



Signals under Control

The powerful new Signal Editor



dSPACE's Signal Editor Module for the ControlDesk Next Generation experiment software is a new creative tool for ECU developers. This powerful add-on features extensive features for synthesizing, processing, and replaying signals.



Clarity and Speed, Please!

Developing and validating ECU software involves handling a vast number of incoming and outgoing signals, which all have to be measured for later analysis. For tests, recorded signals (e.g., from test drives) also have to be reproduced with the correct timing. In addition, synthetic signal behaviors, such as a preset sine behavior, need to be introduced into model parameters accurately. This form of signal generation is as important for HIL simulation as for RCP-based development. Keeping track of all the relevant signals, and being able to create or modify them quickly, is absolutely vital for an efficient workflow. The Signal Editor Module for ControlDesk® Next Generation gives today's developers what they need: a convenient, creative, standard-compliant signal tool (ASAM AE HIL API 1.0) for a wide range of scenarios.

Extra-Large Signal Toolbox

Do you want to make a battery voltage drop to below 4 V for a period of 20 ms, reproducibly? Or repeatedly and reproducibly introduce error events with different ECU parameterizations during a drive on a virtual test track? The Signal Editor is just the toolbox you need, fully equipped for configuring, displaying and editing signals (signal addition and multiplication, loop, and so on). It also combines well with test automation tools like AutomationDesk®. With just a few mouse clicks, you can put signal

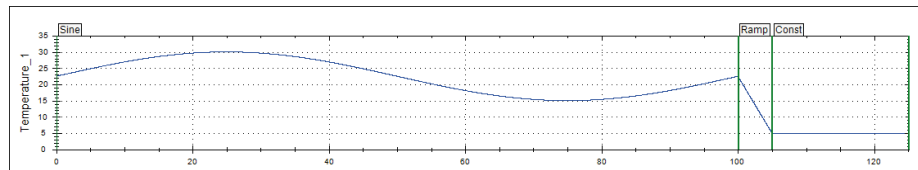


Figure 1: Representing temperature behaviors in the Signal Editor – here, a low-frequency sine between 15 °C and 30 °C followed by a sudden temperature drop to 5 °C.

segments together to create signal behaviors (Figure 1 shows an outside temperature with a low-frequency sine between 15 °C and 30 °C followed by a sudden temperature drop to 5 °C). The signal behaviors can be linked to conditions so that the abrupt drop in temperature is triggered by an event (such as driving into an underground garage).

Synthesis: Shaping Signals

The ability to create artificial signal behaviors is an indispensable part of building test scenarios. Real signals that can be used as a reference are not always available, and measured signals often have to be edited to make them suitable. The Signal Editor's synthesis features are a valuable help here. It has numerous basic signal types that you can base your definition on: sine, ramp, noise, and so on (Figure 2).

You can define time periods for the signals, design signal transitions, or quickly compute combinations of signal behaviors (by addition, multiplication, etc., see Figure 3). You can also combine synthetic signals with real measurements or imported data (to introduce noise on a measurement signal, for example). Dynamic dependencies can be defined for the signals: for example, a disturbance amplitude can be generated in proportion to a measured variable (such as vibrations

proportional to vehicle speed). These signal behaviors are easy to introduce into test scenarios, as they are not integrated into the simulation model, but are added dynamically during run time with Real-Time Testing – a basic technology that has been a great success in AutomationDesk for many years now. The simulation model therefore remains independent of individual test cases. The supply voltage during engine startup is an example of a signal behavior that is required for a test. As the engine starts, the supply voltage signal has to indicate a brief drop in voltage. The HIL simulator sends the drop to the ECU, which then compensates for it.

Play It Again, ControlDesk!

When you want to replay measurement data (such as signals captured during a drive on a test track), you need a clear display and easy handling. The Signal Editor is the solution. Measurements recorded on a platform or device via ControlDesk Next Generation can be assigned to model parameters simply by drag & drop and then replayed. Recorded signals in MDF, MAT oder CSV format can be quickly imported via the measurement data pool. ECU optimization for a race car is one application which uses recorded measurement data. Formula One engineers have to cope with weekly

software releases and numerous last-minute changes, because parameters have to be adapted to each individual race track. With the help of the Signal Editor, it is easy to assign the measured data (driving speed profile, gear change sequences, single wheel rotations, lambda values, etc.) to model variables, and to reuse the data for HIL tests on a test bench.

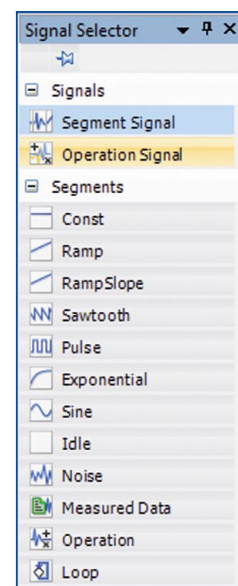


Figure 2: The Signal Selector is an easy way to select signal types.

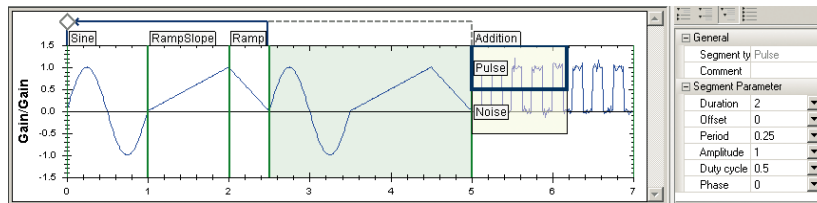


Figure 3: Signals can be put together from different segments and also combined (for example, by adding pulses or noise).

Faster with Automation

The Signal Editor Module in ControlDesk Next Generation can be closely coupled with the AutomationDesk test automation tool, especially for real-time tests. You can create stimulus signals in the Signal Editor Module, save them as STI files according to ASAM AE HIL API 1.0, import them into AutomationDesk and integrate them into test sequences together

with signals from other sources. The tool coupling with AutomationDesk allows each signal to be used in different test runs and even varied automatically. For example, the frequency or amplitude can be increased stepwise in each new test run until a fault memory entry is made in the ECU. A measured signal can also be evaluated for compliance with predefined limits, which are

described as reference signals in the Signal Editor and quickly made available in AutomationDesk for use with the evaluation library. The optional Signal Editor Module for ControlDesk Next Generation is the ideal companion for graphically defining signal behaviors and replaying them with correct timing on dSPACE hardware such as DS1005, DS1006, Micro-AutoBox II and SCALEXIO. ■

Figure 4: Recorded signals can be used for HIL tests on a test bench, for example, for ECU optimization in Formula One vehicles.



Profile

Signal Editor Module ControlDesk Next Generation

- Powerful editor for graphically defining stimulus signals
- Easy replay of measurement data, e.g., MDF
- Dynamic stimulus options, e.g., model-dependent signal changes
- Independent execution of several signal generators
- ASAM AE HIL API 1.0-compliant
- Signal exchange with AutomationDesk