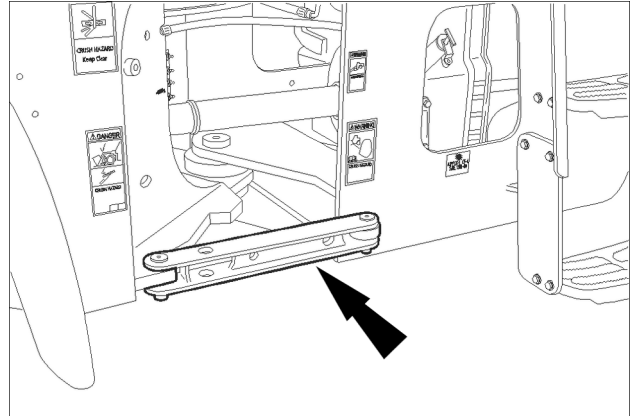
Engine with 5 Speed Transmission	
A. Low idle	870 RPM to 930 RPM
Alternate low idle	570 RPM to 630 RPM
Alternate Accelerated Idle	1170 RPM to 1230 RPM
B. Maximum No Load RPM	2135 RPM to 2185 RPM
C. Converter Stall	1945 RPM to 1985 RPM
D. Hydraulic Stall	2017 RPM to 2097 RPM
E. Converter & Hydraulic Stall	1531 RPM to 1611 RPM
Temperature of the torque converter oil	82 - 104 °C (180 - 219 °F)
Temperature of the hydraulic oil	54 - 57 °C (129 - 135 °F)

NOTE: Hydraulic Stall and Converter & Hydraulic Stall RPM values are read while the lift arms are rising with the bucket held rolled back and the engine at WOT in max power mode with transmission in manual mode and in 3rd gear.

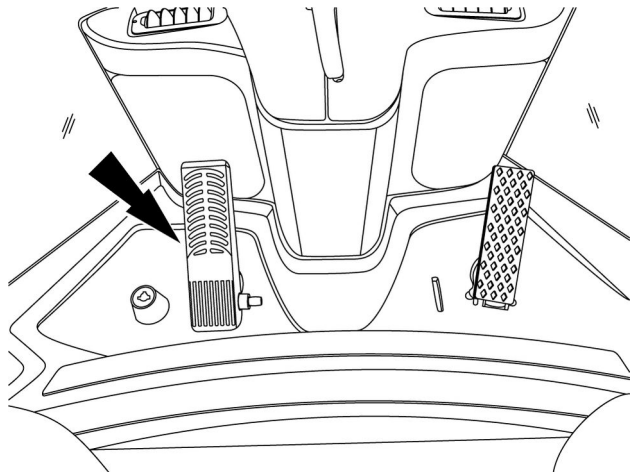
Engine - Remove

NOTE: Emissions sensors mounted in the exhaust stream are sensitive to extreme vibrations. Use of tools that generate extreme vibrations, such as impact wrenches and hammers, will result in damage to emission sensors. Avoid using these tools during any service procedure in close proximity of emission sensors. If the use of these tools cannot be avoided, remove the sensors using extreme caution prior to performing any service procedure.

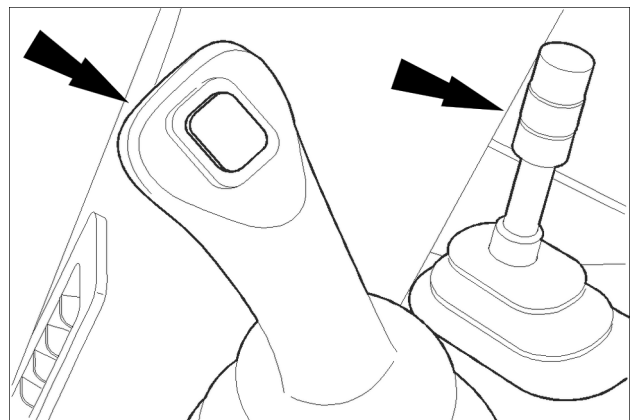
1. Park machine on a level surface and lower the bucket to the ground. Put articulation lock in LOCKED position and stop the engine.



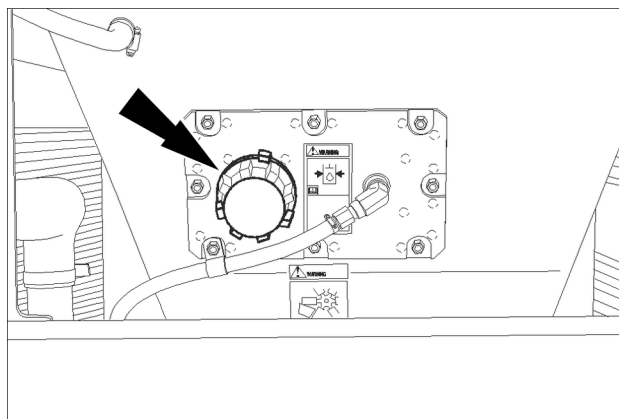
2. Actuate the brake pedal several times to discharge brake accumulators.



3. Put key switch in ON position. Pilot control switch must be in the ON position and then move loader control lever(s) back and forth at least 30 times to release any pressure from hydraulic circuit. Put key switch in OFF position.

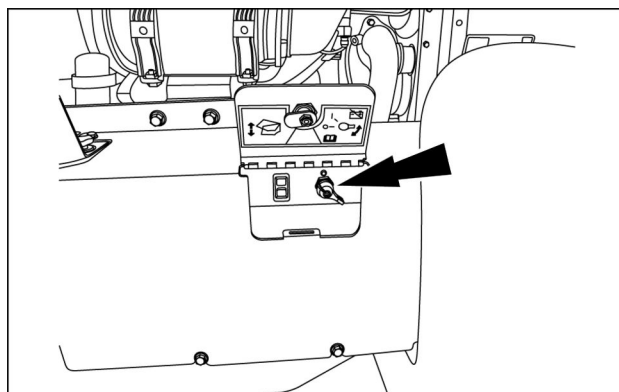


4. Raise grill located above the cooler box just behind the cab. Then slowly loosen the hydraulic reservoir filler cap to release pressure in the reservoir.



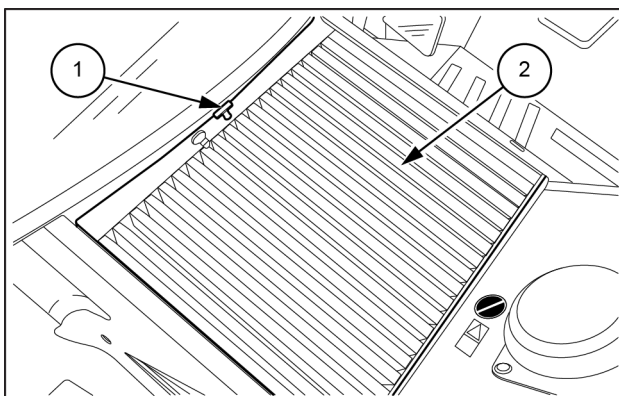
RCPH10WHL099BAL 4

5. Locate the master and hood raise switch by the battery box. Then raise the hood and put the master disconnect switch in the OFF position.



RCPH10WHL106AAH 5

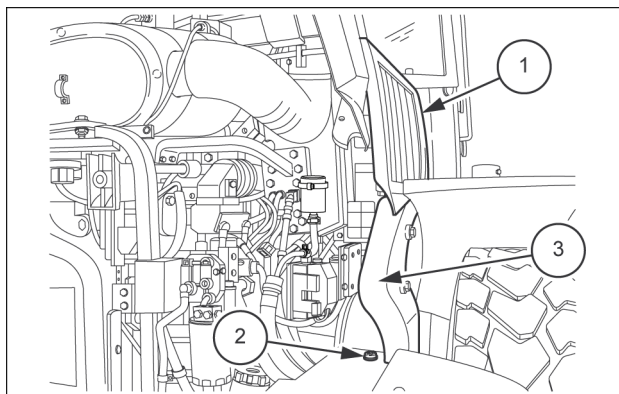
6. Unhook the rubber T-handle (1) and raise the upper panel (2). Make sure that the security levers are blocked.



LEIL13WHL0137AB 6

7. Raise both side panels (1). Then remove the thumb screws (2) and inner fender panels (3).

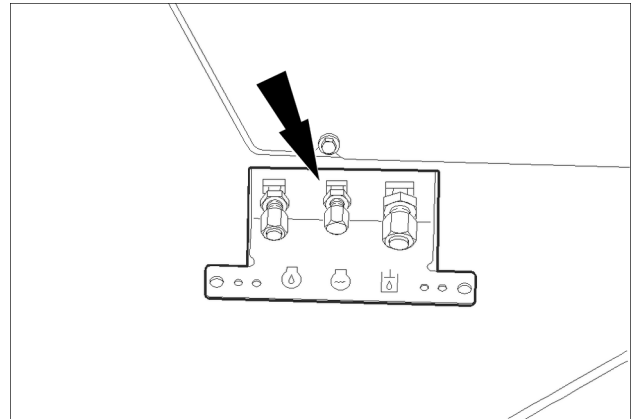
NOTE: Right side of the machine is shown. The operation is similar for the left side.



LEIL13WHL0612AB 7

8. Place a suitable container below radiator drain, remove radiator cap and coolant drain plug (arrow) to drain engine coolant. Then reinstall drain plug and radiator cap after coolant has drained.

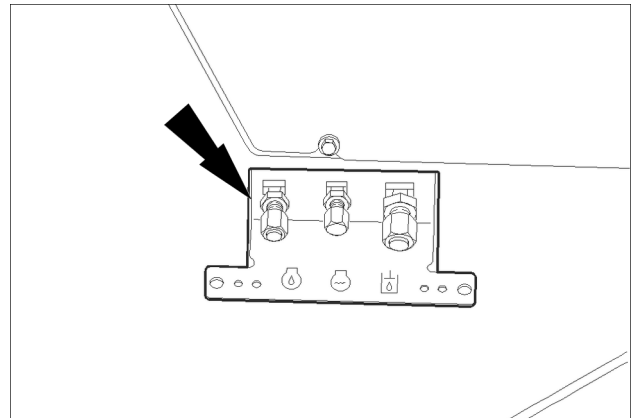
NOTE: See machine specifications for cooling system volume.



RCPH10WHL054BAL 8

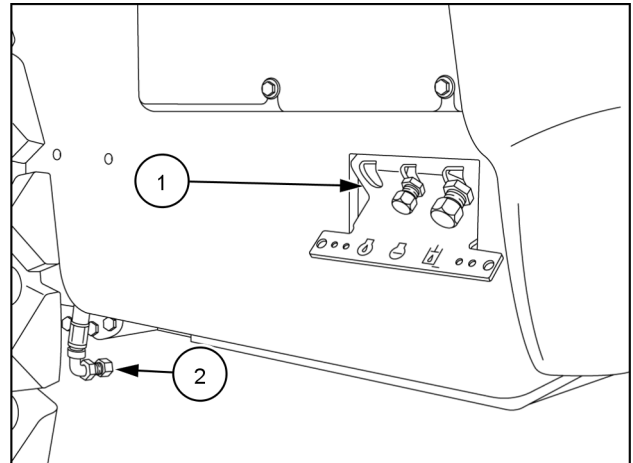
9. Place a suitable container below engine oil drain. Remove drain plug and drain oil into container. Then reinstall drain plug.

NOTE: See machine specifications for engine oil sump volume.



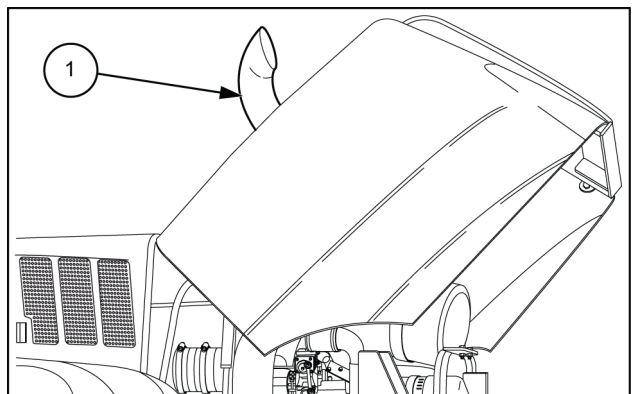
RCPH10WHL054BAL 9

10. After oil drains, disconnect drain hose from frame by removing jam nut (1). Then pull hose from frame in preparation for engine removal. (2)



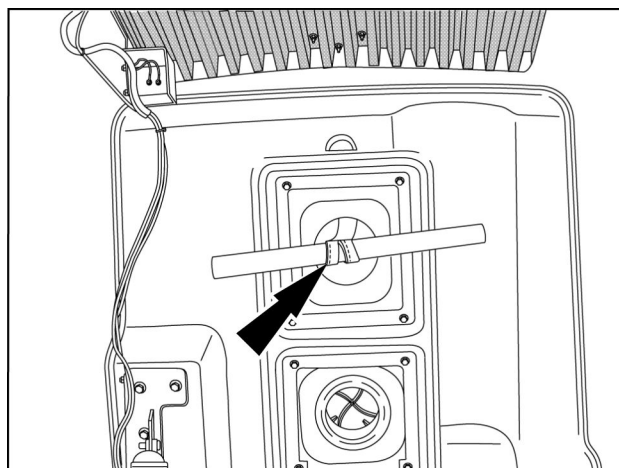
RAPH12WEL0598AA 10

11. Double up a nylon lifting strap and slide through the exhaust stack (1) on the hood.



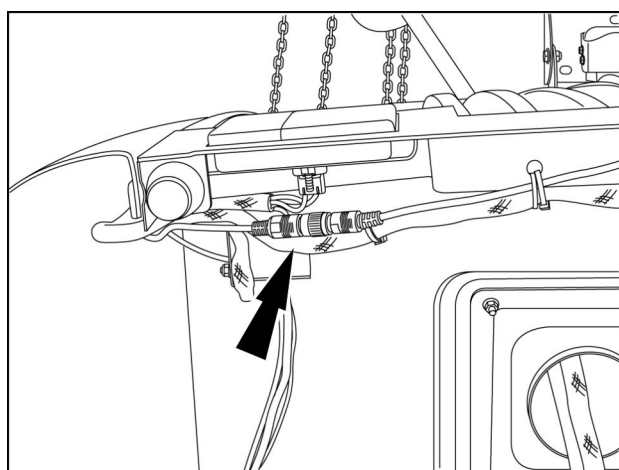
LEIL13WHL0552AB 11

12. Place a bar or pipe through the strap loop inside the hood and attach the strap to a suitable lifting device. Then raise the hood with the strap to release tension on the lifting motor.



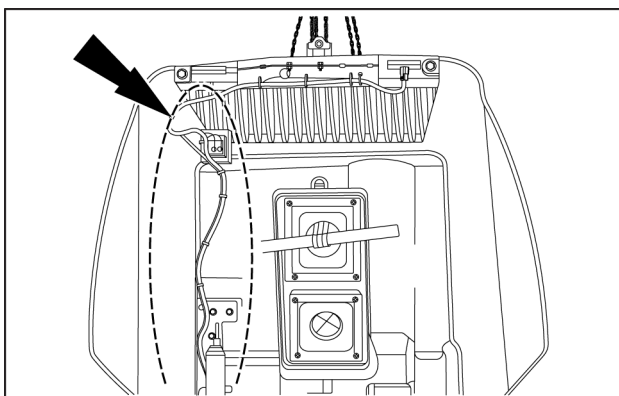
RAPH12WEL0600AA 12

13. Tag and disconnect the rear lights wiring harness connector. Tag and disconnect the rearview camera wire harness (if machine is equipped with a rearview camera).



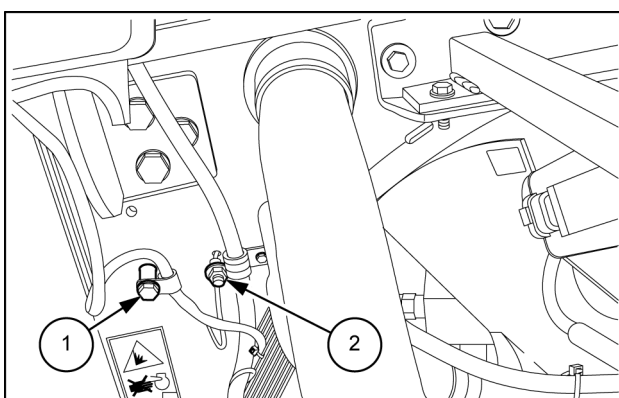
RAPH12WEL0601AA 13

14. Cut wire ties and remove rearview camera wire harness from hood. Then place it off to the side in a safe location. (If machine is equipped with a rearview camera.)



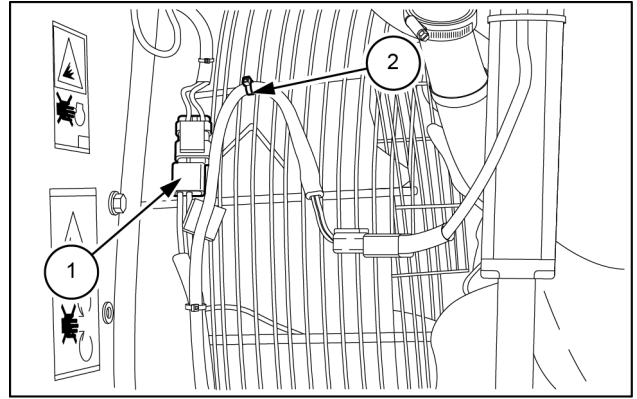
LEIL13WHL0140AB 14

15. Remove hood wire harness clamp (1) from the cooler housing. Then tag and remove the hood ground wire (2) from cooler housing.



LEIL13WHL0149AB 15

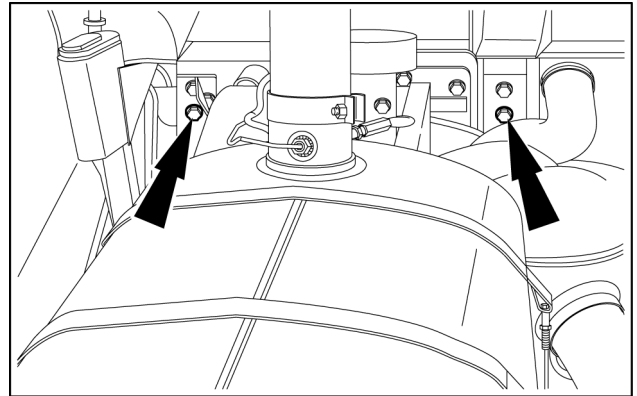
16. Tag and disconnect hood wiring harness connector (1) from rear chassis wiring harness connector. Remove hood wire harness clamp (2) from the fan shroud.



LEIL13WHL0150AB 16

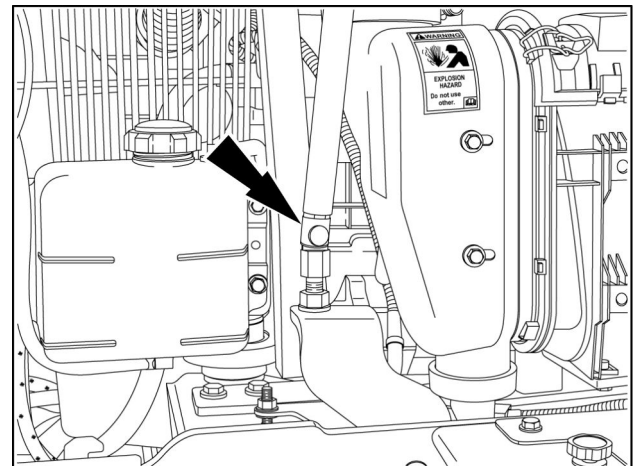
17. Have another person to balance the hood and LOOSEN the hood hinge mounting bolts (arrows) from the cooler frame.

NOTE: Do not remove the hood hinge mounting bolts at this time.



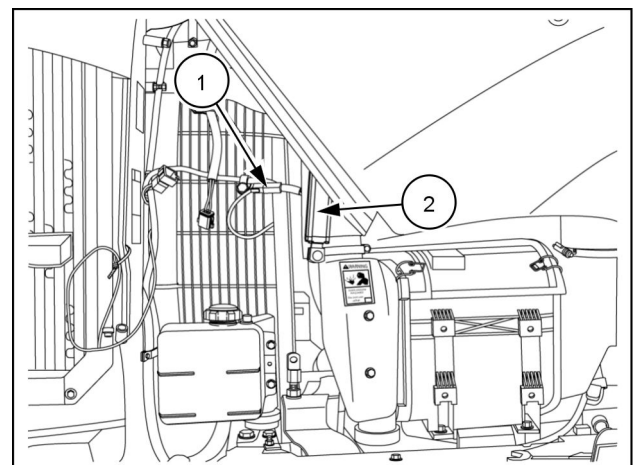
LEIL13WHL0142AB 17

18. Remove the pin from the bottom of the lifting motor cylinder where it attaches to the loader frame.



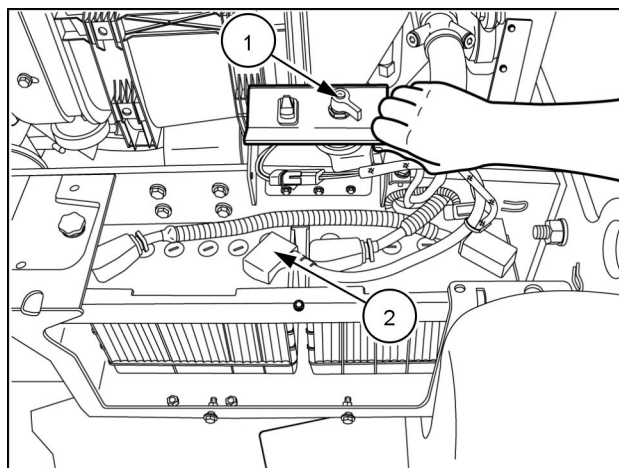
RAPH12WEL0606AA 18

19. Put the master disconnect switch in the ON position. Then, retract the lifting motor cylinder (2), replace pin and disconnect wiring harness (1).



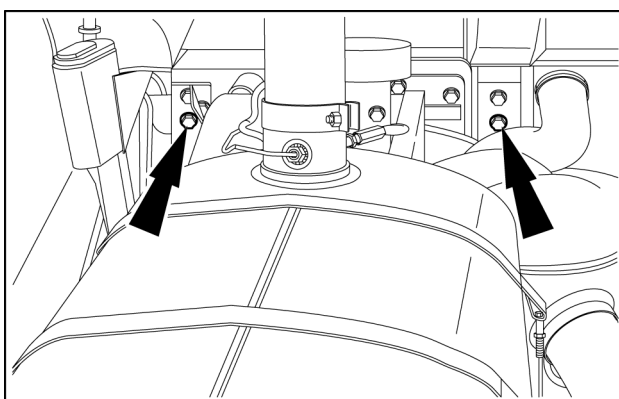
RAPH12WEL0062AA 19

20. Put master disconnect switch **(1)** in OFF position. Remove the battery cover and disconnect ground lead from the batteries **(2)**. You may replace battery cover if desired to give you a place to stand.



RAPH12WEL0608AA 20

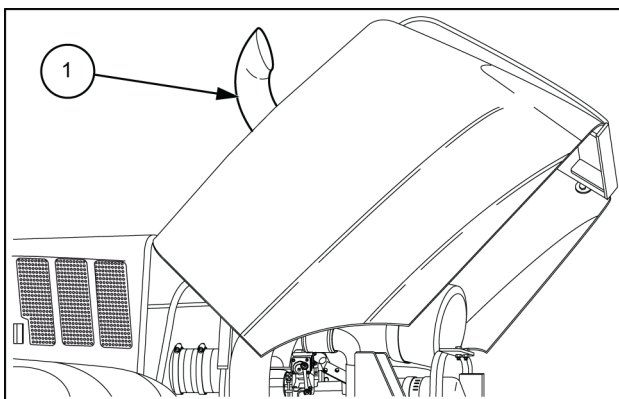
21. Have another person to balance the hood and remove the hood hinge mounting bolts (arrows) from the cooler frame.



LEIL13WHL0142AB 21

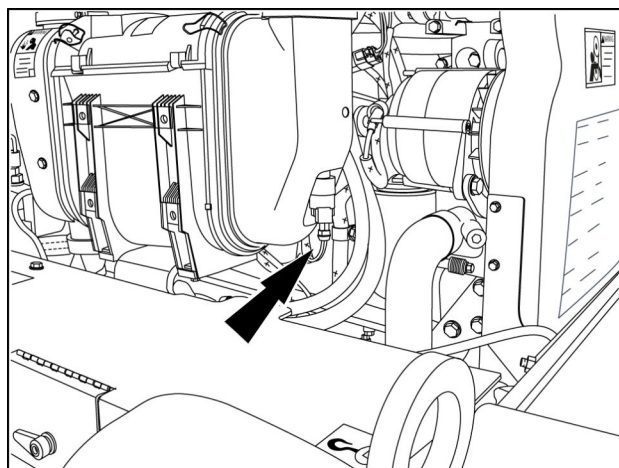
22. Carefully raise and remove hood from loader. Lower hood onto suitable platform and disconnect lifting equipment from exhaust stack **(1)**.

NOTE: Radiator overflow hose may interfere with left hand hood hinge movement and hood removal.



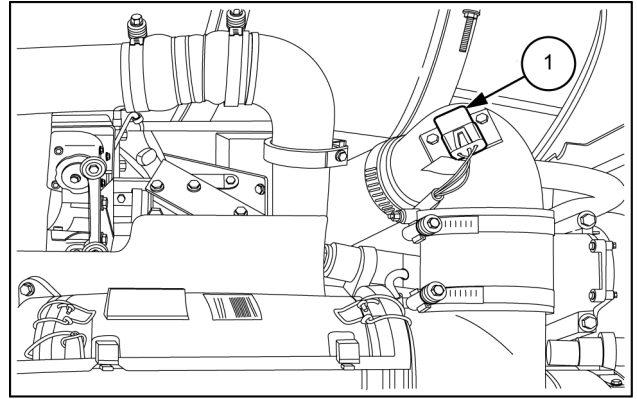
LEIL13WHL0552AB 22

23. Tag and disconnect engine wiring harness connector from air filter restriction switch.



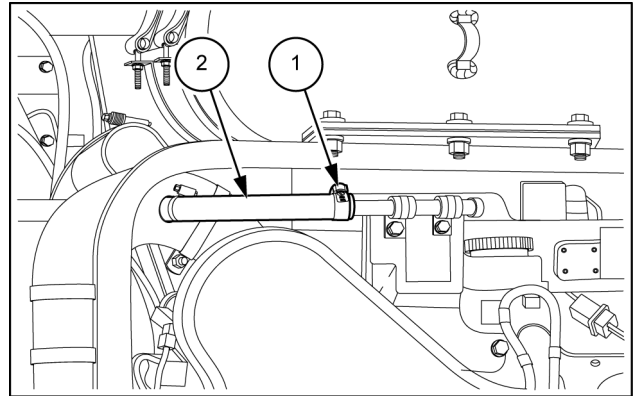
RAPH12WEL0610AA 23

24. Tag and disconnect engine wiring harness connector from air inlet humidity sensor **(1)**.



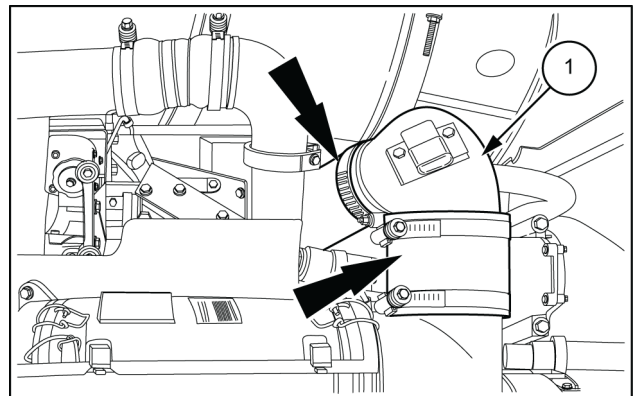
LEIL13WHL0143AB 24

25. Loosen clamp **(1)** on the crankcase ventilation hose **(2)** and disconnect hose.



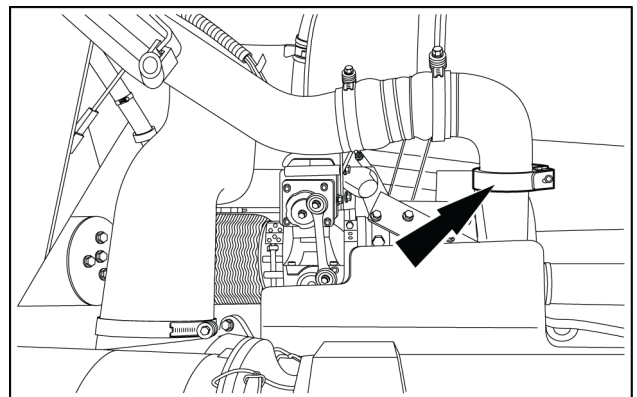
LEIL13WHL0144AB 25

26. Loosen clamps on turbocharger and air filter housing. Then remove the intake air hose **(1)**. Cover turbocharger inlet to prevent debris entry.



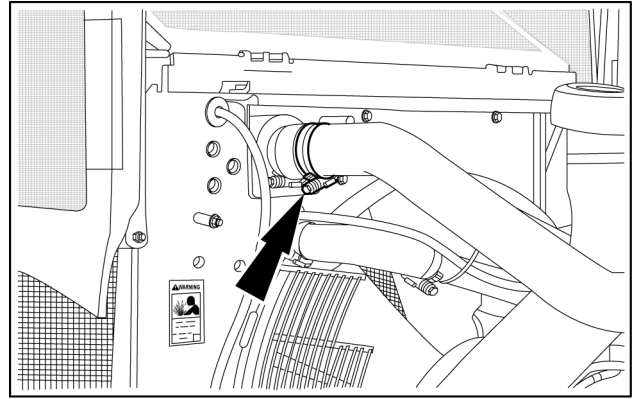
LEIL13WHL0145AB 26

27. Loosen the clamp on the turbocharger for the after cooler inlet elbow.



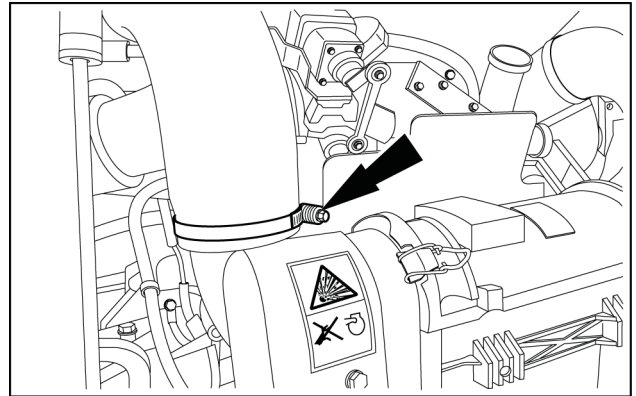
LEIL13WHL0146AB 27

28. Loosen the clamp on the hose at the after cooler inlet and remove the tube.



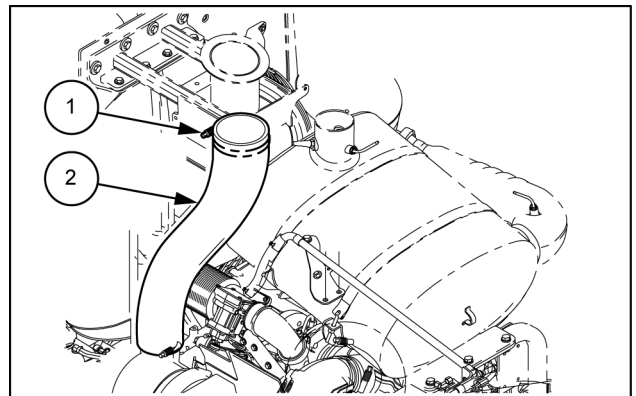
LEIL13WHL0147AB 28

29. Loosen clamp on the air inlet hose at the air filter housing.



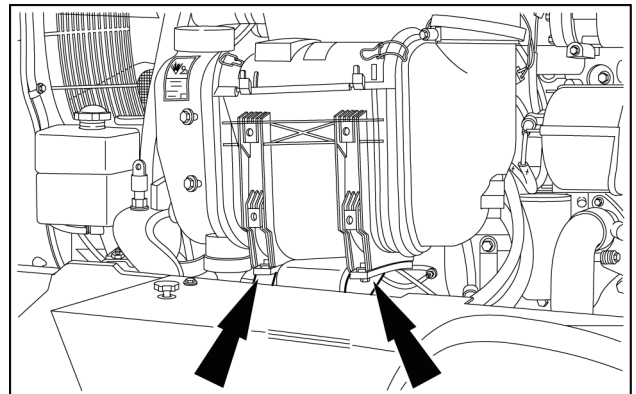
LEIL13WHL0148AB 29

30. Loosen the clamp **(1)** on the air inlet hose **(2)** at the exhaust support bracket. Remove the air inlet hose **(2)**.



LEIL13WHL0151AB 30

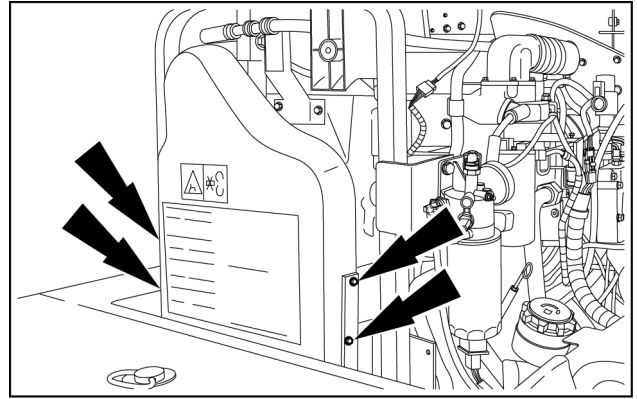
31. Remove the four bolts securing the air filter housing to the mounting support bracket. Then remove the air filter housing.



LEIL13WHL0153AB 31

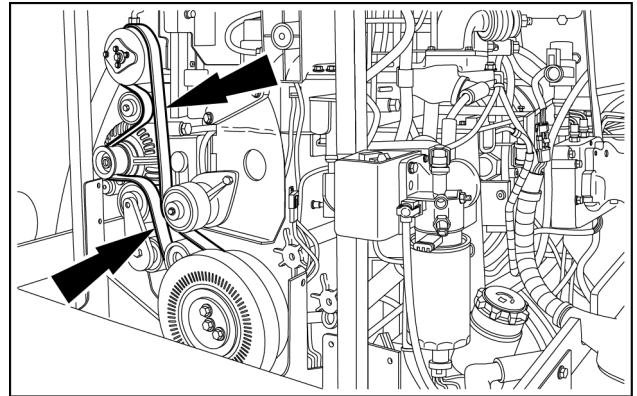
32. Remove the four mounting bolts from the belt cover. Then remove the cover.

NOTE: After removing the belt cover, remove the cover mounting bracket from the left rear side of machine frame.



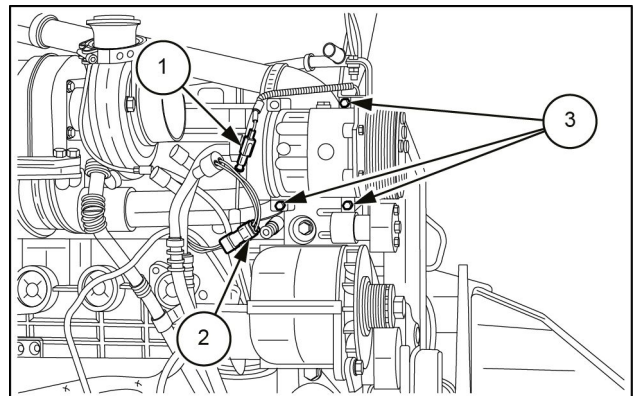
LEIL13WHL0154AB 32

33. Remove the drive belt from the engine.



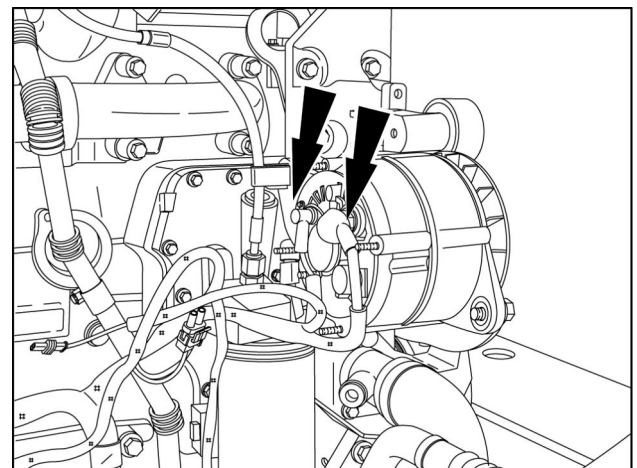
LEIL13WHL0155AB 33

34. If machine is equipped with the air conditioning system, identify, tag, and disconnect the engine wiring harness connectors from air compressor clutch connector (1) and high pressure switch (2). Then remove the three mounting bolts (3) for the compressor and carefully set it on the left battery cover.



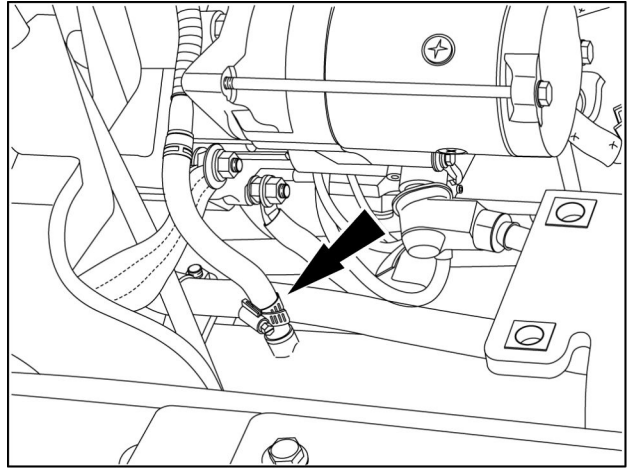
LEIL13WHL0156AB 34

35. Tag and disconnect the wiring from the alternator.



RAPH12WEL0622AA 35

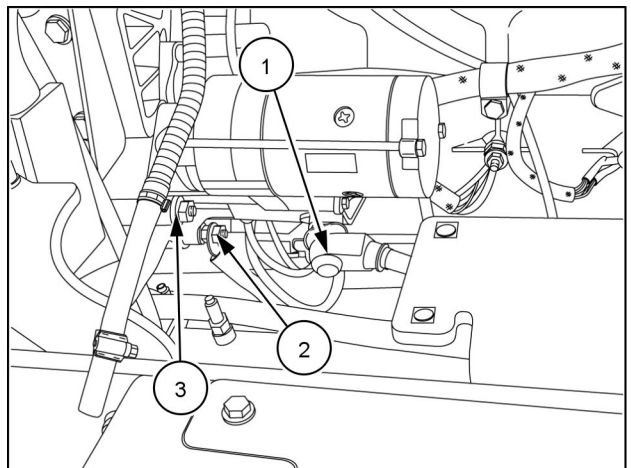
36. Remove the return line of the SCR coolant.



RAPH12WEL0623AA 36

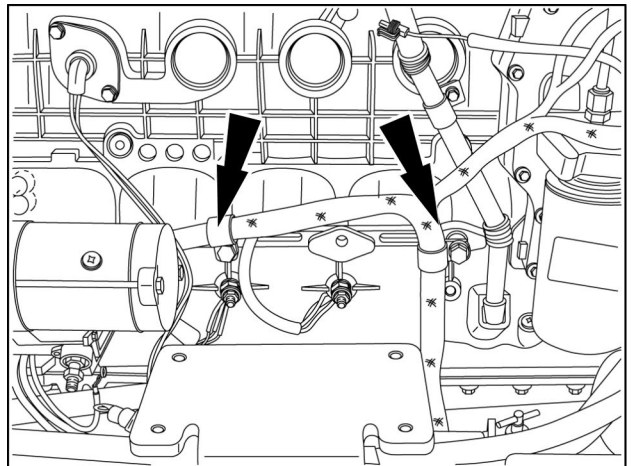
37. Tag and remove the wires from the starter solenoid (1), the ground cable (2), and ground strap (3) from the starter.

NOTE: Move the starter cables away from the engine.



RAPH12WEL0624AA 37

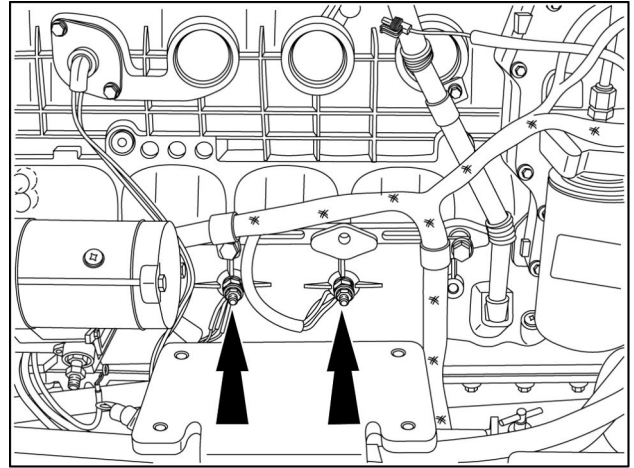
38. Remove the bolts securing the wiring harness clamps to the engine.



RAPH12WEL0625AA 38

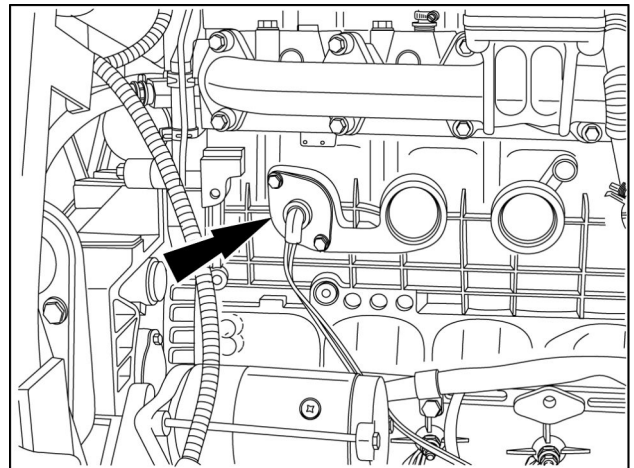
39. Remove the ground wires from the engine.

NOTE: Move the wiring harness away from the engine.



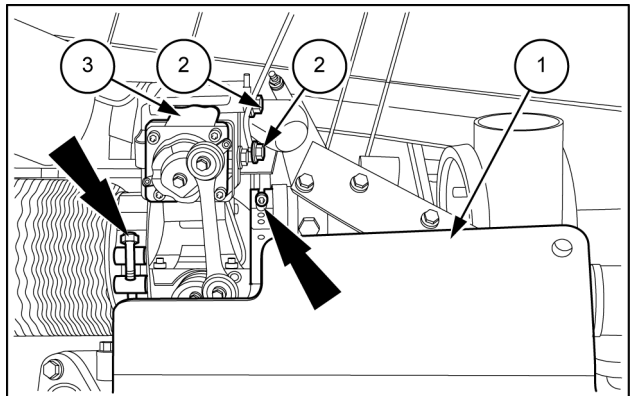
RAPH12WEL0625AA 39

40. If the machine is so equipped, unplug the engine block heater and set it aside.



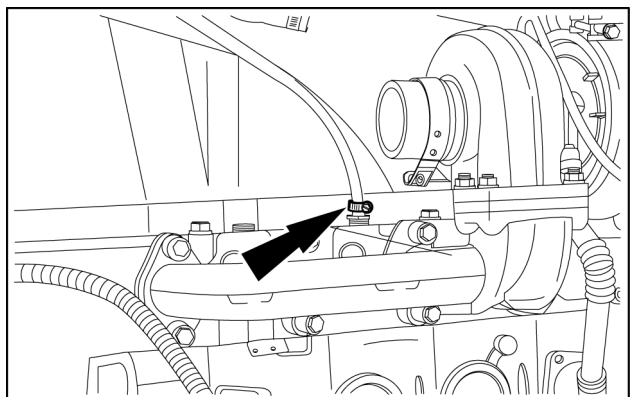
RAPH12WEL0626AA 40

41. Remove the guard (1).
Tag and disconnect the coolant hoses (2).
Tag and disconnect the electrical connector from the exhaust flap (3).
Loosen the exhaust flap clamps (see the arrows in figure) and remove the exhaust flap (3).



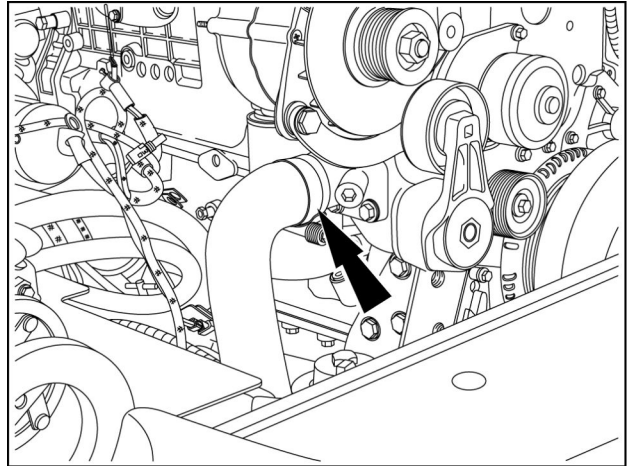
LEIL13WHL0157AB 41

42. Disconnect the engine coolant vent hose from the engine.



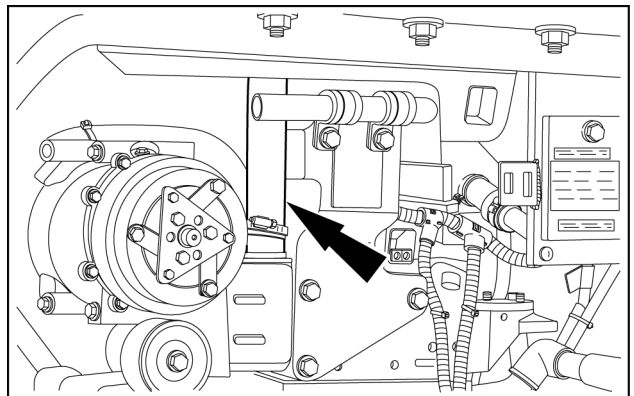
LEIL13WHL0158AB 42

43. Loosen the clamps and remove the lower coolant hose from the engine.



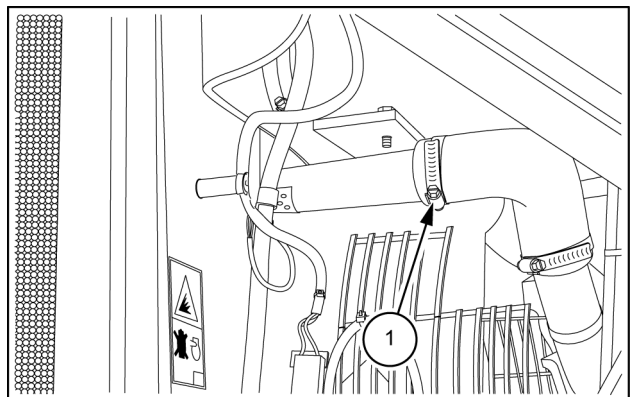
RAPH12WEL0629AA 43

44. Remove the radiator hose from the engine.



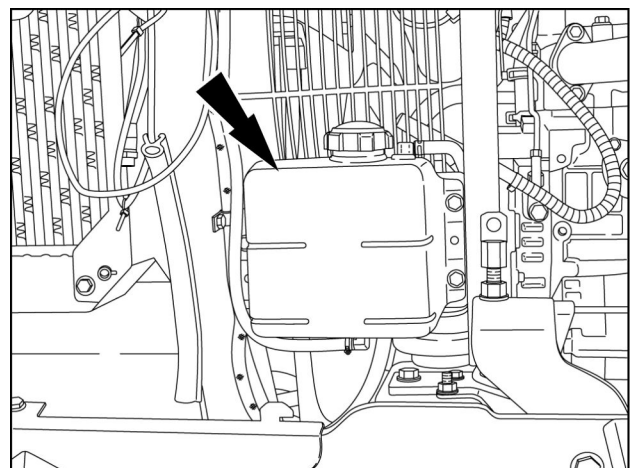
LEIL13WHL0159AB 44

45. Remove the return radiator hose (1) and the engine coolant vent hose from the top of the radiator.



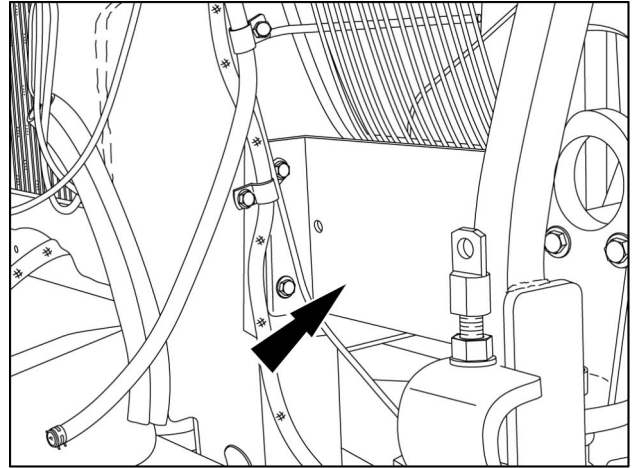
LEIL13WHL0141AB 45

46. Remove the overflow tank of the engine coolant.



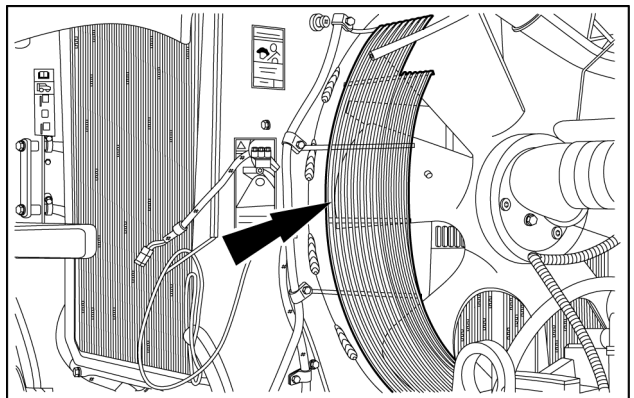
RAPH12WEL0633AA 46

47. Remove the bracket of the overflow tank.



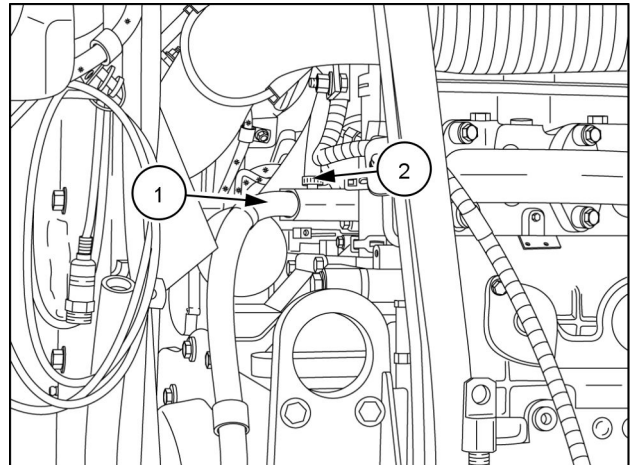
RAPH12WEL0634AA 47

48. Remove the cooling fan screen.



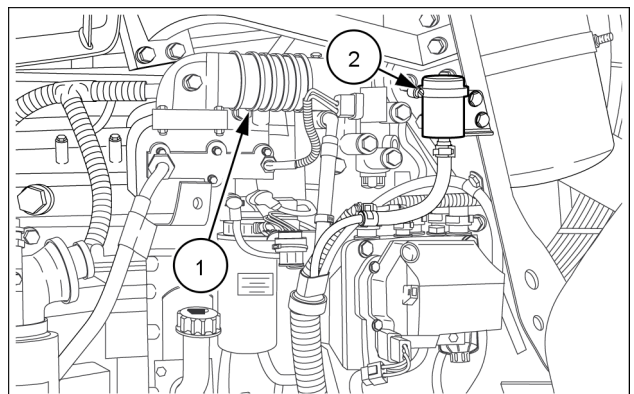
LEIL13WHL0160AB 48

49. Remove the heater hose (1) and the SCR heater supply line (2) from the engine.



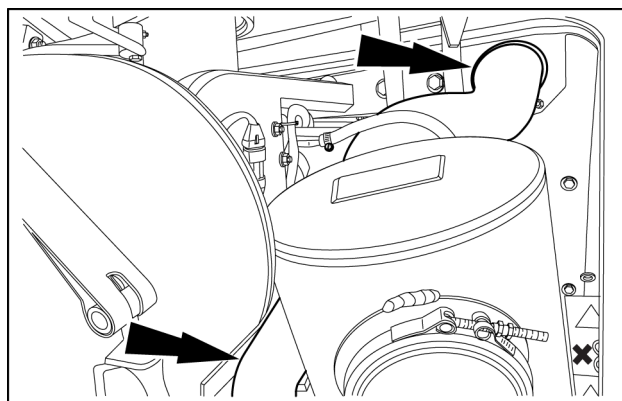
RAPH12WEL0636AA 49

50. Loosen the clamp (1) on the intake manifold for the output hose of the after cooler. Loosen the clamp (2) from the body of the DEF/AdBLUE® tank vent filter.



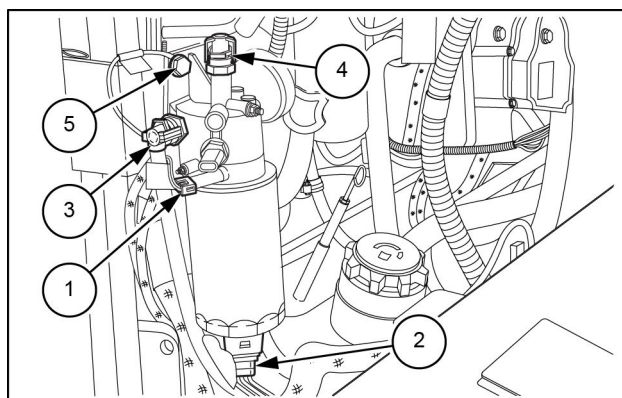
LEIL13WHL0613AA 50

51. Loosen the clamp on the after cooler, and remove the output hose of the after cooler from the machine.



LEIL13WHL0162AB 51

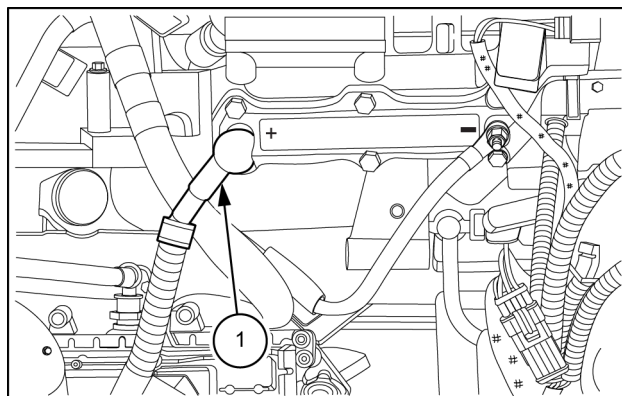
52. Tag and disconnect the fuel filter heater wire (1) and the water sensor (2). Then drain fuel filter and disconnect the inlet (3) and outlet (4) fuel lines from the fuel filter head. Plug the lines and cap the fittings. Remove the ground wire and the attachment bolt (5) of the fuel filter head.



LEIL13WHL0163AB 52

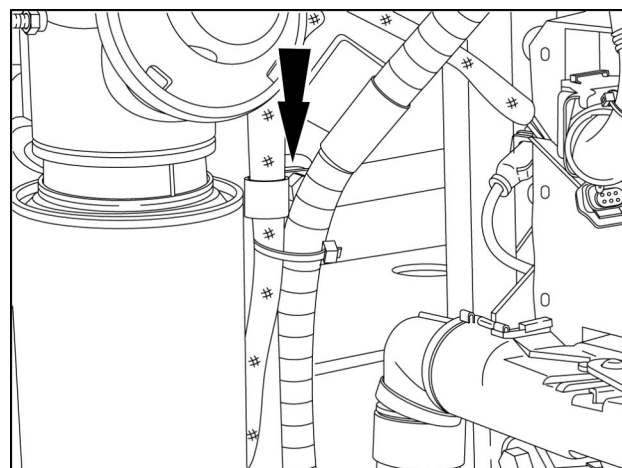
53. Tag and remove the grid heater cable (1).

NOTE: Hold the rear nut with a second wrench to prevent grid heater damage.



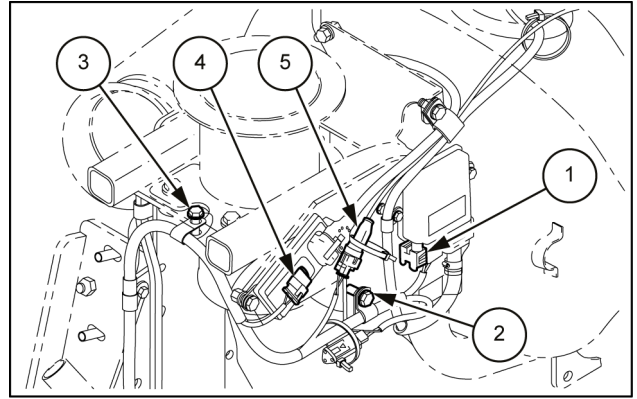
LEIL13WHL0164AB 53

54. Remove wire harness support clamp.



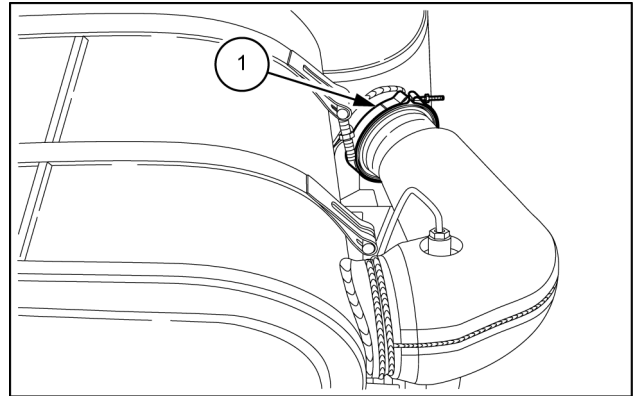
RAPH12WEL0064AA 54

55. Tag and disconnect the **NOx** controller harness (1), the **NH3** sensor connector (4) and the temperature sensor connector (5). Then remove the screws (2) and (3) of the clamp.



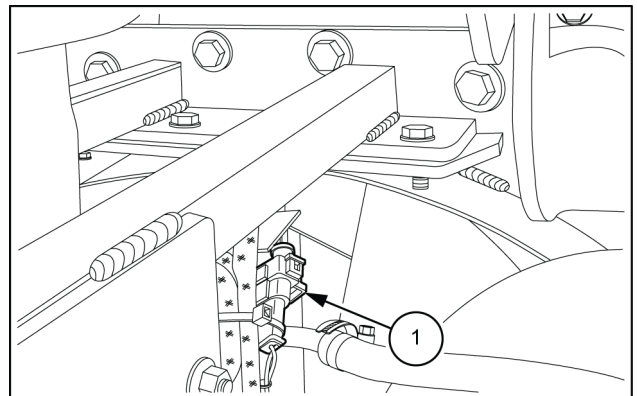
LEIL13WHL0165AB 55

56. Loosen the clamp (1) on the Diesel Oxidation Catalyst (DOC).



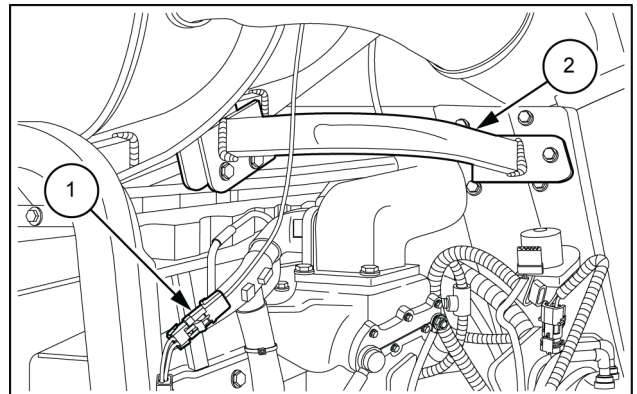
LEIL13WHL0166AB 56

57. Tag and disconnect the connector (1).



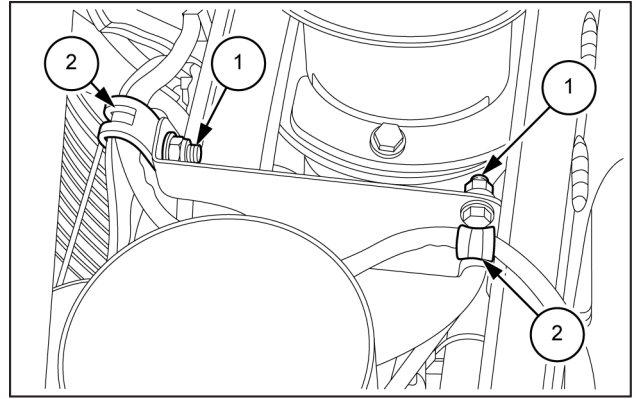
LEIL13WHL0167AB 57

58. Tag and disconnect the wire harness of the temperature sensor (1) for the Clean Up Catalyst (CUC) and cut the connector wire clamps. Loosen the screws and remove the bar (2).



LEIL13WHL0168AB 58

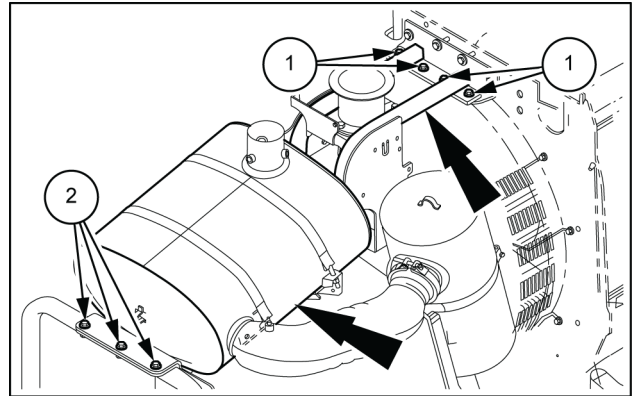
59. Loosen the hexagonal nuts **(1)**, and remove the clamps **(2)** that hold the sensor wiring harness to the catalyst mounting support bracket.



LEIL13WHL0223AB 59

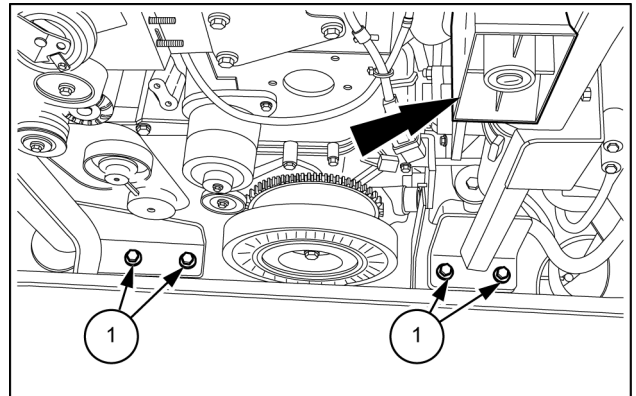
60. Attach a suitable lifting straps to the Clean Up Catalyst (CUC) support structure. Remove the bolts securing the Clean Up Catalyst (CUC) support structure at the front **(1)** and rear **(2)** part of the structure. Use a suitable lifting device and carefully lift the support structure of the Clean Up Catalyst (CUC) from the machine.

NOTE: Pay particular attention to the connection between the Clean Up Catalyst (CUC) and the Diesel Oxidation Catalyst (DOC).



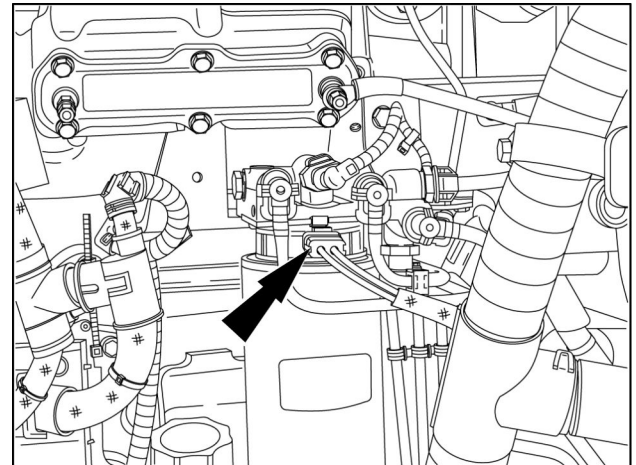
LEIL13WHL0169AB 60

61. Tag and disconnect the wire harness from the buzzer. Remove the bolts **(1)** securing the front support structure of the Clean Up Catalyst (CUC) and remove it.



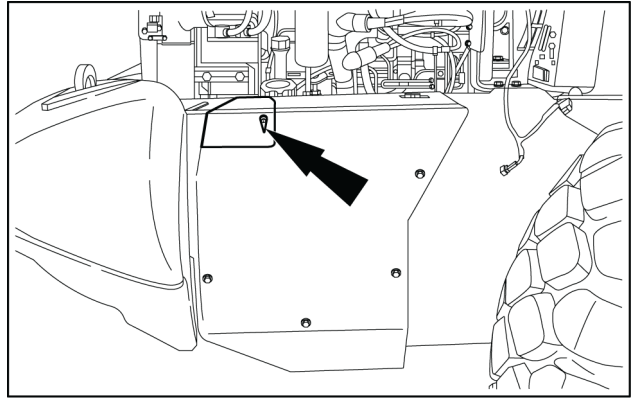
LEIL13WHL0174AB 61

62. Tag and disconnect wire harness from primary fuel filter.



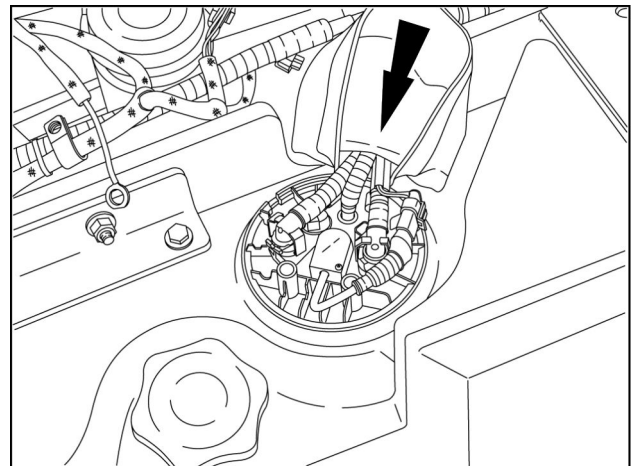
RAPH12WEL0068AA 62

63. Remove **DEF/AdBLUE®** storage tank cover located on the right hand side of the machine.



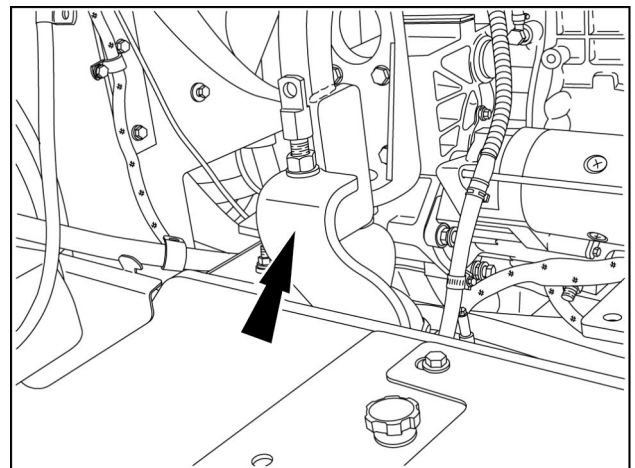
LEIL13WHL0170AB 63

64. Tag and disconnect the wire harness and **DEF/AdBLUE®** supply and return lines from the **DEF/AdBLUE®** storage tank. Cap the supply lines.



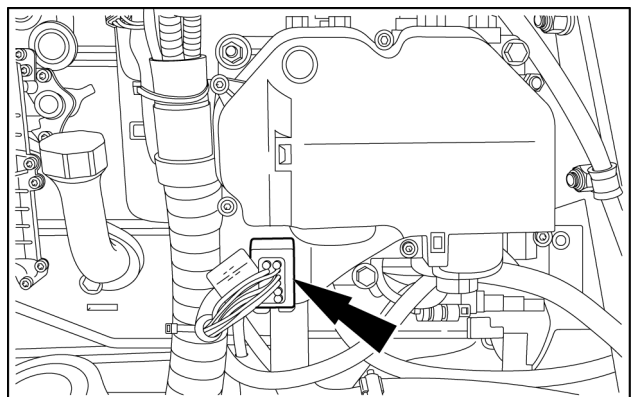
RAPH12WEL0070AA 64

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



RAPH12WEL0071AA 65

66. Disconnect the main connector of the supply module.



LEIL13WHL0171AB 66



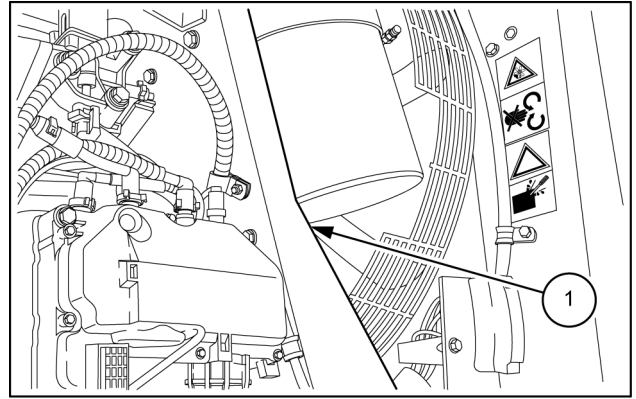
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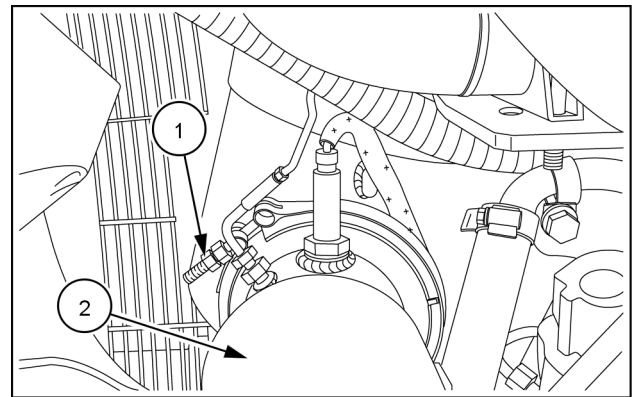
Thank you so much for reading

67. Attach suitable lifting straps to the support structure (1) of the Diesel Oxidation Catalyst (DOC). The supply module and the coolant control valve are also attached to this support structure.



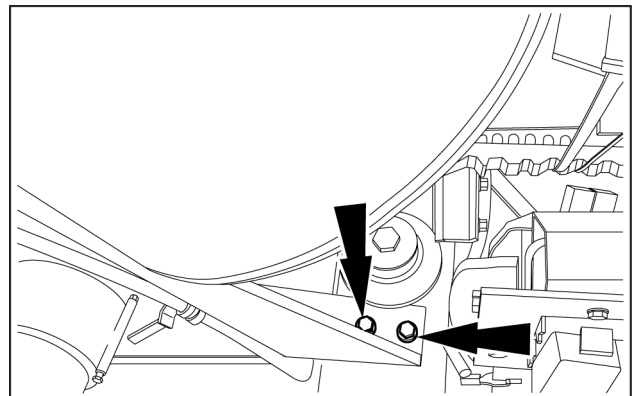
LEIL13WHL0172AB 67

68. Loosen the clamp (1) on the Diesel Oxidation Catalyst (DOC) and disconnect the exhaust pipe (2) from the Diesel Oxidation Catalyst (DOC).



LEIL13WHL0229AA 68

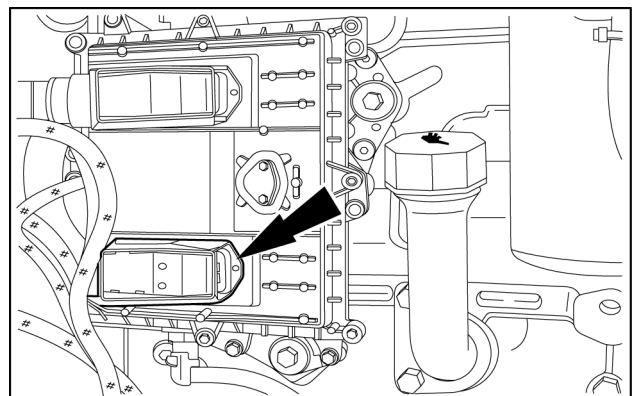
69. Remove the bolts that secure the support structure of the Diesel Oxidation Catalyst (DOC). Use a suitable lifting device and carefully lift the support structure of the Diesel Oxidation Catalyst (DOC) (with SCR system components attached) from the machine.



LEIL13WHL0173AB 69

70. Disconnect the wiring harness from the EDC 7 controller.

NOTE: Lifting up on the lever will release the connector from the controller.



LEIL13WHL0175AB 70

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