

RTK Setting Guide

Before proceeding to the following detailed guideline:

1. Confirm your RTK provider's **geographic coordinate system information**, which includes:

- **Datum Information, which includes:**

- Ellipsoid parameters (semi-major axis, flattening)
- Origin (center of the ellipsoid)
- Orientation (alignment with the Earth)

- **Coordinate System, which includes:**

- Angular units (degrees)
- Prime meridian

Note: our RTK device records Latitude and Longitude information instead of Northing and Easting. Please make sure that you are receiving Lat Long from your RTK CORS.

2. Confirm the **projection** of your interest: (Search for the projection in this website <https://epsg.io/>)

- You would need to have the projection EPSG information which includes parameters such as **central meridian, false northing and easting, latitude of origin, and scale factor**, etc.

Scenarios:

1. Transforming your point cloud data to the geographic coordinate system that is **the same as** your received signal from your RTK CORS provider.
2. Transforming your point cloud data to the geographic coordinate system that is **different from** your received signal from the RTK CORS provider.

Scenario 1 (when source ellipsoid is the same as target ellipsoid):

In your RTK setting page on the Lixel Go app, set the rtk type and ellipsoid accordingly. If your RTK provider type is not shown in the dropdown list, choose "Custom". (For most of the times, if you are not located in Mainland China, you won't be able to use the provided RTK provider type in the dropdown list.)

3D scanning services and scanner rental, Singapore.

Volumet runs reality-capture projects end to end — and rents the same equipment to teams who run their own. This document is the manufacturer's; we host it for our rental and project clients.

CAPTURE & DOCUMENTATION SERVICES

- **3D laser scanning** — reality capture of sites, buildings and interiors.
- **As-built documentation** — floor plans, elevations, sections, RCPs.
- **Scan-to-BIM** — point cloud to Revit at a specified LOD.
- **Drone & LiDAR aerial** — mapping, photogrammetry, inspection.
- **Digital twins & 3DGS** — virtual tours and Gaussian splat models.

EQUIPMENT RENTAL & SALES

- **XGRIDS Lixel K2** — flagship handheld SLAM LiDAR.
- **Lixel K1 · L2 Pro** — entry and long-range handheld.
- **PortalCam** — 3D Gaussian splatting camera.
- **Matterport Pro3** — virtual tours and digital twins.
- **Leica BLK360 G2 · RTC360** — tripod terrestrial scanning.
- **Trimble X12** — high-end survey-grade scanning.

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TALK TO US

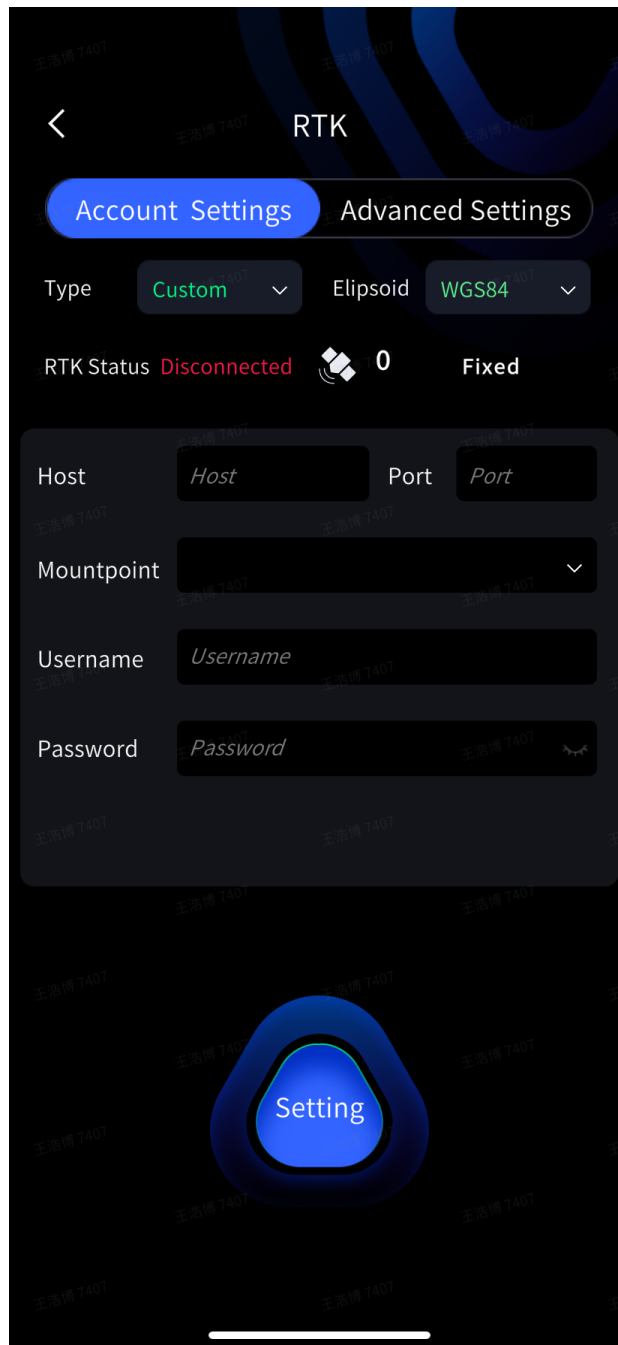
quotes@volumet.net
+65 8996 8765
www.volumet.net

Equipment collection & return
59 Ubi Avenue 1, #03-02
Bizlink Centre, Singapore 408938

Example 1.1 WGS84 to WGS84, project into UTM zone 2

For example, if you have received WGS 84 from your RTK provider and you would like to project your data to UTM zone 2.

Before scanning, you should set your RTK setting in Lixel go app to WGS84, and input your Port and Mountpoint.



After you have collected the data, in LixelStudio RTK setting, set the "source" and "source Ellipsoid" according to the real RTK information you received (in this case, WGS84).

Then, consult for UTM zone 2 parameters then enter them into the projection settings.

EPSG:16002

UTM zone 2N

Share on:



Attributes

Data source: EPSG

Revision date: 1995-12-02

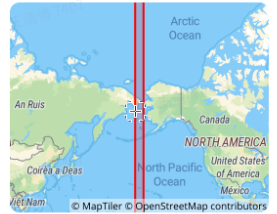
Scope: Engineering survey, topographic mapping.

Method: Transverse Mercator

Area of use: Between 174°W and 168°W, northern hemisphere between equator and 84°N, onshore and offshore.

Description: (0,)

Covered area powered by MapTiler



Between 174°W and 168°W, northern hemisphere between equator and 84°N, onshore and offshore.

UTM zone 2 parameters

```
PROJECTION["Transverse_Mercator"],
PARAMETER["latitude_of_origin",0],
PARAMETER["central_meridian",-171],
PARAMETER["scale_factor",0.9996],
PARAMETER["false_easting",500000],
PARAMETER["false_northing",0]
```

Then, at the projection parameters below, set them to the projection of your interest (in this case UTM Zone 2). In this way, you can project your point cloud into WGS 84 UTM zone 2.

RTK setting

Map1
Map1 Available, Points: 2256



HDOP 3.00
Number of satellites 10
Angle 20

☒ Coordinate transformation

Source coordinate WGS84

Target coordinate WGS84

Projection type: Transverse Mercator

Central meridian -171.0000000000000000

False easting: 500000.0000000000000000

Scale: 0.99960000000000000044

☐ Height fitting HKPD

Source ellipsoid: WGS84

Target ellipsoid: WGS84

Origin latitude: 0.00000000000000000000

False northing: 0.00000000000000000000

Load parameters
Calculation parameter

X translation: -----

Y translation: -----

Z translation: -----

X rotation: -----

Y rotation: -----

Z rotation: -----

Scale: -----

Cancel
Ok

Note: currently, only these following four projection types are supported:

- Gauss Kruger projection(3)
- Gauss Kruger projection(6)
- UTM
- Transverse Mercator

Example 1.2 GRS67 to GRS67

If you are receiving an RTK signal that is not on the dropdown list in the Lixel Go app, for example GRS 67:

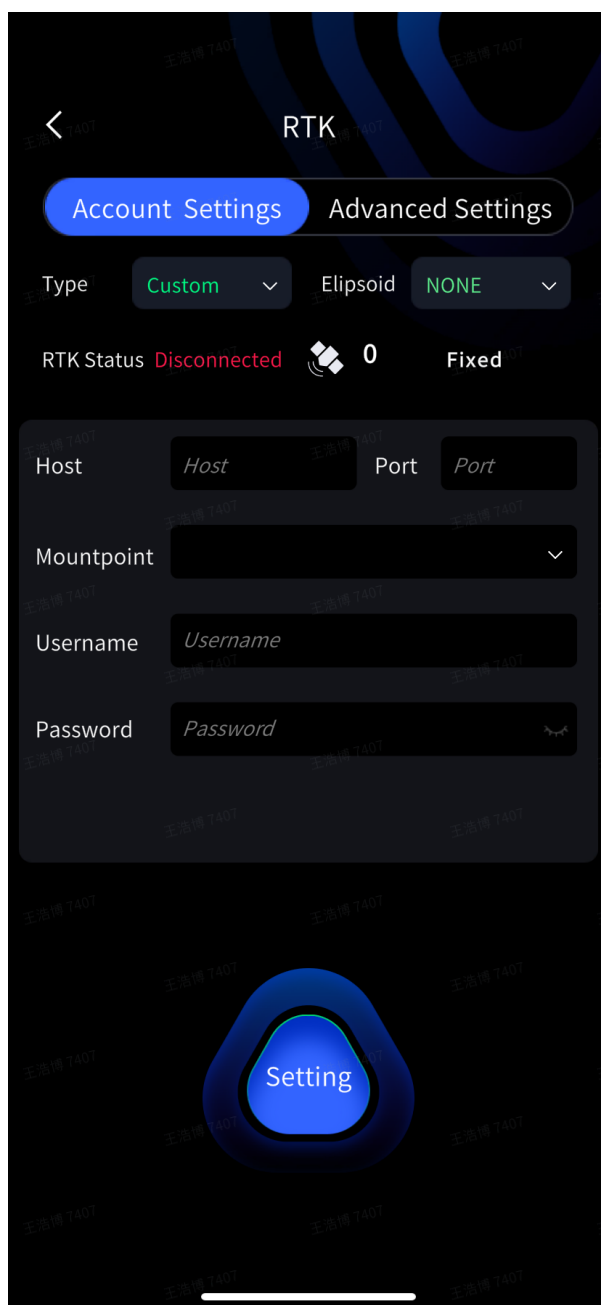
GRS 67 (Geodetic Reference System 1967)

Semi-major Axis (a): 6,378,160 meters

Inverse Flattening (1/f): 298.25

Usage: Used primarily in South America.

Before you collect the data, set the "Type" to "Custom" and set the ellipsoid to "NONE". Then enter your Port and Mountpoint.



And in Lixel Studio, set the source coordinate and source ellipsoid to "other". Then, set your target coordinate and target ellipsoid to "other" and set the projection information according to your need and proceed with project processing.

Note: whenever you choose "other" for source ellipsoid or target ellipsoid, you will be prompted to enter the ellipsoid's semi-major axis (a) and 1/f (where f is the ellipsoid flattening ratio). Please enter the correct a and 1/f value from your ellipsoid of interest at this step.



Ellipsoidal parameter

HDOP 3.00

Angle 20

☒ Coordinate trans

a: 6378137.00

1/f: 298.2572240000

Source coordinate

Target coordinate Other

Target ellipsoid: Other

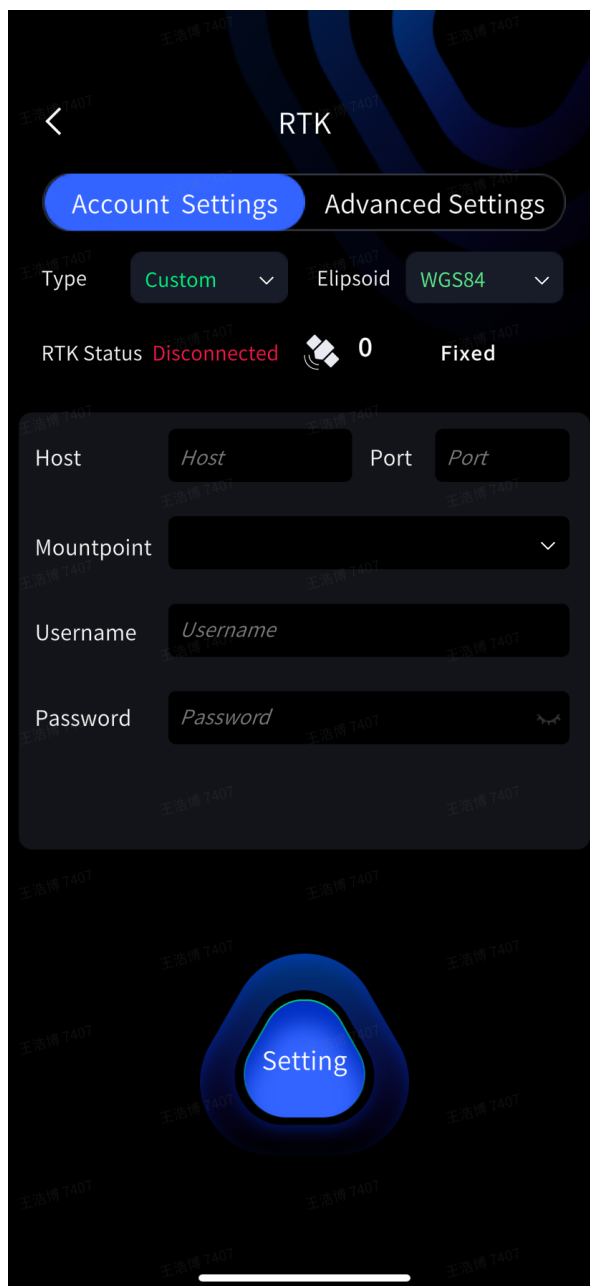
OK

Scenario 2 (whenever source ellipsoid is different from target ellipsoid):

Whenever you received your RTK signal in one ellipsoid (for example WGS84), but you would like to project your point cloud to another ellipsoid (for example JGD2011), besides the projection information, you will also need to enter the seven parameters of Helmert transformation.

Example 2.1 WGS84 to JGD2011, project to Japan Plane Rectangular CS IX (EPSG:6677)

Before you collect the data, set the RTK type and ellipsoid information to Custom and WGS 84.



When processing the data, set the target coordinates to JGD2011 and the target ellipsoid will be fixed to GRS80 by default.

Consult the EPSG website for projection parameters and input those parameters to LixelStudio

EPSG:6677

JGD2011 / Japan Plane Rectangular CS IX

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Transform

Get position on a map

Available transformations to EPSG:4326 ▼

Japan - onshore and offshore., accuracy 1.0 m, code 9936 (default) [3]

Selected transformation

Method: Geocentric translations (geog2D domain)

Remarks:

Information source: IOGP

Revision date: 2021-12-30

Covered area powered by MapTiler



Attributes

Unit: metre

Geodetic CRS: JGD2011

Datum: Japanese Geodetic Datum 2011

Ellipsoid: GRS 1980

Prime meridian: Greenwich

Data source: EPSG

Scope: Cadastre, engineering survey, topographic mapping (large and medium scale).

Remarks: Replaces JGD2000 / Japan Plane Rectangular CS IX (CRS code 2451) with effect from 21st October 2011.

Area of use: Japan - onshore - Honshu - Tokyo-to. (Excludes offshore island areas of Tokyo-to covered by Japan Plane Rectangular Coordinate System zones XIV

Center coordinates

17244.17 -491306.5

Projected bounds:

-1881761.44 -2095056.7
1921995.63 1272689.51

WGS84 bounds:

122.38 17.09
157.65 46.05

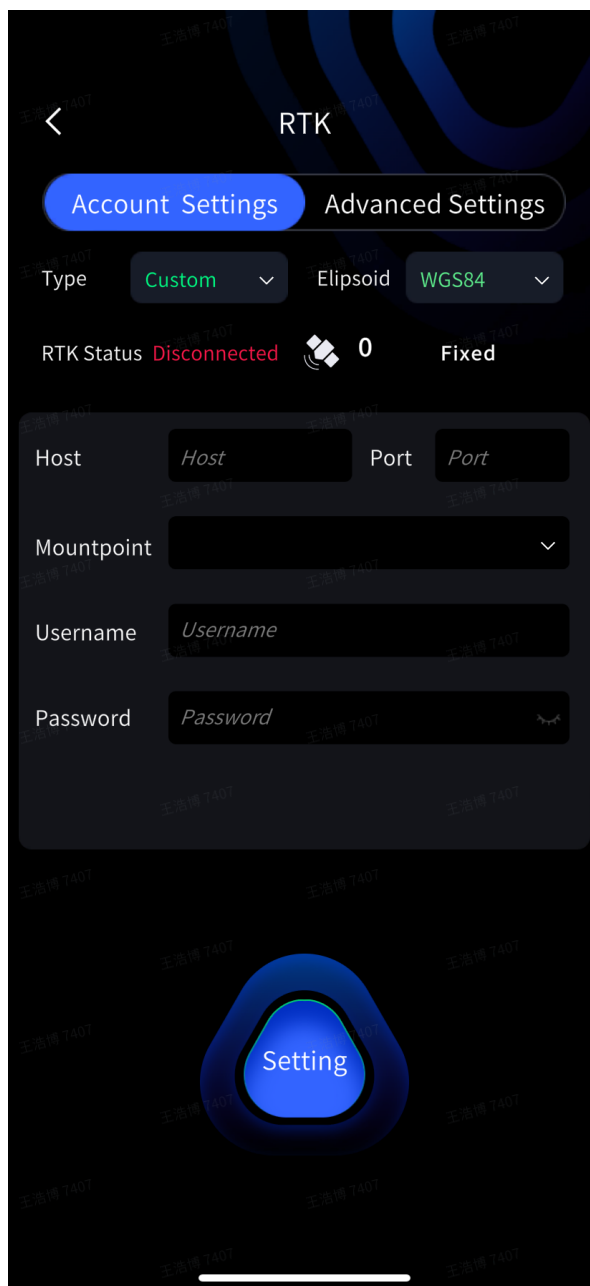
```
PROJCS["JGD2011 / Japan Plane Rectangular CS IX",
  GEOGCS["JGD2011",
    DATUM["Japanese_Geodetic_Datum_2011",
      SPHEROID["GRS 1980",6378137,298.257222101],
      TOWGS84[0,0,0,0,0,0]],
    PRIMEM["Greenwich",0,
      AUTHORITY["EPSG","8901"]],
    UNIT["degree",0.0174532925199433,
      AUTHORITY["EPSG","9122"]],
      AUTHORITY["EPSG","6668"]],
    PROJECTION["Transverse_Mercator"],
    PARAMETER["latitude_of_origin",36],
    PARAMETER["central_meridian",139.833333333333],
    PARAMETER["scale_factor",0.9999],
    PARAMETER["false_easting",0],
    PARAMETER["false_northing",0],
    UNIT["metre",1,
      AUTHORITY["EPSG","9001"]],
      AUTHORITY["EPSG","6677"]]
```

Then choose the correct Height fitting (GSIGEO2011).

 7parameters_Japan.txt

Example 2.2 WGS84 to KGD2002, project to Central Belt 2010 (EPSG:5186)

Similar to the previous example, set the RTK type and ellipsoid information to Custom and WGS 84.



When processing the data, set the target coordinates to KGD2002 and the target ellipsoid will be fixed to GRS80 by default.

Consult the EPSG website for projection parameters and input those parameters to LixelStudio

EPSG:5186

KGD2002 / Central Belt 2010

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Transform

Get position on a map

Available transformations

to EPSG:4326 ▼

Republic of Korea (South Korea) , accuracy 1.0 m,
code 15831 (default) [3]

Selected transformation

Method: Geocentric translations (geog2D domain)

Remarks: Approximation at the +/- 1m level assuming that ITRF2000 is equivalent to WGS 84.

Information source: OGP

Revision date: 2023-07-17

Covered area powered by MapTiler



Attributes

Unit: metre

Geodetic CRS: KGD2002

Datum: Korean Geodetic Datum 2002

Ellipsoid: GRS 1980

Scope: Cadastre, topographic mapping.

Remarks: Legally mandated CRS from 2010-01-01.
Replaces Korean 1985 / Central Belt, Central Belt Jeju, Modified Central Belt, Modified Central Belt Jeju (CRS codes 2097, 5168, 5174 and 5175) and KGD2002 / Central Belt and Central Belt Jeju (CRS codes 5181-82).

Center coordinates

337412.92 205430.25

Projected bounds:

-219825.99 -442558.89
913114.23 877525.22

WGS84 bounds:

122.71 28.6
134.28 40.27

```
PROJCS["KGD2002 / Central Belt 2010",
  GEOGCS["KGD2002",
    DATUM["Korean_Geodetic_Datum_2002",
      SPHEROID["GRS 1980",6378137,298.257222101],
      TOWGS84[0,0,0,0,0,0,0]],
    PRIMEM["Greenwich",0,
      AUTHORITY["EPSG","8901"]],
    UNIT["degree",0.0174532925199433,
      AUTHORITY["EPSG","9122"]],
      AUTHORITY["EPSG","4737"]],
    PROJECTION["Transverse_Mercator"],
    PARAMETER["latitude_of_origin",38],
    PARAMETER["central_meridian",127],
    PARAMETER["scale_factor",1],
    PARAMETER["false_easting",200000],
    PARAMETER["false_northing",600000],
    UNIT["metre",1,
      AUTHORITY["EPSG","9001"]],
      AUTHORITY["EPSG","5186"]]
```

Then choose the correct Height fitting (KNGEOID18).

RTK setting

Map1
Map1 Available, Points: 2256

HDOP ◀ 3.00 ▶
Number of satellites ◀ 10 ▶
Angle ◀ 20 ▶

☒ Coordinate transformation

Source coordinate ▼ WGS84

Target coordinate ▼ KGD2002

Projection type: ▼ Transverse Mercator

Central meridian ◀ 127.00000000000000000000 ▶

False easting: ◀ 200000.0000000000000000 ▶

Scale: ◀ 1.00000000000000000000 ▶

Source ellipsoid: ▼ WGS84

Target ellipsoid: ▼ GRS80

Origin latitude: ◀ 38.00000000000000000000 ▶

False northing: ◀ 600000.0000000000000000 ▶

☒ Height fitting ▼ KNGEOID18

Load parameters
Calculation parameter

X translation 0

Y translation 0

Z translation 0

X rotation: 0

Y rotation: 0

Z rotation: 0

Scale: 1.0000000000

Cancel
Ok

Finally, load the seven parameters. Currently, the software supports files in txt or csv format. The data must include seven parameters, namely three translation parameters, three rotation parameters, and one scale parameter: Dx, Dy, Dz, Rx, Ry, Rz, Scale.

In this case, to transform WGS84 to GRS 80, it should be a txt file with 0 0 0 0 0 0 1 inside. Or a csv file with 0,0,0,0,0,0,1 inside. You can just download this file attached below and load it to the RTK setting.



7parameters_Korea.txt

Calculate parameters:

If you do not have the seven parameters, you can calculate them based on the control points (note these control points differ from the GCP you used for GCP transformation, see below for more details). Click "Calculate" to open the seven-parameter calculation interface.

Parameter calculation

×

Source coordinate (BLH)

Source coordinate ▼ WGS84

Import control point file:

+

Target coordinate(projected coordinate)

Target coord ▼ ERNATIONAL

name	Source B	Source L	Source H	Target N	Target E	Target Z

Calculate

Save

Result

name	X residual	Y residual	Z residual	X translation	X rotation:

Y translation	Y rotation:

Z translation	Z rotation:

Scale:

Cancel

Ok

Click the "Import File" button to import the control point file needed for calculating the seven parameters. The file format supports ".csv" or ".txt" formats. The control points file should include: Point Name, Source coordinate Latitude (degrees:minutes:seconds) [e.g., 121:32:11.235], Source coordinate Longitude (degrees:minutes:seconds), Source coordinate Height, Projected Plane Coordinate Northing X, Projected Plane Coordinate Easting Y, and Projected Elevation Z. **In other words, Lat Long and Height are measured in source coordinate, and Northing Easting and Elevation are measured in projection of your interest.**

Note: At least three or more valid control points are required to ensure the effectiveness of the seven-parameter calculation. The specific data format is shown below. You can click the button next to it to download the template.

After importing the file, click "Calculate" to perform the seven-parameter calculation. Click "Save" and choose a save path to save the calculated seven parameters. After clicking "OK," the calculated seven parameters will be applied to the coordinate transformation.

Parameter calculation

Source(BLH)

Source coord CGCS2000

Target(GAUSS PROJECTION)

Target coord XIAN80

Import control point file:

J:/W



name	Src B	Src L	Src H	Target X	Target Y	Target H
J1	022:	13:52:	1.77	24950	4875	0.74
J3	022:	113:5	0.86	24951	4875	0

Calculate

Save

Calculation results

name	dx	dy	dZ
J1	0.0	-0.00	0.00
J3	0.0	0.00	-0.00

Dx: -32 Rx: -12
Dy: -41 Ry: 10
Dz: -33 Rz: 22
Scale: 1.00

Cancel

OK