NTK2500
UEGO OPERATORS
MANUAL

CONTENTS

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INTRODUCTION

The NTK2500 Uego system uses a Universal Exhaust Gas Oxygen 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 **linerized real time 0 to 5 volt analog output** giving 0.65-2.01 Lambda.
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 USB adapter allows connection to computers and laptops with Win7-10 using the M&W software. Models with CAN bus allow connection the ECU's and other devices. 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.

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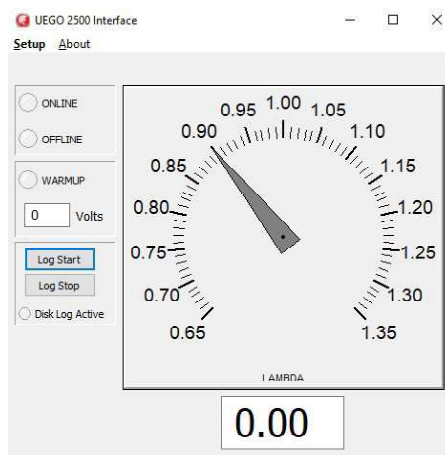
Output configurations

0-5V analog output, USB and CAN provide common interface options.

CAN   ECU

0-5V Output   USB

ECU   DAQ   Meter   Windows 7-10
               system
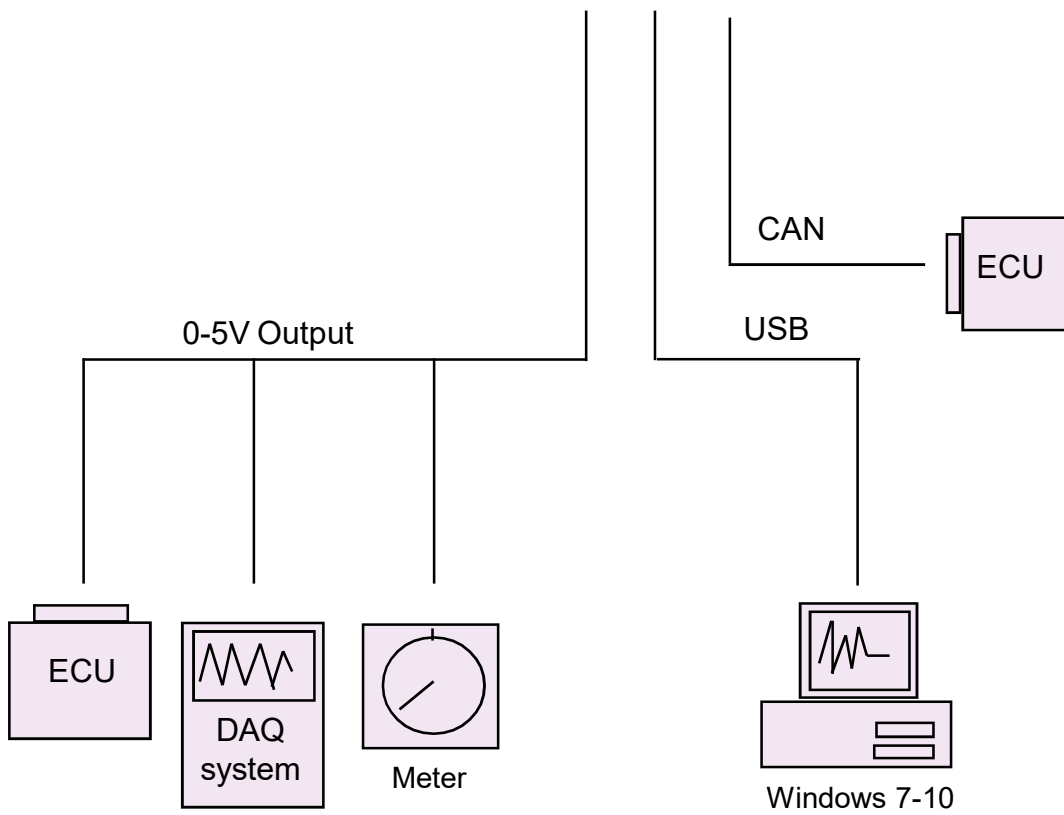
UEGO SENSOR

NTK Uego sensor has a eight pin connector
but only 5 wires are required.

Sensor Wiring

Gray	Vs+
Black	Ip-
White	Ip+
Blue	Heater
Yellow	Heater ground

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

DO NOT

(1) Do not operate the sensor with high lead content fuels as this may reduce the sensor life to under 50 hours.
(2) Influx of water into the exhaust will destroy the sensor if it is immersed.
(3) Do not run the engine with the Uego sensor installed without power applied to the controller.

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.

The sensor should NOT be mounted in the exhaust manifold of a turbo charged engine. **For turbo charged applications it must be installed after the turbo charger**.

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 exhaust manifold factory position (normally aspirated only) however the sensor must not exceed 800°C for any length of time.

For installations using the analog 0-5V output to connect to other devices such as DAQ systems, ECU's and other measuring devices the dyno/hardwired wiring harness should be used as this separates the sensor heater ground to eliminate ground loops. **Note:** however if you have a differential input available on your measuring device the lighter socket wiring harness could still be used.

If used in an engine dyno a suitable regulated +13.8V DC 3A supply must be provided.

Tail pipe probe can be used with a suitable clamp mounting. The cable may be installed through the rear hatch or window.

Pre-Post Catalyst Issues

Contrary to popular belief usable results can be obtained post catalyst. For ECU mapping for emissions compliance and for monitoring of pertibation pre-catalyst measurment must be used. A suitable threaded bung must be welded into the exhaust system before the catalytic converter to allow installation of the sensor. However for quick non intrusive general tuning post catalyst with the tailpipe probe works ok. Why is this so? For full load tuning the catalyst is overwhelmed and has minimal effect on the measurement. Note: Actual AFR may be up to 0.3 AFR richer than the tailpipe measurment indicates.

(1) Mount Uego sensor into exhaust manifold or exhaust pipe.
(2) Connect controller cable
(3) Connect to suitable +12V power supply
(4) Connect Meter, DAQ system, Laptop/PC.
(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.

Tuning Recommendations

It is outside the scope of this document to describe correct tuning or engine mapping techniques however the following gasoline 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 with a tailpipe probe 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.

Tuning Tips

Be aware that on small capacity engines when using the tailpipe probe 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.

CALIBRATION

Use a multimeter to measure the resistance value of the calibration resistor in the connector. Select "Sensor Setup" and enter the value in ohms. For example if it was 6.3K ohms you would enter 6300 ohms.
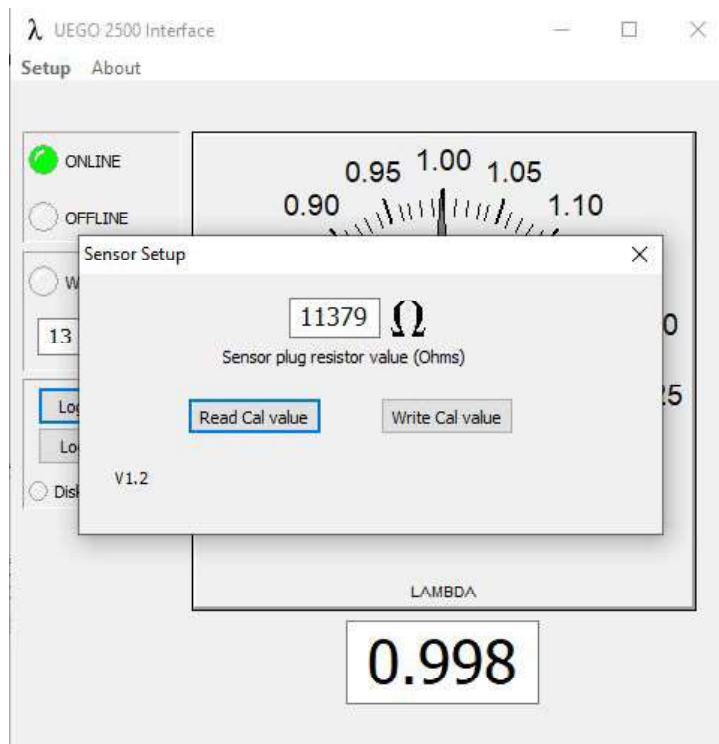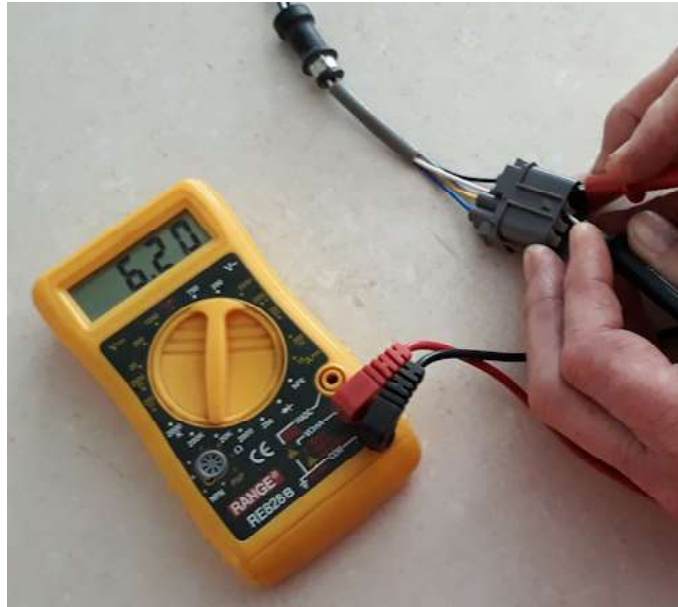
Windows 7-10

System interface
1 X M&W USB cable. Note: you must use the M&W USB cable supplied.

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

Operation
Connect the UEGO USB cable and select the desired comm port using the "pull down" menu. Power up the UEGO and the "UEGO ONLINE" indicator should be green. If not then the UEGO system is not powered or the serial cable is not connected to the correct port. If online the screen will display "WARMUP" for approximately 30 seconds. At the finish of warmup the Lambda value will be displayed. The supply voltage is also displayed. The software allows logging to disk in CSV text format. The text file can then be loaded into a spreedsheet program such as Excel for analysis. You can also change the CAN speed and CAN message ID.
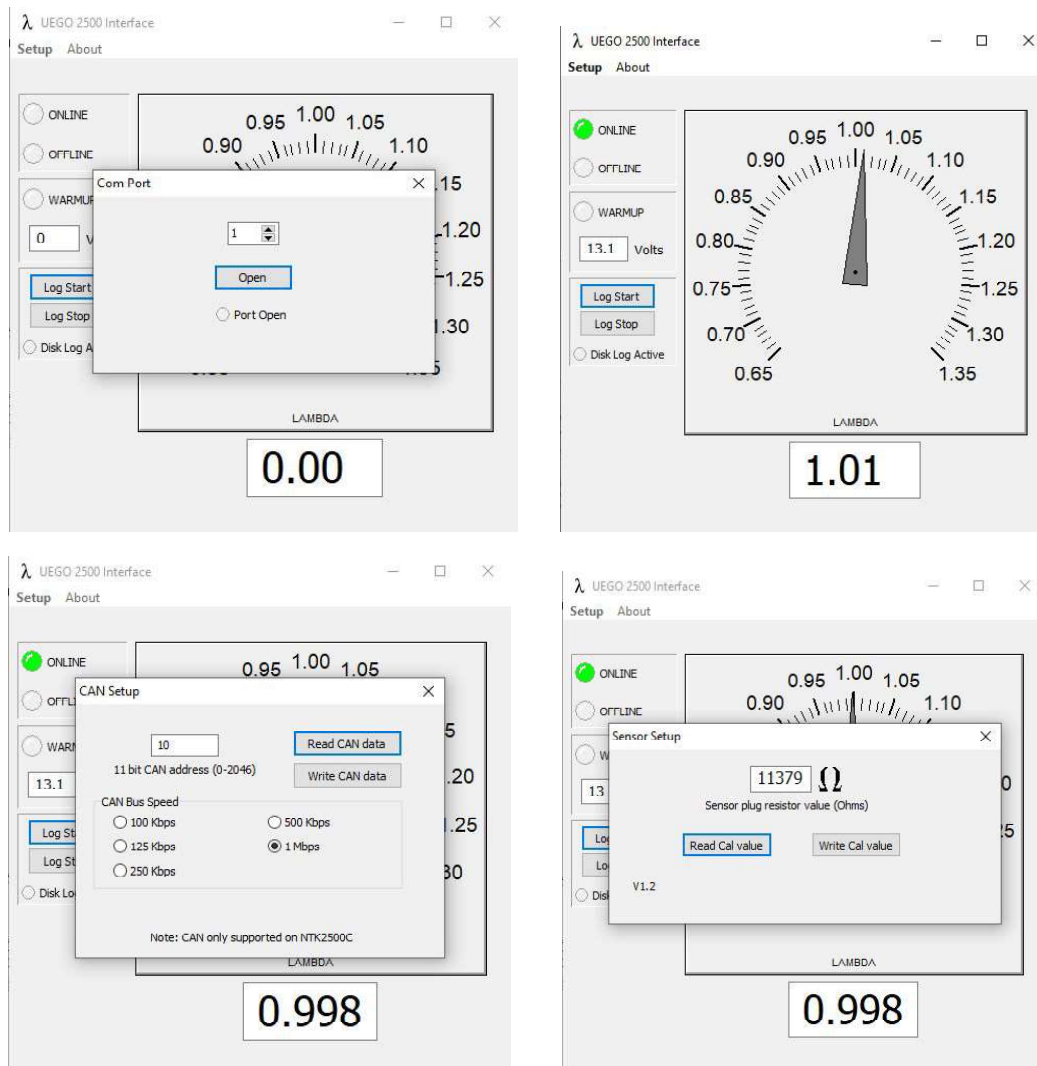
SPECIFICATIONS

CONTROLLER

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 M&W USB interface   1 X CAN
1 X 12 bit DAC 0-5 volt DC analog output
Measuring range:
0.65 - 2.01 lambda

SENSOR

Type:
NGK L1H1 or L2H2 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 continous operation on high lead content fuels. Operation in this mode may limit sensor life to approximately 50 hours.
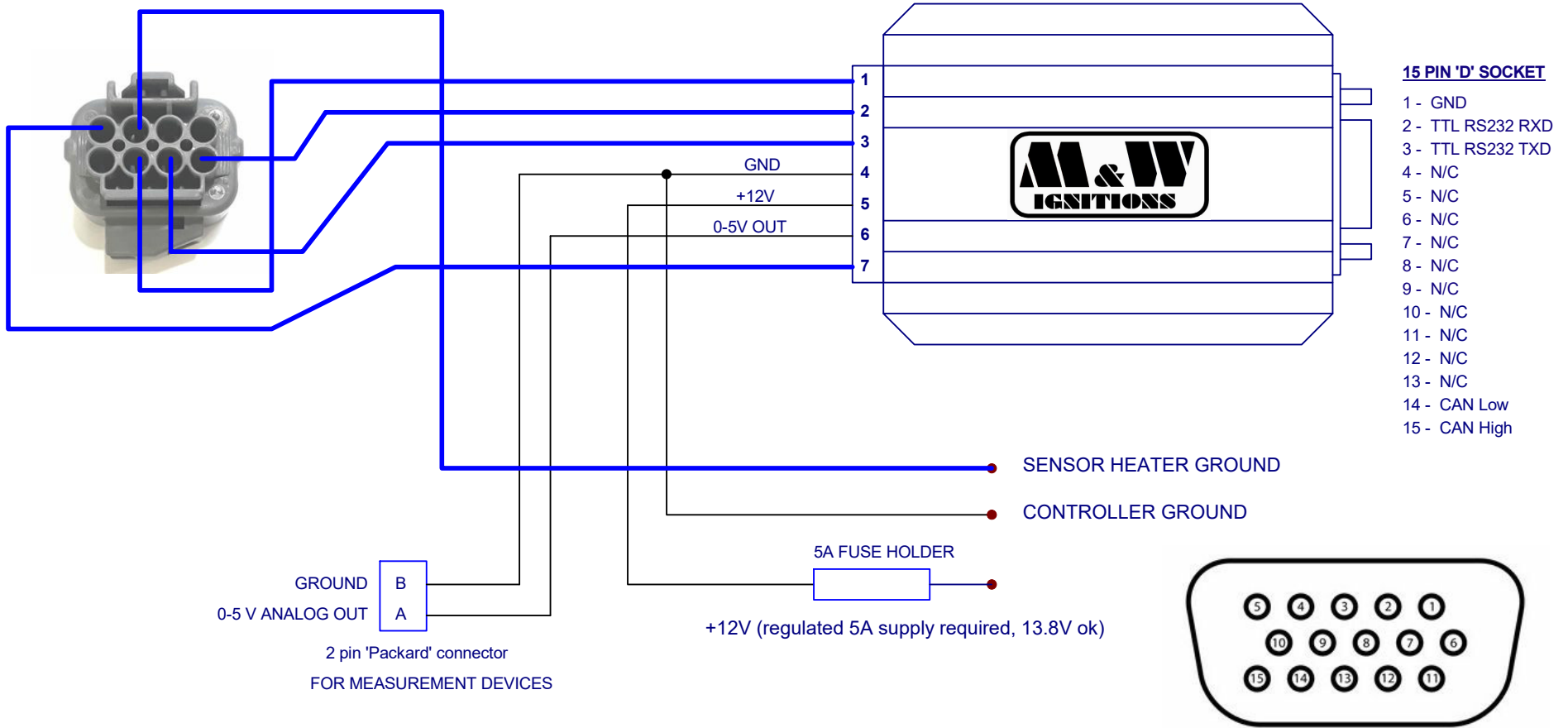
System accuracy:
+/- 0.15 @ 10:1 AFR, +/- 0.025 @ 14.7 AFR, +/- 0.25 @ 20:1 AFR
Controller Repeatability:
+/- 0.01 10-20:1 AFR

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

UEGO SENSOR WIRING

1
2
3
4 GND
5 +12V
6 0-5V OUT
7

15 PIN 'D' SOCKET

1 - GND
2 - TTL RS232 RXD
3 - TTL RS232 TXD
4 - N/C
5 - N/C
6 - N/C
7 - N/C
8 - N/C
9 - N/C
10 - N/C
11 - N/C
12 - N/C
13 - N/C
14 - CAN Low
15 - CAN High

SENSOR HEATER GROUND

CONTROLLER GROUND

5A FUSE HOLDER

GROUND   B
0-5 V ANALOG OUT   A

2 pin 'Packard' connector

FOR MEASUREMENT DEVICES

+12V (regulated 5A supply required, 13.8V ok)

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.

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Size	Number	Revision
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