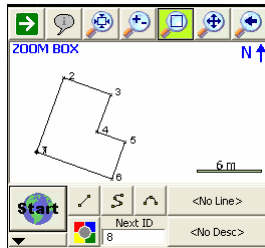


## GPS Multi Point Local Transformation in the Field

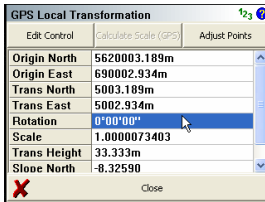
Please use this article as a guide to performing a Multi Point GPS transformation in the field when:

1. You have opened a Project with a range of points downloaded into FieldGenius that are in an assumed coordinate system:



2. You have set up your GPS Reference at one of the above points and have performed at least a single point localization while this job is open.

Please refer to the Helpdesk article: *Quick Reference-Single Point GPS Transformation Day 1 and 2* for more information.



3. You need to perform a Multi point localization because:

- You wish to gain more precision or recalculate the transformation parameters by taking more observations or,
- Your Local and Control Points are in Coordinate systems that do not align with each other and the transformation parameters will require a rotation or,
- Your Local and Control Points are in different units so the transformation parameters will require a scale factor.

### Important Terms:

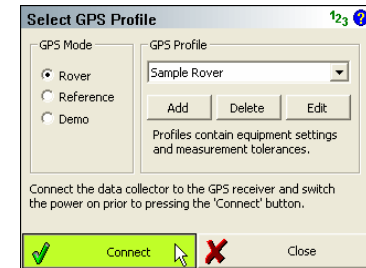
**Local Coordinates** in this case, are the points that you have measured in the field using GPS observations.

**Control Coordinates** are typically defined by an assumed or published coordinate system. These points will not be transformed by the transformation parameters.

While the project is open:

- Load the GPS profile.
- Measure and enter the antenna height.
- Ensure the correct horizontal and vertical datums are selected. Connect the data collector to the Rover.

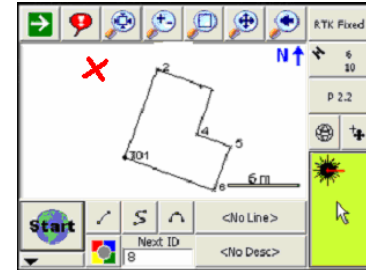
See the *GPS Reference* section in the *FieldGenius* manual for details.



Once connected, set up the rover on one of the points which will be used to compute transformation parameters.

To compute transformation parameters it is best to have four or five reliable observations to choose from that are distributed widely around the job site.

In this example we will observe the local point which corresponds to point 2 in this map view.



**Step 1:** Pick on measure when ready:



**Step 2:** Ensure that the "Use for Local Transformation" box has been checked for this procedure:

**GPS Measurement**

Antenna Height (True): 4.92'

Position Status: Accepted

Horizontal RMS: 0.03'

Vertical RMS: 0.05'

Offset Direction: 0°00'00"

Offset Horz Dist: 0.00'

Offset Vert Dist: 0.00'

Use for Local Transformation

Auto Record Points

Store Pnt Cancel

**Step 3:** This is optional, but a good idea:

**GPS Measurement**

This coordinate has been designated to be used in local transformation calculations. Also save the coordinate to the points database?

Yes No

**Step 4:** Here we store the first Local point as 102:

**Store Point**

Point ID: 102

Description: List

Northing: 5523058.165m

Easting: 311547.633m

Elevation: 380.533m

Note: Tap to enter note

Store Pnt Cancel

**Step 5:** And assign point 2 as the corresponding Control point. Note that this point will be used for Horizontal and Vertical Control:

**GPS Local Transformation**

Control Point: 2

Horizontal  Vertical

Local Coordinates

Select Point

Northing: 5523033.376m

Easting: 311558.976m

Elevation: 383.272m

Do not change Local Coordinates

OK Cancel

**Step 6:** Repeat Steps 1 through 5 until you have collected observations for 2 to 4 more points that are spread widely about the job site.

As you add points you will see a list of **Control** points. The dN and dE values express the difference between the **Control** and corresponding **Local** Northing and Easting.

*Calculating Transformation Parameters using points that are restricted to a small area can exaggerate small errors the way a short backsight/long foresight does in traditional surveying.*

*See p. 341 in the FieldGenius 2007 Manual for an explanation of the two checkboxes. Settings shown are typical.*

*Pick on "Calculate Parameters" to view the residual measurements:*

**GPS Local Transformation**

Calculate Parameters Edit Control Add Control

Do not calculate scale

Do not calculate vertical slopes

Ctrl Pnt	Horz	Vert	dN	dE
2	✓	✓	5518090.4...	306584.3...
3	✓	✓	5518053.7...	306557.8...
6	✓	✓	5518036.2...	306550.1...

Close

The residuals listed here indicate the amount of error that will be introduced at each **Control** Point if the transformation is calculated now. You have the option of Highlighting a point and picking "Edit Control" to check or uncheck points to be used to compute the transformation. *Note that point 2 will be used as the benchmark in this case.*

You can pick "Add Control" to add more pairs of local and control points.

*Pick on "Close" to display the current transformation parameters:*

**GPS Local Transformation**

Calculate Parameters Edit Control Add Control

Do not calculate scale

Do not calculate vertical slopes

Ctrl Pnt	Horz	Vert	dN	dE	dH
1	✓	✗	0.011	0.015	423.33!
2	✓	✓	-0.001	-0.007	0.000
4	✓	✗	-0.011	-0.008	523.33!

Close

These are the transformation parameters:

Any further GPS measurements will now be transformed so that they appear in the same neighborhood as the **control** points in the map view.

**GPS Local Transformation**

Edit Control Calculate Scale (GPS) Adjust Points

Origin North: 5620003.183m

Origin East: 690002.936m

Trans North: 5003.189m

Trans East: 5002.934m

Rotation: 9°06'53"

Scale: 1.0000000000

Trans Height: 523.335m

Slope North: 0.00000

Close

**OPTIONAL:**

If you wish your **Local** points to appear in their transformed locations, you can pick on "Adjust Points." FieldGenius will go through the raw file and apply the transformation parameters to every point that was measured using GPS. In the end, zoom extents should show only the neighborhood of your **control** points with the corresponding **local** points very near.