جامعة الفرات الاوسط التقنية /المعهد التقني سماوة

قسم / تقنيات المساحة

المحاضرة الرابعة عشر

اسم المادة / المساحة-٢

المرحلة الدراسية / الثانية

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Total Station Application

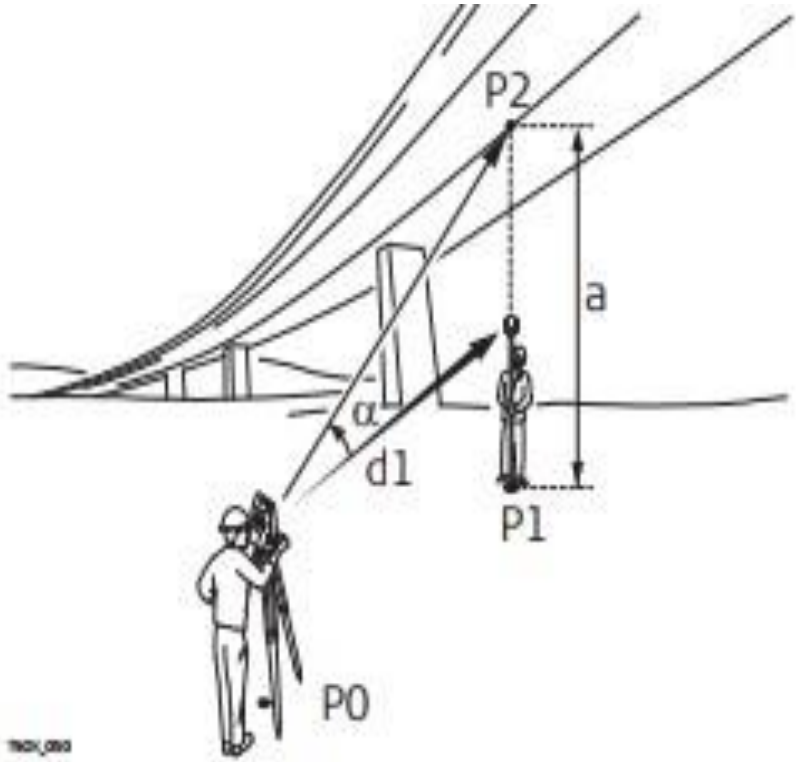
- 1. Remote Height: Remote Height is an application used to compute points directly above the base prism without a prism at the target point.

❖1. Select Prog from the MAIN MENU.

❖2. Select Remote Height from the PROGRAMS menu.

❖3. Complete application pre-settings. Refer to "8 Applications - Getting Started".

1. Remote Height



P0	Instrument station
P1	Base point
P2	Remote point
d1	Slope distance
a	Height difference from P1 to P2
α	Vertical angle between base point and remote point

1. Remote Height

- Remote height measurement

1. Measure to the base point or press hr=? to determine an unknown reflector height.
2. Next step: After measuring, the REMOTE HEIGHT screen appears.

1. Remote Height

- REMOTE HEIGHT -Aim at remote point
- Aim the instrument at the inaccessible remote point.

Field	Description
Δ ◢	Height difference between the base point and the remote point.
Height	Height of the remote point.

1. Remote Height

- Next step:
- Either press OK to save the measurement and record the calculated coordinates of the remote point.
- Or press BASE to enter and measure a new base point.
- Or press ESC to exit the application.

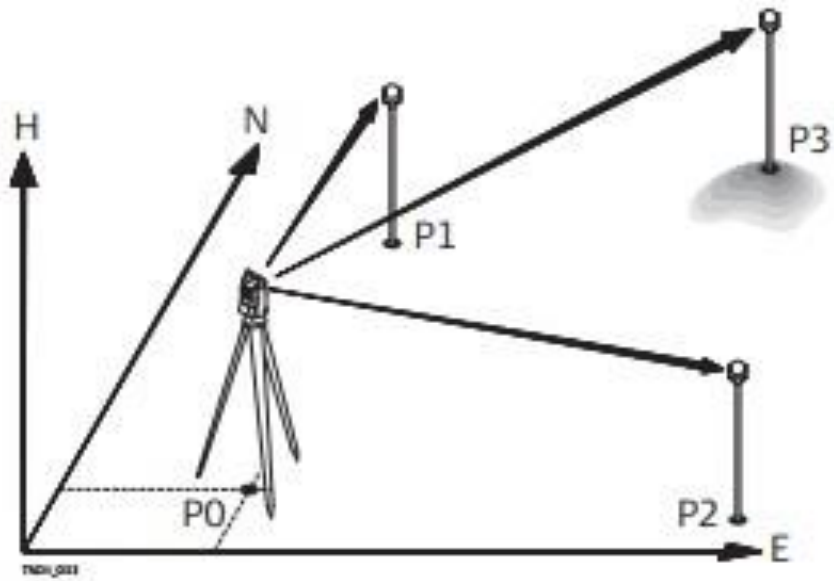
2. Free Station

A. Starting Free Station

- Free Station is an application used to determine the instruments position from measurements to known points. A minimum of two known points can be used to determine the position and a maximum of 5 or 10 known points.

1. Select Prog from the MAIN MENU.
2. Select Free Station from the PROGRAMS menu.
3. Complete application pre-settings. Refer to "8 Applications - Getting Started".

2. Free Station



P0	Instrument station
P1	Known point
P2	Known point
P3	Known point

2. Free Station

- 4. Set Accuracy Limit:
- Status: On to activate a warning message if the calculated standard deviation exceeds the limit.
- Set the accuracy limits for the Easting, Northing and Height coordinates and the standard deviation angle.
- Press OK to save the limits and return to the Pre-settings screen.
- 5. Select Start to begin the application.

2. Free Station

- Enter target data
- Enter the name of the station and the height of the instrument in the Enter station data screen and press OK.
- Next step

To access the Sight target point screen:

- Either press OK after entering the target data fields.
- Or press SKIP to skip entering the target data fields again when measuring the same point in another face.

2. Free Station

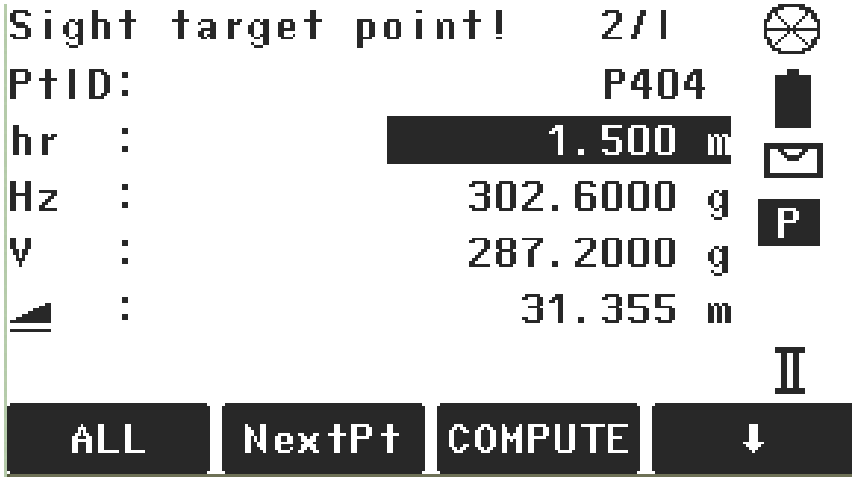
- Sight target point

In the Sight target point screen:

- 2 / I: Indicates that the second point was measured in face I.
- 2 / I II: Indicates that the second point was measured in faces I and II.

2. Free Station

- OMPUTE: To calculate and display the station coordinates, if at least two points and a distance were measured.
- NextPt: To return to the Enter target data screen to select the next known point.



Next step

• Either press NextPt to measure the next known point.

• Or press COMPUTE to calculate the station position.

2. Free Station

B. Measuring Information:

1- Measurement sequences: The following measurement sequences are possible:

- Horizontal direction and vertical-angles only (resection)
- Distance and horizontal direction and vertical-angle
- Horizontal direction and vertical-angles to some point(s) and horizontal direction and vertical angles plus distance to other point(s). Single face I, single face II, or dual face I and II measurements are always possible. No specific point sequence or specific face sequences are required.

2. Free Station

2. Dual face measurements: When measuring the same target in both faces, the reflector height may not be

changed when observing in the second face. Error checks are made for dual face measurements to ensure the same point is sighted with the other face.

- If a target point is measured several times in the same face the last valid measurement is used for computation.
- For the calculation of the station position, measured target points can be remeasured, included in calculations, or excluded from calculations.

2. Free Station

3. Measurements not included in computations:

Target points with 0.000 height are discarded for height processing. If a target point has a valid height of 0.000 m, use 0.001 m to include it for height processing.

2. Free Station

C. Computation Procedure

The measuring procedure automatically determines the method of evaluation, for example resection or three-point resection.

If more than the minimum required measurements are performed, the procedure uses a least squares adjustment to determine the 3D position and averages orientation and height measurements.

- The original averaged face I and face II measurements are used for the computation process.
- All measurements are treated with the same accuracy, whether these are measured in single or dual face.

2. Free Station

- Easting and Northing are determined by the least squares method, which includes standard deviation and improvements for horizontal direction and horizontal distances.
- The final height (H) is computed from averaged height differences based on the original measurements.
- The horizontal direction is computed with the original averaged face I and face II measurements and the final computed plan position.

2. Free Station

D. Free Station Results: Press COMPUTE from the Sight target point screen after at least two points and a distance have been measured

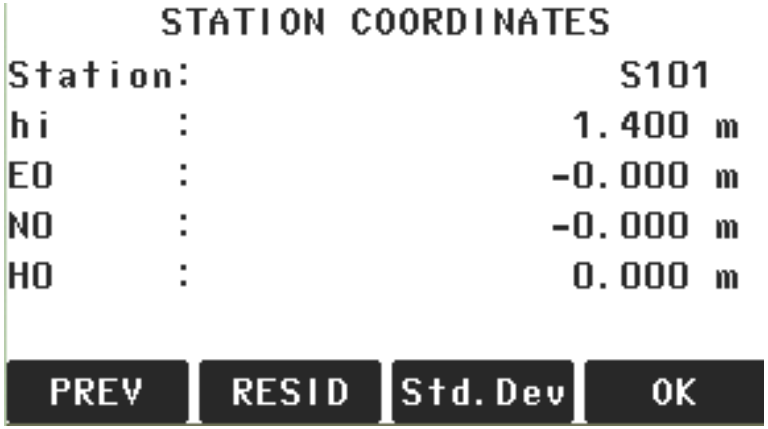
This screen displays calculated station coordinates. The final computed results are Easting, Northing and Height coordinates of the present instrument station, including the instrument height.

Standard deviations and residuals for accuracy assessments are provided.

2. Free Station

- If the instrument height was set to 0.000 in the setup screen, then the station height refers to the height of the tilting axis.
- Next step

Press RESID to display the target residuals.



RESID
To display residuals. Refer to "Target Residuals".
StdDev
To display the standard deviation of the coordinates and angle.

2. Free Station

- Target Residuals: The TARGET RESIDUALS screen displays the computed residuals for the horizontal and vertical distances and the horizontal direction. Residual = Calculated value - Measured value.
- The following are important messages or warnings that may appear.

Messages	Description
Selected point has no valid data!	This message occurs if the selected target point has no Easting or Northing coordinate.

2. Free Station

Messages	Description
Max 5/10 points supported!	5/10 points have already been measured and another point is selected. The system supports a maximum of 10 points for **TS06** **TS09** and 5 points for **TS02**.
Invalid data - no position computed!	The measurements may not allow final station coordinates (Eastings, Northings) to be computed.
Invalid data - no height computed!	Either the target height is invalid or insufficient measurements are available to compute a final station height.
Hz (I - II) > 0.9 deg, measure point again!	This error occurs if a point was measured in one face and the measurement in the other face differs by more than 180° ± 0.9° for the horizontal angle.
V (I - II) > 0.9 deg, measure point again!	This error occurs if a point was measured in one face and the measurement in the other face differs by more than 360° - V ± 0.9° for the vertical angle.
More points or distance required!	There is insufficient data measured to be able to compute a position. Either there are not enough points used or not enough distances measured.

Press **OK** to return to the **PROGRAMS** menu.