

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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System

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Define Job Attributes

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File: Job Settings:

Job Settings

Format Options

Use Last Job Localization

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vCE û 🛱 💭 🕂 🖅 6:3 🖞 📇 ሾገ 🗲 🖅 6:33 ~ 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 <u>Rotate</u> 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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		<u>FILE</u> <u>V</u> IEW	DRAW COGO TOOLS
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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





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):

SurvCE P 💭 K 🖅 6:43	SurvCE	Ŷ # ≧] i (12 7:00
📚 Localization 🛛 🖌 🗙	📚 Ente	er and Edit Coordinates
Points By Helmert		E
Base Translation	Туре С	RD: Alphanumeric
Multi Point Method:	Point ID:	: 1
Plane Similarity	Northing	: 10000.0000 ft
One Point Azimu'h: Geodetic 🛛 📓	Easting:	10000.0000 ft
Geoid File: ContinentalUS_NGS201	Elevation	n: 5400.0000 ft
Geoid Method: Quadratic		
Grid to Ground: 1.000185551647	Descripti	ion: SE L



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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😂 Manual Traverse 🛛 👩 🧲	💝 Pts:4 <	= 12	•	嶭 Localin 🛃	🖃 🗹 🗙
Occupy Pt ID:		🧽 🗾		System 1	rs GPS
1 SE L	P Northir	ng Easting	Elevatio	Points	By Helmert
Backsight Pt ID	1 10000.0 2 15279.0	00 10000.00 5	5400.00 5400.00	Pt ID Northing	Easting Ele
	11 750589	1.69 2286140.53 5	5442.52	1 10000.000	2 10099.8269 540
Target Pt ID: 2 Enter El/Off Desc: NE L	12 751117	/3.97 2286019.63 5	5750.83		
Bearing NE N1°05'00"E NE				Scale:1.000000	> 2nt Rotate Only
Elev. Diff. 0.0000 DZ 💌				Avg HRes:0.0000 Avg	VRes:0.0000
Horz Dist 5280.0000 HD 💌	() =			<u>A</u> dd <u>D</u> elete	<u>E</u> dit <u>O</u> n/Off
N:15279.0562 E:10099.8269 Z:5400.00	Edit	Add		Load View	Monitor Save
<u>Calculate</u> <u>Store</u>	d Eind	Delet	te e		

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			
Distance:	US Survey Fe	et 💌			
	Decimal Feet				
Angle: Deg	rees, Minutes	, Seconds 💌			
LL: Dec	LL: Decimal Degrees				
Zero Azimut	h: 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':

> ⑦ 1:43 ×

5435.9

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💝 Aver	age Res	ults			ݢ Calculator	×
					Standard	Scientific
Valid Re	adings:	10/10			Conversion	Generic
Fixed:		10/10	22		OM->Ft OD- OSD/ZA->HD/VD Lat: ONOS	>G () LLH->Grid Az->Br
	Average	9	StdDev		N 40.902369524	7505891.68848
North:	750589	1.688ft	0.0022ft		Lon: WOE	Easting
East:	228614	0.528ft	0.0017ft		W 109.1640522	2286140.52791
Elev:	5435.95	59ft	0.0027ft		Hgt: 5389.4 Pt I	D: Hgt: 5435.9
	Min		Max		Solve Lat/Lon	Solve N/E
North:	750589	1.685ft	7505891			ave
East:	228614	0.525ft	2286140~		Apply Localizati	ion
b < (=	1	::		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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Scale Facto	or:	1			1
C. Meridiar	1:	-1()9.	1640522	2
Zone Widt	h:	6		1	
Lat. of Orig	gin:	40.90236952		1	
False North	False Northing:		1524.003		m
False Easti	False Easting:		00		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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Syste	m	T:		6	GPS
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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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😂 ЈОВ:003		Î 🚡	•	💝 RAW Files	<mark></mark> Raw File: 003.r	w5
Survey	<u>c</u> 0	GO Ro	ad	🔳 🖪 🖪 📈 🗙		🗾 🔽
File		Equip		Type: RW5 File 🏂 📂 💷		
1 loh	2	6 Data		\Program Files\SurvCE\Data\GWA\	Process No Adjust	Compass
1 505		Transfer		Backup		
2 Job Settings	20	7 Import/	- 📭	⊞001.rw5	Process GPS	Crandall
	~	⁻ Export		■ 002.rw5	Edit/Export RW5	Direct-Reverse
3 Points	E	8 Delete Job	0	🔳 003.rw5	File	Report
				⊞833.rw5	Angle Dalance	Draw Traverse
4 Raw Data	S	9 Write Note	1	■833b.rw5	Angle balance	Lines
					Transit	Triangulate
5 Feature Cod	•	0 Exit	1			mangalace
LIST				Name: 003.rw5		

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></u> O	30	Road	
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Raw File: ()03.rw	5		٦
Save Coordinate file changes: \Program Files\Surta\GWA\003.crd				
Yes			No	
5 Feature Co	de 🔟	0 Exit		



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P	Northing	Eastin	g	Eleva	tion
1	5000.00	5000.0	00 5	5435.	959
2	5000.00	5000.0	00 5	5435.	959
3	10284.61	5017.0)8 5	5744.	272
	5	::			
	Edit		E	Add	
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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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💝 Calculator	×
Standard	Scientific
Conversion	Generic
OM->Ft OD-> SD/ZA->HD/VD	>G 🖲 LLH->Grid O Az->Br
Lat: ONOS	Northing
Lon: WOE	Easting
Hgt: Pt II): Hgt:
Solve Lat/Lon	Solve N/E
Apply Localization	on

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😂 Calculator	×
Standard	Scientific
Conversion	Generic
QM->Ft ODD-	->G 🔘 LLH->Grid
◯ SD/ZA->HD/VD	◯ 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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<mark>ខ</mark> Review File	📚 Localin 📝 🖃 🗸 🗙	<mark>ề</mark> Pts:10 <= 125	;
	System TS GPS		🔁 🖬 🧲
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Localization file> /Program Files/Su	Pt ID Northing Easting Ele	21 10000.0	0 10000.00 5400
Geoid File> /Program Files/SurvCE/	24 10226 1361 10180 8886 540	22 10061.1	6 10050.02 5400
	25 10355 2692 10268 7820 540	23 10196.5	5 10160.75 5400
Point Latitude Longitude		24 10226.1	4 10180.89 5400
No. Northing Easting		25 10355.2	7 10268.78 5400
124 40°45'46.85153" -111°4(26 10131.4	1 10291.83 5400
124 10226.1361 10180.88		27 10008.8	9 10192.17 5400
		108 10017.5	0 10014.44 5291
125 40°45'48.12829" -111°4(Scale:0.999002 2pt Rotate Only	124 10226.1	4 10180.89 5308
125 10355.2692 10268.78	Avg HRes:0.0000 Avg VRes:0.0000	125 10355.2	7 10268.78 5299
108 40°45'44 78884" -111°46	Add Delete Edit On/Off	(:: ::)	>
108 10017.5020 10014.44	Load View Monitor Save	Edit	Add
		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!

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':



14



		Survce ¥ 47 △ 40 7:5%
😂 Point Details	📚 TS Groo Grid 🔽 🛛 🗙	📚 Localization 🛛 🖌 🗙
	Method: Grid Coordina	Points By Helmert
Point ID Northing Fasting F		System TS GPS
▲1 7500553 04 2286248 24 5	North: East: Z:	
	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	f

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'

SurvCE ♀ # と ← 2 3:04 Store Points 🖅 ✓ 🗶 Single Setup Remote Benchmark	SurvCE ♀ # と ≪ @ 3:03 Backsight	SurvCE
Occupy Point: Ì∃ ご∕ [Set to BS Azimuth 🔳 358°30'13" Setup Results	Set to BS Azimuth 📓 358°30'13"
Instr. Height: 5 ft Backsight Point: 2	OC PT: 1 BS PT: 2 BS Azi: 358°30'13' Brg: N1°29'47"W HI: 5.000ft HT: 5.000ft	> Angle Right: 0°00'00" > Elev Diff: 0
Backsight Brg: N1°29'47"W Backsight HT: 5 ft	Check Angle	Slope Distance: 1200
Use Backsight HT for Foresights Confirm NEZ From Job Backsight	Set Angle Check Set Angle and Read	Set Angle Check Set Angle and Read

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



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

15



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 _{SF = 0.99981}72348484848

However if we shoot from 1 to 3:

Meas: 270°00'00 5279.022 5436.537 _{SF} = 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 3722.22 227.25 💽	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: Grid: Elev: 1/Combine	Average Corrections: Grid: 1.000075 Elev: 0.999729 1/Combine 1.000196	Description: AVERAGED PT È∃ 1/Combine 1.000196
Range of Pts: 1-4 III Average	Range of Pts: 1-4 Image On/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):

	SurvCE 🦞 👬 🎦 📢 🖅 6:22	
SurvCE 💡 🗱 ბე 帐 Œ 6:14	😤 Calculator 🛛 🗙	SurvCE 💡 💭 🕂 🖅 6:24
😝 GPS Grto Ground Information	Standard Scientific	ݢ Calculator 🛛 🗙
	Conversion Generic	Standard Scientific
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 Apply Localization Apply Geoid	Conversion Generic M->Ft DD->G LLH->Grid SD/ZA->HD/VD Az->Br Lat: N () S SNorthing N 40°54'34.5575 7508456.5816 Lon: W () E Easting W 109°10'24.83 2283443.08278 Hgt: 5616.8 Pt ID: Hgt: Solve Lat/Lon Save Apply Localization Solve N/E

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

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😂 Enter Lat/Lon 🔽 🗙	Points By Helmert	Weightside Source 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 568	Points have been surveyed prior to updating localization file. Would you like to reprocess the raw file?
West East	Scale:1.00000 2pt Rotate Only	Yes <u>N</u> o
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.)

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Process Raw File	💝 Pts:	:5 <= 5	🗲 🗊 😴
	Point II	D Northing	g Easting I
Scale: 0.99980629	1	5912.53	12189.87 5
	2	11197.1	9 12206.39 5
Localization File	3	11192.7	7 6945.99 5
	4	5886.36	6895.89 5
Geoid Separation File	5	7508456	5.58 2283443.08 5
Localization File: 007.loc Geoid File: ContinentalUS_NGS Transformation: Plane Similarity			
One Point Localization Azimuth:		::	<u>></u>
Geodetic	E	dit	Add
p	a E	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'

SURVCE	∦ ∔≣ ≧ ■€ 0:37
😂 Calculator	×
Standard	Scientific
Conversion	Generic
OM->Ft OD	D->G 🔘 H->Grid
O SD/ZA->HD/V	/D O Az->Br
Lat: ONO	S Northing
N 40°54'34.557	/5 10000
Lon: OWC) E Easting
W 109°10'24.83	3 10000.00002
Hgt: 5616.8	t ID: Hgt: 5663.2
Solve Lat/Lon	Solve N/E
Apply Localiz	ation

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:



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	∷ 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	Pt ID: 2700sMa	iin L <u>}∃</u> [2
Point ID:	1		Use New Point ID	11 Roint ID:		Backsig	ht Pt ID		7
Northing:	10000.0000 ft		Overwrite	1		12		Enter El/Off TR Mode	
Easting:	10000.0000 ft					Desc:	2100 S M	ain (Local)	ÊΞ
Elevation:	4253.8448 ft					Bearing	g NE	N0°05'00"E	NE 🔳
						Elev. D	iff.	0.0000	DZ 🔳
						Horz D	ist	4659.5000	HD 🔳
Description:	2700sMain					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		×
Please enter loc You may use a current or contr	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	╬ど乗@	12:46
SurvCE	# 2) 4 œ 2 •• ••	12:46
SurvCE		12:46
SurvCE	₩ ど € TS GF By Helmert	12:46
SurvCE System Points Pt ID Northi		12:46 × PS Ele
SurvCE System Points Pt ID Northi 11 10000.	Image: Constraint of the second se	12:46 X PS Ele 0 42:
SurvCE System Points Pt ID Northi 11 10000. CE Scale:1.000000 Avg HRes:0.0000	Image: Control of the second	12:46 >S Ele 0 42: Only
SurvCE System Points Pt ID Northi 11 100000 CE Scale:1.000000 Avg HRes:0.0000 Add Delet	Image: Control of the second secon	12:46 × 25 Ele 0 42: Only /Off





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:

😂 Loca	alin 📑	/ 🗟) [~]	X
Syste	em 🗌	TS		GP	S
Poi	nts	B	y Hel	mert	
			_		
Pt ID	Latitude	9	Lon	gitua	le
11	40.4245	52249	-111	.531	.773
12	40.4331	55423	-111	.531	.754
Scale:1.0	<u>**</u>) 000179	<u> </u>	pt <u>R</u> o	otate	> Only
Scale:1.0 Avg HRe	ء: 000179 s:0.0000 /	2 Avg VR	pt <u>R</u> c	otate) Only
Scale:1.0 Avg HRe	::) 000179 s:0.0000 / Delete	2 Avg VRe	pt <u>R</u> e es:0.0	otate 0000 Qn/	> Only
Scale:1.0 Avg HRe Add Load	::) 000179 s:0.0000 / Delete View	2 Avg VRe Ec Mon	pt <u>R</u> o es:0.0 lit itor	otate 0000 Qn/ Sa	Only /Off

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	# ≧ € 🖻 1:12	Survo	E	#2 ⊷ (1:15		SurvCE		# ĭ2 ♣ :	1:18
😤 Manual Traver	se (😧 🧲	ا 🍣	lanual Trave	rse 😡) 🧲		<mark> </mark> Man	ual Trave	erse 🕞) 🧲
Occupy Pt ID: 12 2100 S Mai	n] 📃 📝	Оссц 13	py Pt ID:		2		Occupy 14	Pt ID: POB	<u>i</u> = [2
Backsight Pt ID		Back	sight Pt ID		2		Backsigh	t Pt ID		2
Target Pt ID:	nter El/Off R Mode	Targ 14		nter El/Off R Mode			Target P 15		Enter El/Off TR Mode	
Desc: CL Street	Ê=	Des	:: POB		<u>î</u> =		Desc:	NW COR		Ê
Bearing SW SC)°05'00"W SW 🔳	Bear	ing SW S	89°52'00"	SW 🔳		Bearing	SW	S89°52'00"	SW 🔳
Elev. Diff. 0.	0000 DZ 💌	Elev	. Diff. 0	.0000	DZ 🔳		Elev. Di	f.	0.0000	DZ 💌
Horz Dist 11	77.6900 HD 💌	Hora	Dist 6	6.0000	HD 🔳		Horz Dis	st 🛛	687.6100	HD 🔳
N:13481.8063 E:100	05.0641 Z:4253.84	N:13	481.6527 E:993	39.0643 Z:42	53.844		N:13480	.0526 E:92	251.4561 Z:42	53.844
Calculate	<u>S</u> tore		<u>C</u> alculate	Store		S	<u>C</u> al	culate	Store	e



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):

SurvCE	¶ # ≧ ♣ (∎ 8:24	SurvCE	₽ # č] ◀	E 8:30	SurvCE	Ŷ 🛱 ど̀] 🕂 Œ 8:31
<mark>ề</mark> Pts:2 <= 2	🧽 🗾) 🧲	💝 Coord	inate Projection		<mark> Raw File:</mark>	s2j1.rw5
P Northing 1 3496830.7 2 3502112.4	Easting 5 2286073.29 1 2285948.36	Elevatio 5435.96 5744.28	Name USA/NAD J103 USA/NAD	83/UT Central 83/UT North	Sou Carlson User Carlson	Process No Ad	just Compass
						Process GPS Edit/Export RV File	Crandall Direct-Reverse Report
						Angle Balance	ce Draw Traverse Lines
<u>E</u> dit	# Add		Delete	e Add Prede	fined	Transit	Triangulate
Eind	Delet	te	b View	Add User D	efined	d	

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 💡 💭 🕂 🖼 8:50	SurvCE ♀ ↓ ▲ • • • • • • • • • • • • • • • • • •	SurvCE 💡 💭 🕂 🖅 8:54
📚 Enter data 🛛 🖌	😝 RAW Files	💘 Coordinate Files
S2J2_SFeet	🖪 🖬 🔽 🗙	📕 🔽 🖬 🔽 🗙
	Type: RW5 File 🍺 📂 📰	Type: CRD/CR 🛛 🎓 📂 📰
Alphanumeric Special Num	ProgrurvCE\Data\GWA\S2J2_SFeet\	\ProgrurvCE\Data\GWA\S2J2_SFeet\
ABCDEFG		
HIJKLMN		
OPQRSTU		
VWXYZ abc		
789*+#'		
456/-="		
123 Del Alt		
d 0 Bk Sp Space	e Name: S2J2_SFeet.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 Δ Northing Δ Easting Δ 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 Δ Northing Δ Easting Δ 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	10.0000)	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 COOF	DINATES	STATE PLANE COORDINATES	
	UTM (Zc	one 12)	SPC (4302 UT C)	
Northing (Y)	[meters] 450982	6.918	2266835.529	
Easting (X)	[meters] 42745	6.339	<mark>469661.993</mark>	
Convergence	[degrees] -0.560	68672	-0.23006449	
Point Scale	0.999	66477	1.00002259	
Combined Fact	tor 0.999	46031	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 ' File : Points ' by pressing ' Add ':	Go to the 'COGO' tab and click on the '8 Calculator' button, then select the 'Conversion' tab and click the 'LLH->Grid' button:

×

Elev

►



🛃 SurvCE	÷.	₹Ÿ _X ∎€ X
裬 Add Poir	nt	
Point ID: 2		
Northina:	2266835.529	m ft
Easting:	0.0000	ft
Elevation:	0.0000	ft
Description:		<u>î</u> = 🙆
Input/Edit At	ttributes A	dd Notes

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	⊭: Y_× 4 € ×
💝 Add Point	
Point ID: 2	
Northing: 743	7109.5647 ft
Easting: 0.00	000 ft
Elevation: 0.00	000 ft
Description:	<u></u> 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:'



	NurvCE	,∰Y _× ,, ×			NurvCE	, ₩ 7 × 4€ ×	
	😂 Add Point				<mark> Calculator</mark>	×	
					Standard Conversion	Scientific	
Click th point.	Point ID: 2 Northing: 7437109 Easting: 1540882 Elevation: 4333.577 Description: OPUS NA Input/Edit Attributes ne green check mar	.5647 ft .7220 ft 73 ft D83 = 01 Add Notes k to accept the n	new	SurvCE click Ol then cl	Standard Conversion OM->Ft DD->G SD/ZA->HD//D Lat: Warning N 4 Point No Lon: Q W 1 OK Hgt: 2 Solve Lat/Lon Save ✓ Apply Localization Save ✓ Apply Geoid Apply Geoid will note that point K, ick the 'Save' butto Store Point Pt: 2 Y437109.5657 E: 1540882.7231 Z: 4333.5796 > Category: ALL Desc: OPUS NAD83 ■ BB W ■ SW SW	Scientific Generic \bigcirc LLH->Grid A_{7} Pr A_{7}	exist,
				Enter a	reasonable descrip	otion as showr	٦
				above	and click the green	check mark.	I

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 Δ Northing Δ Easting Δ 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:

- <u> </u>	••••	r terny the tra	1101 011	natioi	
4	7	SurvCE)	Ÿ_× 	×
4	9	Linear Transfor	matio		
				<u> </u>	X
		Pointe			
	Hi	Narning			
	Ra Ac	Transform: Range of Points: Linework selecte	1,3-999 d:None	999.	
		Is this correct?			
		Yes	No)	
) (Automatic - All I Process Froze Manual - Select	Layers en Layers	5	_

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	ight 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 Ortho	Ellip Ground Mark (the point at the tip of the rod)
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.

🚑 SurvCE	"	‡ ₹ <mark>×</mark> =	(€ ×
😝 GPS Base 👘			X
Current Comms	Receive	RTK	Ì.,
IGAIG8 Vertical Ste Antenna Height:		Abs. 114.0	mm ⊐∘
Position Rate:	J 1 Hz		
Adv	/anced		

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 _x ∎⊱ ×
😂 Base Configu	Iration
RTK Broadcast ID: Latitude: N 40°44 Longitude: W 111 Ellipsoid Height: 4	15 '10.45711" °51'33.71295" 261.6129
Store in Point Lis	st
Continue wi	ith 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**

38

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,SREASE,--
```

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):

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<mark>ề</mark> Raw File: bigr	od.rw5	📚 Edit	Rawfile: BigRod.r	w5	<mark>è</mark> Edit Rawfile:	BigRod2.rw5
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Process No Adjust	Compass	GPS 2 GS,PN GT,PN	40.55007329318 12,N 7511173.9789,E 12,SW1825,ST39158	80 -109 A 22860 1900,EV	File: \Program File JB,NMBigRod2,D MO,AD0,UN2,SF	es\SurvCE\Data\GV DT01-01-2015,TM: 1.00000000,EC1,E
Process GPS	Crandall	Entere	ed Rover HR: 40000.	0000 ft,	CRD: Alphanum UT Central NAD	eric 83
Edit/Export RW5 File	Direct-Reverse Report	LS Pht	40000.274 Vo Latitude Long 40 55007329474	jitude	Antenna Type: [X900],RA0.0995m
Angle Balance	Draw Traverse Lines	GS,PN GT,PN	I3,N 7511173.9805,E I3,SW1825,ST39163	22860 3400,EV	Geoid Separation Grid Adjustment	n File: \Program Fi File: None
Transit	Triangulate	HSDV:	:0.007, VSDV:0.026, 		GPS Scale: 1.00	000000
d		d Add	Edit Remove	Eind	Add Edit	Remove Eind

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)

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0	===					
	**	Instrument H	leight: 0.0000	Instrun	nent Height: 0.0000	
.0400m,L10.0838m,L20.0959	9m,Int	Rod Height:	40000.2740	Rod He	eight: 6.8340	
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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



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	X
Process No Adjust	Compass
Process GPS	Crandall
Edit/Export RW5 File	Direct-Reverse Report
Angle Balance	Draw Traverse Lines
Transit	Triangulate

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Save Coordinate file changes: \Program Files\SurWA\BigRod2.crd					
Yes			No		
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Click on Points to verify that the elevation has been fixed (I)

