

# Orion2 Product Information



**Orion2** is a low cost Engine Control Unit (ECU) or Transmission Control Unit (TCU) which replace the whole of our economy range products. With slight changes in some harnesses it is backwards compatible with all the ECU range products. It has negative, positive and coil drivers to cover most applications and reduce costs. It can connect to most sensors found on engines and transmissions. The biggest advantage is that it has a bootloader and firmware can be downloaded with the tuning cable. No special firmware programmer is required.

## Orion2 Overview

This versatile Automotive Controller is designed to be a low cost durable effective replacement for high tech Vehicle Electronic Units. It can be used on most engines, transmissions and other products in the motor vehicle industry. It uses unique and easy features which are easy to install and tune. It is designed with the novice and professional installer in mind.

This universal South African made product can easily be customized for various engines, transmissions etc. It can be used for many applications such as racing engines, vehicle conversions, custom built vehicles, replacement parts for production vehicles etc. It is a compact reliable system which can be epoxy filled to make it rugged and water tight for harsh environments and is easy to mount in the driver's compartment.

The Orion2 can be reprogrammed remotely by a software bootloader. No need for expensive equipment like programmers or separate cables. This will allow a dealer to have less inventory on his floor and customize this product on demand. This product is also sold in different classes which makes it more viable to use for smaller applications. It may also be bought at reduced prices in un-activated status. This will allow the dealer to have better control over his cash flow management in his business. Activations of features can be done over the internet making the unit viable to keep in stock at dealers. Activation will then require the rest of the unpaid amount.

The Orion2 unit is designed to connect directly to most sensors and drive units that is found on engines, transmissions and other products. No need to modify them. It consists of the latest in high speed micro controllers with surface mount technology. These units are machine soldered to minimize human error.

The Orion2 cover features like Lambda control, idle control, launch control, Anti-Lag Control, Flat Shift control, Rapid Fire Exhaust Control, cam control, stepper motor control, throttle by wire control, boost control, line pressure control, tiptronic and lots more. It can drive basic coils, smart coils, injectors, solenoids, throttle by wire motors etc. directly. Due to the versatility some devices may require external resistors or diodes which is supplied with the Orion2. It can read signals from sensors like water & air temperature, throttle position, manifold pressure, crank angles, cam angles, lambda, fuel pressure etc. directly.

The Hyperspace tuning software is user-friendly and makes all the above features customizable by the tuner. This makes the Orion2 adaptable for most applications on site.

To learn more about this amazing package browse through the features and specifications in the sub folders.

## Orion2 ECU Features

Note that some features are in the process to be developed in the future. The hardware has the capability for it. Also note that not all of the features may be included on the same ECU as there is limited amount of drivers available. Some of the hardware classes may not include certain features due to the price range. See the selection chart for the ability of the different classes.

### Fuel Delivery

- Accurate fuel amount and injection timing gives better performance and fuel consumption due to constant atomization on each cylinder.
- Injection methods such as **Batch**, **Split Batch**, **Split Sequential** and **Full Sequential** are offered with the Orion2. Full Sequential can only be done for 4 Cylinder.
- Different Tuning options such as graph or matrix can be selected.
- All graphs or matrix data are interpolated to smooth fuel calculation accuracy for the best performance though the operating ranges.
- Fuel is calculated with MAP or TPS sensor signals versus RPM or a combination of the two. This will accommodate most engines ranging from street to racing and from economy to performance.
- Other sensors that are used to alter the fuel mixture are Water, Air, Altitude, Lambda, Battery Volts and throttle response from the driver.
- Fuel injection timing is adjustable on gear type crank angle sensors as low as 12 pulses per revolution. This will result in a 30° angle resolution or smaller.
- Adjustable MAP sensor, reading angle for multiple throttle body systems.
- Dual injectors can be used in two methods. Staged injectors namely Ratio adjust or Graph Fazed method.
- Injector trimming up to 4 injectors can be used for Full Sequential Injection. Full Sequential can only be done for 4 Cylinder.
- Fuel enrichment can be adjusted during Launch, RapidFire or retard functions.

### Ignition Spark & Timing

- The Orion2 can manage **Distributors**, **Wasted Spark** coil packs, **Wasted Spark COP** coils or **Full Sequential** spark systems. Full Sequential can only be done for 4 Cylinder.
- Orion2 uses standard automotive coil packs found on engines. No need to change them.
- Most Smart Coils with built in drivers and Basic Coils without drivers can be connected directly. Orion2 has up to 6 HV coil drivers built in.
- Orion2 can also use the Mercury Coil drivers to free up internal drivers. Coil drivers can be stacked to accommodate V8 systems and V8 Dual Coil engines. The latter have 16 coils.
- Orion2 has very accurate ignition timing especially with the gear type triggers.

- Timing is calculated with MAP or TPS sensor signals versus RPM or a combination of the two. This will accommodate most engines ranging from street to racing.
- Other sensors that is used to alter the Ignition Timing is Water, Air and Altitude.
- Battery Volts is used to compensate for coil charge time.

### **Sensors**

- Orion2 can use most standard sensors on the engine – No need to do modifications on distributors or converter boards.
- Custom Bolt-On Timing Gears may be used for older engines that run carburetors or engines with incorrect setups. Gear type triggers do make timing more accurate and responsive during blip conditions. This is the preferred method for racing applications.
- Sensors can be calibrated to accommodate the different types found on the engines.

**Idle Control & Cold Start** – This functions will ease with starting a cold engine and keep the RPM's constant when air conditioners or automatic transmissions draw power from the engine. Idle control is included on board for one and two wire idle valves. The Spitronics stepper control units can be connected to control quad and bipolar stepper motors.

**Launch Control** - This feature will increase boost pressure during pull-off to eliminate *Turbo Lag*. Various methods are available to activate launch like buttons clutch switches TPS position etc.

**Launch Delay Recover** – This feature will restore full power with an increasing ramp delay which will help the vehicle with traction control during launch.

**Dual Injectors** – The Venus3 can run dual injectors for 4 cylinder engines. Fuel can be added by Ratio or graph.

**Anti-Lag** – This feature will increase boost pressure during racing to eliminate *Turbo Lag* on corners. Newer firmware has an output option to activate EGR valves to bypass turbo pressure to the exhaust. This will help with engine braking in corners and to keep boost pressure high for accelerating out of the corner.

**RapidFire** – This launch feature will make a machine gun sound in the exhaust which is desired by the drifting crowd. The frequency is adjustable and the amount of flames displayed at the outlet.

**Flat-shift** – This feature will momentarily cut engine power during wide open throttle to assist in manual gear shifting.

**Dual Maps** - This ECU can be tuned for 2 different fuel and performance setups. Ideal for the weekend racing enthusiast. On TCU there is 4 maps available.

**Map Change on the fly** – This feature will allow the driver to change to a different map during driving.

**General Purpose Outputs** - This can be used for injectors, fan control, shift light, Aircon Cut-Out on Pull-Off or Up-Hill etc. The amount of GP outputs varies between firmware and features activated on the device. All drivers that is not used by the firmware will be available as General Purpose Outputs.

**Connection Layout Print** – This feature will allow the dealer to print a layout of the connections of the Venus3 after he set it up in software. It will help new customers to finish their wiring with less time.

**Standard Harness** – No need to keep several harnesses in stock for different engines. Level 2 harnesses will include relays and fuses that will ease installation and save time. All the input wiring harnesses use screened cables for neatness of installation and to prevent electromagnetic interference which may cause erratic behavior of the ECU.

**Internal 3Bar Map Sensor** – This optional sensor can be added to use as Altitude sensor or internal Map sensor. It may save cost and time to do connections to an external map sensor.

**Compact Electronics** – This will make the ECU easy to install under the dashboard as it takes very little space.

**Complete Firmware** for Most Engines.

**Cost Effective** – No need to buy expensive systems as all the necessary features are included with the ECU.

**Rotary Systems** – The 2 rotor engines are covered by this Orion2.

**Dynamic Injection Angle** – This feature is for Rotary engines where the injection angle is adjusted during rpm change. It has 2 graphs for 360° for Primary and Secondary injectors to adjust separately.

**External Map Sensor** – Easy to change between 1Bar, 2.5Bar, 3Bar 4Bar & custom configurations. External sensors are used to reduce the delay in the vacuum signal It makes the ECU more versatile to adapt to standard MAP sensors found on engines.

**Altitude Compensation** – This feature is important as the ECU will automatically compensate for differences in pressure.

**Critical Settings Warning** – With Venus3 all the settings that may change wiring connections are now protected by a warning so that the tuner may not accidentally change the setup of the device.

**Standard Tuning Software** – All the products use the same software. The features that is not used or allowed in the firmware will be blanked out.

**Easy DIY Instructions** – Save money on installation if you are a person who is up to the challenge.

**Start-Up Maps included** – This will make for easy start-up & tuning with the help of a Lambda sensor.

**User Friendly** Tuning Software which is extensively explained in the manual.

**Tuning map** can be **locked** to prevent tampering. Useful for engine builders who gives guarantees.

**No Dyno Required** – Tune your own vehicle with the help of the data logger in the software and save money. Just following the instructions in the manual carefully.

(Note that the last five points are for the person who is handy with tools and understand wiring and operation of an engine. If you are not sure, download the software, Map, manual and drawing and experiment with it first. It's free of charge!)

## **Orion2 TCU Features**

Note that some features are in the process to be developed in the future. The hardware has the capability for it. Also note that not all of the features may be included on the same ECU as there is limited amount of drivers available. Some of the hardware classes may not include certain features due to the price range. See the selection chart for the ability of the different classes.

### **Tiptronic or Paddle shift**

- Automatic Mode - the driver sets the maximum target gear allowed.
- Semi-Automatic Mode - the driver has more manipulation of the gears with the added automatic features.
- Manual Mode - the driver has complete control over the transmission with the added protection against over revving.

**Tune or Map Selection Switch** – lets the driver set up his transmission in 4 different profiles *like Automatic, Tiptronic, Towing, Off-road, Racing etc.*

### **Shifter Position input**

- The TCU can sense all kinds of shifter sensors to operate correctly in all lever positions. Different sensing boards could be connected to sense serial or parallel switches. Also switches with common Positive or Negative could be connected with the Level Shifter board.
- If no shifter sensor is available then the reverse light signal can be used to lockout shifting in reverse.

**Gear Profile Adjustments** – Each gear can be separately manipulated to shift up or down when the tuner requires it. These settings work on RPM, Speed and TPS values.

**Line Pressure Adjustments** – These pressures can be adjusted on a graph with the TPS representing engine load. There may be a number of graphs according to the transmission requirement. The software cater for 3 different graphs.

### **Sensors**

- TPS sensor will indicate to the TCU what the driver's intention is. Shifting can be adjusted accordingly.
- RPM signal will be used to shift the transmission to harness the engine power correctly and be economical.
- Speed sensor will be used as protection against down gear over revving and also other shift algorithms.
- Transmission Oil Temperature sensor will change line pressures during cold conditions to soften gear shifts.
- Low range sensor will adjust speed settings in the transmission automatically.
- Shifter Sensor indicates which position the lever is selected. this will indicate the TCU which gear selections are allowed.
- Tune Map Sensor will adjust shifting behavior according to selections by the driver.
- Sensors can be calibrated to suit most engines and transmissions.

### **Solenoids**

- Shift solenoids will manipulate the required gear to be selected
- Duty control solenoids will control line, lockup and shift control solenoids to make the transmission as comfortable to the driver as possible.

**General Purpose outputs** – These outputs can be used for custom features like speed warning, sirens etc.

**Speedo output** – this signal drives speedometers and can be calibrated in the software.

**Selectable Lockup** – can switch on in all gears if transmission permits to improve economy and reduce heat.

**Standard Harness** – No need to keep several harnesses in stock for different engines. Level 2 harnesses will include relays and fuses that will ease installation and save time. All the input wiring harnesses use screened cables for neatness of installation and to prevent electromagnetic interference which may cause erratic behavior of the TCU. There are a few add-on boards to ease between different transmission wiring options.

**Compact Electronics** – This will make the TCU easy to hide under the dashboard as it takes very little space.

**Complete firmware** for Most transmissions.

**Cost Effective** – No need to buy expensive systems as all the necessary features are included with the TCU.

**Critical Settings Warning** – With Orion2 all the settings that may change wiring connections are now protected by a warning so that the tuner may not accidentally change the setup of the device.

**Standard Tuning Software** – All the products use the same software. The features that is not used or allowed in the firmware will be blanked out.

**Easy DIY Instructions** – Save money on installation if you are a person who is up to the challenge.

**Start-Up Maps included** – This will make for easy start-up & tuning.

**User Friendly** -Tuning Software which is extensively explained in the manual.

**Tuning map** -can be **locked** to prevent tampering. *Useful for transmissions builders to give guarantees.*

**No Dyno Required** – Tune your own transmissions and save some money. Just follow the instructions in the manual carefully.

*(Note that the last five points are for the person who is handy with tools and understand wiring and operation of transmissions. If you are not sure, download the software, Map, manual and drawing and experiment with it first. It's free of charge!)*

## **Orion2 Specifications**

### **Power Supply**

12V Ignition power 200mA, filtered by reverse polarity Diode, 700mA Poly switch and 25V Tranzorb  
2.5mm<sup>2</sup> Earth Strap

12V Driver Power up to 14 amps depending on power used by items driven.

### **Fixed Inputs**

2x Digital Inputs for Magnetic, Hall or Optic sensors. (Jumper selectable)

3x Analog Input 0-5V (May be used by firmware as digital)

1x Built in 3 Bar MAP Sensor input 0-5V (Optional. Sensor is sold Separately)

1x Water Temperature Input 2K NTC Resistance Sensor with 1K pull-up resistor Jumper selectable

1x Air Temperature Input 10K NTC Resistance Sensor with 7K5 pull-up resistor Jumper selectable

## 3Pin USB D-Bug Connection

### Fixed Outputs

4x 18A 500V Ground / Floating output  
4x 6A 36V +12V / Floating Overcurrent Protected  
5x 19A 41V Ground / Floating  
1x 19A 41V Ground / Floating, 1K pull-up resistor to 12V Jumper selectable  
5V 600mA Power Output for TPS & Map Sensor and Magnetic Pickups

### General Purpose I/O

These GP I/O can be used as one of the following features. Note that they are software selectable and requires Jumper settings on the board.

#### I/O 1

18A 500V Ground / Floating output  
Digital Input to Ground  
Analog 0 to 5V with 10K Pull-up to 5V  
Serial Bus1

#### I/O 2

18A 500V Ground / Floating output  
Digital Input to Ground  
Analog 0 to 5V with 74K Pull-up to 5V  
Serial Bus2

### Communication

Software UART Connection via USB2 converter cable  
Universal Serial Bus (Optional)  
Bootloader installed for firmware programming via the USB cable

### Dimensions

Size 144 x 68mm x 22mm  
Weight 187g Non Resin filled \*  
5 x Connector Type Plastic Molex 12, 10, 8, 6, 4

\* This unit can be resin filled. Weight will increase depending on the type of resin.

## ECU Selection

Note that the classes that are not used by the ECU firmware is not displayed to simplify the chart. If firmware is developed they will be added.

<b>Orion2 Hardware</b>	<b>STD</b>	<b>INT</b>	<b>ADV</b>	<b>ULT</b>	
<b>Hardware Inputs</b>					
External Map Sensor	1	1	1	1	
Built In Map Sensor (optional)	1	1	1	1	
TPS Sensor	1	1	1	1	
Water 2K NTC or Tap-In	1	1	1	1	
Air 10K NTC or Tap-In	1	1	1	1	
Lambda Narrow or Wide Band	1	1	1	1	Note 1

Battery Volts	1	1	1	1	
Crank Trigger Pulse	1	1	1	1	
TDC/Home Pulse		1	1	1	
UART Comms Port	1	1	1	1	
USB/Programmer 3Pin PCB Con	1	1	1	1	
Bootloader	1	1	1	1	
<b><u>Hardware Outputs</u></b>					
Low Volt Negative Drivers	2	4	4	6	
Low Volt Positive Drivers	1	1	4	4	Note 2
High Volt Negative Coil Drivers	1	1	4	6	Note 2
General Purpose Input / Output	10	10	10	10	Note 3
<b><u>Features</u></b>					
Graph Tuning MAP	1	1	1	1	
Matrix Tuning MAP or TPS	1	1	1	1	
Altitude Compensation	1	1	1	1	Note 4
Idle Control	1	1	1	1	Note 5
Dual Maps	1	1	1	1	Note 6
Full Sequential Injection			1	1	
V-Tech /Vanos Cam Control	1	1	1	1	Note 7
VVTI Cam Control			1	1	
Launch Control			1	1	
Launch Delay			1	1	
RapidFire			1	1	
Anti-Lag control			1	1	
Flat-Shift control			1	1	
RPM Calibration	1	1	1	1	
Power Management	1	1	1	1	
Can be Epoxy filed	1	1	1	1	

### **Notes**

Note 1 - Wideband requires external electronics to provide 0-5V signal

Note 2 - These drivers share the same Micro driver and cannot be used separately

Note 3 - All drivers that is not used by the firmware become GP outputs

Note 4 - Requires the optional on board MAP sensor

Note 5 - Stepper motors require the external Idle2 Controller

Note 6 - These drivers share features and may not be available

Note 7 - This feature operates in Open loop as there is no cam sensor inputs available

**NB!** Some of the firmware may still be under development. This is merely indicating the capabilities of the different classes. Make sure if such firmware are available before buying or quoting your customers



## TCU Selection

Note that the classes that are not used by the TCU firmware is not displayed to simplify the chart. If firmware is developed they will be added.

<u>Orion2 Hardware</u>	<u>STD</u>	<u>INT</u>	<u>ADV</u>	<u>ULT</u>	<u>Notes</u>
<b><u>Hardware</u></b>					
TPS Sensor	1	1	1	1	
RPM Sensor	1	1	1	1	
Speed Sensor	1	1	1	1	
Oil Temp Sensor			1	1	
Low Range Sensor			1	1	
Shifter Selection Switch	1	1	1	1	
Tuning Maps Selection Switch	1	1	1	1	
Tiptronic Up Switch	1	1	1	1	
Tiptronic Down Switch	1	1	1	1	
<b><u>Hardware Outputs</u></b>					
Low Volt Negative Drivers	6	6	6	6	
Low Volt Positive Drivers	4	4	4	4	Note 1
High Volt Negative Coil Drivers	6	6	6	6	Note 1
GP Outputs	2	2	2	*	Note 2
Speedo Output		1	1	1	
Electronic Relay Output					
Relay Output	1	1	1	1	
Battery Volts	1	1	1	1	
<b><u>Features</u></b>					
Tiptronic Function	1	1	1	1	
Overdrive Function			1	1	
2nd Start Function			1	1	
4 Tuning Maps	1	1	1	1	
Individual Gear Shift Profiles	1	1	1	1	
Duty Cycle Control	1	1	1	1	
Speedo Calibration		1	1	1	
Lockup Control	1	1	1	1	
Lockup Selectable / Gear	1	1	1	1	
Transfer Box Ratio Adjustments			1	1	
Number of Gears Capable	10	10	10	10	
Epoxy filed					
Can be Epoxy filed	1	1	1	1	

## Notes

Note 1 - These drivers share the same Micro driver and cannot be used separately

Note 2 - \* All drivers that is not used by the firmware become GP outputs

**NB! Some of the firmware may still be under development. This is merely indicating the capabilities of the different classes. Make sure if such firmware is available before buying or quoting your customers**

## **Backwards Compatibility**

This document highlights all the factors to consider when using Orion2 on older product harnesses such as Orion, Saturn, Pluto2, Pluto, Venus and Titan. Orion2 was developed with new technology and is an improvement on Orion. It can cover more engines and transmissions with the extra features. In most cases it is backwards compatible with Orion except when it comes to coils. See the notes below.

Neptune2 was also discontinued due to Orion and Orion2 that can now do TCU as well. However, the harnesses and drivers are too different to be backwards compatible. Neptune2 is no longer sold.

### **Basic Coils (No Drivers)**

On most firmware Orion2 will drive basic coils without external drivers the same way as the older products. Orion has a total of 6 HV coil drivers. 2 are shared with inputs like Dual map and Potentiometer input.

Saturn had 6 high voltage coil drivers that were used in combination with injectors where Orion2 has 4 HV drivers and 2 low voltage high current drivers on those same pins. Injector drivers are smaller and less expensive and perfect for injectors. The downside is that if a program used more than 4 coils then the coils must be connected on two other pins. There was very few firmware for Saturn like the Spark only ECU. It could drive 6 coils.

### **Smart Coils (Built in Drivers)**

For coils with built in drivers there is no drop in replacement. Orion2 use 4 positive drivers to drive intelligent coils directly don't require 220 ohm pull-up resistors. If you select Basic Coil or Smart Coil this will move the coil connections to different pins on the Orion2. On Saturn and older products, it would use the same pin but invert the signal. You also need to add a Clean Power relay to bring power into the Orion2 to supply the positive drivers. Do not use the coil relay as it may damage the drivers. See the drawings for wiring of the relay.

### **Injectors**

Orion2 can drive 4 Injectors by using the 2 GP outputs on the P2 connector. When you select Smart Coils then injectors are moved to the more robust HV Coil drivers. There are also 4 GP outputs in total like Saturn. Some firmware did use this connection method but driver placement may be different. Confirm with the drawings and GP layout that you are on the same connections.

### **Power**

Due to the difference in driver voltage it became important to add a 6 Amp diode on the power relays from pin 87 to earth to prevent driver damage. See the wiring diagrams for details.

### **Jumpers**

Orion2 and Saturn jumpers sit in the same position but the Hall/Magnetic selection is swapped around. This made PC Board layout better but it catches old Saturn customers out. Do make a note when you set up a box for a customer.

## **Harnesses**

Orion2 are sold with the latest design in automotive harnesses. Older harnesses became obsolete and are not featured in the manual. If you use Orion2 on older harnesses, then compare drawings in the old manuals to the Orion2 drawings to verify wire colours.

## **Firmware Programmer**

Orion2 has a BootLoader and does not use the USB Debug Adapter to load firmware. It is now done via the USB cable.

## **Orion2 Ver 3.6A Changes v/s Orion Ver3.5B**

Orion2 is a big improvement over Orion. It has 4 more outputs from the processor due to the flash memory that is not used anymore. This let us use the 4 Positive drivers separately from the 4 Coil drivers. The other big improvement is new software Ver 3.6A which addressed new features and terminology for better understanding of the product. Below follows a list of changes. If you knew the older Orion well this would be a good document for you. The new Orion2 manual will hold all the information in more details.

## **Coils**

The biggest hardware change is coils. On Orion there were 4 Positive and 4 Coil drivers that shared the same output from the processor. This mean they could not be used separately. If you had Basic coils, then you connected them to the Coil drivers and if you had Smart coils then you connected them to the Positive drivers. This means there were 8 pins on the Orion occupied where only 4 could be used at any one time. This was an improvement over Saturn which used the same Coil drivers for both applications. The software then inverted the signal for Smart coils and you had to wire in a pull-up resistor for the coils. The drivers or coils were damaged if you had this setting wrong. On Orion2 we can now use all 8 drivers separately resulting in more functions that became available like Cam Control, Anti-Lag valve output and full sequential injection and spark control on 4 cylinders.

The names distinguishing coils has changed. The best we could come up with that has short names is Basic and Smart coils. Basic is coils without drivers and Smart is coils with built in drivers. Dumb or Intelligent coils is not recognized in the international market and is not correct either. Electronic names is Passive and Active coils but that is not familiar either.

## **Injectors**

On Orion2 injectors is moved between the low voltage Negative drivers and the high voltage Coil drivers. If you connect Smart coils, then it means that the Stronger Coil drivers is available. Then Injectors is moved to these outputs. The drawings are marked as Option2. If you use Basic coils, then it means the Coil drivers are occupied and the injectors is placed on the Negative drivers and the drawings are called Option1.

## **Ultimate Firmware**

The requirement in the market made us decide to add Ultimate features of Mercury2 on Orion2. Keep in mind it has less drivers so it may not have all features for 6 and 8 cylinder engines. Depending on features used it may be limited due to drivers. Below is a list. The Orion2 will suit 4 Cylinder engines perfectly as there are enough drivers to do full sequential injection and ignition. It also saves the customer a lot of money due to the built in coil drivers. Fuel Control of Mercury2 could not be added due to the lower amount of drivers and inputs required.

- Full Sequential Fuel – 4Cyl Only
- Injector Trimming – 4Cyl Only
- Full Sequential Spark – 4Cyl Only
- Launch Timing to 30° ATDC

- Launch Delay
- Flat Shift
- Anti-Lag with Output for EGR Valve
- Micro Fuel or Dual Injectors
- 2x Cam Control
- Output Layout Print feature for wiring connections

### **Speed**

The Orion2 Processor runs 40% faster than Orion. This is needed for the extra features.

### **Drivers**

The four positive drivers can now operate independently from the HV coil drivers. This means Orion2 has effectively four more drivers for output functions.

### **Orbit**

Orion2 can house an optional orbit on board. It will come in effect with future development.

### **Dead band**

The injector offset is now used for injector dead band. This value will add injector time at the end of calculations to compensate for the time it takes to open and close the injector. It will not affect the total real-time value displayed on the software. So make sure it is zero if you don't use it. The big advantage of this is for Altitude compensation. On older versions altitude compensation took dead band into calculations and caused a slight error by going leaner at higher altitude. The dead band value is now also added on Micro Fuel graph where previous versions did not have it.

### **Fuel accuracy**

There is a small change in fuel accuracy so that tuned values and displayed values are accurate. This means that if you do upgrade from older map you may need to adjust fuel slightly.

### **Lambda read range**

The read range is increased from 1000 - 6000 RPM to 500 -15000 RPM. This will help cars with wide band Lambda sensor to compensate through the whole range.

### **Check Limits**

A limits check in the firmware were added to ensure that out of bounds values are forced for each firmware type at start-up. This will have no effect on tuning. This feature will fix values that are out of speck when you load new firmware even before the software is connected.

### **Minimum charge time**

This value was effected by the charge time compensation graph. Which means your min time could be less than the value set on the software. It is now fixed. It should not affect any maps as nobody use a negative coil charge compensation for battery voltage.

### **Injection Angle**

The Injection teeth setting will now advance injection timing from engine TDC for 360 or 720 degrees. This is more understandable to the tuner. The old system retarded injection timing from the slot or TDC pulse for 360 or 720 degrees. Do note that injection teeth are adjusted in the same degrees as the gear's pitch. Ex 10 degrees for 36 tooth gear. You may need to change this value if you used an older map.

### **Rotary Adjustable Injection Angle Graph**

Two graphs are implemented on Rotary firmware to change the injection angle with RPM changes. One graph for Primary injectors and one graph for Secondary injectors. The primary graph is activated when the normal **Injection Teeth** setting is set to zero. The secondary graph will come on when you put Micro Fuel on Graph.

### **Accelerator pump Prime pulse**

A change was made here that will help with full sequential injection. If the accelerator pump is activated it will pulse all the injectors once for the same value as the ACC Pump Enrichment setting. The advantage is that fuel is more readily available for cylinders that was pre calculated. This should address the flat spot issue when you blip the engine. It works with TPS and MAP settings.

### **Anti-Lag**

An output was added for an EGR valve. This valve will be activated when Anti-Lag is activated and will enable bypass air from the turbo to be added in the exhaust to enable the fuel to burn. It is only available if the driver is available and deal maps selection are not used.

### **Graph Map and Matrix TPS**

On Graph Map and Matrix TPS selection the compensation range on the boost graph were increased from 250% to 500%. This will cater for high boost engines above 2.5 bar boost.

### **Matrix Software Interpolation**

In the software you can now select a block in the matrix and let the software interpolate the 4 corner values to assist in setting up a map.

### **MAP and ALT sensors**

A 3 Bar sensor must be soldered onto the PC board for Altitude. If you do a MAP/ALT Swop, then you must add a 2.5 Bar sensor external for Altitude.

### **Prime Pulse**

Full sequential prime pulse will only come once Home pulse is established. This will have the fuel ready once cam degrees are established. For split sequential the prime pulse is activated when the crank trigger detects crank movement.

### **Idle Valve**

When the TPS is in run mode the idle valve will be kept open same value as the Minimum Duty opening. Previously it fell shut. This will assist in preventing the engine from stalling during blip conditions.

### **Critical Settings**

All the critical settings that will make wiring differences are marked with a warning sign, and when you click on them a warning message will indicate that you are about to change the wiring of the unit. If it is on a live engine you may break things in the ECU or engine. This feature allows the Orion to move drivers around to cater for extra features.

### **Wiring Layout Print Function**

When you finished to do the setup of the ECU you can now print a layout from the software which will then indicate which driver to use for each item. This will help installation considerably due to the many different connection options. This is an Excel spreadsheet and can be copied over the wiring color information sheet.

### **Coil Charge time when cold**

The coil will now stay on max charge time until the engine reaches 60°C. Before it looked at the water graph and stay at maximum charge time until fuel enrichment was below 5%. Problem came when you enrich the mixture at high temperature to cool the engine off. Then timing will go to max and heat up the coils.

### **Errors**

Many new error numbers were implemented. See the manual for a description.