



# SPTRONICS

Spark Performance Electronics

Installation Instruction for SEM306  
Standalone Engine Management

# Warning

The SEM306 allows for total flexibility in engine tuning, misuse of this product will destroy your engine

SPTRONICS holds no responsibility for any engine damage that may results from the misuse of this product

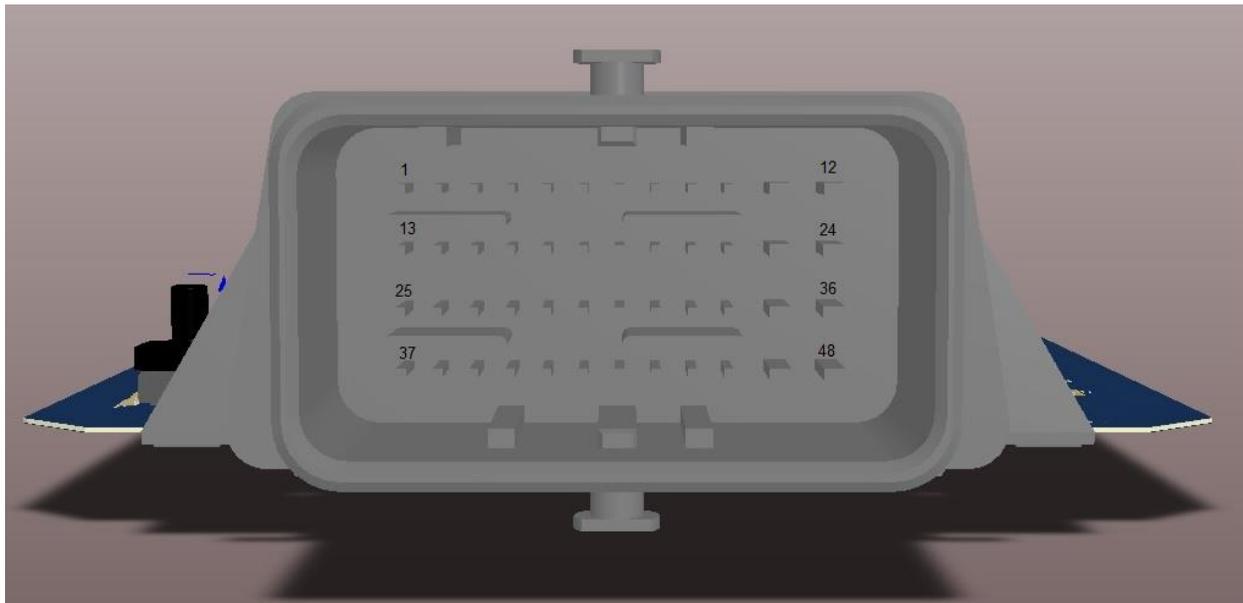
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## SEM201 Specifications:

Trigger Inputs:	2 x Differential Inputs Hall, VR and Opto
Output Drivers:	16 x Low side drivers Saturated (8 ohm minimum, <b>High Impedance Only</b> )
Coil Drivers:	Up to 8 x 0-5V, 12V 1.5A max ( <b>do not connect directly to coil primary</b> )
Inputs:	8 x digital Inputs 5 of them can be used as analog and/or 4x digital inputs shared with Ignition outputs.
Knock Sensor Input	2x Programmable sensor input
Throttle Position Input	1 x 0-5V
Manifold Pressure Sensor	1 x 0-5V
Internal 4 bar Map sensor	Internal sensor
Coolant Temperature Sensor	1 x analog
Inlet Air Temperature Sensor	1 x analog
O2 Sensor	1 x 0-5V
USB	1 x PC Communication
CAN	1 x Programmable Send / Receive
5 Volt Reference	1 x 5 volt output for sensor supply
Bluetooth	1x Bluetooth as main communication port

## Wiring Diagram:



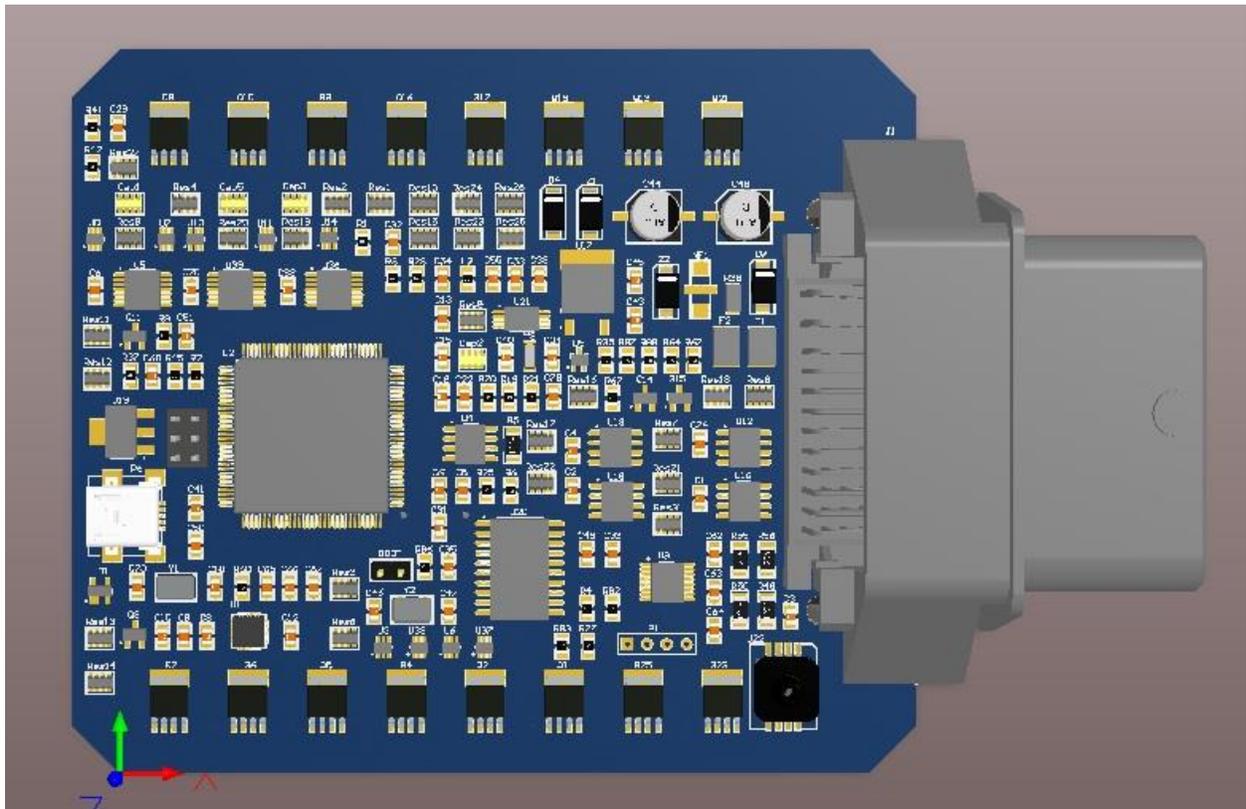
Looking at PCB connectors

## Connector:

Pin	Name	Wire Color	Comment
1	Crack +	yellow	
2	Crank -	black	
3	CAM +	yellow	
4	CAM -	black	
5	Intake air temperature input	white	
6	Coolant temperature input	white	
7	O2 sensor input	white	
8	Throttle position sensor input	white	
9	Knocking sensor 1 input	blue	
10	Knocking sensor 2 input	blue	
11	Power GND	Black	Connected to chassis
12	Power GND	Black	Connected to chassis
13	ADC6 input	white	
14	ADC7 input	white	
15	ADC11 input	white	
16	ADC12 input	white	
17	ADC13 input	white	
18	PE2(Flex) input	blue	
19	PT4 input	blue	
20	PT6(Datalog) input	blue	
21	Reference voltage 5V	grey	
22	Sensor ground	black	
23	Battery voltage 12V	red	
24	Digital ground	black	Connected direct to battery
25	Injector 1 output	orange	
26	Injector 2 output	orange	
27	Injector 3 output	orange	
28	Injector 4 output	orange	
29	Injector 5 output	orange	
30	Injector 6 output	orange	
31	Injector 7 output	orange	
32	Injector 8 output	orange	
33	Boost output	brown	
34	VVT output	brown	
35	INJ1 output	brown	
36	INJ2 output	brown	
37	NOS1 output	brown	
38	NOS2 output	brown	
39	Ignition 1 output	green	

40	Ignition 2 output	green	
41	Ignition 3 output	green	
42	Ignition 4 output	green	
43	Ignition 5 output	green	
44	Ignition 6 output	green	
45	Ignition 7 output	green	
46	Ignition 8 output	green	
47	Idle output	brown	
48	Fidle output	brown	

## PCB Top View:



USB connector is to connect the SEM306 to computer, it's used as backup connection and for configure the Bluetooth name and pin code via AT command, the USB cable is included in the full package. USB driver is available to download on this link:

[https://www.silabs.com/documents/public/software/CP210x\\_Universal\\_Windows\\_Driver.zip](https://www.silabs.com/documents/public/software/CP210x_Universal_Windows_Driver.zip)

Bluetooth default name is SEM306 and default pin code is 1234, however the name and pin can be changed by change Bluetooth to config mode using switch 5 pin3 and using any Terminal

service application, the default baud rate is 1115200 and port number is the same virtual port number assigned to your SEM306 under windows device manager.

To change the Bluetooth name type:

AT+NAME????????

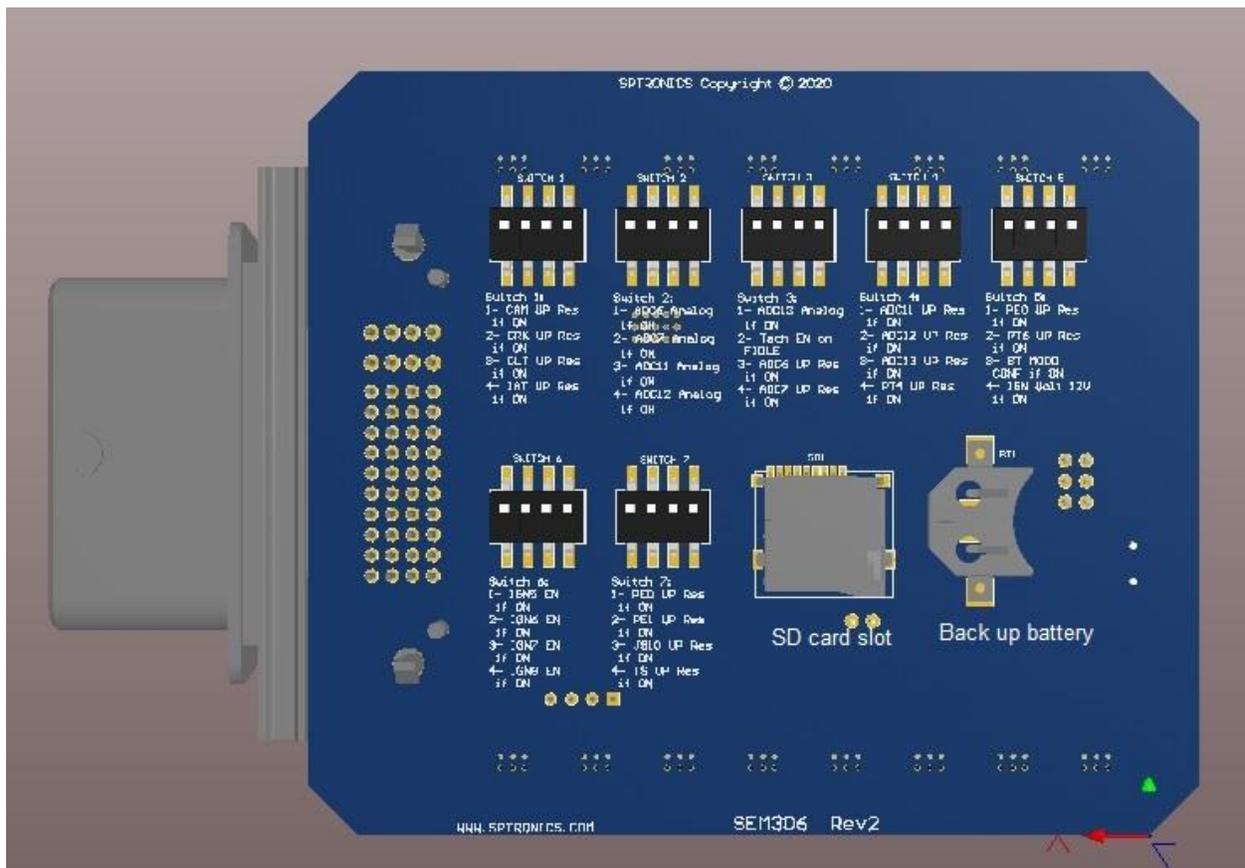
?????? is the required name

And to change the pin code type:

AT+PIN????

?????? is the required pin

## PCB Bottom View:



SD card slot is for using micro SD card for data logging.

Backup battery slot is for powering the RTC circuit to save the time for data logging while the device is not connected to the main power, CR1220 battery should be used.

Switch 1 control the following functions:

Pin1, when it is ON, it pulls up the CAM input CAM+

Pin2, when it is ON, it pulls up the CRK input CRK+

Pin3, when it is ON, it pulls up the CLT input.

Pin4, when it is ON, it pulls up the IAT input.

Switch 2 control the following functions:

Pin1, when it is ON, ADC6 is analog input otherwise its digital input.

Pin2, when it is ON, ADC7 is analog input otherwise its digital input.

Pin3, when it is ON, ADC11 is analog input otherwise its digital input.

Pin4, when it is ON, ADC12 is analog input otherwise its digital input.

Switch 3 control the following functions:

Pin1, when it is ON, ADC13 is analog input otherwise its digital input.

Pin2, when it is ON, Tach output is enabled on Fidle output.

Pin3, when it is ON, ADC6 pull up resistor is enabled.

Pin4, when it is ON, ADC7 pull up resistor is enabled.

Switch 4 control the following functions:

Pin1, when it is ON, AD11 pull up resistor is enabled.

Pin2, when it is ON, ADC12 pull up resistor is enabled.

Pin3, when it is ON, ADC13 pull up resistor is enabled.

Pin4, when it is ON, PT4 pull up resistor is enabled.

Switch 5 control the following functions:

Pin1, when it is ON, PE2 pull up resistor is enabled.

Pin2, when it is ON, PT6 pull up resistor is enabled.

Pin3, when it is ON, Bluetooth module will be in configuration mode.

Pin4, when it is ON, the ignition outputs will be 12V otherwise it is 5V

Switch 6 control the following functions:

Pin1, when it is ON, it enables Ignition output 5 otherwise will be as PE0

Pin2, when it is ON, it enables Ignition output 6 otherwise will be as PE1

Pin3, when it is ON, it enables Ignition output 7 otherwise will be as JS10

Pin4, when it is ON, it enables Ignition output 8 otherwise will be as tableswitch

Switch 7 control the following functions:

Pin1, when it is ON, PE0 pull up resistor is enabled.

Pin2, when it is ON, PE1 pull up resistor is enabled.

Pin3, when it is ON, JS10 pull up resistor is enabled.

Pin4, when it is ON, tableswitch pull up resistor is enabled.

## **Installation:**

### **Grounding:**

The ECU must have an electrically secure ground connection, which means that the battery negative must be properly grounded to the chassis AND engine. The ground wire, whether it is from the battery or to the chassis and engine, must have perfect electrical conductivity. This means that there must not be any paint or rust under the wire terminal. Make sure that when you install the ground wire there is bare metal exposed where the wire contacts the vehicle component. Both of black wires should be connected to secure ground and we also recommend that the ground wire be as short as possible.

### **Power Requirement:**

The SEM306 requires a minimum supply voltage of 10V or greater to run. We recommend that the ECU be supplied with 13.8V nominal operating voltage. Ensure that the vehicle's charging system is in perfect operating condition prior to installation. The red wire should be connected to ignition switched and fused to the battery source.

### **Sensors Reference Voltage:**

The SEM306 has one 5V sensor voltage supply that will be needed during standalone installation. The grey wire output has resettable fuse rated at 0.5A max

# Dedicated Inputs:

## Trigger Inputs:

SEM306 has two differential trigger input crank input+ and crank input- for the Crank signal and cam input+ and cam input- for the CAM signal. Each one has an option to be connected as differential or as single input. The following table summarize trigger connection:

Mode	Connection
Opto Input	<ul style="list-style-type: none"><li>• Input Signal to Input+</li><li>• Leave Input- unconnected.</li></ul>
VR Sensor	<ul style="list-style-type: none"><li>• Connect VR Sensor to Input+/Input-</li></ul>
Hall Input	<ul style="list-style-type: none"><li>• Connect Hall sensor (Collector/Drain) to Input+, Close CRK/CAM UP jumper for pull-up resistor for standalone connection.</li><li>• Connect Hall sensor to Input+ for piggyback connection.</li><li>• Leave Input- unconnected.</li></ul>

## Throttle Position Sensor (TPS):

Name	Wire#	Color	5V Sensor Reference Voltage
+5.0 volts, Vcc	21	grey	
TPS Signal	8	white	TPS 0-5V signal
Ground	22	black	Connect to GND

## Air Temp Sensor (IAT):

Name	Wire#	Color	
IAT Signal	5	white	IAT 0-5V signal
Ground	22	black	Connect to GND

IAT UP jumper connects the IAT Signal to pull up resistor 2.49K ohm that will be needed in standalone setup.

## Coolant Temp Sensor (CLT):

Name	Wire#	Color	
CLT Signal	6	white	CLT 0-5V signal
Ground	22	black	Connect to GND

CLT UP jumper connects the CLT Signal to pull up resistor 2.49K ohm that will be needed in standalone setup.

## O2 Sensor:

Name	Wire#	Color	
O2 Signal	7	white	O2 0-1V or 0-5V signal
Ground	22	black	Connect to GND

## Knock Sensors:

Name	Wire#	Color	
Knock Signal	9, 10	blue	
Ground	22	black	Connect to GND

# Auxiliary Inputs:

## Analog/Digital Inputs:

5 inputs (ADC6, ADC7, ADC11, ADC12, ADC13) can be used as analog or digital inputs. Switch 2 and Switch 3 control the usage of these inputs. Analog inputs can be any value from 0V to 5V( built in clamping circuit to cut voltage more than 5v to 5.1V).

Digital inputs can be switch as on/off input or to detect signal frequency from Hal sensors. Pull up resistor are included and can be switched on by Switch 3 and Switch 4.

## Digital Inputs:

3 dedicated digital inputs (PT4, PE2, PT6) can be switch as on/off input or to detect signal frequency from Hal sensors. Pull up resistor are included and can be switched on by Switch 4 and Switch 5.

## Ignition Shared Digital Inputs:

4 shared digital inputs(PE0, PE1, JS10, tableswitch) can be used as ignition output from IGN5 to IGN8 (Switch 6 control the direction) or as as on/off input or to detect signal frequency from Hal sensors. Pull up resistor are included and can be switched on by Switch 7.

## General Purpose Outputs:

16 low side output each rated at 3A, 8 outputs can be used for injectors in 8 cylinder sequential mode and the rest of the output can be used as general purpose outputs. Unused injectors outputs can be used as general purpose outputs.

Fidle output can be sued as Tach output by pulling up 10K resistor by switching on Switch 3 Pin 2.

## Ignition Outputs:

Up to 8 Ignition outputs (rated 1.5A max, to drive old and new ignition driver and not to be connected directly to drive ignition coil, 5V or 12V can be generated by Switch 5 Pin 4) to drive 8-cylinder engine sequentially. Ign1 to Ign4 work only as ignition outputs, from Ign5 to Ign8 are shared with digital inputs. The selection between ignition output digital inputs is explained in the switches functions.

Unused ignition output can be used as general purpose outputs using extrnal driver like SPTRONICS IDI401 or to solid state relay.

## Warranty

SPTRONICS warrants to the consumer that all High Performance products will be free from defects in material and workmanship for a period of twelve (12) months from date of the original purchase. Products that fail within this 12-month warranty period will be repaired or replaced at SPTRONICS's option, when determined by SPTRONICS that the product failed due to defects in material or workmanship.

This warranty is limited to the repair or replacement of the SPTRONICS part. In no event shall this warranty exceed the original purchase price of the SPTRONICS part nor shall SPTRONICS be responsible for special, incidental or consequential damages or cost incurred due to the failure of this product. Warranty claims to SPTRONICS must be transportation prepaid and accompanied with dated proof of purchase. This warranty applies only to the original purchaser of product and is non-transferable. All implied warranties shall be limited in duration to the said 12-month warranty period. Improper use or installation, accident, abuse, unauthorized repairs or alterations voids this warranty. SPTRONICS disclaims any liability for consequential damages due to breach of any written or implied warranty on all products manufactured by SPTRONICS.

SPTRONICS will not be responsible for electronic products that are installed incorrectly, installed in a non-approved application, misused, or tampered with.

Any SPTRONICS electronics product can be returned for repair if it is out of the warranty period.

There is a minimum charge of \$20.00 for inspection and diagnosis of SPTRONICS electronic parts. Parts used in the repair of SPTRONICS electronic components will be extra.

SPTRONICS will provide an estimate of repairs and receive written or electronic authorization before repairs are made to the product.