RENAULT

Technical Note 5088A

Vehicle types indicated on the following page

Fault finding on vibrations

Fault finding procedure for vibrations linked to vehicle speed.

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Vehicle	Type
Twingo	X06X
Renault 4	
Renault 5	X40X
Extra	F40X
Kangoo	XCXX
Kangoo phase II	XCXX
Clio I	X57X
Clio II	XBXX
Clio II phase II	XBXX
Clio V6	CB1A
Clio V6 phase II	CB1A
Clio Internationale	XB1R
Clio III	XRXX
RENAULT 19	X53X
RENAULT 21	X48X
Modus	XPXX
Logan	LS0X
Mégane	XAXX
Mégane II	XMXX
Scénic	JAXX
Scenic II	JM0X
Laguna	X56X
Laguna II	XGXX
Laguna II phase II	XGXX
Renault 25	X29X
Safrane	X54X
Vel Satis	XJXX
Vel Satis phase II	XJXX
Avantime	DE0X
Espace	J11X
Espace III	J63X
Espace III	JE0X
Espace IV	JK0X
Espace IV phase II	JK0X
Trafic	T/P/VXX
Trafic II	XL0X
Trafic II Phase II	XL0X
Master propulsion	XHXX
Master propulsion Phase II	XHXX
Master	FB/FC
Master	Q/Rxxx
Master II	XDXX
Master II phase II	XDXX
Spider	EF0H
Alpine	D50X

Contents

SCOPE OF THIS DOCUMENT
This document deals with fault finding of vibrations linked to vehicle speed.

It is applicable to all vehicles, except 4X4s.

The procedure detailed in this note only concerns vibrations that are linked to vehicle speed. Some vibrations generated by the engine may be confused with those linked to vehicle speed. In this case, the vibrations are most likely linked to engine speed or engine "load". You can only be certain of this by reproducing the customer complaint.

PREREQUISITES FOR FAULT FINDING:
- Fault finding procedure (this document):
- Repair Manual for the vehicle concerned

SPECIAL TOOLING REQUIRED:
- No special tooling

FAULT FINDING PROCEDURE:
- Fill in the fault finding log with the customer
- Use the ALPs (fault finding charts) to identify the cause of the fault
- If the fault is still present, contact the Techline having completed the fault finding log

FAULT FINDING LOG:

IMPORTANT
Any fault on a complex system requires thorough fault finding 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 document when consulting 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.
- to be attached to monitored parts for which reimbursement is requested. The log is needed for warranty compensation, and enables better analysis of the removed parts.

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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).

INFORMATION:
Vibrations are caused by a series of impulses. In the case of vibrations linked to vehicle speed, these impulses are generated by an imbalance of a component rotating with the wheel, which is then transmitted to an axle. The vehicle speed modifies the frequency of these impulses. The vibrations are generally absorbed by the vehicle's structure and the axle supports, except at a precise frequency, known as the "axle mode". This depends on its longitudinal stiffness. The front and rear axle modes are generally very distinct (apart from the Vel Satis), and can be expressed in terms of vehicle speed as the rolling radius of the wheels does not change.
The number of impulses per wheel revolution is determined via the relation between the axle mode in question, expressed in speed, and the speed of the vehicle at the moment of the vibrations (see the table in this note for the front and rear axle modes for this range).

There are two types of imbalance:
- An **out-of-balance**: imbalance of weights = 1 impulse per wheel revolution only.
- An **out of round**: geometric deformation = 1 or several impulses per wheel revolution.

The components affected by vibrations are:
- **Rotating components** (tyres, wheels, trims, brakes, driveshafts, hollow sunwheels for manual gearboxes with open differential)
- **Damping components** (shock absorber, damping and/or mounting for the axle, sub-frame, steering rack, steering column, seats, etc.)

POSSIBLE CAUSE OF IMBALANCE:

Rotating components	**Out-of-balance** *One impulse per wheel revolution only*	**Out of round** *One or several impulses per wheel revolution*
Tyres	● Non uniform weight distribution	● Structural fault (can be caused by lengthy immobilisation at a high temperature) ● Tyre fitted incorrectly ● Flat spot on tread ● Worn or damaged tyre ● Unsuitable pressure
Wheel rim	● Non uniform weight distribution (build-up of foreign bodies inside the wheel)	● Sign of impact on the edge of the wheel ● Construction fault (oval wheel) ● Centring hole too big compared to the shoulder on the hub (wheel not suitable for the vehicle)
Trims	● Non uniform weight distribution: in terms of the trim weight, a significant off-centre weight will produce an imbalance likely to cause vibrations. (at least one-third of trim broken or build up of dirt on edge)	
Driveshaft	● Sound insulation which has been badly fitted or has become detached. *(This component is not always fitted to the driveshaft)*	● Fault with the driveshaft tripods or rollers, gearbox side (check for a relevant section in the information library) ● Gaiter torn on the gearbox side (resulting in poor lubrication of the driveshaft joint)
Differential		● Fault with hollow sunwheel track
Brake		● Disc warped ● Play in the calliper

LOCATING VIBRATIONS:
Locating vibrations is also a part of fault finding, but to a lesser extent as it is not always systematic. Vibrations are transmitted through the axle, via the hub carrier (center of rotation). Then, their route (or "transfer") depends on vibratory energy, connections between components (e.g. tightness, condition of damping components), their stiffness, or different components which may cause vibrations.
When vibrations are felt in the steering wheel, it is most likely that they have come from the front axle and through the steering system. However, this is not always the case. In fact, certain specific faults on the rear tyres may result in steering wheel oscillations.

WHAT YOU SHOULD REMEMBER:
Vibrations are causes by a series of impulses (impacts) linked to a component that rotates with the wheel. There are two types of vibration:
- ***Out-of-balance:*** weight imbalance
  - One impulse per wheel revolution only
  - Not very sensitive to variations in engine load
- ***Out of round:*** geometric deformation
  - One or several impulses per wheel revolution
  - Sometimes very sensitive to variations in engine load

The front and rear axles have features which can be used for fault finding:
- They absorb vibrations, except if at the "axle mode" frequency
- The axle mode depends on longitudinal stiffness
- This frequency can be expressed in terms of vehicle speed
- The front axle mode is different to the rear axle mode (except for the Vel Satis)

This Technical Note will enable you to identify the axle (front or rear) affected by the vibrations and above all the number of impulses per wheel revolution. With this basic information, you will then be able to follow one of two Fault Finding Charts detailed in this Technical Note. It is therefore essential that you obtain the information from the customer (complete the fault finding log with him/her) or carry out "Test 1".

Order of size:
The extent of **out-of-balance** faults required to generate perceptible vibrations are as follows:
- 20 grams for a wheel (tyres on a 15-inch wheel)
- 100 grams for a brake disc or drum
- 500 grams for a wheel hub
- 1.16 kilograms for a driveshaft

IMPORTANT
Some vibrations generated by the engine may be confused with those linked to vehicle speed. In this case, the vibrations are most likely linked to engine speed or engine "load". You can only be certain of this by reproducing the customer complaint.

FAULT FINDING:
The procedure in this Technical Note gives details on how to find out the number of impulses per wheel revolution as well as the axle on which the vibrations are occurring, in order to know what to repair (use of ALP1 or ALP2).
After having established the customer complaint (see the fault finding log completed by the customer) and confirmed it by reproducing it if possible, note down the speed at which the vibrations start to appear (try to be as accurate as possible). Compare this speed with the speeds for the front and rear axle modes on the model concerned (see table below). There are two options:

- If the vibrations occur in a range of speeds which corresponds to an axle mode (front or rear) → **Follow ALP 1**
- If the range of speed corresponds to half (2 impulses per wheel revolution) or to a third (3 impulses per wheel revolution) of an axle mode (front or rear) → **Follow ALP 2**

Table to be used with Test 2

Vehicle	Axle mode speeds in mph *(km/h)*	
	Front	**Rear**
Twingo	**75 (125)**	**90 (150)**
Kangoo		
Clio II:	**84 (140)**	**102 (170)**
Clio III	**66 (110)**	**96 (160)**
Modus	**66 (110)**	**84 (140)**
Logan	**78 (130)**	**84 (140)**
Mégane II*	**66 (110)**	**90 (150)**
Scénic II	**66 (110)**	**96 (160)**
Laguna II	**63 (105)**	**84 (140)**
Vel Satis	**84 (140)**	**84 (140)**
Espace IV	**66 (110)**	**102 (170)**
Trafic		
Master		

Notes regarding the table opposite:

- If the speed has not been identified by the customer but the vehicle appears in the table showing axle mode speeds, apply Test 1 (seer Test/test 1)
- If the vehicle does not appear in the table showing axle mode speeds, apply Test 1 then define the vehicle using Test 2 (see Test/test 1/test 2)

** : Mégane II 5, 4 and 3-door hatch, estate and cabriolet.*

EXAMPLES:
A customer complains that his/her **Laguna II**, vibrates **at around 84 mph (140 km/h)**. This speed corresponds directly to the speed of the **rear axle mode**. Therefore, there is only **one impulse** per wheel revolution and the rear axle is affected. → **Follow ALP1.**

A customer complains that his/her **Espace IV** vibrates **between 30 and 42 mph (50 and 70 km/h)**. This speed corresponds to half the speed of the **front axle mode**. Therefore, there are **two impulses** per wheel revolution and the front axle is affected. → **Follow ALP 2.**

COMMENTS AND SPECIFIC CASES:

Tyres:

The vibrations may be caused by a fault with the internal structure of the tyres. This fault is invisible. To highlight this fault, you will need to carry out test 3. ***Note:*** *If there is a structural fault in the tyre, it is normal to use large balance weights for the wheel (50 grams and more for a wheel side).*

Rigidity of shock absorbing system:

It is possible that vibrations may be encountered on roads with particularly smooth surfaces (motorway or a new, fast road). Friction in the shock absorbing system combined with a "rigid" axle may lead to a rebound phenomenon, which resembles vibrations. The customer complaint disappears when the axle becomes less rigid (e.g. normal overtaking manœuvre, less smooth road surface).

→ C*hecking tightening torques and the condition of the axles. If vibrations occur in a new vehicle or new component, the phenomenon should fade as the vehicle is run in. Contact the Techline.*

Over-inflation of tyres:

If the tyres are over-inflated, a rebound type phenomenon may occur which resembles vibrations.

→ *Adjust the tyre pressures.*

Test 1: road test to establish the type of customer complaint
Test 2: road test to establish axle mode speeds
Test 3: road test to check the tyre structures

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

TEST 1: ROAD TEST TO ESTABLISH THE TYPE OF CUSTOMER COMPLAINT

- Mark the tyre position on the wheel (making a mark on the inside of the wheel is more discreet)
- Reproduce the customer complaint with a road test and be certain that the vibrations are linked to the vehicle speed (reproduce the customer complaint in several gears)
- Note the range of speeds at which the vibrations occur,
- Check how braking affects the vibrations:
  - When you are within the range of speeds at which the vibrations occur, apply the brakes gently (so that the pads come into contact with the brake discs) and check whether there are variations in vibrations, whilst maintaining the vehicle speed.
- Check the effects of variations in the engine torque (pulling/pulling back):
  - Modulate the engine load within the range of speeds at which the vibrations occur (so that the vehicle "pulls" and "pulls back") and check how this affects vibrations.
- Determine the axle producing the vibrations and the number of impulses per wheel revolution using the table showing the axle mode speeds.
- Follow up your findings using the Fault Finding Chart (see Customer complaints/ALP)

TEST 2: ROAD TEST TO ESTABLISH AXLE MODE SPEEDS

This test is used to determine the mode speed for each axle by creating an out-of-balance (one impulse per wheel revolution only) on one front wheel and then on one rear wheel.
It would be best to use another vehicle (same model, although the engine need not be the same) which does not have the customer complaint.

Test procedure:

- Add a 50-gram balance weight to a front wheel, marking it (it does not matter where the weight is placed on the edge of the wheel). **Leave the original weight(s).**
- Carry out a road test and note down the range of speeds at which the vibrations occur. This corresponds to the speed of the front axle mode for the vehicle being tested
- Remove the weight from the front wheel
- Fit the weight to a rear wheel
- Restart the road test, noting down the range of speeds at which the vibrations occur again. This corresponds to the speed of the rear axle mode for the vehicle being tested
- Compare the results of test 1 (type of customer complaint) with test 2 (speeds of the axle modes for the vehicle) and deduce from this the axle on which the vibrations are occurring and the number of impulses per wheel revolution.

TEST 3: ROAD TEST TO CHECK THE TYRE STRUCTURES:

The vibrations may be caused by a fault with the internal structure of the tyres. This fault is invisible. To highlight the fault, and after having noted the range of speeds at which the vibrations occur in Test 1, swap the front and rear wheels (swap the wheels on the same side) and carry out Test 1 again. When repeating the test, if the range of speeds at which the vibrations occur changes and now corresponds to the mode speed of the other axle (refer to the table showing the axle mode speeds), the fault comes from the tyres, or the wheel balance.
Note: *f there is a structural fault in the tyre, it is normal to use large balance weights for the wheel (50 grams and more for a wheel side).*
Caution: ***"Test 3" is based on the difference between the front and rear axle modes. In the case of the Vel Satis (identical front and rear axle modes) this test is not applicable.***

Vibration at a given speed

Vibrations on the front or rear axle with one impulse per wheel revolution — **ALP 1**

Only use ALP 1 if this a direct link between the speed at which vibrations occur and the front or rear axle mode speeds (for the vehicle concerned). Only apply ALP 1 to the axle in question. In the special case of the Vel Satis (identical front and rear axle modes) apply ALP 1 to the front and the rear.

Vibrations on the front or rear axle with several impulses per wheel revolution — **ALP 2**

Only use ALP 2 if the speed at which vibrations occur is half or a third of the front or rear axle mode speeds (for the vehicle concerned).

ALP 1	Vibrations on the front or rear axle with one impulse per wheel revolution

NOTES	Only consult this ALP for cases of one impulse per wheel revolution, and after having looked for a relevant section in the information library. Position the vehicle on a two-post lift.

Visually inspect the trims

- Check that the trims are not broken (on at least one third of the edge)
- Check that there are no foreign bodies (e.g. mud, tar) clinging on to the edge of the trim piece

If faults present → Clean the trims
Replace the broken trim(s)

Remove the trims

Check the wheels

- Check that there are no foreign bodies (e.g. mud, tar) clinging to the wheel (exterior and interior)
- Check that the wheel is not damaged (impacts to the edge, run-out)
- Check the type of wheels (wheels recommended by Renault, see MR of the vehicle concerned)
- Check the wheel balance

(Refer to the Technical Notes which deal with wheel balancing).

- Check that the wheels are correctly tightened

If faults present → *(Refer to the Technical Notes which deal with wheel balancing).*
If the wheel is damaged or not correct, replace the wheel(s) and then move on to balancing the wheels
If the wheels are not balanced, balance them
If the balance weight is equal to or more than 50 g, carry out Test 3

Remove the wheels

Visually inspect the tyres

- Check the tyre pressures
- Check that there is no rupture, cut, abrasion, impact, flat spot or repair on the tread or tyre walls
- Check the type of tyre (tyres recommended by Renault, see MR for the vehicle concerned)

If faults present → *(Refer to the Technical Notes which deal with wheel balancing).*
Replace the tyre(s)
Balance the wheels.
If the balance weight is equal to or more than 50 g, carry out Test 3

A1

ALP 1

CONTINUED 1

A1

Visually check the brake system for the axle concerned

- Check that there is no play in the brake callipers
- Check that there is no significant run-out on the disc
- Check the condition of the drum (rotate it)

If faults present → Retighten the callipers or replace the faulty components
See section 31A and/or 33A of the MR for the vehicle concerned

Check that the assemblies bolted onto the axle concerned are correctly tightened

- Check that there is no play in the assemblies bolted onto the front and/or rear axle
- Check the condition of the rubber joints and the ball joints on the axle concerned

See Section 31A and/or 33A of the MR for the vehicle concerned to find out about the assemblies

If faults present → Retighten the assemblies
Replace the faulty ball joints and joints

Visually inspect the driveshafts if they are fitted with sound insulation

- Check the condition of the sound insulation and check that it is properly secured

If faults present → Replacing the driveshaft

Have the checks previously carried out highlighted the faults

No → B1

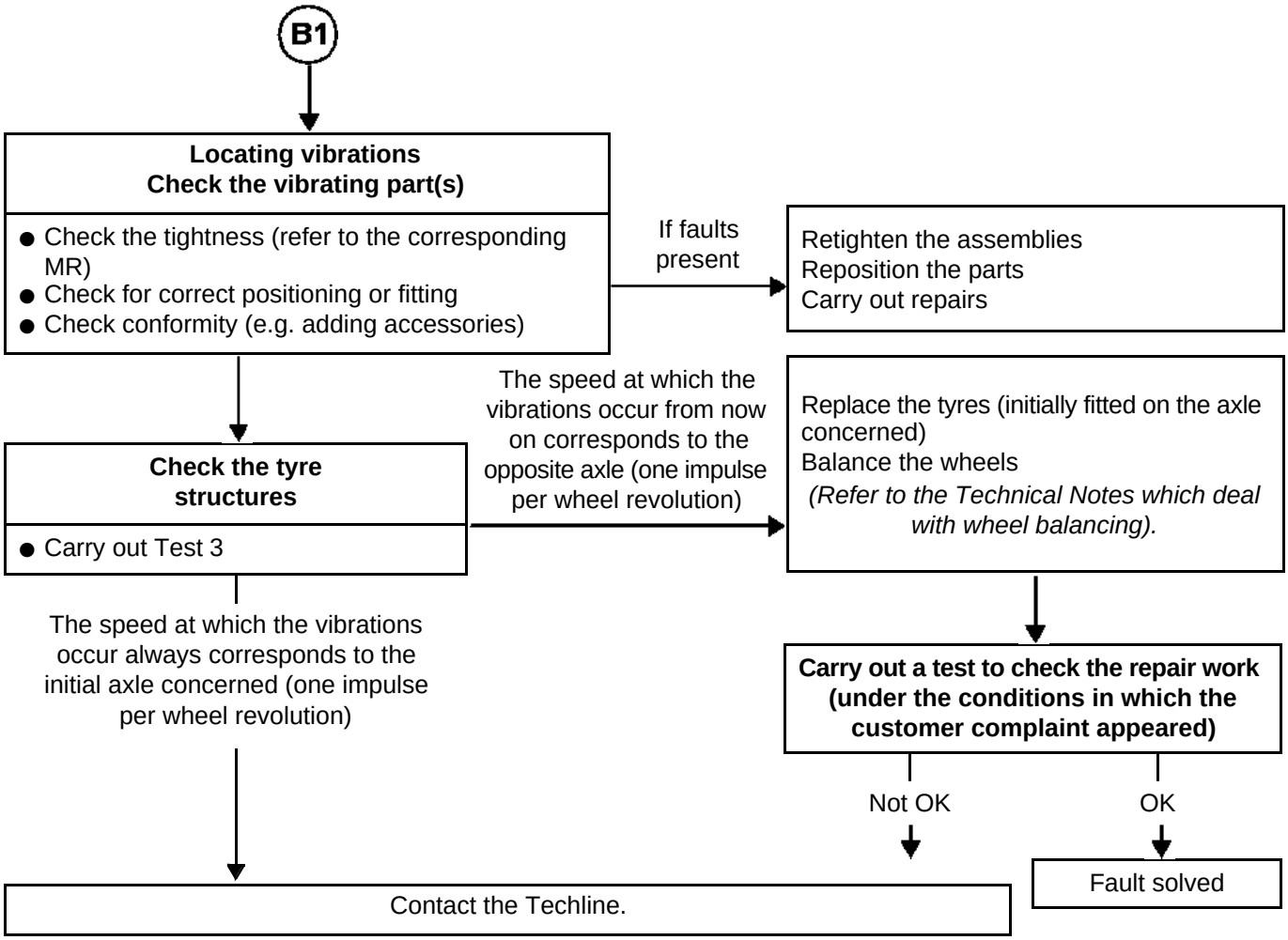
Yes

Correct the faults, refit the parts removed and carry out a test to check the repair work (under the conditions in which the customer complaint appeared)

OK → Fault solved

Not OK → B1

ALP 1 CONTINUED 2	



ALP 2	Vibrations on the front or rear axle with several impulses per wheel revolution

NOTES	Only consult this ALP for cases of several impulses per wheel revolution, and after having looked for a relevant section in the information library. Position the vehicle on a two-post lift.

→ Remove the wheels

Visually inspect the front and rear tyres

- Check the tyre pressures
- Check that there is no rupture, cut, abrasion, impact, flat spot or repair on the tread or tyre walls
- Check the type of tyre (tyres recommended by Renault, see MR for the vehicle concerned)

If faults present →

(Refer to the Technical Notes which deal with wheel balancing).
Replace the tyre(s)
Balance the wheels.
If the balance weight is equal to or more than 50 g, carry out Test 3 (see A2)

↓

Visually inspect the left and right-hand driveshafts

- Check that the sound insulation is properly secured (if fitted)
- Check the general condition of the driveshafts (e.g. fitting, tightness, leaks)
- Check the condition of the driveshaft seals (especially the gearbox side), checking that there are no lubricant leaks (gaiter perforated or badly fitted).
- Check that there are no relevant sections in the information library for the vehicle.

If faults present →

Replace the driveshaft
Apply the relevant section in the information library

↓

A2

ALP 2

CONTINUED 1

A2

Check that the assemblies bolted onto the axle concerned are correctly tightened

- Check that there is no play in the assemblies bolted onto the front and/or rear axle
- Check the condition of the rubber bushes and the ball joints on the axle concerned

See Section 31A and/or 33A of the MR for the vehicle concerned to find out about the assemblies

If faults present → Retighten the assemblies
Replace the faulty ball joints and joints

Remove the left-hand driveshaft (see section 29 of the MR for the vehicle concerned).

Check the hollow sunwheel on the gearbox (does not affect all gearboxes; see corresponding MR)

- Check the condition of the hollow sunwheel tracks. They should not be worn.

Be careful that you do not confuse the hollow sunwheel with the driveshaft joint (gearbox side)
Refer to the MR for the gearbox concerned

If faults present → Contact the Techline, and apply the instructions found in the information library or from the Techline

Have the checks previously carried out highlighted the faults

No → B2

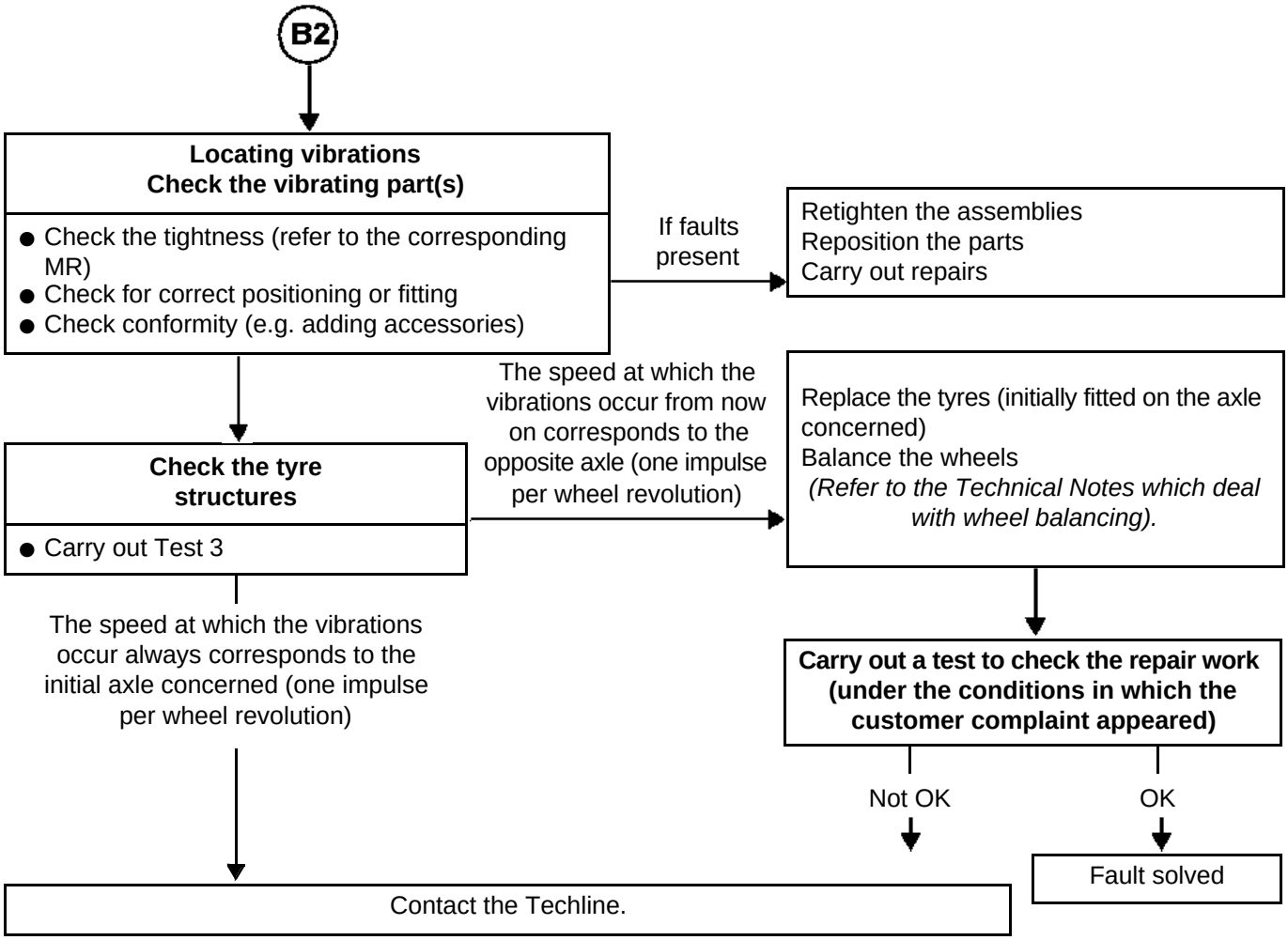
Yes

Correct the faults, refit the parts removed and carry out a test to check the repair work (under the conditions in which the customer complaint appeared)

OK → Fault solved

Not OK → B2

ALP 2 CONTINUED 2	



FAULT FINDING LOG associated with the fault finding of axle vibrations (Technical Note XXXX)

List of monitored parts: driveshafts

Administrative identification

Date _____

Log completed by: _____

Repair Order No. _____ Customer complaint code: _____

Vehicle _____ Bodywork: _____Engine: _____ Gearbox: _____
VIN: _____

Mileage: _____

Customer complaint

What is vibrating?

floor ☐ steering wheel ☐ seat (headrest) ☐ interior rear-view mirror ☐
windows ☐ gear lever ☐ accelerator pedal ☐ _____ ☐
brake pedal ☐ sunroof ☐ clutch pedal ☐

Level of vibration:

slight ☐ medium ☐ high ☐
buzzing/humming *trembling* *shaking, jerking*

Frequency:

always (easy to reproduce) ☐ frequent ☐ very erratic ☐

When did the vibrations first start occurring:

present at 0 miles ☐ encountered after _____miles

occurrences since operation ☐ *(please specify)* _____

Are the vibrations linked to the weather?

yes ☐ no ☐ don't know ☐

temperature cold ☐ average ☐ warm ☐
< 5° *5 to 25°* *25 to 35°*

dry conditions ☐ humid conditions ☐ don't know ☐

Linked to speed? yes ☐ no ☐ unsure ☐

occurs at _____mph, in _____gear

between _____and _____mph, in _____gear

Linked to gears? yes ☐ no ☐ unsure ☐

occurs in one gear yes ☐ which one _____

more than one gear yes ☐ which ones _____

FAULT FINDING LOG associated with the fault finding of axle vibrations (Technical Note XXXX)

Linked to engine load? Acceleration ☐ Deceleration ☐ Stabilised ☐

Driving up a hill ☐ On the flat ☐ Downhill ☐

Linked to steering? Straight lines ☐ Turning (Left/Right) ☐ Roundabouts ☐

Linked to the road surface? all types ☐ specific ☐ don't know ☐

including smooth

if specific, give details rough ☐ cobblestoned ☐ grooved ☐

gravelled road ☐ other ☐ *(be specific)*_____

Normal vehicle load?

No. of passengers _____

a few items in the luggage compartment ☐ very full luggage compartment ☐ trailer ☐ roof rack ☐

Normal type of driving style? slow ☐ normal ☐ quick ☐

traffic jam *family* *sporty*

Additional information:

Documentation used in fault finding

Fault Finding Manual or Technical Note: _____

Other documentation: _____

Faults revealed:

Corrections made:

FIC No. (Customer fault sheet or CIR in some countries):_____