

# LaserAce<sup>®</sup> Hypsometer

Heighting, Diameter & Log Volume Instrument with Data Storage



A WORLD LEADER IN LASER MEASUREMENT TECHNOLOGY

| CONTENTS  | PAGE      |
|---|-----------|
| <b>1 Contact Information and Warranty</b>                           | <b>3</b>  |
| 1.1 Dear Customer .....   | 3         |
| 1.2 About this LaserAce <sup>®</sup> Hypsometer User's Manual ..... | 4         |
| 1.3 Product Warranty .....  | 5         |
| <b>2 Introduction</b>   | <b>6</b>  |
| 2.1 LaserAce <sup>®</sup> Hypsometer .....                          | 6         |
| 2.2 Key Features .....  | 7         |
| <b>3 Safety Information</b>   | <b>8</b>  |
| 3.1 Laser Safety .....  | 8         |
| 3.2 Electromagnetic Compatibility and Emissions .....               | 9         |
| 3.3 Batteries .....   | 9         |
| <b>4 Handling and Storage Precautions</b>                           | <b>10</b> |
| 4.1 Handling .....  | 10        |
| 4.2 Storage .....   | 10        |
| <b>5 Preparation for use</b>  | <b>11</b> |
| 5.1 Power Supply .....  | 11        |
| 5.2 Hand-strap .....  | 12        |
| 5.3 Data Cable .....  | 13        |
| 5.4 Cable Pin Description .....                                     | 14        |
| 5.5 RS232 Interface .....   | 15        |
| 5.6 Bluetooth <sup>®</sup> .....                                    | 15        |
| 5.7 Setup .....   | 16        |
| 5.7.1 Units .....   | 17        |
| 5.7.2 Configuration .....   | 18        |
| 5.7.3 Offsets .....   | 21        |
| <b>6 Operation</b>  | <b>23</b> |
| 6.1 Overview of Applications .....                                  | 23        |
| 6.2 Switching On .....  | 24        |
| 6.3 Switching Off .....   | 24        |
| 6.4 Key Selection .....   | 25        |
| 6.5 Buzzer .....  | 25        |
| 6.6 Basic Instrument Functions .....                                | 26        |
| 6.7 Principle of Operation .....                                    | 27        |
| 6.8 Hand-held Operation .....                                       | 28        |

|           |  |           |
|-----------|--|-----------|
| <b>7</b>  | <b>Main Menu</b>   | <b>29</b> |
| 7.1       | Menu Selection .....   | 29        |
| 7.2       | Rangefinder .....  | 30        |
| 7.3       | Tree Diameter .....  | 32        |
| 7.4       | Length/Lean/Volume .....   | 34        |
| 7.4.1     | Single Point .....   | 34        |
| 7.4.2     | Two Point .....  | 35        |
| 7.4.3     | Three Point .....  | 38        |
| 7.4.4     | Download .....   | 42        |
| 7.4.5     | Print Tree Table .....   | 42        |
| 7.4.6     | Clear Memory .....   | 42        |
| <b>8</b>  | <b>Data Format</b>   | <b>43</b> |
| 8.1       | NMEA Output Format .....   | 43        |
| 8.2       | Format of Tree Measurement String .....                            | 44        |
| <b>9</b>  | <b>Bluetooth® on PC</b>  | <b>45</b> |
| 9.1       | Installing BELKIN® USB 'Bluetooth®' Adapter .....                  | 45        |
| 9.2       | Troubleshooting .....  | 45        |
| 9.3       | Running the 'Bluetooth®' Software for the First Time .....         | 46        |
| 9.4       | Configuring HyperTerminal to use 'Bluetooth®' Communications ..... | 46        |
| <b>10</b> | <b>Bluetooth® on Pocket PDA</b>                                    | <b>47</b> |
| 10.1      | Bluetooth® General .....   | 47        |
| 10.1.1    | Option 1: Use favourite .....                                      | 47        |
| 10.1.2    | Option 2: New search on connection .....                           | 47        |
| 10.2      | Bluetooth® on HP iPaq .....  | 48        |
| 10.2.1    | iPaq Find new .....  | 48        |
| 10.3      | Recon Bluetooth® using Socket C.F. Card .....                      | 49        |
| 10.3.1    | Search make favourite .....  | 49        |
| 10.3.2    | Bluetooth® Connection .....  | 51        |
| <b>11</b> | <b>Troubleshooting with Bluetooth®</b>                             | <b>52</b> |
| 11.1      | PC Examples .....  | 52        |
| 11.2      | PDA Examples .....   | 54        |
| <b>12</b> | <b>Technical Details</b>   | <b>56</b> |
| 12.1      | Specification .....  | 56        |
| <b>13</b> | <b>Notes</b>   | <b>57</b> |

## 1 Contact Information and Warranty

### 1.1 Dear Customer

We would like to congratulate you on the purchase of your LaserAce® Hypsometer. You are now the owner of a high quality, personal laser surveying system. This instrument is easy to operate.

However, we would ask you to take the time to carefully work through this user's manual before using the instrument and keep the manual with the unit at all times.

If your instrument requires a service, contact us at:

Measurement Devices Ltd.  
Silverburn Crescent  
Bridge of Don Industrial Estate  
Aberdeen  
AB23 8EW  
Scotland  
UK

Tel: + 44 (0) 1224 246 700  
Fax: + 44 (0) 1224 824 987  
email: [support@mdl.co.uk](mailto:support@mdl.co.uk)  
Web: <http://www.mdl.co.uk>

Alternatively, for information on your nearest service and support centre visit our web site at <http://www.mdl.co.uk>

To enable us to give you our best help, please obtain the serial number, which can be found on the back of the instrument.

Thank you.

## 1.2 About this LaserAce® Hypsometer User's Manual

Patent applied for.

LaserAce® is a registered trademark of Measurement Devices Ltd.

THIS MANUAL HAS BEEN COMPILED WITH CARE. HOWEVER, SHOULD YOU DISCOVER ANY ERROR, WE WOULD BE GRATEFUL IF YOU COULD CONTACT THE MARKETING DEPARTMENT DIRECT. [marketing@mdl.co.uk](mailto:marketing@mdl.co.uk)

It is important that you read this manual carefully before using the instrument.

Reproduction in whole or in part, including utilisation in machines capable of reproduction or retrieval, without the express written permission of MDL is prohibited. Reverse engineering is also prohibited.

©Copyright 2006 Measurement Devices Ltd. The programs that control this product are protected by copyright and all rights are reserved. Reproduction, adaptation, or translation of these programs without the express written permission of MDL is prohibited.

All trademarks used in this manual are recognised.

The information in this document is subject to change without notice.

Manual Issue Status:

| Date    | Issue | Reviser |
|---------|-------|---------|
| 08/2004 | 1.0   | SJ      |
| 11/2004 | 2.0   | SR      |
| 01/2005 | 3.0   | SR      |
| 09/2005 | 4.0   | SR      |
| 01/2006 | 5.0   | ESB     |
| 06/2006 | 6.0   | SR      |

### 1.3 Product Warranty

- a) Unless otherwise specified, MDL warrants the equipment for a period of twelve months from date of delivery. This warranty is given subject to the following conditions:
  - I. MDL shall be under no liability in respect of any defects in the equipment arising from any drawing, design or specification supplied or modification requested by the customer.
  - II. MDL shall be under no liability in respect of defects arising from fair wear and tear, wilful damage, negligence, abnormal working conditions, failure to follow MDL's instructions (whether oral or in writing), misuse or alteration or repair of the equipment without MDL's approval.
- b) Claims in respect of defective equipment must be intimated by notice in writing to MDL and the equipment must be retained by the customer pending written instructions from MDL.

Following authorised return of the equipment, which must be made by the customer on a freight prepaid basis, MDL will examine the equipment. If the claim is justified, at MDL's option, MDL will repair or replace the defective equipment without charge and MDL will have no further liability to the customer.

## 2 Introduction

### 2.1 LaserAce® Hypsometer

#### LaserAce® Hypsometer with built-in inclinometer



The LaserAce® Hypsometer was designed to help foresters easily and efficiently measure the height of a tree, its diameter (at any height), simple or 'taper' log volumes and tree lean. This multi-role capable instrument is simple to use with selectable modes to suit the required role, these include;

- Measuring reflectorless ranges up to 150m/500'
- Brush filter mode (for use with reflective tape)
- Critical range gating for area plots
- Critical height and diameter detection
- Heighting (with built in inclinometer)
- 2-point height and lean measurement
- 3-point height measurement
- Diameter measurement
- Log volumes
- Plot sampling.

The LaserAce® Hypsometer incorporates an onboard multi-function computer. This computer stores results (up to 2000 trees) for later viewing and/or downloading to PCs or PDAs using the onboard Bluetooth® (or RS232) data link. The onboard memory provides users with cableless data storage out in the field.

The internal microcomputer forestry software program automatically carries out mathematical calculations for instant results in the field.

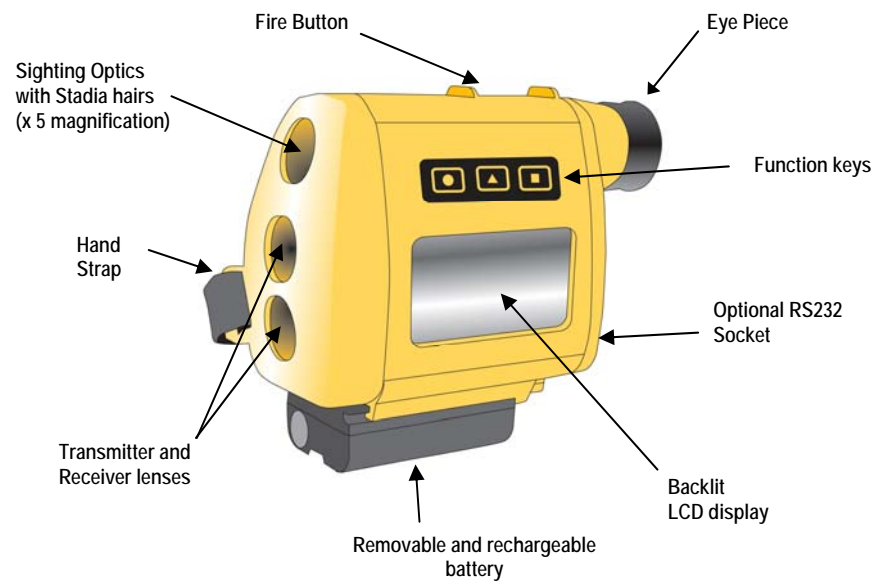
For diameter measurement, the LaserAce® Hypsometer incorporates a specially designed scope (x 5 magnification) and stadia hairs. During operation the (numbered) stadia hairs are used to bracket either side of a tree trunk. On firing the laser, the user can determine the correct diameter of the tree.

The unit has been designed for simple effortless use – point and shoot technology. There is no need for bulky accessories, targets or responders - it does it all in one single compact unit, affording users considerable cost savings on field operations.

## 2.2 Key Features

- Class 1 eye safe laser (FDA/IEC)
- 150m/500' reflectorless range (no reflective target)
- 600m/2000' range with reflector
- Accuracy 5cm/2"
- Range resolution 1cm/0.4"
- Distance measurement in metres/feet
- Angles in degrees/gons
- Low battery indicator and warning buzzer
- Simple telescopic sighting scope with integrated stadia hairs (x 5 magnification)
- RS232/Bluetooth® data interface (option)
- Water & dust resistant (IP63)
- Digital inclinometer: Range +/-70°: Accuracy 0.2° at level
- 'Camcorder' type rechargeable batteries (normal use 8hrs) (charger supplied)
- Weight 400g/14oz
- Size: 110mm L x 100mm W x 50mm H (4.33" L x 3.94" W x 1.97" H).

### LaserAce® Hypsometer Features



### 3 Safety Information

#### 3.1 Laser Safety



The LaserAce® Hypsometer is classified as a Class 1 eye safe laser product in compliance with the European eye safety regulation CENELEC EN60825-1 (2001) and US federal requirements (FDA/CDRH) 21 CFR 1040.10 and 1040.11 (except for deviations pursuant to Laser Notice no. 50, dated July 2001).

**CAUTION!** Use of controls or adjustments or performance of procedures, other than those specified herein, may result in hazardous radiation exposure.

Never open the instrument's housing!

**WARNING** – Opening the protective housing may result in exposure to Class 3B radiation.



(This caution label is positioned inside the outer housing on the access panel to the laser emitter. It is therefore only visible by qualified maintenance engineer prior and after access to the laser emitter)

Do not operate evidently damaged instruments! If the instrument is handled incompetently, the manufacturers absolve themselves from honouring any guarantee or insurance whatsoever.

Do not unnecessarily look into the transmitter lens of the LaserAce® Hypsometer!

This product is intended for use in a locale where the emitted radiation is unlikely to be viewed with optical instruments.

Nevertheless, we recommend that the instrument is not directly pointed at people's eyes, (*especially if they are using binoculars*).

Aligning the LaserAce® Hypsometer with the lenses of CCD-cameras or infrared night vision devices can result in damage to them and is therefore not permitted.



### 3.2 Electromagnetic Compatibility and Emissions

The LaserAce® Hypsometer meets or exceeds the requirements of the following European Standards:

EN 55022: 1998 Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.

EN 55024: 1998 Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurement.

EN 55024 refers to the following specifications:-

EN 6100-4-2: 1995 Electromagnetic Compatibility Part 4. Testing and Measuring Techniques. Section 2. Electrostatic Discharge.

EN 61000-4-3: 1996 + A1 Electromagnetic Compatibility Part 4. Testing and Measuring Techniques. Section 3. Electromagnetic Field Immunity.

### 3.3 Batteries

Dispose of used batteries sensibly. Under no circumstances must the batteries (or instrument) be disposed of by burning. EXPLOSION MAY OCCUR!

## 4 Handling and Storage Precautions

### 4.1 Handling

The LaserAce® Hypsometer is a reflectorless system. **DO NOT USE** reflectors at ranges below 100m, for ranges above 150m, reflectors may be employed.

Note: **DO NOT USE** 'LAST HIT' Mode with reflectors.

Avoid mechanical shock.

Operate within the environmental temperature limits of  $-10^{\circ}\text{C}$  to  $+45^{\circ}\text{C}$ .

Avoid directing the LaserAce® Hypsometer towards the sun or other high power, infrared light source.

Do not use paint solvents to clean the instrument; use mild detergent applied using a cloth.

### 4.2 Storage

If the instrument remains unused for several weeks, it is advisable to remove the battery from the base of the instrument.

Store within the environmental temperature limits of  $-25^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ .

## 5 Preparation for use

### 5.1 Power Supply

An external 7.2V Lithium Ion 'camcorder' battery powers the instrument.



Note: The battery must be charged before use.

A low battery indicator will show the power available from the battery, if it is not fully charged.



When the battery reaches Low Battery status, the symbol will flash and a beeping noise will be heard. The unit will then display the screen as below, before switching itself off.

**LOW BATTERY POWER  
SWITCHING OFF**

5.2 Hand-strap

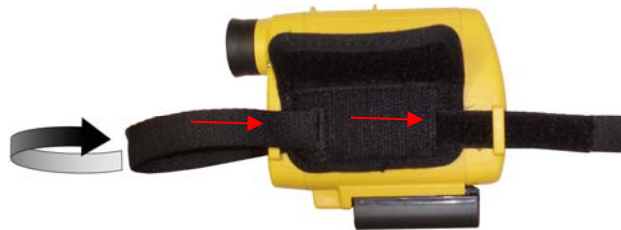
1. Position unit and strap as shown.



2. Pass the strap into the Back Ring Mount until Hand Pad sits between both Ring Mounts.



3. Fold the Strap and insert it into the Hand Pad passing holes from left to right and through the Front Ring Mount.



4. Fully pass the strap through the Front Ring Mount.



5. Fold the strap and lay it on the Hand Pad.



6. Cover the strap with the pad.



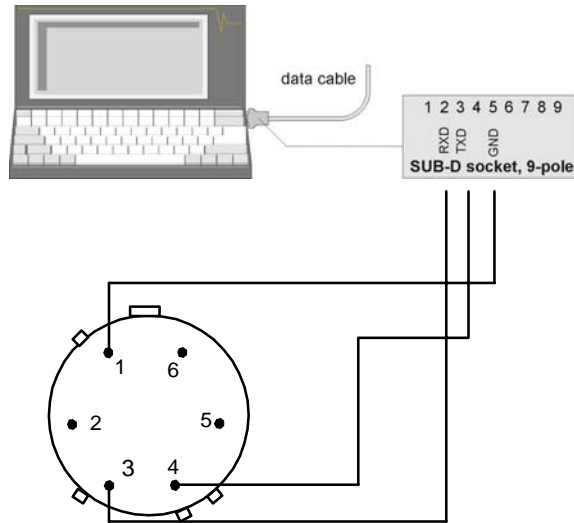
### 5.3 Data Cable

If you have purchased a LaserAce® Hypsometer with the external RS232 port, a 1.5m data cable is also supplied. The cable pushes into the RS232 Data Socket on the LaserAce® Hypsometer and is placed into an RS232 (serial) socket on your data logger.

**5.4 Cable Pin Description**

Connection of a data cable to the instrument RS232 socket.

Note the position of the alignment studs when identifying the pin numbers on the connector.



The above diagram shows the pin configuration for a 9 pin serial connector, which connects to the instrument. The Pin outs for the Data Cable are shown below.

| LaserAce® Hypsometer Pin | Assignment |
|--------------------------|------------|
| 1                        | GND        |
| 2                        | -----      |
| 3                        | RXD        |
| 4                        | TXD        |
| 5                        | -----      |
| 6                        | -----      |

## 5.5 RS232 Interface

If the LaserAce® Hypsometer is fitted with an RS232 output port, the configuration of the pins is described in the diagrams above.

Each time a measurement is taken with the LaserAce®, data is transmitted out of the RS232 port.

The default parameters for this data transfer are as follows:

|                  |       |
|------------------|-------|
| Baud rate        | 57600 |
| No. of Bits      | 8     |
| No. of Stop Bits | 1     |
| Parity           | None  |
| Handshaking      | None  |

## 5.6 Bluetooth®

If you have purchased a LaserAce® Hypsometer with Bluetooth® capability, then data is transmitted via Bluetooth® to your Bluetooth® enabled Data Logger. Note that to enable Bluetooth® communication you will need to configure your Data logger accordingly. See sections 9 to 11 for examples of how to configure Bluetooth® on PC and Pocket PDA.



## 5.7 Setup

This is a representation of the setup menu screen, which can be accessed from the main menu screen.

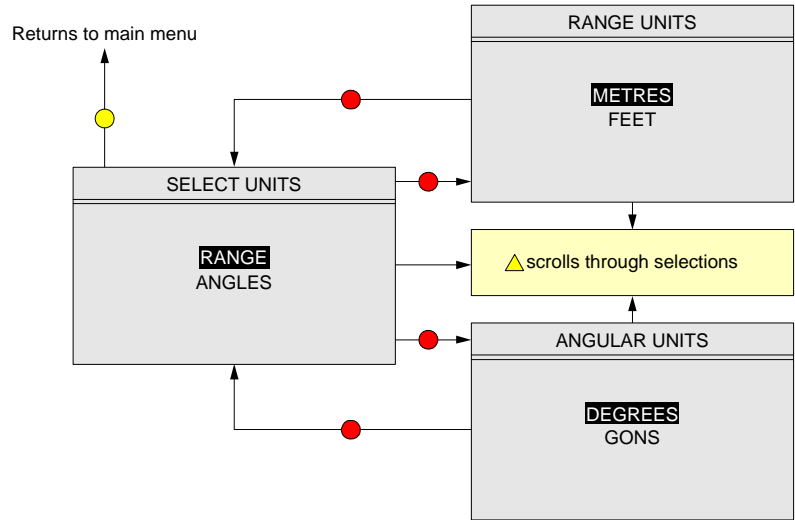


From this menu you can change various parameters in the LaserAce® Hypsometer i.e. units such as range (metres/feet) and angles (degrees/gons) etc. See the following sections for more detail.

To make a change to the LaserAce® Hypsometer press the ▲ key to scroll through the selections and then the FIRE key to make your selection.



5.7.1 Units



Units can be changed in the units sub-menu. Ranges can be displayed in metres or feet and angles in degrees or gons.

You can make a selection within these screens using the ▲ key to scroll through the options and by pressing the FIRE button to accept your selection.

## 5.7.2 Configuration

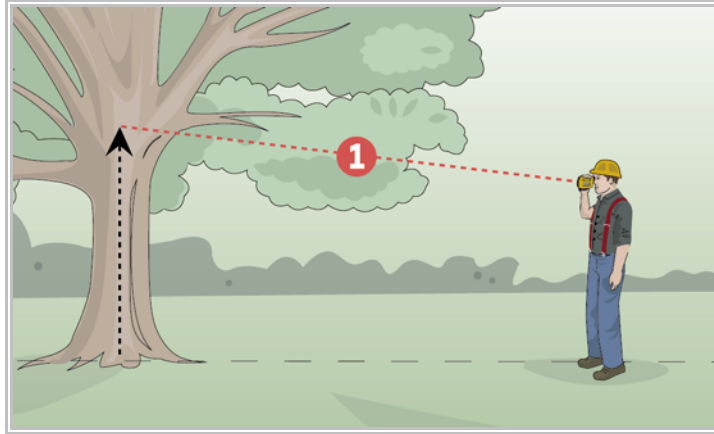
The same key presses and flow apply to the configuration sub menu as for the units sub menu in the previous section.

The user can make a selection within these screens using the ▲ key to scroll through the options and by pressing the FIRE button to accept the selection.

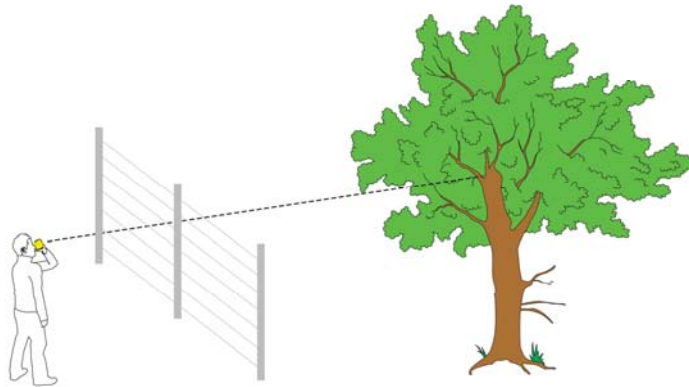
The user can change the configuration of the LaserAce® Hypsometer by using the configuration sub menu within the Setup menu screen. Most of these are self-explanatory but particular attention should be paid to the ranging interface configuration options.

Three choices exist in the Ranging menu; FIRST HIT, LAST HIT and BRUSH FILTER. These can be useful under certain conditions.

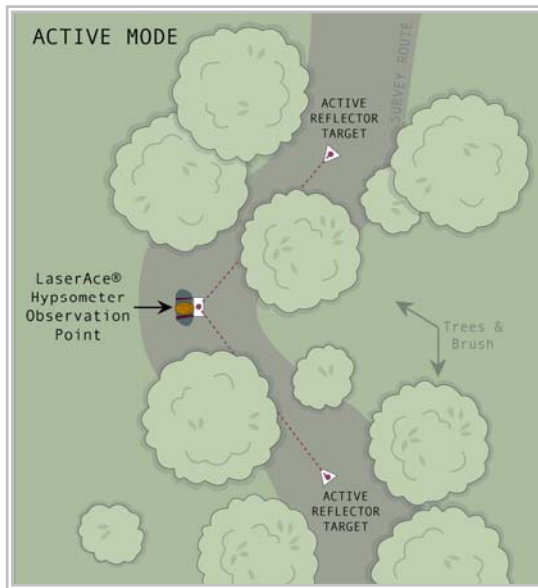
FIRST HIT is the 'standard' mode used for most types of operation where you have a clear sight of a target.



LAST HIT mode instructs the laser to return the last detectable hit in a multiple hit scenario. This mode is intended to help range through a limited type of single obstructions, such as wire fencing or glass. It is also a requirement that the distance between the initial obstruction and the ultimate target has to be several metres in order for a valid range to be calculated.



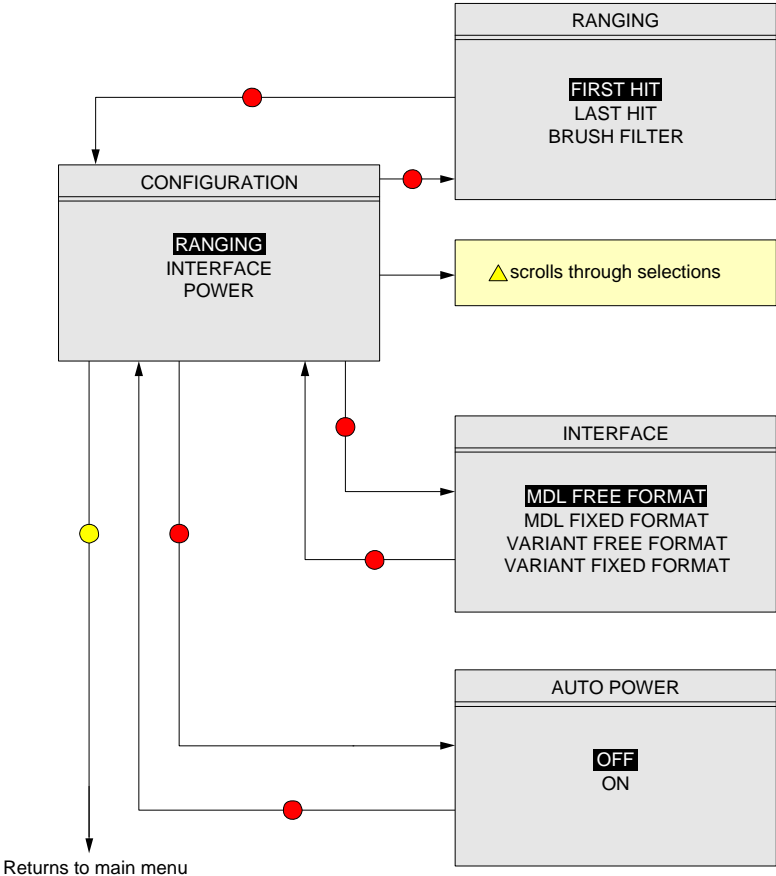
LAST HIT mode cannot be used with reflective targets or prisms nor used to calculate ranges to objects which have numerous obstructions in their path i.e. scrub, trees, brush, double glazing, etc.



BRUSH FILTER mode instructs the laser to only operate to active (reflective) targets. The recommended target is a piece of 3M reflective foil (150mm x 150mm/6" x 6" at 100m range). The laser is NOT to be used to prisms in this mode as the signal returned may be too strong and could lead to errors.

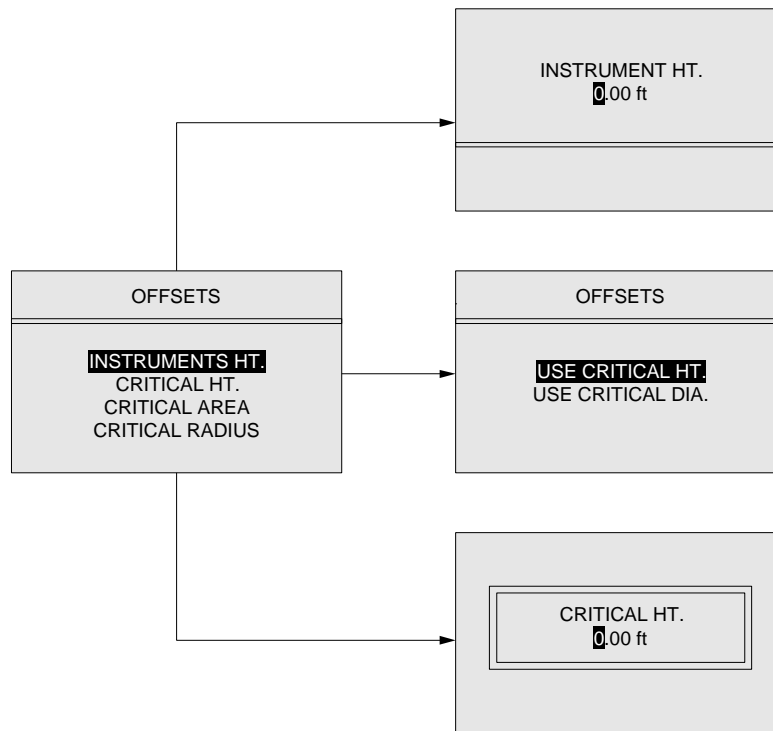
This mode is provided to enable the laser to measure through obstructions (scrub, tree, brush) to the required point where the target has been positioned. The laser can operate through relatively dense obstructions but must be able to see at least part of the target.

Flowchart of options



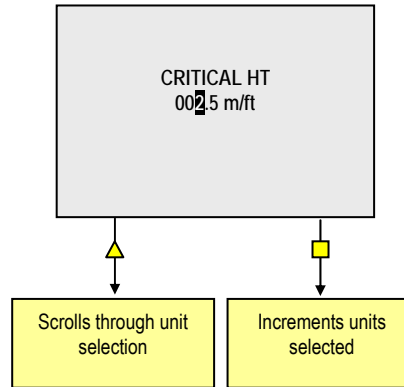
## 5.7.3 Offsets

There are four options available within the Setup Menu Offset functions.



**INSTRUMENT HT.** – allows the height of the unit from ground level to be entered (ie to eye-level), this is used in the Range Finder mode. The entered instrument height is added to the VD (vertical distance) calculated and displayed in this mode so VD (vertical distance) is the height from ground level of your observation (not your eye level, as before).

A plus sign (+) is displayed next to the VD (vertical distance) to show the user that the reading is using an instrument height, this disappears if the user has 0.00 as an instrument height.



The user is asked to use either Critical Height or Critical Diameter to sound alert in two point and three point height methods in length/lean/volume mode.

The CRITICAL HEIGHT offset allows you to enter a height that the instrument will sound an alert once it has been reached. After recording the diameter and the bottom measurement as you move the instrument upwards the unit will beep once the critical height has been reached. Pressing the fire button again will complete the measurement.

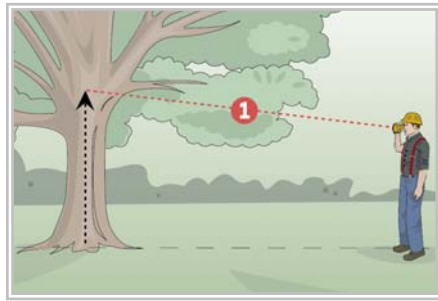
If CRITICAL DIAMETER is set to some non-zero positive value, once a diameter has been measured, using the tapering factor the LaserAce® unit calculates the height at which the critical diameter would be on the tree trunk. Hence as the user moves the instrument along the length of the tree, the unit beeps when the height corresponding to the critical diameter is reached. This way the LaserAce® Hypsometer can be used to measure tree logs with diameters not smaller than the critical diameter.

The CRITICAL AREA & CRITICAL RADIUS options are interrelated, i.e. when one gets changed, the other gets updated as well. Critical area is a circular area within which the user might want to measure trees and not include any tree beyond the critical area with the LaserAce® Hypsometer positioned at the centre of the circular area. The corresponding radius is the Critical Radius; if the Critical Radius is set to any value (other than zero) the laser will not range beyond Critical Radius.

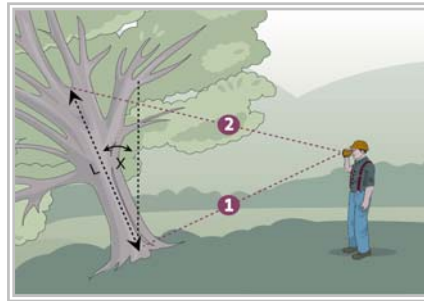
NOTE: Critical Radius cannot be greater than 199 metres to limit excessively large critical area.

6 Operation

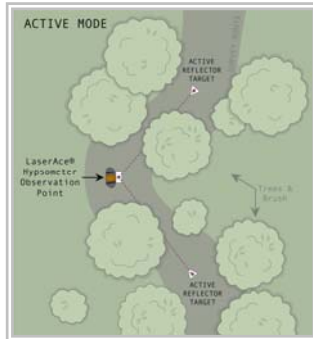
6.1 Overview of Applications



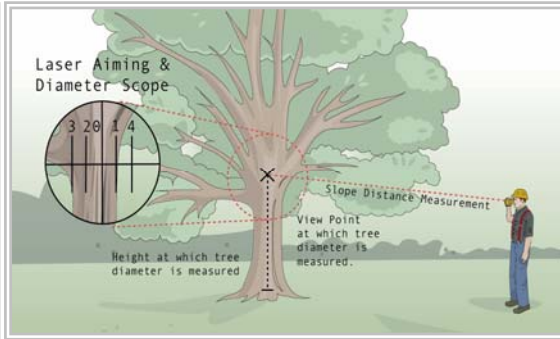
Height measurement



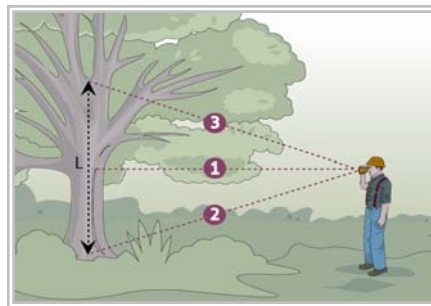
2-point height & lean



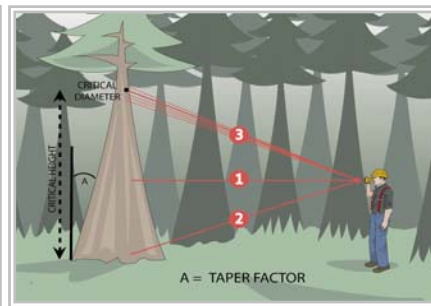
Using 'Brush filter mode' (reflecting) targets



Single-point height and diameter (showing stadia scope)



3-Point height/diameter/volume in scrub



Taper factor for volume and diameter

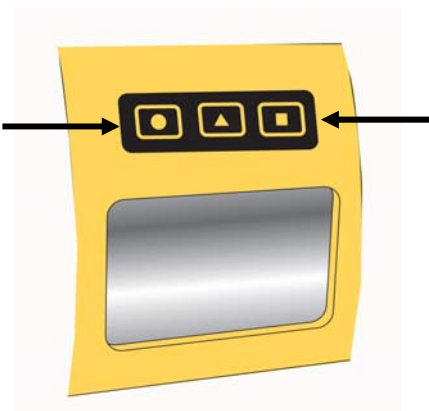
## 6.2 Switching On

To switch the instrument on, press the FIRE button until the unit powers on.



## 6.3 Switching Off

To switch the instrument off, press and hold the ● and ■ keys at the same time. The display will show SWITCHING OFF and a digit will count down from 5 to 0. If the keys are released before 0 is reached then the unit is returned to the screen where the keys were pressed.



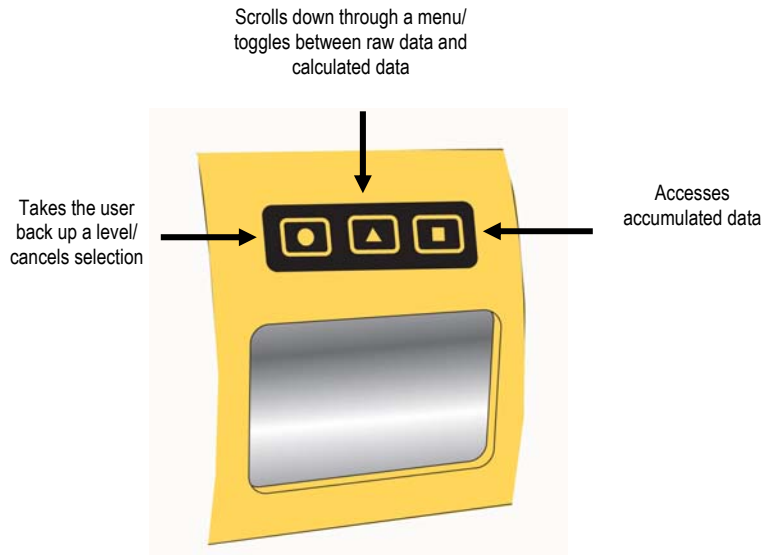
If 'auto switch-off' is activated, the instrument will switch off one minute after the last key press occurred.



## 6.4 Key Selection

The LaserAce® Hypsometer has been designed to be easy to use. With that in mind, the key selection has been kept as consistent as possible within each mode/function of the instrument. In general the keys are used to perform the following actions.

FIRE: Takes a reading/makes a selection.



Refer to section 7 for further information on what each key press does within each function of the Hypsometer.

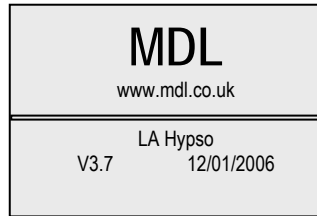
## 6.5 Buzzer

The buzzer in the instrument has been programmed to automatically sound when:

- The FIRE Button is used.
- The keypad is pressed (configurable on/off from setup menu).
- To confirm when a range/distance has been acquired.
- The unit is being switched off.

## 6.6 Basic Instrument Functions

When the LaserAce® is switched on, a built in BUZZER will sound automatically and the LCD will display the MDL logo, the instrument and the revision number and date of the firmware.



After approximately 3 seconds, the unit will display the following screen.



If the unit has Bluetooth® the Bluetooth® configured screen will also appear. The unit will then proceed to the menu option screen (see section 7 onwards).

**PLEASE NOTE:** The unit is designed so that it can be used with or without reflectors. When the unit is switched on, it will go through the start up screens and tell you what ranging method you are working in (i.e. FIRST HIT /LAST HIT /BRUSH FILTER).

**IMPORTANT:** If the user has been carrying out work using the Brush Filter (Reflector mode) and turns the unit off, when it is next switched on it will restart in the Brush Filter mode. This may cause a problem if the operator does not remember that the unit was in the Brush Filter mode, as when the unit is first used again it will not measure to objects without reflectors. Select First Hit or Last Hit to resume reflectorless operations.

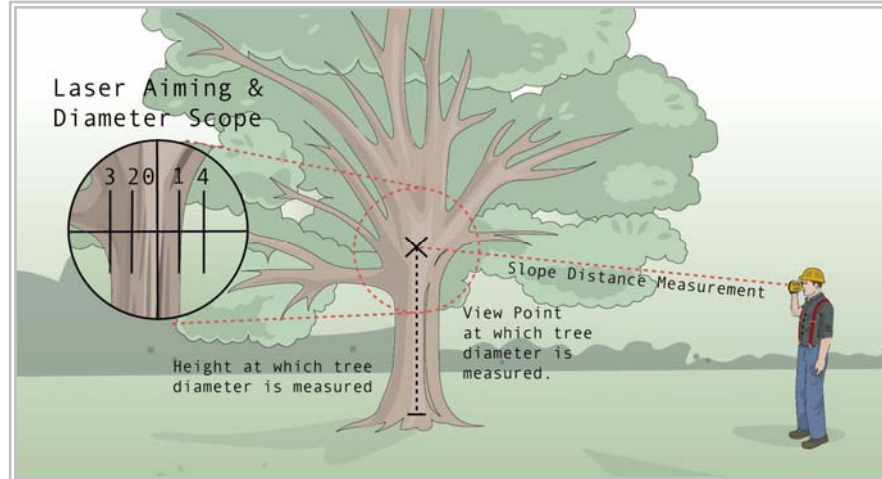
The three keys on the side panel, ●, ▲ and ■ keys are for changing modes/features and displaying raw data or calculations from various functions within the LaserAce® Hypsometer. Refer to section 7 in detail for the functionality of these keys.



## 6.7 Principle of Operation

When the unit is operational and the FIRE button is pressed, invisible pulses are sent out from the LaserAce® Hypsometer transmitter lens and reflected pulses from the target are received via the instrument receiver lens. The time taken to send and receive the pulses is multiplied by the speed of light to determine the 'two way' distance. Half this distance is the correct 'one way' distance to the target. This is known as 'The Time of Flight' method.

A target can be identified/acquired by sighting the target through the telescopic sighting scope.



If a valid range or measurement is observed a built in BUZZER will automatically sound (long continuous sound).

The maximum range observable can vary due to:

- Size of the target (with respect to the laser beam footprint).
- Environmental conditions e.g. overcast/dark for longer ranges, but bright sunlight for shorter ranges.
- Rain or snow - shorter ranges.

**NOTE:** Avoid shooting targets in the direction of the sun. Damage may occur to the receiver optics if pointed directly at the sun.

A few helpful tips to enable optimum ranges to be obtained are:

- Good reflective targets include:  
Light coloured rocks, traffic signs and vehicle reflectors, reflective foils, light coloured masonry and light coloured stone. **NOTE: DO NOT USE 'LAST HIT' Mode with reflectors.**
- Try to observe targets that are in the shade or away from prevailing sunlight.
- Ideal target size is the same, or larger than, the LaserAce® beam footprint.

Laser Footprints at Various Ranges are given below.

| Distance | Typical Dimension of the Measuring Beam (footprint) |
|----------|---|
| 100m     | 25cm  |
| 200m     | 50cm  |
| 300m     | 75cm  |
| 400m     | 100cm   |

## 6.8 Hand-held Operation



The instrument should be held in the right hand, like a camcorder, by putting your fingers through the hand-strap and aiming at the target through the eye scope. It is advisable to sight the instrument using the right eye whilst the left eye should be kept open to make the selection of the target easier to identify.

**7 Main Menu****7.1 Menu Selection**

This is a representation of the initial menu screen.



From this menu you can select one of the 4 functions of the Hypsometer or access the setup menu. See the following sections for more detail.

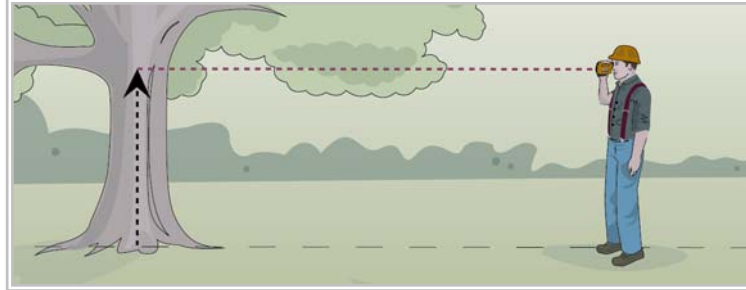
To enter a specific function press the ▲ key to scroll through the selections and then the FIRE key to make your selection.

## 7.2 Rangefinder

### Method of operation

The opening screen shows SD (Slope Distance) and VA (Vertical Angle).

To take a measurement, align the cross hairs in the scope with the required target and press the red FIRE button on the top of the instrument. Once the distance has been acquired a long BEEP is heard and the results displayed on the LCD.



Note: If the range display shows SD --- and the unit does not give a beep after pressing the fire button, this indicates that the LaserAce® Hypsometer has not been able to obtain a distance to the selected target. Try again.

The LCD displays the actual slope distance (SD) from the laser to the target and inclination (+/-VA) (a "-" sign signifies an angle below the horizontal, as in  $-9.3^\circ$ ) from the horizontal. Distance measurement can be in metres or feet and the inclination in degrees or gons (refer to section 5.7 for user preferences).

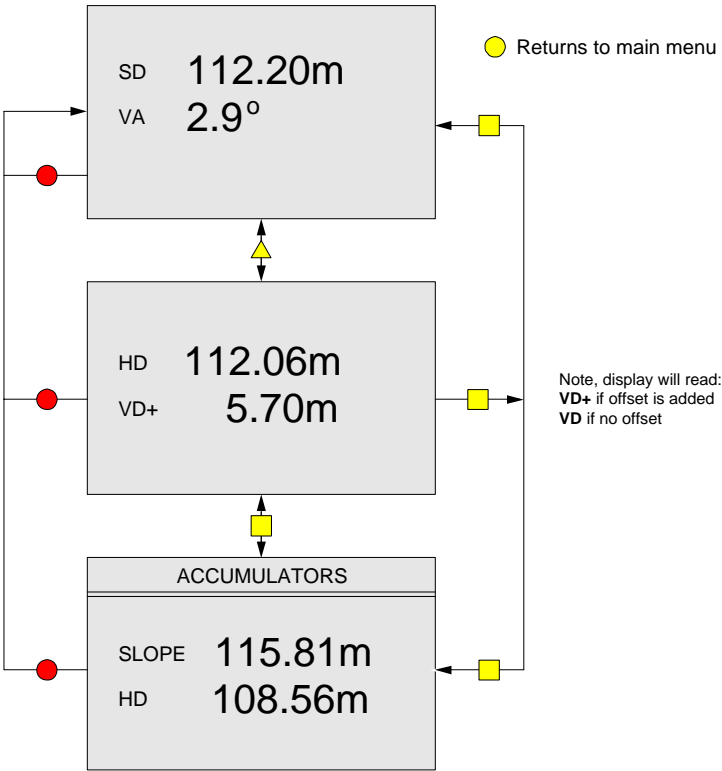
By pressing the ▲ key the HD (Horizontal Distance) to the target and VD (Vertical Distance) to the target will be displayed. Press the ▲ key again to return to the original SD, VA display. A "+" sign following VD (VD+) means an instrument height offset is added to give the vertical distance of the target. If the instrument height offset in set up is set to zero, then the vertical height is the height of the target from the instrument level.

Note: From any screen pressing the ● key returns the Hypsometer to the main menu.

To take a new measurement, sight the target and press the FIRE button. This displays the opening screen containing SD (slope distance) and VA (vertical angle) information.

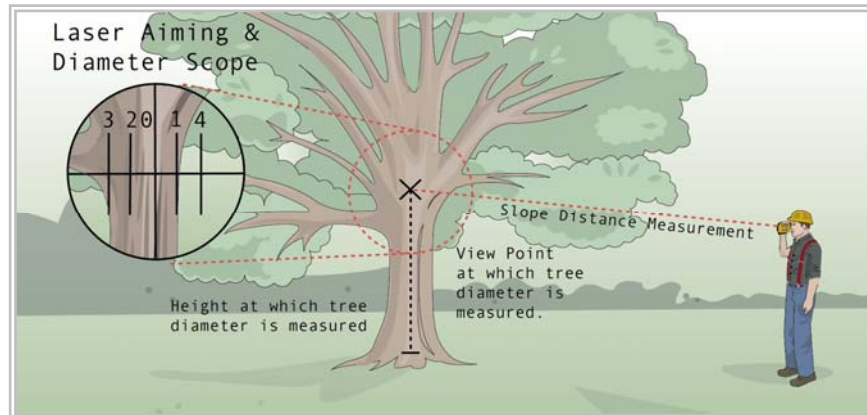
Accumulators: If you wish to show an accumulation of data (Slope and HD) then in either screen press the ■ key, this displays a sum of all SD and HD values acquired. Press ■ key from the accumulator display to return to the previous screen.

Flow diagram



### 7.3 Tree Diameter

The tree diameter function allows the user to remotely measure the diameter of a tree using one single measurement.



#### Method of operation

After selecting Tree Diameter from the main menu, the LCD displays Set Tree Scope and Tree Scope 0 & 1.

Aim the laser at the tree trunk and move back or forwards until the trunk is precisely enclosed between any two of the stadia hairs in the scope.

Press ▲ key repeatedly until the tree scope hairs you want to use are displayed. Press the fire button to take the reading e.g. in the diagram above the display shows Tree Scope 1 & 3. Press the FIRE button to accept your choice of tree scope and take the reading.





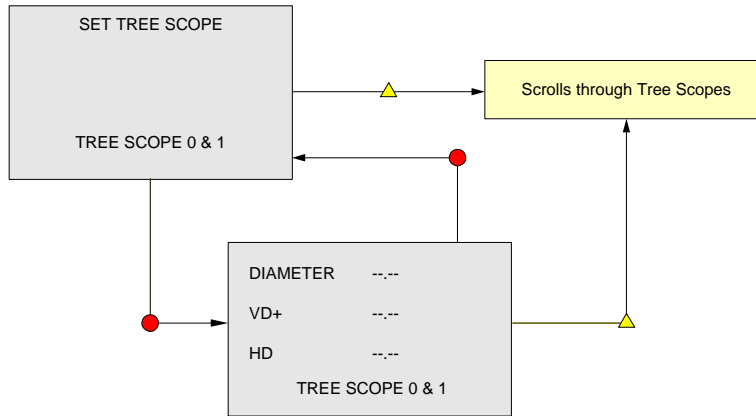
The LCD now displays the tree diameter, VD (vertical distance) and HD (horizontal distance). As this point (if you wish) you may press the ▲ key to change the tree scope pairs. The display will be updated with recalculated data based on the tree scope pairs selected.

To take another measurement, press the FIRE button again.

NOTE: When the fire button is pressed the tree scope choice selected is retained. To select a new tree scope choice, the ▲ key must be pressed again.

From any screen, pressing the ● key returns the Hypsometer to the main menu.

Flow diagram



● Returns to main menu

## 7.4 Length/Lean/Volume

As the name suggests this function allows measurement of tree length, lean and volume. The unit prompts for the Tapering factor to be entered first. The tapering factor, which depends on the species of tree to be measured, should be entered as a percentage. That is, a tapering factor of 10% implies that the tree diameter varies by 10cm for every 100cm in length.

When the tapering factor is zero, the tree is considered to be in a cylindrical shape, with the tree diameter being taken from the middle shot. If the tapering factor is anything other than zero, then it is used to calculate the diameter of the top and bottom of the tree. The tree volume is calculated as volume of the frustrum with the top diameter being less than the diameter at the base of the tree.

Once the tapering factor is entered, the Length/Lean/Volume menu is displayed, this has 6 sections: The first three are SINGLE POINT, TWO POINT and THREE POINT, which are the modes to measure and calculate tree length, lean and volume. The next two options are DOWNLOAD and PRINT TREE TABLE, for retrieving, printing and viewing the measurements saved in the unit's memory. The last option CLEAR MEMORY, deletes the whole memory.

Once the measured values have been calculated using any of the three methods, the calculated and measured data is sent out through the Bluetooth® or serial port (refer to section 8.2).

### 7.4.1 Single Point

In the SINGLE POINT mode, the user is asked to SET DIAMETER SCOPE first. The stadia selection can be a stadia pair (e.g. 0 & 3) or it can be set to NIL. If stadia are set to NIL, only the log height and horizontal distance from the laser is measured. Pressing the ■ key after a shot accumulates the results.

If the stadia scope is set to one of the stadia pairs, the user is asked to enter a plot number first, and then a tree number. The LaserAce® Hypsometer then searches the memory to see if this plot/tree number has already been entered, if the entry already exists then the user is asked if they wish to keep the stored entry or delete it. The screen then displays:

| SINGLE POINT |                      |
|--------------|----------------------|
| LOG DIAMETER | --.-- m.             |
| LOG HEIGHT   | --.-- m.             |
| LOG VOLUME   | --.-- m <sup>3</sup> |
| STADIA 0 & 2 |                      |

The user should then sight the tree at the required diameter point on the trunk ensuring that the stadia hairs chosen "bracket" the tree and press Fire to take the reading. The LaserAce® Hypsometer then calculates the log diameter, height and volume.

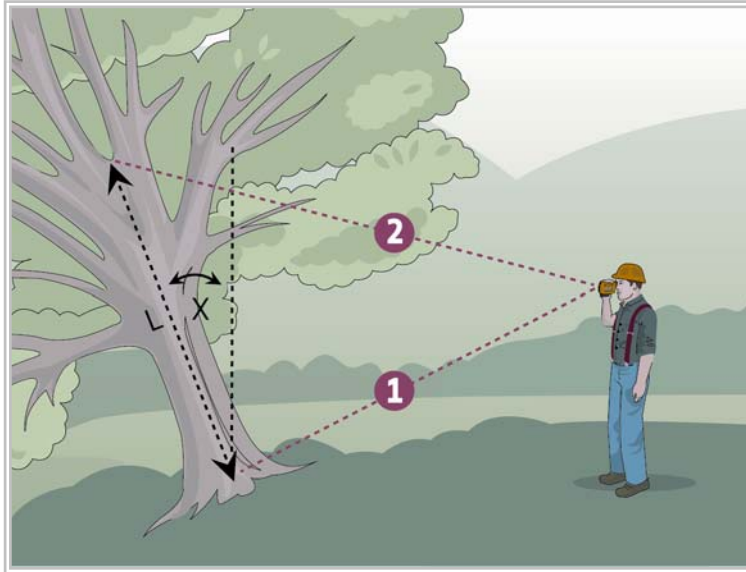
If tapering factor is set to zero, then the volume of the log is calculated as the volume of a cylinder. If the tapering factor is non-zero then this is used to calculate the base diameter and the volume is calculated as the volume of the frustrum. The ■ key accumulates log volume and log height (or only the log height if the stadia scope is set to NIL).

**NOTE:** No volume calculation is done if the stadia scope is set to NIL.

## 7.4.2 Two Point

Two-point height is used for remote calculation of height and distance between two successive points. This is useful for finding the heights of trees and buildings.

As in single-point mode, the user is asked to select the diameter scope first. If the stadia selected is NIL, the LaserAce® Hypsometer unit only calculates tree length and lean. The LaserAce® Hypsometer measures the gradient between measured points.



If using any value other than NIL on the diameter scope, the user will be asked to enter a PLOT NUMBER and a TREE NUMBER. The LCD then displays SHOOT BOTTOM. The first measurement should be taken at this time by pressing the FIRE button.

The display will now show SHOOT TOP and the second measurement should be taken by pressing the FIRE button. The LCD will now display the following:

- Log Length
- Log Diameter
- Log Volume.

By selecting the ▲ button it will show the following:

- Log Lean
- Log Height
- HD (Horizontal distance).



Pressing the ■ key after a shot accumulates the results.

To take another measurement press the FIRE button and continue to follow the method described above.

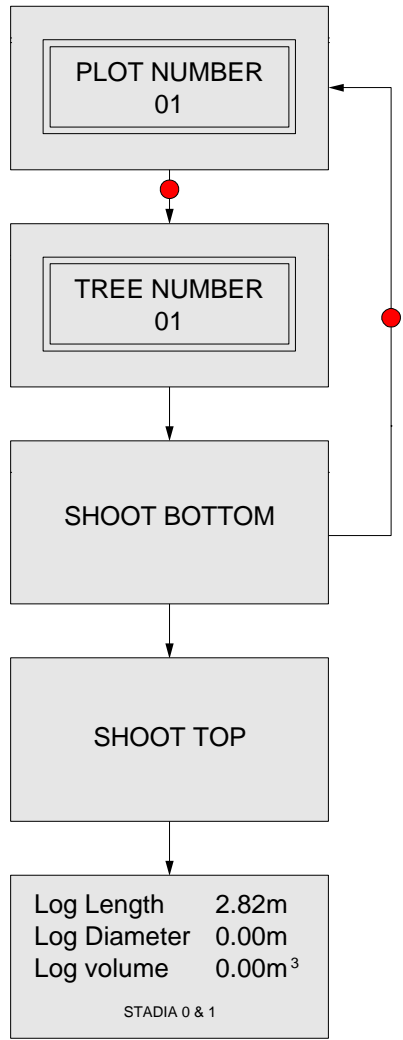
**NOTE:** From any screen pressing the ● key (continuously) will return the LaserAce® Hypsometer back to the main menu.

**Accumulators :** If you wish to show an accumulation of data (Slope and HD) then in either screen press the ■ key, this displays a sum of all SD and HD values acquired. Press ■ key from the accumulator display to return to the previous screen.

If using any value other than NIL on the stadia scope, the LaserAce® Hypsometer will, in addition to calculating log length and lean, also measure the log diameter and calculates the log volume. The first screen after shooting the top displays log length, log diameter and log volume. Pressing the triangle key displays log lean, height and hd (horizontal distance). The ■ key accumulates log volume and length.

Critical height, which is entered in setup/offsets menu, is used in two-point height method. After shooting the bottom of the tree, the user pans (elevates) the unit to aim towards the tree top. If the critical height is reached while the user is moving the unit, the LaserAce® Hypsometer sounds continuously, this feature is useful if trees below a certain height are to be measured (refer to 5.7.3 to set Critical Height).

Flow diagram (using anything other than NIL on the stadia scope)

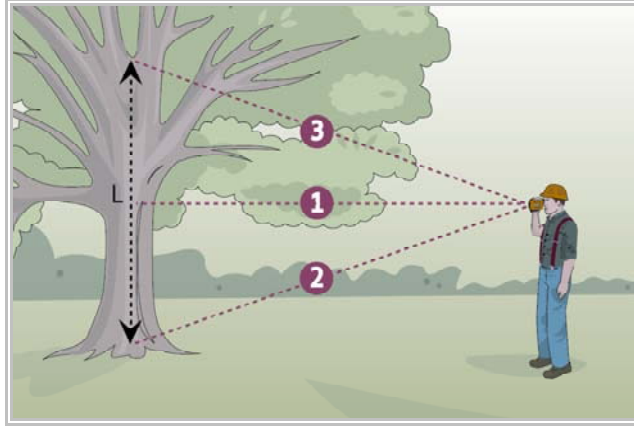


Does not take a shot  
just returns to 1st  
screen

### 7.4.3 Three Point

The three point method allows you to measure the diameter, height and volume of an object using three observations or enter a specific tree height and alert you to when that height has been reached (known as Critical Height). This mode calculates the diameter, height and volume based on one range and three measured angles.

As in the previous two modes, the Diameter Scope selection can either be NIL or any one of the pairs.



#### Method of operation

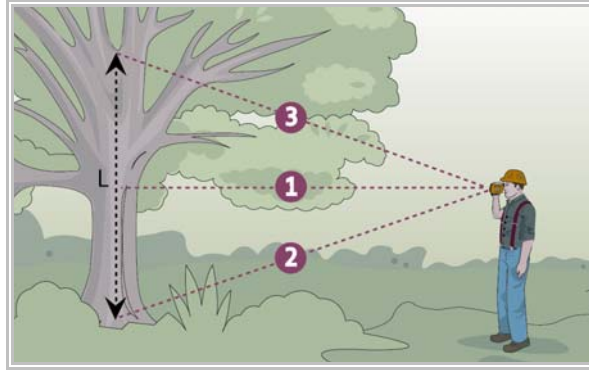
After selecting Three Point from the main menu the LCD displays SET DIAMETER SCOPE and STADIA NIL. If the diameter scope is set to one of the stadia pairs, the user is asked to enter the plot number first and then the tree number.

The Tree Diameter Height mode has the facility to allow you to enter a specific height (e.g. a minimum desired log length). This length value should be entered and saved in the Set Up Menu – Offsets (see 7.5.3). When entered, LaserAce® Hypsometer will alert you (by continuous beeping) when you are aiming at the point on the tree when the height you have entered has been reached. This functionality is disabled by entering a height of 000.0.

Look through the eye scope at the 'mid point' of the tree you wish to measure the diameter/height/volume of. Move back or forwards until the diameter you wish to measure is lined up between two of the stadia hairs in the scope.

Press the ▲ key repeatedly until the stadia pairs you want to use are displayed e.g. using the diagram above until the display shows STADIA 1 & 3. Press the FIRE button to accept your choice of stadia pair. Enter the plot and tree number. The display now shows SHOOT MIDDLE. Line up the tree in the scope as before and press the FIRE button. You are now instructed to SHOOT BOTTOM.

Use the scope to line up the stadia hairs at the bottom of the tree then centre the middle vertical stadia in the midpoint of the tree and press the FIRE button. At this stage the measurement of vertical angle only is required (not distance). This allows the observation to the bottom of the tree, even if scrub or brush partially obscures the view.



If you have enabled the alert facility by entering a non zero height as you pan (elevate) the LaserAce® Hypsometer up the trunk of the tree to **SHOOT TOP** as instructed, the instrument will beep continuously when the instrument has calculated that it is aiming at desired height entered. This is done by a calculation of range and VA (vertical angle) data. Pressing **FIRE** at any point here will display the calculated diameter, height and volume.

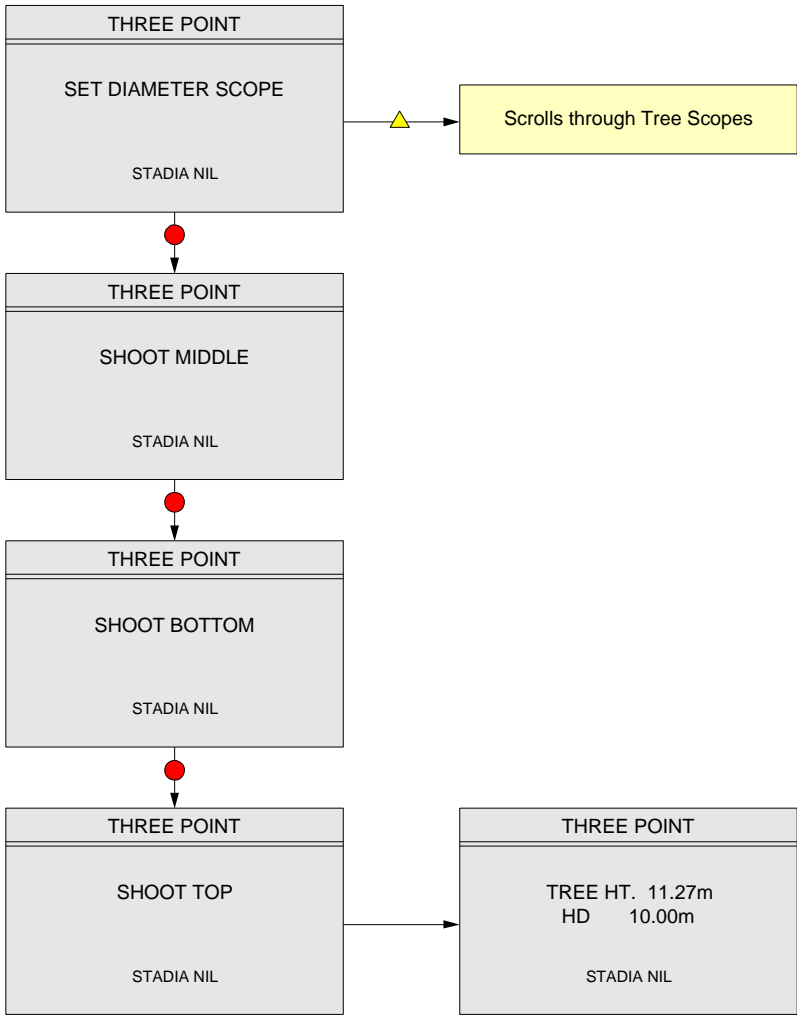


If you have not enabled the alert facility, line up the stadia hairs at the top of the tree trunk and press the **FIRE** button and the LCD will display the calculated diameter, height and volume.

Note that the **SHOOT BOTTOM** and **SHOOT TOP** measurements do not have to obtain a range. The volume and height calculations are performed by using the range data taken to the first '**SHOOT MIDDLE**' measurement, the angle data are taken from the bottom and top shots.

To perform another measurement, press the **FIRE** key. Enter Plot and Tree number and complete as before.

Flow diagram (Tree Scope NIL)

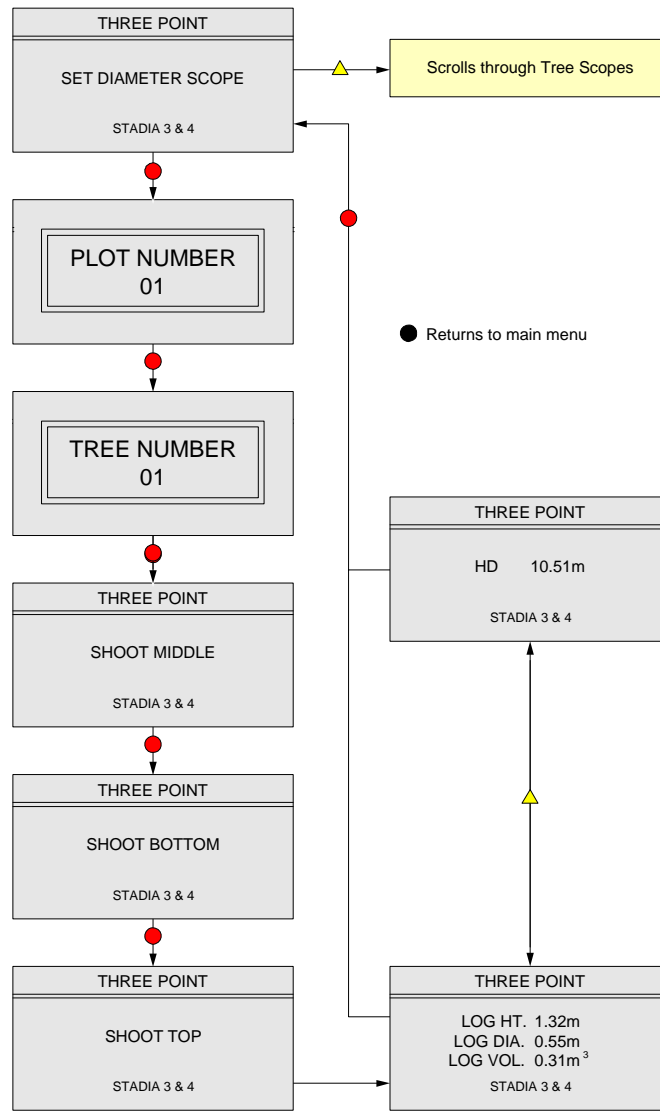


● Returns to main menu

Note : From any screen pressing the ● key returns the Hypsometer to the main menu.



Flow diagram (Stadia Pairs Selected)



Note : From any screen pressing the ▲ key returns the Hypsometer to the main menu.

#### 7.4.4 Download

See sections 9 to 11 which give examples of how to configure Bluetooth® on PC or PDA.

When entering this mode, the LaserAce® prompts the user to PRESS A KEY TO START, press any key to start the download procedure. Once the download has completed, the unit sounds a 'beep' and the message DOWNLOAD COMPLETE appears on the screen.

All the entries in the memory are sent out as ASCII characters via the serial port or Bluetooth® in the following format:

PLOT NO., TREE NO., LENGTH m, DIAMETER m, VOLUME m, TAPER  
 10,10, 3.22, 0.03, 0.00, 0.00%  
 10,21, 3.17, 0.14, 0.05, 0.00%  
 10,22, 2.74, 0.15, 0.05, 0.00%  
 10,23, 2.69, 0.02, 0.00, 0.00%  
 10,24, 0.42, 0.04, 0.00, 0.00%

The first string specifies the data fields in each line that follows (i.e. the first field in a line is the plot number, the next field is the tree number, etc with the last field being the tapering factor). This format is useful if the measured data is to be stored in a spreadsheet.

You can use the Windows HyperTerminal application to view and record this data, if not familiar with this application follow the setup instructions described in section 9.4. If you are using a direct serial port as opposed to Bluetooth®, select your local COM port for the PC, eg COM1.

To save the downloaded data to a file, first open HyperTerminal and connect to your instrument, then click the 'Transfer' menu then 'Capture Text...' enter an appropriate filename and click the 'Start' button. All serial data now sent to the PC will be saved in the specified text file. When complete, select the 'Transfer' menu, 'Capture Text' and 'Stop' option.

#### 7.4.5 Print Tree Table

When entering this option, the user is asked to enter a Plot Number. Enter the number using **■** key and **▲** key. Press FIRE key to enter. Then, using the **▲** key, the user can select to either VIEW TABLE or PRINT TABLE for all the measured trees data of that plot number. Press the FIRE key to view or print the data.

| T. (tree number) | LEN. (length) | DIA. (diameter) | VOL. (volume)      |
|------------------|---------------|-----------------|--------------------|
| 10               | 3.22m         | 0.03m           | 0.00m <sup>3</sup> |
| 21               | 3.17m         | 0.14m           | 0.05m <sup>3</sup> |
| 22               | 2.74m         | 0.15m           | 0.05m <sup>3</sup> |
| 23               | 2.69m         | 0.02m           | 0.00m <sup>3</sup> |
| 24               | 0.42m         | 0.04m           | 0.00m <sup>3</sup> |
| 25               | 2.59m         | 0.01m           | 0.00m <sup>3</sup> |
| 26               | 3.66m         | 0.00m           | 0.00m <sup>3</sup> |
| ***END***        |               |                 |                    |

#### 7.4.6 Clear Memory

Clear Memory wipes out all the data in the memory, but not before prompting the user that this is what they want to do (to prevent accidental deletion of the memory).

## 8 Data Format

### 8.1 NMEA Output Format

The data output via Serial or Bluetooth port is in a standard NMEA format. IF1/3 is floating field & IF2/4 is fixed string length (note that in IF2/4 the range is restricted to 999.99m).

See sections 9 to 11 for details of how to configure Bluetooth® on PC or PDA.

Example data strings (note the strings are terminated with carriage return & line feed).

IF1  
\$PMDLA,HV,2.94,M,288.1,D,8.6,D,2.98,M\*5F

IF2  
\$PMDLA,HV,002.94,M,288.1,D,008.6,D,002.98,M\*67

IF3  
Customer Variant Floating Field

IF4  
Customer Variant Fixed Field

Data Output Formats are:

| FIELD | DESCRIPTION          | RANGE                   |        |
|-------|----------------------|-------------------------|--------|
| 1     | NMEA sentence type   | \$PMDLA /Customer Spec. |        |
| 2     | Horizontal Vector    | HV                      |        |
| 3     | Horizontal Distance  | 2.94-5000.00/002.94     |        |
| 4     | Units of measurement | M (metres) F (feet)     |        |
| 5     | Horizontal Angle     | 0.01-359.99             | 288.1  |
| 6     | Units of Measurement | D (degree)/G (gons)     |        |
| 7     | Vertical Angle       | -0.1-080.0              | -08.6  |
| 8     | Units of measurement | D (degree)/G (gons)     |        |
| 9     | Slope Distance       | 2.98-5000.00            | 002.98 |
| 10    | Units of Measurement | M (metres)/F (feet)     |        |
| 11    | Check Sum            | *67                     |        |

## 8.2 Format of Tree Measurement String

Example of measurement string:

\$PMDLB,HT,004.40,M,DIA,001.06,M,VOL,003.87,M3,TAP,00.00%,R,020.22,M,V,015.1,D\*61

Tree Measurement String Format:

| Field | Description                           | Value                              |
|-------|---------------------------------------|------------------------------------|
| 1     | String Header                         | \$PMDLB                            |
| 2     | Tree Height                           | HT                                 |
| 3     | Measured Tree Height                  | 004.40                             |
| 4     | Units of Measurement                  | M(Metres) or F(Feet)               |
| 5     | Tree Diameter                         | DIA                                |
| 6     | Measured Tree Diameter                | 001.06                             |
| 7     | Units of Measurement                  | M(Metres) or F(Feet)               |
| 8     | Volume of Tree                        | VOL                                |
| 9     | Measured Volume of Tree               | 003.87                             |
| 10    | Units of Measurement                  | M3(cubic metres) or F3(cubic feet) |
| 11    | Tapering Factor                       | TAP                                |
| 12    | Tapering Factor Value                 | 00.00%                             |
| 13    | Range to the Tree (Slope Distance)    | R                                  |
| 14    | Measured Range to the Tree            | 020.22                             |
| 15    | Units of Measurement                  | M (Metres)                         |
| 16    | Vertical Angle to the Top of the Tree | V                                  |
| 17    | Measured Vertical Angle               | 015.10                             |
| 18    | Unit of Vertical Angle                | D (Degrees) or G (Gons)            |
| 19    | Check Sum                             | *61                                |

## 9 Bluetooth® on PC

Whilst the following steps are interchangeable with most Bluetooth® connections, these guidelines are given in accordance with the BELKIN® device which the company can supply.

### 9.1 Installing BELKIN® USB 'Bluetooth®' Adapter

In order to download data from the LaserAce® instrument, using BELKIN® Bluetooth® radio communication, the following steps must be followed. Also, please refer to hardware documents supplied.

1. The software drivers must be installed first, **DO NOT** insert the key into your PC at this point.
2. Place BELKIN® CD in drive. It should start automatically.
3. Answer YES to all questions and to default settings suggested unless there is good reason to do otherwise.
4. The software will start loading. At some point a message will appear indicating that the software cannot find a 'Bluetooth®' device. Press CANCEL to continue.
5. Once the software has finished loading remove the CD from the drive, insert the USB 'Bluetooth®' key into a spare USB port on your PC.
6. Windows will recognise a new device and install the necessary drivers.

### 9.2 Troubleshooting

From this point, problems may occur, especially if your PC is running Windows XP and more so if it has Service Pack 2 installed. After Windows has shown that the 'Hardware is ready to use' check the system icons at the bottom right of your screen. There should only be one 'Bluetooth®' icon, probably with the 'Bluetooth®' symbol filled in, in red. If there are 2 icons then Windows has installed it's own 'Bluetooth®' driver and the product will not function properly. To fix this do the following :

1. Open the Control Panel and select the System icon.
2. Click on the Hardware tab and select Device Manager.
3. The first item should be 'Bluetooth® Devices'. Click on + sign next to this item. This will bring up 2 items 'BELKIN® Bluetooth® Adapter' and 'Microsoft® Bluetooth® Enumerator', the problem.
4. Right click on the BELKIN® Bluetooth® Adapter item and select Update Driver.
5. Select no, not at this time to the question whether Windows should find a driver. Click Next.
6. Click Install from a specific location (Advanced). Click Next.
7. Select Don't search I will choose the driver to install. Click Next.
8. Click on the BELKIN® Bluetooth® Adapter item to highlight it and select Have Disk.
9. Select Browse and go to the directory C:\Program Files\belkin\software\bin (assuming you selected this default destination during installation). A filename will appear in the filename box, do not edit it. Click Open. On return to the window shown in 8. above. Repeat the process for the 'BELKIN® Bluetooth® Device'. Once selected press Next.
10. This should complete installation and only one 'Bluetooth®' icon should now appear in the system icon tray at the bottom of the screen.

### 9.3 Running the 'Bluetooth®' Software for the First Time

Double click the My Bluetooth® Places icon on your computer desktop. This will guide you through selecting services for Bluetooth®. In the case where you only intend using the Bluetooth® to communicate with MDL's laser products you should deselect all items except the Serial Port service. The software will then install the services you have selected.

Once installed you may be asked for another profile. Click Skip then Finish or close the program.

Double click on the My Bluetooth® Places icon again and right click on 'my device', select 'properties' Bluetooth® configuration should be shown. Click Client Applications tab. This shows a list of services provided by the 'Bluetooth®' adapter and particular shows the port to which Bluetooth® serial port communications have been mapped. Take a note of this, it maybe COMM 3 or COMM 5 depending on your system and how it is configured. Also shown in the list, next to the serial port selection, is whether a secure connection is required. For use with the MDL laser ensure this option is de-selected. Click on the serial port connection name to highlight it and click the properties button. Un-tick the secure connection check box. Click OK to finish.

### 9.4 Configuring HyperTerminal to use 'Bluetooth®' Communications

Items 1 to 8 below should only need to be done once and thereafter a short cut icon can be created to make easier access to Hyperterminal and the Bluetooth® communications to the laser.

1. Select the Hyper Terminal application by clicking the All Programs item in Windows START menu, selecting Accessories and then Communications.
2. Select the HyperTerminal application.
3. HyperTerminal will start and display a 'New Connection' window.
4. Type in a name for the connection. i.e. 'Bluetooth®'.
5. A 'Connect To' window will appear. Click the arrow next to the item 'Connect Using' and select the COMM port shown in the 'Bluetooth®' configuration detailed above.
6. A window showing connection details will be displayed. These do not matter to 'Bluetooth®', just click OK.
7. The Hyper Terminal window should clear awaiting communications. On this occasion click the File item on the menu bar and select save. This saves the connection you may have named 'Bluetooth®'.
8. Close Hyper Terminal.
9. Ensure the laser is switched on.
10. Repeat step 1 but this time an item showing Hyper Terminal with a sub menu will be shown. Go into this sub-menu and an item with the name given in 4 above should be present. You can either use this method to quickly select Hyper Terminal with the 'Bluetooth®' settings detailed above or by placing the mouse pointer on the name and holding the left button and dragging it onto your desktop you can create a short cut.
11. A 'Connected' message should appear at the bottom left of the Hyperterminal window and the Bluetooth® icon in the toolbar at the bottom of the screen should change to green, showing a connection is active.

## 10 Bluetooth® on Pocket PDA

### 10.1 Bluetooth® General

An MDL LaserAce® instrument can transfer data by means of Bluetooth® Wireless communication.

Once familiar with the set-up process it is simple use. The PDA on which you install your application must be Bluetooth® capable and activated for the application to function correctly.

If you are familiar with Bluetooth® terminology you will know you have the ability to pair or store familiar Bluetooth® devices once configured, this saves time setting up communications between the two.

#### 10.1.1 Option 1: Use favourite

If you set your LaserAce® instrument to be a 'favourite' device in your Bluetooth® devices folder you will not have to search for new Bluetooth® devices whenever you connect. Your application can automatically establish communication with your LaserAce® device.

#### 10.1.2 Option 2: New search on connection

Do not create any favourite Bluetooth® devices on your PDA device, also do not set up the LaserAce® instrument as a known Bluetooth® device on your PDA.

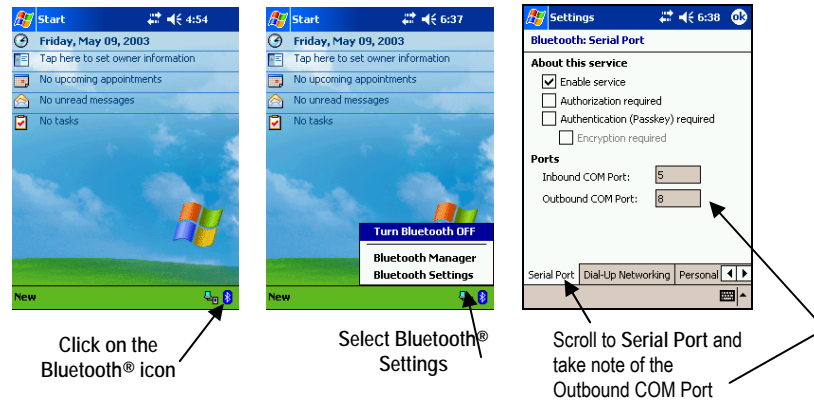
When the your application needs to connect via Bluetooth® you will be prompted by a search screen. Select the LaserAce® device that appears and communication will be established.

This option has the advantage that it performs a new search every time you connect and re-confirms the Bluetooth® interface from the LaserAce® instrument is within range and functioning.

**10.2 Bluetooth® on HP iPaq**

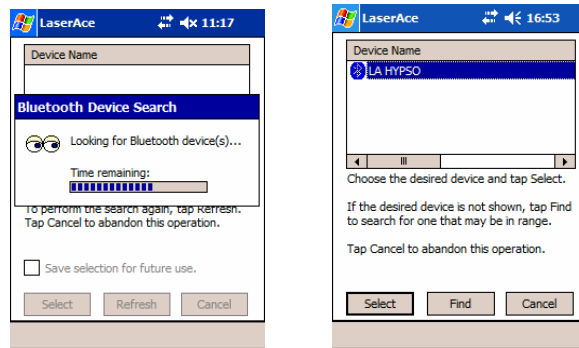
The MDL logger application requires your iPaq to have Bluetooth® assigned to a serial port.

Check that Serial interface over Bluetooth® function is enabled and has been assigned an outbound COM port number; take a note of this number.



**10.2.1 iPaq Find new**

Whenever you start your application you should be prompted to select a Bluetooth® device, as shown:



Firstly ensure the instrument is switched on and within range of your PDA, then either tap the Refresh button to initiate a new search of active devices or highlight an existing device from the list and tap Select to establish communications.

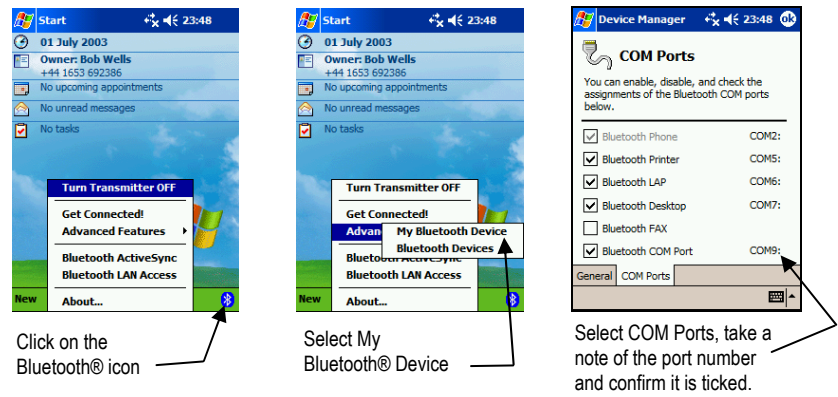
If successfully connected you can now take readings and you will see the results shown on the screen, otherwise an error message will be shown.



**10.3 Recon Bluetooth® using Socket C.F. Card**

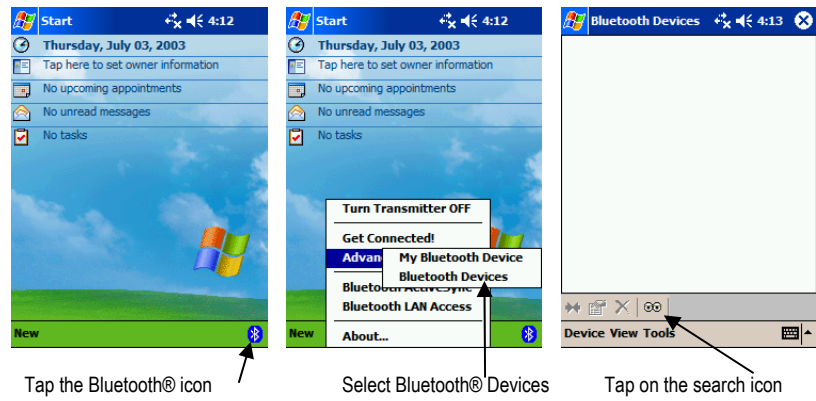
To install a socket Bluetooth® card; follow the instructions supplied by the card manufacturer. Always install driver before inserting hardware card.

Check that Serial interface over Bluetooth® function is enabled and has been assigned a COM port number; take a note of this number.



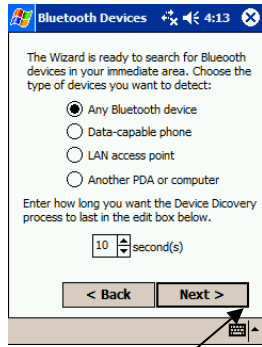
**10.3.1 Search make favourite**

If you want to make your LaserAce® device a Bluetooth® favourite, switch on the instrument, place it within range of the PDA and follow the instructions shown:

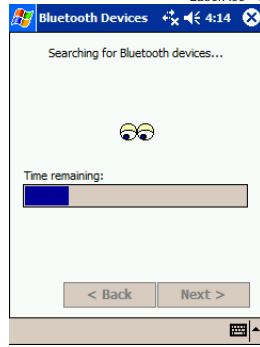




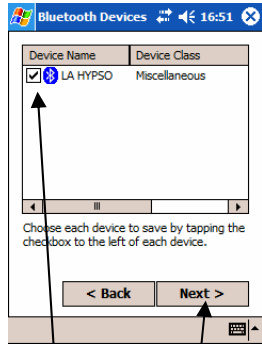
Tap Next



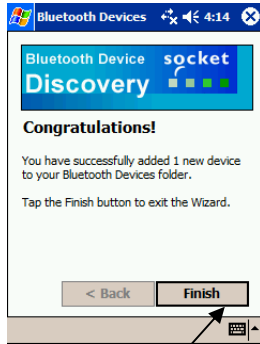
Tap Next



Wait until devices have been found



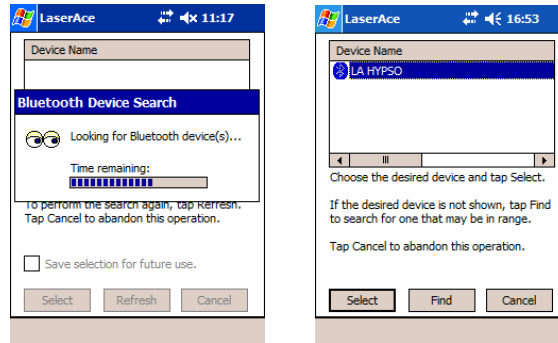
Select a LaserAce instrument then tap Next



Tap Finish

### 10.3.2 Bluetooth® Connection

Whenever you start your application you should be prompted to select a Bluetooth® device as shown:



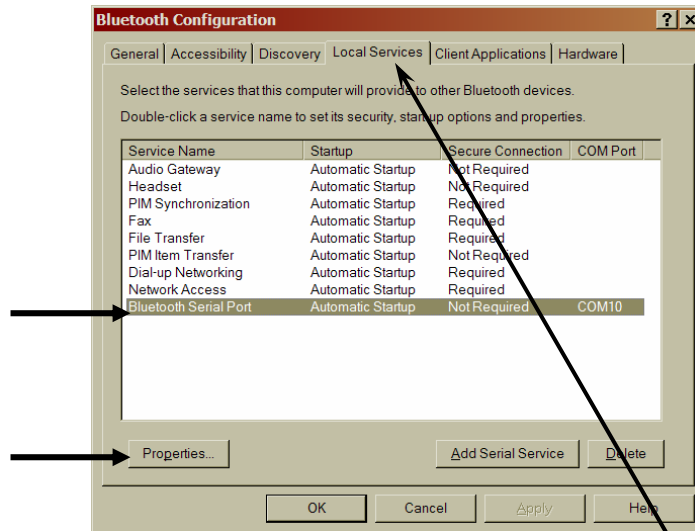
Ensure the instrument is switched on and within range of your PDA, then either tap the Refresh button to initiate a new search of active devices or highlight an existing device from the list. Tap Select to establish communications.

If successfully connected, you can now take readings and you will see the results shown on the screen, otherwise an error message will be shown.

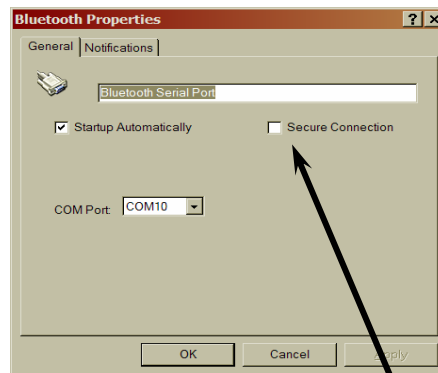
## 11 Troubleshooting with Bluetooth®

If you are having problems connecting, the following sections give examples which solve common problems.

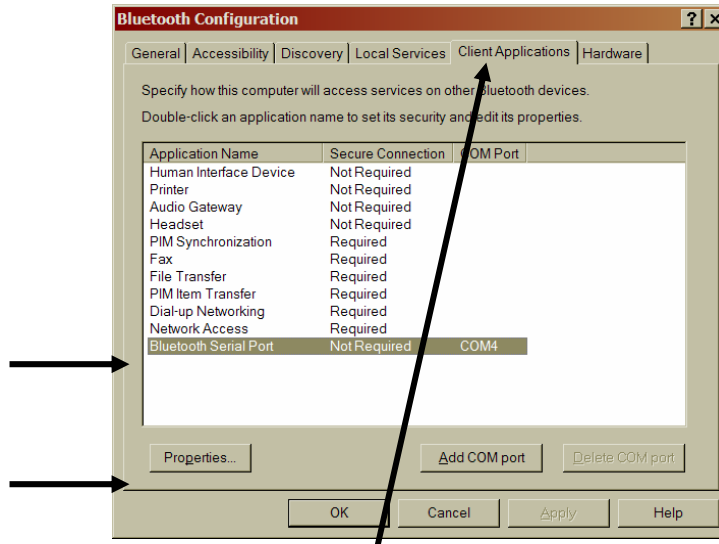
### 11.1 PC Examples



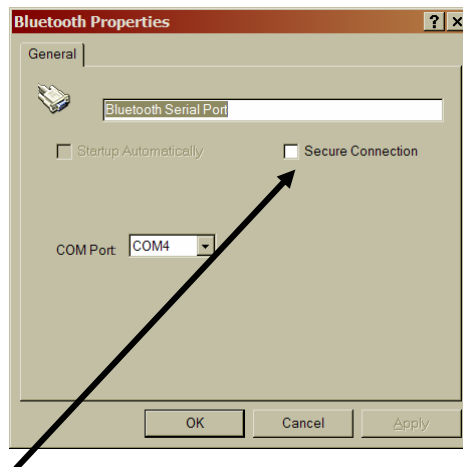
This screen is available with the Bluetooth® Advanced Configuration option and selecting 'Local Services' tab.



Select 'Bluetooth® Serial Port' and click 'Properties' button. Ensure 'Secure Connection' is un-ticked.



Repeat above and check for the 'Client Applications' Tab.

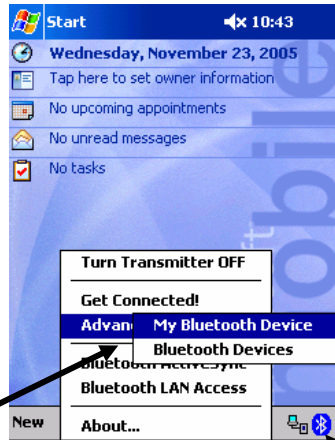


Ensure 'Secure Connection' is un-ticked.

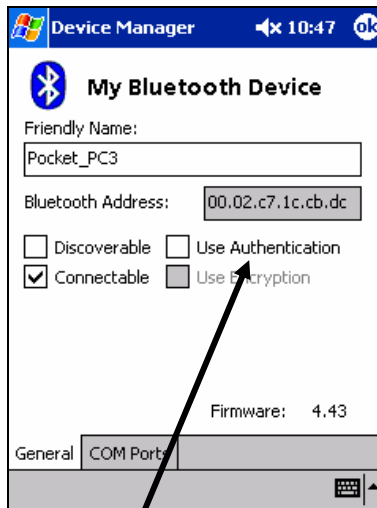
You should now be able to open Windows Hyperterminal. Select COMX as your COM port. When the laser is fired, the data string will be shown on your PC.

11.2 PDA Examples

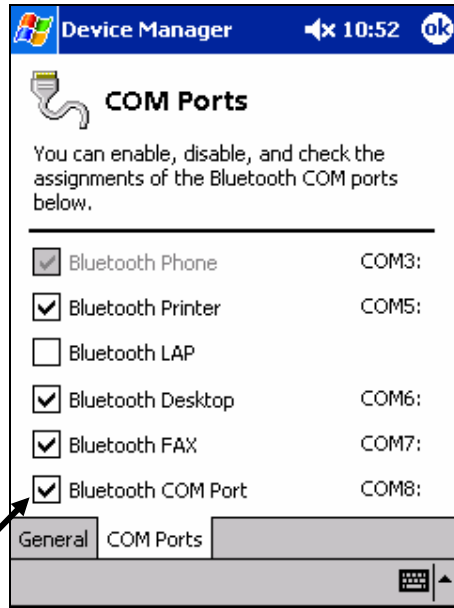
Note: The following screen examples are taken from a PocketPC 2002 PDA fitted with Socket Bluetooth® Card. The procedures are similar to other PDA's and card manufacturers.



Select 'My Bluetooth® Device' via the Bluetooth® Icon at the bottom of the screen and 'Advanced Features'.



Ensure the 'Use Authentication' option is un-ticked.



Ensure a 'Bluetooth® COM Port' is ticked.

You can now search for new Bluetooth® devices in the normal way and connect to your LaserAce® Pocket Series using MDL's PDA Logger software.

|                      |
|----------------------|
| 12 Technical Details |
|----------------------|

|                    |
|--------------------|
| 12.1 Specification |
|--------------------|

|                          |  |
|--------------------------|--|
| <b>Laser</b>             |  |
| Type                     | GaAs Laser Diode (905nm)                         |
| Eye Safe                 | Class 1 CENELEC EN60825-1/FDA                    |
| Range                    | Passive up to 150/500', Reflectors to 600m/2000' |
| Accuracy                 | 5cm/2"   |
| Resolution               | 1cm  |
| Measurement Time         | 0.3 secs   |
| <b>Environmental</b>     |  |
| Operating Temperature    | -10° to +45°C                                    |
| Water and Dust Resistant | IP63   |
| <b>Technical</b>         |  |
| Construction             | Polycarbonate/ABS                                |
| Dimensions (LxWxH)       | 110x100x50mm/4.33" x 2.94" x 1.97"               |
| Data I/O (when fitted)   | RS232 or Bluetooth®                              |
| Power                    | 7.2V Lithium Ion battery                         |
| Weight                   | 400g/14oz  |
| Graphic LCD Display      | Backlit  |
| Alignment Telescope      | Telescopic eye scope with stadia hairs           |
| <b>Inclinometer</b>      |  |
| Type                     | Accelerometer                                    |
| Range                    | -70° to +70°                                     |
| Accuracy                 | 0.2° at 0°                                       |
| Resolution               | 0.1°   |

Information contained herein is believed to be accurate. However, no responsibility is assumed by MDL for its use. Technical information is subject to change without notice.



