Race Technology

CAN Interface

Instruction manual

Version 2.3

www.race-technology.com

Table of Contents

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

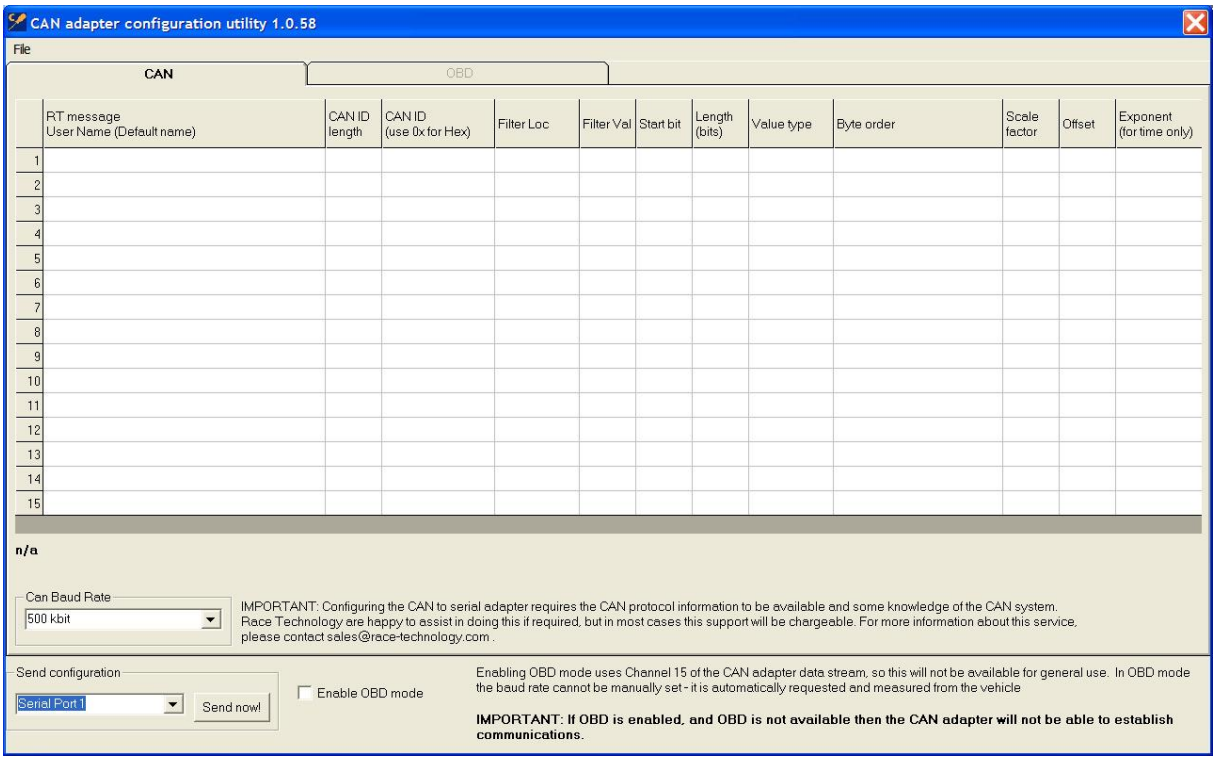
In order for the DL1 or DL2 data logger and DASH1 or DASH2 display to function correctly with the CAN interface it is first necessary to ensure that all units are using the most up to date version of their respective firmware. Display units and data loggers shipped with the CAN interface will already 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. Please contact Race Technology to obtain the latest firmware upgrades for the data loggers and display units.

Reflashing procedures for these units are available in the documentation supplied along with the units. If you are in any doubt about reflashing procedure, please contact Race Technology before proceeding.

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

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)
```

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

There are two CAN addressing modes in common use; 11bit and 29bit addressing. This field must be set to the same type of addressing mode as the messages to be decoded are using. If the addressing modes do not match, messages will not be decoded, **even if the address is otherwise a match.**

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

CAN ID

Selects the CAN ID which will be used to receive the message. This may be either a decimal value or a hexadecimal value. Hexadecimal values are specified using the prefix "0x". For example, the (hexadecimal) channel ID 500h may be entered as either 0x500 or 1280 in the CAN configuration software.

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.

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

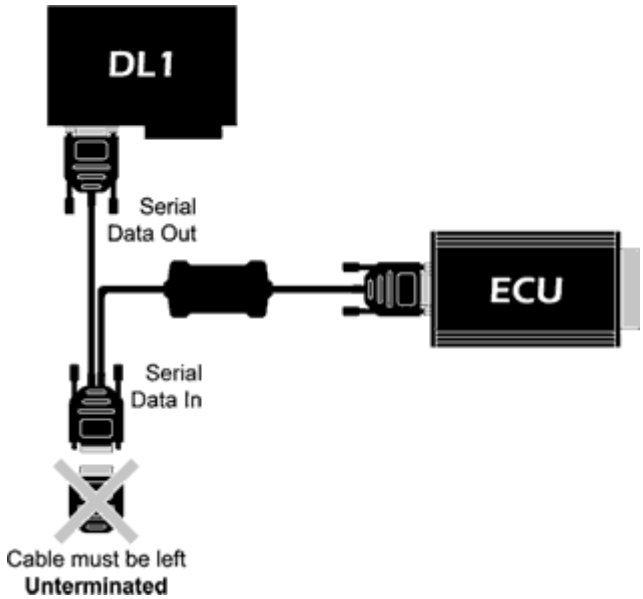
Connecting the CAN Interface

There are several 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 re-flashing (only recommended when given explicit instructions to do so by Race Technology)
5. With DL1 and PC Monitor software
6. With PC Monitor software
7. VIDEO4 and CAN
8. VIDEO4, DL1 and CAN
9. VIDEO4, CAN and DASH2
10. VIDEO4, DL1, CAN and DASH2
11. Daisy Chaining Devices

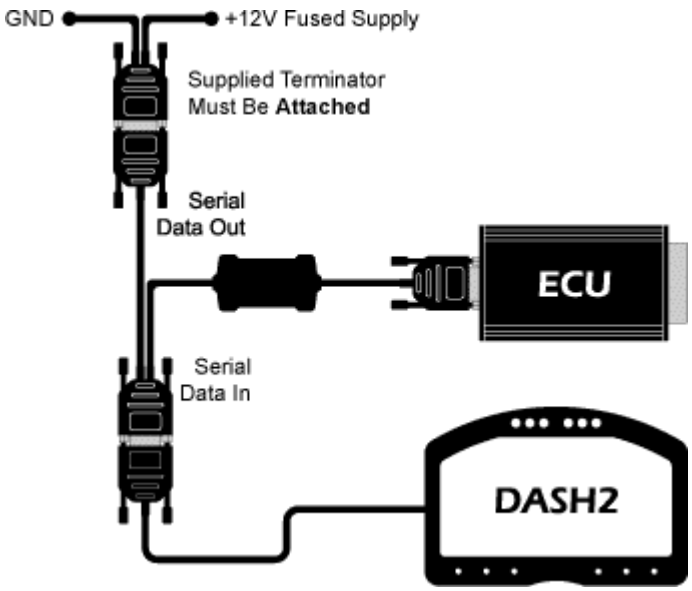
The connections for each type of installation are shown in the following illustrations.

1. DL1 or DL2 Data Logger Only

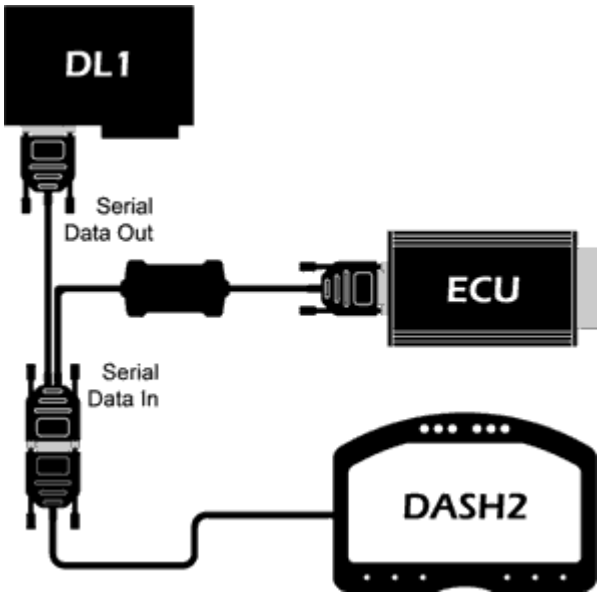


Race Technology Ltd. VAT reg. 715 9671 09
After 12, King Street, Eastwood, Nottingham, NG16 3DA, UK
Tel: +44 (0) 1773 537620 Fax: +44 (0) 1773 537621
Email: sales@race-technology.com

2. DASH2 Display Only

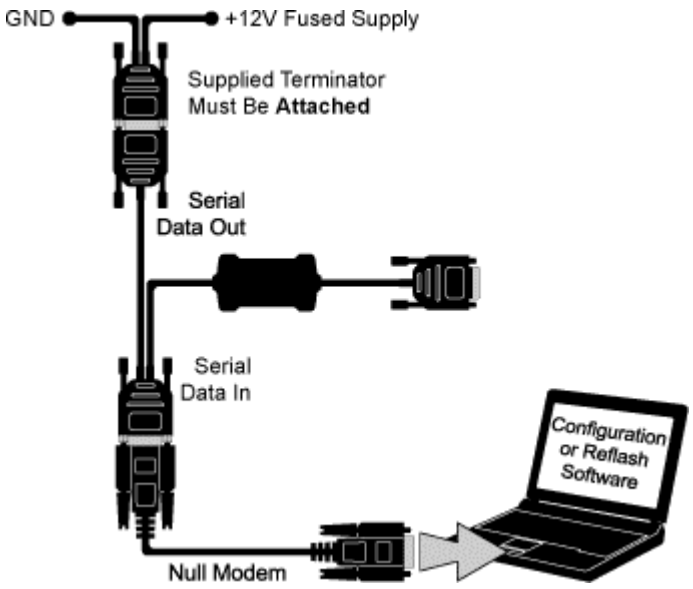


3. Data Logger and Display



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

4. PC Compatible Computer for Reflashing



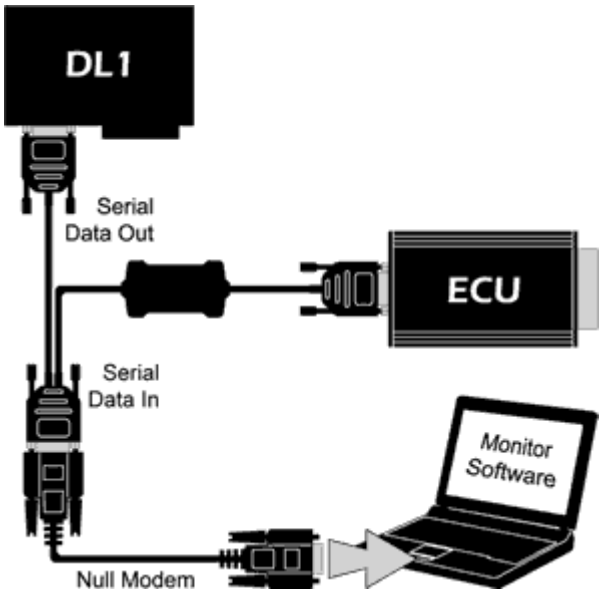
Re-flashing Procedure

After connecting the CAN serial interface as shown 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 v7 \ Reflash. Then follow the on screen instructions provided by the Reflash Utility.

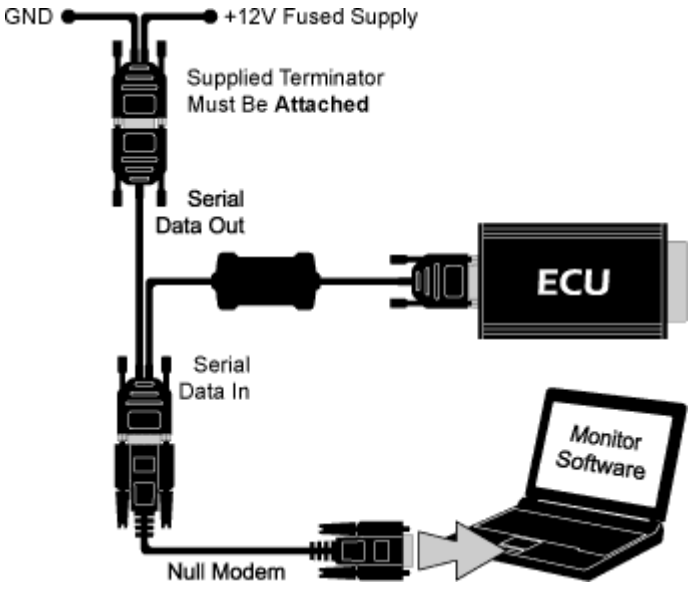
WARNING: Only reflash the CAN serial interface if specifically instructed to do so by Race Technology. Any malfunction due to re-flashing without observing this warning will result in the warranty being void.

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

5. DL1 and PC monitor

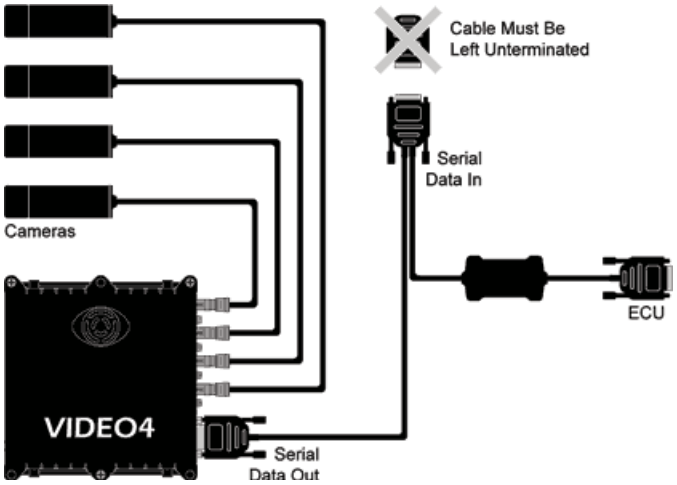


6. PC monitor only

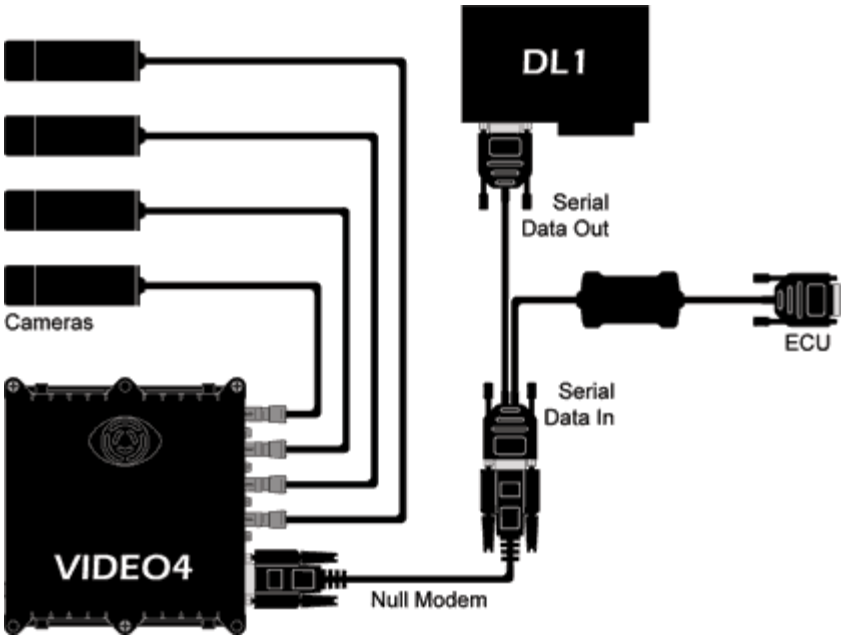


Race Technology Ltd. VAT reg. 715 9671 09
After 12, King Street, Eastwood, Nottingham, NG16 3DA, UK
Tel: +44 (0) 1773 537620 Fax: +44 (0) 1773 537621
Email: sales@race-technology.com

7. VIDEO4 and CAN



8. VIDEO4, DL1 and CAN



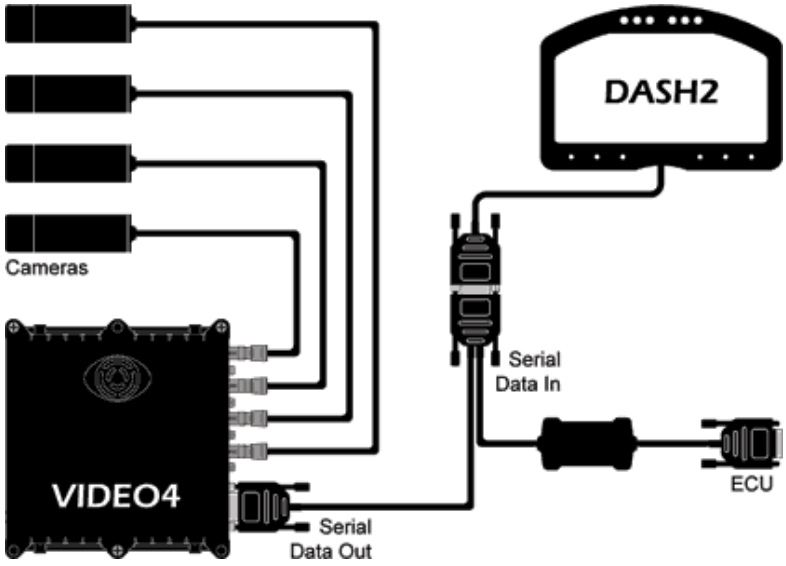
Please note that in this configuration it is important that both the DL1 and the VIDEO4 are configured to work together correctly. There is more information about this on the following web pages:

http://www.race-technology.com/wiki/index.php/UnitConfigurations/VIDEO4ConfigForDL1

http://www.race-technology.com/wiki/index.php/UnitConfigurations/DL1ConfigForVIDEO4

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

9. VIDEO4, CAN and DASH2



Please note that in this configuration it is important that both the DASH display and the VIDEO4 are configured to work together correctly. There is more information about this on following web page:

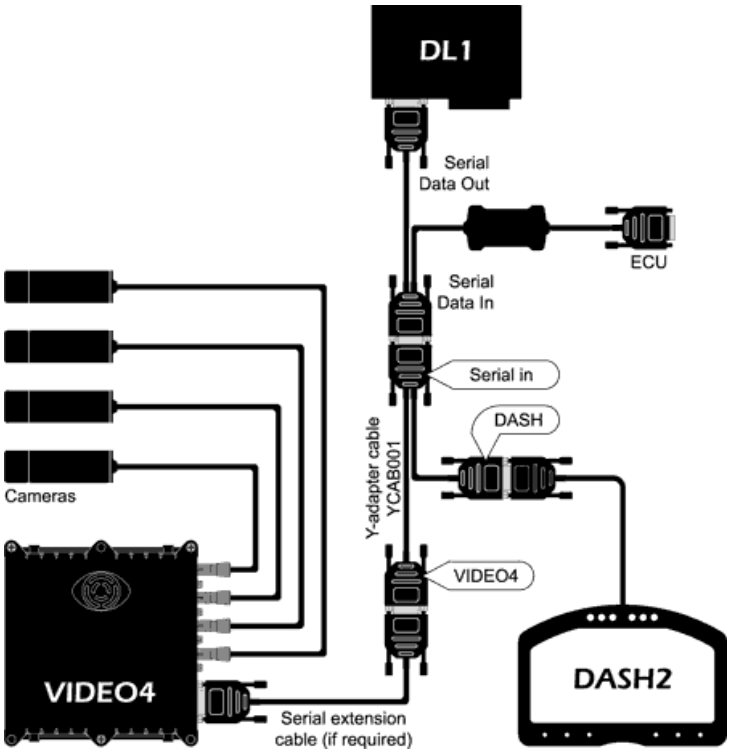
http://www.race-technology.com/wiki/index.php/UnitConfigurations/ VIDEO4ConfigForDASH

IMPORTANT: When connecting a dashboard to a VIDEO4, it must be running firmware that has been published since the release of the VIDEO4 so it correctly decode the new VIDEO4 data. In particular:

- DASH1s must be running firmware version 9.1.5 or later
- DASH2s must be running firmware version 9.1.5 or later
- DASH3s must be running firmware version 1.31.18 or later

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

10. VIDEO4, DL1, CAN and DASH2



Please note that in this configuration it is important that both the DL1, DASH display and the VIDEO4 are configured to work together correctly. There is more information about this on these web pages:

http://www.race-technology.com/wiki/index.php/UnitConfigurations/DL1ConfigForVIDEO4

http://www.race-technology.com/wiki/index.php/UnitConfigurations/VIDEO4ConfigForDASH

11. 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.

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

Configuring a Data Logger to work with the Interface

To enable a DL1 or DL2 data logger to decode the information from 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 re-flashed 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/ECU serial 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 Reflashing

See page 8 for connection and configuration procedure for re-flashing the CAN interface.

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

Appendix A. Channel Names

Temperature channels

Default scaling is 0.1°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

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

Ignition Cut Level Percent

ISBV 1 Open Percent

ISBV 2 Open Percent

Nitrous Oxide Percent

Auxiliary 1 Percent

Auxiliary 2 Percent

Auxiliary 3 Percent

Auxiliary 4 Percent

Fuel Auxiliary Temperature Compensation Percent

Fuel Aux Volt Comp Percent

Time channel data

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 10y. Where -5 < y < 5

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

Coil 1 Charge Time

Coil 2 Charge Time

Coil 3 Charge Time

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

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): 11

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

Intel Sequential

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

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

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

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

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

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

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

PIN 7 Power

Serial Data Out Connector

9 Way Female D-Type

PIN 2 RS232 Output

PIN 3 RS232 Pass through

PIN 5 Ground

PIN 7 Power

CAN Connector

9 Way Male D-Type

PIN 2 CAN Low

PIN 7 CAN High

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

Appendix D. 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: 0-70ºC

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