Serial Interface Protocol Description for use on 941AA35x*

*The serial protocols detailed below for the 941 ECU are the same in principle for all serial ECUs. On less complex models there will simply be less information available.

This document describes the serial interface as used on MBE941 Engine Management System.

The 941 EMS has one Serial port, the serial port has two fundamentally different modes of operation

1. Byte Mode (For use with MBE's Easimap Windows based tool)
2. Broadcast Mode (Normally used to transmit a set of 16 parameters to a logging system)

Mode 1, Byte Mode, is enabled by holding the Fuel Trim and Ignition Trim inputs at a voltage other than zero. This is easiest done by connecting a 914 mapping box or connecting a proprietary MBE systems comms lead.

Mode 2, Broadcast Mode, is enabled by ensuring a nominally zero voltage on the Fuel Trim and Ignition Trim inputs (or open circuit) AND enabling the data logging feature using the Easimap application.

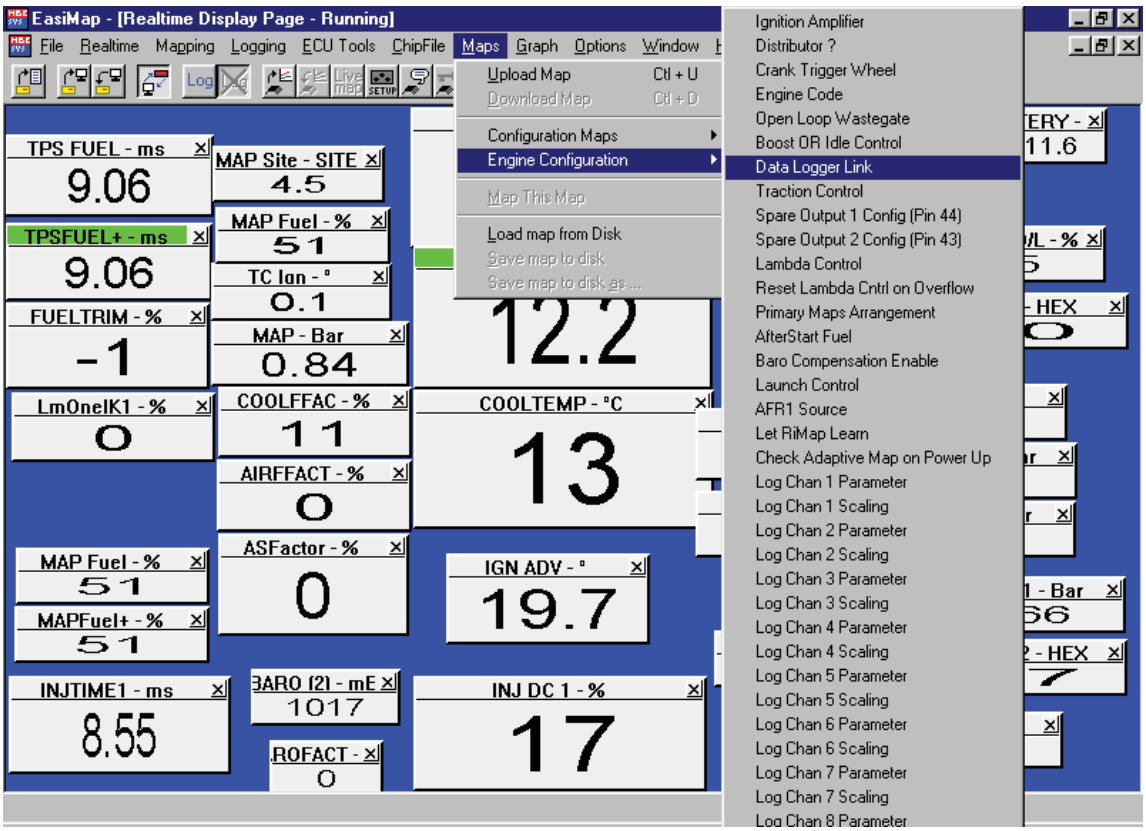
The following pins are used for Serial Port and Mapping Connections:-

	Main 55 Pin ECU Connector PIN NUMBER	9 Pin Connector (Inside 941 or rear of 956) PIN NUMBER	MBE Standard Harness Interface PIN NUMBER	PC Connector 9 way D Type
TXD (Serial ECU TXD data)	45	2	2	2
RCV (Serial ECU RCV data)	46	3	3	3
Fuel Trim	47	6	6	-
Ignition Trim	10	7	7	-
Ground	7	1	1	5

Note that when 914 Mapping box is connected it is not possible to transmit in broadcast mode.

Note that when an MBE comms lead is connected it is not possible to transmit in broadcast mode.

Broadcast mode is employed only when no 914 mapping box is connected AND no MBE comms lead is connected AND Datalogger link is enabled using Easimap application software running on a PC. The method to enable the Datalogger link is shown:-



Serial Interface Protocol

The Engine Management system serial interface is a 5V system and conforms to the following specification:-

Electrical

1. Input impedance (Serial RCV)	> 10 Kohms
2. Output impedance (Serial XMT)	< 350 ohms
3. Max input voltage (Serial RCV)	-15V < Vi < +15V
4. Output Voltage (Serial XMT)	0.1V < V_O < 4.9V

The above is normally acceptable for use with PCs.

The Serial port has two fundamentally different modes of operation

3. Byte Mode

4. Broadcast Mode (Normally used to transmit a set of 16 parameters to a logging system)

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2. Serial Broadcast

Use if :-

1. A higher data rate is required.

2. No connection to EMS RCV pin required thereby removing the risk of erroneously reconfiguring the EMS.

3. EMS data needs to be transmitted to more than one other system.

Description

Baud Rate 19200

Up to 16 parameters can be selected for transmission using the Easimap application. These 16 parameters are sent in a packet as described below.

The message packet is structured thus:-

FF,LSB0,MSB0,LSB1,MSB1,……LSB15,MSB15,Checksum

34 bytes in total

Each transmitted 16 bit word consists of 12 bits of data with the most significant 4 bits set zero.

The Most Significant Bit in the Least Significant Byte (Bit #7) is moved to Bit #14 and Bit #7 is set zero.

The only time a byte will have it's Most Significant Bit set 1 is the start of message flag FF.

The checksum is calculated as an 8 bit summation of the previous 33 bytes (including the FF)

Note that two bytes are transmitted for each channel regardless of the actual size of the channel (8 or 16 bit).

Some examples follow:-

Magnitude	Translation	
	MSB	LSB
0000H	00H	00H
007FH	00H	7FH
0080H	40H	00H
00FFH	40H	7FH
0F00H	0FH	00H
0FFFH	4FH	7FH

Data

The parameters available over the interface depend upon the application but the more popular ones are described in Table 2

Table 2

Word	Parameter	Scaling	Min	Max	Units	Resolution	Min	Max
1	Engine Speed	16 bit	0	12000	rpm	3.90625	0000	0C00
2	Ignition	8 bit	0	60	degs	c. 0.234	0000	0100
3	Injection Time	16 bit	0	32.760	ms	0.008	0000	0FFF
4	Throttle Angle	8 bit	-12	93	°	c. 0.41	0000	0100
5	Coolant Temp	8 bit	-30	130	C	0.625	0000	0100
6	Air Temp	8 bit	-30	130	C	0.625	0000	0100
7	Baro Pressure	8 bit	0	1060	mBar	1.5625	0000	0100
8	Lambda	8 bit	2.55	0.00	-	0.01	0000	0100
9	Ri	16 bit	0	1316	R	0.321	0000	0FFF
10	Oil Pressure	8 bit	0	10.0	Bar	0.0390625	0000	0100
11	Fuel Pressure	8 bit	0	10.0	Bar	0.0390625	0000	0100
12	Water Pressure	8 bit	0	10.0	Bar	0.0390625	0000	0100
13	Engine Oil Temp	8 bit	-30	130	C	0.625	0000	0100
14	Gearbox Oil Temp	8 bit	-30	130	C	0.625	0000	0100
15	Boost Pressure	8 bit	0	3.00	Bar		0000	0100
16	Spare Channel							