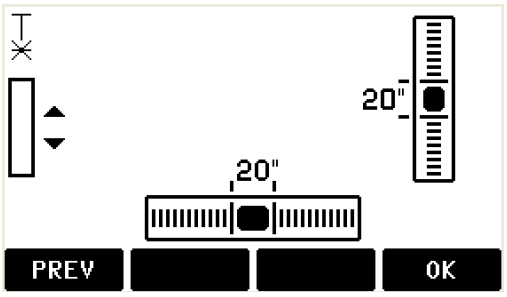
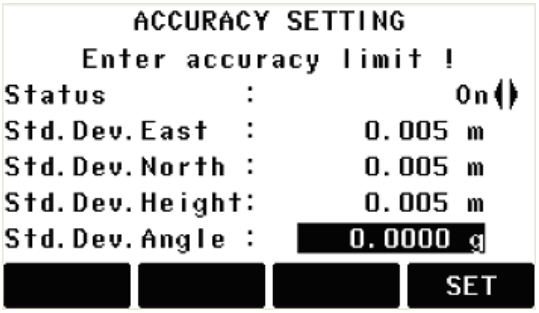
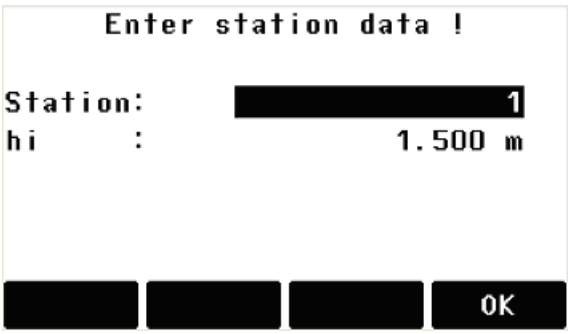
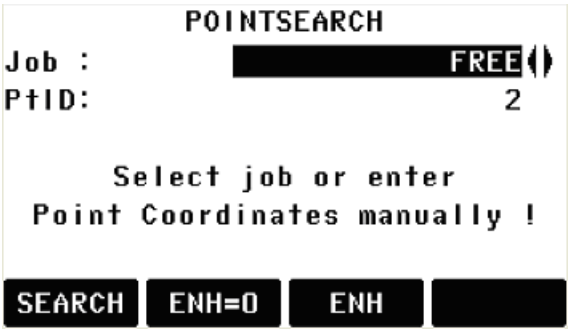
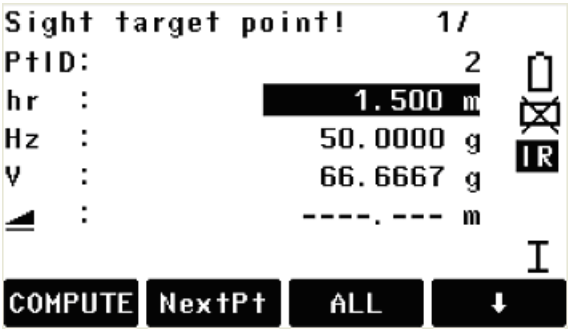
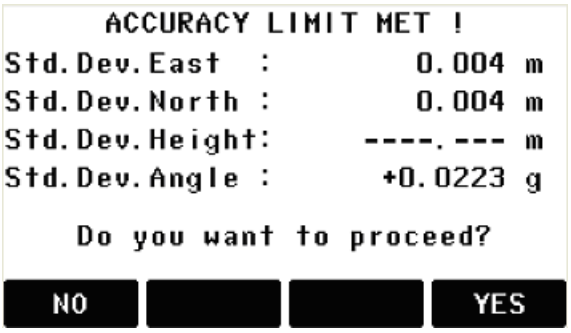
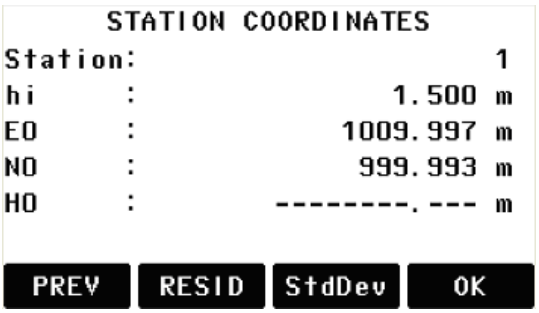
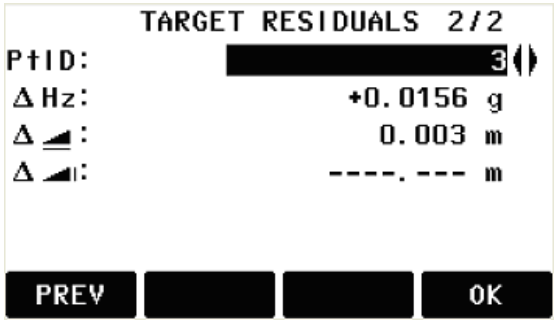
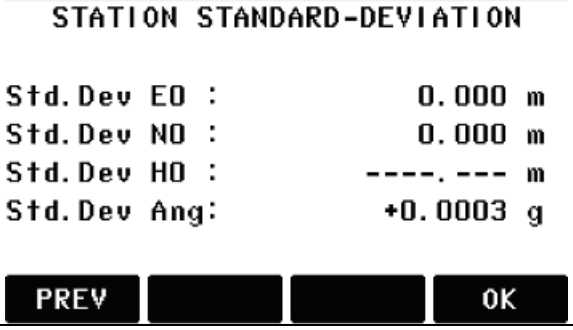
On the TPS300/400/700/800 the application described in this guide can be referred to either as **Resection** or **Free-station**, as these applications use the same process and allow the same task to be carried out.

Step	Action	Display
1	Switch the instrument on: The level screen may start automatically, if not press **FNC** followed by **F1**. The laser plummet will turn on automatically and the beam intensity can be adjusted via the up / down key Press **F4-OK** to continue	
2	Select Free Station (Resection) program to set your instrument up. Press **MENU**, **F1-Programs**, **F3 Free Station**. Set job **F1** and select the job to use. Note: You can create a new one in here (**F1**) if necessary.	
3	Once the Job is set the FREE STATION screen is displayed again, select **F2** to check (and set) the accuracy limits, if required. Press **F4** to Set these and return to the FREE STATION screen. Then **F4** again to Start the Free Station/Resection.	
4	Enter the following information for the location of instrument: **Station:** the Point ID of where the instrument is set. **hi:** the height of the instrument. Then press **F4** OK.	

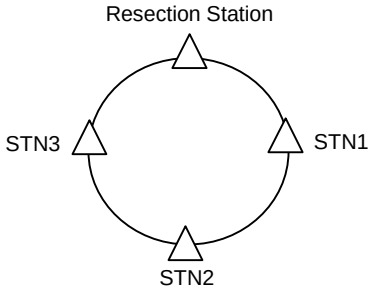
Step	Action	Display
5	Data for the target point is now required. Enter the Point ID and the height of the target/reflector (hr). **F2** List will search all points in the job, display them as a list and allow any point to be selected. **F1** Find or **F3** OK will search for the entered PtID.	
6	The instrument will do a point search from the selected job. If the point is found the screen allows the point's details to be viewed **F1** and the point confirmed **F4**. If the point is not found, the screen to the right is displayed, from which the point can be created using **F3** to allow manual coordinate entry.	
7	Once the Target Point has been selected (or created and selected) it needs to be sighted. Sight the target point and press **F3** - All to measure and record the observation – If no distance measurement is required press **F4** - ↓ then **F2 -** Rec to store only the angle. Once the measurement/angle has been stored using All or Rec press **F2** to move onto the next point (repeating Steps 5-7). Once at least 2 points have been measured select **F1** to compute.	

Step	Action	Display
8	After pressing Compute the instrument will display the results of the observations, Provided that the accuracy is met. If the accuracy is not met then the instrument will prompt for more measurements. To proceed select **F4** Yes. *Note: If the Resection/Free Station continually states that the accuracy has not been achieved and that no position has been calculated then either the accuracy limit is set to be too strict (Step 3), the coordinate data entered for the points is incorrect (Step 5) or the measurements were not suitable (see theory of resection – Step 10).*	
9	After completing the measurements (with the accuracy limit met) the instrument will display the resulting Station Coordinates. This is the Final Result of the Resection/Free Station process. **F4** OK will confirm the setup, close resection and return to the programs menu. …If desired before pressing **F4** OK it is possible to select… **F2** RESID to display the Residuals. **F3** StdDev to display the Standard Deviation.	  

10. Resection Theory

When the station coordinates of your occupied point are unknown, a resection or free station can be performed to compute the coordinates. A resection involves the measurements from an unknown occupied point to several other points with known coordinates. It is possible to perform a resection by measuring angles and distances or by measuring angles only. The type of measurements influences the minimum number of observations needed to perform a resection. In case of angle as well as distance measurements a minimum of 2 observations are required, by measuring angles only a minimum of 3 observations should be performed. It is recommended to use 3 or more known stations with distances and angles to perform some degree of redundancy within the calculation. Measuring to 4 or more stations is the most desirable as the instrument would perform a least square adjustment to fix the new occupied point and any poorly conditioned measurements would show in the residual calculations to each point.

Care should also be taken when positioning your new resection station in relation to the known station points. Well-conditioned triangle formation is recommended to known points.

Danger Circle when measuring with angles only.

Further consideration of the “danger circle” is required when measuring 3 points by angle only. If the resection point falls on or near the same circle as the 3 known station points, then resection results will be poor.