



# Performance ECU



**More Power.**

**More Torque.**

**Engine  
Protection.**

***Power Without Compromise***



**Safari 4x4 Engineering Pty Ltd**  
Melbourne, Australia. [www.safari4x4.com.au](http://www.safari4x4.com.au)

# SAFARI ARMAX

Diesel engines function in a completely opposite manner to Gasoline engines.

That is to say, RICHER fuel/air ratios, (more fuel) results in a diesel engine running HOTTER and producing MORE power.

LEANER (more air) means a diesel engine running COOLER; however producing LESS power.

As a consequence of the above, contrary to assertions from many CHIP suppliers, it is fundamentally impossible to simultaneously offer substantially increased power from a diesel engine, directly coupled with improved fuel consumption, purely by installation of a CHIP.

However, fuel consumption CAN be improved by simultaneously installing other components such as improved flow air entry and exhaust systems, thus increasing engine efficiency.

A well designed, manufactured and correctly CALIBRATED ECU ( Engine Control Unit, not merely a CHIP), CAN offer substantial increases in power. Typically it can provide a 25% increase in power by installation of the ECU alone and upwards of 50 to 60% over standard, when coupled with appropriately matched additional components. In some cases, these additional components may also result in improved fuel consumption under light load, or cruise conditions.

## SAFEGUARDS

Even with the best technological approach possible, it is still necessary to provide safeguards against the adverse 4x4 operating conditions for which Australia is rightly infamous.

(The OEMs do this by simply providing very conservative fuel calibrations).

## Turbocharger Air Delivery (Boost Control)

Safari's ARMAX™ ECU is one of the very few aftermarket diesel 4x4 tuning products to provide calibration of the turbocharger's air delivery (boost) as a standard element of the ECU's function.

This is extremely important as it is the only method of ensuring that the correct Air /Fuel ratio is maintained, following the provision of the increased fuel volume necessary for improved diesel engine power output.

Failure to undertake this function will result in excessive engine operating temperatures under load. The result of this failure is the single most common reason for reported engine overheating following the installation of a typical, non-boost controlling, aftermarket CHIP.



## Exhaust Gas Temperature (Thermal Load)

The exhaust gas temperature of the engine is the fastest responding and most reliable indicator of what is going on inside the combustion chamber of the engine. Measuring this parameter is so important that every large diesel truck in the country is equipped with a gauge showing the driver just what exhaust gas temperatures the engine is experiencing.

# ECU (Engine Control Unit)

## Exhaust Gas Temperature (Thermal Load)

However, as of early 2016, the Safari ARMAX™ ECU was the only 4x4 diesel tuning device to feature REALTIME exhaust gas temperature feedback control as a STANDARD element of the tuning system. The Safari ARMAX™ ECU receives constant input from an industrial grade thermocouple, retrofitted into the exhaust system.

This data is used by the Safari ARMAX™ ECU to modify its pre-set calibrations as required and is the ultimate last line of protection of the engine in adverse conditions. Should this circuitry become inoperative for any reason, the Safari ARMAX™ ECU simply defaults to OEM calibrations.



Most CHIP suppliers claim they calibrate in Australia, although almost none actually do so. Almost all use calibration data from their European suppliers which is completely inappropriate for Australian conditions.

Safari employs Australia's most sophisticated aftermarket Dynamometer facilities, coupled with the country's most demanding in-field test regime. This Engineering approach is applied to one of Australia's largest company owned developmental vehicle fleets, in order to develop unique Australian calibration data.

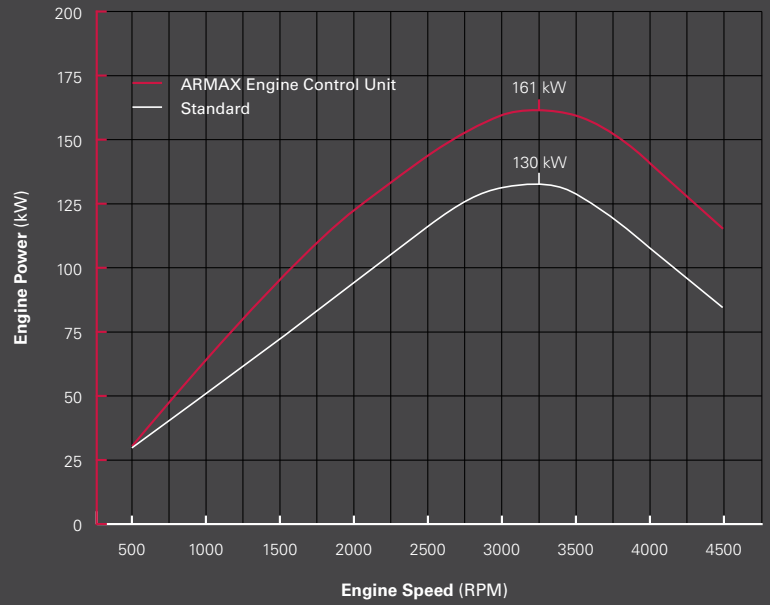


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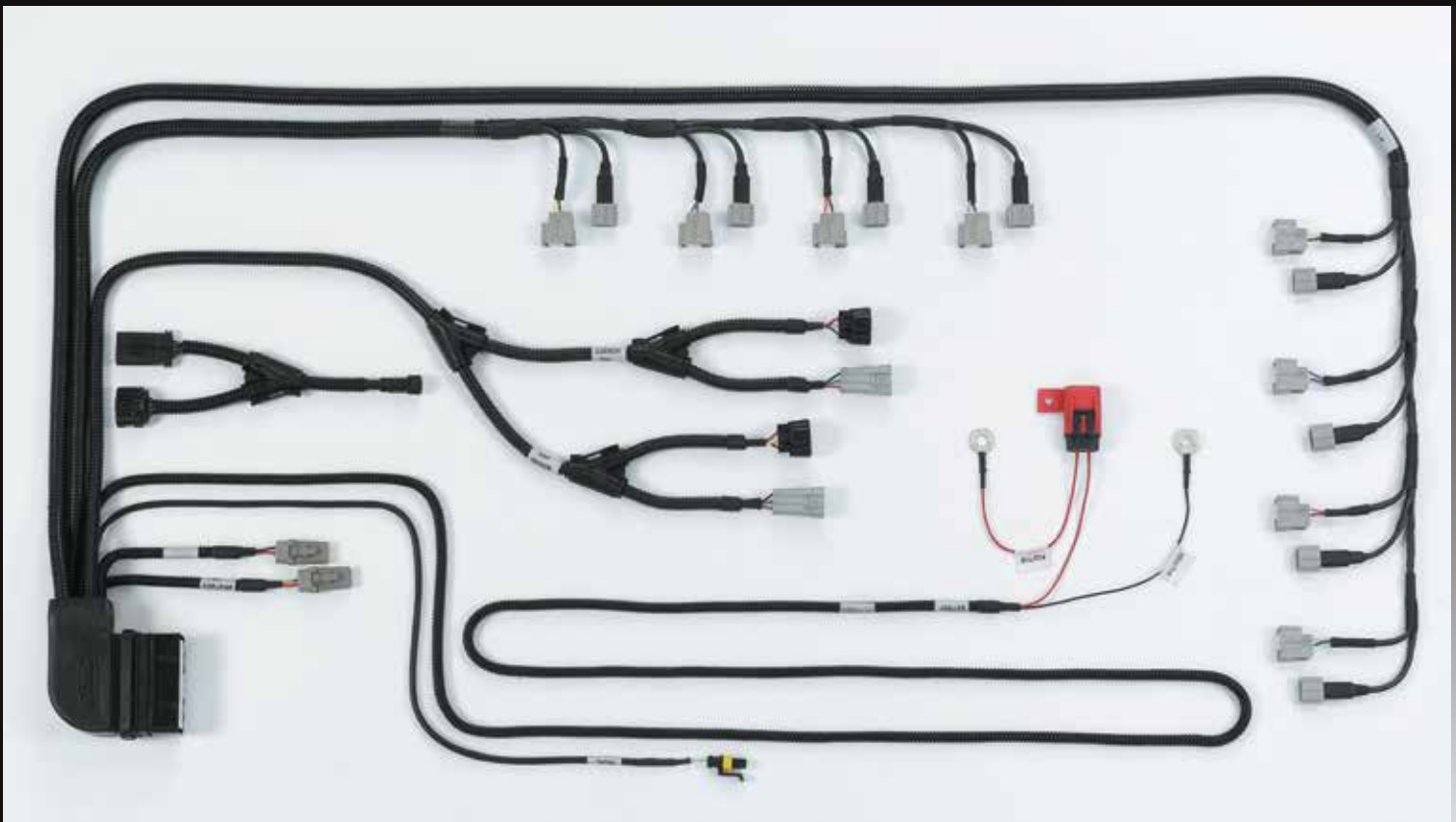
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# ARMAX

## Engine Control Units (ECUs)



Toyota Hilux 1GD-FTV Power Graph shown.



## DESIGN APPROACH

There are two methods of supplying the additional fuel required by a diesel engine in order to make additional power.

### Increased Fuel Pressure

This is simple and thus inexpensive to achieve with most common rail diesel fuel injection systems (Post 2006 in Australia). This is the approach taken by most CHIP suppliers. However, to provide the additional fuel required for a 25% increase in power, requires a 56% increase in fuel pressure. With CRD systems, this approach requires the fuel pump to work under significant increased load, leading to premature wear and failure. Equally, it also requires the electric solenoids in the fuel injectors to open against much higher pressure, unduly stressing them and also resulting in premature failure. These are both expensive items to replace, thus contributing to the poor reputation of many aftermarket tuning CHIPS. Fortunately, the older, simpler, non CRD electronic diesel fuel injector systems, (1998 to 2006 in Australia) can be reliably tuned by this method.

### Control of the Fuel Injector (Open Duration)

The optimum technical approach is to take control of the time duration for which the injector is held open. Additional fuel can then be supplied without increasing fuel pressure and thus unduly stressing expensive fuel injection components. Safari's ARMAX™ ECU takes control of the engine's fuel injectors, without increasing fuel pressure above the system's original maximum threshold. While control of injector duration is obviously the correct technological approach, it has one significant disadvantage over simply raising fuel pressure.

## COST

To take control of injector duration, it is necessary to provide an entirely new fuel injector wiring loom and vastly more sophisticated electronics, including Injector Drivers, in the ECU.

This IS expensive, particularly if German manufacture and quality assurance are used.

However if the best, most reliable product is the objective, it is the only possible approach.

This is Safari's answer to the question of how to achieve increased diesel power from modern CRD diesel fuel injection systems in the most durable manner.



Safari ARMAX™ ECUs are designed in Australia, manufactured in Germany to ISO 9002 QA standards and CALIBRATED in Australia for Australian vehicles and conditions. They feature precision engineered housings and circuitry as follows:-

#### **Glass-fibre Reinforced Housing**

The newly developed glass-fibre reinforced housing meets all 4x4 users' requirements for a robust, long-lasting product capable of extended operation and suitable for use over a wide temperature range of extreme operating conditions. The assembly benefits from the latest developments in shock absorbing technology, together with complete sealing against the typical Australian 4x4 environment.



#### **German Made PCB**

The Printed Circuit Board is manufactured in Germany to Safari's specification. It is assembled to German OEM quality standards by a German OEM supplier.

#### **Heat Resistant Circuitry**

The full surface mount process with epoxy resin coating ensures a particularly high level of component durability. Intelligent thermal management of component layout ensures long term durability and low chip/injector driver temperatures by optimising heat dissipation characteristics.



Industrial Grade Thermocouple

Thermocouple Signal Amplifier



### Dual Ultra High-Speed Processors

The dual ultra high-speed processors reference the data received from the engine against the calibrated, internally stored tables, then use this information to constantly adjust the engine injectors' open duration via the ARMAX™ ECU's internal injector drivers.

### Surface Mount Keypad

With the dust/watertight membrane style on-board controls you can switch between maps as you wish, without compromising the durability of the ARMAX™ ECU. 3 colour LED's display the currently selected program.

### Multi MAP Technology

The multi MAP technology developed by Safari is designed to work within the parameters of the OEM ECU. The protective functions of the engine are thus fully preserved.

Each unit is supplied with three selectable maps (Eg. Sport, Comfort and Towing) to suit your changing requirements.

### ADDITIONAL FEATURES

In addition to the most technologically advanced method of performing its basic function of increasing power, the Safari ARMAX™ ECU has a number of additional features:-

#### Looms and ECU Mounts

Each vehicle application of the Safari ARMAX™ ECU has its own dedicated, custom designed and manufactured Wiring Loom and Mounting Bracketry. Both are manufactured to OEM standards by OEM suppliers. No generic, "one size fits all" loom is used and the vehicle specific mounting bracketry ensures professional, durable location of the Safari ARMAX™ ECU in every application.

#### Owner/Custom Calibration

The Safari ARMAX™ ECU features multiple owner selectable power curves, chosen by a simple push of a water/dust sealed button in a membrane on the outside of the ECU housing.

If you change any mechanical components from their OEM specification, the chances are very high that Safari will be able to provide your original installer with a revised calibration over the Internet as Safari is continually evaluating compatible mechanical products.



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# **SAFARI** **ARMAX**

## Performance ECU



### WARRANTY

As would be expected of Australia's premium product in this field, the Safari Armax ECU features a 3 Year Unlimited Kilometre Warranty for Diesel 4x4 tuning devices.

### SUMMARY

Safari's ARMAX™ ECU is the ultimate tuning device for late model, electronically controlled diesel fuel injected vehicles.

Legendary Safari reputation coupled with German PCB build quality.

Totally sealed electronics, watertight, dustproof, developed and calibrated for the Australian Outback's harshest conditions.

The safari ARMAX™ ECU – the ONLY solution for totally reliable 4x4 diesel engine performance.



### QUALITY AFTERMARKET 4X4 COMPONENT MANUFACTURER.

Safari's signature lies in the quality and durability of its components, the attention to detail in every system and the absolute requirement that "product performance must always be achieved with total reliability".



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