

New Job with 10,000, 10,000 at Section Corner, force Geodetic North with Ground Distances

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Note: this example is applicable to both SurvCE and SurvPC. The screens were captured from version 6.07.

Description

Setup a Base at a random location near the center of a section. Assign the coordinate 10,000, 10,000 to the Southeast corner of the section, rotate our basis of bearings to Geodetic north at the Southeast corner and apply the correct scale factor so that reported distances are 'Ground Distances'.

Solution

This survey is in the 'Utah North' state plane zone, so we make a new job and select 'Utah North' as the underlying projection with 'US Survey Feet' distance units:

🚴 Job Settings	;		✓ ×
Format	Opti	ons	Stake
New Jo	Ь	System	
Distance: US Survey Feet			
	Decimal	Feet	•
Angle: Degrees, Minutes, Second:			
LL: Degrees, Minutes, Second:			
Zero Azimuth: North 💌			
Edit Projection List			
Projection:			
USA/NAD83/UT North			

Here is map showing section 14 where I want to work:



Setup the Base on the bluff (shown above as 'BASE') with a 'Read GPS' (autonomous) position. Drive to the Southeast corner of section, find the BLM resurvey aluminum cap alongside the original stone monument.



Set the receiver on a 2-meter rod at the center of X marked on the BLM aluminum cap using bipod to hold receiver exactly level.

Localize the Southeast Corner

From the main menu, click on 'Equip: Localization', then click on the 'Points' tab:

🔍 Localiz	🚴 Localization [🕼 🔽 🔀		
Syste	System		GPS
Poir	Points By		Helmert
Pt ID N	lorthing	Easting	Elevation +
•			Þ
Add Load	<u>D</u> elete <u>V</u> iew	<u>E</u> dit <u>M</u> onito	On/Off Save

Click on the 'Add' button:

🔍 Local Point		
		×
Please enter local You may use a po or control job.	l coordinate values int ID from the cu	s. rrent
Point From File:]
Local Northing:	10000	ft
Local Easting:	10000	ft
Local Elevation:	5400	ft

Enter the 'Local' (desired) coordinates that we want the SE corner to have, 10,000 1,000 5,400 as shown above.

Click the green checkmark. SurvXX asks where to get the GPS coordinates from:

GPS Coordinates
Read GPS
C Enter Latitude/Longitude
O Erom Raw File

We are occupying the point, so just choose 'Read GPS' then click the green check mark.



SurvXX asks how many epochs we want to average:

Localization
Number of Complex
Number of Samples:
Maximum number of reading: 999
Use Advanced GPS Averaging

10 should be fine. Click the green checkmark at the top of the screen.

🔍 Average GPS
Taking Reading #3 of 10 3 Valid readings recorded.
SD.North: 0.0052 SD.East: 0.0190 SD.Elev: 0.0129
SATS:16/17 STATUS:FIXED(Sim) Hrms:0.056 Vrms:0.121 Stop Averaging and Store Cancel

Wait for all of the samples to be collected. The results of the localization are shown:

🔍 Loca	lization 📃	<u>/</u>			X
Sys	System		rs GPS		rs
P	oints	By Helmert		t	
Pt ID	Northing		Eastin	g	Elev
	10000.000	00	10000.	0000	5400
✓ Scale:1	.000000				►
Avg HR	es:0.0000	Avg	VRes:	0.0000	
<u>A</u> dd	Delete		<u>E</u> dit	<u>O</u> n/	/Off
Load	View		<u>M</u> onitor	<u>S</u> a	ive

Click the green check mark in the upper-right corner.

SurvXX will prompt for a filename for this new localizaton:



Localization File
👅 🖪 🔽 🗙
🍺 📂 📰 🗔
<u> </u>
Backup
r (
Name: J003.loc

Accept the default (which is the Job name with a '.loc' extension) and click on the green checkmark at the upper-right corner of the screen to return to the main menu.

🔍 🗍 JOO3	Î 🚡 💽
<u>S</u> urvey <u>C</u> O	GO <u>R</u> oad
<u>F</u> ile	<u>E</u> quip
1 Total Station	6 Localization
2 GPS Base 🕱	Z Monitor/ K
3 GPS Rover	8 Tolerances
4 GPS Raw Only 🚏	<u>9</u> Peripherals
<u>5</u> Configure 📌	0 GPS Utilities 🛛 🕸

Set 'Grid to Ground'

From: 'Equip: Localization' click on the GPS tab:

Scalization		🔽 🗙			
Points	By H	By Helmert			
System	TS	GPS			
☐ Base Trans Localization M Multi Point Met	Base Translation Localization Method Multi Point Method:				
Plane Similarit	Plane Similarity 🚽				
One Point Azimith: Geodetic 💌					
Geoid File: ContinentalUS_NGS201					
Geoid Method:					
Grid to Ground:					

Set 'One Point Aziumuth' to 'Geodetic'.

Click on the 'Grid to Ground' checkbox, then click on the 'Read GPS' icon:

Grid to Ground:	<u>.</u>
1.0000000000000	7



SurvXX will read the GPS current position and based on the location and elevation compute the correct scale factor:



The combined 'Ground to Grid' scale factor (CSF) will be shown.

Click on the red back button at the top of the screen to return to the GPS tab. Note that the 'Grid to Ground) factor is shown:

Scalization		X	
Points	By H	elmert	
System	TS	GPS	
Base Translation Localization Method Multi Point Method: Plane Similarity			
One Point Azimuth: Geodetic			
Geoid File: ContinentalUS_NGS201 Geoid Method: Quadratic Grid to Ground: 1.000298657089			

Remember that 'Grid to Ground' is the inverse of 'Ground to Grid':

$$1.000298657089 = \frac{1.0}{0.999701432081}$$

We have succesfully applied the correct CSF for the Southeast corner of this section. Click the green checkmark in the upper righthand corner.

SurvXX will ask:

SurvCE		
?	Points hav prior to u Combined Would yo reprocess	ve been surveyed pdating the d Scale Factor. u like to s the raw file?
	<u>Y</u> es	No

Click on 'Yes', the 'Process Raw File' dialog will be shown:



🔍 Proce	Process Raw File			
GPS	Proj.	Redundancies	Types	
CSF Gnd to	Grid: Lo	0.99970143208 calization File	1 GPS	
	Geoid	d Separation File	பு	
Localization File: J003.loc Geoid File: ContinentalUS_NGS				
Trar Plar	nsforma ne Simil	tion: arity	•	
One	Point L	ocalization Azimu	th:	
Geo	detic		-	

6

Click the 'GPS' button recall the new (but sofar unused) CSF, then click the green checkmark.

You can review the reprocessed file (if you did not previously store the base position the point listing will be empty):

🚴 Revie	w File	
		🛃 🛃
File: C	:\Program_Fi	les\SurvCE\scadr
Proces	s Results	
Raw fi	le> C:/Progra	m_Files/SurvCE/J
CRD fil	e> C:/Progra	m_Files/SurvCE/J
Localiz	ation file> C:	/Program_Files/S
Alignm	ent Azimuth>	Geodetic
Geoid	File> C:/Carls	on Projects/Data
Point	Latitude	Longitude
No.	Northing	Easting
4		•

Click the red back button to return to the main menu.

Further Discussion

Note that at this point, we have NO points in our job.

From 'File: Points' you can see an empty list:

Pts:0 <= 0				
		i	*	←
Point ID	Northing	Easting	Eleva	tion
EC	lit		Add	
<u>E</u> ir	nd	De <u>l</u> ete		

Let's store our current position, the Southeast corner of the section which we are still occupying. From 'Survey: Store Points'



	PTS		×
S A	0	C	*
Fixed	I+I 16/ 1	.930) ft
Ň E→	<u>A</u>		
Pt: 1		TH	6.562
N:10000.0001 Hrms:0.062 Vrms:0.1	E:10000.0	018 Z:5	399.> 0P:2.00
		r)@]@

Enter 'SE' as the description, then click the 'S' button to store this location.

Next, drive and hike 1-mile to the north and store the Northeast Corner.

With two points stored the point list looks like this:

🔍 Pts:2 <= 2			
Ť		🧽 🦻	🔁 🔇
Point ID	Northing	Easting	Elevation
1	10000.00	10000.00	5400.000
2	15284.69	10016.87	5438.373
			
<u>E</u> c	lit	<u>A</u> c	ld
<u></u> ii	nd	Delete	

Now we can use the 'COGO: Inverse' function to compute the distance between the points (the survey term for the distance/bearing between two rectangular coordinates is 'inverse'):

Ont Inverse
🔍 2D 🖲 31 🛃 💽 🧲
Pt1: N10000.0001ft E10000.0018ft Z5400.0004ft SE Bearing: N0°10'58"E Ground: 5284.716ft Gr SDist: 5284.855ft EDiff: 38.372ft Slope: 0.73% 137.72:1 Pt2: N15284.6889ft E10016.8694ft Z5438.3725ft NE
< >
Next Pt: 2

Both the Ground and Grid distances are shown:

Ground: 5284.716ft Grid: 5283.138ft

The Ground distance is the Grid distance multiplied by the Grid to Ground Combined Scale Factor:

5284.716 = 5283.138 * 1.00029866



The Bearing:

Bearing: N0°10'58"E

Is the bearing from the the measured vector from the Southeast corner to the Northeast corner to the vector orignating at the Southeast corner pointing to Geodetic North.