The Standard in Information and Diagnostic Systems

DGA 1500

Diagnostics Gas Analyser

- **User's Manual**

User's Manual

DGA 1500

Models: EEEA**15*A

Diagnostics Gas Analyser

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Whilst the authors have taken due care in the preparation of this manual, nothing contained herein:

- modifies or alters in any way the standard terms and conditions of the purchase, lease or rental agreement under the terms of which the equipment to which this manual relates was acquired,
- increases in any way the liability to the customer or to third parties.

TO THE READER

Whilst every effort has been made to ensure that the information contained in this manual is correct, complete and up-to date, the right to change any part of this document at any time without prior notice is reserved.

Before installing, maintaining or operating this unit, please read this manual carefully, paying extra attention to the safety warnings and precautions.

CE

The producer of the equipment has supplied all information:

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FOREWORD

We thank you for acquiring the DGA1500. Of recent design, it takes advantage of the most advanced technologies, both at the software and at the hardware level, harnessing them to serve your priorities: rapid testing, accuracy, reliability and long maintenance intervals. Especially designed for the garage setting, its friendly environment allows you to quickly and effectively master all the possibilities offered by this device. We are therefore convinced that it will give you complete satisfaction.

This manual explains how to use the DGA1500 station, from installation through measurement procedures, as well as measures to be taken in case of malfunction. Please read this manual attentively before operating the device, in order to get the full benefit of it. Keep it in a safe place to consult it when necessary.

Notice:

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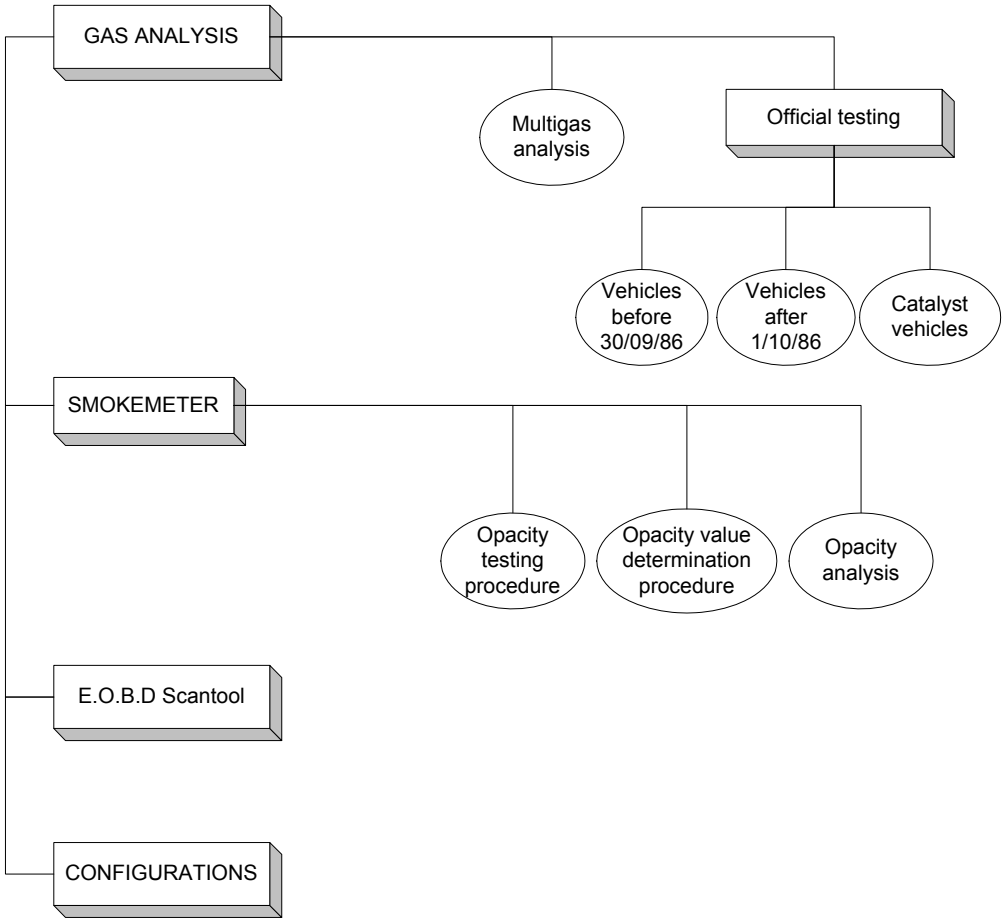
SNAP ON will not be held responsible in any case for any damage, direct or indirect, of any kind whatever, nor for losses or expenses, resulting from improper use.

I. GENERAL DESCRIPTION OF THE DGA 1500

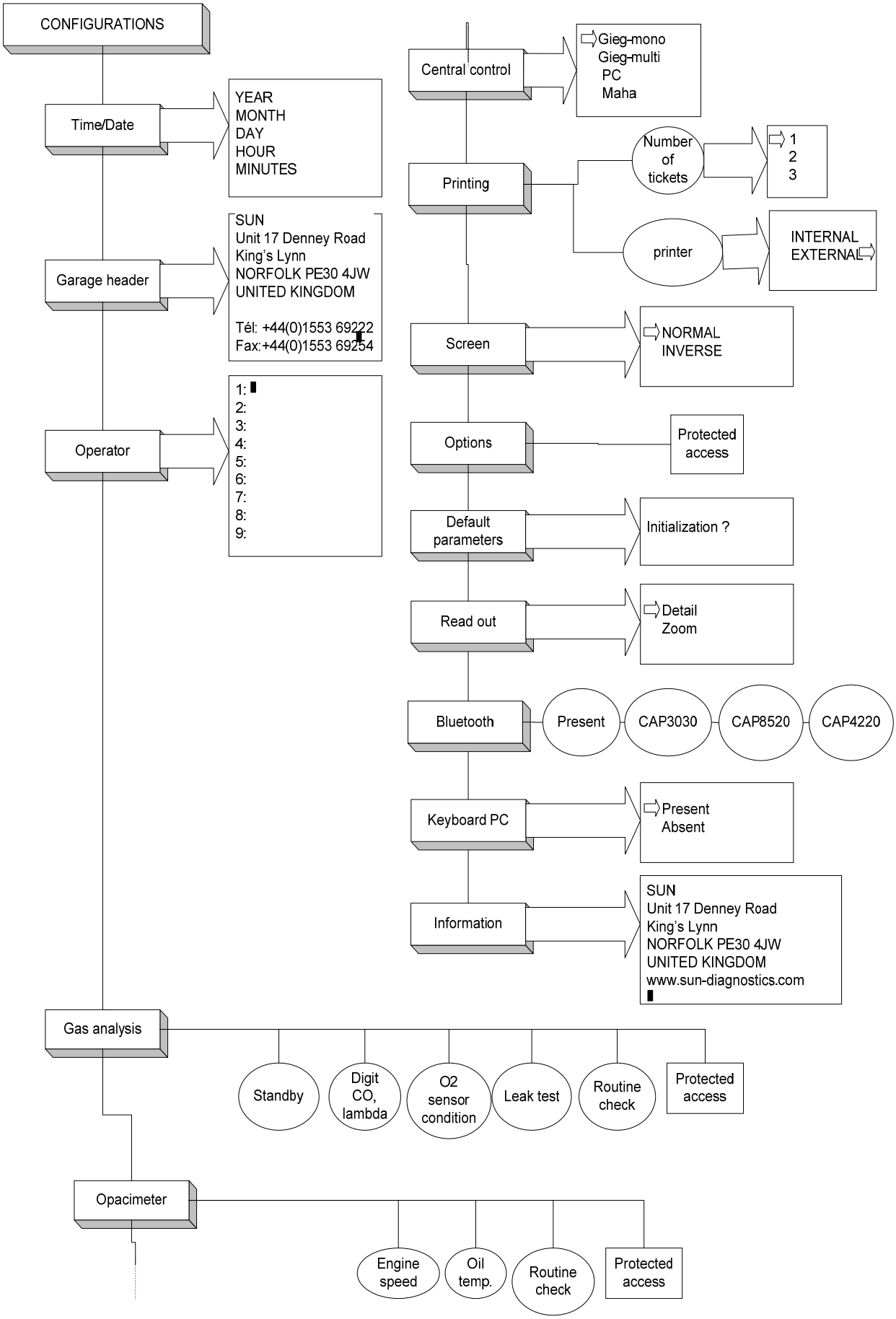
I.1. OVERALL DIAGRAM

The diagrams presented below allow the menu hierarchy to be understood; the user can thus easily follow the sequence of the various sub-parts.

I.1.1. Main menu:



I.1.2. Configuration Menu:


CONFIGURATIONS
Time/Date
YEAR
MONTH
DAY
HOUR
MINUTES
Garage header
SUN
Unit 17 Denney Road
King's Lynn
NORFOLK PE30 4JW
UNITED KINGDOM
Tél: +44(0)1553 69222
Fax:+44(0)1553 69254
Operator
1:
2:
3:
4:
5:
6:
7:
8:
9:
Central control
Gieg-mono
Gieg-multi
PC
Maha
Printing
Number of tickets
1
2
3
printer
INTERNAL
EXTERNAL
Screen
NORMAL
INVERSE
Options
Protected access
Default parameters
Initialization ?
Read out
Detail
Zoom
Bluetooth
Present
CAP3030
CAP8520
CAP4220
Keyboard PC
Present
Absent
Information
SUN
Unit 17 Denney Road
King's Lynn
NORFOLK PE30 4JW
UNITED KINGDOM
www.sun-diagnostics.com
Gas analysis
Standby
Digit CO, lambda
O2 sensor condition
Leak test
Routine check
Protected access
Opacimeter
Engine speed
Oil temp.
Routine check
Protected access

I.2. OVERALL VIEW:

The DGA1500 station is made up of a DGA1500, a DSS-3 opacity measurement cell and trolley.
The DGA1500 has an LCD screen, a gas analysis module for petrol vehicles, a keyboard and a printer. The DSS-3 is connected to the station by a power supply and data cable. It is packaged in the form of a small metal briefcase mounted on legs.

I.2.1. DGA 1500

I.2.2. Components list

For DGA 1500; gas analyzer:

Part Number	Description
CAPPRO00289	GAS SAMPLING PROBE WITH HANDLE
CAPPRO01034	CAP GAS SAMPLING PROBE
CAPPRO00014	BLACK HOSE GAS SAMPLING PROBE
CAPSSE00015	INDUCTIVE PICK-UP
CAPPRO00310	FILTER DECANTER GRADE 12 10PK
CAPPRO00028	PAPER ROLL THERMAL PRINT 20PK
CAPPRO00035	MAINS CORD CEE22 1.80M*
CAPPRO01036	Y MAINS CORD CEE22 2.00M*
CAPSSE00019	TEMPERATURE PROBE 0-150 DEG

*Depending on the configuration

For DGA 1500; Smoke meter:

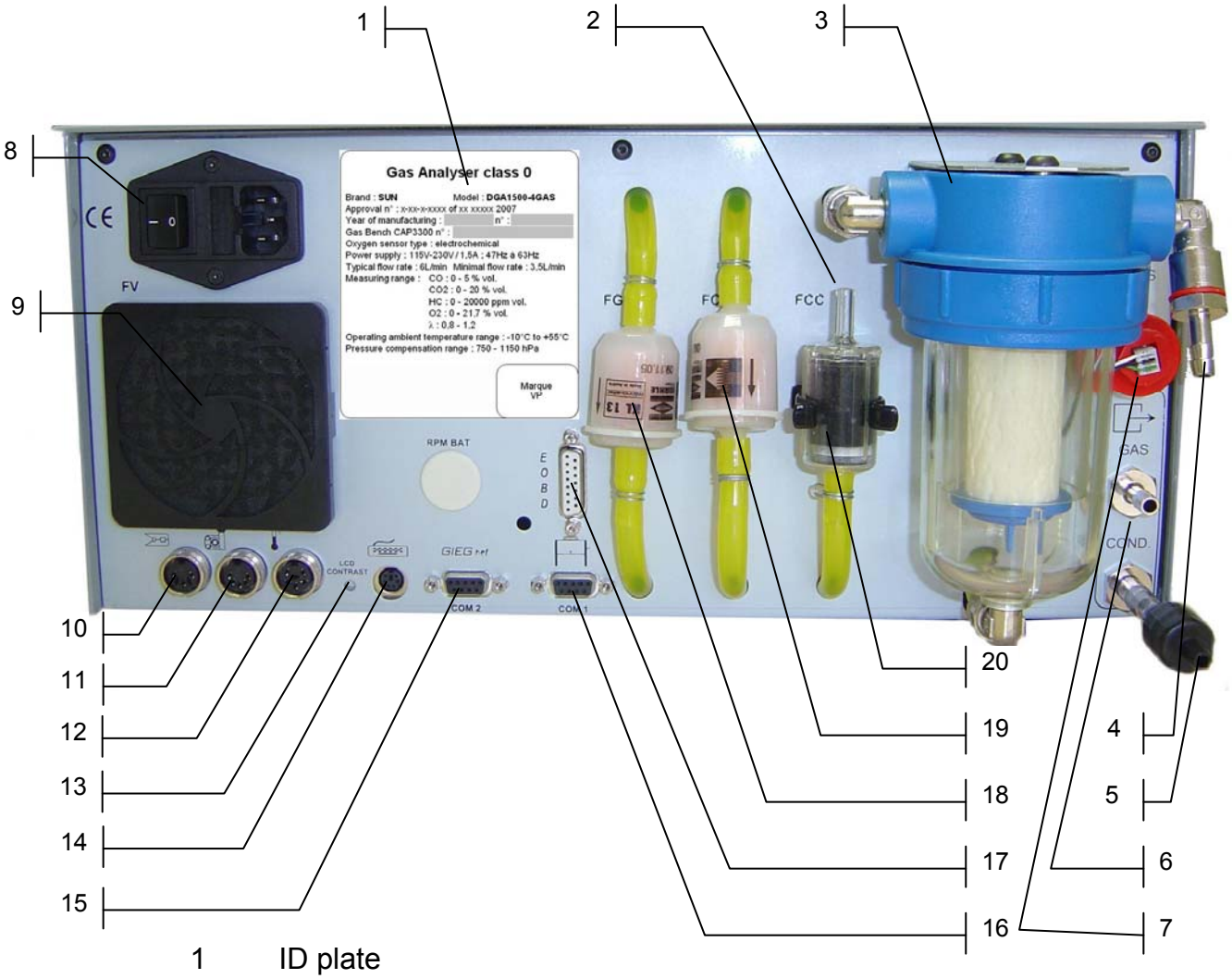
Part Number	Description
CAPSSE00076	CLEANING BRUSH
CAPPRO00308	GAS SAMPLING PROBE
CAP3030-PIEDS	OPACITY TRANSDUCER SUPPORT
CAPPRO00029	DGA 1500 CONN CABLE DSS-3

OPTIONS :

EAK0083E10A	DGA 1500 STAND
EAK0083E11A	DGA 1500 KEYBOARD
EAK0083E12A	DGA 1500 SMOKE METER KIT
	NO Kit DGA 1500
CAP1220	BLUETOOTH ADAPTOR DGA1500
CAP1221	BLUETOOTH ADAPTOR SMOKE HEAD
CAP4220	BLUETOOTH EOBD INTERFACE
EEEA147A	KIT RPM/OIL TEMP WIRELESS

I.2.3. Front side

I.2.4. Rear Side



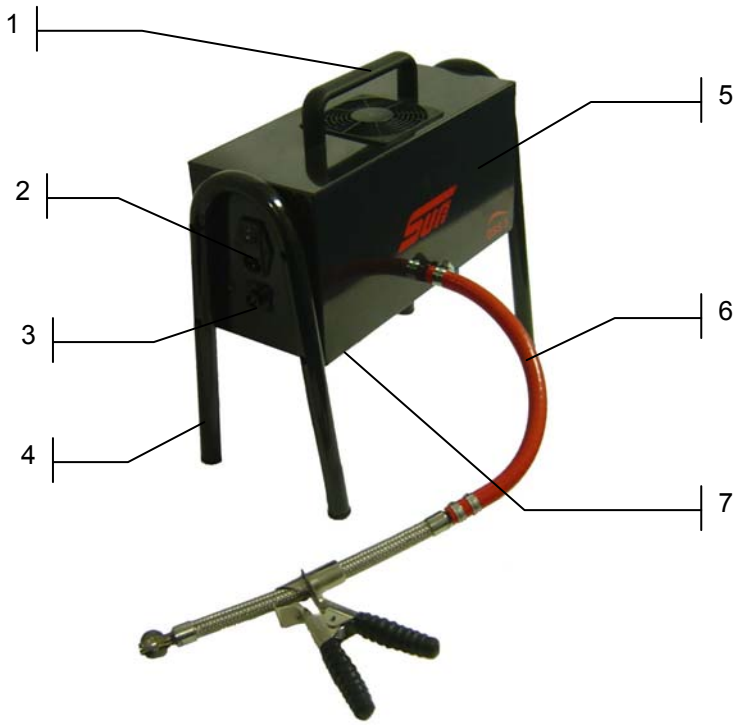
1 ID plate
2 Clean air inlet for zero calibration
3 Separator (***FD***)
4 Sample gas inlet (***GAS***)
5 Condensate water outlet (***COND***)
6 Sample gas outlet (***GAS***)
7 Oxygen sensor
8 Mains power inlet connector
9 Fan with filter (***FV***)
10 Input connector for induction clip
11 TTL and piezoelectric input connector
12 Input connector for oil temperature sensor
13 Contrast control for LCD screen
14 PS2 keyboard input connector
15 COM2 serial port connector
16 COM1 serial port connector
17 Connector for BLUETOOTH adaptor
18 Gas pump protection filter (***FG***)
19 Condensate pump protection filter (***FC***)
20 Activated charcoal filter (***FCC***)

I.2.5. External Gas Connectors

1 Exhaust probe
2 Exhaust attachment grip
3 Black tube (length 7,5m)
4 Transparent tube (length 1.5m)
5 Transparent tube (length 1.5m)

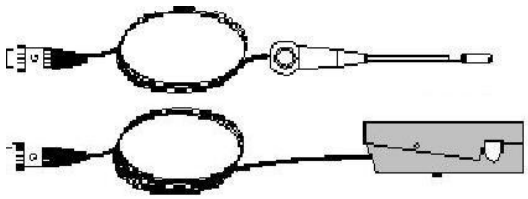
Item 4 and 5 should be routed through the column.

I.2.6. DSS-3 Opacity measuring cell



1 Serial Plate
2 Mains Inlet Connector / switch
3 Data connector
4 Support legs
5 Opacity measuring cell
6 Exhaust probe
7 Outlet of exhaust gas

I.2.7. The temperature/RPM Pick-up



Temperature probe

Inductive Trigger clamp

I.2.8. The keyboard (optional)

This is a standard PS-2 QWERTY keyboard.

The mains keys are ENTER and ESC.

- Select with arrow (Up, Down, Left, Right) .
- ENTER : Valid a choice
- Esc : Quit and return at the last window.

I.3. INSTALLATION, START-UP

I.3.1. Recommendations

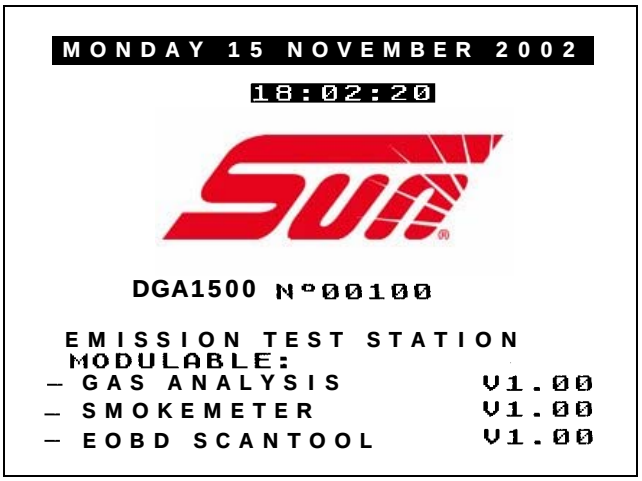
The machine can be left powered up 24 hours a day. It is recommended, however, that the electrical power supply be shut off during the night. Powering up the machine in the morning will involve several minutes' wait before the gas analysis module is operational. Powering up the cell involves a waiting period of at most 9 minutes for the chamber to reach its operating temperature (preheating).

I.3.2. Starting

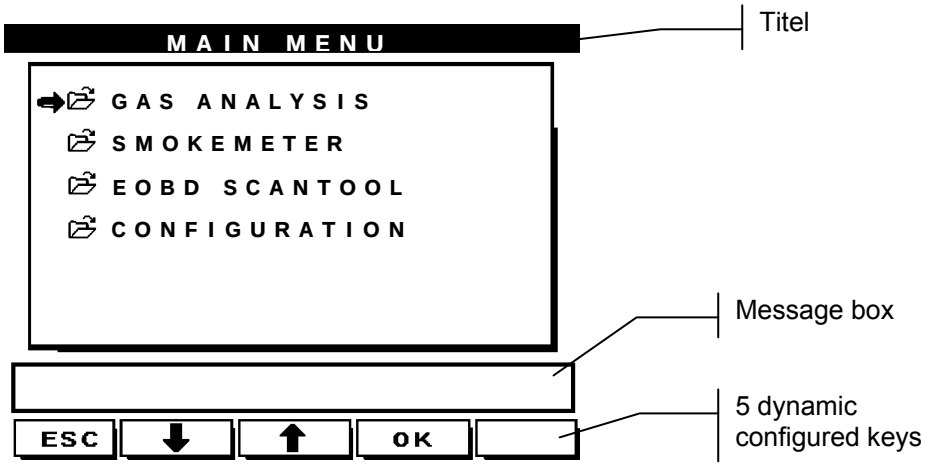
Connect the station to the 230 VAC 50 Hz mains.

Signs of correct operation:

The screen lights up and the cooling fan must start. The presentation page with the SUN logo appears on the graphics screen.



The main menu appears after a few seconds.



Main menu: The machine is ready for use

I.3.3. RPM Mode:

In the petrol gas analyser and the diesel smoke meter measurements we can select the different RPM modes using the  key. By pressing it once it displays the RPM mode currently in use. If you press it again a new speed mode is displayed and after 3 sec. This new speed mode is automatically loaded.

« Induction » : (Inductive trigger pick-up):

The inductive trigger pickup allows detection of the moment that ignition occurs in a cylinder. It is placed around the ignition lead of a cylinder, it generates a signal by inductive effect at the moment of ignition. At the rate of one spark per revolution for 2-stroke engines and 1 spark for two revolutions with a 4-stroke engine. The inductive trigger pick-up allows the engine speed of a **petrol engine** to be measured.

« Induction/2 » :

The procedure is identical to the previous one, only the value is divided by two.

« Piezoelectric» :

The piezoelectric sensor allows detection of the moment of injection on a **diesel engine**. Placed around an injection tube, it detects the dilation caused by the variations of internal pressure caused by injection. The electric signal supplied by the sensor allows the engine speed of a diesel engine to be measured (one dilation of the tube for two engine revolutions).

STEP	ACTION	COMMENT
1	Clean the injection tube locally with sandpaper.	
2	Place the piezoelectric sensor on the cleaned part and tighten it firmly by hand. Connect the cable to the sensor.	Ensure that the piezoelectric sensor is of the same diameter as the injection tube. All diameters are available as options.
3	Connect the ground clamp, preferably to the same tube.	The tachometer is installed and it should be possible to read the RPM of the engine on the screen.

« E.O.B.D » :

This mode allows the engine speed to be read from the data sent to us by the ECU of the vehicle with the optional Bluetooth ScanTool (See chapter **Error! Reference source not found.**).

Connect the cable to the vehicle's computer; the plug provided for this purpose is usually located near the fuse box. Select, using the RPM key, the "E.O.B.D." mode. The display appears automatically.

« TTL » : This mode makes it possible to read an engine speed sensor with a TTL output as the SRA-4. Connect the cable to the Piezo input of the DGA 1500

and Select, using the operating speed key, the “TTL” mode. The display appears automatically.

« Battery » :

With the optional Bluetooth RPM /Oil temperature adaptor we can measure the engine speed via the alternator ripple. This option allows the DGA 1500 to measure the engine speed on **all vehicles - petrol, diesel and LPG.**

Connect this adaptor to vehicles power supply from the cigar lighter or direct from the battery. Select the “battery” mode using the RPM key. After three seconds, the operator must choose and confirm the number of cylinders. If the battery cable is correctly connected, the system carries out an initialization phase. After this phase the RPM is displayed.

ATTENTION: In the event of a problem, the headlights of the vehicle should be turned on, and everything else shut off. (See also chapter **Error! Reference source not found.**)

I.4. MAINTENANCE, PRECAUTIONS DURING OPERATION

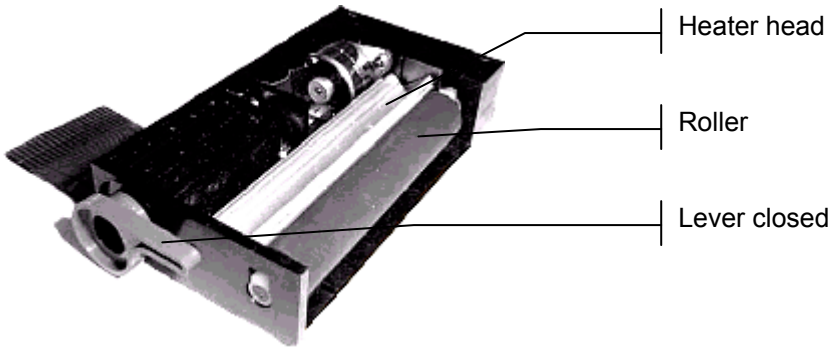
I.4.1. General

Each DGA1500 is inspected before delivery by a representative of the measuring instruments service, who affixes a stamp mark on the plate attached to the rear of the machine.

I.4.2. Cleaning cables and surfaces

The station, the screen, the keyboard (optionally) and the cables may be cleaned with alcohol on a clean rag. Any other solvent is strongly discouraged.

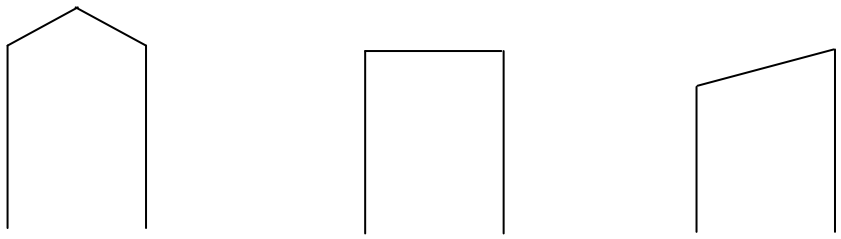
I.4.3. Removal and insertion of paper in the Thermal printer



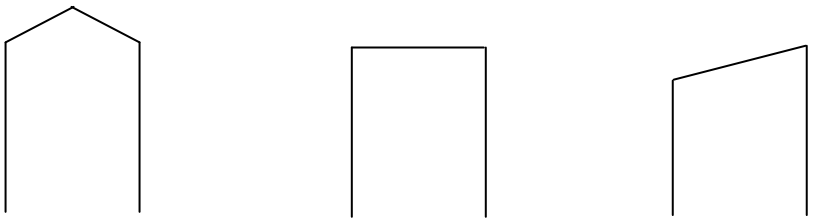
To remove paper from the printer, the lever must always be opened.

To load paper, there are two methods:

- First, the lever must be opened and the paper correctly cut (see below); then insert the paper up to the heater head. Finally, ensure that the paper is correctly aligned and close the lever. The printer is ready to run.



- The lever must be closed; the paper must be cut as shown below. In this method, insertion is automatic. It is only necessary to insert the paper as far as the roller; the paper is automatically loaded, and the printer is ready to run.



Finally, messages continually inform the user of the condition of the printer. For example: OUT OF PAPER or LEVER OPEN. These types of errors appear when the operator starts a print job; adding paper or closing the lever quickly resolves them.

II. GAS ANALYSIS: (PETROL VEHICLE)

II.1. OPERATING CONDITIONS

The gas analyser is equipped with automatic monitoring of parameters that have an influence on measurements. If at least one of these parameters is out of bounds, hence threatening to metrological alter the results, the gas analyser disables itself and prevents any measurement from being performed until operating conditions are re-established.

Failure to observe operating conditions may result in degradation of the equipment or temporary disabling of the DGA1500:

- Atmospheric pressure 1000 mbar +10% -25%
- Mains voltage 115-230 V / 1,5A ; 47-63 Hz
- Ambient temperature: from -10°C to +55°C
- Gas temperature: 200 °C tolerated by the probe
- Storage temperature: -32 to +55 °C
- Relative humidity: <98% non-condensing
- Ambient air clean and room well ventilated
- Dim. Case: (l x h x p): 451 x 181 x 310mm
- Weight: 8,9 kg

II.2. TECHNICAL CHARACTERISTICS

Warming up time:	< 9 minutes At 23°C it wil take about 3 minutes Minimum time is 1 minute
Response time:	Between 5 and 6 seconds for CO, CO2 and HC 28 seconds for oxygen (transition from 20.9% to 0.1% for a gas with 0% O2)
Nominal pump delivery:	6 l/min ; minimum delivery : 3,5 l/min
Air pressure variation:	Automatic correction by integrated absolute pressure sensor
Zero point and sensitivity:	Automatic compensation
Automatic pump standby	
Automatic zeroing	

Measurement	**Ranges:**	**Accuracy:**	**Resolution:**
HC			
Normal resolution :	2001 to 20000ppm Propane	± 10ppm vol. hexane or ± 5% relative *	10ppm
High resolution:	0 to 2000ppm Propane	± 10ppm vol. hexane or ± 5% relative *	1 ppm vol
CO	0 to 5%	± 0,03% vol. or ± 5% relative *	Normal resolution 0,01 % vol High resolution 0,001 % vol
CO2	0 to 20%	± 0,5% vol. or ± 5% relative *	Normal resolution 0.1 % vol
O2	0 to 21.7%	± 0,1% vol. or ± 5% relative *	If O2 ≤ 4% vol. high resolution : 0.01 % vol Otherwise normal resolution : 0.1% vol
Nox	0 to 5000 ppm	± 25ppm vol. or ± 4% relative **	1 ppm vol
Engine speed	0 to 9999 rpm	± 10 rpm	1 rpm
Oil temperature	-5 to 150°C	±1°C	1°C
Corrected CO	0 to 10%	0.03%	0.01%
Air/fuel coefficient (Lambda)	0,8 to 1,2	0.03	0.001 or 0.01 (selectable)

* You have to choose (between the maximum absolute error allowed and the maximum relative error allowed) the best case for user regarding the gas concentration

** in the MID certification or in the OIML R99 certification there is no specification on the maximal error allowed. The values given are identical to the values in the BAR-97 certification

II.3. EMISSION TEST

II.3.1. Preliminary checks

- Place the DGA 1500 in the designated location. The surface must be horizontal and must not be exposed to excessive vibrations, dust or cold. There must be no petrol vapour in the vicinity of its location.
- Connect the exhaust tube and the probe to the separator located on the rear side.
- Do not insert the probe into the exhaust pipe at this stage.
- Switch the DGA 1500 on with the ON / OFF switch.

II.3.2. Cleaning and precautions during operation

The DGA1500 is a machine that needs a little maintenance. Only the pneumatic circuit components that carry the gases, located on the outside of the analyser, need to be maintained by the user. A SUN trained service engineer must preform any maintenance operation other than those described below. Failing to maintain the machine in conform these instructions cancels the warranty.

Every three months, the condition of the pneumatic circuit including tubing and filters must be inspected.

II.3.2.1. General maintenance

- Change the separator filter FD,
- Change filters FC and FG,
- Visually check the filter connections.
- Visual inspection of the sampling probe. Clean it if necessary.
- Perform a leak test.

II.3.2.2. Maintenance of the separator

The separator includes a filter.

Replace the filter when it has become grey.

Filter replacement is carried out in the following manner:

- Shut off the pumps

- Unscrew the condensation residue collector located at the back of the machine. (FD).

IMPORTANT: The absence of one of the components inside the separator or incorrect reassembly of the assembly will contaminate the measuring device and the measurements will be prematurely invalidated due to the resulting errors. This condition of the analyser will require an overhaul that cannot be provided in the context of the warranty.

- A leak test must be carried out after any maintenance on the pneumatic circuit of the DGA 1500 (Chapter IV.5.4)

II.3.2.3. Replacing a filter

If one of the filters appears to be dirty or if an error message is shown as mentioned in the user manual to a filter replacement is necessary. During this process the following points must be observed:

- Turn off the machine.

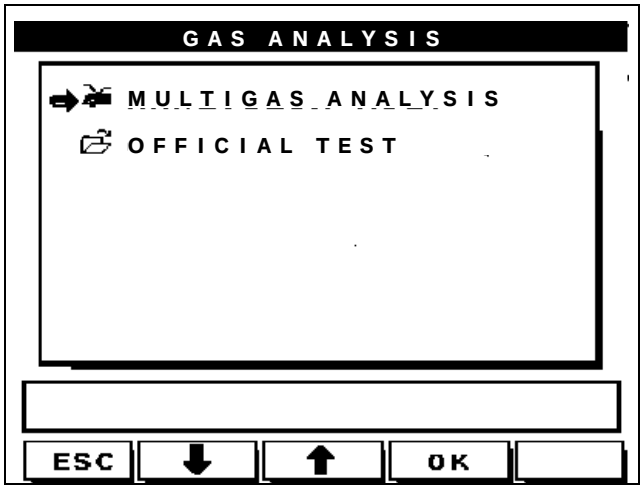
- Remove the filter to be replaced (behind the location designated for each filter, the reference is silkscreen printed on the case).

- Replace the old filter with the new one, maintaining the correct installation orientation

- Turn on the machine.

- Perform a leak test as described in chapter IV.5.4

II.4. GAS ANALYSIS



This menu allows you either to open a window measuring several gases to be analysed, or to choose a submenu relating to the official test procedure

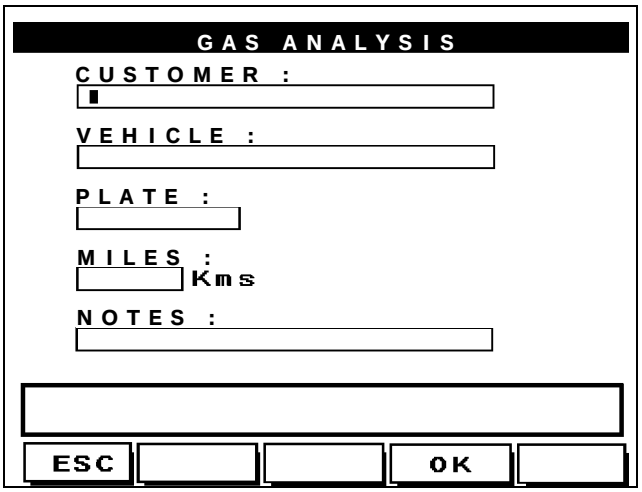
Select GAS ANALYSER and press OK

II.4.1. Customer information:

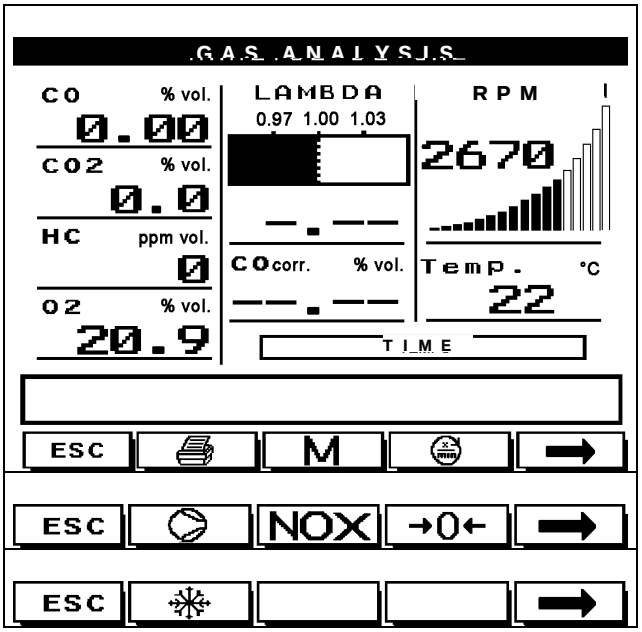
Before any measurement or official test procedure, the user may enter information about the customer and his car (name of client, make of car, mileage and registration plate). These data will appear on the printed test report.

The method of data entry is the same as that described for garage entry (see paragraph IV.3).

The entry window with keyboard option appears this way:



II.4.2. Explanation of the graphic screen:



HC = Hydrocarbons expressed as hexane given in ppm (parts per million).

CO = Carbon monoxide given in % by volume.

COcorr. = Corrected CO

O_2 = Oxygen given in % by volume.

CO_2 = Carbon dioxide given in % by volume.

λ = Lambda value. This is a calculated value from above gases and is giving the Air Fuel Ratio.

RPM = Engine speed in revolutions per minute.

°C = Oil temperature measurement given in degrees Celsius.

The print key: it is displayed only when printing is possible.

The storage key:
Stores in memory the current values from the moment the key was pressed. The DGA1500 can store 6 current values, and at each store operation the corresponding number is displayed in the message box.
These values can be printed on one test report.

The pump key:
Activates or deactivates the pumps. With this key you put the machine either in STANDBY (rest) mode, or in measurement mode (activation of the pumps and starting of an auto-zero operation). The STANDBY stops measurments

which results in dashes in the measurement fields on the display. The standby time is displayed in the message box.

The RPM key:
Allows the engine RPM Mode to be selected.(See also chapter I.3.3).

The NOx / COcorr. key
Press this key, and the COcorr. field will be replaced by NOx, and vice versa.

The auto-zero key
Allows an auto-zero operation to be executed at any time. Note that the device automatically launches an auto-zero operation when it is necessary, and periodically every 30 minutes.
When an auto-zero operation occurs, the DGA 1500 will take clean air via the active charcoal filter.

The freeze data key
Freezes the measured values on the screen. By pressing this key again, the fields on the screen are again updated.

II.4.3. Preliminary checks

Before undertaking any measurement, the operator must satisfy himself that the engine is operating correctly.

The following points are to be observed:

The vehicle exhaust line must be gas-tight.

The gearbox must be in neutral, with the clutch engaged, for vehicles with manual or semi-automatic transmissions; the selector should be in neutral for vehicles with automatic transmissions or in accordance with the instructions of the vehicle manufacturer.

Accessories and optional equipment that influences the engine speed at idle must not be activated, barring manufacturer's instructions or regulation to the contrary.

The engine must be at normal operating temperature, which is with an oil temperature at least equal to 80°C.

II.4.4. Preparation for measurement

- Tachometer

Install the sensor, then press the RPM key to determine the appropriate mode. This mode is automatically saved. The value of the RPM must immediately appear. (see chapter I.3.3).

- Oil temperature

Remove the oil level dipstick and replace it in the tube with the oil temperature probe. Adjust the length so that the probe dips in the oil when the sealing cone acts as a stopper for the dipstick tube. The engine must be warm

before any measurement takes place, which corresponds to an oil temperature greater than 80 °C.

- Gas measurement

Insert the sampling probe as far as possible in the exhaust gas exit tube. The minimum depth, when the layout allows it, is 30 cm. If this condition cannot be fulfilled, it is necessary to use a collector tube that acts as an exhaust system extension.

In exhaust systems with a single exhaust pot, but provided with two exit tubes, it is necessary to use a collector tube into which the probe is inserted.

For analysis of the gases upstream of the catalytic converter, the entire length of the flexible sampling tube must be used.

Start the measurement by pressing the PUMP key (if the pumps are not running).

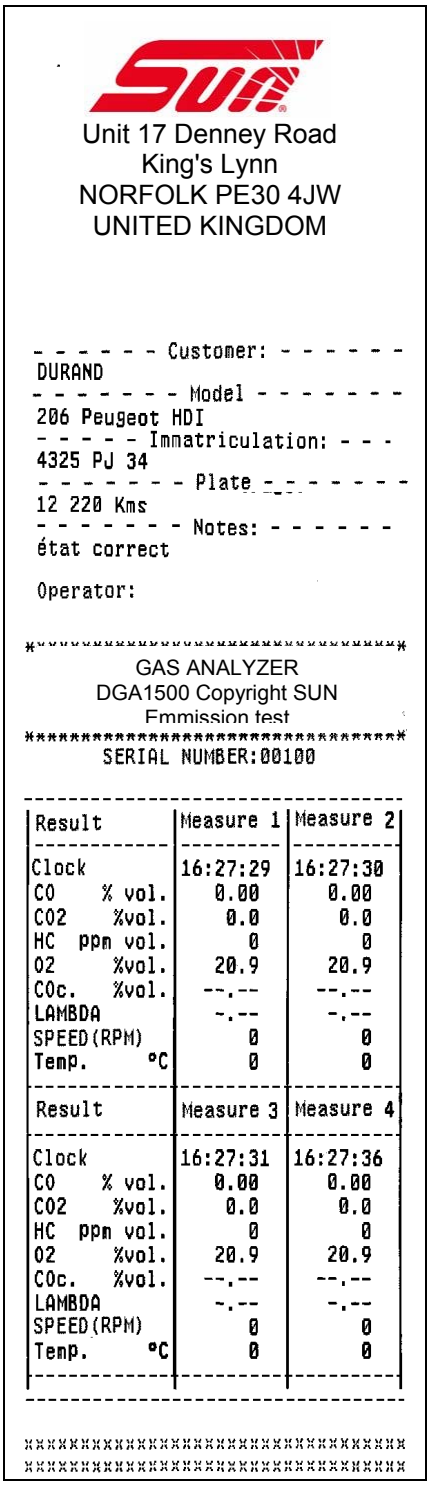
Start the engine (if the engine is running before the probe is inserted, it is preferable to activate the pumps and to wait for zeroing to finish before inserting the sampling probe as indicated above).

II.4.5. Analysis and measurement

Automatic calibration is then engaged for a period of 50 seconds. The pump starts running and the following message is displayed on the screen: “ZERO IN PROGRESS”.

After this period, the LCD screen contains the message: “Measurement in progress,” the results of each measurement appear on the displays, the system is ready to carry out a measurement (concentrations must be similar to those in air: 0% for CO, CO_2, 0 ppm vol. for HC, 20.9% for O_2.)

II.4.6. Example Printout of test



Unit 17 Denney Road
King's Lynn
NORFOLK PE30 4JW
UNITED KINGDOM

- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model - - - - - - -
206 Peugeot HDI
- - - - - Immatriculation: - - -
4325 PJ 34
- - - - - - - Plate - - - - - - -
12 220 Kms
- - - - - - - Notes: - - - - - -
état correct

Operator:

GAS ANALYZER
DGA1500 Copyright SUN
Emmission test
SERIAL NUMBER:00100

Result	Measure 1	Measure 2
Clock	16:27:29	16:27:30
CO % vol.	0.00	0.00
CO2 %vol.	0.0	0.0
HC ppm vol.	0	0
O2 %vol.	20.9	20.9
COc. %vol.	--.--	--.--
LAMBDA	-.--	-.--
SPEED(RPM)	0	0
Temp. °C	0	0

Result	Measure 3	Measure 4
Clock	16:27:31	16:27:36
CO % vol.	0.00	0.00
CO2 %vol.	0.0	0.0
HC ppm vol.	0	0
O2 %vol.	20.9	20.9
COc. %vol.	--.--	--.--
LAMBDA	-.--	-.--
SPEED(RPM)	0	0
Temp. °C	0	0

Measure 1,2,3 are the memorized values.

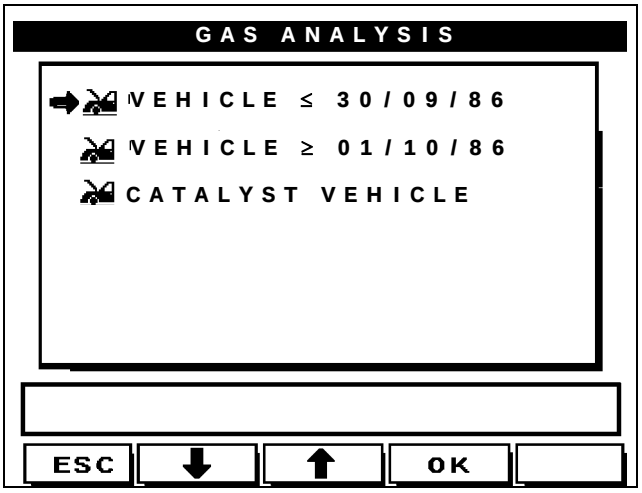
Measure 4 is the currently measurement.

II.5. OFFICIAL TESTING

For offical tests, it is possible to obtain a printout of a test report giving a breakdown of the polluting status of the vehicle in relation to its registration date and current legislation.

In the main menu, select the official test menu.

This action gives access to a menu for selecting one of the four categories.



Using the up and down keys, scroll through the selection. Press OK or ENTER when the selection is made. It appears a client data entry window (see above), then the procedure starts.

II.5.1. Vehicle registered before 1 October 1986

Limit of corrected CO at idle: 4.50 %vol.

Operator guide: NO.

One single measurement carried out at idle.

If CO_2 concentration is lower than 9.0 % vol., it is necessary to perform a leak test of the exhaust, and if necessary a leak test of the analyser. If a leak is detected in the exhaust line, the vehicle must be rejected and the measurement invalidated.

Press the print key to validate the measurement and print it out.

II.5.2. Vehicle registered before 1 January 1993

Limit of corrected CO at idle: 3.50 %vol.

Operator guide: NO.

One single measurement carried out at idle.

If CO_2 concentration is lower than 9.0 % vol., it is necessary to perform a leak test of the exhaust, and if necessary a leak test of the analyser. If a leak is detected in the exhaust line, the vehicle must be rejected and the measurement invalidated.

Press the print key to validate the measurement and print it out.

II.5.3. Catalytic Vehicle

Fast idle measurement:

Fast idle CO limit: 0.3 %vol.

Lambda between 0.97 and 1.03 at fast idle.

Measurement at idle:

CO limit at idle: 0.50 %vol.

No LAMBDA test at idle.

Operator guide: YES.

The user is guided by following instructions readable on the liquid crystal screen. When a phase is limited to time, the analyser indicates on the NOx display (lower right) the time remaining in seconds until the phase terminates.

II.5.4. Printing results:

Unit 17
Denny Road
King's Lynn
NORFOLK
UNITED KINGDOM

- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model: - - - - - - -
26 Peugeot HDI
- - - - - - - Plate: - - - - - - -
4325 PJ 34
- - - - - - - Miles: - - - - - - -
12229 Kms
- - - - - - - Notes: - - - - - - -
none

23/05/2007 13:18:30

Operator:

****
GAS ANALYZER
DGA1500 Copyright SUN
Emission test
****
SERIAL NUMBER:01774

Result	Measure 1	
Clock	13:18:30	
CO % vol.	0.00	
CO2 % vol.	0.0	
HC ppm vol.	0	
02 % vol.	20.9	
LAMBDA	-.--	
COcorr.%vol.	-.--	
SPEED(RPM)	0	
Temp. °C	---	

****
* No catalytic *
* converted before oct. 1,1986 *
COcorr. linited value:4,50 %vol.
COcorr.) 4,50 %vol. idle speed
* INACCEPTABLE RESULT *
****

Vehicles placed in service before 01/10/86

Unit 17
Denny Road
King's Lynn
NORFOLK
UNITED KINGDOM

- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model: - - - - - - -
206 Peugeot HDI
- - - - - - - Plate: - - - - - - -
4325 PJ 34
- - - - - - - Miles: - - - - - - -
12 229 Kms
- - - - - - - Notes: - - - - - - -
none

23/05/2007 13:20:49

Operator:

****
GAS ANALYZER
DGA1500 Copyright SUN
Emission test
****
SERIAL NUMBER:01774

Result	Measure 1	
Clock	13:20:49	
CO % vol.	0.00	
CO2 % vol.	0.0	
HC ppm vol.	0	
02 % vol.	20.9	
LAMBDA	-.--	
COcorr.%vol.	-.--	
SPEED(RPM)	0	
Temp. °C	---	

****
* No catalytic *
* converted after oct. 1,1986 *
COcorr. linited value:3,50 %vol.
COcorr.) 3,50 %vol. idle speed
* INACCEPTABLE RESULT *
****

Vehicles placed in service after 01/10/86 and no Catalytic converter.

Unit 17
Denny Road
King's Lynn
NORFOLK
UNITED KINGDOM

- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model: - - - - - - -
206 Peugeot HDI
- - - - - - - Plate: - - - - - - -
4325 PJ 34
- - - - - - - Miles: - - - - - - -
12 229 Kms
- - - - - - - Notes: - - - - - - -
none

23/05/2007 13:29:22

Operator:

****
GAS ANALYZER
DGA1500 Copyright SUN
Emission test
****
SERIAL NUMBER:01774

Result	Measure 1	Measure 2
Clock	13:28:43	13:29:08
CO % vol.	0.00	0.00
CO2 % vol.	0.0	0.0
HC ppm vol.	0	0
02 % vol.	20.9	20.9
LAMBDA	-.--	-.--
COcorr.%vol.	-.--	-.--
SPEED(RPM)	0	0
Temp. °C	---	---

Measure 1=accelerated idle speed
Measure 2=idle speed
****
* CONTROL OF CATALYSED VEHICLE *
* CAR INACEPTABLE *
* LAMBDA<0,97 at acc. idle speed *
****

Catalyst vehicles

II.6. LIST OF FAULT REPORT MESSAGES AND FAULT TRACING

Error number	Message displayed	Call Service	Do it yourself	Explanation in section
1	Leak present	YES		II.6.1.1
2	Data invalid	YES		II.6.1.2
3	HC out of bounds		YES	II.6.1.3
4	CO out of bounds		YES	II.6.1.4
5	CO2 out of bounds		YES	II.6.1.5
6	O2 out of bounds		YES	II.6.1.6
7	NOx out of bounds	YES	-	II.6.1.7
8	Flow to low		YES	II.6.1.8
9	Out of paper		YES	II.6.1.9
10	Lever open		YES	II.6.1.10
11	Printer problem	YES		II.6.1.11
12	HC residue in gas inlet		YES	II.6.1.12
13	Com. Port problem	YES		II.6.1.13
14	Adjustment necessary	YES		II.6.1.14
15	Change O2 sensor	YES		II.6.1.15
16	Condensation: wait		YES	II.6.1.16
17	Heating problem	YES		II.6.1.17

II.6.1. Leak present

Repeat the test with the exhaust hose / probe disconnected from the separator and blocking the input of the separator. If the problem disappears, the leak is in the probe tubing.

Otherwise, it is in the DGA 1500. Check the filter connections. Check that the separator is correctly installed and adequately tightened.

If it is still not solved Call Service.

II.6.2. Data invalid

Adjustment necessary, Call Service.

II.6.3. HC out of bounds

Out of range.

Check that the ambient air is not polluted and re-zero.

If it is still not solved Call Service.

II.6.4. CO out of bounds

Out of range.

Check that the ambient air is not polluted and re-zero.

If it is still not solved Call Service.

II.6.5. CO2 out of bounds

Out of range.

Check that the ambient air is not polluted and re-zero.

If it is still not solved Call Service.

II.6.6. O2 out of bounds

Out of range.

Check that the ambient air is not polluted and re-zero.

Check sensor connections.

Replace the O2 sensor if the message persists after several attempts to zero.

II.6.7. NOx out of bounds

Out of range.

Check NOx sensor connections (optional).

Replace the NOx sensor if the message persists after several attempts to zero.

II.6.8. Flow too low

Check that the pneumatic hoses y are not kinked, twisted or plugged.

Disconnect the exhaust hose / probe to see whether the problem is connected with this, or persists.

1) If the probe is disconnected, the message is no longer active:

Clean the probe and hose with compressed air

2) If the probe is disconnected, the message remains active:

Check the filters and replace if necessary.

II.6.9. Out of paper

Put in a new paper roll as descript in chapter I.4.3.

II.6.10. Lever open :

The thermal printer lever is open.

II.6.11. PB IMPR

Printer fault, save the error code and call service.

II.6.12. HC residue in gas inlet

When a zero calibration is carried out on ambient air, if the CO_2 concentration is below 2% for more than twenty seconds while the HC measurement gives more than 20 ppm, it is assumed that hydrocarbon residues are present in the inlet circuit.

These residues may also be in the ambient air. One must therefore ensure that the work area is well ventilated. It may be necessary to clean the probe. If the problem appears again, clean the separator.

If the HC measurement drops back to a level below 20 ppm for more than 20 seconds, this message disappears, a zero operation is carried out and the message “measurement in progress” appears.

II.6.13. Com. Port problem

Check that the device is grounded. Extensions for the power supply cable are absolutely required to include a ground connector as well as the power supply plug.

If it is still not solved Call Service.

II.6.14. Adjustment necessary

Call service

II.6.15. Change O2 sensor

During a zero calibration the DGA 1500 founds the O2 sensor out of range and displays the message “Change O2 sensor” appears.

Replace it and follow the procedure indicated by the analyser.

II.6.16. Condensation: wait

This message may appear during the start-up phase. In this case you only need wait for the machine to be warmed up and ready to carry out measurements.

If this message appears during a measurement in the course of a measurement and persists, it is necessary to carry out a check of the following points:

Check that the separator is correctly connected.

Check the flow of water at the exhaust probe / hose.

Perform a leak test.

Depending on the results obtained, call service.

II.6.17. Heating problem

If the estimated start-up time of the machine (elapsed time between the time the machine is turned on and the time when measurements are possible) is greater than 15 minutes, this message appears.

If the temperature is below 5°C, it is necessary to move the machine to a less cold space and restart it.

II.6.18. Other:

a) RPM out of range

This is manifested on screen by a “----“ display.

If this message appears, it means that the measurement of RPM is greater than 9999 rpm. Check that in the RPM menu, the correct sensor has been chosen and the information concerning the engine to be tested are correct and have been entered.

b) TMP. Out of range

This is manifested on screen by a “----“ display.

If the ambient temperature is less than 0°C or if a measurement is in progress on a vehicle, this means that the measured value is outside the range 0-150°C.

If neither of these is the case, check that the oil temperature probe is correctly connected to the connector assigned to it. If this is not the case, replace the sampling probe.

III. THE OPACITY METER: (DIESEL VEHICLES)

III.1. OPERATING CONDITIONS

The opacity meter automatically checks the parameters that have an influence on the measurement. If at least one of these parameters is out of bounds, hence threatening to metrological alter the results, the opacity meter disables itself and prevents any measurement from occurring until operating conditions have been re-established.

The following problems result in the system being disabled:

- Detector temperature out of bounds (limits extending from 41 C to 55°C)
- Chamber temperature out of bounds (limits extending from 70°C to 110 C)
- Supply voltage out of bounds
- Fan speed too low (limits extending from 2100 rpm to 2900 rpm)
- Computer to cell communication problem
- Windows need to be cleaned
- Problem with a temperature sensor

III.2. TECHNICAL CHARACTERISTICS

- Power supply: 1,5 A / 115 VAC 0,9 A / 230 VAC (+10%-15%)
  50-60 Hz (+-2%).
- Effective length of the measuring chamber: 215 mm +-0.05 cm.
- Preheating time: from 3 to 6 min depending on ambient temperature.
- Zero adjustment and calibration before use: automatic.
- Control of zero adjustment: automatic by electrical filter centred at 50%.
- Ambient temperature range for operation: +5 to +40°C.
- Humidity: 30% to 90%.
- Storage temperature: -32°C to +55°C.
- Measurement range of the measured value:
  - Opacity: 0.00 to 9.99 m^{-1}.
  - Resolution 0.01 m^{-1}.
- Maximum relative error:

  Under standard conditions (temperature +20 °C, atmospheric pressure 1013 hPa, relative humidity 60% +/-15%), opacity error below 0.15 m^{-1}.
- Measurement range of influencing factors (which allow correction of the opacity value):
  - Temperature of the gas being measured: 0-256 C (resolution 1°C)
  - Physical response time 10% to 90%: less than 0.2 sec. for gas at 75L/min.
  - Electrical response time: 0.9 sec.

III.3. INSTALLATION AND PRECAUTIONS DURING OPERATION

III.3.1. Installation, start-up :

Each DGA1500 is inspected before delivery by a representative of the measuring instruments service, who affixes a stamp mark on the plate attached to the rear of the machine.

- Check that the opacity cell is correctly connected to the station and connect it to the 230 VAC 50 Hz mains.
- Switch on the DGA 1500 with the On/Off switch.
- Switch on the DSS-3 with the On/Off switch

III.3.2. Cleaning and precautions during operation

The opacity gauge is designed to function without maintenance. The only components requiring periodic maintenance are certain components of the DSS-3.

Occasionally, large carbon particles enter the chamber while the engine is being tested. The great inertia of these particles will cause them to be thrown against the windows located on either side of the chamber. A periodical monthly inspection is recommended to determine whether the two windows have an excessive coating.

A carbon deposit may also be deposited in the measurement chamber. It is sufficient to sweep out the tube to eliminate the soot using the brush supplied with the DSS-3.

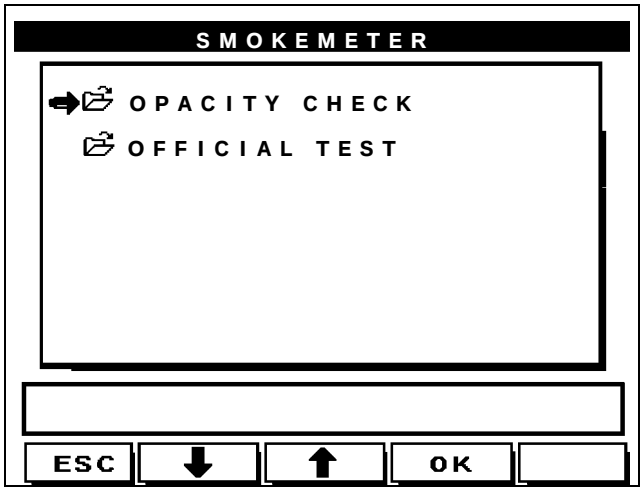
Where the windows are concerned, a dry cotton rag is the proper tool for cleaning these two surfaces.

DO NOT USE ANY CLEANING FLUID.

It is not necessary to open the cell to carry out these maintenance operations.

III.4. OFFICIAL OPACITY CHECK PROCEDURE

This procedure allows a determination, for a given vehicle, of whether or not its opacity is lower than the current limit.



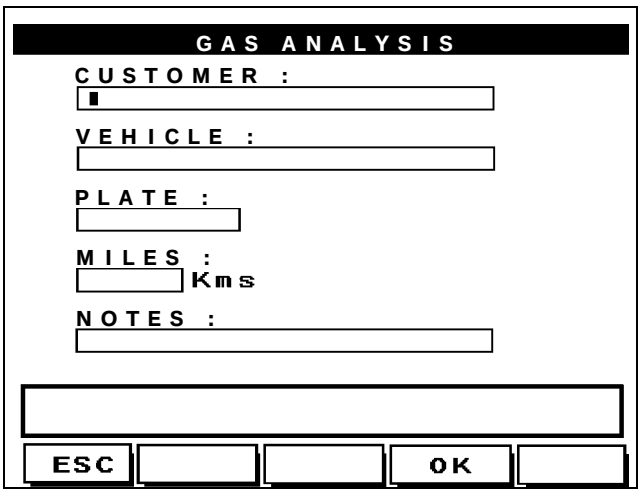
Select in the main menu the smokemeter application, then the opacity check procedure. A series of phases will then take place in sequence. It is important to follow the instructions just as they appear on the screen and to observe the directions in the user manual.

III.4.1. Customer information entry

As soon as the test procedure is launched, the user may, enter information about the client and his car (name of client, make, mileage and registration number). These data will then appear on the test report.

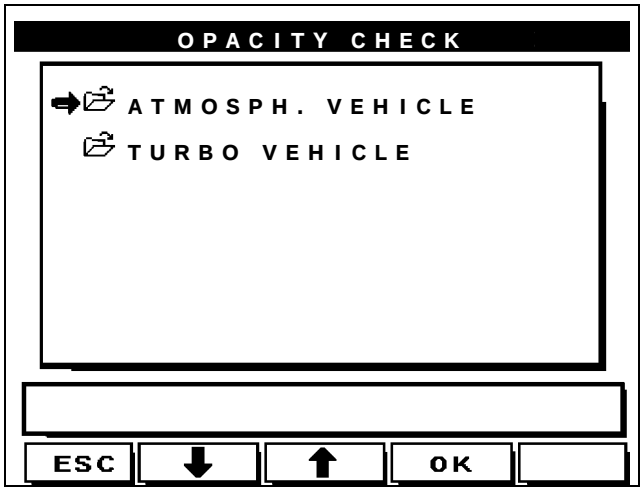
The client entry procedure is the same as for the garage header (See chapter IV.3).

The entry window with keyboard option appears this way:



III.4.2. The engine :

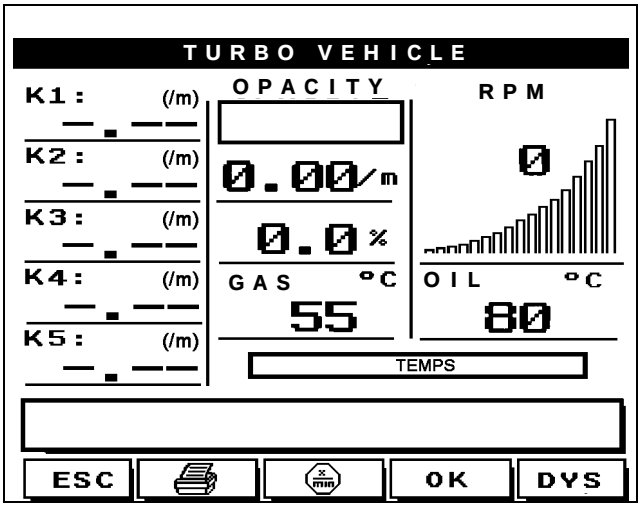
The software then asks you about the type of engine to be tested. This lets it know the limit of opacity that may not be exceeded.



First, it asks you whether the vehicle has a naturally aspirated engine (maximum authorized limit = 2.5 m^{-1}) or a turbocharged engine (permissible limit = 3 m^{-1}).

Select the corresponding type using the UP arrow and the DOWN arrow and confirm the selection using the OK key.

III.4.3. Description of the graphic interface:



This graphic interface exists out of several components:

- The tachometer:

The tachometer reading may run from 0 to 9999 rpm. In addition, a graphic element allows the trend in engine RPM to be quickly visualized.

Only one of the sensors allowing the engine speed to be acquired is needed for reading the RPM., see chapter I.3.3

♦ The oil temperature:

The oil temperature probe has to be installed in the vehicle's oil dipstick for the preliminary phase. The user can therefore monitor this temperature.

♦ Current opacity:

This value constantly shows the current opacity; it is expressed with two opacity units. One is given per meter (m^{-1}) and the other in percent. In addition, a graphic element allow rapid visualization of opacity between 0 and 99.9%.

♦ The message box:

It directs the operator through the procedure. Messages displayed here are of two types:

Error messages. Every detected error or timeout results either in cancellation of the procedure or invalidation of the free acceleration. In one case, the message window contains the type of error that caused the problem.

Explanatory messages. During the procedure, several different phases follow one another in sequence. The message window indicates to the operator what he must do and what the opacy meter is doing. This allows easy understanding of the procedure and gives effective guidance to the operator.

♦ At any moment in the procedure, press "DYS" if you detect the slightest problem regarding the control of engine speed or a leak in the exhaust line. You can print a test report with the annotation "unacceptable result".

♦ The «RPM mode » key:

Allows the RPM mode to be selected depending on the sensor type used at the input (see chapter I.3.3).

♦ The "print" key:

This key allows the results to be printed.

III.4.4. Detecting the DSS-3

At the beginning of the test, the presence of the DSS-3 is verified.

After a few seconds, the cell is detected.

If there is a problem with it the following message is displayed:

```
COMMUNICATION
PROBLEM
```

```
PRESS ESC
THEN RESTART
```

In this case, check whether the cell is plugged in and properly connected.

III.4.5. Auto-zero and error checking

Following the phase, which consists of preparing the vehicle for measurement and ensuring that it is operating correctly, the opacity meter needs to perform an auto-zero.

DURING THE AUTO-ZERO OPERATION, THE SAMPLING PROBE MUST NEVER BE INSERTED INTO THE EXHAUST LINE OF A RUNNING ENGINE.

Three cases could then occur:

1°) The opacity meter was just started and the preheating phase is still active. In this case, it is necessary to wait for the measuring chamber to reach its operating temperature. A message to this effect is displayed on the screen: It provides information on the progress of the percentage of preheating of the cell.

```
WARMUP= 90%
```

2°) The opacity meter refuses to operate because it has detected an error or a breakdown. These errors are listed in chapter III.7.

3°) The opacity meter is ready.

The auto-zero operation will take place as soon as the opacity meter is assured of the normality of its current condition. During auto-zero, this message will be posted on the screen.

```
ZERO IN PROGRESS
PLEASE WAIT
```

The auto-zero operation is a procedure which, taking ambient air as a reference, establishes the signal levels for zero opacity. It is therefore important not to put the measurement probe into the exhaust line before the software requests it.

III.4.6. Insertion of the probe and sensors

Once the auto-zero operation is carried out, the following messages appear on the screen:

Now is the time to put the sampling probe, the oil temperature sensor and the tachometer in place:

III.4.6.1. The exhaust probe:

To do this, move the cell near the exhaust pipe outlet.

The exhaust probe must be inserted to a depth at least equal to 5 cm. If the layout of the exhaust line allows it, it is preferable to insert it as deep as possible. Ensure that the probe is not kinked, which might alter the flow of gas arriving at the measuring chamber.

The sliding clip on the exhaust probe allows the exhaust probe to be fixed to the exhaust pipe.

III.4.6.2. The oil temperature sensor:

It is necessary to insert the oil temperature sensor in the dipstick tube. Do not insert the probe too deeply. Adjusting the rubber stopper on the probe so as to insert the probe to the same depth as the dipstick.

III.4.6.3. Connecting the tachometer:

See chapter I.3.3.

After inserting the probe and the sensors, with the engine still running, it is necessary to notify the DGA 1500 that all is done. To do this, press the OK key to move on to the following phase.

III.4.7. Preliminary checks

Before undertaking any measurement, the operator must satisfy himself that the engine is operating correctly. Opacity measurement being a rather demanding procedure for the engines, it is imperative that this step be carefully followed to avoid engine damage and to obtain a valid opacity measurement. If an obvious malfunction is detected on the vehicle, press the “MAL” key. This will have the effect of rejecting the vehicle test and printing a test report specifying that the vehicle cannot be checked due to its poor condition.

The following points are to be observed:

- The vehicle exhaust line must be gas-tight. This check can be carried out by partially blocking the exhaust while the engine is at idle. No leak must be observed.
- The gearbox must be in neutral, with the clutch engaged, for vehicles with manual or semi-automatic transmissions; the selector should be in neutral for vehicles with automatic transmissions or in accordance with the instructions of the vehicle manufacturer.
- Accessories and optional equipment that influence the engine speed at idle must not be activated, barring manufacturer’s instructions or regulation to the contrary.
- The engine must be at normal operating temperature, that is with an oil temperature at least equal to 80°C.

To satisfy this preliminary check, the following page is then displayed:

The opacity meter may be configured in what is called the “P.L.” mode (see Configuration – opacity meter). One can then move on to the following phase without having to perform an oil temperature measurement or even connecting the probe. Simply press the OK key to escape this blocking phase. In this mode, the following message is activated:

In the so-called “V.L.” mode, required for technical inspections, oil temperature measurement is indispensable.

No test can be carried out as long as the probe has not reached a temperature of 80 °C, the oil temperature at which the engine is considered to be at its operating temperature and in no danger of deterioration during the test procedure. If, for certain vehicles, the manufacturer recommends a higher temperature, it is necessary to wait for this temperature to be reached before carrying out the first acceleration.

On the page, the oil temperature is displayed. It must increase while the engine is running and reach 80 °C after a certain time. If this is not the case, check that the probe is correctly inserted and in contact with the engine oil.

This page also contains a tachometer window (located at the upper right).

III.4.8. Conditioning the engine:

Faced with this message, the operator has ten seconds or so to get into the vehicle, and is charged with carrying out the two preliminary phases of the procedure:

1°) Establish a preliminary check to verify the correct operation of the vehicle.

2°) Test governor operation for one minute.

For a period of 60 seconds, the engine governor operation must be checked in the following manner:

Check the normality of no-load governor operation by carrying out a series of accelerations, step by step, up to the governing level given by the vehicle manufacturer.

If the duration of the check of the normality of no-load governor operation is less than 60 seconds, the balance of the time must be used to maintain the engine at a stabilized RPM around 40 to 60% of the maximum no-load speed, or approximately:

- 3000 rpm for a vehicle with an authorized gross weight less than 3.5 T;

- 1500 rpm for a vehicle with an authorized gross weight greater than 3.5 T;

It is recommended to use the tachometer to reliably check engine governor operation.

The operator must follow along with the following messages:

This vehicle preparation is indispensable; it may not be skipped.

III.4.9. Free acceleration

Definition according to standard NF R 10-025:

Acceleration achieved, with the engine initially at idle, by rapidly but not violently operating the accelerator control in such a way as to obtain maximum injection pump output. This position is maintained until the maximum RPM of the engine is attained and the governor goes into action.

The accelerator must therefore be pushed down all the way in order to advance from idle speed to maximum speed in the shortest possible time. This operation is an essential feature of the procedure, since the opacity that is recorded is the maximum opacity measured during free acceleration. In order to obtain a valid measurement, it is indispensable to undertake this operation so that the opacity is a maximum (maximum injection pump output). It is possible to detect that maximum speed has been reached, either by ear or using the tachometer. The pedal is then released to return to idle speed.

As soon as free acceleration is to be carried out, messages indicate when to accelerate and when to release the accelerator pedal. The software analyses the opacity curve recorded during free acceleration to detect its maximum and establish the validity of the acceleration.

III.4.10. Two non-measured accelerations in succession

A series of two accelerations will now be requested. The following screen appears:

Faced with this screen, the user must push the accelerator down all the way. The following message should then appear:

After a few seconds the following message appears:

The operator must release the accelerator pedal so that the engine speed returns to idle speed.

This operation is requested once again.

These two accelerations are indispensable for cleaning out the exhaust system and thus avoiding excessive and meaningless opacity measurements.

This two accelerations are not counting toward the official

III.4.11. Opacity measurement phase

After the engine preparation phase, the operator is now occupying the driver's seat of the vehicle. He now had nothing to do but concentrate on the message box, which dictates to him when to press the accelerator pedal and when to return to idle. Depending on the vehicle and the results, the operator will need to carry out two to five accelerations.

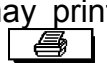
The opacity of each acceleration is displayed on the left side of the page (the window assigned to the first acceleration being named K1, that assigned to the second called K2 and so forth).

III.4.12. Display of the results of each acceleration

The acceptance decision is made in the following manner:

If the result of the two accelerations is below the current limit (2.50 m^{-1} for naturally aspirated engines and 3.00 m^{-1} for turbocharged engines), the procedure is terminated and the vehicle is accepted. Likewise, if the results are 1.5 times higher than the limit, the vehicle is rejected.

Otherwise, 3 more accelerations are carried out and the results compared to the current limit. The result is considered acceptable if the mean value obtained is below the limit. Again, the operator has no calculation to perform and need only concern himself with responding to the orders given him by the software. If the result given by this procedure judges the opacity of the vehicle to be unacceptable, the vehicle will have to be subjected to the opacity value determination procedure (see chapter III.5).

When the test is finished, the user may print or transfer the report by pressing the key corresponding to the  icon.

III.4.13. Printing results

III.4.13.1. Measurement to standard

Unit 17 Denney Road
King's Lynn
NORFOLK PE30 4JW
UNITED KINGDOM

- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model - - - - - - -
206 Peugeot HDI
- - - - - Immatriculation: - - -
4325 PJ 34
- - - - - - - Plate - - - - - - -
12 220 Kms
- - - - - - - Notes: - - - - - -

Operator:

SERIAL NUMBER:00100

Warm engine estimated temp.
above or equal to 80 °C
TURBO ENGINE
Opacity limit :3.00 /m
SPEED: 0/ 0rpm
Oil temperature:---(°C)

	MEASURE (/m)	Gaz ≥40 °C
Acceleration 1	1.45	X
Acceleration 2	1.68	X

****
* RESULT ≤ 3.00 /m *
* ACCEPTABLE RESULT *
****

Acceptable result case

Unit 17 Denney Road
King's Lynn
NORFOLK PE30 4JW
UNITED KINGDOM

- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model - - - - - - -
206 Peugeot HDI
- - - - - Immatriculation: - - -
4325 PJ 34
- - - - - - - Plate - - - - - - -
12 220 Kms
- - - - - - - Notes: - - - - - -

Operator:

SERIAL NUMBER:00100

Warm engine estimated temp.
above or equal to 80 °C
TURBO ENGINE
Opacity limit :3.00 /m
SPEED: 0/ 0rpm
Oil temperature:---(°C)

	MEASURE (/m)	Gaz ≥40 °C
Acceleration 1	7.80	X
Acceleration 2	9.99	X

****
* UNACCEPTABLE RESULT *
****

Figure 17

Unacceptable result case

Unit 17 Denney Road
King's Lynn
NORFOLK PE30 4JW
UNITED KINGDOM

- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model - - - - - - -
206 Peugeot HDI
- - - - - Immatriculation: - - -
4325 PJ 34
- - - - - - - Plate - - - - - - -
12 220 Kms
- - - - - - - Notes: - - - - - -

Operator:

SERIAL NUMBER:00100

TURBO ENGINE
Opacity limit :3.00 /m

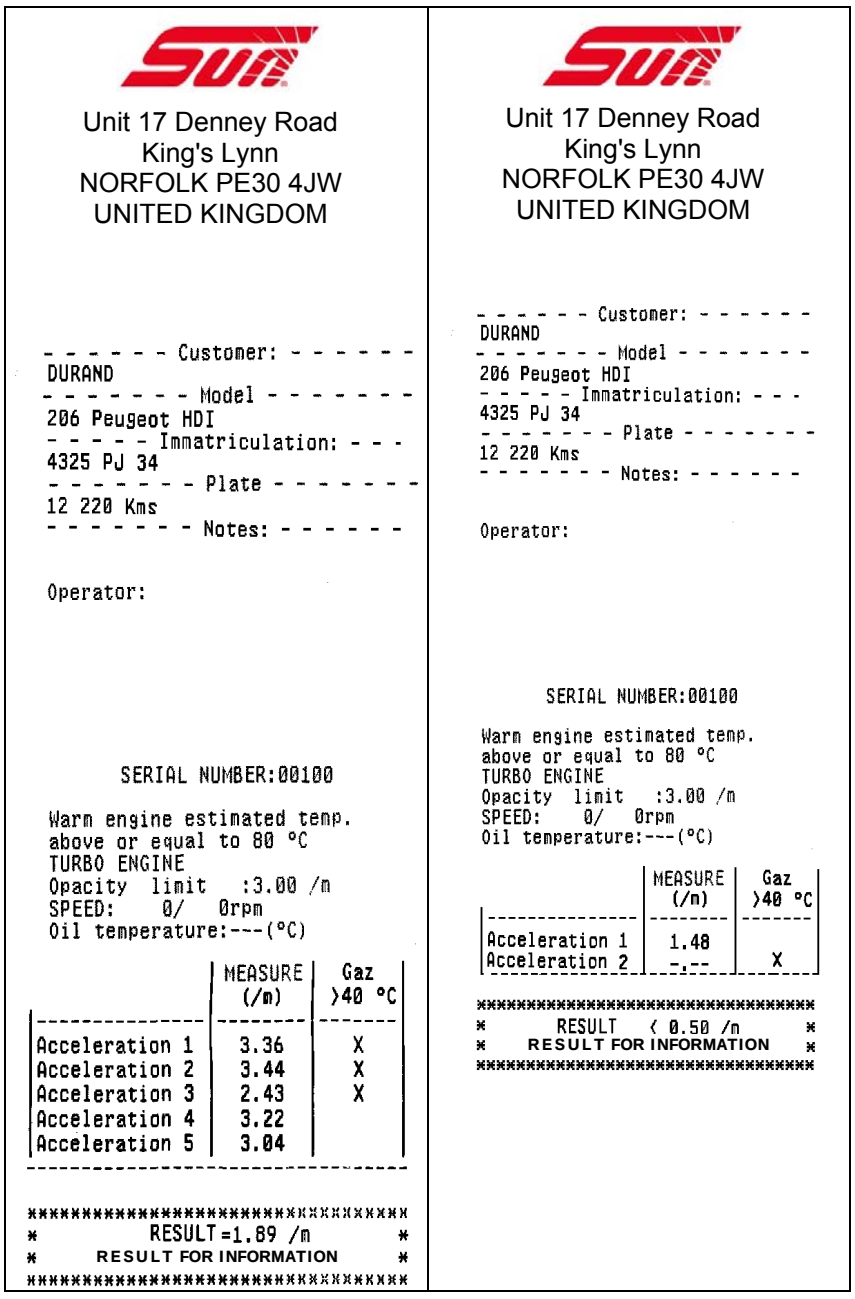
****
* MALFUNCTION OF THE *
* VEHICLE *
* RESULT FOR INFORMATION *
****

Unacceptable result case, due to obvious malfunction

Finally, if the result of an acceleration is shown in the form “-.--”, it means that the acceleration was not detected.

III.4.13.2. Measurement not to standard

When a free acceleration is carried out and the temperature of the gases entering the chamber is less than 40°C, the measurement is considered not to standard. The measurement is not rejected and the result is given for the sake of information.



Unit 17 Denney Road
King's Lynn
NORFOLK PE30 4JW
UNITED KINGDOM

- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model - - - - - - -
206 Peugeot HDI
- - - - - Immatriculation: - - -
4325 PJ 34
- - - - - - - Plate - - - - - - -
12 220 Kms
- - - - - - - Notes: - - - - - -

Operator:

SERIAL NUMBER:00100

Warm engine estimated temp.
above or equal to 80 °C
TURBO ENGINE
Opacity limit :3.00 /m
SPEED: 0/ 0rpm
Oil temperature:---(°C)

	MEASURE (/m)	Gaz)40 °C
Acceleration 1	3.36	X
Acceleration 2	3.44	X
Acceleration 3	2.43	X
Acceleration 4	3.22	
Acceleration 5	3.04	

****
* RESULT=1.89 /m *
* RESULT FOR INFORMATION *
****

Unit 17 Denney Road
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- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model - - - - - - -
206 Peugeot HDI
- - - - - Immatriculation: - - -
4325 PJ 34
- - - - - - - Plate - - - - - - -
12 220 Kms
- - - - - - - Notes: - - - - - -

Operator:

SERIAL NUMBER:00100

Warm engine estimated temp.
above or equal to 80 °C
TURBO ENGINE
Opacity limit :3.00 /m
SPEED: 0/ 0rpm
Oil temperature:---(°C)

	MEASURE (/m)	Gaz)40 °C
Acceleration 1	1.48	
Acceleration 2	-.--	X

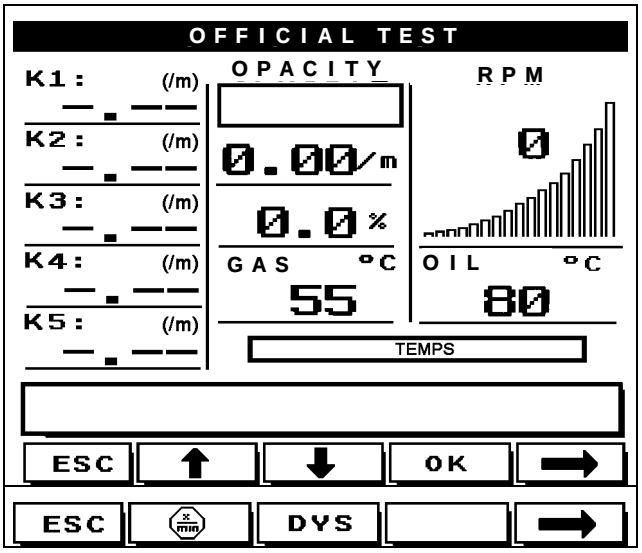
****
* RESULT (0.50 /m *
* RESULT FOR INFORMATION *
****

The test report indicates that the measurement is not in conform with the standard (NFR 10-025) and that the result displayed is for information only. In the ticket examples, the absence of a cross in the third column of the measurement table indicates that the temperature is below 40 °C.

..

III.5. OPACITY VALUE DETERMINATION PROCEDURE

This test must be performed on vehicles whose results from the opacity check procedure have been judged unacceptable. It repeats the same steps as the opacity check procedure. This procedure, however, is longer but more accurate in that the number of free accelerations may go as high as 16 and measurements are taken into account only when the results of successive free accelerations are stabilized. This test is identical to the opacity check procedure, but conditions for termination are different and free acceleration results start to be processed beginning with acceleration number 4. The software continues to order free accelerations as long as the results of successive accelerations do not converge to a stable value. If after 16 accelerations the values are not stable enough, the procedure stops and indicates unstable opacity.



The UP and DOWN arrows allow scrolling of values when there are more than 5 of them. All the other buttons have the same characteristics as in the opacity check procedure.

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- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model - - - - - - -
206 Peugeot
- - - - - Immatriculation: - - -
4325 PJ 34
- - - - - - - Plate - - - - - - -
12 220 Kms
- - - - - - - Notes: - - - - - -

Operator:

SERIAL NUMBER:00100

Warm engine estimated temp.
above or equal to 80 °C

	MEASURE (/m)	Gaz >40 °C
Acceleration 1	0.56	X
Acceleration 2	6.25	X
Acceleration 3	1.52	X
Acceleration 4	2.21	X
Acceleration 5	4.08	X
Acceleration 6	1.52	X
Acceleration 7	1.51	X
Acceleration 8	2.43	X
Acceleration 9	0.27	X
Acceleration 10	1.33	X
Acceleration 11	1.15	X
Acceleration 12	0.62	X
Acceleration 13	0.37	X
Acceleration 14	0.55	X
Acceleration 15	0.49	X

****
* RESULT =0.51 /m *
****

The machine gives the arithmetic mean of the last four accelerations.

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- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model - - - - - - -
206 Peugeot
- - - - - Immatriculation: - - -
4325 PJ 34
- - - - - - - Plate - - - - - - -
12 220 Kms
- - - - - - - Notes: - - - - - -

Operator:

SERIAL NUMBER:00100

Warm engine estimated temp.
above or equal to 80 °C

	MEASURE (/m)	Gaz >40 °C
Acceleration 1	0.81	X
Acceleration 2	0.95	X
Acceleration 3	1.39	X
Acceleration 4	1.99	X
Acceleration 5	2.25	X
Acceleration 6	2.56	X
Acceleration 7	3.09	X
Acceleration 8	3.81	X
Acceleration 9	4.78	X
Acceleration 10	4.87	X
Acceleration 11	5.40	X
Acceleration 12	6.05	X
Acceleration 13	6.58	X
Acceleration 14	7.67	X
Acceleration 15	9.77	X
Acceleration 16	9.99	X

****
* UNSTABLE OPACITY *
****

The values have not stabilized after 16 acceleration; the machine indicates unstable opacity.

Unit 17 Denney Road
King's Lynn
NORFOLK PE30 4JW
UNITED KINGDOM

- - - - - - Customer: - - - - - -
DURAND
- - - - - - - Model - - - - - - -
206 Peugeot
- - - - - Immatriculation: - - -
4325 PJ 34
- - - - - - - Plate - - - - - - -
12 220 Kms
- - - - - - - Notes: - - - - - -

Operator:

SERIAL NUMBER:00100

Warm engine estimated temp.
above or equal to 80 °C

	MEASURE (/m)	Gaz >40 °C
Acceleration 1	0.81	X
Acceleration 2	0.95	X
Acceleration 3	1.39	
Acceleration 4	1.99	
Acceleration 5	2.25	
Acceleration 6	2.56	
Acceleration 7	3.09	X
Acceleration 8	3.81	X
Acceleration 9	4.78	X
Acceleration 10	4.87	X
Acceleration 11	5.40	X
Acceleration 12	6.05	X
Acceleration 13	6.58	X
Acceleration 14	7.67	X
Acceleration 15	9.77	X
Acceleration 16	9.99	X

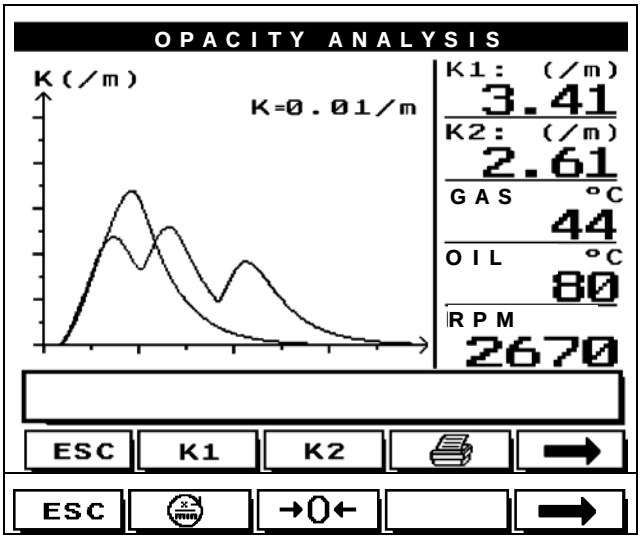
****
* UNSTABLE OPACITY *
* RESULT FOR INFORMATION *
****

The values have not stabilized after 16 acceleration; the machine indicates unstable opacity. What is more, the accelerations have a gas temperature <40 °C, hence the result is only for information.

Indications on the printout ticket are identical to the opacity control procedure; only the termination criteria are different.

III.6. OPACITY ANALYSIS

This page is dedicated to the repairman who wants to analyse the opacity curves of a vehicle without the constraints of the official procedure.



K1 K2 • Enable/Erase:

Press K1 and/or K2 to enable. When an acceleration is detected, the curve is drawn on the screen. To erase curve 1 and/or 2 simply press ERA K1 or/and ERA K2. To draw a new curve, enable again.

- Print:

Printing the opacity curves.

→0← • Auto-zero:

Recalibrates the instrument; the probe must not be in the exhaust when the function is requested.

- RPM mode:

Allows the RPM mode to be selected depending on the sensor type used at the input (See chapter I.3.3).

III.7. OPACITY METER MESSAGES

III.7.1. Error messages

III.7.1.1. «Zero in progress»

This message should disappear after a few seconds at the end of the auto-zero operation. Maximum duration, 4 seconds. It is not an error; it means that the procedure for resetting opacity to zero is in progress. Wait.

III.7.1.2. « Mains voltage out of bounds »

The cell input voltage should be between 195 and 253 VAC.

Beyond that, the cell cannot operate correctly. Have the mains power checked.

III.7.1.3. « Windows dirty »

You must shut off the machine and proceed with cleaning the cell lenses as described in the maintenance chapter of this manual.

III.7.1.4. « Fan is defective »

The air flow system is unable to ensure a constant effective length. Call service.

III.7.1.5. « EEPROM out of service »

Call service.

III.7.1.6. « Sensor problem »

A temperature sensor is defective; Call service.

III.7.1.7. « Preheating »

Tube temperature must be 80°C. It is therefore necessary to carry out a warm-up operation, which varies from 3 to 6 minutes in length.

III.7.1.8. « Detector temp. out of bounds »

The temperature of the optical detector must be between 25 ºC and 45 ºC.

After a preheating period, this error resolves itself. Wait.

III.7.1.9. « Time exceeded »

If no acceleration was detected within the prescribed interval, this message appears.

III.7.1.10. « Probe connected?»

This message appears right after the preceding one, because in general an incorrectly inserted probe causes non-detection of acceleration.

III.7.1.11. « Measurement invalid »

The opacity curve contains several peaks, making it impossible to determine opacity. Use more vigorous foot pressure on the accelerator.

III.7.1.12. « Press ESC and start again »

This message appears when an error threatens to impede the proper operation of the test. The test in progress is therefore interrupted, and it is necessary to quit the test by pressing ESC, then start over.

III.7.2. User guidance messages

III.7.2.1. « Acceleration No. X »

This message indicates the beginning of a new acceleration.

The user must therefore push the accelerator pedal all the way down as soon as this message is displayed.

III.7.2.2. « Measurement in progress »

Acceleration has been detected; the accelerator pedal must be kept pushed to allow acquisition of opacity during the current acceleration.

III.7.2.3. « Return to idle »

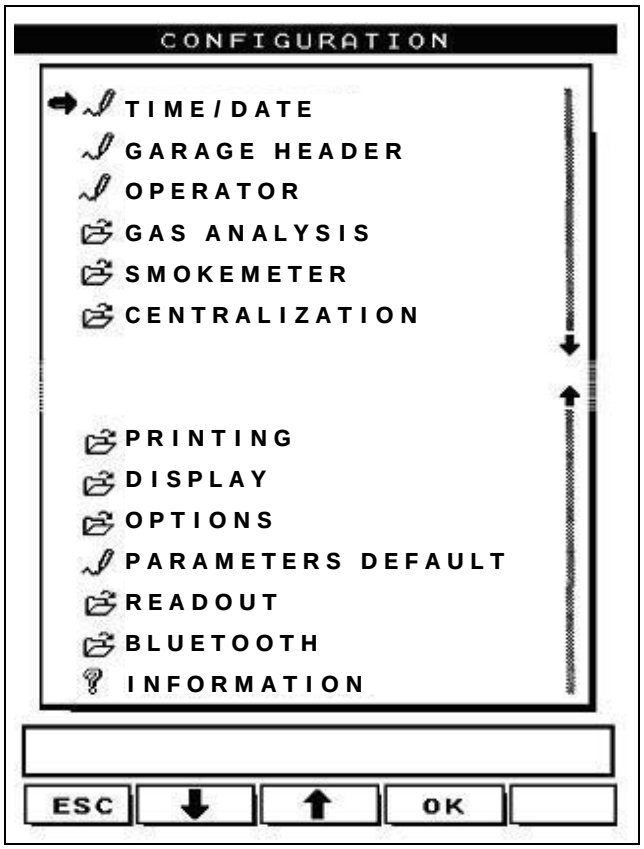
Starting with this message, the accelerator pedal must be released and the cell sends to the central unit information on the vehicle's opacity.

IV.CONFIGURATIONS MENU

IV.1. GENERAL:

To launch this application, select “Configuration” in the main menu.

The following screen appears:



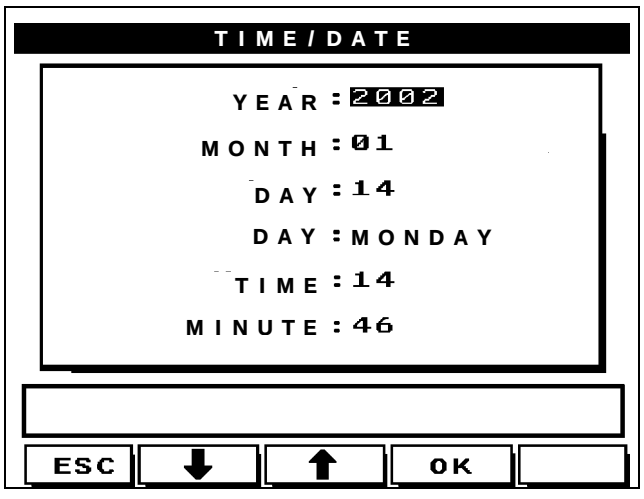
This is a scrolling menu made of several menu options.

Each option allows access to a parameter-setting window.

All these menus are described below.

IV.2. TIME/DATE:

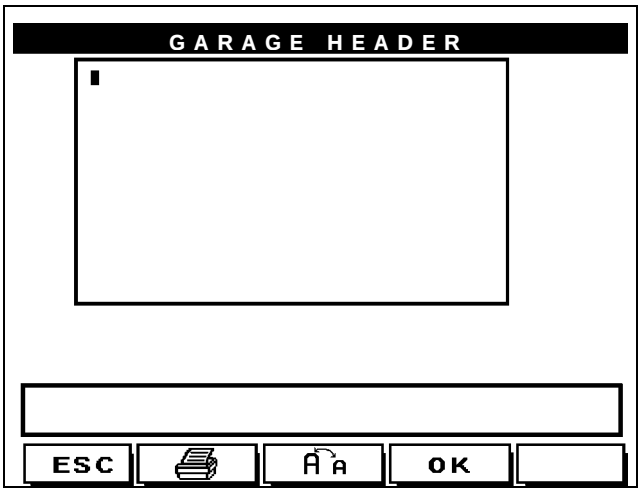
Allows you to update the time and date of the DGA1500.



The field must be selected using the OK key; to change the value, press on the UP and DOWN arrows. Finally, to save the new values, you must press OK to update the next field. To go back to the configurations menu select ESC.

IV.3. GARAGE HEADER:

This menu allows to enter personalize the information related to the garage. This information appears on the top of the printed test report.



It is depending on the unit configuration on how to enter the data:

- With the five dynamic keys when the optional keyboard is **not** installed
- With the optional keyboard

Via the five dynamic keys:

Use the five keys located below the screen (only if the optional keyboard is not installed) The UP and DOWN arrows allow rapid scrolling of characters. Use the >> button to go to the next character and << to return to the previous character. When finishing a line press OK to go to the next line. After editing all lines it will go back to the configurations menu.

Via the optional keyboard:

The UP, DOWN arrows allows a line change. To erase a character, use the BACKSPACE ← key, or the LEFT arrow. Press the OK key (5-key pad) or type ENTER to move back to the configurations menu

The printer button allows to print the garage header.

This button changes the character range.

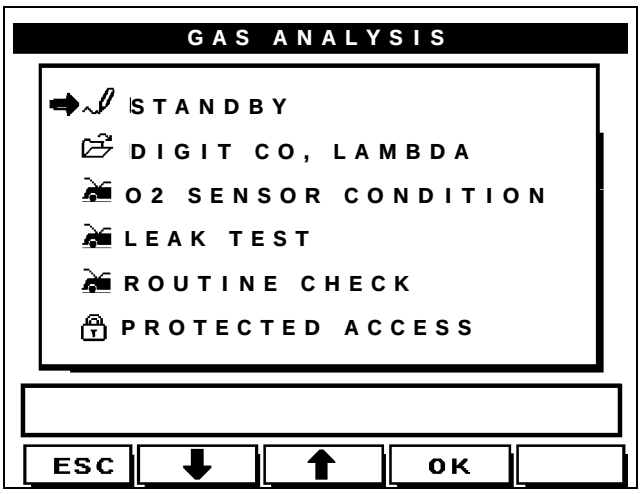
IV.4. OPERATOR:

In this menu you can enter of up to 9 operator names. The principle of entering the names is the same a entering the garage header.

In the main menu, the name of the current user is displayed; to change it, simply press, **if the keyboard option is active**, on the number 1 for the first operator, 2 for the second and so on; if the user **does not have the keyboard option** he can change using the “Op+” icon. This name will be mentioned on the printed test report at the end of a test.

IV.5. GAS ANALYSIS

This gives access to a submenu that allows selection of the standby interval of the gas analysis module, display of Lambda and CO to 3 or 2 decimal places; it also allows evaluation of the oxygen sensor’s condition, execution of a leak test, display of routine control and access to the secure menu.



IV.5.1. Standby

For standby settings, select the standby menu, then press OK. The remaining time until the gas analyser goes in is standby after the last measurement is displayed in the dialog box. By using the UP and DOWN arrow, you can enter the time suited to your needs. During the stand by mode the pump is switched of.

IV.5.2. Digit CO, Lambda

The DIGIT CO and DIGIT LAMBDA submenus allow selection of the number of figures after the decimal that you want to have when CO and LAMBDA are displayed.

IMPORTANT: If you choose CO at 3 DIGITS, the gas analyser is in high resolution for the CO and also for HC. So, the measurement range in high resolution is for the HC to –13 at 2000 ppm with 1 ppm of accuracy and in normal resolution the range resolution is to –13 at 20000 ppm with 10 ppm of accuracy.

IV.5.3. O2 sensor condition

This menu provides information on the condition of the oxygen sensor. The DGA1500 performs a diagnostic on the sensor and gives its opinion of the condition of the sensor. The condition is given in %, 100% corresponding to a new O2 sensor

IV.5.4. Leak test

The leak test is a procedure to detect of any seal problems that might occur in the pneumatic circuit. It is important carry out this test at least once every three months. It is preferable that the user carries it out at least once per month. The presence of a leak results in wrong measurements.

This test is guided throughout. The operator must follow the instructions given on the screen.

Test the pump vacuum site:

The following message appears: “Block the inlet”. The analyser automatically detects blocking of the inlet. The pumps then shuts off and the following message appears: “Test in progress.” It is necessary to keep the inlet blocked. At the end of this phase, a diagnosis of “Leak present” or “Leak absent” is given.
Press the key [OK] to continue the test, otherwise [ESC].

Test the pump pressure site:

The following message appears: “Block the exhaust”. The analyser automatically detects blocking of the exhaust. The pumps then shut off and the following message appears: “Test in progress.” It is necessary to keep the inlet blocked. At the end of this phase, a diagnosis of “Leak present” or “Leak absent” is given.

Stop test and exit: [ESC]

The presence of a leak disables measurements till a new test has been carried out with a final result of “Leak absent”.

IV.5.5. Routine check

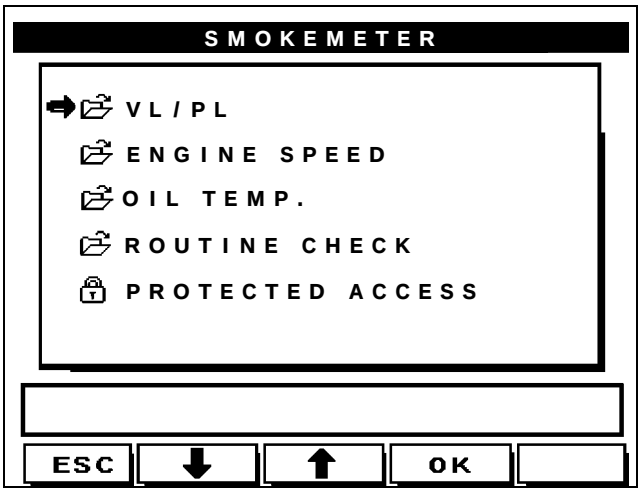
This window is made up of 2 pages (PG1 and PG2). They provide information in real time on the condition of the gas analyzer module used by the service engineer.

IV.5.6. Protected access

This part of the program is **reserved** for SUN trained service engineers.

IV.6. SMOKEMETER:

When the user selects “Opacimeter” the following window is activated:



IV.6.1. VL/PL:

The VL/PL selection list allows a choice of mode: either VL - in this mode, the operator is required to measure an oil temperature of at least 80°C. In the other mode, type PL, he can free himself to measure the temperature by validating manually.

IV.6.2. Engine speed and Oil temperature:

The ENGINE SPEED and OIL TEMP selection list allow a choice whether information concerning the engine speed and the oil temperature will be printed on the test report.

IV.6.3. Routine check:

This window is made up of 3 pages (PG1, PG2 and PG3). They provide information in real time on the condition of the gas analyzer module used by the service engineer.

IV.6.4. Protected access:

This part of the program is **reserved** for SUN trained service engineers.

IV.7. CENTRAL CONTROL:

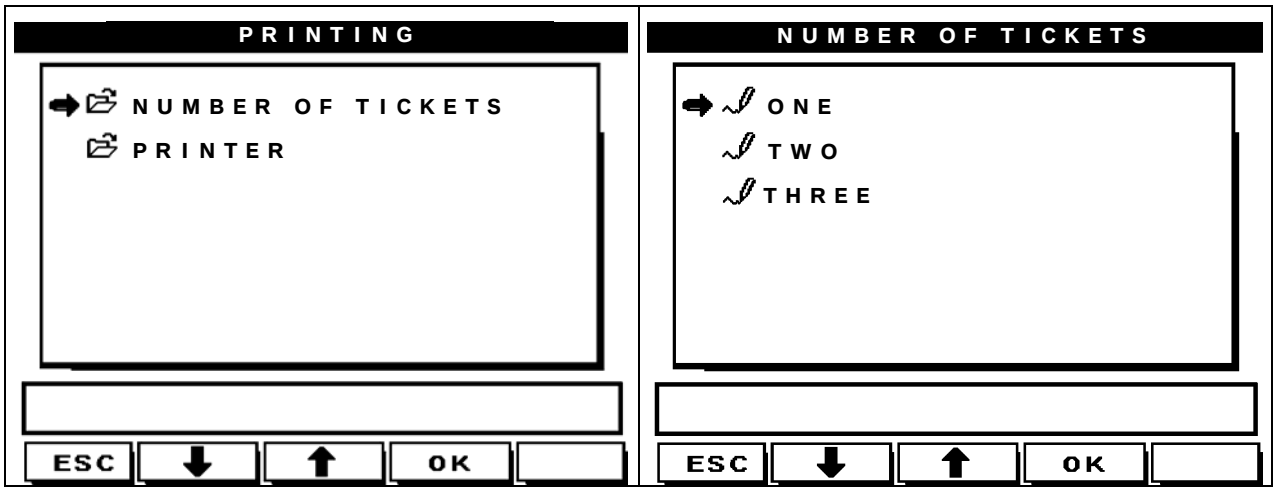
The DGA 1500 can send the test results, data to an external PC as a test lane. In this menu the serial protocol can be selected. Depending on the selected protocol it can be that the print button calls up a second menu to where you want to print to, to the printer or the PC.

IV.8. PRINTING:

This menu has two submenus:

- “Number of tickets”: Allows 1, 2 or 3 reports to be automatically printed after each test sequence.

“Printer”: The operator can select either an external A4 format printer or the internal thermal printer furnished with the machine.



IV.9. SCREEN:

The machine’s screen can be configured; to do this, choose either NORMAL mode (normal operating mode of the screen), or the INVERSE mode (mode in which display is the exact inverse of the normal mode). Press OK to confirm your choice. The screen sets itself automatically to the chosen mode.

IV.10. OPTIONS :

This part of the program is **reserved** for SUN trained service engineers

IV.11. DEFAULT PARAMETERS:

ATTENTION: This window should be used with caution; it will reset the configuration to the default settings!

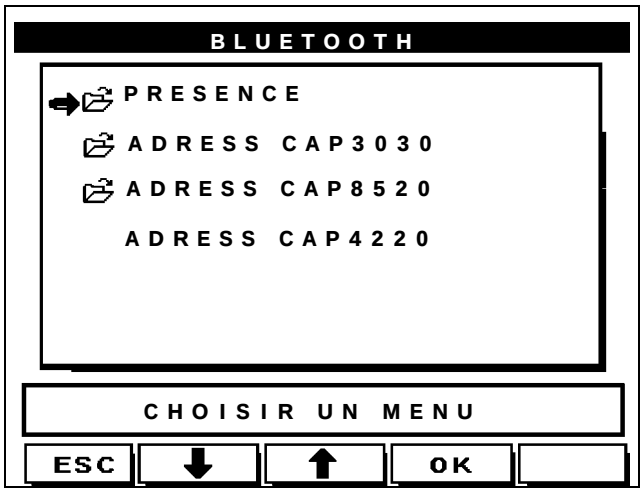
IV.12. READ OUT

Two choices are possible:

- « Detail » Gives a display with more details and there are graphics. There are drawings. But the size of the characters is smaller.
- « ZOOM » The characters are larger on it displays only the important information.

IV.13. BLUETOOTH

In this menu you can configure the DGA 1500 to communicate with the different Bluetooth devices as the smoke meter, RPM Oil temp device and the EOBD module.



If Bluetooth is installed, PRESENCE has to be set to « YES ».

Then put the Bluetooth addresses. This is mentioned on a white sticker on the back of the Bluetooth device. It has a length of 12 characters for example : 008098953D5C.

IV.14. INFORMATION:

This window shows the manufacturer details. For more information on our products, go to our Internet site: **www.sun-diagnostics.com**.

V. BLUETOOTH OBD SCANTOOL

V.1. GENERAL

With the optional Bluetooth Scantool you have access to the data of on-board computer of the vehicle.systems. It connects to the OBDII diagnostic plug (SAE J1962 standard) of the vehicle and scans the information stored in memory or current data made available and accessible by one of the 5 standardized protocols.

–ISO 9141-2
–SAE J1850 41,6 kbps PWM (Pulse Width Modulation)
–SAE J1850 10,4 kbps VPW (Variable Pulse Width)
–ISO 14230-4 (Keyword Protocol 2000)
–ISO 15765-4 (CAN)
–J1939 (Heavy duty vehicles)

Since 1 January 2001, all petrol vehicles sold in Europe must be EOBD compliant. Diesels should be complaint since 1 January 2003.

V.2. PRINCIPLE

The Scantool is not a measuring instrument. All information displayed on the screen is information transmitted by the vehicles computer.

Information available varies according to each vehicle.

Connected to the vehicle, the Scantool asks questions to the computer in the vehicle and displays the answers. Answered is information can be used by the emission tester as the engine speed and oil temperature.

IMPORTANT: In the gas analyzer menu and smokemeter menu, you have to select the RPM OBD mode.

After that the DGA 1500 will display the RPM and oil temperature OBD of the car.

VI. BLUETOOTH RPM / OIL TEMPERATURE ADAPTOR

VI.1. OPERATING PRINCIPLE

The RPM adaptor operates by analysing ripple of the alternator as the alternator has a direct effect on the RPM.

By analysing the ripple the RPM device is able to calculate the engine speed and transmit it via blutooth together with the engine temperature to the DGA 1500

VI.2. TECHNICAL CHARACTERISTICS

Measurement characteristics

- Automatic initialisation
- Measurement range: : 400 - 9 999 rpm.
- Maximum error:
  <20 rpm at speeds below 2000 rpm
  <2 % in other cases
- Response time: <1 second
- Measurement update rate: 10 times per second
- Initialisation time: <17 seconds

VI.3. LIST OF KIT CONTENTS

- One battery connection cable.
- One cigar lighter connection cable.

VI.4. CONNECTING THE TACHOMETER

Connected to the cigar lighter

This is the simplest solution. It lets you measure the engine speed with no need to open the vehicle bonnet. On some vehicles, however, the engine speed measurement may be less accurate than with the unit connected directly to the battery.

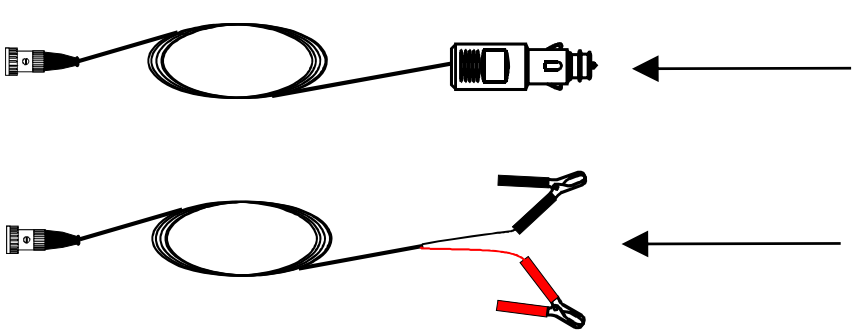
Connect the cable (1) to the INPUT socket RPM BAT. Remove the cigar lighter from its socket on the dashboard

Connected to the battery

Connect the cable (2) to the INPUT socket (RPM BAT) on the du DGA1500 and use the clips to connect it to the battery terminals, taking care not to invert the polarity.

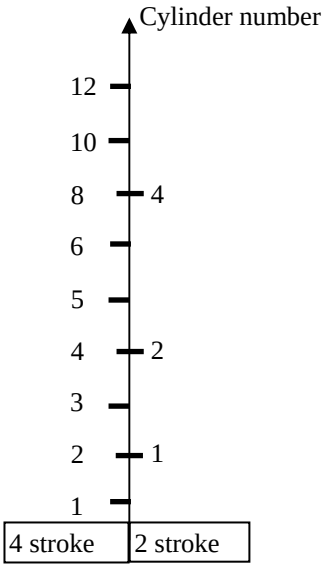
NOTE:

The tachometer is connected to the vehicle's DC power supply for two reasons – to power the unit and to perform the engine speed measurements. It is therefore essential to connect the unit to the battery on the vehicle being tested, and not to a spare battery.



VI.5. MEASURING THE ENGINE SPEED

Pressing this key  displays the speed mode currently in use. On the other hand, if the user again presses the RPM key, a new speed mode displays the new selection. Select the rpm mode call battery. After three seconds, the message box request a cylinder number. This number corresponding to 4 stroke engine. If you want to measure a 2 stroke engine, see the figure:



Troubleshooting:

On some vehicles, measurements may be inconsistent. There can be several causes for this. In the event of a problem (unstable or imprecise readings), minimise the risk of error as follows:

- The battery should be slightly discharged. Better results will be obtained if the headlights are left on for a few minutes before starting the motor.

- During the measurement procedure, switch on the headlights to boost power consumption.

- If measurements were made from the cigar lighter, try measuring directly on the battery.

If, after initialisation, the tickover speed is stable, but incorrect (e.g. double the actual speed), change the cylinder number setting until the correct value appears.