

LandStar8 FAQ Series: OPUS Solution Adjustment

More FAQ's like this one are available here: [[LandStar8 FAQ](#)] Date: 4/16/2024

Filename:LS8_FAQ_OPUSAdjustment_r002.docx

Description

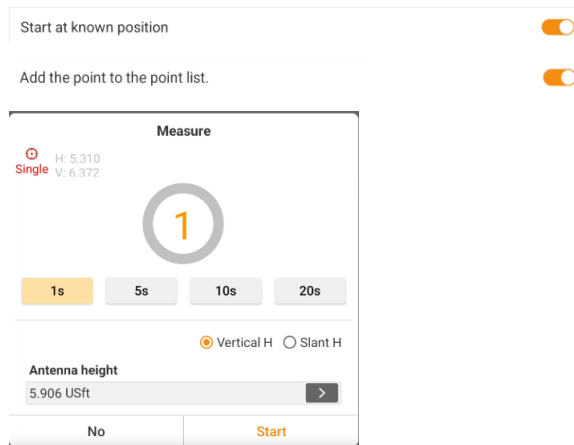
When a Base is configured with an autonomous position, dependent Rover RTK points can be stored. These points will be accurate relative to the Base; however, they will not be framed correctly to any coordinate system.

After completing the initial day's survey the Base observation file can be sent to the NGS for OPUS Processing. The returned OPUS solution can then adjust the Base position and any dependent RTK collected points.

Autonomous Base configuration, two modes

There are two ways to configure the base with an autonomous position. The 2nd method is the most common and simplest method.

Method 1 is **Start at known position** with a manual **Measure** GPS:



Method 1 results in a **Base point** in the project at the Ground Mark elevation. This point can be adjusted with the **Survey > Base Shift** function.

Method 2 **disables** **Start at known position** and starts at an automatic autonomous position:



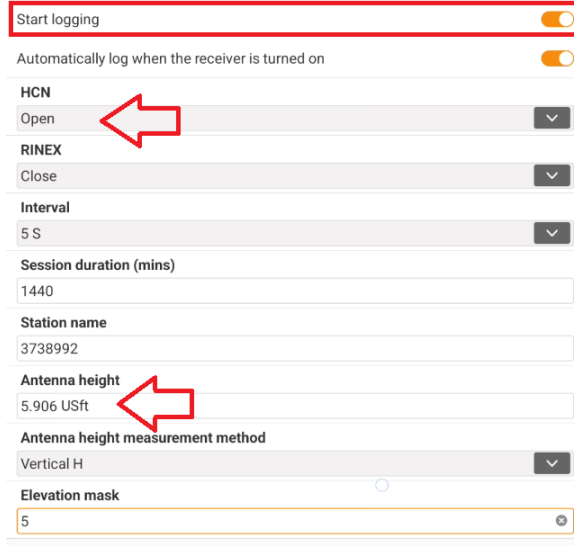
LandStar will automatically store a **Base point** using the Base receiver's L1 Phase Center broadcast position when the Rover first obtains a FIXed solution. The point will be named Base_n, where 1 is the next unused, unique number.

This PC centered point can be adjusted later using the **Project > Points > 3-Dot Button > Shift GNSS base** function. If you choose this method, you should keep track of the HI (Instrument Height) in case you want to submit the recorded observation file to NGS OPUS and subsequently adjust the job to match the OPUS coordinate frame.

Both methods 1 and 2 are shown in detail below.

Method 1: Start at Known position

When starting the Base:



Start logging

Automatically log when the receiver is turned on

HCN
Open

RINEX
Close

Interval
5 S

Session duration (mins)
1440

Station name
3738992

Antenna height
5.906 USft

Antenna height measurement method
Vertical H

Elevation mask
5

2

Make sure **Start logging** is enabled, the observation log file is needed to get an NGS OPUS solution. Set **HCN** or **RINEX3** recording **Open**, or enable both HCN and RINEX 3. The interval must be 1, 5, 10, 15 or 30 (an even multiple of 30); 1 or 5 is best. Set the **Antenna height** to the actual value. Click **OK**.

The Start on a known point dialog will be shown:

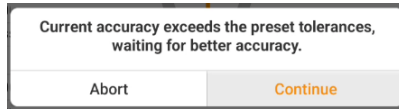
Enable **Add the point to the point list**, this will add a point at the Ground Mark (GM) under the Base receiver. If not enabled, you will use Method 2 below to adjust the job.

Enter a unique **Point name**, enter the **Antenna height** (again), use the **Measure** (Read GPS) button to get an autonomous position from the Base:

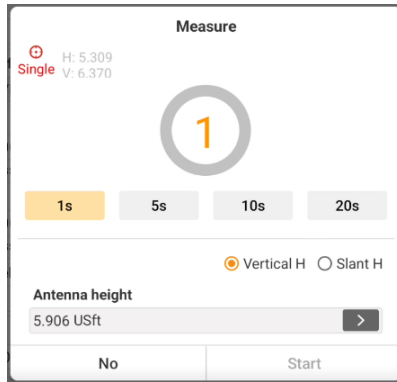
< Click **OK**

Click **Start**

< Click **Continue**



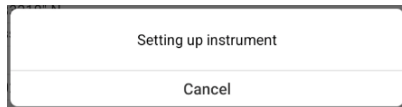
< Click **Continue**



< Wait



Click **OK**:



after a short wait the base will begin transmitting.

Connect to the Rover

Connect LandStar to the Rover and survey points as needed. The coordinates of the surveyed points will not match 'real coordinates' as the Base is autonomous.

For this example, 3 points were stored:

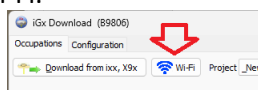
OPUS_Adjust1-Points (5)				
Points			Points to stake	
Name	North (N)[USft]	East (E)[USft]	Elevation[USft]	Description
101	3490640.4323	2280597.6428	5664.299	VH = 5.9060 USft; Pos rea
1002	3490640.4618	2280587.6296	5664.145	
1003	3490640.6337	2280577.8161	5664.077	
1004	3490640.5991	2280567.8068	5664.506	

we hope to adjust the horizontal and vertical positions of the Base 101 and the three Rover measurements to match NAD83 2011 2010.0.

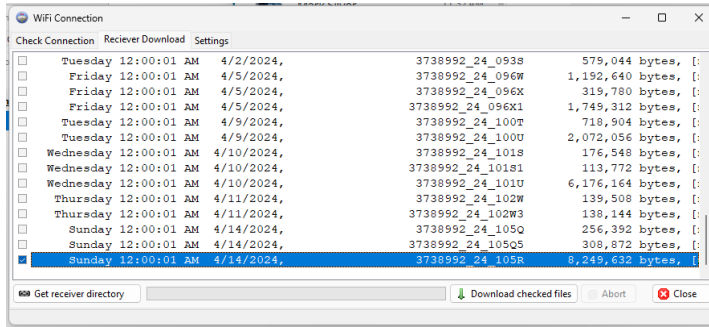
Download the Base observation file, submit to OPUS

This video: <https://igage.com/LS8/LS8Training/videos/iGxWiFiDownload.htm> shows how to download observation files from the iBASE which is Wi-Fi connection only.

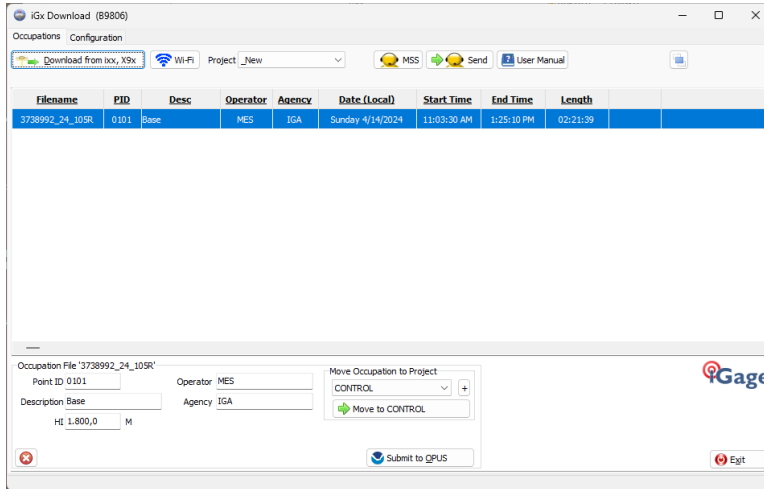
Click Wi-Fi:



Select the correct file:



Submit it to OPUS:



5

Eventually, you will get an OPUS return that looks similar to this:

```

SOFTWARE: page5 2008.25 master293.pl 160321      START: 2024/04/14 17:03:00
EPHEMERIS: igu23100.eph [ultra-rapid]          STOP: 2024/04/14 18:59:00
NAV FILE: brdc1050.24n                        OBS USED: 4872 / 5078 : 96%
ANT NAME: CHCIBASE NONE                       # FIXED AMB: 27 / 33 : 82%
ARP HEIGHT: 1.8000                             OVERALL RMS: 0.011(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000)      ITRF2014 (EPOCH:2024.2862)

X: -1587253.075(m) 0.013(m) -1587254.065(m) 0.013(m)
Y: -4561958.080(m) 0.013(m) -4561956.780(m) 0.013(m)
Z: 4153963.894(m) 0.013(m) 4153963.767(m) 0.013(m)

LAT: 40 53 8.78719 0.004(m) 40 53 8.80325 0.004(m)
E LON: 250 48 56.00768 0.009(m) 250 48 55.94954 0.009(m)
W LON: 109 11 3.99232 0.009(m) 109 11 4.05046 0.009(m)
EL HGT: 1714.977(m) 0.021(m) 1714.212(m) 0.021(m) 5626.565 ft
ORTHO HGT: 1729.110(m) 0.083(m) [NAVD88 (Computed using GEOID18)] 5672.933 ft

UTM COORDINATES STATE PLANE COORDINATES
UTM (Zone 12) SPC (4301 UT N)
Northing (Y) [meters] 4527663.592 1063947.927
Easting (X) [meters] 652958.198 695128.241
Convergence [degrees] 1.18860833 1.52677500
Point Scale 0.99988797 0.99997701
Combined Factor 0.99961906 0.99970807
    
```

The NAD83 2011 2010.0 framed coordinates are boxed in green. Make a new point in the [Point list](#) reflecting these OPUS values:

Name	102
Code	<input type="text"/>
Type	Enter
Coordinate format	Local Lat/Lon (dd.mmsssss)
Local Lat	40.5308787190 N
Local Lon	109.1103992320 W
Local H (ellipsoid)	5626.619 USft
Description	OPUS

Hints: use the '-' minus sign to enter the longitude, notice the positions are entered and displayed as dd.mmsssss values if the Coordinate format is set to [Local Lat/Lon \(dd.mmsssss\)](#). When entering the ellipsoid elevation, enter "1714.977m" and LandStar will convert to feet. You can find the **M** key by clicking the key if you have installed the Google keyboard Gboard.

From the [Survey](#) menu (tab), click on [Base shift](#):



The initial [Base shift](#) dialog will be shown:

Base shift adjustment	
N shift	0.0000 USft
E shift	0.0000 USft
H shift	0.000 USft
GNSS Base	101

Click on [Calculate](#),

GNSS point	
Latitude (B)	40°53'08.833318" N
	dd.mmsssss
Longitude (L)	109°11'04.020162" W
	dd.mmsssss
H (ellipsoid H)	5617.935 USft
Known point	
North (N)	3490635.8223 USft
East (E)	2280599.9049 USft
Elevation	5672.983 USft

Recall the [GNSS Base](#) point, 101 in this case, from the [Point list](#)

If the desired [Base point](#) is not listed in the [Point list](#), change the filter:

Enter	Name
	Name

to [All](#).

Recall the OPUS solution point, 102 in this case, as the **Known point** from the **Point list**

Click the **OK** button at the bottom. The resulting shift will be shown:

Base shift adjustment

N shift
-4.6100 USft

E shift
2.2621 USft

H shift
8.684 USft

GNSS Base
101

Click **Accept** at the bottom of the dialog, then

Accept base shift parameters?

No Yes

click **Yes**, then

GNSS Base 101 and dependent points were shifted, open points?

No Yes

click **Yes** to view the updated point list:

Name	North (N)[USft]	East (E)[USft]	Elevation[USft]	Description
101	3490635.8223	2280599.9049	5672.983	VH = 5.9060 USft; Pos rec
1002	3490635.8518	2280589.8917	5672.829	
1003	3490636.0237	2280580.0782	5672.761	
1004	3490635.9891	2280570.0689	5673.190	
102	3490635.8223	2280599.9049	5672.983	OPUS

The original Ground Mark Base position 101 has now been translated to the OPUS point 102, with the dependent points 1002, 1003, 1004 equally translated.

Method 2: Autonomous Base Position

This is the most used method for configuring a base when a **Known point** is not available at a jobsite.

In the Instrument profile, set **Start at known position** off:

Start at known position

When the **GNSS Base** configuration is **Accepted**:

GNSS rover GNSS base TPS

iBASE UHF Base ReadGPS

Base CHC - RTK - CHCIBASE BT - GNSS-3738992

iBASE APIS

Base CHC - RTK - CHCIBASE BT - GNSS-3738992

iBASE KNOWN Pos

Base CHC - RTK - CHCIBASE BT - GNSS-3738992

iBASE_ReadGPS

Base CHC - RTK - CHCIBASE NONE BT - GNSS-3738992

iBASE KNOWN POSITION 461_025 UHF

Base CHC - RTK - CHCIBASE BT - GNSS-3738992

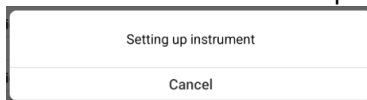
Cancel New Accept

The **GNSS static recording** dialog is shown:

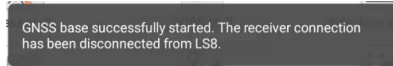
Start logging	<input checked="" type="checkbox"/>
Automatically log when the receiver is turned on	<input checked="" type="checkbox"/>
HCN	Open
RINEX	Close
Interval	5 S
Session duration (mins)	1440
Station name	3738992
Antenna height	5.906 USft
Antenna height measurement method	Vertical H
Elevation mask	5

Always enable Start logging. Enable HCN and optionally enable RINEX3. The interval must be 1, 5, 10, 15 or 30 (an even multiple of 30); 1 or 5 is best. Set the **Antenna height** to the actual value. Click **OK**.

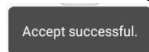
Wait while the Base receiver is setup:



The Base will be disconnected from the data collector:



Then the Base configuration will be confirmed:



Connect to the Rover

Connect LandStar to the Rover and survey points as needed. The coordinates of the surveyed points will not match 'real coordinates' as the Base is autonomous.

For this example, 3 points were stored:

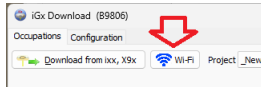
Points		Points to stake			
Name	North (N)[USft]	East (E)[USft]	Elevation[USft]	Description	Code
base_1	3490640.4313	2280597.6442	5670.496		
2002	3490640.4163	2280587.6239	5664.174		
2003	3490640.6593	2280577.7807	5664.092		
2004	3490640.6162	2280567.7655	5664.530		

Download the Base observation file, submit to OPUS

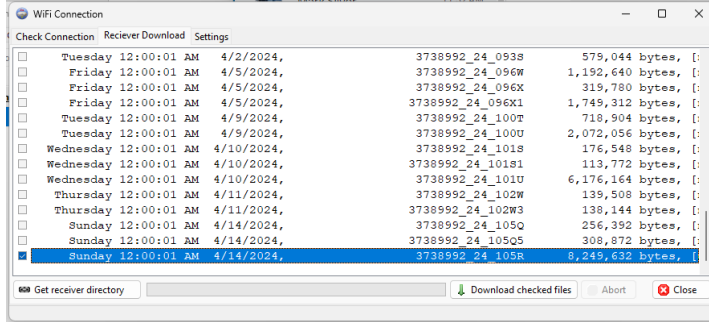
This video: <https://igage.com/LS8/LS8Training/videos/iGxWiFiDownload.htm> shows how to download observation files from the iBASE which is Wi-Fi connection only.



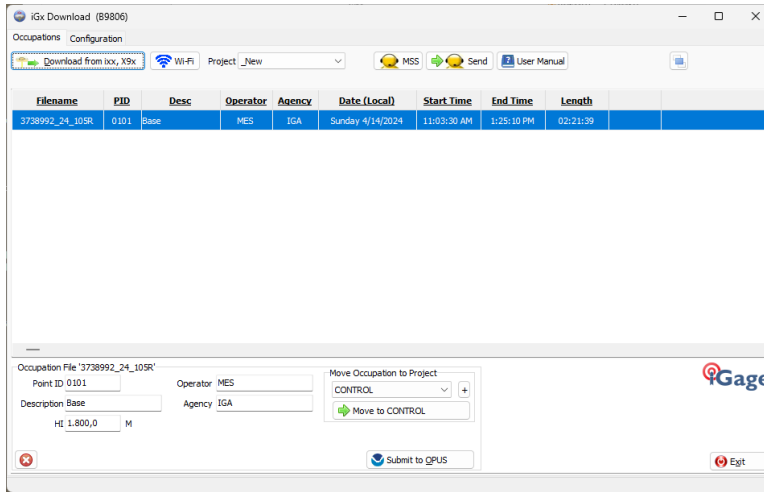
Click Wi-Fi:



Select the correct file:



Submit it to OPUS:



Eventually, you will get an OPUS return that looks similar to this:

```

SOFTWARE: page5 2008.25 master293.pl 160321      START: 2024/04/14 17:03:00
EPHEMERIS: igu23100.eph [ultra-rapid]           STOP: 2024/04/14 18:59:00
NAV FILE: brdc1050.24n                          OBS USED: 4872 / 5078 : 96%
ANT NAME: CHCIBASE      NONE                    # FIXED AMB: 27 / 33 : 82%
ARP HEIGHT: 1.8000      OVERALL RMS: 0.011(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000)        ITRF2014 (EPOCH:2024.2862)

      X:  -1587253.075(m)  0.013(m)      -1587254.065(m)  0.013(m)
      Y:  -4561958.080(m)  0.013(m)      -4561956.780(m)  0.013(m)
      Z:   4153963.894(m)  0.013(m)        4153963.767(m)  0.013(m)


LAT:  40 53  8.78719  0.004(m)      40 53  8.80325  0.004(m)
E LON: 250 48 56.00768  0.009(m)      250 48 55.94954  0.009(m)
W LON: 109 11  3.99232  0.009(m)      109 11  4.05046  0.009(m)
EL HGT:      1714.977(m)  0.021(m)      1714.212(m)  0.021(m)  5626.565 ft
ORTHO HGT:   1729.110(m)  0.083(m) [NAVD88 (Computed using GEOID18)] 5672.933 ft

      UTM COORDINATES      STATE PLANE COORDINATES
      UTM (Zone 12)        SPC (4301 UT N)
Northing (Y) [meters]    4527663.592      1063947.927
Easting (X) [meters]    652958.198      695128.241
Convergence [degrees]   1.18860833      1.52677500
Point Scale              0.99988797      0.99997701
Combined Factor          0.99961906      0.99970807

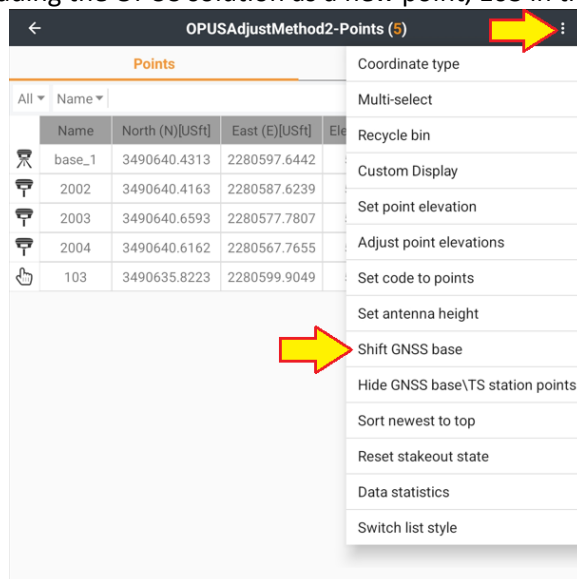
```

The NAD83 2011 2010.0 framed coordinates are boxed in green. Make a new point in the [Point list](#) reflecting these OPUS values:

Name	103
Code	<input type="text"/>
Type	Enter
Coordinate format	Local Lat/Lon (dd.mmssssss)
Local Lat	40.5308787190 N
Local Lon	109.1103992320 W
Local H (ellipsoid)	5626.554 USft
Description	<input type="text"/>

Hints: use the '-' minus sign to enter the longitude, notice the positions are entered and displayed as dd.mmssssss values if the Coordinate format is set to [Local Lat/Lon \(dd.mmssssss\)](#). When entering the ellipsoid elevation, enter "1714.977m" and LandStar will convert to feet. You can find the **M** key by clicking the  key if you have installed the Google keyboard Gboard.

After adding the OPUS solution as a new point, 103 in this case, click the [3-dot button](#):



Name	North (N)[USft]	East (E)[USft]	Elev
base_1	3490640.4313	2280597.6442	
2002	3490640.4163	2280587.6239	
2003	3490640.6593	2280577.7807	
2004	3490640.6162	2280567.7655	
103	3490635.8223	2280599.9049	

- Coordinate type
- Multi-select
- Recycle bin
- Custom Display
- Set point elevation
- Adjust point elevations
- Set code to points
- Set antenna height
- Shift GNSS base
- Hide GNSS base\TS station points
- Sort newest to top
- Reset stakeout state
- Data statistics
- Switch list style

then click on [Shift GNSS base](#).

The Shift GNSS base dialog will be shown:

The **GNSS base** will be prefilled with the last used base, use the drop arrow to select a different automatically generated base if needed. Set the **Antenna type** to match the base receiver. Set the **Antenna height** to match the HI of the Base receiver. These settings are needed to compute the Ground Mark elevation because the Base transmits the antenna L1 Phase center location without the HI or antenna type.

Click the **Accept** button at the bottom of the form.

Confirm the translation: **Yes**.

Click Yes to view the translation points:







Name	North (N)[USft]	East (E)[USft]	Elevation[USft]	Description	Code
base_1	3490635.8223	2280599.9049	5679.116		
2002	3490635.8073	2280589.8846	5672.794		
2003	3490636.0504	2280580.0414	5672.713		
2004	3490636.0072	2280570.0262	5673.151		
103	3490635.8223	2280599.9049	5672.918		

Notice that base_1 has been moved to match the OPUS solution point 103.

Clearing a Base translation

An accepted base translation can be cleared, and all dependent points returned to their unshifted coordinates.

Slide the translated base to the right:

All	Name					
	Name	North (N)[USft]	East (E)[USft]	Elevation[USft]	Description	Code
	base_1				5679.116	
	2003	3490635.8073	2280589.8846	5672.794		
	2004	3490636.0504	2280580.0414	5672.713		
	2004	3490636.0072	2280570.0262	5673.151		
	103	3490635.8223	2280599.9049	5672.918		

then click on the gray edit pencil button. The Base point attributes are shown:

← OPUSAadjustMethod2-Edit point

Name	base_1
Type	Base point
Coordinate format	WGS84 Lat/Lon/H ▼
Latitude (B)	40:53:08.833307 N
Longitude (L)	109:11:04.020144 W
H (ellipsoid H)	5624.132 USft
Antenna type	CHCIBASE
Measure to	Vertical H
Antenna height	5.906 USft
Clear	
N shift	-4.6090 USft
E shift	2.2607 USft
H shift	8.620 USft
Survey time	2024-04-15 18:48:47

Click the Clear button to zero out the N, E and H shifts. When you click on Save at the bottom of the dialog box, the dependent Points will revert to the original values.