



lion alcolmeter® 700

Instrument Version: 700 English

User Handbook

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Product conforms to the requirements of:

BS EN15964:2011

PLEASE...

Read this handbook carefully – BEFORE using the instrument for the first time: then retain it for future reference.

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Glossary

Terminology

BAC	Blood Alcohol Concentration
BrAC	Breath Alcohol Concentration
Calibration Adjustment	Adjusts the calibration of the instrument
Calibration Check	Checks the calibration of the instrument
Configuration	PC application that sets up the functionality of the instrument
Deep-lung air	Air within the lungs that is in intimate contact with the blood
Dry Gas	Dry alcohol gas of a known concentration provided from a gas cylinder
Operator	Person who is carrying out the breath test
PIN	Personal Identification Number, used to unlock features
Sampling Port	White plastic protrusion in top channel of the instrument that fits into the mouthpiece
Service lock	Time until the next service should be carried out
Subject	Person who is to have a breath test performed upon them
Suck back	Intake of breath by the subject during the sampling routine
Suspicious liquid	Liquid with an unknown alcohol content
Trigger Flow	Minimum air flow speed necessary for automatic sampling
Wet vapour	Wet alcohol vapour of a known concentration provided by a simulator

Introduction

The **lion alcolmeter® 700** devices are hand-held portable instruments for fast, on the spot determination of a subject's breath (or blood) alcohol concentration level. They are some of the latest in the range of lion alcolmeter® instruments produced by Lion Laboratories Limited of Barry, South Wales, in the United Kingdom. Lion Laboratories is a company specialised in breath alcohol detection technology for applications in traffic law enforcement, commercial health and safety, and in medicine.

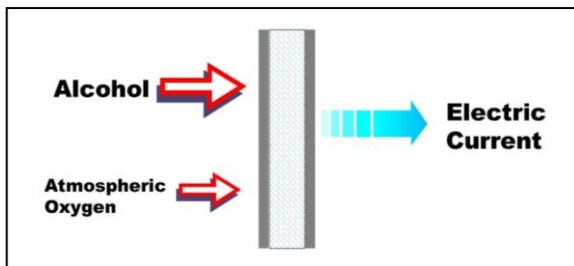
This handbook explains the following aspects of the instrument, so please read it carefully:

- Basic principles of operation.
- How to run a breath test.
- Interpretation of results.
- Care and basic maintenance.
- Calibration checking.
- Calibration adjustment.
- System configuration.
- Basic maintenance.

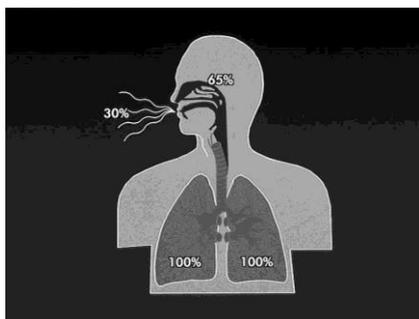
Principle of Operation

The **lion alcolmeter® 700** uses an electrochemical fuel cell sensor to measure the concentration of alcohol vapour in the subject's expired breath, a measured amount of which is drawn from the mouthpiece into the fuel cell by means of the sampling system.

In the fuel cell a voltage is generated in proportion to the breath alcohol concentration: it is therefore amplified and displayed in terms of the subject's alcohol level.



The breath sampling system is factory-set to sample deep-lung air; it is the breath from the bottom of the lungs that truly reflects the amount of alcohol in the body.



To ensure repeatable and accurate results across the temperature range, and particularly at low temperatures the **lion alcolmeter® 700** uses a heater to heat the neck of the fuel cell. This stops the build up of condensation which can affect the alcohol concentration in the sample.

Technical Details

Factor	Target	Comments
Specificity	Specific to alcohol only	When used correctly, not sensitive to acetone, paint and glue evaporation, food, sweets, methane and all materials without any alcohol content which can be found in human breath
Measurement range	0.02mg/L breath (BrAC)	Minimum ^{Note 1}
	2.00mg/L breath (BrAC)	Maximum
Measurement Accuracy	±0.02mg/L ≤ 0.20mg/L ±10% above 0.20mg/L	In Active Mode only
Measurement step	0.01mg/L	
Response time	less than 60 seconds	0.22mg/L alcohol level
Recovery time	less than 100 seconds	0.22mg/L alcohol level
Sampling frequency	Less than 25 seconds	Negative test result
Operating temperature range	-5°C	Minimum
	40°C	Maximum

Ready time	15 seconds	From switch on at 20°C
	Less than 60 seconds	From switch on at -5°C
Operating humidity range	10% to 95%	Non-condensing
Storage temperature	-40°C	Minimum
	70°C	Maximum
Measurement methods	Active	Using mouthpiece, with automatic or manual sampling
	Cup	Using cup, with automatic or manual sampling
	Sniffer	User activates the sampling system to sample the air around a subject or suspect liquid
Trigger Flow	9L/min ^{Note 2}	In active test mode only
	9L/min ^{Note 2}	In passive cup test mode only
Trigger Flow	1.2L ^{Note 2}	In active test mode only
	0.1L ^{Note 2}	In passive cup test mode only

Power supply	2 x AA Alkaline batteries	
Number of tests	1000 ^{note 3}	Minimum
Instrument weight	123g	Without any accessories
Audible notes	Instrument will beep	Upon successful and unsuccessful tests as a minimum
Radio frequency interference	Compliance	EN 61326-1:2006
Mechanical stress testing	Compliance	EN 62262:1995 / A1:2002 (IK-05)
Dust and ingress protection	Compliance	EN 60529:2001 (IP-54)
Calibration frequency	Every 6 months	The instrument shall display, and lock if the instrument is not calibrated within this calibration time

Note 1: Below this value the instrument will report zero.

Note 2: These values are configurable and may vary depending upon the customer's requirements.

Note 3: Testing was carried out by performing tests without alcohol present sequentially at room temperature.

Instrument Features



Mouthpiece port illumination



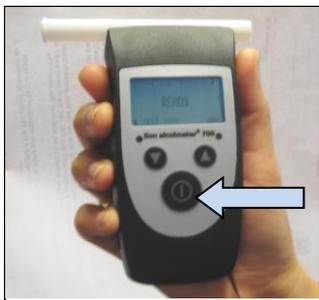
Pass and Fail indication



Please note the following user features of the instrument:

- | | |
|---------------------------|------------------------------|
| 1 – Disposable mouthpiece | 5 – Display |
| 2 – Action button (AB) | 6 – Beeper (internal) |
| 3 – Down button (DB) | 7 – Protective Silicone skin |
| 4 – Up button (UB) | 8 – Wrist strap |

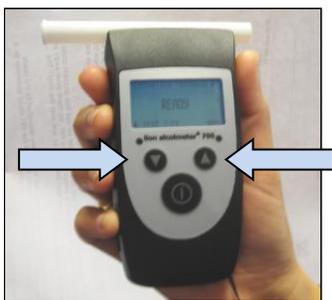
Action Button



The Action Button (AB), bearing a power symbol and located below the display and two other buttons, is Action Button (**AB**). This switches the instrument **ON**: simply press **AB** and release.

AB may also be used at certain stages in the lion alcolmeter® 700's operation to switch it **OFF**.

Up and Down Button



Located directly above **AB**, the smaller two buttons are Down Button (**DB**) and Up Button (**UB**). These are used to scroll around the instrument's menus.

Graphics display

The illuminated display instructs the user during breath sampling, and shows the subject's breath alcohol reading. The small icon at the top right shows the power unit's charge level.

Beeper

This provides various audible tone messages to the instrument operator, and the subject.

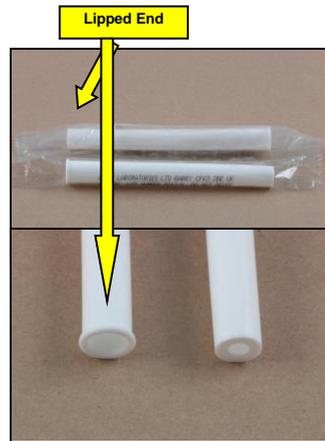
Breath sampling port

The port located in the top channel of the instrument is the entrance to the fuel cell alcohol detector and to the breath flow sensor. **Do not allow fluids to enter this port, or serious damage to the instrument may result.**



Disposable Mouthpiece

The disposable mouthpiece is supplied packed in individual, hygienic wrappers. It is fitted to the instrument by locking its sampling port into the small hole in the side of the tube: it may be attached either way round, whichever is more convenient to the operator, the subject or the situation. But the subject **MUST** blow through the wide-bore, **lipped** end, or the instrument's automatic sampling system will not operate.



A NEW mouthpiece MUST be used for each complete breath test.

Leather Pouch

This protects the instrument from most levels of shock likely to be encountered during operational use, and is fitted with a mouthpiece storage pocket. The lion alcolmeter® 700 should normally be left in place, in its pouch, during use.

Silicone skin

This protects the instrument from dirt and shock that the instrument may encounter during normal use. The lion alcolmeter® 700 should be left in the silicone skin during use.

Power unit

The power unit is located in the rear of the instrument. It holds 2 x AA alkaline batteries: these should provide enough power for at least one thousand tests (depending on operating conditions).

The low power warning message appears when there is enough power for about twenty more breath tests (depending on conditions of usage).

DO NOT USE RECHARGEABLE AA BATTERIES AS THESE HAVE A LOWER POWER CAPACITY THAN ALKALINES AND THE INSTRUMENT MAY NOT ACHIEVE THE STATED SPECIFICATION

Silicone skin

This protects the instrument from most levels of shock likely to be encountered during operational use. The skin should be carefully fitted and removed from the instrument through the large hole at the front.



To replace the batteries the skin should be removed from the instrument to allow access to the battery compartment.

Subject Breath Test Procedure

Step by Step

STEP 1 – Preliminary questions to the subject

As far as possible, ensure the subject has taken nothing by mouth (alcoholic or otherwise) in the last twenty minutes, and has not smoked in the last two minutes. If necessary, wait.

STEP 2 – Switch on

Press Action Button (AB) until the operator hears the beep. The instrument will power up displaying the time, date, and serial number of the instrument. If enabled, the temperature of the instrument will also be displayed and it will also display the number of days until the next service is required.



The instrument will then come ready to take a test.



The display shows the battery status and the type of test that it is ready to take.

If the instrument is in the required test mode then the operator is ready to commence the test sequence. If the operator wishes to change the type

of test, then this can be changed by pressing the Down Button (DB) under the down arrow.

STEP 3 – Function selection

Press and release the Down Button (DB), and the operator can scroll through the different test modes that the instrument can carry out. Scroll through the menu and then use the test option that is required: there are three possible options: Mouthpiece, Cup and Sniffer.



Breath Test

Mouthpiece test, gives a quantitative result, which the user interprets as being within limits. Manual sampling can be used.

Cup Test

The cup must be fitted onto the instrument, and the subject instructed to blow into the cup. The sampling can be either manual or automatic. This test will give either a pass or fail result.

Sniffer Test

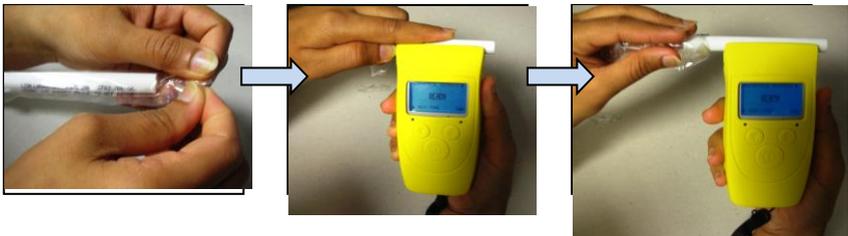
The sniffer test allows the operator to take a sample of air from the environment around the subject, or around a suspicious liquid. The sniffer test will only take a small sample of the air and can be affected by environmental conditions, particularly wind. When using the sniffer test it is recommended that the instrument be held as close to the subject's mouth or the liquid as possible.

Step 4 – Test preparation

Mouthpiece Test – allows the user to carry out a test with a mouthpiece. To carry out a test using a mouthpiece follow the following instructions.

**Attach a new mouthpiece**

The mouthpiece must be attached in a hygienic manner, or the subject could justifiably object to putting it in their mouth. Tear open the wrapper from the non-lipped end, and peel back far enough to expose the hole in the side. Now, holding the mouthpiece through the wrapper around the blowing (lipped) end, push the side hole over the **lion alcolmeter® 700's** sampling port, so it locks firmly into place. The operator may attach it either way round, whichever is more convenient. Now remove the wrapper completely (or have the subject do this himself).



Cup test – allows the user to carry out a test with a cup.

To carry out tests using a cup, select the cup test routine. If this routine does not appear automatically you can scroll through the test types by pressing the Down Button (DB) on any of the “Ready” screens.



Attach a new cup

The cup must be fitted so that it is held securely onto the top of the instrument. It is advisable to replace them on a regular basis, or when they appear to be contaminated. The cup allows for rapid screening of subjects to determine if alcohol is present. It is advisable to carry out a mouthpiece test if a quantifiable alcohol level is needed.

The cup test can be affected by environmental conditions such as the presence of alcohol in the ambient air, or high winds.



This test is an indicative test and will only give a pass or fail result, it should only be used to determine if there is alcohol present in the exhaled breath from a subject. For more accurate testing it is recommended that a mouthpiece test is carried out.

Sniffer test – allows the user to carry out a test using the Action Button (AB) to fire the sampling system.

To carry out a sniffer test, select the sniffer test routine. If this routine does not appear automatically you can scroll through the test types by pressing the Down Button (DB) on any of the “Ready” screens.



The sniffer test allows the operator to carry out a test without any cooperation from the subject, and can also be used on a suspicious liquid. The closer that the top of the instrument is to the subject’s exhaled breath or the suspicious liquid the more reliable the result will be. Subjects who have consumed alcohol will exhale alcohol in their breath, and liquids that contain alcohol will emit alcohol fumes. This alcohol will be present in the air, but will diffuse and become less concentrated the further away from the source they are. The concentration of the fumes will also be dependent upon the concentration of alcohol in the subject or liquid. They will also be dispersed by environmental conditions such as wind and rain.

This test is an indicative test and will only give a pass or fail result; it should only be used to determine if there is alcohol present in the air around suspicious subjects who are uncooperative, or suspicious liquids. For more accurate testing it is recommended that a mouthpiece test is carried out.

STEP 5 – Instruct the subject

Instruct the subject to take in a deep breath, and provide a sample. When providing a sample the subject only need blow out a constant, steady flow of air, similar to whistling. Blowing too hard or too softly could result in an invalid sample and the instrument will report this to the operator.

If using a mouthpiece, instruct the subject to form a seal around the lipped-end of the mouthpiece with their lips and then blow; if using a cup they should blow towards the cup, held about 10cm from their mouth.

The sniffer test should be carried out with the top of the instrument held near to the subject or suspicious liquid.

The sample provided should be blown steadily and continuously until **THE OPERATOR** says stop. He or she does **NOT** have to blow **VERY HARD**: a **LONG, MODERATE BREATH** is all that is required. The subject must keep his or her hands away from the instrument, so they cannot hide the display from the operator's view. Also, if relevant, warn the subject not to try to 'beat the instrument'.

STEP 6 – Take the breath specimen

The subject now blows hard enough to bring on the message FLOW and to sound the continuous beep tone; and then for long enough for the sample to be taken into the sensor for analysis.

If enabled in the instrument a manual sample can be taken if necessary at any point during the routine by pressing the Action Button (AB).

STEP 7 – Analysis and Alcohol Reading

The fuel cell sensor in the lion alcolmeter® 700, along with its controlling electronics and software based systems, now determine the alcohol level in the specimen. The result is then displayed, along with the time and date when that specimen was actually taken.

In sniffer mode the instrument will state whether alcohol was present (Fail) or not (Pass) at the end of the analysis stage only.

The indication lights will show whether the sample is above or below a configured level. This may be different for both the cup test and the mouthpiece test.

STEP 8 – Prepare for the next test

Following the successful completion of the mouthpiece test, remove and discard the mouthpiece, and the wrapper. Do not reuse the mouthpiece, except in the case of a repeat blow by the same subject for the same specimen.

The cup does not need to be removed unless the operator has decided to replace it with a new cup or a mouthpiece.

STEP 9 – Test next subject or switch off

Once the result has been shown it is possible to move to the next test by pressing the Action Button (AB), or waiting for two minutes. If the operator wants the back light back on they can do this by pressing one of the smaller buttons.

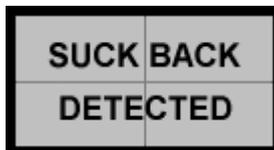
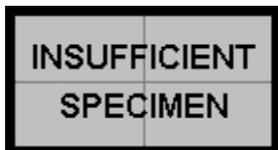
The instrument will continue in the selected mode, until the operator switches the instrument off, by pressing and holding the Action Button (AB), or moving back from the ready screen by pressing the Down Button (DB).

The breath test procedure summarised

STEP	ACTION
1	Ask Preliminary Questions
2	Switch On the Instrument
3	Select New Function
4	Attach a New Mouthpiece or cup
5	Instruct the Subject
6	Take Breath Specimen
7	Note Alcohol Reading
8	Prepare for next test
9	Test Next Subject, or Switch Off

Invalid breath samples

If the subject does not blow for long enough, or sucks back before the breath specimen is taken into the fuel cell sensor for analysis, then no sample is actually taken. The display shows the following warnings:



The system will reset itself and then display that it is ready again. Re-instruct the subject to blow into the instrument. **There is no requirement to change the mouthpiece for this repeat attempt, though the operator may of course do so.**

If the operator is unable to obtain a sample and manual sampling is enabled they can activate the sampling mechanism by pressing the Action Button (AB) at any point during the test routine.

If the subject sucks back when the analysis is underway (ie after the **Sample Taken** message has appeared) then there is no effect on the alcohol measurement, so the alcohol reading will be given as normal.

Manual breath sampling

If enabled, it is possible to take a manual sample of the sample provided by the subject. With the screen in the **READY** mode, instruct the subject to provide the sample. As the subject blows into the unit, press the Action Button (**AB**).

The unit will carry out the analysis and display the result as detailed previously. This feature may be disabled in the configuration if not needed.

Menu access

The lion alcolmeter® 700 can be configured to give the operator extended functionality.

In the ready screen, by pressing the Up Button (UB) the operator can access the following options if they are enabled:

- Log
- Calibration check
- Calibration adjustment
- Language selection
- Set time and date

The log is always enabled and this allows the operator to scroll through the database.

If any of the other features are enabled, rather than showing log on the ready screen, the instrument will display menu.



Screens showing (1) menu enabled, and (2) menu disabled

The log is always available to the operator, but the extended menu may not be available, and if it is available it may be protected by a PIN. This PIN and each of the features that may be available are enabled or disabled through the configuration application.

Log access

If the operator presses the Up Button (UB) in the ready screen, the instrument will display the last test result.

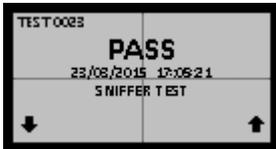
From this screen the operator can scroll through the database reviewing the test results.



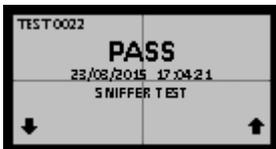
In the breath test ready screen the operator presses the Up Button (UB).



This shows the last test result...



...and allows the operator to scroll through the database.



The result screen will show for five seconds, after which time it will revert back to the test ready screen.

Extended menu

Features within this menu may be disabled and may not appear.

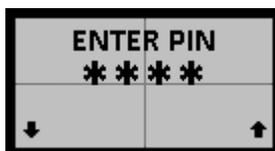
These verification and adjustment operations shall be conducted by competent persons.

This menu can be protected by a PIN. If enabled this PIN must be entered correctly before being able to access these features.

To enter the extended menu, on the log screen showing the last test, press the Up Button (UB).

PIN entry

When requested use the up and down buttons to select the correct number. Once selected confirm this selection by pressing the Action Button (AB), and this will then allow the operator to select the next number.



Please contact your supervisor for the PIN number setting.

Set time and date

Selecting this option allows the operator to adjust the time and date on the instrument.

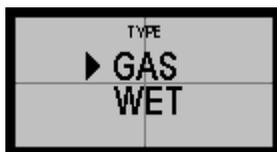
Set language

If applicable, selecting this option allows the operator to select the language for the instrument. There will always be the option to select English, and one other language.

Standard Type Selection (Wet or Dry)

In most cases the operator instrument will have been set up in its operating software for use with either a wet or dry alcohol standard.

However, in some cases, having entered the **Standard Value** as described previously, the operator will also have to define the **Standard Type**, in the following way:



It is imperative in such cases that the correct setting is made, or the instrument will not be calibrated correctly.

Calibration check

This allows the operator to carry out a calibration check. If unsure on how to carry out a calibration check, or for further details, please see the calibration check procedure contained in the supervisor section of the supervisor handbook.

The Calibration CHECK Procedure

Calibration CHECK Mode ensures the instrument is in its proper temperature range for checking purposes. A screen message will appear if its temperature is below +15°C or higher than +30°C.

Procedure for carrying out a check

Carry out the calibration check using your calibration standard. This may be either dry gas or wet vapour simulators. The instrument may give you the choice to select which type of standard you are using, or may be set up if the operator only has one standard available. If unsure contact your supervisor.



This mouthpiece MUST be DRY: do NOT blow through it!

Now push the lipped end of the mouthpiece on the **lion alcolmeter® 700** over the **Connector Tube**, to form a tight fit. Then activate the sample and allow gas to flow through the mouthpiece. After at least five seconds of flow, press and release **AB** to take the sample. It is important that the gas then flows at least a further second, **after** pressing **AB**, **before** stopping the sample. The instrument should then be removed from the mouthpiece. Once the sample has been taken, the result of the analysis will be shown.

Check that the result is an acceptable result for the standard that you are using. If in doubt contact your supervisor.

Calibration Adjustment

This allows the operator to carry out a calibration adjustment. If unsure on how to carry out a calibration adjustment, or for further details, please see the calibration adjustment procedure contained in the supervisor section of the supervisor handbook.

The Calibration ADJUSTMENT Procedure

The instrument temperature must be in the range 15°C - 30°C. Assuming this condition is met, the next screen to appear will be:



Use **DB** and **UB** to change the displayed number to agree with the known alcohol standard (after making any allowance for altitude for a dry-gas); then press **AB** to **ENTER**.

Then select either "Dry" or "Wet" depending upon whether the operator is using a dry gas or wet vapour.

When the instrument is ready, take a sample of the alcohol standard:



The instrument now calibrates itself, automatically.

Before returning the **700** to service, the operator may wish to **CHECK** its accuracy of calibration, to verify that the above process has been carried out satisfactorily.

The auto power down function

If the **lion alcolmeter® 700** is left switched on, but no action is then taken for two minutes, it will automatically switch itself off, to conserve battery life. This is preceded by a series of ten warning beeps.

The auto power down function can be stopped at any point by pressing either of the two buttons. This resets the two minute counter.

Do not attempt to switch off the 700 by simply removing the batteries. Such action is recorded in the system memory.

Mouthpiece port illumination

The **lion alcolmeter® 700** is fitted with mouthpiece port illumination. This is activated when the instrument is ready to carry out a test. This essential feature is used when fitting the mouthpiece in low light conditions or is used to indicate to the subject where to blow when providing a sample into a cup or zero tolerance test.

Indication LED's

The **lion alcolmeter® 700** is fitted with two indication LED's, one red, denoting a fail, and one green, denoting a pass. The level at which these LEDs change colour is set in the configuration program.

The pass / fail level for the cup test and the breath test may be different.

Fuel cell heater

To maintain the instrument's performance at very low temperatures it is fitted with a heater. The heater functionality is automatically controlled by the instrument, and requires no user intervention at all.

Printing with the lion alcolmeter® 700

The **lion alcolmeter® 700** can be connected to a printer so that it gives a printout of the test result.

This is configured and enabled through the configuration application.

If enabled and if a printer is connected and switched on, the instrument will print a printout following a successful test result.

To get an extra printout, or print outs of previous tests, the operator can scroll through the database log, and press the Action Button (AB). If the number of printouts in the configuration of the instrument is anything other than zero, the operator will now have the option of performing a printout.

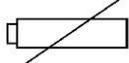
If they wish to perform a printout they should select “yes”, in which case they will have the option of printing the record that they were viewing, or a summary of the database.



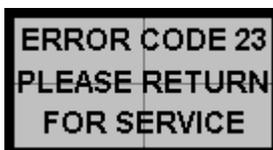
Warning messages

Fatal error messages

If a fatal message is shown, the **lion alcolmeter® 700** automatically powers down and cannot be used until the appropriate remedial action has been taken. The most likely occurring examples of such a message are:

		
Instrument too hot	Instrument too cold	Change battery

Error code messages



The Error code X messages are explained in the following table. If any of these occur, please contact service personnel for attention.

lion alcolmeter® 700: Error Code Messages	
Code	Meaning/Significance
2	Fuel cell amplifier signal is too high
3	Fuel cell output too low during instrument calibration
4	Gas flow rate applied during breath flow sensor calibration too low
5	Charge pump did not generate the required voltage
6	Temperature below -6°C
7	Calibration or checking attempted below 15°C
8	Calibration or checking attempted above 30°C
16	Fuel cell offset voltage has drifted too low
17	Blockage in sampling system
18	Used in Factory Mode only
19	Used in Factory Mode only
23	False peak

Non-fatal error messages

If a non-fatal message appears, the instrument can still be used with no effect on its operation or accuracy.

An example of such a message is:

Low Power: Change the disposable batteries as described in the following section.



Care and maintenance

To ensure optimum performance, follow these simple instructions:

Cleaning the instrument

Simply wipe over with a slightly damp cloth.

Do not use chemical solvents, abrasives or excess water to clean the instrument: these could damage the case material, and possibly the various internal sensors.

Changing the batteries

The standard power supply unit used with the **lion alcolmeter® 700** (and unless otherwise specified at the time of ordering) is two **AA** cells. These should give enough power for approximately 1000 breath tests, depending on the conditions of use.

When the low power warning screen appears it is recommended that the operator change these batteries as soon as possible. When so doing please remember the following:

- Change both batteries together; and
- Ensure that each is fitted with its positive end **Upwards**



Do's and Don'ts

Do's

- DO...Change or charge batteries when **Low Battery** appears.
- DO...When changing batteries, replace **BOTH** cells.
- DO...Use the correct mouthpiece for this instrument.
- DO...Use a clean, new mouthpiece for each **COMPLETE** breath test.
- DO...Ensure the subject blows into the lipped end of the mouthpiece.
- DO...Read this handbook carefully, and comply with its contents.
- DO...Use a **DRY** mouthpiece for calibration checking.

Don'ts

- DO NOT...Test the subject if the operator thinks he may have drunk or taken **ANYTHING** by mouth in the last 20 minutes
- DO NOT...Test the subject if he has smoked in the last 2 minutes.
- DO NOT...Let the subject hyperventilate before supplying breath. This cools the mouth and upper airways, so that alcohol is lost (by condensation) from the breath on expiration, and so produces a falsely low reading of the body alcohol loading. If necessary, wait a minute or so before proceeding to take the breath sample, after any such action by the subject.
- DO NOT...Store the **lion alcolmeter® 700** in extremes of temperature, hot or cold.
- DO NOT...Subject the **lion alcolmeter® 700** to violent shock.
- DO NOT...Clean the case with chemical or abrasive products.
- DO NOT...Allow the sampling port to become blocked.
- DO NOT...Block or restrict the end of the mouthpiece while the subject is blowing. This can seriously damage the instrument.
- DO NOT...Re-use mouthpieces, for hygiene **and** accuracy.
- DO NOT...Open the case: this will invalidate the warranty/service.
- DO NOT...Deviate from the instructions in this handbook.

Appendix I: Supplier's Details

Lion's exclusive distributor and service support company is:

Appendix II: Manufacturer's Details

Mail

Lion Laboratories Limited
Ty Verlon Industrial Estate
Barry, Vale of Glamorgan, CF63 2BE
Wales, United Kingdom

Telephone (main switchboard)

+44 1446 724500

Telephone (technical service)

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or, for technical service

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