

AUTRONIC MAFM1 B version

- UEGO Sensor calibration

UEGO Sensors supplied by Autronic are pre-calibrated, but when initially connected to MAFM1, operating with its factory default settings may produce less than optimal air-fuel ratio measurement accuracy.

Without any additional calibration, accuracy is always high at $\lambda = 1$ but can deteriorate as air-fuel ratio departs from $\lambda = 1$. Measurement accuracy away from $\lambda = 1$ can be optimized by performing a system calibration using ambient air that will eliminate residual sensor and meter errors.

Therefore air calibration SHOULD be performed prior to initial use, after sensor replacement and should also be repeated periodically to compensate for sensor ageing and changes to ambient conditions.

Several different calibration procedures are possible. The procedure chosen depends upon the intended application and the availability of an onsite meteorological (weather) station.

Method 1 requires minimal technical expertise and time, and is adequate for general performance engine tuning.

Method 2 requires a weather station, basic mathematical skills and a computer or scientific calculator; this method produces the best accuracy. It can maintain measurement accuracy when ambient air conditions change without having to remove the sensor from the exhaust to perform an 'air calibration'. This is the preferred method when best accuracy is required and the sensor cannot be removed from the engine exhaust during extended test sessions.

Method 1 - BASIC. No weather station required.

Expose the UEGO sensor to uncontaminated ambient air (i.e.: remove from exhaust) for at least 10 minutes. While 'Air' is displayed, simultaneously press the 2 right-hand front panel push-buttons to complete air calibration. If after this 10 minute wait the meter fails to display 'Air', it will either display 'SENSOR FAULTY' or an Air-fuel ratio (or λ) reading.

If 'SENSOR FAULTY' is displayed then increase Fn 11 'UEGO Air Cal O2 %' setting until 'Air' displays. If 'SENSOR FAULTY' still displays after Fn 11 'UEGO Air Cal O2 %' setting has been increased to its maximum (22%), a meter or wiring harness failure or connection of the wrong sensor type error condition is indicated.

If an air-fuel ratio (or λ) reading is displayed then decrease Fn 11 'UEGO Air Cal O2 %' setting until "Air" displays. If an air-fuel ratio (or λ) reading is still displayed after Fn 11 'UEGO Air Cal O2 %' setting has been decreased to its minimum (18%), then it is likely that the sensor is degraded (usually poisoned by leaded fuel) and should be replaced, or the ambient air pressure is too low (i.e. Air calibration is being attempted at an altitude exceeding 1500 metres).

To maintain accuracy repeat the procedure daily.

Method 2 - RECOMMENDED. Requires a weather station.

Preparation.

Measure the local air Temperature, relative humidity & pressure. Use the following formula to calculate an O2% value. Set the meter Fn 11 'UEGO Air Cal O2 %' to this value.

$$O2\% = 20.9 * (P - RH\%/100 * 10^{(8.07131 - \frac{1730.63}{233.426 + T})}) / 760$$

Where

T = Ambient air temperature in deg C (range 1 to 60 deg C)

P = Ambient air pressure in mm of Hg (use local pressure at test site not barometric pressure reported by meteorological office)

$RH\%$ = Ambient air relative humidity %

Expose the UEGO sensor to uncontaminated ambient air (i.e.: remove from exhaust) for at least 10 minutes. While 'Air' is displayed, simultaneously press the 2 right-hand front panel push-buttons to complete air calibration. If after this 10 minute wait the meter fails to display 'Air', it will either display 'SENSOR FAULTY' or an air-fuel ratio (or λ) reading.

If 'SENSOR FAULTY' is displayed this is an indication of meter or wiring harness failure or connection of the wrong sensor type.

Display of an air-fuel ratio (or λ) reading indicates that the sensor is degraded (usually poisoned by leaded fuel) and should be replaced or the ambient air pressure is too low (i.e. Air calibration is being attempted at an altitude exceeding 1500 metres).

Normal use.

Daily or whenever ambient air conditions change measure ambient air conditions, then use equation to calculate O2% and set the meter Fn 11 'UEGO Air Cal O2 %' to this value.

!!!! IMPORTANT!!!! DO NOT INITIATE AN 'AIR CALIBRATION' BY SIMULTANEOUSLY PRESSING THE 2 RIGHT-HAND FRONT PANEL PUSH-BUTTONS

If sensor ageing or degradation is suspected (e.g. Sensor has been overheated or contaminated), remove the sensor from the exhaust and repeat the 'preparation' step above.