

VITALOGRAPH-*alpha* OPERATING MANUAL

Buckingham
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Ennis

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1. INTRODUCTION

The Vitalograph-alpha is a portable spirometer designed for measuring expiratory parameters of forced tests (FVC) and slow tests (VC). Progress of a test is dynamically shown on a liquid crystal display on the front of the instrument. A print-out of the test results can be produced. The actual test results depend upon the software cartridge fitted.

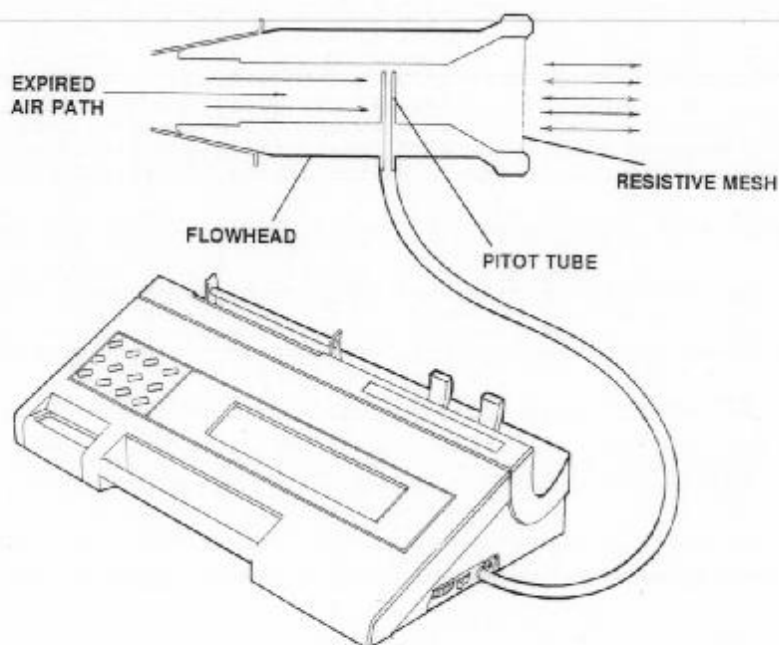
We recommend that you read the following instructions carefully before attempting to use the instrument.

Never allow a print-out to be performed without paper in the printer. To do so will damage the printer head.

2. PRINCIPLES OF OPERATION

To know how your spirometer works it is useful to understand the measuring principles. The measurement of expired air from the subject is made on the Vitalograph-alpha using a pneumotachograph type of flowhead. The Vitalograph-alpha's large diameter flowhead is capable of giving linear results throughout the entire physiological range for expiratory manoeuvres.

Flow through the flowhead and into the resistive element produces a positive pressure, with respect to the surrounding air pressure, at the pitot tube situated at the rear of the flowhead. This pressure is transferred to the transducer, located in the Vitalograph-alpha, via a length of silicone rubber tubing. The pressure transducer output is converted to an electrical signal and a microprocessor manages the data and displays the results on screen.



3.1 ELECTRIC SHOCK HAZARD

There is no high voltage inside the instrument. The **PowerSAFE** unit is not designed to be dismantled and no attempt to do so should be made.

3.2 EXPLOSION HAZARD

NEVER use the instrument in explosive atmospheres, such as in the presence of ignitable or inflammable anaesthetic gases or vapours.

3.3 POWER SUPPLY

The instrument **MUST** be used with the purpose built low voltage **PowerSAFE** unit.

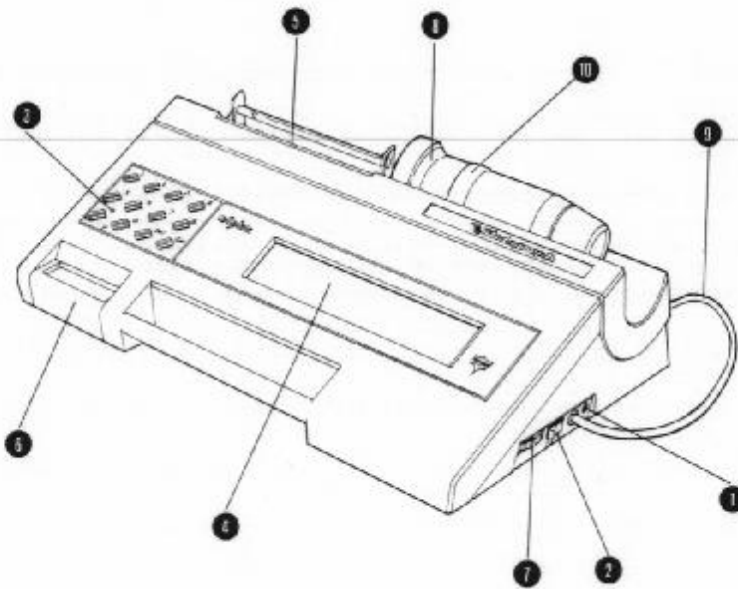
The mains plug on the **PowerSAFE** conforms to the following convention.

Brown=Live Blue=Neutral

The **PowerSAFE** is double insulated and no earth connection is required.

Following removal from the outer packaging and carrying case the Vitalograph-**alpha** is ready for immediate use.

4.1 IDENTIFICATION CHART



- | | | |
|-----------------------|-----------------------|------------------------------|
| 1. Power Inlet Socket | 5. Printer | 9. Flowhead Tubing |
| 2. On/Off Switch | 6. Software Cartridge | 10. Flowhead Retaining Strap |
| 3. Keyboard | 7. Contrast Adjuster | |
| 4. Display | 8. Flowhead | |

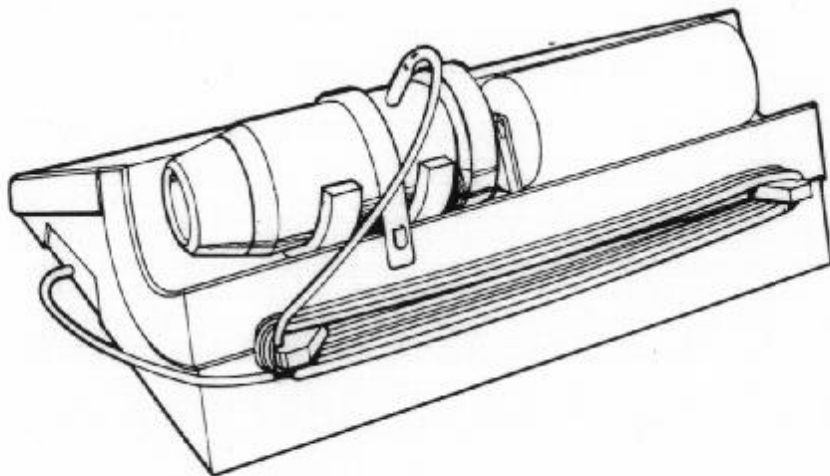
3. SAFETY PRECAUTIONS

4. COMMISSIONING OF SPIROMETER

4.2 THE FLOWHEAD AND TUBING

The silicone rubber tubing connecting the flowhead to the instrument should be wound loosely around the storage lugs provided at the rear of the instrument during transit. It is important that this tubing is not damaged. The retaining strap should be used when carrying or transporting the instrument.

IMPORTANT: The flowhead should always be replaced in the holder at the rear of the instrument following patient testing. This will ensure that the flowhead resistive element is kept clean and clear as this is essential for accurate results. If the element becomes soiled it must be cleaned and dried or replaced.



4.3 CONNECTING THE POWER SUPPLY

The **PowerSAFE** unit is fitted with leads, one end of which connects to the mains outlet, the other to the power inlet socket on the right-hand side of the instrument.

4.4 FITTING PRINTER PAPER

This is carried out by pressing the 'ENT' key when either of the following screens are displayed.

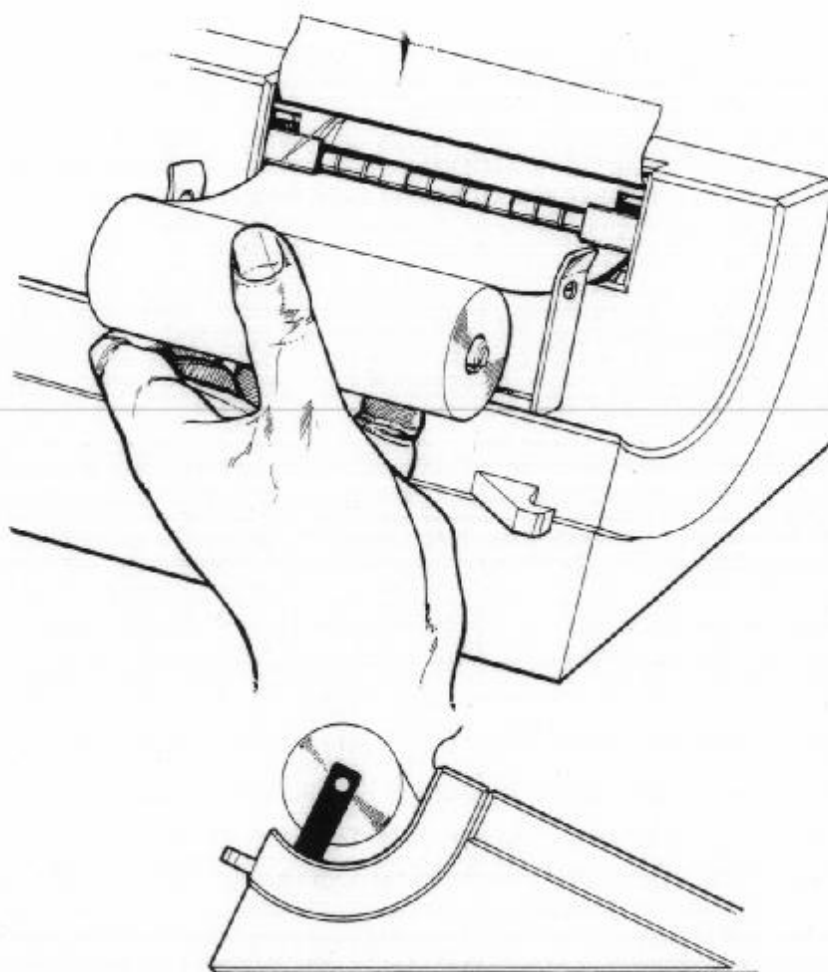
<p style="text-align: center;"><u>VITALOGRAPH - ALPHA</u></p> <p style="text-align: center;">TODAY'S DATE: 27/04/87</p> <p style="text-align: center;">IS THIS CORRECT? PRESS <Y> OR <N></p>
--

OR

VITALOGRAPH - ALPHA : MAIN MENU

- 1 : FVC TEST
- 2 : VC TEST
- 3 : PRINT
- 4 : CLEAR ALL RESULTS
- 5 : NEW PATIENT
- 6 : CALIBRATION CHECK

The new roll of paper should be fitted onto the paper rod ensuring the paper unrolls from on top of the roll. (See diagram below). The 'ENT' key should then be pressed and the printer mechanism will operate, allowing the paper to be fed into the slot under the roller and through the printer. When the paper appears out of the top of the printer the 'ENT' key must be pressed again and the printer will stop. The paper rod may now be fitted into the spring clip and the Vitalograph-alpha is ready for use.



IMPORTANT: Printer paper must unroll as shown.

5. OPERATING INSTRUCTIONS

IMPORTANT: If more than 20 tests per hour are performed it is recommended that the flowhead resistive mesh is changed or dried before commencing a further series.

5.1 INTRODUCTION

The keypad consists of 10 numeric keys (0-9), two of which double up as function keys and are also marked N (NO) and Y (YES). There are also two separate function keys 'ENT' (ENTER) and 'DEL' (DELETE).

The numeric keys are used to enter data and the 'ENT' key to indicate that data entry is complete and to exit certain routines. The 'DEL' key is used to delete a keyboard entry when a mistake has been made. The Vitalograph-alpha has been designed for easy use; simply follow the instructions displayed on the screen.

5.2 DATE ENTRY

<p style="text-align: center;"><u>VITALOGRAPH - ALPHA</u></p> <p style="text-align: center;">TODAY'S DATE: 27/04/87</p> <p style="text-align: center;">IS THIS CORRECT ? PRESS <Y> OR <N></p>

If the date is correct PRESS the <Y> key.

To change the date PRESS the <N> key.

The date **MUST** be entered in full (either day, month or year first).

Note that for the day, month and year, two digits are required e.g. 04/05/87. Failure to enter the date in full will cause all previous digits to be cleared and the date input requested again.

5.3 PATIENT DATA ENTRY

This data will enable the instrument to calculate the patient's predicted values. If no predicted values are required, simply press the 'ENT' key when age is requested. After each data entry is complete the 'ENT' key must be pressed.

1. Reference Number

Up to 15 digits may be entered.

2. Patient Age

Enter patient's age.

3. Patient Height

The height may be entered in INCHES or CENTIMETRES; 85 or less will automatically be taken as inches.

4. Patient Sex

The spirometer assumes the patient to be male and shows the following display. Use the 'Y' and 'N' keys accordingly to make the correct choice.

REFERENCE NUMBER	:	1234
AGE	:	46
HEIGHT	:	70 INCHES
SEX	:	MALE ?
IS MALE CORRECT ? PRESS (Y) OR (N)		

5. Patient Ethnic Origin

(This option is not available on all software cartridges).

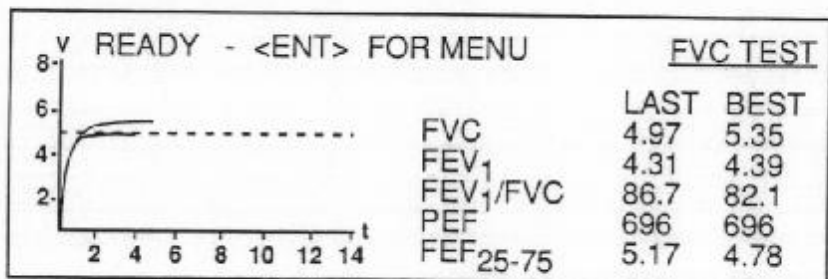
Follow screen prompts to enter this information.

5.4 MAIN MENU

The main menu lists the operations that you may perform. Each one is selected by depressing the key with the corresponding number. If the 'ENT' key alone is pressed this enables new paper to be loaded. Pressing the 'ENT' key again stops the printer. (See section 4.4).

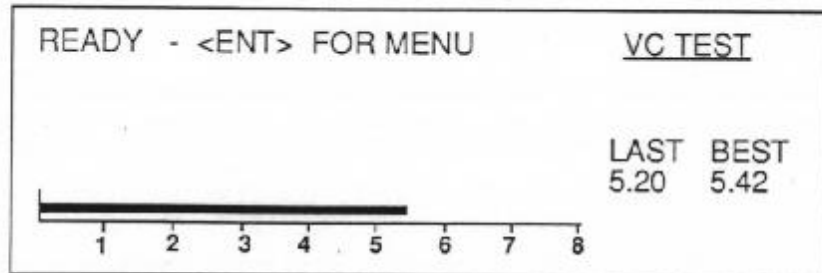
1. FVC Test

The test may be repeated as often as you wish by blowing into the flowhead in response to the ready prompt. Curves from each test will be superimposed. The best test only (highest sum of FVC and FEV₁) will be used for determination of printed results.



2. Slow VC Test

The test may be repeated as often as required with the best result so far being indicated by a short vertical line.



3. Print

This selection will print out the patient data and test results. To stop the print-out prematurely press the 'ENT' key.

4. Clear Results

By pressing 'YES' patient test results are cleared but patient data (age, height, etc.) is retained for further testing.

VITALOGRAPH - ALPHA

ALL RESULTS WILL BE CLEARED

PRESS <Y> OR <N>

5. New Patient

This clears all results and returns to the patient data entry prompt.

6. Pre/Post

If the software cartridge fitted to your instrument has this option, the best pre test results are remembered by the internal memory and are compared on the print-out with the best post test results along with the percentage change.

6. PERFORMING THE TEST

6.1 **SUBJECT INSTRUCTION:** It is essential that the subject performing the test is clearly instructed in the procedure prior to the commencement of each test.

A very enthusiastic performance by the operator is required so that a maximum effort is made when carrying out the forced expiratory test. A subject who has not previously had a spirometry test should make two or more practice attempts until it appears that a maximum effort is being obtained.

IMPORTANT NOTE: It is vital that the operator ensures the subject keeps their fingers clear of the flowhead mesh during testing.

USE THE FOLLOWING GUIDELINES TO HELP YOU.

6.2. SLOW VC TEST

Before selecting VC test from the menu, instruct the subject in the following way.

Let the subject hold the flowhead in one hand, then say "I am measuring how much air you can get out of your lungs". (Even if not quite accurate scientifically, this statement is usually quite readily understood).

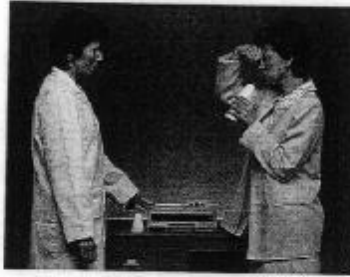
"This is what you'll do." Take a mouthpiece in your hand to demonstrate.



1.
*"Breathe in and out normally.
Take in a deep breath and fill
your lungs completely
through your nose like this"
(and you do it).*



2.
*"Now, put the mouthpiece into
your mouth close lips
around it like this so
that there is no leakage there,
not like a trumpet, with pursed
lips".*



3.

"Next you breathe out into the instrument... as much and as completely as you can like this". Pinching your nose tightly, you breathe through the mouthpiece. (A patient may benefit from a noseclip if, for example, he finds it difficult to grip his nose or has a cleft palate.) *"That is all you'll have to do".*



4.

When the subject is ready to perform the test - select VC test from the menu. **It is important that the flowhead is not moved excessively after the selection has been made.**

"Now let's do the test anytime you're ready deep breath fill your lungs completely". As soon as the subject has his lips sealed on the mouthpiece, encourage him. *"Slowly go on breathe out as much as you can".*

When you are satisfied that the subject has expired his total air volume. *"Thank you that was very good".*

Repeat test as required.

6.2. FORCED VITAL CAPACITY TEST/FLOW VOLUME CURVE



1.

"I want to measure now how fast you can blow". (Though not quite accurate scientifically this usually gives a clear understanding of the difference between the VC and FVC test). "This is what you do breathe in and out normally. Then take in a deep breath much deeper than before".



2.

"Put the mouthpiece into your mouth close your lips around it" "But this time, blow as hard and fast as you possibly can like this".



3.

"Now let's do this test any time you're ready". As the subject is getting ready to do the test, you quickly reiterate the main points.

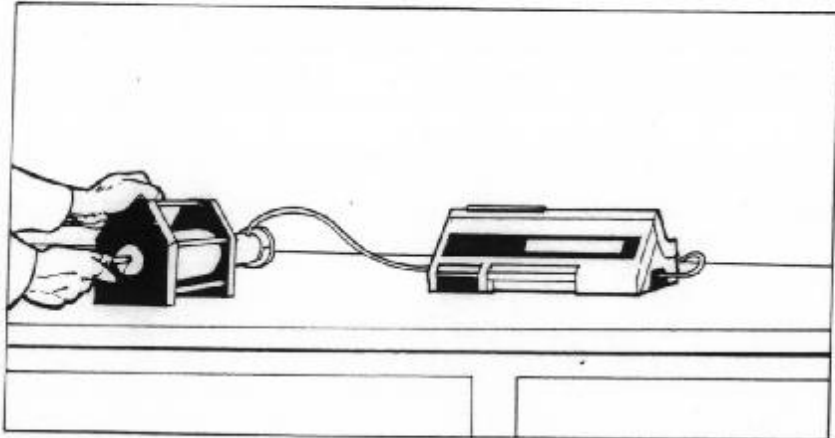


4.

Select FVC test from the menu. It is important that the flowhead is not moved excessively after the selection has been made. After the first half second of the FVC test, urge in a raised voice. "Go on fast faster much faster go on go on go on".

7. ACCURACY CHECK/ CALIBRATION

This routine allows the user to simply check and adjust, if necessary, the calibration of the instrument. **The actual adjustment, if made, is carried out totally by control from the keyboard and no mechanical adjustment is necessary.** The revised calibration is retained until altered again, even when the machine is switched off.



To perform the accuracy check/calibration a precision syringe is required. Before attempting calibration it is essential that the flowhead and syringe are at ambient room temperature. Blowing through the flowhead raises its temperature. If the flowhead has recently been blown through by a patient prior to calibration, then the temperature must be lowered to ambient by pumping room air through it prior to accuracy check using the syringe.

RECOMMENDED CALIBRATION PROCEDURE

1. It is important to pump 10 litres (approx) of air through the flowhead prior to commencing this procedure.
2. The user is asked to enter the ambient temperature. **THIS MUST BE MEASURED ACCURATELY BEFORE ENTERING.**
3. Air must be pumped through the flowhead when requested on the screen. The air must be pumped through the flowhead for at least one second continuously or it will be ignored.
4. At the end of the first stroke of the syringe, the user may exit the routine or pump more air to increase the calibration volume.
5. If a second stroke of the syringe is to be performed it is important to wait for at least half a second after the syringe fills. This allows the system to settle.

6. Strokes of the syringe may be repeated up to a maximum displayed volume of 9.99L.
7. When the air pumping routine is exited the measured volume is displayed and the user is requested to enter the actual total volume pumped. This is then compared with the measured value and the difference is displayed.
8. The user is then offered the chance to change the calibration. This is only necessary **IF THE ERROR IS GREATER THAN 3%**.
9. Once the check or adjustment is completed a Calibration Report is printed.

Cleaning/Disinfecting/Sterilising - Recommendations Chart

PART	MATERIAL	CLEANING	DISINFECTING	STERILISING
Case	Polystyrene	Lint free	Mild liquid	N/A
Exterior	high density foam painted with epoxy paint	damp cloth DO NOT USE SOLVENTS	disinfectant wipe over	
Display	Glass	Lint free damp cloth DO NOT USE SOLVENTS	Mild liquid disinfectant wipe over	N/A
Screen Surround	(ABS)	Lint free damp cloth DO NOT USE SOLVENTS	Mild liquid disinfectant wipe over	N/A
Keypads	(ABS)	Lint free damp cloth DO NOT USE SOLVENTS	Mild liquid disinfectant wipe over	N/A

8.
CLEANING/
DISINFECTING/
STERILISING

Cleaning/Disinfecting/Sterilising - Recommendations Chart

PART	MATERIAL	CLEANING	DISINFECTING	STERILISING
Flowhead tube	Silicone-rubber	Mild detergent flush with clean water. Dry thoroughly	Mild disinfectant flush with clean water. Dry thoroughly	Cold liquid recommended. Autoclaving possible.
Flowhead cone	Acetal	Mild detergent flush with clean water	Mild disinfectant flush with clean water. Dry thoroughly	Cold liquid recommended. Autoclaving possible.
Flowhead resistive element	ABS/ stainless steel mesh	DISPOSABLE, CHANGE MONTHLY OR WHEN SOILED RECALIBRATE AFTER REPLACING ELEMENT		

DISASSEMBLING THE FLOWHEAD FOR CLEANING, DISINFECTING AND STERILISING

1. Disconnect the FLOWHEAD from the FLOWHEAD tube.
2. Grip the resistive element in one hand and pull the cone off with the other.
3. Discard resistive element if soiled.
4. Clean as described in Cleaning/Disinfecting/Sterilising. **IMPORTANT: ENSURE THAT NO LIQUID REMAINS IN THE HOLES, GROOVES OR PITOT TUBE OF THE BODY.**
5. After cleaning etc. check the FLOWHEAD RINGS for damage and see that they are correctly positioned in the grooves.
6. Fit new resistive element and push firmly home, reconnect pressure tube. Remember to re-calibrate when fitting a new resistive element.

20.302	Paediatric Mouthpiece Adaptor
20.202	Paediatric Mouthpieces (box of 400)
20.201	Cardboard Mouthpieces (box of 200)
42.085	COMPACT Mouthpieces (pack of 200)
44.058	Thermal Printer Paper (5 rolls)
20.303	Nose Clips (pack of 10)
44.057	Resistive Elements (pack of 5)
20.408	1 Litre Precision Syringe

SOFTWARE CARTRIDGES

44.125	Standard Program
44.128	Flow Volume Program
44.130	Pre/Post Program

PROBLEM

No instrument response when turned on.

The instrument operates intermittently and "jumps" to the start of the program.

Test begins automatically and volume accumulates for 20 seconds without the patient blowing or very small VC or FVC test displayed or only responds to very large air flow.

Calibration air not accepted or measured volumes vary greatly from the volumes of pumped air.

SOLUTION

Check fuses in the mains plug (where applicable) and proper insertion of the power supply lead. Check power at wall socket. Check that the software cartridge is fully inserted.

Check the following: The mains plug is properly inserted into the wall socket. The power inlet plug is fully inserted into the socket in the side of the machine.

Keep flowhead and tubing stationary at the start of a test until the 'READY' prompt appears. Return to MENU and re-enter the test routine.

Keep flowhead, tubing and syringe plunger stationary until prompted to 'PUMP AIR'. Terminate the calibration procedure WITHOUT UP-DATE, return to menu and re-enter the calibration procedure.

9. CONSUMABLES AND ACCESSORIES

10. FAULT FINDING GUIDE

Last entered DATE corrupted on 'Power On' and/or obviously false test readings.

Internal memory corrupted.
Re-enter the correct date and re-calibrate the instrument.

Printer operating but no print-out appearing on paper.

Check that paper roll is inserted correct side up.

Erratic recording of test.

Check that the tubing from the flowhead has not become deformed by being trapped under the instrument and that there are no tight bends, kinks or damage along its length.

Test results appear to be suspiciously high.

Check that the flowhead resistive element has not become soiled.
If necessary clean and dry or replace the element and recalibrate.

11. GUARANTEE AND CUSTOMER SERVICE

ONE YEAR GUARANTEE AND CUSTOMER SERVICE

SERVICE AND REPAIRS should be carried out only by the manufacturer, the approved importer or by Service Agents specifically approved by VITALOGRAPH LIMITED. There are no user serviceable components inside the equipment.

Terms of Guarantee

Subject to the conditions listed below, Vitalograph Ltd., (hereinafter called the Company) guarantee to repair or at its option replace any component thereof, which, in the opinion of the Company is faulty or below standard as a result of inferior workmanship or materials.

The conditions of this Guarantee are:-

1. This Guarantee shall only apply to alleged defects or faults which are notified to the Company or to its accredited agent within 1 year of the date of purchase of the equipment.
2. This Guarantee does not cover any faults caused by accident, misuse, neglect, tampering with the equipment, or any attempt at adjustment or repair other than by the accredited agent of the Company.
3. If a defect occurs please contact the supplier from whom it was purchased for advice. The Company does not authorize any person to create for it any other obligation or liability in connection with Vitalograph® equipment.
4. This Guarantee is not transferable and no person, firm or company has any authority to vary the terms or conditions of this Guarantee.
5. This Guarantee is offered as an additional benefit to the Consumer's statutory rights and does not affect these rights in any way.

Procedure for checking the Vitalograph (Traditional Bellows Types)

1. Connect the Precision 1-litre Syringe to the Vitalograph via the Breathing Tube, making sure all the connections are air-tight.
2. Insert a Vitalogram and set the Stylus onto the "STYLUS START" line (NOT the zero line).
3. Fill the Syringe by withdrawing the piston to its limit (ambient air is drawn in due to the internal valve systems).
4. Discharge the Syringe into the Vitalograph, pushing the Piston steadily to maintain a steady flow of air (typically 1 L/Sec.). Ensure that the Piston travels fully to the end stop, but do not use excessive force.
5. Mark the Stylus position on the ATPS Chart (or Calibration Scale) by gently tapping the side of the Stylus Head.
6. Repeat steps 4. and 5., litre by litre until full scale deflection is achieved.

Repeat the test procedure to verify readings, especially after making calibration adjustments:-

Empty the Bellows by removing the Breathing Tube from the Spirometer, then move the Chart Carrier approximately 0.2 seconds along the time axis. Check that the Stylus has returned to the "STYLUS START" line before replacing the Breathing Tube into Spirometer; re-adjust as necessary.

Adjustments to Calibration of Spirometer — Refer to Service Manual.

S-Model Spirometer

Accuracy: ± 50 ml or $\pm 0.5\%$ — Linearity: $\pm 0.5\%$ F.S.D. (± 35 ml/Litre)

LITRE POSITION (L)	1	2	3	4	5	6	7
ACCURACY UPPER LIMIT (L)	1.05	2.05	3.05	4.05	5.05	6.05	7.05
ACCURACY LOWER LIMIT (L)	0.95	1.95	2.95	3.95	4.95	5.95	6.95
LINEARITY POINT TO POINT (L)	0.035	0.035	0.035	0.035	0.035	0.035	0.035

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