

## SM2 ECU - SPECIFICATIONS

IMPORTANT: Please note that this product is intended for high performance motor sport applications and compliance with statutory regulations when used on public roads cannot be guaranteed.

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### Features.

1. Eight injector drivers for full sequential operation on engines up to eight cylinders. Staging injection possible in some applications. May be set for 'semi-sequential' operation on engines that have more than 8 cylinders (e.g. 12 cylinder engine using 6 groups of two cylinders). All common port injector types catered for (0.9 ohm to 16 ohm coil resistance) with selectable Low or High current driver. When ordering, request an initial configuration to suit injectors. Drive current selection is field re-configurable.
2. Four open collector outputs for triggering Capacitor Discharge or Smart Inductive Ignition Modules.  
Note: Standard product does NOT provide dwell control (installation of optional dwell control interface module/s is required).
3. Single coil distributor, twin coil distributor or multicoil distributor-less ignition configurations are possible on most engines.
4. Fuel pump safety shut-off. Pump stops 3 to 4 seconds after the engine stops.
5. Seven auxiliary outputs in addition to fuel pump control. Auxiliary outputs can be defined for boost control, nitrous oxide, staged injectors, camshaft timing, A/C, fan control, idle valve etc...
6. User choice of Manifold absolute pressure or Throttle position as Engine load input. Internal absolute pressure sensor for simplified installation 0 to 200 kPa (0 to 29.4 PSI) and 0 to 300 kPa (0 to 44.1 PSI) available from stock. 0 to 450 kPa (0 to 66.1 PSI) available on request.
7. Autronic patented 'Mass-flow determination method' simplifies fuel delivery calibration, especially for multi-butterfly or variable inlet geometry engines equipped with forced induction. This method, combined with other measures, ensures precise fuel delivery matching, irrespective of altitude and exhaust back-pressure (when a back pressure sensor is connected) whilst reducing calibration effort.
8. Compensation of engine control parameters for engine operation over a wide altitude range (fuel delivery, ignition timing and boost pressure).
9. Measurement of and correction for exhaust back pressure.
10. Unique transient calibration strategy allows accurate control of fuel delivery under both acceleration and deceleration.
11. Direct connect a narrow band O2 sensor for closed loop emissions control, or a compatible wide band Air-fuel ratio meter (e.g. Autronic MAFM1) for full range engine tuning.
12. Autronic '**Autotune**' self-tune software feature for air-fuel ratio calibration requiring minimal user intervention (compatible with firmware versions from v1.90).
13. Closed loop (feedback) boost pressure control for turbocharged engines with multiple calibration curves selectable by switch input and/or gear ratio (e.g. lower boost curve for use in low gear).
14. Closed loop (feedback) idle speed control.
15. Adaptive learning (with memory) to minimize the number of user setups required and to provide optimal control of air/fuel ratio, boost pressure and idle stability.
16. Precise compensation for injector dead-time and non-linearity. Large library of predefined compensations for popular injector types.
17. Precise spark advance control strategy for both static and dynamic operating conditions.

18. User selectable spark and fuel delivery strategy for abnormal engine operation conditions to minimize possibility of engine damage whilst still maintaining engine operation (e.g. over heated or over boosted).
19. Comprehensive limp-home functions with user selectable default settings that, whenever possible, ensure engine operation can continue after sensor failure has occurred.
20. Coolant temperature dependent Rev Limiter with soft characteristic that uses a combination of fuel delivery and spark control.
21. Traction Control, Flat Shift, Launch Control & Anti-Lag (Turbo boost enhancement) are available (depending on Firmware version fitted).
22. Diagnostic/Error indicator light with memory for reporting sensor or ECU fault conditions. Ideal for detection of intermittent fault conditions. Error history information is also accessible from P.C. screen.
23. User configurable internal data logging of up to 17 channels with the selected channels being sampled as fast as 50 times a second. 32k bytes of non-volatile memory. Peak capture feature aids detection of over-rev, over-boost and over-temperature conditions.
24. Serial data port can be used in a bi-directional communication mode for P.C. calibration, monitoring and data logging, or in unidirectional mode for data streaming output to a Dash / Data logger. Remote adjustment and/or monitoring are possible if Radio modems are added to the serial link.
25. Simultaneous and independent operation of the internal data logger and serial port data link is allowed.
26. Control of engine cooling fans and coordination with air conditioner operation.
27. Control of Water Injection/spray or Intercooler fan/s cooling function for intake charge temperature reduction in Turbo/super charged applications.
28. Programmable On-Off output function for solenoid or relay driving that operates according to engine speed and load (e.g. can be used for gear shift control or light, over rev indicator, inlet camshaft timing selection or control of a supplementary electric fuel pump that augments main fuel pump).
29. Programmable proportional output function that can be used for additional functions, or as an extra on/off output.
30. Fuel used pulse output to electronic or electromechanical counter with resolution of 0.1 litres (or use with trip computer).
31. Compatible with optional No.1 cylinder spark plug pick-up interface unit that allows sequential injector operation on engines equipped with distributor ignition, without the need for separate crank/camshaft sensors or a special multi-sensor distributor.

Note: The above list describes the product family capability. Individual product feature set depends upon firmware version fitted. See 'SM2 ECU FIRMWARE VERSION - FEATURE MATRIX' document.

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## **Interface Requirements.**

### **INPUTS**

#### Sensors:

1. Crankshaft position input. Hall Effect pickup (use optional Reluctor interface for compatibility with magnetic reductor type pickups)
2. No.1 cylinder reference. Hall Effect pickup (use optional Reluctor interface for compatibility with magnetic reductor type pickups)
3. Road speed input. Hall Effect pickup (use optional Reluctor interface for compatibility with magnetic reductor type pickups)
4. Additional Road speed or Turbo speed input. Hall Effect pickup (use optional Reluctor interface for compatibility with magnetic reductor type pickups).
5. Manifold pressure (Internal to ECU)
6. Barometric pressure derived from Manifold pressure sensor
7. Throttle position
8. Intake air temperature
9. Engine coolant temperature
10. Exhaust back pressure (optional)
11. Exhaust oxygen sensor (or optional Air/Fuel Ratio meter for wide band measurement)

#### Switches:

1. Air conditioner request (Switch to Gnd)
2. Boost curve select (Switch to Gnd)
3. Bi-directional I/O (Switch to Gnd. Requires pull-up to +5 V)

#### Adjustments:

1. Overall / Idle mixture adjustor. (Configurable, internal to ECU and screwdriver adjustable from outside)

## OUTPUTS

### 8 x injector drivers:

User selectable 4A/1A or 2A/0.5A Peak/Hold switching type

(Note: Early SM2 production. ECUs were fitted with fixed current peak/hold drivers. These variants can only have injector driver current rating changed by performing complete driver replacement. The AUTRONIC service facility can perform this service, subject to drive availability)

### 4 x ignition outputs:

Each are open collector output type compatible with:

- 'Smart' Inductive high energy ignitions that have internal dwell control
- Autronic Capacitor Discharge Ignitions
- Other capacitor discharge ignitions e.g. MSD 6A etc...

(Note: The SM2 ECU is primarily intended for extreme performance applications and is best suited for use with capacitor discharge ignitions. Optional dwell interface module/s can be installed that will provide compatibility with non-dwell controlled inductive high energy ignition systems)

### Fuel Pump:

- Dedicated Fuel pump/injector fuel shut off (For safety relay control)

### Auxiliary:

4 x On-Off O/Ps (comprising 2 x 1A Open collector & 1 x 1A High side) suitable for:

- Air conditioner clutch relay control
- Engine/Air conditioner condenser cooling fan relay control
- Engine cooling fan relay control
- Spare On-Off output with user define characteristic
- Fuel used pulse output (for trip computer function)

2 x Proportional variable O/Ps (comprising 2 x 1A High side Duty cycle & 1 x 0 to 1A DC current sink) suitable for:

- Idle speed actuator (variable duty cycle or current driven types)
- Turbocharger waste gate control duty cycle valve (suits Autronic low & large high capacity & most OEM types)
- Spare variable output with user define characteristic

## SERIAL I/O

- RS232 communication port for connection to P.C., Dash or Data logger

## SOFTWARE COMPATIBILITY

- SM2 firmware versions v1.34 to v2.07  
Software available for P.C.s running Win XP, Vista, Win7 & Win8 32 & 64 bit (requires x86-32bit code support), & MS-DOS
  - Early SM2 to firmware versions to v1.07  
Software only available for P.C.s running MS-DOS only (Recommend ECU firmware update to >= v1.34)
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## Specifications

Microcomputer		Intel 16 bit running @ 16MHz
Supply Voltage	Normal operation Safe limits	6.2V to 23V DC continuous +/- 24V (5 min) +/- 80V alternator load dump (0.5 SEC) +/- 1000V inductive spike (10 µSEC)
Current Drain	@ Standby(Ign off) @ Engine idle @ Max Engine Load	< 1 mA < 1 Amp < 16 Amp (less depending on injector type and number)
Outputs	Injector	8 x User selectable 4A/1A or 2A/0.5A (Peak/Hold)
	Ignition	4 x Open collector 1A (standard product does not have dwell control)
	On-Off	4 x Open collector 1A
	PWM	2 x High side 1A
	Linear	1 x Variable pull-down 0 to 1A
Inputs	Digital Pulse	1 x Crankshaft 1 x Camshaft 1 x Vehicle Speed 1 x Turbo or Vehicle Speed
	Switch	2 x Switch to Gnd 1 x Switch to Gnd or + 5V
	Analog	1 x Throttle Position 1 x Manifold Air Intake Temperature 1 x Engine Coolant Temperature 1 x O2 Sensor or Air/Fuel Ratio Meter 1 x Exhaust Back Pressure 4 x Temperature (special option)
	Serial Data	1 x RS232
Operating Temperature Range	Min Max	- 40 deg C + 85 deg C
Engine Cylinder Number Settings	Number of cylinders	1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 14 & 16
Engine RPM Range	0 to 30,000 RPM 0 to 16,000 RPM 0 to 15,000 RPM	Engines up to 4 cylinders Engines 5 to 8 cylinders Engines 10 to 16 cylinders
Injection Duration Timing	Min Max Accuracy Setting resolution	0.7 msec. 30 msec. +/- < (10 µSEC + 1%) 0.1% approx.
Injection Timing	Range Accuracy Setting resolution	0 to 720 deg (crank angle) +/- < (1.4 deg + 0.3 mSEC) 2.8 deg.
Ignition Timing	Advance range Accuracy Setting resolution	0 to 45 deg (crank angle) +/- 0.2 deg (crank angle) 0.5 deg (crank angle)
Fuel Delivery and Ignition Mapping	No. Load sites No. RPM sites	16 (max) both Load and RPM sites 32 (max) are freely selectable.
Size	L * W * H	190 * 190 * 38 mm 235 * 190 * 38 mm (overall, including mounts & connector)
Weight		1.35 kg
External Connectors	52 way 'AMP' socket using 3 separate plugs	10 way high current plug 18 way low current plug 24 way low current plug
	Serial Data	3.5mm stereo

