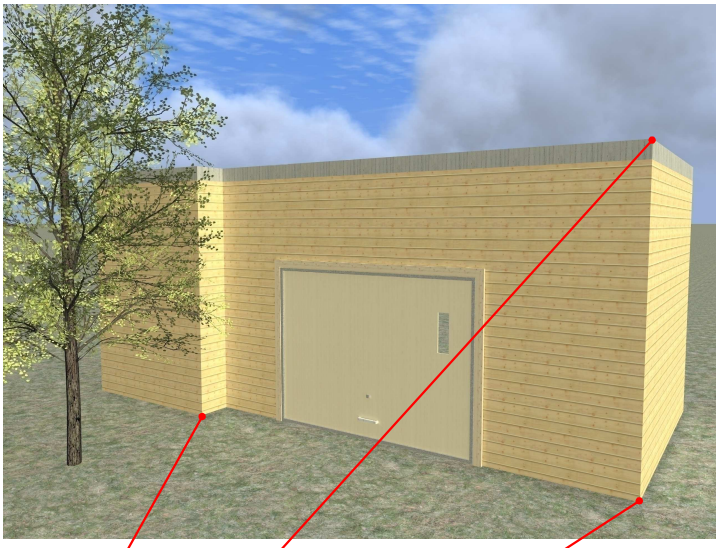
cadwork®



Leica Geosystems

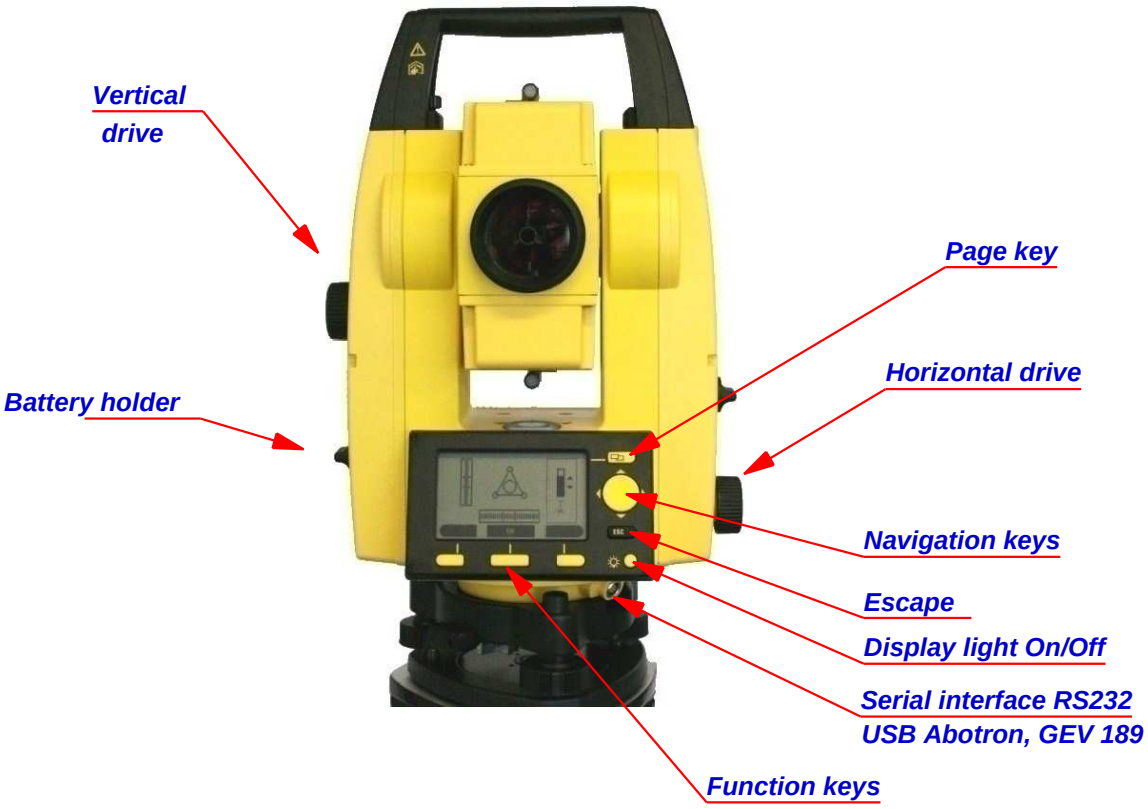
BUILDER 309

(R100M)

cadwork®.com

Total station manual

Total station manual



Leica Geosystems

BUILDER 309

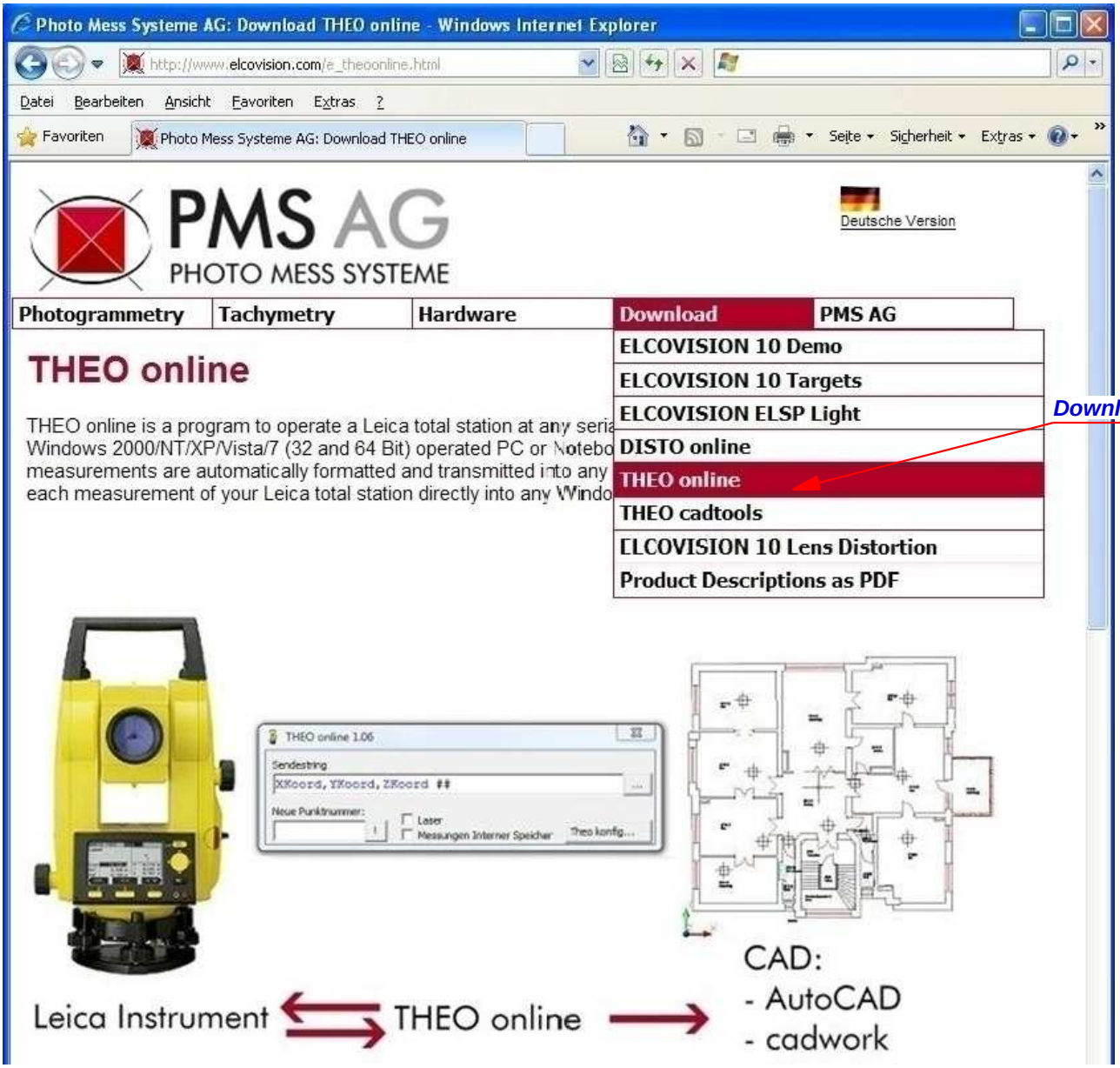
(R100M)

Table of contents

1. Connection with PC

1.1 PC setup

-On the following website http://www.elcovision.com/e_theoonline.html you will be able to download the software.
-Note that THEO online is necessary to load data in real time in Cadwork 3Dusing the optional Abotron download cable GEV189.



-Send your serial number to *theoonline@elcovision.com* and you will receive a temporary code valid for 2 days. The software can be purchased directly on Elcovision's website.

1.2 **Abotron GEV189** USB cable driver installation

-Insert the installation CD provided with the cable and folow instructions (**USB Download Cable GEV189**). Note that the most current driver can also be found on the Leica Geosystems website in the download area.

1.2a Install **Construction Data Manager** (CDM)

-Insert the installation DVD (**Leica BUILDER series, Instruments CD**) and install the Construction Data Manager software. Note that the most current version can be found on the Leica Geosystems website in the download area.

-Connect the PC and the total station with USB Abotron, GEV 189 download cable.

Lemo 0/USB = USB Abotron download cable

Connection port for USB Abotron, GEV 189 download cable

-The red dot on the device should correspond with the one on the cable!

1.3 Start Cadwork, assign functions

-Open a new Cadwork 3D file, Cadwork Version 17.0

-Click on Help\Functions F1-F12

-Make sure keys are assigned with the following functions:

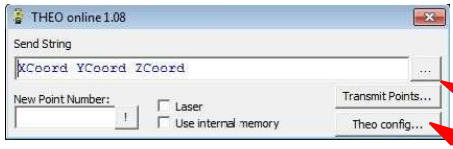
F1	Category =	Total station	=	**Add total station "Line" (3D)**
F2	Category =	Total station	=	**Add total station "Node" (3D)**
F3	Category =	Total station	=	**Export total station layout (3D)**

Execute THEO online for the 1st time

Attention: Theo online and Leica Construction Data Manager should not be executed at the same time!!

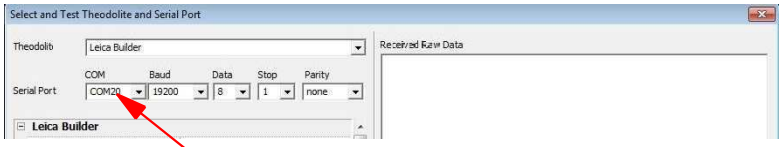
(Figure 7)

-Double click ->



Open window to format string

Open configuration window



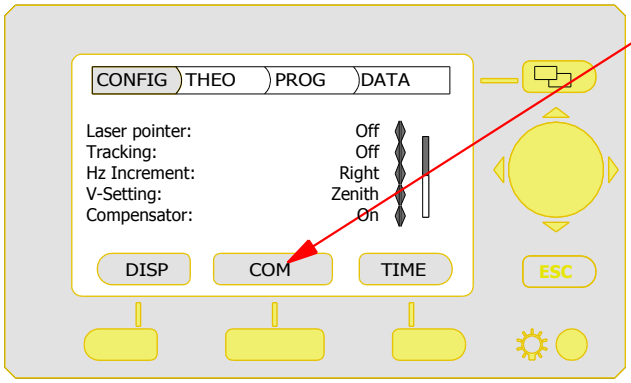
Set communication parameter

as seen in the total station or Construction Data Manager, *(Figure 7B, page 6)*

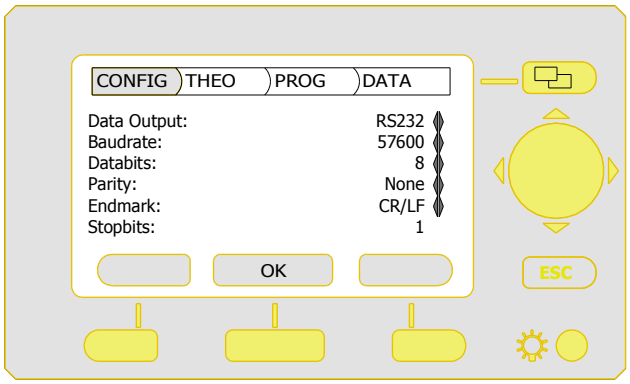
Setting should be set only once. *Make sure you always plug the cable to the same port. Doing so will prevent the need to re-configure the COM #!*

Edit communication parameter

(Figure 7A)

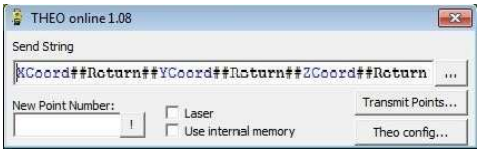


(Figure 7B)



Test connection

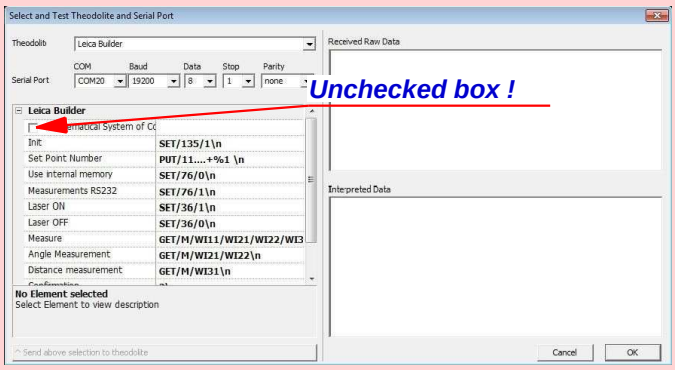
(Figure 7)



-Check the box besides **Laser**.

Test 1: Is the connection successful?
You should be able to turn On/Off the laser.
Test 2: Write a number in the field New Point Number and click on (**!**). If connection is successful,the point appears on the total station display. *(PROG tab, application As Built...)*

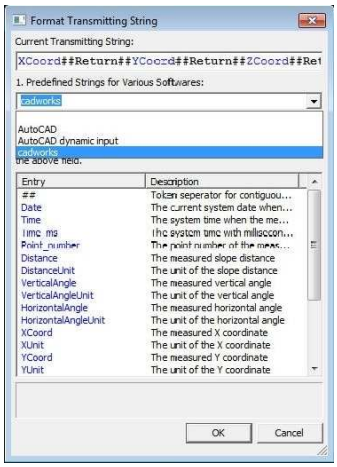
Make 1 of these 2 tests to check the connection!
-In case of an error,please choose another **COM #** in the configuration window.



-In Theo config... Make sure the box **Mathematical System of Coordinates** is not checked!!

If box is selected, X and Y axis will be rotated!!!

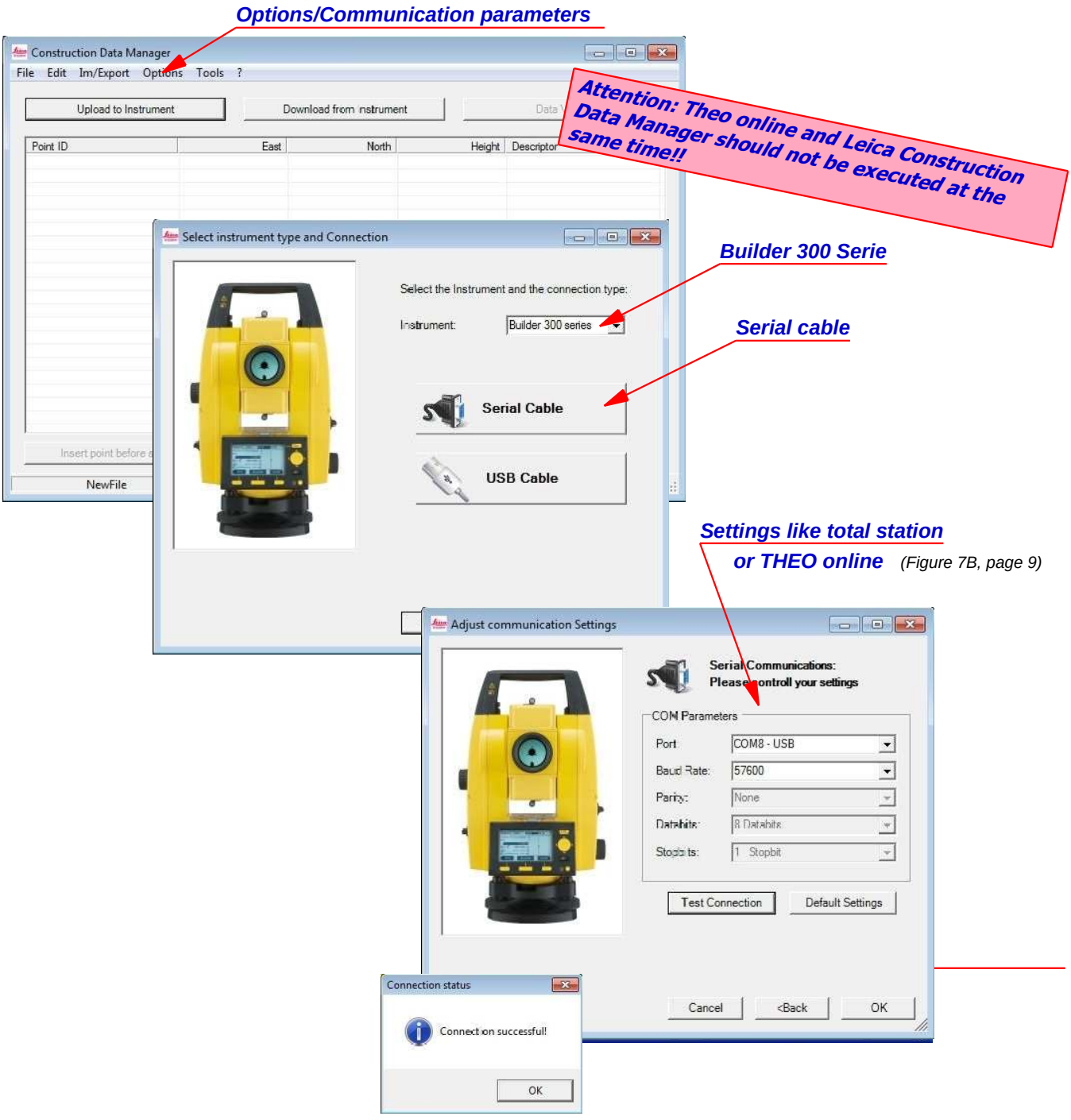
Transmitting string



-In the **Format Transmitting String** window, in **Predefined Strings**, choose cadwork and confirm with OK.

The string will be set to:
XCoord##Enter##YCoord##Enter##ZCoord##Enter

Execute CDM for the 1st time



2. Set up control line

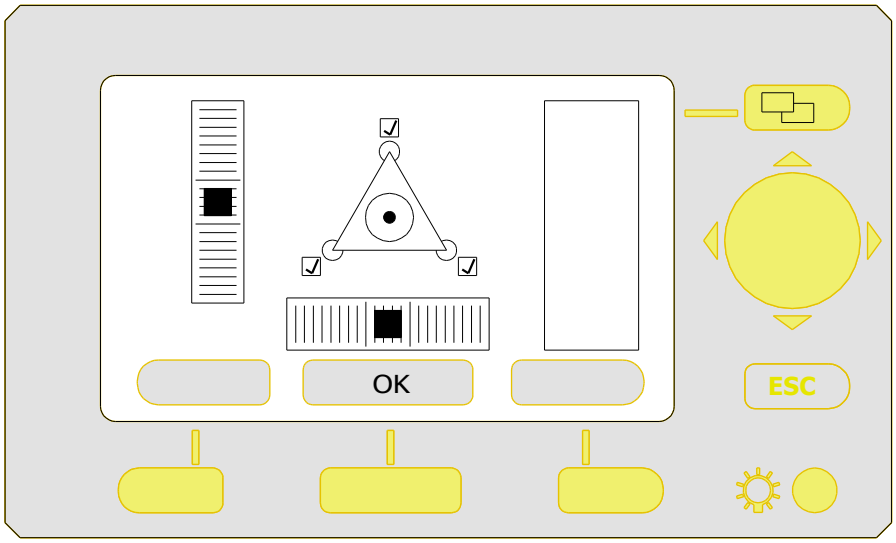
2.1 Total station installation

-Assemble the total station with the tripod and center the bubble

-Press the red power button for 3 seconds.

-Adjust the electronic bubble (Figure 1), once the 3 boxes are checked, press **OK**.

(Figure 1)



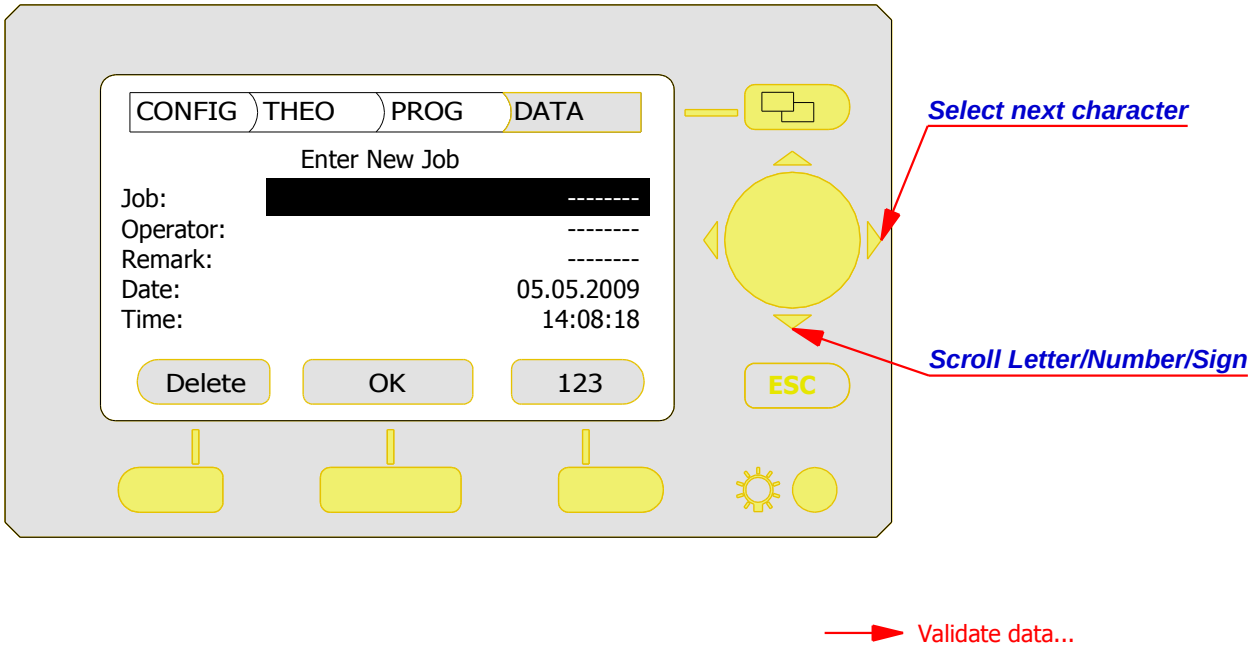
-Select the **DATA** menu (Page key)

-Select **JOB** (Function key)

-Select **NEW** (Right function key)

-Type a new name using navigation keys; the operator name can also be entered. (Figure 2), confirm with **ok**.

(Figure 2)



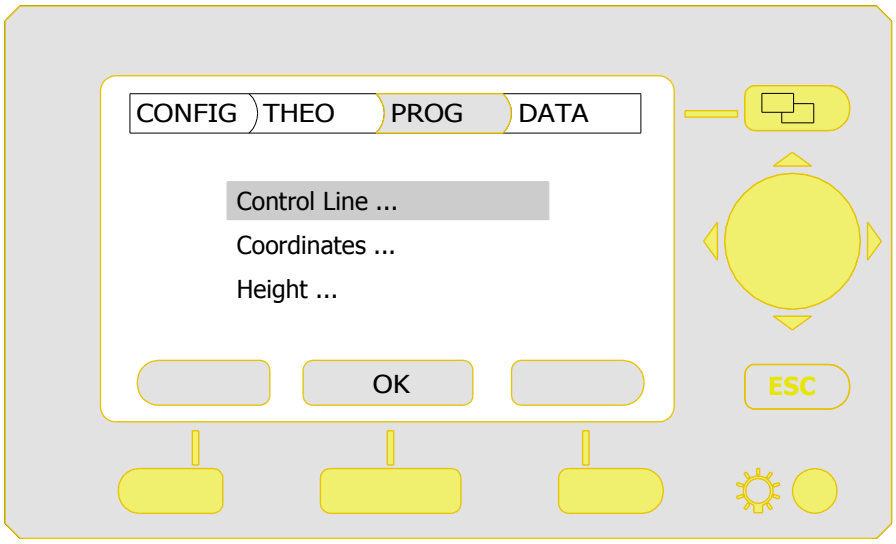
2.2 Set up control line

-Select **PROG** menu (Page key) ***(ATTENTION: Select Application -> As Built... !)***

-Select **SETUP**, (Right function key)

-Select **Control Line...** (Navigation keys) (Figure 3), confirm with **ok**.

(Figure 3)



-Select **Anywhere...** (Navigation keys), confirm with **ok**.

-Shoot the start point of line P1 and measure **M & R** (measure and record). (Figure 4)

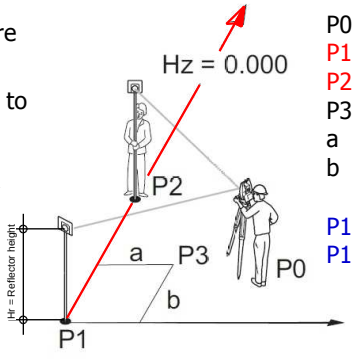
- If laser is not visible, press the middle function key for 3 sec to activate it.

- Answer NO to message (Record to external ?), (*message will only apears if the PC and THEO online are connected and in the THEO online window, the box* ***Use internal memory*** *is unchecked!*)

-Shoot second point of control line **P2** and measure using key **M & C**.

Arrow represent Y axis in Cadwork 3d

P1 = Height Z = 0.00 mm

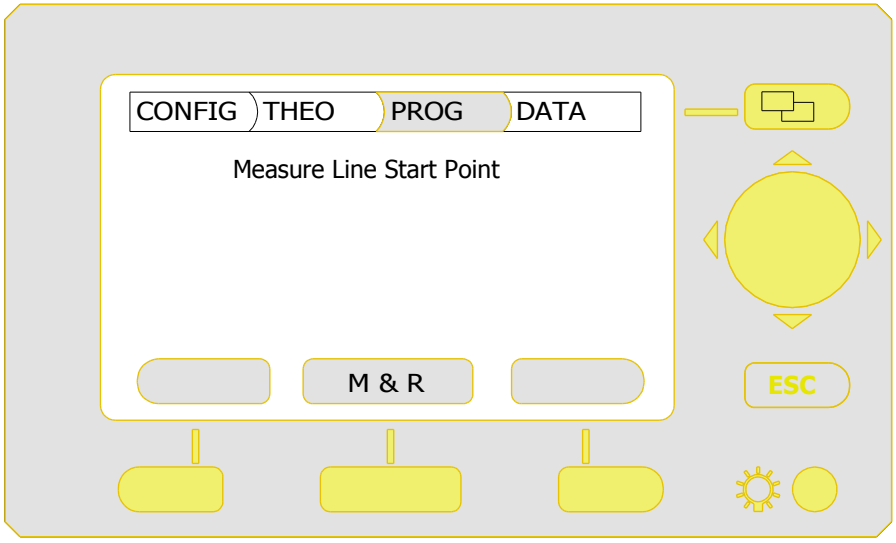


P0	Total station
P1	Start point of control line
P2	Second point of control line
P3	Point de départ décalé
a	Offset value for shift
b	Line value for shift

P1 and P2 define the control line
P1 is set at x0.0/y0.0/z0.0

With the Shift function, the 0 point of X and Y axis can be changed, (a+b) = P3.

(Figure 4)



-A value can also be entered to shift the control line (a and b, above image) to find point P3.

Station and Orientation will be changed and set

Press YES to confirm

2.3 Set up height

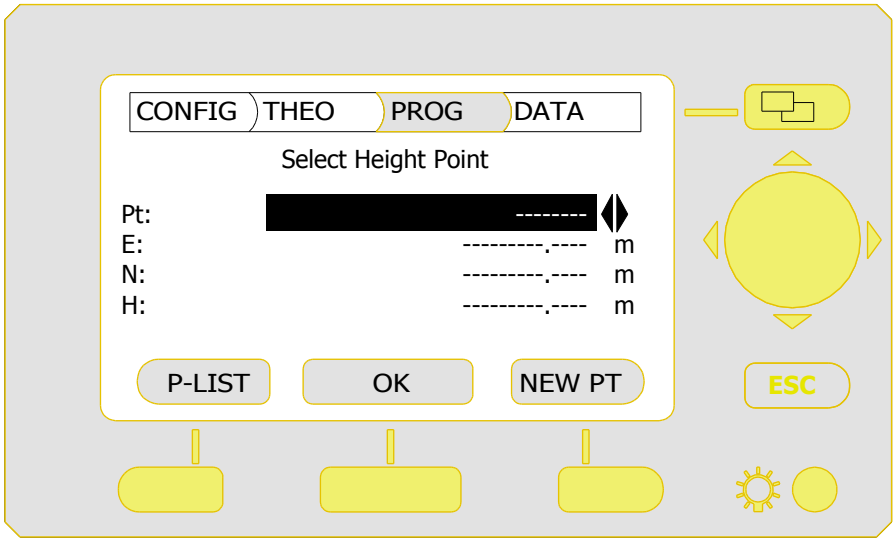
with this function, point 1 of control line is not at Z=0.0, height is defined through a measure.

-Select **SETUP**, (Right key)

-Select **Height** (navigation keys) (Figure 3), confirm with **OK**.

-Select **HTrans**, Height transfer (Right key), (Figure 5)

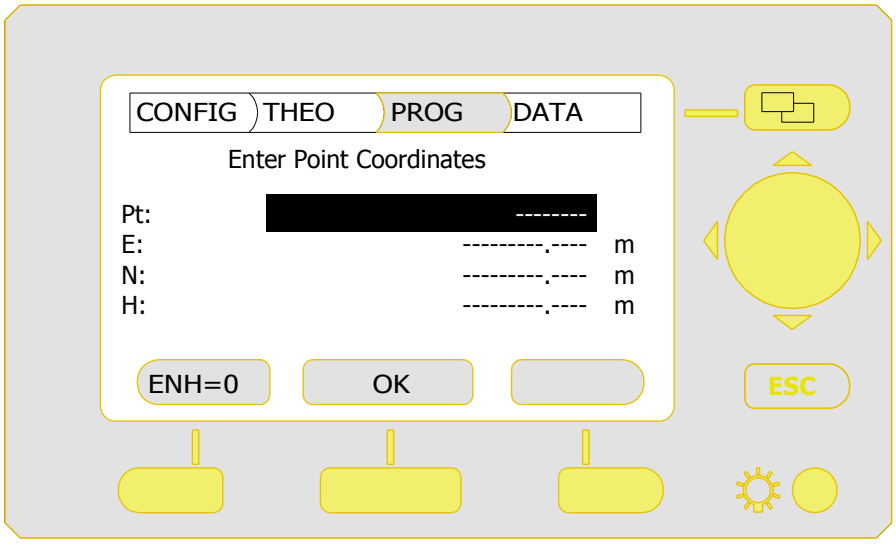
(Figure 5)



-Select **NEW PT**, New point (Right key)

-Write **H01** as the point name (Navigation keys), (Figure 6)

(Figure 6)



-Scroll to the 3rd line (Navigation keys), in order to enter the True Line height, **1.000 m** for example. Height is entered using the navigation keys, and confirmed with **OK**.

-Confirm with **OK** → Validate data !

-Shoot the True Line and measure point (**M & R**) → New Station Height 1.????m will be set

Confirm with **YES**

Explanation:
In Switzerland, maconry is done using a virtual height at 1.0m. This virtual height is called the ***True Line****.*

From now on, Cadwork, THEO Online, CDM, and the total station are ready to use.

-For the points measured to be transfered to Cadwork, the **Use internal memory** box should not be checked! (Figure 7, page 8)

-Select **APPL** (Right function key) , Application on the total station in **PROG** menu

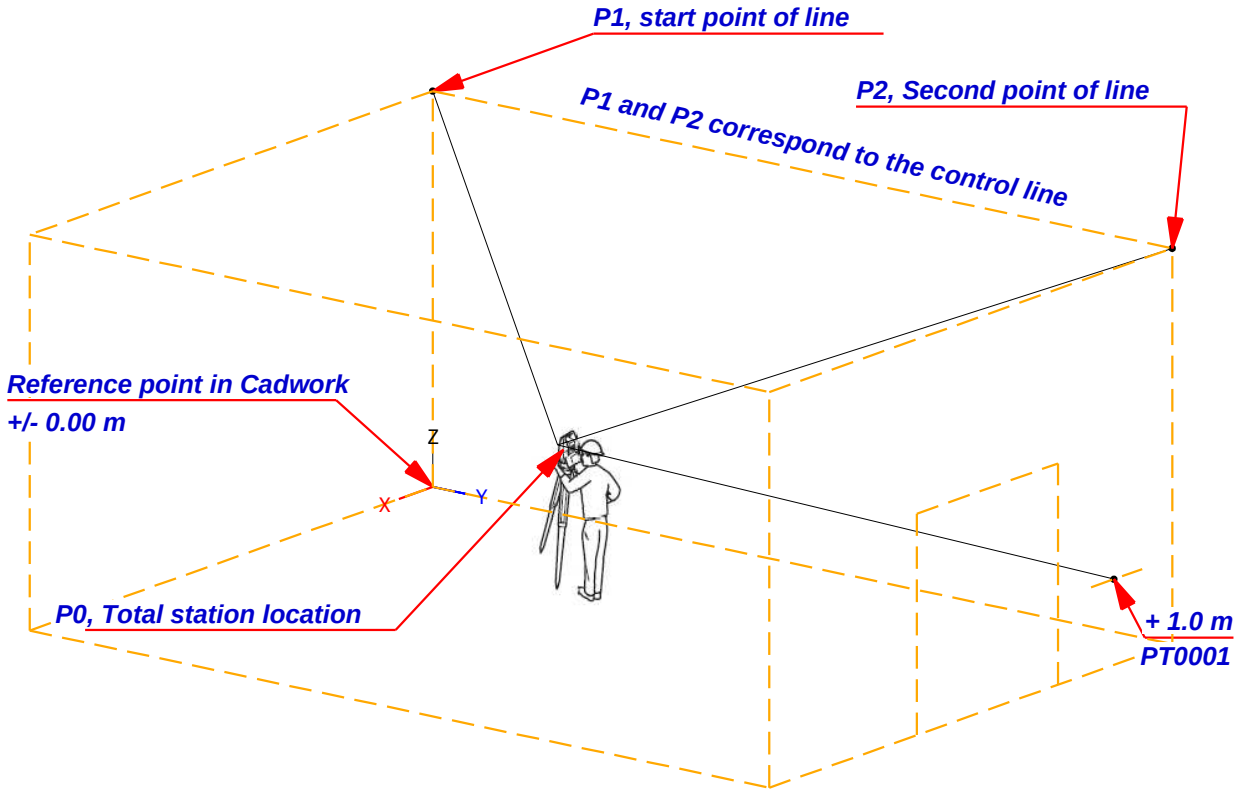
-Select **As Built...** and confirm with **OK**

-In Cadwork **3D** Version 17, press **F1** key

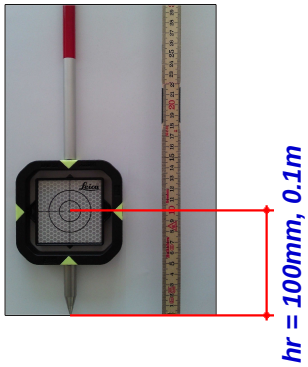
-Select a line color (Proceed with available polyline ?) = No

-Now any points can be measured, a line will be drawn in Cadwork point after point with the selectes color. To exit the function, right click. *(Measured points are transfered to the PC through the cable, name of points are kept)*

-Before measuring, it's possible to assign a name to the line or node in Cadwork with key (**?**) and (**Enter**), traced by the total station. (It is saved in the user attributes 10)



2.4 Working with the reflector



-In a case of a point that can be hardly measured, the use of a reflector is necessary.
-To do this, the reflector height should be adapted hr=Reflector height

-To adapt the reflector height:

1. Select **SETUP** (Right function key), in the **PROG** menu
2. Select **Height** (Navigation keys) (Figure 3), confirm with **OK**.
3. Select **hr**, reflector heigh (Navigation keys)
4. Type value **0.1** m (or depending on the configuration: **0.4, 0.7, 1.0, 1.3** m))
5. Confirm with **OK**
6. You now see the chosen height, confirm again with **OK**.

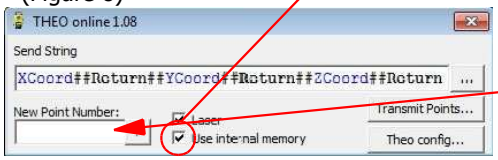
3. Offset total station location

3.1 Total station new location

When measuring buildings (interior and exterior) the total station should be moved on several occasions. How to do this? The following describes how to do it.

-To save points asscіated with the internal memory, the **Use internal memory** box should be checked! (Figure 8)

(Figure 8)



The name of the point can be typed here and then be sent to the total station using the (!) button

-Now mark 2 points on the building (Reference points) using positionning items *(or while doing the layout during the raising)*, and make sure they are visible.
Write also the names of the points on the building !

-Using the navigation keys, you can modify the name of the points on the total station, (Figure 9), or on THEO online (Figure 8)

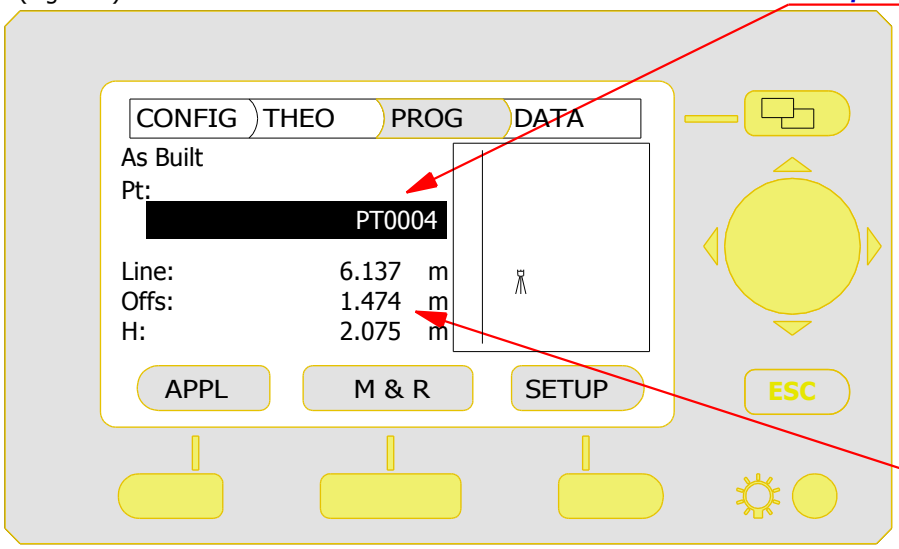
-Measure the 2 points **(Example. V0001 - V0002)**. *(Both points should be saved in the internal memory)*

-To load the 2 reference points in Cadwork also called security points, press F2 on the PC to **Add total station "node" (3D)**, select a color and measur points again. *(Attention; The Use internal memory box should be unchecked)*
Assign the same names in Cadwork 3D as in the building and the total station!

It highly recommended, depending on the situation of the building site to use more than 2 points!!!!

(Figure 9)

Next point to be measured



Coordinates of the last point measured

3.2 Set up using known points

-Relocate the total station to its new location , center the bubble (Like in point 2.1: Installation)

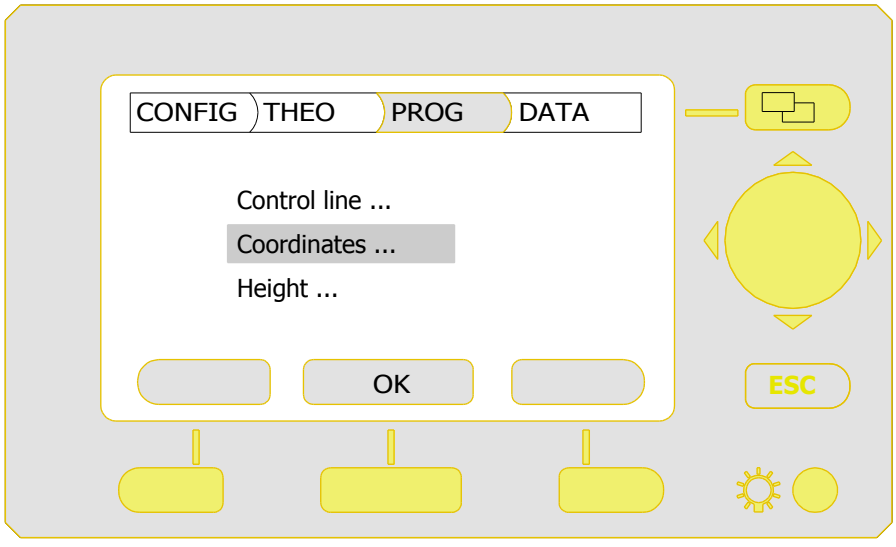
-Select **PROG** (Page key)

-Select **SETUP**, (Function key)

-Select **Coordinates** (Navigation keys), (Figure 10) confirm with **OK**

-Select **Anywhere...** (Navigation keys), and confirm with **OK**

(Figure 10)



-Do not edit hi (Instrument height).

-hr (=reflector height) see ***Point 2.4***, press **ok** to continue.

-Select **the 1st reference point** (Navigation keys) and confirm with **OK**.

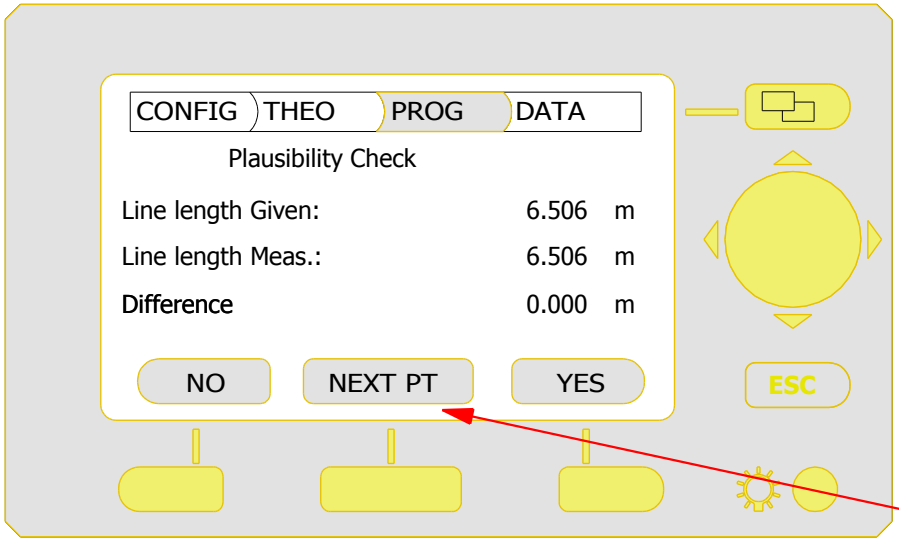
-Measure the 1st point! **V0001**, while shooting the point on the **reference surface**.

-Select the **second reference point** (Navigationkeys) and confirm with **OK**

-Measure the 2nd point the same way: **V0002**

-On the **Plausibility Check**, you see the difference between the 2 measures. If its within the tolerance, validate with **YES**.

(Figure 11)

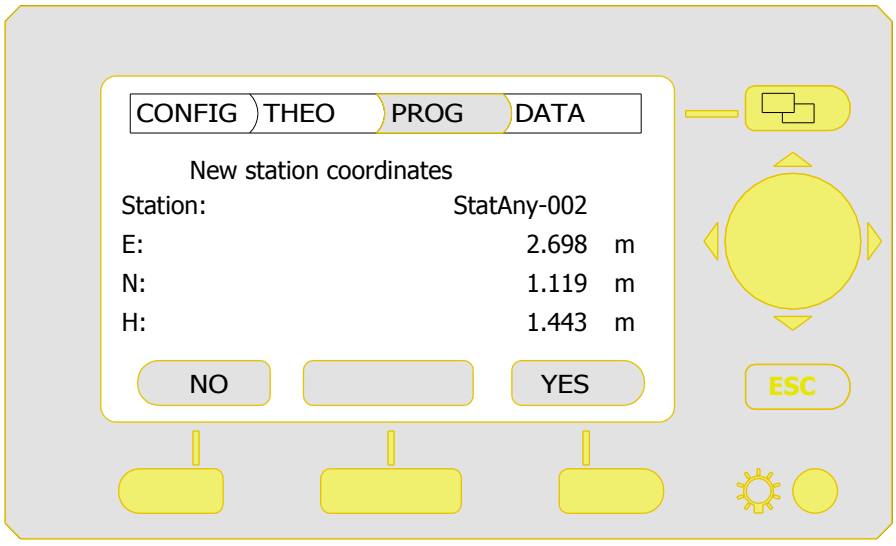


If needed, a 3rd point can also be measured. The location is then reprocessed using 3 points

3.2 Set up using known points

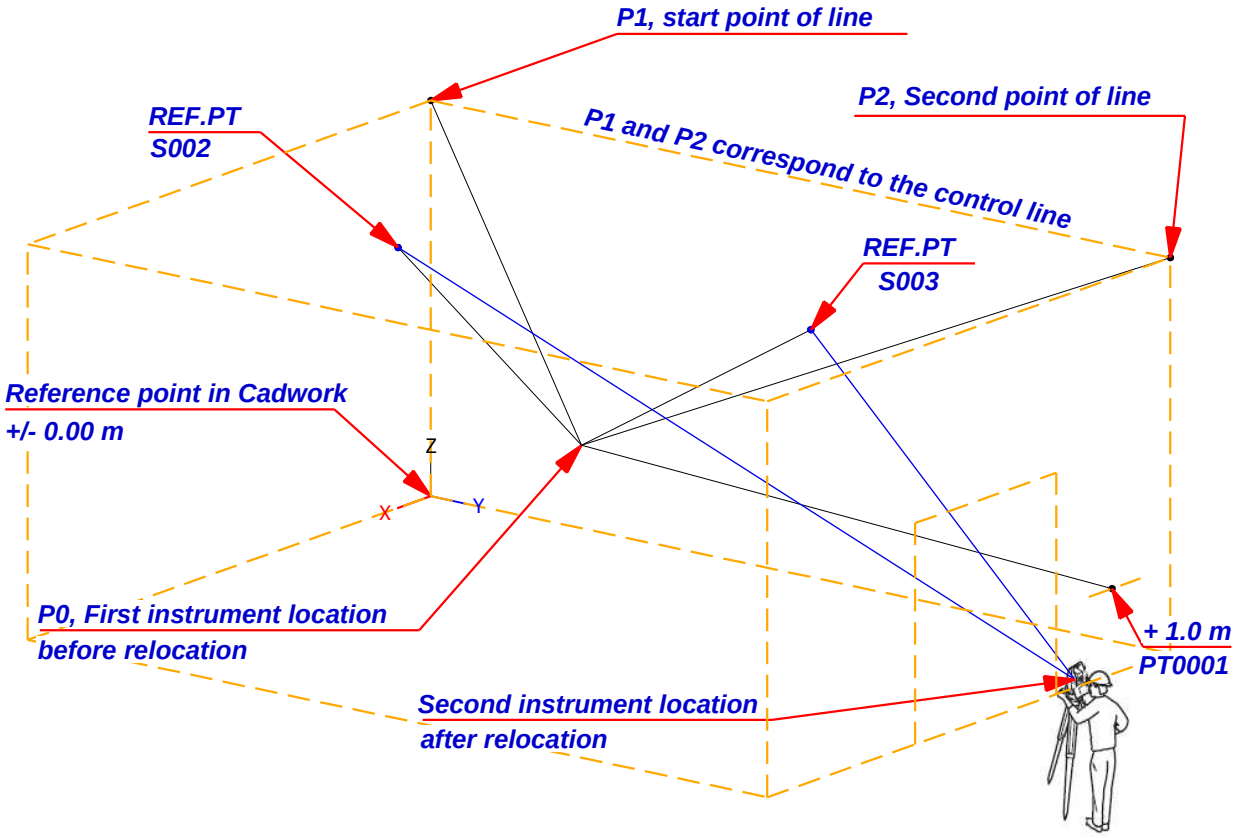
-Station and Orientation StatAny-002 will be changed and set! Confirm with **YES**.

(Figure 12)



-New coordinates of the station are displayed, confirm with **YES**. (Figure 12)

-The total station is ready to measure.



4. Points layout

4.1 Export points from Cadwork 3D

-In Cadwork 3D, Version 17, assign F3 key to function: Total station\Export total station layout (3D)

-Now press F3 (**Export total station layout (3D)**)

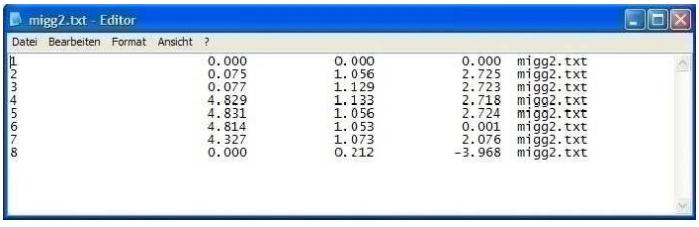
-Type a file name for the new list of nodes in the window that pops up (ex: AS 1) and choose a location where to save it. (Default location is the current folder)

-Select a **color** to export nodes.

-Type a starting number for the nodes numbering (ex: migg2))

-In 3D select all points that have to be exported using the left click, exit the function by right click

-A text file apears (.....txt) on the display, see figure 13



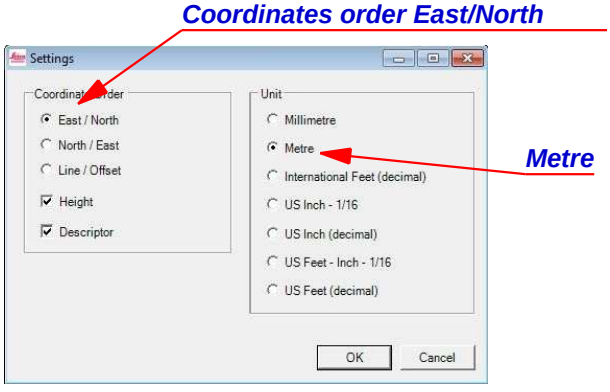
(Figure 13)

-Once the text file is open, it can be edited and modified (ex: Nodes number)

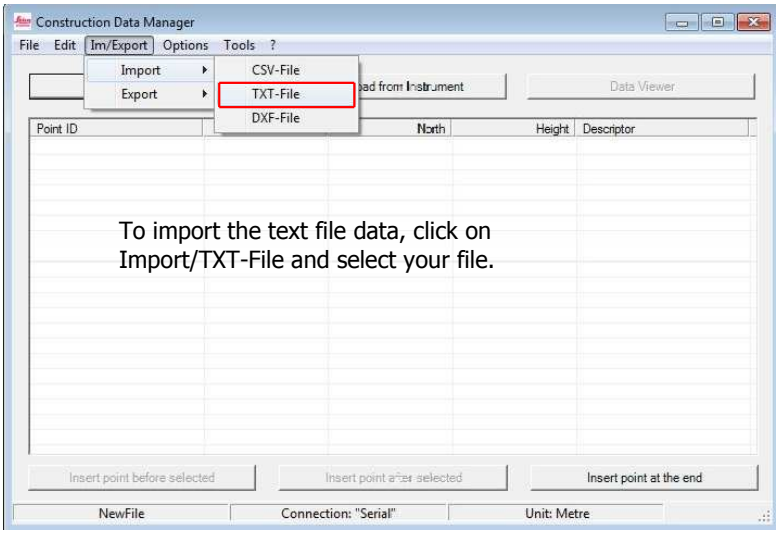
-double click -> Execute **Construction Data Manager** (CDM), Figure 14

-In CDM, click on **Options/Settings..** and make sure values for coordinates and units are set the same as in Cadwork.

Coordinates: East/North (X/Y) and unit: metre!



(Figure 14)



-Send data using the **Upload to instrument** button

-In the **Pick up a Job...** , type a New Job name (Figure 15)

(Figure 15)

-Click on **OK**

4.2 Layout stored points on site

-Select **DATA** with the Page key and select the imported **JOB** with the navigation Keys.

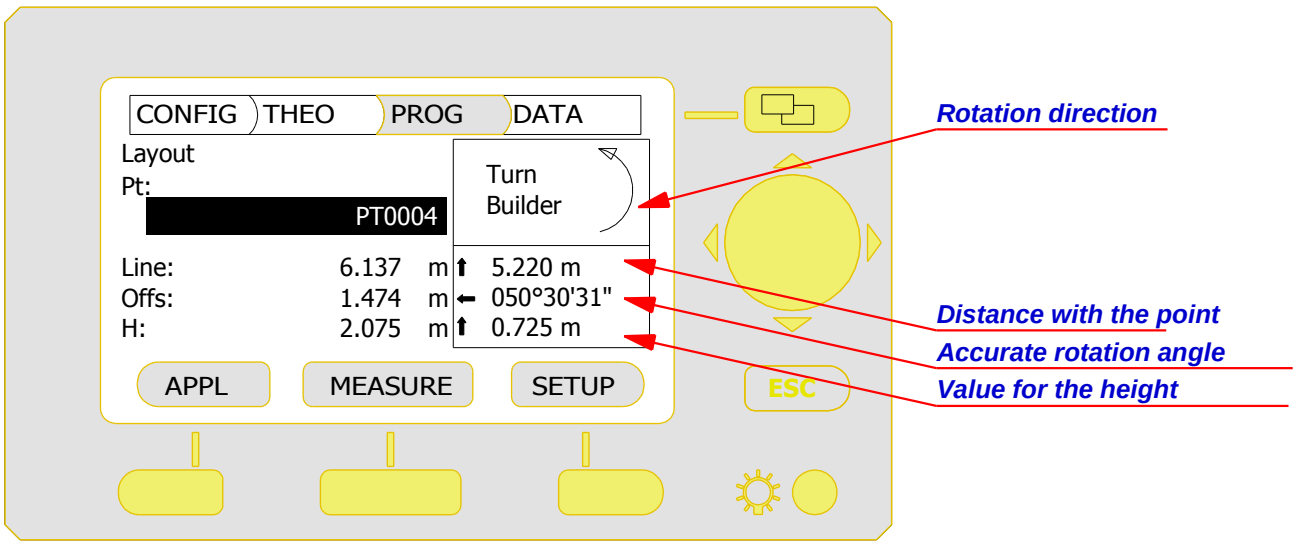
-Set up the total station, bubble and location thanks toreference points (description in point 3.2)
(Note that reference points can be saved as a different Job!)

- It is also possible that reference points are concrete slab corners, which are also represented in the cadwork 3D file and available on site.

-Select **PROG** using the Page key, then with the function key **APPL.** and navigation key **Layout...**, press **OK**.

Using navigation keys, select the point you wish to trace.

(Figure 16)



-Using the vertical and horizontal drive, adjust the total station precisely.

-Once the instrument is on target, press the middle function key **MEASURE**

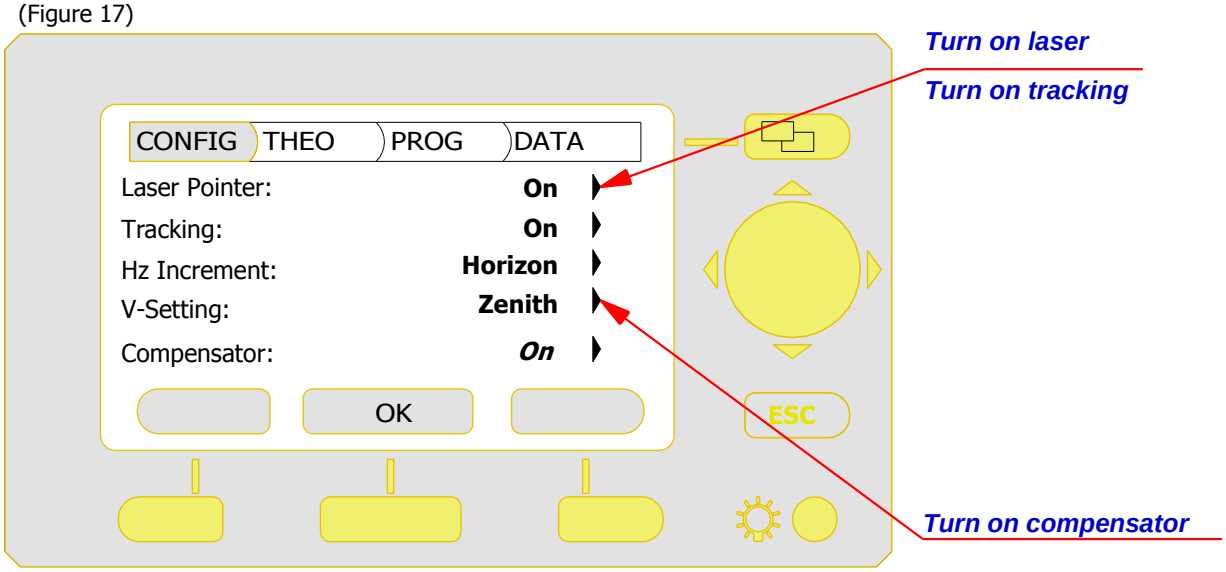
-If the value is slightly off, reposition until you get a result within an allowed tolerance.

4.2 Layout stored points on site

-The result of the traced points can only be accurate if the total station measures constantly and that parameters (Reference points) are accurate also.
-Set, like described in **figure 17**, in **CONFIG**, the **Laser Pointer** and **Tracking** functions on **ON**.

-**Once tracking is turned on, the total station measures in real time and displays the Rotation / Distance / Height values**

(Figure 17)



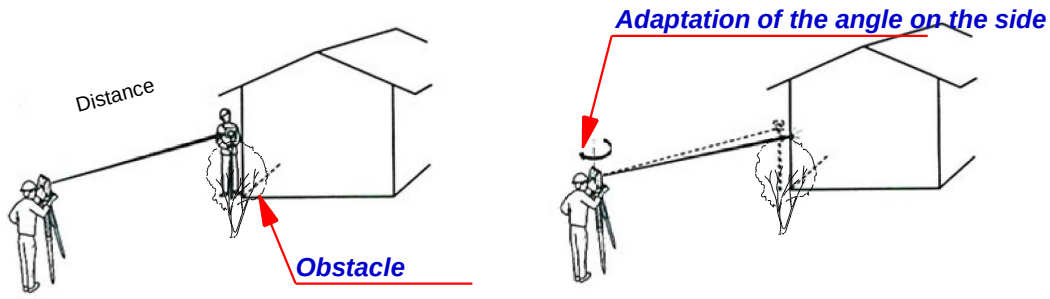
4.3 Transfer a list of points using the USB stick

- Once data are imported in "Construction Data Manager ", as described in 4.1, they will be directly exported. However, the export function will not be used but rather the **Save As...** function in the **File** menu. The file format to select is *.GSI and data should be saved on the USB stick in a sub-folder called "DATA".

- Once the USB stick is plugged to the total station, the job can be read in the instrument. To access data, select **DATA** (Page key) then press the left function key **IMP/EXP,** select the file to import nd once imported, the layout can start.

5.0 Measure hidden or inaccessible points

5.1 Measure inaccessible points with "Measure & Record"

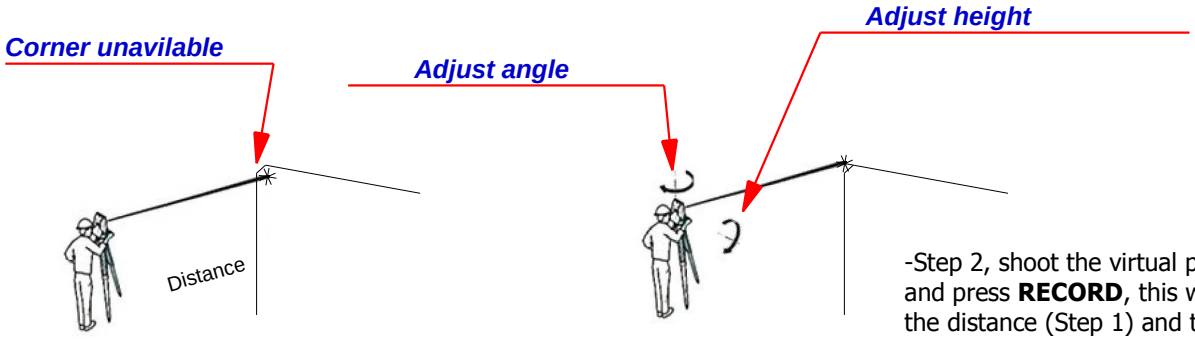


-Combination of MEASURE and RECORD step by step:

The combination of keys Measure & Record can be used, with the reflector for points that are inaccessible. When a corner of a building has to be measured for instance.

-Select **PROG** with the Page key.
-Parameters should be: Config <Measure&Record: **MEAS/REC**> (See figure 18)

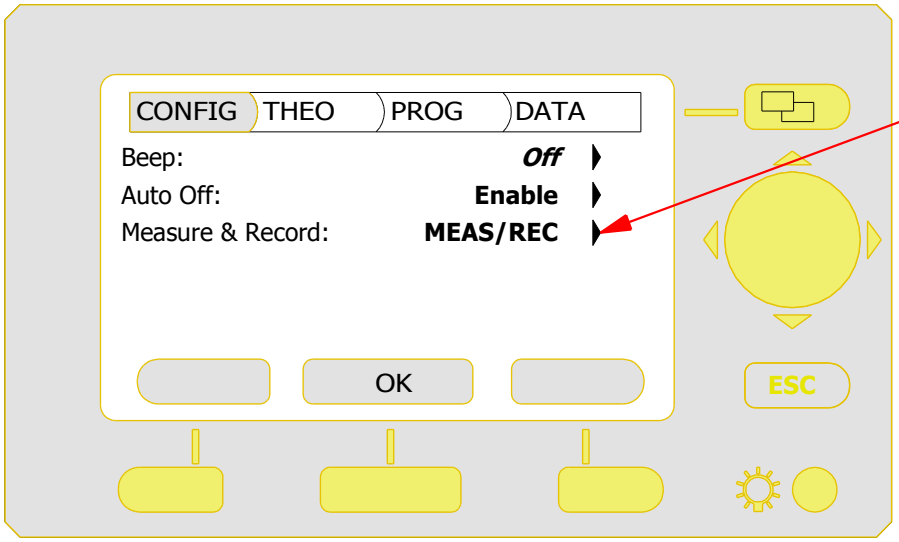
-Step 1, position the reflector at the same distance from the instrument as the corner of the building to be measured.
(The distance from the total station to the corner of the building should however be the same to the reflector!)
-Press function key **MEASURE**, to measure distance.
-Step 2, adjust the angle and save it with **RECORD.** The saved result is a distance (Step 1) and the angle (Step 2).



-Step 1, measure the distance (**MEASURE**).

-Step 2, shoot the virtual point and press **RECORD**, this way, the distance (Step 1) and the direction (Step 2) will be sent to Cadwork or saved in the total station internal memory.

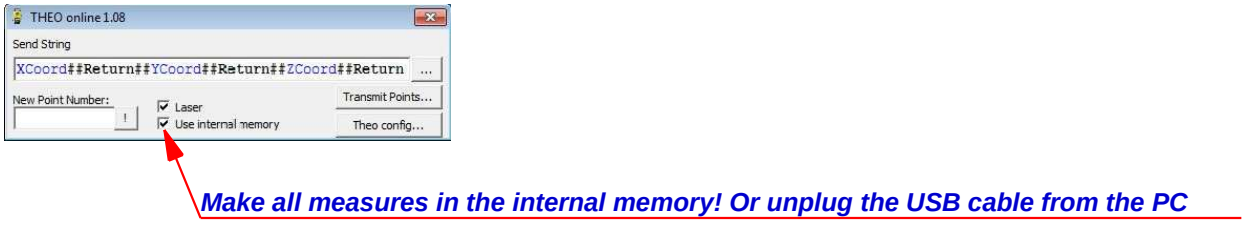
(Figure 18)



6.0 Measure without PC

6.1 Save measure in internal memory

(Figure 19)

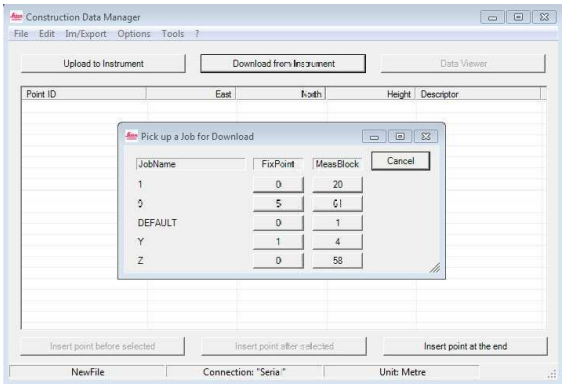


-Installation/Setup look at points 2.1 - 2.3

-Now all points that are measured are stored in the total station

6.2 Export measured points on the PC

-Execute the Construction Data Manager, (Figure 20)



(Figure 20)

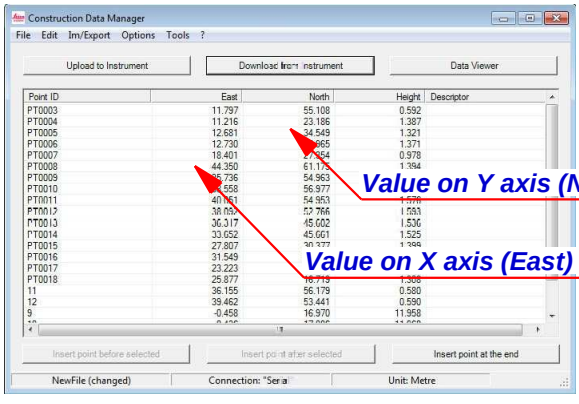
-Click on **Download from instrument**

-Wait until a window with all jobs stored pops up.

-Click on number 61, (Figure 20) in order to load points measured in Job 9.

-Wait until points are loaded (Figure 21)

6.3 Export values in a text file



(Figure 21)

No X Y Z Order of values (For nodes name / Number)

-Click on **Im/Export/Export/TXT-File**, a window pops up and a file name can be entered.
Continue by clicking on **Save**.

6.4 Import points in Cadwork

-Open a **cadwork 2d** file

-**Add/File.../Terrain points.../No X Y Z**

-**Add/Node.../Global coord.** and enter values X=0, Y=0, Z=0
to obtain **Point-0** (Origine).

-Activate the node **Point-0** with a left click and select all nodes to be exported with a right click lasso.

-Now press ',' (Comma) in Cadwork 2d, (To write a clipboard for the 3D) and assign a number.

-Open a **Cadwork 3d** file and paste '3' all points.

Notes:

7. Container contents