Race Technology

ECU Serial Interface

Instruction manual

Version 2.10
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Introduction

The Race Technology ECU serial interface is a small unit (35 x 24 x 8mm) which when connected to the correct ECU will convert the serial output from the ECU in to a format which can be read and understood by the Race Technology range of products. The output data from this unit can be used directly with a PC to show ECU 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 ECU serial 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:

- ECU serial interface unit with 3 x 9 way connectors
- Null modem serial cable - only required if the ECU interface is to be re-flashed with new firmware. This 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 ECU serial 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 ECU serial interface will already have the correct firmware version installed, but if you have received the ECU serial 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.

Connecting the ECU Interface to other equipment

There are ten different ways in which the ECU serial 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. With DL1 or DL2, and a Computer running RT Monitor software and ECU
5. With a Computer running RT Monitor software and ECU
6. With VIDEO4 and ECU
7. With VIDEO4, DL1, and ECU
8. With VIDEO4, ECU, and DASH2
9. With VIDEO4, ECU, DL1, and DASH2
10. Daisy Chaining The connections for each type of installation

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

Note: The DL1, DL2, DASH2 and DASH3 are all compatible with the ECU interface. In the diagrams that follow, only the DL1 and DASH2 have been shown. In these configurations the DL1 and DL2 can be used interchangeably and the DASH2 and DASH3 can be exchanged for one another.

1. DL1 or DL2 data logger and ECU

Serial
Data Out

ECU

Serial
Data In

Cable must be left
Unterminated
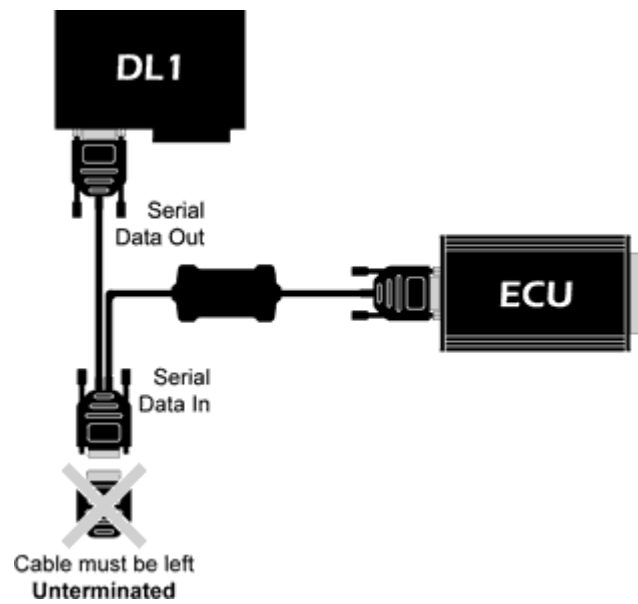
2. ECU and DASH2 display (in standalone mode)

GND   +12V Fused Supply

Supplied Terminator
Must Be **Attached**

Serial
Data Out

ECU

Serial
Data In
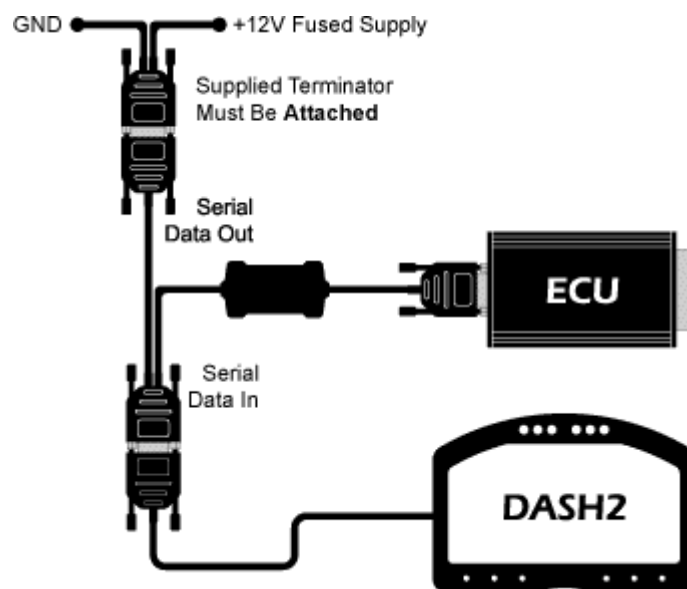
DASH2

3. DL1 or DL2, ECU, and DASH1 or DASH2
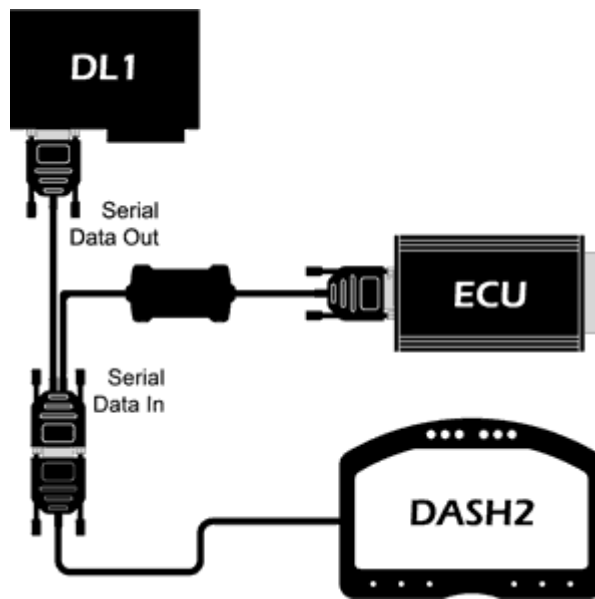
Please note that in this configuration, you must ensure that your DL1 is correctly configures to work with a DASH display. More information is there on the following web page:

http://www.race-technology.com/wiki/index.php/UnitConfigurations/DL1ConfigForDASH

4. DL1 or DL2, ECU and a Computer running RT Monitor software
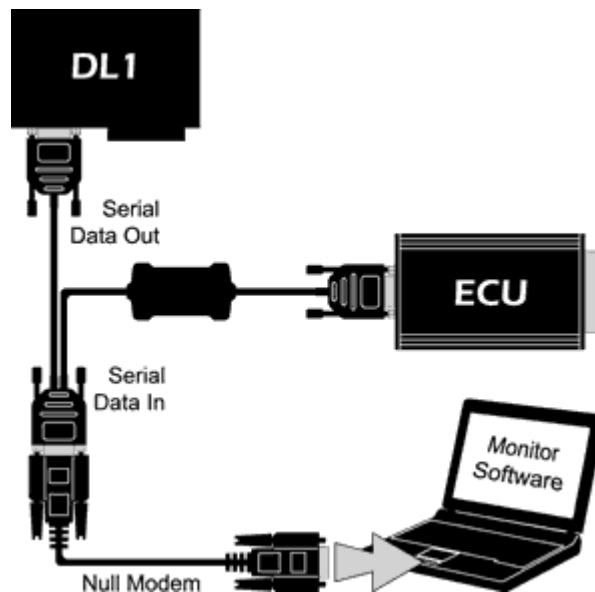
5. ECU and Computer running RT Monitor software
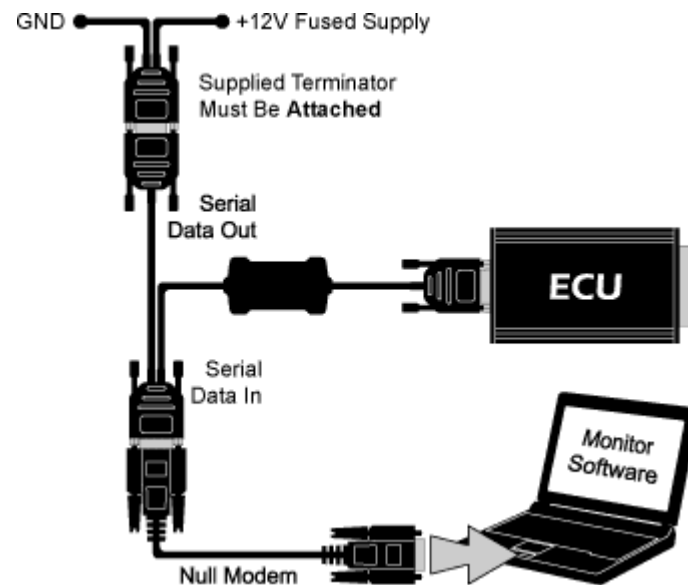
6. VIDEO4 and ECU

7. VIDEO4, DL1 and ECU
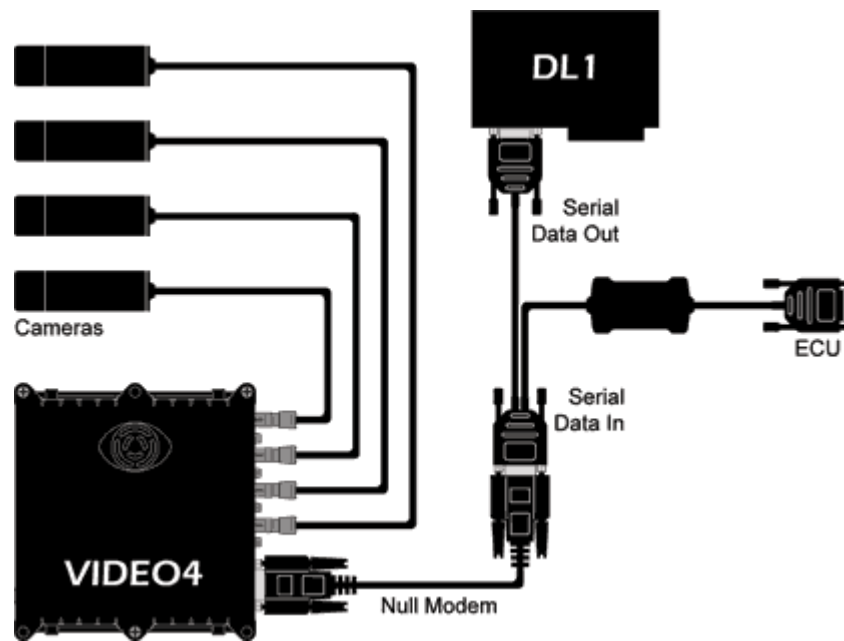
Please note that in this configuration it is important that both the DL1 and the VIDEO4 are configured to work together correctly. More information is there on the following web pages:

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

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

8. VIDEO4, ECU and DASH2
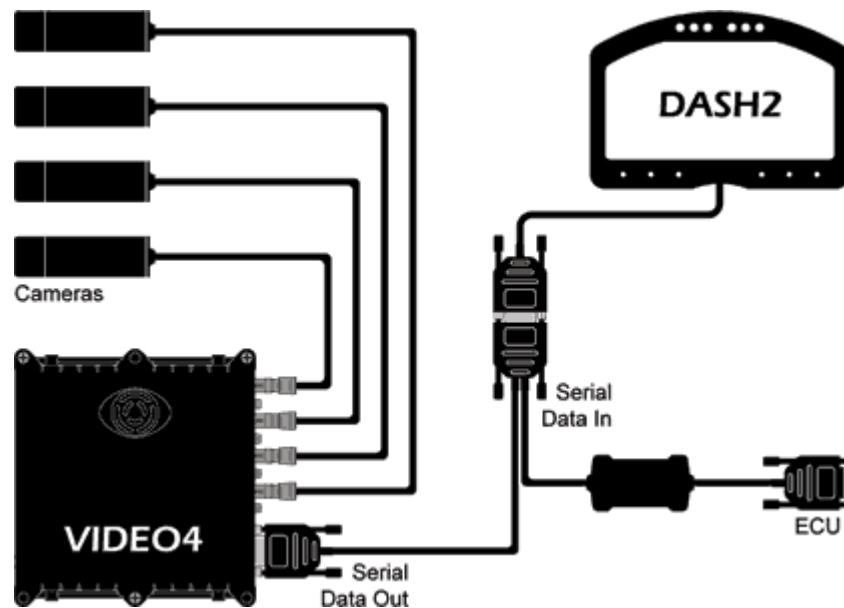
Please note that in this configuration it is important that both the DASH display and the VIDEO4 are configured to work together correctly. More information is there on the following web page:

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 decodes 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

9. VIDEO4, DL1, ECU and DASH2
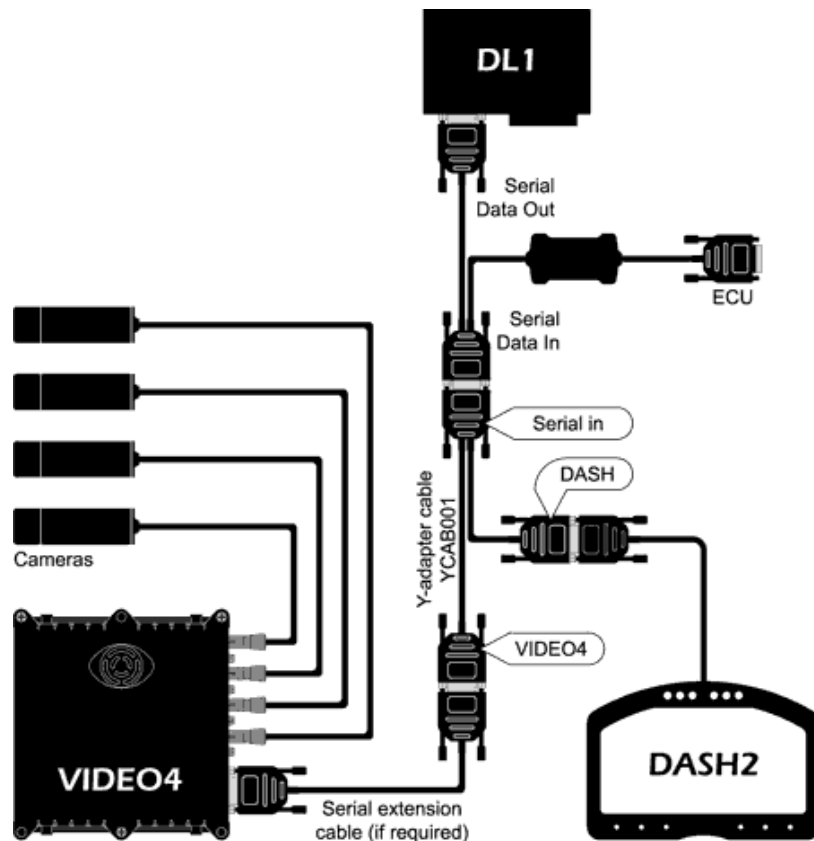
Please note that in this configuration it is important that both the DL1, DASH display and the VIDEO4 are configured to work together correctly. More information is there on the following web pages:

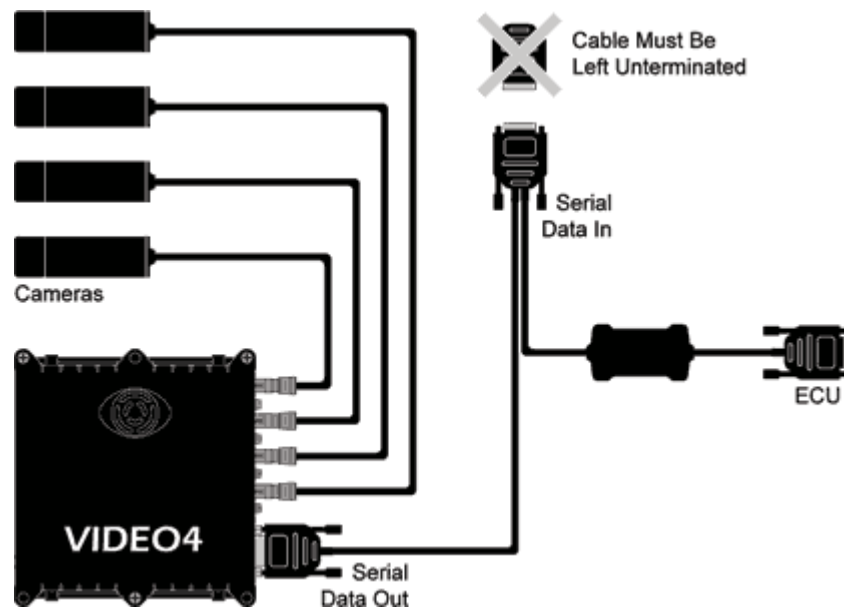*http://www.race-technology.com/wiki/index.php/UnitConfigurations/DL1ConfigForVIDEO4*

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 decodes 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

- For full compatibility with the VIDEO4, the DL1/2 must be running firmware version 25 or later. If this is not the case the remote start/stop and add lap marker will not work.

10. Daisy Chaining

Race Technology ECU serial interfaces may also be daisy-chained together by connecting the output of the first unit to the input of the second unit.

Configuring a Data Logger to work with the ECU 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.

Data Output Channels

The data sent from each ECU serial interface and the baud rate of the data depends on the particular model and which ECU it is programmed to be used with. The following sections of this instruction manual describe the data available from each model and any special set up requirements for each ECU.

Adaptronic e420c

The Adaptronic e420c ECU should be set to output data at 57.6 kbaud.

Name	Measured Channel	Resolution
Engine RPM	RPM	25 RPM
Temperature 1	Air Temperature	0.1 ^{o}C
temperature 8	Water temp	0.1 ^{o}C
temperature 25	Aux 1	0.1 ^{o}C
aux 1	Throttle position	0.1%
aux 2	Lambda 1 short trim	0.1%
measured time 1	Fuel inj 1 PW on	1ms
measured time 2	Fuel inj 2 Pw on	1ms
measured time 3	Fuel inj 3 Pw on	1ms
measured time 4	Fuel inj 4 Pw on	1ms
angle 2	Ignition angle	0.1^{o}
pressure 5	Manifold pressure	1 mBar
misc 1	Lambda 1	0.01 lambda
misc 3	Battery voltage	0.01v

AEM ECU

The AEM ECU outputs a 21 byte sequence of data at 19200 baud. From this data, the following channels are extracted.

Name	Race Technology Channel	Resolution
Engine speed	Engine Speed	25 RPM
Engine Load	Boost Pressure	1 mBar
Throttle	Throttle Position percentage	0.1%
Air temp	Inlet post intercooler 1	0.1 ^{o}C
Coolant temp	Water temp	0.1 ^{o}C
02-1	Lambda1	0.01 lambda
02-2	Lambda2	0.01 lambda
ADCR8	Analogue 21	0.001V
ADCR11	Analogue 22	0.001V
ADCR13	Analogue 23	0.001V
ADCR14	Analogue 24	0.001V
ADCR15	Analogue 25	0.001V
ADCR16	Analogue 26	0.001V
ADCR17	Analogue 27	0.001V
ADCR18	Analogue 28	0.001V

Autronic SMC v1.91, 1.92, 1.99

The Autronic SMC firmware v1.91, v1.92, v1.99 streams data out automatically at a rate of 9600baud. The following channels of data are available.

Name	Race Technology Channel	Resolution
RPM	Engine speed	25 RPM
Coolant temp	Water temp	0.1 ^{o}C
Charge temp	Inlet pre turbo temp 1	0.1 ^{o}C
Intake air temp	ambient air temp	0.1 ^{o}C
Manifold pressure	boost pressure	1 mBar
AF ratio	Lambda1	0.01 lambda
Injection time	Fuel Inj 1 PW	1 ms
Ignition angle	Ignition angle	0.1^{o}
Battery voltage	Battery voltage	0.01 V
Throttle position	Throttle position percentage	0.1%

Autronic SM2 v1.91, 1.92, 1.94, 1.99

The Autronic SM2 firmware v1.91, v1.92, v1.94, v1.99 streams data out automatically at a rate of 9600baud. The following channels of data are available.

Name	Race Technology Channel	Resolution
RPM	Engine speed	25 RPM
Coolant temp	Water temp	0.1 ^{o}C
Charge temp	Inlet pre turbo temp 1	0.1 ^{o}C
Intake air temp	Ambient air temp	0.1 ^{o}C
Manifold pressure	Boost pressure	1 mBar
AF ratio	Lambda1	0.01 lambda
Injection time	Fuel Inj 1 PW	1 ms
Ignition angle	Ignition angle	0.1^{o}
Battery voltage	Battery voltage	0.01 V
Throttle position	Throttle position percentage	0.1%

Autronic SM2 v1.93 and v1.95

The Autronic SM2 with firmware version v1.93 or v1.95 streams data out automatically at a rate of 19200baud. The following channels of data are available.

Name	Race Technology Channel	Resolution
RPM	Engine speed	25 RPM
Coolant temp	Water temp	0.1 ^{o}C
Charge temp	Inlet pre turbo temp 1	0.1 ^{o}C
Intake air temp	Ambient air temp	0.1 ^{o}C
Manifold pressure	Boost pressure	1 mBar
AF ratio	Lambda1	0.01 lambda
Injection time	Fuel Inj 1 PW	1 ms
Ignition angle	Ignition angle	0.1^o
Battery voltage	Battery voltage	0.01 V
Throttle position	Throttle position percentage	0.1%
User selectable data 1	Exhaust 1 temp	0.1 ^{o}C
User selectable data 2	Exhaust 2 temp	0.1 ^{o}C
User selectable data 3	Exhaust 3 temp	0.1 ^{o}C
User selectable data 4	Exhaust 4 temp	0.1 ^{o}C

Autronic SM4 up to v1.07

The Autronic SM4 with firmware versions up to v1.07 streams data out automatically at a rate of 19200baud. The following channels of data are available.

Name	Race Technology Channel	Resolution
RPM	Engine speed	25 RPM
Coolant temp	Water temp	0.1 ^{o}C
Charge temp	Inlet pre turbo temp 1	0.1 ^{o}C
Intake air temp	Ambient air temp	0.1 ^{o}C
Manifold pressure	Boost pressure	1 mBar
AF ratio	Lambda1	0.01 lambda
Injection time	Fuel Inj 1 PW	1 ms
Ignition angle	Ignition angle	0.1^o
Battery voltage	Battery voltage	0.01 V
Throttle position	Throttle position percentage	0.1%

Autronic SM4 v1.08

The Autronic SM4 with firmware version v1.08 streams data out automatically at a rate of 19200baud. The following channels of data are available.

Name	Race Technology Channel	Resolution
RPM	Engine speed	25 RPM
Coolant temp	Water temp	0.1 $^{\circ}$C
Charge temp	Inlet pre turbo temp 1	0.1 $^{\circ}$C
Intake air temp	Ambient air temp	0.1 $^{\circ}$C
Oil temp	Oil temp	0.1 $^{\circ}$C
Manifold pressure	Boost pressure	1 mBar
Fuel pressure	Fuel pressure	1 mBar
AF ratio	Lambda1	0.01 lambda
Injection time	Fuel Inj 1 PW	1 ms
Ignition angle	Ignition angle	0.1°
Battery voltage	Battery voltage	0.01 V
Throttle position	Throttle position percentage	0.1%
User selectable data 1	Exhaust 1 temp	0.1 $^{\circ}$C

Autronic SM3 v1.09 and SM4 v1.09

The Autronic SM3 with firmware version 1.09 and the Autronic SM4 with firmware version v1.09 streams data out automatically at a rate of 19200baud. The following channels of data are available.

Name	Race Technology Channel	Resolution
RPM	Engine speed	25 RPM
Coolant temp	Water temp	0.1 ^{o}C
Charge temp	Inlet pre turbo temp 1	0.1 ^{o}C
Intake air temp	Ambient air temp	0.1 ^{o}C
Manifold pressure	Boost pressure	1 mBar
AF ratio	Lambda1	0.01 lambda
Injection time	Fuel Inj 1 PW	1 ms
Ignition angle	Ignition angle	0.1^o
Battery voltage	Battery voltage	0.01 V
Throttle position	Throttle position percentage	0.1%
User selectable data 1	Exhaust 1 temp	0.1 ^{o}C
User selectable data 2	Exhaust 2 temp	0.1 ^{o}C
User selectable data 3	Exhaust 3 temp	0.1 ^{o}C
User selectable data 4	Exhaust 4 temp	0.1 ^{o}C

DTA E48 and P8 PRO ECUs

The DTA E48 or P8 PRO ECU outputs a 34 byte sequence of data at 9600 baud. From this data, the following channels are extracted.

Name	Race Technology Channel	Resolution
RPM	Engine Speed	25 RPM
Air temp	Ambient air temp	0.1^{o}C
Water temp	Water temp	0.1^{o}C
Throttle	Throttle Position percentage	0.1%
Manifold pressure	Boost pressure	10 mBar
Lambda	Lambda1	0.01 Volts
Bat Volts	battery voltage	0.01 V
Oil temp	Oil temperature	0.1^{o}C
Oil Pressure	Oil pressure	10 mbar
Fuel pressure	Fuel pressure	10 mbar

The ECU must be configured from the Other Map Settings / Data Stream menu to enable the output data stream and set up the header bytes as shown below.
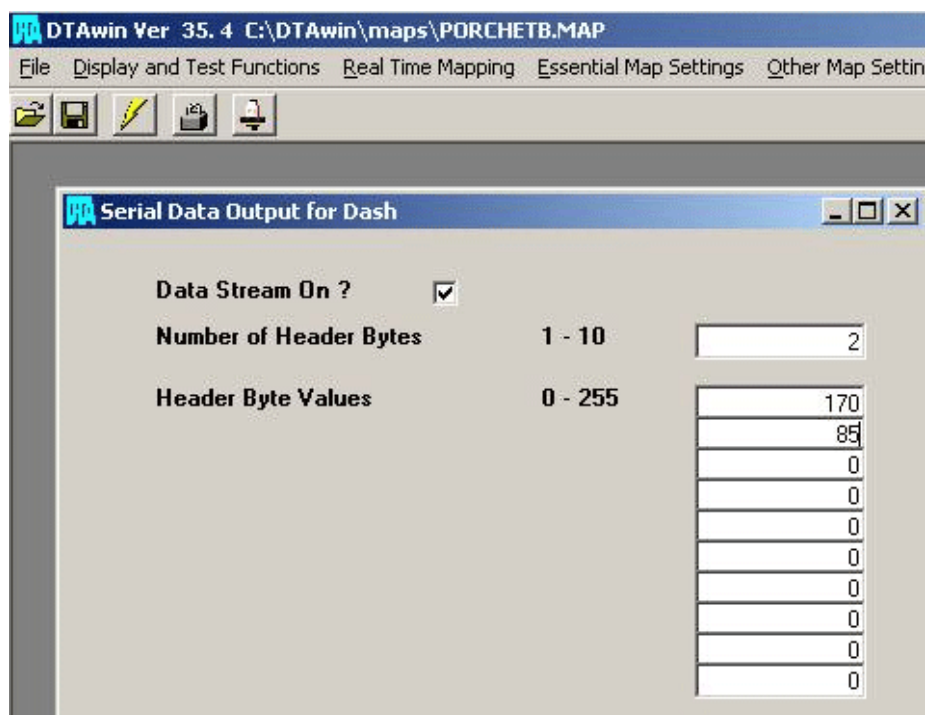
DTA S40

The DTA S40 ECU can be configured to output a serial data stream at 57.6kbaud. The ECU may need to be configured correctly for operation with the adapter.

To set up the ECU, open the DTASwin software and connect to the ECU, in the Other Map Settings / Data Stream options, set the unit up as follows:
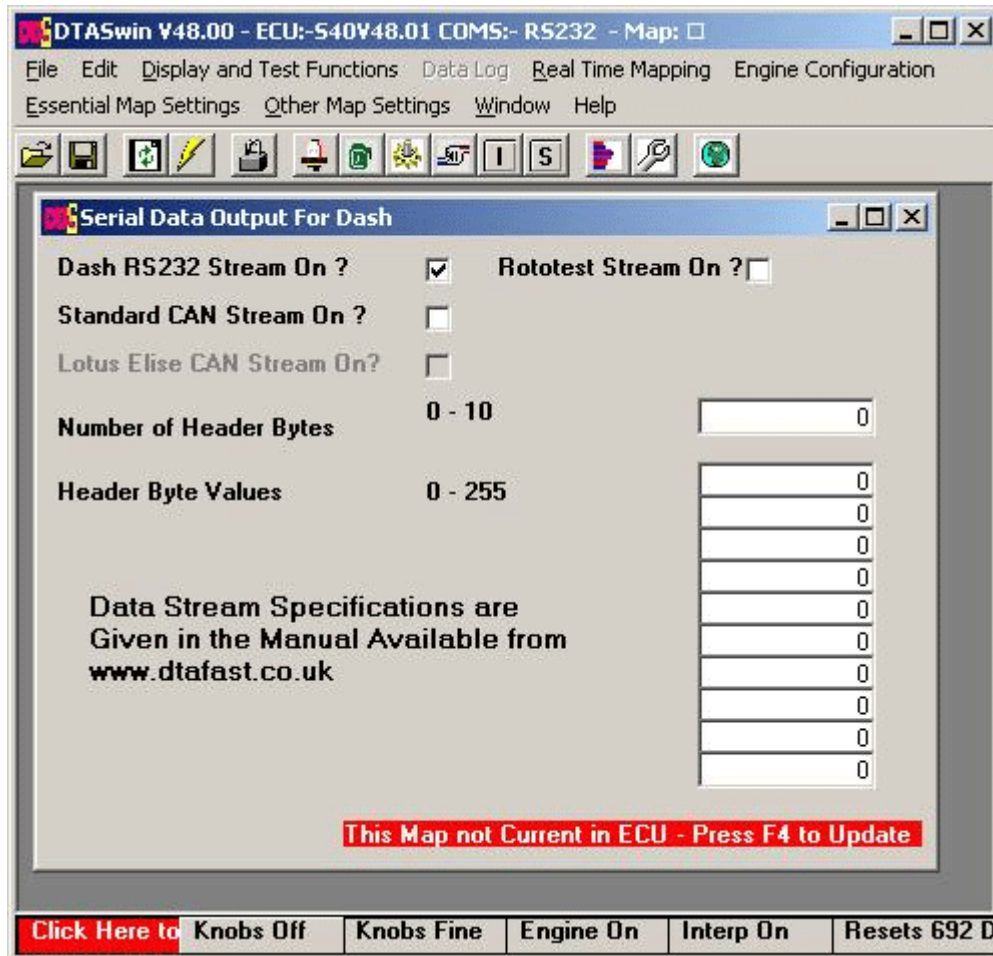
Press F4 to update the Map to the ECU.
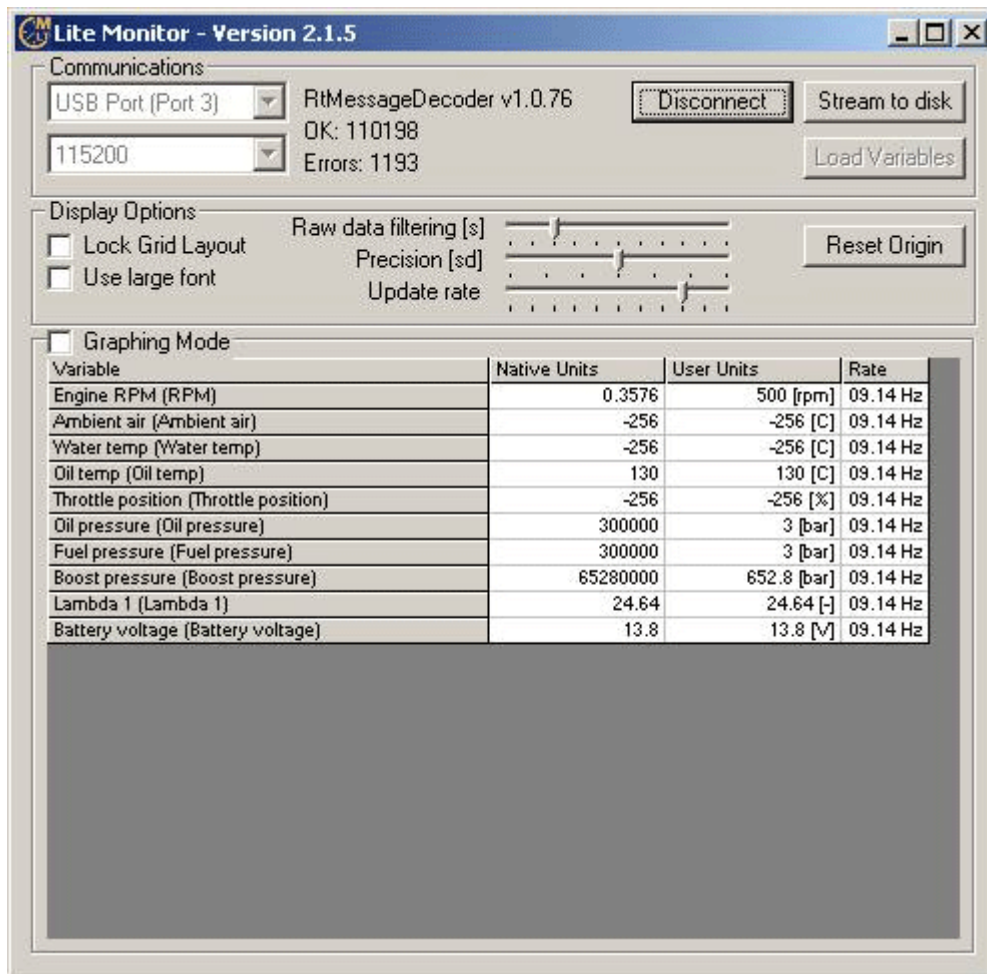
For the section on the output data, the information is the same as for the DTA P8 Pro, but additionally there is Oil Temperature and Oil Pressure

Electromotive TEC3

The electromotive TEC3 ECU interface requires firmware version WT303T3 or later to be installed on the ECU. The serial communication must be set to 38400 baud on the ECU. The following data is available from the interface:

Name	Race Technology Name	Resolution
RPM	Engine speed	25 RPM
Coolant temp	Water temp	0.1 ^{o}C
Ignition advance	Ignition angle	0.1^{o}
Manifold air temp	Ambient air temp	0.1 ^{o}C
Manifold pressure	boost pressure	1 mBar
AF ratio	Lambda1	0.01 lambda
Battery voltage	Battery voltage	0.01 V
TFPW	Fuel Inj 1 PW percentage	0.1%
Primary pulse width	Fuel Inj 1 PW	1 ms
Staged pulse width	Fuel Inj 2 PW	1 ms
User defined pulse width	Fuel Inj 3 PW	1 ms
Throttle position	Throttle position percentage	0.1%

Electromotive TEC GT

The following data is available from the interface.

Name	Race Technology Name	Resolution
RPM	Engine speed	1 RPM
Boost Pressure	Boost pressure	1 mBar
Throttle Position	Throttle Position	0.1 %
Water Temp	Water Temp	0.1 ^{o}C
Inlet Post Turbo	Inlet Temperature	0.1 ^{o}C
Battery Voltage	Battery Voltage	0.01 V
Ignition Angle	Ignition Angel	0.1^{o}
Primary Pulse Width	Fuel Inj 1 PW	1 ms
Lambda Short Trim	lambda 1 short trim	0.1 %
Staged Pulse Width	Fuel Inj 2 Pulse width	1 ms
EGO	Exhaust gas oxygen	0.1 %

Electromotive sells a **Y adapter** that breaks out their connector to CAN and RS232.

Use of Electromotive ECU with CAN:

In their connector (assuming one does not use their Y adapter) pin 1 is CAN high and pin 4 is CAN low. Neither their end nor ours is terminated, and there are no other nodes, so two 120 Ohm resistors are required, even if the intervening length is very short.

The CAN bus does need to be enabled in their ECU configuration tool. All Tec GT ECUs sold since around year 2005 are compatible with this CAN configuration.

EMS Stinger and 8860 ECU

The EMS serial – Race Technology interface connects between an EMS Stinger ECU and either a data logger or a dashboard enabling monitoring of all the data channels. The data input rate from the ECU is set at 19200 baud, which is compatible with the Stinger ECU and some versions of the 8860 ECU. The data sent to the data logger or dashboard is as follows:

Name	Race Technology Name	Resolution
Engine Speed	RPM Frequency	0.1 Hz
Throttle	Throttle Angle	0.1^o
Barometric pressure	Ambient Air pressure	1 mBar
Lambda 1	Lambda 1	0.01 lambda
Lambda 2	Lambda 2	0.01 lambda
Air temperature	Ambient Temperature	0.1 ^{o}C
Coolant temperature	Water temperature	0.1 ^{o}C
Ignition	Ignition angle	0.1^o BTDC
Injection time	Injector 1 on time	1 ms
Battery voltage	Battery voltage	0.01 V

The channel numbers for the data as used within the Race Technology analysis software are as follows: (Main channel . Sub channel)

Name	Race Technology Name
Engine speed	67.1
Throttle	93.1
Barometric pressure	94.1
Lambda 1	95.1
Lambda 2	95.2
Air temperature	66.1
Coolant temperature	66.8
Ignition	93.2
Injection time	69.1
Battery voltage	95.3

EMERALD K3 and K6 ECUs

The Emerald K3 and K6 ECUs output data at 19200bps. When connected to the Race Technology ECU decoder the following channels are decoded:

Byte	Name	Race Technology Name	Resolution
1	Engine Speed	RPM	25 RPM
2	Throttle position	Throttle position	0.1%
3	Manifold pressure	Boost pressure	0.1 kPa
4	Ambient Air Pressure	Ambient air pressure	0.1 kPa
5	Ignition advance	Ignition Angle	0.1^o BTDC
6	Air Fuel Ratio	Lambda 1	0.01 lambda
7	Air Fuel Ratio target	Lambda 2	0.01 lambda
8	Battery voltage	Battery Voltage	0.01 V
9	Primary Ing Time	Fuel Inj 1 PW on	µs
10	Secondary Inj Time	Fuel Inj 2 PW on	µs
11	Coil on Time	Coil 1 PW	µs
12	Air Temperature	Air Temperature	$0.1\ ^oC$
13	Coolant Temperature	Water Temperature	$0.1\ ^oC$
14	Aux Temperature	Aux Temperature 1	$0.1\ ^oC$
15	Exhaust Gas Temp	Exhaust 1 temp	$0.1\ ^oC$

Please note that on the Emerald the serial data is NOT ON STANDARD PINS, the Emerald ECU uses serial data pins 8 and 9. Race Technology understand that EMERALD supply a cable that switch over these pins with the ECU, if you are unable to locate this lead then please contact Emerald for a replacement.

Comms
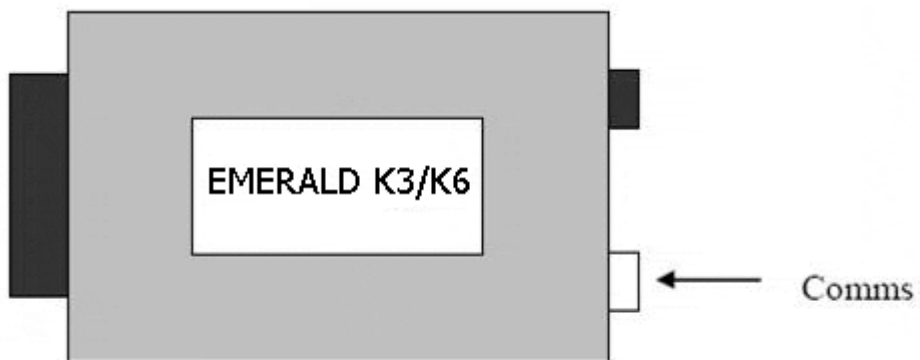
Pin Number	Connection	Comments
1	CAN_H	CAN bus interface
2	CAN_L	CAN bus interface
3	-	Not used
4	-	Not used
5	earth	Signal earth
6	-	Not Used
7	Rx	RS232 serial interface, data receive
8	Tx	RS232 serial interface, data transmit
9	CTS	RS232 serial interface, clear to send

HONDATA K-SERIES ECU

The Hondata K–Series ECU has software selectable 9600 bps or 115200 bps output baud rates. To be compatible with the Race Technology ECU decoder, the ECU must be set to output data at 9600 baud. There are two models of this ECU in common usage, the PRA and PRB. This unit will only work with the PRB ECU.

Name	Race Technology Name	Resolution
Engine Speed	RPM	25 RPM
Coolant temp	Water temperature	0.1 ^{o}C
Air temp	Air temperature	0.1 ^{o}C
Battery Voltage	Battery voltage	0.01 V
Air Fuel Ratio	Lambda1	0.01 lambda
Throttle Position	Throttle position	0.1%
Manifold pressure	Boost pressure	0.1 kPa
Injector Time	Fuel Inj 1 PW on	µs
Ignition Timing	Ignition Angle	0.5^o

There is more information about connecting to the hondata ECU here:

http://www.hondata.com/help/kmanager/index.html

In particular the data output from the ECU is on Pin 24 on the E connector, this is labelled as "SEFMJ"

E Connector

IMPORTANT: The Hondata ECU does not use standard serial data voltage levels, so the hardware of the Race technology ECU adapter must be modified to suit this adapter. A Hondata ECU adapter cannot be used with any other ECU, and visa-versa.

On the Race Technology ECU adaptor there is a 9-way d-type connector labelled ECU. You need to connect **PIN2** to **PIN E24** of the ECU.

If you are powering the ECU from a different power source as the ECU adaptor then you will also need to connect pin 5 from the ECU adaptor to the ECU's power supply ground.

HYDRA 2.60 ECU

The ECU must be configured to output data with the standard checksum at a baud rate of 19200.

Byte	Name	Race Technology Name	Resolution
1	Engine Speed	RPM	25 RPM
2	Air Temp	Air Temperature	0.1 ^{o}C
3	Coolant Temp	Water Temperature	0.1 ^{o}C
4	Throttle Position	Throttle Position	0.1%
5	Air fuel Ratio	Lambda 1	0.01 lambda
6	air fuel ratio target	Lambda 2	0.01 lambda
7	battery voltage	Battery voltage	0.01 V
8	Boost Pressure	Boost Pressure	0.1 kPa
9	Ignition angle	Ignition angle	0.1^o BTDC
10	Injector time	Fuel Inj 1 PW on	μs
11	Injector duty cycle	Fuel inj 1 PW percent	0.1%
12	Lambda 1 short term trim	Lambda 1 short term trim	0.1%

KMS ECU

This data protocol is valid for data speeds of 9600 baud or 115200 baud, which can be set within the KMS software.

Default baud rate after reset is 115200 bit/sec.

Byte	Name	Race Technology Name	Resolution
1	Engine speed	RPM	25 RPM
2	Battery Voltage	Battery Voltage	0.01 V
3	Air to Fuel Ratio	Lambda1	0.01 lambda
4	Water temp	Water temperature	0.1 ^{o}C
5	Air Temp	Air temperature	0.1 ^{o}C
6	Boost pressure	Boost pressure	0.1 kPa
7	Oil pressure	Oil pressure	0.1 kPa
8	Ignition angle	Ignition angle	0.1^{o}
9	Inject pulse time	Fuel inj 1 PW on	µs

MBE 941 Serial interface

The MBE941 serial – Race Technology interface connects between the ECU and either a data logger or a dashboard enabling monitoring of all the data channels.

The output of the ECU must be enabled for continuous operation on the serial port. Please refer to your ECU documentation for instructions on how to do this.

 For the output of the MBE ECU to be decoded correctly, the 16 channel output from the ECU must be set up to send the following data, which will appear on the following channels

Byte	Name	Race Technology Name	Resolution
1	Engine Speed	RPM	25 RPM
2	Ignition	Ignition angle	0.1^{o}
3	Injection time	Injector 1 on time	1 ms
4	Throttle	Throttle angle	0.1^{o}
5	Coolant temperature	Water temperature	$0.1\ ^{o}C$
6	Air temperature	Ambient temperature	$0.1\ ^{o}C$
7	Barometric pressure	Ambient air pressure	1 mBar
8	lambda	Lambda 1	0.01 lambda
9	spare		
10	Oil pressure	Oil pressure	1 mBar
11	Fuel pressure	Fuel pressure	1 mBar
12	Water pressure	Water pressure	1 mBar
13	Engine oil temperature	Oil temperature	$0.1\ ^{o}C$
14	Gearbox oil temperature	Gearbox temperature	$0.1\ ^{o}C$
15	Boost pressure	Boost pressure	1 mBar
16	Spare		

MBE 967 Serial interface

The MBE 967 serial – Race Technology interface connects between the ECU and either a data logger or a dashboard enabling monitoring of all the data channels.

The output of the ECU must be enabled for continuous operation on the serial port. Please refer to your ECU documentation for instructions on how to do this.

For the output of the MBE ECU to be decoded correctly, the 16 channel output from the ECU must be set up to send the following data, which will appear on the following channels.

The ECU should be set up with following configuration:

Bytes	Channel	Data Length
1-2	Engine Speed	16 bit
3-4	Throttle percentage	8 bit
5-6	Lambda Sensor Voltage	8 bit
7-8	Lambda	8 bit
9-10	Coolant Temperature	8 bit
11-12	Air Temperature	8 bit
13-14	Manifold Pressure	8 bit
15-16	Engine Oil Pressure	8 bit
17-18	Injection Time	16 bit
19-20	Ignition Angle	8 bit
21-22	Fuel Pressure	8 bit
23-24	Engine Oil Temp	8 bit
25-26	Baro pressure	8 bit
27-28	P14	8 bit
29-30	P15	8 bit
31-32	P16	8 bit

The data appears on the following channels:

ECU Channel	RT default channel name	RT internal channel name	Resolution
Engine Speed	RPM	Engine RPM	25rpm
Throttle percentage	Throttle Position	Aux 1	0.1%
Lambda Sensor Voltage	NOT USED		
Lambda	Lambda 1	misc 1	0.01
Coolant Temperature	Water Temperature	temperature 8	0.1^{o}C
Air Temperature	Ambient Air Temperature	temperature 1	0.1^{o}C
Manifold Pressure	Boost Pressure	pressure 5	1mBar
Engine Oil Pressure	Oil Pressure	pressure 2	1mBar
Injection Time	Fuel Inj 1 PW on	measured time 1	1ms
Ignition Angle	Ignition Angle	angle 2	0.1^{o}
Fuel Pressure	Fuel Pressure	pressure 3	1mBar
Engine Oil Temp	Oil Temp	temperature 9	0.1^{o}C
Baro pressure	Ambient Air Pressure	pressure 1	1mBar

Motec M800 ECU

The Motec M800 ECU outputs a 175 byte sequence of data at 19.2kbaud. This is the standard MoTeC M800 Set 3 data protocol. From this data, the following channels are extracted.

Name	Race Technology Channel	Resolution
Engine speed	RPM	25 RPM
Throttle position	Throttle percentage	0.1%
Ambient temp	Air temperature	0.1 $^\circ$C
Coolant temp	Water temperature	0.1 $^\circ$C
Auxiliary temp	Auxiliary temperature	0.1 $^\circ$C
ECU Temp	ECU Temperature	0.1 $^\circ$C
Oil Temp	Oil temperature	0.1 $^\circ$C
Exhaust Temp 1	Exhaust Temperature 1	0.1 $^\circ$C
Exhaust Temp 2	Exhaust Temperature 2	0.1 $^\circ$C
Lambda 1 short term trim	Lambda 1 short term trim	0.1%
Lambda 1 long term trim	Lambda 1 long term trim	0.1%
Lambda 2 short term trim	Lambda 2 short term trim	0.1%
Lambda 2 long term trim	Lambda 2 long term trim	0.1%
Ignition cut level	Ignition cut level percent	0.1%
Fuel cut level	Fuel inj 1 cut level percent	0.1%
Fuel Aux Temp compensation	Auxiliary 1 percent	0.1%
Fuel Aux Volt compensation	Auxiliary 2 percent	0.1%
Fuel injector duty cycle	Fuel Injector 1 duty cycle	0.1%
Fuel Actual pulse width	Fuel injector 1 pulse length	µs
Lambda 1 and Lambda 2	Lambda n (n = 1or 2)	0.01 lambda
Manifold pressure	Boost pressure	0.1 kPa
Barometric pressure	Ambient pressure	0.1 kPa
Fuel pressure	Fuel pressure	0.1 kPa
Exhaust manifold pressure	Water pressure	0.1 kPa
Battery voltage	Battery voltage	0.01 V
Ignition Advance	Ignition advance	0.1° BTDC

MoTec M4 and M48 ECU

The MoTec M4 (and M48) ECU outputs an 84 byte sequence of data at 9.6kbaud. This is the standard MoTeC M4 Set 5 data protocol. The ECU must be configured to output data set 5 at 9600 baud. From this data, the following channels are extracted.

Name	Race Technology Channel	Resolution
Engine Speed	RPM	25 RPM
Throttle Position	throttle percentage	0.1%
Ambient Temp	Air Temperature	0.1 ^{o}C
Coolant temp	Water temperature	0.1 ^{o}C
Auxiliary temp	Auxiliary temperature	0.1 ^{o}C
ECU Temp	ECU Temperature	0.1 ^{o}C
Lambda short term trim	Lambda 1 short term trim	0.1%
Lambda long term trim	lambda 1 long term trim	0.1%
Fuel injector duty cycle	Fuel injector 1 duty cycle	0.1%
Ignition cut level	Ignition cut percentage	0.1%
Fuel cut level	Fuel inj 1 cut level percent	0.1%
Fuel Aux Temp compensation	Fuel Aux temp compensation	0.1%
Fuel Aux volt compensation	Fuel Aux voltage compensation	0.1%
Lambda	Lambda 1	0.01 lambda
Manifold pressure	Boost pressure	0.1 kPa
Barometric pressure	Ambient pressure	0.1 kPa
Battery voltage	Battery voltage	0.01 V
Fuel actual pulse width	Fuel injector 1 pulse length	μs
Ignition Advance	Ignition Advance	0.1^o BTDC

IMPORTANT: If your ECU is serial number 2999 or lower the ECU Interface must be connected to the ECU via the MoTeC Computer Interface Cable. The cable must be connected the right way around (one end is labelled ECU); the other end must be connected to the ECU Interface connector marked ECU. This is a special cable that contains electronic circuitry; a standard cable will not work. If your ECU is serial number 3000 or above the MoTeC Computer Interface Cable is not required – the Race Technology ECU interface should be connected directly to the ECU.

Nira i3+

The following data is available from the interface:

ECU channel name	RT channel name
RPM	Engine speed
Throttle position	Throttle position %
Manifold Air Pressure Sensor	Ambient Air Pressure
Boost before throttle	Boost Pressure
Water Temperature	Water temperature
Manifold Air Temperature	Ambient Air Temperature
Lambda sensor	Lambda 1
Exhaust Temperature	Exhaust Temperature 1
Injector duty	Fuel injector 1 pulse width %
Ignition angle	Ignition Angle
Battery voltage	Battery Voltage

OMEX 100 and 500 ECUs

Note: **Requires ECU firmware version G1.31**

Header byte must be set to Ox55

Data length = 10 bytes + header and checksum

Name	Race Technology channel	Resolution
RPM	RPM	25RPM
Air Temperature	temperature 1	1°C
Coolant temperature	temperature 8	1°C
Battery Voltage	misc 3	0.1 V
Load	misc 1	1
Throttle position	aux 1	1°
Ignition angle	angle 2	1°
Accel Fuel	measured time 2	1 ms
Fuel Pulse	measured time 1	1 ms

OMEX 600 and 710 ECUs

The OMEX 600 and 710 ECUs with V0.70 firmware are fully configurable in terms of which channels of data are transmitted and at what data rate. To be compatible with the Race Technology ECU decoder the ECU must be set up to output the following channels of data:

Byte	Name	Units	Scalar	Offset	Min	Max	Signed?
1	Air temp	°C	1	0	-128	127	Y
2	Air pressure	kPa	0.5	0	0	127.5	N
3	Battery	Volts	0	0	0	15.93750	N
4	Fuel 1 PW	µs	512	0	0	131070	N
5	Spark adv(map)	°	0.3515	-30	-30	59.64844	N
6	RPM 50	rpm	50	0	0	12799.80469	N
7	MAP as Load	kPa	0.3922	0	0	99.99847	N
8	Coolant	°C	1	0	-128	127	Y
9	Lambda1	Lambda	0.0078125	0	0	1.992188	N
10	Throttle	%	0.3922	0	0	99.99847	N
11	Lambda2	Lambda	0.0078125	0	0	1.992188	N
12	Lambda Target	Lambda	0.0078125	0	0	1.992188	N

Baud rate is set to 38400baud with standard checksum. Start byte must be set to 0x00

The data is translated in the following manner:

Name	Race Technology Channel	Resolution
Air temp	Air temperature	0.1 °C
Air pressure	Ambient air pressure	1 mBar
battery	Battery voltage	0.01 V
Fuel 1 PW	Fuel injector 1 pulse width	1 ms
Spark adv (map)	Ignition angle	0.1°
RPM 50	RPM	0.1 Hz

Map as Load	Boost pressure	1 mBar
Coolant	Water temperature	0.1 ^{o}C
Lambda1	Lambda1	0.01 lambda
Throttle	Throttle percent	0.1%
Lambda2	Lambda2	0.01 lambda
Lambda Target	Tyre Temp 1	0.01 lambda

The OMEX MAP3000 software is used to configure the ECU to output these data channels. This is carried out by selecting the "telemetry setup" option from the "user advanced" menu. Load the .sts file from the CD supplied with the ECU Serial Interface to automatically load the correct channel settings, or select the channels manually.

Notes:

- 600 ECU must be v0.70D or later. The letter will not appear in the software, they need to look on the ECU itself.
- 710 ECU must be v0.70C or later. There were no non-working versions of 0.70 on the 710 so if it shows 0.70 in the software it will be fine.
- If your OMEX 710 ECU is running **version 0.89 firmware** or later your will need different firmware on your Race Technology ECU Serial Adapter. Please specify this when ordering or contact Race Technology if you require the alternative firmware for your ECU Serial Adapter.

PECTEL (Stack) ECU

The Pectel data format is also used by MoTeC dashboards and some ECUs. For compatibility with the Race Technology interface the Pectel ECU should be configured to output the "STACK" data set.

The ECU must be set up to output data at 19200 baud with standard checksum. Start byte must be set to 0xA3.

Byte	Name	Race Technology Channel	Resolution
1	Engine Speed	RPM	25 RPM
2	Air charge temp	Air temperature	0.1 ^{o}C
3	Water temp	Water temperature	0.1 ^{o}C
4	Oil Temp	Oil temp	0.1 ^{o}C
5	Exhaust temp	Exhaust 1 temp	0.1 ^{o}C
6	Fuel pressure	Fuel pressure	0.1 kPa
7	Oil pressure	Oil pressure	0.1 kPa
8	Manifold pressure	Boost pressure	0.1 kPa
9	Throttle angle	Throttle angle	0.1^o
10	Battery Voltage	Battery Voltage	0.01 V
11	Lambda 1	Lambda1	0.01 lambda

Channel Update Frequency		
Byte	**Name**	**Frequency**
1	Engine Speed	10 Hz
2	Air charge temp	2 Hz
3	Water temp	2 Hz
4	Oil temp	2 Hz
5	Exhaust temp	2 Hz
6	Fuel pressure	5 Hz
7	Oil pressure	5 Hz

8	Manifold pressure	10 Hz
9	Throttle angle	10 Hz
10	Battery Voltage	5 Hz
11	Lambda 1	10 Hz

Tatech V0.5

The Tatech ECU with V0.5 firmware outputs serial data at 57.6kbaud. The following configuration is used with the ECU interface:

Name	Race Technology Channel	Resolution
Engine rpm	Engine speed	25 RPM
EGT1	Exhaust 1 temp	5 ^{o}C
EGT2	Exhaust 2 temp	5 ^{o}C
EGT3	Exhaust 3 temp	5 ^{o}C
EGT4	Exhaust 4 temp	5 ^{o}C
Aux/EGT5	Exhaust 5 temp	5 ^{o}C
Aux/EGT6	Exhaust 6 temp	5 ^{o}C
Air temp	Ambient air temp	1 ^{o}C
Water temp	Water temp	1 ^{o}C
Oil temp	Oil temp	1 ^{o}C
Pressure 1	Boost pressure	0.1 bar
Pressure 2	Fuel pressure	0.1 bar
Pressure 3	Water pressure	0.1 bar
Lambda	Lambda1	0.01 lambda
Trim	Lambda 1 short term trim	1%
Throttle	Throttle position percentage	1%

VEMS ECU

Note: **AIM protocol used**

The VEMS ECU outputs 56 byte sequence of data at 19200bps baud rate. From this you will get the following channels of data:

Name	Race Technology Channel	Resolution
Battery Voltage	Battery Voltage	0.01 V
Lambda	Lambda 1	0.01 lambda
Coolant Temperature	Water Temperature	0.1 ^{o}C
Manifold air Temperature	Ambient Air Temperature	0.1 ^{o}C
Boost Pressure	Boost Pressure	1 mBar
Injector1 Pulse width	Fuel Injector 1 Pulse Width	1 ms
Throttle Percentage	Throttle Percentage	0.1%
RPM	RPM	25rpm

ViPEC V44, V88 and Link G4

The ECU with firmware version 4.2.0 onwards must be set up to output the required data at 57.6 kbaud, the DataStream mode also needs to be set to "off". After these settings have been configured turn the power off the ECU and back on again. Changes to baud rate and DataStream only take effect if this is done.

You will also need a cable from the ECU manufacturer in order to connect the Race Technology interface to the data output of the ECU.

The following configuration is used with the ECU interface:

ViPEC channel	RT channel	Resolution
RPM	RPM (Engine RPM)	25 rpm
ECT	Water temp (temperature 8)	1 ^{o}C
IAT	temperature 1	1 ^{o}C
ECU temperature	ECU temp (temperature 16)	1 ^{o}C
AN Temp 1	temperature 17	1 ^{o}C
AN Temp 2	temperature 18	1 ^{o}C
AN Temp 3	temperature 19	1 ^{o}C
AN Temp 4	temperature 20	1 ^{o}C
AN Volt1	Aux 14	0.1
AN Volt2	Aux 15	0.1
AN Volt3	Aux 16	0.1
AN Volt4	Aux 17	0.1
AN Volt5	Aux 18	0.1
AN Volt6	Aux 19	0.1
AN Volt7	Aux 20	0.1
AN Volt8	Aux 21	0.1
AN Volt9	Aux 26	0.1
AN Volt10	Aux 27	0.1
AN Volt11	Aux 28	0.1
MAP	Boost pressure	1 mbar
AIP	Ambient air pressure (Pressure 1)	1 mbar

Battery voltage	Battery voltage (misc 3)	0.01v
Throttle position	Throttle position	0.1%
Injector duty cycle	Fuel inj 1 PW	0.1%
Inj duty cycle (stg)	Fuel inj 2 PW	0.1%
Injector time	Fuel inj 1 PW on	1ms
Dwell time	Fuel inj 2 PW on	1ms
Injector angle	Throttle Angle	1°
Ignition angle	Ignition Angle	0.1^o
DI 1 frequency	EGR frequency	0.1 Hz
DI 2 frequency	ISBV frequency	0.1 Hz
DI 3 frequency	Nitrous Frequency	0.1 Hz

Connection to a PC Compatible Computer for Reflashing

The connection procedure for reflashing Race Technology interface products is illustrated in the diagram below.

OBD Interface, CAN and ECU Serial Interface:
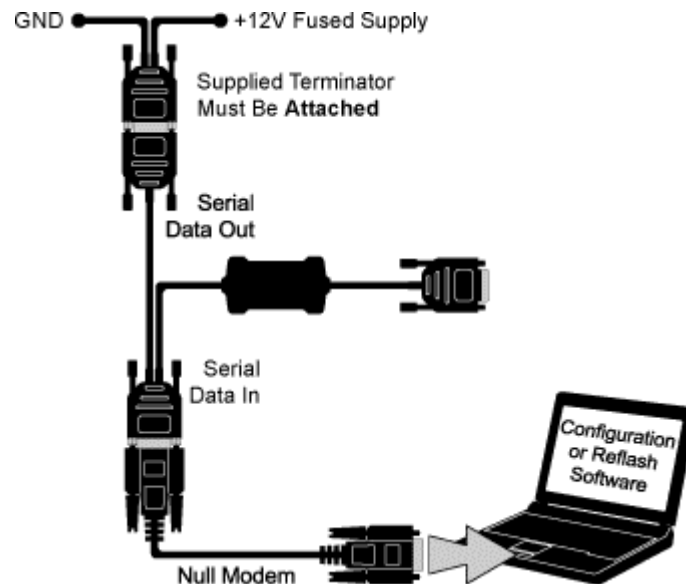
Reflashing Procedure

After connecting the ECU 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 \ configuration \ reflash. Then follow the on screen instructions provided by the Reflash Utility.

WARNING: Only reflash the ECU serial 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 – 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

ECU Connector

- 9 Way Male D-Type
- PIN 2 RS232 Input
- PIN 3 RS232 Output
- PIN 5 Ground

Appendix B - Specifications

- 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
- Serial Baud Rate: 115.2kbaud

Appendix C - Requirements for ECU interface data

In order to enable us to produce an ECU interface which will receive the serial data stream and re-transmit it for use with either a data logger or dashboard we need the following information as a minimum:

ECU interface specification

A detailed description of the data stream including checksums, marker bytes, standard data length, baud rate, etc. This is the basic data we require to enable us to decode the incoming stream.

Sample data stream

A sample of the ECU data, collected with the engine running. Ideally with the car actually being driven. As a minimum there should be some transient data on there such as increase / decrease in RPM. A minutes worth of data would be sufficient.

Other information

It is useful if data can be provided with regard to the engine operating conditions when the test data was recorded. This will enable us to confirm that the decoded rpm/temperature/pressure data etc is all correct.

How to log data using HyperTerminal

The Hyperterminal program can usually be found in the directory Programs/accessories/communications/hyperterminal. After starting the program you will be asked to enter a name for the new connection. Enter a name and click OK. The next screen will ask how you would like to connect. This will be through one of the serial ports, probably COM1 or COM2. After selecting the port click on OK. The baud rate settings which need setting up next will depend on the ECU you are using. You will need to consult the documentation for this. After the Bits per second have been set, the remaining settings will most likely be:

- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

After setting up this the main window should open showing connected in the bottom left hand corner of the screen.

To store the data from the ECU, select Transfer/Capture text and then set the file name you wish to store the data in. Click on Start to start the logging.

To end the data logging select Transfer/Capture text/stop.