

## Localization & Grid to Ground Scale Factors in SurvCE

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### Grid-to-Ground

CSF is function of:

Latitude, Elevation and Projection

Difficult to choose a single reasonable CSF for a large project:



Especially if you have moderate elevation changes. Here is an example of the change of 400' elevation at my house:



### Localizations

A localization (or calibration) allows you to best match an existing survey or to start a new survey at ground and control the basis of bearings.

### Reusing last localization? Clean slate!

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Define Job Attributes

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#### File: Job Settings:

Job Settings

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vCE û 🛱 💭 🕂 🖅 6:3 🖞 📇 ሾገ 🗲 🖅 6:33  $\sim 1$ Localizat 🛃 🖬 🗸 🛛 Localization Points By Helmert System TS GPS By Helmert TS System Pt ID Nor hing Easting Eleva Base Translation 1 -Localization Method Multi Point Method: Plane Similarity One Point Azimuth: Geodetic <>Geoid File: ContinentalUS\_NGS201 ✓ 2pt Rotate Only Quadratic Geoid Method: <u>E</u>dit Add Delete On/Off Grid to Ground: Load View <u>Monitor</u> Save

### Equip: Loc..: GPS

V



If you work at a mine and reuse the localization on every job, you might want to check 'Use Last Job Localization' (a), otherwise probably not.

The 'Clear Localizaiton' (b) disassociates the .loc file from your job. But it does not delete it, so you can always get back.

Be careful with Grid to Ground and Azimuth (c); always (almost) have a GEOID file loaded in the background.

001 Start a new job at 10,000, 10,000; use Geodetic North at Ground based at a chosen parcel corner.

At Grid SurvCE P 💭 Č 🕂 🖅 6:37 🖞 🗱 🏹 帐 🖼 6:39 × **Point Inverse** VIEW DRAW COGO TOOLS FILE 🔵 2D 💽 3D 🛃 💽 Pt1: N7505891.6903ft E2286140.5269ft Layer: 0 Cmd: Z5442.5241ft se Bearing: N1°18'40"W HDist: 5283.66 2 SDist: 5292.655ft EDiff: 308.306f × Slope: 5.84% 17.14:1 Pt2: N7511173.9744ft E2286019.6261ft Z5750.8304ft ne ų -3800 ft Next Pt: ]= [ 2 0 **₽** 2 Brg N,E Show:

Pt1: N7505891.6903ft E2286140.5269ft Z5442.5241ft se Bearing: N1°18'40"W HDist: 5283.667ft SDist: 5292.655ft EDiff: 308.306ft Slope: 5.84% 17.14:1 Pt2: N7511173.9744ft E2286019.6261ft Z5750.8304ft ne





Occupy SE, compute combined scale factor, translate to 10000,10000 with GeoN Basis of Bearing (BOB). Verify the resulting ground distance and bearing (a), enter a starting point (b):





Do single point localization from 'Equip: Localization: Points: Add', read the GPS (occupying SE mark), then store both points and inverse:

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Pt1: N10000.0004ft E9999.9999ft Z5400.0042ft se Bearing: N0°11'07"E Ground: 5284.654ft Grid: 5283.673ft SDist: 5293.639ft EDiff: 308.306ft Slope: 5.83% 17.14:1 Pt2: N15284.6263ft E10017.0834ft Z5708.3105ft ne

Now, let's pick up a local benchmark for elevation, store VBM (e), turn off vertical on exiting point (f):





Add new point by recalling point 3, then editing elevation to match VBM (g), use Raw File for GPS coordinate (h), turn off Horz on VBM:



Then reprocess, finally verify that the VBM has the correct elevation.

002 Stat a new job, following a historic plat, matching the original basisof-bearing but holding exact ground measurements.

First occupy the SE corner and compute a valid CSF (a). The record BOB is North 1 deg 5 min East. Add a new base point 10000,10000 (b):

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Points By Helmert System TS GPS		
Base Translation	Туре С	RD: Alphanumeric
Multi Point Method:	Point ID:	1
Plane Similarity	Northing	: 10000.0000 <b>ft</b>
One Point Azimuth: Geodetic 🛛 🔹	Easting:	10000.0000 <b>ft</b>
Geoid File: ContinentalUS_NGS201	Elevation	: 5400.0000 <b>ft</b>
Geoid Method: Quadratic 💽		
Grid to Ground: 1.000185551647	Description	on: SEL <u><u><u></u><u></u><u></u><u></u> Next Store Utilities</u></u>



COGO: 9. Manual Traverse (a), compute a coordinate, based on 1 for some point about 1 mile north on record BOB. Occupy and Store both points (11&22). Add to localization(1->11; 2->12)

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癸 Manual Tra	verse 👩 🧲	🔶	Pts:4 <= 12				Localin	<b>I</b>		×
Occupy Pt ID:				🧼 🛃	i 🧲		System Points	TS	GPS By Helmert	5
1 SE L		P	Northing	Easting	Elevatio		Tomes		by Heimert	
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Bearing NE	N1°05'00"E NE 💌					Sca	le:1.00000	00 🗸	2pt Rotate (	Only
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N:15279.0562 E:	10099.8269 Z:5400.00		Edit	A			oad <u>V</u>	iew Mo	onitor <u>S</u> av	/e
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Check the '2pt Rotate Only' box, we don't want to honor the original distance as it was slope chained. Reprocess when prompted. Inverse when complete:

```
Pt11: N10000.0000ft E10000.0000ft
Z5089.4188ft se m
Bearing: N1°05'00"E Ground: 5284.648ft Grid: 5283.668ft
SDist: 5293.634ft EDiff: 308.306ft
Slope: 5.83% 17.14:1
Pt12: N15283.7033ft E10099.9148ft
Z5397.7251ft ne m
```

003 Start a new job, using a custom Low Distortion Projection, based at a central location at the job. Choose the correct projection scale factor so that distances are ground.

Start a new job, change the System option for LL display to decimal degrees:

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😂 Job Seti	tings				
Format	Options	Stake			
New Jo	ob S	System			
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	Decimal Feet				
Angle: Deg	rees, Minutes	, Seconds 💌			
LL: Dec	LL: Decimal Degrees				
Zero Azimuth: North 🕑					
	Edit Pro	jection List			
Projection:					
USA/NAD8	3/UT Central				



Occupy the point that you want to use for the project datum. Store a 30-second average as point #1; then COGO: Calculator: Conversion and recall point 1, then click on 'Solve Lat/Lon':

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💝 Aver	age Res	ults			ݢ Calculator	×
					Standard	Scientific
Valid Re	adinas:	10/10			Conversion	Generic
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	Average	9	StdDev		N 40.902369524	
North:	750589	1.688ft	0.0022ft			Easting
East:	228614	0.528ft	0.0017ft		W 109.1640522	2286140.52791
Elev:	5435.95	59ft	0.0027ft		Hgt: 5389.4 Pt	ID: Hgt: 5435.9
	Min		Max		Solve Lat/Lon	Solve N/E
North:	750589	1.685ft	7505891			ave
East:	228614	0.525ft	2286140		Apply Localizat	tion
b < (=	-	::		d d		

Note the Lat and Lon:

N 40.9023695246 W 109.1640522309

Navigate to Equip: Localization: System, edit the projection list and choose Add User Defined

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Zone Widt	h:	6		٦				
Lat. of Orig	gin:	40.90236952						
False North	False Northing:		1524.003		٦	m		
False Easti	Easting:		5000f			m		
d								

Set the 'C. Meridian' to the longitude (make sure negative!) of the point; the Lat of Origin to the latitude. Set the False N & E to what you wan the point to be (5000f will automatically translate to 1524.003 meters).

Navigate back to Localization: GPS and use the Grid to Ground to find a reasonable scale factor (e):

# Gage



Then go back to the coordinate system definitation and change the scale factor to the computed scale factor (f); finally return to the Grid to Ground computation and verify that the CSF is nearly 1.0.

Change the Lat/Lon display back to DMS.

Next store the SE and NE corner and inverse between them:

```
Pt2: N5000.0003ft E5000.0022ft
Z5435.9592ft se
Bearing: N0°11'07"E HDist: 5284.640ft
SDist: 5293.626ft EDiff: 308.313ft
Slope: 5.83% 17.14:1
Pt3: N10284.6125ft E5017.0823ft
Z5744.2720ft ne
```

Save the system description to an HTM file for later use as job metadata:

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Pt ID	Northing		Las	ting	Eleva

Reprocess the job so that the stored point is localized to match the local datum point, here are the EXACT steps:



From the 'File' menu (h) click on 'Raw Data', then (i) accept the current job's RW5 file, (j) click on 'Process GPS':

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3 Points 👌 🗄	Delete Job 💿	<b>⊞</b> 003.rw5	File	Report
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4 Raw Data 🛛 🗔 🧕	Write Note 🤌	<u>■</u> 833b.rw5	Angle Balance	Lines
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5 Feature Code	Frit 🧐		Transit	Triangulate
List		Name: 003.rw5		
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Accept the defaults (k) (sometimes you will need to enter 1/jobCSF but not in the LDP case); look at the results (I) and save to text file if desired; click the red check mark (m):



Click 'Yes' (n); then you are back at the main menu (o); check out the point list (p):

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Survey	<u>C</u> O	GO	Road		
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Raw File: 003.rw5					
Save Coordinate file     changes:     \Program     Files\Surta\GWA\003.crd					
Yes			No		
5 Feature Co List	de	<u>0</u> Exit	1		



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9.	Pts:3 <= 3				
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P	Northing	Easting	Elevation		
1	5000.00	5000.00	5435.959		
1 2 3	5000.00	5000.00	5435.959		
3	10284.61	5017.08	5744.272		
		::			
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	Eind		Delete		

It worked!



# 004 Using the previous job, with LDP geodetic basis of bearings and ground distances (10,000, 10,000.) Hand enter a couple of NGS Control Points using the published geodetic positions.

So, if we are working in a modified SPC or in an LDP, how can we export Lat/Lon's or import Lat/Lons? In this example, we have Geodetic coordinates for a NGS Control Monument with Orthometric height:



How can we enter this Lat/Lon coordinate with Ortho height into our LDP job?

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Solve Lat/Lon Save	Solve N/E
Apply Localization Apply Geoid	_

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Standard	Scientific
Conversion	Generic
SD/ZA->HD/VD	>G 🖲 LLH->Grid O Az->Br
Lat: 🔘 N 🔾 S	Northing
N 40°53'52.797"	3407.36645
Lon: 🔘 W 🔾 E	Easting
W 109°10'17.22	2954.06518
Hgt: 5471.5 Pt I	D: Hgt: 5471.5
Solve Lat/Lon	Solve N/E
Apply Localizat	ion

COGO: Calculator: Conversion: LLH->Grid (a)

Show how to enter a point AND explain 'Apply Localization' and 'Apply Geoid'.



005 Start a new job, retracing an existing survey. Initially use a few points to 'get on the system' then after finding the remaining corners, do a multipoint calibration looking for blunders.



Begin by entering point 21 as 10000,10000,5800 (a) then project 22 (b) and continue to 23, 24, 25, 26 and 27:



Points 24 and 25 have found 5RBC with reputable surveyor's license number. 21, 22, 23, 26 and 27 are missing, in heavy shrubs and under 1' of snow.



Draw parcel boundary (MapView: Draw Polyline 2D) d, then occupy and store the points that we found (24=124 & 25=125):





We have both local and Utah Central SPC points in our job at this point (e).



Click on Save to store the localization and then Reprocess the Raw File when prompted. Here are the EXACT Steps:



Click on Yes (g), (h) scale does not matter, we will honor the two points, 'One Point Loca...' does not matter as this is a two (and will become more) point.



Click on the green checkmark, the full results are shown in a text file. You can click the disk button if you would like to save to a text file.

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Localization file> /Program Files/Su	Pt ID Northing Easting Ele	21 10000.00 10000.00 5400
Geoid File> /Program Files/SurvCE/	24 10226.1361 10180.8886 540	22 10061.16 10050.02 5400
	25 10355.2692 10268.7820 540	23 10196.55 10160.75 5400
Point Latitude Longitude	25 10555.2052 10200.7020 5 10	24 10226.14 10180.89 5400
No. Northing Easting		25 10355.27 10268.78 5400
124 40°45'46.85153" -111°4(		26 10131.41 10291.83 5400
124 10226.1361 10180.88		27 10008.89 10192.17 5400
		108 10017.50 10014.44 5291
125 40°45'48.12829" -111°4(	Scale:0.999002 2pt Rotate Only	124 10226.14 10180.89 5308
125 10355.2692 10268.78	Avg HRes:0.0000 Avg VRes:0.0000	125 10355.27 10268.78 5299
108 40°45'44.78884" -111°4(a)	Add Delete Edit On/Off	
108 10017.5020 10014.44	Load View Monitor Save	Edit <u>A</u> dd
		K Eind Delete

(j) Click on the red back button to return to the points tab, then click the green check mark to return to the Equip menu. Look at the point list (k), all of the occupations are now local coordinates.

Now stake the un-found points. We were able to find 26 and 27 fully buried, within 0.5' of the staked values. #26 is a 5RBC but there is sprinkler construction next to it and it appears to be leaning. Let's add these two points to our localization:



Sure enough, #26 appears to have a horizontal issue (I). Turn #26 off (m). Reprocess with point 27 included and point 26 removed.



Let's check out that brass plug in the gutter. From map view, zoom in and select Inverse then enter point 108:



Click on the snap perpendicular button (n), then click on the line (o): 0.22' is amazing considering where this 1982 survey is, the terrain and the ground stability!

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With this existing job, show how to enter a state plane coordinate (for a subdivision control point), convert to Lat/Lon and then convert to the local coordinates. Use this UTC USFeet coordinate:

7447599.30 N 1563871.41 5300.10 Ortho

## 006 Mix total station shots with GPS measurements at Grid.

Start a new job, shoot two GPS points, a starting point and a backsight point. Set the TS up on start and backsight BS. In Equip: Localization: TS check the 'Apply Ground to Grid' checkbox (b). Click on the calculator button and chose 'Method: Grid Coordinates':



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<mark>ề</mark> Point Details	📚 TS Groo Grid 🔽 🛛 🗙	📚 Localization 🛛 🖌 🗙
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Point ID Northing Easting E		System TS GPS
	North: East: Z:	
∳2 7501752.12 2286216.92 5	7500553.03612286248.24075551.451	
	Grid Factor: 1.000067839218	Curvature & Refraction
	Height Factor: 0.999736702072	Sea Level Correction
	Combined: 0.999804523428	Apply Ground to Grid:
		0.999804523428
		Automatic scale to grid
	e	† L

Click the 123 button and choose point 1 to compute a CSF (d).

Click the green check mark and go to 'Survey: Store Points' (g); setup and click 'Backsight'

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📚 Store Points 🛛 🔽 🗙	💝 Backsight	😝 Backsight
Single Setup Remote Benchmark	🔀 🏓 🔽	🗙 🔁 🔽
Occupy Point:	Set to BS Azimuth 🔳 358°30'13"	Set to BS Azimuth 📓 358°30'13"
	Setup Results	≷ Manual Read 🛛 🔽
Instr. Height: 5 ft	OC PT: 1 BS PT: 2	> Angle Right: 0°00'00"
Backsight Point: 2	BS Azi: 358°30'13' Brg: N1°29'47"W	> Elev Diff: 0
	HI: 5.000ft HT: 5.000ft	
Backsight Brg: N1°29'47"W		Slope Distance: 1200
Backsight HT: 5 ft	Check Angle	Check Angle
Use Backsight HT for Foresights	Set Angle Check	Set Angle Check
	Set Angle and Read	Set Angle and <u>R</u> ead

SurvCE applies the single computed CSF to reduce each ground measurement (shot with TS) to grid:

1200.00 * 0.9998	04523 = 1199.7654
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Point Inverse     O 2D O 3D	📚 Backsight 🔽 🧲 🗙
Pt1: N7500553.0361ft E2286248.2407ft Z5551l4512ft start Bearing: N1°29'47"W Grid: 11! SDist: 1199.498ft EDiff: 0.009ft Slope: 0.00% 140487.15:1	Set to BS Azimuth 💌 358°30'13" Setup Results
5009E 0.00% Pt2: N7501752.1247ft E2286216.9184ft Z5551.4597ft bs	Angle:         Dist:         Elv(Z):           Calc:         358°30'1;         1199,498         5551.46(           Meas:         358°30'1;         1199,765         5551.481           Delta:         0°00'00"         0.268         0.021
	Check Angle
Next Pt: 2	Set Angle Check
Show: Brg N,E	K Set Angle and Read

Alternatively, you can choose 'Automatic scale to grid' which computes a scale factor for every vector independently: the CSF at both ends of the total station shot are applied to the measured ground



distance.



Consider (m) where 3 is 5280 W of 1 and 2 is 5280 N of 1. If we shoot from 1 to 2:

Meas: 0°00'00" 5279.035 5436.537 <sub>SF = 0.99981</sub>72348484848

However if we shoot from 1 to 3:

Meas: 270°00'00 5279.022 5436.537 <sub>SF</sub> = 0.9998147727272727

For large projects, this is a very accurate method for combining traditional and GPS measurements.

007 Choose an appropriate Combined Scale Factor based on Job corners. Set a Geodetic (True North) BOB system at the job center. (Tricky because you need raw data at Job Center.)

Store the 4 corners of a job (a). Equip: Localization: GPS (tab), check Grid to Ground (b). Select 'Average Points' (c)



Enter the point range (d), then click 'Average', note the scale factor (looks about right) (e) and then click the store point button (looks like a diskette). The next available point is automatically selected with the



### description 'AVERAGED PT' (f):

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On/Off Point ID Northing Ea	cription H Res V Res	cription H Res V Res H
	se 3722.22 227.251	se 3722.22 227.293 🗹 📕
	ne 3744.70 81.026	Store Point
	nw 3718.10 251.251 🔽	
	sw 3764.26 104.985	Point ID: 5
Average Corrections:	Average Corrections:	
Grid: Elev:	Grid: 1.000075 Elev: 0.999729	Description: AVERAGED PT
1/Combine	1/Combine 1.000196	1/Combine 1.000196
Range of Pts: 1-4 Ì∃ ☑ On/Off Average	Range of Pts: 1-4 DN/Off Average	Range of Pts: 1-4 f

Red back then green check mark back, SurvCE will choose the average point for the scale point and register the new scale factor (g). Exit all the way back to the Equip menu. You will not be prompted to reprocess the raw file. Go to COGO: Calculator: Converstion and recall point 5 (h). Mark sure 'Apply Geoid' is check and click on Solve Lat/Lon (i):

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SurvCE 💡 🗱 Ă 🕂 🕀 🖅 6:14	😤 Calculator 🛛 🗙	SurvCE 💡 👯 Čī 📢 Œ 6:24
😝 GPS Grto Ground Information	Standard Scientific	📚 Calculator 🛛 🗙
	Conversion Generic	Standard Scientific Conversion Generic
GPS Grid to Ground HAS BEEN Scale factor set by Average Points to a Combined Factor value of: 1.000193744733 -14.151m geoid offset applied to Scale Point set by Average Points N: 7508456.582 E: 2283443.083	M->Ft OD->G OLLH->Grid SD/ZA->HD/VD Az->Br Lat: N S Northing 7508456.5816 Lon: W E Easting 2283443.08278 Hgt: Pt ID: Hgt: 5663.2 Solve Lat/Lon Save Solve N/E Apply Localization Apply Geoid	Conversion       Generic         M->Ft       DD->G         M->Ft       DD->G         M->SD/ZA->HD/VD       Az->Br         Lat:       N       S Northing         N 40°54'34.5575       7508456.5816         Lon:       W       E Easting         W 109°10'24.83       2283443.08278         Hgt:       5616.8       Pt ID:         Hgt:       5616.8       Pt ID:         Solve Lat/Lon       Save       Solve N/E         Apply Localization       Apply Geoid       Apply Geoid

Make a note of the Lat, Lon and Ellipsoid Height:

### N 40°54'34.557508"

W 109°10'24.832991" 5616.824

Re-enter the Localization menu, make sure the 'One Point Azimuth' is set to Geodetic, then select the Points tab and add a new point. Choose point 5 to be the 'Local Point' (this loads the measured elevation) (j); then change the Northing and Easting to rounded values (k). Choose to enter the Lat/Lon

17



#### for the GPS coordinates:



Click the green check mark, then enter the saved Lat, Lon and Ellipsoid Height (m). Clcik the green check mark to return to the points menu (n), click the green check mark and then save the localization

SurvCE 💡 🛱 🎦 📢 🖅 6:29	SurvCE 💡 📰 Č⊇ €:30	SurvCE ♀ # △ ← 🖅 6:31
😂 Enter Lat/Lon 🔽 🗙	Points By Helmert	System TS GPS Points By Helmert
Use dd.mmssss format.	Pt ID Northing Easting Ele	SurvCE
Latitude: N 40°54'34.55750 North South Longitude: W 109°10'24.832	5 10000.0000 10000.0000 560	Points have been surveyed prior to updating localization file. Would you like to reprocess the raw file?
West Elevation: 5616.824	Scale:1.000000 V 2pt Rotate Only Avg HRes:0.0000 Avg VRes:0.0000	Yes No
m	Add         Delete         Edit         Qn/Off           Load         View         Monitor         Save	Add Delete Edit On/Off Load View Monitor Save

Choose Yes to reprocess the raw file (o) Notice that the scale is set to the inverse of the CSF (p), click the green check mark, the then red X, then the red X. Notice that (q) point 5 has not been recomputed (because there was no raw data for this entry.)

SurvCE ♀ 🛱 렀 🕂 🖅 6:31	SurvCE	9	¢∎∎	5:34
Process Raw File	💝 Pts	s:5 <= 5	و این این	÷
	Point I	D Northin	ng Easting	E
Scale: 0.99980629	1	5912.53	3 12189.87	5
	2	11197.1	12206.39	5
Localization File	3	11192.7	77 6945.99	5
	4	5886.36	6895.89	5
Geoid Separation File	5	7508456	6.58 2283443.0	8 5
Localization File: 007.loc Geoid File: ContinentalUS_NGS Transformation: Plane Similarity				
One Point Localization Azimuth:	. < [ =	::		$\rightarrow$
Geodetic		Edit	Add	
0	q	<u>F</u> ind	Delete	

If you would like to have a point at this location you can use COGO: Calculator: Conversion.



Uncheck 'Apply Localization' then recall point 5 (a). Solve for Lat/Lon. Check 'Apply Localization' then click 'Solve N/E'. Finally enter a new point ID 6 and click 'Save'

Calculator	×
Standard	Scientific
Conversion	Generic
○ M->Ft ○ DD->	>G 🔘 LLH->Grid
◯ SD/ZA->HD/VD	Ō Az->Br
Lat: ONOS	Northing
N 40°54'34.5575	10000
Lon: WOE	Easting
W 109°10'24.83	10000.00002
Hgt: 5616.8 Pt II	): Hgt: 5663.2
Solve Lat/Lon Sa	Solve N/E
Apply Localization	on

### 008 Network Leveraging of Localization



Construction has obliterated the North West corner of a parcel in Salt Lake City. The current owners are replacing the fence, repaying a parking area and setting landscaping.

We want to match an existing survey which is based on street monuments in two busy intersections in Utah (2700 S & Main Street, 2100 S and Main Street).

We are NOT going to occupy these two points.

We know from experience checking in on similar monuments in the area that the County Tie Sheets are always within a couple of hundredths of RTK solutions using the local 'TURN' network.

Our goal is to use the two street monuments, without occupying them, but checking in on the previous survey POB as a check point and then resetting the NW corner.





Enter the two street monuments (a 2700 S) (b 2100 S) as points 1 and 2:





The tie sheets are in meters so you need to enter 'M' after each distance:

SurvCE	#i ≧] ♣ @ :	2:15	SurvCE	#1 ど € @ 1	2:15	SurvCE	₩ ど 🕂 🖅 12:27
<mark>ề</mark> Enter an	d Edit Coordinates		<mark></mark> Enter and	d Edit Coordinates		裬 Point In	
Type CRD: /	Alphanumeric	<b>←</b>	Type CRD: A	lphanumeric	<b>←</b>	-	
Point ID: Northing: Easting: Elevation:	1 7428566.1943 1532778.5585 4253.8448	ft ft ft	Point ID: Northing: Easting: Elevation:	1532813.6666	ft ft ft	SDist: 4658.66 Slope: -0.02%	8ft EDiff: -0.937ft -4973.81:1 4.7300ft E1532813.6666ft
Description:	2700sMain	ĝΞ ties	Description:	2100sMain	ê≡ ties	Next Pt: Show:	2 Brg N,E
Inversing	(c):						
R	ECORD: N	0 05	00 E	4659.	500 (1	L/CSF 1.00	0178592)
В	earing: N	0°25'	54"E HI	Dist: 4658	8.6681	Et	
S	Dist: 465	8.668	ft EI	Diff: -0.9	937ft		
S	lope: -0.	02%	-4973.8	1:1			

Use COGO: Calculator: Conversion to compute the Lat/Lon/Ellipsoid height at these monuments:

# Gage





N 40°42'45.522485" W 111°53'17.733773" 4198.313 (ellips) N 40°43'31.554234" W 111°53'17.540435" 4197.441 (ellips)

Now that we have geographic coordinates (Lat,Lon,Height) for these two controlling monuments, we can create a local coordinate system. Let's start at the South control point and call it 10,000, 10,000 with the elevation from point 1. In COGO: Keyboard Input, recall point 1 then set Northing and Easting to 10,000, when prompted to overwrite change the PID to 11, next project a point (at ground) the record bearing and distance from 11 (use COGO: Manual Traverse) (h):

SurvCE	<b>∷</b> È € 12:39		SurvCE	# ≧ 🕂 🔁 12:40		SurvCE		# ≿] ♣ @	₽ 12:42
<mark>ề</mark> Enter and	Edit Coordinates		癸 Point Protect	×		😤 Mai	nual Trav	erse 😡	) 🧲
Type CRD: Alp	ohanumeric	]	Point ID 1 already u	ised!		Occupy 11	_	iin L <u>}∃</u> [	2
Point ID:	1		Use New Point ID	11 Point ID:		Backsig			7
Northing:	10000.0000 <b>ft</b>		Overwrite	<b>1</b>		12		Enter El/Off TR Mode	
Easting:	10000.0000 <b>ft</b>					Desc:	2100 S M	ain (Local)	ÊΞ
Elevation:	4253.8448 <b>ft</b>					Bearing	g NE	N0°05'00"E	NE 🔳
						Elev. D	iff.	0.0000	DZ 🔳
						Horz D	ist	4659.5000	HD 🔳
Description:	2700sMain 2					N:1465	9.4951 E:1	0006.7770 Z:4	253.84
<u>P</u> rev <u>N</u> e	ext <u>S</u> tore <u>U</u> tilities	g			h	<u>C</u> a	alculate	Store	9

Now create ground system that matches the plat. From Equip: Localization use point 11 as the first control point's local value (i), you will have to hand enter the Lat/Lon/Height (j,k), since the local point's elevation exactly matches the control point leave Elevation enabled (I):

22

# Gage

SurvCE	#2 ↓ @	12:44
<mark>è</mark> Local Point		×
	cal coordinate value point ID from the rol job.	es.
Point From File:	11 ]=	
Local Northing:	10000	ft
Local Easting:	10000	ft
Local Elevation:	4253.8448	ft
SurvCE	╡と	12:46
SurvCE	# 2] + @ /	12:46
System	TS GF	× ×
Localin	TS GF By Helmert	× ×
System Points	TS GF By Helmert	× >S El€
System Points	TS GF By Helmert	× >S El€
Cocalin System Points Pt ID Northi 11 10000. CE Scale:1.000000	TS GF By Helmert	× 
Cocalin System Points Pt ID Northi 11 10000. CE Scale:1.000000	TS GF By Helmert ing Easting .0000 10000.000	× 





Next enter the second control point 12. Use point 12 for local coordinates (m), then hand enter the Lat/Lon/Height (n), turn off vertical (o):









Make sure '2pt Rotate' is unchecked, notice that the scale is exactly what we calculated earlier:

SurvCE		••••			1:0
😂 Loca	alin 📃	/ 🖬	ן נ	~]	X
Syste	em 🗌	TS		GP	S
Poi	nts	B	y Hel	mert	
Pt ID	Latitud	e	Lon	gitua	le
11	40.4245	52249	-111	.531	.773
		55423	-111	531	754
12	40.4551	.55425			.7 54
< [ #	::				
Cale:1.0	:: 000179	2	2pt <u>R</u> o	otate	
Scale:1.0	::	2	2pt <u>R</u> o	otate	
Scale:1.0	:: 000179	2 Avg VR	2pt <u>R</u> o es:0.0	otate	
Scale:1.0 Avg HRe	2000179 s:0.0000	2 Avg VR	2pt <u>R</u> e es:0.0	otate 0000 Qn/	) Only

There are is no raw data (all of the points so far are SP's) so SurvCE does not offer to reprocess the raw file.

Now let's use the ALTA survey to compute local coordinates from the 2100 S Main control point back to the POB:

S 0 5 0 W 1177.69 to CLStreet [13], thence

S 89 52 0 W 66.00' to POB [14], thence

S 89 52 0 W 687.61 to the NorthWest corner that we want to stake [15]

Starting at PID 12, use COGO: Manual Traverse to compute PID13 (q) the street CL, then continue West from 13 to compute the POB (r), then continue from PID 14 the POB west to the NW corner 15 (s):

				( )/								
	SurvCE	# <b>*</b> ≥ +€ (	▣ 1:12		SurvCE	# ≧ €	@ 1:15		SurvCE		#21 +€ @	1:18
	웥 Manual Trav	erse 🛛 🕞	) 🧲		😂 Manual Trav	erse 💽	) 🧲		铃 Manual Tra	ver	se 😡	<del>(</del>
	Occupy Pt ID: 12 2100 S N	1ain ]∃ [	2		Occupy Pt ID: 13 CL Street		2		Occupy Pt ID: 14 POB		]= .2	1
	Backsight Pt ID Target Pt ID: 13	Enter El/Off	2		Backsight Pt ID Target Pt ID: 14	Enter El/Off	2		Backsight Pt ID Target Pt ID:		nter El/Off R Mode	1
	Desc: CL Street	TR Hode	] ĝ⊟		Desc: POB	TR Plote	] î=		Desc: NW CO	_	IT HOUE	îΞΙ
	Bearing SW	S0°05'00"W	SW 💌		Bearing SW	S89°52'00"	SW 💌		Bearing SW	S	39°52'00" S	W
	Elev. Diff.	0.0000	DZ 💌		Elev. Diff.	0.0000	DZ 💌		Elev. Diff.	0.	0000 D	Z
	Horz Dist	1177.6900	HD 🔳		Horz Dist	66.0000	HD 🔳		Horz Dist	68	37.6100 H	D 💌
	N:13481.8063 E:1	0005.0641 Z:4	253.84		N:13481.6527 E:9	939.0643 Z:42	53.844		N:13480.0526 E	:925	1.4561 Z:4253	3.844
n	<u>C</u> alculate	Store	e	l r	<u>C</u> alculate	Stor	е	<pre> </pre>	<u>C</u> alculate		<u>S</u> tore	



You can use the Map View to make sure that we are on track (t):



Now check in on the POB, use Survey: Stake Points and target the POB [14](u):



Considering how we got here, a couple hundredths in Northing and Easting is okay.

Now we can stake the North West lot corner with confidence that we are on the previous survey. (Actually, we checked in on two additional points hitting them within a couple of hundredths.)

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# SURVCE / GNSS: FIXING MISTAKES

Mark Silver | Tuesday 10:00 -11:30 am / Bay

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### 01:: I just collected 1,200 GPS field shots in the wrong state plane zone!

Ouch! That hurts, but it is no big deal. Just reprocess the raw file.

Here are some points that were collected in Utah North NAD83 (a):

SurvC	E	ያ # ዾገ ቀ	(⊒ 8:24		SurvCE	¶ # ≿_	€ 🕑 8:30		SurvCE	Ŷ 🗰 Ž] 🕀 🖅 8:31
<del>)</del> Р	Pts:2 <= 2	🧽 🛃	] 🧲		<mark>è</mark> Coordinate	Projectior			Raw File: s	s2j1.rw5
P 1 2	Northing 3496830.75 3502112.41	Easting 2286073.29 2285948.36			Name USA/NAD83/UT J103		Sou Carlson User		Process No Adju	ust Compass
					USA/NAD83/UT	l North	Carlson		Process GPS	Crandall
									Edit/Export RW File	/5 Direct-Reverse Report
									Angle Balance	Draw Traverse Lines
<[:	<u>E</u> dit		d		Delete	Add Pree			Transit	Triangulate
	<u>F</u> ind	Dele	ete	b	View	Add User	Defined	C		

To reprocess, first make sure that the target projection is available in the Projection List, (File: Job Settings: System (tab)) (b) MAKE SURE YOU SELECT THE DESIRED PROJECTION HERE (because you want additional points to have the desired projection); then File: Raw Data; choose the current job raw file (c). Click on 'Process GPS' then choose the desired projection on the 'Proj.' tab (d), on the GPS tab make sure the localization file is empty and a Geoid file is selected (e) click the green check mark, a review of the newly projected points is displayed (f) which you can save with the disk button. Click on the red back arrow.





Then click on the Red X to exit the Raw File tool. Click on 'Yes' when prompted to save the coordinates (g); finally use File: Point List to view the updated coordinates:



Process GPS in Raw File ONLY works for points that have GNSS underlying data. Stored Points (SP) won't be reprojected.

The only way to get GNSS data is to setup a base OR to store a GNSS derived point.

# 02:: I just collected a ton of GPS data in international feet, it should have been US Survey Feet!

This is a very common issue and it is harder to fix than you might expect.

Let's make a new job and choose International Feet (a) and store a couple of points (b):



The best thing is to store the Raw Data file in a new folder: choose File: Raw Data, select he current file and then click on 'Edit/Export RW5 File' (c), then push the 'Save' button:



Make a new folder with the new units as part of the name (d); enter the folder and store the job with a filename that matches the folder (e); return to the File menu and open a new job in the new folder with



the same name as the raw file that we just saved (f):

SurvCE	Ŷ 🗱 ბ̀] 🕂 🖅 8:50	SurvCE	Ŷ # ≿] � Œ 8:52	SurvCE	Ŷ # ≿] 📢 Œ 8:54
💝 Enter da	ata 🔽 🗙	😪 RAW Files		💝 Coordin	ate Files
S2J2_SFeet			l 🖬 🗹 🗙		18 e 🗸 🗙
		Type: RW5 File	🏂 📂 🖽 🔲	Type: CRD/C	R 🛛 🏂 📂 🖽 🕅
	eric Special Num	ProgrurvCE\D	ata\GWA\S2J2_SFeet\	🗀 \Progrun	CE\Data\GWA\S2J2_SFeet\
AB	CDEFG				
HI	JKLMN				
<b>0</b> P	QRSTU				
VW	X Y Z abc				
78	9 * + # '				
4 5	6 / - = "				
12	3 Del Alt				
	Bk Sp Space	e <sup>Name:</sup> S2J2_SFee	t.rw5	Name: S2J2_	SFeet

When prompted, select 'Survey Feet' (g). Go to File: Raw File and then click on Process GPS, then green check mark, then red back, then Yes. Check the final coordinates in File: Points, they should be in the selected units:



# ۵ Elevation . Northing Easting 7505891.69 2286140.53 5435.956 7511173.98 2286019.63 5744.27 Add Delete

## 03:: I collected a day's worth of data using an autonomous base position, I would like to convert it to a true base position.

### Adjusting Data Stored with an Autonomous Base to an OPUS Position

Often when you first visit a site, you will use '**Read GPS**' to initialize your base position. The resulting position will be within 6 feet of the True position for the base point, but it will not be exact. The stored / broadcast base location will have some  $\Delta$ Northing  $\Delta$ Easting  $\Delta$ Height from the True NAD83 2011 Epoch 2010.0 framed coordinate for my base.

Every point that you store will include this positional offset: the vectors between the Base and the Rover points will all be exact, but the entire job will be 3D shifted around the true positions by the  $\Delta$ Northing  $\Delta$ Easting  $\Delta$ Height.

This section details a workflow to adjust your autonomous day's work to exactly match an OPUS position.

For this example:

A hub and tack have been set at a random point south of a PLS job site The Base was initialized using 'Read GPS' as point ID 1 with description of 'BB' as shown in the



previous section

Two points: the South West Corner Pt 101 and West Quarter of Section 12 Pt 102 have been stored:



The Static Occupation file from the Base was downloaded and submitted it to OPUS using the tools and procedures described in the 'Downloading, Processing and Archiving Static Data' section found on page Error! Bookmark not defined...

NGS's OPUS returned a OPUS report which is partially shown below:

REF FRAME: NA	AD_83(2011)(EPOCH:20	IGS08 (EPOCH:2	017.6624)	
х:	-1802337.501(m)	0.013(m)	-1802338.395(m)	0.013(m)
Υ:	-4492708.224(m)	0.013(m)	-4492706.940(m)	0.013(m)
Ζ:	4141119.504(m)	0.007(m)	4141119.412(m)	0.007(m)
LAT:	40 44 10.27259	0.007(m)	40 44 10.28846	0.007(m)
E LON:	248 8 27.05615	0.007(m)	248 8 27.00042	0.007(m)
W LON:	111 51 32.94385	0.007(m)	111 51 32.99958	0.007(m)
EL HGT:	<mark>1304.150</mark> (m)	0.017(m)	1303.439(m)	0.017(m)
ORTHO HGT:	<mark>1320.877</mark> (m)	0.032(m)	[NAVD88 (Computed using G	EOID12B)]
	UTM COOI	RDINATES	STATE PLANE COORDINATES	
	UTM (Zo	one 12)	SPC (4302 UT C)	
Northing (Y)	[meters] 450982	26.918	2266835.529	
Easting (X)	[meters] 4274	56.339	<mark>469661.993</mark>	
Convergence	[degrees] -0.560	068672	-0.23006449	
Point Scale	0.99	966477	1.00002259	
Combined Fact	or 0.99	946031	0.99981805	

The method for entering a new point, #2 differs depending on if the projection (the coordinate system) is the State Plane projection returned in the OPUS solution, or a Localized Coordinate System:

State Plane Coordinate System	Localized Coordinate System
Enter a new pointe '2' from the ' <b>File</b> : <b>Points</b> ' by pressing ' <b>Add</b> ':	Go to the ' <b>COGO</b> ' tab and click on the ' <b>8</b> Calculator' button, then select the ' <b>Conversion</b> ' tab and click the ' <b>LLH-&gt;Grid</b> ' button:

X

Elev

►



🐴 SurvCE		<b>∷</b> ‡ ₹,	, <b>≼</b> × ≯
<mark>ल</mark> े Add Poir	nt		
Point ID: 2			
Northing:	2266835.52	9m	ft
Easting:			ft
Elevation:	0.0000		ft
Description:		A B L	
Input/Edit At	tributes	Add N	lotes

Enter the Northing from the OPUS result with a 'm' after the number, when you click to the Easting the coordinate will automatically change to US Survey Feet:

💦 SurvCE	<b>⊭: Y<sub>×</sub> 4</b> € ×
💝 Add Point	
Point ID: 2	
Northing: 743	7109.5647 <b>ft</b>
Easting: 0.00	000 <b>ft</b>
Elevation: 0.00	000 <b>ft</b>
Description:	î= 🖸
Input/Edit Attribu	tes Add Notes
e same for the E	asting and Orthor

Do the same for the Easting and **Orthometric** elevation, don't forget to enter a 'm' after each:



Click the 'Apply Localization' and 'Apply Geoid' checkboxes.

Enter the NAD83 Latitude, Longitude, and Ellipsoid Height on the left side. Be sure to put an 'm' after the metric ellipsoid height:



Click the 'Solve N/E' button on the right, then enter 2 (or any unused point ID) in the 'Pt ID:' box:'



	SurvCE	,∰ Y <sub>×</sub> ∔∈ ×		考 SurvCE	,∰ Ÿ <sub>x</sub> ₊(∈ X	
	😂 Add Point			<mark> Calculator</mark>	×	
					Scientific	
Click th point.	Point ID: 2 Northing: 7437109 Easting: 1540882 Elevation: 4333.577 Description: OPUS NA Input/Edit Attributes ne green check mark	.5647 ft .7220 ft '3 ft D83 ⋛Ξ 🔯	click C	Standard Conversion M->Ft ODD->G SD/ZA_>HD/VD Lat: Warning N 44 Lon: W 1 Point No W 1 QK Hgt: Solve Lat/Lon Save Apply Localization V Apply Geoid E will note that poin	Scientific Generic LLH->Grid Az->Br ot Found! 3.5 Solve N/E t #2 does not e	exist,
			Enter	a reasonable descrij	ation as shown	
				and click the green		

If you return to the 'File: Points' list you can view the offset from the OPUS result to the autonomous base:





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

Go to the 'COGO: 7 Transformation' tool from the main menu. Enter the 'Original Point ID:' as '1' and the 'Destination Point ID' as '2':



SurvCE will automatically calculate the  $\Delta$ Northing  $\Delta$ Easting  $\Delta$ Height between the two points as shown above. Click the green check mark:



Change the '**Range of IDs**' to **NOT** include the OPUS point #2 that we just hand entered (as shown above), then click the green check mark.

SurveCE will verify the transformation:

		verify the t	anoroi	mat		•
	2	SurvCE	÷	• <b>Y</b> x	€	×
8	ı ف	inear Transf.	ormatio	on		
				$\checkmark$		×
[		oints:				•
	Hi V	/arning				
		Transform: Range of Point Linework selec				
		Is this correct?	)			
[		Yes	N	0		
	C C	) Automatic - Al Process Fro Manual - Seleo	, zen Laye	rs		_

Click 'Yes'. The adjustment will be completed and the job coordinates will be modified to match the OPUS solution.

You can verify that it was successful by returning to the 'File: Points' list:





Points 1 and 2 are now identical and points 101 and 102 have been adjusted.

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### 03B:: How to read a GNSS Raw File

### **GNSS** Base

The following discussion explains what is going on for when you setup a base in SurvCE, what gets loaded in the receiver and what entries are made in the .CRD, .REF and .RW5 files:

.CRD	Job 'Card' file. May also have a .CRDB extension (new style)
.REF	Base Reference file

Information you may need when looking at this discussion and example:

iG8	Receiver Type	IGAIG8
PC	1301.0562 m = 4268.5489 sFeet	Electrical Phase Center of GNSS antenna element
HR	6.9357 = 6.5617 + 0.3740	HR = (HI + L1) ; Distance from GM to PC
L1	0.1140 m = 0.3740 sFeet	L1 Offset (distance from ARP to PC)
HI	2.0000 m = 6.5617 sFeet	Vertical distance from GM to ARP
SHMP	0.0839 m Slant He	eight Measurement Point (distance from ARP) at bottom of receiver to the slant measurement point
ARP	2.000 m higher than GM	Antenna Reference Point (bottom of receiver)
GM	4261.6129 sFeet = 1298.9422 m 4316.4974 sFeet = 1315.6710 m Orth	Ellip Ground Mark (the point at the tip of the rod) o
GEOID	-16.728 m = -54.8818 sFeet	GEOID12B separation at the GM
R		radius of receiver at the SHMP

SurvCE Job is set to Utah Central NAD83, US Survey Feet

The base position for this example is:

40 44 10.457107	-111 51 33.712948	DMS: DD MM SS.sssss
40.7362380852	-111.8593647077	Decimal Deg: DDD.dddddddddd

When you setup a base, the HI is entered on the Receiver tab.

😽 GPS Base 🛛 📉 📈 🗙
Current Comms Receiver RTK
IGAIG8     N ▼ ↑ =     Abs.       ● Vertical     Slant     114.0mm       Antenna Height:     6.5617     ft       Elevation Mask:     ■
Position Rate: 1 Hz  Use IMU
Advanced

In this example the base is on a fixed height 2-meter rod so the Antenna Height is:

HI2.0000 m = 6.5617 sFeetVertical distance from GM to ARPAfter configuring the 'RTK' tab, and then doing a 10 point average, this is what the 'Base Configuration'screen looks like:

# Gage

NurvCE	,∰ Ÿ <sub>x</sub> ∎⊱ ×				
😂 Base Configu	Iration				
RTK Broadcast ID: Latitude: N 40°44 Longitude: W 111 Ellipsoid Height: 4	'10.45711" °51'33.71295"				
Store in Point Lis	st				
Continue with Base Setup?					
Yes	No				

The displayed Ellipsoid height (4261.6129) is the Ground Mark (GM) ellipsoid elevation in job distance units (US Survey Feet.)

Ground Mark (GM) 4261.6129 sFeet = 1298.9422 m Ellipsoid

When you click on the 'Store in Point List' button, the point is stored in the .RW5 file with raw data (it is not just a Stored Point (SP)).

Here is a snippet showing the two lines that 'Store in Point List' generates:

```
GPS, PN1, LA40.441045710682, LN-111.513371294781, EL1301.056221, --BB
--GS, PN1, N 7437128.4776, E 1540823.5914, EL4316.4974, --BB
```

Discussion:

This 'GPS,' line has the base position in DD.MMSSssssss, the height is the ellipsoid height of the PC in meters. This is the 'raw' data for the base point.

This '--GS line' is the grid coordinates and Orthometric Height of the Ground Mark in SFeet and the orthometric elevation. Note that 4316.4974 = 4261.6129 – (-54.8818) Ortho = Ellipsoid - Geoid

the point list entry (File: Points) looks like this:

Northing	Easting	Elevation
7437128.48	1540823.59	4316.497

This point matches the --GS line in the raw file. Note that the elevation is the orthometric height of the Ground Mark. This is the same point that an OPUS solution references.

### .REF File Description

When you finish setting up the base, SurvCE prompts you to 'Save Settings to File':



You always should click on 'Yes'.

This is the .REF file that is generated:



```
VERSION2
40.7362380852
-111.8593647077
1298.9422109783
15
```

Note that the .REF file has the decimal (DD.ddddddd) for Lat, Lon; and the Ellipsoid Height of the GM in meters. The '15' on the last line is the 'RTK Broadcast ID' entered by the user.

The .REF file is extremely useful for setting the base on the same Ground Mark on subsequent days, you only need to supply the antenna height and the base can be loaded with coordinates that result in identical Rover points.

#### .RW5 Base File Description

The file below shows the raw file entries for the example base setup. Each section is color coded to match the description lines which follow:

```
--Entered Base HR: 6.5617 ft, Vertical

LS,HR6.9357

GPS,PN1,LA40.441045710682,LN-111.513371294781,EL1301.056221,--BB

--GS,PN1,N 7437128.4776,E 1540823.5914,EL4316.4974,--BB

--Base Configuration by Reading GPS Position

--DT02-03-2015

--TM00:57:26

--Entered Base HR: 6.5617 ft, Vertical

--Antenna Type: [IGAIG8 NONE],RA0.0676m,SHMP0.0839m,L10.1140m,L20.0911m,--L1/L2 Internal Antenna

BP,PN15,LA40.441045710682,LN-111.513371294781,EL1301.0562,AG2.0000,PA0.1140,ATAPC,SRBASE,--

--GS,PN15,N 7437128.4776,E 1540823.5914,EL4316.4974,--Base

--GT,PN15,SW1964,ST310997000,EW1964,ET310997000
```

A comment that details the HI (GM to ARP) height entered by the user.

**LS** is the HI + L1 (6.9357 = 6.5617 + 0.3740) in the Distance units (SFeet)

The following two lines were stored by pressing **Store in Point List**:

'GPS' The base position in DD.MMSSssssss, the height is the ellipsoid height of the PC in meters.

**'--GS'** The grid coordinates and Orthometric Height of the Ground Mark in SFeet 4316.4974 = 4261.6129 – (-54.8818) Ortho = Ellipsoid – Geoid

The red section is the final Base Configuration entry. It details the method, the date (DT), the time (TM). The HR (Receiver Height) is shown with the measurement method: Vertical or Slant.

The --Antenna Type message includes everything needed to compute the PC from the GM for Vertical and Slant measurements:

The 20-character antenna name: [IGAIG8 NONE] the receiver radius at the SHMP: RA0.0676m the distance from the ARP to the SHMP0.0839m the L1 offset (distance from the ARP to the L1 PC): L10.1140m the L1 offset (distance from the ARP to the L2 PC): L20.0911m

The final three lines include a BP (Base Point) 3-record set which includes

#### BP record:

PN	Point ID
LA	Latitude in DD.MMSSsssssss
LN	Longitude in DDD.MMSSssssss formant
EL	Elevation of PC in meters
AG	Antenna-Ground, HI (GM to ARP), Instrument Height in meters
PA	Phase Center to Antenna: L1 Offset in meters
ATAPC	broadcast point Phase Center: broadcast coordinate is for PC



A --GS comment record: ΡN Point ID **Projected Northing** Ν W **Projected Easting** EL Orthometric Elevation of the Ground Mark in job units Description 'Base' \_\_\_ A – GT comment record (included if 'Store GPS Accuracy' is enabled) ΡN Point ID SW Start Week ST Start Time FW **End Week** FT **End Time** 

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04:: I did not store the base position as a point when I did a 'Read GPS', can I extract the base position from the raw file (.RW5) or the ref file (.ref)?

```
VERSION2
40.7362380852
-111.8593647077
1298.9422109783
15
```

Notice that the .REF file has the Ground Mark with Ellipsoid Height. You can convert the Lat and Lon to DMS and use the COGO: Calculator to convert to Grid Coordinates and add them to the job. You must add in the HI and L1 offset.

Or, you can look in the .RW5 file:

```
--Entered Base HR: 6.5617 ft, Vertical

LS,HR6.9357

GPS,PN1,LA40.441045710682,LN-111.513371294781,EL1301.056221,--BB

--GS,PN1,N 7437128.4776,E 1540823.5914,EL4316.4974,--BB

--Base Configuration by Reading GPS Position

--DT02-03-2015

--TM00:57:26

--Entered Base HR: 6.5617 ft, Vertical

--Antenna Type: [IGAIG8 NONE],RA0.0676m,SHMP0.0839m,L10.1140m,L20.0911m,--L1/L2 Internal Antenna

BP,PN15,LA40.441045710682,LN-111.513371294781,EL1301.0562,AG2.0000,PA0.1140,ATAPC,SRBASE,--
```

05:: I localized on two points at this job and stored a ton of existing features. Now I realize that one of my control points was actually an offset. How do I save my work?

Edit the point on the Points tab, save the localization and reprocess the raw file.



## 06:: I just stored a shot with a 40000 foot HI!

(Why does SurvCE let you do this?) You accidently store a point with an HI of 40000 feet (a). This makes a point with an elevation that is way negative (b).



From the File menu: Raw Data (c), then Edit/Export RW5 File (d). Find the errant LS line (d) that can't be good! Before we edit it, drag to the top of the file and find the Antenna Type comment (e):

SurvCE	ੈ 🛱 ८ॅ 🗲 🖅 1:54	SurvCE	ହ 🚅 どੋ 📢 建 1:55	SurvCl	E ♀ # ≿ ← Œ 2:08
😂 Raw File: big	rod.rw5	😂 Edit Ra	wfile: BigRod.rw5	😂 Е	dit Rawfile: BigRod2.rw5
	🗾 🔀		🗾 🖬 🧲		🗾 🖬 🧲
			40.550073293180 -109.		\Program Files\SurvCE\Data\GV
Process No Adjust	Compass		7511173.9789,E 22860		NMBigRod2,DT01-01-2015,TM
Troccoo no Adjust	compass		W1825,ST391581900,EV 007, VSDV:0.026, STATU		D,AD0,UN2,SF1.00000000,EC1,E rvCE Version 5.08
			Rover HR: 40000.0000 ft,		D: Alphanumeric
Process GPS	Crandall		RodHt		Central NAD83
Edit/Export RW5	Direct-Reverse		10000.274		uipment. NMEA GPS Receiver,
File	Report		Latitude Longitude		tenna Type: [X900],RA0.0995m
1110	Керон		40.550073294740 -109		calization File: None
Angle Balance	Draw Traverse		7511173.9805,E 22860		oid Separation File: \Program Fi
Anyle balance	Lines		SW1825,ST391633400,EV		id Adjustment File: None
		HSDV:0.0	007, VSDV:0.026, STATU		S Scale: 1.00000000
Transit	Triangulate				ale Doint not used
		Add	Edit Remove Find	Ad	ld Edit Remove Find
C		d	Edit Remove Find	e	East Femore Find

Drag to the right side (f) to find the L1 (phase offset) -0.0838m; then go back to the LS line, highlight it and click on Edit (g) change the Rod Height to '2.0838m' (h)

SurvCE 💡 🗰 🎦 🕇	<ul><li>(■ 2:10)</li></ul>	SurvCE	Ŷ # ≿] ┽ Œ 3:02	SurvCE	₽ # či €	⊉ 3:03
<mark></mark> Edit Rawfile: BigRod2.	rw5	😪 Edit Inst	r/Rod Height	📚 Edit	t Instr/Rod Height	
	🗅 🧲		🗹 🔀			×
pd2.rw5						
0	====					
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.0400m,L10.0838m,L20.0959	9m,Int	Rod Height:	40000.2740	Rod He	eight: 6.8340	
CE\Data\Geoids\ContinentalL	IS NGS					
	~					
Add Edit Remove	Find					
Aud Edit Keniove	Lind	g		h		

Click the green check mark and then click the red back button. Click Yes (i) to save the changes; replace the file when prompted. Next click on 'Process GPS' (j); click on the green check mark, red back arrow, then red X, finally save the raw file (k).

# Gage



SurvCE 🛛 💡 😫 Raw File: bigro	,#* ど) •€ @ 3:0 od2.rw5
	<b>F</b>
Process No Adjust	Compass
Process GPS	Crandall
Edit/Export RW5 File	Direct-Reverse Report
Angle Balance	Draw Traverse Lines
Transit	Triangulate

SurvCE		#* ×	) -(€ Œ	3:07			
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Raw File: b	oigrod		Equip				
cha \Pro	Save Coordinate file changes: \Program Files\SurWA\BigRod2.crd						
Yes No							
5 Feature Code 🔟 0 Exit 🧐							

Click on Points to verify that the elevation has been fixed (I)

