14POINT7 Spartan 3 Lambda Sensor User Manual

Contents

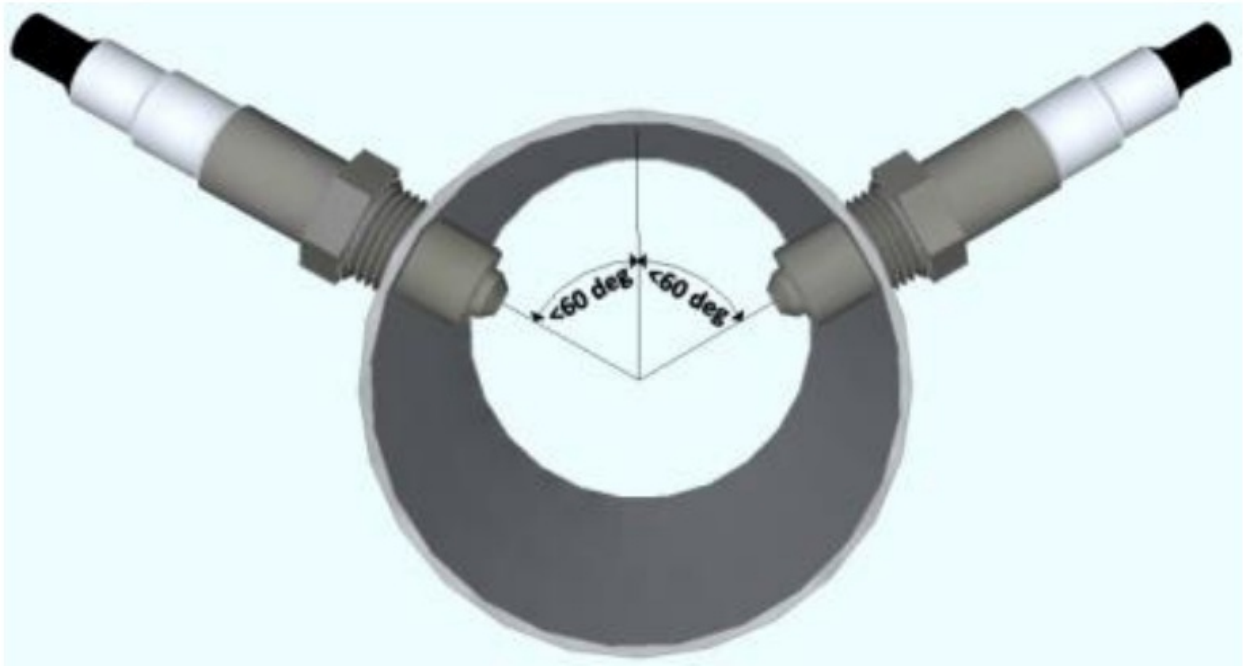
14POINT7 Spartan 3 Lambda Sensor

Warning

- Do not connect or disconnect the Lambda Sensor while Spartan 3 is powered.
- The Lambda Sensor will get very hot during normal operation, please be careful when handling it.
- Do not install the Lambda Sensor in such a manner that the unit is powered before your engine is running. An engine start can move condensation in your exhaust system to the sensor, if the sensor is already heated this can cause thermal shock and cause the ceramic internals inside the sensor to crack and deform.
- While the Lambda Sensor is in an active exhaust stream, it must be controlled by Spartan 3. Carbon from an active exhaust can easily build up on an unpowered sensor and foul it.
- Lambda sensor life when used with leaded fuels is between 100-500 hrs.
- Spartan 3 should be located in the driver’s compartment.
- Do not coil the lambda cable.

Package Contents

1x Spartan 3, 8ft lambda cable, 2x blade fuse holder, two 1 Amp blade fuse, two 5 Amp blade fuse.



Exhaust Installation

The Lambda Sensor should be installed between the 10 o'clock and the 2 o'clock position, less than 60 degrees from vertical, this will allow gravity to remove water condensation from the sensor. For all Oxygen sensor installations, the sensor must be installed before the catalytic converter. For normally aspirated engines the sensor should be installed about 2ft from the engine exhaust port. For Turbocharged engines the sensor should be installed after the turbocharger. For Supercharged engines the sensor should be installed 3ft from the engine exhaust port.

Wiring

Terminal #	Name	Connects to	Note
1	Electronics Power	Switched 12[v]	Use fuse holder with 1 Amp fuse, 12[v] should l live only when engine is running. Electronics Power and LSU Heater Power can be the same source.
2	Electronics Ground	Ground	Ground where interfacing device is grounded; ECU, datalogger, gauge, etc...
3	LSU Heater Power	Switched 12[v]	Use fuse holder with 5 Amp blade fuse, 12[v] should be live only when engine is running. Electronics Power and LSU Heater Power can b the same source.
4	LSU Heater Ground	Ground	Ground to chassis away from where Terminal # (Electronics Ground) is grounded
5	Std Perf Linear Output		Factory Default is simulated narrowband outpu with a switch point of 1[Lamda]. Output is an R filtered 8 bit PWM signal.
6	High Perf Linear Output	Interfacing device; ECU, Gauge, datalogger, etc...	Factory Default is 0[v] @ 0.68 [Lambda] Linear 5[v] @ 1.36 [Lambda]. Output is a 12 Bit DAC with a 0.1% voltage reference.
7	CAN High		
8	CAN Low		
9	Not Applicable		
10	Not Applicable		

Sensor Temperature LED

Spartan 3 has an onboard red LED, which can be observed through the case slits, to show LSU Temperature. Slow blink means the sensor is too cool, Solid light means the sensor temperature is ok, fast blink means the sensor is too hot.

Serial-USB connection

Spartan 3 has a built-in serial to USB converter to provide USB communications with your computer. The converter is based on the popular FTDI chipset so most operating systems already have the driver preinstalled.

Serial Commands

LSU Heater Ground, Pin 4 on screw terminal, must be connected to enter serial commands

Serial Command	Usage Note	Purpose	Example	Factory Default
GETHW		Gets Hardware Version		
GETFW		Gets Firmware version		
SETTYPEx	If x is 0 then Bosch LSU 4.9 If x is 1 then Bosch LSU ADV	Sets LSU sensor type	SETTYPE1	X=0, LSU 4.9
GETTYPE		Gets LSU sensor type		
SETCANFORMATx	x is an integer 1 to 3 character long. x=0; default x=1; Link ECU x=2; Adaptronic ECU x=3; Haltech ECU x=4; % Oxygen*100		SETCANFORMAT0	x=0
GETCANFORMAT		Gets CAN format		

SETCANIDx	x is an integer 1 to 4 characters long	Sets 11 bit CAN id	SETCANID1024 SETCANID128	x=1024
GETCANID		Gets 11 bit CAN id		
SETCANBAUDx	x is an integer 1 to 7 characters long	Sets CAN Baud Rate	SETCANBAUD1000000 will set CAN Baud rate to 1Mbit/s	X=500000, 500kbit/s
GETCANBAUD		Gets CAN Baud Rate		
SETCANRx	If x is 1 the resistor is enabled. If x is 0 the resistor is disabled	Enable/Disable CAN Termination Resistor	SETCANR1 SETCANR0	x=1, CAN term Res Enabled
GETCANR		Gets CAN Term Res State; 1=enabled, 0=disabled		
SETAFRMxx.x	xx.x is a decimal exactly 4 characters long including decimal point	Sets AFR Multiplier for Torque app	SETAFM14.7 SETAFM1.00	x=14.7

GETAFRM		Gets AFR Multiplier fo r Torque app		
SETLAMFIVE Vx.xx	x.xx is a decimal exactly 4 charac ters long including decimal point. Minimum value is 0.60, maximum value is 3.40. This value can be h igher or lower than the SETLAMZEROV value.	Sets Lambda at 5[v] f or the linear output	SETLAMFIVEV1. 36	x=1.36
GETLAMFIVE V		Gets the Lambda at 5 [v]		
SETLAMZERO Vx.xx	x.xx is a decimal exactly 4 charac ters long including decimal point. Minimum value is 0.60, maximum value is 3.40. This value can be h igher or lower than the SETLAMFIVEV value.	Sets Lambda at 0[v] f or the linear output	SETLAMZEROV0 .68	x=0.68
GETLAMZER OV		Gets Lambda at 0[v]		
SETPERFx	If x is 0 then standard performanc e of 20ms. If x is 1 then high perf ormance of 10ms. If x is 2 then o ptimize for lean operation.		SETPERF1	x=0, standar d performanc e

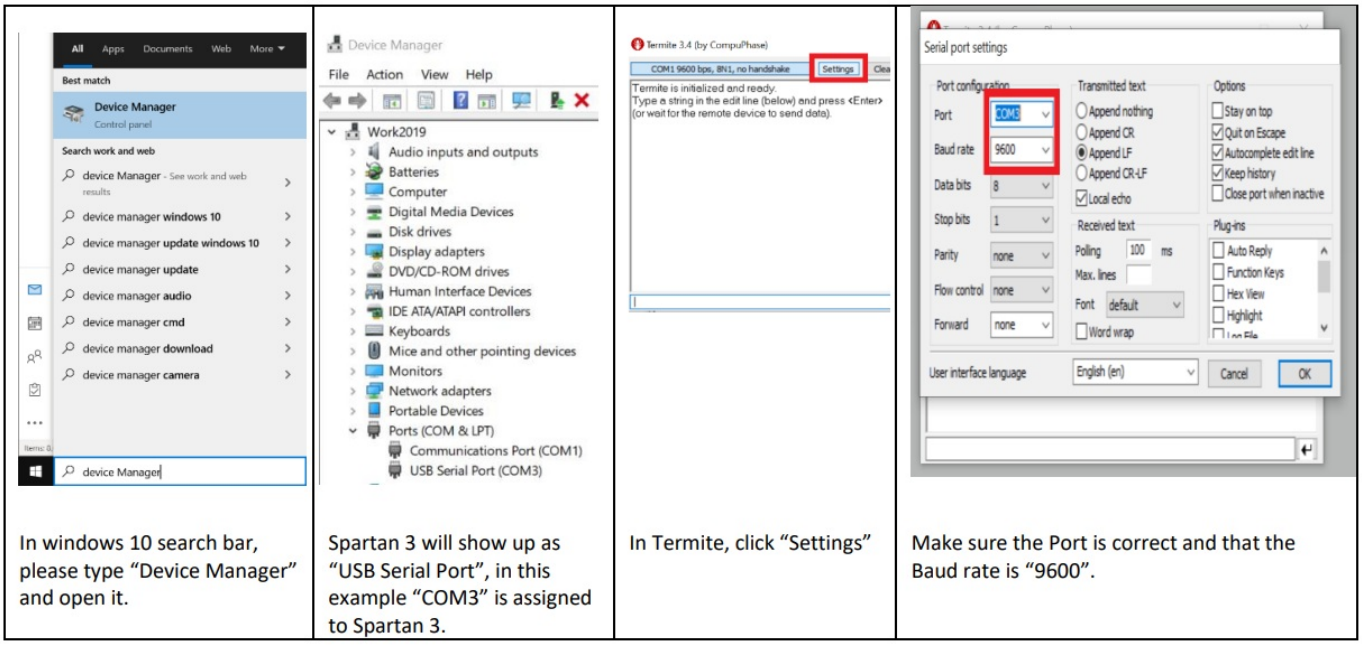
GETPERFx		Gets performance		
SETSLOWHEATx	If x is 0 then sensor is heated at normal rate during initial power up. If x is 1 then sensor is heated at 1/3 the normal rate during initial power up. If x is 2 then wait for MegaSquirt 3 CAN RPM signal before heating.		SETSLOWHEAT1	X=0, normal sensor heatup rate
GETSLOWHEAT		Gets slowheat setting		
MEMRESET		Reset to factory settings.		

SETLINOUTx.xxx	Where x.xxx is a decimal exactly 5 characters long including decimal point, greater than 0.000 and less than 5.000. Linear Output will resume normal operation on reboot.	Allows the user to set the High Perf Linear Output to a specific voltage	SETLINOUT2.500	
DOCAL	Requires Firmware 1.04 and above	Do Free Air Calibration and display the value. Recommended for clone sensors only.		
GETCAL	Requires Firmware 1.04 and above	Gets Free Air Calibration value		
RESETCAL	Requires Firmware 1.04 and above	Resets Free Air Calibration value to 1.00		
SETCANDRx	x is an integer 1 to 4 characters long Requires Firmware 1.04 and above	Sets CAN Data Rate in hz		X=50
GETCANDR	Requires Firmware 1.04 and above	Gets CAN Data Rate		

All commands are in ASCII, case does not matter, spaces do not matter.

Windows 10 serial terminal

LSU Heater Ground, Pin 4 on screw terminal, must be connected to access the serial terminal The recommended serial terminal is Termite, **https://www.compuphase.com/software_termite.htm**, please download and install the complete setup.



- In windows 10 search bar, please type “Device Manager” and open it.
- Spartan 3 will show up as “USB Serial Port”, in this example “COM3” is assigned to Spartan 3.
- In Termite, click “Settings”
- Make sure the Port is correct and that the Baud rate is “9600”.

CAN Bus Protocol Default Format (Lambda)

For %O2 CAN Format please see “Spartan 3 and Spartan 3 Lite for Lean Burn and Oxygen Metering Applications.pdf” Spartan 3’s CAN Bus operates with 11 bit addressing.

- Default CAN Baud rate is 500kbit/s
- Default CAN Termination resistor is enabled, this can be changed by sending “SETCANRx” serial command.
- Default CAN Id is 1024, this can be changed by sending “SETCANIDx” serial command.
- Data Length (DLC) is 4.
- Default Data Rate is 50 hz, data is sent every 20[ms], this can be changed by sending “SETCANDRx” serial command.
- Data[0] = Lambda x1000 High Byte
- Data[1] = Lambda x1000 Low Byte
- Data[2] = LSU_Temp/10
- Data[3] = Status
- Lambda = (Data[0]<<8 + Data[1])/1000
- Sensor Temperature [C] = Data[2]*10

Supported CAN devices

Name	CAN Format Serial Command	CAN Id Serial Command	CAN BAUD Rate Serial Command	Note
Link ECU	SETCANFORMAT1	SETCANID950	SETCANBAUD1000000	Read “Spartan 3 to Link G4+ ECU.pdf” for additional information
Adaptronic ECU	SETCANFORMAT2	SETCANID1024 (Default from factory)	SETCANBAUD1000000	
MegaSquirt 3 ECU	SETCANFORMAT0 (Default from factory)	SETCANID1024 (Default from factory)	SETCANBAUD500000 (Default from factory)	Read “Spartan 3 to MegaSquirt 3.pdf”
Haltech ECU	SETCANFORMAT3	Not required	SETCANBAUD1000000	Spartan 3 Emulates Haltech WBC1 wideband controller
YourDyno Dyno Controller	SETCANFORMAT0 (Default from factory)	SETCANID1024 (Default from factory)	SETCANBAUD1000000	

CAN Termination Resistor

Suppose we call the ECU; Master, and devices that send/receive data to/from the ECU we call; Slave (Spartan 3, digital dashboard, EGT controller, etc…). In most applications there is one Master (ECU) and one or more Slaves that all share the same CAN Bus. If Spartan 3 is the only Slave on the CAN Bus then the CAN Termination Resistor on Spartan 3 should-be enabled using the serial command “SETCANR1”. By default the CAN Termination Resistor on Spartan 3 is enabled. If There are multiple Slaves, the Slave that is farthest from the Master (based on wire length) should have the CAN Termination Resistor enabled, all other Slaves should have their CAN Termination Resistor
disabled/disconnected. In practice; it often does not matter if the CAN Termination Resistors are properly set, but for highest reliability the CAN Termination Resistors should be properly set.

Bootloader

When Spartan 3 is powered up without the LSU Heater Ground connected, it will enter bootloader mode.

Powering up Spartan 3 with the Heater Ground connected will not trigger the bootloader and Spartan 3 will work as normal. When Spartan 3 is in Bootloader mode there is an onboard LED, which can be observed through the case slits, that will shine a solid green. When in bootloader mode, serial commands are not possible. In Bootloader mode, only firmware update is possible, all other functions are disabled.

To enter bootloader mode for a firmware upgrade:

1. Make sure Spartan 3 is off, no power to Pin 1 or Pin 3 of the screw terminal
2. Disconnect the sensor
3. Disconnect LSU Heater Ground from Pin 4 of the screw terminal
4. Power on Spartan 3,
5. Check if the onboard LED is shining a solid green, if it is then your Spartan 3 is in bootloader mode.

Warranty

14Point7 warrants Spartan 3 to be free from defects for 2 years.

Disclaimer
14Point7 is liable for damages only up to the purchase price of its products. 14Point7 products should not be used on public roads.

Documents / Resources

	14POINT7 Spartan 3 Lambda Sensor [pdf] User Manual Spartan 3, Lambda Sensor, Spartan 3 Lambda Sensor, Sensor

References

- Termite: a simple RS232 terminal