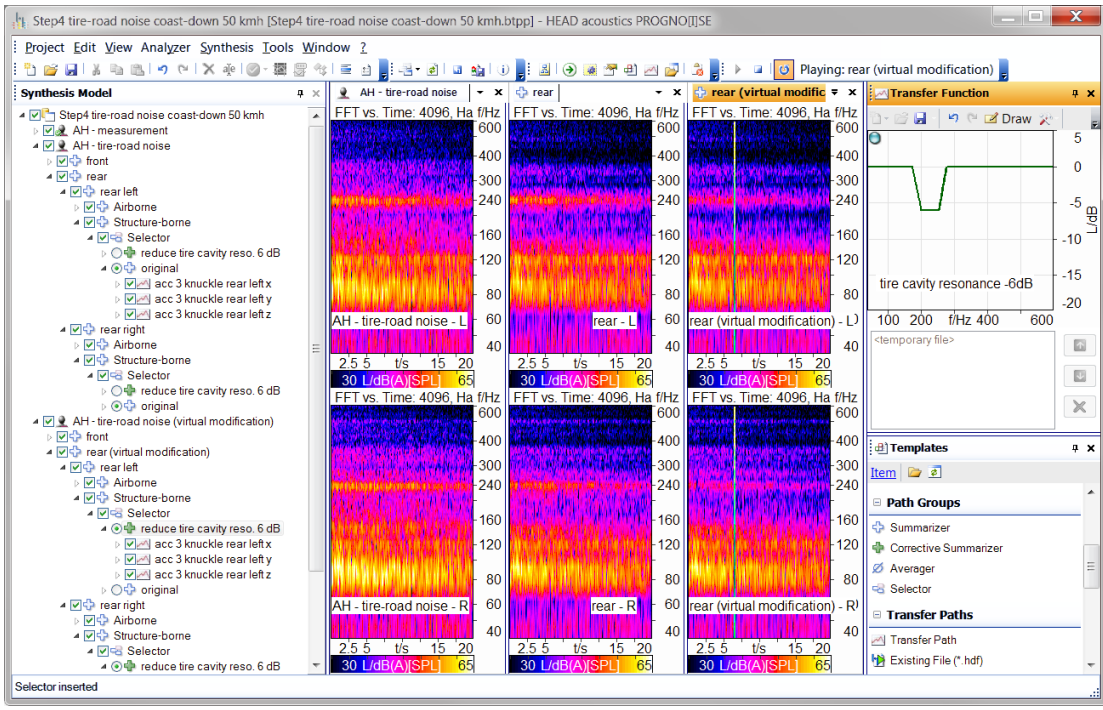
HEAD acoustics

DATA SHEET



Code 4914

PROGNOISE

Prognoise is a software application for binaural transfer path synthesis, enabling playback and processing of individual paths, path groups, and the overall noise, along with interactive editing of the synthesis tree. Furthermore, various specialized applications, including Operational Transfer Path Analysis, are available.

OVERVIEW

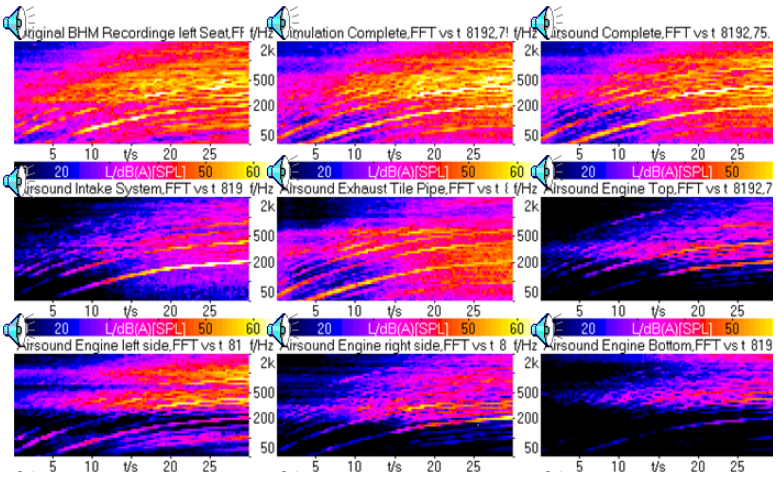
Prognoise

Code 4914

Prognoise enables the synthesis of binaural or monaural sounds for one or several receivers, including airborne and structure-borne sound, based on transfer functions and excitation signals derived from time-domain data measured under operating conditions.

During synthesis, the individual transfer functions—such as mount transfer, apparent mass, and acoustic transfer function—are aggregated and assigned to their respective input signal. The corresponding time signal can be determined, analyzed, and auralized for each node in the model.

TPA Project of ArtemiS SUITE (APR 600 is required) provides a fast and straightforward solution for the development of transfer path models and for the time-domain calculation of source characteristics and path contributions. The export interface transfers TPA Projects into ready-to-use Prognoise Projects, which are available in Prognoise for interactive analysis and advanced applications.



KEY FEATURES

Flexible, component-based BTPS model creation with editing options for individual paths, path groups, and the overall noise

Enabling or disabling paths or submodels

Playback of individual results or the complete set of calculated results at all nodes

Contribution Analyzer for in-phase determination of noise contributions

Quadripole Wizard incorporating a Kelvin-Voigt model for the virtual substitution of engine mounts

Time-domain signal analysis and export at each point of the model

Optional features (license required)

- Prognoise Tool Pack 01 (Code 4915)
  OTPA Wizard (Operational Transfer Path Analysis) for calculating the transfer functions
- Prognoise Tool Pack 02 (Code 4916)
  Synchronization of input data

APPLICATIONS

- Analysis and prediction of the effects of individual noise paths on the noise quality of vehicles, machinery, or other products

DETAILS

Operational Transfer Path Analysis (OTPA)

In conventional transfer path analysis (TPA), the required transfer functions are determined by means of additional measurements, some of which can be complex and time-consuming. OTPA calculates the transfer functions solely from operating data, without requiring additional measurements. The OTPA model is developed using the OTPA Wizard, and the transfer functions are calculated after the parameters are configured. You can then continue working with the generated Prognoise model as usual.

The wizard settings can be saved and reopened to exchange measurement data or to modify parameters efficiently. When running on 64-bit operating systems, the OTPA Wizard is capable of processing larger amounts of input data during the calculation of transfer functions.

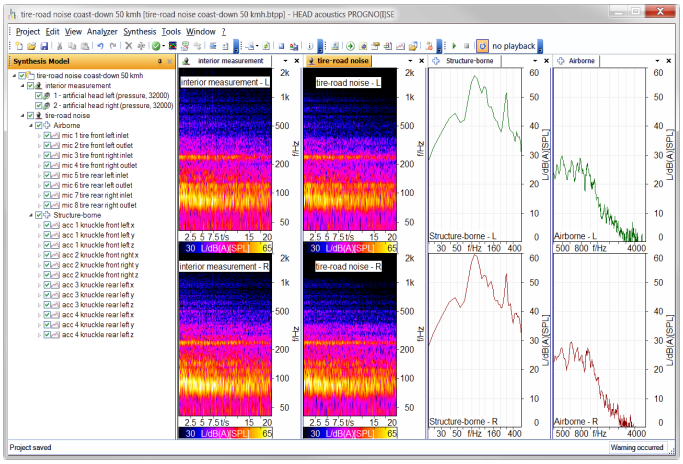
OTPA is suitable for applications such as the analysis of tire-road noise. For engine noise analysis, however, the use of measured transfer functions is recommended, since the strongly correlated engine signals can lead to inaccuracies in the calculation of OTPA transfer functions.

Using the OTPA Wizard requires Prognoise Tool Pack 01 (Code 4915).

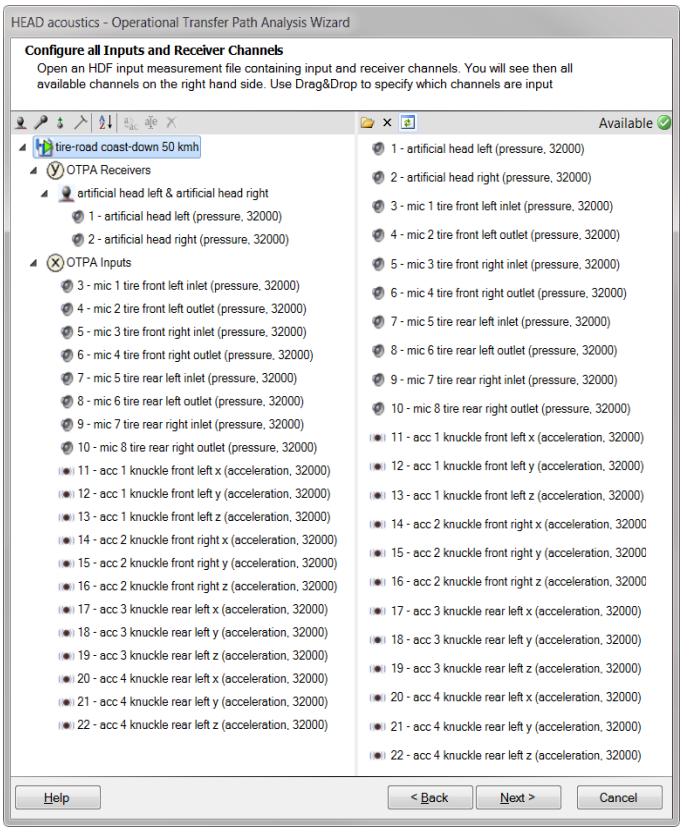
Configuring the Transfer Path Model

Even in extensive projects involving a large number of transfer paths, the transfer paths synthesis model remains easy to understand at all times thanks to its clear, well-structured tree representation.

Each model is composed of the individual binaural (or monaural) transfer paths and can be customized in just a few steps. For this purpose, established standard commands, such as drag-and-drop and copy-and-paste, are available. Prognoise also enables the generation of user-defined templates, which, for example, allow typical transfer paths to be inserted with a single mouse click.



The OTPA Wizard creates a Prognoise model that can be used, for example, to synthesize the tire-road noise of a vehicle.



Within the OTPA Wizard, the model can be rapidly configured based on the channels of a measurement.

Editing the Transfer Path Model

Each transfer path is represented by a series of signal-processing components, such as FIR and IIR filters, as well as factors that can be combined as required. The transfer paths can be consolidated into groups, with the signals within each group either summed or averaged. Such groups may in turn contain other groups, resulting in multi-level hierarchies in many applications.

Using the so-called Selector, alternative transfer paths (for example, different exhaust tailpipes) can be exchanged with a single mouse click, and the corresponding overall noise can be calculated. In this way, the overall noise levels of multiple subsystems can be easily compared.

Calculation and Playback of Time-Domain Signals

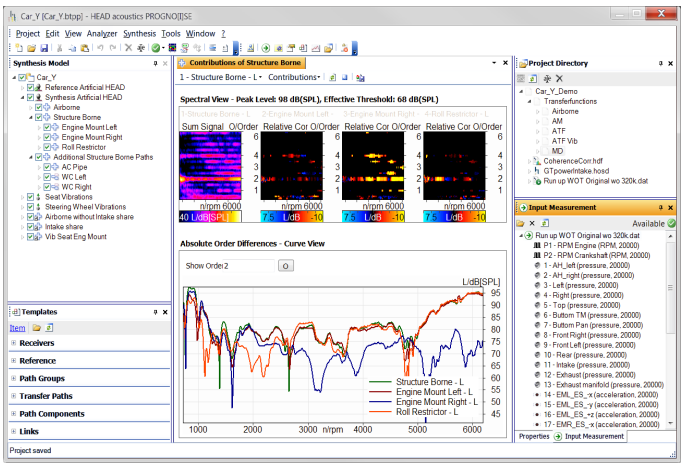
A calculation run can be initiated from any node in the model and includes all subordinate nodes. Optionally, both the overall noise and the partial noise contributions of individual transfer paths can be simulated. Clicking the Calculate button causes Prognoise to generate the time signal of a node and store it.

Prognoise enables not only playback of an individually calculated node or all calculated results, but also time-synchronized crossfading during playback.

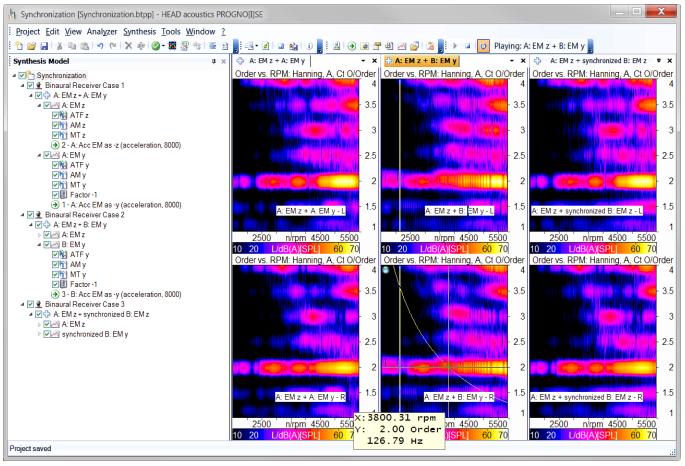
Signal Analysis

A Signal Analyzer is integrated into the program interface, displaying FFT spectrograms of time-domain signals from various nodes. In addition, FFT-versus-RPM and order spectrum analyses are available. Transfer functions can also be displayed in a separate window section.

Comparing the time signals of results with those of nodes at lower levels of the model hierarchy enables noise phenomena to be traced back to their root cause.



The Contribution Analyzer displays the sum signal and all direct subelements by means of specially prepared order spectra (upper diagrams). The display of the order cuts (lower diagram) enables a rapid identification of prominent sound components.



Peaks and cancellations (in the second motor order in the figure) caused by superposition of non-synchronous input data can be avoided by synchronization using order synthesis.

Contribution Analyzer

Using the Contribution Analyzer, dominant paths can be quickly visualized and identified. Specially prepared order spectra indicate, in phase, the respective contributions of individual subelements to the overall noise. An intelligent threshold algorithm examines the displayed paths and automatically determines the dynamic range.

Furthermore, the Contribution Analyzer provides in-phase order cuts across all subelements. This allows paths that amplify the overall noise to be distinguished from those that have no effect. All results can be exported.

Order Synthesis

To synthesize realistic target sounds, the sound-synthesis process must be as realistic as possible. The Order Synthesis Wizard enables calculated order curves to be applied to existing input measurements and further processed.

This approach enables significant time savings by allowing sound components from other measurements, simulation data, and similar sources to be realistically integrated into an existing transfer path model using order synthesis. Your specific plug-ins can be used to ensure precise synchronization between the base signal and any newly added sound components.

Synchronization of Input Data

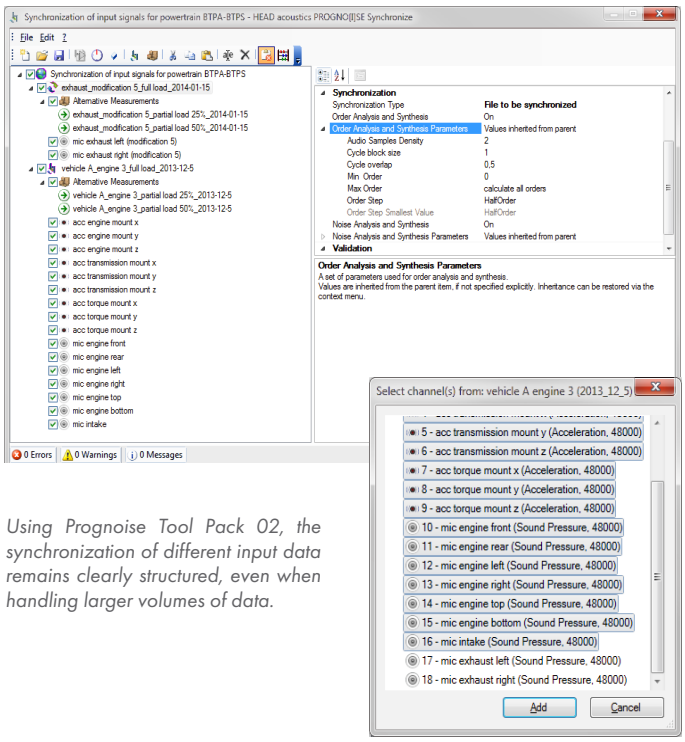
Prognoise Tool Pack 02 can be used to subsequently synchronize non-synchronous input data for a BTPA/BTPS model.

In scenarios such as engine development involving measurements on different test benches, subsequent partial measurements on modified components, or limited sensor or measurement channel availability, the recorded data in the individual datasets are no longer synchronized with one another. In particular, the measured RPM curves are no longer identical, which may result in audible artifacts, such as beats, cancellations, and peaks, when the filtered excitation signals are superimposed.

To avoid such effects, subsequent synchronization using Prognoise Tool Pack 02 is therefore required. The user-friendly tool is easy and intuitive to operate. An Event Viewer verifies the correct configuration and displays any errors that occur, enabling them to be readily localized and corrected.

The synchronization of input data is not the sole application of this method. Engine run-ups can also be virtually slowed down or accelerated. Even a reversal of the RPM curve is possible.

Multiple measurements of the same type, for example, different gears of the same gearbox, can be synchronized with corresponding recordings without the need to create new projects (Multiple Calculation).



Using Prognoise Tool Pack 02, the synchronization of different input data remains clearly structured, even when handling larger volumes of data.

Quadripole Wizard with Kelvin-Voigt Model

The Quadripole Wizard is used to determine dynamic stiffness characteristics, for example of engine mounts. The Z parameters required for this purpose can, for example, be derived from measurements or calculated using the Quadripole Wizard on the basis of a parametrizable Kelvin-Voigt model. In this way, a virtual engine mount can be integrated into an existing engine model. The Quadripole Wizard supports the virtual substitution and calculates the dynamic stiffness characteristics, which are then implemented as filters within the engine model.

Export and Playback with PreSense, the Interactive NVH Simulator for Virtual Engineering and Prototyping

The Prognoise interface of PreSense transfers the synthesized sounds from Prognoise to PreSense, enabling them to be played back and evaluated interactively. Playback with PreSense can be performed, for example, on a workstation computer, in the HEAD SoundCar, or in a mobile setup, i.e., in a production vehicle.

For playback using PreSense, so called link groups can be created in Prognoise, enabling the muting, filtering, and level adjustment of individual paths and path groups.

Transfer Path Analysis (TPA Data Acquisition and TPA Project of ArtemiS SUITE)

The TPA Data Acquisition Project of ArtemiS SUITE (APR 610 is required) enables the reliable and intuitive measurement of transfer functions required for operation with Prognoise or a TPA Project (APR 600 is required), by using Impact Measurement (APR 430 is required) or the Recorder of ArtemiS SUITE (APR 040 is required). The Measurement Point Library, the model tree of the TPA Project, and the 3D model are available to configure the measurement set-up and perform the measurements.

Network Licenses

Prognoise can be purchased as a single-user license or as a network license. With the single-user configuration, the license is stored on a dongle and can be used alternately on several computers on which the Prognoise software is installed by simply plugging the dongle into the desired system. With the network configuration, one or more licenses are stored on a network dongle. Users can select these licenses via the network from a computer that has the appropriate authorization and a Prognoise installation, and return them when they are no longer needed.

LICENSES AND OPTIONAL FEATURES

Required

Code	Product Name	Description
4914	Prognoise	Software for binaural transfer path synthesis

Required for Individual Prognoise Functions and Modules

Code	Product Name	Description
4915	PTP 01 Prognoise Tool Pack 01	Operational transfer path analysis module
4916	PTP 02 Prognoise Tool Pack 02	Synchronization module

Optional Features: Network Licenses

Code	Product Name	Description
4914N	Prognoise-N	Network license for Prognoise
4915 N	PTP 01-N	Network license for PTP 01
4916 N	PTP 02-N	Network license for PTP 02

Optional Features: Hardware

Code	Product Name	Description
37XX	HEAD*lab*	Modular multi-channel frontend system for mobile data acquisition
31020	*lab*COMPACT12 II	HEAD*lab* 12-channel compact module
31021	*lab*COMPACT24 II	HEAD*lab* 24-channel compact module
3324	SQuadriga III	Mobile 8-channel recording and playback system

LICENSES AND OPTIONAL FEATURES

Optional Features: Software

Code	Product Name	Description
7600	PreSense	Interactive simulator for NVH assessments
50600	APR 600 TPA Project	Performing transfer path analyses
50601	APR 601 TPA – Virtual Point Transformation	Calculating forces, moments, accelerations, and angular accelerations at points that cannot be measured physically
51602	ASP 602 TPA – Structure-Borne Analysis	Calculating the Effective Mount Transfer Matrix (EMTF) and the procedure for quantifying indirectly acting structure-borne sound contributions (IFC)
51603	ASP 603 TPA – Airborne Analysis	Indirect determination of the volume velocity via matrix inversion (IQD) and calculation of the airborne sound attenuation model (p2p)

50610	APR 610 TPA – Data Acquisition	Measuring the transfer functions required for a TPA Project
50430	APR 430 Impact Measurement	Performing impact measurements (Roving Hammer / Roving Accelerometer)
50040	APR 040 Recorder	Universal Recorder of ArtemiS SUITE for all types of measurements

SYSTEM REQUIREMENTS

- Windows 11 x64 (Pro, Enterprise, Education; version: 21H2 or later; languages: US, Western European)
- Core2Duo Processor 2 GHz
- 2 GB RAM
- DirectX 9.0c-compliant graphics card 256 MB

Installing our software/drivers requires administrator privileges. Operating the software requires standard user privileges.

HEAD acoustics

Contact

Ebertstrasse 30a
52134 Herzogenrath, Germany
Phone: +49 2407 577-0
E-Mail: sales@head-acoustics.com
Website: www.head-acoustics.com