



NOSTRUM

HIGH PERFORMANCE



NOSTRUM ESSIM (ETHANOL SENSOR SIGNAL INTERFACE MODULE) SPECIFICATIONS & OPERATING INSTRUCTIONS

PART #: E467-1143

WARNING! PLEASE FOLLOW ALL WARNINGS AND INSTRUCTIONS FOUND IN YOUR VEHICLE OWNER'S MANUAL. THE FOLLOWING INSTRUCTIONS MUST BE READ AND FULLY UNDERSTOOD BEFORE BEGINNING INSTALLATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN VEHICLE DAMAGE, PERSONAL INJURY OR DEATH. IF THESE INSTRUCTIONS ARE NOT FULLY UNDERSTOOD, DO NOT ATTEMPT INSTALLATION.

Date: 19 July 2024
Document: Nostrum ESSIM (Ethanol Sensor Signal Interface Module), E467-1143, v1.3

1145 Oak Valley Drive, Suite B, Ann Arbor, MI 48108 | 734-548-8677 | support@nostrumshop.com

WWW.NOSTRUMSHOP.COM

NOSTRUM ESSIM (ETHANOL SENSOR SIGNAL INTERFACE MODULE) SPECIFICATIONS & OPERATING
INSTRUCTIONS

PART #: E467-1143

Contents

Parts List	3
Optional Items	3
Recommended Tools	3
Module Specification	4
App Installation	5
Demo Mode	6
Menu Options	7
Connection Settings	7
Display Settings	8
Input Settings	9
Output Settings	10-11
Diagnostics	12
About	13
Module Update	13
Wiring	14-15
Mounting Location & Dimensions	16
Pairing an E85 Interface Module to a Smart Phone	17
Status Indicator and Error Symptoms & Responses	18-19
Additional Support & Rev Level	20



Parts list

Description	Quantity
Nostrum ESSIM (Ethanol Sensor Signal Interface Module)	1
Module operating instructions	1

Optional items available from Nostrum High Performance

Generic ESSIM power harness	E417-1713
Generic ESSIM output signal harness (CAN & analog outputs)	E417-1714
Ethanol content sensor, with mounting holes and short 3/8" fuel fittings	SE1003
Ethanol content sensor, compact layout, 3/8" fuel fittings	SE1004
Nostrum E85 sensor interface to ethanol sensor harness, 6" long	E066-1461
Ethanol sensor intercept harness	E417-1494
Nostrum E85 sensor interface to ethanol sensor harness, 64" long	E411-1312
Pressure Sensor, 0-250psi, 0.5-4.5 ratiometric, 1/8" NPT, Metri-Pack 3 pin	E461-0955
Pressure sensor to ESSIM harness	E417-1504

Additional parts that may be required (not included)

- Zip ties (for wiring retention and module mounting)
- 10-32 or M5 screws and lock nuts, two of each (for module mounting)
- Hook & loop tape (for module mounting)
- Dielectric grease
- Mating connector electrical terminals (see above for parts list for pre-made power & output harnesses)
- Ethanol sensor mating connector (see above parts list for pre-made sensor harness solutions)

Recommended tools

- | | |
|---------------------|--------------|
| Wire cutter | Side cutters |
| Wire stripping tool | Small pliers |
| Crimping tool | Pick tool |

NOTE - Apple iOS phone or Android phone required. Device will not function and cannot be configured without installing the application (app). Application may not be compatible with tablet-based operating systems. Not compatible with Windows.

Thank you for purchasing the Nostrum ESSIM (Ethanol Sensor Signal Interface Module). The ESSIM is designed to connect to commonly available ethanol content sensors. It then transmits this data via Bluetooth, allowing you to view the ethanol content and fuel temperature on your mobile device.

The ESSIM also converts the ethanol content signal into an analog voltage signal and a CAN signal, which can be used by other OEM and third-party devices including data acquisition systems, displays and tuning software interface hardware. The fuel temperature sensor signal is converted to an analog voltage signal that can be output to other devices.

The module features a pass-thru/sensor simulation capability, which enables it to retransmit the ethanol content and temperature signals as frequency and duty cycle signals. This duplicates the original sensor signals, making it possible to install the Nostrum module in vehicles already equipped with ethanol content sensors. You can then view the data directly and in real-time via the Bluetooth app on your mobile phone.

Additionally, the ESSIM offers an optional feature that allows you to add a fuel pressure sensor to your vehicle. You can then monitor the fuel pressure using your mobile app.

ESSIM inputs:

- +12V switched power
- Battery ground
- Ethanol content & fuel temperature sensor signal (frequency & pulse width signal on a single wire)
- Fuel pressure (0-5V)
- Push button (used for pairing with a mobile device)

ESSIM outputs:

- Ethanol content and fuel temperature sensor simulated sensor signal. Open collector output that will simulate the unloaded output of a standard sensor. Allows the Nostrum module to be installed in applications that already have an ethanol content sensor, allowing you to monitor the ethanol content and fuel temperature without impacting the vehicle measurements. Also allows the Nostrum module to connect to newer sensors and simulate older sensors, allowing older vehicles to use the newer, cheaper and more compact sensors.
- Sensor power (switched +12V, 9-18V, not regulated, pass-through)
- Sensor ground (pass-through Battery ground)
- CAN Hi
- CAN Lo
- 0-5V analog output for ethanol content
- 0-5V analog output for fuel temperature
- +5V sensor power for fuel pressure sensor

ESSIM communications:

- Wireless Bluetooth (BLE)

ESSIM on-board measurements:

- Battery voltage
- Module temperature
- Number of power cycles
- Run time

Operating and installation instructions

NOTE - all module setup and configuration is done via Bluetooth using an app so we recommend that the first step you perform is installing the iOS or Android mobile app. The app can be found in the Apple App store and the Google Play Store. The Nostrum E85 app is free to download and use for both platforms.



For iOS devices you must be running iOS version 12.0 or higher.

For Android devices you must be running version 7.0 and higher.

The Nostrum app is designed for use on mobile phone devices. It has not been configured for use on tablets and other similar devices so screen layout and other functions may not perform properly on those devices.

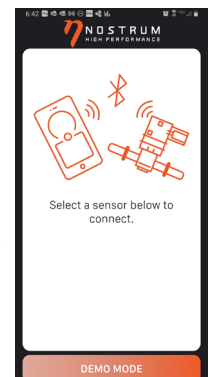
Once you have downloaded and installed the app on your device, find the icon on your device and select the icon to launch the app.



When you initially start the app you will have the option to select an interface module (sensor) or select DEMO MODE. If you have not paired with an interface module yet you will not see a sensor available to connect to (as shown in the screen to the right). See section on "Pairing A Nostrum E85 Sensor Interface Module To A Smart Phone" for instructions on that process.

To enter DEMO MODE click on the DEMO MODE text button at the bottom of the screen. You can use DEMO MODE to view simulated data and to see the different menu option screens and become familiar with the software.

You do not need to have a Nostrum E85 interface module installed, connected or have even purchased a module to use the DEMO MODE feature.



Once you have entered DEMO MODE (or have selected a sensor) you will be brought to the main data screen for the app.

The upper half of the main screen features a gauge that displays the ethanol content percentage and the fuel temperature as well as the fuel pressure (if this is enabled and a sensor is connected to the module).

The ethanol percentage is shown in blue and is also displayed as a rotary bar graph (with the default range of 0% to 100%).

The fuel temperature is shown in green and the fuel pressure, if enabled, is shown in yellow.

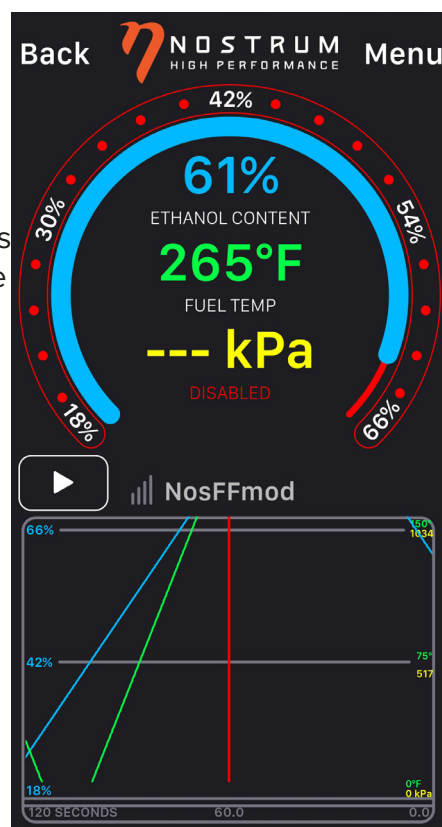
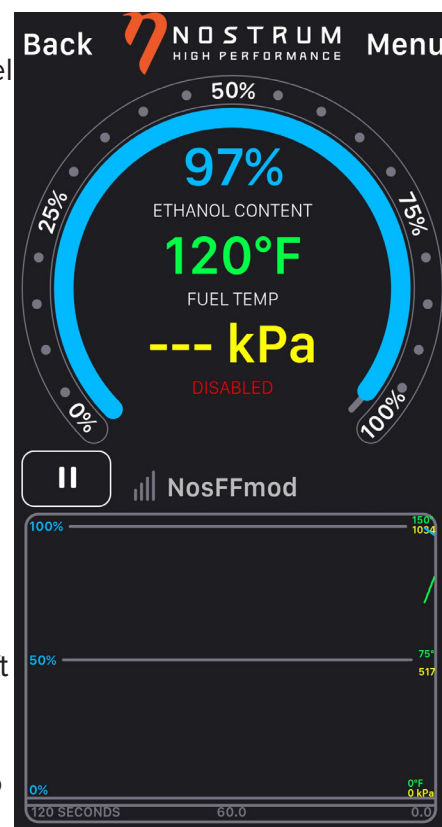
The center of the screen indicates the name of the interface module you are currently connected to and the signal strength of that connection. The default ESSIM name when in DEMO MODE is "NosFFmod".

The bottom half of the display shows a line graph of the ethanol content, fuel temperature and pressure versus time. The same colors used for the numeric values above apply to the lines in the graph. You can pause or play the sensor data using the Pause / Play icon to the left of the device name.

In the upper example screen shot, the PAUSE icon  is displayed to the left of the device name, indicating that the device is displaying (playing) real time data (or simulated data when in DEMO MODE).

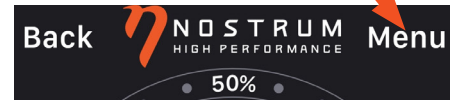
Selecting PAUSE will pause the data in both the upper and lower portions of the screen. As shown in the lower screen shot, the gauge will switch to a red background and a red cursor line will appear in the

real-time plot data and the PLAY icon  will now be displayed to the left of the device name. The data in the upper half now corresponds to the values at the cursor. Moving the cursor in the plot will change the values displayed in the gauge based on where the cursor is located in the data.



Menu Options

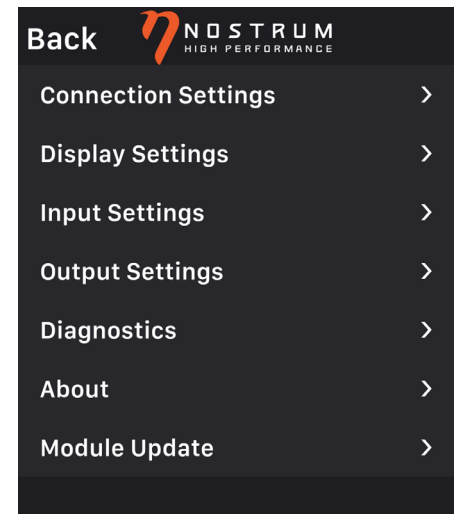
To see the menu options select “Menu” from the upper right corner of the main display screen.



Note - for the Menu settings, some parameters are saved to the ESSIM itself (Global variables) and others are saved only in the app on the mobile device (Local variables). Parameters saved to the module itself will be the same when another device connects to the module whereas parameters saved to the app will only have those settings stored when the particular mobile device connects to that module. Parameters marked in the following pages with an “M” indicate they are saved to the module and parameters marked with an “A” indicate they are saved to the app.

Once in the Menu screen you will have the following options:

- Connection Settings
- Display Settings
- Input Settings
- Output Settings
- Diagnostics
- About
- Module Update



Connection Settings

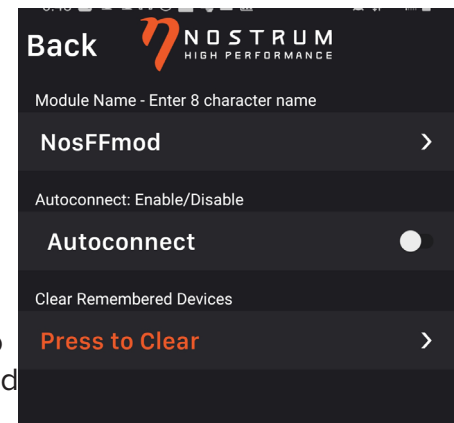
Under “Connection Settings” you will find the following options:

- Module Name - Enter 8 character name
- Autoconnect: Enable/Disable
- Clear Remembered Devices

Module Name (M) - The default device name is “NosFFmod”. Once you have paired to a new device you can use the “Module Name” option to give the device a unique name. Changes to the module name are saved to the module itself. The factory default module name is “NosFFmod”.

Autoconnect (A) - When enabled the app will automatically connect to the paired module when you start the app. If disabled you have to select the module at the initial start screen to connect to a module. The factory default setting is disabled.

Clear Remembered Devices - When you select this option you clear the remembered device that you are currently connected to from the app.



Display Settings

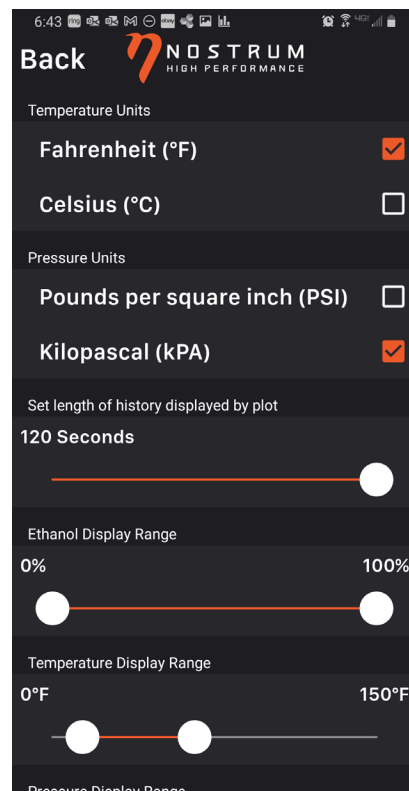
In the “Display Settings” menu area you can adjust the settings for units and display ranges for the main screen gauge.

Select the units for the fuel temperature display (Fahrenheit or Celsius).

Select the units for the fuel pressure display (PSI or kPa).

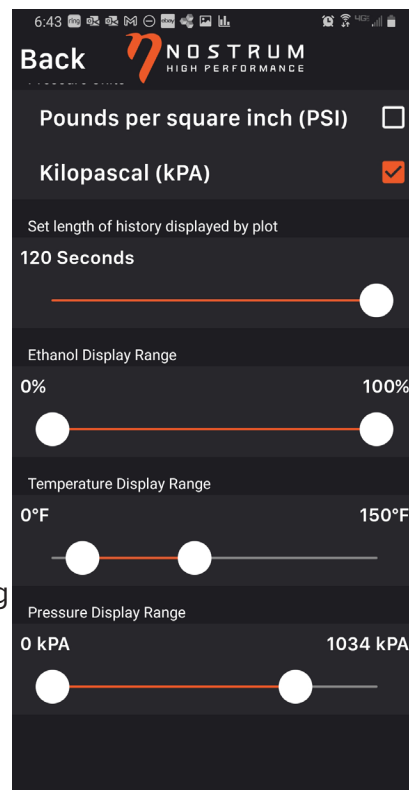
Set the length of the history displayed in the line graph at the bottom of the main display screen. The minimum length of history displayed is 10 seconds and the maximum is 120 seconds.

Set the minimum and maximum ethanol percentage for the graphical ethanol percentage gauge in the main screen, The left side of the slider controls the minimum value and the right side slider controls the maximum value.



Set the temperature display range. Like the ethanol section, the left side slider is used to set the minimum temperature for the gauge in the main screen and the right side slider sets the maximum value. Range is -40 deg F to +390 deg F or -40 deg C to +200 deg C.

Set the pressure display range (optional sensor required). The left side slider controls the minimum pressure and the right side controls the maximum pressure. Range is 0 to 200 psi or 0 to 1375 kPa.



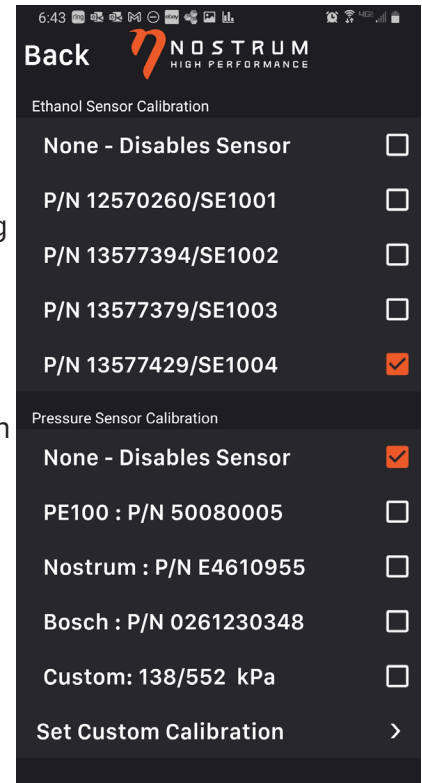
Input Settings

In the “Input Settings” section you select which ethanol sensor type you are using along with what pressure sensor you are using (if installed).

The module supports the common Continental sensors found in GM, Ford and other vehicle applications. Select the part number you are using to set the ethanol percentage calibration and the temperature sensor calibration.

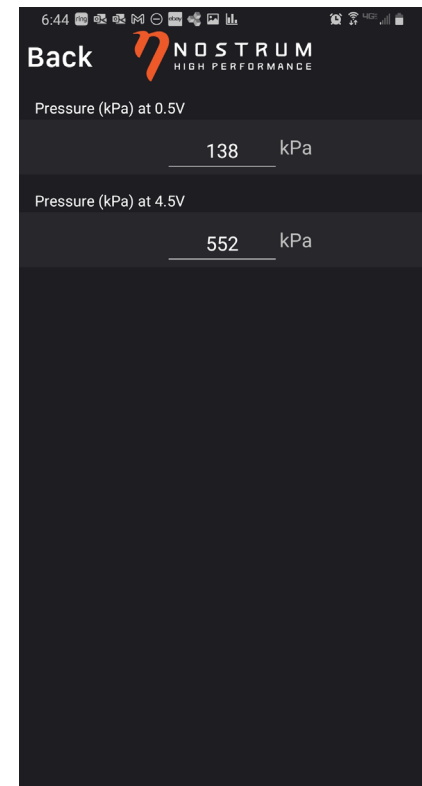
The module also supports add on fuel pressure sensors. Several common sensors, including the Nostrum 250 psi sensor (part number E461-0955), are preconfigured. If you are using one of these sensors select the appropriate check box.

If you are using a sensor not indicated by these menu options you can also enter a custom calibration by selecting “Set Custom Calibration”. Sensors should be 5 volt sensors and you will need to know the signal output at 0.5 volts and 4.5 volts.



Enter the pressure value for the 0.5 volt signal output (in kPa or PSI depending on what display units you have selected in the “Display Settings” menu).

Now enter the pressure value for the sensor output at 4.5 volts.



Output Settings

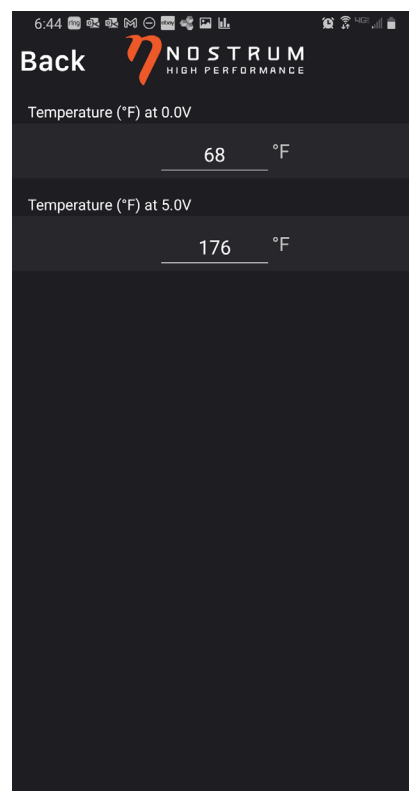
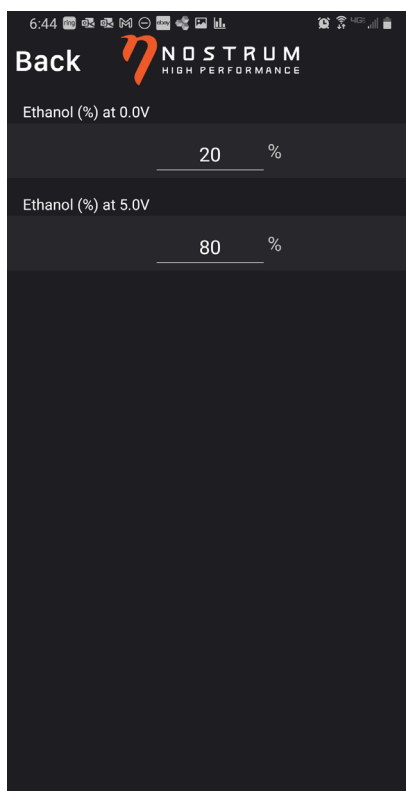
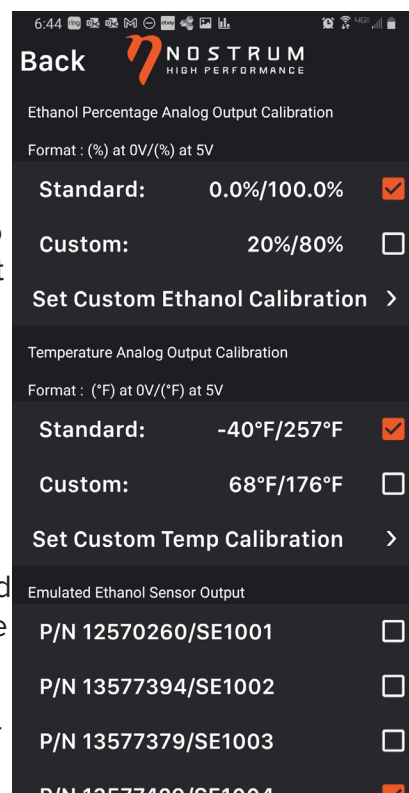
In the “Output Settings” menu you can select the output settings for the analog ethanol and temperature values, the emulated sensor output as well as the CAN settings.

If you are using the analog output to send the ethanol percentage data to another device, the most common setting is the default value. The default setting is 0% ethanol at 0V and 100% ethanol at 5V.

For some applications you may need a custom percentage range. If you need a custom range select the custom check-box and then select the “Custom Ethanol Calibration” menu below it to set the values. The 1st value is your low value for the ethanol percentage at 0 volts and the second value is your high value for the ethanol percentage at 5 volts.

For the temperature sensor analog output, the default is 0V=-40deg F and 5V =257 deg F (0V=-40deg C & 5V=125 deg C). The units in this menu are controlled by the display units but the temperature range is the same.

If you need a custom temperature output range, select the custom check-box and then select “Set Custom Temp Calibration” menu option. From there you can set the 0V and 5V output range.



Output settings (continued)

In the “Emulated Ethanol Sensor Output” section you can select what sensor you are outputting via the simulated sensor signal output wire.

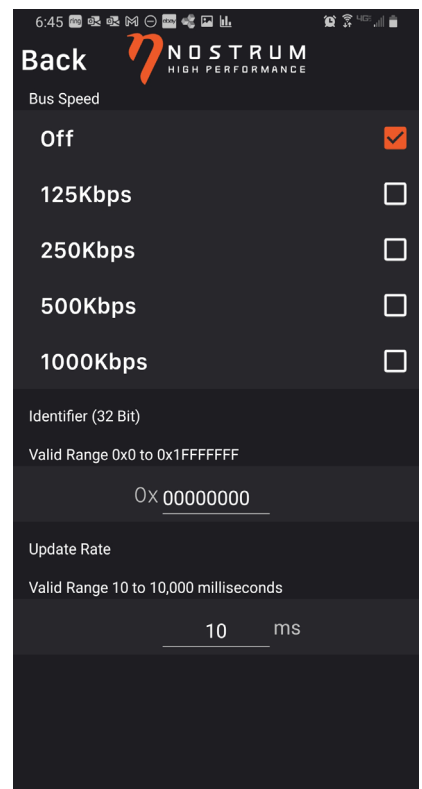
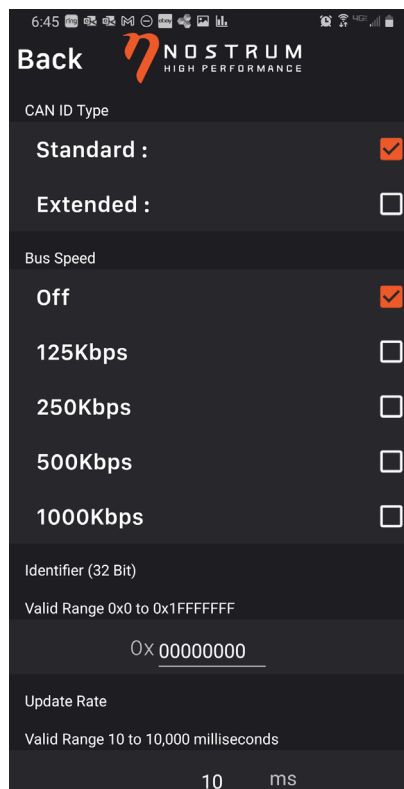
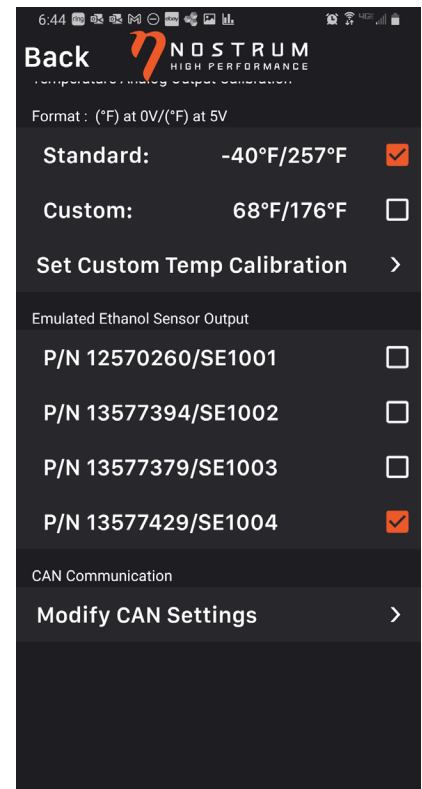
In the “Modify CAN settings” menu you are able to make the following CAN setting changes:

CAN ID type (Standard or Extended)

Bus speed (Off, 125, 250, 500 or 1000 Kbps)

CAN identifier (valid range of 0x0 to 0x1FFFFFFF)

Update rate for the CAN message (10ms to 10,000 milliseconds)



Diagnostics

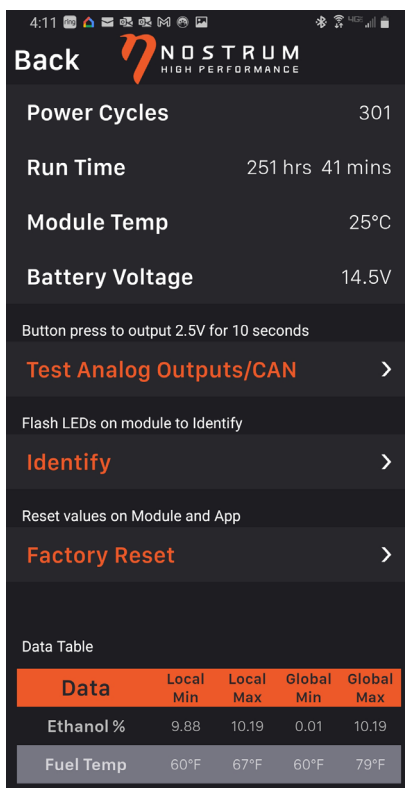
In the “Diagnostics” menu area you are able to view module related information including:

The number of power cycles the device has seen.

The total device run time.

The current internal module temperature.

The vehicle battery voltage as measured at the module connection point.



4:11

Back **NOSTRUM**
HIGH PERFORMANCE

Power Cycles 301

Run Time 251 hrs 41 mins

Module Temp 25°C

Battery Voltage 14.5V

Button press to output 2.5V for 10 seconds

Test Analog Outputs/CAN >

Flash LEDs on module to Identify

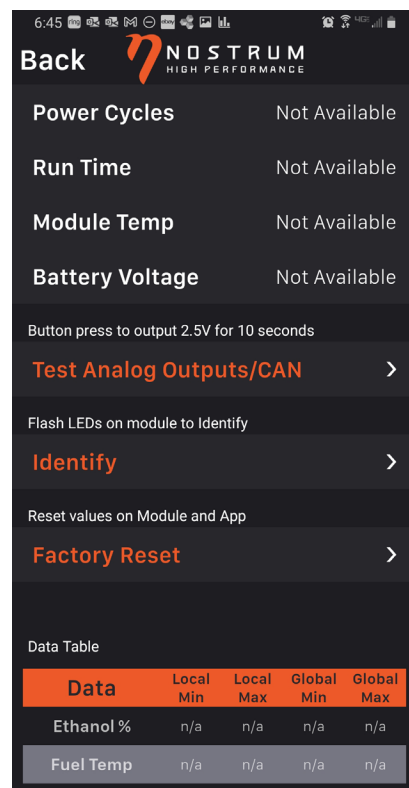
Identify >

Reset values on Module and App

Factory Reset >

Data Table

Data	Local Min	Local Max	Global Min	Global Max
Ethanol %	9.88	10.19	0.01	10.19
Fuel Temp	60°F	67°F	60°F	79°F



6:45

Back **NOSTRUM**
HIGH PERFORMANCE

Power Cycles Not Available

Run Time Not Available

Module Temp Not Available

Battery Voltage Not Available

Button press to output 2.5V for 10 seconds

Test Analog Outputs/CAN >

Flash LEDs on module to Identify

Identify >

Reset values on Module and App

Factory Reset >

Data Table

Data	Local Min	Local Max	Global Min	Global Max
Ethanol %	n/a	n/a	n/a	n/a
Fuel Temp	n/a	n/a	n/a	n/a

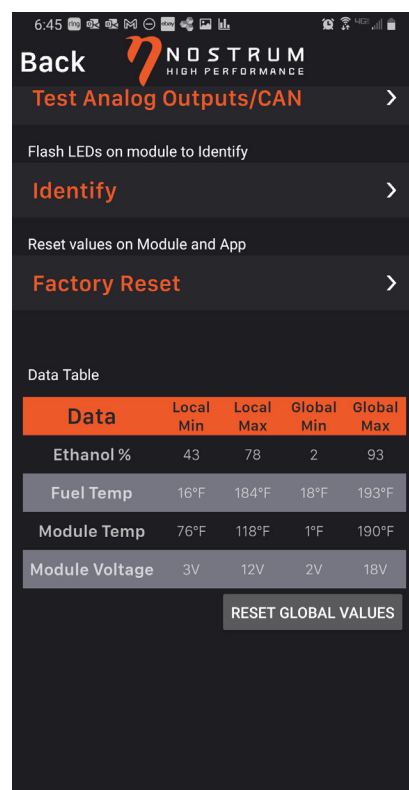
At the Diagnostic menu you can also perform an output signal test. Selecting the “Test Analog Outputs/CAN” menu will generate a 2.5V analog output test signal and, if applicable, test CAN messages that can be used to verify the signal connection and calibration of the vehicle or other device connected to the Nostrum module.

The “Flash LEDs on module to Identify” menu option can be used to confirm which device you are currently connected to if you have multiple modules paired to your phone and you need to confirm which one is which.

The “Reset values on Module and app” menu option is used to reset all the settings in the module and in the app to the factory default values.

The “Data Table” shows you the local (phone app) and global (module) min and max values for ethanol %, fuel temperature, module temperature and module voltage.

The “RESET GLOBAL VALUES” button will reset the min and max stored values in the module.



6:45

Back **NOSTRUM**
HIGH PERFORMANCE

Test Analog Outputs/CAN >

Flash LEDs on module to Identify

Identify >

Reset values on Module and App

Factory Reset >

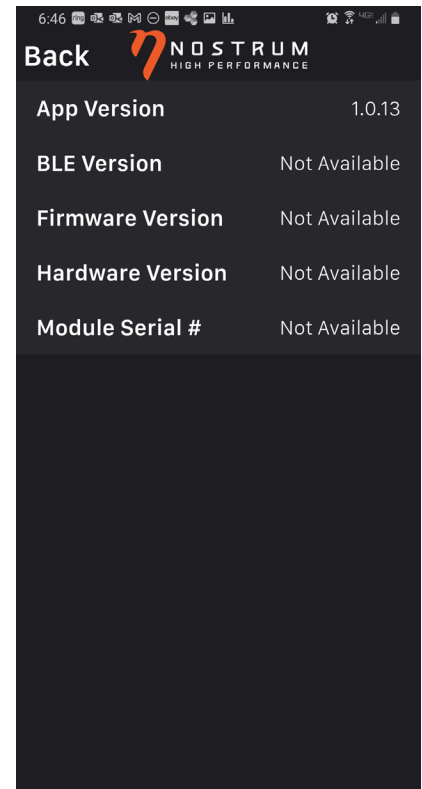
Data Table

Data	Local Min	Local Max	Global Min	Global Max
Ethanol %	43	78	2	93
Fuel Temp	16°F	184°F	18°F	193°F
Module Temp	76°F	118°F	1°F	190°F
Module Voltage	3V	12V	2V	18V

RESET GLOBAL VALUES

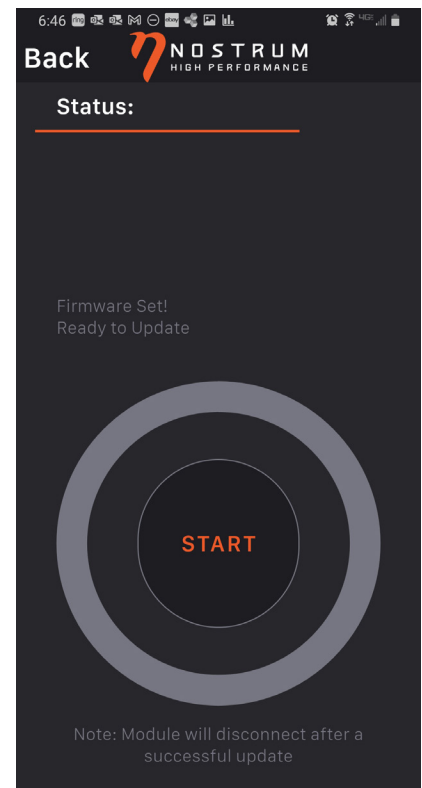
About

The “About” menu shows you the app version, the Bluetooth (BLE) version, the module firmware version, the module hardware version and the module serial number.



Module Update

The “Module Update” menu is used to send new firmware to the module. If a new firmware is made available, go to this menu while connected to the module and press the “START” button on the app screen.



Wiring

Warning - the two 3-pin connections on C1 & C3 use the same connector type. Be very careful to connect the correct connector to the correct mating harness.

For the NHP E85 module to function properly only connectors 3 and 4 need to be connected. Connector 4 provides the power and ground and connector 3 is connected to the E85 sensor to provide the ethanol content and fuel temperature information and to provide power and ground to the sensor. On connector 4 only the power and ground connections are required. The +12V power source should be a switched power source so that the device is powered down when the vehicle is off. If you just want to power up the device, for example to pair it with a phone or check Diagnostics, then only connector 4 is needed.

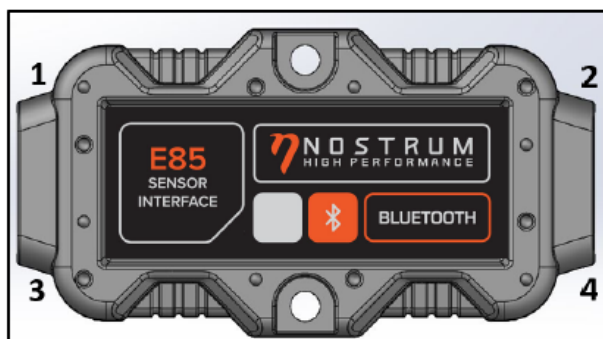
If you will be using the app to view the ethanol content and fluid temperature, no other connections are needed.

If you are installing the NHP E85 signal module in an application that already has an ethanol sensor connected to the ECU or you want to connect the raw sensor signal to an ECU, then you will need to connect the digital output wire on connector 4 to the ECU. Do not “T” into the OEM sensor signal - you must put the Nostrum module in line with the sensor signal. In this configuration the signal enters the module on the Digital Input on connector 3 and exits the module on the Digital Output on connector 4.

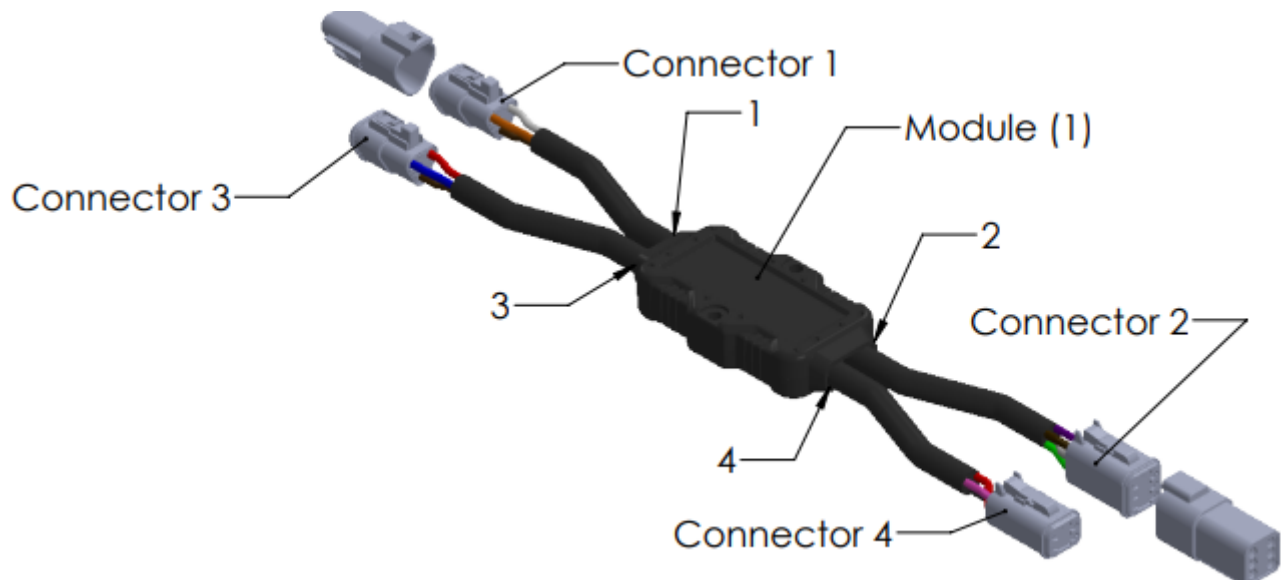
If you want to connect a fuel pressure sensor to the system and view the fuel pressure data in the E85 module app then you will connect the pressure sensor to connector 1. The sensor should be a 0.5 to 4.5V sensor that uses a 5V regulated power supply. The +5V for the sensor should come from Cavity B on connector 1 and the ground for the sensor should be provided by Cavity C on connector 1. The sensor signal should be connected to Cavity A on connector 1.

Connector 2 is the Analog Output & Communications connector. If you want to send the ethanol percentage and/or fuel temperature data to an ECU, gauge or other external device using a 0-5V analog voltage signal, you will be using cavities 2 (fluid temperature) and 5 (ethanol percentage). If you want to send the ethanol percentage and fluid temperature data to another device via CAN messages you will connect to cavity 3 (CAN LO) and cavity 4 (CAN HI). Note that the NHP E85 interface module does not have built in CAN termination so if you do not already have the proper CAN termination in your system you will need to add the appropriate CAN termination resistor.

If you will not be connecting anything to connectors C1 and C2 make sure the supplied mating connectors with seal plugs are installed in order to seal and protect the unused connections.



Connector #	Function	Wire Size	Wire Color	Cavity	Description
Analog Sensor Inputs					
C1	Analog In	20	White	A	Fuel pressure signal input
	Sensor +5V	20	Orange	B	External sensor +5V regulated power
	Sensor GND	20	Brown	C	External sensor ground
Analog Outputs & Communications					
C2	Sensor GND	20	Brown	1	Ground for analog outputs
	Analog Out #2	20	Gray	2	Fuel temperature voltage output
	CAN LO	20	Green	3	CAN LO (no termination)
	CAN HI	20	Yellow	4	CAN HI (no termination)
	Analog Out #1	20	Violet	5	Ethanol % voltage output
	EMPTY	NA	NA	6	EMPTY
Ethanol (E85) Sensor Input					
C3	Vbat (+12V)	20	Red	A	Ethanol sensor +12V power, unregulated
	Digital Input	20	Blue	B	Ethanol sensor signal
	Sensor GND	20	Brown	C	Ethanol sensor ground
Power & Control					
C4	Digital Output	20	Pink	1	Simulated ethanol (E85) sensor signal out
	Vbat (+12V)	20	Red	2	Switched battery voltage (main power)
	Battery GND	20	Black	3	Main power ground
	EMPTY	NA	NA	4	EMPTY



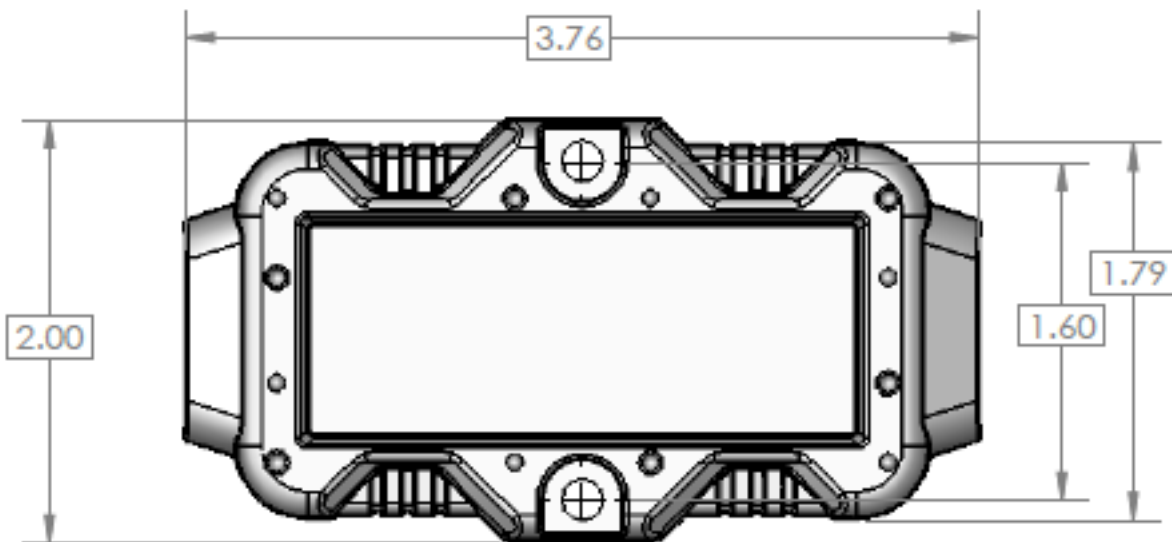
Mounting Location & Dimensions

The Nostrum E85 module is dust and splash resistant but is not meant to be submerged in water. The module should be mounted away from direct water spray. The module should also **NOT** be mounted in hot locations or in line of sight of hot components like exhaust manifolds or turbocharger turbine housings.

When deciding on a mounting location keep in mind that in order to pair the app with the module you must have access to the Bluetooth pairing button on the face of the E85 module. For this reason we recommend mounting the device in an accessible location in the vehicle or leaving enough extra wire length that you can move the unit temporarily to access the pairing button. The status LEDs on the face of the unit also provide status and error message information so having access to the unit can be help for diagnosing errors.

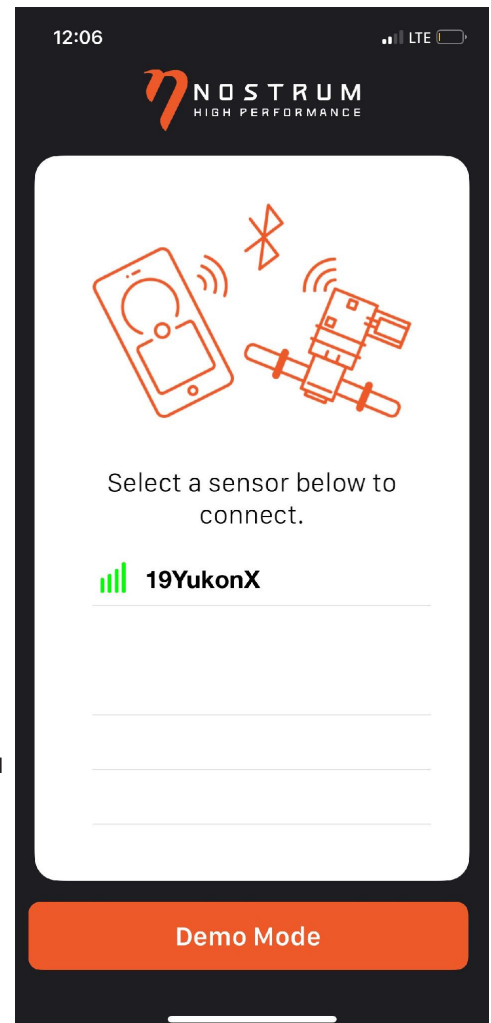
Controller dimensions (see image below) are: 3.76" x 2.00" x 0.75" (95 mm x 51 mm x 19 mm).

The two mounting holes accept 10-32 or M5 screws (not included). The module can also be secured using zip ties or hook & loop tape (aka Velcro).



Pairing A Nostrum E85 Sensor Interface Module To A Smart Phone

- Follow these instructions for connecting your phone to the Nostrum E85 Sensor Interface module so that you can display data and configure the module.
- Do not use the Bluetooth device menu on your phone to pair to the Nostrum E85 Sensor Interface module.
- Download and install the required app as indicated at the beginning of these instructions.
- Wire up the module so that it has switched +12V to cavity B and ground on cavity C on connector 4.
- Power up the module by turning on switched +12V power.
- Look for the indicator light to blink red rapidly, indicating the module has power.
- Once the LED status indicator slows to a once-per-second blink pattern, open the app.
- You should see the available sensor module in the list.
- Press and hold the Bluetooth pairing button on the module until the indicator light turns blue, then release.
- While the indicator light is flashing blue, select the E85 signal interface module from the list in the app.
- Once communication is established, the LED indicator will blink blue once per second indicating the module is paired with the mobile device. The app will now redirect to the main display screen.
- NOTE - if a new version of the app is installed on your phone you will need to pair the device to the phone again.



Pairing button



Diagram illustrating the back of the NOSTRUM E85 sensor interface. The device features a black display area with the following elements:

- LED Status Indicator:** A small white square indicator located below the "E85 SENSOR INTERFACE" text.
- Pair button:** A red square button with a white Bluetooth symbol, located to the right of the LED status indicator.
- Display Text:**
 - E85 SENSOR INTERFACE:** Large orange text on the left side of the display.
 - NOSTRUM HIGH PERFORMANCE:** White text on the right side of the display.
 - BLUETOOTH:** White text on a red rectangular button to the right of the pair button.

Red arrows point from the labels "LED Status Indicator" and "Pair button" to their respective locations on the device. The device is also labeled with numbers 1, 2, 3, and 4 at the corners of the frame.

The table on the next page provides information on potential errors and the Module and app responses to those errors.

Error	Symptom	Module Output Response	Mobile App Response	LED Blink Pattern
E85 sensor disconnect	"Frequency = 0 Hz Pulse-width = 0 ms"	"CAN E85 Sensor Status, Data 7: 0x01 (Sensor Fault) CAN E% = Last measurement. If at startup E%=0%. CAN Fuel Temp = Last measurement. If at startup T=0°C. Analog E% = Same as CAN based on calibration Analog Fuel Temp = Same as CAN based on calibration Simulated output = Same as measured E85 sensor"	"Indicates that sensor is faulty or not connected."	Constant red on.
"E85 sensor frequency (E%) out of range but not = 0 Hz"	"Frequency > 150 Hz Frequency < 50 Hz"	"CAN E85 Sensor Status, Data 7: 0x00 (Sensor OK) CAN E% = Saturated engineering value based on high or low CAN Fuel Temp = Measured engineering value Analog E% = Same as CAN based on calibration Analog Fuel Temp = Same as CAN based on calibration Simulated output = Same as measured E85 sensor"	"Displays saturated engineering value and indicates E% is out of range too high or too low."	Normal pattern.
E85 sensor pulse-width (Temperature) out of range but not = 0 ms	"PW > 5.0 ms PW < 1.0 ms"	"CAN E85 Sensor Status, Data 7: 0x00 (Sensor OK) CAN E% = Measured engineering value CAN Fuel Temp = Saturated engineering value Analog E% = Same as CAN based on calibration Analog Fuel Temp = Same as CAN based on calibration Simulated output = Same as measured E85 sensor"	"Displays saturated engineering value and indicates Fuel Temperature is out of range too high or too low."	Normal pattern.
Fuel pressure sensor out of range	No observable symptom	"The fuel pressure sensor is user adjustable and the module has no way of knowing that the voltage is out of range. The pressure will be calculated according to the calibration curve selected."	"Displays measured engineering value."	Normal pattern.

For additional technical & software support please contact**Email:** support@nostrumshop.com**Phone:** **734-548-8677** (during normal business hours, M-F, Eastern time zone, USA)

Revision	Notes	Date
1.0	Production release	6/05/2023
1.1	Corrected harness length in optional parts. Removed product rev level.	6/07/2023
1.2	Added reference to ESSIM	6/08/2023
1.3	Added part numbers for Nostrum pre-made mating harnesses	7/19/2024