

## Lingenfelter ECSS-001 Ethanol Content Sensor Signal Simulator Installation & Operating Instructions



PN: L460350085



## Parts List

### Lingenfelter ECSS-001 Ethanol Content Sensor Simulator (PN: L460350085)

#	Description	Part number
1	Lingenfelter Ethanol Content Sensor Simulator	ECSS-001
1	Hook & loop tape	
2	Self-tapping screw	AV16037
1	LPE decal	L920010000
1	Instructions	

## Tools & Materials Required

- Phillips head screwdriver
- Wire crimping tool
- Heat Shrink

## Optional Items

#	Description	Part number
1	LPE technician's screwdriver	L950050000
1	E38/E67 ECM terminals	33468-0003

## Description:

ECSS-001 is a fuel composition signal generator that generates the same output signals as the OEM fuel composition sensor that is used in many vehicles. By enabling this input on engine control modules capable of reading this sensor, the ECSS-001 allows the user to change air-fuel ratio and modify ignition timing based on external activation inputs. This allows a nitrous system or other external system to change the Air Fuel Ratio (AFR) and/or ignition timing.

The ECSS-001 works with GM Engine Control Modules (ECMs) and Powertrain Control Modules (PCMs) that have operating system software capable of recognizing a fuel composition sensor signal. The ECSS-001 is currently able to simulate the ethanol content signals generated by the GM Siemens (PN: 12570260) and GM Continental (PN: 13577394) fuel composition sensors.

The Lingenfelter ECSS-001 Ethanol Content Sensor Simulator is not designed to replace an existing Fuel Composition sensor in your vehicle.

**Note:** If your ECM does not already have the Fuel Temperature/Composition Signal enabled, you can enable the Fuel Temperature/Composition Signal pin using vehicle calibration software such as EFILive Tune v7.5, HPTuners, Tuner Cat, or SCT (not included, check before purchasing).

The ECSS-001 allows nitrous to be installed on engines where it may be difficult to achieve even fuel distribution with inlet mounted fuel solenoids, or where it is not recommended to have fuel (i.e. pre supercharger). This simplifies nitrous installation and reduces installation cost by eliminating the need to provide additional fuel via an ad-on system.

The ECSS-001 also allows the user to easily make adjustments to fueling and/or timing based on almost any switched input so it can be used for a high or low octane switch, race gas switch, etc.

The ECSS-001 can also be used to:

- Change timing/fuel when running a higher boost setting in turbo applications
- Reduce timing and/or change AFR when alcohol or water injector fluid is low (activated by a level switch)

The ECSS-001 can connect to an existing fuel composition sensor signal to monitor the ethanol percentage. The ECSS-001 can output a switched signal based on the ethanol percentage. The ECSS-001 accepts the ethanol content signal generated by the GM Siemens and GM Continental fuel composition sensors. This can be used to provide a warning alert or other switched output when fuel composition goes above or below a user specified percentage.

### Specifications:

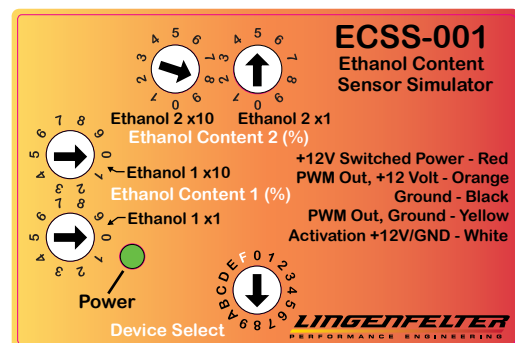
- Available output types:
  - Two frequency based output wires in Simulated Ethanol Content Mode
    - Push-pull +12V peak output (orange wire)
    - Open drain ground control type output (yellow wire)
  - Two outputs in Ethanol Content Switch Mode
    - Push-pull +12V peak output (+12V, orange)
    - Open drain ground control type output (ground, yellow)
  - Outputs rate for up to 0.75 amp each
  - Outputs have a self protect feature and will turn OFF in case of direct short or over current condition
- Current draw: 0.1 amp plus current draw of device being controlled (when active)
- Available input types:
  - +12V or ground activation signal wire determined by a DIP switch inside the back cover in Simulated Ethanol Content Mode (white wire)
  - Fuel Composition signal input (ethanol content input) in Ethanol Content Switch Mode
- Operating voltage range: 9.0 to 18.0 volts
- Accepts/Simulates the following GM fuel composition sensors at 89°F
  - Siemens (PN: 12570260)
  - Continental (PN: 13577394)
- Provides a switched output based on ethanol content percentage
- Ethanol Content switch settings can be adjusted in 1% increments from 0 to 99 percent
- Custom molded high temperature glass filled Nylon 6 enclosure
- Fully encapsulated (potted) construction for increased durability
- Input signal impedance: 100k Ohms
- One year warranty (from date of purchase)

### Simulated Ethanol Content Mode

<b>Table A:</b> Wiring (also labeled on module) Simulated Ethanol Content Mode		
Wire Color	Label Notes	Notes
Red	+12V Switched Power	Connects to a switched +12V source.
Orange	PWM Out, +12V	This wire provides a +12V push-pull peak output.
Black	Ground	Connects to a vehicle ground.
Yellow	PWM Out, Ground	This wire provides open drain ground control.
White	Activation +12V/GND	This connects to a device that will provide a +12V or ground signal to activate the module.

#### Settings on the front face of the ECSS-001:

- Single sixteen position switch used to select the different modes
  - The different modes are located in Table B (Page 6)
- Two ten position switches for selecting the Ethanol Content 1%
  - Ethanol 1 x1
  - Ethanol 1 x10
- Two ten position switches for selecting the Ethanol Content 2%
  - Ethanol 2 x1
  - Ethanol 2 x10
- Ethanol Content 1% MUST BE LESS THAN Ethanol Content 2% in order for the controller to run correctly.



### Settings inside the rear cover of the ECSS-001:

- Five two position DIP switches (The location of the switches is shown in the figure below).
- DIP switch #1 is not used.
- DIP switch #2 selects the desired polarity of the output signal.
  - For GM vehicles, use the positive (downward) position.

Duty Cycle Polarity	DIP Switch
	#2
Positive	↓
Negative	↑



- DIP switch #3 is not used.
- DIP switch #4 and #5 select the Override Input Activation polarity.

Input			Output		
Activation Polarity	DIP Switch		Override Input Activation Present	Ethanol Content %	LED
	#4	#5			
+12V Activation	↓	↓	NO	Ethanol 1	GREEN
	↓	↓	YES	Ethanol 2	RED
	↓	↑	NO	Ethanol 2	RED
	↓	↑	YES	Ethanol 1	GREEN
Ground Activation	↑	↓	NO	Ethanol 2	RED
	↑	↓	YES	Ethanol 1	GREEN
	↑	↑	NO	Ethanol 1	GREEN
	↑	↑	YES	Ethanol 2	RED

### LED operation:

- Solid GREEN when powered up, all settings are properly configured, and Ethanol 1 is active.
- Solid RED when all settings are properly configured and Ethanol 2 is active.
- Blinking RED indicates Ethanol Content 1 is greater than Ethanol Content 2.

### Installation:

1. Disconnect the negative battery terminal.
2. Connect the black wire of the ECSS-001 to a suitable vehicle ground. **Failure to fully secure the ground wire to a vehicle ground source could result in malfunction of the module.**
3. Connect the red wire to a **switched and fused** +12V DC source. The +12V source that the red wire is connected to should be powered anytime the ECM is powered. A 5-10 amps fuse should be sufficient.
4. The PWM outputs are rated for up to only 0.75 amp, so a solid state relay should be used if any of the ECSS-001 outputs will be controlling a device that pulls more than 0.75 amp. If connecting to an ECM, you will not need a relay.
5. Connect the white wire to the activation source.
6. Find the **Fuel Temperature/Composition Signal** wire on the ECM.
  - If the ECM has a pull-up resistor enabled on this wire, connect the yellow wire from the ECSS-001 to the wire from the ECM. To check to see if your ECM has a pull-up resistor on this wire, turn the ignition on but do not start the vehicle. Use a multimeter/voltmeter to measure the voltage on the Fuel Temperature/Composition Signal pin. If the voltage is near zero use the orange wire from the ECSS-001. Otherwise, use the yellow wire. For GM ECMs, use the yellow wire from the ECM.
  - If the ECM does not have a pull-up resistor enabled on this wire, connect the orange wire from the ECSS-001 to the wire from the ECM.
7. Secure the ECSS-001 using the supplied hook and loop tape or using the supplied self-tapping screws.
8. Adjust the dials on the front of the ECSS-001 to desired settings. There are two examples shown on page 7.
9. Reconnect the negative battery terminal.

### Example Settings 1:

Table B: 16 Position Mode Select Switch	
Mode Select switch position	Mode
0	Simulated Ethanol Content Mode
1	Ethanol Content Switch Mode 1
2	Ethanol Content Switch Mode 2
3	Simulated Ethanol Content Mode
4	Simulated Ethanol Content Mode
5	Simulated Ethanol Content Mode
6	Simulated Ethanol Content Mode
7	Simulated Ethanol Content Mode
8	Simulated Ethanol Content Mode
9	Simulated Ethanol Content Mode
A	Simulated Ethanol Content Mode
B	Simulated Ethanol Content Mode
C	Simulated Ethanol Content Mode
D	Simulated Ethanol Content Mode
E	Simulated Ethanol Content Mode
F	Simulated Ethanol Content Mode

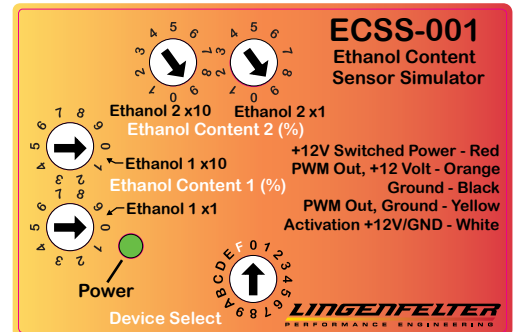


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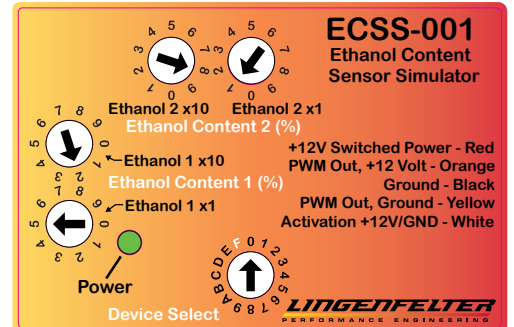
### Example Settings 1 Continued:

- Ethanol Content 1 (0%), Ethanol Content 2 (99%), Ethanol content without Activation signal present (Ethanol Content 1), positive polarity, and ground activation:
  - Sixteen position switch set to position 0.
  - Ethanol Content 1 - 0%:
    - Ethanol Content 1 programming for ones of % (x1) on position 0.
    - Ethanol Content 1 programming for tens of % (x10) on position 0.
  - Ethanol Content 2 - 99%:
    - Ethanol Content 2 programming for ones of % (x1) on position 9.
    - Ethanol Content 2 programming for tens of % (x10) on position 9.
  - Polarity - positive:
    - DIP switch #2 set to the down/off position.
  - Ethanol content without Activation signal present (Ethanol Content 1):
    - DIP switch #4 set to the up/on position.
  - Activation - ground:
    - DIP switch #5 set to the up/on position.



### Example Settings 2:

- Ethanol Content 1 (25%), Ethanol Content 2 (81%), Ethanol content without Activation signal present (Ethanol Content 1), negative polarity, and +12V activation:
  - Sixteen position switch set to position 0.
  - Ethanol Content 1 - 25%:
    - Ethanol Content 1 programming for ones of % (x1) on position 5.
    - Ethanol Content 1 programming for tens of % (x10) on position 2.
  - Ethanol Content 2 - 81%:
    - Ethanol Content 2 programming for ones of % (x1) on position 1.
    - Ethanol Content 2 programming for tens of % (x10) on position 8.
  - Polarity - positive:
    - DIP switch #2 set to the up/on position.
  - Ethanol content without Activation signal present (Ethanol Content 1):
    - DIP switch #1 set to the down/off position.
  - Activation - ground:
    - DIP switch #5 set to the down/off position.



### Ethanol Content Switch Mode

In Ethanol Content Switch Mode, the outputs are switched based on ethanol content. This mode can be used to provide a warning alert or other switched output when fuel composition goes above or below a user specified percentage.

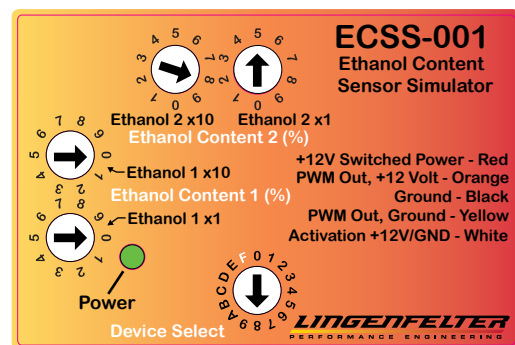
There are two Ethanol Content switch modes, Mode 1 and Mode 2. Both of the modes, Mode 1 and Mode 2, are opposites of each other (outputs are switched).

<b>Table C: Wiring (also labeled on module) Ethanol Content Switch Mode</b>		
<b>Wire Color</b>	<b>Label Notes</b>	<b>Function</b>
Red	+12V Switched Power	Connects to a switched +12V source
Orange	PWM Out, +12V	+12V push-pull simple ON/OFF output
Black	Ground	Connects to a vehicle ground
Yellow	PWM Out, Ground	Open drain ground simple ON/OFF control
White	Activation +12V/GND	Connects to the ethanol content sensor

**NOTE: In this mode, the wire descriptions as labeled on the front of the ECSS-001 can be ignored. The PWM Out, +12V wire (orange) is not a PWM signal. The signal will be a simple ON/OFF. The PWM Out, GND wire (yellow) is not a PWM signal. The signal will be a simple ON/OFF. The Activation +12V/GND wire (white) is not an activation signal. The input will behave as the ethanol content signal input.**

#### Settings on the front face of the ECSS-001

- Single sixteen position switch used to select the different modes.
  - The different modes are located in Table B (Page 6).
- Two ten position switches for selecting the Ethanol Content 1%
  - Ethanol 1 x1
  - Ethanol 1 x10
- Two ten position switches for selecting the Ethanol Content 2%
  - Ethanol 2 x1
  - Ethanol 2 x10
- Ethanol Content 1% MUST BE LESS THAN Ethanol Content 2% in order for the controller to run correctly.



#### Settings inside the rear cover of the ECSS-001

- DIP Switch 1 does not change anything.
- DIP Switch 2 - set the switch to the down position.
- DIP Switch 3 does not change anything.
- DIP Switch 4 and 5
  - If the ethanol content sensor signal is being shared by another device, set DIP switches 4 and 5 to the down position.
  - If the ECSS-001 is the only device connected to the ethanol content sensor, set DIP switches 4 and 5 to the up position.





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### Installation:

1. Disconnect the negative battery terminal.
2. Connect the black wire of ECSS-001 to a suitable vehicle ground. **Failure to fully secure the ground wire to a vehicle ground source could result in malfunction of the module.**
3. Connect the red wire to a **switched and fused** +12 volt DC source. The +12V source that the red wire is connected to should be powered anytime the ECM is powered. A 5-10 amps fuse should be sufficient.
4. The switched outputs are rated 0.75 amp, so a relay should be used if any of the ECSS-001 outputs will be controlling a device that pulls more than 0.75 amp.
5. Connect the white wire to the vehicle's **Fuel Temperature/Composition Signal**.
6. Set the DIP switches to the correct settings.
7. Secure the ECSS-001 by using the supplied hook and loop tape or by using the supplied self-tapping screws.
8. Adjust the dials on the front of the ECSS-001 to desired settings. There are examples shown on pages 9-10.
9. Reconnect the negative battery terminal.

### Mode 1

- Set the 16 position switch to position 1

### Example 1:

- Ethanol Content Switch Mode, standard configuration
- Ethanol Content 1 (%) = 0 [Ethanol 1 x1 = 0, Ethanol Content 1 x10 = 0]
- Ethanol Content 2 (%) = 80 [Ethanol 2 x1 = 0, Ethanol Content 2 x10 = 8]

Output (Wire Color)	Output state below Ethanol Content 2	Output state above Ethanol Content 2
PWM Out, +12V (Orange)	ON (+12V)	OFF (OPEN)
PWM Out, +12V (Yellow)	OFF (OPEN)	ON (GND)
ECSS-001 LED status	Solid GREEN*	Blinking GREEN

**\*NOTE:** On initial power up, the LED will be solid RED. The LED will switch to solid green when a valid Ethanol Content Signal is present.

### Example 2:

- Ethanol Content Window Switch Mode, standard configuration
- Ethanol Content 1 (%) = 20 [Ethanol 1 x1 = 0, Ethanol Content 1 x10 = 2]
- Ethanol Content 2 (%) = 80 [Ethanol 2 x1 = 0, Ethanol Content 2 x10 = 8]

Output (Wire Color)	Output state below Ethanol Content 1	Output state between Ethanol Content 1 & Ethanol Content 2	Output state above Ethanol Content 2
PWM Out, +12V (Orange)	OFF (OPEN)	ON (+12V)	OFF (OPEN)
PWM Out, +12V (Yellow)	ON (GND)	OFF (OPEN)	ON (GND)
ECSS-001 LED status	Solid GREEN*	Blinking GREEN	Solid GREEN

**\*NOTE:** On initial power up, the LED will be solid RED. The LED will switch to solid green when a valid Ethanol Content Signal is present.

### Mode 2

In Mode 2, the outputs are opposite compared to Mode 1.

- Set the 16 position switch to position 2

#### Example 1:

- Ethanol Content Switch Mode, reversed outputs
- Ethanol Content 1 (%) = 20 [Ethanol 1 x1 = 0, Ethanol Content 1 x10 = 2]
- Ethanol Content 2 (%) = 80 [Ethanol 2 x1 = 0, Ethanol Content 2 x10 = 8]

Output (Wire Color)	Output state below Ethanol Content 2	Output state above Ethanol Content 2
PWM Out, +12V (Orange)	OFF (OPEN)	ON (+12V)
PWM Out, +12V (Yellow)	ON (GND)	OFF (OPEN)
ECSS-001 LED status	Solid GREEN*	Blinking GREEN

**\*NOTE:** On initial power up, the LED will be solid RED. The LED will switch to solid GREEN when a valid Ethanol Content Signal is present.

#### Example 2:

- Ethanol Content Window Switch Mode, reversed outputs
- Ethanol Content 1 (%) = 20 [Ethanol 1 x1 = 0, Ethanol Content 1 x10 = 2]
- Ethanol Content 2 (%) = 80 [Ethanol 2 x1 = 0, Ethanol Content 2 x10 = 8]

Output (Wire Color)	Output state below Ethanol Content 1	Output state between Ethanol Content 1 & Ethanol Content 2	Output state above Ethanol Content 2
PWM Out, +12V (Orange)	ON (+12V)	OFF (OPEN)	ON (+12V)
PWM Out, +12V (Yellow)	OFF (OPEN)	ON (GND)	OFF (OPEN)
ECSS-001 LED status	Solid GREEN*	Blinking GREEN	Solid GREEN

**\*NOTE:** On initial power up, the LED will be solid RED. The LED will switch to solid green when a valid Ethanol Content Signal is present.

### **Additional Notes and Warnings:**

- Changes to the switch settings must be done with the ECSS-001 powered off.
  - The switch positions are only read on start up (initial device power up).
- The Ethanol Content 1 setting must be less than the Ethanol Content 2 setting.
- Make sure that the ECSS-001 ground wire is secured to a vehicle ground. Failure to fully secure the ECSS-001 ground wire to a vehicle ground source could cause the ECSS-001 to malfunction.
- Do NOT submerge the module in liquid or directly wash the unit with liquid of any type. The switches on the ECSS-001 are sealed but are NOT rated for high pressure washing, use caution if power washing near the ECSS-001 module.
- Do NOT mount the ECSS-001 directly on top of the engine or near the exhaust manifolds due to heat concerns.
- Do NOT mount the ECSS-001 in the line of site of high temperature objects such as exhaust manifolds, turbine housings, etc. If needed, install a heat shield in between the heat source and the module to protect the plastic case.
- Do NOT install within 6" of nitrous solenoids or other devices with strong magnetic fields.
- Do NOT install near the spark plugs or the spark plug wires (or other potential strong sources of electrical noise).
- LPE recommends the use of resistor type spark plugs and RFI (Radio Frequency Interference) and EMI (Electromagnetic Interference) suppression spark plug wires on all EFI engines and any vehicle that has electronic control modules on board (including the ECSS-001). Failure to do so may result in erratic operation of electronic devices.
- Not meant to replace an existing ethanol content sensor.

### Appendix A: Enabling ECM Fuel Composition Input Signal

On some vehicles the Fuel Composition input signal is not enabled in the ECM. In most cases, however, the vehicle's ECM has an unpopulated pin that can be used to communicate the Fuel Composition input signal from the ECSS-001 to the ECM. The following sections explain how to connect a wire to the correct pin on the ECM, as well as how to enable the ECM Fuel Composition input signal using EFILive Tune v7.5.

#### Populating the Fuel Composition signal wire on the ECM (GM E38, E67, E92 ECM's)

1. Determine the correct ECM pin location for the Fuel Composition signal input signal location. A list of Fuel Composition signal input pin locations for some GM vehicles has been provided in Table D (Page 13).
2. Disconnect the ECM connector that houses the Fuel Composition input signal terminal. Use a small flat head screwdriver to open the wire enclosure on the back side of the connector. This exposes the wires as they come out of the connector.
3. If there is a terminal cover on the front side of the connector, use a small flat head screwdriver to remove it by prying up on each end. You should now see the terminals of each wire, along with colored terminal plugs in pin locations that are not currently populated.
4. Locate the ECM's Fuel Composition input signal pin location on the connector. Remove the colored terminal plug from the connector with a small screwdriver.
5. Crimp a terminal (PN: 33468-0003 -- for E38/E67/E92 ECM's) to a piece of wire (long enough to reach from the ECM to the ECSS-001), which will become your Fuel Composition input signal wire. The terminal will lock into the connector when oriented correctly, so make sure that you have the terminal correctly oriented before attempting to insert the terminal into the connector.
6. Insert the terminal into the correct pin location from the back side of the connector. You should hear an audible "click", which tells you that the terminal is inserted in the correct orientation and has locked into place.
7. Reinstall the terminal cover, close the connector wire enclosure, and reinstall the connector onto the ECM.
8. This wire can now be connected to the "PWM Out, Ground" terminal on the ECSS-001.

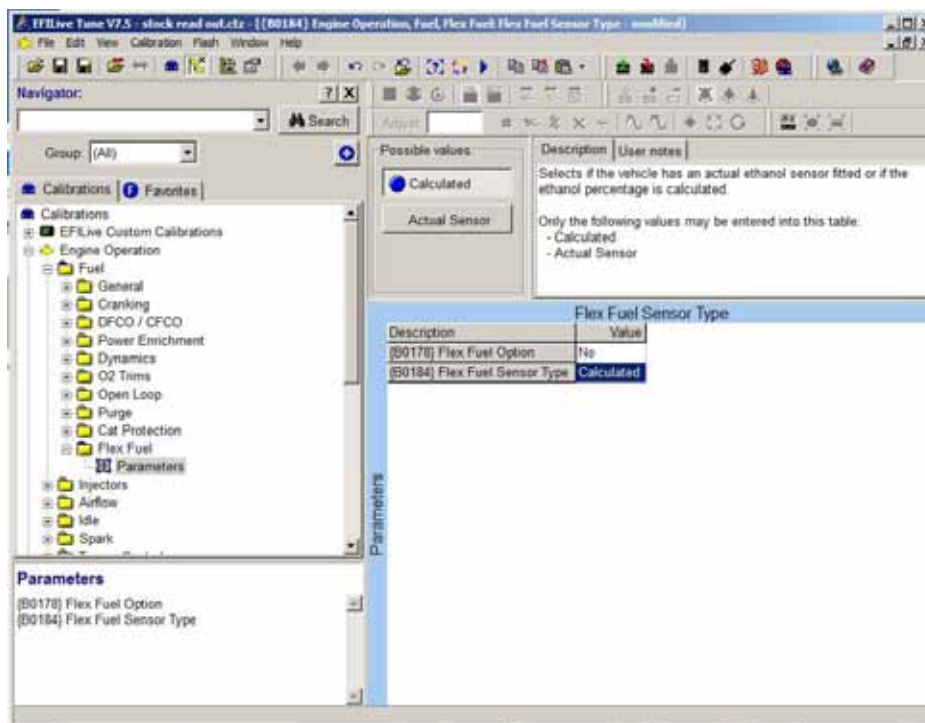
## Appendix A: Continued



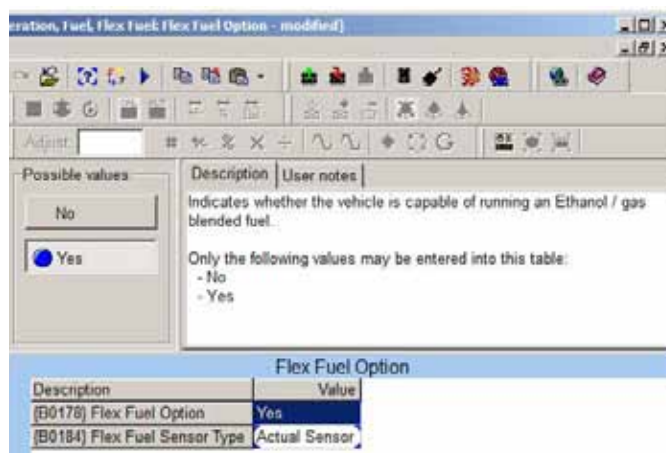
Table D: ECM Information for Common GM Vehicles		
ECM	ECM Connector	Pin
E67	C1	5
E38	C1	40
E92	C1	38

### Enabling the ECM's Fuel Composition Input Signal through EFILive Tune v7.5

1. In the "Navigation" window, under the "Calibrations" tab on the left side of the screen, navigate to the Flex Fuel Parameters ("Engine Operation" → "Fuel" → "Flex Fuel"), to reach the Flex Fuel signal related calibration parameters.



2. Double-click on 'Parameters' to bring up the window shown in the illustration above. This calibration is currently set to "Flex Fuel Option" "No." Set the "Flex Fuel Option" to "Yes." "Yes" indicates the vehicle is capable of running on Ethanol/gas blended fuel. Set "Flex Fuel Sensor Type" to "Actual Sensor."

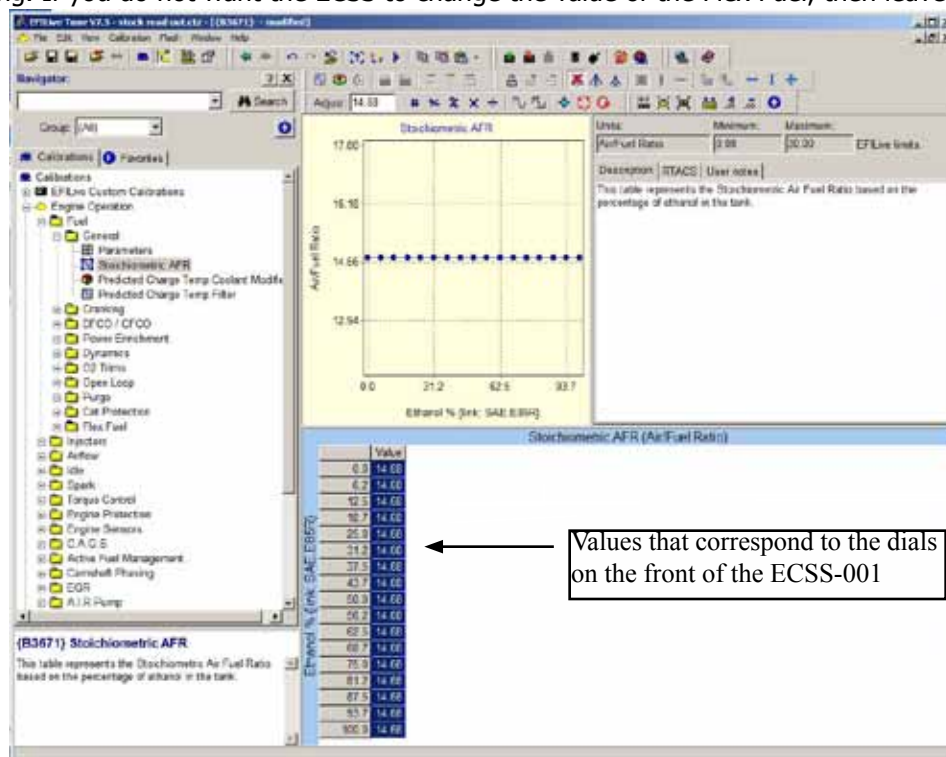




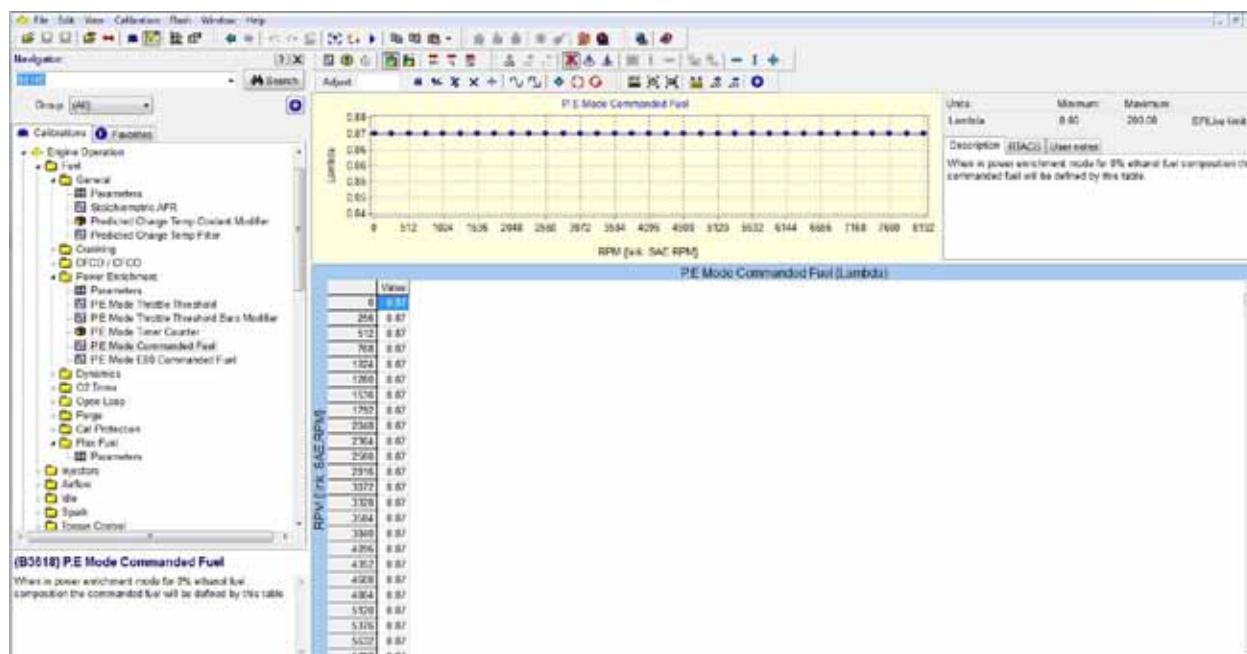
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- In the "Navigation" window, under the "Calibrations" tab on the left side of the screen, navigate to the Flex Fuel Parameters ("Engine Operation" → "Fuel" → "General"), to reach the General Fuel related calibration parameters. Double-click on 'Parameters' to bring up the window shown in the illustration below. The values on the ECSS correspond to the values shown as shown below. Adjust the values in the table to the stoichiometric AFR of the fuel you are using. If you do not want the ECSS to change the value of the Flex Fuel, then leave the values constant.



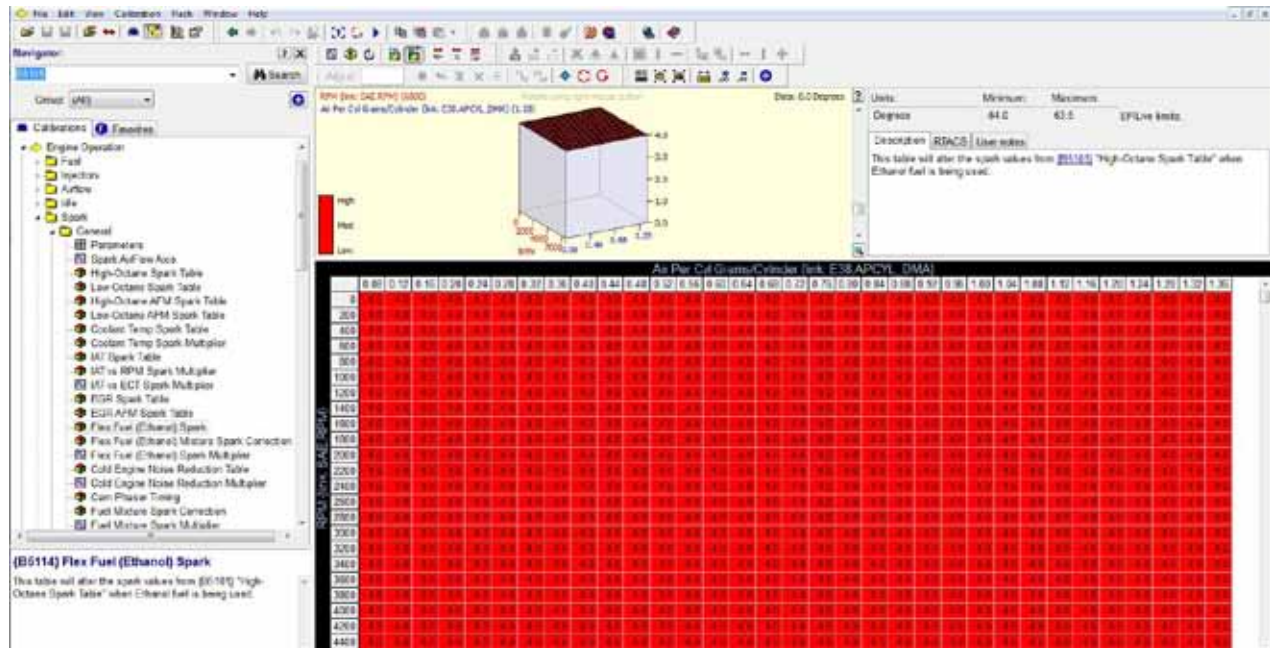
- In the "Navigation" window, under the "Calibrations" tab on the left side of the screen, navigate to the Flex Fuel Parameters ("Engine Operation" → "Fuel" → "Power Enrichment"), to reach the Power Enrichment Fuel related calibration parameters. Adjust the "P.E. Mode Commanded Fuel" and "P.E. E80 Mode Commanded Fuel" tables to the desired values.



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- In the "Navigation" window, under the "Calibrations" tab on the left side of the screen, navigate to the Flex Fuel Parameters ("Engine Operation" → "Spark" → "General"), to reach the General Spark related calibration parameters. Adjust the "Flex Fuel (Ethanol) Spark", "Flex Fuel (Ethanol) Mixture Spark", and "Flex Fuel (Ethanol) Spark Multiplier" tables to the desired values. An example "Flex Fuel (Ethanol) Spark" table is shown below.



- NOTE:** When adjusting the values from the tables in steps 3, 4, and 5, we suggest making all of the values within each table equal to each other for initial testing. When activating the Activation input on the ECSS-001, spark, HP, and commanded fuel should not change when viewing the data using the EFILive scan tool. If the values do change, there may be a table that was not adjusted.
- Save the calibration and then flash the new calibration to the vehicle.

**NOTE:** Similar changes will be required if using HPTuners or any other programming system.

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### NOTICES:

It is the responsibility of the purchaser to follow all guidelines and safety procedures supplied with this product and any other manufacturer's product used with this product.

Lingenfelter Performance Engineering assumes no responsibility for damages resulting from accident, improper installation, misuse, abuse, improper operation, lack of reasonable care, or all previously stated reasons due to incompatibility with other manufacturer's products.

Lingenfelter Performance Engineering assumes no responsibility or liability for damages incurred from the use of products manufactured or sold by Lingenfelter Performance Engineering on vehicles used for competition racing.

It is the purchaser's responsibility to check the state and local laws and sanctioning body requirements pertaining to the use of this product for racing applications. Lingenfelter Performance Engineering does not recommend nor condone the use of its products for illegal street racing.

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### Limited Warranty:

LPE warrants the Lingenfelter ECSS-001 Ethanol Content Sensor Simulator Module be free from defects in material and workmanship under normal use and if properly installed for a period of one year from the date of purchase. If the module is found to be defective as mentioned above, it will be replaced or repaired if returned prepaid along with proof of date of purchase. This shall constitute the sole remedy of the purchaser and the sole liability of LPE. To the extent permitted by law, the foregoing is exclusive and in lieu of all other warranties or representations whether expressed or implied, including any implied warranty of merchantability or fitness. In no event shall LPE be liable for special or consequential damages.

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