

NVH



Eradicate NVH issues
with PicoDiagnostics and a
Pico NVH Kit.



Take the guesswork
out of your noise,
vibration and
harshness testing!

PicoScope®

www.picoauto.com

WHAT IS NOISE, VIBRATION AND HARSHNESS TESTING?

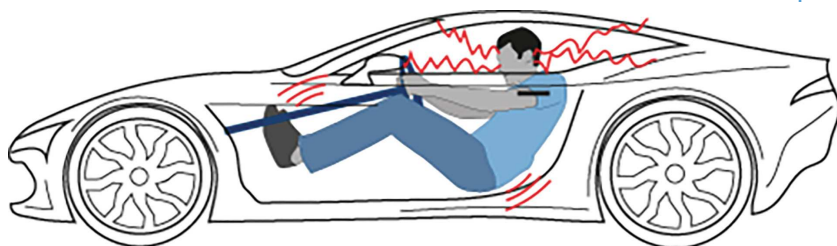
Noise, vibration and harshness (NVH) is the study of noise and vibration signals about a vehicle. Noise refers to an unexpected sound at any time (be it steady or intermittent), vibration is any repetitive motion of an object, while harshness is a sudden, sharp and aggressive shock following an event.

In reality, your customers may describe it as an “annoying rattle or sound”. Often this sound or vibration will change with the vehicle’s road or engine speed. While the cure for these symptoms can be found simply and quickly, have you actually fixed the root cause of the problem? Modifying a panel may cause it to stop vibrating, but what was causing the panel to vibrate in the first place and will it return?

Noise and vibration are very subjective, and there is likely to be a difference between your experience of them and your customer’s. What if you cannot find a simple explanation? How do you prove a reduction in the NVH occurrence?

A PicoDiagnostics NVH kit can help you with these questions. More importantly, it gives you the ability to record data both before and after your fix. This enables you to show your results (and prove any work undertaken) to your customer.

Understanding NVH and the way it is detected, recorded, and resolved, is key in a successful diagnosis and repair.



OVERVIEW

A PicoDiagnostics NVH kit from Pico Technology is a cost-effective answer to the many NVH problems facing technicians today. It provides a real-time diagnosis in the form of either: a bar graph, a frequency chart, a 3D frequency chart, RPM order, road speed, or time domain view. The ability to start the recording before a road test, and play back the recording for analysis upon return, ensures that the driver’s attention remains on the road. Saving the recordings couldn’t be simpler: as with our other automotive software, you simply save the file to the hard drive on your PC or laptop.

All the Pico NVH kits make use of the PicoScope Automotive oscilloscopes. You can be sure that this investment will benefit your business well into the future, as the software updates for PicoDiagnostics are free for the life of the product.

HOW DO THE NVH KITS WORK?

The Pico NVH kits provide a breakthrough in accurate analysis of vehicle noise, vibration and harshness problems. They use the display of your laptop and combines lightning-fast capture and analysis of vehicle data with a clear, easy-to-read presentation of results and actions. They offer everything you need from an NVH tool, harnessing the power of your laptop to impress with fantastic performance, flexibility and information that is easily viewed and shared.

In addition to single channel mode, the software offers the following three signal vibration modes:

3-AXIS MODE

Allows the measurement of vibration in all three directions of travel (X axis, Y axis and Z axis).

3-AXIS MODE + SINGLE CHANNEL

As above, but with the added option to measure a vibration or sound in one axis at another location on the vehicle.

MULTIPLE SENSORS

Allows between two and four individual readings of vibration or sound from different locations on the same vehicle.

You also get:

LICENCE FREE VIEWING

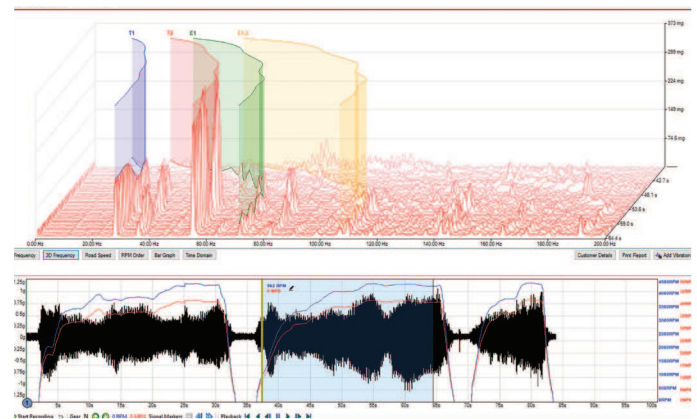
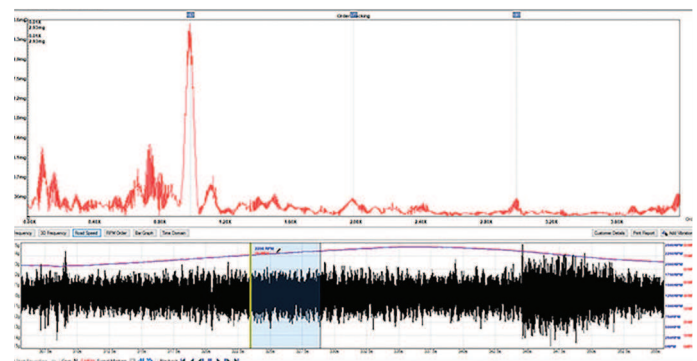
You can easily and freely use the NVH software to share the NVH results. You don't need a PicoScope to open, view, and analyze recorded files.

CUSTOM VIBRATIONS

This feature allows you to add an unlimited number of known or calculated vibrations.

EXPORT TO CSV AND WAV

The option to export your recorded data as CSV (comma separated values text file) makes the data viewable by third party tools and makes it easy to share with design teams. Audio recordings can be exported and imported as WAV (waveform audio file format files).



Our NVH kits use a combination of accelerometers, microphones and technical data to measure, calculate and analyze the rotating and vibrating components in a vehicle. By being able to correctly analyze the results you see on-screen, you can identify the root cause of your NVH issue.

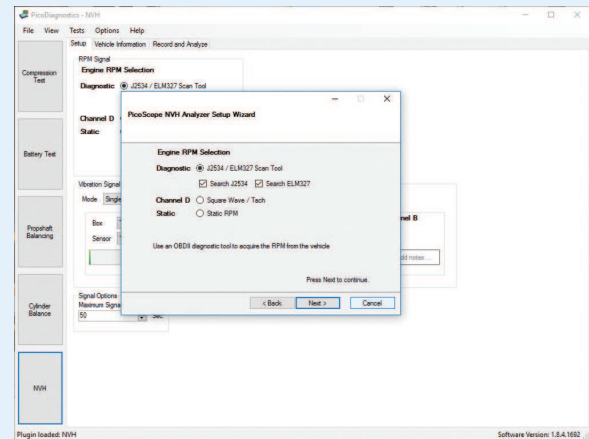
Let's see how PicoDiagnostics NVH works in a practical situation:



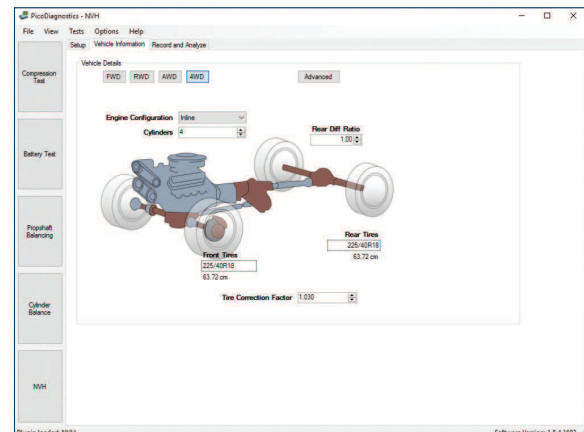
The NVH test is built into our PicoDiagnostics software. Click the icon on your Desktop and select NVH from the selection of test buttons (you have to have a PicoScope connected and an NVH license to run this test). The software will run you through a setup wizard to prepare the vehicle for a live test.

You will be asked to:

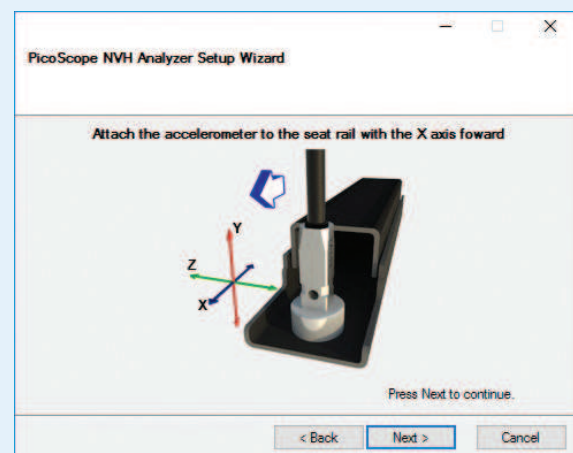
1. Select J2534 (this is the suggested manner in which) to obtain Engine/Road speed via the vehicle's OBD socket.



2. Input vehicle data, engine configuration, drivetrain arrangement, differential ratio, and tire size information.



3. Configure and position accelerometers as instructed by the wizard



4. Start capturing data until you have reproduced and recorded the problem.

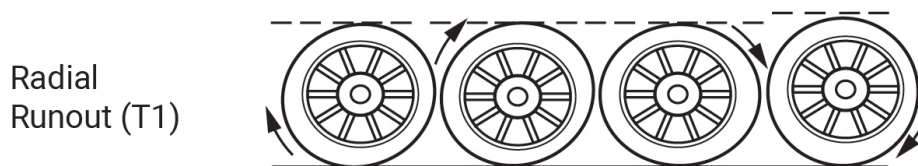
THE RESULT

Once you have completed the test, you will have an analysis page like the one below: On the analysis page, you can move the yellow bars within the signal history chart (at the bottom of the screen), to view portions of time and look for changes in vibration orders and high levels of frequency changes. These spikes indicate the component type that is likely to cause the issue. The information provided by PicoDiagnostics is very clear and detailed, complete with a help system to guide you through your results and the likely causes to investigate.



As you become more proficient with the software you can add additional vibration orders if required. E (Engine), T (Tire) and P (Propshaft) refer to the rotating parts the software is analyzing, and in each case, this is suffixed by a number. This number refers to the vibration order of each recorded event (the number of occurrences of a given vibration per revolution of that component). The illustration below shows a wheel with a radial runout, which would cause one shock per revolution (cycle). This is called a 1st order tire vibration, or T1 in our software.

It is also worth noting that in most cases, the area you or your customer feels or hears the issue is not always the root of the problem. The definitions below will help explain this.



Every vibration consists of 3 elements:

Source Component

(Excitation) – A component causing a vibration, for example the engine.

Transfer Path

The object that transfers the vibration, for example the exhaust mounts.

Responding Component

The noticeable component that is vibrating, for example the trim panel in the drivers compartment.

It might be tempting to pack the trim in the cabin to solve the issue. However, once we understand that this could be the responding component, and have reached a diagnosis with our NVH software, we discover an engine vibration being transmitted by a faulty exhaust mount. Armed with this information you can fix the source of the problem.

Once the complaint is resolved, you can run the same road test again and prove the fix. This gives you a record of your diagnosis and work completed that you can save and share with other users. The real benefit of our NVH system is that it is objective and repeatable.

DYNAMIC DRIVELINE BALANCING

With the addition of our Optical Balancing kit, the PicoDiagnostics NVH system provides clear advice, analysis and procedures for balancing of propshafts:

- Direct support for pinion flange, single weight, and hose clamp balancing weights
- Step-by-step procedures with help and graphical displays

TYPICAL USES

Customer complaints surrounding noise and vibration are subjective and present technicians with a challenge, even before the diagnosing and rectification begin. You can use an NVH kit on the vehicle and road-test the vehicle with the customer to obtain all vibration and noise levels. When this valuable data has been collected, it can be analyzed and compared to previous captures or to other vehicles.

A “problem” vibration can, in many cases, be a characteristic vibration of the vehicle. With the collected data you can present and compare with previous captures or donor vehicles and can confidently assure your customer that everything is as it should be. Alternately, the data comparison could highlight a problem, giving the technician the necessary information to repair the vehicle with confidence. Below are just a few typical scenarios where an NVH kit can save you both time and money:

- Cabin vibrations at speed
- Engine vibrations throughout the entire RPM range
- Clutch judder or vibration
- Transmission and bearing whine
- Auxiliary driving noise
- Brake judder
- Steering vibrations

“Whether it’s an obvious issue or a very subtle vibration, the NVH kit will give you the data to start looking in the right area and get an accurate diagnosis quickly. The data also gives you concrete qualitative data, so in issues where the concern is very subjective you have the ability to compare two similar vehicles and see immediately what differences you’re dealing with and make a quick decision about what action you take. It has saved us so much time.”

– Mark Dalton

How do I start?

KIT SELECTION

Starter, Standard or Advanced

The Starter NVH Kit will allow you to measure vibrations on 3 axes, (X, Y and Z). The Standard NVH Kit gives you the option to measure vibration or sound on a single axis at an additional location on the vehicle. The Advanced Kit gives you the option to measure vibration or sound at four different locations on the vehicle. The Starter to Standard Upgrade Kit give you a set of one of all the kit items.

All kits are available in a carry case or foam tray. The foam trays enable users to store their NVH Diagnostics kits safely in a tool chest of their own choosing.



WHAT IS IN THE KITS

NVH Kit	NVH Interface	Accelerometer	Magnet	Microphone	Extension cable	PicoScope 4425
Starter NVH Kit	1	1	1	1	1	-
Standard NVH Kit	2	2	2	2	2	-
Advanced NVH Kit	4	4	4	4	4	-
Starter to Standard upgrade Kit	1	1	1	1	1	-
Upgrade to equivalent Starter, Standard or Advanced Essentials kit	-	-	-	-	-	+1

Mongoose Pro ISO/CAN J2534 lead (TA293)

Having used the Mongoose Pro alongside Pico products for some time, we are confident it is the best and most reliable product to use with our NVH kit for the acquisition of a road speed signal. Therefore, we now have kits available with the Mongoose lead included.



Optical balancing kit (PP991)

The purchase of our Optical Balancing kit allows on-vehicle balancing in order to rectify first order shaft vibrations. Included as part of our PicoDiagnostics software, the Propshaft balancing test provides clear advice and guides you through analysis and test procedures:

- Support for pinion flange, single weight, and hose clamp balancing weights
- Step-by-step procedures with help and graphical displays

Key features

- Simple bar charts and easy-to-read results make for quick diagnosis and ease of use. Full analysis and advanced features (including waterfall and spectral displays) are at your fingertips
- Designed for road testing, workshop diagnosis and driveline balancing
- Detects and isolates multiple vibrations and noises providing help and advice on causes and fixes
- Can use a J2534-compliant interface or an alternative speed signal input for engine speed data - this is particularly useful for older or non-compliant vehicles
- Full-screen, high-resolution results are presented clearly and accurately
- Record up to 500 seconds of data with automatic analysis
- Free software updates.
- PicoDiagnostics allows you to store multiple road tests for playback, analysis, sharing and comparison.
- Report feature allows for easy presentation of the diagnosis and repair for your customer
- The inbuilt function generator can generate sounds using your laptop to stimulate resonance, causing an object to vibrate with a greater amplitude at its specific natural frequency.
- Time domain analysis to make measuring and tracing of knocks and rattles easier.
- Import WAV audio files of vehicle noise (perhaps recorded by the customer)
- NVH requires your automotive PicoScope (available separately or in NVH Essentials kits)
- Software compatible with Windows 7, 8 and 10



“ It has been a great tool for the stubborn noises that are very difficult to locate. Very user friendly, and helps to pinpoint the problem ”

– Jerry Smith

The NVH Essentials kits

If you want to use an NVH kit but do not have a PicoScope, you can now purchase an NVH Essentials kit. These kits are available in the three basic sizes with a 4-channel automotive PicoScope added, all in a single carry case.

DESCRIPTION	ORDER CODE		
	IN CARRY CASE	IN FOAM	IN BOX
Starter NVH Kit	PQ126	PQ127	
Standard NVH Kit	PQ129	PQ130	
Advanced NVH Kit	PQ120	PQ121	
Starter NVH Essentials Kit	KP249	–	
Standard NVH Essentials Kit	PQ123	–	
Advanced NVH Essentials Kit	PQ109	–	
Mongoose Pro ISO/CAN J2534 lead	–	–	TA293
Optical Balancing kit	PP991	–	

Free technical support • Free updates • Software compatible with Windows 7, 8, and 10

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