

# PRODUCT DATA

## PULSE SPC Time Insight — Type 8601-S

*In today's competitive automotive industry, it is crucial to quickly and accurately evaluate the noise and vibration perceived by vehicle occupants. Based on customers' expectations, automotive engineers start designing and developing the automobile using the concept and brand value definitions.*

*The PULSE™ Source Path Contribution (SPC) system allows parallel evaluation of design alternatives and product variants throughout the vehicle development process – this can help automotive engineers and managers improve the engineering decision process.*

*Time Domain SPC enables engineers to calculate, listen to, and modify individual contributions to the vehicle occupants (both airborne and structure-borne), and assists with design and validation of program NVH targets.*

*SPC Time Insight Type 8601-S is the ideal playback and analysis system for the time domain results of Time Domain SPC analysis.*



### Uses and Features

#### Uses

- Evaluate Time Domain Source Path Contribution analysis results (transfer functions and operating conditions) for airborne or structure-borne paths, calculated by any source path contribution method
- Listen to and modify contributions
- Management of sources, paths and receivers in a structured model
- Easy management of models
- Easy comparisons for target setting
- Evaluation of design alternatives and their effects
- Evaluate any set of time files

#### Features

- Listen to contributions synchronised for time, speed or RPM
- Perform A/B comparisons
- Record and store modified sounds
- Perform spectral analysis of sources and contributions – view spectra of source level, path sensitivity and contribution off-line or in real-time during playback
- Full suite of filters
- Filters can be applied to source or to path, for easy modelling of design changes
- Easy interface for all task operations – model creation, data assignment, calculations and analysis
- Cascading tree structure for easy viewing and organisation
- Export data for further post-analysis, such as order extraction with PULSE Reflex™
- Same look and feel as PULSE NVH Vehicle Simulator
- Easily upgraded to the full PULSE NVH Vehicle Simulator

## Introduction

Time Domain Source Path Contribution offers many benefits and possibilities over traditional frequency domain techniques. The foremost amongst these is the ability to listen to any contribution or combinations of contributions. Additionally, source and path analysis for transient signals is now possible where it was not feasible in the past with frequency domain techniques. With the ability to listen to contributions comes the ability to easily communicate results and design alternatives to other engineers, managers and anyone else who needs to understand them.

SPC Time Insight Type 8601-S is a part of the Time Domain SPC Type 7798-E system. It includes advanced listening, mixing and filtering tools and allows inspection of data in the time and frequency domains. For more information on Time Domain SPC, see the Source Path Contribution Type 7798 Product Data, [BP 2086](#).

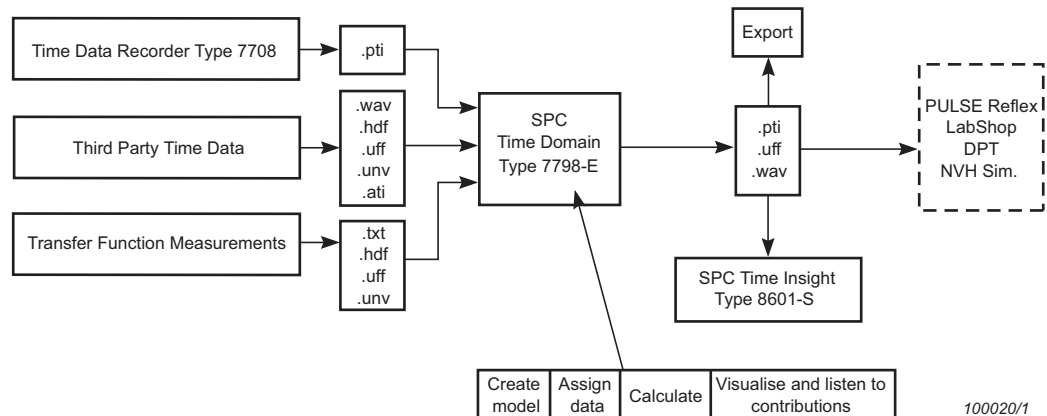
Brüel & Kjær offers complete SPC solutions, including transducers, instrumentation and signal processing platforms, SPC analysis software as well as training and engineering services for SPC.

## Time Domain SPC Technique with SPC Time Insight Type 8601-S

The basis of the SPC technique is to calculate tactile and acoustic responses under specific operating conditions. These responses are contributions from various sources and paths. Whether operating in the frequency domain or the time domain, the goal is the same: to understand how the sound and vibration travel from the sources to the receivers in order to better control the sound or vibration at the receiver locations. Time Domain SPC enables the calculation of source strengths and contributions in the time domain.

To perform a Time Domain SPC analysis, the process begins with recording time data, processing in SPC using time domain techniques, basic playback and analysis within SPC, then exporting to SPC Time Insight, PULSE Reflex, the PULSE NVH Vehicle Simulator or other software for more in-depth analysis and playback (an overview is shown in Fig. 1).

**Fig. 1**  
Time Domain SPC  
Type 7798-E overview



SPC Time Insight Type 8601-S provides all the tools necessary to playback and analyse the results of a Time SPC calculation. It embodies an interactive, intuitive approach to understand and evaluate SPC results. Through highly advanced playback and modification methods, engineers can easily analyse and comprehend SPC results, and make modifications to simulate engineering changes.

With SPC Time Insight Type 8601-S, the following features are included:

- Contributions can be played simultaneously, in groups or individually
- Contributions or groups of contributions can be toggled on and off during playback
- Multiple sets of contributions can be used for back-to-back comparison, for example, different vehicles, or different design alternatives. These datasets can be synchronised to various parameters, including time, RPM and speed
- A range of data can be selected for playback, and can be looped to play continuously. This range can be selected using time, RPM, vehicle speed or other parameters
- A comprehensive set of filters including high-pass, low-pass, notch, user-defined FIR and others, make editing and modification easy and intuitive
- Filters can be saved/loaded, applied in real-time or off-line, and mixed together
- Real-time and off-line displays of source level, path sensitivity and contribution spectra

- Type 8601-S can be easily upgraded to the full PULSE NVH Desktop Simulator Type 8601 (DTS) program
- SPC Time Insight projects can be used in the full DTS program, with the same functionality included in DTS as in SPC Time Insight

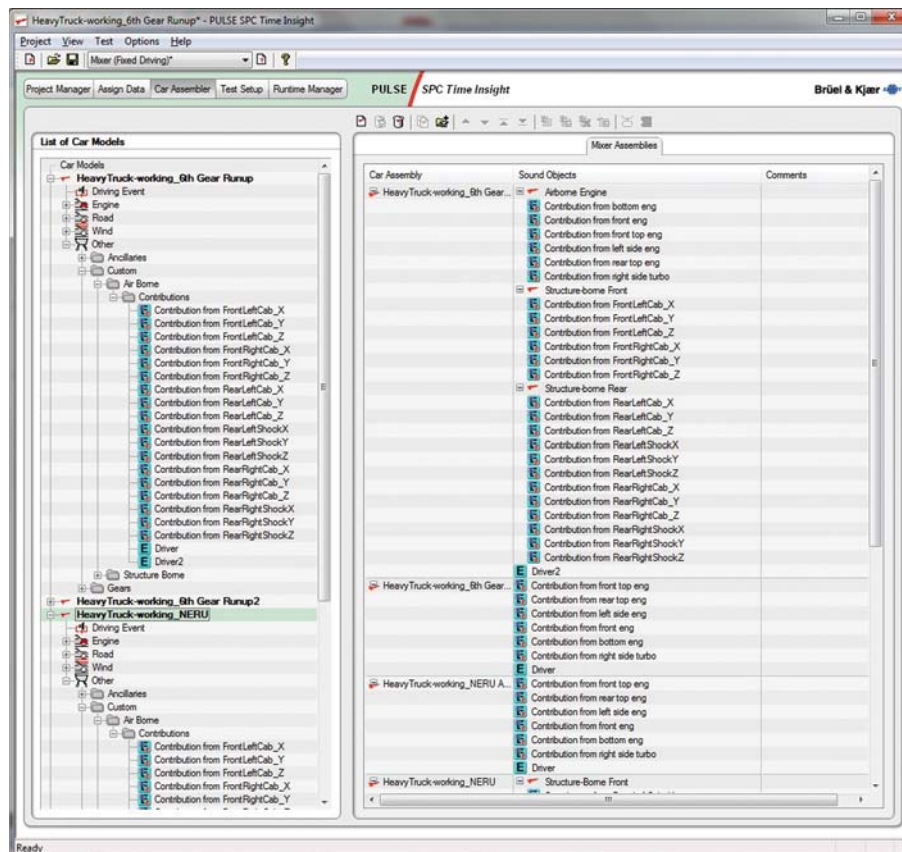
## Using SPC Time Insight

Prior to analysing and playing back the results in SPC Time Insight, you create models, measure the data and perform SPC calculations in Time Domain SPC Type 7798-E. When you load a model in SPC Time Insight, the interface organises it in a tree structure with sound objects containing both time domain data for sources and contributions, and frequency domain data for path sensitivity functions. You select contributions in the model for playback and analysis as you would in Type 7798-E.

Models can easily be modified, combined, organised and stored.

### Model Creation

**Fig. 2**  
Model creation in SPC  
Time Insight



SPC Time Insight models are most often generated within Time Domain SPC Type 7798-E. In this case, the sound objects are automatically defined by SPC and data is automatically assigned.

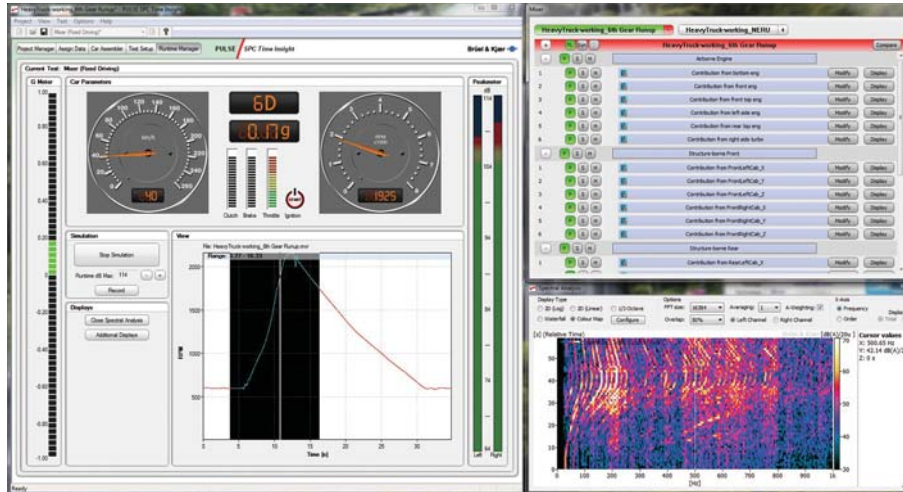
Alternatively, you can manually create and modify models in SPC Time Insight. This opens the possibility of adding data from any source (Time Domain SPC or another program).

Multiple assembly models can be used for playback at one time, facilitating back-to-back playback of different models and different sets of data.

# Playback and Real-time Modification and Analysis

## Playback

**Fig. 3**  
Playback. Using the Mixer and spectra display

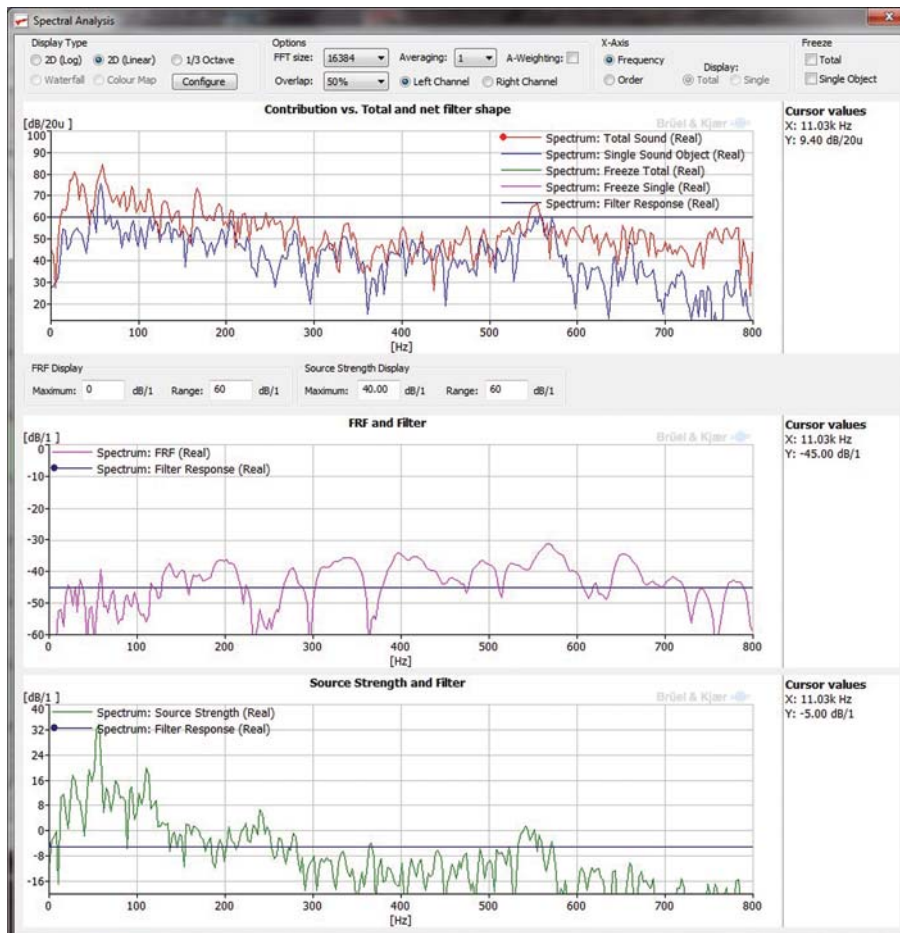


Playback is simple and intuitive. Load individual or multiple assemblies into the interface's Mixer for back-to-back comparison. Select from the Mixer list the contributions and sound objects you wish to listen to. There are various options for selecting, grouping, playing sound objects/contributions individually and turning sound objects on and off. You can also select a specific range for playback, toggle continuous looping and set up sound synchronisation with another dataset based on a specific parameter (such as engine RPM).

## Analysis

For vehicle models, engine RPM and vehicle speed are shown on large dials. These and other vehicle parameters can be displayed as quantity vs. time plots at the top of the Mixer display. A spectral display can be configured to display 2D frequency spectra in linear, log and 1/3-octave formats, and can be configured for 3D waterfall and contour displays.

**Fig. 4**  
Analysis. Real-time spectra for source, path and contribution during playback

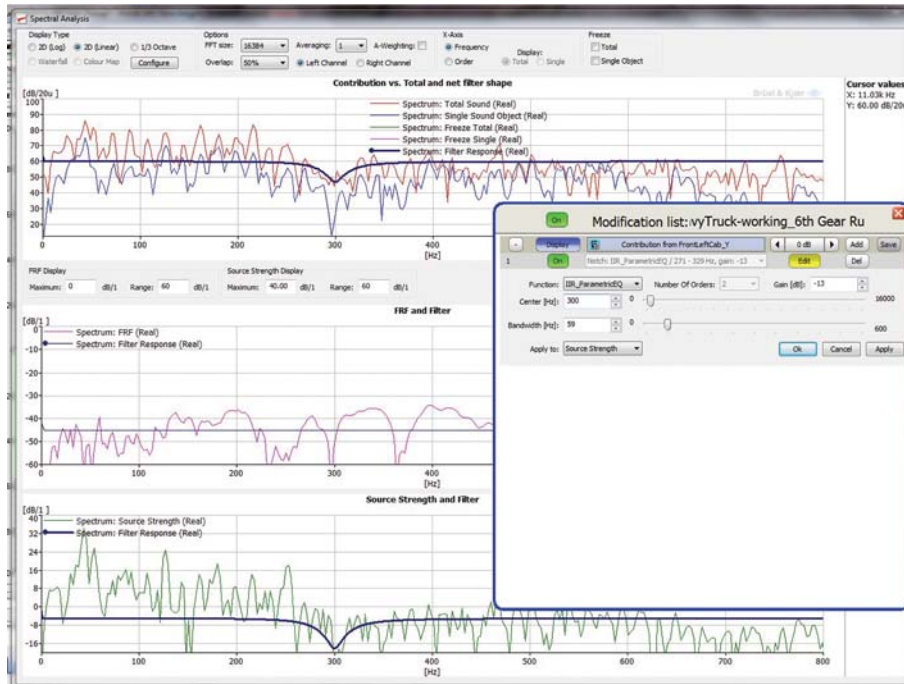




Various setup parameters for the spectra displays are conveniently located right at the top of the display, including A-weighting, frequency resolution, averaging, etc. Spectra can be "frozen" to compare to other datasets, other sets of contributions, or other points in time of the playback. Individual contributions can be overlaid with the overall spectrum in the spectra display, making it easy to see exactly how much a single contribution is affecting the total sound level. In addition, a triple spectra display is employed to show levels of source, path and contribution simultaneously during playback. These are in real-time, updating as the sound is played.

### Modifications

**Fig. 5**  
Modifications. Applying a Notch Filter to the source level of a single contribution

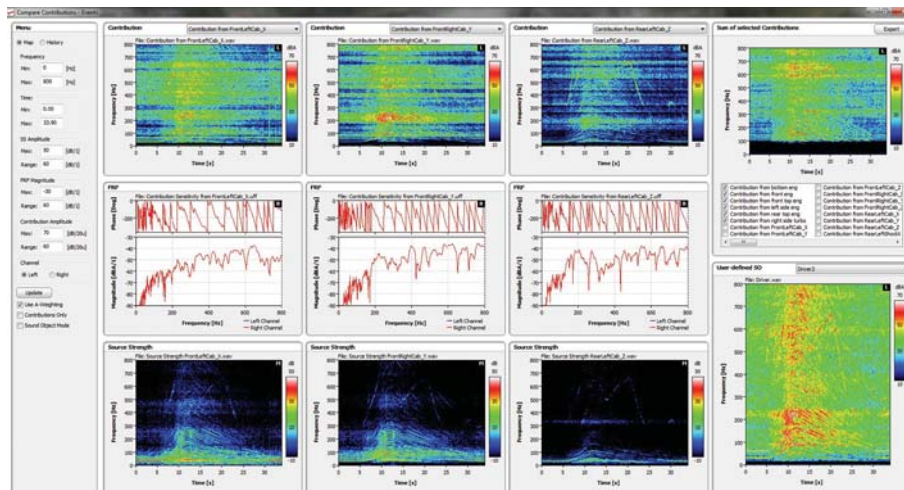


Modifications can be performed on the individual contributions (not the overall sound) through the application of any of the available filter types in the Modification List panel, including high-pass, low-pass, band-pass, band-stop, notch (cut or boost), or user-definable FIR filter. The user-definable FIR filter can use a profile imported from another application. Additionally, simple level adjustments are also easily accomplished through the Modification List panel.

Modifications can also be applied to either the source level or the path. These features enable the simulation of engineering changes in a realistic manner and in a way paralleling the actual physical changes to the physical system.

### Off-line Data Display and Analysis

**Fig. 6**  
Off-line display and spectral analysis of source strengths, paths, contributions and summed contributions



Data can also be viewed either in the time domain or frequency domain using the off-line data display tools. Source, path and contribution levels can be plotted and analysed, with synchronised cursors between contribution, source and path sensitivity FRF. Contributions can be added together and displayed and compared to measured response data. The sum of the paths can be exported as a new time history.

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## Specifications – PULSE SPC Time Insight Type 8601-S

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Source Path Contribution Type 7798 solutions, including Time Domain SPC Type 7798-E and SPC Time Insight Type 8601-S, are NVH analysis software tools based on the PULSE Multi-analyzer System

### PC Configuration

#### REQUIRED SOFTWARE

- PULSE SPC Viewer Type 7798-A
- PULSE Time Domain SPC Type 7798-E

#### RECOMMENDED PULSE SOFTWARE

- PULSE SPC Mount Stiffness and Matrix Methods Type 7798-B
- PULSE SPC Matrix Method with PCD Type 7798-C
- PULSE SPC Multiple Coherence Method Type 7798-D
- PULSE Reflex Base Type 8700 + any relevant PULSE Reflex application modules

#### RECOMMENDED PC CONFIGURATION

- 2.5 GHz Intel® Core™ 2 Duo processor, or faster
- At least 4 GB of memory, for Windows® 7 (64-bit) – 8 GB RAM
- 160 GB Solid State Drive with 20 GB of free space
- DVD-RW drive
- Sound Board: 16-bit SB Pro-compatible 3D

- 1 Gigabit Ethernet connection
- TFT 14.1" display, 1024 × 768, 16000 colours or better
- PULSE 16 Installation CD
- Microsoft® Windows® XP Professional (SP 3)\*, Windows Vista® Business or Ultimate (SP 2)\* or Windows® 7 (SP 1)\* 32- or 64-bit
- Microsoft® Office 2003 (SP 3), Office 2007 (SP 1) or Office 2010 (SP 1)\* 32-bit
- Microsoft® .NET Framework
- Web browser
- Adobe® Reader® 10.1\*

### Software

#### USER INTERFACE

- Task-driven user interface
- Data-centric architecture

**Display Functionality:** Advanced graphic tools

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\* US only: If your PC system does not include these tools, upgrades are available on the PULSE Installation DVD, Disk 1

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## Ordering Information

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Type 8601-S-X† PULSE SPC Time Insight

#### REQUIRED SOFTWARE

Type 7798-A-X† PULSE SPC Viewer  
 Type 7798-E-X† PULSE Time Domain SPC

#### RECOMMENDED SOFTWARE

Type 7798-B-X† PULSE SPC Mount Stiffness and Matrix Methods  
 Type 7798-C-X† PULSE SPC Matrix Method with PCD  
 Type 7798-D-X† PULSE SPC Multiple Coherence Method

#### OPTIONAL SYSTEM

Type 3644-A PULSE Desktop NVH Simulator  
 Type 8601-K-X† PULSE DTS Vehicle Level Data Preparation

#### SOFTWARE MAINTENANCE AND SUPPORT

M1-8601-S-X† PULSE SPC Time Insight Software Maintenance and Upgrade

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† Where 'X' indicates the license model, either N: Node-locked or F: Floating



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