MoTeC Engine Management Systems

Fully Programmable and Field Upgradeable

- Fully Programmable
- Field Upgradeable
- Advanced Tuning Features
- Data Logging
- Powerful Software
- 32 bit Microprocessor
- Wideband Lambda Measurement
- Rugged Aluminium Case
- Quality Standard ISO 9002
- Worldwide Support

MoTeC have created a range of advanced Engine Management Systems designed to cater for the needs of all types of users. Whether you are running a street car, touring car, rally car, formula car, motorbike or a boat, ***MoTeC*** have a system to suit you and your budget.

Tuning an engine correctly can be time consuming with some systems. However, ***MoTeC*** provides management systems that offer ease of tuning, flexibility and maximum power to give you that winning edge.

Your goal is to maximise horsepower and reliability. At ***MoTeC*** we've provided the tools to do just that. The key variables of ignition advance, air fuel ratio and injection timing are easily tuned to ensure the best performance and reliability.

All ***MoTeC*** Engine Management Systems are fully programmable, this allows them to be programmed to suit any engine from a Rotary to a V12.

Many sporting application engines controlled by ***MoTeC*** Engine Management Systems have passed full EPA emissions certification tests.

Latest Technology

The ***MoTeC*** range of Engine Management Systems (ECU's) share similar architecture and componentry. At the heart of all MoTeC ECU's is a 32 bit 33MHz microprocessor with time co-processor. The electronics are produced on an automated robotic assembly line to IS0 9002 standards.

Compatibility

Nearly all Original Equipment Manufacturers (OEM's) and after market trigger systems, injectors and ignition systems can be used with the ***MoTeC*** ECU's. This avoids the cost and time needed to remanufacture systems to suit the ECU. The ECU can be triggered by either a hall effect, a logic drive, optical, or a magnetic sensor, using various signal types and with intelligent signal filtering. This method insures proper signal to noise ratio at any crank speed.

MoTeC's unique software programmable switch mode drivers can trigger any injector with up to 70% less power usage than other products. This method offers significant advantages by drawing less power from the electrical system & generating less heat inside the ECU.

Electrical Noise

Electromagnetic interference can play havoc with electronic devices, and ***MoTeC*** takes extensive preventative measures to reject low impedance conducted interference and to shield from radiated interference.

A Wealth of Experience

MoTeC was formed in 1987 solely to design, manufacture and market Engine Management and Data Logging systems for the automotive, marine and racing industries.

MoTeC supplies the industry with products designed from a combination of **research**, **development** and **practical field experience** while still maintaining **quality** and **prices** to satisfy your requirements. With ***MoTeC*** offices and distribution worldwide you can be assured of the highest level of customer service wherever you are.

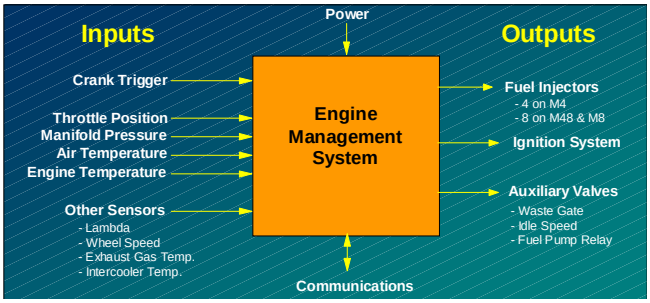
Advanced Features

All ***MoTeC*** Engine Management Systems offer highly advanced features including: traction control, launch control, overrun boost enhancement, data logging, gear change ignition cut, gear or throttle position dependent boost control, individual cylinder tuning, wideband lambda control and many more, either as standard or optionally.

Basics of an Engine Management System

The basic task of an Engine Management System (ECU) is to control the fuel injectors, ignition system and various other devices associated with the engine.

The ECU does this by taking measurements from a number of sensors, it then uses the calibration data to determine how much fuel to inject and what ignition timing to apply, under the current conditions. The calibration data may be changed at any time by connecting a computer. ***MoTeC's*** range of ECU's differ in the number of inputs and outputs so as to suit many applications and budgets.



ECU Models

There are three families of ***MoTeC*** ECU's; ***M4***, ***M48*** and ***M8***. Within each of these families are various models with a number of upgrade options.

All ***MoTeC*** ECU's have both field updateable operating systems and field upgradeable features. This policy allows you to maintain the very latest in technology for many years to come.

M4

The ***M4*** is our 4 cylinder sequential and rotary engine ECU designed to provide you with the most common features at the lowest possible cost. The M4 is the most compact and lightweight model in the ***MoTeC*** ECU range. The M4 represents excellent value with four injector drivers controlling engines up to four cylinders in sequential injection mode or twelve cylinders in group fire mode. Although predominantly designed for performance street cars and bikes, by choosing the optional upgrade features (advanced tuning, logging and lambda), it is also ideally suited for competition use.

Optional Mil Spec connectors available for all models

M4-Clubman

As the name suggests, the Clubman has the features the club/enthusiast needs. The M4-Clubman offers 3D mapping and can be upgraded to the features of the M4-Pro at a later time.

M4-Pro

The M4-Pro has the Advanced Tuning & Data Logging option as standard. The Advanced Tuning offers traction control, boost enhancement and greater configurability.

M48

The ***M48*** ECU is designed for 4 to 8 cylinder engines. The M48 represents excellent performance and value with eight injector drivers controlling engines up to eight cylinders in sequential injection mode, or twelve cylinders in group fire mode.

The M48's sequential injection capability makes it perfect for competition use as well as performance street cars and bikes. Optional upgrades for advanced tuning, logging and lambda make the M48 the ideal solution for your immediate needs now and for years to come.

M48-Clubman

The Clubman offers 3D mapping giving you the ability to drive your injectors and set your spark timing to be at its absolute best at all points. The M48-Clubman can be upgraded to the features of the M48-Pro at a later time.

M48-Pro

Like the M4-Pro, the M48-Pro has the Advanced Tuning & Data Logging option as standard. This offers traction control, boost enhancement and greater configurability. The Pro is for the leading edge engines up to eight cylinders where peak performance is required.

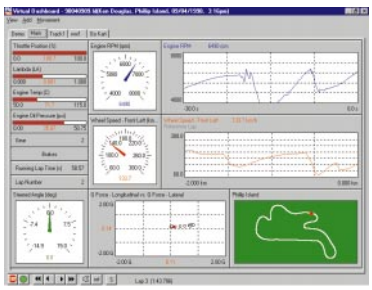
M8-Pro

The ***M8*** ECU is our top of the line unit, providing unrivalled power and flexibility. It is intended for no compromise competition and road usage.

Standard features include sequential injection for up to 8 cylinders and group injection for up to 12 cylinders. The M8 offers a large number of inputs, all of which can be configured to suit an extremely wide range of sensors. In addition extra switched and Pulse Width Modulated outputs can be defined by the user to perform any of a wide range of functions.

The M8 Pro ECU offers the ultimate in Engine Management features. Advanced Tuning is standard on the M8, with optional upgrades for Logging, Lambda and Pro Logging.

Unique to the M8 is the Pro Logging upgrade, which offers additional Analysis Software. This upgrade includes: Graph Overlays, XY Plots, Maths Functions, Virtual Instrument Display, Track Maps, Histograms and Statistical Functions.

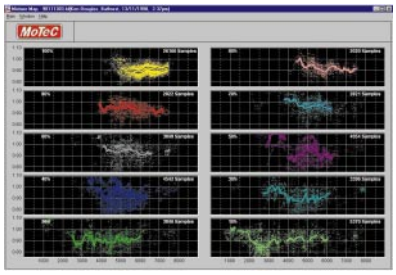


Virtual Instrument and Track Map screens available for M8 with Pro Logging upgrade

Data Logging

Data logging is available as an optional upgrade on all ECU's. Data logging allows the user to quickly verify the operation of the vehicle during 'on track' conditions. All ***MoTeC*** ECU's are capable of recording the ECU operating parameters at up to 20 times per second. The data may then be downloaded to a computer and analysed using the Interpret software.

Important parameters such as engine temperature and air fuel ratio can be quickly checked using the graphical analysis features. The special air fuel ratio analysis screen presents the air fuel ratio in a load/RPM plot.



When combined with a ***MoTeC*** lap beacon and accelerometer, an M8 with Pro logging can even show lap times and a detailed track map. This includes minimum and maximum speed and RPM, gear change points and braking points.

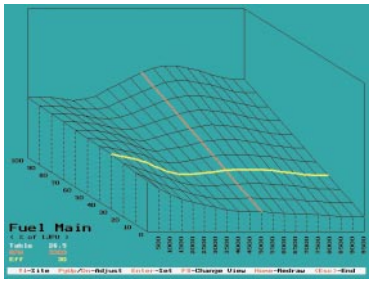
Computer Software

The ***MoTeC*** software has been designed with the emphasis on useability, enabling you to quickly optimise the setup of your vehicle.

MoTeC's computer software is acclaimed by many satisfied users around the world as the standard in engine management software. It is filled with features that make the tuning operation easier, safer and quicker. It is friendly for beginners and powerful for experts. All programs are menu driven and have extensive help screens.

A comprehensive suite of computer software tools is supplied with every ECU. Their principal functions include:

- Engine setup, tuning, diagnostic and utilities
- Monitoring, data logging and analysis
- Utilities for loading new program code & special features



EMP Program

The EMP program is designed for setup, tuning and diagnostics of the ECU. Tuning may be done online with the ECU connected, or offline then sent to the ECU at a later time.

The EMP program allows for viewing of all sensor readings, output settings, status reading, compensations and diagnostic errors.

It has many powerful features, including quick Lambda, which allows the fuel to be automatically adjusted to the correct value at the press of a button.

Other features include; 3D graphing of calibration tables, site target, output testing, file comparison, table interpolation, table copy, table export, table mathematics and online help.

Interpret

The Interpret program provides advanced tools to assist users in analysing the logged data quickly and efficiently. Data can be collected from any of the ***MoTeC*** ECU's internal log memory, by telemetry, or by direct connection to a PC.

The information contained within the log files can be viewed numerically or graphically. The ability to take numerical data and render it graphically is a powerful tool for understanding the interrelationships contained within the data.

Upgrades

The ***MoTeC*** ECU's are completely field updateable by the user. The control software and logged data is stored in FLASH memory. Simply send to the ECU the new program and the latest features are immediately available.

Upgrade Options

All ECU's have field upgradeable options using a password enabling system. Upgrade Options Include:

- *Advanced Tuning* – Upgrades a M4/M48-Clubman to all of the advanced features of a Pro
- *Data Logging* – Enables the 512KByte data logging upgrade
- *Wideband Lambda (Air Fuel Ratio)* – Enables the use of our high accuracy fully temperature compensated Wideband Lambda (mixture strength) sensor. This facility is free on the M4/M48 for the first six hours running to assist with initial setup and tuning
- *Pro Logging (M8 Only)* – Enables advanced data analysis with Graph Overlays, XY Plots, Maths Functions, Virtual Instrument Display and Track Maps

See Specifications & Model Comparison table for further details.

Choose from a wide range of sensors for use with the ECU's including: temperature, position, accelerometers, speed, pressure, hall and magnetic and many others.

And for peace of mind, a full 2 year worldwide warranty.

Specifications

	M4	M48	M8
General			
Microprocessor - 32 Bit 33MHz with Time Co Processor	✓	✓	✓
Quality Standard	ISO 9002	ISO 9002	ISO 9002
Manufacturing Standard - IPC-S-815-A Class 3 High Reliability	✓	✓	✓
Warranty Parts & Labour	2 year	2 year	2 year
Burn in –50 to 70 Deg C for 32 hours	✓	✓	✓
ECU Control Software stored in updatable memory	✓	✓	✓
High RFI Immunity	✓	✓	✓
Low heat generation	✓	✓	✓
Battery transient protection	✓	✓	✓
Environmentally sealed electronics	✓	✓	✓
Water-proof connector with gold plated contacts	✓	✓	✓
Mil. Spec. connector	Optional	Optional	Optional
Case Size (mm)	120x100x36	150x100x36	185x142x48
Weight (kg)	0.4	0.48	1.15
Communication: - RS232 (to PC or Dash Logger), via optional interface cable	✓	✓	✓
Cylinders	1,2,3,4,5,6,8,12	1,2,3,4,5,6,8,10,12	1,2,3,4,5,6,8,10,12
Engines 2 stroke, 4 stroke, Rotary(1~4)	✓	✓	✓
Maximum RPM > 15,000	✓	✓	✓
Operating Condition			
Internal Temperature Range	-10~85°C	-10~85°C	-10~85°C
Ambient Temperature (Depending on load & ventilation)	-10~70°C	-10~70°C	-10~70°C
Operating Voltage	6~22V DC	6~22V DC	6~22V DC
Operating Current	0.40 A	0.4 A max.	0.4 A max.
Reverse Battery Protection	External Fuse	External Fuse	-24V
Computer Software			
Software Included with every ECU: *EMP Program* - tuning, setup & diagnostic *Interpret* - data analysis	✓	✓	✓
Computer Requirements	IBM PC, DOS Win 95/98	IBM PC, DOS Win 95/98	IBM PC, DOS Win 95/98
Built-in help system	✓	✓	✓
Advanced Analysis Software: Graph Overlays, XY Plots, Maths Functions, Virtual Instrument Display, Track Maps	✘	✘	✓

Specifications & Model Comparison

Engine Management Systems	M4* Club	M4* Pro	M48* Club	M48* Pro	M8 Pro
Injection					
Number and Type	4 sequential or group		8 sequential or group		8 sequential
User Programmable Current	0.5~12 Amp peak		0.5~6 Amp peak		0.5~8 Amp peak
User Definable Battery Compensation	✓	✓	✓	✓	✓
Fuel Calibration					
Accuracy	0.00001sec		0.00001sec		0.00001sec
RPM & Load Sites are user programmable	✓	✓	✓	✓	✓
Main Table (3D) - RPM sites x Load sites	40x21		40x21		40x21
End of Injection Primary & Secondary – RPM sites	20		20		20
End of Injection Primary & Secondary (3D) – RPM sites x Load sites	✘	20x6	✘	20x6	20x6
Overall Trim	✓	✓	✓	✓	✓
Individual Cylinder Trim	✓	✓	✓	✓	✓
Individual Cylinder Tables (3D) – RPM sites x Load sites	✘	20x11	✘	✘	20x11
Secondary Injector Balance Table (3D) – RPM sites x Load sites	20x6		20x6		20x11
Adjustable MAP, Engine & Air Temperature Compensations	✓	✓	✓	✓	✓
Auxiliary Compensations	2		2		5
Gear Compensation	✓	✓	✓	✓	✓
Accel./Deccel. Clamp, Decay & Sensitivity	✓	✓	✓	✓	✓
Cold Start (5 parameter)	✓	✓	✓	✓	✓
Ignition Outputs					
Number	4		2		4
One output may drive up to 8 coils using the MoTeC Ignition Expander	✓	✓	✓	✓	✓
Ignition Interface allows connection to most OEM Ignition systems	✓	✓	✓	✓	✓
Ignition Calibration					
Accuracy	0.25 degree		0.25 degree		0.25 degree
RPM & Load Sites are user programmable	✓	✓	✓	✓	✓
Main Table (3D) - RPM sites x Load sites	40x21		40x21		40x21
Overall Trim – % or Degrees	✓	✓	✓	✓	✓
Individual Cylinder Trim	✓	✓	✓	✓	✓
Individual Cylinder Tables (3D) – RPM sites x Load sites	✘	20x11	✘	✘	10x6
Adjustable MAP, Engine & Air Temperature Compensations	✓	✓	✓	✓	✓
Auxiliary Compensations	2	2	2	2	5
Gear Compensation	✓	✓	✓	✓	✓
Accel. Adv. Clamp, Decay & Sensitivity	✘	✓	✘	✓	✘
Dwell Time – RPM x Battery Voltage	✘	20x11	✘	20x11	10x11
Odd Fire engine capability	✓	✓	✓	✓	✓
Rotary Ignition Split	✓	✓	✘	✘	✓
Boost Control					
Main Table – 20 RPM Sites	✓	✓	✓	✓	✓
Main Table (3D) - RPM Sites x Throttle or Gear Sites	20x11		20x11		20x11
Overall Trim	✓	✓	✓	✓	✓
Engine & Air Temperature Compensation	✓	✓	✓	✓	✓
Auxiliary Compensation	2	2	2	2	1
Trigger Sensors					
Directly Compatible with most OEM trigger systems including: HALL, Magnetic and Optical types Multi-Tooth (eg Mazda and Toyota) 1 or 2 Missing Teeth (eg Porsche) Many Other special types including:Ford Narrow Tooth, Nissan Optical,Harley Davidson	✓	✓	✓	✓	✓

Engine Management Systems	M4* Club	M4* Pro	M48* Club	M48* Pro	M8 Pro
Sensor Inputs					
Throttle Position, Manifold Pressure, Engine and Air Temperature	✓	✓	✓	✓	✓
Switch Input	✘	✘	✘	✘	1
Auxiliary Sensor Inputs	2		2		7
Digital/Speed Inputs	2		2		4
Air Fuel Ratio Inputs					
Narrow Band Air Fuel Ratio	✓	✓	✓	✓	✓
Wideband Air Fuel Ratio	Opt.		Opt.		Opt.
Number	1		1		2
Range – Lambda	0.75 to 1.20		0.75 to 1.20		0.75 to 1.20
Resolution – Lambda	0.01		0.01		0.01
Accuracy (below 1.05 Lambda)	1.5%		1.5%		1.5%
Data Logging					
Allows Logging of all ECU parameters	Opt.	✓	Opt.	✓	Opt.
Memory Size	512KBytes		512KBytes		512KBytes
Individual Parameter & Rate Selection	✘	✘	✘	✘	✓
Logging Rate – Sets / second	1~20		1~20		1~20
Logging Time – 28 Par. + Diag. at 5/sec	38 minutes		38 minutes		38 minutes
Interpret Software – Graphical Analysis	✓	✓	✓	✓	✓
– Advanced Analysis	✘	✘	✘	✘	✓
Special Functions					
Traction Control & Launch Control *Note M4 & 48: 4 wheel using the MoTeC TC Mux*	2	2	2	2	4 wheel
Narrow Band Lambda Control	✓	✓	✓	✓	✓
Wideband Lambda Control	✘	✓	✘	✓	✓
Gear Change Ignition Cut	✘	✓	✘	✓	✓
Over Run Boost Enhancement	✘	✓	✘	✓	✓
Warning Alarms (Sensor HI / LO)	✓	✓	✓	✓	✓
Gear Detection	✘	✓	✘	✓	✓
Ground Speed Limiting	✘	✓	✘	✓	✓
Dual RPM Limit	✓	✓	✓	✓	✓
Nitrous Oxide Enrich / Retard	✓	✓	✓	✓	✓
Air Conditioner Request	✓	✓	✓	✓	✓
Over Run Fuel Cut	✓	✓	✓	✓	✓
Standard Sensor Calibrations	✓	✓	✓	✓	✓
Programmable Sensor Calibrations	✓	✓	✓	✓	✓
RPM Limit, Hard or Soft, cut fuel and / or ignition	✓	✓	✓	✓	✓
Outputs					
Number of Auxiliary	4 (3 shared)		4 (3 shared)		4
Auxiliary Type – Switched / PWM	Any mix		2 / 2		2 / 2
Auxiliary Outputs can be used for: Turbo Wastegate Control Idle Speed Control Fuel Used Control Tacho Output Shift Light Driver Warning Alarm RPM / Load dependent device User Definable Table (20x11) with selectable axis parameters Slip Warning Fuel Pump Relay Thermatic Fan Air Conditioner Fan or Clutch					
Alternate Injector Functions	✘	✘	✓	✓	✓
Diagnostics					
Injectors Open Circuit, Short Circuit, Peak Current not reached	✓	✓	✓	✓	✓
Sensors Open & Short Circuit	✓	✓	✓	✓	✓
Operating Errors: RPM Limit Exceeding, Injector Overduty, Over Boost, Low Battery, REF Error etc.	✓	✓	✓	✓	✓
Telemetry Link					
Allows real time monitoring & data acquisition via a Telemetry Link	Opt.		Opt.		Opt.

Notes	
*	An M4 or M48 Clubman with Advanced Tuning Upgrade enabled has the same features as the M4 or M48 Pro
Opt.	Upgrade Option must be installed to enable this feature
PWM	Pulse Width Modulation. Can also be used as switched outputs

MoTeC
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