

SPARTAN 3 ADV

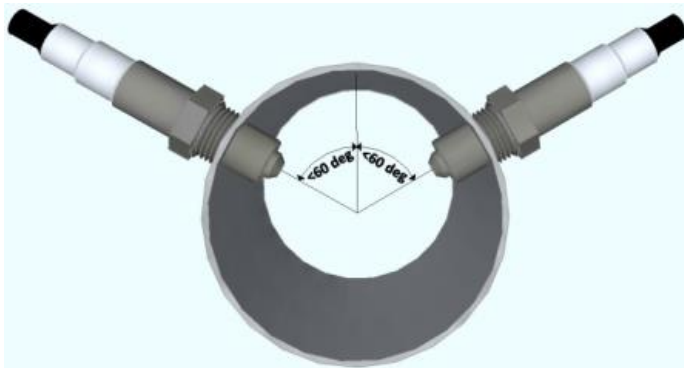
1. Warning

- Do not connect or disconnect the Lambda Sensor while Spartan 3 ADV 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 ADV. 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 ADV is water resistant, not waterproof.
- Please try to locate Spartan 3 ADV away from sources of water and heat.

2. Package Contents

1x Spartan 3 ADV, 1x Fuse holder, 2x 5amp Fuse (only need 1, other is for replacement if needed)

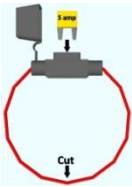
3. Exhaust Installation



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.



4. Fuse

Insert 5 amp fuse into fuse holder, cut wire at midpoint, and secure lid. One end of the fuse holder connects to the red wire on the grey cable, the other end of the fuse holder connects to a switched 12[v] source.

5. Wiring

Wire Color	Name	Connects to	Note
Red	Power	Switched 12[v]	Use fuse holder, 12[v] should be live only when engine is running
Black	Electronics Ground	Ground	
Orange	Heater Ground	Ground	Ground to chassis away from where the Black wire (Electronics Ground) is grounded
White	CAN Low		
Brown	CAN High		
Green	Linear Output	Interfacing device; ECU/Gauge/datalogger/etc...	0[v] @ 0.68 [Lambda] Linear to 5[v] @ 1.36 [Lambda], equivalent to 10-20 [AFR] for gasoline fuel
Blue	Bootloader Trigger/Bluetooth wake up		Normally leave disconnected. Ground during powerup to enter bootloader mode. Ground after power up to turn on Bluetooth if Bluetooth has auto powered off due to inactivity.

6. Bluetooth Auto Shutdown

By default, upon Spartan 3 ADV power up, it's Bluetooth module will automatically shutdown after 5 minutes of inactivity. If there is activity (Torque or BT Serial Terminal) within the first 5 minutes, the Bluetooth module will continue to be active for the duration of time Spartan 3 ADV remains powered. If the Bluetooth module has entered auto shutdown, by grounding the blue wire (Bootloader Trigger/Bluetooth wake up) momentarily the Bluetooth module will be active again and remain active for the duration of time Spartan 3 ADV remains powered.

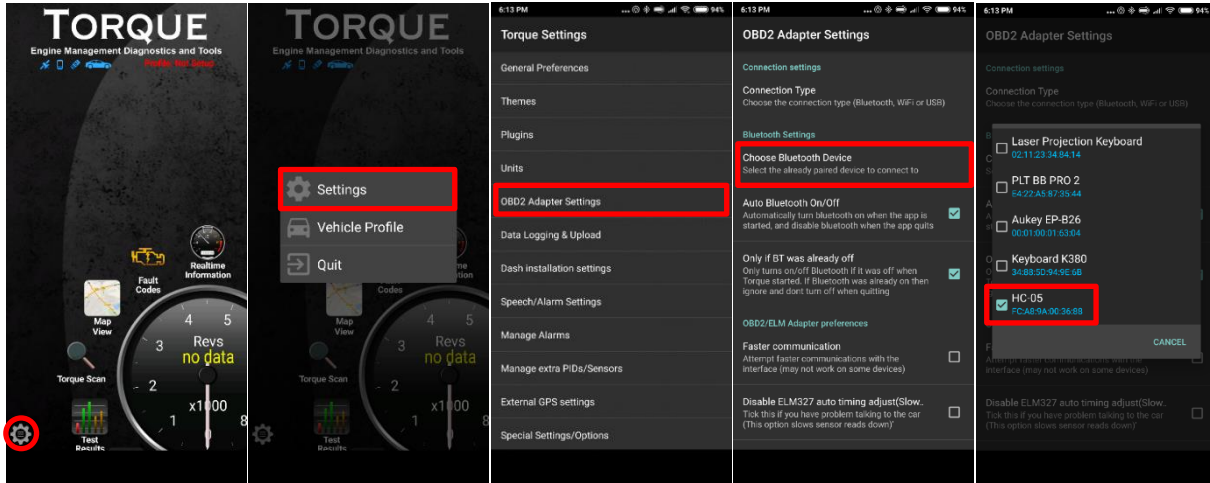
The Bluetooth Module consumes a large amount of power and it also creates electrical noise. Ideally, you want the Bluetooth only to be active when you need it to be active and off at all other times.

7. Pairing Spartan 3 ADV to your Android Device

Navigate to your device's Bluetooth settings, Spartan 3 ADV's BT name is "HC-05", pair your device with "HC-05". The passcode is "1234". Sometimes the name "HC-05" is not shown but instead it's MAC address is shown in the form of XX:XX:XX:XX:XX:XX.

8. Torque Pro Android App

[Torque pro](#) is required, the free version of Torque will not work, it is ~\$5 USD on Google Play.



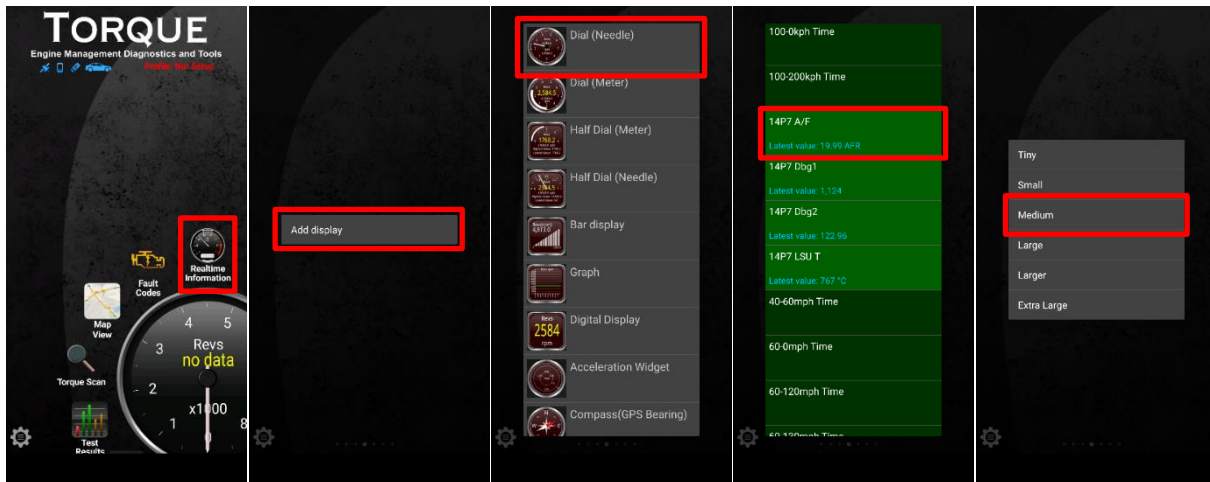
Select the gear icon, bottom left corner

Select "Settings"

Select "OBD2 Adapter Settings"

Select "Chose Bluetooth Device"

Select "HC-05"



Go back to the home screen. Select "Realtime Information"

Long press on an empty area. Select "Add display"

Select "Dial (Needle)"

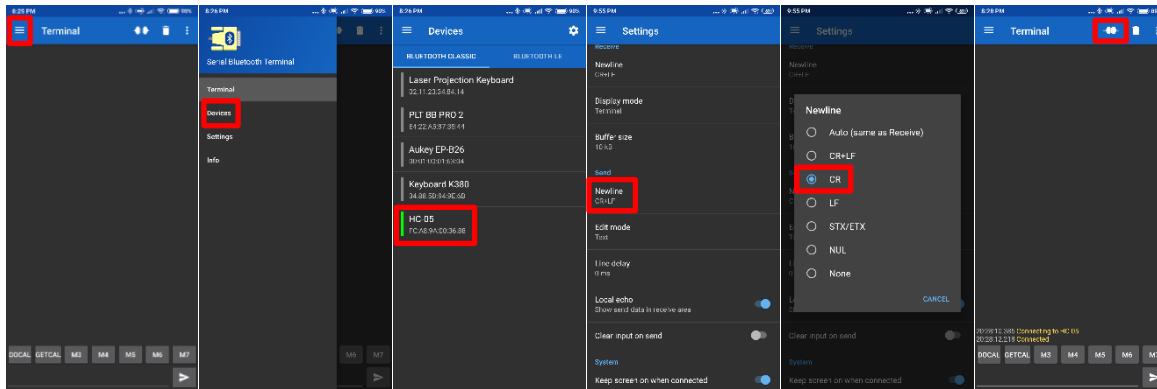
Select "14P7 A/F"

Select "Medium"



9. Bluetooth Serial Terminal (For Advanced Users)

Install [Serial Bluetooth Terminal](#) from Google Play onto your Android Device.



Select the File icon

Select "Devices"

Select "HC-05"

Select the File icon, and select "Settings". Under "Send" select "Newline"

Select "CR"

Go Back to the main screen. Press the Connect icon.

9.1 Serial Commands

Serial Command	Usage Note	Purpose	Example	Factory Default
DOCAL		Performs Free Air Cal		1.00
GETCAL		Gets Free Air Cal Value		
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 for Torque app		
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	SETCANBAUD500000 will set CAN Baud rate to 500kb/s	1000000 1 Mb/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		
GETHW		Gets the Hardware Version		
GETFW		Gets the Firmware version		
SETLAMFIVEVx.xx	x.xx is a decimal exactly 4 characters long including decimal point. Minimum value is 0.60, maximum value is 3.40	Sets Lambda at 5[v] for the linear output	SETLAMFIVEV1.36	x=1.36[Lambda]
GETLAMFIVEV		Gets the Lambda at 5[v]		
SETLAMZEROVx.xx	x.xx is a decimal exactly 4 characters long including decimal point. Minimum value is 0.60, maximum value is 3.40	Sets Lambda at 0[v] for the linear output	SETLAMZEROV0.68	x=0.68[Lambda]
GETLAMZEROV		Gets the Lambda at 0[v]		
SETCANFORMATx	x is an integer 1 to 3 character long	x=0; default CAN format x=1; Link ECU format x=2; Adaptronic ECU format	SETCANFORMAT0	x=0
GETCANFORMAT		Gets CAN format		
SETBTTIMEx	x is an integer 1 to 3 characters long. Minimum value is 60.	Sets Bluetooth auto power off time in seconds	SETBTTIME100 SETBTTIME50	x=300
GETBTTIME				
SETFILTERx	x is an integer 1 to 3 characters long. Minimum value is 1.	Sets the number of samples to average	SETFILTER8 SETFILTER1	x=4
GETFILTER		Gets the number of samples to average		
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 5.00. Linear Output will resume normal operation on reboot.	Allows user to test the accuracy of the Linear Output	SETLINOUT2.500	

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

Free Air Calibration: Free Air Calibration is not recommended for sensors with less than 500 hours or 25000 km of use.

SETFILTER: With a filter set to “1” the response time of Spartan 3 ADV is approximately 7[ms]. By default the filter is set to “4” which results in a response time of about 28[ms] (4x7[ms]).

10. CAN Bus Protocol Default Format

Spartan 3 ADV's CAN Bus operates with 11 bit addressing.

Default CAN Baud rate is 1Mbit/s

Default CAN Termination resistor is enabled, this can be changed through a serial terminal over Bluetooth.

Default CAN Id is 1024, this can be changed through a serial terminal over Bluetooth.

Data Length (DLC) is 4.

Data Rate is 50 hz, data is sent every 20[ms].

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

Status: To be disclosed

11. Supported CAN devices

Name	CAN Format Serial Command	CAN Id Serial Command	CAN BAUD Rate Serial Command	CAN Termination Resistor	Note
Link ECU	SETCANFORMAT1	SETCANID950	SETCANBAUD1000000 (Default from factory)	See next section	Read "Spartan 3 ADV to Link G4+ ECU.pdf" for additional information
Adaptronic ECU	SETCANFORMAT2	SETCANID1024 (Default from factory)	SETCANBAUD1000000 (Default from factory)	See next section	
MegaSquirt 3 ECU	SETCANFORMAT0 (Default from factory)	SETCANID1024 (Default from factory)	SETCANBAUD500000	See next section	Read "Interfacing Spartan 3 ADV to MegaSquirt 3 via CAN Bus.pdf"

12. CAN Termination Resistor:

Suppose we call the ECU; Master, and devices that send/receive data to/from the ECU we call; Slave (Spartan 3 ADV, 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 ADV is the only Slave on the CAN Bus then the CAN Termination Resistor on Spartan 3 ADV should be enabled using the serial command "SETCANR1". By default the CAN Termination Resistor on Spartan 3 ADV 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.

Warranty

14Point7 warrants Spartan 3 ADV 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.