

Race Technology
www.Race-Technology.com

CAN Interface Instruction Manual

Version 2.0

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Race Technology Ltd. VAT reg. 715 9671 09
After 12, King Street, Eastwood, Nottingham, NG16 3DA, UK
Tel: +44 (0) 1773 537620 Fax: +44 (0) 1773 537621
email: sales@race-technology.com

Introduction

The Race Technology CAN interface is a small unit (35 x 24 x 8mm) which can be configured to receive up to 15 CAN messages and retransmit them using the Race Technology serial protocol. The output data from this unit can be used directly with a PC to show CAN data, with a dashboard such as the DASH1 or DASH2 to monitor in-vehicle information, or with a data logger to log the data and further analyse on a PC.

Parts Supplied

The CAN interface is supplied with the following components. Please take a moment to check that you have all of these items and inform Race Technology of any shortages immediately:

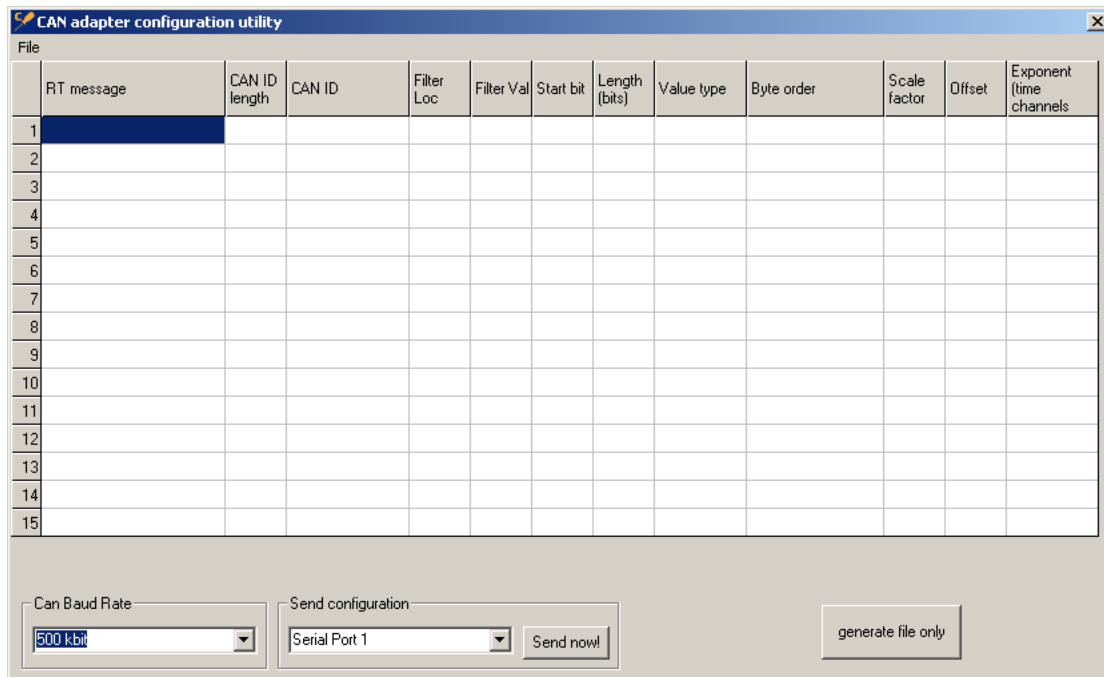
- CAN interface unit with 3 x 9 way connectors
- Null modem serial cable – for configuration and reflashing. Reflashing is not required during normal operation and should only be carried out with explicit instructions to do so from Race Technology
- Terminator connector
- Software CD
- Instruction manual

Before You Begin...

In order for the DL1 or DL2 data logger and DASH1 or DASH2 display to function correctly with the CAN interface it is first necessary to ensure that all units are using the most up to date version of their respective firmware. Display units and data loggers shipped with the CAN interface will already have the correct firmware version installed, but if you have received the CAN interface separately to use with your existing data logger and/or display unit you will need to update the firmware on these units. The updated firmware files are included on the software CD supplied with the CAN interface, along with a short technical note that explains how to identify the correct firmware file for each unit. Please take a few moments to read this file. If you are in any doubt about which file to use or the reflashing procedure, please contact Race Technology before proceeding.

Description of Operation

The configuration of the interface module is performed using the CAN configuration software, which is a standard part of the Race Technology V7 software installation. This can be found in the configuration section of the installation. When started, the CAN Configuration software will look like this:



RT message

These are the available output messages. All output messages must be scaled for a value from 0-65535 for unsigned and -32768 to 32767 for signed values. Output messages are split in to the following groups

Temperatures (25 channels)

Time (12 channels)

Percentages (31 channels)

Frequencies (4 channels)

For a full list of the channels see the end of this document.

With the exception of the time channels, all channels are of exactly the same data format, so can easily be used for any other function

CAN ID length

Selects between 11 or 29 bit identifier

CAN ID

Selects the CAN ID which will be used to receive the message, this must be a decimal value.

Filter location

It is possible to use one byte of the message as a filter, when a byte is selected for the filter location, only messages which have the correct filter value will be used.

Filter value

Used in conjunction with filter location to enable message reception only when the byte specified in filter location matches this value.

Start bit

The location of the first bit of the data to be received. Ranges from 0-63

Length

Total number of bits in the message, from 1-32

Value type

Select signed, unsigned or floating point. Floating point values are as defined in the IEEE754 Format,

Byte order

Select from the following byte orders:

Intel Standard

Motorola forward MSB

Intel Sequential

Motorola sequential

Motorola forward LSB

Motorola backward

For more information on these formats, see the appendix Byte Ordering.

Scale factor

A factor by the output value will be divided before being sent out through the serial port

Offset

A value which is added to the output value before it is output (scale factor is applied before offset)

Loading and saving files

From the file menu you can select to load or save data files

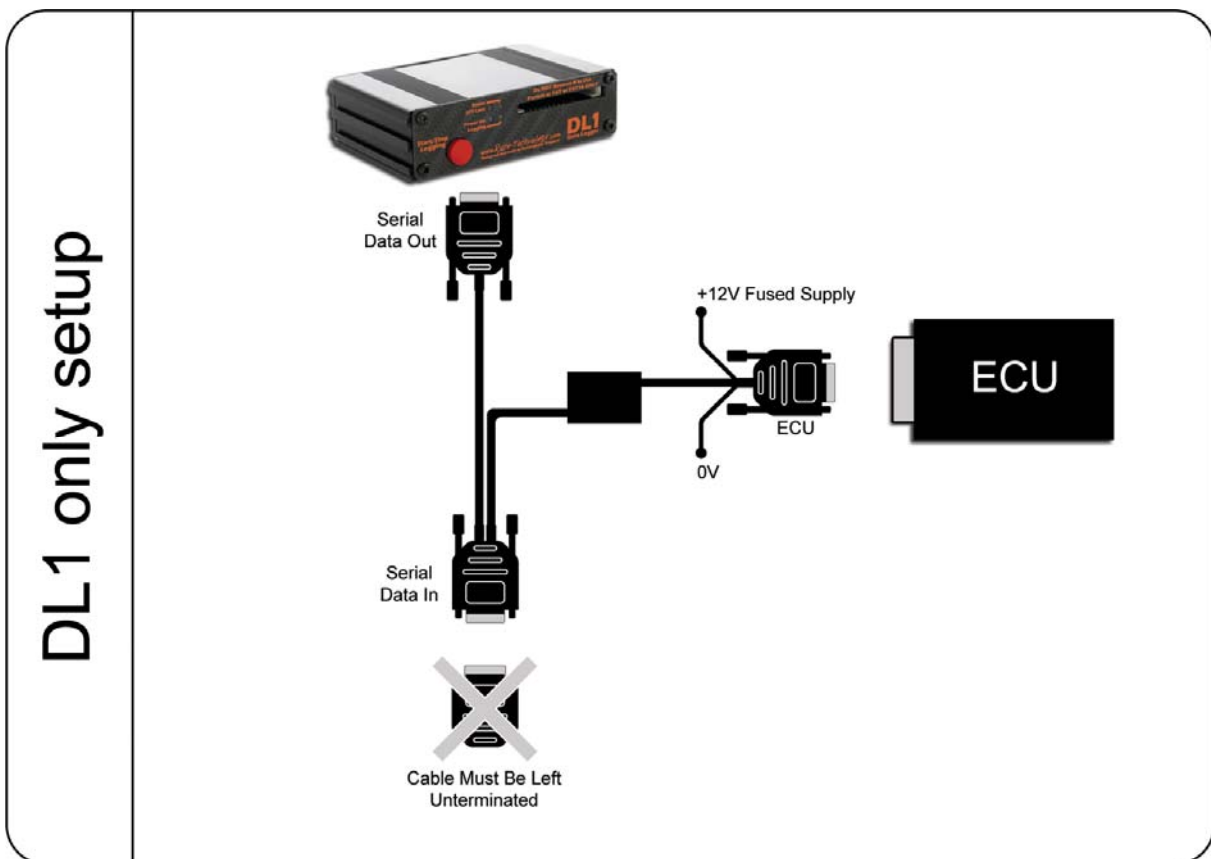
Connecting the CAN Interface

There are four different ways in which the CAN interface can be used:

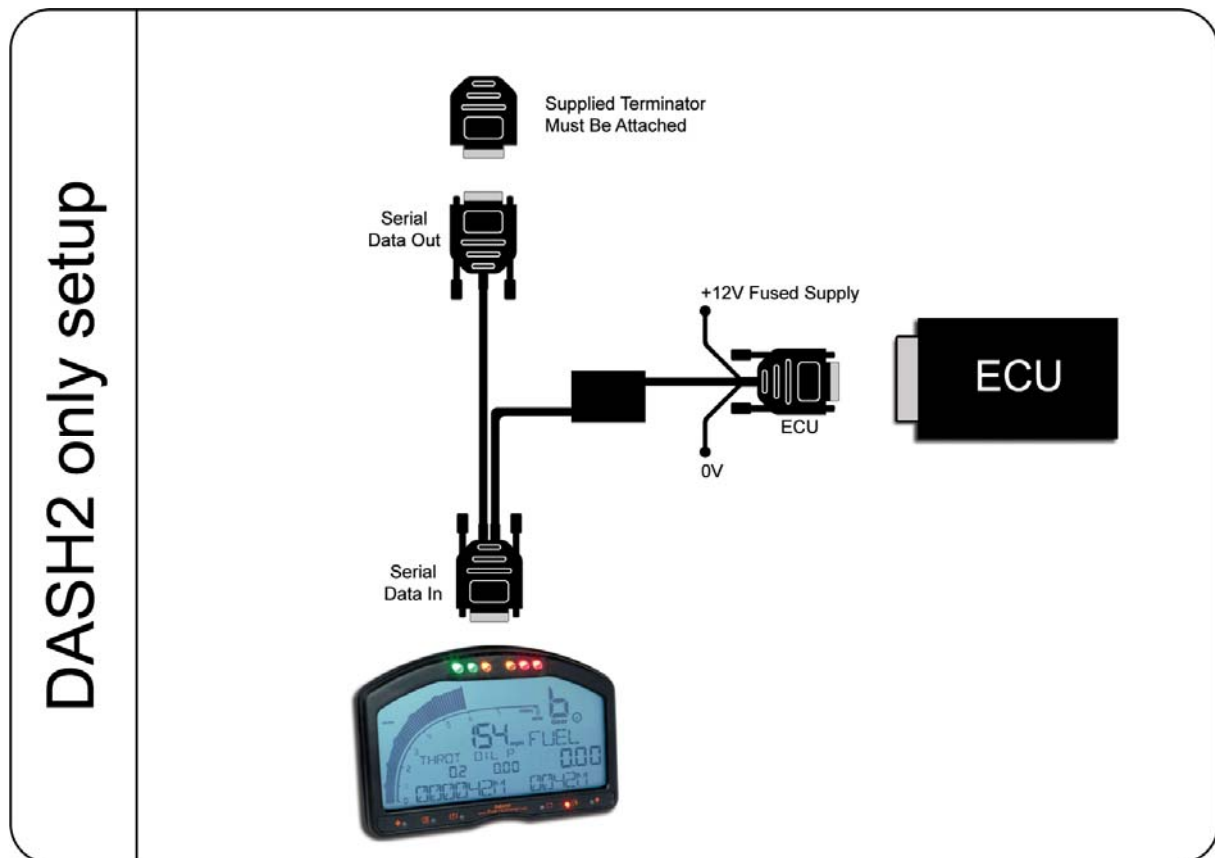
1. With DL1 or DL2 data logger and ECU
2. With DASH2 display (in standalone mode) and ECU
3. With DL1 or DL2, and DASH1 or DASH2, and ECU
4. Connected to a PC compatible computer for reflashing (only recommended when given explicit instructions to do so by Race Technology)

The connections for each type of installation are shown in the following illustrations.

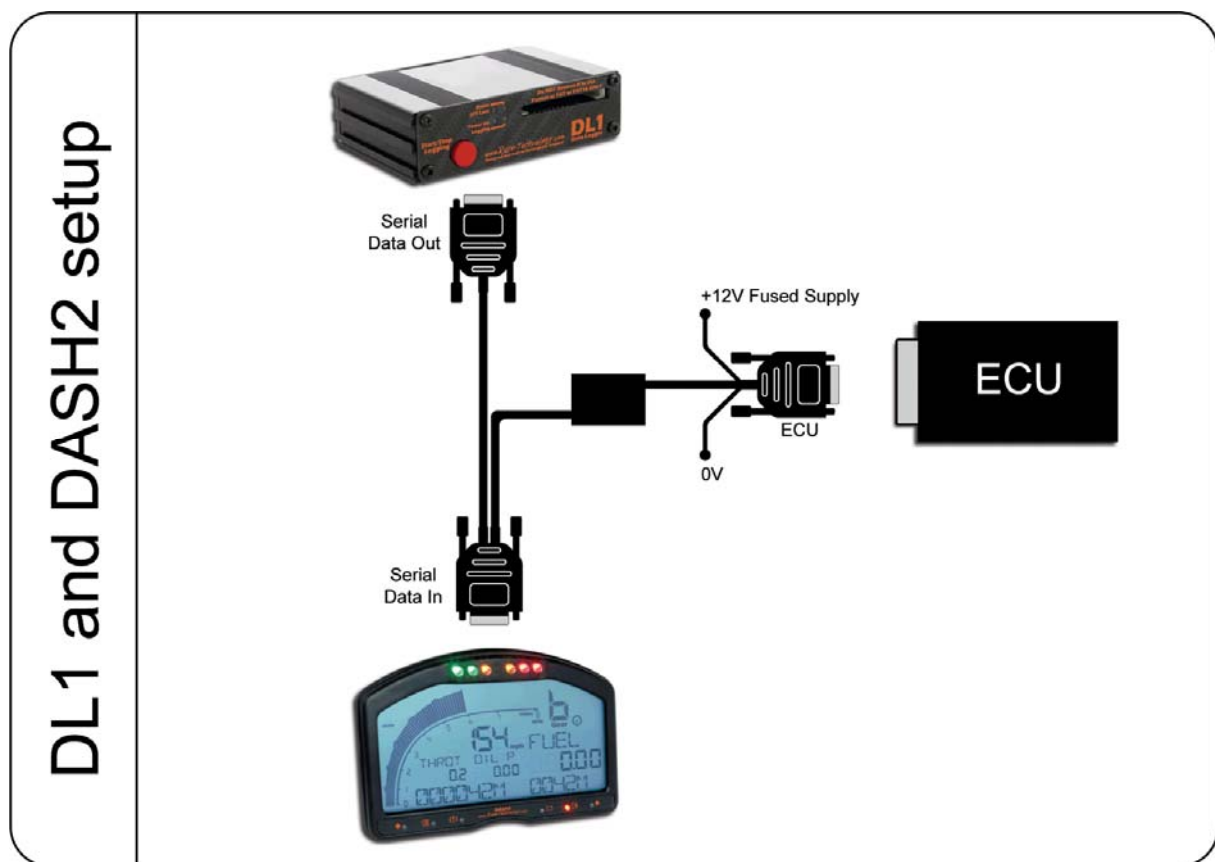
1. DL1 or DL2 Data Logger Only



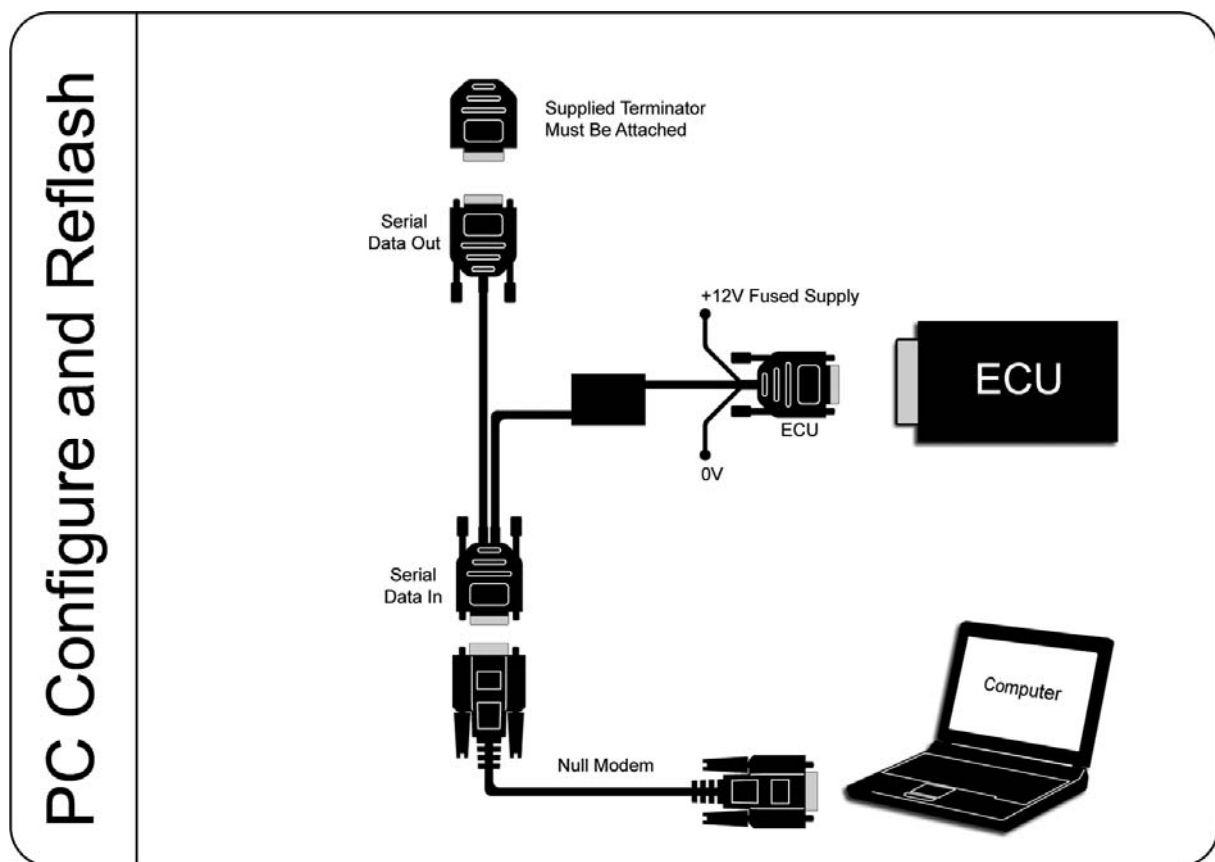
2. DASH2 Display Only



3. Data Logger and Display



4. PC Compatible Computer for Reflashing



Daisy Chaining Devices

CAN interface units can be daisy-chained by connecting the output of the first unit to the input of the second unit.

Configuring a Data Logger to work with the CAN Interface

To enable a DL1 or DL2 data logger to decode the information from the CAN interface, the data logger must be using Version 9 firmware or later. To find the firmware version, load a run file from your data logger into the Analysis software and use the Data / Run Manager menu to read information from the run data. In the information section the firmware version should be given as 9-4 or similar. The first number is the firmware revision number. If the firmware is earlier than this please contact Race Technology to obtain the latest firmware upgrade. This is available free of charge and can be reflashed onto your data logger from your PC

Under normal circumstances the DL1 or DL2 does not try to decode the data it receives over the serial port, it simply stores the data onto the memory card. To enable the decoding of the data when using the CAN interface, start the data logger configuration program and make sure that the “Decode Serial Data” box is ticked and set the serial port speed to 115200 baud, then upload these new configuration settings to the data logger. The data will now be decoded at the correct speed, as it is being received from the ECU.

This data can either be saved to the memory card or sent out again over the serial port. If the data logger is used with a dashboard and you wish to view the ECU variables on the dashboard, ensure that “Incoming serial data” is enabled in the “Update Rates” section for the serial port, using the data logger configuration software. For storage to the CF card ensure that the “Incoming serial data / memory card” option is also enabled. These settings can all be accessed via the data logger configuration software.

Save the SETUP.BIN file on to the CF card and put it in to the data logger. From now on, the data logger will decode the incoming data and store it in the normal data stream.

Connection to a PC Compatible Computer for Configuration and Reflashing

The connection procedure for reflashing the CAN interface is illustrated in the diagram on Page 8 of this manual.

Configuration Procedure

Connect the CAN interface to the PC as described above. Ensure that the power to the unit is turned off. Enter all required configuration settings for your ECU. From the configuration utility click on the Send now button. When prompted to turn the unit on, apply power to the CAN interface and the reflash should take place automatically.

Reflashing Procedure

After connecting the CAN interface as described above, ensure that the power to the unit is initially turned off. Use the Reflash Utility provided with the Race Technology software to



reflash the unit. This is normally found from the Windows start menu by following programs \ Race Technology \ configuration \ reflash. Then follow the on screen instructions provided by the Reflash Utility

WARNING: Only reflash the CAN interface if specifically instructed to do so by Race Technology. Any malfunction due to reflashing without observing this warning will result in the warranty being void.

Appendix A. Channel names

Temperature channels

Default scaling is 1°C per bit.

Ambient Air Temperature

Inlet Pre Turbo Temperature 1

Inlet Pre Turbo Temperature 2

Inlet Post Turbo Temperature 1

Inlet Post Turbo Temperature 2

Inlet Post Intercooler Temperature 1

Inlet Post Intercooler Temperature 2

Water Temperature

Oil Temperature

Gearbox Temperature

Gearbox Temperature Post Cooler

Tyre Temperature 1

Tyre Temperature 2

Tyre Temperature 3

Tyre Temperature 4

ECU Temperature

Exhaust Temperature 1

Exhaust Temperature 2

Exhaust Temperature 3

Exhaust Temperature 4

Exhaust Temperature 5

Exhaust Temperature 6

Exhaust Temperature 7

Exhaust Temperature 8

Auxiliary Temperature

Frequency channels

Default scaling is 0.1Hz per bit

RPM Frequency RPM

EGR Frequency EGR

ISBV Frequency ISBV

Nitrous Solenoid Frequency

Percentage channel data

Default units for percentage channels are 0.1%

Throttle Position Percent

Lambda 1 Short Term Trim Percent

Lambda 2 Short Term Trim Percent

Lambda 1 Long Term Trim Percent

Lambda 2 Long Term Trim Percent

Fuel Injector 1 Pulse Width Percent

Fuel Injector 2 Pulse Width Percent
Fuel Injector 3 Pulse Width Percent
Fuel Injector 4 Pulse Width Percent
Fuel Injector 5 Pulse Width Percent
Fuel Injector 6 Pulse Width Percent
Fuel Injector 7 Pulse Width Percent
Fuel Injector 8 Pulse Width Percent

Auxiliary 3 Percent

Auxiliary 4 Percent

Fuel Auxiliary Temperature Compensation Percent

Fuel Aux Volt Comp Percent

Time channel data

Fuel Injector 1 Cut Level Percent
Fuel Injector 2 Cut Level Percent
Fuel Injector 3 Cut Level Percent
Fuel Injector 4 Cut Level Percent
Fuel Injector 5 Cut Level Percent
Fuel Injector 6 Cut Level Percent
Fuel Injector 7 Cut Level Percent
Fuel Injector 8 Cut Level Percent

The default units for time channels are ms.

For all time channels there is an additional scaling value which provides additional scaling in the format output = value x 10^y.
Where -5 < y < 5

Ignition Cut Level Percent
ISBV 1 Open Percent
ISBV 2 Open Percent

Injector 1 On Time

Injector 2 On Time

Injector 3 On Time

Injector 4 On Time

Injector 5 On Time

Injector 6 On Time

Injector 7 On Time

Injector 8 On Time

Nitrous Oxide Percent

Coil 1 Charge Time

Coil 2 Charge Time

Auxiliary 1 Percent

Auxiliary 2 Percent

Coil 3 Charge Time

Coil 4 Charge Time

Appendix B. Byte Ordering

There are six options available for the ordering of the bytes. These different methods will be demonstrated with an example of a 12 bit channel in a 32 bit (4 byte) message.

Bit ordering within the message

There are two methods of bit numbering in common usage, sequential and sawtooth. For a two byte method, saw tooth numbering would be as follows:

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

Sequential numbering would be:

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

Intel Standard

7	6	5	4	3	2	1	0	
								0
<...	....	....	....	lsb				1
msb	....	....	....	....	....	....	....	2
								3

Start position of the signal (lsb, sawtooth): 12

Intel Sequential

0	1	2	3	4	5	6	7	
								0
<....	....	....	....	lsb				1
msb	....	....	....	....	....	....	....	2
								3

Start position of the signal (lsb, monotone): 11

Motorola forward LSB

7	6	5	4	3	2	1	0	
								0
				msb	....	....	....	1
<...	....	....	....	....	....	....	lsb	2
								3

Start position of the signal (lsb, sawtooth): 16

Motorola forward MSB

7	6	5	4	3	2	1	0	
								0
				msb	....	....	....	1
<...	....	....	....	....	....	....	lsb	2
								3

Start position of the signal (msb, sawtooth): 11

Motorola sequential

0	1	2	3	4	5	6	7	
								0
				msb	....	....	....	1
<...	....	....	....	....	....	....	lsb	2
								3

Start position of the signal (lsb, sawtooth): 12

Motorola backward

7	6	5	4	3	2	1	0	
								0
				msb	....	....	....	1
<...	....	....	....	....	....	....	lsb	2
								3

Start position of the signal (lsb, sawtooth): 8

Appendix C. Pin connections

Serial Data In Connector

9 Way Male D-Type

PIN 2 RS232 Input

PIN 3 RS232 Pass through

PIN 5 Ground

Serial Data Out Connector

9 Way Female D-Type

PIN 2 RS232 Output

PIN 3 RS232 Pass through

PIN 5 Ground

CAN Connector

9 Way Male D-Type

PIN 2 CAN Low

PIN 7 CAN High

Appendix E. Physical parameters

Dimensions:	35 x 24 x 8mm
Mass:	Approx 85g
Cable lengths:	Approx 25cm
Power supply:	9-16V @40mA
Sealing:	Main body to IP67, Connectors to IP44
Operating Temp:	0-70°C

