



GE  **MAX**

TUTORIAL
SURVEY CALCULATION

Calculation

DESCRIPTION

- GNSS Calculation; TPS Calculation; Digital Level Calculation

GOAL

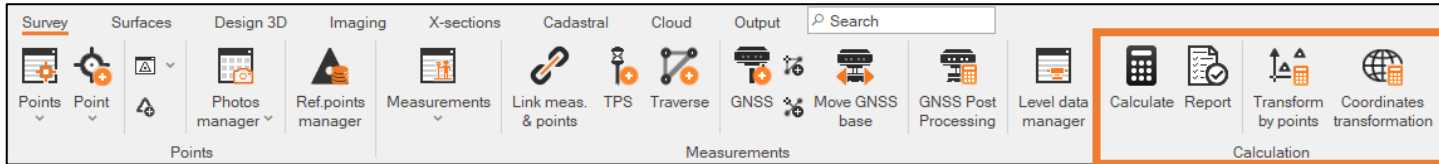
- How to use survey functions when operating with GNSS, TPS and Digital Level data

DATA

- TPS Office.zip
- ALTO0908.GSI



Calculation

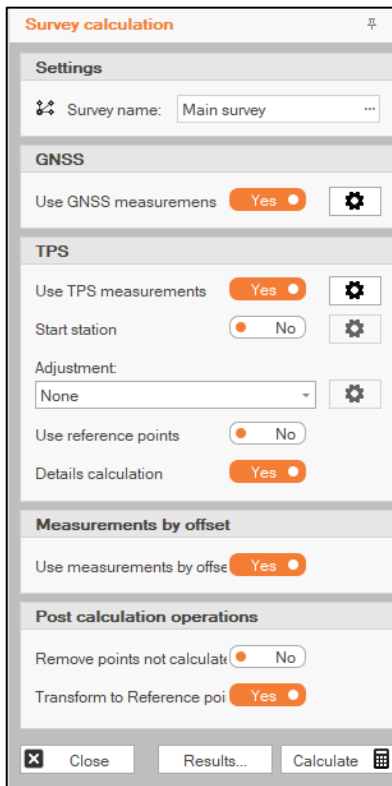
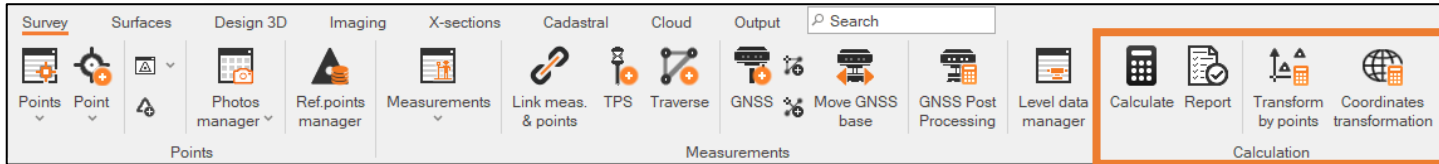


From the Survey menu it is possible to select the Calculation functions:

- Calculate: for TPS and GNSS survey calculation
- Report: to view the calculated surveys and generate reports
- Transform by points: for 2D and 3D transformations by roto-translation
- Coordinate Transformation: to transform points, projects or sub-projects on other cartographic or local coordinate systems



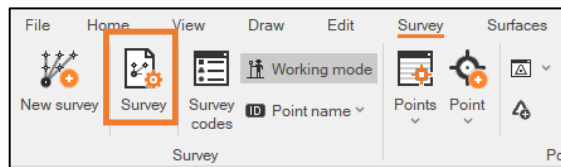
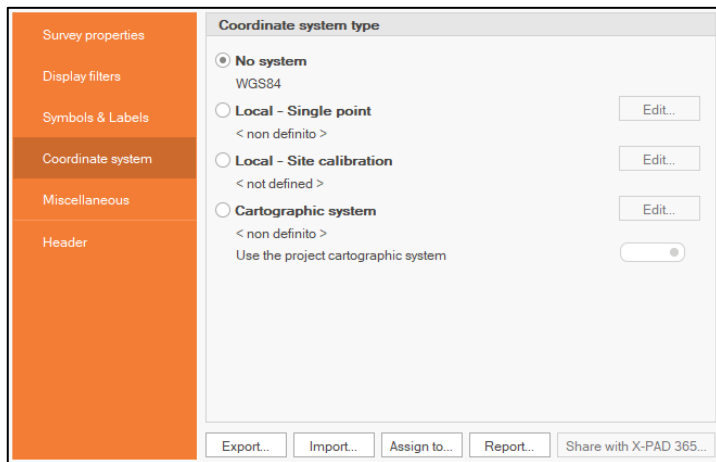
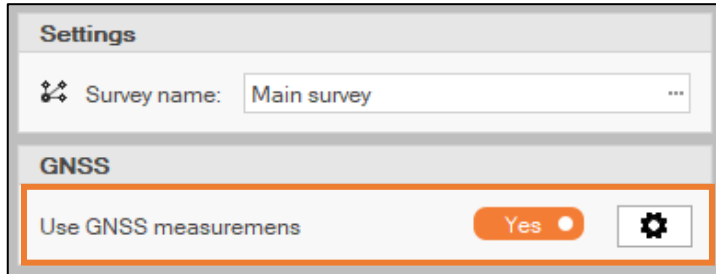
Survey Calculation



- Survey calculation is the panel that allows to use survey calculation and define its parameters



Survey Calculation



USE GNSS MEASURE


- As first step the software calculate all the GNSS baseline and coordinates, according to the coordinate system defined
- Click on the Setting page to define or change the coordinate system

The survey settings window can also be accessed from the Survey function in the Survey menu



Survey Calculation

TPS

Use TPS measurements Yes No 

Calculation

TPS calculation

TPS start station

Traverse adjustment

Average points - Tolerances

Distance:

Elevation:

Automatic: On Off
(if within the tolerance)

Calculation

TPS calculation

TPS start station

Traverse adjustment

TPS Calculation - Tolerances

Azimuth:

Distance:

Elevation:

TPS Calculation - Atmospheric corrections

Temp. Pressure: On Off

Temperature (°C):

Pressure (mb):

Refraction/Sphericity: On Off



Refraction coefficient:

USE TPS MEASURE

- TPS measure are used in the calculation, to calculate final TPS coordinates
- Click on the Setting to change the average points and calculation tolerance or apply atmospheric corrections



Survey Calculation

TPS	
Use TPS measurements	Yes <input type="radio"/> 
Start station	Yes <input type="radio"/> 


<ul style="list-style-type: none"> Calculation TPS calculation TPS start station Traverse adjustment 	TPS start station
	Start station: <input type="text" value="..."/>
	X: <input type="text" value="0.000m"/>
	Y: <input type="text" value="0.000m"/>
	Z: <input type="text" value="0.000m"/>
Start azimuth: <input type="radio"/> Off	
Backsight point: <input type="text" value="..."/>	
Azimuth: <input type="text" value="0.0000g"/>	


START STATION

- Used to define the coordinate and the orientation of the starting station
- Click on the Setting to select the start station with its coordinates, and define the backsight point or azimuth
- It is also possible to operating the Traverse adjustment


Survey Calculation

TPS

Use TPS measurements Yes No 

Start station No 

Adjustment:

- Traverse adjustment 
- None
- Traverse adjustment
- Network adjustment - Only stations
- Network adjustment - All points

Calculation

TPS calculation

TPS start station

Traverse adjustment

Angular error

Tolerance calculation:

Coefficient value:

Distribution mode:

Linear error

Tolerance calculation:

Coefficient value:

Distribution mode:

Elevation error

Tolerance calculation:

Tolerance value:

Distribution mode:

NETWORK ADJUSTMENT

- If a network has been defined, using Adjustment function is possible to calculate the adjusted coordinates of the stations (*Only stations*) or of all points (*All points*)


TRAVERSE ADJUSTMENT


- Used to calculate a traverse
- Traverse can be defined using the dedicated function in the Measures menu
- Traverse is defined selecting the stations used in the traverse




Survey Calculation

TPS

Use TPS measurements Yes 

Start station Yes 

Adjustment
 Traverse adjustment 

Use reference points No

Details calculation Yes

Measurements by offset

Use measurements by offset Yes

Post calculation operations

Remove points not calculated No

Transform to Reference points Yes

DETAILS CALCULATION

- All points coordinates are recalculated

USE MEASURE BY OFFSET

- Measures done by offset are recalculated (for example hidden points)

TRANSFORM TO REFERENCE POINT

- If a point ID is found in the point list and in the reference list, at the end of all calculations the survey is transformed to fit the reference points



Survey Calculation

Project Manager

- Surveys
 - GNSS Office
 - TPS Office
- Surfaces
- Drawings
 - Main drawing
 - Sections groups
 - External documents
 - Flight sessions
 - Ground photos sessions
 - Point clouds (Registered)
 - Point clouds (Not registered)
 - Raster maps
 - Orthophotos
- Projection planes
 - None
 - Clipping planes
 - Clipping boxes
 - Plot boxes

Survey calculation

Settings

Survey name: TPS Office

GNSS

Use GNSS measurements: No

TPS

Use TPS measurements: Yes

Start station: No

Adjustment: None

Use reference points: No

Details calculation: Yes

Measurements by offset

Use measurements by offset: Yes

Post calculation operations

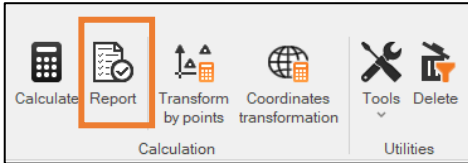
Remove points not calculated: No

Transform to Reference points: Yes

Scale 1: 1000 Meters (m) GON



Survey Report



- At the end of each survey calculation, the detailed report is created
- It is possible to check the results after each single step and customize each report

1. GNSS Calculation
2. TPS Calculation
3. Offset calculation

Results

Results

- ⚙️ Calculation parameters
- 🌐 Coordinate system
 - 📍 Local calibration (1 point)
 - 📏 Elevations calculation
- 📏 Ground to Grid settings
- ⚠️ Reference points
 - ⚠️ REF1
 - ⚠️ REF2
 - ⚠️ REF3
- 📏 TPS Calculation
 - 📏 TPS Calculated points
 - 📏 ST_0001
 - 📏 999
 - 📏 CT1
 - 📏 CT2
 - 📏 CT3
 - 📏 PR1
 - 📏 ...

Details

General

Survey name	TPS Office
Calculation date & time	28/12/2021 17:25

Calculation options

Calculate GNSS measurements/p...	<input type="checkbox"/>
Calculate TPS measurements	<input checked="" type="checkbox"/>
Calculate measurements by offset	<input checked="" type="checkbox"/>
Adjustment	No adjustment
Use reference points	<input type="checkbox"/>
Automatic rototranslation on refer...	<input checked="" type="checkbox"/>

Calculation parameters.

Report... Save Cancel

Report Manager

Main

- Store report
- Options
- Print
- PDF File
- XLSX file
- Other export
- Send as
- Scale
- Margins
- Orientation
- Size
- Page setup
- Navigation
- Find
- Page width
- Close

Templates

- 📄 Survey calculation

Survey calculation - Final results

Calculation parameters

Survey name: TPS Office
 Calculation date & time: 28/12/2021 17:25

Coordinate system

GNSS single point localization
 Reference: IGS
 Latitude: 41° 46' 00" N 0.000m
 Longitude: 2° 17' 00" W 0.000m
 Height: 476.500m 2.000m

GNSS corrections

Mode: L2/L3

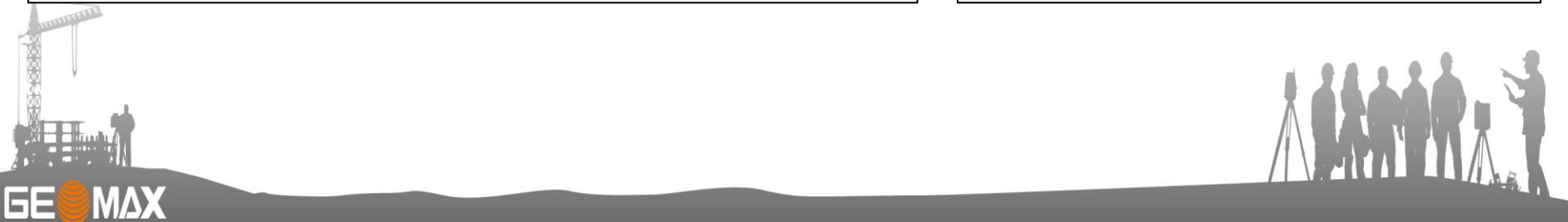
TPS absolute reduction

Reference: IGS
 Control error: 0.000000m

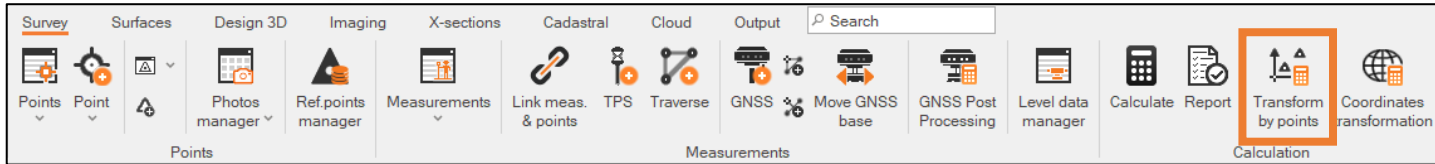
Reference points

Point	X	Y	Z	U	V	W
REF1	476.500	100.000	100.000	0.000	0.000	0.000
REF2	100.000	476.500	100.000	0.000	0.000	0.000
REF3	100.000	100.000	476.500	0.000	0.000	0.000
CT1	100.000	100.000	100.000	0.000	0.000	0.000
CT2	100.000	100.000	100.000	0.000	0.000	0.000
CT3	100.000	100.000	100.000	0.000	0.000	0.000
PR1	100.000	100.000	100.000	0.000	0.000	0.000

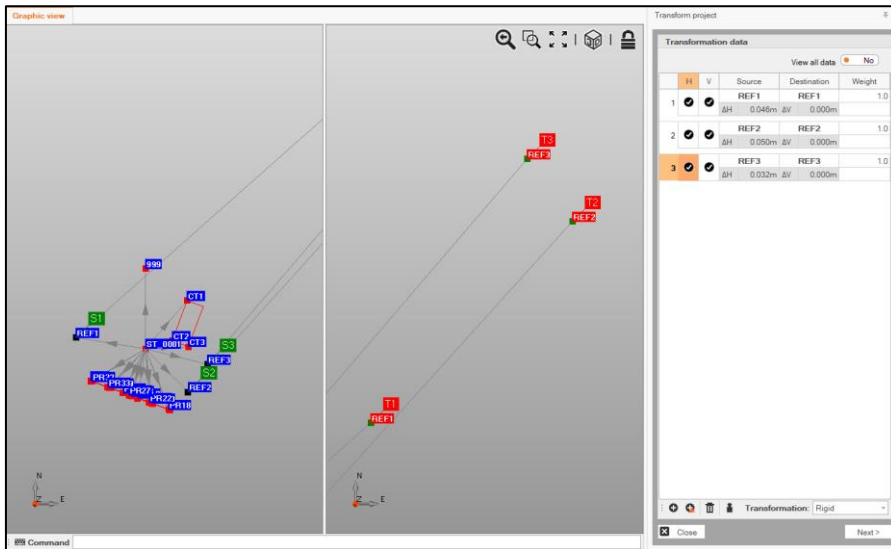
Page 1 of 6 | A4 (210mm x 297mm) | 53%



Transform by points Calculation



- Transform by points: for 2D and 3D transformations by roto-translation



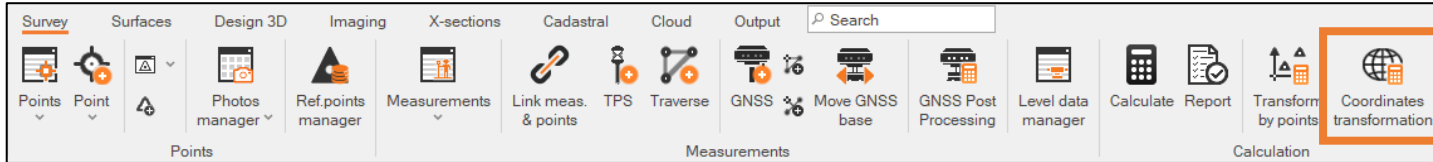
- It is possible to add manually the Source and Destination Points or automatically select the Reference Points



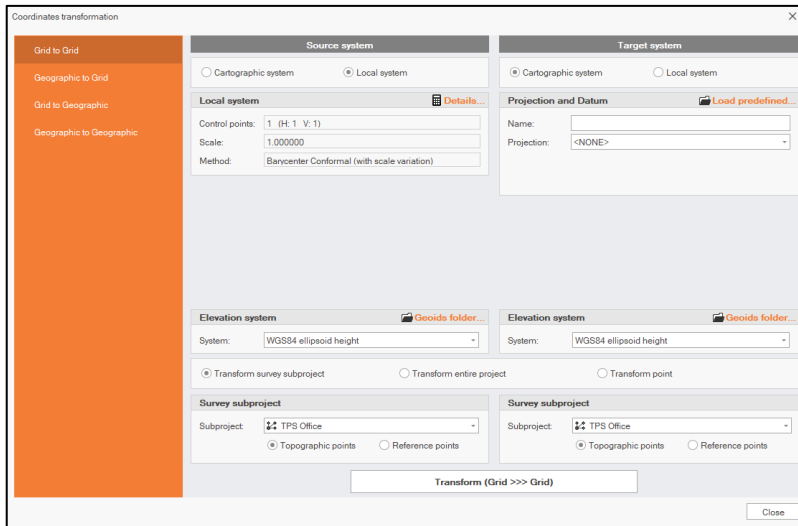
- Three different types of transformations are available



Coordinate transformation



- This command allows to transform a single point, part or the whole project from one coordinate system (cartographic or local) to another coordinate

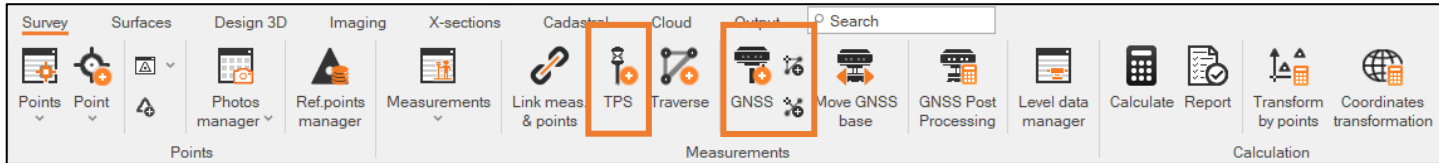


Possible transformations are:

- Grid to Grid
- Geographic to Grid
- Grid to Geographic
- Geographic to Geographic



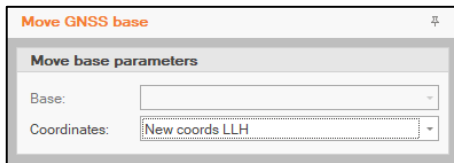
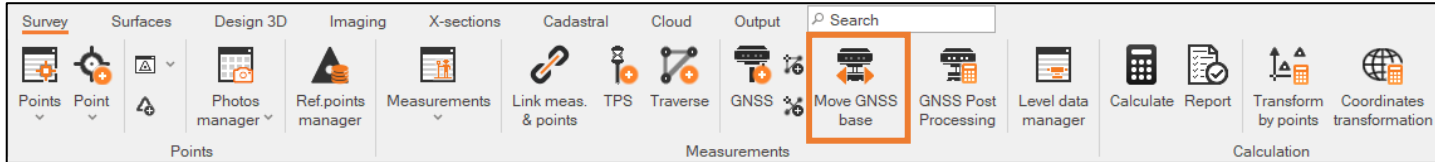
Add manual GNSS/TPS measure



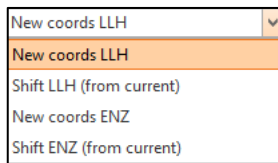
- It is possible to add manual TPS/GNSS measure entering the requested information
- A manually created observation has all the properties as an observation taken in the field



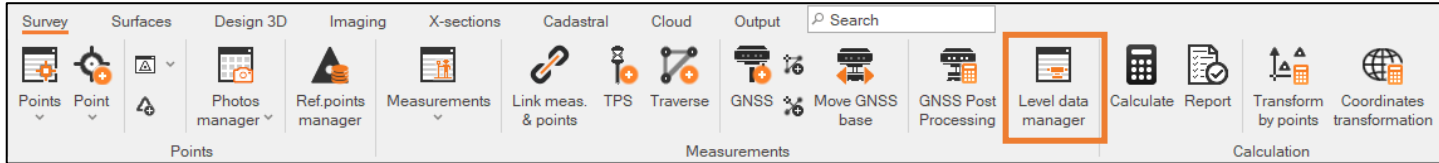
Move GNSS base



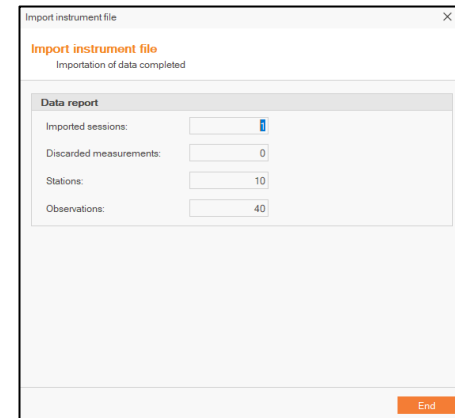
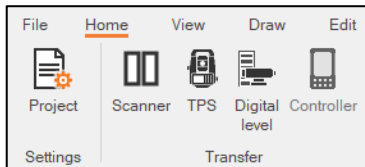
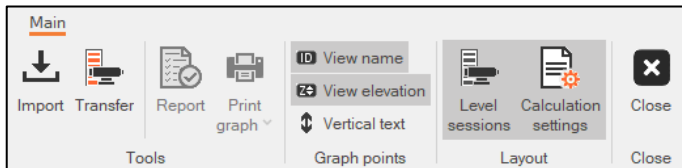
- Function to define the new GNSS base coordinates
- Base can be moved entering or selecting the new LLH or ENZ coordinates
- All baselines from this base are recalculated



Level data manager



- Level Data Manager is the tool to import and manage data from digital level
- It is possible to transfer digital level data from Home menu or import the data from Survey menu



Level data manager

Main

Import
 Transfer
 Report
 Print graph
 View name View elevation Vertical text Level sessions Calculation settings Close

ALTO0908 - 1

Calculation settings

Observation tolerance

Max distance:

Max elevation difference:

Session tolerance

Adjustment method:

Misclosure (mm/Km):

Property	Value
Name	ALTO0908 - 1
Date	29/12/2021 09:38:56
Start point	1000
End point	3000
Stations	10
Observations	40
Total length	289.845m
Height difference	3.2294m
Misclosure	0.0100mm
Max misclosure	2.8984mm

Point name	Type	BS	IS	FS	Standard dev.	Distance	Elevation ref.	Elevation
1 1000	-	-	-	-	-	-	226.2460m	226.2460m
1 1000	BS1	0.9183m	-	-	0.02mm	16.156m	-	-
1 1001	FS1	-	-	0.4383m	0.02mm	14.004m	-	-
1 1001	FS2	-	-	0.4383m	0.02mm	13.996m	-	-
1 1000	BS2	0.9183m	-	-	0.03mm	16.158m	-	-
2 1001	-	-	-	-	-	-	-	226.7260m

