

# X-PAD Ultimate FAQ Series

Move-Rotate-Scale: Align

More FAQ's like this one are available here: [ [X-PAD FAQ Series](#) ]

Date: 10/5/2023

Filename: Document1

## Thesis

Align can be used to move a design set of points to match measured points.



## Process

The example parcel record size is 125.00' (east-west) x 54.00' (north-south).

A theoretical parcel is generated starting from 1000, 1000. The two Westmost pins are found and stored as 1001 and 1002:

Points/Measurements/...			
	POINTS	MEASURE...	R
	104	N 1000.000ft E 875.000ft Z 4332.000ft	
	103	N 1054.000ft E 875.000ft Z 4332.000ft	
	102	N 1054.000ft E 1000.000ft Z 4332.000ft	
	101	N 1000.000ft E 1000.000ft Z 4332.000ft	
	1002 PC SW	N 7437067.950ft E 1540785.317ft Z 4332.230ft	
	0021	N 7437122.480ft E 1540836.903ft Z 4354.016ft	
	1001 PC NW	N 7437121.956ft E 1540785.589ft Z 4331.905ft	

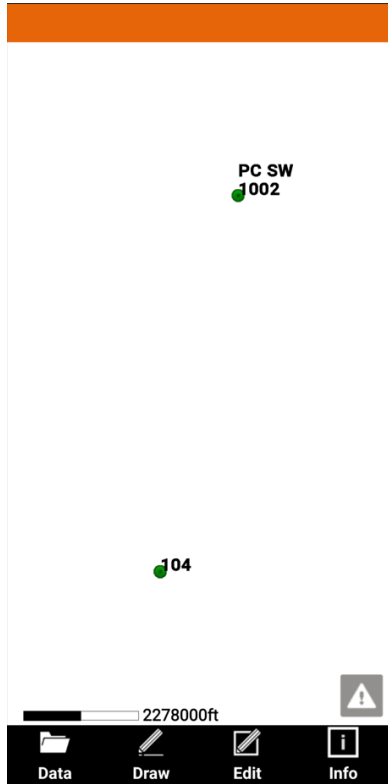
Topographic points: 7

Tools Add

101 is the Southwest corner, 102 is the Northwest corner.

1001 is the found and measured Northwest corner, 1002 is the found and measured Southwest corner. Notice that 1001, 1002 have Utah Central US Survey Feet coordinates. 0021 is the local base.

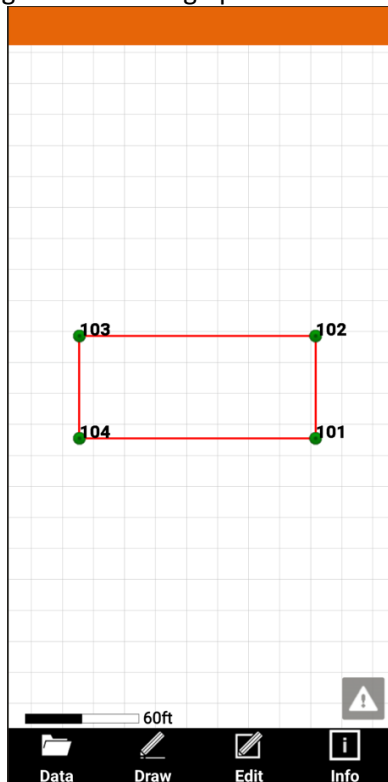
In CAD, zoomed to extents we see:



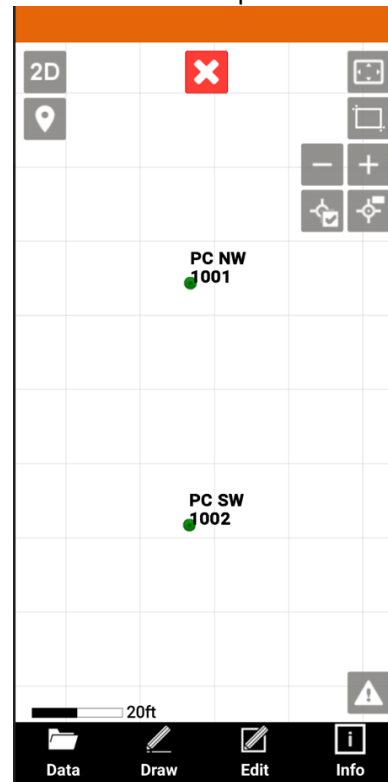
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Where there is a huge distance from the designed points to the measured points.

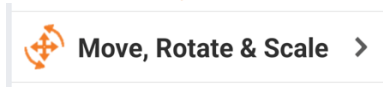
Zooming in on the design points:



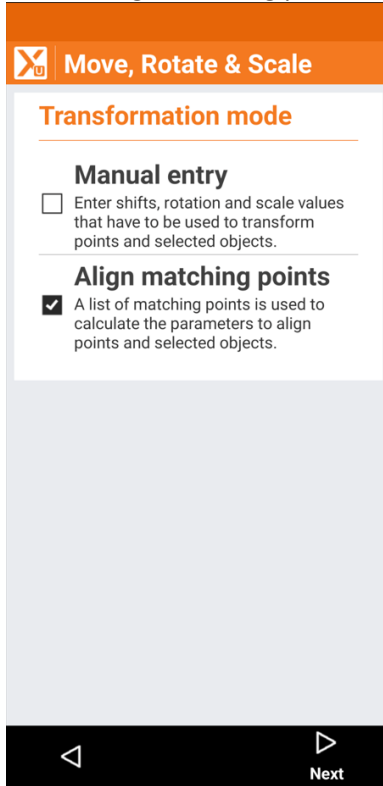
and the measured points:



Use the **COGO** > **Move, Rotate & Scale** tool:

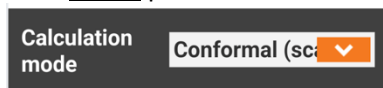


We will use the Align matching points function:

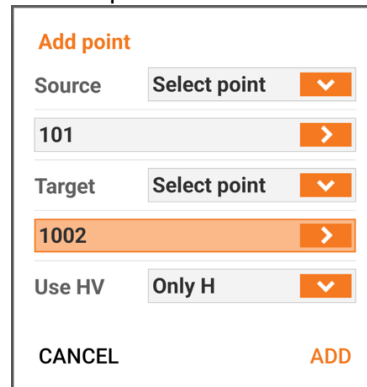
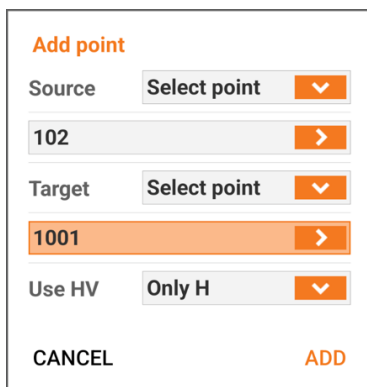


### Method: Conformal (Scaled) Honor Measured Points

Set the **Calculation** mode to **Conformal**, we want to honor the measured distance and bearing between the **found** pins:



Click the **Add** button and add the first and second affine pairs:



This is the setup:

Use	Sour...point	Target point
<input checked="" type="checkbox"/> H 0.000ft	102	1001
<input type="checkbox"/> V--		
<input checked="" type="checkbox"/> H 0.000ft	101	1002
<input type="checkbox"/> V--		

Calculation mode: Conformal (sc)

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Choose to only translate selected points:

**Select points/objects**

- All points**  
Transformation is applied to all topographic points of the current job.
- Select points**  
Select from the list the topographic points that have to be transformed.
- All points/drawings**  
Transformation is applied to all entities (points and drawing objects) of the current job.
- Select points/drawings**  
Select from the CAD view the points and drawing objects that have to be transformed.
- Only drawings**  
Transformation is applied to all drawing entities of the current job.
- IFC documents**  
Transformation is applied to selected IFC document.

Only select the design points, the measured points are already in the correct location:

Topographic points			
<input checked="" type="checkbox"/>		104	N 1000.000ft E 875.000ft Z 4332.000ft
<input checked="" type="checkbox"/>		103	N 1054.000ft E 875.000ft Z 4332.000ft
<input checked="" type="checkbox"/>		102	N 1054.000ft E 1000.000ft Z 4332.000ft
<input checked="" type="checkbox"/>		101	N 1000.000ft E 1000.000ft Z 4332.000ft
<input type="checkbox"/>		1002 PC SW	N 7437067.950ft E 1540785.317ft Z 4332.230ft
<input type="checkbox"/>		0021	N 7437122.480ft E 1540836.903ft Z 4354.016ft
<input type="checkbox"/>		1001 PC NW	N 7437121.956ft E 1540785.589ft Z 4331.905ft

Topographic points: 7

Tools Search Accept

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Click **Accept**:

**Move, Rotate & Scale**

**Transformation results**

Points

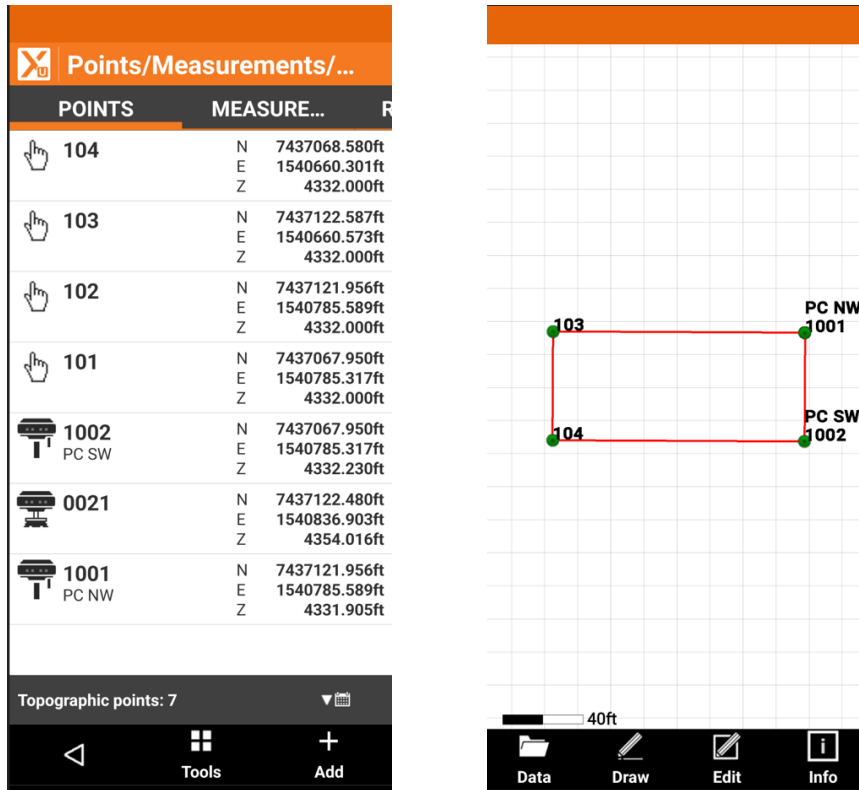
Drawing objects

Transformation completed successfully.

Accept

This looks great, click **Accept**.

The translated result look like this:



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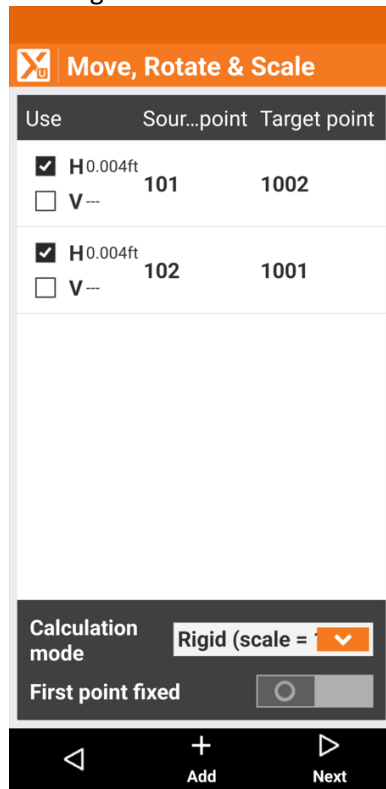
Points 101 and 102 are directly underneath 1002 and 1001 and the labels are not visible. You can verify this in the point list because the Northing and Eastings for the point pairs 101-1002 and 102-1001 are exactly the same.

The distance between 102 and 101 has been scaled to: 54.007 feet. This matches the found property corners – EXACTLY. Points 103 and 104 are slightly scaled to reflect the original surveyors chain.

As a result of this scaling, the distance between 101 and 104 is now: 125.017 feet.

## Method: Rigid (Scale = 1) Honor Design Points

It is also possible to honor the design points. The resulting transformation distances will exactly match the design. Choose **Calculation mode = Rigid (Scale = 1)**:



Use	Sour...point	Target point
<input checked="" type="checkbox"/> H0.004ft	101	1002
<input type="checkbox"/> V---		
<input checked="" type="checkbox"/> H0.004ft	102	1001
<input type="checkbox"/> V---		

Calculation mode: Rigid (scale = 1)

First point fixed:

Navigation: < Add Next >

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If **First point fixed** is **OFF**, then the result will balance the distance difference between the points. In other words, the resulting distance from 101 to 1002 will exactly equal the distance from 102 to 1001.

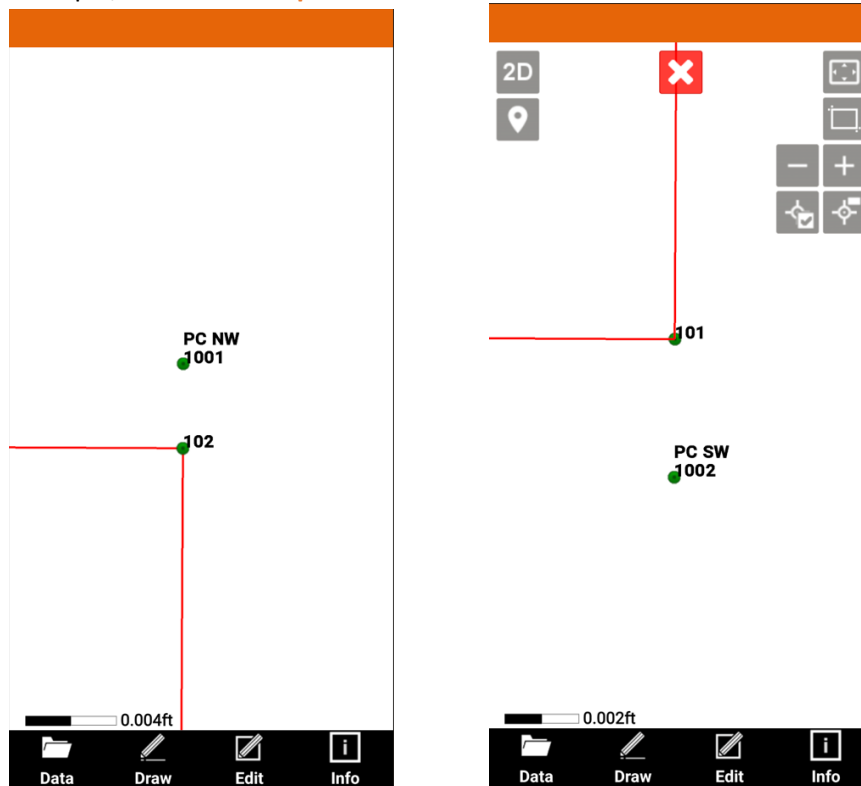
If **First point fixed** is **ON**:



First point fixed:

then the first point (101 in this case) will overlay the target point (1002) and the distance error will be pushed to all other points.

For this example, we leave **First point fixed = OFF**:



The resulting transformed distance from 102 to 1001 is 0.004 feet. The distance from 101 to 1002 is 0.004 feet.

The design distance has been honored and the alignment to the points on the ground has been balanced for a best-fit.