Preview Solution CBR-2171-11

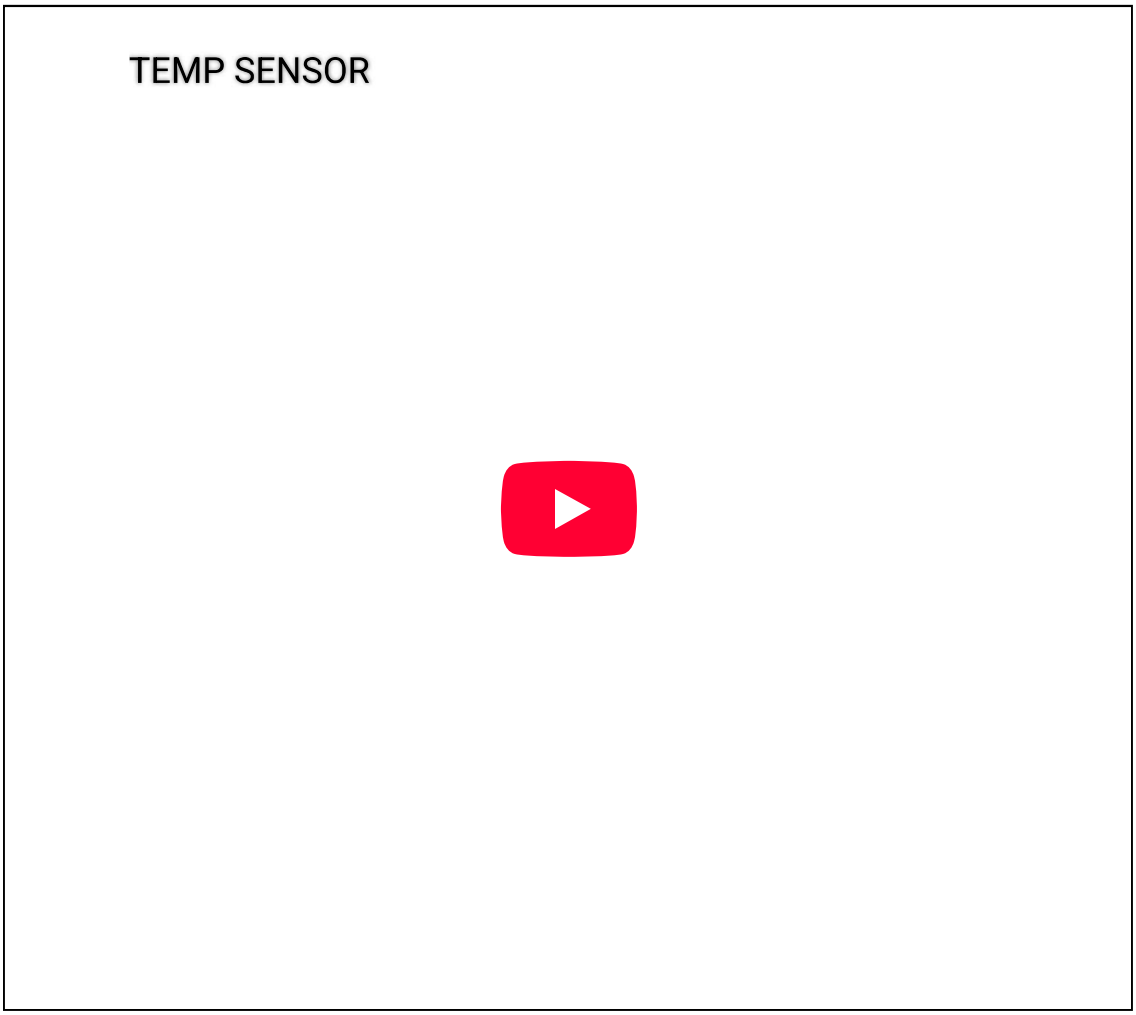
Mack Temperature Sensor Troubleshooting Guide - US10+OBD13 And Newer

Published 21 November 2025

Valid For

CXU/CHU/PI, AN, GU/GR, LEU, LR vehicles 2014 to current.

Component Overview



The Exhaust Gas Temperature Sensors are utilized in the Exhaust Aftertreatment System for temperature readings at specific locations in different stages of the system. These are two-wire sensors which corollate resistance to temperature. The sensors are

Live UI

commonly referred to as T1, T2, T3 & T4 respective to their place in the exhaust stream. T4 was added for OBD19 and newer emissions. These sensors report to the Aftertreatment Control Module (ACM) and play an important part in the EATS strategy and diagnostics.

The primary failure mode for Temperature Sensors is internal failure.

Diagnosis and Repair

Perform a DTC Readout. Review the tables below to determine which category the DTC currently being diagnosed falls under. Proceed according to the directions for the appropriate section.

NOTE: Active Temperature Sensor DTCs will cause Regens to abort.

High Exhaust Temperature DTCs

DTC	Description
P115100	Aftertreatment System Over Temperature
P242800	Exhaust Gas Temperature Too High

Directions: The above DTCs commonly fault in correlation to an upstream component failure that causes high temperature readings in the EATS. If other system DTCs are present prioritize the system DTCs first. If no other DTCs or upstream faults observed, proceed with the directions below.

Exhaust Temp Plausibility DTCs

Note: These codes should only be diagnosed if they are Active or have a DTC Confirmed status of True.

DTC	Description
P246F64	Exhaust Gas Temperature Sensor Circuit Range/Performance Bank 1 Sensor 4 **(See notes Below)**
P208464	Exhaust Gas Temperature Sensor Circuit Range/Performance (Bank 1 Sensor 2)
P208064	Exhaust Gas Temperature Sensor Circuit Range/Performance Bank 1 Sensor 1
P242B64	Exhaust Gas Temperature Sensor Circuit Range/Performance (Bank 1 Sensor 3)

P246F64 NOTE FOR VEHICLES WITH US17+OBD19, US17+OBD20, US21+OBD20 EMISSIONS AND 1-BOX SCR: Follow TSB *DEF Crystallization, dosing valve, clean.*

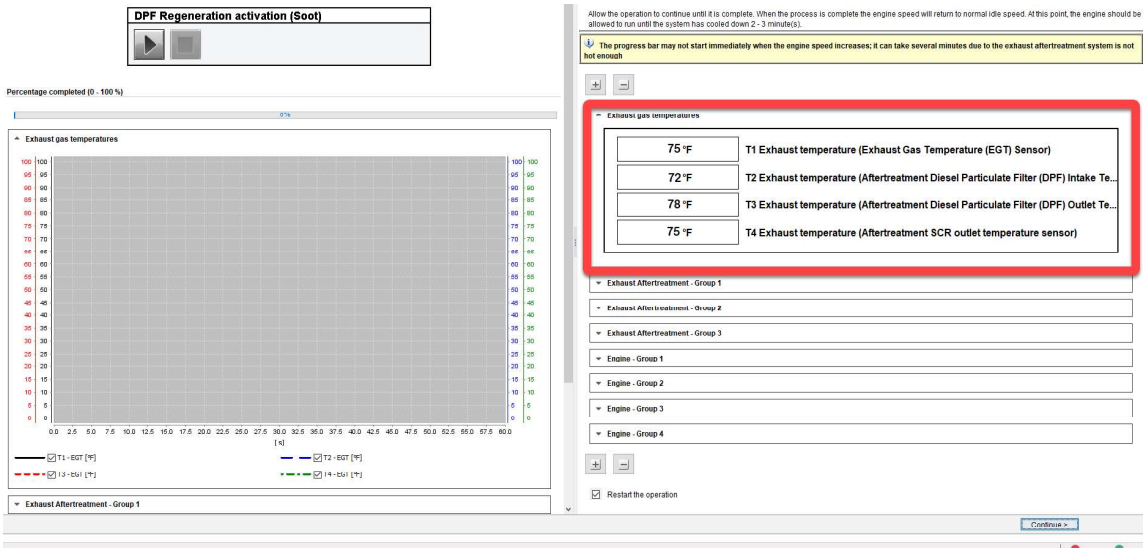
Directions: Confirm the Temperature Sensor Values at Ambient and/or during a Heating Cycle (Regen). Any sensors that are out of expected range should be replaced using the Impact operations below:

Operation	Title
2581-03-02-05	Exhaust Temperature Sensor, Replacement. T1
2581-03-02-06	Exhaust Temperature Sensor, Replacement. T2
2581-03-02-07	Exhaust Temperature Sensor, Replacement. T3
2846-03-02-24	Exhaust Temperature Sensor, Replacement (T4)

If no fault is found, ensure software is up to date on the Engine ECU (EMS), as some diagnostics improvements have been released.

Ambient Temperature Evaluation - Using PTT Operation 2589-08-03-02 Subtest A, Select Soot Regeneration:

- **DO NOT START THE ENGINE** (this is a manual condition that can be bypassed); rather use key on, engine off.
- Before starting the regen click the arrow next the Exhaust gas temperature section to expand and view temperature sensor readings as shown below.
- When the engine and exhaust are at ambient temperature, all Temperature Sensors should display similar readings (within ~10 °F, ~5.5 °C) to the same value.

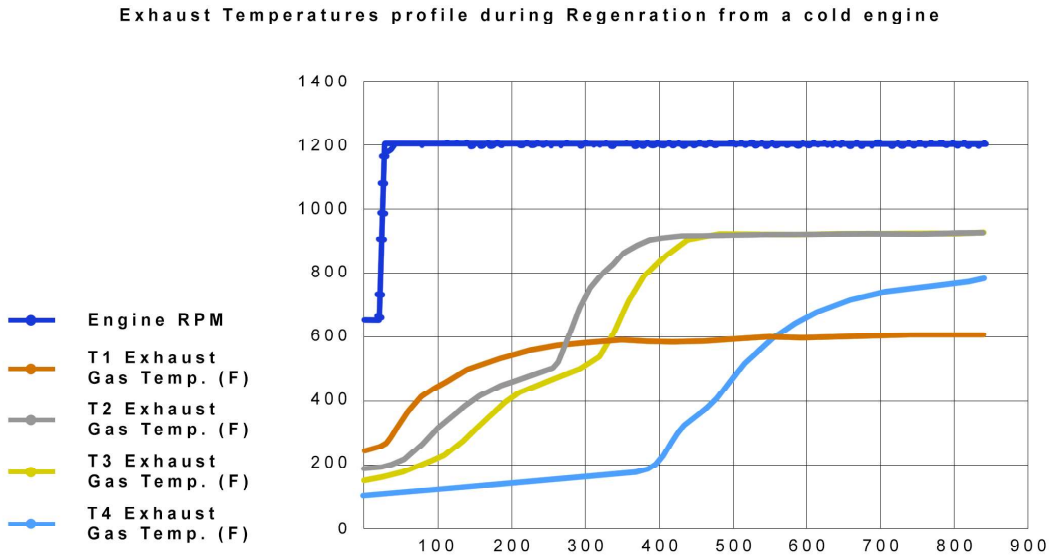


Heating Cycle Evaluation - Using PTT 2589-08-03-02 Subtest A, perform a Soot Regen.

- View/graph the temperature sensors.
- Make sure the values rise in the respective order shown in the graph below.

Note: PTT will abort the regen for active Temp Sensor DTCs, it may be necessary to clear DTCs in order to perform the evaluation.

Note: PTT will provide the expected value under the information tab during the regeneration.



Electrical DTCs - Only diagnose active and/or confirmed DTCs.

DTC	DESCRIPTION
P242A15	Exhaust Gas Temperature Sensor Bank 1 Sensor 3
P203115	Exhaust Gas Temperature Sensor Bank 1 Sensor 2
P054415	Exhaust Gas Temperature Sensor Bank 1 Sensor 1
P203200	Engine Exhaust Gas Temperature Circuit Low (Bank 1 Sensor 2)
P242C00	Exhaust Gas Temperature Sensor Circuit Low (Bank 1 Sensor 3)
P054500	Exhaust Gas Temperature Short Circuit Low
P247100	Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 4
P247000	Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 4

Directions:

1. Visually inspect the wiring harness for damage.
2. Follow PTT Diagnostic to perform harness and sensor checks.

Rules For Replacement

- In order for a repair to be eligible for warranty coverage, one of the diagnostic trouble codes (DTCs) listed above must be present. However, in rare cases

where there is a potential failure but no DTCs are detected, please provide supporting evidence of the failure. This can be in the form of a photo or video, along with an explanation for the need of replacement. This evidence will be used to determine if the repair qualifies for warranty coverage.

- Standard Diagnostic Time for a Temperature Sensor 1.4 hrs.

Related links and attachments

KC-2171 2581-03-02-06 REDUCED

KC-2171 2581-03-02-05 REDUCED

KC-2171 2581-03-02-07 REDUCED

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25968-2 Exhaust Temperature Sensor, Replacement

T1

i	Illustrations may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

i	Colors used in illustrations are for highlighting purposes only and do not correspond to the actual colors of the vehicle.

i	All threaded fasteners that do not have a tightening torque specification in the information are tightened to a standard torque. Standard torques are available in the following specification. ➠ Standard Tightening Torques

WARNING

Risk of severe burns.

Exhaust gases and component surfaces are hot. Avoid exposure and contact.

▸	Wait for the engine to cool before working with exhaust-related components.

WARNING

Risk of burn injuries.

Heated components and mechanical parts can cause burns.

▸	Exercise caution when working with heated components. Always use the appropriate protective equipment.

CAUTION

Service Information Advisory.

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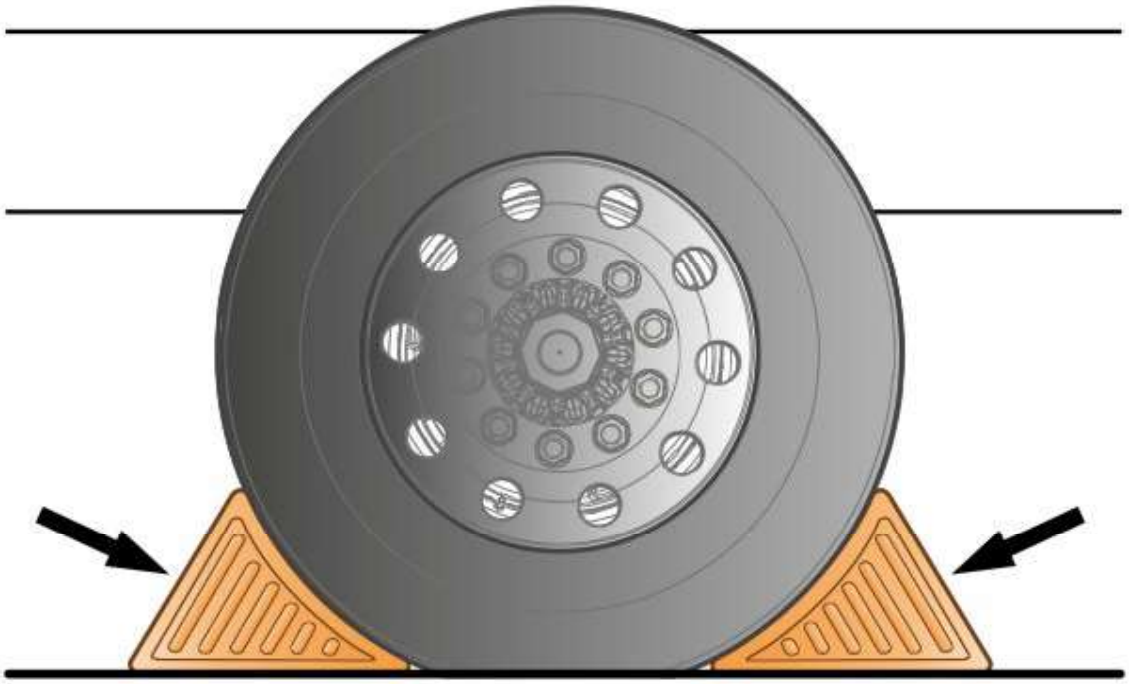
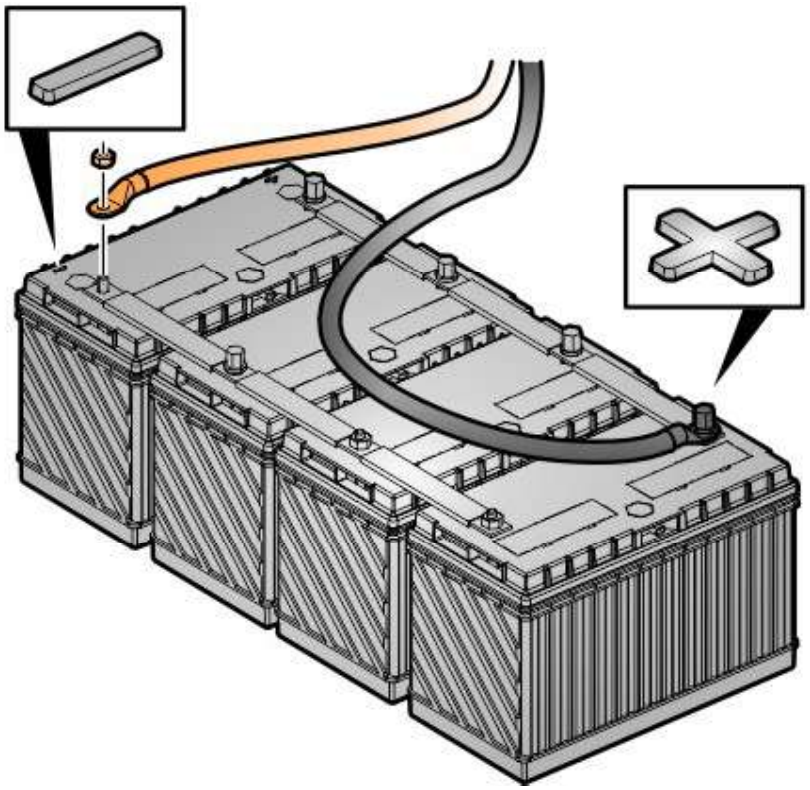
▸	You must read and understand the precautions and guidelines in Service Information, Function Group 2, "General Safety Practices, Engine" before performing this procedure.

1	Park the vehicle on a level surface.
2	Apply the parking brake.
3	Place the gear lever in neutral.
4	Install the wheel chocks.

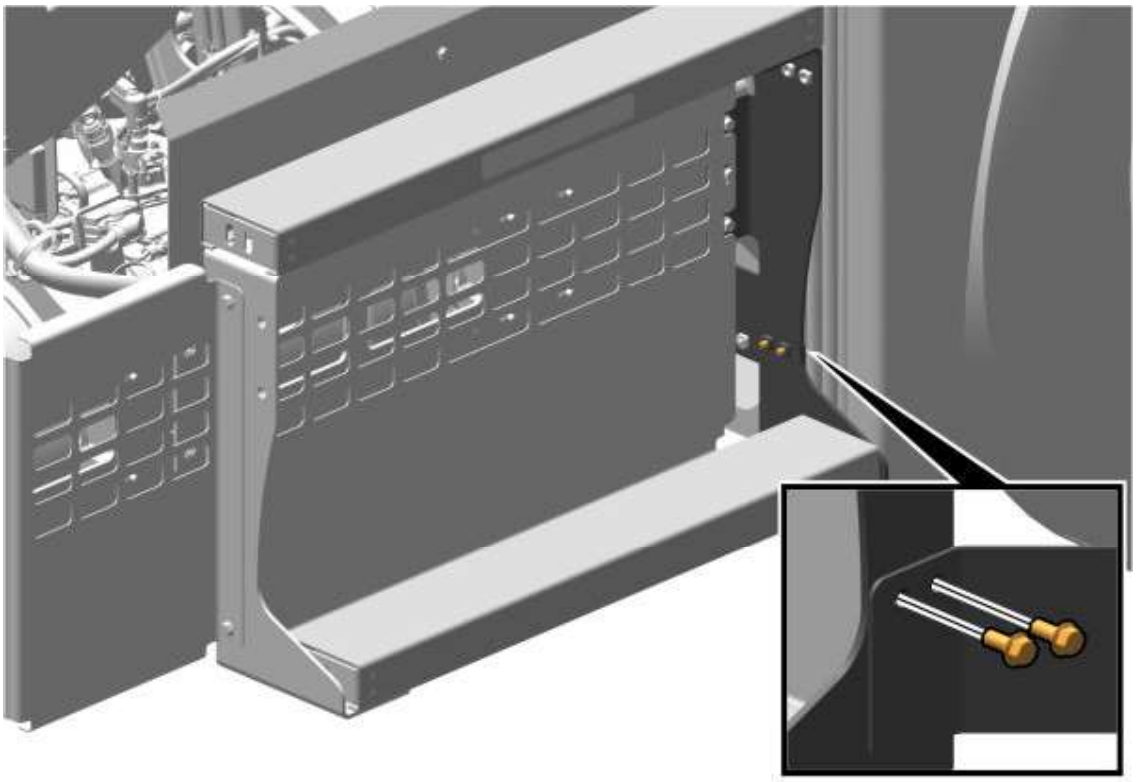


5	Disconnect the cable from the negative terminal.



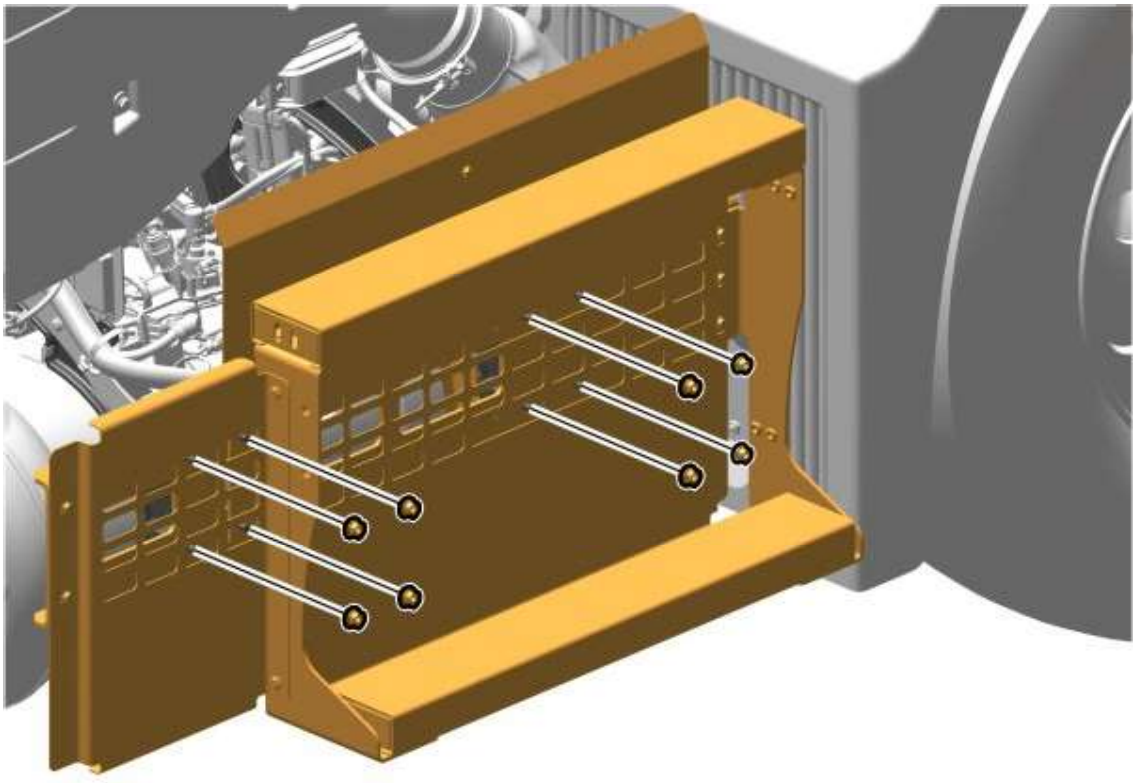
6	Perform this procedure when the condition below is met. **Conditions**
	• If equipped with lane change support
	▸ Disconnect the connector.

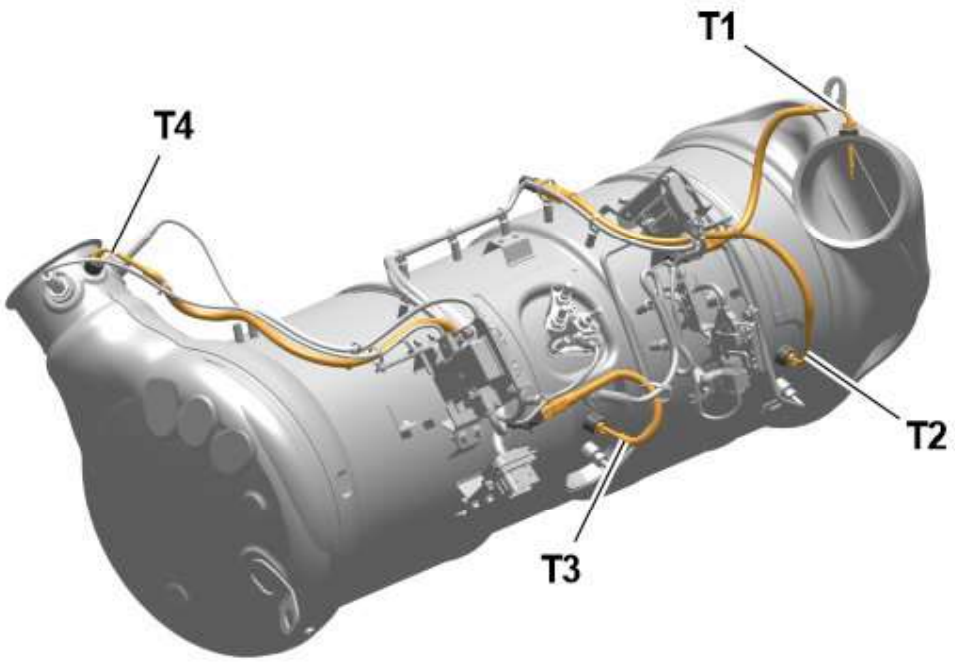
7	Remove the screws.



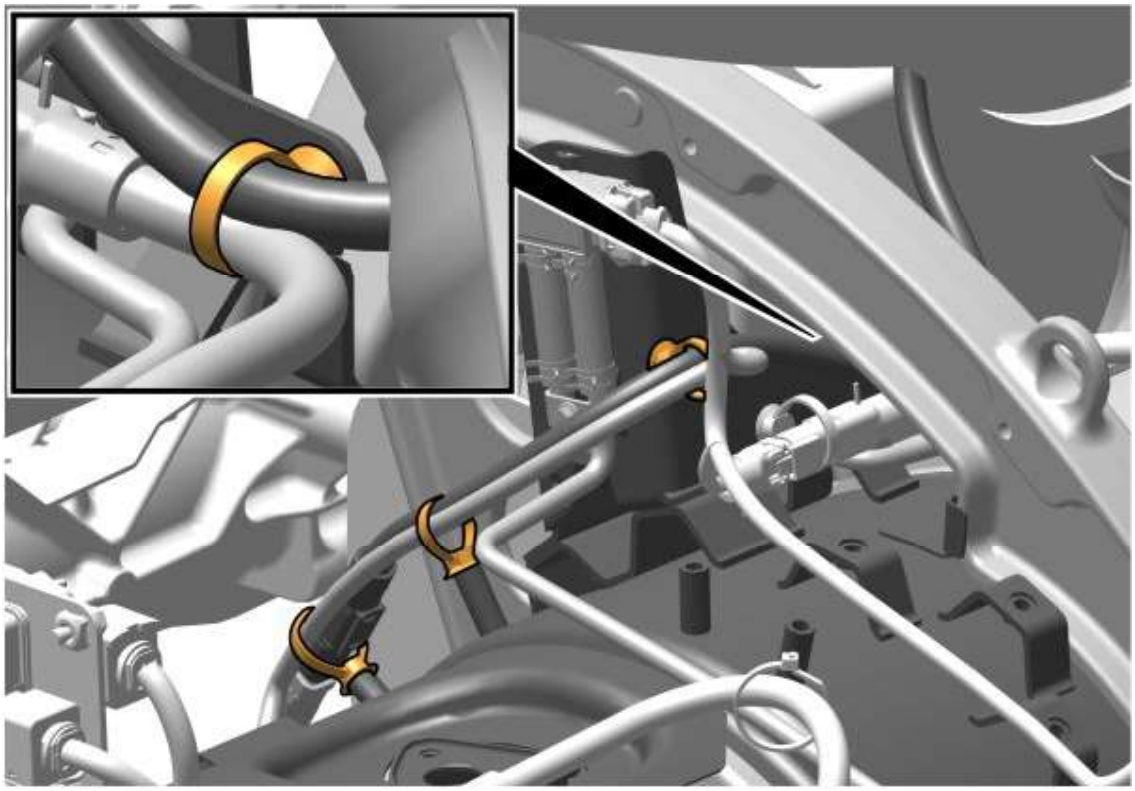
8	Remove the nuts.

9	Remove the footstep along with the heat shield.

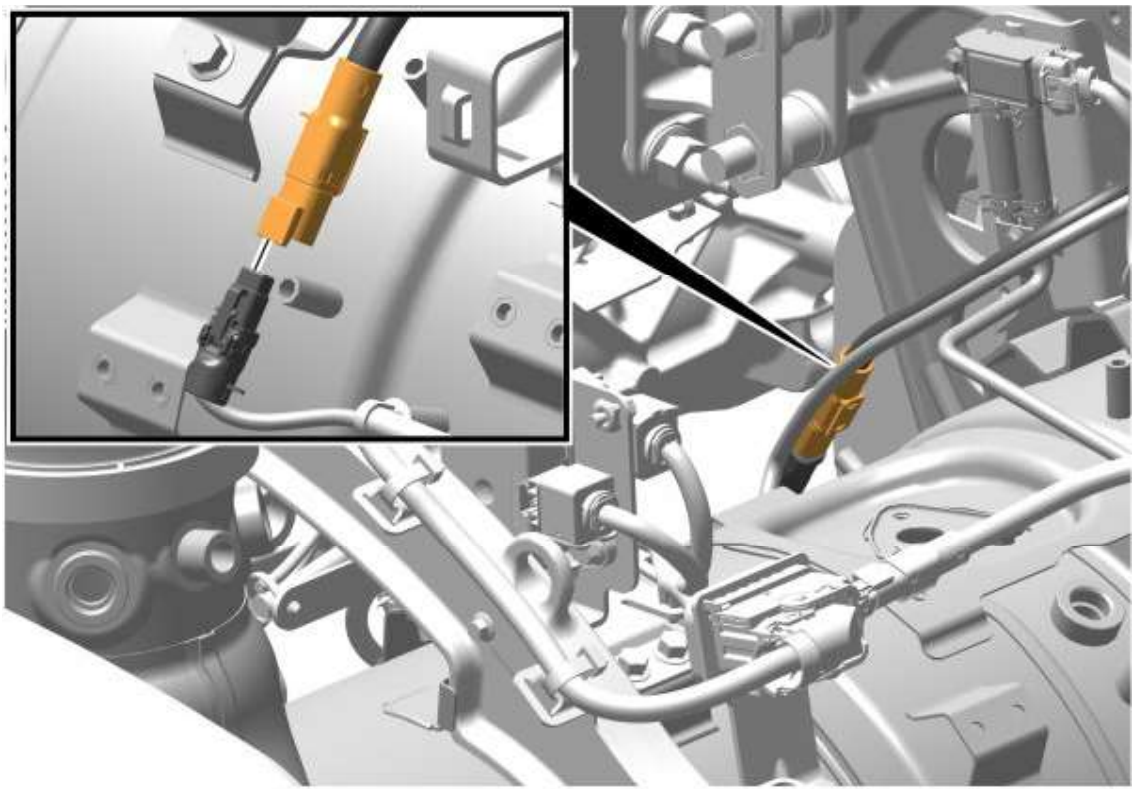


10	

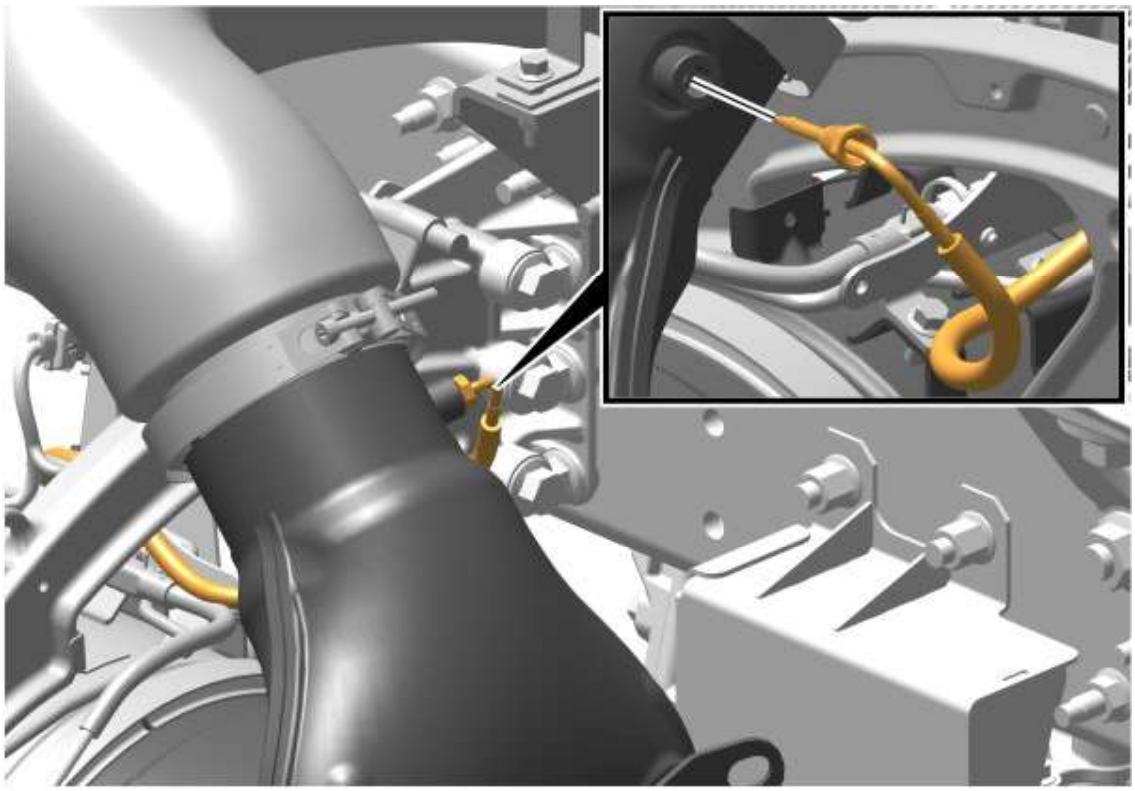
11	Remove the cable ties. **Note** Note the positions.



12	Disconnect the connector.



13	Remove the sensor.



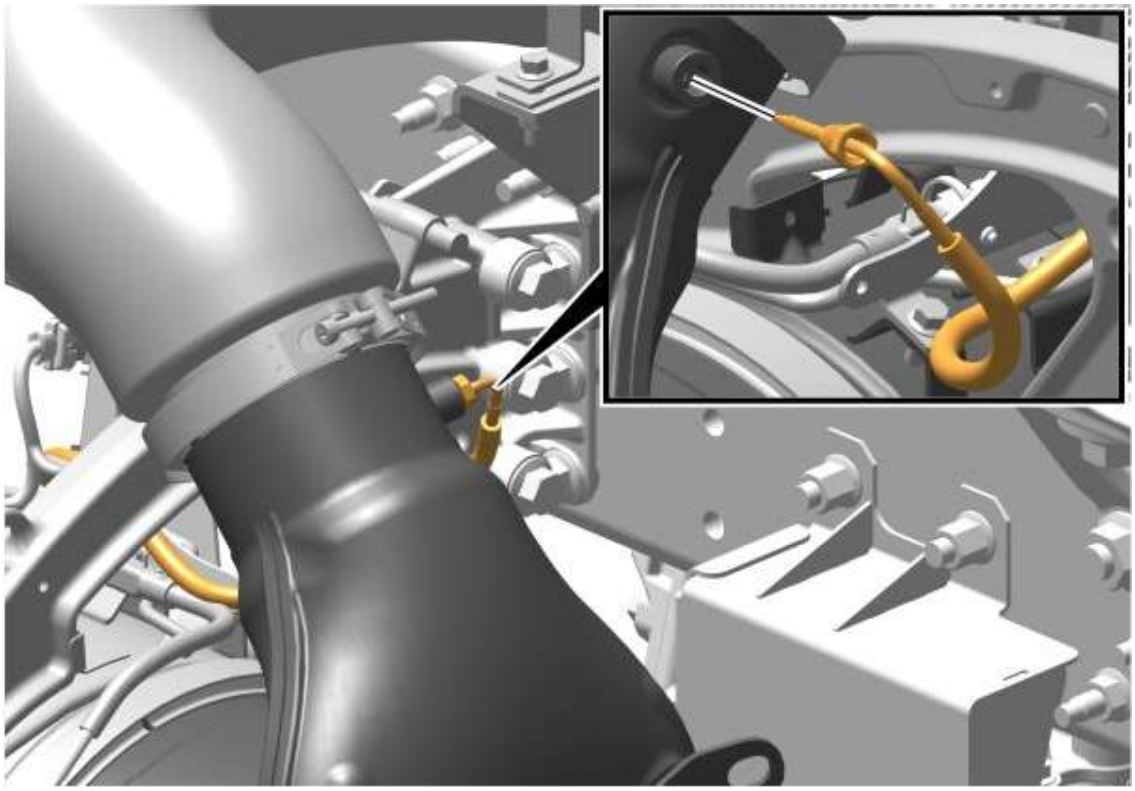
14	Repack the defective component(s) before returning for warranty evaluation. **Note** Take care when handling fragile components, such as sensors.

15	Install the sensor.

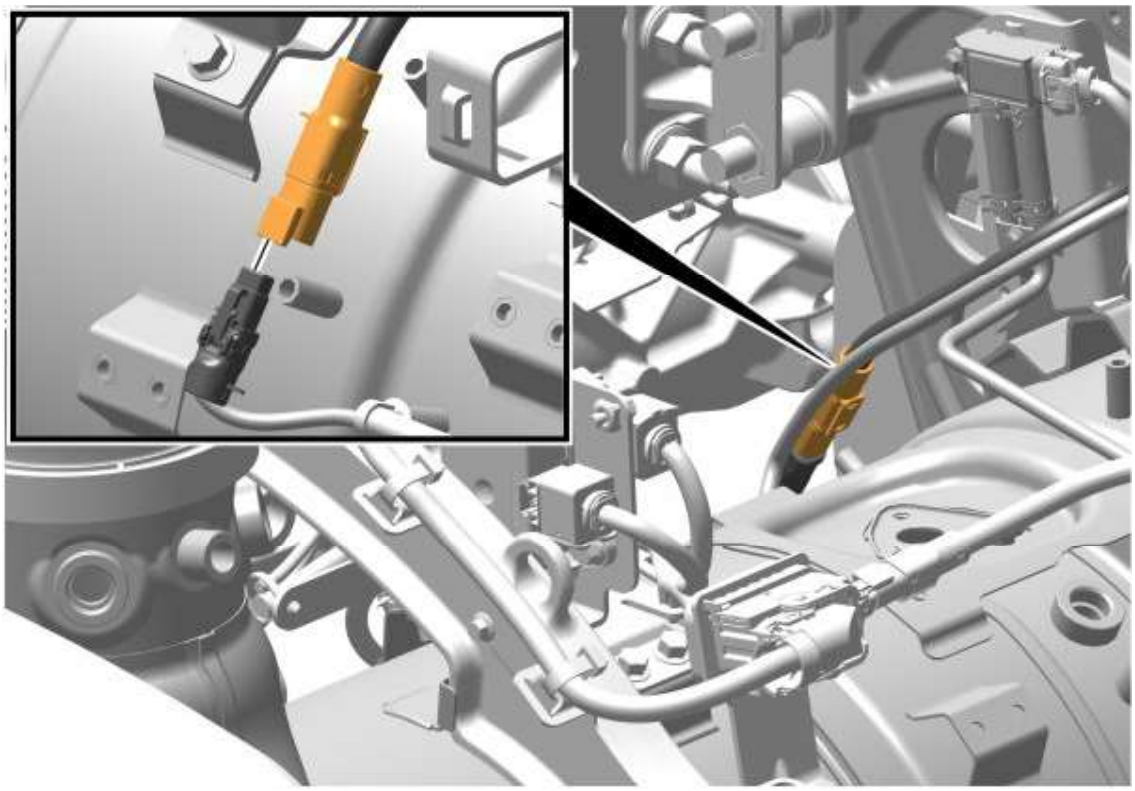
16	Torque tighten the sensor.

Tightening torque	
Sensor, screw	45 ±5 Nm (33 ±4 lb_f·ft)

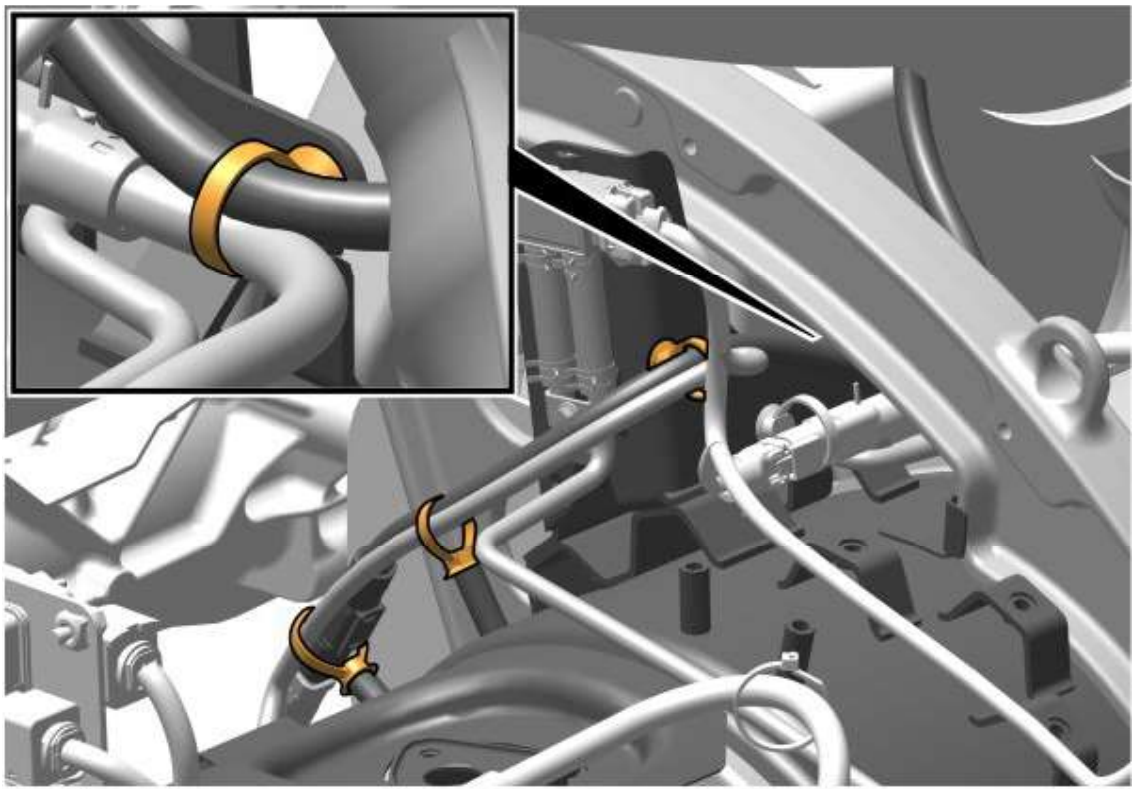
Note
Use the torque wrench that suits your application.



17	Connect the connector.

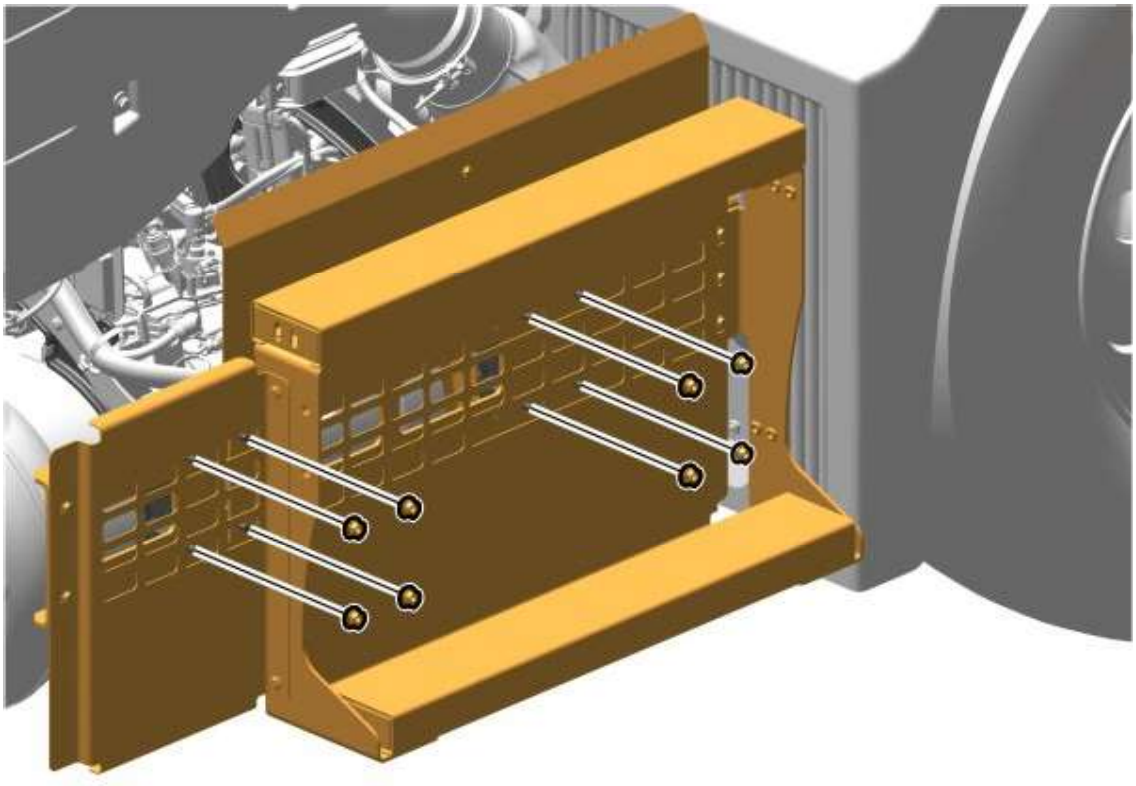


18	Install the cable ties. **Note** As noted. **Note** Use new parts.

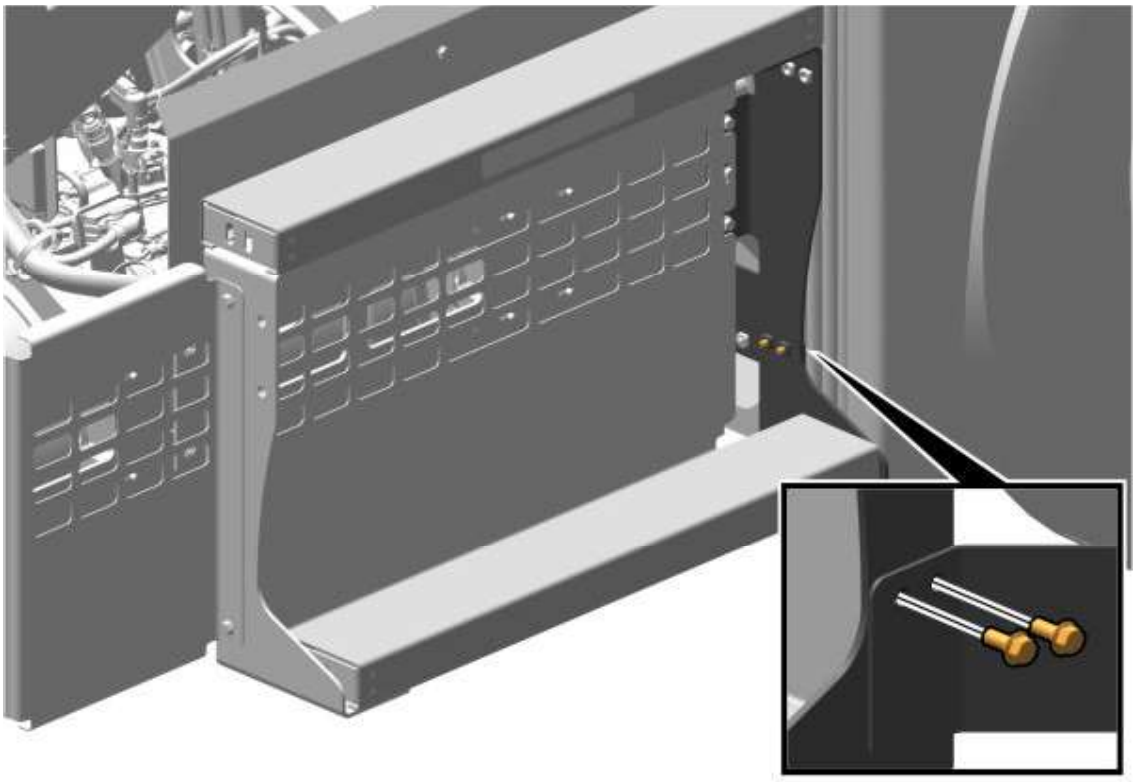


19	Install the footstep along with the heat shield.

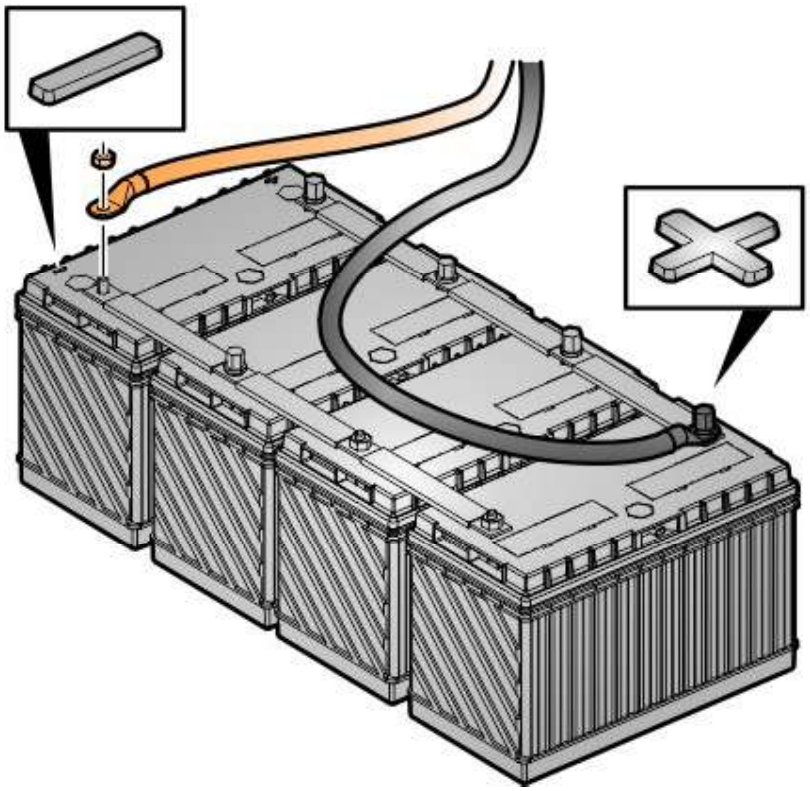
20	Install the nuts.



21	Install the screws.



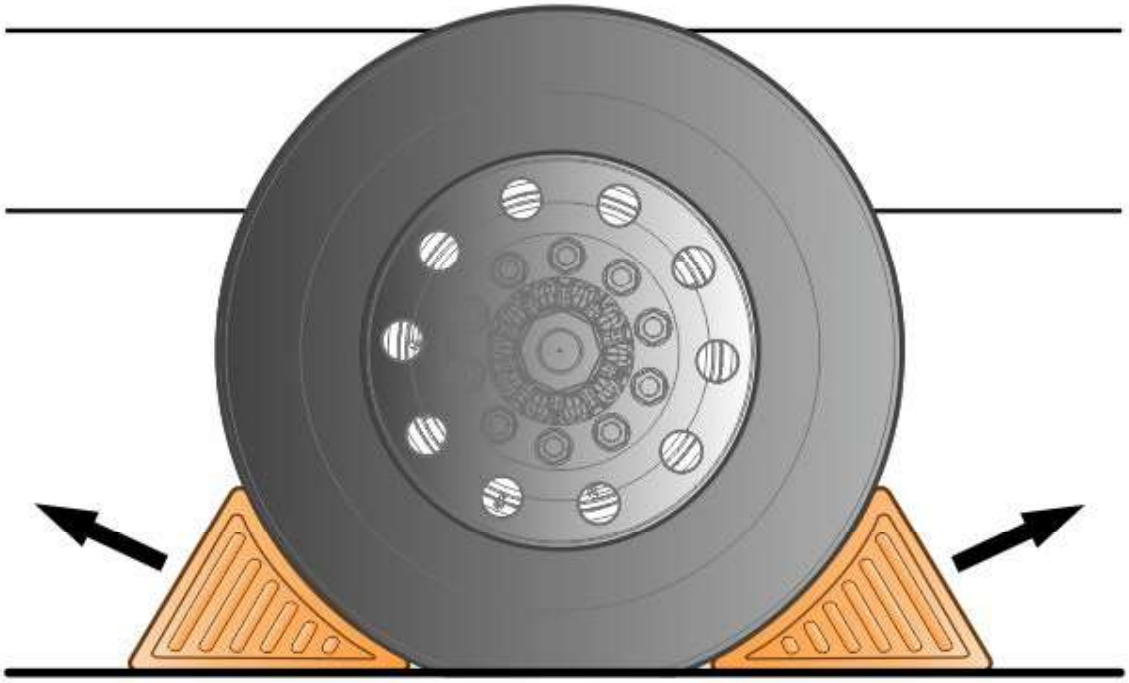
22	Perform this procedure when the condition below is met. **Conditions** • If equipped with lane change support ▸ Connect the connector.
23	Connect the cable to the negative terminal.
24	Apply protectant to battery terminals and cable terminals. **Note** Use recommended grease.



25	Connect the diagnostic tool.

26	Delete the DTC (Diagnostic Trouble Code) according to the instructions.
27	Disconnect the diagnostic tool.

28	Remove the wheel chocks.



25970-2 Exhaust Temperature Sensor, Replacement

T2

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CAUTION

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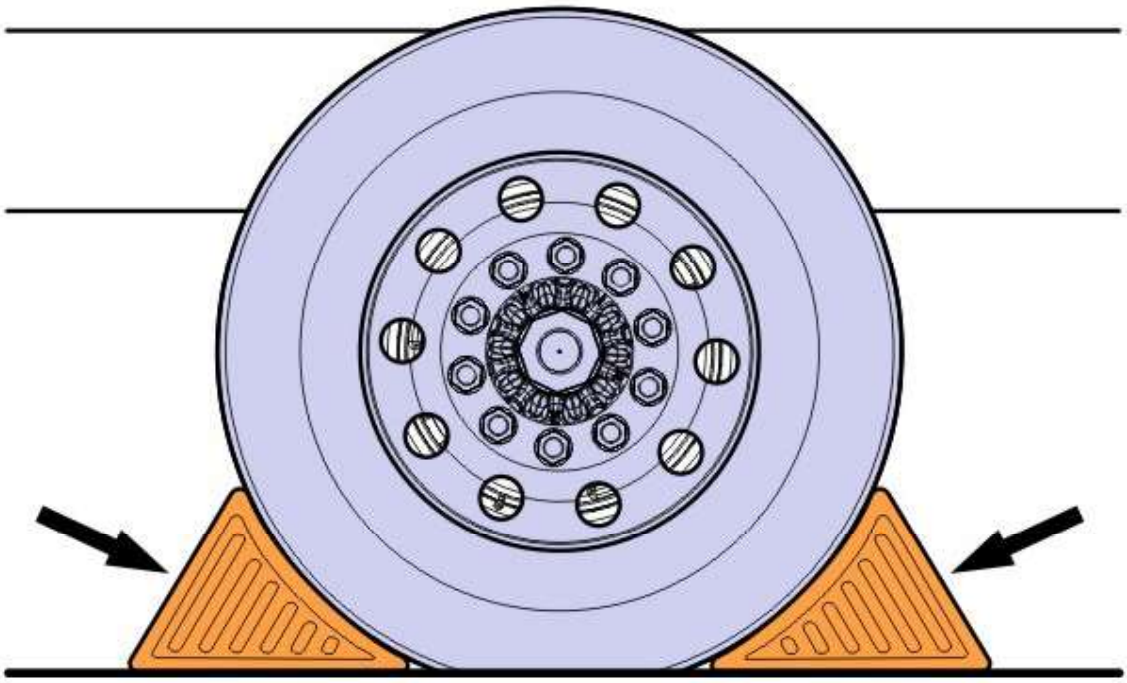
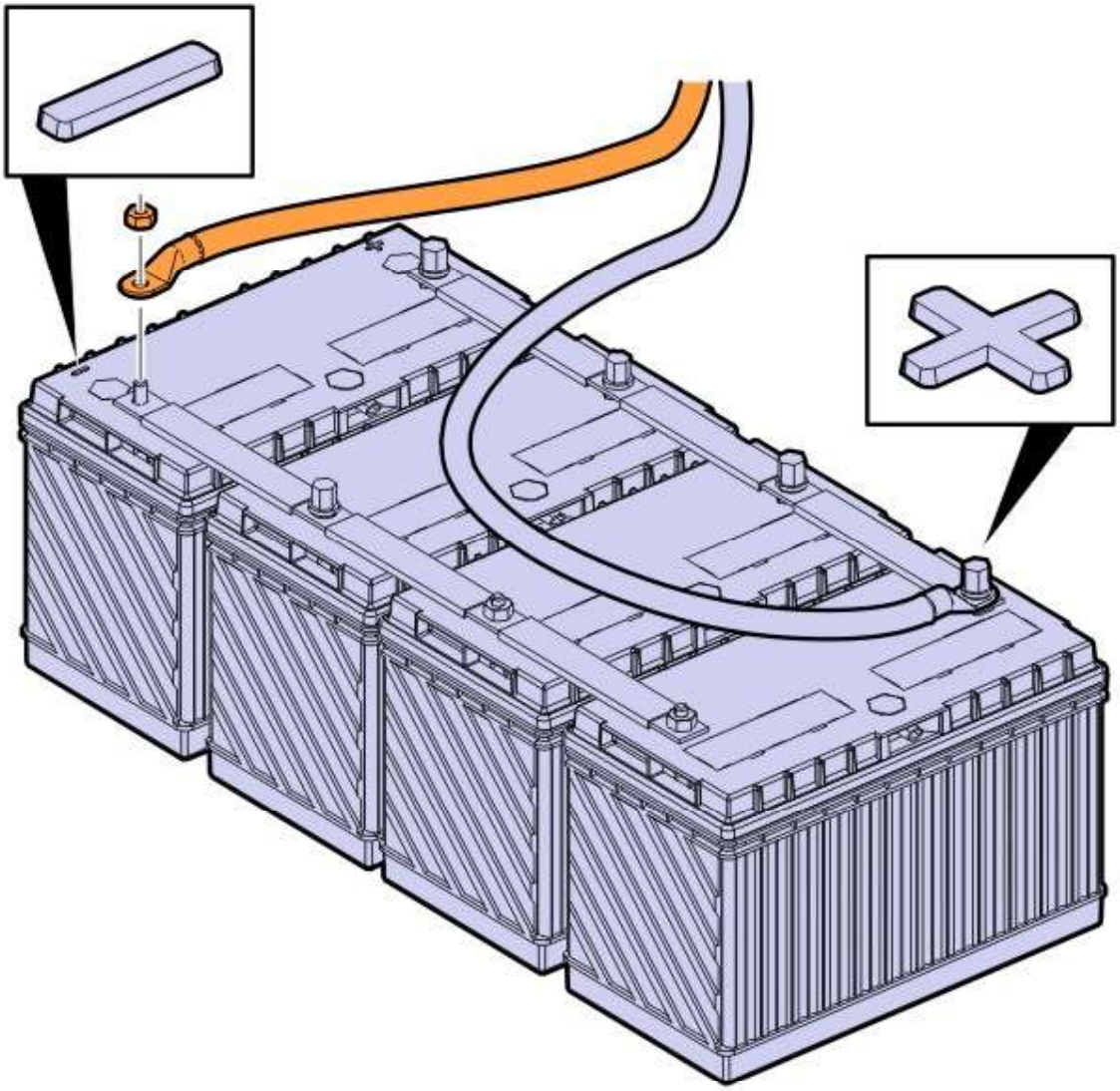
▸	You must read and understand the precautions and guidelines in Service Information, Function Group 2, "General Safety Practices, Engine" before performing this procedure.

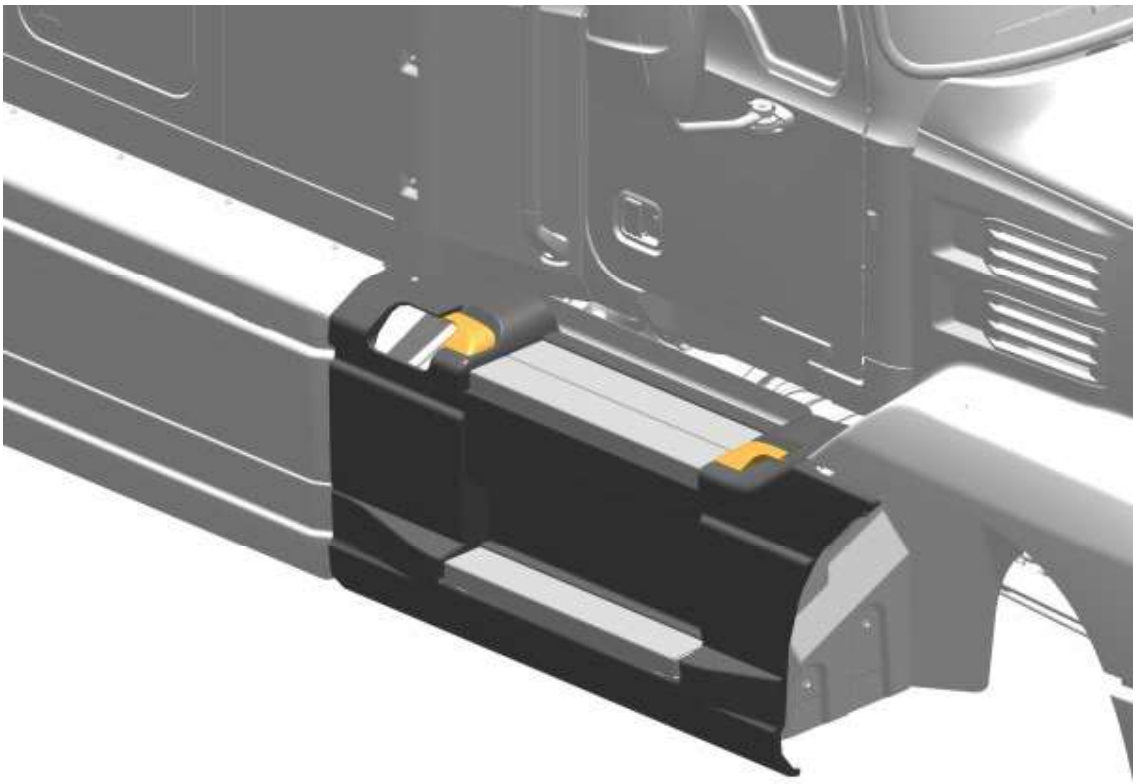
1	Park the vehicle on a level surface with the steering wheel in the straight ahead position.
2	Apply the parking brake.
3	Place the gear lever in neutral.
4	Install the wheel chocks.



5	Disconnect the cable from the negative terminal.

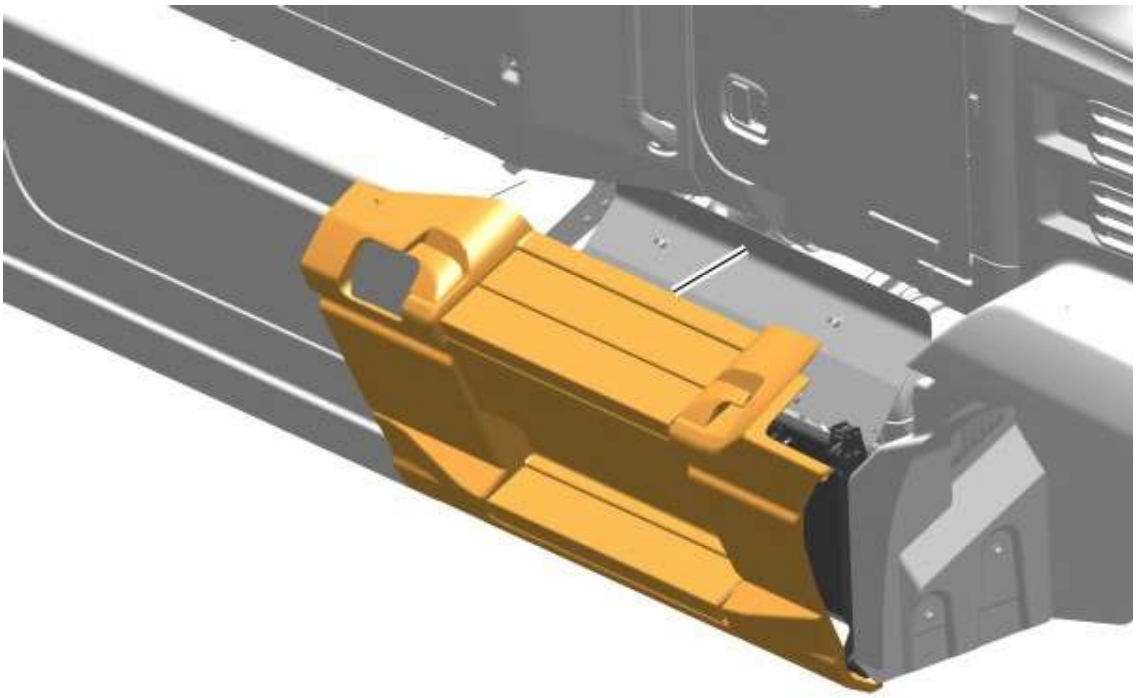


6	Unlatch the fairing.



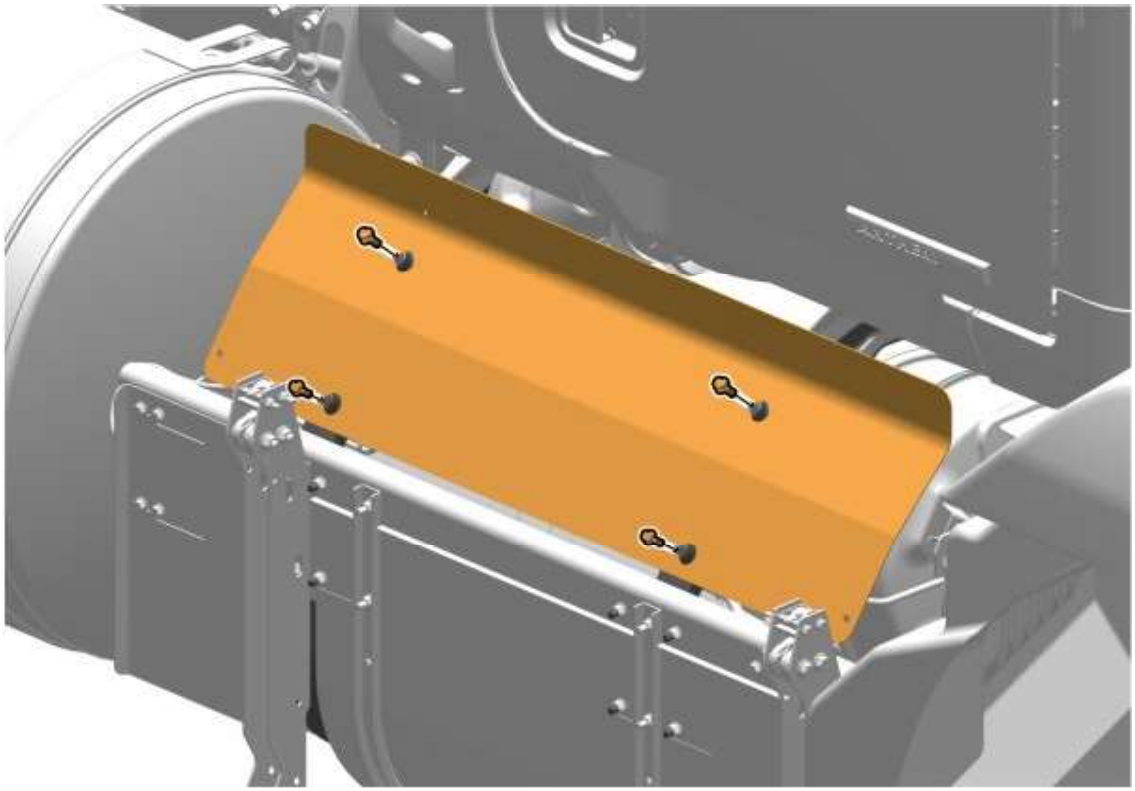
7	Remove the tether.

8	Remove the fairing.

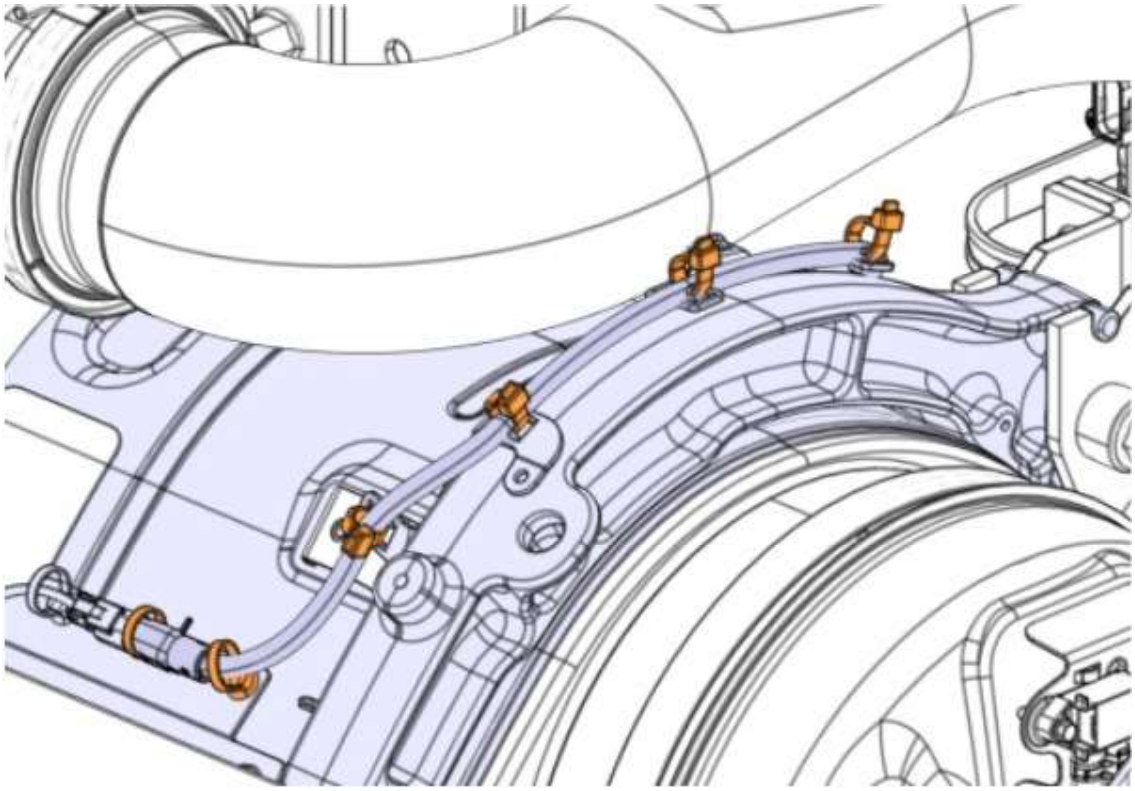


9	Remove the screws.

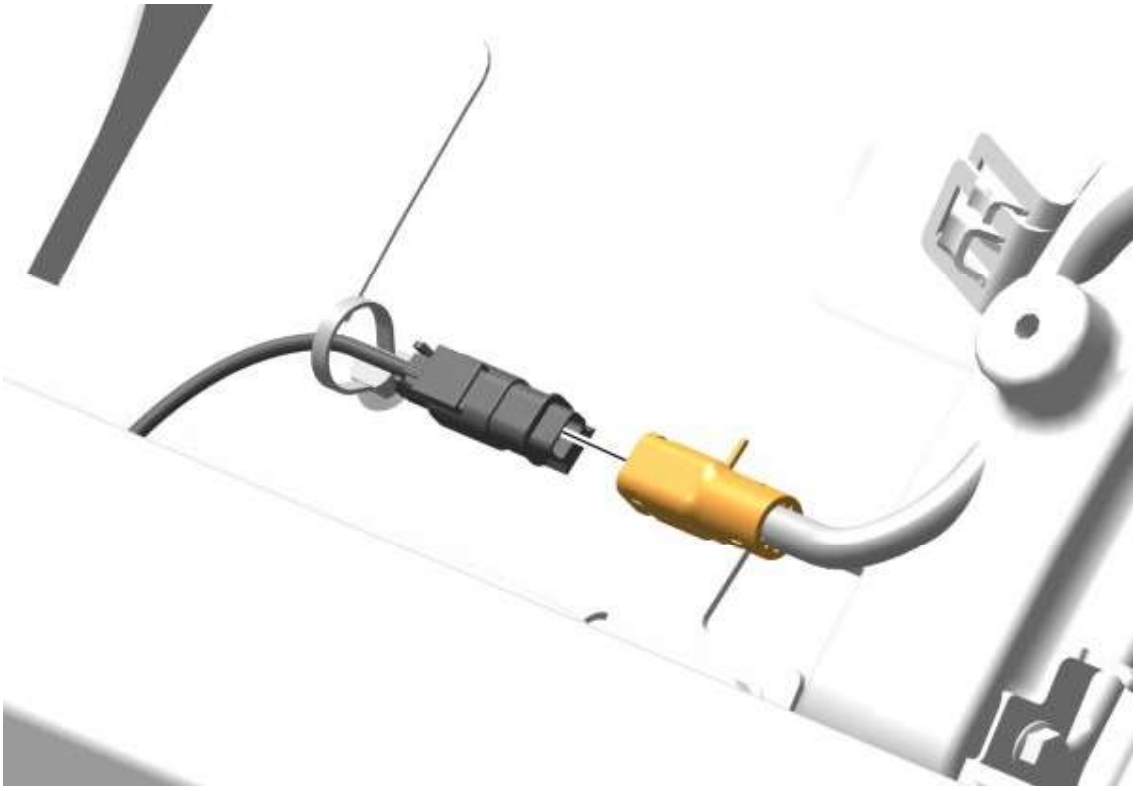
10	Remove the heat shield.



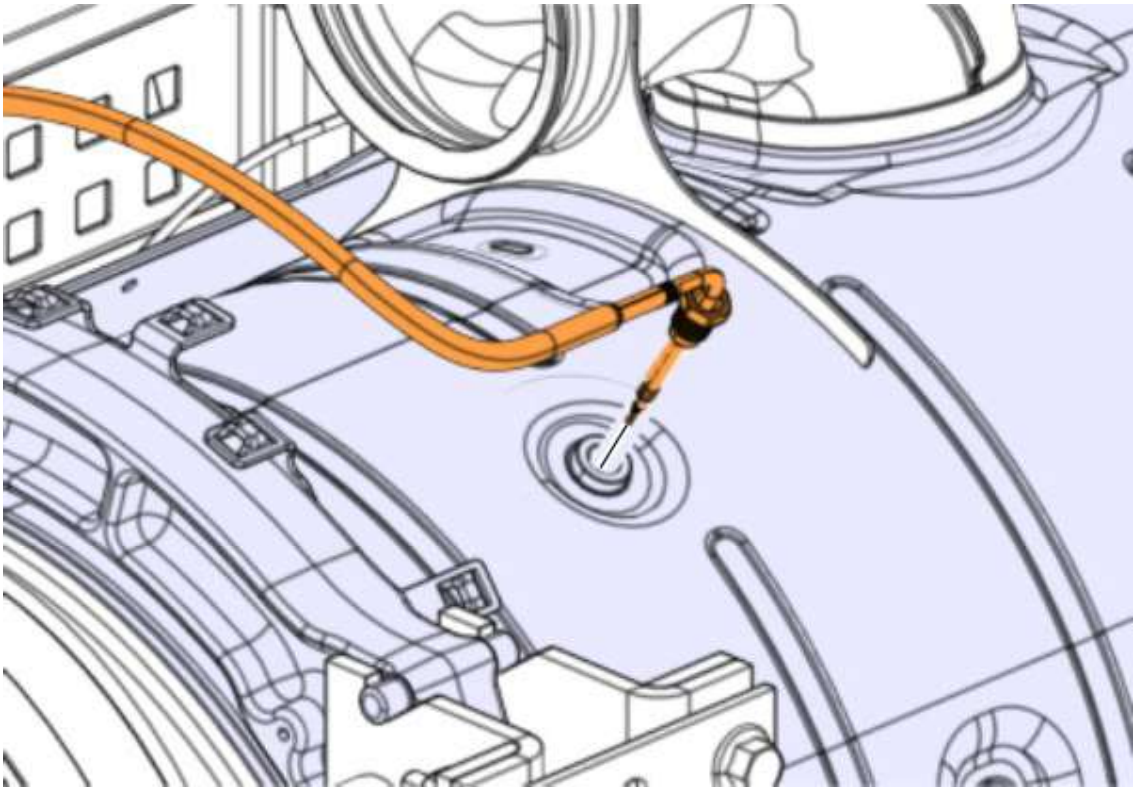
11	Remove the cable ties. **Note** Note the positions.



12	Disconnect the connector.



13	Remove the sensor.



14	Repack the defective component(s) before returning for warranty evaluation.

Note

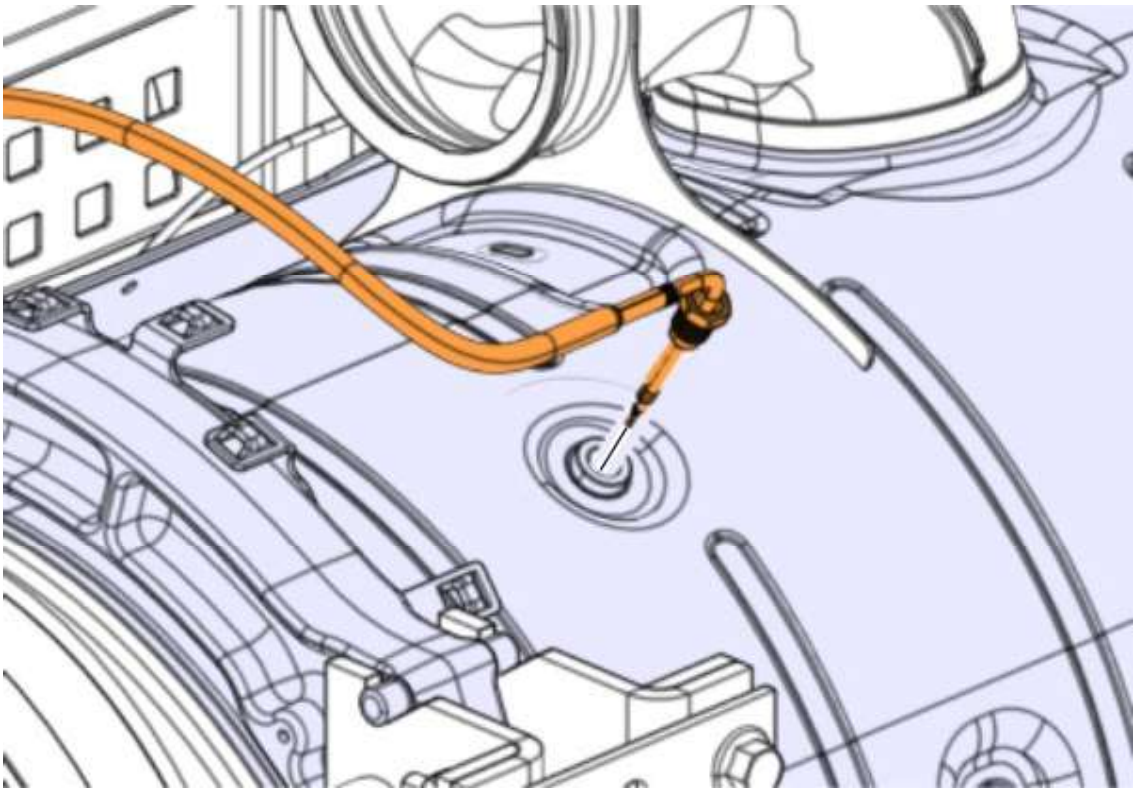
Take care when handling fragile components, such as sensors.

15	Install the sensor.

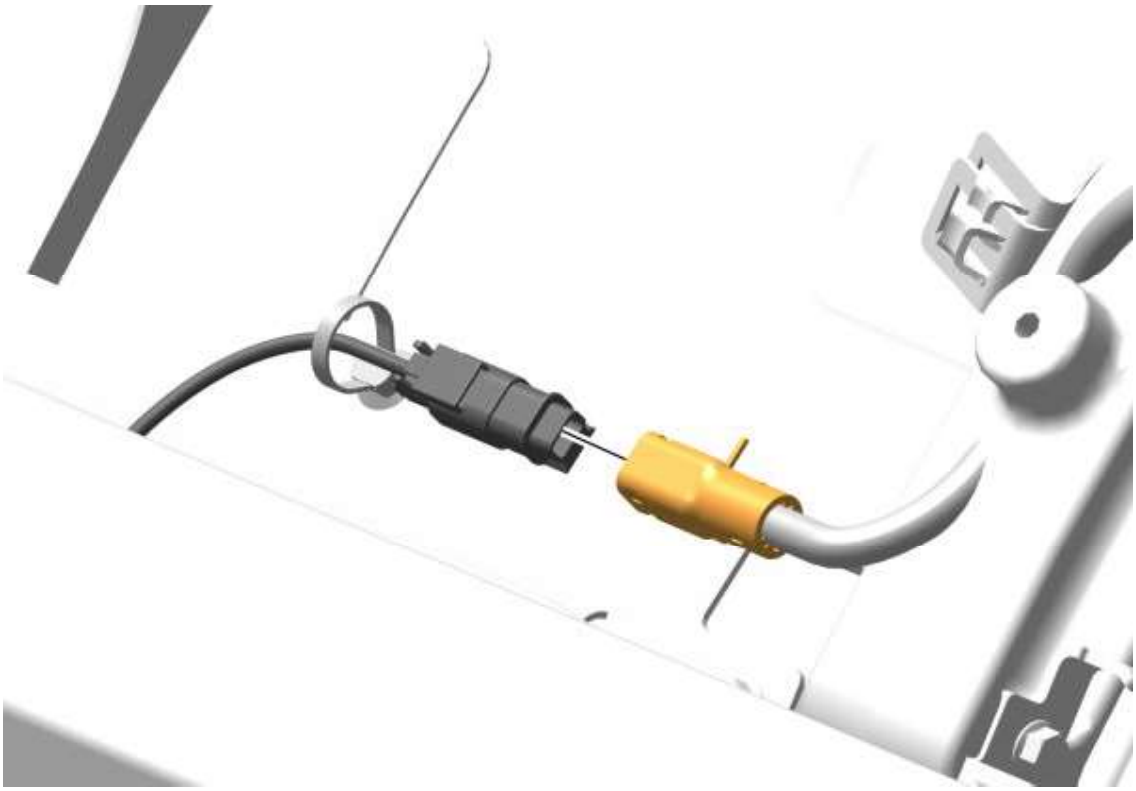
16	Torque tighten the sensor.

Tightening torque	
Sensor, screw	45 ±5 Nm (33 ±4 lb_f·ft)

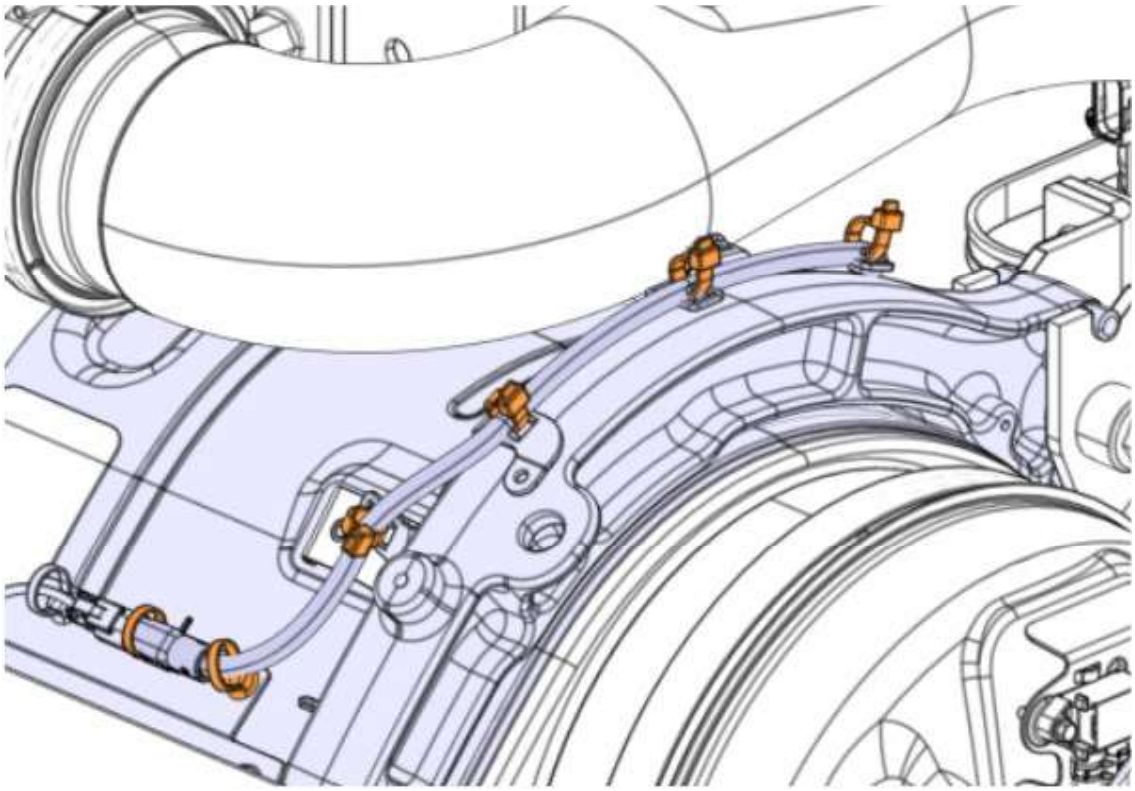
Note
Use the torque wrench that suits your application.



17	Connect the connector.

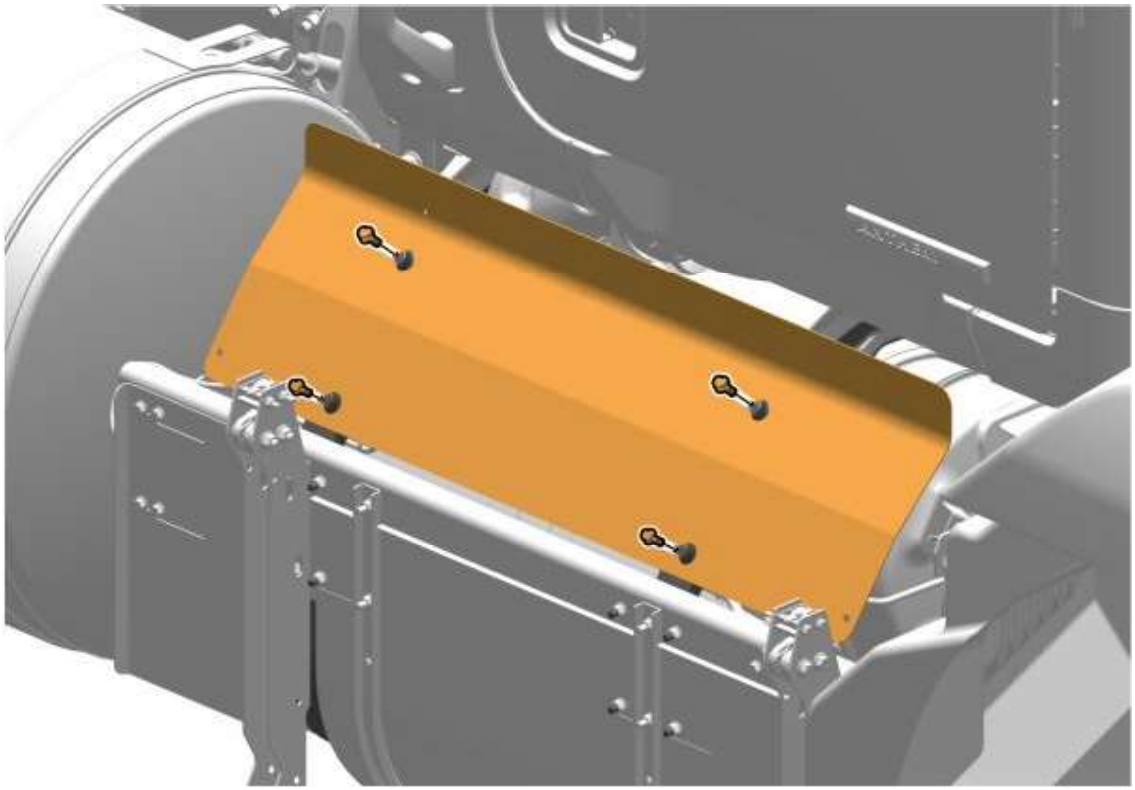


18	Install the cable ties. **Note** Use new parts. **Note** As noted.



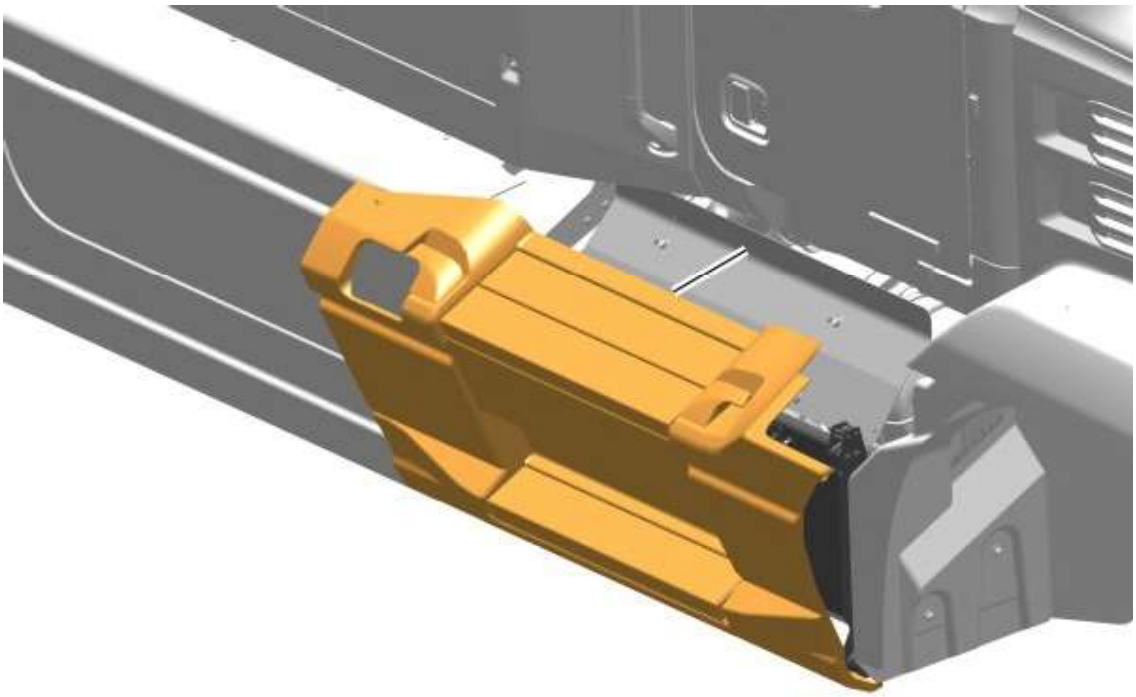
19	Install the heat shield.

20	Install the screws.

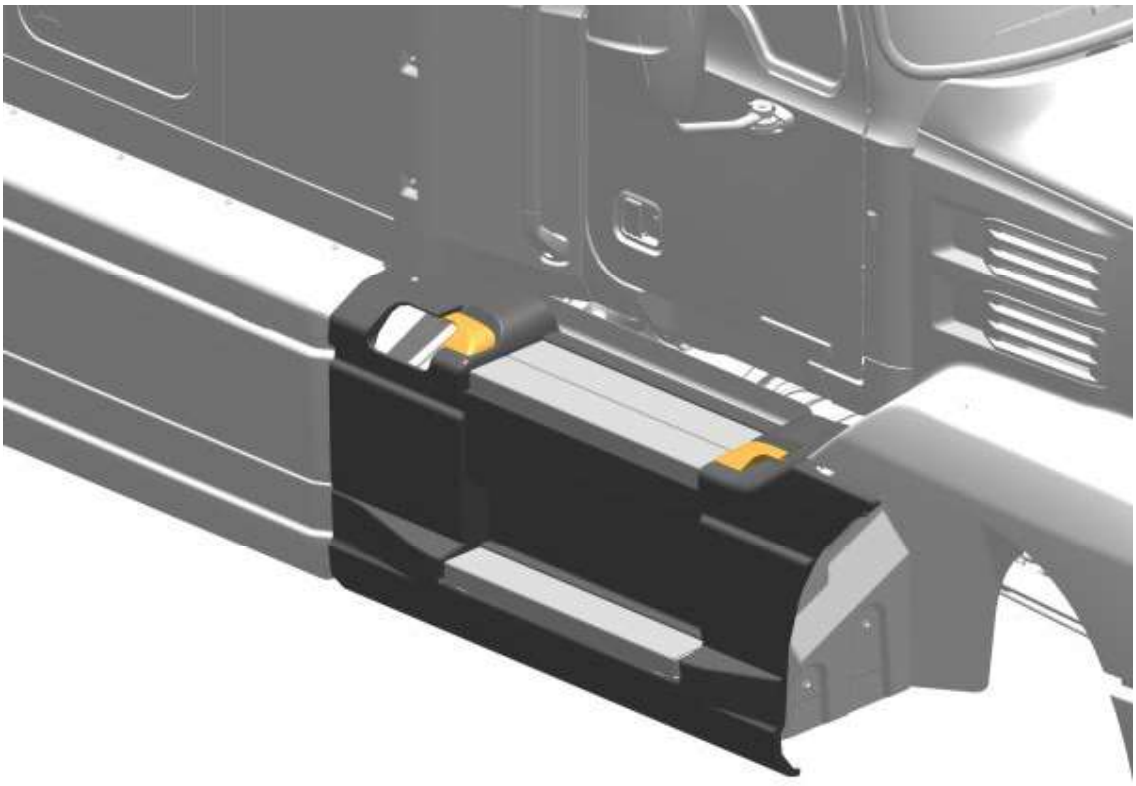


21	Install the fairing.

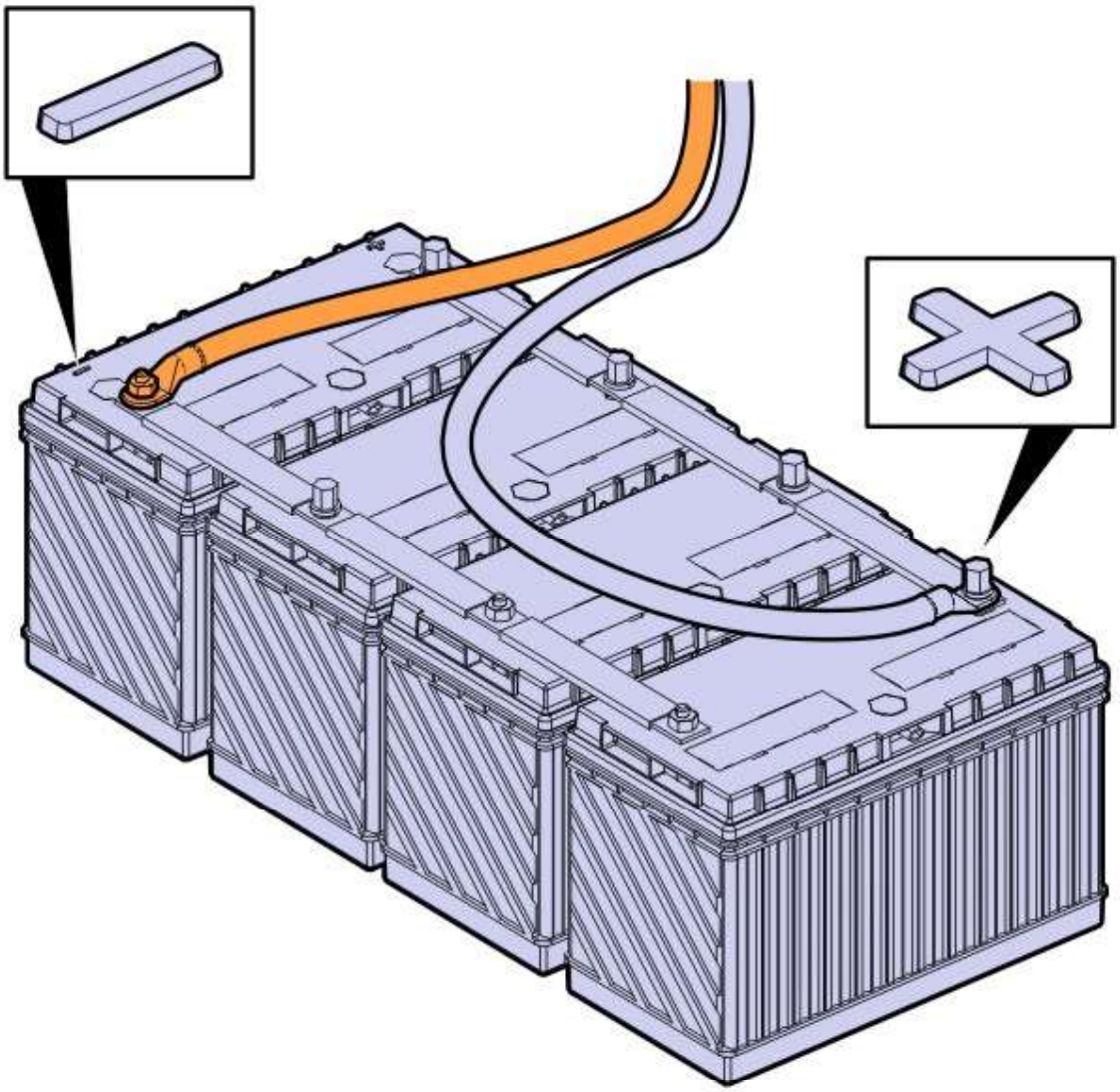
22	Install the tether.



23	Latch the fairing.



24	Connect the cable to the negative terminal.

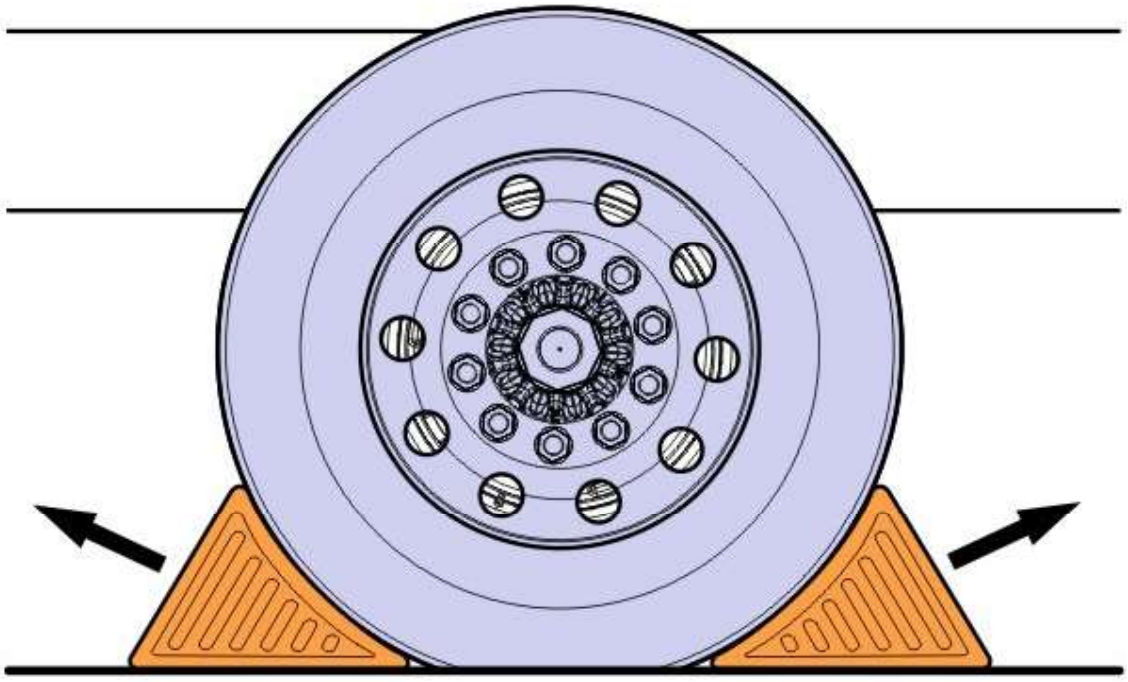


25	Connect the diagnostic tool (Premium Tech Tool).

26	Delete the DTC (Diagnostic Trouble Code) according to the diagnostic tool instructions.

27	Disconnect the diagnostic tool (Premium Tech Tool).

28	Remove the wheel chocks.



25971-2 Exhaust Temperature Sensor, Replacement

T3

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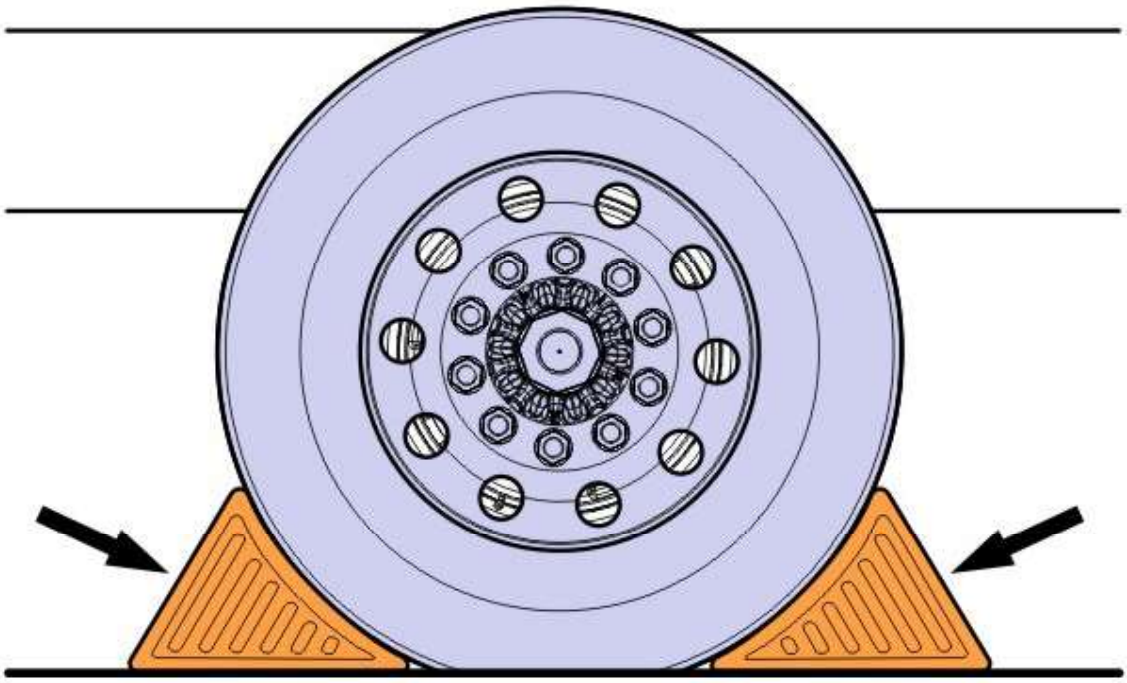
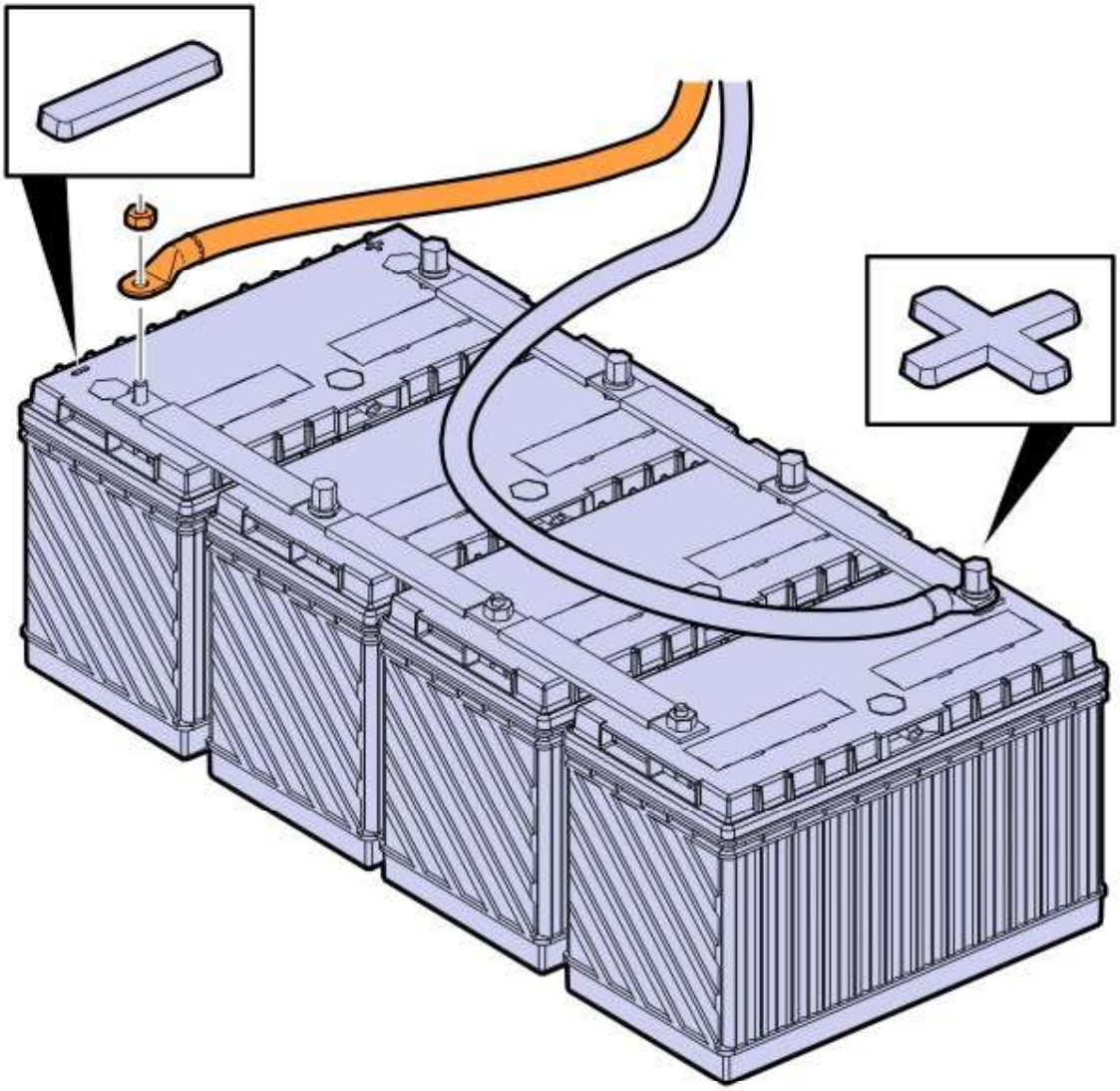
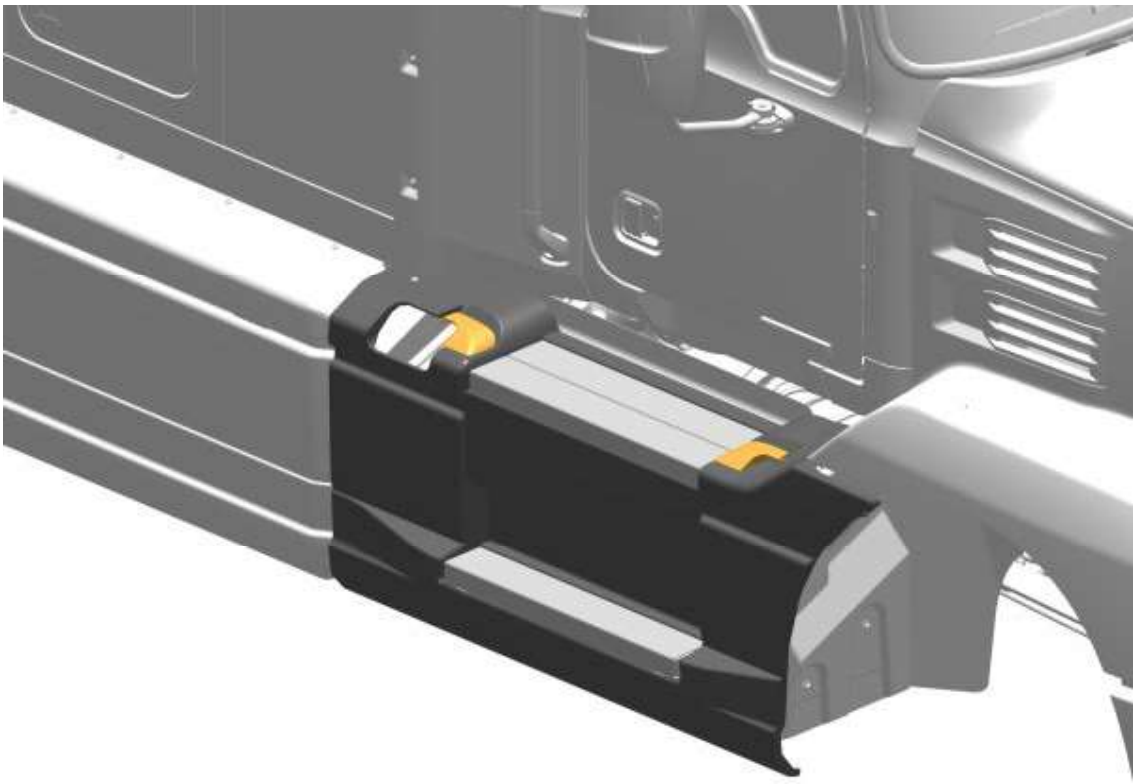
2	Apply the parking brake.
3	Place the gear lever in neutral.
4	Install the wheel chocks.



5	Disconnect the cable from the negative terminal.

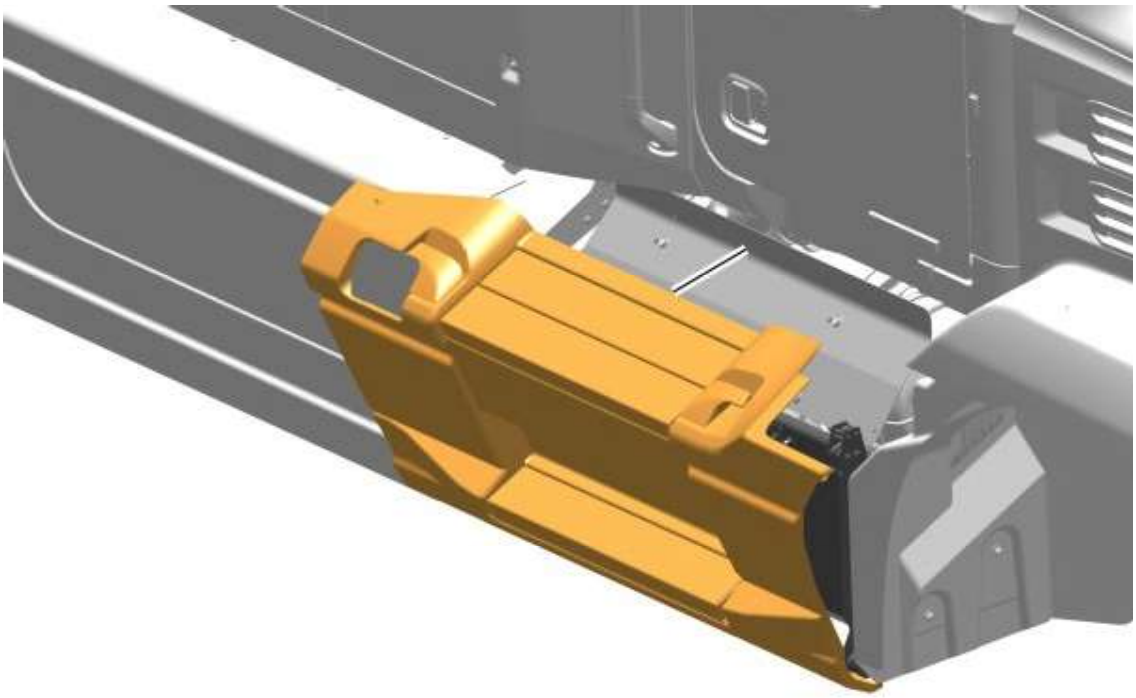


6	Unlatch the fairing.



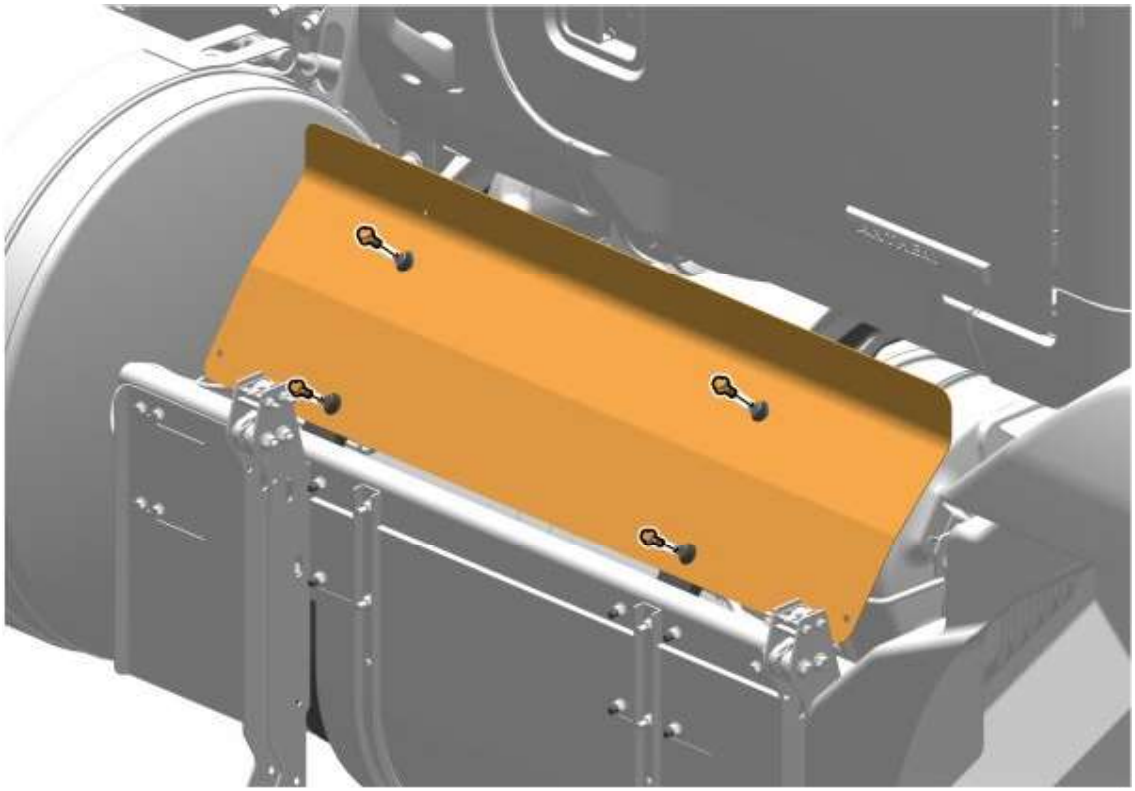
7	Remove the tether.

8	Remove the fairing.



9	Remove the screws.

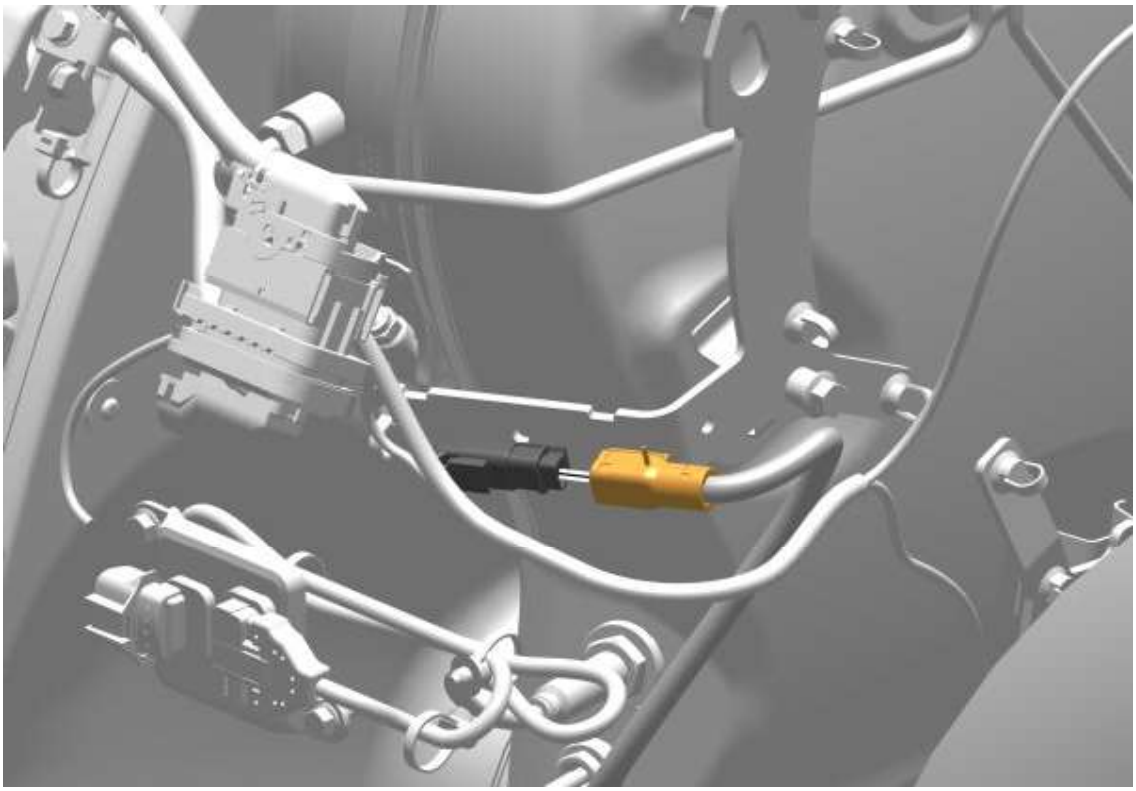
10	Remove the heat shield.



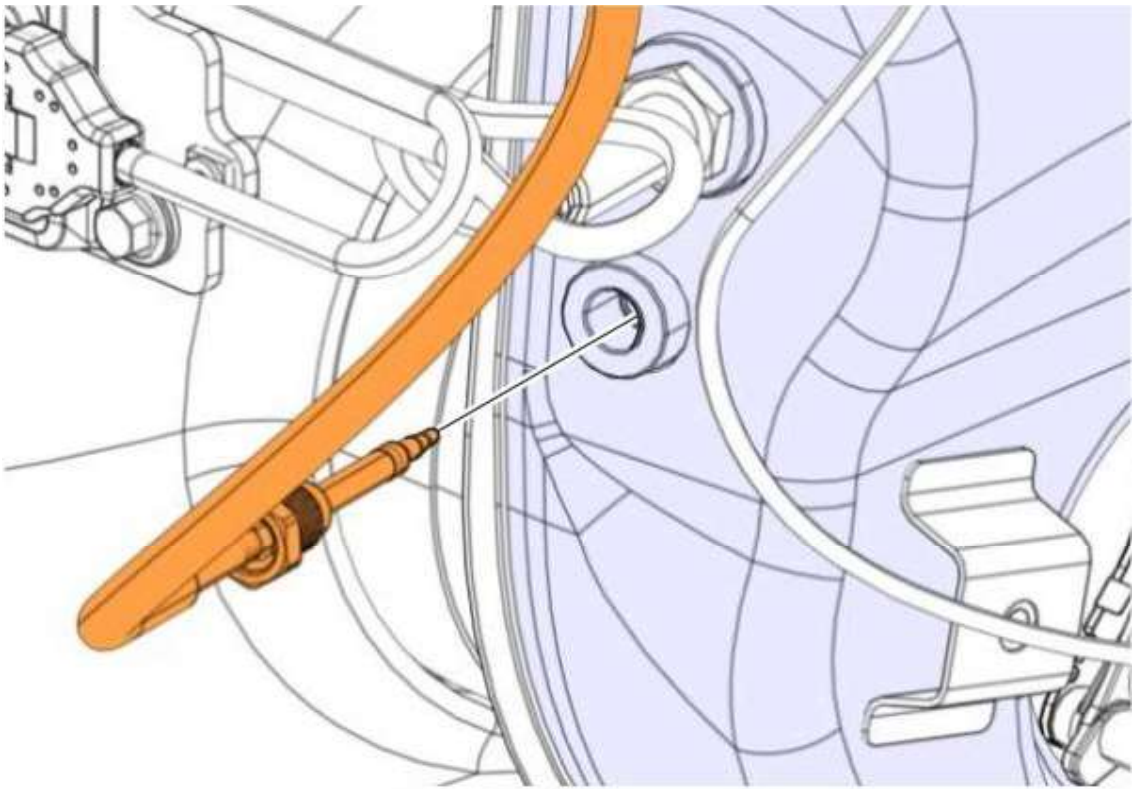
CAUTION
Risk of material damage. The cables can be damaged by sharp tools.
▸ Take care when removing the cable ties.

11	Remove the cable ties. **Note** Note the positions.

12	Disconnect the connector.



13	Remove the sensor.



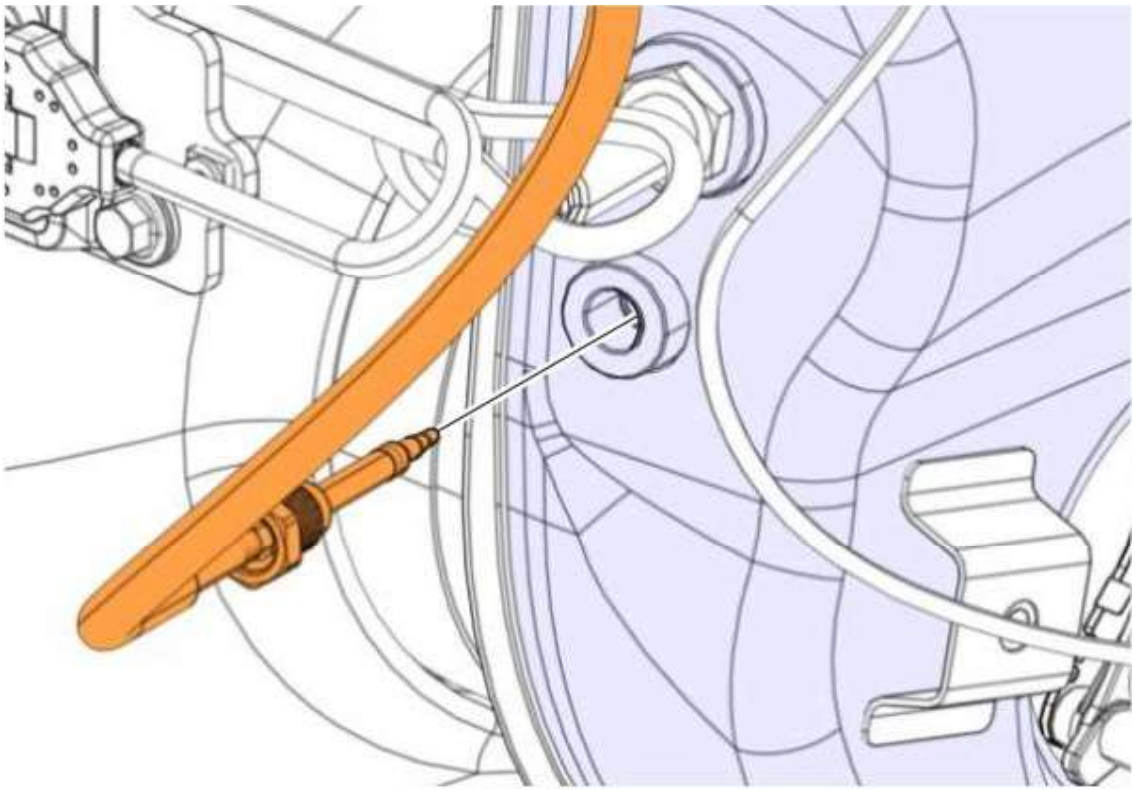
14	Repack the defective component(s) before returning for warranty evaluation. **Note** Take care when handling fragile components, such as sensors.

15	Install the sensor.

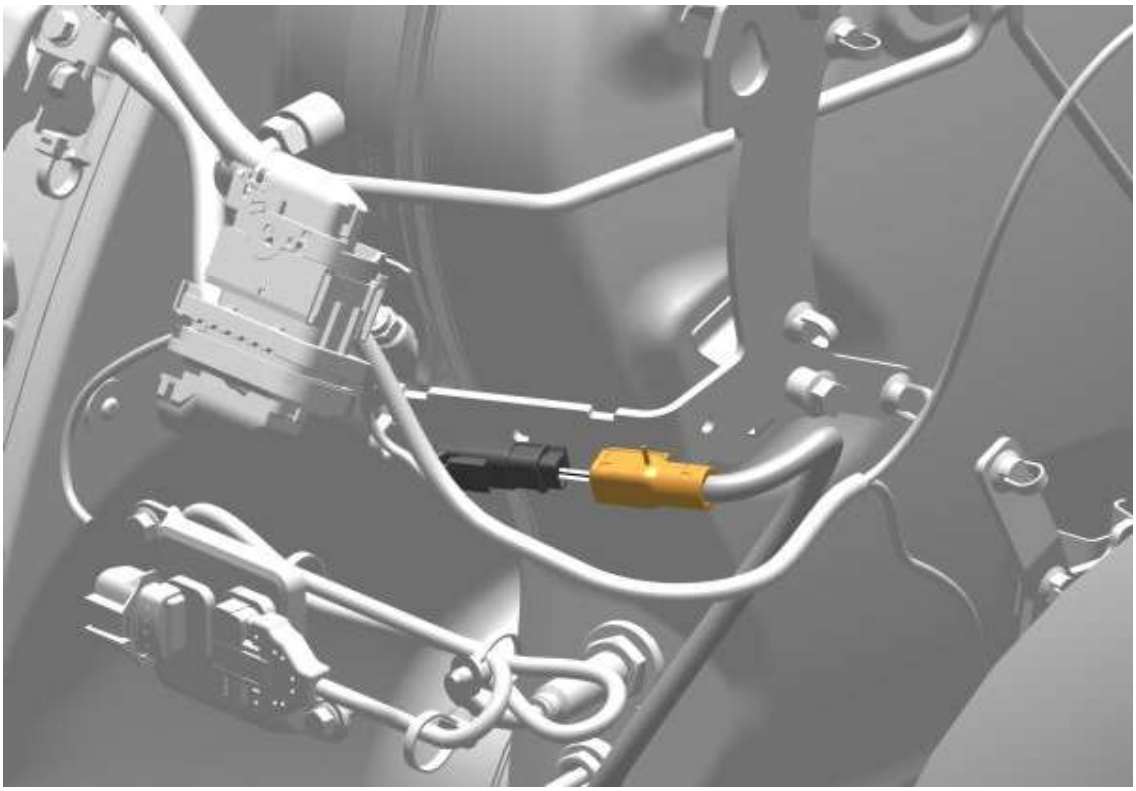
16	Torque tighten the sensor.

Tightening torque	
Sensor, screw	45 ±5 Nm (33 ±4 lb_f·ft)

Note
Use the torque wrench that suits your application.

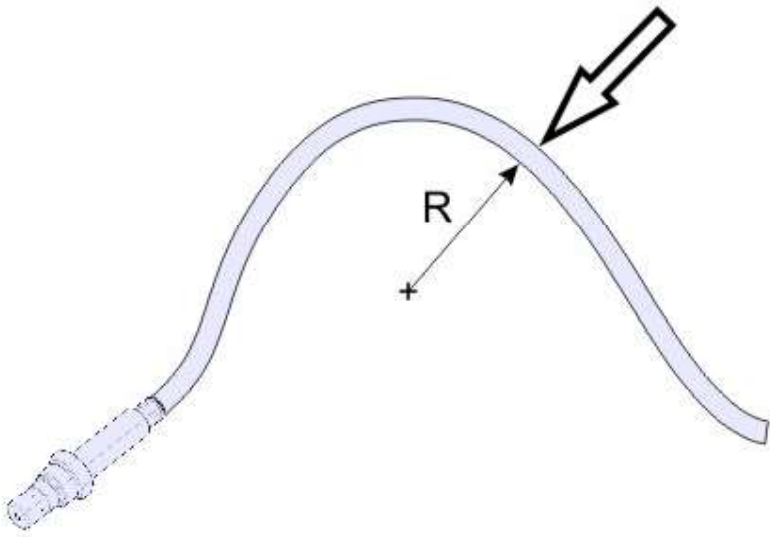


17	Connect the connector.



18	Install the cable ties. **Conditions** • The bend radius of the cable must not be less than the specified value

Cable, radius



R	Cable, radius	≥20 mm (≥0.79 in)

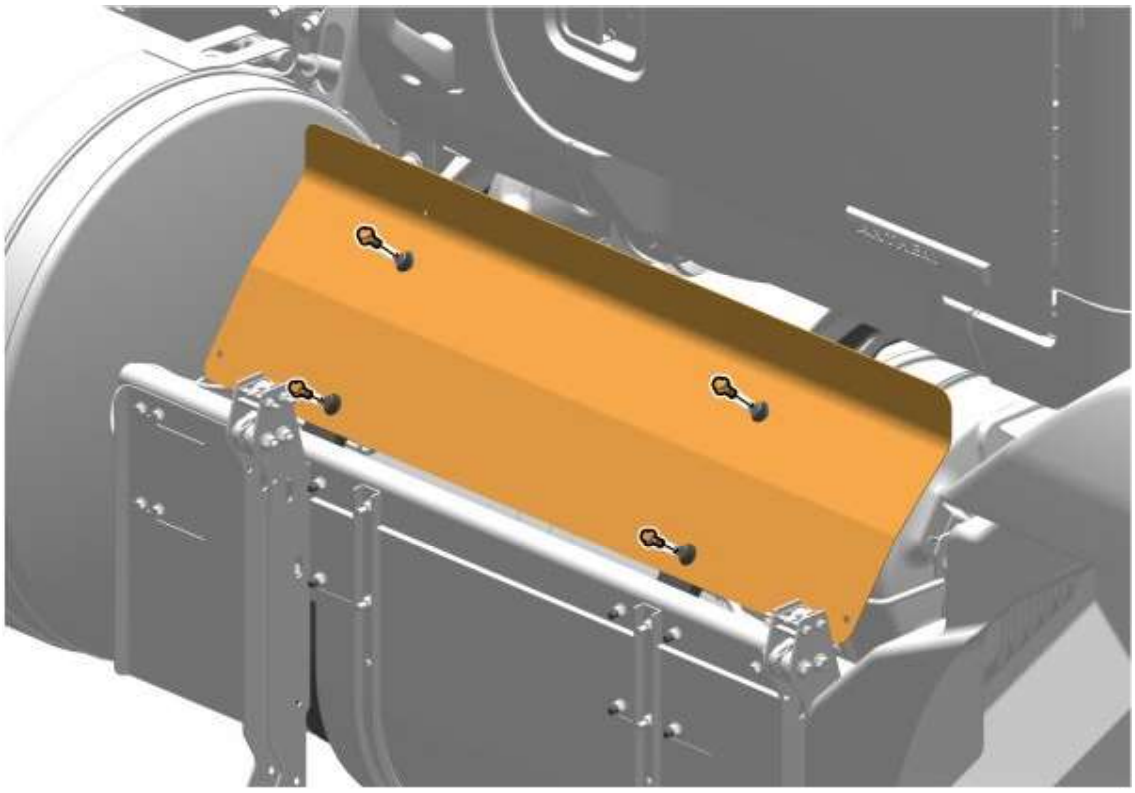
Note
Use new parts.

Note
Use high temperature cable ties.

Note
Install as noted.

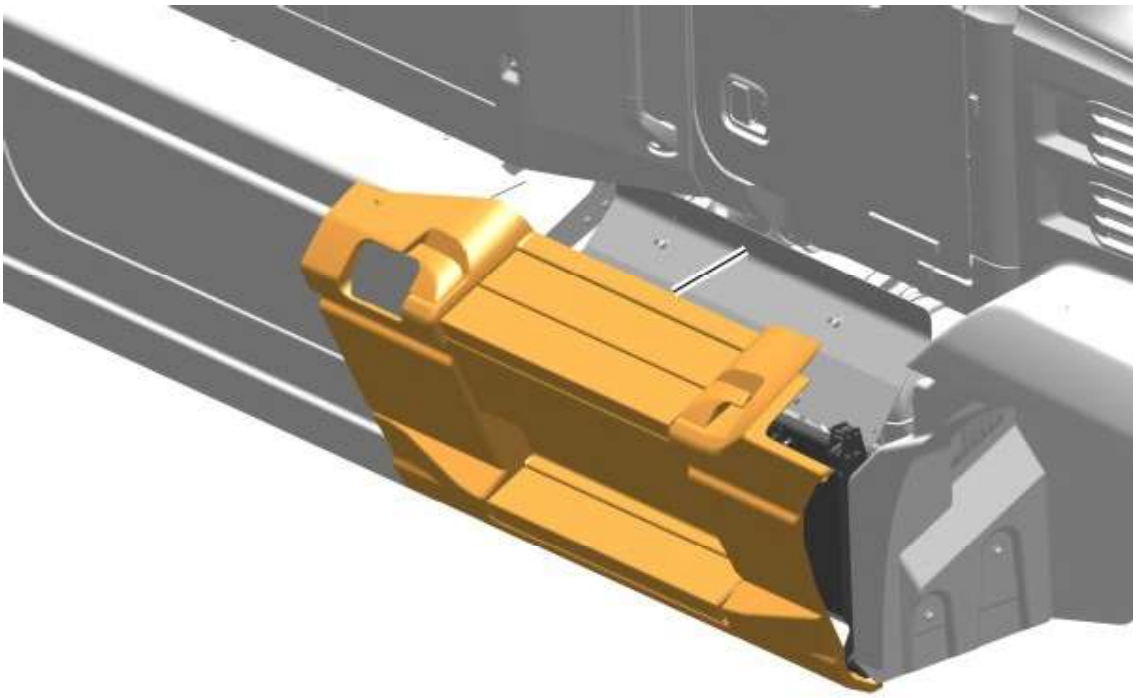
19	Install the heat shield.

20	Install the screws.

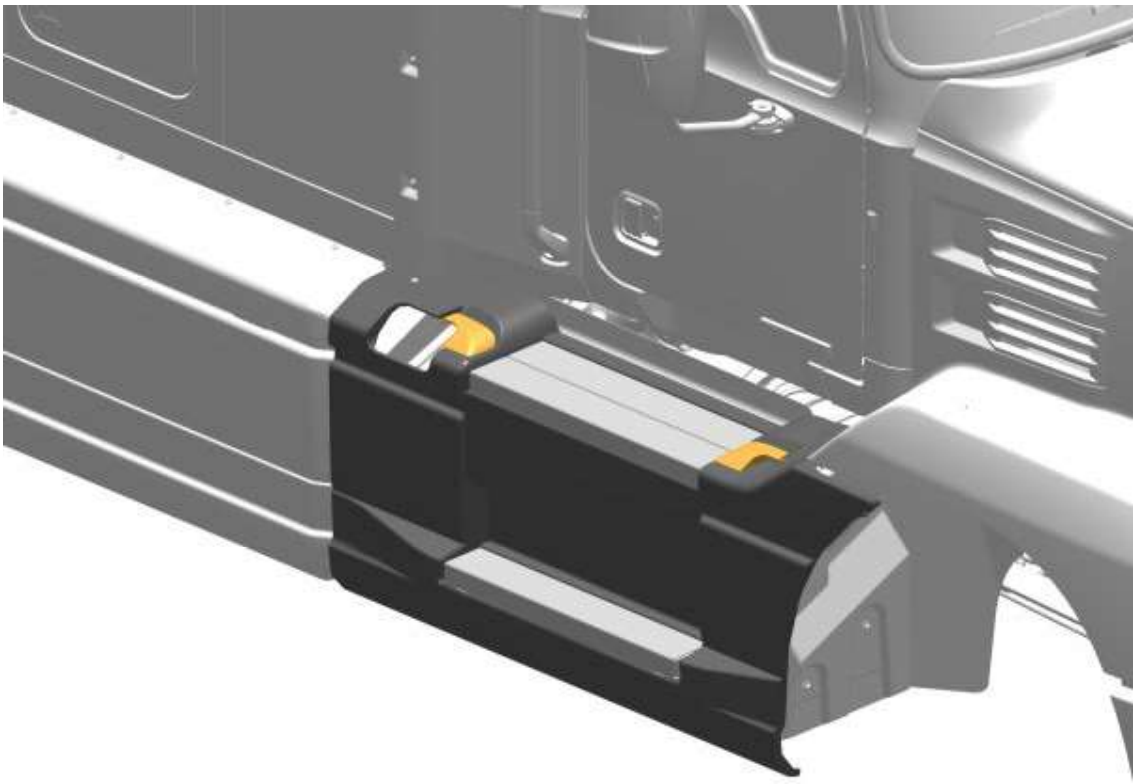


21	Install the fairing.

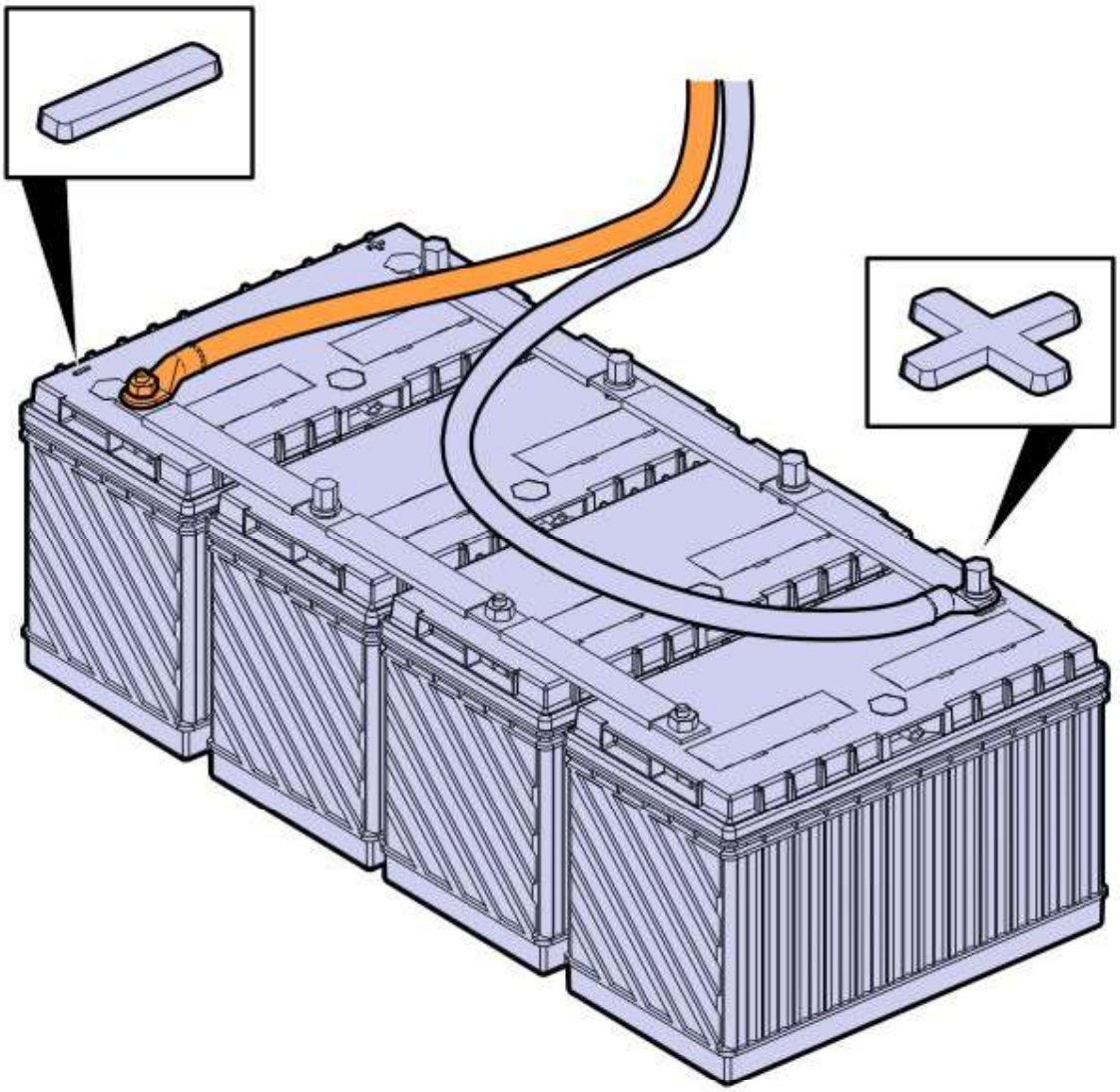
22	Install the tether.



23	Latch the fairing.



24	Connect the cable to the negative terminal.

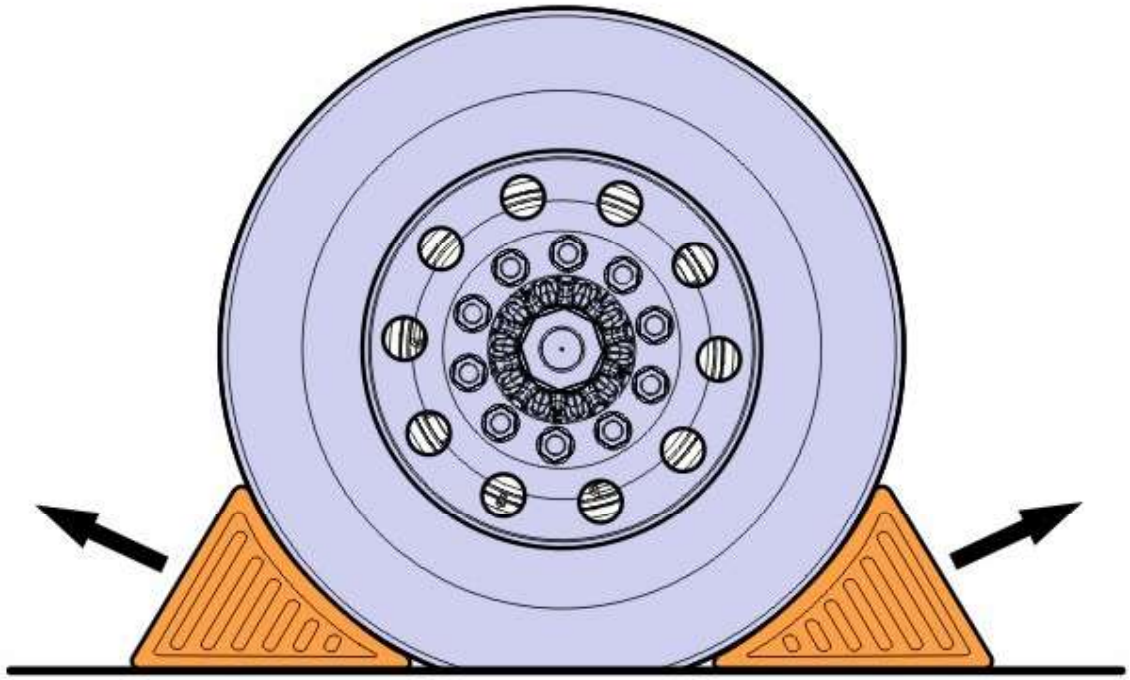


25	Connect the diagnostic tool (Premium Tech Tool).

26	Delete the DTC (Diagnostic Trouble Code) according to the diagnostic tool instructions.

27	Disconnect the diagnostic tool (Premium Tech Tool).

28	Remove the wheel chocks.



Tech Tool

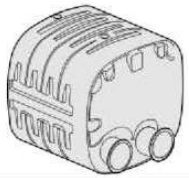
Tech Tool | Links | Help

BRADLEY PICKENS

Product | **Product History** | **Diagnose** | **Test** | **Calibrate** | **Program** | **Impact**

A **DPF 20 - 60 minute(s)**

B **SCR 30 - 90 minute(s)**



2589-08-03-02 Exhaust Aftertreatment System, Service Regeneration

Simulation

Information >> Conditions >> Execution

Purpose

- Perform a service regeneration (DPF)
- Perform DEF crystal sublimation
- Check that the regeneration functions properly
- Prepare particulate filter for ash cleaning

Selections

Select the illustration corresponding to the method or test to be performed

A - 2545-08-03-03 Diesel Particulate Filter Service Regeneration

- This operation is used to perform a "service regeneration" of the diesel particulate filter (DPF)
- During engine operation, the DPF becomes loaded with soot. Regeneration of the DPF takes place during engine operation in order to remove the soot.
- If the soot level becomes greater than what can be removed by the normally-occurring regeneration process, service regeneration may be needed. Service regeneration may also be needed to prepare the filter for ash cleaning.

B - 2585-11-03-03 SCR, Diesel Exhaust Fluid, Crystal Sublimation

- Under certain circumstances, the SCR catalyst may become loaded with DEF crystals. These deposits develop when the DEF is injected in cold duty cycles in which the SCR catalyst does not reach the proper temperature needed for chemical reaction. If the crystallization level becomes greater than that which can be removed by normal engine operation, manual regeneration may be needed.
- In this process the solid crystals are converted to a gaseous state. This conversion is performed by heating the SCR unit to a temperature that causes the conversion of the crystals to occur, thereby removing them from the system.
- Heating of the **SCR** catalyst is accomplished by heating of the diesel particulate filter (DPF), similar to the DPF regeneration except that the temperatures are higher and it can take longer time.

Continue > | Cancel

Chassis ID: M744 41340 VIN: 1M1AW07Y9EM041340 Work Order: 9999

Product | Online

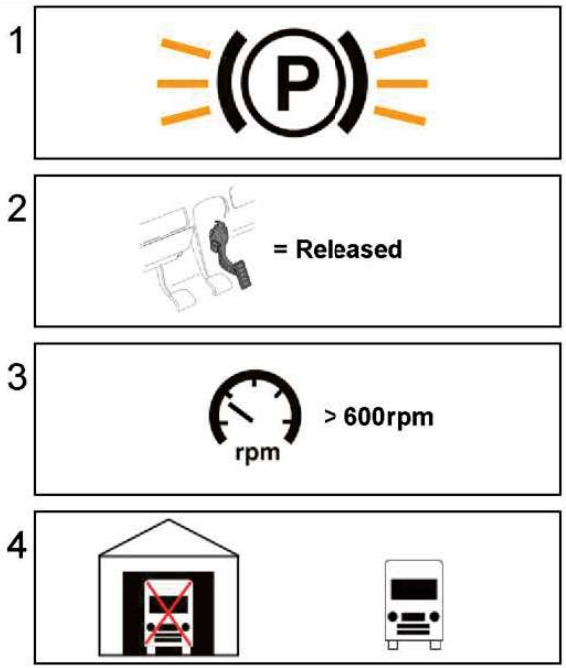
12:29 PM
6/30/2022

Tech Tool

Tech Tool | Links | Help

BRADLEY PICKENS

Product | **Product History** | **Diagnose** | **Test** | **Calibrate** | **Program** | **Impact**



2589-08-03-02 Exhaust Aftertreatment System, Service Regeneration

Simulation

Information >> **Conditions** >> Execution

Manual conditions

1 Parking brake applied
2 Accelerator pedal (AP) released
3 Engine running
4 Vehicle outdoors in a suitable area

☑ Confirmed

Continue > | Cancel

Chassis ID: M744 41340 VIN: 1M1AW07Y9EM041340 Work Order: 9999

Product | Online

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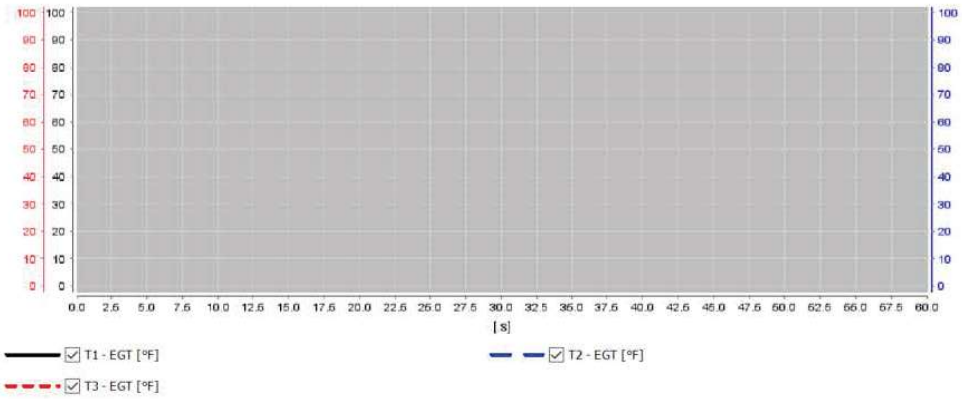
6/30/2022

DPF Regeneration activation (Soot)

Percentage completed (0 - 100 %)

0%

Exhaust gas temperatures



Exhaust Aftertreatment - Group 1

Exhaust Aftertreatment - Group 2

Exhaust Aftertreatment - Group 3

Engine - Group 1

Engine - Group 2

2589-08-03-02 Exhaust Aftertreatment System, Service Regeneration

Simulation

Information >> Conditions >> **Execution**

Information

Action

Note: The process can be stopped at any point by selecting the stop button

Start the regeneration by pressing the play button

Allow the operation to continue until it is complete. When the process is complete the engine speed will return to normal idle speed. At this point, the engine should be allowed to run until the system has cooled down 2 - 3 minute(s).

The progress bar may not start immediately when the engine speed increases; it can take several minutes due to the exhaust aftertreatment system is not hot enough

Exhaust gas temperatures

Exhaust Aftertreatment - Group 1

Exhaust Aftertreatment - Group 2

Exhaust Aftertreatment - Group 3

Engine - Group 1

Engine - Group 2

Engine - Group 3

Engine - Group 4

Restart the operation

Continue >

28006-2 Exhaust Temperature Sensor, Replacement (T4)

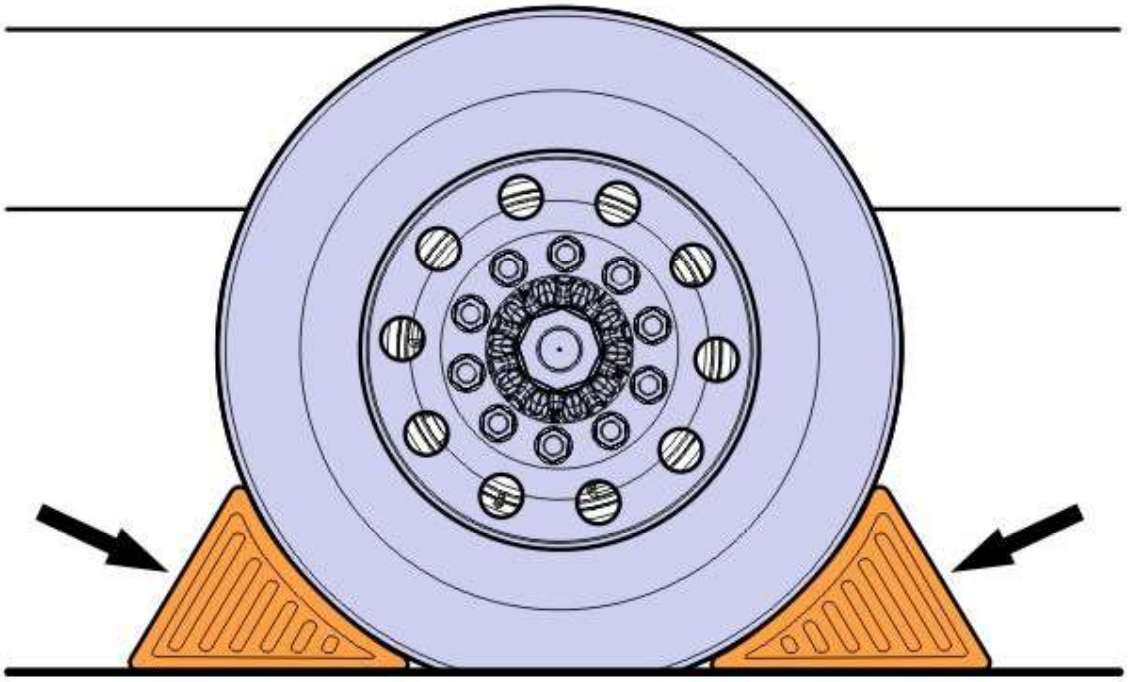
i	Illustrations may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

i	Colors used in illustrations are for highlighting purposes only and do not correspond to the actual colors of the vehicle.

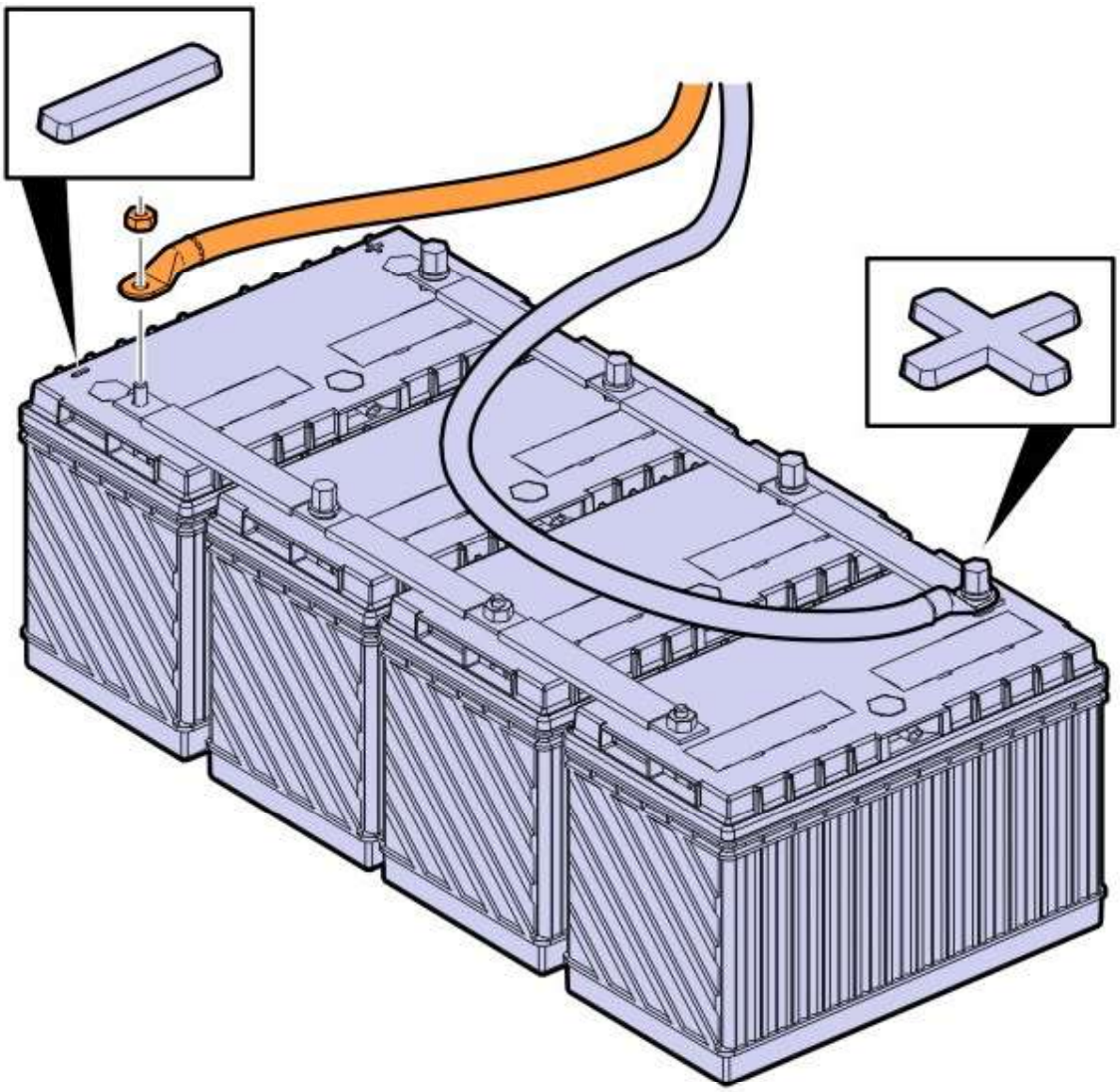
i	All threaded fasteners that do not have a tightening torque specification in the information are tightened to a standard torque. Standard torques are available in the following specification. ➠ Standard Tightening Torques

CAUTION
Service Information Advisory. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.
▸ You must read and understand the precautions and guidelines in Service Information, Function Group 2, "General Safety Practices, Engine" before performing this procedure.

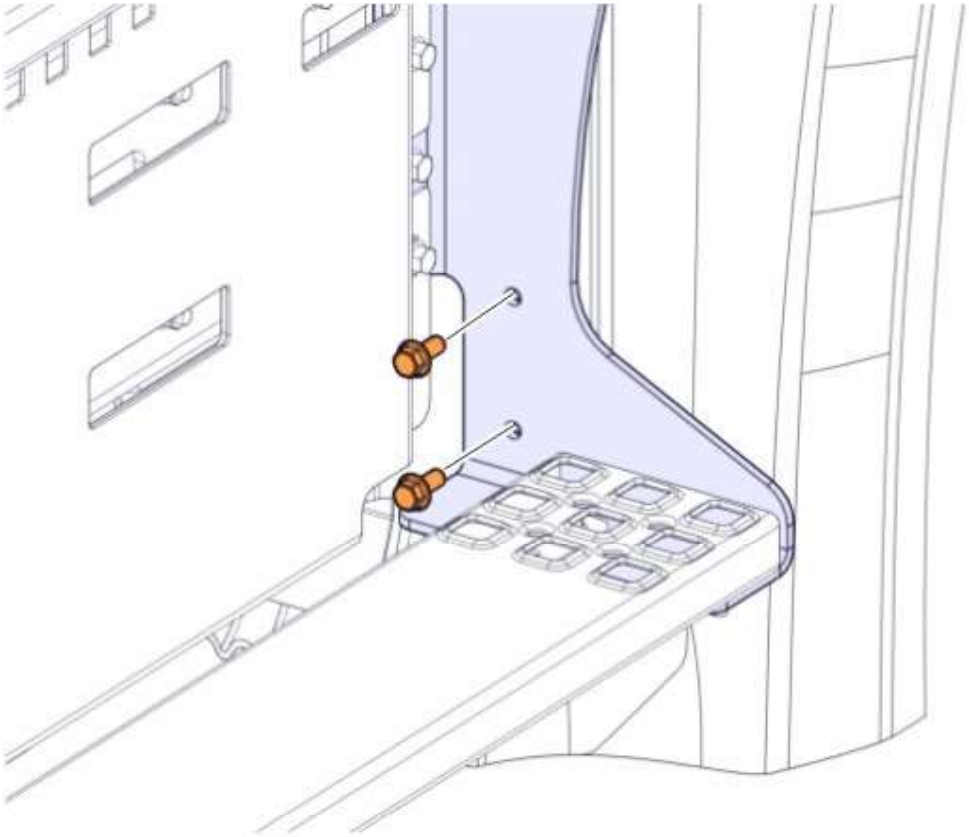
1	Park the vehicle on a level surface and turn the front wheels to the left.
2	Apply the parking brake.
3	Place the gear lever in neutral.
4	Install the wheel chocks.



5	Disconnect the cable from the negative terminal.

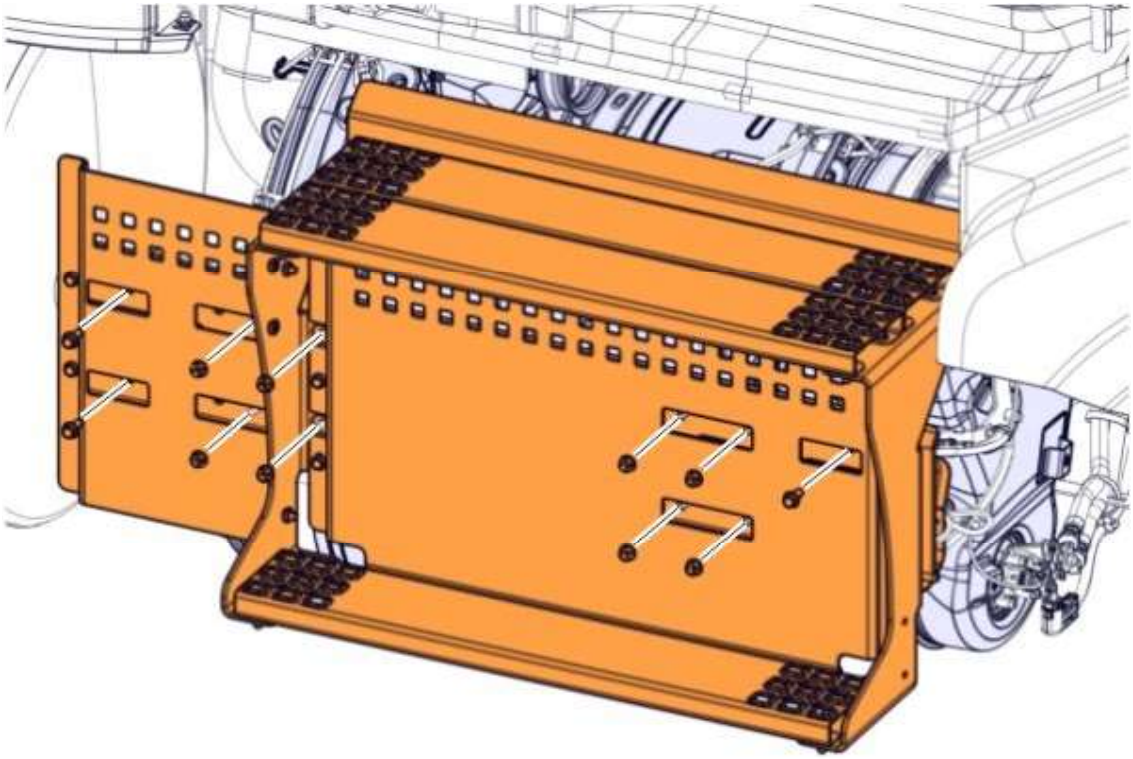


6	Remove the screws.



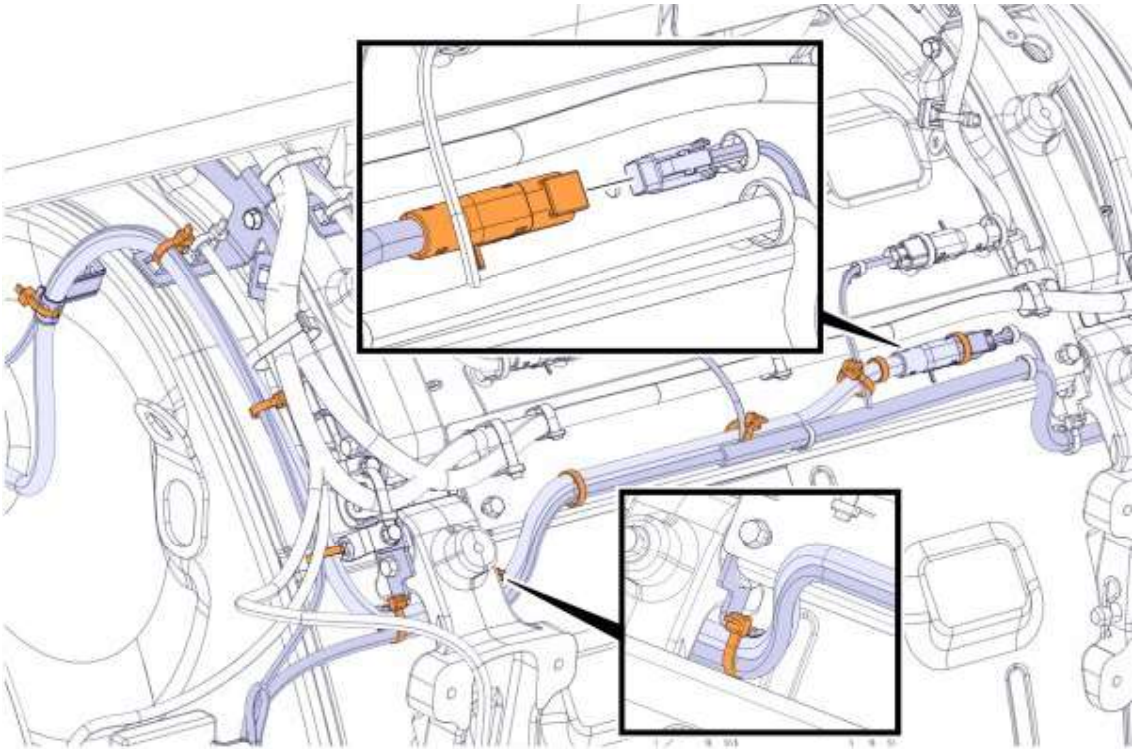
7	Remove the screws and nuts.

8	Remove the foot step.

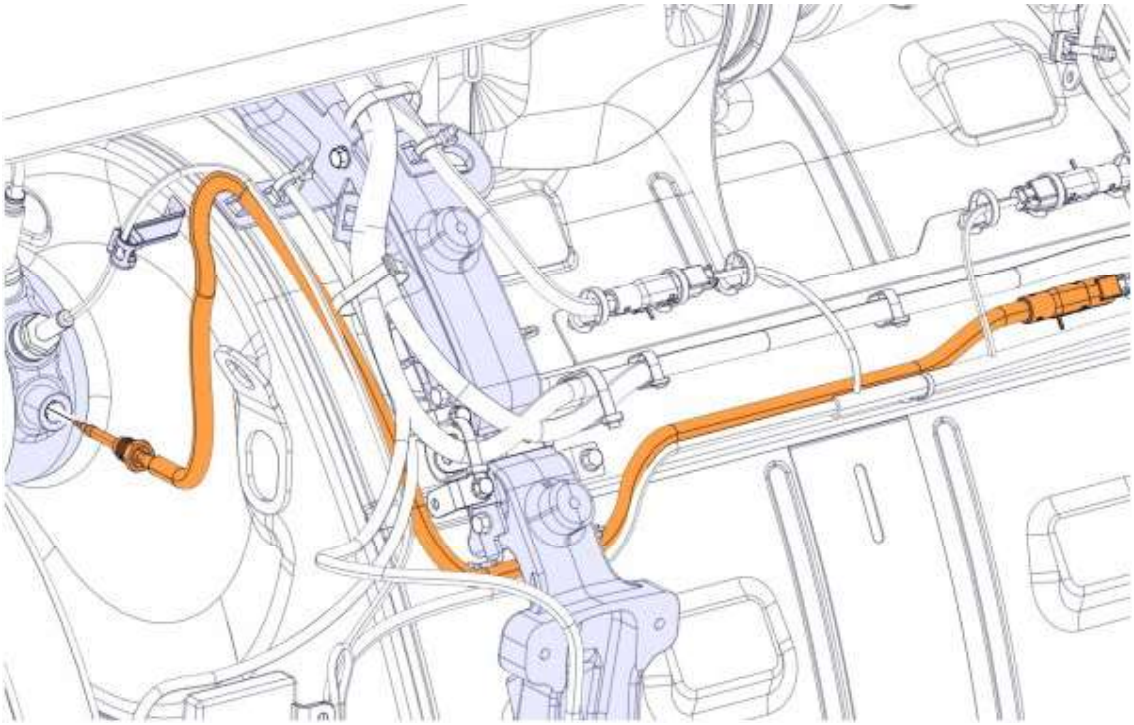


9	Remove the cable ties.

10	Disconnect the connector.



11	Remove the sensor.

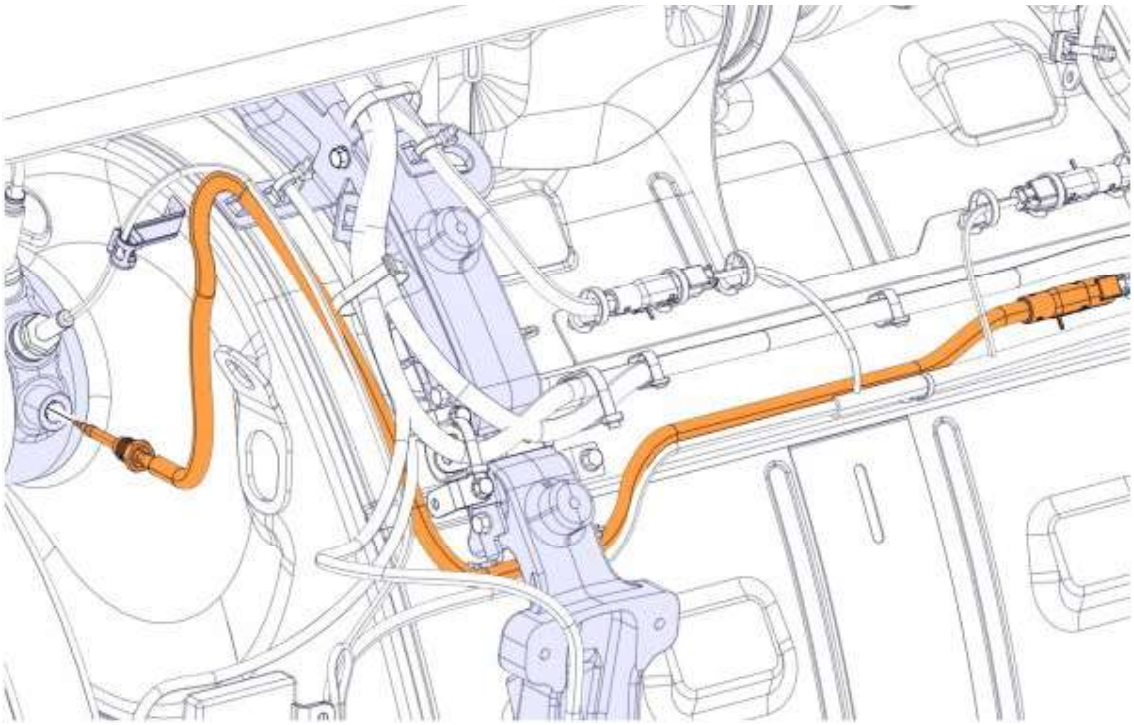


12	Install the sensor.
	Required material
	Grease

13	Torque tighten the sensor.

Tightening torque	
Sensor, screw	45 ±5 Nm (33 ±4 lb_f·ft)

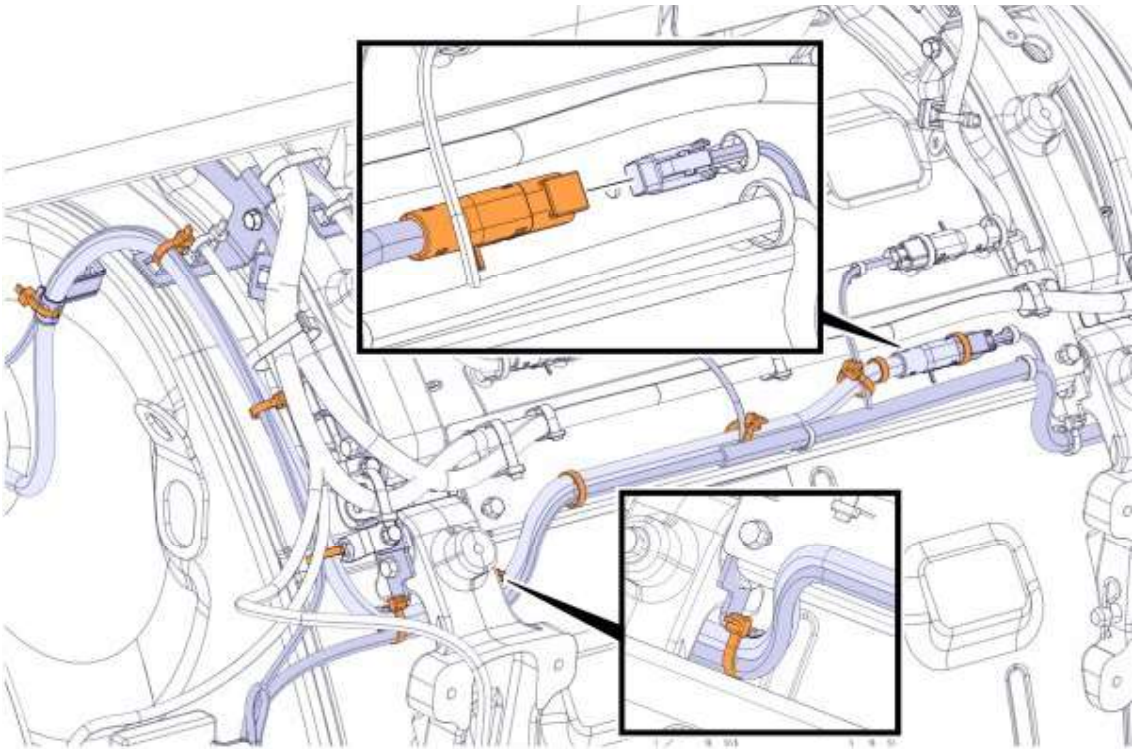
14	Route the cable.



15	Connect the connector.

16	Install the cable ties.

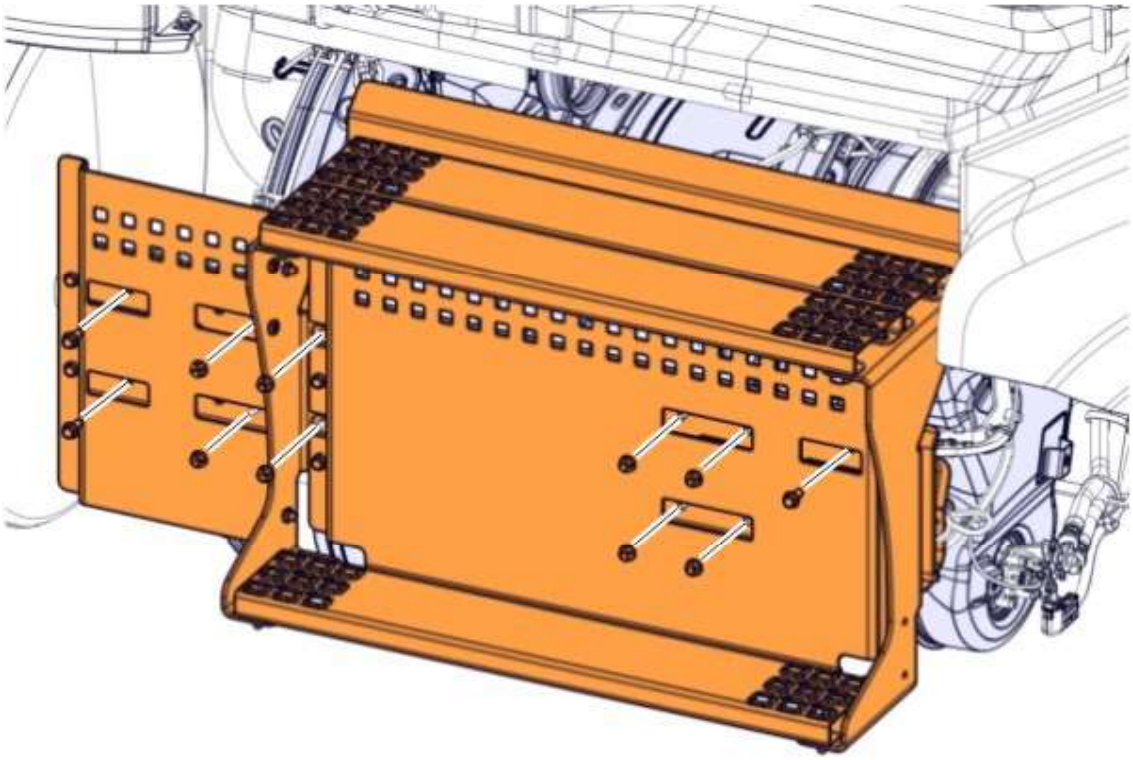
i	**Note** Use new parts.



17	Install the foot step.

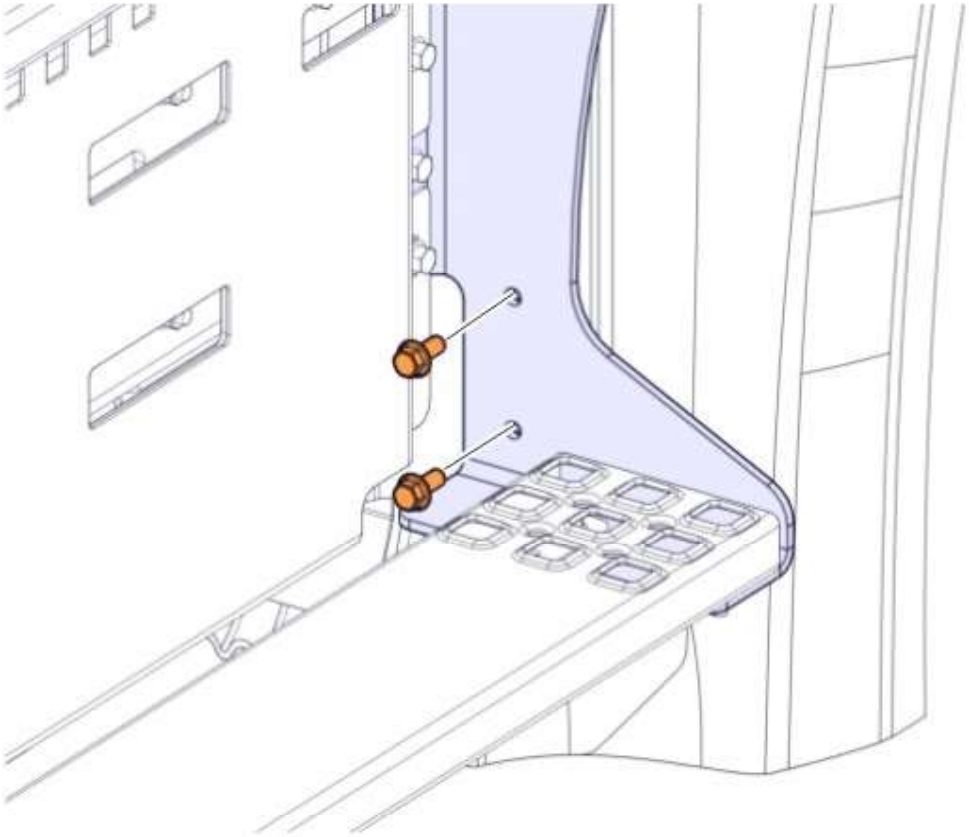
18	Install the screws and nuts.

19	Torque-tighten the screws and nuts.	
	Tightening torque	
	Screw	M8
		24 ±4 Nm (18 ±3 lb_f·ft)

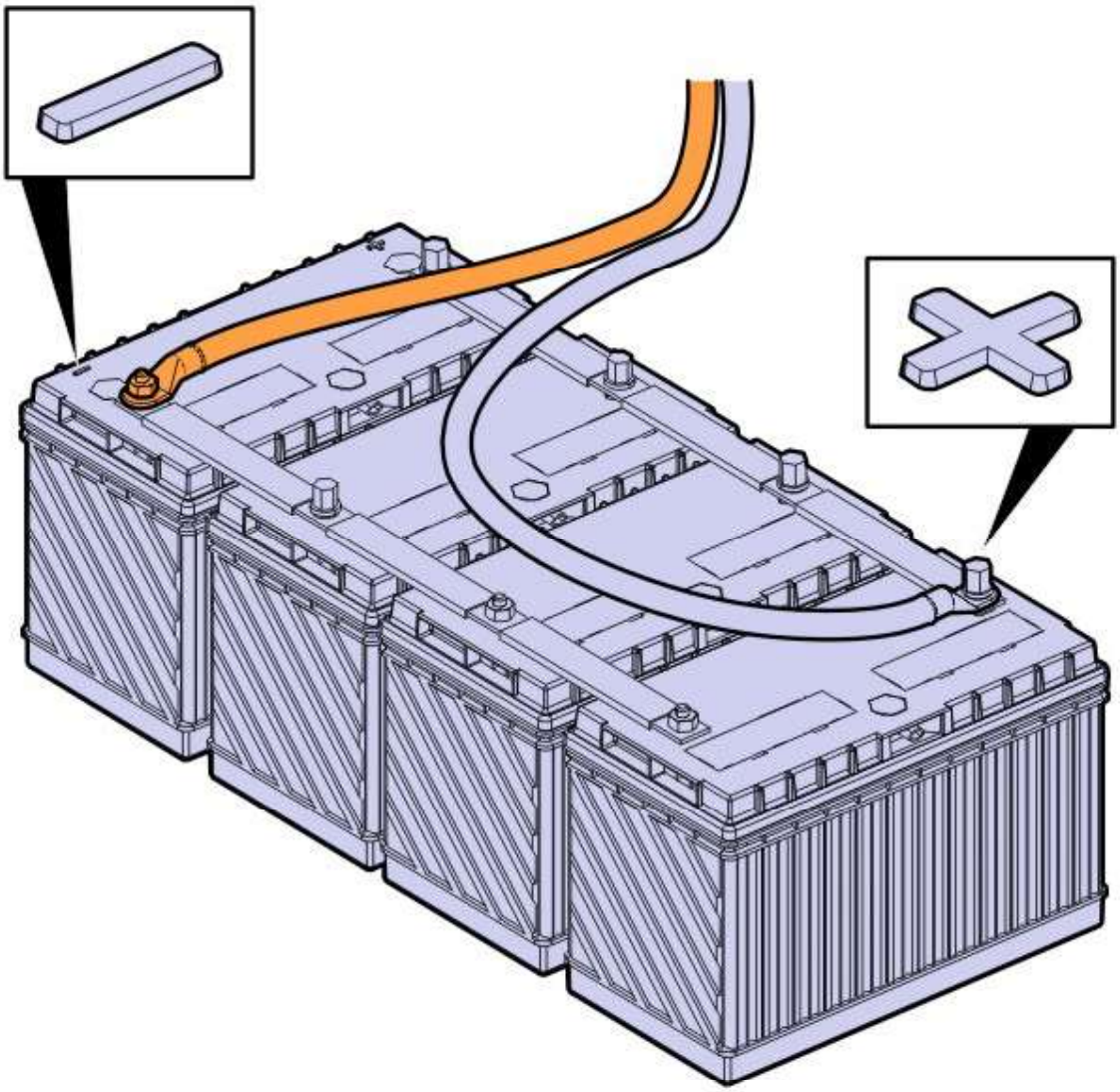


20	Install the screws.

21	Tighten the screws to torque.	
	Tightening torque	
	Screw	M8
		24 ±4 Nm (18 ±3 lb_f·ft)



22	Connect the cable to the negative terminal.



23	Delete the DTC (Diagnostic Trouble Code) according to the diagnostic tool (Mack Tech Tool) instructions.

24	Remove the wheel chocks.