AUTO TEST
Products Pty Ltd

MTS User Manual
Version 1.5

AutoTest AutoGas®

Exhaust Gas Analyser

AUSTRALIAN MADE AND OWNED

Licence ID number: 10242

AUTO TEST
Products Pty Ltd

E7474 CE UK CA RoHS COMPLIANT 2002 / 95 / EC AUSTRALIAN MADE AND OWNED Licence ID 10242

DECLARATION OF CONFORMITY
We, AutoTest Products Pty Ltd. declare under our sole responsibility that the product **AutoGas** Exhaust Gas Analyser is in conformity with the provisions of the following Council Directive: 1999/5/EC.
A copy of the Declaration of Conformity is available from http://www.autotest.net.au

Table of Contents

1. FOR YOUR SAFETY

Read these simple guidelines. Not following them may be dangerous. Read the complete user guide. Further detailed information is given in this manual.

SWITCH ON SAFELY

Do not switch the device on when wireless device use is prohibited or when it may cause interference or danger.

INTERFERENCE

All wireless devices may be susceptible to interference, which could affect performance.

SWITCH OFF WHEN REFUELING

Do not use the device at a refuelling point. Do not use near fuel or chemicals.

USE SENSIBLY

Use only in the positions as explained in the product documentation.

QUALIFIED SERVICE

Only qualified personnel may install or repair this product.

WATER-RESISTANCE

Your device is not water-resistant. Keep it dry.

CONNECTING TO OTHER DEVICES

When connecting to any other device, read its user's guide for detailed safety instructions. Do not connect incompatible products.

BE MINDFUL OF HOT SURFACES

Watch out for hot temperatures zones of vehicles particularly engine head, exhaust pipe, and radiator hoses.

BE MINDFUL OF MOVING PARTS

Watch out for engine cooling fan. Watch out for any moving parts of a running engine.

RISK OF FUMES INHALATION

Inhalation of fuel and exhaust fumes is harmful to health. Never start vehicles in a closed area. Always work in a well-ventilated area.

RISK OF DAMAGE TO EYES

Wear safety goggles when operating near vehicle battery as Battery acid, fumes, oil and dust particles might cause damage to the eyes.

2. ACRONYMS

AC	Alternate Current – Mains supply
AFR	Air to Fuel Ratio
BET	Basic Emission Test
CC	Cubic Centimetre
CO	Carbon Monoxide
CO_2	Carbon Dioxide
DC	Direct Current – Battery supply
DSM	Diesel Smoke Meter
ECU	Engine Control Unit
EGA	Exhaust Gas Analyser
HC	Hydro Carbon
HT cable	High Tension cable – Spark-plug cable
KM	Kilometre
Lambda (λ)	Engine efficiency
MOT	Ministry of Transport
MTS	Ministry of Transport Testing System
NO_x	Nitrogen-Oxides
O_2	Oxygen
PC	Personal Computer – Desktop or Laptop computer
PEF	Propane/hexane Equivalency Factor
PPM	Parts per million
RPM	Revolution Per Minute – Engine speed
SPI	Serial Peripheral Interface Bus

3. UNPACKING AND FIRST TIME USE

Congratulations on your choice of Auto*Test*® AutoGas. Please take the time to read this document before using AutoGas Analyser in the field. Incorrect or inappropriate use of this instrument may void the warranty. Please retain the packing materials for future shipping and transport of the unit for periodic calibration.

Please complete the warranty registration card and post it to Auto*Test*® Products Pty Ltd, alternatively visit our website www.autotest.net.au and complete your warranty registration on line. Your warranty registration ensures that you are kept up-to-date on any software or hardware changes to your Auto*Test*® AutoGas Analyser. It also helps us to provide you with faster services.

4. PRODUCT DESCRIPTION

Auto*Test*® Exhaust Gas Analyser (AutoGas) analyses the contents of exhaust gas. The analysis of exhaust gas describes the degree of efficiency of a vehicle's engine in reducing the amount of pollutant gases being released into the atmosphere. AutoGas can measure the contents of five gases (CO, HC, CO_2, O_2, and NOx). The measurement of the fifth gas (NOx) is optional and depends on the presence of a NOx sensor. AutoGas can also calculate Lambda (λ), Propane Equivalency Factor (PEF) and Air-to-Fuel Ratio (AFR) using the measured values of CO, HC, CO_2 and O_2 gases.

Non-Dispersive Infra-Red (NDIR) sensing technology is used to measure the contents of the input gas (CO, CO_2, HC). While the gas flows through the gas bench, a light source emits lights of different frequencies and then measures the amount of light that has been received at the opposite end by a detector. The signal received at the detector informs the gas bench about the concentration of each gas. The measurement of O2 and NOx gases is taken from two electro-chemical sensors (O_2 Sensor and NO_X Sensor).

AutoGas is capable of measuring engine oil temperature as well as the engine speed using the supplied probes. It allows a number of methods that can be used to measure the engine speed. The methods available for measuring the engine speed are listed below:

No	RPM Measurement Type	Description	Probe / Sensor
1	Battery sense method	Measures engine RPM by monitoring the fluctuations in the vehicle battery voltage	Battery / DC cable
2	Inductive pick-up (HT cable)	Picks up ignition signal in a HT (high tension) cable using a inductive pick-up clamp	Inductive Pick-up clamp
3	Accelerometer (optional)	Monitors the mechanical vibration of an engine	Accelerometer sensor
4	OBD-II (optional)	Obtains engine RPM and oil temperature from vehicle's ECU	Bluetooth OBD-II reader

For vehicles that support OBD-II, AutoGas can wirelessly obtain engine oil temperature and engine speed from the vehicle's ECU using the supplied Bluetooth OBD-II reader.
AutoGas can be used on vehicles that run on Petrol, LPG, or CNG. Its lightweight and portable characteristics make it useful to carry out roadside emissions test. It is capable of carrying out standalone emissions test using the MOT Exhaust Emissions - Spark Ignition test procedure. A database of vehicles along with their emission limits is included.

AutoGas can perform electronic leak test to make sure no gas other than the exhaust gas is sampled and measured by the meter. A leakage in the input stage of the sample will cause erroneous measurement. The leak check is required once every 24-hour or whenever the meter is power-up. During a leak test, AutoGas builds a vacuum in the gas bench and then measures the vacuum pressure. The fluctuations in the vacuum pressure inform the meter about the presence of a leakage.

- For vehicles that operate on diesel fuel, AutoGas can be used in conjunction with Auto*Test*® Diesel Smoke Meter (Auto Smoke) via a wireless interface to carry out a series of Free Acceleration Smoke (FAS) trials according to the MOT Diesel Smoke Test procedure (Exhaust Emissions - Compression Ignition).

4.1 Measurement System Overview

The measurement of the exhaust gas requires the gas to flow from the sampling probe into the gas bench, where the contents of the input gas are analysed. Figure 1 illustrates an overview layout of exhaust gas flow.

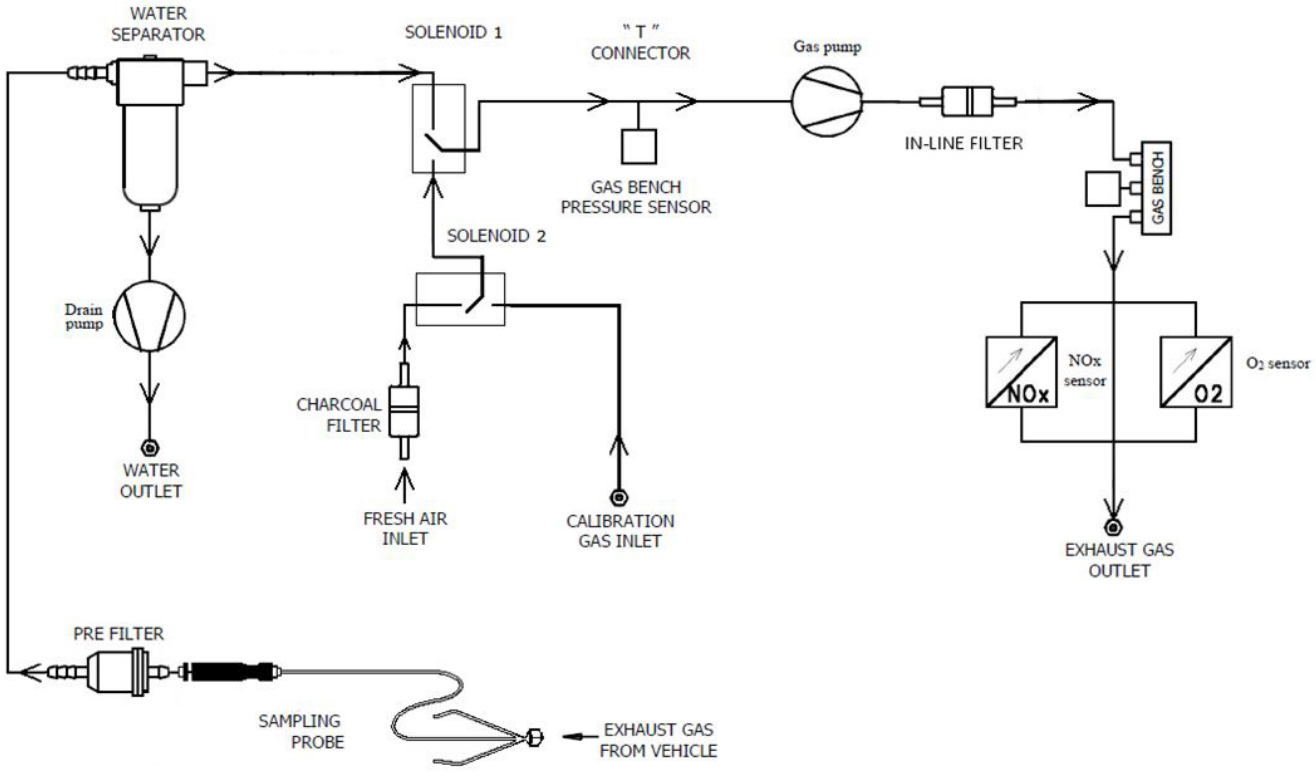


Figure 1. Gas Flow Diagram Of AutoGas

AutoGas has a dual head diaphragm pump. The first head of the pump circulates the input exhaust gas through a set of filters into bench board, where the contents of the sampled gas are analysed. The second head of the pump circulates any water particles trapped in the water separator filter.

The use of filters prevents any exhaust contaminants from reaching the gas bench. The exhaust gas flows through an in-line filter, which filter out any particle. After the in-line filter, exhaust gas flows through a water separator, which filters out the moisture or water droplet. After the water separator filter , the gas flows through bench pre-filter. The bench pre-filter further filters out any particle in the micrometre scale. After the pre-bench filter, the gas flows through the gas bench where the contents of the input gas are analysed. The gas bench analyses CO, CO2 and HC gases. After the gas bench, the exhaust gas flows through two electrochemical sensors: O2 sensor and NOx sensor. The O2 sensor measures the concentration of O2 gas in the exhaust gas, whereas, the NOx sensor measures the NOx level in the exhaust gas. The In-line filter should be changed weekly, the Bench Pre-Filter should be changed monthly and the Charcoal filter should be replaced before every calibration. The O2 Filter should be replaced approximately every year or two however the Gas Analyser will alert the user when it needs replacing.

When zero calibration is performed, solenoid 1 is activated to block the input gas. The pump then circulates the fresh air (ambient air) through a charcoal filter. The fresh air then flows through the pre-bench filter and into the gas bench, where the zero calibration is performed. During calibration, solenoid 1 is activated to block the input gas while the solenoid 2 is also activated to block the zero gas. The calibration gas then flows through the pre-bench filter and then into the gas bench, where the calibration gas is analysed, and the gas bench is calibrated.

The temperature of the gas bench is maintained from 40 to 45°C to prevent condensation building up inside the gas bench tube. The gas bench includes two pressure transducers for measuring gas pressure and vacuum pressure.

4.2 Components of AutoGas

AutoGas comes with necessary probes, and some spare filters.

No	Component	Description
1	Gas Bench	Gas content measurement system located inside the device body
2	Gas Filters	Filters are used to filter out dust and contaminant particles before gas reaches the gas bench chamber
3	Gas Sampling Probe	Sampling probe is inserted into a vehicle's exhaust pipe to collect exhaust gas for analysis
4	Oil Temperature Probe	Oil temperature probe is used to measure the temperature of the vehicle engine oil
5	Battery/DC cable	Battery cable is used to power the meter through a vehicle's battery. The battery cable is also used to sense engine speed.
6	OBD-II Reader (optional)	Obtains engine speed and engine oil temperature data from the vehicle via OBD-II interface
7	Accelerometer Sensor (optional)	Measures engine speed (RPM) based on the mechanical vibration of an engine
8	Inductive (HT) probe	Measures engine speed (RPM) based on the inductive probe

4.2.1 Rear View of AutoGas

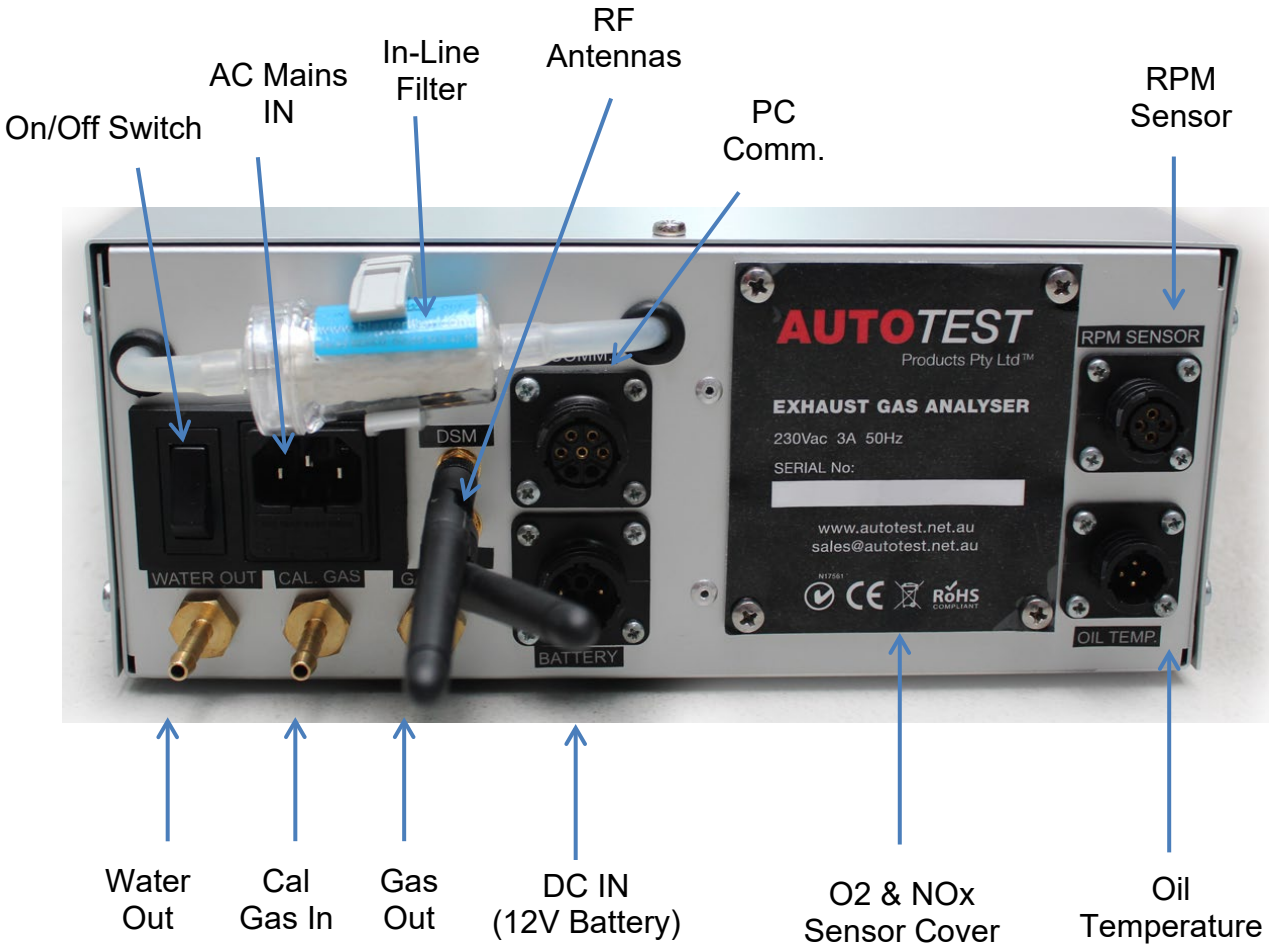


Figure 2 Rear View of AutoGas

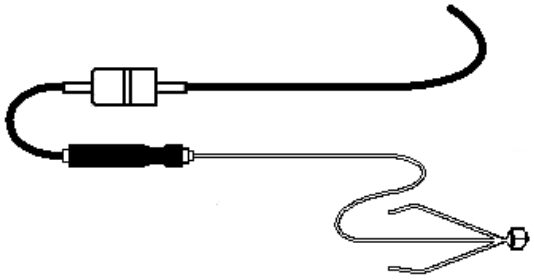
4.2.2 Side View of AutoGas

Figure 3 Side View of AutoGas

4.2.3 Standard Accessories

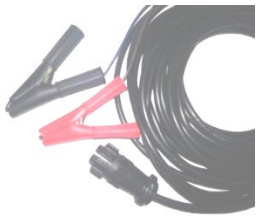
The following items are provided with the AutoGas as standard accessories.

Sampling Probe
with in-line filter
(Code: 917829)



Oil Temperature Probe
(Code: 917830)

Battery Cable
(Code: 917831)



AC Power Cable
(Code: 104324)

Inductive Pick-up Probe
(HT cable probe)
(Code: 917671)

Auto*Test*® Software USB
(Code: 104343)

RS232 Serial Cable
(Code: 917832)

4.3 Optional Accessories

The following listed accessories are provided as optional (at extra cost).

NO_x Sensor
(Code: 917568)

Bluetooth OBD-II Reader
(Code 104093)

Accelerometer Sensor
(Code: 917670)

4.4 Standard Consumables

The following listed consumables are available to purchase from your distributor.

Prefilter
(Code: 104012)

In-line Disposable Filter
(Code: 917683)

Oxygen Sensor
(Code: 917684)

5. TURNING ON THE DEVICE

Auto*Test*® AutoGas can be powered up using AC power supply (AC mains, wall socket) or through vehicle's 12V battery (DC power supply).

5.1 Using AC Mains

When powering AutoGas using AC mains, please ensure that the AC supply meets the following conditions:

195 – 255 V_{AC} single phase at 50-60 Hz

Ensure the live phase is on the right side of wall socket. Phase to Neutral voltage should be 230V_{AC} and Phase to Earth should be 230 V_{AC}.

5.2 Using Vehicle Battery (DC power supply)

AutoGas can be powered using the vehicle's battery. Please ensure the battery rating of the vehicle's battery is over 60 AH. The battery voltage must not exceed the maximum rated voltage.

Please ensure that the battery has enough charge to conduct a test.

To power AutoGas using vehicle's 12V_{DC} battery, connect one end of the supplied battery cable (21) to the device and connect the other end, which contains two clamps, to the terminals of the vehicle's battery. Please ensure that the red clamp connects to the positive (+) terminal of the battery, and the black clamp connects to the negative (-) terminal.

Once the battery cable is connected, the device will turn on by itself automatically.

6. PC SOFTWARE

Auto*Test*® Emission Tester software allows user to perform emission tests from PC as well as to download test data previously stored on AutoGas Analyser.

System requirements:

- Microsoft Windows 2000 or greater
- Microsoft .NET Framework 2.0
- 1 serial port
- 100MB of hard disk space

Installation steps:

- Insert Auto*Test*® Emission Tester software CD into your CD-ROM drive; if you are given a USB drive instead, plug it into your PC
- Select and run "*setup.exe*" (or "AutoTest_EmissionsTester_v1.44.exe")
- Follow on-screen prompts to complete installation

Run Auto*Test*® Emission Tester:

Figure 4 – Home Page

6.1 Installation of MTS Certification Keys

Auto*Test*® Emission Tester software allows user to perform emission tests from PC as well as to upload these tests directly to the MTS.

To install MTS Certification Keys to allow for directly uploading tests please follow these steps:

1. From the main dashboard click settings. Then click the tab MTS Client Certificates.

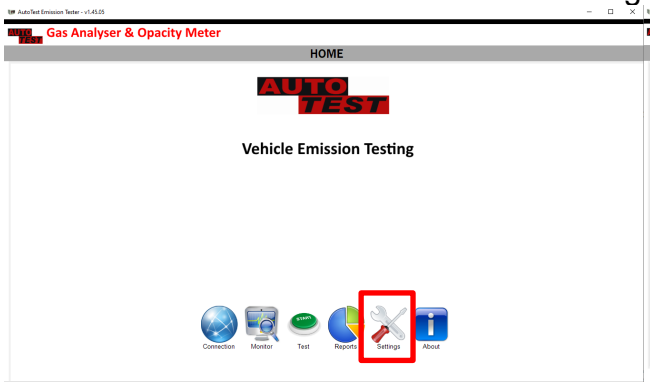


Figure 5 Dashboard Menu

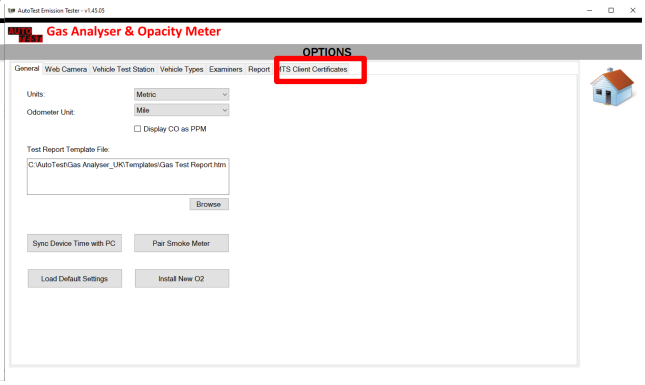


Figure 6 Settings Menu

2. First click "Browse Client Certificates" to locate your certificate files.

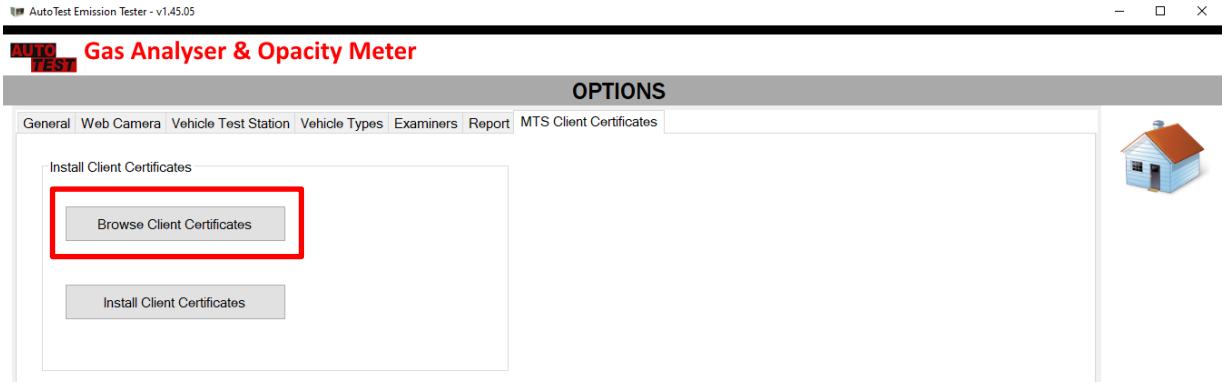


Figure 7 MTS Client Certificates

3. Then Select all files by holding control and clicking each individual file. There must be 5 files matching your client number named as shown below, then click "Open".

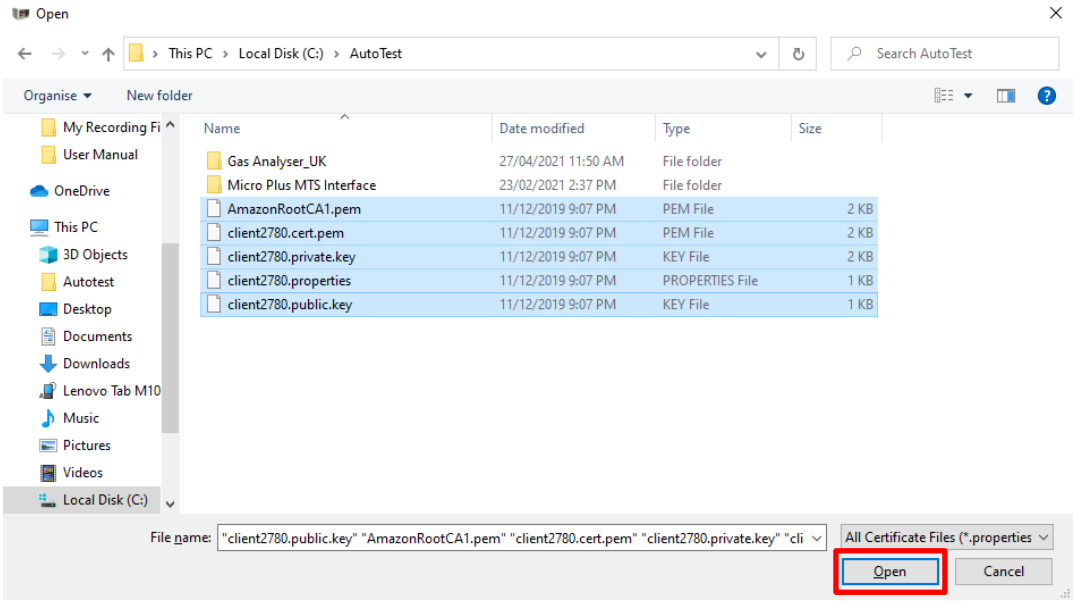


Figure 8 Browse Client Certification files

4. Now click "Install Client Certificates". Then click Yes when asked to allow the program to make changes to your PC. This may require administrator permission.

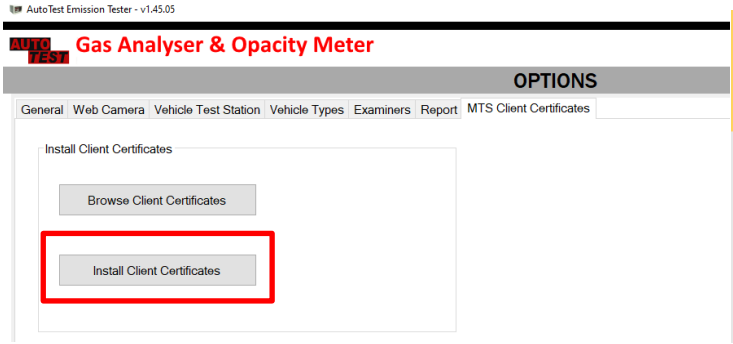


Figure 9 Install Client Certificates

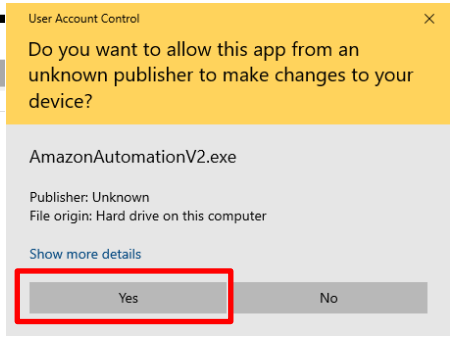


Figure 10 Permission Window

You can now upload Emission Tests to the MTS server.

6.2 Connection via RS232 Serial Cable

Connect one end of the supplied RS232 serial cable to AutoGas Analyser and connect the other end to the PC. If the PC does not support RS232 connectivity, a USB-to-Serial adapter should be used.

Turn on AutoGas Analyser.

In Auto*Test*® Emission Tester software, click on the  (Connection) icon to open the connection page.

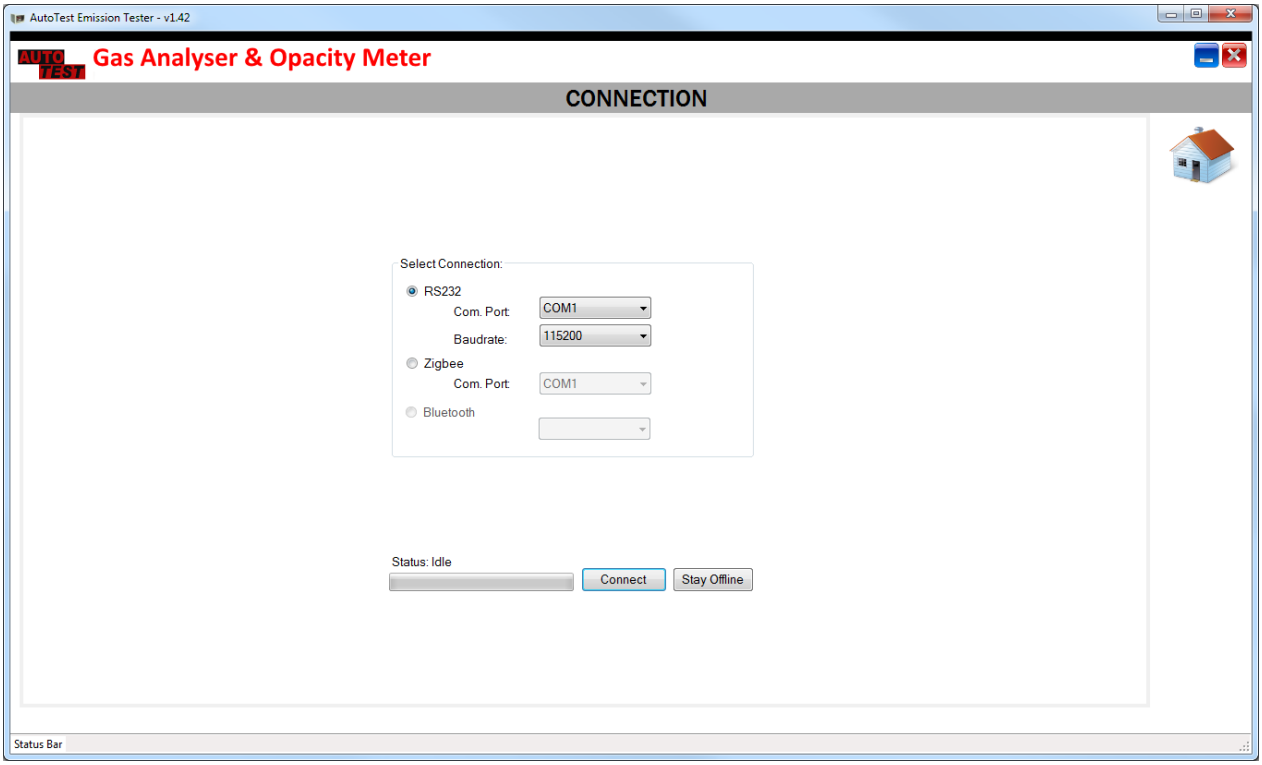


Figure 11 – Connection Page

Select the serial COM port to which AutoGas Analyser is connected. For desktop computers with RS232 support, the communication port is likely to be COM1. If a USB-to-serial adapter is used with the serial cable, enter the communication port number that the computer displays on the lower-right corner of the screen (near clock) when the USB connector is attached to the computer (it can also be found from "Control Panel -> Device Manager -> Ports").

The baudrate should be selected as 115200.

Now, click on the "Connect" button to establish connection.

Note: In case if the connection with AutoGas Analyser is suddenly lost, you need to restart Auto*Test*® Emission Tester software.

6.3 Real Time View

Once Auto*Test*® Emission Tester software is connected to AutoGas Analyser, click on the  (Monitor) icon to open the real-time view page.

Click on the "Gas Pump On" button to run the gas pump and start sampling gas readings.

Please be noted that the PRM reading comes from the RPM source selected in the last test conducted (ref Figure **24**).

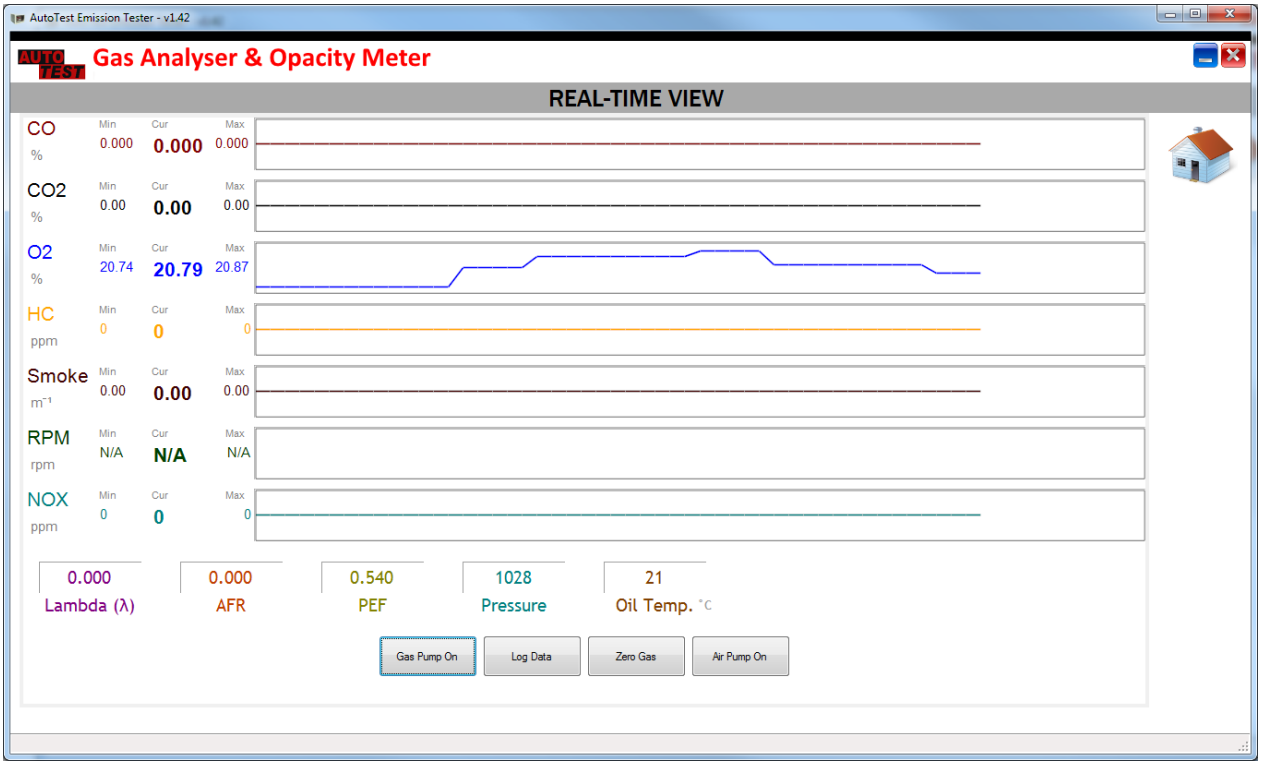


Figure 12 – Real Time View Page

6.4 Test Reports

AutoGas Analyser stores all test data in its memory. Auto*Test*® Emission Tester software can be used to view test reports on the PC.

Once Auto*Test*® Emission Tester software is connected to AutoGas Analyser, click on the  (Reports) icon to open the reports index page.

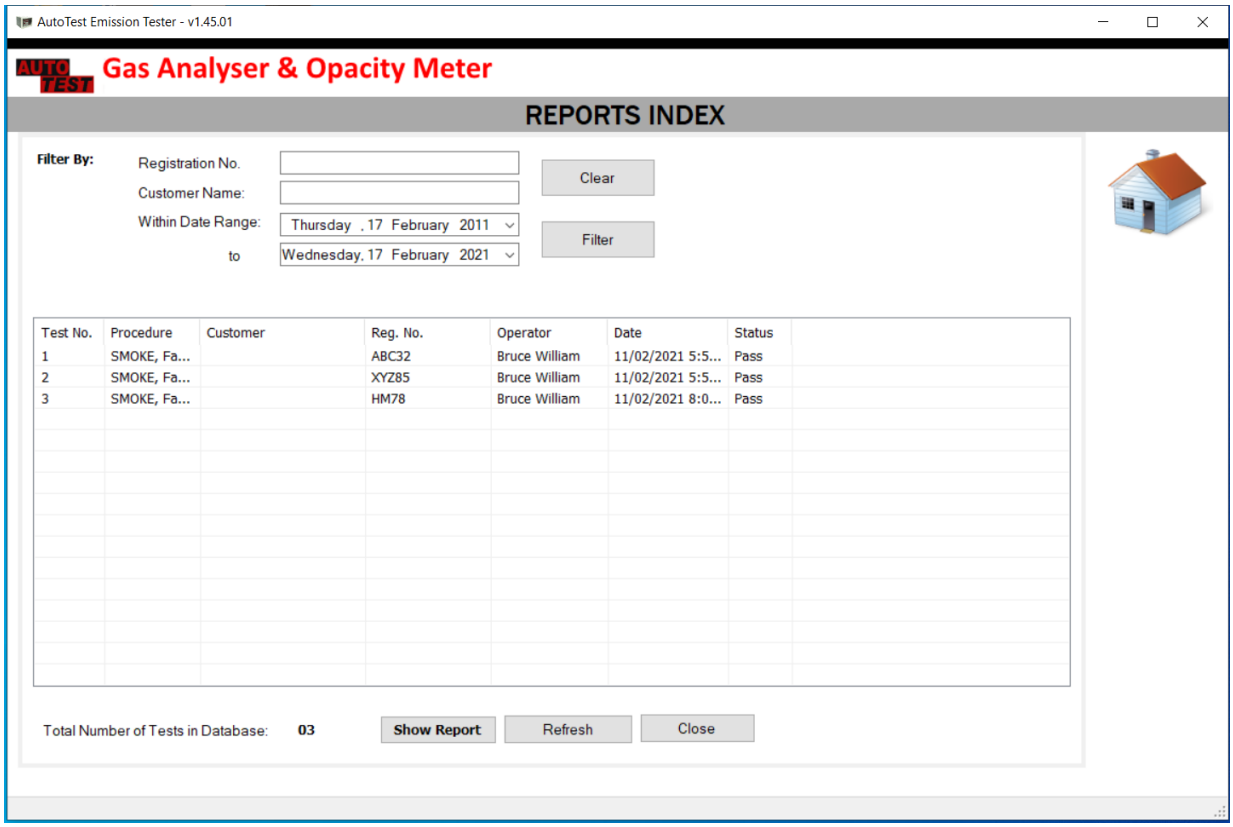


Figure 13 – Report Index Page

6.4.1 View Test Reports

From the "REPORTS INDEX" list, select a desired test record by double-clicking on it or clicking on the "Show Report" button on a highlighted entry. This will bring up a "TEST REPORT" page showing all the test information.

To print the report from that page, click on the  (Print) icon. A new window will appear to show the print preview. To carry on printing to a printer, click on the "Print" icon and follow prompts. To return to the "TEST REPORT" page, just close the "Print Preview" window.

6.4.2 Filter Test Reports

Test reports can be searched with filter for fast retrieval using vehicle registration number, customer name and/or test date range.

In the "REPORTS INDEX" page, set the values accordingly, and then click on the "Filter" button to launch a new search. Those values can be removed by clicking on the "Clear" button.

6.4.3 View updated Test Data

Entering the correct vehicle registration number is critical when connecting to MTS. An incorrect vehicle registration number that has been entered at the beginning of test can be corrected before connecting to MTS on "TEST REPORT" page.
In order to see updated test records, click on the "Refresh" button in the "REPORTS INDEX" page.

6.5 Settings

Once Auto*Test*® Emission Tester software is connected to AutoGas Analyser, click on the  (Settings) icon to open the options page.

6.5.1 General Settings

General settings allow the user to

- select the units used by the software to Metric or Imperial
- select the odometer unit to Kilometer, Mile or Hour
- choose to display CO value in the unit of PPM (default is %)

Test reports are formatted according to a template file. The default location for that file is C:\Program Files (x86)\AutoTest\Gas Analyser\Templates\Gas Test Report.htm. However, user can modify that file to suit their needs or simply browse to another template file on the PC.

Click on the "Sync Device Time with PC" button to set the time on the connected device to be the same as PC. Please note this only changes the hour/minute/second on the device but not the date.

Auto*Test*® Emission Tester software communicates with Auto*Test*® Diesel Smoke Meter via AutoGas Analyser. Click on the "Pair Smoke Meter" button to pair a Diesel Smoke Meter to AutoGas Analyser. The Smoke Meter will turn on its fan once the pairing is successful.

Click on the "Load Default Settings" button to restore factory default settings.

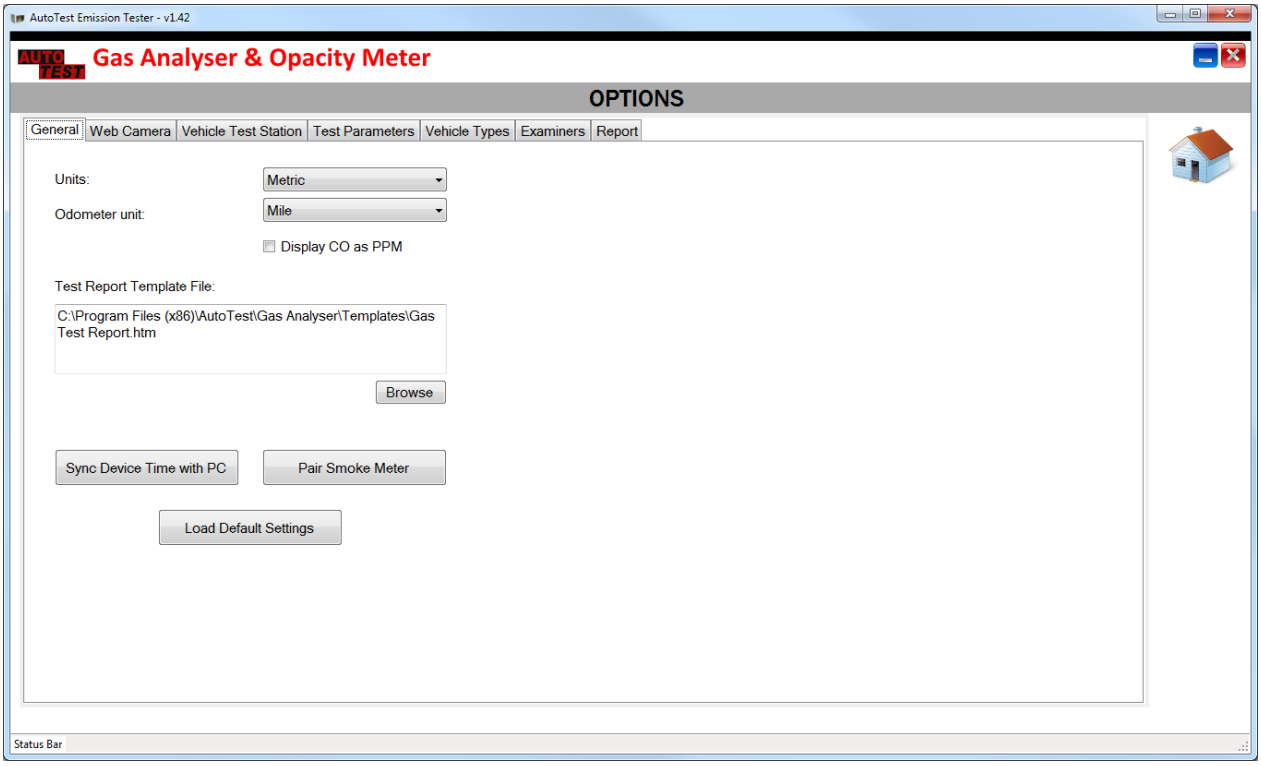


Figure 14 – General Settings

6.5.2 Web Camera

To enable the Web Camera for the purpose of capturing the vehicle registration plate during a gas test, check the "Enable Webcam" box and then make the selection from a list of available webcams connected to the PC.

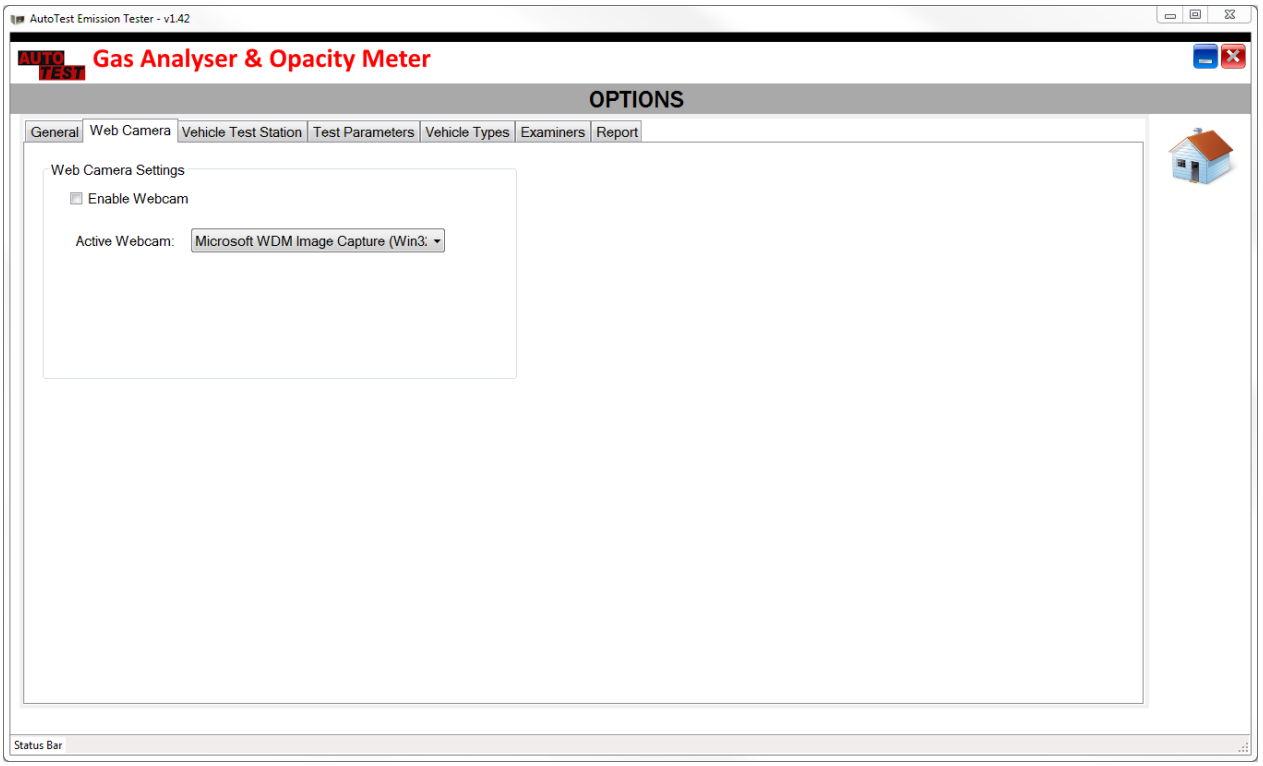


Figure 15 – Web Camera Settings

6.5.3 Vehicle Test Station

User can view and change the Vehicle Test Station (VTS) information under this tab. If AutoGas Analyser is connected to the PC, these information will be synchronised by the Auto*Test*® Emission Tester software.

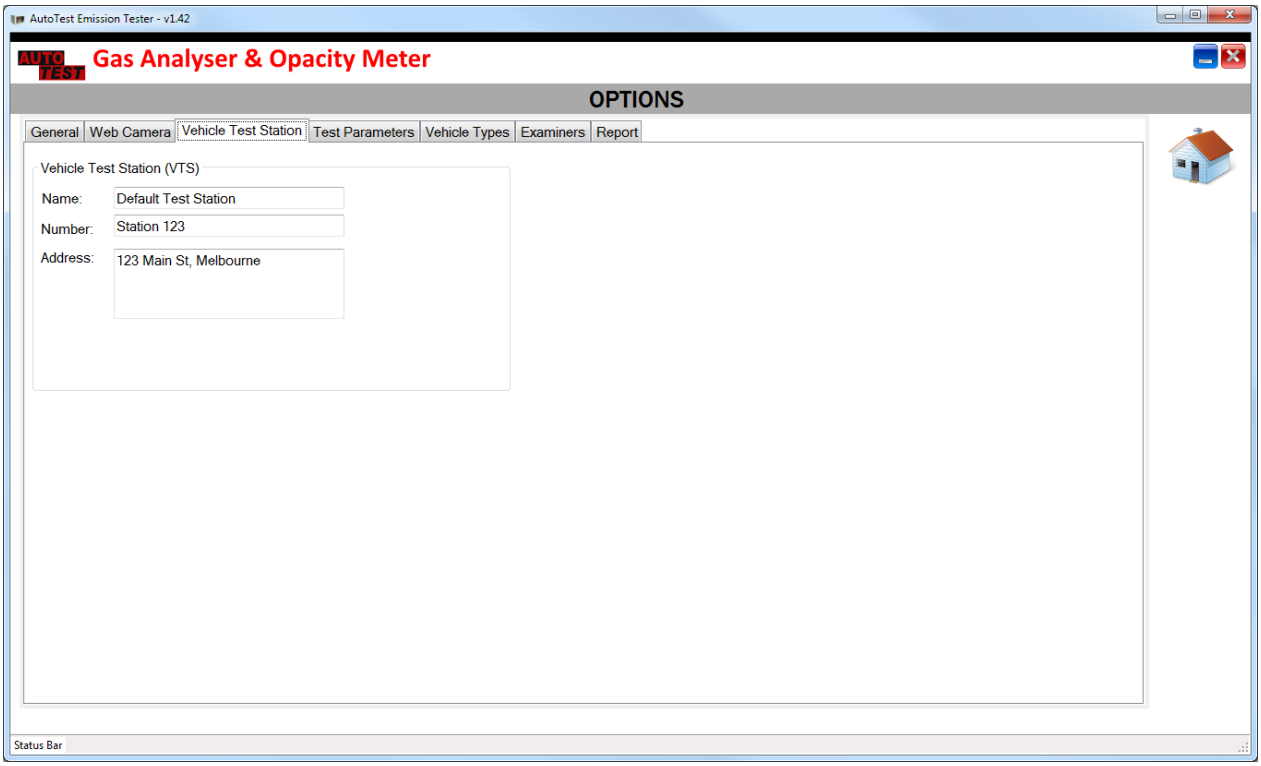


Figure 16 – Vehicle Test Station (VTS) Settings

User can enter the following information regarding the vehicle test station (or workshop):

Field	Description
Name	The name of the vehicle test station
Number	The registration number or reference number of the vehicle test station
Address	The address of the vehicle test station

6.5.4 Vehicle Types

The vehicle types tab shows the content of the Vehicle Emission Database and lists down all the vehicle test limit values. These limit values will be used for Catalyst gas test.

User can use the  (add),  (edit) or  (delete) button to make changes to the list.

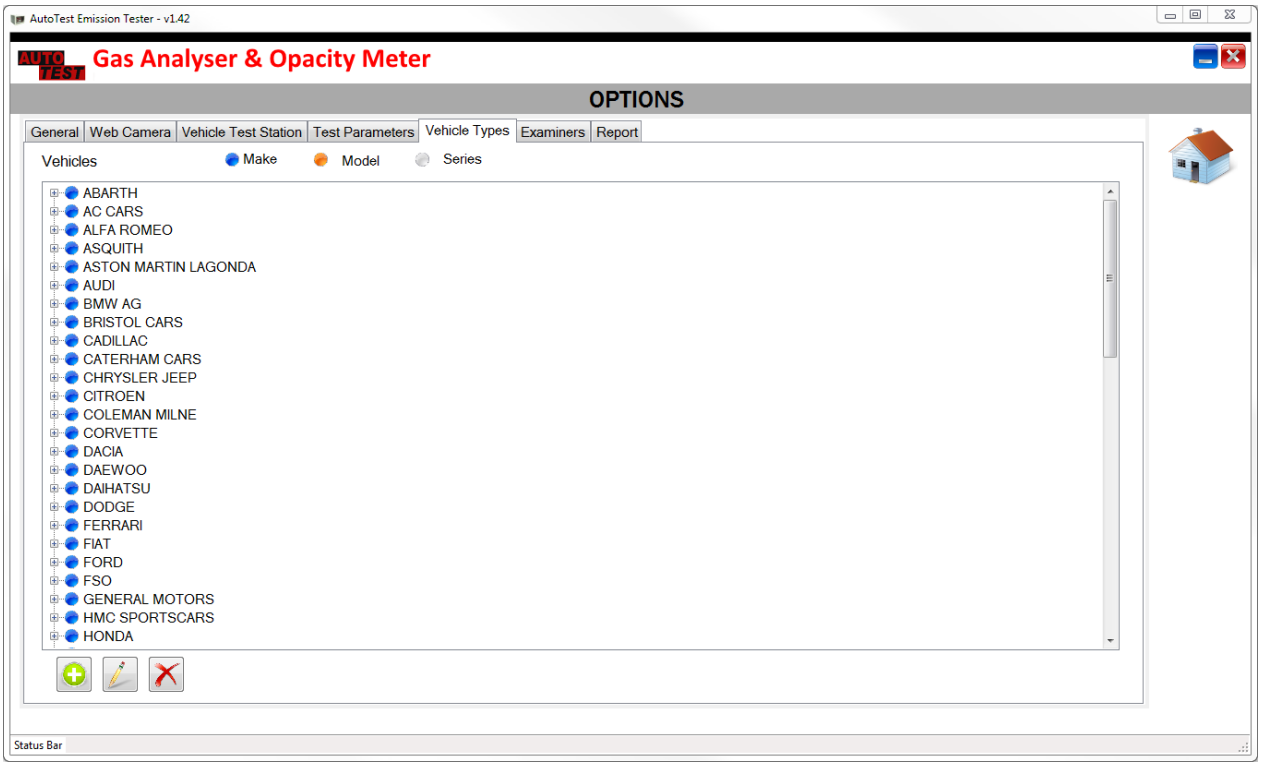


Figure 17 – Vehicle Types Settings

6.5.5 Examiners

The examiners tab allows user to view and change the test examiner details. At the start of a gas test, the user will be prompted to select the examiner from this list.

User can use the (add), (edit) or (delete) button to make changes to the list.

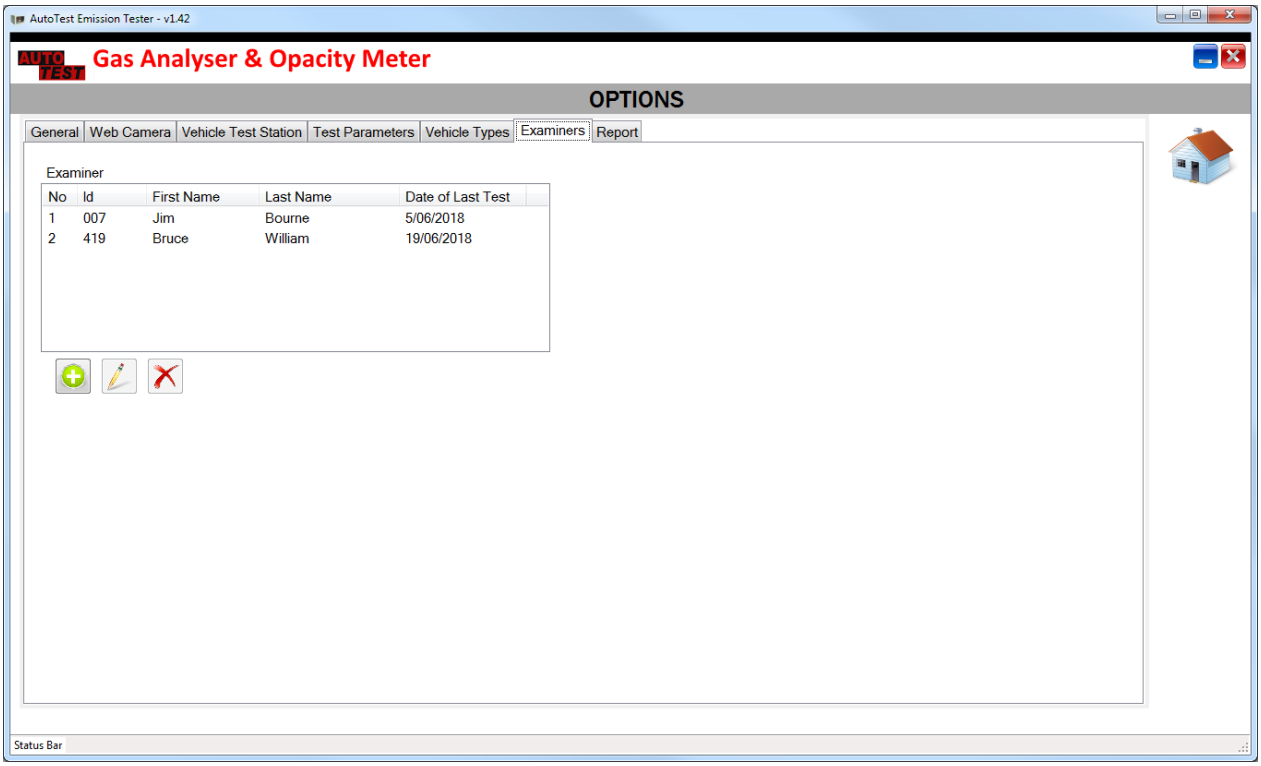


Figure 18 – Examiners Settings

6.5.6 Report

The report tab allows user to select what to show on the test report.

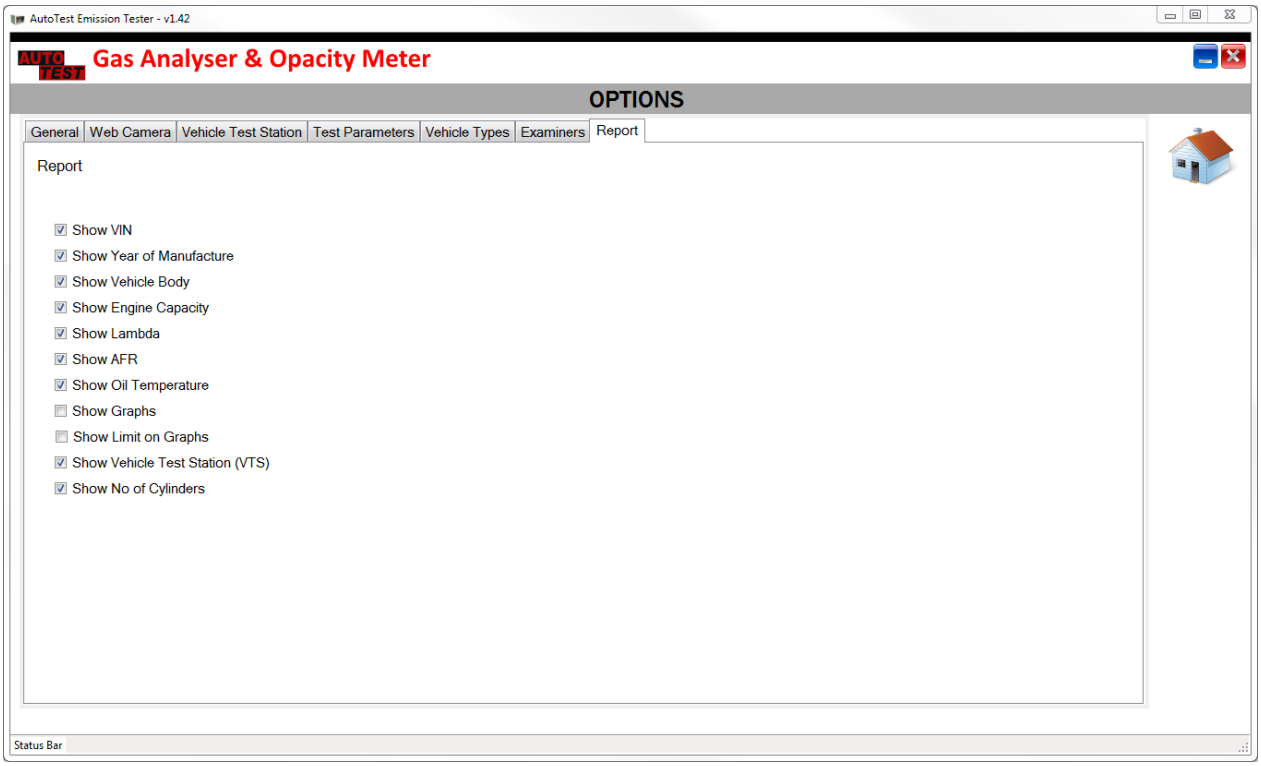


Figure 19 – Report Settings

7. EXHAUST GAS TEST

7.1 Preliminary Checks

- ✓ Make sure the vehicle is securely parked
- ✓ The vehicle should be running at normal operating temperature
- ✓ Do not carry out the test in an enclosed area
- ✓ Always take caution when working near engine or moving parts
- ✓ Make sure the vehicle contains sufficient engine oil

7.2 Equipment Setup

Securely park the vehicle before connecting all necessary accessories to AutoGas Analyser. Make sure the vehicle engine is turned off.

Turn on AutoGas Analyser and let it go through its initialisation phase and warm up to its operating temperature.

7.3 Engine Oil Temperature Measurement

Connect the supplied oil temperature probe to AutoGas Analyser. Before inserting the oil temperature probe into the oil dipstick, take out the oil dipstick from the vehicle and extent the oil temperature stopper by pressing its lock button until the length of the oil temperature probe equals with the length of the oil dipstick. Insert the temperature probe in place of the oil dipstick until the cable stopper prevents it going deeper any further. Turn ON the vehicle and you will notice the oil temperature value rising as the vehicle heats up.

If the oil dipstick housing tube is wide enough to hold the oil temperature-sensing probe and the dipstick together, then insert the oil dipstick over the previously inserted oil temperature probe to prevent any dust entering into the engine compartment.

Note:

- Always ensure the oil dipstick and oil temperature probe are clean before inserting them into engine housing
- If OBD-II device is used during the test for RPM measurement, it is not necessary to attach oil temperature probe, as the engine oil temperature reading will be taken from OBD-II.

Warning:

- If the oil temperature probe is longer than the dipstick, it could get in contact with the moving parts of an engine and cause damage to the engine compartment and the temperature-sensing element.

7.4 Engine RPM measurement

If engine RPM is required during the test, make sure you set up the engine RPM measurement device before the test is started. The engine RPM can be automatically measured using one of the following methods:

- using vehicle battery
- using accelerometer sensor (optional accessory)
- using OBD-II reader (optional accessory)
- using inductive pickup

7.4.1 Using Vehicle Battery

To measure engine RPM from the vehicle battery, operate AutoGas Analyser from 12V vehicle battery.

First, disconnect AC mains cable from AutoGas Analyser. Then, follow the steps in Section 5.2 to connect AutoGas Analyser to the vehicle battery.

When starting a test procedure, make sure to select "Battery" as RPM source.

Note:

- If the RPM reading indicated by AutoGas Analyser differs significantly with vehicle's actual RPM at various engine speeds, try to turn on headlights, fan, heater and other electrical load in the vehicle to amplify the electrical load signal across the battery.

7.4.2 Using Accelerometer Sensor (Optional Accessory)

To measure engine RPM from the accelerometer sensor (optional accessory), connect the accelerometer cable to the back of AutoGas Analyser ("RPM SENSOR"). Make sure the magnetic base is attached to the accelerometer.

Place the accelerometer on the engine mount. Try to place accelerometer at various spots on the engine and notice the spot where vertical vibration is the greatest. The location where engine vibration is maximum might be the most appropriate location to stick accelerometer.

Check the RPM reading and compare with the RPM readings indicated in the cluster panel. If the RPM readings measured AutoGas Analyser vary significantly, try to place the accelerometer in a different location until readings match.

Warning:

- Components of a running engine can cause fatal injuries. Engine head and radiator hosing can get very hot. Make sure the accelerometer remains on the engine mount all the time. A loosely mounted accelerometer can get stuck in moving engine parts, which could cause injury and badly damage the sensor as well as engine components.
- The maximum operating temperature for the accelerometer is 130 °C. Make sure the accelerometer is not mounted on surfaces that exceed the maximum temperature (such as exhaust body).

7.4.3 Using OBD-II Reader (Optional Accessory)

Engine RPM and oil temperature can be obtained from the vehicle via an OBD-II reader.

However, this option is only valid for those vehicles supporting OBD-II interface.

An OBD-II reader connects to the vehicle's OBD-II interfacing port and transmits the engine RPM and oil temperature readings via Bluetooth to AutoGas Analyser.

To set up, first locate the OBD-II port on the vehicle, which is usually located under the steering wheel or near the fuse box. Then plug the OBD-II reader. Make sure the engine is switched off and the key is positioned to the OFF position before plugging in the OBD-II reader.

When starting a test procedure, make sure to select "OBD-II" as RPM source.

Note:

- If OBD-II is enabled and selected, it might take AutoGas Analyser up to 20 seconds at the start of the test to establish communication with the OBD-II reader over Bluetooth.

7.4.4 Using Inductive Pickup

Engine RPM can be measured from the supplied inductive pickup probe (HT cable probe) with the following steps:

- Locate the spark plugs that are attached to the vehicle
- Locate the spark plugs' electrical leads that are connected to the vehicle's power harness
- On the clamp end of the supplied inductive pickup cable, there is a sticker with an arrow indicating the clamp orientation with respect to the cable it clamps onto
- Make sure the arrow points in the direction of the cable going towards the spark plugs
- Clamp one of the electrical leads that run to the spark plugs
- Connect the other end of the supplied inductive pickup cable to the back of AutoGas Analyser ("RPM SENSOR")

When starting a test procedure, make sure to select "Inductive Pickup" as RPM source.

7.5 Running Gas Test

AutoGas Analyser allows a gas test to be executed from a PC using Auto*Test*® Emission Tester software. One major advantage of running a gas test from a PC is that user can monitor gas readings on a computer screen in real-time, as well as view on-screen instructions more clearly.

Once Auto*Test*® Emission Tester software is connected to AutoGas Analyser, click on the  (Test) icon to open the test page.

Press "Run Gas Test" to start a new test. If the connection to AutoGas Analyser is established, the software will prompt for the test information.

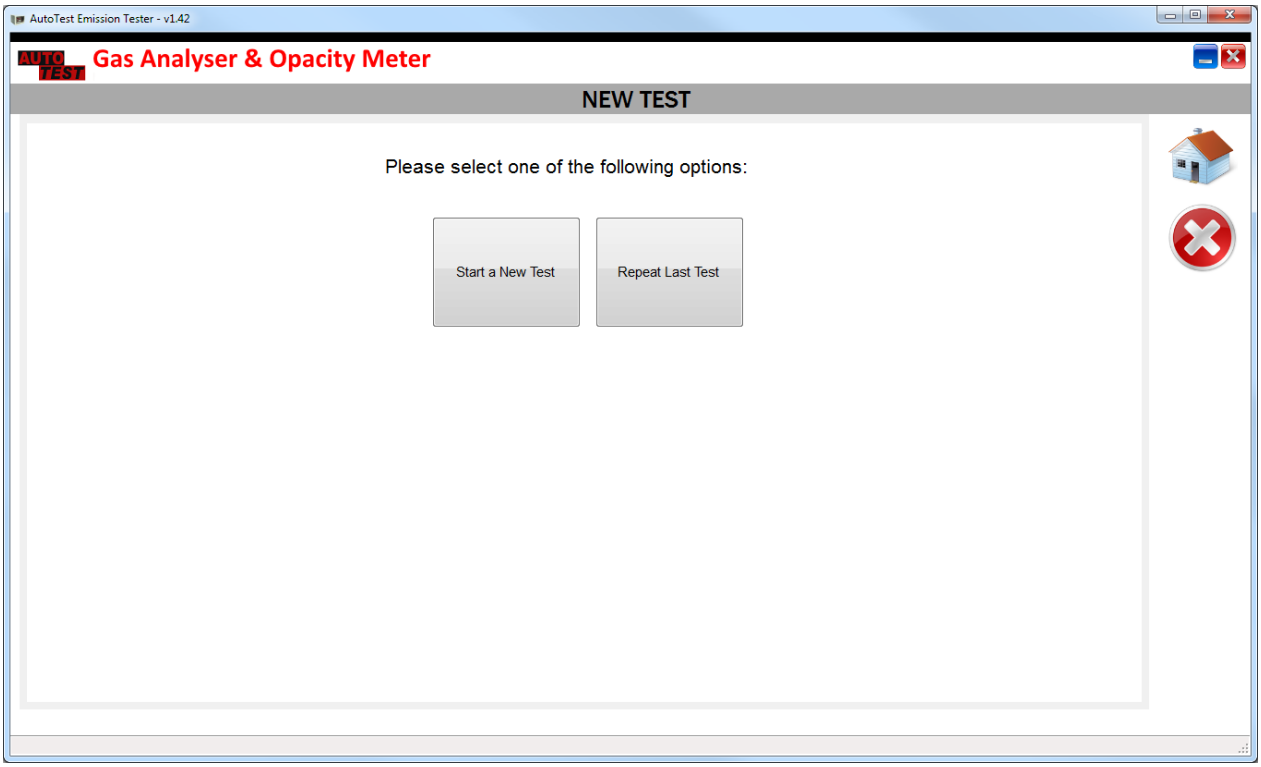


Figure 20 – Test Page

Select "Start a New Test" to run a test from beginning with new vehicle details and testing options. Alternatively, user can select "Repeat Last Test" to reload from last test's information and use that to carry out a gas test.

If "Start a New Test" is selected, user then needs to select the examiner and the vehicle type. The examiner information can be edited in the settings (ref: Section 6.5.5)

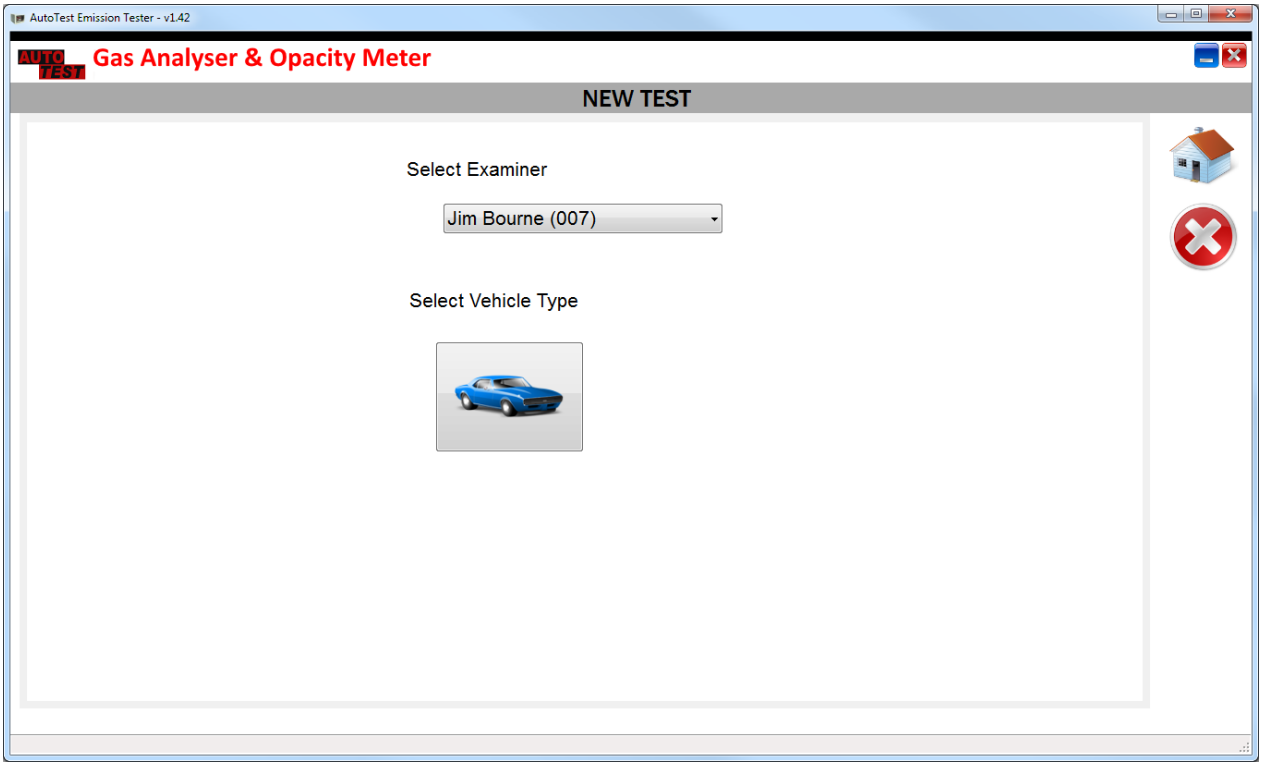


Figure 21 – Select Examiner and Vehicle Type

The next step will prompt user for test type.

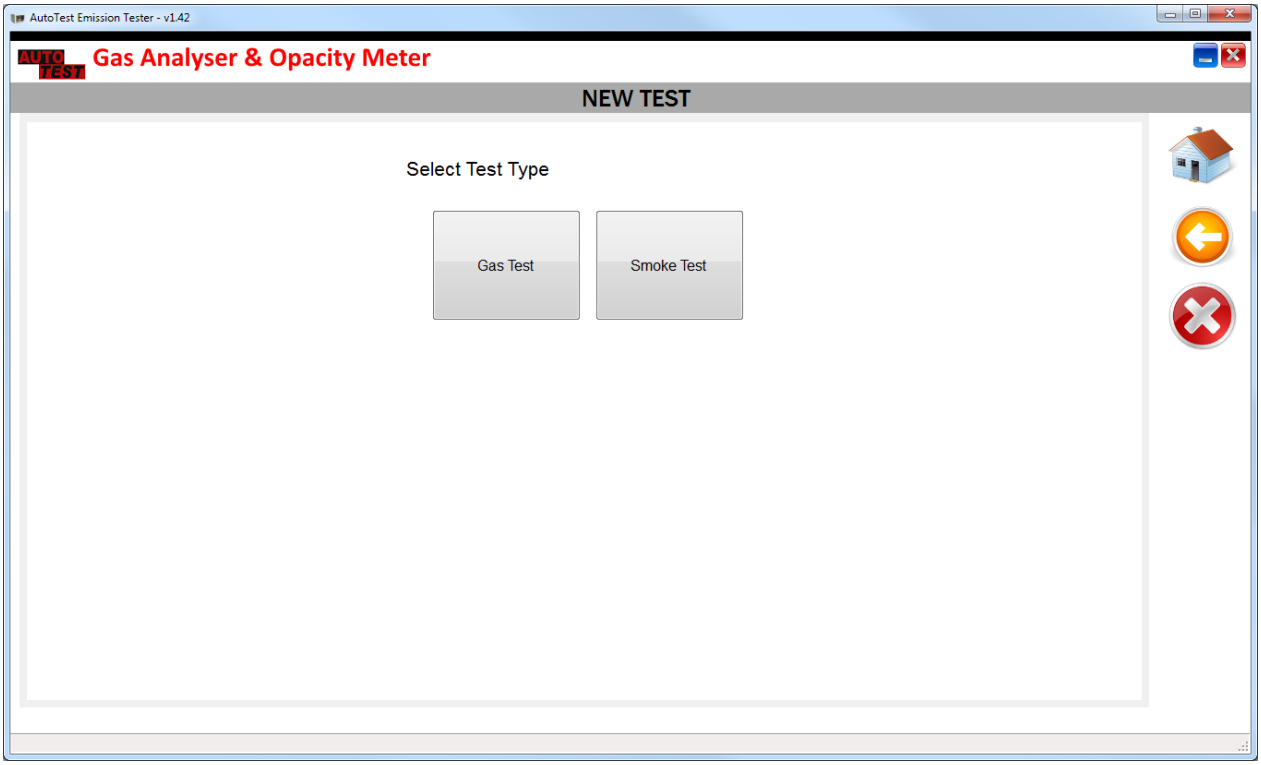


Figure 22 – Select Test Type

If "Gas Test" is selected, the next step will prompt user for fuel type.

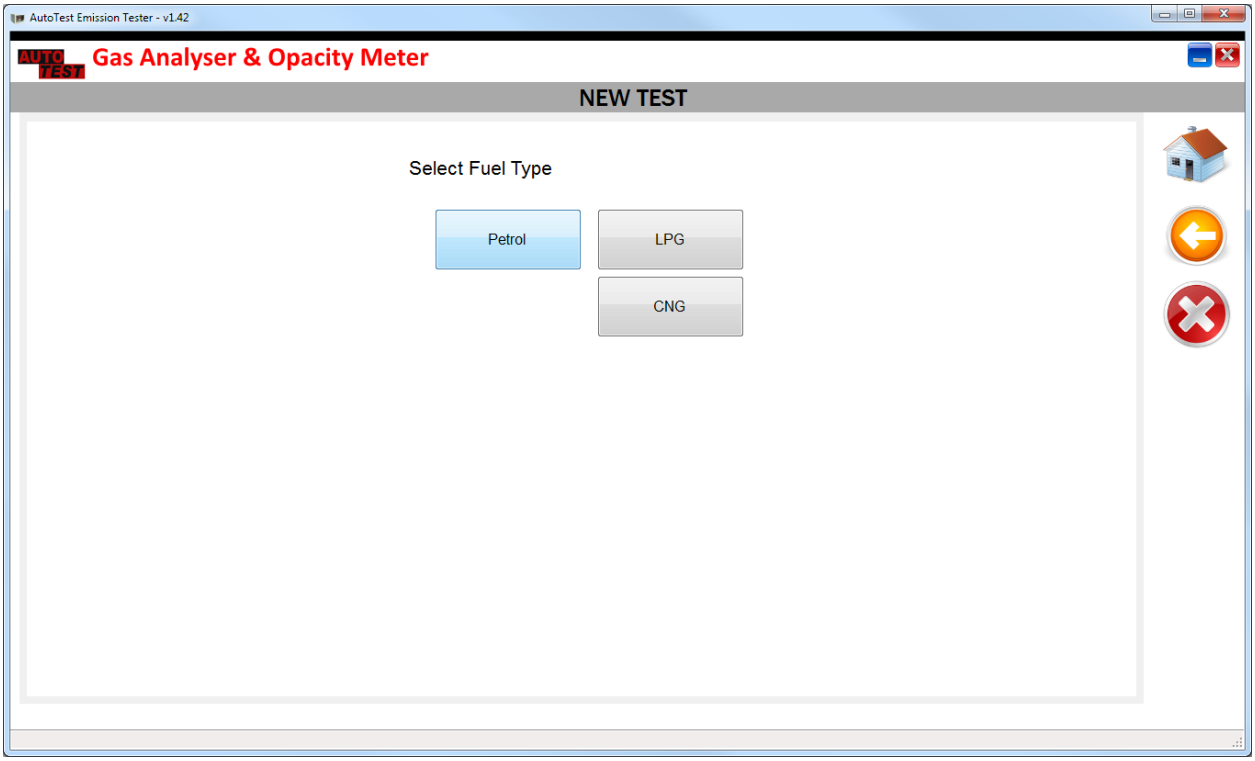


Figure 23 – Select Fuel Type

The next step will prompt user for RPM source.

Figure 24 – Select RPM Source

The next step will prompt user to fill in the vehicle details such as registration number, VIN, make, model, series, cylinders, engine size, etc.

The highlighted part only appears when a "Smoke Test" has been selected. User needs to input the smoke test limits printed on the vehicle manufacturer's plate (if fitted) according to "MOT special notice 07-17".

Once the vehicle details are entered, press the "Begin Test" button to start the test.

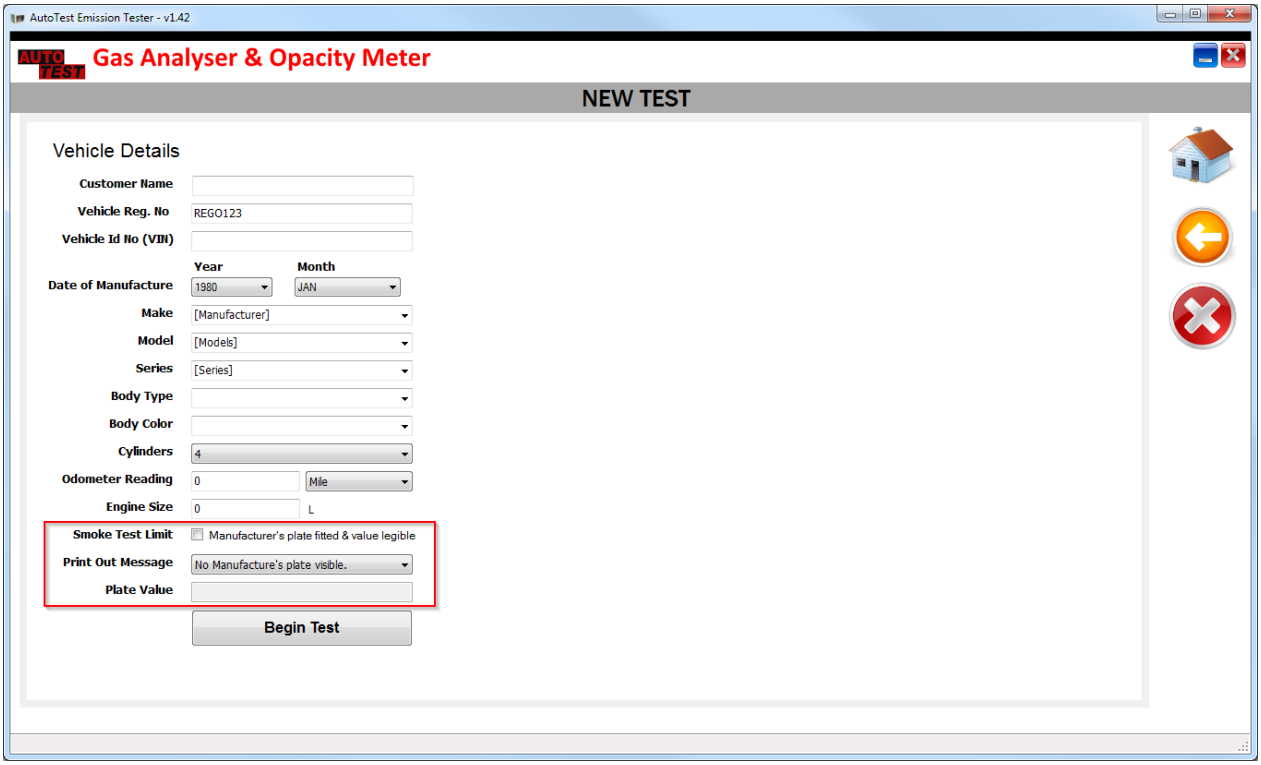


Figure 25 – Vehicle Details

As the gas emission test starts, the software will display detailed user instructions on the screen following each step. It will also show a graph of currently sampled gas measurements and the test limit values.

User can abort the test at any time by pressing the (stop) icon. At certain stages during a test, user can/needs to press the (next) icon to skip that step or move to the next step.

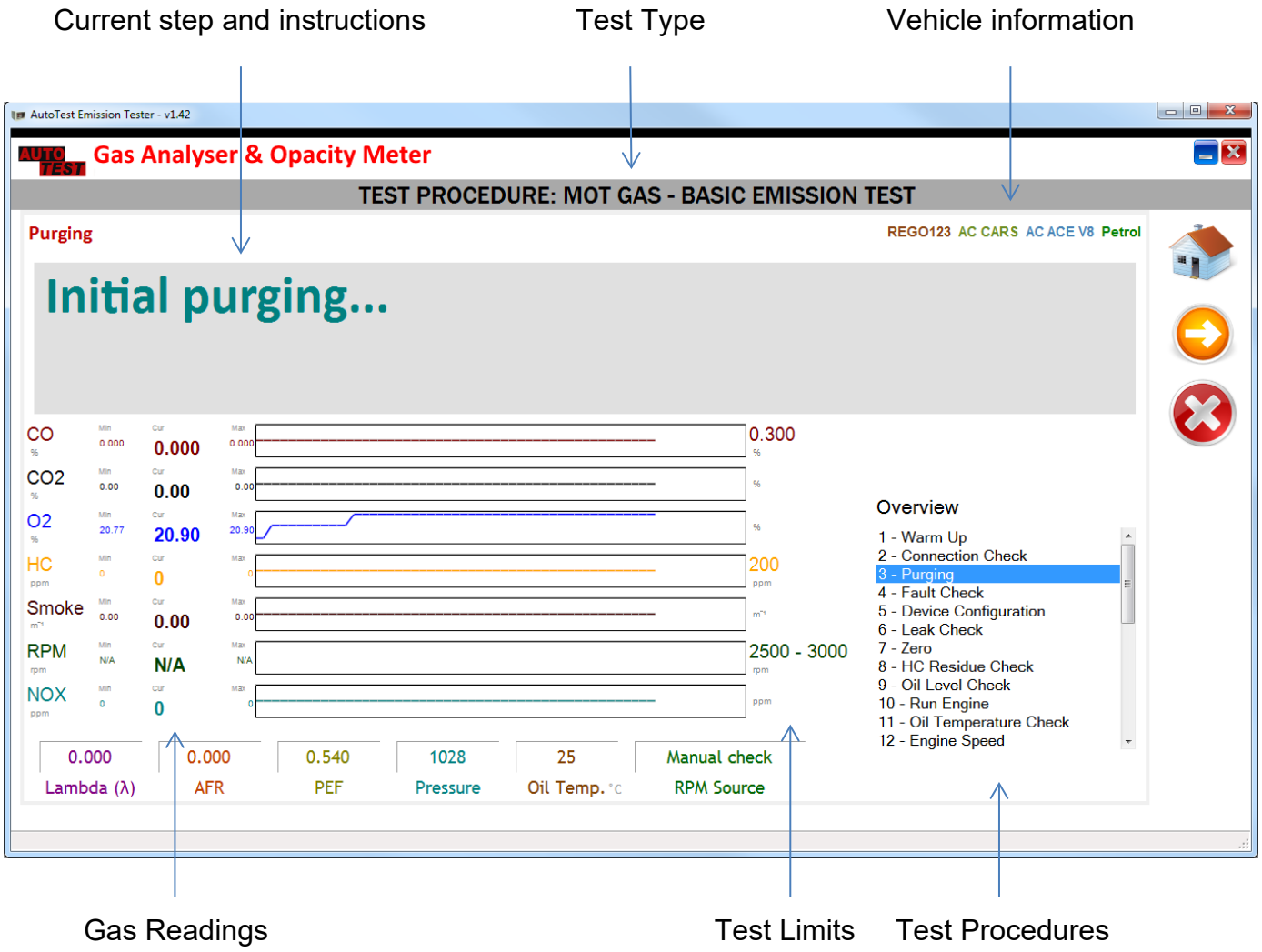


Figure 26 – Test Procedure

Exhaust Emissions Test Results

Operator ID: 123456

Test No. 1 **Test Date:** 26/03/2013 2:35:59 PM

Vehicle Details

Customer Name:	Chris Smith
Vehicle Reg.:	ABC123
VIN :	123456789
Year of Manufacture:	2007
Vehicle Make:	Holden
Vehicle Model:	Astra
Vehicle Body Type:	Hatchback (Blue)
Vehicle Engine:	Four Cyl. (Petrol)
Engine Capacity:	1,500 cc
Odometer Reading:	35,000 km

Test Results

	Description	Limits	Obtained Value	Result
Fast Idle Test				
	RPM	2,150 - 2,850 rpm	2,556 rpm	Pass
	CO	0.300 %	0.090 %	Pass
	HC	200 ppm	32 ppm	Pass
	CO2		14.800 %	
	O2		0.210 %	
	NOX		89 ppm	
	Lambda	0.970 - 1.030	1.006	
	Air Fuel Ratio (AFR)		14.788	
Idle Test				
	RPM	450 - 1,500 rpm	867 rpm	Pass
	CO	0.500 %	0.100 %	Pass
	HC		96 ppm	
	CO2		14.700 %	
	O2		0.190 %	
	NOX		32 ppm	
	Lambda		1.002	
	Air Fuel Ratio (AFR)		14.729	
Overall Result				Pass

Operator: 123456

Signature:

Figure 27 – Test Report Sample

7.6 Submit Test Results to MTS

Once the test is completed, the test report will be displayed on "TEST REPORT" page where user can submit test results to MTS.

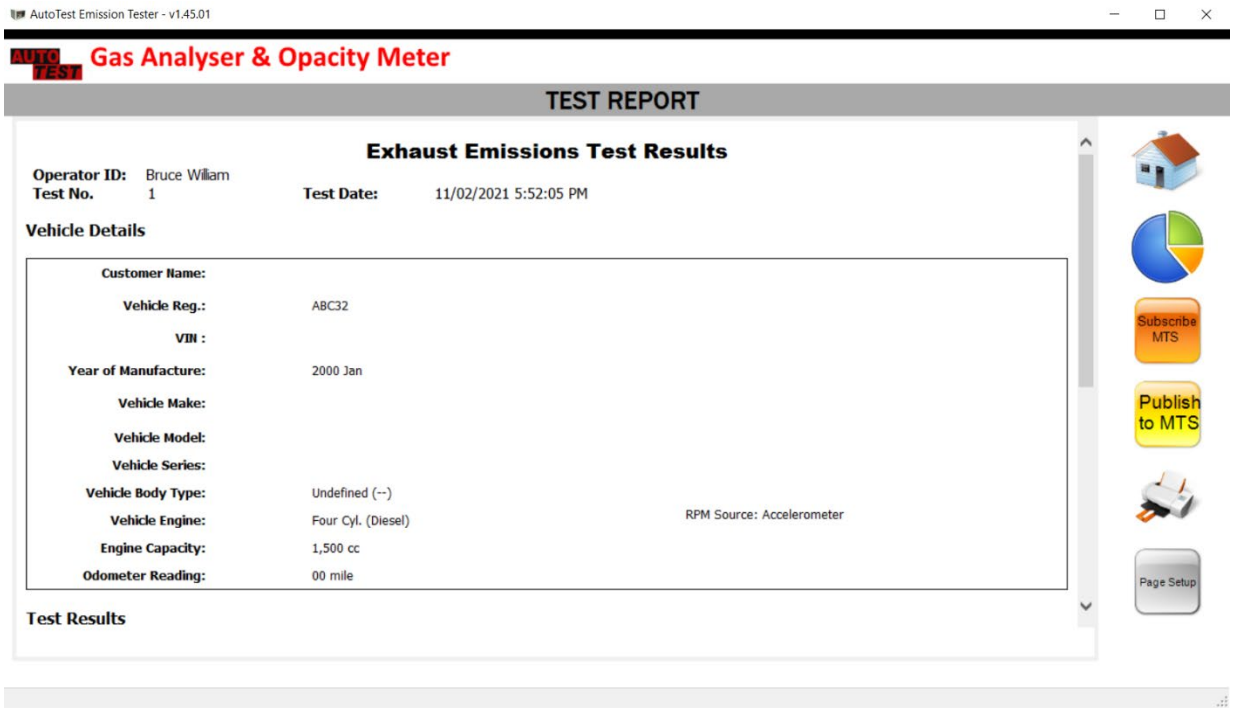


Figure 28 Test Report View with MTS Functions

Press "Subscribe MTS" to connect with MTS and obtain the corresponding work order.

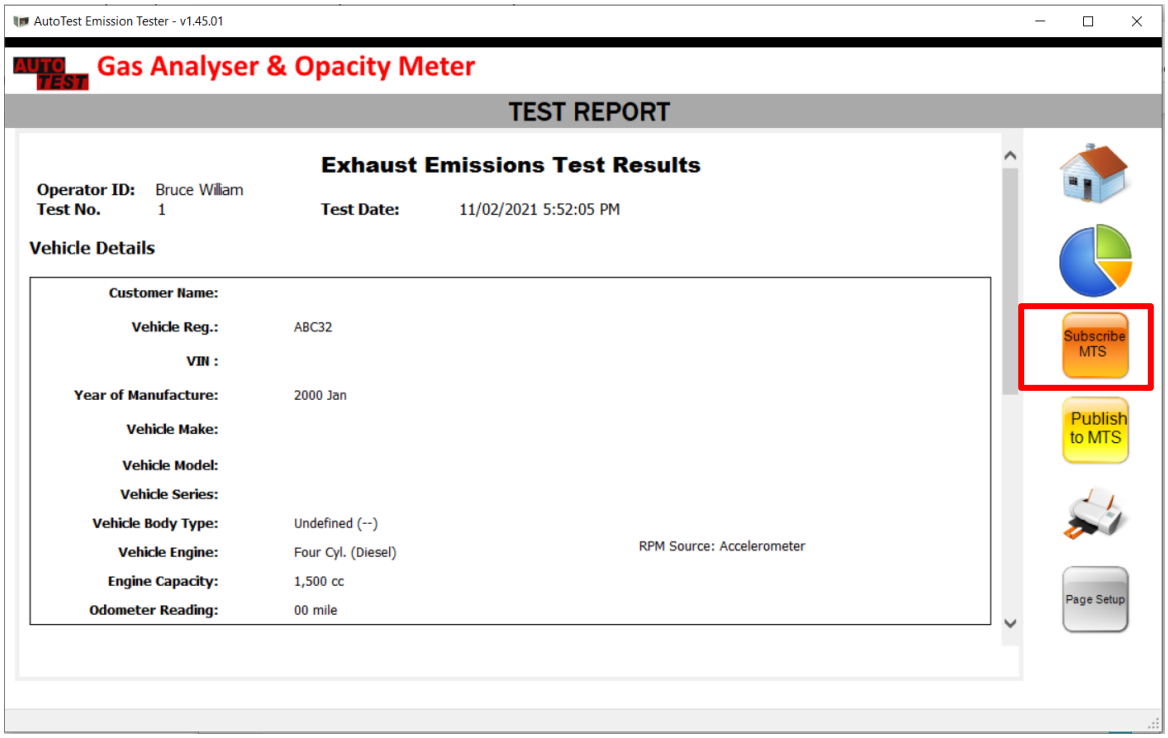


Figure 29 Subscribe MTS

If test has been published to MTS before, the following message will appear.

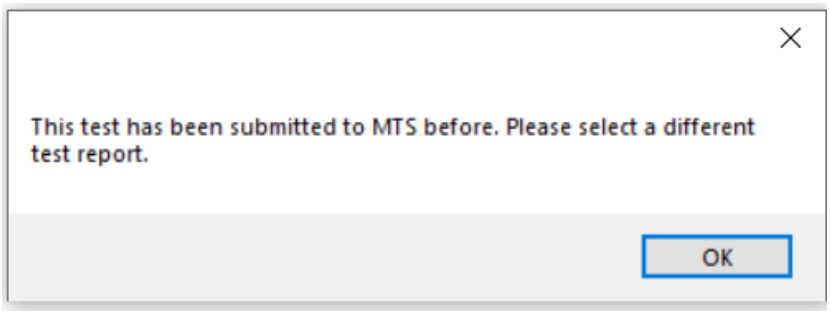


Figure 30 Previously Published

If not, the next step will prompt the user for vehicle registration number.
"Test VRM" input box will display vehicle registration number mentioned in the test report as the default value. If vehicle registration is correct, please confirm it by pressing "OK". Otherwise, user can edit the text field and enter correct vehicle registration before proceeding.
Press "Cancel" if you do not wish to proceed with MTS connection.

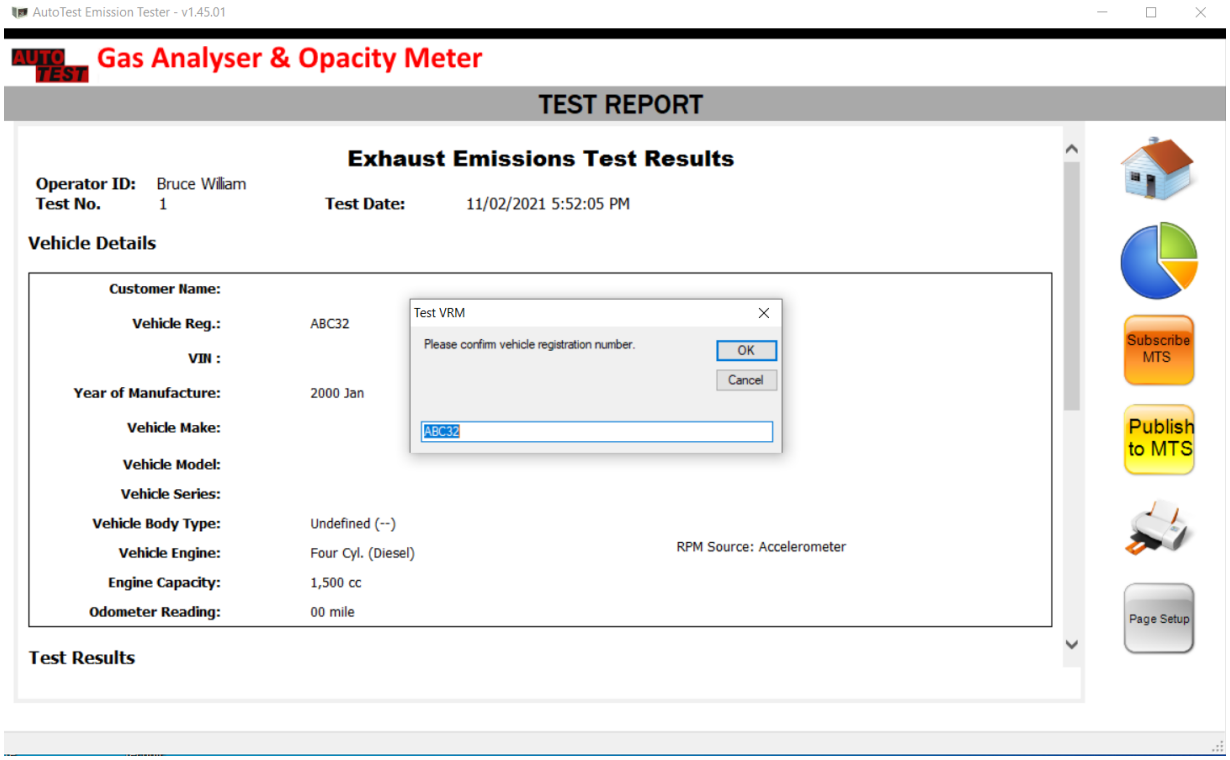


Figure 31 Confirm Vehicle Registration Number

Note: Remain in "TEST REPORT" page once the MTS connection is initiated.

"Searching for Work Order …" message indicates that program is waiting for the work order.

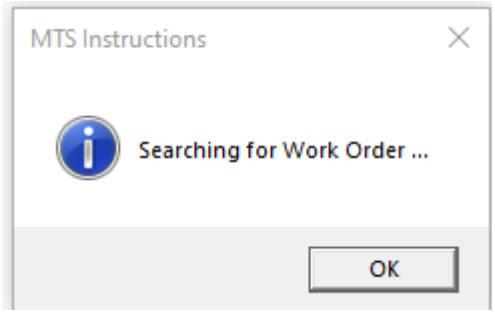


Figure 32 Searching for Work Order

"Work order Received. Submit Test Results." message signals user to submit test results.

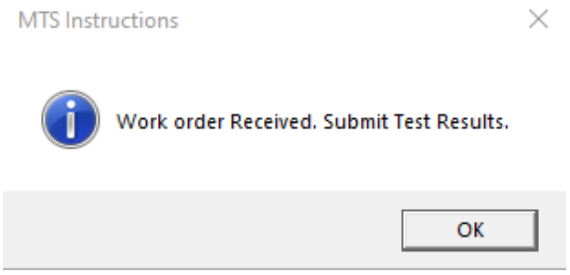


Figure 33 Work Order Received

If vehicle registration number entered in the software or into MTS by the tester is incorrect, a matching work order will not be available, and therefore user will see following message on the screen.

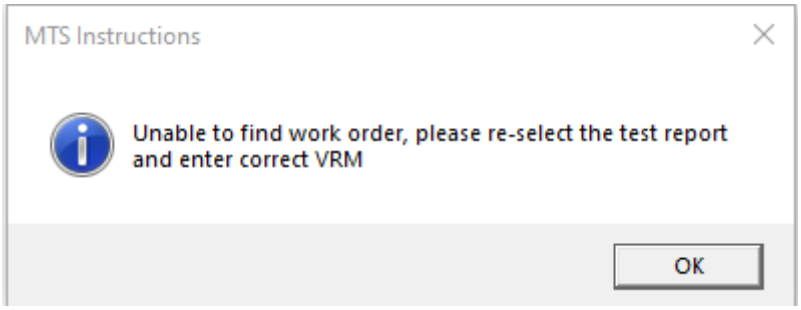


Figure 34 Unable to find Work Order

Note: To re-submit the test, go back to "REPORTS INDEX" page and select the test report and repeat the steps to connect with MTS.

Press "Publish to MTS" to submit test results to MTS.

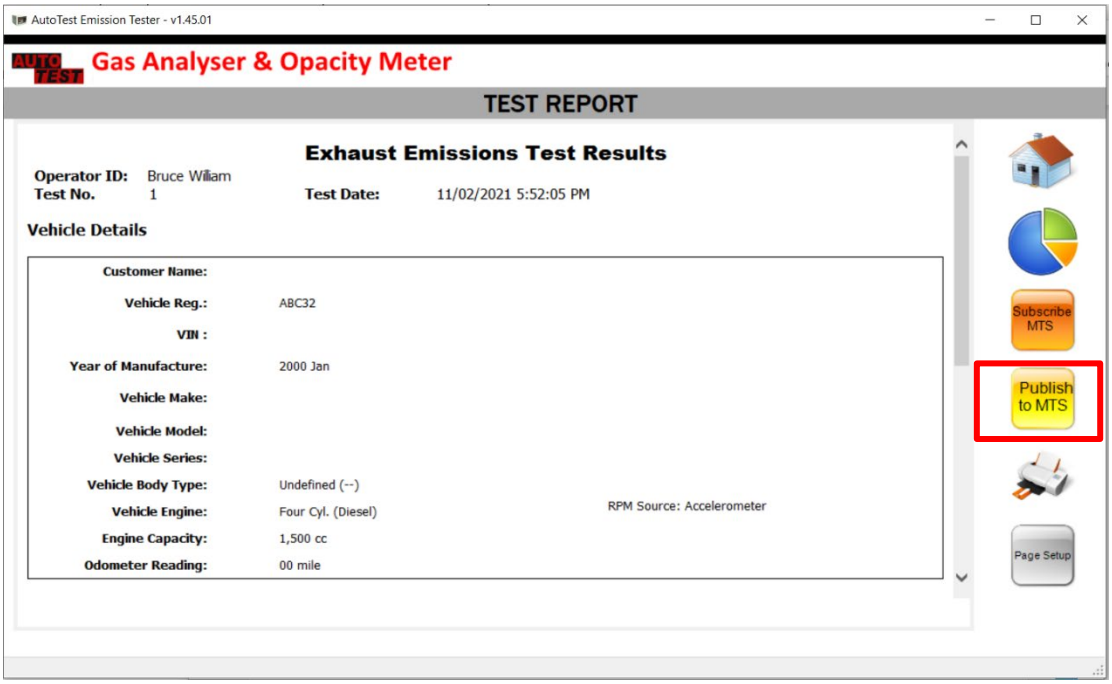


Figure 35 Publish Test Results to MTS

"Results Published to MTS" message will indicate that test results have been submitted to MTS by the software.
Note: This message is not an indication of successful submission of test results to MTS.

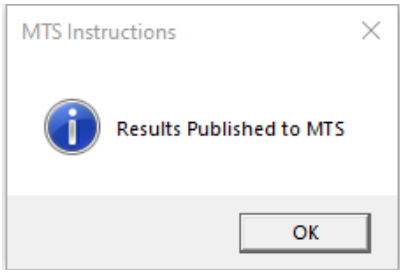


Figure 36 Test Results Published

Wait until "Results submitted to MTS successfully" message appear to conclude the test. This message indicates that submission of test results to MTS has succeeded.

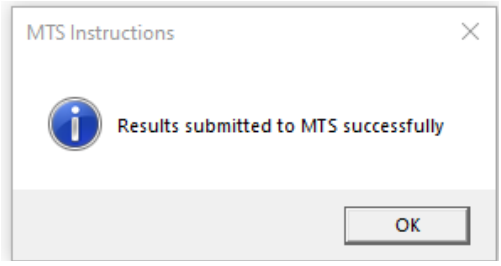


Figure 37 Confirmation Received

8. TROUBLESHOOTING

Fault Description	Possible Reasons	Possible Solution
Device not turning ON	• AC Fuse blown	Check the AC fuse located in the compartment where AC-in cable is connected. Notice the fuse value printed on a sticker next to the AC input socket.
Smoke Meter's fan not running	• Smoke meter just started	Normal. The fan does not turn on during the initial warmed up phase.
	• Faulty Fan	If the FAN does not turn on after the warmup is done while the communication between Auto Smoke and AutoGas is ok, replace the fan as it might be faulty.
AutoGas unable to connect to Auto Smoke	• Signal reception problem	Change the angle and direction of the RF antenna located on the smoke meter
		Reduce the distance between AutoGas and Auto Smoke
"Smoke Bench Failed" message appears on AutoGas when starting a smoke test	• Smoke bench is faulty or dead	Contact Auto*Test*® Service Centre

8.1 Error Messages

Fault Description	Possible Reasons	Possible Solution
"Calibration Expired! Measurements may be inaccurate."	• Calibration has expired	Recalibrate the meter
"RTC clock on the device has failed."	• Internal clock chip fault or the 3V clock battery is flat	The meter needs to be repaired. Contact Auto*Test*® Service Centre.
"Gas bench board failed"	• Faulty gas bench board	The gas bench needs to be checked.
"EEPROM memory on gas bench board has failed"		Contact Auto*Test*® Service Centre.
"Gas bench channel has failed"		
"Leak test failed"	• Leak in the sampling probe / tube	Check the leak or loose fittings and then perform leak-check again
"NOx sensor has failed"	• NOx sensor has failed/expired.	Install a new NOx sensor

"O2 sensor has failed"	• O2 sensor has failed/expired	Install a new O2 sensor
"RPM board has failed"	• RPM board is faulty	The RPM board needs to be checked. Contact Auto*Test*® Service Centre.
"Data flash memory is faulty"	• Internal flash memory is faulty	The flash memory needs to be checked/replaced. Contact Auto*Test*® Service Centre.

For other problems, contact Auto*Test*® Products or any Authorised Service Centre or Auto*Test*® Products Head Office in Australia on (61 3) 9647 9797. Repairs should only be carried out by an authorised Auto*Test*® service centre, in order to ensure that the gas analyser retains its calibration. Refer to Section 12 regarding warranty. For instructions on returning products for calibration or servicing, see Section 9.1.

9. SPECIFICATIONS

9.1 Technical Specifications

	Measurement parameters	Range	Resolution	Accuracy
1	CO (Carbon Monoxide)	0 – 15.5%	0.01%	±0.03% Abs., or ±3% Rel.
2	CO_2 (Carbon Dioxide)	0 – 21.0%	0.10%	±0.4% Abs., or ±4% Rel.
3	HC (Hydro Carbon)	0 - 20000 PPM	1 PPM	±10 PPM Abs., or ±5% Rel.
4	O_2 (Oxygen)	0 - 25%	0.01%	±0.1% Abs., or ±3% Rel.
5	NO_x (Optional)	0 - 5000 PPM	1 PPM	±20 PPM Abs., or ±4% Rel.
6	Oil Temperature	0 – 110 °C	1°C	
7	Oil Temperature (via OBD-II)	-40 – 210 °C	1°C	
8	AFR	0 - 30%	0.01%	
9	Lambda	0.200 - 2.000	0.001	
10	Engine Speed	400 - 4000 RPM	10 RPM	
11	Engine Speed (via OBD-II)	0 - 16383 RPM	1 RPM	
12	Automatic compensation for variations in temperature and pressure			
13	Measuring gas intake	3 litres / minute		
14	Leak test	Electronic		
15	Condensate discharge	Automatic		
16	Response time (for sample probe length of 5m or less)	< 10 seconds		
17	Warm-up time (for ambient temperature of above 25°C)	< 3 minutes		
18	Zero & RPM calibration	Automatic		

9.2 Electrical Specification

1	AC Power supply	195 - 255 V_{AC} Single phase, 50 Hz ± 2%
2	DC Power supply	12 - 16 V_{DC} (Battery)
3	Power consumption	< 2 A

9.3 General Specifications

1	Operating temperature	
	AutoGas Analyser & Diesel Smoke Meter	+2°C to +45°C
	Accelerometer	+2°C to +130°C
3	Storage temperature	-20°C to +70°C
4	Overall machine dimensions- Unpacked (WxDxH)	270 mm x 400 mm x 110 mm
5	Machine weight (Unpacked)	4.3 kg
6	OIML R99 (ISO 3930) Class 0 specification, ISO3930	

9.4 Communication Interfaces

1	RS232	Between AutoGas Analyser and PC
2	ZigBee	Between AutoGas Analyser and Auto Smoke Meter
3	Bluetooth	Between AutoGas Analyser and OBD-II reader

9.5 PEF, AFR and Lambda

Propane Equivalency Factor (PEF) is calculated by the Gas Analyser automatically and is the factor used to convert the Hydrocarbon (HC) reading from the fuel type selected to the Propane Equivalent. For example if the fuel selected is Petrol (Hexane) then an example PEF of 0.523 and a HC of 1046 ppm Hexane could be converted to the Propane equivalent by diving the HC value by the PEF to give a HC value of 2000 ppm Propane which corresponds to the standard calibration gas.

The Air Fuel Ratio (AFR) is the ratio between the mass of air and the mass of fuel used by the engine when running. The ideal (theoretical) air-fuel ratio for a complete combustion is called the stoichiometric air-fuel ratio. When the AFR is higher than the stoichiometric ratio, the AFR mixture is called lean as there is more air than necessary for perfect combustion. When the AFR is lower than the stoichiometric ratio the AFR mixture is called rich, as there is more fuel. The stoichiometric AFR is different depending on the fuel used, some common stoichiometric AFR's are shown below:

Fuel	Chemical Formula	Stoichiometric AFR
Petrol (Hexane)	C6H14	14.7
LPG (Propane)	C3H8	15.67
CNG (Methane)	CH4	17.19
Diesel	C12H24	15.5

Lambda (λ) is a standardised mathematical representation of AFR designed to be more easily comparable between fuel sources and simpler to understand. A Lambda value of 1 indicates perfect stoichiometric fuel ratio. Lambda > 1 represents a Lean mixture, while Lambda < 1 represents a Rich fuel mixture. Lambda is calculated by dividing the observed AFR with the fuels stoichiometric AFR.

10. CALIBRATION PROCEDURE

AutoGas must be re-calibrated at least once a year. The reason for this is to maintain creditability in tests and acceptance of data according to international standards. Each time the results are printed, the printout will include the day and month of the last calibration. There are two ways of calibrating AutoGas - either via your local authorised service centre or by returning the unit to Auto*Test*® Products (See Section 10.1).

10.1 Returning AutoGas for Calibration

10.1.1 Packaging

Please remember that you are shipping an electronic instrument. Bubble pack or foam should surround AutoGas Analyser, which should be inserted into a sturdy cardboard box.

10.1.2 Shipping

Labelling - A label noting "Electronic Device - Fragile" should be placed on the box.
Freight Carrier – Container should be sent **freight prepaid**. Auto*Test*® Products has no preference on freight carriers. However, we prefer companies such as TNT, IPEC, UPS, or Federal Express to forward units, if a prompt delivery is required.

Ship to the following address:

Tecalemit Garage Equipment
Langage Business Park
1 Eagle Rd, Plymouth PL7 5JY
United Kingdom

Or to AutoTest Products Head Office in Australia:
The Service Department,
Auto*Test* Products Pty Ltd,
61-63 Parsons St,
Kensington, VIC 3031,
Australia.
Phone: (+61 3) 8840 3000.

Alternatively, you may also contact your nearest service distributor (Section 11).

10.2 Replacing O2 Sensor

The O_2 sensor is located inside AutoGas Analyser and can be accessed by removing the screws from the small window located at the back of the gas analyser.

Figure 38 Remove Screws from Case

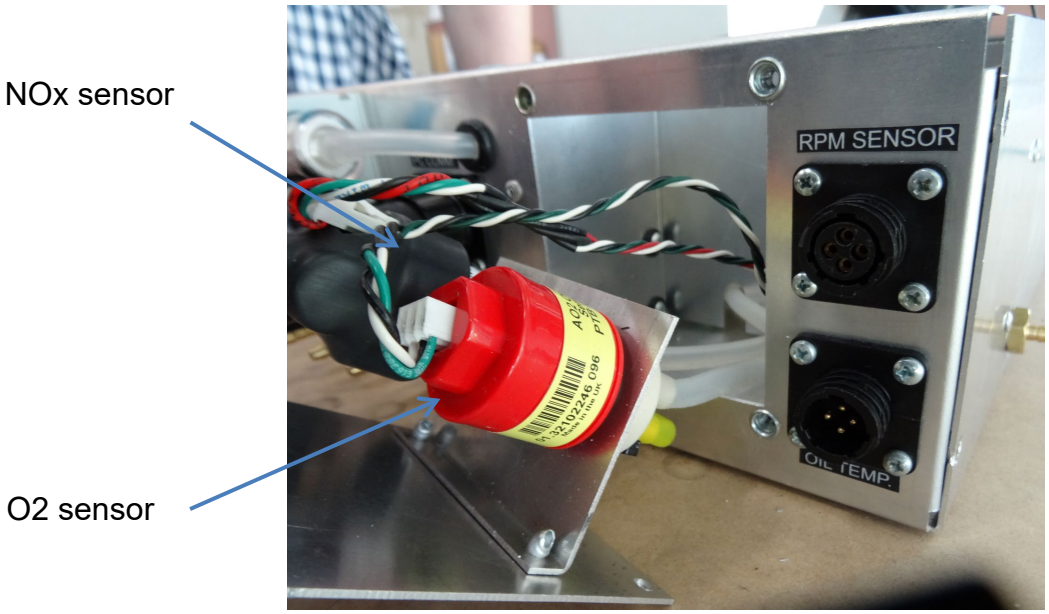


Figure 39 O2 and NOx Sensors

The following steps guide on how to replace an O_2 sensor.

1. Turn off gas analyser, remove the power cord, and open the back cover.
2. Locate the O_2 sensor (Red sensor) and remove the connector.
3. Once the connector has been removed, unscrew the sensor by rotating it counter-clockwise.
4. Mount the new O_2 sensor in place of the old one and make sure it is firmly screwed in tightly.
5. Plug in the connector clip back on the sensor and make sure it is firmly connected.

6. Close the back cover with screws.
7. Turn ON gas analyser and let it perform the initial tests.

11. AUTHORISED SERVICE AGENTS

UNITED KINGDOM
Tecalemit Garage Equip. Co. Ltd
Unit 2, Eagle Rd, Langage Business Park,
Plymouth, PL7 5JY, United Kingdomo
PH: (+017) 5221 9150

AUSTRALIA
Auto*Test*® Products
61-63 parsons Street, Kensington,VIC-3301
+61 3 88403016

12. WARRANTY

Auto*Test*® Products Pty Ltd or any Authorised Auto*Test*® Service Centre warrants this product against defects in material and workmanship for a period of 12 months from the original date of purchase. This warranty applies only to products and components supplied by AUTO*TEST* Products which can be identified by the trade name or logo affixed to them or by other documents. Auto*Test*® Products does not warrant any products not supplied by Auto*Test*® Products.

During the warranty period, Auto*Test*® Products or any Authorised Service Centre will repair (or at its option replace) any defective component(s) without charge for parts or labour, provided the product is returned freight prepaid to an authorised Auto*Test*® Service Centre. Transit insurance and return freight will be at the owner's expense.

In order to obtain calibration, warranty or non-warranty service, ship the product, freight and insurance prepaid to your nearest Auto*Test*® Service Centre. Attach to the product your name, address, contact phone numbers, description of the problem and if a warranty claim, proof of purchase (dated sales receipt or invoice).

Auto*Test*® Products or any Authorised Auto*Test*® Service Centre reserves the right to refuse warranty repair if accident, abuse, misuse or misapplication has damaged the product, or if the product has been damaged in transit or as a result of service or modification by other than an Authorised Service Centre, nor are any other warranties expressed or implied, including any regarding merchantability or fitness for any other particular purpose.

Auto*Test*® Products or any Authorised Service Centre is not responsible for incidental or consequential damages resulting from the breach of any express or implied warranty, including damage to property and, to the extent permitted by law, damages for personal injury.

Register your AutoTest Product today:
www.autotest.net.au/warranty-information

NOTES:

AUTO*TEST* Products Pty Ltd

U.K. Authorised Dealer
Tecalemit Garage Equipment
Langage Business Park
1 Eagle Rd, Plymouth PL7 5JY
United Kingdom
Phone: (+44) 1752 219 111
Email: sales@tecalemit.co.uk

www.autotestproducts.co.uk