fjoracing.com

CWC0002
Wideband Oxygen Sensor Controller
(RPM/AUX Input option)

INSTALLATION GUIDE

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MWI0002 rev J

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Record your product serial numbers below (required to register or obtain service)

Controller _____

Display _____

Software _____

1. Introduction

The FJO Racing Electronics Wideband Oxygen Sensor Controller has been designed to provide the user with rapid and accurate air/fuel ratio (AFR) readings ranging from 10:1 to 20:1 for unleaded gasoline *(for alternate fuel use, please see section 5)*. Determining correct air/fuel ratios is critical when tuning gasoline four stroke engines to produce maximum fuel economy, drivability and power. The FJO wideband controller is easy to use and installation is straightforward. Two components make up the system, the wide band oxygen sensor and the controller. In addition, an optional display, datalogging software, RPM pickup, and auxiliary 5-volt input may be used.

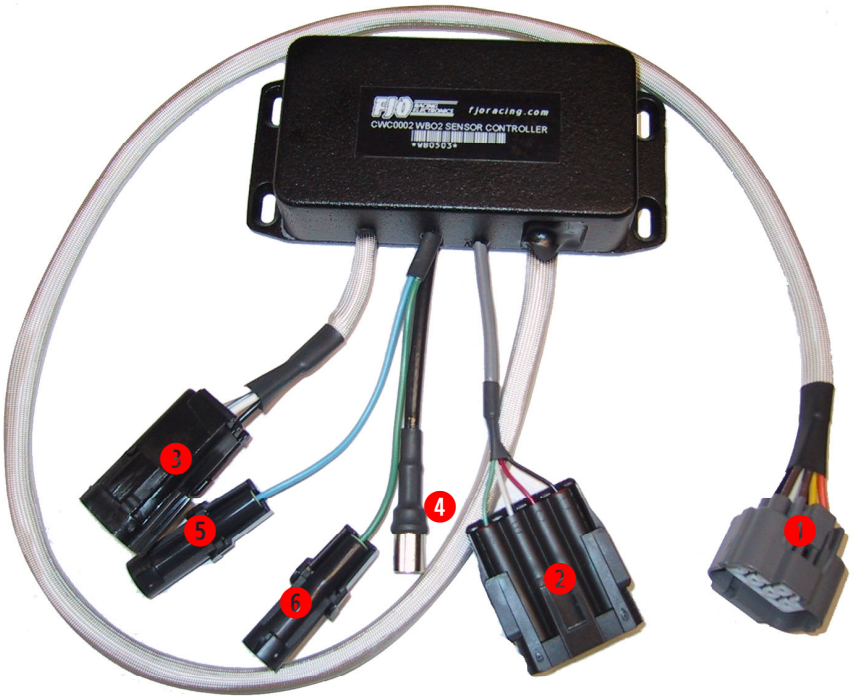
2. Registration

Thank you for purchasing your FJO Racing Electronics Wideband Oxygen Sensor Controller. Please take a moment to register your product online at "http://www.fjoracing.com". Should you not be able to register online, you may do so by contacting us via telephone or fax at the numbers shown on the bottom of this page - please be sure to have your controller serial number handy along with your contact information and the name of the dealer you purchased it from.

3. Installation

3.1 Controller

The control unit is of robust construction and may be installed almost anywhere on the vehicle. The unit is equipped with four, slotted 4mm [5/32”] mounting holes. The use of all four is highly recommended. The mounting surface should be as flat as possible. The unit is filled with an epoxy based potting solution, and the connectors are environmentally sealed, but the unit and its’ wiring should not be placed in such an area that it may become completely submerged, subjected to extreme heat, or road debris.



There are six connectors protruding from the box, ❶ a grey 8-pin connector, ❷ a black 4-pin flat connector, ❸ a black 4-pin square connector, ❹ a silver BNC coaxial connector, ❺ a black 1-pin connector (blue wire), and ❻ a black 1-pin connector (green wire). The grey 8-pin connector connects to the oxygen sensor. Ensure the wiring to the sensor will not become kinked or lie directly on the exhaust system. The black 4-pin flat connector plugs into the digital display unit or serial cable. The silver BNC coaxial connector plugs directly into the optional RPM pickup. The black 1 pin connector (blue wire) may be used to connect to an auxiliary 5-volt source. The black 1 pin connector (green wire) may be used to connect to various types of tachometer signals if use of the optional RPM pickup is not desired.

The black 4-pin square connector may be configured to either provide power to the control unit or connect to the FJO Racing Electronics 341B Engine Management System or many other standalone engine management systems. When connecting to the 341B, the control box is to be connected to the oxygen sensor input wiring. Follow the wiring diagrams and colour coding included in the 341B hardware installation manual. When the Wideband Oxygen Sensor Controller is being used as a standalone instrument, only two of the wires on this socket are to be used. The black wire is to be connected to a chassis ground. Ensure the ground connection is clean and tight. The white wire is to provide switched +12 volts. This wire should have power when the ignition switch is in the “on” position only. Do not allow the unit to be powered up without the engine running for prolonged periods, this may completely drain your vehicle's battery. **DO NOT run the engine with an unpowered sensor in the exhaust stream. This WILL damage the sensor.** An inline 5 amp fuse is recommended on this wire. When connecting to a third party engine management system, the analog output of the controller is to be connector to the analog input of the ECU – consult your ECU documentation for detailed instructions. The ECU input must have an input impedance of 1 MΩ or greater to avoid attenuating the controller signal.

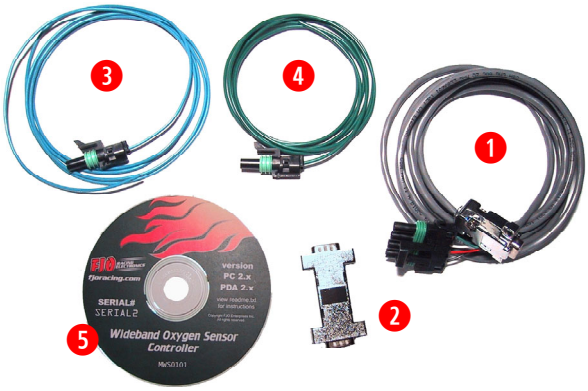
3.2 Wideband Oxygen Sensor

The Oxygen Sensor is to be mounted in the exhaust system, ideally 450 mm [18 inches] or more from the exhaust valves. When installing the sensor on an engine equipped with individual exhaust runners (headers), the collector area is the preferred mounting location. If the engine was originally equipped with an oxygen sensor, this location may also be used. If the engine has a turbocharger, it is best to place the sensor down stream of the turbo outlet. The sensor requires an M18 X 1.5 threaded boss for installation. A small amount of an anti-seizing compound is recommended on the threads of the sensor, being careful not to get any on the sensor area. Always install the sensor so that the tip (the part in the exhaust stream) is **lower** than the body (the part where the wires exit). The mounting position should be chosen such that the sensor will never become submerged. Tighten the sensor to 45 N-m [33 lbf-ft]. Over tightening or cross threading during installation will cause irreparable damage to the sensor – if the sensor does not thread in easily and smoothly DO NOT FORCE IT – check the threads as they may need to be cleaned or re-tapped.

3.3 AFR Display

The optional AFR display unit should be mounted in an area that is clearly visible to the operator. If permanently installing the display in the vehicle, ensure that the wiring does not interfere with any other wiring or cable operated controls within the dashboard. The display is very lightweight, so no special mounting procedure is required. Double-sided foam tape has been provided for affixing the unit in a convenient location. Avoid placing the unit where it will be subjected to extreme heat or cold.

3.4 Connectivity Kit



The optional connectivity kit includes ❶ a 2 meter (8 foot) PC cable, ❷ a crossover adapter for connecting to a PDA serial cable (not included), ❸ a 1.8 meter (6 foot) auxiliary input cable (blue), ❹ a 1.8 meter (6 foot) direct-connect tachometer input cable (green), and ❺ a CDROM containing the advanced datalogging and analysis software.

3.4.1 Auxiliary Input Cable (blue)

The auxiliary input cable has a length of approximately 1.8 meters (6 feet). The input wire should be connected to a 0-5 volt source. It is most common to connect this to the output of a throttle position sensor (TPS) or manifold pressure (MAP) sensor. Connection to voltages greater than 5 volts can damage the controller - always check the signal you intend to measure with a reliable multi-meter before connecting. When used in conjunction with a tachometer input, the auxiliary input will allow full 3D mapping of air/fuel ratios for various RPM and load conditions.

3.4.2 Tachometer Input Cable (green)

The tachometer input cable has a length of approximately 1.8 meters (6 feet). The input wire should be connected to a 0-12 volt square-wave tachometer signal. In some cases connecting this signal to the LOW VOLTAGE switched side of an ignition coil may be acceptable. Connection to voltages greater than 12 volts can damage the controller - always check the signal you intend to measure before connecting. Where an appropriate tachometer signal is not available or for greater portability, the optional RPM Pickup may be used in place of the tachometer input cable. When used in conjunction with an auxiliary input, the tachometer input will allow full 3D mapping of air/fuel ratios for various RPM and load conditions.

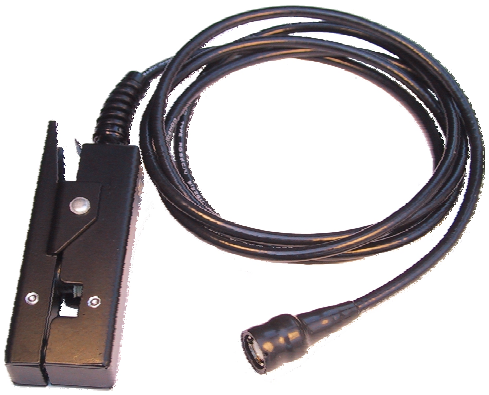
3.4.3 PC Cable and PDA Adapter

The PC cable has a length of approximately 2 meters (8 feet). The cable has a standard DB9-F connector for connection to the serial port of most PC computers and laptops. Laptop computers not having a standard RS232 serial port will require a “USB/Serial” adapter (not included). Connection to a PDA requires use of the crossover adapter (included in the connectivity kit) and a serial PDA cable (not included) that may be obtained from the PDA manufacturer.

3.4.4 Advanced Datalogging and Analysis Software

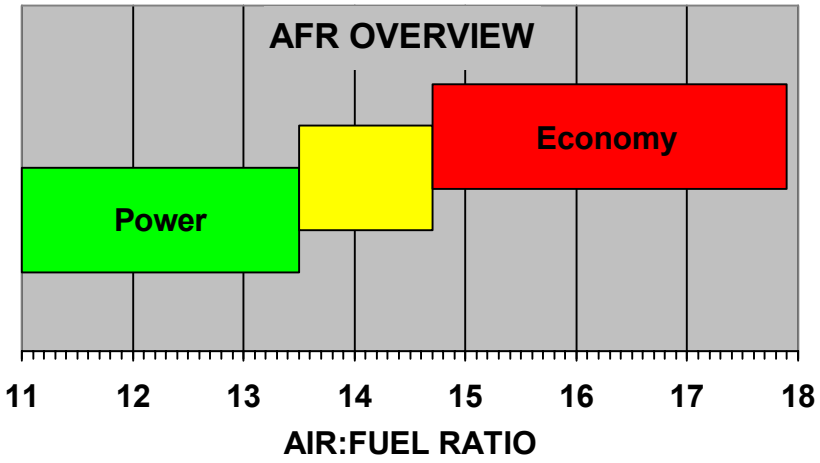
The advanced datalogging and analysis software is provided on CDROM and includes software versions for both the PC and PDA. This software provides the functionality to display, log, and analyze the data from the wideband controller. Free updates to the software packages are available for download by registering your connectivity kit purchase on our website (www.fjoracing.com).

3.5 RPM Pickup



The optional RPM Pickup has a cable length of approximately 1.5 meters (5 feet). The pickup should be clamped around a conveniently located spark plug wire being careful to avoid installation in areas of extreme heat. If a spark plug wire is not accessible, the high voltage coil wire from the ignition coil may be used. For coil-on-plug applications where the high voltage wires are not accessible, clamp the pickup around one of the switched battery voltage wires feeding a coil. Once the system is tested, if no RPM signal is present first try reversing the orientation of the pickup. When routing the wire from the pickup to the controller, keep well away from items that can become hot (such as the exhaust manifold) and any moving objects under the hood (such as belts or fans). In order to display RPM readings, the optional connectivity kit is required. **Do NOT connect a tachometer or other signal directly into the RPM input without using the RPM pickup. Also, do NOT connect BOTH the RPM pickup and the tachometer signal input connector. Doing so can damage the controller and/or your ignition system.**

4. Operation

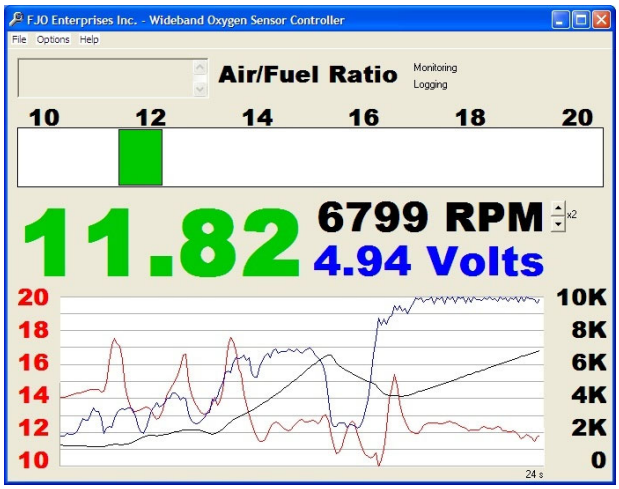


4.1 Operation with AFR Display

When the unit is first activated, it will run through a "self-test" which lasts approximately 2 seconds. It will, in sequence, display "8.8.8.", "FJO". While the sensor is warming, the display will indicate "H-1". If the sensor takes longer to heat, the display will indicate "H--" until the sensor is sufficiently hot. Once through the test and heat cycle, the unit will begin to display accurate air/fuel ratio numbers. Should the letters "Err" appear, the controller is indicating that an error has occurred due to a defective sensor or faulty wiring. The letters "Hot" or "Cld" indicate that the sensor temperature is outside the calibrated range. If the symbols "---" appear on the display at any time, the controller may not be configured for "LED Display" mode or the communication link between the display and the controller is faulty. In any case, the user should discontinue operation of the sensor and diagnose the cause of the fault.

4.2 Operation with Advanced Datalogging and Analysis Software (PC or PDA)

If you purchased the optional connectivity kit, please refer to the "readme.txt" file on the CDROM included with the kit. There you will find additional instructions for installing and using the datalogging software on a PC or PDA.



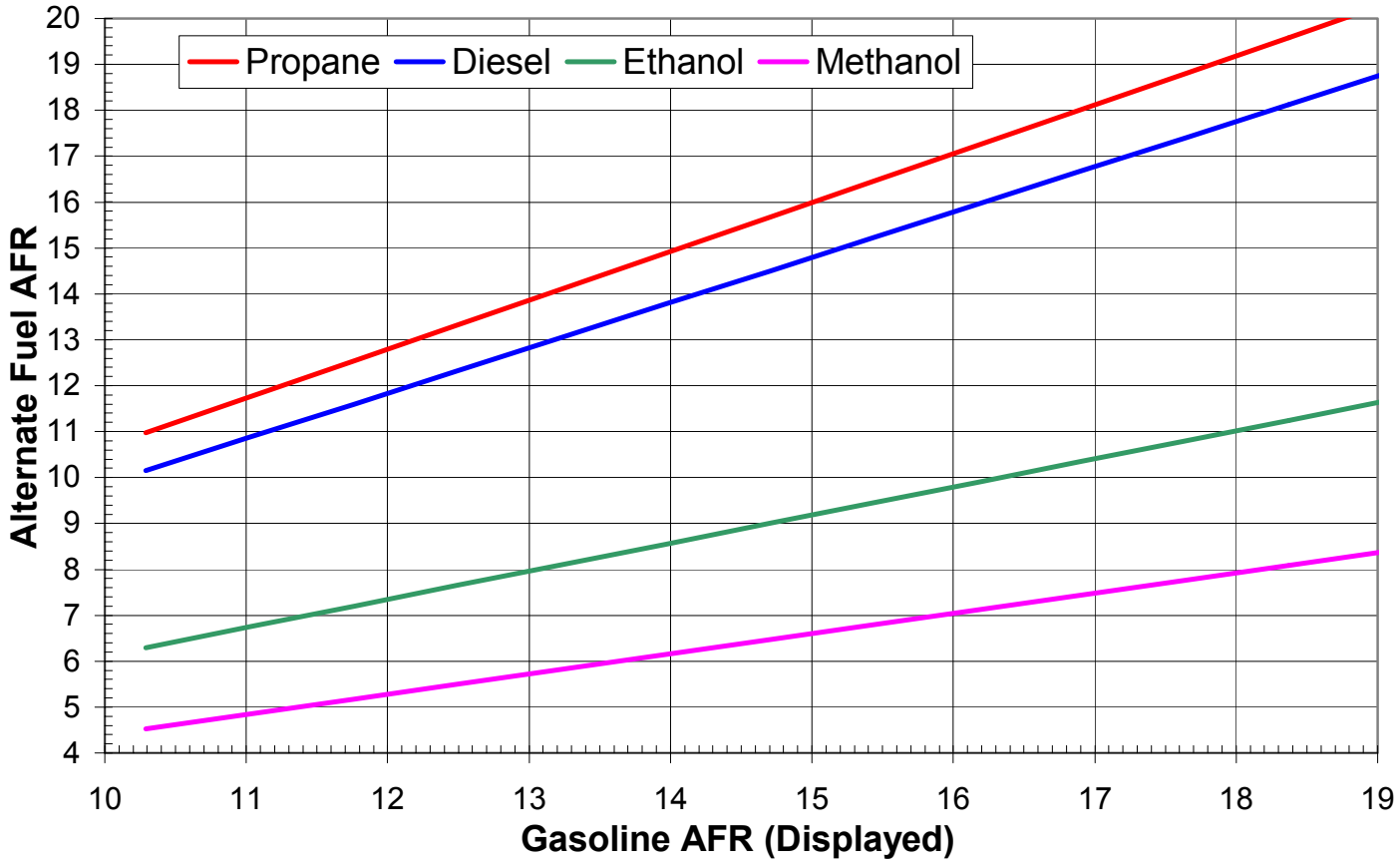
The datalogging and analysis software provides the functionality to display, log, and analyze the data from the wideband controller. AFR plots can be viewed in real time, playback, or on static 2-dimensional or 3-dimensional graphs. In addition, by analyzing RPM rate-of-change plots, customers can analyze the effects of modifications and tuning.

Free updates to the software packages are available for download by registering your connectivity kit purchase on our website (www.fjoracing.com).

5. Alternate Fuels

While the FJO Racing Electronics Wideband Oxygen Sensor Controller has been designed for use with unleaded gasoline, it may be used with alternate fuels using the following conversion table.

Air/Fuel Ratio					
Gasoline	Lambda	Propane	Methanol	Ethanol	Diesel
10.3	0.70	11.0	4.5	6.3	10.2
11.0	0.75	11.8	4.9	6.8	10.9
11.8	0.80	12.5	5.2	7.2	11.6
12.5	0.85	13.3	5.5	7.7	12.3
13.2	0.90	14.1	5.8	8.1	13.1
14.0	0.95	14.9	6.1	8.6	13.8
14.7	1.00	15.7	6.5	9.0	14.5
15.4	1.05	16.5	6.8	9.5	15.2
16.2	1.10	17.2	7.1	9.9	16.0
16.9	1.15	18.0	7.4	10.4	16.7
17.6	1.20	18.8	7.8	10.8	17.4
18.4	1.25	19.6	8.1	11.3	18.1
19.1	1.30	20.4	8.4	11.7	18.9



6. Disclaimer

FJO Racing Electronics may not be held responsible for any damages, how so ever caused, to any persons or equipment during the installation or operation of its' products. FJO Racing Electronics products are meant for off-road use only, and make no claims as to the units' ability to meet local safety or emissions laws.

7. Warranty

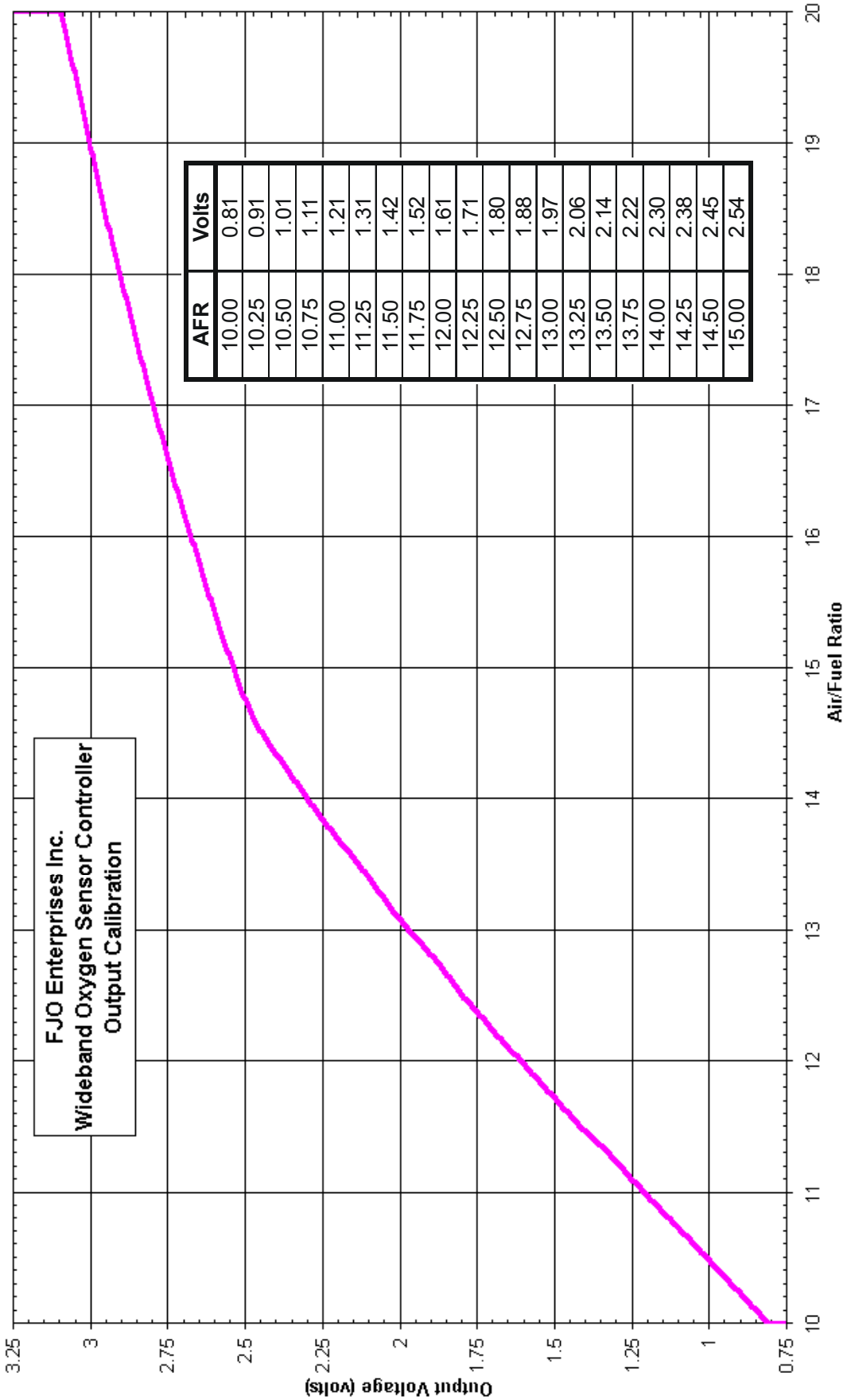
FJO Enterprises Inc. (FJO) warrants the material and workmanship of the equipment, components and parts manufactured by FJO against defects under normal use and service. This warranty shall extend for six months from the original date of purchase provided that the customer first returns the defective part or component through an FJO authorized distributor, shipping costs prepaid, to FJO's place of business. Prior to returning a product for warranty inspection, the customer must first contact FJO with the product serial number to receive a WARRANTY CLAIM NUMBER. Units returned without this number will be refused.

FJO may at its option, repair or replace without cost for parts and labour, the defective product. This warranty does not cover finishes, normal wear and tear, nor does it cover damage resulting from accident, misuse, dirt, tampering, unreasonable use, service attempted or performed by unauthorized service agencies, failure to provide reasonable maintenance, or FJO products that have been modified or used for commercial reasons.

FJO specifically does not warrant equipment, parts or components purchased by FJO or the customer from any third party manufacturers or suppliers. Rather, for any defect in respect of equipment, parts and components purchased from third party manufacturers and suppliers, the customer shall have recourse only to the terms of the warranty of that particular manufacturer or supplier. Any recommendations made by the third party manufacturer or suppliers concerning the use or application of their products are those of the manufacturer or supplier, and FJO extends no warranty with respect to the results obtained for their use. FJO does not warranty those products in any way beyond the term of the warranty extended by the manufacturer or supplier.

The warranty provided above, FJO's obligations and liabilities hereafter, and the rights and remedies of the customer are exclusive and in substitution for, and the customer waives all other warranties, guarantees, obligations, liabilities, rights and remedies, expressed or implied, arising by law or otherwise, including (without limitation) the implied warranties of merchantability or fitness of purpose, and any obligations or liability of FJO arising from tort, or loss of use, revenue or profit, or for incidental or consequential damage.

8. Output Calibration



AFR	Volts
10.00	0.81
10.25	0.91
10.50	1.01
10.75	1.11
11.00	1.21
11.25	1.31
11.50	1.42
11.75	1.52
12.00	1.61
12.25	1.71
12.50	1.80
12.75	1.88
13.00	1.97
13.25	2.06
13.50	2.14
13.75	2.22
14.00	2.30
14.25	2.38
14.50	2.45
15.00	2.54

9. Wiring Diagram