

1. SCOPE OF THIS DOCUMENT

This document covers the following topics:

- Noise from the drive train,
- Noise when changing gear,
- Air inlet noises,
- Noise from the turbocharger,
- Noise from the exhaust
- Interference noise (suspension, steering, etc.)
- Noise from the dashboard,
- Noise from the upholstery,
- Noise from the sunroof,
- Noise from the window winders,
- Noise from the speakers.

This document presents the fault finding procedure applicable to all vehicles with the following specifications:

- Vehicles with 2 drive wheels for the drive train,
- Manual gearboxes (for drive train noises)
- Original sliding/tilting sunroof.

2. PRE-REQUISITES FOR FAULT FINDING

Documentation type

- Fault finding procedure (this document):
- Repair Manual for the vehicle concerned

Type of diagnostic tools

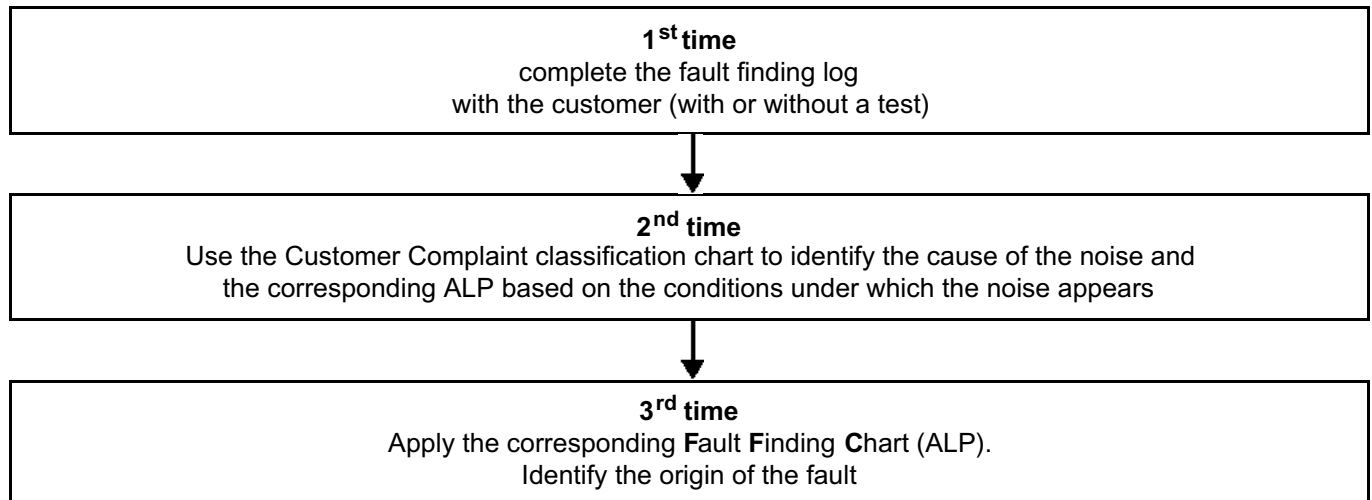
- CLIP to lock the airbags (if necessary)
- Noise diagnostic tool (see **01E GENERAL VEHICLE INFORMATION, Noise diagnostic tool - Use**)

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3. FAULT FINDING PROCEDURE



Rules for dealing with a noise-related customer complaint when the vehicle is received or in the workshop:

Rule no. 1: When the customer complaint is registered.

When the appointment is made by telephone, ask if the customer would be able to reproduce the noise in the workshop (enable the cotech to hear the noise with the customer present so that the fault finding procedure is more efficient).

If the customer cannot, preferably offer a date when they are not busy in order to deal with the noise.

Rule no. 2: Take information in a methodical manner.

The fault finding log must be completed to accurately describe the customer complaint in addition to the Order of repair.

4. FAULT FINDING LOG



IMPORTANT!

WARNING

All problems involving a complex system call for thorough diagnostics with the appropriate tools. The FAULT FINDING LOG, which should be completed during the fault finding procedure, ensures a record is kept of the procedure carried out. It is an essential item when discussing the fault with the manufacturer.

It is therefore mandatory to fill out a fault finding log for each fault finding procedure.

You will always be asked for this log:

- when requesting technical assistance from the Techline,
- for approval requests before replacing parts for which approval is compulsory
- which must be attached to monitored parts for which reimbursement is requested. It is therefore used to decide whether a reimbursement will be made under warranty and leads to improved analysis of the removed parts.

A blank log is available on the following pages

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● Administrative identification

Date					2	0		
Log completed by								
VIN								
Engine								
Diagnostic tool		CLIP						
Update version								

● Customer complaint

	520	Abnormal noise, vibrations
Other	Your comments: 	

● Conditions under which the customer complaint occurs

		In forwards gear (whilst driving)			Whilst reversing			When starting (increased engine speed in 1st)
		Whilst parking			When stationary (engine running)			When stationary (engine not running)
		Switching the engine on/off						

– Engine

	Engine fitted with a turbocharger		Petrol		Diesel
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– Vehicle speed

	between 0 and 30 mph (0-50 km/h)		between 30 and 54 mph (50-90 km/h)		between 54 and 78 mph (90-130 km/h)
	constant		variable		

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– Engine speed

	at idle speed (neutral)		at low engine speed Diesel and Petrol < 1500 rpm		at medium engine speed 1500 < Diesel < 3000 rpm 1500 < Petrol < 4000 rpm
	at high speed Diesel > 3000 rpm Petrol > 4000 rpm		stabilised		variable
	under speed		over speed		increasing engine speed (no load)
	lessens when engine speed increases				

– Engine temperature

	When cold		When warm		Quieter when hot
	Worse when hot				

– Driving conditions

	In neutral		When decelerating		Heavy acceleration
	On a hill		Pedal released suddenly after it is fully depressed		

– Vehicle speed

	Stabilised: vehicle speed or engine speed constant.		Accelerating
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– Driver's action on the accelerator (acceleration or deceleration)

	no pressure		foot resting on or lightly depressing the accelerator pedal		Accelerator pedal moderately depressed and held (neither slightly nor fully depressed)
	pedal held fully depressed		pedal fully depressed suddenly (on-off)		Accelerator pedal gradually released
	Accelerator pedal suddenly released		disappears when pedal released without braking		

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– Driver's action on the gear lever (gearbox)

	when changing gear (one or more)
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	gets worse when changing gear quickly
--	---------------------------------------

	only appears when engaging the gear.
--	--------------------------------------

	Always appears when engaging AND disengaging gear.
--	--

	worse when downshifting
--	-------------------------

– Driver's action on the clutch

	the customer complaint disappears when declutching and reappears when engaging the clutch
--	---

	the customer complaint disappears when changing gear, disengaged.
--	---

	the customer complaint lessens when changing gear, disengaged. (test type handling in a motor show)
--	---

– Driver's action on the steering wheel

	Little movement (pressure change, cornering)
--	--

	Significant movement (roundabout, manoeuvres)
--	---

– Driver's action on a vehicle fitting

	Upholstery (adjustments)
--	--------------------------

	Sunroof (opening/closing)
--	---------------------------

	Sunblind (opening/closing the sunblind)
--	---

	Dashboard (glovebox, air conditioning controls, etc.)
--	---

	Speaker (switching on)
--	------------------------

	whilst opening/closing the window
--	-----------------------------------

	whilst opening or closing the window fully
--	--

	when closing the door (window half-open)
--	--

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– Weather conditions

	cold weather (frost)
--	----------------------

	hot weather (sun)
--	-------------------

	humid conditions
--	------------------

	dry conditions
--	----------------

– Main beam

	smooth
--	--------

	cobbled
--	---------

	grooved
--	---------

	in poor condition: unmade, road seams, drain cover, pot hole, etc.
--	--

	When driving over a speed bump
--	--------------------------------

	Mounting/dismounting the pavement
--	-----------------------------------

	Corner (to the left or right)
--	-------------------------------

	parallel parking
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5. SAFETY INSTRUCTIONS

Safety rules must be observed during any work on a component to prevent any damage or injury:

The road tests referred to in this document should be carried out in accordance with Road Traffic Regulations (speed limits must be obeyed).

During the tests performed with the engine running, observe the safety advice. Pay particular attention to the accessories, moving parts or parts which heat up (fan assembly activation, increase in temperature of the air pipe at the turbocharger outlet, etc.)

WARNING

When carrying out road tests, obey Road Traffic Regulations, especially speed limits.

Within the framework of a fault finding test, two people are required to carry out the research and specific identification of the source of the noise.

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6.1. DEFINITIONS OF CAUSES:

This document deals with the following causes of noise:

Drive train:

TEST PROTOCOL FOR CLASSIFICATION OF THE CUSTOMER COMPLAINT

A. If the customer complaint appears when driving

- Perform **gradual** accelerations and decelerations [1] [2] on each gear to determine which gear(s) display the customer complaint (on an even straight line with a good surface, warm engine and after having checked that the oil and coolant levels are correct). Note the vehicle speed, gear ratio and engine speed.
- **Disengage / re-engage**: if the customer complaint disappears when disengaging and reappears when re-engaging the gear and the engine speed is stabilised, there is a whining noise and/or growling.
- **Change pressure**: if the noise level is more pronounced or decreases when pressure is applied (when overtaking, cornering, on a roundabout, moving steering wheel to the left/right), this is not a drive train fault (check the wheel bearings).

B. If the customer complaint appears particularly during a parking manoeuvre (steering greater than one steering wheel revolution, in 1st or 2nd gear)

If a noise appears when accelerating and disappears when decelerating, there is a murmuring noise from the differential.

C. If the customer complaint appears when stationary

In neutral and disengaged, increase the engine speed **very** gradually [2].

If the noise identified when driving is still present at the same engine speed, it is not a drive chain fault.

[1]: The speed range under which the customer complaint appears may be restricted. It is necessary to slowly increase and decrease the engine speed for each gear.

[2]: Increased engine speed: as long as the noise can be heard.

- up to approximately 4500 rpm (petrol engine),
- up to approximately 3000 rpm (diesel engine).

Never go into the red zone.

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Whining noise (drive train)

Definition: high-pitched noise caused by teeth engaging when driving.

Note: this customer complaint can be noticed from 0 miles. It is more noticeable on long journeys on a constant road type (motorway). Not to be confused with aerodynamic noise.

Test to identify the whining noise from the engaging teeth: during a road test, hold the gear lever to dampen the gearbox control driveshaft chain. If the noise is quieter or disappears, check the gear lever first and, if the gear lever is correct, consult ALP 13 - Whining noise from the drive train.

Murmuring (differential - relay bearings)

Definition: modulated noise which is similar to the cooing of a pigeon.

Note: this customer complaint can occur at any point in the vehicle's lifetime.

Test to identify the murmuring noise from a driveshaft: during a road test, if there is significant noise when driving in a straight line and when cornering, study the right-hand driveshaft relay bearing. If there is only significant noise when cornering, there is a fault in the gearbox, mainly with the differential.

Growling noise (drive train)

Definition: continuous noise which is similar to the noise when shaking a bag of nuts.

Note: appears particularly when hot and can be easily heard when the windows are open when passing alongside a wall. It is quite noticeable at low speed.

Test to identify the growling noise: during a road test, perform gentle accelerations in 1st and 2nd gear. If the noise dies down or disappears whilst holding the gear lever, study the control instead.

Noise from neutral (drive train)

Definition: sewing machine noise.

Note: disappears when accelerating and declutching.

Exhaust

Crackling from the pipe or ball joint.

Definition:

- For the pipe: noise like a bag of marbles shaken energetically. Very high frequency (very high-pitched).
- The ball joint may grate when fitted to the spring.

Note: can be heard easily from the outside or when the window is open (car park exit, when passing alongside a wall). The noise becomes more pronounced very quickly if no repair work is carried out on the vehicle. It can be reproduced when stationary by shaking the exhaust pipe.

Warning

The crackling may spread and get worse along the exhaust system, despite the cause being very localised at the beginning of the system (connecting hose or ball joint bracket). It may appear that the entire pipe is concerned but this is not the case.

Noise from underbody contact.

Definition: dull or bright metallic noise (fist banging on a table).

Note: it can be reproduced when stationary by shaking the exhaust pipe.

Exhaust leak noise.

Definition: none.

Note: it depends on the engine speed and can be heard according to the extent and location of the leak.

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Turbocharger

Meowing noise from the turbocharger.

Definition: single frequency continuous noise, **sub-synchronous to the speed of the turbocharger.**

Note: the meowing noise from the turbocharger is quieter when hot.

Whistling noise from the turbocharger.

Definition: high-pitched whistling which follows the turbocharger rotation speed, **either synchronous to the turbocharger speed, or super-synchronous to this speed (vane number x turbocharger speed).**

Notes:

- the whistling noise from the turbocharger is worse when hot.
- Any of the fittings installed, poor bonding of the windscreen or cable routing through the bulkhead may be the cause of the detected noise.

Blowing noise from the turbocharger.

Definition: noise similar to the noise made by a ventilation fan (passenger compartment ventilation, engine cooling system)

Note: the blowing noise from the turbocharger is even louder when the turbocharger air flow is higher.

Sighing noise from the turbocharger (Diesel terminology).

Definition: noise similar to a volume of pressurised air being released **suddenly.**

Note: the sighing noise from the turbocharger is even greater when the turbocharging pressure is greater as the pedal is released.

Releasing noise from the turbocharger: (petrol terminology).

Definition: noise similar to a volume of pressurised air being released **very suddenly** (activation of the turbocharger recirculation valve).

Note: the releasing noise from the turbocharger is even greater when the turbocharging pressure is greater as the pedal is released.

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Air intake

Air inlet whistling.

Definition: high-pitched noise similar to whistling.

Test protocol.

Carry out at test in the workshop with the vehicle stationary and the bonnet open:

Warm engine: increased engine speed (neutral) to average speed (4000 rpm for a petrol engine; 3000 rpm for a diesel engine).

Warning.

The air inlet whistling noise must be distinguished from the turbocharger whistling noise. It is directly related to the engine speed and not to the speed of the turbocharger.

Air inlet humming.

Definition: dull noise which is similar to the noise of a bumblebee in flight.

Note: noise sensitive to engine load (petrol).

Noise not sensitive to engine load (diesel).

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Noise when changing gear

Noise when engaging and disengaging gear.

Definition: more or less marked dull clicking (short thud).

Note:

- engine stopped, when static, if the same gears are engaged one after another (e.g. neutral- first), the first gear change is always the noisiest. On the other hand, if the gear is changed from neutral - 1st - 2nd then neutral - 1st, there will be as much noise during the first gear change in the first series as in the second.
- depending on the clutch "performance" (ability to separate the engine from the gearbox quickly) the noises when engaging/disengaging may be more pronounced.

Creaking:

Definition: onomatopoeia of a dry noise heard whilst engaging a gear (partially or completely). A malfunctioning gearbox can potentially be accompanied by successive shocks in the gear knob which may prevent gear engagement. Sporadic noise which is similar to a rattle.

Note: for basic range vehicles, it may be normal to notice creaking noises in reverse gear.

Banging during power take-up:

Definition: banging whilst changing gear or during torque inversion (successive acceleration or deceleration).

Note: mainly in the lower gears (1st, 2nd, 3rd).

Interference noise

Definition: noise which is difficult to locate, due to a fault in the chassis, steering, engine and transmission assembly suspensions, underbody area, rotating components or front end panel.

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Dashboard

There are three types of dashboard noise:

- **rubbing noises**: two components or sections rub against each other which produces a creaking or grating noise.
- **banging noises**: two components or sections knock together which produces a crackling or rattling noise.
- **vibration**: too much play between two components or sections

These noises are mainly related to contact between two components (cover or front panel and dashboard casing) or related to a component which moves with another component.



↔ : Area likely to produce a noise

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Noise from the upholstery

There are three types of seat noise:

- **rubbing noises:** two components or sections rub against each other which produces a squeaking or grating noise (e.g. adjustment lever)
- **banging noises:** two components or sections knock together which produces a crackling noise (e.g. cover) or a rattling noise (e.g. wiring)
- **vibration:** too much play between two components or sections

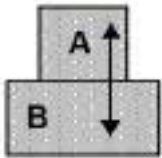
These noises are mainly related to contact between two components (e.g. cover and dashboard casing) or related to a component which moves against another component (e.g. runners)



↔ : Area likely to produce a noise

Crackling from the speaker

Definition:



Crackling: quick alternating impact between two components.

Sunroof:

Sunroof chattering: jerky movement of mobile panel when opening/closing (vertical movement of the panel while moving longitudinally)