



BODYSTAT[®] 1500

BODY COMPOSITION MONITORING UNIT



USER'S GUIDE

Version 1/10
Date of Issue: 9/20/10

Thank You

Welcome to the large family of **BODYSTAT**[®] users. Thank you for selecting **BODYSTAT**[®] 1500; we hope our product and service will earn your trust.

BODYSTAT[®] is a long established reputable company, incorporated on the Isle of Man in 1990.

The company's business is the research, development, manufacture and marketing of state-of-the-art Body Composition & Fluid measurement products using proven **Bioelectrical Impedance** techniques which are safe, reliable, and deliver reproducible results.

The application of these measurements has an ever-increasing scope - from medicine and nutritional status, to lifestyle improvement, to fitness and health assessment.

The company is founded on some important truths:

- *Body Composition is a more significant indicator of health than simple Body Weight.*
- **BODYSTAT**[®] consistently and conveniently provides reliable Body Composition information in a simple, safe and scientific manner.

BODYSTAT[®] products have been independently tested and approved. They are currently used in the UK, continental Europe, USA, Canada, Asia, Australia, Africa and elsewhere throughout the world.

All surplus profits are re-invested in Research and Development.

BODYSTAT IS changing attitudes to health.

INDICATIONS FOR USE

For the purposes of performing a non-invasive bio-impedance analysis (BIA) measurements on normal healthy human adults to determine their Body Composition status.

This device measures bio-electrical impedance when a 50 kHz signal is applied at specific locations on the subject. From this and the subject's age, gender, weight, height, waist and hip circumferences (optional), the device calculates the following estimated values: fat%, fat weight, lean%, lean weight, total body water%, total body water, dry lean weight, basal metabolic rate, basal metabolic rate/body weight ratio, average requirement (EAR), and actual body mass index and waist/hip ratio.

OPTIONAL ACCESSORIES:

Bodystat (1) BODY MANAGER and (2) WELLNESS SOFTWARE PROGRAMS.

The **Body Manager Program** is ideal when a client returns to be tested in order to track their changes in body composition over a period of time.

The **Wellness Program** is ideal for first time assessments on subjects. The program's graphical presentations provide information on each of the specific measurements in an educational format.

WARRANTY DISCLAIMER

Although all **BODYSTAT** hardware units and software programs are tested before release, no claim is made concerning the accuracy of the product. **BODYSTAT LTD**, as the manufacturers of the product and authors of the software, their distributors and dealers, cannot assume liability or responsibility either implied or expressed for any loss or damage either real or consequential arising out of the use of this product.

It is a condition of every sale and purchase of the product that the purchaser accepts all such risk, and acceptance thereof shall be deemed to have been given when purchase is made.

**Copyright © 2000, 2007 BODYSTAT (Isle of Man) LTD.
All rights reserved.**


BODYSTAT and  are the Registered Trademarks of **BODYSTAT (Isle of Man) LIMITED.**


HEAD OFFICE:

Postal Address:
Bodystat Ltd.
P.O. Box 50
Douglas
Isle of Man
IM99 1DQ
BRITISH ISLES

CE0120

Delivery Address:
Bodystat Ltd.
Ballakaap, Ballafletcher Road
Cronkbourne, Douglas
Isle of Man
IM4 4QJ
BRITISH ISLES

 : + 44 - (0)1624 - 629 571

 : + 44 - (0)1624 - 611 544

info@bodystat.com

www.bodystat.com

CAUTION

The test is NOT recommended for females in the early stages of pregnancy nor subjects with pace-makers or any implantable electronic device.



1. If your **BODYSTAT[®]1500** unit arrives in cold weather, allow the system to warm up to room temperature before you switch on the unit.
2. Exposing a cold computerized system to a warm room causes condensation that could damage the system.
3. Wait at least 24 hours to allow for any possible condensation that may have formed inside the casing to dry before you operate the system.

QUICK GUIDE TO PERFORMING A MEASUREMENT BODYSTAT® 1500

1. Subject must lie down in the supine position.
2. No parts of the body should be touching one another.
3. Place new set of electrodes on right hand and foot.
4. Attach the crocodile (alligator) clips to the metal tab strip of the electrodes (black to wrist and ankle).
5. Switch the **BODYSTAT®1500** unit **ON**.
6. Key in accurate subject data, i.e. height, weight, etc.
7. Ensure subject has been in the supine position for 4 minutes.
8. Press the *Enter* <↔> key finally to perform measurement.
9. Results are displayed on the **LCD** screen within 4 seconds.
10. Disconnect the crocodile clips from the electrodes.
11. Remove the electrodes.
12. Subject may sit or stand up.
13. Discuss/interpret results with subject.
14. Switch the **BODYSTAT®1500** unit **OFF**.

For further information refer to the section of the User's Guide, *Entering Subject Data Into the Hardware Unit*

CONTENTS

SECTION A – HOW TO USE BODYSTAT®1500

INTRODUCTION	10
IMPORTANT GUIDELINES FOR EQUIPMENT CARE	11
PRODUCTION DESCRIPTION	12
OPERATIONAL FEATURES	14
INSTALLATION MODE	16
BODYSTAT MEASUREMENT	24
ENTER SUBJECT DATA	29
DISPLAY RESULTS	33
RECALL SUBJECT DATA	35
DISPLAY SERIAL NUMBER	38
ADDITIONAL INFORMATION	39
METABOLIC RATES – BASAL AND ACTIVITY	42
BODY MASS INDEX (BMI)	44

SECTION B – TECHNICAL INFORMATION

FAULT FINDING	46
CALIBRATION	48
BATTERY REPLACEMENT	50
SUPPORTING LITERATURE	51
SPECIFICATIONS	52

SECTION A

HOW TO

USE

BODYSTAT[®] 1500

INTRODUCTION

The **BODYSTAT 1500** body composition monitoring unit is designed to provide a fast and effective method of measuring body composition using modern technology.

Using the scientifically validated principle of *Bio-electrical Impedance Analysis (BIA)*, a complete analysis of body composition comprising fat, lean weight, optimal total body weight range and body water levels, is instantly displayed on the liquid crystal display (LCD) screen of the hand-held unit.

The **BODYSTAT 1500** unit is battery-operated, lightweight and easy to use requiring no specialist skills. The unit has been electronically precision engineered to the highest quality standards offering the user a safe and efficient means of measurement.

THE MEANING AND IMPORTANCE OF BODY COMPOSITION ANALYSIS

Body composition is the amount of lean and fat that makes up total body weight. Lean comprises muscle, bone and water.

Whatever the total weight, lean and fat proportions need to be within established recommended limits in order to avoid the many health problems associated with being "over-fat". These include high blood pressure and cholesterol levels, arteriosclerosis, coronary disease, respiratory problems and kidney disorders.

Equally serious, however, is the problem of having too little body fat, since adipose tissue is vital for normal organic function. The dramatic increase in anorexia nervosa, bulimia and a "fear of obesity" over the last decade demands an awareness of correct body composition.

WHAT DOES THE BODYSTAT 1500 UNIT MEASURE?

The **Bodystat[®]1500** measures/estimates:

Fat %*
Fat Weight*
Lean %*
Lean Weight*
Water %*
Total Body Water*

OPTIMAL RANGES OF EACH OF THE ABOVE AND OF TOTAL
BODY WEIGHT

Dry Lean Weight*

Basal Metabolic Rates*

BMR/Body Weight*

Est. Average Requirement* (As defined on pages 64 & 65)

Body Mass Index (BMI) and Normal Range

Waist/Hip Ratio

Impedance Value at 50 kHz

**estimated*

IMPORTANT GUIDELINES FOR EQUIPMENT CARE

It is important to consider that the measurement of bio-impedance involves measuring highly sensitive values. Therefore, care should be exercised when handling the equipment, in particular the Cable Leads.



Detailed below are guidelines that we recommend should be followed:

1. The **BODYSTAT®1500** is calibrated with the exact length of leads which are screened/shielded from outside electrical interference and noise to ensure greatest level of measurement accuracy. Therefore, it is recommended that only leads supplied by Bodystat Limited are to be used.
2. Computers and other electrical equipment close by can cause interference with the hardware device which may affect the impedance measurement.
3. Regular calibration checks of the equipment are recommended (refer to **CALIBRATION section**).
4. Care should be taken at all times to avoid damaging the cables, ie they should not be tangled together and avoid tightly rolling them when not in use.
5. **Cleaning Instructions:** The hardware unit should periodically be wiped with a clean damp cloth.
6. **Disposal Instructions** of disposable Items:
 - Batteries** - these must be disposed of as per local regulations;
 - Electrodes** - these may be disposed of as normal waste.

PRODUCT DESCRIPTION

The **BODYSTAT 1500** package consists of the following:



- * Bio-electrical Impedance (BIA) Measuring Unit
- * Red & Black 1.2 metre Cable Leads (2)
- * User's Guide on CD
- * Disposable Electrodes (100)
- * Duracell/Procell AA Batteries (6)
- * Bodystat Calibrator
- * Report Pad (50 pages)
- * Protective Navy Blue Carrying Bag
- * 12 month warranty on a return to factory basis
(excluding on lead wires).

CONNECTING THE CABLE LEADS

Prior to connecting your cable leads we recommend that you read the section of the manual called **IMPORTANT GUIDELINES FOR EQUIPMENT CARE**.

The **BODYSTAT®1500** unit has two main cable leads. Each lead is to be inserted to the connectors at the rear of the unit.



The two main blue cable leads each contain a **RED** and **BLACK** crocodile clip. These can be attached to either the foot or the hand, they are therefore, interchangeable.

OPERATIONAL FEATURES

The **BODYSTAT 1500** hand-held unit has been specifically designed to facilitate ease of use, speed of input and subsequent access to subject data. The following operational features are provided:

<u>SELECTION</u>	<u>WHAT TO DO</u>
ENTER SUBJECT DATA	SWITCH UNIT ON .
INSTALLATION MODE <i>Display Options</i> <i>Language Options</i> <i>Mid-Range</i> <i>Imperial/Metric</i>	HOLD DOWN THE <↑> KEY WHILE SWITCHING THE UNIT ON .
SERIAL NUMBER/YEAR	HOLD DOWN THE <↓> KEY WHILE SWITCHING THE UNIT ON .
RECALL SUBJECT DATA	HOLD DOWN THE <←> KEY WHILE SWITCHING THE UNIT ON .

The most recent 100 tests are always automatically stored in the memory of the **BODYSTAT 1500** unit and subject data may be recalled at any time. Data stored in memory is **not lost** after the unit is switched off (refer **RECALL SUBJECT DATA**).

If the unit has been switched on and no data has been entered for 60 seconds, an alarm signal sounds to warn the operator that the unit is still on and that battery power is being utilized.

The **BODYSTAT 1500** unit is provided with a facility to download the stored test data into a PC computer using our optional **Windows Software** programs or direct into a portable **Bluetooth Printer**.

Symbols on the **BODYSTAT 1500** unit used in this User's Guide:



ON / OFF Key



<↑>

UP Arrow Key



DOWN Arrow Key



ENTER Key

INSTALLATION MODE

The Installation Mode comprises the following:

- **DISPLAY OPTIONS**
- **IMPERIAL / METRIC OPTIONS**
- **MID-RANGE OPTIONS**
- **LANGUAGE OPTIONS**

This facility allows the operator to choose:

1. **Information** required to be **entered**, e.g. Gender, Age, Height & Weight;
2. **Information** required for **display**, e.g. Fat %;
3. Units of measure in **metric** or **imperial**;
4. The **average expected input measurements** (or mid-range) of subjects to reduce the time of subject data entry.
5. Data for Input/Display e.g. measure and display of the Impedance value only.
6. Select language option.

The entered values for Gender, Age, Height and Weight have the following options which can be selected in the installation mode.

Input This option allows the user to enter any values for Gender, Age, Height & Weight each time a test is performed. The User can select a Mid-Range value for Age, Height & Weight in order to save time in the event of a similar group being constantly measured (e.g. similar age group). This option will automatically be selected when the unit is despatched.

Default When it is necessary to perform measurements on the same subject on a continuous basis, e.g. at half-hourly intervals, this option will be useful for maximum operational efficiency. A user can simply switch the unit on and connect the electrodes to perform a test without having to re-enter Gender, Age, Height or Weight. However, if required, any of the four input figures may be selected for specific input (e.g. Weight only) when one or either of the input parameters are likely to change at the time of the test being performed. Once this option has

been selected and the installation has been saved, the selected values will not need to be re-entered.

Omit This option allows the user to entirely Omit the need to enter an input parameter e.g. Gender or Age, when performing a test. This may be useful, for example, when Impedance values only are required to be measured. A user can then choose to Omit Gender, Age, Height or Weight. This option again increases operational efficiency. If any of the values for Gender, Age, Height or Weight are omitted the Message “Results out of Range” is displayed along with the Impedance value only.

To access **Installation Mode**, while switching the unit **ON**, hold down the **<↑>** key **FIRMLY, UNTIL** this screen is displayed:

**INSTALLATION
MODE**

THEN only release the **<↑>** key to display:

**Select Language
English**

NOTE: *As each screen is displayed, a black and white cell flashes indicating the previously selected option stored in memory.*

Press the **<↑>** or **<↓>** selection key to change values.
Press **<↔>** to select.

The unit can store up to 5 languages. Press either the **<↑>** or **<↓>** key to switch between the language options. Press **<↔>** to select the displayed option.

**GENDER
Display Female**

Male or **Female** must be selected.

In the next screen, if the **Default** option is selected, then the Gender of the subject entered as above will be stored in memory for use when performing a measurement and will not be requested again.

**GENDER
Mode Input**

(**Input, Default** or **Omit** must be selected)

**SELECT MID-RANGE
AGE 30 Yrs**

The **Average Age** of the subjects being tested must be entered.

If the **Default** option is selected in the next screen, then the Age of the subject entered as above will be stored in memory for use when performing a measurement and will not be requested again.

This feature is designed to save time in the event of a particular age group or subject being constantly measured.

Min/Max range is 1 to 99 years.

**AGE
Mode Input**

(**Input, Default** or **Omit** must be selected)

**HEIGHT
Display cm**

Cm (centimetres) or **ft in** (feet & inches) must be selected.

**SELECT MID-RANGE
HEIGHT 164 cm**

The **Average Height** of the subjects being tested must be entered.

If the **Default** option is selected in the next screen, then the Height of the subject entered as above will be stored in memory for use when performing a measurement and will not be requested again.

Height will automatically be displayed in **imperial** or **metric** depending on the choice made in the previous screen selection.

Min/Max range is 1' to 7'6" or metric equivalent of 30 cm to 229 cm.

**HEIGHT
Mode Input**

(**Input, Default** or **Omit** must be selected)

WEIGHT
Display kg

Kg (kilograms), **lb** (pounds), or **st/lb** (stones/pounds) must be selected.

SELECT MID-RANGE
WEIGHT 54.9 kg

The **Average Weight** of subjects being tested must be entered.

If the **Default** option is selected in the next screen, then the Weight of the subject entered as above will be stored in memory for use when performing a measurement and will not be requested again.

Weight will automatically be displayed in **imperial** or **metric** depending on the choice made on the previous screen.

Min/Max range is 2 lb to 660 lb or metric equivalent of 0.9 kg to 300 kg.

WEIGHT
Mode Input

(**Input**, **Default** or **Omit** must be selected)

ACTIVITY (E.A.R.)
Very Low

Select one of five choices of **average** expected **Activity Level** of subjects ranging from **Very Low** to **Very High**.

If the **Default** option is selected in the next screen, then the activity level of the subject entered as above will be stored in memory for use when performing a measurement and will not be requested again.

ACTIVITY
Mode Input

(**Input**, **Default** or **Omit** must be Selected)

SELECT MID-RANGE
WAIST 85 cm

The **Average** measurement of subject's waist being tested must be entered. The Waist measurement can be shown in cm and inches, this is dependent on the Height input value selected. For example, if Height is selected to be shown in ft ins, then the hip measurement will be shown in inches.

If the **Default** option is selected in the next screen, then the Waist measurement of the subject entered as above will be stored in memory for use when performing a measurement and will not be requested again.

Min/Max range is 5 cm to 648 cm or 2" to 255".

WAIST	
Mode	Input

(**Input, Default** or **Omit** must be selected)

SELECT MID-RANGE	
HIP	91 cm

The **Average** measurement of subject's hip being tested must be entered. The Hip measurement can be shown in cm and inches, this is dependent on the Height input value selected. For example, if Height is selected to be shown in ft ins, then the hip measurement will be shown in inches.

If the **Default** option is selected in the next screen, then the Hip measurement of the subject entered as above will be stored in memory for use when performing a measurement and will not be requested again.

Min/Max range is 5 cm to 648 cm or 2" to 255".

HIP	
Mode	Input

(**Input, Default** or **Omit** must be selected)

METABOLIC RATES	
Display	kcal

Kcal (kilocalories) or **kJoule** (kilojoule) must be selected.

Select **<Yes>** or **<No>** and press **<↔>** and for all of the following:

FAT %	
Display	Yes

(or No)

FAT WEIGHT		
Display	Yes	(or No)

LEAN %		
Display	No	(or Yes)

LEAN WEIGHT		
Display	Yes	(or No)

TOTAL WEIGHT		
Display	Yes	(or No)

Total Body Weight

DRY LEAN WEIGHT		
Display	Yes	(or No)

Lean excluding Water

BODY WATER %		
Display	Yes	(or No)

Total Body Water

BODY WATER LT		
Display	Yes	(or No)

Volume of Body Water

Body water is only displayed in litres (**LT**) as a unit of measure.

BASAL MET. RATE		
Display	Yes	(or No)

Basal Metabolic Rate is the **ESTIMATED** minimum energy requirement of the body at rest. May be expressed as kilocalories or kilojoules.

BMR/Weight		
Display	Yes	(or No)

This is the amount of Kilocalories or Kilojoules per Kg or Lb of Total Body Weight.

EST. AVERAGE REQ		
Display	Yes	(or No)

ESTIMATED Average Requirement is the energy requirement relating to the activity level selected by the subject, i.e. the Activity Metabolic Rate. (refer to pages 64 & 65 for a detailed explanation). May be expressed as kilocalories or kilojoules.

BMI EQUATION Display	Yes	(or No)
---------------------------------	------------	----------------

WAIST/HIP Display	Yes	(or No)
------------------------------	------------	----------------

IMPEDANCE Display	Yes	(or No)
------------------------------	------------	----------------

This value relates to the impedance or resistance to the flow of the current in the body at 50 kHz.

Min/Max range is 20 to 1000 ohms.

This measurement is required by researchers in the medical profession in certain clinical monitoring applications and for downloading into the **BODYSTAT WINDOWS SOFTWARE PROGRAMS**.

The **BODYSTAT WINDOWS SOFTWARE**, the **BODY MANAGER** and the **WELLNESS** program, may be purchased as a future upgrade option to the hand-held **BODYSTAT 1500** unit.

PRINTER ENABLED?	No	(or YES)
-----------------------------	-----------	-----------------

If using the optional Bluetooth Printer, this setting must be selected to **YES**.

INSTALLATION COMPLETE?	No	(or Yes)
-----------------------------------	-----------	-----------------

If **<No>** is selected, the first screen, **Select Language**, is again displayed to re-select the appropriate options.

Press **<↑>** or **<↓>** key to select **<Yes>** and then the **<↔>** key to save the selections into memory.

PARAMETERS STORED

This message is briefly displayed if **<Yes>** has been selected. The options selected above will now be stored in memory until any changes are made thereto.

Thereafter, the unit automatically reverts to **ENTER SUBJECT DATA** mode.

TEST NUMBER
= 100

BODYSTAT MEASUREMENT

MEASUREMENT ADVICE

THE TEST IS NOT RECOMMENDED FOR FEMALES IN THE EARLY STAGES OF PREGNANCY OR SUBJECTS WITH PACE-MAKERS OR ANY IMPLANTABLE ELECTRONIC DEVICE.

The **Bodystat 1500** unit is designed for use on subjects aged between **18 and 70 years of age**. For ages outside of that range, the **Bodystat Body Manager** software program or ideally, the **Bodystat 1500MDD** device should be used.

With the application of our single frequency **BODYSTAT® 1500** unit, certain pre-test protocols are recommended. However, in the medical environment it is unlikely that these requirements necessarily apply and will vary from circumstance to circumstance.

Nevertheless, these pretest conditions are listed for information purposes only.

For accurate and reproducible results on repeat tests, it is very important that the subject is as normally hydrated as possible.

The following guidelines should ideally be followed.

- NO eating or drinking 4 to 5 hours prior to the test.
- NO exercise 12 hours prior to the test.
- NO alcohol or caffeine consumption 24 hours prior to the test.

Proper hydration is essential for a healthy body status.

DO NOT therefore perform a test after strenuous exercise.

The body would have lost excessive fluid through sweat and an abnormally low fluid level would increase the Impedance measurement resulting in an artificially higher fat % than would normally be the case.

For best results with repeat tests on the same subject over a period of time, many users try to perform the test the same time of day (e.g. early morning, before lunch) wherever practicable.

The above precautions are not specific to **BODYSTAT** but apply to all methods of body composition analysis (e.g. skinfold, hydrostatic weighing).

PREPARING SUBJECT FOR MEASUREMENT

Height and weight must first be accurately determined. Note that these input factors are required to determine body composition results of Fat, Lean, etc which is displayed on the **BODYSTAT®1500** unit.

However, where the subject weight is not available, the impedance measurement will still be displayed.

Ensure that the scale being used to measure weight has been accurately calibrated to measure to the nearest 0.1 kg or 0.2 lb.

For greater accuracy, it is preferable to measure height in metric, i.e. centimetres, as opposed to inches or half inches.

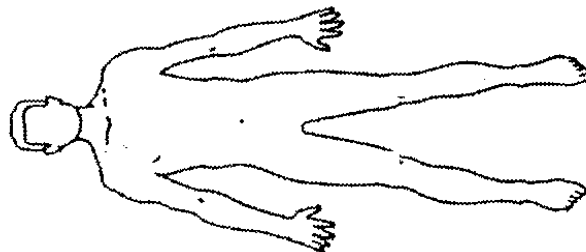
When repeat measurements are made on the same subject ensure that the **exact same** height as earlier measurements is used unless the subject has in the interim grown naturally in length.

Then have the subject remove the right shoe and sock or stocking, and lie flat with the arms and legs spread slightly as shown in the diagram.

NO parts of the body should be touching one another.

In some overweight cases the inner thighs may touch in spite of the legs being spread slightly. Ensure that this does not happen by further spreading the legs. The client should be in a comfortable relaxed position and then proceed to place the electrodes.

SUBJECT POSITION



PLACEMENT OF ELECTRODES AND LEADS

The self-adhesive disposable electrodes are attached to the **RIGHT** hand and **RIGHT** foot, in order to avoid the battery current (low voltage) passing through the side of the body where the heart is situated.

The **BODYSTAT 1500** has two sets of main leads which are then divided into a **RED** and a **BLACK** lead. *It does NOT matter which of the two sets of main leads is connected to the right hand or right foot.* The two sets of main leads are therefore interchangeable.

However, it is important to ensure that the **RED** leads are connected to the electrodes just behind the **finger** and **toe** as shown in the illustration.

Attach the crocodile clips to the exposed metal tab strip of the electrode.

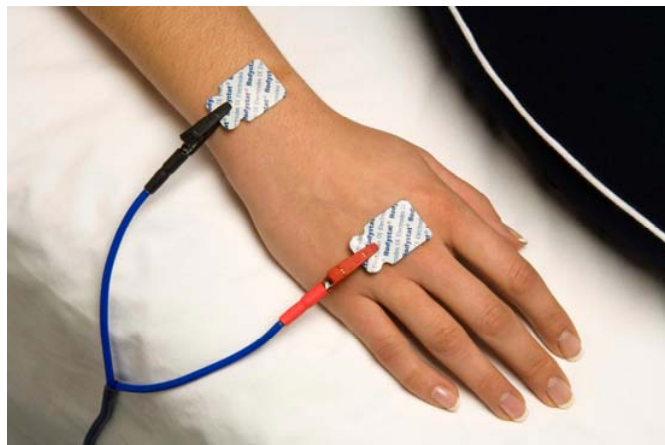
For convenience, the metal tab on the electrode should point in the direction from which the leadwire tension will occur as illustrated.

The **BLACK** leads are then connected to the electrodes on the right **wrist** and right **ankle**. Placement of the electrodes is as follows:

RIGHT HAND

RED LEAD: Behind the knuckle of the middle finger.

BLACK LEAD: On the wrist next to the ulna head.



RIGHT FOOT

RED LEAD: Behind the 2nd toe next to the big toe.

BLACK LEAD: On the ankle at the level of and between the medial and lateral malleoli (the large protruding bones on the sides of the ankle).

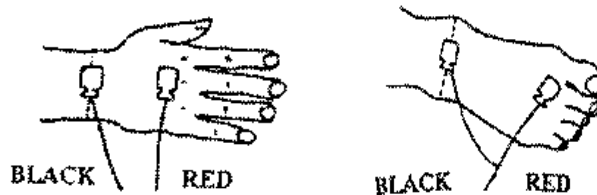


Once the subject is lying in the supine position, ensure that at least 4 minutes has elapsed before pressing the ENTER button on the equipment.

This is to ensure that the fluid levels have stabilized in the body before a measurement is performed.

IMPORTANT POINTS REGARDING MEASUREMENT

- Subjects should be measured on a non-conductive surface.
- **Correct placement of the BLACK INNER electrode on the wrist and the ankle is critical.**
- The electrode placement behind the fingers and toes is not as critical.
- Another easy way to find the correct position of **the black inner electrodes** is to **draw an imaginary straight line** between the protruding bones on the wrist and ankle as described above and illustrated in the diagram. Then place each electrode in the centre of that line with the line also passing through the centre of the electrode tab.



- **BLACK** leads are placed on the **BACK** (rear) of the hand and foot.
- Once the electrode sites have been selected it may be necessary to apply a solvent to remove excess skin oil. In research conditions it might be considered necessary to shave the site of excess hair. This is to ensure that good contact is made between the skin and the electrode. Poor contact will result in higher Impedance values resulting in an over-determination of body fat levels.
- The skin should be at normal body temperature and not be sweating.
- Once in place, press down on the electrodes to ensure good contact.
- Keep unused electrodes in the sealed plastic bag to ensure freshness.
- Only the **best quality BODYSTAT electrodes** as those supplied by **BODYSTAT LTD**, or their accredited distributors, should be used and **used only once**. This is to ensure accuracy of measurement and good reproducibility of tests.
- Pins in bones will not affect the body composition measurements.

ENTER SUBJECT DATA

Switch the **BODYSTAT 1500** unit **ON**. No message will be displayed on the LCD screen if the battery is flat, in which case replace the batteries with new ones.

Entering subject data is simple and quick. The operational principle of the three key pads is as follows:

<↑> **Increases** or changes a value;

<↓> **Reduces** or changes a value;

<↔> **Accepts** a displayed value and the next screen is automatically displayed.

By holding down the <↑> or <↓> key for longer than 3 seconds, *the rate of numerical change is accelerated*. Release the key and press again to revert to the normal speed.

Once the unit has been successfully switched on, the following messages will be displayed on the two line LCD screen:

TEST NUMBER = 100

The **BODYSTAT 1500** unit automatically allocates the next available number. The test number is used to identify the subjects' data if tests are to be recalled for viewing. It is, therefore, recommended that a manual record of the test numbers should be maintained against the respective subjects.

Press the <↔> key. The screen then displays:

GENDER Female

Press either the <↑> or <↓> key to switch between Male and Female. Press <↔> to select the displayed gender.

AGE 56 Yrs

Press the <↑> key to increase value.

Press the <↓> key to reduce the value.

HEIGHT
163 cm

Height may be displayed either in imperial, metric or omitted (refer **INSTALLATION MODE**).

Changes by 0.5" or 1 cm for greater accuracy of measurement.

WEIGHT
54.9 kg

Total body weight may be displayed in metric, imperial or omitted.

Changes by 0.2 lb or 0.1 kg for greater accuracy of measurement.

ACTIVITY(E.A.R.)
Very Low

Estimated Average Requirement, i.e. to estimate the "Activity" Metabolic Rate.

Options include:

Very Low (Note 1)

Low/Medium

Medium

Medium/High

Very High (Note 2)

Refer notes at end of this section.

WAIST
85 cm

Press the <↑> key to increase value.

Press the <↓> key to reduce the value.

HIP
91 cm

Press the <↑> key to increase value.

Press the <↓> key to reduce the value.

One of the four following messages will then be displayed. This will depend on the OPTIONS selected in the "**Installation Mode**".

**CONNECT
ELECTRODES**

This message is displayed if one or more of the entered values e.g. Age, etc. have been Omitted in the Installation Mode.

**CONNECT
ELECTRODES (O)**

This message is displayed when the user has selected the Default option in the Installation Mode on one or more of the entered values, e.g. Age, etc.

**CONNECT
ELECTRODES (D)**

This message is displayed when the user has selected one or more of the values to be Omitted **and** one or more values set to the Default option.

**CONNECT
ELECTRODES (O/D)**

The unit has already been connected to the four surface electrodes as fully explained in the **BODYSTAT MEASUREMENT** section of this manual and the required subject data has now been entered.

Ensure that the unit has been switched on for *at least one minute* before taking the electronic measurement and that the subject has been lying down for approx. 4 minutes for greatest accuracy of measurement and reproducibility of results.

Check the subject to ensure that all the electrodes and leads are firmly connected and that the subject is still lying flat in the correct position.

Press the <⇄> key.

If the leads have not been properly attached to the electrodes, a message will be displayed:

**FAULTY ELECTRODE
CHECK CONNECTION**

Re-check the electrode and lead connections. Ensure that the subject is still in the correct position and press the <⇄> key as before.

MEASURING

Wait a few seconds for the results to be displayed on the LCD screen. An audible signal will be heard indicating the completion of the electronic measurement.

The data has now automatically been saved and stored enabling both input and output subject data to be recalled at a later date.

The electrodes and leads may at this stage be removed.

The next screen that is automatically displayed is dependent on how the operator has set up the user selectable **DISPLAY OPTIONS** (refer **INSTALLATION MODE**) as defined in that section.

REPEATING A MEASUREMENT

In the event that you wish to repeat a measurement and provided that the unit **is not switched OFF**, it will hold the previous input data in it's memory. This will allow a quick re-test or simple amendment to an incorrectly keyed in parameter. Once the unit is switched off, it will revert to the default settings.

The user can select to change the default settings, refer to **INSTALLATION MODE**. This facility is useful if the same subject is being constantly measured over a period of time. This will allow the testing to be performed quickly, saving time for maximum operational efficiency.

ACTIVITY LEVELS

NOTE 1: *Very Low* - for a person with light energy expenditure at work and who has non-active leisure pursuits.

NOTE 2: *Very High* - for a person in energy-demanding work whose leisure time pursuits are also energy-demanding.

Refer **METABOLIC RATES** for detailed description for each of the five Activity Levels.

The ACTIVITY level has no effect on the body composition results. It is used only in the estimation of the Activity energy requirement (E.A.R.).

DISPLAY RESULTS

After successful measurement and processing of the subject data, the results are displayed as selected by the operator.

The **Top Line** displays the **Actual Measured Result**.
The **Bottom Line** displays the **Recommended** or **Optimal Range** for the subject measured.



Press either the \leftarrow or \rightarrow key to display the next screen.
Press the \uparrow key to scroll back to the previous screen.

The display results are automatically stored in memory and the operator can safely scroll backwards and forwards through the data by using the \uparrow and \downarrow keys.

FAT = 32.1% 22 - 30%	Actual Measurement Optimal Range
FAT = 17.6 kg 11 - 15 kg	Est. FAT Weight determines Health Risk
LEAN = 37.3 kg 36 - 40 kg	Est. Lean Muscle Mass includes Muscle, Water, Bone
TOTAL = 54.9 kg 48 - 53 kg	Total Actual Body Weight Optimal Weight Range
DRY LEAN WEIGHT = 7.6 kg	Lean excluding Water
WATER = 54.1% 50 - 60%	Fluid Level as % of Total Body Weight
WATER = 29.7 lt 27 - 33 lt	Est. Total Body Water Volume Optimal Hydration Range

BASAL MET. RATE
= 1253 kcal

Basal Metabolic Rate
(**ESTIMATED**)

BMR/Body Weight
= 22.8 kcal/kg

Basal Metabolic Rate
per Kg or lb of Body Weight

EST. AVERAGE REQ.
= 1754 kcal

ESTIMATED Average
(Energy) Requirement

BMI = 20.7
20 - 25

Body Mass Index
(Weight/Ht² in metric)

Waist / Hip = 0.93
High Risk = 0.80<

Waist/Hip Ratio *

IMPEDANCE
= 649 Ω

The Resistance to the
Flow of the Current

* Ratios above 0.95 for men and 0.86 for women, place the individual at significantly increased health risk of disease (American College of Sports Medicine Guidelines for Exercise Testing and Prescription 5th Edition Page 59).

RECALL SUBJECT DATA

This feature allows an operator to recall, at a later stage, both the input and output test data for manual recording purposes or entry into other computer software programs such as spreadsheets, etc. However, if the User has either of the two **Bodystat**[®] software programs, it may be more efficient to download the data into either program and then in turn to easily save the subject data in dbase or Excel/Lotus files.

At the time of subject data entry, a test number is automatically allocated by the **BODYSTAT 1500** unit. It is advisable to manually record the name of the subject being tested against that number. This will enable an operator to subsequently recall data of the correct subject number.

A maximum of 100 tests will be stored in the memory of the **BODYSTAT 1500** unit at any one time. When the memory reaches its maximum capacity FOR THE FIRST TIME, and a further test (number 101) is performed, the oldest number, i.e. test number 1, is automatically dropped from the memory.

At all times thereafter, the most recent 100 tests will always be stored but successive tests will be numbered in ascending order, i.e. 101, 102, 103, etc to a maximum number of 99,999. Thereafter, the numerical series will automatically revert back to number 1. Thus each test will maintain its own unique allocated number for subsequent recall purposes.

NOTE: Tests are automatically stored in memory after subject data has been entered and the **BODYSTAT 1500** unit has successfully performed a measurement.

Data is not lost after the unit is switched off or during battery replacement.

The **Recall** function may be accessed as follows:

While switching the unit **ON**, hold down the **<⇄>** key **FIRMLY, UNTIL** this screen is displayed:

**RECALL
DATA**

THEN only release the
<⇄> key to display:

**SELECT TEST
NUMBER = 236**

The number that will be displayed here each time this option is accessed, shall be the most recent test that was tested and saved immediately prior to selecting this option.

If it is necessary to access the oldest test, i.e. number **137** in this example, press the **<↑>** key after the **latest** test number is viewed (number 236). It automatically wraps round to the start of the 100 tests held in memory, i.e. number 137.

Press **<↓>** to reduce or **<↑>** to increase value and **<↔>** to select the displayed value.

INPUT subject data is first displayed:

GENDER	FEMALE
---------------	---------------

AGE	30 Yrs
------------	---------------

.... and so on, i.e. the data that was originally entered against that test number.

Followed by the **OUTPUT** data:

FAT = 22.6%
20 - 26%

.... and so on.

The **<↓>** key scrolls to the next screen. The **<↑>** key scrolls back to the previous screen display.

Press **<↔>** to **recall** a NEW TEST number. The same number that was previously selected will be displayed. Use the appropriate arrow keys to change the selection.

SELECT TEST
NUMBER = 236

To **EXIT** from this program switch off the **BODYSTAT 1500** unit.

NOTE:

- The **OUTPUT** data displayed will depend on what has last been saved in **DISPLAY OPTIONS** (refer **INSTALLATION MODE**) of the program. If the operator wishes to display, for example, only **FAT %**, the **DISPLAY OPTIONS** must first be amended.
- Test data originally stored in **kg** weights may be recalled in **lb** or **st/lb** and vice versa. Similarly, height may be entered in **ft/ins** and recalled in **cm**. In each case, simply change the options in **INSTALLATION MODE**.

DISPLAY SERIAL NUMBER

Access to the **BODYSTAT 1500** unit serial number may be necessary from time to time. This will be required for warranty purposes and when the upgrade **Bodystat® WINDOWS** software programs are purchased.

The serial number may be accessed as follows:

While switching the unit **ON**, hold down the **<↓>** key **FIRMLY**, **UNTIL** this screen is displayed:

Bodystat 1500
Version 3.17.10.11

THEN only release the **<↓>** key to display:

SERIAL #
= 210422 (2010)

The date displayed indicates the Year of Manufacture and can be ignored.

This screen is displayed for 5 seconds or for as long as the **<↓>** key is held down.

NEW SUBJECT DATA entry mode is then automatically accessed and this screen appears next:

TEST NUMBER
= 237

Either enter new subject data or switch the unit off.

ADDITIONAL INFORMATION

AGE OUT OF RANGE

The regression equation or formula used in the program of the **BODYSTAT 1500** unit for the determination of body composition, is suited for the age groups 18 to 70 years.

Age groups outside of this range may of course still be measured (for example, for regular monitoring of changes in body composition) but the results, in particular the recommended or optimal results, will have to be treated with caution.

If the age of the subject being measured is **between 12 and 17** or **older than 70 years**, the following message will be displayed before the first output message is displayed:

**TREAT RESULTS
WITH CAUTION**

Press the <↔> key to access the output results.

If the age of the subject being measured is **under 12 years**, the following message will be displayed:

**RESULTS MAY NOT
BE ACCURATE**

Press the <↔> key to access the output results.

An accurately measured Impedance value and the BMI equation will still be displayed in either of the above eventualities.

The **BODY MANAGER** optional software program provides for additional regression equations for these population groups and others. Simply download the data and apply the **Geriatric** or **Children's equation**. If looking at Metabolic rates, the User will need to select **Schofield** when applying the **Children's equation**. (Refer to separate **Windows User's Guide**).

RESULTS OUT OF RANGE

In the event that an error is made in the entering of subject data which may result in obviously ridiculous output results, e.g. FAT = 234% or FAT = -10%, the following message will be displayed:

**RESULTS
OUT OF RANGE**

RESULTS NOT AVAILABLE

If any of the input parameters have been omitted, e.g., Gender, Age, Height or Weight the following message will be displayed:

**RESULTS
NOT AVAILABLE**

Only the BMI and Impedance values will be displayed (and stored in memory).

IMPORTANCE OF TRACKING CHANGES

It may be important to note, even if the absolute percentage fat figures, for example, are suspect for a particular subject, that accurate measurements can still nevertheless be made on a regular basis to **monitor the changes in body composition** over a period of time.

Since the **BODYSTAT 1500** unit measures the Impedance value very accurately it has excellent reproducible qualities. This enables an operator to track whether fat or lean weight (for example) on the same subject is on the increase or decline. Thus even if there is some doubt as to the accuracy of the absolute figures, tracking the changes of body composition can help to determine whether any weight reducing or nutritional program, for example, is having the desired effect in that fat weight is reducing and/or lean weight is increasing.

The **Impedance value** on its own may also give the first signs of **changes in the nutritional status of a patient**. If the Impedance value increases over consecutive measurements (in terms of days, weeks or months, etc) it may indicate that the body is losing fluid (assuming that there is not a significant change in total body weight). This is because the electronic resistance to the flow of the current in the body when the measurement is taken has increased. Water is a good conductor of electricity and the less fluid in the body the higher therefore the resistance factor in the

body. This results in a higher Impedance value being registered by the **BODYSTAT 1500** unit and hence higher fat % figures and lower body fluid volumes.

METABOLIC RATES - BASAL (At Rest) and ACTIVITY LEVELS

Basal Metabolic Rates (BMRs), expressed either in kilocalories or kilojoules, are of interest to those concerned with estimating food requirements for the energy needs of a person.

The energy requirement may be defined as the amount needed to maintain healthy growth with an “appropriate” level of physical activity.

For each person there is a minimum level of energy required to sustain the vital elements of the body, such as body temperature, heartbeat, brain and lungs, to function at **REST**. This energy requirement, or BMR, is usually determined by accurately measuring oxygen consumption with the use of scientific calorimeters which are expensive and time consuming. However, various predictive equations have been developed and published to **estimate** the BMR of healthy people. The effects of disease should be considered separately.

Energy expenditure will be affected by the nature and level of physical activity, by the body weight (and composition), by age and gender.

Average BMR is not equal between genders - it is lower in women than in men at all ages. The lower BMR of women can be attributed to their larger percentage of body fat and smaller muscle mass.

Once the BMR at rest for a subject has been estimated using either of the available prediction equations, **the Estimated Average Requirement (E.A.R.)** may be calculated by applying a factor based on the average activity level of that subject. This is a means of estimating the overall daily energy expenditure of a person. With the **BODYSTAT 1500** unit, five levels of activity may be selected ranging from **Very Low** to **Very High**. Most people from our experience are probably fairly inactive.

The BMR predictive equation used by the **BODYSTAT 1500** unit is the **Brozek and Grande** formula. This is based on the measured **lean weight** of a subject and not on total body weight. It is after all, the lean tissue, rich in potassium, that essentially burns the excess kilocalories. However, in general, we have found that this BMR may be over-estimated by approx. 10% to 15%. The Brozek and Grande Formula is applicable to healthy individuals only and are not applicable to patients with a pathologic condition.

Other predictive equations such as the **Schofield** and **Harris-Benedict** equation, are based on **total body weight**.

The **BODYSTAT BODY MANAGER** software program allows a user to select either one of these three equations in determining BMR.

ESTIMATED AVERAGE (Energy) REQUIREMENT (E.A.R.)

To estimate the total daily energy expenditure level of a person, an assessment of the average activity level during a 24 hour period should be made when entering the data in the **BODYSTAT 1500** unit. This can only be a subjective assessment but the following table may help:

ACTIVITY LEVEL

Level of Activity	General	Activities
Very Low <i>Movement Restricted</i>	Generally inactive.	Laying at ease, sitting, writing, standing, driving.
Low/ Medium <i>Office/Light Work</i>	Recreational activities for short duration and at low intensity.	Cycling (5.5 mph/9 kph), bowling, golf, hiking, tennis, walking (2.5 mph/4 kph).
Medium <i>Weekend Recreation</i>	Sporadic involvement in recreational activities for short duration and at moderate intensity.	Aerobics (low intensity), badminton, cycling (9 mph/14 kph), gymnastics (light), skiing (alpine), swimming, tennis (competitive), ballroom dancing.
Medium/High <i>Moderate Exercise</i>	Moderate job activity and moderate exercise 3 times per week.	Basketball, cycling (11-14 mph/18-22 kph), canoeing (vigorously), disco dancing, martial arts, handball, rope skipping (60-80 rpm), running (5-6 mph/8-10kph), walking (5-6 mph/8-10kph).
Very High <i>Vigorous Exercise at Competitive Level</i>	Consistent job activity and vigorous exercise 4 times per week.	Aerobic (high-intensity), cycling (15-20 mph/24-32 kph), circuit weight training, calisthenics, field hockey, gymnastics (heavy), squash, ice hockey, handball, racquetball, rope skipping (120-140 rpm), soccer, running (7-9 mph/11-14 kph), cross-country skiing (7-9 mph/11-14 kph), swimming (55-70 yds/min / 46-64 metres/min)

BODY MASS INDEX (BMI)

BMI was established as a **guide** for most people as a measure of weight status for healthy adults aged 20 to 65 years. **It is not therefore, suitable for children.**

BMI is calculated as **WEIGHT** in **KILOGRAMS** divided by **HEIGHT** in **METRES** squared.

Example: Weight = 85.0 kg Height = 1.72 metre
BMI = $85.0 / (1.72)^2$
= $85.0 / 2.96$
= **28.7**

In the absence of a direct measure of body fat, it is an index based on weight and height.

BMI is limited in its prediction of correct body fat for a given individual for a number of reasons:

- A large framed person heavy in muscle in relation to height can give a BMI in the obese range and yet not be over-fat;
- Similarly, BMI will categorize individuals with a small frame mass relative to their height as being underweight;
- Individuals with short legs for their upper body height have a higher BMI.

BMI is itself NOT a direct measure of fatness. It is only a generalised measure of proportional weight.

With the advancement of technology and the development of the principles of Bioelectrical Impedance Analysis (BIA), we now have equipment, such as the **BODYSTAT 1500** units, to measure body fat levels more precisely.

The **BODYSTAT** body composition monitoring units can measure changes in body fat levels in individuals undergoing weight loss or gain with greater accuracy and precision than the use of BMI.

BMI guidelines

Below 18	=	Very Underweight
18 - 20	=	Underweight
20 - 25	=	Healthy Weight Range
25 - 30	=	Overweight
30 +	=	Obese

SECTION B

**TECHNICAL
INFORMATION**

FAULT FINDING

The **BODYSTAT 1500** has been designed with the use of the highest component quality standards in mind to give our customers years of trouble-free service.

However, there may be the odd occasion when a unit does not perform to its full specifications. This is generally due to some electronic component failure beyond the control of **BODYSTAT LTD**.

Nevertheless, typical faults that have been encountered are listed below:

“UNIT IS SWITCHED ON BUT THE LCD SCREEN REMAINS BLANK”

Check that the batteries have been inserted correct.

If the batteries have been inserted correctly, then check each battery connector in the battery compartment. Particularly when **ALL** the batteries have just been replaced, and the unit is switched on but nothing is displayed on the LCD screen, it may be that there is no contact between the battery terminal and the battery connector. This could be due to the round metal clamps on the connectors having opened up through successive replacement of the battery.

In this event use a pair of pliers to gently squeeze the clamps back into position. This will again ensure a solid contact between the battery terminal and the connectors.

“% BODY FAT READINGS ARE ALWAYS CLEARLY INCORRECT”

Since the **BODYSTAT 1500** unit uses the unique Lock-in Signal Conversion Technology, you cannot calibrate the unit yourself.

However, a **BODYSTAT** calibrator is supplied with each unit to enable the operator to independently verify that the unit remains in calibration at all times. Refer to the **CALIBRATION** section for full details on how to perform this check.

Should the unit still remain out of calibration even after all new batteries have been fitted, the fault could lie in the fine copper wires connecting the lead wires to the crocodile clips which may have been damaged or broken. The result is that the Impedance

values are no longer being measured accurately resulting in false % fat readings.

Please note that the BODYSTAT WARRANTY does not cover damage to the lead wires & crocodile clips due to customer misuse.

If the unit is still out of calibration even after replacing the lead wires, it may be due to a malfunction of the electronic memory micro processor in the **BODYSTAT 1500** unit. In this event, the only alternative is to return the unit to your dealer or direct to **BODYSTAT LTD** for factory repair.

“STRANGE CHARACTERS ARE DISPLAYED ON THE LCD SCREEN”

This may be due to a malfunction of the liquid crystal display (LCD) screen arising perhaps from the unit having been dropped onto a concrete or other hard surface or other accidental damage.

In such event the crystals may have been damaged beyond repair and the LCD screen will have to be replaced. Return the unit to your dealer or direct to **BODYSTAT LTD** for factory repair.

NOTE

All out-of-warranty repairs will be charged for at reasonable rates and returned as speedily as possible.

CALIBRATION

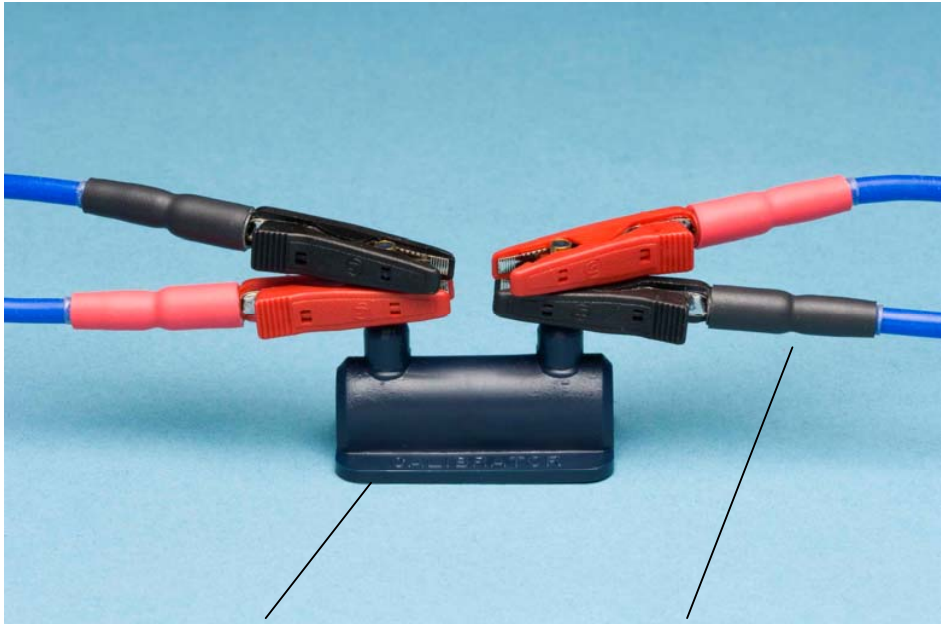
To ensure that correct results of body composition are displayed at all times, a **BODYSTAT** calibrator is supplied with each **BODYSTAT** unit to enable the operator to independently verify that the unit remains in calibration at all times.

This should be done from time to time perhaps weekly depending on frequency of use. However, this is only an independent check and an operator will not be able to physically re-calibrate the unit nor will there be a need to do so.

PROCEDURE

1. Attach one pair of red and black leads from either of the main leadwires to any one terminal of the calibration unit.
2. Attach the other pair of red and black leads from the remaining main leadwire to the other terminal of the calibration unit.
3. Switch the unit **ON** and enter any subject data or accept the default displays on the LCD screen.
4. The leads have already been attached to "**ELECTRODES**" (i.e. the calibrator) and after "**MEASURING**" is displayed, the Impedance value should reflect a reading of between **496** to **503**.
5. If the reading is outside of this range, first replace BOTH lead wires.
6. If the unit remains outside the calibration range, replace **ALL 6** batteries with **ONLY** Duracell or Procell batteries (**DO NOT use RECHARGABLES**).
7. If the unit still remains out of range, contact **BODYSTAT LTD** or your local **BODYSTAT** dealer.

CALIBRATION CHECK



Bodystat Calibrator

**Red & Black
Crocodile Clips**

Impedance to read between 496 & 503

BATTERY REPLACEMENT

Due to its unique electronic design, **BODYSTAT LIMITED** estimates an approximate **40 to 50** hour battery life from the batteries supplied with the **BODYSTAT 1500** unit.

The exact specification for batteries is:

**6 x AA Type LR6 batteries. Alkaline 1.5V.
MN1500. NON-rechargeables.**

ONLY **Duracell** or **Procell** batteries are recommended.
Do not use Type R6 Carbon zinc batteries.

When the device is switched **ON** with a new set of batteries, 6 black squares will appear on the LCD screen. As power is consumed fewer black squares will appear. When only one square is visible it may become necessary for replacement of **ALL** six the batteries.

However, a warning will be displayed on the LCD screen when the battery power is too low and needs IMMEDIATE replacement before further use is made of the **BODYSTAT 1500** unit:

**REPLACE
BATTERY**

If the unit has been switched **ON** and no data has been entered for 60 seconds, an **alarm signal** sounds to warn the operator that the unit is still on and that battery power is being utilized.

It is highly recommended that the batteries should be removed from the Bodystat unit should the unit not be used for some time.

Keep battery contact surfaces and battery compartment contacts clean by rubbing them with a clean pencil eraser or a rough cloth each time you replace batteries.

WARNING



Ensure the unit is switched OFF when replacing the batteries.

SUPPORTING LITERATURE and VALIDATION

Additional reading matter on principles of [Bioelectrical Impedance Analysis \(BIA\)](#).

1. **Methods for assessment of human body composition: traditional and new.** Lukaski HC et al, *Am.J.Clin.Nutr.*, (1987) **46**: 537-556.
2. **Lean body mass estimation by bioelectrical impedance analysis: a four-site cross-validation study.** Segal KR et al, *Am.J.Clin.Nutr.*, (1988) **47**: 7-14.
3. **Alterations in body fluid content can be detected by BIA.** Scheltinga et al, *Journal of Surgical Research* (1991) **50**: 461-468.
4. **A comparison of four commercial systems used to measure whole body electrical impedance.** Smye SW et al, *Physiological Measurement* (1993) **14**: 473-478.
5. **Estimation of total body water by bioelectrical impedance analysis.** Kushner RF et al, *Am.J.Clin.Nutr.*, (1986) **44**: 417-424.

SPECIFICATIONS

MEASUREMENT:

- Measuring Principle : Bioelectrical Impedance Analysis (BIA) Lock-in Signal Conversion Technology.
- Impedance Measuring Range : 20 - 1300 Ω (ohms)
- Accuracy : $\pm 2 \Omega$ (ohm)

TEST CURRENT : 200 Micro-Amps R.M.S. (Root Mean Square)

WAVEFORM : Sinusoidal

PC COMMUNICATION : Bluetooth Wireless Interface (optional)

FREQUENCY : 50 KHz (KiloHertz)

INTERNAL POWER SOURCE :
6 x AA Type LR6 batteries. Alkaline 1.5V. MN1500. NON-rechargeable. Duracell battery preference.
Do not use type R6 Carbon zinc batteries.

(DO NOT CONNECT AN EXTERNAL POWER SUPPLY)

OPERATING TEMPERATURE : +5°C to +45°C

STORAGE TEMPERATURE : 0°C to +60°C

HUMIDITY : Less than 70% R.H. (relative humidity) up to +60°C - non-condensing

(It should therefore NOT be used in an area where condensation could form on the inside of the casing.)

ATMOSPHERIC PRESSURE : 860 hPa to 1060 hPa

There are no serviceable components