

Description and Operation

Wind noises as well as other general noises are dealt with under Noise, Vibration and Harshness (NVH).

NOTE: Basic and in-depth training is offered on the following topics. You will find an overview of the complete range of courses in the Training Brochure issued by the Ford Service Organization.
Due to the continuous reduction in drivetrain noises, wind noises have come to the fore in the vehicle and are perceived to a greater extent by the customer.

There are various causes of wind noises. They can be due to the design of the vehicle, or they can occur after a repair. They are mostly caused by poorly mounted components, which must be located and installed in the correct position.

General information

In order to carry out targeted diagnosis, it is important to know the basics of noise formation and sound transmission.

Potential areas of wind noises



Item	Description
1	Wiper arms
2	Windscreen seal
3	Antenna/antenna base
4	Sun roof/roof rail
5	Tailgate
6	Door handles
7	Exterior Rear View Mirror
8	Door seals
9	Headlamps
10	Radiator grille.

Noises are categorized according to their type and formation as follows:

"Normal" air flow noises:

Normal air flow noises are caused by air blowing against even, flat vehicle surfaces, such as the roof, doors and side windows. When the vehicle is moving fast, air layers (turbulence) form, which cause variations in air pressure. These variations in air pressure spread in the form of sound waves and are transferred to the vehicle interior via the side windows and seals.

Noises caused by deviations in air flow and circulation around separate components:

If air flows over an edge on a vehicle, the air flow cannot follow the shape of the surface, but separates at the edge. Eddies are formed, which collapse again after a certain time or distance. The associated fluctuations in air pressure create a corresponding sound wave which is noticeable by for instance a rushing noise at the A-pillar or the outside mirror.

Turbulence and the associated radiation of noise can also occur at the vehicle underbody. Air circulation around small components and also flow through small gaps (e.g. the radiator grille) cause the rushing noise to change to a whistling, which rises and becomes louder as the vehicle speed increases.

Noises caused by vibrating seals:

Seals which do not make firm contact at the door or window area can be made to vibrate by pressure variations outside the vehicle, which in turn mean noise radiating into the interior of the vehicle.

Noises caused by air flowing out:

Noises caused by air flowing out are created by leaks at the vehicle interior sealing system, when stationary air mixes with flowing air. As a result, the noise increases as the speed of the air flowing out increases. Example: Letting air out of a tire.

Cavity noises:

Cavity noises are those created when the air volumes found in bodywork cavities are caused to vibrate by an opening located in the airflow. The frequency of the tone does not vary with the vehicle speed but depends on the volume of the cavity and the size of the opening. Example: Blowing across the top of a bottle.

Wind noises overview:

Workshop diagnosis

Assessment	Type of wind noises	Place of origin
Normal	"Normal" wind noises	Roof, side windows
Normal	Noises caused partly by changes in the direction of air flow and by air flow around separate components	A-pillars, outside mirrors, antennas
Serious	Noises caused by vibrating seals	Door gaps too large, door/window seals not making firm contact
Serious	Air escape and air passage noises	Leaks in the bodywork/sealing system
Serious	Cavity noises	Unsealed bodywork cavities

Those noises listed under "Serious" indicate a possible source of the fault.

Workshop diagnosis

There are two ways that the level of noise in the vehicle interior can be reduced and the character of the noise can be improved through assessment and diagnosis in the service department:

- Reducing the intensity of the noise sources.
- Reducing the noise transfer routes.

Before carrying out repair work, a visual inspection of the vehicle must be carried out. The gaps in the doors, the sunroof and at all other body parts must be checked in particular.

When the doors are adjusted to fit exactly, development of wind noises at high speeds can often be eliminated (lifting of doors off the seals). Furthermore, the following points should be noted:

- The windows and doors must be fully closed.
- The air guides and air grilles must be correctly seated.
- All of the trim strips and plastic components must be firmly fixed down without gaps.
- All blanking plugs present.

Test method

The test procedures given in the chapter Noise, Vibration and Harshness can also be used to diagnose wind noises.

Road tests

Wind noises can usually only be localized by road tests

NOTE: There should always be two people present during road tests to find noises. A driver who reconstructs the situation causing the noise, and a person to carry out the checks.

The following points should be taken into account for such road tests:

- Check that the tire pressure is correct.
- Remove non-standard ancillary components from the vehicle.
- Choose a dry, flat road with as little traffic as possible.
- Carry out the road test in all speed ranges. Use a high gear so that the engine noise is low.
- Do not perform a road test near any sound reflecting objects.

If it is difficult to detect the noise sources, the search can be made easier by masking potential areas.

Chalk / powder test

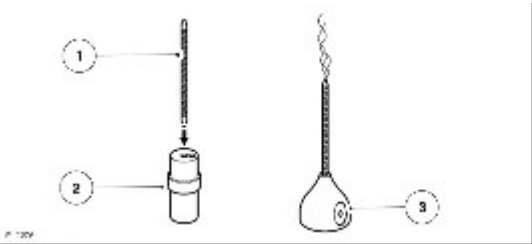
This test checks the contact surfaces of seals on doors, hatches and lids.

Process using a door seal as an example:

To do this, the door seal is coated with powder or brushed with chalk. A thin layer of grease is applied to the surface against which the seal makes contact. The door must then be slowly closed and reopened. The width and continuity of the imprint can now be checked on the seal.

Smoke test

Flow checking device



Item	Description
1	Test pipe
2	Test pipe opener
3	Puffer ball

Mode of operation:

The flow checking device is a set made up of a flow-testing pipe, a test pipe opener, puffer ball and closing-off caps for the pipe.

The test pipe contains a filling layer which is impregnated with fuming sulfuric acid. When air is blown through the pipe by the puffer ball, sulfuric acid aerosol is emitted in the form of a white smoke.

NOTE: Pay attention to the instructions for use and the safety directions issued by the manufacturer. The smoke test can only be performed in a draft-free environment.
This test can be used to detect leaks visually.

Procedure:

- Break off both tips of the pipe in the pipe opener, in exceptional cases in the top of the packaging.
- Insert the pipe into the puffer ball so there are no leaks.
- Close the hole in the puffer ball with your thumb and press the air contained in the ball through the pipe.
- Set the ventilation blower in the passenger compartment to the highest setting.
- Close all doors so that a slight overpressure can build up in the passenger compartment.
- Move the smoke pipe along the outside of the body to the areas to be checked. Leaks can be detected through the irregular movement of the smoke.

Ultrasonic test

This test searches for leaks in the system of seals or rather acoustic bridges. When an ultrasonic transmitter is placed inside the vehicle, it sends out ultrasonic waves. A leak is located by running a detector along the suspected area. The position with the loudest reception of the escaping ultrasonic waves indicates places where noises occur.

Ultrasonic test device

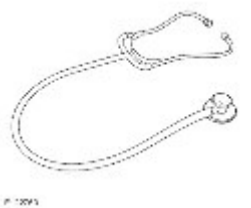


Procedure:

- Place the ultrasonic transmitter in the vehicle.
- Completely close the vehicle.
- Search the exterior of the vehicle using the detector.
- The detector provides a simple indication of a leak.

Stethoscope test

Stethoscope



Diagnosis

Wind noises often have similar causes as the general NVH noises. For instance, a windshield which is incorrectly bonded in position can cause normal driving noises to become more noticeable.

Asking the customer detailed questions and a road test together with the customer are the requirements for a targeted diagnosis.

NOTE: Take the customer concern seriously. But do not confirm that a noise is a problem until you are sure that it is something which is not normal for the vehicle series.

Possible questions:

- How long has the noise been there?
- Has any work been done on the vehicle?
- Where does the noise come from?
- In which driving situation does the noise appear?
- Is there any special situation in which the noise appears?

Remember that a noise is often more or less noticeable depending on where you are sitting in the vehicle.

Stage	to test	Result	Reference or Action
1st	Road test the vehicle with the customer. First let the customer drive to demonstrate the noise, before you drive the vehicle yourself. Check that the concern is justified. Is this a noise which gives cause for concern?	Yes	Step 2.
		No	Explain the noise and tell the customer what is causing it. Possibly offer a comparable vehicle for a road test.
2nd	Visually inspect the vehicle. Look for loose, damaged or missing components. Check that the vehicle is to standard production series specification. In particular, check for any after-market components which may have been installed. Depending on the type of noise, check the suspected area. Could a cause of the noise be found?	Yes	Eliminate the noise or carry out a repair as the case may be. Check whether the measures have been successful.
		No	Step 3.
3rd	Before starting any further work, use the VIN to look for model-specific information in eTIS. Perform Oasis query and check TSBs. Can a cause for the noise be determined based on the information available?	Yes	Take the action specified in the Oasis or TSB information. Check whether the measures have been successful.
		No	Step 4.
4th	Localize the noise. In doing so, check whether it is an unusual noise or if it is a usual driving noise that is more noticeable because of inadequate sealing. Is it an unusual noise?	Yes	Step 5.
		No	Step 7.
5th	Determine the source of the noise. Can the cause be determined?	Yes	Eliminate the noise or carry out a repair as the case may be. Check whether the measures have been successful.
		No	Step 6.
6th	Determine the path of the noise using the stethoscope. By way of a trial, mask the suspected area or components or remove them. Can the cause be determined?	Yes	Eliminate the noise or carry out a repair as the case may be. Check whether the measures have been successful.
		No	Step 7.
7th	Check the vehicle for inadequate or damaged seals. The sealing of a vehicle can be checked using the stethoscope, the powder test, the smoke test and the ultrasonic detector. (See under test method.) Could a leak be detected?	Yes	Renew the seal or perform the appropriate repair as necessary. Check whether the measures have been successful.
		No	Step 8.
8th	Under certain circumstances there may be a constructional problem which is not yet known about. Record the problem in an Express Service Report and send it on by the usual method.		

Possible concerns with corrective measures

NOTE: Instructions on general noise are summarized separately in the Noise, Vibration and Harshness section.

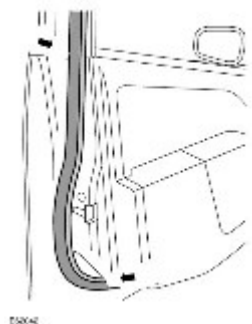
These can be useful when searching for the causes of wind noises.

There follows an outline of the possible concerns relating to wind noises. Selected examples are given showing the causes of wind noises and the ways in which they can be eliminated. They are intended to provide troubleshooting tips and suggestions for the user but do not represent an exhaustive faults list. The topics are subdivided by the different groups of components.

The test procedures described in the Noise, Vibration and Harshness section can be used when troubleshooting.

Seals

In general, seals are very important when eliminating wind noises. Special attention should always be paid here to the possible causes of wind noises.

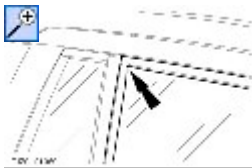


Take the following points into account:

- Seals age, i.e. they become porous and with time they lose their original elasticity. If the vehicle is relatively old and there are already visible signs of distortion or damage to a seal, then it should be replaced.
- At high speeds the doors or hatches may lift slightly from the seal surfaces because of variations in air pressure. Wind noises are caused when the preload on the sealing surface is not sufficient. The preload depends on the installation position of the components, the elasticity of the seal and the location of the sealing flange.
- The contact surface of the seal must be sufficient. This can be checked using the chalk test. If the specified width of the contact surface is not known, you must determine it on another component of identical construction.
- A bulging seal carrier indicates that the sheet metal of the retaining flange is uneven.
- Seals must be correctly installed. Special attention must be paid at corners **-arrow-** that the installation follows the contours.
- The seal must not show any kinks or folds or any other damage.
- Seals must seal all around their circumference. Gaps in seals result in openings which lead to an increased incidence of noise. In this respect, it is especially important to pay attention to the seals in the area of the windows.

Remedial Action

Renew older seals which no longer have adequate preload. Deformed or widened retaining flanges must be reworked and provided with a new seal.

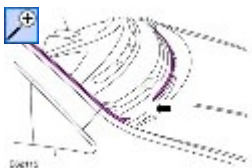


The corner areas **-arrow-** of a seal must be properly seated. In some circumstances, a butyl sealing strip must be affixed to support the sealing at a corner.

Bonded joints

Glass is usually installed today using a bonded joint. Gaps in the bonded joint can lead to noises in the vehicle interior. If there are noises which are believed to be associated with window glass, the following points should be checked:

Gap in window bonding



- The window must be bonded without any gaps **-arrow-**. Leaks can be found using the ultrasonic tester or compressed air carefully blown from inside onto the window glass bonding.
- The installed position of the window glass must be correct. It must not have been bonded into a position which is too low or offset to one side.
- The sealing or trim strips must fit tightly and the glass must be mounted so that it is fully enclosed. If a sealing or trim strip has not been applied with enough pressure, high air speeds can cause it to lift up. This can lead to wind noises at higher speeds. Apply masking tape to these areas for test purposes.

Corrective measures

Leaking areas of the window glass bonding material can be sealed using PU sealing compound. Pay special attention at the front windshield, that any breaks in the bonding are not too large. Otherwise the glass must be removed and bonded in place again.

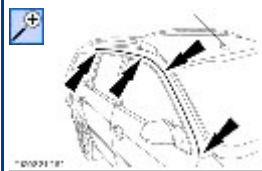
The installed location of a window glass cannot be corrected. It must be removed and bonded into place again.

Replace the trim strips or secure the lip seal using PU adhesive.

Gaps, edges

Door gaps and edges are places where air turbulence can form. This causes noises which can be perceived as troublesome.

Gaps and edges - problem areas



Doors, hood and tailgate can cause wind noises because of gaps **-arrow-** which are too large. If the components are not installed flush to the bodywork or the neighboring component, air break edges can arise, which in turn can create a wind noise.

The sun roof may be the cause of whistling noises in the roof area. The sun roof may be incorrectly adjusted or the seal on the sun roof may be damaged.

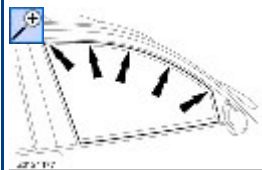
Noises from the door area could come from a window which does not fully close. Side guides (seals) can also be the cause of wind noises.

The covers of window frames can be incorrectly mounted or aligned. The quarter-lights in doors must also be checked for correct installation.

Corrective measures

Check the gaps and adjust them according to the specifications. If there are problems at the sun roof, correct the adjustment and if necessary replace the seals.

Problem area at side windows



Side windows which do not fully shut **-arrows-** must be adjusted. If the vehicle is equipped with electric window regulators, the remedy may be to perform the window regulator learning process again. In all cases, make certain that the glass enters far enough into the seal.

Ancillary Components

Components installed on the bodywork may cause noises when they are not correctly mounted.

When troubleshooting it may be helpful to remove the suspected component or, when this is not possible, to mask it off with suitable covering tape.

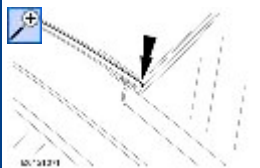
Roof moldings, roof rail, roof antennas

Moldings and roof moldings must touch the bodywork along their whole length without any gap. Check the end sections in particular. These must neither have any splits nor stand away from the bodywork.

Noises may come from the roof rail if the seal between it and the roof is not correctly installed or is cracked. Gaps at the mounting grooves of the carrier can also create wind noises.

The roof antenna and antenna foot seal must be correctly secured. The seal must lie completely on the roof and must not be damaged.

Roof moldings mounting



If the original mounting points of the roof moldings are in good condition, the fixing can be improved using silicone sealant -arrow- if necessary. Align or renew the seals of the roof rail. Reduce the clearances of the mounting grooves.

Corrective measures

If the original mounting points of the roof moldings are in good condition, the fixing can be improved if necessary using silicone sealant -arrow-.

Exterior mirrors

Exterior mirrors or covers of exterior mirrors which are not correctly mounted cause noises. The cover must lie evenly on the component and must not lift during driving. There are ducts present on the doors for the electrical or mechanical adjusters for the exterior mirrors. If there are leaks, wind noises will be caused. Holes can also be present at the transition to other components.

Exterior mirror seals



There are ducts present on the doors for the electrical or mechanical adjusters for the exterior mirrors. If there are leaks, wind noises will be caused. Holes can also be present at the transition to other components.

Remedial Action

If there is inadequate sealing of the foam seals -2- they must be replaced or supplemented with suitable material. Transitions to other components can be sealed with butyl sealing compound -1-.

Moldings, covers, door handles, windshield wiper arms

Moldings and covers especially tend to cause wind noises because of their location. These components interrupt smooth bodywork surfaces and air turbulence therefore arises at the edges. If there are noise concerns in the area of the doors, check especially for gaps and projections. Moldings must not stand away from the bodywork or the door. There must not be any gaps or discontinuities at the location of joints.

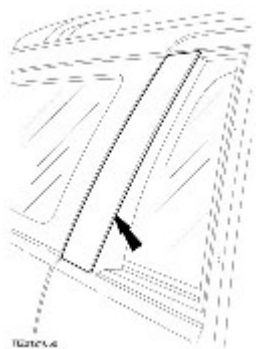
Incorrectly adjusted windshield wiper arms can cause wind noises. Especially if they are too far over the glass surface when in the rest position.

Wind noises in the transition area between the air cowl cover and the wing or the windshield can be caused by an incorrectly installed air cowl cover. At high air speeds the air cowl cover may lift and noises will then occur.

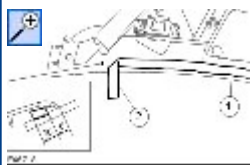
Because of their necessary mechanical features, door handles have a range of openings and edges which allow noise to be generated. The door handle can be masked off for testing purposes. If a reduction in wind noises is noticed, inadequate sealing may be the reason for the noises.

Remedial Action

Openings which are used to secure trim panels must be checked for leaks. Any leaks found can be rectified using butyl strips.



Loose or damaged outer trim on the pillars **-arrow-** must be secured or replaced.



A butyl sealing strip **-1-** can be laid underneath the cover in the transition area between the air cowl cover and the wing or windshield.

The sealing of the door handles must be renewed when required. In addition, noise absorbing material can be applied to the back of the door handles.