



# 600 Series ECU

## Installation Manual

OMEM600

# Contents

<b>1 Introducing Omex Engine Management.....</b>	<b>4</b>
<b>2 Standard Functions.....</b>	<b>5</b>
2.1 Crank Position Sensor (CPS).....	6
2.2 Throttle Position Sensor (TPS).....	9
2.3 Coolant Temperature Sensor (CTS).....	10
2.4 Air Temperature Sensor (ATS).....	11
2.5 Manifold Absolute Pressure (MAP) Sensor.....	12
2.6 Barometric Pressure Sensor.....	13
2.7 Lambda Sensor (oxygen sensor).....	14
2.8 Fuel Injectors.....	15
2.9 Ignition Coil(s).....	17
2.10 Idle Controls.....	20
2.11 Shift Light.....	23
2.11.1 Shift points per gear (Road Speed Sensor).....	23
2.12 Tachometer.....	25
2.13 Fuel Pump.....	26
2.14 Radiator Fan.....	27
2.15 Knock Sensor.....	28
<b>3 Auxiliary Function Inputs and Outputs.....</b>	<b>29</b>
3.1 Radiator Fan 2.....	30
3.2 VTEC Cam Control.....	31
3.3 Turbocharger Boost Control.....	32
3.4 Full Throttle Gearshift.....	33
3.5 Anti-lag (ALS).....	34

<b>4 Other features.....</b>	<b>35</b>
4.1 Launch Control.....	36
<b>5 Wriing.....</b>	<b>37</b>
5.1 Semi Assembled Loom Construction.....	37
5.2 Ready Built Harness.....	37
5.3 ECU Connector.....	38
5.4 Typical Complete Wiring.....	40

# **1 Introducing Omex Engine Management**

Thank you for choosing Omex Engine Management. This manual is written to help the user through the specifics of installing the OMEM600 ECU. It is essential that the user reads the whole of the manual before attempting to install the system. Incorrect use of the Omex system could potentially lead to damage to the engine and personal injury. If you have any doubts about fitting these parts then please contact Omex for help.

Omex may not be held responsible for damage caused through following these instructions, technical, or editorial errors or omissions. If you have any doubts about fitting these parts or using the software then please contact Omex for help.

## 2 Standard Functions

Things that are common to nearly all engines have dedicated positions in the ECU. Things that are used on only some engines such as VTEC cam control or full throttle gearshift are not in dedicated positions; they can be placed on one of the auxiliary function positions.

This chapter covers fitting the components that have dedicated ECU positions. Auxiliary functions are in chapter 3.

## 2.1 Crank Position Sensor (CPS)

### Trigger Wheel

The ECU needs to know engine speed and position in order to supply the correct fuelling and ignition timing. This is often achieved using the standard sensors, but can involve putting new sensors on the engine. Engine speed is measured using a pattern of teeth on a crank wheel or flywheel (known as a trigger wheel). The 600 ECU supports the following patterns;

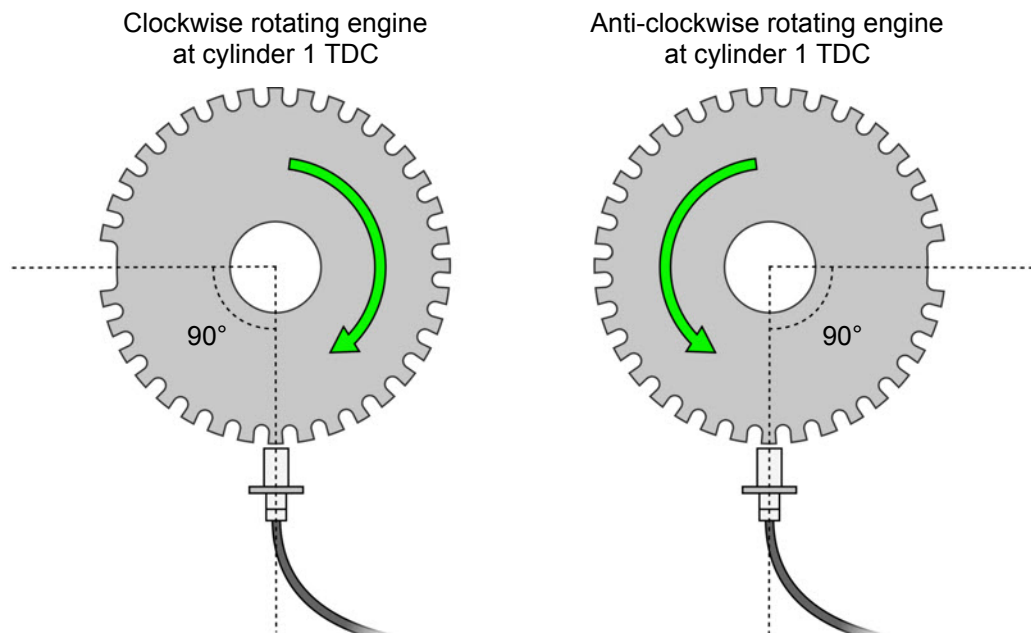
Ford 36-1	Rover 18-1, 18-1 (distributor ignition only)
Bosch 60-2	Toyota 36-2
Rover K (late)	Honda 12+1

If you have any doubt as to whether the trigger pattern on your engine is supported by the 600 ECU, then remove the sensor, count the pattern of teeth, and contact Omex.

Many older engines do not have a trigger wheel. In this case an external wheel must be fitted. 36-1 is our preferred pattern. There is a minimum diameter for these wheels dependent on the sensor used, the trigger pattern, and the engine operating speeds. Typically the larger the trigger wheel diameter the better. The wheel needs to be mounted on the front pulley. It may also be possible to machine this pattern into the front pulley wheel, remembering that the pattern must be in a ferrous material for the sensor to work and if the crank pulley has a damper inbuilt you must mount the trigger wheel onto the crank side of this damper. Omex can supply general purpose trigger wheels in diameters of 100mm and 140mm.

If installing a trigger wheel of missing tooth type,

- Accurately mark TDC.
- Mount your crank position sensor (CPS) anywhere around the perimeter of the trigger wheel pointing towards the centre of the wheel such that the sensor can touch the pulley (it will be spaced out so that it does not touch later). The mount should be strong enough that you can lean on it and it not move.
- Mount the trigger wheel so that the missing tooth is approximately 90 degrees after the crank sensor. (the exact angle can be adjusted in software but for first start of the engine it helps if you are within 10 degrees of this position). If the crank pulley has a damper inbuilt you must mount the trigger wheel onto the crank side of this damper.
- Run the crank pulley / trigger wheel assembly in a lathe to ensure that the trigger wheel is exactly central on the pulley.
- Refit the pulley / trigger wheel assembly and adjust the sensor-to-wheel gap to 0.3mm-0.5mm by spacing out the sensor with shims.
- Rotate the pulley and ensure that the gap does not alter by more than 0.2mm.



If machining a trigger pattern into the front pulley then it is usually easiest to machine all of the teeth in, mount the front pulley, and then remove the tooth pointing at the sensor at 90° BTDC.

## Sensor

There are two types of crank position sensor; MVR and Hall Effect. The Hall Effect type require ignition switched power to make them work.

2 wire sensors must be MVR. Usually terminal 1 is the signal and terminal 2 the timing ground

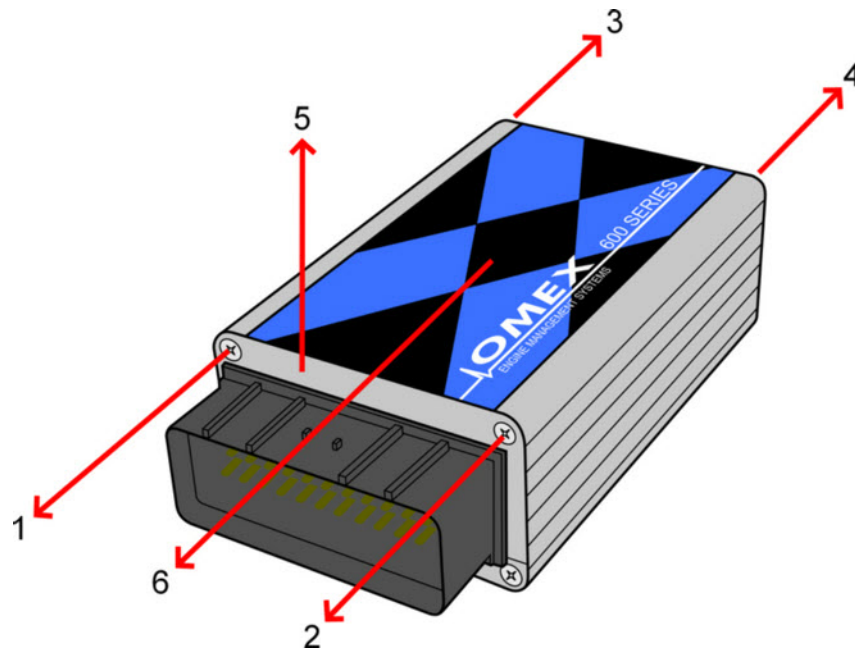
3 wire sensors can be either MVR or Hall Effect. If MVR, then usually terminal 1 is the signal, terminal 2 the timing ground and terminal 3 has no connection. If Hall Effect, there is no way of measuring externally to find which pin has which function; you must find out from the manufacturer.

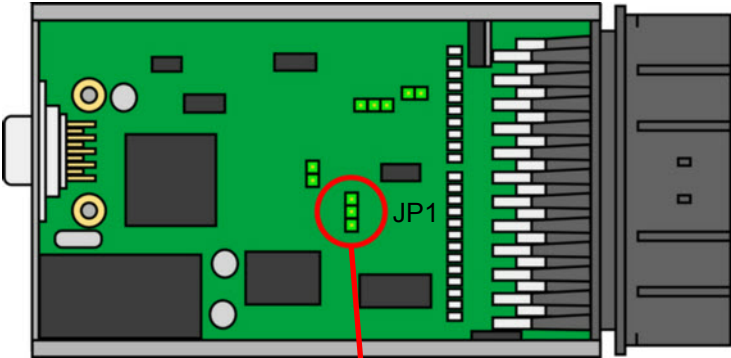
If the sensor is Hall Effect, a jumper (supplied with the ECU) must be put onto header pins on the ECU board.





To fit this part you will need to part-disassemble the ECU to gain access to the board. As shown in the diagram;

- remove screws (1, 2, 3 and 4)
- slide up the end plate (5)
- slide off the lid plate (6)





Sensor Type	Jumper Position
MVR	 no jumper
Hall Effect	



## 2.2 Throttle Position Sensor (TPS)

This sensor will be found on the end of the throttle spindle. All originally electronically fuel injected engines will have one, but some will be switches rather than potentiometers. You must use a potentiometer. If unsure, use a multimeter on a resistance setting ( $k\Omega$ ), and you should find that two of the terminals will have a smoothly varying resistance as the potentiometer is turned. A switch will have a point where the resistance changes from one value to another.

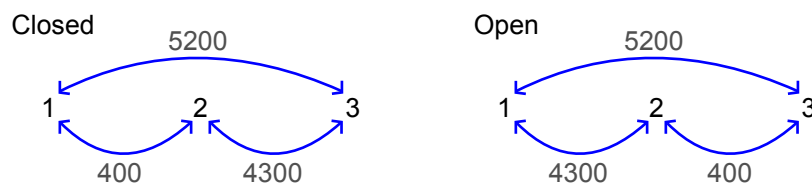
### Pin-outs

If you have purchased a throttle position sensor from Omex, then the pin-outs for your sensor can be found on the information sheet with the sensor. If you are using an unknown sensor then you will need to test the potentiometer to find this information.

Allocate the sensor terminals with numbers 1,2,3. With the sensor disconnected from any wiring use a multimeter on the resistance setting ( $k\Omega$ ) to measure the resistance between each of the terminals with the throttle in an approximate closed position and then with the throttle in an approximate open position (the absolute position is not important).

Between two of the terminals the resistance will not change as the throttle is opened. This tells us that the remaining terminal is the signal (Omex orange cable). From the remaining two terminals, one of them will have a resistance to the signal that is lower when throttle open than when throttle closed, this is the 5V reference voltage terminal (Omex pink cable). The last terminal must therefore be the sensor 0V (Omex grey cable).

Example;



When the throttle position is moved from closed to open, the resistance does not change between 1 and 3. Therefore, 2 must be the signal (Omex orange). 3 has the lower resistance to the signal with the throttle open and so must be the 5V (Omex pink), leaving 1 to be the sensor 0V (Omex grey).

## 2.3 Coolant Temperature Sensor

The coolant temperature sensor is required to give the ECU information on the temperature of the engine's coolant, allowing corrections for cold starting and running.

In many cases the standard engine's temperature sensor can be used. If the engine does not have a suitable sensor, Omex can supply general-purpose parts to fit to your engine.

### 1 wire Sensor

These sensors are for dashboard coolant gauges and cannot be used with the ECU.

### 2 wire Sensor

These sensors are correct for use with the ECU. The two wires from the ECU can go either way round on the terminals.

### 3 wire Sensor

These rare coolant temperature sensors are a 1 wire sensor and a 2 wire sensor in one package. The 1 wire part is for the vehicle's dashboard coolant gauge and the 2 wire part is for the ECU. You can find the correct terminals using a multimeter continuity test. The terminal for the dashboard coolant gauge has connection to the metal body of the sensor. The two terminals for the ECU connection do not. The two wires from the ECU can go either way round on the two applicable terminals.

## Dashboard Coolant Gauge

A gauge cannot be connected onto the sensor being used for the ECU. The gauge must have its own separate sensor supplied by the gauge manufacturer.

## Retro-fitting

If fitting a sensor to an engine that does not have one as standard, the sensor must be fitted to the engine side of the thermostat so that it sees the engine's coolant temperature even when the thermostat is closed. Omex can supply suitable sensors.

## 2.4 Air Temperature Sensor (ATS)

The air temperature sensor is used to give the ECU information on the temperature of the inlet air. This allows corrections to the fuelling and ignition timing to suit varying conditions.

In many cases the standard air temperature sensor can be used, though not all engines have standalone air temperature sensors as standard, some have them included as part of the MAP or MAF sensor in which case a standalone part must be fitted.

The air temperature should be measured as close to the inlet as possible, preferably in the inlet airbox, the back of the airfilter, or with forced induction engines, in the inlet plenum. Heat-soak into the body of the air temperature sensor needs to be minimised so it is preferable when installing the sensor into an inlet plenum to install it onto a non-metallic section of the inlet. If this is not possible, then a pipe just before the throttle plate that is insulated from the direct conduction of engine temperature can be used.

The two wires can go onto the sensor either way round.

## 2.5 Manifold Absolute Pressure (MAP)

Forced induction engines need a MAP sensor to give the ECU a reading of manifold pressure (boost pressure). In some cases a MAP sensor is used to measure engine load on NA engines but this is rare.

MAP sensor ratings are absolute rather than boost pressure so 1bar is for normally aspirated (NA) non-boosted engines, 2bar for up to 1bar boost, 2.5bar for up to 1.5bar boost, and 3bar for up to 2bar boost.

The MAP sensor will be joined to the inlet plenum by a small diameter tube.

It is not possible to find which wiring terminal has which function externally so this information must come from the manufacturer of the component.

## 2.6 Barometric Pressure Sensor

As the air pressure changes, so does the amount of oxygen per volume of air. Changes in most countries are relatively small, but if driving in large mountain ranges, these changes can be significant.

If using throttle position for load, then the MAP sensor input can take a 1bar sensor and instead of being used for load sensing, can be used for barometric pressure corrections.

This sensor is optional.

It is not possible to find which wiring terminal has which function externally so this information must come from the manufacturer of the component.

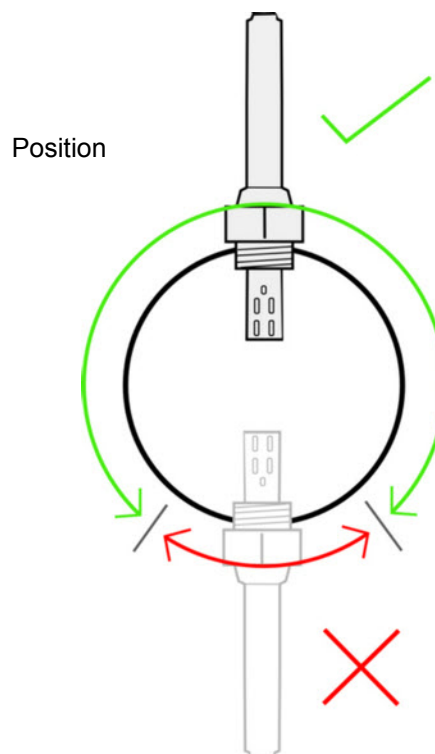
## 2.7 Lambda Sensor (oxygen sensor)

Engines that are required to meet catalytic emissions regulations will require a narrowband lambda sensor to allow the ECU to trim the fuelling constantly whilst in the emissions test and gentle driving conditions. Any 3 or 4 wire lambda sensor can be used. If the engine does not need to meet emissions regulations then it is not necessary to have a lambda sensor.

Wideband lambda sensors are used during the tuning process and so a boss will be required in the exhaust to allow for this regardless of whether the engine will be running oxygen feedback (a lambda sensor) after the tuning process is completed.

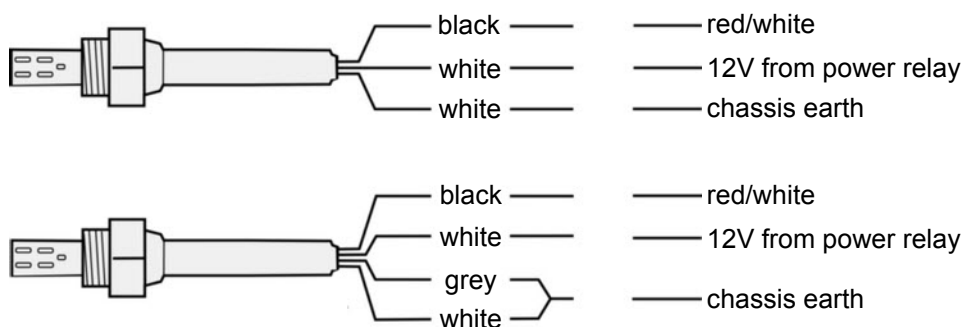
### Positioning

All modern vehicles have lambda sensors as standard and so use the standard pre-catalyst position. If fitting your own lambda sensor boss, the lambda sensor should be positioned as soon as possible in the exhaust after all of the manifold pipes have joined into one. For the lambda sensor to work it is essential that there are no air leaks in the exhaust before or for quite a distance after the lambda sensor. The sensor should not be at the bottom of the exhaust pipe as condensation can build up in the exhaust.



### Wiring

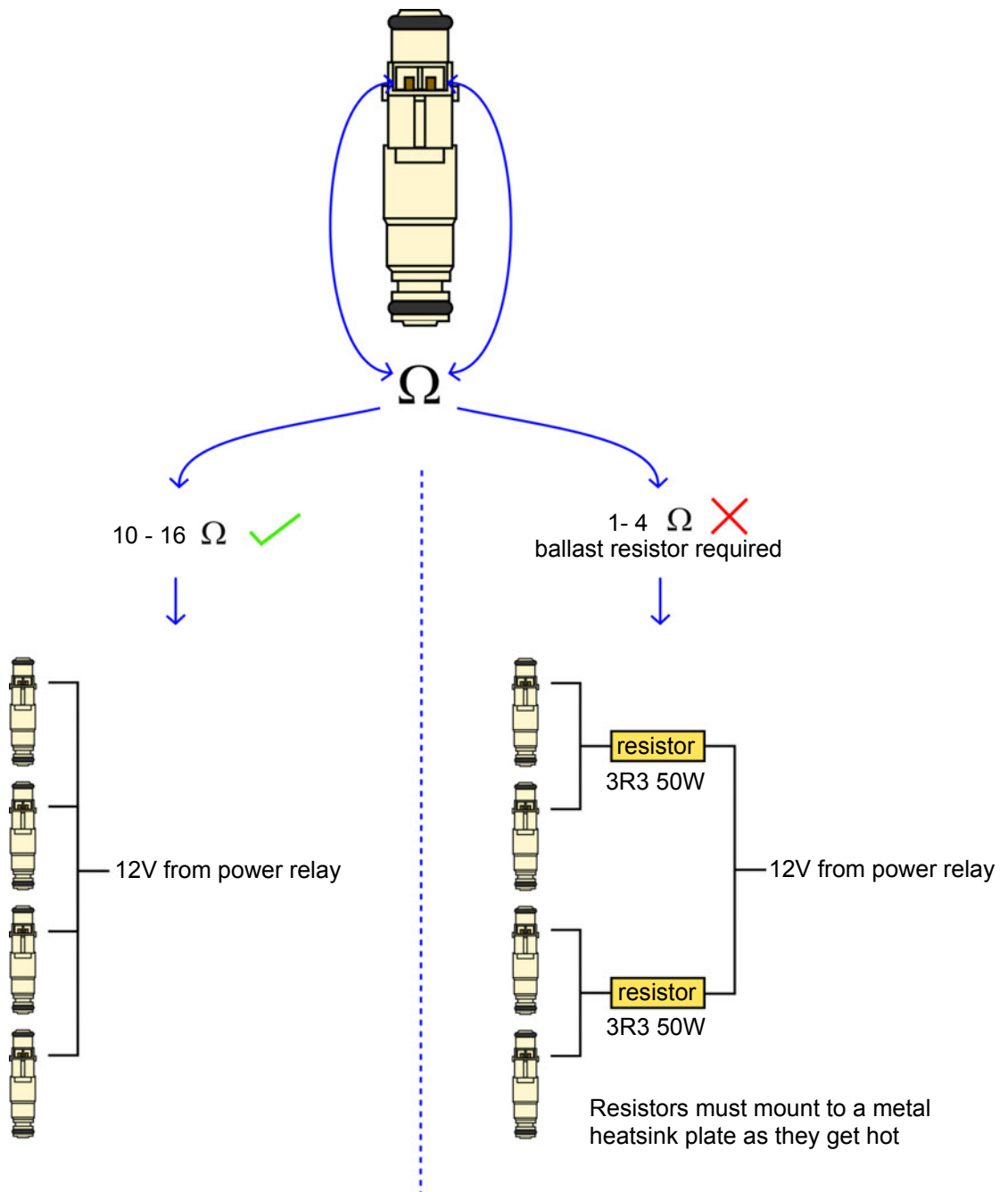
Sensors are wired as shown below. The white wires can be either way round.



## 2.8 Fuel Injectors

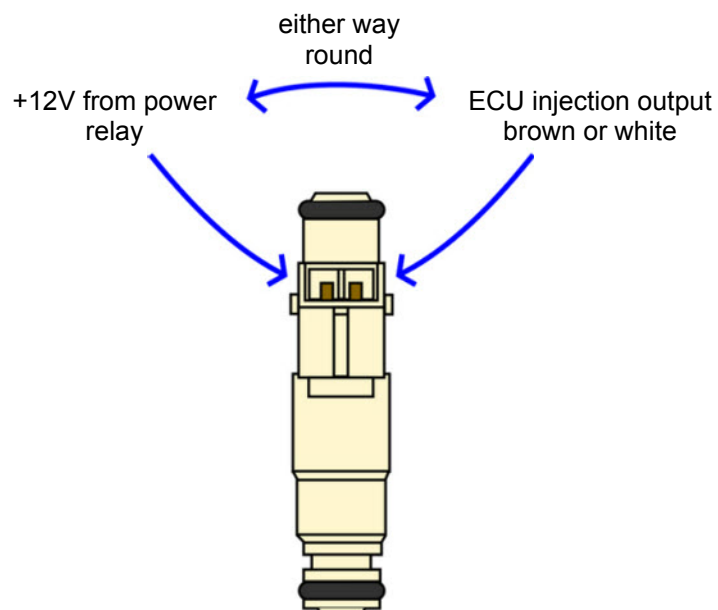
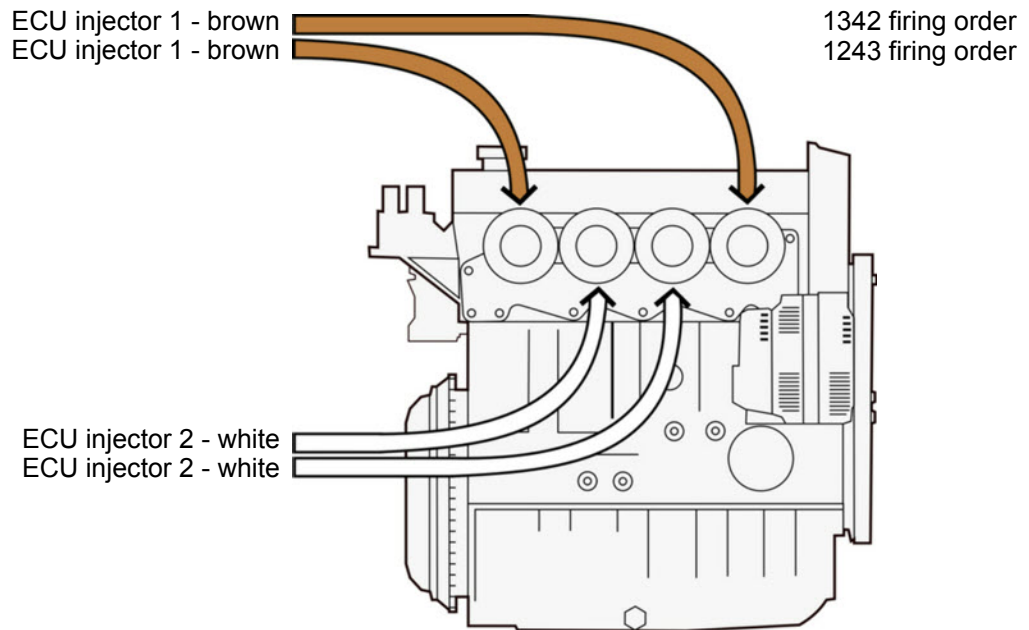
There are two electrical types of injector, high impedance, and low impedance. High impedance is approximately  $12\Omega$  between the two terminals, and low impedance is approximately  $3\Omega$ . The OMEM600 ECU is designed to use high impedance injectors. Low impedance injectors can be used if ballast resistors are fitted but this is best avoided as it is not always successful. The ballast resistors are shown in the wiring diagram.

Injectors are available in a range of flowrates. There are many online calculators available to help you select the correct flowrate injectors for your application.



## Control

The injectors are controlled in a way known as semi-sequential. This is timed injection with inlet valve opening, every engine revolution. There are two injector outputs in the ECU. Therefore to control 4 injectors, the injectors must be paired. The paired cylinders are those that reach TDC together, so in the case of a standard I4 engine with firing order of 1342, cylinders 1+4 are a pair, as are cylinders 2+3.

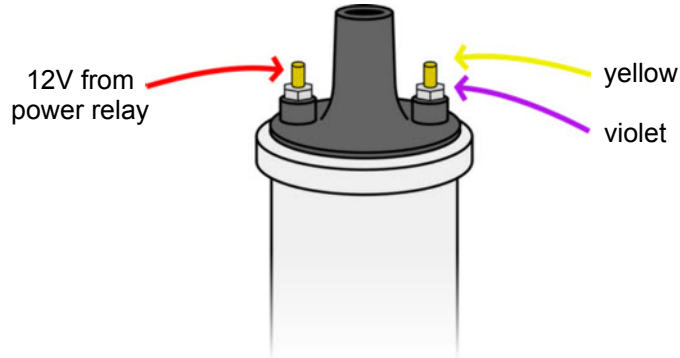




## 2.9 Ignition Coil(s)

The ECU is fitted with two amplified ignition outputs. This allows the following types of ignition;

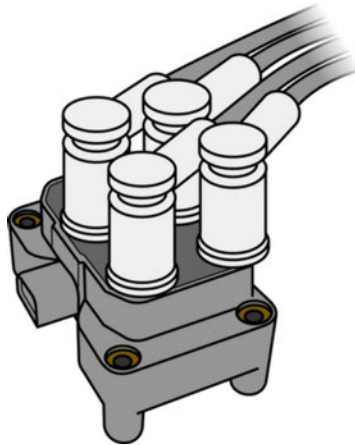
### Single Coil and Distributor



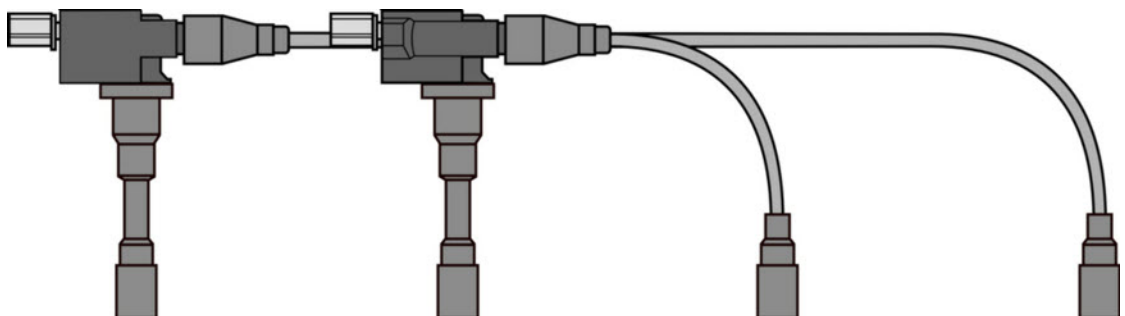
Both ignition outputs from the ECU go onto the coil negative terminal. The distributor can be left as standard but all that is now used are the rotor arm and cap; the advance mechanisms, points etc are redundant.

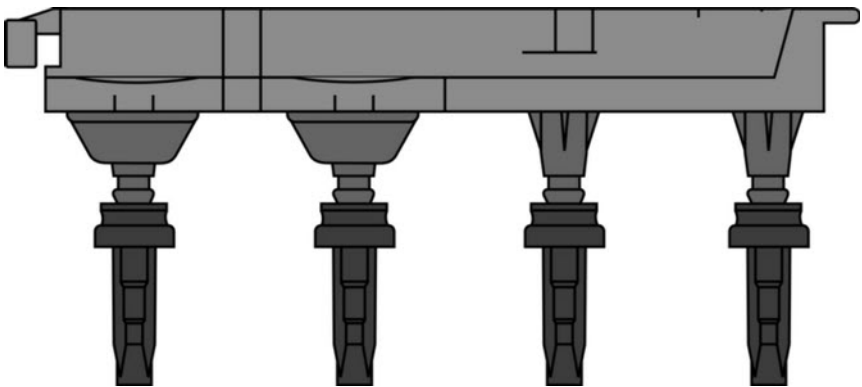
### Wasted Spark Coil Pack

These are typically a single pack containing two double-ended coils with 4 HT leads coming directly from it.







Some engines have wasted spark coil packs that look like 4 individual coils, but are still two double ended coils and so can still be controlled directly by the ECU. Examples are some Rover K Series and some small Peugeot engines;





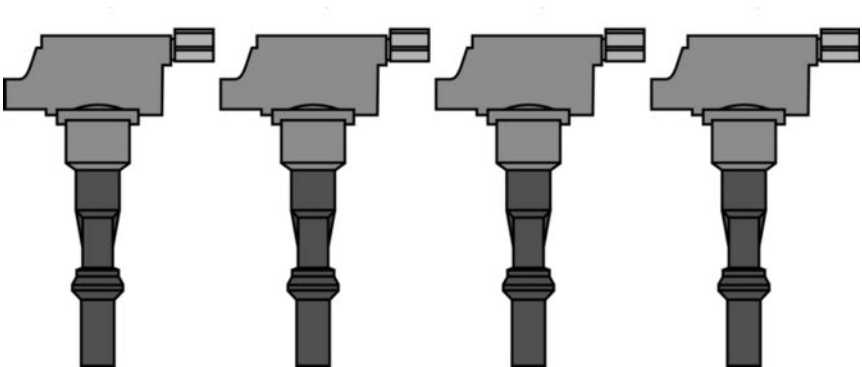
The coil should be non-amplified. You can test this by measuring with a multimeter (resistance setting). Between the 12V terminal and one of the signal terminals (also known as coil negative) a non-amplified coil will measure approximately 1Ω. An amplified coil pack will measure several kΩ. Amplified coil packs can be used if necessary, but are not ideal and the ECU hardware must be modified by Omex to allow this.

Known wiring

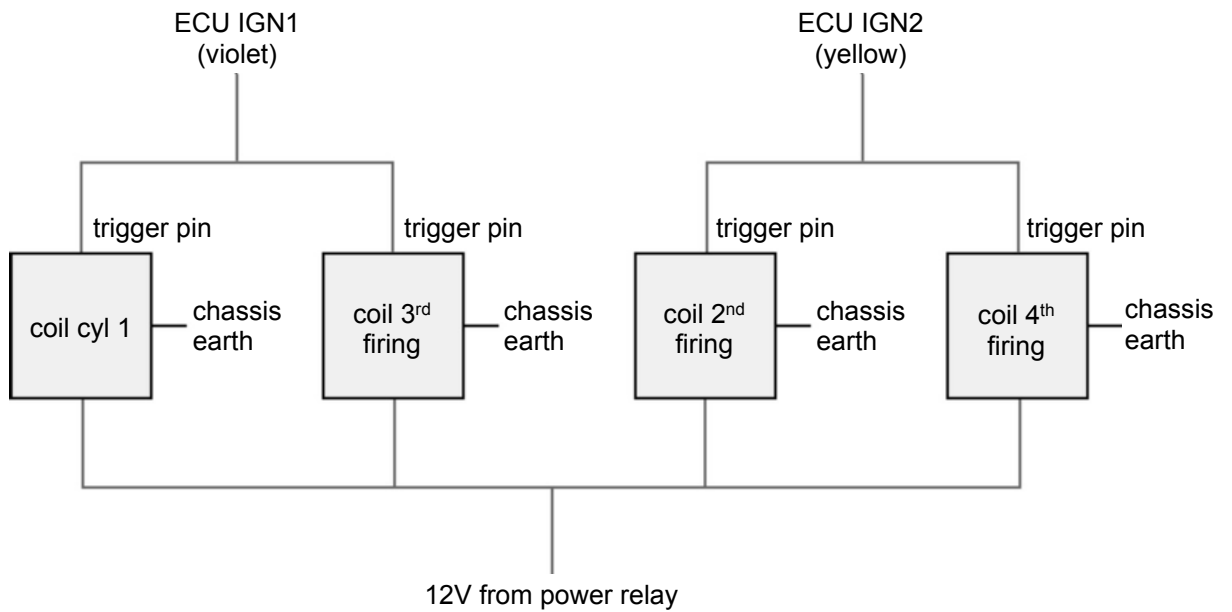
	Ford Type A (early oval connector)	1	ECU IGN1	Violet
		2	+12V supply	
		3	ECU IGN2	Yellow
	Ford Type B (later rectangular connector)	1	ECU IGN2	Yellow
		2	+12V supply	
		3	ECU IGN1	Violet
	Sagem / Valio (3pin connector)	1	ECU IGN1	Violet
		2	ECU IGN2	Yellow
		3	+12V supply	
	Sagem / Valio (4pin connector)	1	ECU IGN1	Violet
		2	ECU IGN2	Yellow
		3	+12V supply	
		4	Not used	

Coil-per-plug

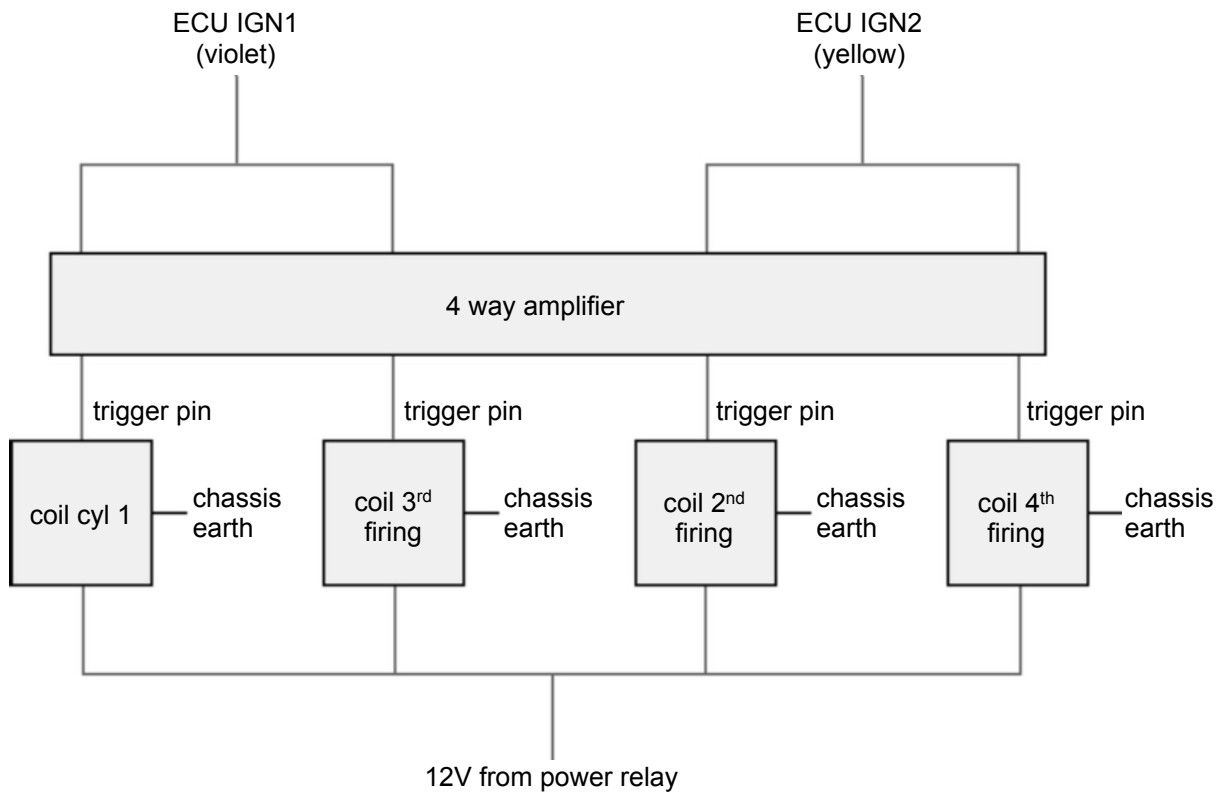
Coil-per-plug ignition coils can be controlled but only with wasted-spark ignition and will require amplification and the ECU hardware modified.



### Amplified coil-per-plug



### Coil-per-plug with external amps

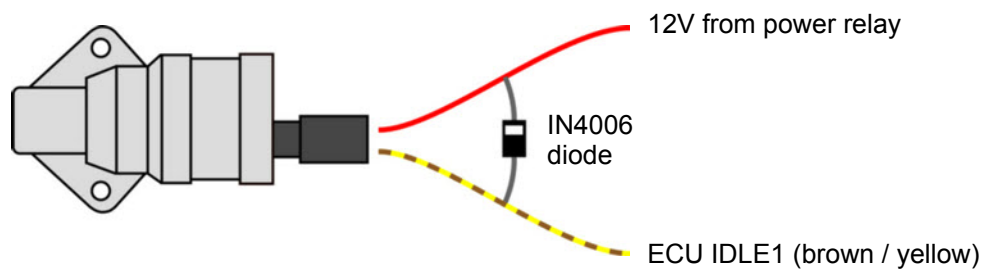


## 2.10 Idle Controls

The 600 series ECU can control idle using spark scattering, 2 and 3 wire air bypass solenoid valves and 4 wire air bypass stepper motors.

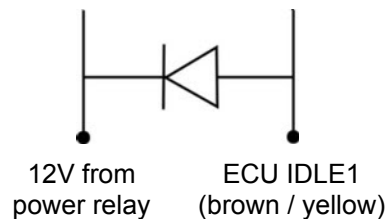
For competition cars, engines using individual throttle bodies, or cars that are not used everyday, it is acceptable to use just scatter spark idle control, removing the complexity and extra setup time associated with idle motors. Without an idle motor, scatter spark idle controls should allow the engine to idle instantly from start on a warm day, and at worst require 30seconds of engine warming on a very cold day before idling without driver input.

### 2 wire solenoid valve



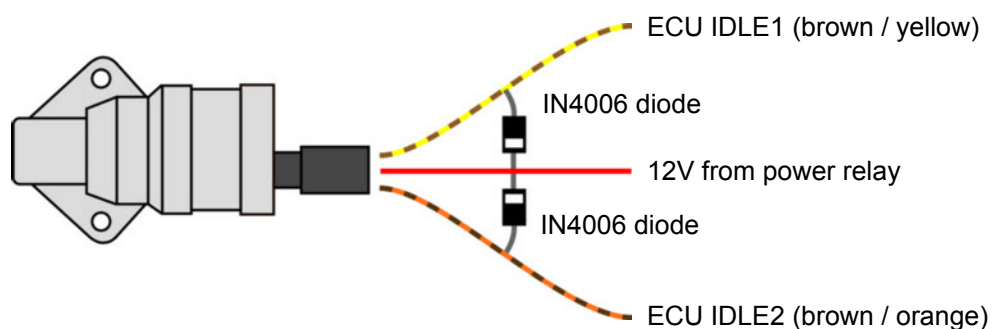
The diode in the wiring is required. The polarity of the wiring onto the valve is not important, but the polarity of the diode with respect to the wires is. The marked blocking end must face the 12V wire.

Some valves have the diode inbuilt and will have a diode diagram on them. If so, the polarity of the wiring must be as shown below.



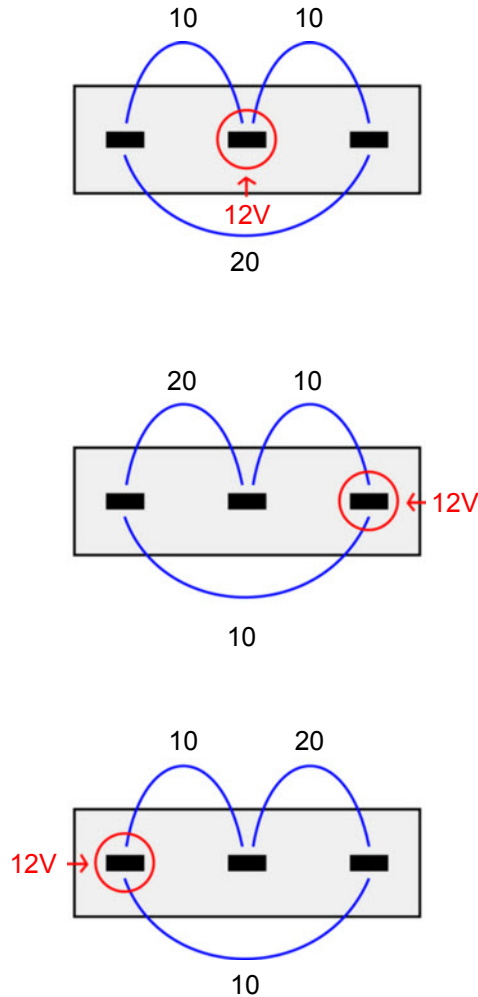
The resistance between the two terminals must be greater than 12Ω. Lower resistance valves are not suitable.

### 3 wire solenoid valve

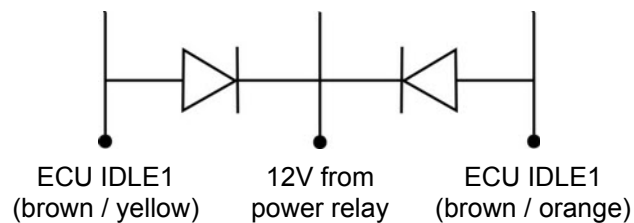


The diodes in the wiring are required. The marked blocking end must face the 12V wire.

The wiring terminal positions may not be as shown above but can be found by finding the resistance values as shown below. The resistance shown is just an example; the actual resistance may be different. The lower resistance values must be 12Ω or greater. Lower resistance valves are not suitable.



Some valves have the diodes inbuilt and will have a diode diagram on them. If so, the polarity of the wiring must be as shown below.



The IDLE1 and IDLE2 wires can go either way round as the operation direction can be swapped in software.

## 4 wire stepper motor



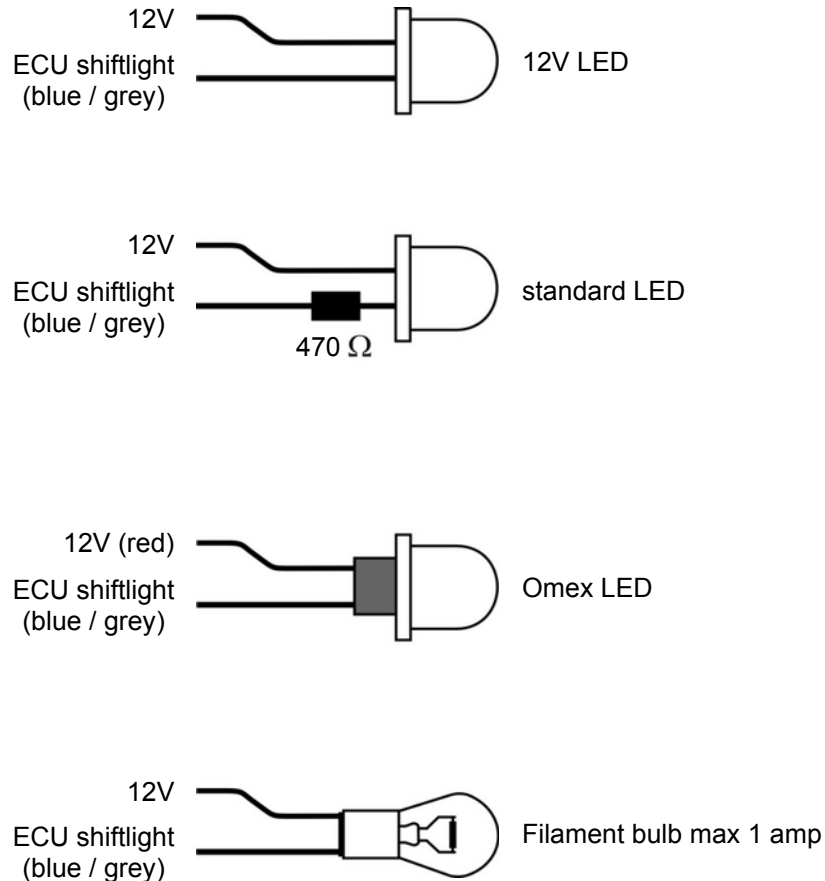
With a multimeter on the continuity setting, find the two pairs of terminals on the idle motor (the paired terminals are those which have continuity between them). Fit IDLE1 and IDLE2 on one pair, the IDLE3 and IDLE4 on the other pair. Within the pairings it does not matter which way round they go.

## Retro-fitting

If fitting an idle motor to an engine that does not have one as standard then you need to firstly source an idle motor from an engine of similar size. The 2pin idle motors are the most simple to install and calibrate. The direction of air flow is important as if it is incorrect the valve will be noisy and some will not operate at all if wrong. Stepper motors are best avoided for a one-off fitment as they can be difficult to install successfully. Omex can supply a general-purpose idle air bypass valve

## 2.11 Shift Light

The shift light can be either an LED or a filament bulb of up to 1A current draw. If an LED is used it will need to be a 12V specific LED or must have an inline resistor fitted. An LED will glow slightly all of the time then turn on bright at the shift point. Omex can supply shift light LEDs that are fully off normally. If a filament bulb is used it will be fully off then fully on at the shift point.



### 2.11.1 Shift points per gear (Road Speed Sensor)

Different shift light engine speeds can be used in each gear if a suitable road speed input is provided. The input should be a pre-differential input, eg propshaft rpm. Wheel speeds (such as from ABS sensors) are not suitable.

#### Sharing a speedometer signal

If the vehicle has an electronic speedo, then the signal for the speedo can often be used. The output of the sensor can be connected to the small red road speed input cable, with the small blue road speed earth cable not required.

#### Using a standalone sensor

There are two types sensor; MVR and Hall Effect. The Hall Effect type require ignition switched power to make them work.

2 wire sensors must be MVR. Usually terminal 1 is the signal and terminal 2 the timing ground

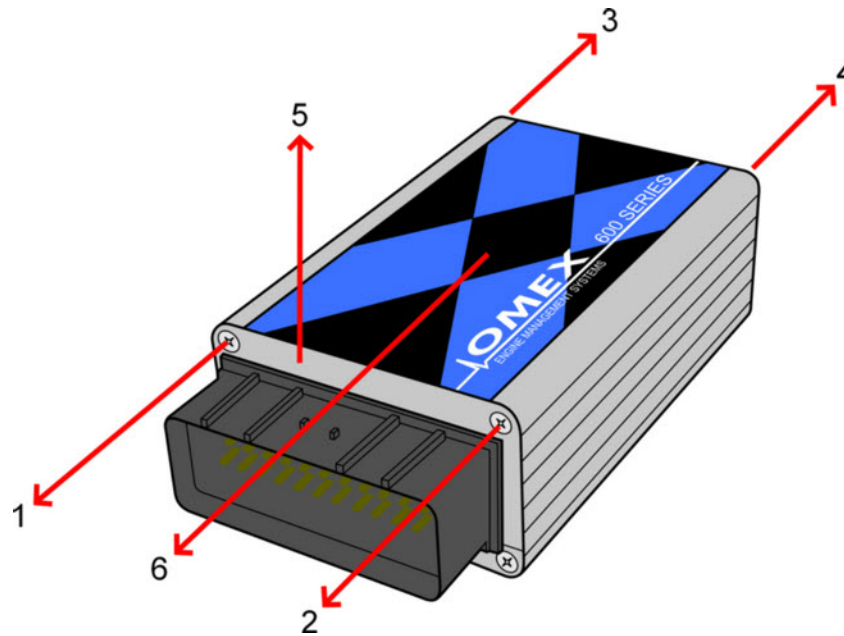
3 wire sensors can be either MVR or Hall Effect. If MVR, then usually terminal 1 is the signal, terminal 2 the timing ground and terminal 3 has no connection. If Hall Effect, there is no way of measuring externally to find which pin has which function; you must find out from the manufacturer.

If the sensor is Hall Effect, a jumper (supplied with the ECU) must be put onto header pins on the ECU board. The MVR type does not need this.

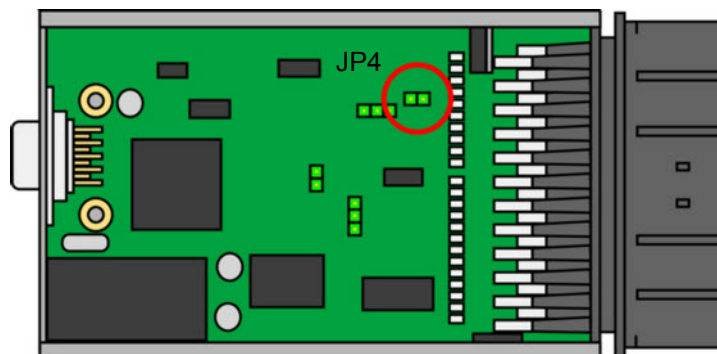


To fit this part you will need to part-disassemble the ECU to gain access to the board. As shown in the diagram;

- remove screws (1, 2, 3 and 4)
- slide up the end plate (5)
- slide off the lid plate (6)



Fit the jumper to the below location if a standalone hall-effect sensor is used.





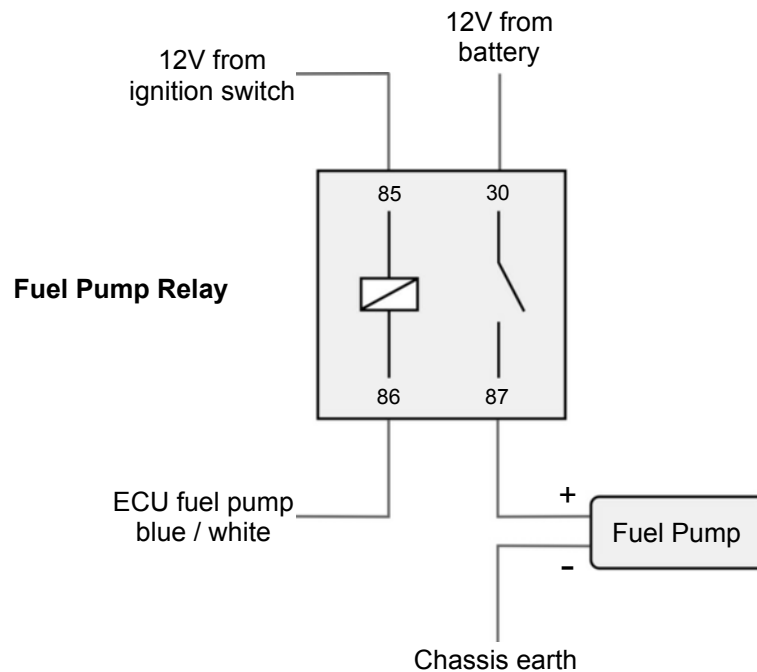
## 2.12 Tachometer

The tachometer output can directly drive any tachometer that is normally controlled by an ECU. If the tachometer is from a vehicle where it was originally driven from the coil negative then you may need to use a 'tacho driver' available from Omex to give a voltage spike to trigger the tacho. Some very old tachos were 'current' driven and triggered from coil positive. Omex can supply a convertor box to allow these to work.

## 2.13 Fuel Pump

When power is first given to the ECU it will turn on the fuel pump output for 2 seconds to prime the fuel system. When the ECU sees the engine cranking it will turn on the fuel pump output continuously. When the engine is stopped by turning off the ignition switch the fuel pump output will turn off immediately. If the engine stops in the event of a crash, the fuel pump output will turn off after 2 seconds.

The fuel pump is not controlled directly by the ECU, it must be controlled through a relay.



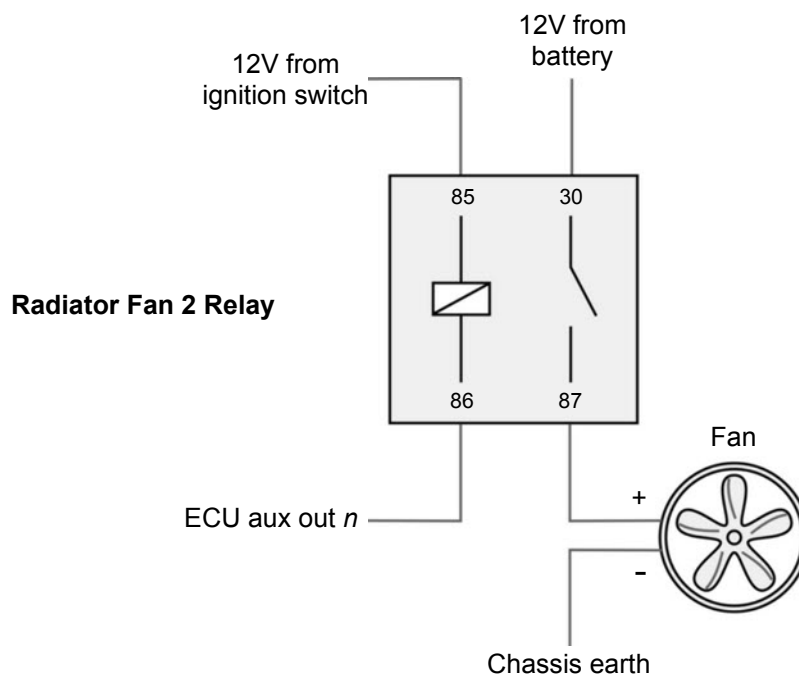
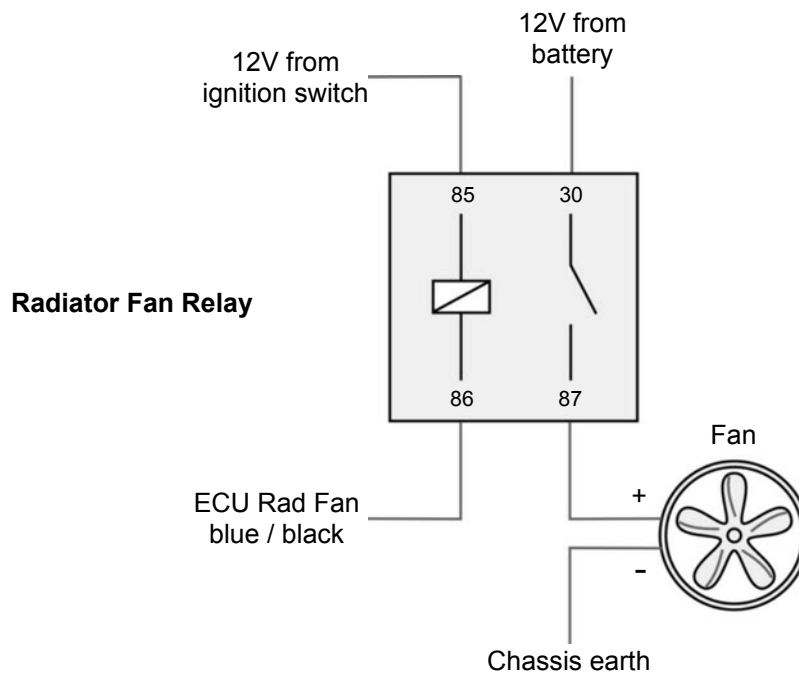
The power supply relay for the injectors, coil, lambda sensor etc is also controlled by the fuel pump output.

## 2.14 Radiator Fan

The ECU has two software outputs switchable on coolant temperature values. These would normally be used for radiator cooling fans. The two outputs may be set to two different temperatures to control two fans or a single twin speed fan.

The first radiator fan is a dedicated output pin on the ECU. The second available output, known as Bay fan, is not dedicated and so needs to be wired to one of the auxiliary outputs (see the Auxiliary Inputs and Outputs section).

The radiator fans are not driven directly by the ECU, they must be controlled through a relay.



## 2.15 Knock Sensor

A knock sensor is essentially a microphone that listens to the noises the engine makes. By frequency filtering, and ambient noise filtering, the knock sensor can detect which noises are engine knock and so allow ignition retards and fuel additions to stop this.

Most modern engines have knock sensors on them as standard. Not all sensors work with the Omex ECU, but the standard sensor should be tried first.

Knock sensors are rarely used as if the fuel type used is consistent and the engine is correctly mapped, there should be no need for one. If you are going to use two different octane rating fuels (one for road and one for track) then an 'octane switch' may be the best thing to use as this removes the problem before it happens. See the Auxiliary Inputs and Outputs section.

### 3 Auxiliary Function Inputs and Outputs

Many functions have dedicated wiring, but there are also 3 auxiliary inputs and 4 auxiliary outputs that may be assigned to whichever functions are required in your installation.

Each function is assigned to an input or output. Each input or output may only be assigned to one function.

The functions can be used for other purposes e.g. the Anti-lag used as launch control. The following chapters in this manual describe the auxiliary controls and what auxiliary inputs and outputs are required to do these. If you are trying to use a lot of auxiliary controls you may need to compromise due to the number of inputs and outputs available so please read the following chapters to decide which controls you are going to use.

#### Inputs

The AUX IN inputs can switch any of the following functions;

- A/C (for high idle speed controls when air conditioning is on. Rarely used.)
- Anti-lag
- Alt Function
- Full Throttle Gearshift
- Main Relay (specialist control, rarely used)

AUX IN 1 – this input is satisfied by putting the wire to earth so is typically used for Full Throttle Gearshift as Omex can supply a clutch switch that makes contact with earth when the clutch is pressed.

AUX IN 2 – this input is suitable as a switched 5V or 12V input to switch any of the auxiliary functions.

AUX IN 3 – this input is a 12V switch input (5V will not switch this input) to switch any of the auxiliary functions.

#### PWM outputs

There are two auxiliary PWM functions available in the ECU;

- Wastegate Control (Boost control valve)
- User1 table output (specialist control, rarely used)

One of these functions may be assigned to AUX OUT 1.

#### Switch outputs

The following output functions are available in the ECU;

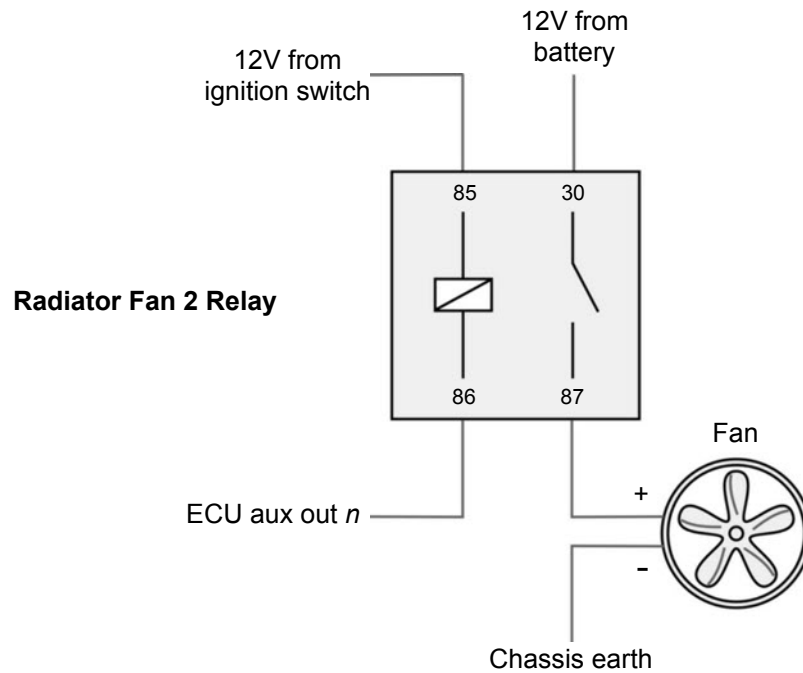
- A/C (for inverting the air conditioning input as required on some vehicles)
- Antilag valve
- Bay fan (second cooling fan)
- VTEC
- Alt function
- Main relay (specialist control, rarely used)

Auxiliary outputs AUX OUT 2, 3, and 4 can be assigned to any of these functions.

## 3.1 Radiator Fan 2

The ECU has two software outputs switchable on coolant temperature values. These would normally be used for cooling fans. The two outputs may be set to two different fans or set at different temperatures for twin speed fans.

The rad fan is a dedicated output pin on the ECU (6C blue black). The second available output, known as Bay fan, is not dedicated and so needs to be wired to one of the auxiliary outputs.



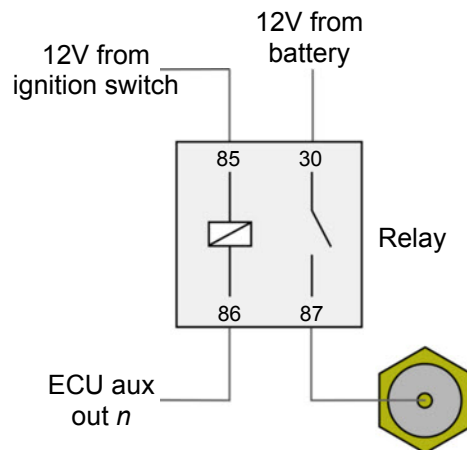
## 3.2 VTEC Cam Control

The simple on/off VTEC control is switchable on any of the AUX outputs. VTEC solenoids greater than  $12\Omega$  can be controlled directly from an AUX output, but some are lower resistance and will require relay control as they will draw greater electrical currents.

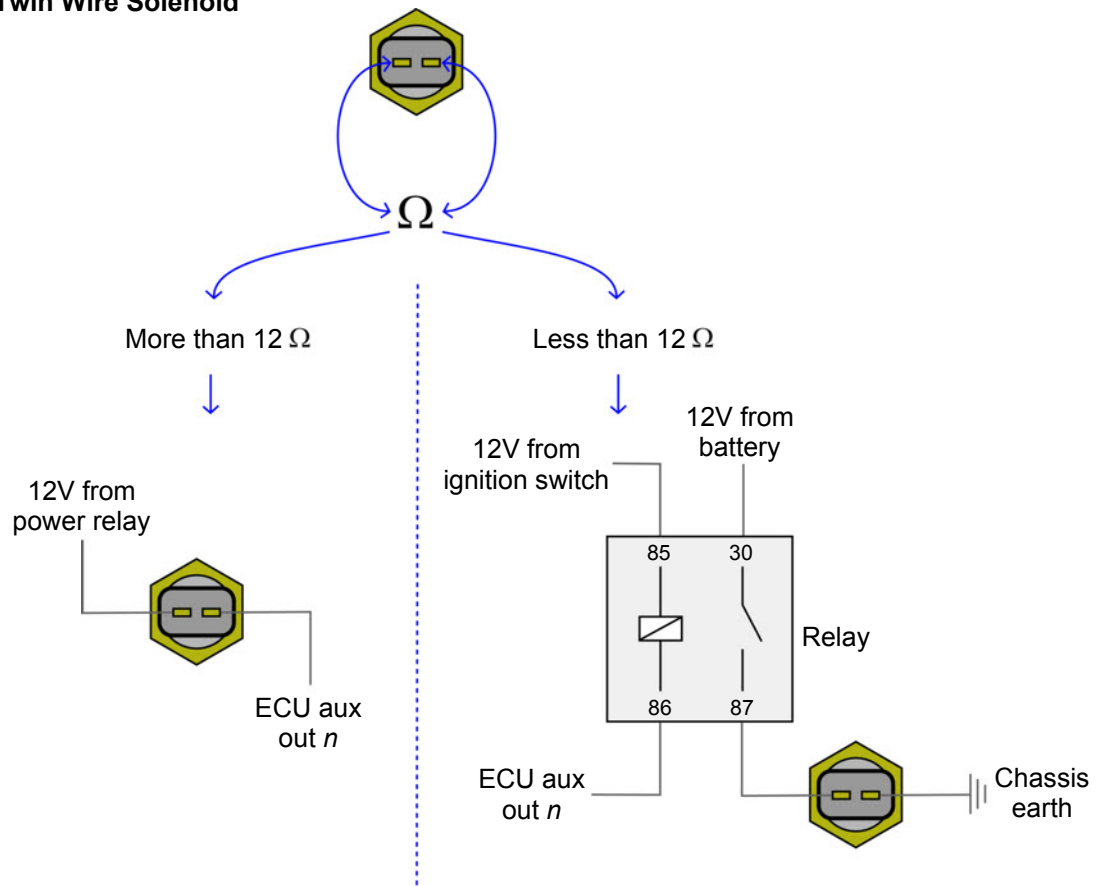
VTEC control has no dedicated wiring and instead uses one of the auxiliary outputs. See the start of this chapter for advice.

Infinitely variable VTEC (such as Honda i-VTEC, Rover VVC etc) cannot be controlled by this function and require the Omex 710 ECU.

### Single Wire Solenoid



### Twin Wire Solenoid



### 3.3 Turbocharger Boost Control

Boost pressure is regulated by the turbo wastegate which is opened at a boost pressure set by the actuator. To increase the boost pressure at which the wastegate is opened, the actuator needs to see a lower pressure than actually exists in the manifold. The ECU is able to control a valve to lower the pressure that the actuator sees, therefore increasing the boost pressure at which it opens the wastegate. The ECU can therefore never reduce the maximum boost to below that of the actuator setting, it can only be increased.

Two level boost can be run by having a physical switch inline with the control wire to the boost control valve so switched on is the ECU controlled high boost, and switched off is the actuator controlled low boost.

Wastegate control (boost control) has no dedicated wiring and instead uses one of the auxiliary outputs. See the start of this chapter for advice.



## 3.4 Full Throttle Gearshift

Full throttle gearshift allows the driver to change gear without lifting the throttle by sending a signal to the ECU when the gearshift is occurring so that the ECU can retard the ignition to reduce the power output of the engine, allowing the gears to change.

On a 'normal' gearbox that requires clutch depression during the shift, a switch should be placed on the clutch pedal to signal to the ECU that the shift is occurring. Gearboxes that shift without clutch depression will require a switch on the lever to indicate the shift occurring.

Full throttle gearshift has no dedicated wiring and instead uses any of the auxiliary inputs. See the start of this chapter for advice.

Clutch switches are available from Omex.

## 3.5 Anti-lag (ALS)

Anti-lag keeps the boost pressure high and the turbocharger spinning by keeping the gas flow high, but maintains drivability by controlling the torque. The gas flow is achieved by bypassing air past a closed throttle plate, or not allowing the throttle plate to close completely. To control torque, the ECU retards the ignition.

In reducing engine torque, anti-lag produces very high exhaust gas temperatures which can cause damage to the manifold and turbo. If using anti-lag, monitor exhaust gas temperature very closely when setting-up and consult your turbo manufacturer for guidance on maximum temperatures.

A latching switch input is required to tell the ECU to run anti-lag. It has no dedicated wiring and instead uses any of the auxiliary inputs. See the start of this chapter for advice.

The 'amount' of anti-lag is dependent on the airflow into the engine. For engines with an idle control valve already controlling idle speed, this valve can be opened by the ECU to provide the air bypass when in anti-lag mode, though boost levels achievable are normally low.

If more boost is required then more air must be allowed into the engine. A secondary air bypass valve (often an idle control valve is used), or a throttle jack, is required. The output to control this is one of the auxiliary outputs; see the Auxiliary Inputs and Outputs section of the manual for advice. Switching the output wire with an inline physical switch will give 2 levels anti lag – first being just the idle control valve, the second being the addition of the secondary air bypass or throttle jack.

The 600 ECU is limited in how much air can be bypassed in anti lag by the way the rev limiters work. To bypass a lot of air (so give higher off-throttle boost) either our 710 ECU should be used, or one of our standalone Rev Limiter Clubman Twin Coil units.

## **4 Other features**

It is possible to control far more than described in this manual through re-use of other functions (e.g. launch control). If you have any specific requirements then please contact Omex for advice on how to achieve them.

## 4.1 Launch Control

Launch control is through the use of the ALS function, or if not available, the Alt Function. A momentary push-to-make button is required in reach of the driver; usually a thumb button on the steering wheel. This input gives a momentary lower rev-limit or ignition retard, preventing the engine from accelerating.

This requires an auxiliary input. Please refer to the start of the Auxiliary Inputs and Outputs chapter for advice.

## 5 Wiring

### 5.1 Semi Assembled Loom Construction

The Omex 600 semi-assembled loom (OMEM1502) contains all of the wires except for;

Auxiliary inputs  
Auxiliary outputs  
Idle control

If you wish to use any auxiliary functions or air bypass idle control, then you will need the auxiliary wire pack (OMEM1504).

The engine bay is a harsh environment for wiring harnesses with oil, water, solvents, high temperatures, high vibration, and high electrical noise. The semi-assembled wiring harness is made from automotive grade cable and the shielded cables are already made-up at the ECU connector to prevent electrical noise problems.

The following should be noted when constructing the loom;

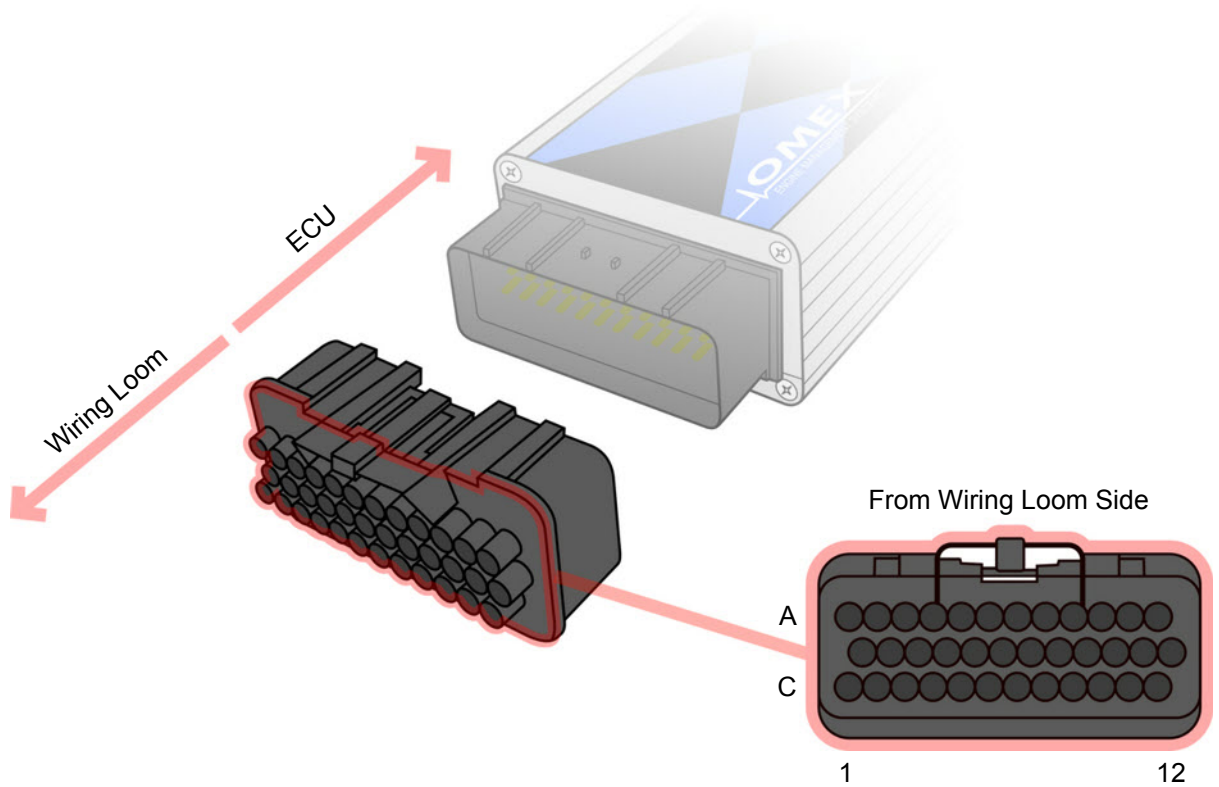
- The ECU should be mounted away from sources of extreme heat (such as exhaust), and away from direct water spray.
- If the loom is to go through panels, grommets should be used.
- The looming material holding the wires in the loom should totally cover the wires to prevent chaffing of the wire insulation.
- To minimize electrical interference, the sensors should be in a separately loomed section of the harness to the injectors and ignition coils.
- The connector terminals should be either crimped with the correct tool or crimped and soldered. Do not allow solder to go into the non-crimped section of the cable as this makes the cable brittle.
- Any joins should if possible be covered by a mechanically stiff material such as heatshrink.
- Care should be taken if using Raychem DR-25 heatshrink or glue lined heatshrink as the shrink temperature of these materials is high and it is possible to melt the cable insulation when shrinking these materials.
- The loom should be tied to mounting points using cable ties or p-clips to limit the additional stresses of the loom moving.

### 5.2 Ready Built Harness

Please see the notes supplied with the harness.

## 5.3 ECU Connector

It is occasionally necessary whilst fault finding to trace through your wiring harness to check continuity. The following are the pin-outs for the ECU plug as found on the end of the wiring harness. Where there are two colours on a cable, the main colour and the tracer colour can be either way round.



number	colour code	function
1A	Violet	Ignition 1
2A	Yellow / violet	Aux Out 4
3A	Brown / pink	Idle 4
4A	Red	Battery power
5A	Black	Chassis earth 1
6A	Grey	Sensor ground
7A	Black screened red	Crank sensor
8A	Blue cables from the inside of the screened cables	Timing ground
9A	White / violet	Coolant temperature sensor
10A	White / yellow	Aux In 1
11A		
12A	Yellow	Ignition 2
1B	Brown	Injection 1
2B	White	Injection 2
3B	Brown / violet	Idle 3
4B	Yellow / green	Aux Out 1
5B	Blue / white	Fuel pump
6B	Green	MAP sensor
7B	Black	Chassis earth 2
8B	Blue / grey	Shift light
9B	Green / white	Air temperature sensor
10B	Grey screened	Knock sensor
11B	White / orange	Aux In 2
12B	Yellow / red	Aux Out 2
1C		
2C	Brown / orange	Idle 2
3C	Brown / yellow	Idle 1
4C	Yellow / black	Aux Out 3
5C		
6C	Blue / black	Rad fan relay
7C	White / red	Oxygen (lambda) sensor
8C	Orange	Throttle position sensor
9C	Pink	5V out
10C	Blue screened red	Road speed sensor
11C	White / pin	Aux In 3
12C	Blue / yellow	Tacho

## 5.4 Typical Complete Wiring

