



APSX WIDE BAND D2 AFR CONTROLLER GAUGE

Installation and User Manual

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APSX WIDE BAND D2 Manual V1.0

This manual is intended to provide information for safe operation and installation. APSX WIDEBAND reserves the right to make changes to product in an effort to continually improve it, features, and/or performance. These changes may result in different and/or additional safety measures that are communicated to customers through bulletins as changes occur.

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APSX WIDEBAND does not guarantee the product functionality with any ECU, data logger or other devices that uses the output signals. Implementation and integration of the product with any other device(s) must be done at your own risk. Improper installation and usage may lead to engine damage. Mount and install the product in a location where it does not obstruct the driver's view and/or ability to safely control the vehicle.

APSX WIDEBAND shall not be liable for direct, special, incidental, or consequential damages resulting from any legal theory including, but not limited to, lost profits, downtime, goodwill, damage, injury to persons, or replacement of equipment and property due to improper installation, integration and/or misuse of any APSX WIDEBAND's product(s). This warranty applies to the original purchaser of product and is non-transferable. All implied warranties shall be limited in duration to the said 90 day warranty period.

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General Information

For questions you can email to support@wide-band.com

Accessories

All accessories for APSX WIDEBAND can be ordered online at www.WIDE-BAND.com.

Unauthorized Modifications

Under no circumstances should any changes or modifications be made to the electrical circuits, mechanical structures without the prior, written permission of WIDEBAND.

The warranty shall terminate and APSX WIDEBAND shall have no obligation pursuant to it if (1) your product has been modified or repaired in a manner not previously authorized by APSX WIDEBAND in writing, (2) your product was subjected to accident, abuse, shipping damage, or improper use; (3) your product was not used or configured as specified in the this manual; or (4) your product was subjected to operating conditions more severe than those specified in the this manual.

STOP AND READ BEFORE INSTALLATION!

WARNING: This installation requires WELDING and connection to vehicle electrical system. You can easily damage the parts and cause a fire or explosion if you don't take proper safety actions. If you don't know what you are doing and with even a small doubt, DO NOT attempt any installation and get professional help. Even with using an engine tuner professional, it is their responsibility to validate and confirm the vehicle safety for the intended use of this product. APSX WIDEBAND holds no responsibility for any engine damage that results from the misuse or abuse of this product.



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APSX WIDEBAND D2

Overpaying is over.

The 52mm (2-1/16") APSX WIDEBAND D2 AFR CONTROLLER Gauge features a clear LED readout and sweeping color-coded LED display. It provides immediate reference to the engine air fuel ratio (or lambda) in real-time.

The D2 gauge is ideal for all vehicles including carbureted applications and engine dynamometers. Analog output is 0-5V and can be used with data loggers or aftermarket ECUs including the MegaSquirt PNP and others. In addition, a digital output is also available for real-time monitoring via PC or display.

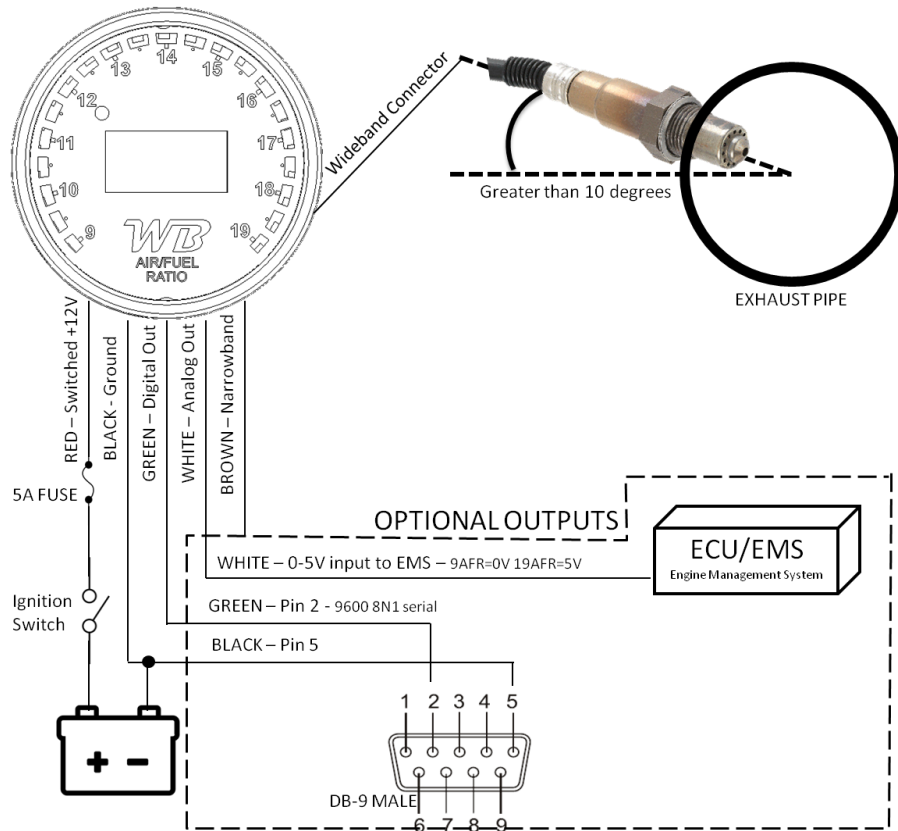
Features

- One of the five bright LED color options (Red / Green / Orange / Blue / White)
- Fast response, 30 msec
- Configurable four types of fuel (E85, Diesel, Gasoline, Methanol) and lambda display (Faceplates for fuel types are sold as accessories)
- Sweeping LED "needle" indicator from rich (green) then normal (orange) to lean (red)
- Fail safe connector
- Two faceplates (black / white) options
- Multiple outputs for digital (to PC), 0-5V analog (to data logger/EMS), narrowband for simulation and extra switch options
- 2-1/16" (52mm) outer diameter mounting and supports Bosch LSU4.2 sensor

Package Includes

| | |
|---------------|---|
| APSX_D2: | D2 AFR CONTROLLER GAUGE |
| APSX_D2CABLE: | D2 HARNESS |
| BUNG: | STEEL M18 X 1.5mm WELD-IN BUNG AND PLUG |
| BOSCH_LSU4_2: | BOSCH WIDEBAND O2 SENSOR (#17014) LSU 4.2 |

Wiring Diagram

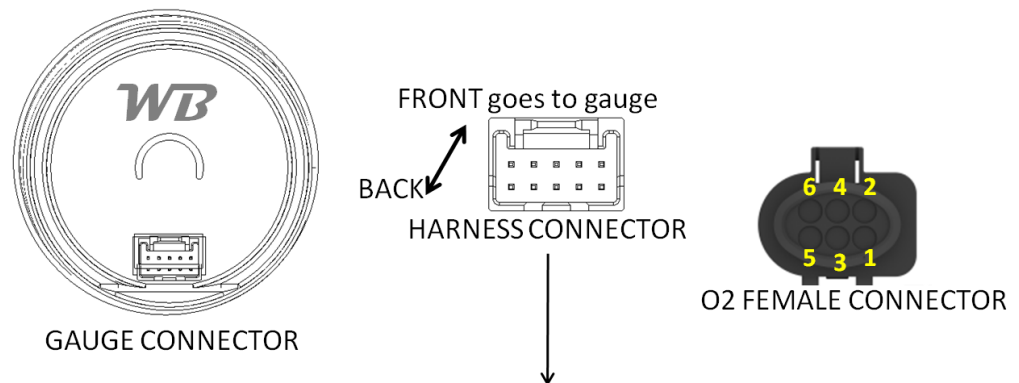


Warnings on Wiring

- As a general rule, never route the harness close to ignition wires.
- Route the harness very carefully to avoid chafing or undue strain.
- Secure wiring to vehicle with wire ties with special attention to the sensor harness routing beneath the vehicle and in the engine compartment.
- Take care when routing sensor harness near hot exhaust components.
- Use a 5A inline fuse on the switched 12V power supply line (RED - Power/IO).
- Avoid cutting or extending the sensor harness.
- Use appropriate gauge wire (20 AWG or thicker) when extending wires, especially RED (Switched 12V with min 3A) or BLACK (Ground) of the Power/IO harness.
- Ensure all connections are secure and insulated from shorts to adjacent wires and the vehicle structure. Utilize proper crimping and solder/heat shrink techniques.

Connectors

APSX WIDEBAND D2 comes with a harness that is connected to the gauge as shown below. Wideband connector goes and clicks to Bosch (#17014) LSU4.2 O2 sensor connector. The other branch of the harness has the power/IO features. At minimum, switched 12V RED (5A fuse) and ground BLACK wires need to be connected as explained above.



| On O2 Sensor Female Conn | 1 | 5 | 6 | 4 | 3 |
|--------------------------|--------|-------|---------|-------|--------|
| UPPER ROW - O2 Sensor | black | Brown | red | white | Green |
| LOWER ROW - Power / IO | white | brown | green | red | Black |
| | analog | NB | digital | 12V | Ground |

Calibration



Please note that all APSX WIDEBAND products are tested and calibrated just before they are shipped from Cincinnati, OH validating that they are working properly. No need any calibration when first use. However if there is any change in setups and environment being used (altitude, temperature etc.), it should be open air calibrated.

WATCH: YOUTUBE VIDEO: <https://youtu.be/p-gKXABfd9E>

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The O2 sensor should be exposed to free air for the first time calibration, if needed. Hold the button back of D2, you will see display unit counting from 1 to 6.

Hold the button until you see 6 and release it to complete the calibration. This should take less than 60 seconds.

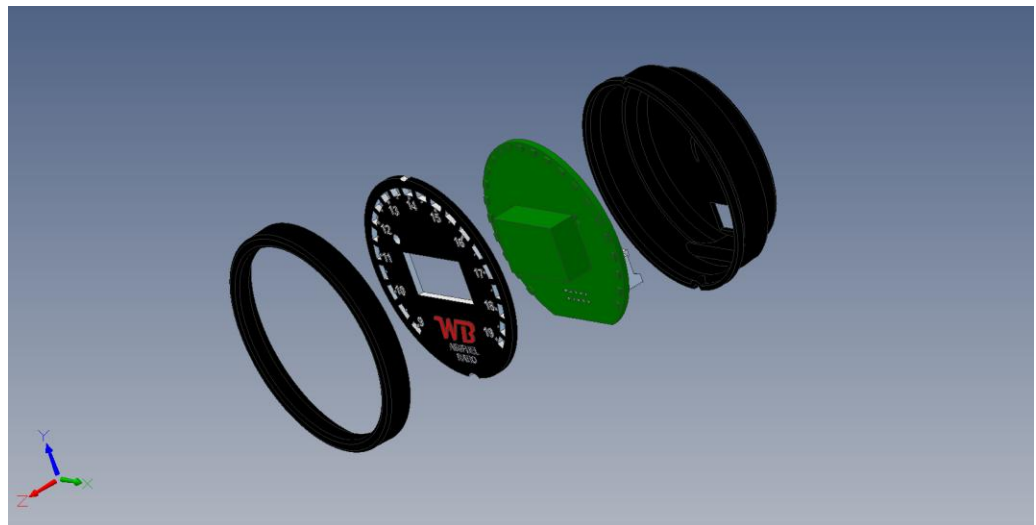
Once it calibrated, display reads 19.0 at gasoline settings. You can now connect the O2 Sensor onto the exhaust pipe.

For the factory settings, disconnect power, hold the switch while turning the power on and wait for 3 blinks. You should re-calibrate after this action.

Faceplate / Bezel Assembly and Disassembly

The default gauge comes with a black faceplate and black bezel. There is a white faceplate is available as an accessory or an option. When you want to use D2 with different fuel types or lambda scale, you can replace the faceplate accordingly to lambda, diesel, E85 etc...

Disassemble is so easy since there are only four parts involves as seen on the picture below. They are a bezel, faceplate, PCB electronic board and a case. No screws, no buttons or brackets are involved.



Just pop the bezel out first. Either push the faceplate out from the connector at the back or pull it out from the front side via tweezers or small screwdriver. Take the PCB board out when you need to replace it with a new one.

Bung and Plug Replacement

The stainless steel (SS304) bung and its mild steel plug can be purchased either from www.wide-band.com or another retailer available. The specs are M18 X 1.5mm.

O2 Sensor Installation on a Exhaust Pipe

The bung should be installed (welded) from the side so that the sensor orientation is greater than 10 degrees but not greater than 45 degrees from horizontal line. That helps for perfect condensation drainage from the sensor. Otherwise the sensor may prematurely die.

Wideband O2 Sensors

Handle with caution! They become hot quickly. They can burn the human skin and can start a fire.

At the end they are sensors and they are very sensitive to harsh usage. So please handle with care. NO WARRANTY is offered for the sensor. Because it is impossible to verify the user's operating conditions for the sensor.

Sensor life gets shorter with the followings:

- Leaded fuel
- Silicone
- Oil
- Coolants
- Excessive rich AFR
- 2 stroke engines
- Damaging by dropping to ground or hitting hard to other surfaces
- Thermal shock
- Extreme exhaust temperatures (above 930 Celsius or 1700 F)
- Unheated (no powered) sensor left in exhaust pipe stream

Gauge Installation on a Pod

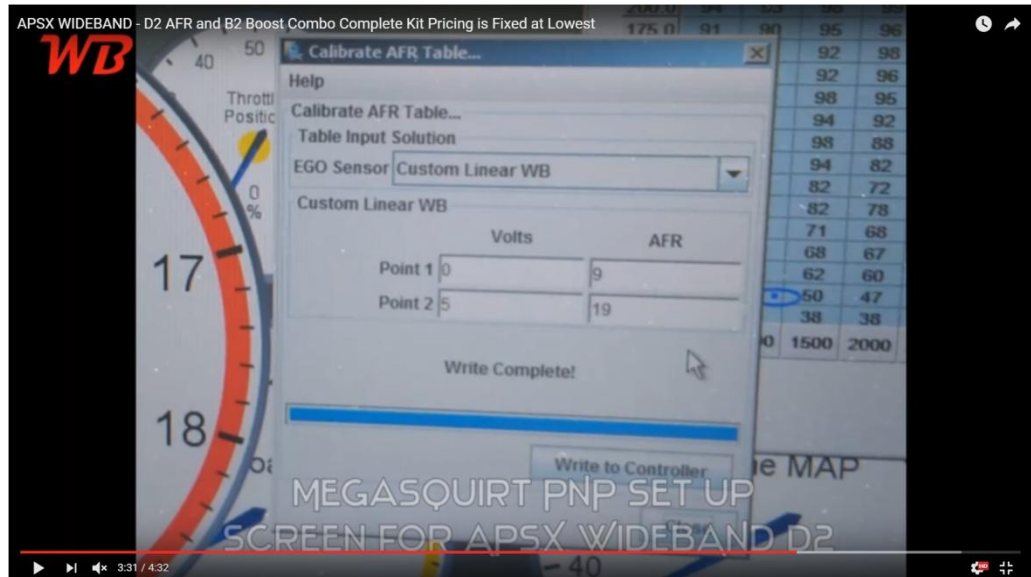
The APSX WIDEBAND gauges are universal 52mm (2-1/16") diameter in size. They can be "pushed-in" to a universal 52mm pod. If the fitment is not solid, a black tape can be applied on the perimeter of the gauge and re-insert it back to pod for a nice and snug fit.

Analog Output (White Wire)

0-5V analog output scaling formula for Gasoline AFR = (2 * Volts) + 9. It is
Lambda = (0.136 * Volts) + 0.61.

| APSX WIDEBAND VOLT vs AFR READING CONVERSIONS | | | | | |
|---|--------|---------|----------|-------|--------|
| VOLTS | LAMBDA | AFR GAS | METHANOL | E85 | DIESEL |
| - | 0.61 | 9.00 | 3.96 | 5.98 | 8.88 |
| 0.50 | 0.68 | 10.00 | 4.40 | 6.64 | 9.86 |
| 1.00 | 0.75 | 11.00 | 4.84 | 7.31 | 10.85 |
| 1.50 | 0.82 | 12.00 | 5.28 | 7.97 | 11.83 |
| 2.00 | 0.88 | 13.00 | 5.72 | 8.64 | 12.82 |
| 2.50 | 0.95 | 14.00 | 6.16 | 9.30 | 13.81 |
| 2.85 | 1.00 | 14.70 | 6.47 | 9.77 | 14.50 |
| 3.00 | 1.02 | 15.00 | 6.60 | 9.96 | 14.79 |
| 3.50 | 1.09 | 16.00 | 7.04 | 10.63 | 15.78 |
| 4.00 | 1.16 | 17.00 | 7.48 | 11.29 | 16.77 |
| 4.50 | 1.22 | 18.00 | 7.92 | 11.96 | 17.75 |
| 5.00 | 1.29 | 19.00 | 8.36 | 12.62 | 18.74 |

Please refer to drawing on page 2 for analog output connections for ECU data logging. There are 256 steps involved that means 0.04 AFR per step between 0V and 5V. The picture below shows the set up screen for MegaSquirt.



Digital Output (Green Wire)

The digital output is for monitoring the readings from a PC or from APSX G1 LED display. Please refer to drawing on page 2 for digital output connections via DB-9 connector to a PC. Baud rate is 9600 bps, data bits is 8, no parity and stop bits is 1 (9600 8N1).

- 1- Wire the DB-9 pin numbers 2 and 3.
- 2- Run <http://www.ontrak.net/adrcom.zip> application.
- 3- Select and open the related port.
- 4- Write some letters on the black area on the software.
- 5- If you see a repeat of the letters then all is correct. (When you type “A”, it should display another “A” next to it immediately.)

If not, check comport numbers. Go to device manager and change the port number to something lower than 9.

We use single byte protocol. It is not ASCII. If it reads 1 then device is not ready. Otherwise it should read 90 to 190.

90 = 9.0 AFR

190 = 19.0 AFR

147 = 14.7 AFR

This will be only for gasoline even if you change the fuel type to others.

FAQ & Troubleshooting

What are the minimum wiring needed to start using the gauge?

The RED and BLACK should be connected. The rest of the wires can be secured away. But first always perform the bench test as described on the website:

http://www.wide-band.com/help_answer.asp?ID=17#253

DO I need to calibrate right after out of the box?

No.

The display shows 8.88 when connected or at full throttle.

There may be several reasons. Please check the voltage level and verify if it is min 12V and 3A. Use a scope to monitor if there are any voltage spikes in the system. You can apply a min 35V capacitor to smooth out the spikes.

http://www.wide-band.com/help_answer.asp?ID=17#254

My gauge got stuck at A1, A2, 9 or 19AFR.

Check your sensor location and the sensor itself if there are any contaminations built up on it. Perform a factory reset if the problem persists. For the factory settings, disconnect power, hold the switch while turning the power on and wait for 3 blinks. You should re-calibrate after this action. If still having the issue, please take a clear and close picture of the PCB board for a remote inspection by following the directions above to disassemble the gauge. Please email that and the order details to support@wide-band.com.

Follow the directions as described on the link, if you need to send the product back to us for inspection or repair: <http://www.wide-band.com/returns.asp>

Can I extend the wires in my sensor harness?

Yes. Please follow the guidelines listed on page 2.

Can I install D2 to my motorcycle?

If you are going to install the D2 to a motorcycle permanently you can follow the guidelines below.

- Temperature of the location. <700C
- 6 inches, away from the end pipe
- Ability to install 10 degree above horizontal in the desired location

We are mainly experienced on cars and know that motorcycles are pain in the ass in terms of voltage spikes. But as a general rule nobody should wire anything close to ignition wires even in cars.

- check voltage spikes by using a scope not voltmeter
- isolate the O2 sensor area from the voltage spikes

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- check your ground and be sure that you get the max grounding possible
- if needed use a metal sleeve on the gauge wire and ground it
- keep trying other solutions....

Internet has tons of discussions about this. Such as:

<http://www.britbike.com/forums/ubbthreads.php?ubb=showflat&Number=621546&page=3>

Any plans for introducing LSU4.9 sensor with the D2?

We still believe LSU4.2 market is much bigger. Plus it is more reliable when you perform open air calibration rather than relying on self calibration. We do not plan to utilize LSU4.9 sensor soon.

SUPPORT

As with all APSX WIDEBAND products, APSX D2 gauges are backed with our technical support team to ensure your satisfaction. We support your product with email and with our extensive online resources.

SPARE AND ACCESSORY PARTS

100% in stock – APSX D2 is designed with ease of maintenance in mind. Accessory and spare parts are in stock in our Cincinnati location. All critical part orders are shipped on the same day.

LIMITED WARRANTY

APSX WIDEBAND warrants this product to be free from defects for 12 months from the date of purchase. Oxygen sensors are excluded from stated warranty. APSX WIDEBAND's obligation under warranty shall be limited to repairing or replacing, under the discretion of APSX WIDEBAND, any part proven defective. This warranty is limited to the repair or replacement of parts in the manufactured good and the necessary labor done to affect its repair or replacement.

SERVICE UNDER WARRANTY

In the unlikely event that your APSX WIDEBAND hardware should fail during the warranty period, a Return Material Authorization number (RMA) must be first retrieved from APSX WIDEBAND.

DISCLAIMER

APSX WIDEBAND shall not be liable for direct, special, incidental, or consequential damages resulting from any legal theory including, but not limited to, lost profits, downtime, goodwill, damage, injury to persons, or replacement of equipment and property due to improper installation, integration and/or misuse of any APSX WIDEBAND's product(s). This warranty applies to the original purchaser of product and is non-transferable. All implied warranties shall be limited in duration to the said 90 day warranty period.

CONDITIONS FOR WARRANTY VOID

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