# Leica TS15

## Athletics Measurements Manual for SmartWorx Viva Onboard Application

Version 1.0
**English**

- when it has to be **right**

Leica Geosystems

# Introduction

To use the product in a permitted manner, please refer to the detailed safety directions in the TS15 User Manual. Also refer to the Leica Viva TPS Getting Started Guide and to the Leica Viva Series Series Technical Reference Manual.

**Validity of this manual**

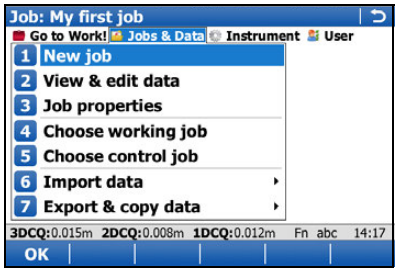
- This manual applies to the **Athletics** application of SmartWorx Viva running on the TS15. The application allows measurements to be taken for athletics field events.
- Distances or heights may be measured for the following events:
  - Pole Vault
  - Long Jump and Triple Jump
  - Discus
  - Hammer
  - Shot Putt
  - Javelin
- Distances and heights are recorded according to the rules set out in the Competition Rules Handbook of the **I**nternational **A**ssociation of **A**thletics **F**ederations (IAAF).

# Table of Contents

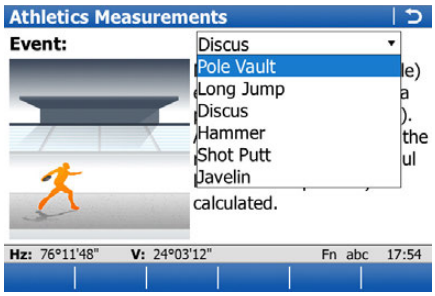
**In this manual**

# 1 Accessing Athletics

## Accessing a menu option

| Description | Illustration |
|---|---|
| There are three ways to access a menu option.<br>1 Using the touchscreen functionality. Tap on the menu item using the stylus provided.<br><br>2 Using the up and down navigation arrows. Move the focus to the menu item. Select **OK**, or press the OK button, or the ENTER button.<br><br>3 Using the numbered keypad. Select the number that corresponds to the menu item. For example, press 1 from the **Jobs & Data** menu to access the **New job** screen. |  <br>  |

## Access

| Step | Description |
|---|---|
| 1. | Select **Main Menu: Go to Work!**.<br>OR<br>Press . |
| 2. | Select **Survey+**/**Athletics**. |
| 3. | Press **OK**. |
| 4. | In **Athletics measurements**, select the required event.<br>  |
| ☞ | It is not necessary to position and orient the instrument in order to use any of the options. All measurements are made relative to the instrument position. |

☞ Make sure that the correct prism type (prism constant) is set. A wrong prism constant would lead to incorrect results in all following distance measurements.

# 2 Configuring Athletics

## 2.1 Overview

**Types of configurations**

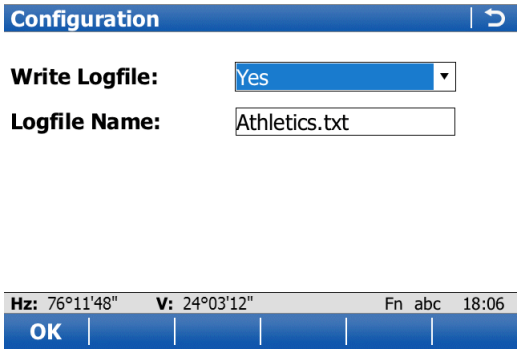
The application can be configured to suit user preferences. Two configurations are available:

- **Standard** configuration: Available to all users, containing basic configuration information.
- **Hidden** configuration: Used to configure vital measurement parameters. This configuration is reached by a special sequence of key strokes. It could be that the sequence of key strokes is not given to some operators to ensure that the configured parameters are not changed.

## 2.2 Standard Configuration

**Standard configuration**

The standard configuration can be accessed from most screens by pressing Fn **Conf**.




| Key | Description |
|---|---|
| **OK** | To return to the screen from where this screen was accessed. |

**Description of fields**

| Field | Option | Description |
|---|---|---|
| **Write Logfile** | **Yes** or **No** | Establishes whether a logfile is written or not. The default value for this parameter is **Yes**. If this parameter is set to **Yes**, each time **Store** is pressed whilst running the application, information is written to the logfile. The information written depends on the place in the application where **Store** is pressed. |
| **Logfile Name** | Editable field | The name of the logfile. The logfile is saved to the \DATA folder of the data storage device.<br>By using the txt-extension, the logfile can directly be accessed and viewed using the text editor of WinCE onboard. |

## 2.3 Hidden Configuration

**Access**

| Step | Description |
|---|---|
| 1. | Access the standard configuration by pressing Fn **Conf**. |
| 2. | Press the "." key three times in rapid succession. |

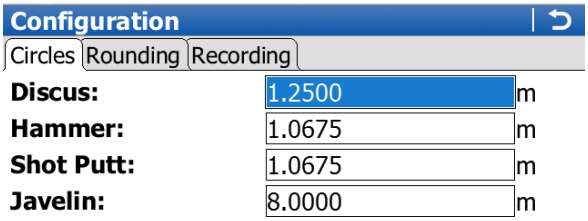
**Configuration, Circles page**

In this screen. the radius of the throwing circles can be entered.

☞ This is the only place in the application where these values can be edited.

The default values for the circle radius of each event is that specified in the IAAF Competition Rules handbook.

To modify a value, select the required event and type in the new value.





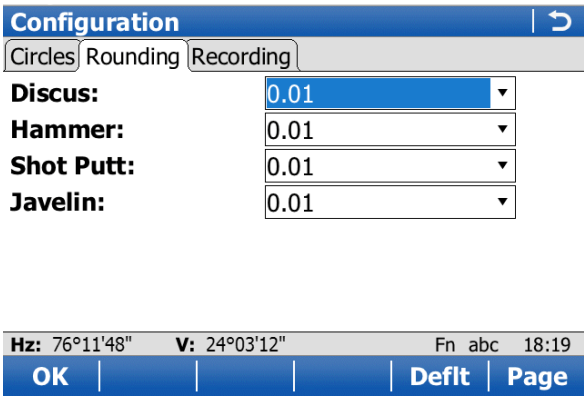
| Key | Description |
|---|---|
| **OK** | To save changes and return to standard configuration screen. |
| **Deflt** | To recall the default settings. The default values are:<br>• Discus: 1.2500 m<br>• Hammer: 1.0675 m<br>• Shot Putt: 1.0675 m<br>• Javelin: 8.0000 m |
| **Page** | To change to another page on this screen. |
| ESC | To return to the standard configuration without saving changes.. |

**Configuration, Rounding page**

This screen is used to define the number of decimal places to which the reported distances is displayed for the throwing events. Distances are always rounded down to the nearest place as specified in the configuration.

☞ The rounding value entered in this screen does not affect the decimal places of the distances sent via the serial port.

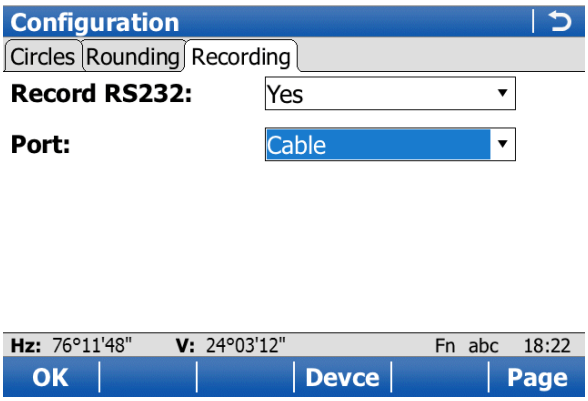
To modify a value, select the required event and select the value from the list.




| Key | Description |
|---|---|
| **OK** | To save changes and return to standard configuration screen. |
| **Deflt** | To recall the default settings. The default value for all events is 0.01. |
| **Page** | To change to another page on this screen. |
| ESC | To return to the standard configuration without saving changes.. |

**Configuration, Recording page**

This screen allows the settings to send results of the application through one of the instrument serial ports.




| Key | Description |
|---|---|
| **OK** | To save changes and return to standard configuration screen. |
| **Devce** | To call the standard system **Connection Settings** screen. The device associated with each available RS232 port can be configured. |
| **Page** | To change to another page on this screen. |
| ESC | To return to the standard configuration without saving changes.. |

### Description of fields

| Field | Option | Description |
|---|---|---|
| **Record RS232** | **YES** or **NO** | To activate and deactivate the sending of results through the serial port.<br>☞ All distances sent through the RS232 port are rounded down to the nearest centimetre. |

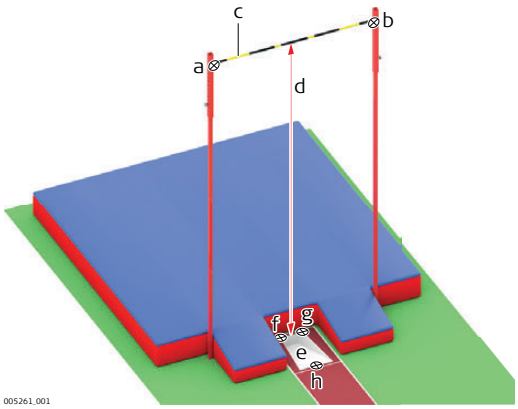
| Field | Option | Description |
|---|---|---|
| | | • If this parameter is set to **YES**, pressing **Store** sends a distance through the serial port in the following format:<br>‹STX›nnn.nn‹ETX›<br>‹STX› ASCII 2, start transmission<br>‹ETX› ASCII 3, end transmission<br>nnn.nn Distance in meters. Leading spaces are used for shorter distances.<br>• The screen indicates that the distance has been sent successfully with the message **Measurement sent sucessfully**.<br>• In the case of the **Foul** key being pressed, the following message is sent via the serial port:<br>‹STX› x‹ETX› Leading spaces are used to pad the message to six characters. |
| **Port** | Selectable list | The RS232 port through which the results are sent. |

# 3 Pole Vault

## 3.1 Understanding Terms and Expressions

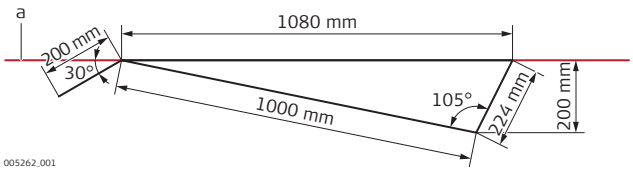
**Pole vault**

In the pole vault event it is required to measure the distance (reported height), in whole centimetres, perpendicular to a horizontal plane defining the level of the runway to the lowest part of the upperside of the crossbar. It is assumed that the lowest part of the crossbar is in the centre of the two vertical crossbar supports defined by two measured points (base point 1, base point 2). However it is also possible to measure the lowest point of the crossbar if this is not the case.




a) Base point 1
b) Base point 2
c) Crossbar
d) Reported height
e) Pit
f) Ground point 1
g) Ground point 2
h) Ground point 3

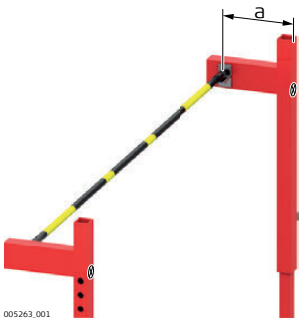
The horizontal plane marking the level of the runway is defined by the measuring of three points at the level of the runway (ground point 1, ground point 2, ground point 3) on the box used for planting the pole when vaulting:




**Pole vault box**
a) Level of the runway

Once the plane of the level of the runway has been established, the two base points (base point 1, base point 2) are measured on the vertical supports of the crossbar. These two points are then used to calculate the centre of the crossbar where the height should be measured.

The pole can be offset in a plane parallel to the vertical plane defined by the two base points. The athlete can decide the distance of the pole offset for each jump.



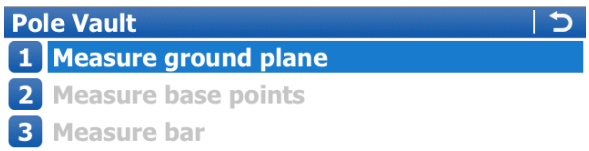

a) Pole offset

**Steps of pole vault measurements**

The pole vault event involves three steps. Each step in the process can be selected in the **Pole Vault** menu.

| Step | Description |
|---|---|
| 1. | Measure three points in a horizontal plane to define the level of the runway from which heights will be measured. |
| 2. | Measure two base points on the vertical supports of the crossbar. |
| 3. | Measure the height of the crossbar. |

**Pole Vault**





| Key | Description |
|---|---|
| **OK** | To select the highlighted option and to continue with the subsequent screen. |
| **Resum** | To re-start pole vault measurements. Refer to "6 Resuming Measurements". |
| Fn **Conf** | To configure the Athletics application. |
| Fn **Quit** | To exit the screen. |

**Description of options**

| Option | Description |
|---|---|
| **Measure ground plane** | To measure three points in a horizontal plane to define the level of the runway from which heights will be measured.<br>If no ground plane has been measured previously, only **Measure ground plane** is available for selection. |
| **Measure base points** | To measure two base points on the vertical supports of the crossbar.<br>It is necessary to measure the ground plane successfully before **Measure base points** can commence. |
| **Measure bar** | To measure the height of the crossbar.<br>It is necessary to measure the base point successfully before **Measure bar** can commence. |

**Next step**

Select an option and press **OK**.

## 3.3 Measuring the Ground Plane

**Description**

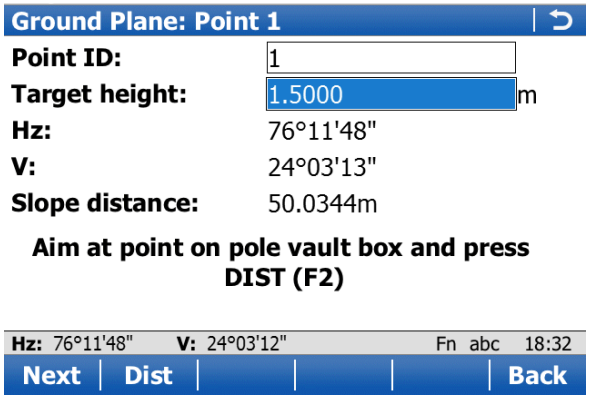
The level of the runway is defined by a horizontal plane. The height of this horizontal plane is defined by measuring three points on the pole vault box. These points are measured in turn and then the deviation of the three points from the plane is calculated. Before continuing, decide if the maximum deviation from the plane is acceptable or not.

**Measuring a point in the ground plane**

To measure a point on the ground plane, locate a prism pole on a point on the pole vault box and aim at the prism.

☞ Set the correct **Target height** of the prism.

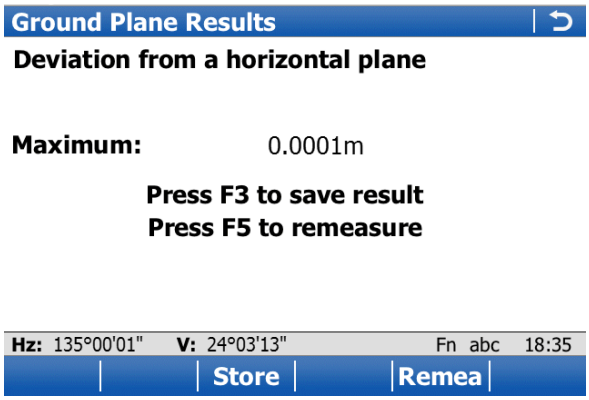
Reflectorless measurements can be used if a reflectorless EDM is available.




| Key | Description |
|---|---|
| **Next** | To store the measurement and to move on to measure the next point on the ground plane. It is only possible to move on to the next point if a valid distance has been measured. If all three points have been measured, the maximum deviation from a horizontal plane is calculated and displayed. |
| **Dist** | To measure and display distances. |
| **Back** | To return to the previous screen. |

**Results**

Once three points have been measured successfully, the maximum deviation from a horizontal plane is displayed. Decide, if the maximum deviation from the plane meets the requirements.

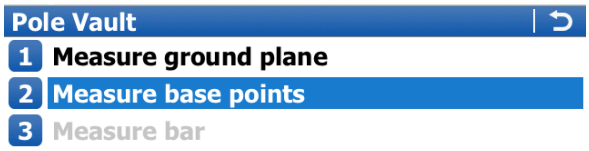


| Key | Description |
|---|---|
| **Store** | To store the mean height of the three measured points as the ground plane height and to return to the **Pole Vault** menu. |
| **Remea** | To return to **Ground Plane:** measurement. |

## 3.4 Measuring the Base Point

**Access**

If the ground plane has been measured successfully, the option **Measure base points** is enabled in the **Pole Vault** menu.



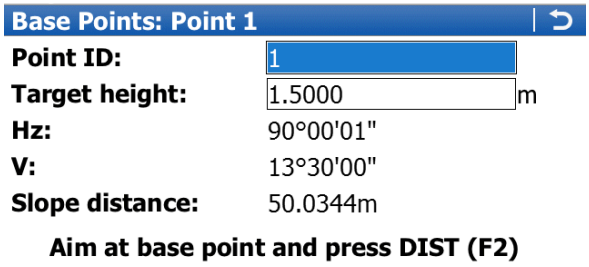


This option allows the measurement of two points located on the vertical crossbar supports. By these points, the position of the centre of the crossbar can be calculated.

Press **OK**.

**Measuring the base points**

To measure a base point, locate a prism on the point to measure and aim at the prism. Reflectorless measurements can be used if a reflectorless EDM is available.





| Key | Description |
|---|---|
| **Next** | To store the measurement and to move on to measure the next base point. It is only possible to move on to the next base point if a valid distance has been measured. If both points have been measured successfully, the application returns to the **Pole Vault** menu. |
| **Dist** | To measure and display distances. |
| **Back** | To return to the previous screen. |

## 3.5 Measuring the Crossbar

**Access**

If the base points have been measured successfully, the option **Measure bar** is enabled in the **Pole Vault** menu.



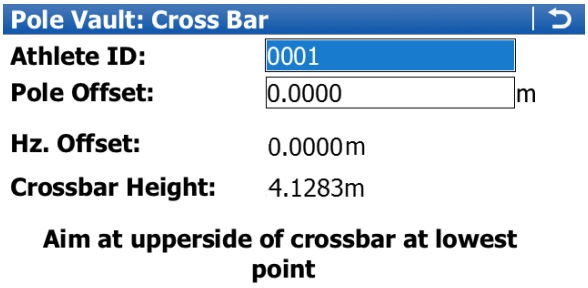
This option allows the measurement of the height of the crossbar over the defined ground plane.

Press **OK**.

**Measuring the crossbar**

On entering the screen, the instrument turns to the point that is calculated to be halfway between, and in the same plane as, the two base points.

Manually turn the instrument so that the crosshairs of the telescope coincide with the upper part of the bar at it's lowest point.





| Key | Description |
|---|---|
| **Store** | To store the measurement. Depending on the configuration, the measurement is sent to a serial port and/or the log file. If the distance is sent successfully, a message appears. |
| ESC | To return to the **Pole Vault** menu. |

**Description of fields**

| Field | Option | Description |
|---|---|---|
| **Athlete ID** | Editable field | The point ID of the point to be measured. |

| Field | Option | Description |
|---|---|---|
| **Pole Offset** | Editable field | The athlete may decide to offset the pole from the plane of the measured base points. In this case, the pole offset must be entered so that the calculation of the intersection of the pointing of the sensor and the plane of the crossbar is correct. Refer to "Pole vault". |
| **Hz. Offset** | Display only | The horizontal distance from the calculated centre point of the crossbar, halfway between the base points. |
| **Crossbar Height** | Display only | The height of the crossbar over the ground plane. |

# 4 Long Jumps

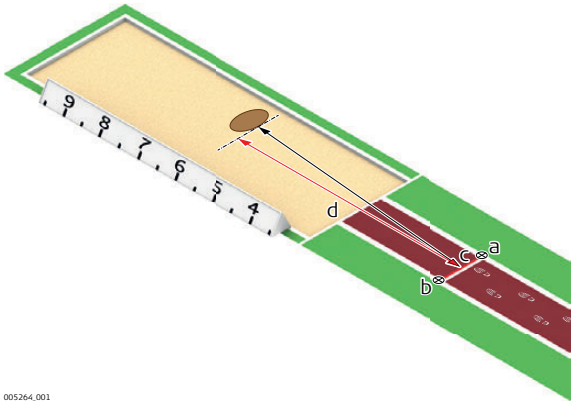
## 4.1 Understanding Terms and Expressions

**Jump events**

The triple jump and long jump share the same measuring methodology and terminology.

A foul line marking the vertical plane from which the jump must be measured is defined by two points (P1, P2).

Once a jump has been made, a judge places a prism at the point indicating the nearest break in the landing area made by any part of the body to the foul line, or the projection of the foul line.




a) Point 1
b) Point 2
c) Foul line (reference line)
d) Reported distance

The reported distance must be measured perpendicular to the foul line or its projection. The reported distance is recorded in whole centimetres.

## 4.2 Menu

**Steps of long jump measurements**

The long jumps function can be used for measuring both the long jump and triple jump events. No distinction is made between these events as the methodology used is identical for both events.

Measurement of a long jump involves two steps. Each step in the process can be selected in the **Long Jump**.

| Step | Description |
|---|---|
| 1. | Measure two points that define the foul line from which jumps will be measured. |
| 2. | Measure the jump distance of each competitor. |



| Key | Description |
|---|---|
| **OK** | To select the highlighted option and to continue with the subsequent screen. |
| **Resum** | To re-start long jumps measurements. Refer to "6 Resuming Measurements". |
| Fn **Conf** | To configure the Athletics application. |
| Fn **Quit** | To exit the screen. |

### Description of options

| Option | Description |
|---|---|
| **Measure foul line** | To measure two points that define the foul line from which jumps are measured.<br>If no foul line has been measured previously, only **Measure foul line** is available for selection. |
| **Measure jumps** | To measure the jump distance of each competitor.<br>It is necessary to measure the foul line successfully before **Measure jumps** can commence. |

### Next step

Select an option and press **OK**.

## 4.3 Measuring the Foul Line

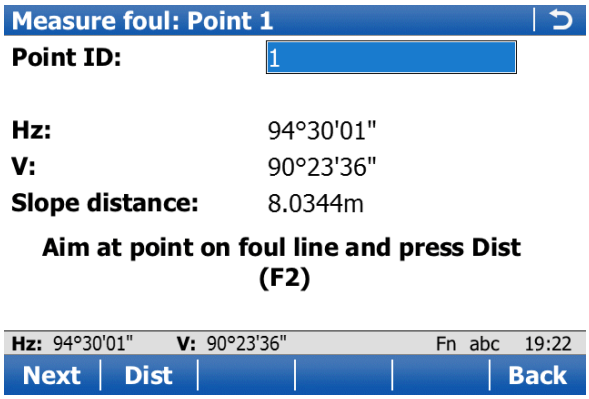
**Description**

The foul line is defined by two points. Each point must be measured in turn.

**Measuring points on the foul line**

To measure a point on the foul line, locate a prism on the point to measure and aim at the prism. Reflectorless measurements can be used if a reflectorless EDM is available.

Repeated the process for the both points on the foul line.

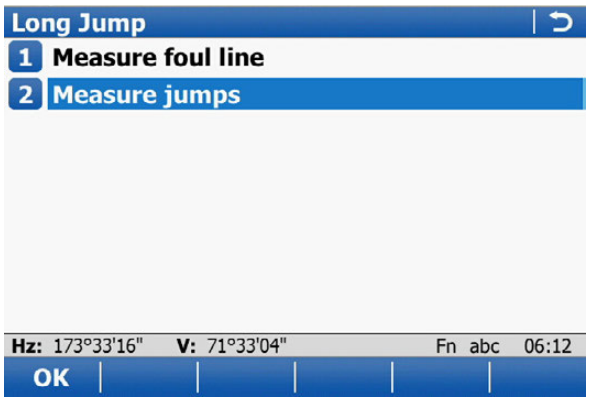



| Key | Description |
|---|---|
| **Next** | To store the measurement and to move on to measure the next point on the foul line. It is only possible to move on to the next point if a valid distance has been measured.<br>To return to **Long Jump**, if both points have been measured. |
| **Dist** | To measure and display distances. |
| **Back** | To return to the previous screen. |

## 4.4 Measuring the Jumps

**Access**

If the base points have been measured successfully, the option **Measure jumps** is enabled in the **Long Jump**.

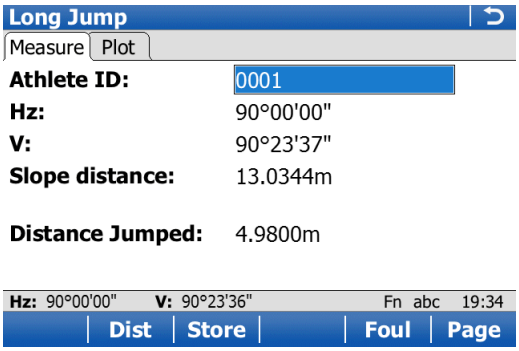


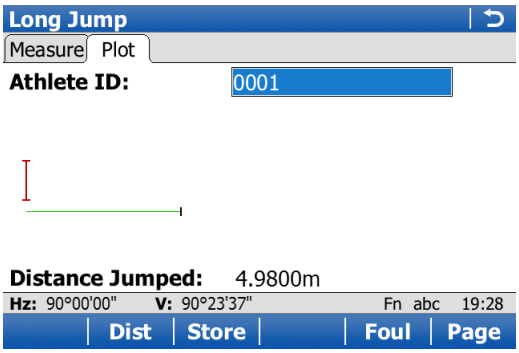

This option allows the measurement the length of a jump with respect to the foul line.

Press **OK**.

## Measuring long jumps

To measure a jump, locate a prism on the point to measure and aim at the prism. Reflectorless measurements can be used if a reflectorless EDM is available.




The **Plot** page allows a graphical view of the jump in relation to the foul line.

The description of keys is valid for both pages.

| Key | Description |
|---|---|
| **Dist** | To measure and display distances in **Distance Jumped**. |
| **Store** | To store the measurement. Depending on the configuration, the measurement is sent to a serial port and/or the log file. If the distance is sent successfully, a message appears. |
| **Foul** | To store the jump as invalid. Depending on the configuration, an invalid measurement is sent to a serial port and/or the log file. If the information is sent successfully, a message appears. |
| **Page** | To change to another page on this screen. |
| Fn **Save** | To save the measurement to the logfile. |
| Fn **Fine** | To change the display for **Distance Jumped** to fine mode. The distance is displayed with three decimal places for ten seconds. Then the display reverts to two decimal places. This function may be used for checking purposes but does not affect the recording of the data. All measurements are recorded in centimetres. |

### Description of fields

| Field | Option | Description |
|---|---|---|
| **Athlete ID** | Editable field | The number of the athlete.<br>Enter the number in order to save this information with the corresponding measurement in the log file. |
| **Distance Jumped** | Display only | The distance jumped. |

# 5 Throwing Events

## 5.1 Understanding Terms and Expressions

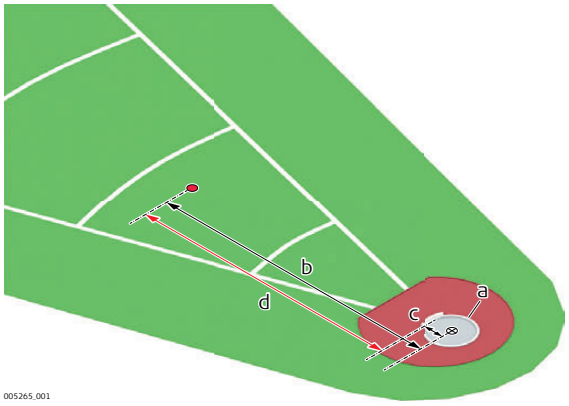
**Throwing events**

The same methodology is used for the hammer, discus and shot putt and javelin events.

A foul line is delimited by a circle or part of a circle.

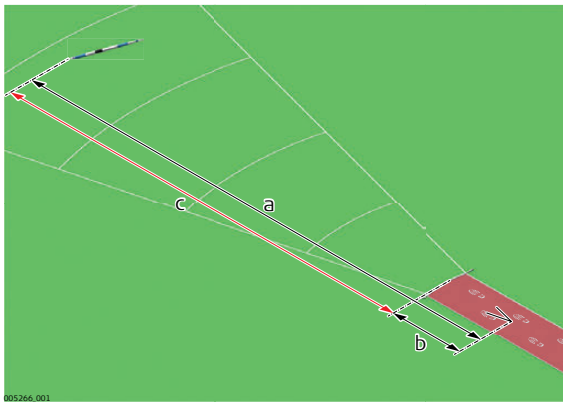
Once a throw is made, the calculated distance from the centre of the circle defining the foul line to the point where the implement lands is made. The radius of the circle (R for discus, hammer, shot putt, L for the javelin) is then subtracted from the calculated distance to give the reported distance.

The foul line for the hammer, discus and shot putt is represented by a circle (boundary) and is defined by measuring three points on the circle:




a) Boundary
b) Calculated distance
c) Radius R of the circle
d) Reported distance

The foul line for the javelin is represented by an arc defined by two points measured in a clockwise direction:




a) Calculated distance
b) Radius R of the circle
c) Reported distance

**Throwing events**

The throwing events comprise four available events: **Discus**, **Hammer**, **Shot Putt** or **Javelin**.
The methodology used for each event is identical apart from the measurement of the javelin foul line. More details are given in the appropriate section of this chapter.
The process explained in this manual is applicable to all events except where any modifications to the process for a specific event are explicitly stated.

**Steps of throwing measurements**

A throwing event involves two steps. Each step in the process can be selected in the menu.

| Step | Description |
|---|---|
| 1. | Define the foul line. |
| 2. | Measure the throw distance of each competitor. |

**Discus Menu**



| Key | Description |
|---|---|
| **OK** | To select the highlighted option and to continue with the subsequent screen. |
| **Resum** | To re-start measurements. Refer to "6 Resuming Measurements". |
| Fn **Conf** | To configure the Athletics application. |
| Fn **Quit** | To exit the screen. |

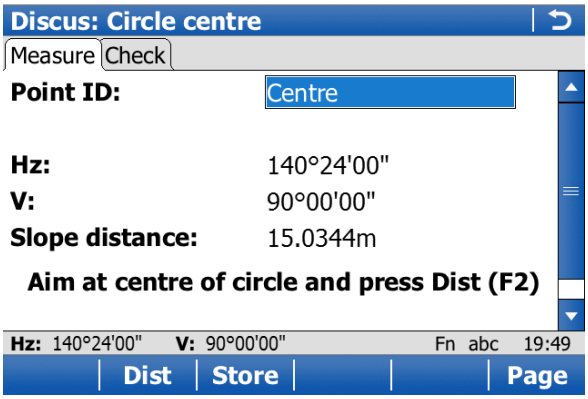
**Description of options**

| Option | Description |
|---|---|
| **Measure centre point** | The foul line for the throwing events is defined by a circle or part of a circle. In some installations, the centre of the circle is marked on the ground and may be measured. In this case, definition of the foul line is possible by simply measuring the centre point. |
| **Measure foul line** | If the centre point is not marked on the ground, it can be calculated by measuring three (two for javelin) points along the foul line. |
| **Measure throw** | To measure the distance of a throw.<br>It is necessary to measure the foul line successfully before **Measure throw** can commence. |

**Next step**
Select an option and press **OK**.

**Measuring the centre point**

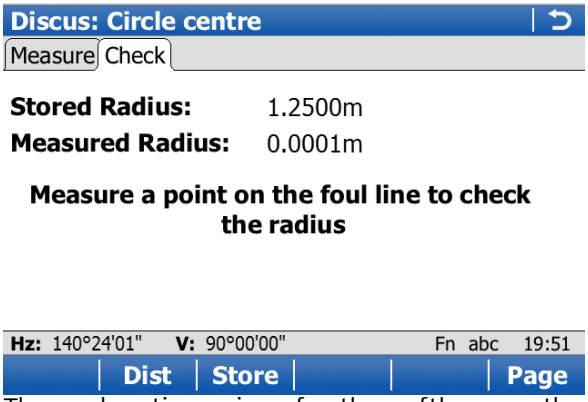
The centre point of a circle can be measured for each throw event.




| Key | Description |
|---|---|
| **Dist** | To measure the distance from the instrument to the centre point. |
| **Store** | To store the centre point as the point from which measurements will be calculated. |
| **Done** | To return to the throw event menu. This function is only enabled once a valid distance has been stored. |
| **Page** | To change to another page on this screen. |
| Fn **Config..** | To configure the Athletics application. |

**Checking the centre point**

The distance from the centre point of the circle to the foul line can be checked on the **Check** page.




The explanations given for the softkeys on the **Measure** page are valid.

| Key | Description |
|---|---|
| **Dist** | To check the circle radius, measure a point on the foul line. |

**Description of fields**

| Field | Option | Description |
|---|---|---|
| **Stored Radius** | Display only | The radius of the event circle stored in the program configuration.<br>☞ In the configuration, a different radius is stored for each throwing event. Refer to "2 Configuring Athletics" for information on the configuration. |
| **Measured Radius** | Display only | The measured distance from the centre point to the point measured on the foul line. |

## 5.4 Measuring the Foul Line

**Description**

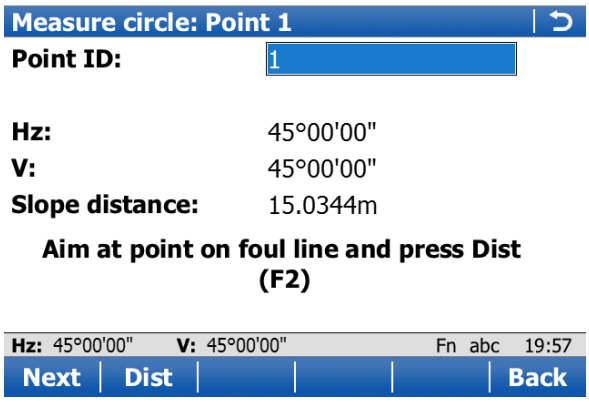
If the centre point of the throwing circle is unavailable, it is possible to define the foul line by measuring points along the line. In the case of the javelin, two points must be measured in a **clockwise** direction. For the other events, three points are measured on the foul line with the direction of measurement being unimportant.
The measure foul line function can be selected from the menu of each individual throw event.

**Measuring points on the foul line**

To measure a point on the foul line, locate a prism on the point to measure and aim at the prism. Reflectorless measurements can be used if a reflectorless EDM is available.

Repeated the process for the other points on the foul line.

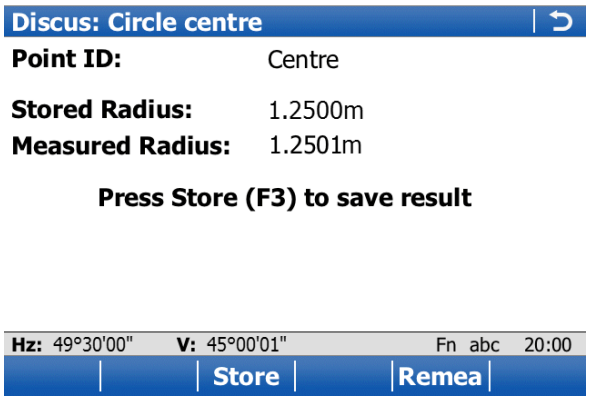
☞ In case of javelin, measure two points in **clockwise** direction.




| Key | Description |
|---|---|
| **Next** | To store the measurement and to move on to measure the next point on the foul line. It is only possible to move on to the next point if a valid distance has been measured.<br>To display the results, if all points have been measured. |
| **Dist** | To measure and display distances. |
| **Back** | To return to the previous screen. |

**Results**

Once enough points have been measured successfully, the distance from the centre point of the circle to the foul line is displayed. Decide, if the requirements are met.



| Key | Description |
|---|---|
| **Store** | To store the radius of the measured points and to return to throw event menu. |
| **Remea** | To return to the **Measure circle:** screen. |

**Description of fields**

| Field | Option | Description |
|---|---|---|
| **Stored Radius** | Display only | The radius of the event circle stored in the program configuration.<br>☞ In the configuration, a different radius is stored for each throwing event. Refer to "2 Configuring Athletics" for information on the configuration. |
| **Measured Radius** | Display only | The measured distance from the centre point to the point measured on the foul line. |

**Access**

If the foul line has been measured successfully, the option **Measure throw** is enabled in the throw event menu.

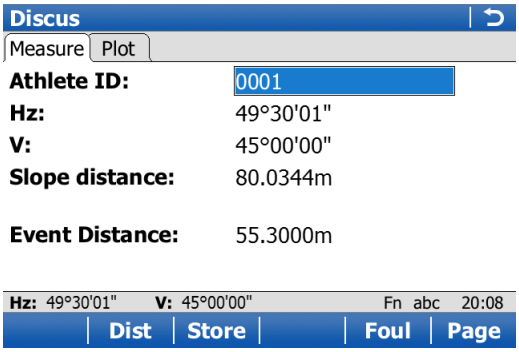


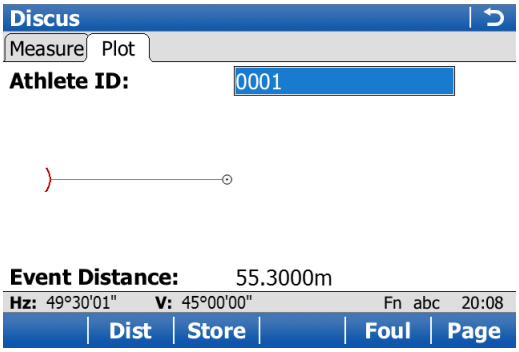
This option allows the measurement the length of a throw with respect to the foul line.

Press **OK**.

**Measuring throws**

To measure a throw, locate a prism on the point to measure and aim at the prism. Reflectorless measurements can be used if a reflectorless EDM is available.




The **Plot** page allows a graphical view of the throw in relation to the foul line.

The description of keys is valid for both pages.

| Key | Description |
|---|---|
| **Dist** | To measure and display distances in **Event Distance**. |
| **Store** | To store a valid throw measurement. Depending on the configuration, the measurement is sent to a serial port and/or the log file. If the distance is sent successfully, a message appears. |
| **Foul** | To store the throw as invalid. Depending on the configuration, an invalid measurement is sent to a serial port and/or the log file. If the information is sent successfully, a message appears. |
| **Page** | To change to another page on this screen. |
| Fn **Save** | To store the results to the logfile. |

| Key | Description |
|---|---|
| Fn **Fine** | To change the display for **Event Distance** to fine mode. The distance is displayed with three decimal places for ten seconds. Then the display reverts to two decimal places. This function may be used for checking purposes but does not affect the recording of the data. All measurements are recorded in centimetres. |

**Description of fields**

| Field | Option | Description |
|---|---|---|
| **Athlete ID** | Editable field | The number of the athlete.<br>Enter the number in order to save this information with the corresponding measurement in the log file. |
| **Distance Jumped** | Display only | The distance jumped. |

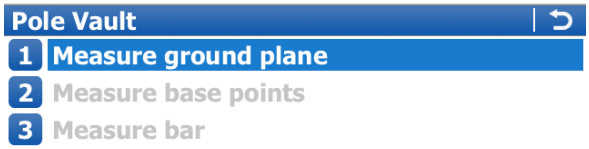
# 6 Resuming Measurements

**Access**

Sometimes it is necessary to leave a measurement function and return at a later time, for example, to measure a distance for another event.

Either the ground plane and the base points or the foul line must have been measured successfully. A measurement function can then be re-started without re-measuring the ground plane and base points or the foul line.

To resume an existing measurement, enter the menu of an athletic event from the Main Menu.





| Key | Description |
|---|---|
| **Resum** | To re-start pole vault measurements.<br>The measured ground plane and base points or the foul line are recalled from the memory. The measurement screen starts up directly. |

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**805530-1.0.0en**
Original text
Published in Switzerland


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