Digital Analogue Converter
RLVBDAC01

Instruction Manual

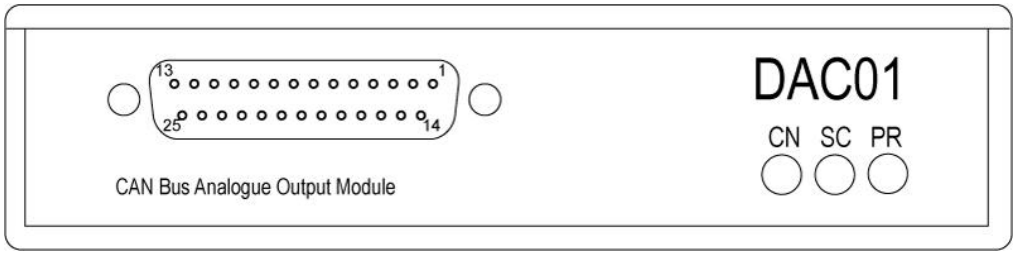
Contents

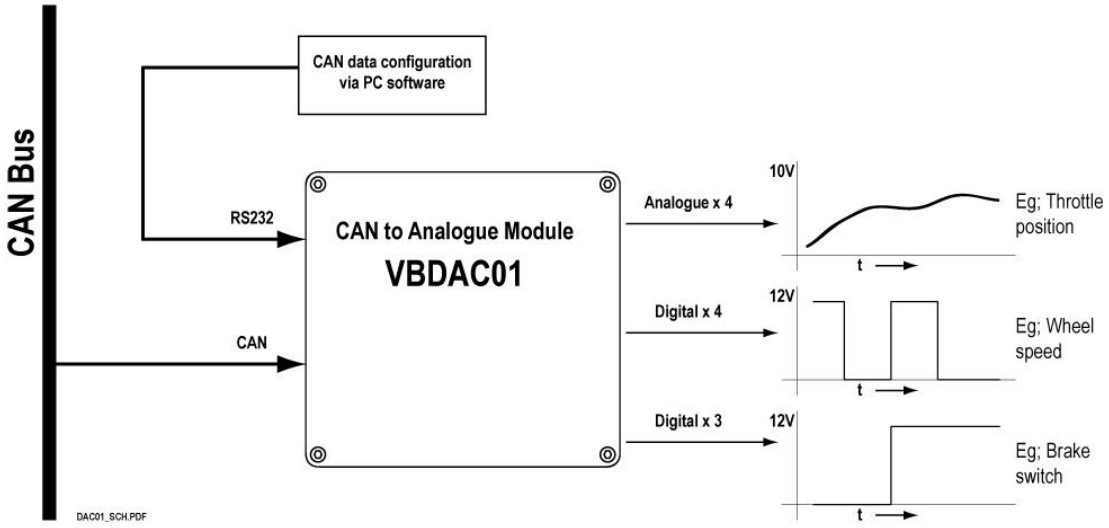
CONTENTS 2
INTRODUCTION 3
PARTS SUPPLIED WITH RLVBDAC01 4
SPECIFICATION 4
DAC01 FRONT 5
Channel outputs 5
DAC01 REAR 5
UNIT CONFIGURATION 7
Calibration: 7
CHANNEL SETUP 9
SIGNAL CONFIGURATION 9
EXAMPLE APPLICATIONS 11
1) Engine RPM output as voltage 11
2) Brake on output as level 11
3) Wheel speeds output as frequencies 12
4) Current gear selection as levels 13
CONTACT DETAILS 14
DOCUMENT UPDATES 14

Introduction

The CAN to analogue output module is designed to convert CAN bus data into a voltage, frequency or level output. In this way it is possible to log data from a CAN bus with data logging equipment not incorporating a CAN interface.

Using the software supplied each channel can be configured to respond to virtually any CAN bus parameter either by manually setting up a signal or loading a signal from a CAN database (.DBC) file. Examples include, but are not limited to, throttle position converted into a 0 to 10v signal, a wheel speed converted to a frequency output or a level output set to go high when a brake trigger is detected.





Parts supplied with RLVBDAC01

1 x **RLVBDAC01**	Digital to Analogue Converter
1 x **RLVBACS030**	CD-ROM containing software
1 x **ADC25IPCON**	25 way D connector
1 x **RLVBCAB01**	Connection cable for configuring the unit

In addition the unit can be supplied with other cables for power and connecting to a CAN bus. The cable(s) supplied depends on the intended application.

Specification

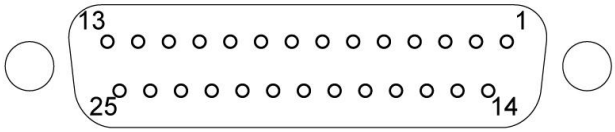
Output Channels	4 Analogue channels 7 Digital channels (3 fixed as level outputs, 4 user selectable level or frequency outputs in range 1Hz – 2kHz).
Output Signal Range	
Analogue voltage	0 to +10 VDC
Digital	0v +12 VDC
Resolution	
Analogue voltage	12 bit 2.44 mV per bit
Timer compare	16 bit
Voltage Accuracy	± 0.1 %
Power supply voltage	+12 VDC (± 10%)

CAN	
Type	CAN 2.0A or CAN 2.0B compatible
Baud Rates	1Mbit/s 500Kbit/s 250Kbit/s

DAC01 Front

CN LED – CAN. This will flash as the DAC01 receives CAN data.
SC LED – serial. This will flash as the DAC01 receives RS232 data.
PR LED – power. This should be on as long as the DAC01 is powered up.

Channel outputs

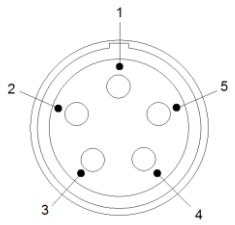


25 way Female Sub D connector

Pin	Function	Pin	Function
1	Digital Output 1 (Channel 5)	14	Ground
2	Digital Output 2 (Channel 6)	15	Ground
3	Digital Output 3 (Channel 7)	16	Ground
4	Digital Output 4 (Channel 8)	17	Ground
5	Digital Output 5 (Channel 9)	18	Ground
6	Digital Output 6 (Channel 10)	19	Ground
7	Digital Output 7 (Channel 11)	20	Ground
8	Ground	21	Analogue Ground
9	Analogue Ground	22	Analogue Output 4 (Channel 4)
10	Analogue Output 3 (Channel 3)	23	Analogue Ground
11	Analogue Ground	24	Analogue Ground
12	Analogue Ground	25	Analogue Output 2 (Channel 2)
13	Analogue Output 1 (Channel 1)		

DAC01 Rear

Connectors 1 and 2 on the DAC01 share the same pin-out to allow “daisy-chaining” of multiple Racelogic units. It is therefore possible, for example, to link two DAC01 units together to output eight wheel speeds simultaneously.



Pin numbering on LEMO socket connector

Connector 1 – CAN/POWER IN

Pin	I/O	Function
1	I/O	Direct connection to Connector 2 pin 1
2	I/O	Direct connection to Connector 2 pin 2
3	I/O	CAN High
4	I/O	CAN Low
5	O	+12 V Power
Chassis		Ground

Connector 2 – CAN OUT

Pin	I/O	Function
1	I/O	Direct connection to Connector 1 pin 1
2	I/O	Direct connection to Connector 1 pin 2
3	I/O	CAN High
4	I/O	CAN Low
5	O	+12 V Power
Chassis		Ground

Connector 3 – RS232

Pin	I/O	Function
1	O	TxD, Serial Data Transmit
2	I	RxD, Serial Data Receive
3	I/O	CAN High
4	I/O	CAN Low
5	O	+V Power
Chassis		Ground

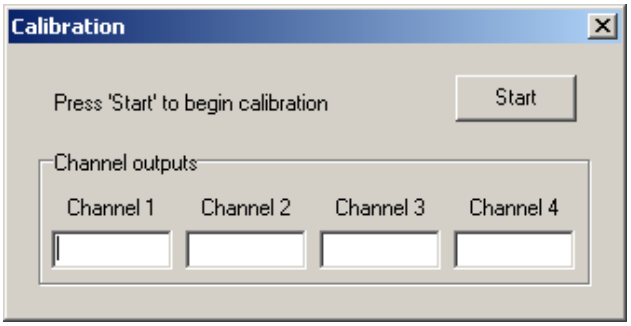
Unit Configuration

The unit can be configured by selecting the options button. This gives the following two options:

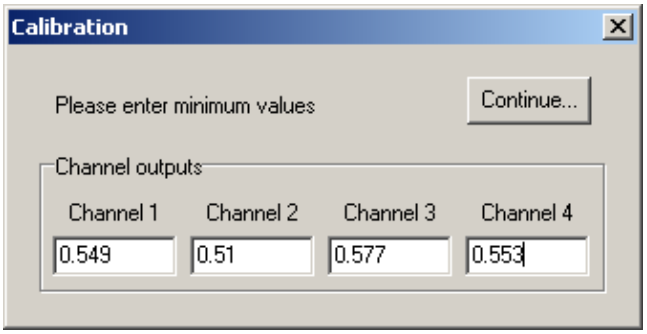
Com Port:
The user can select whichever available COM Port is required. If a COM port is unavailable (if, for example, it is use by another application) it will not be displayed.

Calibration:
Periodically the analogue output channels (1 – 4) may require calibration. You will also require a calibrated Voltmeter to measure the analogue outputs during this procedure.
The accuracy of this device will affect the calibration.
The calibration procedure is as follows:

1. Run the DAC software and then select 'Options' then 'Calibrate'. A calibration window will open, containing four data input boxes and a button.

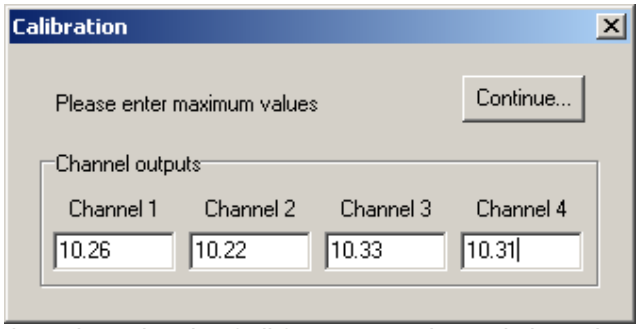


2. Click the 'Start' button. The DAC's four analogue outputs will be set to output low voltages.
3. Measure the voltage on each channel with a calibrated measuring instrument, then record the levels in the relevant boxes of the calibration screen. A diagram of the analogue output pin positions can be found in the table in the section entitled 'DAC01 Front' in this manual.

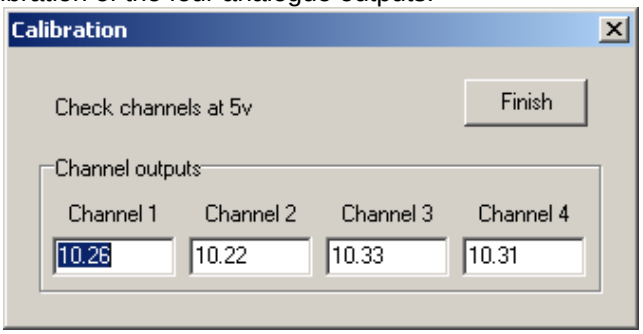


4. Once the voltage levels of all four output channels have been recorded, click 'Continue...' to proceed.

5. The DAC will now output a higher level voltage on each channel. Measure the voltage on each channel with a calibrated measuring instrument, then record the levels in the relevant boxes of the calibration screen.



6. Once each of the voltage levels of all four output channels have been recorded, click 'Continue...' to proceed.
7. All four of the output channels will now be set to 5V so that you can confirm and record the calibration of the four analogue outputs.



8. Click 'Finish' and then close the calibration window to exit the calibration screen.

Note: If the calibration begins part-way through a cycle (for example, if the calibration has just been started but was not completed successfully), skip to the end of the calibration cycle and start from the beginning; the beginning can easily be identified as the button will show 'Start'.

Channel Setup

Each channel on the DAC01 can be configured in any of the following three ways using the software supplied.

Configuration file:
If a DAC01 configuration file exists (*.DAC) it can be selected and loaded using the 'LOAD' button. This will configure every channel to the saved settings.

CAN Database (*.DBC):
If a valid CAN database file exists it can be selected and loaded using the 'DATABASE' button. The available elements will then be displayed in the list box on the left hand side of the application window. Double clicking on a signal will display the settings for this signal. Loading can be cancelled at any time by pressing 'ESC' on the keyboard.

Any signal can then be 'drag and dropped' onto whichever of the channels is required. Double clicking on the channel will allow the user to modify settings if required (see 'Signal Configuration' below for details).

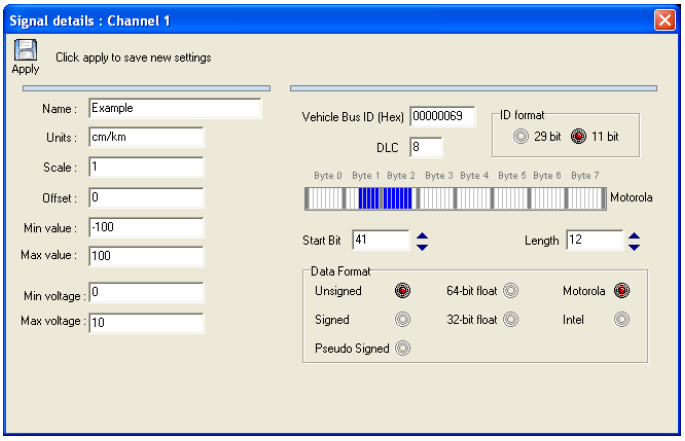
Manually:
At any time the user can double click on a channel to manually configure the settings, either from a 'blank' state or having first loaded a signal either from a CAN database or from a DAC01 configuration file (see 'Signal Configuration' below for details).

Signal Configuration

Each channel can be set up by setting each of the fields in the 'Signal Details' window which is displayed when the user double clicks on a channel.

In addition to the signal details the window displays some extra setup options depending on which type of channel is being displayed.

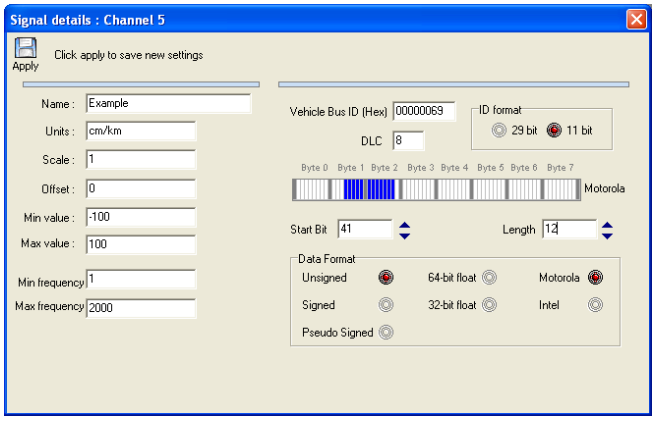
Analogue Outputs
The analogue outputs are an analogue voltage representation of the input CAN signal.



For the analogue output channels (1–4) the user can set the 'Min. voltage' and 'Max voltage'. These values correspond to the output voltage of the channel when the signal is at the 'Min. value' and 'Max value' levels.

Frequency Outputs

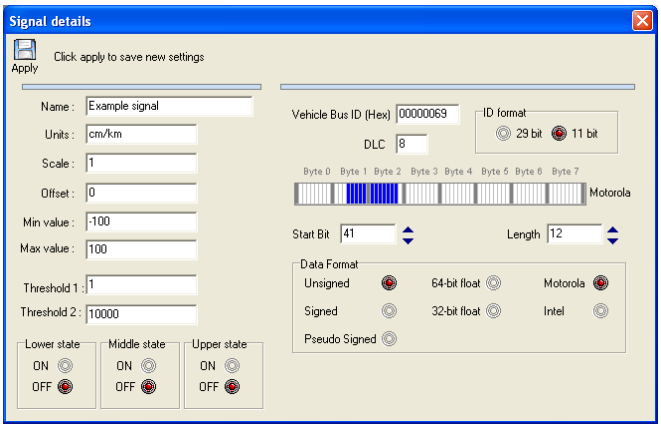
Frequency outputs are a digital frequency representation of the input signal



For frequency channels (5–8) the user can set the 'Min and Max frequency'. These values correspond to the output frequency of the channel when the signal is at the 'Minimum and Maximum value' levels.

Level Outputs

Level outputs force the output to be either a high or low level dependent on how the thresholds for the channel are set.



For the level channels (5-11) the user can set the 'Threshold 1' and Threshold 2' values and the Lower, Middle and Upper states. When the signal level is below the Threshold 1 level the channel output is specified by the 'Lower state' box. Otherwise if the signal level is above the Threshold 2 level the channel output is specified by the 'Upper state' box. Otherwise the level will be in the state specified by the 'Middle state' box (See figure 1).

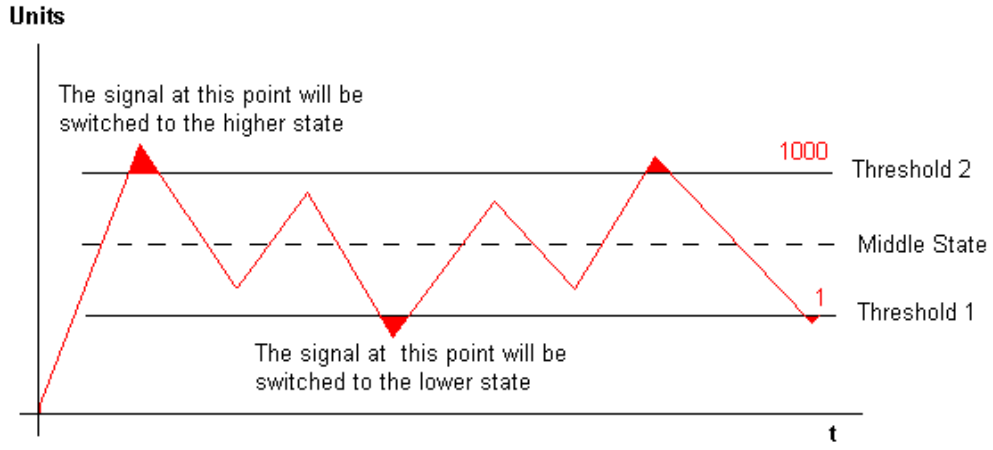
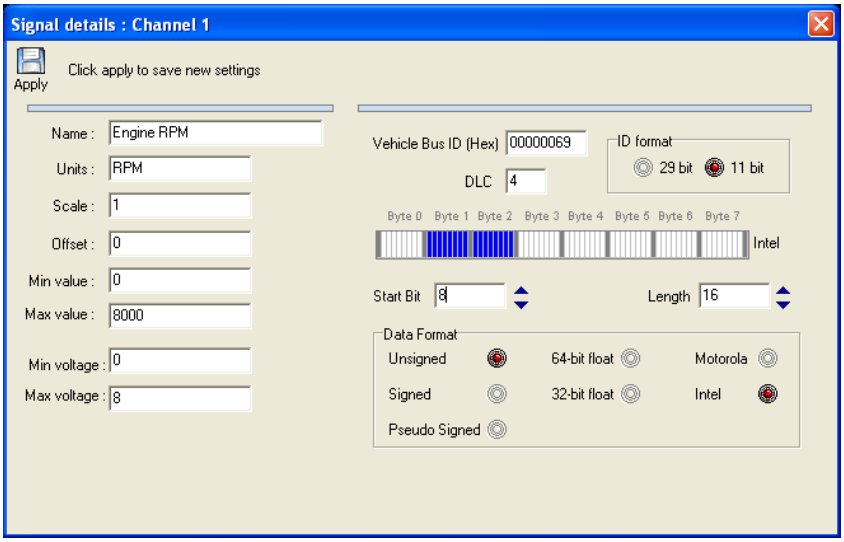


Figure 1

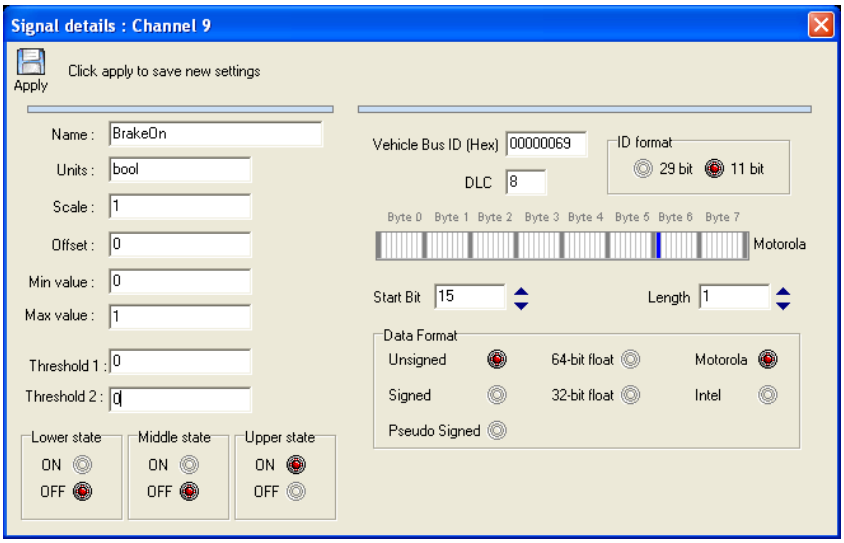
Graphical representation of the level settings.

Example applications

1) Engine RPM output as voltage
Supposing the engine revs signal is on standard CAN identifier 069 (hex) as a 16bit Intel format value in the middle two bytes of a four-byte message. The signal could then be output as voltage on channel 1 using the settings shown below. The output voltage would then move between 0 – 8v as the engine revs vary between 0-8000rpm.

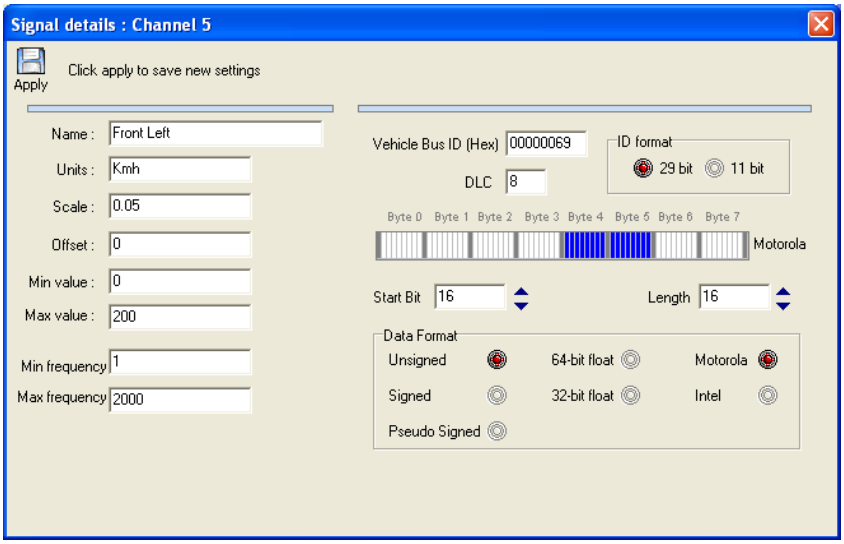


2) Brake on output as level
Supposing a 'brake on' flag is on extended CAN identifier 069 (hex) as bit 15 in an eight byte message, the brake state could then be output on channels 9 using the settings shown below. Channel 9 output would then be high when the brake was on, low otherwise.

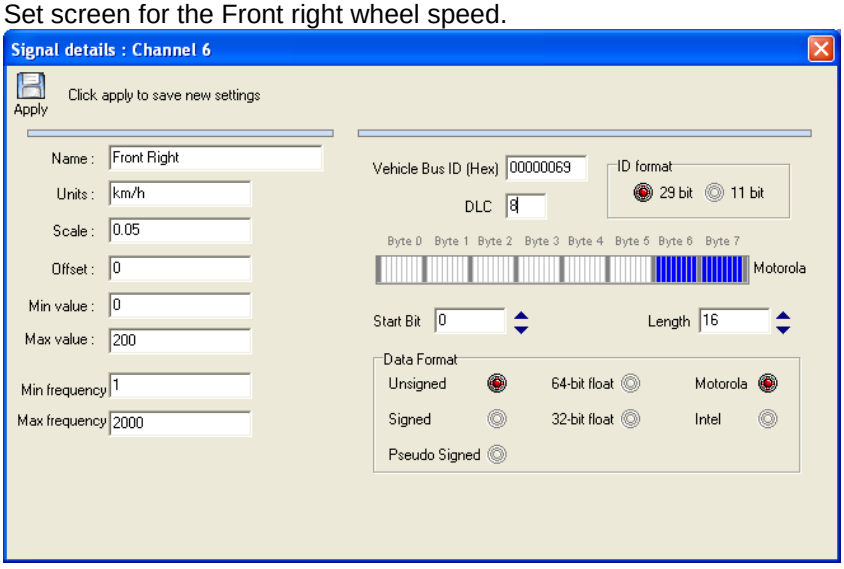


3) Wheel speeds output as frequencies

Supposing two wheel speeds are on extended CAN identifier 069 (hex) as two 16 bit Motorola format values in an eight byte message, with the values sent at 20 times the actual speed. The signals could then be output as frequencies on channels 5 and 6 using the settings shown below. The output frequencies would then move between 0 – 2000Hz as the wheel speeds moved between 0-200km/h.

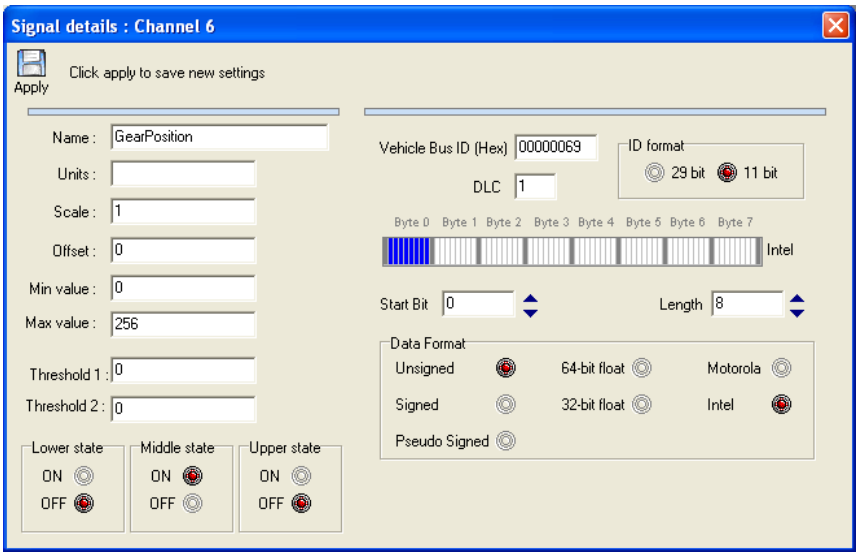


Set screen for the Front right wheel speed.



4) Current gear selection as levels
Supposing the currently selected gear is on standard CAN identifier 069 (hex), as an 8-bit Intel format value and a single byte message such that 0 represents neutral, 1 is first etc. The gear selection could then be output as on channels 6 to 11 using the settings demonstrated below. Below shows a screen shot of Channel 6 setup in this case. With both thresholds set to the byte value and the Middle state set to ON. Would mean that if the byte value is anything other than zero it would be off. But the output would then would then be high when neutral was selected (byte value equals 0), as the byte value would effectively be in the middle state.

Channel 6:



To complete this gear indication example the **Channels 7 – 11** should be set up as channel 6 except that the threshold levels would change as shown in the table below.

	Threshold 1	Threshold 2
Channel 6	0	0
Channel 7	1	1
Channel 8	2	2
Channel 9	3	3
Channel 10	4	4
Channel 11	5	5

Contact details

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Document updates

#	Description	Date
1	First issue. CLS	06/07/2005
1.1	Release version DL	14/07/2005
1.3	Calibration procedure expanded	13/9/2005
1.4	Grammatical correction	8/3/2007
1.5	Updated contact details	30/04/08