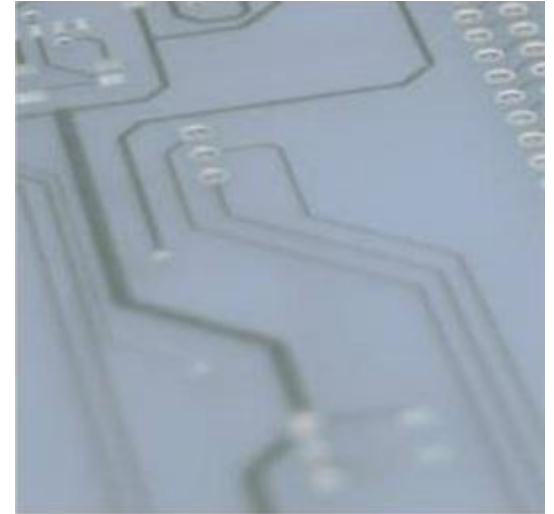
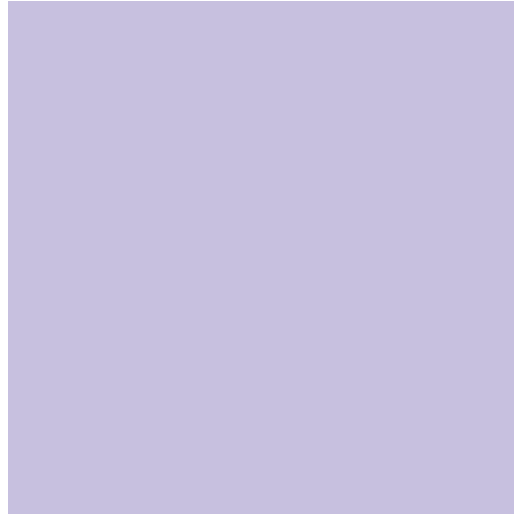
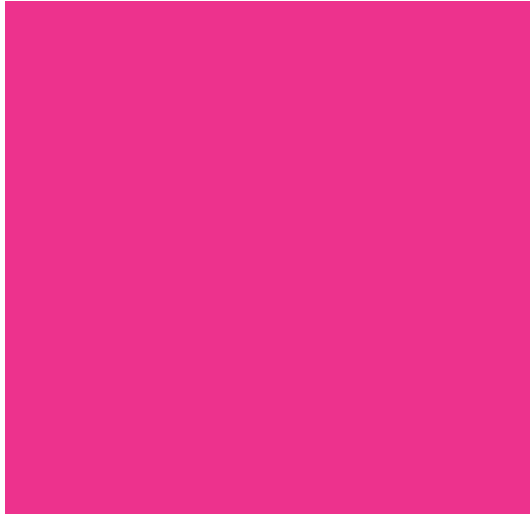


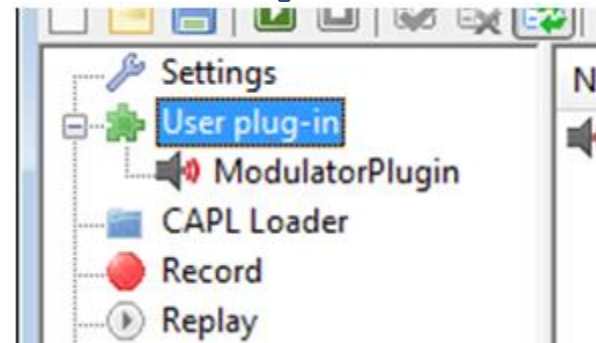
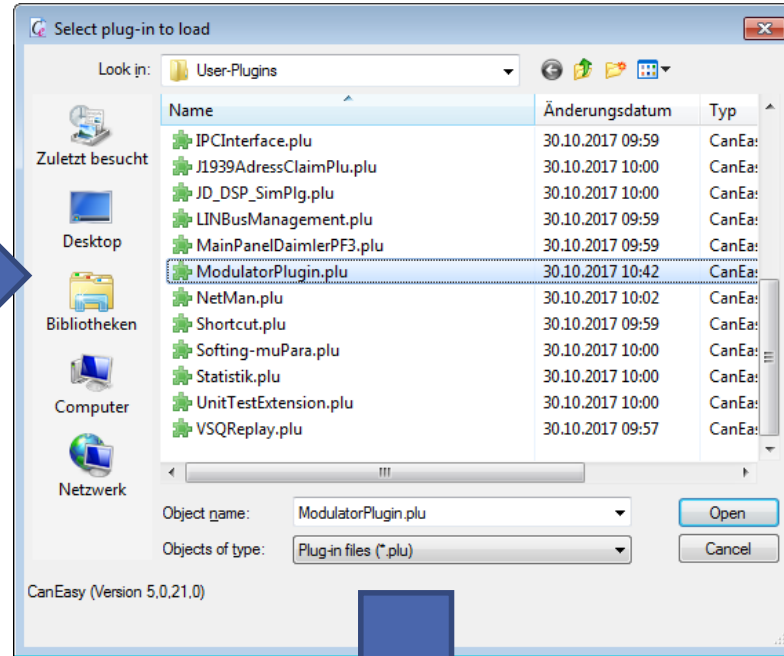
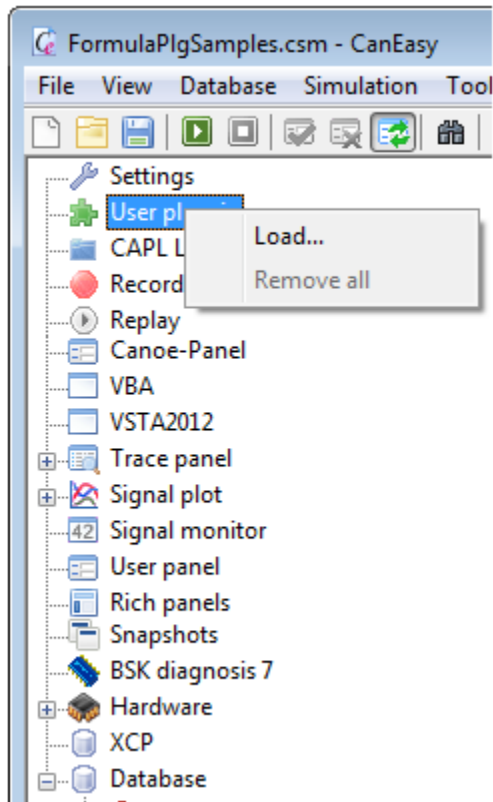
Modulator Plugin



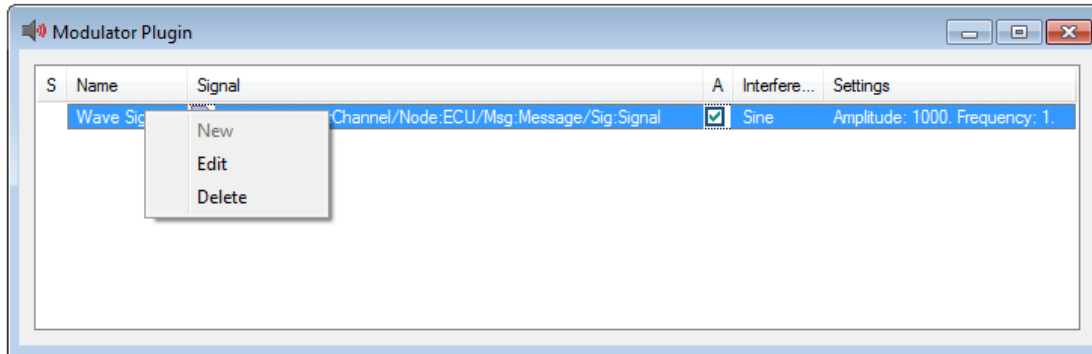
Michael Gerhardt
Sven Schuchmann

- Basic configurations of a remaining bus simulation have static signal values because transmission control configuration does not contain any „dynamic behavior“
 - Real ECUs normally do not behave statically
 - Simulation should be closer to reality than to a „static“ lab model
 - Easy way to change a number of signals to generate a lot of signal changes
-

Start



Main Dialog



Context menu

- New
- Edit
- Delete

Use Drag&Drop of signal
for quick access

Information in overview	
S	Signal value will also be updated in the panels
Name	Descriptive name given by user
Signal	Database link to the signal that should be modulated
A	Active, modulation is active
Interference signal	Type of modulation
Settings	Textural summary of configuration for signal modulation

Edit Dialog

Setting when formula should be evaluated

The image shows a 'Settings' dialog box with various fields and checkboxes. Blue arrows point from descriptive text labels to specific fields in the dialog:

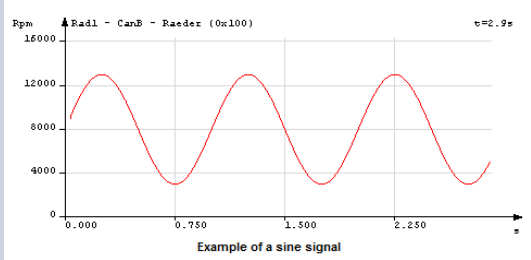
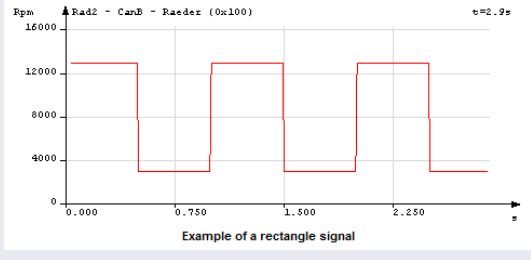
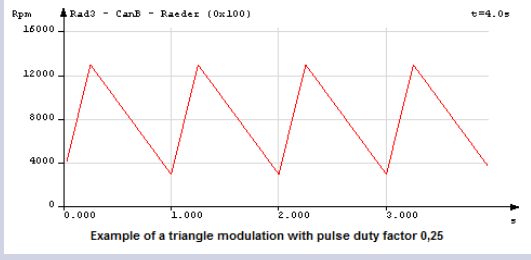
- Update value in panels**: Points to the 'Change signal values' checkbox.
- Signal Init value for simulation start**: Points to the 'Set signal value' checkbox.
- Modulation type custom settings**: Points to the 'Interference signal' dropdown menu.
- Unique name**: Points to the 'Name' text field.
- Signal reference**: Points to the 'Signal' text field.
- Cycle time**: Points to the 'Sending frequency' text field.
- Type of modulation**: Points to the 'Interference signal' dropdown menu.

The dialog box contains the following fields and options:

- Name: Wave Signal
- Signal: Sig:Signal
- Sending frequency: 4 [Hz]
- ☒ Change signal values
- ☐ Set signal value: 0
- Interference signal: Sine
- Amplitude: 1000
- Frequency: 1
- Buttons: OK, Cancel

Modulation types

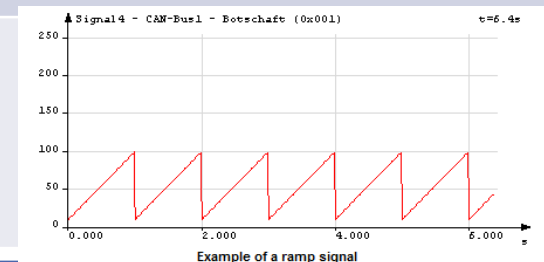
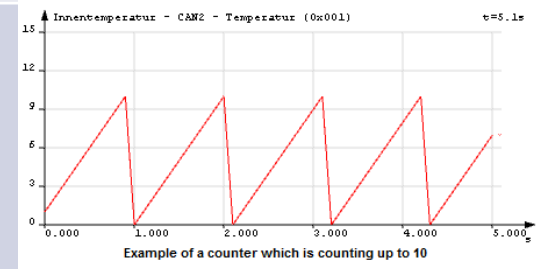
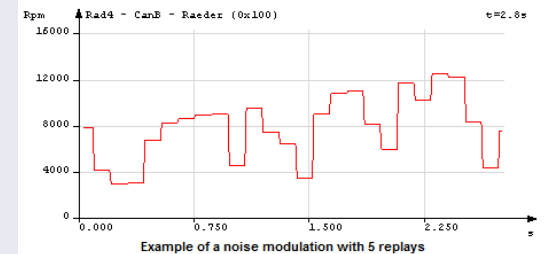
Determines function type to modify signal value

Modulation type	
Sine wave	<p>Standard sine wave signal, Settings: Amplitude and frequency</p>  <p>The graph shows a sine wave signal. The y-axis is labeled 'Rpm' and ranges from 0 to 16000. The x-axis is labeled 's' and ranges from 0.000 to 2.250. The signal oscillates between approximately 3000 and 13000 Rpm. The title of the graph is 'Rad1 - CanB - Raeder (0x100)' and the time scale is 't=2.2s'. Below the graph is the caption 'Example of a sine signal'.</p>
Rectangle	<p>Rectangle signal with variable scan level [duty factor], Settings: Amplitude, frequency and scan level</p>  <p>The graph shows a rectangle signal. The y-axis is labeled 'Rpm' and ranges from 0 to 16000. The x-axis is labeled 's' and ranges from 0.000 to 2.250. The signal alternates between approximately 3000 and 13000 Rpm. The title of the graph is 'Rad2 - CanB - Raeder (0x100)' and the time scale is 't=2.2s'. Below the graph is the caption 'Example of a rectangle signal'.</p>
Triangle	<p>Ramp up/down signal with variable scan level [duty factor], Settings: Amplitude, frequency and scan level</p>  <p>The graph shows a triangle modulation signal. The y-axis is labeled 'Rpm' and ranges from 0 to 16000. The x-axis is labeled 's' and ranges from 0.000 to 3.000. The signal ramps up and down between approximately 3000 and 13000 Rpm. The title of the graph is 'Rad3 - CanB - Raeder (0x100)' and the time scale is 't=4.0s'. Below the graph is the caption 'Example of a triangle modulation with pulse duty factor 0,25'.</p>

Modulation types

Determines function type to modify signal value

Modulation type	
Custom	Values based on external input file with signal value lists (pick a value from the input file * factor for each cycle of the message), Settings: Factor, Source File, Auto Repeat
Noise	Randomized values Settings: Maximum value, repetitions
Counter	Simple incremental counter with overflow functionality Settings: Maximum value
Ramp	Simple ramp with start/end values, simplified Triangle Settings: Start-, End value and Duration.

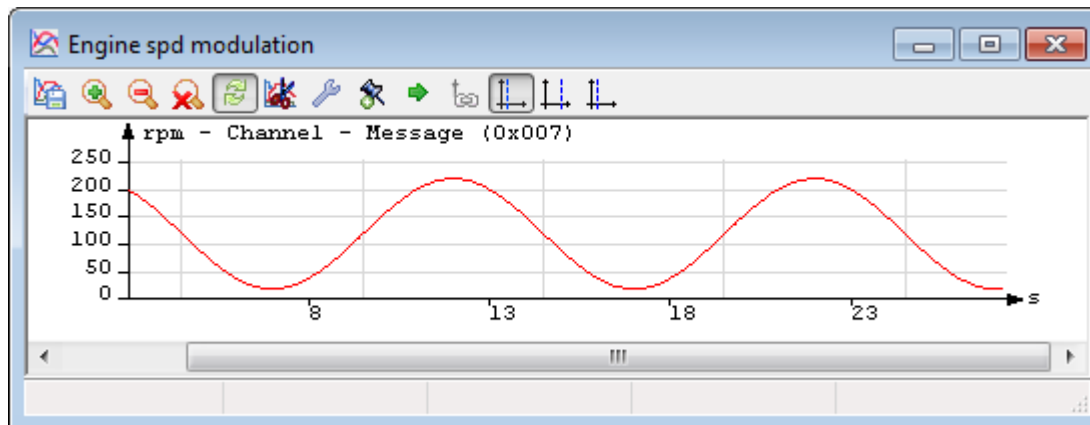
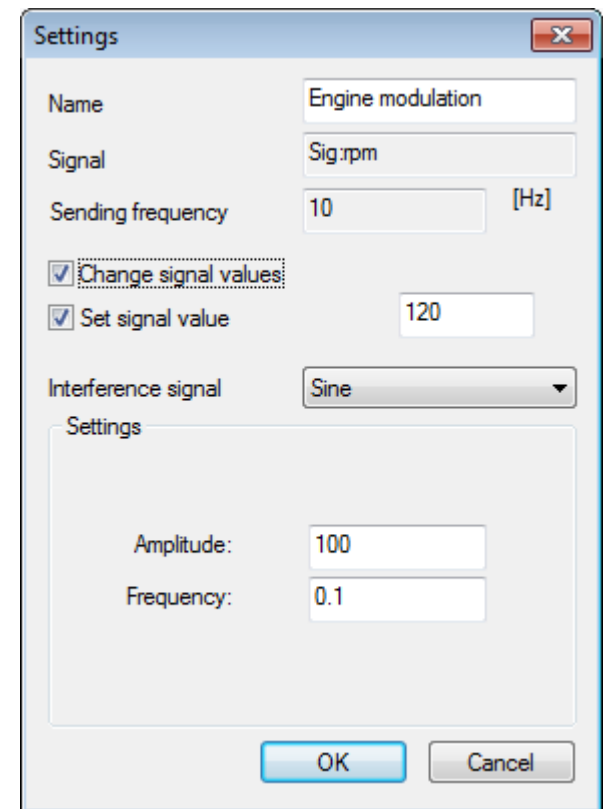


- Use „set signal value“ to add starting values to modulations
[especially when using „Change signal values“]
- Min/Max signal values are:
`starting signal value +/- Amplitude`
- Frequency is for a full cycle based on modulation type
- Use noise to add jittering to user set signals

Examples (1)

Simple modulation of "static" signal

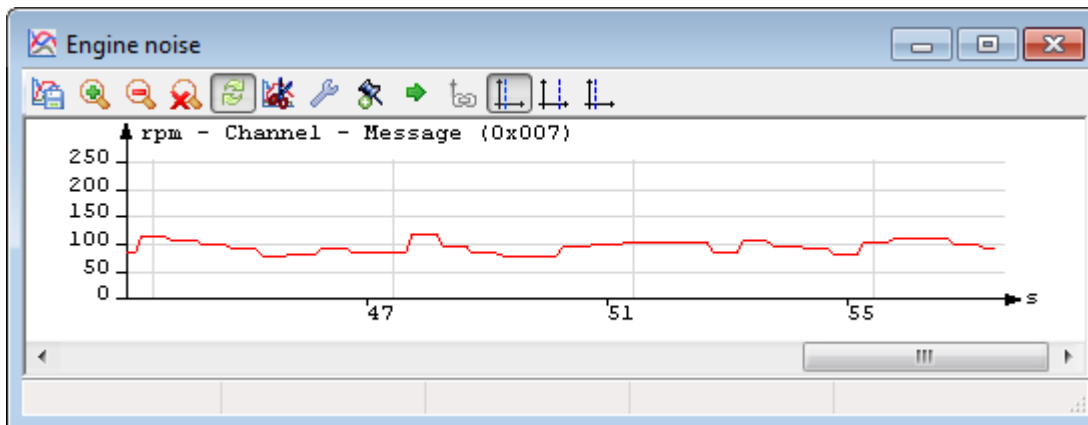
- Choose any type of modulation
- Configure
- Remember to set a "starting" value



Examples (2)

Dynamic noise for user set signals
(e.g. realistic motor rpm)

- Panels can still be used to set signal values (base value taken from panel)
- Sent signal value is visible in trace/plot



The screenshot shows a "Settings" dialog box for the "Engine noise" signal. The dialog has a title bar with a close button. The main area contains the following settings:

- Name:** Engine noise
- Signal:** Sig.rpm
- Sending frequency:** 10 [Hz]
- ☐ **Change signal values:**
- ☐ **Set signal value:** 0
- Interference signal:** Noise (selected from a dropdown menu)

Below these settings is a section titled "Settings" with the following options:

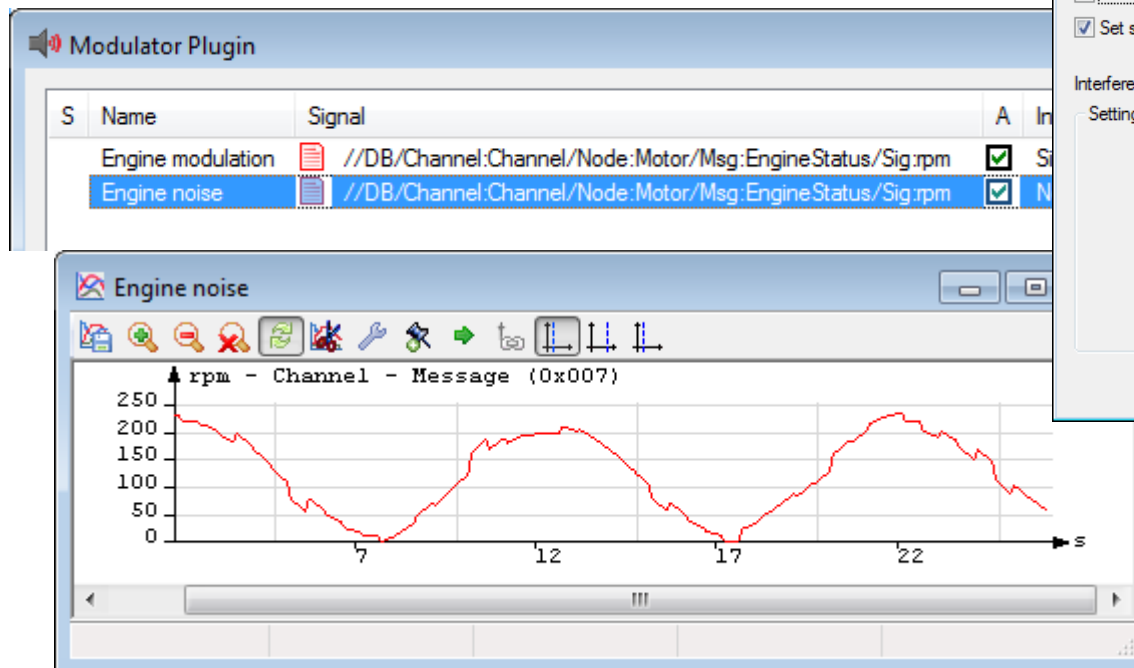
- Maximum value:** 20
- Repetitions:** 4

At the bottom of the dialog are "OK" and "Cancel" buttons.

Examples (3)

Multiple modulations for single signal

- Add multiple modulations to a single signal



Settings dialog for 'Engine modulation'.

Name: Engine modulation

Signal: Sig.rpm

Sending frequency: 10 [Hz]

☐ Change signal values

☒ Set signal value

Interference signal: Sine

Settings:

Amplitude: 100

Frequency: 0.1

OK

Settings dialog for 'Engine noise'.

Name: Engine noise

Signal: Sig.rpm

Sending frequency: 10 [Hz]

☐ Change signal values

☐ Set signal value

Interference signal: Noise

Settings:

Maximum value: 20

Repetitions: 4

OK Cancel

Thank you for your attention!
