AUTOplus

Automotive Exhaust Gas Analyser

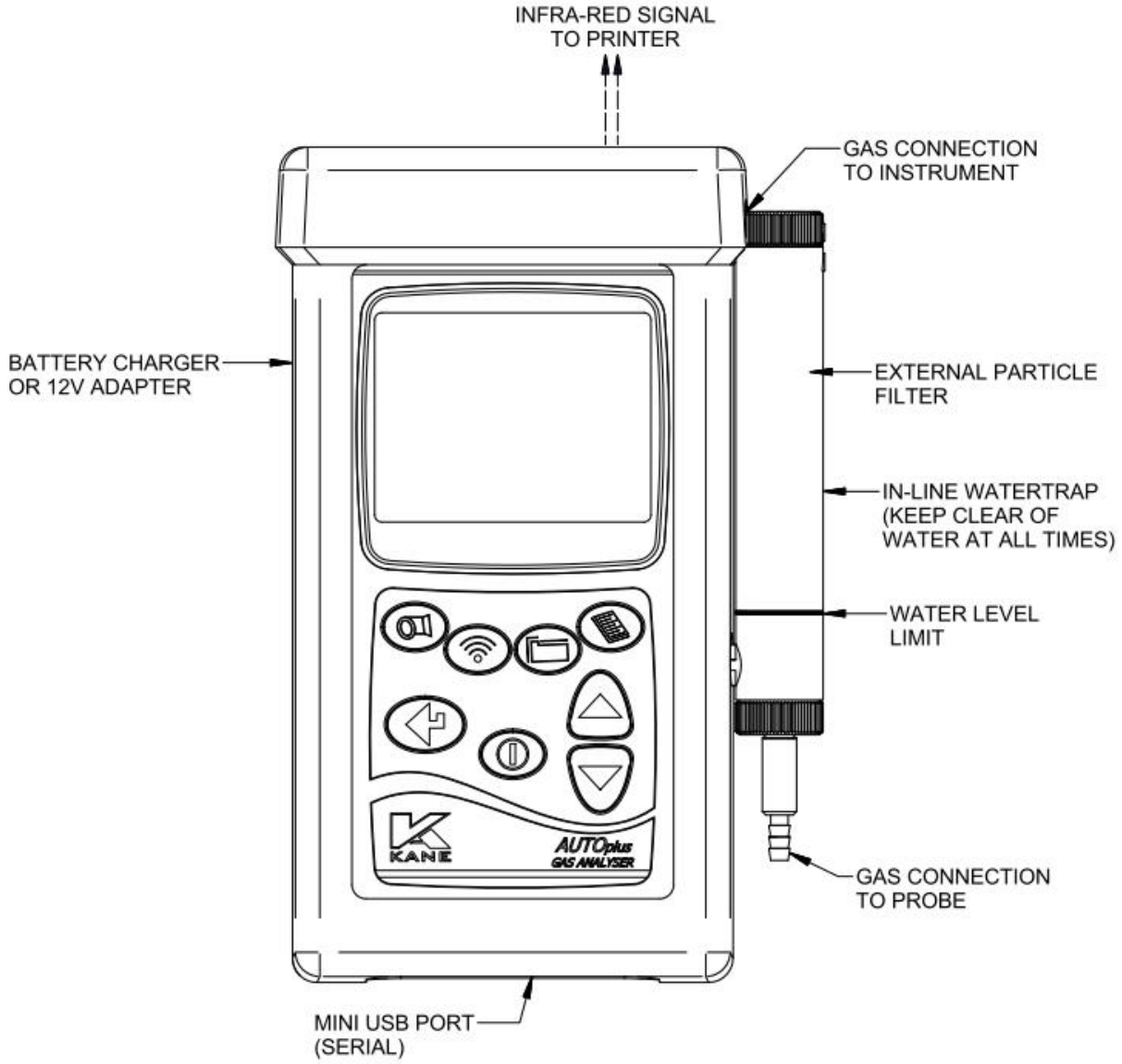
Stock No: 19158-3 August 2013

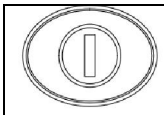
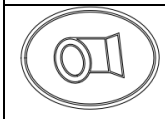
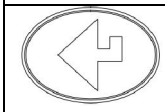
CONTENTS

Page No:

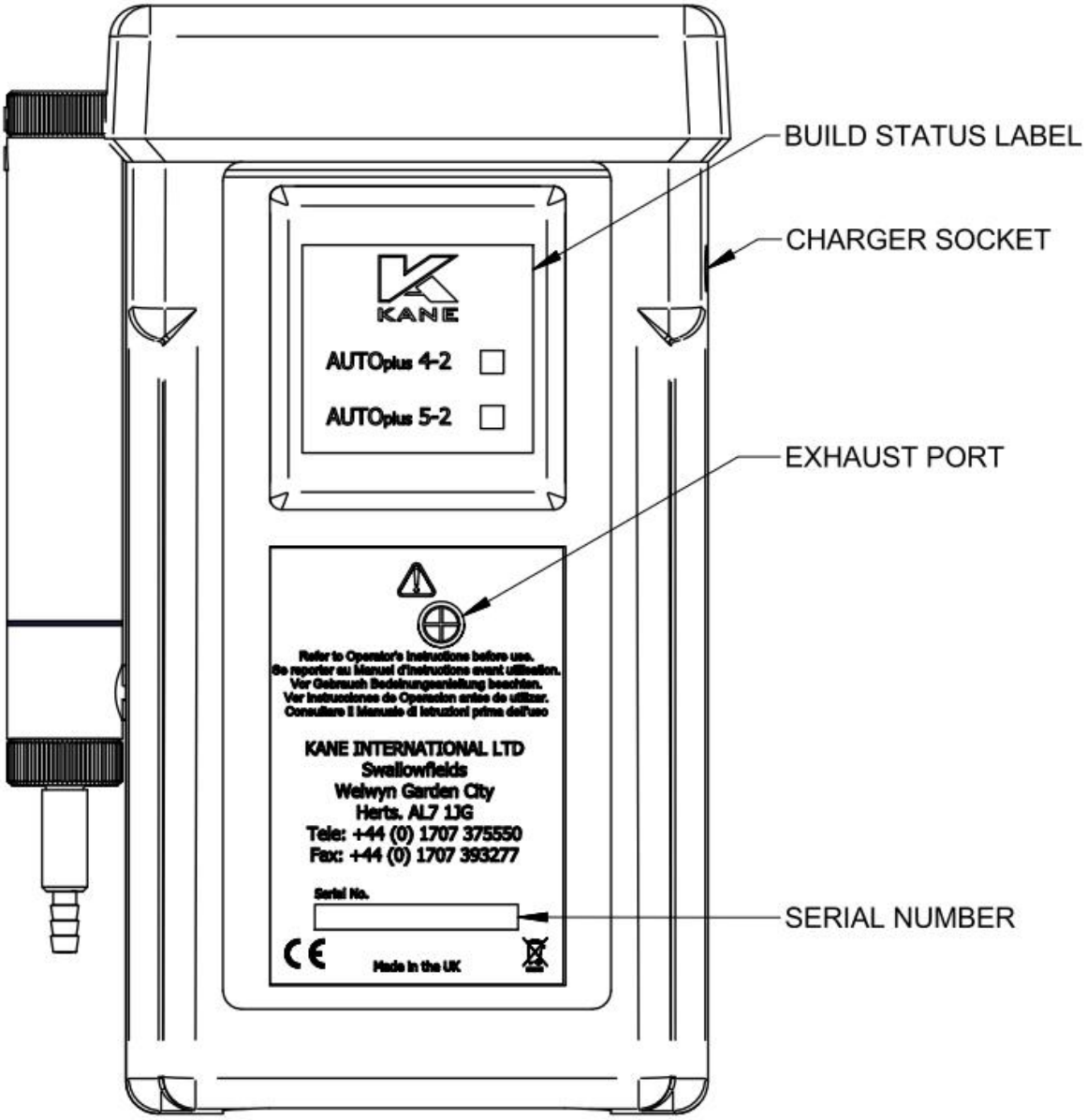
1. ANALYSER LAYOUT AND FEATURES

1.1 Features and Keypad

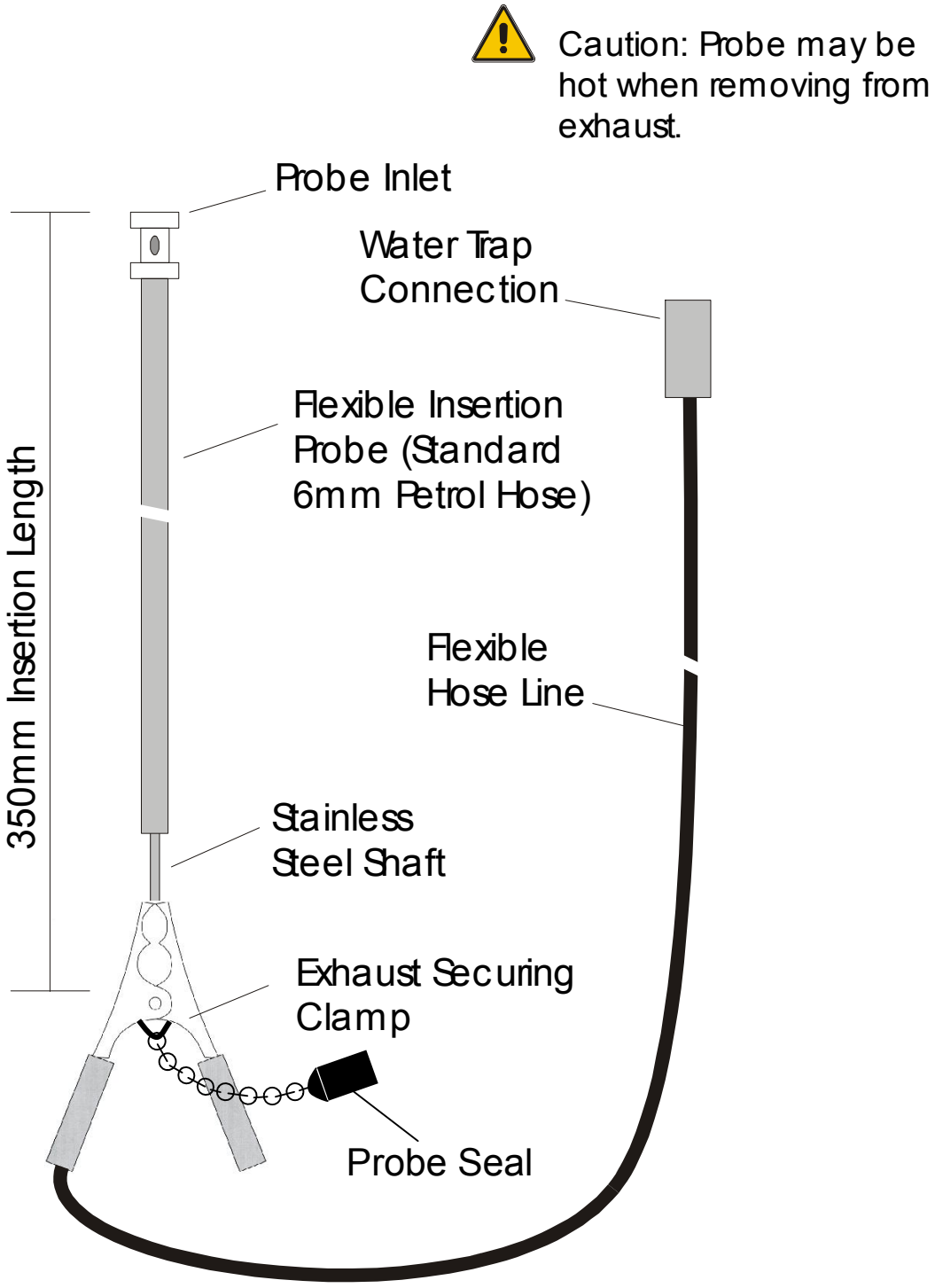


	**ON/OFF**			**UP** Scrolls up through options
	**MENU** Allows access to all menu functions			**DOWN** Scrolls down through options
	**PUMP** Turns pump on and off			**STORE** Enters data storage menu
	**ENTER** Accepts a command, i.e. enters a menu option			**PRINT** Prints current data

1.2 Layout (Rear)



1.3 Standard Probe Configuration



Note: A variety of probes are available, including high temperature probes necessary for on-road / rolling road vehicle testing when the temperature of the emission gases increase. Please request further details from your distributor or contact Kane International Ltd directly.

2. SAFETY WARNING

This analyser extracts combustion gases that may be toxic in relatively low concentrations. These gases are exhausted from the top of the analyser. This analyser must only be used in well ventilated locations. It must only be used by trained and competent persons after due consideration of all the potential hazards.

Protection Against Electric Shock (in accordance with EN 61010-1 : 2010)

This analyser is designated as Class III equipment and should only be connected to SELV circuits.

The battery charger is designated as:

Class II equipment
Installation category II
Pollution degree 2
Indoor use only
Altitude to 2000m
Ambient temperature 0°C-40°C
Maximum relative humidity 80%
Mains supply fluctuations not to exceed 10% of the nominal voltage.

3. FIRST TIME USE

Charge the battery for 12 hours, following this an overnight charge should be sufficient for an average 8 hour day (turning pump off to save power between tests).

The analyser has a rechargeable NiMh battery, use only the mains charger or 12 volt adapter supplied or damage may occur to the analyser and battery.

Check that you have all the items you have ordered.

Take time to read this manual fully.

When using the analyser for the first time you will need to choose from:-

Language selection
Time and date
Printed header name and telephone number

4. NORMAL START UP SEQUENCE

4.1 Every Time You Use The Analyser

BEFORE SWITCH-ON CHECK THAT:

the particle filter is dry and not dirty or damaged

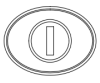
the water trap and probe line are empty of water

all hose connections, etc, are properly made

the probe is sampling CLEAN AMBIENT air

the water trap is correctly fitted and the analyser upright

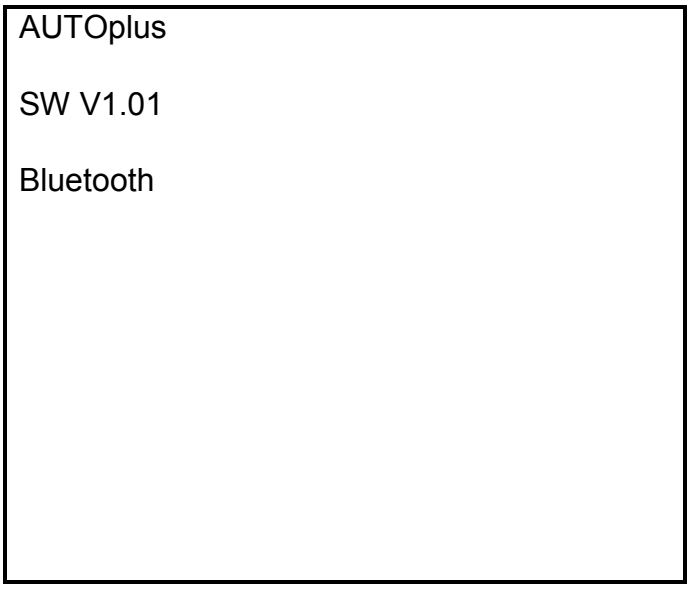
* DO NOT RUN ANALYSER WITHOUT WATER TRAP FITTED *

Switch ON the analyser by pressing 

4.2 Automatic Zero Calibration

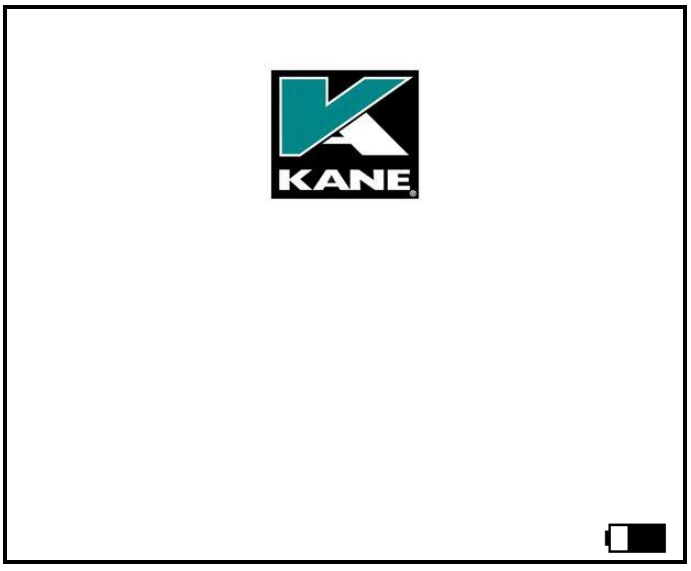
During this sequence the analyser pumps fresh air into the sensors to allow them to zero and the oxygen sensor to be set to 20.9 %.

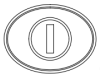
After switch-on the analyser will briefly display information:



Auto 4 or Auto 5 indicates 4 or 5 gas version
SW is the software version
Bluetooth indicates Bluetooth fitted and enabled

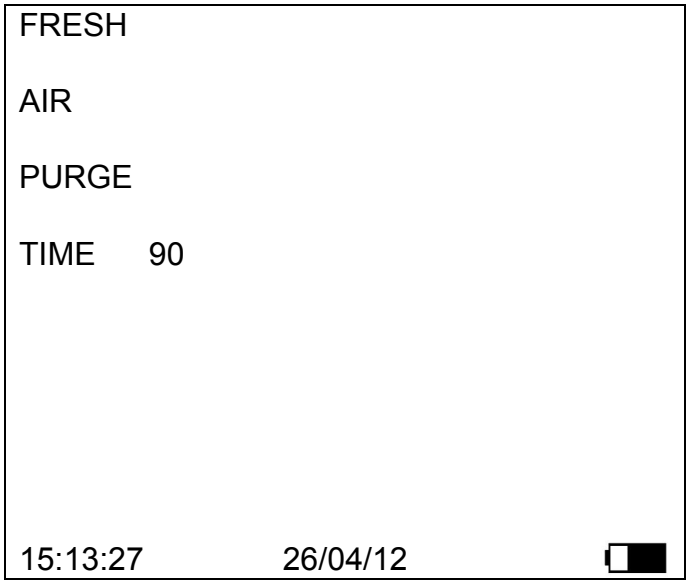
(*If the charger is connected and*  *is pressed the display will show*



Press  again and the display header screen will be shown.

NOTE: When the “CHARGING BATTERY” screen is displayed fast charging mode is operating.)

And then the initialising screen is shown:

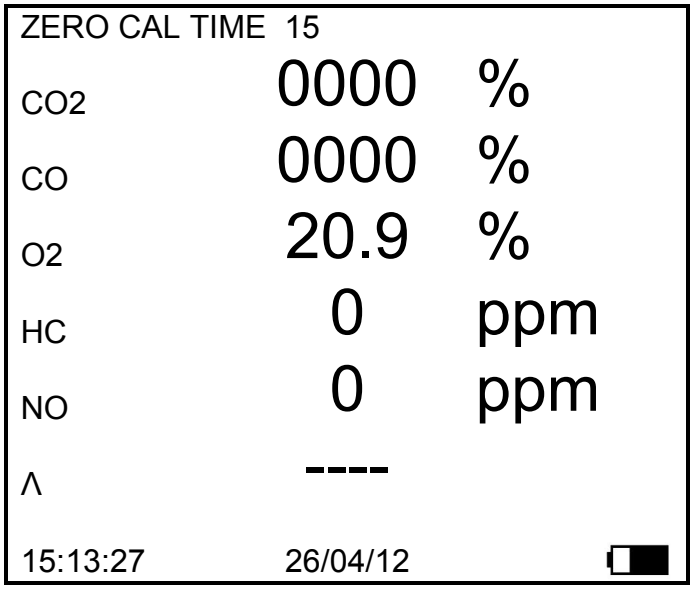


The time will count down in seconds to zero and is pre-set by the analyser. During countdown the analyser will initialise the measuring system, do not block the end of the probe or insert into or near the vehicle exhaust. It also displays some setup values including atmospheric pressure and internal ambient temperature.

TIP: Take care to purge the analyser in really fresh air. Often the air in a garage or workshop is contaminated with HC up to about 1 metre from the floor with the emissions from past spills of oil, lubricants etc that may have soaked into the floor.

Once the initialisation is completed the analyser will zero the CO, HC, CO_2 and NO sensors if fitted and set oxygen to 20.9%. Keep the analyser and exhaust probe sampling fresh air.

The next screen is the **MAIN DISPLAY** of the analyser:-



The first time to zero is 15 minutes. After that the time to zero is 30 minutes. The analyser will beep 3 times one minute before a fresh air zeroing is required and then after a further minute beep continuously.

The bottom line of the display shows time, date and battery level.

When a zero is required the top left hand corner of the display will show "ZERO REQUIRED". Press the key to initiate zeroing. When zeroing always ensure that the analyser is sampling fresh air

The analyser is now ready for use.

NOTE: The backlight comes on automatically whenever a button is pressed and then switches off after about 30 seconds.

TIP: It has been found that in most workshops there is a background level of HC due to oil permeation of the floor. For true fresh air you need to be sampling outside the workshop or at least 2 metres above the floor.

Notes:
1) Lambda can be replaced by AFR as described below.
2) If AUTOLOG is active then the log time will be displayed at the top right hand side of the screen
3) If the charger is connected then the display will show the Battery icon filling up.

4.3 The Keypad

The keypad has 8 keys:

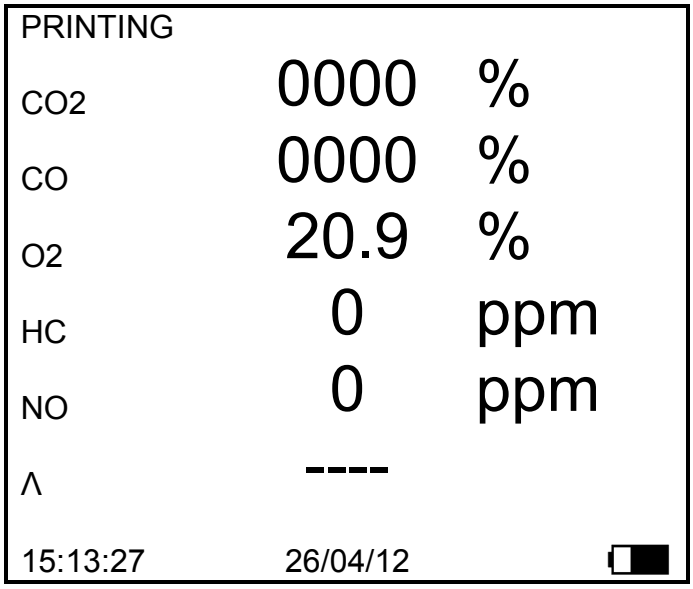
ON/OFF
UP
DOWN
ENTER
PUMP toggle
PRINT .... and SEND
STORE
MENU

ON/OFF:
Turns the analyser ON or OFF. If you press OFF by mistake simply press ENTER to cancel.

UP / DOWN / ENTER:
Mainly used after selecting MENU to change options and make selections.

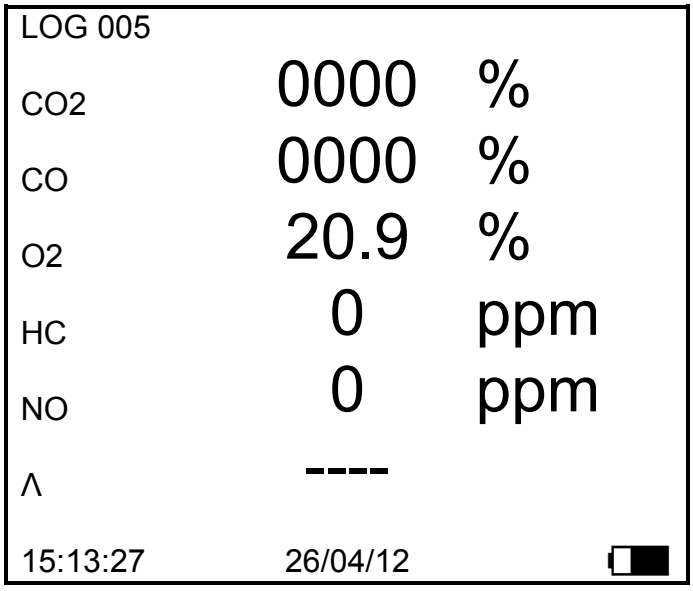
PUMP:
Turns the pump OFF or ON. Turn the pump off when not sampling to preserve battery life.

PRINT:
Also acts as SEND key for Bluetooth and serial communications. When active PRINTING appears in the top left hand corner of the display



TIP: When an IR printer is selected you can get a duplicate print automatically by pressing and holding  until a double beep is heard.

STORE:
Press to log readings from the screen into memory. The log number of the readings is displayed for a few seconds in the top left hand corner of the screen.



You can LOG up to 500 sets of readings. Stored reading can be accessed from the MENU function

Press and hold  for 2 seconds to toggle AUTOLOG on and off.

Note: AUTOLOG is disabled when the pump is switched off.

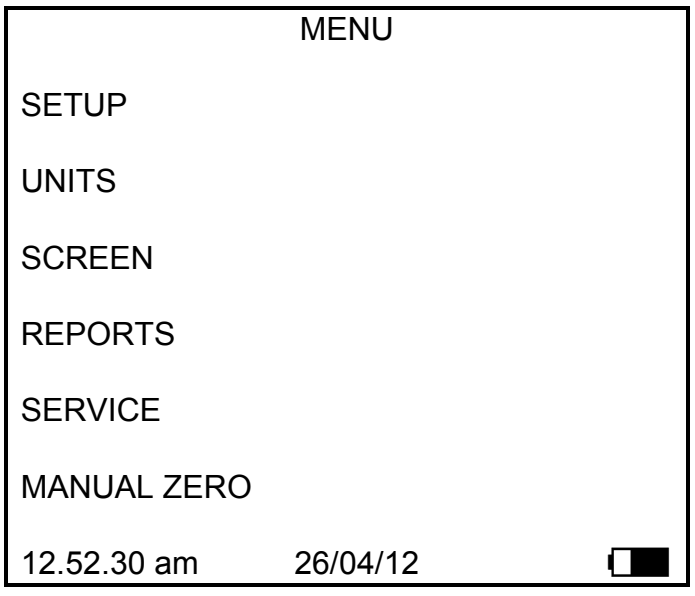
4.4 Menu

There are 5 main menu categories each with their own sub-menu.

SETUP	UNITS	SCREEN	REPORTS	SERVICE	MANUAL ZERO
LANGUAGE	FUEL	CONTRAST	VIEW	CODE	
PUMP	VEHICLE	B'LIGHT	DELETE	CAL DUE	
PRINTER	EFF	LINES	AUTOLOG TIME		
SET TIME	PEF	BACK	AUTOLOG START		
SET DATE	MEF		HEADER 1		
PASSKEY	BACK		HEADER 2		
BACK			BACK		

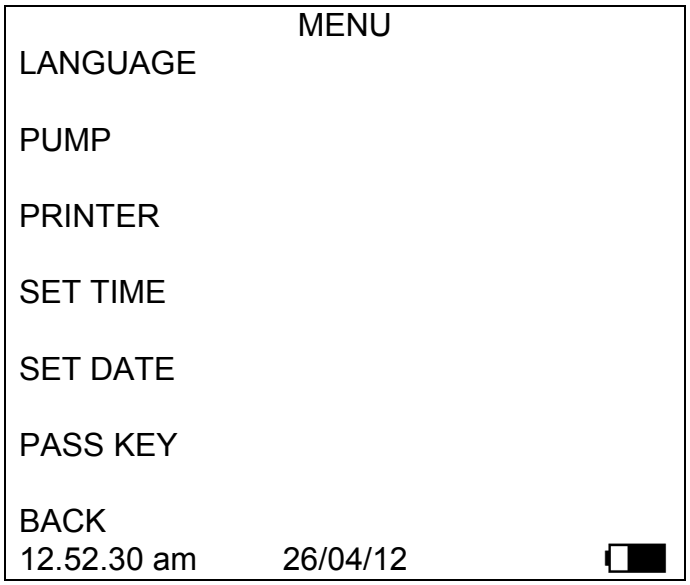
Note: In SERVICE: CODE is reserved for official service agents only.

Pressing the MENU key causes the following screen to be displayed



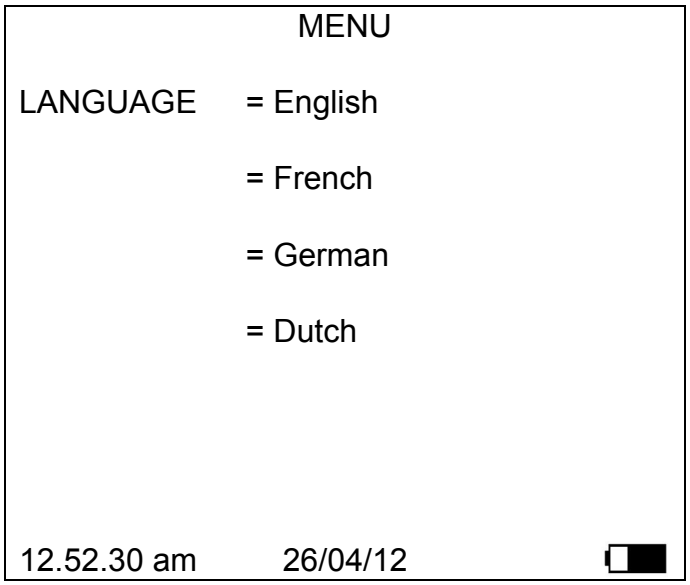
Use  to scroll the cursor through the selection and the press  to choose, To exit this screen press MENU again.

SETUP



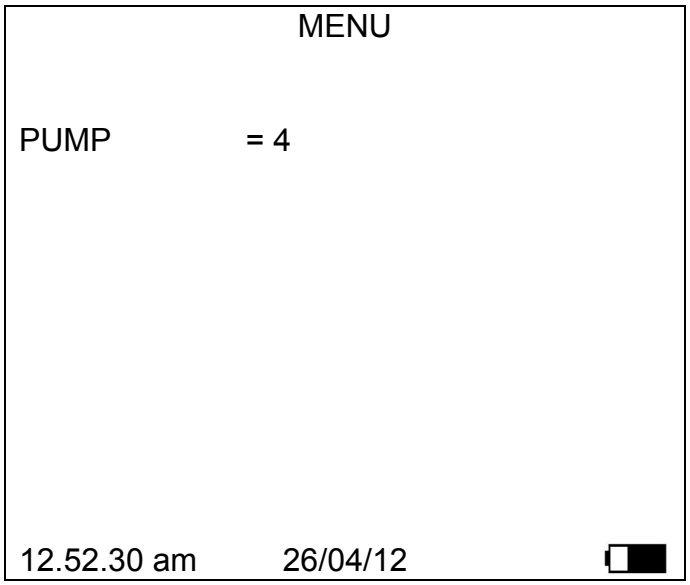
Language:

Use / to change. Use to accept.



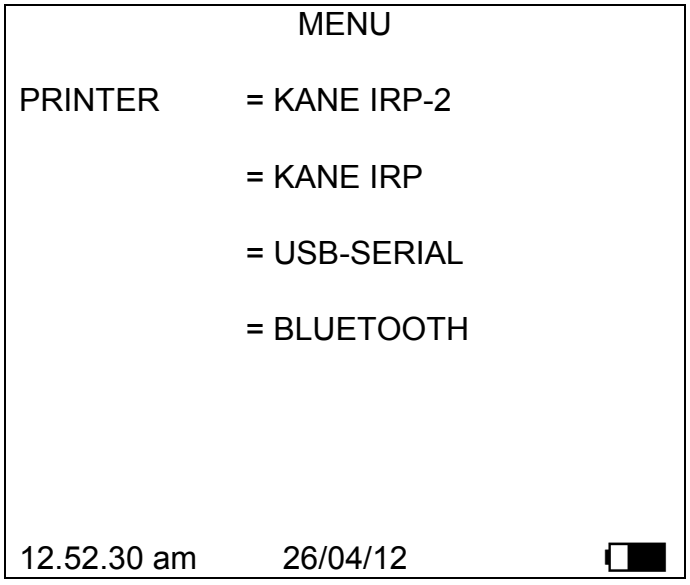
PUMP: Pump speed can be set from 1 (slowest) to 4 (fastest).

Use / to change. Use to accept



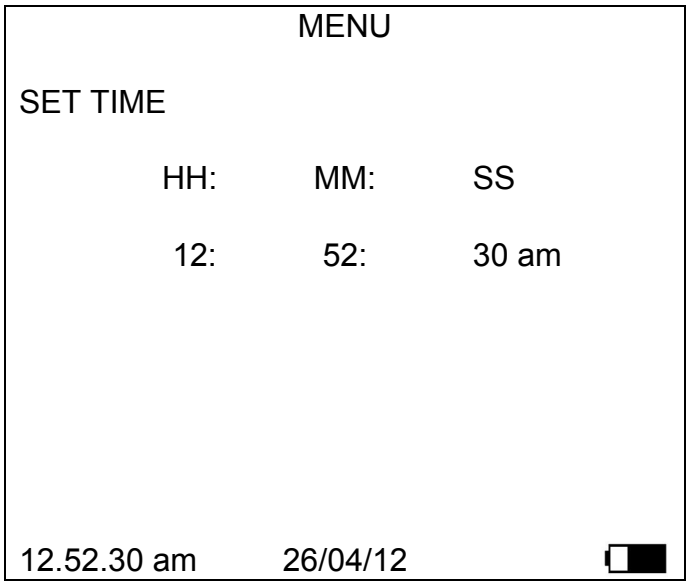
PRINTER: Select from the following communication methods

Use / to change. Use to accept



SET TIME:

Use / to change number. Use to accept and move the cursor.

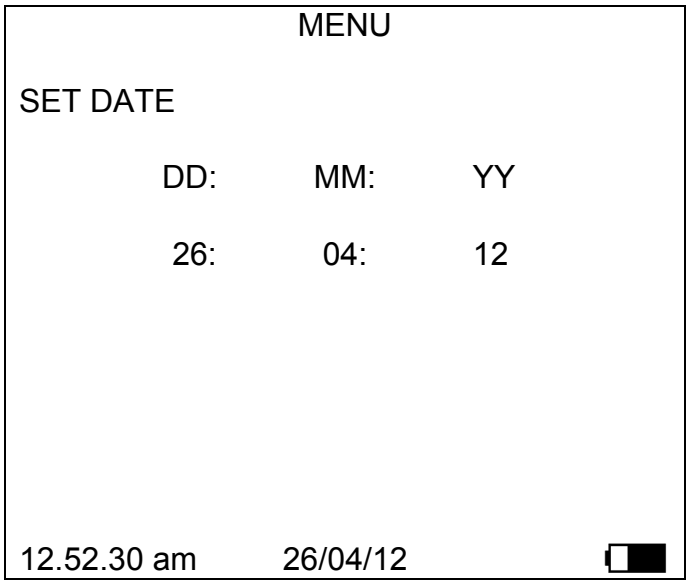


NOTE: If 'FUNCTION LOCKED' appears, delete all reports (see p23-25).

SET DATE:

Use / to change number. Use to accept and move the cursor.

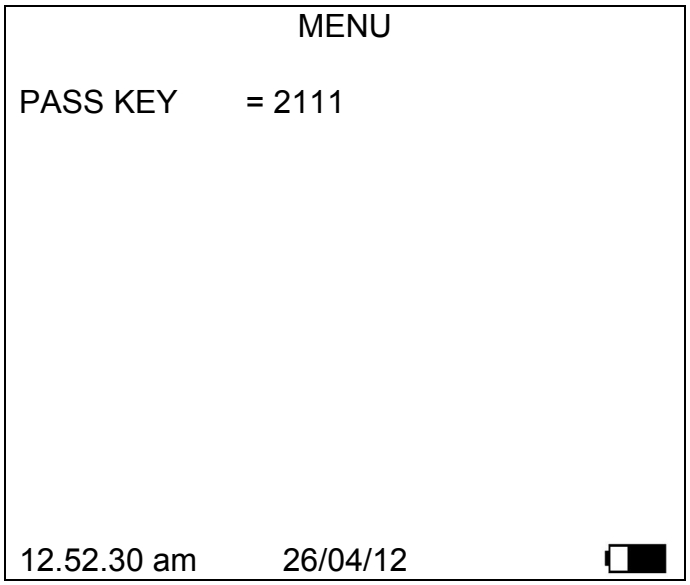
Date format can also be changed.



NOTE: If 'FUNCTION LOCKED' appears, delete all reports (see p23-25).

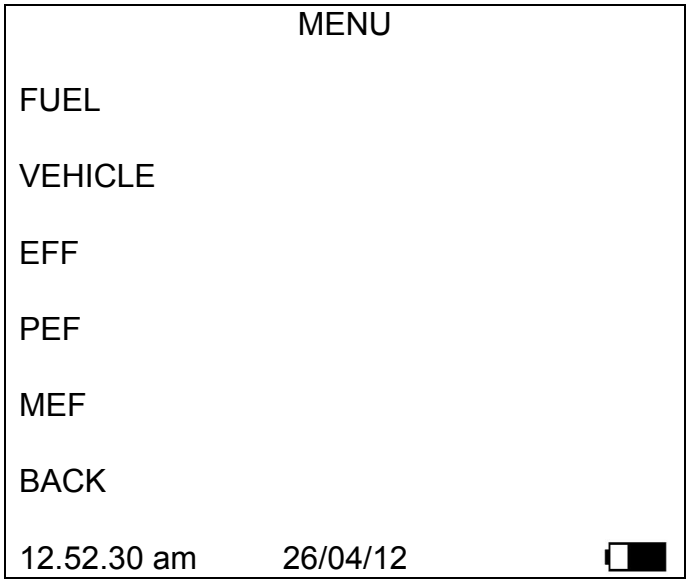
PASSKEY: This needs to be set to suit particular Bluetooth devices.

Use / to change number. Use to accept and move the cursor.

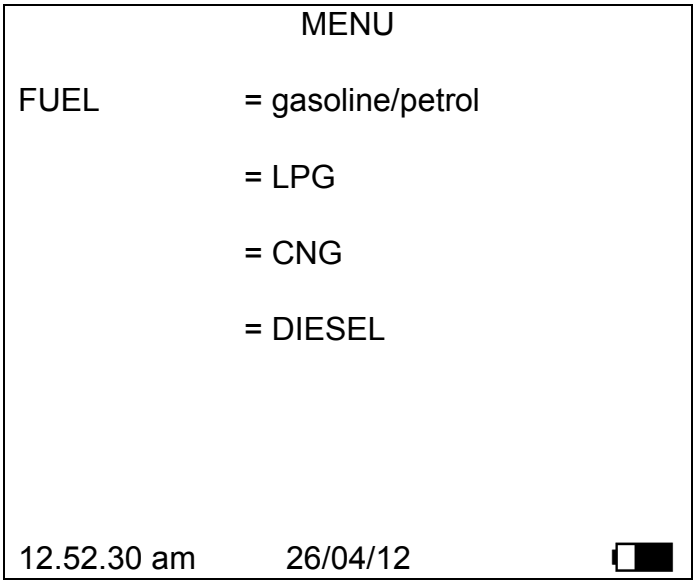


UNITS:

Use / to change. Use to accept.

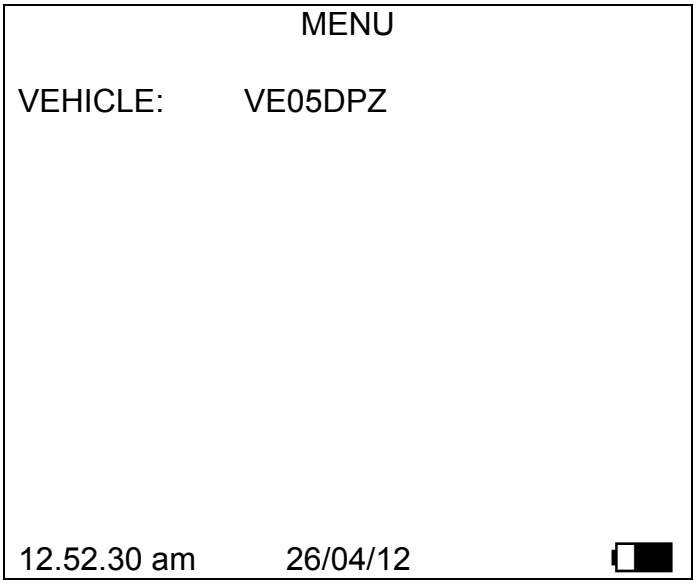


FUEL: note when diesel is selected HC and Lambda are not displayed.



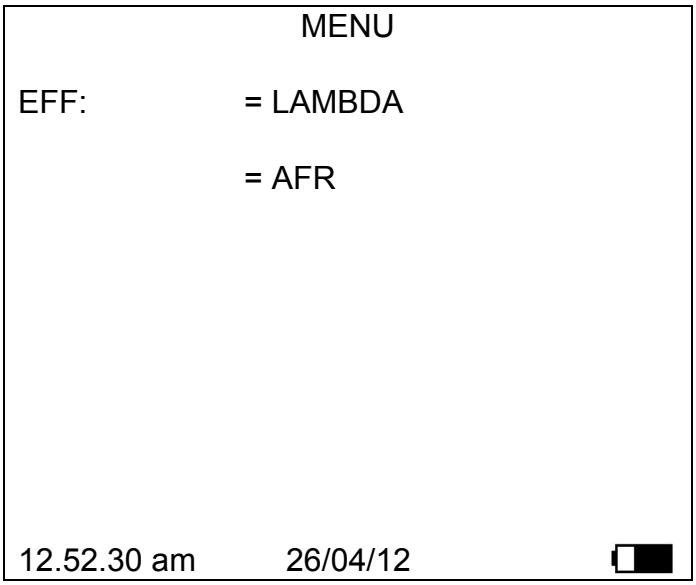
VEHICLE: allows a vehicle registration number to be entered.

Use / to change. Use to accept.

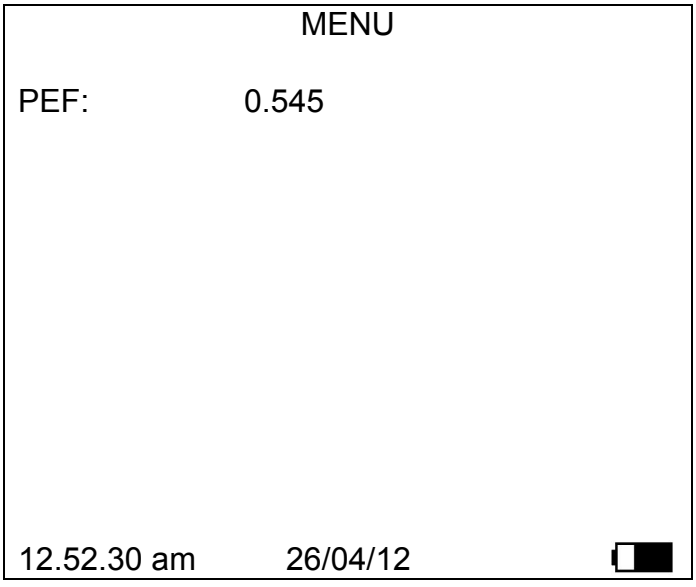


EFF: Set Lambda or AFR

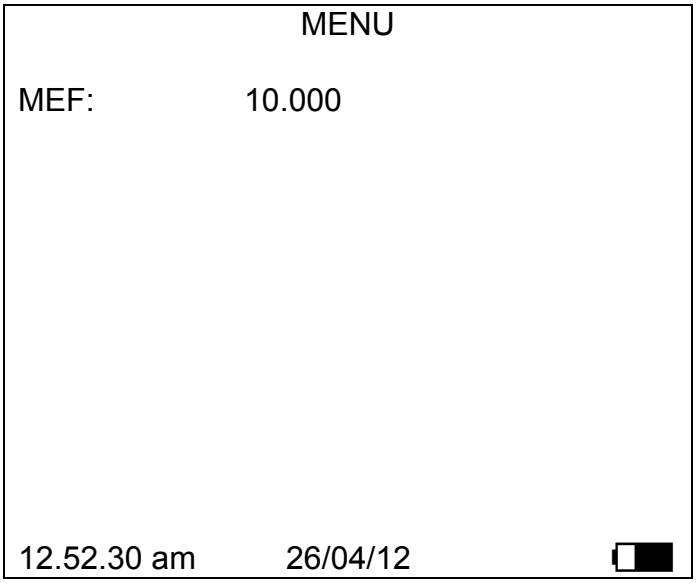
Use / to change. Use to accept.



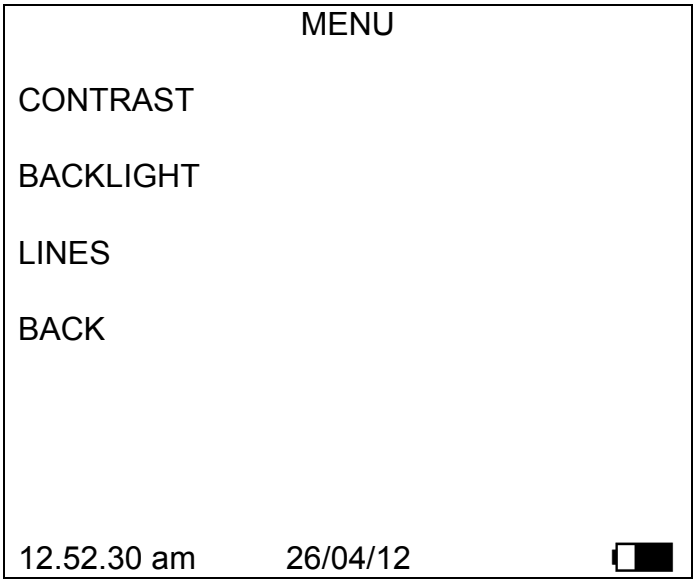
PEF: (Propane equivalency Factor) displays value only.



MEF: (METHANE equivalency Factor) displays value only.

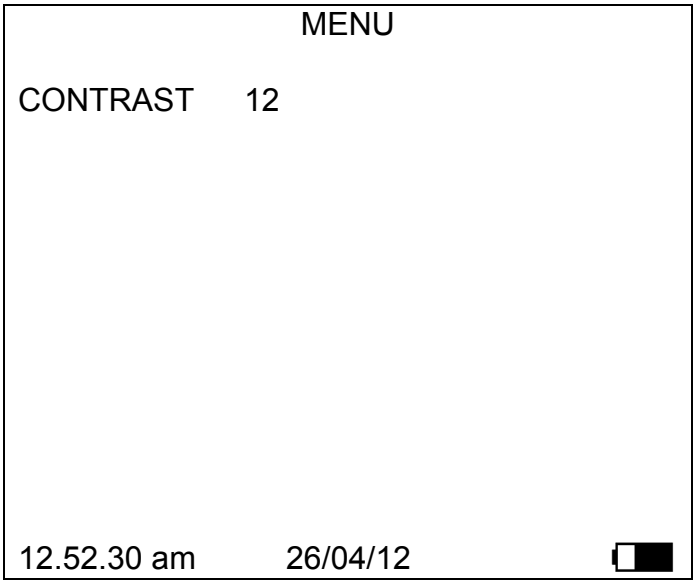


SCREEN

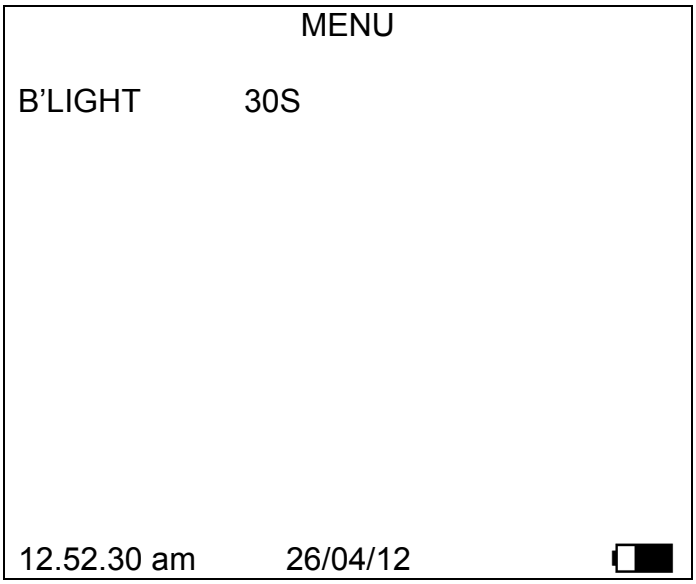


Use / to change. Use to accept.

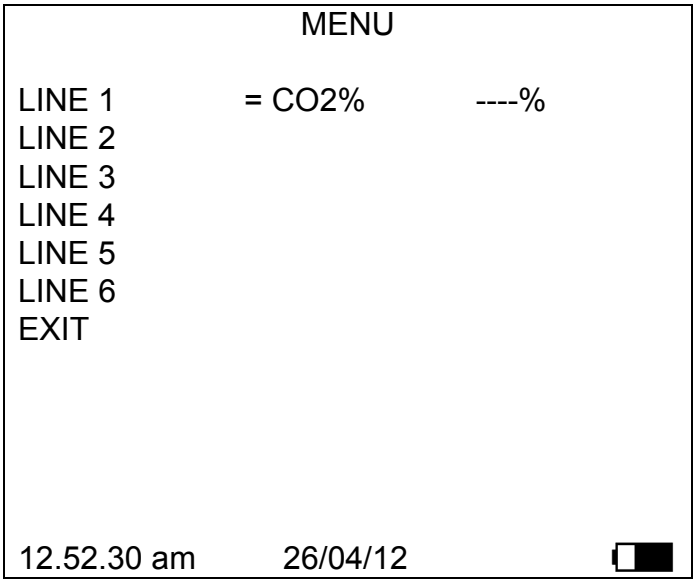
CONTRAST: set contrast from 1 to 15



BACKLIGHT: adjust switch off time from 30 to 300 secs



LINES: Allows the main display to be configured by the user to his preferences

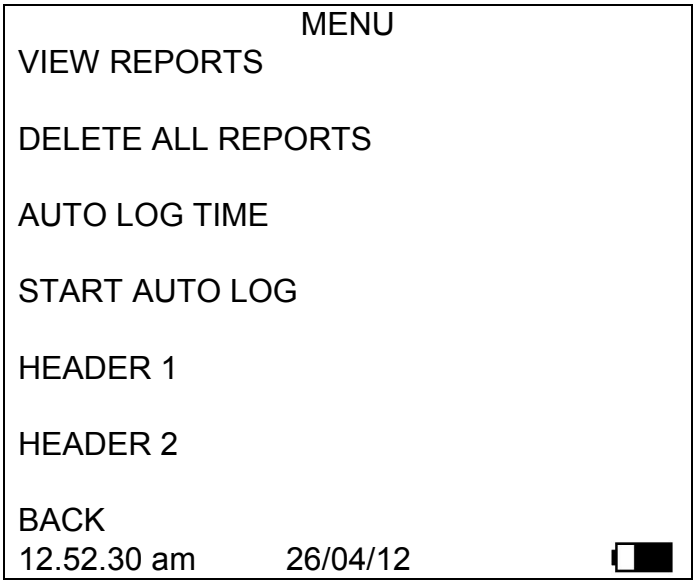


NOTE: If 'FUNCTION LOCKED' appears, delete all reports (see p23-25).

Use / to change. Use to accept.

Choose from:
CO2
NO
O2
LAMBDA/AFR
COK
NOX
HC
CO

REPORTS



VIEW REPORTS

MENU

LOG 13

Date: 07/10/11 Time: 03:35

VEHICLE: VE05DPZ FUEL: DIESEL

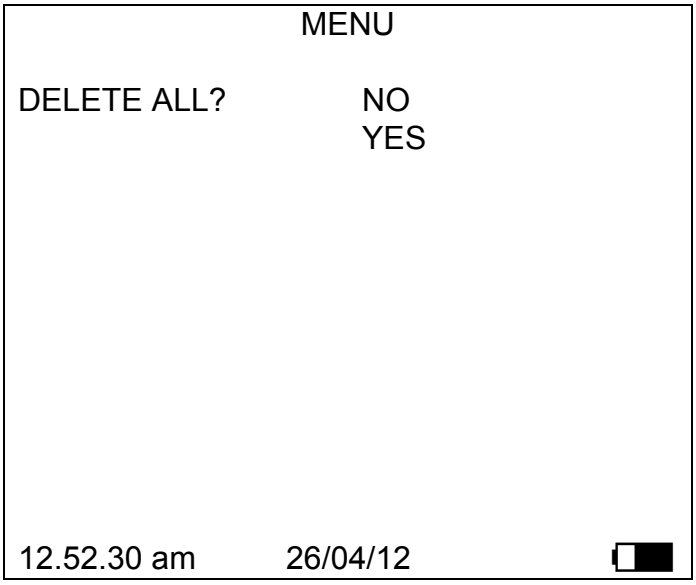
CO2	14.4%
CO	0.05%
O2	1.1%
HC	----
NO	150 ppm
Λ	----

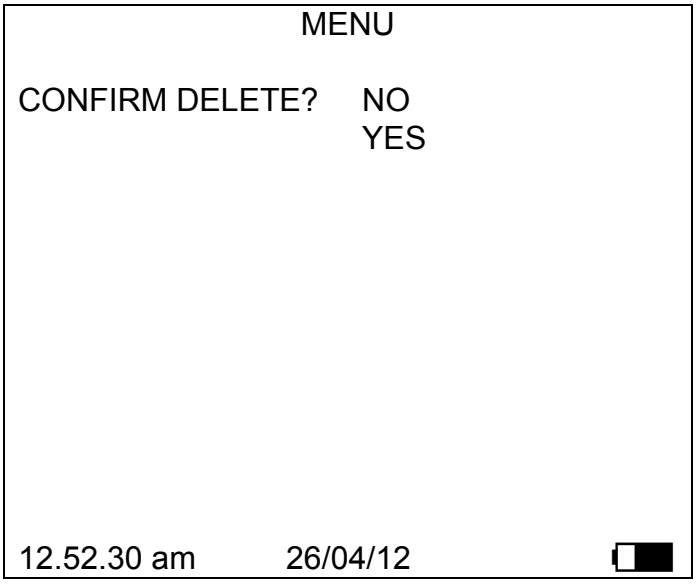
12.52.30 am 26/04/12

Reports can be printed by pressing  .

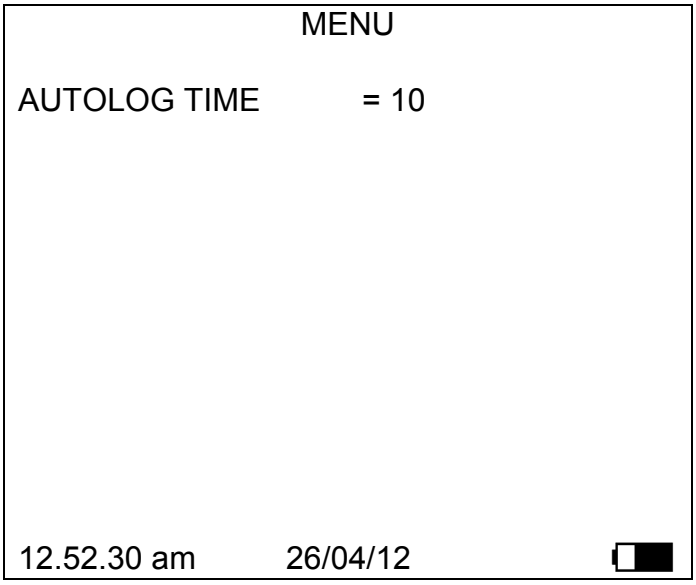
LOG number to be viewed can be changed by pressing  .

DELETE ALL REPORTS:





AUTOLOG TIME: Can be set from 5 secs to 300 secs,

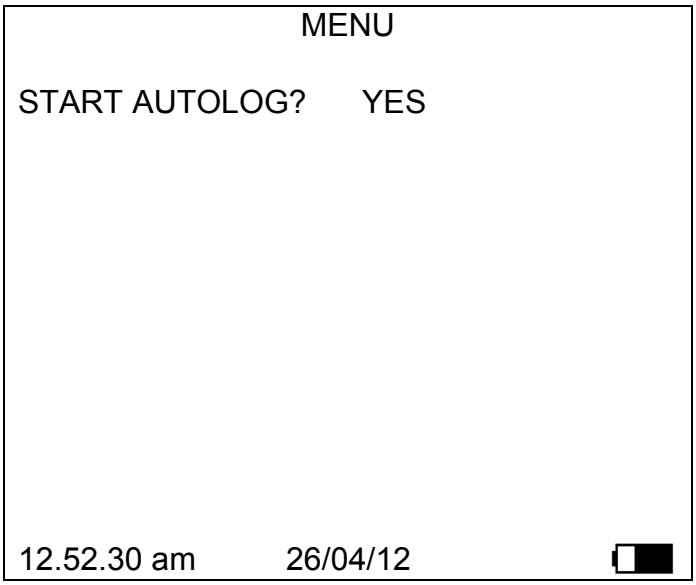


Note: If the PUMP is switched off then AUTOLOG is inhibited

START AUTOLOG

TIP: Before starting AUTOLOG you might want to manually re-zero the analyser so that you have 30 minutes of logging time before a re-zero is requested.

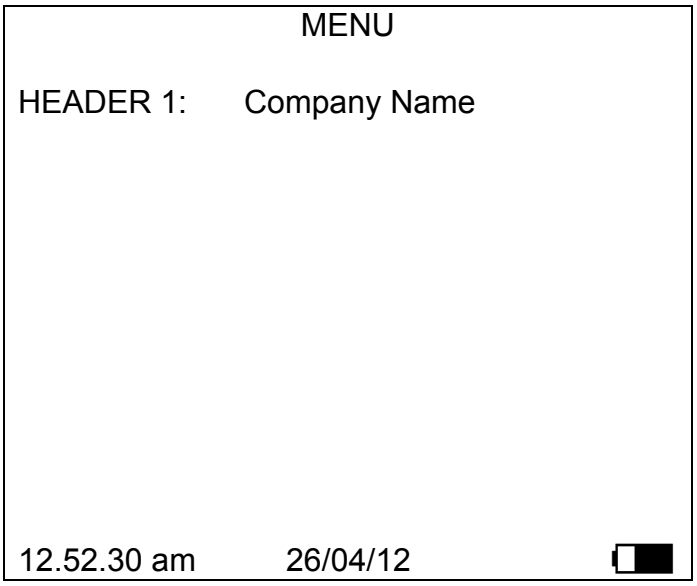
Switches ON or OFF automatic timed logging

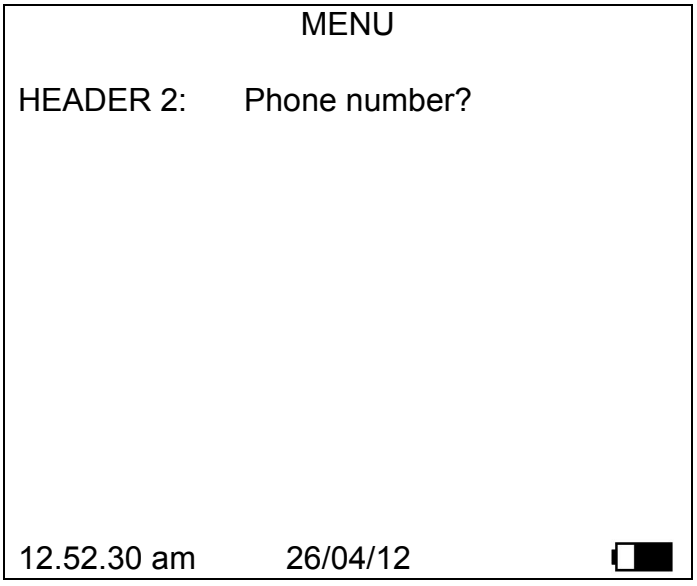


To initiate AUTOLOG go back to the main display where the Autolog time will be displayed in the top right hand corner of the display, and then press  . The analyser will beep and the autolog time will disappear for a second or so.

AUTOLOG can be toggled on and off by pressing and holding  until the autostore time in the top right hand side of the screen appears or disappears.

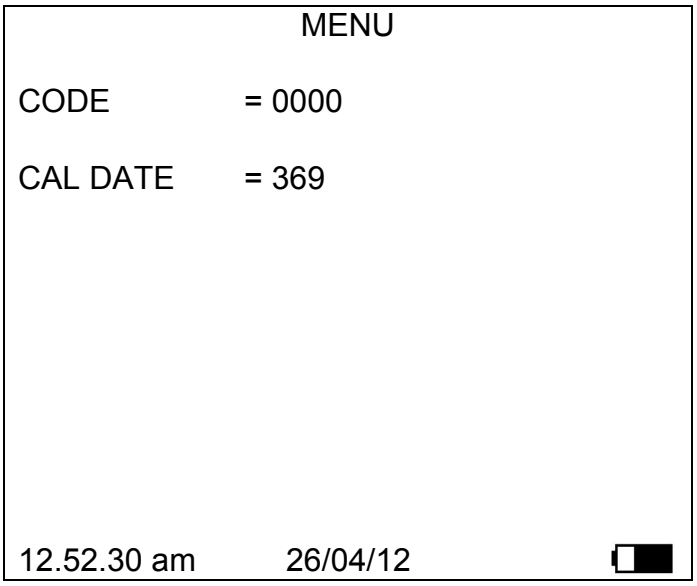
HEADER 1
HEADER 2 allows inputting of company details to appear on two lines of the printout





Use  to change. Use  to accept.

SERVICE

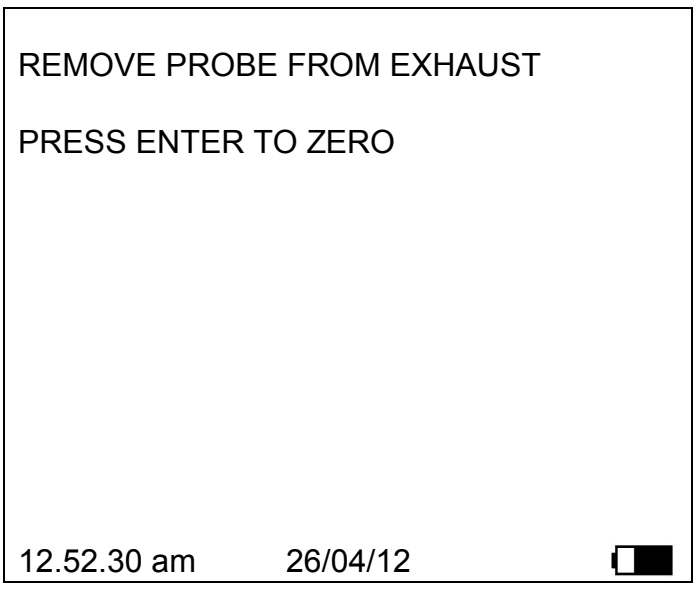


CODE entry is reserved for approved service agents.

CAL DATE is the countdown for days remaining until annual calibration is due.

MANUAL ZERO

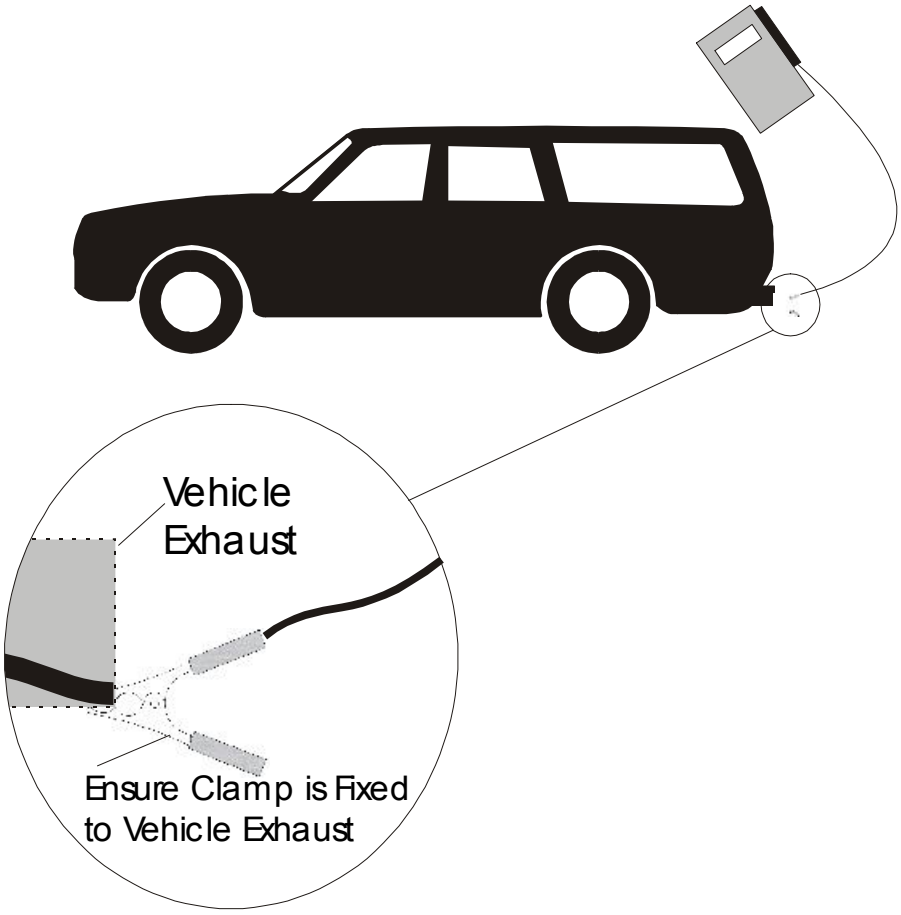
This allows the user to manually re-zero the analyser



4.5 Sampling the Exhaust Gas

Once the zero calibration and test procedures have been completed and the fuel has been selected the probe can be inserted into the desired vehicle exhaust.

Ensure the probe is inserted into the exhaust pipe so as to not allow air into the probe. The exhaust of a car can pulse, especially at low RPM, drawing air in causing bad readings, ensure the flexible probe is fully inserted and the clip attached to the exhaust pipe.



4.6 Turning the pump ON/OFF

The analyser is fitted with a pump to draw gas from the vehicle exhaust. To conserve battery power, switch off the pump when you are not taking a measurement. Gas values will not be displayed when the pump is turned off .

Use the  key to turn ON and OFF the pump.

The analyser will block readings while the pump is off and display '----' on all gas channels.

It is recommended that the analyser samples fresh air for 60 seconds before the pump is turned off.

4.7 Regular Checks During Sampling

 Care must be taken at all times not to exceed the analysers operating specifications, in particular ensure the following :-

- DO NOT PLACE THE ANALYSER IN THE ENGINE BAY.
- Do not expose the analyser to temperatures outside its normal operating range.
- DO NOT PLACE THE ANALYSER ON A HOT SURFACE.
- Ensure that liquid in the water trap does not go over the level indicator. Note! The indicator only works while the trap is vertical. Water condenses in the probe line and can quickly fill the water trap when the probe is moved. **Take care,** watch the water trap closely and empty any water when it is noticed.
- Make sure that the in-line particle filter is clean and does not become blocked. If this filter is allowed to become dirty then damage may occur inside the analyser.

Check the following for water:-

- Probe line, water trap and particle filter

When the blockage is cleared the analyser should resume normal operation. If it not possible to clear the problem then internal damage may have occurred and the unit should be returned to a service centre.

TIP: After testing hang the sample hose so that both ends are free to drain any condensate.

4.8 Normal Shutdown Sequence

 DO THIS EVERY TIME YOU USE THE ANALYSER

Remove the probe from the vehicle exhaust **- TAKE CARE ! THE PROBE WILL BE HOT -** and allow it to cool naturally. Do not immerse the probe in water as this will be drawn into the analyser and damage the pump and sensors.

Once the probe is removed from the exhaust allow the readings to return to zero and press the analyser will count down from 30 to switch off.

If you have not finished but press by mistake, you can press to return to normal operation and not switch OFF.

TIP: It's a good idea to empty the water trap after testing so that the risk of water getting on to the particle filter or into the analyser is minimised.

5. PRINTING INFORMATION – OPTIONAL EXTRA ONLY

Supplied as an accessory for the analyser is an infra-red thermal printer. Read the manual supplied with the printer prior to operation. Connections to the analyser are detailed below :

- **Infra-red thermal printer** - this does not require a cable to transmit the data but uses an infra-red (IR) link similar to a TV remote control. The IR emitter is positioned on the top of the Analyser and the bottom of the printer. Ensure they are pointing at each other and within 300 mm, with no obstructions in the way. Data may be lost if transmission is interrupted, a black square is evidence of this. Keep the Analyser pointing at the printer until the printout has finished.

Data can either be printed from a 'live' test or from stored data.

5.1 Printing a 'Live' Test

During a vehicle test the Analyser will print data on request. With the analyser showing the MAIN DISPLAY press and hold until the second bleep. Current data will be sent to the printer. If the print button is held until the third bleep, the test results will be printed in duplicate.

5.2 Standard Printout

The standard printout is shown below :-

```
AUTOplus V1.00
SERIAL No. 030912287

        Kane Auto Plus
     (44) - 1707 - 375550

DATE:                09/07/12
TIME:             08:25:33AM

VEHICLE          AB11 DEF
FUEL             GAS/PETROL

CO2        %             0.0
CO         %…            0.1
O2         %            20.95
HC         ppm             0
COK        %            ----
Lambda                  ----
```

NOTE: The analyser will stop logging once it has reached 500 readings and will return to the main display if  is pressed. Data can still be viewed and printed.

TIP : Make a note of the location number for your particular test as it may be useful when printing.

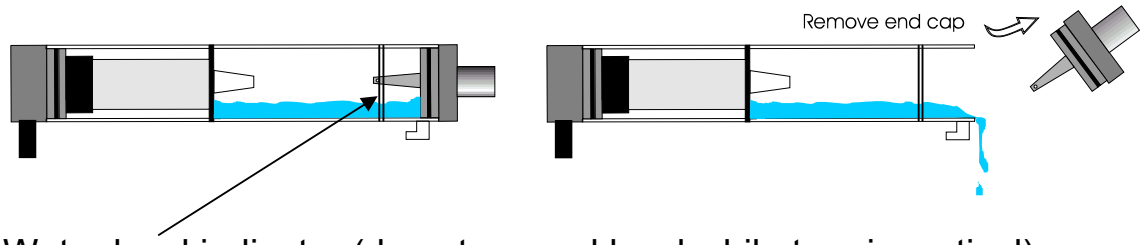
TIP : Stored and displayed with the data are actual time and date of the test.

6. MAINTENANCE

6.1 Emptying and Cleaning the In-line Water Trap

The in-line water trap should be checked and emptied on a regular basis. Water vapour will condense and gather in the probe line. This may move suddenly to the trap when the probe is moved. Care should be taken at all times.

Emptying of the water trap is detailed below :-

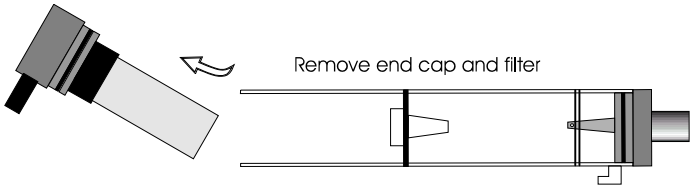


Water level indicator (do not exceed level while trap is vertical)

Carefully remove the end cap from the in-line housing. Dispose of the condensate in a suitable drain. Clean the inside of the water trap using a soft cloth

6.2 Changing the Particle Filter

This is a very important part of the analyser and should be changed regularly. It prevents dust and dirty particles entering the pump and sensors and hence causing damage. The filter MUST be changed when it is discoloured.



Remove the end cap from the in-line filter housing. Carefully remove the paper filter element and dispose of it. Clean the inside of the filter housing with a suitable soft cloth. Insert a new filter element onto the spigot in the filter housing and carefully replace the end cap.

IF THE FILTER IS NOT CHANGED REGULARLY DAMAGE WILL OCCUR TO THE SENSORS RESULTING IN A CHARGEABLE SERVICE. IT IS EVIDENT FROM AN INTERNAL INSPECTION OF THE ANALYSER IF THE FILTER HAS BEEN CHANGED REGULARLY.

6.3 Cleaning

The body of the analyser, its screen and rubber boot can be cleaned using a damp cloth and standard household detergents. Wipe clean with a damped cloth rinsed in water. Leave the analyser in a warm place until all surface moisture has evaporated and the analyser is completely dry.

Under no circumstances should you use solvent based cleaners as they can cause blooming on the display and degradation of the plastic parts.

6.4 User Serviceable Parts

This product contains NO user serviceable parts. If problems occur seek advice from your nearest approved service centre.

7. PROBLEM SOLVING

The following is a list of problems that may occur on the analyser through its operating life. If the cause of the fault is not easy to identify then we advise you contact Kane International Technical Support or an International Distributor for expert advice.

Fault symptom	**Causes**
• Oxygen too high	• Air leaking into probe, tubing, water trap, connectors or internal to analyser. • Oxygen cell needs replacing.
• Oxygen Error (FAULT) • Infrared gas Error (FAULT)	• Zero calibration fault • Analyser has been stored in a cold environment and is not at normal working temperature. • Oxygen cell or infrared bench needs replacing.
• Analyser not holding charge • Analyser not charging	• Battery exhausted. • Charger not giving correct output. • Charger could be faulty.
• Analyser does not respond to exhaust gas	• Particle filter blocked. • Probe or tubing blocked. • Pump not working or damaged with contaminants.
• Analyser automatically switches off in operation	• Battery below alarm level. • Ambient temperature above 50°C. • Battery quickly discharging and is faulty.

INTERNAL FILTER

To protect the analyser from water ingress a filter is installed inside the casing to protect the infrared measuring system. This filter will block if care is not taken during sampling:

- Ensure any build-up of water in the probe line and water trap are removed as soon as possible.
- The external particle filter is changed regularly.
- The analyser is allowed to sample fresh air on a regular basis.
- The analyser samples fresh air for 3 minutes before switch off.
- Do not blow smoke from a cigarette into the analyser.

If you suspect the internal filter is blocked perform the following:

- Remove the probe connection from the water trap.
- Empty and clean the water trap with a dry cloth.
- Fit a new external particle filter.
- Run the analyser in fresh air (pump ON) for at least one hour.

If the problem does not clear contact a service agent

8. ZERO CHECKS AND RE-CALIBRATION

During normal operation of the analyser the following checks may be requested as required:

- Zero setting of all sensors (can also be selected manually)

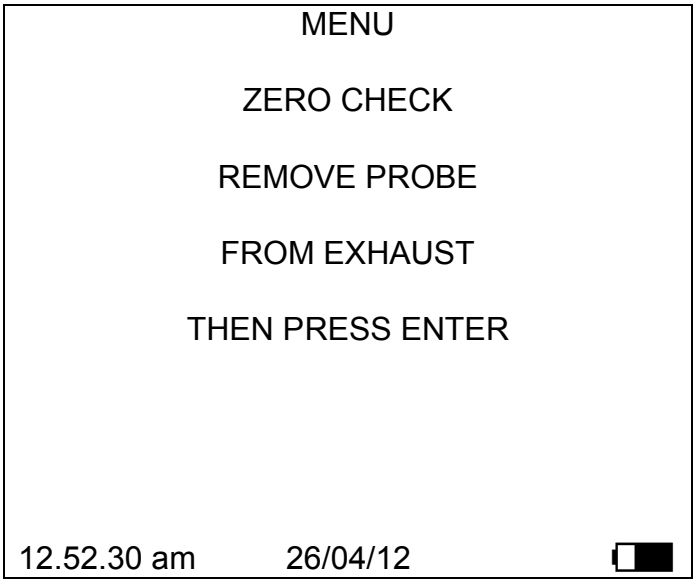
8.1 Zero setting

The zero setting function sets the working sensors to zero using fresh air. This function is activated as follows:

- Following analyser switch ON.
- On a timed basis. Following the analyser first being turned ON a zero will requested automatically at 15 and then 30 minute intervals. Subsequent requests will be every 30 minutes.

- On request by the user from the **MENU**

The zero sequence is as follows, ensure the on screen commands are followed or the analyser may not zero correctly.



Ensure the probe is removed from the vehicle exhaust and is sampling fresh air, in the garage environment this should be ½ metre or 18 inches above the ground. Once this is done press  to activate the pump.

WARNING : The sensors will only be reset if the probe is sampling fresh air for at least 60 seconds.

Once the zero is complete the screen will return to the **MAIN DISPLAY**.

9. PRODUCT SPECIFICATION FOR HANDHELD AUTOplus 4-2 & AUTOplus 5-2

Parameter	Resolution	Accuracy	Range
Carbon Monoxide (Infrared)	0.01 %	+/- 5 % of reading *1 +/- 0.06 % volume *1	0-10 % Over-range 20 %
Oxygen (fuel cell)	0.01 %	+/- 5 % of reading*1 +/- 0.1 % volume *1	0-21 % Over-range 25 %
Hydrocarbon (Infrared)	1 ppm	+/- 5 % of reading *1 +/- 12 ppm volume *1	0-5000 ppm Over-range: 10,000 ppm
Carbon Dioxide (Infrared))	0.1 %	+/- 5 % of reading *1 +/- 0.5 % volume *1	0-16 % Over-range: 25%
Nitric Oxide*² (fuel cell)	1 ppm	0-1500ppm +/-5% or 25ppm;	0-1500ppm Over-range: 5000 ppm
Carbon Monoxide Corrected COK	0.01%	Calculated	0-15%
Lambda AFR (Petrol) (LPG)	0.001 00.01		0.8 – 1.2 11.76 – 17.64 12.48 – 18.72
Sensor response T_{95}	Nominal 20 seconds AUTOplus 4-2, 5-2.		
Warm up	Less than 2 minutes		
Pre-programmed Fuels	Petrol/Gasolene, LPG Diesel and CNG.		
PC connection	Via RS 232 port		
Data-Logging	500 Tests		
Dimensions Weight Handset Probe	 1kg 220mm x 55mm x 120mm Insertion depth 350mm x Diameter 15mm Clip handle to secure to exhaust, 4m long hose Various probes available including high temperature		
Ambient Operating Range	+5°C to +45°C/10% to 90% RH non condensing		
Storage temperature	Minimum: 0°C Maximum: +50°C		
Battery Charger	Input: 100-240 V ~ 47-63 Hz Output: 12 V DC		
Analyser battery run time	>4 hours from full charge with the pump running		

*1 Using dry gases at STP

*² Standard on models AUTOplus 5-2

To obtain the quoted specification an analyser should be calibrated with clean ambient air (normally outside the workshop) at standard temperature and pressure (STP).

Note: The analyser is not for use with a Dynamometer, unless the high temperature probe is fitted.

APPENDICES

A. MAIN DISPLAY PARAMETERS

The parameters and their meanings are detailed as follows : -

FUEL: The selected fuel will be displayed, i.e. PETROL.
- PETROL – Leaded or Unleaded petrol/gasoline.
- LPG – Liquid Petroleum Gas
- CNG – Compressed Natural Gas
- DIESEL

DATE : Analyser date. See **Set-Up menu** to change.

TIME : Analyser time. Use **Set-Up menu** to change.

BATTERY : Displays the battery level from 0-100%. During normal data display operation the analyser will show **LOW BATTERY** briefly at intervals of about 45 seconds for less than 30% of charge. The analyser will turn off if less than 10% charge is detected. With the charger connected the display will read close to 100%. Note: Allowing the battery to discharge fully may destroy it.

O2 : Oxygen measured in the exhaust gas indicated in percentage %. With the pump off the analyser will display - - - -. If there is a fault with the oxygen sensor then **FLT** will be displayed.

CO : Carbon monoxide measured in the exhaust gas indicated in percentage %. With the pump off the analyser will display - - - -. If there is a fault with the CO reading then **FLT** will be displayed.

CO2 : Carbon dioxide measured in the exhaust gas in percentage %. With the pump off the analyser will display - - - -. If there is a fault with the CO_2 reading then **FLT** will be displayed.

HC : Hydrocarbons measured in the exhaust gas indicated in ppm (parts per million) n-hexane (petrol). With the pump off the analyser will display - - - -. If there is a fault with the HC reading then **FLT** will be displayed.

COK : Generally known as corrected CO. This value is calculated and used for comparison with the actual infra-red measured CO value.

COK = (COx15)/(CO + CO2), for normal car exhaust CO + CO2 = about 15%. In this case CO is approximately equal to COK. If COK is clearly higher than CO this indicates defects such as exhaust leaks. At near zero COK is not valid.

LAMBDA (λ) : The value of Lambda gives an indication of the burning efficiency of the engine. This can be replaced with the Air Fuel Ratio (AFR) below. See section 5.2.3.to change between displays. Appendix B gives the formula used.

When sampling fresh air and lambda is outside operation range this indication will show '-----'.

AFR : Air Fuel Ratio is another method for displaying the efficiency of an engine. The calculation for the AFR is Lambda multiplied by 14.7 for Petrol and 15.6 for LPG (typically). When sampling fresh air this indication will show '-----'.

NO : Nitric oxide reading in ppm (parts per millions) of the exhaust gas. Displayed when Nitric oxide sensor fitted, indicated on the rear label. Displays NOT FITTED or N/F when sensor not fitted and FAULT or FLT if failed.

NOx : A calculated value based on the measured level of Nitric Oxide to display total oxides of Nitrogen. NOx = NO X 1.05

TIME TO: ZERO The analyser requires to regularly zero the sensors. Once a has been performed the time to the next zero is displayed in minutes. Check there is sufficient time remaining before starting a test and perform a manual zero if not.

B. LAMBDA CALCULATION

The value for Lambda is a determinant for the burning efficiency of an engine. The value depends on the composition of the fuel, the air that is used for the combustion and on the combustion products as found in the exhaust gases.

A basic formula, taking into account:
- Components of the fuel: carbon, hydrogen, oxygen and water content;
- Water content of the air;
- Components of the exhaust gases: carbon dioxide, carbon monoxide, hydrocarbons and nitrogen oxide;

has been developed by J. Brettschneider and published in Bosh Technishe Berichte, Volume 6 (1979), No. 4, page 177-186.

A simplified formula, derived from the basic formula, and based upon the assumption that the water content of the fuel and air and the NOx content in the exhaust gases are negligible, allows the computation of Lambda when certain components of the exhaust are measured.

B.1 Oxygen balance formula

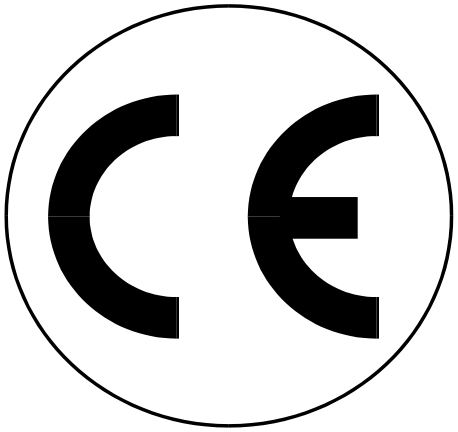
For Lambda calculation, based upon measurements of CO, CO2, HC and O2, the following formula is standardised: Displayed on the analyser as LAMBDA (O)

$$\lambda = \frac{CO_2 + (CO/2) + O_2 + [H_{CV}/4 \times \{3.5 / (3.5 + CO/CO_2)\} - O_{CV}/2] \times (CO_2 + CO)}{(1 + H_{CV}/4 - O_{CV}/2) \times \{(CO_2 + CO) + (K_1 \times HC)\}}$$

Where:

CO = Carbon monoxide % volume measured.
CO_2 = Carbon dioxide % volume measured.
HC = Hydrocarbon ppm volume measured.
O_2 = Oxygen % volume measured.
K_1 = Conversion factor for HC is expressed in ppm vol n-hexane (C_6H_{14}) equivalent. Its value in this formula is 6.10^{-4}
H_{cv} = Atomic ratio hydrogen to carbon in the fuel. Nominal value is 1.7261
O_{cv} = Atomic ratio oxygen to carbon in the fuel. Nominal value is 0.0176

C. ELECTROMAGNETIC COMPATABILITY (CE) STATEMENT



This product has been tested for compliance with the following generic standards:

EN 61000-6-3:2011
EN 61000-6-1:2007

and is certified to be compliant

Specification EC/EMC/KI/Autoplus details the specific test configuration, performance and conditions of use.

Please Note: Batteries used in this analyser should be disposed of in accordance with current legislation and local guidelines.

E: END OF LIFE DISPOSAL

At the end of its life this analyser should be sent to the appropriate recycling centre in accordance with current legislation and local guidelines.

Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

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