Gateway Template Editor User Guide

Introduction

Stack Multi-Function modules are able to record and display CAN bus data generated by an ECU. This mechanism is achieved through the module's Gateway function. The user may configure this Gateway function with Stack DataPro Designer software. The software requires that the user select a gateway protocol and it's this protocol, or template, that describes the various CAN messages sent by the ECU.

The Stack Gateway Template Editor application provides the user with the ability to create and edit these ECU Gateway templates for selection within Designer.

CAN Bus Message Basics

CAN Identifier

Every CAN message has a unique identifier, also known as an address. This identifier will either be an 11-bit value or an extended 29-bit value.

CAN Data

A CAN message can contain up to 8 bytes (64 bits) of data. This data will contain values for one or more ECU channels such as wheel speed, oil temperature, oil pressure, etc. The channel values may be stored in Intel (little-endian) or Motorola (big-endian) byte-order format within the CAN data. Byte-ordering effects the way 16-bit values are stored in the CAN data. For example, say a value of 3500 RPM is stored in the first two bytes of the CAN data, in Intel format the most significant byte will be stored in byte 1 and the least significant byte in byte 0 as shown below. The value of 3500 in decimal is 0x0DAC in hexadecimal, where the most significant byte is 0x0D (00001101 binary) and the least significant byte is 0xAC (10101100 binary).

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	7 **1**	6 **0**	5 **1**	4 **0**	3 **1**	2 **1**	1 **0**	0 **0**
Byte 1	15 **0**	14 **0**	13 **0**	12 **0**	11 **1**	10 **1**	9 **0**	8 **1**

Table 1 Intel Format

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	7 **0**	6 **0**	5 **0**	4 **0**	3 **1**	2 **1**	1 **0**	0 **1**
Byte 1	15 **1**	14 **0**	13 **1**	12 **0**	11 **1**	10 **1**	9 **0**	8 **0**

Table 2 Motorola Format

In Intel format the least significant bit (LSB) or start bit is in position bit 0 (Byte: 0 Bit: 0), whereas in Motorola format the start bit is in position bit 8 (Byte: 1 Bit: 0).

Multiplexed Channels

Some channels may be multiplexed so that a system requires fewer CAN messages. A CAN message containing multiplexed channels will reserve up to 8 bits in the data for a multiplex control value. This control value determines what channels have been stored in the message data. In the example below, when the multiplex control value is 0 (multiplex mode 0), the CAN data could contain values for oil temperature and fuel pressure but when the control value is 1 (multiplex mode 1), the CAN data would contain values for water temperature and oil pressure. The oil temperature and water temperature channel values would occupy the same bits in the CAN data message but it's the value of the multiplex control that determines whether the bits store oil or water values. In this way a single message can contain many more channel values.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	7	6	5	4	3	2	1	0 **0**
Byte 1	15	14	13	12	11	10	9	8
Byte 2	23 **OILT**	22 **OILT**	21 **OILT**	20 **OILT**	19 **OILT**	18 **OILT**	17 **OILT**	16 **OILT**
Byte 3	31 **OILT**	30 **OILT**	29 **OILT**	28 **OILT**	27 **OILT**	26 **OILT**	25 **OILT**	24 **OILT**
Byte 4	39 **FUELP**	38 **FUELP**	37 **FUELP**	36 **FUELP**	35 **FUELP**	34 **FUELP**	33 **FUELP**	32 **FUELP**
Byte 5	47 **FUELP**	46 **FUELP**	45 **FUELP**	44 **FUELP**	43 **FUELP**	42 **FUELP**	41 **FUELP**	40 **FUELP**

Table 3 Example Multiplexed Channels for Mode 0 (Bit 0)

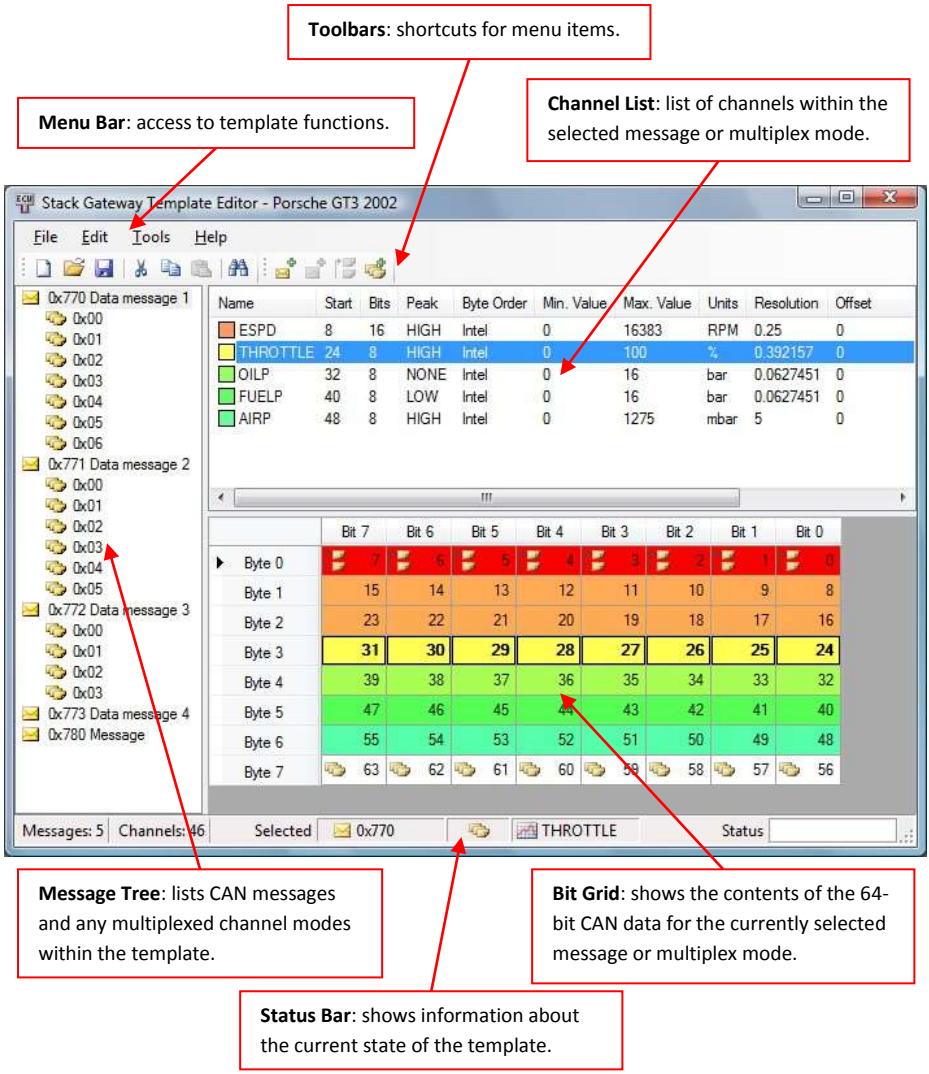
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	7	6	5	4	3	2	1	0 **1**
Byte 1	15	14	13	12	11	10	9	8
Byte 2	23 **WTMP**	22 **WTMP**	21 **WTMP**	20 **WTMP**	19 **WTMP**	18 **WTMP**	17 **WTMP**	16 **WTMP**
Byte 3	31 **WTMP**	30 **WTMP**	29 **WTMP**	28 **WTMP**	27 **WTMP**	26 **WTMP**	25 **WTMP**	24 **WTMP**
Byte 4	39 **OILP**	38 **OILP**	37 **OILP**	36 **OILP**	35 **OILP**	34 **OILP**	33 **OILP**	32 **OILP**
Byte 5	47 **OILP**	46 **OILP**	45 **OILP**	44 **OILP**	43 **OILP**	42 **OILP**	41 **OILP**	40 **OILP**

Table 4 Example Multiplexed Channels for Mode 1 (Bit 0)

Editor Overview

This section provides an overview of the editor application user interface.

Main Application Window



Message Tree

The message tree lists all CAN messages that exist within the template being edited. The messages are marked with an envelope icon and display the CAN ID in hexadecimal (indicated by a 0x prefix) followed by the message comment. If the message contains multiplexed channels, then the multiplex control modes are listed under the message and are marked with an icon and mode value, again in hexadecimal.

Double-clicking an item within the list will display the appropriate editor window. Right-clicking will display a context menu of options.

Channel List

The channel list displays the channels defined within the currently selected message or multiplex mode. The icon next to the channel name uses the same colour as that in the Bit Grid for easy identification.

Double-clicking an item within the list will display the channel editor window. Right-clicking will display a context menu of options.

Bit Grid

The Bit Grid displays the 8 byte CAN data for the currently selected message or multiplex mode. The Bit Grid is where the user creates, copies, pastes and edits channels within the message. A multiplex control is indicated by an icon on a red background. When a message is selected that contains multiplexed channels the channels are indicated by the icon.

Bit channels are indicated with the 1010 0101 icon.

Use the mouse left-click and drag to select bits in the grid and then the right-click to display a context menu of options.

Status Bar

The Status Bar displays the total messages and channels that exist within the open template. The bar also indicates the currently selected message, multiplex mode and channel. If the template has been modified since it's last save then the status will show "modified".

Menu Bar

File Menu

	New	Creates a new blank template.
	Open	Browse to open a template file.
	Save	Saves the template to a file.
	Save As	Saves the template to a file using another name.
	Exit	Exits the application.

Edit Menu

Add Message...	Creates a new CAN message.
Add Channel...	Adds a channel to the currently selected message.
Add Multiplex Control...	Adds a multiplex control to the currently selected message.
Add Multiplex Mode...	Adds a multiplex mode to the currently selected message.
Cut	Cuts selected channel(s) and saves to the Windows clipboard.
Copy	Copies selected channel(s) and saves to the Windows clipboard.
Paste	Pastes channel(s) from Windows clipboard.
Find	Find a channel.
Template Comments...	Display or edit the template comments.

Tools Menu

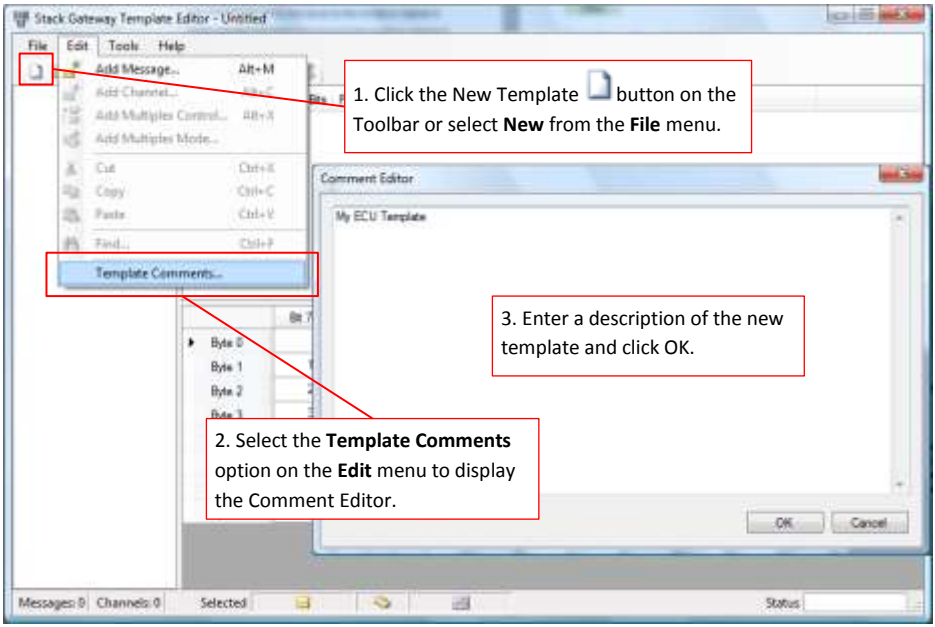
Options	Change various template and application options.
View Errors...	View any template errors.
Localize	Menu to convert template to UK, EC or US.

Getting Started

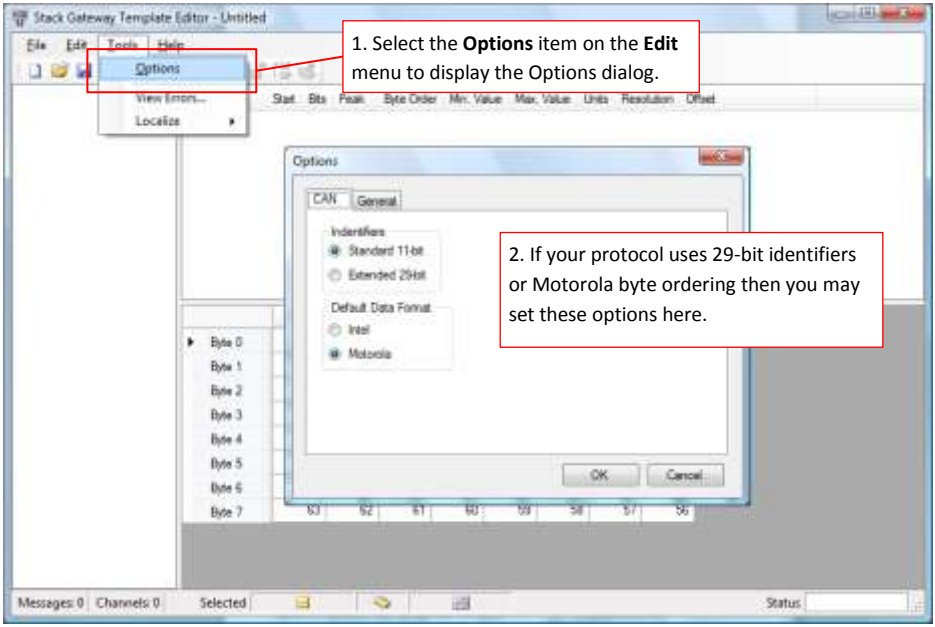


Double-click the Stack Gateway Template Editor icon on the computer Desktop to launch the application or, if using DataPro Designer, then click on the toolbar icon for the template editor.

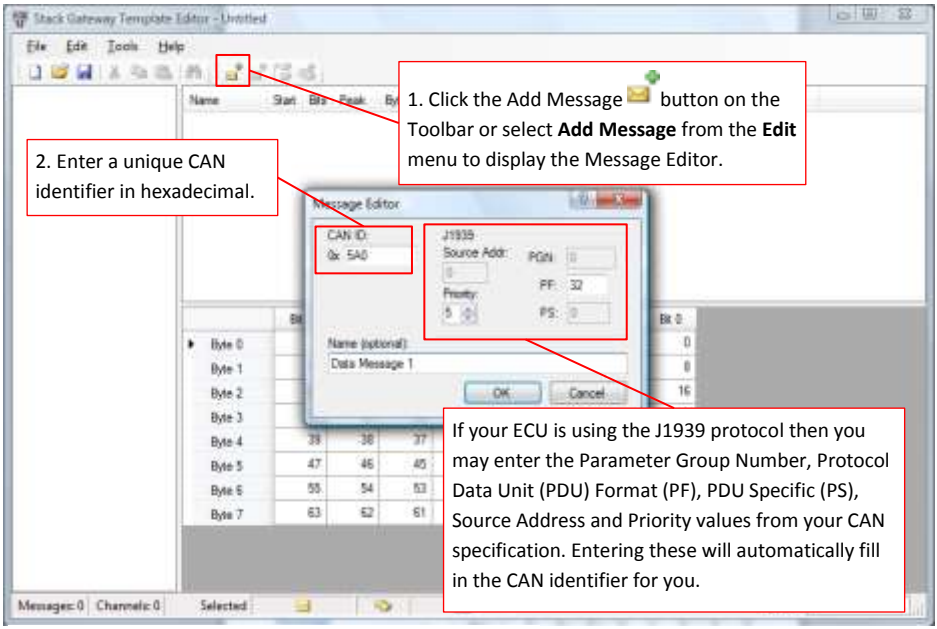
Creating a New Template



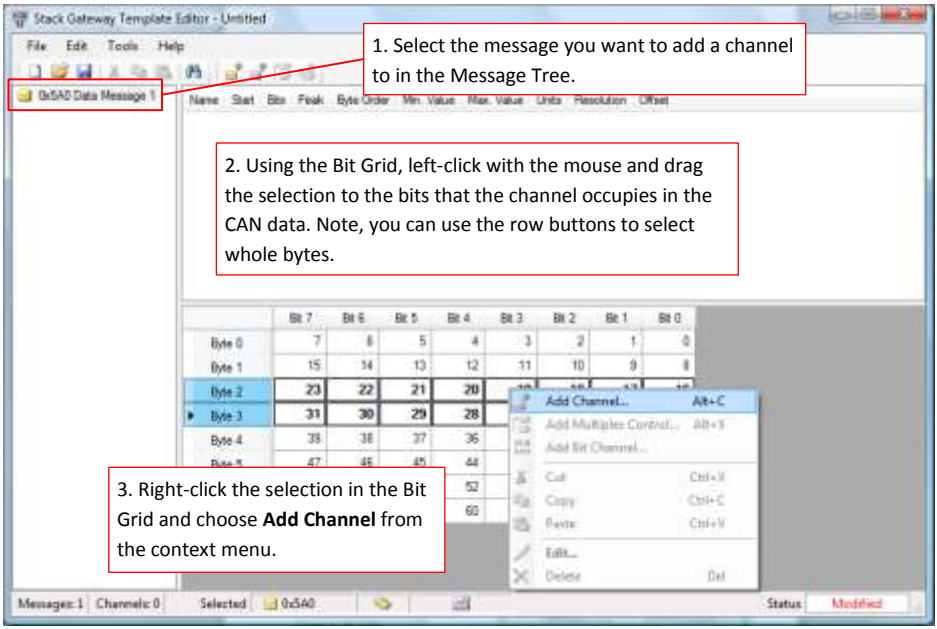
Setting Options



Adding a Message



Adding a Channel to a Message



Adding a Channel to a Message (continued)

1. Enter a unique channel name. This must be no longer than 8 characters and must only contain alphanumeric characters (A – Z and 0 – 9) and an underscore character.

2. Select **Input Peak** if you want the Stack system to recorder or display a peak value for this channel.

3. If the ECU signal is a signed value or uses a Sign Bit, where the top bit signifies whether the value is negative, then select these under the Input Type.

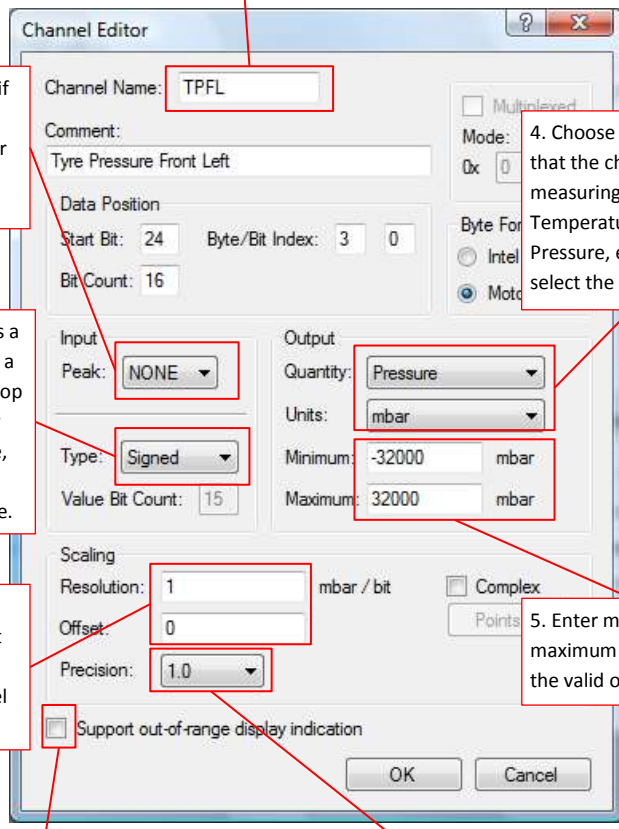
4. Choose the quantity that the channel is measuring i.e. Velocity, Temperature, Pressure, etc. Then select the units.

5. Enter minimum and maximum values for the valid output range.

6. Enter a Resolution and Offset value that describes the linear scaling of the channel value.

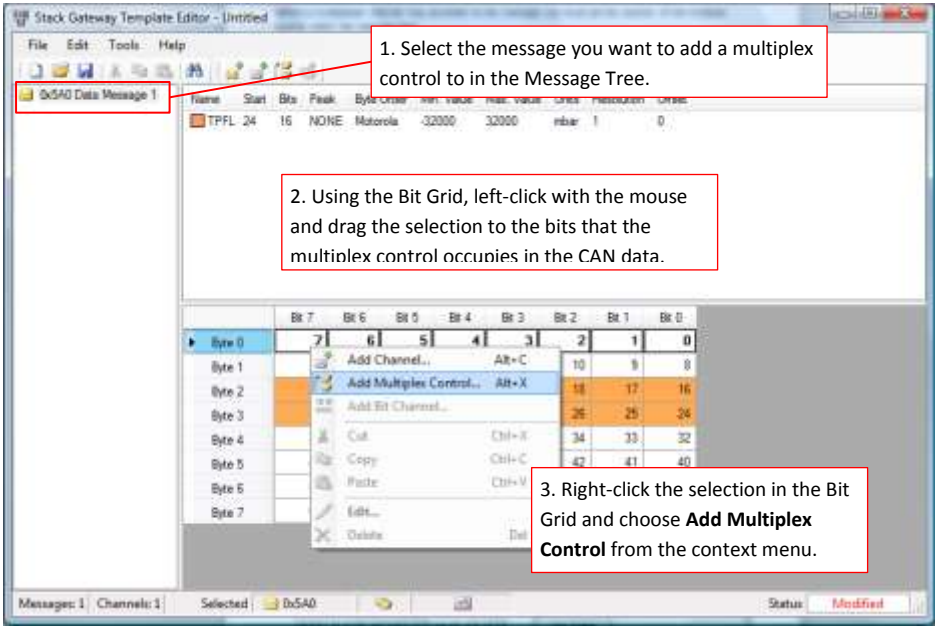
7. For Stack displays you may set the required precision value to be displayed for this channel.

8. If you want a Stack display to show out-of-range values (values outside of the minimum and maximum values you have entered) as all 9's, then check the appropriate option.



Adding a Multiplex Control to a Message

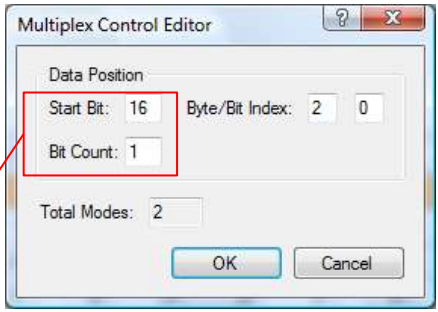
Before a multiplexed channel may be added to the message, you must set the location of the multiplex control within the message data.



Changing the location of a control once it has been

1. Double-click the Bit Grid on any of the Multiplex Control bits to show the Multiplex Control Editor.

2. Change the Start Bit and /or the Bit Count to relocate the multiplex control within the data.

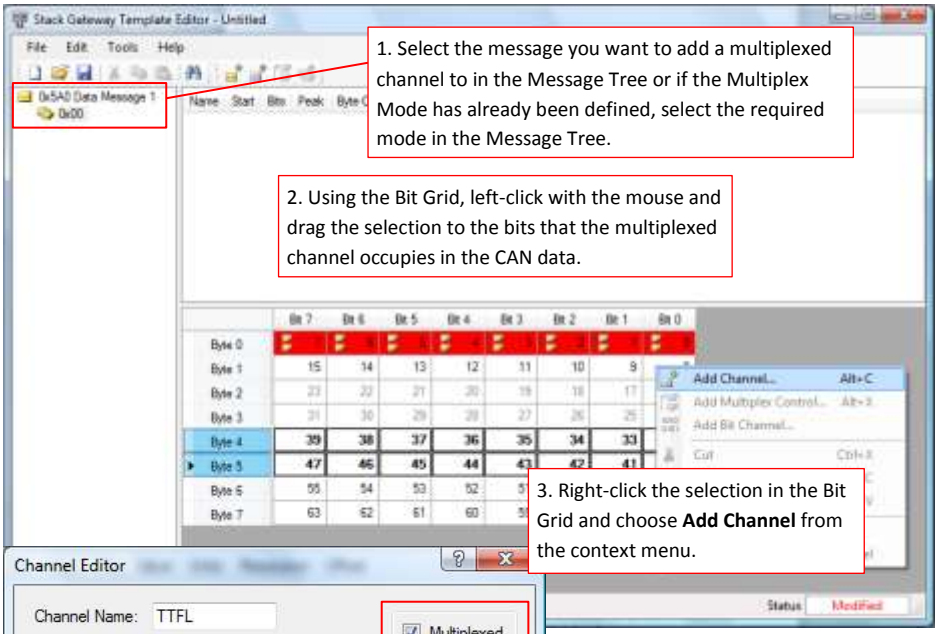


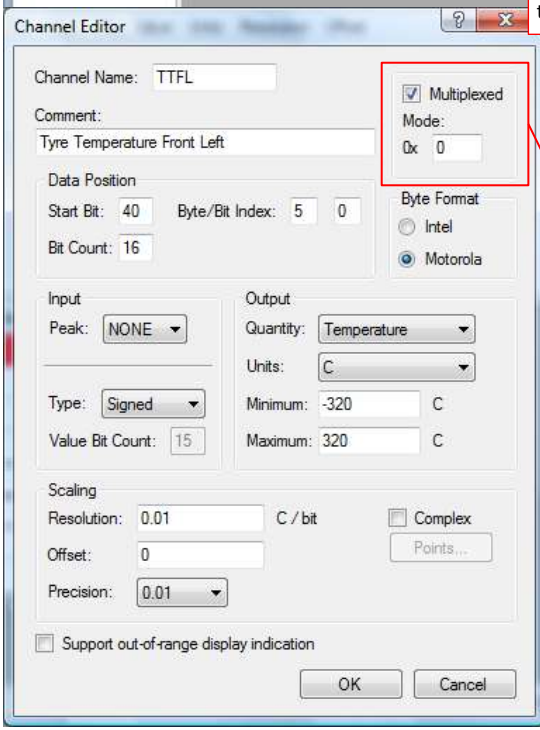
Deleting

To delete an item, first select the message, channel, multiplex mode or multiplex control you want to delete, and then press the DELETE key on the keyboard. You can also use the right-click context menus to access the Delete option.

Adding a Multiplexed Channel to a Message

Once a Multiplex Control has been added to a message then you can start adding multiplexed channels.

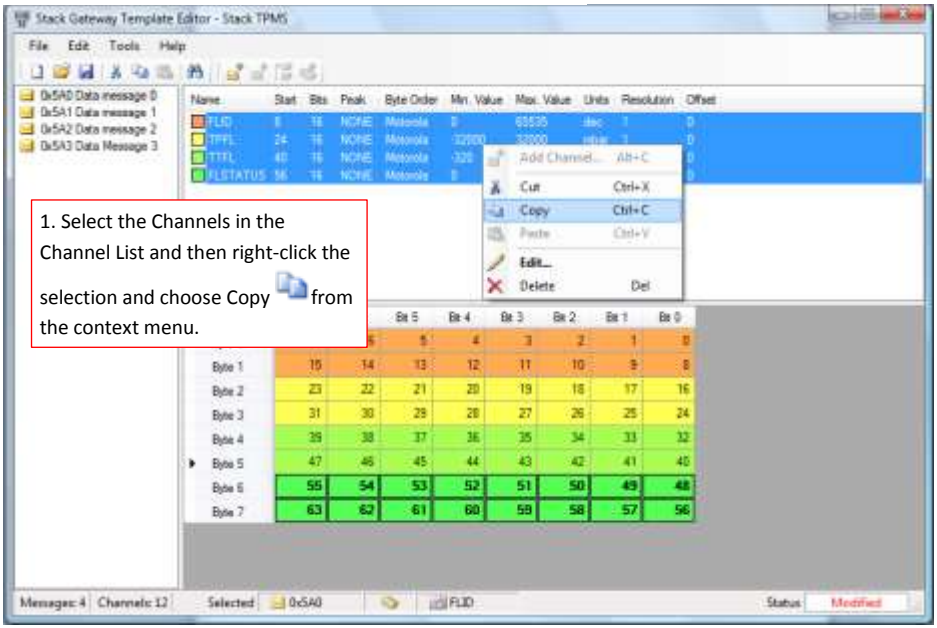


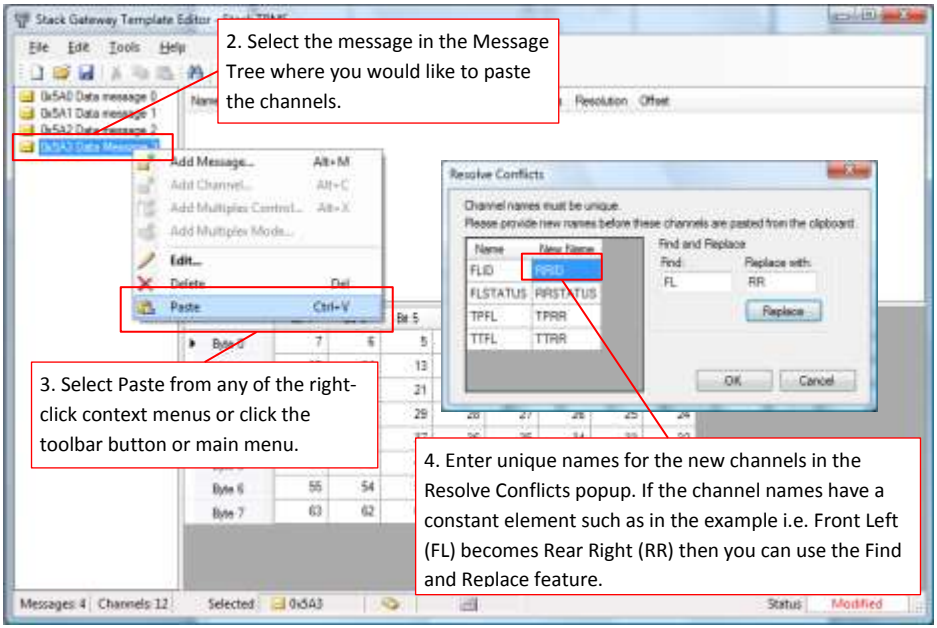


4. Tick the Multiplexed option and enter the mode for which this channel will be value in hexadecimal. This is the value of the Multiplex Control when this channel exists in the message.

Copying and Pasting Channels

Multiple Channels

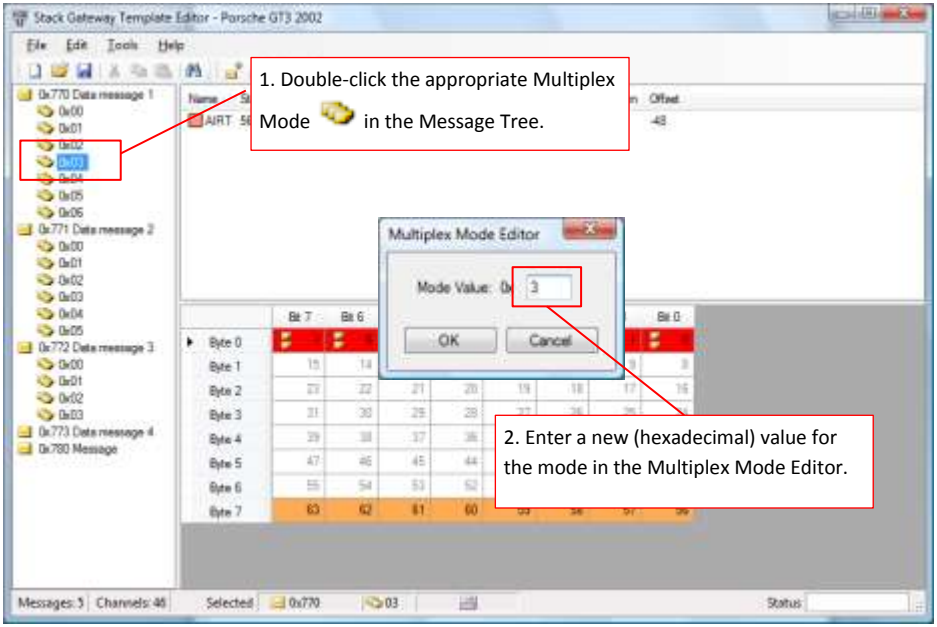




Single Channels

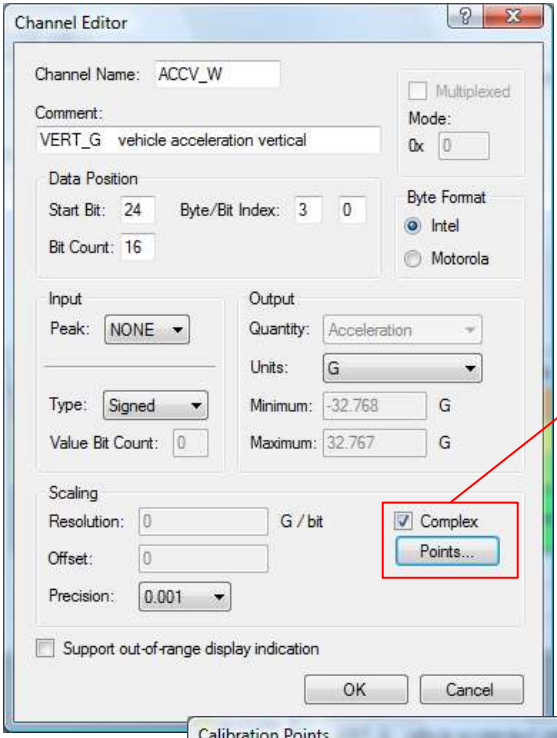
1. Select the Channel in the Bit Grid and then click the Copy button on the toolbar.
2. Select the message in the Message Tree where you would like to paste the channel.
3. Select the bits in the Bit Grid where you would like to paste the new channel then choose Paste from any of the right-click context menus or click the toolbar button or main menu.
4. Enter a new name for the channel in the displayed Channel Editor.

Changing a Multiplex Mode Value

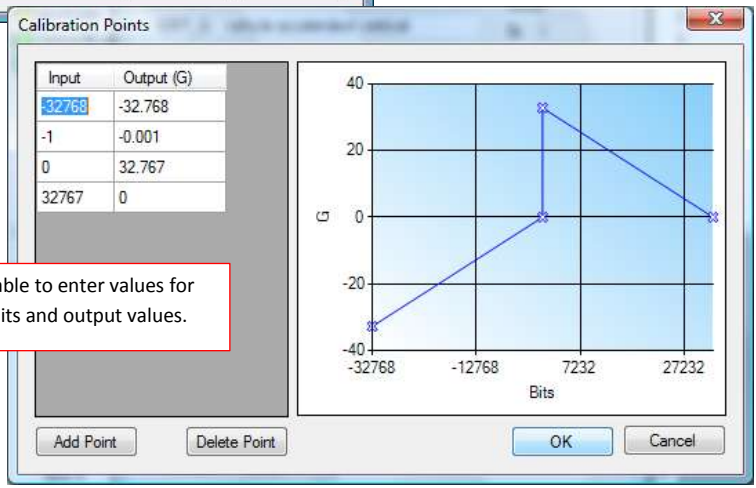


Adding a Channel with a Complex Scaling

Sometimes an ECU signal may have a scaling that consists of several linear segments and cannot be represented by a single Resolution and Offset value.



1. Follow the instructions for adding a Channel but instead of entering a Resolution and Offset value in the Channel Editor, tick the Complex option and click the Points button.

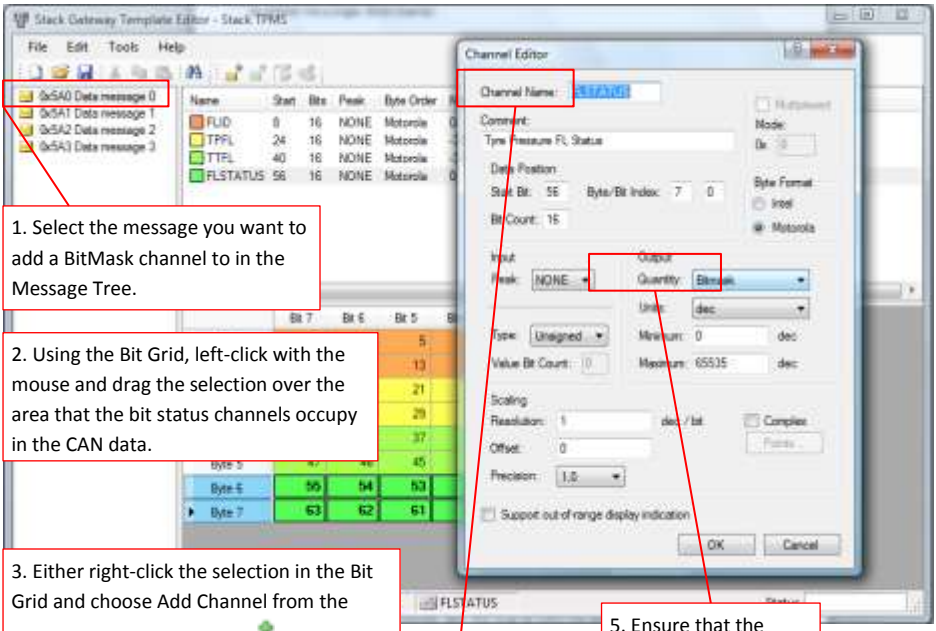


2. Use the table to enter values for both input bits and output values.

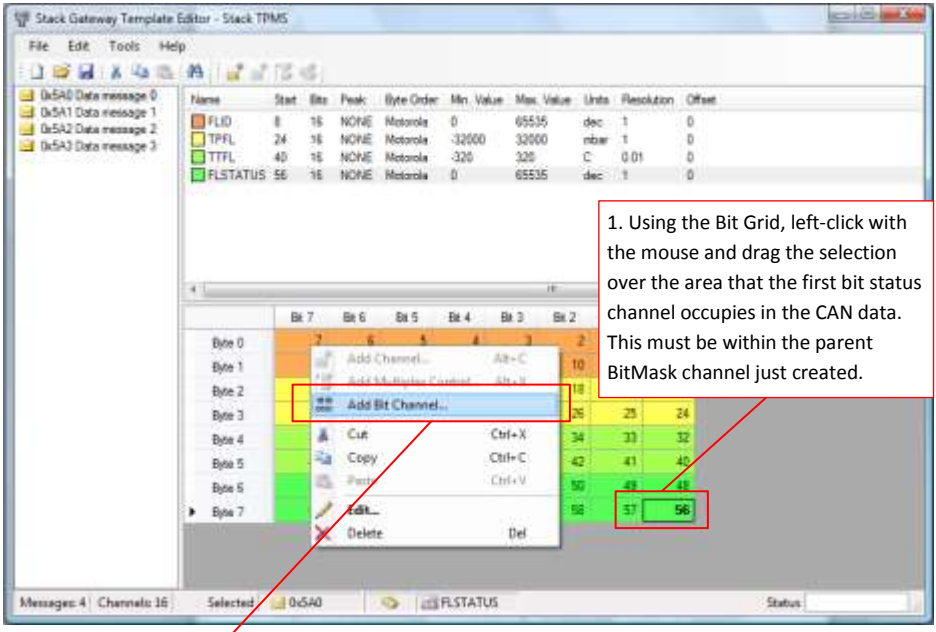
Grouping Status Bit Channels

If you have a number of status bit channels within the ECU protocol that you would like a Stack recorder to log, you may group them together to reduce the overall number of channels within a message. First you need to create a BitMask channel of up to 16-bits that will cover the area occupied by the status bits. Then you can add the Bit Channels to this area using the Bit Grid. In this way a number of bit status channels can be packed into a single 16-bit channel.

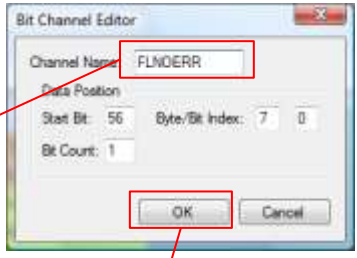
Creating Parent BitMask Channel



Creating Bit Channel



2. Right-click the selection in the Bit Grid and choose Add Bit Channel from the context menu.



3. Enter a unique channel name.

4. Click OK.

Repeat these steps to create other bit channels.

Note, only the parent BitMask channel will be displayed in Designer for selection and recording.



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