

Code 4914

# PROGNOISE

Prognoise is a software for Binaural Transfer Path Synthesis enabling playback and editing of individual paths, path groups, and overall noise as well as interactive editing of the synthesis tree. In addition, various special applications (Operational Transfer Path Analysis, ...) are available.

# OVERVIEW

## Prognose

### Code 4914

Prognose enables the synthesis of binaural or monaural sounds for one or several recipients (airborne and structure-borne sound) based on transfer functions and excitation signals (time data measured in operating state).

During the synthesis, the individual transfer functions (e.g., mount transfer, apparent mass, and acoustic transfer function) are consolidated and assigned to the corresponding input signal. The corresponding time signal can be determined, analyzed, and auralized for each node in the model.

TPA Project of ArtemiS SUITE (APR 620 is required) is a fast and easy solution for creating transfer path models as well as for calculating source characteristics and path contributions in the time domain. The export interface transfers TPA Projects into ready-to-use Prognose Projects that are available for interactive analyses and advanced applications.

## KEY FEATURES

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

Adding or removing paths or partial models

Playback of individual or all calculated results at any node of the model

Contribution Analyzer for an in-phase determination of the sound components

Quadripole Wizard with Kelvin-Voigt model for a virtual exchange of engine mounts

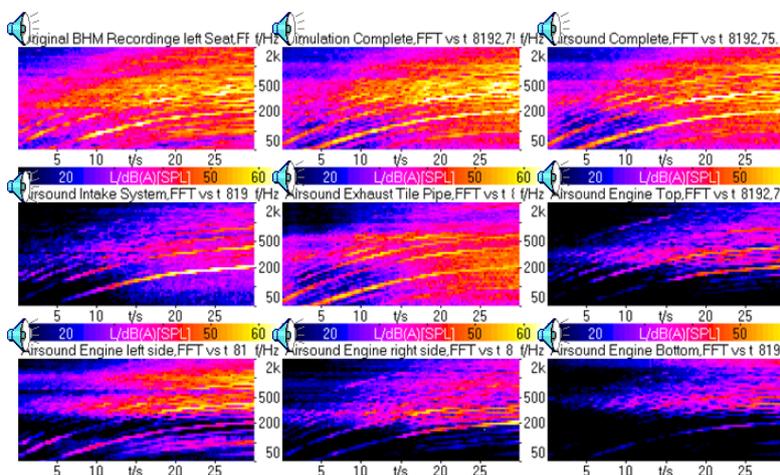
Time analysis and export at any point of the model

Options (need to be licensed)

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

## APPLICATIONS

- › Examining and predicting the influences of individual noise paths on the noise quality of vehicles, machines, and other products



# DETAILS

## Operational Transfer Path Analysis (OTPA)

In conventional TPA, the required transfer functions are determined by means of additional, sometimes complex, measurements. OTPA calculates the transfer functions only from operating data without additional measurements. The OTPA model is developed using the OTPA Wizard, and the transfer functions are calculated after the parameters have been configured. Users continue to work as usual with the generated Prognose model. The Wizard settings can be saved and opened in order to exchange measurement data or quickly change parameters. With 64-bit operating systems, the OTPA Wizard is capable of processing larger amounts of input data when calculating transfer functions.

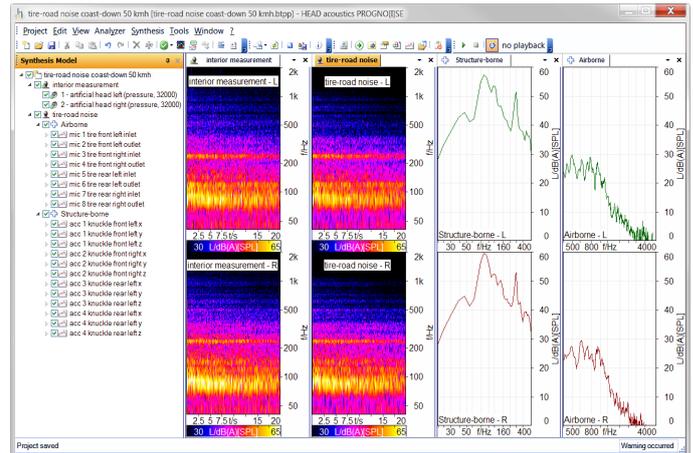
OTPA is suitable for analyzing tire noise, for example. When it comes to examining engine noise, however, it is recommended to use measured transfer functions, as the highly correlated signals from the engine may lead to errors when calculating the OTPA transfer functions.

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

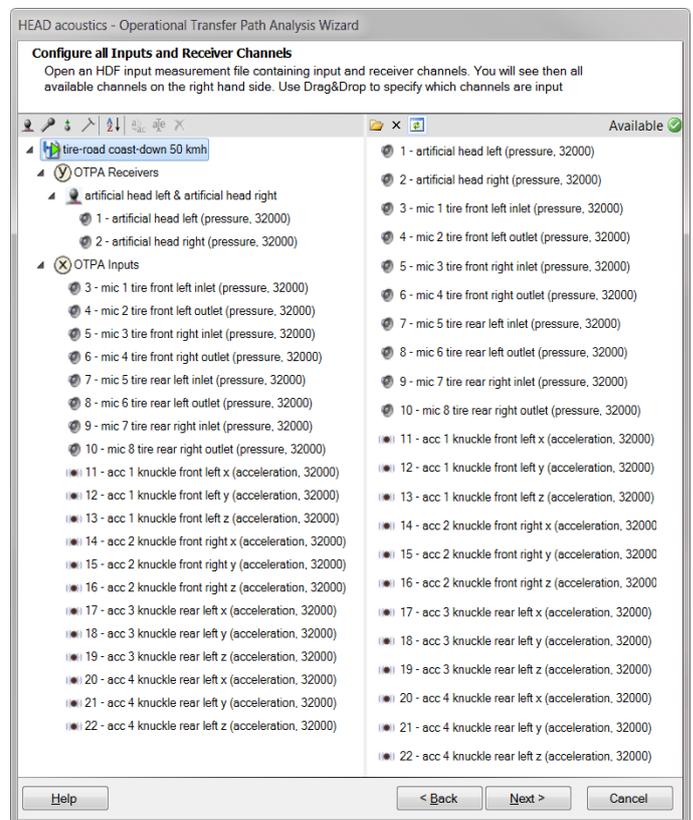
## Configuring the Transfer Path Model

Thanks to the clear tree structure, the model of a transfer path synthesis is always easy to manage, even for large projects with numerous transfer functions.

Each model is made up of the individual binaural (or monaural) transfer paths and can be customized in just a few steps. The usual standard commands, such as drag-and-drop and copy-and-paste, are available for this purpose. Prognose also provides the option of generating user-defined templates that can be used to insert typical transfer paths with a single mouse click, for example.



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



In the OTPA Wizard, the model can be quickly configured from 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 these groups either being summed or averaged. Such groups may in turn contain other groups, resulting in multi-level hierarchies in many applications.

The Selector is a tool that is used to exchange alternative transfer paths (e.g., different exhaust tailpipes) at the click of a mouse and calculate the corresponding overall noise. This makes it easy to compare the overall noise of multiple subsystems.

## Calculation and Playback of Audio Signals

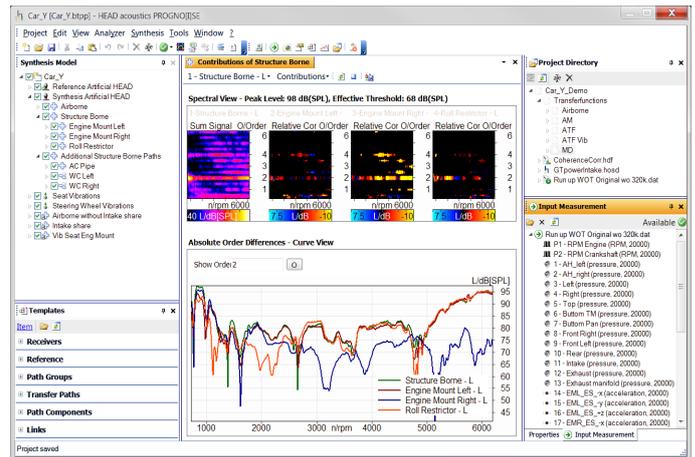
A calculation run can be started from any node of the model, and the subordinate nodes are included. Optionally, both the overall noise and partial noises of individual transfer paths can be simulated. Clicking the Calculate button causes Prognose to generate the time signal of a node and store it.

Prognose not only enables playback of a calculated node or all calculated results, but also time-synchronized crossfading during playback.

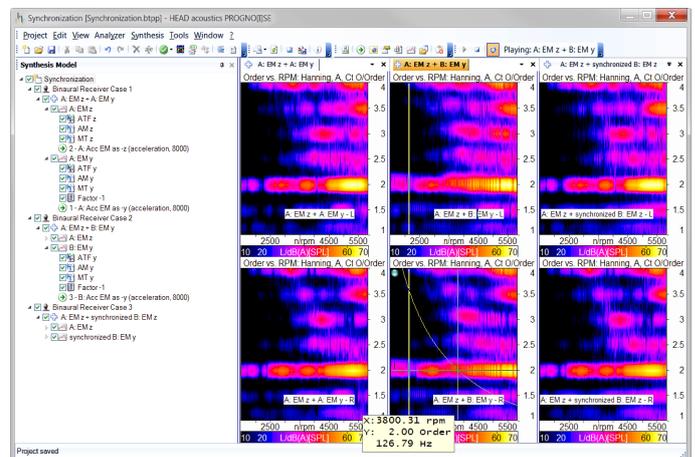
## Signal Analysis

A Signal Analyzer that has been integrated into the program interface displays the FFT spectrograms of the time signals of various nodes. The FFT vs. RPM and order spectrum analyses are also available. In addition, the transfer function can be displayed in another window section.

Comparing the time signals of results with those of nodes deeper in the model hierarchy enables noise phenomena to be traced back to their actual origin.



The Contribution Analyzer displays the summation signal and all direct sub-elements by means of specially prepared order spectra (upper diagrams). The display of the order cuts (lower diagram) is used to quickly identify prominent noise components.



Peaks and cancellations (in the 2nd motor order of the figure) resulting from a superposition of non-synchronous input data can be avoided by means of a synchronization using order synthesis.

## Contribution Analyzer

The Contribution Analyzer can be used to quickly visualize and identify dominant paths. Specially prepared, in-phase order spectra show the respective sub-elements' contributions to the overall noise. An intelligent threshold algorithm examines the displayed paths, automatically displaying the dynamic range.

The Contribution Analyzer also displays in-phase order cuts in all sub-elements. This enables users to recognize which paths amplify or do not change the overall noise. All results can be exported.

## Order Synthesis

In order to synthesize authentic target sounds, the sound synthesis has to be as realistic as possible. Using the Order Synthesis Wizard, calculated order curves can be applied to existing input measurements and further processed.

This may save users a great deal of time as sound components from other measurements, simulation data, etc. can be realistically integrated into an existing transfer path model using order analysis. Customer-specific plug-ins can be used for precise synchronization of the base signal and new sound components.

## Synchronization of Input Data

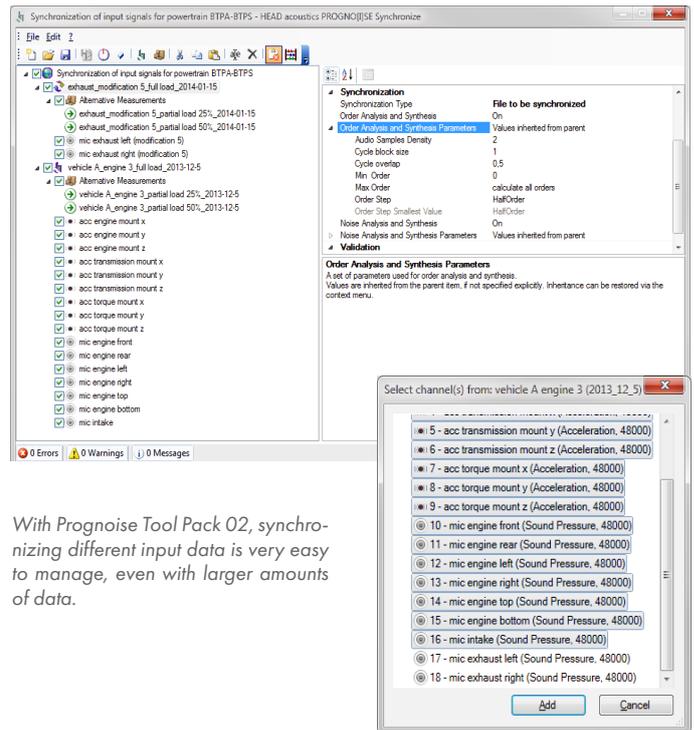
Prognose Tool Pack O2 can be used to subsequently synchronize non-synchronous input data for a BTPA/BTPS model.

For example, if recordings for the development of a new engine are performed on different test benches, or partial measurements are subsequently performed on modified components, or the number of sensors or measurement channels is insufficient, the recorded data are no longer synchronized with each other in the recordings. In particular, the measured RPM curves are not identical, causing audible artifacts in the form of beats, cancellations, and peaks when the filtered excitation signals are superimposed.

Consequently, subsequent synchronization using Prognose Tool Pack O2 is necessary to avoid such effects. Working with this tool is easy and intuitive. An Event Viewer checks the correct configuration and displays any errors that have occurred so they can be easily located and eliminated.

Synchronizing input data is not the only possible application of this method. It also enables engine run-ups to be virtually slowed down or accelerated. It is even possible to reverse the RPM curve.

Several similar measurements, e.g., different gears of the same gearbox, can be synchronized with the respective recordings without having to create new projects (Multiple Calculation).



*With Prognose Tool Pack O2, synchronizing different input data is very easy to manage, even with larger amounts of data.*

## Quadripole Wizard with Kelvin-Voigt Model

Using the Quadripole Wizard, users can determine the dynamic stiffness of engine mounts, for example. The required Z parameters can be taken from a measurement, for example, or calculated by 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 exchange and calculates the dynamic stiffnesses that are inserted into the engine model as filters.

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

The Prognose interface of PreSense transmits the synthesized sounds from Prognose to PreSense, enabling them to be played back and evaluated interactively. Playback with PreSense is performed, for example, at the workstation computer, in the HEAD SoundCar, or on a mobile setup variant, i.e., in a standard vehicle.

For playback with PreSense, Prognose provides the option to create so-called link groups, 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 safe and intuitive measurement of the transfer path functions that are required for Prognose or a TPA Project (APR 620 is required) using 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 setup and perform the measurements.

## Network Licenses

Prognose can be purchased as a single user license or as a network license. With the single-user solution, the license is stored on a dongle and can be used alternately on several computers with Prognose software installed by simply plugging in the dongle. With the network solution, one or more licenses are stored on a network dongle. Users can select them over the network using a computer that has the appropriate authorizations and is running Prognose, and return them after use.

## More Information, System Requirements

### Prognose Tool Packs (Optional)

- › PTP 01: Prognose Tool Pack 01 (Code 4915)  
Operative Transfer Path Analysis
- › PTP 02: Prognose Tool Pack 02 (Code 4916)  
Synchronization

### Network Licenses (Optional)

- › Prognose-N (Code 4914N)
- › PTP 01-N: Prognose Tool Pack 01-N (Code 4915N)
- › PTP 02-N: Prognose Tool Pack 02-N (Code 4916 N)

### Hardware (Optional)

- › Modular multi-channel HEAD*lab* system
- › *lab*COMPACT12 II (Code 31020)  
12-channel compact system
- › *lab*COMPACT24 II (Code 31021)  
24-channel compact system
- › SQuadriga III  
Mobile 8-channel recording and playback system

### Software (Optional)

- › PreSense (Code 7600)  
Interactive NVH simulator for virtual engineering and prototyping
- › TPA Data Acquisition – APR 610 (Code 50610)  
Fast and reliable measurement of transfer functions
- › TPA Project – APR 620 (Code 50620)  
Performing transfer path analyses and creating data sets for Prognose and PreSense
- › Recorder – APR 040 (Code 50040)  
Recorder of ArtemiS SUITE

### System Requirements

- › Windows 10 x64 (Pro, Enterprise, Education; Version: 1809 or newer; languages: US, Western European)
- › Core2Duo Processor 2 GHz
- › 2 GB RAM
- › DirectX 9.0c-compliant graphics card 256 MB



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