Water Leaks

General

- If water leaks occur after bodywork repairs, the cause can be established using the checks described below. A systematic and logical procedure is required to locate water leaks. Before beginning extensive checks, a thorough visual inspection must be carried out.
- Visual Inspection
  - The following characteristics may indicate existing leaks:
  - Check the clearance and accurate fit of ancillary components such as the hood, tailgate, doors, and so on.
  - Check for correct fit and possible damage to sealing elements such as blanking plugs, rubber door seals, and so on.
  - Check water drain holes for unhindered flow.
- Various tests can be used to provide further information on possible leaks:
  - Water test
  - Washer test
  - Road test
  - Test with UV lamp
  - Special mirror test
  - Chalk (powder) test
  - Flow tube (smoke) test

Practical execution of tests and checks

Water test

Note:
Never aim a jet of water directly at a rubber seal.

- Carry out the water test with a second person present (passenger compartment).
- Use variable washer nozzles (concentrated water jet to fine spray mist).
- Start in the lower section and spray the whole area, working upwards in stages.
- The following are suitable for the water test:
  - softened water (liquid soap additive)
  - Special mirror
  - Test with UV lamp

Washer test

- Further tests can be carried out in the washer system.
- Some leaks originate here, or only occur here.
- The relevant passenger compartment should be checked using a torch during the wash procedure.

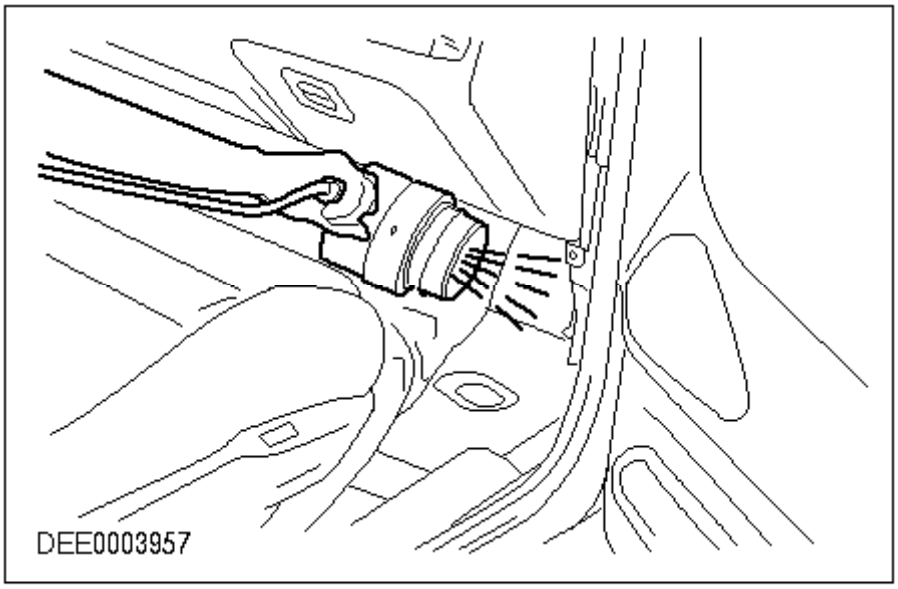
Road test

- If no leaks are located during the tests above, road tests should be carried out on wet roads.
- Road tests under various conditions:
  - At various speeds.
  - On various road surfaces (asphalt to cobbles).
  - With loaded or unloaded vehicle.
  - Driving through puddles (splash water).

Test with UV lamp

- Wet the test area with clear water from the outside.
- Prepare test liquid (see Owner's Handbook) and apply it from the outside using a suitable water sprayer.
- Illuminate the relevant area from the inside using the UV lamp.
- The test liquid will make the leak visible.

UV lamp

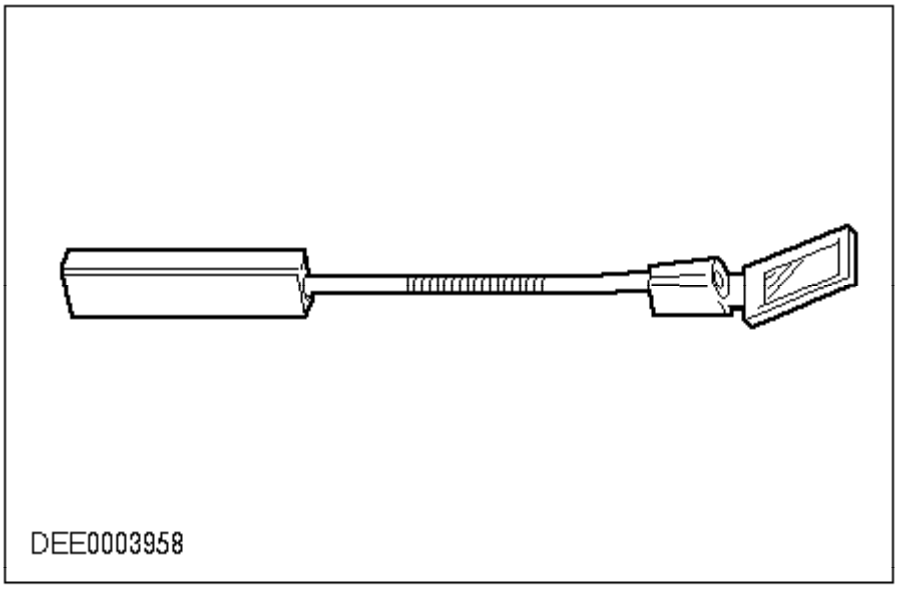


- Benefits of the UV lamp:
  - No need to dry out wet areas before the test.
  - The ingress of water and its subsequent path can be identified precisely.
  - No need to remove most ancillary components from the vehicle.

Special mirror test

The special mirror can be used to see into hard-to-reach areas.

Special mirror



Benefits

- A switchable light is built into the mirror area.
- The angle of inclination of the mirror can be set manually using the handle.
- The connector between the handle and the mirror is flexible.

Chalk test (powder test)

- In this test, the clamping load and the bearing surface of the seal are checked.
- Performing the test:
  - Dust the door seal with powder or coat with chalk.
  - Coat the bearing surface of the seal with a thin film of grease.
  - Slowly close the door and open it again.
  - Check the width and continuity of the imprint on the door seal.

Flow tube test (smoke test)

- Test for locating leaks.
  - Set the interior ventilation to the highest setting.
  - An assistant creates smoke in the test area (interior) using the flow tube.
  - A second assistant locates points at which the smoke escapes on the outside.

Other test equipment

- Other equipment such as stethoscopes or ultrasound measuring instruments can be used to locate leaks.

Rectifying the leak using recommended tools, auxiliary equipment and materials

- Tools and auxiliary equipment:
  - Dry, absorbent cloths
  - Variable washer nozzle
  - Torch, fluorescent tube
  - Mirror
  - Compressed air
  - Seal lip installer
  - Wet/dry vacuum cleaner
  - Sealing compound compressor
  - Remover for interior trim
  - Cutter blade or pocket knife
  - Wedge (wood or plastic)
  - Hot air blower
  - UV lamp
  - Special mirror for concealed leaks
  - Stethoscope
  - Air flow checker
  - Ultrasound measuring instrument
- Materials: (refer to spare parts microfiche)
  - Sealing compound (tape and plastic compound)
  - Multi-purpose sticker
  - Clinched flange sealer
  - Window sealing compound
  - Water shield (PVC)
  - Foam watershield
  - Double-sided adhesive tape for water shield
  - Butyl tape for foam watershield
  - Methylated spirit (available from trade outlets)
  - PU adhesive
  - Silicone remover
  - Tar remover

Water leaks according to mileage or running time

Increasing mileage has an effect on the problem of leaks in a vehicle. Possible influencing factors are:

- Servicing and maintenance of seals:
  - No maintenance, lack of maintenance or incorrect maintenance
  - Using an incorrect agent
- Damaged seals:
  - As a result of aging, wear or incorrect handling/assembly.
- Heavy soiling of the vehicle:
  - Heavy soiling of a vehicle can seriously impair the function of water drainage channels in particular, and also of rubber seals.
- Age-related factors:
  - Environmental factors
  - UV radiation
  - Extreme climatic conditions
- Corrosion can have a serious impact on bodywork, in particular as a result of:
  - Lightly or heavily rusted seal carriers
  - Rusted body seal welds
  - Perforation corrosion

Water leaks after body repairs

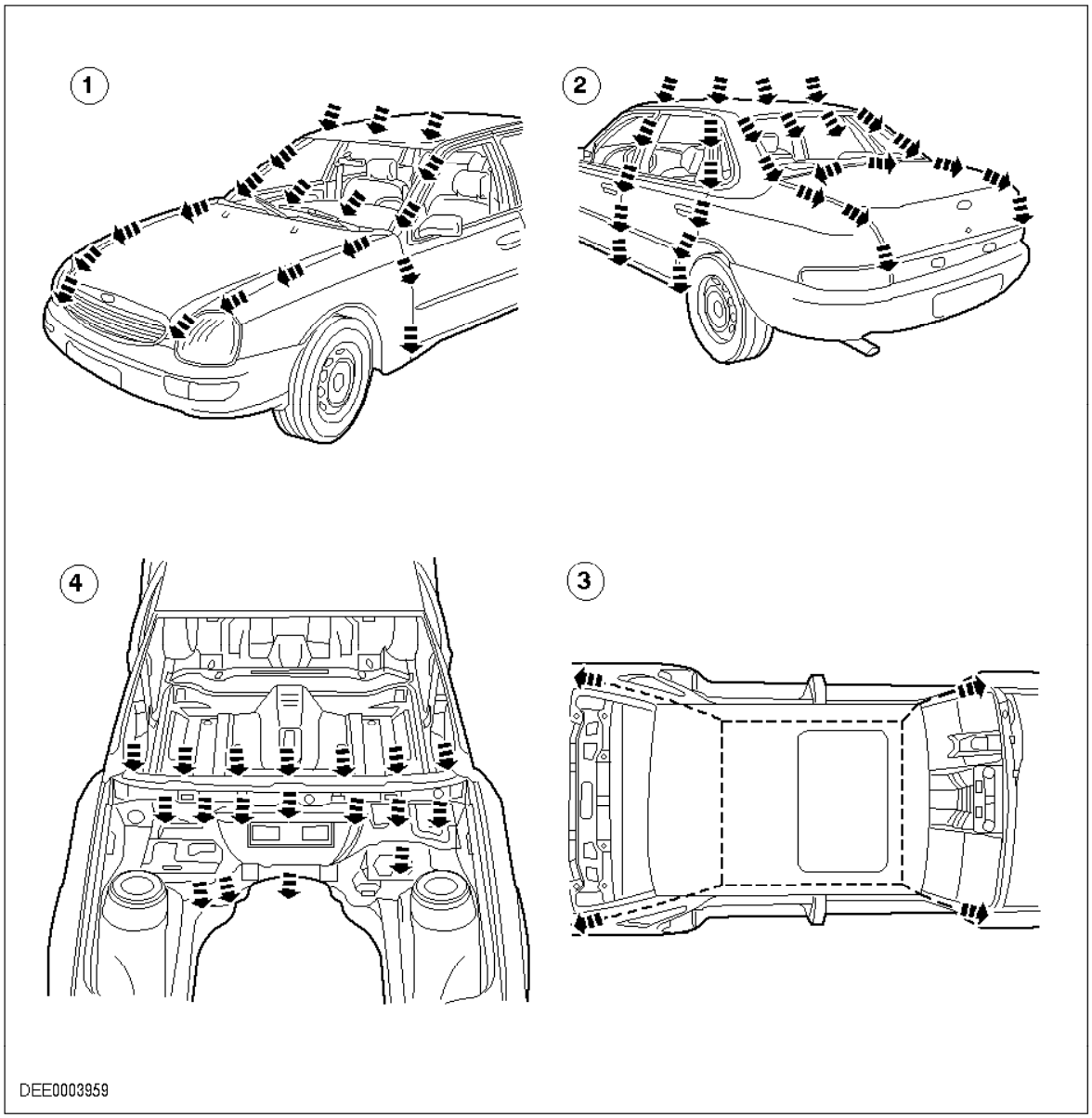
If a vehicle develops a leak after body repairs, the following points must be taken into consideration in particular:

- The correct seating of ancillary components and their seals (e.g. rear lamps, etc.) must be checked.
- The correct alignment of doors and luggage compartment lids/tailgates must be checked. The associated seals must not be damaged and must be installed correctly.
- Check that welded seams are correctly sealed.
- The correct seating of rubber grommets must be checked.
- The seals of windows fitted using rubber seals must be installed precisely and make contact all the way round.
- Directly-glazed windows must have correct and complete bonding.

Water drainage system

If a vehicle develops water leaks, then areas into which water is routed or drained should be checked first.

Water drainage systems



Item	Part Number	Description
1	-	Water drainage, front
2	-	Water drainage, side and rear
3	-	Sliding roof drainage
4	-	Drainage water tank

Water leaks, diagnosis and corrective action: Front passenger compartment

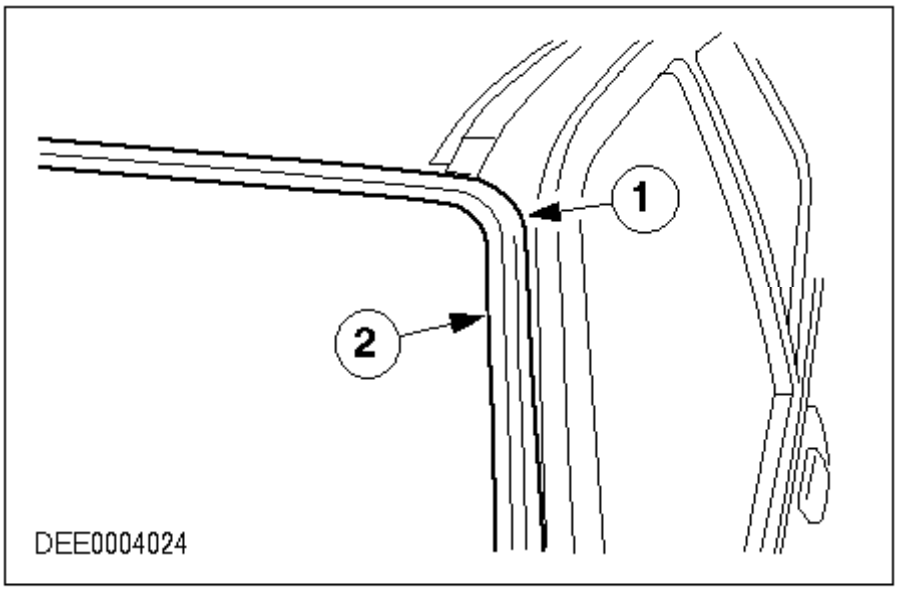
Windscreens (rubber fitted)

- Diagnosis:
  - Ingress of water into A-pillar area
- Cause:
  - An old or incorrectly fitted seal can cause insufficient or irregular clamping load of the rubber

seal on the windscreen or window frame. This results in water ingress between the rubber seal and the windscreen or between the rubber seal and the window frame.

- Corrective action:
  - Seal the problem area using window sealing compound between the rubber seal and the windscreen, or between the seal and the window frame. Wipe off excess sealing compound immediately.
  - If a new leak is found after the necessary leak check, then the rubber seal must be renewed.

Windscreen seal



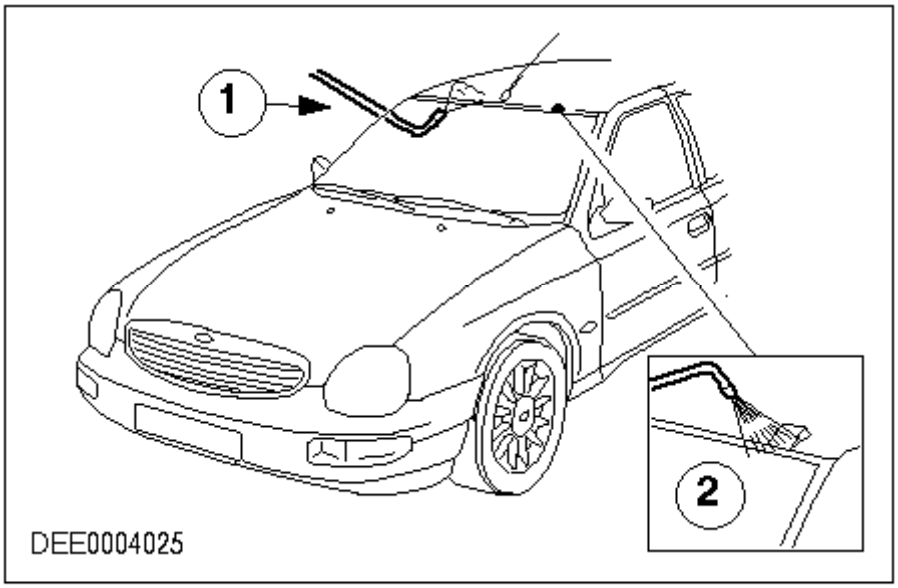
Item	Part Number	Description
1	-	Window frame seal
2	-	Window seal

Windscreens (directly-glazed version)

- Diagnosis:
  - Ingress of water into A-pillar area or instrument cluster area
- Cause:
  - Breaks in adhesive beads
- Corrective action:
  - **Note:**
    The repair must be carried out in line with approved methods (service microfiche/TIS CD group 42/501-11).

    The breaks in adhesive beads can be located from inside by using compressed air. The leak can be identified from outside by the escaping air.
  - The second test method is by means of a water test. The outer cover must also be raised carefully using a plastic wedge. The leak should be located from inside by a second assistant.

Diagnosis of a water leak

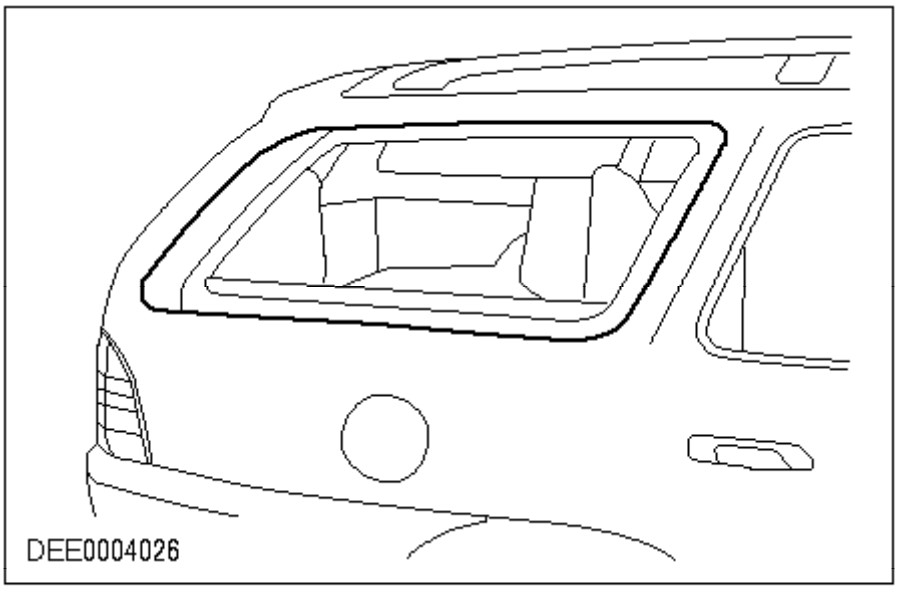


Item	Part Number	Description
1	-	Compressed air test
2	-	Water test

Side windows

In the case of fixed side windows (rubber fitted or directly glazed), the same problems can arise as for a windscreen. The same corrective actions must therefore be used.

Side windows



Door seal

— Diagnosis:

- Water ingress in the lower part of the interior door trim or in the rocker panel area.

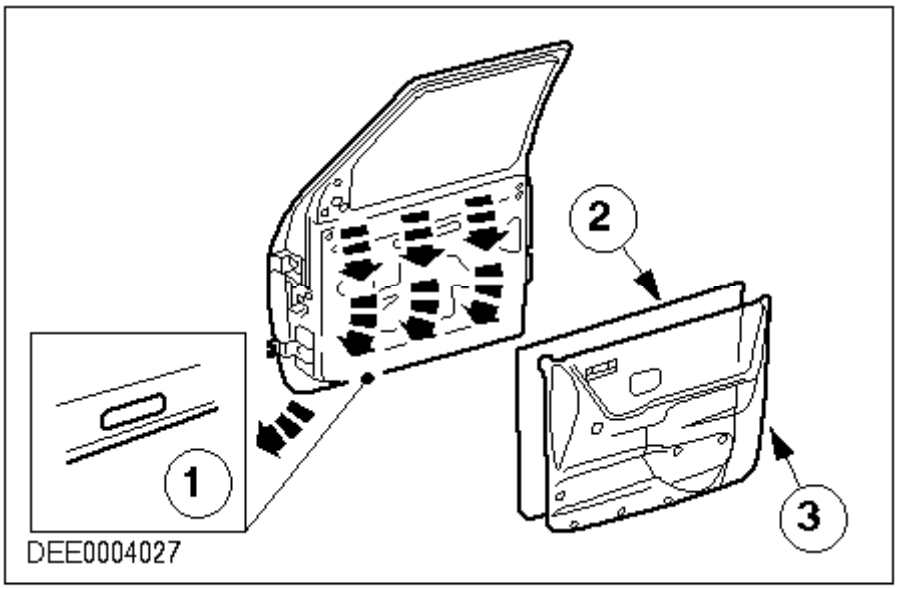
- Cause:
  - The water shield or foam watershield fitted behind the interior door trim exists to drain off water that has entered the door via the drainage holes, either downwards or outwards. If the water shield or foam watershield is damaged or has been fitted incorrectly, then water can get into the passenger compartment.
  - In addition to this, the drainage holes can become clogged with leaves, dirt or excess cavity protection agents. Water gathers in the door and ingresses into the passenger compartment.
  - **Note:**
    If a water shield or foam watershield becomes damaged in any way, then it must always be renewed.

    Check water shield or foam watershield for damage or correct fitting.
  - **Note:**
    When detaching a foam watershield, the butyl tape must be cut with a knife.

    If the water shield needs to be re-bonded, then double-sided adhesive tape must be used. Butyl tape is used for the foam watershields.
  - Before the water shield or foam watershield is installed, the drainage holes must be checked for unhindered flow.
- Corrective action:
  - **Note:**
    When installing the butyl tape, do not touch the mating surface (this impairs the adhesion).

    Detach the interior door trim.

Door seal



Item	Part Number	Description
1	-	Drainage holes
2	-	Foam watershield

3	-	Interior door trim

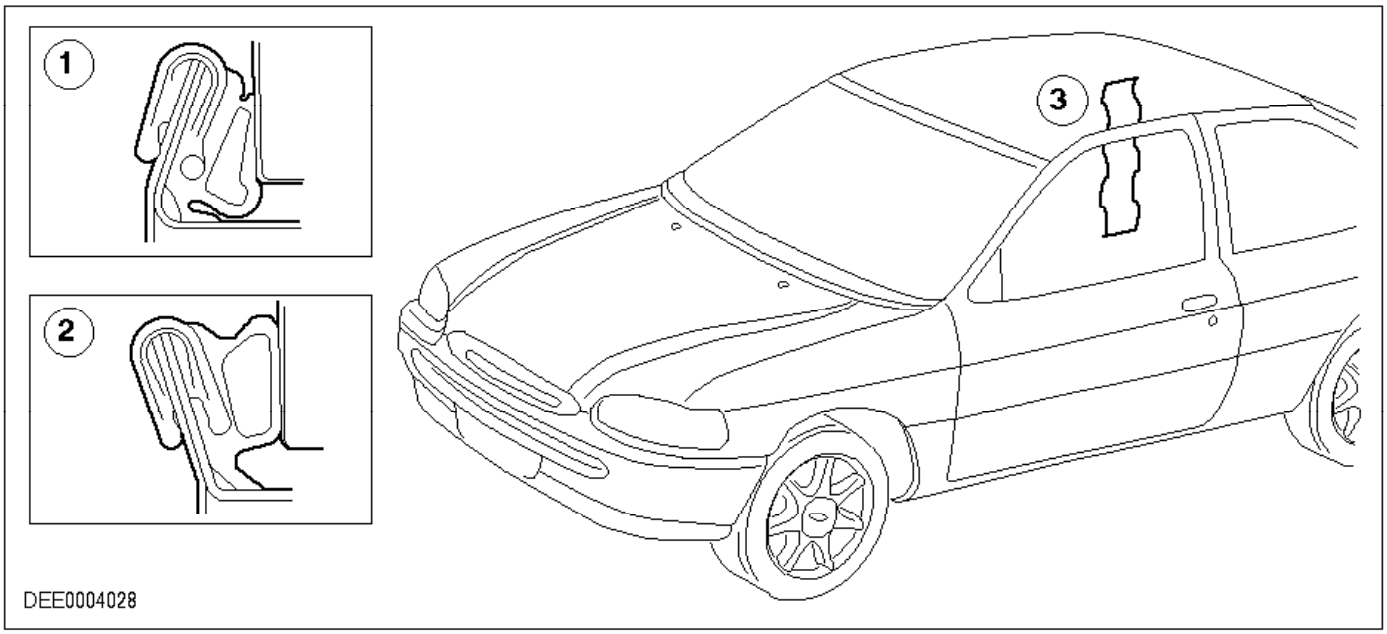
Door seals

- Diagnosis:
  - Ingress of water into the rocker panel area
- Cause:
  - Insufficient clamping load between seal and door.
- Corrective action:
  - Check clamping load:
  - The easiest way to check the clamping load of a seal to the respective bearing surface is by means of a paper strip test. This consists of trapping strips of paper at various points between the door and the seal, and fully closing the door. If it is possible to pull out the paper with no great resistance, then the clamping load is too low.
  - Adjust the clamping load:
  - **Note:**
    When adjusting the clamping load, the edge alignment of the relevant components must always be taken into consideration.

    The clamping load is normally adjusted using the striker. When doing so, the edge alignment from the door to the side panel, or from the front door to the rear door must be taken into account.
  - Another setting method is to realign the panel flange for the seal mounting. The clamping load is increased by moving the flange towards the door.
  - **Note:**
    Do not realign the flange too far in the direction of the door, as this can reduce the bearing surface of the seal to the door.

    Check the bearing surface:
  - Apply chalk evenly to the surface of the seal. Evenly coat the bearing surface of the door with vaseline.
  - Close the door fully, the lock must engage. Open the door. The imprint of the chalk (bearing surface) can be identified in the film of grease.
  - The bearing surface should be at least 5mm across at all points.

Checking the seal

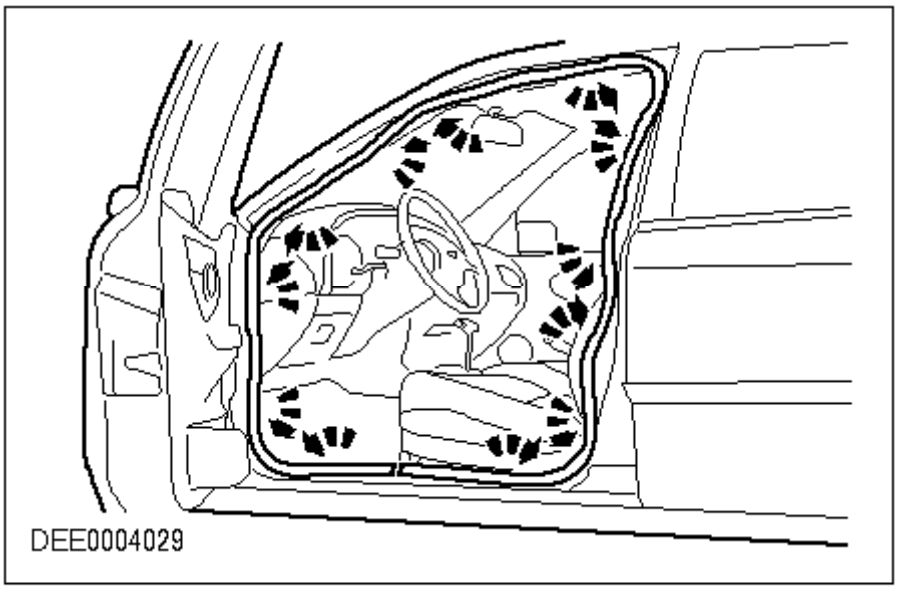


Item	Part Number	Description
1	-	Panel flange bent too far inwards: small bearing surface
2	-	Panel flange adjusted correctly: correct bearing surface
3	-	Check clamping load with a strip of paper

- Other causes:
  - The door seal must completely seal the door where it meets the bodywork.
  - Water can ingress directly or indirectly into the interior of the vehicle if the seal is damaged at any point.
- Corrective action:
  - A damaged or worn door seal must always be renewed in full.
  - When renewing the seal, the following must be taken into account:
  - Always fit the seal first in the area of the narrow radii (corner points).
  - Next, secure the seal to the flange evenly by tapping lightly with a rubber hammer. The installed seal must not be kinked at any point.

Note:
The prescribed length of a seal must not be shortened.

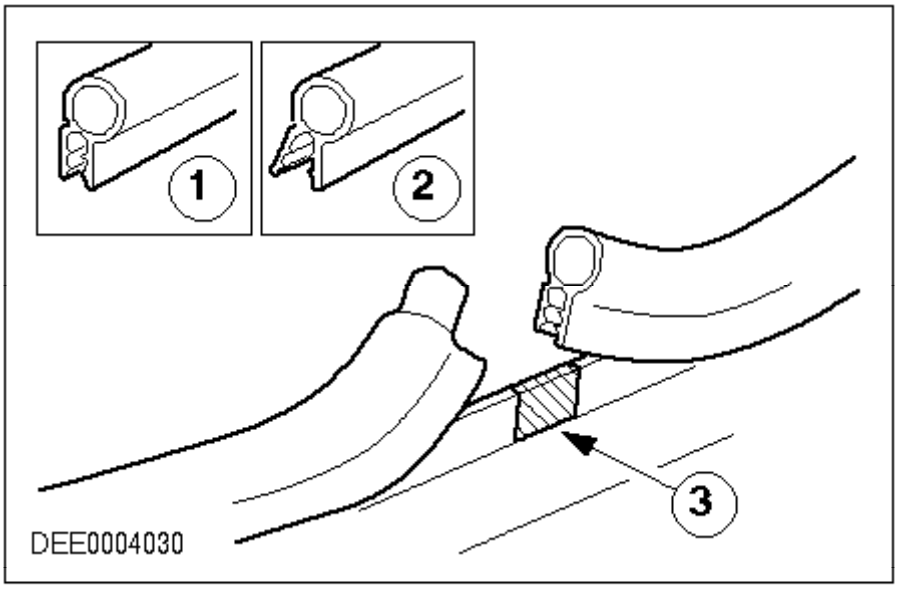
Correct installation of the door seal



- Other cause:
  - The door seal is attached to the welded flange all the way round. If this welded flange is uneven or damaged at any point (usually in areas with narrow radii) then this point could be subject to leaks.
  - A stretched seal carrier can also cause a leak.
  - In both cases, water gets into the vehicle interior under the seal carrier.
- Corrective action:
  - Align the deformed welded flange using a hammer and anvil block, prevent and if necessary repair any paint damage.
  - **Note:**
    If the seal has a connecting joint, this must always be at the bottom of the door surround.

    A stretched seal carrier must be realigned by hand. If this is no longer possible, the seal must be renewed.

Door seal leaks



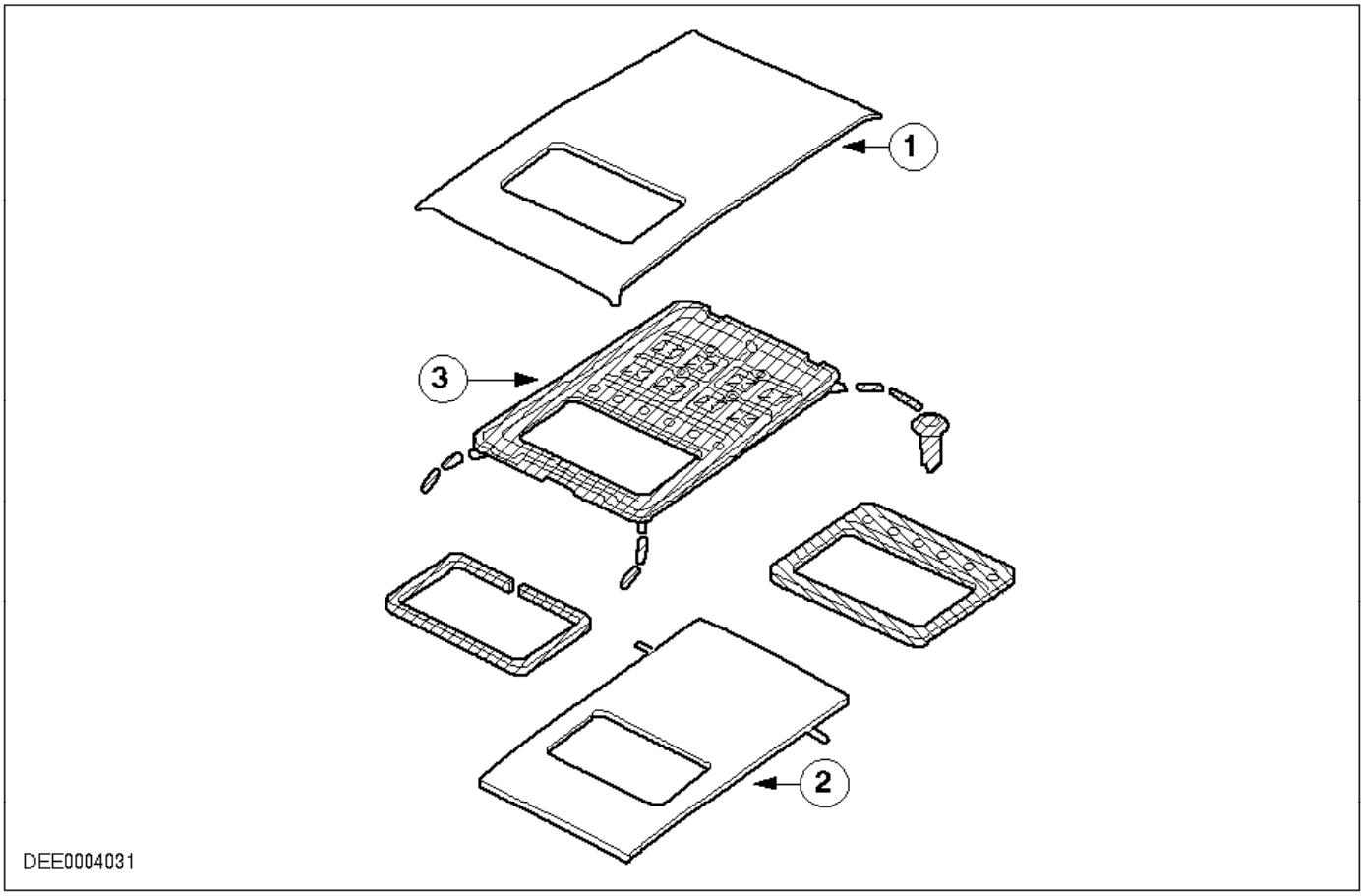
Item	Part Number	Description
1	-	Correct seal carrier
2	-	Stretched seal carrier
3	-	Seal on connecting joint

Sliding roof/tilting roof

- Diagnosis:
  - Ingress of water at sliding roof aperture
- Cause:
  - The sliding roof/tilting roof is installed in a water trap. The water drains off via the water trap, water drain holes and drain hoses. The drain hoses lead downwards on both sides via the A-pillar and C-pillar.
  - The drain holes or drain hoses can become clogged with leaves, dirt, underbody protection and so on.
- Corrective action:
  - **Note:**
    In the case of a sliding or tilting roof, the external rubber seal and the lock actuator or latch mechanism must be checked first of all.

    Check the water trap for leaks.
  - Check the drain hoses for leaks and for correct connection to the water trap.
  - Check the drainage system for unhindered flow, and blow out with compressed air if necessary.
  - Check the external seal and the correct adjustment of the sliding roof.

Sliding roof/tilting roof

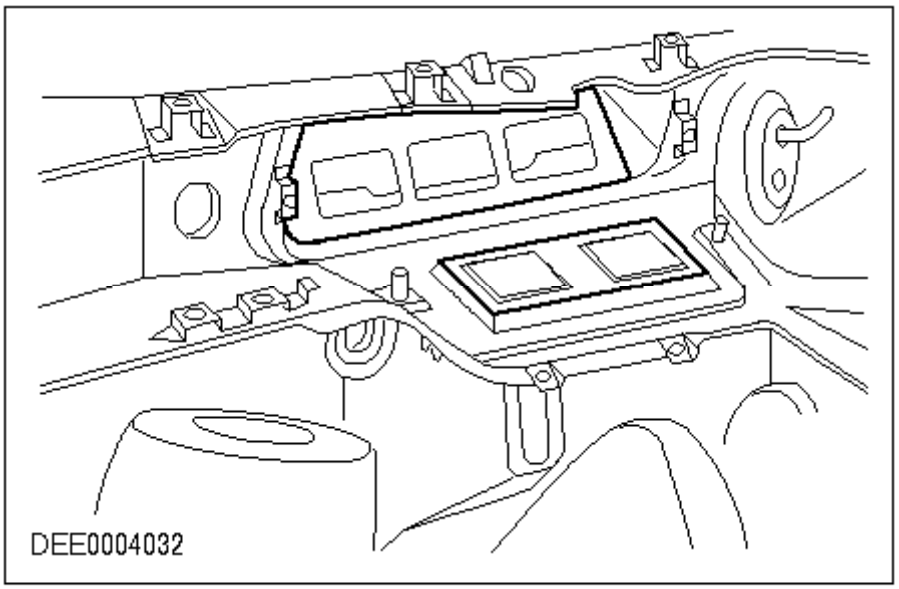


Item	Part Number	Description
1	-	Roof
2	-	Roof moulding
3	-	Water trap with drainage flow

Apron panel and heating/ventilation

- Diagnosis:
  - Ingress of water into the front footwell area
- Cause:
  - The apron panel is sealed in several places to adjacent components, such as at the joints to the A-pillar or to the floor pan. These seals can be broken.
  - The heater and ventilation housing is attached to the apron panel. The through area is sealed with a foam watershield that is fixed to the housing.
  - The housing has drain holes to allow the water to drain off.
  - If the foam watershield is defective or the drain hole is clogged, water can ingress into the front footwell area.

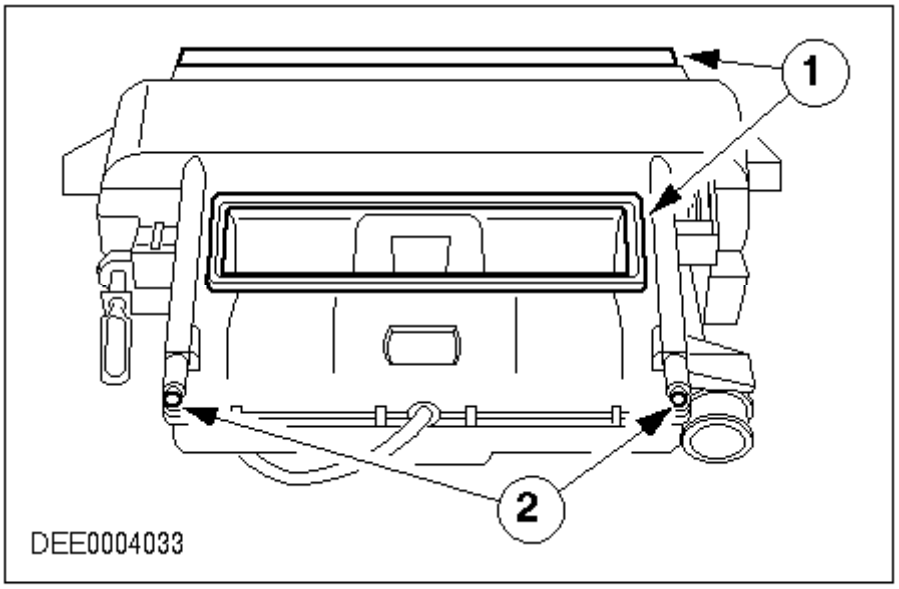
Heater and ventilation housing seal



- Corrective action:
  - Seal the broken seal welds.
  - If a leak is found in the heater or ventilation housing, the drain holes must be checked first.
  - **Note:**
    Damaged foam watershield must always be renewed.

    The housing may have to be removed to check the foam watershield and its bearing surface for damage.

Checking foam watershields and water drain holes

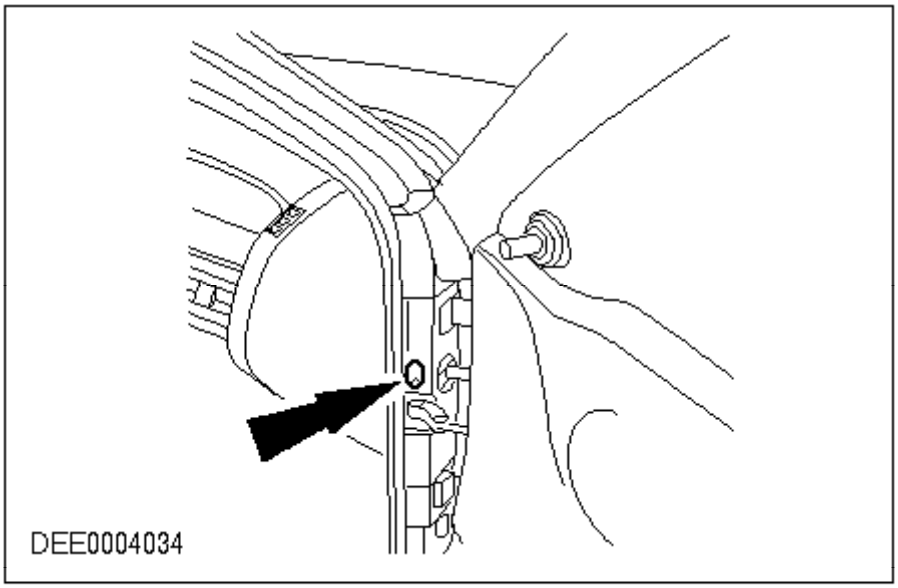


Item	Part Number	Description
1	-	Foam watershields
2	-	Water drain holes

- Other causes:

- Fastening bolts and routing holes for cables and hoses must be checked for leaks in the area of the apron panel and instrument cluster (rubber grommets in particular).
- If the footwell area is wet, then the door hinge seal, the door light switch and cable routing holes must also be checked.

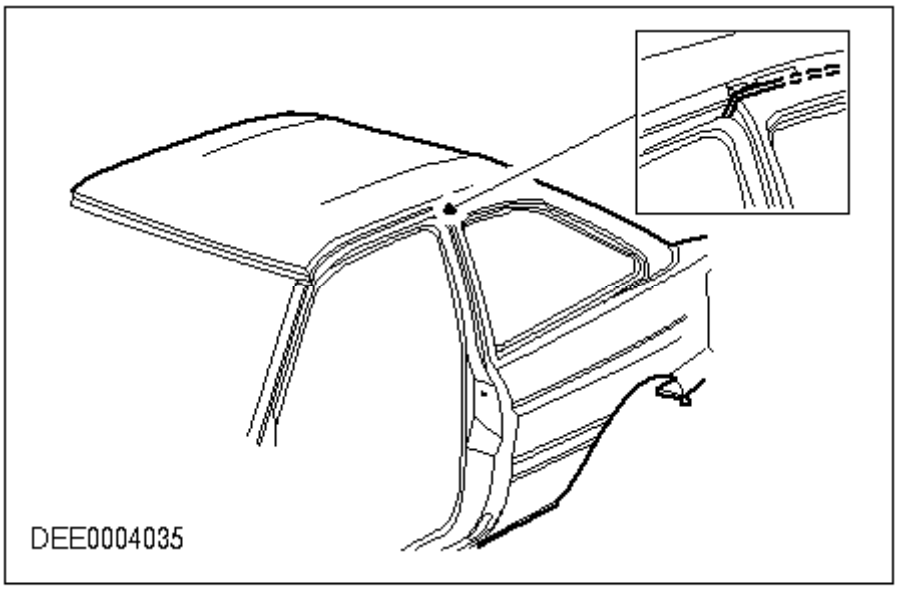
Door light switch seal



Rear drip rail seal

- Diagnosis:
  - Ingress of water into side headlining area
- Cause:
  - The roof outer panel is sealed with a seal weld at the connection point to the side panel. This seal weld can be concealed with a bezel or trim strip.
  - In the case of estate and hatchback vehicles, there is an additional seal to the rear roof crossmember.
  - Water can enter here if there is a break in the seal weld.
- Corrective action:
  - Remove trim strip or bezel. Check and re-seal the seal weld.

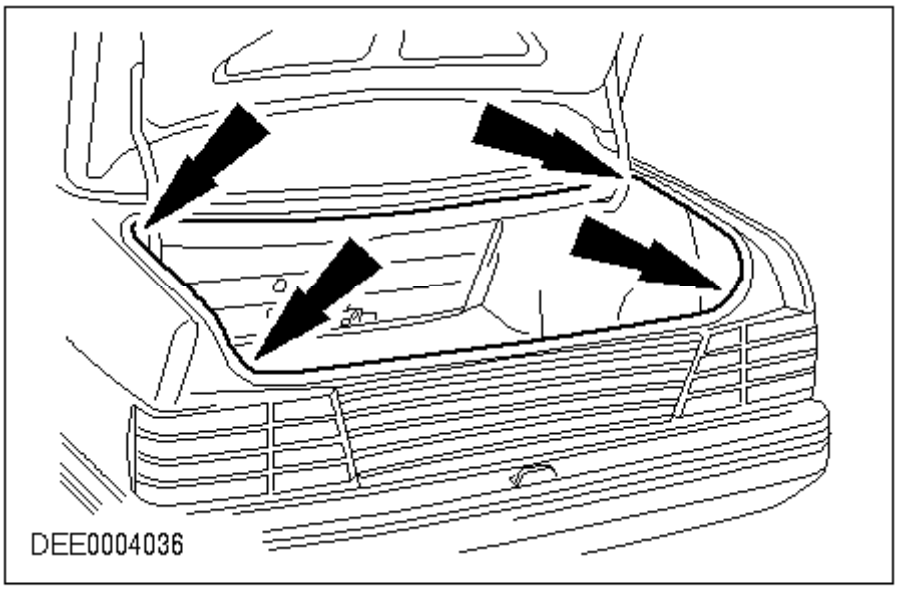
Drip rail seal



Luggage compartment seal

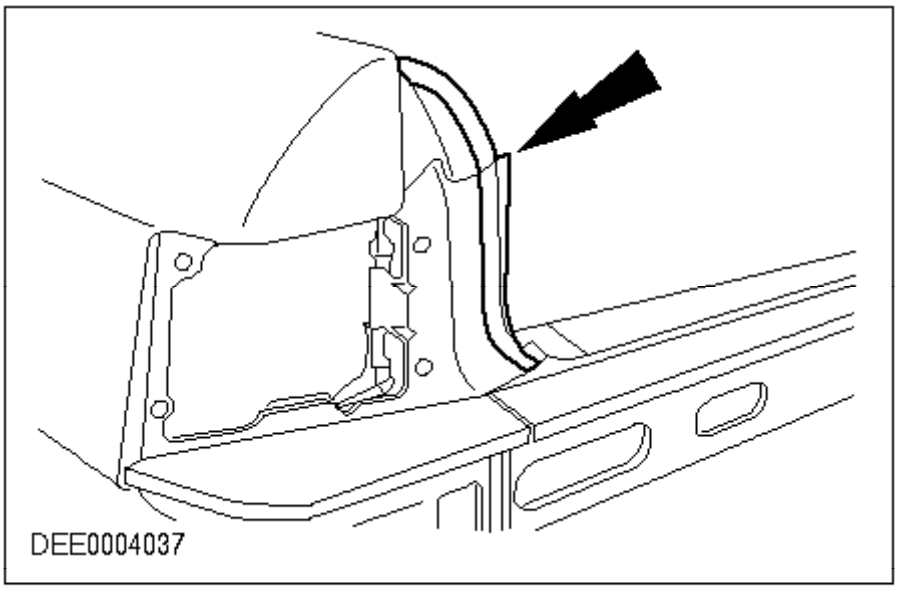
- Diagnosis:
  - Ingress of water into the luggage compartment
- Cause:
  - The luggage compartment lid seal corresponds to the door seal.
  - If there is a water leak, the seal must be checked for damage and the seal carrier must be checked for correct seating.
  - The clamping load and the bearing surface of the lid must also be checked for leaks.
- Corrective action:
  - The adjustment of the lid is made using the lock striker or the lock.
  - Rubber bump stops are attached to both sides of the luggage compartment opening. These are normally adjustable, and the clamping load can be modified.
  - The narrow radii of the luggage compartment lid seal are also problem areas.

Check the seal for correct installation position



- Other cause:
  - The seal is not attached evenly around the lid because of a deformed or uneven welded flange.
- Corrective action:
  - Check the seal and bearing surface.
  - Re-align a deformed or uneven welded flange.

Uneven welded flange.

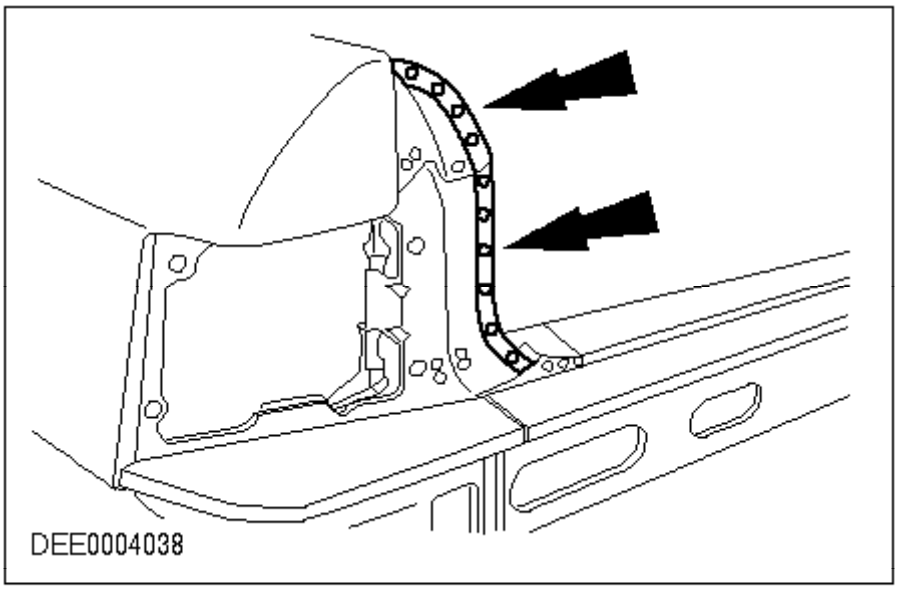


- Other cause:
  - **Note:**
    The seal carrier covers a defective weld.

    Leaking weld on welded flange (melted through). Water can ingress into the luggage compartment under the seal carrier.
- Corrective action:
  - Pull the seal from the seal carrier.

- Seal the leaking weld using sealing compound.

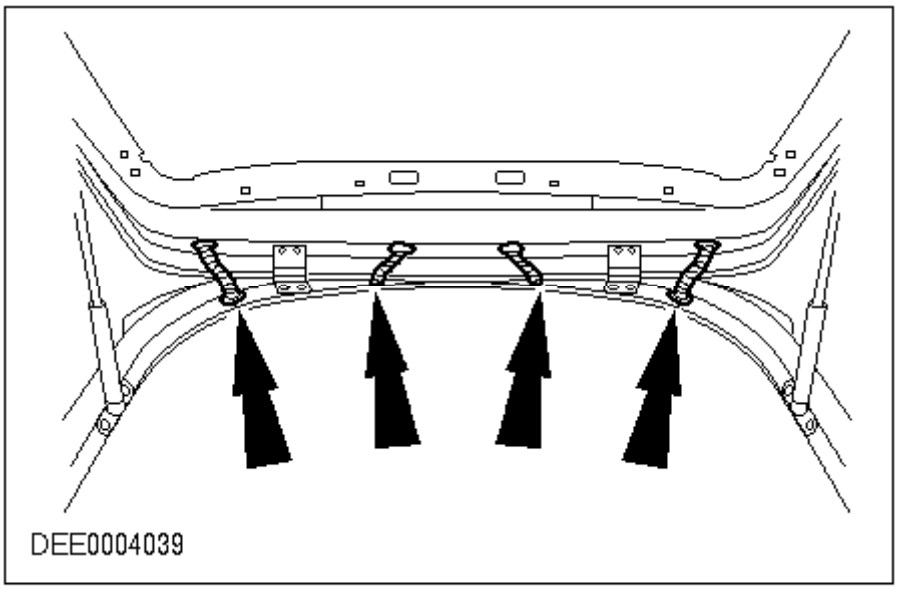
Welds melted through



Tailgate

- Diagnosis:
  - Ingress of water into rear headlining area
- Cause:
  - The leak problems of the tailgate correspond to those of the doors.
  - In addition to this, the area to be sealed is much bigger. The routing holes for cables and hoses must also be sealed.
  - The rubber grommets for the routing holes must be checked for damage and correct seating (fully unhooked).
  - The mounting points of the tailgate hinges may leak.
- Corrective action:
  - Check the rubber grommets and renew if necessary.
  - Check the hinge mounting points, and re-seal with sealing compound if necessary.

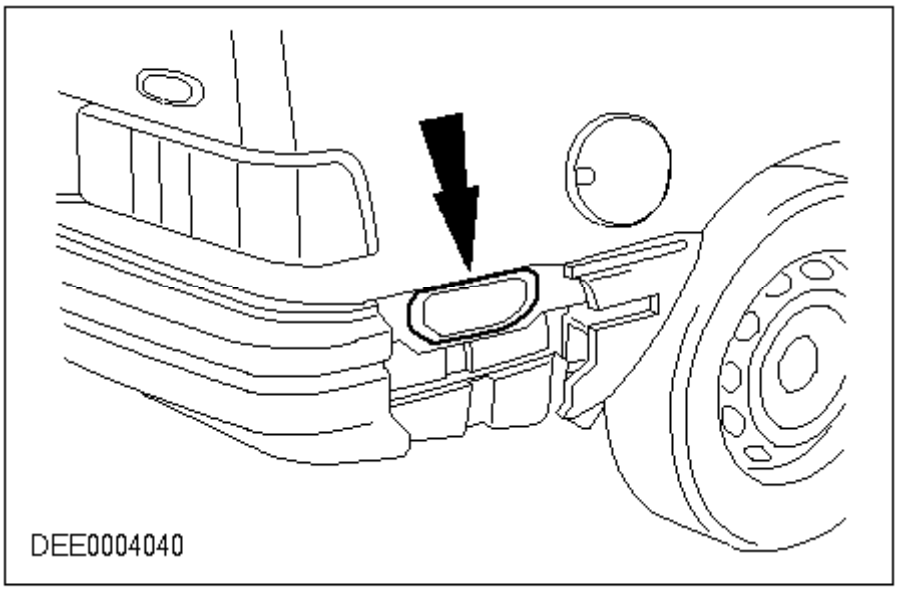
Check the routing holes for rubber grommets, cables and hoses



Forced air extraction

- Diagnosis:
  - Ingress of water into side luggage compartment area
- Cause:
  - The forced air extraction for the vehicle interior is often located in the lower side panel area of the luggage compartment. The ventilation housing is sealed with a foam watershield on the bodywork side.
  - The rubber flap of the forced air extraction must be able to move freely.
- Corrective action:
  - Remove the forced air extraction. Detach the bumper if required.
  - Check the seal area between the bodywork and housing, as well as the rubber flap.
  - Renew a damaged foam watershield if necessary.

Check the seal for the forced air extraction.



Rear window

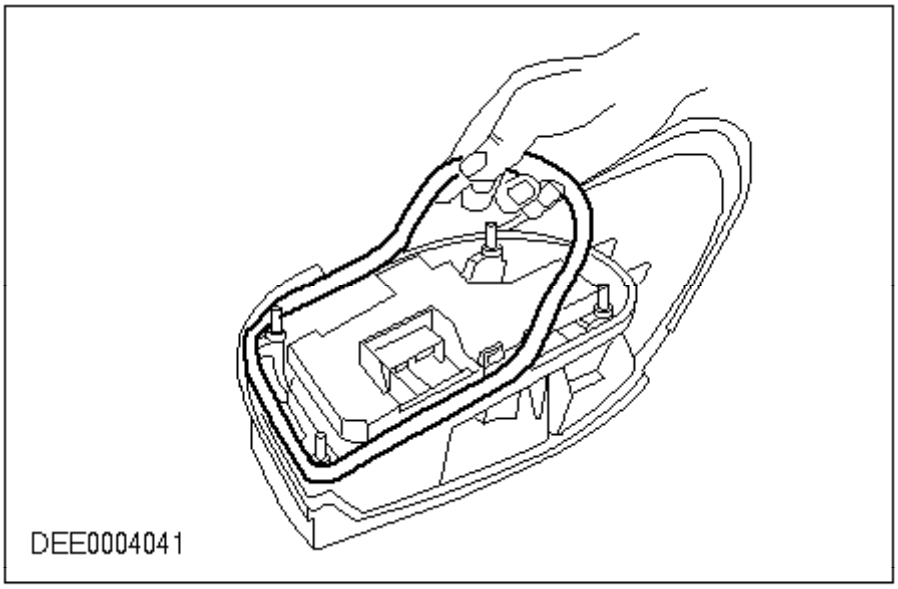
- Diagnosis:
  - Ingress of water into the luggage compartment area
- Cause:
  - Rear window leaking.
  - Check for leak in the same way as for leaking windscreen.

Rear lights

- Diagnosis:
  - Ingress of water into rear luggage compartment area
- Cause:
  - Rear lights are leaking. There are two sealing methods:
  - Sealing with a foam watershield
  - Sealing with plastic sealing compound
  - If a rear light has a leak, this usually means that the seal was fitted incorrectly.
- Corrective action:
  - Remove the rear light. Check the housing and glass for damage. Check the plastic seal for leaks.

Note:
The sealing compound must always be removed during repair work.

Check the seal for the rear lights



Panel connections with seal welds

- Diagnosis:
  - Ingress of water into the luggage compartment area

— Cause:
  — Several panel connections must be fitted in production in the wheelhouse and luggage compartment areas. These connections are sealed with sealing compound.
  — Uneven application of sealing compound can lead to a break in a seal weld.
— Corrective action:
  — Expose the seal weld.
  — Locate the leak in the seal weld.
  — Re-seal using sealing compound.

Possible water leaks at the panel connections in the luggage compartment