Mercury2 Product Information

Mercury2 is a cost effective Engine Control Unit (ECU) or Transmission Control Unit (TCU) which is the flagship of our range products. It has negative and positive drivers to cover most applications and reduce costs. It can connect to most sensors found on engines and transmissions. The Mercury2 can easily be customized on site with the use of the low cost firmware programmer. This feature makes it a very versatile product to keep in stock.

Mercury2 Overview

This versatile Automotive Controller is designed to be a cost effective durable 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 Mercury2 can be reprogrammed remotely by a firmware programmer. 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 Mercury2 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 Mercury2 cover features like Lambda control, idle control, launch control, cam control, stepper motor control, throttle by wire control, boost control, line pressure control, fuel pressure control tiptronic and lots more. It can drive intelligent 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 Mercury2. 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 Mercury2 adaptable for most applications on site.

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

Mercury2 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 Mercury2.
- 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, Fuel Pressure 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.
- Fuel pressure control can be done with pressure compensation maps.
- Injector trimming up to 8 injectors can be used for Full Sequential Injection.
- Fuel enrichment can be adjusted during Launch, RapidFire or retard functions.

Ignition Spark & Timing
- The Mercury2 can manage *Distributors*, *Wasted Spark* coil packs, *Wasted Spark COP* coils or *Full Sequential* spark systems.
- Mercury2 uses standard automotive coil packs found on engines. No need to change them.
- Most Smart Coils with built in drivers can be connected directly.

- Basic Coils is connected via the Mercury Coil drivers that is sold separately in different versions. Coil drivers can be stacked to accommodate V12 systems and V8 Dual Coil engines. The latter have 16 coils.
- The Mercury2 high performance firing module ensure a high quality spark adequate to ignite most mixtures of different fuels. It also has built in protection against overload conditions.
- Mercury2 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
- Mercury2 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 – Up to 10 GP drivers can be used if there are enough available. They can be used for injectors, fan control, shift light, Aircon Cut-Out on Pull-Off or Up-Hill etc.

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.

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 & 3 rotor engines are covered by this Mercury2. 4 & 6 Rotors can be done as well.

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.

Fuel Pressure control – This will control the speed of the fuel pump which eliminate the need for the mechanical fuel pressure regulator and return fuel line. It also compensates injector time versus fuel pressure to ensure accurate mixtures during blip conditions.

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 accidently 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!)

Mercury2 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.

Indication LED's – The TCU has up to 6 dashboard LED's to indicate different functions that is selected. This will help the driver to manage his transmission.

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.

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!)

Mercury2 Specifications

Power Supply
12V Ignition power 200mA, filtered by reverse polarity Diode, 700mA Poly switch and 25V Tranzorb
12V Relay power 14A Max, filtered by reverse polarity Diode
12V Driver Power up to 14 amps depending on power used by items driven.

Fixed Inputs
4x Digital inputs – Magnetic Isolated (2 Inputs require a 1K pull-up resistor for Hall or Optic inputs)
5x Analogue input 0 – 5V
1x Water Temperature Input 2K NTC Resistance Sensor with 1K pull-up resistor
1x Air Temperature Input 10K NTC Resistance Sensor with 7K5 pull-up resistor
1x Lambda Input 0 – 1 V or Processed 0 – 5V signal.

Fixed Outputs
8x 6A P Channel Mossfets 12V Output Floating, Over-current protected
8x 6A N Channel Mossfets Ground Output Floating, Over-current protected
1x Mechanical Relay 3.5A Ground Output Floating, Over-current protected
1x RPM 3.5A Ground Output Floating with 1K pull-up resistor to 12V, Over-current protected
2x General Purpose 3.5A Ground Output Floating, Over-current protected
5V 600mA Power Output for TPS & Map Sensor
Electronic Relay 5V 5mA output for Spitronics custom 45A solid state relay

Communication
Software UART Connection via USB2 converter cable
Firmware Programmer Connection

Dimensions
Size 145mm x 68mm x 21mm
Weight 240g
6 x Connector Type Plastic Molex 12, 10, 8, 6, 6, 4

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.

Merury2 Hardware	STD	INT	ADV	ULT	COM	
Hardware Inputs						
External Map Sensor	1	1	1	1	1	
Altitude Sensor	1	1	1	1	1	
TPS Sensor	1	1	1	1	1	
Water 2K NTC 1K Pull-up	1	1	1	1	1	
Air 10K NTC 7.5K Pull-up	1	1	1	1	1	
Lambda Narrow or Wide Band	1	1	1	1	1	Note 1

Battery Volts	1	1	1	1	1	
Tuning Pot	1	1	1	1	1	
Fuel Pressure Sensor			1	1	1	
Power Management	1	1	1	1	1	
Crank Trigger Pulse	1	1	1	1	1	
TDC/Home Pulse		1	1	1	1	
VVTI Cam 1 Pulse				1	1	
VVTI Cam 2 Pulse				1	1	
UART Comms Port	1	1	1	1	1	
Hardware Outputs						
Low Volt Negative Drivers	2	8	8	8	8	Note 2
Low Volt Positive Drivers	1	1	8	8	8	Note 2
General Purpose Negative Drivers	2	2	2	2		
Features						
Graph Tuning MAP	1	1	1	1	1	
Matrix Tuning MAP or TPS	1	1	1	1	1	
Altitude Compensation	1	1	1	1	1	
Idle Control	1	1	1	1	1	Note 3
Dual Maps	1	1	1	1	1	
Dual Injectors					1	
Split Sequential Injection	1	1	1	1	1	
Full Sequential Injection			1	1	1	
Fuel Pressure Control			1	1	1	Note 4
VVTI Cam Control Open Loop			2	2	2	
VVTI Cam Control Closed Loop					2	
V-Tech /Vanos Cam Control	1	1	1	1	1	
Launch control			1	1	1	
Launch control Delay				1	1	
Anti-Lag control			1	1	1	
Flat-Shift control			1	1	1	
RPM Calibration	1	1	1	1	1	
Epoxy filed	1	1	1	1	1	

Notes

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

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

Note 3 - Stepper motors require the external Idle2 Controller

Note 4 - This feature requires the Electronic Relay

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.

Mercury2 Hardware	STD	INT	ADV	ULT	Notes
Hardware Inputs					
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	
Battery Volts	1	1	1	1	
Power Management	1	1	1	1	
UART Comms Port	1	1	1	1	
Hardware Outputs					
Low Volt Negative Drivers	8	8	8	8	
Low Volt Positive Drivers	8	8	8	8	
GP Outputs	2	2	2	*	Note 1
Speedo Output		1	1	1	
Electronic Relay Output	1	1	1	1	
Relay Output	1	1	1	1	
Reverse lights Relay Output	1	1	1	1	
Starter Relay Output	1	1	1	1	
LED Output	5	5	5	5	
Power Management	1	1	1	1	

Features					
Tiptronic Function	1	1	1	1	Note 2
Overdrive Function				1	1	Note 2
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 per Gear	1	1	1	1	
Transfer Box Ratio Adjustments			1	1	
Number of Gears Capable	10	10	10	10	
Epoxy filed	1	1	1	1	

Notes
Note 1 - * All drivers that is not used by the firmware become GP outputs
Note 2 - These drivers share the same input as Tiptronic buttons.

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

Mercury2 Ver 3.6 Changes v/s Mercury2 Ver3.5

Coils
Full sequential spark is included in 4 and 6 cylinders in Ultimate Class.

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/ALT Swop
This setting will select between 1.1Bar or 2.5Bar altitude sensor. The 1.1Bar sensor became expensive and scarce to find due to popularity. This setting must be on to chose the more popular 2.5Bar sensor as Altitude sensor.

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 Mercury2 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.