Mitsubishi EVO 4-8 Plug-in

Evolution 4-8

EMtron Australia

Contents

1.0 Introduction

The Mitsubishi EVO 4-8 ECU is designed to be plugged into the OEM harness to allow for a true "Plug and Play" install. The system is based on the KV Series Motorsport ECU, so all the same features are available excluding any limitations based around the OEM connector system. An Expansion port is included giving access to unused Input channels. CAN Bus 1 is also available providing additional I/O expandability.

2.0 Plugin Features

General

- KV8 ECU based platform.
  - Dual 100MHz processors
  - 32MB ECU logging memory
  - Over 1000 logging channels available
  - 1Hz to 500Hz logging rate
- Aluminium 6061 Grade CNC billet enclosure
- Compatible with all Emtron proven motorsport features (Launch Control, Rolling Launch, Anti-Lag, Traction Control)
- Upgradeable to run the Emtron fuel model through installation of a flex meter, fuel temperature and fuel pressure sensor
- Idle speed closed loop control using DBW with advanced Throttle Mass Flow (TMF) airflow calculations
- Knock control with high speed digital filtering for each cylinder using the OEM sensor with selectable centre frequency and bandwidth
- Pre-configured Calibration file loaded providing a comprehension tuning platform
- Input Expansion Capabilities through DTM connector
  - 3x User Analog Volt Inputs (Fuel Temperature, Fuel Pressure, Inlet Temperature)
  - 1x User Digital Input (Flex Meter Input and switch inputs)
  - 2x User Analog Inputs
- Emtune software for tuning and data analysis

Communications

- CAN 2.0B Bus 1: User CAN Bus for I/O expansion (Lambda, EGT)
- High Speed Ethernet 100Mbps for tuning software connection

Operating Temperature

- Recommended operating range: -30 to 85°C (-22 to 185°F)

Physical

- Enclosure Size 160 mm x 162 mm x 38 mm
- 890g

3.0 Installation

3.1 Expansion Port

The ECU's input capabilities can be expanded using the expansion connection which is a male DTM 12 Way. See Table 3.0.

These additional inputs can be connected to any sensor, but the recommended sensors are indicated in brackets.

Pin	Function
1	Analog Sensor 0V Reference
2	5V Vref2 Supply
3	AN 8 (e.g. Fuel Temp or Inlet Temp)
4	AN 11 (e.g. Fuel Temp or Inlet Temp)
5	AN 12 (e.g. Fuel Pressure)
6	DI 6 (e.g. Ethanol Content Sensor)
7	DI 13
8	DI 14
9	14V Out Protected (e.g. ELC2 Power Supply). Post ECU serial numbers 2700 only.
10	ECU Ground (e.g. ELC2 or E85 Sensor Ground) Post ECU serial numbers 2700 only.
11	CAN 1 Hi
12	CAN 1 Lo

Table 3.0 - Expansion Port Pinout (DTM06-12SA)

3.2 CAN Bus 1 Wiring

The ECU CAN Bus 1 is reserved for Emtron CAN Bus devices, expanding the IO capability of the ECU. The following devices can be connected:

- ELC1/2 (Emtron Lambda to CAN 1/2 channel)
- ETC4/ETC8M (Emtron Thermocouple to CAN 4/8 channels)
- EIC10/EIC16M (Emtron Input to CAN 10/16 Channel)

For more information on each device refer to the downloads section on the website: (emtron.world/downloads)

Emtron ELC/ETC4/EIC10 to CAN

All these CAN devices share a common power, ground and CAN pinout using a 4-way DTM. See Table 3.1.

Pin	Function	Wire Colour
1	Ground	BLACK
2	CAN Lo	GREEN
3	CAN Hi	YELLOW
4	12V Supply	RED

Table 3.1. CAN Device Power and CAN Deustch Connector Pinout

To help with installation time, each CAN Device pin can be directly connected into the ECU IO Expansion port. Pinout information is shown Table 3.2.

Name	ECU IO Expansion 12-Way DTM	CAN Device 4-Way DTM
Ground	Pin 8	Pin 1
CAN 1 Lo	Pin 12	Pin 2
CAN 1 Hi	Pin 11	Pin 3
Power	Pin 7	Pin 4

Table 3.2. IO Expansion to CAN Device wiring

The following points should be noted when using the CAN Bus:

- CAN Bus High and Low are differential signals, so twisted pair **MUST** be used. Failing to do so will compromise the entire CAN Bus System. It is recommended to twist the CAN wire pairs at a minimum one twist per 40mm of cable.
- In some extreme environments, shielded twisted pair may be required to help with reliability and data integrity.
- The less connectors in any transmission system the better. Unnecessary connectors are almost guaranteed to present an impedance discontinuity and hence may cause reflections and data loss.
- CAN Bus termination must be done correctly by using a 120 ohm 0.25W resistor at each END of the bus system. See the example in Figure 3.1.
- Maximum Stub length to a device from the main Bus is recommended at 0.3m, in accordance with High-Speed ISO 11898 Standard specification. See Figure 3.2.

ALL Emtron CAN devices do **not** include an on-board CAN termination resistor, allowing the device to be wired at any position on the Bus. CAN Bus termination must be done correctly by using a 120 ohm 0.25W resistor at each end of the bus system as mentioned above.
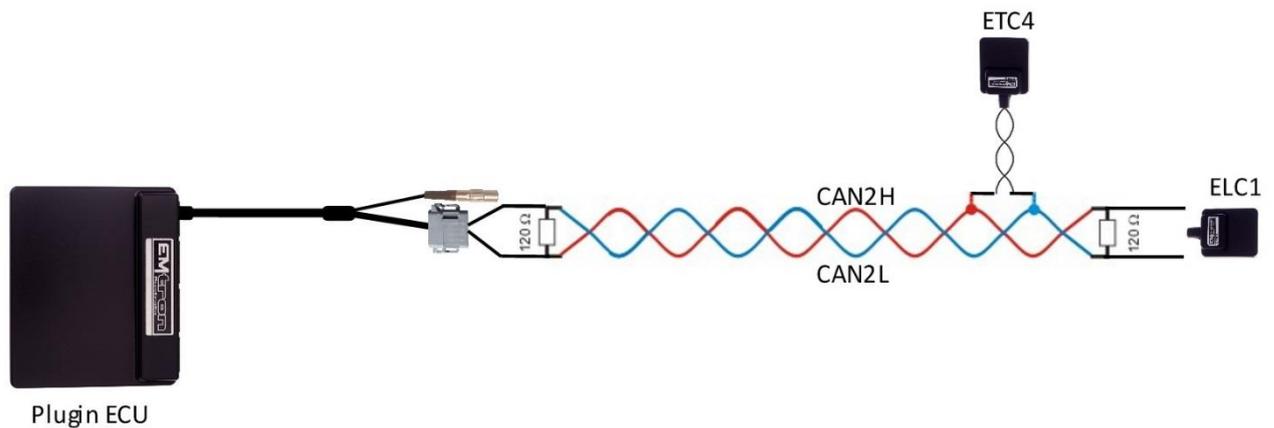

Figure 3.1. CAN Bus Wiring Example. ECU and ELC1 at each end with 120 Ohm Termination
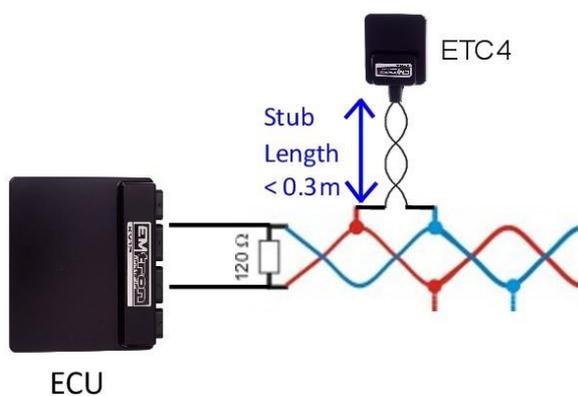

Figure 3.2. CAN Bus Wiring Example. Stub Length less than 0.3m

3.3 Sensor Wiring

5V VRef2 Sensor Supply Pin (Pin 2 of Expansion port)

This is a 250mA 5V output designed to supply automotive sensors.

Sensor 0V Reference Pin (Pin 1 of Expansion port)

This pin should be connected directly to the 0V (Ground) pin on any low current analog sensor, for example Pressure or Temperature. Figures 3.3 and 3.4 show the correct and incorrect wiring system.

- **DO NOT** connect the 0V Reference pin directly to the Engine Block or ECU Ground. This is a dedicated and specialised 0V/ground output for analog sensors.
- **DO NOT** connect frequency-based sensor grounds to the 0V Reference pin; for example, an Ethanol content sensor. Use Pin 8 (Ground) in the Expansion port.
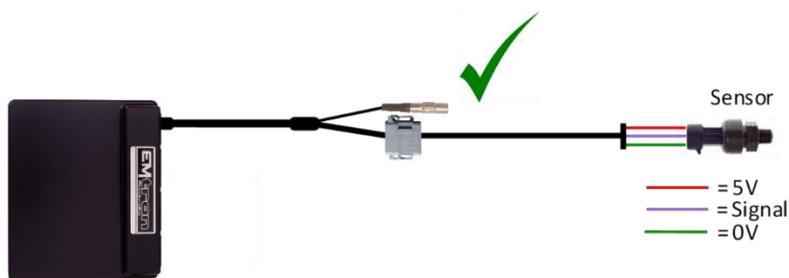

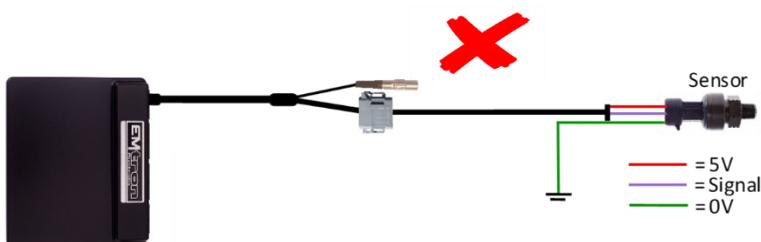
Figure 3.3. Correct Pressure Sensor 0V Wiring

Figure 3.4. Incorrect Pressure Sensor 0V Wiring

3.4 Ethanol Content Sensor wiring

An Ethanol Content sensor can be wired into the ECU using the Expansion port. The following channel assignment is recommended for the GM sensor:

GM Sensor Pinout	Expansion Port	Description
Pin 1	Pin 9. 14V Protected	Supply, 8V or 14V
Pin 2	Pin 10. ECU Ground	Ground
Pin 3	Pin 6. DI 6	Output. Temperature and Ethanol Content
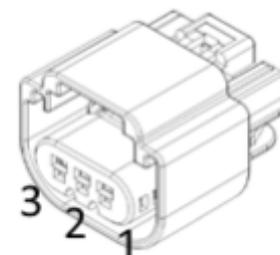
NOTE:

- **DO NOT** connect the Ethanol Content sensor ground to the "Analog Sensor 0V Reference". Use the ECU Ground from Pin 10 in the Expansion port.
- The Ethanol sensor produces a frequency based output. Suitable ECU channels are DI 1-8.

Description	Calibration
Ethanol Content (%)	50Hz = 0% Ethanol 150Hz = 100% Ethanol
Fuel Temperature	1ms = -40 DegC 5ms = 125 DegC

To config the ECU for this sensor, select the Ethanol Sensor Input Source to DI6. The ECU will automatically decode the Ethanol Content and Fuel Temperature.

Once the Ethanol Senor has been assigned an input, more settings become available in the Tuning View -> Engine Functions menu.
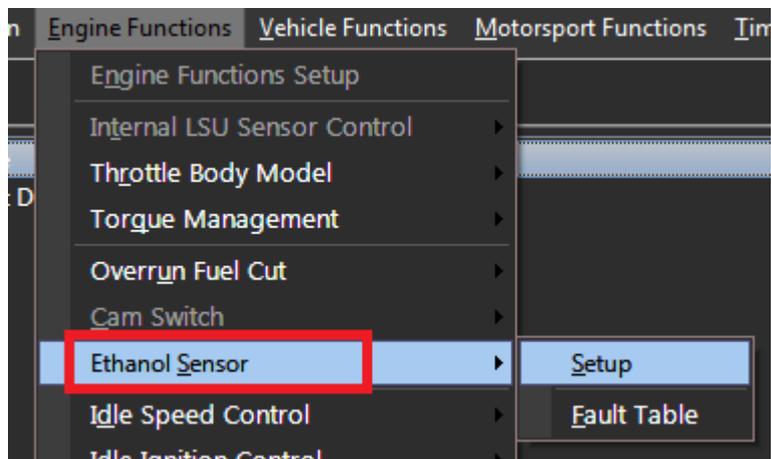
4.0 ECU Channel Assignment

ECU Channel - Injection	Function
Injection Channel 1	Fuel Injector Cylinder 1
Injection Channel 2	Fuel Injector Cylinder 2
Injection Channel 3	Fuel Injector Cylinder 3
Injection Channel 4	Fuel Injector Cylinder 4
Injection Channel 5	Rear Lambda Heater
Injection Channel 6	Front Lambda Heater
Injection Channel 7	A/C Fan Relay (High)
Injection Channel 8	CE Light
Injection Channel 9	Not Used
Injection Channel 10	Not Used
Injection Channel 11	Not Used
Injection Channel 12	Not Used

ECU Channel - Ignition	Function
Ignition Channel 1	Ignition Cylinder 1/4
Ignition Channel 2	Ignition Cylinder 2/3
Ignition Channel 3	A/C Fan Relay (Low)
Ignition Channel 4	IC Spray Lamp
Ignition Channel 5	Alternator Load Control
Ignition Channel 6	Fuel Pump Relay
Ignition Channel 7	Fuel Pump Speed Relay
Ignition Channel 8	A/C Clutch Relay
Ignition Channel 9	Not Used
Ignition Channel 10	Not Used
Ignition Channel 11	Not Used
Injection Channel 12	Not Used

ECU Channel - Analog Inputs	Function
Analog Voltage 1	MAP
Analog Voltage 2	TPS
Analog Voltage 3	02 Front
Analog Voltage 4	02 Rear
Analog Voltage 5	Not Used
Analog Voltage 6	Not Used
Analog Voltage 7 (Pull-up Channel)	Engine Temperature
Analog Voltage 8 (Pull-up Channel)	(IO Expansion port)
Analog Voltage 9 (Pull-up Channel)	Intake Temperature (IAT MAF)
Analog Voltage 10 (Pull-up Channel)	Fuel Tank Temp (USDM)
Analog Voltage 11 (Pull-up Channel)	IO Expansion port)
Analog Voltage 12 (Pull-up Channel)	IO Expansion port)
Analog Voltage 13	Not Used
Analog Voltage 14	Not Used

NOTE: Analog Voltage Channels 7-12 have switchable pull-ups which are suitable for temperature measurement.

ECU Channel - Digital Inputs	Function
Digital Input 1	MAF Reset
Digital Input 2	Vehicle Speed
Digital Input 3	Clutch Switch
Digital Input 4	Power Steer Pressure Switch
Digital Input 5	Alternator FR Signal
Digital Input 6	IO Expansion port (Ethanol Sensor)
Digital Input 7	MAF
Digital Input 8	I/C Spray Switch - Auto
Digital Input 9	I/C Spray Switch - Manual
Digital Input 10	ACD Input
Digital Input 11	Ignition Start
Digital Input 12	A/C Pressure Switch
Digital Input 13	IO Expansion port
Digital Input 14	IO Expansion port

ECU Channel - Auxiliary Outputs	Function
Auxiliary 1	Purge Solenoid
Auxiliary 2	Wastegate Solenoid
Auxiliary 3	Tacho
Auxiliary 4	Engine Fan Relay (EVO 7-8) - PWM
Auxiliary 5	Stepper Motor A1
Auxiliary 6	Stepper Motor A2
Auxiliary 7	Stepper Motor B1
Auxiliary 8	Stepper Motor B2
Auxiliary 9	Fuel Pressure Solenoid
Auxiliary 10	I/C Spray Relay
Auxiliary 11	Engine Fan Relay
Auxiliary 12	Sec Air/EGR Solenoid
Auxiliary 13	EV08 Crank ground/EVO7 Cat Light
Auxiliary 14	Not Used
Auxiliary 15	Not Used
Auxiliary 16	Not Used

ECU Channel - Crank/Cam	Function
Crank Index	Crank Sensor
Sync Sensor	Cam Position - Inlet LH

5.0 Plug-in Specific Information

5.1 Fuel Model

The base ECU calibration is supplied in Speed Density mode. It is recommended to install an Emtron 4Bar MAP sensor and wire it to a spare ANV Input in the Emtron expansion port. The ECU may also be configured to run on MAF only or using a combination MAF and Speed Density (MAP).

5.2 Inlet Air Temperature

ANV9 (ECU Pin 72) is assigned to the Inlet Air Temperature Sensor. The sensor is physically located in the Mass Air Flow Meter. This is not ideal for the fuel model and it is recommended to install an inlet air temperature sensor in the inlet manifold. The Mass Air Flow Meter wiring can be reassigned or the Air Temp sensor can be wired directly to pin 3 or 4 in the Emtron expansion port connector as shown in Table 3.0. Anv8, 11 or 12 may then be assigned in the inputs setup page in Emtune.

Some EVO models have an inlet air temperature sensor fitted however this is not accounted for in the Emtron Plugin ECU. It is recommended to wire to the expansion port connector.

5.3 ECU Pin 40 Configuration

ECU Pin 40 configuration will depend on the model. A low current, low side driver is connected to this pin controlled by Auxiliary Output 13.

EVO 8- Crank/Cam Sensor Ground

This is a ground pin for the Crank and Cam sensors and acts as an immobiliser function. Aux 13 needs to be switched ON to provide a ground and allow the engine to start.

EVO 4-7 – CAT Light

This is the CAT light and requires a ground to switch the light on. Aux 13 can be used to control this light.

6.0 Diagnostic Trouble Codes (DTCs)

On initial installation it is advised to clear all the DTC's if error(s) are reported. To check: connect to Emtune and look at the DTC status in the bottom toolbar. If there are Errors the status box will be Red as shown in Figure 6.0.
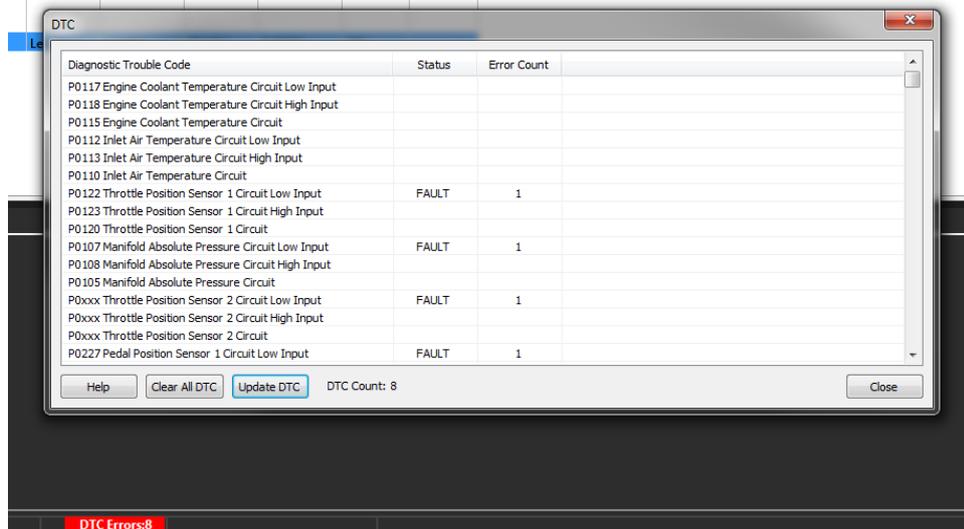

Figure 6.0. DTC example showing 8 errors.

To open the DTC window, click on the DTC Status box in the bottom toolbar OR use the File menu -> Open DTC. Next select "Clear ALL DTCs" and confirm all the Error Codes have been removed; the DTC Status box should go Green indicating this as shown in Figure 6.1. Close the DTC window.
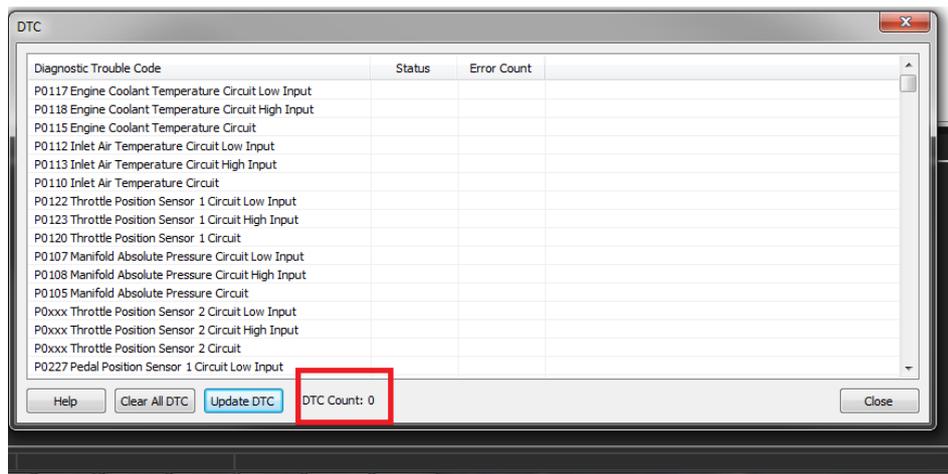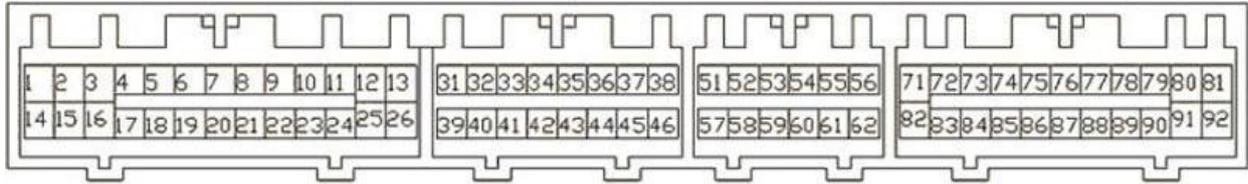

Figure 6.1. DTC example showing no errors.

If the Error Codes have not all been removed, select "Update DTC" then use the DTC window to locate the sensor that is on fault.

7.0 Ordering Information

Product	Part Number
Emtron Mitsubishi EVO 4-8 Plugin	1609-52248
Emtron Ethernet Tuning Cable (1.5m)	553-15

Appendix A – EVO 4-8 ECU Pinout

Pin	Function	Channel Assignment
1	Injector 1	INJ 1
2	Injector 3	INJ 3
3	Fuel Pressure Solenoid	AUX 9
4	Stepper Motor Coil A1	AUX 5
5	Stepper Motor Coil B1	AUX 6
6	EGR Solenoid Relay	AUX 12
7	N/C	
8	Fuel Pump Relay	IGN 6
9	Purge Solenoid	AUX 1
10	Ignition Coil 1 & 4	IGN 1
11	Wastegate Solenoid	AUX 2
12	ECU 14V from Main Relay	ECU SUPPLY
13	Engine Block/Power Ground	ECU GROUND
14	Injector 2	INJ 2
15	Injector 4	INJ 4
16	Evaporative Purge Solenoid	AUX 1
17	Stepper Motor Coil A2	AUX 6
18	Stepper Motor Coil B3	AUX 8
19	Volume Airflow Sensor Reset Signal	DI 1
20	Engine Fan Speed low (EVO 4-6)	AUX 11
21	Engine Fan PWM Control (EVO 7-8)	AUX 4
22	A/C Clutch Relay	IGN 8
23	Ignition Coil 2 & 3	IGN 2
24	N/C	
25	ECU 14V from Main Relay	ECU SUPPLY
26	Engine Block/Power Ground	ECU GROUND

Pin	Function	Channel Assignment
31	N/C	
32	A/C Fan Relay High	**INJ 7**
33	Alternator G Terminal	**IGN 5**
34	A/C Fan Relay Low	**IGN 3**
35	I/C Spray Lamp	**IGN 4**
36	CE Light	**INJ 8**
37	Power Steer Pressure Switch	**DI 4**
38	ECU Main Relay Control	**MAIN EFI RELAY**
39	Fuel Pump Speed	**IGN 7**
40	Crank/Cam sensor ground (EVO8) / CAT (EVO 4-7)	**AUX 13**
41	Alt FR terminal (Field response) - Freq Based	**DI 5**
42	N/C	
43	Clutch Switch	**DI 3**
44	I/C Spray Switch - Auto	**DI 8**
45	AC Pressure Switch	**DI 12**
46	N/C	

Pin	Function	Channel Assignment
51	Immobiliser	
52	N/C	
53	Sec Air Solenoid (EVO7)	**AUX 12**
54	O2 Heater Rear	**INJ 5**
55	I/C Spray Relay (EVO7)	**AUX 10**
56	Diagnostics – OBD II Pin 1	
57	I/C Spray Relay (EVO8)	**AUX 10**
58	Tacho	**AUX 3**
59	N/C	
60	O2 Heater Front	**INJ 6**
61	N/C	
62	Diagnostics – OBD II Pin 7	

Pin	Function	Channel Assignment
71	Start Switch	DI 11
72	Intake Air Temperature	ANV 8
73	Manifold Absolute Pressure Sensor	ANV 1
74	N/C	
75	O2 Sensor Signal Rear	ANV 4
76	O2 Sensor Signal Front	ANV 3
77	Fuel Tank Temperate (USDM)	ANV 10
78	Knock Sensor	KNOCK 1+
79	N/C	
80	Battery Backup (+12 Constant)	Internal Flywheel Supply
81	+ 5V Supply	+5V Vref1
82	Ignition Switch	Ignition Switch
83	Engine Coolant temperature	ANV 7
84	Throttle Position Sensor	ANV 2
85	External Barometric Pressure	
86	Vehicle Speed	DI 2
87	ACD Signal/Idle Switch	DI 10
88	Cam Signal	Sync Sensor
89	Crank Signal	Crank Index
90	Volume Air Flow Sensor	DI 7
91	I/C Spray Switch – Manual (EVO 7-8)	DI 9
92	Sensor Ground (MAP, TPS)	Sensor 0V Reference

Emtron Australia Pty Ltd
Unit 8, 36 Lidco Street
Arndell Park NSW 2148
Australia

(See the www for contact information)

www.emtron.world
www.emtronaustralia.com.au