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ULTRA TUNE Gas Analyser User Manual

1.0 Before Starting

Congratulations on your purchase of the 4 Gas ULTRA TUNE Exhaust Gas Analyser.
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The software described in this document is furnished under a license agreement and may be used only within the constraints of the license agreement. These constraints are as follows :
a. A single license of the Gas Analyser Software is implicitly supplied upon your purchase of the Gas Analyser Unit. Use of more than one Gas Analyser Unit off the same license is prohibited.
b. Disassembly or reverse engineering of the software in any form or means is prohibited.
c. The licensee may make a copy of the software for backup purposes only.
d. The licence issued is specific to each Gas Analyser. The licensee may therefore install the software on as many computers as desired.

2.0 Getting Started

2.1 Brief System Overview

Two versions of the ULTRA TUNE Gas Analyser are available:
a. Gas Analyser and PC contained within single cavity housing.
b. Gas Analyser only contained within single cavity housing. Includes external PC interconnection cable.
Depending on your choice of the above it may be required for you to interconnect the communication cable between the PC and the Gas Analyser. Please see paragraph 2.2 for more details.

The analyser is shipped as standard with the ability to measure the concentration of 4 basic emission gases as follows :

a. Carbon Monoxide	-	In percent of total sample volume (%)
b. Carbon Dioxide	-	In percent of total sample volume (%)
c. Oxygen	-	In percent of total sample volume (%)
d. Hydro-Carbons	-	In parts per million Hexane / Propane (ppm)

Additional measurements that may be included at a increased cost by customer request are as follows :
a. NOx gas concentration
b. Engine RPM
c. External Temperature

These measured values are used to calculate the Lambda Reading (λ) in real time using the internationally accepted “Brettschneider Formulae” and display it on the PC screen. A correctly tuned motor should result in a Lambda reading of 1.00 although this is considered an optimum value. Please see paragraph 3.5 for further details.

The Gas-Analyser uses an extensive array of built in test facilities to ensure sustainable accuracy and long term reliability. Automatic Zero-Calibration is periodically performed to reduce short term inaccuracies even further. The user may monitor the zero-calibration sequence by observing the cycle on the PC screen. A maintenance scheduled reference gas calibration is required approximately every year, depending on the frequency of operation of the unit during that period. Please refer to your dealer for further details.
The CO, CO_2, HC readings are measured using an infrared spectrometer located within the analyser, while the O_2 readings are measured using a chemical sensor module. The result is a reliable and repeatable measurement of the principle gas concentrations required to perform a Lambda calculation.

2.2 Electrical Interconnection with External Personal Computer

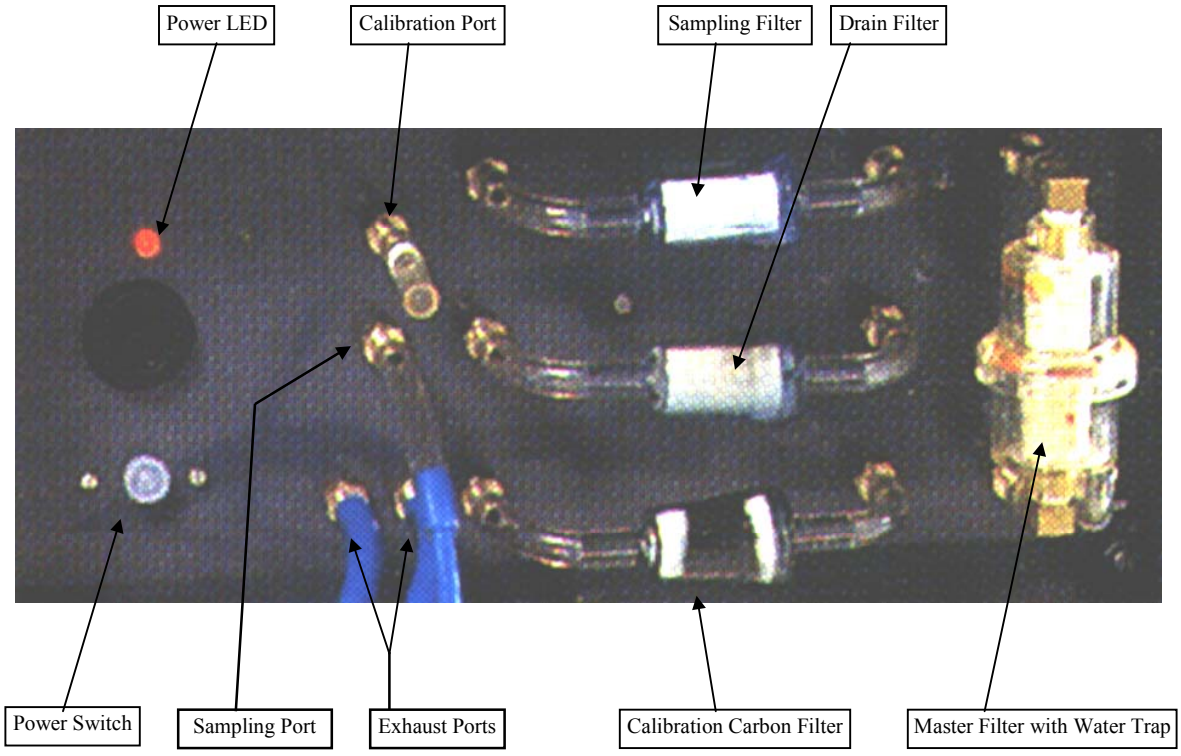
The Ultra-Tune Gas Analyser communicates with an external Personal Computer via a single standard RS232 communications port only. Most modern PC's are supplied with at least 2 RS232 communications ports located on the rear panel assembly. It is recommended that the user connects a mouse or alternative pointer control device to the 9-pin COM port connector leaving the 25-pin COM port available for connection to the Gas Analyser. In the event that the connectors are of the incorrect pin-count, 25-way to 9-way and vice versa, conversion adapters should be readily available from any reputable computer vendor. Alternatively, please contact your Gas Analyser supplier who will supply a conversion adapter.

2.3 Gas Interconnection

Four gas connector ports are available on the front panel assembly of the Gas Analyser. These perform functions as follows:

a. Calibration Port	-	Only used when performing calibration procedures with reference gas.
b. Sampling Port	-	The emission sample is sucked into this port from the sampling probe using negative pressure.
c. Exhaust Port 1	-	Exit port for Sampled emission gas under positive pressure.
d. Exhaust Port 2	-	Exit port for Drain cycle under positive pressure.

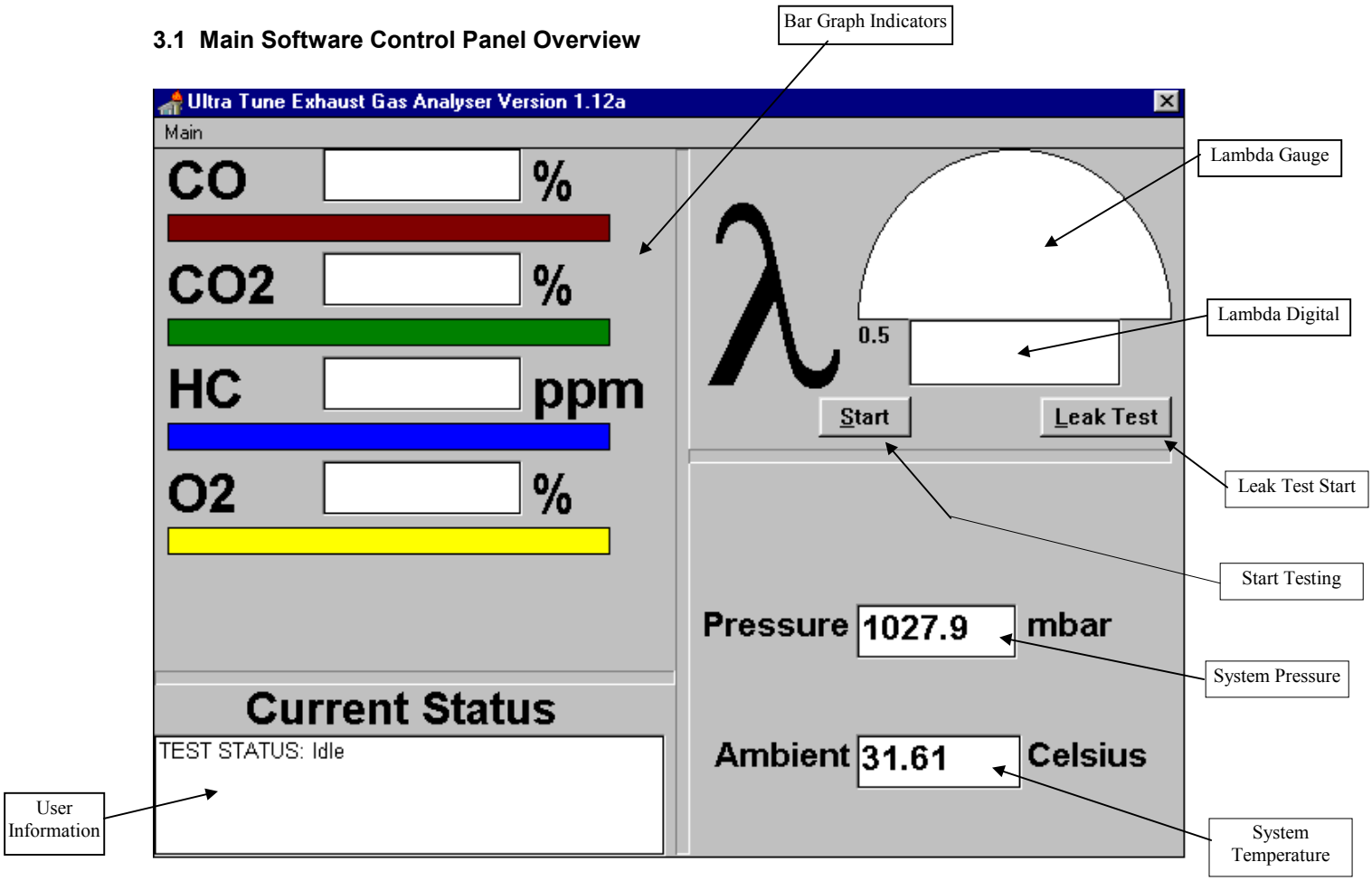
2.4 Front Panel Overview



The filters are required to prevent contamination of the gas concentration sensors within the unit and will require periodic replacement. The frequency of this replacement depends on how regularly the unit is sampling incoming exhaust gases. It is for this reason that the user is recommended NOT to leave the gas analyser sampling for extended periods of time when the measured values are not being used.

3.0 Operational Description

3.1 Main Software Control Panel Overview



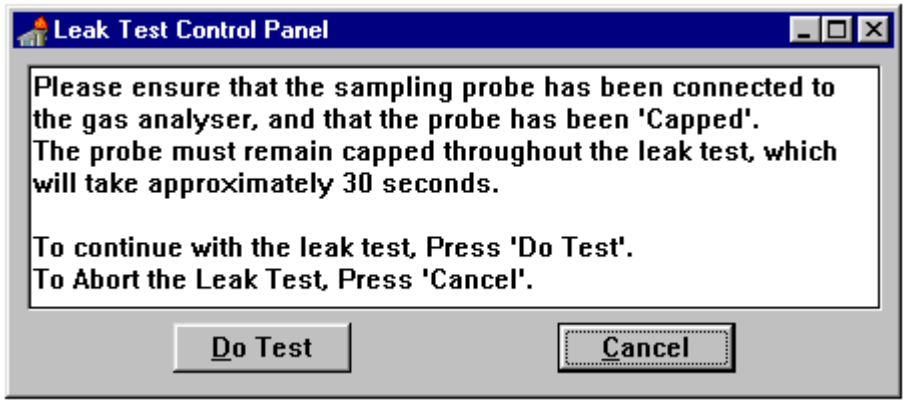
3.2 Initial Switch ON

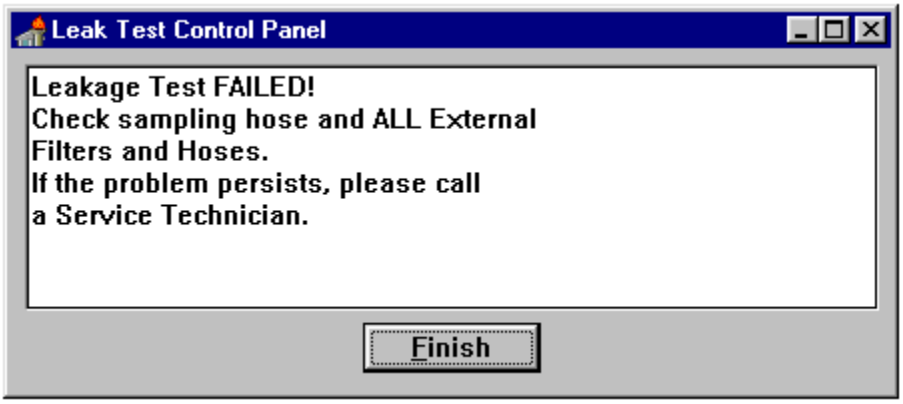
If your Gas Analyser is contained in a separate enclosure to the Computer, please ensure that the **Gas Analyser** Power is turned ON approximately 10 seconds **BEFORE** the Computer power is turned ON. This allows the Computer software to locate and identify the Gas Analyser immediately upon power up. This sequence is an **important** step to ensuring reliable communication between the Gas Analyser and the Computer.

Immediately after the Gas Analyser is powered up it will begin its warm up sequence. This can take anything between 8 and 15 minutes. This warm-up sequence is timed within the Gas Analyser system from system start-up. This means that even though the Analyser may have been running for some time, powering off and back on again will require that the warm-up sequence is repeated. It is for this reason that ULTRA TUNE recommends that the user does not cycle the power to the unit on a regular basis. The user may observe the "CURRENT STATUS" window of the main control panel to determine whether warm-up is in process. Once the warm-up has completed, the "CURRENT STATUS" will display "TEST STATUS: Idle". The Gas Analyser software will enable the **Start** button located to the left under the Lambda gauge. Sampling of the exhaust gas via the sampling probe is started by clicking this button. The user should however refer to paragraph 3.2 before clicking the **Start** button.

3.3 Leakage Testing

The Gas Analyser measures the pressure within its sampling system continuously. This pressure measurement (in mbar) may be observed on the main control panel. In order to extract certain relative gas densities, the unit needs to be confident that there are no leaks in its sampling system (Including the exhaust sampling probe). A "Leakage Test" is facilitated for this purpose. This test should be performed **at least once a day** by clicking the **Leak Test** button located to the right under the Lambda gauge.
A "Leak Test Control Panel" pops up with instructions to ensure that the sampling probe is attached and that its end is pressure sealed against any samples being sucked in. The user should ensure that a good seal is maintained throughout the Leakage test period (Approximately 30seconds) since the majority of Leakage test failures are as a result of inadequate sealing of the sampling probe.
The **Do Test** button should then be clicked. An internal pump will start-up and the result will be displayed in the "Leak Test Control Panel" once the test period has expired. If a failure is reported, please refer to the "Trouble Shooting" paragraph no. 4.6 of this document.





3.4 Filter Replacement

Immediately before use, the four filters located on the front panel should be inspected for excessive contamination. If excessive contamination is present , they should be replaced with an approved replacement. The Master Filter (With water trap) contaminates from the inside and contamination is therefore not immediately obvious. Please contact your supplier for details on spare filters.
Note: A "Leakage Test" must be performed after replacing any of the filters to check the seal on the flexible piping connectors.

3.5 Starting Emission Measurements

Once the warm-up and the leakage test have been completed, sampling of a vehicle exhaust pipe emission may begin. Click on the **Start** button now and the Gas Analyser will begin sampling.
Insert the probe of the Gas Analyser fully into the Exhaust Outlet. The vehicle engine temperature **must** be at normal operating temperature.
Note: Please observe the manufacturers specifications. Auto Data books will normally provide the optimum running temperature as well.

3.6 Interpretation of Measured Results

Immediately after the exhaust emission gases reach the Gas Analyser sensors, the Main Panel Bar graphs and Lambda gauge will begin to display the mixture composition.

The **IDEAL** mixture for most cars running under idling conditions is a **LAMBDA value of 1.00.** Interpretation of the Lambda value measurement in conjunction with the oxygen measurement will give the user valuable insight into the vehicles performance. Some interpretation examples are given below :

Should the measured value **EXCEED 1.00** (eg 1.40) the mixture is **TOO LEAN**.
Should the value be **LESS THAN 1.00** (eg.0.80) the mixture is **TOO RICH**.

If Oxygen content too high -	Fuel / Air Ratio may require adjustment
	Exhaust may have a leak
	Probe may not be properly seated in the exhaust outlet
	Probe may have a leak

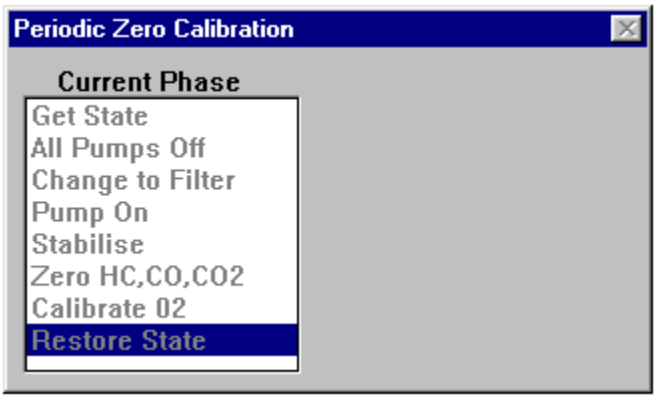
An internal (User adjustable time delay) may stop sampling automatically after the time has elapsed. If this time is insufficient, the user may adjust the auto-stop time under the "Constants Setup" window.

3.7 Printing Results Sheets

The Gas Analyser software supports the printing of measurement results using any Windows supported printer. Once the **Start** button is clicked and the unit switches to "RUNNING" mode, a **Print** button appears under the Lambda reading. Clicking this button will result in one of two output formats being printed on the Windows system printer. Graphic printouts are recommended for Laser or Bubblejet printers, while Text printouts are recommended for Dot Matrix printers. The selection between printout options is made under the "PREFERENCES" window selected from the Main pulldown menu.

3.8 Terminating Emission Measurement

Once the user has completed the measurement clicking the **Stop** button will terminate the sampling process. The sampling pump will turn off and the **Start** button will reappear. The "PERIODIC ZERO CALIBRATION" window will pop up automatically and the unit will complete a mandatory zero calibration cycle before returning to "IDLE" state.
Note : The unit will force a "PERIODIC ZERO CALIBRATION" when required from time to time without having completed a sampling phase. This is normal operation and ensures that the unit will be promptly ready for measurement when it is required. It is for this reason that the user is urged not to leave the sampling probe in the exhaust outlet for extended periods of time while the unit is not in use.
To begin using sampling exhaust emissions once again simply click the **Start** button again.



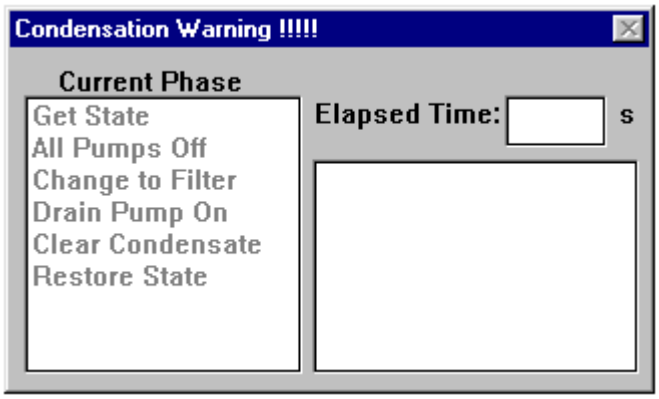
3.9 System Shutdown

Ensure that the unit is in its "IDLE" condition as indicated by the "CURRENT STATUS" window on the bottom left of the screen. "IDLE" condition may be forced by clicking the **Stop** button if required. Clickig the **X** button on the top right of the screen will close the Gas Analyser application. Depending on how your Gas Analyser software was installed, this will either shut down Windows completely or return the user to the Windows operating system. If the Gas Analyser is contained in a separate enclosure to the Computer, the **computer** should be switched **off BEFORE** the Gas Analyser. This sequence is important. It is advisable to remove the power connection to the Gas Analyser and Computer to avoid damage from power line spikes and lightning induced surges.

4.0 Trouble-shooting

4.1 Condensation Warning

The internal spectrometer may be rendered inoperable by excessive moisture content in the sampled gases. To prevent this from happening the Gas Analyser has interlock hardware built in to warn the user when excessive condensation is present. The following window will pop up superimposed on the Main Control Panel :



The unit attempts to clear the condensation by switching to its Drain filter path and averting gas from the spectrometer sub-system. If the fault persists after the sequence of execution described in the window completes itself, please follow these instructions :
a. Shut down the computer. Use the keystrokes "CONTROL-ALT-DELETE" simultaneously if required.
b. Disconnect the sampling hose from the Gas Analyser and blow out the HOSE with compressed air to remove any moisture content. **Do not blow into the Gas Analyser under any circumstances.**
c. Inspect the filters for condensation build-up and renew filters if required.
d. Power up the Analyser and leave it to run under sampling conditions with the probe disconnected for at least 2 hours. Auto-Stop time-out may force the unit to terminate sampling prematurely depending on the time-out setting found on the "CONSTANTS SETUP" window. Adjust this value if required, or alternatively restart the sampling process manually each time.

4.2 Condensation Warning Window Frozen

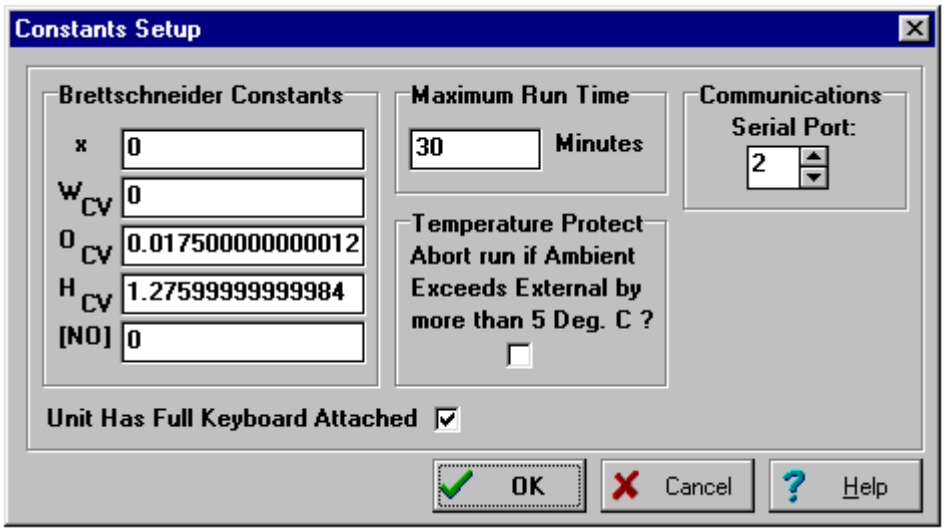
If the condensation warning window appears superimposed over the normal Main Control Panel window and the user cannot exit from this window by any means, it is possible that the Computer and Gas Analyser serial communication link has failed and the application has locked up. Pressing "CONTROL-ALT-DELETE" simultaneously is the only way to escape the condition. Shut down the computer and the gas analyser for a period of approximately 10 minutes before powering up the system again as described under section 3.0.

4.3 Cannot Detect Gas Analyser

If the "CURRENT STATUS" window reports "**Communication Failure**" probable causes include:
a. Gas Analyser was powered up after the Computer.
b. Communications cable has been damaged or is not properly connected.
c. Communications Serial Port number is incorrectly set under the "CONSTANTS SETUP" window.
d. Another application, running under the Windows operating system, has control of the Serial Communications port to which the Gas Analyser is connected. Typical culprits include FAX software and PC to PC data transfer packages.

4.4 Gas Analyser Switches To Idle Mode On Its Own

Please ensure that the "Maximum Run Time" setting found under the "CONSTANTS SETUP" window is sufficient to allow completion of an emission measurement. The Brettschneider Constants are displayed for user reference only and cannot be edited under normal conditions. These constants are set by Government Emission Control authorities.



4.5 Negative Hydro-Carbon Measurement

The HC ppm measurement may read slightly negative when no exhaust emission is present at the sampling probe input. The "PERIODIC ZERO CALIBRATION" may automatically remove this condition, however, while the Gas Analyser is still reaching stable operating internal temperatures, this condition may persist. The reason for this is the incredibly high resolution of the HC measurement process. Measurement of Parts Per Million gas molecules can result in a very small error but this should not exceed a few ppm units in either direction. Once the Gas Analyser has reached steady state operating temperatures, the error usually reduced to almost zero.

4.6 Leakage Test Failure

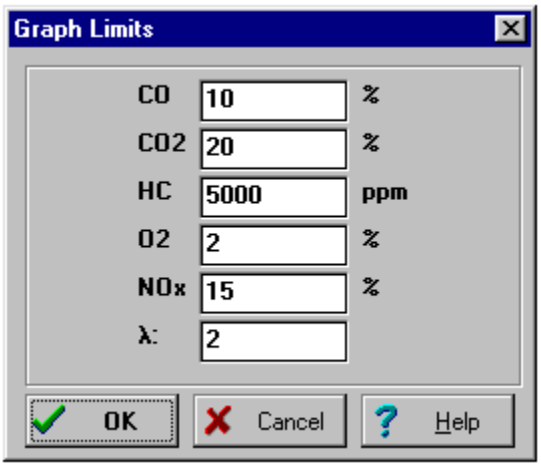
A failed leakage test window appears as per the example in paragraph 3.3.
Leakage test failure can be caused by internal or external leaks in the Gas Analyser piping system. Typical trouble spots include linkages in the piping system. The user should attempt clamping any external piping connections to identify leakage points. Failing this, the unit should be referred to a service technician to trace internal leakage faults or faulty pressure transducers.

4.7 Low Flow Detected

If a low sampling flow rate is detected, the software will alert the user with warning window.
The Gas Analyser employs internal pumps to facilitate the flow of gas from the sampling probe through the system to the exhaust gas ports. If the flow is blocked or the pressure is insufficient, the built in self-diagnostics will prevent further measurement. Please follow the instructions in the warning window to correct the condition. Probable causes include :
a. The Master Filter has been obstructed.
b. There is a leak in the filter connecting pipes.

4.8 Insufficient Bar Graph Resolution

The MAXIMUM values of the bar graphs may be set using the “GRAPH LIMITS” control window as follows :



The user may adjust these values to obtain a more visible bar graph measurement. For example, the CO limit may be changed from 10% to 2% since CO emissions are usually quite low when catalytic converters are fitted.

4.9 Cannot Obtain Printout of Results

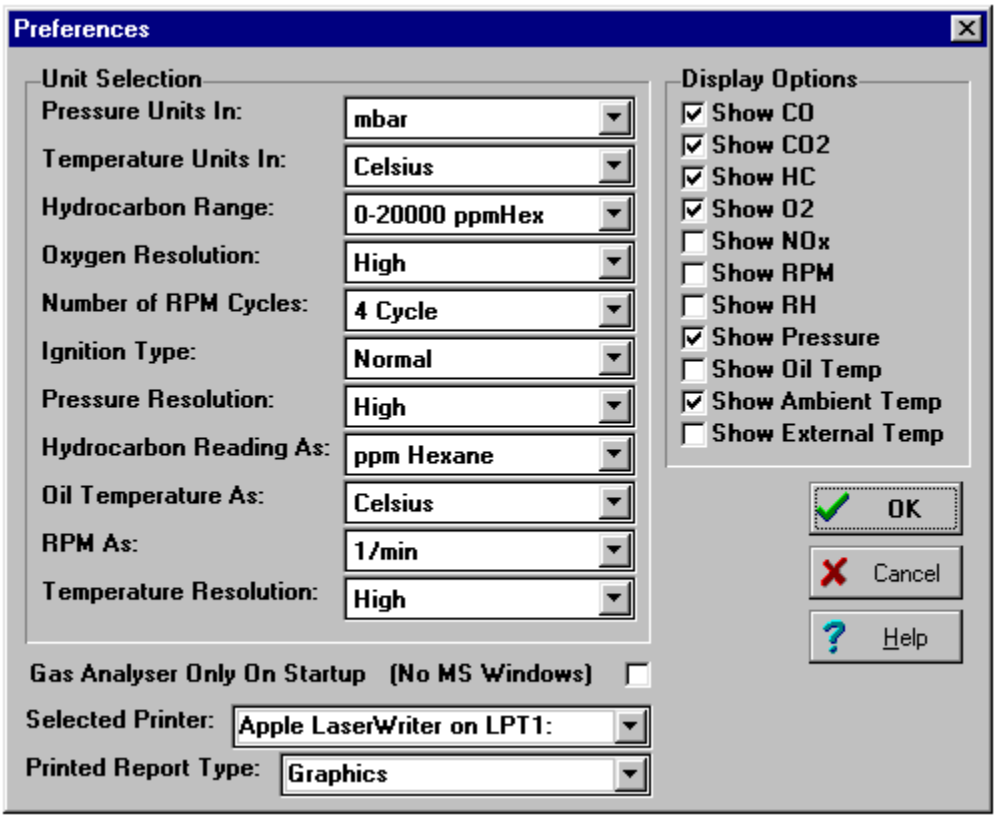
The Gas Analyser software is capable of printing the results of a measurement on any Windows supported printer. Please ensure that the “Printer” options under Windows are correctly setup. The exact setup procedure is dependant on your particular operating system, but is usually found under the “Settings” or “Control Panel” folders.
Please ensure that the Selected Printer under “PREFERENCES” is also correct.
Note: There are two printout formats, full graphic and text only, as selected under the “PREFERENCES” menu. The analyser must be sampling in order for a printout to be made.

4.10 Selecting the “Test” Option under “Main” Does Nothing

The “Test” option listed under the “Main” pulldown menu is reserved for diagnostic and service purposes and is not accessible under normal operating conditions.

4.11 Items Missing From Main Control Panel

The user may select which items appear on the Main Control Panel from the "PREFERENCES" window. The factory preset checkboxes are as follows :



4.12 Lambda Reading Missing

The Lambda reading calculation requires the presence of realistic CO, CO_2 and O_2 values. If the software Main Panel Screen Lambda measurement indicates "---------" **while valid exhaust emissions** are being sampled, please contact your dealer.

4.13 Further Technical Support

If you have any questions or technical queries please do not hesitate to contact your supplier or call for technical support on 082 652 4707 (ULTRA TUNE Technical Consultant direct)