12 51 235 Remove and install / replace Module 1, sensor system engine wiring

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Damage to battery terminal, the safety battery terminal or the intelligent battery sensor (IBS).

Damaged battery terminals can lead to malfunctions or vehicle electrical system faults.

- Pull off battery terminal from battery pole by carefully moving to and fro. Do not pry off using a tool.

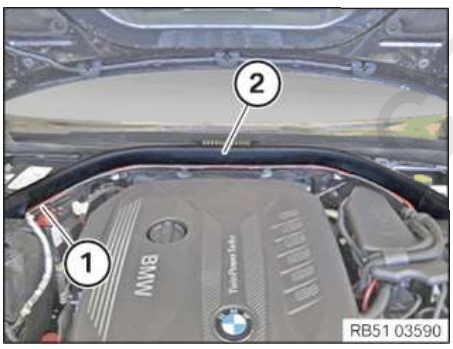
PRELIMINARY WORK

1 – Disconnecting all battery earth leads



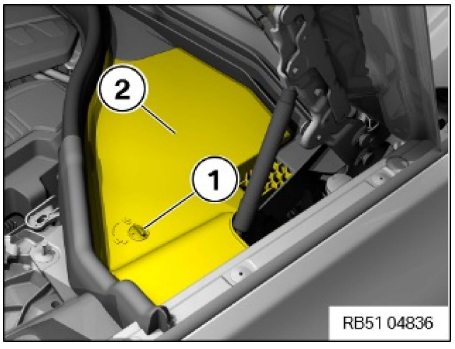
- See additional information.

2 – Remove the seal for the rear bonnet



- Feed the cable (1) out of the brackets toward the front.
- Remove the rear bonnet seal (2) from the guide toward the inside.

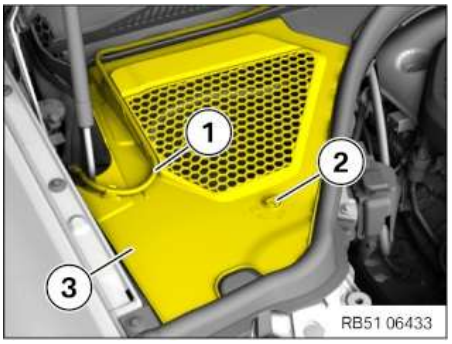
3 – Remove the cover of the engine compartment at the rear left



- Loosen the lock (1).
- Remove rear left cover of engine compartment (2).

4 – Remove the cover of the rear right engine compartment

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- Release washer fluid hose (1) from the guides.
- Loosen the lock (2).
- Remove the cover of rear right engine compartment (3).

5 – Removing both wiper arms

NOTICE

Description is for left component only. Procedure on the right side is identical.

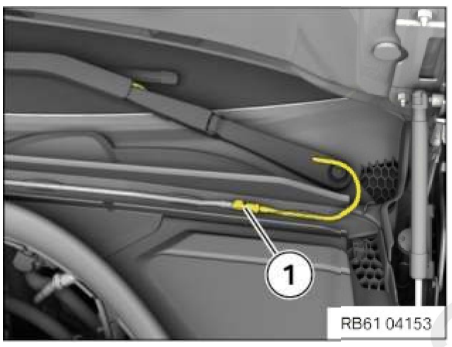
▶ **Remove the wiper arm**

RISK OF DAMAGE

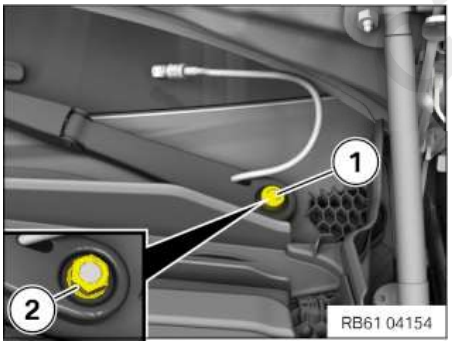
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

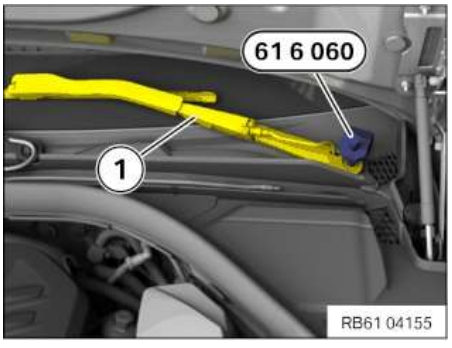
- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Disconnect the windscreen wash hose(1) at the separation point and remove from the cowl guide.



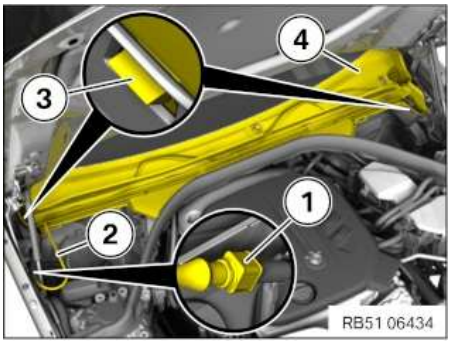
- Remove the protective cap (1).
- Loosen nut (2).



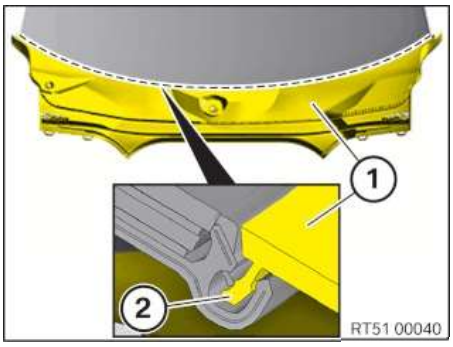
- Pull off the wiper arm (1) using special tool .

6 – Remove cowl panel cover

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- Release snap fastener of the washer fluid hose (1) and put the washer fluid hose(2) to one side.
- Unclip clips (3) on the cowl panel cover (4).

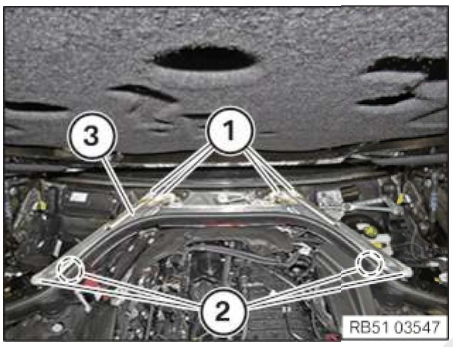


- Pull the cowl panel cover (1) upward out of the latch mechanism (2) beginning on the side.

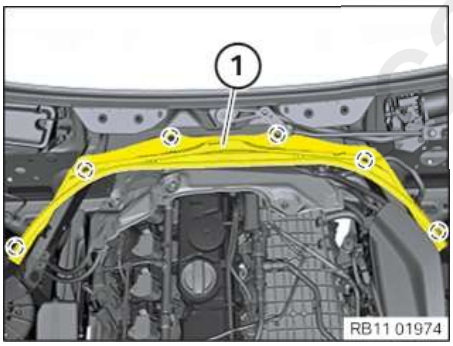
7 – Removing the centre bulkhead upper part

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.



- **If installed:** Remove tension strut on spring strut dome.
- Loosen screws (1) and (2).
- Remove tension strut (3) in the spring strut dome upwards.



- Unscrew the bolts in the marked areas.
- Remove the centre bulkhead upper part (1).

8 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Damage to the acoustic cover.

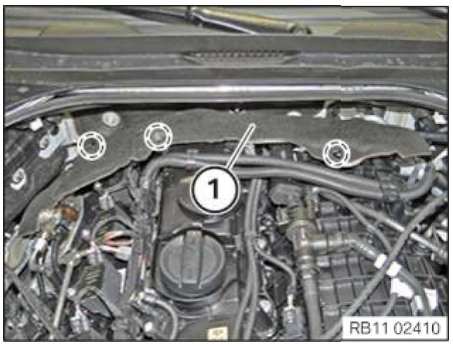
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Unclip the acoustic cover (1) from the holders in the **marked** areas towards the top.

9 – Removing acoustic cover at rear



- Unclip the acoustic cover (1) in the marked areas and remove it to the top.

10 – Removing the DME control unit

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

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TECHNICAL INFORMATION

In a warranty case, you must always provide a fault memory printout with the defective part, even if the fault memory does not contain an entry.

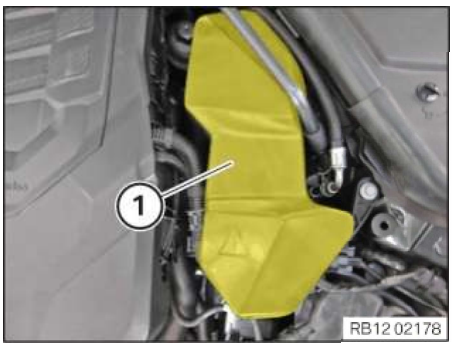
TECHNICAL INFORMATION

Control unit must be programmed after it is replaced.

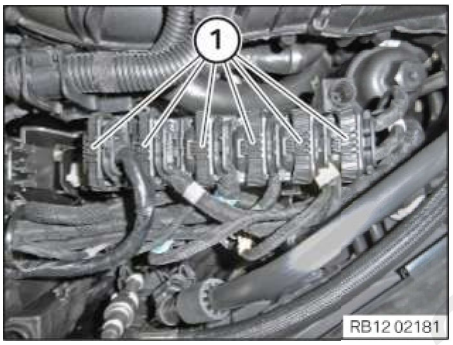
For additional information see: 61 00 ... Programming/encoding control unit(s)

TECHNICAL INFORMATION

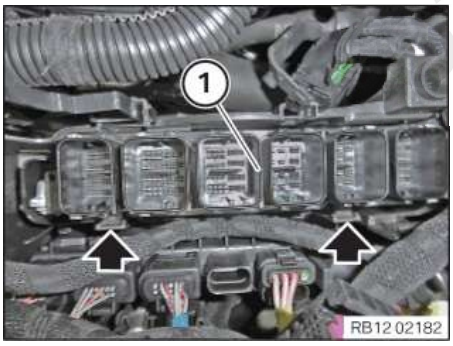
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Pull the cover (1) towards the top and feed out.



- Unlock and disconnect the plug connection (1).



- Unlock the locks (arrows).
- Guide out and remove DME control unit (1).

11 – Removing integrated supply module (PDM)

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

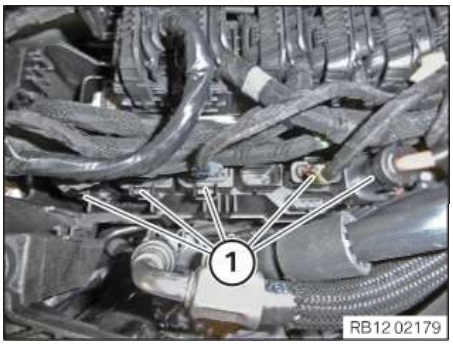
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RISK OF DAMAGE

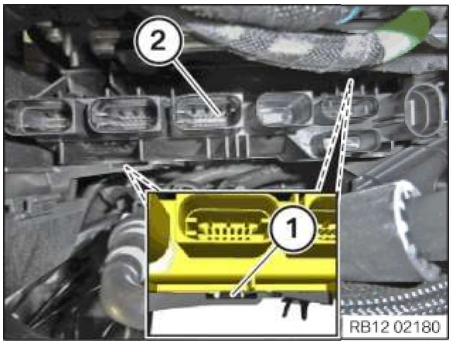
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

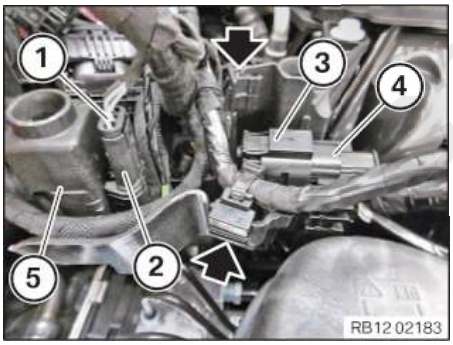


- Unlock and disconnect plug connections (1).

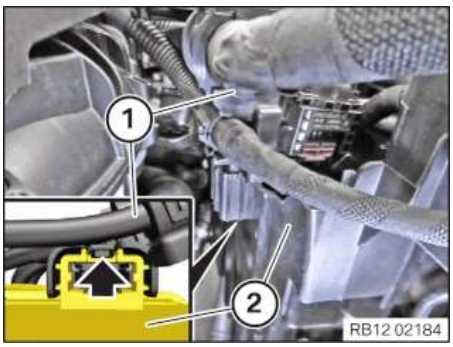


- Unlock the latch mechanisms (1).
- Guide out and remove integrated supply module (PDM) (2) upwards.

12 – Removing the control unit holder

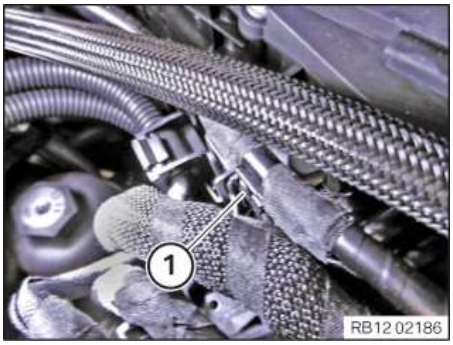


- Unlock plug connection (1) and disconnect.
- Unlock the connector (2) and disconnect from the starter (5).
- Unlock plug connection (3) and disconnect.
- Unlock the connector (4) and disconnect from the starter (5).
- Release the clamps (arrows).

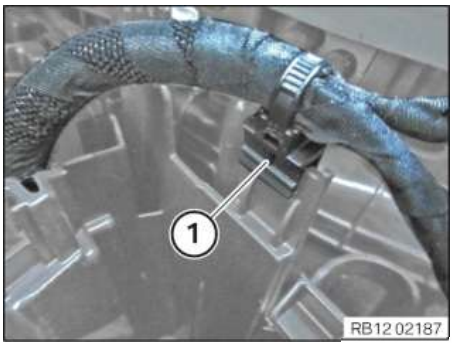


- Unlock the lock (arrow).
- Disconnect the cable plug (1) upwards from the control unit holder (2).

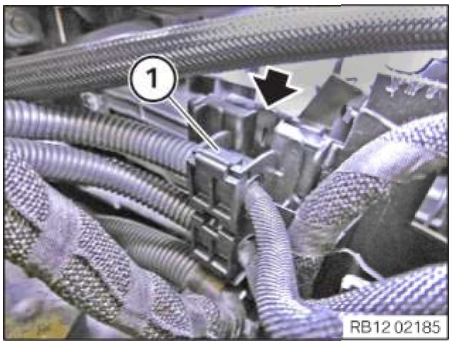
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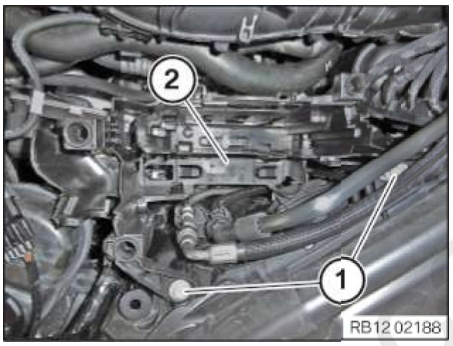
- Loosen clamp (1).



- Loosen clamp (1).



- Unlock the lock (arrow).
- Feed out the cable clip (1) upwards and set it aside.



- Loosen screws (1).
- Guide out and remove the control unit holder (2).

13 – Remove tank vent valve

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

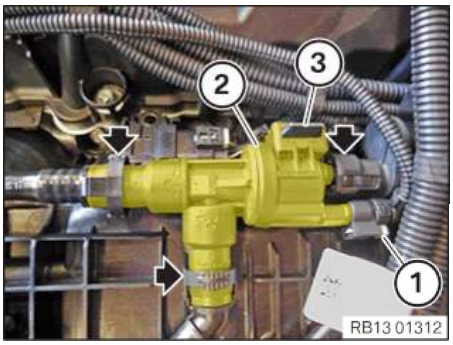
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RISK OF DAMAGE

Electrostatic discharge.

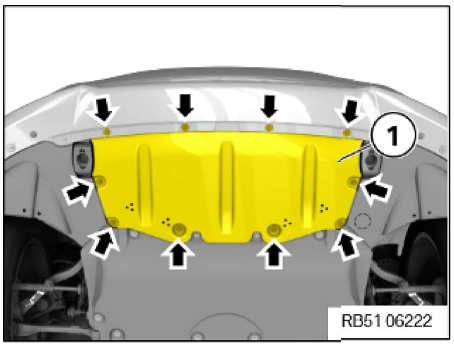
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the tank ventilation lines (arrows).
- Unlock and loosen connector (1).
- Remove the tank vent valve (2) from the holder (3).

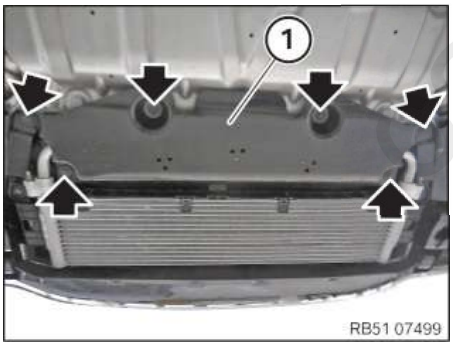
14 – Removing the front underbody protection



- **Version 1:**

  Remove screws (arrows).

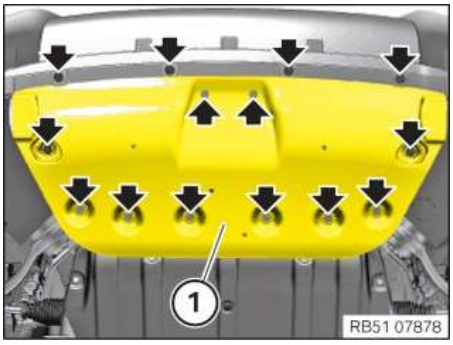
  Feed front underbody protection (1) backwards out of the bumper panel.



- **Version 2:**

  Remove screws (arrows).

  Guide out front underbody protection (1) and remove it.



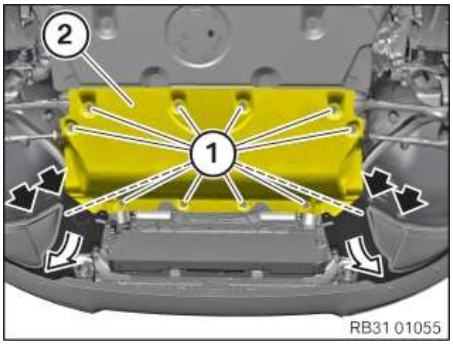
- **Version 3:**

  Remove screws (arrows).

  Guide out front underbody protection (1) and remove it.

15 – Remove the underbody protection of the steering gear

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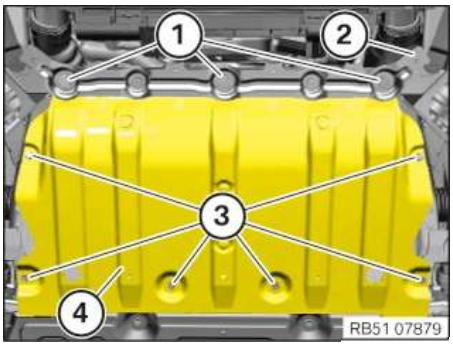
- **Version 1:**

  Unscrew the screws (arrows) of the wheel arch cover on wheel arch cover.

  Fold the bottom wheel arch cover to the side.

  Loosen screws (1).

  Remove underbody protection of the steering gear (2).



- **Version 2:**

  Loosen screws (1).

  Remove the holder of the underride protection (2).

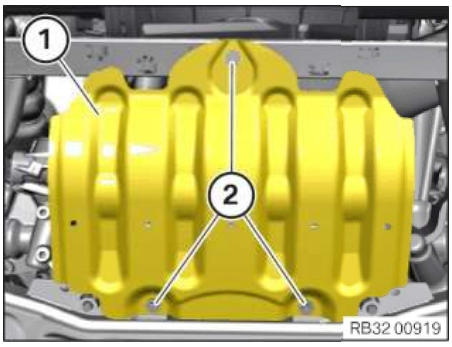
  Loosen screws (3).

  Slide the steering gear underbody protection (4) out and remove.

16 – If installed: Removing the steering start protection

Prerequisite

The front underbody protection is removed.



- Loosen screws (2).
- Remove guard (1).

17 – Draining the coolant from the low-temperature cooling system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

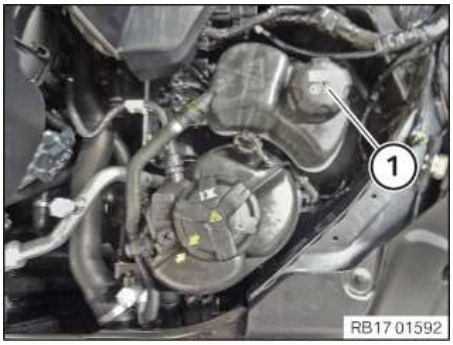
When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

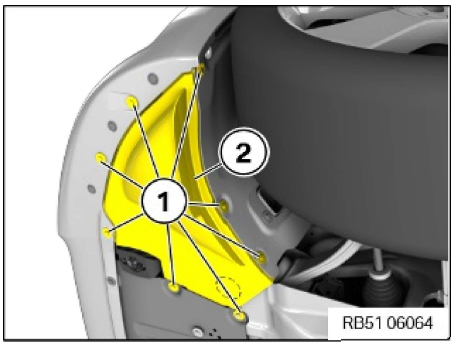
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

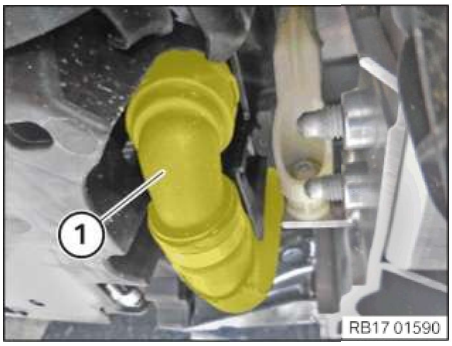
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- Loosen sealing cap (1).



- Loosen screws (1).
- Guide out and remove bottom left cover (2) to the front.

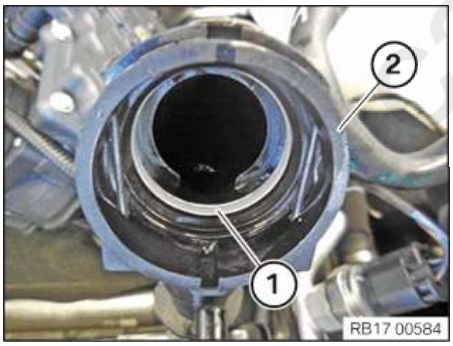


- Unlock and disconnect the coolant line (1).
- Catch and dispose of escaping coolant.

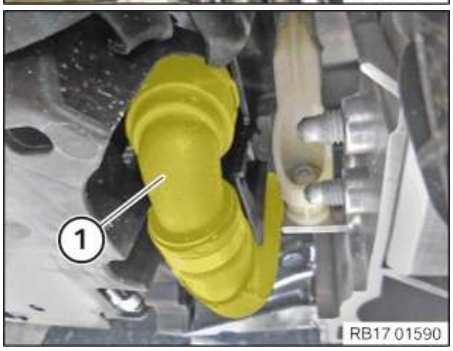
18 – Connecting the coolant lines for the low-temperature coolant circuit

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



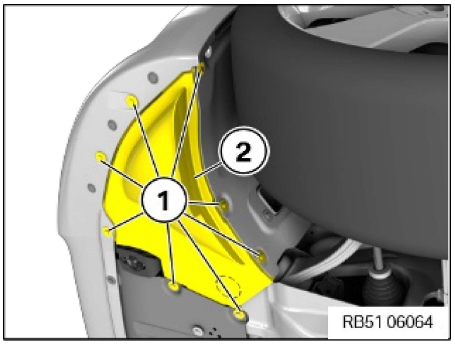
- Check the sealing rings (1) of the coolant lines (2) for damage and renew if necessary.



- Connect and lock the coolant line (1).

  The coolant line (1) must audibly engage.

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- Feed in and install cover (2) at the bottom front left.
- Tighten the screws (1).

Cover, front bottom on side

Hexagon screw for thermoplastic		Tightening torque	3 Nm

19 – Removing the intake plenum

RISK OF DAMAGE

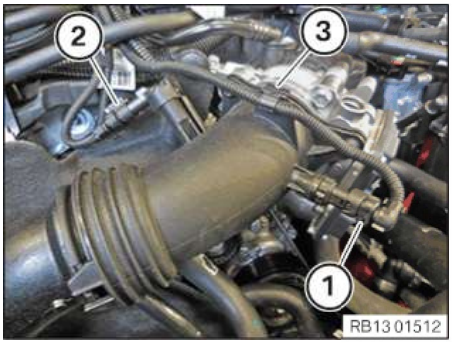
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

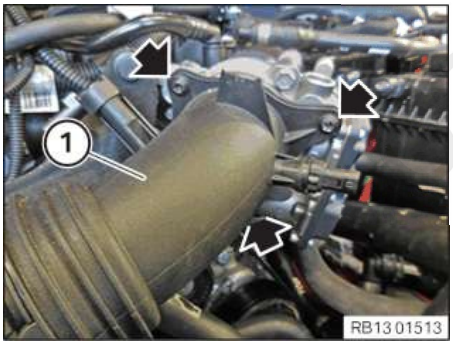
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

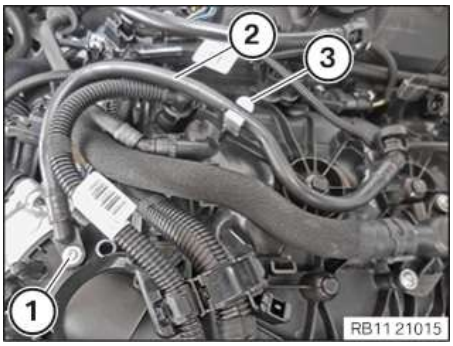
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock plug connection (1) and disconnect.
- Unlock plug connection (2) and disconnect.
- Unlock and loosen clamp (3).

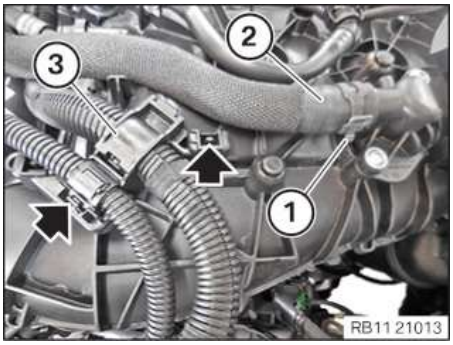


- Remove screws (arrows).
- Feed out charge air line (1) and place to one side.

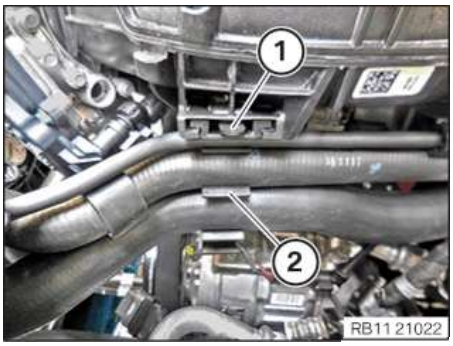


- Loosen screw (1).
- Guide tank ventilation line (2) out of clamp (3) and remove it.

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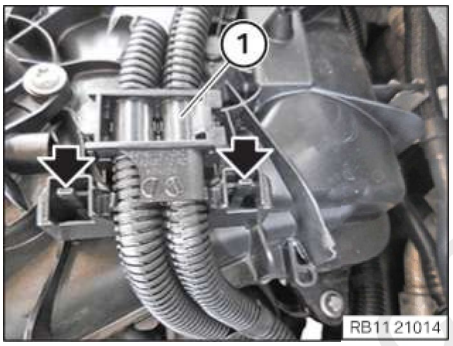
- Release the clamping collar (1) with the special tool 0 495 794 (17 2 050).
- Guide the coolant hose (2) out and remove.
- Catch and dispose of escaping coolant.
- Unlock the locks (arrows).
- Guide out the wiring harness section (3) for sensor system 2 and place to one side.



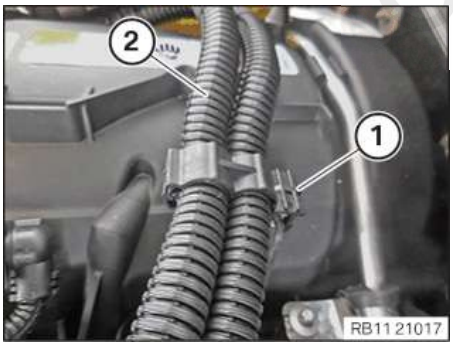
- Unlock the lock (1).
- Thread out holder (2) and set aside.



- Unlock plug connection (1) and disconnect.
- Loosen screw (2).



- Unlock the locks (arrows).
- Thread out the wiring harness section (1) for the injectors and ignition coils and set it aside.

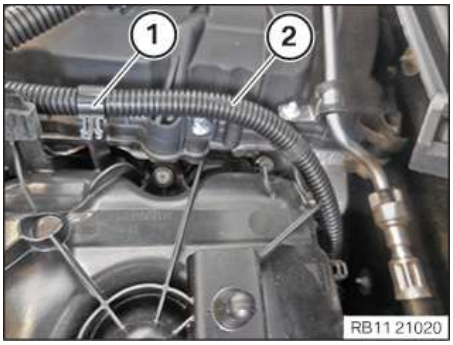


- Loosen clamp (1).
- Thread out the wiring harness section (2) for the injectors and ignition coils and set it aside.



- Guide tank ventilation line (1) out of clamp (2) and place it aside.

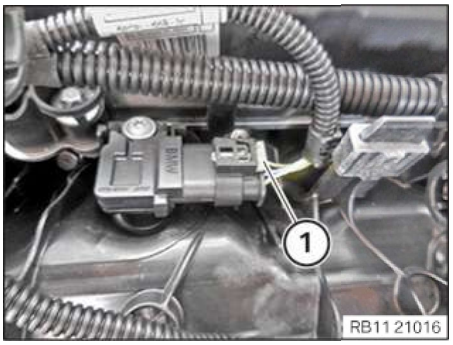
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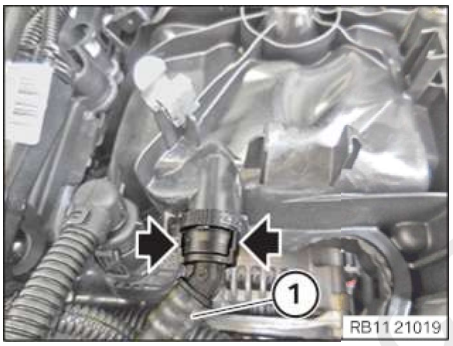
- Loosen clamp (1).
- Guide out the wiring harness section (2) for the sensor system 1 and place to one side.



- Loosen screw (1).



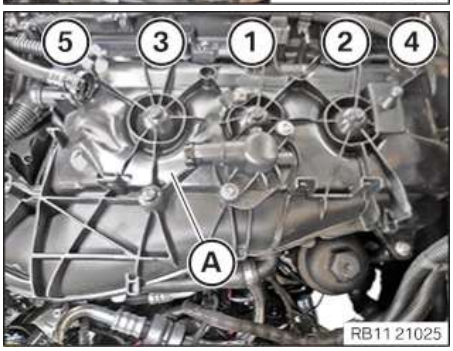
- Unlock plug connection (1) and disconnect.



- Unlock the locks (arrows).
- Feed the tank ventilation line (1) out and set it aside.



- Unlock and release coolant feed line (1).
- Catch and dispose of escaping coolant.



TECHNICAL INFORMATION

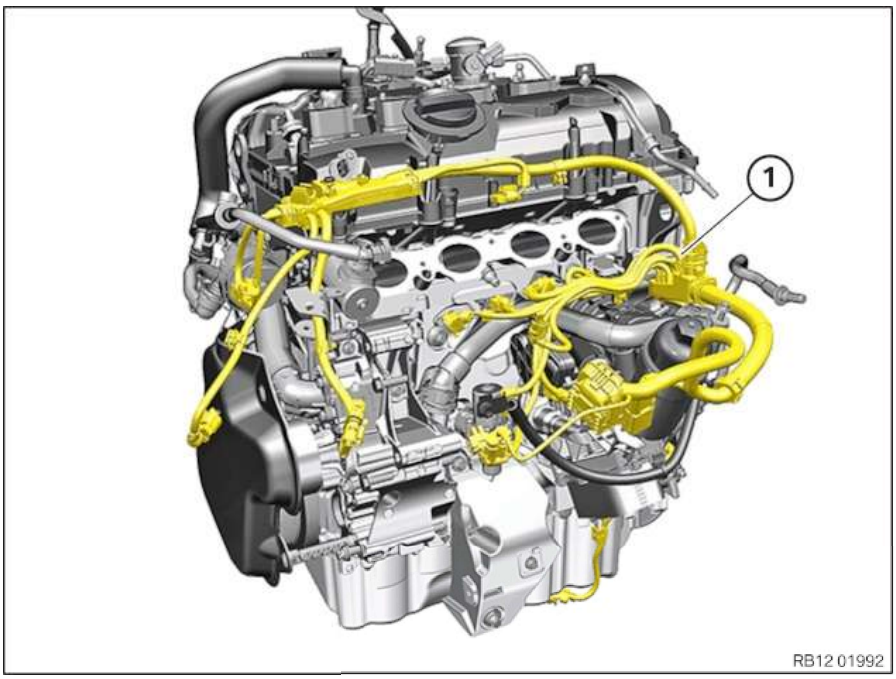
Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

- Loosen screws in the order (5) to (1).
- Thread out intake plenum (A) and remove.

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20 – Remove the engine wiring harness for sensor system 1

Engine wiring harness for sensor system 1



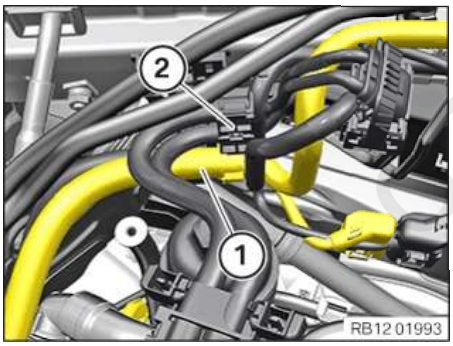
1 Engine wiring harness for sensor system 1

RISK OF DAMAGE

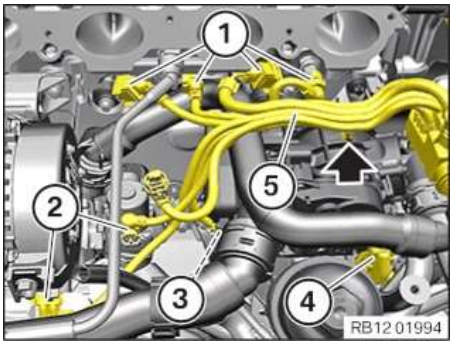
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

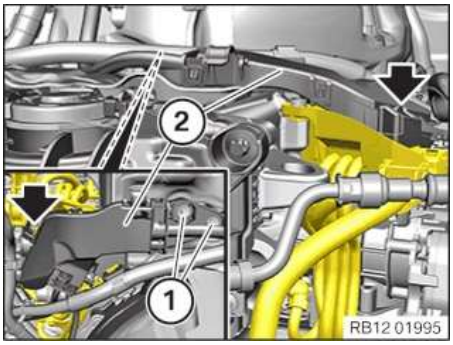
- Do not pull on the wires when disconnecting connectors and plug connections.



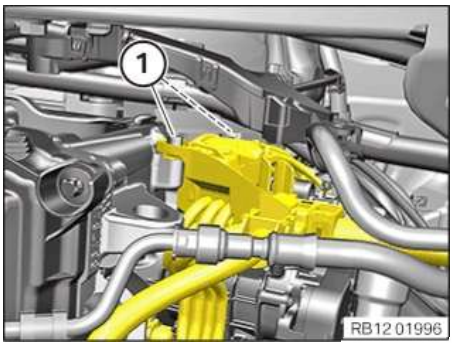
- Guide out the wiring harness section (1) for the sensor system 1 from the holder (2) and place to one side.



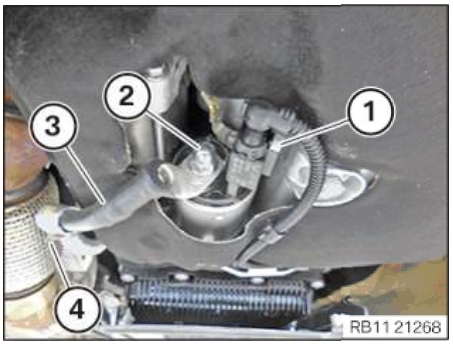
- Unlock and disconnect plug connections (1).
- Unlock and disconnect plug connections (2).
- Unlock plug connection (3) and disconnect.
- Unlock plug connection (4) and disconnect.
- Loosen the clamp (arrow).
- Guide out the wiring harness section (5) for sensor system 1 and place to one side.



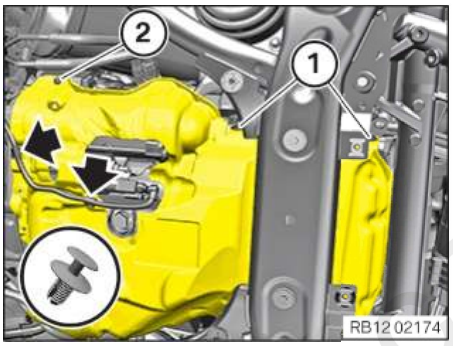
- Loosen screws (1).
- Unlock the lock (arrow).
- Feed out the wiring harness section (2) and put to one side.



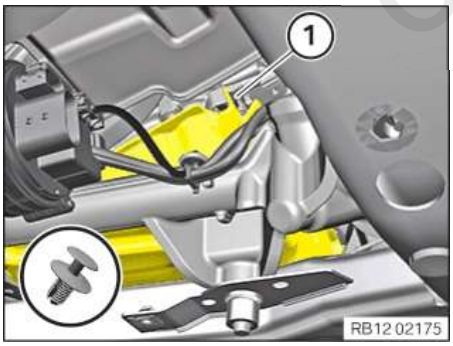
- Loosen screws (1).



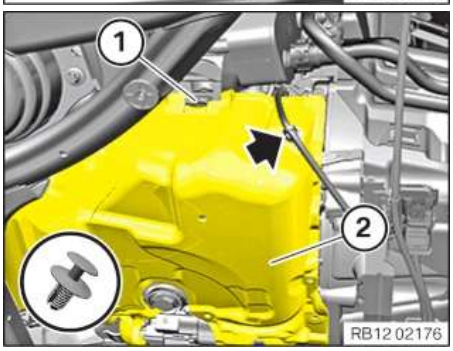
- Unlock plug connection (1) and disconnect.
- Loosen nut (2).
- Guide the positive battery cable (3) out of the clamp (4) and lay to one side.



- Loosen the expanding rivet (1).
- Undo fir tree clip (2).
- Release the clamps (arrows).

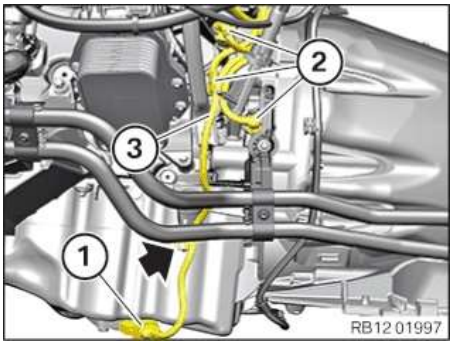


- Loosen expanding rivet (1).
- Lower the acoustic cover of the oil sump.

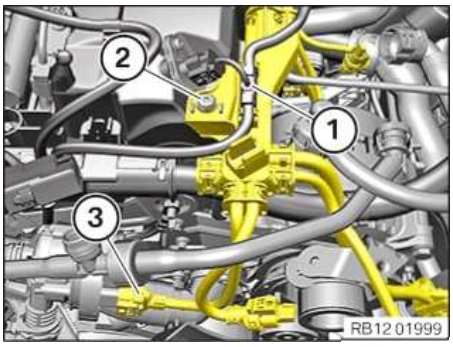


- Loosen expanding rivet (1).
- Loosen the clamp (arrow).
- Lower acoustic cover (2).

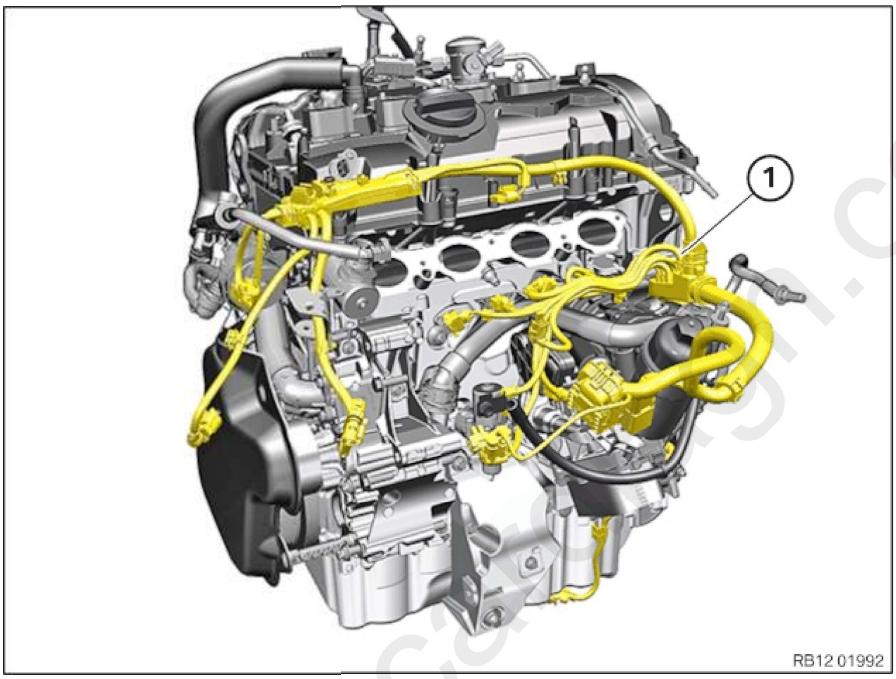
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- Unlock plug connection (1) and disconnect.
- Unlock and disconnect plug connections (2).
- Release the wiring harness section (3) for sensor system 1 from the clamp (arrow) and place to one side.



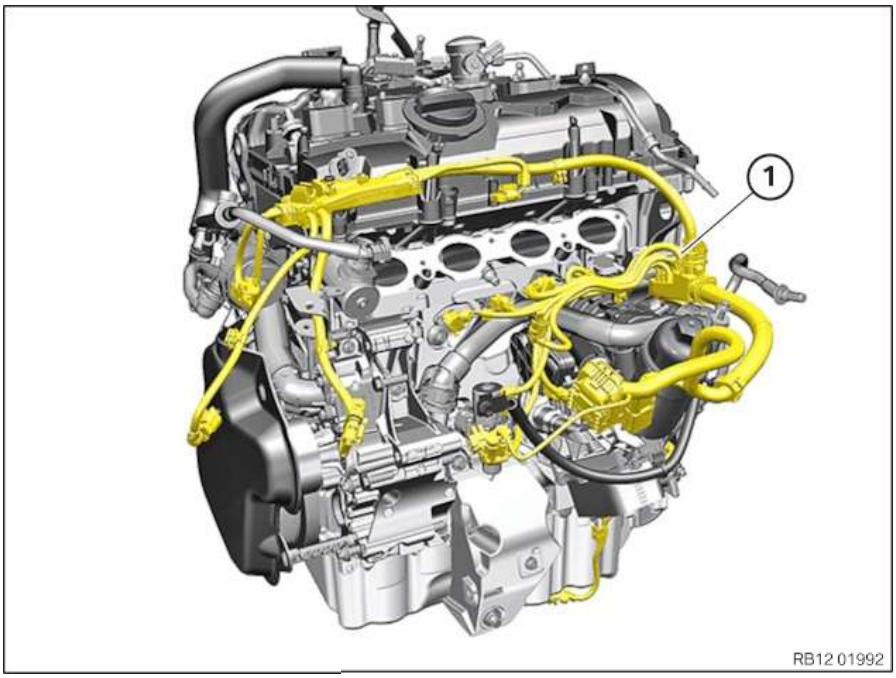
- Remove the wiring harness section (1) and put to one side.
- Loosen screw (2).
- Unlock plug connection (3) and disconnect.



- Feed out the wiring harness section (1) for sensor system 1 and remove.

21 – Install the engine wiring harness for sensor system 1

Engine wiring harness for sensor system 1



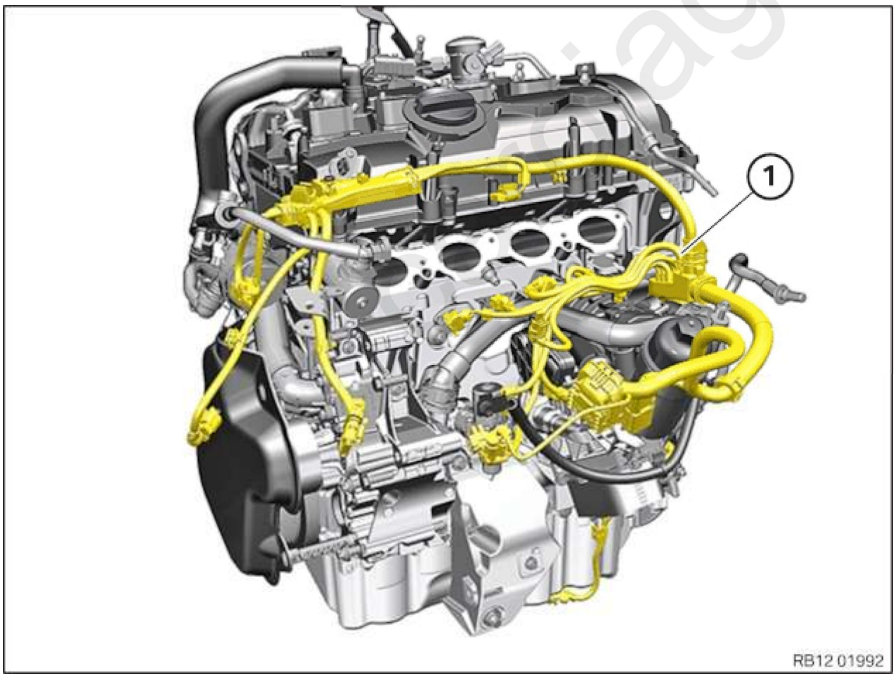
1 Engine wiring harness for sensor system 1

RISK OF DAMAGE

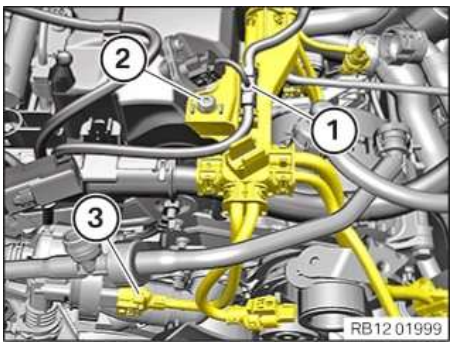
Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.



- Guide in and install wiring harness section (1) for sensor system 1.



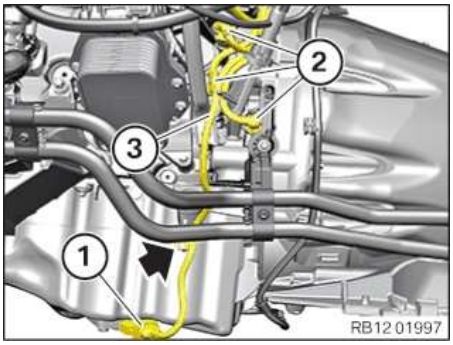
- Connect connectors (3) and lock.

  The connector (3) must engage audibly.
- Tighten down screw (2).

Wiring harness section of engine to cylinder head cover

M6		Tightening torque	8 Nm

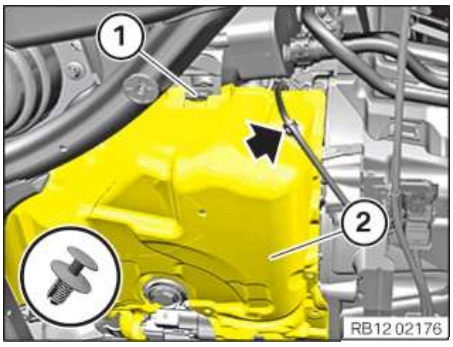
- Guide in and secure wiring harness section (1).



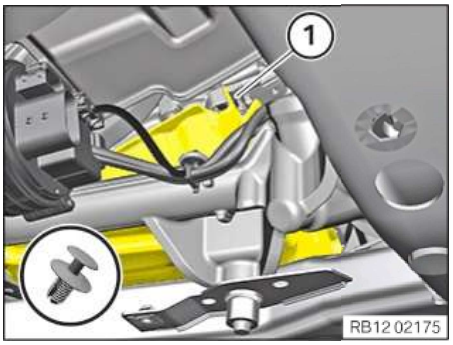
- Guide in and install wiring harness section (3) for sensor system 1.
- Connect connectors (2) and lock.

  The connectors (2) must engage audibly.
- Secure clamp (arrow).
- Connect connectors (1) and lock.

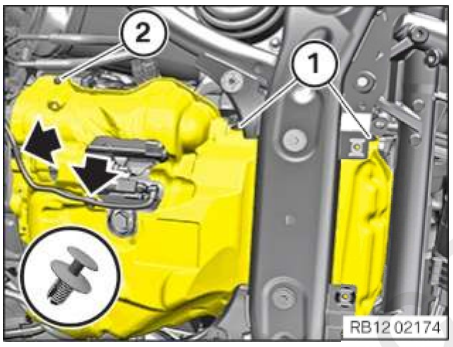
  The connector (1) must engage audibly.



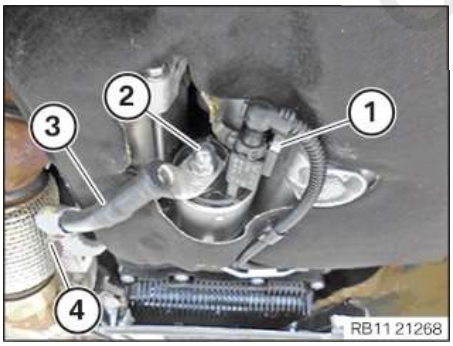
- Position the acoustic cover (2).
- Fasten expanding rivet (1).
- Secure clamp (arrow).



- Fasten expanding rivet (1).

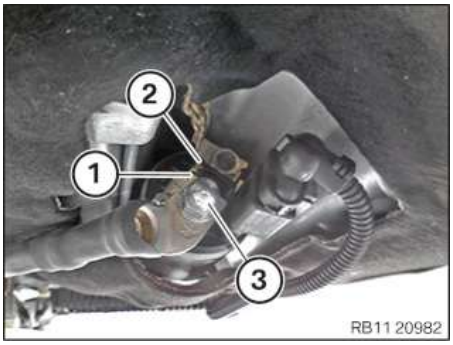


- Secure fir tree clip (2).
- Secure expanding rivet (1).
- Secure the clamps (arrows).



- Connect connectors (1) and lock.
- Make sure the connector (1) engages audibly.
- Insert and install the positive battery cable (3).
- Secure positive battery cable (3) at the clamp (4).
- Tighten the nut (2) hand-tight.

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CAUTION

Improper routing of the positive battery cable.

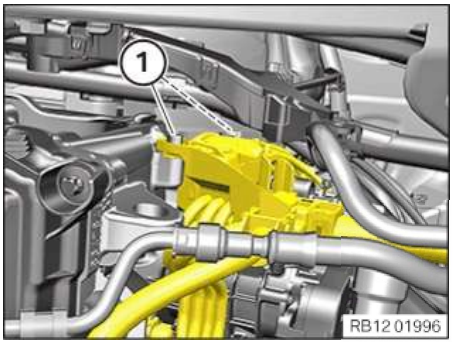
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Attach positive battery cable (1) **correctly** to anti-twist lock (2).
- Tighten nut (3).

Battery positive lead to starter

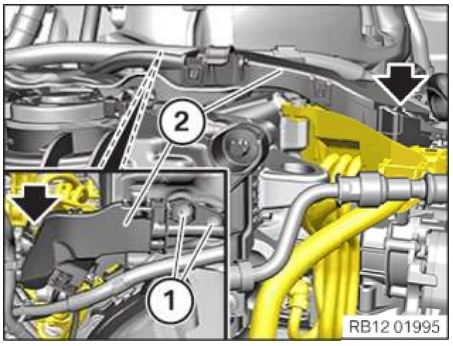
M8		Tightening torque	13,5 Nm



- Tighten the screws (1).

Cable routing to cylinder head, rear

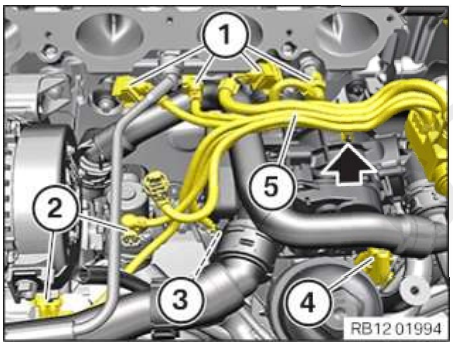
M6 x 20		Tightening torque	8 Nm



- Guide in the wiring harness section (2) and install.
- Ensure that the lock (arrow) engages correctly.
- Tighten the screws (1).

Cable routing to cylinder head, rear

M6 x 20		Tightening torque	8 Nm



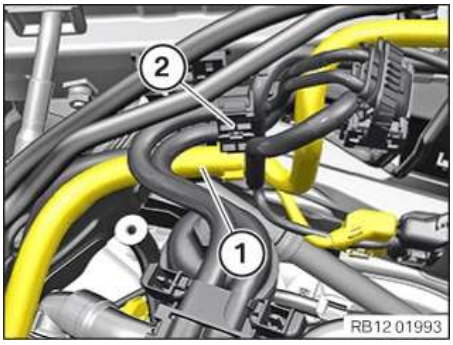
- Guide in and install wiring harness section (5) for sensor system 1.
- Secure clamp (arrow).
- Connect connectors (4) and lock.

  The connector (4) must engage audibly.
- Connect connectors (3) and lock.

  The connector (3) must engage audibly.
- Connect connectors (2) and lock.

  The connectors (2) must engage audibly.
- Connect connectors (1) and lock.

  The connectors (1) must engage audibly.



- Guide in and install wiring harness section (1) for sensor system 1 on the holder (2).

POSTPROCESSES

22 – Installing the intake plenum

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RISK OF DAMAGE

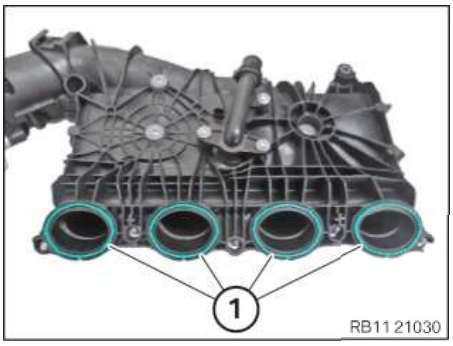
Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

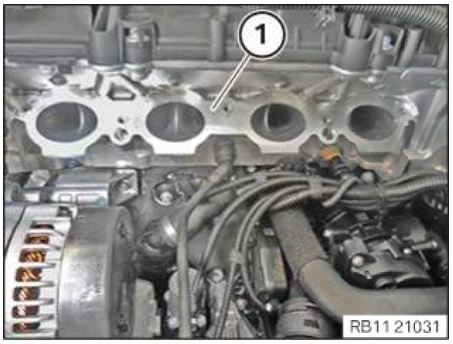
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

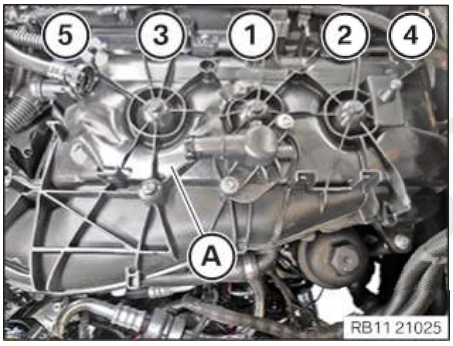


- Renew gaskets (1).

  Parts: Seals



- Clean contact surface (1).



TECHNICAL INFORMATION

Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

- Guide in and position intake plenum (A) on the cylinder head.
- Tighten screws in the order (1) to (5).

Note: Tighten the bolts in 360 degree steps.

Intake plenum to cylinder head

M6		Tightening torque	10 Nm



- Connect and lock coolant feed line (1).
- Make sure that coolant feed line (1) engages audibly.

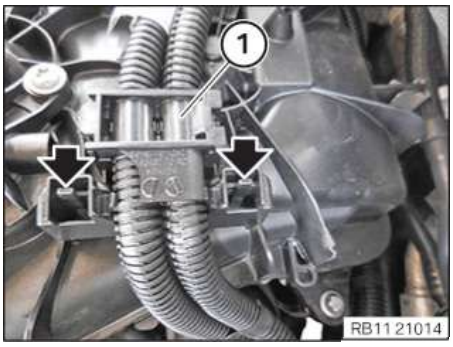
audiagn.com



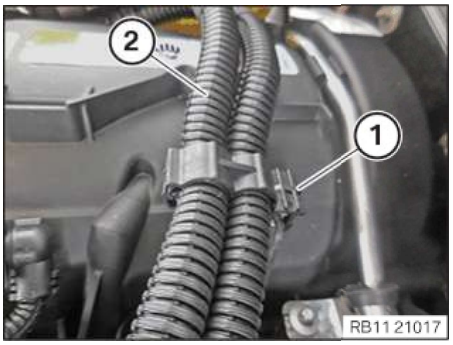
- Tighten down screw (1).

Intake plenum to support

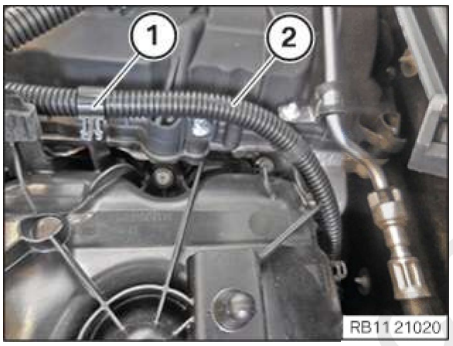
M6X25		Tightening torque	8 Nm



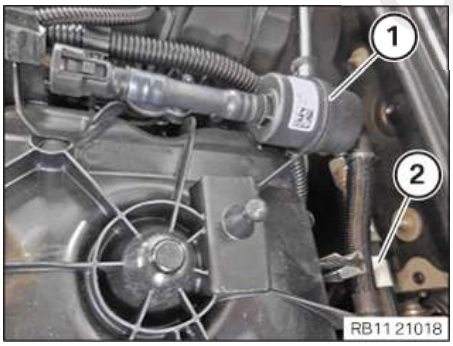
- Insert and install the wiring harness section (1) for the injectors and ignition coils.
  The locks (arrows) must engage audibly.



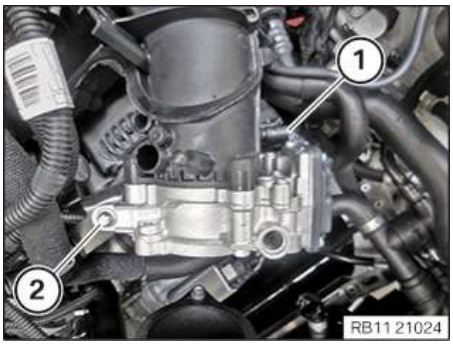
- Insert and install the wiring harness section (2) for the injectors and ignition coils.
- Secure clamps (1).



- Guide in and install wiring harness section (2) for sensor system 1.
- Secure clamps (1).



- Insert and install the tank ventilation line (1).
- Secure the tank ventilation line (1) to the clamp (2).

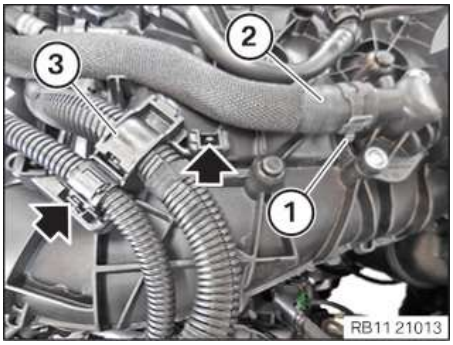


- Connect connectors (1) and lock.
- Make sure the connector (1) engages audibly.
- Tighten down screw (2).

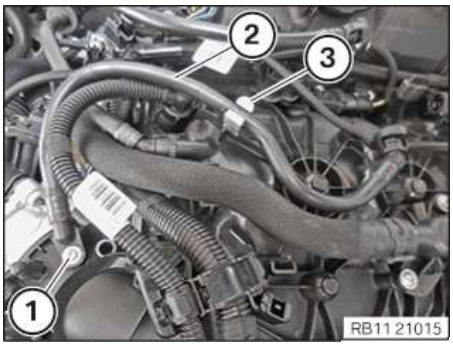
Throttle body to holder

M6X25		Tightening torque	8 Nm

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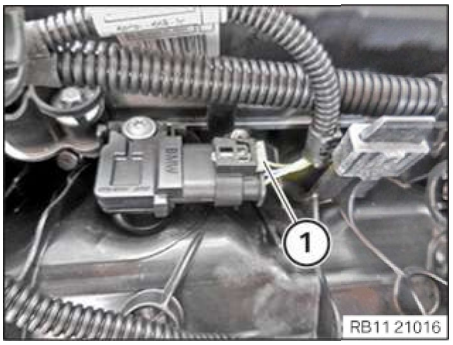
- Insert and install the coolant hose (2).
- Secure clamping collar (1) with the special tool 0 495 794 (17 2 050).
- Guide in and install wiring harness section (3) for sensor system 2.
- Make sure that you can hear the locks (arrows) engage.



- Insert and install the tank ventilation line (2).
- Secure the tank ventilation line (2) to the clamp (3).
- Tighten down screw (1).

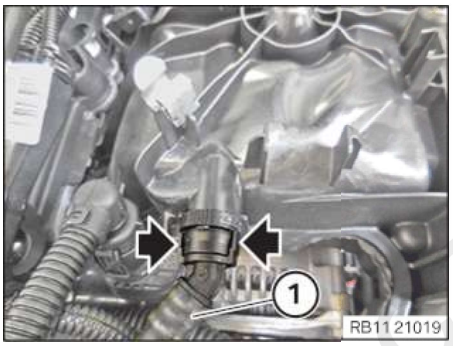
Tank ventilation line to intake plenum

Oval-head screw		Tightening torque	3 Nm



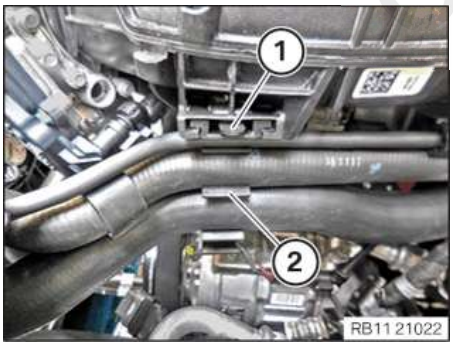
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

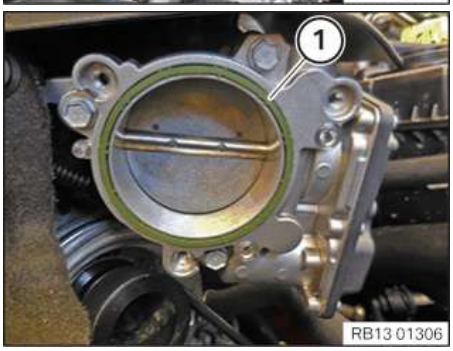


- Insert and install the tank ventilation line (1).

  The locks (arrows) must engage audibly.



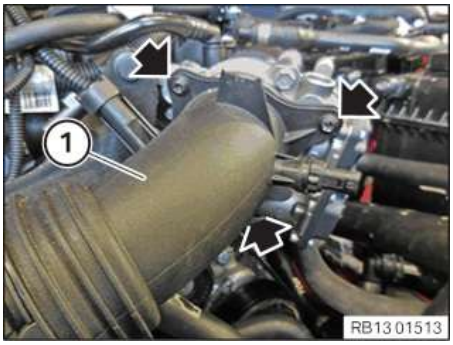
- Insert and install the holder (2).
- Ensure that the lock (1)engages audibly.



- Renew the gasket (1).

  Parts: Gasket

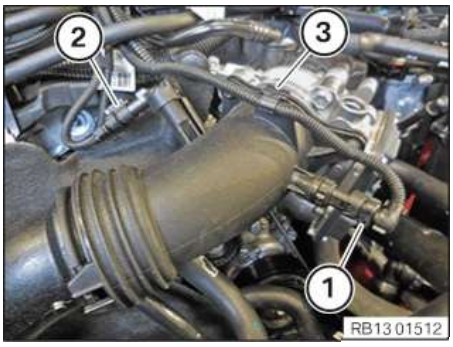
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- Insert and install charge air line (1).
- Tighten screws (arrows).

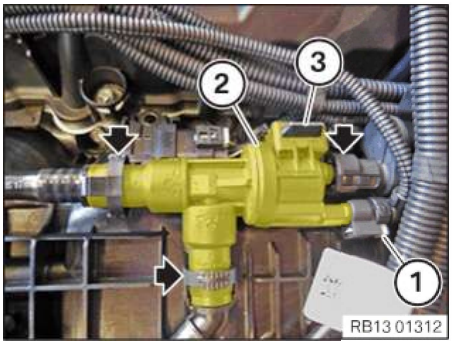
Charge air line to throttle body

M6		Tightening torque	8 Nm



- Connect connectors (1) and lock.
- Connect connectors (2) and lock.
- Make sure you can hear the connectors (1) and (2) engage.
- Secure clamps (3).

23 – Installing the tank vent valve

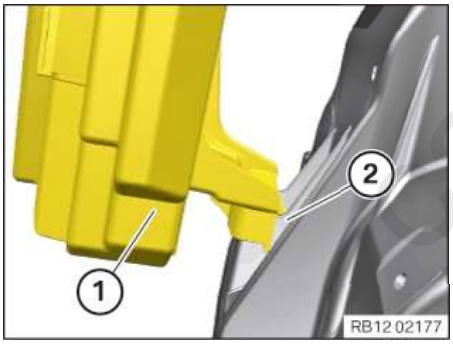


- Secure the tank vent valve (2) to the holder (3).
- Connect and lock the tank ventilation lines (arrows).

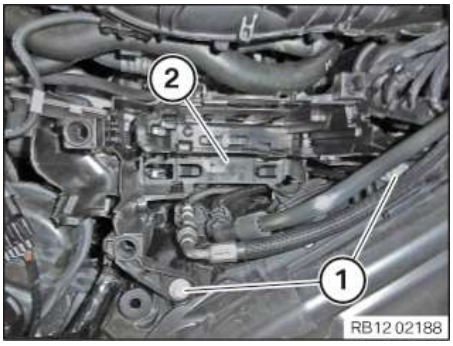
  The tank ventilation lines (arrows) must audibly engage.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

24 – Installing the control unit holder



- Make sure the bottom control unit holder (1) is inserted correctly into the fixture (2).

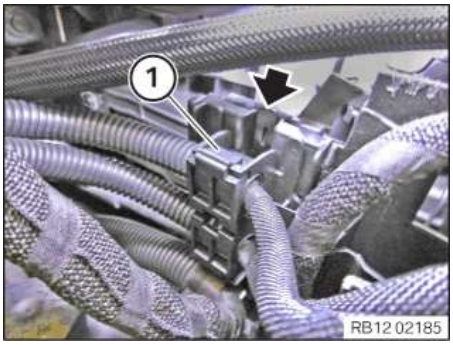


- Guide in and install control unit holder (2).
- Tighten the screws (1).

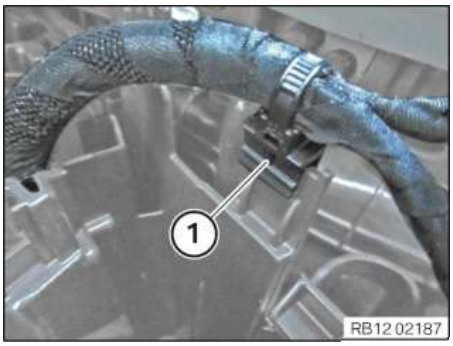
Control unit holder on spring strut dome

Hexagon screw		Tightening torque	8 Nm

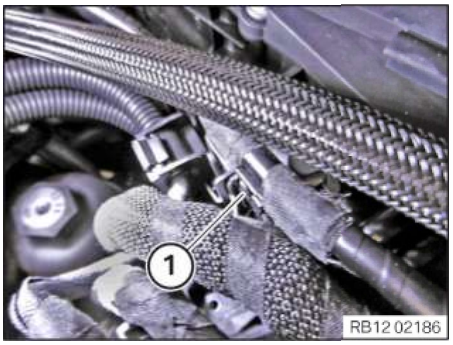
cardiagn.com



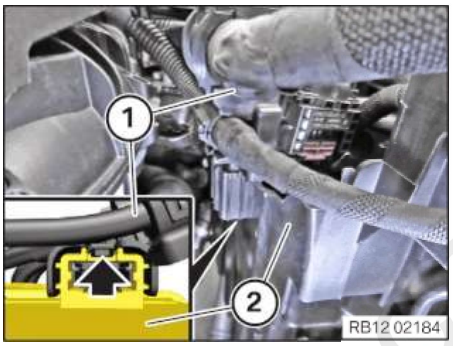
- Feed in and install the cable clip (1).
  Lock (arrow) must audibly engage.



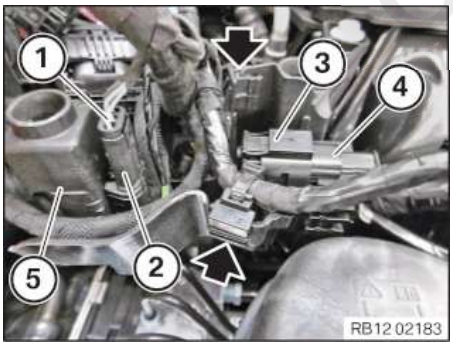
- Secure clamps (1).



- Secure clamps (1).



- Connect the cable clip (1) with the control unit holder (2) and lock.
  Lock (arrow) must audibly engage.



- Connect and lock the connector (4) with the control unit holder (5).
  The connector (4) must engage audibly.
- Connect connectors (3) and lock.
  The connector (3) must engage audibly.
- Connect and lock the connector (2) with the control unit holder (5).
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.
- Secure the clamps (arrows).

25 – Installing the integrated supply module (PDM)

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WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

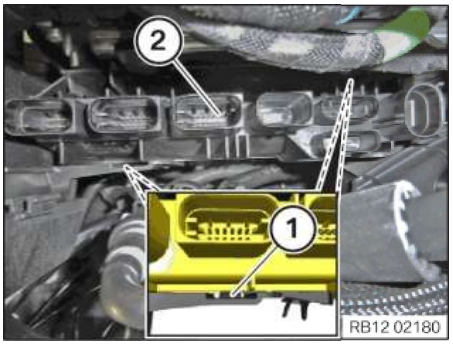
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Insert and install the integrated supply module (PDM) (2).

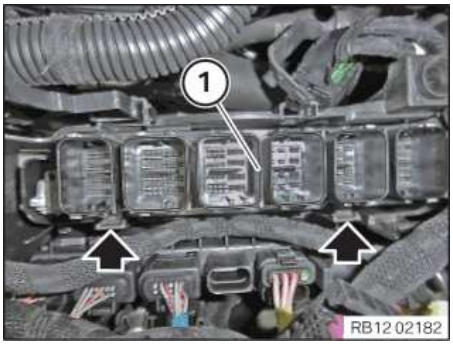
  The latch mechanisms (1) must engage audibly.
- Unlock the latch mechanisms (1).



- Connect connectors (1) and lock.

  The connectors (1) must engage audibly.

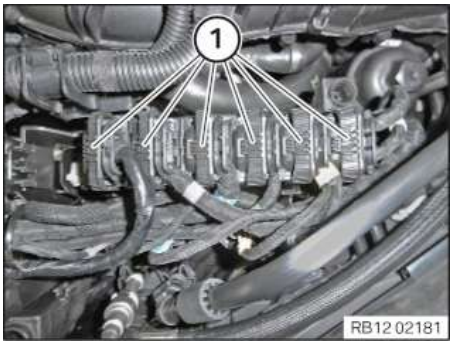
26 – Installing the DME control unit



- Feed in and install DME control unit (1).

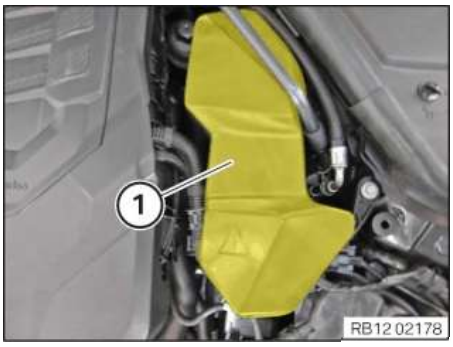
  The locks (arrows) must engage audibly.

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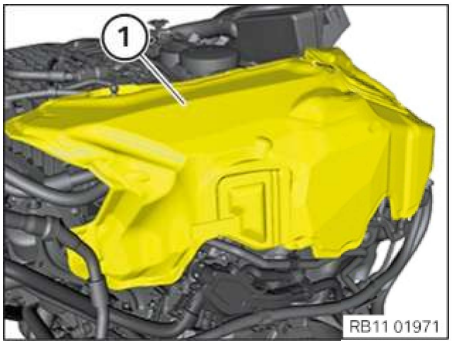
- Connect connectors (1) and lock.

  All connectors (1) must engage audibly.



- Insert and install cover (1) into guides.

27 – Installing acoustic cover at rear

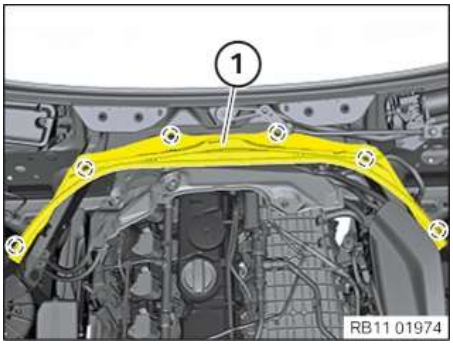


- Make sure the acoustic cover (1) is correctly positioned on the rear side of the engine.



- Install the acoustic cover (1) from the top and clip it in into the marked areas.

28 – Installing the centre bulkhead upper part

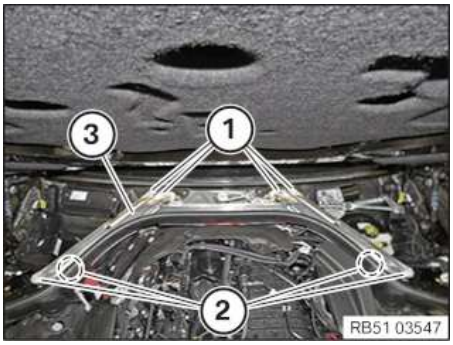


- Position the centre bulkhead upper part (1).
- Tighten the bolts in the marked areas.

Bulkhead upper part to bottom bulkhead

	Tightening torque	3 Nm

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- **If installed:** Install tension strut on spring strut dome.
- Install the tension strut (3) on the spring strut dome.
- Tighten the screws (1).

Tension strut on bulkhead

M10x25 screw		Tightening torque	56 Nm

- Renew screws (2).

  Parts: Bolts
- Tighten the screws (2).

Tension strut to spring strut dome

Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

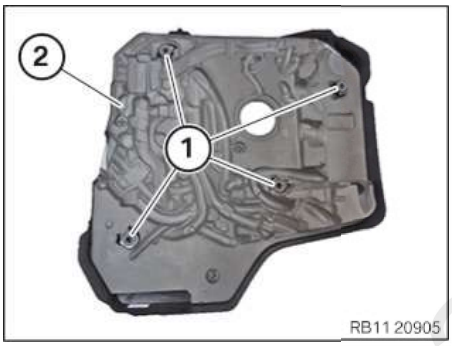
29 – Install acoustic cover

RISK OF DAMAGE

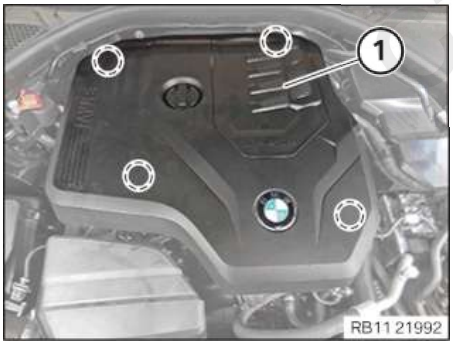
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check all rubber mounts (1) of acoustic cover (2) for correct seating.



- Clip in the acoustic cover (1) into the holders in the **marked** areas.

  The acoustic cover (1) must audibly engage into place.

30 – Installing cowl panel cover

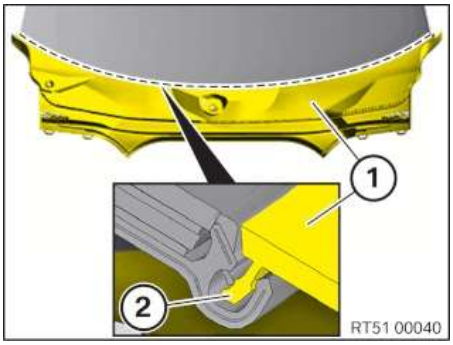
RISK OF DAMAGE

Damage caused by water ingress into the vehicle.

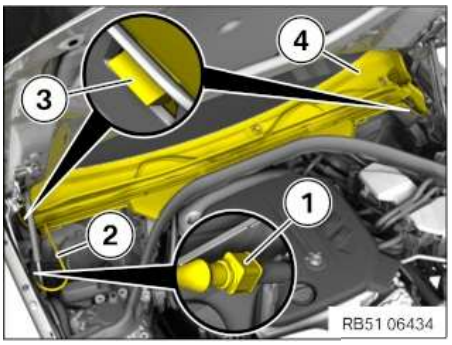
Water ingress into the vehicle may result in damage to components, malfunctions and corrosion.

- Ensure correct installation of the components.
- Only use undamaged components.

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- Push the cowl panel cover (1) into the latch mechanism (2) beginning on the side.



- Clip cowl panel cover (4)in by means of the latch mechanisms (3).
- Position windscreen wash hose (2) and connect windscreen wash hose (1)quick lock.

31 – Installing both wiper arms

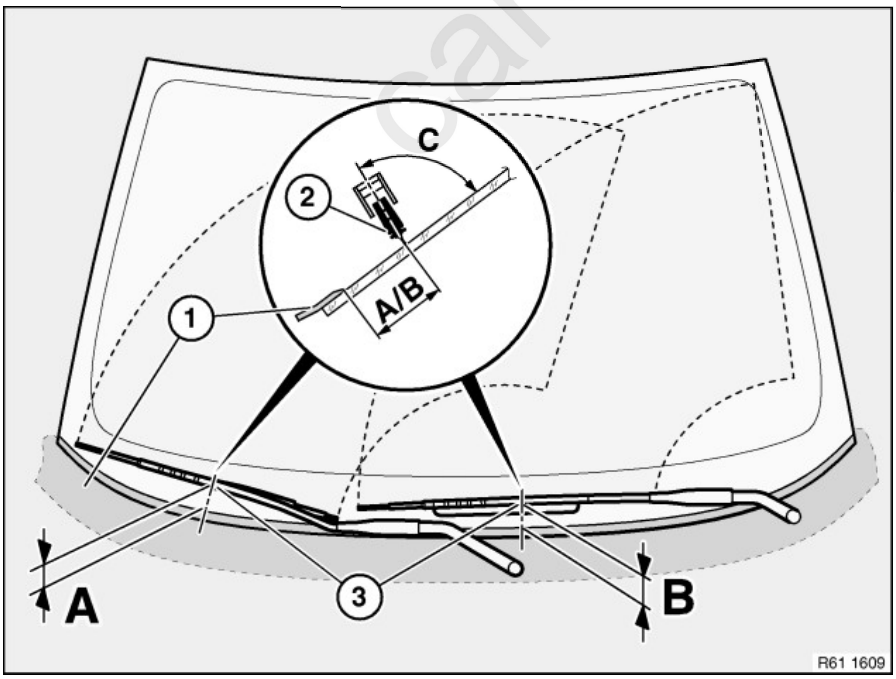
NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.

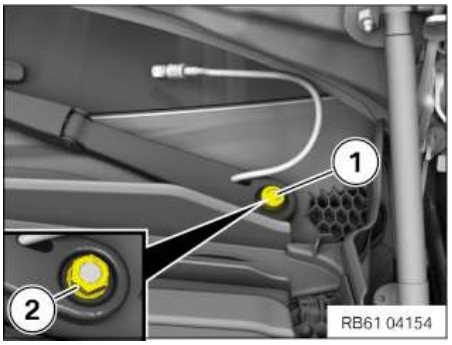


- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).

Distance from window pane edge to wiper blade

Wiper arm right (A)	57,5 ± 5 mm
Wiper arm left (B)	63,3 ± 4 mm

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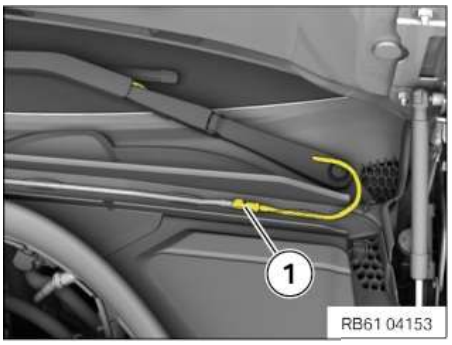


- Tighten nut (2).

Windscreen wiper arm

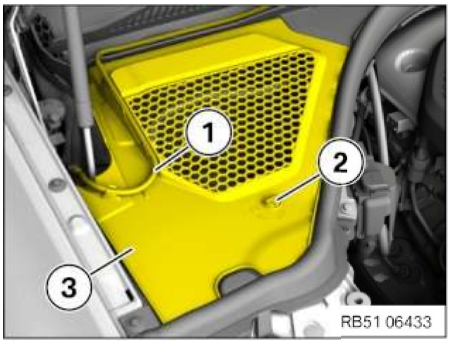
Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).



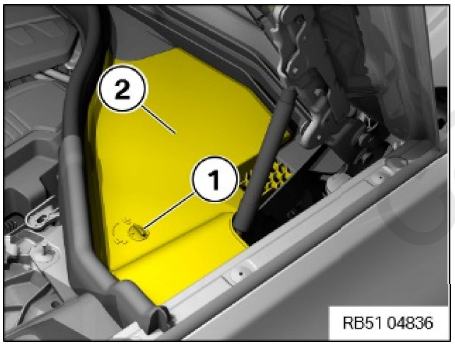
- Insert windscreen wash hose (1) into the cowl and connect at the separating point.

32 – Install the rear right engine compartment cover



- Position the cover of the engine compartment on the rear right (3).
- Close lock (2).
- Insert washer fluid hose (1) into the guides.

33 – Install the cover of the engine compartment on the rear left



- Position the engine compartment cover at the rear left (2) .
- Close lock (1).

34 – Install the seal for the bonnet



- Press the rear bonnet seal (2) into the guide.
- Feed in cable (1) into the brackets.
- Check that the rear bonnet seal (2) and the cable (1) are seated correctly.

35 – Filling and bleed the low-temperature coolant circuit

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- See additional information.

36 – Disconnecting all battery earth leads

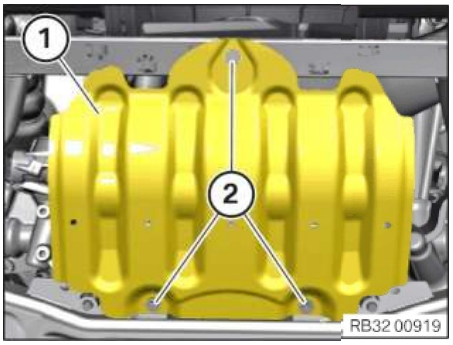


- See additional information.

37 – If installed: Installing the steering guard

Prerequisite

The front underbody protection is removed.

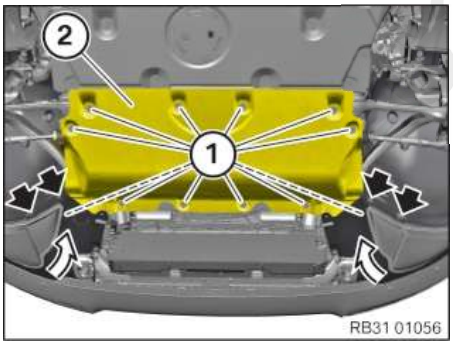


- Remove guard (1).
- Tighten the screws (2).

Bumper buffer device steering on front axle support

M10		Tightening torque	56 Nm

38 – Install the underbody protection of the steering gear



- **Version 1:**
- Position the underbody protection of the steering gear (2).
- Tighten the screws (1).

Underbody protection of the steering gear

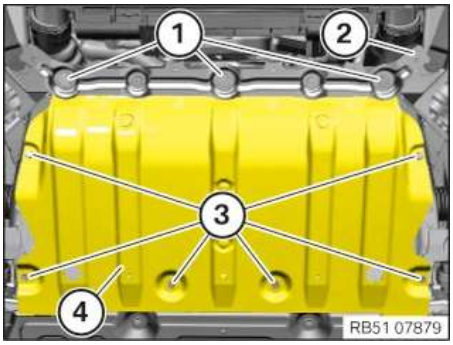
Hexagon screw for thermoplastic		Tightening torque	3 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

- Position the bottom wheel arch cover.
- Tighten the screws (arrows) of the bottom wheel arch cover on the wheel arch cover.

Wheel arch cover (screws)

Thermoplastic hexagon screw		Tightening torque	3 Nm

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- **Version 2:**
- Guide in the steering gear underbody protection (4) and install.
- Tighten the screws (3).

Underbody protection of the steering gear

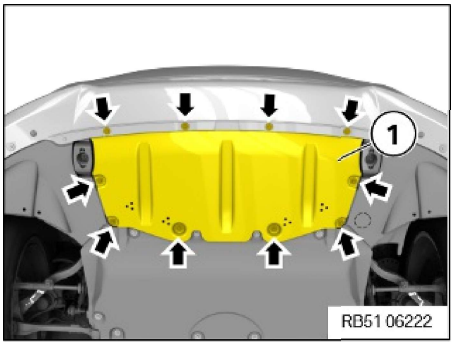
Hexagon screw for thermoplastic		Tightening torque	3 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

- Position holder of underride protection (2).
- Tighten the screws (1).

Holder underride guard to front axle support

M10		Tightening torque	56 Nm

39 – Installing the front underbody protection



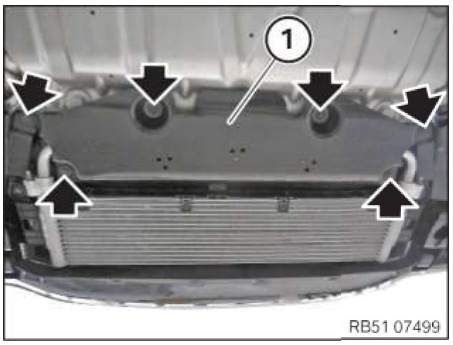
- **Version 1:**

  Feed in the front underbody protection (1) towards the front under the bumper panel and position.

  Tighten screws (arrows).

Underbody protection front

Hexagon screw for thermoplastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



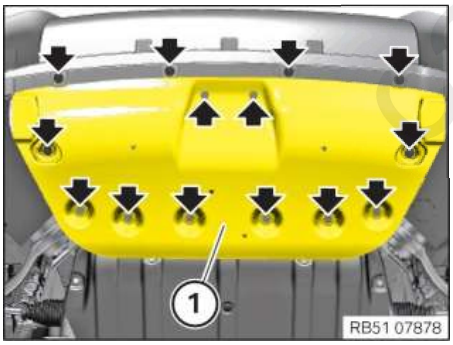
- **Version 2:**

  Feed in and position the front underbody protection (1).

  Tighten screws (arrows).

Underbody protection front

Hexagon screw for thermoplastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm



- **Version 3:**

  Feed in and install front underbody protection (1).

  Tighten screws (arrows).

Underbody protection front

Hexagon screw for thermoplastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Additional Information

Overview of Tightening Torques

Cover, front bottom on side Used in step 18

Hexagon screw for thermoplastic		Tightening torque	3 Nm

Wiring harness section of engine to cylinder head cover Used in step 21

M6		Tightening torque	8 Nm

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Battery positive lead to starter			Used in step 21
M8		Tightening torque	13,5 Nm

Cable routing to cylinder head, rear			Used in step 21
M6 x 20		Tightening torque	8 Nm

Intake plenum to cylinder head			Used in step 22
M6		Tightening torque	10 Nm

Intake plenum to support			Used in step 22
M6X25		Tightening torque	8 Nm

Throttle body to holder			Used in step 22
M6X25		Tightening torque	8 Nm

Tank ventilation line to intake plenum			Used in step 22
Oval-head screw		Tightening torque	3 Nm

Charge air line to throttle body			Used in step 22
M6		Tightening torque	8 Nm

Control unit holder on spring strut dome			Used in step 24
Hexagon screw		Tightening torque	8 Nm

Bulkhead upper part to bottom bulkhead			Used in step 28
		Tightening torque	3 Nm

Tension strut on bulkhead			Used in step 28
M10x25 screw		Tightening torque	56 Nm

Tension strut to spring strut dome			Used in step 28
Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

Windscreen wiper arm			Used in step 31
Combination hexagon nut		Tightening torque	35 Nm

Bumper buffer device steering on front axle support			Used in step 37
M10		Tightening torque	56 Nm

Underbody protection of the steering gear			Used in step 38
Hexagon screw for thermoplastic		Tightening torque	3 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Wheel arch cover (screws)			Used in step 38
Thermoplastic hexagon screw		Tightening torque	3 Nm

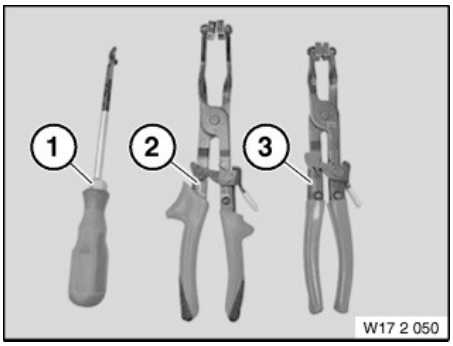
Holder underride guard to front axle support			Used in step 38
M10		Tightening torque	56 Nm

Underbody protection front			Used in step 39
Hexagon screw for thermoplastic		Tightening torque	2,6 Nm
Hexagon screw M6x20		Tightening torque	8 Nm

Overview of Special Tools

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0 495 794 (17 2 050) Pliers



Common Used in step 1922

Usage	(Set of pliers) For assembling and disassembling the spring band clamps (Coolant hoses)
Included in the tool or work	
Storage location	B85
Replaced by	
In connection with	
SI-Number	01 26 06 (321)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 795 (17 2 051)		**Release tool** Remaining inventories will be sold off and then no longer available individually, but as part of complete tool set 17 2 050 = 0495794 only.	
2	0 495 796 (17 2 052)		**Pliers** (Pliers (curved version) Remaining inventories will be sold off and then no longer available as individual parts, but as part of complete tool set 17 2 050 = 0495794 only.	
3	0 495 797 (17 2 053)		**Pliers** (Pliers (straight version) Remaining inventories will be sold off and then no longer available as individual parts, but as part of complete tool set 17 2 050 = 0495794 only.	

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Distance from window pane edge to wiper blade	Used in step 31
Wiper arm right (A)	57,5 ± 5 mm
Wiper arm left (B)	63,3 ± 4 mm

Links

General repair instructions	Used in step
12 00 ... Instructions for removal and replacement of control units	1026

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	136
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	136
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
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61 20 900 Disconnecting and connecting battery earth lead	136
61 20 900 Disconnecting and connecting battery earth lead	136
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12 51 240 Remove and install / replace Module 2, sensor system engine wiring

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

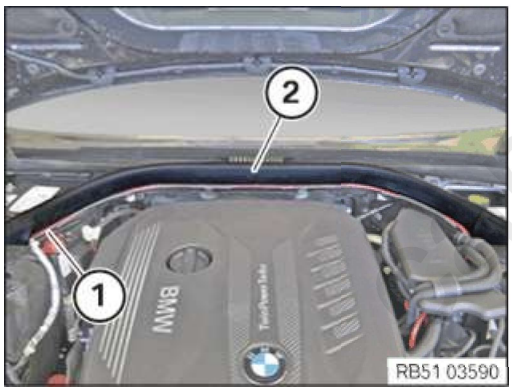
PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Remove the seal for the rear bonnet



- Feed the cable (1) out of the brackets toward the front.
- Remove the rear bonnet seal (2) from the guide toward the inside.

3 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

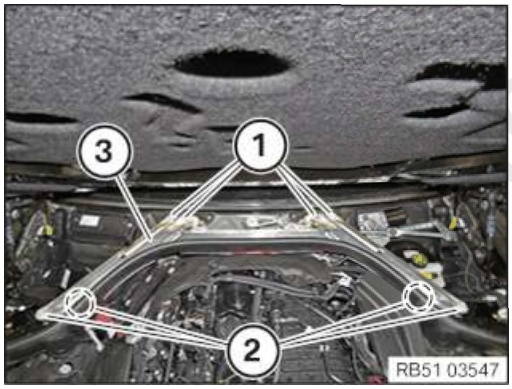


- Unclip the acoustic cover (1) from the holders in the **marked** areas towards the top.

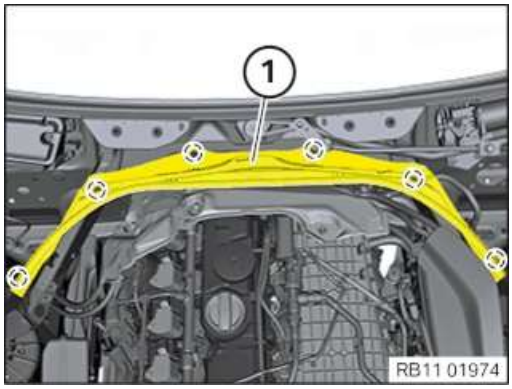
4 – Removing the centre bulkhead upper part

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.



- **If installed:** Remove tension strut on spring strut dome.
- Loosen screws (1) and (2).
- Remove tension strut (3) in the spring strut dome upwards.



- Unscrew the bolts in the marked areas.
- Remove the centre bulkhead upper part (1).

5 – Removing acoustic cover at rear



- Unclip the acoustic cover (1) in the marked areas and remove it to the top.

6 – Removing the clean air pipe with the resonator

WARNING

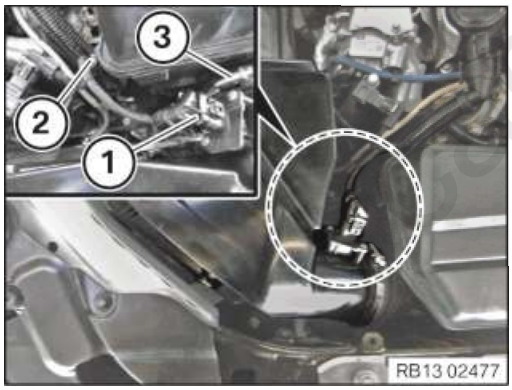
Hot surfaces.

Risk of burning!

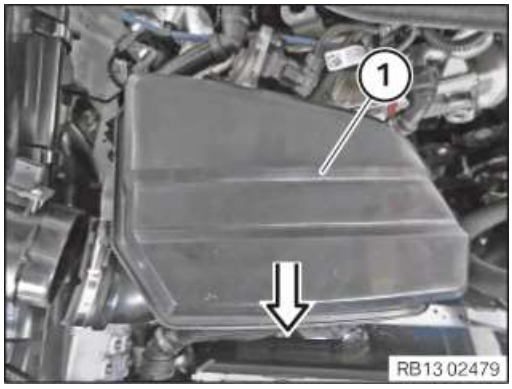
- Perform all work only on components that have cooled down.



- Unlock the locks (1).
- Feed the engine ventilation line (2) out and set it aside.

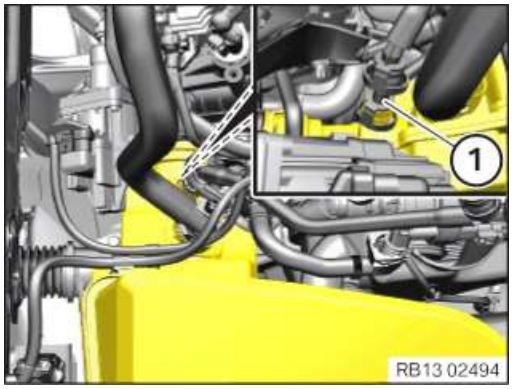


- Unlock plug connection (1) and disconnect.
- Loosen clamp (2).
- Unfasten clamp (3).
- Separate the clean air pipe with resonator from the intake filter housing.

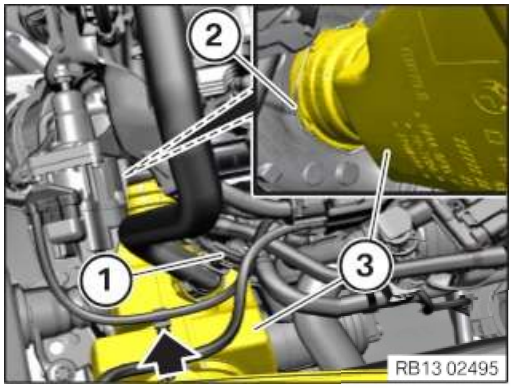


- Press and hold clean air pipe with resonator (1) in the direction of the arrow.

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- Unlock and disconnect the tank ventilation line (1).



- Loosen the clamp (arrow).
- Unlock plug connection (1) and disconnect.
- Unlock the clamp (2).
- Feed out clean air pipe with resonator (3) and remove.

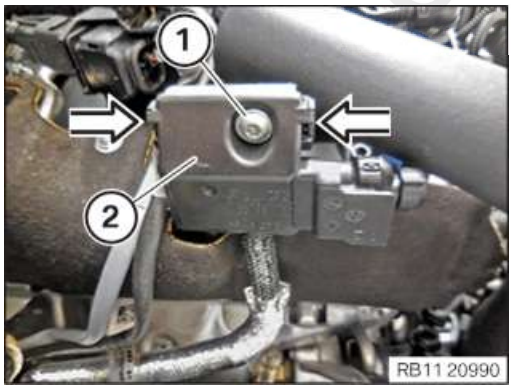
7 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

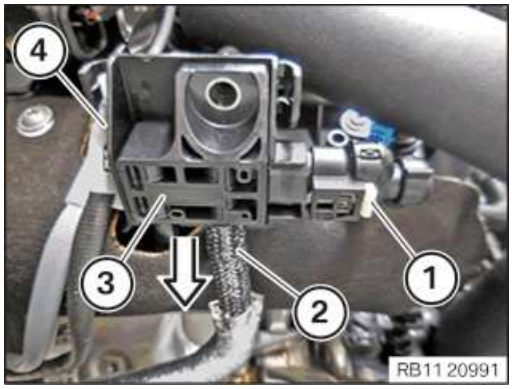
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



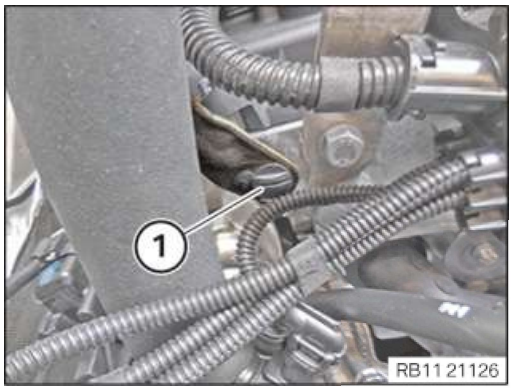
- Loosen screw (1).
- Release the locks (arrows).
- Guide out and remove the cover (2).

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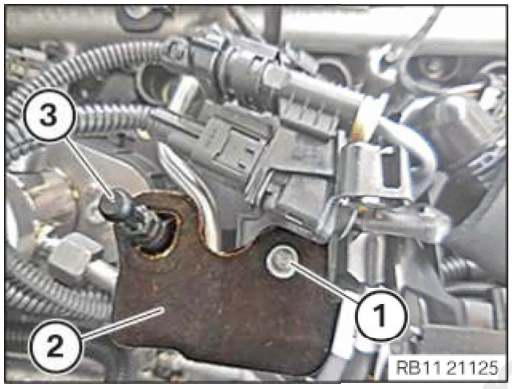


- Unlock plug connection (1) and disconnect.
- Pull off the pressure hose (2) from the differential pressure sensor (3) in the direction of arrow and place it to one side.
- Guide the differential pressure sensor (3) out of the holder (4) and remove.

8 – Removing the cylinder head cover acoustic cover

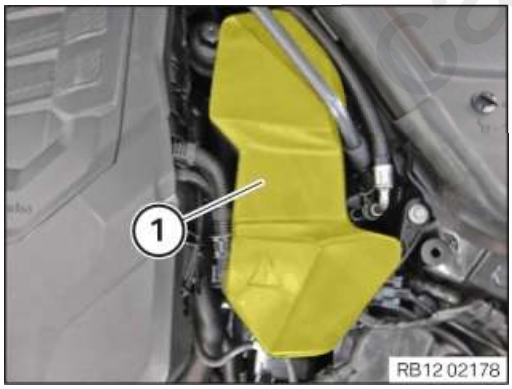


- Loosen clip (1).



- Loosen screw (1).
- Guide the acoustic cover (2) out of the ball pin (3) and remove.

9 – Remove the cover of the DME control unit



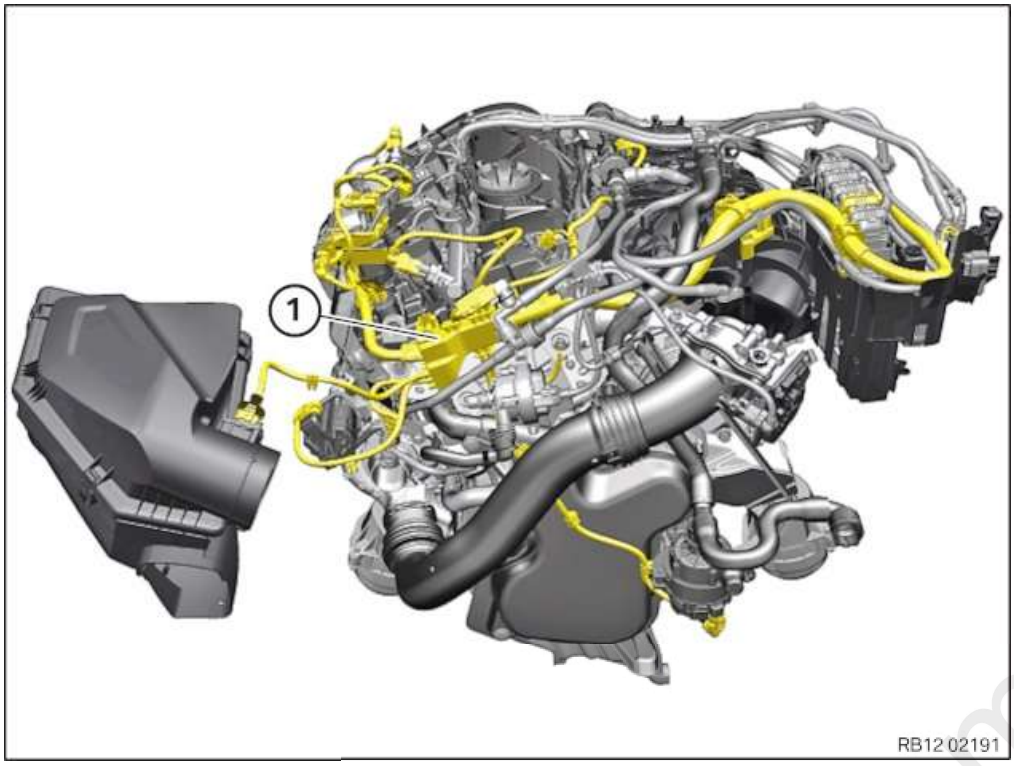
- Pull the cover (1) toward the top and remove.

MAIN WORK

10 – Removing the engine wiring harness for sensor system 2

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Engine wiring harness for sensor system 2



1 Engine wiring harness for sensor system 2

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

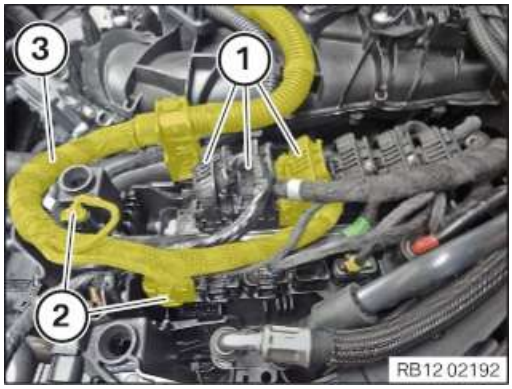
RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

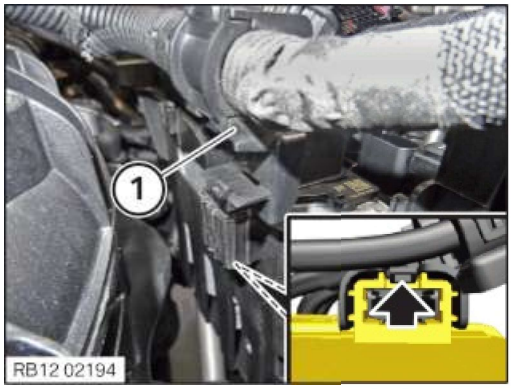
carlagn.com



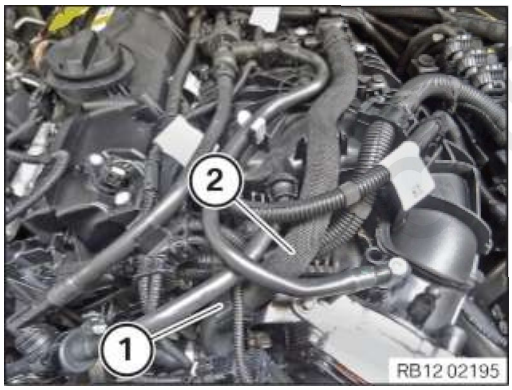
- Unlock and disconnect plug connections (1).
- Unlock and disconnect plug connections (2).
- Guide out the wiring harness section (3) for sensor system 2 and place to one side.



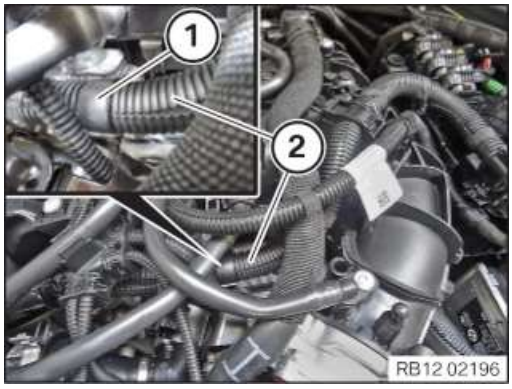
- Unlock the locks (arrows).
- Guide out the wiring harness section (1) for sensor system 2 and place to one side.



- Unlock the lock (arrow).
- Guide out the wiring harness section (1) for sensor system 2 and place to one side.

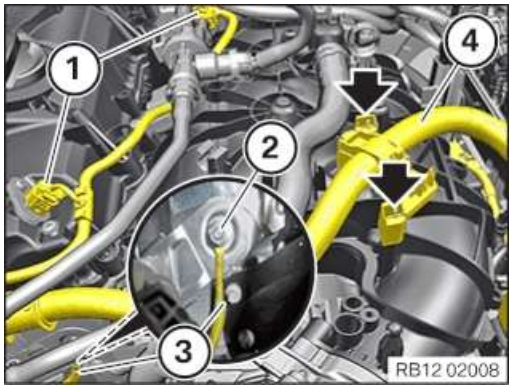


- Unlock the holder (1).
- Feed out coolant line (2) and place to one side.

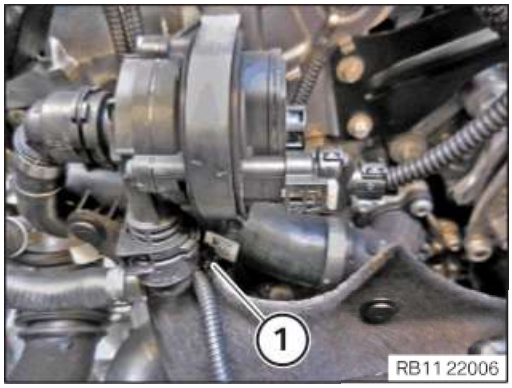


- Unlock the holder (1).
- Guide out the wiring harness section (2) for sensor system 2 and place to one side.

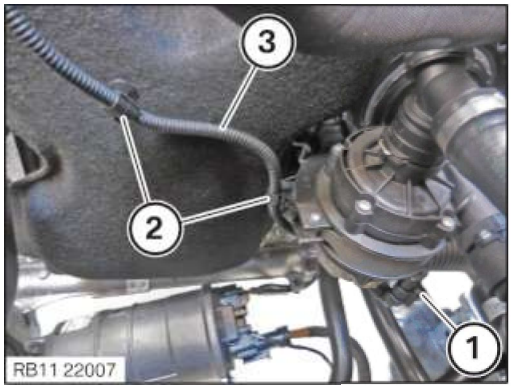
ardiagn.com



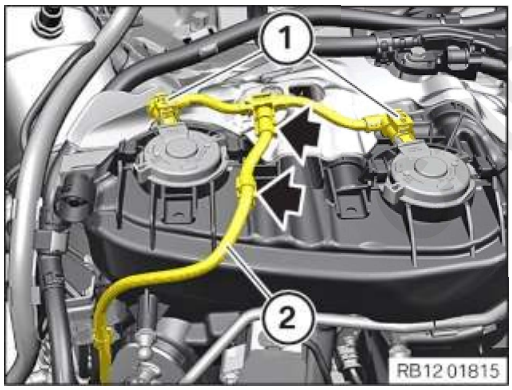
- Unlock and disconnect plug connections (1).
- Loosen nut (2).
- Feed out and remove the ground cable (3).
- Unlock the locking mechanisms (arrows) and feed out the wiring harness section(4) for sensor system 2 and place to one side.



- Loosen clamp (1).



- Unlock plug connection (1) and disconnect.
- Loosen clamps (2).
- Remove the wiring harness section (3) and put to one side.

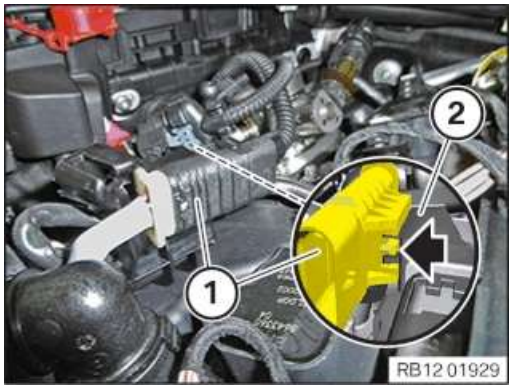


- Unlock and disconnect plug connections (1).
- Release the clamps (arrows).
- Guide out the wiring harness section (2) for sensor system 2 and place to one side.

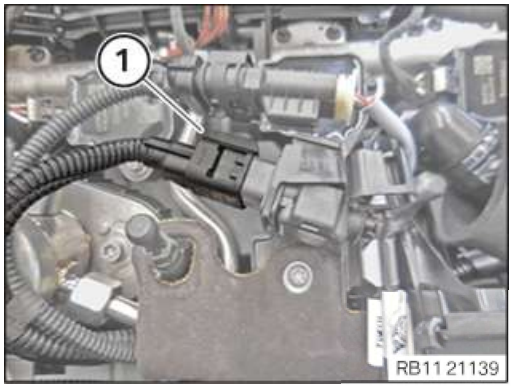


- Unlock plug connection (1) and disconnect.

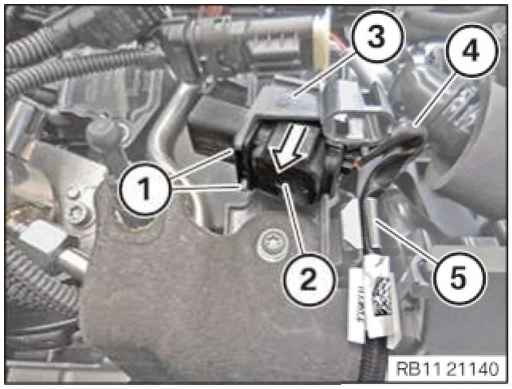
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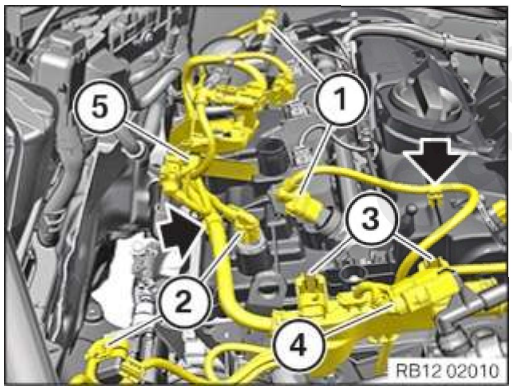
- Unlock plug connection (1)(arrow) and disconnect from the holder (2).



- Unlock plug connection (1) and disconnect.

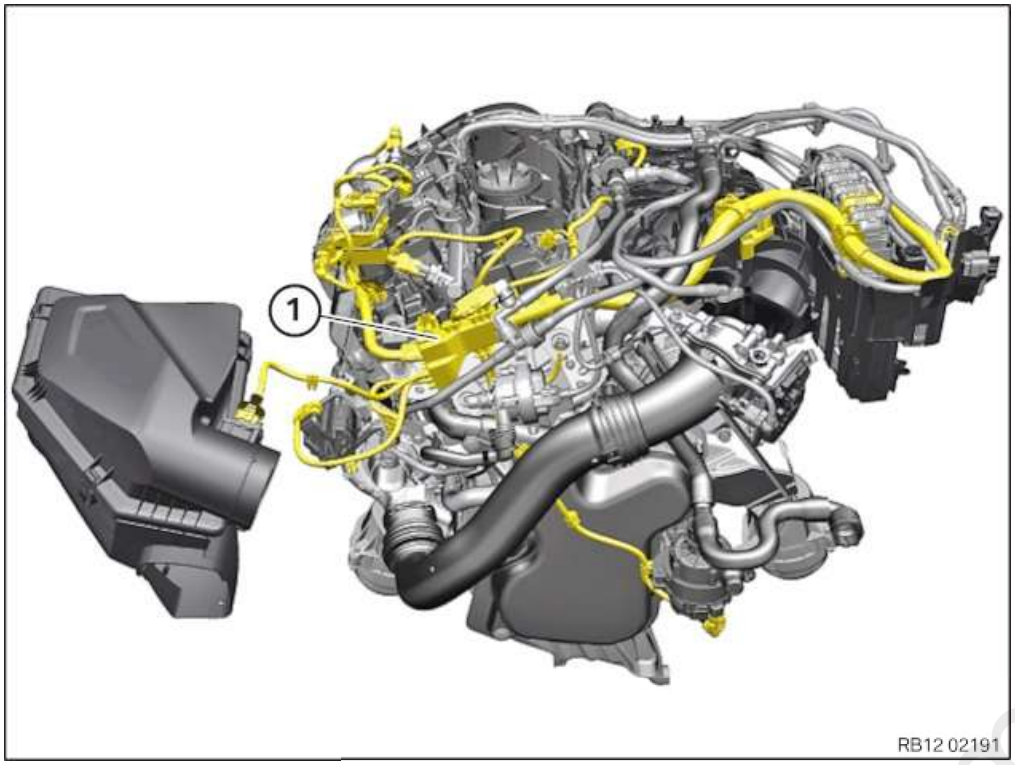


- Unlock the locks (1).
- Guide the connector (2) out of the bracket (3)in the **direction of the arrow** and set it aside.
- Release the cable (4) from the clamp (5).



- Unlock and disconnect plug connections (1).
- Unlock and disconnect plug connections (2).
- Release the clamps (arrows).
- Unlock and loosen the locks (3).
- Unlock plug connection (4) and disconnect.
- Guide out the wiring harness section (5) for sensor system 2 and place to one side.

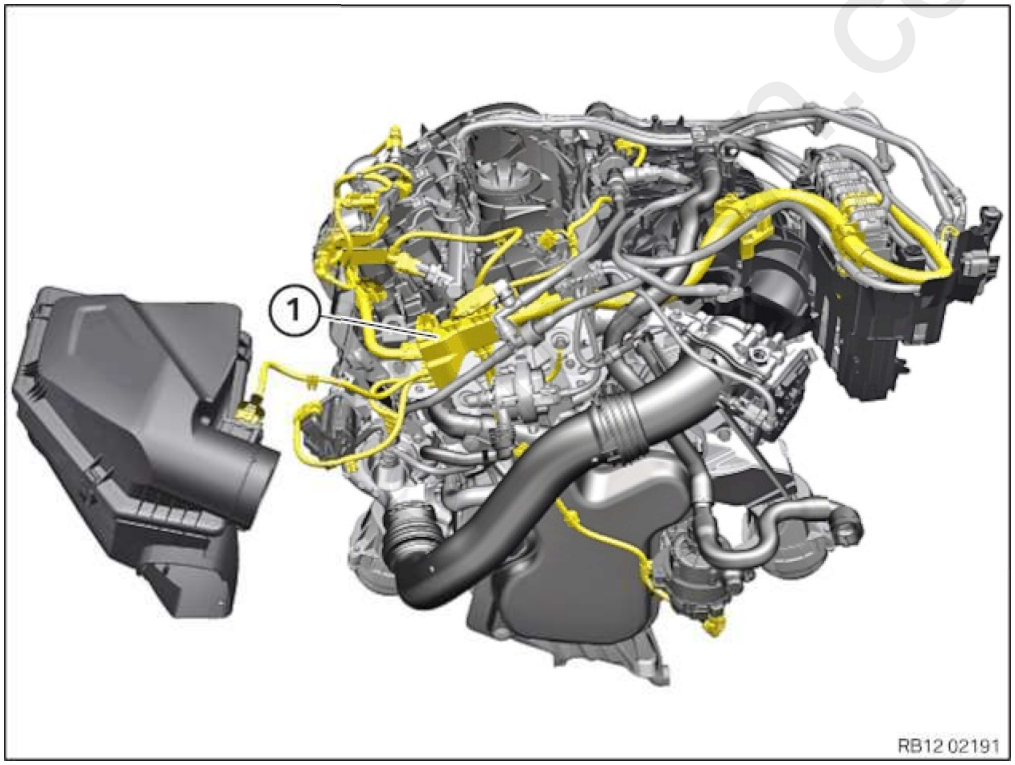
fdiagn.com



- Feed out the engine wiring harness (1) for sensor system 2 and remove it.

11 – Installing the engine wiring harness for sensor system 2

Engine wiring harness for sensor system 2



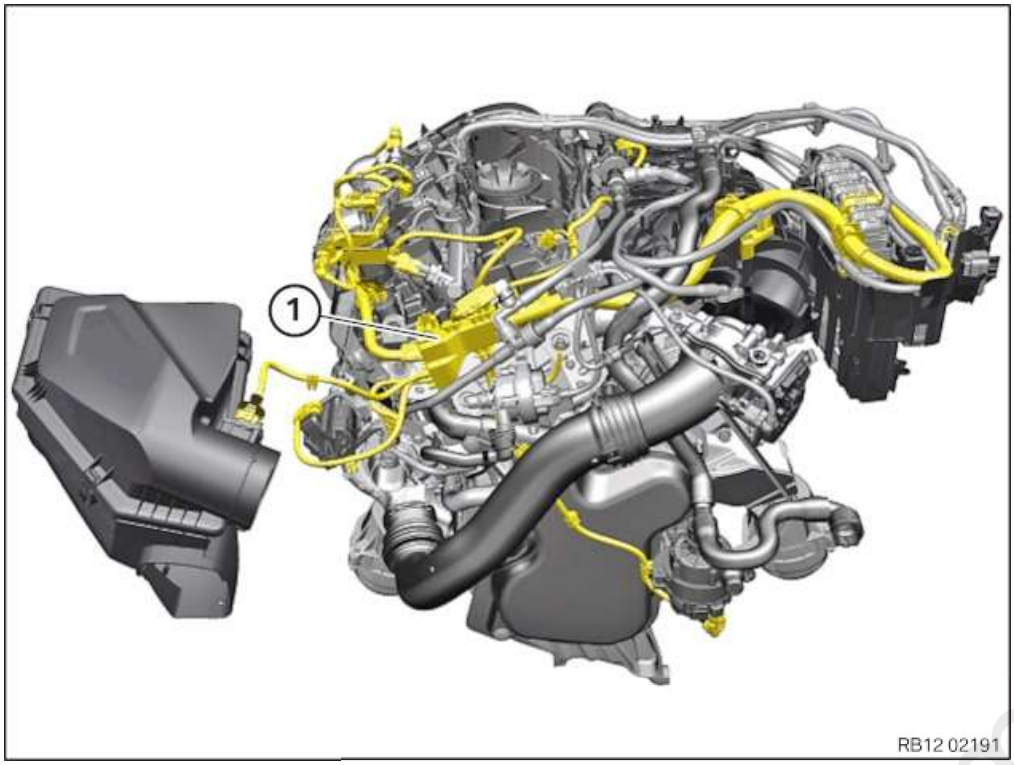
1 Engine wiring harness for sensor system 2

RISK OF DAMAGE

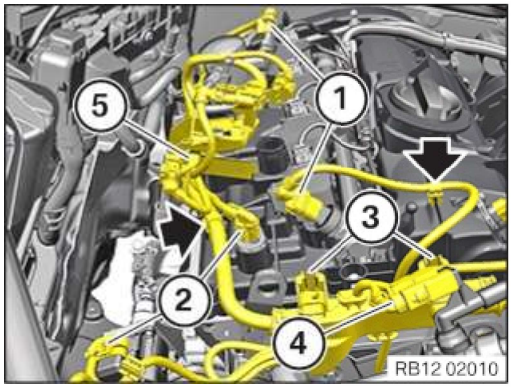
Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.



- Feed in and install the engine wiring harness (1) for sensor system 2.

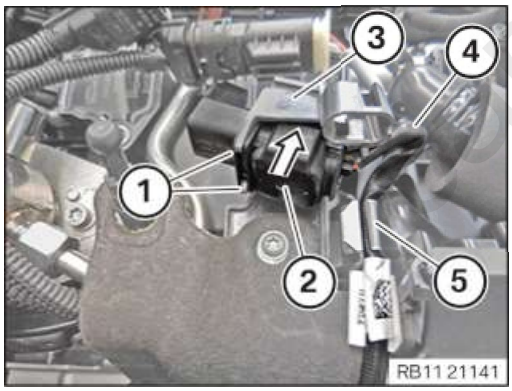


- Guide in and install wiring harness section (5) for sensor system 2.
- Connect connectors (4) and lock.

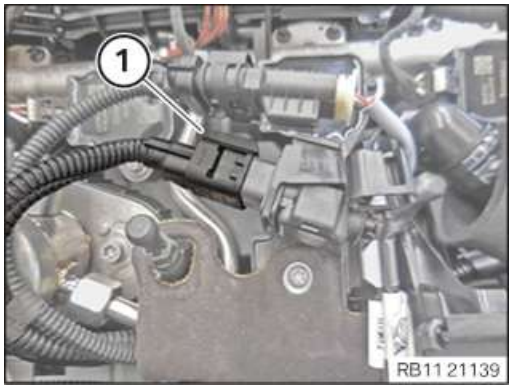
  The connector (4) must engage audibly.
- Install and lock locks (3).
- Secure the clamps (arrows).
- Connect connectors (2) and lock.

  The connectors (2) must engage audibly.
- Connect connectors (1) and lock.

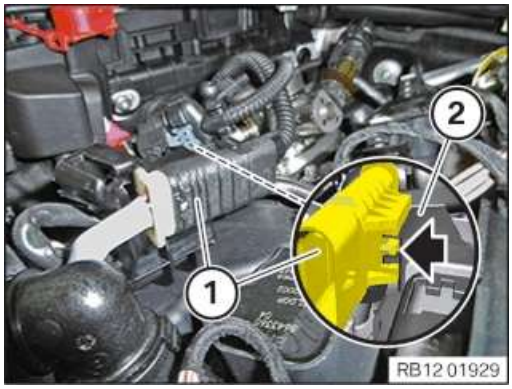
  The connectors (1) must engage audibly.



- Guide in the connector (2) in the direction of arrow at the carrier plate (3) and install.
- Ensure that locks (1) engage correctly.
- Secure cable (4) to the clamp (5).



- Connect connectors (1) and lock.
- Make sure the connector (1) engages audibly.



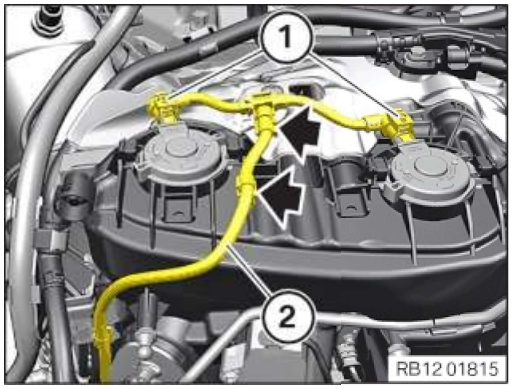
- Connect connector (1) to holder (2) and lock it (arrows).

  The connector (1) must engage audibly.



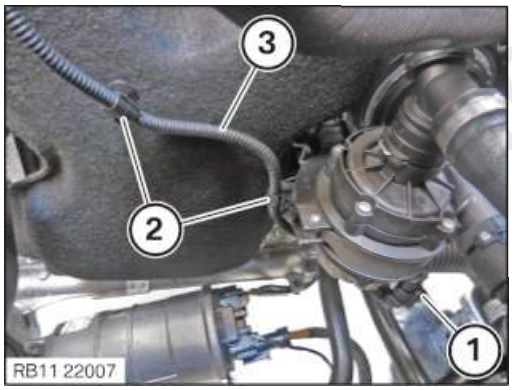
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



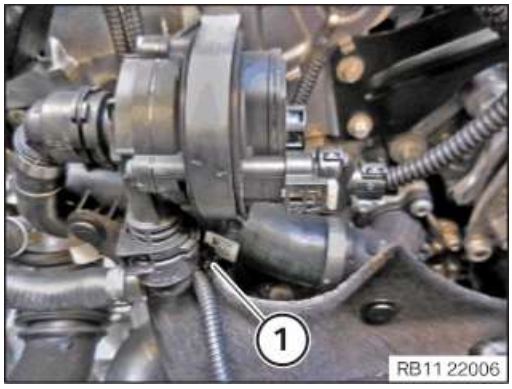
- Feed in and install the engine wiring harness (2) for sensor system 2.
- Secure the clamps (arrows).
- Connect connectors (1) and lock.

  The connectors (1) must engage audibly.



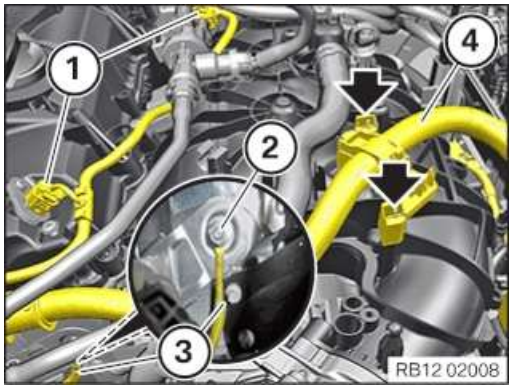
- Feed in and position wiring harness section (3).
- Secure clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Secure clamps (1).

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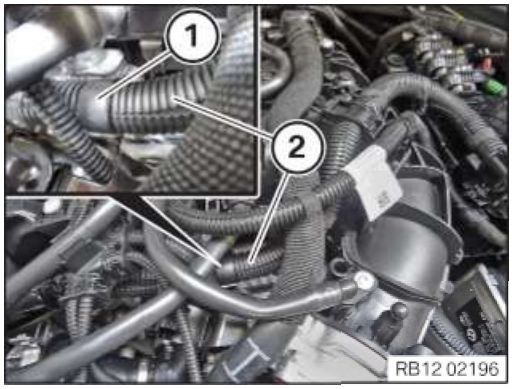
- Guide in and install wiring harness section (4) for sensor system 2.
- Ensure that the locks (arrows) engage correctly.
- Thread in ground cable (3) and install.
- Tighten nut (2).

Standard screw connection M6

M6		8 Nm

- Connect connectors (1) and lock.

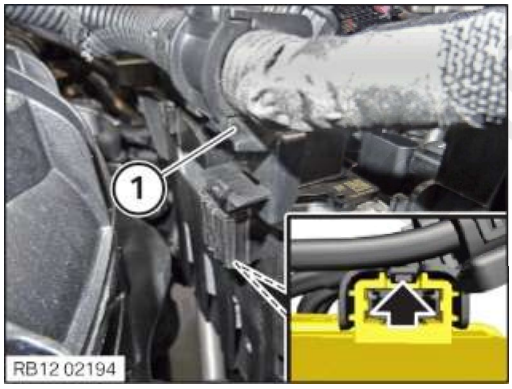
  The connectors (1) must engage audibly.



- Guide in and install wiring harness section (2) for sensor system 2.
- Lock holder (1).



- Feed in and install coolant line (2).
- Lock holder (1).

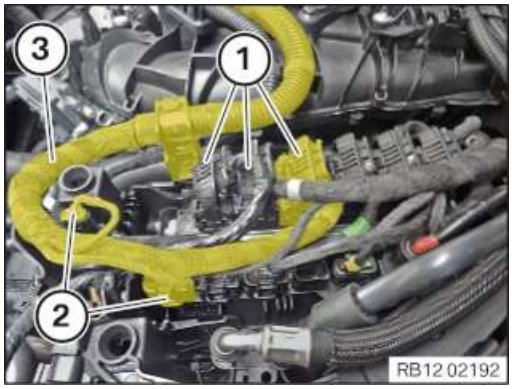


- Guide in and install wiring harness section (1) for sensor system 2.
- Ensure that the lock (arrow) engages audibly.



- Feed-in and lock wiring harness section (1) for sensor system 2 in holder.

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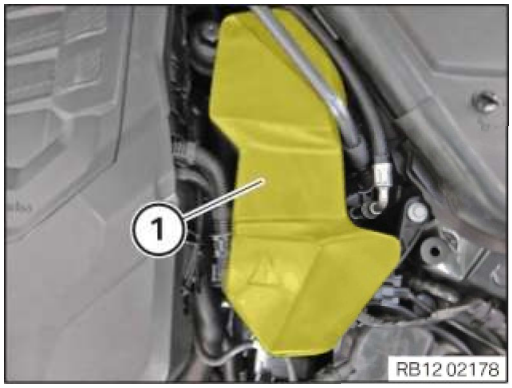
- Guide in and install wiring harness section (3) for sensor system 2.
- Connect connectors (2) and lock.

  The connectors (2) must engage audibly.
- Connect connectors (1) and lock.

  The connectors (1) must engage audibly.

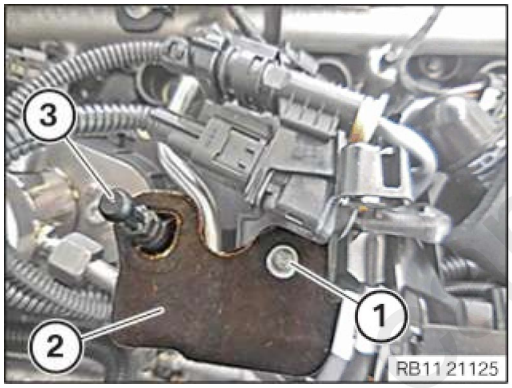
POSTPROCESSES

12 – Installing the cover of the DME control unit



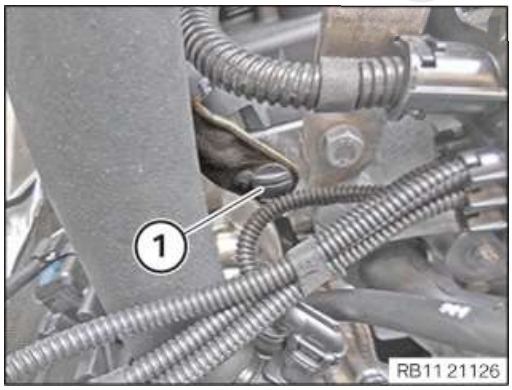
- Insert and install cover (1) into guides.

13 – Install the cylinder head cover acoustic cover



- Guide in and position the acoustic cover (2) on the ball pin (3).
- Tighten down screw (1).

Acoustic cover (side) to cylinder head cover		
TS6 x 20		8 Nm



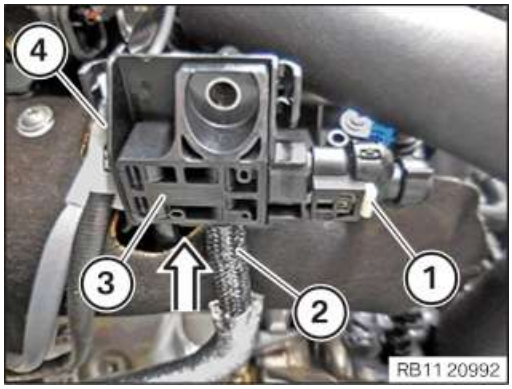
- Secure the clip (1).

14 – Install differential pressure sensor

TECHNICAL INFORMATION

Check the pressure hose on the pressure sensor and/or the differential pressure sensor. Replace hardened pressure hose. Check connection on pressure pipe and pressure sensor for leaks.

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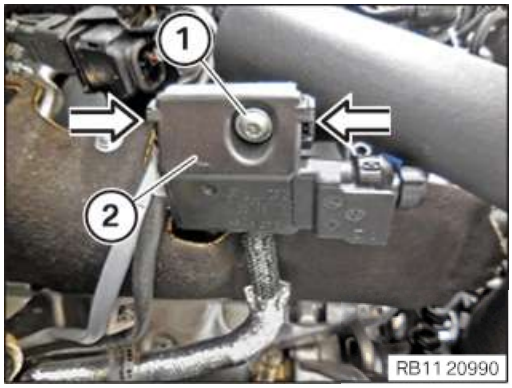


- Thread in differential pressure sensor (3) on the holder (4) and install.

  Differential pressure sensor (3) must engage audibly.
- Renew pressure hose (2).

  Parts: Pressure hose
- Connect the pressure hose (2) to the differential pressure sensor (3) in the direction of arrow until the limit position.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



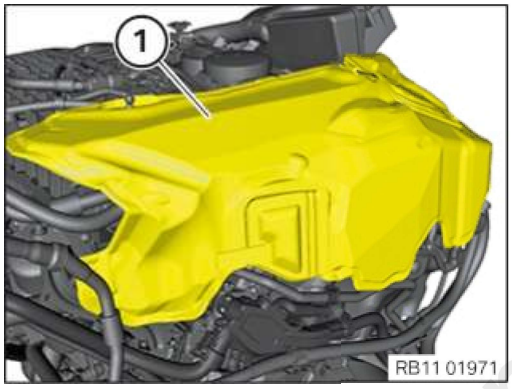
- Guide in and install cover (2).

  Cover (2) must engage audibly in the locks (arrows).
- Tighten down screw (1).

Differential pressure sensor to holder

TS6X20		Tightening torque	4 Nm

15 – Installing acoustic cover at rear

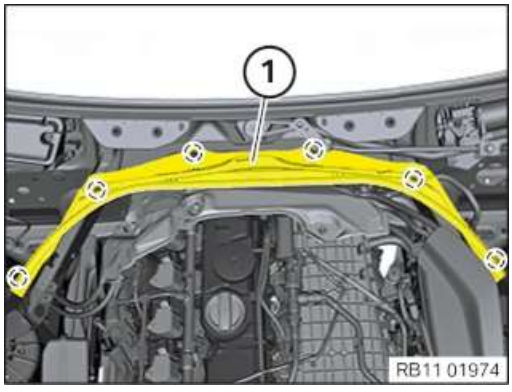


- Make sure the acoustic cover (1) is correctly positioned on the rear side of the engine.



- Install the acoustic cover (1) from the top and clip it in into the marked areas.

16 – Installing the centre bulkhead upper part

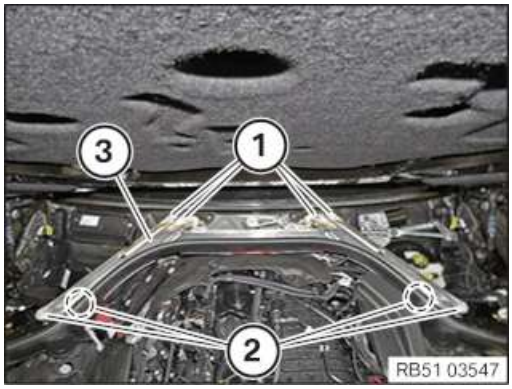


- Position the centre bulkhead upper part (1).
- Tighten the bolts in the marked areas.

Bulkhead upper part to bottom bulkhead

		Tightening torque	3 Nm

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- **If installed:** Install tension strut on spring strut dome.
- Install the tension strut (3) on the spring strut dome.
- Tighten the screws (1).

Tension strut on bulkhead

M10x25 screw		Tightening torque	56 Nm

- Renew screws (2).

  Parts: Bolts
- Tighten the screws (2).

Tension strut to spring strut dome

Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

17 – Installing the clean air pipe with resonator

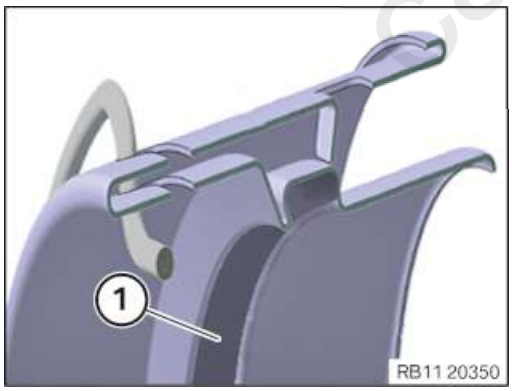


- Check the seal (1) for damages, replace if necessary.

▸ **Replace damaged gasket**

TECHNICAL INFORMATION

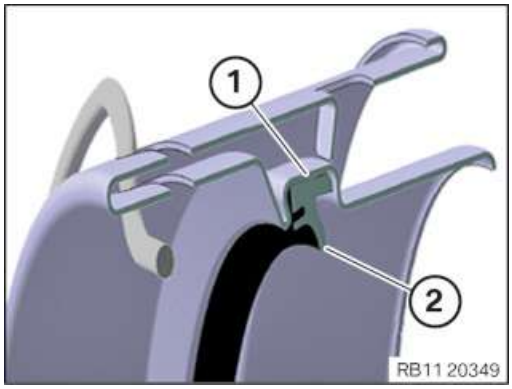
Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.

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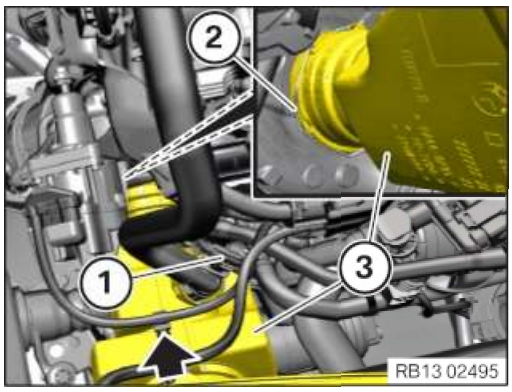
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

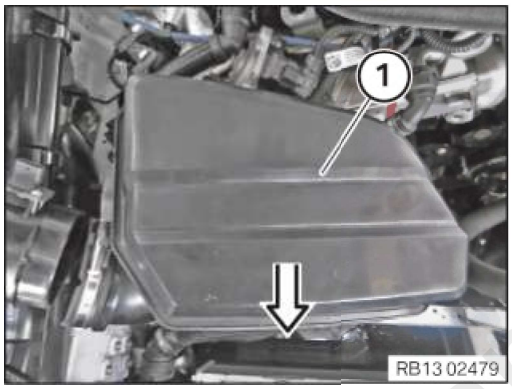
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



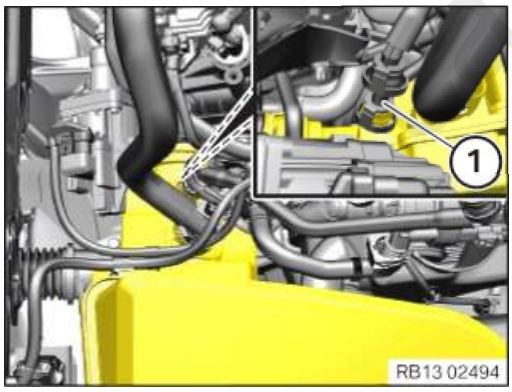
- Guide in and install the clean air pipe with resonator (3).
- Lock clamp (2).

  The clamp (2) must engage audibly.
- Connect connectors (1) and lock.

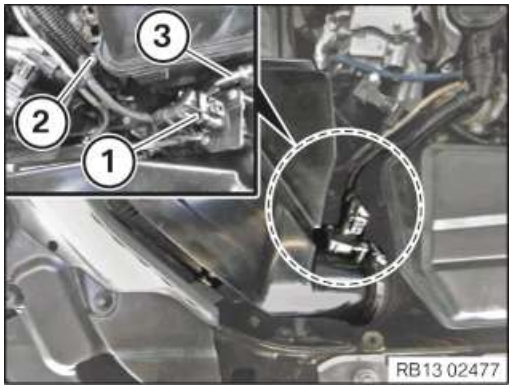
  The connector (1) must engage audibly.
- Secure clamp (arrow).



- Press and hold clean air pipe with resonator (1) in the direction of the arrow.



- Connect and lock the tank ventilation line (1).



- Connect the clean air pipe with resonator to the intake filter housing.
- Tighten clamp (3).

Clean air pipe to upper section of intake filter housing

Clamp		Tightening torque	3 Nm

- Secure the clamp (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

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- Insert and install the engine ventilation line (2).
- Ensure that the locks (1) engage audibly.

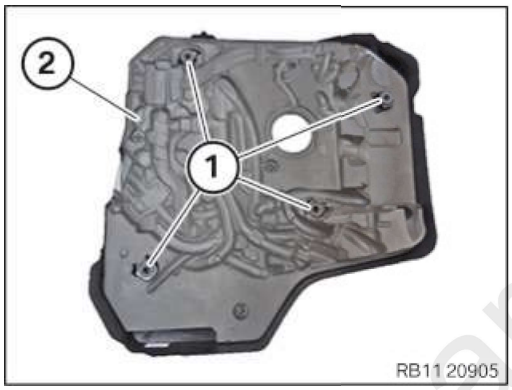
18 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Check all rubber mounts (1) of acoustic cover (2) for correct seating.



- Clip in the acoustic cover (1) into the holders in the **marked** areas.

  The acoustic cover (1) must audibly engage into place.

19 – Install the seal for the bonnet

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- Press the rear bonnet seal (2) into the guide.
- Feed in cable (1) into the brackets.
- Check that the rear bonnet seal (2) and the cable (1) are seated correctly.

20 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Standard screw connection M6			Used in step 11
M6			8 Nm

Acoustic cover (side) to cylinder head cover			Used in step 13
TS6 x 20			8 Nm

Differential pressure sensor to holder			Used in step 14
TS6X20		Tightening torque	4 Nm

Bulkhead upper part to bottom bulkhead			Used in step 16
		Tightening torque	3 Nm

Tension strut on bulkhead			Used in step 16
M10x25 screw		Tightening torque	56 Nm

Tension strut to spring strut dome			Used in step 16
Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

Clean air pipe to upper section of intake filter housing			Used in step 17
Clamp		Tightening torque	3 Nm

Links

Repair instructions	**Used in step**

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61 20 900 Disconnecting and connecting battery earth lead	120
61 20 900 Disconnecting and connecting battery earth lead	120
61 20 900 Disconnecting and connecting battery earth lead	120
61 20 900 Disconnecting and connecting battery earth lead	120
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61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	120
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61 20 900 Disconnecting and connecting battery earth lead	120
61 20 900 Disconnecting and connecting battery earth lead	120
61 35 ... Notes on ESD protection (Electro Static Discharge)	710
61 13 ... Unlocking and disconnecting different plug connections	10

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12 51 245 Removing and installing/replacing transmission module engine wiring,

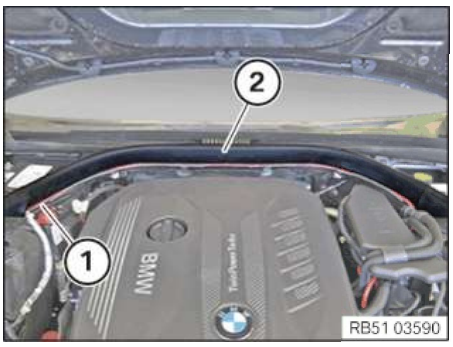
PRELIMINARY WORK

1 – Disconnecting all battery earth leads



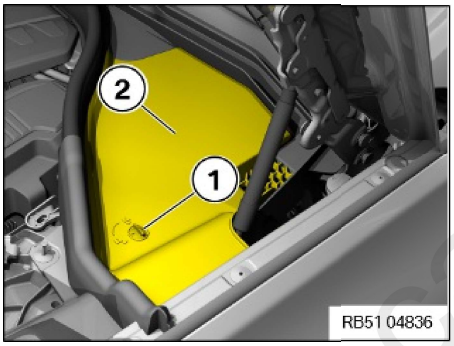
- See additional information.

2 – Remove the seal for the rear bonnet



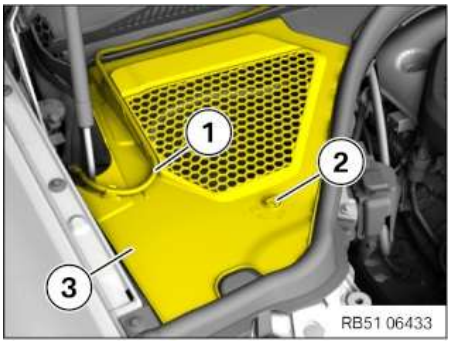
- Feed the cable (1) out of the brackets toward the front.
- Remove the rear bonnet seal (2) from the guide toward the inside.

3 – Remove the cover of the engine compartment at the rear left



- Loosen the lock (1).
- Remove rear left cover of engine compartment (2).

4 – Remove the cover of the rear right engine compartment



- Release washer fluid hose (1) from the guides.
- Loosen the lock (2).
- Remove the cover of rear right engine compartment (3).

5 – Removing both wiper arms

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Remove the wiper arm**

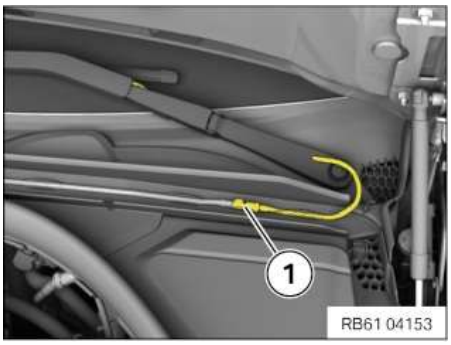
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RISK OF DAMAGE

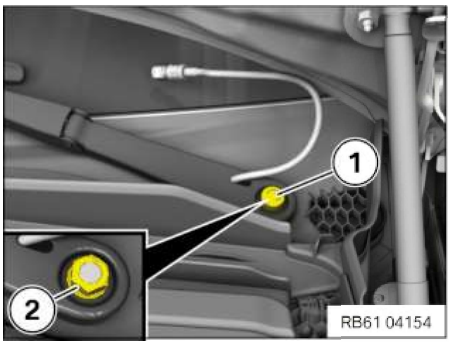
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

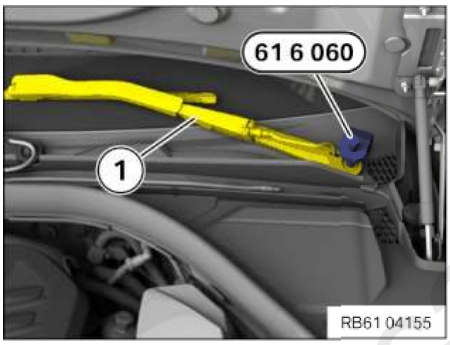
- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Disconnect the windscreen wash hose(1) at the separation point and remove from the cowl guide.

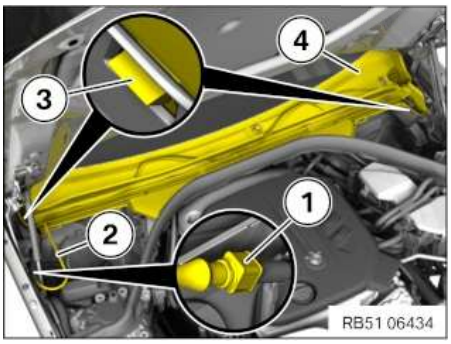


- Remove the protective cap (1).
- Loosen nut (2).



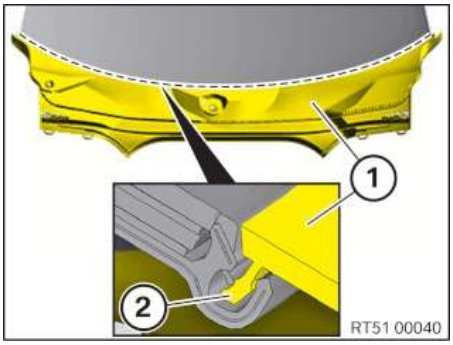
- Pull off the wiper arm (1) using special tool .

6 – Remove cowl panel cover



- Release snap fastener of the washer fluid hose (1) and put the washer fluid hose(2) to one side.
- Unclip clips (3) on the cowl panel cover (4).

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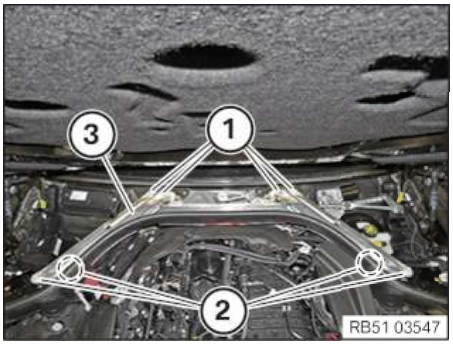


- Pull the cowl panel cover (1) upward out of the latch mechanism (2) beginning on the side.

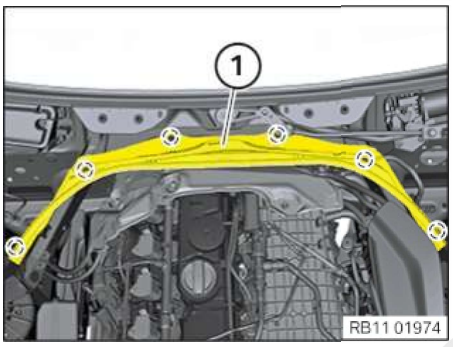
7 – Removing the centre bulkhead upper part

TECHNICAL INFORMATION

Driving without the strut brace/front end or tension strut is not permitted.



- **If installed:** Remove tension strut on spring strut dome.
- Loosen screws (1) and (2).
- Remove tension strut (3) in the spring strut dome upwards.



- Unscrew the bolts in the marked areas.
- Remove the centre bulkhead upper part (1).

8 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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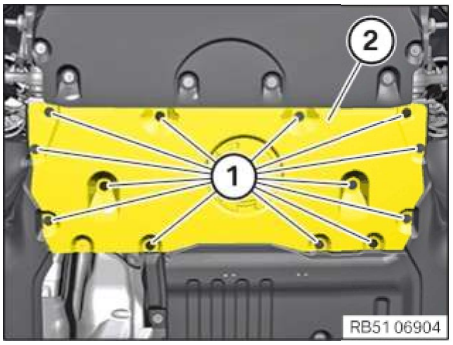
- Unclip the acoustic cover (1) from the holders in the **marked** areas towards the top.

9 – Removing acoustic cover at rear



- Unclip the acoustic cover (1) in the marked areas and remove it to the top.

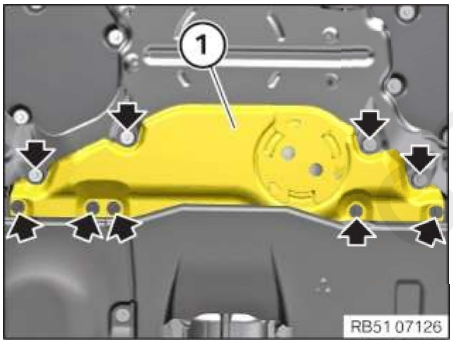
10 – Removing the centre underbody protection



- **Version with rear-wheel drive:**

  Loosen screws (1).

  Remove centre underbody protection (2) .

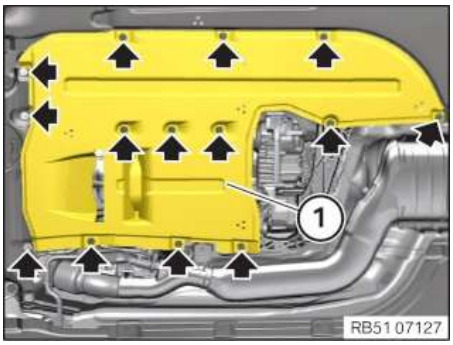


- **Version with all-wheel drive:**

  Remove screws (arrows).

  Feed out and remove the centre underbody protection (1).

11 – Remove rear underbody protection

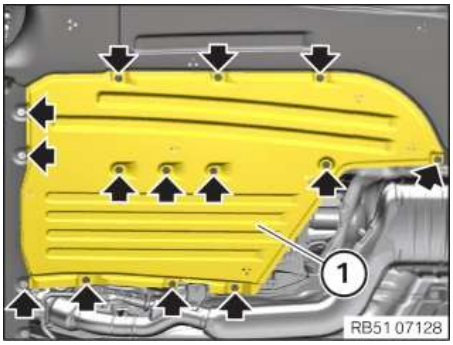


- **Version 1:**

  Remove screws (arrows).

  Feed out the rear underbody protection (1).

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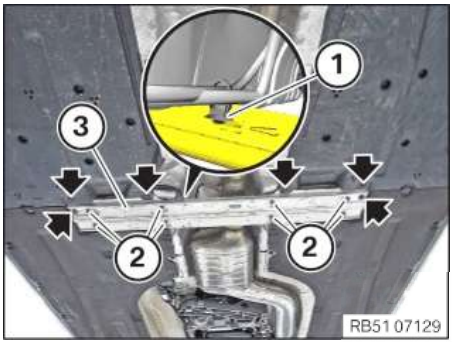


- **Version 2:**

  Remove screws (arrows).

  Guide out rear underbody protection (1) and remove it.

12 – Remove the connecting support from the tunnel



- Remove screws (arrows).
- **If installed:** Loosen clamp (1).
- Loosen screws (2).
- Guide out and remove connecting support (3) on the tunnel.

13 – Remove complete exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Component with heavy weight.

Danger of injury!

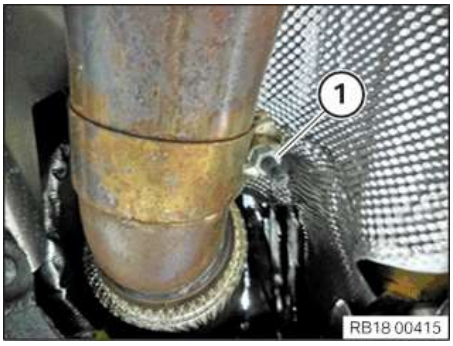
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

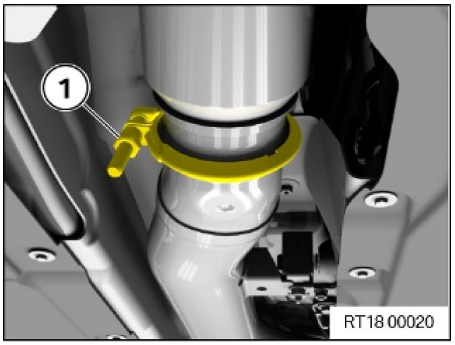
- Remove and install heavy components with the aid of another person/other persons.



- **Equipment specification 1 (ribbon clamp)**

  Detach the ribbon clamp (1).

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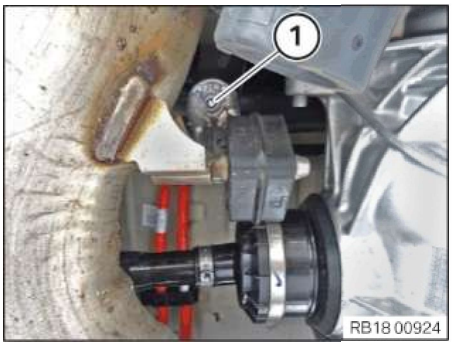


- **Equipment specification 2 (V-clips)**

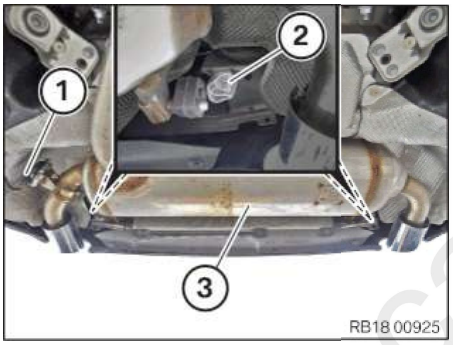
  Unfasten clamp (1).



- Loosen nut (1).

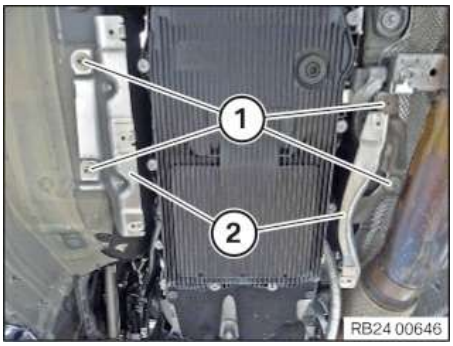


- Release nut (1) on the rear axle support.



- Unlock plug connection (1) and disconnect.
- Loosen nuts (2).
- Lower and remove the exhaust system (3) with the assistance of a second person.

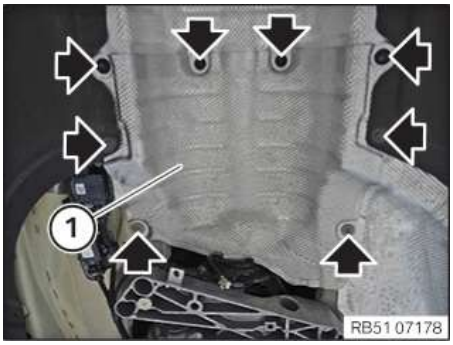
14 – Remove the retaining plates



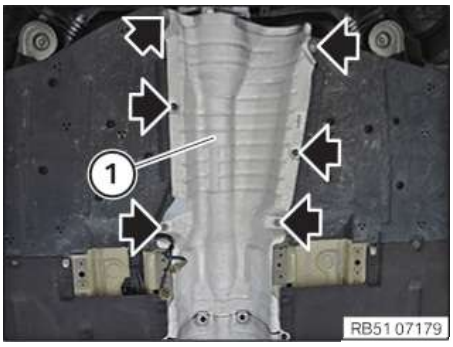
- Loosen nuts (1).
- Feed out retaining plates (2) and remove.

15 – Remove heat shields

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- Loosen bolts and nuts (arrows).
- Remove heat shield (1).



- Loosen bolts and nuts (arrows).
- Remove heat shield (1).

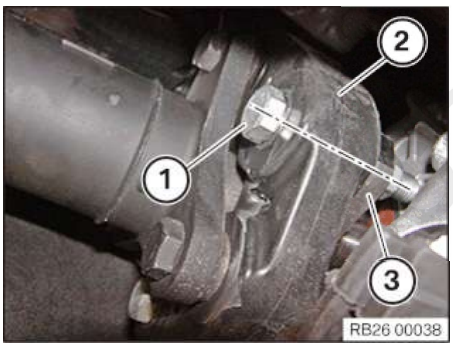
16 – Partially release propeller shaft

RISK OF DAMAGE

Damage to propeller shaft during removal.

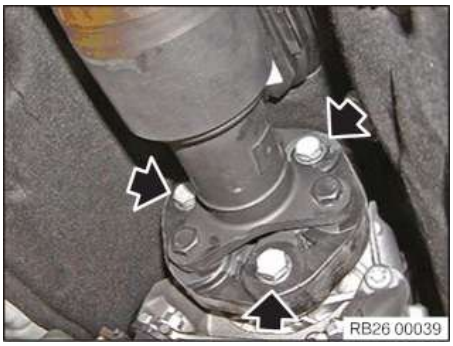
Non-observance of the removal guidelines for the propeller shaft on the rear axle differential may cause severe damage.

- Do not disassemble the three-hole flange, flexible disc and propeller shaft. The three-hole flange to the rear axle differential is balanced with the flexible disc and propeller shaft.
- Loosen the recessed nut against the direction of travel in clockwise direction. The propeller shaft must be loosened on the recessed nut only and exclusively in the direction of rotation otherwise the anti-twist lock of the bi-hexagonal flange nut is damaged.
- In the event of a damaged anti-twist lock on the bi-hexagonal flange nut: Replace the rear axle differential.

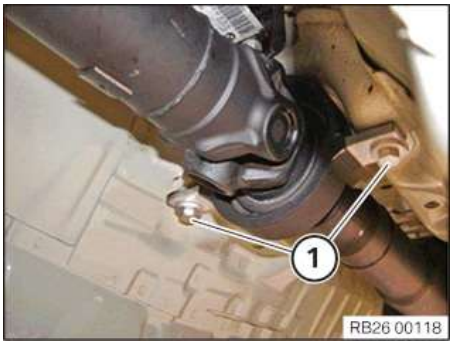


- Mark the installation position of the screw connection (1) of the flexible disc (2) and the three-hole flange (3).

  The mark makes it possible for the propeller shaft to be installed again in the same position. This should prevent a humming noise from the drive train during driving.



- Remove screws (arrows).



- Unscrew the bolts (1) on the centre mount and hold down the propeller shaft.

  Major deflection angles of the propeller shaft may damage the propeller shaft and/or the joints.
- Tie up propeller shaft to underbody.

17 – Removing the DME control unit

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

In a warranty case, you must always provide a fault memory printout with the defective part, even if the fault memory does not contain an entry.

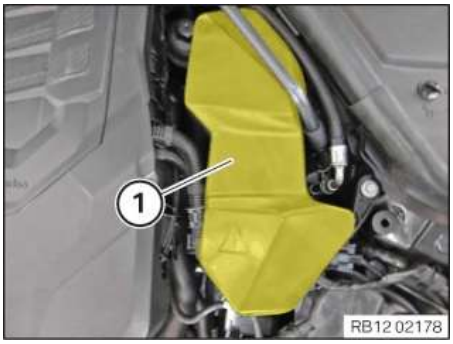
TECHNICAL INFORMATION

Control unit must be programmed after it is replaced.

For additional information see: 61 00 ... Programming/encoding control unit(s)

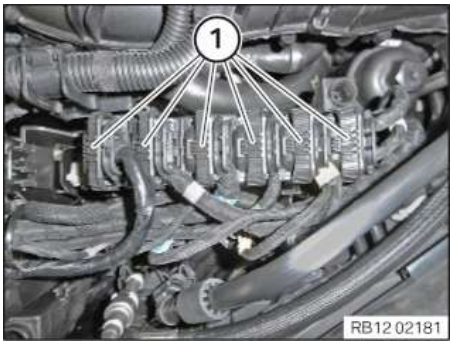
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

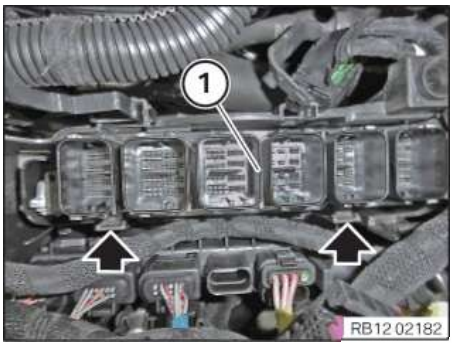


- Pull the cover (1) towards the top and feed out.

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- Unlock and disconnect the plug connection (1).



- Unlock the locks (arrows).
- Guide out and remove DME control unit (1).

18 – Removing integrated supply module (PDM)

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

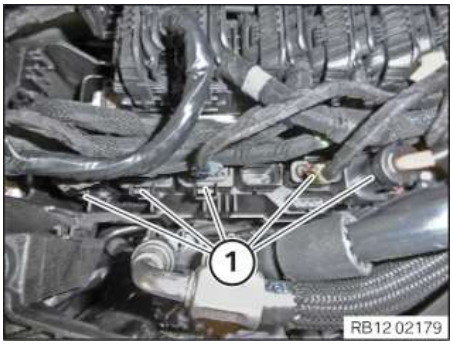
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

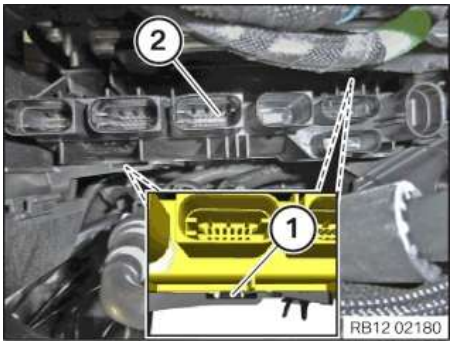
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



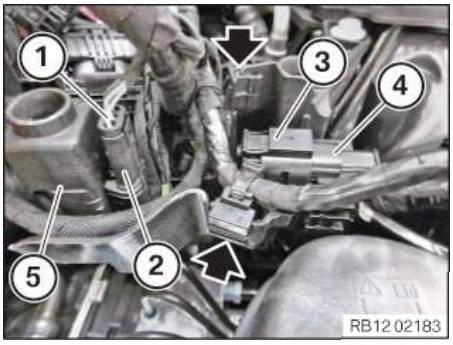
- Unlock and disconnect plug connections (1).

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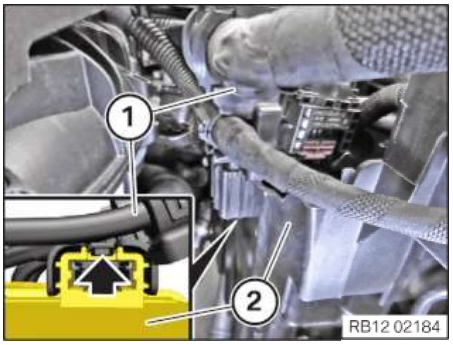


- Unlock the latch mechanisms (1).
- Guide out and remove integrated supply module (PDM) (2) upwards.

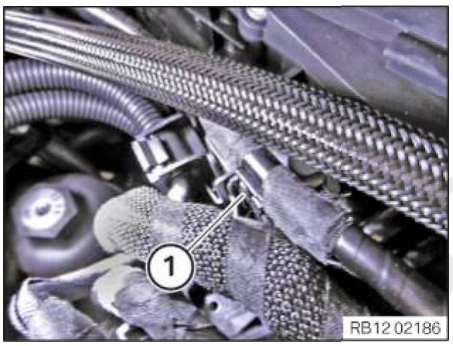
19 – Removing the control unit holder



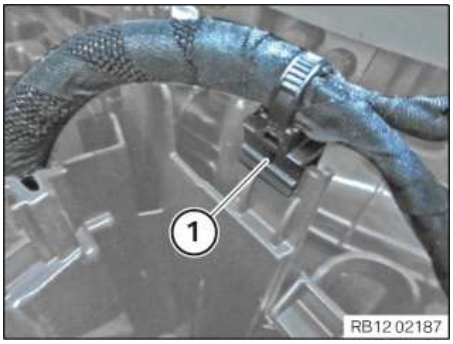
- Unlock plug connection (1) and disconnect.
- Unlock the connector (2) and disconnect from the starter (5).
- Unlock plug connection (3) and disconnect.
- Unlock the connector (4) and disconnect from the starter (5).
- Release the clamps (arrows).



- Unlock the lock (arrow).
- Disconnect the cable plug (1) upwards from the control unit holder (2).

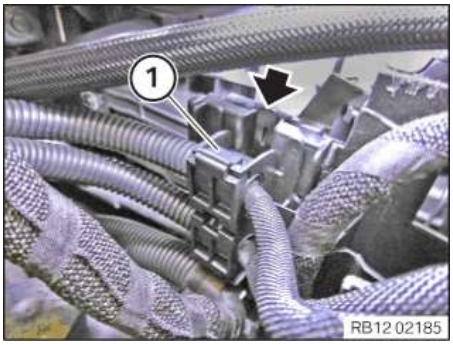


- Loosen clamp (1).

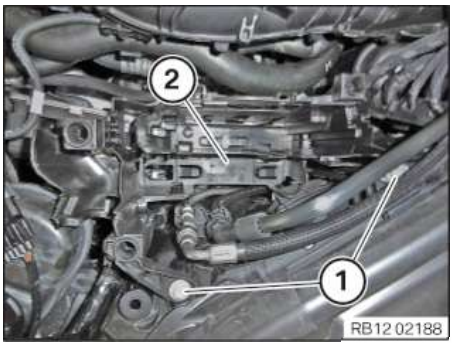


- Loosen clamp (1).

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- Unlock the lock (arrow).
- Feed out the cable clip (1) upwards and set it aside.

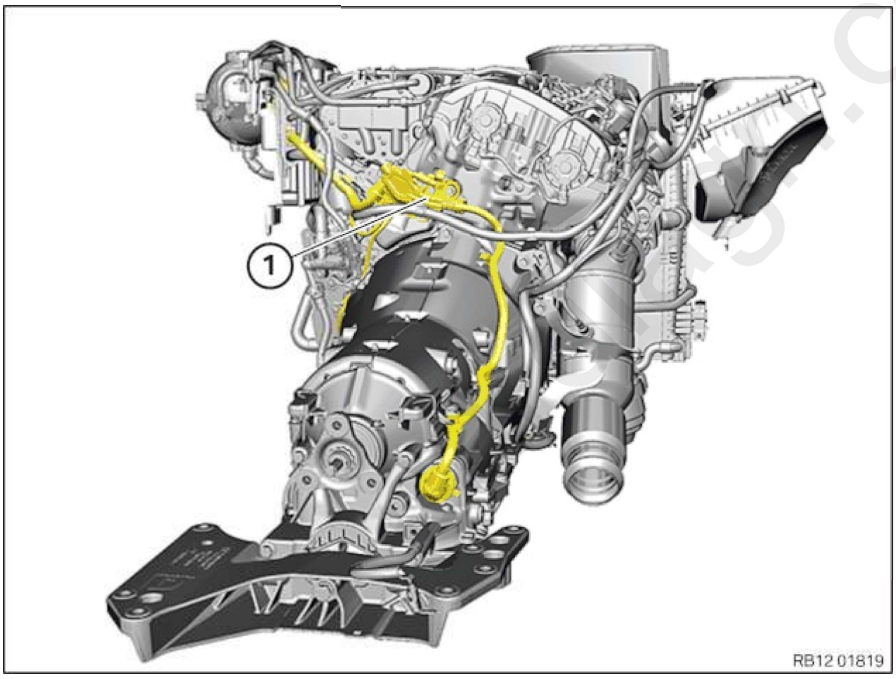


- Loosen screws (1).
- Guide out and remove the control unit holder (2).

MAIN WORK

20 – Removing the wiring harness section of the transmission wiring harness

Wiring harness section of transmission wiring harness



1 Wiring harness section of transmission wiring harness

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

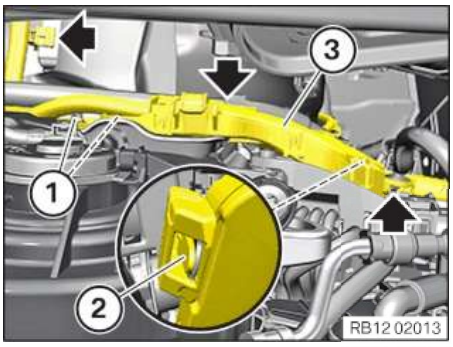
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

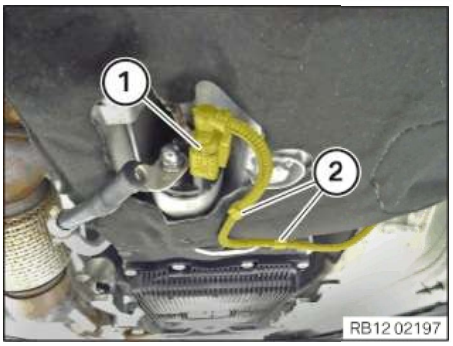
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

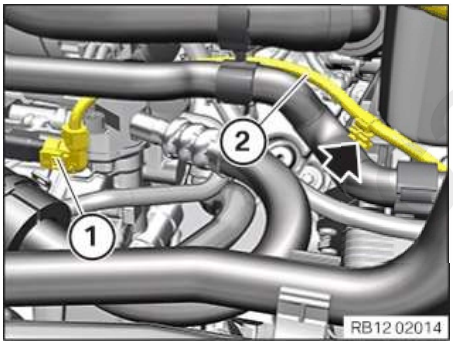
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



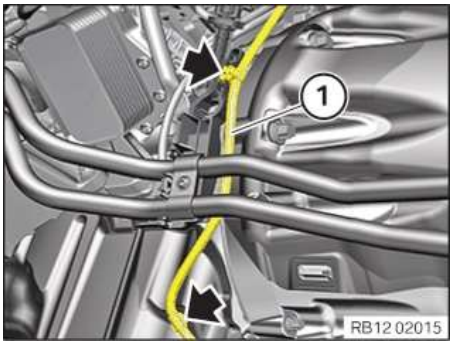
- Release clamps (Arrows) and place aside.
- Loosen screws (1).
- Unlock lock (2).
- Remove wiring harness section (3) of the transmission wiring harness and put to one side.



- Unlock plug connection (1) and disconnect.
- Loosen clamps (2).



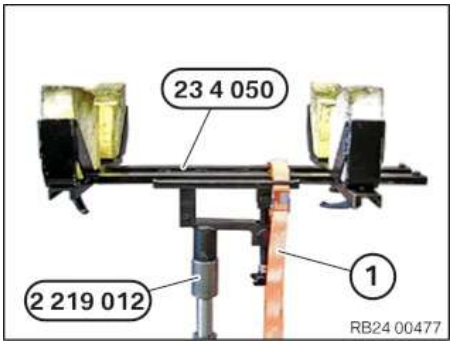
- Unlock plug connection (1) and disconnect.
- Loosen the clamp (arrow).
- Remove wiring harness section (2) of the transmission wiring harness and put to one side.



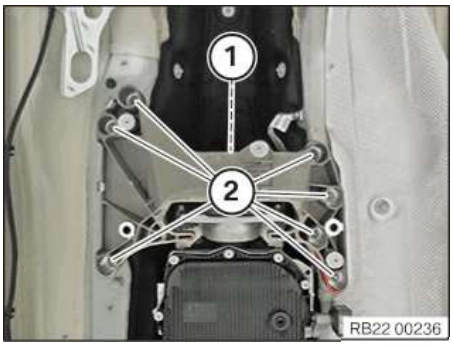
- Release the clamps (arrows).
- Remove wiring harness section (1) of the transmission wiring harness and put to one side.

▸ **Slightly lower the transmission**

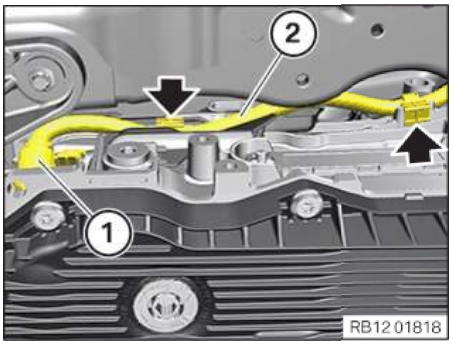
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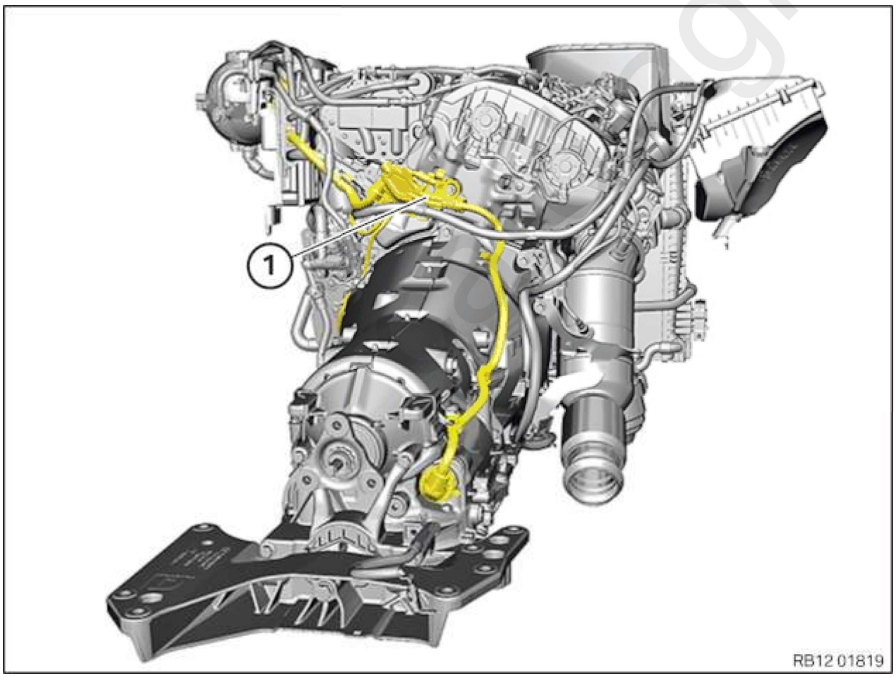
- Support the transmission using special tools 2 219 012 and 0 495 498 (23 4 050).
- Secure the transmission with the tensioning strap (1).



- Loosen screws (2).
- Lower the transmission cross member with the transmission (1) a little.



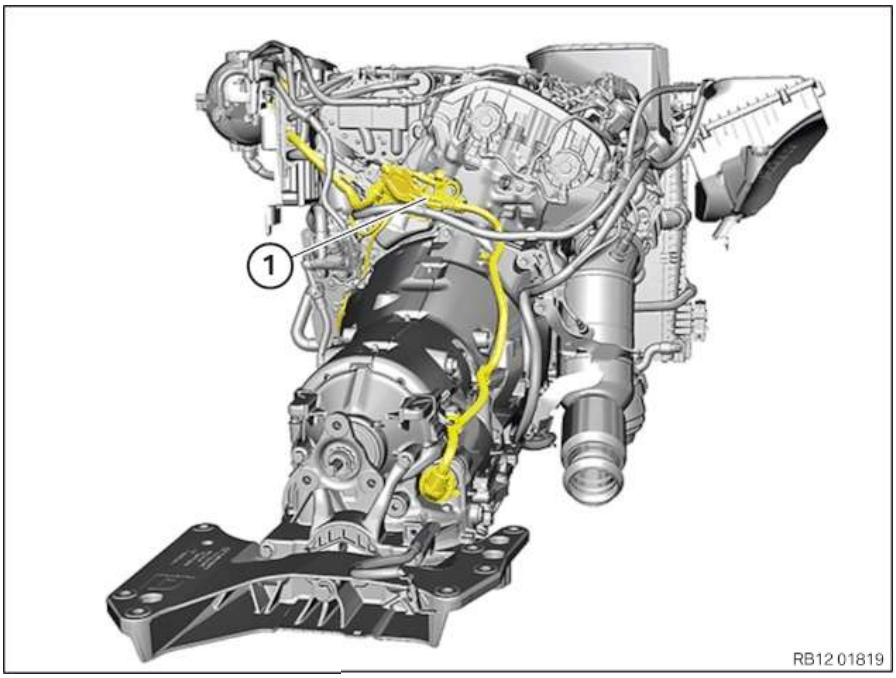
- Unlock plug connection (1) and disconnect.
- Release the clamps (arrows).
- Remove wiring harness section (2) of the transmission wiring harness and put to one side.



- Unthread and remove wiring harness section (1) of transmission wiring harness.

21 – Installing the wiring harness section of the transmission wiring harness

Wiring harness section of transmission wiring harness



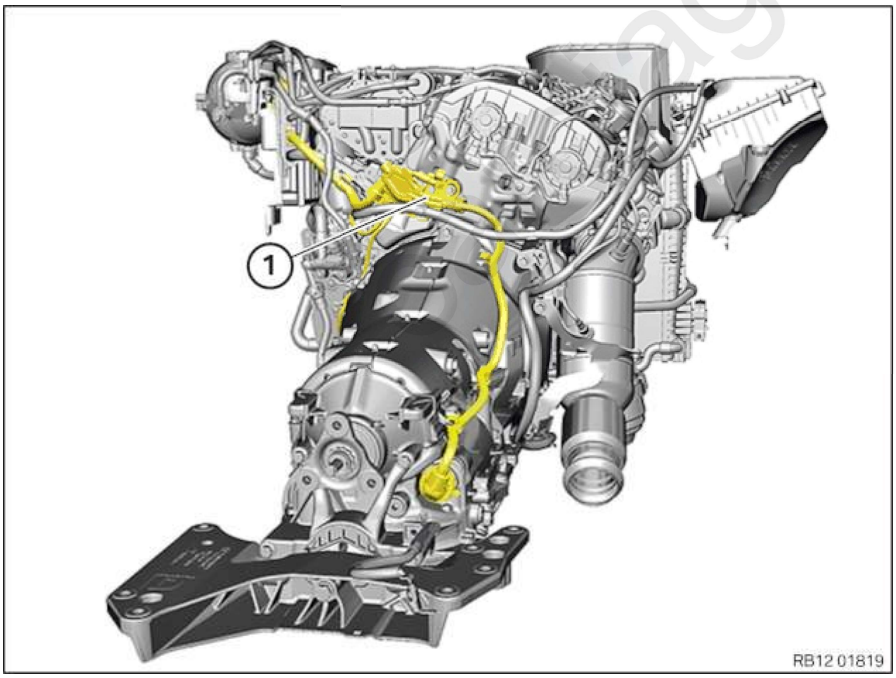
1 Wiring harness section of transmission wiring harness

RISK OF DAMAGE

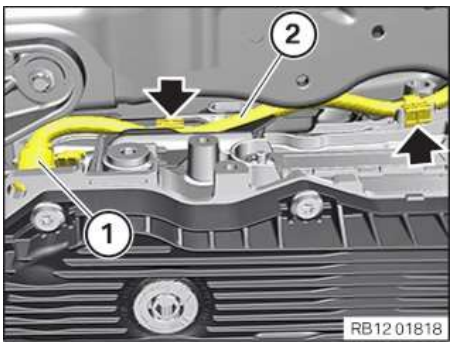
Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.



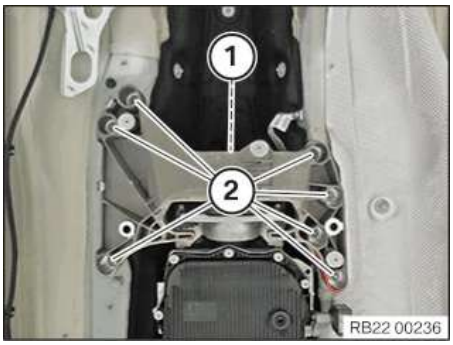
- Insert and install wiring harness (1) of the transmission module.



- Thread in the wiring harness section (2) of the transmission wiring harness and install.
- Secure the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

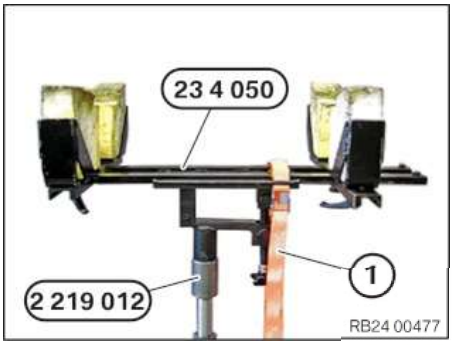
▶ **Fasten the transmission**



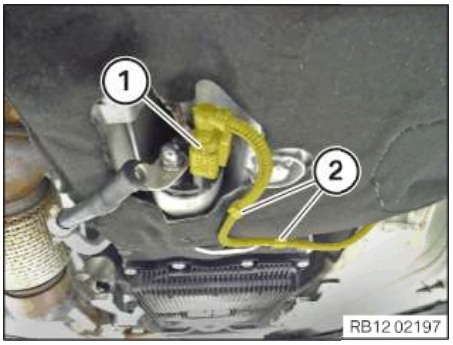
- Lift the transmission cross member with the transmission (1) into the mounting orientation.
- Tighten down screws (2).

Transmission cross member to body

M8	Renew screws.	Tightening torque	19 Nm

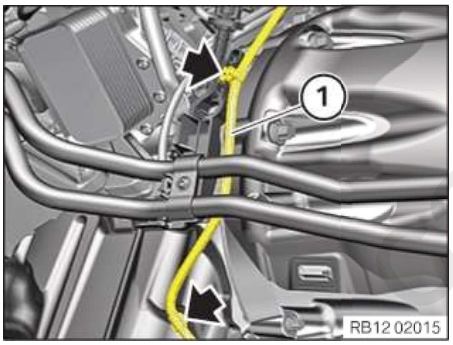


- Loosening the tensioning strap (1).
- Remove special tools 2 219 012 and 0 495 498 (23 4 050).

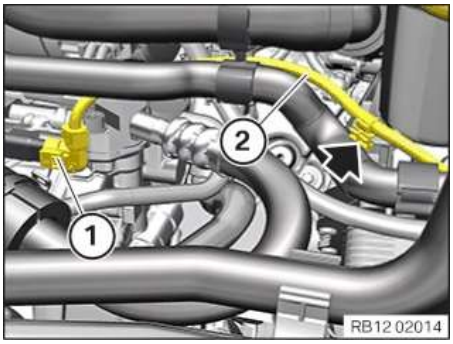


- Install the wiring harness section (3) and fasten it with the clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



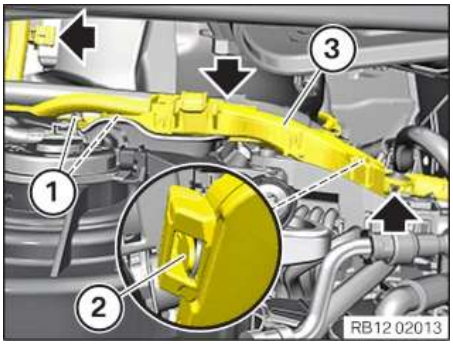
- Thread in the wiring harness section (1) of the transmission wiring harness and install.
- Secure the clamps (arrows).



- Thread in the wiring harness section (2) of the transmission wiring harness and install.
- Secure clamp (arrow).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

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- Thread in the wiring harness section (3) of the transmission wiring harness and install.
- Ensure that lock (2) engages correctly.
- Tighten the screws (1).

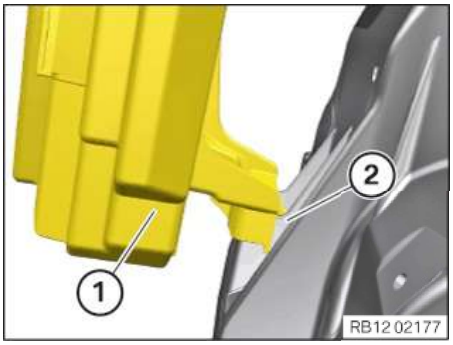
Cable routing to cylinder head, rear

M6 x 20		Tightening torque	8 Nm

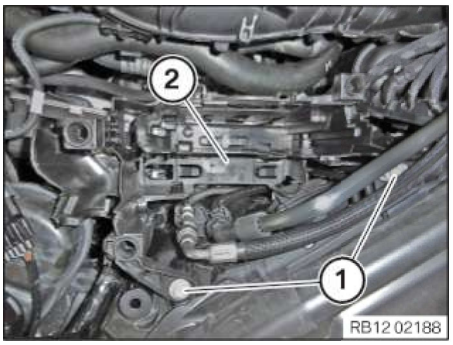
- Secure the clamps (arrows).

POSTPROCESSES

22 – Installing the control unit holder



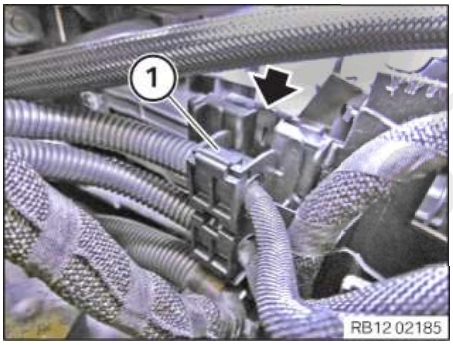
- Make sure the bottom control unit holder (1) is inserted correctly into the fixture (2).



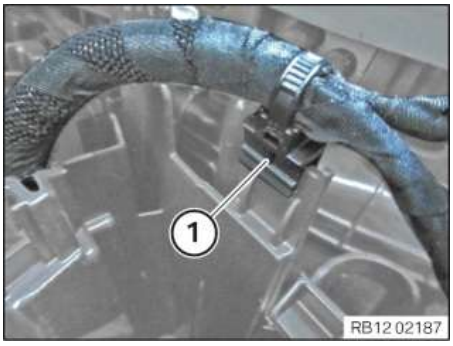
- Guide in and install control unit holder (2).
- Tighten the screws (1).

Control unit holder on spring strut dome

Hexagon screw		Tightening torque	8 Nm

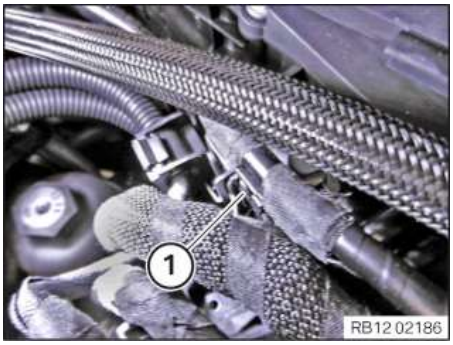


- Feed in and install the cable clip (1).
  Lock (arrow) must audibly engage.

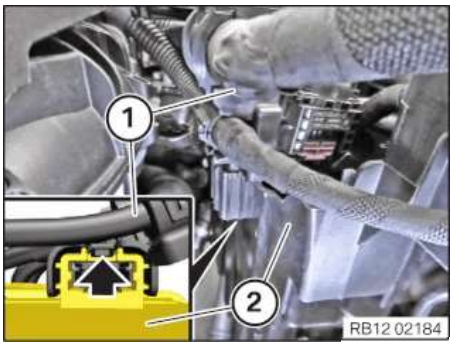


- Secure clamps (1).

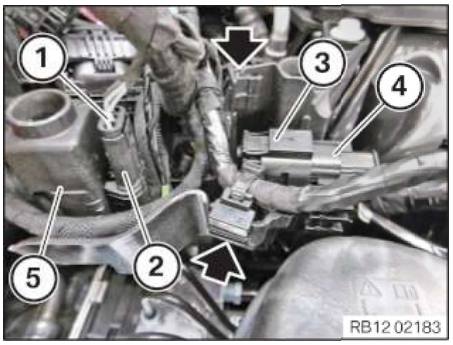
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- Secure clamps (1).



- Connect the cable clip (1) with the control unit holder (2) and lock.
  Lock (arrow) must audibly engage.



- Connect and lock the connector (4) with the control unit holder (5).
  The connector (4) must engage audibly.
- Connect connectors (3) and lock.
  The connector (3) must engage audibly.
- Connect and lock the connector (2) with the control unit holder (5).
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.
- Secure the clamps (arrows).

23 – Installing the integrated supply module (PDM)

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

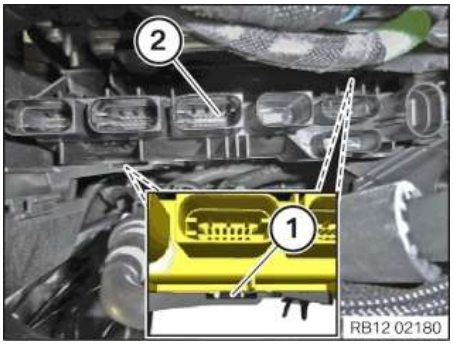
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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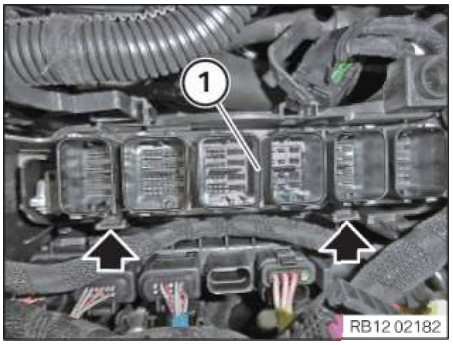


- Insert and install the integrated supply module (PDM) (2).
  The latch mechanisms (1) must engage audibly.
- Unlock the latch mechanisms (1).



- Connect connectors (1) and lock.
  The connectors (1) must engage audibly.

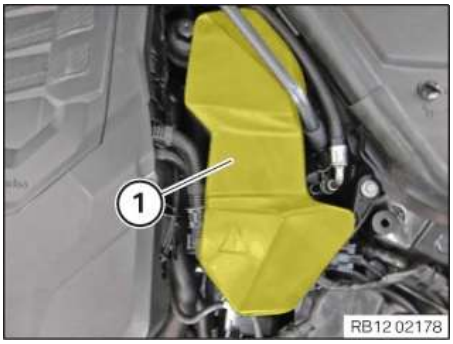
24 – Installing the DME control unit



- Feed in and install DME control unit (1).
  The locks (arrows) must engage audibly.



- Connect connectors (1) and lock.
  All connectors (1) must engage audibly.



- Insert and install cover (1) into guides.

25 – Partially installing the propeller shaft

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- Check centring (1) for damage; renew if necessary.

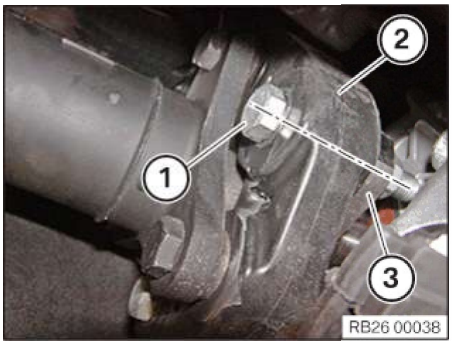


- Apply a thin coat of grease to the soft centring (1), if necessary.

  Do not grease the hard centring (2).

Expendable materials

Lubricating grease Olistamoly 2 LN 584 LO	100 g, Tube	83 19 0 447 919

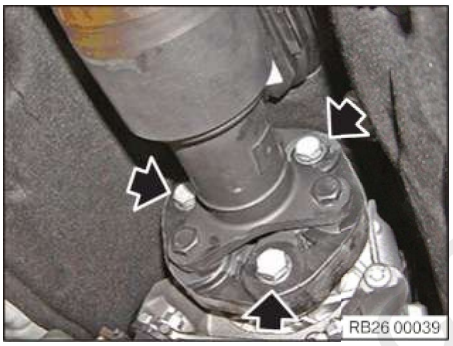


- Renew screws and the self-locking nuts.

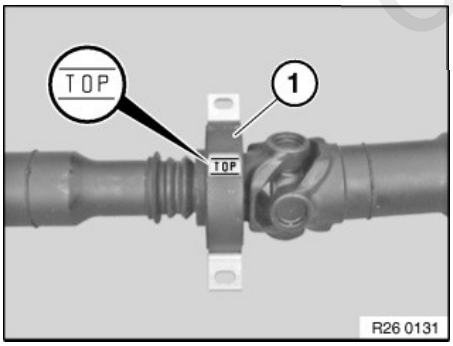
  Parts: Screws, self-locking nuts

- Assemble the screw connections (1) of the flexible disc (2) and the three-hole flange (3) according to the self-affixed identification.

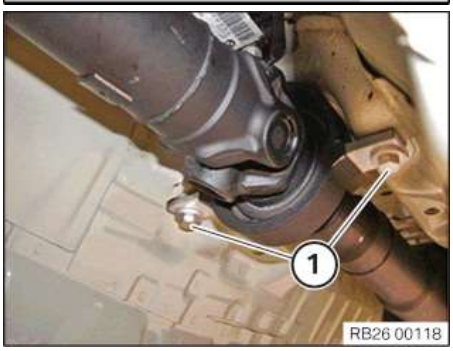
  This should prevent a humming noise from the drive train during driving.



- Hand-tighten the screws and nuts (arrows), but do not tighten fully.



- **Centre mount with TOP marking:**
- The centre mount (1) must be installed with the TOP marking at the top in the gearbox tunnel.



- Position centre mount.
- Hand-tighten the bolts (1), but do not tighten fully.

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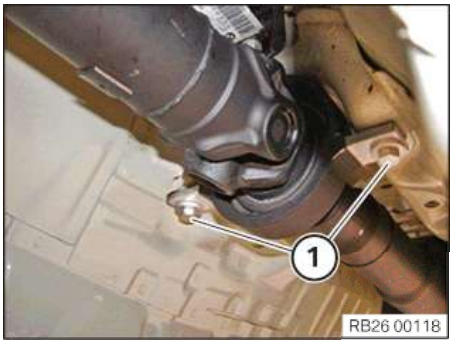
- Renew screws.

  Parts: Bolts
- Provide counter support for the bolts of the flexible disc on the nut and tighten with the bolts.

Front flexible disc to propeller shaft

M12	Renew screws. Comply with jointing torque and angle of rotation. Tightening via screw.	Jointing torque Angle of rotation	55 Nm 90 °

- Secure the special tool 0 490 504 (00 9 120) with the special tool on the vehicle underbody and continue to screw it in according to the angle of rotation.

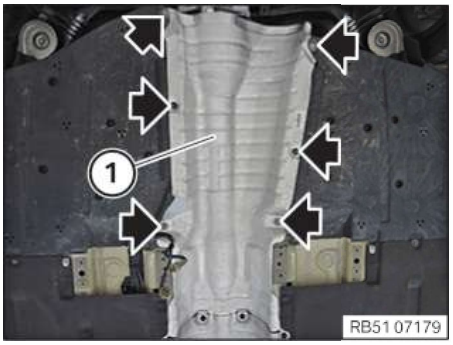


- Tighten the screws (1).

Centre mount to body

M8		Tightening torque	19 Nm

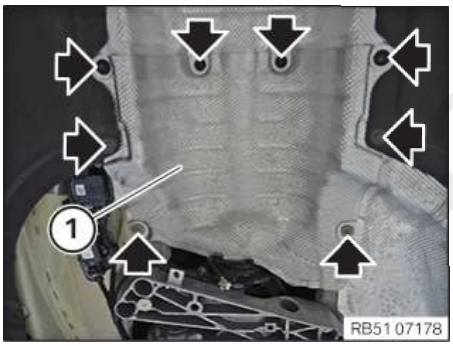
26 – Install the heat shields



- Install heat shield (1).
- Tighten the nuts and bolts (arrows).

Heat shield to vehicle underbody

Screws and nuts		Tightening torque	3 Nm

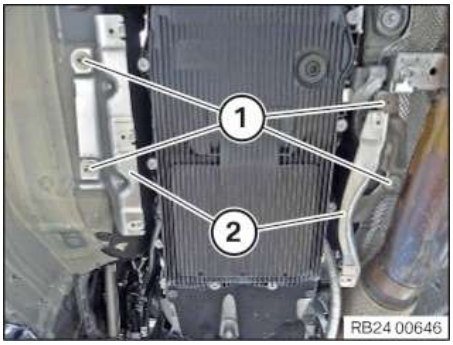


- Install heat shield (1).
- Tighten the nuts and bolts (arrows).

Heat shield to vehicle underbody

Screws and nuts		Tightening torque	3 Nm

27 – Install the retaining plates



- Feed in retaining plate (2) and install.
- Tighten nuts (1).

Retaining plates for vehicle underbody cover

Sheet metal nut	Replace nuts.	Tightening torque	3 Nm

28 – Installing the complete exhaust system

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CAUTION

Component with heavy weight.

Danger of injury!

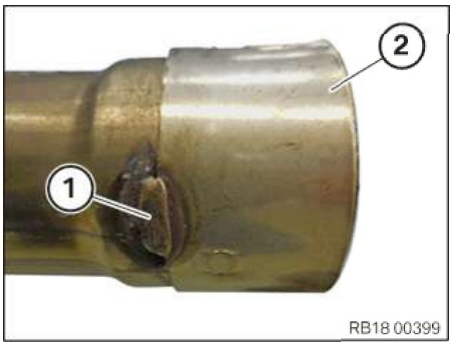
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



CAUTION

Swarf resulting from sawing or grinding components.

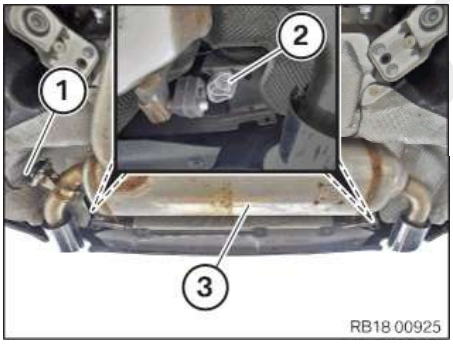
Danger of injury!

- Conduct all work in appropriate personal protective equipment only.
- Wear safety goggles and protective gloves.

- **Equipment specification 1 (ribbon clamp)**

  Open the weld seam (1) with a conventional tool.
- Remove ribbon clamp (2).
- Renew the (2) ribbon clamp.

  Parts: Ribbon cable clamp



- Feed in and install the exhaust system (3) with a second person.
- Renew nuts (2).

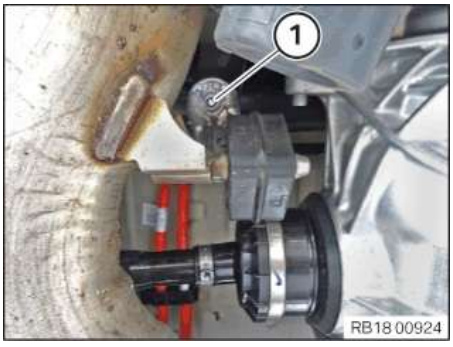
  Parts: Nuts
- Tighten nuts (2).

Rear silencer to body / bumper support

M8	Replace nuts.	Tightening torque	19 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.



- Renew nut (1).

  Parts: Nut
- Tighten the bolt (1) on the rear axle support.

Exhaust system to rear axle carrier

Nut M8	Renew nut.	Tightening torque	19 Nm

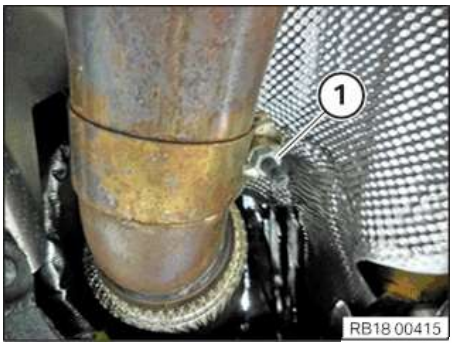


- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Front silencer / petrol particulate filter on transmission bracket

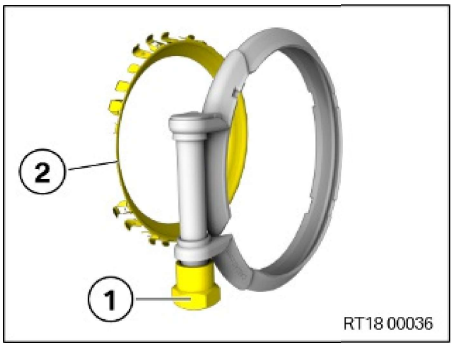
M8	Renew nut.	Tightening torque	19 Nm



- Tighten the ribbon clamp (1).

Exhaust system to catalytic converter

Ribbon cable clamp	Renew flat band clip.	Tightening torque	26 Nm

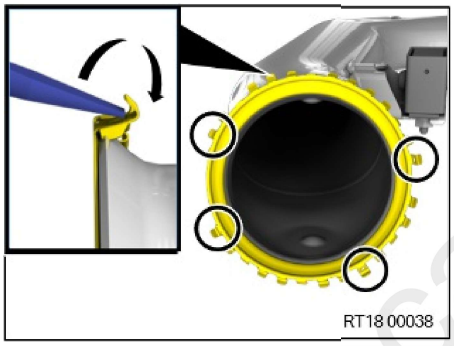


- **Equipment specification 2 (V-clips)**

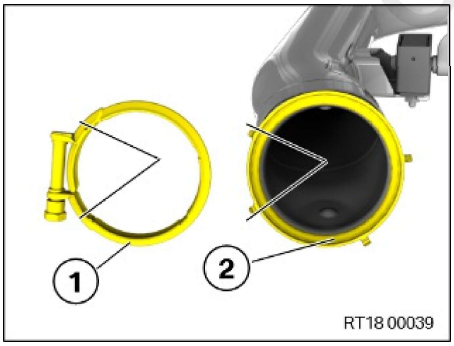
  Renew V-band clamp.

  Parts: V-band clamp

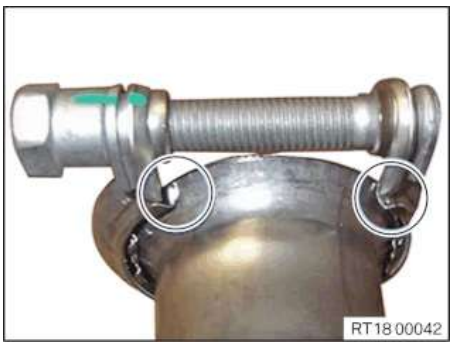
  Unscrew the nut (1) and remove the sealing ring (2).



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

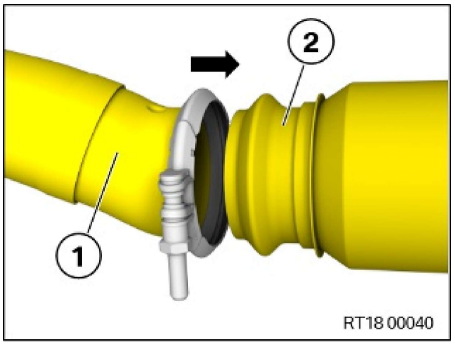


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

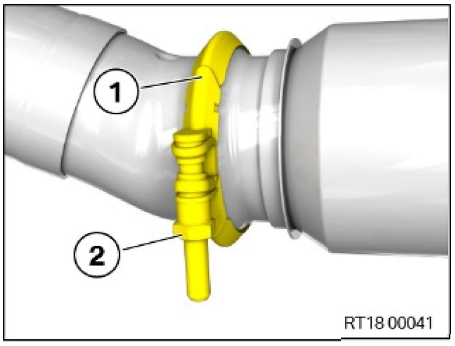


- Ensure that the V-clip rests against the sheet metal tabs in the marked areas after mounting.

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- Connect the exhaust system (1) with the catalytic converter (2) and position it correctly (arrow).

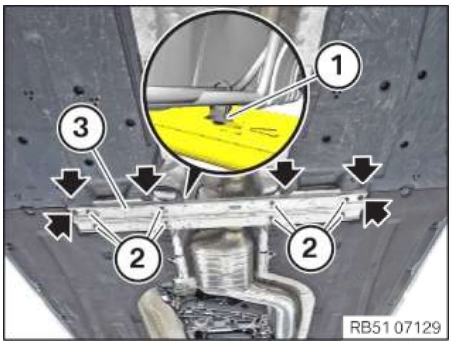


- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

29 – Install the connecting supports on the tunnel



- Guide in and install connecting support (3) on the tunnel.
- Tighten the screws (2).

Connecting support to tunnel

M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

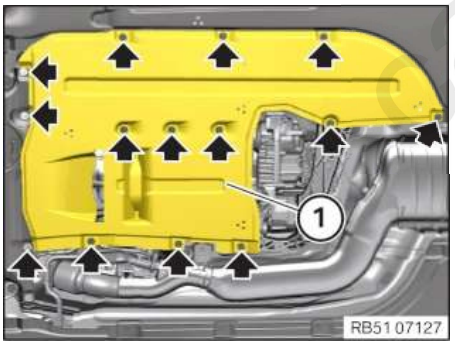
- Tighten screws (arrows).

Connecting support to tunnel

M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

- **If installed:** Secure clamps (1).

30 – Installing underbody protection at rear



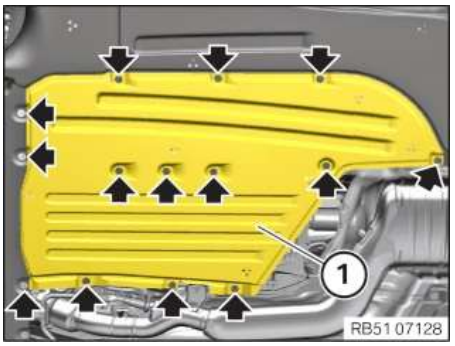
- **Version 1:**

  Insert and install the rear underbody protection (1).

  Tighten screws (arrows).

Underbody protection

Hexagon screw		Tightening torque	3 Nm



- **Version 2:**

  Insert and install the rear underbody protection (1).

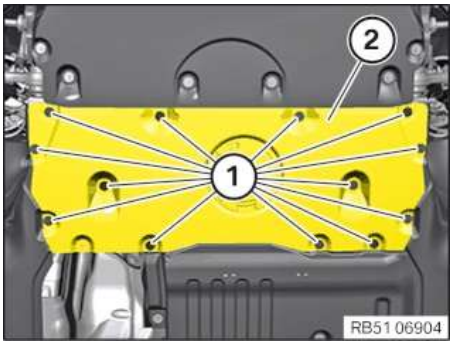
  Tighten screws (arrows).

Underbody protection

Hexagon screw		Tightening torque	3 Nm

31 – Installing the centre underbody protection

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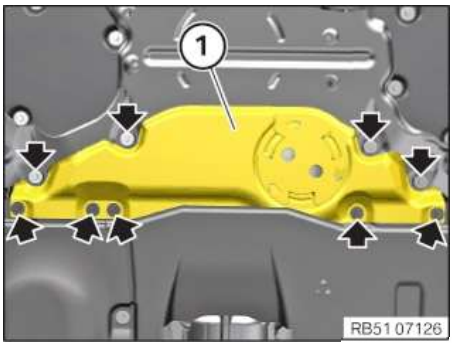
- **Version with rear-wheel drive:**

  Position central underbody protection (2).

  Tighten the screws (1).

Underbody protection

Hexagon screw		Tightening torque	3 Nm



- **Version with all-wheel drive:**

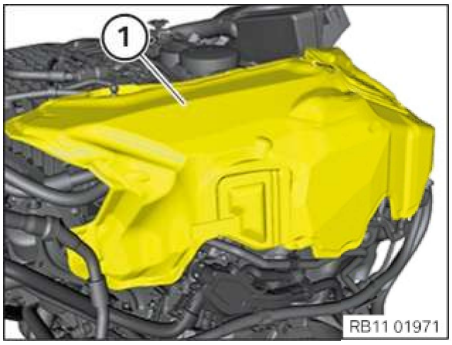
  Guide in and install the centre of underbody protection (1).

  Tighten screws (arrows).

Underbody protection

Hexagon screw		Tightening torque	3 Nm

32 – Installing acoustic cover at rear



- Make sure the acoustic cover (1) is correctly positioned on the rear side of the engine.



- Install the acoustic cover (1) from the top and clip it in into the marked areas.

33 – Install acoustic cover

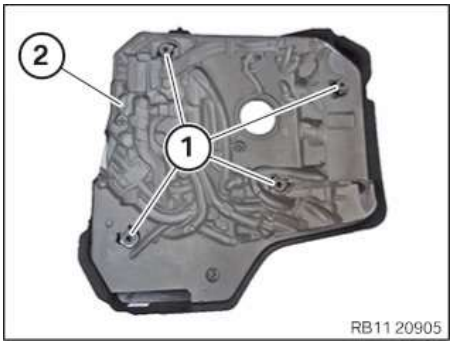
RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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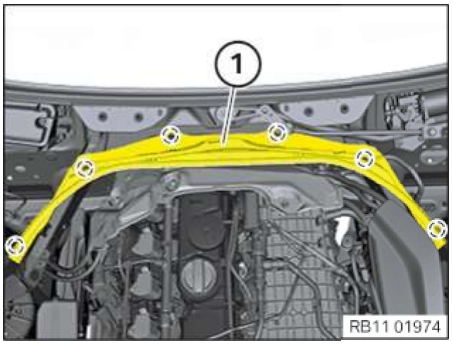
- Check all rubber mounts (1) of acoustic cover (2) for correct seating.



- Clip in the acoustic cover (1) into the holders in the **marked** areas.

  The acoustic cover (1) must audibly engage into place.

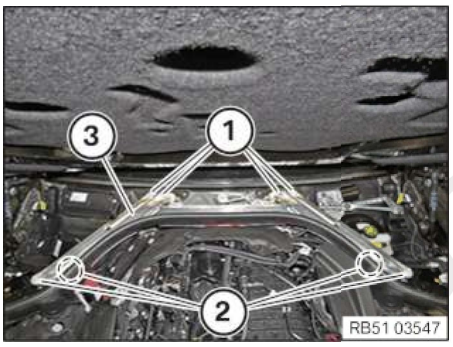
34 – Installing the centre bulkhead upper part



- Position the centre bulkhead upper part (1).
- Tighten the bolts in the marked areas.

Bulkhead upper part to bottom bulkhead

		Tightening torque	3 Nm



- **If installed:** Install tension strut on spring strut dome.
- Install the tension strut (3) on the spring strut dome.
- Tighten the screws (1).

Tension strut on bulkhead

M10x25 screw		Tightening torque	56 Nm

- Renew screws (2).

  Parts: Bolts
- Tighten the screws (2).

Tension strut to spring strut dome

Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

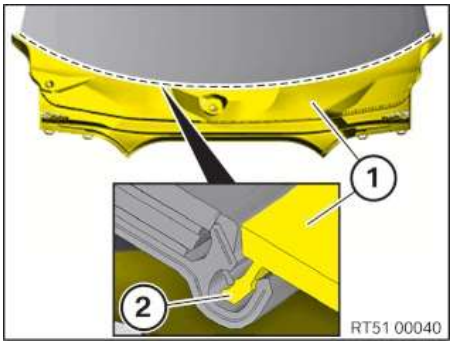
35 – Installing cowl panel cover

RISK OF DAMAGE

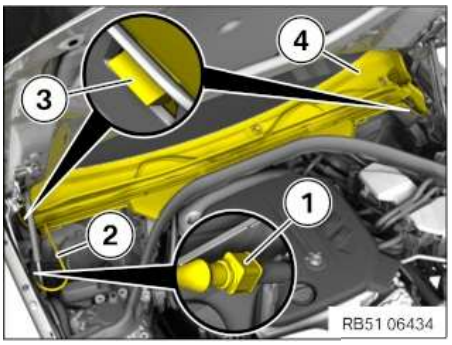
Damage caused by water ingress into the vehicle.

Water ingress into the vehicle may result in damage to components, malfunctions and corrosion.

- Ensure correct installation of the components.
- Only use undamaged components.



- Push the cowl panel cover (1) into the latch mechanism (2) beginning on the side.



- Clip cowl panel cover (4)in by means of the latch mechanisms (3).
- Position windscreen wash hose (2) and connect windscreen wash hose (1)quick lock.

36 – Installing both wiper arms

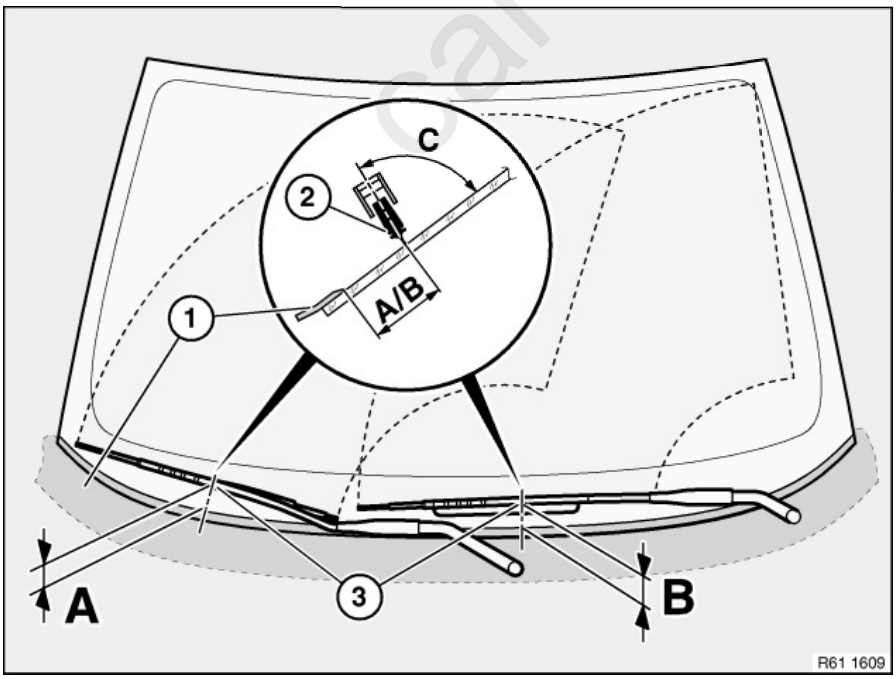
NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.

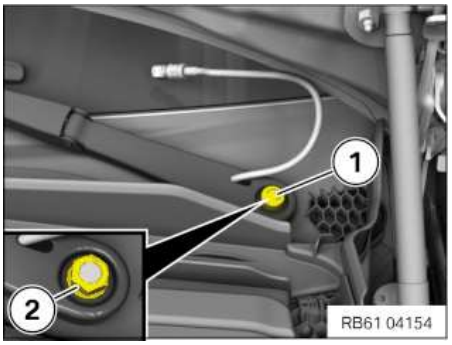


- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).

Distance from window pane edge to wiper blade

Wiper arm right (A)	57,5 ± 5 mm
Wiper arm left (B)	63,3 ± 4 mm

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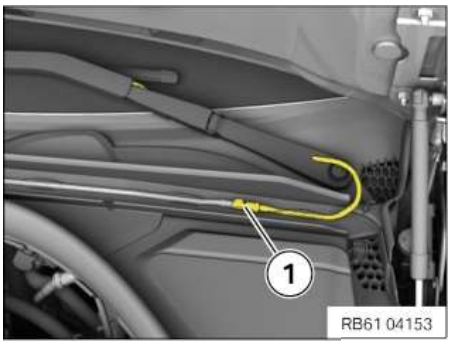


- Tighten nut (2).

Windscreen wiper arm

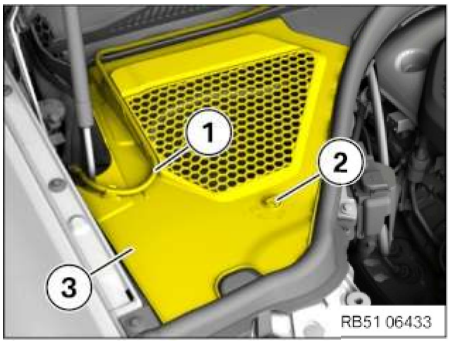
Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).



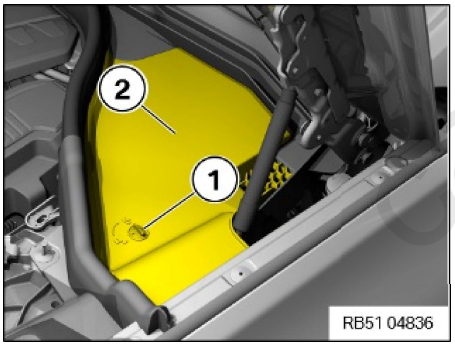
- Insert windscreen wash hose (1) into the cowl and connect at the separating point.

37 – Install the rear right engine compartment cover



- Position the cover of the engine compartment on the rear right (3).
- Close lock (2).
- Insert washer fluid hose (1) into the guides.

38 – Install the cover of the engine compartment on the rear left



- Position the engine compartment cover at the rear left (2) .
- Close lock (1).

39 – Install the seal for the bonnet



- Press the rear bonnet seal (2) into the guide.
- Feed in cable (1) into the brackets.
- Check that the rear bonnet seal (2) and the cable (1) are seated correctly.

40 – Disconnecting all battery earth leads

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- See additional information.

Additional Information

Overview of Tightening Torques

Transmission cross member to body			Used in step 21
M8	Renew screws.	Tightening torque	19 Nm

Cable routing to cylinder head, rear			Used in step 21
M6 x 20		Tightening torque	8 Nm

Control unit holder on spring strut dome			Used in step 22
Hexagon screw		Tightening torque	8 Nm

Front flexible disc to propeller shaft			Used in step 25
M12	Renew screws. Comply with jointing torque and angle of rotation. Tightening via screw.	Jointing torque Angle of rotation	55 Nm 90 °

Centre mount to body			Used in step 25
M8		Tightening torque	19 Nm

Heat shield to vehicle underbody			Used in step 26
Screws and nuts		Tightening torque	3 Nm

Retaining plates for vehicle underbody cover			Used in step 27
Sheet metal nut	Replace nuts.	Tightening torque	3 Nm

Rear silencer to body / bumper support			Used in step 28
M8	Replace nuts.	Tightening torque	19 Nm

Exhaust system to rear axle carrier			Used in step 28
Nut M8	Renew nut.	Tightening torque	19 Nm

Front silencer / petrol particulate filter on transmission bracket			Used in step 28
M8	Renew nut.	Tightening torque	19 Nm

Exhaust system to catalytic converter			Used in step 28
Ribbon cable clamp	Renew flat band clip.	Tightening torque	26 Nm

V-clip to catalytic converter			Used in step 28
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Connecting support to tunnel			Used in step 29
M8x25 screw		Tightening torque	20 Nm
Screw		Tightening torque	3 Nm

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Underbody protection — Used in step 3031

Hexagon screw		Tightening torque	3 Nm

Bulkhead upper part to bottom bulkhead — Used in step 34

		Tightening torque	3 Nm

Tension strut on bulkhead — Used in step 34

M10x25 screw		Tightening torque	56 Nm

Tension strut to spring strut dome — Used in step 34

Screw	Renew screws.	Jointing torque	56 Nm
		Angle of rotation	90 °

Windscreen wiper arm — Used in step 36

Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

2 219 012 Hydraulic lifter



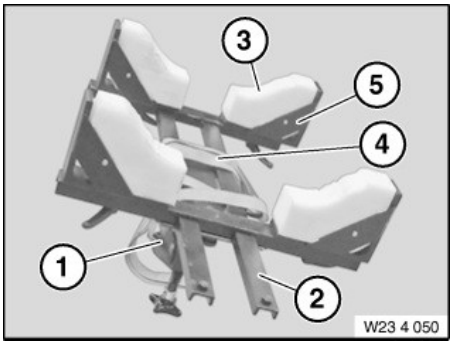
Common — Used in step 2021

Usage	For raising and lowering various vehicle components.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

0 495 498 (23 4 050) Support

Used in step 2021

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Common

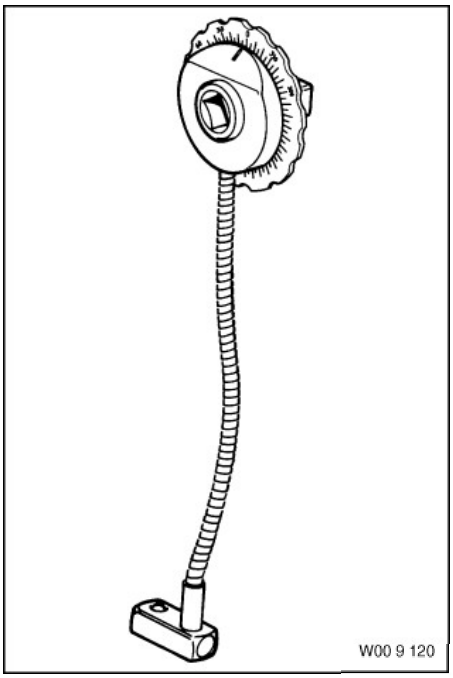
Usage	(universal gearbox holder) Support for removing and installing manual gearboxes and automatic transmissions for BMW & RR.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 06 (256)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
3	0 495 549 (23 4 053)		**Insert** (Foam material insert (1 set = 4 pieces)) deleted, can be ordered only via tool set	
1	0 495 547 (23 4 051)		**Joint** Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	
2	0 495 548 (23 4 052)		**Frame** (Basic frame) Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	
4	0 495 550 (23 4 054)		**Belt** (Tensioning strap) Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	
5	0 496 018 (23 4 055)		**Support** (Fixture for foam insert) Available only as a complete tool set 23 4 050 (83 30 0 495 498) - as of 16.07.12.	

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0 490 504 (00 9 120) Torque angle measuring dial



Common	Used in step 25
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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Overview Technical Data

Distance from window pane edge to wiper blade	Used in step 36
Wiper arm right (A)	57,5 ± 5 mm
Wiper arm left (B)	63,3 ± 4 mm

Links

General repair instructions	Used in step
12 00 ... Instructions for removal and replacement of control units	1724

Repair instructions	Used in step

61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	140
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	140
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
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61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 20 900 Disconnecting and connecting battery earth lead	140
61 35 ... Notes on ESD protection (Electro Static Discharge)	17182023
61 13 ... Unlocking and disconnecting different plug connections	20
61 00 730 Encode/program control unit(s) (after vehicle test)	24

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12 51 210 Replacing the wiring harness section for injectors and ignition coils

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Damage to battery terminal, the safety battery terminal or the intelligent battery sensor (IBS).

Damaged battery terminals can lead to malfunctions or vehicle electrical system faults.

- Pull off battery terminal from battery pole by carefully moving to and fro. Do not pry off using a tool.

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Damage to the acoustic cover.

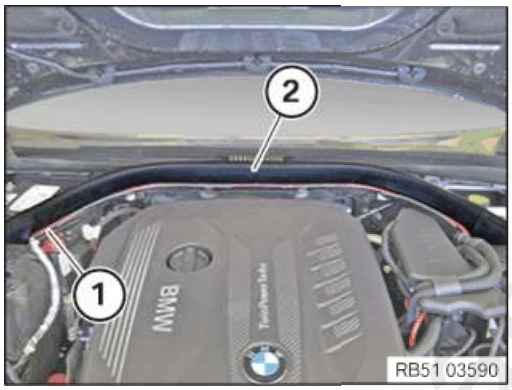
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Unclip the acoustic cover (1) from the holders in the **marked** areas towards the top.

3 – Remove the seal for the rear bonnet



- Feed the cable (1) out of the brackets toward the front.
- Remove the rear bonnet seal (2) from the guide toward the inside.

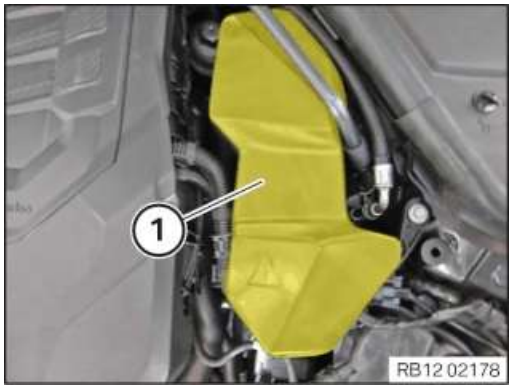
4 – Removing acoustic cover at rear



- Unclip the acoustic cover (1) in the marked areas and remove it to the top.

5 – Remove the cover of the DME control unit

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- Pull the cover (1) toward the top and remove.

MAIN WORK

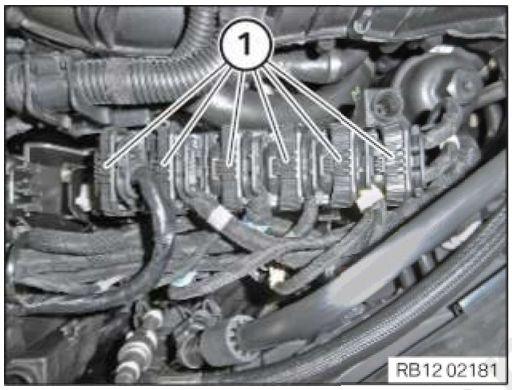
6 – Removing the wiring harness section for the ignition and injectors

RISK OF DAMAGE

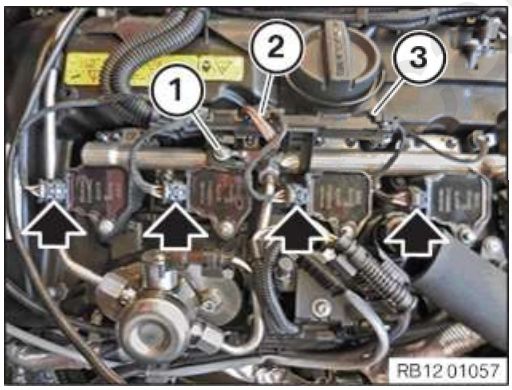
Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

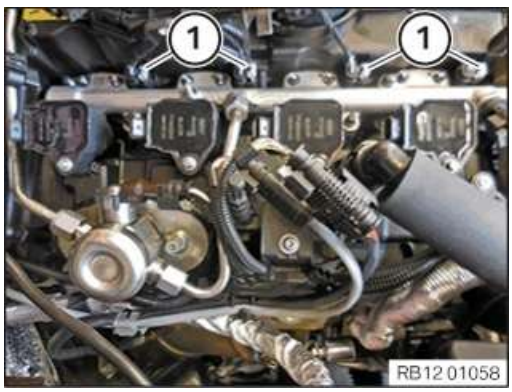
- Do not pull on the wires when disconnecting connectors and plug connections.



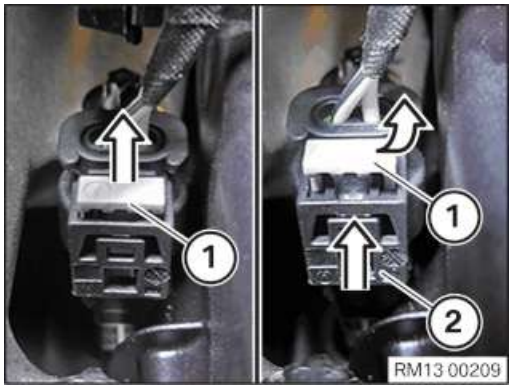
- Unlock and disconnect plug connections (1).



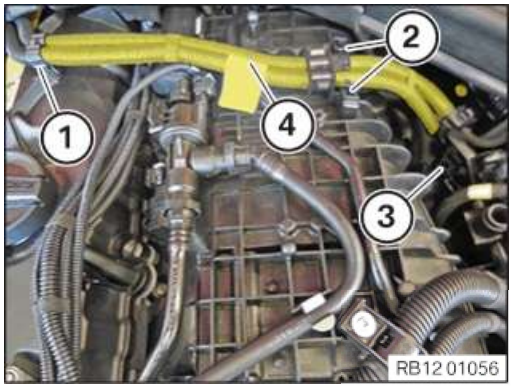
- Unlock and disconnect the plug connections (arrows).
- Loosen nut (1).
- Feed out ground cable (2) and set aside.
- Lift cable channel (3).



- Unlock and disconnect the plug connections (1) on the injectors.



- Unlock lock (1) in direction of arrow from the top.
- Press lock (1) together and release.
- Disconnect the plug connections (2) from the injectors.



- Loosen clamp (1).
- Unlock and loosen holder (2).
- Unlock and loosen holder (3).
- Guide the wiring harness section for the ignition and the injectors (4) out and remove them.

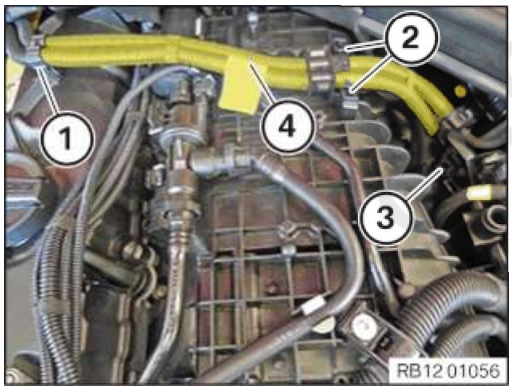
7 – Installing the wiring harness section for the ignition and injectors

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

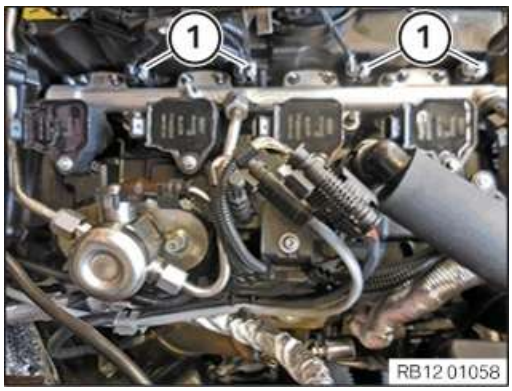
Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.



- Guide in and Install the wiring harness section for the ignition and injectors(4).
- Connect and lock the holder (3).
- Connect and lock the holder (2).
- Secure clamps (1).

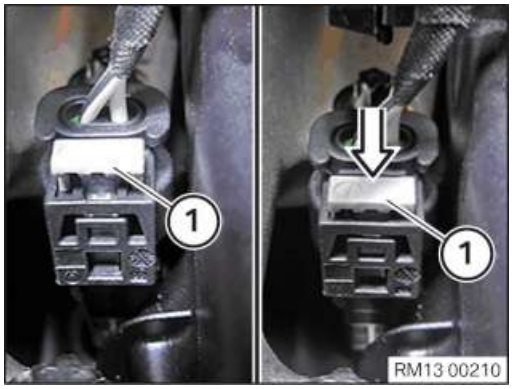
  The holder (3) and clamps (1) must be heard to engage.



- Connect and lock connector (1) on the injectors.

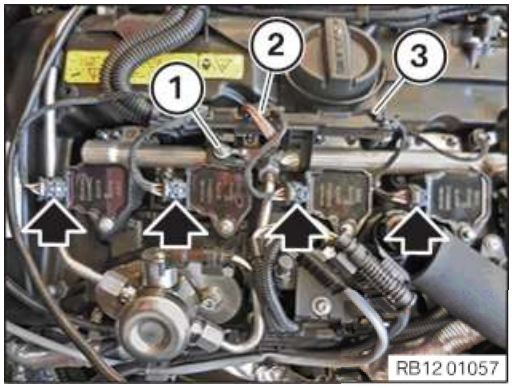
  The connectors (1) must engage audibly.

fdiagn.com



- Connect the connector with the injectors.
- Lock the lock (1) in the direction of the arrow.

  The lock (1) must audibly engage.



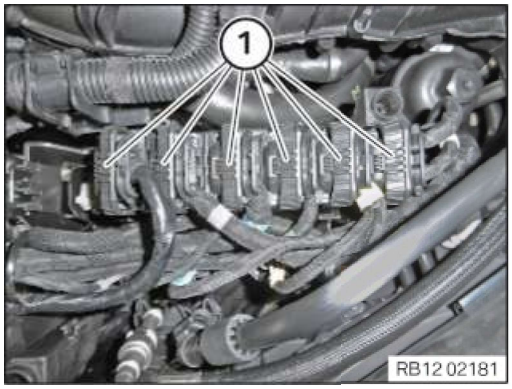
- Thread in cable channel (3) and install.
- Guide in and install ground cable (2).
- Tighten nut (1).

Ground cable to rail

M6		Tightening torque	5 Nm

- Connect and lock the connectors (arrows).

  The connectors (arrows) must engage audibly.

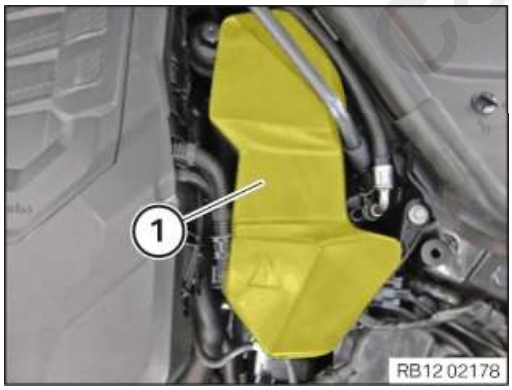


- Connect connectors (1) and lock.

  The connectors (1) must engage audibly.

POSTPROCESSES

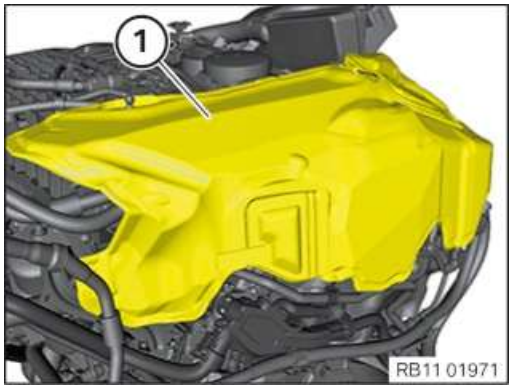
8 – Installing the cover of the DME control unit



- Insert and install cover (1) into guides.

9 – Installing acoustic cover at rear

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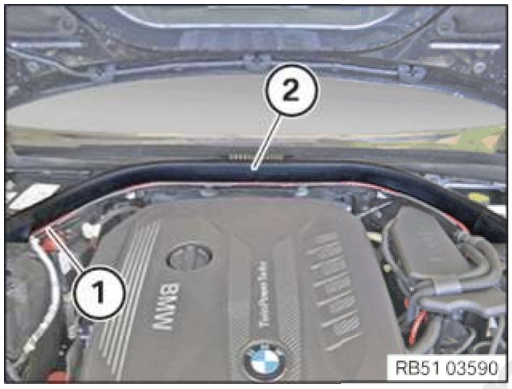


- Make sure the acoustic cover (1) is correctly positioned on the rear side of the engine.



- Install the acoustic cover (1) from the top and clip it in into the marked areas.

10 – Install the seal for the bonnet



- Press the rear bonnet seal (2) into the guide.
- Feed in cable (1) into the brackets.
- Check that the rear bonnet seal (2) and the cable (1) are seated correctly.

11 – Install acoustic cover

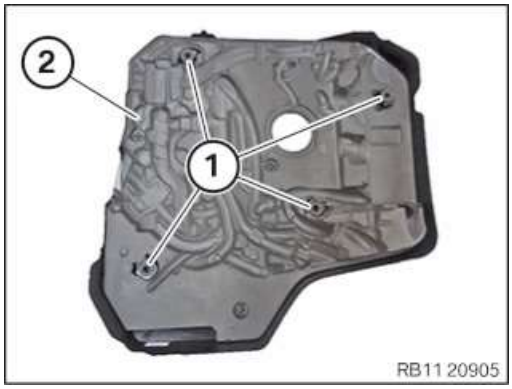
RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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- Check all rubber mounts (1) of acoustic cover (2) for correct seating.



- Clip in the acoustic cover (1) into the holders in the **marked** areas.
  The acoustic cover (1) must audibly engage into place.

12 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Overview of Tightening Torques

Ground cable to rail			Used in step 7
M6		Tightening torque	5 Nm

Links

Repair instructions	**Used in step**
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	112
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	112

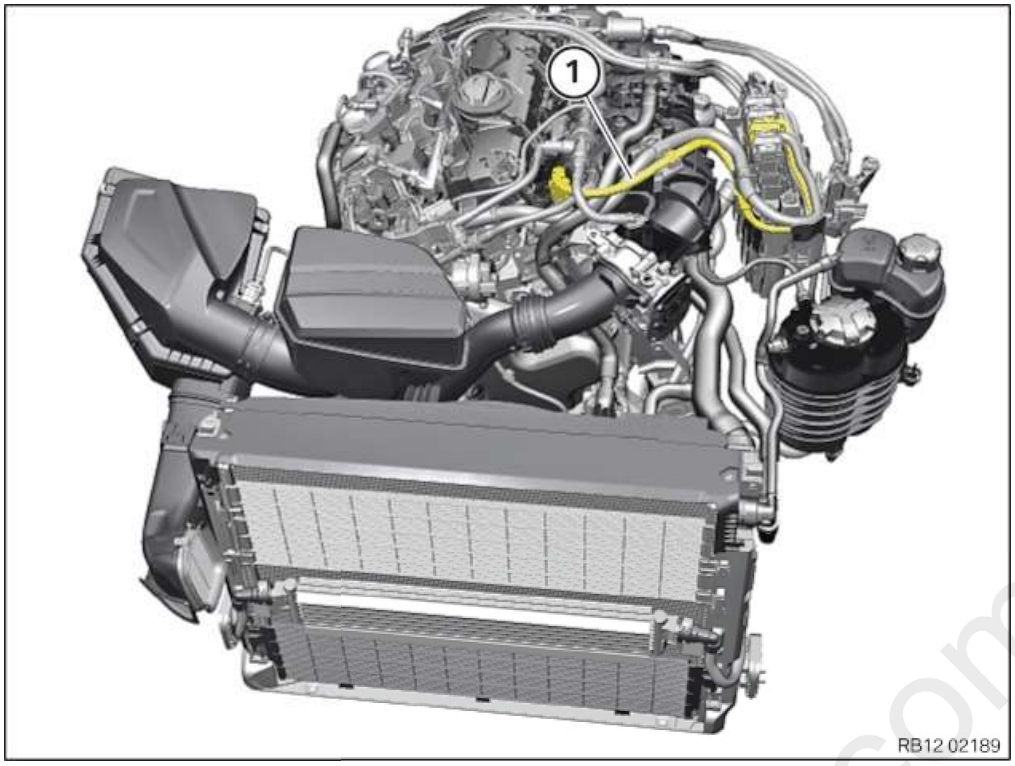
cardiagn.com

61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	112
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112
61 20 900 Disconnecting and connecting battery earth lead	112

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12 51 215 Replacing wiring harness section for Valvetronic actuator

Overview: Wiring harness section for the Valvetronic servomotor



1: Wiring harness section for the Valvetronic servomotor

PRELIMINARY WORK

1 – Disconnecting all battery earth leads



- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

bardiagn.com

RISK OF DAMAGE

Damage to the acoustic cover.

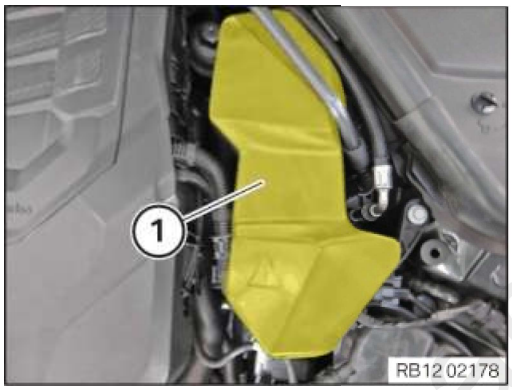
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



- Unclip the acoustic cover (1) from the holders in the **marked** areas towards the top.

3 – Remove the cover of the DME control unit



- Pull the cover (1) toward the top and remove.

MAIN WORK

4 – Removing the wiring harness section for the Valvetronic servomotor

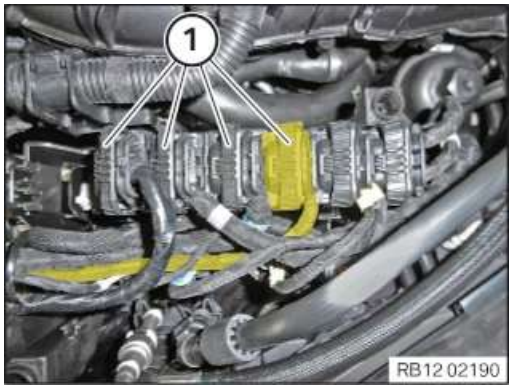
RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

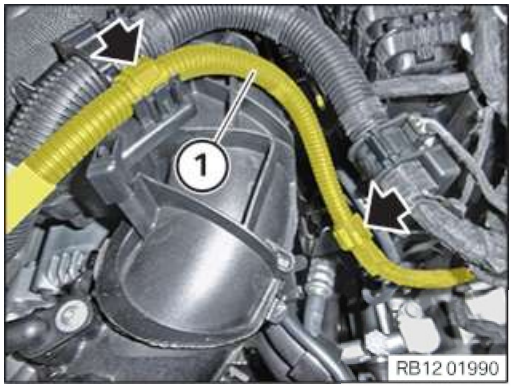
Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

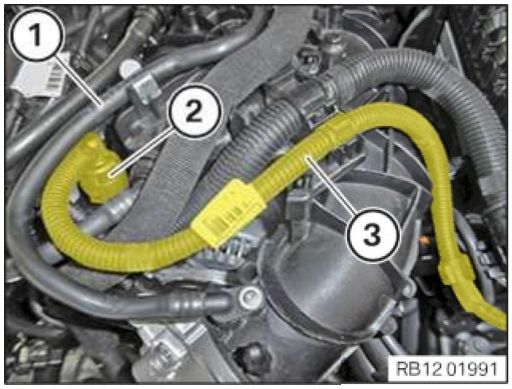
cardiagn.com



- Unlock and disconnect plug connections (1).
- Guide out the wiring harness section for Valvetronic servomotor (2) and set it aside.



- Release the wiring harness mountings (arrows).
- Remove the wiring harness section (1) and put to one side.



- Feed the tank ventilation line (1) out and set it aside.
- Unlock plug connection (2) and disconnect.
- Remove the wiring harness section (3).

5 – Installing the wiring harness section for the Valvetronic servomotor

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

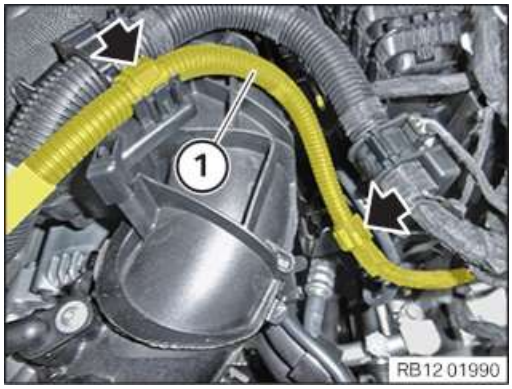
- Route all cables without abrasions, do not trap and crush.



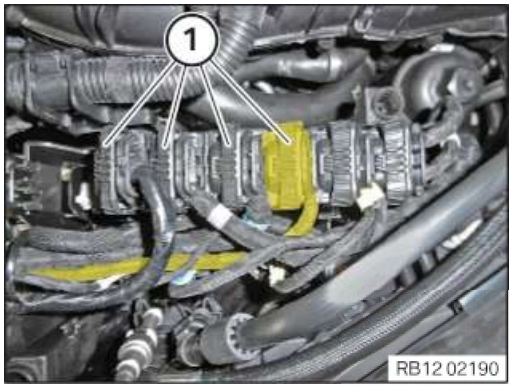
- Guide in the wiring harness section (3) and install.
- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Insert and install the tank ventilation line (1).

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- Guide in the wiring harness section (1) and install.
- Secure the wiring harness mounting (Arrows).

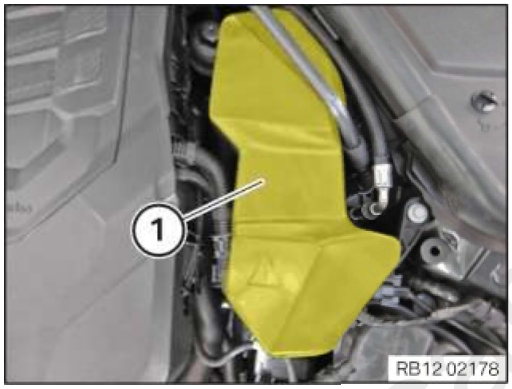


- Connect connectors (1) and lock.

  The connectors (1) must engage audibly.

POSTPROCESSES

6 – Installing the cover of the DME control unit



- Insert and install cover (1) into guides.

7 – Install acoustic cover

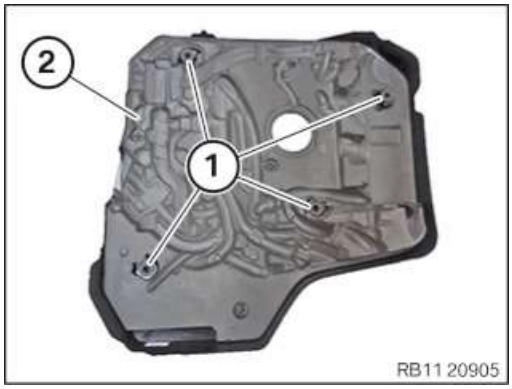
RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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- Check all rubber mounts (1) of acoustic cover (2) for correct seating.



- Clip in the acoustic cover (1) into the holders in the **marked** areas.

  The acoustic cover (1) must audibly engage into place.

8 – Disconnecting all battery earth leads



- See additional information.

Additional Information

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	18
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	18
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18

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61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
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61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
61 20 900 Disconnecting and connecting battery earth lead	18
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61 00 ... Safety information on handling hybrid cars

1. *Qualification:*
   All repair work on high-voltage components may **only be performed by specially trained personnel** (qualification: Work on high-voltage inherently save vehicles) must be performed by qualified technicians. Each hybrid car requires additional vehicle specific training with training achievement controls.
   Required training is offered by the BMW Training Academy.
2. *Identification:*
   Observe **warning notices** on high-voltage components. When replacing individual high-voltage components, check if warning stickers are present. Independently attaching warnings is only allowed on the locations provided for them. Use only approved and appropriately identified original new parts.
3. *Rules of conduct/protective measures:*
   - Note operating instructions for handling high-voltage battery units.
   - Do not under any circumstances touch open high-voltage cables and high-voltage components on damaged vehicle before shutting down the high-voltage electrical system.
   - In the event of damage (mechanical, thermal) transition metal oxides, carbon, electrolyte solvents and their products of decomposition may be released.
     Suitable acid-resistant protective clothing/equipment must therefore be used when handling the vehicle!
     - Hand protection: Gloves
     - Eye protection: Safety goggles

     Damaged high-voltage battery units must be stored in an acid-resistant pan in a location in the open that is protected against the weather (sun, rain) and secured against unauthorised access. Do not inhale escaping gasses.
   - Prevent escaping substances from entering drains, pits and the sewer system.
   - Collect any material that is discharged and have it disposed of according to the work instruction, wear acid-resistant protective clothing when doing so.
   - Notify the fire brigade if fire breaks out, clear the area immediately and make accident scene safe. Attempt to extinguish the fire without putting persons in danger (suitable extinguishant: water and water foam).
   - A cut 2nd emergency separation point must be repaired with a butt connector.
4. *Measures before starting work:*
   - Each job on the vehicle must be assigned by appropriately trained personnel. Before work is started, this electrician must place the vehicle in the operating condition required to perform the relevant activity. The qualified personnel's instructions and directions absolutely must be followed. **No work may be carried out without this qualified personnel being consulted first.**
   - It is **not** permitted to work on the high voltage system or on high voltage components while the engine is running.
   - The readiness to drive must be ended before shutting off the voltage of the high-voltage system. The readiness to drive is ended when the driver is absent only under the following conditions:
     1. seat belt buckle unlocked **and**
     2. the driver's door is open **and**
     3. no brake activated **and**
     4. the accelerator pedal is not activated **and**
     5. speed < 3 km/h (2 mph)
   - Work on live high-voltage components is expressly prohibited. Before each operation on the high-voltage system, the system must be isolated from the power supply by qualified personnel (high-voltage safety connector Off) and secured against unauthorised recommissioning (padlock).
   - After each deactivation of the high-voltage system, it is essential to observe a **waiting period** of at least **10 seconds** prior to further work.
   - Before beginning work, it is mandatory to check that the equipment is de-energised and is protected against being energised again.
     Work is only permitted to begin if:
     1. Corresponding display in the KOMBI **High-voltage system deactivated** or

     When a high-voltage warning is active (indicator light, Check Control, etc.), it is essential to determine and eliminate the cause of this warning via the diagnosis system before continuing with any other work.
     If it cannot be definitively established that the equipment is de-energised, work is not permitted to begin. **Danger to life!** Before work begins, a qualified electrician (1000 V AC) must verify that the

system is de-energised using appropriate measuring devices and procedures.
=> In this case, Technical Support must be contacted!

- Do not perform any work on the vehicle while it is charging. Before starting work, disconnect the charging cable from the vehicle.
  Battery charging may result in heating of the high-voltage battery unit. This heating may lead to sporadic launches of the electric fan (switch-on request from the electric fan). Therefore, work in the vicinity of the electric fan during the charging procedure is prohibited. Ensure freedom of movement of the battery charge lines in the vicinity of the electric fan.

5. *Measures during/after activities:*
   - Identifiable mechanical damage to or tampering with high-voltage components must be reported immediately to the qualified personnel in charge.
   - When carrying out any work on the high-voltage system, it is prohibited to drive externally all the drivetrain components (wheels, gearbox, drive shafts, etc.).
   - *E72 only:* When the "Power Electronic Box Cover" is removed, the high-voltage system is not permitted to be activated. The high-voltage service disconnect must only be used when the "Power Electronics Box Cover" is completely installed.
   - High-voltage cables (orange coating) and their connectors and stop parts **may not** be repaired. If damaged, a cable must always be replaced completely.
   - When working in the vicinity of high-voltage components (identified accordingly with warning stickers and orange-coloured coating), protect these components against damage.
   - The specified work steps in the repair instructions must be adhered to exactly.
   - High-voltage components and their holders must be screwed/bolted to the defined tightening torque. Tightening torques and tightening specifications must be observed.
   - Connecting high-voltage components to body ground is crucial to safety for reasons of equipotential bonding. For this reason, it is prohibited to operate any high-voltage components without them being correctly connected to body ground. The measurements (insulation/potential equalisation measurement) are performed automatically by the vehicle. Manual measurement is not therefore necessary.
     For a correct earthing connection, the retaining elements of high-voltage components must not be painted. Follow further painting notes.
   - Removed high-boltage battery units must be stored in a manner that protects them from misuse and damage.
   - Damaged or warning stickers that are no longer legible on high-voltage components must always be replaced.
6. *Potential compensation:*
   Equipotential bonding lines, high-voltage cables and the battery negative lead to the EME are fitted with safety screws.
   - Clean contact faces and have then checked by a second person.
   - Tighten down screws/bolts to specified torque.
   - Have tightening torque checked by a second person.
   - Both persons must document that the work has been carried out correctly in the vehicle records.

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