

Emtron Shadow 8 ECU

PRODUCT
DATASHEET

Rev 1.1



SHADOW 8

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1.0 General

The Shadow ECU range is built upon the outstanding foundation of the KV Series. This lightweight package is housed in a Billet Aluminium Enclosure and features a comprehensive 68-pin connector system. The Shadow ECU will support up to 8 Channels of fully sequential Fuel and Ignition. Up to 16MB permanent memory for on-board logging is available, DBW control, Knock control up to 2 channels using digital filter technology, and High-Speed USB C communications.

Functionality Count

- 8x Injection
- 8x Ignition
- 10x Analog Input
- 10x Digital Inputs
- 12x Auxiliary Outputs
- 2x CAN buses
- 2x Knock Inputs
- 2x GDI Pump Logic Control using Aux 11/12
- 1x DBW Control (Aux9/10)

Power Supply

- Operating voltage: 6.0 to 22.0 Volts DC (ECU shutdowns at 24.0V)
- Operating current: 290mA at 14.0V (excluding sensor and load currents)
- Reverse battery protection via external fuse
- “Smart” battery transient protection

Operating Temperature

- Max operating range: -30 to 110°C (-22 to 230°F)
- Recommended operating range: -30 to 85°C (-22 to 185°F)

Physical

- Aluminium 6061 grade CNC billet enclosure
- Enclosure size 152 mm x 139 mm x 26 mm
- Weight: 520g
- Connector system: 68-way Super Seal waterproof connectors with gold plated contacts
 - Pin diameter: 1 mm.
 - Current rating: maximum 15A per pin (wire gauge dependant)
 - Connector A: 34 pin Key 1 Super Seal
 - Connector B: 34 pin Key 2 Super Seal

Internal

- 100MHz Processor
- 16 MB ECU logging memory
 - Over 1200 channels available
 - 1Hz to 500Hz logging rate.

2.0 Outputs

8x Port Injector Outputs—high ohm

- 70V clamping.
- Outputs can be used for ground switching, 6A Continuous, 10A Limit.
- All outputs are short circuit and over current protected.
- No Flywheel diodes (external diode(s) required for VVT control).

8x Ignition Outputs

- Adjustable TTL Ignition drive current (35mA or 70mA).
- Outputs can be used for ground switching, 1A Continuous, 3A Limit.
- All outputs are short circuit and over current protected.
- No Flywheel diodes (external diode(s) required for VVT control).

12x Auxiliary Outputs

- Variable Valve Timing (VVT) and Variable Valve Timing Electric (VTiE), Drive by Wire (DBW), dual boost control, gearshift solenoids, stepper motor and many more.
- All outputs have PWM control, maximum frequency = 10 kHz.
- Flywheel diodes integrated into all outputs.
 - Auxiliary 1-8 Flywheel to the “Hot Supply” pin B1 connector B
 - Auxiliary 9-12 Flywheel to the “Aux 9-12 Supply” pin B26 connector B
- All outputs are short circuit and over current protected.

Low Side Drivers

- Auxiliary 1-4: Low Side 4A continuous, 6A peak modulated, 8A limit .
- Auxiliary 5-8: Low Side 2.5A continuous, 4A peak modulated, 5A limit.

High Side Drivers

- Auxiliary 5-8: High Side 4A continuous, 8A limit.

Half Bridge Drivers

- Auxiliary 9-12: Half Bridge 5A continuous and 8A limit. Can be used as Low Side, High Side or together in H-bridge configuration for DC motor control (DBW).

1x Shield Output

- Connection for Trigger and Knock shielded cables. Short to battery protection.

3.0 Inputs

10x Analog Voltage/Temperature Inputs

- Fully configurable including custom calibrations.
- Switchable 1k ohm pull-up resistors on ANV 7-10.
- Accepts a 0.0 - 5.000V Analog input. Resolution is 1.22mV (12-Bit).
- Input Impedance 100k Ohms to ground.

10x Digital/Speed Inputs/Switched Inputs/Analog Inputs

- Frequency Range from 0.0Hz up to 5.0kHz on channels 1-4.
- Magnetic and Hall effect sensor compatible on DI 1-4, with programmable frequency-based arming threshold control, range 0.0 - 12.0V.
- Hall effect sensor only on DI 5-8 with fixed frequency-based arming thresholds (1.45V).
- Wheel speed, output shaft speed and other frequency-based signals.
- VVT position(s) up to 4 channels available on DI 1- 4, Magnetic and Hall effect sensor compatible.
- DI1-10 all have ON/OFF switched control: AC request, Launch enable, Cruise switch, table control switching etc with arming threshold control, range 0.0 -20.0V.
- DI1-10 channels ALL accept a 0.0 - 20.0V Analog input voltage. Resolution is 4.88mV (10-Bit).
- Switchable 4k7 ohm pull-up resistors on DI1-8 channels to 10V.
- Maximum input signal amplitude +/- 50V.
- Input Impedance 110k ohms to ground.

2x Knock Inputs

- 2 Independent knock input channels.
- Digital Knock Integrated Circuit Technology with programmable Centre Frequency, Gain and Integrator Time Constant.
- Centre frequency configurable from 1kHz - 20kHz.
- Gain control from 0.1 to 2.0.
- Cylinder selectable knock input.
- Knock control available on ALL Ignition modes (Direct, Wasted, Distributor etc).

2x Crank Index and Sync Engine Decoding Inputs

- Magnetic and Hall effect sensor compatible with programmable trigger edge(s)
- "True" zero crossing detection on magnetic signals for precise engine position decoding.
- Programmable independent arming threshold control from 0.1V to 12.0V
- Switchable 4k7 ohm pull-up resistor to 5V
- OEM patterns supported.
- Maximum input signal amplitude +/- 80V
- Input Impedance 100k ohms to ground.

1x Ignition Switch Input/DI10

- 6.0 - 20.0V input used for EFI Relay Control. (With input > 6V the Internal Hold-power system turns the ECU ON using the HOT Supply). Refer to document "Shadow 8 Power Supply Wiring".

4.0 Voltage and Ground Supplies

1x ECU Supply Input

- 15.0A Max (pin limited).
- 6V - 22.0V Range.
- Supplies ECU power.
- Supplies power to Auxiliary 1-8 High Side Drivers.

1x Auxiliary 9-12 Supply Input

- 15.0A Max (pin limited).
- Power supply for Auxiliary channels 9 -12. (See “Shadow Series Power Distribution Wiring - Emtron.pdf” for more information on how this should be wired. Refer Appendix B).

1x Battery Constant Supply Input

- 15.0A Max (pin limited).
- ECU **MUST** always have constant power. Used by Auxiliary Flywheel diodes and for the ECU automated shutdown procedure.

1x 5.0V Sensor Supply

- 5V Vref1 output current 250mA.

1x 8.0V Sensor Supply

- Output current 400mA.

2x ECU Main Grounds

- 15.0A per pin, total 30A.

1x Sensor 0V Reference

- Analog Sensor 0V Reference with short to battery protection (See note in Section 6.1).

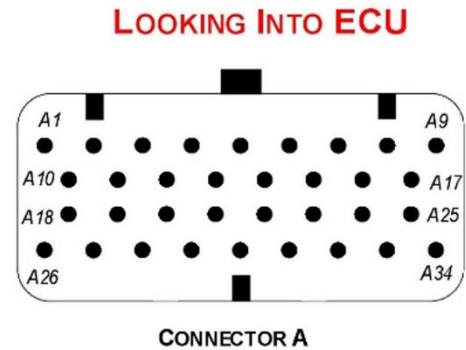
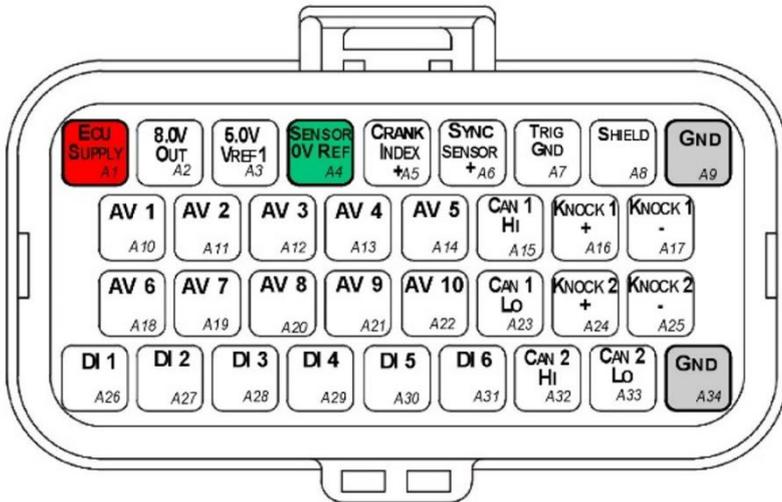
NOTE: The **Sensor 0V Reference** pin(s) is a specialised ground output for all Analog sensors. Connect direct to the sensor 0V pin, **DO NOT** connect to the Engine Block or ECU Ground.

5.0 Communications

- 1x High Speed USB for tuning software connection.
- 2x CAN 2.0B 1Mbps/ 6 Channels per node, total 128 messages.

6.0 Shadow 8 Pinout

Connector A: Signal/Power/Communications/Triggers/Knock (15.0A Max continuous current - wire gauge dependant)

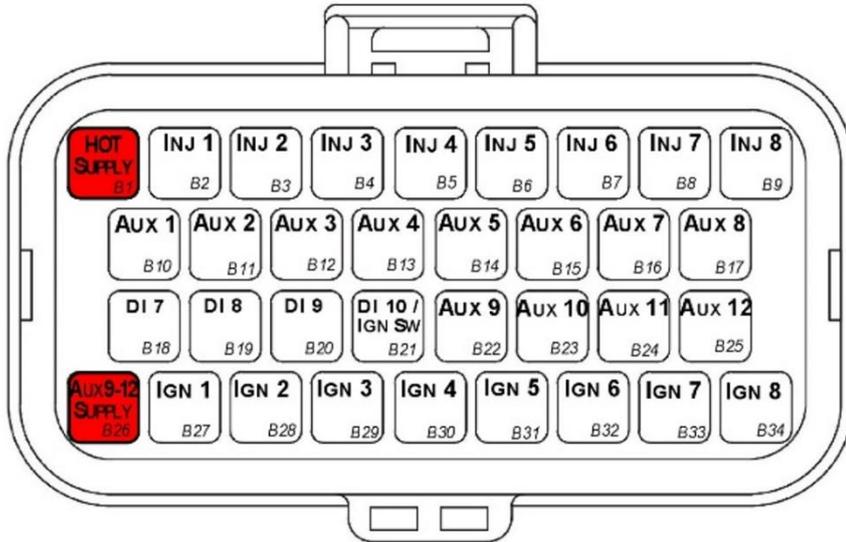


Looking into ECU connector

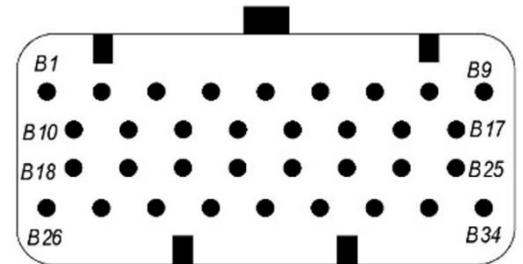
Pin	Channel Name	Pin	Channel Name
A1	ECU Supply	A18	Analog Voltage 6
A2	Sensor 8.0V Sensor Supply	A19	Analog Voltage 7
A3	Sensor 5.0V Sensor Supply	A20	Analog Voltage 8
A4	0V Analog Reference	A21	Analog Voltage 9
A5	Crank Position Sensor	A22	Analog Voltage 10
A6	Sync Position Sensor	A23	CAN Bus 1 Low
A7	Trigger Ground	A24	Knock 2 +ve
A8	Shield	A25	Knock 2 -ve
A9	Ground 1	A26	Digital Input 1
A10	Analog Voltage 1	A27	Digital Input 2
A11	Analog Voltage 2	A28	Digital Input 3
A12	Analog Voltage 3	A29	Digital Input 4
A13	Analog Voltage 4	A30	Digital Input 5
A14	Analog Voltage 5	A31	Digital Input 6
A15	CAN Bus 1 High	A32	CAN Bus 2 High
A16	Knock 1 +ve	A33	CAN Bus 2 Low
A17	Knock 1 -ve	A34	Ground 2

Connector: B Injection/Ignition/Auxiliary Outputs

(15.0A Max continuous current - wire gauge dependant)



LOOKING INTO ECU



CONNECTOR B

Looking into ECU connector

Pin	Channel Name	Pin	Channel Name
B1	Battery Constant (HOT) Supply	B18	Digital Input 7
B2	Injector Cylinder 1	B19	Digital Input 8
B3	Injector Cylinder 2	B20	Digital Input 9
B4	Injector Cylinder 3	B21	Digital Input 10/Ignition Switch
B5	Injector Cylinder 4	B22	Aux Output 9
B6	Injector Cylinder 5	B23	Aux Output 10
B7	Injector Cylinder 6	B24	Aux Output 11
B8	Injector Cylinder 7	B25	Aux Output 12
B9	Injector Cylinder 8	B26	Aux9-12 Power Supply
B10	Aux Output 1	B27	Ignition TTL Cylinder 1
B11	Aux Output 2	B28	Ignition TTL Cylinder 2
B12	Aux Output 3	B29	Ignition TTL Cylinder 3
B13	Aux Output 4	B30	Ignition TTL Cylinder 4
B14	Aux Output 5	B31	Ignition TTL Cylinder 5
B15	Aux Output 6	B32	Ignition TTL Cylinder 6
B16	Aux Output 7	B33	Ignition TTL Cylinder 7
B17	Aux Output 8	B34	Ignition TTL Cylinder 8

Analog Inputs Summary:

Pin	Channel Name	Pullup Control
A10	Analog Input Channel 1	No
A11	Analog Input Channel 2	No
A12	Analog Input Channel 3	No
A13	Analog Input Channel 4	No
A14	Analog Input Channel 5	No
A18	Analog Input Channel 6	No
A19	Analog Input Channel 7	Yes
A20	Analog Input Channel 8	Yes
A21	Analog Input Channel 9	Yes
A22	Analog Input Channel 10	Yes

Digital Inputs Summary:

Pin	Channel Name	Pullup Control	Type
A26	Digital Input 1 (Wheel Speed)	Yes	Mag or Hall 0 -5kHz, OR Analog 0 -20V, Adj Arm
A27	Digital Input 2 (Wheel Speed)	Yes	Mag or Hall 0 -5kHz, OR Analog 0 -20V, Adj Arm
A28	Digital Input 3 (Wheel Speed)	Yes	Mag or Hall 0 -5kHz, OR Analog 0 -20V, Adj Arm
A29	Digital Input 4 (Wheel Speed)	Yes	Mag or Hall 0 -5kHz, OR Analog 0 -20V, Adj Arm
A30	Digital Input 5	Yes	Hall 0 -5kHz ,Analog 0 -20V, Fixed Arm 1.45V, SENT Protocol compatible
A31	Digital Input 6	Yes	Hall 0 -5kHz ,Analog 0 -20V, Fixed Arm 1.45V, SENT Protocol compatible
B18	Digital Input 7	Yes	Hall 0 -5kHz ,Analog 0 -20V, Fixed Arm 1.45V, SENT Protocol compatible
B19	Digital Input 8	Yes	Hall 0 -5kHz ,Analog 0 -20V, Fixed Arm 1.45V, SENT Protocol compatible
B20	Digital Input 9	No Pullup	Analog 0 -20V
B21	Digital Input 10 /Ignition Switch	No Pullup	Analog 0 -20V

Auxiliary Output Summary:

Pin	Channel Name	Drive Type	Mode	Description
B10	Aux Output 1	LS Only Inductive or Resistive	ON/OFF or PWM	Relay or Solenoid
B11	Aux Output 2	LS Only Inductive or Resistive	ON/OFF or PWM	Relay or Solenoid
B12	Aux Output 3	LS Only Inductive or Resistive	ON/OFF or PWM	Relay or Solenoid
B13	Aux Output 4	LS Only Inductive or Resistive	ON/OFF or PWM	Relay or Solenoid
B14	Aux Output 5	LS or HS Inductive or Resistive	ON/OFF or PWM	Relay or Solenoid
B15	Aux Output 6	LS or HS Inductive or Resistive	ON/OFF or PWM	Relay or Solenoid
B16	Aux Output 7	LS or HS Inductive or Resistive	ON/OFF or PWM	Relay or Solenoid
B17	Aux Output 8	LS or HS Inductive or Resistive	ON/OFF or PWM	Relay or Solenoid
B22	Aux Output 9	Half Bridge DBW +	PWM	Engine Main Throttle
B23	Aux Output 10	Half Bridge DBW -	PWM	Engine Main Throttle
B24	Aux Output 11	Half Bridge	ON/OFF or PWM	Relay or Solenoid or GDI Pump Ctrl Signal
B25	Aux Output 12	Half Bridge	ON/OFF or PWM	Relay or Solenoid or GDI Pump Ctrl Signal

6.1 Important Notes

Analog Sensor 0V Reference (Pin A4)

This pin should be connected directly to the 0V (Ground) pin on any low current Analog sensor, for example Pressure or Temperature.

- **DO NOT** connect the ECU pin A4 directly to the Engine Block or ECU Ground. These are dedicated and specialised ground outputs for all Analog channels and should be connected directly to the sensor.
- **DO NOT** connect frequency-based sensors to these pins, for example, an Ethanol content sensor. Frequency based sensor 0V pins should be connected to the ECU ground.

Aux 9-12 (Half Bridge) Driver Power Supply Input (Pin B26)

Pin B26 is a dedicated power supply for Auxiliary Channels 9-12. Power must be supplied to this pin for these channels to operate correctly. In non-DBW (Drive by Wire) applications the ECU Supply power can be shared, assuming the wire gauge has a sufficient rating for the current demand. In DBW applications power to this pin **MUST** come from an ECU controlled DBW Relay.

Battery Constant Supply Input (Pin B1)

- Pin B1 should **ALWAYS** be connected to a constant 12V supply.
NOTE: The ECU draws zero current once completely shut down.
- ALL Auxiliary flywheel control is directed to the pin.
- Constant power to this pin allows the ECU and control its power-down sequence. See “Shadow Series Power Distribution Wiring - Emtron.pdf” for more information on how this should be wired and configured. Refer Appendix B.

Ignition TTL Outputs

DO NOT connect these outputs directly to a coil. These Outputs are TTL or 0 – 7V which are designed to drive the input of an Ignitor. Connection directly to a coil will permanently damage the ECU!!

7.0 Software

Comprehensive Emtune tuning software is used to connect to the ECU.

- Microsoft Windows™ 7 -11 compatible
- Free licence
- Memory requirements: 0.5GB RAM
- ECU connection using USB C
- Tuning and data analysis
- PC and ECU data logging
- Live pause and data playback
- Advanced tuning functions
- Diagnostics

8.0 Ordering Information

Product	Part Number
Emtron Shadow ECU	1908-082
Emtron USB Tuning Cable (1.5m)	

Appendix B – Shadow Series ECU Wiring

