Document Number		DVIN0009	
Title		M800 OEM WRX56 Installation Document	
Approved By		*JA*	
Revision	**Date**	**Prepared By**	**Change History**
1	30/06/2006	RB	
2	18/12/2006	RB	Additional fuel pump pin out information
3	3/12/2007	RB	Correction to AUX8 detail and AT sensor information

Subaru WRX56

This Document refers to MoTeC M800 OEM installations to Subaru WRX and Sti Versions 5 and 6 using the WRX56 adaptor **(MoTeC Part No. 13004A)**. For all other applications please refer to the correct installation notes.

Contents

Introduction

The MoTeC M800 OEM is a MoTeC M800 ECU with an adaptor board that allows it to plug directly into the cars original wiring. ECU functionality is the same as the MoTeC M800 with the exception of the peak and hold injector drive function which is not possible using the M800 OEM. Only high impedance injectors can be used with the M800 OEM.

The WRX56 M800 Adaptor is an interface that allows an M800 OEM to be mounted in the factory ECU case for a Subaru WRX or Sti version 5 or version 6. The version 5 and 6 cars were produced from 1999 – 2000. This document describes the details of the WRX56 adaptor and the configuration options that are available.

The Motec M800 OEM is supplied as an assembly which consists of the M800 OEM ECU and the adaptor board. The adaptor board is vehicle specific and there are links on the adaptor board to allow for variations in different models and functional requirements of the user. A start file is installed which should be sufficient to start the engine prior to tuning. To ensure that the correct adaptor board, link setup and start file is provided full details of the vehicle must be quoted when ordering. Details should include the factory ECU part number, year, model and version.

Important Note!

The M800 OEM has been made to the highest standards and will provide reliable performance but should not be dismantled in any way due to the risk of damage. If the Link setup needs to be changed this should only be done by an authorised MoTeC dealer or someone with suitable equipment and soldering experience.

Parts Required

MoTeC Part No.	Description	Notes
13004A	ECU M800 OEM WRX56	MoTeC M800 OEM and WRX56 Adaptor board assembly
61046	OEM-CAN Loom	For PC connection to the ECU. Connects to the Communications connector on the OEM adaptor board to provide an external CAN communications connection.

Optional

MoTeC Part No.	Description	Notes
61044	OEM to lambda loom	For lambda sensor connection to the Lambda 2 connector on the OEM adaptor board. One end has a connector which connects to the Lambda 2 connection on the OEM Board, the other end is terminated with a 6 pin female DTM connector. Length is 30 cm.
61051	Lambda extension loom	A 2.5 meter extension to connect between the OEM-Lambda loom and a Bosch LSU wideband lambda sensor. One end has a 6 pin male DTM connector to mate to 61044; the other end has a connector for a Bosch LSU wideband lambda sensor. (MoTeC Europe part no.61050 3.0 metre).
28102	M800 Wideband Lambda	ECU upgrade required to control a wideband lambda sensor (free for the first 8 hours of engine running time).
28101	Logging 1 Mb	ECU data logging (free for the first 8 hours of engine running time).
26105	Advanced functions	ECU upgrade to enable the following functions: Over-run boost (ORB), Launch Control, Traction Control, Gear Change Ignition Cut.
28117	Over-run boost	ECU upgrade to enable Over-run boost (ORB) only without other advanced functions.

Model Specific Information

Engine Immobiliser.

The adaptor has been setup for vehicles with an engine immobiliser. **If the vehicle has no immobiliser fitted the links must be changed, otherwise the ECU will not receive correct ref/sync signals and will not start**. The links must be changed from "ref/sync with immobiliser" to "ref/sync without immobiliser". This changes the adaptor to account for the differences in wiring between vehicle models.

Air Temperature Sensor

STI models are fitted with an Air Temperature sensor which is connected to AT1. This sensor is not fitted to non-STI versions. If the sensor is assigned to the input and not fitted the ECU will report an AT Sensor Error.

Wide band Lambda

An NTK or Bosch LSU wide band sensor may be connected to the ECU in two different ways:

1. The adaptor PCB has a lambda connector. This connector allows an external loom to be used to connect a lambda sensor directly to the Lambda 2 pins on the M800. Note that Lambda 2 can be used with a single Lambda enable, as long as Lambda 1 is set to OFF or narrowband. This option is selected by default.
2. Modify the factory wiring. The Lambda 1 pins are connected to the front lambda sensor wiring.

Input / Output Test

It is important to carry out an output test and to check that all sensors are working prior to starting the engine. If outputs are not functioning or sensors are not reading correctly refer to the setup information in the Pinout Diagram.

Additional Sensors

It is possible to use un-assigned pins for additional sensors. The availability of spare inputs will vary depending on the application; refer to the table below and the M800 Pinout for details. There are spare 5v 8v 0v pins which are connected by joining links (refer to M800 Pinout section and Link Table for details).

Spare input	Notes
AT4	Without air conditioning, join Link6
AV5	No TCK, Join Link14
AV6	No TCK, Join Link20
AV7	
AV8	
DIG4	

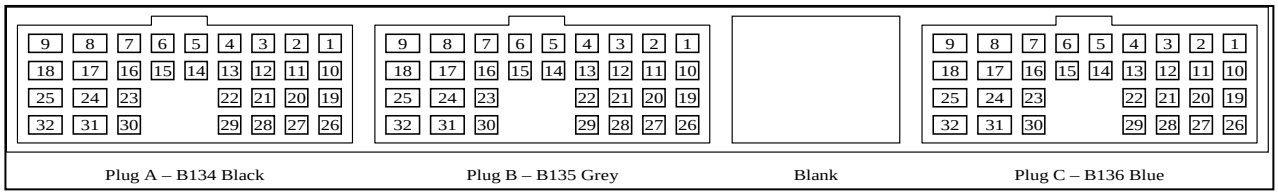
Using the Pinout Diagram

There are 2 Pinout sections in this document.

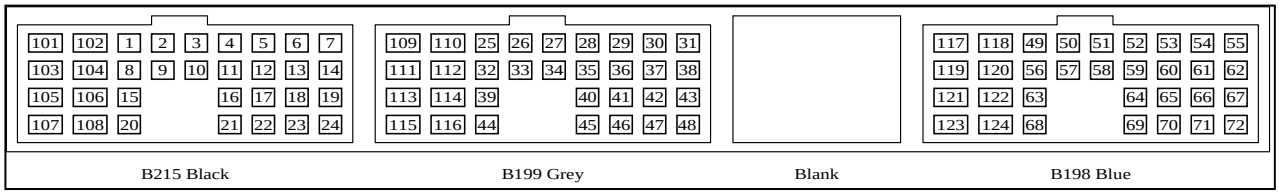
The M800 Pinout describes the function of each M800 pin with a reference to the OEM pin number it is connected to. There is a description of its function and optional function where applicable as well as notes on functional setup or calibration as necessary. Where there is one or more options for the pin the option is marked with a # or ##. The corresponding OEM Pin, function and setup notes refer to the parameters in M800 ECU Manager and are all marked with # or ## with any changes in link setup or vehicle modifications detailed.

The OEM ECU Pinout lists pins in order of the factory connector with corresponding MoTeC M800 pin and functional description.

M800 Pinout



Looking into Connector on ECU - English Language manual (note Manual shows numbering from pin side of female plugs)



Looking into Connector on ECU - Japanese Manual (note Manual shows numbering from pin side of female plugs)

M800 Pin	OEM Pin No.	Standard Function	Optional Function	Setup Notes
Power				
12V	C8 (118) C9 (117)	12v Switched (ECU Relay)		
GND	A9 (101) B28 (46) C17 (120) C18 (119) C29 (69) C30 (68)	ECU Earth		
8V ENG	C14 (58)	8V sensor supply		
5V ENG	B31 (116) C12 (60)	B31. Spare 5V pin C12. Sensor 5V		
0V ENG	B32 (116) C23 (63) C31 (124)	B32. Spare 0V pin C23. REF /SYNC 0V C31. 0V MAF		
8V AUX	B27 (47)			
5V AUX		5 V to internal barometer		
0V AUX				
Outputs				
INJ1	A31 (108)	Injector Cylinder 1		
INJ2	A25 (105)	Injector Cylinder 3		
INJ3	A32 (107)	Injector Cylinder 2		
INJ4	A18 (103)	Injector Cylinder 4		
INJ5	A22 (16)	A/C Clutch		**Function:** 104 Air Conditioner Clutch Parameters: On Throttle Pos 80 Off Throttle Pos 82 On RPM 4500 Off RPM 4600 Recover Time 2

M800 Pin	OEM Pin No.	Standard Function	Optional Function	Setup Notes
INJ6	A20 (18)	Alternator Control	# Spare output	**Function:** 113 Alternator Control Parameters Set as required. The alternator can be switched off at full throttle if desired. Use battery voltage and throttle position as table axis and configure so that the alternator is only cut when battery voltage is sufficiently high.
INJ7	A26 (24)	Pressure Exchange	#Spraybars Could be used as a spraybar output with wiring modification.	**Notes:** The factory ECU uses this solenoid to switch between measuring Barometric Pressure and MAP. Not normally required. #With wiring modifications this output could be used as an intercooler spraybar output. **#Optional Function:** 104 Spray Bars Parameters: Mode 1 On Value 90 Off Value 90 On Time 2.0 Off Time 5.0 Source 1 Logic Polarity 0
INJ8	A1 (7) A21 (17)	A1. Fuel Pump (with immobiliser) A21. Fuel Pump (without immobiliser)		**Function:** 101 Fuel Pump Parameters: Delay 5 Polarity 0 Output Mode 0
IGN1	A7 (1)	Ignition Cylinder 1 & 2		
IGN2	A16 (8)	Ignition Cylinder 3 & 4		
IGN3	A4 (4)	Thematic Fan		**Function:** 102 Thematic Fan Parameters On Temp 85 Off Temp 80 Time Out 10 Frequency 0 Polarity 0 Output Mode 0 Min Duty 0

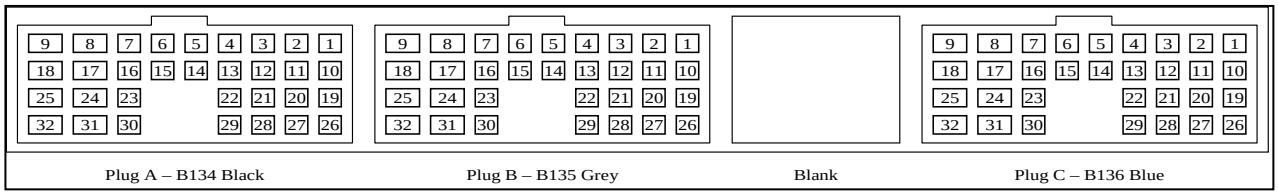
M800 Pin	OEM Pin No.	Standard Function	Optional Function	Setup Notes
IGN4	A13 (11)	A/C Fan		**Function:** 103 A/C Fan Parameters: On Temp 94 Off Temp 90 On Speed 0 Off Speed 0 Speed Channel 0 Time Out 0
IGN5	A28 (22)	Driver Warning Light (uses engine check light)	#Shift light	**Function:** 108 Driver Warning Alarm Parameters: Hold Time 2 Logic Polarity 0 Output Mode 0 Power Hold 1 **#Optional Function:** 107 Gear change light Set Parameters as required.
IGN6	B14 (34)	Tacho output		**Function:** 4 Tacho Signal Parameters: Calibration 2
AUX1	C32 (123)	Power down control		**Function:** 115 Status Output Parameters: Selection 19 Logic polarity 0 Output Mode 0 Flash 0 Flash Rate 0
AUX2		Lambda Heater (LA2 via connector on adaptor board)		**Function:** 9 Lambda Sensor Heater Parameters: Lambda Sensor 2
AUX3	A19 (19)	Boost Control Solenoid		**Function:** 1 Boost Control Parameters: Frequency 15

M800 Pin	OEM Pin No.	Standard Function	Optional Function	Setup Notes
AUX4	B7 (25)	Canister Purge		**Function:** 3 Aux Table Parameters: X Axis 1 Y Axis 4 PWM/Switched 1 Output Mode 0 Frequency 15 Minimum Duty 0 Maximum Duty 100
AUX5	A5 (3)	Idle Stepper Motor		**Function:** 8 Stepper Idle Speed Control Parameters: Idle RPM 850 Dead Band 50 Proportional Gain 8 Derivative Gain 88 Anti Stall Gain 60 Max Step Rate 200 Air Conditioner 13 Power Steering 12 ORB 0 Polarity 1 Also uses AUX6, AUX7 &AUX8. Automatically allocated.
AUX6	A6 (2)	Idle Stepper Motor		Automatically allocated
AUX7	A14 (10)	Idle Stepper Motor		Automatically allocated
AUX8	A15 (9)	Idle Stepper Motor		Automatically allocated

M800 Pin	OEM Pin No.	Standard Function	Optional Function	Setup Notes
Inputs				
REF	C5 (51) #C6 (50)	C5. With immobiliser	#C6. Without immobiliser	#Cut Link7 and Link8, join Link 16 and Link17 for cars without immobiliser.
SYNC	C6 (50) #C5 (51)	C6. With immobiliser	#C5. Without immobiliser	#Cut Link7 and Link8, join Link 16 and Link17 for cars without immobiliser
AT1	C19 (67)	Air Temperature Sensor (STI only)		Calibration: #2
AT2	C28 (70)	Engine Temp Sensor		Calibration: Select -1 refer to Engine temperature Sensor calibration table.
AT3	C25 (63)	Ignition Switch		**Function:** 8 Ignition Switch Parameters: Logic Polarity 1 Delay 0 Latch 0 Set AT Levels: AT3 Lo Level 5.5 AT3 Hi Level 6.0
AT4	B11 (37)	A/C request	# Spare input (no A/C	**Function:** 5 Air conditioning Request Parameters: Logic Polarity 1 Set AT Levels: AT5 Lo Level 5.5 AT5 Hi Level 6.0 **#Optional Function:** # Join Link6 to use as a spare AT input.
AT5	B29 (45)	Clutch Switch		Function: 12 Clutch Parameters: Logic Polarity 0
AT6	LA2 - 4	LA2 Calibration resistor		
AV1	C20 (66)	Throttle Position Sensor		Calibration : #9
AV2	C7 (49)	Manifold Pressure Sensor		Calibration: Select -15 and refer to MAP Sensor calibration table.
AV3	C1 (55)	Mass Air Flow sensor (MAF)		Calibration: #48
AV4		Internal Barometer		Calibration: #62
AV5	#C26	TCK	#Spare input	#Join Link14
AV6	#C10	TCK	#Spare input	#Join Link20
AV7	C2 (54)	Spare AV input		
AV8	C27 (71)	Spare AV input		

M800 Pin	OEM Pin No.	Standard Function	Optional Function	Setup Notes
DIG1	B26 (48)	Speed Measure		**Function:** 1 Speed Measure Parameters: Units 1 Calibration 248 Active Edge 0
DIG2	B22 (40)	Overrun Boost		**Function:** 13 Overrun Boost Parameters: Polarity 0 Spray Bars 0 Logging As required, this can be set so that logging will only start when ORB switch is active.
DIG3	B1 (31)	Power steering switch		**Function:** 18 Power Steering Set AT Levels: AT4 Lo Level 2 AT4 Hi Level 3
DIG4	C13 (59)	Spare digital input		
LA1S	C21 (65)	Narrow Band Lambda Sensor	#Wideband Lambda sensor (requires wiring modification – see LA1-P).	#Cut Link5
LA1P	C15 (57)		#Wideband Lambda Sensor Pump. Wiring must be modified to use sensor shield wire for LA1-P (user option)	#Cut Link5
LA2S		Wide band lambda using internal Lambda 2 connector		Calibration: 38 LA-2 connector on Adaptor
LA2P		Wide band lambda using internal Lambda 2 connector		
Communications				
RS232 TX	B16 (32) C4 (52)			
RS232 RX	B20 (42) C3 (53)			
CAN LO	B23 (39) #C4 (52)			#Cut Link9 and join Link2 for CAN-Lo on pin C4
CAN HI	B30 (44) #C3 (53)			# Cut Link1 and join Link3 for CAN-Hi on pin C3

OEM ECU Pinout



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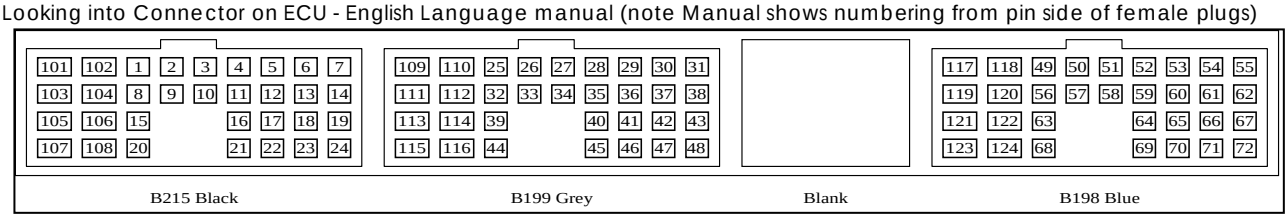


Looking into Connector on ECU - Japanese Manual (note Manual shows numbering from pin side of female plugs)

OEM Pin	Alt Pin	M800 Pin	Function
A1	7	INJ8	Fuel pump relay (with immobiliser)
A2	6	O/C	Not used
A3	5	O/C	Not used
A4	4	IGN3	Thematic fan
A5	3	AUX5	Idle stepper motor.
A6	2	AUX6	Idle stepper motor.
A7	1	IGN1	Ignition module Cylinders 1 and 2
A8	102	O/C	
A9	101	GND	Ground
A10	14	O/C	Not used
A11	13	O/C	Not used
A12	12	O/C	Not used
A13	11	IGN4	A/C fan
A14	10	AUX7	Idle stepper motor.
A15	9	AUX8	Idle stepper motor.
A16	8	IGN2	Ignition module Cylinders 3 and 4
A17	104	O/C	Not used
A18	103	INJ4	Injector Cylinder 4
A19	19	AUX3	Boost control valve
A20	18	INJ6	Alternator control or spare output
A21	17	INJ8	Fuel pump relay (without immobiliser)
A22	16	INJ5	A/C clutch or # spray bars
A23	15	O/C	Not used
A24	106	O/C	Not used
A25	105	INJ2	Injector Cylinder 3
A26	24	INJ7	Manifold pressure exchange
A27	23	O/C	Not used
A28	22	IGN5	Engine warning light or gear shift light
A29	21	O/C	Not used
A30	20	O/C	Not used
A31	108	INJ1	Injector Cylinder 1
A32	107	INJ3	Injector Cylinder 2

OEM Pin	Alt Pin	M800 Pin	Function
B1	31	DIG3	Power steering switch
B2	30	O/C	Not used
B3	29	O/C	Not used
B4	28	O/C	Not used
B5	27	O/C	Not used
B6	26	O/C	Not used
B7	25	AUX4	Canister purge #spare output
B8	110	O/C	Not used
B9	109	O/C	Not used
B10	38	O/C	Not used
B11	37	AT4	A/C request
B12	36	O/C	Not used
B13	35	O/C	Not used
B14	34	IGN6	Tacho
B15	33	O/C	Not used
B16	32	TX-232	Comms
B17	112	O/C	Not used
B18	111	O/C	Not used
B19	43	O/C	Not used
B20	42	RX-232	Comms
B21	41	O/C	Not used
B22	40	DIG2	ORB enable
B23	39	CAN-Hi	Comms
B24	114	O/C	Not used
B25	113	O/C	Not used
B26	48	DIG1	Speed measure
B27	47	8V-AUX	8V - RS232 and CAN comms connector (user option)
B28	46	GND	0V - RS232 and CAN comms connector (user option)
B29	45	AT5	Neutral switch
B30	44	CAN-Lo	
B31	116	5V-ENG	Spare 5V pin
B32	115	0V-ENG	Spare 0V pin

OEM Pin	Alt Pin	M800 Pin	Function
C1	55	AV3	MAF signal
C2	54	AV7	Spare AV input
C3	53	RX-232, #CAN-Hi	Comms
C4	52	TX-232, #CAN-Lo	Comms
C5	51	REF, #SYNC	REF (with immobiliser) #SYNC (without immobiliser)
C6	50	SYNC, #REF	SYNC (with immobiliser) #REF (without immobiliser)
C7	49	AV2	MAP sensor
C8	118	V-BAT	12 V supply
C9	117	V-BAT	12 V supply
C10	62	K-12, #AV6	Thermocouple (TCK) or #spare AV input
C11	61	K-13	TC- (TCK)
C12	60	5V-ENG	5V sensor supply
C13	59	DIG4	Spare digital input
C14	58	8V-ENG	8V sensor supply
C15	57	LA1-P	Wideband lambda sensor pump
C16	56	O/C	Not used
C17	120	GND	Ground
C18	119	GND	Ground
C19	67	AT1	Air temperature sensor (STI Models only)
C20	66	AV1	Throttle position sensor
C21	65	LA1-P	
C22	64	O/C	Not used
C23	63	0V-ENG	REF/SYNC 0V
C24	122	0V- ENG	MAP, ET, TPS 0V
C25	121	AT3	Ignition switch input
C26	72	K-1, #AV5	Knock monitor (TCK), # spare voltage input
C27	71	AV8	Spare AV input
C28	70	AT2	Engine temperature
C29	69	GND	Ground
C30	68	GND	Ground
C31	124	0V-ENG	MAF 0V
C32	123	AUX1	Power down

Calibration Tables

Engine Temperature Sensor (AT2)

Degrees C 1 Decimal place

Temp	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
Input(V)	5.468	5.322	5.175	4.980	4.672	4.321	3.955	3.569	3.071	2.597	2.080	1.660	1.352
A/D	1120	1090	1060	1020	957	885	810	731	629	532	426	340	277

Temp	80	90	100	110	120	130	140	150	160	170	180	190	200
Input(V)	1.137	1.005	0.834	0.693	0.610	0.556	0.502	0.449	0.400	0.356	0.322	0.283	0.244
A/D	233	206	171	142	125	114	103	92	82	73	66	58	50

MAP Sensor (AV2)

MAP kPa

MAP	0	20	40	60	80	100	120	140	160	180	200	220	240
Input(V)	0.732	1.064	1.362	1.655	1.943	2.236	2.524	2.817	3.110	3.403	3.691	3.974	4.267
A/D	160	228	288	348	410	473	538	600	657	721	785	850	908

Temp	260	280	300	320	340	360	380	400	420	440	460	480	500
Input(V)	4.555	4.599	4.648	4.687	4.785	4.882	4.980	5.029	5.039	5.048	5.058	5.068	5.078
A/D	976	1019	1068	1105	1142	1163	1168	1173	1179	1184	1189	1195	1200

Setup

Parameter	Value	Notes
Injector Current	0	
Injector Battery Comp	4	See Injector Battery Comp Table
Eff Calc Method	4	
Load Calc Method	4	
Number of Cylinders	4	
Ref/Sync Mode (REF)	15	
Crank Ref Teeth (CRT)	6	
Tooth Ratio	50	
Crank Index Position(CRIP)	604	
Ignition Type (IGN)	1	
Number of Coils (COIL)	2	
Ignition Dwell Time (DELL)	4.0	See Ignition Dwell Table
Ignition Delay Time	50	
Firing Order	1, 3, 2, 4.	

Injector Battery Comp

Bat V	5	6	7	8	9	10	11	12	13	14	15

U sec	2500	2500	2400	2140	1660	1320	1060	880	740	660	580

Ignition Dwell Table

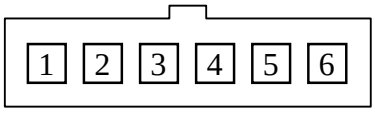
Bat V	10	11	12	13	14	15
Dwell	7.0	6.1	5.4	4.9	4.3	4.0

Link Table

Open Links	Closed Links	Function
2, 3	1, 9	RS232 via diagnostic pins *
1, 9	2, 3	CAN via diagnostic pins
	5	LA1 Narrow band sensor *
5		LA1 Wide band sensor
6		AT4 active high A/C request *
	6	AT4 spare input
16, 17	7, 8	REF/SYNC with immobiliser *
7, 8	16, 17	REF/SYNC without immobiliser
	10, 11, 12, 15	D9 Comms via spare pins *
10, 11, 12, 15		No D9 Comms via spare pins
13		No CAN terminator *
	13	CAN terminator
14, 20		TCK Installed *
	14, 20	AV5 and AV6 spare inputs (no TCK)
21		2 wire thermocouple *
	21	Thermocouple to 0V in loom

*** Denotes the default link setup**

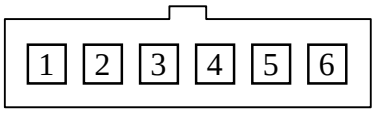
Lambda 2 Connector



Looking at pins on male plug (into connector)

OEM	M800	Function
La2-1	LA2-P	La2 header – Pump
La2-2	0V-AUX	La2 header – 0V to sensor
La2-3	LA2-S	La2 header – Sense
La2-4	AT6	La2 header – Calibration resistor
La2-5	VBAT	La2 header - +12 heater
La2-6	INJ6	La2 header – heater

Comms Connector



Looking at pins on male plug (into connector)

OEM	M800	Function
C-1	CAN-HI	to D9 pin 1 - CAN Hi
C-2	CAN-LO	to D9 pin 6 - CAN Lo
C-3	TX-232	to D9 pin 2 - Tx RS232
C-4	RX-232	to D9 pin 3 - Rx RS232
C-5	8V-AUX	to D9 pin 8 – 8V AUX
C-6	GND	to D9 pin 5 – 0V COMMS