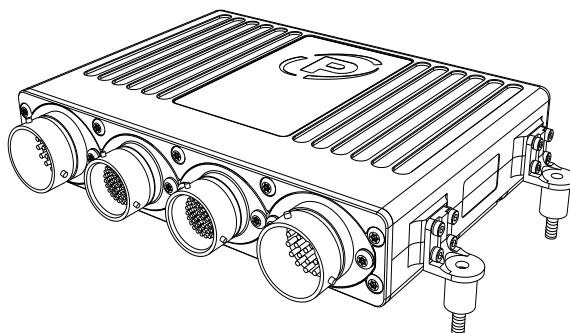




Pectel MQ12 ECU



Introduction

The Pectel MQ12 is a high-performance engine management system. Its two microprocessors, a Motorola MPC565 and a Motorola MPC5200B, provide class leading performance in a cost-effective package.

Twenty configurable injector/PWM drivers combined with twelve IGBT ignition outputs and sixteen logic level coil driving outputs make this ECU capable of fully sequential fuelling on normally aspirated, turbo and supercharged engines up to twelve cylinders. Fly-by-wire capability is also included along with provision for Stepper and DC motors.

The MQ12 crank and camshaft pattern recognition system allows the ECU to be used with virtually any OEM timing wheel. This sophisticated pattern recognition algorithm also facilitates synchronisation during slow and uneven cranking conditions.

The MQ12 has two, and sometimes three functions on many of its pins:

Unused injector and IGBT ignition outputs can be used as digital outputs;

- Unused digital inputs can be used as 12 bit analogue inputs;
- H-bridge outputs can be used in either full or half bridge mode;
- H-bridge outputs can be combined to drive a stepper motor or used to provide additional high or low-side drive capability.

All of these features are enabled by software configuration.

The MQ12 includes reverse-battery, over-voltage and load dump protection built in as standard. Sensor supply and signal ground pins are also protected against shorts to battery positive and negative.

Advanced software features include closed loop knock control, traction control, launch control, gearshift strategies, variable valve timing of up to 4 camshafts (including BMW VANOS), high speed data logging and scrutineering modes for single make championships.

The MQ12 is designed to function up to a maximum RPM of 22,000rpm. There are two lambda sensor inputs, which will accept NTK/Bosch style wideband sensors and narrow band sensors. There are also eight specialised knock inputs with a software enabled gain stage.

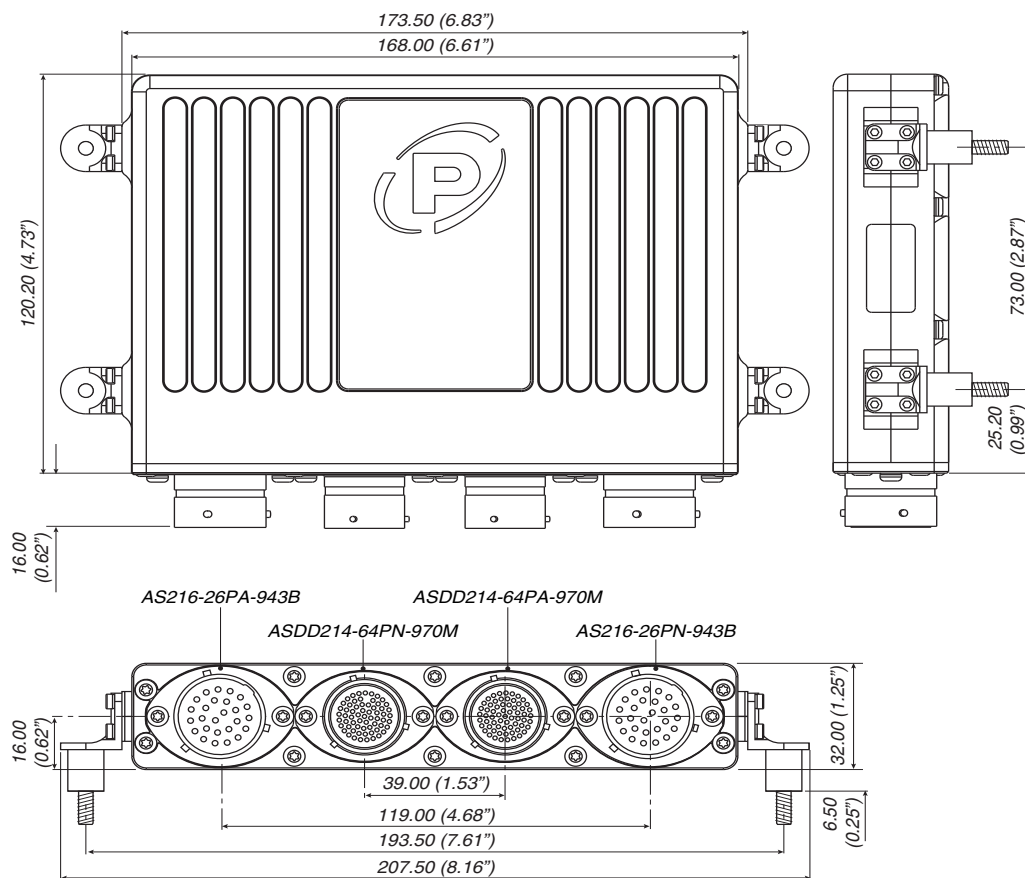
The wide range of functionality makes the MQ12 capable of working with almost any combination of coil, injector, OEM sensor and actuator to deliver optimal engine performance.

Installation

When installing the ECU:

- select a position where the ECU will not be in constant contact with water, fuel or oil;
- protect the ECU from vibration;
- make sure that the ECU will not be affected by heat soak;
- make sure that air can flow over the ECU to keep it below 60°C;
- avoid placing sensors near sources of electrical interference i.e., ignition coils, plug leads, alternators and telemetry antennas.

Dimensions



Dimensions in millimetres and (inches)

Ordering information

Product	Part number
Pectel MQ12 ECU	01E-500961
Pectel download, Autosport to Ethernet 1.5m	60E-500905
Pectel download, Autosport to Ethernet 10m	60E-500906



Specifications

Description	Value	Description	Value
Processor	Motorola MPC565 and Motorola MPC5200B 8MB of external RAM 4MB Flash Memory 2 GB internal SD Card	Analogue inputs	37x dedicated (12 bit) 2x wide band lambda (12 bit) 8x knock sensor (12 bit) with configurable gain stage (see Note 4 below) 16x digital configured as analogue
Supply voltage	+8V to +18V with reverse battery, over-voltage and load dump protection (see Notes below)	Auxiliary outputs	1x full bridge (10 A) peak 2x full bridge (5 A) peak 1x stepper motor alternate function
Engine configuration	1 to 12 cylinders 2 stroke, 4 stroke or rotary Natural or forced induction	Ignition drivers	12x IGBT internal clamp (+400V, 20 A) 16x logic level driven
Digital outputs	20x PWM alternate function (5A) 16x logic level driven	Internal sensors	4x ECU internal temperature 1x battery voltage
Digital inputs	16x dedicated, can also be configured as analogue inputs	Comms ports	1x RS232 (RXD/TXD port) 2x CAN 2.0B 1x CAN/RS232 1x Ethernet (100baseT)
Logging throughput	2000 samples/second	Case operating temp	-25 °C to +70 °C
Crank and cam sensor	Dual crank input, single dedicated cam input, Hall effect or inductive	Environmental	IP67
Injector/PWM drivers	20x peak and hold (5 A peak, 2.5 A hold)	Vibration	DV-V(a) DV-V(b) DV-V(c) DV-V(c+)
EMC	Refer to DofC	Weight	622 grams
Thermocouple inputs	3x k-type (12 bit)		

Quoted currents are peak rating

Note 1: The ECU will allow the battery voltage to drop to +7V during cranking without tripping /or resetting.

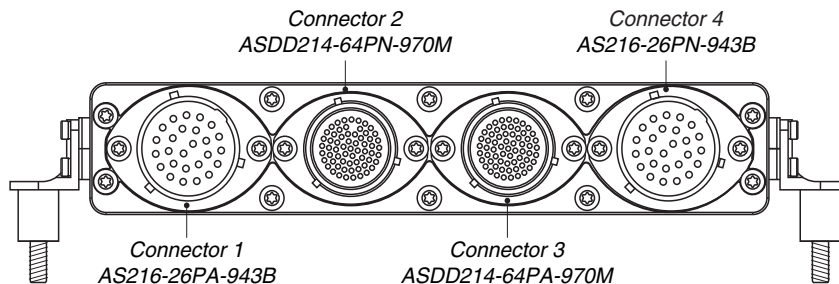
Note 2: If the power dissipation of the ECU is high, airflow must be used to maintain the case temperature below +60 °C

Note 3: The MPC5200B processor and associated SD card are available for development of custom logging and control applications.

Note 4: If any of the Knock inputs are unused for Knock sensors, they can be used as DC-coupled analogue inputs.

Connector information

Connector (ECU)	Mating connector (Loom)
AS216-26PA-943B	AS616-26SA
ASDD214-64PN-970M	ASDD614-64SN
ASDD214-64PA-970M	ASDD614-64SA
AS216-26PN-943B	AS616-26SN



Connectors viewed from the front of the ECU

Connector 1 - AS216-26PA-943B

Pin	Function	Description
W	BATTNEG	Battery connections
X	BATTNEG	
Y	BATTNEG	
c	BATTNEG	
F	BATTPOS	
V	BATTPOS	
B	Fuel/PWM1	Standard injectors 1 to 10 that can also be used as low side PWM outputs Peak and hold specifications: 5 A peak, 2.5 A hold All injector drivers have a software enabled 10k pull-up resistor to VBAT
A	Fuel/PWM2	
T	Fuel/PWM3	
b	Fuel/PWM4	
P	Fuel/PWM5	
Z	Fuel/PWM6	
N	Fuel/PWM7	
a	Fuel/PWM8	
S	Fuel/PWM9	
R	Fuel/PWM10	
C	H-Bridge 1A	Two H bridge drives. Can be combined to create a single stepper motor control output, four independent half-bridge outputs, high or low side drive. 5 A peak, 2 A continuous
U	H-Bridge 1B	
D	H-Bridge 2A	
E	H-Bridge 2B	
G	Spark1	Dedicated ignition outputs 1 to 6 20 A peak, 3 A continuous
H	Spark2	
J	Spark3	
K	Spark4	
L	Spark5	
M	Spark6	



Connector 2 - ASDD214-64PN-970M

Pin	Function	Description
3	5V/12V_5	Sensor supplies Individually protected, switchable (5V @ 50mA) or (12V @ 1A)
20	5V/12V_6	
18	5V/12V_7	
16	5V/12V_8	
51	Cam	Dedicated CAM input, Hall effect or inductive
1	CAN_HA	CAN 2.0B 1 Mbps, with fixed 120 R termination
2	CAN_LA	
26	CAN_HB	
44	CAN_LB	
43	CAN_HC / ALT_TX	CAN (2.0B 1 Mbps, with fixed 120 R termination) or alternate function RS232 (RXD/TXD port)
42	CAN_LC / ALT_RX	
52	Crank1	Dual crank input, Hall effect or inductive
36	Crank2	
35	DIN1	Digital inputs Can be used as speed or switch inputs, Can also be configured as 12bit analogue inputs or cam angle latch Inputs have software enabled 3k pull-up resistor to +5V DIN1 to DIN4 can be used for cam angle measurement
23	DIN2	
34	DIN3	
22	DIN4	
33	DIN5	
11	DIN6	
32	DIN7	
21	DIN8	
31	DIN9	
41	DIN10	
50	DIN11	
8	DIN12	
49	DIN13	
7	DIN14	
30	DIN15	
6	DIN16	
27	DOUT1	Digital outputs or logic coil driver +6V @ 20mA
45	DOUT2	
58	DOUT3	
57	DOUT4	
40	DOUT5	
56	DOUT6	
39	DOUT7	
55	DOUT8	
62	DOUT9	
63	DOUT10	
61	DOUT11	
64	DOUT12	
38	DOUT13	
54	DOUT14	
37	DOUT15	
53	DOUT16	

Pin	Function	Description
10	Ethernet_RX-	100baseT Ethernet communications
9	Ethernet_RX+	
13	Ethernet_TX-	
12	Ethernet_TX+	
4	ExtGnd6	Sensor grounds (crank, digital, analogue and knock)
19	ExtGnd7	
17	ExtGnd8	
15	ExtGnd9	
14	ExtGnd10	Knock inputs with software configurable gain stage (1x or 30x). If any of the Knock inputs are unused for Knock sensors, they can be used as DC-coupled analogue inputs.
48	Knock1	
47	Knock2	
29	Knock3	
28	Knock4	
60	Knock5	
59	Knock6	
46	Knock7	
5	Knock8	RS232 (RXD/TXD port)
24	RS232_RX	
25	RS232_TX	



Connector 3 - ASDD214-64PA-970M

Pin	Function	Description
4	5V/12V_1	Sensor supplies Individually protected, switchable (+5V @ 50mA) or (+12V @ 1 A)
17	5V/12V_2	
19	5V/12V_3	
21	5V/12V_4	
52	AIN1	0 to +5V analogue inputs Inputs 1 to 28 have software enabled 3k and 33k pull-up resistors to +5V
51	AIN2	
13	AIN3	
12	AIN4	
11	AIN5	
10	AIN6	
9	AIN7	
8	AIN8	
7	AIN9	
6	AIN10	
15	AIN11	
14	AIN12	
36	AIN13	
35	AIN14	
34	AIN15	
33	AIN16	
32	AIN17	
31	AIN18	
50	AIN19	
49	AIN20	
30	AIN21	
48	AIN22	
47	AIN23	
29	AIN24	
28	AIN25	
46	AIN26	
45	AIN27	
27	AIN28	
43	AIN29	0 to +5V high speed analogue inputs (5kHz low-pass filter) Inputs have software enabled 3k and 33k pull-up resistors to +5V
40	AIN30	
39	AIN31	
38	AIN32	0 to +5V analogue inputs Inputs have software enabled 3k and 240R pull-up resistors to +5V
37	AIN33	
42	AIN34	
41	AIN35	
26	AIN36	0 to +5V analogue input Input has software enabled 3k and 33k pull-up resistors to +5V
44	AIN37	
5	ExtGnd1	Sensor grounds (crank, digital, analogue and knock)
16	ExtGnd2	
18	ExtGnd3	
20	ExtGnd4	
22	ExtGnd5	

Pin	Function	Description
24	LambdaIP1	Lambda inputs NTK/Bosch wide-band or narrow-band sensors
23	LambdaIP2	
54	LambdaVS1	
53	LambdaVS2	
61	5V_9	Sensor supplies Individually protected (+5V @ 50mA)
62	5V_10	
2	5V_11	
3	5V_12	
25	5V_13	
1	5V_14	
59	5V_15	
60	5V_16	Thermocouple k-type inputs
63	TC1NEG	
58	TC1POS	
57	TC2NEG	
64	TC2POS	
55	TC3NEG	
56	TC3POS	

Connector 4 - AS216-26PN-943B

Pin	Function	Description
V	BATTNEG	VBATT Battery connections
W	BATTNEG	
X	BATTNEG	
Y	BATTNEG	
b	BATTNEG	
c	BATTNEG	
G	BATTPOS	
H	BATTPOS	
L	Fuel/PWM11	Standard injectors 11 to 20, can also be used as low side PWM outputs Peak & hold specification: 5 A peak, 2.5A hold Injector drivers 11 to 20 have software enabled 10k pull-up resistor to VBAT Where Lambda heater control is required use PWM19 and PWM20
M	Fuel/PWM12	
Z	Fuel/PWM13	
a	Fuel/PWM14	
S	Fuel/PWM15	
U	Fuel/PWM16	
T	Fuel/PWM17	
R	Fuel/PWM18	
P	Fuel/PWM19	
N	Fuel/PWM20	
J	H-Bridge 3A	H bridge drive 3. Configurable as independent half-bridge outputs, high or low side drive DC motor drive 6 A peak
K	H-Bridge 3B	
F	Spark7	Dedicated ignition outputs 7 to 10 +430V, 20 A peak, 3 A continuous
E	Spark8	
D	Spark9	
C	Spark10	
B	Spark11	
A	Spark12	



**Declaration of
Conformity**

Declaration of Conformity

We, the undersigned,

Pi Research
Brookfield Motorsports Centre,
Cottenham,
Cambridgeshire, CB4 8PS
United Kingdom

Certify and declare under our sole responsibility that the following equipment:

Pectel MQ12 – part number 01E-500961

An ECU for use only in motorsport applications

Conforms to the following EC directives including applicable amendments:

EMC Directive 89/336/EEC, 72/245/EEC (last amended 2004/104/EC)

The following standards have been applied:

2004/104/EC

Cottenham, 30th October 2008

George Lendrum - Divisional Managing Director

