



# UEGO OPERATORS MANUAL

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## INTRODUCTION



The M&W Uego system uses a **U**niversal **E**xhaust **G**as **O**xygen sensor and this works completely differently from a normal oxygen sensor you would find in your car. It allows precise measurement over a wide AFR range. UEGO sensor systems are used by all original equipment manufacturers for ECU mapping and are also widely used in motorsports including F1.

The microprocessor controlled M&W Uego controller features a fully **linearized real time 0 to 5 volt analog output** (UEGO2 only) giving 10 to 20/1 air fuel ratio. This simple scaling allows easy input into data acquisition systems and engine management systems. 12V operation with a cigarette lighter plug allows easy fitment for vehicle testing. The RS232 port allows connection to IBM compatible computers and laptops with DOS, Windows 95/98/NT/2000 and PocketPC software available. The controller uses a **true wide range** NGK sensor which when used with the tail pipe probe adapter provides a very versatile tuning tool for engine mapping and diagnostic purposes.

### Tuning Recommendations

It is outside the scope of this document to describe correct tuning or engine mapping techniques however the following figures are offered as a guide:

Normally asperated engines at full load = 12.5 to 13.0 AFR

Turbo engines at full load = 11.0 to 12.5 AFR.

Cruise mixture both types = 14.0 to 14.7 AFR. (14.7 if closed loop operation)

Much can be learned by checking the manufactures settings as a starting point. The Uego is an ideal tool for such testing.

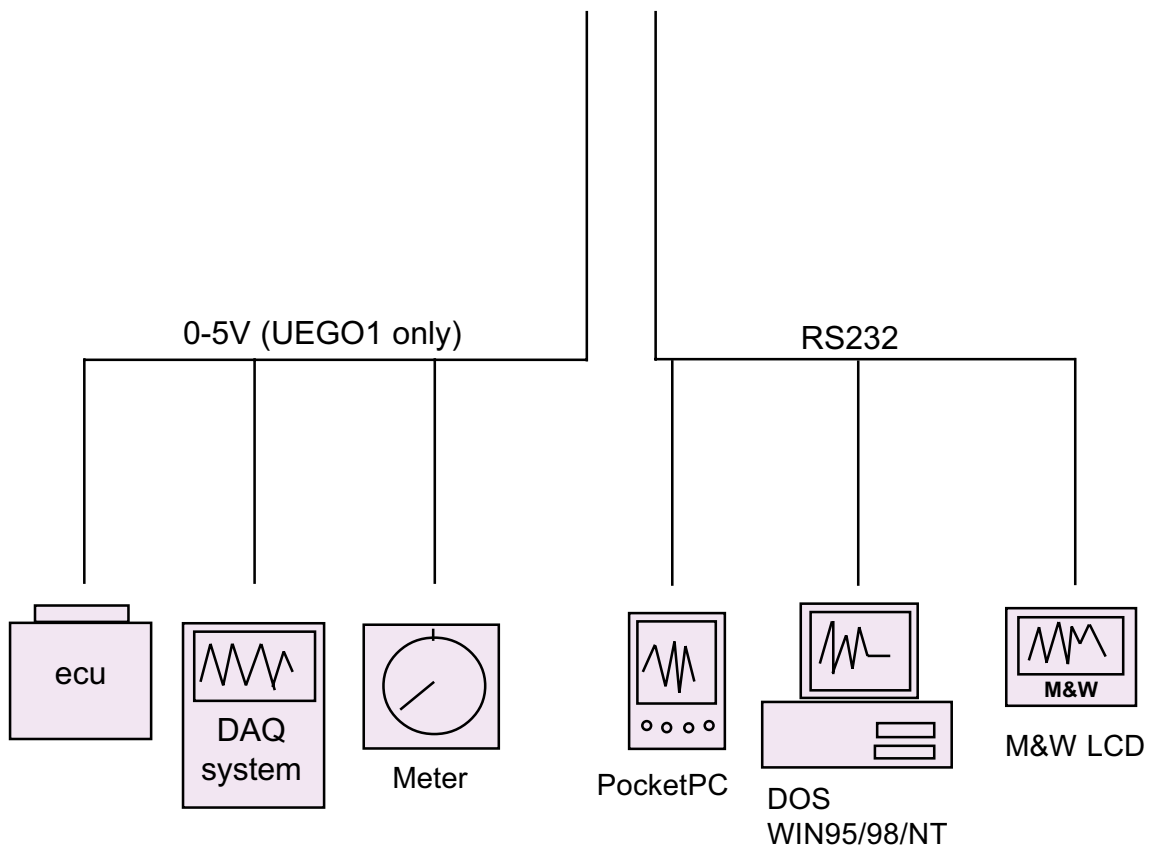
### DO NOT

- (1) **Do not operate the sensor with high lead content fuels as this may reduce the sensor life to 50 hours.**
- (2) **Avoid tuning in the rain as this can cause excessive thermal shock to the sensor which may destroy the ceramic element. Also when tuning boats an influx of water into the exhaust will destroy the sensor if it is immersed.**
- (3) **Generally do not run the engine with the Uego installed without power applied to the controller.**

## INTRODUCTION

### Output configurations

0-5V analog output (Uego1 controller only) and RS232 ( Uego1 & 2 controller) provide common interface options.



## OPERATION

- (1) Insert probe with Uego sensor into exhaust tail pipe.
- (2) Connect controller cable through back windows, hatch or trunk.
- (3) Connect to lighter socket.
- (4) Connect meter, laptop/PC, PocketPC or M&W LCD.
- (5) Power may now be applied.
- (6) Warm up cycle will take approx 30 seconds. During this time the laptop will display "WARMUP" and if the 0-5V is connected it will be at 2.5V.
- (7) After warmup the current AFR will be displayed and tuning can commence.

**NOTE:** Do not operate engine without power to controller when sensor is in the exhaust.



Tail pipe probe has a simple clamp mounting. The cable may be installed through the rear hatch or window.

### Sensor Placement

The sensor may be removed from the tailpipe probe and mounted in the exhaust system however for all general tuning this is not necessary unless you are installing the system in an engine Dyno cell. If the sensor is to be mounted in the exhaust there is no need to place the sensor in the actual exhaust manifold as the heater has enough capacity to warm the sensor to operating temperature. Normally the sensor should be mounted at least 1 metre from the cylinder head. Contact us for specific engine dyno installations. For emission's work the sensor may be mounted in the factory position however the sensor must not exceed 800°C for any length of time, when tuning a turbo engine at full load this temperature is quite easy to reach !

### Tuning Tips

Be aware that on small capacity engines with big exhausts (eg. turbocharged 4 cyl) it is not uncommon to get erratic measurements at idle. This is due to the small amount of exhaust gas available at idle. Also a strong wind can also affect this. When backing off the throttle while decelerating, erratic readings due to the same problem can be experienced.

## SOFTWARE

### DOS

#### System Requirements

286- on

VGA

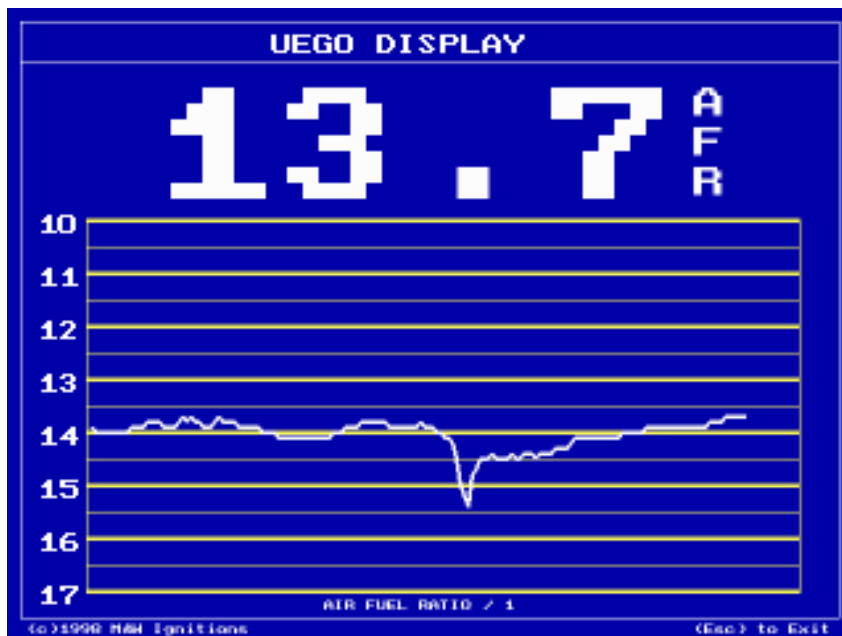
1 X Serial port (Com1 only)

#### Installation

The EXE file can be run from the floppy or copied to the hard disk. This program is configured for COM1 port only.

#### Operation

Connect the UEGO serial cable to the COM1 port. Power up the UEGO and run the EXE the message "UEGO ONLINE" should appear in the top right hand corner of the screen. If not then the UEGO system is not powered or the serial cable is not connected to the correct serial port (most PC's have 2 serial ports also most laptops have 1 serial port and this is normally configured as COM1). If online the screen will display "WARMUP" for approximately 30 seconds and then the graph trace will begin. Lambda or Air Fuel Ratio display may be selected. The supply voltage is displayed if this goes below 12V the heater may not reach the correct temperature.



## SOFTWARE

Windows 95/98/NT/2000

### System Requirements (Min)

486 DX2 50Mhz

VGA

1 X Serial port

### Installation

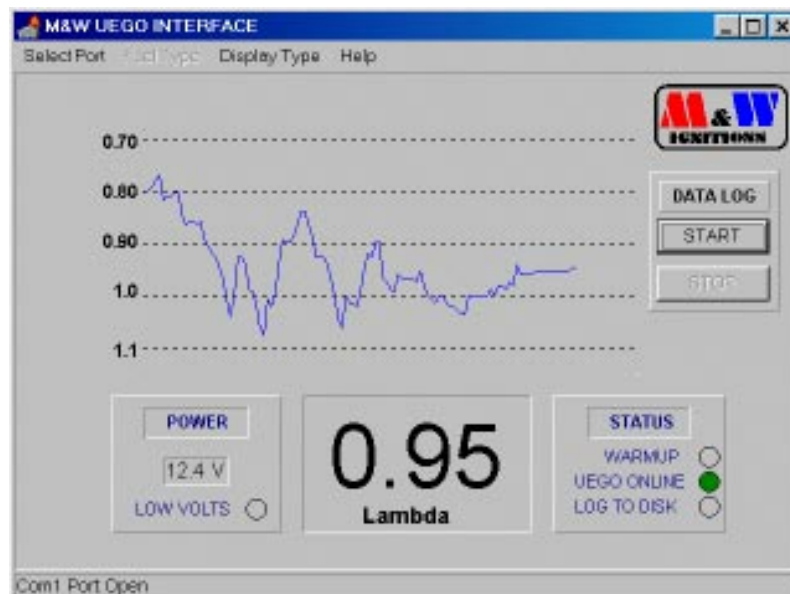
The EXE file can be run from the floppy or copied to the hard disk. There are no DLL's or other files to install.

### Operation

Connect the UEGO serial cable to the desired comm port (1 to 4). Power up the UEGO and run the EXE the "UEGO ONLINE" indicator should be green.

(Note: The software defaults to COM1 so if using a different port select it from the "SETUP" pull down menu.) If not then the UEGO system is not powered or the serial cable is not connected to the correct serial port (most PC's have 2 serial ports also most laptops have 1 serial port and this is normally configured as COM1). If online the screen will display "WARMUP" for approximately 30 seconds and then the graph trace will begin. Various fuel types and Lambda or Air Fuel Ratio display may be selected. The supply voltage is displayed if this goes below 12V the "Low volts" indicator will come on. This is because the heater may not reach the correct temperature at less than 12V.

Version 2.0 UegoGraph software allows logging to disk in CSV text format. The text file can then be loaded into a spreadsheet program such as Excel for analysis.



## SOFTWARE

### Pocket PC

#### System Requirements

Pocket PC

WinCE 3.0

1 X Serial port available with 9 pin connector.

#### Installation

Once the CAB file has been installed the UEGO icon should appear in the Programs Window.

#### Operation

Connect the UEGO serial cable to the serial port. Power up the UEGO and run UEGO.EXE if online the screen will display "WARMUP" for approximately 30 seconds and then the graph trace will begin. If "OFFLINE" is displayed then the UEGO system is not powered or the serial cable is not connected. Lambda or Air Fuel Ratio display may be selected. The supply voltage is displayed if this goes below 12V the heater may not reach the correct temperature.





## M&W LCD



LCD shown supplied with high quality suction cup and swivel mount.

### Installation

The four pin connector should be connected to the Uego harness. The LCD is powered by the harness so no other connections are necessary. The LCD uses the serial interface and so may be used with UEGO1 & 2 controllers.

### Operation

Power up the UEGO and if online the screen will display "WARMUP" for approximately 30 seconds and then the graph trace will begin. If "OFFLINE" is displayed then the LCD has power but there is a problem with the cable or Uego controller. The LCD will remember the last settings you used before shutdown.

'**CONT**' button to adjust the contrast if the display is hard to read.

'**FUEL**' button selects which of 5 modes the display is using Petrol(Gasoline), LAMBDA, L.P.G. (Liquified Petroleum Gas), Diesel or Alcohol.

'**HOLD**' button freezes the display for analysis, by pressing the button a second time the display clears and the trace starts over.

'**INVT**' button reverses the display foreground and background colours for ease of viewing during changing conditions.

The button on the lower left of the screen activates or deactivates the digital display window. With the digital display inactive the sampling rate for the main trace is approximately 21 samples/second and with the digital display active this drops to approximately 15 samples/second.

### NOTE

(1) Only use your finger on the touch screen, never use any metal object or sharp implement that may scratch.

(2) Never leave the display hanging from the suction cup unattended as changes in temperature and air pressure may cause it to fall.

## UEGO SENSOR

### The wide range sensor

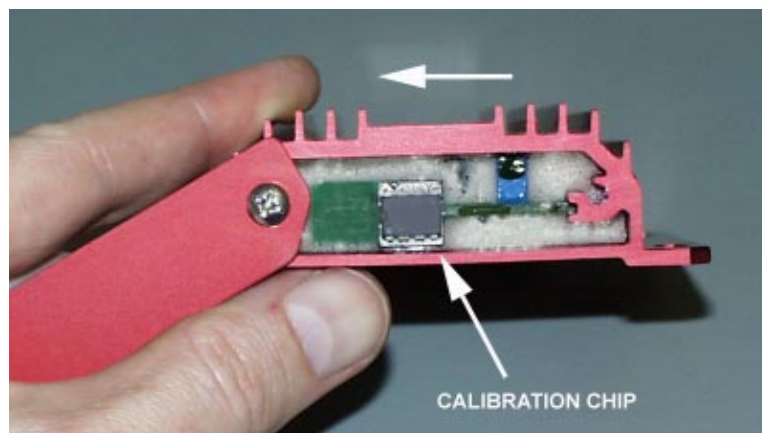
The sensor uses a special pumping cell which gives a current output depending on the air fuel ratio. This is completely different to a “normal” oxygen sensor. The pumping cell design allows measurement of air fuel ratios over the whole range whereas a “normal” oxygen sensor is only capable of measuring a small range either side of 14.7/1 air fuel ratio. Each wide range sensor is calibrated and supplied with a calibration chip which can be easily changed should a replacement sensor be required.

**Note:** the sensor contains a ceramic module and should not be subject to mechanical or thermal shock or it may be damaged.



### Replacement Sensors

Each sensor is individually calibrated and comes with a calibration chip which can be easily changed by removing the controller end plate. The chip should be installed with the correct orientation as shown below.



## STANDARD UEGO2 KIT COMPONENTS

Standard UEGO2 Kit contains:

- 1 X UEGO2 controller (with RS232 only).
- 1 X main wiring harness with lighter plug.
- 1 X RS232 cable.
- 1 X stainless steel tail pipe probe.
- 1 X operators manual.
- 1 X UEGO sensor.
- 1 X 3.5" disk with PC software (95/98/NT and DOS) (PocketPC available by request).
- 1 X aluminium carry case.

MAIN WIRING HARNESS



CARRY CASE

UEGO SENSOR



RS232 CABLE



UEGO CONTROLLER



TAIL PIPE PROBE



## PROFESSIONAL UEGO1 KIT COMPONENTS

UEGO1 Professional Kit contains:

- 1 X UEGO1 controller (with RS232 and 0-5V output)
- 1 X main wiring harness with lighter plug.
- 1 X RS232 cable
- 1 X stainless steel tail pipe probe
- 1 X M&W LCD with swivel mount and suction cup
- 1 X operators manual
- 1 X UEGO sensor
- 1 X 3.5" disk with PC software (95/98/NT and DOS) (PocketPC available by request).
- 1 X High quality Pelican carry case



M&W LCD

RS232 CABLE



PELICAN CARRY CASE



MAIN WIRING HARNESS



UEGO SENSOR



UEGO CONTROLLER



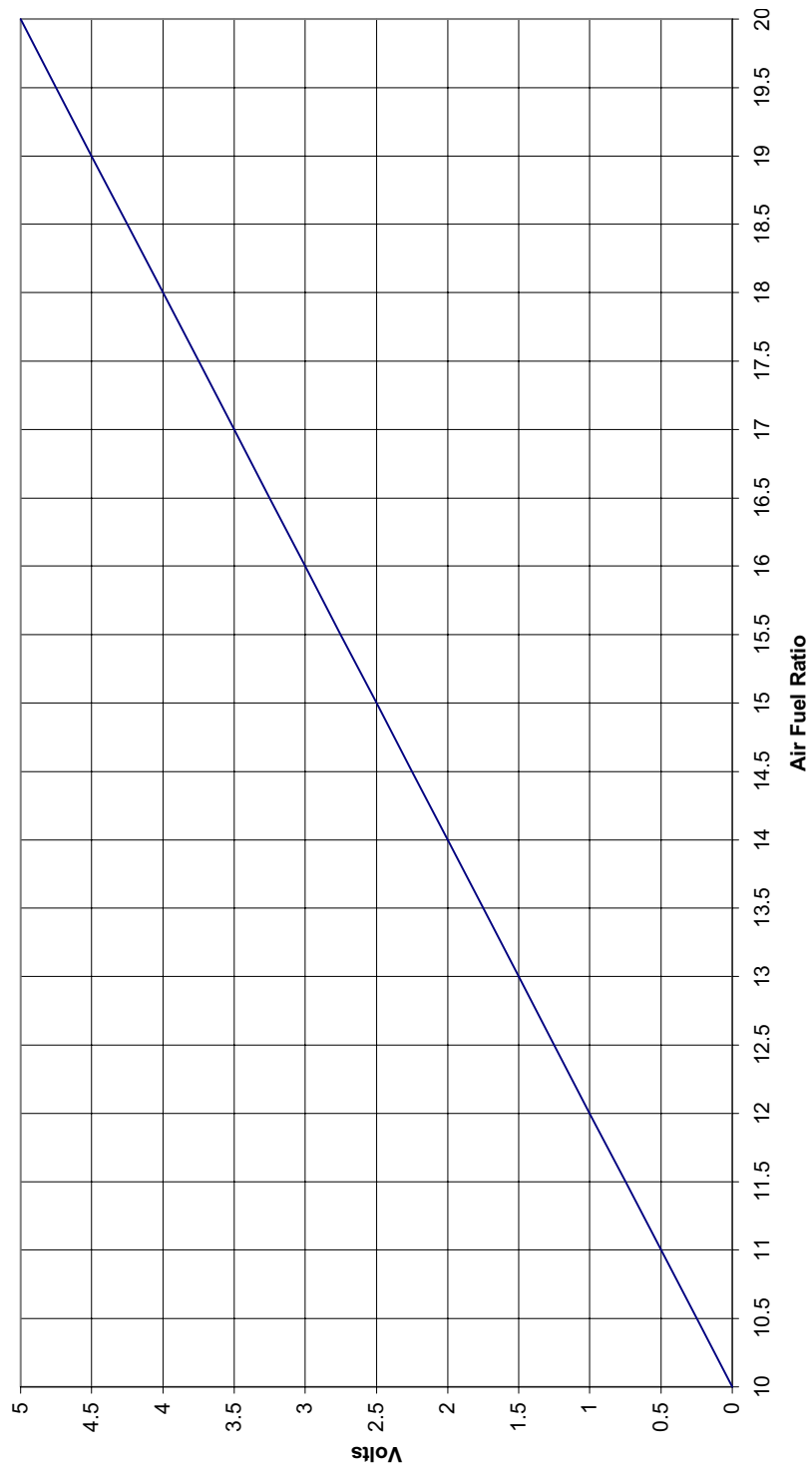
TAIL PIPE PROBE



## Output Scaling

$$\text{AFR} = (\text{volts} \times 2) + 10$$

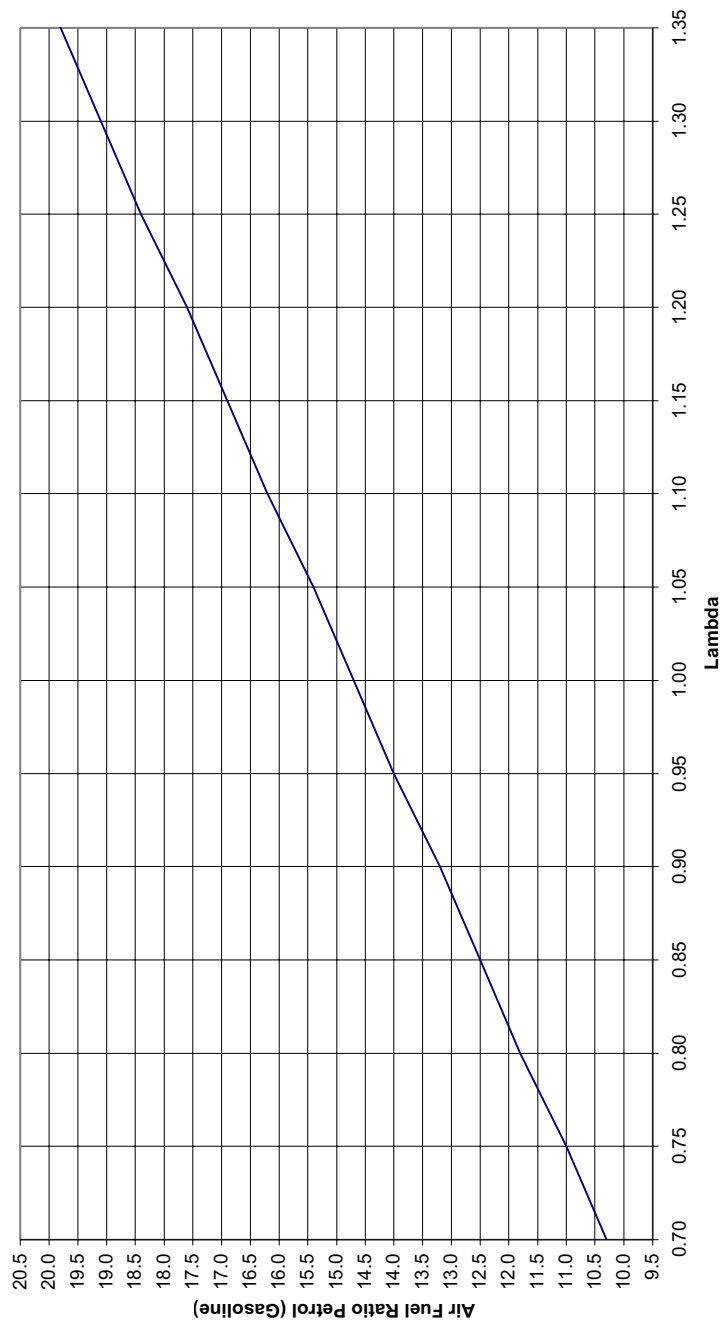
M&W Uego Controller Analog Output



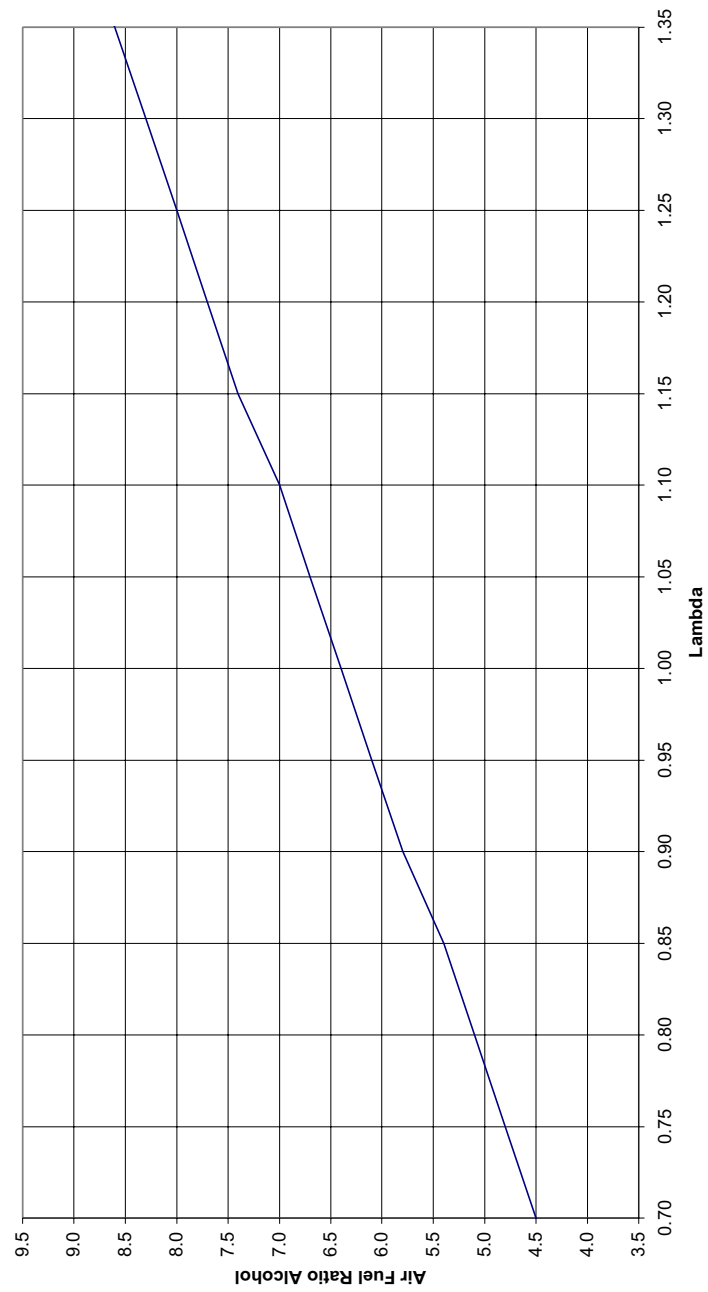
[www.mwignitions.com](http://www.mwignitions.com)



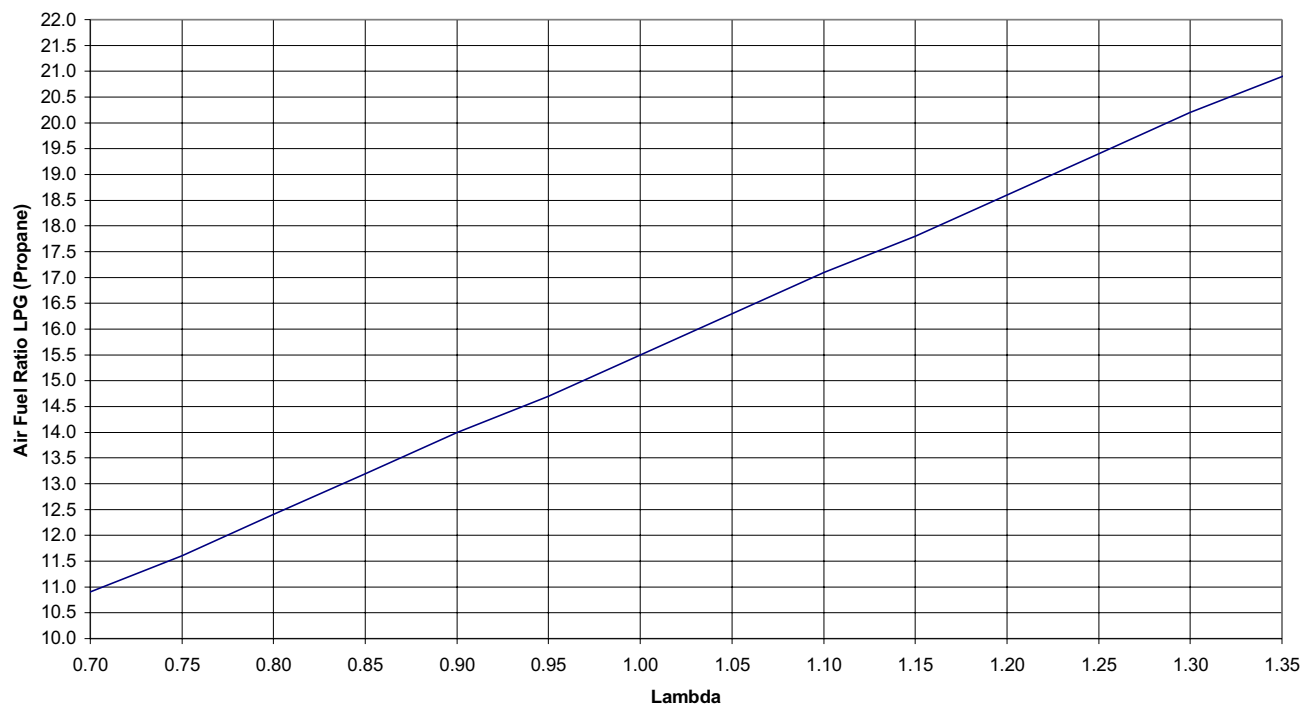
Lambda Chart for Petrol (Gasoline)



Lambda Chart for Alcohol

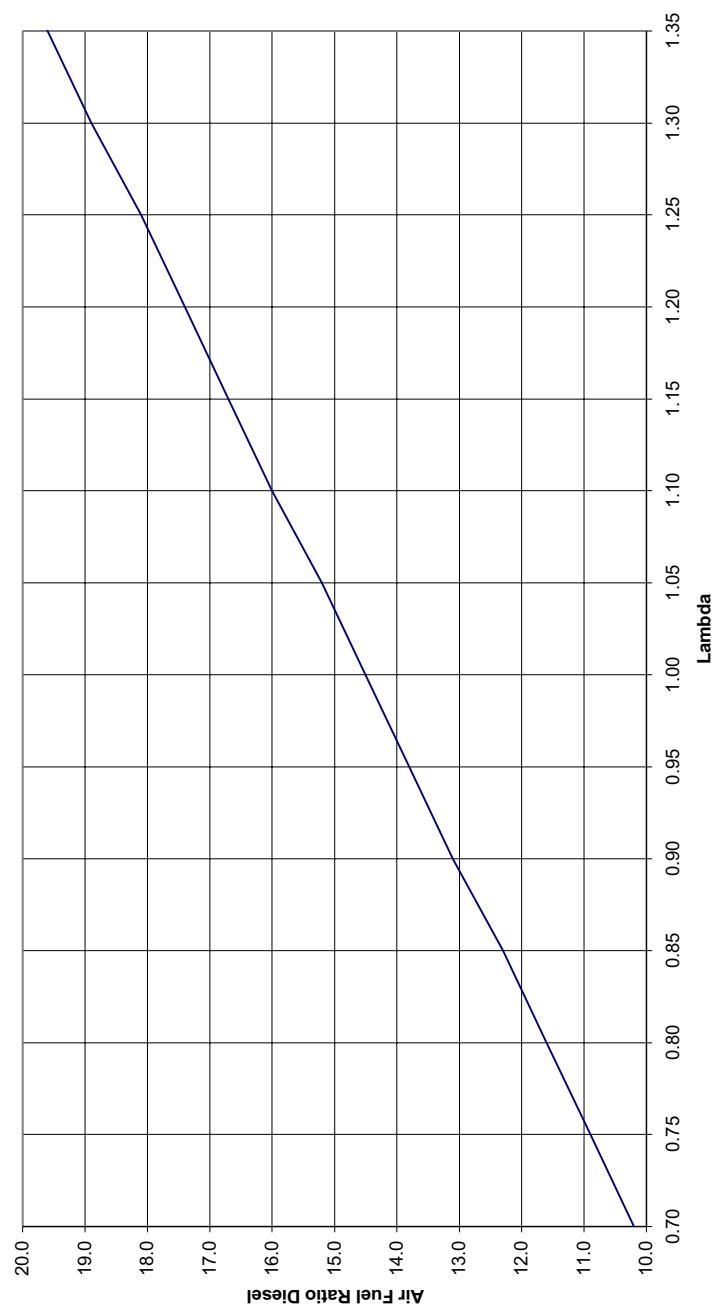


Lambda Chart for LPG (Propane)





Lambda Chart for Diesel



## SPECIFICATIONS

### CONTROLLER

**Processor:**

8 bit with Eeprom calibration chip

**Supply voltage:**

12 to 15 volts DC (negative ground only), 200mA (controller only).

**Weight:**

330 grams

**Dimensions:**

Width 88mm

Length 105mm

Height 27mm

**Inputs:**

1 X Uego sensor

1 X supply voltage (internal)

**Outputs:**

1 X RS232 port

1 X 8 bit DAC 0-5 volt DC analog output (UEGO1 controller only)

**Measuring range:**

10 to 20/1 air fuel ratio (petrol/gasoline)



### SENSOR

**Type:**

NGK LH1 wide range 5 wire sensor. (Exhaust temperature should not exceed 800°C)

**Warmup time:**

approx 30 seconds @ 25°C ambient

**Weight:**

85 grams

**Heater Current:**

1.5A at 12.8V approx. warm

Note: 12V min recommended

**Mounting:**

M18 X 1.5 thread



**NOTE:** sensor is not rated for continuous operation on high lead content fuels. Operation in this mode may limit sensor life to approximately 50 hours.

**System accuracy:**

+/- 0.15 @ 10:1 AFR, +/- 0.025 @ 14.7 AFR, +/- 0.25 @ 20:1 AFR

**Controller Repeatability:**

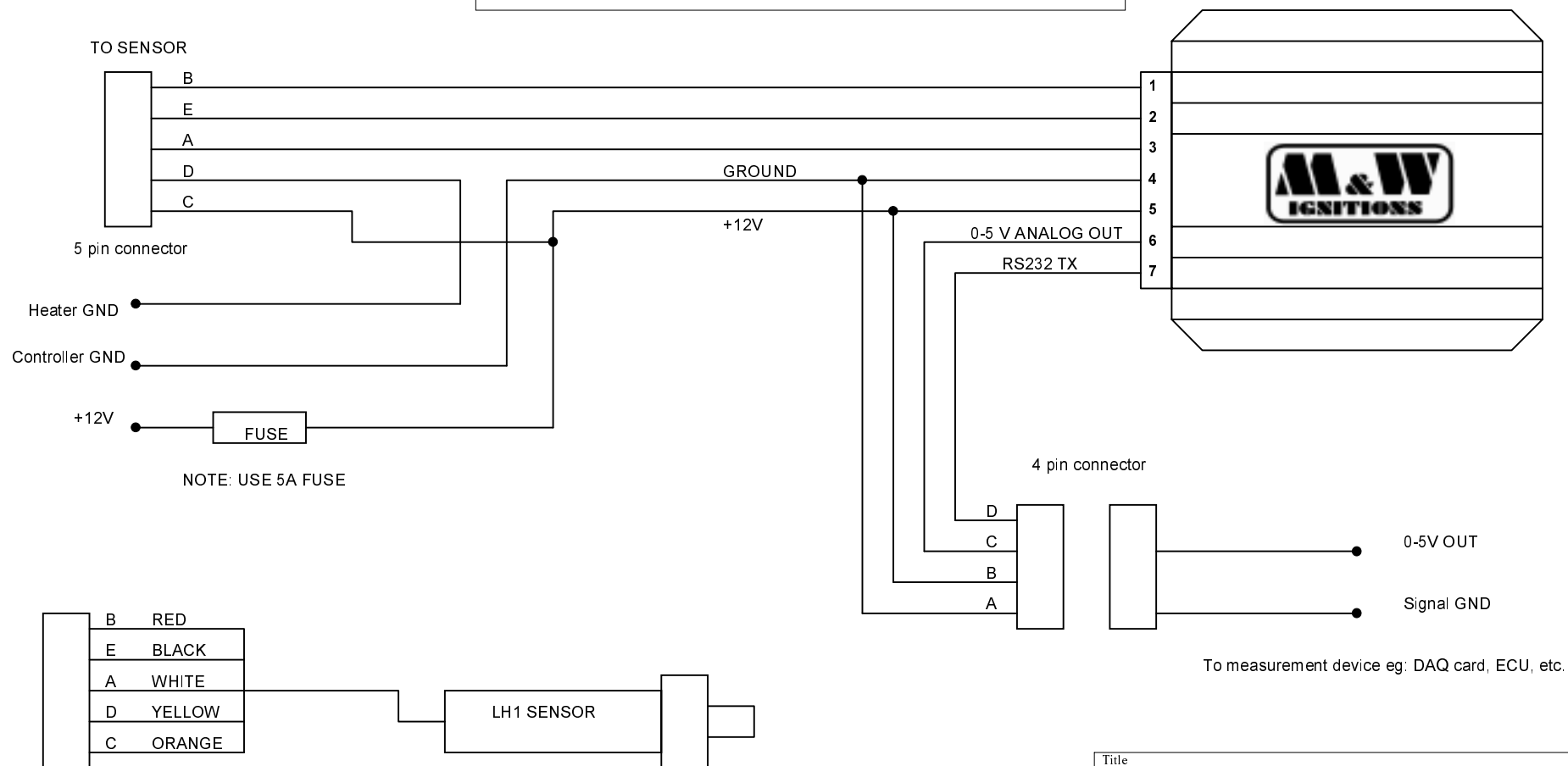
+/- 0.01 10-20:1 AFR



Note: 5A fuse in lighter plug

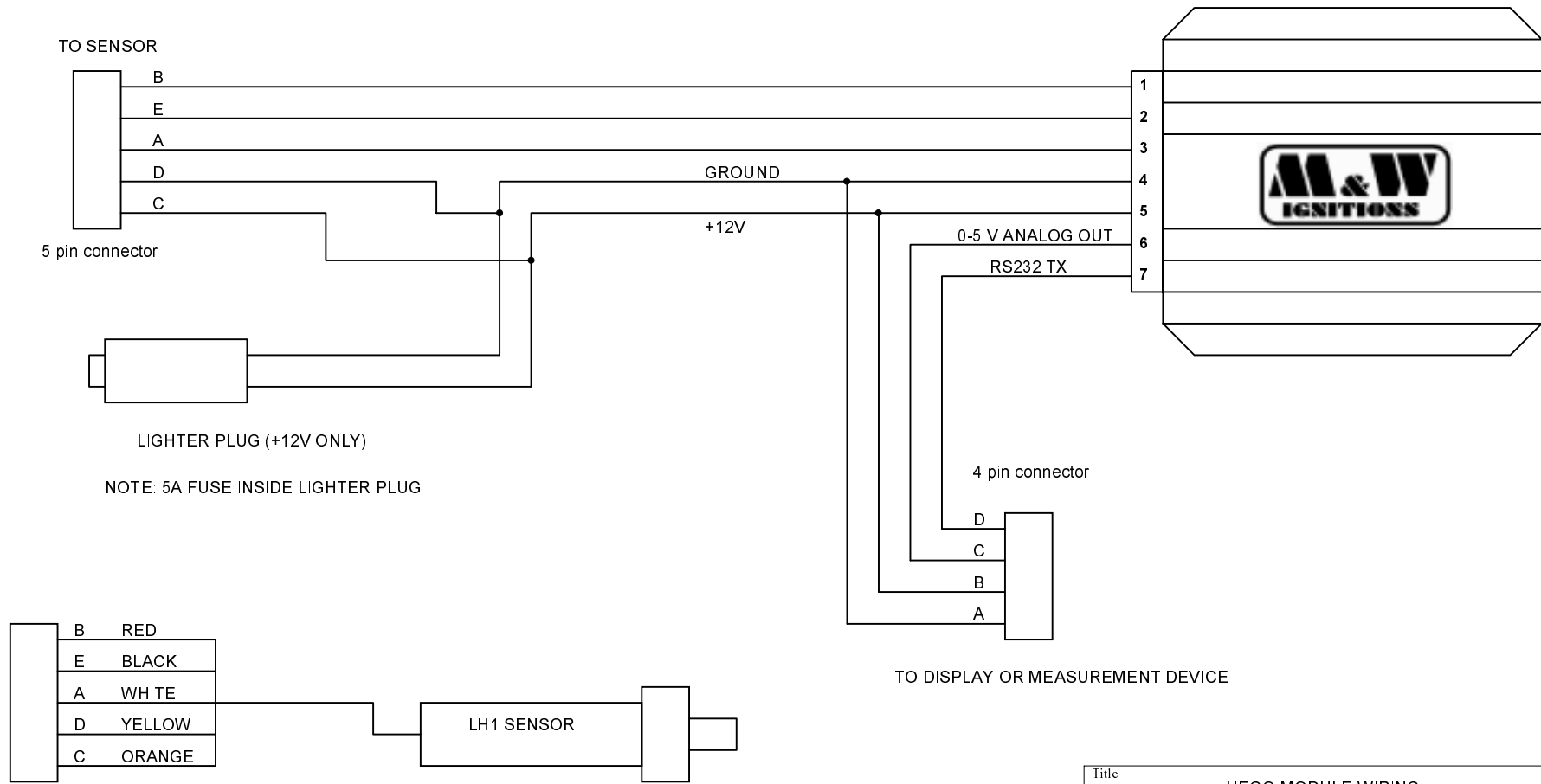
**RECOMMENDED UEGO WIRING FOR HARD WIRED SYSTEMS SUCH AS DYNAMOMETER OR RACE CAR.**

**NOTE: To reduce ground loop errors when using equipment with non-differential inputs the heater ground wire and controller ground should be connected to ground separately as shown.**



Title				UEGO MODULE HARD WIRING			
Size		Number				Revision	
A4		WIR002				1.0	
Date:		26-Jul-2001			Sheet 1 of 1		
File:		CAM&WUEGO\Uego Dyno Harness.Sch			Drawn By:		MRB

# UEGO WIRING DIAGRAM



Title			UEGO MODULE WIRING	
Size	Number	Revision		
A4	WIR001	1.0		
Date:	10-May-2001	Sheet	1 of 1	
File:	CAM&W\UEGO\Uego Harness.Sch	Drawn By:	MRB	