

LandStar8 FAQ Series: OPUS Solution Adjustment

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

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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.

Start at known position Add the point to the point list.

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:

Start at known 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.

 \bigcirc

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.

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Both methods 1 and 2 are shown in detail below.

Method 1: Start at Known position

When st	arting 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	8

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:

Antenna type		
CHCIBASE		>
Antenna height		
5.906 USft		\rightarrow
Туре	Vertical H	⊖ Slant
Select point	:=	<u> 8</u> =
Name		Δ
101		6
Coordinate format		
WGS84 Lat/Lon/H		
WGS84 Lat		
40°53'08.833318" N		
dd.mmssssss		
WGS84 Lon		
109°11'04.020162" W		
dd.mmssssss		
WGS84 H (ellipsoid)		
5617.935 USπ		
Description		
VH = 5.9060 USft; Pos read from GPS		
Time		

3

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:





	Current accura waiti	cy exceed ng for bet	ls the preset to ter accuracy.	olerances,		
	Abort		Cont	inue	< Click C	ontinue
	⊕ H: 5.309 Single ∨: 6.370 1s	Meas 5s	IOs • Vertical H	20s O Slant H		
	Antenna height					
	No		Sta	art	< Wait	
			ок			
Click OK	:					
	S	etting up i	nstrument			

cancel 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:

÷		0	PUS_Adjust1-F	Points (5)	:
		Points		Poir	nts to stake
All 🔻	Name 🔻				
	Name	North (N)[USft]	East (E)[USft]	Elevation[USft]	Description
₹	101	3490640.4323	2280597.6428	5664.299	VH = 5.9060 USft; Pos rea
P	1002	3490640.4618	2280587.6296	5664.145	
Ŧ	1003	3490640.6337	2280577.8161	5664.077	
T	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: <u>https://igage.com/LS8/LS8Training/videos/iGxWiFiDowload.htm</u> shows how to download observation files from the iBASE which is Wi-Fi connection only.

Click Wi-Fi:

iGx Dow	nload (B9806)		
Occupations	Configuration	<u></u>	
Par Down	load from ixx, X9x	😤 Wi-Fi	Project



Select the correct file:

Ch	l. Constantion	Reciever Download	Cattle as				
Lnec	k Connection	Receiver Download	settings				
	Tuesd	ay 12:00:01 AM	1 4/2/2024,	3738992_24_0938	579,044	bytes,	0
	Frid	ay 12:00:01 AM	4/5/2024,	3738992_24_096W	1,192,640	bytes,	[
	Frid	ay 12:00:01 AM	1 4/5/2024,	3738992_24_096X	319,780	bytes,	[
	Frid	ay 12:00:01 AM	1 4/5/2024,	3738992_24_096x1	1,749,312	bytes,	I
	Tuesd	ay 12:00:01 AM	1 4/9/2024,	3738992_24_100T	718,904	bytes,	[
	Tuesd	ay 12:00:01 AM	4/9/2024,	3738992_24_100U	2,072,056	bytes,	I
	Wednesd	ay 12:00:01 AM	4/10/2024,	3738992_24_1018	176,548	bytes,	I
	Wednesd	ay 12:00:01 AM	4/10/2024,	3738992 24 101s1	113,772	bytes,	[
	Wednesd	ay 12:00:01 AM	4/10/2024,	3738992 24 101U	6,176,164	bytes,	ſ
	Thursd	ay 12:00:01 AM	1 4/11/2024,	3738992 24 102W	139,508	bytes,	E
	Thursd	ay 12:00:01 AM	1 4/11/2024,	3738992 24 102W3	138,144	bytes,	E
	Sund	ay 12:00:01 AM	1 4/14/2024,	3738992 24 1050	256,392	bytes,	E
	Sund	av 12:00:01 AM	4/14/2024,	3738992 24 10505	308,872	bytes,	Ē
	Sund	ay 12:00:01 AM	4/14/2024,	3738992 24 105R	8,249,632	bytes,	1
63	Get receiver din	ectory		L Download checke	d files Abort	🔀 Cli	ose

Submit it to OPUS:

Download from	n ixx, X9x	🛜 Wi-Fi	Project _New		🗸 📃 😡	ss 🗼 👥 Ser	nd 🔝 User M	anual			
Filename	PID	Desc	Operator	Agency	Date (Local)	Start Time	End Time	Length			
38992_24_105R	0101	Base	MES	IGA	Sunday 4/14/2024	11:03:30 AM	1:25:10 PM	02:21:39			
-											
	1992_24_10				Move Occupation to 1	Project	1			<u>@</u>	
– upation File '3738 Point ID 0101	1992_24_10	SR' Operato	r MES		Move Occupation to A	Project]			ଙ୍କିତ୍ୱ	aį
– upation File '3738 Point ID 0101 scription Base	1992_24_10	SR' Operato Agenc	r MES		Move Occupation to F	roject				ଡ଼ିଙ୍କ	aį
	1992_24_10	SR' Operato Agenc	r MES y IGA		Move Occupation to I CONTROL	Project			 	ଡ଼ିଙ୍କ	aį

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

SOFTWARE: EPHEMERIS: NAV FILE: ANT NAME: ARP HEIGHT:	page5 2008.25 ma: igu23100.eph [ultr brdc1050.24n CHCIBASE NG 1.8000	ster293.pl 160 ra-rapid] DNE	0321 START: STOP: OBS USED: # FIXED AMB: OVERALL RMS:	2024/04/14 2024/04/14 4872 / 5 27 / 0.011(m)	4 17:03:00 4 18:59:00 5078 : 90 33 : 83	5% 2%
REF FRAME:	NAD_83(2011)(EPOCH	H:2010.0000)	ITRF	2014 (EPOC	CH:2024.286	2)
×٠	-1587253 075()	m) 0.013(m)	-158725	54 065(m)	0 013(m)	
Y:	-4561958.080(m) $0.013(m)$	-456195	6.780(m)	0.013(m)	
Ζ:	4153963.894(1	m) 0.013(m)	415396	3.767(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(1	m) 0.021(m)	171	4.212(m)	0.021(m)	5626.565 ft
ORTHO HGT:	1729.110(	m) 0.083(m)	[NAVD88 (Compute	ed using GB	EOID18)]	5672.933 ft
	UTM CO	OORDINATES (Zone 12)	STATE PLANE COOR SPC (4301 UT	DINATES		
Northing (Y)	[meters] 452	7663.592	1063947.927			
Easting (X)	[meters] 652	2958.198	695128.241			
Convergence	[degrees] 1.3	18860833	1.52677500			
Point Scale	0.9	99988797	0.99997701			
Combined Fac	tor 0.9	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		$\rightarrow$
Туре	Enter	~
Coordinate format	Local Lat/Lon (dd.mmssssss)	~
Local Lat	40.5308787190 N	
Local Lon	109.1103992320 W	٢
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.mmsssssss 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,

I GNSS point	≣	8
Latitude (B)		
40°53'08.833318" N		
dd.mmssssss		
Longitude (L)		
109°11'04.020162" W		
dd.mmssssss		
H (ellipsoid H)		
5617.935 USft		
I 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  $\Xi$ .

If the desired **Base point** is not listed in the **Point list**, change the filter:



to All.



Recall the OPUS solution point, 102 in this case, as the Known point from the Point list  $\Xi$ .

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 sh	ift parameters?
No	Yes

#### click Yes, then

GNSS Base 101 and depe open p	ndent points were shifted, points?
No	Yes

click Yes to view the updated point list:

All	r Name ▼				
	Name	North (N)[USft]	East (E)[USft]	Elevation[USft]	Description
烹	101	3490635.8223	2280599.9049	5672.983	VH = 5.9060 USft; Pos rea
<b>P</b>	1002	3490635.8518	2280589.8917	5672.829	
7	1003	3490636.0237	2280580.0782	5672.761	
<b>न</b>	1004	3490635.9891	2280570.0689	5673.190	
6	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**:

O GNS	SS rover	GNSS base	() TPS	
R Base	iBASE UHF Base Re CHC - RTK - CHCIBASE BT - GNSS-3738992	adGPS	¢	9
R Base	iBASE APIS CHC - RTK - CHCIBASE BT - GNSS-3738992		(	С
R Base	iBASE KNOWN Pos CHC - RTK - CHCIBASE BT - GNSS-3738992	:	(	С
R Base	iBASE_ReadGPS CHC - RTK - CHCI89 N BT - GNSS-3738992	ONE	(	С
Base	iBASE KNOWN POS CHC - RTK - CHCIBASE BT - GNSS-3738992	BITION 461_025 UHF	(	С
	Cancel	New	Accept	



### The GNSS static recording dialog is shown:

Start logging	
Automatically log when the receiver is turned on	
HCN	
Open	$\sim$
RINEX	
Close	~
Interval	
5 S	~
Session duration (mins)	
1440	
Station name	
3738992	
Antenna height	
5.906 USft	
Antenna height measurement method	
Vertical H	$\checkmark$
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:

Setting up instrument	
Cancel	

The Base will be disconnected from the data collector:

GNSS base successfully started. The receiver connection has been disconnected from LS8.

Then the Base configuration will be confirmed:

Accept successful.

## 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		Poin	its to stake		
All 🔻	Name 🔻						
	Name	North (N)[USft]	East (E)[USft]	Elevation[USft]	Description	Code	
累	base_1	3490640.4313	2280597.6442	5670.496			
<b>T</b>	2002	3490640.4163	2280587.6239	5664.174			
<b>T</b>	2003	3490640.6593	2280577.7807	5664.092			
<b>T</b>	2004	3490640.6162	2280567.7655	5664.530			

## Download the Base observation file, submit to OPUS

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



### Click Wi-Fi:



## Select the correct file:

-								-
	Tuesday :	12:00:01	АМ	4/2/2024,	3738992_24_0938	579,044	bytes,	- D
	Friday 3	12:00:01	AM	4/5/2024,	3738992_24_096W	1,192,640	bytes,	- D
	Friday 1	12:00:01	AM	4/5/2024,	3738992_24_096x	319,780	bytes,	- ()
	Friday 3	12:00:01	AM	4/5/2024,	3738992_24_096x1	1,749,312	bytes,	Ð
	Tuesday 1	12:00:01	AM	4/9/2024,	3738992_24_100T	718,904	bytes,	Ð
	Tuesday 1	12:00:01	AM	4/9/2024,	3738992_24_100U	2,072,056	bytes,	- [:
	Wednesday 1	12:00:01	AM	4/10/2024,	3738992_24_1018	176,548	bytes,	Ð
	Wednesday :	12:00:01	AM	4/10/2024,	3738992_24_101s1	113,772	bytes,	Ð
	Wednesday :	12:00:01	AM	4/10/2024,	3738992_24_101U	6,176,164	bytes,	- ()
	Thursday 1	12:00:01	AM	4/11/2024,	3738992_24_102W	139,508	bytes,	Ð
	Thursday :	12:00:01	AM	4/11/2024,	3738992_24_102w3	138,144	bytes,	Ð
	Sunday :	12:00:01	AM	4/14/2024,	3738992_24_105Q	256,392	bytes,	- [:
	Sunday :	12:00:01	AM	4/14/2024,	3738992_24_105Q5	308,872	bytes,	- D
<b>V</b>	Sunday 1	12:00:01		4/14/2024,	3738992 24 105R	8,249,632	bytes,	T

## Submit it to OPUS:

ccupations Config	ration										
Download fro	n ixx, X9x	🛜 Wi-Fi 🛛 F	roject _New		<u>(</u>	🔰 MSS 🛛 🔿 👥 Se	nd 🔝 User N	anual			
Filename	PID	Desc	Operator	Agency	Date (Local	Start Time	End Time	Length			
738992_24_105R	0101	Base	MES	IGA	Sunday 4/14/20	24 11:03:30 AM	1:25:10 PM	02:21:39			
_											
	3992_24_10	5R'			Move Occupatio	n to Project	]			<u>@</u>	
	3992_24_10	SR' Operator	MES		Move Occupatio	n to Project				ଡ଼ିକ୍ତ	ag
	3992_24_10	SR' Operator Agency	MES IGA		Move Occupatio CONTROL	n to Project				<mark>ଡ଼</mark> େ	ag
cupation File '373 Point ID 0101 Escription Base HI 1.800,0	3992_24_10	SR' Operator Agency	MES IGA		Move Occupatio CONTROL	n to Project				ଡ଼ିକ୍ତ	ag

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

SOFTWARE: EPHEMERIS: NAV FILE: ANT NAME: ARP HEIGHT:	page5 2008.25 u igu23100.eph [u brdc1050.24n CHCIBASE 1.8000	master293.pl 160 ltra-rapid] NONE	0321 START: STOP: OBS USED: # FIXED AMB: OVERALL RMS:	2024/04/1 2024/04/1 4872 / 27 / 0.011(m)	4 17:03:00 4 18:59:00 5078 : 90 33 : 83	5% 2%
REF FRAME:	NAD_83(2011)(EP	OCH:2010.0000)	ITR	RF2014 (EPO	CH:2024.286	2)
Х:	-1587253.07	5(m) 0.013(m)	-15872	254.065(m)	0.013(m)	
Y:	-4561958.08	0(m) 0.013(m)	-45619	956.780(m)	0.013(m)	
Ζ:	4153963.894	4(m) 0.013(m)	41539	63.767(m)	0.013(m)	
LAT:	40 53 8.7871	9 0.004(m)	40 53 8	8.80325	0.004(m)	
E LON:	250 48 56.0076	8 0.009(m)	250 48 55	.94954	0.009(m)	
W LON:	109 11 3.9923	20.009(m)	109 11 4	1.05046	0.009(m)	
EL HGT:	1714.97	7(m) 0.021(m)	17	714.212(m)	0.021(m)	5626.565 ft
ORTHO HGT:	1729.11	0(m) 0.083(m)	[NAVD88 (Comput	ed using G	EOID18)]	5672.933 ft
	MTU TU	COORDINATES M (Zone 12)	STATE PLANE COO SPC (4301 U	ORDINATES JT N)		
Northing (Y)	[meters] 4	527663.592	1063947.927	7		
Easting (X)	[meters]	652958.198	695128.241	L		
Convergence	[degrees]	1.18860833	1.52677500	)		
Point Scale	(	0.99988797	0.99997701	L		
Combined Fac	tor	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		>
Туре	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		

Hints: use the '-' minus sign to enter the longitude, notice the positions are entered and displayed as dd.mmsssssss 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.

After adding the OPUS solution as a new point, 103 in this case, click the **3-dot button**:

		Points			Coordinate type
All 🔻	Name 🔻				Multi-select
	Name	North (N)[USft]	East (E)[USft]	Ele	Recycle bin
R	base_1	3490640.4313	2280597.6442	-	Custom Display
7	2002	3490640.4163	2280587.6239	÷	
7	2003	3490640.6593	2280577.7807		Set point elevation
7	2004	3490640.6162	2280567.7655		Adjust point elevations
5	103	3490635.8223	2280599.9049		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:

← OPUSAdjustMethod2-Shift GNSS base			
Parameters			
GNSS base			
base_1			$\sim$
Antenna type			
CHCIBASE			>
Antenna height			
5.906			ĨI
Known point (103)	CAD	凸	≔
Coordinate format			
Local N/E/Elev (Projection grid)			$\sim$
North (N)			
3490635.8223 USft			
East (E)			
2280599.9049 USft			
Elevation			
5672.918 USft			

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.

N Shift:-4.6090 USft E Shift:2.2607 USft Elev Shift:8.620 USft The coordinates of all points under the base base_1 will be updated,continue?	
No	Yes

Confirm the translation: Yes.

GNSS Base base_1 and o shift open po	GNSS Base base_1 and dependent points were shifted, open points?	
No	Yes	

Click Yes to view the translation points:

÷		OPUSAdjustMethod2-Points (5)				
All 🖣	Name 🔻					
	Name	North (N)[USft]	East (E)[USft]	Elevation[USft]	Description	Code
累	base_1	3490635.8223	2280599.9049	5679.116		
<b>T</b>	2002	3490635.8073	2280589.8846	5672.794		
<b>T</b>	2003	3490636.0504	2280580.0414	5672.713		
Ŧ	2004	3490636.0072	2280570.0262	5673.151		
$\mathbb{C}$	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

All *	Name 🔻					
	Name	North (N)[USft]	East (E)[USft]	Elevation[USft]	Description	Code
<b>8</b>	/ 5	k base_1 3			5679.116	
<b>न</b>	$\sim$	3490635.8073	2280589.8846	5672.794		
<b>P</b>	2003	3490636.0504	2280580.0414	5672.713		
<b>P</b>	2004	3490636.0072	2280570.0262	5673.151		
6	103	3490635.8223	2280599.9049	5672.918		

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

÷	OPUSAdjustMethod2-Edit point
Name	base_1
Туре	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.